



2023 Annual Groundwater Monitoring Report and Corrective Action Report and Semi-Annual Remedy Selection and Design Progress Report

for Compliance with the Coal Combustion
Residuals (CCR) Rule

Erickson Station

Lansing Board of Water & Light

January 30, 2024





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Summary of 40 CFR Section § 257.90(e)(6) Groundwater Monitoring System Requirements and Site-Specific Compliance at Erickson Station		
40 CFR Section § 257.90(e)(6) Requirement		CCR Impoundments Status
§ 257.90(e)(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:		
§257.90(e)(6)(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.	Assessment Monitoring Program and Evaluation of Potential Remedies
§257.90(e)(6)(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.	Assessment Monitoring Program and Evaluation of Potential Remedies
§257.90(e)(6)(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):	Yes
§257.90(e)(6)(iii)(A)	Identify those constituents listed in appendix III to this part and the names of the monitoring wells associated with such an increase. (These SSIs are from the original triggering event.)	<ul style="list-style-type: none"> • MW-2 – boron, calcium, chloride, sulfate, total dissolved solids (TDS) • MW-5 – boron, calcium, sulfate, TDS • MW-6 - boron, sulfate, TDS
§257.90(e)(6)(iii)(B)	Provide the date when the assessment monitoring program was initiated for the CCR unit.	November 19, 2020
§257.90(e)(6)(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:	Yes
§257.90(e)(6)(iv)(A)	Identify those constituents listed in appendix IV to this part and the names of the monitoring wells associated with such an increase. (These are SSLs through 2023)	<ul style="list-style-type: none"> • MW-2 – lithium • MW-5 – lithium • MW-6 – lithium • MW-7 – lithium and molybdenum • MW-7C – lithium and molybdenum • MW-14 – lithium
§257.90(e)(6)(iv)(B)	Provide the date when the assessment of corrective measures was initiated for the CCR unit.	November 23, 2020
§257.90(e)(6)(iv)(C)	Provide the date when the public meeting was held for the assessment of corrective measures for the CCR unit.	Required 30 days prior to remedy selection
§257.90(e)(6)(iv)(D)	Provide the date when the assessment of corrective measures was completed for the CCR unit.	October 1, 2021
§257.90(e)(6)(v)	Whether a remedy was selected pursuant to § 257.97 during the current annual reporting period, and if so, the date of remedy selection.	Evaluation of potential remedies ongoing
§257.90(e)(6)(vi)	(vi) Whether remedial activities were initiated or are ongoing pursuant to § 257.98 during the current annual reporting period.	Evaluation of potential remedies ongoing

1.0 Introduction

The U.S. Environmental Protection Agency's (EPA) final Coal Combustion Residuals (CCR) Rule 40 CFR §257 establishes a comprehensive set of requirements for the management and disposal of CCR (or coal ash) in surface impoundments by electric utilities. Erickson Power Station (Erickson or Site), located in Delta Township, Michigan is owned and operated by Lansing Board of Water & Light (BWL) (**Figure 1**). Erickson has three CCR impoundments subject to the CCR Rule: the Forebay, Retention Basin, and Clear Water Pond (CWP) (**Figure 2**). The three CCR impoundments are currently inactive.

In 2019, BWL completed a hydrogeologic characterization study in order to develop a certified groundwater monitoring network, BWL installed monitoring wells that were sampled for CCR constituents of interest (COIs) background water quality between 2019 and 2020 background threshold values (BTVs) were developed. Detection monitoring was completed in October 2020 and statistically significant increases (SSIs) of constituents of interest (COIs) over BTVs were identified (CCR Rule Part §257.94). The initial assessment monitoring event was in November 2020, and statistically significant levels (SSL) of COIs were observed over groundwater protection standards (GPS). The SSL over GPS triggered the assessment of corrective measures and BWL completed the Assessment of Corrective Measures (ACM) on October 1, 2021. This Annual Groundwater Monitoring Report presents the sampling and analysis completed in 2023:

- The status of the groundwater monitoring program for the ash impoundment multi-unit at the end of 2023 is assessment monitoring, and evaluation of potential remedies.

2.0 Facility Description

Erickson Power Station (Erickson or Site) is an electrical power generation facility located at 3725 South Canal Road in Delta Township, Eaton County, Michigan owned and operated by Lansing Board of Water & Light (BWL) (**Figure 1**). Erickson was retired from operations on November 27, 2022. During active operations, a single coal-fired generator was capable of producing 165 megawatts of electricity and CCR was stored in dewatering tanks (hydro-bins). After the majority of the CCR was removed from the waste stream at the hydro-bins, flow was discharged into three CCR impoundments in sequence: the Forebay, Retention Basin, and Clear Water Pond (CWP) (**Figure 2**). The plant pipelines were washed down and CCR waste disposal ceased to the CCR impoundments on December 29, 2022. The non-CCR stormwater flows to the impoundments ceased January 3, 2023. A CCR removal contractor was selected and mobilized to the site in February 2023 to begin dewatering operations for the three impoundments. The water removed from the ponds was treated onsite, monitored, and discharged into nearby Lake Delta in compliance with a NPDES permit. Ash and liner material was removed and transported to Granger Wood Street Landfill.

The operation and monitoring of the CCR unit are described further in the Erickson Station Groundwater Monitoring System Certification (HDR, 2020).



Figure 1. Vicinity Map for Erickson Station



ERICKSON POWER STATION
EATON COUNTY, MICHIGAN

Figure 2. Erickson Station Facility Layout

2.1 Impoundment Closure Status

The CCR Impoundments Closure Work Plan for removal of CCR was completed in April 2022 and approved by EGLE on January 17, 2023, with the intent to later submit an amendment associated with the closure verification objectives or thresholds. Additional ash sampling and analysis was completed, and a Closure Work Plan Amendment was submitted to EGLE on May 2, 2023. The Closure Work Plan Amendment further detailed closure objectives and included the ash analytical data as well as the microscopy verification thresholds. Nine ash samples (three each from the Forebay, Retention Basin, and CWP) were collected and submitted for analysis. The microscopy verification thresholds were determined based on a ratio of CCR to native material that would reduce the expected concentration of the constituent to less than that of the established cleanup criteria.

BWL performed a site-specific background soil study as part of the development of the Closure Work Plan, approved by EGLE on January 17, 2023. Also conditional to this approval was the expansion of the Soil Background Study. BWL performed additional background soil sampling, analysis, and statistics to refine the established-site specific soil background values, and a revised Soil Background Study was submitted to EGLE on April 25, 2023. EGLE returned comments to BWL regarding the Soil Background Study and the Closure Work Plan Amendment on June 28, 2023. These comments were addressed and a final version of the Soil Background Study and Closure Work Plan Amendment was returned to EGLE for approval on July 21, 2023.

The CCR removal contractor was selected and mobilized to the site in February 2023 to begin dewatering operations from the three impoundments. The water removed from the impoundments was treated on site, monitored, and discharged into nearby Lake Delta in compliance with an NPDES permit. Initial CCR dewatering efforts and ash and liner material removal commenced and was completed in May 2023. Subsequent precipitation dewatering took place intermittently to collect dry verification samples. Solid waste material was disposed of at Granger Wood Street Landfill. Through mid-November 2023, approximately 64,000 cubic yards of material (ash, liner, and CCR impacted riprap) have been removed and disposed of offsite from the three impoundments.

Verification was completed through visual, photographic, and soil sampling and laboratory analytical testing. Visual verification was completed in August 2023. Sampling was completed for the CWP in July 2023. Multiple samples were collected for the Forebay and Retention Basin throughout July to December 2023 as analytical results indicated exceedances above established closure criteria. Analytical verification results were statistically analyzed and exceedances were found for arsenic and boron for the Retention Basin and boron and molybdenum for the Forebay; however, microscopy results were below 3% CCR (microscopy closure criteria 7% CCR) for the Forebay and Retention Basin. BWL has coordinated with EGLE regarding the next steps for verification. Ash removal verification efforts for the Forebay, Retention Basin, and CWP are expected to be completed in February 2024.

HDR previously performed stability and seepage analyses at two selected cross-sections along the embankment of the Retention Basin and Clear Water Pond. The results of the previous analyses determined that the factor of safety for seepage was not adequate for the Retention Basin

embankment. HDR subsequently installed two piezometers, RBPZ-1 and RBPZ-2 to further refine the seepage analysis. Data obtained indicates that at the Retention Basin, the upward gradient and heave potential at the toe of the embankment meet the minimum required factor of safety, and additional work to stabilize the embankment was not necessary. Daily monitoring of the embankments adjacent to Lake Delta will continue through the duration of the project.

2.2 Hydrogeology

The three CCR impoundments at Erickson Power Station are in areas underlain with unconsolidated clay, silt, sand, and gravel of glacial origin which rest upon approximately 10,000 feet of consolidated bedrock sediments composed of limestone, shale, siltstone, sandstone, salt, and gypsum. Depth to the uppermost aquifer under the impoundments is determined to be approximately 6 to 20 feet below surface. Given the bedrock surface between 36 and 61 feet below surface, the upper glacial aquifer thickness at the site is approximately between 16 and 47 feet thick. The groundwater flow direction is east directly under the impoundments and remains similar flow direction throughout the year (**Appendix A**). Recently collected data from newly installed wells MW-16A, MW-16B, and MW-16C, located on the east side of the wetlands near Creytes Road, indicate that groundwater further east of the wetlands on the Erickson eastern property boundary flows west, back towards the BWL property, indicating the glacial aquifer groundwater flow direction under the wetlands on the east side of Erickson is to the north, which is consistent with the Carrier Creek Subwatershed that shows the surface water flow to the north following Carrier Creek. Groundwater flow direction typically mimics surface water flow. Additional information detailing the groundwater flow direction at Erickson Power Station may be found in **Section 4.1**.

2.3 Monitoring Well Network

For monitoring in 2023, the certified monitoring system for the ash impoundments includes the following wells (**Figure 3**):

- Glacial background (upgradient) wells: MW-1, MW-4, MW-11, and MW-12.
- Glacial waste boundary compliance wells: MW-2, MW-5, MW-6, and MW-14.

2.3.1 Additional Wells

The certified groundwater monitoring system includes additional wells installed to evaluate groundwater further downgradient of the impoundments in response to identification of concentrations of constituents at statistically significant levels (SSLs) over groundwater protection standards in the impoundment compliance wells (**Figure 3**):

- Glacial downgradient wells to evaluate extent of GPS exceedances: MW-7, MW-7C, MW-8, MW-9, MW-10, MW-13, MW-15, MW-16A, MW-16B, MW-100A, MW-100B
- Bedrock background (upgradient) wells: MW-11B, MW-12B
- Bedrock downgradient wells: MW-7B, MW-16C, MW-16D, MW-100C, and MW-100D

Ten of these wells (MW-14, MW-15, MW-16A, MW-16B, MW-16C, MW-16D, MW-100A, MW-100B, MW-100C, and MW-100D) were installed in 2023. Additional details regarding the



construction of these wells can be found in the revision to the Monitoring Well Installation Report, completed by HDR on October 24, 2023.

Table 1. Construction Details for Wells Installed in 2023

Well	Screen Elevation	Aquifer	Screen Lithology
MW-14	857-867	Glacial	Sand and sandy lean clay
MW-15	862-872	Glacial	Sandy lean clay, sand, and silt
MW-16A	857-867	Glacial	Lean clay with sand
MW-16B	835-845	Glacial	Silt
MW-16C	811-821	Bedrock	Shale (40%) and sandstone (60%)
MW-16D	752-762	Bedrock	Shale (100%)
MW-100A	845-855	Glacial	Clayey sand and sandy silt
MW-100B	829-839	Glacial	Silt with sand and clayey sand
MW-100C	814-824	Bedrock	Shale (90%) and sandstone (10%)
MW-100D	756-766	Bedrock	Shale (100%)

No wells were repaired or abandoned in 2023.

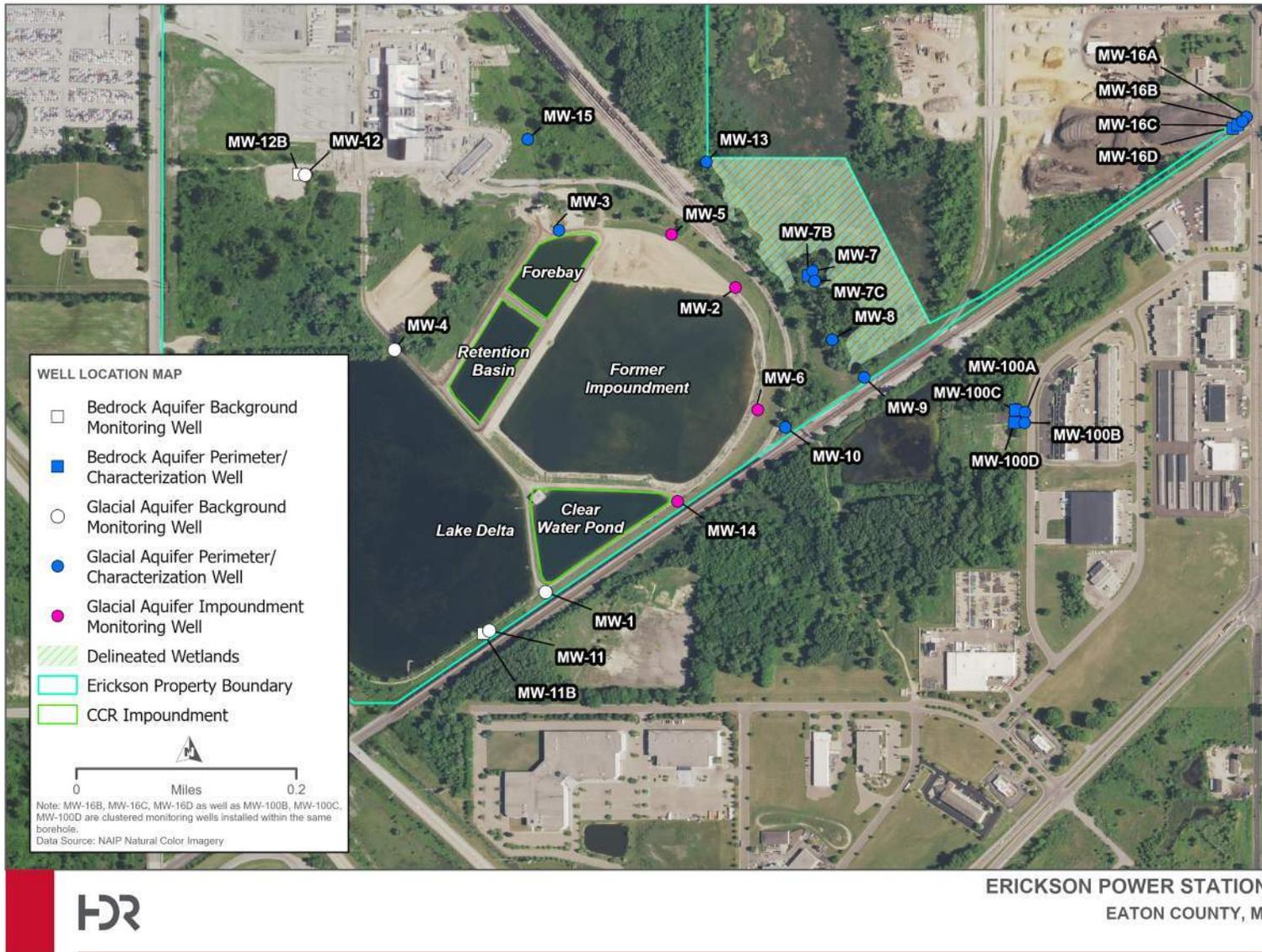


Figure 3. Erickson Station CCR Units and Monitoring Wells

3.0 Monitoring

3.1 Groundwater

3.1.1 Frequency

The assessment monitoring schedule for the Federal groundwater compliance monitoring program was shifted to coincide with the State program and assessment monitoring occurred in February and August 2022. **Error! Reference source not found.** provides the well identification number, well location, the dates the samples were collected, and whether the sample was required by the CCR Rule for the background sampling, detection monitoring or assessment monitoring.

In 2023, ten new monitoring wells were installed. Each time new wells are installed they are developed and sampled. Wells are sampled at a 5-week frequency to establish background as quickly as practicable in each well per §257.94(b). In 2023, background sampling was completed for wells MW-14, MW-15, MW-16A, MW-16B, MW-16C, and MW-16D. Samples will continue to be collected for wells MW-100A, MW-100B, MW-100C, and MW-100D until eight sampling events are achieved, at which time sampling will continue on a semiannual basis or as needed for additional investigative efforts. To date, six sampling events have been completed for the wells within the MW-100 well series.

Additional 2023 sampling events for groundwater included five (5) private well sampling efforts at the request of homeowners. Data from these events were provided to those homeowners.



Table 2. Dates of Groundwater Samples Collected for each Well in 2023 and the Required Monitoring Programs for the Erickson Impoundments (§257.90(e)(3))

Monitoring Well I.D.	Well Location	Aquifer Monitored	Dates Monitored	Monitoring Purpose
MW-1	Background/Upgradient	Glacial	February 7, 2023 August 1, 2023	Assessment Monitoring
MW-2	Downgradient	Glacial	February 7, 2023	Assessment Monitoring
			August 1, 2023, 2023	Assessment Monitoring
MW-3	Cross-Gradient	Glacial	February 7, 2023 August 1, 2023	Assessment Monitoring
MW-4	Background/Upgradient	Glacial	February 7, 2023 August 1, 2023	Assessment Monitoring
MW-5	Downgradient	Glacial	February 7, 2023 August 1, 2023	Assessment Monitoring
MW-6	Downgradient	Glacial	February 7, 2023 August 1, 2023	Assessment Monitoring
MW-7	Downgradient	Glacial	February 8, 2023	Assessment Monitoring
			August 2, 2023	Assessment Monitoring
MW-7B	Downgradient	Bedrock	February 8, 2023	Assessment Monitoring
			August 2, 2023	Assessment Monitoring
MW-7C	Downgradient	Glacial	February 8, 2023	Assessment Monitoring
			August 2, 2023	Assessment Monitoring
MW-8	Downgradient	Glacial	February 8, 2023 August 2, 2023	Assessment Monitoring
MW-9	Downgradient	Glacial	February 8, 2023 August 2, 2023	Assessment Monitoring
MW-10	Downgradient	Glacial	February 8, 2023 August 2, 2023	Assessment Monitoring
MW-11	Background/Upgradient	Glacial	February 9, 2023	Assessment Monitoring
			August 3, 2023	Assessment Monitoring
MW-11B	Background/Upgradient	Bedrock	February 9, 2023	Assessment Monitoring
			August 3, 2023	Assessment Monitoring
MW-12	Background/Upgradient	Glacial	February 9, 2023	Assessment Monitoring
			August 3, 2023	Assessment Monitoring
MW-12B	Background/Upgradient	Bedrock	February 9, 2023	Assessment Monitoring
			August 3, 2023	Assessment Monitoring
MW-13	Downgradient	Glacial	February 8, 2023 August 2, 2023	Assessment Monitoring



Monitoring Well I.D.	Well Location	Aquifer Monitored	Dates Monitored	Monitoring Purpose
MW-14 (installed January 9, 2023)	Downgradient	Glacial	January 12, 2023	Background Monitoring
			February 17, 2023	Background Monitoring / Assessment Monitoring
			March 24, 2023 April 28, 2023 June 2, 2023 July 7, 2023	Background Monitoring
			August 11, 2023	Background Monitoring / Assessment Monitoring
			September 15, 2023	Background Monitoring
MW-15 (installed January 9, 2023)	Downgradient	Glacial	January 12, 2023	Background Monitoring
			February 17, 2023	Background Monitoring / Assessment Monitoring
			March 24, 2023 April 28, 2023 June 2, 2023 July 7, 2023	Background Monitoring
			August 11, 2023	Background Monitoring / Assessment Monitoring
			September 15, 2023	Background Monitoring
MW-16A (installed January 25, 2023)	Downgradient	Glacial	February 2, 2023	Background Monitoring / Assessment Monitoring
			March 21, 2023 April 25, 2023 May 30, 2023 July 5, 2023	Background Monitoring
			August 8, 2023	Background Monitoring / Assessment Monitoring
			September 12, 2023 October 17, 2023 November 21, 2023	Background Monitoring
MW-16B (installed January 25, 2023)	Downgradient	Glacial	February 2, 2023	Background Monitoring / Assessment Monitoring
			March 21, 2023 April 25, 2023 May 30, 2023 July 5, 2023	Background Monitoring
			August 8, 2023	Background Monitoring / Assessment Monitoring
			September 12, 2023 October 17, 2023 November 21, 2023	Background Monitoring
MW-16C (installed January 25, 2023)	Downgradient	Bedrock	February 2, 2023	Background Monitoring / Assessment Monitoring
			March 2023 April 25, 2023 May 30, 2023 July 5, 2023	Background Monitoring
			August 8, 2023	Background Monitoring and Assessment Monitoring
			September 12, 2023 October 17, 2023 November 21, 2023	Background Monitoring



Monitoring Well I.D.	Well Location	Aquifer Monitored	Dates Monitored	Monitoring Purpose
MW-16D (installed January 25, 2023)	Downgradient	Bedrock	February 2, 2023	Background Monitoring / Assessment Monitoring
			March 21, 2023 April 25, 2023 May 30, 2023 July 5, 2023	Background Monitoring
			August 8, 2023	Background Monitoring / Assessment Monitoring
			September 12, 2023 October 17, 2023 November 21, 2023	Background Monitoring
MW-100A (installed May 15, 2023)	Downgradient	Glacial	June 5, 2023 July 10, 2023	Background Monitoring
			August 14, 2023	Background Monitoring / Assessment Monitoring
			September 18, 2023 October 23, 2023 November 27, 2023	Background Monitoring
MW-100B (installed May 15, 2023)	Downgradient	Glacial	June 5, 2023 July 10, 2023	Background Monitoring
			August 14, 2023	Background Monitoring / Assessment Monitoring
			September 18, 2023 October 23, 2023 November 27, 2023	Background Monitoring
MW-100C (installed May 15, 2023)	Downgradient	Bedrock	June 5, 2023 July 10, 2023	Background Monitoring
			August 14, 2023	Background Monitoring / Assessment Monitoring
			September 18, 2023 October 23, 2023 November 27, 2023	Background Monitoring
MW-100D (installed May 15, 2023)	Downgradient	Bedrock	June 5, 2023 July 10, 2023	Background Monitoring
			August 14, 2023	Background Monitoring / Assessment Monitoring
			September 18, 2023 October 23, 2023 November 27, 2023	Background Monitoring

3.1.2 Water Levels and Sample Collection

Water levels were collected in each well following the Groundwater Level Monitoring Standard Operating Procedure (SOP) (HDR, 2019). Water levels were measured before purging of the wells began.

Wells were purged with a peristaltic pump until field parameters (pH, turbidity, conductivity, dissolved oxygen, temperature, and oxidation reduction potential) stabilized. The results of field measurements were recorded on a field data form, which is maintained as part of the field records. After field parameters stabilized, samples were collected and tested for the parameters listed in **Table 3**. For quality control, one field duplicate sample was collected during each sample event. Water samples were delivered under Chain of Custody to Merit Laboratories in East Lansing, Michigan.



3.1.3 Analytical Testing

Groundwater samples for each type of monitoring were analyzed for the COIs shown in **Table 3**. Background monitoring analyses included the parameters in Appendices III and IV of CCR Rule Part 257, plus TSS. Assessment monitoring and background monitoring samples are analyzed for all Appendix III and IV COIs plus the additional metals required under the State monitoring program (copper, iron, nickel, silver, vanadium, and zinc). The laboratory analyzed matrix spike/matrix spike duplicates at a rate of 5 percent, per laboratory quality control procedures.



Table 3. Constituents of Interest

Appendix III Constituents	Appendix IV Constituents
Boron	Antimony
Calcium	Arsenic
Chloride	Barium
Fluoride	Beryllium
pH	Cadmium
Sulfate	Chromium
Total Dissolved Solids (TDS)	Cobalt
Additional Parameters	Fluoride
Total Suspended Solids (TSS)	Lead
Copper*	Lithium
Iron*	Mercury
Nickel*	Molybdenum
Silver*	Selenium
Vanadium*	Thallium
Zinc*	Radium 226 and 228 combined

*State monitoring program requirement

3.1.4 Data Validation and Data Management

Data validation and data management tasks were performed per the Data Management and Statistical Procedures Plan for Compliance with the Coal Combustion Residuals Rule (HDR, 2020a). Data validation was conducted to eliminate data that did not meet validation criteria and designate a data qualifier for data quality limitation discovered.

All samples and quality control (QC) data for the reporting period were reviewed and evaluated, and no samples were rejected. Most QC analyses were within reportable limits; however, when QC was outside control limits, samples were reported as estimated. Data analyses required minimal qualifications, and all data were usable, even when qualified. Data validation reports for 2023 are in **Appendix C**.

3.2 Private Well Sampling

BWL previously performed a limited sampling of private wells completed in the bedrock aquifer in 2022. Data from this sampling has been reviewed, results were provided to the owners, and findings were discussed with EGLE. The Private Well Sampling Report for Erickson Station was completed on April 16, 2023 and reported under separate cover. A summary of the report findings was subsequently distributed to private well owners and the summary as well as the entirety of the report was made accessible via the BWL website. The findings of the Private Well Sampling Report are summarized in **Section 4.2.1**.

BWL performed additional re-sampling of private wells in the area at the request of homeowners in March, May, and November 2023. Data from these events were provided to those homeowners.

4.0 Monitoring Results

4.1 Water Levels and Groundwater Flow Direction

Water levels for Erickson Power Station are provided in **Table 4**. Groundwater beneath the area of the impoundments is between 863 to 875 feet amsl. Groundwater elevation fluctuated between 0.93 and 5.27 feet over the year.

Water levels in the paired and multi-level glacial and bedrock wells is inconsistent between the sets. As shown in **Table 4**, bedrock well MW-7B has historically had a slightly higher water level than glacial paired well MW-7, indicating an upward vertical gradient, however, data collected since its installation in 2022 indicate that this trend may be seasonally dependent as the gradient has been inconsistent. Glacial wells MW-11 and MW-12 have higher water levels than the paired bedrock wells MW-11B and MW-12B (approximately 8-9 feet and 3 feet higher, respectively), indicating a downward vertical gradient. Similarly, groundwater elevations in the MW-16 series (except the D designated well) decrease with well depth, indicating a downward vertical gradient. Wells MW-16B and MW-16C have similar elevations, while MW-16A is three feet higher. In the MW-100 well series, groundwater elevations in MW-100B and MW-100C are similar, while MW-100A is one foot higher and MW-100D is also one foot higher.

Bedrock well MW-16D does not appear to be hydraulically connected to the other wells within its multi-level well series (MW-16A, MW-16B, and MW-16C) or to other bedrock wells installed at Erickson Power Station. As shown in **Table 4** and highlighted in **Figure 5**, MW-16D does not demonstrate seasonal fluctuations similar to those observed at other glacial and bedrock wells and has a substantially lower groundwater elevation than other wells despite being completed at a similar elevation and lithology as bedrock wells MW-11B, MW-12B, MW-7B, and MW-100D. However, shallower bedrock well MW-16C does have groundwater elevations that fluctuate similarly to the glacial well and other bedrock wells onsite.

Because the groundwater elevations differed between glacial wells and bedrock wells, two separate sets of potentiometric contour maps were developed, one for wells screened in the glacial aquifer and one for the wells screened in the shale/sandstone bedrock aquifer. Potentiometric surface maps were developed for the glacial and bedrock aquifers for the February, June, August, and October 2023 water level measurement dates. Maps displaying the groundwater elevations at the wells and the groundwater contours and are provided in **Appendix A**. Bedrock groundwater contour maps include well MW-16C (and not well MW-16D) due to the apparent MW-16D disconnection described above, whereas MW-100D is included on the map (as opposed to MW-100C) due to the similar screened elevation as the onsite bedrock wells (MW-7B, MW-11B, and MW-12B).

The water levels and contour maps confirm that the groundwater flow direction under the impoundments for both aquifers is to the east-northeast and is consistent year-round. Data collected in wells to the east of the impoundments show that the groundwater flow direction does not continue eastward. Wells within the MW-16 and MW-100 series show groundwater at higher elevations than MW-7 and indicate that groundwater within the glacial and bedrock

aquifers in the vicinity of these wells flows west towards the wetland area at the Erickson Station eastern property boundary. At this time, data collected from the MW-16 and MW-100 well series as well as from Carrier Creek to the north indicate that groundwater within the glacial aquifer flows north under the wetland on the east side of Erickson, which is consistent with the Carrier Creek Subwatershed boundary. Therefore, glacial groundwater that flows under the CCR impoundments flows east-northeast under the impoundments and when it reaches the wetland topographic low area, it turns north, consistent with the surface water flow and Carrier Creek Subwatershed.

This is also consistent with data collected from the Reith Riley Construction Company property located adjacent to Erickson on the east between the wetland and Creyts Road. As reported in the Comprehensive Remedial Investigation and Risk Evaluation Report, prepared for the site in May 2003 by Prein & Newhof, groundwater elevations in shallow monitoring wells was flowing westward on the Reith Riley property between Creyts Road and the wetland on the east side of the Erickson property (**Figure 4**) (Prien & Newhof, 2003).

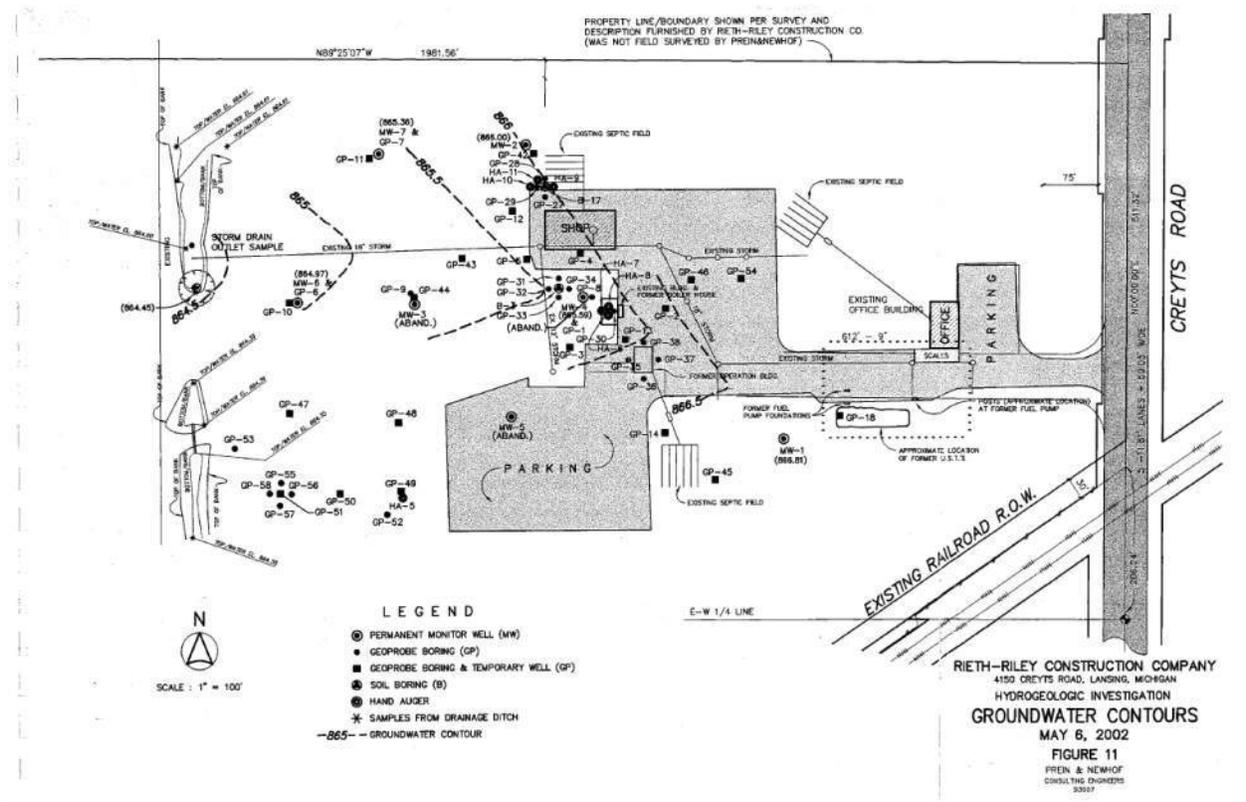


Figure 4. Groundwater Contours for Shallow Groundwater Wells on the Adjacent Reith Riley Property demonstrating groundwater flow under that property to be westward towards the wetland and Erickson (Prien & Newhof, 2003).

The property owner east of Erickson has declined to allow for any monitoring on their property. BWL has designed and submitted permit applications for proposed multi-level wells and supporting access paths in the wetland on the eastern Erickson property boundary. Data from

these proposed wells will help further define the groundwater flow directions. The permit to construct these wells within the wetland was submitted to EGLE on April 21, 2023. Review of the permit was completed in May 2023 and comments were sent back to BWL to address prior to resubmission in July 2023. Additional concerns regarding the constructed access paths and interference with the floodplain after this submission resulted in multiple meetings with BWL, EGLE, and HDR from September 8, 2023 through the end of the year, with the last meeting occurring on December 22, 2023. During the meeting, EGLE requested additional information which is expected to be submitted to EGLE in January 2024 for review and final approval.

Additionally, the area of the proposed wells is in the Floodway. BWL requested information from FEMA and had a meeting with Eaton County Drain Commission to request data regarding the floodway. Floodplain permitting may be needed before monitoring wells can be installed in the proposed area.

The potentiometric surface maps for the indicate that monitoring wells MW-1, MW-4, MW-11, MW-12 are located upgradient in the glacial aquifer and wells MW-11B and MW-12B are upgradient in the bedrock aquifer relative to the Forebay, Retention Pond, and CWP and are appropriate to represent background water quality.



Table 4. Groundwater Elevations Measured in 2023

Monitoring Well ID	Aquifer Monitored	TOC (ft amsl)	2/14/2023	3/14/2023	4/14/2023	5/15/2023	6/13/2023	7/17/2023	8/16/2023	9/13/2023	10/13/2023	11/14/2023	12/14/2023
MW-1	Glacial	888.74	874.40	874.52	874.62	873.89	871.70	873.38	873.07	872.99	873.70	873.72	873.84
MW-2	Glacial	885.97	866.08	867.00	867.73	866.45	865.29	865.00	864.57	864.81	864.87	865.41	866.05
MW-3	Glacial	884.81	869.93	871.41	872.70	871.24	869.52	869.28	868.94	869.07	869.15	869.97	870.43
MW-4	Glacial	889.15	870.71	872.84	873.85	872.06	870.73	870.28	870.08	870.16	870.06	870.81	871.20
MW-5	Glacial	885.50	867.32	868.32	868.60	867.95	866.53	866.19	866.33	866.41	866.65	867.17	867.51
MW-6	Glacial	885.53	865.50	866.70	867.81	865.86	864.92	864.60	864.26	864.62	864.63	865.20	865.27
MW-7	Glacial	870.144	864.96	865.45	865.68	864.95	863.89	863.96	863.59	863.82	863.90	864.27	864.92
MW-7B	Bedrock	870.28	864.37	865.11	865.79	865.22	864.38	863.94	863.60	863.89	863.85	864.24	864.53
MW-7C	Glacial	871.53	865.24	865.78	866.16	865.42	864.44	864.45	864.06	864.31	864.35	864.69	864.98
MW-8	Glacial	873.743	865.26	865.90	866.45	865.44	864.49	864.45	864.02	864.37	864.35	864.69	864.98
MW-9	Glacial	872.6	865.06	865.65	866.60	864.92	864.17	864.26	862.78	864.24	864.19	864.50	864.74
MW-10	Glacial	875.654	865.56	866.99	868.75	866.23	865.19	864.84	864.42	864.85	864.86	865.19	865.51
MW-11	Glacial	885.64	874.71	874.72	875.11	874.74	873.48	874.40	874.36	874.25	874.32	874.58	874.71
MW-11B	Bedrock	885.58	865.19	866.02	866.89	866.41	865.79	865.17	864.91	864.97	864.91	865.24	865.53
MW-12	Glacial	886.19	869.55	871.54	872.57	870.44	869.44	869.21	868.92	868.99	868.89	869.62	870.02
MW-12B	Bedrock	886.27	866.11	867.08	868.11	867.66	866.93	866.36	866.19	866.26	866.12	866.51	866.78
MW-13	Glacial	871.80	865.00	865.87	866.00	864.94	863.00	863.42	863.02	862.89	863.37	863.91	864.47
MW-14	Glacial	884.59	870.34	870.45	870.55	869.91	868.46	869.24	868.55	868.69	869.25	869.47	869.61
MW-15	Glacial	880.24	873.66	875.33	875.02	873.74	871.08	870.66	870.06	871.04	872.18	873.63	874.50
MW-16A	Glacial	877.48	870.53	871.87	872.21	870.82	869.02	870.24	870.07	870.00 ²	870.14	870.37	870.67
MW-16B	Glacial	877.49	866.94	868.26	868.76	867.78	866.65	866.38	866.33	866.47 ²	866.47	866.98	867.30
MW-16C	Bedrock	877.49	866.70	868.01	868.51	867.57	866.42	866.10	866.04	866.20 ²	866.21	866.73	867.07
MW-16D	Bedrock	877.53	852.30	853.21	852.33	853.30	854.08	853.13	852.28	852.37 ²	852.82	852.61	852.81
MW-100A	Glacial	879.77	---	---	---	---	864.20	863.48	863.19 ¹	863.35	863.15	863.44	863.55
MW-100B	Glacial	879.74	---	---	---	---	863.51	862.71	862.34 ¹	862.59	862.37	862.65	862.76
MW-100C	Bedrock	879.72	---	---	---	---	863.89	863.45	862.96 ¹	863.48	863.28	863.60	863.77
MW-100D	Bedrock	879.70	---	---	---	---	864.57	863.95	863.59 ¹	863.89	863.83	864.23	864.50

1) Groundwater elevation measured on August 14, 2023. Groundwater elevation measured during sitewide monthly monitoring determined to be affected by recovery after sampling.

2) Groundwater elevation measured on September 12, 2023. Groundwater elevation measured during sitewide monthly monitoring determined to be affected by recovery after sampling.

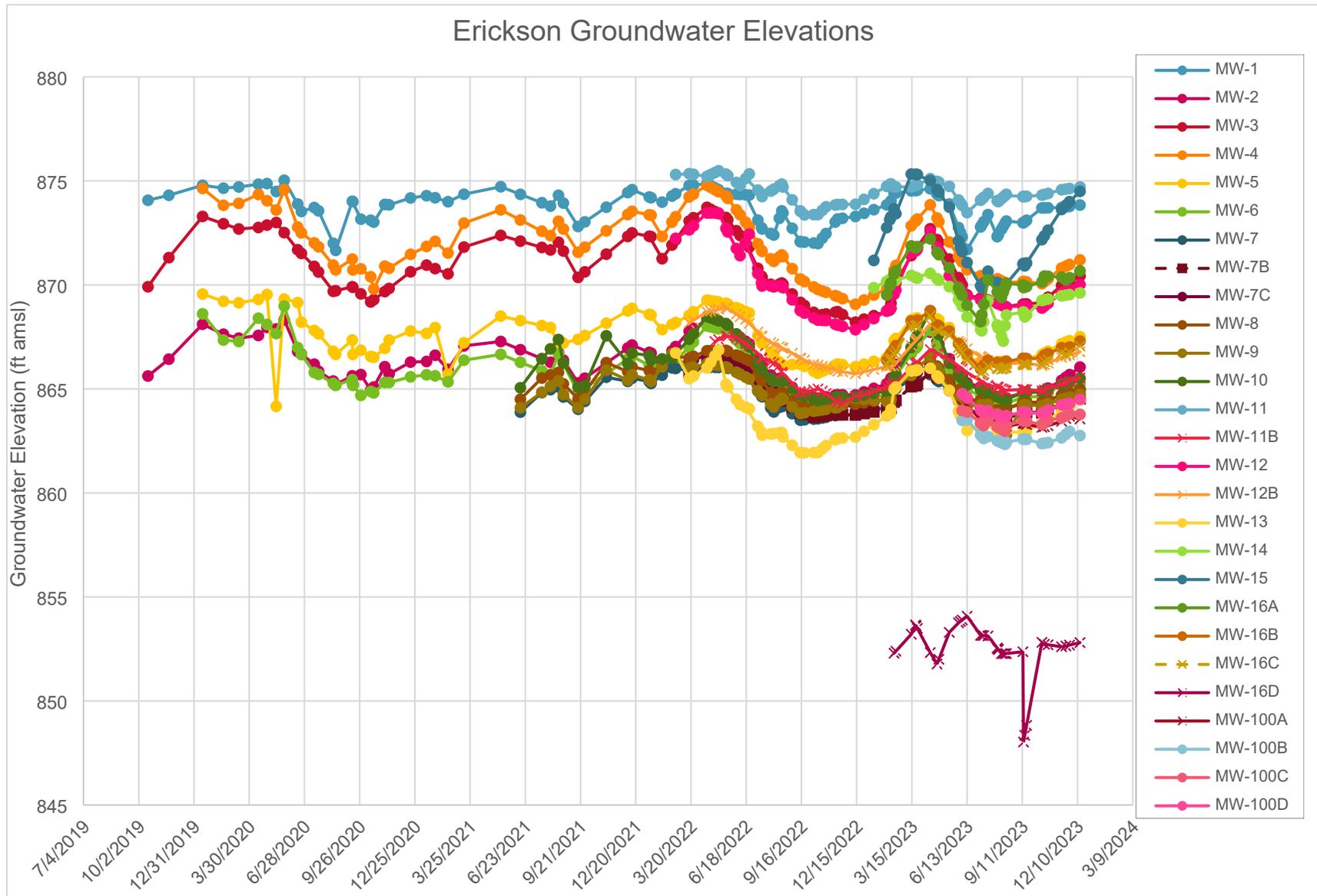


Figure 5. Erickson Power Station Groundwater Elevations

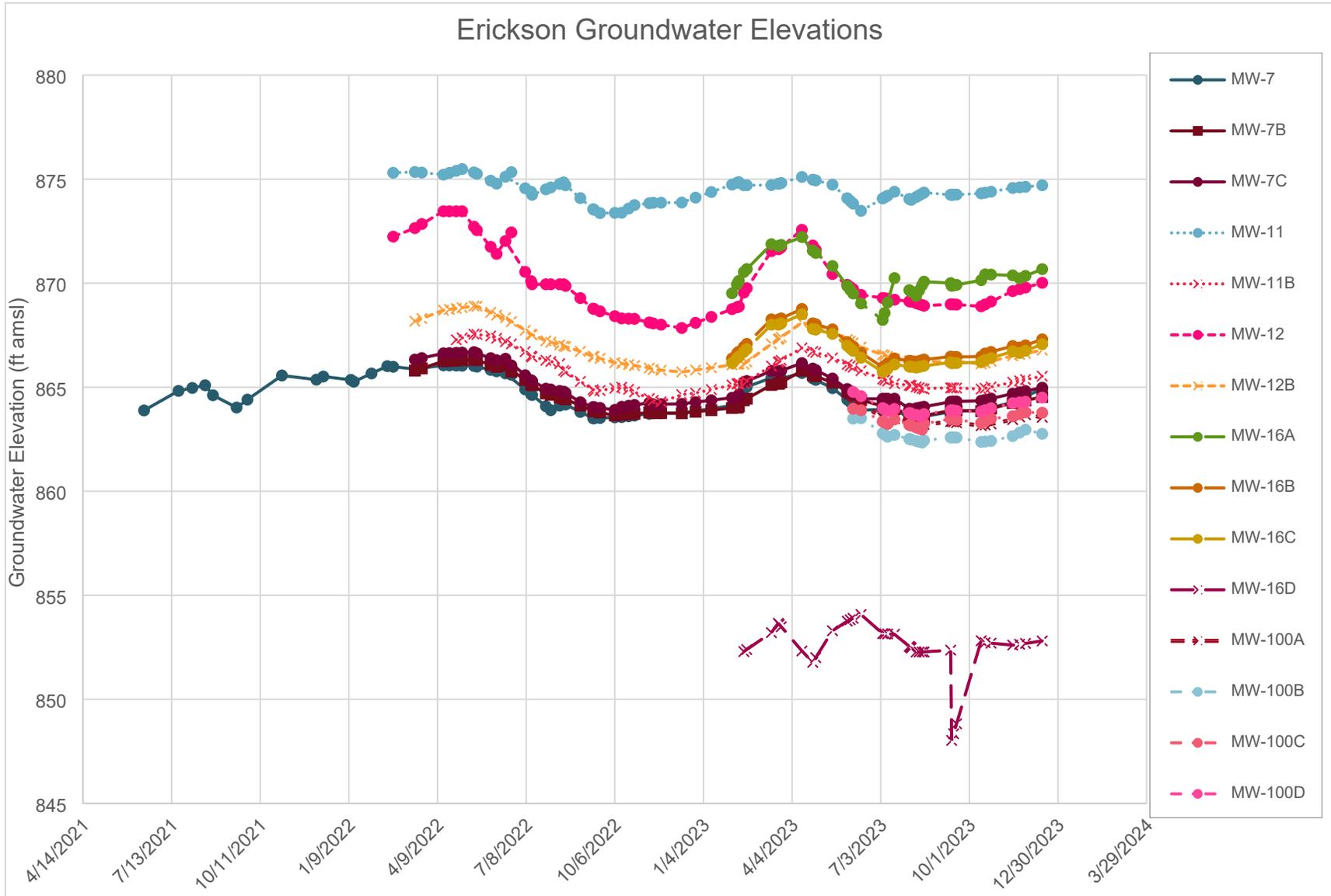


Figure 6. Erickson Power Station Paired Glacial and Bedrock Well Groundwater Elevations



4.2 Water Quality

4.2.1 Impoundments

A table summary of the analytical data is provided in **Appendix B** and laboratory reports are provided in **Appendix C**. **Table 5** lists the EPA established MCL from 40 CFR §141.62 and §141.66, the assessment monitoring BTV (upper tolerance limit (UTL)) for the Erickson impoundments, and the site-specific GPS for all detected Appendix IV constituents. The background water quality was previously described in the Background Water Quality Statistical Certification published by HDR on November 19, 2020 (HDR, 2020b).

Glacial Aquifer Background Values

The background values for the glacial aquifer based on pooled data from wells MW-1, MW-4, MW-11, and MW-12 were updated with data collected between April 2020 and February 2023. **Table 5** provides the updated UTL for the CCR impoundments along with the GPS values for the bedrock aquifer. The Background Statistical Certification Report summarizing these background statistics is being finalized and will be provided under separate cover in the first quarter of 2024.

Table 5. Background Values and Groundwater Protection Standards for the Glacial Aquifer

Parameter	Site-Specific Background Level Upper Tolerance Limit (UTL) ¹ (mg/L)	Federal Maximum Contaminant Level (mg/L)	State Non-Residential Drinking Water Cleanup Criteria for Groundwater ² (mg/L)	Groundwater Protection Standards for Site (mg/L)
Antimony	0.005	0.006	0.006	0.006
Arsenic	0.021	0.01	0.01	0.021
Barium	0.168	2	2	2
Beryllium	0.001	0.004	0.004	0.004
Boron	0.48	NV	0.5	0.5
Cadmium	0.0005	0.005	0.005	0.005
Chromium	0.005	0.1	0.1	0.1
Cobalt	0.005	0.006	0.1	0.006
Lead	0.003	0.015	0.004	0.004
Lithium	0.0397	0.04	0.35	0.04
Mercury	0.0002	0.002	0.002	0.002
Molybdenum	0.024	0.1	0.21	0.1
Selenium	0.005	0.05	0.05	0.05
Thallium	0.002	0.002	0.002	0.002
Calcium	188	NV	NV	188
Fluoride	1	4	2	2
Chloride	94.377	250	250	250
Sulfate	344	250	250	344
Total Dissolved Solids	1168.639	500	500	1168.639
Radium 226 and 228 combined	5.00 pCi/L	5 pCi/L	NV	5 pCi/L

¹ Calculated by pooling wells MW-1, MW-4, MW-11, and MW-12, through February 9, 2023 data. BTVs calculated in October 2023.

² Cleanup Criteria Requirements for Response Activity (Formerly the Part 201 Generic Cleanup Criteria and Screening Levels) found in R 299.44 Generic groundwater cleanup criteria.



NV=no value

Bedrock Aquifer Background Values

Wells MW-11B and MW-12B were installed upgradient of the CCR impoundments and were completed in shale and sandstone at approximately 120 feet below ground surface. These two wells are considered background bedrock aquifer wells. The 8th background sample event for the upgradient bedrock wells was in December 2022; and background threshold values were calculated using data collected between March 2022 and February 2023. Background values for the bedrock aquifer are provided in **Table 6** along with the GPS values for the bedrock aquifer. The Background Statistical Certification Report summarizing these background statistics is being finalized and will be provided under separate cover in the first quarter of 2024.

Table 6. Background Values and Groundwater Protection Standards for the Bedrock Aquifer

Parameter	Site-Specific Background Level Upper Tolerance Limit (UTL) ¹ (ug/L)	Federal Maximum Contaminant Level (ug/L)	State Non-Residential Drinking Water Cleanup Criteria for Groundwater ² (ug/L)	Groundwater Protection Standards for Site (ug/L)
Antimony	0.005	0.006	0.006	0.006
Arsenic	0.009	0.01	0.01	0.01
Barium	0.081	2	2	2
Beryllium	0.001	0.004	0.004	0.004
Boron	3.52	NV	0.5	3.52
Cadmium	0.0005	0.005	0.005	0.005
Chromium	0.005	0.1	0.1	0.1
Cobalt	0.005	0.006	0.1	0.006
Lead	0.003	0.015	0.004	0.004
Lithium	0.051	0.04	0.35	0.051
Mercury	0.0002	0.002	0.002	0.002
Molybdenum	0.011	0.1	0.21	0.1
Selenium	0.005	0.05	0.05	0.05
Thallium	0.002	0.002	0.002	0.002
Calcium	69.6	NV	NV	69.6
Fluoride	1	4	2	2
Chloride	5	250	250	250
Sulfate	5	250	250	250
Total Dissolved Solids	380	500	500	500
Radium 226 and 228 combined	5.5 pCi/L	5 pCi/L	NV	5.5 pCi/L

¹ Calculated by pooling wells MW-11B and MW-12B, through February 9, 2023 data. BTVs calculated in October 2023.

² Cleanup Criteria Requirements for Response Activity (Formerly the Part 201 Generic Cleanup Criteria and Screening Levels) found in R 299.44 Generic groundwater cleanup criteria.

NV=no value

Assessment Monitoring Event – February 2023

Twenty-three (23) wells were sampled during February 2023 assessment monitoring event as presented in **Table 2**. The following wells had concentrations of one or more COIs that exceeded GPS: MW-2, MW-3, MW-5, MW-6, MW-7, and MW-7C. Therefore, in accordance with CCR Rule §257.95(g), downgradient well concentrations were statistically evaluated to



determine if one or more constituents were detected at SSLs above the GPS for each assessment monitoring event. To determine if an exceedance of a GPS value was statistically significant, the 95% lower confidence limit (95LCL) was calculated for each of the downgradient wells. **Table 8** contains the statistical evaluation for comparison against GPS, with LCL values from the February 2023 sample event that exceeded GPS values. Statistical output files are in **Appendix D**.

Glacial Aquifer

Wells MW-2, MW-5, MW-6, MW-7, and MW-7C had SSLs of lithium over the GPS. Additionally, wells MW-7 and MW-7C had SSLs of molybdenum over the GPS. Well MW-3 also had LCL values greater than the GPS for lithium, but this has been calculated on only five sample events and is therefore not yet considered an SSL due to having less than 8 sample events.

Table 7. Statistical GPS Exceedances for Appendix IV Constituents for Glacial Aquifer Wells – February 2023 Assessment Monitoring Event

Monitoring Well	Appendix IV Constituent	Lithium	Molybdenum
	GPS	0.04 mg/l	0.100 mg/l
MW-2 ¹	95% LCL	0.056	-
MW-5 ¹	95% LCL	0.061	-
MW-6 ¹	95% LCL	0.044	-
MW-7 ¹	95% LCL	0.089	0.173
MW-7C	95% LCL	0.126	0.388

¹95% Adjusted Gamma LCL

“-“ Denotes the LCL did not exceed GPS

Bedrock Aquifer

No bedrock aquifer wells had concentrations of COIs that exceeded GPS values during the February 2023 sampling event. Additionally, no bedrock aquifer wells had concentrations of COIs that demonstrated SSLs above the GPS during the February 2023 sampling event. Therefore, the GPS exceedances for lithium and molybdenum have been delineated vertically as no exceedances have been detected in bedrock wells.

Assessment Monitoring Event – August 2023

Twenty-seven (27) wells were sampled during August 2023 assessment monitoring event as presented in **Table 2**. The following wells had concentrations of one or more COIs that exceeded GPS: MW-2, MW-3, MW-5, MW-6, MW-7, and MW-7C. Therefore, in accordance with CCR Rule §257.95(g), downgradient well concentrations were statistically evaluated to determine if one or more constituents were detected at SSLs above the GPS for each assessment monitoring event. To determine if an exceedance of a GPS value was statistically significant, the 95% lower confidence limit (95LCL) was calculated for each of the downgradient wells. **Table 8** contains the statistical evaluation for comparison against GPS, with LCL values from the February 2023 sample event that exceeded GPS values. Statistical output files are in **Appendix D**.



Glacial Aquifer

Wells MW-2, MW-5, MW-6, MW-7, and MW-7C had SSLs of lithium over the GPS. Additionally, wells MW-7 and MW-7C had SSLs of molybdenum over the GPS. Well MW-3 also had LCL values greater than the GPS for lithium, but this has been calculated on only six sample events and is therefore not yet considered an SSL due to having less than eight sample events. Well MW-14 had GPS exceedances of boron and lithium and well MW-16A had GPS exceedances of chloride during this sampling event. However, LCLs were not calculated for MW-14, MW-15, MW-16A or MW-16B during this event because these wells had less than eight sample events. These results are consistent with prior year results.

Table 8. Statistical GPS Exceedances for Appendix IV Constituents for Glacial Aquifer Wells – August 2023 Assessment Monitoring Event

Monitoring Well	Appendix IV Constituent	Lithium	Molybdenum
	GPS	0.04 mg/l	0.100 mg/l
MW-2 ¹	95% LCL	0.055	-
MW-5 ¹	95% LCL	0.061	-
MW-6 ¹	95% LCL	0.045	-
MW-7 ¹	95% LCL	0.084	0.173
MW-7C	95% LCL	0.126	0.391

¹95% Adjusted Gamma LCL

Bedrock Aquifer

No bedrock aquifer wells had concentrations of COIs that exceeded GPS values during the August 2023 sampling event. Additionally, no bedrock aquifer wells had concentrations of COIs that demonstrated SSLs above the GPS during the August 2023 sampling event. Therefore, the GPS exceedances for lithium and molybdenum have been delineated vertically as no exceedances have been detected in bedrock wells.

Background Monitoring Events – January, March, April, May, June, July, September, November 2023

Monitoring wells installed in 2023 (MW-14, MW-15, MW-16A, MW-16B, MW-16C, MW-16D, MW-100A, MW-100B, MW-100C, and MW-100D) have been sampled on a five-week frequency after installation for the first eight sample events. As stated previously, all background events have been completed for wells MW-14, MW-15, and wells within the MW-16 series. Therefore, statistical significance for these wells was achieved, and groundwater quality information as well as statistical evaluation completed for this evaluation are described in the subsequent section. Dates for the associated sampling events for MW-14, MW-15, and MW-16 series wells can be found in **Table 2**. Six background sampling events have been completed for the MW-100 series wells, for which sampling events were completed in June, July, August, September, October, and November, 2023.



Glacial Aquifer

Wells MW-100A and MW-100B do not have GPS exceedances. The plume extent southeast the impoundments is delineated. Data from these wells compared to the GPS during the background monitoring events in 2023 may be found in **Appendix B**.

Bedrock Aquifer

Wells MW-100C and MW-100D do not have GPS exceedances. Data from these wells compared to the GPS during the background monitoring events in 2023 may be found in **Appendix B**.

Sampling Events for Wells Reaching Statistical Significance – September, November 2023

As shown in **Table 2** and described in **Section 3.1**, wells MW-14, MW-15, and wells within the MW-16 series completed enough sampling events to achieve statistical significance on dates not concurrent with scheduled assessment monitoring events for Erickson Station. Therefore, LCLs were calculated using data obtained from MW-14 and MW-15 through the September 15, 2023 sampling event and from the MW-16 series wells with data obtained through the November 21, 2023 sampling event. The following wells had concentrations of one or more COIs that exceeded the GPS: MW-14. Therefore, in accordance with CCR Rule §257.95(g), downgradient well concentrations were statistically evaluated to determine if one or more constituents were detected at SSLs above the GPS for each assessment monitoring event. To determine if an exceedance of a GPS value was statistically significant, the 95% lower confidence limit (95LCL) was calculated for each of the downgradient wells. **Table 8** contains the statistical evaluation for comparison against GPS, with LCL values from the February 2023 sample event that exceeded GPS values. Statistical output files are in **Appendix D**.

Glacial Aquifer

Well MW-14 had SSLs of lithium over the GPS (**Table 10**). No concentrations of COIs above the GPS have been detected in MW-15, MW-16A, or MW-16B. Therefore, the plume extent north of the impoundments is considered delineated and the farthest extent of the plume is east of MW-7 and west of MW-16.

Table 9. Statistical GPS Exceedances for Appendix IV Constituents for Wells Reaching Statistical Significance – September, November 2023 Monitoring Events

Monitoring Well	Appendix IV Constituent	Lithium
	GPS	0.04 mg/l
MW-14 ¹	95% LCL	0.109

¹95% Adjusted Gamma LCL

Bedrock Aquifer

Wells MW-16C and MW-16D did not have concentrations of COIs that exceeded GPS values during background sampling events. Additionally, wells MW-16C and MW-16D did not have concentrations of COIs that demonstrated SSLs above the GPS as they reached statistical

significance. Therefore, the GPS exceedances for lithium and molybdenum have been delineated both horizontally and vertically as no exceedances have been detected in bedrock wells MW-16C and MW-16D.

4.2.2 Private Well Sampling

BWL performed a limited sampling of downgradient private wells completed in the bedrock aquifer in 2022. The Private Well Sampling Report was completed on April 16, 2023 and reported under separate cover. The report reviewed data from Erickson Station and the downgradient private wells and found via multiple lines of evidence that the boron and lithium concentrations in private wells appeared to be likely naturally occurring and representative of the shale bedrock aquifer in which they are screened. Data approaches included a comparison of private well data to the background bedrock water quality observed at Erickson Station, review of concentrations relative to distance and depth, transport solutions for continuous release to groundwater, Erickson Station's comparison of general water quality parameters between known impacted and unimpacted areas, and a review and comparison of local Ingham County and Delta Township bedrock aquifer studies. BWL presented these data and lines of evidence were presented to the regulatory authorities with the intent of discontinuing private well sampling, which was met with verbal approval.

5.0 Remedy Selection Progress Update

BWL is moving forward with source removal to close the impoundments, and the groundwater measures evaluated in the Assessment of Corrective Measures (ACM) in November 2021 assumed the impoundment would be excavated and all source removed prior to implementation of groundwater remedy measures.

As discussed in the ACM, to select a groundwater remedy, additional data collection and analyses is ongoing to understand off-site plume transport and potential human or ecological receptors. Potential receptors were evaluated and, at this time, the risk to private wells is considered very low. The additional wells required to delineate the plume boundaries and characterization require offsite wells and private landowner agreements to the east and southeast of the impoundments, which has been ongoing throughout 2022. Ten new wells were installed in 2023 to further assess conditions at Erickson Power Station:

- MW-14, installed immediately east of the CWP to further categorize impacts originating from the CWP.
- MW-15, installed northwest of MW-3 to further delineate the northern extents of the plume.
- MW-16A, MW-16B, MW-16C, and MW-16D installed on the eastern extent of the BWL property near the intersection of South Creyts Road and the railroad to delineate the eastern extent of the plume in the glacial and bedrock aquifers.
- MW-100A, MW-100B, MW-100C, and MW-100D, installed offsite on a parcel owned by Daylight Holdings LLC along Westland Way (Parcel No. 040-084-800-260-00) to the

southwest from Erickson to delineate the southern extents of the plume in the glacial and bedrock aquifers.

Exceedances of COIs above the GPS were not detected in the MW-16 series glacial wells and as described in **Section 4.1** the groundwater flow direction turns and flows northward under the Carrier Creek Subwatershed. Additionally, the wetland surface water sample collected March 2021, reported in the previous Annual Report for Erickson Station did not have exceedances of lithium or molybdenum above the site-specific GPS. Therefore, the boundaries for the lithium and molybdenum plumes at Erickson Station have delineated; however proposed wells to further refine the plume boundaries are described below.

Eight more wells are proposed to be installed in 2024 to further assess conditions at Erickson Power Station:

- MW-17A, MW-17B, MW-17C, and MW-17D installed east of MW-7 at the BWL property boundary to delineate the eastern extent of the plume in the glacial and bedrock aquifers.
- MW-18A, MW-18B, MW-18C, and MW-18D installed north-northeast of MW-7 at the BWL property boundary to delineate the northern extent of the plume in the glacial and bedrock aquifers based on additional hydrologic information obtained from the wells installed in 2023.

The Private Well Sampling Report was completed and the report in full as well as a summary of its findings were distributed to EGLE, private well owners and posted for public access on BWL's website. Findings of the report concluded that concentrations of COIs observed in the private wells appear to be naturally occurring and representative of conditions of the shale bedrock aquifer and not related to Erickson Station. BWL presented to the regulatory agencies the findings of this report and their intent to not sample the private wells further at this time, which was met with verbal approval.

Efforts to close Erickson Power Station have continued in 2023. The CCR Impoundments Closure Work Plan for removal of CCR, completed in April 2022, was approved by EGLE on January 17, 2023. Additional ash sampling and analysis was completed, and a Closure Work Plan Amendment detailing closure objectives as well as the microscopy verification thresholds was submitted to EGLE on May 2, 2023. BWL also performed supplementary work for the Soil Background Survey, which was submitted to EGLE on April 25, 2023. EGLE returned comments to BWL regarding the Soil Background Study and the Closure Work Plan Amendment on June 28, 2023.

A CCR removal contractor was selected and mobilized to the site in February 2023 to begin dewatering operations from the three impoundments. The water removed from the ponds was treated on site, monitored, and discharged into nearby Lake Delta in compliance with an NPDES permit. Dewatering efforts were completed in May 2023 and ash and liner material removal commenced, with the material being transported to Granger Wood Street Landfill.

Through mid-November 2023, approximately 64,000 cubic yards of material (ash, liner, and CCR impacted riprap) have been removed and disposed of offsite from the three impoundments.

Verification was completed through visual, photographic, and soil sampling and laboratory analytical testing. Visual verification was completed in August 2023. Sampling was completed for the CWP in July 2023. Multiple samples were collected for the Forebay and Retention Basin throughout July to December 2023 as analytical results indicated exceedances above established closure criteria. Analytical verification results were statistically analyzed and exceedances were found for arsenic and boron for the Retention Basin and boron and molybdenum for the Forebay based on the Michigan cleanup standards and an extra site-specific safety factor applied by EGLE; however, microscopy results were below 3% CCR (microscopy closure criteria 7% CCR) for the Forebay and Retention Basin. BWL has coordinated with EGLE regarding the next steps for verification. Ash removal verification efforts for the Forebay, Retention Basin, and CWP are expected to be completed in February 2024.

Additionally, BWL will continue implementing CCR groundwater compliance schedule in conformance with §257.90 - §257.98, which includes semiannual assessment monitoring in accordance with §257.95 to monitor groundwater conditions and inform the remedy selection. The final remedy will be formally selected per §257.97 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 following activities are proposed to be completed or initiated in the next 6-month period:

- development of a Pump Test Work Plan for use in assessing corrective measures using site specific data,
- development of an MNA Sampling and Analysis Work Plan for use in assessing corrective measures using site specific data,
- continued semiannual groundwater assessment monitoring,
- installation of wetland monitoring wells pending resolution of permitting requirements, and,
- completion of removal of CCR source materials and closure verification of the Erickson CCR impoundments.

6.0 Summary

The following observations are based on CCR Rule compliance groundwater monitoring program development during 2022:

- Ten new monitoring wells were installed in 2023 (MW-14, MW-15, MW-16A, MW-16B, MW-16C, MW-16D, MW-100A, MW-100B, MW-100C, and MW-100D).
- Water levels were measured during each sample event and monthly, starting in February 2023. Groundwater flow in the glacial aquifer is consistently east-northeast under the impoundments; however, groundwater flow further east in the vicinity of MW-

MW-16A and MW-16B appears to be flowing east to west back towards Erickson Station. Groundwater elevation data collected since the installation of MW-16A and MW-16B indicate that groundwater flows east-northeast under the impoundments and then turns north and follows the wetland and Carrier Creek to the north. This is consistent with the Carrier Creek Subwatershed.

- Groundwater flow in the bedrock aquifer shows an east-northeast flow direction under the impoundments, however contours are different than the glacial aquifer. Groundwater elevation data collected after the installation of MW-16C indicate that groundwater elevations in the immediate vicinity of MW-16C are higher than at MW-7B and seem to indicate flow northward between MW-7B and MW-16C similar to the glacial aquifer.
- New BTVs for the glacial aquifer and BTVs for the bedrock aquifer were developed in October 2023.
- Assessment monitoring for the first half of 2023 was completed in February for twenty-three (23) wells. Monitoring data was statistically evaluated, and SSLs above the GPS were observed at MW-2, MW-5, MW-6, MW-7, and MW-7C for lithium and boron. Additionally, SSLs above the GPS was observed at MW-2, MW-5, and MW-7C for calcium, sulfate, and TDS, and in MW-7 and MW-7C for molybdenum. These wells are all glacial wells.
- Assessment monitoring for the latter half of 2023 was completed in August for twenty-seven (27) wells. Monitoring data was statistically evaluated, and SSLs above the GPS were observed at MW-2, MW-5, MW-6, MW-7, and MW-7C for lithium and boron. Additionally, SSLs above the GPS was observed at MW-2, MW-5, and MW-7C for calcium, sulfate, and TDS, and in MW-7 and MW-7C for molybdenum. These wells are all glacial wells.
- Background monitoring at a five-week frequency at six monitoring wells (MW-14, MW-15, MW-16A, MW-16B, MW-16C, and MW-16D) installed in early 2023 was completed and the data statistically evaluated. GPS exceedances were detected at glacial wells MW-14, MW-16A, and MW-16B. However, based on groundwater flow and no detections of other exceedances expected to be migrating from site based on GPS exceedances in other glacial wells, the exceedances in glacial wells MW-16A and MW-16B are likely to have an alternate source for which an ASD will be prepared and submitted in 2024. No GPS exceedances were detected at MW-15. Similarly to the GPS exceedances detected in glacial wells MW-16A and MW-16B, GPS exceedances observed in bedrock wells MW-16C and MW-16D are also assumed to be naturally occurring and/or have an alternate source based on groundwater flow and no detection of other exceedances known to be migrating from Erickson. The alternative sources for exceedances in these wells will be included in the ASD prepared for the glacial wells in the MW-16 series.
- Well MW-16D does not appear to be hydraulically connected to the currently established well network at Erickson Station. This well will continue to be monitored and sampled.
- Background monitoring at a five-week frequency for the four remaining wells installed in 2023 (MW-100A, MW-100B, MW-100C, and MW-100D) commenced in 2023 and is



proposed to be completed in early 2024. To date, exceedances of COIs above the GPS have not been observed in the glacial wells nor the bedrock wells in the MW-100 series.

- Cleanout and closure of the CCR impoundments at Erickson Station has been initiated and is expected to be complete by February 2024. Through mid-November 2023, approximately 64,000 cubic yards of material (ash, liner, and CCR impacted riprap) have been removed and disposed of offsite from the three impoundments. BWL is coordinating with EGLE regarding the next steps for verification.
- Erickson Power Station impoundment monitoring status is assessment monitoring and assessment of corrective measures.

7.0 References

HDR, 2019. Groundwater Level Monitoring Standard Operating Procedure (SOP). November 18, 2019.

HDR, 2020. Groundwater Monitoring System Certification, Erickson Station. May 4, 2020.

HDR, 2020a. Erickson Power Station Statistical Procedures Plan. May 11, 2020.

HDR, 2020b. Background Water Quality Statistical Certification for Compliance with the Coal Combustion Residuals (CCR) Rule. November 19, 2020.

HDR, 2020c. Determination of Statistically Significant Increases over Background per §257.93(h)(2). November 19, 2020.

HDR, 2021. Background Water Quality Statistical Certification. November 5, 2021.

HDR, 2021a. Conceptual Site Model and Assessment of Corrective Measures. November 5, 2021.

Prein & Newhof, 2003. Comprehensive Remedial Investigation and Risk Evaluation Report (1993-2002). May, 2003.

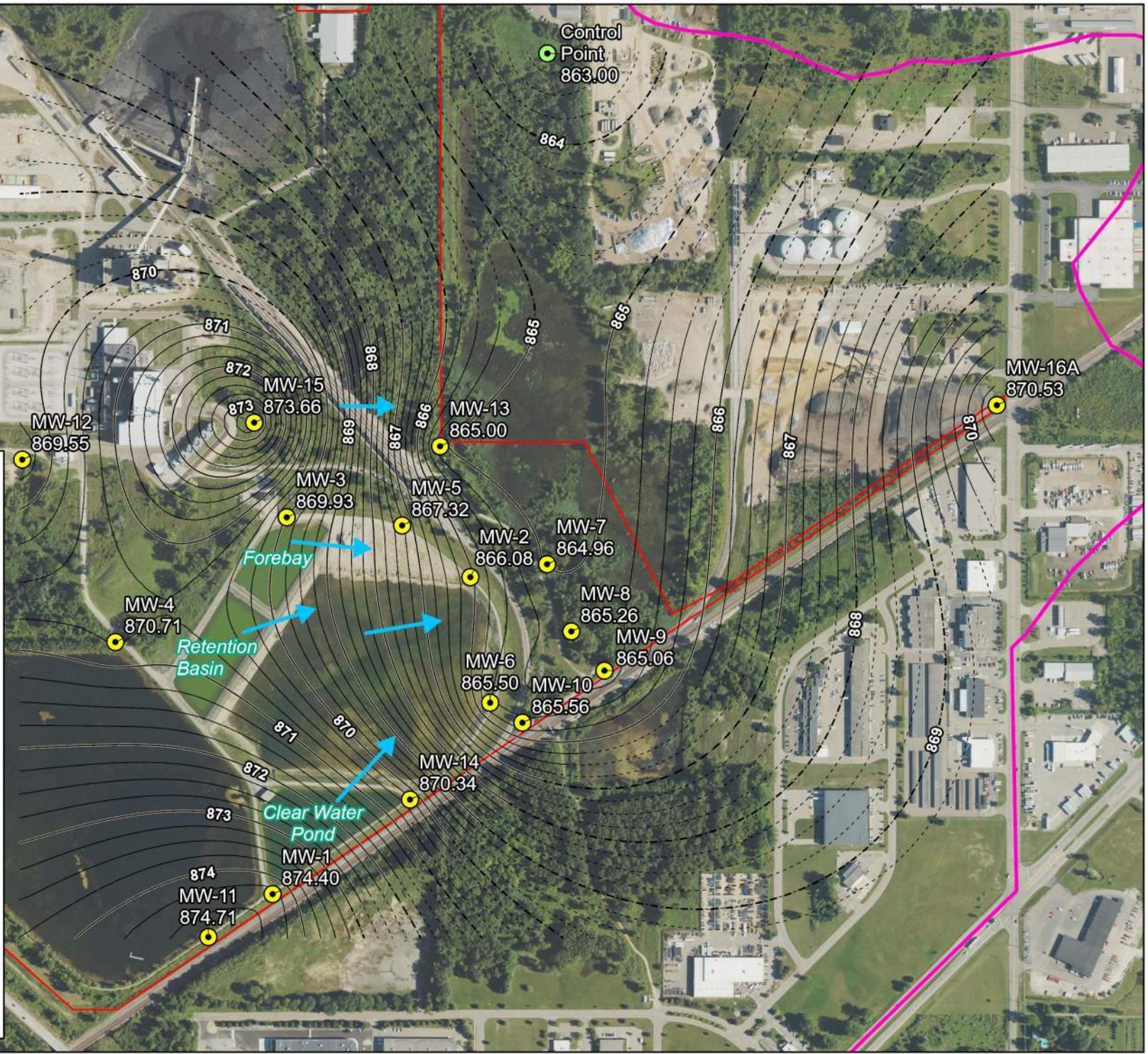
Appendix A

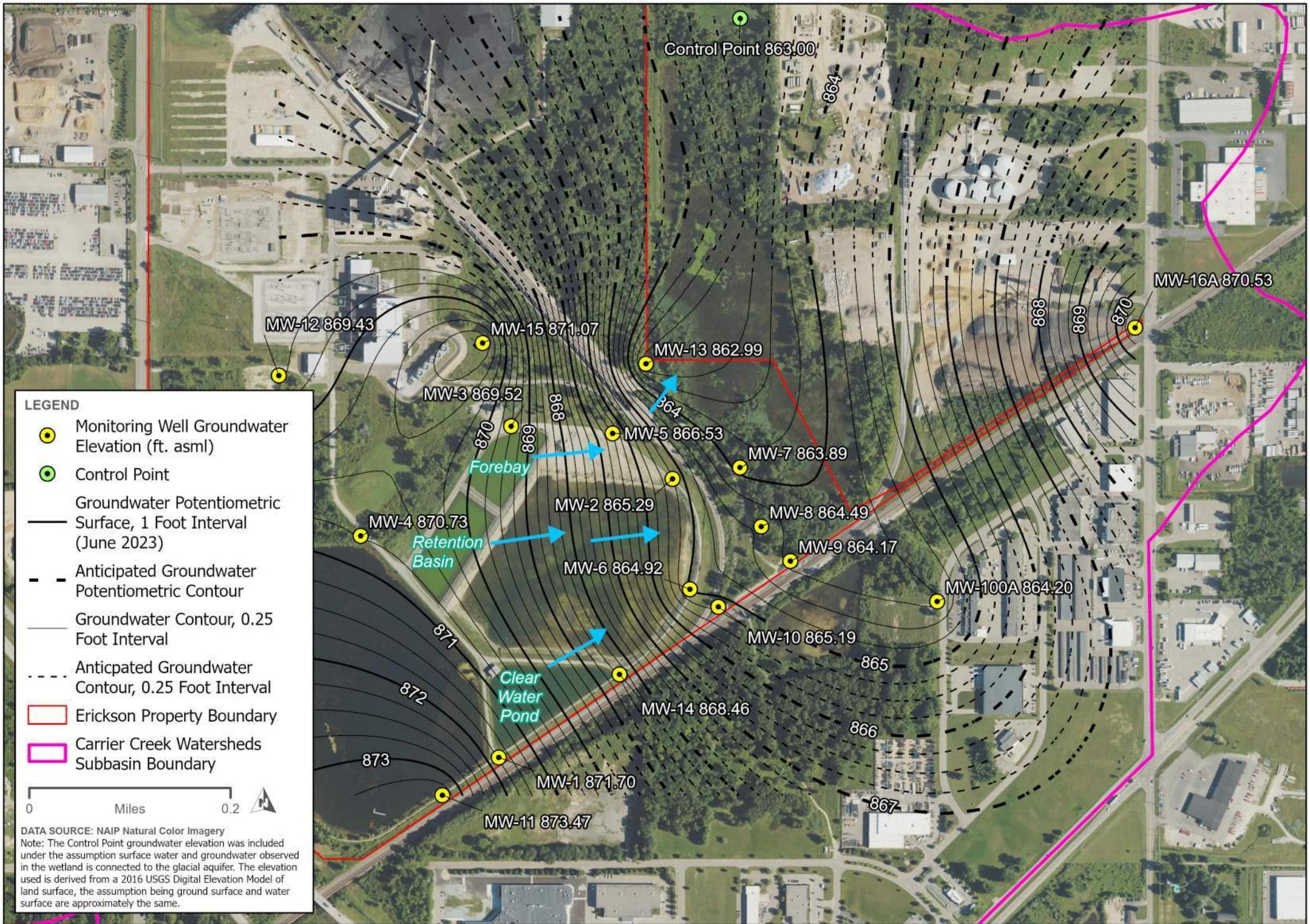
Potentiometric Surface Maps

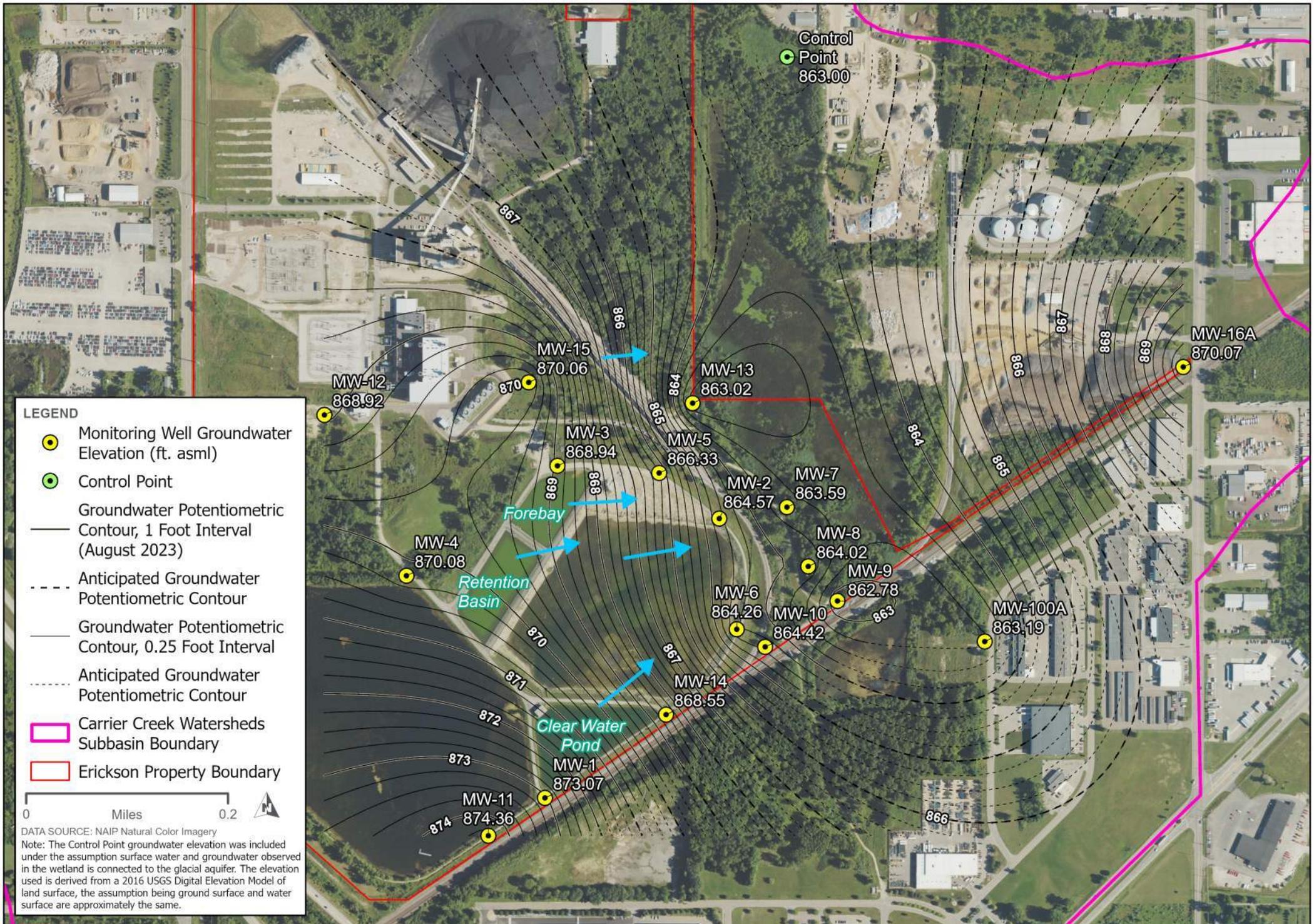
- LEGEND**
-  Monitoring Well Groundwater Elevation (ft. asml)
 -  Control Point
 -  Groundwater Potentiometric Contour, 1 Foot Interval (February 2023)
 -  Anticipated Groundwater Potentiometric Contour
 -  Groundwater Potentiometric Contour, 0.25 Foot Interval
 -  Anticipated Groundwater Potentiometric Contour
 -  Carrier Creek Watersheds Subbasin Boundary
 -  Erickson Property Boundary



DATA SOURCE: NAIP Natural Color Imagery
 Note: The Control Point groundwater elevation was included under the assumption surface water and groundwater observed in the wetland is connected to the glacial aquifer. The elevation used is derived from a 2016 USGS Digital Elevation Model of land surface, the assumption being ground surface and water surface are approximately the same.





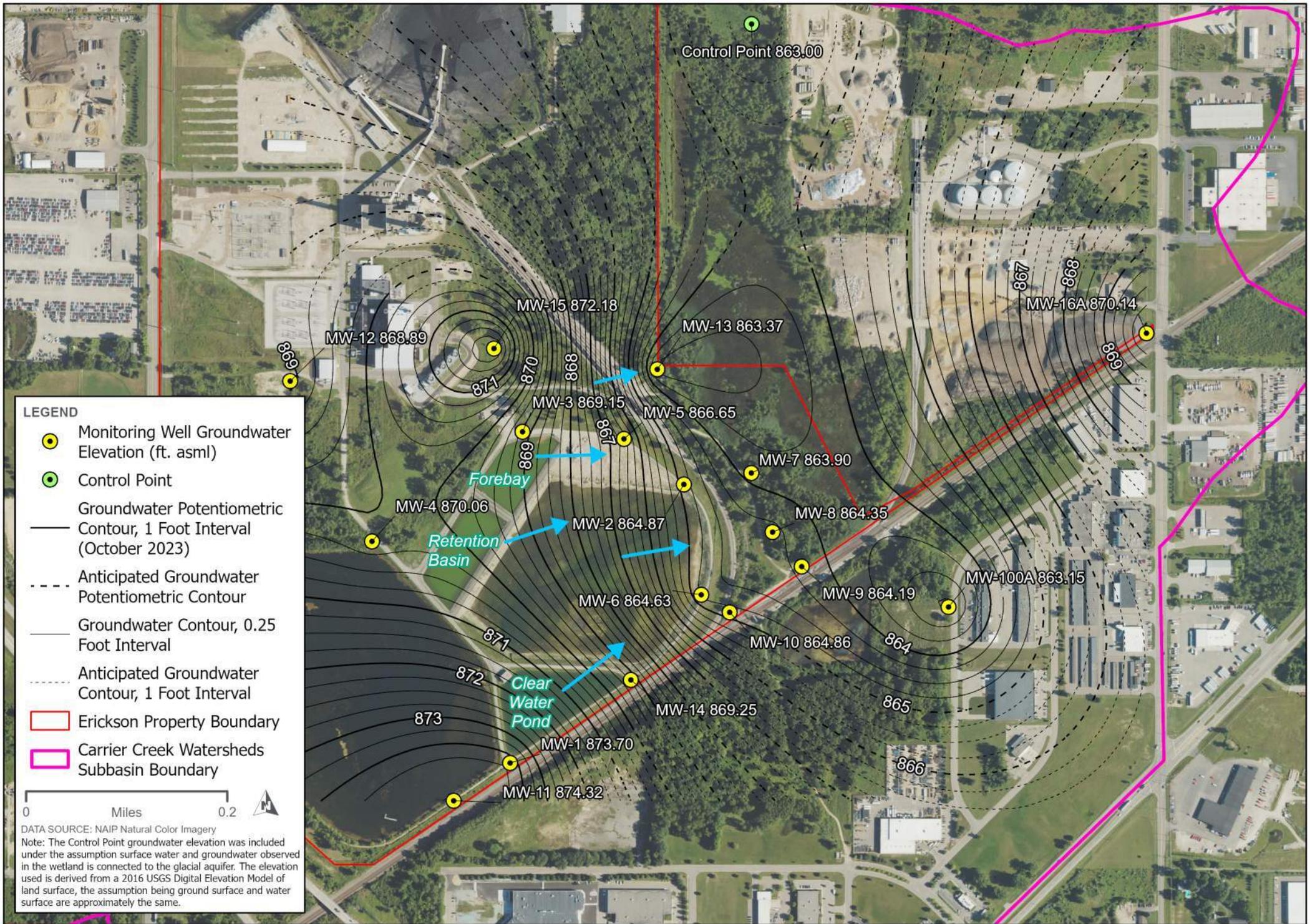


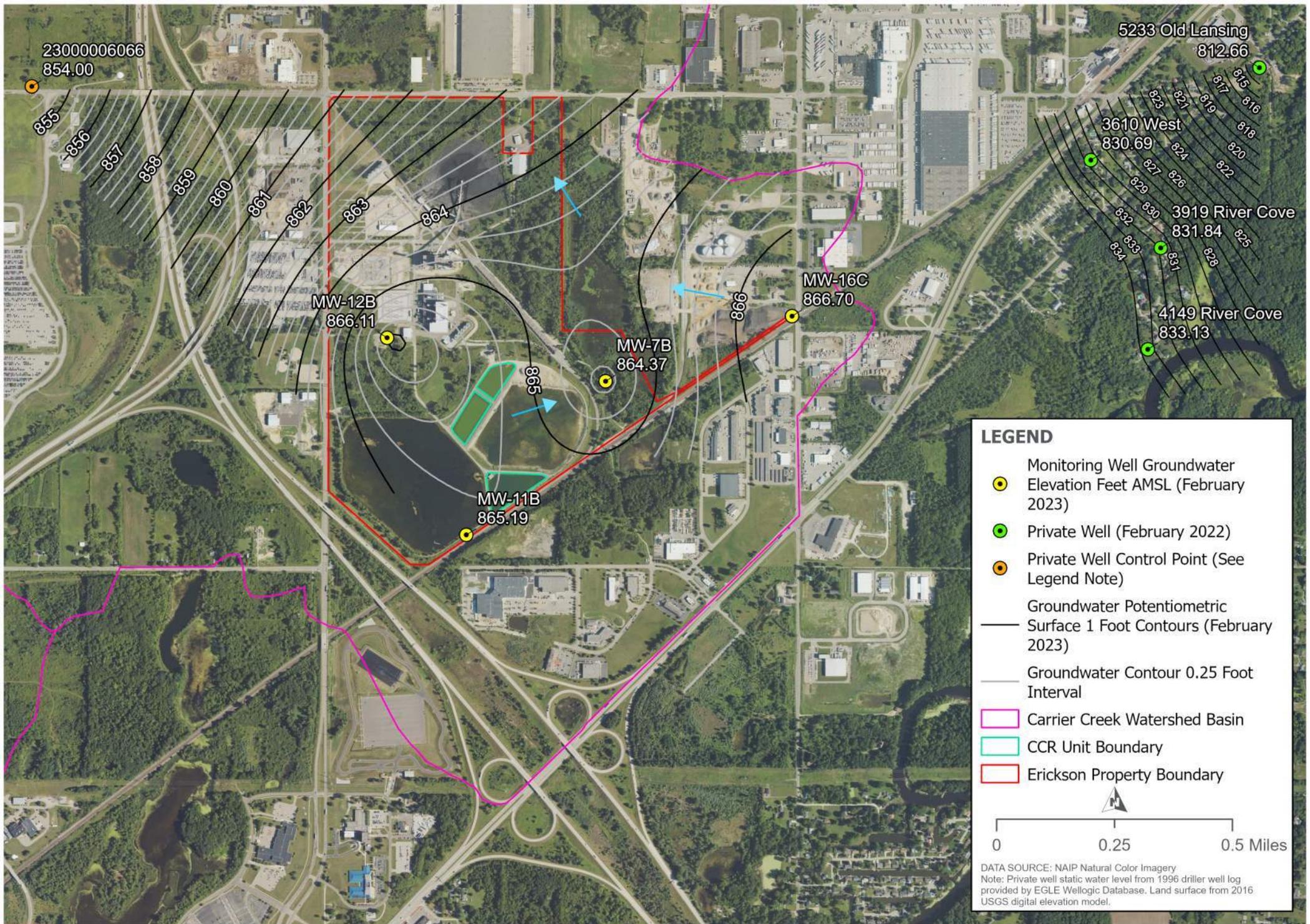
- LEGEND**
- Monitoring Well Groundwater Elevation (ft. asml)
 - Control Point
 - Groundwater Potentiometric Contour, 1 Foot Interval (August 2023)
 - - - Anticipated Groundwater Potentiometric Contour
 - Groundwater Potentiometric Contour, 0.25 Foot Interval
 - - - Anticipated Groundwater Potentiometric Contour
 - Carrier Creek Watersheds Subbasin Boundary
 - Erickson Property Boundary

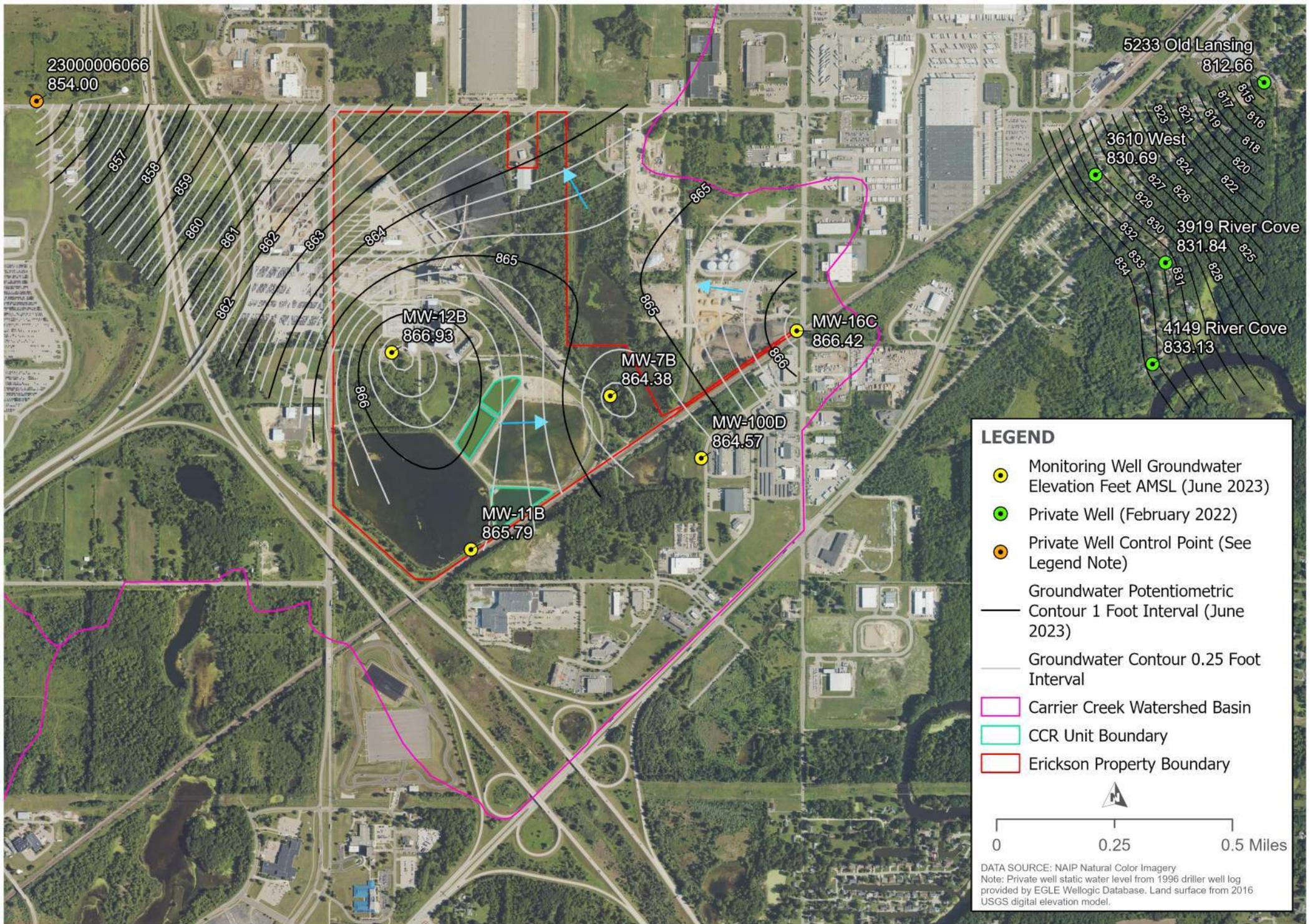


DATA SOURCE: NAIP Natural Color Imagery
 Note: The Control Point groundwater elevation was included under the assumption surface water and groundwater observed in the wetland is connected to the glacial aquifer. The elevation used is derived from a 2016 USGS Digital Elevation Model of land surface, the assumption being ground surface and water surface are approximately the same.

Monitoring Well ID	Groundwater Elevation (ft. asml)
MW-1	873.07
MW-2	864.57
MW-3	868.94
MW-4	870.08
MW-5	866.33
MW-6	864.26
MW-7	863.59
MW-8	864.02
MW-9	862.78
MW-10	864.42
MW-11	874.36
MW-12	868.92
MW-13	863.02
MW-14	868.55
MW-15	870.06
MW-16A	870.07
MW-100A	863.19
Control Point	863.00





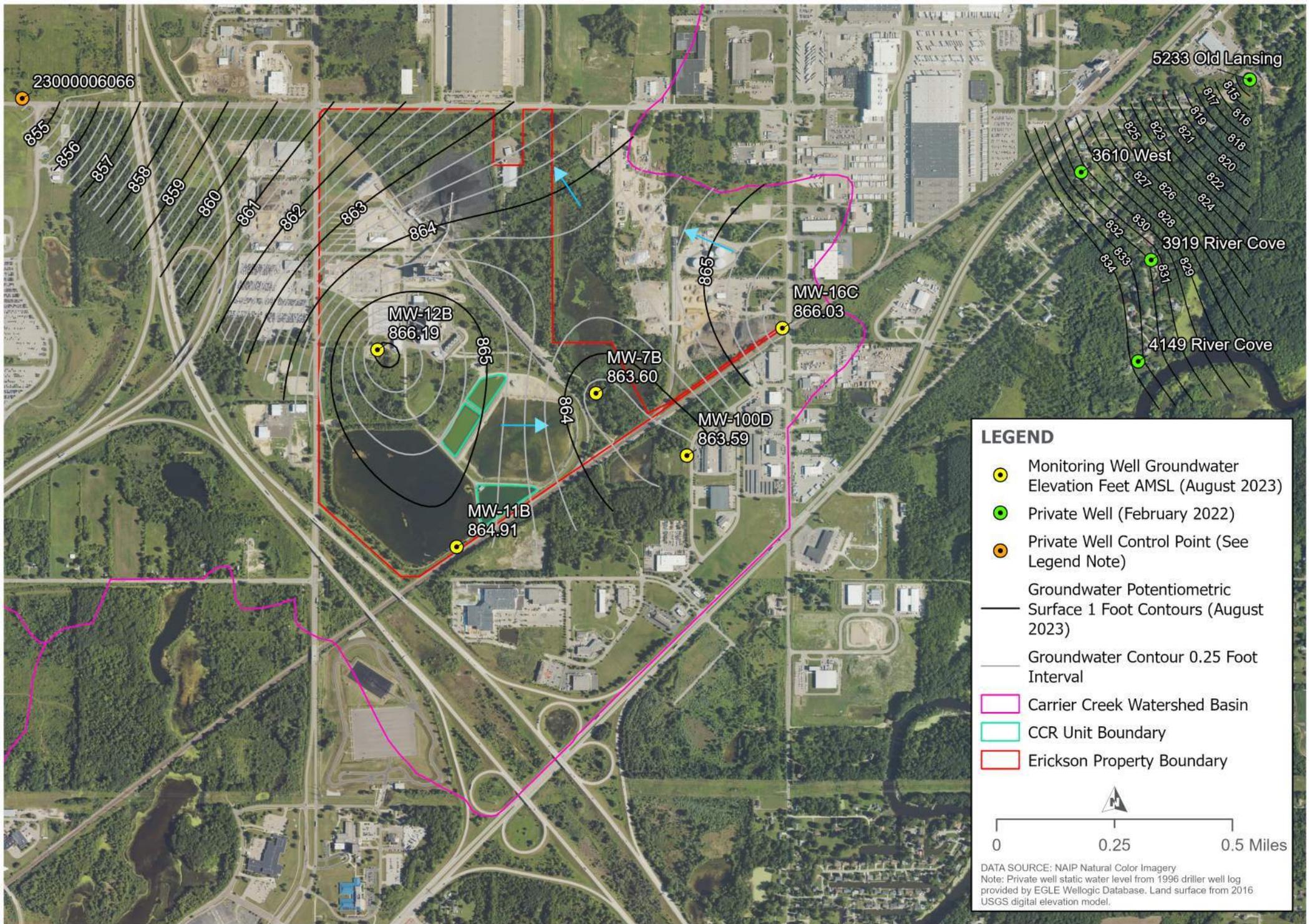


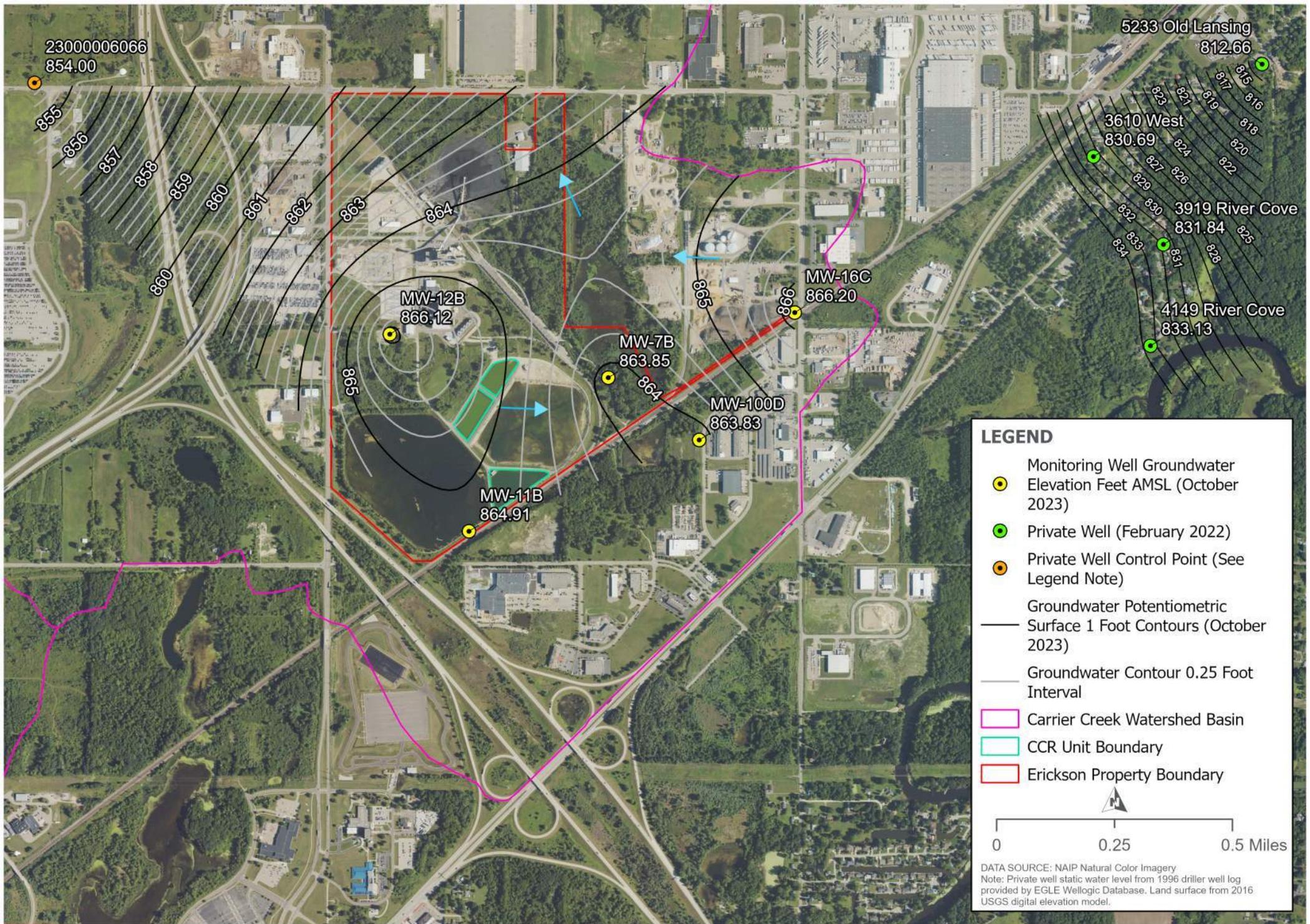
LEGEND

- Monitoring Well Groundwater Elevation Feet AMSL (June 2023)
- Private Well (February 2022)
- Private Well Control Point (See Legend Note)
- Groundwater Potentiometric Contour 1 Foot Interval (June 2023)
- Groundwater Contour 0.25 Foot Interval
- Carrier Creek Watershed Basin
- CCR Unit Boundary
- Erickson Property Boundary

0 0.25 0.5 Miles

DATA SOURCE: NAIP Natural Color Imagery
 Note: Private well static water level from 1996 driller well log provided by EGLE Wellogic Database. Land surface from 2016 USGS digital elevation model.





LEGEND

- Monitoring Well Groundwater Elevation Feet AMSL (October 2023)
- Private Well (February 2022)
- Private Well Control Point (See Legend Note)
- Groundwater Potentiometric Surface 1 Foot Contours (October 2023)
- Groundwater Contour 0.25 Foot Interval
- Carrier Creek Watershed Basin
- CCR Unit Boundary
- Erickson Property Boundary

0 0.25 0.5 Miles

DATA SOURCE: NAIP Natural Color Imagery
 Note: Private well static water level from 1996 driller well log provided by EGLE Wellogic Database. Land surface from 2016 USGS digital elevation model.

Appendix B

Lab Results Summary Tables

		Sample Location:		MW-1									
		Sample Type:		Upgradient									
		Sample Date:		11/6/2020	1/27/2021	5/4/2021	8/3/2021	2/1/2022	8/2/2022	2/7/2023	8/1/2023		
Constituent	Unit	BTVs ¹	MCL	State Program GPS	Initial A.M.	Assessment Monitoring							
Field Parameters													
pH	su	-	-	-	6.87	6.82	6.7	6.73	6.77	6.84	6.88	6.73	
Conductivity	mS/cm	-	-	-	1.205	1.240	1.2	1.185	1.188	1.208	1.098	1.172	
Turbidity	NTU	-	-	-	8.02	9.95	8.5	7.95	5.51	5.85	9.09	6.68	
Dissolved Oxygen	mg/L	-	-	-	0.21	0.09	0.1	0.08	0.07	0.14	0.22	0.14	
Temperature	°C	-	-	-	15.9	9.8	12	15.7	11.7	14.6	10.7	15.9	
Oxidation Reduction Potential	mV	-	-	-	-78.8	-27.5	-20.1	-63.4	-46.6	-95.2	-67.2	-64.0	
Appendix III													
Boron	mg/L	0.48	-	0.50	-	0.21	0.19	0.22	0.27	0.34	0.32	0.16	
Calcium	mg/L	188	-	188	-	173	156	153	166	158	150	169	
Chloride	mg/L	94.3	250	250	-	44	48	46	52	66	61	42	
Fluoride	mg/L	1.0	4	2.0	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
pH, Field	su	-	-	-	6.87	6.82	6.7	6.73	6.77	6.84	6.88	6.73	
Sulfate	mg/L	344	250	344	-	78	65	57	49	37	31	54	
Total Dissolved Solids	mg/L	1168	500	1168	-	776	760	748	746	742	546	746	
Appendix IV													
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Arsenic	mg/L	0.021	0.01	0.021	0.007	0.005	0.005	0.005	0.007	0.007	0.007	0.007	
Barium	mg/L	0.168	2.0	2.0	0.133	0.121	0.113	0.109	0.122	0.155	0.140	0.110	
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Chromium	mg/L	0.005	0.1	0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Fluoride	mg/L	1.0	4.0	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	
Lithium	mg/L	0.0396	0.040	0.040	0.034	0.019	0.015	0.016	0.021	0.027	0.031	0.014	
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Molybdenum	mg/L	0.024	0.1	0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Radium-226	pCi/L	-	-	-	0.533	0.504	0.560	0.301	0.816	0.715	0.300	0.066	
Radium-228	pCi/L	-	-	-	-0.0288	0.850	3.47	0.0172	1.76	0.891 ⁺	1.24	0.576	
Radium-226/228	pCi/L	5.00	5	5.00	0.533	1.35	4.03	0.318	2.58	1.61 ⁺	1.54	0.64	
Selenium	mg/L	0.005	0.05	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Other													
Total Suspended Solids	mg/L	-	-	-	19	14	14	11	13	36	32	19.4	
Bicarbonate	mg/L	-	-	-	-	-	-	-	-	650	636	690	
Carbonate	mg/L	-	-	-	-	-	-	-	-	<10	<10	<10	
Hardness	mg/L	-	-	-	-	-	-	-	-	588	546	638	
Magnesium	mg/L	-	-	-	-	-	-	-	-	43.1	41.3	52.7	
Potassium	mg/L	-	-	-	-	-	-	-	-	1.14	1.08	0.96	
Sodium	mg/L	-	-	-	-	-	-	-	-	40.4	41.0	30.9	

		Sample Location:			MW-2								
		Sample Type:			Downgradient								
		Sample Date:			11/6/2020	1/27/2021	5/4/2021	8/3/2021	2/1/2022	8/2/2022	2/7/2023	8/1/2023	
Constituent	Unit	BTVs	MCL	State Program GPS	Initial A.M.	Assessment Monitoring							
Field Parameters													
pH	su	-	-	-	6.83	6.76	6.70	6.65	6.73	6.86	6.85	6.75	
Conductivity	mS/cm	-	-	-	1.792	1.734	1.700	1.655	1.614	1.395	1.411	1.344	
Turbidity	NTU	-	-	-	11.27	10.15	10.00	9.62	9.95	9.01	8.25	2.38	
Dissolved Oxygen	mg/L	-	-	-	0.19	0.08	0.21	0.02	0.20	1.01	0.37	0.49	
Temperature	°C	-	-	-	14.3	9.1	12.0	14.3	11.7	15.4	11.7	14.1	
Oxidation Reduction Potential	mV	-	-	-	-29.0	55.9	181.8	94.5	46.6	21.0	54.2	75.4	
Appendix III													
Boron	mg/L	0.48	-	0.50	-	5.8	5.04	6.17	5.33	4.76	5.10	4.44	
Calcium	mg/L	188	-	188	-	260	254	226	237	204	204	198	
Chloride	mg/L	94.3	250	250	-	94	77	79	87	87	88	82	
Fluoride	mg/L	1.0	4	2.0	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
pH, Field	su	-	-	-	6.83	6.76	6.70	6.65	6.73	6.86	6.85	6.75	
Sulfate	mg/L	344	250	344	-	506	505	504	398	330	322	278	
Total Dissolved Solids	mg/L	1168	500	1168	-	1320	1250	1300	1180	1020	1050	1010	
Appendix IV													
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Arsenic	mg/L	0.021	0.01	0.021	<0.002	<0.002	<0.002	<0.002	0.004	<0.002	0.002	0.003	
Barium	mg/L	0.168	2.0	2.0	0.042	0.041	0.041	0.039	0.048	0.043	0.037	0.034	
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Chromium	mg/L	0.005	0.1	0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Fluoride	mg/L	1.0	4.0	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	
Lithium	mg/L	0.0396	0.040	0.040	0.063	0.067	0.061	0.058	0.058	0.051	0.050	0.049	
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Molybdenum	mg/L	0.024	0.1	0.100	0.012	0.01	0.009	0.012	0.011	0.013	0.015	0.014	
Radium-226	pCi/L	-	-	-	0.539	0.296	0.366	0.170	0.630	0.290	0.184	0.423	
Radium-228	pCi/L	-	-	-	0.874	0.713	0.150	1.02	1.49	-0.338 ⁺	-0.445	0.62	
Radium-226/228	pCi/L	5.00	5	5.00	1.41	1.01	0.515	1.19	2.12	0.29 ⁺	0.184	1.05	
Selenium	mg/L	0.005	0.05	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Other													
Total Suspended Solids	mg/L	-	-	-	10	10	12	10	12	19	22	34.1	
Bicarbonate	mg/L	-	-	-	-	-	-	-	-	410	454	470	
Carbonate	mg/L	-	-	-	-	-	-	-	-	<10	<10	<10	
Hardness	mg/L	-	-	-	-	-	-	-	-	654	708	680	
Magnesium	mg/L	-	-	-	-	-	-	-	-	50.5	50.2	50.6	
Potassium	mg/L	-	-	-	-	-	-	-	-	2.7	0.87	0.86	
Sodium	mg/L	-	-	-	-	-	-	-	-	61.6	68.3	64.5	

		Sample Location:			MW-3					
		Sample Type:			Upgradient					
		Sample Date:			5/4/2021	8/3/2021	2/1/2022	8/2/2022	2/7/2023	8/1/2023
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring					
Field Parameters										
pH	su	-	-	-	7.20	7.15	7.23	7.27	7.28	7.18
Conductivity	mS/cm	-	-	-	1.800	1.796	1.815	1.829	1.765	1.726
Turbidity	NTU	-	-	-	2.10	8.01	4.83	5.19	4.15	4.95
Dissolved Oxygen	mg/L	-	-	-	0.10	0.03	0.16	0.17	0.35	0.12
Temperature	°C	-	-	-	12.0	14.1	10.6	14.2	12.2	14.2
Oxidation Reduction Potential	mV	-	-	-	-37.5	-65.2	-40.3	-92.1	-74.2	-64.1
Appendix III										
Boron	mg/L	0.48	-	0.50	5.41	6.16	5.62	5.89	5.63	5.67
Calcium	mg/L	188	-	188	243	223	255	241	248	253
Chloride	mg/L	94.3	250	250	89	92	94	101	102	99
Fluoride	mg/L	1.0	4	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
pH, Field	su	-	-	-	7.20	7.15	7.23	7.27	7.28	7.18
Sulfate	mg/L	344	250	344	698	727	682	704	727	675
Total Dissolved Solids	mg/L	1168	500	1168	1490	1500	1480	1440	1450	1440
Appendix IV										
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	0.021	0.01	0.021	0.003	0.003	0.003	0.003	0.003	0.004
Barium	mg/L	0.168	2.0	2.0	0.021	0.021	0.020	0.019	0.019	0.019
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chromium	mg/L	0.005	0.1	0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoride	mg/L	1.0	4.0	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Lithium	mg/L	0.0396	0.040	0.040	0.077	0.086	0.086	0.091	0.082	0.079
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	mg/L	0.024	0.1	0.100	0.162	0.153	0.164	0.162	0.182	0.166
Radium-226	pCi/L	-	-	-	0.437	0.152	0.554	0.355	0.566	0.176
Radium-228	pCi/L	-	-	-	0.760	0.963	1.90	2.56 ⁺	1.61	0.236
Radium-226/228	pCi/L	5.00	5	5.00	1.20	1.11	2.45	2.92 ⁺	2.18	0.412
Selenium	mg/L	0.005	0.05	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Other										
Total Suspended Solids	mg/L	-	-	-	3	1 ^U	2 ^U	4	<3	3.3
Bicarbonate	mg/L	-	-	-	-	-	-	210	215	210
Carbonate	mg/L	-	-	-	-	-	-	<10	<10	<10
Hardness	mg/L	-	-	-	-	-	-	784	795	794
Magnesium	mg/L	-	-	-	-	-	-	45.9	46.5	49.8
Potassium	mg/L	-	-	-	-	-	-	1.67	1.67	1.73
Sodium	mg/L	-	-	-	-	-	-	111	113	121

		Sample Location:			MW-4									
		Sample Type:			Upgradient									
		Sample Date:		1/27/2021	5/4/2021	8/3/2021	2/1/2022	8/2/2022						
Constituent	Unit	BTVs	MCL	State Program GPS	Assessment Monitoring									
Field Parameters					Field Dup	Field Dup	Field Dup	Field Dup	Field Dup	Field Dup	Field Dup	Field Dup	Field Dup	Field Dup
pH	su	-	-	-	7.14	7.14	7.10	7.10	7.03	7.03	7.13	7.13	7.19	7.19
Conductivity	mS/cm	-	-	-	0.900	0.900	0.910	0.910	0.884	0.884	0.911	0.911	0.429	0.429
Turbidity	NTU	-	-	-	1.57	1.57	2.00	2.00	1.84	1.84	2.54	2.54	0.75	0.75
Dissolved Oxygen	mg/L	-	-	-	0.13	0.13	0.19	0.19	0.03	0.03	0.37	0.37	0.12	0.12
Temperature	°C	-	-	-	9.7	9.7	13.0	13.0	14.4	14.4	10.6	10.6	13.8	13.8
Oxidation Reduction Potential	mV	-	-	-	-21.9	-21.9	-22.5	-22.5	-66.4	-66.4	-34.0	-34.0	-88.8	-88.8
Appendix III														
Boron	mg/L	0.48	-	0.50	0.05	0.05	0.05	0.05	0.08	0.07	0.07	0.06	0.06	0.07
Calcium	mg/L	188	-	188	112	109	102	107	98.4	94.6	110	110	110	109
Chloride	mg/L	94.3	250	250	70	70	72	75	68	68	72	74	75	76
Fluoride	mg/L	1.0	4	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
pH, Field	su	-	-	-	7.14	7.14	7.10	7.10	7.03	7.03	7.13	7.13	7.19	7.19
Sulfate	mg/L	344	250	344	57	57	56	58	52	53	54	53	51	52
Total Dissolved Solids	mg/L	1168	500	1168	522	514	532	526	568	570	548	540	554	574
Appendix IV														
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	0.021	0.01	0.021	0.007	0.007	0.006	0.007	0.008	0.008	0.008	0.008	0.008	0.008
Barium	mg/L	0.168	2.0	2.0	0.157	0.153	0.156	0.156	0.155	0.159	0.163	0.162	0.167	0.165
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chromium	mg/L	0.005	0.1	0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoride	mg/L	1.0	4.0	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Lithium	mg/L	0.0396	0.040	0.040	0.012	0.01	<0.010	0.011	0.01	0.01	0.010	0.011	0.009	0.009
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	mg/L	0.024	0.1	0.100	<0.005	<0.005	<0.005	<0.005	0.009	<0.005	<0.005	<0.005	<0.005	<0.005
Radium-226	pCi/L	-	-	-	0.524 ⁺	0.297 ⁻	2.12	0.626	0.232 ⁻	0.532 ⁺	0.606 ⁺	0.322 ⁻	0.393	0.457
Radium-228	pCi/L	-	-	-	-0.957 ⁻	0.956 ⁺	2.89	-0.910	-0.362 ⁻	1.81 ⁺	2.17 ⁺	1.41 ⁻	-0.793 ⁻	2.88 ⁺
Radium-226/228	pCi/L	5.00	5	5.00	0.524 ⁺	1.25 ⁺	5.00 ⁺	0.626 ⁻	0.232 ⁻	2.34 ⁺	2.78 ⁺	1.74 ⁻	0.393 ⁻	3.34 ⁺
Selenium	mg/L	0.005	0.05	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Other														
Total Suspended Solids	mg/L	-	-	-	1 ^U	<3	1 ^U	<3	1 ^U	1 ^U	2 ^U	1 ^U	3 ⁺	<3 ^U
Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	400	410
Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	<10	<10
Hardness	mg/L	-	-	-	-	-	-	-	-	-	-	-	412	426
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	39.3	38.8
Potassium	mg/L	-	-	-	-	-	-	-	-	-	-	-	1.41	1.41
Sodium	mg/L	-	-	-	-	-	-	-	-	-	-	-	28.9	28.3

			Sample Location:		MW-4			
			Sample Type:		Upgradient			
			Sample Date:		2/7/2023	8/1/2023		
Constituent	Unit	BTVs	MCL	State Program GPS	Assessment Monitoring			
Field Parameters						Field Dup		Field Dup
pH	su	-	-	-	7.19	7.19	7.06	7.06
Conductivity	mS/cm	-	-	-	0.882	0.882	0.893	0.893
Turbidity	NTU	-	-	-	3.28	3.28	1.97	1.97
Dissolved Oxygen	mg/L	-	-	-	0.44	0.44	0.08	0.08
Temperature	°C	-	-	-	11.5	11.5	14.1	14.1
Oxidation Reduction Potential	mV	-	-	-	-44.2	-44.2	-68.3	-68.3
Appendix III								
Boron	mg/L	0.48	-	0.50	0.06	0.06	0.08	0.06
Calcium	mg/L	188	-	188	106	106	112	114
Chloride	mg/L	94.3	250	250	74	75	77	77
Fluoride	mg/L	1.0	4	2.0	<1.0	<1.0	<1.0	<1.0
pH, Field	su	-	-	-	7.19	7.19	7.06	7.06
Sulfate	mg/L	344	250	344	56	56	52	52
Total Dissolved Solids	mg/L	1168	500	1168	532	530	558	572
Appendix IV								
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	0.021	0.01	0.021	0.007	0.007	0.007	0.008
Barium	mg/L	0.168	2.0	2.0	0.166	0.163	0.169	0.166
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	<0.0005
Chromium	mg/L	0.005	0.1	0.1	<0.005	<0.005	<0.005	<0.005
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005
Fluoride	mg/L	1.0	4.0	2.0	<1.0	<1.0	<1.0	<1.0
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003
Lithium	mg/L	0.0396	0.040	0.040	0.011	0.010	0.009	0.010
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	mg/L	0.024	0.1	0.100	<0.005	<0.005	<0.005	<0.005
Radium-226	pCi/L	-	-	-	0.701	0.898	0.744	0.501
Radium-228	pCi/L	-	-	-	0.692 [±]	-0.593 ⁻	0.877 [±]	0.0402 ⁻
Radium-226/228	pCi/L	5.00	5	5.00	1.39 [±]	0.898 ⁻	0.744 [±]	0.541 ⁻
Selenium	mg/L	0.005	0.05	0.050	<0.005	<0.005	<0.005	<0.005
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002
Other								
Total Suspended Solids	mg/L	-	-	-	<3	<3	1.8	2.1
Bicarbonate	mg/L	-	-	-	406	407	420	400
Carbonate	mg/L	-	-	-	<10	<10	<10	<10
Hardness	mg/L	-	-	-	420	431	450	434
Magnesium	mg/L	-	-	-	38.3	38.9	39.6	40.5
Potassium	mg/L	-	-	-	1.39	1.41	1.45	1.49
Sodium	mg/L	-	-	-	28.5	28.2	31.2	31.7

		Sample Location:			MW-5										
		Sample Type:			Downgradient										
		Sample Date:			11/6/2020	1/27/2021	5/4/2021	8/3/2021	2/1/2022	8/2/2022	2/7/2023		8/1/2023		
Constituent	Unit	BTVs	MCL	State Program GPS	Initial A.M.	Assessment Monitoring									
Field Parameters															
pH	su	-	-	-	7.16	7.35	6.40	7.22	7.18	7.40	7.13	Diss. Metals	7.13	7.24	7.24
Conductivity	mS/cm	-	-	-	2.234	1.295	1.600	1.772	1.238	1.643	1.304	1.304	1.076	1.076	1.076
Turbidity	NTU	-	-	-	18.49	15.25	21.00	9.52	14.21	20.19	23.53	23.53	15.85	15.85	15.85
Dissolved Oxygen	mg/L	-	-	-	1.02	2.34	2.45	2.45	3.21	5.42	3.52	3.52	3.81	3.81	3.81
Temperature	°C	-	-	-	12.5	8.6	13.0	13.3	10.1	15.3	10.5	10.5	16.1	16.1	16.1
Oxidation Reduction Potential	mV	-	-	-	17.5	191.2	248.4	132.6	59.1	28.6	164.6	164.6	158	158	158
Appendix III															
Boron	mg/L	0.48	-	0.50	-	4.61	3.66	4.82	0.37	4.29	3.53	3.26	2.77	2.67	2.67
Calcium	mg/L	188	-	188	-	245	221	229	70.1	223	187	176	173	162	162
Chloride	mg/L	94.3	250	250	-	66	73	66	43	66	56	-	51	-	-
Fluoride	mg/L	1.0	4	2.0	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	<1.0	-	-
pH, Field	su	-	-	-	7.16	7.35	6.40	7.22	7.18	7.40	7.13	7.13	7.24	7.24	7.24
Sulfate	mg/L	344	250	344	-	578	581	700	186	598	411	-	288	-	-
Total Dissolved Solids	mg/L	1168	500	1168	-	1220	1230	1390	592	1210	984	-	792	-	-
Appendix IV															
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	0.021	0.01	0.021	<0.002	<0.002	0.002	<0.002	0.007	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Barium	mg/L	0.168	2.0	2.0	0.033	0.039	0.038	0.04	0.055	0.044	0.040	0.036	0.047	0.041	0.041
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chromium	mg/L	0.005	0.1	0.1	<0.005	<0.005	<0.005	<0.005	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoride	mg/L	1.0	4.0	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	<1.0	-	-
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	0.014	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Lithium	mg/L	0.0396	0.040	0.040	0.057	0.08	0.073	0.078	0.016	0.076	0.083	0.085	0.085	0.081	0.081
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	mg/L	0.024	0.1	0.100	0.032	0.054	0.05	0.039	0.010	0.063	0.055	0.055	0.072	0.070	0.070
Radium-226	pCi/L	-	-	-	3.30	0.787	0.349	0.374	0.252	0.525	0.558	-	0.409	-	-
Radium-228	pCi/L	-	-	-	0.921	3.2 ^l	0.726	0.271	1.54	0.33 ^{h+}	1.22	-	1.24	-	-
Radium-226/228	pCi/L	5.00	5	5.00	4.22	3.99 ^l	1.08	0.644	1.79	0.855 ^{h+}	1.78	-	1.65	-	-
Selenium	mg/L	0.005	0.05	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Other															
Total Suspended Solids	mg/L	-	-	-	4	7	8	4	63	17	21	-	8.6	-	-
Bicarbonate	mg/L	-	-	-	-	-	-	-	-	280	320	-	290	-	-
Carbonate	mg/L	-	-	-	-	-	-	-	-	<10	<10	-	<10	-	-
Hardness	mg/L	-	-	-	-	-	-	-	-	748	629	-	530	-	-
Magnesium	mg/L	-	-	-	-	-	-	-	-	54.5	42.3	39.9	38.1	34.5	34.5
Potassium	mg/L	-	-	-	-	-	-	-	-	3.77	4.44	4.06	4.61	4.22	4.22
Sodium	mg/L	-	-	-	-	-	-	-	-	69.5	57.4	52.3	47.8	44.1	44.1

		Sample Location:			MW-6								
		Sample Type:			Downgradient								
		Sample Date:			11/6/2020	1/27/2021	5/4/2021	8/3/2021	2/1/2022	8/2/2022	2/7/2023	8/1/2023	
Constituent	Unit	BTVs	MCL	State Program GPS	Initial A.M.	Assessment Monitoring							
Field Parameters													
pH	su	-	-	-	6.76	6.72	7.00	6.51	6.69	6.79	6.74	6.71	
Conductivity	mS/cm	-	-	-	1.169	1.178	1.000	1.022	1.045	1.091	1.224	1.133	
Turbidity	NTU	-	-	-	9.69	1.19	8.00	8.74	4.52	2.65	4.43	2.15	
Dissolved Oxygen	mg/L	-	-	-	0.18	0.12	0.10	0.07	0.08	0.44	0.19	0.33	
Temperature	°C	-	-	-	15.2	11.0	12.0	13.2	13.4	14.4	12.8	14.2	
Oxidation Reduction Potential	mV	-	-	-	12.0	122.9	70.8	168.5	68.6	18.3	30.1	202.1	
Appendix III													
Boron	mg/L	0.48	-	0.50	-	0.91	0.64	0.76	0.68	0.80	0.99	0.85	
Calcium	mg/L	188	-	188	-	191	149	146	160	169	193	189	
Chloride	mg/L	94.3	250	250	-	38	27	27	27	35	42	39	
Fluoride	mg/L	1.0	4	2.0	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
pH, Field	su	-	-	-	6.76	6.72	7.00	6.51	6.69	6.79	6.74	6.71	
Sulfate	mg/L	344	250	344	-	198	133	139	131	172	233	185	
Total Dissolved Solids	mg/L	1168	500	1168	-	798	658	692	688	728	866	822	
Appendix IV													
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Arsenic	mg/L	0.021	0.01	0.021	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Barium	mg/L	0.168	2.0	2.0	0.052	0.052	0.044	0.043	0.044	0.038	0.046	0.050	
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Chromium	mg/L	0.005	0.1	0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Fluoride	mg/L	1.0	4.0	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	
Lithium	mg/L	0.0396	0.040	0.040	0.058	0.048	0.048	0.047	0.044	0.046	0.054	0.049	
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Molybdenum	mg/L	0.024	0.1	0.100	0.028	0.024	0.024	0.029	0.036	0.016	0.027	0.021	
Radium-226	pCi/L	-	-	-	0.343	0.263	0.320	0.116	0.571	0.0773	0.961	0.462	
Radium-228	pCi/L	-	-	-	1.36	1.72	1.13	1.30	2.04	0.324 ⁺	-1.09	0.201	
Radium-226/228	pCi/L	5.00	5	5.00	1.70	1.98	1.45	1.42	2.61	0.401 ⁺	0.961	0.663	
Selenium	mg/L	0.005	0.05	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Other													
Total Suspended Solids	mg/L	-	-	-	<3	<3	<3	2 ^U	32	<3	<3	1.4	
Bicarbonate	mg/L	-	-	-	-	-	-	-	-	480	543	530	
Carbonate	mg/L	-	-	-	-	-	-	-	-	<10	<10	<10	
Hardness	mg/L	-	-	-	-	-	-	-	-	532	624	616	
Magnesium	mg/L	-	-	-	-	-	-	-	-	32.9	39.4	40.3	
Potassium	mg/L	-	-	-	-	-	-	-	-	6.4	6.85	7.02	
Sodium	mg/L	-	-	-	-	-	-	-	-	38.8	43.9	34.3	

			Sample Location:		MW-7											
			Sample Type:		Downgradient											
			Sample Date:		6/15/2021	7/20/2021	8/24/2021	9/28/2021	11/2/2021	12/7/2021	1/11/2022	2/17/2022	8/2/2022	2/8/2023	8/2/2023	
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring								Assessment Monitoring			
Field Parameters																
pH	su	-	-	-	8.18	7.40	7.40	7.47	7.37	7.47	7.56	7.24	7.58	7.58	7.44	
Conductivity	mS/cm	-	-	-	0.879	0.900	0.916	0.925	0.462	0.972	0.964	1.129	0.965	0.780	0.845	
Turbidity	NTU	-	-	-	1.71	5.00	5.37	16.01	5.18	2.2	2.49	2.21	2.65	3.53	1.45	
Dissolved Oxygen	mg/L	-	-	-	0.03	<0.1	0.01	0.02	0	0.02	0.49	0.01	0.16	0.04	0.01	
Temperature	°C	-	-	-	12.9	14.0	17.0	14.3	13	11	9.1	6.2	14.6	9.9	15.9	
Oxidation Reduction Potential	mV	-	-	-	-142.1	-117.2	-139.5	-128.3	-146.5	-157.1	-112.6	-36.9	-129.0	-81.3	-146.9	
Appendix III																
Boron	mg/L	0.48	-	0.50	1.88	1.78	1.89	1.81	2.12	2.19	2.14	2.75	1.43	1.36	1.08	
Calcium	mg/L	188	-	188	110	111	112	108	122	126	121	149	104	98.8	97.2	
Chloride	mg/L	94.3	250	250	73	74	74	75	73	72.2	78	75	98	82	81	
Fluoride	mg/L	1.0	4	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.338	<1.0	<1.0	<1.0	<1.0	<1.0	
pH, Field	su	-	-	-	8.18	7.40	7.40	7.47	7.37	7.47	7.56	7.24	7.58	7.58	7.44	
Sulfate	mg/L	344	250	344	189	181	184	191	212	203	214	260	175	198	172	
Total Dissolved Solids	mg/L	1168	500	1168	586	574	592	588	622	634	624	758	590	564	548	
Appendix IV																
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Arsenic	mg/L	0.021	0.01	0.021	0.006	0.006	0.007	0.006	0.005	0.006	0.006	0.005	0.004	0.004	0.006	
Barium	mg/L	0.168	2.0	2.0	0.056	0.06	0.052	0.051	0.054	0.056	0.055	0.062	0.047	0.049	0.050	
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Chromium	mg/L	0.005	0.1	0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Fluoride	mg/L	1.0	4.0	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.338	<1.0	<1.0	<1.0	<1.0	<1.0	
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	
Lithium	mg/L	0.0396	0.040	0.040	0.089	0.096	0.093	0.097	0.100	0.100	0.100	0.112	0.086	0.073	0.063	
Mercury	mg/L	0.0002	0.002	0.002	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Molybdenum	mg/L	0.024	0.1	0.100	0.259	0.26	0.292	0.276	0.276	0.293	0.296	0.284	0.146	0.173	0.156	
Radium-226	pCi/L	-	-	-	0.253	1.4	0.766	0.829	0.666 ^j	2.64	0.676	0.818	0.568	1.06	0.619	
Radium-228	pCi/L	-	-	-	1.85 ^{jt}	3.42	0.535	2.49	0.115	0.179	-0.650	1.51	1.27 ^{jt}	4.38	1.18	
Radium-226/228	pCi/L	5.00	5	5.00	2.11 ^{jt}	4.82	1.30	3.32	0.781 ^j	2.82	0.676	2.33	1.84 ^{jt}	5.44	1.80	
Selenium	mg/L	0.005	0.05	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Other																
Total Suspended Solids	mg/L	-	-	-	<3	<3	<3	<3	<3	<3	<3	1 ^u	<3	<3	<3	
Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	180	163	150	
Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	<10	<10	<10	
Hardness	mg/L	-	-	-	-	-	-	-	-	-	-	-	305	290	289	
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	12.3	12.3	12.1	
Potassium	mg/L	-	-	-	-	-	-	-	-	-	-	-	9.53	8.90	9.44	
Sodium	mg/L	-	-	-	-	-	-	-	-	-	-	-	71.1	66.5	68.1	

		Sample Location:			MW-7B										
		Sample Type:			Downgradient										
		Sample Date:			3/9/2022	4/13/2022	5/19/2022	6/23/2022	7/28/2022	9/1/2022	10/6/2022	11/10/2022			
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring										
Field Parameters						Field Dup		Field Dup							
pH	su	-	-	-	8.14	8.14	8.04	8.04	8.07	7.73	7.81	7.90	7.80	7.85	
Conductivity	ms/cm	-	-	-	0.73	0.73	0.588	0.588	0.589	0.586	0.588	0.580	0.587	0.577	
Turbidity	NTU	-	-	-	0.02	0.02	7.01	7.01	6.25	6.01	4.05	4.20	5.25	6.01	
Dissolved Oxygen	mg/L	-	-	-	0.85	0.85	0.26	0.26	0.1	0.09	0.11	0.67	0.16	0.12	
Temperature	°C	-	-	-	11.7	11.7	11.0	11.0	13.1	13.3	14.1	14.0	13.3	13.4	
Oxidation Reduction Potential	mV	-	-	-	19.2	19.2	-95.1	-95.1	-135.8	-38.8	-108.9	-117.5	-98.2	-106.9	
Appendix III															
Boron	mg/L	3.52	-	3.52	3.07	3.09	2.90	2.88	3.02	3.04	2.98	3.17	2.91	2.94	
Calcium	mg/L	69.6	-	69.6	10.2	10.4	9.59	9.28	8.24	9.22	9.25	9.14	8.73	9.24	
Chloride	mg/L	5.0	250	250	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
Fluoride	mg/L	1.0	4	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
pH, Field	su	-	-	-	8.14	8.14	8.04	8.04	8.07	7.73	7.81	7.90	7.80	7.85	
Sulfate	mg/L	5.0	250	250	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
Total Dissolved Solids	mg/L	380	500	500	366	366	362	370	366	362	376	356	376	368	
Appendix IV															
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Arsenic	mg/L	0.009	0.01	0.01	<0.002	<0.002	0.003	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Barium	mg/L	0.081	2	2.0	0.01	0.009	0.011	0.011	0.01	0.009	0.009	0.010	0.008		
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Chromium	mg/L	0.005	0.1	0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Fluoride	mg/L	1.0	4	2.00	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	0.012	<0.003	<0.003	<0.003	<0.003	
Lithium	mg/L	0.051	0.04	0.051	0.034	0.035	0.028	0.029	0.031	0.031	0.032	0.032	0.032	0.032	
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Molybdenum	mg/L	0.011	0.1	0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Radium-226	pCi/L	-	-	-	0.451	0.629	0.439	0.52	0.378	0.547	0.278	0.440	0.988	0.463	
Radium-228	pCi/L	-	-	-	1.270	0.536	0.872	0.428	-0.123	1.88	0.136 [±]	0.286	0.103	1.30	
Radium-226/228	pCi/L	4.42	5.00	5.00	1.720	1.160	1.31	0.948	0.378	2.43	0.414 [±]	0.726	1.09	1.77	
Selenium	mg/L	0.005	0.05	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Other															
Total Suspended Solids	mg/L	-	-	-	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	
Bicarbonate	mg/L	-	-	-	390	390	390	400	400	380	390	390	390	400	
Carbonate	mg/L	-	-	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	
Hardness	mg/L	-	-	-	38	40	37	51	29	31	30	29	30	29	
Magnesium	mg/L	-	-	-	2.93	3.00	2.99	2.93	2.43	2.75	2.79	2.84	2.75	2.78	
Potassium	mg/L	-	-	-	5.48	5.57	5.64	5.57	4.8	5.57	5.72	5.61	5.53	5.85	
Sodium	mg/L	-	-	-	132	131	136	133	116	135	138	140	138	137	

MW-7B	
Downgradient	
2/8/2023	8/2/2023
Assessment Monitoring	
8.15	7.87
0.577	0.565
3.12	0.98
0.07	0.02
11.2	14.9
-130.1	-138.4
3.00	3.06
8.77	9.36
<5	<5
<1.0	<1.0
8.15	7.87
<5	<5
362	356
<0.005	<0.005
<0.002	<0.002
0.009	0.008
<0.001	<0.001
<0.0005	<0.0005
<0.005	<0.005
<0.005	<0.005
<1.0	<1.0
<0.003	<0.003
0.032	0.031
<0.0002	<0.0002
<0.005	<0.005
0.504	0.434
-0.879	1.13
0.504	1.57
<0.005	<0.005
<0.002	<0.002
<3	<3
418	400
<10	<10
29	38
2.81	2.81
5.58	5.78
142	146

		Sample Location:			MW-7C									
		Sample Type:			Downgradient									
		Sample Date:			3/10/2022	3/10/2022	4/14/2022	5/19/2022	6/23/2022	7/28/2022	9/1/2022	10/6/2022	11/10/2022	
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring									
Field Parameters						Field Dup								
pH	su	-	-	-	7.32	7.32	7.51	7.49	7.28	7.24	7.30	7.23	7.35	
Conductivity	mS/cm	-	-	-	2.01	2.01	1.811	1.758	1.651	1.672	1.700	1.330	1.678	
Turbidity	NTU	-	-	-	0.02	0.02	5.87	3.95	2.59	1.97	2.80	4.20	4.01	
Dissolved Oxygen	mg/L	-	-	-	1.77	1.77	0.23	0.07	0.08	0.09	0.61	0.12	0.09	
Temperature	°C	-	-	-	12.3	12.3	11.0	13.7	13.8	14.3	16.0	13.7	13.8	
Oxidation Reduction Potential	mV	-	-	-	-39	-39	-121.4	-182.8	-110.2	-151.5	-136.4	-128.8	-120.4	
Appendix III														
Boron	mg/L	0.48	-	0.50	6.54	6.55	6.44	6.74	6.46	6.7	7.24	6.29	6.62	
Calcium	mg/L	188	-	188	277	272	255	183	245	241	247	234	243	
Chloride	mg/L	94.3	250	250	96	95	101	93	91	90	93	93	92	
Fluoride	mg/L	1.0	4	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
pH, Field	su	-	-	-	7.32	7.32	7.51	7.49	7.28	7.24	7.30	7.23	7.35	
Sulfate	mg/L	344	250	344	751	761	736	723	668	660	703	675	685	
Total Dissolved Solids	mg/L	1168	500	1168	1500	1500	1450	1420	1360	1360	1370	1360	1360	
Appendix IV														
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Arsenic	mg/L	0.021	0.01	0.021	0.007	0.007	0.006	0.007	0.006	0.006	0.006	0.006	0.005	
Barium	mg/L	0.168	2.0	2.0	0.045	0.046	0.043	0.046	0.041	0.042	0.047	0.041	0.044	
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	0.0007	<0.0005	<0.0005	0.0008	<0.0005	0.0009	
Chromium	mg/L	0.005	0.1	0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Fluoride	mg/L	1.0	4.0	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	
Lithium	mg/L	0.0396	0.040	0.040	0.132	0.129	0.121	0.130	0.127	0.138	0.137	0.128	0.125	
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Molybdenum	mg/L	0.024	0.1	0.100	0.41	0.41	0.40	0.42	0.379	0.39	0.405	0.377	0.415	
Radium-226	pCi/L	-	-	-	0.867	0.916	0.566	0.444	0.958	0.193	0.606	0.595	0.680	
Radium-228	pCi/L	-	-	-	2.790	2.110	3.090	0.550	2.35	0.58 ⁺	0.204	1.39	1.08	
Radium-226/228	pCi/L	5.00	5	5.00	3.660	3.030	3.650	0.994	3.31	0.773 ⁺	0.810	1.99	1.76	
Selenium	mg/L	0.005	0.05	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Other														
Total Suspended Solids	mg/L	-	-	-	27 ⁺	13 ⁻	10	9	8	<3	<3	<3	6	
Bicarbonate	mg/L	-	-	-	150	160	160	170	160	160	170	150	150	
Carbonate	mg/L	-	-	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	
Hardness	mg/L	-	-	-	840	860	812	812	777	740	764	750	754	
Magnesium	mg/L	-	-	-	44.1	44.90	43.10	33.70	40	40	42.2	42.1	41.0	
Potassium	mg/L	-	-	-	5.34	5.04	5.68	4.92	5.89	5.71	5.88	6.14	5.96	
Sodium	mg/L	-	-	-	97.9	97.1	96.8	79	94.2	95.7	99.1	95.7	98.7	

MW-7C	
Downgradient	
2/8/2023	8/2/2023
Assessment Monitoring	
7.41	7.24
1.537	1.619
7.29	0.65
0.09	0.06
11.3	16.4
-111.5	-130.0
6.46	6.68
246	235
94	93
<1.0	<1.0
7.41	7.24
687	656
1360	1350
<0.005	<0.005
0.006	0.007
0.041	0.044
<0.001	<0.001
<0.0005	<0.0005
<0.005	<0.005
<0.005	<0.005
<1.0	<1.0
<0.003	<0.003
0.125	0.126
<0.0002	<0.0002
0.386	0.397
1.11	0.795
2.17	0.451
3.27	1.25
<0.005	<0.005
<0.002	<0.002
7	7.4
172	170
<10	<10
742	779
42.7	41.5
6.07	5.79
99.8	96.6

			Sample Location:		MW-8											
			Sample Type:		Downgradient											
			Sample Date:		6/15/2021	7/20/2021	8/24/2021	9/28/2021	11/2/2021	12/7/2021	1/11/2022	2/17/2022	8/2/2022	2/8/2023	8/2/2023	
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring								Assessment Monitoring			
Field Parameters																
pH	su	-	-	-	7.78	7.00	6.99	7.24	7.03	7.12	7.26	6.99	7.18	7.18	7.06	
Conductivity	mS/cm	-	-	-	0.620	0.640	0.620	0.721	0.656	0.653	0.637	0.638	0.665	0.634	0.744	
Turbidity	NTU	-	-	-	2.24	7.00	7.18	6.53	5.25	2.95	5.43	2	4.31	6.17	2.75	
Dissolved Oxygen	mg/L	-	-	-	2.29	1.00	1.66	0.04	7.83	1.76	2.24	1.64	0.88	2.92	0.01	
Temperature	°C	-	-	-	10.7	14.0	16.4	14.3	14	11.2	9.2	5.9	14.4	9.4	14.2	
Oxidation Reduction Potential	mV	-	-	-	72.1	280.5	325.9	112.7	228.5	122	234.6	365.3	100.5	249.8	114.5	
Appendix III																
Boron	mg/L	0.48	-	0.50	0.11	0.10	0.08	0.21	0.08	0.05	0.04	<0.04	0.08	0.08	0.14	
Calcium	mg/L	188	-	188	91.2	94.6	89.8	86.5	93.0	98.5	98.6	100.0	95.3	104	86.9	
Chloride	mg/L	94.3	250	250	11	17	10	59	8	4.45	<5	<5	15.00	24	66	
Fluoride	mg/L	1.0	4	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.0587	<1.0	<1.0	<1.0	<1.0	<1.0	
pH, Field	su	-	-	-	7.78	7.00	6.99	7.24	7.03	7.12	7.26	6.99	7.18	7.18	7.06	
Sulfate	mg/L	344	250	344	25	35	17	48	16	13.8	11	11	15	32	52	
Total Dissolved Solids	mg/L	1168	500	1168	392	384	362	414	368	370	372	382	382	430	460	
Appendix IV																
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Arsenic	mg/L	0.021	0.01	0.021	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Barium	mg/L	0.168	2.0	2.0	0.028	0.021	0.022	0.026	0.021	0.021	0.018	0.017	0.019	0.022	0.026	
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Chromium	mg/L	0.005	0.1	0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Fluoride	mg/L	1.0	4.0	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.0587	<1.0	<1.0	<1.0	<1.0	<1.0	
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	
Lithium	mg/L	0.0396	0.040	0.040	<0.010	<0.005	<0.005	0.013	0.009	0.006	<0.005	<0.005	0.005	0.007	0.009	
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002 ^U	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Molybdenum	mg/L	0.024	0.1	0.100	<0.011	0.006	<0.005	0.013	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Radium-226	pCi/L	-	-	-	0.287	0.389	0.437	0.228	0.228 ^J	1.70	1.77	0.843	0.201	0.118	0.245	
Radium-228	pCi/L	-	-	-	0.396 ⁺	-0.103	0.114	0.469	1.71	0.583	4.44	2.00	3.04 ⁺	-0.133	4.30	
Radium-226/228	pCi/L	5.00	5	5.00	0.683 ⁺	0.389	0.551	0.697	1.93 ^J	2.28	6.21	2.84	3.24 ⁺	0.118	4.55	
Selenium	mg/L	0.005	0.05	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Other																
Total Suspended Solids	mg/L	-	-	-	<3	<3	<3	<3	<3	2 ^U	<3	<3	<3	<3	<3	
Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	410	440	320	
Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	<10	<10	<10	
Hardness	mg/L	-	-	-	-	-	-	-	-	-	-	-	347	384	326	
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	28.9	31.8	25.3	
Potassium	mg/L	-	-	-	-	-	-	-	-	-	-	-	0.57	0.53	0.76	
Sodium	mg/L	-	-	-	-	-	-	-	-	-	-	-	12.7	14.2	40.9	

		Sample Location: MW-9											
		Sample Type: Downgradient											
		Sample Date:	12/7/2021		1/11/2022		2/17/2022		8/2/2022	2/8/2023	8/2/2023		
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring						Assessment Monitoring		
						Field Dup		Field Dup		Field Dup			
Field Parameters													
pH	su	-	-	-	7.27	7.27	7.35	7.35	7.16	7.16	7.44	7.45	7.13
Conductivity	mS/cm	-	-	-	0.459	0.459	0.455	0.455	0.471	0.471	0.420	0.424	0.474
Turbidity	NTU	-	-	-	2.21	2.21	2.89	2.89	1.6	1.6	3.44	3.01	2.20
Dissolved Oxygen	mg/L	-	-	-	5.42	5.42	6.13	6.13	6.17	6.17	3.96	6.33	3.35
Temperature	°C	-	-	-	9.5	9.5	7	7	4.7	4.7	19.2	7.3	16.5
Oxidation Reduction Potential	mV	-	-	-	135.9	135.9	260.1	260.1	380.9	380.9	99.2	252.1	132.5
Appendix III													
Boron	mg/L	0.48	-	0.50	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Calcium	mg/L	188	-	188	76.6	75.8	76.9	75.0	77.6	78	61.8	76.9	75.7
Chloride	mg/L	94.3	250	250	1.11	1.07	<5	<5	<5	<5	<5	<5	<5
Fluoride	mg/L	1.0	4	2.0	0.033	0.033	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
pH, Field	su	-	-	-	7.27	7.27	7.35	7.35	7.16	7.16	7.44	7.45	7.13
Sulfate	mg/L	344	250	344	3.58	3.52	<5	<5	<5	<5	5.00	<5	6
Total Dissolved Solids	mg/L	1168	500	1168	244	246	264	266	280	276	242	274	282
Appendix IV													
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	0.021	0.01	0.021	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Barium	mg/L	0.168	2.0	2.0	0.014	0.015	0.013	0.013	0.013	0.013	0.013	0.014	0.016
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chromium	mg/L	0.005	0.1	0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoride	mg/L	1.0	4.0	2.0	0.033	0.033	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Lithium	mg/L	0.0396	0.040	0.040	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	mg/L	0.024	0.1	0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Radium-226	pCi/L	-	-	-	1.67	1.69	0.838 ⁺	1.22 ⁺	0.533	0.657	0.0527	0.372	0.305
Radium-228	pCi/L	-	-	-	0.666	0.826	1.53 ⁺	-0.724 ⁻	0.0438 ⁺	0.283 ⁺	1.88 ⁺	1.60	-0.426
Radium-226/228	pCi/L	5.00	5	5.00	2.34	2.51	2.37 ⁺	1.22 ⁺	0.576 ⁺	0.940 ⁺	1.94 ⁺	1.97	0.305
Selenium	mg/L	0.005	0.05	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Other													
Total Suspended Solids	mg/L	-	-	-	<3	<3	<3	<3	<3	<3	<3	<3	<3
Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	260	336	310
Carbonate	mg/L	-	-	-	-	-	-	-	-	-	<10	<10	<10
Hardness	mg/L	-	-	-	-	-	-	-	-	-	218	261	270
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	15.2	19.4	19.5
Potassium	mg/L	-	-	-	-	-	-	-	-	-	1.09	0.93	1.28
Sodium	mg/L	-	-	-	-	-	-	-	-	-	2.41	2.86	3.84

MW-10				
Downgradient				
8/2/2022	2/8/2023		8/2/2023	

Assessment Monitoring

		Field Dup		Field Dup
6.85	6.73	6.73	6.52	6.52
0.691	0.679	0.679	0.739	0.739
3.57	1.88	1.88	2.34	2.34
2.82	4.03	4.03	3.15	3.15
15.4	9.5	9.5	14.4	14.4
98.9	238.0	238	163.5	163.5
0.05	0.04	0.05	0.05	0.06
117	136	140	131	129
<5	<5	<5	6	6
<1.0	<1.0	<1.0	<1.0	<1.0
6.85	6.73	6.73	6.52	6.52
10	13	13	18	17
398	494	482	452	450
<0.005	<0.005	<0.005	<0.005	<0.005
<0.002	<0.002	<0.002	<0.002	<0.002
0.037	0.036	0.036	0.037	0.037
<0.001	<0.001	<0.001	<0.001	<0.001
<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
<0.005	<0.005	<0.005	<0.005	<0.005
<0.005	<0.005	<0.005	<0.005	<0.005
<1.0	<1.0	<1.0	<1.0	<1.0
<0.003	<0.003	<0.003	<0.003	<0.003
<0.005	<0.005	<0.005	<0.005	<0.005
<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
<0.005	<0.005	<0.005	<0.005	<0.005
0.195	0.407	0.443	0.519 ⁺	0.840 ⁺
0.402 ⁺	-0.255 ⁺	0.758 ⁺	-0.799 ⁺	0.502 ⁺
0.597 ⁺	0.407 ⁺	1.20 ⁺	0.519 ⁺	1.34 ⁺
<0.005	<0.005	<0.005	<0.005	<0.005
<0.002	<0.002	<0.002	<0.002	<0.002
<3	<3	<3	<3	<3
440	525	522	450	450
<10	<10	<10	<10	<10
382	461	460	433	420
23.6	29.5	29.2	25.8	25.6
0.73	0.62	0.70	0.68	0.68
2.24	2.54	2.73	4.55	4.64

				MW-11											
				Upgradient											
				2/23/2022		3/30/2022		5/4/2022		6/8/2022		7/13/2022		8/17/2022	
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring										
						Field Dup		Field Dup		Field Dup		Field Dup		Field Dup	
Field Parameters						Field Dup		Field Dup		Field Dup		Field Dup		Field Dup	
pH	su	-	-	-	6.84	6.84	6.64	6.64	6.78	6.76	6.76	6.73	6.73	6.88	6.88
Conductivity	mS/cm	-	-	-	1.08	1.08	1.119	1.119	1.093	1.11	1.11	1.008	1.008	1.117	1.117
Turbidity	NTU	-	-	-	9.65	9.65	8.95	8.95	9.22	6.98	6.98	3.02	3.02	4.01	4.01
Dissolved Oxygen	mg/L	-	-	-	0.01	0.01	0.07	0.07	0.06	0.56	0.56	0.08	0.08	0.21	0.21
Temperature	°C	-	-	-	9.50	9.50	9.8	9.8	12	11.3	11.3	12.8	12.8	14.4	14.4
Oxidation Reduction Potential	mV	-	-	-	-88.90	-88.90	-83.9	-83.9	-103.4	-109.6	-109.6	-97.3	-97.3	-129.8	-129.8
Appendix III															
Boron	mg/L	0.48	-	0.50	0.22	0.22	0.20	0.22	0.21	0.22	0.22	0.21	0.2	0.21	0.2
Calcium	mg/L	188	-	188	136	130	138	140	144	139	138	134	135	140	138
Chloride	mg/L	94.3	250	250	67	67	67	67	63	63	63	61	62	63	64
Fluoride	mg/L	1.0	4	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
pH, Field	su	-	-	-	6.84	6.84	6.64	6.64	6.78	6.76	6.76	6.73	6.73	6.88	6.88
Sulfate	mg/L	344	250	344	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Total Dissolved Solids	mg/L	1168	500	1168	632	532	642	636	612	644	654	666	644	368	344
Appendix IV															
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	0.021	0.01	0.021	0.018	0.018	0.018	0.017	0.02	0.018	0.018	0.019	0.018	0.021	0.019
Barium	mg/L	0.168	2.0	2.0	0.147	0.146	0.144	0.145	0.146	0.142	0.144	0.143	0.147	0.15	0.146
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chromium	mg/L	0.005	0.1	0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoride	mg/L	1.0	4.0	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Lithium	mg/L	0.0396	0.040	0.040	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	mg/L	0.024	0.1	0.100	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Radium-226	pCi/L	-	-	-	0.273 [±]	0.472 [±]	0.358 [±]	0.603 [±]	0.545	0.618 [±]	1.520 [±]	0.325 [±]	0.942 [±]	0.542 [±]	0.971 [±]
Radium-228	pCi/L	-	-	-	0.000 [±]	0.248 [±]	0.757 [±]	-0.419 [±]	0.479 [±]	0.573 [±]	0.630 [±]	0.925	0.383	0.0495 [±]	0.835 [±]
Radium-226/228	pCi/L	5.00	5	5.00	0.273 [±]	0.720 [±]	1.11 [±]	0.603 [±]	1.020	1.190 [±]	2.150 [±]	1.25 [±]	1.33 [±]	0.591 [±]	1.81 [±]
Selenium	mg/L	0.005	0.05	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Other															
Total Suspended Solids	mg/L	-	-	-	48	41	32	32	23	32	31	29	28	20	23
Bicarbonate	mg/L	-	-	-	-	-	-	-	610	595	593	600	610	620	630
Carbonate	mg/L	-	-	-	-	-	-	-	<10	<10	<10	<10	<10	<10	<10
Hardness	mg/L	-	-	-	-	-	-	-	506	495	490	503	512	529	502
Magnesium	mg/L	-	-	-	-	-	39.0	37.8	40.80	39.4	39.1	38.8	38.3	39.8	39
Potassium	mg/L	-	-	-	-	-	1.47	1.45	1.38	1.3	1.32	1.31	1.3	1.38	1.34
Sodium	mg/L	-	-	-	-	-	40.4	39.6	39.70	37.5	38.8	38.9	37	38.7	37.8

		Sample Location: MW-11									
		Sample Type: Upgradient									
		Sample Date:		9/21/2022		10/26/2022		2/9/2023		8/3/2023	
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring				Assessment Monitoring		
						Field Dup		Field Dup		Diss. Metals	
Field Parameters											
pH	su	-	-	-	6.91	6.91	6.77	6.77	7.43	7.43	6.74
Conductivity	mS/cm	-	-	-	1.122	1.122	1.075	1.075	1.082	1.082	1.095
Turbidity	NTU	-	-	-	5.25	5.25	5.78	5.78	25.29	25.29	0.98
Dissolved Oxygen	mg/L	-	-	-	0.18	0.18	0.37	0.37	0.33	0.33	0.06
Temperature	°C	-	-	-	15.7	15.7	12.2	12.2	10.9	10.9	13.8
Oxidation Reduction Potential	mV	-	-	-	-122.9	-122.1	-99.1	-99.1	-191.1	-191.1	-97.1
Appendix III											
Boron	mg/L	0.48	-	0.50	0.22	0.22	0.21	0.21	0.21	0.20	0.20
Calcium	mg/L	188	-	188	141	142	138	139	140	132	140
Chloride	mg/L	94.3	250	250	61	62	62	62	59	-	62
Fluoride	mg/L	1.0	4	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	<1.0
pH, Field	su	-	-	-	6.91	6.91	6.77	6.77	7.43	7.43	6.74
Sulfate	mg/L	344	250	344	<5	<5	<5	<5	<5	-	<5
Total Dissolved Solids	mg/L	1168	500	1168	652	658	664	664	668	-	682
Appendix IV											
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	0.021	0.01	0.021	0.021	0.02	0.02	0.02	0.017	0.004	0.017
Barium	mg/L	0.168	2.0	2.0	0.167	0.165	0.158	0.154	0.151	0.105	0.170
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chromium	mg/L	0.005	0.1	0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoride	mg/L	1.0	4.0	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	<1.0
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Lithium	mg/L	0.0396	0.040	0.040	<0.005	<0.005	<0.005	<0.005	0.005	<0.005	<0.005
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	mg/L	0.024	0.1	0.100	<0.005 ^U	0.005 ⁺	<0.005	<0.005	0.006	0.006	<0.005
Radium-226	pCi/L	-	-	-	0.396	0.443	0.981	0.59	0.194	-	1.58
Radium-228	pCi/L	-	-	-	0.0525 ⁻	0.994 ⁺	1.53	1.18	0.824	-	1.58
Radium-226/228	pCi/L	5.00	5	5.00	0.449 ⁻	1.44 ⁺	2.51	1.77	1.02	-	3.16
Selenium	mg/L	0.005	0.05	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Other											
Total Suspended Solids	mg/L	-	-	-	23	20	29	32	35	-	19.8
Bicarbonate	mg/L	-	-	-	600	620	601	604	645	-	630
Carbonate	mg/L	-	-	-	<10	<10	<10	<10	<10	-	<10
Hardness	mg/L	-	-	-	512	508	512	518	509	-	538
Magnesium	mg/L	-	-	-	40.8	39.6	39.4	39.3	40.5	37.5	41.2
Potassium	mg/L	-	-	-	1.55	1.52	1.47	1.45	11.4	10.9	3.01
Sodium	mg/L	-	-	-	39.7	38.5	39.1	38.3	37.5	36.1	37.4

		Sample Location:			MW-11B										
		Sample Type:			Upgradient										
		Sample Date:			4/28/2022	6/2/2022	7/7/2022	8/11/2022	9/15/2022						
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring										
Field Parameters						Field Dup		Field Dup		Field Dup		Field Dup		Field Dup	
pH	su	-	-	-	7.95	7.95	7.28	7.28	7.15	7.15	7.37	7.37	7.33	7.33	
Conductivity	mS/cm	-	-	-	0.538	0.538	0.544	0.544	0.537	0.537	0.527	0.527	0.535	0.535	
Turbidity	NTU	-	-	-	1.12	1.12	8.03	8.03	8.02	8.02	6.15	6.15	4.14	4.14	
Dissolved Oxygen	mg/L	-	-	-	11.68	11.68	0.35	0.35	0.22	0.22	0.24	0.24	0.07	0.07	
Temperature	°C	-	-	-	12.3	12.3	13.7	13.7	14.6	14.6	13.4	13.4	13.2	13.2	
Oxidation Reduction Potential	mV	-	-	-	228	228	-74.2	-74.2	-110.4	-110.4	-158.4	-158.4	-189.3	-189.4	
Appendix III															
Boron	mg/L	3.52	-	3.52	0.62	0.63	0.65	0.66	0.69	0.71	0.77	0.75	0.73	0.72	
Calcium	mg/L	69.6	-	69.6	64.6	63.9	63.8	65	66.1	66.1	66.6	65.6	64	64.7	
Chloride	mg/L	5.0	250	250	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
Fluoride	mg/L	1.0	4	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<0.5	<1.0	<1.0	
pH, Field	su	-	-	-	7.95	7.95	7.28	7.28	7.15	7.15	7.37	7.37	7.33	7.33	
Sulfate	mg/L	5.0	250	250	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
Total Dissolved Solids	mg/L	380	500	500	304	294	300	308	296	306	308	288	300	300	
Appendix IV															
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Arsenic	mg/L	0.009	0.01	0.01	0.003	0.003	0.004	0.004	0.007	0.008	0.009	0.009	0.009	0.009	
Barium	mg/L	0.081	2	2.0	0.081	0.08	0.07	0.072	0.07	0.071	0.068	0.069	0.068	0.069	
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Chromium	mg/L	0.005	0.1	0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Fluoride	mg/L	1.0	4	2.00	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<0.5	<1.0	<1.0	
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	
Lithium	mg/L	0.051	0.04	0.051	0.03	0.03	0.02	0.02	0.024	0.025	0.025	0.024	0.026	0.028	
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Molybdenum	mg/L	0.011	0.1	0.100	<0.005	<0.005	0.01	0.01	0.007	0.007	0.007	0.006	0.006	0.006	
Radium-226	pCi/L	-	-	-	1.010	1.440	1.72	1.79	0.638 ¹⁺	0.0501 ¹⁺	0.702	1.06	0.518	0.509	
Radium-228	pCi/L	-	-	-	1.680	2.140	0.633	1.68	0.753 ¹⁺	0.445 ¹⁺	-1.33 ¹⁺	1.32 ¹⁺	0.773 ¹⁺	0.0951 ¹	
Radium-226/228	pCi/L	4.42	5.00	5.00	2.690	3.590	2.35	3.47	1.39 ¹⁺	0.495 ¹⁺	0.702 ¹⁺	2.38 ¹⁺	1.29 ¹⁺	0.604 ¹	
Selenium	mg/L	0.005	0.05	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Other															
Total Suspended Solids	mg/L	-	-	-	1.7 ^U	2.7 ^U	<3	<3	3	4	<3 ^{UJ}	4 ¹⁺	5	5	
Bicarbonate	mg/L	-	-	-	350	350	350	350	350	360	370	370	350	360	
Carbonate	mg/L	-	-	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	
Hardness	mg/L	-	-	-	265	265	260	260	260	260	261	258	261	258	
Magnesium	mg/L	-	-	-	24.30	24.80	23.30	23.10	24.6	24.3	24.3	24.2	23.4	23.7	
Potassium	mg/L	-	-	-	6.07	6.12	6.08	6.07	6.28	6.24	6.4	6.31	5.98	6.24	
Sodium	mg/L	-	-	-	13.50	13.70	17.60	17.20	17.9	17.9	17.7	17.3	16	16.2	

		Sample Location: MW-11B												
		Sample Type: Upgradient												
		Sample Date:		10/20/2022		11/22/2022		12/27/2022		2/9/2023		8/3/2023		
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring						Assessment Monitoring			
						Field Dup	Field Dup	Field Dup	Field Dup	Field Dup	Field Dup	Field Dup		
Field Parameters														
pH	su	-	-	-	7.29	7.29	7.10	7.10	7.16	7.16	7.35	7.35	7.18	
Conductivity	mS/cm	-	-	-	0.535	0.535	0.532	0.532	0.515	0.515	0.522	0.522	0.527	
Turbidity	NTU	-	-	-	5.15	5.15	6.15	6.15	8.45	8.45	7.12	7.12	0.45	
Dissolved Oxygen	mg/L	-	-	-	0.03	0.03	0.12	0.12	0.09	0.09	0.23	0.23	0.20	
Temperature	°C	-	-	-	11.4	11.4	11.8	11.8	11.4	11.4	11.9	11.9	17.0	
Oxidation Reduction Potential	mV	-	-	-	-138.1	-138.1	-92.6	-92.6	-94.7	-94.7	-133.1	-133.1	-95.6	
Appendix III														
Boron	mg/L	3.52	-	3.52	0.72	0.71	0.73	0.73	0.83	0.83	0.80	0.82	0.85	
Calcium	mg/L	69.6	-	69.6	60.3	59.9	66.3	66.2	69.6	67	65.7	66	65.6	
Chloride	mg/L	5.0	250	250	<5	<5	1.7 ^U	1.7 ^U	<5	<5	<5	<5	<5	
Fluoride	mg/L	1.0	4	2.0	<1.0	<1.0	<1.0	0.16 ^U	<1.0	<1.0	<1.0	<1.0	<1.0	
pH, Field	su	-	-	-	7.29	7.29	7.10	7.10	7.16	7.16	7.35	7.35	7.18	
Sulfate	mg/L	5.0	250	250	<5	<5	2.58 ^U	2.78 ^U	<5	<5	<5	<5	<5	
Total Dissolved Solids	mg/L	380	500	500	304	314	294	268	294	268	292	294	298	
Appendix IV														
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Arsenic	mg/L	0.009	0.01	0.01	0.008	0.008	0.007	0.007	0.008	0.007	0.006	0.006	0.006	
Barium	mg/L	0.081	2	2.0	0.066	0.066	0.059	0.06	0.062	0.062	0.063	0.065	0.064	
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Chromium	mg/L	0.005	0.1	0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Fluoride	mg/L	1.0	4	2.00	<1.0	<1.0	<1.0	0.16	<1.0	<1.0	<1.0	<1.0	<1.0	
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	
Lithium	mg/L	0.051	0.04	0.051	0.026	0.025	0.029	0.027	0.029	0.028	0.031	0.031	0.032	
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Molybdenum	mg/L	0.011	0.1	0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Radium-226	pCi/L	-	-	-	0.633	0.527	0.919	1.07	0.926	0.773	1.46	1.39	1.43	
Radium-228	pCi/L	-	-	-	1.33 ^J	2.60 ⁺	2.40 ⁺	0.745 ⁺	2.63 ^{J+}	0.56 ^J	0.131	0.583	3.26	
Radium-226/228	pCi/L	4.42	5.00	5.00	1.96 ^J	3.13 ⁺	3.32 ⁺	1.81 ^J	3.56 ^{J+}	1.33 ^J	1.59	1.97	4.70	
Selenium	mg/L	0.005	0.05	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Other														
Total Suspended Solids	mg/L	-	-	-	4	3	<3	<3	54 ⁺	32 ^J	<3	<3	2.4	
Bicarbonate	mg/L	-	-	-	360	360	360	360	371	372	378	377	370	
Carbonate	mg/L	-	-	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	
Hardness	mg/L	-	-	-	261	260	260	260	265	268	264	262	258	
Magnesium	mg/L	-	-	-	21.3	21.2	23.9	24.1	24.4	24.5	24.4	24.7	23.9	
Potassium	mg/L	-	-	-	5.81	5.82	6.28	6.41	6.93	6.61	6.43	6.46	6.37	
Sodium	mg/L	-	-	-	14.5	14.3	15.8	15.9	16.2	16	16.1	16.4	16.5	

					MW-12									
					Upgradient									
					2/23/2022		3/30/2022		5/4/2022		6/8/2022		7/13/2022	
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring									
Field Parameters						Diss. Metals		Diss. Metals		Diss. Metals		Diss. Metals		Diss. Metals
pH	su	-	-	-	7.22	7.22	6.81	6.81	7.26	7.26	7.24	7.24	7.02	7.02
Conductivity	mS/cm	-	-	-	0.75	0.75	1.648	1.648	1.734	1.734	1.797	1.797	1.686	1.686
Turbidity	NTU	-	-	-	65.25	65.25	44.12	44.12	16.45	16.45	31.26	31.26	30.26	30.26
Dissolved Oxygen	mg/L	-	-	-	5.45	5.45	3.95	3.95	3.34	3.34	5.25	5.25	3.20	3.20
Temperature	°C	-	-	-	8.40	8.40	8.5	8.5	12	12	15.4	15.4	16.8	16.8
Oxidation Reduction Potential	mV	-	-	-	-113.50	-113.50	188.2	188.2	-35	-35	140.2	140.2	14.2	14.2
Appendix III														
Boron	mg/L	0.48	-	0.50	0.05	0.05	0.09	0.09	0.08	0.08	0.1	0.1	0.07	0.07
Calcium	mg/L	188	-	188	185	188	157	147	149	143	149	144	147	143
Chloride	mg/L	94.3	250	250	90	-	94	-	90	-	82	-	83	-
Fluoride	mg/L	1.0	4	2.0	<1.0	-	<1.0	-	<1.0	-	<1.0	-	<1.0	-
pH, Field	su	-	-	-	7.22	7.22	6.81	6.81	7.26	7.26	7.24	7.24	7.02	7.02
Sulfate	mg/L	344	250	344	344	-	308	-	283	-	254	-	250	-
Total Dissolved Solids	mg/L	1168	500	1168	1090	-	1110	-	1140	-	1080	-	1090	-
Appendix IV														
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	0.021	0.01	0.021	<0.002	<0.002	0.003	<0.002	0.004	0.002	<0.002	<0.002	0.002	<0.002
Barium	mg/L	0.168	2.0	2.0	0.069	0.059	0.074	0.068	0.07	0.064	0.064	0.064	0.067	0.06
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chromium	mg/L	0.005	0.1	0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoride	mg/L	1.0	4.0	2.0	<1.0	-	<1.0	-	<1.0	-	<1.0	-	<1.0	-
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Lithium	mg/L	0.0396	0.040	0.040	0.02	0.018	0.021	0.018	0.023	0.021	0.025	0.022	0.022	0.019
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	mg/L	0.024	0.1	0.100	0.013	0.011	0.024	0.024	0.023	0.024	0.019	0.018	0.017	0.017
Radium-226	pCi/L	-	-	-	0.252	-	0.783	-	1.23	-	1.9	-	0.394 ⁺	-
Radium-228	pCi/L	-	-	-	0.948	-	2.33	-	0.237	-	0.721	-	1.23	-
Radium-226/228	pCi/L	5.00	5	5.00	1.200	-	3.110	-	1.46	-	2.62	-	1.63 ⁺	-
Selenium	mg/L	0.005	0.05	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Other														
Total Suspended Solids	mg/L	-	-	-	24	-	39	-	22	-	17	-	50	-
Bicarbonate	mg/L	-	-	-	-	-	-	-	650	-	695	-	670	-
Carbonate	mg/L	-	-	-	-	-	-	-	<10	-	<10	-	<10	-
Hardness	mg/L	-	-	-	-	-	-	-	572	-	565	-	566	-
Magnesium	mg/L	-	-	-	-	-	58.80	56.40	56.40	52.80	56.2	54.5	56.2	55.7
Potassium	mg/L	-	-	-	-	-	3.93	3.87	3.73	3.55	3.91	3.95	3.3	3.13
Sodium	mg/L	-	-	-	-	-	168.00	169.00	193.00	189.00	199	195	171	167

		Sample Location: MW-12												
		Sample Type: Upgradient												
		Sample Date:			8/17/2022	9/21/2022	10/26/2022	2/9/2023	8/3/2023					
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring						Assessment Monitoring			
						Diss. Metals		Diss. Metals		Diss. Metals		Diss. Metals		Diss. Metals
Field Parameters														
pH	su	-	-	-	7.24	7.24	7.38	7.38	7.05	7.05	7.13	7.13	7.10	7.10
Conductivity	mS/cm	-	-	-	1.586	1.586	1.600	1.600	1.387	1.387	1.391	1.391	1.457	1.457
Turbidity	NTU	-	-	-	45.15	45.15	46.25	46.25	26.20	26.20	17.01	17.01	10.32	10.32
Dissolved Oxygen	mg/L	-	-	-	4.64	4.64	1.95	1.96	3.57	3.57	2.95	2.95	3.41	3.41
Temperature	°C	-	-	-	16.9	16.9	15.9	15.9	11.8	11.8	11.5	11.5	16.0	16.0
Oxidation Reduction Potential	mV	-	-	-	-17.9	-17.9	15.2	15.2	155.8	155.8	-27.4	-27.4	122.7	122.7
Appendix III														
Boron	mg/L	0.48	-	0.50	0.07	0.07	0.08	0.08	0.08	0.08	0.07	0.07	0.06	0.06
Calcium	mg/L	188	-	188	157	148	154	148	156	136	143	141	156	151
Chloride	mg/L	94.3	250	250	83	-	80	-	78	-	71	-	70	-
Fluoride	mg/L	1.0	4	2.0	<1.0	-	<1.0	-	<1.0	-	<1.0	-	<1.0	-
pH, Field	su	-	-	-	7.24	7.24	7.38	7.38	7.05	7.05	7.13	7.13	7.10	7.10
Sulfate	mg/L	344	250	344	256	-	255	-	252	-	207	-	184	-
Total Dissolved Solids	mg/L	1168	500	1168	1050	-	1020	-	1020	-	948	-	928	-
Appendix IV														
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	0.021	0.01	0.021	0.002	<0.002	0.002	<0.002	0.002	0.002	<0.002	<0.002	0.002	<0.002
Barium	mg/L	0.168	2.0	2.0	0.064	0.06	0.064	0.058	0.057	0.052	0.058	0.054	0.052	0.049
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.005	<0.0005	<0.0005
Chromium	mg/L	0.005	0.1	0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoride	mg/L	1.0	4.0	2.0	<1.0	-	<1.0	-	<1.0	-	<1.0	-	<1.0	-
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Lithium	mg/L	0.0396	0.040	0.040	0.019	0.018	0.022	0.019	0.021	0.018	0.027	0.023	0.020	0.020
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	mg/L	0.024	0.1	0.100	0.014	0.014	0.015	0.014	0.013	0.012	0.011	0.011	0.007	0.007
Radium-226	pCi/L	-	-	-	0.398	-	0.739	-	0.628	-	0.836	-	0.663	-
Radium-228	pCi/L	-	-	-	1.8	-	-0.692	-	2.11	-	2.60	-	0.731 [±]	-
Radium-226/228	pCi/L	5.00	5	5.00	2.2	-	0.739	-	2.74	-	3.43	-	1.39	-
Selenium	mg/L	0.005	0.05	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Other														
Total Suspended Solids	mg/L	-	-	-	23	-	43	-	16	-	9	-	8.4	-
Bicarbonate	mg/L	-	-	-	620	-	610	-	631	-	689	-	700	-
Carbonate	mg/L	-	-	-	<10	-	<10	-	<10	-	<10	-	<10	-
Hardness	mg/L	-	-	-	609	-	611	-	618	-	575	-	628	-
Magnesium	mg/L	-	-	-	58.8	57.6	58.6	57.5	59.9	53	56.8	55.6	64.2	60.0
Potassium	mg/L	-	-	-	3.33	3.1	3.65	3.54	3.71	3.04	3.01	3.02	2.74	2.65
Sodium	mg/L	-	-	-	145	138	145	138	139	123	136	130	109	101

			Sample Location:		MW-12B									
			Sample Type:		Upgradient									
			Sample Date:		3/8/2022	4/14/2022	5/19/2022	6/23/2022	7/28/2022					
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring									
Field Parameters						Field Dupe			Field Dupe		Field Dupe		Field Dupe	
pH	su	-	-	-	8.00	8.00	7.68	7.86	7.86	7.51	7.51	7.50	7.50	
Conductivity	mS/cm	-	-	-	0.72	0.72	0.611	0.61	0.61	0.601	0.601	0.602	0.602	
Turbidity	NTU	-	-	-	10.2	10.2	9.89	9.72	9.72	6.89	6.89	8.35	8.35	
Dissolved Oxygen	mg/L	-	-	-	3.58	3.58	0.31	0.05	0.05	0.2	0.2	0.22	0.22	
Temperature	°C	-	-	-	10.8	10.8	10.1	12	12	12.8	12.8	14	14	
Oxidation Reduction Potential	mV	-	-	-	100.9	100.9	-80.1	-97.8	-97.8	-73.2	-73.2	-141.0	-141.0	
Appendix III														
Boron	mg/L	3.52	-	3.52	3.25 ^j	3.2	3.16	3.34	3.30	3.32	3.38	3.37	3.37	
Calcium	mg/L	69.6	-	69.6	23.7	24	24	21.5	21.7	26.1	25.5	25.7	25.4	
Chloride	mg/L	5.0	250	250	<5	<5	<5	<5	<5	<5	<5	<5	<5	
Fluoride	mg/L	1.0	4	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
pH, Field	su	-	-	-	8.00	8.00	7.68	7.86	7.86	7.51	7.51	7.50	7.50	
Sulfate	mg/L	5.0	250	250	<5	<5	<5	<5	<5	<5	<5	<5	<5	
Total Dissolved Solids	mg/L	380	500	500	380	374	376	370	372	364	372	380	374	
Appendix IV														
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Arsenic	mg/L	0.009	0.01	0.01	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Barium	mg/L	0.081	2	2.0	0.025	0.025	0.026	0.027	0.026	0.026	0.025	0.023	0.024	
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Chromium	mg/L	0.005	0.1	0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Fluoride	mg/L	1.0	4	2.00	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	
Lithium	mg/L	0.051	0.04	0.051	0.042	0.043	0.036	0.038	0.038	0.041	0.039	0.041	0.043	
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Molybdenum	mg/L	0.011	0.1	0.100	<0.005	<0.005	<0.005	0.011 ¹⁺	0.005 ¹⁻	<0.005	<0.005	<0.005	<0.005	
Radium-226	pCi/L	-	-	-	0.480 ¹⁺	0.302 ¹⁻	0.264	0.611	0.657	1.00 ¹⁺	1.89 ¹⁺	0.581 ¹⁻	2.17 ¹⁺	
Radium-228	pCi/L	-	-	-	0.275 ¹⁻	1.03 ¹⁺	0.116	0.421 ¹⁻	1.10 ¹⁺	0.209 ¹⁻	1.47 ¹⁺	-0.356 ¹⁺	-1.12 ¹⁻	
Radium-226/228	pCi/L	4.42	5.00	5.00	0.755 ¹⁻	1.33 ¹⁺	0.38	1.03 ¹⁻	1.76 ¹⁺	1.21 ¹⁺	3.37 ¹⁺	0.581 ¹⁻	2.17 ¹⁺	
Selenium	mg/L	0.005	0.05	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Other														
Total Suspended Solids	mg/L	-	-	-	28	31	3 ^u	7	7	5	<3	<3	<3	
Bicarbonate	mg/L	-	-	-	390	400	410	410	420	400	390	410	420	
Carbonate	mg/L	-	-	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	
Hardness	mg/L	-	-	-	96	83	99	93	96	94	97	90	90	
Magnesium	mg/L	-	-	-	7.5	7.36	8.12	6.63	6.68	8.31	8.14	8.22	8.02	
Potassium	mg/L	-	-	-	8.99	8.61	8.26	6.93	7.07	8.27	8.15	8.28	8.07	
Sodium	mg/L	-	-	-	116	117	109	90.9	92.4	111	107	107	107	

		Sample Location: MW-12B											
		Sample Type: Upgradient											
		Sample Date:		9/1/2022	10/6/2022	11/10/2022	2/9/2023	8/3/2023					
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring						Assessment Monitoring		
						Field Dupe		Field Dupe		Field Dupe		Field Dup	
Field Parameters													
pH	su	-	-	-	7.60	7.60	7.50	7.50	7.61	7.61	7.71	7.52	7.52
Conductivity	mS/cm	-	-	-	0.600	0.600	0.593	0.593	0.591	0.591	0.587	0.582	0.582
Turbidity	NTU	-	-	-	6.70	6.70	7.15	7.15	6.35	6.35	8.18	2.25	2.25
Dissolved Oxygen	mg/L	-	-	-	0.74	0.74	0.24	0.24	0.18	0.18	0.29	0.13	0.13
Temperature	°C	-	-	-	13.0	13.0	12.7	12.7	13.1	13.1	10.9	15.1	15.1
Oxidation Reduction Potential	mV	-	-	-	-124.1	-124.1	-117.2	-117.2	-100.3	-100.3	-107.5	-113.5	-113.5
Appendix III													
Boron	mg/L	3.52	-	3.52	3.52	3.35	3.22	3.3	3.35	3.19	3.33	3.33	3.38
Calcium	mg/L	69.6	-	69.6	26.2	26.2	26.2	25.9	25.7	26.2	26.3	25.8	25.9
Chloride	mg/L	5.0	250	250	<5	<5	<5	<5	<5	<5	<5	<5	<5
Fluoride	mg/L	1.0	4	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
pH, Field	su	-	-	-	7.60	7.60	7.50	7.50	7.61	7.61	7.71	7.52	7.52
Sulfate	mg/L	5.0	250	250	<5	<5	<5	<5	<5	<5	<5	<5	<5
Total Dissolved Solids	mg/L	380	500	500	360	370	362	374	358	356	356	364	362
Appendix IV													
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	0.009	0.01	0.01	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Barium	mg/L	0.081	2	2.0	0.028	0.028	0.027	0.026	0.025	0.025	0.025	0.025	0.025
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chromium	mg/L	0.005	0.1	0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoride	mg/L	1.0	4	2.00	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Lithium	mg/L	0.051	0.04	0.051	0.041	0.038	0.039	0.042	0.04	0.037	0.043	0.040	0.041
Mercury	mg/L	0.0002	0.002	0.002	0.0002	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	mg/L	0.011	0.1	0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Radium-226	pCi/L	-	-	-	0.398	0.519	0.370 ⁺	0.615 ⁺	0.608	0.619	0.831	1.13 ⁺	0.880 ⁺
Radium-228	pCi/L	-	-	-	-0.204 ⁺	1.34 ⁺	1.26 ⁺	0.165 ⁺	0.638	0.282	3.31	0.848 ⁺	2.68 ⁺
Radium-226/228	pCi/L	4.42	5.00	5.00	0.398 ⁺	1.86 ⁺	1.63 ⁺	0.779 ⁺	1.25	0.901	4.14	1.98 ⁺	3.56 ⁺
Selenium	mg/L	0.005	0.05	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Other													
Total Suspended Solids	mg/L	-	-	-	<3 ^U	3 ⁺	1 ^U	<3	<3	<3	<3	1.1	1.2
Bicarbonate	mg/L	-	-	-	400	400	400	400	390	390	417	360	390
Carbonate	mg/L	-	-	-	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hardness	mg/L	-	-	-	91	95	100	90	96	96	98	92	110
Magnesium	mg/L	-	-	-	8.33	8.65	8.39	8.33	8.2	8.15	8.61	8.48	8.52
Potassium	mg/L	-	-	-	8.18	8.36	8.32	8.14	8.19	8.15	7.88	8.19	8.15
Sodium	mg/L	-	-	-	113	115	112	109	109	110	112	117	114

		Sample Location:			MW-13									
		Sample Type:			Downgradient									
		Sample Date:			2/23/2022	3/30/2022	5/4/2022	5/4/2022	6/8/2022	7/13/2022	8/17/2022	9/21/2022	10/26/2022	
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring									
Field Parameters								Field Dupe						
pH	su	-	-	-	6.91	6.75	7.01	7.01	7.07	7.06	7.22	7.25	7.11	
Conductivity	mS/cm	-	-	-	0.78	0.73	0.549	0.549	0.585	0.661	0.595	0.635	0.624	
Turbidity	NTU	-	-	-	7.11	7.90	4.15	4.15	6.50	1.79	3.55	4.24	3.75	
Dissolved Oxygen	mg/L	-	-	-	1.31	2.61	6.23	6.23	5.42	6.21	4.94	3.83	2.39	
Temperature	°C	-	-	-	5.8	6.9	8.5	8.5	12.2	14.5	17.5	17.4	13.8	
Oxidation Reduction Potential	mV	-	-	-	163.0	151.8	96.4	96.4	101.6	66.9	89.1	84.8	216.8	
Appendix III														
Boron	mg/L	0.48	-	0.50	0.16	0.14	0.14	0.14	0.18	0.18	0.17	0.20	0.22	
Calcium	mg/L	188	-	188	138	128.00	95.80	97.60	96.1	107	94.1	100	101	
Chloride	mg/L	94.3	250	250	<5	<5	9.00	9.00	13	16	16	20	32	
Fluoride	mg/L	1.0	4	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
pH, Field	su	-	-	-	6.91	6.75	7.01	7.01	7.07	7.06	7.22	7.25	7.11	
Sulfate	mg/L	344	250	344	32	45	16	16	17	55	33	30	22	
Total Dissolved Solids	mg/L	1168	500	1168	478	430	336	342	354	396	380	384	386	
Appendix IV														
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Arsenic	mg/L	0.021	0.01	0.021	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Barium	mg/L	0.168	2.0	2.0	0.030	0.03	0.02	0.02	0.023	0.027	0.029	0.027	0.028	
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Chromium	mg/L	0.005	0.1	0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Fluoride	mg/L	1.0	4.0	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	
Lithium	mg/L	0.0396	0.040	0.040	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Molybdenum	mg/L	0.024	0.1	0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Radium-226	pCi/L	-	-	-	0.300	0.755	0.322 ^{J+}	0.149 ^{J-}	0.657	0.291 ^{J+}	0.402	0.286	0.392	
Radium-228	pCi/L	-	-	-	-0.842	1.320	0.0544 ^J	0.893 ^{J+}	1.66	1.35	0.00710	-0.0026	0.291	
Radium-226/228	pCi/L	5.00	5	5.00	0.300	2.080	0.376 ^{J-}	1.04 ^{J+}	2.31	1.64 ^{J+}	0.410	0.286	0.683	
Selenium	mg/L	0.005	0.05	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Other														
Total Suspended Solids	mg/L	-	-	-	<3	<3	<3	<3	<3	<3	<3	<3	<3	
Bicarbonate	mg/L	-	-	-	-	-	340	330	349	330	320	340	351	
Carbonate	mg/L	-	-	-	-	-	<10	<10	<10	<10	<10	<10	<10	
Hardness	mg/L	-	-	-	-	-	309	308	310	353	312	333	358	
Magnesium	mg/L	-	-	-	-	26.30	19.70	20.10	20.7	23.1	20.6	21.9	23.0	
Potassium	mg/L	-	-	-	-	0.75	0.69	0.70	0.83	0.779	0.78	0.82	0.81	
Sodium	mg/L	-	-	-	-	3.05	2.45	2.51	2.59	5.59	4.60	5.70	4.99	

MW-13	
Downgradient	
2/8/2023	8/2/2023
Assessment Monitoring	
7.04	6.39
0.672	0.777
6.01	0.30
0.65	4.69
8.4	16.1
61.2	-48.6
0.18	0.17
132	124
43	45
<1.0	<1.0
7.04	6.39
37	87
476	492
<0.005	<0.005
<0.002	0.004
0.028	0.034
<0.001	<0.001
<0.0005	<0.0005
<0.005	<0.005
<0.005	<0.005
<1.0	<1.0
<0.003	<0.003
<0.005	<0.005
<0.0002	<0.0002
<0.005	<0.005
0.000	0.0699
0.188	-0.6698
0.188	0.0699
<0.005	<0.005
<0.002	<0.002
<3	<3
437	330
<10	<10
444	428
29.0	26.9
0.76	0.94
4.68	8.34

		Sample Location:			MW-14							
		Sample Type:			Downgradient							
		Sample Date:			1/12/2023		2/17/2023		3/24/2023		4/28/2023	
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring							
Field Parameters						Field Dup		Field Dup		Field Dup		Field Dup
pH	su	-	-	-	7.04	7.04	7.11	7.11	6.98	6.98	7.13	7.13
Conductivity	mS/cm	-	-	-	1.27	1.27	1.091	1.091	1.295	1.295	1.323	1.323
Turbidity	NTU	-	-	-	6.31	6.31	5.34	5.34	3.95	3.95	4.05	4.05
Dissolved Oxygen	mg/L	-	-	-	0.45	0.45	0.39	0.39	0.07	0.07	0.09	0.09
Temperature	°C	-	-	-	10.9	10.9	10.1	10.1	10.5	10.5	10.3	10.3
Oxidation Reduction Potential	mV	-	-	-	-105.6	-105.6	-89.4	-89.4	-104.3	-104.3	-124.8	-124.8
Appendix III												
Boron	mg/L	0.48	-	0.50	2.29	2.32	2.23	2.20	2.11	2.20	2.03	2.06
Calcium	mg/L	188	-	188	147	149	144	144	144	148	143	140 ^l
Chloride	mg/L	94.3	250	250	108	109	111	112	114	114	115	115
Fluoride	mg/L	1.0	4	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
pH, Field	su	-	-	-	7.04	7.04	7.11	7.11	6.98	6.98	7.13	7.13
Sulfate	mg/L	344	250	344	30	30	22	21	748	748	17	16
Total Dissolved Solids	mg/L	1168	500	1168	774	768	732	716	<0.005	<0.005	796	782
Appendix IV												
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	0.021	0.01	0.021	0.004	0.004	0.006	0.005	0.005	0.006	0.006	0.005
Barium	mg/L	0.168	2.0	2.0	0.177	0.122	0.119	0.116	0.128	0.126	0.120	0.119
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chromium	mg/L	0.005	0.1	0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoride	mg/L	1.0	4.0	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Lithium	mg/L	0.0396	0.040	0.040	0.125	0.132	0.122	0.126	0.113	0.113	0.111	0.111
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	mg/L	0.024	0.1	0.100	0.012	0.013	0.015	0.014	0.014	0.014	0.013	0.012
Radium-226	pCi/L	-	-	-	0.907	0.322	0.396	0.363	0.964 ⁺	0.321 ⁺	0.260 ⁺	1.27 ⁺
Radium-228	pCi/L	-	-	-	3.53	3.07	0.272 ⁻	1.07 ⁺	0.853	1.10	1.20 ⁺	0.807 ⁺
Radium-226/228	pCi/L	5.00	5	5.00	4.44	3.39	0.668 ⁻	1.43 ⁺	1.82	1.41	1.46 ⁺	2.08 ⁺
Selenium	mg/L	0.005	0.05	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Other												
Total Suspended Solids	mg/L	-	-	-	16	16	4 ⁻	7 ⁺	22.2	22.0	23.4	24.3
Bicarbonate	mg/L	-	-	-	600	610	601	606	650	650	660	670
Carbonate	mg/L	-	-	-	<10	<10	<10	<10	<10	<10	<10	<10
Hardness	mg/L	-	-	-	556	554	498	506	536	548	566	562
Magnesium	mg/L	-	-	-	42.3	42.2	41.3	41.2	40.3	42.1	39.7	38.5
Potassium	mg/L	-	-	-	4.79	4.76	5.82	5.81	4.72	4.82	4.55	4.43
Sodium	mg/L	-	-	-	79.2	80.4	78.3	77.9	75.8	77.3	72.5	70.9

MW-14							
Downgradient							
6/2/2023	7/7/2023	8/11/2023	9/15/2023				
Background Monitoring							
	Field Dup		Field Dup		Field Dup		Field Dup
7.00	7.00	7.06	7.06	6.95	6.95	6.92	6.92
1.307	1.307	1.285	1.285	1.285	1.285	1.277	1.277
5.42	5.42	3.24	3.24	3.10	3.1	6.35	6.35
0.21	0.21	0.06	0.06	0.02	0.02	0.00	0
13.3	13.3	13.7	13.7	14.1	14.1	13.5	13.5
-114.2	-114.2	-96.5	-96.5	-116.2	-116.2	-127.9	-127.9
2.06	2.02	2.16	2.14	2.14	2.10	2.17	2.13
141	141	148	148	147	149	154	155
114	114	113	114	118	118	111	110
<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
7.00	7.00	7.06	7.06	6.95	6.95	6.92	6.92
19	19	20	19	16	16	16	16
792	784	784	774	804	804	808	824
<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
0.005	0.006	0.007	0.008	0.007	0.007	0.008	0.007
0.126	0.128	0.134	0.131	0.122	0.124	0.132	0.138
<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
0.106	0.106	0.108	0.106	0.111	0.109	0.109	0.112
<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
0.014	0.015	0.016	0.016	0.013	0.014	0.014	0.014
0.275	0.271	0.388	0.244	0.624	0.465	0.442 ^J	1.06 ^{J+}
0.601 ^{J+}	0.983 ⁺	0.0761 ^{J+}	0.915 ^{J+}	0.326 ^{J+}	0.147 ^{J+}	0.497 ^J	0.821 ^{J+}
0.876 ^{J+}	1.25 ^{J+}	0.464 ^{J+}	1.16 ^{J+}	0.951 ^{J+}	0.612 ^{J+}	0.939 ^J	1.88 ^{J+}
0.009	0.009	0.013	0.012	<0.005	<0.005	<0.005	<0.005
<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
26.0	26.0	24.8	26.3	25.9	26.6	24.8	25.4
630	630	640	650	690	680	670	660
<10	<10	<10	<10	<10	<10	<10	<10
540	550	536	548	588	630	574	584
40.0	39.5	41.9	41.0	42.2	42.1	42.1	43.8
4.65	4.72	5.03	5.08	4.96	5.07	5.43	5.58
73.7	73.9	79.0	77.0	77.8	78.3	79.4	80.4

		Sample Location:			MW-15								
		Sample Type:			Downgradient								
		Sample Date:			1/12/2023	2/17/23	3/24/23	4/28/2023	6/2/2023	7/7/2023	8/11/2023	9/15/2023	
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring								
Field Parameters													
pH	su	-	-	-	6.86	6.98	6.90	6.99	6.84	6.83	6.70	6.69	
Conductivity	mS/cm	-	-	-	1.319	0.872	0.912	0.851	0.879	0.945	1.007	1.021	
Turbidity	NTU	-	-	-	2.4	5.15	4.15	4.84	6.51	5.75	3.33	5.64	
Dissolved Oxygen	mg/L	-	-	-	5.41	4.81	3.72	2.48	0.89	0.38	0.87	0.67	
Temperature	°C	-	-	-	7.9	7.5	7.3	8.4	13.0	13.3	14.5	14.6	
Oxidation Reduction Potential	mV	-	-	-	195.6	153.9	59.8	133.9	113.8	11.3	30.8	44.2	
Appendix III													
Boron	mg/L	0.48	-	0.50	0.37	0.34	0.33	0.34	0.35	0.40	0.41	0.44	
Calcium	mg/L	188	-	188	183	140	119	104	115	133	140	145	
Chloride	mg/L	94.3	250	250	100	84	72	60	59	65	73	78	
Fluoride	mg/L	1.0	4	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
pH, Field	su	-	-	-	6.86	6.98	6.90	6.99	6.84	6.83	6.70	6.69	
Sulfate	mg/L	344	250	344	238	135	124	109	109	117	117	109	
Total Dissolved Solids	mg/L	1168	500	1168	878	606	690	528	578	638	670	680	
Appendix IV													
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Arsenic	mg/L	0.021	0.01	0.021	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Barium	mg/L	0.168	2.0	2.0	0.077	0.050	0.047	0.042	0.049	0.061	0.067	0.069	
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Chromium	mg/L	0.005	0.1	0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Fluoride	mg/L	1.0	4.0	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	
Lithium	mg/L	0.0396	0.040	0.040	0.014	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Molybdenum	mg/L	0.024	0.1	0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Radium-226	pCi/L	-	-	-	0.629	0.334	0.868	0.464	0.876	0.525	0.750	0.491	
Radium-228	pCi/L	-	-	-	1.43	-0.367	-0.188	1.51 [±]	-0.108	-0.119	0.470	1.46	
Radium-226/228	pCi/L	5.00	5	5.00	2.06	0.334	0.868	1.97 [±]	0.876	0.525	1.22	1.95	
Selenium	mg/L	0.005	0.05	0.050	0.01	0.026	0.034	0.021	0.011	0.009	<0.005	<0.005	
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Other													
Total Suspended Solids	mg/L	-	-	-	<3	<3	<3	<3	1.8	1.6	<3	<3	
Bicarbonate	mg/L	-	-	-	410	354	330	330	350	380	430	440	
Carbonate	mg/L	-	-	-	<10	<10	<10	<10	<10	<10	<10	<10	
Hardness	mg/L	-	-	-	464	473	426	406	420	460	512	506	
Magnesium	mg/L	-	-	-	47.2	35.1	31.1	25.7	28.9	32.2	34.2	34.2	
Potassium	mg/L	-	-	-	0.61	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
Sodium	mg/L	-	-	-	40.5	30.3	29.5	28.3	27.4	28.5	29.7	38.8	

			Sample Location:		MW-16A									
			Sample Type:		Downgradient									
			Sample Date:		2/2/2023	3/21/2023	4/25/2023	5/30/2023	7/5/2023					
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring									
						Field Dup		Field Dup		Field Dup		Field Dup		Field Dup
Field Parameters														
pH	su	-	-	-	6.95	6.95	6.91	6.91	7.00	7.00	6.72	6.72	6.79	6.79
Conductivity	mS/cm	-	-	-	2.219	2.219	1.871	1.871	1.948	1.948	1.875	1.875	2.163	2.163
Turbidity	NTU	-	-	-	3.06	3.06	4.15	4.15	6.54	6.54	4.01	4.01	6.18	6.18
Dissolved Oxygen	mg/L	-	-	-	0.22	0.22	0.20	0.20	0.10	0.10	0.05	0.05	0.43	0.43
Temperature	°C	-	-	-	7.3	7.3	8.6	8.6	8.3	8.3	12.5	12.5	15.6	15.6
Oxidation Reduction Potential	mV	-	-	-	-51.0	-51.0	-48.6	-48.6	-65.2	-65.2	-49.9	-49.9	-102.3	-102.3
Appendix III														
Boron	mg/L	0.48	-	0.50	0.21	0.21	0.11	0.11	0.10	0.10	0.10	0.11	0.11	0.11
Calcium	mg/L	188	-	188	179	176	147	150	145	148	172	171	173	174
Chloride	mg/L	94.3	250	250	383	383	405	411	391	397	401	400	436	439
Fluoride	mg/L	1.0	4	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
pH, Field	su	-	-	-	6.95	6.95	6.91	6.91	7.00	7.00	6.72	6.72	6.79	6.79
Sulfate	mg/L	344	250	344	145	146	86	85	92	92	132	132	151	154
Total Dissolved Solids	mg/L	1168	500	1168	1360	1350	1180	1180	1170	1170	1260	1270	1370	1340
Appendix IV														
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	0.021	0.01	0.021	0.003	0.004	0.003	0.003	0.003	0.003	0.002	0.002	0.003	0.004
Barium	mg/L	0.168	2.0	2.0	0.160	0.156	0.118	0.119	0.108	0.111	0.126	0.121	0.136	0.138
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chromium	mg/L	0.005	0.1	0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoride	mg/L	1.0	4.0	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Lithium	mg/L	0.0396	0.040	0.040	0.005 ⁺	<0.005 ^U	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	mg/L	0.024	0.1	0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Radium-226	pCi/L	-	-	-	0.385	0.325	0.510 ⁺	1.22 ⁺	0.781	0.721	0.585 ⁺	0.261 ⁺	6.13 ⁺	1.17 ⁺
Radium-228	pCi/L	-	-	-	0.178 ⁺	-0.723 ⁺	0.698	0.907	1.59 ⁺	-2.75 ⁺	-0.313 ⁺	4.94 ⁺	1.33 ⁺	-0.181 ^U
Radium-226/228	pCi/L	5.00	5	5.00	0.562 ⁺	0.325 ⁺	1.21 ⁺	2.13 ⁺	2.37 ⁺	0.721 ⁺	0.585 ⁺	5.20 ⁺	7.46 ⁺	1.17 ⁺
Selenium	mg/L	0.005	0.05	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Other														
Total Suspended Solids	mg/L	-	-	-	7	7	<3	<3	2.0	1.6	5.7	5.2	2.5 ⁺	2.0 ⁺
Bicarbonate	mg/L	-	-	-	610	620	460	470	420	420	440	430	460	470
Carbonate	mg/L	-	-	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hardness	mg/L	-	-	-	608	605	524	522	526	519	570	576	598	600
Magnesium	mg/L	-	-	-	42.4	42.3	33.9	34.1	33.2	34.4	37.2	36.6	39.9	38.5
Potassium	mg/L	-	-	-	2.12	2.06	1.58	1.58	1.34	1.45	1.16	1.04	1.24	1.23
Sodium	mg/L	-	-	-	276	281	244	247	229	243	241	240	253	258

MW-16A							
Downgradient							
8/8/2023	9/12/2023		10/17/2023		11/21/2023		
Background Monitoring							
	Field Dup		Field Dup		Field Dup		Field Dup
6.84	6.84	6.76	6.76	6.78	6.78	6.82	6.82
2.271	2.271	2.579	2.579	2.599	2.599	2.44	2.44
3.81	3.81	5.28	5.28	6.41	6.41	4.39	4.39
0.07	0.07	0.34	0.34	0.01	0.01	0.01	0.01
16.5	16.5	16.8	16.8	15.8	15.8	13.6	13.6
-67.3	-67.3	-59.8	-59.8	-3.1	-3.1	-43.9	-43.9
0.16	0.17	0.23	0.22	0.21	0.21	0.19	0.20
172	167	220	219	226	226	210	211
423	442	484	493	505	505	459	455
<2.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
6.84	6.84	6.76	6.76	6.78	6.78	6.82	6.82
131	130	239	250	257	257	264	257
1390	1390	1640	1630	1720	1730	1580	1590
<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
0.004	0.004	0.003	0.004	0.004	0.004	0.004	0.003
0.132	0.135	0.178	0.172	0.177	0.181	0.163	0.166
<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
<2.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
0.232 ⁻	1.18 ⁺	0.421 ⁻	1.06 ⁺	0.892	0.682	2.26	1.78
0.945	1.01	0.285 ⁻	1.05 ⁺	2.26	2.85	0.548 ⁻	1.23 ⁺
1.18 ⁻	2.19 ⁺	0.705 ⁻	2.10 ⁺	3.15	3.53	2.80	3.01
<0.005	<0.005	0.005 ⁺	<0.005 ^{UJ}	<0.005	<0.005	<0.005	<0.005
<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
2.1 ⁺	1.2 ⁻	3.5	3.9	4.5	4.5	1.2 ⁺	<3 ^{UJ}
510	500	520	520	520	510	510	510
<10	<10	<10	<10	<10	<10	<10	<10
578	568	840	860	732	724	754	766
38.5	38.7	52.2	52.2	51.1	51.7	52.4	52.1
1.25	1.21	1.40	1.44	1.45	1.40	1.49	1.49
279	262	307	308	324	322	312	294

		Sample Location:			MW-16B									
		Sample Type:			Downgradient									
		Sample Date:			2/2/2023	3/21/2023	4/25/2023	5/30/2023	7/5/2023	8/8/2023	9/12/2023	10/17/2023	11/21/2023	
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring									
Field Parameters														
pH	su	-	-	-	7.49	7.45	7.50	7.25	7.34	7.42	7.32	7.46	7.47	
Conductivity	mS/cm	-	-	-	0.623	0.587	0.619	0.578	0.613	0.635	0.590	0.634	0.625	
Turbidity	NTU	-	-	-	7.42	5.65	6.29	3.94	4.41	4.32	0.44	1.32	6.34	
Dissolved Oxygen	mg/L	-	-	-	0.18	0.12	0.11	0.09	0.37	0.05	0.00	0.01	0.00	
Temperature	°C	-	-	-	9.2	12.0	11.1	14.4	15.8	15.6	14.5	13.6	13	
Oxidation Reduction Potential	mV	-	-	-	-125.7	-107.0	-102.1	-104.2	-130.4	-101.2	-136.1	-63.3	-127.7	
Appendix III														
Boron	mg/L	0.48	-	0.50	0.12	0.13	0.12	0.13	0.11	0.12	0.11	0.11	0.12	
Calcium	mg/L	188	-	188	74.5	76.9	78.4	79.5	80.8	81.7	80.2	85.4	83.9	
Chloride	mg/L	94.3	250	250	<5	11	5	<5	<5	3.7	<5	<5	3.1	
Fluoride	mg/L	1.0	4	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.31	<1.0	<1.0	0.58	
pH, Field	su	-	-	-	7.49	7.45	7.50	7.25	7.34	7.42	7.32	7.46	7.46	
Sulfate	mg/L	344	250	344	18	16	16	15	17	17	18	18	17.8	
Total Dissolved Solids	mg/L	1168	500	1168	366	366	350	358	366	366	366	378	370	
Appendix IV														
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Arsenic	mg/L	0.021	0.01	0.021	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Barium	mg/L	0.168	2.0	2.0	0.09	0.085	0.085	0.082	0.089	0.085	0.086	0.089	0.091	
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Chromium	mg/L	0.005	0.1	0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Fluoride	mg/L	1.0	4.0	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.31	<1.0	<1.0	<1.0	
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	
Lithium	mg/L	0.0396	0.040	0.040	0.023	0.023	0.022	0.022	0.019	0.022	0.021	0.020	0.021	
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Molybdenum	mg/L	0.024	0.1	0.100	0.008	0.006	0.006	0.005	0.006	0.006	0.006	0.007	0.006	
Radium-226	pCi/L	-	-	-	0.997	0.761	0.490	0.160	3.03	0.391	1.31	1.56	0.804	
Radium-228	pCi/L	-	-	-	0.829	1.79	1.30 ⁺	1.81	1.07	0.644	1.09	4.87	0.831	
Radium-226/228	pCi/L	5.00	5	5.00	1.83	2.56	1.79 ⁺	1.97	4.09	1.04	2.40	6.43	1.63	
Selenium	mg/L	0.005	0.05	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Other														
Total Suspended Solids	mg/L	-	-	-	7	<3	1.4	2.4	1.0	<3	<3	<3	<3	
Bicarbonate	mg/L	-	-	-	390	400	400	420	410	410	400	400	400	
Carbonate	mg/L	-	-	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	
Hardness	mg/L	-	-	-	322	329	335	324	334	344	380	348	355	
Magnesium	mg/L	-	-	-	29.7	32.7	33.3	32.6	35.6	35.0	33.4	34.5	36.4	
Potassium	mg/L	-	-	-	3.81	3.17	3.00	2.89	2.97	2.91	2.86	2.80	3.02	
Sodium	mg/L	-	-	-	24.5	15.5	12.6	12.2	11.1	11.1	10.6	11.1	11.0	

		Sample Location:			MW-16C									
		Sample Type:			Downgradient									
		Sample Date:			2/2/2023	3/21/2023	4/25/2023	5/30/2023	7/5/2023	8/8/2023	9/12/2023	10/17/2023	11/21/2023	
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring									
Field Parameters														
pH	su	-	-	-	7.44	7.46	7.41	7.17	7.18	7.25	7.25	7.36	7.36	
Conductivity	ms/cm	-	-	-	0.601	0.575	0.585	0.529	0.580	0.590	0.562	0.592	0.586	
Turbidity	NTU	-	-	-	34.25	7.24	6.41	2.58	1.81	0.45	1.02	4.01	6.01	
Dissolved Oxygen	mg/L	-	-	-	0.10	0.17	0.12	0.02	0.36	0.04	0.00	0.00	0.00	
Temperature	°C	-	-	-	9.9	11.9	11.0	14.2	1.1	14.8	14.3	13.7	13.2	
Oxidation Reduction Potential	mV	-	-	-	-62.2	-103.8	-97.3	-89.0	-126.5	-108.1	-139.6	-92.6	-145.6	
Appendix III														
Boron	mg/L	3.52	-	3.52	0.40	0.40	0.39	0.40	0.39	0.41	0.40	0.40	0.43	
Calcium	mg/L	69.6	-	69.6	63.2	62.1	66.5	70.5	73.4	73.9	71.7	77.1	76.8	
Chloride	mg/L	5.0	250	250	8	<5	<5	<5	<5	2.5	<5	<5	2.2	
Fluoride	mg/L	1.0	4	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	0.20	
pH, Field	su	-	-	-	7.44	7.46	7.41	7.17	7.18	7.25	7.25	7.36	7.36	
Sulfate	mg/L	5.0	250	250	19	8	7	7	8	7.2	8	8	7.90	
Total Dissolved Solids	mg/L	380	500	500	418	370	330	344	320	322	334	332	340	
Appendix IV														
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Arsenic	mg/L	0.009	0.01	0.01	0.002	0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Barium	mg/L	0.081	2	2.0	0.051	0.061	0.050	0.041	0.035	0.032	0.033	0.031	0.030	
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Chromium	mg/L	0.005	0.1	0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Fluoride	mg/L	1.0	4	2.00	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	0.20	
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	
Lithium	mg/L	0.051	0.04	0.051	0.030	0.026	0.027	0.026	0.026	0.029	0.027	0.026	0.029	
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Molybdenum	mg/L	0.011	0.1	0.100	0.007	0.009	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Radium-226	pCi/L	-	-	-	0.230	0.509	0.478	0.255	1.14	0.450	0.30	0.101	0.821	
Radium-228	pCi/L	-	-	-	0.0142	3.09	-0.309 ⁺	-0.804	1.39	1.14	0.492	2.16	0.480	
Radium-226/228	pCi/L	4.42	5.00	5.00	0.244	3.60	0.478 ⁺	0.225	2.52	1.59	0.796	2.26	1.30	
Selenium	mg/L	0.005	0.05	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Other														
Total Suspended Solids	mg/L	-	-	-	40	11.6	1.6	5.8	1.2	<3	1.1	1.4	<3	
Bicarbonate	mg/L	-	-	-	370	400	400	470	410	400	400	410	390	
Carbonate	mg/L	-	-	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	
Hardness	mg/L	-	-	-	263	253	272	292	293	298	310	304	318	
Magnesium	mg/L	-	-	-	24.4	25.6	27.3	27.0	29.9	31.1	29.9	30.5	31.4	
Potassium	mg/L	-	-	-	3.72	3.56	3.97	4.08	4.86	4.65	4.93	4.75	5.11	
Sodium	mg/L	-	-	-	39.4	41.4	28.5	25.4	17.2	15.6	15.7	15.7	15.7	

		Sample Location:			MW-16D									
		Sample Type:			Downgradient									
		Sample Date:			2/2/2023	3/21/2023	4/25/2023	5/30/2023	7/5/2023	8/8/2023	9/12/2023	10/17/2023	11/21/2023	
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring									
Field Parameters														
pH	su	-	-	-	7.67	7.56	7.73	7.44	7.52	7.53	7.47	7.49	7.45	
Conductivity	mS/cm	-	-	-	0.582	0.596	0.620	0.638	0.624	0.614	0.588	0.612	0.601	
Turbidity	NTU	-	-	-	8.31	7.31	4.95	7.05	4.32	5.12	7.02	7.95	6.01	
Dissolved Oxygen	mg/L	-	-	-	4.82	0.39	0.38	0.28	0.28	0.07	0.19	0.17	0.08	
Temperature	°C	-	-	-	8.6	8.4	3.9	19.6	22.5	19.0	15.2	12.5	11.2	
Oxidation Reduction Potential	mV	-	-	-	44.3	85.9	-44.2	-3.5	-106.7	-101.2	-141.5	-103.6	-122.4	
Appendix III														
Boron	mg/L	3.52	-	3.52	4.65	4.59	4.59	4.70	4.39	4.70	4.69	4.62	4.85	
Calcium	mg/L	69.6	-	69.6	29.3	29.0	28.9	28.9	28.5	29.3	29.4	30.5	30.0	
Chloride	mg/L	5.0	250	250	6	7	8	8	8	6.8	7	7	7.25	
Fluoride	mg/L	1.0	4	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	0.36	
pH, Field	su	-	-	-	7.67	7.56	7.73	7.44	7.52	7.53	7.47	7.49	7.49	
Sulfate	mg/L	5.0	250	250	<5	9	13	7	7	6.2	6	5	4.47	
Total Dissolved Solids	mg/L	380	500	500	366	364	380	396	374	376	376	380	372	
Appendix IV														
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Arsenic	mg/L	0.009	0.01	0.01	<0.002	<0.002	0.004	0.003	0.003	0.004	<0.002	0.004	0.003	
Barium	mg/L	0.081	2	2.0	0.037	0.036	0.038	0.037	0.036	0.034	0.036	0.035	0.035	
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Chromium	mg/L	0.005	0.1	0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Fluoride	mg/L	1.0	4	2.00	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	0.36	
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	
Lithium	mg/L	0.051	0.04	0.051	0.039	0.032	0.022	0.026	0.028	0.030	0.030	0.030	0.031	
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Molybdenum	mg/L	0.011	0.1	0.100	0.005	0.011	0.012	0.010	0.011	0.011	0.010	0.011	0.010	
Radium-226	pCi/L	-	-	-	0.591	0.763	2.21	0.515	1.21	0.542 ⁺	0.461	0.593	0.500	
Radium-228	pCi/L	-	-	-	1.84	0.757	1.93 ⁺	-0.743	0.128	0.276	0.773	2.25	1.34	
Radium-226/228	pCi/L	4.42	5.00	5.00	2.43	1.52	4.14 ⁺	0.515	1.33	0.818	1.23	2.85	1.84	
Selenium	mg/L	0.005	0.05	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Other														
Total Suspended Solids	mg/L	-	-	-	5	3.80	2.0	14.0	6.4	12.4	7.3	12.0	2.0	
Bicarbonate	mg/L	-	-	-	380	390	380	430	400	380	400	390	400	
Carbonate	mg/L	-	-	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	
Hardness	mg/L	-	-	-	96	107	103	101	97	96	100	105	118	
Magnesium	mg/L	-	-	-	6.99	7.31	7.28	7.41	7.39	7.33	7.45	7.69	7.68	
Potassium	mg/L	-	-	-	9.4	9.79	9.65	9.90	9.38	9.21	9.61	9.18	9.83	
Sodium	mg/L	-	-	-	106	110	115	115	112	108	108	116	114	

		Sample Location:			MW-100A					
		Sample Type:			Downgradient					
		Sample Date:			6/5/2023	7/10/2023	8/14/2023	9/18/2023	10/23/2023	11/27/2023
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring					
Field Parameters										
pH	su	-	-	-	7.29	7.21	7.31	7.28	7.34	7.08
Conductivity	mS/cm	-	-	-	0.750	0.766	0.728	0.719	0.725	0.68
Turbidity	NTU	-	-	-	3.52	7.95	0.65	4.21	7.35	3.32
Dissolved Oxygen	mg/L	-	-	-	4.15	1.31	1.15	0.98	0.45	0.39
Temperature	°C	-	-	-	14.2	17.2	14.6	16.8	14.9	10.2
Oxidation Reduction Potential	mV	-	-	-	60.9	-55.8	-130.6	-98.1	-117.7	-98.9
Appendix III										
Boron	mg/L	0.48	-	0.50	0.04	0.05	0.05	0.05	0.05	0.04
Calcium	mg/L	188	-	188	92.3	95.3	93.0	94.0	92.8	92.1
Chloride	mg/L	94.3	250	250	10	10	10	10	10	10.0
Fluoride	mg/L	1.0	4	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.66
pH, Field	su	-	-	-	7.29	7.21	7.31	7.28	7.34	7.08
Sulfate	mg/L	344	250	344	35	38	28	22	21	16.2
Total Dissolved Solids	mg/L	1168	500	1168	418	434	424	414	416	402
Appendix IV										
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	0.021	0.01	0.021	0.009	0.010	0.015	0.017	0.016	0.014
Barium	mg/L	0.168	2.0	2.0	0.206	0.202	0.206	0.207	0.201	0.199
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chromium	mg/L	0.005	0.1	0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoride	mg/L	1.0	4.0	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Lithium	mg/L	0.0396	0.040	0.040	0.017	0.018	0.019	0.020	0.018	0.016
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	mg/L	0.024	0.1	0.100	0.012	0.012	0.012	0.013	0.011	0.010
Radium-226	pCi/L	-	-	-	0.869	0.470	1.14 [±]	0.320 [±]	-0.164 [±]	1.09 [±]
Radium-228	pCi/L	-	-	-	1.64	0.716	0.400	0.0819	0.527	0.0586
Radium-226/228	pCi/L	5.00	5	5.00	2.50	0.857	1.54	0.402	0.527	1.15
Selenium	mg/L	0.005	0.05	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Other										
Total Suspended Solids	mg/L	-	-	-	<3	25	7.5	7.4	4.9	8.6
Bicarbonate	mg/L	-	-	-	450	430	460	440	450	410
Carbonate	mg/L	-	-	-	<10	<10	<10	<10	<10	<10
Hardness	mg/L	-	-	-	390	393	396	394	398	398
Magnesium	mg/L	-	-	-	38.4	40.3	40.0	39.0	38.9	39.9
Potassium	mg/L	-	-	-	2.35	2.62	2.27	2.23	2.16	2.19
Sodium	mg/L	-	-	-	12.6	11.8	11.3	11.6	11.0	11.3

		Sample Location:			MW-100B							
		Sample Type:			Downgradient							
		Sample Date:			6/5/2023		7/10/2023		8/14/2023		9/18/2023	
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring							
Field Parameters						Field Dup		Field Dup		Field Dup		Field Dup
pH	su	-	-	-	7.34	7.34	7.33	7.33	7.40	7.40	7.34	7.34
Conductivity	mS/cm	-	-	-	0.799	0.799	0.805	0.805	0.776	0.776	0.745	0.745
Turbidity	NTU	-	-	-	4.02	4.02	4.15	4.15	4.15	4.15	0.81	0.81
Dissolved Oxygen	mg/L	-	-	-	0.03	0.03	0.08	0.08	0.19	0.19	0	0
Temperature	°C	-	-	-	13.8	13.8	13.9	13.9	14.2	14.2	12.9	12.9
Oxidation Reduction Potential	mV	-	-	-	-129.9	-129.9	-145.9	-145.9	-176.8	-176.8	-149.9	-149.9
Appendix III												
Boron	mg/L	0.48	-	0.50	0.21	0.23	0.23	0.23	0.25	0.25	0.25	0.24
Calcium	mg/L	188	-	188	108	106	102	101	98.0	99.2	97.8	100
Chloride	mg/L	94.3	250	250	22	22	23	23	25	25	25	25
Fluoride	mg/L	1.0	4	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
pH, Field	su	-	-	-	7.34	7.34	7.33	7.33	7.40	7.40	7.34	7.34
Sulfate	mg/L	344	250	344	136	135	126	126	116	116	110	110
Total Dissolved Solids	mg/L	1168	500	1168	538	534	534	526	508	510	492	496
Appendix IV												
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	0.021	0.01	0.021	0.009	0.008	0.010	0.010	0.011	0.010	0.011	0.012
Barium	mg/L	0.168	2.0	2.0	0.164	0.163	0.159	0.156	0.153	0.154	0.154	0.159
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chromium	mg/L	0.005	0.1	0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoride	mg/L	1.0	4.0	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Lithium	mg/L	0.0396	0.040	0.040	0.017	0.018	0.016	0.016	0.017	0.017	0.019	0.017
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	mg/L	0.024	0.1	0.100	0.009	0.008	0.011	0.011	0.010	0.010	0.009	0.008
Radium-226	pCi/L	-	-	-	0.549 ^{UJ}	0.295 ^{UJ}	0.576 ^{UJ}	0.395 ^{UJ}	1.31 ⁺	0.200 ⁺	0.983 ⁺	0.188 ^g
Radium-228	pCi/L	-	-	-	1.61 ⁺	1.50 ⁺	1.52 ⁺	1.17 ⁺	0.682	0.960	0.0316	0.832 ⁺
Radium-226/228	pCi/L	5.00	5	5.00	2.16 ^J	1.80 ^J	1.62 ⁺	1.23 ⁺	1.99 ⁺	1.16 ⁺	1.01	1.02
Selenium	mg/L	0.005	0.05	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Other												
Total Suspended Solids	mg/L	-	-	-	3	2.3	7.1	6.7	3.0	3.4	3.7	4.7
Bicarbonate	mg/L	-	-	-	350	360	440	350	360	360	320	330
Carbonate	mg/L	-	-	-	<10	<10	<10	<10	<10	<10	<10	<10
Hardness	mg/L	-	-	-	410	410	397	393	364	364	374	378
Magnesium	mg/L	-	-	-	35.7	38.0	35.0	34.9	35.8	35.5	32.7	33.5
Potassium	mg/L	-	-	-	3.34	3.35	3.50	3.54	3.46	3.54	3.51	3.61
Sodium	mg/L	-	-	-	23.2	23.0	26.9	27.1	24.8	24.9	25.9	24.8

MW-100B	
Downgradient	
10/23/2023	11/27/2023
Background Monitoring	
7.44	7.40
0.752	0.713
5.16	5.01
0	0
12.1	10.6
-154.8	-141.7
0.26	0.29
95.9	94.5
24	24.0
<1.0	0.15
7.44	7.40
108	105
490	482
<0.005	<0.005
0.010	0.010
0.145	0.147
<0.001	<0.001
<0.0005	<0.0005
<0.005	<0.005
<0.005	<0.005
<1.0	0.15
<0.003	<0.003
0.017	0.018
<0.0002	<0.0002
0.009	0.009
0.732 ⁺	0.868 ⁺
0.613	0.953
1.35	1.82
<0.005	<0.005
<0.002	<0.002
4.1	2.5
330	310
<10	<10
364	369
33.2	32.5
3.69	3.76
27.4	30.3

		Sample Location:			MW-100C								
		Sample Type:			Downgradient								
		Sample Date:			6/5/2023	7/10/2023	8/14/2023	9/18/2023	10/23/2023		11/27/2023		
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring								
Field Parameters										Field Dup		Field Dup	
pH	su	-	-	-	7.54	7.30	7.34	7.23	7.29	7.29	7.27	7.27	
Conductivity	mS/cm	-	-	-	0.544	0.539	0.537	0.525	0.538	0.538	0.523	0.523	
Turbidity	NTU	-	-	-	4.68	4.02	5.89	0.81	5.15	5.15	4.15	4.15	
Dissolved Oxygen	mg/L	-	-	-	0.02	0.06	0.23	0.01	0	0	0	0	
Temperature	°C	-	-	-	13.5	13.7	14.0	12.8	12.3	12.3	10.2	10.2	
Oxidation Reduction Potential	mV	-	-	-	-95.6	-131.4	-129.7	-113.3	-115.8	-115.8	-107.2	-107.2	
Appendix III													
Boron	mg/L	3.52	-	3.52	1.54	1.68	1.81	1.83	1.76	1.76	1.82	1.84	
Calcium	mg/L	69.6	-	69.6	55.9	56.3	55.2	59.8	61.2	61.5	61.1	60.7	
Chloride	mg/L	5.0	250	250	14	10	8	6	5	5	5.01	5.04	
Fluoride	mg/L	1.0	4	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.13 ⁺	<1.0 ^{UJ}	
pH, Field	su	-	-	-	7.54	7.30	7.34	7.23	7.29	7.29	7.27	7.27	
Sulfate	mg/L	5.0	250	250	27	14	13	8	7	6	5.59	5.66	
Total Dissolved Solids	mg/L	380	500	500	310	300	314	302	302	298	306	302	
Appendix IV													
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Arsenic	mg/L	0.009	0.01	0.01	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	
Barium	mg/L	0.081	2	2.0	0.067	0.082	0.082	0.092	0.082	0.083	0.081	0.085	
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Chromium	mg/L	0.005	0.1	0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Fluoride	mg/L	1.0	4	2.00	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.13	<1.0	
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	
Lithium	mg/L	0.051	0.04	0.051	0.029	0.028	0.031	0.035	0.034	0.032	0.032	0.032	
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Molybdenum	mg/L	0.011	0.1	0.100	0.009	0.009	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	
Radium-226	pCi/L	-	-	-	0.677	0.520	1.20	0.581 ⁺	0.542 ^l	1.07 ⁺	1.69 ⁺	0.450 ^l	
Radium-228	pCi/L	-	-	-	-0.307	0.827	-0.958	0.276	0.836	1.02	-0.293 ⁻	0.906 ⁺	
Radium-226/228	pCi/L	4.42	5.00	5.00	0.677	0.977	1.20	0.857	1.38	2.09	1.69	1.36	
Selenium	mg/L	0.005	0.05	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Other													
Total Suspended Solids	mg/L	-	-	-	1.8	1.4	8.9	2.8	<3	<3	1.2 ⁺	<3 ^{UJ}	
Bicarbonate	mg/L	-	-	-	310	100	340	340	340	340	330	340	
Carbonate	mg/L	-	-	-	<10	<10	<10	<10	<10	<10	<10	<10	
Hardness	mg/L	-	-	-	200	204	218	232	232	238	237	237	
Magnesium	mg/L	-	-	-	18.1	18.1	18.5	19.1	19.5	19.2	19.3	19.7	
Potassium	mg/L	-	-	-	6.40	6.59	6.49	6.67	6.83	6.90	6.56	6.68	
Sodium	mg/L	-	-	-	44.1	38.2	36.4	30.5	29.2	29.1	28.3	28.2	

			Sample Location:		MW-100D					
			Sample Type:		Downgradient					
			Sample Date:		6/5/2023	7/10/2023	8/14/2023	9/18/2023	10/23/2023	11/27/2023
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring					
Field Parameters										
pH	su	-	-	-	8.04	7.82	7.90	7.58	7.59	8.01
Conductivity	mS/cm	-	-	-	0.575	0.585	0.598	0.597	0.6	0.592
Turbidity	NTU	-	-	-	8.78	8.15	7.95	5.58	5.05	4.95
Dissolved Oxygen	mg/L	-	-	-	0.01	0.05	0.15	0.02	0.01	0
Temperature	°C	-	-	-	13.8	14.3	14.5	13	13	9.9
Oxidation Reduction Potential	mV	-	-	-	-73.2	-90.1	-184.8	-201.5	-182.6	-163.3
Appendix III										
Boron	mg/L	3.52	-	3.52	3.45	3.23	3.39	3.35	3.22	3.37
Calcium	mg/L	69.6	-	69.6	7.77	7.18	6.27	6.21	5.86	5.57
Chloride	mg/L	5.0	250	250	<5	<5	5	<5	<5	4.20
Fluoride	mg/L	1.0	4	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.50
pH, Field	su	-	-	-	8.04	7.82	7.90	7.58	7.59	8.01
Sulfate	mg/L	5.0	250	250	<5	6	14	11	10	9.17
Total Dissolved Solids	mg/L	380	500	500	366	392	414	396	390	388
Appendix IV										
Antimony	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	0.009	0.01	0.01	<0.002	<0.002	0.003	0.003	0.003	0.003
Barium	mg/L	0.081	2	2.0	0.010	0.011	0.010	0.010	0.008	0.008
Beryllium	mg/L	0.001	0.004	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.0005	0.005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chromium	mg/L	0.005	0.1	0.100	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	mg/L	0.005	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoride	mg/L	1.0	4	2.00	<1.0	<1.0	<1.0	<1.0	<1.0	0.50
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Lithium	mg/L	0.051	0.04	0.051	0.031	0.016	0.016	0.017	0.017	0.018
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	mg/L	0.011	0.1	0.100	<0.005	0.010	0.012	0.010	0.009	0.008
Radium-226	pCi/L	-	-	-	0.509	0.426	1.32	0.535 [±]	0.649 [±]	0.893 [±]
Radium-228	pCi/L	-	-	-	4.56	0.921	0.135	0.261	0.947	-0.914
Radium-226/228	pCi/L	4.42	5.00	5.00	5.06	1.01	1.46	0.796	1.60	0.893
Selenium	mg/L	0.005	0.05	0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Other										
Total Suspended Solids	mg/L	-	-	-	2.7	2.7	2.2	2.0	<3	<3
Bicarbonate	mg/L	-	-	-	390	390	390	380	390	370
Carbonate	mg/L	-	-	-	<10	<10	<10	<10	<10	<10
Hardness	mg/L	-	-	-	30	32	19	17	19	49
Magnesium	mg/L	-	-	-	2.03	1.81	1.47	1.46	1.28	1.27
Potassium	mg/L	-	-	-	4.92	4.62	4.22	4.48	4.35	4.03
Sodium	mg/L	-	-	-	147	152	151	158	148	151

Footnotes:

1. BTV=UTL, calculated with data through February 2023.

Qualifiers:

U: The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the adjusted reporting limit (RL) for the sample and method.

J: The analyte was positively identified, and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain QC criteria were not met, or to the concentration of the analyte being below the RL).

J+: Same as J, and the reported concentration is potentially biased high.

J-: Same as J, and the reported concentration is potentially biased low.

UJ: The analyte was not detected at a level greater than or equal to the adjusted method detection limit (MDL). However, the reported adjusted MDL is approximate and might be inaccurate or imprecise.

R: The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte might or might not be present in the sample.

Appendix C

Lab Reports and Data Validation Reports



Data Verification & Validation Report

Lansing Board of Water & Light – Erickson Power Station

Sampling Event (dates and purpose): New Wells MW-14 & MW-15 – Background Round 1 – January 2023

Data Package Number: S44308.01
Data Validator: Aryka Thomson

Lab Report Date: 03/01/2023
Data Validation Completion Date: 03/02/2023

General Overall Assessment:

- Data are usable without qualification.
 Data are usable with qualification (as noted below).
 Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	
MW-7C	
MW-8	
MW-9	
MW-10	
MW-11	
MW-11B	
MW-12	
MW-12B	
MW-13	
MW-14	X
MW-15	X

Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-14	GW	S44308.01	01/12/2023	X	X	X	X	X	X	
MW-15	GW	S44308.02	01/12/2023	X	X	X	X	X	X	
MWT-14	QC	S44308.03	01/12/2023	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO₃, CO₃, hardness

Any planned sampling or analysis NOT completed? If yes, explain: _____

Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Field Data							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
Analytical Data Package							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies for sulfate
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested	X			RLs for TDS, chloride, and hardness were not met
			MDLs<RLs	X			
			MDLs<GPS			X	
QC Validation							
Evaluate Accuracy							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Evaluate Precision							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Zinc non-detect in parent and detected in field duplicate
Evaluate Representativeness							
Equipment Blanks (if applicable)	N/A		Non-detect (<RL)			X	
QC Verification							
Verify Instrument Calibration & Analytical Process							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	High recovery for Al, Ni, Mo, and As
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	Lab-generated duplicate outside control limits for Rad-226; does not affect project samples
Method Blanks	X		Laboratory-determined	-	-	-	
Evaluate Completeness (# usable measurements/ # unusable measurements)							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative: None

Comments:

Zinc was non-detect in the parent sample MW-14 but detected in the field duplicate MWT-14. Zinc required qualification as estimated but not detected (UJ) in the parent sample MW-14 and as estimated with high bias (J+) in the field duplicate MWT-14.



Report ID: S44308.01(02)
Generated on 02/17/2023
Replaces report S44308.01(01) generated on 01/18/2023

Report to
Attention: Jennifer Caporale
Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Report produced by
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Contacts for report questions:
John Lavery (johnlavery@meritlabs.com)
Barbara Ball (bball@meritlabs.com)

Report Summary
Lab Sample ID(s): S44308.01-S44308.04
Project: Erickson AM MI Wells 14-15
Collected Date(s): 01/12/2023
Submitted Date/Time: 01/13/2023 10:29
Sampled by: Marc Wahrer
P.O. #:

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Maya Murshak
Technical Director



General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

Report Narrative

All analyses completed



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



Sample Summary (4 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S44308.01	MW-14 L301176-01	Groundwater	01/12/23 16:12
S44308.02	MW-15 L301176-02	Groundwater	01/12/23 14:36
S44308.03	MWT-14 L301176-03	Groundwater	01/12/23 16:12
S44308.04	Field Blank L301176-04	Groundwater	01/12/23 13:25



Analytical Laboratory Report

Lab Sample ID: S44308.01

Sample Tag: MW-14 L301176-01

Collected Date/Time: 01/12/2023 16:12

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.8	IR
2	1L Plastic	None	Yes	1.8	IR
1	125ml Plastic	HNO3	Yes	1.8	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	01/17/23 12:29	CTV	
Metal Digestion	Completed	SW3015A	01/17/23 10:15	CCM	

Inorganics

Method: E300.0, Run Date: 01/17/23 11:02, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	108	25	0.32	mg/L	25	16887-00-6	

Method: E300.0, Run Date: 01/17/23 10:22, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	30	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 01/18/23 12:06, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	600	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 01/13/23 13:00, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	556	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 01/13/23 19:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	774	50	10	mg/L	2		

Method: SM2540D, Run Date: 01/17/23 18:50, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	16	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 01/17/23 11:46, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.004	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.117	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	2.29	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S44308.01 (continued)

Sample Tag: MW-14 L301176-01

Method: E200.8, Run Date: 01/17/23 11:46, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	6.58	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.125	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.012	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.006	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 01/17/23 14:17, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	147	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	42.3	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	4.79	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	79.2	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 01/17/23 13:46, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 02/16/23 13:42, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S44308.02

Sample Tag: MW-15 L301176-02

Collected Date/Time: 01/12/2023 14:36

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.8	IR
2	1L Plastic	None	Yes	1.8	IR
1	125ml Plastic	HNO3	Yes	1.8	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	01/17/23 12:29	CTV	
Metal Digestion	Completed	SW3015A	01/17/23 10:15	CCM	

Inorganics

Method: E300.0, Run Date: 01/17/23 10:32, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 01/17/23 11:22, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	100	25	0.32	mg/L	25	16887-00-6	
Sulfate	238	25	2.6	mg/L	25	14808-79-8	

Method: SM2320B, Run Date: 01/18/23 12:10, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	410	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 01/13/23 13:02, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	464	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 01/13/23 19:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	878	50	10	mg/L	2		

Method: SM2540D, Run Date: 01/17/23 18:50, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 01/17/23 11:52, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.077	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.37	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S44308.02 (continued)

Sample Tag: MW-15 L301176-02

Method: E200.8, Run Date: 01/17/23 11:52, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	Not detected	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.014	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	0.010	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 01/17/23 14:19, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	183	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	47.2	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	0.61	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	40.5	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 01/17/23 13:49, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 02/16/23 13:42, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S44308.03

Sample Tag: MWT-14 L301176-03

Collected Date/Time: 01/12/2023 16:12

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.8	IR
2	1L Plastic	None	Yes	1.8	IR
1	125ml Plastic	HNO3	Yes	1.8	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	01/17/23 12:29	CTV	
Metal Digestion	Completed	SW3015A	01/17/23 10:15	CCM	

Inorganics

Method: E300.0, Run Date: 01/17/23 11:12, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	109	25	0.32	mg/L	25	16887-00-6	

Method: E300.0, Run Date: 01/17/23 10:42, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	30	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 01/18/23 12:16, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	610	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 01/13/23 13:04, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	554	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 01/13/23 19:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	768	50	10	mg/L	2		

Method: SM2540D, Run Date: 01/17/23 18:50, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	16	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 01/17/23 11:59, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.004	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.122	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	2.32	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S44308.03 (continued)

Sample Tag: MWT-14 L301176-03

Method: E200.8, Run Date: 01/17/23 11:59, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	6.78	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.132	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.013	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.007	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.007	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 01/17/23 14:21, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	149	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	42.2	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	4.76	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	80.4	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 01/17/23 13:52, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 02/16/23 13:42, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

**Lab Sample ID: S44308.04**

Sample Tag: Field Blank L301176-04
 Collected Date/Time: 01/12/2023 13:25
 Matrix: Groundwater
 COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.8	IR
2	1L Plastic	None	Yes	1.8	IR
1	125ml Plastic	HNO3	Yes	1.8	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	01/17/23 12:29	CTV	
Metal Digestion	Completed	SW3015A	01/17/23 10:15	CCM	

Inorganics**Method: E300.0, Run Date: 01/17/23 10:52, Analyst: JDP**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.03	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.04	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.26	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 01/18/23 12:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 01/13/23 13:06, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 01/13/23 19:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	10	mg/L	2		

Method: SM2540D, Run Date: 01/17/23 18:50, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals**Method: E200.8, Run Date: 01/17/23 11:42, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S44308.04 (continued)

Sample Tag: Field Blank L301176-04

Method: E200.8, Run Date: 01/17/23 11:42, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 01/17/23 14:16, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 01/17/23 13:56, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 02/16/23 13:42, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

Merit Laboratories Login Checklist

Lab Set ID:S44308

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 14-15

Submitted:01/13/2023 10:29 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

Sample Receiving

- | | | |
|-----|--|--|
| 01. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples are received at 4C +/- 2C Thermometer # IR 1.8 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Received on ice/ cooling process begun |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples shipped |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples left in 24 hr. drop box |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Are there custody seals/tape or is the drop box locked |

Chain of Custody

- | | | |
|-----|--|--|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC adequately filled out |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC signed and relinquished to the lab |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sample tag on bottles match COC |
| 09. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Subcontracting needed? Subcontracted to: GEL |

Preservation

- | | | |
|-----|--|---|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Do sample have correct chemical preservation |
| 11. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Completed pH checks on preserved samples? (no VOAs) |
| 12. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Did any samples need to be preserved in the lab? |

Bottle Conditions

- | | | |
|-----|--|---|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | All bottles intact |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Appropriate analytical bottles are used |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Merit bottles used |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sufficient sample volume received |
| 17. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples require laboratory filtration |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples submitted within holding time |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Do water VOC or TOX bottles contain headspace |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S44308 Submitted: 01/13/2023 10:29

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 14-15

Attention: Jennifer Caporale
Address: Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Initial Preservation Check: 01/13/2023 12:27 MMC

Preservation Recheck (E200.8): N/A

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S44308.01	125ml Plastic HNO3	<2			
S44308.01	1L Plastic HNO3	<2			
S44308.01	1L Plastic HNO3	<2			
S44308.02	125ml Plastic HNO3	<2			
S44308.02	1L Plastic HNO3	<2			
S44308.02	1L Plastic HNO3	<2			
S44308.03	125ml Plastic HNO3	<2			
S44308.03	1L Plastic HNO3	<2			
S44308.03	1L Plastic HNO3	<2			
S44308.04	125ml Plastic HNO3	<2			
S44308.04	1L Plastic HNO3	<2			
S44308.04	1L Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823
 Phone (517) 332-0167 Fax (517) 332-4034
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

REPORT TO

CHAIN OF CUSTODY RECORD

INVOICE TO

CONTACT NAME **Jennifer Caporale**
 COMPANY **Lansing Board of Water and Light**
 ADDRESS **PO Box 13007 48901-3007**
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**
 PHONE NO. **517-702-6372** FAX NO. P.O. NO.
 E-MAIL ADDRESS **Environmental_Laboratory@lbwl.com** QUOTE NO.

CONTACT NAME **Kelly Gleason** SAME
 COMPANY
 ADDRESS
 CITY STATE ZIP CODE
 PHONE NO. E-MAIL ADDRESS **Kelly.Gleason@lbwl.com**

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

PROJECT NO./NAME **Erickson AM MI Wells 14-15** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**

TURNAROUND TIME REQUIRED 1 DAY 2 DAYS 3 DAYS STANDARD OTHER **ASAP**
 DELIVERABLES REQUIRED STD LEVEL II LEVEL III LEVEL IV EDD OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WPE A=AIR W=WASTE

Containers & Preservatives
 Total Metals
 F- undistilled, Cl-, SO4, TDS
 Radium 226
 Radium 228
 TSS
 HCO3, CO3, Hardness
 Certifications
 OHIO VAP Drinking Water
 DoD NPDES
 Project Locations
 Detroit New York
 Other
 Special Instructions

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO3	H2SO4	NaOH	MeOH	OTHER	Total Metals	F- undistilled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness							
	DATE	TIME																							
4430801	01/12/23	1612	MW-14 L301176-01	GW	5	2	3						✓	✓	✓	✓	✓	✓							Metals to analyse: Na, Mg, K
.02		1436	MW-15 -02	GW	5	2	3						✓	✓	✓	✓	✓	✓							B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03		1612	MWT-14 -03	GW	5	2	3						✓	✓	✓	✓	✓	✓							Co, Li, Hg, Mo, Pb, Se, Tl,
.04		1325	Field Blank -04	di	5	2	3						✓	✓	✓	✓	✓	✓							Fe, Cu, Ni, Ag, V, Zn
																									Please send a preliminary report

RELINQUISHED BY: *Kelly Gleason* Sampler DATE **01/13/23** TIME **1029**
 RECEIVED BY: *Marc Wahrer* DATE **1/13/23** TIME **1229**
 RELINQUISHED BY: DATE TIME
 RECEIVED BY: DATE TIME

RELINQUISHED BY: DATE TIME
 RECEIVED BY: DATE TIME
 SEAL NO. SEAL INTACT YES NO INITIALS
 SEAL NO. SEAL INTACT YES NO INITIALS
 NOTES: TEMP. ON ARRIVAL **1.8**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total		250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005



February 16, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 607953
SDG: S44308

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on January 20, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Heather Millar for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S44308
Work Order: 607953**

February 16, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on January 20, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

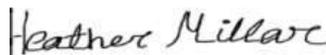
Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
607953001	S44308.01
607953002	S44308.02
607953003	S44308.03 Field Dupe
607953004	S44308.04 Field Blank

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.


Heather Millar for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

Laboratory Certifications

List of current GEL Certifications as of 16 February 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S44308
Work Order #: 607953**

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2373642

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
607953001	S44308.01
607953002	S44308.02
607953003	S44308.03 Field Dupe
607953004	S44308.04 Field Blank
1205303607	Method Blank (MB)
1205303608	607884001(NonSDG) Sample Duplicate (DUP)
1205303609	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2373612

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
607953001	S44308.01
607953002	S44308.02
607953003	S44308.03 Field Dupe
607953004	S44308.04 Field Blank
1205303555	Method Blank (MB)
1205303556	607884001(NonSDG) Sample Duplicate (DUP)
1205303557	607884001(NonSDG) Matrix Spike (MS)
1205303558	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

The matrix spike, 1205303557 (Non SDG 607884001MS), aliquot was reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S44308 GEL Work Order: 607953

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 17 FEB 2023

Title: Group Leader

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: February 16, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S44308.01 Project: MERI00120
Sample ID: 607953001 Client ID: MERI001
Matrix: Ground Water
Collect Date: 12-JAN-23 16:12
Receive Date: 20-JAN-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		3.53	+/-1.18	1.48	3.00	pCi/L		JE1	02/15/23	0844	2373642	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		4.44	+/-1.25			pCi/L		NXL1	02/16/23	1342	2373640	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.907	+/-0.435	0.434	1.00	pCi/L		LXP1	02/12/23	0933	2373612	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			89.6	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: February 16, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S44308.02 Project: MERI00120
Sample ID: 607953002 Client ID: MERI001
Matrix: Ground Water
Collect Date: 12-JAN-23 14:36
Receive Date: 20-JAN-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228		1.43	+/-0.939	1.41	3.00	pCi/L		JE1	02/15/23	0845	2373642		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		2.06	+/-1.04			pCi/L		NXL1	02/16/23	1342	2373640		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.629	+/-0.455	0.649	1.00	pCi/L		LXP1	02/12/23	0933	2373612		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			77.8	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: February 16, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S44308.03 Field Dupe Project: MERI00120
Sample ID: 607953003 Client ID: MERI001
Matrix: Ground Water
Collect Date: 12-JAN-23 16:12
Receive Date: 20-JAN-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		3.07	+/-1.36	1.96	3.00	pCi/L		JE1	02/15/23	0845	2373642	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		3.39	+/-1.39			pCi/L		NXL1	02/16/23	1342	2373640	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.322	+/-0.295	0.444	1.00	pCi/L		LXP1	02/12/23	0933	2373612	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			84.5	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: February 16, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S44308.04 Field Blank Project: MERI00120
Sample ID: 607953004 Client ID: MERI001
Matrix: Ground Water
Collect Date: 12-JAN-23 13:25
Receive Date: 20-JAN-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.870	+/-0.906	1.50	3.00	pCi/L		JE1	02/15/23	0840	2373642	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.06	+/-0.944			pCi/L		NXL1	02/16/23	1342	2373640	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.193	+/-0.267	0.462	1.00	pCi/L		LXP1	02/12/23	1007	2373612	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			86.4	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: February 16, 2023

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Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan

Contact: John Laverty

Workorder: 607953

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2373642										
QC1205303608	607884001	DUP									
Radium-228		1.35		1.69	pCi/L	22.2		(0% - 100%)	JE1	02/15/23	08:39
	Uncertainty	+/-0.848		+/-1.08							
QC1205303609	LCS										
Radium-228	63.0			72.7	pCi/L		115	(75%-125%)		02/15/23	08:39
	Uncertainty			+/-4.37							
QC1205303607	MB										
Radium-228			U	0.853	pCi/L					02/15/23	08:39
	Uncertainty			+/-1.38							
Rad Ra-226											
Batch	2373612										
QC1205303556	607884001	DUP									
Radium-226		0.569		0.509	pCi/L	11.1		(0% - 100%)	LXP1	02/12/23	10:07
	U										
	Uncertainty	+/-0.455		+/-0.346							
QC1205303558	LCS										
Radium-226	26.5			24.1	pCi/L		91	(75%-125%)		02/12/23	10:07
	Uncertainty			+/-2.02							
QC1205303555	MB										
Radium-226			U	0.412	pCi/L					02/12/23	10:07
	Uncertainty			+/-0.395							
QC1205303557	607884001	MS									
Radium-226	129 U	0.569		129	pCi/L		100	(75%-125%)		02/12/23	10:07
	Uncertainty	+/-0.455		+/-10.1							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- H Analytical holding time was exceeded
- < Result is less than value reported
- > Result is greater than value reported

GEL LABORATORIES LLC

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QC Summary

Workorder: 607953

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Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
NI											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2373642 Check-list

This check-list was completed on 15-FEB-23 by Nat Long

This batch was reviewed by Nat Long on 15-FEB-23 and Kenshalla Oston on 16-FEB-23.

Batch ID:
2373642

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous		No	
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2373642
Analyst: Jacqueline Emond (JE1)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: LUCAS-C202389980

Due Dates for Lab: 14-FEB-2023 **Package:** 16-FEB-2023 **SDG:** 17-FEB-2023

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205303609	228	1952-B	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	607884001	08-FEB-2023	3	304.46	304.46	02/10/23 15:19	02/15/23 06:56
2	607884002	08-FEB-2023	3	300.28	300.28	02/10/23 15:19	02/15/23 06:56
3	607884003	08-FEB-2023	3	304.97	304.97	02/10/23 15:19	02/15/23 06:56
4	607884004	08-FEB-2023	3	300.63	300.63	02/10/23 15:19	02/15/23 06:56
5	607884005	08-FEB-2023	3	301.74	301.74	02/10/23 15:19	02/15/23 06:56
6	607884006	08-FEB-2023	3	301.24	301.24	02/10/23 15:19	02/15/23 06:56
7	607884007	08-FEB-2023	3	300.42	300.42	02/10/23 15:19	02/15/23 06:56
8	607884008	08-FEB-2023	3	301.09	301.09	02/10/23 15:19	02/15/23 06:56
9	607884009	08-FEB-2023	3	304.64	304.64	02/10/23 15:19	02/15/23 06:56
10	607884010	08-FEB-2023	3	301.57	301.57	02/10/23 15:19	02/15/23 06:56
11	607884011	08-FEB-2023	3	300.15	300.15	02/10/23 15:19	02/15/23 06:56
12	607884012	08-FEB-2023	3	300.73	300.73	02/10/23 15:19	02/15/23 06:56
13	607884013	08-FEB-2023	3	306.79	306.79	02/10/23 15:19	02/15/23 06:56
14	607953001	08-FEB-2023	3	300.62	300.62	02/10/23 15:19	02/15/23 06:56
15	607953002	08-FEB-2023	3	303.7	303.7	02/10/23 15:19	02/15/23 06:56
16	607953003	08-FEB-2023	3	300.17	300.17	02/10/23 15:19	02/15/23 06:56
17	607953004	08-FEB-2023	3	301.46	301.46	02/10/23 15:19	02/15/23 06:56
18	1205303607 MB	08-FEB-2023	3		306.79	02/10/23 15:19	02/15/23 06:56
19	1205303608 DUP (607884001)	08-FEB-2023	3	302.17	302.17	02/10/23 15:19	02/15/23 06:56
20	1205303609 LCS	08-FEB-2023	3		306.79	02/10/23 15:19	02/15/23 06:56

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-D	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 08-FEB-2023 00:00
REGNT 3858567	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3862351	RGF-1M Citric Acid	5 mL	
REGNT 3862361	RGF-50% Potassium Carbonate	2 mL	
REGNT 3648549	RGF-7M Nitric Acid	25 mL	
REGNT DGA013123	2372406	2 g	
REGNT 3418276.6	29M HF (48-50%)	4 mL	
REGNT 3528714	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3521298	RGF-Neodymium Substrate	5 mL	
REGNT 3454370.1	Nitric Acid	5 mL	
REGNT 3465466	Barium Carrier Ra228 REG	1 mL	
REGNT 3850768	2M HCl	20 mL	
REGNT 3645221.6	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 1951-D
 Tracer Exp Date : 6/2/2023
 Tracer Volume Added: 0.10

Batch : 2373642
 Analyst : JAC02417
 Prep Date : 2/8/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 3 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	607884001.1	0.3045	1.8534E-05	1/17/2023 9:30	1235.0	1.64%	1032.0	1.80%	0.1	0.000200
2	607884002.1	0.3003	1.8464E-05	1/17/2023 11:15	1235.0	1.64%	1095.0	1.74%	0.1	0.000200
3	607884003.1	0.3050	1.8542E-05	1/17/2023 7:30	1235.0	1.64%	1024.8	1.80%	0.1	0.000200
4	607884004.1	0.3006	1.8470E-05	1/18/2023 10:40	1235.0	1.64%	1015.5	1.81%	0.1	0.000200
5	607884005.1	0.3017	1.8488E-05	1/18/2023 10:20	1235.0	1.64%	981.4	1.84%	0.1	0.000200
6	607884006.1	0.3012	1.8480E-05	1/18/2023 10:35	1235.0	1.64%	1078.9	1.76%	0.1	0.000200
7	607884007.1	0.3004	1.8466E-05	1/18/2023 11:15	1235.0	1.64%	1010.2	1.82%	0.1	0.000200
8	607884008.1	0.3011	1.8478E-05	1/18/2023 8:30	1235.0	1.64%	1007.5	1.82%	0.1	0.000200
9	607884009.1	0.3046	1.8537E-05	1/18/2023 8:30	1235.0	1.64%	1025.8	1.80%	0.1	0.000200
10	607884010.1	0.3016	1.8486E-05	1/18/2023 9:15	1235.0	1.64%	1045.5	1.79%	0.1	0.000200
11	607884011.1	0.3002	1.8462E-05	1/18/2023 9:50	1235.0	1.64%	1119.4	1.73%	0.1	0.000200
12	607884012.1	0.3007	1.8471E-05	1/18/2023 7:30	1235.0	1.64%	970.7	1.85%	0.1	0.000200
13	607884013.1	0.3068	1.8572E-05	1/19/2023 8:50	1235.0	1.64%	1041.9	1.79%	0.1	0.000200
14	607953001.1	0.3006	1.8470E-05	1/12/2023 16:12	1235.0	1.64%	1106.9	1.74%	0.1	0.000200
15	607953002.1	0.3037	1.8521E-05	1/12/2023 14:36	1235.0	1.64%	960.6	1.86%	0.1	0.000200
16	607953003.1	0.3002	1.8462E-05	1/12/2023 16:12	1235.0	1.64%	1043.7	1.79%	0.1	0.000200
17	607953004.1	0.3015	1.8484E-05	1/12/2023 13:25	1235.0	1.64%	1066.8	1.77%	0.1	0.000200
18	1205303607.1	0.3068	1.8572E-05	2/8/2023 0:00	1235.0	1.64%	987.5	1.84%	0.1	0.000200
19	1205303608.1	0.3022	1.8496E-05	1/17/2023 9:30	1235.0	1.64%	1018.4	1.81%	0.1	0.000200
20	1205303609.1	0.3068	1.8572E-05	2/8/2023 0:00	1235.0	1.64%	984.1	1.84%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated Sample Recovery %	Sample Recovery Error %
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction		
1	1A	60	19	47	0.783	2/15/2023 8:43	2/10/2023 15:19	2/15/2023 6:56	0.990	0.816	1.000	1.057	83.6%	2.45%
2	1B	60	15	43	0.717	2/15/2023 8:44	2/10/2023 15:19	2/15/2023 6:56	0.991	0.816	1.000	1.057	88.7%	2.41%
3	1C	60	9	78	1.300	2/15/2023 8:44	2/10/2023 15:19	2/15/2023 6:56	0.990	0.816	1.000	1.057	83.0%	2.45%
4	2A	60	14	58	0.967	2/15/2023 8:44	2/10/2023 15:19	2/15/2023 6:56	0.991	0.816	1.000	1.057	82.2%	2.46%
5	2B	60	7	138	2.300	2/15/2023 8:44	2/10/2023 15:19	2/15/2023 6:56	0.991	0.816	1.000	1.057	79.5%	2.48%
6	2C	60	13	49	0.817	2/15/2023 8:44	2/10/2023 15:19	2/15/2023 6:56	0.991	0.816	1.000	1.057	87.4%	2.42%
7	2D	60	9	113	1.883	2/15/2023 8:44	2/10/2023 15:19	2/15/2023 6:56	0.991	0.816	1.000	1.057	81.8%	2.47%
8	4C	60	10	60	1.000	2/15/2023 8:44	2/10/2023 15:19	2/15/2023 6:56	0.991	0.816	1.000	1.057	81.6%	2.47%
9	5B	60	17	51	0.850	2/15/2023 8:44	2/10/2023 15:19	2/15/2023 6:56	0.991	0.816	1.000	1.057	83.1%	2.45%
10	7B	60	14	57	0.950	2/15/2023 8:44	2/10/2023 15:19	2/15/2023 6:56	0.991	0.815	1.000	1.057	84.7%	2.44%
11	7C	60	11	74	1.233	2/15/2023 8:44	2/10/2023 15:19	2/15/2023 6:56	0.991	0.815	1.000	1.057	90.6%	2.40%
12	8A	60	18	47	0.783	2/15/2023 8:44	2/10/2023 15:19	2/15/2023 6:56	0.991	0.815	1.000	1.057	78.6%	2.49%
13	9B	60	9	65	1.083	2/15/2023 8:44	2/10/2023 15:19	2/15/2023 6:56	0.991	0.815	1.000	1.057	84.4%	2.44%
14	10A	60	15	107	1.783	2/15/2023 8:44	2/10/2023 15:19	2/15/2023 6:56	0.989	0.815	1.000	1.057	89.6%	2.41%
15	10C	60	21	51	0.850	2/15/2023 8:45	2/10/2023 15:19	2/15/2023 6:56	0.989	0.815	1.000	1.057	77.8%	2.50%
16	10D	60	30	117	1.950	2/15/2023 8:45	2/10/2023 15:19	2/15/2023 6:56	0.989	0.815	1.000	1.057	84.5%	2.44%
17	11A	60	15	59	0.983	2/15/2023 8:40	2/10/2023 15:19	2/15/2023 6:56	0.989	0.822	1.000	1.057	86.4%	2.43%
18	11B	60	27	127	2.117	2/15/2023 8:39	2/10/2023 15:19	2/15/2023 6:56	0.998	0.823	1.000	1.057	80.0%	2.48%
19	12B	60	13	74	1.233	2/15/2023 8:39	2/10/2023 15:19	2/15/2023 6:56	0.990	0.823	1.000	1.057	82.5%	2.46%
20	12A	60	18	1173	19.550	2/15/2023 8:39	2/10/2023 15:19	2/15/2023 6:56	0.998	0.823	1.000	1.057	79.7%	2.48%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.6209	0.00738	0.420	2/12/2023 12:53	1000
2	PIC	6/1/2022	5/31/2023	0.6068	0.00711	0.541	2/12/2023 12:54	1000
3	PIC	6/1/2022	5/31/2023	0.6190	0.00847	0.990	2/12/2023 12:54	1000
4	PIC	6/1/2022	5/31/2023	0.6201	0.01914	0.624	2/12/2023 12:54	1000
5	PIC	6/1/2022	5/31/2023	0.6097	0.02111	1.869	2/12/2023 12:54	1000
6	PIC	6/1/2022	5/31/2023	0.6022	0.01274	0.649	2/12/2023 12:54	1000
7	PIC	6/1/2022	5/31/2023	0.6046	0.00745	1.058	2/12/2023 12:54	1000
8	PIC	6/1/2022	5/31/2023	0.6359	0.00889	0.519	2/12/2023 12:54	1000
9	PIC	6/1/2022	5/31/2023	0.6336	0.00426	0.831	2/12/2023 12:54	1000
10	PIC	6/1/2022	5/31/2023	0.6366	0.00627	0.591	2/12/2023 12:54	1000
11	PIC	6/1/2022	5/31/2023	0.6407	0.00790	0.838	2/12/2023 12:54	1000
12	PIC	6/1/2022	5/31/2023	0.6398	0.01579	0.879	2/12/2023 12:54	1000
13	PIC	6/1/2022	5/31/2023	0.6318	0.00754	0.690	2/12/2023 12:54	1000
14	PIC	6/1/2022	5/31/2023	0.6384	0.00651	0.756	2/12/2023 12:54	1000
15	PIC	6/1/2022	5/31/2023	0.6321	0.00638	0.488	2/12/2023 12:54	1000
16	PIC	6/1/2022	5/31/2023	0.6148	0.00557	1.140	2/12/2023 12:54	1000
17	PIC	6/1/2022	5/31/2023	0.6371	0.01317	0.737	2/12/2023 12:52	1000
18	PIC	6/1/2022	5/31/2023	0.6481	0.00697	1.883	2/12/2023 12:52	1000
19	PIC	6/1/2022	5/31/2023	0.6334	0.01114	0.776	2/10/2023 16:27	500
20	PIC	6/1/2022	5/31/2023	0.6090	0.01964	0.903	2/12/2023 12:52	1000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 1952-B
LCS Exp Date : 8/9/2023
LCS Activity (dpm/ml): 429.14
LCS Volume Added: 0.10

Results																		
Pos.	Decision	Critical	Required	Sample Act.		Sample Act.	Net Count	Net Count	2 SIGMA		2 SIGMA		Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
	Level pCi/L	Level pCi/L	MDA pCi/L	MDA pCi/L	Conc. pCi/L	Error %	Rate CPM	Rate Error CPM	Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L								
1	0.7484	0.5284	3	1.2433	1.3549	32.05%	0.3633	0.1161	0.8485	0.9154				SAMPLE				
2	0.8306	0.5864	3	1.3551	0.6405	63.66%	0.1757	0.1117	0.7985	0.8149				SAMPLE				
3	1.1591	0.8183	3	1.8247	1.1660	48.62%	0.3100	0.1505	1.1097	1.1485				SAMPLE				
4	0.9401	0.6637	3	1.5195	1.3168	37.88%	0.3427	0.1294	0.9743	1.0310				SAMPLE				
5	1.7061	1.2045	3	2.6105	1.7368	46.63%	0.4310	0.2005	1.5836	1.6451				SAMPLE				
6	0.9275	0.6548	3	1.4956	0.6233	71.27%	0.1677	0.1194	0.8701	0.8845				SAMPLE				
7	1.2634	0.8920	3	1.9823	3.2734	21.98%	0.8253	0.1801	1.4003	1.6279				SAMPLE				
8	0.8418	0.5943	3	1.3773	1.8148	27.38%	0.4810	0.1311	0.9694	1.0733				SAMPLE				
9	1.0379	0.7328	3	1.6494	0.0699	644.56%	0.0190	0.1225	0.8825	0.8826				SAMPLE				
10	0.8636	0.6097	3	1.4009	1.3023	35.79%	0.3590	0.1282	0.9112	0.9691				SAMPLE				
11	0.9590	0.6771	3	1.5232	1.3373	37.08%	0.3953	0.1463	0.9697	1.0272				SAMPLE				
12	1.1323	0.7994	3	1.7939	-0.3731	123.43%	-0.0957	0.1180	0.9023	0.9024				SAMPLE				
13	0.9276	0.6549	3	1.4900	1.4182	34.90%	0.3933	0.1369	0.9676	1.0322				SAMPLE				
14	0.9252	0.6532	3	1.4782	3.5299	17.18%	1.0273	0.1746	1.1757	1.4771				SAMPLE				
15	0.8565	0.6047	3	1.4073	1.4331	33.54%	0.3620	0.1211	0.9393	1.0072				SAMPLE				
16	1.2535	0.8850	3	1.9594	3.0705	22.78%	0.8100	0.1834	1.3627	1.5691				SAMPLE				
17	0.9386	0.6627	3	1.5018	0.8696	53.20%	0.2463	0.1309	0.9055	0.9321				SAMPLE				
18	1.5516	1.0955	3	2.3735	0.8532	82.54%	0.2337	0.1928	1.3795	1.3964				MB				
19	1.0385	0.7332	3	1.6516	1.6937	32.62%	0.4573	0.1487	1.0792	1.1619	607884001.1	DUP	22.2%					
20	1.1472	0.8099	3	1.8147	72.6865	4.41%	18.6470	0.5716	4.3672	19.1240		LCS				63.0087	115.4%	

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
607884001	1A	60	19	47	2/15/2023 8:43	2/15/2023 9:43	PIC	2373642
607884002	1B	60	15	43	2/15/2023 8:44	2/15/2023 9:44	PIC	2373642
607884003	1C	60	9	78	2/15/2023 8:44	2/15/2023 9:44	PIC	2373642
607884004	2A	60	14	58	2/15/2023 8:44	2/15/2023 9:44	PIC	2373642
607884005	2B	60	7	138	2/15/2023 8:44	2/15/2023 9:44	PIC	2373642
607884006	2C	60	13	49	2/15/2023 8:44	2/15/2023 9:44	PIC	2373642
607884007	2D	60	9	113	2/15/2023 8:44	2/15/2023 9:44	PIC	2373642
607884008	4C	60	10	60	2/15/2023 8:44	2/15/2023 9:44	PIC	2373642
607884009	5B	60	17	51	2/15/2023 8:44	2/15/2023 9:44	PIC	2373642
607884010	7B	60	14	57	2/15/2023 8:44	2/15/2023 9:44	PIC	2373642
607884011	7C	60	11	74	2/15/2023 8:44	2/15/2023 9:44	PIC	2373642
607884012	8A	60	18	47	2/15/2023 8:44	2/15/2023 9:44	PIC	2373642
607884013	9B	60	9	65	2/15/2023 8:44	2/15/2023 9:44	PIC	2373642
607953001	10A	60	15	107	2/15/2023 8:44	2/15/2023 9:44	PIC	2373642
607953002	10C	60	21	51	2/15/2023 8:45	2/15/2023 9:45	PIC	2373642
607953003	10D	60	30	117	2/15/2023 8:45	2/15/2023 9:45	PIC	2373642
607953004	11A	60	15	59	2/15/2023 8:40	2/15/2023 9:40	PIC	2373642
1205303607	11B	60	27	127	2/15/2023 8:39	2/15/2023 9:39	PIC	2373642
1205303608	12B	60	13	74	2/15/2023 8:39	2/15/2023 9:39	PIC	2373642
1205303609	12A	60	18	1173	2/15/2023 8:39	2/15/2023 9:39	PIC	2373642

ASSAY 15-Feb-23 7:22:08
 Wizard 2480 s/n 46190630
 Protocol id 8 Ba-133
 Time limit
 Count limit
 Isotope Ba-133
 Protocol date 2/15/2023
 Run id. 6186

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	87	1	180	3705.57	1234.99	1.64	07:22:08
607884001	2	87	2	180	3096.28	1031.95	1.8	83.56	07:25:22
607884002	3	87	3	180	3285.57	1095.02	1.74	88.67	07:28:36
607884003	4	87	4	180	3075	1024.84	1.8	82.98	07:31:49
607884004	5	87	5	180	3047	1015.49	1.81	82.23	07:35:03
607884005	1	88	1	180	2945	981.41	1.84	79.47	07:38:43
607884006	2	88	2	180	3237.28	1078.91	1.76	87.36	07:41:57
607884007	3	88	3	180	3031.28	1010.21	1.82	81.80	07:45:11
607884008	4	88	4	180	3023	1007.51	1.82	81.58	07:48:25
607884009	5	88	5	180	3078	1025.84	1.8	83.06	07:51:39
607884010	1	10	1	180	3137.28	1045.51	1.79	84.66	07:55:15
607884011	2	10	2	180	3359	1119.38	1.73	90.64	07:58:29
607884012	3	10	3	180	2912.28	970.68	1.85	78.60	08:01:43
607884013	4	10	4	180	3126.28	1041.92	1.79	84.37	08:04:57
607953001	5	10	5	180	3321.28	1106.91	1.74	89.63	08:08:11
607953002	1	2	1	180	2882.28	960.61	1.86	77.78	08:12:09
607953003	2	2	2	180	3132	1043.74	1.79	84.51	08:15:22
607953004	3	2	3	180	3201	1066.81	1.77	86.38	08:18:36
1205303607	4	2	4	180	2963	987.5	1.84	79.96	08:21:50
1205303608	5	2	5	180	3055.57	1018.41	1.81	82.46	08:25:04
1205303609	1	15	1	180	2953	984.14	1.84	79.69	08:28:40

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 15-Feb-2023

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	Above	Beta bkg	15-Feb 04:39	60	2.267	1.385	3.072	+0.14
LB4100E2	need 2nd	Beta eff	15-Feb 05:41	5	14309	14120	15200	-1.95
LB4100E3	Below	Alpha XTalk	15-Feb 05:52	5	0.214	0.215	0.300	-3.05
LB4100E3	need 2nd	Beta eff	15-Feb 05:41	5	13989	13690	15550	-2.04
LB4100F2	Below	Alpha eff	15-Feb 07:59	5	6205	6533	7372	-5.35
LB4100F2	Above	Alpha XTalk	15-Feb 07:59	5	0.375	0.318	0.366	+4.15
LB4100F2	Above	Beta bkg	15-Feb 04:39	60	35.017	1.173	1.833	+304.67
LB4100F3	Above	Alpha eff	15-Feb 07:59	5	17168	11460	15350	+5.80
LB4100F3	Below	Alpha XTalk	15-Feb 07:59	5	0.290	0.328	0.439	-5.03
LB4100H1	Above	Beta bkg	15-Feb 04:39	60	3.017	0.216	2.462	+4.48
LB4100H2	Above	Alpha eff	15-Feb 07:48	5	7302	5091	7055	+3.76
PIC1D	Above	Alpha bkg	15-Feb 08:22	60	0.350	-1.03E-1	0.386	+2.56
PIC1D	need 2nd	Beta XTalk	15-Feb 04:55	5	0.009	0.001	0.011	+1.95
PIC3D	Above	Alpha bkg	15-Feb 05:07	60	0.883	-1.75E-1	0.473	+6.79
PIC3D	need 2nd	Alpha eff	15-Feb 04:54	5	10059	8165	10130	+2.78
PIC3D	Below	Alpha XTalk	15-Feb 04:54	5	0.253	0.260	0.381	-3.33
PIC3D	Above	Beta XTalk	15-Feb 05:01	5	0.017	-4.26E-4	0.001	+68.05
PIC4B	Above	Alpha bkg	15-Feb 05:08	60	0.650	-9.02E-2	0.287	+8.78
PIC6A	Above	Beta bkg	15-Feb 05:13	60	4.733	0.669	2.752	+8.71
PIC8C	Above	Alpha bkg	15-Feb 08:15	60	0.317	-1.61E-2	0.410	+1.68
PIC8C	need 2nd	Beta XTalk	15-Feb 05:12	5	0.012	7.40E-4	0.012	+2.86
PIC13A	Above	Alpha bkg	15-Feb 05:34	60	0.850	-9.05E-2	0.347	+9.90
PIC13A	Above	Beta bkg	15-Feb 05:34	60	3.350	-8.16E-2	2.573	+4.76
PIC14B	need 2nd	Alpha bkg	15-Feb 05:35	60	0.100	-1.08E-1	0.400	-0.55
PIC14B	Above	Alpha eff	15-Feb 05:21	5	9015	8474	8989	+3.30
PIC14B	Below	Alpha XTalk	15-Feb 05:21	5	0.273	0.279	0.316	-3.91
PIC14B	Above	Beta bkg	15-Feb 05:35	60	3.333	0.370	3.004	+3.75

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100A1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
PIC8D	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by Jais Burt

Date 2/15/23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2373642

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205303608	DUP	JE1	PIC12B	FEB-15-23 08:39:50	DONE	25mm Filter	01-JUN-22 00:00
1205303609	LCS	JE1	PIC12A	FEB-15-23 08:39:53	DONE	25mm Filter	01-JUN-22 00:00
1205303607	MB	JE1	PIC11B	FEB-15-23 08:39:59	DONE	25mm Filter	01-JUN-22 00:00
607953004	SAMPLE	JE1	PIC11A	FEB-15-23 08:40:06	DONE	25mm Filter	01-JUN-22 00:00
607884001	SAMPLE	JE1	PIC1A	FEB-15-23 08:43:59	DONE	25mm Filter	01-JUN-22 00:00
607884002	SAMPLE	JE1	PIC1B	FEB-15-23 08:44:03	DONE	25mm Filter	01-JUN-22 00:00
607884003	SAMPLE	JE1	PIC1C	FEB-15-23 08:44:07	DONE	25mm Filter	01-JUN-22 00:00
607884004	SAMPLE	JE1	PIC2A	FEB-15-23 08:44:11	DONE	25mm Filter	01-JUN-22 00:00
607884005	SAMPLE	JE1	PIC2B	FEB-15-23 08:44:15	DONE	25mm Filter	01-JUN-22 00:00
607884006	SAMPLE	JE1	PIC2C	FEB-15-23 08:44:19	DONE	25mm Filter	01-JUN-22 00:00
607884007	SAMPLE	JE1	PIC2D	FEB-15-23 08:44:23	DONE	25mm Filter	01-JUN-22 00:00
607884008	SAMPLE	JE1	PIC4C	FEB-15-23 08:44:27	DONE	25mm Filter	01-JUN-22 00:00
607884009	SAMPLE	JE1	PIC5B	FEB-15-23 08:44:34	DONE	25mm Filter	01-JUN-22 00:00
607884010	SAMPLE	JE1	PIC7B	FEB-15-23 08:44:38	DONE	25mm Filter	01-JUN-22 00:00
607884011	SAMPLE	JE1	PIC7C	FEB-15-23 08:44:41	DONE	25mm Filter	01-JUN-22 00:00
607884012	SAMPLE	JE1	PIC8A	FEB-15-23 08:44:48	DONE	25mm Filter	01-JUN-22 00:00
607884013	SAMPLE	JE1	PIC9B	FEB-15-23 08:44:51	DONE	25mm Filter	01-JUN-22 00:00
607953001	SAMPLE	JE1	PIC10A	FEB-15-23 08:44:58	DONE	25mm Filter	01-JUN-22 00:00
607953002	SAMPLE	JE1	PIC10C	FEB-15-23 08:45:04	DONE	25mm Filter	01-JUN-22 00:00
607953003	SAMPLE	JE1	PIC10D	FEB-15-23 08:45:07	DONE	25mm Filter	01-JUN-22 00:00

Lucas Cell Raw Data

Batch 2373612 Check-list

This check-list was completed on 12-FEB-23 by Lyndsey Pace

This batch was reviewed by Lyndsey Pace on 12-FEB-23 and Elizabeth Krouse on 14-FEB-23.

Batch ID:
2373612

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous		No	
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2373612
Analyst: Lyndsey Pace (LXP1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: LUCAS-C202389980

Due Dates for Lab: 14-FEB-2023			Package: 16-FEB-2023	SDG: 17-FEB-2023		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
MS	1205303557	Radium-226 SPIKE	1715-G	.1	mL	
LCS	1205303558	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	607884001	08-FEB-2023	1	504.52	504.52	02/09/23 10:15	104	02/12/23 05:40	02/12/23 09:02	6	18
2	607884002	08-FEB-2023	1	493.18	493.18	02/09/23 10:15	202	02/12/23 05:40	02/12/23 09:02	4	15
3	607884003	08-FEB-2023	1	484.38	484.38	02/09/23 10:15	304	02/12/23 05:40	02/12/23 09:02	1	8
4	607884004	08-FEB-2023	1	468.42	468.42	02/09/23 10:15	406	02/12/23 05:40	02/12/23 09:02	3	14
5	607884005	08-FEB-2023	1	488.83	488.83	02/09/23 10:15	501	02/12/23 05:40	02/12/23 09:02	2	15
6	607884006	08-FEB-2023	1	501.5	501.5	02/09/23 10:15	601	02/12/23 05:40	02/12/23 09:02	7	14
7	607884007	08-FEB-2023	1	501.1	501.1	02/09/23 10:15	708	02/12/23 05:40	02/12/23 09:02	1	10
8	607884008	08-FEB-2023	1	490.93	490.93	02/09/23 10:15	802	02/12/23 05:40	02/12/23 09:02	6	19
9	607884009	08-FEB-2023	1	465.74	465.74	02/09/23 10:15	106	02/12/23 06:05	02/12/23 09:33	6	15
10	607884010	08-FEB-2023	1	480.1	480.1	02/09/23 10:15	206	02/12/23 06:05	02/12/23 09:33	1	20
11	607884011	08-FEB-2023	1	495.54	495.54	02/09/23 10:15	303	02/12/23 06:05	02/12/23 09:33	5	8
12	607884012	08-FEB-2023	1	468.12	468.12	02/09/23 10:15	401	02/12/23 06:05	02/12/23 09:33	1	14
13	607884013	08-FEB-2023	1	493.77	493.77	02/09/23 10:15	502	02/12/23 06:05	02/12/23 09:33	1	11
14	607953001	08-FEB-2023	1	505.39	505.39	02/09/23 10:15	604	02/12/23 06:05	02/12/23 09:33	2	22
15	607953002	08-FEB-2023	1	501.53	501.53	02/09/23 10:15	704	02/12/23 06:05	02/12/23 09:33	5	18
16	607953003	08-FEB-2023	1	502.3	502.3	02/09/23 10:15	805	02/12/23 06:05	02/12/23 09:33	3	11
17	607953004	08-FEB-2023	1	503.71	503.71	02/09/23 10:15	102	02/12/23 06:25	02/12/23 10:07	2	6
18	1205303555 MB	08-FEB-2023	1	505.39	505.39	02/09/23 10:15	204	02/12/23 06:25	02/12/23 10:07	7	17
19	1205303556 DUP (607884001)	08-FEB-2023	1	503.85	503.85	02/09/23 10:15	402	02/12/23 06:25	02/12/23 10:07	1	11
20	1205303557 MS (607884001)	08-FEB-2023	1	103.66	103.66	02/09/23 10:15	505	02/12/23 06:25	02/12/23 10:07	2	634
21	1205303558 LCS	08-FEB-2023	1		505.39	02/09/23 10:15	707	02/12/23 06:25	02/12/23 10:07	1	549

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 08-FEB-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Procedure Code : LUC26RAL
 Parmname : Radium-226
 Required MDA : 1 pCi/L
 Halflife of Ra-226 : 1600 years
 Ra-226 Abundance : 1.00
 Halflife of Rn-222 : 3.8235 days

Batch : 2373612
 Analyst : LIN01615
 Prep Date : 2/8/2023
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	607884001.1	0.5045	2.0274E-05	1/17/2023 9:30	104	30	18	0.600	6	0.200	30	1.6160
2	607884002.1	0.4932	2.0227E-05	1/17/2023 11:15	202	30	15	0.500	4	0.133	30	1.8360
3	607884003.1	0.4844	2.0188E-05	1/17/2023 7:30	304	30	8	0.267	1	0.033	30	1.8850
4	607884004.1	0.4684	2.0112E-05	1/18/2023 10:40	406	30	14	0.467	3	0.100	30	1.4650
5	607884005.1	0.4888	2.0208E-05	1/18/2023 10:20	501	30	15	0.500	2	0.067	30	1.8220
6	607884006.1	0.5015	2.0262E-05	1/18/2023 10:35	601	30	14	0.467	7	0.233	30	1.7610
7	607884007.1	0.5011	2.0260E-05	1/18/2023 11:15	708	30	10	0.333	1	0.033	30	1.6020
8	607884008.1	0.4909	2.0217E-05	1/18/2023 8:30	802	30	19	0.633	6	0.200	30	2.0910
9	607884009.1	0.4657	2.0098E-05	1/18/2023 8:30	106	30	15	0.500	6	0.200	30	1.6990
10	607884010.1	0.4801	2.0169E-05	1/18/2023 9:15	206	30	20	0.667	1	0.033	30	1.8770
11	607884011.1	0.4955	2.0237E-05	1/18/2023 9:50	303	30	8	0.267	5	0.167	30	1.7210
12	607884012.1	0.4681	2.0110E-05	1/18/2023 7:30	401	30	14	0.467	1	0.033	30	1.2390
13	607884013.1	0.4938	2.0230E-05	1/19/2023 8:50	502	30	11	0.367	1	0.033	30	1.8630
14	607953001.1	0.5054	2.0278E-05	1/12/2023 16:12	604	30	22	0.733	2	0.067	30	1.6810
15	607953002.1	0.5015	2.0262E-05	1/12/2023 14:36	704	30	18	0.600	5	0.167	30	1.5870
16	607953003.1	0.5023	2.0265E-05	1/12/2023 16:12	805	30	11	0.367	3	0.100	30	1.9080
17	607953004.1	0.5037	2.0271E-05	1/12/2023 13:25	102	30	6	0.200	2	0.067	30	1.5820
18	1205303555.1	0.5054	2.0278E-05	2/8/2023 0:00	204	30	17	0.567	7	0.233	30	1.8470
19	1205303556.1	0.5039	2.0272E-05	1/17/2023 9:30	402	30	11	0.367	1	0.033	30	1.4980
20	1205303557.1	0.1037	1.1592E-05	1/17/2023 9:30	505	30	634	21.133	2	0.067	30	1.8130
21	1205303558.1	0.5054	2.0278E-05	2/8/2023 0:00	707	30	549	18.300	1	0.033	30	1.7280

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
2.000%	4/28/2022	4/30/2023	2/9/2023 10:15	2/12/2023 5:40	2/12/2023 9:02	0.399	0.975	1.002	1.000
5.100%	8/1/2022	7/31/2023	2/9/2023 10:15	2/12/2023 5:40	2/12/2023 9:02	0.399	0.975	1.002	1.000
8.900%	10/25/2022	10/31/2023	2/9/2023 10:15	2/12/2023 5:40	2/12/2023 9:02	0.399	0.975	1.002	1.000
2.900%	2/1/2023	1/31/2024	2/9/2023 10:15	2/12/2023 5:40	2/12/2023 9:02	0.399	0.975	1.002	1.000
7.900%	6/1/2022	5/31/2023	2/9/2023 10:15	2/12/2023 5:40	2/12/2023 9:02	0.399	0.975	1.002	1.000
9.400%	7/1/2022	6/30/2023	2/9/2023 10:15	2/12/2023 5:40	2/12/2023 9:02	0.399	0.975	1.002	1.000
7.700%	11/1/2022	10/31/2023	2/9/2023 10:15	2/12/2023 5:40	2/12/2023 9:02	0.399	0.975	1.002	1.000
8.000%	4/1/2022	3/31/2023	2/9/2023 10:15	2/12/2023 5:40	2/12/2023 9:02	0.399	0.975	1.002	1.000
8.800%	4/28/2022	4/30/2023	2/9/2023 10:15	2/12/2023 6:05	2/12/2023 9:33	0.401	0.974	1.002	1.000
2.800%	8/1/2022	7/31/2023	2/9/2023 10:15	2/12/2023 6:05	2/12/2023 9:33	0.401	0.974	1.002	1.000
7.400%	10/25/2022	10/31/2023	2/9/2023 10:15	2/12/2023 6:05	2/12/2023 9:33	0.401	0.974	1.002	1.000
3.100%	2/1/2023	1/31/2024	2/9/2023 10:15	2/12/2023 6:05	2/12/2023 9:33	0.401	0.974	1.002	1.000
6.700%	6/1/2022	5/31/2023	2/9/2023 10:15	2/12/2023 6:05	2/12/2023 9:33	0.401	0.974	1.002	1.000
6.700%	7/1/2022	6/30/2023	2/9/2023 10:15	2/12/2023 6:05	2/12/2023 9:33	0.401	0.974	1.002	1.000
4.200%	11/1/2022	10/31/2023	2/9/2023 10:15	2/12/2023 6:05	2/12/2023 9:33	0.401	0.974	1.002	1.000
7.400%	4/1/2022	3/31/2023	2/9/2023 10:15	2/12/2023 6:05	2/12/2023 9:33	0.401	0.974	1.002	1.000
6.300%	4/28/2022	4/30/2023	2/9/2023 10:15	2/12/2023 6:25	2/12/2023 10:07	0.402	0.972	1.002	1.000
7.400%	8/1/2022	7/31/2023	2/9/2023 10:15	2/12/2023 6:25	2/12/2023 10:07	0.402	0.972	1.002	1.000
5.300%	2/1/2023	1/31/2024	2/9/2023 10:15	2/12/2023 6:25	2/12/2023 10:07	0.402	0.972	1.002	1.000
1.200%	6/1/2022	5/31/2023	2/9/2023 10:15	2/12/2023 6:25	2/12/2023 10:07	0.402	0.972	1.002	1.000
2.200%	11/1/2022	10/31/2023	2/9/2023 10:15	2/12/2023 6:25	2/12/2023 10:07	0.402	0.972	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-G
Spike Exp Date : 9/8/2023
Spike Activity (dpm/ml): 297.44
Spike Volume Added: 0.10

LCS S/N : 1715-G
LCS Exp Date : 9/8/2023
LCS Activity (dpm/ml): 297.44
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.3828	0.2703	1	0.6829	0.5692	40.87%	0.4000	0.1633	0.4554	0.4633		SAMPLE				
2	0.2814	0.1987	1	0.5255	0.4698	39.95%	0.3667	0.1453	0.3649	0.3741		SAMPLE				
3	0.1396	0.0985	1	0.3241	0.2965	43.77%	0.2333	0.1000	0.2490	0.2579		SAMPLE				
4	0.3216	0.2271	1	0.6232	0.6199	37.59%	0.3667	0.1374	0.4554	0.4654		SAMPLE				
5	0.2023	0.1428	1	0.4159	0.5644	32.69%	0.4333	0.1374	0.3509	0.3707		SAMPLE				
6	0.3817	0.2695	1	0.6704	0.3065	66.14%	0.2333	0.1528	0.3933	0.3998		SAMPLE				
7	0.1587	0.1121	1	0.3686	0.4335	37.65%	0.3000	0.1106	0.3131	0.3260		SAMPLE				
8	0.3041	0.2147	1	0.5423	0.4897	39.28%	0.4333	0.1667	0.3692	0.3836		SAMPLE				
9	0.3929	0.2774	1	0.7008	0.4381	51.67%	0.3000	0.1528	0.4372	0.4482		SAMPLE				
10	0.1408	0.0994	1	0.3271	0.8121	24.28%	0.6333	0.1528	0.3839	0.4039		SAMPLE				
11	0.3328	0.2349	1	0.6054	0.1355	120.41%	0.1000	0.1202	0.3192	0.3204		SAMPLE				
12	0.2188	0.1545	1	0.5082	0.8633	29.95%	0.4333	0.1291	0.5041	0.5219		SAMPLE				
13	0.1380	0.0974	1	0.3204	0.4187	35.28%	0.3333	0.1155	0.2843	0.2958		SAMPLE				
14	0.2113	0.1492	1	0.4343	0.9068	25.39%	0.6667	0.1633	0.4353	0.4699		SAMPLE				
15	0.3566	0.2517	1	0.6487	0.6291	37.13%	0.4333	0.1599	0.4549	0.4667		SAMPLE				
16	0.2294	0.1619	1	0.4445	0.3215	47.35%	0.2667	0.1247	0.2947	0.3020		SAMPLE				
17	0.2248	0.1587	1	0.4621	0.1930	70.99%	0.1333	0.0943	0.2674	0.2699		SAMPLE				
18	0.3590	0.2535	1	0.6305	0.4118	49.55%	0.3333	0.1633	0.3954	0.4043		MB				
19	0.1678	0.1185	1	0.3898	0.5093	35.04%	0.3333	0.1155	0.3458	0.3575	607884001.1	DUP	11.1%			
20	0.9532	0.6729	1	1.9595	129.2709	4.17%	21.0667	0.8406	10.1104	21.4399	607884001.1	MS			129.2549	100.0%
21	0.1450	0.1024	1	0.3368	24.1208	4.81%	18.2667	0.7817	2.0232	4.1591		LCS			26.5107	91.0%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 12-FEB-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:01	1	1.21E+05	121218	-1.49		
LUCAS2	EFF	06:59	1	1.34E+05	134210	0.4		
LUCAS3	EFF	06:58	1	1.10E+05	110134	0.4		
LUCAS4	EFF	06:57	1	1.27E+05	127309	-0.9		
LUCAS5	EFF	06:56	1	1.32E+05	131619	-0.98		
LUCAS6	EFF	06:54	1	1.30E+05	129955	-1.46		
LUCAS7	EFF	06:44	1	1.30E+05	130294	-0.63		
LUCAS8	EFF	06:42	1	1.24E+05	123626	-1.18		

Reviewed by: 
Lyndsey Pace

Date: 12-FEB-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2373612

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
607884001	SAMPLE	LXP1	LUCAS1	FEB-12-23 09:02:00	DONE	Lucas Cell	28-APR-22 00:00
607884002	SAMPLE	LXP1	LUCAS2	FEB-12-23 09:02:00	DONE	Lucas Cell	01-AUG-22 00:00
607884003	SAMPLE	LXP1	LUCAS3	FEB-12-23 09:02:00	DONE	Lucas Cell	25-OCT-22 00:00
607884004	SAMPLE	LXP1	LUCAS4	FEB-12-23 09:02:00	DONE	Lucas Cell	01-FEB-23 00:00
607884005	SAMPLE	LXP1	LUCAS5	FEB-12-23 09:02:00	DONE	Lucas Cell	01-JUN-22 00:00
607884006	SAMPLE	LXP1	LUCAS6	FEB-12-23 09:02:00	DONE	Lucas Cell	01-JUL-22 00:00
607884007	SAMPLE	LXP1	LUCAS7	FEB-12-23 09:02:00	DONE	Lucas Cell	01-NOV-22 00:00
607884008	SAMPLE	LXP1	LUCAS8	FEB-12-23 09:02:00	DONE	Lucas Cell	01-APR-22 00:00
607884009	SAMPLE	LXP1	LUCAS1	FEB-12-23 09:33:00	DONE	Lucas Cell	28-APR-22 00:00
607884010	SAMPLE	LXP1	LUCAS2	FEB-12-23 09:33:00	DONE	Lucas Cell	01-AUG-22 00:00
607884011	SAMPLE	LXP1	LUCAS3	FEB-12-23 09:33:00	DONE	Lucas Cell	25-OCT-22 00:00
607884012	SAMPLE	LXP1	LUCAS4	FEB-12-23 09:33:00	DONE	Lucas Cell	01-FEB-23 00:00
607884013	SAMPLE	LXP1	LUCAS5	FEB-12-23 09:33:00	DONE	Lucas Cell	01-JUN-22 00:00
607953001	SAMPLE	LXP1	LUCAS6	FEB-12-23 09:33:00	DONE	Lucas Cell	01-JUL-22 00:00
607953002	SAMPLE	LXP1	LUCAS7	FEB-12-23 09:33:00	DONE	Lucas Cell	01-NOV-22 00:00
607953003	SAMPLE	LXP1	LUCAS8	FEB-12-23 09:33:00	DONE	Lucas Cell	01-APR-22 00:00
607953004	SAMPLE	LXP1	LUCAS1	FEB-12-23 10:07:00	DONE	Lucas Cell	28-APR-22 00:00
1205303555	MB	LXP1	LUCAS2	FEB-12-23 10:07:00	DONE	Lucas Cell	01-AUG-22 00:00
1205303556	DUP	LXP1	LUCAS4	FEB-12-23 10:07:00	DONE	Lucas Cell	01-FEB-23 00:00
1205303557	MS	LXP1	LUCAS5	FEB-12-23 10:07:00	DONE	Lucas Cell	01-JUN-22 00:00
1205303558	LCS	LXP1	LUCAS7	FEB-12-23 10:07:00	DONE	Lucas Cell	01-NOV-22 00:00

Data Verification & Validation Report

Lansing Board of Water & Light – Erickson Power Station

Sampling Event (dates and purpose): Wells MW-1-MW-6 – Semi-Annual Assessment Monitoring – February 2023

Data Package Number: S45134.01
Data Validator: Aryka Thomson

Lab Report Date: 03/22/2023
Data Validation Completion Date: 04/04/2023

General Overall Assessment:

- Data are usable without qualification.
 Data are usable with qualification (as noted below).
 Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	X
MW-2	X
MW-3	X
MW-4	X
MW-5	X
MW-6	X
MW-7	
MW-7B	
MW-7C	
MW-8	
MW-9	
MW-10	
MW-11	
MW-11B	
MW-12	
MW-12B	
MW-13	
MW-14	
MW-15	
MW-16A	
MW-16B	
MW-16C	
MW-16D	

Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-1	GW	S45134.01	02/07/2023	X	X	X	X	X	X	
MW-2	GW	S45134.02	02/07/2023	X	X	X	X	X	X	
MW-3	GW	S45134.03	02/07/2023	X	X	X	X	X	X	
MW-4	GW	S45134.04	02/07/2023	X	X	X	X	X	X	
MW-5	GW	S45134.05	02/07/2023	X	X	X	X	X	X	X
MW-6	GW	S45134.06	02/07/2023	X	X	X	X	X	X	
MWT-4	QC	S45134.07	02/07/2023	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO₃, CO₃, hardness

Any planned sampling or analysis NOT completed? If yes, explain: _____

Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Field Data							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan		X		MW-5 turbidity > 10 NTU. An additional container was collected for dissolved metals analysis.
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
Analytical Data Package							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies for chloride and sulfate
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested		X		RLs for TDS, chloride, and sulfate were not met
			MDLs<RLs	X			
			MDLs<GPS			X	
QC Validation							
Evaluate Accuracy							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Evaluate Precision							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Combined Radium 226+228 RPD 22%
Evaluate Representativeness							
Equipment Blanks (if applicable)	X		Non-detect (<RL)			X	
QC Verification							
Verify Instrument Calibration & Analytical Process							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	High recovery for Al, As, K, and Li
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
Evaluate Completeness (# usable measurements/ # unusable measurements)							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative: Radium samples were received with pH > 2. Lab correspondence revealed these results would be flagged if needed. No results were flagged.

Comments:

Combined Radium 226+228 RPD was 22%. Radium-228 and combined radium required qualification as estimated with high bias (J+) in the parent sample MW-4 and as estimated with low bias (J-) in the field duplicate MWT-4.



Analytical Laboratory Report

Final Report

Report ID: S45134.01(02)
Generated on 03/13/2023
Replaces report S45134.01(01) generated on 02/10/2023

Report to
Attention: Jennifer Caporale
Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

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Report Summary

Lab Sample ID(s): S45134.01-S45134.08
Project: Erickson AM MI Wells 1-6
Collected Date(s): 02/07/2023
Submitted Date/Time: 02/08/2023 15:45
Sampled by: Marc Wahrer
P.O. #:

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Maya Murshak
Technical Director



General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

Report Narrative

All analyses completed



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



Sample Summary (8 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S45134.01	MW-1 L302144-01	Groundwater	02/07/23 13:52
S45134.02	MW-2 L302144-02	Groundwater	02/07/23 17:00
S45134.03	MW-3 L302144-03	Groundwater	02/07/23 10:18
S45134.04	MW-4 L302144-04	Groundwater	02/07/23 11:49
S45134.05	MW-5 L302144-05	Groundwater	02/07/23 17:35
S45134.06	MW-6 L302144-06	Groundwater	02/07/23 15:29
S45134.07	MWT-4 L302144-07	Groundwater	02/07/23 11:49
S45134.08	Field Blank L302144-08	Groundwater	02/07/23 07:55



Analytical Laboratory Report

Final Report

Lab Sample ID: S45134.01

Sample Tag: MW-1 L302144-01

Collected Date/Time: 02/07/2023 13:52

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.1	IR
2	1L Plastic	None	Yes	3.1	IR
1	250ml Plastic	HNO3	Yes	3.1	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/09/23 12:54	CTV	
Metal Digestion	Completed	SW3015A	02/09/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 02/09/23 12:11, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	61	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	31	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 02/10/23 07:06, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	636	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/09/23 18:08, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	546	10	0.238	mg/L	10		

Method: SM2540C, Run Date: 02/08/23 21:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	686	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/10/23 12:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	32	3	1	mg/L	4		

Metals

Method: E200.8, Run Date: 02/09/23 11:53, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.007	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.140	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.32	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	9.57	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S45134.01 (continued)

Sample Tag: MW-1 L302144-01

Method: E200.8, Run Date: 02/09/23 11:53, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.031	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 02/09/23 14:04, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	150	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	41.3	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.08	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	41.0	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 02/09/23 14:25, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/13/23 08:38, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S45134.02

Sample Tag: MW-2 L302144-02

Collected Date/Time: 02/07/2023 17:00

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.1	IR
2	1L Plastic	None	Yes	3.1	IR
1	250ml Plastic	HNO3	Yes	3.1	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/09/23 12:54	CTV	
Metal Digestion	Completed	SW3015A	02/09/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 02/09/23 12:21, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 02/09/23 13:31, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	88	25	0.32	mg/L	25	16887-00-6	
Sulfate	322	25	2.6	mg/L	25	14808-79-8	

Method: SM2320B, Run Date: 02/10/23 07:10, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	454	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/09/23 18:10, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	708	10	0.238	mg/L	10		

Method: SM2540C, Run Date: 02/08/23 21:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,050	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/10/23 12:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	22	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 02/09/23 11:59, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.002	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.037	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	5.10	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S45134.02 (continued)

Sample Tag: MW-2 L302144-02

Method: E200.8, Run Date: 02/09/23 11:59, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	1.30	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.050	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.015	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.020	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 02/09/23 14:05, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	204	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	50.2	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	0.87	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	68.3	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 02/09/23 14:28, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/13/23 08:38, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Lab Sample ID: S45134.03

Sample Tag: MW-3 L302144-03

Collected Date/Time: 02/07/2023 10:18

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.1	IR
2	1L Plastic	None	Yes	3.1	IR
1	250ml Plastic	HNO3	Yes	3.1	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/09/23 12:54	CTV	
Metal Digestion	Completed	SW3015A	02/09/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 02/09/23 12:31, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 02/09/23 13:41, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	102	50	0.65	mg/L	50	16887-00-6	
Sulfate	727	50	5.2	mg/L	50	14808-79-8	

Method: SM2320B, Run Date: 02/10/23 07:14, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	215	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/09/23 18:12, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	795	10	0.238	mg/L	10		

Method: SM2540C, Run Date: 02/08/23 21:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,450	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/10/23 12:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 02/09/23 12:04, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.003	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.019	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	5.63	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S45134.03 (continued)

Sample Tag: MW-3 L302144-03

Method: E200.8, Run Date: 02/09/23 12:04, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	2.03	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.082	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.182	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 02/09/23 14:07, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	248	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	46.5	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.67	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	113	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 02/09/23 14:38, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/13/23 08:38, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S45134.04

Sample Tag: MW-4 L302144-04

Collected Date/Time: 02/07/2023 11:49

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.1	IR
2	1L Plastic	None	Yes	3.1	IR
1	250ml Plastic	HNO3	Yes	3.1	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/09/23 12:54	CTV	
Metal Digestion	Completed	SW3015A	02/09/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 02/09/23 12:41, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	74	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	56	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 02/10/23 07:16, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	406	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/09/23 18:14, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	420	10	0.238	mg/L	10		

Method: SM2540C, Run Date: 02/08/23 21:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	532	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/10/23 12:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 02/09/23 12:10, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.007	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.166	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.06	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	1.31	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S45134.04 (continued)

Sample Tag: MW-4 L302144-04

Method: E200.8, Run Date: 02/09/23 12:10, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.011	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 02/09/23 14:08, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	106	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	38.3	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.39	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	28.5	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 02/09/23 14:42, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/13/23 08:38, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Lab Sample ID: S45134.05

Sample Tag: MW-5 L302144-05

Collected Date/Time: 02/07/2023 17:35

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.1	IR
2	1L Plastic	None	Yes	3.1	IR
1	250ml Plastic	HNO3	Yes	3.1	IR
1	250ml Plastic	None	Yes	3.1	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/09/23 12:54	CTV	
Mercury Digestion	Completed	E245.1	02/09/23 12:54	CTV	
Metal Digestion	Completed	SW3015A	02/09/23 10:10	CCM	
Metal Digestion	Completed	SW3015A	02/09/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 02/09/23 14:41, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfate	411	25	2.6	mg/L	25	14808-79-8	

Method: E300.0, Run Date: 02/09/23 12:51, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	56	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	

Method: SM2320B, Run Date: 02/10/23 07:18, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	320	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/09/23 18:16, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	629	10	0.238	mg/L	10		

Method: SM2540C, Run Date: 02/08/23 21:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	984	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/10/23 12:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	21	3	1	mg/L	1.33		

Metals

Method: E200.8, Run Date: 02/09/23 12:13, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.040	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	



Analytical Laboratory Report

Lab Sample ID: S45134.05 (continued)

Sample Tag: MW-5 L302144-05

Method: E200.8, Run Date: 02/09/23 12:13, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Boron	3.53	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.53	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.083	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.055	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.006	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.005	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 02/09/23 12:17, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony, Dissolved*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	f
Arsenic, Dissolved	Not detected	0.002	0.000255	mg/L	5	7440-38-2	f
Barium, Dissolved	0.036	0.005	0.000162	mg/L	5	7440-39-3	f
Beryllium, Dissolved	Not detected	0.001	0.000215	mg/L	5	7440-41-7	f
Boron, Dissolved	3.26	0.04	0.00175	mg/L	5	7440-42-8	f
Cadmium, Dissolved	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	f
Chromium, Dissolved	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	f
Cobalt, Dissolved	Not detected	0.005	0.000108	mg/L	5	7440-48-4	f
Copper, Dissolved	Not detected	0.005	0.000377	mg/L	5	7440-50-8	f
Iron, Dissolved	Not detected	0.02	0.00192	mg/L	5	7439-89-6	f
Lead, Dissolved	Not detected	0.003	0.000190	mg/L	5	7439-92-1	f
Lithium, Dissolved*	0.085	0.005	0.00163	mg/L	5	7439-93-2	f
Molybdenum, Dissolved	0.055	0.005	0.000217	mg/L	5	7439-98-7	f
Nickel, Dissolved	0.005	0.005	0.000250	mg/L	5	7440-02-0	f
Selenium, Dissolved	Not detected	0.005	0.00209	mg/L	5	7782-49-2	f
Silver, Dissolved	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	f
Thallium, Dissolved	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	f
Vanadium, Dissolved	Not detected	0.005	0.000139	mg/L	5	7440-62-2	f
Zinc, Dissolved	Not detected	0.005	0.000730	mg/L	5	7440-66-6	f

Method: E200.8, Run Date: 02/09/23 14:10, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	187	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	42.3	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	4.44	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	57.4	0.50	0.00850	mg/L	5	7440-23-5	

Method: E200.8, Run Date: 02/09/23 14:11, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium, Dissolved*	176	0.50	0.0435	mg/L	5	7440-70-2	f
Magnesium, Dissolved	39.9	0.50	0.0120	mg/L	5	7439-95-4	f

f-Filtered and preserved in lab



Analytical Laboratory Report

Final Report

Lab Sample ID: S45134.05 (continued)

Sample Tag: MW-5 L302144-05

Method: E200.8, Run Date: 02/09/23 14:11, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Potassium, Dissolved	4.06	0.50	0.0230	mg/L	5	7440-09-7	f
Sodium, Dissolved	52.3	0.50	0.00850	mg/L	5	7440-23-5	f

Method: E245.1, Run Date: 02/09/23 14:48, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury, Dissolved	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	f

Method: E245.1, Run Date: 02/09/23 14:45, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/13/23 08:38, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

f-Filtered and preserved in lab

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Lab Sample ID: S45134.06

Sample Tag: MW-6 L302144-06

Collected Date/Time: 02/07/2023 15:29

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.1	IR
2	1L Plastic	None	Yes	3.1	IR
1	250ml Plastic	HNO3	Yes	3.1	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/09/23 12:54	CTV	
Metal Digestion	Completed	SW3015A	02/09/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 02/09/23 14:51, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfate	233	10	1.0	mg/L	10	14808-79-8	

Method: E300.0, Run Date: 02/09/23 13:01, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	42	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	

Method: SM2320B, Run Date: 02/10/23 07:20, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	543	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/09/23 18:18, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	624	10	0.238	mg/L	10		

Method: SM2540C, Run Date: 02/08/23 21:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	866	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/10/23 12:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 02/09/23 12:21, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.046	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.99	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S45134.06 (continued)

Sample Tag: MW-6 L302144-06

Method: E200.8, Run Date: 02/09/23 12:21, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	Not detected	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.054	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.027	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.006	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 02/09/23 14:13, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	193	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	39.4	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	6.85	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	43.9	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 02/09/23 14:52, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/13/23 08:38, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S45134.07

Sample Tag: MWT-4 L302144-07

Collected Date/Time: 02/07/2023 11:49

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.1	IR
2	1L Plastic	None	Yes	3.1	IR
1	250ml Plastic	HNO3	Yes	3.1	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/09/23 12:54	CTV	
Metal Digestion	Completed	SW3015A	02/09/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 02/09/23 13:11, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	75	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	56	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 02/10/23 07:22, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	407	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/09/23 18:26, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	431	10	0.238	mg/L	10		

Method: SM2540C, Run Date: 02/08/23 21:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	530	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/10/23 12:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 02/09/23 12:24, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.007	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.163	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.06	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	1.30	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S45134.07 (continued)

Sample Tag: MWT-4 L302144-07

Method: E200.8, Run Date: 02/09/23 12:24, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.010	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 02/09/23 14:21, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	106	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	38.9	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.41	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	28.2	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 02/09/23 14:55, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/13/23 08:38, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S45134.08

Sample Tag: Field Blank L302144-08

Collected Date/Time: 02/07/2023 07:55

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.1	IR
2	1L Plastic	None	Yes	3.1	IR
1	250ml Plastic	HNO3	Yes	3.1	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/09/23 12:54	CTV	
Metal Digestion	Completed	SW3015A	02/09/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 02/09/23 13:21, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.03	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.04	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.26	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 02/10/23 07:24, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/09/23 18:28, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	0.238	mg/L	10		

Method: SM2540C, Run Date: 02/08/23 21:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/10/23 12:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 02/09/23 11:48, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S45134.08 (continued)

Sample Tag: Field Blank L302144-08

Method: E200.8, Run Date: 02/09/23 11:48, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 02/09/23 14:02, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 02/09/23 14:58, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/13/23 08:38, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

Merit Laboratories Login Checklist

Lab Set ID:S45134

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 1-6

Submitted:02/08/2023 15:45 Login User: PFD

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Selection	Description	Note
Sample Receiving		
01.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples are received at 4C +/- 2C Thermometer # IR 3.1
02.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Received on ice/ cooling process begun
03.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples shipped
04.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples left in 24 hr. drop box
05.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Are there custody seals/tape or is the drop box locked
Chain of Custody		
06.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC adequately filled out
07.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC signed and relinquished to the lab
08.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sample tag on bottles match COC
09.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Subcontracting needed? Subcontracted to:
Preservation		
10.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Do sample have correct chemical preservation
11.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Completed pH checks on preserved samples? (no VOAs)
12.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Did any samples need to be preserved in the lab? .05 Metals
Bottle Conditions		
13.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	All bottles intact
14.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Appropriate analytical bottles are used
15.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Merit bottles used
16.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sufficient sample volume received
17.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples require laboratory filtration .05 Metals
18.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples submitted within holding time
19.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S45134 Submitted: 02/08/2023 15:45

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 1-6

Attention: Jennifer Caporale
Address: Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Initial Preservation Check: 02/08/2023 16:44 PFD

Preservation Recheck (E200.8): N/A

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S45134.01	1L Plastic HNO3	<2			
S45134.01	1L Plastic HNO3	<2			
S45134.01	250ml Plastic HNO3	<2			
S45134.02	1L Plastic HNO3	<2			
S45134.02	1L Plastic HNO3	<2			
S45134.02	250ml Plastic HNO3	<2			
S45134.03	1L Plastic HNO3	<2			
S45134.03	1L Plastic HNO3	<2			
S45134.03	250ml Plastic HNO3	<2			
S45134.04	1L Plastic HNO3	<2			
S45134.04	1L Plastic HNO3	<2			
S45134.04	250ml Plastic HNO3	<2			
S45134.05	1L Plastic HNO3	<2			
S45134.05	1L Plastic HNO3	<2			
S45134.05	250ml Plastic HNO3	<2			
S45134.06	1L Plastic HNO3	<2			
S45134.06	1L Plastic HNO3	<2			
S45134.06	250ml Plastic HNO3	<2			
S45134.07	1L Plastic HNO3	<2			
S45134.07	1L Plastic HNO3	<2			
S45134.07	250ml Plastic HNO3	<2			
S45134.08	1L Plastic HNO3	<2			
S45134.08	1L Plastic HNO3	<2			
S45134.08	250ml Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823
 Phone (517) 332-0167 Fax (517) 332-4034
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

REPORT TO

CHAIN OF CUSTODY RECORD

INVOICE TO

CONTACT NAME **Jennifer Caporale**
 COMPANY **Lansing Board of Water and Light**
 ADDRESS **PO Box 13007 48901-3007**
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**
 PHONE NO. **517-702-6372** FAX NO. _____ P.O. NO. _____
 E-MAIL ADDRESS **Environmental_Laboratory@lbwl.com** QUOTE NO. _____

CONTACT NAME **Beth Zimpfer** SAME
 COMPANY _____
 ADDRESS _____
 CITY _____ STATE _____ ZIP CODE _____
 PHONE NO. _____ E-MAIL ADDRESS **Beth.Zimpfer@lbwl.com**

PROJECT NO./NAME **Erickson AM MI Wells 1-6** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**
 TURNAROUND TIME REQUIRED 1 DAY 2 DAYS 3 DAYS STANDARD OTHER **ASAP**
 DELIVERABLES REQUIRED STD LEVEL II LEVEL III LEVEL IV EDD OTHER _____

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WPE A=AIR W=WASTE

Containers & Preservatives

Total Metals	F- undistilled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness	dissolved Metals
✓	✓	✓	✓	✓	✓	
✓	✓	✓	✓	✓	✓	
✓	✓	✓	✓	✓	✓	
✓	✓	✓	✓	✓	✓	
✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓	
✓	✓	✓	✓	✓	✓	
✓	✓	✓	✓	✓	✓	
✓	✓	✓	✓	✓	✓	
✓	✓	✓	✓	✓	✓	
✓	✓	✓	✓	✓	✓	
✓	✓	✓	✓	✓	✓	

Certifications
 OHIO VAP Drinking Water
 DoD NPDES
 Project Locations
 Detroit New York
 Other _____
 Special Instructions

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO3	H2SO4	NaOH	MeOH	OTHER
	DATE	TIME										
45134.01	02/07/23	1352	MW-1 L302144-01	GW	5	2	3					
.02		1700	MW-2 -02	GW	5	2	3					
.03		1018	MW-3 -03	GW	5	2	3					
.04		1149	MW-4 -04	GW	5	2	3					
.05		1735	MW-5 -05	GW	5	2	3					
.06		1529	MW-6 -06	GW	5	2	3					
.07		1149	MWT-4 -07	GW	5	2	3					
.08		0755	Field Blank -08	DI	5	2	3					

Metals to analyse: Na, Mg, K
 B, Ca, Sb, As, Ba, Be, Cd, Cr,
 Co, Li, Hg, Mo, Pb, Se, Tl,
 Fe, Cu, Ni, Ag, V, Zn
 Please send a preliminary report
 Dissolved metals are the same as total.

RELINQUISHED BY: _____ DATE **2-8-23** TIME **1545**
 RECEIVED BY: **M. Chilcote** DATE **2/8/23** TIME **1545**
 RELINQUISHED BY: _____ DATE _____ TIME _____
 RECEIVED BY: _____ DATE _____ TIME _____

RELINQUISHED BY: _____ DATE _____ TIME _____
 RECEIVED BY: _____ DATE _____ TIME _____
 SEAL NO. _____ SEAL INTACT YES NO INITIALS _____
 SEAL NO. _____ SEAL INTACT YES NO INITIALS _____
 NOTES: TEMP. ON ARRIVAL **3.1**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005



March 13, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 610687
SDG: S45134

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on February 13, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Jordan Melton for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S45134
Work Order: 610687**

March 13, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on February 13, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. Sample was received out of pH. Client approved for preservation. *610687004(S45134.04)*.

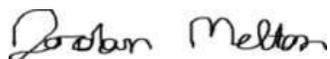
Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
610687001	S45134.01
610687002	S45134.02
610687003	S45134.03
610687004	S45134.04
610687005	S45134.05
610687006	S45134.06
610687007	S45134.07
610687008	S45134.08

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Jordan Melton". The signature is written in a cursive style with a large initial 'J'.

Jordan Melton for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation



2680 East Lansing Dr., East Lansing, MI 48823
 Phone (517) 332-0167 Fax (517) 332-4034
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

610687

REPORT TO		CHAIN OF CUSTODY RECORD		INVOICE TO	
CONTACT NAME Project Management Team		CONTACT NAME Julie Teague		E-NAME	
COMPANY Merit Laboratories		COMPANY Merit Laboratories			
ADDRESS 2680 East Lansing Drive		ADDRESS 2680 East Lansing Drive		STATE MI	
CITY East Lansing		CITY East Lansing		ZIP CODE 48823	
PHONE NO. 517-332-0167		PHONE NO. 517-332-0167		E-MAIL ADDRESS juliet@meritlabs.com	
E-MAIL ADDRESS results@meritlabs.com		E-MAIL ADDRESS juliet@meritlabs.com			
PROJECT NO./NAME S45134		PROJECT NO./NAME S45134		ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)	
TURNAROUND TIME REQUIRED <input type="checkbox"/> 1 DAY <input type="checkbox"/> 2 DAYS <input type="checkbox"/> 3 DAYS <input checked="" type="checkbox"/> STANDARD <input type="checkbox"/> OTHER		SAMPLER(S) - PLEASE PRINT/SIGN NAME			
DELIVERABLES REQUIRED <input type="checkbox"/> STD <input type="checkbox"/> LEVEL II <input type="checkbox"/> LEVEL III <input checked="" type="checkbox"/> LEVEL IV <input type="checkbox"/> EDD <input type="checkbox"/> OTHER					
MATRIX CODE GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIFE A=AIR W=WASTE					
YEAR		SAMPLE TAG		# Containers & Preservatives	
DATE	TIME	IDENTIFICATION-DESCRIPTION		OTHER	
2/7/23	1352	S45134.01		H ₂ O ₂	
2/7/23	1700	S45134.02		H ₂ SO ₄	
2/7/23	1018	S45134.03		NaOH	
2/7/23	1149	S45134.04		NaOH	
2/7/23	1735	S45134.05		H ₂ O ₂	
2/7/23	1529	S45134.06		H ₂ O ₂	
2/7/23	1149	S45134.07		H ₂ O ₂	
2/7/23	0755	S45134.08		H ₂ O ₂	
MATERIAL		MATRIX		OTHER	
Radium 226 *		GW 2		NONE	
Radium 228 **		GW 2		BOTTLES	
* E903.1 Mod.		GW 2		# OF	
** E904.0/SW 9320 Mod.		GW 2		MATERIAL	
Please use calculation product & provide Radium 226/228 combined results on the report		GW 2			
(No Ice needed)		GW 2			
** Subcontracted to GEL Laboratories, Inc.		GW 2			
2040 Savage Road		GW 2			
Charleston, SC 29407		GW 2			

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

SAMPLE RECEIPT & REVIEW FORM DS

Client: <u>MERI</u>		SDG/AR/COC/Work Order: <u>610287</u>	
Received By: <u>MVH</u>		Date Received: <u>02-13-2023</u>	
Carrier and Tracking Number		Circle-Applicable: FedEx Express FedEx Ground <u>UPS</u> Field Services Courier Other	
		<u>1240664770362195189</u>	
Suspected Hazard Information		Yes	No
*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.			
A) Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples are to be received as radioactive?		<input checked="" type="checkbox"/>	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?		<input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>00</u> CPM/mR/Hr Classified as: Rad 1 Rad 2 Rad 3
D) Did the client designate samples are hazardous?		<input checked="" type="checkbox"/>	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?		<input checked="" type="checkbox"/>	If D or E is yes, select Hazards below. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other: _____
Sample Receipt Criteria		Yes	NA
		No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	Preservation Method: Wet Ice Ice Packs Dry ice None Other: _____ *all temperatures are recorded in Celsius <u>TEMP: 21</u>
4	Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	Temperature Device Serial #: <u>IR2-21</u> Secondary Temperature Device Serial # (If Applicable): _____
5	Sample containers intact and sealed?	<input checked="" type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	Sample ID's and Containers Affected: <u>S45134.04</u> If Preservation added, Lot#: _____
7	Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer)
		<input checked="" type="checkbox"/>	Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No)
		<input checked="" type="checkbox"/>	Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected: _____
8	Samples received within holding time?	<input checked="" type="checkbox"/>	ID's and tests affected: _____
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	ID's and containers affected: _____
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	
13	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	Circle Applicable: Not relinquished Other (describe)
Comments (Use Continuation Form if needed):			

PM (or PMA) review: Initials JM Date 2/14/23 Page 1 of 1

Jordan Melton

From: Patrick Dean <pdean@meritlabs.com>
Sent: Monday, February 13, 2023 2:27 PM
To: Jordan Melton
Cc: John Lavery; RESULTS; Team Stone
Subject: Re: S45134.04 did not hold pH

Follow Up Flag: Follow up
Flag Status: Completed

[EXTERNAL EMAIL] DO NOT CLICK links or attachments unless you recognize the sender and know the content is safe.

Jordan,

Will the report be flagged? If it isn't please represerve the sample.

On Mon, Feb 13, 2023 at 2:22 PM Patrick Dean <pdean@meritlabs.com> wrote:

Jordan,

I will reach out to our client.

On Mon, Feb 13, 2023 at 2:15 PM Jordan Melton <Jordan.Melton@gel.com> wrote:

Hello Patrick,

It may affect results, but we do recommend samples having a pH<2 for Rad 226 and Rad 228 analysis. We can attempt preservation, or we can run as is.

Thanks,

Jordan Melton

GEL Laboratories LLC

Project Manager Assistant

From: Patrick Dean <pdean@meritlabs.com>
Sent: Monday, February 13, 2023 2:10 PM
To: John Lavery <johnlavery@meritlabs.com>; Jordan Melton <Jordan.Melton@gel.com>
Cc: RESULTS <results@meritlabs.com>; Team Stone <Team.Stone@gel.com>
Subject: Re: S45134.04 did not hold pH

Jordan,

Would adding more preservative effect results?

Thanks,
Patrick

On Mon, Feb 13, 2023 at 1:56 PM John Lavery <johnlavery@meritlabs.com> wrote:

----- Forwarded message -----

From: **Jordan Melton** <Jordan.Melton@gel.com>

Date: Mon, Feb 13, 2023 at 1:40 PM

Subject: S45134.04 did not hold pH

To: John Lavery <johnlavery@meritlabs.com>

CC: Team Stone <Team.Stone@gel.com>

Good afternoon,

GEL received SDG S45134 this morning however, sample S45134.04 did not hold preservation. Please advise on how you would like to proceed.

Thank you,

Jordan Melton
Project Manager Assistant



[2040 Savage Road, Charleston, SC 29407](#) | [P.O. Box 30712, Charleston, SC 29417](#)

Office Main: 843.556.8171 | Office Fax: 843.769.7383

E-Mail: Jordan.Melton@gel.com | Website: www.gel.com

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--

John Laverty

Merit Laboratories, Inc.

2680 East Lansing Drive East Lansing, MI 48823

Direct: (517) 827-2730 Cell: (517) 763-6976

johnlaverty@meritlabs.com

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--

Patrick Dean

Merit Laboratories, Inc.

2680 East Lansing Drive | East Lansing, MI 48823

(517) 332-0167 x128 | Direct: (517) 827-2740

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Patrick Dean

Merit Laboratories, Inc.

2680 East Lansing Drive | East Lansing, MI 48823

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Patrick Dean

Merit Laboratories, Inc.

2680 East Lansing Drive | East Lansing, MI 48823

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Laboratory Certifications

List of current GEL Certifications as of 13 March 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S45134
Work Order #: 610687**

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2387247

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
610687001	S45134.01
610687002	S45134.02
610687003	S45134.03
610687004	S45134.04
610687005	S45134.05
610687006	S45134.06
610687007	S45134.07
610687008	S45134.08
1205326726	Method Blank (MB)
1205326727	609452001(NonSDG) Sample Duplicate (DUP)
1205326728	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

Sample results verify with historical activity.

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2387198

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
610687001	S45134.01
610687002	S45134.02

610687003	S45134.03
610687004	S45134.04
610687005	S45134.05
610687006	S45134.06
610687007	S45134.07
610687008	S45134.08
1205326616	Method Blank (MB)
1205326617	609452001(NonSDG) Sample Duplicate (DUP)
1205326618	609452001(NonSDG) Matrix Spike (MS)
1205326619	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

The matrix spike, 1205326618 (Non SDG 609452001MS), aliquot was reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S45134 GEL Work Order: 610687

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 13 MAR 2023

Title: Group Leader

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: March 13, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S45134.01 Project: MERI00120
Sample ID: 610687001 Client ID: MERI001
Matrix: Ground Water
Collect Date: 07-FEB-23 13:52
Receive Date: 13-FEB-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.24	+/-1.39	2.32	3.00	pCi/L		JE1	03/09/23	1043	2387247		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.54	+/-1.41			pCi/L		NXL1	03/13/23	0838	2387244		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.300	+/-0.270	0.411	1.00	pCi/L		LXP1	03/12/23	0917	2387198		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			78.2	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: March 13, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S45134.02 Project: MERI00120
Sample ID: 610687002 Client ID: MERI001
Matrix: Ground Water
Collect Date: 07-FEB-23 17:00
Receive Date: 13-FEB-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	-0.445	+/-1.20	2.41	3.00	pCi/L		JE1	03/09/23	1043	2387247	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.184	+/-1.22			pCi/L		NXL1	03/13/23	0838	2387244	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.184	+/-0.216	0.352	1.00	pCi/L		LXP1	03/12/23	0917	2387198	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			57.2	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: March 13, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S45134.03 Project: MERI00120
Sample ID: 610687003 Client ID: MERI001
Matrix: Ground Water
Collect Date: 07-FEB-23 10:18
Receive Date: 13-FEB-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	1.61	+/-1.48	2.40	3.00	pCi/L		JE1	03/09/23	1043	2387247	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		2.18	+/-1.51			pCi/L		NXL1	03/13/23	0838	2387244	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.566	+/-0.336	0.387	1.00	pCi/L		LXP1	03/12/23	0917	2387198	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			59.5	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: March 13, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S45134.04	Project: MERI00120
Sample ID: 610687004	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 07-FEB-23 11:49	
Receive Date: 13-FEB-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.692	+/-1.27	2.22	3.00	pCi/L		JE1	03/09/23	1043	2387247	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.39	+/-1.31			pCi/L		NXL1	03/13/23	0838	2387244	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.701	+/-0.340	0.369	1.00	pCi/L		LXP1	03/12/23	0917	2387198	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			72.1	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: March 13, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive
 East Lansing, Michigan 48823
 Contact: John Lavery
 Project: Routine Analysis

Client Sample ID: S45134.05	Project: MERI00120
Sample ID: 610687005	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 07-FEB-23 17:35	
Receive Date: 13-FEB-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.22	+/-1.32	2.21	3.00	pCi/L		JE1	03/09/23	1043	2387247		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.78	+/-1.36			pCi/L		NXL1	03/13/23	0838	2387244		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.558	+/-0.295	0.314	1.00	pCi/L		LXP1	03/12/23	0917	2387198		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			56.6	(15%-125%)

Notes:
 Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: March 13, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S45134.06 Project: MERI00120
Sample ID: 610687006 Client ID: MERI001
Matrix: Ground Water
Collect Date: 07-FEB-23 15:29
Receive Date: 13-FEB-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	-1.09	+/-1.16	2.65	3.00	pCi/L		JE1	03/09/23	1043	2387247	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.961	+/-1.23			pCi/L		NXL1	03/13/23	0838	2387244	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.961	+/-0.419	0.425	1.00	pCi/L		LXP1	03/12/23	0917	2387198	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			45.6	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: March 13, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S45134.07 Project: MERI00120
Sample ID: 610687007 Client ID: MERI001
Matrix: Ground Water
Collect Date: 07-FEB-23 11:49
Receive Date: 13-FEB-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	-0.593	+/-1.18	2.31	3.00	pCi/L		JE1	03/09/23	1043	2387247		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.898	+/-1.24			pCi/L		NXL1	03/13/23	0838	2387244		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.898	+/-0.377	0.395	1.00	pCi/L		LXP1	03/12/23	0917	2387198		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			76.3	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: March 13, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S45134.08 Project: MERI00120
Sample ID: 610687008 Client ID: MERI001
Matrix: Ground Water
Collect Date: 07-FEB-23 07:55
Receive Date: 13-FEB-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	-0.0728	+/-1.11	2.17	3.00	pCi/L		JE1	03/09/23	1043	2387247	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.179	+/-1.13			pCi/L		NXL1	03/13/23	0838	2387244	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.179	+/-0.253	0.441	1.00	pCi/L		LXP1	03/12/23	0949	2387198	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			56.5	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: March 13, 2023

Page 1 of 2

Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan

Contact: John Laverty

Workorder: 610687

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2387247										
QC1205326727	609452001	DUP									
Radium-228	U	-0.308	U	1.30	pCi/L	N/A		N/A	JE1	03/09/23	10:42
	Uncertainty	+/-1.10		+/-1.38							
QC1205326728	LCS										
Radium-228	62.6			65.2	pCi/L		104	(75%-125%)		03/09/23	10:42
	Uncertainty			+/-4.40							
QC1205326726	MB										
Radium-228			U	-0.360	pCi/L					03/09/23	10:41
	Uncertainty			+/-1.12							
Rad Ra-226											
Batch	2387198										
QC1205326617	609452001	DUP									
Radium-226		0.828		0.696	pCi/L	17.4		(0% - 100%)	LXP1	03/12/23	09:49
	Uncertainty	+/-0.353		+/-0.386							
QC1205326619	LCS										
Radium-226	26.4			25.2	pCi/L		95.6	(75%-125%)		03/12/23	10:21
	Uncertainty			+/-1.91							
QC1205326616	MB										
Radium-226			U	0.225	pCi/L					03/12/23	09:49
	Uncertainty			+/-0.247							
QC1205326618	609452001	MS									
Radium-226	129	0.828		111	pCi/L		84.9	(75%-125%)		03/12/23	09:49
	Uncertainty	+/-0.353		+/-8.55							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- H Analytical holding time was exceeded
- < Result is less than value reported
- > Result is greater than value reported

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QC Summary

Workorder: 610687

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
NI											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2387247 Check-list

This check-list was completed on 09-MAR-23 by Nat Long

This batch was reviewed by Nat Long on 09-MAR-23 and Lois Buist on 10-MAR-23.

Batch ID:
2387247

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2387247
Analyst: Jacqueline Emond (JE1)
 Prep: Lyndsey Pace (LXP1)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: LUCAS-C202389980

Due Dates for Lab: 08-MAR-2023 **Package:** 12-MAR-2023 **SDG:** 10-MAR-2023

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205326728	228	1952-B	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	609452001	03-MAR-2023	3	301.55	301.55	03/06/23 13:52	03/09/23 08:30
2	609452002	03-MAR-2023	3	303.13	303.13	03/06/23 13:52	03/09/23 08:30
3	609452003	03-MAR-2023	3	300.84	300.84	03/06/23 13:52	03/09/23 08:30
4	609452004	03-MAR-2023	3	301.57	301.57	03/06/23 13:52	03/09/23 08:30
5	609452005	03-MAR-2023	3	300.55	300.55	03/06/23 13:52	03/09/23 08:30
6	609452006	03-MAR-2023	3	301.46	301.46	03/06/23 13:52	03/09/23 08:30
7	609452007	03-MAR-2023	3	303.27	303.27	03/06/23 13:52	03/09/23 08:30
8	609452008	03-MAR-2023	3	302.22	302.22	03/06/23 13:52	03/09/23 08:30
9	609452009	03-MAR-2023	3	303.28	303.28	03/06/23 13:52	03/09/23 08:30
10	610687001	03-MAR-2023	3	303.58	303.58	03/06/23 13:52	03/09/23 08:30
11	610687002	03-MAR-2023	3	305.87	305.87	03/06/23 13:52	03/09/23 08:30
12	610687003	03-MAR-2023	3	304.95	304.95	03/06/23 13:52	03/09/23 08:30
13	610687004	03-MAR-2023	3	304.53	304.53	03/06/23 13:52	03/09/23 08:30
14	610687005	03-MAR-2023	3	305.49	305.49	03/06/23 13:52	03/09/23 08:30
15	610687006	03-MAR-2023	3	300.47	300.47	03/06/23 13:52	03/09/23 08:30
16	610687007	03-MAR-2023	3	305.63	305.63	03/06/23 13:52	03/09/23 08:30
17	610687008	03-MAR-2023	3	306.22	306.22	03/06/23 13:52	03/09/23 08:30
18	610893001	03-MAR-2023	3	305.21	305.21	03/06/23 13:52	03/09/23 08:30
19	610893002	03-MAR-2023	3	301.02	301.02	03/06/23 13:52	03/09/23 08:30
20	1205326726 MB	03-MAR-2023	3		306.22	03/06/23 13:52	03/09/23 08:30
21	1205326727 DUP (609452001)	03-MAR-2023	3	305.44	305.44	03/06/23 13:52	03/09/23 08:30
22	1205326728 LCS	03-MAR-2023	3		306.22	03/06/23 13:52	03/09/23 08:30

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-E	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 03-MAR-2023 00:00
REGNT 3873289	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3862351	RGF-1M Citric Acid	5 mL	
REGNT 3873685	2M HCl	20 mL	
REGNT 3873277	RGF-50% Potassium Carbonate	2 mL	
REGNT 3864851	RGF-7M Nitric Acid	25 mL	
REGNT DGA013123	2372406	2 g	
REGNT 3418276.6	29M HF (48-50%)	4 mL	
REGNT 3528714	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3521298	RGF-Neodymium Substrate	5 mL	
REGNT 3855914.1	Nitric Acid	5 mL	
REGNT 3465466	Barium Carrier Ra228 REG	1 mL	
REGNT 3857883.6	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 1951-E
 Tracer Exp Date : 1/10/2024
 Tracer Volume Added: 0.10

Batch : 2387247
 Analyst : JAC02417
 Prep Date : 3/3/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 3 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	609452001.1	0.3016	1.8485E-05	2/1/2023 9:34	1226.8	1.65%	663.9	2.24%	0.1	0.000200
2	609452002.1	0.3031	1.8512E-05	2/1/2023 11:13	1226.8	1.65%	902.2	1.92%	0.1	0.000200
3	609452003.1	0.3008	1.8473E-05	2/1/2023 12:32	1226.8	1.65%	1040.3	1.79%	0.1	0.000200
4	609452004.1	0.3016	1.8486E-05	2/1/2023 13:44	1226.8	1.65%	622.3	2.31%	0.1	0.000200
5	609452005.1	0.3006	1.8468E-05	2/1/2023 14:52	1226.8	1.65%	858.1	1.97%	0.1	0.000200
6	609452006.1	0.3015	1.8484E-05	2/2/2023 9:42	1226.8	1.65%	1002.5	1.82%	0.1	0.000200
7	609452007.1	0.3033	1.8514E-05	2/2/2023 11:13	1226.8	1.65%	668.6	2.23%	0.1	0.000200
8	609452008.1	0.3022	1.8497E-05	2/2/2023 11:18	1226.8	1.65%	820.0	2.02%	0.1	0.000200
9	609452009.1	0.3033	1.8514E-05	2/2/2023 13:21	1226.8	1.65%	858.0	1.97%	0.1	0.000200
10	610687001.1	0.3036	1.8519E-05	2/7/2023 13:52	1226.8	1.65%	959.9	1.86%	0.1	0.000200
11	610687002.1	0.3059	1.8557E-05	2/7/2023 17:00	1226.8	1.65%	701.2	2.18%	0.1	0.000200
12	610687003.1	0.3050	1.8542E-05	2/7/2023 10:18	1226.8	1.65%	729.3	2.14%	0.1	0.000200
13	610687004.1	0.3045	1.8535E-05	2/7/2023 11:49	1226.8	1.65%	885.1	1.94%	0.1	0.000200
14	610687005.1	0.3055	1.8551E-05	2/7/2023 17:35	1226.8	1.65%	694.7	2.19%	0.1	0.000200
15	610687006.1	0.3005	1.8467E-05	2/7/2023 15:29	1226.8	1.65%	558.9	2.44%	0.1	0.000200
16	610687007.1	0.3056	1.8553E-05	2/7/2023 11:49	1226.8	1.65%	935.6	1.89%	0.1	0.000200
17	610687008.1	0.3062	1.8563E-05	2/7/2023 7:55	1226.8	1.65%	692.5	2.19%	0.1	0.000200
18	610893001.1	0.3052	1.8546E-05	2/8/2023 11:41	1226.8	1.65%	830.9	2.00%	0.1	0.000200
19	610893002.1	0.3010	1.8476E-05	2/8/2023 11:46	1226.8	1.65%	1021.3	1.81%	0.1	0.000200
20	1205326726.1	0.3062	1.8563E-05	3/3/2023 0:00	1226.8	1.65%	806.0	2.03%	0.1	0.000200
21	1205326727.1	0.3054	1.8550E-05	2/1/2023 9:34	1226.8	1.65%	910.7	1.91%	0.1	0.000200
22	1205326728.1	0.3062	1.8563E-05	3/3/2023 0:00	1226.8	1.65%	962.7	1.86%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
			Alpha	Beta										
1	5D	60	1	29	0.483	3/9/2023 10:42	3/6/2023 13:52	3/9/2023 8:30	0.988	0.780	0.999	1.057	54.1%	2.80%
2	1C	60	6	59	0.983	3/9/2023 10:42	3/6/2023 13:52	3/9/2023 8:30	0.988	0.780	0.999	1.057	73.5%	2.55%
3	2D	60	16	282	4.700	3/9/2023 10:42	3/6/2023 13:52	3/9/2023 8:30	0.988	0.780	0.999	1.057	84.8%	2.45%
4	3B	60	14	40	0.667	3/9/2023 10:42	3/6/2023 13:52	3/9/2023 8:30	0.988	0.780	0.999	1.057	50.7%	2.85%
5	4B	60	15	67	1.117	3/9/2023 10:42	3/6/2023 13:52	3/9/2023 8:30	0.988	0.780	0.999	1.057	69.9%	2.59%
6	8C	60	8	99	1.650	3/9/2023 10:42	3/6/2023 13:52	3/9/2023 8:30	0.988	0.779	0.999	1.057	81.7%	2.47%
7	1D	60	2	59	0.983	3/9/2023 10:42	3/6/2023 13:52	3/9/2023 8:30	0.989	0.779	0.999	1.057	54.5%	2.79%
8	4C	60	2	57	0.950	3/9/2023 10:42	3/6/2023 13:52	3/9/2023 8:30	0.989	0.779	0.999	1.057	66.8%	2.62%
9	6C	60	7	62	1.033	3/9/2023 10:42	3/6/2023 13:52	3/9/2023 8:30	0.989	0.779	0.999	1.057	69.9%	2.59%
10	8B	60	9	105	1.750	3/9/2023 10:43	3/6/2023 13:52	3/9/2023 8:30	0.990	0.779	0.999	1.057	78.2%	2.50%
11	2A	60	4	39	0.650	3/9/2023 10:43	3/6/2023 13:52	3/9/2023 8:30	0.990	0.779	0.999	1.057	57.2%	2.75%
12	2C	60	9	61	1.017	3/9/2023 10:43	3/6/2023 13:52	3/9/2023 8:30	0.990	0.779	0.999	1.057	59.5%	2.72%
13	8A	60	29	74	1.233	3/9/2023 10:43	3/6/2023 13:52	3/9/2023 8:30	0.990	0.778	0.999	1.057	72.1%	2.56%
14	5C	60	9	48	0.800	3/9/2023 10:43	3/6/2023 13:52	3/9/2023 8:30	0.990	0.778	0.999	1.057	56.6%	2.76%
15	1A	60	8	22	0.367	3/9/2023 10:43	3/6/2023 13:52	3/9/2023 8:30	0.990	0.778	0.999	1.057	45.6%	2.96%
16	6A	60	8	70	1.167	3/9/2023 10:43	3/6/2023 13:52	3/9/2023 8:30	0.990	0.778	0.999	1.057	76.3%	2.52%
17	1B	60	9	31	0.517	3/9/2023 10:43	3/6/2023 13:52	3/9/2023 8:30	0.990	0.778	0.999	1.057	56.5%	2.76%
18	5A	60	6	67	1.117	3/9/2023 10:43	3/6/2023 13:52	3/9/2023 8:30	0.990	0.778	0.999	1.057	67.7%	2.61%
19	6B	60	13	125	2.083	3/9/2023 10:44	3/6/2023 13:52	3/9/2023 8:30	0.990	0.777	0.999	1.057	83.2%	2.47%
20	5B	60	13	48	0.800	3/9/2023 10:41	3/6/2023 13:52	3/9/2023 8:30	0.998	0.780	0.999	1.057	65.7%	2.63%
21	3C	60	10	93	1.550	3/9/2023 10:42	3/6/2023 13:52	3/9/2023 8:30	0.988	0.780	0.999	1.057	74.2%	2.54%
22	2B	60	48	1035	17.250	3/9/2023 10:42	3/6/2023 13:52	3/9/2023 8:30	0.998	0.780	0.999	1.057	78.5%	2.50%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.6236	0.00925	0.534	3/3/2023 18:13	1000
2	PIC	6/1/2022	5/31/2023	0.6190	0.00847	1.046	3/3/2023 18:12	1000
3	PIC	6/1/2022	5/31/2023	0.6046	0.00745	1.513	3/3/2023 18:12	1000
4	PIC	6/1/2022	5/31/2023	0.6245	0.01614	0.530	3/3/2023 18:12	1000
5	PIC	6/1/2022	5/31/2023	0.6400	0.01519	0.995	3/3/2023 18:12	1000
6	PIC	6/1/2022	5/31/2023	0.6294	0.01955	1.393	3/3/2023 18:11	1000
7	PIC	6/1/2022	5/31/2023	0.6048	0.00692	0.515	3/3/2023 18:12	1000
8	PIC	6/1/2022	5/31/2023	0.6359	0.00889	0.884	3/3/2023 18:13	1000
9	PIC	6/1/2022	5/31/2023	0.6123	0.01970	0.940	3/3/2023 18:08	1000
10	PIC	6/1/2022	5/31/2023	0.6437	0.02148	1.443	3/3/2023 18:11	1000
11	PIC	6/1/2022	5/31/2023	0.6201	0.01914	0.728	3/3/2023 18:12	1000
12	PIC	6/1/2022	5/31/2023	0.6022	0.01274	0.732	3/3/2023 18:12	1000
13	PIC	6/1/2022	5/31/2023	0.6398	0.01579	1.076	3/3/2023 18:11	1000
14	PIC	6/1/2022	5/31/2023	0.6242	0.00657	0.587	3/3/2023 18:13	1000
15	PIC	6/1/2022	5/31/2023	0.6209	0.00738	0.516	3/3/2023 18:12	1000
16	PIC	6/1/2022	5/31/2023	0.6328	0.02228	1.308	3/3/2023 18:08	1000
17	PIC	6/1/2022	5/31/2023	0.6068	0.00711	0.529	3/3/2023 18:12	1000
18	PIC	6/1/2022	5/31/2023	0.6332	0.00851	0.931	3/3/2023 18:13	1000
19	PIC	6/1/2022	5/31/2023	0.6280	0.00851	1.415	3/3/2023 18:08	1000
20	PIC	6/1/2022	5/31/2023	0.6336	0.00426	0.875	3/3/2023 18:13	1000
21	PIC	6/1/2022	5/31/2023	0.6365	0.00988	1.246	3/3/2023 18:12	1000
22	PIC	6/1/2022	5/31/2023	0.6097	0.02111	1.633	3/3/2023 18:12	1000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

* - RPD changed to 0% due to sample & dup activity below MDA

LCS S/N : 1952-B
LCS Exp Date : 8/9/2023
LCS Activity (dpm/ml): 425.89
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	1.3749	0.9707	3	2.2451	-0.3078	182.94%	-0.0507	0.0927	1.1036	1.1039		SAMPLE				
2	1.4194	1.0021	3	2.2283	-0.2808	210.72%	-0.0627	0.1320	1.1598	1.1599		SAMPLE				
3	1.5274	1.0784	3	2.3572	12.7787	9.23%	3.1870	0.2826	2.2207	3.9280		SAMPLE				
4	1.4597	1.0305	3	2.3848	0.8848	79.01%	0.1367	0.1079	1.3691	1.3878		SAMPLE				
5	1.4203	1.0028	3	2.2354	0.5594	115.13%	0.1217	0.1400	1.2618	1.2699		SAMPLE				
6	1.4583	1.0296	3	2.2586	1.0253	66.21%	0.2570	0.1700	1.3292	1.3549		SAMPLE				
7	1.3757	0.9712	3	2.2520	2.8989	27.91%	0.4683	0.1300	1.5774	1.7418		SAMPLE				
8	1.4026	0.9903	3	2.2214	0.3179	195.92%	0.0660	0.1293	1.2207	1.2234		SAMPLE				
9	1.4308	1.0102	3	2.2586	0.4448	144.43%	0.0933	0.1348	1.2587	1.2639		SAMPLE				
10	1.5034	1.0614	3	2.3249	1.2407	57.08%	0.3070	0.1750	1.3858	1.4220		SAMPLE				
11	1.5065	1.0636	3	2.4123	-0.4447	137.89%	-0.0780	0.1075	1.2015	1.2018		SAMPLE				
12	1.5004	1.0593	3	2.4018	1.6120	46.80%	0.2847	0.1330	1.4756	1.5320		SAMPLE				
13	1.4131	0.9976	3	2.2152	0.6921	93.53%	0.1573	0.1471	1.2680	1.2803		SAMPLE				
14	1.3591	0.9595	3	2.2054	1.2200	55.46%	0.2130	0.1180	1.3245	1.3605		SAMPLE				
15	1.6192	1.1432	3	2.6502	-1.0869	54.60%	-0.1493	0.0814	1.1613	1.1617		SAMPLE				
16	1.4860	1.0491	3	2.3080	-0.5929	101.98%	-0.1413	0.1441	1.1846	1.1847		SAMPLE				
17	1.3290	0.9383	3	2.1716	-0.0728	775.17%	-0.0123	0.0956	1.1056	1.1059		SAMPLE				
18	1.4126	0.9973	3	2.2311	0.8777	75.34%	0.1857	0.1398	1.2953	1.3144		SAMPLE				
19	1.4491	1.0231	3	2.2428	2.6289	28.56%	0.6683	0.1901	1.4656	1.6103		SAMPLE				
20	1.3906	0.9818	3	2.2036	-0.3600	158.95%	-0.0750	0.1192	1.1215	1.1217		MB				
21	1.4806	1.0453	3	2.3047	1.3020	54.20%	0.3040	0.1646	1.3814	1.4205	609452001.1	DUP	* 0.0%			
22	1.6535	1.1674	3	2.5436	65.2481	4.75%	15.6170	0.5377	4.4033	17.3169		LCS			62.6486	104.1%

ASSAY 9-Mar-23 9:07:53
 Wizard 2480 s/n 46190630
 Protocol id 9 Ba-133_1
 Time limit
 Count limit
 Isotope Ba-133_1
 Protocol date 3/9/2023
 Run id. 6300

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	94	1	180	3681	1226.8	1.65	09:07:53
609452001	2	94	2	180	1992.13	663.92	2.24	54.12	09:11:07
609452002	3	94	3	180	2707.28	902.19	1.92	73.54	09:14:21
609452003	4	94	4	180	3121	1040.25	1.79	84.79	09:17:35
609452004	5	94	5	180	1867.28	622.28	2.31	50.72	09:20:49
609452005	1	10	1	180	2574.57	858.05	1.97	69.94	09:24:25
609452006	2	10	2	180	3008	1002.47	1.82	81.71	09:27:39
609452007	3	10	3	180	2006	668.6	2.23	54.50	09:30:53
609452008	4	10	4	180	2460.28	819.95	2.02	66.84	09:34:06
609452009	5	10	5	180	2574.44	858	1.97	69.94	09:37:21
610687001	1	11	1	180	2880.28	959.93	1.86	78.25	09:40:58
610687002	2	11	2	180	2104	701.18	2.18	57.16	09:44:12
610687003	3	11	3	180	2188.57	729.34	2.14	59.45	09:47:26
610687004	4	11	4	180	2656	885.11	1.94	72.15	09:50:40
610687005	5	11	5	180	2084.28	694.68	2.19	56.63	09:53:54
610687006	1	14	1	180	1677	558.89	2.44	45.56	09:57:43
610687007	2	14	2	180	2807.28	935.6	1.89	76.26	10:00:57
610687008	3	14	3	180	2078	692.54	2.19	56.45	10:04:11
610893001	4	14	4	180	2493	830.88	2	67.73	10:07:25
610893002	5	14	5	180	3064.28	1021.27	1.81	83.25	10:10:39
1205326726	1	21	1	180	2418.28	806	2.03	65.70	10:14:26
1205326727	2	21	2	180	2732.85	910.73	1.91	74.24	10:17:40
1205326728	3	21	3	180	2888.57	962.7	1.86	78.47	10:20:54

END OF ASSAY

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
609452001	5D	60	1	29	3/9/2023 10:42	3/9/2023 11:42	PIC	2387247
609452002	1C	60	6	59	3/9/2023 10:42	3/9/2023 11:42	PIC	2387247
609452003	2D	60	16	282	3/9/2023 10:42	3/9/2023 11:42	PIC	2387247
609452004	3B	60	14	40	3/9/2023 10:42	3/9/2023 11:42	PIC	2387247
609452005	4B	60	15	67	3/9/2023 10:42	3/9/2023 11:42	PIC	2387247
609452006	8C	60	8	99	3/9/2023 10:42	3/9/2023 11:42	PIC	2387247
609452007	1D	60	2	59	3/9/2023 10:42	3/9/2023 11:42	PIC	2387247
609452008	4C	60	2	57	3/9/2023 10:42	3/9/2023 11:42	PIC	2387247
609452009	6C	60	7	62	3/9/2023 10:42	3/9/2023 11:42	PIC	2387247
610687001	8B	60	9	105	3/9/2023 10:43	3/9/2023 11:43	PIC	2387247
610687002	2A	60	4	39	3/9/2023 10:43	3/9/2023 11:43	PIC	2387247
610687003	2C	60	9	61	3/9/2023 10:43	3/9/2023 11:43	PIC	2387247
610687004	8A	60	29	74	3/9/2023 10:43	3/9/2023 11:43	PIC	2387247
610687005	5C	60	9	48	3/9/2023 10:43	3/9/2023 11:43	PIC	2387247
610687006	1A	60	8	22	3/9/2023 10:43	3/9/2023 11:43	PIC	2387247
610687007	6A	60	8	70	3/9/2023 10:43	3/9/2023 11:43	PIC	2387247
610687008	1B	60	9	31	3/9/2023 10:43	3/9/2023 11:43	PIC	2387247
610893001	5A	60	6	67	3/9/2023 10:43	3/9/2023 11:43	PIC	2387247
610893002	6B	60	13	125	3/9/2023 10:44	3/9/2023 11:44	PIC	2387247
1205326726	5B	60	13	48	3/9/2023 10:41	3/9/2023 11:41	PIC	2387247
1205326727	3C	60	10	93	3/9/2023 10:42	3/9/2023 11:42	PIC	2387247
1205326728	2B	60	48	1035	3/9/2023 10:42	3/9/2023 11:42	PIC	2387247

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 09-Mar-2023

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z and LB4200 OA1 through OA1

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	Above	Beta bkg	09-Mar 04:48	60	2.033	1.385	3.072	-0.69
LB4100F2	Below	Alpha eff	09-Mar 05:57	5	6060	6533	7372	-6.38
LB4100F2	Above	Alpha XTalk	09-Mar 05:57	5	0.382	0.318	0.366	+5.08
LB4100F2	Above	Beta bkg	09-Mar 04:48	60	24.717	1.173	1.833	+211.03
LB4100H1	Above	Beta bkg	09-Mar 04:48	60	2.700	0.216	2.462	+3.64
PIC3D	Below	Alpha XTalk	09-Mar 05:07	5	0.249	0.260	0.381	-3.56
PIC3D	Above	Beta XTalk	09-Mar 05:14	5	0.010	-4.26E-4	0.001	+42.14
PIC13A	Above	Alpha bkg	09-Mar 05:47	60	1.967	-9.05E-2	0.347	+25.21
PIC14D	Below	Beta XTalk	09-Mar 10:46	5	0.012	0.013	0.018	-4.11

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100A1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4200OA1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by  _____

Date 3-9-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2387247

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205326726	MB	JE1	PIC5B	MAR-09-23 10:41:58	DONE	25mm Filter	01-JUN-22 00:00
1205326727	DUP	JE1	PIC3C	MAR-09-23 10:42:05	DONE	25mm Filter	01-JUN-22 00:00
1205326728	LCS	JE1	PIC2B	MAR-09-23 10:42:08	DONE	25mm Filter	01-JUN-22 00:00
609452001	SAMPLE	JE1	PIC5D	MAR-09-23 10:42:13	DONE	25mm Filter	01-JUN-22 00:00
609452002	SAMPLE	JE1	PIC1C	MAR-09-23 10:42:18	DONE	25mm Filter	01-JUN-22 00:00
609452003	SAMPLE	JE1	PIC2D	MAR-09-23 10:42:22	DONE	25mm Filter	01-JUN-22 00:00
609452004	SAMPLE	JE1	PIC3B	MAR-09-23 10:42:26	DONE	25mm Filter	01-JUN-22 00:00
609452005	SAMPLE	JE1	PIC4B	MAR-09-23 10:42:33	DONE	25mm Filter	01-JUN-22 00:00
609452006	SAMPLE	JE1	PIC8C	MAR-09-23 10:42:41	DONE	25mm Filter	01-JUN-22 00:00
609452007	SAMPLE	JE1	PIC1D	MAR-09-23 10:42:48	DONE	25mm Filter	01-JUN-22 00:00
609452008	SAMPLE	JE1	PIC4C	MAR-09-23 10:42:52	DONE	25mm Filter	01-JUN-22 00:00
609452009	SAMPLE	JE1	PIC6C	MAR-09-23 10:42:58	DONE	25mm Filter	01-JUN-22 00:00
610687001	SAMPLE	JE1	PIC8B	MAR-09-23 10:43:04	DONE	25mm Filter	01-JUN-22 00:00
610687002	SAMPLE	JE1	PIC2A	MAR-09-23 10:43:11	DONE	25mm Filter	01-JUN-22 00:00
610687003	SAMPLE	JE1	PIC2C	MAR-09-23 10:43:17	DONE	25mm Filter	01-JUN-22 00:00
610687004	SAMPLE	JE1	PIC8A	MAR-09-23 10:43:21	DONE	25mm Filter	01-JUN-22 00:00
610687005	SAMPLE	JE1	PIC5C	MAR-09-23 10:43:29	DONE	25mm Filter	01-JUN-22 00:00
610687006	SAMPLE	JE1	PIC1A	MAR-09-23 10:43:37	DONE	25mm Filter	01-JUN-22 00:00
610687007	SAMPLE	JE1	PIC6A	MAR-09-23 10:43:44	DONE	25mm Filter	01-JUN-22 00:00
610687008	SAMPLE	JE1	PIC1B	MAR-09-23 10:43:50	DONE	25mm Filter	01-JUN-22 00:00
610893001	SAMPLE	JE1	PIC5A	MAR-09-23 10:43:57	DONE	25mm Filter	01-JUN-22 00:00
610893002	SAMPLE	JE1	PIC6B	MAR-09-23 10:44:07	DONE	25mm Filter	01-JUN-22 00:00

Lucas Cell Raw Data

Batch 2387198 Check-list

This check-list was completed on 13-MAR-23 by Lyndsey Pace

This batch was reviewed by Gregory Ramsay on 13-MAR-23 and Lyndsey Pace on 13-MAR-23.

Batch ID:
2387198

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2387198
Analyst: Lyndsey Pace (LXP1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: LUCAS-C202389980

Due Dates for Lab: 08-MAR-2023			Package: 12-MAR-2023		SDG: 10-MAR-2023	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205326619	Radium-226 SPIKE	1715-G	.1	mL	
MS	1205326618	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	609452001	03-MAR-2023	1	502.31	502.31	03/08/23 09:45	107	03/12/23 05:45	03/12/23 08:45	1	24
2	609452002	03-MAR-2023	1	502.82	502.82	03/08/23 09:45	208	03/12/23 05:45	03/12/23 08:45	6	25
3	609452003	03-MAR-2023	1	503.56	503.56	03/08/23 09:45	303	03/12/23 05:45	03/12/23 08:45	7	133
4	609452004	03-MAR-2023	1	501.75	501.75	03/08/23 09:45	403	03/12/23 05:45	03/12/23 08:45	3	33
5	609452005	03-MAR-2023	1	506.97	506.97	03/08/23 09:45	502	03/12/23 05:45	03/12/23 08:45	1	18
6	609452006	03-MAR-2023	1	505.4	505.4	03/08/23 09:45	604	03/12/23 05:45	03/12/23 08:45	1	14
7	609452007	03-MAR-2023	1	506.72	506.72	03/08/23 09:45	703	03/12/23 05:45	03/12/23 08:45	5	33
8	609452008	03-MAR-2023	1	501.57	501.57	03/08/23 09:45	802	03/12/23 05:45	03/12/23 08:45	6	28
9	609452009	03-MAR-2023	1	502.31	502.31	03/08/23 09:45	101	03/12/23 06:10	03/12/23 09:17	5	16
10	610687001	03-MAR-2023	1	500.18	500.18	03/08/23 09:45	202	03/12/23 06:10	03/12/23 09:17	4	13
11	610687002	03-MAR-2023	1	507.74	507.74	03/08/23 09:45	301	03/12/23 06:10	03/12/23 09:17	2	7
12	610687003	03-MAR-2023	1	506.5	506.5	03/08/23 09:45	402	03/12/23 06:10	03/12/23 09:17	2	16
13	610687004	03-MAR-2023	1	503.69	503.69	03/08/23 09:45	501	03/12/23 06:10	03/12/23 09:17	3	24
14	610687005	03-MAR-2023	1	501.75	501.75	03/08/23 09:45	602	03/12/23 06:10	03/12/23 09:17	2	19
15	610687006	03-MAR-2023	1	501.71	501.71	03/08/23 09:45	706	03/12/23 06:10	03/12/23 09:17	3	28
16	610687007	03-MAR-2023	1	500.85	500.85	03/08/23 09:45	805	03/12/23 06:10	03/12/23 09:17	4	32
17	610687008	03-MAR-2023	1	502.77	502.77	03/08/23 09:45	106	03/12/23 06:35	03/12/23 09:49	4	9
18	610893001	03-MAR-2023	1	506.68	506.68	03/08/23 09:45	201	03/12/23 06:35	03/12/23 09:49	4	19
19	610893002	03-MAR-2023	1	501.36	501.36	03/08/23 09:45	408	03/12/23 06:35	03/12/23 09:49	1	24
20	1205326616 MB	03-MAR-2023	1		507.74	03/08/23 09:45	503	03/12/23 06:35	03/12/23 09:49	6	14
21	1205326617 DUP (609452001)	03-MAR-2023	1	504.21	504.21	03/08/23 09:45	701	03/12/23 06:35	03/12/23 09:49	6	26
22	1205326618 MS (609452001)	03-MAR-2023	1	103.74	103.74	03/08/23 09:45	801	03/12/23 06:35	03/12/23 09:49	1	645
23	1205326619 LCS	03-MAR-2023	1		507.74	03/08/23 09:45	104	03/12/23 07:00	03/12/23 10:21	4	682

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 03-MAR-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Procedure Code : LUC26RAL
 Parmname : Radium-226
 Required MDA : 1 pCi/L
 Halflife of Ra-226 : 1600 years
 Ra-226 Abundance : 1.00
 Halflife of Rn-222 : 3.8235 days

Batch : 2387198
 Analyst : LIN01615
 Prep Date : 3/3/2023
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	609452001.1	0.5023	2.0265E-05	2/1/2023 9:34	107	30	24	0.800	1	0.033	30	1.6990
2	609452002.1	0.5028	2.0267E-05	2/1/2023 11:13	208	30	25	0.833	6	0.200	30	1.7740
3	609452003.1	0.5036	2.0270E-05	2/1/2023 12:32	303	30	133	4.433	7	0.233	30	1.7210
4	609452004.1	0.5018	2.0263E-05	2/1/2023 13:44	403	30	33	1.100	3	0.100	30	1.5070
5	609452005.1	0.5070	2.0284E-05	2/1/2023 14:52	502	30	18	0.600	1	0.033	30	1.8630
6	609452006.1	0.5054	2.0278E-05	2/2/2023 9:42	604	30	14	0.467	1	0.033	30	1.6810
7	609452007.1	0.5067	2.0283E-05	2/2/2023 11:13	703	30	33	1.100	5	0.167	30	1.6440
8	609452008.1	0.5016	2.0262E-05	2/2/2023 11:18	802	30	28	0.933	6	0.200	30	2.0910
9	609452009.1	0.5023	2.0265E-05	2/2/2023 13:21	101	30	16	0.533	5	0.167	30	1.5720
10	610687001.1	0.5002	2.0257E-05	2/7/2023 13:52	202	30	13	0.433	4	0.133	30	1.8360
11	610687002.1	0.5077	2.0287E-05	2/7/2023 17:00	301	30	7	0.233	2	0.067	30	1.6430
12	610687003.1	0.5065	2.0282E-05	2/7/2023 10:18	402	30	16	0.533	2	0.067	30	1.4980
13	610687004.1	0.5037	2.0271E-05	2/7/2023 11:49	501	30	24	0.800	3	0.100	30	1.8220
14	610687005.1	0.5018	2.0263E-05	2/7/2023 17:35	602	30	19	0.633	2	0.067	30	1.8620
15	610687006.1	0.5017	2.0263E-05	2/7/2023 15:29	706	30	28	0.933	3	0.100	30	1.5900
16	610687007.1	0.5009	2.0259E-05	2/7/2023 11:49	805	30	32	1.067	4	0.133	30	1.9080
17	610687008.1	0.5028	2.0267E-05	2/7/2023 7:55	106	30	9	0.300	4	0.133	30	1.6990
18	610893001.1	0.5067	2.0283E-05	2/8/2023 11:41	201	30	19	0.633	4	0.133	30	1.7110
19	610893002.1	0.5014	2.0261E-05	2/8/2023 11:46	408	30	24	0.800	1	0.033	30	1.5020
20	1205326616.1	0.5077	2.0287E-05	3/3/2023 0:00	503	30	14	0.467	6	0.200	30	2.1390
21	1205326617.1	0.5042	2.0273E-05	2/1/2023 9:34	701	30	26	0.867	6	0.200	30	1.7440
22	1205326618.1	0.1037	1.1597E-05	2/1/2023 9:34	801	30	645	21.500	1	0.033	30	1.7180
23	1205326619.1	0.5077	2.0287E-05	3/3/2023 0:00	104	30	682	22.733	4	0.133	30	1.6160

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrowth End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
3.900%	4/28/2022	4/30/2023	3/8/2023 9:45	3/12/2023 5:45	3/12/2023 8:45	0.501	0.978	1.002	1.000
5.500%	8/1/2022	7/31/2023	3/8/2023 9:45	3/12/2023 5:45	3/12/2023 8:45	0.501	0.978	1.002	1.000
7.400%	10/25/2022	10/31/2023	3/8/2023 9:45	3/12/2023 5:45	3/12/2023 8:45	0.501	0.978	1.002	1.000
6.100%	2/1/2023	1/31/2024	3/8/2023 9:45	3/12/2023 5:45	3/12/2023 8:45	0.501	0.978	1.002	1.000
6.700%	6/1/2022	5/31/2023	3/8/2023 9:45	3/12/2023 5:45	3/12/2023 8:45	0.501	0.978	1.002	1.000
6.700%	7/1/2022	6/30/2023	3/8/2023 9:45	3/12/2023 5:45	3/12/2023 8:45	0.501	0.978	1.002	1.000
9.000%	11/1/2022	10/31/2023	3/8/2023 9:45	3/12/2023 5:45	3/12/2023 8:45	0.501	0.978	1.002	1.000
8.000%	4/1/2022	3/31/2023	3/8/2023 9:45	3/12/2023 5:45	3/12/2023 8:45	0.501	0.978	1.002	1.000
1.200%	4/28/2022	4/30/2023	3/8/2023 9:45	3/12/2023 6:10	3/12/2023 9:17	0.502	0.977	1.002	1.000
5.100%	8/1/2022	7/31/2023	3/8/2023 9:45	3/12/2023 6:10	3/12/2023 9:17	0.502	0.977	1.002	1.000
4.500%	10/25/2022	10/31/2023	3/8/2023 9:45	3/12/2023 6:10	3/12/2023 9:17	0.502	0.977	1.002	1.000
5.300%	2/1/2023	1/31/2024	3/8/2023 9:45	3/12/2023 6:10	3/12/2023 9:17	0.502	0.977	1.002	1.000
7.900%	6/1/2022	5/31/2023	3/8/2023 9:45	3/12/2023 6:10	3/12/2023 9:17	0.502	0.977	1.002	1.000
5.700%	7/1/2022	6/30/2023	3/8/2023 9:45	3/12/2023 6:10	3/12/2023 9:17	0.502	0.977	1.002	1.000
2.900%	11/1/2022	10/31/2023	3/8/2023 9:45	3/12/2023 6:10	3/12/2023 9:17	0.502	0.977	1.002	1.000
7.400%	4/1/2022	3/31/2023	3/8/2023 9:45	3/12/2023 6:10	3/12/2023 9:17	0.502	0.977	1.002	1.000
8.800%	4/28/2022	4/30/2023	3/8/2023 9:45	3/12/2023 6:35	3/12/2023 9:49	0.504	0.976	1.002	1.000
8.900%	8/1/2022	7/31/2023	3/8/2023 9:45	3/12/2023 6:35	3/12/2023 9:49	0.504	0.976	1.002	1.000
7.000%	2/1/2023	1/31/2024	3/8/2023 9:45	3/12/2023 6:35	3/12/2023 9:49	0.504	0.976	1.002	1.000
5.000%	6/1/2022	5/31/2023	3/8/2023 9:45	3/12/2023 6:35	3/12/2023 9:49	0.504	0.976	1.002	1.000
6.200%	11/1/2022	10/31/2023	3/8/2023 9:45	3/12/2023 6:35	3/12/2023 9:49	0.504	0.976	1.002	1.000
5.000%	4/1/2022	3/31/2023	3/8/2023 9:45	3/12/2023 6:35	3/12/2023 9:49	0.504	0.976	1.002	1.000
2.000%	4/28/2022	4/30/2023	3/8/2023 9:45	3/12/2023 7:00	3/12/2023 10:21	0.506	0.975	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-G
Spike Exp Date : 9/8/2023
Spike Activity (dpm/ml): 297.43
Spike Volume Added: 0.10

LCS S/N : 1715-G
LCS Exp Date : 9/8/2023
LCS Activity (dpm/ml): 297.43
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.1186	0.0837	1	0.2755	0.8280	22.09%	0.7667	0.1667	0.3528	0.3778		SAMPLE				
2	0.2780	0.1963	1	0.4959	0.6544	29.82%	0.6333	0.1856	0.3759	0.3939		SAMPLE				
3	0.3091	0.2182	1	0.5428	4.4668	11.96%	4.2000	0.3944	0.8221	1.2294		SAMPLE				
4	0.2319	0.1637	1	0.4493	1.2189	20.91%	1.0000	0.2000	0.4778	0.5296		SAMPLE				
5	0.1072	0.0757	1	0.2489	0.5530	26.50%	0.5667	0.1453	0.2779	0.2981		SAMPLE				
6	0.1192	0.0841	1	0.2767	0.4701	30.54%	0.4333	0.1291	0.2745	0.2894		SAMPLE				
7	0.2717	0.1918	1	0.4943	1.0326	23.78%	0.9333	0.2055	0.4456	0.5039		SAMPLE				
8	0.2364	0.1669	1	0.4217	0.6445	27.69%	0.7333	0.1944	0.3348	0.3619		SAMPLE				
9	0.2860	0.2019	1	0.5203	0.4270	41.68%	0.3667	0.1528	0.3487	0.3542		SAMPLE				
10	0.2200	0.1553	1	0.4108	0.3004	46.10%	0.3000	0.1374	0.2698	0.2749		SAMPLE				
11	0.1712	0.1209	1	0.3520	0.1837	60.17%	0.1667	0.1000	0.2161	0.2183		SAMPLE				
12	0.1883	0.1329	1	0.3870	0.5656	30.76%	0.4667	0.1414	0.3360	0.3507		SAMPLE				
13	0.1906	0.1346	1	0.3694	0.7014	25.97%	0.7000	0.1732	0.3402	0.3712		SAMPLE				
14	0.1529	0.1079	1	0.3143	0.5578	27.55%	0.5667	0.1528	0.2947	0.3118		SAMPLE				
15	0.2193	0.1548	1	0.4250	0.9607	22.46%	0.8333	0.1856	0.4193	0.4450		SAMPLE				
16	0.2114	0.1492	1	0.3947	0.8982	22.67%	0.9333	0.2000	0.3772	0.4196		SAMPLE				
17	0.2360	0.1666	1	0.4406	0.1790	72.65%	0.1667	0.1202	0.2530	0.2562		SAMPLE				
18	0.2325	0.1642	1	0.4341	0.5292	33.19%	0.5000	0.1599	0.3316	0.3526		SAMPLE				
19	0.1338	0.0945	1	0.3108	0.9342	22.84%	0.7667	0.1667	0.3980	0.4394		SAMPLE				
20	0.2273	0.1605	1	0.4054	0.2253	56.12%	0.2667	0.1491	0.2468	0.2500		MB				
21	0.2807	0.1982	1	0.5008	0.6957	28.96%	0.6667	0.1886	0.3857	0.4074	609452001.1	DUP	17.4%			
22	0.5655	0.3992	1	1.3133	110.5191	6.37%	21.4667	0.8472	8.5492	21.0929	609452001.1	MS			129.1530	84.9%
23	0.2451	0.1731	1	0.4577	25.2171	4.35%	22.6000	0.8731	1.9093	4.2276		LCS			26.3872	95.6%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 12-MAR-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:08	1	1.21E+05	121249	-0.68		
LUCAS2	EFF	07:05	1	1.34E+05	134007	0.24		
LUCAS3	EFF	07:01	1	1.04E+05	104036	-2		
LUCAS4	EFF	06:59	1	1.28E+05	127668	-0.35		
LUCAS5	EFF	06:51	1	1.33E+05	132724	0.12		
LUCAS6	EFF	06:50	1	1.30E+05	129726	-0.95		
LUCAS7	EFF	06:44	1	1.31E+05	130778	0.1		
LUCAS8	EFF	06:33	1	1.24E+05	124265	-1.65		

Reviewed by:


Lyndsey Pace

Date: 13-MAR-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2387198

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
609452001	SAMPLE	LXP1	LUCAS1	MAR-12-23 08:45:00	DONE	Lucas Cell	28-APR-22 00:00
609452002	SAMPLE	LXP1	LUCAS2	MAR-12-23 08:45:00	DONE	Lucas Cell	01-AUG-22 00:00
609452003	SAMPLE	LXP1	LUCAS3	MAR-12-23 08:45:00	DONE	Lucas Cell	25-OCT-22 00:00
609452004	SAMPLE	LXP1	LUCAS4	MAR-12-23 08:45:00	DONE	Lucas Cell	01-FEB-23 00:00
609452005	SAMPLE	LXP1	LUCAS5	MAR-12-23 08:45:00	DONE	Lucas Cell	01-JUN-22 00:00
609452006	SAMPLE	LXP1	LUCAS6	MAR-12-23 08:45:00	DONE	Lucas Cell	01-JUL-22 00:00
609452007	SAMPLE	LXP1	LUCAS7	MAR-12-23 08:45:00	DONE	Lucas Cell	01-NOV-22 00:00
609452008	SAMPLE	LXP1	LUCAS8	MAR-12-23 08:45:00	DONE	Lucas Cell	01-APR-22 00:00
609452009	SAMPLE	LXP1	LUCAS1	MAR-12-23 09:17:00	DONE	Lucas Cell	28-APR-22 00:00
610687001	SAMPLE	LXP1	LUCAS2	MAR-12-23 09:17:00	DONE	Lucas Cell	01-AUG-22 00:00
610687002	SAMPLE	LXP1	LUCAS3	MAR-12-23 09:17:00	DONE	Lucas Cell	25-OCT-22 00:00
610687003	SAMPLE	LXP1	LUCAS4	MAR-12-23 09:17:00	DONE	Lucas Cell	01-FEB-23 00:00
610687004	SAMPLE	LXP1	LUCAS5	MAR-12-23 09:17:00	DONE	Lucas Cell	01-JUN-22 00:00
610687005	SAMPLE	LXP1	LUCAS6	MAR-12-23 09:17:00	DONE	Lucas Cell	01-JUL-22 00:00
610687006	SAMPLE	LXP1	LUCAS7	MAR-12-23 09:17:00	DONE	Lucas Cell	01-NOV-22 00:00
610687007	SAMPLE	LXP1	LUCAS8	MAR-12-23 09:17:00	DONE	Lucas Cell	01-APR-22 00:00
610687008	SAMPLE	LXP1	LUCAS1	MAR-12-23 09:49:00	DONE	Lucas Cell	28-APR-22 00:00
610893001	SAMPLE	LXP1	LUCAS2	MAR-12-23 09:49:00	DONE	Lucas Cell	01-AUG-22 00:00
610893002	SAMPLE	LXP1	LUCAS4	MAR-12-23 09:49:00	DONE	Lucas Cell	01-FEB-23 00:00
1205326616	MB	LXP1	LUCAS5	MAR-12-23 09:49:00	DONE	Lucas Cell	01-JUN-22 00:00
1205326617	DUP	LXP1	LUCAS7	MAR-12-23 09:49:00	DONE	Lucas Cell	01-NOV-22 00:00
1205326618	MS	LXP1	LUCAS8	MAR-12-23 09:49:00	DONE	Lucas Cell	01-APR-22 00:00
1205326619	LCS	LXP1	LUCAS1	MAR-12-23 10:21:00	DONE	Lucas Cell	28-APR-22 00:00



Data Verification & Validation Report

Lansing Board of Water & Light – Erickson Power Station

Sampling Event (dates and purpose): Semiannual Assessment Monitoring – February 2023

Data Package Number: S45182.01

Lab Report Date: 04/03/2023

Data Validator: Aryka Thomson

Data Validation Completion Date: 04/09/2023

General Overall Assessment:

Data are usable without qualification.

Data are usable with qualification (as noted below).

Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	X
MW-7B	X
MW-7C	X
MW-8	X
MW-9	X
MW-10	X
MW-11	
MW-11B	
MW-12	
MW-12B	
MW-13	X
MW-14	
MW-15	
MW-16A	
MW-16B	
MW-16C	
MW-16D	

Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-7	GW	S45182.01	02/08/2023	X	X	X	X	X	X	
MW-7B	GW	S45182.05	02/08/2023	X	X	X	X	X	X	
MW-7C	GW	S45182.06	02/08/2023	X	X	X	X	X	X	
MW-8	GW	S45182.02	02/08/2023	X	X	X	X	X	X	
MW-9	GW	S45182.03	02/08/2023	X	X	X	X	X	X	
MW-10	GW	S45182.04	02/08/2023	X	X	X	X	X	X	
MW-13	GW	S45182.09	02/08/2023	X	X	X	X	X	X	
MWT-10	QC	S45182.07	02/08/2023	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO₃, CO₃, hardness

Any planned sampling or analysis NOT completed? If yes, explain: _____

Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Field Data							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	X		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
Analytical Data Package							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies for chloride and sulfate
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested	X			RLs for TDS, chloride, and sulfate were not met
			MDLs<RLs	X			
			MDLs<GPS	X			
QC Validation							
Evaluate Accuracy							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Evaluate Precision							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Combined Radium 226+228 RPD 49%
Evaluate Representativeness							
Equipment Blanks (if applicable)	X		Non-detect (<RL)	X			
QC Verification							
Verify Instrument Calibration & Analytical Process							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	High recovery for As and Mo
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
Evaluate Completeness (# usable measurements/ # unusable measurements)							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

Rad-228 in the sample 1205343480 and duplicate S45182.01DUP did not meet the relative percent difference requirement; however, they do meet the relative error ratio requirement. No qualification was required.

Comments:

Radium 228 and Combined Radium 226+228 RPD was 201% and 49%, respectively. Radium-228 and Combined Radium 226+228 in the parent sample required qualification as estimated with low bias (J-) in the parent sample MW-10 and as estimated with high bias (J+) in the field duplicate MWT-10.



Report ID: S45182.01(02)
Generated on 03/30/2023
Replaces report S45182.01(01) generated on 02/13/2023

Report to
Attention: Jennifer Caporale
Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Report produced by
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Contacts for report questions:
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Barbara Ball (bball@meritlabs.com)

Report Summary
Lab Sample ID(s): S45182.01-S45182.09
Project: Erickson AM MI Wells 7-10
Collected Date(s): 02/08/2023
Submitted Date/Time: 02/09/2023 13:55
Sampled by: Marc Wahrer
P.O. #:

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Maya Murshak
Technical Director



General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

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Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

Report Narrative

All analyses completed



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



Sample Summary (9 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S45182.01	MW-7 L302145-01	Groundwater	02/08/23 13:40
S45182.02	MW-8 L302145-02	Groundwater	02/08/23 12:23
S45182.03	MW-9 L302145-03	Groundwater	02/08/23 11:06
S45182.04	MW-10 L302145-04	Groundwater	02/08/23 09:11
S45182.05	MW-7B L302145-05	Groundwater	02/08/23 14:53
S45182.06	MW-7C L302145-06	Groundwater	02/08/23 16:04
S45182.07	MWT-10 L302145-07	Groundwater	02/08/23 09:11
S45182.08	Field Blank L302145-08	Water	02/08/23 08:15
S45182.09	MW-13 L302145-09	Groundwater	02/08/23 17:22



Analytical Laboratory Report

Lab Sample ID: S45182.01

Sample Tag: MW-7 L302145-01

Collected Date/Time: 02/08/2023 13:40

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	250ml Plastic	HNO3	Yes	2.0	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/13/23 12:07	CTV	
Metal Digestion	Completed	SW3015A	02/10/23 10:00	CCM	

Inorganics

Method: E300.0, Run Date: 02/10/23 10:48, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 02/10/23 12:49, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	82	10	0.13	mg/L	10	16887-00-6	
Sulfate	198	10	1.0	mg/L	10	14808-79-8	

Method: SM2320B, Run Date: 02/10/23 10:36, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	163	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/13/23 11:28, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	290	10	0.238	mg/L	10		

Method: SM2540C, Run Date: 02/10/23 20:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	564	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/10/23 18:45, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 02/10/23 12:09, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.004	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.049	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	1.36	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S45182.01 (continued)

Sample Tag: MW-7 L302145-01

Method: E200.8, Run Date: 02/10/23 12:09, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	1.00	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.073	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.173	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 02/10/23 15:31, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	98.8	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	12.3	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	8.90	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	66.5	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 02/13/23 13:08, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/30/23 12:06, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S45182.02

Sample Tag: MW-8 L302145-02

Collected Date/Time: 02/08/2023 12:23

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	250ml Plastic	HNO3	Yes	2.0	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/13/23 12:07	CTV	
Metal Digestion	Completed	SW3015A	02/10/23 10:00	CCM	

Inorganics

Method: E300.0, Run Date: 02/10/23 10:58, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	24	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	32	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 02/10/23 10:40, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	440	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/13/23 11:36, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	384	10	0.238	mg/L	10		

Method: SM2540C, Run Date: 02/10/23 20:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	430	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/10/23 18:45, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 02/10/23 12:13, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.022	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.08	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	Not detected	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S45182.02 (continued)

Sample Tag: MW-8 L302145-02

Method: E200.8, Run Date: 02/10/23 12:13, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.007	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 02/10/23 15:33, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	104	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	31.8	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	0.53	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	14.2	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 02/13/23 13:18, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/30/23 12:06, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S45182.03

Sample Tag: MW-9 L302145-03

Collected Date/Time: 02/08/2023 11:06

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	250ml Plastic	HNO3	Yes	2.0	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/13/23 12:07	CTV	
Metal Digestion	Completed	SW3015A	02/10/23 10:00	CCM	

Inorganics

Method: E300.0, Run Date: 02/10/23 11:09, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 02/10/23 10:44, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	336	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/13/23 11:38, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	261	10	0.238	mg/L	10		

Method: SM2540C, Run Date: 02/10/23 20:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	274	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/10/23 18:45, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 02/10/23 12:17, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.014	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	Not detected	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	Not detected	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S45182.03 (continued)

Sample Tag: MW-9 L302145-03

Method: E200.8, Run Date: 02/10/23 12:17, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 02/10/23 15:34, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	76.9	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	19.4	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	0.93	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	2.86	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 02/13/23 13:21, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/30/23 12:06, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S45182.04

Sample Tag: MW-10 L302145-04

Collected Date/Time: 02/08/2023 09:11

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	250ml Plastic	HNO3	Yes	2.0	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/13/23 12:07	CTV	
Metal Digestion	Completed	SW3015A	02/10/23 10:00	CCM	

Inorganics

Method: E300.0, Run Date: 02/10/23 11:19, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	13	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 02/10/23 10:46, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	525	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/13/23 11:40, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	461	10	0.238	mg/L	10		

Method: SM2540C, Run Date: 02/10/23 20:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	494	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/10/23 18:45, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 02/10/23 12:20, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.036	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.04	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	Not detected	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S45182.04 (continued)

Sample Tag: MW-10 L302145-04

Method: E200.8, Run Date: 02/10/23 12:20, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 02/10/23 15:36, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	136	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	29.5	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	0.62	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	2.54	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 02/13/23 13:25, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/30/23 12:06, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S45182.05

Sample Tag: MW-7B L302145-05

Collected Date/Time: 02/08/2023 14:53

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	250ml Plastic	HNO3	Yes	2.0	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/13/23 12:07	CTV	
Metal Digestion	Completed	SW3015A	02/10/23 10:00	CCM	

Inorganics

Method: E300.0, Run Date: 02/10/23 11:29, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 02/10/23 10:48, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	418	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/13/23 11:42, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	29	10	0.238	mg/L	10		

Method: SM2540C, Run Date: 02/10/23 20:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	362	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/10/23 18:45, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 02/10/23 12:23, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.009	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	3.00	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.08	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S45182.05 (continued)

Sample Tag: MW-7B L302145-05

Method: E200.8, Run Date: 02/10/23 12:23, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.032	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 02/10/23 15:38, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	8.77	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	2.81	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	5.58	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	142	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 02/13/23 13:28, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/30/23 12:06, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S45182.06

Sample Tag: MW-7C L302145-06

Collected Date/Time: 02/08/2023 16:04

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	250ml Plastic	HNO3	Yes	2.0	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/13/23 12:07	CTV	
Metal Digestion	Completed	SW3015A	02/10/23 10:00	CCM	

Inorganics

Method: E300.0, Run Date: 02/10/23 11:39, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 02/10/23 13:09, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	94	50	0.65	mg/L	50	16887-00-6	
Sulfate	687	50	5.2	mg/L	50	14808-79-8	

Method: SM2320B, Run Date: 02/10/23 10:50, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	172	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/13/23 11:44, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	742	10	0.238	mg/L	10		

Method: SM2540C, Run Date: 02/10/23 20:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,360	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/10/23 18:45, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	7	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 02/10/23 12:26, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.006	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.041	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	6.46	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S45182.06 (continued)

Sample Tag: MW-7C L302145-06

Method: E200.8, Run Date: 02/10/23 12:26, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	3.67	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.125	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.386	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.007	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 02/10/23 15:39, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	246	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	42.7	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	6.07	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	99.8	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 02/13/23 13:38, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/30/23 12:06, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S45182.07

Sample Tag: MWT-10 L302145-07

Collected Date/Time: 02/08/2023 09:11

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	250ml Plastic	HNO3	Yes	2.0	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/13/23 12:07	CTV	
Metal Digestion	Completed	SW3015A	02/10/23 10:00	CCM	

Inorganics

Method: E300.0, Run Date: 02/10/23 11:49, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	13	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 02/10/23 10:52, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	522	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/13/23 11:46, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	460	10	0.238	mg/L	10		

Method: SM2540C, Run Date: 02/10/23 20:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	482	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/10/23 18:45, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 02/10/23 12:32, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.036	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.05	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	Not detected	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S45182.07 (continued)

Sample Tag: MWT-10 L302145-07

Method: E200.8, Run Date: 02/10/23 12:32, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 02/10/23 15:41, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	140	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	29.2	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	0.70	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	2.73	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 02/13/23 13:41, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/30/23 12:06, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S45182.08

Sample Tag: Field Blank L302145-08

Collected Date/Time: 02/08/2023 08:15

Matrix: Water

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	250ml Plastic	HNO3	Yes	2.0	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/13/23 12:07	CTV	
Metal Digestion	Completed	SW3015A	02/10/23 10:00	CCM	

Inorganics

Method: E300.0, Run Date: 02/10/23 11:59, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.03	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.04	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.26	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 02/10/23 10:54, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/13/23 11:48, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	0.238	mg/L	10		

Method: SM2540C, Run Date: 02/10/23 20:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/10/23 18:45, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 02/10/23 12:03, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S45182.08 (continued)

Sample Tag: Field Blank L302145-08

Method: E200.8, Run Date: 02/10/23 12:03, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 02/10/23 15:30, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 02/13/23 13:44, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/30/23 12:06, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S45182.09

Sample Tag: MW-13 L302145-09

Collected Date/Time: 02/08/2023 17:22

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	250ml Plastic	HNO3	Yes	2.0	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/13/23 12:07	CTV	
Metal Digestion	Completed	SW3015A	02/10/23 10:00	CCM	

Inorganics

Method: E300.0, Run Date: 02/10/23 12:09, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	43	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	37	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 02/10/23 10:56, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	437	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/13/23 11:50, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	444	10	0.238	mg/L	10		

Method: SM2540C, Run Date: 02/10/23 20:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	476	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/10/23 18:45, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 02/10/23 12:36, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.028	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.18	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.06	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S45182.09 (continued)

Sample Tag: MW-13 L302145-09

Method: E200.8, Run Date: 02/10/23 12:36, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 02/10/23 15:42, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	132	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	29.0	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	0.76	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	4.68	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 02/13/23 13:48, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/30/23 12:06, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

Merit Laboratories Login Checklist

Lab Set ID:S45182

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 7-10

Submitted:02/09/2023 13:55 Login User: PFD

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

Sample Receiving

- | | | |
|-----|--|--|
| 01. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples are received at 4C +/- 2C Thermometer # IR 2.0 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Received on ice/ cooling process begun |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples shipped |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples left in 24 hr. drop box |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Are there custody seals/tape or is the drop box locked |

Chain of Custody

- | | | |
|-----|--|--|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC adequately filled out |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC signed and relinquished to the lab |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sample tag on bottles match COC |
| 09. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Subcontracting needed? Subcontracted to: GEL |

Preservation

- | | | |
|-----|--|---|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Do sample have correct chemical preservation |
| 11. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Completed pH checks on preserved samples? (no VOAs) |
| 12. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Did any samples need to be preserved in the lab? |

Bottle Conditions

- | | | |
|-----|--|---|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | All bottles intact |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Appropriate analytical bottles are used |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Merit bottles used |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sufficient sample volume received |
| 17. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples require laboratory filtration |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples submitted within holding time |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Do water VOC or TOX bottles contain headspace |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S45182 Submitted: 02/09/2023 13:55

Attention: Jennifer Caporale
Address: Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 7-10

Initial Preservation Check: 02/09/2023 16:59 PFD

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Preservation Recheck (E200.8): N/A

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S45182.01	1L Plastic HNO3	<2			
S45182.01	1L Plastic HNO3	<2			
S45182.01	250ml Plastic HNO3	<2			
S45182.02	1L Plastic HNO3	<2			
S45182.02	1L Plastic HNO3	<2			
S45182.02	250ml Plastic HNO3	<2			
S45182.03	1L Plastic HNO3	<2			
S45182.03	1L Plastic HNO3	<2			
S45182.03	250ml Plastic HNO3	<2			
S45182.04	1L Plastic HNO3	<2			
S45182.04	1L Plastic HNO3	<2			
S45182.04	250ml Plastic HNO3	<2			
S45182.05	1L Plastic HNO3	<2			
S45182.05	1L Plastic HNO3	<2			
S45182.05	250ml Plastic HNO3	<2			
S45182.06	1L Plastic HNO3	<2			
S45182.06	1L Plastic HNO3	<2			
S45182.06	250ml Plastic HNO3	<2			
S45182.07	1L Plastic HNO3	<2			
S45182.07	1L Plastic HNO3	<2			
S45182.07	250ml Plastic HNO3	<2			
S45182.08	1L Plastic HNO3	<2			
S45182.08	1L Plastic HNO3	<2			
S45182.08	250ml Plastic HNO3	<2			
S45182.09	1L Plastic HNO3	<2			
S45182.09	1L Plastic HNO3	<2			
S45182.09	250ml Plastic HNO3	<2			

Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Ti, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005



March 23, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 612576
SDG: S45182

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on March 01, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Jordan Melton for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S45182
Work Order: 612576**

March 23, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on March 01, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. Sample was received half empty 612576008(S45182.08). There are no additional comments concerning sample receipt.

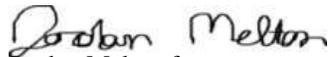
Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
612576001	S45182.01
612576002	S45182.02
612576003	S45182.03
612576004	S45182.04
612576005	S45182.05
612576006	S45182.06
612576007	S45182.07
612576008	S45182.08
612576009	S45182.09

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Jordan Melton". The signature is written in a cursive style with a large initial 'J'.

Jordan Melton for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation



Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: **MERI** SDG/AR/COC/Work Order: **612576**

Received By: **Stacy Boone** Date Received: **MARCH 1, 2023**
Circle Applicable: FedEx Express FedEx Ground UPS Field Services Courier Other

Carrier and Tracking Number
12 466 477 03 6210 0413

Suspected Hazard Information

Yes No *If Net Counts > 100cpm on samples not marked "inactive", contact the Radiation Safety Group for further investigation.

A) Shipped as a DOT Hazardous? Hazard Class Shipped: UN#: If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___

B) Did the client designate the samples are to be received as radioactive? COC notation or radioactive stickers on containers equal client designation.

C) Did the RSO classify the samples as radioactive? Maximum Net Counts Observed* (Observed Counts - Area Background Counts): ___ CPM / mR/Hr
Classified as: Rad 1 Rad 2 Rad 3

D) Did the client designate samples are hazardous? COC notation or hazard labels on containers equal client designation.

E) Did the RSO identify possible hazards? If D or E is yes, select Hazards below.
PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:

Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>			Circle Applicable: Client contacted and provided COC COC created upon receipt
3 Samples requiring cold preservation within (0 ≤ deg. C)?*	<input checked="" type="checkbox"/>			Preservation Method: Wet Ice Ice Packs Dry ice None Other: TEMP: 21C *all temperatures are recorded in Celsius
4 Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>			Temperature Device Serial #: IR3-22 Secondary Temperature Device Serial # (If Applicable):
5 Sample containers intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: Seals broken Damaged container Leaking container Other (describe) 545182.08 1 of 2 ALMOST EMPTY
6 Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>			Sample ID's and Containers Affected: If Preservation added, Lot#: If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer) Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No) Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected:
7 Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>			ID's and tests affected:
8 Samples received within holding time?	<input checked="" type="checkbox"/>			ID's and containers affected:
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>			Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
10 Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>			Circle Applicable: No container count on COC Other (describe)
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>			Circle Applicable: Not relinquished Other (describe)
12 Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>			
13 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>			

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials **JM** Date **3-1-23** Page **1** of **1**

Laboratory Certifications

List of current GEL Certifications as of 23 March 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S45182
Work Order #: 612576**

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2397396

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
612576001	S45182.01
612576002	S45182.02
612576003	S45182.03
612576004	S45182.04
612576005	S45182.05
612576006	S45182.06
612576007	S45182.07
612576008	S45182.08
612576009	S45182.09
1205343479	Method Blank (MB)
1205343480	612576001(S45182.01) Sample Duplicate (DUP)
1205343481	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

Duplication Criteria between QC Sample and Duplicate Sample

The Sample and the Duplicate, (See Below), did not meet the relative percent difference requirement; however, they do meet the relative error ratio requirement with the value listed below.

Sample	Analyte	Value
1205343480 (S45182.01DUP)	Radium-228	RPD 103* (0.0%-100.0%) RER 2.77 (0-3)

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2397378

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
612576001	S45182.01
612576002	S45182.02
612576003	S45182.03
612576004	S45182.04
612576005	S45182.05
612576006	S45182.06
612576007	S45182.07
612576008	S45182.08
612576009	S45182.09
1205343412	Method Blank (MB)
1205343413	612576001(S45182.01) Sample Duplicate (DUP)
1205343414	612576001(S45182.01) Matrix Spike (MS)
1205343415	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

The matrix spike, 1205343414 (S45182.01MS), aliquot was reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S45182 GEL Work Order: 612576

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 30 MAR 2023

Title: Group Leader

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: March 30, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S45182.01	Project: MERI00120
Sample ID: 612576001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 08-FEB-23 13:40	
Receive Date: 01-MAR-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228		4.38	+/-1.49	1.88	3.00	pCi/L		JE1	03/27/23	1501	2397396		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		5.44	+/-1.62			pCi/L		NXL1	03/30/23	1206	2397753		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		1.06	+/-0.633	0.540	1.00	pCi/L		LXP1	03/30/23	0933	2397378		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			73.3	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: March 30, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S45182.02	Project: MERI00120
Sample ID: 612576002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 08-FEB-23 12:23	
Receive Date: 01-MAR-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	-0.133	+/-0.817	1.62	3.00	pCi/L		JE1	03/27/23	1501	2397396		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.118	+/-0.870			pCi/L		NXL1	03/30/23	1206	2397753		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.118	+/-0.299	0.625	1.00	pCi/L		LXP1	03/30/23	0933	2397378		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			78.7	(15%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: March 30, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive
 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S45182.03	Project: MERI00120
Sample ID: 612576003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 08-FEB-23 11:06	
Receive Date: 01-MAR-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.60	+/-1.13	1.76	3.00	pCi/L		JE1	03/27/23	1501	2397396		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.97	+/-1.23			pCi/L		NXL1	03/30/23	1206	2397753		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.372	+/-0.482	0.809	1.00	pCi/L		LXP1	03/30/23	0950	2397378		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			82.4	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: March 30, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S45182.04 Project: MERI00120
Sample ID: 612576004 Client ID: MERI001
Matrix: Ground Water
Collect Date: 08-FEB-23 09:11
Receive Date: 01-MAR-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	-0.255	+/-0.795	1.63	3.00	pCi/L		JE1	03/27/23	1501	2397396	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.407	+/-0.935			pCi/L		NXL1	03/30/23	1206	2397753	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.407	+/-0.492	0.812	1.00	pCi/L		LXP1	03/30/23	1008	2397378	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			76.5	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: March 30, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S45182.05 Project: MERI00120
Sample ID: 612576005 Client ID: MERI001
Matrix: Ground Water
Collect Date: 08-FEB-23 14:53
Receive Date: 01-MAR-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	-0.879	+/-1.16	2.39	3.00	pCi/L		JE1	03/27/23	1501	2397396	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.504	+/-1.26			pCi/L		NXL1	03/30/23	1206	2397753	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.504	+/-0.494	0.731	1.00	pCi/L		LXP1	03/30/23	1008	2397378	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			65.4	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: March 30, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S45182.06 Project: MERI00120
Sample ID: 612576006 Client ID: MERI001
Matrix: Ground Water
Collect Date: 08-FEB-23 16:04
Receive Date: 01-MAR-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		2.17	+/-1.34	2.02	3.00	pCi/L		JE1	03/27/23	1501	2397396	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		3.27	+/-1.55			pCi/L		NXL1	03/30/23	1206	2397753	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		1.11	+/-0.777	1.00	1.00	pCi/L		LXP1	03/30/23	1008	2397378	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			70.5	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: March 30, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive
 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S45182.07	Project: MERI00120
Sample ID: 612576007	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 08-FEB-23 09:11	
Receive Date: 01-MAR-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.758	+/-0.957	1.63	3.00	pCi/L		JE1	03/27/23	1501	2397396		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.20	+/-1.03			pCi/L		NXL1	03/30/23	1206	2397753		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.443	+/-0.394	0.471	1.00	pCi/L		LXP1	03/30/23	1008	2397378		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			76.3	(15%-125%)

Notes:
 Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: March 30, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S45182.08	Project: MERI00120
Sample ID: 612576008	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 08-FEB-23 08:15	
Receive Date: 01-MAR-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	-0.909	+/-1.33	2.62	3.00	pCi/L		JE1	03/27/23	1501	2397396	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.46	+/-1.51			pCi/L		NXL1	03/30/23	1206	2397753	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		1.46	+/-0.701	0.490	1.00	pCi/L		LXP1	03/30/23	1008	2397378	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			71.2	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: March 30, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S45182.09 Project: MERI00120
Sample ID: 612576009 Client ID: MERI001
Matrix: Ground Water
Collect Date: 08-FEB-23 17:22
Receive Date: 01-MAR-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.188	+/-0.643	1.22	3.00	pCi/L		JE1	03/27/23	1501	2397396	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.188	+/-0.682			pCi/L		NXL1	03/30/23	1206	2397753	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.000	+/-0.226	0.663	1.00	pCi/L		LXP1	03/30/23	1008	2397378	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			82.5	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: March 30, 2023

Page 1 of 2

Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan

Contact: John Laverty

Workorder: 612576

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2397396										
QC1205343480	612576001	DUP									
Radium-228		4.38		1.41	pCi/L	103*		(0% - 100%)	JE1	03/27/23	15:01
	Uncertainty	+/-1.49		+/-0.915							
QC1205343481	LCS										
Radium-228	62.5			57.4	pCi/L		91.9	(75%-125%)		03/27/23	15:06
	Uncertainty			+/-3.90							
QC1205343479	MB										
Radium-228			U	0.222	pCi/L					03/27/23	15:01
	Uncertainty			+/-0.791							
Rad Ra-226											
Batch	2397378										
QC1205343413	612576001	DUP									
Radium-226		1.06		1.30	pCi/L	20.1		(0% - 100%)	LXP1	03/30/23	10:26
	Uncertainty	+/-0.633		+/-0.689							
QC1205343415	LCS										
Radium-226	26.5			26.1	pCi/L		98.7	(75%-125%)		03/30/23	10:26
	Uncertainty			+/-2.97							
QC1205343412	MB										
Radium-226			U	0.159	pCi/L					03/30/23	10:26
	Uncertainty			+/-0.292							
QC1205343414	612576001	MS									
Radium-226	133	1.06		105	pCi/L		78.2	(75%-125%)		03/30/23	10:26
	Uncertainty	+/-0.633		+/-12.3							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- H Analytical holding time was exceeded
- < Result is less than value reported
- > Result is greater than value reported

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QC Summary

Workorder: 612576

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
NI											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2397396 Check-list

This check-list was completed on 27-MAR-23 by Nat Long

This batch was reviewed by Nat Long on 27-MAR-23 and Kenshalla Oston on 28-MAR-23.

Batch ID:
2397396

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous		No	
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?		No	
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2397396
Analyst: Jacqueline Emond (JE1)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: LUCAS-C202389980

Due Dates for Lab: 26-MAR-2023			Package: 28-MAR-2023	SDG: 29-MAR-2023		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205343481	228	1952-B	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	612576001	22-MAR-2023	3	300.88	300.88	03/23/23 18:42	03/27/23 12:58
2	612576002	22-MAR-2023	3	301.77	301.77	03/23/23 18:42	03/27/23 12:58
3	612576003	22-MAR-2023	3	301.42	301.42	03/23/23 18:42	03/27/23 12:58
4	612576004	22-MAR-2023	3	300.08	300.08	03/23/23 18:42	03/27/23 12:58
5	612576005	22-MAR-2023	3	304.65	304.65	03/23/23 18:42	03/27/23 12:58
6	612576006	22-MAR-2023	3	302.42	302.42	03/23/23 18:42	03/27/23 12:58
7	612576007	22-MAR-2023	3	303.15	303.15	03/23/23 18:42	03/27/23 12:58
8	612576008	22-MAR-2023	3	301.25	301.25	03/23/23 18:42	03/27/23 12:58
9	612576009	22-MAR-2023	3	301.8	301.8	03/23/23 18:42	03/27/23 12:58
10	612583001	22-MAR-2023	3	301.47	301.47	03/23/23 18:42	03/27/23 12:58
11	612583002	22-MAR-2023	3	301.62	301.62	03/23/23 18:42	03/27/23 12:58
12	612583003	22-MAR-2023	3	301.84	301.84	03/23/23 18:42	03/27/23 12:58
13	612583004	22-MAR-2023	3	303.63	303.63	03/23/23 18:42	03/27/23 12:58
14	612583005	22-MAR-2023	3	305.11	305.11	03/23/23 18:42	03/27/23 12:58
15	612583006	22-MAR-2023	3	303.97	303.97	03/23/23 18:42	03/27/23 12:58
16	1205343479 MB	22-MAR-2023	3		305.11	03/23/23 18:42	03/27/23 12:58
17	1205343480 DUP (612576001)	22-MAR-2023	3	300.6	300.6	03/23/23 18:42	03/27/23 12:58
18	1205343481 LCS	22-MAR-2023	3		305.11	03/23/23 18:42	03/27/23 12:58

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-E	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 22-MAR-2023 00:00
REGNT 3879554	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3862351	RGF-1M Citric Acid	5 mL	
REGNT 3878183	2M HCl	20 mL	
REGNT 3883537	RGF-50% Potassium Carbonate	2 mL	
REGNT 3878163	RGF-7M Nitric Acid	25 mL	
REGNT 3857893.11	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT DGA030723	2396801	2 g	
REGNT 3867075.26	RGF-Hydrofluoric Acid	4 mL	
REGNT 3528714	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3521298	RGF-Neodymium Substrate	5 mL	
REGNT 3875878.6	Nitric Acid	5 mL	
REGNT 3465466	Barium Carrier Ra228 REG	1 mL	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 1951-E
 Tracer Exp Date : 1/10/2024
 Tracer Volume Added: 0.10

Batch : 2397396
 Analyst : JAC02417
 Prep Date : 3/22/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 3 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	612576001.1	0.3009	1.8474E-05	2/8/2023 13:40	1218.3	1.65%	892.7	1.93%	0.1	0.000200
2	612576002.1	0.3018	1.8489E-05	2/8/2023 12:23	1218.3	1.65%	959.3	1.86%	0.1	0.000200
3	612576003.1	0.3014	1.8483E-05	2/8/2023 11:06	1218.3	1.65%	1003.8	1.82%	0.1	0.000200
4	612576004.1	0.3001	1.8460E-05	2/8/2023 9:11	1218.3	1.65%	932.0	1.89%	0.1	0.000200
5	612576005.1	0.3047	1.8537E-05	2/8/2023 14:53	1218.3	1.65%	797.1	2.04%	0.1	0.000200
6	612576006.1	0.3024	1.8500E-05	2/8/2023 16:04	1218.3	1.65%	859.0	1.97%	0.1	0.000200
7	612576007.1	0.3032	1.8512E-05	2/8/2023 9:11	1218.3	1.65%	929.3	1.89%	0.1	0.000200
8	612576008.1	0.3013	1.8480E-05	2/8/2023 8:15	1218.3	1.65%	867.5	1.96%	0.1	0.000200
9	612576009.1	0.3018	1.8489E-05	2/8/2023 17:22	1218.3	1.65%	1005.1	1.82%	0.1	0.000200
10	612583001.1	0.3015	1.8484E-05	2/9/2023 12:58	1218.3	1.65%	1072.3	1.76%	0.1	0.000200
11	612583002.1	0.3016	1.8486E-05	2/9/2023 17:10	1218.3	1.65%	871.7	1.96%	0.1	0.000200
12	612583003.1	0.3018	1.8490E-05	2/9/2023 14:23	1218.3	1.65%	819.9	2.02%	0.1	0.000200
13	612583004.1	0.3036	1.8520E-05	2/9/2023 15:40	1218.3	1.65%	797.8	2.04%	0.1	0.000200
14	612583005.1	0.3051	1.8544E-05	2/9/2023 14:23	1218.3	1.65%	898.5	1.93%	0.1	0.000200
15	612583006.1	0.3040	1.8526E-05	2/9/2023 9:30	1218.3	1.65%	897.9	1.93%	0.1	0.000200
16	1205343479.1	0.3051	1.8544E-05	3/22/2023 0:00	1218.3	1.65%	1005.3	1.82%	0.1	0.000200
17	1205343480.1	0.3006	1.8469E-05	2/8/2023 13:40	1218.3	1.65%	1041.3	1.79%	0.1	0.000200
18	1205343481.1	0.3051	1.8544E-05	3/22/2023 0:00	1218.3	1.65%	962.5	1.86%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data														
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Calculated Sample Recovery %	Sample Recovery Error %
			Alpha	Beta										
1	1A	60	11	100	1.667	3/27/2023 15:01	3/23/2023 18:42	3/27/2023 12:58	0.985	0.793	1.000	1.057	73.3%	2.55%
2	1B	60	13	31	0.517	3/27/2023 15:01	3/23/2023 18:42	3/27/2023 12:58	0.985	0.793	1.000	1.057	78.7%	2.50%
3	1C	60	8	70	1.167	3/27/2023 15:01	3/23/2023 18:42	3/27/2023 12:58	0.985	0.793	1.000	1.057	82.4%	2.47%
4	1D	60	2	27	0.450	3/27/2023 15:01	3/23/2023 18:42	3/27/2023 12:58	0.985	0.793	1.000	1.057	76.5%	2.52%
5	2A	60	8	45	0.750	3/27/2023 15:01	3/23/2023 18:42	3/27/2023 12:58	0.985	0.793	1.000	1.057	65.4%	2.64%
6	2C	60	9	69	1.150	3/27/2023 15:01	3/23/2023 18:42	3/27/2023 12:58	0.985	0.793	1.000	1.057	70.5%	2.59%
7	3B	60	4	44	0.733	3/27/2023 15:01	3/23/2023 18:42	3/27/2023 12:58	0.985	0.792	1.000	1.057	76.3%	2.52%
8	3C	60	5	73	1.217	3/27/2023 15:01	3/23/2023 18:42	3/27/2023 12:58	0.985	0.792	1.000	1.057	71.2%	2.58%
9	3D	60	4	21	0.350	3/27/2023 15:01	3/23/2023 18:42	3/27/2023 12:58	0.985	0.792	1.000	1.057	82.5%	2.47%
10	4A	60	12	53	0.883	3/27/2023 15:02	3/23/2023 18:42	3/27/2023 12:58	0.985	0.792	1.000	1.057	88.0%	2.43%
11	4C	60	4	77	1.283	3/27/2023 15:02	3/23/2023 18:42	3/27/2023 12:58	0.985	0.792	1.000	1.057	71.5%	2.58%
12	4D	60	5	33	0.550	3/27/2023 15:02	3/23/2023 18:42	3/27/2023 12:58	0.985	0.792	1.000	1.057	67.3%	2.62%
13	5A	60	5	93	1.550	3/27/2023 15:02	3/23/2023 18:42	3/27/2023 12:58	0.985	0.792	1.000	1.057	65.5%	2.64%
14	5B	60	14	57	0.950	3/27/2023 15:02	3/23/2023 18:42	3/27/2023 12:58	0.985	0.792	1.000	1.057	73.7%	2.55%
15	5C	60	10	38	0.633	3/27/2023 15:02	3/23/2023 18:42	3/27/2023 12:58	0.985	0.792	1.000	1.057	73.7%	2.55%
16	5D	60	5	36	0.600	3/27/2023 15:01	3/23/2023 18:42	3/27/2023 12:58	0.998	0.793	1.000	1.057	82.5%	2.47%
17	7A	60	6	51	0.850	3/27/2023 15:01	3/23/2023 18:42	3/27/2023 12:58	0.985	0.793	1.000	1.057	85.5%	2.45%
18	7B	60	10	906	15.100	3/27/2023 15:06	3/23/2023 18:42	3/27/2023 12:58	0.998	0.786	1.000	1.057	79.0%	2.50%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.6209	0.00738	0.684	3/24/2023 18:31	500
2	PIC	6/1/2022	5/31/2023	0.6068	0.00711	0.548	3/24/2023 18:31	500
3	PIC	6/1/2022	5/31/2023	0.6190	0.00847	0.764	3/24/2023 18:31	500
4	PIC	6/1/2022	5/31/2023	0.6048	0.00692	0.508	3/24/2023 18:31	500
5	PIC	6/1/2022	5/31/2023	0.6201	0.01914	0.928	3/24/2023 18:33	500
6	PIC	6/1/2022	5/31/2023	0.6022	0.01274	0.694	3/24/2023 18:33	500
7	PIC	6/1/2022	5/31/2023	0.6245	0.01614	0.554	3/24/2023 18:31	500
8	PIC	6/1/2022	5/31/2023	0.6365	0.00988	1.420	3/24/2023 18:31	500
9	PIC	6/1/2022	5/31/2023	0.5999	0.02297	0.304	3/24/2023 18:32	500
10	PIC	6/1/2022	5/31/2023	0.6013	0.01123	0.668	3/24/2023 18:32	500
11	PIC	6/1/2022	5/31/2023	0.6359	0.00889	0.700	3/24/2023 18:32	500
12	PIC	6/1/2022	5/31/2023	0.5954	0.00773	0.524	3/24/2023 18:32	500
13	PIC	6/1/2022	5/31/2023	0.6332	0.00851	0.868	3/24/2023 18:32	500
14	PIC	6/1/2022	5/31/2023	0.6336	0.00426	0.814	3/24/2023 18:32	500
15	PIC	6/1/2022	5/31/2023	0.6242	0.00657	0.640	3/24/2023 18:32	500
16	PIC	6/1/2022	5/31/2023	0.6236	0.00925	0.542	3/24/2023 18:32	500
17	PIC	6/1/2022	5/31/2023	0.6257	0.00594	0.478	3/24/2023 18:28	500
18	PIC	6/1/2022	5/31/2023	0.6366	0.00627	0.592	3/24/2023 18:29	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 1952-B
LCS Exp Date : 8/9/2023
LCS Activity (dpm/ml): 423.23
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	Sample Act. MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	1.1733	0.8284	3	1.8796	4.3793	17.58%	0.9827	0.1707	1.4912	1.8602		SAMPLE				
2	0.9972	0.7040	3	1.6196	-0.1326	314.45%	-0.0313	0.0985	0.8171	0.8173		SAMPLE				
3	1.1046	0.7799	3	1.7582	1.5985	36.06%	0.4027	0.1448	1.1268	1.1976		SAMPLE				
4	0.9974	0.7041	3	1.6281	-0.2550	159.13%	-0.0580	0.0923	0.7951	0.7953		SAMPLE				
5	1.5143	1.0691	3	2.3851	-0.8789	67.39%	-0.1780	0.1198	1.1596	1.1598		SAMPLE				
6	1.2606	0.8900	3	2.0176	2.1675	31.57%	0.4560	0.1434	1.3357	1.4454		SAMPLE				
7	1.0018	0.7073	3	1.6260	0.7582	64.45%	0.1793	0.1155	0.9568	0.9762		SAMPLE				
8	1.6966	1.1978	3	2.6192	-0.9094	74.83%	-0.2033	0.1520	1.3328	1.3329		SAMPLE				
9	0.7174	0.5065	3	1.2174	0.1880	174.51%	0.0460	0.0803	0.6430	0.6448		SAMPLE				
10	0.9957	0.7030	3	1.5973	0.8241	58.91%	0.2153	0.1267	0.9505	0.9733		SAMPLE				
11	1.1849	0.8365	3	1.8955	2.5951	26.02%	0.5833	0.1510	1.3163	1.4723		SAMPLE				
12	1.1635	0.8214	3	1.8953	0.1313	388.73%	0.0260	0.1011	1.0002	1.0007		SAMPLE				
13	1.4389	1.0159	3	2.2743	3.3087	24.50%	0.6820	0.1660	1.5789	1.7892		SAMPLE				
14	1.2307	0.8689	3	1.9520	0.5828	97.20%	0.1360	0.1321	1.1098	1.1196		SAMPLE				
15	1.1130	0.7858	3	1.7900	-0.0291	1631.87%	-0.0067	0.1088	0.9319	0.9320		SAMPLE				
16	0.8980	0.6340	3	1.4595	0.2222	181.54%	0.0580	0.1053	0.7906	0.7926		MB				
17	0.8351	0.5896	3	1.3689	1.4115	33.15%	0.3720	0.1230	0.9145	0.9820	612576001.1	DUP	102.5%	2.7653		
18	0.9695	0.6845	3	1.5669	57.4284	4.32%	14.5080	0.5028	3.9013	15.0784		LCS			62.4835	91.9%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
612576001	1A	60	11	100	3/27/2023 15:01	3/27/2023 16:01	PIC	2397396
612576002	1B	60	13	31	3/27/2023 15:01	3/27/2023 16:01	PIC	2397396
612576003	1C	60	8	70	3/27/2023 15:01	3/27/2023 16:01	PIC	2397396
612576004	1D	60	2	27	3/27/2023 15:01	3/27/2023 16:01	PIC	2397396
612576005	2A	60	8	45	3/27/2023 15:01	3/27/2023 16:01	PIC	2397396
612576006	2C	60	9	69	3/27/2023 15:01	3/27/2023 16:01	PIC	2397396
612576007	3B	60	4	44	3/27/2023 15:01	3/27/2023 16:01	PIC	2397396
612576008	3C	60	5	73	3/27/2023 15:01	3/27/2023 16:01	PIC	2397396
612576009	3D	60	4	21	3/27/2023 15:01	3/27/2023 16:01	PIC	2397396
612583001	4A	60	12	53	3/27/2023 15:02	3/27/2023 16:02	PIC	2397396
612583002	4C	60	4	77	3/27/2023 15:02	3/27/2023 16:02	PIC	2397396
612583003	4D	60	5	33	3/27/2023 15:02	3/27/2023 16:02	PIC	2397396
612583004	5A	60	5	93	3/27/2023 15:02	3/27/2023 16:02	PIC	2397396
612583005	5B	60	14	57	3/27/2023 15:02	3/27/2023 16:02	PIC	2397396
612583006	5C	60	10	38	3/27/2023 15:02	3/27/2023 16:02	PIC	2397396
1205343479	5D	60	5	36	3/27/2023 15:01	3/27/2023 16:01	PIC	2397396
1205343480	7A	60	6	51	3/27/2023 15:01	3/27/2023 16:01	PIC	2397396
1205343481	7B	60	10	906	3/27/2023 15:06	3/27/2023 16:06	PIC	2397396

ASSAY 27-Mar-23 13:34:27
 Wizard 2480 s/n 46190630
 Protocol id 8 Ba-133
 Time limit
 Count limit
 Isotope Ba-133
 Protocol date 3/27/2023
 Run id. 6396

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	93	1	180	3655.57	1218.34	1.65	01:34:27
612576001	2	93	2	180	2678.57	892.69	1.93	73.27	01:37:40
612576002	3	93	3	180	2878.28	959.28	1.86	78.74	01:40:54
612576003	4	93	4	180	3012	1003.75	1.82	82.39	01:44:08
612576004	5	93	5	180	2796.57	932.04	1.89	76.50	01:47:23
612576005	1	14	1	180	2391.57	797.06	2.04	65.42	01:50:58
612576006	2	14	2	180	2577.57	859.04	1.97	70.51	01:54:12
612576007	3	14	3	180	2788.57	929.28	1.89	76.27	01:57:26
612576008	4	14	4	180	2603	867.52	1.96	71.21	02:00:40
612576009	5	14	5	180	3016	1005.14	1.82	82.50	02:03:54
612583001	1	2	1	180	3217.57	1072.3	1.76	88.01	02:07:31
612583002	2	2	2	180	2615.57	871.71	1.96	71.55	02:10:45
612583003	3	2	3	180	2460	819.89	2.02	67.30	02:13:58
612583004	4	2	4	180	2393.57	797.8	2.04	65.48	02:17:12
612583005	5	2	5	180	2695.85	898.47	1.93	73.75	02:20:27
612583006	1	10	1	180	2694	897.86	1.93	73.70	02:24:09
1205343479	2	10	2	180	3016.28	1005.27	1.82	82.51	02:27:23
1205343480	3	10	3	180	3124.28	1041.3	1.79	85.47	02:30:37
1205343481	4	10	4	180	2888	962.51	1.86	79.00	02:33:51

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 27-Mar-2023

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z and LB4200 OA1 through OA1

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	Above	Beta bkg	27-Mar 06:45	60	2.817	1.385	3.072	+2.09
LB4100E3	Above	Beta bkg	27-Mar 06:45	60	2.600	0.484	2.814	+2.45
LB4100F1	Above	Beta bkg	27-Mar 06:45	60	3.333	0.188	2.691	+4.54
LB4100F2	Below	Alpha eff	27-Mar 05:41	5	6168	6533	7372	-5.61
LB4100F2	Above	Alpha XTalk	27-Mar 05:41	5	0.373	0.318	0.366	+3.86
LB4100F2	Above	Beta bkg	27-Mar 06:45	60	51.550	1.173	1.833	+454.97
LB4100F3	need 2nd	Beta bkg	27-Mar 06:45	60	1.700	0.185	2.570	+0.81
LB4100G1	Above	Beta bkg	27-Mar 06:46	60	3438	0.380	1.675	+15,926.73
LB4100G2	Above	Beta bkg	27-Mar 06:46	60	2.417	1.168	2.328	+3.46
LB4100G3	Above	Beta bkg	27-Mar 06:46	60	2.167	0.987	2.738	+1.04
LB4100H1	Above	Beta bkg	27-Mar 06:45	60	3.200	0.216	2.462	+4.97
LB4100H3	Above	Beta bkg	27-Mar 06:45	60	3.000	-8.10E-1	3.745	+2.02
PIC4B	Above	Alpha bkg	27-Mar 07:00	60	0.450	-9.58E-2	0.436	+3.16
PIC4B	Above	Beta bkg	27-Mar 07:00	60	2.467	-2.76E-1	1.864	+4.69
PIC4B	Below	Beta eff	27-Mar 05:48	5	12957	19730	21460	-26.49
PIC4B	Above	Beta XTalk	27-Mar 05:48	5	0.010	2.14E-4	7.66E-4	+105.36
PIC6B	Above	Beta bkg	27-Mar 10:07	60	3.683	0.389	2.636	+5.80
PIC8A	Above	Beta bkg	27-Mar 06:14	60	3.000	-2.72E-1	2.644	+3.73
PIC12C	Above	Beta bkg	27-Mar 06:26	60	2.433	0.142	2.845	+2.09

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100A1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

LB4100I1 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4200OA1 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by Lois Buis

Date 3/27/2023

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2397396

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205343479	MB	JE1	PIC5D	MAR-27-23 15:01:13	DONE	25mm Filter	01-JUN-22 00:00
1205343480	DUP	JE1	PIC7A	MAR-27-23 15:01:24	DONE	25mm Filter	01-JUN-22 00:00
612576001	SAMPLE	JE1	PIC1A	MAR-27-23 15:01:25	DONE	25mm Filter	01-JUN-22 00:00
612576002	SAMPLE	JE1	PIC1B	MAR-27-23 15:01:29	DONE	25mm Filter	01-JUN-22 00:00
612576003	SAMPLE	JE1	PIC1C	MAR-27-23 15:01:33	DONE	25mm Filter	01-JUN-22 00:00
612576004	SAMPLE	JE1	PIC1D	MAR-27-23 15:01:36	DONE	25mm Filter	01-JUN-22 00:00
612576005	SAMPLE	JE1	PIC2A	MAR-27-23 15:01:40	DONE	25mm Filter	01-JUN-22 00:00
612576006	SAMPLE	JE1	PIC2C	MAR-27-23 15:01:46	DONE	25mm Filter	01-JUN-22 00:00
612576007	SAMPLE	JE1	PIC3B	MAR-27-23 15:01:50	DONE	25mm Filter	01-JUN-22 00:00
612576008	SAMPLE	JE1	PIC3C	MAR-27-23 15:01:53	DONE	25mm Filter	01-JUN-22 00:00
612576009	SAMPLE	JE1	PIC3D	MAR-27-23 15:01:56	DONE	25mm Filter	01-JUN-22 00:00
612583001	SAMPLE	JE1	PIC4A	MAR-27-23 15:02:02	DONE	25mm Filter	01-JUN-22 00:00
612583002	SAMPLE	JE1	PIC4C	MAR-27-23 15:02:05	DONE	25mm Filter	01-JUN-22 00:00
612583003	SAMPLE	JE1	PIC4D	MAR-27-23 15:02:11	DONE	25mm Filter	01-JUN-22 00:00
612583004	SAMPLE	JE1	PIC5A	MAR-27-23 15:02:19	DONE	25mm Filter	01-JUN-22 00:00
612583005	SAMPLE	JE1	PIC5B	MAR-27-23 15:02:24	DONE	25mm Filter	01-JUN-22 00:00
612583006	SAMPLE	JE1	PIC5C	MAR-27-23 15:02:27	DONE	25mm Filter	01-JUN-22 00:00
1205343481	LCS	JE1	PIC7B	MAR-27-23 15:06:25	DONE	25mm Filter	01-JUN-22 00:00

Lucas Cell Raw Data

Batch 2397378 Check-list

This check-list was completed on 30-MAR-23 by Lyndsey Pace

This batch was reviewed by Elizabeth Krouse on 30-MAR-23 and Lyndsey Pace on 30-MAR-23.

Batch ID:
2397378

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous		No	
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2397378
Analyst: Lyndsey Pace (LXP1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: LUCAS-C202389980

Due Dates for Lab: 26-MAR-2023			Package: 28-MAR-2023		SDG: 29-MAR-2023	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
MS	1205343414	Radium-226 SPIKE	1715-G	.1	mL	
LCS	1205343415	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	612576001	22-MAR-2023	1	500.62	500.62	03/27/23 09:15	703	03/30/23 06:12	03/30/23 09:33	1	12
2	612576002	22-MAR-2023	1	506.46	506.46	03/27/23 09:15	804	03/30/23 06:12	03/30/23 09:33	3	3
3	612576003	22-MAR-2023	1	502.08	502.08	03/27/23 09:15	104	03/30/23 06:40	03/30/23 09:50	4	6
4	612576004	22-MAR-2023	1	502.97	502.97	03/27/23 09:15	204	03/30/23 06:40	03/30/23 10:08	6	8
5	612576005	22-MAR-2023	1	500.72	500.72	03/27/23 09:15	302	03/30/23 06:40	03/30/23 10:08	4	8
6	612576006	22-MAR-2023	1	500.23	500.23	03/27/23 09:15	408	03/30/23 06:40	03/30/23 10:08	6	14
7	612576007	22-MAR-2023	1	504.44	504.44	03/27/23 09:15	502	03/30/23 06:40	03/30/23 10:08	1	6
8	612576008	22-MAR-2023	1	500.76	500.76	03/27/23 09:15	607	03/30/23 06:40	03/30/23 10:08	1	18
9	612576009	22-MAR-2023	1	500.34	500.34	03/27/23 09:15	708	03/30/23 06:40	03/30/23 10:08	2	1
10	612583001	22-MAR-2023	1	500.33	500.33	03/27/23 09:15	806	03/30/23 06:40	03/30/23 10:08	3	4
11	612583002	22-MAR-2023	1	501.17	501.17	03/27/23 09:15	106	03/30/23 07:08	03/30/23 10:08	1	10
12	612583003	22-MAR-2023	1	504.54	504.54	03/27/23 09:15	202	03/30/23 07:08	03/30/23 10:26	2	19
13	612583004	22-MAR-2023	1	503.43	503.43	03/27/23 09:15	304	03/30/23 07:08	03/30/23 10:26	3	12
14	612583005	22-MAR-2023	1	505.26	505.26	03/27/23 09:15	402	03/30/23 07:08	03/30/23 10:26	8	18
15	612583006	22-MAR-2023	1	501.2	501.2	03/27/23 09:15	503	03/30/23 07:08	03/30/23 10:26	4	2
16	1205343412 MB	22-MAR-2023	1		506.46	03/27/23 09:15	602	03/30/23 07:08	03/30/23 10:26	2	3
17	1205343413 DUP (612576001)	22-MAR-2023	1	502.64	502.64	03/27/23 09:15	707	03/30/23 07:08	03/30/23 10:26	2	16
18	1205343414 MS (612576001)	22-MAR-2023	1	100.46	100.46	03/27/23 09:15	803	03/30/23 07:08	03/30/23 10:26	2	283
19	1205343415 LCS	22-MAR-2023	1		506.46	03/27/23 09:15	107	03/30/23 07:35	03/30/23 10:26	5	304

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 22-MAR-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Procedure Code : LUC26RAL
 Parmname : Radium-226
 Required MDA : 1 pCi/L
 Halflife of Ra-226 : 1600 years
 Ra-226 Abundance : 1.00
 Halflife of Rn-222 : 3.8235 days

Batch : 2397378
 Analyst : LIN01615
 Prep Date : 3/22/2023
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	612576001.1	0.5006	2.0258E-05	2/8/2023 13:40	703	15	12	0.800	1	0.033	30	1.6440
2	612576002.1	0.5065	2.0282E-05	2/8/2023 12:23	804	15	3	0.200	3	0.100	30	1.9050
3	612576003.1	0.5021	2.0264E-05	2/8/2023 11:06	104	15	6	0.400	4	0.133	30	1.6160
4	612576004.1	0.5030	2.0268E-05	2/8/2023 9:11	204	15	8	0.533	6	0.200	30	1.8470
5	612576005.1	0.5007	2.0259E-05	2/8/2023 14:53	302	15	8	0.533	4	0.133	30	1.7980
6	612576006.1	0.5002	2.0257E-05	2/8/2023 16:04	408	15	14	0.933	6	0.200	30	1.5020
7	612576007.1	0.5044	2.0274E-05	2/8/2023 9:11	502	15	6	0.400	1	0.033	30	1.8630
8	612576008.1	0.5008	2.0259E-05	2/8/2023 8:15	607	15	18	1.200	1	0.033	30	1.8040
9	612576009.1	0.5003	2.0257E-05	2/8/2023 17:22	708	15	1	0.067	2	0.067	30	1.6020
10	612583001.1	0.5003	2.0257E-05	2/9/2023 12:58	806	15	4	0.267	3	0.100	30	1.9460
11	612583002.1	0.5012	2.0261E-05	2/9/2023 17:10	106	15	10	0.667	1	0.033	30	1.6990
12	612583003.1	0.5045	2.0274E-05	2/9/2023 14:23	202	15	19	1.267	2	0.067	30	1.8360
13	612583004.1	0.5034	2.0270E-05	2/9/2023 15:40	304	15	12	0.800	3	0.100	30	1.8850
14	612583005.1	0.5053	2.0277E-05	2/9/2023 14:23	402	15	18	1.200	8	0.267	30	1.4980
15	612583006.1	0.5012	2.0261E-05	2/9/2023 9:30	503	15	2	0.133	4	0.133	30	2.1390
16	1205343412.1	0.5065	2.0282E-05	3/22/2023 0:00	602	15	3	0.200	2	0.067	30	1.8620
17	1205343413.1	0.5026	2.0267E-05	2/8/2023 13:40	707	15	16	1.067	2	0.067	30	1.7280
18	1205343414.1	0.1005	1.1398E-05	2/8/2023 13:40	803	15	283	18.867	2	0.067	30	2.0020
19	1205343415.1	0.5065	2.0282E-05	3/22/2023 0:00	107	15	304	20.267	5	0.167	30	1.6990

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrowth End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
9.000%	11/1/2022	10/31/2023	3/27/2023 9:15	3/30/2023 6:12	3/30/2023 9:33	0.406	0.975	1.001	1.000
9.900%	4/1/2022	3/31/2023	3/27/2023 9:15	3/30/2023 6:12	3/30/2023 9:33	0.406	0.975	1.001	1.000
2.000%	4/28/2022	4/30/2023	3/27/2023 9:15	3/30/2023 6:40	3/30/2023 9:50	0.408	0.976	1.001	1.000
7.400%	8/1/2022	7/31/2023	3/27/2023 9:15	3/30/2023 6:40	3/30/2023 10:08	0.408	0.974	1.001	1.000
3.300%	10/25/2022	10/31/2023	3/27/2023 9:15	3/30/2023 6:40	3/30/2023 10:08	0.408	0.974	1.001	1.000
7.000%	2/1/2023	1/31/2024	3/27/2023 9:15	3/30/2023 6:40	3/30/2023 10:08	0.408	0.974	1.001	1.000
6.700%	6/1/2022	5/31/2023	3/27/2023 9:15	3/30/2023 6:40	3/30/2023 10:08	0.408	0.974	1.001	1.000
3.400%	7/1/2022	6/30/2023	3/27/2023 9:15	3/30/2023 6:40	3/30/2023 10:08	0.408	0.974	1.001	1.000
7.700%	11/1/2022	10/31/2023	3/27/2023 9:15	3/30/2023 6:40	3/30/2023 10:08	0.408	0.974	1.001	1.000
7.300%	4/1/2022	3/31/2023	3/27/2023 9:15	3/30/2023 6:40	3/30/2023 10:08	0.408	0.974	1.001	1.000
8.800%	4/28/2022	4/30/2023	3/27/2023 9:15	3/30/2023 7:08	3/30/2023 10:08	0.410	0.978	1.001	1.000
5.100%	8/1/2022	7/31/2023	3/27/2023 9:15	3/30/2023 7:08	3/30/2023 10:26	0.410	0.975	1.001	1.000
8.900%	10/25/2022	10/31/2023	3/27/2023 9:15	3/30/2023 7:08	3/30/2023 10:26	0.410	0.975	1.001	1.000
5.300%	2/1/2023	1/31/2024	3/27/2023 9:15	3/30/2023 7:08	3/30/2023 10:26	0.410	0.975	1.001	1.000
5.000%	6/1/2022	5/31/2023	3/27/2023 9:15	3/30/2023 7:08	3/30/2023 10:26	0.410	0.975	1.001	1.000
5.700%	7/1/2022	6/30/2023	3/27/2023 9:15	3/30/2023 7:08	3/30/2023 10:26	0.410	0.975	1.001	1.000
2.200%	11/1/2022	10/31/2023	3/27/2023 9:15	3/30/2023 7:08	3/30/2023 10:26	0.410	0.975	1.001	1.000
7.300%	4/1/2022	3/31/2023	3/27/2023 9:15	3/30/2023 7:08	3/30/2023 10:26	0.410	0.975	1.001	1.000
3.900%	4/28/2022	4/30/2023	3/27/2023 9:15	3/30/2023 7:35	3/30/2023 10:26	0.412	0.979	1.001	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-G
Spike Exp Date : 9/8/2023
Spike Activity (dpm/ml): 297.43
Spike Volume Added: 0.10

LCS S/N : 1715-G
LCS Exp Date : 9/8/2023
LCS Activity (dpm/ml): 297.43
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.1862	0.1315	1	0.5397	1.0612	31.74%	0.7667	0.2333	0.6330	0.6776		SAMPLE				
2	0.2751	0.1942	1	0.6246	0.1181	129.48%	0.1000	0.1291	0.2988	0.3001		SAMPLE				
3	0.3753	0.2650	1	0.8089	0.3720	66.17%	0.2667	0.1764	0.4822	0.4854		SAMPLE				
4	0.4023	0.2841	1	0.8123	0.4070	62.09%	0.3333	0.2055	0.4918	0.4988		SAMPLE				
5	0.3390	0.2393	1	0.7306	0.5040	50.11%	0.4000	0.2000	0.4939	0.5003		SAMPLE				
6	0.4975	0.3512	1	1.0044	1.1071	36.47%	0.7333	0.2625	0.7766	0.8073		SAMPLE				
7	0.1624	0.1146	1	0.4707	0.4426	45.95%	0.3667	0.1667	0.3943	0.4036		SAMPLE				
8	0.1689	0.1193	1	0.4896	1.4649	24.65%	1.1667	0.2848	0.7009	0.7386		SAMPLE				
9	0.2692	0.1901	1	0.6632	0.000E+00	0.00%	0.0000	0.0816	0.2265	0.2267		SAMPLE				
10	0.2714	0.1916	1	0.6163	0.1942	87.48%	0.1667	0.1453	0.3318	0.3341		SAMPLE				
11	0.1777	0.1254	1	0.5150	0.8365	34.83%	0.6333	0.2134	0.5525	0.5837		SAMPLE				
12	0.2315	0.1634	1	0.5702	1.4601	25.06%	1.2000	0.2944	0.7021	0.7474		SAMPLE				
13	0.2767	0.1954	1	0.6283	0.8314	35.15%	0.7000	0.2380	0.5542	0.5853		SAMPLE				
14	0.5666	0.4000	1	1.0979	1.3899	32.38%	0.9333	0.2981	0.8702	0.9046		SAMPLE				
15	0.2829	0.1997	1	0.6097	0.000E+00	0.00%	0.0000	0.1155	0.2379	0.2380		SAMPLE				
16	0.2274	0.1605	1	0.5601	0.1594	93.71%	0.1333	0.1247	0.2922	0.2936		MB				
17	0.2469	0.1743	1	0.6081	1.2977	27.17%	1.0000	0.2708	0.6888	0.7160	612576001.1	DUP	20.1%			
18	1.0662	0.7527	1	2.6263	105.3599	9.43%	18.8000	1.1225	12.3299	24.7100	612576001.1	MS			133.3686	78.2%
19	0.3908	0.2759	1	0.8116	26.1108	6.98%	20.1000	1.1648	2.9656	5.1947		LCS			26.4533	98.7%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 30-MAR-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:37	1	1.19E+05	119307	-1.83		
LUCAS2	EFF	07:36	1	1.34E+05	134035	0.26		
LUCAS3	EFF	07:35	1	1.00E+05	100006	-2.52		
LUCAS4	EFF	07:33	1	1.28E+05	128494	0.9		
LUCAS5	EFF	07:32	1	1.33E+05	133444	0.84		
LUCAS6	EFF	07:31	1	1.29E+05	129492	-1.29		
LUCAS7	EFF	07:29	1	1.34E+05	133959	2.48		
LUCAS8	EFF	07:27	1	1.23E+05	123440	-1.82		

Reviewed by:


Lyndsey Pace

Date: 30-MAR-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2397378

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
612576001	SAMPLE	LXP1	LUCAS7	MAR-30-23 09:33:00	DONE	Lucas Cell	01-NOV-22 00:00
612576002	SAMPLE	LXP1	LUCAS8	MAR-30-23 09:33:00	DONE	Lucas Cell	01-APR-22 00:00
612576003	SAMPLE	LXP1	LUCAS1	MAR-30-23 09:50:00	DONE	Lucas Cell	28-APR-22 00:00
612576004	SAMPLE	LXP1	LUCAS2	MAR-30-23 10:08:00	DONE	Lucas Cell	01-AUG-22 00:00
612576005	SAMPLE	LXP1	LUCAS3	MAR-30-23 10:08:00	DONE	Lucas Cell	25-OCT-22 00:00
612576006	SAMPLE	LXP1	LUCAS4	MAR-30-23 10:08:00	DONE	Lucas Cell	01-FEB-23 00:00
612576007	SAMPLE	LXP1	LUCAS5	MAR-30-23 10:08:00	DONE	Lucas Cell	01-JUN-22 00:00
612576008	SAMPLE	LXP1	LUCAS6	MAR-30-23 10:08:00	DONE	Lucas Cell	01-JUL-22 00:00
612576009	SAMPLE	LXP1	LUCAS7	MAR-30-23 10:08:00	DONE	Lucas Cell	01-NOV-22 00:00
612583001	SAMPLE	LXP1	LUCAS8	MAR-30-23 10:08:00	DONE	Lucas Cell	01-APR-22 00:00
612583002	SAMPLE	LXP1	LUCAS1	MAR-30-23 10:08:00	DONE	Lucas Cell	28-APR-22 00:00
612583003	SAMPLE	LXP1	LUCAS2	MAR-30-23 10:26:00	DONE	Lucas Cell	01-AUG-22 00:00
612583004	SAMPLE	LXP1	LUCAS3	MAR-30-23 10:26:00	DONE	Lucas Cell	25-OCT-22 00:00
612583005	SAMPLE	LXP1	LUCAS4	MAR-30-23 10:26:00	DONE	Lucas Cell	01-FEB-23 00:00
612583006	SAMPLE	LXP1	LUCAS5	MAR-30-23 10:26:00	DONE	Lucas Cell	01-JUN-22 00:00
1205343412	MB	LXP1	LUCAS6	MAR-30-23 10:26:00	DONE	Lucas Cell	01-JUL-22 00:00
1205343413	DUP	LXP1	LUCAS7	MAR-30-23 10:26:00	DONE	Lucas Cell	01-NOV-22 00:00
1205343414	MS	LXP1	LUCAS8	MAR-30-23 10:26:00	DONE	Lucas Cell	01-APR-22 00:00
1205343415	LCS	LXP1	LUCAS1	MAR-30-23 10:26:00	DONE	Lucas Cell	28-APR-22 00:00



Data Verification & Validation Report

Lansing Board of Water & Light – Erickson Power Station

Sampling Event (dates and purpose): Semiannual Assessment Monitoring – February 2023

Data Package Number: S45204.01

Lab Report Date: 04/03/2023

Data Validator: Aryka Thomson

Data Validation Completion Date: 04/09/2023

General Overall Assessment:

Data are usable without qualification.

Data are usable with qualification (as noted below).

Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	
MW-7C	
MW-8	
MW-9	
MW-10	
MW-11	X
MW-11B	X
MW-12	X
MW-12B	X
MW-13	
MW-14	
MW-15	
MW-16A	
MW-16B	
MW-16C	
MW-16D	

Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-11	GW	S45204.01	02/09/2023	X	X	X	X	X	X	X
MW-11B	GW	S45204.03	02/09/2023	X	X	X	X	X	X	
MW-12	GW	S45204.02	02/09/2023	X	X	X	X	X	X	X
MW-12B	GW	S45204.04	02/09/2023	X	X	X	X	X	X	
MWT-11B	QC	S45204.05	02/09/2023	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO₃, CO₃, hardness

Any planned sampling or analysis NOT completed? If yes, explain: _____

Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Field Data							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan		X		MW-11 and MW-12 turbidity > 10 NTU. An additional container was collected for dissolved metals analysis.
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	X		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
Analytical Data Package							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies for calcium and sulfate
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested	X			RLs for TDS were not met
			MDLs<RLs	X			
			MDLs<GPS	X			
QC Validation							
Evaluate Accuracy							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Evaluate Precision							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Zinc detected in parent and non-detect in field duplicate
Evaluate Representativeness							
Equipment Blanks (if applicable)	X		Non-detect (<RL)	X			
QC Verification							
Verify Instrument Calibration & Analytical Process							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	High recovery for Al and Mo
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
Evaluate Completeness (# usable measurements/ # unusable measurements)							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

Sample 612583001 (S45204.01) was non-homogenous matrix. Yellowish tint 612583001 (S45204.01).

Rad-228 in the sample 1205343480 and duplicate S45182.01DUP did not meet the relative percent difference requirement; however, they do meet the relative error ratio requirement. No qualification was required.

Comments:

Zinc was detected in the parent sample MW-11B but not detected in the field duplicate MWT-11B. Zinc required qualification as estimated with high bias (J+) in the parent sample MW-11B and as estimated but not detected (UJ) in the field duplicate MWT-11B.



Report ID: S45204.01(03)
Generated on 03/31/2023
Replaces report S45204.01(02) generated on 02/14/2023

Report to
Attention: Jennifer Caporale
Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Report produced by
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East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:
John Lavery (johnlavery@meritlabs.com)
Barbara Ball (bball@meritlabs.com)

Report Summary
Lab Sample ID(s): S45204.01-S45204.06
Project: Erickson AM MI Wells 11-13
Collected Date(s): 02/09/2023
Submitted Date/Time: 02/10/2023 09:28
Sampled by: Marc Wahrer
P.O. #:

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Maya Murshak
Technical Director



General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

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Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

Report Narrative

All analyses completed



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



Sample Summary (6 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S45204.01	MW-11 L302146-01	Groundwater	02/09/23 12:58
S45204.02	MW-12 L302146-02	Groundwater	02/09/23 17:10
S45204.03	MW-11B L302146-04	Groundwater	02/09/23 14:23
S45204.04	MW-12B L302146-05	Groundwater	02/09/23 15:40
S45204.05	MWT-11B L302146-06	Groundwater	02/09/23 14:23
S45204.06	Field Blank L302146-07	Water	02/09/23 09:30



Analytical Laboratory Report

Final Report

Lab Sample ID: S45204.01

Sample Tag: MW-11 L302146-01

Collected Date/Time: 02/09/2023 12:58

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.2	IR
2	1L Plastic	None	Yes	2.2	IR
1	250ml Plastic	HNO3	Yes	2.2	IR
1	250ml Plastic	None	Yes	2.2	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/13/23 12:07	CTV	
Mercury Digestion	Completed	E245.1	02/13/23 13:41	CTV	
Metal Digestion	Completed	SW3015A	02/13/23 10:10	CCM	
Metal Digestion	Completed	SW3015A	02/13/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 02/13/23 09:12, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	59	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 02/10/23 14:06, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	645	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/13/23 12:30, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	509	10	0.238	mg/L	10		

Method: SM2540C, Run Date: 02/10/23 20:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	668	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/13/23 19:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	35	3	1	mg/L	2		

Metals

Method: E200.8, Run Date: 02/13/23 11:55, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.017	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.151	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.21	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Lab Sample ID: S45204.01 (continued)

Sample Tag: MW-11 L302146-01

Method: E200.8, Run Date: 02/13/23 11:55, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	15.5	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.005	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.006	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 02/13/23 12:01, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony, Dissolved*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	f
Arsenic, Dissolved	0.004	0.002	0.000255	mg/L	5	7440-38-2	f
Barium, Dissolved	0.105	0.005	0.000162	mg/L	5	7440-39-3	f
Beryllium, Dissolved	Not detected	0.001	0.000215	mg/L	5	7440-41-7	f
Boron, Dissolved	0.20	0.04	0.00175	mg/L	5	7440-42-8	f
Cadmium, Dissolved	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	f
Chromium, Dissolved	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	f
Cobalt, Dissolved	Not detected	0.005	0.000108	mg/L	5	7440-48-4	f
Copper, Dissolved	Not detected	0.005	0.000377	mg/L	5	7440-50-8	f
Iron, Dissolved	0.44	0.02	0.00192	mg/L	5	7439-89-6	f
Lead, Dissolved	Not detected	0.003	0.000190	mg/L	5	7439-92-1	f
Lithium, Dissolved*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	f
Molybdenum, Dissolved	0.006	0.005	0.000217	mg/L	5	7439-98-7	f
Nickel, Dissolved	Not detected	0.005	0.000250	mg/L	5	7440-02-0	f
Selenium, Dissolved	Not detected	0.005	0.00209	mg/L	5	7782-49-2	f
Silver, Dissolved	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	f
Thallium, Dissolved	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	f
Vanadium, Dissolved	Not detected	0.005	0.000139	mg/L	5	7440-62-2	f
Zinc, Dissolved	Not detected	0.005	0.000730	mg/L	5	7440-66-6	f

Method: E200.8, Run Date: 02/13/23 14:10, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	140	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	40.5	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	11.4	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	37.5	0.50	0.00850	mg/L	5	7440-23-5	

Method: E200.8, Run Date: 02/13/23 14:11, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium, Dissolved*	132	0.50	0.0435	mg/L	5	7440-70-2	f
Magnesium, Dissolved	37.5	0.50	0.0120	mg/L	5	7439-95-4	f
Potassium, Dissolved	10.9	0.50	0.0230	mg/L	5	7440-09-7	f
Sodium, Dissolved	36.1	0.50	0.00850	mg/L	5	7440-23-5	f

f-Filtered and preserved in lab



Analytical Laboratory Report

Final Report

Lab Sample ID: S45204.01 (continued)

Sample Tag: MW-11 L302146-01

Method: E245.1, Run Date: 02/13/23 15:20, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury, Dissolved	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	f

Method: E245.1, Run Date: 02/13/23 13:51, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/30/23 17:15, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

f-Filtered and preserved in lab

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S45204.02

Sample Tag: MW-12 L302146-02

Collected Date/Time: 02/09/2023 17:10

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.2	IR
2	1L Plastic	None	Yes	2.2	IR
1	250ml Plastic	HNO3	Yes	2.2	IR
1	250ml Plastic	None	Yes	2.2	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/13/23 12:07	CTV	
Mercury Digestion	Completed	E245.1	02/13/23 13:41	CTV	
Metal Digestion	Completed	SW3015A	02/13/23 10:10	CCM	
Metal Digestion	Completed	SW3015A	02/13/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 02/13/23 09:25, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 02/13/23 10:29, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	71	10	0.16	mg/L	10	16887-00-6	
Sulfate	207	10	0.59	mg/L	10	14808-79-8	

Method: SM2320B, Run Date: 02/10/23 14:10, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	689	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/13/23 12:32, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	575	10	0.238	mg/L	10		

Method: SM2540C, Run Date: 02/10/23 20:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	948	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/13/23 19:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	9	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 02/13/23 12:05, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.058	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	



Analytical Laboratory Report

Lab Sample ID: S45204.02 (continued)

Sample Tag: MW-12 L302146-02

Method: E200.8, Run Date: 02/13/23 12:05, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Boron	0.07	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.60	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.027	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.011	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.017	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 02/13/23 12:08, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony, Dissolved*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	f
Arsenic, Dissolved	Not detected	0.002	0.000255	mg/L	5	7440-38-2	f
Barium, Dissolved	0.054	0.005	0.000162	mg/L	5	7440-39-3	f
Beryllium, Dissolved	Not detected	0.001	0.000215	mg/L	5	7440-41-7	f
Boron, Dissolved	0.07	0.04	0.00175	mg/L	5	7440-42-8	f
Cadmium, Dissolved	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	f
Chromium, Dissolved	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	f
Cobalt, Dissolved	Not detected	0.005	0.000108	mg/L	5	7440-48-4	f
Copper, Dissolved	Not detected	0.005	0.000377	mg/L	5	7440-50-8	f
Iron, Dissolved	Not detected	0.02	0.00192	mg/L	5	7439-89-6	f
Lead, Dissolved	Not detected	0.003	0.000190	mg/L	5	7439-92-1	f
Lithium, Dissolved*	0.023	0.005	0.00163	mg/L	5	7439-93-2	f
Molybdenum, Dissolved	0.011	0.005	0.000217	mg/L	5	7439-98-7	f
Nickel, Dissolved	0.016	0.005	0.000250	mg/L	5	7440-02-0	f
Selenium, Dissolved	Not detected	0.005	0.00209	mg/L	5	7782-49-2	f
Silver, Dissolved	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	f
Thallium, Dissolved	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	f
Vanadium, Dissolved	Not detected	0.005	0.000139	mg/L	5	7440-62-2	f
Zinc, Dissolved	Not detected	0.005	0.000730	mg/L	5	7440-66-6	f

Method: E200.8, Run Date: 02/13/23 14:13, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	143	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	56.8	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	3.01	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	136	0.50	0.00850	mg/L	5	7440-23-5	

Method: E200.8, Run Date: 02/13/23 14:14, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium, Dissolved*	141	0.50	0.0435	mg/L	5	7440-70-2	f
Magnesium, Dissolved	55.6	0.50	0.0120	mg/L	5	7439-95-4	f

f-Filtered and preserved in lab



Analytical Laboratory Report

Final Report

Lab Sample ID: S45204.02 (continued)

Sample Tag: MW-12 L302146-02

Method: E200.8, Run Date: 02/13/23 14:14, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Potassium, Dissolved	3.02	0.50	0.0230	mg/L	5	7440-09-7	f
Sodium, Dissolved	130	0.50	0.00850	mg/L	5	7440-23-5	f

Method: E245.1, Run Date: 02/13/23 15:23, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury, Dissolved	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	f

Method: E245.1, Run Date: 02/13/23 13:54, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/30/23 17:15, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

f-Filtered and preserved in lab

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S45204.03

Sample Tag: MW-11B L302146-04

Collected Date/Time: 02/09/2023 14:23

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.2	IR
2	1L Plastic	None	Yes	2.2	IR
1	250ml Plastic	HNO3	Yes	2.2	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/13/23 12:07	CTV	
Metal Digestion	Completed	SW3015A	02/13/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 02/13/23 09:38, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 02/10/23 14:14, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	378	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/13/23 12:34, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	264	10	0.238	mg/L	10		

Method: SM2540C, Run Date: 02/10/23 20:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	292	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/13/23 19:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 02/13/23 12:12, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.006	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.063	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.80	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	1.23	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S45204.03 (continued)

Sample Tag: MW-11B L302146-04

Method: E200.8, Run Date: 02/13/23 12:12, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.031	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.012	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 02/13/23 14:16, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	65.7	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	24.4	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	6.43	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	16.1	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 02/13/23 13:58, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/30/23 17:15, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Lab Sample ID: S45204.04

Sample Tag: MW-12B L302146-05

Collected Date/Time: 02/09/2023 15:40

Matrix: Groundwater

COC Reference:

Sample Containers

Table with 6 columns: #, Type, Preservative(s), Refrigerated?, Arrival Temp. (C), Thermometer #. Rows include 1L Plastic and 250ml Plastic containers.

Extraction / Prep.

Table with 6 columns: Parameter, Result, Method, Run Date, Analyst, Flags. Rows include Mercury Digestion and Metal Digestion.

Inorganics

Method: E300.0, Run Date: 02/13/23 09:51, Analyst: JDP

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Chloride, Fluoride (Undistilled), and Sulfate.

Method: SM2320B, Run Date: 02/10/23 14:16, Analyst: JDP

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Bicarbonate* and Carbonate*.

Method: SM2340C, Run Date: 02/13/23 12:36, Analyst: PJH

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Hardness.

Method: SM2540C, Run Date: 02/10/23 20:00, Analyst: SSM

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Dissolved Solids.

Method: SM2540D, Run Date: 02/13/23 19:00, Analyst: SSM

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Suspended Solids.

Metals

Method: E200.8, Run Date: 02/13/23 12:15, Analyst: CCM

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Antimony*, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, and Iron.



Analytical Laboratory Report

Final Report

Lab Sample ID: S45204.04 (continued)

Sample Tag: MW-12B L302146-05

Method: E200.8, Run Date: 02/13/23 12:15, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.043	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 02/13/23 14:17, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	26.3	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	8.61	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	7.88	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	112	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 02/13/23 14:01, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/30/23 17:15, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S45204.05

Sample Tag: MWT-11B L302146-06

Collected Date/Time: 02/09/2023 14:23

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.2	IR
2	1L Plastic	None	Yes	2.2	IR
1	250ml Plastic	HNO3	Yes	2.2	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/13/23 12:07	CTV	
Metal Digestion	Completed	SW3015A	02/13/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 02/13/23 10:03, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 02/10/23 14:18, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	377	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/13/23 12:38, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	262	10	0.238	mg/L	10		

Method: SM2540C, Run Date: 02/10/23 20:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	294	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/13/23 19:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 02/13/23 12:19, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.006	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.065	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.82	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	1.24	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S45204.05 (continued)

Sample Tag: MWT-11B L302146-06

Method: E200.8, Run Date: 02/13/23 12:19, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.031	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 02/13/23 14:19, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	66.0	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	24.7	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	6.46	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	16.4	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 02/13/23 14:04, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/30/23 17:15, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S45204.06

Sample Tag: Field Blank L302146-07

Collected Date/Time: 02/09/2023 09:30

Matrix: Water

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.2	IR
2	1L Plastic	None	Yes	2.2	IR
1	250ml Plastic	HNO3	Yes	2.2	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/13/23 12:07	CTV	
Metal Digestion	Completed	SW3015A	02/13/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 02/13/23 10:16, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 02/10/23 14:20, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/13/23 12:40, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	0.238	mg/L	10		

Method: SM2540C, Run Date: 02/10/23 20:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/13/23 19:00, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 02/13/23 11:51, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S45204.06 (continued)

Sample Tag: Field Blank L302146-07

Method: E200.8, Run Date: 02/13/23 11:51, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 02/13/23 14:07, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 02/13/23 14:14, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/30/23 17:15, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

Merit Laboratories Login Checklist

Lab Set ID:S45204

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 11-13

Submitted:02/10/2023 09:28 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Selection	Description	Note
Sample Receiving		
01.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples are received at 4C +/- 2C Thermometer # IR 2.2
02.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Received on ice/ cooling process begun
03.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples shipped
04.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples left in 24 hr. drop box
05.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Are there custody seals/tape or is the drop box locked
Chain of Custody		
06.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC adequately filled out
07.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC signed and relinquished to the lab
08.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sample tag on bottles match COC
09.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Subcontracting needed? Subcontracted to: GEL
Preservation		
10.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Do sample have correct chemical preservation
11.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Completed pH checks on preserved samples? (no VOAs)
12.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Did any samples need to be preserved in the lab? Sample .01/.02
Bottle Conditions		
13.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	All bottles intact
14.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Appropriate analytical bottles are used
15.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Merit bottles used
16.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sufficient sample volume received
17.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples require laboratory filtration Sample .01/.02
18.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples submitted within holding time
19.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S45204 Submitted: 02/10/2023 09:28

Attention: Jennifer Caporale
 Address: Board of Water & Light
 P.O. Box 13007
 Lansing, MI 48901

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 11-13

Initial Preservation Check: 02/10/2023 11:26 MMC

Phone: 517-702-6372 FAX:
 Email: Environmental_Laboratory@LBWL.com

Preservation Recheck (E200.8): N/A

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S45204.01	1L Plastic HNO3	<2			
S45204.01	1L Plastic HNO3	<2			
S45204.01	250ml Plastic HNO3	<2			
S45204.02	1L Plastic HNO3	<2			
S45204.02	1L Plastic HNO3	<2			
S45204.02	250ml Plastic HNO3	<2			
S45204.03	1L Plastic HNO3	<2			
S45204.03	1L Plastic HNO3	<2			
S45204.03	250ml Plastic HNO3	<2			
S45204.04	1L Plastic HNO3	<2			
S45204.04	1L Plastic HNO3	<2			
S45204.04	250ml Plastic HNO3	<2			
S45204.05	1L Plastic HNO3	<2			
S45204.05	1L Plastic HNO3	<2			
S45204.05	250ml Plastic HNO3	<2			
S45204.06	1L Plastic HNO3	<2			
S45204.06	1L Plastic HNO3	<2			
S45204.06	250ml Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823
 Phone (517) 332-0167 Fax (517) 332-4034
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C.O.C. PAGE # 1 OF 1

REPORT TO **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME **Jennifer Caporale**
 COMPANY **Lansing Board of Water and Light**
 ADDRESS **PO Box 13007 48901-3007**
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**
 PHONE NO. **517-702-6372** FAX NO. P.O. NO.
 E-MAIL ADDRESS **Environmental_Laboratory@lbwl.com** QUOTE NO.

CONTACT NAME **Beth Zimpfer** SAME
 COMPANY
 ADDRESS
 CITY STATE ZIP CODE
 PHONE NO. E-MAIL ADDRESS **Beth.Zimpfer@lbwl.com**

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

PROJECT NO./NAME **Erickson AM MI Wells 11-13** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**
 TURNAROUND TIME REQUIRED 1 DAY 2 DAYS 3 DAYS STANDARD OTHER **ASAP**
 DELIVERABLES REQUIRED STD LEVEL II LEVEL III LEVEL IV EDD OTHER

MATRIX GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID
 CODE: SL=SLUDGE DW=DRINKING WATER O=OIL WP=WPE A=AIR W=WASTE

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO ₃	H ₂ SO ₄	NH ₄ OH	MNH ₄ OH	OTHER	Total Metals	F- undistilled, Cl ⁻ , SO ₄ , TDS	Radium 226	Radium 228	TSS	Dissolved Metals	HCO ₃ , CO ₃ , Hardness	Certifications	
	DATE	TIME																		<input type="checkbox"/> OHIO VAP	<input type="checkbox"/> Drinking Water
45204.01	02/09/13	1358	MW-11 L302146-01	GW	5	2	3						✓	✓	✓	✓	✓	✓	✓	<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES
.02	↓	1710	MW-12 -02	GW	6	3	3						✓	✓	✓	✓	✓	✓	✓	<input type="checkbox"/> Detroit	<input type="checkbox"/> New York
	JSC 02/09/13		MW-13 N/A -03	GW	5	2	3						✓	✓	✓	✓	✓	✓	✓	<input type="checkbox"/> Other	
.03	02/09/13	1423	MW-11B -04	GW	5	2	3						✓	✓	✓	✓	✓	✓	✓	Special Instructions	
.04	↓	1540	MW-12B -05	GW	5	2	3						✓	✓	✓	✓	✓	✓	✓	Metals to analyse: Na, Mg, K	
.05	↓	1423	MWT-11B -06	GW	5	2	3						✓	✓	✓	✓	✓	✓	✓	B, Ca, Sb, As, Ba, Be, Cd, Cr,	
.06	↓	0930	Field Blank -07	DI	5	2	3						✓	✓	✓	✓	✓	✓	✓	Co, Li, Hg, Mo, Pb, Se, Tl,	
																				Fe, Cu, Ni, Ag, V, Zn	
																				Please send a preliminary report	
																				The analytes for dissolved metals are same metals that are analysed for total.	

RELINQUISHED BY: *[Signature]* **Sampler** DATE **2-10-23** TIME **0928**
 RECEIVED BY: *[Signature]* DATE **2/10/23** TIME **0928**
 RELINQUISHED BY: DATE TIME
 RECEIVED BY: DATE TIME

RELINQUISHED BY: DATE TIME
 RECEIVED BY: DATE TIME
 SEAL NO. SEAL INTACT YES NO INITIALS
 SEAL NO. SEAL INTACT YES NO INITIALS
 NOTES: TEMP. ON ARRIVAL **2.2**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total		250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005



March 23, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 612583
SDG: S45204

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on March 01, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Jordan Melton for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S45204
Work Order: 612583**

March 23, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on March 01, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

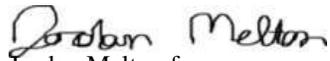
Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
612583001	S45204.01
612583002	S45204.02
612583003	S45204.03
612583004	S45204.04
612583005	S45204.05
612583006	S45204.06

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Jordan Melton". The signature is written in a cursive style with a large initial 'J'.

Jordan Melton for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation



2680 East Lansing Dr., East Lansing, MI 48823
 Phone (517) 332-0167 Fax (517) 332-4034
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1
 612583

REPORT TO

CHAIN OF CUSTODY RECORD

INVOICE TO

CONTACT NAME: Project Management Team
 COMPANY: Merit Laboratories
 ADDRESS: 2680 East Lansing Drive
 CITY: East Lansing STATE: MI ZIP CODE: 48823
 PHONE NO.: 517-332-0167 FAX NO.:
 E-MAIL ADDRESS: results@meritlabs.com
 CONTACT NAME: Julie Teague
 COMPANY: Merit Laboratories
 ADDRESS: 2680 East Lansing Drive
 CITY: East Lansing STATE: MI ZIP CODE: 48823
 PHONE NO.: 517-332-0167 E-MAIL ADDRESS: juliet@meritlabs.com

PROJECT NO./NAME: S45204 SAMPLER(S) - PLEASE PRINT/SIGN NAME:
 ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

TURNAROUND TIME REQUIRED: 1 DAY 2 DAYS 3 DAYS STANDARD OTHER
 DELIVERABLES REQUIRED: STD LEVEL II LEVEL III LEVEL IV EDD OTHER

MATRIX CODE	YEAR	DATE	TIME	IDENTIFICATION-DESCRIPTION	# Containers & Preservatives					
					GW	SL	HW	SW	HW	SW
GW	2023	2/9/23	12:58	S45204.01	2	2	2	2	2	2
GW	2023	2/9/23	17:10	S45204.02	2	2	2	2	2	2
GW	2023	2/9/23	14:23	S45204.03	2	2	2	2	2	2
GW	2023	2/9/23	15:40	S45204.04	2	2	2	2	2	2
GW	2023	2/9/23	14:23	S45204.05	2	2	2	2	2	2
GW	2023	2/9/23	09:30	S45204.06	2	2	2	2	2	2

CERTIFICATIONS	PROJECT LOCATIONS	SPECIAL INSTRUCTIONS
<input type="checkbox"/> OHIO VAP <input type="checkbox"/> Drinking Water	<input type="checkbox"/> Detroit <input type="checkbox"/> New York	* E903.1 Mod.
<input type="checkbox"/> DoD <input type="checkbox"/> NPDES	<input type="checkbox"/> Other	** E904.0/SW 9320 Mod.
Please use calculation product & provide Radium 226/228 combined results on the report		
(No Ice needed)		
** Subcontracted to GEL Laboratories, Inc.		
2040 Savage Road		
Charleston, SC 29407		

RELINQUISHED BY: [Signature] DATE: 2/11/23 TIME: 1700
 RECEIVED BY: [Signature] DATE: 2/11/23 TIME: 1700
 SEAL NO. [] SEAL INTACT [] INITIALS []
 NOTES: 3/11/23
 TEMP. ON ARRIVAL: _____



Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: **MERI** SDG/AR/COC/Work Order: **612583**

Received By: **Stacy Boone** Date Received: **MARCH 1, 2023**

Carrier and Tracking Number

Circle Applicable:
 FedEx Express FedEx Ground UPS Field Services Courier Other

1Z 466 477 03 6210 0413

Suspected Hazard Information Yes No *If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.

A) Shipped as a DOT Hazardous? Hazard Class Shipped: UN#: IF UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___

B) Did the client designate the samples are to be received as radioactive? COC notation or radioactive stickers on containers equal client designation.

C) Did the RSO classify the samples as radioactive? Maximum Net Counts Observed* (Observed Counts - Area Background Counts): CPM / mSv/hr
 Classified as: Rad 1 Rad 2 Rad 3

D) Did the client designate samples are hazardous? COC notation or hazard labels on containers equal client designation.

E) Did the RSO identify possible hazards? If D or E is yes, select Hazards below:
 PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:

Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Client contacted and provided COC COC created upon receipt
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Preservation Method: Wet Ice Ice Packs Dry Ice None Other: <u> </u> *all temperatures are recorded in Celsius TEMP: <u>21C</u>
4 Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Temperature Device Serial #: <u>IR3-22</u> Secondary Temperature Device Serial # (If Applicable): <u> </u>
5 Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe) <u>545182.08 1 of 2 ALMOST EMPTY</u>
6 Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sample ID's and Containers Affected: If Preservation added, Leak: If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer) Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No) Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___
7 Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sample ID's and containers affected: <u> </u>
8 Samples received within holding time?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ID's and tests affected: <u> </u>
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ID's and containers affected: <u> </u>
10 Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No container count on COC Other (describe)
12 Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Not relinquished Other (describe)
13 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials JM Date 3-1-23 Page 1 of 1

Laboratory Certifications

List of current GEL Certifications as of 23 March 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S45204
Work Order #: 612583**

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2397396

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
612583001	S45204.01
612583002	S45204.02
612583003	S45204.03
612583004	S45204.04
612583005	S45204.05
612583006	S45204.06
1205343479	Method Blank (MB)
1205343480	612576001(S45182.01) Sample Duplicate (DUP)
1205343481	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Preparation Information

Homogenous Matrix

Sample 612583001 (S45204.01) was non-homogenous matrix. yellowish tint 612583001 (S45204.01).

Quality Control (QC) Information

Duplication Criteria between QC Sample and Duplicate Sample

The Sample and the Duplicate, (See Below), did not meet the relative percent difference requirement; however, they do meet the relative error ratio requirement with the value listed below.

Sample	Analyte	Value
1205343480 (S45182.01DUP)	Radium-228	RPD 103* (0.0%-100.0%) RER 2.77 (0-3)

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2397378

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
612583001	S45204.01
612583002	S45204.02
612583003	S45204.03
612583004	S45204.04
612583005	S45204.05
612583006	S45204.06
1205343412	Method Blank (MB)
1205343413	612576001(S45182.01) Sample Duplicate (DUP)
1205343414	612576001(S45182.01) Matrix Spike (MS)
1205343415	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Preparation Information

Homogenous Matrix

Sample 612583001 (S45204.01) was non-homogenous matrix. Sample 612583001 (S45204.01) is tinted yellow.

Miscellaneous Information

Additional Comments

The matrix spike, 1205343414 (S45182.01MS), aliquot was reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S45204 GEL Work Order: 612583

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 30 MAR 2023

Title: Group Leader

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: March 30, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S45204.01 Project: MERI00120
Sample ID: 612583001 Client ID: MERI001
Matrix: Ground Water
Collect Date: 09-FEB-23 12:58
Receive Date: 01-MAR-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.824	+/-0.951	1.60	3.00	pCi/L		JE1	03/27/23	1502	2397396	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.02	+/-1.01			pCi/L		NXL1	03/30/23	1206	2397753	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.194	+/-0.332	0.616	1.00	pCi/L		LXP1	03/30/23	1008	2397378	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			88	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: March 30, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S45204.02 Project: MERI00120
Sample ID: 612583002 Client ID: MERI001
Matrix: Ground Water
Collect Date: 09-FEB-23 17:10
Receive Date: 01-MAR-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		2.60	+/-1.32	1.90	3.00	pCi/L		JE1	03/27/23	1502	2397396	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		3.43	+/-1.43			pCi/L		NXL1	03/30/23	1206	2397753	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.836	+/-0.553	0.515	1.00	pCi/L		LXP1	03/30/23	1008	2397378	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			71.5	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: March 30, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S45204.03 Project: MERI00120
Sample ID: 612583003 Client ID: MERI001
Matrix: Ground Water
Collect Date: 09-FEB-23 14:23
Receive Date: 01-MAR-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.131	+/-1.00	1.90	3.00	pCi/L		JE1	03/27/23	1502	2397396	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.59	+/-1.22			pCi/L		NXL1	03/30/23	1206	2397753	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		1.46	+/-0.702	0.570	1.00	pCi/L		LXP1	03/30/23	1026	2397378	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			67.3	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: March 30, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S45204.04 Project: MERI00120
Sample ID: 612583004 Client ID: MERI001
Matrix: Ground Water
Collect Date: 09-FEB-23 15:40
Receive Date: 01-MAR-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		3.31	+/-1.58	2.27	3.00	pCi/L		JE1	03/27/23	1502	2397396	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		4.14	+/-1.67			pCi/L		NXL1	03/30/23	1206	2397753	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.831	+/-0.554	0.628	1.00	pCi/L		LXP1	03/30/23	1026	2397378	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			65.5	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: March 30, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S45204.05 Project: MERI00120
Sample ID: 612583005 Client ID: MERI001
Matrix: Ground Water
Collect Date: 09-FEB-23 14:23
Receive Date: 01-MAR-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.583	+/-1.11	1.95	3.00	pCi/L		JE1	03/27/23	1502	2397396	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.97	+/-1.41			pCi/L		NXL1	03/30/23	1206	2397753	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		1.39	+/-0.870	1.10	1.00	pCi/L		LXP1	03/30/23	1026	2397378	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			73.7	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: March 30, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S45204.06 Project: MERI00120
Sample ID: 612583006 Client ID: MERI001
Matrix: Ground Water
Collect Date: 09-FEB-23 09:30
Receive Date: 01-MAR-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	-0.0291	+/-0.932	1.79	3.00	pCi/L		JE1	03/27/23	1502	2397396	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.000	+/-0.962			pCi/L		NXL1	03/30/23	1206	2397753	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.000	+/-0.238	0.610	1.00	pCi/L		LXP1	03/30/23	1026	2397378	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			73.7	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: March 30, 2023

Page 1 of 2

Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan

Contact: John Laverty

Workorder: 612583

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2397396										
QC1205343480	612576001	DUP									
Radium-228		4.38		1.41	pCi/L	103*		(0% - 100%)	JE1	03/27/23	15:01
	Uncertainty	+/-1.49		+/-0.915							
QC1205343481	LCS										
Radium-228	62.5			57.4	pCi/L		91.9	(75%-125%)		03/27/23	15:06
	Uncertainty			+/-3.90							
QC1205343479	MB										
Radium-228			U	0.222	pCi/L					03/27/23	15:01
	Uncertainty			+/-0.791							
Rad Ra-226											
Batch	2397378										
QC1205343413	612576001	DUP									
Radium-226		1.06		1.30	pCi/L	20.1		(0% - 100%)	LXP1	03/30/23	10:26
	Uncertainty	+/-0.633		+/-0.689							
QC1205343415	LCS										
Radium-226	26.5			26.1	pCi/L		98.7	(75%-125%)		03/30/23	10:26
	Uncertainty			+/-2.97							
QC1205343412	MB										
Radium-226			U	0.159	pCi/L					03/30/23	10:26
	Uncertainty			+/-0.292							
QC1205343414	612576001	MS									
Radium-226	133	1.06		105	pCi/L		78.2	(75%-125%)		03/30/23	10:26
	Uncertainty	+/-0.633		+/-12.3							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- H Analytical holding time was exceeded
- < Result is less than value reported
- > Result is greater than value reported

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Workorder: 612583

Page 2 of 2

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
NI											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2397396 Check-list

This check-list was completed on 27-MAR-23 by Nat Long

This batch was reviewed by Nat Long on 27-MAR-23 and Kenshalla Oston on 28-MAR-23.

Batch ID:
2397396

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous		No	
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?		No	
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2397396
Analyst: Jacqueline Emond (JE1)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: LUCAS-C202389980

Due Dates for Lab: 26-MAR-2023			Package: 28-MAR-2023	SDG: 29-MAR-2023		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205343481	228	1952-B	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	612576001	22-MAR-2023	3	300.88	300.88	03/23/23 18:42	03/27/23 12:58
2	612576002	22-MAR-2023	3	301.77	301.77	03/23/23 18:42	03/27/23 12:58
3	612576003	22-MAR-2023	3	301.42	301.42	03/23/23 18:42	03/27/23 12:58
4	612576004	22-MAR-2023	3	300.08	300.08	03/23/23 18:42	03/27/23 12:58
5	612576005	22-MAR-2023	3	304.65	304.65	03/23/23 18:42	03/27/23 12:58
6	612576006	22-MAR-2023	3	302.42	302.42	03/23/23 18:42	03/27/23 12:58
7	612576007	22-MAR-2023	3	303.15	303.15	03/23/23 18:42	03/27/23 12:58
8	612576008	22-MAR-2023	3	301.25	301.25	03/23/23 18:42	03/27/23 12:58
9	612576009	22-MAR-2023	3	301.8	301.8	03/23/23 18:42	03/27/23 12:58
10	612583001	22-MAR-2023	3	301.47	301.47	03/23/23 18:42	03/27/23 12:58
11	612583002	22-MAR-2023	3	301.62	301.62	03/23/23 18:42	03/27/23 12:58
12	612583003	22-MAR-2023	3	301.84	301.84	03/23/23 18:42	03/27/23 12:58
13	612583004	22-MAR-2023	3	303.63	303.63	03/23/23 18:42	03/27/23 12:58
14	612583005	22-MAR-2023	3	305.11	305.11	03/23/23 18:42	03/27/23 12:58
15	612583006	22-MAR-2023	3	303.97	303.97	03/23/23 18:42	03/27/23 12:58
16	1205343479 MB	22-MAR-2023	3		305.11	03/23/23 18:42	03/27/23 12:58
17	1205343480 DUP (612576001)	22-MAR-2023	3	300.6	300.6	03/23/23 18:42	03/27/23 12:58
18	1205343481 LCS	22-MAR-2023	3		305.11	03/23/23 18:42	03/27/23 12:58

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-E	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 22-MAR-2023 00:00
REGNT 3879554	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3862351	RGF-1M Citric Acid	5 mL	
REGNT 3878183	2M HCl	20 mL	
REGNT 3883537	RGF-50% Potassium Carbonate	2 mL	
REGNT 3878163	RGF-7M Nitric Acid	25 mL	
REGNT 3857893.11	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT DGA030723	2396801	2 g	
REGNT 3867075.26	RGF-Hydrofluoric Acid	4 mL	
REGNT 3528714	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3521298	RGF-Neodymium Substrate	5 mL	
REGNT 3875878.6	Nitric Acid	5 mL	
REGNT 3465466	Barium Carrier Ra228 REG	1 mL	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 1951-E
 Tracer Exp Date : 1/10/2024
 Tracer Volume Added: 0.10

Batch : 2397396
 Analyst : JAC02417
 Prep Date : 3/22/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 3 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	612576001.1	0.3009	1.8474E-05	2/8/2023 13:40	1218.3	1.65%	892.7	1.93%	0.1	0.000200
2	612576002.1	0.3018	1.8489E-05	2/8/2023 12:23	1218.3	1.65%	959.3	1.86%	0.1	0.000200
3	612576003.1	0.3014	1.8483E-05	2/8/2023 11:06	1218.3	1.65%	1003.8	1.82%	0.1	0.000200
4	612576004.1	0.3001	1.8460E-05	2/8/2023 9:11	1218.3	1.65%	932.0	1.89%	0.1	0.000200
5	612576005.1	0.3047	1.8537E-05	2/8/2023 14:53	1218.3	1.65%	797.1	2.04%	0.1	0.000200
6	612576006.1	0.3024	1.8500E-05	2/8/2023 16:04	1218.3	1.65%	859.0	1.97%	0.1	0.000200
7	612576007.1	0.3032	1.8512E-05	2/8/2023 9:11	1218.3	1.65%	929.3	1.89%	0.1	0.000200
8	612576008.1	0.3013	1.8480E-05	2/8/2023 8:15	1218.3	1.65%	867.5	1.96%	0.1	0.000200
9	612576009.1	0.3018	1.8489E-05	2/8/2023 17:22	1218.3	1.65%	1005.1	1.82%	0.1	0.000200
10	612583001.1	0.3015	1.8484E-05	2/9/2023 12:58	1218.3	1.65%	1072.3	1.76%	0.1	0.000200
11	612583002.1	0.3016	1.8486E-05	2/9/2023 17:10	1218.3	1.65%	871.7	1.96%	0.1	0.000200
12	612583003.1	0.3018	1.8490E-05	2/9/2023 14:23	1218.3	1.65%	819.9	2.02%	0.1	0.000200
13	612583004.1	0.3036	1.8520E-05	2/9/2023 15:40	1218.3	1.65%	797.8	2.04%	0.1	0.000200
14	612583005.1	0.3051	1.8544E-05	2/9/2023 14:23	1218.3	1.65%	898.5	1.93%	0.1	0.000200
15	612583006.1	0.3040	1.8526E-05	2/9/2023 9:30	1218.3	1.65%	897.9	1.93%	0.1	0.000200
16	1205343479.1	0.3051	1.8544E-05	3/22/2023 0:00	1218.3	1.65%	1005.3	1.82%	0.1	0.000200
17	1205343480.1	0.3006	1.8469E-05	2/8/2023 13:40	1218.3	1.65%	1041.3	1.79%	0.1	0.000200
18	1205343481.1	0.3051	1.8544E-05	3/22/2023 0:00	1218.3	1.65%	962.5	1.86%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data														
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Calculated Sample Recovery %	Sample Recovery Error %
			Alpha	Beta										
1	1A	60	11	100	1.667	3/27/2023 15:01	3/23/2023 18:42	3/27/2023 12:58	0.985	0.793	1.000	1.057	73.3%	2.55%
2	1B	60	13	31	0.517	3/27/2023 15:01	3/23/2023 18:42	3/27/2023 12:58	0.985	0.793	1.000	1.057	78.7%	2.50%
3	1C	60	8	70	1.167	3/27/2023 15:01	3/23/2023 18:42	3/27/2023 12:58	0.985	0.793	1.000	1.057	82.4%	2.47%
4	1D	60	2	27	0.450	3/27/2023 15:01	3/23/2023 18:42	3/27/2023 12:58	0.985	0.793	1.000	1.057	76.5%	2.52%
5	2A	60	8	45	0.750	3/27/2023 15:01	3/23/2023 18:42	3/27/2023 12:58	0.985	0.793	1.000	1.057	65.4%	2.64%
6	2C	60	9	69	1.150	3/27/2023 15:01	3/23/2023 18:42	3/27/2023 12:58	0.985	0.793	1.000	1.057	70.5%	2.59%
7	3B	60	4	44	0.733	3/27/2023 15:01	3/23/2023 18:42	3/27/2023 12:58	0.985	0.792	1.000	1.057	76.3%	2.52%
8	3C	60	5	73	1.217	3/27/2023 15:01	3/23/2023 18:42	3/27/2023 12:58	0.985	0.792	1.000	1.057	71.2%	2.58%
9	3D	60	4	21	0.350	3/27/2023 15:01	3/23/2023 18:42	3/27/2023 12:58	0.985	0.792	1.000	1.057	82.5%	2.47%
10	4A	60	12	53	0.883	3/27/2023 15:02	3/23/2023 18:42	3/27/2023 12:58	0.985	0.792	1.000	1.057	88.0%	2.43%
11	4C	60	4	77	1.283	3/27/2023 15:02	3/23/2023 18:42	3/27/2023 12:58	0.985	0.792	1.000	1.057	71.5%	2.58%
12	4D	60	5	33	0.550	3/27/2023 15:02	3/23/2023 18:42	3/27/2023 12:58	0.985	0.792	1.000	1.057	67.3%	2.62%
13	5A	60	5	93	1.550	3/27/2023 15:02	3/23/2023 18:42	3/27/2023 12:58	0.985	0.792	1.000	1.057	65.5%	2.64%
14	5B	60	14	57	0.950	3/27/2023 15:02	3/23/2023 18:42	3/27/2023 12:58	0.985	0.792	1.000	1.057	73.7%	2.55%
15	5C	60	10	38	0.633	3/27/2023 15:02	3/23/2023 18:42	3/27/2023 12:58	0.985	0.792	1.000	1.057	73.7%	2.55%
16	5D	60	5	36	0.600	3/27/2023 15:01	3/23/2023 18:42	3/27/2023 12:58	0.998	0.793	1.000	1.057	82.5%	2.47%
17	7A	60	6	51	0.850	3/27/2023 15:01	3/23/2023 18:42	3/27/2023 12:58	0.985	0.793	1.000	1.057	85.5%	2.45%
18	7B	60	10	906	15.100	3/27/2023 15:06	3/23/2023 18:42	3/27/2023 12:58	0.998	0.786	1.000	1.057	79.0%	2.50%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.6209	0.00738	0.684	3/24/2023 18:31	500
2	PIC	6/1/2022	5/31/2023	0.6068	0.00711	0.548	3/24/2023 18:31	500
3	PIC	6/1/2022	5/31/2023	0.6190	0.00847	0.764	3/24/2023 18:31	500
4	PIC	6/1/2022	5/31/2023	0.6048	0.00692	0.508	3/24/2023 18:31	500
5	PIC	6/1/2022	5/31/2023	0.6201	0.01914	0.928	3/24/2023 18:33	500
6	PIC	6/1/2022	5/31/2023	0.6022	0.01274	0.694	3/24/2023 18:33	500
7	PIC	6/1/2022	5/31/2023	0.6245	0.01614	0.554	3/24/2023 18:31	500
8	PIC	6/1/2022	5/31/2023	0.6365	0.00988	1.420	3/24/2023 18:31	500
9	PIC	6/1/2022	5/31/2023	0.5999	0.02297	0.304	3/24/2023 18:32	500
10	PIC	6/1/2022	5/31/2023	0.6013	0.01123	0.668	3/24/2023 18:32	500
11	PIC	6/1/2022	5/31/2023	0.6359	0.00889	0.700	3/24/2023 18:32	500
12	PIC	6/1/2022	5/31/2023	0.5954	0.00773	0.524	3/24/2023 18:32	500
13	PIC	6/1/2022	5/31/2023	0.6332	0.00851	0.868	3/24/2023 18:32	500
14	PIC	6/1/2022	5/31/2023	0.6336	0.00426	0.814	3/24/2023 18:32	500
15	PIC	6/1/2022	5/31/2023	0.6242	0.00657	0.640	3/24/2023 18:32	500
16	PIC	6/1/2022	5/31/2023	0.6236	0.00925	0.542	3/24/2023 18:32	500
17	PIC	6/1/2022	5/31/2023	0.6257	0.00594	0.478	3/24/2023 18:28	500
18	PIC	6/1/2022	5/31/2023	0.6366	0.00627	0.592	3/24/2023 18:29	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 1952-B
LCS Exp Date : 8/9/2023
LCS Activity (dpm/ml): 423.23
LCS Volume Added: 0.10

Results																2 SIGMA		2 SIGMA	
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	Sample Act. MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery			
1	1.1733	0.8284	3	1.8796	4.3793	17.58%	0.9827	0.1707	1.4912	1.8602		SAMPLE							
2	0.9972	0.7040	3	1.6196	-0.1326	314.45%	-0.0313	0.0985	0.8171	0.8173		SAMPLE							
3	1.1046	0.7799	3	1.7582	1.5985	36.06%	0.4027	0.1448	1.1268	1.1976		SAMPLE							
4	0.9974	0.7041	3	1.6281	-0.2550	159.13%	-0.0580	0.0923	0.7951	0.7953		SAMPLE							
5	1.5143	1.0691	3	2.3851	-0.8789	67.39%	-0.1780	0.1198	1.1596	1.1598		SAMPLE							
6	1.2606	0.8900	3	2.0176	2.1675	31.57%	0.4560	0.1434	1.3357	1.4454		SAMPLE							
7	1.0018	0.7073	3	1.6260	0.7582	64.45%	0.1793	0.1155	0.9568	0.9762		SAMPLE							
8	1.6966	1.1978	3	2.6192	-0.9094	74.83%	-0.2033	0.1520	1.3328	1.3329		SAMPLE							
9	0.7174	0.5065	3	1.2174	0.1880	174.51%	0.0460	0.0803	0.6430	0.6448		SAMPLE							
10	0.9957	0.7030	3	1.5973	0.8241	58.91%	0.2153	0.1267	0.9505	0.9733		SAMPLE							
11	1.1849	0.8365	3	1.8955	2.5951	26.02%	0.5833	0.1510	1.3163	1.4723		SAMPLE							
12	1.1635	0.8214	3	1.8953	0.1313	388.73%	0.0260	0.1011	1.0002	1.0007		SAMPLE							
13	1.4389	1.0159	3	2.2743	3.3087	24.50%	0.6820	0.1660	1.5789	1.7892		SAMPLE							
14	1.2307	0.8689	3	1.9520	0.5828	97.20%	0.1360	0.1321	1.1098	1.1196		SAMPLE							
15	1.1130	0.7858	3	1.7900	-0.0291	1631.87%	-0.0067	0.1088	0.9319	0.9320		SAMPLE							
16	0.8980	0.6340	3	1.4595	0.2222	181.54%	0.0580	0.1053	0.7906	0.7926		MB							
17	0.8351	0.5896	3	1.3689	1.4115	33.15%	0.3720	0.1230	0.9145	0.9820	612576001.1	DUP	102.5%	2.7653					
18	0.9695	0.6845	3	1.5669	57.4284	4.32%	14.5080	0.5028	3.9013	15.0784		LCS			62.4835	91.9%			

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
612576001	1A	60	11	100	3/27/2023 15:01	3/27/2023 16:01	PIC	2397396
612576002	1B	60	13	31	3/27/2023 15:01	3/27/2023 16:01	PIC	2397396
612576003	1C	60	8	70	3/27/2023 15:01	3/27/2023 16:01	PIC	2397396
612576004	1D	60	2	27	3/27/2023 15:01	3/27/2023 16:01	PIC	2397396
612576005	2A	60	8	45	3/27/2023 15:01	3/27/2023 16:01	PIC	2397396
612576006	2C	60	9	69	3/27/2023 15:01	3/27/2023 16:01	PIC	2397396
612576007	3B	60	4	44	3/27/2023 15:01	3/27/2023 16:01	PIC	2397396
612576008	3C	60	5	73	3/27/2023 15:01	3/27/2023 16:01	PIC	2397396
612576009	3D	60	4	21	3/27/2023 15:01	3/27/2023 16:01	PIC	2397396
612583001	4A	60	12	53	3/27/2023 15:02	3/27/2023 16:02	PIC	2397396
612583002	4C	60	4	77	3/27/2023 15:02	3/27/2023 16:02	PIC	2397396
612583003	4D	60	5	33	3/27/2023 15:02	3/27/2023 16:02	PIC	2397396
612583004	5A	60	5	93	3/27/2023 15:02	3/27/2023 16:02	PIC	2397396
612583005	5B	60	14	57	3/27/2023 15:02	3/27/2023 16:02	PIC	2397396
612583006	5C	60	10	38	3/27/2023 15:02	3/27/2023 16:02	PIC	2397396
1205343479	5D	60	5	36	3/27/2023 15:01	3/27/2023 16:01	PIC	2397396
1205343480	7A	60	6	51	3/27/2023 15:01	3/27/2023 16:01	PIC	2397396
1205343481	7B	60	10	906	3/27/2023 15:06	3/27/2023 16:06	PIC	2397396

ASSAY 27-Mar-23 13:34:27
 Wizard 2480 s/n 46190630
 Protocol id 8 Ba-133
 Time limit
 Count limit
 Isotope Ba-133
 Protocol date 3/27/2023
 Run id. 6396

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	93	1	180	3655.57	1218.34	1.65	01:34:27
612576001	2	93	2	180	2678.57	892.69	1.93	73.27	01:37:40
612576002	3	93	3	180	2878.28	959.28	1.86	78.74	01:40:54
612576003	4	93	4	180	3012	1003.75	1.82	82.39	01:44:08
612576004	5	93	5	180	2796.57	932.04	1.89	76.50	01:47:23
612576005	1	14	1	180	2391.57	797.06	2.04	65.42	01:50:58
612576006	2	14	2	180	2577.57	859.04	1.97	70.51	01:54:12
612576007	3	14	3	180	2788.57	929.28	1.89	76.27	01:57:26
612576008	4	14	4	180	2603	867.52	1.96	71.21	02:00:40
612576009	5	14	5	180	3016	1005.14	1.82	82.50	02:03:54
612583001	1	2	1	180	3217.57	1072.3	1.76	88.01	02:07:31
612583002	2	2	2	180	2615.57	871.71	1.96	71.55	02:10:45
612583003	3	2	3	180	2460	819.89	2.02	67.30	02:13:58
612583004	4	2	4	180	2393.57	797.8	2.04	65.48	02:17:12
612583005	5	2	5	180	2695.85	898.47	1.93	73.75	02:20:27
612583006	1	10	1	180	2694	897.86	1.93	73.70	02:24:09
1205343479	2	10	2	180	3016.28	1005.27	1.82	82.51	02:27:23
1205343480	3	10	3	180	3124.28	1041.3	1.79	85.47	02:30:37
1205343481	4	10	4	180	2888	962.51	1.86	79.00	02:33:51

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 27-Mar-2023

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z and LB4200 OA1 through OA1

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	Above	Beta bkg	27-Mar 06:45	60	2.817	1.385	3.072	+2.09
LB4100E3	Above	Beta bkg	27-Mar 06:45	60	2.600	0.484	2.814	+2.45
LB4100F1	Above	Beta bkg	27-Mar 06:45	60	3.333	0.188	2.691	+4.54
LB4100F2	Below	Alpha eff	27-Mar 05:41	5	6168	6533	7372	-5.61
LB4100F2	Above	Alpha XTalk	27-Mar 05:41	5	0.373	0.318	0.366	+3.86
LB4100F2	Above	Beta bkg	27-Mar 06:45	60	51.550	1.173	1.833	+454.97
LB4100F3	need 2nd	Beta bkg	27-Mar 06:45	60	1.700	0.185	2.570	+0.81
LB4100G1	Above	Beta bkg	27-Mar 06:46	60	3438	0.380	1.675	+15,926.73
LB4100G2	Above	Beta bkg	27-Mar 06:46	60	2.417	1.168	2.328	+3.46
LB4100G3	Above	Beta bkg	27-Mar 06:46	60	2.167	0.987	2.738	+1.04
LB4100H1	Above	Beta bkg	27-Mar 06:45	60	3.200	0.216	2.462	+4.97
LB4100H3	Above	Beta bkg	27-Mar 06:45	60	3.000	-8.10E-1	3.745	+2.02
PIC4B	Above	Alpha bkg	27-Mar 07:00	60	0.450	-9.58E-2	0.436	+3.16
PIC4B	Above	Beta bkg	27-Mar 07:00	60	2.467	-2.76E-1	1.864	+4.69
PIC4B	Below	Beta eff	27-Mar 05:48	5	12957	19730	21460	-26.49
PIC4B	Above	Beta XTalk	27-Mar 05:48	5	0.010	2.14E-4	7.66E-4	+105.36
PIC6B	Above	Beta bkg	27-Mar 10:07	60	3.683	0.389	2.636	+5.80
PIC8A	Above	Beta bkg	27-Mar 06:14	60	3.000	-2.72E-1	2.644	+3.73
PIC12C	Above	Beta bkg	27-Mar 06:26	60	2.433	0.142	2.845	+2.09

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100A1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

LB4100I1 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4200OA1 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by Lois Buis

Date 3/27/2023

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2397396

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205343479	MB	JE1	PIC5D	MAR-27-23 15:01:13	DONE	25mm Filter	01-JUN-22 00:00
1205343480	DUP	JE1	PIC7A	MAR-27-23 15:01:24	DONE	25mm Filter	01-JUN-22 00:00
612576001	SAMPLE	JE1	PIC1A	MAR-27-23 15:01:25	DONE	25mm Filter	01-JUN-22 00:00
612576002	SAMPLE	JE1	PIC1B	MAR-27-23 15:01:29	DONE	25mm Filter	01-JUN-22 00:00
612576003	SAMPLE	JE1	PIC1C	MAR-27-23 15:01:33	DONE	25mm Filter	01-JUN-22 00:00
612576004	SAMPLE	JE1	PIC1D	MAR-27-23 15:01:36	DONE	25mm Filter	01-JUN-22 00:00
612576005	SAMPLE	JE1	PIC2A	MAR-27-23 15:01:40	DONE	25mm Filter	01-JUN-22 00:00
612576006	SAMPLE	JE1	PIC2C	MAR-27-23 15:01:46	DONE	25mm Filter	01-JUN-22 00:00
612576007	SAMPLE	JE1	PIC3B	MAR-27-23 15:01:50	DONE	25mm Filter	01-JUN-22 00:00
612576008	SAMPLE	JE1	PIC3C	MAR-27-23 15:01:53	DONE	25mm Filter	01-JUN-22 00:00
612576009	SAMPLE	JE1	PIC3D	MAR-27-23 15:01:56	DONE	25mm Filter	01-JUN-22 00:00
612583001	SAMPLE	JE1	PIC4A	MAR-27-23 15:02:02	DONE	25mm Filter	01-JUN-22 00:00
612583002	SAMPLE	JE1	PIC4C	MAR-27-23 15:02:05	DONE	25mm Filter	01-JUN-22 00:00
612583003	SAMPLE	JE1	PIC4D	MAR-27-23 15:02:11	DONE	25mm Filter	01-JUN-22 00:00
612583004	SAMPLE	JE1	PIC5A	MAR-27-23 15:02:19	DONE	25mm Filter	01-JUN-22 00:00
612583005	SAMPLE	JE1	PIC5B	MAR-27-23 15:02:24	DONE	25mm Filter	01-JUN-22 00:00
612583006	SAMPLE	JE1	PIC5C	MAR-27-23 15:02:27	DONE	25mm Filter	01-JUN-22 00:00
1205343481	LCS	JE1	PIC7B	MAR-27-23 15:06:25	DONE	25mm Filter	01-JUN-22 00:00

Lucas Cell Raw Data

Batch 2397378 Check-list

This check-list was completed on 30-MAR-23 by Lyndsey Pace

This batch was reviewed by Elizabeth Krouse on 30-MAR-23 and Lyndsey Pace on 30-MAR-23.

Batch ID:
2397378

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous		No	
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2397378
Analyst: Lyndsey Pace (LXP1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: LUCAS-C202389980

Due Dates for Lab: 26-MAR-2023			Package: 28-MAR-2023		SDG: 29-MAR-2023	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
MS	1205343414	Radium-226 SPIKE	1715-G	.1	mL	
LCS	1205343415	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	612576001	22-MAR-2023	1	500.62	500.62	03/27/23 09:15	703	03/30/23 06:12	03/30/23 09:33	1	12
2	612576002	22-MAR-2023	1	506.46	506.46	03/27/23 09:15	804	03/30/23 06:12	03/30/23 09:33	3	3
3	612576003	22-MAR-2023	1	502.08	502.08	03/27/23 09:15	104	03/30/23 06:40	03/30/23 09:50	4	6
4	612576004	22-MAR-2023	1	502.97	502.97	03/27/23 09:15	204	03/30/23 06:40	03/30/23 10:08	6	8
5	612576005	22-MAR-2023	1	500.72	500.72	03/27/23 09:15	302	03/30/23 06:40	03/30/23 10:08	4	8
6	612576006	22-MAR-2023	1	500.23	500.23	03/27/23 09:15	408	03/30/23 06:40	03/30/23 10:08	6	14
7	612576007	22-MAR-2023	1	504.44	504.44	03/27/23 09:15	502	03/30/23 06:40	03/30/23 10:08	1	6
8	612576008	22-MAR-2023	1	500.76	500.76	03/27/23 09:15	607	03/30/23 06:40	03/30/23 10:08	1	18
9	612576009	22-MAR-2023	1	500.34	500.34	03/27/23 09:15	708	03/30/23 06:40	03/30/23 10:08	2	1
10	612583001	22-MAR-2023	1	500.33	500.33	03/27/23 09:15	806	03/30/23 06:40	03/30/23 10:08	3	4
11	612583002	22-MAR-2023	1	501.17	501.17	03/27/23 09:15	106	03/30/23 07:08	03/30/23 10:08	1	10
12	612583003	22-MAR-2023	1	504.54	504.54	03/27/23 09:15	202	03/30/23 07:08	03/30/23 10:26	2	19
13	612583004	22-MAR-2023	1	503.43	503.43	03/27/23 09:15	304	03/30/23 07:08	03/30/23 10:26	3	12
14	612583005	22-MAR-2023	1	505.26	505.26	03/27/23 09:15	402	03/30/23 07:08	03/30/23 10:26	8	18
15	612583006	22-MAR-2023	1	501.2	501.2	03/27/23 09:15	503	03/30/23 07:08	03/30/23 10:26	4	2
16	1205343412 MB	22-MAR-2023	1		506.46	03/27/23 09:15	602	03/30/23 07:08	03/30/23 10:26	2	3
17	1205343413 DUP (612576001)	22-MAR-2023	1	502.64	502.64	03/27/23 09:15	707	03/30/23 07:08	03/30/23 10:26	2	16
18	1205343414 MS (612576001)	22-MAR-2023	1	100.46	100.46	03/27/23 09:15	803	03/30/23 07:08	03/30/23 10:26	2	283
19	1205343415 LCS	22-MAR-2023	1		506.46	03/27/23 09:15	107	03/30/23 07:35	03/30/23 10:26	5	304

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 22-MAR-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Procedure Code : LUC26RAL
 Parmname : Radium-226
 Required MDA : 1 pCi/L
 Halflife of Ra-226 : 1600 years
 Ra-226 Abundance : 1.00
 Halflife of Rn-222 : 3.8235 days

Batch : 2397378
 Analyst : LIN01615
 Prep Date : 3/22/2023
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	612576001.1	0.5006	2.0258E-05	2/8/2023 13:40	703	15	12	0.800	1	0.033	30	1.6440
2	612576002.1	0.5065	2.0282E-05	2/8/2023 12:23	804	15	3	0.200	3	0.100	30	1.9050
3	612576003.1	0.5021	2.0264E-05	2/8/2023 11:06	104	15	6	0.400	4	0.133	30	1.6160
4	612576004.1	0.5030	2.0268E-05	2/8/2023 9:11	204	15	8	0.533	6	0.200	30	1.8470
5	612576005.1	0.5007	2.0259E-05	2/8/2023 14:53	302	15	8	0.533	4	0.133	30	1.7980
6	612576006.1	0.5002	2.0257E-05	2/8/2023 16:04	408	15	14	0.933	6	0.200	30	1.5020
7	612576007.1	0.5044	2.0274E-05	2/8/2023 9:11	502	15	6	0.400	1	0.033	30	1.8630
8	612576008.1	0.5008	2.0259E-05	2/8/2023 8:15	607	15	18	1.200	1	0.033	30	1.8040
9	612576009.1	0.5003	2.0257E-05	2/8/2023 17:22	708	15	1	0.067	2	0.067	30	1.6020
10	612583001.1	0.5003	2.0257E-05	2/9/2023 12:58	806	15	4	0.267	3	0.100	30	1.9460
11	612583002.1	0.5012	2.0261E-05	2/9/2023 17:10	106	15	10	0.667	1	0.033	30	1.6990
12	612583003.1	0.5045	2.0274E-05	2/9/2023 14:23	202	15	19	1.267	2	0.067	30	1.8360
13	612583004.1	0.5034	2.0270E-05	2/9/2023 15:40	304	15	12	0.800	3	0.100	30	1.8850
14	612583005.1	0.5053	2.0277E-05	2/9/2023 14:23	402	15	18	1.200	8	0.267	30	1.4980
15	612583006.1	0.5012	2.0261E-05	2/9/2023 9:30	503	15	2	0.133	4	0.133	30	2.1390
16	1205343412.1	0.5065	2.0282E-05	3/22/2023 0:00	602	15	3	0.200	2	0.067	30	1.8620
17	1205343413.1	0.5026	2.0267E-05	2/8/2023 13:40	707	15	16	1.067	2	0.067	30	1.7280
18	1205343414.1	0.1005	1.1398E-05	2/8/2023 13:40	803	15	283	18.867	2	0.067	30	2.0020
19	1205343415.1	0.5065	2.0282E-05	3/22/2023 0:00	107	15	304	20.267	5	0.167	30	1.6990

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
9.000%	11/1/2022	10/31/2023	3/27/2023 9:15	3/30/2023 6:12	3/30/2023 9:33	0.406	0.975	1.001	1.000
9.900%	4/1/2022	3/31/2023	3/27/2023 9:15	3/30/2023 6:12	3/30/2023 9:33	0.406	0.975	1.001	1.000
2.000%	4/28/2022	4/30/2023	3/27/2023 9:15	3/30/2023 6:40	3/30/2023 9:50	0.408	0.976	1.001	1.000
7.400%	8/1/2022	7/31/2023	3/27/2023 9:15	3/30/2023 6:40	3/30/2023 10:08	0.408	0.974	1.001	1.000
3.300%	10/25/2022	10/31/2023	3/27/2023 9:15	3/30/2023 6:40	3/30/2023 10:08	0.408	0.974	1.001	1.000
7.000%	2/1/2023	1/31/2024	3/27/2023 9:15	3/30/2023 6:40	3/30/2023 10:08	0.408	0.974	1.001	1.000
6.700%	6/1/2022	5/31/2023	3/27/2023 9:15	3/30/2023 6:40	3/30/2023 10:08	0.408	0.974	1.001	1.000
3.400%	7/1/2022	6/30/2023	3/27/2023 9:15	3/30/2023 6:40	3/30/2023 10:08	0.408	0.974	1.001	1.000
7.700%	11/1/2022	10/31/2023	3/27/2023 9:15	3/30/2023 6:40	3/30/2023 10:08	0.408	0.974	1.001	1.000
7.300%	4/1/2022	3/31/2023	3/27/2023 9:15	3/30/2023 6:40	3/30/2023 10:08	0.408	0.974	1.001	1.000
8.800%	4/28/2022	4/30/2023	3/27/2023 9:15	3/30/2023 7:08	3/30/2023 10:08	0.410	0.978	1.001	1.000
5.100%	8/1/2022	7/31/2023	3/27/2023 9:15	3/30/2023 7:08	3/30/2023 10:26	0.410	0.975	1.001	1.000
8.900%	10/25/2022	10/31/2023	3/27/2023 9:15	3/30/2023 7:08	3/30/2023 10:26	0.410	0.975	1.001	1.000
5.300%	2/1/2023	1/31/2024	3/27/2023 9:15	3/30/2023 7:08	3/30/2023 10:26	0.410	0.975	1.001	1.000
5.000%	6/1/2022	5/31/2023	3/27/2023 9:15	3/30/2023 7:08	3/30/2023 10:26	0.410	0.975	1.001	1.000
5.700%	7/1/2022	6/30/2023	3/27/2023 9:15	3/30/2023 7:08	3/30/2023 10:26	0.410	0.975	1.001	1.000
2.200%	11/1/2022	10/31/2023	3/27/2023 9:15	3/30/2023 7:08	3/30/2023 10:26	0.410	0.975	1.001	1.000
7.300%	4/1/2022	3/31/2023	3/27/2023 9:15	3/30/2023 7:08	3/30/2023 10:26	0.410	0.975	1.001	1.000
3.900%	4/28/2022	4/30/2023	3/27/2023 9:15	3/30/2023 7:35	3/30/2023 10:26	0.412	0.979	1.001	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-G
Spike Exp Date : 9/8/2023
Spike Activity (dpm/ml): 297.43
Spike Volume Added: 0.10

LCS S/N : 1715-G
LCS Exp Date : 9/8/2023
LCS Activity (dpm/ml): 297.43
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.1862	0.1315	1	0.5397	1.0612	31.74%	0.7667	0.2333	0.6330	0.6776		SAMPLE				
2	0.2751	0.1942	1	0.6246	0.1181	129.48%	0.1000	0.1291	0.2988	0.3001		SAMPLE				
3	0.3753	0.2650	1	0.8089	0.3720	66.17%	0.2667	0.1764	0.4822	0.4854		SAMPLE				
4	0.4023	0.2841	1	0.8123	0.4070	62.09%	0.3333	0.2055	0.4918	0.4988		SAMPLE				
5	0.3390	0.2393	1	0.7306	0.5040	50.11%	0.4000	0.2000	0.4939	0.5003		SAMPLE				
6	0.4975	0.3512	1	1.0044	1.1071	36.47%	0.7333	0.2625	0.7766	0.8073		SAMPLE				
7	0.1624	0.1146	1	0.4707	0.4426	45.95%	0.3667	0.1667	0.3943	0.4036		SAMPLE				
8	0.1689	0.1193	1	0.4896	1.4649	24.65%	1.1667	0.2848	0.7009	0.7386		SAMPLE				
9	0.2692	0.1901	1	0.6632	0.000E+00	0.00%	0.0000	0.0816	0.2265	0.2267		SAMPLE				
10	0.2714	0.1916	1	0.6163	0.1942	87.48%	0.1667	0.1453	0.3318	0.3341		SAMPLE				
11	0.1777	0.1254	1	0.5150	0.8365	34.83%	0.6333	0.2134	0.5525	0.5837		SAMPLE				
12	0.2315	0.1634	1	0.5702	1.4601	25.06%	1.2000	0.2944	0.7021	0.7474		SAMPLE				
13	0.2767	0.1954	1	0.6283	0.8314	35.15%	0.7000	0.2380	0.5542	0.5853		SAMPLE				
14	0.5666	0.4000	1	1.0979	1.3899	32.38%	0.9333	0.2981	0.8702	0.9046		SAMPLE				
15	0.2829	0.1997	1	0.6097	0.000E+00	0.00%	0.0000	0.1155	0.2379	0.2380		SAMPLE				
16	0.2274	0.1605	1	0.5601	0.1594	93.71%	0.1333	0.1247	0.2922	0.2936		MB				
17	0.2469	0.1743	1	0.6081	1.2977	27.17%	1.0000	0.2708	0.6888	0.7160	612576001.1	DUP	20.1%			
18	1.0662	0.7527	1	2.6263	105.3599	9.43%	18.8000	1.1225	12.3299	24.7100	612576001.1	MS			133.3686	78.2%
19	0.3908	0.2759	1	0.8116	26.1108	6.98%	20.1000	1.1648	2.9656	5.1947		LCS			26.4533	98.7%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 30-MAR-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:37	1	1.19E+05	119307	-1.83		
LUCAS2	EFF	07:36	1	1.34E+05	134035	0.26		
LUCAS3	EFF	07:35	1	1.00E+05	100006	-2.52		
LUCAS4	EFF	07:33	1	1.28E+05	128494	0.9		
LUCAS5	EFF	07:32	1	1.33E+05	133444	0.84		
LUCAS6	EFF	07:31	1	1.29E+05	129492	-1.29		
LUCAS7	EFF	07:29	1	1.34E+05	133959	2.48		
LUCAS8	EFF	07:27	1	1.23E+05	123440	-1.82		

Reviewed by:


Lyndsey Pace

Date: 30-MAR-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2397378

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
612576001	SAMPLE	LXP1	LUCAS7	MAR-30-23 09:33:00	DONE	Lucas Cell	01-NOV-22 00:00
612576002	SAMPLE	LXP1	LUCAS8	MAR-30-23 09:33:00	DONE	Lucas Cell	01-APR-22 00:00
612576003	SAMPLE	LXP1	LUCAS1	MAR-30-23 09:50:00	DONE	Lucas Cell	28-APR-22 00:00
612576004	SAMPLE	LXP1	LUCAS2	MAR-30-23 10:08:00	DONE	Lucas Cell	01-AUG-22 00:00
612576005	SAMPLE	LXP1	LUCAS3	MAR-30-23 10:08:00	DONE	Lucas Cell	25-OCT-22 00:00
612576006	SAMPLE	LXP1	LUCAS4	MAR-30-23 10:08:00	DONE	Lucas Cell	01-FEB-23 00:00
612576007	SAMPLE	LXP1	LUCAS5	MAR-30-23 10:08:00	DONE	Lucas Cell	01-JUN-22 00:00
612576008	SAMPLE	LXP1	LUCAS6	MAR-30-23 10:08:00	DONE	Lucas Cell	01-JUL-22 00:00
612576009	SAMPLE	LXP1	LUCAS7	MAR-30-23 10:08:00	DONE	Lucas Cell	01-NOV-22 00:00
612583001	SAMPLE	LXP1	LUCAS8	MAR-30-23 10:08:00	DONE	Lucas Cell	01-APR-22 00:00
612583002	SAMPLE	LXP1	LUCAS1	MAR-30-23 10:08:00	DONE	Lucas Cell	28-APR-22 00:00
612583003	SAMPLE	LXP1	LUCAS2	MAR-30-23 10:26:00	DONE	Lucas Cell	01-AUG-22 00:00
612583004	SAMPLE	LXP1	LUCAS3	MAR-30-23 10:26:00	DONE	Lucas Cell	25-OCT-22 00:00
612583005	SAMPLE	LXP1	LUCAS4	MAR-30-23 10:26:00	DONE	Lucas Cell	01-FEB-23 00:00
612583006	SAMPLE	LXP1	LUCAS5	MAR-30-23 10:26:00	DONE	Lucas Cell	01-JUN-22 00:00
1205343412	MB	LXP1	LUCAS6	MAR-30-23 10:26:00	DONE	Lucas Cell	01-JUL-22 00:00
1205343413	DUP	LXP1	LUCAS7	MAR-30-23 10:26:00	DONE	Lucas Cell	01-NOV-22 00:00
1205343414	MS	LXP1	LUCAS8	MAR-30-23 10:26:00	DONE	Lucas Cell	01-APR-22 00:00
1205343415	LCS	LXP1	LUCAS1	MAR-30-23 10:26:00	DONE	Lucas Cell	28-APR-22 00:00



Data Verification & Validation Report

Lansing Board of Water & Light – Erickson Power Station

Sampling Event (dates and purpose): Wells MW-14 and MW-15 – Semi-Annual Assessment Monitoring and Background Round 2 – February 2023

Data Package Number: S45490.01
Data Validator: Andrew Byks

Lab Report Date: 3/21/2023
Data Validation Completion Date: 4/9/2023

General Overall Assessment:

- Data are usable without qualification.
- Data are usable with qualification (as noted below).
- Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	
MW-7C	
MW-8	
MW-9	
MW-10	
MW-11	
MW-11B	
MW-12	
MW-12B	
MW-13	
MW-14	X
MW-15	X
MW-16A	
MW-16B	
MW-16C	
MW-16D	

Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-14	GW	S45490.01	2/17/23	X	X	X	X	X	X	
MW-15	GW	S45490.02	2/17/23	X	X	X	X	X	X	
MWT-14	GW	S45490.03	2/17/23	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO₃, CO₃, Hardness

Any planned sampling or analysis NOT completed? If yes, explain: _____

Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Field Data							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
Analytical Data Package							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies for sulfate.
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested		X		RLs for TDS were not met.
			MDLs<RLs	X			
			MDLs<GPS			X	
QC Validation							
Evaluate Accuracy							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Evaluate Precision							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		TSS RPD is 27%, Rad-228 and Combined Rad RPD is 59% and 36%, respectively. Nickel detected in the parent sample and non-detect in the -duplicate sample.
Evaluate Representativeness							
Equipment Blanks (if applicable)	N/A		Non-detect (<RL)			X	
QC Verification							
Verify Instrument Calibration & Analytical Process							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	High recovery for Al, Mo, As, and K
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
Evaluate Completeness (# usable measurements/ # unusable measurements)							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative: None

Comments:

TSS RPD was 27%. TSS required qualification as estimated with low bias (J-) in the parent sample MW-14 and as estimated with high bias (J+) in the field duplicate MWT-14.

Radium 228 and Combined Radium 226+228 RPD was 59% and 36%, respectively. Radium-228 and Combined Radium 226+228 in the parent sample required qualification as estimated with low bias (J-) in the parent sample MW-14 and as estimated with high bias (J+) in the field duplicate MWT-14.

Nickel was detected in the parent sample MW-14 but non-detect in the field duplicate MWT-14. Nickel required qualification as estimated with high bias (J+) in the parent sample and as estimated but not detected (UJ) in the field duplicate MWT-14.



Analytical Laboratory Report

Final Report

Report ID: S45490.01(02)

Generated on 03/21/2023

Replaces report S45490.01(01) generated on 02/21/2023

Report to

Attention: Jennifer Caporale

Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372 FAX:

Email: Environmental_Laboratory@LBWL.com

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Contacts for report questions:

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Barbara Ball (bball@meritlabs.com)

Report Summary

Lab Sample ID(s): S45490.01-S45490.04

Project: Erickson AM MI Wells 14-15

Collected Date(s): 02/17/2023

Submitted Date/Time: 02/17/2023 15:02

Sampled by: Marc Wahrer

P.O. #:

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Maya Murshak

Technical Director



General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

Report Narrative

All analyses completed



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



Sample Summary (4 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S45490.01	MW-14 L302181-01	Groundwater	02/17/23 11:15
S45490.02	MW-15 L302181-02	Groundwater	02/17/23 13:10
S45490.03	MWT-14 L302181-03	Groundwater	02/17/23 11:15
S45490.04	Field Blank L302181-04	Water	02/17/23 10:20



Analytical Laboratory Report

Final Report

Lab Sample ID: S45490.01

Sample Tag: MW-14 L302181-01

Collected Date/Time: 02/17/2023 11:15

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	5.7	IR
2	1L Plastic	None	Yes	5.7	IR
1	250ml Plastic	HNO3	Yes	5.7	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/20/23 12:58	CTV	
Metal Digestion	Completed	SW3015A	02/20/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 02/20/23 10:12, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	111	10	0.13	mg/L	10	16887-00-6	

Method: E300.0, Run Date: 02/20/23 09:27, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	22	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 02/20/23 08:06, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	601	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/21/23 12:00, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	498	10	0.238	mg/L	1		

Method: SM2540C, Run Date: 02/17/23 19:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	732	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/20/23 17:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	4	3	1	mg/L	5		

Metals

Method: E200.8, Run Date: 02/20/23 11:33, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.006	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.119	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	2.23	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S45490.01 (continued)

Sample Tag: MW-14 L302181-01

Method: E200.8, Run Date: 02/20/23 11:33, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	9.46	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.122	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.015	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.005	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 02/20/23 13:26, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	144	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	41.3	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	5.82	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	78.3	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 02/20/23 15:26, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/20/23 13:20, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Lab Sample ID: S45490.02

Sample Tag: MW-15 L302181-02

Collected Date/Time: 02/17/2023 13:10

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	5.7	IR
2	1L Plastic	None	Yes	5.7	IR
1	250ml Plastic	HNO3	Yes	5.7	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/20/23 12:58	CTV	
Metal Digestion	Completed	SW3015A	02/20/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 02/20/23 09:37, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 02/20/23 10:34, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	84	10	0.13	mg/L	10	16887-00-6	
Sulfate	135	10	1.0	mg/L	10	14808-79-8	

Method: SM2320B, Run Date: 02/20/23 08:10, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	354	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/21/23 13:07, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	473	10	0.238	mg/L	1		

Method: SM2540C, Run Date: 02/17/23 19:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	606	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/20/23 17:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 02/20/23 11:38, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.050	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.34	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S45490.02 (continued)

Sample Tag: MW-15 L302181-02

Method: E200.8, Run Date: 02/20/23 11:38, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.04	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	0.026	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 02/20/23 13:29, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	140	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	35.1	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	Not detected	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	30.3	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 02/20/23 15:29, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/20/23 13:20, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S45490.03

Sample Tag: MWT-14 L302181-03

Collected Date/Time: 02/17/2023 11:15

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	5.7	IR
2	1L Plastic	None	Yes	5.7	IR
1	250ml Plastic	HNO3	Yes	5.7	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/20/23 12:58	CTV	
Metal Digestion	Completed	SW3015A	02/20/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 02/20/23 11:14, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	112	10	0.13	mg/L	10	16887-00-6	

Method: E300.0, Run Date: 02/20/23 09:47, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	21	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 02/20/23 08:14, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	606	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/21/23 13:14, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	506	10	0.238	mg/L	1		

Method: SM2540C, Run Date: 02/17/23 19:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	716	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/20/23 17:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	7	3	1	mg/L	2.86		

Metals

Method: E200.8, Run Date: 02/20/23 11:42, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.005	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.116	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	2.20	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S45490.03 (continued)

Sample Tag: MWT-14 L302181-03

Method: E200.8, Run Date: 02/20/23 11:42, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	9.35	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.126	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.014	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 02/20/23 13:31, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	144	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	41.2	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	5.81	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	77.9	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 02/20/23 15:33, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/20/23 13:20, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Lab Sample ID: S45490.04

Sample Tag: Field Blank L302181-04

Collected Date/Time: 02/17/2023 10:20

Matrix: Water

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	5.7	IR
2	1L Plastic	None	Yes	5.7	IR
1	250ml Plastic	HNO3	Yes	5.7	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/20/23 12:58	CTV	
Metal Digestion	Completed	SW3015A	02/20/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 02/20/23 09:47, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfate	Not detected	2.5	0.26	mg/L	2.5	14808-79-8	

Method: E300.0, Run Date: 02/20/23 09:57, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.03	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.04	mg/L	2.5	16984-48-8	

Method: SM2320B, Run Date: 02/20/23 08:16, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10	0.5	mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/21/23 13:17, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	0.238	mg/L	1		

Method: SM2540C, Run Date: 02/17/23 19:20, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/20/23 17:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 02/20/23 11:23, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S45490.04 (continued)

Sample Tag: Field Blank L302181-04

Method: E200.8, Run Date: 02/20/23 11:23, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 02/20/23 13:24, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 02/20/23 15:36, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/20/23 13:20, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

Merit Laboratories Login Checklist

Lab Set ID:S45490

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 14-15

Submitted:02/17/2023 15:02 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Selection	Description	Note
Sample Receiving		
01.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples are received at 4C +/- 2C Thermometer # IR 5.7
02.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Received on ice/ cooling process begun
03.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples shipped
04.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples left in 24 hr. drop box
05.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Are there custody seals/tape or is the drop box locked
Chain of Custody		
06.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC adequately filled out
07.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC signed and relinquished to the lab
08.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sample tag on bottles match COC
09.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Subcontracting needed? Subcontracted to: GEL
Preservation		
10.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Do sample have correct chemical preservation
11.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Completed pH checks on preserved samples? (no VOAs)
12.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Did any samples need to be preserved in the lab?
Bottle Conditions		
13.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	All bottles intact
14.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Appropriate analytical bottles are used
15.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Merit bottles used
16.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sufficient sample volume received
17.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples require laboratory filtration
18.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples submitted within holding time
19.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S45490 Submitted: 02/17/2023 15:02

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 14-15

Attention: Jennifer Caporale
Address: Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Initial Preservation Check: 02/17/2023 15:20 MMC

Preservation Recheck (E200.8): N/A

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S45490.01	1L Plastic HNO3	<2			
S45490.01	1L Plastic HNO3	<2			
S45490.01	250ml Plastic HNO3	<2			
S45490.02	1L Plastic HNO3	<2			
S45490.02	1L Plastic HNO3	<2			
S45490.02	250ml Plastic HNO3	<2			
S45490.03	1L Plastic HNO3	<2			
S45490.03	1L Plastic HNO3	<2			
S45490.03	250ml Plastic HNO3	<2			
S45490.04	1L Plastic HNO3	<2			
S45490.04	1L Plastic HNO3	<2			
S45490.04	250ml Plastic HNO3	<2			

Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total		250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005



March 20, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 611797
SDG: S45490

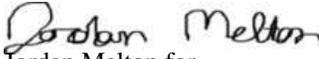
Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on February 22, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,


Jordan Melton for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S45490
Work Order: 611797**

March 20, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on February 22, 2023 for analysis. Chain of Custody form did not contain a relinquished signature. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

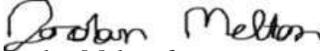
Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
611797001	S45490.01
611797002	S45490.02
611797003	S45490.03
611797004	S45490.04

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.


Jordan Melton for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation



2680 East Lansing Dr., East Lansing, MI 48823
 Phone (517) 332-0167 Fax (517) 332-4034
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

611797

REPORT TO

CONTACT NAME Project Management Team
 COMPANY Merit Laboratories
 ADDRESS 2680 East Lansing Drive
 CITY East Lansing STATE MI ZIP CODE 48823
 PHONE NO. 517-332-0167 FAX NO.
 E-MAIL ADDRESS results@meritlabs.com

CHAIN OF CUSTODY RECORD

CONTACT NAME Julie Teague
 COMPANY Merit Laboratories
 ADDRESS 2680 East Lansing Drive
 CITY East Lansing STATE MI ZIP CODE 48823
 PHONE NO. 517-332-0167 E-MAIL ADDRESS juliet@meritlabs.com

INVOICE TO

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

OBJECT NO./NAME S45490 SAMPLER(S) - PLEASE PRINT/SIGN NAME

TURNAROUND TIME REQUIRED 1 DAY 2 DAYS 3 DAYS STANDARD OTHER
 DELIVERABLES REQUIRED STD LEVEL II LEVEL III LEVEL IV EDD OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WPIPE A=AIR W=WASTE

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR	DATE	TIME	IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives									
							NONE	HCl	HNO ₃	H ₂ O ₂	NaOH	MeOH	OTHER			
	2/17/23	1115		S45490.01	GW	2		2								
	2/17/23	1310		S45490.02	GW	2		2								
	2/17/23	1115		S45490.03	GW	2		2								
	2/17/23	1020		S45490.04	GW	2		2								

Radium 226*		Radium 228**		Certifications	
<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input type="checkbox"/> OHIO VAP	<input type="checkbox"/> Drinking Water
<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input type="checkbox"/> DoD	<input type="checkbox"/> NPDES
<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		Project Locations	
<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input type="checkbox"/> Detroit	<input type="checkbox"/> New York
<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input type="checkbox"/> Other	
				Special Instructions	
				* E903.1 Mod.	
				** E904.0/SW 9320 Mod.	
				Please use calculation product & provide Radium 226/228 combined results on the report	
				(No Ice needed)	
				** Subcontracted to	
				GEL Laboratories, Inc.	
				2040 Savage Road	
				Charleston, SC 29407	

RELINQUISHED BY: M Chalco
 SIGNATURE/ORGANIZATION U.S.
 RECEIVED BY: Hayd
 SIGNATURE/ORGANIZATION
 DATE 2/22/23
 TIME 1:40

RELINQUISHED BY: [Signature]
 SIGNATURE/ORGANIZATION
 RECEIVED BY: [Signature]
 SIGNATURE/ORGANIZATION
 SEAL NO. [] YES [] NO []
 SEAL INTACT [] YES [] NO []
 INITIALS []
 NOTES: []
 TEMP. ON ARRIVAL []
 DATE [] TIME []

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE



Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: **MERI** SDG/AR/COC/Work Order: **611797**
 Received By: **Stacy Boone** Date Received: **FEB 22, 2023**
 Carrier and Tracking Number: **1Z 466 477 03 6322 6250**

Circle Applicable:
 FedEx Express FedEx Ground UPS Field Services Courier Other

Suspected Hazard Information Yes No *If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.

A) Shipped as a DOT Hazardous? Hazard Class Shipped: _____ UN#: _____
 If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___

B) Did the client designate the samples are to be received as radioactive? COC notation or radioactive stickers on containers equal client designation.

C) Did the RSO classify the samples as radioactive? Maximum Net Counts Observed* (Observed Counts - Area Background Counts): CPM / mR/Hr
 Classified as: Rad 1 Rad 2 Rad 3

D) Did the client designate samples are hazardous? COC notation or hazard labels on containers equal client designation.

E) Did the RSO identify possible hazards? If D or E is yes, select Hazards below.
 PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other: _____

Sample Receipt Criteria		Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ deg. C)?*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Preservation Method: Wet Ice Ice Packs Dry ice <u>None</u> Other: _____ *all temperatures are recorded in Celsius TEMP: 19°C
4	Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Temperature Device Serial #: IR3-22 Secondary Temperature Device Serial # (If Applicable): _____
5	Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sample ID's and Containers Affected: If Preservation added, Lot#: _____ If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to YOA Freezer) Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No)
7	Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected: _____
8	Samples received within holding time?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ID's and tests affected: _____
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ID's and containers affected: _____
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Not relinquished Other (describe)
13	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Comments (Use Continuation Form if needed): _____

PM (or PMA) review: Initials **JM** Date **2/22/23** Page **1** of **2**

Laboratory Certifications

List of current GEL Certifications as of 20 March 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S45490
Work Order #: 611797**

Product: Radium-226+Radium-228 Calculation

Analytical Method: Calculation

Analytical Procedure: GL-RAD-D-003 REV# 45

Analytical Batch: 2393678

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
611797001	S45490.01
611797002	S45490.02
611797003	S45490.03
611797004	S45490.04

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2393679

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
611797001	S45490.01
611797002	S45490.02
611797003	S45490.03
611797004	S45490.04
1205336988	Method Blank (MB)
1205336989	611797001(S45490.01) Sample Duplicate (DUP)
1205336990	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2393661

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
611797001	S45490.01
611797002	S45490.02
611797003	S45490.03
611797004	S45490.04
1205336926	Method Blank (MB)
1205336927	611624001(NonSDG) Sample Duplicate (DUP)
1205336928	611624001(NonSDG) Matrix Spike (MS)
1205336929	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

The matrix spike, 1205336928 (Non SDG 611624001MS), aliquot was reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S45490 GEL Work Order: 611797

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 20 MAR 2023

Title: Group Leader

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: March 20, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Lavery
 Project: Routine Analysis

Client Sample ID: S45490.01	Project: MERI00120
Sample ID: 611797001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 17-FEB-23 11:15	
Receive Date: 22-FEB-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.272	+/-1.04	1.92	3.00	pCi/L		JE1	03/15/23	1121	2393679		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.668	+/-1.10			pCi/L		1 NXL1	03/20/23	1320	2393678		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.396	+/-0.364	0.570	1.00	pCi/L		LXP1	03/17/23	1035	2393661		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			74.6	(15%-125%)

Notes:
 Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: March 20, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive
 East Lansing, Michigan 48823
 Contact: John Lavery
 Project: Routine Analysis

Client Sample ID: S45490.02	Project: MERI00120
Sample ID: 611797002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 17-FEB-23 13:10	
Receive Date: 22-FEB-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	-0.367	+/-1.06	2.09	3.00	pCi/L			JE1	03/15/23	1121	2393679	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.334	+/-1.09			pCi/L		1	NXL1	03/20/23	1320	2393678	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.334	+/-0.259	0.319	1.00	pCi/L			LXP1	03/17/23	1035	2393661	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			75.3	(15%-125%)

Notes:
 Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: March 20, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S45490.03	Project: MERI00120
Sample ID: 611797003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 17-FEB-23 11:15	
Receive Date: 22-FEB-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.07	+/-0.988	1.61	3.00	pCi/L		JE1	03/15/23	1121	2393679		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.43	+/-1.06			pCi/L		1 NXL1	03/20/23	1320	2393678		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.363	+/-0.375	0.580	1.00	pCi/L		LXP1	03/17/23	1035	2393661		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			87.6	(15%-125%)

Notes:
 Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: March 20, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S45490.04 Project: MERI00120
Sample ID: 611797004 Client ID: MERI001
Matrix: Ground Water
Collect Date: 17-FEB-23 10:20
Receive Date: 22-FEB-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.896	+/-1.13	1.92	3.00	pCi/L		JE1	03/15/23	1121	2393679	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.27	+/-1.17			pCi/L		1 NXL1	03/20/23	1320	2393678	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.375	+/-0.295	0.399	1.00	pCi/L		LXP1	03/17/23	1035	2393661	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			68.3	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: March 20, 2023

Page 1 of 2

Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan

Contact: John Laverty

Workorder: 611797

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2393679										
QC1205336989	611797001	DUP									
Radium-228	U	0.272	U	0.969	pCi/L	N/A		N/A	JE1	03/15/23	11:21
	Uncertainty	+/-1.04		+/-0.853							
QC1205336990	LCS										
Radium-228	63.4			66.8	pCi/L		105	(75%-125%)		03/15/23	11:21
	Uncertainty			+/-4.53							
QC1205336988	MB										
Radium-228			U	0.668	pCi/L					03/15/23	11:21
	Uncertainty			+/-1.12							
Rad Ra-226											
Batch	2393661										
QC1205336927	611624001	DUP									
Radium-226		1.43		0.491	pCi/L	97.6		(0% - 100%)	LXP1	03/17/23	11:14
	Uncertainty	+/-0.546		+/-0.321							
QC1205336929	LCS										
Radium-226	26.5			22.0	pCi/L		83.2	(75%-125%)		03/17/23	11:17
	Uncertainty			+/-2.00							
QC1205336926	MB										
Radium-226			U	0.492	pCi/L					03/17/23	11:14
	Uncertainty			+/-0.431							
QC1205336928	611624001	MS									
Radium-226	133	1.43		120	pCi/L		88.7	(75%-125%)		03/17/23	11:14
	Uncertainty	+/-0.546		+/-9.89							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- H Analytical holding time was exceeded
- < Result is less than value reported
- > Result is greater than value reported

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Workorder: 611797

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Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
NI											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2393679 Check-list

This check-list was completed on 15-MAR-23 by Kenshalla Oston

This batch was reviewed by Kenshalla Oston on 15-MAR-23 and Rhonda Birch on 15-MAR-23.

Batch ID:
2393679

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?	Yes		
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2393679
Analyst: Jacqueline Emond (JE1)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: LUCAS-C202389980

Due Dates for Lab: 19-MAR-2023			Package: 21-MAR-2023	SDG: 21-MAR-2023		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205336990	228	1952-B	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	611797001	09-MAR-2023	3	300.56	300.56	03/13/23 14:03	03/15/23 08:34
2	611797002	09-MAR-2023	3	300.28	300.28	03/13/23 14:03	03/15/23 08:34
3	611797003	09-MAR-2023	3	300.98	300.98	03/13/23 14:03	03/15/23 08:34
4	611797004	09-MAR-2023	3	301.62	301.62	03/13/23 14:03	03/15/23 08:34
5	613018001	09-MAR-2023	3	301.98	301.98	03/13/23 14:03	03/15/23 08:34
6	613018002	09-MAR-2023	3	302.11	302.11	03/13/23 14:03	03/15/23 08:34
7	1205336988 MB	09-MAR-2023	3	302.11	302.11	03/13/23 14:03	03/15/23 08:34
8	1205336989 DUP (611797001)	09-MAR-2023	3	301.77	301.77	03/13/23 14:03	03/15/23 08:34
9	1205336990 LCS	09-MAR-2023	3		302.11	03/13/23 14:03	03/15/23 08:34

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-D	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 10-MAR-2023 16:25 LUCAS-C202389980 Jacqueline Emond Data Entry Date3: 09-MAR-2023 00:00
REGNT 3877362	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3862351	RGF-1M Citric Acid	5 mL	
REGNT 3878183	2M HCl	20 mL	
REGNT 3877480	RGF-50% Potassium Carbonate	2 mL	
REGNT 3878163	RGF-7M Nitric Acid	25 mL	
REGNT 3857893.11	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT DGA030723	2396801	2 g	
REGNT 3867075.26	RGF-Hydrofluoric Acid	4 mL	
REGNT 3528714	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3521298	RGF-Neodymium Substrate	5 mL	
REGNT 3454413.21	Nitric Acid	5 mL	
REGNT 3465466	Barium Carrier Ra228 REG	1 mL	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 1951-D
 Tracer Exp Date : 6/3/2023
 Tracer Volume Added: 0.10

Batch : 2393679
 Analyst : JAC02417
 Prep Date : 3/9/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 3 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	611797001.1	0.3006	1.8469E-05	2/17/2023 11:15	1174.9	1.68%	876.7	1.95%	0.1	0.000200
2	611797002.1	0.3003	1.8464E-05	2/17/2023 13:10	1174.9	1.68%	884.6	1.94%	0.1	0.000200
3	611797003.1	0.3010	1.8476E-05	2/17/2023 11:15	1174.9	1.68%	1029.8	1.80%	0.1	0.000200
4	611797004.1	0.3016	1.8486E-05	2/17/2023 10:20	1174.9	1.68%	802.0	2.04%	0.1	0.000200
5	613018001.1	0.3020	1.8493E-05	2/21/2023 8:42	1174.9	1.68%	868.1	1.96%	0.1	0.000200
6	613018002.1	0.3021	1.8495E-05	2/21/2023 8:53	1174.9	1.68%	890.2	1.93%	0.1	0.000200
7	1205336988.1	0.3021	1.8495E-05	3/9/2023 0:00	1174.9	1.68%	747.9	2.11%	0.1	0.000200
8	1205336989.1	0.3018	1.8489E-05	2/17/2023 11:15	1174.9	1.68%	1057.5	1.78%	0.1	0.000200
9	1205336990.1	0.3021	1.8495E-05	3/9/2023 0:00	1174.9	1.68%	888.9	1.94%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated Sample Recovery %	Sample Recovery Error %
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction		
1	4D	60	4	37	0.617	3/15/2023 11:21	3/13/2023 14:03	3/15/2023 8:34	0.991	0.730	0.992	1.057	74.6%	2.59%
2	5B	60	9	43	0.717	3/15/2023 11:21	3/13/2023 14:03	3/15/2023 8:34	0.991	0.730	0.992	1.057	75.3%	2.58%
3	5C	60	8	52	0.867	3/15/2023 11:21	3/13/2023 14:03	3/15/2023 8:34	0.991	0.730	0.992	1.057	87.6%	2.48%
4	5D	60	6	41	0.683	3/15/2023 11:21	3/13/2023 14:03	3/15/2023 8:34	0.991	0.730	0.992	1.057	68.3%	2.66%
5	6A	60	16	91	1.517	3/15/2023 11:21	3/13/2023 14:03	3/15/2023 8:34	0.993	0.730	0.992	1.057	73.9%	2.60%
6	6B	60	13	64	1.067	3/15/2023 11:21	3/13/2023 14:03	3/15/2023 8:34	0.993	0.730	0.992	1.057	75.8%	2.57%
7	7A	60	2	36	0.600	3/15/2023 11:21	3/13/2023 14:03	3/15/2023 8:34	0.998	0.731	0.992	1.057	63.7%	2.71%
8	7B	60	10	43	0.717	3/15/2023 11:21	3/13/2023 14:03	3/15/2023 8:34	0.991	0.730	0.992	1.057	90.0%	2.46%
9	7C	60	13	945	15.750	3/15/2023 11:21	3/13/2023 14:03	3/15/2023 8:34	0.998	0.730	0.992	1.057	75.7%	2.58%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.5954	0.00773	0.562	3/13/2023 18:43	500
2	PIC	6/1/2022	5/31/2023	0.6336	0.00426	0.796	3/10/2023 17:27	500
3	PIC	6/1/2022	5/31/2023	0.6242	0.00657	0.602	3/10/2023 16:28	500
4	PIC	6/1/2022	5/31/2023	0.6236	0.00925	0.510	3/10/2023 17:28	500
5	PIC	6/1/2022	5/31/2023	0.6328	0.02228	1.206	3/10/2023 15:02	1000
6	PIC	6/1/2022	5/31/2023	0.6280	0.00851	1.827	3/11/2023 10:23	1000
7	PIC	6/1/2022	5/31/2023	0.6257	0.00594	0.478	3/10/2023 16:28	500
8	PIC	6/1/2022	5/31/2023	0.6366	0.00627	0.464	3/10/2023 16:28	500
9	PIC	6/1/2022	5/31/2023	0.6407	0.00790	0.906	3/10/2023 16:28	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

* - RPD changed to 0% due to sample & dup activity below MDA

LCS S/N : 1952-B
LCS Exp Date : 8/9/2023
LCS Activity (dpm/ml): 425.05
LCS Volume Added: 0.10

Results Pos.	Decision	Critical	Required	Sample Act.		Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA	Sample	Sample	RPD	RER	Nominal	Recovery
	Level	Level	MDA	MDA	Conc.	Error	Rate	Rate Error	Counting	Total Prop.						
	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	%	CPM	CPM	Uncertainty	Uncertainty						
1	1.1857	0.8371	3	1.9226	0.2716	195.35%	0.0547	0.1068	1.0398	1.0421		SAMPLE				
2	1.3155	0.9287	3	2.0891	-0.3674	146.68%	-0.0793	0.1163	1.0562	1.0564		SAMPLE				
3	0.9955	0.7028	3	1.6072	1.0667	47.33%	0.2647	0.1251	0.9882	1.0245		SAMPLE				
4	1.1752	0.8297	3	1.9179	0.8960	64.33%	0.1733	0.1114	1.1286	1.1515		SAMPLE				
5	1.5970	1.1275	3	2.4898	1.4588	52.50%	0.3107	0.1627	1.4978	1.5441		SAMPLE				
6	1.9308	1.3632	3	2.9570	-3.5071	18.61%	-0.7603	0.1400	1.2658	1.2660		SAMPLE				
7	1.2051	0.8508	3	1.9754	0.6680	85.84%	0.1220	0.1047	1.1233	1.1361		MB				
8	0.8317	0.5872	3	1.3662	0.9691	44.98%	0.2527	0.1135	0.8529	0.8876	611797001.1	DUP	* 0.0%			
9	1.3637	0.9628	3	2.1506	66.8048	4.39%	14.8440	0.5141	4.5349	17.5704		LCS			63.3753	105.4%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
611797001	4D	60	4	37	3/15/2023 11:21	3/15/2023 12:21	PIC	2393679
611797002	5B	60	9	43	3/15/2023 11:21	3/15/2023 12:21	PIC	2393679
611797003	5C	60	8	52	3/15/2023 11:21	3/15/2023 12:21	PIC	2393679
611797004	5D	60	6	41	3/15/2023 11:21	3/15/2023 12:21	PIC	2393679
613018001	6A	60	16	91	3/15/2023 11:21	3/15/2023 12:21	PIC	2393679
613018002	6B	60	13	64	3/15/2023 11:21	3/15/2023 12:21	PIC	2393679
1205336988	7A	60	2	36	3/15/2023 11:21	3/15/2023 12:21	PIC	2393679
1205336989	7B	60	10	43	3/15/2023 11:21	3/15/2023 12:21	PIC	2393679
1205336990	7C	60	13	945	3/15/2023 11:21	3/15/2023 12:21	PIC	2393679

ASSAY 15-Mar-23 10:47:49
 Wizard 2480 s/n 46190630
 Protocol id 8 Ba-133
 Time limit
 Count limit
 Isotope Ba-133
 Protocol date 3/15/2023
 Run id. 6336

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	95	1	180	3525.28	1174.92	1.68	10:47:49
611797001	2	95	2	180	2630.57	876.68	1.95	74.62	10:51:03
611797002	3	95	3	180	2654.28	884.6	1.94	75.29	10:54:17
611797003	4	95	4	180	3090	1029.77	1.8	87.65	10:57:31
611797004	5	95	5	180	2406.57	802.03	2.04	68.26	11:00:45
613018001	1	5	1	180	2604.57	868.05	1.96	73.88	11:04:22
613018002	2	5	2	180	2671	890.17	1.93	75.76	11:07:36
1205336988	3	5	3	180	2244	747.86	2.11	63.65	11:10:50
1205336989	4	5	4	180	3173	1057.52	1.78	90.01	11:14:04
1205336990	5	5	5	180	2667.28	888.87	1.94	75.65	11:17:17

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 15-Mar-2023

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z and LB4200 OA1 through OA1

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	Above	Beta bkg	15-Mar 03:30	60	2.150	1.385	3.072	-0.28
LB4100F2	Above	Alpha bkg	15-Mar 03:30	60	0.300	0.042	0.294	+3.16
LB4100F2	Below	Alpha eff	15-Mar 04:40	5	5994	6533	7372	-6.86
LB4100F2	Above	Alpha XTalk	15-Mar 04:40	5	0.388	0.318	0.366	+5.79
LB4100F2	Above	Beta bkg	15-Mar 03:30	60	20.600	1.173	1.833	+173.61
LB4100G1	need 2nd	Beta bkg	15-Mar 03:31	60	1.017	0.380	1.675	-0.05
LB4100G1	Below	Beta eff	15-Mar 04:40	5	12745	12880	18320	-3.15
LB4100G3	Below	Alpha eff	15-Mar 04:33	5	4708	5785	8229	-5.65
LB4100G3	Above	Alpha XTalk	15-Mar 04:33	5	0.556	0.275	0.391	+11.50
LB4100G3	Below	Beta eff	15-Mar 04:40	5	16478	19160	24060	-6.28
LB4100H1	Above	Beta bkg	15-Mar 03:30	60	2.933	0.216	2.462	+4.26
PIC12C	Above	Beta bkg	15-Mar 09:03	60	2.517	0.142	2.845	+2.27
PIC13A	Above	Alpha bkg	15-Mar 12:35	60	0.317	-9.05E-2	0.347	+2.58

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100A1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4200OA1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by 

Date 3/15/23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2393679

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205336988	MB	JE1	PIC7A	MAR-15-23 11:21:08	DONE	25mm Filter	01-JUN-22 00:00
1205336989	DUP	JE1	PIC7B	MAR-15-23 11:21:13	DONE	25mm Filter	01-JUN-22 00:00
1205336990	LCS	JE1	PIC7C	MAR-15-23 11:21:17	DONE	25mm Filter	01-JUN-22 00:00
611797001	SAMPLE	JE1	PIC4D	MAR-15-23 11:21:24	DONE	25mm Filter	01-JUN-22 00:00
611797002	SAMPLE	JE1	PIC5B	MAR-15-23 11:21:28	DONE	25mm Filter	01-JUN-22 00:00
611797003	SAMPLE	JE1	PIC5C	MAR-15-23 11:21:32	DONE	25mm Filter	01-JUN-22 00:00
611797004	SAMPLE	JE1	PIC5D	MAR-15-23 11:21:36	DONE	25mm Filter	01-JUN-22 00:00
613018001	SAMPLE	JE1	PIC6A	MAR-15-23 11:21:40	DONE	25mm Filter	01-JUN-22 00:00
613018002	SAMPLE	JE1	PIC6B	MAR-15-23 11:21:44	DONE	25mm Filter	01-JUN-22 00:00

Lucas Cell Raw Data

Batch 2393661 Check-list

This check-list was completed on 19-MAR-23 by Lyndsey Pace

This batch was reviewed by Gregory Ramsay on 17-MAR-23 and Lyndsey Pace on 19-MAR-23.

Batch ID:
2393661

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous		No	
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2393661
Analyst: Lyndsey Pace (LXP1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: LUCAS-C202389980

Due Dates for Lab: 19-MAR-2023			Package: 21-MAR-2023		SDG: 21-MAR-2023	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
MS	1205336928	Radium-226 SPIKE	1715-G	.1	mL	
LCS	1205336929	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	611624001	09-MAR-2023	.999	501.34	501.34	03/14/23 09:20	607	03/17/23 06:10	03/17/23 09:10	5	39
2	611626001	09-MAR-2023	.999	506.04	506.04	03/14/23 09:20	708	03/17/23 06:10	03/17/23 09:10	3	82
3	611627001	09-MAR-2023	.999	500	500	03/14/23 09:20	106	03/17/23 06:41	03/17/23 09:48	4	12
4	611628001	09-MAR-2023	.999	500.6	500.6	03/14/23 09:20	201	03/17/23 06:41	03/17/23 09:48	8	15
5	611629001	09-MAR-2023	.999	503.68	503.68	03/14/23 09:20	308	03/17/23 06:41	03/17/23 09:48	8	15
6	611630001	09-MAR-2023	.999	502.64	502.64	03/14/23 09:20	403	03/17/23 06:41	03/17/23 09:48	4	12
7	611632001	09-MAR-2023	.999	501.18	501.18	03/14/23 09:20	506	03/17/23 06:41	03/17/23 09:48	4	17
8	611634001	09-MAR-2023	.999	503.91	503.91	03/14/23 09:20	604	03/17/23 06:41	03/17/23 09:48	2	26
9	611635001	09-MAR-2023	.999	504.76	504.76	03/14/23 09:20	704	03/17/23 06:41	03/17/23 09:48	5	20
10	611718001	09-MAR-2023	.999	503.84	503.84	03/14/23 09:20	105	03/17/23 07:15	03/17/23 10:35	3	7
11	611797001	09-MAR-2023	1	505.74	505.74	03/14/23 09:20	206	03/17/23 07:15	03/17/23 10:35	6	16
12	611797002	09-MAR-2023	1	500.93	500.93	03/14/23 09:20	302	03/17/23 07:15	03/17/23 10:35	1	9
13	611797003	09-MAR-2023	1	501.65	501.65	03/14/23 09:20	401	03/17/23 07:15	03/17/23 10:35	2	8
14	611797004	09-MAR-2023	1	500.41	500.41	03/14/23 09:20	508	03/17/23 07:15	03/17/23 10:35	2	11
15	611829001	09-MAR-2023	.999	501.97	501.97	03/14/23 09:20	608	03/17/23 07:15	03/17/23 10:35	1	29
16	611846001	09-MAR-2023	.999	500.88	500.88	03/14/23 09:20	707	03/17/23 07:15	03/17/23 10:35	2	17
17	611846002	09-MAR-2023	.999	500.3	500.3	03/14/23 09:20	805	03/17/23 07:15	03/17/23 10:35	3	2
18	611846003	09-MAR-2023	.999	500.17	500.17	03/14/23 09:20	101	03/17/23 07:51	03/17/23 11:14	2	11
19	613018001	09-MAR-2023	1	500.81	500.81	03/14/23 09:20	208	03/17/23 07:51	03/17/23 11:14	3	23
20	613018002	09-MAR-2023	1	500.22	500.22	03/14/23 09:20	303	03/17/23 07:51	03/17/23 11:14	3	43
21	1205336926 MB	09-MAR-2023	.999		506.04	03/14/23 09:20	408	03/17/23 07:51	03/17/23 11:14	5	15
22	1205336927 DUP (611624001)	09-MAR-2023	.999	501.11	501.11	03/14/23 09:20	501	03/17/23 07:51	03/17/23 11:14	2	14
23	1205336928 MS (611624001)	09-MAR-2023	.999	100.52	100.52	03/14/23 09:20	601	03/17/23 07:51	03/17/23 11:14	2	569
24	1205336929 LCS	09-MAR-2023	.999		506.04	03/14/23 09:20	706	03/17/23 07:51	03/17/23 11:17	3	477

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 09-MAR-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Procedure Code : LUC26RAL
 Parmname : Radium-226
 Required MDA : 1 pCi/L
 Halfife of Ra-226 : 1600 years
 Ra-226 Abundance : 1.00
 Halflife of Rn-222: 3.8235 days

Batch : 2393661
 Analyst : LIN01615
 Prep Date : 3/9/2023
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	611624001.1	0.5013	2.0261E-05	2/16/2023 12:00	607	30	39	1.300	5	0.167	30	1.8040
2	611626001.1	0.5060	2.0280E-05	2/15/2023 12:00	708	30	82	2.733	3	0.100	30	1.6020
3	611627001.1	0.5000	2.0256E-05	2/15/2023 13:00	106	30	12	0.400	4	0.133	30	1.6990
4	611628001.1	0.5006	2.0258E-05	2/15/2023 10:50	201	30	15	0.500	8	0.267	30	1.7110
5	611629001.1	0.5037	2.0271E-05	2/16/2023 11:30	308	30	15	0.500	8	0.267	30	1.5970
6	611630001.1	0.5026	2.0267E-05	2/15/2023 14:30	403	30	12	0.400	4	0.133	30	1.5070
7	611632001.1	0.5012	2.0261E-05	2/16/2023 13:00	506	30	17	0.567	4	0.133	30	1.7710
8	611634001.1	0.5039	2.0272E-05	2/16/2023 10:30	604	30	26	0.867	2	0.067	30	1.6810
9	611635001.1	0.5048	2.0275E-05	2/15/2023 13:45	704	30	20	0.667	5	0.167	30	1.5870
10	611718001.1	0.5038	2.0272E-05	2/15/2023 10:15	105	30	7	0.233	3	0.100	30	1.5830
11	611797001.1	0.5057	2.0279E-05	2/17/2023 11:15	206	30	16	0.533	6	0.200	30	1.8770
12	611797002.1	0.5009	2.0260E-05	2/17/2023 13:10	302	30	9	0.300	1	0.033	30	1.7980
13	611797003.1	0.5017	2.0263E-05	2/17/2023 11:15	401	30	8	0.267	2	0.067	30	1.2390
14	611797004.1	0.5004	2.0258E-05	2/17/2023 10:20	508	30	11	0.367	2	0.067	30	1.8020
15	611829001.1	0.5020	2.0264E-05	2/16/2023 12:00	608	30	29	0.967	1	0.033	30	1.7970
16	611846001.1	0.5009	2.0259E-05	2/15/2023 12:45	707	30	17	0.567	2	0.067	30	1.7280
17	611846002.1	0.5003	2.0257E-05	2/15/2023 13:30	805	30	2	0.067	3	0.100	30	1.9080
18	611846003.1	0.5002	2.0257E-05	2/15/2023 14:50	101	30	11	0.367	2	0.067	30	1.5720
19	613018001.1	0.5008	2.0259E-05	2/21/2023 8:42	208	30	23	0.767	3	0.100	30	1.7740
20	613018002.1	0.5002	2.0257E-05	2/21/2023 8:53	303	30	43	1.433	3	0.100	30	1.7210
21	1205336926.1	0.5060	2.0280E-05	3/9/2023 0:00	408	30	15	0.500	5	0.167	30	1.5020
22	1205336927.1	0.5011	2.0260E-05	2/16/2023 12:00	501	30	14	0.467	2	0.067	30	1.8220
23	1205336928.1	0.1005	1.1402E-05	2/16/2023 12:00	601	30	569	18.967	2	0.067	30	1.7610
24	1205336929.1	0.5060	2.0280E-05	3/9/2023 0:00	706	30	477	15.900	3	0.100	30	1.5900

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
3.400%	7/1/2022	6/30/2023	3/14/2023 9:20	3/17/2023 6:10	3/17/2023 9:10	0.405	0.978	1.002	1.000
7.700%	11/1/2022	10/31/2023	3/14/2023 9:20	3/17/2023 6:10	3/17/2023 9:10	0.405	0.978	1.002	1.000
8.800%	4/28/2022	4/30/2023	3/14/2023 9:20	3/17/2023 6:41	3/17/2023 9:48	0.408	0.977	1.002	1.000
8.900%	8/1/2022	7/31/2023	3/14/2023 9:20	3/17/2023 6:41	3/17/2023 9:48	0.408	0.977	1.002	1.000
9.600%	10/25/2022	10/31/2023	3/14/2023 9:20	3/17/2023 6:41	3/17/2023 9:48	0.408	0.977	1.002	1.000
6.100%	2/1/2023	1/31/2024	3/14/2023 9:20	3/17/2023 6:41	3/17/2023 9:48	0.408	0.977	1.002	1.000
5.300%	6/1/2022	5/31/2023	3/14/2023 9:20	3/17/2023 6:41	3/17/2023 9:48	0.408	0.977	1.002	1.000
6.700%	7/1/2022	6/30/2023	3/14/2023 9:20	3/17/2023 6:41	3/17/2023 9:48	0.408	0.977	1.002	1.000
4.200%	11/1/2022	10/31/2023	3/14/2023 9:20	3/17/2023 6:41	3/17/2023 9:48	0.408	0.977	1.002	1.000
0.500%	4/28/2022	4/30/2023	3/14/2023 9:20	3/17/2023 7:15	3/17/2023 10:35	0.410	0.975	1.002	1.000
2.800%	8/1/2022	7/31/2023	3/14/2023 9:20	3/17/2023 7:15	3/17/2023 10:35	0.410	0.975	1.002	1.000
3.300%	10/25/2022	10/31/2023	3/14/2023 9:20	3/17/2023 7:15	3/17/2023 10:35	0.410	0.975	1.002	1.000
3.100%	2/1/2023	1/31/2024	3/14/2023 9:20	3/17/2023 7:15	3/17/2023 10:35	0.410	0.975	1.002	1.000
4.500%	6/1/2022	5/31/2023	3/14/2023 9:20	3/17/2023 7:15	3/17/2023 10:35	0.410	0.975	1.002	1.000
6.300%	7/1/2022	6/30/2023	3/14/2023 9:20	3/17/2023 7:15	3/17/2023 10:35	0.410	0.975	1.002	1.000
2.200%	11/1/2022	10/31/2023	3/14/2023 9:20	3/17/2023 7:15	3/17/2023 10:35	0.410	0.975	1.002	1.000
7.400%	4/1/2022	3/31/2023	3/14/2023 9:20	3/17/2023 7:15	3/17/2023 10:35	0.410	0.975	1.002	1.000
1.200%	4/28/2022	4/30/2023	3/14/2023 9:20	3/17/2023 7:51	3/17/2023 11:14	0.413	0.975	1.002	1.000
5.500%	8/1/2022	7/31/2023	3/14/2023 9:20	3/17/2023 7:51	3/17/2023 11:14	0.413	0.975	1.002	1.000
7.400%	10/25/2022	10/31/2023	3/14/2023 9:20	3/17/2023 7:51	3/17/2023 11:14	0.413	0.975	1.002	1.000
7.000%	2/1/2023	1/31/2024	3/14/2023 9:20	3/17/2023 7:51	3/17/2023 11:14	0.413	0.975	1.002	1.000
7.900%	6/1/2022	5/31/2023	3/14/2023 9:20	3/17/2023 7:51	3/17/2023 11:14	0.413	0.975	1.002	1.000
9.400%	7/1/2022	6/30/2023	3/14/2023 9:20	3/17/2023 7:51	3/17/2023 11:14	0.413	0.975	1.002	1.000
2.900%	11/1/2022	10/31/2023	3/14/2023 9:20	3/17/2023 7:51	3/17/2023 11:17	0.413	0.974	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-G
Spike Exp Date : 9/8/2023
Spike Activity (dpm/ml): 297.43
Spike Volume Added: 0.10

LCS S/N : 1715-G
LCS Exp Date : 9/8/2023
LCS Activity (dpm/ml): 297.43
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.3092	0.2183	1	0.5625	1.4269	19.80%	1.1333	0.2211	0.5456	0.5909		SAMPLE				
2	0.2672	0.1887	1	0.5178	3.6987	13.98%	2.6333	0.3073	0.8460	1.1456		SAMPLE				
3	0.2930	0.2069	1	0.5472	0.3557	50.77%	0.2667	0.1333	0.3486	0.3577		SAMPLE				
4	0.4110	0.2902	1	0.7127	0.3087	69.09%	0.2333	0.1599	0.4145	0.4204		SAMPLE				
5	0.4377	0.3090	1	0.7589	0.3287	69.18%	0.2333	0.1599	0.4414	0.4482		SAMPLE				
6	0.3286	0.2320	1	0.6136	0.3989	50.37%	0.2667	0.1333	0.3910	0.3980		SAMPLE				
7	0.2805	0.1980	1	0.5237	0.5532	35.65%	0.4333	0.1528	0.3822	0.3947		SAMPLE				
8	0.2078	0.1467	1	0.4272	1.0702	23.04%	0.8000	0.1764	0.4625	0.5075		SAMPLE				
9	0.3474	0.2453	1	0.6320	0.7073	33.60%	0.5000	0.1667	0.4621	0.4768		SAMPLE				
10	0.2691	0.1900	1	0.5214	0.1886	79.06%	0.1333	0.1054	0.2922	0.2935		SAMPLE				
11	0.3197	0.2257	1	0.5703	0.3961	46.99%	0.3333	0.1563	0.3641	0.3693		SAMPLE				
12	0.1376	0.0971	1	0.3195	0.3340	39.67%	0.2667	0.1054	0.2588	0.2641		SAMPLE				
13	0.2819	0.1990	1	0.5796	0.3630	52.80%	0.2000	0.1054	0.3750	0.3792		SAMPLE				
14	0.1943	0.1372	1	0.3995	0.3753	40.31%	0.3000	0.1202	0.2947	0.3014		SAMPLE				
15	0.1374	0.0970	1	0.3190	1.1672	20.55%	0.9333	0.1826	0.4475	0.4994		SAMPLE				
16	0.2024	0.1429	1	0.4162	0.6517	29.14%	0.5000	0.1453	0.3712	0.3839		SAMPLE				
17	0.2248	0.1587	1	0.4356	-0.0394	223.73%	-0.0333	0.0745	0.1726	0.1728		SAMPLE				
18	0.2215	0.1564	1	0.4554	0.4278	40.08%	0.3000	0.1202	0.3359	0.3417		SAMPLE				
19	0.2401	0.1695	1	0.4652	0.8413	26.08%	0.6667	0.1700	0.4204	0.4469		SAMPLE				
20	0.2478	0.1749	1	0.4801	1.7365	18.50%	1.3333	0.2261	0.5771	0.6777		SAMPLE				
21	0.3623	0.2558	1	0.6591	0.4917	45.27%	0.3333	0.1491	0.4310	0.4420		MB				
22	0.1907	0.1347	1	0.3921	0.4912	34.26%	0.4000	0.1333	0.3209	0.3373	611624001.1	DUP	97.6%			
23	0.9839	0.6946	1	2.0226	119.7089	10.30%	18.9000	0.7965	9.8882	29.7121	611624001.1	MS			133.2878	88.7%
24	0.2652	0.1872	1	0.5138	22.0245	5.46%	15.8000	0.7303	1.9953	3.9567		LCS			26.4757	83.2%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 17-MAR-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	08:39	1	1.19E+05	119152	-1.98		
LUCAS2	EFF	08:40	1	1.32E+05	132244	-1.13		
LUCAS3	EFF	08:42	1	1.02E+05	102205	-1.41		
LUCAS4	EFF	08:43	1	1.28E+05	127847	-0.08		
LUCAS5	EFF	08:45	1	1.34E+05	133930	1.32		
LUCAS6	EFF	08:46	1	1.29E+05	129167	-1.7		
LUCAS7	EFF	09:46	1	1.31E+05	131183	0.65		
LUCAS8	EFF	08:51	1	1.37E+05	136679	0.93		

Reviewed by:



Elizabeth Krouse

Date: 17-MAR-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2393661

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
611624001	SAMPLE	LXP1	LUCAS6	MAR-17-23 09:10:00	DONE	Lucas Cell	01-JUL-22 00:00
611626001	SAMPLE	LXP1	LUCAS7	MAR-17-23 09:10:00	DONE	Lucas Cell	01-NOV-22 00:00
611627001	SAMPLE	LXP1	LUCAS1	MAR-17-23 09:48:00	DONE	Lucas Cell	28-APR-22 00:00
611628001	SAMPLE	LXP1	LUCAS2	MAR-17-23 09:48:00	DONE	Lucas Cell	01-AUG-22 00:00
611629001	SAMPLE	LXP1	LUCAS3	MAR-17-23 09:48:00	DONE	Lucas Cell	25-OCT-22 00:00
611630001	SAMPLE	LXP1	LUCAS4	MAR-17-23 09:48:00	DONE	Lucas Cell	01-FEB-23 00:00
611632001	SAMPLE	LXP1	LUCAS5	MAR-17-23 09:48:00	DONE	Lucas Cell	01-JUN-22 00:00
611634001	SAMPLE	LXP1	LUCAS6	MAR-17-23 09:48:00	DONE	Lucas Cell	01-JUL-22 00:00
611635001	SAMPLE	LXP1	LUCAS7	MAR-17-23 09:48:00	DONE	Lucas Cell	01-NOV-22 00:00
611718001	SAMPLE	LXP1	LUCAS1	MAR-17-23 10:35:00	DONE	Lucas Cell	28-APR-22 00:00
611797001	SAMPLE	LXP1	LUCAS2	MAR-17-23 10:35:00	DONE	Lucas Cell	01-AUG-22 00:00
611797002	SAMPLE	LXP1	LUCAS3	MAR-17-23 10:35:00	DONE	Lucas Cell	25-OCT-22 00:00
611797003	SAMPLE	LXP1	LUCAS4	MAR-17-23 10:35:00	DONE	Lucas Cell	01-FEB-23 00:00
611797004	SAMPLE	LXP1	LUCAS5	MAR-17-23 10:35:00	DONE	Lucas Cell	01-JUN-22 00:00
611829001	SAMPLE	LXP1	LUCAS6	MAR-17-23 10:35:00	DONE	Lucas Cell	01-JUL-22 00:00
611846001	SAMPLE	LXP1	LUCAS7	MAR-17-23 10:35:00	DONE	Lucas Cell	01-NOV-22 00:00
611846002	SAMPLE	LXP1	LUCAS8	MAR-17-23 10:35:00	DONE	Lucas Cell	01-APR-22 00:00
611846003	SAMPLE	LXP1	LUCAS1	MAR-17-23 11:14:00	DONE	Lucas Cell	28-APR-22 00:00
613018001	SAMPLE	LXP1	LUCAS2	MAR-17-23 11:14:00	DONE	Lucas Cell	01-AUG-22 00:00
613018002	SAMPLE	LXP1	LUCAS3	MAR-17-23 11:14:00	DONE	Lucas Cell	25-OCT-22 00:00
1205336926	MB	LXP1	LUCAS4	MAR-17-23 11:14:00	DONE	Lucas Cell	01-FEB-23 00:00
1205336927	DUP	LXP1	LUCAS5	MAR-17-23 11:14:00	DONE	Lucas Cell	01-JUN-22 00:00
1205336928	MS	LXP1	LUCAS6	MAR-17-23 11:14:00	DONE	Lucas Cell	01-JUL-22 00:00
1205336929	LCS	LXP1	LUCAS7	MAR-17-23 11:17:00	DONE	Lucas Cell	01-NOV-22 00:00



Data Verification & Validation Report

Lansing Board of Water & Light – Erickson Power Station

Sampling Event (dates and purpose): New Wells MW-16A/B/C/D – Background Round 1 – February 2023

Data Package Number: S44989.01
Data Validator: Aryka Thomson

Lab Report Date: 03/21/2023
Data Validation Completion Date: 04/03/2023

General Overall Assessment:

- Data are usable without qualification.
- Data are usable with qualification (as noted below).
- Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	
MW-7C	
MW-8	
MW-9	
MW-10	
MW-11	
MW-11B	
MW-12	
MW-12B	
MW-13	
MW-14	
MW-15	
MW-16A	X
MW-16B	X
MW-16C	X
MW-16D	X

Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-16A	GW	S44989.01	02/02/2023	X	X	X	X	X	X	
MW-16B	GW	S44989.02	02/02/2023	X	X	X	X	X	X	
MW-16C	GW	S44989.03	02/02/2023	X	X	X	X	X	X	X
MW-16D	GW	S44989.04	02/02/2023	X	X	X	X	X	X	
MWT-16A	QC	S44989.05	02/02/2023	X	X	X	X	X	X	
EB (MW-16D)	QC	S44989.07	02/02/2023	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO₃, CO₃, hardness

Any planned sampling or analysis NOT completed? If yes, explain: _____

Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Field Data							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan		X		MW-16C turbidity > 10 NTU. An additional container was collected for dissolved metals analysis.
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation		X	Record of decontamination for non-dedicated sampling equipment		X		Decontamination was not documented. A dedicated pump has since been installed.
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
Analytical Data Package							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies for calcium, sodium, and sulfate
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested	X			RLs for TDS, chloride, sodium, and sulfate were not met
			MDLs<RLs		X		RL=MDL for carbonate
			MDLs<GPS			X	
QC Validation							
Evaluate Accuracy							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Evaluate Precision							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Lithium detected in parent and non-detect in field duplicate Combined Radium 226+228 RPD 27%
Evaluate Representativeness							
Equipment Blanks (if applicable)	X		Non-detect (<RL)	X			
QC Verification							
Verify Instrument Calibration & Analytical Process							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	High recovery for Al and Li
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
Evaluate Completeness (# usable measurements/ # unusable measurements)							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative: None

Comments:

Lithium was detected in the parent sample MW-16A but not detected in the field duplicate MWT-16A. Lithium required qualification as estimated with high bias (J+) in the parent sample MW-16A and as estimated but not detected (UJ) in the field duplicate MWT-16A.

Combined Radium 226+228 RPD was 27%. Radium-228 required qualification as estimated with high bias (J+) in the parent sample MW-16A and as estimated with low bias (J-) in the field duplicate MWT-16A. Combined Radium 226+228 was lower in the parent sample and higher in the field duplicate. This was resolved by qualifying the Combined Radium in both MW-16A and MWT-16A as estimated (J) with no bias.



Report ID: S44989.01(02)
Generated on 03/09/2023
Replaces report S44989.01(01) generated on 02/07/2023

Report to
Attention: Jennifer Caporale
Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

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Report Summary
Lab Sample ID(s): S44989.01-S44989.07
Project: Erickson AM MI Wells 16A-16D
Collected Date(s): 02/02/2023
Submitted Date/Time: 02/03/2023 10:50
Sampled by: Marc Wahrer
P.O. #:

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Maya Murshak
Technical Director



General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

Report Narrative

All analyses completed



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



Sample Summary (7 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S44989.01	MW-16A L301214-01	Groundwater	02/02/23 09:35
S44989.02	MW-16B L301214-02	Groundwater	02/02/23 11:10
S44989.03	MW-16C L301214-03	Groundwater	02/02/23 14:08
S44989.04	MW-16D L301214-04	Groundwater	02/02/23 16:08
S44989.05	MWT- L301214-05	Groundwater	02/02/23 09:35
S44989.06	Field blank - L301214-06	Groundwater	02/02/23 08:15
S44989.07	Equipment Blank - L301214-07	Groundwater	02/02/23 08:30



Analytical Laboratory Report

Final Report

Lab Sample ID: S44989.01

Sample Tag: MW-16A L301214-01

Collected Date/Time: 02/02/2023 09:35

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.1	IR
2	1L Plastic	None	Yes	2.1	IR
1	250ml Plastic	HNO3	Yes	2.1	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/07/23 12:06	CTV	
Metal Digestion	Completed	SW3015A	02/07/23 09:40	CCM	

Inorganics

Method: E300.0, Run Date: 02/03/23 13:58, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 02/03/23 15:18, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	383	25	0.32	mg/L	25	16887-00-6	
Sulfate	145	25	2.6	mg/L	25	14808-79-8	

Method: SM2320B, Run Date: 02/03/23 15:06, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	610	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/03/23 13:00, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	608	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 02/03/23 16:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,360	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/06/23 17:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	7	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 02/07/23 11:15, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.003	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.160	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.21	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S44989.01 (continued)

Sample Tag: MW-16A L301214-01

Method: E200.8, Run Date: 02/07/23 11:15, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	3.71	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.005	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 02/07/23 13:14, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	179	2.5	0.217	mg/L	25	7440-70-2	
Magnesium	42.4	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	2.12	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	276	2.5	0.0425	mg/L	25	7440-23-5	

Method: E245.1, Run Date: 02/07/23 13:26, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/08/23 14:25, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Lab Sample ID: S44989.02

Sample Tag: MW-16B L301214-02

Collected Date/Time: 02/02/2023 11:10

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.1	IR
2	1L Plastic	None	Yes	2.1	IR
1	250ml Plastic	HNO3	Yes	2.1	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/07/23 12:06	CTV	
Metal Digestion	Completed	SW3015A	02/07/23 09:40	CCM	

Inorganics

Method: E300.0, Run Date: 02/03/23 14:08, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	18	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 02/03/23 15:10, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	390	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/03/23 13:02, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	322	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 02/03/23 16:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	366	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/06/23 17:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	7	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 02/07/23 11:19, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.090	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.12	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.93	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S44989.02 (continued)

Sample Tag: MW-16B L301214-02

Method: E200.8, Run Date: 02/07/23 11:19, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.023	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.008	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 02/07/23 13:17, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	74.5	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	29.7	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	3.81	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	24.5	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 02/07/23 13:30, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/08/23 14:25, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S44989.03

Sample Tag: MW-16C L301214-03

Collected Date/Time: 02/02/2023 14:08

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.1	IR
2	1L Plastic	None	Yes	2.1	IR
1	250ml Plastic	HNO3	Yes	2.1	IR
1	250ml Plastic	None	Yes	2.1	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/07/23 12:06	CTV	
Mercury Digestion	Completed	E245.1	02/07/23 12:06	CTV	
Metal Digestion	Completed	SW3015A	02/07/23 09:40	CCM	
Metal Digestion	Completed	SW3015A	02/07/23 09:40	CCM	

Inorganics

Method: E300.0, Run Date: 02/03/23 14:18, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	8	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	19	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 02/03/23 15:12, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	370	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/03/23 13:08, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	263	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 02/03/23 16:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	418	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/06/23 17:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	40	3	1	mg/L	2		

Metals

Method: E200.8, Run Date: 02/07/23 11:22, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.002	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.051	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.40	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Lab Sample ID: S44989.03 (continued)

Sample Tag: MW-16C L301214-03

Method: E200.8, Run Date: 02/07/23 11:22, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.76	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.030	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.007	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 02/07/23 11:25, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony, Dissolved*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic, Dissolved	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium, Dissolved	0.048	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium, Dissolved	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron, Dissolved	0.40	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium, Dissolved	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium, Dissolved	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt, Dissolved	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper, Dissolved	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron, Dissolved	0.02	0.02	0.00192	mg/L	5	7439-89-6	
Lead, Dissolved	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium, Dissolved*	0.029	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum, Dissolved	0.007	0.005	0.000217	mg/L	5	7439-98-7	
Nickel, Dissolved	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium, Dissolved	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver, Dissolved	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium, Dissolved	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium, Dissolved	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc, Dissolved	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 02/07/23 13:18, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	63.2	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	24.4	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	3.72	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	39.4	0.50	0.00850	mg/L	5	7440-23-5	

Method: E200.8, Run Date: 02/07/23 13:20, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium, Dissolved*	63.5	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium, Dissolved	23.2	0.50	0.0120	mg/L	5	7439-95-4	
Potassium, Dissolved	3.64	0.50	0.0230	mg/L	5	7440-09-7	
Sodium, Dissolved	38.7	0.50	0.00850	mg/L	5	7440-23-5	



Analytical Laboratory Report

Final Report

Lab Sample ID: S44989.03 (continued)

Sample Tag: MW-16C L301214-03

Method: E245.1, Run Date: 02/07/23 13:43, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury, Dissolved	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Method: E245.1, Run Date: 02/07/23 13:33, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/08/23 14:25, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S44989.04

Sample Tag: MW-16D L301214-04

Collected Date/Time: 02/02/2023 16:08

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.1	IR
2	1L Plastic	None	Yes	2.1	IR
1	250ml Plastic	HNO3	Yes	2.1	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/07/23 12:06	CTV	
Metal Digestion	Completed	SW3015A	02/07/23 09:40	CCM	

Inorganics

Method: E300.0, Run Date: 02/03/23 14:28, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	6	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 02/03/23 15:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	380	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/03/23 13:10, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	96	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 02/03/23 16:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	366	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/06/23 17:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	5	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 02/07/23 11:29, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.037	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	4.65	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	0.010	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.16	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S44989.04 (continued)

Sample Tag: MW-16D L301214-04

Method: E200.8, Run Date: 02/07/23 11:29, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.039	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.005	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.011	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 02/07/23 13:21, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	29.3	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	6.99	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	9.40	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	106	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 02/07/23 13:46, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/08/23 14:25, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S44989.05

Sample Tag: MWT- L301214-05

Collected Date/Time: 02/02/2023 09:35

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.1	IR
2	1L Plastic	None	Yes	2.1	IR
1	250ml Plastic	HNO3	Yes	2.1	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/07/23 12:06	CTV	
Metal Digestion	Completed	SW3015A	02/07/23 09:40	CCM	

Inorganics

Method: E300.0, Run Date: 02/03/23 14:38, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 02/03/23 15:39, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	383	25	0.32	mg/L	25	16887-00-6	
Sulfate	146	25	2.6	mg/L	25	14808-79-8	

Method: SM2320B, Run Date: 02/03/23 15:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	620	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/03/23 13:12, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	605	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 02/03/23 16:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,350	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/06/23 17:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	7	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 02/07/23 11:32, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.004	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.156	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.21	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S44989.05 (continued)

Sample Tag: MWT- L301214-05

Method: E200.8, Run Date: 02/07/23 11:32, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	3.70	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 02/07/23 13:23, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	176	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	42.3	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	2.06	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	281	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 02/07/23 13:49, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/08/23 14:25, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Lab Sample ID: S44989.06

Sample Tag: Field blank - L301214-06

Collected Date/Time: 02/02/2023 08:15

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.1	IR
2	1L Plastic	None	Yes	2.1	IR
1	250ml Plastic	HNO3	Yes	2.1	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/07/23 12:06	CTV	
Metal Digestion	Completed	SW3015A	02/07/23 09:40	CCM	

Inorganics

Method: E300.0, Run Date: 02/03/23 14:48, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.03	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.04	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.26	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 02/03/23 15:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/03/23 13:14, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 02/03/23 16:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/06/23 17:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 02/07/23 11:10, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S44989.06 (continued)

Sample Tag: Field blank - L301214-06

Method: E200.8, Run Date: 02/07/23 11:10, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 02/07/23 13:12, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 02/07/23 13:53, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/08/23 14:25, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S44989.07

Sample Tag: Equipment Blank - L301214-07

Collected Date/Time: 02/02/2023 08:30

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.1	IR
2	1L Plastic	None	Yes	2.1	IR
1	250ml Plastic	HNO3	Yes	2.1	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	02/07/23 12:06	CTV	
Metal Digestion	Completed	SW3015A	02/07/23 09:40	CCM	

Inorganics

Method: E300.0, Run Date: 02/03/23 14:58, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.03	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.04	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.26	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 02/03/23 15:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 02/03/23 13:16, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 02/03/23 16:30, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	10	mg/L	2		

Method: SM2540D, Run Date: 02/06/23 17:15, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 02/07/23 11:12, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S44989.07 (continued)
Sample Tag: Equipment Blank - L301214-07

Method: E200.8, Run Date: 02/07/23 11:12, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 02/07/23 13:13, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 02/07/23 13:56, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 03/08/23 14:25, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

Merit Laboratories Login Checklist

Lab Set ID:S44989

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 16A-16D

Submitted:02/03/2023 10:50 Login User: PFD

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Selection	Description	Note
Sample Receiving		
01.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples are received at 4C +/- 2C Thermometer # IR 2.1
02.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Received on ice/ cooling process begun
03.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples shipped
04.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples left in 24 hr. drop box
05.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Are there custody seals/tape or is the drop box locked
Chain of Custody		
06.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC adequately filled out
07.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC signed and relinquished to the lab
08.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sample tag on bottles match COC
09.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Subcontracting needed? Subcontracted to: GEL
Preservation		
10.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Do sample have correct chemical preservation
11.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Completed pH checks on preserved samples? (no VOAs)
12.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Did any samples need to be preserved in the lab? Sample .03
Bottle Conditions		
13.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	All bottles intact
14.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Appropriate analytical bottles are used
15.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Merit bottles used
16.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sufficient sample volume received
17.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples require laboratory filtration Sample .03
18.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples submitted within holding time
19.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S44989 Submitted: 02/03/2023 10:50

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 16A-16D

Attention: Jennifer Caporale
Address: Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Initial Preservation Check: 02/03/2023 12:52 PFD

Preservation Recheck (E200.8): N/A

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S44989.01	125ml Plastic HNO3	<2			
S44989.01	1L Plastic HNO3	<2			
S44989.01	1L Plastic HNO3	<2			
S44989.02	125ml Plastic HNO3	<2			
S44989.02	1L Plastic HNO3	<2			
S44989.02	1L Plastic HNO3	<2			
S44989.03	125ml Plastic HNO3	<2			
S44989.03	1L Plastic HNO3	<2			
S44989.03	1L Plastic HNO3	<2			
S44989.04	125ml Plastic HNO3	<2			
S44989.04	1L Plastic HNO3	<2			
S44989.04	1L Plastic HNO3	<2			
S44989.05	125ml Plastic HNO3	<2			
S44989.05	1L Plastic HNO3	<2			
S44989.05	1L Plastic HNO3	<2			
S44989.06	125ml Plastic HNO3	<2			
S44989.06	1L Plastic HNO3	<2			
S44989.06	1L Plastic HNO3	<2			
S44989.07	125ml Plastic HNO3	<2			
S44989.07	1L Plastic HNO3	<2			
S44989.07	1L Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823
 Phone (517) 332-0167 Fax (517) 332-4034
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

REPORT TO

CHAIN OF CUSTODY RECORD

INVOICE TO

CONTACT NAME **Jennifer Caporale**
 COMPANY **Lansing Board of Water and Light**
 ADDRESS **PO Box 13007 48901-3007**
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**
 PHONE NO. **517-702-6372** FAX NO. P.O. NO.
 E-MAIL ADDRESS **Environmental_Laboratory@lbwl.com** QUOTE NO.

CONTACT NAME **Beth Zimpfer** SAME
 COMPANY
 ADDRESS
 CITY STATE ZIP CODE
 PHONE NO. E-MAIL ADDRESS **Beth.Zimpfer@lbwl.com**

PROJECT NO./NAME **Erickson AM MI Wells 14-15** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**
 TURNAROUND TIME REQUIRED 1 DAY 2 DAYS 3 DAYS STANDARD OTHER **ASAP**
 DELIVERABLES REQUIRED STD LEVEL II LEVEL III LEVEL IV EDD OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives								Total Metals	F-undisilled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness	Dissolved Metals	Certifications	Project Locations	Special Instructions
	DATE	TIME				NONE	HCl	HNO3	H2SO4	NaOH	MeOH	OTHER											
	2/2/23	935	MW-16A L301214-01	GW	5	2	3															Metals to analyse: Na, Mg, K	
		1110	MW-16B -02	GW	5	2	3															B, Ca, Sb, As, Ba, Be, Cd, Cr,	
		1408	MW-16C -03	GW	5	2	3															Co, Li, Hg, Mo, Pb, Se, Tl,	
		1608	MW16-D -04	GW	5	2	3															Fe, Cu, Ni, Ag, V, Zn	
		935	MWT- -05	GW	5	2	3															Please send a preliminary report	
		815	Field Blank -06	DI	5	2	3															Dissolved metals = same	
		830	Equipment Blank -07	DI	5	2	3															analyses as f. metals	

RELINQUISHED BY: *[Signature]* DATE **2-3-23** TIME **10:50**
 RECEIVED BY: *[Signature]* DATE **2/3/23** TIME **10:50**

RELINQUISHED BY: DATE TIME
 RECEIVED BY: DATE TIME
 SEAL NO. SEAL INTACT YES NO INITIALS
 SEAL NO. SEAL INTACT YES NO INITIALS
 NOTES: TEMP. ON ARRIVAL **2.1**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Ti, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005



February 27, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 610325
SDG: S44989

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on February 09, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Jordan Melton for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S44989
Work Order: 610325**

February 27, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on February 09, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

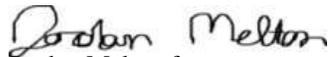
Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
610325001	S44989.01
610325002	S44989.02
610325003	S44989.03
610325004	S44989.04
610325005	S44989.05
610325006	S44989.06
610325007	S44989.07

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Jordan Melton". The signature is written in a cursive style with a large initial 'J'.

Jordan Melton for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

SAMPLE RECEIPT & REVIEW FORM DS

Client: <u>MERI</u>	SDG/AR/COC/Work Order: <u>610325</u>
Received By: <u>MVH</u>	Date Received: <u>07.09.2023</u>
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground <u>UPS</u> Field Services Courier Other <u>124664770362566448</u>

Suspected Hazard Information	Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
A) Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples are to be received as radioactive?		<input checked="" type="checkbox"/>	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?		<input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> <u>CPM</u> / mR/Hr Classified as: Rad 1 Rad 2 Rad 3
D) Did the client designate samples are hazardous?		<input checked="" type="checkbox"/>	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?		<input checked="" type="checkbox"/>	If D or E is yes, select Hazards below. PCBs Flammable Foreign Soil RCRA Asbestos Beryllium Other:

Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Client contacted and provided COC COC created upon receipt
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Preservation Method: Wet Ice Ice Packs Dry ice <u>None</u> Other: *all temperatures are recorded in Celsius TEMP: <u>21</u>
4 Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Temperature Device Serial #: <u>IR2-21</u> Secondary Temperature Device Serial # (If Applicable):
5 Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6 Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sample ID's and Containers Affected: If Preservation added, Lot#:
7 Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer) Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No) Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected:
8 Samples received within holding time?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ID's and tests affected:
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ID's and containers affected:
10 Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No container count on COC Other (describe)
12 Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
13 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: <u>Not relinquished</u> Other (describe)

Comments (Use Continuation Form if needed): MVH 10-23

PM (or PMA) review: Initials HM Date 21/11/23 Page 1 of 1

Laboratory Certifications

List of current GEL Certifications as of 27 February 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S44989
Work Order #: 610325**

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2387212

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
610325001	S44989.01
610325002	S44989.02
610325003	S44989.03
610325004	S44989.04
610325005	S44989.05
610325006	S44989.06
610325007	S44989.07
1205326653	Method Blank (MB)
1205326654	610267001(NonSDG) Sample Duplicate (DUP)
1205326655	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2387191

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
610325001	S44989.01
610325002	S44989.02
610325003	S44989.03
610325004	S44989.04
610325005	S44989.05
610325006	S44989.06
610325007	S44989.07
1205326596	Method Blank (MB)

1205326597	609996001(NonSDG) Sample Duplicate (DUP)
1205326598	609996001(NonSDG) Matrix Spike (MS)
1205326599	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Preparation Information

Homogenous Matrix

Samples 1205326597 (Non SDG 609996001DUP) and 1205326598 (Non SDG 609996001MS) were non-homogenous matrix.

Miscellaneous Information

Additional Comments

The matrix spike, 1205326598 (Non SDG 609996001MS), aliquot was reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S44989 GEL Work Order: 610325

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 09 MAR 2023

Title: Group Leader

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: March 8, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Lavery
 Project: Routine Analysis

Client Sample ID: S44989.01	Project: MERI00120
Sample ID: 610325001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 02-FEB-23 09:35	
Receive Date: 09-FEB-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.178	+/-1.19	2.15	3.00	pCi/L		JE1	03/08/23	0913	2387212		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.562	+/-1.23			pCi/L		NXL1	03/08/23	1425	2387217		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.385	+/-0.300	0.409	1.00	pCi/L		LXP1	03/08/23	1036	2387191		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			94.8	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: March 8, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S44989.02 Project: MERI00120
Sample ID: 610325002 Client ID: MERI001
Matrix: Ground Water
Collect Date: 02-FEB-23 11:10
Receive Date: 09-FEB-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.829	+/-0.959	1.61	3.00	pCi/L		JE1	03/08/23	0913	2387212		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.83	+/-1.04			pCi/L		NXL1	03/08/23	1425	2387217		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.997	+/-0.394	0.296	1.00	pCi/L		LXP1	03/08/23	1100	2387191		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			88.2	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: March 8, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S44989.03 Project: MERI00120
Sample ID: 610325003 Client ID: MERI001
Matrix: Ground Water
Collect Date: 02-FEB-23 14:08
Receive Date: 09-FEB-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.0142	+/-1.25	2.28	3.00	pCi/L		JE1	03/08/23	0914	2387212	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.244	+/-1.27			pCi/L		NXL1	03/08/23	1425	2387217	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.230	+/-0.223	0.321	1.00	pCi/L		LXP1	03/08/23	1100	2387191	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			86.6	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: March 8, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive
 East Lansing, Michigan 48823
 Contact: John Lavery
 Project: Routine Analysis

Client Sample ID: S44989.04	Project: MERI00120
Sample ID: 610325004	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 02-FEB-23 16:08	
Receive Date: 09-FEB-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.84	+/-1.34	2.12	3.00	pCi/L		JE1	03/08/23	0914	2387212		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		2.43	+/-1.39			pCi/L		NXL1	03/08/23	1425	2387217		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.591	+/-0.391	0.502	1.00	pCi/L		LXP1	03/08/23	1100	2387191		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			77.9	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

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Certificate of Analysis

Report Date: March 8, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S44989.05 Project: MERI00120
Sample ID: 610325005 Client ID: MERI001
Matrix: Ground Water
Collect Date: 02-FEB-23 09:35
Receive Date: 09-FEB-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	-0.723	+/-0.714	1.53	3.00	pCi/L		JE1	03/08/23	0914	2387212		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.325	+/-0.752			pCi/L		NXL1	03/08/23	1425	2387217		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.325	+/-0.235	0.252	1.00	pCi/L		LXP1	03/08/23	1100	2387191		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			96	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: March 8, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S44989.06	Project: MERI00120
Sample ID: 610325006	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 02-FEB-23 08:15	
Receive Date: 09-FEB-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	-0.184	+/-0.947	1.82	3.00	pCi/L		JE1	03/08/23	0914	2387212		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.492	+/-1.00			pCi/L		NXL1	03/08/23	1425	2387217		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.492	+/-0.321	0.397	1.00	pCi/L		LXP1	03/08/23	1100	2387191		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			83.6	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

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Certificate of Analysis

Report Date: March 8, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S44989.07 Project: MERI00120
Sample ID: 610325007 Client ID: MERI001
Matrix: Ground Water
Collect Date: 02-FEB-23 08:30
Receive Date: 09-FEB-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.438	+/-1.04	1.85	3.00	pCi/L		JE1	03/08/23	0914	2387212		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.850	+/-1.09			pCi/L		NXL1	03/08/23	1425	2387217		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.413	+/-0.322	0.439	1.00	pCi/L		LXP1	03/08/23	1100	2387191		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			79.6	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: March 8, 2023

Page 1 of 2

Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan

Contact: John Laverty

Workorder: 610325

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2387212										
QC1205326654	610267001	DUP									
Radium-228	U	0.876	U	1.52	pCi/L	N/A		N/A	JE1	03/08/23	09:13
	Uncertainty	+/-1.15		+/-1.48							
QC1205326655	LCS										
Radium-228	63.2			63.0	pCi/L		99.8	(75%-125%)		03/08/23	09:13
	Uncertainty			+/-4.18							
QC1205326653	MB										
Radium-228			U	-0.106	pCi/L					03/08/23	09:13
	Uncertainty			+/-1.02							
Rad Ra-226											
Batch	2387191										
QC1205326597	609996001	DUP									
Radium-226		0.983		1.04	pCi/L	5.59		(0% - 100%)	LXP1	03/08/23	11:22
	Uncertainty	+/-0.430		+/-0.419							
QC1205326599	LCS										
Radium-226	26.6			22.1	pCi/L		83.1	(75%-125%)		03/08/23	11:22
	Uncertainty			+/-1.86							
QC1205326596	MB										
Radium-226			U	0.166	pCi/L					03/08/23	11:22
	Uncertainty			+/-0.265							
QC1205326598	609996001	MS									
Radium-226	134	0.983		104	pCi/L		77.3	(75%-125%)		03/08/23	11:22
	Uncertainty	+/-0.430		+/-8.23							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- H Analytical holding time was exceeded
- < Result is less than value reported
- > Result is greater than value reported

GEL LABORATORIES LLC

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QC Summary

Workorder: 610325

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
NI											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2387212 Check-list

This check-list was completed on 08-MAR-23 by Nat Long

This batch was reviewed by Kenshalla Oston on 08-MAR-23 and Nat Long on 08-MAR-23.

Batch ID:
2387212

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2387212
Analyst: Jacqueline Emond (JE1)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: LUCAS-C202389980

Due Dates for Lab: 06-MAR-2023			Package: 08-MAR-2023	SDG: 09-MAR-2023		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205326655	228	1952-B	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	610267001	01-MAR-2023	3	300.62	300.62	03/02/23 14:42	03/08/23 07:05
2	610325001	01-MAR-2023	3	300.75	300.75	03/02/23 14:42	03/08/23 07:05
3	610325002	01-MAR-2023	3	303.9	303.9	03/02/23 14:42	03/08/23 07:05
4	610325003	01-MAR-2023	3	301.89	301.89	03/02/23 14:42	03/08/23 07:05
5	610325004	01-MAR-2023	3	303.1	303.1	03/02/23 14:42	03/08/23 07:05
6	610325005	01-MAR-2023	3	302.04	302.04	03/02/23 14:42	03/08/23 07:05
7	610325006	01-MAR-2023	3	300.27	300.27	03/02/23 14:42	03/08/23 07:05
8	610325007	01-MAR-2023	3	301.45	301.45	03/02/23 14:42	03/08/23 07:05
9	610447001	01-MAR-2023	3	301.17	301.17	03/02/23 14:42	03/08/23 07:05
10	610447002	01-MAR-2023	3	302.3	302.3	03/02/23 14:42	03/08/23 07:05
11	610447003	01-MAR-2023	3	301.17	301.17	03/02/23 14:42	03/08/23 07:05
12	610449001	01-MAR-2023	3	300.81	300.81	03/02/23 14:42	03/08/23 07:05
13	1205326653 MB	01-MAR-2023	3		303.9	03/02/23 14:42	03/08/23 07:05
14	1205326654 DUP (610267001)	01-MAR-2023	3	302.74	302.74	03/02/23 14:42	03/08/23 07:05
15	1205326655 LCS	01-MAR-2023	3		303.9	03/02/23 14:42	03/08/23 07:05

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-E	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 01-MAR-2023 00:00
REGNT 3862351	RGF-1M Citric Acid	5 mL	
REGNT 3850768	2M HCl	20 mL	
REGNT 3864851	RGF-7M Nitric Acid	25 mL	
REGNT DGA013123	2372406	2 g	
REGNT 3418276.6	29M HF (48-50%)	4 mL	
REGNT 3528714	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3521298	RGF-Neodymium Subtrate	5 mL	
REGNT 3855914.1	Nitric Acid	5 mL	
REGNT 3871043	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3465466	Barium Carrier Ra228 REG	1 mL	
REGNT 3869397	RGF-50% Potassium Carbonate	2 mL	
REGNT 3857883.6	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 1951-E
 Tracer Exp Date : 1/10/2024
 Tracer Volume Added: 0.10

Batch : 2387212
 Analyst : JAC02417
 Prep Date : 3/1/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 3 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	610267001.1	0.3006	1.8470E-05	2/6/2023 15:00	1196.3	1.67%	846.8	1.98%	0.1	0.000200
2	610325001.1	0.3008	1.8472E-05	2/2/2023 9:35	1196.3	1.67%	1134.4	1.71%	0.1	0.000200
3	610325002.1	0.3039	1.8525E-05	2/2/2023 11:10	1196.3	1.67%	1054.8	1.78%	0.1	0.000200
4	610325003.1	0.3019	1.8491E-05	2/2/2023 14:08	1196.3	1.67%	1035.8	1.79%	0.1	0.000200
5	610325004.1	0.3031	1.8511E-05	2/2/2023 16:08	1196.3	1.67%	931.5	1.89%	0.1	0.000200
6	610325005.1	0.3020	1.8494E-05	2/2/2023 9:35	1196.3	1.67%	1148.8	1.70%	0.1	0.000200
7	610325006.1	0.3003	1.8464E-05	2/2/2023 8:15	1196.3	1.67%	1000.4	1.83%	0.1	0.000200
8	610325007.1	0.3015	1.8484E-05	2/2/2023 8:30	1196.3	1.67%	952.2	1.87%	0.1	0.000200
9	610447001.1	0.3012	1.8479E-05	2/2/2023 12:15	1196.3	1.67%	1029.5	1.80%	0.1	0.000200
10	610447002.1	0.3023	1.8498E-05	2/2/2023 12:55	1196.3	1.67%	1004.4	1.82%	0.1	0.000200
11	610447003.1	0.3012	1.8479E-05	2/2/2023 14:40	1196.3	1.67%	926.2	1.90%	0.1	0.000200
12	610449001.1	0.3008	1.8473E-05	2/1/2023 12:25	1196.3	1.67%	1071.3	1.76%	0.1	0.000200
13	1205326653.1	0.3039	1.8525E-05	3/1/2023 0:00	1196.3	1.67%	873.2	1.95%	0.1	0.000200
14	1205326654.1	0.3027	1.8505E-05	2/6/2023 15:00	1196.3	1.67%	882.1	1.94%	0.1	0.000200
15	1205326655.1	0.3039	1.8525E-05	3/1/2023 0:00	1196.3	1.67%	958.9	1.86%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Sample Recovery Error %
			Alpha	Beta										
1	2A	60	6	55	0.917	3/8/2023 9:13	3/2/2023 14:42	3/8/2023 7:05	0.990	0.785	1.000	1.057	70.8%	2.61%
2	2B	60	3	101	1.683	3/8/2023 9:13	3/2/2023 14:42	3/8/2023 7:05	0.989	0.785	1.000	1.057	94.8%	2.41%
3	2C	60	9	57	0.950	3/8/2023 9:13	3/2/2023 14:42	3/8/2023 7:05	0.989	0.785	1.000	1.057	88.2%	2.46%
4	2D	60	4	91	1.517	3/8/2023 9:14	3/2/2023 14:42	3/8/2023 7:05	0.989	0.785	1.000	1.057	86.6%	2.46%
5	4A	60	6	86	1.433	3/8/2023 9:14	3/2/2023 14:42	3/8/2023 7:05	0.989	0.785	1.000	1.057	77.9%	2.54%
6	4C	60	3	40	0.667	3/8/2023 9:14	3/2/2023 14:42	3/8/2023 7:05	0.989	0.785	1.000	1.057	96.0%	2.40%
7	5A	60	9	53	0.883	3/8/2023 9:14	3/2/2023 14:42	3/8/2023 7:05	0.989	0.784	1.000	1.057	83.6%	2.49%
8	5B	60	14	59	0.983	3/8/2023 9:14	3/2/2023 14:42	3/8/2023 7:05	0.989	0.784	1.000	1.057	79.6%	2.52%
9	5C	60	10	39	0.650	3/8/2023 9:14	3/2/2023 14:42	3/8/2023 7:05	0.989	0.784	1.000	1.057	86.1%	2.47%
10	6A	60	10	102	1.700	3/8/2023 9:14	3/2/2023 14:42	3/8/2023 7:05	0.989	0.784	1.000	1.057	84.0%	2.49%
11	6C	60	6	64	1.067	3/8/2023 9:14	3/2/2023 14:42	3/8/2023 7:05	0.989	0.784	1.000	1.057	77.4%	2.55%
12	7B	60	5	65	1.083	3/8/2023 9:14	3/2/2023 14:42	3/8/2023 7:05	0.989	0.784	1.000	1.057	89.5%	2.44%
13	7C	60	6	50	0.833	3/8/2023 9:13	3/2/2023 14:42	3/8/2023 7:05	0.998	0.785	1.000	1.057	73.0%	2.58%
14	8B	60	14	108	1.800	3/8/2023 9:13	3/2/2023 14:42	3/8/2023 7:05	0.990	0.785	1.000	1.057	73.7%	2.58%
15	8C	60	51	1037	17.283	3/8/2023 9:13	3/2/2023 14:42	3/8/2023 7:05	0.998	0.785	1.000	1.057	80.1%	2.52%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.6201	0.01914	0.728	3/3/2023 18:12	1000
2	PIC	6/1/2022	5/31/2023	0.6097	0.02111	1.633	3/3/2023 18:12	1000
3	PIC	6/1/2022	5/31/2023	0.6022	0.01274	0.732	3/3/2023 18:12	1000
4	PIC	6/1/2022	5/31/2023	0.6046	0.00745	1.513	3/3/2023 18:12	1000
5	PIC	6/1/2022	5/31/2023	0.6013	0.01123	1.008	3/3/2023 18:12	1000
6	PIC	6/1/2022	5/31/2023	0.6359	0.00889	0.884	3/3/2023 18:13	1000
7	PIC	6/1/2022	5/31/2023	0.6332	0.00851	0.931	3/3/2023 18:13	1000
8	PIC	6/1/2022	5/31/2023	0.6336	0.00426	0.875	3/3/2023 18:13	1000
9	PIC	6/1/2022	5/31/2023	0.6242	0.00657	0.587	3/3/2023 18:13	1000
10	PIC	6/1/2022	5/31/2023	0.6328	0.02228	1.308	3/3/2023 18:08	1000
11	PIC	6/1/2022	5/31/2023	0.6123	0.01970	0.940	3/3/2023 18:08	1000
12	PIC	6/1/2022	5/31/2023	0.6366	0.00627	0.556	3/3/2023 18:10	1000
13	PIC	6/1/2022	5/31/2023	0.6407	0.00790	0.858	3/3/2023 18:10	1000
14	PIC	6/1/2022	5/31/2023	0.6437	0.02148	1.443	3/3/2023 18:11	1000
15	PIC	6/1/2022	5/31/2023	0.6294	0.01955	1.393	3/3/2023 18:11	1000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

* - RPD changed to 0% due to sample & dup activity below MDA

LCS S/N : 1952-B
LCS Exp Date : 8/9/2023
LCS Activity (dpm/ml): 426.17
LCS Volume Added: 0.10

Results														2 SIGMA		2 SIGMA	
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery	
1	1.2269	0.8662	3	1.9645	0.8760	67.13%	0.1887	0.1265	1.1513	1.1730		SAMPLE					
2	1.3966	0.9860	3	2.1484	0.1776	342.34%	0.0503	0.1723	1.1917	1.1926		SAMPLE					
3	1.0076	0.7114	3	1.6129	0.8290	59.10%	0.2180	0.1287	0.9593	0.9822		SAMPLE					
4	1.4796	1.0446	3	2.2834	0.0142	4463.97%	0.0037	0.1637	1.2460	1.2462		SAMPLE					
5	1.3450	0.9496	3	2.1155	1.8399	37.20%	0.4253	0.1578	1.3378	1.4174		SAMPLE					
6	0.9692	0.6842	3	1.5349	-0.7234	50.46%	-0.2173	0.1095	0.7145	0.7146		SAMPLE					
7	1.1542	0.8149	3	1.8228	-0.1841	262.49%	-0.0477	0.1251	0.9472	0.9473		SAMPLE					
8	1.1703	0.8263	3	1.8545	0.4377	121.31%	0.1083	0.1314	1.0404	1.0463		SAMPLE					
9	0.9010	0.6361	3	1.4620	0.2392	169.65%	0.0630	0.1069	0.7953	0.7976		SAMPLE					
10	1.3549	0.9566	3	2.1044	1.4995	44.05%	0.3920	0.1722	1.2909	1.3472		SAMPLE					
11	1.2922	0.9123	3	2.0398	0.5451	108.06%	0.1267	0.1368	1.1540	1.1625		SAMPLE					
12	0.8280	0.5845	3	1.3484	1.8907	25.99%	0.5273	0.1364	0.9587	1.0717		SAMPLE					
13	1.2271	0.8664	3	1.9466	-0.1055	492.32%	-0.0247	0.1214	1.0182	1.0183		MB					
14	1.5859	1.1196	3	2.4524	1.5218	49.78%	0.3570	0.1773	1.4816	1.5324	610267001.1	DUP	* 0.0%				
15	1.4498	1.0236	3	2.2455	63.0284	4.65%	15.8903	0.5380	4.1826	16.6839		LCS			63.1686	99.8%	

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
610267001	2A	60	6	55	3/8/2023 9:13	3/8/2023 10:13	PIC	2387212
610325001	2B	60	3	101	3/8/2023 9:13	3/8/2023 10:13	PIC	2387212
610325002	2C	60	9	57	3/8/2023 9:13	3/8/2023 10:13	PIC	2387212
610325003	2D	60	4	91	3/8/2023 9:14	3/8/2023 10:14	PIC	2387212
610325004	4A	60	6	86	3/8/2023 9:14	3/8/2023 10:14	PIC	2387212
610325005	4C	60	3	40	3/8/2023 9:14	3/8/2023 10:14	PIC	2387212
610325006	5A	60	9	53	3/8/2023 9:14	3/8/2023 10:14	PIC	2387212
610325007	5B	60	14	59	3/8/2023 9:14	3/8/2023 10:14	PIC	2387212
610447001	5C	60	10	39	3/8/2023 9:14	3/8/2023 10:14	PIC	2387212
610447002	6A	60	10	102	3/8/2023 9:14	3/8/2023 10:14	PIC	2387212
610447003	6C	60	6	64	3/8/2023 9:14	3/8/2023 10:14	PIC	2387212
610449001	7B	60	5	65	3/8/2023 9:14	3/8/2023 10:14	PIC	2387212
1205326653	7C	60	6	50	3/8/2023 9:13	3/8/2023 10:13	PIC	2387212
1205326654	8B	60	14	108	3/8/2023 9:13	3/8/2023 10:13	PIC	2387212
1205326655	8C	60	51	1037	3/8/2023 9:13	3/8/2023 10:13	PIC	2387212

ASSAY 8-Mar-23 7:27:45
 Wizard 2480 s/n 46190630
 Protocol id 9 Ba-133_1
 Time limit
 Count limit
 Isotope Ba-133_1
 Protocol date 3/8/2023
 Run id. 6289

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	92	1	180	3589.57	1196.33	1.67	07:27:45
610267001	2	92	2	180	2541	846.84	1.98	70.79	07:30:59
610325001	3	92	3	180	3403.57	1134.43	1.71	94.83	07:34:13
610325002	4	92	4	180	3165	1054.84	1.78	88.17	07:37:27
610325003	5	92	5	180	3107.85	1035.76	1.79	86.58	07:40:41
610325004	1	2	1	180	2795	931.49	1.89	77.86	07:44:17
610325005	2	2	2	180	3447.28	1148.82	1.7	96.03	07:47:31
610325006	3	2	3	180	3001.57	1000.37	1.83	83.62	07:50:45
610325007	4	2	4	180	2857	952.18	1.87	79.59	07:53:59
610447001	5	2	5	180	3089	1029.54	1.8	86.06	07:57:13
610447002	1	15	1	180	3013.57	1004.35	1.82	83.95	08:00:49
610447003	2	15	2	180	2779.28	926.22	1.9	77.42	08:04:02
610449001	3	15	3	180	3214.28	1071.27	1.76	89.55	08:07:16
1205326653	4	15	4	180	2620.28	873.21	1.95	72.99	08:10:30
1205326654	5	15	5	180	2646.57	882.05	1.94	73.73	08:13:45
1205326655	1	5	1	180	2877	958.85	1.86	80.15	08:17:32

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 08-Mar-2023

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z and LB4200 OA1 through OA1

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	Above	Beta bkg	08-Mar 04:42	60	2.317	1.385	3.072	+0.31
LB4100F1	Above	Beta bkg	08-Mar 04:42	60	2.550	0.188	2.691	+2.66
LB4100F2	Below	Alpha eff	08-Mar 06:16	5	6207	6533	7372	-5.33
LB4100F2	Above	Alpha XTalk	08-Mar 06:16	5	0.378	0.318	0.366	+4.50
LB4100F2	Above	Beta bkg	08-Mar 04:42	60	27.250	1.173	1.833	+234.06
LB4100G1	need 2nd	Alpha eff	08-Mar 06:09	5	9753	7975	12090	-0.41
LB4100G1	need 2nd	Alpha XTalk	08-Mar 06:09	5	0.269	0.088	0.447	+0.03
LB4100G1	need 2nd	Beta bkg	08-Mar 04:43	60	1.417	0.380	1.675	+1.80
LB4100G2	need 2nd	Beta bkg	08-Mar 04:43	60	1.750	1.168	2.328	+0.01
LB4100G3	need 2nd	Beta bkg	08-Mar 04:43	60	1.733	0.987	2.738	-0.44
LB4100H1	Above	Beta bkg	08-Mar 04:42	60	2.567	0.216	2.462	+3.28
LB4200OA1	need 2nd	Alpha bkg	08-Mar 10:07	60	0.00E+0			#NUM!
LB4200OA1	Above	Beta bkg	08-Mar 10:07	60	0.550			#NUM!
PIC3D	Below	Alpha XTalk	08-Mar 09:04	5	0.242	0.260	0.381	-3.87
PIC3D	Above	Beta XTalk	08-Mar 10:53	5	0.012	-4.26E-4	0.001	+48.92
PIC13A	Above	Alpha bkg	08-Mar 10:46	60	1.950	-9.05E-2	0.347	+24.98

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100A1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4200OA1	Alpha eff, Alpha XTalk, Beta eff, Beta XTalk

Reviewed by 

Date 3-8-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2387212

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205326653	MB	JE1	PIC7C	MAR-08-23 09:13:36	DONE	25mm Filter	01-JUN-22 00:00
1205326654	DUP	JE1	PIC8B	MAR-08-23 09:13:40	DONE	25mm Filter	01-JUN-22 00:00
1205326655	LCS	JE1	PIC8C	MAR-08-23 09:13:44	DONE	25mm Filter	01-JUN-22 00:00
610267001	SAMPLE	JE1	PIC2A	MAR-08-23 09:13:48	DONE	25mm Filter	01-JUN-22 00:00
610325001	SAMPLE	JE1	PIC2B	MAR-08-23 09:13:52	DONE	25mm Filter	01-JUN-22 00:00
610325002	SAMPLE	JE1	PIC2C	MAR-08-23 09:13:55	DONE	25mm Filter	01-JUN-22 00:00
610325003	SAMPLE	JE1	PIC2D	MAR-08-23 09:14:02	DONE	25mm Filter	01-JUN-22 00:00
610325004	SAMPLE	JE1	PIC4A	MAR-08-23 09:14:06	DONE	25mm Filter	01-JUN-22 00:00
610325005	SAMPLE	JE1	PIC4C	MAR-08-23 09:14:09	DONE	25mm Filter	01-JUN-22 00:00
610325006	SAMPLE	JE1	PIC5A	MAR-08-23 09:14:18	DONE	25mm Filter	01-JUN-22 00:00
610325007	SAMPLE	JE1	PIC5B	MAR-08-23 09:14:21	DONE	25mm Filter	01-JUN-22 00:00
610447001	SAMPLE	JE1	PIC5C	MAR-08-23 09:14:27	DONE	25mm Filter	01-JUN-22 00:00
610447002	SAMPLE	JE1	PIC6A	MAR-08-23 09:14:30	DONE	25mm Filter	01-JUN-22 00:00
610447003	SAMPLE	JE1	PIC6C	MAR-08-23 09:14:36	DONE	25mm Filter	01-JUN-22 00:00
610449001	SAMPLE	JE1	PIC7B	MAR-08-23 09:14:45	DONE	25mm Filter	01-JUN-22 00:00

Lucas Cell Raw Data

Batch 2387191 Check-list

This check-list was completed on 08-MAR-23 by Lyndsey Pace

This batch was reviewed by Gregory Ramsay on 08-MAR-23 and Lyndsey Pace on 08-MAR-23.

Batch ID:
2387191

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous		No	
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2387191
Analyst: Lyndsey Pace (LXP1)
 Prep: Jacqueline Emond (JE1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: LUCAS-C202389980

Due Dates for Lab: 05-MAR-2023			Package: 07-MAR-2023	SDG: 08-MAR-2023		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205326599	Radium-226 SPIKE	1715-G	.1	mL	
MS	1205326598	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	609996001	01-MAR-2023	1	502.07	502.07	03/02/23 09:55	703	03/08/23 07:11	03/08/23 10:36	3	25
2	610267001	01-MAR-2023	1	500.96	500.96	03/02/23 09:55	804	03/08/23 07:11	03/08/23 10:36	3	8
3	610325001	01-MAR-2023	1	501.32	501.32	03/02/23 09:55	107	03/08/23 07:38	03/08/23 10:36	4	12
4	610325002	01-MAR-2023	1	501.41	501.41	03/02/23 09:55	206	03/08/23 07:38	03/08/23 11:00	2	28
5	610325003	01-MAR-2023	1	503.94	503.94	03/02/23 09:55	303	03/08/23 07:38	03/08/23 11:00	2	7
6	610325004	01-MAR-2023	1	500.33	500.33	03/02/23 09:55	403	03/08/23 07:38	03/08/23 11:00	5	16
7	610325005	01-MAR-2023	1	500.75	500.75	03/02/23 09:55	508	03/08/23 07:38	03/08/23 11:00	1	9
8	610325006	01-MAR-2023	1	500.63	500.63	03/02/23 09:55	601	03/08/23 07:38	03/08/23 11:00	4	15
9	610325007	01-MAR-2023	1	500.54	500.54	03/02/23 09:55	706	03/08/23 07:38	03/08/23 11:00	4	12
10	610447001	01-MAR-2023	1	501.5	501.5	03/02/23 09:55	803	03/08/23 07:38	03/08/23 11:00	1	22
11	610447002	01-MAR-2023	1	503.49	503.49	03/02/23 09:55	105	03/08/23 08:07	03/08/23 11:00	4	30
12	610447003	01-MAR-2023	1	500.78	500.78	03/02/23 09:55	205	03/08/23 08:07	03/08/23 11:22	4	55
13	610449001	01-MAR-2023	1	500.05	500.05	03/02/23 09:55	308	03/08/23 08:07	03/08/23 11:22	8	7
14	610894001	01-MAR-2023	1	500.41	500.41	03/02/23 09:55	402	03/08/23 08:07	03/08/23 11:22	3	34
15	611029001	01-MAR-2023	1	500.27	500.27	03/02/23 09:55	505	03/08/23 08:07	03/08/23 11:22	4	9
16	1205326596 MB	01-MAR-2023	1	503.94	503.94	03/02/23 09:55	604	03/08/23 08:07	03/08/23 11:22	6	8
17	1205326597 DUP (609996001)	01-MAR-2023	1	501.59	501.59	03/02/23 09:55	707	03/08/23 08:07	03/08/23 11:22	2	27
18	1205326598 MS (609996001)	01-MAR-2023	1	100.1	100.1	03/02/23 09:55	802	03/08/23 08:07	03/08/23 11:22	3	625
19	1205326599 LCS	01-MAR-2023	1		503.94	03/02/23 09:55	106	03/08/23 08:35	03/08/23 11:22	2	543

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 01-MAR-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Procedure Code : LUC26RAL
 Parmname : Radium-226
 Required MDA : 1 pCi/L
 Halflife of Ra-226 : 1600 years
 Ra-226 Abundance : 1.00
 Halflife of Rn-222 : 3.8235 days

Batch : 2387191
 Analyst : LXP1
 Prep Date : 3/1/2023
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	609996001.1	0.5021	2.0264E-05	2/7/2023 13:45	703	20	25	1.250	3	0.100	30	1.6440
2	610267001.1	0.5010	2.0260E-05	2/6/2023 15:00	804	20	8	0.400	3	0.100	30	1.9050
3	610325001.1	0.5013	2.0261E-05	2/2/2023 9:35	107	20	12	0.600	4	0.133	30	1.6990
4	610325002.1	0.5014	2.0262E-05	2/2/2023 11:10	206	20	28	1.400	2	0.067	30	1.8770
5	610325003.1	0.5039	2.0272E-05	2/2/2023 14:08	303	20	7	0.350	2	0.067	30	1.7210
6	610325004.1	0.5003	2.0257E-05	2/2/2023 16:08	403	20	16	0.800	5	0.167	30	1.5070
7	610325005.1	0.5008	2.0259E-05	2/2/2023 9:35	508	20	9	0.450	1	0.033	30	1.8020
8	610325006.1	0.5006	2.0258E-05	2/2/2023 8:15	601	20	15	0.750	4	0.133	30	1.7610
9	610325007.1	0.5005	2.0258E-05	2/2/2023 8:30	706	20	12	0.600	4	0.133	30	1.5900
10	610447001.1	0.5015	2.0262E-05	2/2/2023 12:15	803	20	22	1.100	1	0.033	30	2.0020
11	610447002.1	0.5035	2.0270E-05	2/2/2023 12:55	105	20	30	1.500	4	0.133	30	1.5830
12	610447003.1	0.5008	2.0259E-05	2/2/2023 14:40	205	20	55	2.750	4	0.133	30	1.8920
13	610449001.1	0.5001	2.0256E-05	2/1/2023 12:25	308	20	7	0.350	8	0.267	30	1.5970
14	610894001.1	0.5004	2.0258E-05	2/9/2023 12:30	402	20	34	1.700	3	0.100	30	1.4980
15	611029001.1	0.5003	2.0257E-05	2/8/2023 12:30	505	20	9	0.450	4	0.133	30	1.8130
16	1205326596.1	0.5039	2.0272E-05	3/1/2023 0:00	604	20	8	0.400	6	0.200	30	1.6810
17	1205326597.1	0.5016	2.0262E-05	2/7/2023 13:45	707	20	27	1.350	2	0.067	30	1.7280
18	1205326598.1	0.1001	1.1376E-05	2/7/2023 13:45	802	20	625	31.250	3	0.100	30	2.0910
19	1205326599.1	0.5039	2.0272E-05	3/1/2023 0:00	106	20	543	27.150	2	0.067	30	1.6990

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrowth End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
9.000%	11/1/2022	10/31/2023	3/2/2023 9:55	3/8/2023 7:11	3/8/2023 10:36	0.656	0.975	1.001	1.000
9.900%	4/1/2022	3/31/2023	3/2/2023 9:55	3/8/2023 7:11	3/8/2023 10:36	0.656	0.975	1.001	1.000
3.900%	4/28/2022	4/30/2023	3/2/2023 9:55	3/8/2023 7:38	3/8/2023 10:36	0.657	0.978	1.001	1.000
2.800%	8/1/2022	7/31/2023	3/2/2023 9:55	3/8/2023 7:38	3/8/2023 11:00	0.657	0.975	1.001	1.000
7.400%	10/25/2022	10/31/2023	3/2/2023 9:55	3/8/2023 7:38	3/8/2023 11:00	0.657	0.975	1.001	1.000
6.100%	2/1/2023	1/31/2024	3/2/2023 9:55	3/8/2023 7:38	3/8/2023 11:00	0.657	0.975	1.001	1.000
4.500%	6/1/2022	5/31/2023	3/2/2023 9:55	3/8/2023 7:38	3/8/2023 11:00	0.657	0.975	1.001	1.000
9.400%	7/1/2022	6/30/2023	3/2/2023 9:55	3/8/2023 7:38	3/8/2023 11:00	0.657	0.975	1.001	1.000
2.900%	11/1/2022	10/31/2023	3/2/2023 9:55	3/8/2023 7:38	3/8/2023 11:00	0.657	0.975	1.001	1.000
7.300%	4/1/2022	3/31/2023	3/2/2023 9:55	3/8/2023 7:38	3/8/2023 11:00	0.657	0.975	1.001	1.000
0.500%	4/28/2022	4/30/2023	3/2/2023 9:55	3/8/2023 8:07	3/8/2023 11:00	0.658	0.978	1.001	1.000
3.900%	8/1/2022	7/31/2023	3/2/2023 9:55	3/8/2023 8:07	3/8/2023 11:22	0.658	0.976	1.001	1.000
9.600%	10/25/2022	10/31/2023	3/2/2023 9:55	3/8/2023 8:07	3/8/2023 11:22	0.658	0.976	1.001	1.000
5.300%	2/1/2023	1/31/2024	3/2/2023 9:55	3/8/2023 8:07	3/8/2023 11:22	0.658	0.976	1.001	1.000
1.200%	6/1/2022	5/31/2023	3/2/2023 9:55	3/8/2023 8:07	3/8/2023 11:22	0.658	0.976	1.001	1.000
6.700%	7/1/2022	6/30/2023	3/2/2023 9:55	3/8/2023 8:07	3/8/2023 11:22	0.658	0.976	1.001	1.000
2.200%	11/1/2022	10/31/2023	3/2/2023 9:55	3/8/2023 8:07	3/8/2023 11:22	0.658	0.976	1.001	1.000
8.000%	4/1/2022	3/31/2023	3/2/2023 9:55	3/8/2023 8:07	3/8/2023 11:22	0.658	0.976	1.001	1.000
8.800%	4/28/2022	4/30/2023	3/2/2023 9:55	3/8/2023 8:35	3/8/2023 11:22	0.660	0.979	1.001	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-G
Spike Exp Date : 9/8/2023
Spike Activity (dpm/ml): 297.43
Spike Volume Added: 0.10

LCS S/N : 1715-G
LCS Exp Date : 9/8/2023
LCS Activity (dpm/ml): 297.43
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.1818	0.1284	1	0.3849	0.9830	24.06%	1.1500	0.2566	0.4299	0.4848		SAMPLE				
2	0.1572	0.1110	1	0.3329	0.2218	51.87%	0.3000	0.1528	0.2213	0.2278		SAMPLE				
3	0.2024	0.1429	1	0.4094	0.3846	39.96%	0.4667	0.1856	0.2998	0.3063		SAMPLE				
4	0.1299	0.0917	1	0.2956	0.9974	20.35%	1.3333	0.2687	0.3940	0.4231		SAMPLE				
5	0.1410	0.0995	1	0.3208	0.2300	50.11%	0.2833	0.1404	0.2234	0.2283		SAMPLE				
6	0.2564	0.1810	1	0.5021	0.5914	34.25%	0.6333	0.2134	0.3906	0.4060		SAMPLE				
7	0.0958	0.0676	1	0.2523	0.3251	37.15%	0.4167	0.1537	0.2350	0.2413		SAMPLE				
8	0.1961	0.1385	1	0.3967	0.4924	34.52%	0.6167	0.2048	0.3206	0.3406		SAMPLE				
9	0.2173	0.1534	1	0.4395	0.4128	39.88%	0.4667	0.1856	0.3218	0.3281		SAMPLE				
10	0.0861	0.0608	1	0.2268	0.7480	23.38%	1.0667	0.2369	0.3256	0.3593		SAMPLE				
11	0.2157	0.1523	1	0.4364	1.2005	20.63%	1.3667	0.2819	0.4853	0.5154		SAMPLE				
12	0.1820	0.1285	1	0.3681	1.9389	14.92%	2.6167	0.3768	0.5472	0.6322		SAMPLE				
13	0.3054	0.2156	1	0.5630	0.0733	195.17%	0.0833	0.1624	0.2799	0.2805		SAMPLE				
14	0.1992	0.1406	1	0.4218	1.4985	19.32%	1.6000	0.2972	0.5456	0.6072		SAMPLE				
15	0.1901	0.1342	1	0.3845	0.2451	51.85%	0.3167	0.1641	0.2490	0.2516		SAMPLE				
16	0.2493	0.1760	1	0.4763	0.1657	81.92%	0.2000	0.1633	0.2653	0.2672		MB				
17	0.1407	0.0993	1	0.3201	1.0395	20.69%	1.2833	0.2640	0.4192	0.4475	609996001.1	DUP	5.6%			
18	0.7134	0.5037	1	1.5105	104.4831	8.95%	31.1500	1.2513	8.2265	23.7392	609996001.1	MS			133.8484	77.3%
19	0.1416	0.1000	1	0.3223	22.0888	9.80%	27.0833	1.1661	1.8640	5.3063		LCS			26.5863	83.1%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 08-MAR-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:40	1	1.22E+05	122295	0.41		
LUCAS2	EFF	07:39	1	1.34E+05	133894	0.15		
LUCAS3	EFF	07:36	1	1.05E+05	105087	-1.6		
LUCAS4	EFF	07:35	1	1.28E+05	127949	0.07		
LUCAS5	EFF	07:34	1	1.33E+05	133186	0.58		
LUCAS6	EFF	07:33	1	1.31E+05	131349	0.36		
LUCAS7	EFF	07:32	1	1.32E+05	131538	1.13		
LUCAS8	EFF	07:30	1	1.36E+05	136054	0.8		

Reviewed by:


Lyndsey Pace

Date: 08-MAR-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2387191

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
609996001	SAMPLE	LXP1	LUCAS7	MAR-08-23 10:36:00	DONE	Lucas Cell	01-NOV-22 00:00
610267001	SAMPLE	LXP1	LUCAS8	MAR-08-23 10:36:00	DONE	Lucas Cell	01-APR-22 00:00
610325001	SAMPLE	LXP1	LUCAS1	MAR-08-23 10:36:00	DONE	Lucas Cell	28-APR-22 00:00
610325002	SAMPLE	LXP1	LUCAS2	MAR-08-23 11:00:00	DONE	Lucas Cell	01-AUG-22 00:00
610325003	SAMPLE	LXP1	LUCAS3	MAR-08-23 11:00:00	DONE	Lucas Cell	25-OCT-22 00:00
610325004	SAMPLE	LXP1	LUCAS4	MAR-08-23 11:00:00	DONE	Lucas Cell	01-FEB-23 00:00
610325005	SAMPLE	LXP1	LUCAS5	MAR-08-23 11:00:00	DONE	Lucas Cell	01-JUN-22 00:00
610325006	SAMPLE	LXP1	LUCAS6	MAR-08-23 11:00:00	DONE	Lucas Cell	01-JUL-22 00:00
610325007	SAMPLE	LXP1	LUCAS7	MAR-08-23 11:00:00	DONE	Lucas Cell	01-NOV-22 00:00
610447001	SAMPLE	LXP1	LUCAS8	MAR-08-23 11:00:00	DONE	Lucas Cell	01-APR-22 00:00
610447002	SAMPLE	LXP1	LUCAS1	MAR-08-23 11:00:00	DONE	Lucas Cell	28-APR-22 00:00
610447003	SAMPLE	LXP1	LUCAS2	MAR-08-23 11:22:00	DONE	Lucas Cell	01-AUG-22 00:00
610449001	SAMPLE	LXP1	LUCAS3	MAR-08-23 11:22:00	DONE	Lucas Cell	25-OCT-22 00:00
610894001	SAMPLE	LXP1	LUCAS4	MAR-08-23 11:22:00	DONE	Lucas Cell	01-FEB-23 00:00
611029001	SAMPLE	LXP1	LUCAS5	MAR-08-23 11:22:00	DONE	Lucas Cell	01-JUN-22 00:00
1205326596	MB	LXP1	LUCAS6	MAR-08-23 11:22:00	DONE	Lucas Cell	01-JUL-22 00:00
1205326597	DUP	LXP1	LUCAS7	MAR-08-23 11:22:00	DONE	Lucas Cell	01-NOV-22 00:00
1205326598	MS	LXP1	LUCAS8	MAR-08-23 11:22:00	DONE	Lucas Cell	01-APR-22 00:00
1205326599	LCS	LXP1	LUCAS1	MAR-08-23 11:22:00	DONE	Lucas Cell	28-APR-22 00:00



Data Verification & Validation Report

Lansing Board of Water & Light – Erickson Power Station

Sampling Event (dates and purpose): New Wells: MW-14-15 – Background Round 3 – March 2023

Data Package Number: S46674.01

Lab Report Date: 04/24/2023

Data Validator: Andrew Byks

Data Validation Completion Date: 06/04/2023

General Overall Assessment:

Data are usable without qualification.

Data are usable with qualification (as noted below).

Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	
MW-7C	
MW-8	
MW-9	
MW-10	
MW-11	
MW-11B	
MW-12	
MW-12B	
MW-13	
MW-14	X
MW-15	X
MW-16A	
MW-16B	
MW-16C	
MW-16D	

Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-14	GW	S46674.01	03/24/2023	X	X	X	X	X	X	
MW-15	GW	S46674.02	03/24/2023	X	X	X	X	X	X	
MWT-14	QC	S46674.03	03/24/2023	X	X	X	X	X	X	
EB (MW-14)	QC	S46674.04	03/24/2023	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO₃, CO₃, hardness

Any planned sampling or analysis NOT completed? If yes, explain: _____

Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Field Data							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
Analytical Data Package							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies for multiple analytes across samples
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested	X			RLs for sulfate, TDS were not met
			MDLs<RLs		X		RL=MDL for carbonate
			MDLs<GPS			X	
QC Validation							
Evaluate Accuracy							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Evaluate Precision							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Lithium detected in parent and non-detect in field duplicate Combined Radium 226+228 RPD 27%
Evaluate Representativeness							
Equipment Blanks (if applicable)	X		Non-detect (<RL)	X			
QC Verification							
Verify Instrument Calibration & Analytical Process							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
Evaluate Completeness (# usable measurements/ # unusable measurements)							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative: None

Comments:

Nickel was not detected in parent sample MW-14 but detected in the field duplicate MWT-14. Nickel required qualification as estimated but not detected (UJ) in the parent sample MW-14 and as estimated with high bias (J+) in the field duplicate MWT-14.

Zinc was not detected in parent sample MW-14 but detected in the field duplicate MWT-14. Zinc required qualification as estimated but not detected (UJ) in the parent sample MW-14 and as estimated with high bias (J+) in the field duplicate MWT-14.

The RPD for Radium 226 was 50%. Radium-226 required qualification as estimated with high bias (J+) in the parent sample MW-14 and as estimated with low bias (J-) in field duplicate MWT-14.



Report ID: S46674.01(02)
Generated on 04/21/2023
Replaces report S46674.01(01) generated on 03/29/2023

Report to
Attention: Jennifer Caporale
Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Report produced by
Merit Laboratories, Inc.
2680 East Lansing Drive
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:
John Lavery (johnlavery@meritlabs.com)
Barbara Ball (bball@meritlabs.com)

Report Summary
Lab Sample ID(s): S46674.01-S46674.04
Project: Erickson AM MI Wells 14-15
Collected Date(s): 03/24/2023
Submitted Date/Time: 03/24/2023 15:50
Sampled by: Marc Wahrer
P.O. #:

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- Sample Summary (Page 5)

Maya Murshak
Technical Director



Lansing Board of Water and Light
Environmental Services Laboratory (MI00079)

Cert ID:3760

1232 Haco Dr.

Lansing, Michigan 48901

24 April 2023

BWL - Erickson Station

Attn: Cheryl Louden

3725 S. Canal

Lansing, MI 48917

Project: Erickson AM MI

Dear Cheryl Louden,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

Work Order

L303201

Received

3/24/2023 3:33:00PM

Account Number

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



Analytical Report

Client: BWL - Erickson Station
Address: 3725 S. Canal
 Lansing MI, 48917

Client Project Manager: Cheryl Louden

Report Date: 04/24/2023

Sample Name: MW-14

Lab #: L303201-01 Ground Water

Collected: 24-Mar-23 12:42

By: Marc Wahrer

Analyte	Reporting		Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit							
Conductivity	1300	1.0	uS/cm	1		24-Mar-23 12:42	maw	SM 2510B	
Dissolved oxygen	ND	0.100	mg/L	1		24-Mar-23 12:42	maw	FIELD	
Milliliters Purged	200		ml/min	1		24-Mar-23 12:42	maw	FIELD	
Oxidation Reduction Potential	-104.3	-999.0	mV	1		24-Mar-23 12:42	maw	FIELD	
pH	7.0	7.0	pH Units	1		24-Mar-23 12:42	maw	SM 4500H+B	
Temperature	10		°C	1		24-Mar-23 12:42	maw	SM 2550B	
Turbidity	4.0	0.10	NTU	1		24-Mar-23 12:42	maw	SM 2130B	

Sample Name: MW-15

Lab #: L303201-02 Ground Water

Collected: 24-Mar-23 14:35

By: Marc Wahrer

Analyte	Reporting		Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit							
Conductivity	910	1.0	uS/cm	1		24-Mar-23 14:35	maw	SM 2510B	
Dissolved oxygen	3.72	0.100	mg/L	1		24-Mar-23 14:35	maw	FIELD	
Milliliters Purged	200		ml/min	1		24-Mar-23 14:35	maw	FIELD	
Oxidation Reduction Potential	59.80	-999.0	mV	1		24-Mar-23 14:35	maw	FIELD	
pH	6.9	7.0	pH Units	1		24-Mar-23 14:35	maw	SM 4500H+B	
Temperature	7.3		°C	1		24-Mar-23 14:35	maw	SM 2550B	
Turbidity	4.2	0.10	NTU	1		24-Mar-23 14:35	maw	SM 2130B	



Analytical Report

Client: BWL - Erickson Station

Client Project Manager: Cheryl Louden

Report Date: 04/24/2023

Address: 3725 S. Canal
Lansing MI, 48917

Approved By: _____

Jennifer Caporale

Notes and Definitions

- AL Action Level (Action Level = Regulatory Limit)
 - MCL Maximum Contaminant Level
 - PEL Permissible Exposure Limit (Permissible Exposure Limit = Regulatory Limit)
 - RPD Relative Percent Difference
 - OT Odor Threshold
 - ND Non Detect is less than the reporting limit value
- All drinking water regulatory limits are MCL's with the exception of Lead and Copper unless otherwise noted.



General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

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Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

Report Narrative

All analyses completed



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



Sample Summary (4 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S46674.01	MW-14	Groundwater	03/24/23 12:42
S46674.02	MW-15	Groundwater	03/24/23 14:35
S46674.03	MWT-14	Groundwater	03/24/23 12:42
S46674.04	Field Blank	Water	03/24/23 11:45



Analytical Laboratory Report

Final Report

Lab Sample ID: S46674.01

Sample Tag: MW-14

Collected Date/Time: 03/24/2023 12:42

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	5.9	IR
2	1L Plastic	None	Yes	5.9	IR
1	250ml Plastic	HNO3	Yes	5.9	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	03/27/23 12:25	CTV	
Metal Digestion	Completed	SW3015A	03/27/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 03/27/23 11:14, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	114	10	0.13	mg/L	10	16887-00-6	

Method: E300.0, Run Date: 03/27/23 10:33, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	18	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 03/27/23 17:06, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	650	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 03/27/23 16:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	536	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 03/27/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	748	100	1	mg/L	4		

Method: SM2540D, Run Date: 03/27/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	22.2	3	1	mg/L	2		

Metals

Method: E200.8, Run Date: 03/27/23 12:46, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.005	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.128	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	2.11	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S46674.01 (continued)

Sample Tag: MW-14

Method: E200.8, Run Date: 03/27/23 12:46, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	10.2	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.113	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.014	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 03/27/23 15:59, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	144	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	40.3	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	4.72	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	75.8	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 03/27/23 14:17, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 04/19/23 09:04, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S46674.02

Sample Tag: MW-15

Collected Date/Time: 03/24/2023 14:35

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	5.9	IR
2	1L Plastic	None	Yes	5.9	IR
1	250ml Plastic	HNO3	Yes	5.9	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	03/27/23 12:25	CTV	
Metal Digestion	Completed	SW3015A	03/27/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 03/27/23 11:44, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfate	124	10	1.0	mg/L	10	14808-79-8	

Method: E300.0, Run Date: 03/27/23 10:43, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	72	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	

Method: SM2320B, Run Date: 03/27/23 17:10, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	330	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 03/27/23 16:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	426	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 03/27/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	690	50	1	mg/L	2		

Method: SM2540D, Run Date: 03/27/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 03/27/23 12:52, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.047	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.33	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S46674.02 (continued)

Sample Tag: MW-15

Method: E200.8, Run Date: 03/27/23 12:52, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.02	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	0.034	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 03/27/23 16:01, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	119	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	31.1	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	Not detected	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	29.5	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 03/27/23 14:20, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 04/19/23 09:04, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S46674.03

Sample Tag: MWT-14

Collected Date/Time: 03/24/2023 12:42

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	5.9	IR
2	1L Plastic	None	Yes	5.9	IR
1	250ml Plastic	HNO3	Yes	5.9	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	03/27/23 12:25	CTV	
Metal Digestion	Completed	SW3015A	03/27/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 03/27/23 11:24, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	114	10	0.13	mg/L	10	16887-00-6	

Method: E300.0, Run Date: 03/27/23 10:54, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	18	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 03/27/23 17:16, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	650	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 03/27/23 16:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	548	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 03/27/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	748	100	1	mg/L	4		

Method: SM2540D, Run Date: 03/27/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	22.0	3	1	mg/L	2		

Metals

Method: E200.8, Run Date: 03/27/23 12:55, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.006	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.126	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	2.20	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S46674.03 (continued)

Sample Tag: MWT-14

Method: E200.8, Run Date: 03/27/23 12:55, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	10.4	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.113	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.014	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.005	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.013	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 03/27/23 16:02, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	148	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	42.1	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	4.82	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	77.3	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 03/27/23 14:23, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 04/19/23 09:04, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S46674.04

Sample Tag: Field Blank

Collected Date/Time: 03/24/2023 11:45

Matrix: Water

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	5.9	IR
2	1L Plastic	None	Yes	5.9	IR
1	250ml Plastic	HNO3	Yes	5.9	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	03/27/23 12:25	CTV	
Metal Digestion	Completed	SW3015A	03/27/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 03/27/23 11:04, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.03	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.04	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.26	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 03/27/23 17:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 03/27/23 16:26, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 03/27/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	1	mg/L	2		

Method: SM2540D, Run Date: 03/27/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 03/27/23 11:42, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



Analytical Laboratory Report

Lab Sample ID: S46674.04 (continued)

Sample Tag: Field Blank

Method: E200.8, Run Date: 03/27/23 11:42, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 03/27/23 15:33, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 03/27/23 14:27, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 04/19/23 09:04, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

Merit Laboratories Login Checklist

Lab Set ID:S46674

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 14-15

Submitted:03/24/2023 15:50 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Selection	Description	Note
Sample Receiving		
01.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples are received at 4C +/- 2C Thermometer # IR 5.9
02.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Received on ice/ cooling process begun
03.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples shipped
04.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples left in 24 hr. drop box
05.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Are there custody seals/tape or is the drop box locked
Chain of Custody		
06.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC adequately filled out
07.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC signed and relinquished to the lab
08.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sample tag on bottles match COC
09.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Subcontracting needed? Subcontracted to: GEL
Preservation		
10.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Do sample have correct chemical preservation
11.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Completed pH checks on preserved samples? (no VOAs)
12.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Did any samples need to be preserved in the lab?
Bottle Conditions		
13.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	All bottles intact
14.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Appropriate analytical bottles are used
15.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Merit bottles used
16.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sufficient sample volume received
17.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples require laboratory filtration
18.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples submitted within holding time
19.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S46674 Submitted: 03/24/2023 15:50

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 14-15

Initial Preservation Check: 03/24/2023 16:02 MMC

Preservation Recheck (E200.8): N/A

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S46674.01	1L Plastic HNO3	<2			
S46674.01	1L Plastic HNO3	<2			
S46674.01	250ml Plastic HNO3	<2			
S46674.02	1L Plastic HNO3	<2			
S46674.02	1L Plastic HNO3	<2			
S46674.02	250ml Plastic HNO3	<2			
S46674.03	1L Plastic HNO3	<2			
S46674.03	1L Plastic HNO3	<2			
S46674.03	250ml Plastic HNO3	<2			
S46674.04	1L Plastic HNO3	<2			
S46674.04	1L Plastic HNO3	<2			
S46674.04	250ml Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823
 Phone (517) 332-0167 Fax (517) 332-4034
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

REPORT TO **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME **Jennifer Caporale**
 COMPANY **Lansing Board of Water and Light**
 ADDRESS **PO Box 13007 48901-3007**
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**
 PHONE NO. **517-702-6372** FAX NO. P.O. NO.
 E-MAIL ADDRESS **Environmental_Laboratory@lbwl.com** QUOTE NO.

CONTACT NAME **Beth Zimpfer** SAME
 COMPANY
 ADDRESS
 CITY STATE ZIP CODE
 PHONE NO. E-MAIL ADDRESS **Beth.Zimpfer@lbwl.com**

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

PROJECT NO./NAME **Erickson AM MI Wells 14-15** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**
 TURNAROUND TIME REQUIRED 1 DAY 2 DAYS 3 DAYS STANDARD OTHER **ASAP**
 DELIVERABLES REQUIRED STD LEVEL II LEVEL III LEVEL IV EDD OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WPE A=AIR W=WASTE # Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO ₃	H ₂ SO ₄	NaOH	MeOH	OTHER	Total Metals	F- undissolved, Cl-, SO ₄ , TDS	Radium 226	Radium 228	TSS	HCO ₃ , CO ₃ , Hardness	Certifications		Project Locations		Special Instructions
	DATE	TIME																	<input type="checkbox"/> OHIO VAP	<input type="checkbox"/> Drinking Water	<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES	
46674.01	2/21/23	1242	MW-14	GW	5	2	3						✓	✓	✓	✓	✓	✓					Metals to analyse: Na, Mg, K
.02		1435	MW-15	GW	5	2	3						✓	✓	✓	✓	✓	✓					B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03		1242	MWT-14	GW	5	2	3						✓	✓	✓	✓	✓	✓					Co, Li, Hg, Mo, Pb, Se, Tl,
.04		1145	Field Blank	di	5	2	3						✓	✓	✓	✓	✓	✓					Fe, Cu, Ni, Ag, V, Zn
																							Please send a preliminary report

RELINQUISHED BY: *[Signature]* **3/24/23 1550** DATE TIME
 RECEIVED BY: *[Signature]* **3/24/23 1550** DATE TIME

RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
 RECEIVED BY: SIGNATURE/ORGANIZATION DATE TIME
 SEAL NO. SEAL INTACT INITIALS
 YES NO
 SEAL NO. SEAL INTACT INITIALS
 YES NO NOTES: TEMP. ON ARRIVAL **5.9**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	2.5
Cl	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cr, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
F	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Fe, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Pb, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Li, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Hg, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Mo, total	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Ni, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Se, total	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Ag, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
SO4	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
Tl, total	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
TDS	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
TSS	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
V, total							
Zn, total							

April 19, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 616069
SDG: S46674

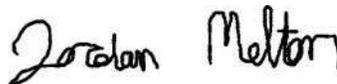
Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on March 29, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,



Jordan Melton for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S46674
Work Order: 616069**

April 19, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on March 29, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

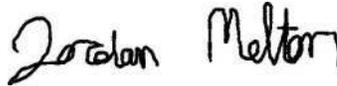
Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
616069001	S46674.01
616069002	S46674.02
616069003	S46674.03
616069004	S46674.04

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.



Jordan Melton for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

SAMPLE RECEIPT & REVIEW FORM

Client: MERJ		SDG/AR/COC/Work Order: 616069	
Received By: Stacy Boone		Date Received: MARCH 29, 2023	
Carrier and Tracking Number		Circle Applicable: FedEx Express FedEx Ground <u>UPS</u> Field Services Courier Other	
		1Z 466 477 03 6331 3478	
Suspected Hazard Information	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.	
A) Shipped as a DOT Hazardous?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___	
B) Did the client designate the samples to be received as radioactive?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	COC notation or radioactive stickers on containers equal client designation.	
C) Did the RSO classify the samples as radioactive?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM / mR/Hr Classified as: Rad 1 Rad 2 Rad 3	
D) Did the client designate samples are hazardous?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	COC notation or hazard labels on containers equal client designation.	
E) Did the RSO identify possible hazards?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	If D or E is yes, select Hazards below. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other: _____	
Sample Receipt Criteria	Yes	NA	No
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5 Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6 Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7 Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8 Samples received within holding time?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10 Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12 Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments (Use Continuation Form if needed):			

PM (or PMA) review: Initials JM Date 3-29-23 Page 1 of 1

Laboratory Certifications

List of current GEL Certifications as of 19 April 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S46674
Work Order #: 616069**

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2406255

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
616069001	S46674.01
616069002	S46674.02
616069003	S46674.03
616069004	S46674.04
1205361131	Method Blank (MB)
1205361132	615636001(S46568.01) Sample Duplicate (DUP)
1205361133	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2406215

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
616069001	S46674.01
616069002	S46674.02
616069003	S46674.03
616069004	S46674.04
1205361072	Method Blank (MB)
1205361073	615636001(S46568.01) Sample Duplicate (DUP)
1205361074	615636001(S46568.01) Matrix Spike (MS)
1205361075	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information**Additional Comments**

The matrix spike, 1205361074 (S46568.01MS), aliquot was reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S46674 GEL Work Order: 616069

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 21 APR 2023

Title: Group Leader

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: April 21, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S46674.01	Project: MERI00120
Sample ID: 616069001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 24-MAR-23 12:42	
Receive Date: 29-MAR-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.853	+/-0.991	1.67	3.00	pCi/L		JE1	04/12/23	1013	2406255		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.82	+/-1.14			pCi/L		NXL1	04/19/23	0904	2407931		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.964	+/-0.556	0.718	1.00	pCi/L		LXP1	04/16/23	0946	2406215		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			84	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: April 21, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S46674.02 Project: MERI00120
Sample ID: 616069002 Client ID: MERI001
Matrix: Ground Water
Collect Date: 24-MAR-23 14:35
Receive Date: 29-MAR-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	-0.188	+/-1.14	2.18	3.00	pCi/L		JE1	04/12/23	1013	2406255	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.868	+/-1.23			pCi/L		NXL1	04/19/23	0904	2407931	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.868	+/-0.463	0.533	1.00	pCi/L		LXP1	04/16/23	1017	2406215	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			79.2	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: April 21, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S46674.03 Project: MERI00120
Sample ID: 616069003 Client ID: MERI001
Matrix: Ground Water
Collect Date: 24-MAR-23 12:42
Receive Date: 29-MAR-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	1.10	+/-0.980	1.58	3.00	pCi/L		JE1	04/12/23	1013	2406255	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.42	+/-1.04			pCi/L		NXL1	04/19/23	0904	2407931	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.321	+/-0.352	0.578	1.00	pCi/L		LXP1	04/16/23	1017	2406215	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			92.1	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: April 21, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S46674.04 Project: MERI00120
Sample ID: 616069004 Client ID: MERI001
Matrix: Ground Water
Collect Date: 24-MAR-23 11:45
Receive Date: 29-MAR-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.535	+/-0.977	1.73	3.00	pCi/L		JE1	04/12/23	1013	2406255	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.04	+/-1.04			pCi/L		NXL1	04/19/23	0904	2407931	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.503	+/-0.369	0.482	1.00	pCi/L		LXP1	04/16/23	1017	2406215	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			78.7	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: April 21, 2023

Page 1 of 2

Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan
Contact: John Laverty

Workorder: 616069

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2406255										
QC1205361132	615636001	DUP									
Radium-228	U	0.698	U	-0.124	pCi/L	N/A		N/A	JE1	04/12/23	10:12
	Uncertainty	+/-1.04		+/-1.16							
QC1205361133	LCS										
Radium-228	80.5			77.5	pCi/L		96.3	(75%-125%)		04/12/23	10:12
	Uncertainty			+/-4.66							
QC1205361131	MB										
Radium-228			U	0.285	pCi/L					04/12/23	10:12
	Uncertainty			+/-0.956							
Rad Ra-226											
Batch	2406215										
QC1205361073	615636001	DUP									
Radium-226	U	0.510		0.660	pCi/L	25.7		(0% - 100%)	LXP1	04/16/23	10:17
	Uncertainty	+/-0.408		+/-0.433							
QC1205361075	LCS										
Radium-226	26.4			24.1	pCi/L		91.2	(75%-125%)		04/16/23	10:51
	Uncertainty			+/-2.07							
QC1205361072	MB										
Radium-226			U	0.288	pCi/L					04/16/23	10:17
	Uncertainty			+/-0.351							
QC1205361074	615636001	MS									
Radium-226	103 U	0.510		94.0	pCi/L		91.3	(75%-125%)		04/16/23	10:17
	Uncertainty	+/-0.408		+/-8.37							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- H Analytical holding time was exceeded
- < Result is less than value reported
- > Result is greater than value reported

GEL LABORATORIES LLC

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QC Summary

Workorder: 616069

Page 2 of 2

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
NI											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2406255 Check-list

This check-list was completed on 12-APR-23 by Nat Long

This batch was reviewed by Lois Buist on 12-APR-23 and Nat Long on 12-APR-23.

Batch ID:
2406255

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2406255
Analyst: Jacqueline Winston (JE1)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: LUCAS-C202389980

Due Dates for Lab: 18-APR-2023			Package: 20-APR-2023	SDG: 21-APR-2023		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205361133	228	2051-B	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	615636001	05-APR-2023	3	302.6	302.6	04/06/23 14:16	04/12/23 07:06
2	615636002	05-APR-2023	3	308.31	308.31	04/06/23 14:16	04/12/23 07:06
3	615636003	05-APR-2023	3	304.68	304.68	04/06/23 14:16	04/12/23 07:06
4	615636004	05-APR-2023	3	312.87	312.87	04/06/23 14:16	04/12/23 07:06
5	615636005	05-APR-2023	3	304.81	304.81	04/06/23 14:16	04/12/23 07:06
6	615636006	05-APR-2023	3	306.96	306.96	04/06/23 14:16	04/12/23 07:06
7	616069001	05-APR-2023	3	300.56	300.56	04/06/23 14:16	04/12/23 07:06
8	616069002	05-APR-2023	3	307.04	307.04	04/06/23 14:16	04/12/23 07:06
9	616069003	05-APR-2023	3	307.44	307.44	04/06/23 14:16	04/12/23 07:06
10	616069004	05-APR-2023	3	307.7	307.7	04/06/23 14:16	04/12/23 07:06
11	1205361131 MB	05-APR-2023	3		312.87	04/06/23 14:16	04/12/23 07:06
12	1205361132 DUP (615636001)	05-APR-2023	3	306.8	306.8	04/06/23 14:16	04/12/23 07:06
13	1205361133 LCS	05-APR-2023	3		312.87	04/06/23 14:16	04/12/23 07:06

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-E	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 05-APR-2023 00:00
REGNT 3887296	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3885444	RGF-1M Citric Acid	5 mL	
REGNT 3887348	2M HCl	20 mL	
REGNT 3889999	RGF-50% Potassium Carbonate	2 mL	
REGNT 3884583	RGF-7M Nitric Acid	25 mL	
REGNT 3857893.11	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT DGA030723	2396801	2 g	
REGNT 3867057.17	RGF-Hydrofluoric Acid	4 mL	
REGNT 3528714	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3887517	RGF-Neodymium Substrate	5 mL	
REGNT 3465466	Barium Carrier Ra228 REG	1 mL	
REGNT 3879639.10	Nitric Acid	5 mL	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 1951-E
 Tracer Exp Date : 1/10/2024
 Tracer Volume Added: 0.10

Batch : 2406255
 Analyst : JAC02417
 Prep Date : 4/5/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 3 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	615636001.1	0.3026	1.8503E-05	3/21/2023 11:08	1196.5	1.67%	920.8	1.90%	0.1	0.000200
2	615636002.1	0.3083	1.8596E-05	3/21/2023 14:44	1196.5	1.67%	1020.9	1.81%	0.1	0.000200
3	615636003.1	0.3047	1.8537E-05	3/21/2023 13:17	1196.5	1.67%	1048.5	1.78%	0.1	0.000200
4	615636004.1	0.3129	1.8668E-05	3/21/2023 14:06	1196.5	1.67%	965.9	1.86%	0.1	0.000200
5	615636005.1	0.3048	1.8540E-05	3/21/2023 11:08	1196.5	1.67%	1015.7	1.81%	0.1	0.000200
6	615636006.1	0.3070	1.8575E-05	3/21/2023 8:05	1196.5	1.67%	873.7	1.95%	0.1	0.000200
7	616069001.1	0.3006	1.8469E-05	3/24/2023 12:42	1196.5	1.67%	1004.7	1.82%	0.1	0.000200
8	616069002.1	0.3070	1.8576E-05	3/24/2023 14:35	1196.5	1.67%	947.5	1.88%	0.1	0.000200
9	616069003.1	0.3074	1.8582E-05	3/24/2023 12:42	1196.5	1.67%	1102.4	1.74%	0.1	0.000200
10	616069004.1	0.3077	1.8587E-05	3/24/2023 11:45	1196.5	1.67%	941.6	1.88%	0.1	0.000200
11	1205361131.1	0.3129	1.8668E-05	4/5/2023 0:00	1196.5	1.67%	915.0	1.91%	0.1	0.000200
12	1205361132.1	0.3068	1.8572E-05	3/21/2023 11:08	1196.5	1.67%	828.9	2.01%	0.1	0.000200
13	1205361133.1	0.3129	1.8668E-05	4/5/2023 0:00	1196.5	1.67%	975.3	1.85%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Sample Recovery Error %
			Alpha	Beta										
1	1B	60	10	40	0.667	4/12/2023 10:12	4/6/2023 14:16	4/12/2023 7:06	0.993	0.704	1.000	1.057	77.0%	2.55%
2	1C	60	6	73	1.217	4/12/2023 10:12	4/6/2023 14:16	4/12/2023 7:06	0.993	0.704	1.000	1.057	85.3%	2.48%
3	1D	60	7	75	1.250	4/12/2023 10:12	4/6/2023 14:16	4/12/2023 7:06	0.993	0.704	1.000	1.057	87.6%	2.46%
4	2A	60	8	60	1.000	4/12/2023 10:13	4/6/2023 14:16	4/12/2023 7:06	0.993	0.704	1.000	1.057	80.7%	2.52%
5	2C	60	16	56	0.933	4/12/2023 10:13	4/6/2023 14:16	4/12/2023 7:06	0.993	0.704	1.000	1.057	84.9%	2.48%
6	2D	60	7	63	1.050	4/12/2023 10:13	4/6/2023 14:16	4/12/2023 7:06	0.993	0.703	1.000	1.057	73.0%	2.58%
7	4A	60	9	42	0.700	4/12/2023 10:13	4/6/2023 14:16	4/12/2023 7:06	0.994	0.703	1.000	1.057	84.0%	2.49%
8	4C	60	14	56	0.933	4/12/2023 10:13	4/6/2023 14:16	4/12/2023 7:06	0.994	0.703	1.000	1.057	79.2%	2.53%
9	4D	60	6	51	0.850	4/12/2023 10:13	4/6/2023 14:16	4/12/2023 7:06	0.994	0.703	1.000	1.057	92.1%	2.43%
10	5C	60	10	40	0.667	4/12/2023 10:13	4/6/2023 14:16	4/12/2023 7:06	0.994	0.703	1.000	1.057	78.7%	2.53%
11	7B	60	7	39	0.650	4/12/2023 10:12	4/6/2023 14:16	4/12/2023 7:06	0.998	0.704	1.000	1.057	76.5%	2.55%
12	1A	60	8	42	0.700	4/12/2023 10:12	4/6/2023 14:16	4/12/2023 7:06	0.993	0.704	1.000	1.057	69.3%	2.63%
13	7C	60	31	1175	19.583	4/12/2023 10:12	4/6/2023 14:16	4/12/2023 7:06	0.998	0.704	1.000	1.057	81.5%	2.51%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.6068	0.00711	0.522	4/7/2023 18:45	500
2	PIC	6/1/2022	5/31/2023	0.6190	0.00847	0.788	4/7/2023 18:45	500
3	PIC	6/1/2022	5/31/2023	0.6048	0.00692	0.518	4/7/2023 18:45	500
4	PIC	6/1/2022	5/31/2023	0.6201	0.01914	0.826	4/7/2023 18:45	500
5	PIC	6/1/2022	5/31/2023	0.6022	0.01274	0.726	4/7/2023 18:46	500
6	PIC	6/1/2022	5/31/2023	0.6046	0.00745	0.898	4/7/2023 18:46	500
7	PIC	6/1/2022	5/31/2023	0.6013	0.01123	0.510	4/7/2023 18:46	500
8	PIC	6/1/2022	5/31/2023	0.6359	0.00889	0.976	4/7/2023 18:46	500
9	PIC	6/1/2022	5/31/2023	0.5954	0.00773	0.578	4/7/2023 18:46	500
10	PIC	6/1/2022	5/31/2023	0.6242	0.00657	0.548	4/7/2023 18:47	500
11	PIC	6/1/2022	5/31/2023	0.6366	0.00627	0.586	4/7/2023 18:43	500
12	PIC	6/1/2022	5/31/2023	0.6209	0.00738	0.724	4/7/2023 18:45	500
13	PIC	6/1/2022	5/31/2023	0.6407	0.00790	0.898	4/7/2023 18:43	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

* - RPD changed to 0% due to sample & dup activity below MDA

LCS S/N : 2051-B
LCS Exp Date : 3/27/2024
LCS Activity (dpm/ml): 559.43
LCS Volume Added: 0.10

Results														2 SIGMA		2 SIGMA	
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery	
1	1.1091	0.7830	3	1.8071	0.6976	76.26%	0.1447	0.1103	1.0420	1.0570		SAMPLE					
2	1.1829	0.8351	3	1.8795	1.7943	34.59%	0.4287	0.1478	1.2128	1.2955		SAMPLE					
3	0.9672	0.6828	3	1.5767	3.0900	20.36%	0.7320	0.1479	1.2236	1.4528		SAMPLE					
4	1.2594	0.8892	3	1.9960	0.7574	77.85%	0.1740	0.1353	1.1548	1.1710		SAMPLE					
5	1.1871	0.8381	3	1.8950	0.9074	62.96%	0.2073	0.1304	1.1186	1.1422		SAMPLE					
6	1.5182	1.0719	3	2.3954	0.7650	91.43%	0.1520	0.1389	1.3702	1.3840		SAMPLE					
7	1.0209	0.7207	3	1.6660	0.8532	59.34%	0.1900	0.1126	0.9913	1.0148		SAMPLE					
8	1.3862	0.9786	3	2.1777	-0.1881	310.13%	-0.0427	0.1323	1.1431	1.1432		SAMPLE					
9	0.9781	0.6905	3	1.5831	1.0992	45.58%	0.2720	0.1238	0.9805	1.0193		SAMPLE					
10	1.0629	0.7504	3	1.7263	0.5352	93.14%	0.1187	0.1105	0.9767	0.9861		SAMPLE					
11	1.0844	0.7656	3	1.7537	0.2848	171.22%	0.0640	0.1096	0.9557	0.9584		MB					
12	1.3982	0.9871	3	2.2323	-0.1239	477.17%	-0.0240	0.1145	1.1586	1.1588	615636001.1	DUP	* 0.0%				
13	1.2516	0.8837	3	1.9748	77.5274	4.04%	18.6853	0.5729	4.6588	20.2217		LCS			80.5428	96.3%	

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
615636001	1B	60	10	40	4/12/2023 10:12	4/12/2023 11:12	PIC	2406255
615636002	1C	60	6	73	4/12/2023 10:12	4/12/2023 11:12	PIC	2406255
615636003	1D	60	7	75	4/12/2023 10:12	4/12/2023 11:12	PIC	2406255
615636004	2A	60	8	60	4/12/2023 10:13	4/12/2023 11:13	PIC	2406255
615636005	2C	60	16	56	4/12/2023 10:13	4/12/2023 11:13	PIC	2406255
615636006	2D	60	7	63	4/12/2023 10:13	4/12/2023 11:13	PIC	2406255
616069001	4A	60	9	42	4/12/2023 10:13	4/12/2023 11:13	PIC	2406255
616069002	4C	60	14	56	4/12/2023 10:13	4/12/2023 11:13	PIC	2406255
616069003	4D	60	6	51	4/12/2023 10:13	4/12/2023 11:13	PIC	2406255
616069004	5C	60	10	40	4/12/2023 10:13	4/12/2023 11:13	PIC	2406255
1205361131	7B	60	7	39	4/12/2023 10:12	4/12/2023 11:12	PIC	2406255
1205361132	1A	60	8	42	4/12/2023 10:12	4/12/2023 11:12	PIC	2406255
1205361133	7C	60	31	1175	4/12/2023 10:12	4/12/2023 11:12	PIC	2406255

ASSAY 12-Apr-23 7:36:07
 Wizard 2480 s/n 46190630
 Protocol id 8 Ba-133
 Time limit
 Count limit
 Isotope Ba-133
 Protocol date 4/12/2023
 Run id. 6479

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	87	1	180	3590.28	1196.48	1.67	07:36:07
615636001	2	87	2	180	2762.85	920.78	1.9	76.96	07:39:21
615636002	3	87	3	180	3063.28	1020.86	1.81	85.32	07:42:35
615636003	4	87	4	180	3145.85	1048.54	1.78	87.64	07:45:49
615636004	5	87	5	180	2898.28	965.87	1.86	80.73	07:49:03
615636005	1	1	1	180	3047.57	1015.7	1.81	84.89	07:52:39
615636006	2	1	2	180	2621.57	873.72	1.95	73.02	07:55:53
616069001	3	1	3	180	3014.57	1004.7	1.82	83.97	07:59:06
616069002	4	1	4	180	2843	947.52	1.88	79.19	08:02:20
616069003	5	1	5	180	3308	1102.42	1.74	92.14	08:05:35
616069004	1	15	1	180	2825.28	941.63	1.88	78.70	08:09:10
1205361131	2	15	2	180	2745.57	914.99	1.91	76.47	08:12:24
1205361132	3	15	3	180	2487.28	828.87	2.01	69.28	08:15:38
1205361133	4	15	4	180	2926.28	975.28	1.85	81.51	08:18:52

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 12-Apr-2023

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z and LB4200 OA1 through OA1

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	Above	Beta bkg	12-Apr 04:09	60	2.383	1.385	3.072	+0.55
LB4100E2	need 2nd	Beta eff	12-Apr 05:22	5	14211	14120	15200	-2.50
LB4100E4	Above	Beta bkg	12-Apr 06:28	60	2.150	1.058	2.464	+1.66
LB4100F2	Above	Alpha bkg	12-Apr 04:09	60	0.383	0.042	0.294	+5.15
LB4100F2	Below	Alpha eff	12-Apr 05:13	5	6016	6533	7372	-6.69
LB4100F2	Above	Alpha XTalk	12-Apr 05:13	5	0.386	0.318	0.366	+5.55
LB4100F2	Above	Beta bkg	12-Apr 04:09	60	21.933	1.173	1.833	+185.73
LB4100F2	Below	Beta eff	12-Apr 05:22	5	14989	15040	15710	-3.46
LB4100F3	Above	Alpha bkg	12-Apr 04:09	60	0.333	0.059	0.442	+1.30
LB4100G1	need 2nd	Alpha eff	12-Apr 05:23	5	8596	7975	12090	-2.09
LB4100G1	Above	Beta bkg	12-Apr 04:10	60	793	0.380	1.675	+3,671.02
LB4100G3	Above	Beta bkg	12-Apr 04:10	60	2.050	0.987	2.738	+0.64
LB4100H1	Above	Beta bkg	12-Apr 04:09	60	2.283	0.216	2.462	+2.52
PIC2B	Above	Beta bkg	12-Apr 07:38	60	2.200	-5.22E-1	2.315	+2.76
PIC4B	Above	Alpha bkg	12-Apr 09:07	60	0.400	0.127	0.391	+3.21
PIC6B	Above	Alpha bkg	12-Apr 09:14	60	0.433	-6.69E-2	0.412	+3.26
PIC12C	Above	Beta bkg	12-Apr 06:03	60	3.650	0.142	2.845	+4.79
PIC14B	Above	Beta bkg	12-Apr 06:14	60	7.383	-7.38E-1	2.727	+11.06
PIC14C	Above	Beta bkg	12-Apr 06:14	60	2.500	-1.36E+0	4.189	+1.17

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100A1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

LB410012 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB410013 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB410014 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4200OA1 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by 

Date 4/12/23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2406255

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205361131	MB	JE1	PIC7B	APR-12-23 10:12:30	DONE	25mm Filter	01-JUN-22 00:00
1205361132	DUP	JE1	PIC1A	APR-12-23 10:12:35	DONE	25mm Filter	01-JUN-22 00:00
1205361133	LCS	JE1	PIC7C	APR-12-23 10:12:37	DONE	25mm Filter	01-JUN-22 00:00
615636001	SAMPLE	JE1	PIC1B	APR-12-23 10:12:47	DONE	25mm Filter	01-JUN-22 00:00
615636002	SAMPLE	JE1	PIC1C	APR-12-23 10:12:54	DONE	25mm Filter	01-JUN-22 00:00
615636003	SAMPLE	JE1	PIC1D	APR-12-23 10:12:58	DONE	25mm Filter	01-JUN-22 00:00
615636004	SAMPLE	JE1	PIC2A	APR-12-23 10:13:05	DONE	25mm Filter	01-JUN-22 00:00
615636005	SAMPLE	JE1	PIC2C	APR-12-23 10:13:12	DONE	25mm Filter	01-JUN-22 00:00
615636006	SAMPLE	JE1	PIC2D	APR-12-23 10:13:15	DONE	25mm Filter	01-JUN-22 00:00
616069001	SAMPLE	JE1	PIC4A	APR-12-23 10:13:19	DONE	25mm Filter	01-JUN-22 00:00
616069002	SAMPLE	JE1	PIC4C	APR-12-23 10:13:26	DONE	25mm Filter	01-JUN-22 00:00
616069003	SAMPLE	JE1	PIC4D	APR-12-23 10:13:29	DONE	25mm Filter	01-JUN-22 00:00
616069004	SAMPLE	JE1	PIC5C	APR-12-23 10:13:32	DONE	25mm Filter	01-JUN-22 00:00

Lucas Cell Raw Data

Batch 2406215 Check-list

This check-list was completed on 17-APR-23 by Lyndsey Pace

This batch was reviewed by Gregory Ramsay on 17-APR-23 and Lyndsey Pace on 17-APR-23.

Batch ID:
2406215

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2406215
Analyst: Lyndsey Pace (LXP1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: LUCAS-C202389980

Due Dates for Lab: 18-APR-2023			Package: 20-APR-2023		SDG: 21-APR-2023	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205361075	Radium-226 SPIKE	1715-G	.1	mL	
MS	1205361074	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	615636001	05-APR-2023	1	507.93	507.93	04/13/23 10:04	208	04/16/23 06:25	04/16/23 09:46	6	18
2	615636002	05-APR-2023	1	506.57	506.57	04/13/23 10:04	304	04/16/23 06:25	04/16/23 09:46	2	21
3	615636003	05-APR-2023	1	502.26	502.26	04/13/23 10:04	402	04/16/23 06:25	04/16/23 09:46	4	14
4	615636004	05-APR-2023	1	501.22	501.22	04/13/23 10:04	508	04/16/23 06:25	04/16/23 09:46	8	26
5	615636005	05-APR-2023	1	502.3	502.3	04/13/23 10:04	604	04/16/23 06:25	04/16/23 09:46	1	28
6	615636006	05-APR-2023	1	503.32	503.32	04/13/23 10:04	701	04/16/23 06:25	04/16/23 09:46	4	11
7	616069001	05-APR-2023	1	502.87	502.87	04/13/23 10:04	801	04/16/23 06:25	04/16/23 09:46	5	23
8	616069002	05-APR-2023	1	501.92	501.92	04/13/23 10:04	101	04/16/23 06:55	04/16/23 10:17	3	21
9	616069003	05-APR-2023	1	504.99	504.99	04/13/23 10:04	206	04/16/23 06:55	04/16/23 10:17	6	14
10	616069004	05-APR-2023	1	503.24	503.24	04/13/23 10:04	408	04/16/23 06:55	04/16/23 10:17	2	12
11	1205361072 MB	05-APR-2023	1		507.93	04/13/23 10:04	501	04/16/23 06:55	04/16/23 10:17	6	13
12	1205361073 DUP (615636001)	05-APR-2023	1	507.79	507.79	04/13/23 10:04	706	04/16/23 06:55	04/16/23 10:17	4	18
13	1205361074 MS (615636001)	05-APR-2023	1	130.12	130.12	04/13/23 10:04	802	04/16/23 06:55	04/16/23 10:17	4	497
14	1205361075 LCS	05-APR-2023	1		507.93	04/13/23 10:04	104	04/16/23 07:15	04/16/23 10:51	1	521

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 05-APR-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Procedure Code : LUC26RAL
 Parmname : Radium-226
 Required MDA : 1 pCi/L
 Halflife of Ra-226 : 1600 years
 Ra-226 Abundance : 1.00
 Halflife of Rn-222 : 3.8235 days

Batch : 2406215
 Analyst : LIN01615
 Prep Date : 4/5/2023
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting		Gross CPM	Background Counts	Background CPM	Background Count Time (min.)	Cell Efficiency (cpm/dpm)
						Time (min.)	Gross Counts					
1	615636001.1	0.5079	2.0288E-05	3/21/2023 11:08	208	30	18	0.600	6	0.200	30	1.7740
2	615636002.1	0.5066	2.0282E-05	3/21/2023 14:44	304	30	21	0.700	2	0.067	30	1.8850
3	615636003.1	0.5023	2.0265E-05	3/21/2023 13:17	402	30	14	0.467	4	0.133	30	1.4980
4	615636004.1	0.5012	2.0261E-05	3/21/2023 14:06	508	30	26	0.867	8	0.267	30	1.8020
5	615636005.1	0.5023	2.0265E-05	3/21/2023 11:08	604	30	28	0.933	1	0.033	30	1.6810
6	615636006.1	0.5033	2.0269E-05	3/21/2023 8:05	701	30	11	0.367	4	0.133	30	1.7440
7	616069001.1	0.5029	2.0268E-05	3/24/2023 12:42	801	30	23	0.767	5	0.167	30	1.4200
8	616069002.1	0.5019	2.0264E-05	3/24/2023 14:35	101	30	21	0.700	3	0.100	30	1.5720
9	616069003.1	0.5050	2.0276E-05	3/24/2023 12:42	206	30	14	0.467	6	0.200	30	1.8770
10	616069004.1	0.5032	2.0269E-05	3/24/2023 11:45	408	30	12	0.400	2	0.067	30	1.5020
11	1205361072.1	0.5079	2.0288E-05	4/5/2023 0:00	501	30	13	0.433	6	0.200	30	1.8220
12	1205361073.1	0.5078	2.0287E-05	3/21/2023 11:08	706	30	18	0.600	4	0.133	30	1.5900
13	1205361074.1	0.1301	1.3068E-05	3/21/2023 11:08	802	30	497	16.567	4	0.133	30	1.5330
14	1205361075.1	0.5079	2.0288E-05	4/5/2023 0:00	104	30	521	17.367	1	0.033	30	1.6160

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
5.500%	8/1/2022	7/31/2023	4/13/2023 10:04	4/16/2023 6:25	4/16/2023 9:46	0.403	0.975	1.002	1.000
8.900%	10/25/2022	10/31/2023	4/13/2023 10:04	4/16/2023 6:25	4/16/2023 9:46	0.403	0.975	1.002	1.000
5.300%	2/1/2023	1/31/2024	4/13/2023 10:04	4/16/2023 6:25	4/16/2023 9:46	0.403	0.975	1.002	1.000
4.500%	6/1/2022	5/31/2023	4/13/2023 10:04	4/16/2023 6:25	4/16/2023 9:46	0.403	0.975	1.002	1.000
6.700%	7/1/2022	6/30/2023	4/13/2023 10:04	4/16/2023 6:25	4/16/2023 9:46	0.403	0.975	1.002	1.000
6.200%	11/1/2022	10/31/2023	4/13/2023 10:04	4/16/2023 6:25	4/16/2023 9:46	0.403	0.975	1.002	1.000
3.200%	4/8/2023	3/31/2024	4/13/2023 10:04	4/16/2023 6:25	4/16/2023 9:46	0.403	0.975	1.002	1.000
1.200%	4/28/2022	4/30/2023	4/13/2023 10:04	4/16/2023 6:55	4/16/2023 10:17	0.406	0.975	1.002	1.000
2.800%	8/1/2022	7/31/2023	4/13/2023 10:04	4/16/2023 6:55	4/16/2023 10:17	0.406	0.975	1.002	1.000
7.000%	2/1/2023	1/31/2024	4/13/2023 10:04	4/16/2023 6:55	4/16/2023 10:17	0.406	0.975	1.002	1.000
7.900%	6/1/2022	5/31/2023	4/13/2023 10:04	4/16/2023 6:55	4/16/2023 10:17	0.406	0.975	1.002	1.000
2.900%	11/1/2022	10/31/2023	4/13/2023 10:04	4/16/2023 6:55	4/16/2023 10:17	0.406	0.975	1.002	1.000
6.100%	4/8/2023	3/31/2024	4/13/2023 10:04	4/16/2023 6:55	4/16/2023 10:17	0.406	0.975	1.002	1.000
2.000%	4/28/2022	4/30/2023	4/13/2023 10:04	4/16/2023 7:15	4/16/2023 10:51	0.407	0.973	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-G
Spike Exp Date : 9/8/2023
Spike Activity (dpm/ml): 297.42
Spike Volume Added: 0.10

LCS S/N : 1715-G
LCS Exp Date : 9/8/2023
LCS Activity (dpm/ml): 297.42
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.3427	0.2420	1	0.6113	0.5095	41.19%	0.4000	0.1633	0.4077	0.4179		SAMPLE				
2	0.1867	0.1318	1	0.3839	0.7613	26.76%	0.6333	0.1599	0.3766	0.4142		SAMPLE				
3	0.3351	0.2366	1	0.6258	0.5085	42.76%	0.3333	0.1414	0.4229	0.4324		SAMPLE				
4	0.3948	0.2787	1	0.6846	0.7625	32.71%	0.6000	0.1944	0.4841	0.5010		SAMPLE				
5	0.1493	0.1054	1	0.3468	1.2234	21.04%	0.9000	0.1795	0.4783	0.5346		SAMPLE				
6	0.2873	0.2028	1	0.5364	0.3051	55.67%	0.2333	0.1291	0.3309	0.3358		SAMPLE				
7	0.3948	0.2787	1	0.7182	0.9645	29.57%	0.6000	0.1764	0.5557	0.5761		SAMPLE				
8	0.2753	0.1943	1	0.5333	0.8681	27.24%	0.6000	0.1633	0.4631	0.4802		SAMPLE				
9	0.3240	0.2288	1	0.5780	0.3212	55.97%	0.2667	0.1491	0.3519	0.3554		SAMPLE				
10	0.2346	0.1656	1	0.4823	0.5034	38.07%	0.3333	0.1247	0.3692	0.3826		SAMPLE				
11	0.3319	0.2343	1	0.5920	0.2878	62.77%	0.2333	0.1453	0.3513	0.3565		MB				
12	0.3106	0.2193	1	0.5800	0.6598	33.63%	0.4667	0.1563	0.4333	0.4452	615636001.1	DUP	25.7%			
13	1.2572	0.8876	1	2.3475	94.0487	7.60%	16.4333	0.7461	8.3691	19.5138	615636001.1	MS			102.9631	91.3%
14	0.1525	0.1076	1	0.3541	24.0608	4.83%	17.3333	0.7616	2.0720	4.1528		LCS			26.3763	91.2%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 16-APR-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:13	1	1.19E+05	119159	-0.66		
LUCAS2	EFF	07:07	1	1.34E+05	134180	0.37		
LUCAS3	EFF	07:00	1	97638	97638	-2.49		
LUCAS4	EFF	06:51	1	1.29E+05	129040	1.73		
LUCAS5	EFF	06:49	1	1.33E+05	132999	0.4		
LUCAS6	EFF	06:46	1	1.31E+05	130751	1.09		
LUCAS7	EFF	06:44	1	1.33E+05	133353	0.25		
LUCAS8	EFF	06:40	1	1.20E+05	120435	-2.45		

Reviewed by: 
Lyndsey Pace

Date: 16-APR-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2406215

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
615636001	SAMPLE	LXP1	LUCAS2	APR-16-23 09:46:00	DONE	Lucas Cell	01-AUG-22 00:00
615636002	SAMPLE	LXP1	LUCAS3	APR-16-23 09:46:00	DONE	Lucas Cell	25-OCT-22 00:00
615636003	SAMPLE	LXP1	LUCAS4	APR-16-23 09:46:00	DONE	Lucas Cell	01-FEB-23 00:00
615636004	SAMPLE	LXP1	LUCAS5	APR-16-23 09:46:00	DONE	Lucas Cell	01-JUN-22 00:00
615636005	SAMPLE	LXP1	LUCAS6	APR-16-23 09:46:00	DONE	Lucas Cell	01-JUL-22 00:00
615636006	SAMPLE	LXP1	LUCAS7	APR-16-23 09:46:00	DONE	Lucas Cell	01-NOV-22 00:00
616069001	SAMPLE	LXP1	LUCAS8	APR-16-23 09:46:00	DONE	Lucas Cell	08-APR-23 00:00
616069002	SAMPLE	LXP1	LUCAS1	APR-16-23 10:17:00	DONE	Lucas Cell	28-APR-22 00:00
616069003	SAMPLE	LXP1	LUCAS2	APR-16-23 10:17:00	DONE	Lucas Cell	01-AUG-22 00:00
616069004	SAMPLE	LXP1	LUCAS4	APR-16-23 10:17:00	DONE	Lucas Cell	01-FEB-23 00:00
1205361072	MB	LXP1	LUCAS5	APR-16-23 10:17:00	DONE	Lucas Cell	01-JUN-22 00:00
1205361073	DUP	LXP1	LUCAS7	APR-16-23 10:17:00	DONE	Lucas Cell	01-NOV-22 00:00
1205361074	MS	LXP1	LUCAS8	APR-16-23 10:17:00	DONE	Lucas Cell	08-APR-23 00:00
1205361075	LCS	LXP1	LUCAS1	APR-16-23 10:51:00	DONE	Lucas Cell	28-APR-22 00:00



Environmental Laboratory
 1232 Haco Drive
 Lansing
 Michigan, 48910

CHAIN OF CUSTODY

Page 1 of 1

Phone: (517)702-6372

Lab Work Order Number L303201

Client Name BWL - Erickson Station		Project Name Erickson AM MI Wells 14-15		Requested Analyses								Requested Turn Around		
Client Contact Cheryl Louden		Project Number [none]		Ag:: As:: B:: Ba:: Be:: Ca:: Cd:: Cr:: Co:: Cu:: Fe:: Hg:: Li:: Mo:: Ni:: Pb:: Sb:: Se:: Ti:: V:: Zn:: Na:: K:: Mg	TSS, HCO3, CO3, Hardness	Cl-IC:: F-ISE:: SO4:: TDS	Radium 226 and Radium 228							Rush requests subject to additional charge Rush requests subject to lab approval.
Address 3725 S. Canal		Project Description												
City Lansing		PO Number 30926 10021												
State/Zip MI, 48917		Shipped By												
Phone (517) 702-6396	Fax (517) 702-6373	Tracking Number												
Sampler Marc Wahrer														

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code				Sample	Comments
						b	a	b			
MW-14	03/24/23	1242	G	GW	5	1	1	1	2		
MW-15	↓	1435	G	GW	5	1	1	1	2		
MWT-1A	↓	1242	G	GW	5	1	1	1	2		
Field Blank	↓	1145	G	DI	5	1	1	1	2		

Relinquished By 	Date/Time 3-24-23 1533	Received By 	Date/Time 3/24/23 1533
	Date/Time		Date/Time

Matrix Codes:



Data Verification & Validation Report

Lansing Board of Water & Light – Erickson Power Station

Sampling Event (dates and purpose): New Wells: MW-16A/B/C/D – Background Round 2 – March 2023

Data Package Number: S46568.01
Data Validator: Andrew Byks

Lab Report Date: 04/24/2023
Data Validation Completion Date: 06/04/2023

General Overall Assessment:

- Data are usable without qualification.
- Data are usable with qualification (as noted below).
- Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	
MW-7C	
MW-8	
MW-9	
MW-10	
MW-11	
MW-11B	
MW-12	
MW-12B	
MW-13	
MW-14	
MW-15	
MW-16A	X
MW-16B	X
MW-16C	X
MW-16D	X

Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-16A	GW	S46568.01	03/21/2023	X	X	X	X	X	X	
MW-16B	GW	S46568.02	03/21/2023	X	X	X	X	X	X	
MW-16C	GW	S46568.03	03/21/2023	X	X	X	X	X	X	
MW-16D	GW	S46568.04	03/21/2023	X	X	X	X	X	X	
MWT-16A	QC	S46568.05	03/21/2023	X	X	X	X	X	X	
EB (MW-16D)	QC	S46568.06	03/21/2023	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO₃, CO₃, hardness

Any planned sampling or analysis NOT completed? If yes, explain: _____

Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Field Data							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation		X	Record of decontamination for non-dedicated sampling equipment		X		Decontamination was not documented. A dedicated pump has since been installed.
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
Analytical Data Package							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies for multiple analytes across samples
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested	X			RLs for TDS were not met
			MDLs<RLs		X		RL=MDL for carbonate, TSS, and Alkalinity
			MDLs<GPS			X	
QC Validation							
Evaluate Accuracy							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Evaluate Precision							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Radium 226 and Combined Radium 226+228 RPD 41%, 28% respectively
Evaluate Representativeness							
Equipment Blanks (if applicable)	X		Non-detect (<RL)	X			
QC Verification							
Verify Instrument Calibration & Analytical Process							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
Evaluate Completeness (# usable measurements/ # unusable measurements)							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative: None

Comments:

The RPDs for Radium 226 and Combined Radium 226+228 RPD were 41.04% and 27.54%, respectively. Radium-228 and Combined Radium 226+228 required qualification as estimated with low bias (J-) in the parent sample MW-16A and as estimated with high bias (J+) in field duplicate MWT-16A.



Lansing Board of Water and Light
Environmental Services Laboratory (MI00079)

Cert ID:3760

1232 Haco Dr.

Lansing, Michigan 48901

24 April 2023

BWL - Erickson Station

Attn: Cheryl Loudon

3725 S. Canal

Lansing, MI 48917

Project: Erickson AM MI

Dear Cheryl Loudon,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

Work Order

L303200

Received

3/22/2023 8:30:00AM

Account Number

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



Analytical Report

Client: BWL - Erickson Station
Address: 3725 S. Canal
 Lansing MI, 48917

Client Project Manager: Cheryl Louden

Report Date: 04/24/2023

Sample Name: MW-16A

Lab #: L303200-01 Ground Water

Collected: 21-Mar-23 11:08

By: Marc Wahrer

Analyte	Reporting		Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit							
Conductivity	1900	1.0	uS/cm	1		21-Mar-23 11:08	maw	SM 2510B	
Dissolved oxygen	0.200	0.100	mg/L	1		21-Mar-23 11:08	maw	FIELD	
Milliliters Purged	200		ml/min	1		21-Mar-23 11:08	maw	FIELD	
Oxidation Reduction Potential	-48.60	-999.0	mV	1		21-Mar-23 11:08	maw	FIELD	
pH	6.9	7.0	pH Units	1		21-Mar-23 11:08	maw	SM 4500H+B	
Temperature	8.6		°C	1		21-Mar-23 11:08	maw	SM 2550B	
Turbidity	4.2	0.10	NTU	1		21-Mar-23 11:08	maw	SM 2130B	

Sample Name: MW-16B

Lab #: L303200-02 Ground Water

Collected: 21-Mar-23 14:44

By: Marc Wahrer

Analyte	Reporting		Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit							
Conductivity	590	1.0	uS/cm	1		21-Mar-23 14:44	maw	SM 2510B	
Dissolved oxygen	0.120	0.100	mg/L	1		21-Mar-23 14:44	maw	FIELD	
Milliliters Purged	210		ml/min	1		21-Mar-23 14:44	maw	FIELD	
Oxidation Reduction Potential	-107.0	-999.0	mV	1		21-Mar-23 14:44	maw	FIELD	
pH	7.4	7.0	pH Units	1		21-Mar-23 14:44	maw	SM 4500H+B	
Temperature	12		°C	1		21-Mar-23 14:44	maw	SM 2550B	
Turbidity	5.6	0.10	NTU	1		21-Mar-23 14:44	maw	SM 2130B	

Sample Name: MW-16C

Lab #: L303200-03 Ground Water

Collected: 21-Mar-23 13:17

By: Marc Wahrer

Analyte	Reporting		Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit							
Conductivity	580	1.0	uS/cm	1		21-Mar-23 13:17	maw	SM 2510B	
Dissolved oxygen	0.170	0.100	mg/L	1		21-Mar-23 13:17	maw	FIELD	
Milliliters Purged	200		ml/min	1		21-Mar-23 13:17	maw	FIELD	
Oxidation Reduction Potential	-103.8	-999.0	mV	1		21-Mar-23 13:17	maw	FIELD	
pH	7.5	7.0	pH Units	1		21-Mar-23 13:17	maw	SM 4500H+B	
Temperature	12		°C	1		21-Mar-23 13:17	maw	SM 2550B	
Turbidity	7.3	0.10	NTU	1		21-Mar-23 13:17	maw	SM 2130B	



Analytical Report

Client: BWL - Erickson Station
Address: 3725 S. Canal
 Lansing MI, 48917

Client Project Manager: Cheryl Louden

Report Date: 04/24/2023

Sample Name: MW-16D

Lab #: L303200-04 Ground Water

Collected: 21-Mar-23 14:06

By: Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	600	1.0	uS/cm	1		21-Mar-23 14:06	maw	SM 2510B	
Dissolved oxygen	0.390	0.100	mg/L	1		21-Mar-23 14:06	maw	FIELD	
Milliliters Purged	0.00		ml/min	1		21-Mar-23 14:06	maw	FIELD	
Oxidation Reduction Potential	85.90	-999.0	mV	1		21-Mar-23 14:06	maw	FIELD	
pH	7.6	7.0	pH Units	1		21-Mar-23 14:06	maw	SM 4500H+B	
Temperature	8.4		°C	1		21-Mar-23 14:06	maw	SM 2550B	
Turbidity	7.3	0.10	NTU	1		21-Mar-23 14:06	maw	SM 2130B	



Analytical Report

Client: BWL - Erickson Station

Client Project Manager: Cheryl Louden

Report Date: 04/24/2023

Address: 3725 S. Canal
Lansing MI, 48917

Approved By: _____

Jennifer Caporale

Notes and Definitions

- AL Action Level (Action Level = Regulatory Limit)
 - MCL Maximum Contaminant Level
 - PEL Permissible Exposure Limit (Permissible Exposure Limit = Regulatory Limit)
 - RPD Relative Percent Difference
 - OT Odor Threshold
 - ND Non Detect is less than the reporting limit value
- All drinking water regulatory limits are MCL's with the exception of Lead and Copper unless otherwise noted.



Report ID: S46568.01(02)
Generated on 04/21/2023
Replaces report S46568.01(01) generated on 03/24/2023

Report to
Attention: Jennifer Caporale
Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Report produced by
Merit Laboratories, Inc.
2680 East Lansing Drive
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:
John Lavery (johnlavery@meritlabs.com)
Barbara Ball (bball@meritlabs.com)

Report Summary
Lab Sample ID(s): S46568.01-S46568.06
Project: Erickson AM MI Wells 16A-16D
Collected Date(s): 03/21/2023
Submitted Date/Time: 03/22/2023 16:04
Sampled by: Marc Wahrer
P.O. #:

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- General Report Notes (Page 2)
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- Sample Summary (Page 5)

Maya Murshak
Technical Director



General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

Report Narrative

All analyses completed



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



Sample Summary (6 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S46568.01	MW-16A	Groundwater	03/21/23 11:08
S46568.02	MW-16B	Groundwater	03/21/23 14:44
S46568.03	MW-16C	Groundwater	03/21/23 13:17
S46568.04	MW-16D	Groundwater	03/21/23 14:06
S46568.05	MWT-16A	Groundwater	03/21/23 11:08
S46568.06	Field Blank	Water	03/21/23 08:05



Analytical Laboratory Report

Final Report

Lab Sample ID: S46568.01

Sample Tag: MW-16A

Collected Date/Time: 03/21/2023 11:08

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.6	IR
2	1L Plastic	None	Yes	1.6	IR
1	250ml Plastic	HNO3	Yes	1.6	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	03/23/23 13:00	CTV	
Metal Digestion	Completed	SW3015A	03/23/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 03/23/23 10:27, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	405	100	1.3	mg/L	100	16887-00-6	

Method: E300.0, Run Date: 03/23/23 09:27, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	86	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 03/23/23 14:06, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	460	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 03/23/23 13:42, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	524	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 03/24/23 17:10, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,180	50	1	mg/L	2		

Method: SM2540D, Run Date: 03/22/23 19:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 03/23/23 11:32, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.003	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.118	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.11	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S46568.01 (continued)

Sample Tag: MW-16A

Method: E200.8, Run Date: 03/23/23 11:32, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	3.15	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 03/23/23 13:29, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	147	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	33.9	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.58	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	244	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 03/23/23 15:49, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 04/19/23 10:12, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Lab Sample ID: S46568.02

Sample Tag: MW-16B

Collected Date/Time: 03/21/2023 14:44

Matrix: Groundwater

COC Reference:

Sample Containers

Table with 6 columns: #, Type, Preservative(s), Refrigerated?, Arrival Temp. (C), Thermometer #. Rows include 1L Plastic and 250ml Plastic containers.

Extraction / Prep.

Table with 6 columns: Parameter, Result, Method, Run Date, Analyst, Flags. Rows include Mercury Digestion and Metal Digestion.

Inorganics

Method: E300.0, Run Date: 03/23/23 09:37, Analyst: JDP

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Chloride, Fluoride (Undistilled), and Sulfate.

Method: SM2320B, Run Date: 03/23/23 14:10, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Bicarbonate* and Carbonate*.

Method: SM2340C, Run Date: 03/23/23 13:44, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Hardness.

Method: SM2540C, Run Date: 03/24/23 17:10, Analyst: MDG

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Dissolved Solids.

Method: SM2540D, Run Date: 03/22/23 19:30, Analyst: MDG

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Suspended Solids.

Metals

Method: E200.8, Run Date: 03/23/23 11:36, Analyst: CCM

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Antimony*, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, and Iron.



Analytical Laboratory Report

Final Report

Lab Sample ID: S46568.02 (continued)

Sample Tag: MW-16B

Method: E200.8, Run Date: 03/23/23 11:36, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.023	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.006	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 03/23/23 13:31, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	76.9	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	32.7	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	3.17	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	15.5	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 03/23/23 15:53, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 04/19/23 10:12, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S46568.03

Sample Tag: MW-16C

Collected Date/Time: 03/21/2023 13:17

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.6	IR
2	1L Plastic	None	Yes	1.6	IR
1	250ml Plastic	HNO3	Yes	1.6	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	03/23/23 13:00	CTV	
Metal Digestion	Completed	SW3015A	03/23/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 03/23/23 09:47, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	8	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 03/23/23 14:16, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	400	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 03/23/23 13:50, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	253	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 03/24/23 17:10, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	370	50	1	mg/L	2		

Method: SM2540D, Run Date: 03/22/23 19:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	11.6	3	1	mg/L	2		

Metals

Method: E200.8, Run Date: 03/23/23 11:39, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.003	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.061	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.40	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	1.10	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S46568.03 (continued)

Sample Tag: MW-16C

Method: E200.8, Run Date: 03/23/23 11:39, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.026	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.009	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 03/23/23 13:32, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	62.1	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	25.6	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	3.56	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	41.4	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 03/23/23 15:56, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 04/19/23 10:12, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S46568.04

Sample Tag: MW-16D

Collected Date/Time: 03/21/2023 14:06

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.6	IR
2	1L Plastic	None	Yes	1.6	IR
1	250ml Plastic	HNO3	Yes	1.6	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	03/23/23 13:00	CTV	
Metal Digestion	Completed	SW3015A	03/23/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 03/23/23 09:57, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	7	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	9	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 03/23/23 14:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	390	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 03/23/23 13:52, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	107	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 03/24/23 17:10, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	364	50	1	mg/L	2		

Method: SM2540D, Run Date: 03/22/23 19:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	3.80	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 03/23/23 11:42, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.036	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	4.59	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.06	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S46568.04 (continued)

Sample Tag: MW-16D

Method: E200.8, Run Date: 03/23/23 11:42, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.032	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.011	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.271	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 03/23/23 13:34, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	29.0	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	7.31	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	9.79	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	110	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 03/23/23 15:59, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 04/19/23 10:13, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S46568.05

Sample Tag: MWT-16A

Collected Date/Time: 03/21/2023 11:08

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.6	IR
2	1L Plastic	None	Yes	1.6	IR
1	250ml Plastic	HNO3	Yes	1.6	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	03/23/23 13:00	CTV	
Metal Digestion	Completed	SW3015A	03/23/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 03/23/23 11:08, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	411	100	1.3	mg/L	100	16887-00-6	

Method: E300.0, Run Date: 03/23/23 10:07, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	85	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 03/23/23 14:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	470	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 03/23/23 13:54, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	522	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 03/24/23 17:10, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,180	50	1	mg/L	2		

Method: SM2540D, Run Date: 03/22/23 19:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 03/23/23 11:49, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.003	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.119	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.11	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S46568.05 (continued)

Sample Tag: MWT-16A

Method: E200.8, Run Date: 03/23/23 11:49, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	3.14	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 03/23/23 13:37, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	150	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	34.1	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.58	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	247	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 03/23/23 16:02, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 04/19/23 10:13, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S46568.06

Sample Tag: Field Blank

Collected Date/Time: 03/21/2023 08:05

Matrix: Water

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.6	IR
2	1L Plastic	None	Yes	1.6	IR
1	250ml Plastic	HNO3	Yes	1.6	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	03/23/23 13:00	CTV	
Metal Digestion	Completed	SW3015A	03/23/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 03/23/23 10:17, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.03	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.04	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.26	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 03/23/23 14:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 03/23/23 13:56, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 03/24/23 17:10, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	1	mg/L	2		

Method: SM2540D, Run Date: 03/22/23 19:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 03/23/23 11:29, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S46568.06 (continued)

Sample Tag: Field Blank

Method: E200.8, Run Date: 03/23/23 11:29, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 03/23/23 13:27, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 03/23/23 16:06, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 04/19/23 10:13, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

Merit Laboratories Login Checklist

Lab Set ID:S46568

Attention: Jennifer Caporale
Address: Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 16A-16D

Submitted:03/22/2023 16:04 Login User: MMC

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

Sample Receiving

- | | | |
|-----|--|--|
| 01. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples are received at 4C +/- 2C Thermometer # IR 1.6 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Received on ice/ cooling process begun |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples shipped |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples left in 24 hr. drop box |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Are there custody seals/tape or is the drop box locked |

Chain of Custody

- | | | |
|-----|--|--|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC adequately filled out |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC signed and relinquished to the lab |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sample tag on bottles match COC |
| 09. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Subcontracting needed? Subcontracted to: GEL |

Preservation

- | | | |
|-----|--|---|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Do sample have correct chemical preservation |
| 11. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Completed pH checks on preserved samples? (no VOAs) |
| 12. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Did any samples need to be preserved in the lab? |

Bottle Conditions

- | | | |
|-----|--|---|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | All bottles intact |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Appropriate analytical bottles are used |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Merit bottles used |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sufficient sample volume received |
| 17. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples require laboratory filtration |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples submitted within holding time |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Do water VOC or TOX bottles contain headspace |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S46568 Submitted: 03/22/2023 16:04

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 16A-16D

Attention: Jennifer Caporale
Address: Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Initial Preservation Check: 03/22/2023 16:39 MMC

Preservation Recheck (E200.8): N/A

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S46568.01	1L Plastic HNO3	<2			
S46568.01	1L Plastic HNO3	<2			
S46568.01	250ml Plastic HNO3	<2			
S46568.02	1L Plastic HNO3	<2			
S46568.02	1L Plastic HNO3	<2			
S46568.02	250ml Plastic HNO3	<2			
S46568.03	1L Plastic HNO3	<2			
S46568.03	1L Plastic HNO3	<2			
S46568.03	250ml Plastic HNO3	<2			
S46568.04	1L Plastic HNO3	<2			
S46568.04	1L Plastic HNO3	<2			
S46568.04	250ml Plastic HNO3	<2			
S46568.05	1L Plastic HNO3	<2			
S46568.05	1L Plastic HNO3	<2			
S46568.05	250ml Plastic HNO3	<2			
S46568.06	1L Plastic HNO3	<2			
S46568.06	1L Plastic HNO3	<2			
S46568.06	250ml Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823
 Phone (517) 332-0167 Fax (517) 332-4034
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

REPORT TO **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME Jennifer Caporale			CONTACT NAME Beth Zimpfer <input checked="" type="checkbox"/> SAME		
COMPANY Lansing Board of Water and Light			COMPANY		
ADDRESS PO Box 13007 48901-3007			ADDRESS		
CITY Lansing	STATE Mi	ZIP CODE 48901	CITY	STATE	ZIP CODE
PHONE NO. 517-702-6372	FAX NO.	P.O. NO.	PHONE NO.	E-MAIL ADDRESS Beth.Zimpfer@lbwl.com	
E-MAIL ADDRESS Environmental_Laboratory@lbwl.com		QUOTE NO.	ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)		

PROJECT NO./NAME Erickson AM MI Wells 16A-16D	SAMPLER(S) - PLEASE PRINT/SIGN NAME Marc Wahrer	Total Metals F- undistilled, Cl-, SO4, TDS Radium 226 Radium 228 TSS HCO3, CO3, Hardness	Certifications <input type="checkbox"/> OHIO VAP <input type="checkbox"/> Drinking Water <input type="checkbox"/> DoD <input checked="" type="checkbox"/> NPDES Project Locations <input type="checkbox"/> Detroit <input type="checkbox"/> New York <input type="checkbox"/> Other _____ Special Instructions
TURNAROUND TIME REQUIRED <input type="checkbox"/> 1 DAY <input checked="" type="checkbox"/> 2 DAYS <input type="checkbox"/> 3 DAYS <input type="checkbox"/> STANDARD <input checked="" type="checkbox"/> OTHER ASAP			
DELIVERABLES REQUIRED <input type="checkbox"/> STD <input type="checkbox"/> LEVEL II <input checked="" type="checkbox"/> LEVEL III <input type="checkbox"/> LEVEL IV <input checked="" type="checkbox"/> EDD <input type="checkbox"/> OTHER _____			

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO3	H2SO4	NaOH	MeOH	OTHER	Total Metals	F- undistilled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness					
	DATE	TIME																					
46568.01	03/21/23	1108	MW-16A	GW	5	2	3						✓	✓	✓	✓	✓	✓					Metals to analyse: Na, Mg, K
02		1444	MW-16B	GW	5	2	3						✓	✓	✓	✓	✓	✓					B, Ca, Sb, As, Ba, Be, Cd, Cr,
03		1317	MW-16C	GW	5	2	3						✓	✓	✓	✓	✓	✓					Co, Li, Hg, Mo, Pb, Se, Tl,
04		1406	MW16-D	GW	5	2	3						✓	✓	✓	✓	✓	✓					Fe, Cu, Ni, Ag, V, Zn
05		1108	MWT-16A	GW	5	2	3						✓	✓	✓	✓	✓	✓					Please send a preliminary report
06	↓	0805	Field Blank	DI	5	2	3						✓	✓	✓	✓	✓	✓					
			Equipment Blank	DI	5	2	3						✓	✓	✓	✓	✓	✓					

RELINQUISHED BY: SIGNATURE/ORGANIZATION <i>[Signature]</i>	DATE 3-22-23 TIME 1604	RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME			
RECEIVED BY: SIGNATURE/ORGANIZATION <i>M. [Signature]</i>	DATE 3/22/23 TIME 1604	RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME			
RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME	SEAL NO.	SEAL INTACT YES <input type="checkbox"/> NO <input type="checkbox"/>	INITIALS	NOTES:	TEMP. ON ARRIVAL
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME	SEAL NO.	SEAL INTACT YES <input type="checkbox"/> NO <input type="checkbox"/>	INITIALS		1.6

Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total		250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005

April 19, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 615636
SDG: S46568

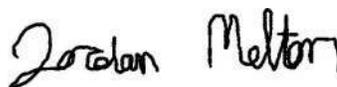
Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on March 24, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,



Jordan Melton for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S46568
Work Order: 615636**

April 19, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on March 24, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

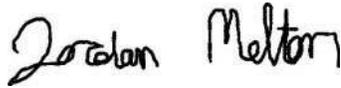
Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
615636001	S46568.01
615636002	S46568.02
615636003	S46568.03
615636004	S46568.04
615636005	S46568.05
615636006	S46568.06

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Jordan Melton". The signature is written in a cursive, slightly slanted style.

Jordan Melton for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation



SAMPLE RECEIPT & REVIEW FORM

Client: **MERI** SDG/AR/COC/Work Order: **615-636**

Received By: **SNS** Date Received: **3/24/23** Circle Applicable: UPS FedEx Express FedEx Ground Field Services Courier Other

Carrier and Tracking Number
1246647703 63754377

Suspected Hazard Information	Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
A) Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples are to be received as radioactive?		<input checked="" type="checkbox"/>	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?		<input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u> </u> <u>CPM</u> /mR/Hr Classified as: Rad 1 Rad 2 Rad 3
D) Did the client designate samples are hazardous?		<input checked="" type="checkbox"/>	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?		<input checked="" type="checkbox"/>	If D or E is yes, select Hazards below. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other: _____

Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>			Circle Applicable: Client contacted and provided COC COC created upon receipt
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*			<input checked="" type="checkbox"/>	Preservation Method: Wet Ice Ice Packs Dry Ice <input checked="" type="checkbox"/> None Other: _____ *all temperatures are recorded in Celsius TEMP: 20C
4 Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>			Temperature Device Serial #: IR1-23 Secondary Temperature Device Serial # (If Applicable): _____
5 Sample containers intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6 Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>			Sample ID's and Containers Affected: If Preservation added, Lot#: _____ If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer)
7 Do any samples require Volatile Analysis?			<input checked="" type="checkbox"/>	Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No) Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected: _____
8 Samples received within holding time?	<input checked="" type="checkbox"/>			ID's and tests affected: _____
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>			ID's and containers affected: _____
10 Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>			Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>			Circle Applicable: No container count on COC Other (describe)
12 Are sample containers identifiable as GEL provided by use of GEL labels?			<input checked="" type="checkbox"/>	
13 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>			Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials **MB** Date **3/27/23** Page **1** of **1**

Laboratory Certifications

List of current GEL Certifications as of 19 April 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S46568
Work Order #: 615636**

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2406255

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
615636001	S46568.01
615636002	S46568.02
615636003	S46568.03
615636004	S46568.04
615636005	S46568.05
615636006	S46568.06
1205361131	Method Blank (MB)
1205361132	615636001(S46568.01) Sample Duplicate (DUP)
1205361133	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2406215

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
615636001	S46568.01
615636002	S46568.02
615636003	S46568.03
615636004	S46568.04
615636005	S46568.05
615636006	S46568.06
1205361072	Method Blank (MB)
1205361073	615636001(S46568.01) Sample Duplicate (DUP)
1205361074	615636001(S46568.01) Matrix Spike (MS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

The matrix spike, 1205361074 (S46568.01MS), aliquot was reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S46568 GEL Work Order: 615636

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 20 APR 2023

Title: Group Leader

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: April 19, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S46568.01 Project: MERI00120
Sample ID: 615636001 Client ID: MERI001
Matrix: Ground Water
Collect Date: 21-MAR-23 11:08
Receive Date: 24-MAR-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.698	+/-1.04	1.81	3.00	pCi/L		JE1	04/12/23	1012	2406255	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.21	+/-1.12			pCi/L		NXL1	04/19/23	0904	2407931	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.510	+/-0.408	0.611	1.00	pCi/L		LXP1	04/16/23	0946	2406215	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			77	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: April 19, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive
 East Lansing, Michigan 48823
 Contact: John Lavery
 Project: Routine Analysis

Client Sample ID: S46568.02	Project: MERI00120
Sample ID: 615636002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 21-MAR-23 14:44	
Receive Date: 24-MAR-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	1.79	+/-1.21	1.88	3.00	pCi/L		JE1	04/12/23	1012	2406255	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		2.56	+/-1.27			pCi/L		NXL1	04/19/23	0904	2407931	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.761	+/-0.377	0.384	1.00	pCi/L		LXP1	04/16/23	0946	2406215	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			85.3	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: April 19, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S46568.03 Project: MERI00120
Sample ID: 615636003 Client ID: MERI001
Matrix: Ground Water
Collect Date: 21-MAR-23 13:17
Receive Date: 24-MAR-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		3.09	+/-1.22	1.58	3.00	pCi/L		JE1	04/12/23	1012	2406255	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		3.60	+/-1.29			pCi/L		NXL1	04/19/23	0904	2407931	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.509	+/-0.423	0.626	1.00	pCi/L		LXP1	04/16/23	0946	2406215	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			87.6	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: April 19, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S46568.04 Project: MERI00120
Sample ID: 615636004 Client ID: MERI001
Matrix: Ground Water
Collect Date: 21-MAR-23 14:06
Receive Date: 24-MAR-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.757	+/-1.15	2.00	3.00	pCi/L		JE1	04/12/23	1013	2406255	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.52	+/-1.25			pCi/L		NXL1	04/19/23	0904	2407931	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.763	+/-0.484	0.685	1.00	pCi/L		LXP1	04/16/23	0946	2406215	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			80.7	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: April 19, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S46568.05 Project: MERI00120
Sample ID: 615636005 Client ID: MERI001
Matrix: Ground Water
Collect Date: 21-MAR-23 11:08
Receive Date: 24-MAR-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.907	+/-1.12	1.89	3.00	pCi/L		JE1	04/12/23	1013	2406255	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		2.13	+/-1.22			pCi/L		NXL1	04/19/23	0904	2407931	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		1.22	+/-0.478	0.347	1.00	pCi/L		LXP1	04/16/23	0946	2406215	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			84.9	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: April 19, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Lavery
 Project: Routine Analysis

Client Sample ID: S46568.06	Project: MERI00120
Sample ID: 615636006	Client ID: MERI001
Matrix: Water	
Collect Date: 21-MAR-23 08:05	
Receive Date: 24-MAR-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.765	+/-1.37	2.40	3.00	pCi/L		JE1	04/12/23	1013	2406255	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.07	+/-1.41			pCi/L		NXL1	04/19/23	0904	2407931	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.305	+/-0.331	0.536	1.00	pCi/L		LXP1	04/16/23	0946	2406215	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			73	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: April 19, 2023

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Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan
Contact: John Laverty

Workorder: 615636

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2406255										
QC1205361132	615636001	DUP									
Radium-228	U	0.698	U	-0.124	pCi/L	N/A		N/A	JE1	04/12/23	10:12
	Uncertainty	+/-1.04		+/-1.16							
QC1205361133	LCS										
Radium-228	80.5			77.5	pCi/L		96.3	(75%-125%)		04/12/23	10:12
	Uncertainty			+/-4.66							
QC1205361131	MB										
Radium-228			U	0.285	pCi/L					04/12/23	10:12
	Uncertainty			+/-0.956							
Rad Ra-226											
Batch	2406215										
QC1205361073	615636001	DUP									
Radium-226	U	0.510		0.660	pCi/L	25.7		(0% - 100%)	LXP1	04/16/23	10:17
	Uncertainty	+/-0.408		+/-0.433							
QC1205361075	LCS										
Radium-226	26.4			24.1	pCi/L		91.2	(75%-125%)		04/16/23	10:51
	Uncertainty			+/-2.07							
QC1205361072	MB										
Radium-226			U	0.288	pCi/L					04/16/23	10:17
	Uncertainty			+/-0.351							
QC1205361074	615636001	MS									
Radium-226	103 U	0.510		94.0	pCi/L		91.3	(75%-125%)		04/16/23	10:17
	Uncertainty	+/-0.408		+/-8.37							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- H Analytical holding time was exceeded
- < Result is less than value reported
- > Result is greater than value reported

GEL LABORATORIES LLC

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QC Summary

Workorder: 615636

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Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
NI											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2406255 Check-list

This check-list was completed on 12-APR-23 by Nat Long

This batch was reviewed by Lois Buist on 12-APR-23 and Nat Long on 12-APR-23.

Batch ID:
2406255

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2406255
Analyst: Jacqueline Winston (JE1)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: LUCAS-C202389980

Due Dates for Lab: 18-APR-2023			Package: 20-APR-2023	SDG: 21-APR-2023		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205361133	228	2051-B	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	615636001	05-APR-2023	3	302.6	302.6	04/06/23 14:16	04/12/23 07:06
2	615636002	05-APR-2023	3	308.31	308.31	04/06/23 14:16	04/12/23 07:06
3	615636003	05-APR-2023	3	304.68	304.68	04/06/23 14:16	04/12/23 07:06
4	615636004	05-APR-2023	3	312.87	312.87	04/06/23 14:16	04/12/23 07:06
5	615636005	05-APR-2023	3	304.81	304.81	04/06/23 14:16	04/12/23 07:06
6	615636006	05-APR-2023	3	306.96	306.96	04/06/23 14:16	04/12/23 07:06
7	616069001	05-APR-2023	3	300.56	300.56	04/06/23 14:16	04/12/23 07:06
8	616069002	05-APR-2023	3	307.04	307.04	04/06/23 14:16	04/12/23 07:06
9	616069003	05-APR-2023	3	307.44	307.44	04/06/23 14:16	04/12/23 07:06
10	616069004	05-APR-2023	3	307.7	307.7	04/06/23 14:16	04/12/23 07:06
11	1205361131 MB	05-APR-2023	3		312.87	04/06/23 14:16	04/12/23 07:06
12	1205361132 DUP (615636001)	05-APR-2023	3	306.8	306.8	04/06/23 14:16	04/12/23 07:06
13	1205361133 LCS	05-APR-2023	3		312.87	04/06/23 14:16	04/12/23 07:06

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-E	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 05-APR-2023 00:00
REGNT 3887296	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3885444	RGF-1M Citric Acid	5 mL	
REGNT 3887348	2M HCl	20 mL	
REGNT 3889999	RGF-50% Potassium Carbonate	2 mL	
REGNT 3884583	RGF-7M Nitric Acid	25 mL	
REGNT 3857893.11	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT DGA030723	2396801	2 g	
REGNT 3867057.17	RGF-Hydrofluoric Acid	4 mL	
REGNT 3528714	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3887517	RGF-Neodymium Substrate	5 mL	
REGNT 3465466	Barium Carrier Ra228 REG	1 mL	
REGNT 3879639.10	Nitric Acid	5 mL	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 1951-E
 Tracer Exp Date : 1/10/2024
 Tracer Volume Added: 0.10

Batch : 2406255
 Analyst : JAC02417
 Prep Date : 4/5/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 3 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	615636001.1	0.3026	1.8503E-05	3/21/2023 11:08	1196.5	1.67%	920.8	1.90%	0.1	0.000200
2	615636002.1	0.3083	1.8596E-05	3/21/2023 14:44	1196.5	1.67%	1020.9	1.81%	0.1	0.000200
3	615636003.1	0.3047	1.8537E-05	3/21/2023 13:17	1196.5	1.67%	1048.5	1.78%	0.1	0.000200
4	615636004.1	0.3129	1.8668E-05	3/21/2023 14:06	1196.5	1.67%	965.9	1.86%	0.1	0.000200
5	615636005.1	0.3048	1.8540E-05	3/21/2023 11:08	1196.5	1.67%	1015.7	1.81%	0.1	0.000200
6	615636006.1	0.3070	1.8575E-05	3/21/2023 8:05	1196.5	1.67%	873.7	1.95%	0.1	0.000200
7	616069001.1	0.3006	1.8469E-05	3/24/2023 12:42	1196.5	1.67%	1004.7	1.82%	0.1	0.000200
8	616069002.1	0.3070	1.8576E-05	3/24/2023 14:35	1196.5	1.67%	947.5	1.88%	0.1	0.000200
9	616069003.1	0.3074	1.8582E-05	3/24/2023 12:42	1196.5	1.67%	1102.4	1.74%	0.1	0.000200
10	616069004.1	0.3077	1.8587E-05	3/24/2023 11:45	1196.5	1.67%	941.6	1.88%	0.1	0.000200
11	1205361131.1	0.3129	1.8668E-05	4/5/2023 0:00	1196.5	1.67%	915.0	1.91%	0.1	0.000200
12	1205361132.1	0.3068	1.8572E-05	3/21/2023 11:08	1196.5	1.67%	828.9	2.01%	0.1	0.000200
13	1205361133.1	0.3129	1.8668E-05	4/5/2023 0:00	1196.5	1.67%	975.3	1.85%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Sample Recovery Error %
			Alpha	Beta										
1	1B	60	10	40	0.667	4/12/2023 10:12	4/6/2023 14:16	4/12/2023 7:06	0.993	0.704	1.000	1.057	77.0%	2.55%
2	1C	60	6	73	1.217	4/12/2023 10:12	4/6/2023 14:16	4/12/2023 7:06	0.993	0.704	1.000	1.057	85.3%	2.48%
3	1D	60	7	75	1.250	4/12/2023 10:12	4/6/2023 14:16	4/12/2023 7:06	0.993	0.704	1.000	1.057	87.6%	2.46%
4	2A	60	8	60	1.000	4/12/2023 10:13	4/6/2023 14:16	4/12/2023 7:06	0.993	0.704	1.000	1.057	80.7%	2.52%
5	2C	60	16	56	0.933	4/12/2023 10:13	4/6/2023 14:16	4/12/2023 7:06	0.993	0.704	1.000	1.057	84.9%	2.48%
6	2D	60	7	63	1.050	4/12/2023 10:13	4/6/2023 14:16	4/12/2023 7:06	0.993	0.703	1.000	1.057	73.0%	2.58%
7	4A	60	9	42	0.700	4/12/2023 10:13	4/6/2023 14:16	4/12/2023 7:06	0.994	0.703	1.000	1.057	84.0%	2.49%
8	4C	60	14	56	0.933	4/12/2023 10:13	4/6/2023 14:16	4/12/2023 7:06	0.994	0.703	1.000	1.057	79.2%	2.53%
9	4D	60	6	51	0.850	4/12/2023 10:13	4/6/2023 14:16	4/12/2023 7:06	0.994	0.703	1.000	1.057	92.1%	2.43%
10	5C	60	10	40	0.667	4/12/2023 10:13	4/6/2023 14:16	4/12/2023 7:06	0.994	0.703	1.000	1.057	78.7%	2.53%
11	7B	60	7	39	0.650	4/12/2023 10:12	4/6/2023 14:16	4/12/2023 7:06	0.998	0.704	1.000	1.057	76.5%	2.55%
12	1A	60	8	42	0.700	4/12/2023 10:12	4/6/2023 14:16	4/12/2023 7:06	0.993	0.704	1.000	1.057	69.3%	2.63%
13	7C	60	31	1175	19.583	4/12/2023 10:12	4/6/2023 14:16	4/12/2023 7:06	0.998	0.704	1.000	1.057	81.5%	2.51%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.6068	0.00711	0.522	4/7/2023 18:45	500
2	PIC	6/1/2022	5/31/2023	0.6190	0.00847	0.788	4/7/2023 18:45	500
3	PIC	6/1/2022	5/31/2023	0.6048	0.00692	0.518	4/7/2023 18:45	500
4	PIC	6/1/2022	5/31/2023	0.6201	0.01914	0.826	4/7/2023 18:45	500
5	PIC	6/1/2022	5/31/2023	0.6022	0.01274	0.726	4/7/2023 18:46	500
6	PIC	6/1/2022	5/31/2023	0.6046	0.00745	0.898	4/7/2023 18:46	500
7	PIC	6/1/2022	5/31/2023	0.6013	0.01123	0.510	4/7/2023 18:46	500
8	PIC	6/1/2022	5/31/2023	0.6359	0.00889	0.976	4/7/2023 18:46	500
9	PIC	6/1/2022	5/31/2023	0.5954	0.00773	0.578	4/7/2023 18:46	500
10	PIC	6/1/2022	5/31/2023	0.6242	0.00657	0.548	4/7/2023 18:47	500
11	PIC	6/1/2022	5/31/2023	0.6366	0.00627	0.586	4/7/2023 18:43	500
12	PIC	6/1/2022	5/31/2023	0.6209	0.00738	0.724	4/7/2023 18:45	500
13	PIC	6/1/2022	5/31/2023	0.6407	0.00790	0.898	4/7/2023 18:43	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

* - RPD changed to 0% due to sample & dup activity below MDA

LCS S/N : 2051-B
LCS Exp Date : 3/27/2024
LCS Activity (dpm/ml): 559.43
LCS Volume Added: 0.10

Results														2 SIGMA		2 SIGMA	
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery	
1	1.1091	0.7830	3	1.8071	0.6976	76.26%	0.1447	0.1103	1.0420	1.0570		SAMPLE					
2	1.1829	0.8351	3	1.8795	1.7943	34.59%	0.4287	0.1478	1.2128	1.2955		SAMPLE					
3	0.9672	0.6828	3	1.5767	3.0900	20.36%	0.7320	0.1479	1.2236	1.4528		SAMPLE					
4	1.2594	0.8892	3	1.9960	0.7574	77.85%	0.1740	0.1353	1.1548	1.1710		SAMPLE					
5	1.1871	0.8381	3	1.8950	0.9074	62.96%	0.2073	0.1304	1.1186	1.1422		SAMPLE					
6	1.5182	1.0719	3	2.3954	0.7650	91.43%	0.1520	0.1389	1.3702	1.3840		SAMPLE					
7	1.0209	0.7207	3	1.6660	0.8532	59.34%	0.1900	0.1126	0.9913	1.0148		SAMPLE					
8	1.3862	0.9786	3	2.1777	-0.1881	310.13%	-0.0427	0.1323	1.1431	1.1432		SAMPLE					
9	0.9781	0.6905	3	1.5831	1.0992	45.58%	0.2720	0.1238	0.9805	1.0193		SAMPLE					
10	1.0629	0.7504	3	1.7263	0.5352	93.14%	0.1187	0.1105	0.9767	0.9861		SAMPLE					
11	1.0844	0.7656	3	1.7537	0.2848	171.22%	0.0640	0.1096	0.9557	0.9584		MB					
12	1.3982	0.9871	3	2.2323	-0.1239	477.17%	-0.0240	0.1145	1.1586	1.1588	615636001.1	DUP	* 0.0%				
13	1.2516	0.8837	3	1.9748	77.5274	4.04%	18.6853	0.5729	4.6588	20.2217		LCS			80.5428	96.3%	

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
615636001	1B	60	10	40	4/12/2023 10:12	4/12/2023 11:12	PIC	2406255
615636002	1C	60	6	73	4/12/2023 10:12	4/12/2023 11:12	PIC	2406255
615636003	1D	60	7	75	4/12/2023 10:12	4/12/2023 11:12	PIC	2406255
615636004	2A	60	8	60	4/12/2023 10:13	4/12/2023 11:13	PIC	2406255
615636005	2C	60	16	56	4/12/2023 10:13	4/12/2023 11:13	PIC	2406255
615636006	2D	60	7	63	4/12/2023 10:13	4/12/2023 11:13	PIC	2406255
616069001	4A	60	9	42	4/12/2023 10:13	4/12/2023 11:13	PIC	2406255
616069002	4C	60	14	56	4/12/2023 10:13	4/12/2023 11:13	PIC	2406255
616069003	4D	60	6	51	4/12/2023 10:13	4/12/2023 11:13	PIC	2406255
616069004	5C	60	10	40	4/12/2023 10:13	4/12/2023 11:13	PIC	2406255
1205361131	7B	60	7	39	4/12/2023 10:12	4/12/2023 11:12	PIC	2406255
1205361132	1A	60	8	42	4/12/2023 10:12	4/12/2023 11:12	PIC	2406255
1205361133	7C	60	31	1175	4/12/2023 10:12	4/12/2023 11:12	PIC	2406255

ASSAY 12-Apr-23 7:36:07
 Wizard 2480 s/n 46190630
 Protocol id 8 Ba-133
 Time limit
 Count limit
 Isotope Ba-133
 Protocol date 4/12/2023
 Run id. 6479

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	87	1	180	3590.28	1196.48	1.67	07:36:07
615636001	2	87	2	180	2762.85	920.78	1.9	76.96	07:39:21
615636002	3	87	3	180	3063.28	1020.86	1.81	85.32	07:42:35
615636003	4	87	4	180	3145.85	1048.54	1.78	87.64	07:45:49
615636004	5	87	5	180	2898.28	965.87	1.86	80.73	07:49:03
615636005	1	1	1	180	3047.57	1015.7	1.81	84.89	07:52:39
615636006	2	1	2	180	2621.57	873.72	1.95	73.02	07:55:53
616069001	3	1	3	180	3014.57	1004.7	1.82	83.97	07:59:06
616069002	4	1	4	180	2843	947.52	1.88	79.19	08:02:20
616069003	5	1	5	180	3308	1102.42	1.74	92.14	08:05:35
616069004	1	15	1	180	2825.28	941.63	1.88	78.70	08:09:10
1205361131	2	15	2	180	2745.57	914.99	1.91	76.47	08:12:24
1205361132	3	15	3	180	2487.28	828.87	2.01	69.28	08:15:38
1205361133	4	15	4	180	2926.28	975.28	1.85	81.51	08:18:52

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 12-Apr-2023

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z and LB4200 OA1 through OA1

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	Above	Beta bkg	12-Apr 04:09	60	2.383	1.385	3.072	+0.55
LB4100E2	need 2nd	Beta eff	12-Apr 05:22	5	14211	14120	15200	-2.50
LB4100E4	Above	Beta bkg	12-Apr 06:28	60	2.150	1.058	2.464	+1.66
LB4100F2	Above	Alpha bkg	12-Apr 04:09	60	0.383	0.042	0.294	+5.15
LB4100F2	Below	Alpha eff	12-Apr 05:13	5	6016	6533	7372	-6.69
LB4100F2	Above	Alpha XTalk	12-Apr 05:13	5	0.386	0.318	0.366	+5.55
LB4100F2	Above	Beta bkg	12-Apr 04:09	60	21.933	1.173	1.833	+185.73
LB4100F2	Below	Beta eff	12-Apr 05:22	5	14989	15040	15710	-3.46
LB4100F3	Above	Alpha bkg	12-Apr 04:09	60	0.333	0.059	0.442	+1.30
LB4100G1	need 2nd	Alpha eff	12-Apr 05:23	5	8596	7975	12090	-2.09
LB4100G1	Above	Beta bkg	12-Apr 04:10	60	793	0.380	1.675	+3,671.02
LB4100G3	Above	Beta bkg	12-Apr 04:10	60	2.050	0.987	2.738	+0.64
LB4100H1	Above	Beta bkg	12-Apr 04:09	60	2.283	0.216	2.462	+2.52
PIC2B	Above	Beta bkg	12-Apr 07:38	60	2.200	-5.22E-1	2.315	+2.76
PIC4B	Above	Alpha bkg	12-Apr 09:07	60	0.400	0.127	0.391	+3.21
PIC6B	Above	Alpha bkg	12-Apr 09:14	60	0.433	-6.69E-2	0.412	+3.26
PIC12C	Above	Beta bkg	12-Apr 06:03	60	3.650	0.142	2.845	+4.79
PIC14B	Above	Beta bkg	12-Apr 06:14	60	7.383	-7.38E-1	2.727	+11.06
PIC14C	Above	Beta bkg	12-Apr 06:14	60	2.500	-1.36E+0	4.189	+1.17

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100A1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

LB410012 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB410013 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB410014 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4200OA1 Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by 

Date 4/12/23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2406255

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205361131	MB	JE1	PIC7B	APR-12-23 10:12:30	DONE	25mm Filter	01-JUN-22 00:00
1205361132	DUP	JE1	PIC1A	APR-12-23 10:12:35	DONE	25mm Filter	01-JUN-22 00:00
1205361133	LCS	JE1	PIC7C	APR-12-23 10:12:37	DONE	25mm Filter	01-JUN-22 00:00
615636001	SAMPLE	JE1	PIC1B	APR-12-23 10:12:47	DONE	25mm Filter	01-JUN-22 00:00
615636002	SAMPLE	JE1	PIC1C	APR-12-23 10:12:54	DONE	25mm Filter	01-JUN-22 00:00
615636003	SAMPLE	JE1	PIC1D	APR-12-23 10:12:58	DONE	25mm Filter	01-JUN-22 00:00
615636004	SAMPLE	JE1	PIC2A	APR-12-23 10:13:05	DONE	25mm Filter	01-JUN-22 00:00
615636005	SAMPLE	JE1	PIC2C	APR-12-23 10:13:12	DONE	25mm Filter	01-JUN-22 00:00
615636006	SAMPLE	JE1	PIC2D	APR-12-23 10:13:15	DONE	25mm Filter	01-JUN-22 00:00
616069001	SAMPLE	JE1	PIC4A	APR-12-23 10:13:19	DONE	25mm Filter	01-JUN-22 00:00
616069002	SAMPLE	JE1	PIC4C	APR-12-23 10:13:26	DONE	25mm Filter	01-JUN-22 00:00
616069003	SAMPLE	JE1	PIC4D	APR-12-23 10:13:29	DONE	25mm Filter	01-JUN-22 00:00
616069004	SAMPLE	JE1	PIC5C	APR-12-23 10:13:32	DONE	25mm Filter	01-JUN-22 00:00

Lucas Cell Raw Data

Batch 2406215 Check-list

This check-list was completed on 17-APR-23 by Lyndsey Pace

This batch was reviewed by Gregory Ramsay on 17-APR-23 and Lyndsey Pace on 17-APR-23.

Batch ID:
2406215

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2406215
Analyst: Lyndsey Pace (LXP1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: LUCAS-C202389980

Due Dates for Lab: 18-APR-2023			Package: 20-APR-2023		SDG: 21-APR-2023	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205361075	Radium-226 SPIKE	1715-G	.1	mL	
MS	1205361074	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	615636001	05-APR-2023	1	507.93	507.93	04/13/23 10:04	208	04/16/23 06:25	04/16/23 09:46	6	18
2	615636002	05-APR-2023	1	506.57	506.57	04/13/23 10:04	304	04/16/23 06:25	04/16/23 09:46	2	21
3	615636003	05-APR-2023	1	502.26	502.26	04/13/23 10:04	402	04/16/23 06:25	04/16/23 09:46	4	14
4	615636004	05-APR-2023	1	501.22	501.22	04/13/23 10:04	508	04/16/23 06:25	04/16/23 09:46	8	26
5	615636005	05-APR-2023	1	502.3	502.3	04/13/23 10:04	604	04/16/23 06:25	04/16/23 09:46	1	28
6	615636006	05-APR-2023	1	503.32	503.32	04/13/23 10:04	701	04/16/23 06:25	04/16/23 09:46	4	11
7	616069001	05-APR-2023	1	502.87	502.87	04/13/23 10:04	801	04/16/23 06:25	04/16/23 09:46	5	23
8	616069002	05-APR-2023	1	501.92	501.92	04/13/23 10:04	101	04/16/23 06:55	04/16/23 10:17	3	21
9	616069003	05-APR-2023	1	504.99	504.99	04/13/23 10:04	206	04/16/23 06:55	04/16/23 10:17	6	14
10	616069004	05-APR-2023	1	503.24	503.24	04/13/23 10:04	408	04/16/23 06:55	04/16/23 10:17	2	12
11	1205361072 MB	05-APR-2023	1		507.93	04/13/23 10:04	501	04/16/23 06:55	04/16/23 10:17	6	13
12	1205361073 DUP (615636001)	05-APR-2023	1	507.79	507.79	04/13/23 10:04	706	04/16/23 06:55	04/16/23 10:17	4	18
13	1205361074 MS (615636001)	05-APR-2023	1	130.12	130.12	04/13/23 10:04	802	04/16/23 06:55	04/16/23 10:17	4	497
14	1205361075 LCS	05-APR-2023	1		507.93	04/13/23 10:04	104	04/16/23 07:15	04/16/23 10:51	1	521

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 05-APR-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Procedure Code : LUC26RAL
 Parmname : Radium-226
 Required MDA : 1 pCi/L
 Halflife of Ra-226 : 1600 years
 Ra-226 Abundance : 1.00
 Halflife of Rn-222 : 3.8235 days

Batch : 2406215
 Analyst : LIN01615
 Prep Date : 4/5/2023
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	615636001.1	0.5079	2.0288E-05	3/21/2023 11:08	208	30	18	0.600	6	0.200	30	1.7740
2	615636002.1	0.5066	2.0282E-05	3/21/2023 14:44	304	30	21	0.700	2	0.067	30	1.8850
3	615636003.1	0.5023	2.0265E-05	3/21/2023 13:17	402	30	14	0.467	4	0.133	30	1.4980
4	615636004.1	0.5012	2.0261E-05	3/21/2023 14:06	508	30	26	0.867	8	0.267	30	1.8020
5	615636005.1	0.5023	2.0265E-05	3/21/2023 11:08	604	30	28	0.933	1	0.033	30	1.6810
6	615636006.1	0.5033	2.0269E-05	3/21/2023 8:05	701	30	11	0.367	4	0.133	30	1.7440
7	616069001.1	0.5029	2.0268E-05	3/24/2023 12:42	801	30	23	0.767	5	0.167	30	1.4200
8	616069002.1	0.5019	2.0264E-05	3/24/2023 14:35	101	30	21	0.700	3	0.100	30	1.5720
9	616069003.1	0.5050	2.0276E-05	3/24/2023 12:42	206	30	14	0.467	6	0.200	30	1.8770
10	616069004.1	0.5032	2.0269E-05	3/24/2023 11:45	408	30	12	0.400	2	0.067	30	1.5020
11	1205361072.1	0.5079	2.0288E-05	4/5/2023 0:00	501	30	13	0.433	6	0.200	30	1.8220
12	1205361073.1	0.5078	2.0287E-05	3/21/2023 11:08	706	30	18	0.600	4	0.133	30	1.5900
13	1205361074.1	0.1301	1.3068E-05	3/21/2023 11:08	802	30	497	16.567	4	0.133	30	1.5330
14	1205361075.1	0.5079	2.0288E-05	4/5/2023 0:00	104	30	521	17.367	1	0.033	30	1.6160

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
5.500%	8/1/2022	7/31/2023	4/13/2023 10:04	4/16/2023 6:25	4/16/2023 9:46	0.403	0.975	1.002	1.000
8.900%	10/25/2022	10/31/2023	4/13/2023 10:04	4/16/2023 6:25	4/16/2023 9:46	0.403	0.975	1.002	1.000
5.300%	2/1/2023	1/31/2024	4/13/2023 10:04	4/16/2023 6:25	4/16/2023 9:46	0.403	0.975	1.002	1.000
4.500%	6/1/2022	5/31/2023	4/13/2023 10:04	4/16/2023 6:25	4/16/2023 9:46	0.403	0.975	1.002	1.000
6.700%	7/1/2022	6/30/2023	4/13/2023 10:04	4/16/2023 6:25	4/16/2023 9:46	0.403	0.975	1.002	1.000
6.200%	11/1/2022	10/31/2023	4/13/2023 10:04	4/16/2023 6:25	4/16/2023 9:46	0.403	0.975	1.002	1.000
3.200%	4/8/2023	3/31/2024	4/13/2023 10:04	4/16/2023 6:25	4/16/2023 9:46	0.403	0.975	1.002	1.000
1.200%	4/28/2022	4/30/2023	4/13/2023 10:04	4/16/2023 6:55	4/16/2023 10:17	0.406	0.975	1.002	1.000
2.800%	8/1/2022	7/31/2023	4/13/2023 10:04	4/16/2023 6:55	4/16/2023 10:17	0.406	0.975	1.002	1.000
7.000%	2/1/2023	1/31/2024	4/13/2023 10:04	4/16/2023 6:55	4/16/2023 10:17	0.406	0.975	1.002	1.000
7.900%	6/1/2022	5/31/2023	4/13/2023 10:04	4/16/2023 6:55	4/16/2023 10:17	0.406	0.975	1.002	1.000
2.900%	11/1/2022	10/31/2023	4/13/2023 10:04	4/16/2023 6:55	4/16/2023 10:17	0.406	0.975	1.002	1.000
6.100%	4/8/2023	3/31/2024	4/13/2023 10:04	4/16/2023 6:55	4/16/2023 10:17	0.406	0.975	1.002	1.000
2.000%	4/28/2022	4/30/2023	4/13/2023 10:04	4/16/2023 7:15	4/16/2023 10:51	0.407	0.973	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-G
Spike Exp Date : 9/8/2023
Spike Activity (dpm/ml): 297.42
Spike Volume Added: 0.10

LCS S/N : 1715-G
LCS Exp Date : 9/8/2023
LCS Activity (dpm/ml): 297.42
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.3427	0.2420	1	0.6113	0.5095	41.19%	0.4000	0.1633	0.4077	0.4179		SAMPLE				
2	0.1867	0.1318	1	0.3839	0.7613	26.76%	0.6333	0.1599	0.3766	0.4142		SAMPLE				
3	0.3351	0.2366	1	0.6258	0.5085	42.76%	0.3333	0.1414	0.4229	0.4324		SAMPLE				
4	0.3948	0.2787	1	0.6846	0.7625	32.71%	0.6000	0.1944	0.4841	0.5010		SAMPLE				
5	0.1493	0.1054	1	0.3468	1.2234	21.04%	0.9000	0.1795	0.4783	0.5346		SAMPLE				
6	0.2873	0.2028	1	0.5364	0.3051	55.67%	0.2333	0.1291	0.3309	0.3358		SAMPLE				
7	0.3948	0.2787	1	0.7182	0.9645	29.57%	0.6000	0.1764	0.5557	0.5761		SAMPLE				
8	0.2753	0.1943	1	0.5333	0.8681	27.24%	0.6000	0.1633	0.4631	0.4802		SAMPLE				
9	0.3240	0.2288	1	0.5780	0.3212	55.97%	0.2667	0.1491	0.3519	0.3554		SAMPLE				
10	0.2346	0.1656	1	0.4823	0.5034	38.07%	0.3333	0.1247	0.3692	0.3826		SAMPLE				
11	0.3319	0.2343	1	0.5920	0.2878	62.77%	0.2333	0.1453	0.3513	0.3565		MB				
12	0.3106	0.2193	1	0.5800	0.6598	33.63%	0.4667	0.1563	0.4333	0.4452	615636001.1	DUP	25.7%			
13	1.2572	0.8876	1	2.3475	94.0487	7.60%	16.4333	0.7461	8.3691	19.5138	615636001.1	MS			102.9631	91.3%
14	0.1525	0.1076	1	0.3541	24.0608	4.83%	17.3333	0.7616	2.0720	4.1528		LCS			26.3763	91.2%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 16-APR-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:13	1	1.19E+05	119159	-0.66		
LUCAS2	EFF	07:07	1	1.34E+05	134180	0.37		
LUCAS3	EFF	07:00	1	97638	97638	-2.49		
LUCAS4	EFF	06:51	1	1.29E+05	129040	1.73		
LUCAS5	EFF	06:49	1	1.33E+05	132999	0.4		
LUCAS6	EFF	06:46	1	1.31E+05	130751	1.09		
LUCAS7	EFF	06:44	1	1.33E+05	133353	0.25		
LUCAS8	EFF	06:40	1	1.20E+05	120435	-2.45		

Reviewed by: 
Lyndsey Pace

Date: 16-APR-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2406215

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
615636001	SAMPLE	LXP1	LUCAS2	APR-16-23 09:46:00	DONE	Lucas Cell	01-AUG-22 00:00
615636002	SAMPLE	LXP1	LUCAS3	APR-16-23 09:46:00	DONE	Lucas Cell	25-OCT-22 00:00
615636003	SAMPLE	LXP1	LUCAS4	APR-16-23 09:46:00	DONE	Lucas Cell	01-FEB-23 00:00
615636004	SAMPLE	LXP1	LUCAS5	APR-16-23 09:46:00	DONE	Lucas Cell	01-JUN-22 00:00
615636005	SAMPLE	LXP1	LUCAS6	APR-16-23 09:46:00	DONE	Lucas Cell	01-JUL-22 00:00
615636006	SAMPLE	LXP1	LUCAS7	APR-16-23 09:46:00	DONE	Lucas Cell	01-NOV-22 00:00
616069001	SAMPLE	LXP1	LUCAS8	APR-16-23 09:46:00	DONE	Lucas Cell	08-APR-23 00:00
616069002	SAMPLE	LXP1	LUCAS1	APR-16-23 10:17:00	DONE	Lucas Cell	28-APR-22 00:00
616069003	SAMPLE	LXP1	LUCAS2	APR-16-23 10:17:00	DONE	Lucas Cell	01-AUG-22 00:00
616069004	SAMPLE	LXP1	LUCAS4	APR-16-23 10:17:00	DONE	Lucas Cell	01-FEB-23 00:00
1205361072	MB	LXP1	LUCAS5	APR-16-23 10:17:00	DONE	Lucas Cell	01-JUN-22 00:00
1205361073	DUP	LXP1	LUCAS7	APR-16-23 10:17:00	DONE	Lucas Cell	01-NOV-22 00:00
1205361074	MS	LXP1	LUCAS8	APR-16-23 10:17:00	DONE	Lucas Cell	08-APR-23 00:00
1205361075	LCS	LXP1	LUCAS1	APR-16-23 10:51:00	DONE	Lucas Cell	28-APR-22 00:00



Environmental Laboratory
1232 Haco Drive
Lansing
Michigan, 48910

CHAIN OF CUSTODY

Page 1 of 1

Phone: (517)702-6372

Lab Work Order Number L303200

Client Name BWL - Erickson Station		Project Name Erickson AM MI Wells 16A-D	Requested Analyses						Requested Turn Around	
Client Contact Cheryl Louden		Project Number [none]	Ag: As: B: Ba: Be: Ca: Cd: Cr: Co: Cu: Fe: Hg: Li: Mo: Ni: Pb: Sb: Se: Si: Tl: V: Zn: Na: K: Mg TSS, HCO3, CO3, Hardness Cl-IC: F-ISE: SO4: TDS Radium 226 and Radium 228						Rush requests subject to additional charge.	
Address 3725 S. Canal		Project Description							Rush requests subject to lab approval.	
City Lansing		PO Number 30926 10021								
State/Zip MI, 48917		Shipped By								
Phone (517) 702-6396	Fax (517) 702-6373	Tracking Number								
Sampler Marc Wahrer										

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code				Sample	Comments
						b	a	a	b		
MW-16A	03/21/23	1108	G	GW	5	1	1	1	2		
MW-16B		1444	G	GW	5	1	1	1	2		
MW-16C		1317	G	GW	5	1	1	1	2		
MW-16D		1406	G	GW	5	1	1	1	2		
MWT-16A		1108	G	GW	5	1	1	1	2		
Field Blank		0905	G	DI	5	1	1	1	2		
Equipment Blank			G	DI	5	1	1	1	2		No equipment blank JSC 03/22/23

Relinquished By 	Date/Time 3-21-23 1945	Received By J. Caporale	Date/Time 03/21/23 0830	
Relinquished By	Date/Time	Received By	Date/Time	Comments
Relinquished By	Date/Time	Received By	Date/Time	
Cooler Numbers and Temperatures E0776 1.0°C (in fridge w/ ice in cooler)				

Matrix Codes:

DI=Deionized Water, GW=Ground Water

Preserv. Codes:

a=None, b=0.5% HNO3



Lansing Board of Water and Light
Environmental Services Laboratory (MI00079)

Cert ID: 3760
1232 Haco Dr.
Lansing, Michigan 48901

03 April 2023

BWL - Erickson Station

Attn: Cheryl Loudon

3725 S. Canal

Lansing, MI 48917

Project: General Lab

Dear Cheryl Loudon,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

Work Order	Received	Account Number
L303217	3/22/2023 8:30:00AM	30926 10021
L303220	3/22/2023 3:23:00PM	30926 10021
L303222	3/23/2023 3:00:00PM	30926 10021
L303223	3/23/2023 3:00:00PM	30926 10021

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jennifer Caporale, Supervisor

Note: Added additional report to the end of original report on 06/29/23 JSC



**COVALENT
METROLOGY**

**CM000027054
ICP-MS Analysis Report**

03/31/2023

Created by: Adlai Katzenberg, Ph.D.

Reviewed by: Nanette Jarenwattananon, Ph.D.

covalentmetrology.com

Table of Contents

Results Summary	3
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<u>Instrument Description</u>	5-7
<u>Analytical Terminology</u>	8-9
<u>Metrology Summary</u>	10

Sample Description and Objective

- 20 sample of groundwater were received for analysis by ICPMS:
Goal: Quantify ^7Li , ^{11}B , ^{86}Sr , ^{87}Sr , and $^{87}\text{Sr}/^{86}\text{Sr}$ ratio
- Sample was diluted 100X in deionized water
- Deionized water was used as a process blank to assess impurities that are due to sample preparation steps and reagents - and is used for background correction of samples.
- All concentrations are reported with respect to the as-received (un-diluted) samples

Results Summary

- Li concentrations were below 100 ng/mL, except in one sample: L30322-01A
- Average $^{87}\text{Sr}/^{86}\text{Sr}$ ratio was 0.52, with a low of 0.51 and a high of 0.55

Analytical Results

4

All results are listed in ppb (ng/mL)

Element / Isotope	Instrument Mode	FieldBlank 3-22-23 0815	MW-11 3-22-23 1304	MW-16D 3-21-23 1406	MW-12B 3-22-23 1019	MW-16B 3-21-23 1444	MW-12 3-22-23	L303223-01A
⁷ Li	SQ-KED	N.D.	67.68	31.29	34.69	17.45	12.56	N.D.
¹¹ B	SQ-KED	N.D.	N.D.	4418.66	3111.84	154.31	65.20	1334.04
⁸⁶ Sr	SQ-KED	N.D.	492.01	1211.11	775.78	888.43	391.79	2903.30
⁸⁷ Sr	SQ-KED	N.D.	270.32	616.22	411.06	456.29	201.82	1517.54
⁸⁷ Sr/ ⁸⁶ Sr Ratio		-----	0.55	0.51	0.53	0.51	0.52	0.52

Element / Isotope	Instrument Mode	MW-11B 3-22-23 1404	MWF-12B 3-22-23 1019	MW-7 3-21-23 1732	MW-16C 3-21-23 1317	MW-7B 3-21-23 1830	MW-16A 3-21-23 1108	L303223-02A
⁷ Li	SQ-KED	19.58	31.92	52.57	18.30	13.62	N.D.	N.D.
¹¹ B	SQ-KED	996.08	3153.90	1448.23	386.16	2842.92	108.79	1026.18
⁸⁶ Sr	SQ-KED	1320.00	758.88	1103.10	914.80	298.39	453.62	2656.78
⁸⁷ Sr	SQ-KED	682.51	397.79	575.61	477.04	153.94	236.39	1394.17
⁸⁷ Sr/ ⁸⁶ Sr Ratio		0.52	0.52	0.52	0.52	0.52	0.52	0.52

Element / Isotope	Instrument Mode	MW-7C 3-21-23 1926	MWT-16A 3-21-23 1108	L30322-01A	FB 3-21-23 0805	L30322-02A	MW-2 3-22-23 1140
⁷ Li	SQ-KED	93.00	N.D.	1126.74	N.D.	45.33	23.62
¹¹ B	SQ-KED	5864.84	145.05	644.25	10.03	125.76	5017.11
⁸⁶ Sr	SQ-KED	1579.83	469.46	332.68	N.D.	586.08	445.73
⁸⁷ Sr	SQ-KED	821.03	244.43	174.32	N.D.	305.79	234.40
⁸⁷ Sr/ ⁸⁶ Sr Ratio		0.52	0.52	0.52	-----	0.52	0.53

N.D. = not detected at or above the method detection limit

- Analytical work was performed on a Thermo Scientific iCAP triple quadrupole inductively coupled plasma mass spectrometer – TQ-ICP-MS.
- To remove interferences from analysis matrix, instrument can use a variety of instrument modes as described below and on next page.
 - After ionization in plasma (P), quadrupole 1 (Q1) works as a selective mass filter for ions entering instrument.
 - Using hydrogen, helium, oxygen or ammonia gas, selective reaction chemistry- or collision interference removal takes place in Q2. When no gases are used, cell is in pass-through mode.
 - Q3 is the final mass filter after collisions/reactions in Q2 before the product (analyte) ions are counted by detector.
 - Reactive gases either form a product ion with the analyte that is interference free (mass shift mode) or reacts with the interference to remove the interference signal from the analyte (on mass mode).
 - The mass analyzer quadrupole (Q3) is either set to the original analyte mass (on-mass analysis) or the product ion mass (mass shift mode).



The Thermo Scientific
iCAP TQ ICP-MS System

- The dual mode detector has a linear dynamic range of ~10 orders of magnitude, making it possible to determine ppt- to ppm concentrations in one analysis run with appropriate standard curve set up.
- For most analytical work, instrument is used in pulse counting mode for ppt to ppb (pg/mL to ng/mL) trace element analysis.
- Semi-quantitative analysis was performed for the following element set:

Li, B, Sr.

Table A: TQ-ICP-MS Instrument Modes

Instrument Mode	Description	Reaction Mechanism
SQ-N/A	Single quadrupole mode, no collision or reaction gases	(none)
SQ-KED	SQ mode using helium as collision gas with kinetic energy discrimination	Gas collisions, remove polyatomic interferences
SQ-He	SQ mode using helium as collision gas	Gas collisions, remove polyatomic interferences
SQ-H ₂	SQ mode using hydrogen as reaction gas	Gas reaction, remove polyatomic interferences
TQ-O ₂	Triple quadrupole mode using oxygen as reaction gas	On-mass or mass shift
TQ-NH ₃	Triple quadrupole mode using ammonia as reaction gas	On-mass or mass shift

Table B: Analytical Terminology

SD	Standard deviation for n replicate measurements	$SD = \sqrt{\frac{1}{n-1} \cdot \sum_{i=1}^n (x_i - \bar{x})^2}$
SQL	Method quantitation limit where SD_{Blank} is the standard deviation for the calibration blank measured 10 times	$SQL = \left(\frac{10 \times SD_{Blank}}{a_1} \right) \times TDF$
a_1, a_0	Slope and intercept of the calibration function	$f(x) = a_1x + a_0$
TDF	Total dilution factor	$TDF = \frac{V_S + V_D}{V_S} = \frac{\text{Total volume of sample + diluent}}{\text{Volume of sample}}$
$C_{m,i}$	Measured concentration or mass fraction where X_i is the mean value of n replicate measurements of element (or isotope) i	$C_{m,i} = X_i \pm U_{m,i}$
$U_{m,i}$	Measurement uncertainty, expressed as a 95% confidence interval of the mean measured value X_i . t = Student's t -value for $n-1$ replicate measurements; SD_i is the standard deviation for element (or isotope) i .	$U_{m,i} = \frac{t \cdot SD_i}{\sqrt{n}}$

Table C: Commonly Used Concentration or Mass Fraction Units

Common Name	Description	Fraction	Liquid Concentration		Solids Mass Fractions	
ppq	Parts per quadrillion	10^{-15}	fg/mL	pg/L	fg/g	pg/kg
ppt	Parts per trillion	10^{-12}	pg/mL	ng/L	pg/g	ng/kg
ppb	Parts per billion	10^{-9}	ng/mL	ug/L	ng/g	ug/kg
ppm	Parts per million	10^{-6}	ug/mL	mg/L	ug/g	mg/kg
% wt	Weight percent	10^{-2}	n/a	n/a	10,000 ug/g	10,000 mg/kg

1. All sample preparation and analysis was done by according to ISO/IEC 17025 - *General requirements for the competence of testing and calibration laboratories* – by trained personnel familiar with this standard.
2. Class A glass volumetric flasks are calibrated according to ASTM-E288 - *Standard Specification for Laboratory Glass Volumetric Flasks*.
3. Polymethyl pentene PMP Class A volumetric flasks are calibrated according to ISO 4787 - *Laboratory glassware - Volumetric instruments - Methods for testing of capacity and for use*.
4. Pipettes were checked before use and met specifications using a balance calibrated using ISO/IEC 17025 and ANSI/NCLZ-36.2-2013 accredited calibration weights.
5. Analytical standards are all NIST-traceable.

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- Advanced Analysis and Interpretation
- Expert Advisory Services



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& Imaging

- Fast & Easy [Quotation](#) Process
- Sample Pick-Up in Bay Area
- Full Service Analytical Lab for All Your Characterization Needs



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Turn Around

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& Rentals

Cost
Effective



- Strong Partnerships with Global Instrument Leaders
- Operational excellence
- Value & Cost Savings Directly to Our Customers



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(408) 498-4611

hello@covalentmetrology.com





Environmental Laboratory
 1232 Haco Drive
 Lansing
 Michigan, 48910

CHAIN OF CUSTODY

Phone: (517)702-6372

Lab Work Order Number L303217

Client Name BWL - Erickson Station		Project Name General Lab	Requested Analyses						Requested Turn Around	
Client Contact Cheryl Louden		Project Number [none]	6(11)B, (7)Li, (87)Sr,(86), Sr,(87)Sr/(86)Sr ratio							Rush requests subject to additional charge Rush requests subject to lab approval.
Address 3725 S. Canal		Project Description General Lab Analysis								
City Lansing		PO Number								
State/Zip MI, 48917		Shipped By								
Phone (517) 702-6396	Fax (517) 702-6373	Tracking Number								
Sampler Marc Wahrer										

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code											Sample	Comments	
						a													
MW-16A	03/21/2023	11:08	G	GW	1	1													Send to Covalent Metrology
MW-16B	03/21/2023	14:44	G	GW	1	1													Send to Covalent Metrology
MW-16C	03/21/2023	13:17	G	GW	1	1													Send to Covalent Metrology
MW-16D	03/21/2023	14:06	G	GW	1	1													Send to Covalent Metrology
MWT-16A	03/21/2023	11:08	G	GW	1	1													Send to Covalent Metrology
MW-7	03/21/2023	17:32	G	GW	1	1													Send to Covalent Metrology
MW-7B	03/21/2023	18:30	G	GW	1	1													Send to Covalent Metrology
MW-7C	03/21/2023	19:26	G	GW	1	1													Send to Covalent Metrology
Field Blank	03/21/2023	08:05	G	GW	1	1													Send to Covalent Metrology

Relinquished By  MAW	Date/Time 3/21/23 1945	Received By Jennifer Caporale	Date/Time 3/22/2023 8:30	
Relinquished By	Date/Time	Received By	Date/Time	Comments
Relinquished By	Date/Time	Received By	Date/Time	
Cooler Numbers and Temperatures E0776 at 1 °C				



Environmental Laboratory
 1232 Haco Drive
 Lansing
 Michigan, 48910

CHAIN OF CUSTODY

Phone: (517)702-6372

Lab Work Order Number L303220

Client Name BWL - Erickson Station		Project Name General Lab		Requested Analyses								Requested Turn Around			
Client Contact Cheryl Louden		Project Number [none]		δ(11)B, (7)Li, (87)Sr, (86)Sr, (87)Sr/(86)Sr ratio											Rush requests subject to additional charge. Rush requests subject to lab approval.
Address 3725 S. Canal		Project Description General Lab Analysis													
City Lansing		PO Number													
State/Zip MI, 48917		Shipped By													
Phone (517) 702-6396	Fax (517) 702-6373	Tracking Number													
Sampler Marc Wahrer															

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code										Sample	Comments
						a											
MW-2	03/22/2023	11:40	G	GW	1	1											Send to Covalent Metrology
MW-11	03/22/2023	13:04	G	GW	1	1											Send to Covalent Metrology
MW-11B	03/22/2023	14:04	G	GW	1	1											Send to Covalent Metrology
MW-12	03/22/2023	14:20	G	GW	1	1											Send to Covalent Metrology
MW-12B	03/22/2023	10:19	G	GW	1	1											Send to Covalent Metrology
MWT-12B	03/22/2023	10:19	G	GW	1	1											Send to Covalent Metrology
Field blank	03/22/2023	08:15	G	GW	1	1											Send to Covalent Metrology

Relinquished By 	Date/Time 3/22/2023 15:23	Received By Jennifer Caporale	Date/Time 3/22/2023 15:23	Comments
Relinquished By	Date/Time	Received By	Date/Time	
Relinquished By	Date/Time	Received By	Date/Time	
Cooler Numbers and Temperatures E0776 at 1.3 °C				



Environmental Laboratory
 1232 Haco Drive
 Lansing
 Michigan, 48910

CHAIN OF CUSTODY

Phone: (517)702-6372

Lab Work Order Number L303222

Client Name BWL - Erickson Station		Project Name General Lab		Requested Analyses								Requested Turn Around			
Client Contact Cheryl Loudon		Project Number [none]		To Merit for SPLP Isotope Analysis sent to Covalent Metrology											Rush requests subject to additional charge Rush requests subject to lab approval.
Address 3725 S. Canal		Project Description General Lab Analysis													
City Lansing		PO Number													
State/Zip MI, 48917		Shipped By													
Phone (517) 702-6396	Fax (517) 702-6373	Tracking Number													
Sampler HDR															

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code								Sample	Comments	
						a	a									
FB Ash 1	3/23/2023	1345	G	S	1	x	x									
CWP Ash 1	3/23/2023	1405	G	S	1	x	x									

Relinquished By 	Date/Time 3/23/23 18:00	Received By 	Date/Time 3-23-23 1500	
				Comments



Environmental Laboratory
 1232 Haco Drive
 Lansing
 Michigan, 48910

CHAIN OF CUSTODY

Page 1 of 1

Phone: (517)702-6372

Lab Work Order Number L303223

Client Name BWL - Erickson Station		Project Name General Lab	Requested Analyses							Requested Turn Around			
Client Contact Cheryl Louden		Project Number [none]	Centrifuge before going to Covalent Metrology	Isotope Analysis sent to Covalent Metrology									Rush requests subject to additional charge. Rush requests subject to lab approval.
Address 3725 S. Canal		Project Description General Lab Analysis											
City Lansing		PO Number											
State/Zip MI, 48917		Shipped By											
Phone (517) 702-6396	Fax (517) 702-6373	Tracking Number											
Sampler HDR													

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code										Sample	Comments
						a	a										
FB Ash 2	3/23/2023	1350	G	S	1	x	x										
CWP Ash 2	3/23/2023	1415	G	S	1	x	x										

Relinquished By 	Date/Time 3/23/23 15:00	Received By 	Date/Time 3-23-23 1500	
	Date/Time	Received By	Date/Time	
E0776 8L2				

Preserv. Codes:



2680 East Lansing Dr., East Lansing, MI 48823
 Phone (517) 332-0167 Fax (517) 332-4034
 www.meritlabs.com

C.O.C. PAGE 1 OF 1

REPORT TO

CONTACT NAME: Jennifer Caporale
 COMPANY: Lansing Board of Water and Light
 ADDRESS: PO Box 13007 48901-3007
 CITY: Lansing STATE: MI ZIP CODE: 48901
 PHONE NO.: 517-702-6372 FAX NO.: P.O. NO.:
 E-MAIL ADDRESS: Environmental_Laboratory@lbwl.com QUOTE NO.:

CHAIN OF CUSTODY RECORD

INVOICE TO

CONTACT NAME: Beth Zimpfer
 COMPANY:
 ADDRESS:
 CITY:
 PHONE NO.:
 E-MAIL ADDRESS: Beth.Zimpfer@lbwl.com

PROJECT NO./NAME: Erickson SPLP SAMPLER(S) - PLEASE PRINT/SIGN NAME:
 TURNAROUND TIME REQUIRED: 1 DAY 2 DAYS 3 DAYS STANDARD OTHER ASAP
 DELIVERABLES REQUIRED: STD LEVEL II LEVEL III LEVEL IV EDD OTHER

MATRIX CODE: GW-GROUNDWATER WW-WASTEWATER S-SOIL L-LIQUID SD-SOLID
 SL-SLUDGE DW-DRINKING WATER O-OIL WP-WIPE A-AIR W-WASTE

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MTRX	QTY	BOTTLES	PHONE	# Containers & Preservatives												
	DATE	TIME						PC	WV	WV2	WV3	WV4	WV5	WV6	WV7	WV8	OTHER			
46672.01	3-23-23	1345	FB Ash I L303222-01	S	1	1														
.02	3-23-23	1405	CWP Ash I L303222-02	S	1	1														

SPLP, Send back to LBWL

- Special Instructions:
- OHIO VAL
 - DoD
 - WEST
 - Detroit
 - New York

SPLP ASTM Leach Performed

Return

RELINQUISHED BY: *[Signature]* DATE: 3/24/23 TIME: 1543
 RECEIVED BY: *[Signature]* DATE: 3/24/23 TIME: 1543
 RELINQUISHED BY: *[Signature]* DATE: 3/28/23 TIME: 1505
 RECEIVED BY: *J. Caporale* DATE: 03/28/23 TIME: 1505

RELINQUISHED BY: *[Signature]* DATE: 3/28/23 TIME: 1430
 RECEIVED BY: *[Signature]* DATE: TIME:
 SEAL NO. SEAL INTACT YES NO INITIALS: NOTES: TEMP ON ARRIVAL: 13.6

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

Sending to Covalent + Metrology 03/29/23 JSC 03/28/23

Covalent Internal Chain of Custody			
Analysis by ICPMS	Qty	Description of Sample	Date/Time Sampled
$\delta(11)\text{B}, \text{b}(7)\text{Li}, (87)\text{Sr}, (86)\text{Sr}$ $(87)\text{Sr}/(86)\text{Sr}$ ratio 	1	MW-16A L303217-01	3/21/23 1108
	1	MW-16B L303217-02	3/21/23 1444
	1	MW-16C L303217-03	3/21/23 1317
	1	MW-16D L303217-04	3/21/23 1406
	1	MWT-16A L303217-05	3/21/23 1108
	1	MW-7 L303217-06	3/21/23 1732
	1	MW-7B L303217-07	3/21/23 1830
	1	MW-7C L303217-08	3/21/23 1926
	1	Field Blank L303217-09	3/21/23 0805

Client ID	Date/Time	Released by	Received By	Comments
CM000027054				
Quote Q-10878				

1. To be kept with Client Sample
2. File with sample until;
 - a. Return of Sample/Job
 - b. Disposal per request



Covalent Internal Chain of Custody			
Analysis by ICPMS	Qty	Description of Sample	Date/Time Sampled
$\delta(11)\text{B}, \text{b}(7)\text{Li}, (87)\text{Sr}, (86)\text{Sr}$ (87)Sr/(86)Sr ratio	1	MW-2 L303220-01	3/22/23 1140
	1	MW-11 L303220-02	3/22/23 1304
	1	MW-11B L303220-03	3/22/23 1404
	1	MW-12 L303220-04	3/22/23 1420
	1	MW-12B L303220-05	3/22/23 1019
	1	MWT-12B L303220-06	3/22/23 1019
	1	Field Blank L303220-07	3/22/23 0815
	1	FB Ash 1 SPLP L303222-01	3/23/23 1345
	1	CWP Ash 1 SPLP L303222-02	3/23/23 1405
	1	FB Ash 2 L303223-01	3/23/23 1350
	1	CWP Ash 2 L303223-02	3/23/23 1415

Client ID	Date/Time	Released by	Received By	Comments
CM000027054				
Quote Q-10878				

1. To be kept with Client Sample
2. File with sample until;
 - a. Return of Sample/Job
 - b. Disposal per request





**COVALENT
METROLOGY**

**CM000028749
ICP-MS Analysis Report**

06/15/2023

Created by: Joern T. Larsen, M.S.

Reviewed by: Adlai Katzenberg, Ph.D.

covalentmetrology.com

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Sample Description and Objective

- 20 sample of groundwater were received for analysis by ICPMS:
Goal: Quantify ^7Li , ^{11}B , ^{86}Sr , ^{87}Sr , $^{87}\text{Sr}/^{86}\text{Sr}$ ratio, and $^{11}\text{B}/^{10}\text{B}$ ratio.
- Sample was diluted 100X in deionized water
- Deionized water was used as a process blank to assess impurities that are due to sample preparation steps and reagents - and is used for background correction of samples.
- All concentrations are reported with respect to the as-received (un-diluted) samples

Analytical Results

4

		FieldBlank 3-22-23 0815			MW-11 3-22-23 1304			MW-16D 3-21-23 1406			MW-12B 3-22-23 1019			MW-16B 3-21-23 1444			MW-12 3-22-23			L303223-01A		
Element /	Instrument	C _m	U _m	U _m	C _m	U _m	U _m	C _m	U _m	U _m	C _m	U _m	U _m	C _m	U _m	U _m	C _m	U _m	U _m	C _m	U _m	U _m
Isotope	Mode	(ng/mL)	(ng/mL)	(%)	(ng/mL)	(ng/mL)	(%)	(ng/mL)	(ng/mL)	(%)	(ng/mL)	(ng/mL)	(%)	(ng/mL)	(ng/mL)	(%)	(ng/mL)	(ng/mL)	(%)	(ng/mL)	(ng/mL)	(%)
⁷ Li	SQ-N/A	Trace	> 0.044	-	3.58	0.03	0.84	19.7	0.3	1.5	21.8	0.4	2	14	0.6	4.3	12.2	0.2	1.4	0.819	0.04	4.9
¹¹ B	SQ-N/A	2.29	0.39	17	143	4	2.7	5040	60	1.2	3610	60	1.8	153	3	2.1	71.9	1.8	2.5	618	9	1.4
⁸⁷ Rb	SQ-KED	< 0.3	-	-	81.7	3.4	4.1	168	5	3.2	108	3	2.6	113	4	3.3	53.5	1.7	3.1	47.7	1.5	3.1
⁸⁶ Sr	TQ-O2	< 2	-	-	286	13	4.7	825	37	4.5	522	19	3.7	561	15	2.6	268	14	5.3	235	10	4.1
δ(¹¹ B/ ¹⁰ B)	SQ-N/A IR Mode	4.03	0.02	0.5	4.06	0.02	0.5	4.14	0.02	0.5	4.16	0.02	0.5	4.09	0.02	0.5	4.12	0.02	0.5	3.77	0.02	0.5
δ(⁸⁷ Sr/ ⁸⁶ Sr)	TQ-O2-IR Mode	-	-	-	0.717	0.001	0.2	0.709	0.001	0.2	0.714	0.001	0.2	0.712	0.001	0.2	0.718	0.001	0.2	0.724	0.001	0.2

		MW-11B 3-22-23 1404			MWF-12B 3-22-23 1019			MW-7 3-21-23 1732			MW-16C 3-21-23 1317			MW-7B 3-21-23 1830			MW-16A 3-21-23 1108			L303223-02A		
Element /	Instrument	C _m	U _m	U _m	C _m	U _m	U _m	C _m	U _m	U _m	C _m	U _m	U _m	C _m	U _m	U _m	C _m	U _m	U _m	C _m	U _m	U _m
Isotope	Mode	(ng/mL)	(ng/mL)	(%)	(ng/mL)	(ng/mL)	(%)	(ng/mL)	(ng/mL)	(%)	(ng/mL)	(ng/mL)	(%)	(ng/mL)	(ng/mL)	(%)	(ng/mL)	(ng/mL)	(%)	(ng/mL)	(ng/mL)	(%)
⁷ Li	SQ-N/A	21.4	0.5	2.2	22.9	0.5	2.4	48.2	1.3	2.7	16.4	0.5	3.3	18.1	0.1	0.82	1.77	0.02	0.86	8.20	0.42	5.1
¹¹ B	SQ-N/A	1100	10	1.3	3040	40	1.5	1720	20	1.1	464	6	1.4	3110	50	1.5	111	3	2.5	1110	10	1.2
⁸⁷ Rb	SQ-KED	169	4	2.1	89.5	3.3	3.6	171	6	3.3	127	4	3.2	46.0	1.6	3.5	63.3	2.1	3.4	390	14	3.6
⁸⁶ Sr	TQ-O2	830	29	3.5	429	19	4.5	856	24	2.9	623	20	3.3	223	10	4.4	316	13	4.2	1880	50	2.9
δ(¹¹ B/ ¹⁰ B)	SQ-N/A IR Mode	4.11	0.02	0.5	4.17	0.02	0.5	4.02	0.02	0.5	4.08	0.02	0.5	4.15	0.02	0.5	4.08	0.02	0.5	4.04	0.02	0.5
δ(⁸⁷ Sr/ ⁸⁶ Sr)	TQ-O2-IR Mode	0.709	0.001	0.2	0.710	0.001	0.2	0.711	0.001	0.2	0.713	0.001	0.2	0.711	0.001	0.2	0.720	0.001	0.2	0.715	0.001	0.2

		MW-7C 3-21-23 1926			MWT-16A 3-21-23 1108			L30322-01A			FB 3-21-23 0805			L30322-02A			MW-2 3-22-23 1140		
Element /	Instrument	C _m	U _m	U _m	C _m	U _m	U _m	C _m	U _m	U _m	C _m	U _m	U _m	C _m	U _m	U _m	C _m	U _m	U _m
Isotope	Mode	(ng/mL)	(ng/mL)	(%)	(ng/mL)	(ng/mL)	(%)	(ng/mL)	(ng/mL)	(%)	(ng/mL)	(ng/mL)	(%)	(ng/mL)	(ng/mL)	(%)	(ng/mL)	(ng/mL)	(%)
⁷ Li	SQ-N/A	72.8	1.7	2.4	1.75	0.02	1.3	0.792	0.020	2.5	< 0.05	-	-	44.8	2.0	4.4	25.3	0.3	1.3
¹¹ B	SQ-N/A	6440	60	0.88	110	3	3.1	1350	30	2	6.69	0.63	9.4	129	3	2	4180	50	1.2
⁸⁷ Rb	SQ-KED	239	7	2.9	63.6	1.9	3	391	10	2.5	< 0.3	-	-	78.4	2.8	3.6	52.1	2.4	4.6
⁸⁶ Sr	TQ-O2	1170	30	2.9	316	14	4.6	1890	50	2.8	< 2	-	-	386	14	3.8	256	10	3.9
δ(¹¹ B/ ¹⁰ B)	SQ-N/A IR Mode	4.03	0.02	0.5	4.05	0.02	0.5	4.02	0.02	0.5	4.03	0.02	0.5	4.01	0.02	0.5	4.00	0.02	0.5
δ(⁸⁷ Sr/ ⁸⁶ Sr)	TQ-O2-IR Mode	0.715	0.001	0.2	0.710	0.001	0.2	0.716	0.001	0.2	-	-	-	0.719	0.001	0.2	0.717	0.001	0.2

- Analytical work was performed on a Thermo Scientific iCAP triple quadrupole inductively coupled plasma mass spectrometer – TQ-ICP-MS.
- To remove interferences from analysis matrix, instrument can use a variety of instrument modes as described below and on next page.
 - After ionization in plasma (P), quadrupole 1 (Q1) works as a selective mass filter for ions entering instrument.
 - Using hydrogen, helium, oxygen or ammonia gas, selective reaction chemistry- or collision interference removal takes place in Q2. When no gases are used, cell is in pass-through mode.
 - Q3 is the final mass filter after collisions/reactions in Q2 before the product (analyte) ions are counted by detector.
 - Reactive gases either form a product ion with the analyte that is interference free (mass shift mode) or reacts with the interference to remove the interference signal from the analyte (on mass mode).
 - The mass analyzer quadrupole (Q3) is either set to the original analyte mass (on-mass analysis) or the product ion mass (mass shift mode).



The Thermo Scientific
iCAP TQ ICP-MS System

- The dual mode detector has a linear dynamic range of ~10 orders of magnitude, making it possible to determine ppt- to ppm concentrations in one analysis run with appropriate standard curve set up.
- For most analytical work, instrument is used in pulse counting mode for ppt to ppb (pg/mL to ng/mL) trace element analysis.
- Semi-quantitative analysis was performed for the following element set:

Li, B, Sr.

Table A: TQ-ICP-MS Instrument Modes

Instrument Mode	Description	Reaction Mechanism
SQ-N/A	Single quadrupole mode, no collision or reaction gases	(none)
SQ-KED	SQ mode using helium as collision gas with kinetic energy discrimination	Gas collisions, remove polyatomic interferences
SQ-He	SQ mode using helium as collision gas	Gas collisions, remove polyatomic interferences
SQ-H ₂	SQ mode using hydrogen as reaction gas	Gas reaction, remove polyatomic interferences
TQ-O ₂	Triple quadrupole mode using oxygen as reaction gas	On-mass or mass shift
TQ-NH ₃	Triple quadrupole mode using ammonia as reaction gas	On-mass or mass shift

Table B: Analytical Terminology

SD	Standard deviation for n replicate measurements	$SD = \sqrt{\frac{1}{n-1} \cdot \sum_{i=1}^n (x_i - \bar{x})^2}$
SQL	Method quantitation limit where SD_{Blank} is the standard deviation for the calibration blank measured 10 times	$SQL = \left(\frac{10 \times SD_{Blank}}{a_1} \right) \times TDF$
a_1, a_0	Slope and intercept of the calibration function	$f(x) = a_1x + a_0$
TDF	Total dilution factor	$TDF = \frac{V_S + V_D}{V_S} = \frac{\text{Total volume of sample + diluent}}{\text{Volume of sample}}$
$C_{m,i}$	Measured concentration or mass fraction where X_i is the mean value of n replicate measurements of element (or isotope) i	$C_{m,i} = X_i \pm U_{m,i}$
$U_{m,i}$	Measurement uncertainty, expressed as a 95% confidence interval of the mean measured value X_i . t = Student's t -value for $n-1$ replicate measurements; SD_i is the standard deviation for element (or isotope) i .	$U_{m,i} = \frac{t \cdot SD_i}{\sqrt{n}}$

Table C: Commonly Used Concentration or Mass Fraction Units

Common Name	Description	Fraction	Liquid Concentration		Solids Mass Fractions	
ppq	Parts per quadrillion	10^{-15}	fg/mL	pg/L	fg/g	pg/kg
ppt	Parts per trillion	10^{-12}	pg/mL	ng/L	pg/g	ng/kg
ppb	Parts per billion	10^{-9}	ng/mL	ug/L	ng/g	ug/kg
ppm	Parts per million	10^{-6}	ug/mL	mg/L	ug/g	mg/kg
% wt	Weight percent	10^{-2}	n/a	n/a	10,000 ug/g	10,000 mg/kg

1. All sample preparation and analysis was done by according to ISO/IEC 17025 - *General requirements for the competence of testing and calibration laboratories* – by trained personnel familiar with this standard.
2. Class A glass volumetric flasks are calibrated according to ASTM-E288 - *Standard Specification for Laboratory Glass Volumetric Flasks*.
3. Polymethyl pentene PMP Class A volumetric flasks are calibrated according to ISO 4787 - *Laboratory glassware - Volumetric instruments - Methods for testing of capacity and for use*.
4. Pipettes were checked before use and met specifications using a balance calibrated using ISO/IEC 17025 and ANSI/NCLZ-36.2-2013 accredited calibration weights.
5. Analytical standards are all NIST-traceable.

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Data Verification & Validation Report

Lansing Board of Water & Light – Erickson Power Station

Sampling Event (dates and purpose): New Wells: MW-14-15 – Background Round 4 – April 2023

Data Package Number: S48012.01

Lab Report Date: 06/13/2023

Data Validator: Aryka Thomson

Data Validation Completion Date: 06/28/2023

General Overall Assessment:

Data are usable without qualification.

Data are usable with qualification (as noted below).

Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	
MW-7C	
MW-8	
MW-9	
MW-10	
MW-11	
MW-11B	
MW-12	
MW-12B	
MW-13	
MW-14	X
MW-15	X
MW-16A	
MW-16B	
MW-16C	
MW-16D	

Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-14	GW	S48012.01	04/28/2023	X	X	X	X	X	X	
MW-15	GW	S48012.02	04/28/2023	X	X	X	X	X	X	
MWT-14	QC	S48012.03	04/28/2023	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO₃, CO₃, hardness

Any planned sampling or analysis NOT completed? If yes, explain: _____

Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Field Data							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
Analytical Data Package							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies for Cl- across samples
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested		X		RLs for TDS were not met
			MDLs<RLs		X		RL=MDL for carbonate
			MDLs<GPS			X	
QC Validation							
Evaluate Accuracy							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table		X		Ca and Fe recovered outside control limits in one sample
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Evaluate Precision							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Rad-226 RPD outside control limits at 66%
Evaluate Representativeness							
Equipment Blanks (if applicable)	X		Non-detect (<RL)	X			
QC Verification							
Verify Instrument Calibration & Analytical Process							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	Al, As, Mo, and Pb had recoveries outside control limits
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	Rad-228 detected in MB
Evaluate Completeness (# usable measurements/ # unusable measurements)							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

The matrix spike (48012.03) associated with Run Batch MT5-23-0501A had high recovery for Iron. MWT-14 required qualification as estimated (J) for iron.

The matrix spike (48012.03) associated with Run Batch MT5-23-0501 had high recovery for Calcium. MWT-14 required qualification as estimated (J) for calcium.

Method blank MB 1205394668 result is greater than the MDC but less than the required detection limit for Rad-228. Result: 2.74 pCi/L > MDA: 2.68 pCi/L ≤ RDL: 3.00 pCi/L. Rad-228 and consequently combined radium in all samples required qualification as estimated with high bias (J+).

Comments: The COC missed the “-14” identifier for MWT-14 (field duplicate of MW-14). The lab reports and EDD have “MWT-“ as the sample ID. A revision was requested on 6/28 and a revised lab report and EDD was received the same day.

Rad-226 RPD was outside control limits at 66%. Rad-226 and consequently combined radium in parent sample MW-14 required qualification as estimated with low bias (J-) and as estimated with high bias (J+) in field duplicate MWT-14. The MB detection required qualification of Rad-228 and combined radium in all samples as estimated with high bias (J+). This was resolved by qualifying combined radium in MW-14 as estimated with no bias (J).



Report ID: S48012.01(03)
Generated on 06/28/2023
Replaces report S48012.01(02) generated on 05/31/2023

Report to

Attention: Jennifer Caporale
Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Report produced by

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John Lavery (johnlavery@meritlabs.com)
Barbara Ball (bball@meritlabs.com)

Report Summary

Lab Sample ID(s): S48012.01-S48012.04
Project: Erickson AM MI Wells 14-15
Collected Date(s): 04/28/2023
Submitted Date/Time: 04/28/2023 15:20
Sampled by: Marc Wahrer
P.O. #:

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Maya Murshak
Technical Director



General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

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Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

Report Narrative

Sample tag for .03 revised per client request



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



Sample Summary (4 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S48012.01	MW-14 L304235-01	Groundwater	04/28/23 11:42
S48012.02	MW-15 L304235-02	Groundwater	04/28/23 13:54
S48012.03	MWT-14 L304235-03	Groundwater	04/28/23 11:42
S48012.04	Field Blank L304235-04	Groundwater	04/28/23 10:30



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S48012.01

Sample Tag: MW-14 L304235-01

Collected Date/Time: 04/28/2023 11:42

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.7	IR
2	1L Plastic	None	Yes	3.7	IR
1	250ml Plastic	HNO3	Yes	3.7	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	05/02/23 13:57	CTV	
Metal Digestion	Completed	SW3015A	05/01/23 10:10	JRH	

Inorganics

Method: E300.0, Run Date: 05/01/23 10:30, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	115	10	0.16	mg/L	10	16887-00-6	

Method: E300.0, Run Date: 05/01/23 08:57, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	17	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 05/01/23 10:46, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	660	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 05/01/23 11:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	566	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 04/28/23 18:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	796	50	12	mg/L	2		

Method: SM2540D, Run Date: 05/01/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	23.4	3	1	mg/L	1.4		

Metals

Method: E200.8, Run Date: 05/01/23 11:38, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.0026	mg/L	5	7440-36-0	
Arsenic	0.006	0.002	0.00026	mg/L	5	7440-38-2	
Barium	0.120	0.005	0.00016	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.00022	mg/L	5	7440-41-7	
Boron	2.03	0.04	0.0018	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.00019	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000097	mg/L	5	7440-47-3	



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S48012.01 (continued)

Sample Tag: MW-14 L304235-01

Method: E200.8, Run Date: 05/01/23 11:38, Analyst: JRH (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.00011	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.00038	mg/L	5	7440-50-8	
Iron	11.2	0.02	0.0019	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.00019	mg/L	5	7439-92-1	
Lithium*	0.111	0.005	0.0016	mg/L	5	7439-93-2	
Molybdenum	0.013	0.005	0.00022	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00025	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.0021	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000068	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000086	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00014	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00073	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 05/01/23 15:17, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	143	0.50	0.044	mg/L	5	7440-70-2	
Magnesium	39.7	0.50	0.012	mg/L	5	7439-95-4	
Potassium	4.55	0.50	0.023	mg/L	5	7440-09-7	
Sodium	72.5	0.50	0.0085	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 05/02/23 15:15, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 05/25/23 13:42, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

**Lab Sample ID: S48012.02**

Sample Tag: MW-15 L304235-02

Collected Date/Time: 04/28/2023 13:54

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.7	IR
2	1L Plastic	None	Yes	3.7	IR
1	250ml Plastic	HNO3	Yes	3.7	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	05/02/23 13:57	CTV	
Metal Digestion	Completed	SW3015A	05/01/23 10:10	JRH	

Inorganics**Method: E300.0, Run Date: 05/01/23 09:10, Analyst: JDP**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	60	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	109	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 05/01/23 10:48, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	330	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 05/01/23 11:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	406	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 04/28/23 18:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	528	50	12	mg/L	2		

Method: SM2540D, Run Date: 05/01/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals**Method: E200.8, Run Date: 05/01/23 11:40, Analyst: JRH**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.0026	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.00026	mg/L	5	7440-38-2	
Barium	0.042	0.005	0.00016	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.00022	mg/L	5	7440-41-7	
Boron	0.34	0.04	0.0018	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.00019	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000097	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.00011	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.00038	mg/L	5	7440-50-8	
Iron	0.03	0.02	0.0019	mg/L	5	7439-89-6	



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S48012.02 (continued)

Sample Tag: MW-15 L304235-02

Method: E200.8, Run Date: 05/01/23 11:40, Analyst: JRH (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.00019	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.0016	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.00022	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00025	mg/L	5	7440-02-0	
Selenium	0.021	0.005	0.0021	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000068	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000086	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00014	mg/L	5	7440-62-2	
Zinc	0.021	0.005	0.00073	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 05/01/23 15:19, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	104	0.50	0.044	mg/L	5	7440-70-2	
Magnesium	25.7	0.50	0.012	mg/L	5	7439-95-4	
Potassium	Not detected	0.50	0.023	mg/L	5	7440-09-7	
Sodium	28.3	0.50	0.0085	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 05/02/23 15:25, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 05/25/23 13:42, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Lab Sample ID: S48012.03

Sample Tag: MWT-14 L304235-03

Collected Date/Time: 04/28/2023 11:42

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.7	IR
2	1L Plastic	None	Yes	3.7	IR
1	250ml Plastic	HNO3	Yes	3.7	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	05/02/23 13:57	CTV	
Metal Digestion	Completed	SW3015A	05/01/23 10:10	JRH	

Inorganics

Method: E300.0, Run Date: 05/01/23 10:43, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	115	10	0.16	mg/L	10	16887-00-6	

Method: E300.0, Run Date: 05/01/23 09:23, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	16	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 05/01/23 10:50, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	670	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 05/01/23 11:26, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	562	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 04/28/23 18:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	782	50	12	mg/L	2		

Method: SM2540D, Run Date: 05/01/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	24.3	3	1	mg/L	1.3		

Metals

Method: E200.8, Run Date: 05/01/23 11:42, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.0026	mg/L	5	7440-36-0	
Arsenic	0.005	0.002	0.00026	mg/L	5	7440-38-2	
Barium	0.119	0.005	0.00016	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.00022	mg/L	5	7440-41-7	
Boron	2.06	0.04	0.0018	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.00019	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000097	mg/L	5	7440-47-3	



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S48012.03 (continued)

Sample Tag: MWT-14 L304235-03

Method: E200.8, Run Date: 05/01/23 11:42, Analyst: JRH (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.00011	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.00038	mg/L	5	7440-50-8	
Iron	11.2	0.02	0.0019	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.00019	mg/L	5	7439-92-1	
Lithium*	0.111	0.005	0.0016	mg/L	5	7439-93-2	
Molybdenum	0.012	0.005	0.00022	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00025	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.0021	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000068	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000086	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00014	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00073	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 05/01/23 15:20, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	140	0.50	0.044	mg/L	5	7440-70-2	
Magnesium	38.5	0.50	0.012	mg/L	5	7439-95-4	
Potassium	4.43	0.50	0.023	mg/L	5	7440-09-7	
Sodium	70.9	0.50	0.0085	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 05/02/23 15:29, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 05/25/23 13:42, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Lab Sample ID: S48012.04

Sample Tag: Field Blank L304235-04
Collected Date/Time: 04/28/2023 10:30
Matrix: Groundwater
COC Reference:

Sample Containers

Table with 6 columns: #, Type, Preservative(s), Refrigerated?, Arrival Temp. (C), Thermometer #. Contains 3 rows of container data.

Extraction / Prep.

Table with 6 columns: Parameter, Result, Method, Run Date, Analyst, Flags. Contains 2 rows of extraction data.

Inorganics

Method: E300.0, Run Date: 05/01/23 09:36, Analyst: JDP

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Contains 3 rows of inorganic data.

Method: SM2320B, Run Date: 05/01/23 10:52, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Contains 2 rows of inorganic data.

Method: SM2340C, Run Date: 05/01/23 11:28, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Contains 1 row of inorganic data.

Method: SM2540C, Run Date: 04/28/23 18:45, Analyst: MDG

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Contains 1 row of inorganic data.

Method: SM2540D, Run Date: 05/01/23 17:30, Analyst: MDG

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Contains 1 row of inorganic data.

Metals

Method: E200.8, Run Date: 05/01/23 11:32, Analyst: JRH

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Contains 13 rows of metal data.



Lab Sample ID: S48012.04 (continued)

Sample Tag: Field Blank L304235-04

Method: E200.8, Run Date: 05/01/23 11:32, Analyst: JRH (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000076	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.00065	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.000087	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.00010	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.00084	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.000027	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.000034	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.000056	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.00029	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 05/01/23 15:14, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.017	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.0048	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.0092	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.0034	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 05/02/23 15:32, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 05/25/23 13:42, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

Merit Laboratories Login Checklist

Lab Set ID:S48012

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 14-15

Submitted:04/28/2023 15:20 Login User: PFD

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

Sample Receiving

- | | | |
|-----|--|--|
| 01. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples are received at 4C +/- 2C Thermometer # IR 3.7 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Received on ice/ cooling process begun |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples shipped |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples left in 24 hr. drop box |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Are there custody seals/tape or is the drop box locked |

Chain of Custody

- | | | |
|-----|--|--|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC adequately filled out |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC signed and relinquished to the lab |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sample tag on bottles match COC |
| 09. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Subcontracting needed? Subcontracted to: GEL |

Preservation

- | | | |
|-----|--|---|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Do sample have correct chemical preservation |
| 11. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Completed pH checks on preserved samples? (no VOAs) |
| 12. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Did any samples need to be preserved in the lab? |

Bottle Conditions

- | | | |
|-----|--|---|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | All bottles intact |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Appropriate analytical bottles are used |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Merit bottles used |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sufficient sample volume received |
| 17. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples require laboratory filtration |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples submitted within holding time |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Do water VOC or TOX bottles contain headspace |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S48012 Submitted: 04/28/2023 15:20

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 14-15

Initial Preservation Check: 04/28/2023 16:53 PFD

Preservation Recheck (E200.8): N/A

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S48012.01	1L Plastic HNO3	<2			
S48012.01	1L Plastic HNO3	<2			
S48012.01	250ml Plastic HNO3	<2			
S48012.02	1L Plastic HNO3	<2			
S48012.02	1L Plastic HNO3	<2			
S48012.02	250ml Plastic HNO3	<2			
S48012.03	1L Plastic HNO3	<2			
S48012.03	1L Plastic HNO3	<2			
S48012.03	250ml Plastic HNO3	<2			
S48012.04	1L Plastic HNO3	<2			
S48012.04	1L Plastic HNO3	<2			
S48012.04	250ml Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823
 Phone (517) 332-0167 Fax (517) 332-4034
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

REPORT TO **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME **Jennifer Caporale**
 COMPANY **Lansing Board of Water and Light**
 ADDRESS **PO Box 13007 48901-3007**
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**
 PHONE NO. **517-702-6372** FAX NO. _____ P.O. NO. _____
 E-MAIL ADDRESS **Environmental_Laboratory@lbwl.com** QUOTE NO. _____

CONTACT NAME **Beth Zimpfer** SAME
 COMPANY _____
 ADDRESS _____
 CITY _____ STATE _____ ZIP CODE _____
 PHONE NO. _____ E-MAIL ADDRESS **Beth.Zimpfer@lbwl.com**

PROJECT NO./NAME **Erickson AM MI Wells 14-15** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**
 TURNAROUND TIME REQUIRED 1 DAY 2 DAYS 3 DAYS STANDARD OTHER **ASAP**
 DELIVERABLES REQUIRED STD LEVEL II LEVEL III LEVEL IV EDD OTHER _____

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIFE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO ₃	H ₂ SO ₄	NaOH	MeOH	OTHER	Total Metals	F- undissisted, Cl ⁻ , SO ₄ , TDS	Radium 226	Radium 228	TSS	HCO ₃ , CO ₃ , Hardness	Certifications		Project Locations		Special Instructions
	DATE	TIME																	<input type="checkbox"/> OHIO VAP	<input type="checkbox"/> Drinking Water	<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES	
480201	04/28/23	1142	MW-14 L304235-01	GW	5	2	3						✓	✓	✓	✓	✓	✓		<input type="checkbox"/>	<input type="checkbox"/>		Metals to analyse: Na, Mg, K
.02	04/28/23	1354	MW-15 L304235-02	GW	5	2	3						✓	✓	✓	✓	✓	✓		<input type="checkbox"/>	<input checked="" type="checkbox"/>		B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03	04/28/23	1142	MWT- L304235-03	GW	5	2	3						✓	✓	✓	✓	✓	✓		<input type="checkbox"/>	<input type="checkbox"/>		Co, Li, Hg, Mo, Pb, Se, Tl,
.04	04/28/23	1030	Field Blank L304235-04	DI	5	2	3						✓	✓	✓	✓	✓	✓		<input type="checkbox"/>	<input type="checkbox"/>		Fe, Cu, Ni, Ag, V, Zn
																							Please send a preliminary report

RELINQUISHED BY: DATE **4/28/23** TIME **1520**
 SIGNATURE/ORGANIZATION _____
 RECEIVED BY: DATE **4/28/23** TIME **1520**
 SIGNATURE/ORGANIZATION _____

RELINQUISHED BY: _____ DATE _____ TIME _____
 SIGNATURE/ORGANIZATION _____
 RECEIVED BY: _____ DATE _____ TIME _____
 SIGNATURE/ORGANIZATION _____

SEAL NO. _____ SEAL INTACT YES NO INITIALS _____
 SEAL NO. _____ SEAL INTACT YES NO INITIALS _____

NOTES: TEMP. ON ARRIVAL **3.7**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total		250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005

May 26, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 620562
SDG: S48012

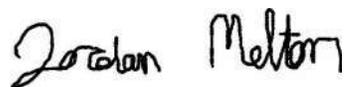
Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on May 03, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,



Jordan Melton for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S48012
Work Order: 620562**

May 26, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on May 03, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

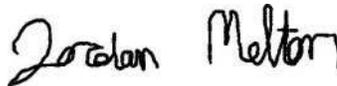
Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
620562001	S48012.01
620562002	S48012.02
620562003	S48012.03
620562004	S48012.04

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.



Jordan Melton for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

SAMPLE RECEIPT & REVIEW FORM

Client: <u>MEPA</u>		SDG/AR/COC/Work Order: <u>620502</u>		
Received By: <u>MVH</u>		Date Received: <u>05-03-23</u>		
Carrier and Tracking Number		FedEx Express FedEx Ground <u>UPS</u> Field Services Courier Other <u>1Z4K664770361126746</u>		
Suspected Hazard Information		*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.		
A) Shipped as a DOT Hazardous?	<input checked="" type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___		
B) Did the client designate the samples are to be received as radioactive?	<input checked="" type="checkbox"/>	COC notation or radioactive stickers on containers equal client designation.		
C) Did the RSO classify the samples as radioactive?	<input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>00</u> CPM / mR/Hr Classified as: <u>Rad 1</u> <u>Rad 2</u> <u>Rad 3</u>		
D) Did the client designate samples are hazardous?	<input checked="" type="checkbox"/>	COC notation or hazard labels on containers equal client designation.		
E) Did the RSO identify possible hazards?	<input checked="" type="checkbox"/>	If D or E is yes, select Hazards below. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other: _____		
Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>			Circle Applicable: Client contacted and provided COC COC created upon receipt
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>			Preservation Method: Wet Ice Ice Packs Dry ice <u>None</u> Other: _____ *all temperatures are recorded in Celsius TEMP: <u>21</u>
4 Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>			Temperature Device Serial #: <u>IR2-21</u> Secondary Temperature Device Serial # (If Applicable): _____
5 Sample containers intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6 Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>			Sample ID's and Containers Affected: _____ If Preservation added, Lot#: _____
7 Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>			If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer)
				Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No)
				Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected: _____
8 Samples received within holding time?	<input checked="" type="checkbox"/>			ID's and tests affected: _____
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>			ID's and containers affected: _____
10 Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>			Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>			Circle Applicable: No container count on COC Other (describe)
12 Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>			
13 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>			Circle Applicable: Not relinquished Other (describe)
Comments (Use Continuation Form if needed):				

PM (or PMA) review: Initials JM Date 5-5-23 Page 1 of 1

Laboratory Certifications

List of current GEL Certifications as of 26 May 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S48012
Work Order #: 620562**

Product: Radium-226+Radium-228 Calculation

Analytical Method: Calculation

Analytical Procedure: GL-RAD-D-003 REV# 45

Analytical Batch: 2429541

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
620562001	S48012.01
620562002	S48012.02
620562003	S48012.03
620562004	S48012.04

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2423921

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
620562001	S48012.01
620562002	S48012.02
620562003	S48012.03
620562004	S48012.04
1205394668	Method Blank (MB)
1205394669	620147001(S47857.01) Sample Duplicate (DUP)
1205394670	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

Method Blank Criteria

The blank result (See Below) is greater than the MDC but less than the required detection limit.

Sample	Analyte	Value
1205394668 (MB)	Radium-228	Result: 2.74 pCi/L > MDA: 2.68 pCi/L <= RDL: 3.00 pCi/L

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2423881

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
620562001	S48012.01
620562002	S48012.02
620562003	S48012.03
620562004	S48012.04
1205394583	Method Blank (MB)
1205394584	620147001(S47857.01) Sample Duplicate (DUP)
1205394585	620147001(S47857.01) Matrix Spike (MS)
1205394586	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

The matrix spike, 1205394585 (S47857.01MS), aliquot was reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S48012 GEL Work Order: 620562

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: Kenshalla Oston

Date: 31 MAY 2023

Title: Analyst I

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: May 31, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S48012.01	Project: MERI00120
Sample ID: 620562001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 28-APR-23 11:42	
Receive Date: 03-MAY-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.20	+/-0.989	1.59	3.00	pCi/L		JE1	05/25/23	1152	2423921		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.46	+/-1.03			pCi/L		NXL1	05/25/23	1342	2429541		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.260	+/-0.299	0.457	1.00	pCi/L		LXP1	05/23/23	0937	2423881		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			92.6	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: May 31, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive
 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S48012.02	Project: MERI00120
Sample ID: 620562002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 28-APR-23 13:54	
Receive Date: 03-MAY-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.51	+/-1.38	2.27	3.00	pCi/L		JE1	05/25/23	1152	2423921		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.97	+/-1.45			pCi/L		NXL1	05/25/23	1342	2429541		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.464	+/-0.448	0.669	1.00	pCi/L		LXP1	05/23/23	0937	2423881		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			76.7	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: May 31, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S48012.03 Project: MERI00120
Sample ID: 620562003 Client ID: MERI001
Matrix: Ground Water
Collect Date: 28-APR-23 11:42
Receive Date: 03-MAY-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.807	+/-0.831	1.37	3.00	pCi/L		JE1	05/25/23	1152	2423921		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		2.08	+/-1.05			pCi/L		NXL1	05/25/23	1342	2429541		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		1.27	+/-0.649	0.481	1.00	pCi/L		LXP1	05/23/23	0937	2423881		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			83.9	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: May 31, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S48012.04 Project: MERI00120
Sample ID: 620562004 Client ID: MERI001
Matrix: Water
Collect Date: 28-APR-23 10:30
Receive Date: 03-MAY-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		1.78	+/-1.09	1.63	3.00	pCi/L		JE1	05/25/23	1152	2423921	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.99	+/-1.14			pCi/L		NXL1	05/25/23	1342	2429541	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.209	+/-0.334	0.606	1.00	pCi/L		LXP1	05/23/23	0937	2423881	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			78.2	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: May 31, 2023

Page 1 of 2

Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan

Contact: John Laverty

Workorder: 620562

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2423921										
QC1205394669	620147001	DUP									
Radium-228	U	1.59		2.61	pCi/L	49		(0% - 100%)	JE1	05/25/23	11:50
	Uncertainty	+/-1.32		+/-1.06							
QC1205394670	LCS										
Radium-228	80.5			67.9	pCi/L		84.3	(75%-125%)		05/25/23	11:50
	Uncertainty			+/-4.15							
QC1205394668	MB										
Radium-228				2.74	pCi/L					05/25/23	11:52
	Uncertainty			+/-1.72							
Rad Ra-226											
Batch	2423881										
QC1205394584	620147001	DUP									
Radium-226		0.781		0.685	pCi/L	13		(0% - 100%)	LXP1	05/23/23	09:36
	Uncertainty	+/-0.587		+/-0.517							
QC1205394586	LCS										
Radium-226	26.5			27.9	pCi/L		106	(75%-125%)		05/23/23	10:11
	Uncertainty			+/-2.93							
QC1205394583	MB										
Radium-226			U	-0.0693	pCi/L					05/23/23	09:37
	Uncertainty			+/-0.192							
QC1205394585	620147001	MS									
Radium-226	134	0.781		124	pCi/L		92.2	(75%-125%)		05/23/23	09:36
	Uncertainty	+/-0.587		+/-14.6							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- H Analytical holding time was exceeded
- < Result is less than value reported
- > Result is greater than value reported

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QC Summary

Workorder: 620562

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
NI											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2423921 Check-list

This check-list was completed on 25-MAY-23 by Rhonda Birch

This batch was reviewed by Rhonda Birch on 25-MAY-23 and Kenshalla Oston on 26-MAY-23.

Batch ID:
2423921

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?	Yes		
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?		No	
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2423921
Analyst: Jacqueline Winston (JE1)
 Prep: Lyndsey Pace (LXP1)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: LUCAS-C202389980

Due Dates for Lab: 23-MAY-2023			Package: 25-MAY-2023	SDG: 26-MAY-2023		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205394670	228	2051-B	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	620147001	16-MAY-2023	3	301.36	301.36	05/17/23 15:25	05/25/23 09:46
2	620147002	16-MAY-2023	3	301	301	05/17/23 15:25	05/25/23 09:46
3	620147003	16-MAY-2023	3	305.79	305.79	05/17/23 15:25	05/25/23 09:46
4	620147004	16-MAY-2023	3	300.64	300.64	05/17/23 15:25	05/25/23 09:46
5	620147005	16-MAY-2023	3	303.97	303.97	05/17/23 15:25	05/25/23 09:46
6	620147006	16-MAY-2023	3	300.88	300.88	05/17/23 15:25	05/25/23 09:46
7	620562001	16-MAY-2023	3	306.78	306.78	05/17/23 15:25	05/25/23 09:46
8	620562002	16-MAY-2023	3	308.91	308.91	05/17/23 15:25	05/25/23 09:46
9	620562003	16-MAY-2023	3	300.38	300.38	05/17/23 15:25	05/25/23 09:46
10	620562004	16-MAY-2023	3	306.86	306.86	05/17/23 15:25	05/25/23 09:46
11	1205394668 MB	16-MAY-2023	3		308.91	05/17/23 15:25	05/25/23 09:46
12	1205394669 DUP (620147001)	16-MAY-2023	3	303.46	303.46	05/17/23 15:25	05/25/23 09:46
13	1205394670 LCS	16-MAY-2023	3		308.91	05/17/23 15:25	05/25/23 09:46

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-E	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 16-MAY-2023 00:00
REGNT 3909714	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3906586	RGF-1M Citric Acid	5 mL	
REGNT 3910170	2M HCl	20 mL	
REGNT 3907858	RGF-50% Potassium Carbonate	2 mL	
REGNT 3903777	RGF-7M Nitric Acid	25 mL	
REGNT DGA042223	2418797	2 g	
REGNT 3885305.13	RGF-Hydrofluoric Acid	4 mL	
REGNT 3528714	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3887517	RGF-Neodymium Subtrate	5 mL	
REGNT 3908482.6	Nitric Acid	5 mL	
REGNT 3911267	Barium Carrier Ra228 REG	1 mL	
REGNT 3907855	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 1951-E
 Tracer Exp Date : 9/16/2023
 Tracer Volume Added: 0.10

Batch : 2423921
 Analyst : JAC02417
 Prep Date : 5/16/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 3 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	620147001.1	0.3014	1.8482E-05	4/25/2023 12:36	1173.6	1.69%	1026.1	1.80%	0.1	0.000200
2	620147002.1	0.3010	1.8476E-05	4/25/2023 14:32	1173.6	1.69%	961.9	1.86%	0.1	0.000200
3	620147003.1	0.3058	1.8556E-05	4/25/2023 15:54	1173.6	1.69%	914.8	1.91%	0.1	0.000200
4	620147004.1	0.3006	1.8470E-05	4/25/2023 11:39	1173.6	1.69%	882.2	1.94%	0.1	0.000200
5	620147005.1	0.3040	1.8526E-05	4/25/2023 12:36	1173.6	1.69%	1029.5	1.80%	0.1	0.000200
6	620147006.1	0.3009	1.8474E-05	4/25/2023 9:25	1173.6	1.69%	864.6	1.96%	0.1	0.000200
7	620562001.1	0.3068	1.8572E-05	4/28/2023 11:42	1173.6	1.69%	1086.8	1.75%	0.1	0.000200
8	620562002.1	0.3089	1.8606E-05	4/28/2023 13:54	1173.6	1.69%	900.2	1.92%	0.1	0.000200
9	620562003.1	0.3004	1.8465E-05	4/28/2023 11:42	1173.6	1.69%	985.0	1.84%	0.1	0.000200
10	620562004.1	0.3069	1.8573E-05	4/28/2023 10:30	1173.6	1.69%	917.8	1.91%	0.1	0.000200
11	1205394668.1	0.3089	1.8606E-05	5/16/2023 0:00	1173.6	1.69%	637.8	2.29%	0.1	0.000200
12	1205394669.1	0.3035	1.8517E-05	4/25/2023 12:36	1173.6	1.69%	1012.8	1.81%	0.1	0.000200
13	1205394670.1	0.3089	1.8606E-05	5/16/2023 0:00	1173.6	1.69%	941.3	1.88%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Sample Recovery Error %
			Alpha	Beta										
1	2C	60	20	101	1.683	5/25/2023 11:51	5/17/2023 15:25	5/25/2023 9:46	0.990	0.790	1.000	1.057	87.4%	2.49%
2	5B	60	19	69	1.150	5/25/2023 11:52	5/17/2023 15:25	5/25/2023 9:46	0.990	0.788	1.000	1.057	82.0%	2.53%
3	5C	60	12	25	0.417	5/25/2023 11:52	5/17/2023 15:25	5/25/2023 9:46	0.990	0.788	1.000	1.057	78.0%	2.57%
4	5D	60	13	73	1.217	5/25/2023 11:52	5/17/2023 15:25	5/25/2023 9:46	0.990	0.788	1.000	1.057	75.2%	2.59%
5	6A	60	9	46	0.767	5/25/2023 11:52	5/17/2023 15:25	5/25/2023 9:46	0.990	0.788	1.000	1.057	87.7%	2.49%
6	7A	60	12	50	0.833	5/25/2023 11:52	5/17/2023 15:25	5/25/2023 9:46	0.990	0.788	1.000	1.057	73.7%	2.60%
7	8B	60	3	76	1.267	5/25/2023 11:52	5/17/2023 15:25	5/25/2023 9:46	0.991	0.789	1.000	1.057	92.6%	2.45%
8	8D	60	8	100	1.667	5/25/2023 11:52	5/17/2023 15:25	5/25/2023 9:46	0.991	0.788	1.000	1.057	76.7%	2.57%
9	9D	60	10	41	0.683	5/25/2023 11:52	5/17/2023 15:25	5/25/2023 9:46	0.991	0.788	1.000	1.057	83.9%	2.51%
10	10D	60	15	61	1.017	5/25/2023 11:52	5/17/2023 15:25	5/25/2023 9:46	0.991	0.788	1.000	1.057	78.2%	2.57%
11	5A	70	12	104	1.486	5/25/2023 11:52	5/17/2023 15:25	5/25/2023 9:46	0.997	0.788	1.000	1.067	54.3%	2.86%
12	11C	60	13	73	1.217	5/25/2023 11:50	5/17/2023 15:25	5/25/2023 9:46	0.990	0.791	1.000	1.057	86.3%	2.49%
13	11D	60	13	1097	18.283	5/25/2023 11:50	5/17/2023 15:25	5/25/2023 9:46	0.997	0.791	1.000	1.057	80.2%	2.54%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.6022	0.01274	1.270	5/19/2023 17:48	500
2	PIC	6/1/2022	5/31/2023	0.6336	0.00426	0.818	5/19/2023 17:48	500
3	PIC	6/1/2022	5/31/2023	0.6242	0.00657	0.492	5/22/2023 17:12	500
4	PIC	6/1/2022	5/31/2023	0.6236	0.00925	0.772	5/19/2023 17:48	500
5	PIC	6/1/2022	5/31/2023	0.6328	0.02228	1.526	5/19/2023 17:48	500
6	PIC	6/1/2022	5/31/2023	0.6257	0.00594	0.508	5/19/2023 17:48	500
7	PIC	6/1/2022	5/31/2023	0.6437	0.02148	0.908	5/19/2023 17:48	500
8	PIC	6/1/2022	5/31/2023	0.6347	0.00609	1.294	5/19/2023 17:48	500
9	PIC	6/1/2022	5/31/2023	0.6330	0.02610	0.472	5/19/2023 17:48	500
10	PIC	6/1/2022	5/31/2023	0.6148	0.00557	0.586	5/19/2023 17:48	500
11	PIC	6/1/2022	5/31/2023	0.6332	0.00851	1.010	5/19/2023 17:48	500
12	PIC	6/1/2022	5/31/2023	0.6276	0.01278	0.510	5/20/2023 16:07	500
13	PIC	6/1/2022	5/31/2023	0.6372	0.01068	0.540	5/21/2023 11:41	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 2051-B
LCS Exp Date : 3/27/2024
LCS Activity (dpm/ml): 551.91
LCS Volume Added: 0.10

Results																
Pos.	Decision	Critical	Required	Sample Act.		Net Count	Net Count	2 SIGMA		2 SIGMA		Sample	Sample	Nominal		
	Level	Level	MDA	MDA	Conc.	Error	Rate	Rate Error	Counting	Total Prop.	QC			Type	RPD	RER
	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	%	CPM	CPM	Uncertainty	Uncertainty	pCi/L	pCi/L				
1	1.3766	0.9719	3	2.1356	1.5861	42.41%	0.4133	0.1749	1.3155	1.3761			SAMPLE			
2	1.1242	0.7937	3	1.7826	1.2963	43.52%	0.3320	0.1442	1.1038	1.1517			SAMPLE			
3	0.9161	0.6468	3	1.4986	-0.3091	118.23%	-0.0753	0.0890	0.7160	0.7162			SAMPLE			
4	1.2116	0.8554	3	1.9273	1.9261	33.33%	0.4447	0.1477	1.2542	1.3464			SAMPLE			
5	1.4227	1.0044	3	2.1897	-2.7471	16.90%	-0.7593	0.1258	0.8921	0.8923			SAMPLE			
6	0.9987	0.7051	3	1.6302	1.4320	37.62%	0.3253	0.1221	1.0532	1.1142			SAMPLE			
7	1.0108	0.7136	3	1.5939	1.1952	42.34%	0.3587	0.1514	0.9889	1.0354			SAMPLE			
8	1.4675	1.0361	3	2.2748	1.5103	46.83%	0.3727	0.1743	1.3841	1.4363			SAMPLE			
9	0.8354	0.5898	3	1.3706	0.8072	52.67%	0.2113	0.1111	0.8314	0.8572			SAMPLE			
10	1.0074	0.7112	3	1.6292	1.7803	31.36%	0.4307	0.1346	1.0906	1.1805			SAMPLE			
11	1.7200	1.2143	3	2.6753	2.7381	32.19%	0.4757	0.1525	1.7200	1.8566			MB			
12	0.8410	0.5938	3	1.3725	2.6143	20.84%	0.7067	0.1459	1.0582	1.2500	620147001.1		DUP	49.0%		
13	0.8948	0.6318	3	1.4548	67.8730	4.16%	17.7433	0.5530	4.1461	17.7539			LCS		80.4789	84.3%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
620147001	2C	60	20	101	5/25/2023 11:51	5/25/2023 12:51	PIC	2423921
620147002	5B	60	19	69	5/25/2023 11:52	5/25/2023 12:52	PIC	2423921
620147003	5C	60	12	25	5/25/2023 11:52	5/25/2023 12:52	PIC	2423921
620147004	5D	60	13	73	5/25/2023 11:52	5/25/2023 12:52	PIC	2423921
620147005	6A	60	9	46	5/25/2023 11:52	5/25/2023 12:52	PIC	2423921
620147006	7A	60	12	50	5/25/2023 11:52	5/25/2023 12:52	PIC	2423921
620562001	8B	60	3	76	5/25/2023 11:52	5/25/2023 12:52	PIC	2423921
620562002	8D	60	8	100	5/25/2023 11:52	5/25/2023 12:52	PIC	2423921
620562003	9D	60	10	41	5/25/2023 11:52	5/25/2023 12:52	PIC	2423921
620562004	10D	60	15	61	5/25/2023 11:52	5/25/2023 12:52	PIC	2423921
1205394668	5A	70	12	104	5/25/2023 11:52	5/25/2023 13:02	PIC	2423921
1205394669	11C	60	13	73	5/25/2023 11:50	5/25/2023 12:50	PIC	2423921
1205394670	11D	60	13	1097	5/25/2023 11:50	5/25/2023 12:50	PIC	2423921

ASSAY 25-May-23 10:07:52
 Wizard 2480 s/n 46190630
 Protocol id 8 Ba-133
 Time limit
 Count limit
 Isotope Ba-133
 Protocol date 5/25/2023
 Run id. 6694

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	95	1	180	3521.28	1173.56	1.69	10:07:52
620147001	2	95	2	180	3079	1026.11	1.8	87.44	10:11:06
620147002	3	95	3	180	2886.28	961.92	1.86	81.97	10:14:20
620147003	4	95	4	180	2745	914.84	1.91	77.95	10:17:33
620147004	5	95	5	180	2647	882.17	1.94	75.17	10:20:48
620147005	1	10	1	180	3089.28	1029.5	1.8	87.72	10:24:20
620147006	2	10	2	180	2594.28	864.62	1.96	73.67	10:27:34
620562001	3	10	3	180	3261	1086.75	1.75	92.60	10:30:48
620562002	4	10	4	180	2701	900.18	1.92	76.71	10:34:01
620562003	5	10	5	180	2955.57	985.03	1.84	83.94	10:37:16
620562004	1	14	1	180	2754	917.84	1.91	78.21	10:40:51
1205394668	2	14	2	180	1914	637.82	2.29	54.35	10:44:05
1205394669	3	14	3	180	3039	1012.82	1.81	86.30	10:47:19
1205394670	4	14	4	180	2824.57	941.33	1.88	80.21	10:50:33

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 25-May-2023

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z and LB4200 GA1 through OD4

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	Above	Beta bkg	25-May 04:14	60	2.317	1.385	3.072	+0.31
LB4100F1	Above	Beta bkg	25-May 04:14	60	2.600	0.188	2.691	+2.78
LB4100F2	Above	Beta bkg	25-May 04:14	60	3.383	1.173	1.833	+17.09
LB4100F4	need 2nd	Alpha bkg	25-May 04:14	60	0.217	-2.75E-2	0.313	+1.30
LB4100F4	Above	Beta bkg	25-May 04:14	60	2.917	-7.15E-2	3.199	+2.48
LB4100G1	Above	Alpha XTalk	25-May 05:17	5	0.753	0.088	0.447	+8.12
LB4100G1	Above	Beta bkg	25-May 04:14	60	3779	0.380	1.675	+17,505.51
LB4100G1	Above	Beta eff	25-May 05:24	5	19912	12880	18320	+4.76
LB4100H2	Above	Alpha bkg	25-May 12:24	60	0.300	-1.10E-1	0.243	+3.96
LB4200OA1	need 2nd	Alpha eff	25-May 06:11	5	11290	11120	11630	-1.00
LB4200OA1	need 2nd	Beta bkg	25-May 08:33	60	1.267	-9.98E-2	1.494	+2.14
LB4200OA2	Above	Beta bkg	25-May 03:17	60	1.983	0.241	1.025	+10.33
LB4200OA3	Above	Alpha bkg	25-May 03:17	60	0.417	0.014	0.814	+0.02
LB4200OA3	Below	Alpha eff	25-May 06:11	5	9678	9726	9942	-4.33
LB4200OA3	Above	Beta XTalk	25-May 07:53	5	0.002	7.71E-4	0.002	+4.51
LB4200OA4	Above	Beta bkg	25-May 08:33	60	1.500	0.044	1.346	+3.71
LB4200OA4	need 2nd	Beta eff	25-May 07:53	5	16972	16800	17680	-1.83
LB4200OA4	Above	Beta XTalk	25-May 07:53	5	0.002	7.19E-4	0.002	+3.72
LB4200OB1	need 2nd	Beta XTalk	25-May 07:53	5	0.003	0.001	0.004	+2.62
LB4200OB2	Above	Alpha bkg	25-May 03:17	60	0.383	0.049	0.542	+1.07
LB4200OB2	Below	Alpha eff	25-May 06:11	5	9645	9676	10040	-3.50
LB4200OB2	Above	Beta bkg	25-May 03:17	60	1.433	0.176	1.400	+3.16
LB4200OB3	Above	Alpha bkg	25-May 03:17	60	0.550	-2.51E-1	0.957	+0.98
LB4200OB3	need 2nd	Alpha eff	25-May 06:11	5	21500	21460	22180	-2.67
LB4200OB3	Above	Beta bkg	25-May 03:17	60	1.817	0.031	1.553	+4.04
LB4200OC1	Above	Alpha bkg	25-May 03:17	60	0.650	-3.01E-1	1.067	+1.17
LB4200OC1	Below	Alpha eff	25-May 07:38	5	11063	11120	11520	-3.85
LB4200OC1	Above	Alpha XTalk	25-May 07:38	5	0.207	0.183	0.203	+4.23
LB4200OC1	Above	Beta bkg	25-May 03:17	60	1.500	0.288	1.060	+6.42
LB4200OC2	Above	Beta bkg	25-May 08:33	60	2.133	0.275	1.220	+8.80

LB4200OC3	Above	Alpha bkg	25-May 03:17	60	0.833	-2.99E-1	1.153	+1.68
LB4200OC3	Below	Alpha eff	25-May 07:38	5	9597	9651	9914	-4.24
LB4200OC3	Above	Beta bkg	25-May 03:17	60	1.400	0.316	1.139	+4.90
LB4200OC3	Above	Beta XTalk	25-May 06:11	5	0.003	0.001	0.003	+5.09
LB4200OD1	Above	Beta XTalk	25-May 06:11	5	0.002	5.69E-4	0.002	+3.94
LB4200OD2	Above	Alpha bkg	25-May 03:17	60	0.417	-2.30E-1	0.829	+0.66
LB4200OD2	Above	Alpha XTalk	25-May 07:38	5	0.215	0.185	0.211	+3.89
LB4200OD3	Above	Alpha bkg	25-May 03:17	60	0.367	-3.01E-1	1.146	-0.23
LB4200OD3	Below	Alpha eff	25-May 07:38	5	21694	21710	22170	-3.21
LB4200OD4	Below	Alpha eff	25-May 07:38	5	17957	18070	18550	-4.41
PIC4A	Above	Alpha bkg	25-May 13:41	60	0.383	-5.84E-2	0.311	+4.17
PIC4B	Above	Alpha bkg	25-May 04:45	60	1.033	-8.41E-1	2.241	+0.65
PIC4B	need 2nd	Beta eff	25-May 04:37	5	13841	10440	27300	-1.79
PIC6B	Above	Alpha eff	25-May 12:23	5	9686	8319	9448	+4.26
PIC6B	Below	Beta eff	25-May 14:03	5	16495	16860	22460	-3.39
PIC7B	Above	Beta bkg	25-May 07:30	60	2.483	0.146	1.265	+9.53
PIC7C	need 2nd	Beta eff	25-May 14:03	5	19514	19410	21710	-2.73
PIC10C	Above	Alpha bkg	25-May 05:05	60	0.717	-1.05E-1	0.324	+8.49
PIC10C	Above	Beta bkg	25-May 05:05	60	9.117	-3.39E-1	2.310	+18.42
PIC10C	Above	Beta XTalk	25-May 04:59	5	6.46E-4	9.29E-5	6.05E-4	+3.49
PIC12B	Above	Alpha bkg	25-May 08:46	60	0.333	-8.27E-2	0.413	+2.03
PIC12B	Above	Beta bkg	25-May 08:46	60	2.817	-5.75E-1	2.641	+3.33
PIC14B	Above	Alpha eff	25-May 05:00	5	9390	8571	9265	+4.08
PIC14B	Above	Beta bkg	25-May 05:19	60	6.800	-4.03E-1	2.348	+12.71

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100A1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

LB4100I4

Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by Lois Buist

Date 5/25/23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2423921

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205394669	DUP	JE1	PIC11C	MAY-25-23 11:50:42	DONE	25mm Filter	01-JUN-22 00:00
1205394670	LCS	JE1	PIC11D	MAY-25-23 11:50:42	DONE	25mm Filter	01-JUN-22 00:00
620147001	SAMPLE	JE1	PIC2C	MAY-25-23 11:51:28	DONE	25mm Filter	01-JUN-22 00:00
620562001	SAMPLE	JE1	PIC8B	MAY-25-23 11:52:25	DONE	25mm Filter	01-JUN-22 00:00
620562002	SAMPLE	JE1	PIC8D	MAY-25-23 11:52:31	DONE	25mm Filter	01-JUN-22 00:00
620562003	SAMPLE	JE1	PIC9D	MAY-25-23 11:52:38	DONE	25mm Filter	01-JUN-22 00:00
620147002	SAMPLE	JE1	PIC5B	MAY-25-23 11:52:48	DONE	25mm Filter	01-JUN-22 00:00
620147003	SAMPLE	JE1	PIC5C	MAY-25-23 11:52:48	DONE	25mm Filter	01-JUN-22 00:00
620147004	SAMPLE	JE1	PIC5D	MAY-25-23 11:52:48	DONE	25mm Filter	01-JUN-22 00:00
620147005	SAMPLE	JE1	PIC6A	MAY-25-23 11:52:48	DONE	25mm Filter	01-JUN-22 00:00
1205394668	MB	JE1	PIC5A	MAY-25-23 11:52:48	DONE	25mm Filter	01-JUN-22 00:00
620147006	SAMPLE	JE1	PIC7A	MAY-25-23 11:52:52	DONE	25mm Filter	01-JUN-22 00:00
620562004	SAMPLE	JE1	PIC10D	MAY-25-23 11:52:53	DONE	25mm Filter	01-JUN-22 00:00

Lucas Cell Raw Data

Batch 2423881 Check-list

This check-list was completed on 23-MAY-23 by Lyndsey Pace

This batch was reviewed by Elizabeth Krouse on 23-MAY-23 and Lyndsey Pace on 23-MAY-23.

Batch ID:
2423881

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2423881
Analyst: Lyndsey Pace (LXP1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: LUCAS-C202389980

Due Dates for Lab: 23-MAY-2023			Package: 25-MAY-2023		SDG: 26-MAY-2023	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
MS	1205394585	Radium-226 SPIKE	1715-G	.1	mL	
LCS	1205394586	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	620147001	16-MAY-2023	1	502.48	502.48	05/19/23 10:02	402	05/23/23 05:29	05/23/23 09:01	5	12
2	620147002	16-MAY-2023	1	501.8	501.8	05/19/23 10:02	503	05/23/23 05:29	05/23/23 09:01	3	10
3	620147003	16-MAY-2023	1	504.59	504.59	05/19/23 10:02	608	05/23/23 05:29	05/23/23 09:01	4	9
4	620147004	16-MAY-2023	1	502.3	502.3	05/19/23 10:02	703	05/23/23 05:29	05/23/23 09:01	3	31
5	620147005	16-MAY-2023	1	501.49	501.49	05/19/23 10:02	805	05/23/23 05:29	05/23/23 09:01	6	12
6	620147006	16-MAY-2023	1	501.43	501.43	05/19/23 10:02	107	05/23/23 05:56	05/23/23 09:37	1	5
7	620562001	16-MAY-2023	1	501.97	501.97	05/19/23 10:02	205	05/23/23 05:56	05/23/23 09:37	2	5
8	620562002	16-MAY-2023	1	502.6	502.6	05/19/23 10:02	303	05/23/23 05:56	05/23/23 09:37	5	9
9	620562003	16-MAY-2023	1	500.34	500.34	05/19/23 10:02	408	05/23/23 05:56	05/23/23 09:37	1	16
10	620562004	16-MAY-2023	1	500.56	500.56	05/19/23 10:02	506	05/23/23 05:56	05/23/23 09:37	4	5
11	1205394583 MB	16-MAY-2023	1		506.02	05/19/23 10:02	601	05/23/23 05:56	05/23/23 09:37	4	1
12	1205394584 DUP (620147001)	16-MAY-2023	1	506.02	506.02	05/19/23 10:02	708	05/23/23 05:56	05/23/23 09:36	4	11
13	1205394585 MS (620147001)	16-MAY-2023	1	100.04	100.04	05/19/23 10:02	801	05/23/23 05:56	05/23/23 09:36	8	290
14	1205394586 LCS	16-MAY-2023	1		506.02	05/19/23 10:02	105	05/23/23 06:21	05/23/23 10:11	4	354

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 16-MAY-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Procedure Code : LUC26RAL
 Parmname : Radium-226
 Required MDA : 1 pCi/L
 Halflife of Ra-226 : 1600 years
 Ra-226 Abundance : 1.00
 Halflife of Rn-222: 3.8235 days

Batch : 2423881
 Analyst : LIN01615
 Prep Date : 5/16/2023
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	620147001.1	0.5025	2.0266E-05	4/25/2023 12:36	402	15	12	0.800	5	0.167	30	1.4980
2	620147002.1	0.5018	2.0263E-05	4/25/2023 14:32	503	15	10	0.667	3	0.100	30	2.1390
3	620147003.1	0.5046	2.0275E-05	4/25/2023 15:54	608	15	9	0.600	4	0.133	30	1.7970
4	620147004.1	0.5023	2.0265E-05	4/25/2023 11:39	703	15	31	2.067	3	0.100	30	1.6440
5	620147005.1	0.5015	2.0262E-05	4/25/2023 12:36	805	15	12	0.800	6	0.200	30	1.5410
6	620147006.1	0.5014	2.0262E-05	4/25/2023 9:25	107	15	5	0.333	1	0.033	30	1.7160
7	620562001.1	0.5020	2.0264E-05	4/28/2023 11:42	205	15	5	0.333	2	0.067	30	1.8920
8	620562002.1	0.5026	2.0266E-05	4/28/2023 13:54	303	15	9	0.600	5	0.167	30	1.7210
9	620562003.1	0.5003	2.0257E-05	4/28/2023 11:42	408	15	16	1.067	1	0.033	30	1.5020
10	620562004.1	0.5006	2.0258E-05	4/28/2023 10:30	506	15	5	0.333	4	0.133	30	1.7710
11	1205394583.1	0.5060	2.0280E-05	5/16/2023 0:00	601	15	1	0.067	4	0.133	30	1.7610
12	1205394584.1	0.5060	2.0280E-05	4/25/2023 12:36	708	15	11	0.733	4	0.133	30	1.6020
13	1205394585.1	0.1000	1.1373E-05	4/25/2023 12:36	801	15	290	19.333	8	0.267	30	1.4200
14	1205394586.1	0.5060	2.0280E-05	5/16/2023 0:00	105	15	354	23.600	4	0.133	30	1.5340

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
5.300%	2/1/2023	1/31/2024	5/19/2023 10:02	5/23/2023 5:29	5/23/2023 9:01	0.499	0.974	1.001	1.000
5.000%	6/1/2022	5/31/2023	5/19/2023 10:02	5/23/2023 5:29	5/23/2023 9:01	0.499	0.974	1.001	1.000
6.300%	7/1/2022	6/30/2023	5/19/2023 10:02	5/23/2023 5:29	5/23/2023 9:01	0.499	0.974	1.001	1.000
9.000%	11/1/2022	10/31/2023	5/19/2023 10:02	5/23/2023 5:29	5/23/2023 9:01	0.499	0.974	1.001	1.000
9.600%	4/8/2023	3/31/2024	5/19/2023 10:02	5/23/2023 5:29	5/23/2023 9:01	0.499	0.974	1.001	1.000
8.100%	5/1/2023	4/30/2024	5/19/2023 10:02	5/23/2023 5:56	5/23/2023 9:37	0.501	0.973	1.001	1.000
3.900%	8/1/2022	7/31/2023	5/19/2023 10:02	5/23/2023 5:56	5/23/2023 9:37	0.501	0.973	1.001	1.000
7.400%	10/25/2022	10/31/2023	5/19/2023 10:02	5/23/2023 5:56	5/23/2023 9:37	0.501	0.973	1.001	1.000
7.000%	2/1/2023	1/31/2024	5/19/2023 10:02	5/23/2023 5:56	5/23/2023 9:37	0.501	0.973	1.001	1.000
5.300%	6/1/2022	5/31/2023	5/19/2023 10:02	5/23/2023 5:56	5/23/2023 9:37	0.501	0.973	1.001	1.000
9.400%	7/1/2022	6/30/2023	5/19/2023 10:02	5/23/2023 5:56	5/23/2023 9:37	0.501	0.973	1.001	1.000
7.700%	11/1/2022	10/31/2023	5/19/2023 10:02	5/23/2023 5:56	5/23/2023 9:36	0.501	0.973	1.001	1.000
3.200%	4/8/2023	3/31/2024	5/19/2023 10:02	5/23/2023 5:56	5/23/2023 9:36	0.501	0.973	1.001	1.000
7.900%	5/1/2023	4/30/2024	5/19/2023 10:02	5/23/2023 6:21	5/23/2023 10:11	0.502	0.971	1.001	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-G
Spike Exp Date : 9/8/2023
Spike Activity (dpm/ml): 297.41
Spike Volume Added: 0.10

LCS S/N : 1715-G
LCS Exp Date : 9/8/2023
LCS Activity (dpm/ml): 297.41
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.3710	0.2619	1	0.7705	0.7811	38.68%	0.6333	0.2427	0.5866	0.6029		SAMPLE				
2	0.2015	0.1423	1	0.4575	0.4901	38.90%	0.5667	0.2186	0.3706	0.3803		SAMPLE				
3	0.2755	0.1945	1	0.5937	0.4778	45.61%	0.4667	0.2108	0.4231	0.4327		SAMPLE				
4	0.2619	0.1849	1	0.5947	2.2110	21.11%	1.9667	0.3756	0.8277	0.9691		SAMPLE				
5	0.3958	0.2795	1	0.7992	0.7208	41.94%	0.6000	0.2449	0.5768	0.6016		SAMPLE				
6	0.1448	0.1022	1	0.4198	0.3229	51.56%	0.3000	0.1528	0.3223	0.3297		SAMPLE				
7	0.1855	0.1310	1	0.4571	0.2601	58.76%	0.2667	0.1563	0.2989	0.3019		SAMPLE				
8	0.3221	0.2274	1	0.6690	0.4640	49.81%	0.4333	0.2134	0.4480	0.4579		SAMPLE				
9	0.1658	0.1171	1	0.4806	1.2736	26.93%	1.0333	0.2687	0.6492	0.6970		SAMPLE				
10	0.2811	0.1985	1	0.6059	0.2090	81.82%	0.2000	0.1633	0.3344	0.3365		SAMPLE				
11	0.2797	0.1974	1	0.6028	-0.0693	141.73%	-0.0667	0.0943	0.1921	0.1922		MB				
12	0.3074	0.2170	1	0.6625	0.6855	39.25%	0.6000	0.2309	0.5171	0.5366	620147001.1	DUP	13.0%			
13	2.4806	1.7513	1	4.8066	124.3068	6.78%	19.0667	1.1392	14.5571	24.3859	620147001.1	MS			133.9165	92.2%
14	0.3204	0.2262	1	0.6906	27.9458	9.54%	23.4667	1.2561	2.9319	6.6025		LCS			26.4746	105.6%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 23-MAY-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:52	1	1.19E+05	118574	-1.26		
LUCAS2	EFF	07:51	1	1.33E+05	133145	-0.43		
LUCAS3	EFF	07:50	1	95454	95454	-1.81		
LUCAS4	EFF	07:48	1	1.29E+05	128812	1.38		
LUCAS5	EFF	07:47	1	1.34E+05	133702	1.1		
LUCAS6	EFF	07:46	1	1.30E+05	129668	-0.3		
LUCAS7	EFF	07:45	1	1.34E+05	134068	1.4		
LUCAS8	EFF	07:44	1	1.22E+05	121738	-1.47		

Reviewed by:


Lyndsey Pace

Date: 23-MAY-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2423881

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
620147001	SAMPLE	LXP1	LUCAS4	MAY-23-23 09:01:00	DONE	Lucas Cell	01-FEB-23 00:00
620147002	SAMPLE	LXP1	LUCAS5	MAY-23-23 09:01:00	DONE	Lucas Cell	01-JUN-22 00:00
620147003	SAMPLE	LXP1	LUCAS6	MAY-23-23 09:01:00	DONE	Lucas Cell	01-JUL-22 00:00
620147004	SAMPLE	LXP1	LUCAS7	MAY-23-23 09:01:00	DONE	Lucas Cell	01-NOV-22 00:00
620147005	SAMPLE	LXP1	LUCAS8	MAY-23-23 09:01:00	DONE	Lucas Cell	08-APR-23 00:00
1205394584	DUP	LXP1	LUCAS7	MAY-23-23 09:36:00	DONE	Lucas Cell	01-NOV-22 00:00
1205394585	MS	LXP1	LUCAS8	MAY-23-23 09:36:00	DONE	Lucas Cell	08-APR-23 00:00
620147006	SAMPLE	LXP1	LUCAS1	MAY-23-23 09:37:00	DONE	Lucas Cell	01-MAY-23 00:00
620562001	SAMPLE	LXP1	LUCAS2	MAY-23-23 09:37:00	DONE	Lucas Cell	01-AUG-22 00:00
620562002	SAMPLE	LXP1	LUCAS3	MAY-23-23 09:37:00	DONE	Lucas Cell	25-OCT-22 00:00
620562003	SAMPLE	LXP1	LUCAS4	MAY-23-23 09:37:00	DONE	Lucas Cell	01-FEB-23 00:00
620562004	SAMPLE	LXP1	LUCAS5	MAY-23-23 09:37:00	DONE	Lucas Cell	01-JUN-22 00:00
1205394583	MB	LXP1	LUCAS6	MAY-23-23 09:37:00	DONE	Lucas Cell	01-JUL-22 00:00
1205394586	LCS	LXP1	LUCAS1	MAY-23-23 10:11:00	DONE	Lucas Cell	01-MAY-23 00:00



Data Verification & Validation Report

Lansing Board of Water & Light – Erickson Power Station

Sampling Event (dates and purpose): New Wells: MW-16A/B/C/D – Background Round 3 – April 2023

Data Package Number: S47857.01

Lab Report Date: 06/16/2023

Data Validator: Aryka Thomson

Data Validation Completion Date: 06/28/2023

General Overall Assessment:

Data are usable without qualification.

Data are usable with qualification (as noted below).

Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	
MW-7C	
MW-8	
MW-9	
MW-10	
MW-11	
MW-11B	
MW-12	
MW-12B	
MW-13	
MW-14	
MW-15	
MW-16A	X
MW-16B	X
MW-16C	X
MW-16D	X

Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-16A	GW	S47857.01	04/25/2023	X	X	X	X	X	X	
MW-16B	GW	S47857.02	04/25/2023	X	X	X	X	X	X	
MW-16C	GW	S47857.03	04/25/2023	X	X	X	X	X	X	
MW-16D	GW	S47857.04	04/25/2023	X	X	X	X	X	X	
MWT-16A	QC	S47857.05	04/25/2023	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO₃, CO₃, hardness

Any planned sampling or analysis NOT completed? If yes, explain: _____

Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Field Data							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	X		Record of decontamination for non-dedicated sampling equipment	X			
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
Analytical Data Package							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies for chloride across samples
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested		X		RLs for chloride, TDS were not met
			MDLs<RLs		X		RL=MDL for carbonate
			MDLs<GPS			X	
QC Validation							
Evaluate Accuracy							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Evaluate Precision							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Radium 228 and Combined Radium 226+228 RPD 374%, 53% respectively
Evaluate Representativeness							
Equipment Blanks (if applicable)	X		Non-detect (<RL)	X			
QC Verification							
Verify Instrument Calibration & Analytical Process							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	K had recoveries outside control limits
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
Evaluate Completeness (# usable measurements/ # unusable measurements)							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

Method blank MB 1205394668 result is greater than the MDC but less than the required detection limit for Rad-228. Result: 2.74 pCi/L > MDA: 2.68 pCi/L ≤ RDL: 3.00 pCi/L. Rad-228 and consequently combined radium in all samples required qualification as estimated with high bias (J+).

Comments:

The RPDs for Radium 228 and Combined Radium 226+228 RPD were 374% and 53%, respectively. Radium-228 and Combined Radium 226+228 required qualification as estimated with high bias (J+) in the

parent sample MW-16A and as estimated with low bias (J-) in field duplicate MWT-16A. The high bias qualification due to the MB has been resolved to a qualification as estimated (J) with no bias in field duplicate MWT-16A.

Sample ID S47857.05 was incorrectly tagged as MW-16A. A revision was requested on 6/28 to revise the sample tag to MWT-16A. A revised lab report and EDD was received the same day.



Report ID: S47857.01(03)
Generated on 06/28/2023
Replaces report S47857.01(02) generated on 05/26/2023

Report to
Attention: Jennifer Caporale
Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

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Report Summary
Lab Sample ID(s): S47857.01-S47857.06
Project: Erickson AM MI Wells 16A-16D
Collected Date(s): 04/25/2023
Submitted Date/Time: 04/26/2023 09:34
Sampled by: Marc Wahrer
P.O. #:

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Maya Murshak
Technical Director



General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

Report Narrative

Sample tag for .05 corrected to match COC per client request



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



Sample Summary (6 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S47857.01	MW-16A L304234-01	Groundwater	04/25/23 12:36
S47857.02	MW-16B L304234-02	Groundwater	04/25/23 14:32
S47857.03	MW-16C L304234-03	Groundwater	04/25/23 15:54
S47857.04	MW-16D L304234-04	Groundwater	04/25/23 11:39
S47857.05	MWT-16A L304234-05	Groundwater	04/25/23 12:36
S47857.06	Field Blank L304234-06	Groundwater	04/25/23 09:25



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S47857.01

Sample Tag: MW-16A L304234-01

Collected Date/Time: 04/25/2023 12:36

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.3	IR
2	1L Plastic	None	Yes	2.3	IR
1	250ml Plastic	HNO3	Yes	2.3	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	04/27/23 13:42	CTV	
Metal Digestion	Completed	SW3015A	04/27/23 09:45	CCM	

Inorganics

Method: E300.0, Run Date: 04/26/23 13:09, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	391	50	0.65	mg/L	50	16887-00-6	

Method: E300.0, Run Date: 04/26/23 11:38, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	92	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 04/27/23 12:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	420	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 04/26/23 15:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	526	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 04/26/23 17:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,170	50	12	mg/L	2		

Method: SM2540D, Run Date: 04/26/23 17:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	2.0	3	1	mg/L	1		b

Metals

Method: E200.8, Run Date: 04/27/23 11:31, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.003	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.108	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.10	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	

b-Value detected less than reporting limit, but greater than MDL



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S47857.01 (continued)

Sample Tag: MW-16A L304234-01

Method: E200.8, Run Date: 04/27/23 11:31, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	2.96	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 04/27/23 13:43, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	145	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	33.2	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.34	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	229	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 04/27/23 16:00, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 05/25/23 11:51, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S47857.02

Sample Tag: MW-16B L304234-02

Collected Date/Time: 04/25/2023 14:32

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.3	IR
2	1L Plastic	None	Yes	2.3	IR
1	250ml Plastic	HNO3	Yes	2.3	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	04/27/23 13:42	CTV	
Metal Digestion	Completed	SW3015A	04/27/23 09:45	CCM	

Inorganics

Method: E300.0, Run Date: 04/26/23 11:48, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	5	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	16	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 04/27/23 12:26, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	400	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 04/26/23 15:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	335	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 04/26/23 17:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	350	50	12	mg/L	2		

Method: SM2540D, Run Date: 04/26/23 17:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	1.4	3	1	mg/L	1		b

Metals

Method: E200.8, Run Date: 04/27/23 11:35, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.085	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.12	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL



Lab Sample ID: S47857.02 (continued)

Sample Tag: MW-16B L304234-02

Method: E200.8, Run Date: 04/27/23 11:35, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	0.51	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.022	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.006	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 04/27/23 13:44, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	78.4	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	33.3	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	3.00	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	12.6	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 04/27/23 16:03, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 05/25/23 11:52, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Lab Sample ID: S47857.03

Sample Tag: MW-16C L304234-03

Collected Date/Time: 04/25/2023 15:54

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.3	IR
2	1L Plastic	None	Yes	2.3	IR
1	250ml Plastic	HNO3	Yes	2.3	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	04/27/23 13:42	CTV	
Metal Digestion	Completed	SW3015A	04/27/23 09:45	CCM	

Inorganics

Method: E300.0, Run Date: 04/26/23 11:58, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	7	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 04/27/23 12:28, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	400	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 04/26/23 15:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	272	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 04/26/23 17:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	330	50	12	mg/L	2		

Method: SM2540D, Run Date: 04/26/23 17:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	1.6	3	1	mg/L	1		b

Metals

Method: E200.8, Run Date: 04/27/23 11:39, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.050	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.39	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S47857.03 (continued)

Sample Tag: MW-16C L304234-03

Method: E200.8, Run Date: 04/27/23 11:39, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	0.64	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.027	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 04/27/23 13:46, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	66.5	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	27.3	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	3.97	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	28.5	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 04/27/23 16:06, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 05/25/23 11:52, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Lab Sample ID: S47857.04

Sample Tag: MW-16D L304234-04

Collected Date/Time: 04/25/2023 11:39

Matrix: Groundwater

COC Reference:

Sample Containers

Table with 6 columns: #, Type, Preservative(s), Refrigerated?, Arrival Temp. (C), Thermometer #. Rows include 1L Plastic and 250ml Plastic containers.

Extraction / Prep.

Table with 6 columns: Parameter, Result, Method, Run Date, Analyst, Flags. Rows include Mercury Digestion and Metal Digestion.

Inorganics

Method: E300.0, Run Date: 04/26/23 12:08, Analyst: JDP

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Chloride, Fluoride (Undistilled), and Sulfate.

Method: SM2320B, Run Date: 04/27/23 12:30, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Bicarbonate* and Carbonate*.

Method: SM2340C, Run Date: 04/26/23 15:24, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Hardness.

Method: SM2540C, Run Date: 04/26/23 17:45, Analyst: MDG

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Dissolved Solids.

Method: SM2540D, Run Date: 04/26/23 17:45, Analyst: MDG

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Suspended Solids.

Metals

Method: E200.8, Run Date: 04/27/23 11:42, Analyst: CCM

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Antimony*, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, and Copper.

b-Value detected less than reporting limit, but greater than MDL



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S47857.04 (continued)

Sample Tag: MW-16D L304234-04

Method: E200.8, Run Date: 04/27/23 11:42, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	0.08	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.022	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.012	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.183	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 04/27/23 13:47, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	28.9	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	7.28	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	9.65	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	115	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 04/27/23 16:10, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 05/25/23 11:52, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S47857.05

Sample Tag: MWT-16A L304234-05

Collected Date/Time: 04/25/2023 12:36

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.3	IR
2	1L Plastic	None	Yes	2.3	IR
1	250ml Plastic	HNO3	Yes	2.3	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	04/27/23 13:42	CTV	
Metal Digestion	Completed	SW3015A	04/27/23 09:45	CCM	

Inorganics

Method: E300.0, Run Date: 04/26/23 13:19, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	397	50	0.65	mg/L	50	16887-00-6	

Method: E300.0, Run Date: 04/26/23 12:18, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	92	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 04/27/23 12:32, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	420	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 04/26/23 15:26, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	519	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 04/26/23 17:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,170	50	12	mg/L	2		

Method: SM2540D, Run Date: 04/26/23 17:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	1.6	3	1	mg/L	1		b

Metals

Method: E200.8, Run Date: 04/27/23 11:47, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.003	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.111	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.10	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	

b-Value detected less than reporting limit, but greater than MDL



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S47857.05 (continued)

Sample Tag: MWT-16A L304234-05

Method: E200.8, Run Date: 04/27/23 11:47, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	2.99	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 04/27/23 13:49, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	148	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	34.4	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.45	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	243	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 04/27/23 16:13, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 05/25/23 11:52, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

**Lab Sample ID: S47857.06**

Sample Tag: Field Blank L304234-06
 Collected Date/Time: 04/25/2023 09:25
 Matrix: Groundwater
 COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.3	IR
2	1L Plastic	None	Yes	2.3	IR
1	250ml Plastic	HNO3	Yes	2.3	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	04/27/23 13:42	CTV	
Metal Digestion	Completed	SW3015A	04/27/23 09:45	CCM	

Inorganics**Method: E300.0, Run Date: 04/26/23 12:28, Analyst: JDP**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.03	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.04	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.26	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 04/27/23 12:34, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 04/26/23 15:28, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 04/26/23 17:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	12	mg/L	2		

Method: SM2540D, Run Date: 04/26/23 17:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals**Method: E200.8, Run Date: 04/27/23 11:19, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S47857.06 (continued)

Sample Tag: Field Blank L304234-06

Method: E200.8, Run Date: 04/27/23 11:19, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 04/27/23 13:37, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 04/27/23 16:16, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 05/25/23 11:52, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

Merit Laboratories Login Checklist

Lab Set ID:S47857

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 16A-16D

Submitted:04/26/2023 09:34 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Selection	Description	Note
Sample Receiving		
01.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples are received at 4C +/- 2C Thermometer # IR 2.3
02.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Received on ice/ cooling process begun
03.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples shipped
04.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples left in 24 hr. drop box
05.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Are there custody seals/tape or is the drop box locked
Chain of Custody		
06.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC adequately filled out
07.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC signed and relinquished to the lab
08.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sample tag on bottles match COC
09.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Subcontracting needed? Subcontracted to: GEL
Preservation		
10.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Do sample have correct chemical preservation
11.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Completed pH checks on preserved samples? (no VOAs)
12.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Did any samples need to be preserved in the lab?
Bottle Conditions		
13.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	All bottles intact
14.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Appropriate analytical bottles are used
15.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Merit bottles used
16.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sufficient sample volume received
17.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples require laboratory filtration
18.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples submitted within holding time
19.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S47857 Submitted: 04/26/2023 09:34

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 16A-16D

Attention: Jennifer Caporale
Address: Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Initial Preservation Check: 04/26/2023 10:14 MMC

Preservation Recheck (E200.8): N/A

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S47857.01	1L Plastic HNO3	<2			
S47857.01	1L Plastic HNO3	<2			
S47857.01	250ml Plastic HNO3	<2			
S47857.02	1L Plastic HNO3	<2			
S47857.02	1L Plastic HNO3	<2			
S47857.02	250ml Plastic HNO3	<2			
S47857.03	1L Plastic HNO3	<2			
S47857.03	1L Plastic HNO3	<2			
S47857.03	250ml Plastic HNO3	<2			
S47857.04	1L Plastic HNO3	<2			
S47857.04	1L Plastic HNO3	<2			
S47857.04	250ml Plastic HNO3	<2			
S47857.05	1L Plastic HNO3	<2			
S47857.05	1L Plastic HNO3	<2			
S47857.05	250ml Plastic HNO3	<2			
S47857.06	1L Plastic HNO3	<2			
S47857.06	1L Plastic HNO3	<2			
S47857.06	250ml Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823
 Phone (517) 332-0167 Fax (517) 332-4034
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

REPORT TO **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME **Jennifer Caporale**
 COMPANY **Lansing Board of Water and Light**
 ADDRESS **PO Box 13007 48901-3007**
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**
 PHONE NO. **517-702-6372** FAX NO. P.O. NO.
 E-MAIL ADDRESS **Environmental_Laboratory@lbwl.com** QUOTE NO.

CONTACT NAME **Beth Zimpfer** SAME
 COMPANY
 ADDRESS
 CITY STATE ZIP CODE
 PHONE NO. E-MAIL ADDRESS **Beth.Zimpfer@lbwl.com**

PROJECT NO./NAME **Erickson AM MI Wells 16A-16D** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**
 TURNAROUND TIME REQUIRED 1 DAY 2 DAYS 3 DAYS STANDARD OTHER **ASAP**
 DELIVERABLES REQUIRED STD LEVEL II LEVEL III LEVEL IV EDD OTHER

MATRIX GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID
 CODE: SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIFE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives							Total Metals	F- undistilled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness	Certifications	Project Locations	Special Instructions
	DATE	TIME				NONE	HCl	HNO3	H2SO4	NaOH	MeOH	OTHER									
47857.01	04/25/23	1236	MW-16A L304234-01	GW	5	2	3											<input type="checkbox"/> OHIO VAP <input type="checkbox"/> Drinking Water	<input type="checkbox"/> Detroit <input type="checkbox"/> New York	Metals to analyse: Na, Mg, K	
.02	04/25/23	1432	MW-16B L304234-02	GW	5	2	3											<input type="checkbox"/> DoD <input checked="" type="checkbox"/> NPDES		B, Ca, Sb, As, Ba, Be, Cd, Cr,	
.03	04/25/23	155A	MW-16C L304234-03	GW	5	2	3													Co, Li, Hg, Mo, Pb, Se, Tl,	
.04	04/25/23	1139	MW16-D L304234-04	GW	5	2	3													Fe, Cu, Ni, Ag, V, Zn	
.05	04/25/23	1236	MWT-16A L304234-05	GW	5	2	3													Please send a preliminary report	
.06	04/25/23	0985	Field Blank L304234-06	DI	5	2	3														

RELINQUISHED BY: *[Signature]* DATE **4/26/23** TIME **0934**
 SIGNATURE/ORGANIZATION: *[Signature]*
 RECEIVED BY: *M. Chilcote* DATE **4/26/23** TIME **0934**
 SIGNATURE/ORGANIZATION: *[Signature]*

RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
 RECEIVED BY: SIGNATURE/ORGANIZATION DATE TIME
 SEAL NO. SEAL INTACT INITIALS
 YES NO
 SEAL NO. SEAL INTACT INITIALS
 YES NO
 NOTES: TEMP. ON ARRIVAL **2.3**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005

May 25, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 620147
SDG: S47857

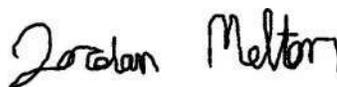
Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on April 28, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,



Jordan Melton for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S47857
Work Order: 620147**

May 25, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on April 28, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

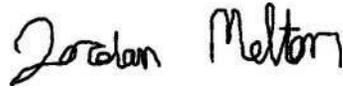
Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
620147001	S47857.01
620147002	S47857.02
620147003	S47857.03
620147004	S47857.04
620147005	S47857.05
620147006	S47857.06

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Jordan Melton". The signature is written in a cursive, slightly slanted style.

Jordan Melton for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

Laboratory Certifications

List of current GEL Certifications as of 25 May 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S47857
Work Order #: 620147**

Product: Radium-226+Radium-228 Calculation

Analytical Method: Calculation

Analytical Procedure: GL-RAD-D-003 REV# 45

Analytical Batch: 2429541

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
620147001	S47857.01
620147002	S47857.02
620147003	S47857.03
620147004	S47857.04
620147005	S47857.05
620147006	S47857.06

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2423921

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
620147001	S47857.01
620147002	S47857.02
620147003	S47857.03
620147004	S47857.04
620147005	S47857.05
620147006	S47857.06
1205394668	Method Blank (MB)
1205394669	620147001(S47857.01) Sample Duplicate (DUP)
1205394670	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

Method Blank Criteria

The blank result (See Below) is greater than the MDC but less than the required detection limit.

Sample	Analyte	Value
1205394668 (MB)	Radium-228	Result: 2.74 pCi/L > MDA: 2.68 pCi/L <= RDL: 3.00 pCi/L

Technical Information

Negative > 3 sigma TPU

Sample result was more negative than the three sigma TPU. The background control chart was examined and the detector was determined to be fully functional.

Sample	Analyte	Value
620147005 (S47857.05)	Radium-228	Negative Result > 3 sigma value

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2423881

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
620147001	S47857.01
620147002	S47857.02
620147003	S47857.03
620147004	S47857.04
620147005	S47857.05
620147006	S47857.06
1205394583	Method Blank (MB)
1205394584	620147001(S47857.01) Sample Duplicate (DUP)
1205394585	620147001(S47857.01) Matrix Spike (MS)
1205394586	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and

procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

The matrix spike, 1205394585 (S47857.01MS), aliquot was reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S47857 GEL Work Order: 620147

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 26 MAY 2023

Title: Analyst III - Data Validator

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: May 26, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S47857.01 Project: MERI00120
Sample ID: 620147001 Client ID: MERI001
Matrix: Ground Water
Collect Date: 25-APR-23 12:36
Receive Date: 28-APR-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.59	+/-1.32	2.14	3.00	pCi/L		JE1	05/25/23	1151	2423921		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		2.37	+/-1.44			pCi/L		NXL1	05/25/23	1342	2429541		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.781	+/-0.587	0.771	1.00	pCi/L		LXP1	05/23/23	0901	2423881		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			87.4	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: May 26, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S47857.02 Project: MERI00120
Sample ID: 620147002 Client ID: MERI001
Matrix: Ground Water
Collect Date: 25-APR-23 14:32
Receive Date: 28-APR-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.30	+/-1.10	1.78	3.00	pCi/L		JE1	05/25/23	1152	2423921		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.79	+/-1.16			pCi/L		NXL1	05/25/23	1342	2429541		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.490	+/-0.371	0.458	1.00	pCi/L		LXP1	05/23/23	0901	2423881		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			82	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: May 26, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S47857.03	Project: MERI00120
Sample ID: 620147003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 25-APR-23 15:54	
Receive Date: 28-APR-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	-0.309	+/-0.716	1.50	3.00	pCi/L		JE1	05/25/23	1152	2423921		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.478	+/-0.832			pCi/L		NXL1	05/25/23	1342	2429541		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.478	+/-0.423	0.594	1.00	pCi/L		LXP1	05/23/23	0901	2423881		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			78	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: May 26, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S47857.04 Project: MERI00120
Sample ID: 620147004 Client ID: MERI001
Matrix: Ground Water
Collect Date: 25-APR-23 11:39
Receive Date: 28-APR-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.93	+/-1.25	1.93	3.00	pCi/L		JE1	05/25/23	1152	2423921		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		4.14	+/-1.50			pCi/L		NXL1	05/25/23	1342	2429541		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		2.21	+/-0.828	0.595	1.00	pCi/L		LXP1	05/23/23	0901	2423881		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			75.2	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: May 26, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S47857.05 Project: MERI00120
Sample ID: 620147005 Client ID: MERI001
Matrix: Ground Water
Collect Date: 25-APR-23 12:36
Receive Date: 28-APR-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	-2.75	+/-0.892	2.19	3.00	pCi/L		JE1	05/25/23	1152	2423921		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.721	+/-1.06			pCi/L		NXL1	05/25/23	1342	2429541		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.721	+/-0.577	0.799	1.00	pCi/L		LXP1	05/23/23	0901	2423881		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			87.7	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: May 26, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S47857.06	Project: MERI00120
Sample ID: 620147006	Client ID: MERI001
Matrix: Water	
Collect Date: 25-APR-23 09:25	
Receive Date: 28-APR-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.43	+/-1.05	1.63	3.00	pCi/L		JE1	05/25/23	1152	2423921		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.75	+/-1.10			pCi/L		NXL1	05/25/23	1342	2429541		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.323	+/-0.322	0.420	1.00	pCi/L		LXP1	05/23/23	0937	2423881		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			73.7	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: May 26, 2023

Page 1 of 2

Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan

Contact: John Laverty

Workorder: 620147

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2423921										
QC1205394669	620147001	DUP									
Radium-228	U	1.59		2.61	pCi/L	49		(0% - 100%)	JE1	05/25/23	11:50
	Uncertainty	+/-1.32		+/-1.06							
QC1205394670	LCS										
Radium-228	80.5			67.9	pCi/L		84.3	(75%-125%)		05/25/23	11:50
	Uncertainty			+/-4.15							
QC1205394668	MB										
Radium-228				2.74	pCi/L					05/25/23	11:52
	Uncertainty			+/-1.72							
Rad Ra-226											
Batch	2423881										
QC1205394584	620147001	DUP									
Radium-226		0.781		0.685	pCi/L	13		(0% - 100%)	LXP1	05/23/23	09:36
	Uncertainty	+/-0.587		+/-0.517							
QC1205394586	LCS										
Radium-226	26.5			27.9	pCi/L		106	(75%-125%)		05/23/23	10:11
	Uncertainty			+/-2.93							
QC1205394583	MB										
Radium-226			U	-0.0693	pCi/L					05/23/23	09:37
	Uncertainty			+/-0.192							
QC1205394585	620147001	MS									
Radium-226	134	0.781		124	pCi/L		92.2	(75%-125%)		05/23/23	09:36
	Uncertainty	+/-0.587		+/-14.6							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- H Analytical holding time was exceeded
- < Result is less than value reported
- > Result is greater than value reported

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QC Summary

Workorder: 620147

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
NI											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2423921 Check-list

This check-list was completed on 25-MAY-23 by Rhonda Birch

This batch was reviewed by Rhonda Birch on 25-MAY-23 and Kenshalla Oston on 26-MAY-23.

Batch ID:
2423921

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?	Yes		
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?		No	
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2423921
Analyst: Jacqueline Winston (JE1)
 Prep: Lyndsey Pace (LXP1)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: LUCAS-C202389980

Due Dates for Lab: 23-MAY-2023 **Package:** 25-MAY-2023 **SDG:** 26-MAY-2023

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205394670	228	2051-B	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	620147001	16-MAY-2023	3	301.36	301.36	05/17/23 15:25	05/25/23 09:46
2	620147002	16-MAY-2023	3	301	301	05/17/23 15:25	05/25/23 09:46
3	620147003	16-MAY-2023	3	305.79	305.79	05/17/23 15:25	05/25/23 09:46
4	620147004	16-MAY-2023	3	300.64	300.64	05/17/23 15:25	05/25/23 09:46
5	620147005	16-MAY-2023	3	303.97	303.97	05/17/23 15:25	05/25/23 09:46
6	620147006	16-MAY-2023	3	300.88	300.88	05/17/23 15:25	05/25/23 09:46
7	620562001	16-MAY-2023	3	306.78	306.78	05/17/23 15:25	05/25/23 09:46
8	620562002	16-MAY-2023	3	308.91	308.91	05/17/23 15:25	05/25/23 09:46
9	620562003	16-MAY-2023	3	300.38	300.38	05/17/23 15:25	05/25/23 09:46
10	620562004	16-MAY-2023	3	306.86	306.86	05/17/23 15:25	05/25/23 09:46
11	1205394668 MB	16-MAY-2023	3		308.91	05/17/23 15:25	05/25/23 09:46
12	1205394669 DUP (620147001)	16-MAY-2023	3	303.46	303.46	05/17/23 15:25	05/25/23 09:46
13	1205394670 LCS	16-MAY-2023	3		308.91	05/17/23 15:25	05/25/23 09:46

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-E	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 16-MAY-2023 00:00
REGNT 3909714	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3906586	RGF-1M Citric Acid	5 mL	
REGNT 3910170	2M HCl	20 mL	
REGNT 3907858	RGF-50% Potassium Carbonate	2 mL	
REGNT 3903777	RGF-7M Nitric Acid	25 mL	
REGNT DGA042223	2418797	2 g	
REGNT 3885305.13	RGF-Hydrofluoric Acid	4 mL	
REGNT 3528714	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3887517	RGF-Neodymium Substrate	5 mL	
REGNT 3908482.6	Nitric Acid	5 mL	
REGNT 3911267	Barium Carrier Ra228 REG	1 mL	
REGNT 3907855	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 1951-E
 Tracer Exp Date : 9/16/2023
 Tracer Volume Added: 0.10

Batch : 2423921
 Analyst : JAC02417
 Prep Date : 5/16/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 3 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	620147001.1	0.3014	1.8482E-05	4/25/2023 12:36	1173.6	1.69%	1026.1	1.80%	0.1	0.000200
2	620147002.1	0.3010	1.8476E-05	4/25/2023 14:32	1173.6	1.69%	961.9	1.86%	0.1	0.000200
3	620147003.1	0.3058	1.8556E-05	4/25/2023 15:54	1173.6	1.69%	914.8	1.91%	0.1	0.000200
4	620147004.1	0.3006	1.8470E-05	4/25/2023 11:39	1173.6	1.69%	882.2	1.94%	0.1	0.000200
5	620147005.1	0.3040	1.8526E-05	4/25/2023 12:36	1173.6	1.69%	1029.5	1.80%	0.1	0.000200
6	620147006.1	0.3009	1.8474E-05	4/25/2023 9:25	1173.6	1.69%	864.6	1.96%	0.1	0.000200
7	620562001.1	0.3068	1.8572E-05	4/28/2023 11:42	1173.6	1.69%	1086.8	1.75%	0.1	0.000200
8	620562002.1	0.3089	1.8606E-05	4/28/2023 13:54	1173.6	1.69%	900.2	1.92%	0.1	0.000200
9	620562003.1	0.3004	1.8465E-05	4/28/2023 11:42	1173.6	1.69%	985.0	1.84%	0.1	0.000200
10	620562004.1	0.3069	1.8573E-05	4/28/2023 10:30	1173.6	1.69%	917.8	1.91%	0.1	0.000200
11	1205394668.1	0.3089	1.8606E-05	5/16/2023 0:00	1173.6	1.69%	637.8	2.29%	0.1	0.000200
12	1205394669.1	0.3035	1.8517E-05	4/25/2023 12:36	1173.6	1.69%	1012.8	1.81%	0.1	0.000200
13	1205394670.1	0.3089	1.8606E-05	5/16/2023 0:00	1173.6	1.69%	941.3	1.88%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
			Alpha	Beta										
1	2C	60	20	101	1.683	5/25/2023 11:51	5/17/2023 15:25	5/25/2023 9:46	0.990	0.790	1.000	1.057	87.4%	2.49%
2	5B	60	19	69	1.150	5/25/2023 11:52	5/17/2023 15:25	5/25/2023 9:46	0.990	0.788	1.000	1.057	82.0%	2.53%
3	5C	60	12	25	0.417	5/25/2023 11:52	5/17/2023 15:25	5/25/2023 9:46	0.990	0.788	1.000	1.057	78.0%	2.57%
4	5D	60	13	73	1.217	5/25/2023 11:52	5/17/2023 15:25	5/25/2023 9:46	0.990	0.788	1.000	1.057	75.2%	2.59%
5	6A	60	9	46	0.767	5/25/2023 11:52	5/17/2023 15:25	5/25/2023 9:46	0.990	0.788	1.000	1.057	87.7%	2.49%
6	7A	60	12	50	0.833	5/25/2023 11:52	5/17/2023 15:25	5/25/2023 9:46	0.990	0.788	1.000	1.057	73.7%	2.60%
7	8B	60	3	76	1.267	5/25/2023 11:52	5/17/2023 15:25	5/25/2023 9:46	0.991	0.789	1.000	1.057	92.6%	2.45%
8	8D	60	8	100	1.667	5/25/2023 11:52	5/17/2023 15:25	5/25/2023 9:46	0.991	0.788	1.000	1.057	76.7%	2.57%
9	9D	60	10	41	0.683	5/25/2023 11:52	5/17/2023 15:25	5/25/2023 9:46	0.991	0.788	1.000	1.057	83.9%	2.51%
10	10D	60	15	61	1.017	5/25/2023 11:52	5/17/2023 15:25	5/25/2023 9:46	0.991	0.788	1.000	1.057	78.2%	2.57%
11	5A	70	12	104	1.486	5/25/2023 11:52	5/17/2023 15:25	5/25/2023 9:46	0.997	0.788	1.000	1.067	54.3%	2.86%
12	11C	60	13	73	1.217	5/25/2023 11:50	5/17/2023 15:25	5/25/2023 9:46	0.990	0.791	1.000	1.057	86.3%	2.49%
13	11D	60	13	1097	18.283	5/25/2023 11:50	5/17/2023 15:25	5/25/2023 9:46	0.997	0.791	1.000	1.057	80.2%	2.54%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2022	5/31/2023	0.6022	0.01274	1.270	5/19/2023 17:48	500
2	PIC	6/1/2022	5/31/2023	0.6336	0.00426	0.818	5/19/2023 17:48	500
3	PIC	6/1/2022	5/31/2023	0.6242	0.00657	0.492	5/22/2023 17:12	500
4	PIC	6/1/2022	5/31/2023	0.6236	0.00925	0.772	5/19/2023 17:48	500
5	PIC	6/1/2022	5/31/2023	0.6328	0.02228	1.526	5/19/2023 17:48	500
6	PIC	6/1/2022	5/31/2023	0.6257	0.00594	0.508	5/19/2023 17:48	500
7	PIC	6/1/2022	5/31/2023	0.6437	0.02148	0.908	5/19/2023 17:48	500
8	PIC	6/1/2022	5/31/2023	0.6347	0.00609	1.294	5/19/2023 17:48	500
9	PIC	6/1/2022	5/31/2023	0.6330	0.02610	0.472	5/19/2023 17:48	500
10	PIC	6/1/2022	5/31/2023	0.6148	0.00557	0.586	5/19/2023 17:48	500
11	PIC	6/1/2022	5/31/2023	0.6332	0.00851	1.010	5/19/2023 17:48	500
12	PIC	6/1/2022	5/31/2023	0.6276	0.01278	0.510	5/20/2023 16:07	500
13	PIC	6/1/2022	5/31/2023	0.6372	0.01068	0.540	5/21/2023 11:41	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
 Spike Exp Date : N/A
 Spike Activity (dpm/ml): N/A
 Spike Volume Added: N/A

LCS S/N : 2051-B
 LCS Exp Date : 3/27/2024
 LCS Activity (dpm/ml): 551.91
 LCS Volume Added: 0.10

Results																
Pos.	Decision	Critical	Required	Sample Act.		Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA	Sample	Sample	Nominal			
	Level	Level	MDA	MDA	Conc.	Error	Rate	Rate Error	Counting	Total Prop.						
	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	%	CPM	CPM	Uncertainty	Uncertainty	QC	Type	RPD	RER	pCi/L	Recovery
1	1.3766	0.9719	3	2.1356	1.5861	42.41%	0.4133	0.1749	1.3155	1.3761		SAMPLE				
2	1.1242	0.7937	3	1.7826	1.2963	43.52%	0.3320	0.1442	1.1038	1.1517		SAMPLE				
3	0.9161	0.6468	3	1.4986	-0.3091	118.23%	-0.0753	0.0890	0.7160	0.7162		SAMPLE				
4	1.2116	0.8554	3	1.9273	1.9261	33.33%	0.4447	0.1477	1.2542	1.3464		SAMPLE				
5	1.4227	1.0044	3	2.1897	-2.7471	16.90%	-0.7593	0.1258	0.8921	0.8923		SAMPLE				
6	0.9987	0.7051	3	1.6302	1.4320	37.62%	0.3253	0.1221	1.0532	1.1142		SAMPLE				
7	1.0108	0.7136	3	1.5939	1.1952	42.34%	0.3587	0.1514	0.9889	1.0354		SAMPLE				
8	1.4675	1.0361	3	2.2748	1.5103	46.83%	0.3727	0.1743	1.3841	1.4363		SAMPLE				
9	0.8354	0.5898	3	1.3706	0.8072	52.67%	0.2113	0.1111	0.8314	0.8572		SAMPLE				
10	1.0074	0.7112	3	1.6292	1.7803	31.36%	0.4307	0.1346	1.0906	1.1805		SAMPLE				
11	1.7200	1.2143	3	2.6753	2.7381	32.19%	0.4757	0.1525	1.7200	1.8566		MB				
12	0.8410	0.5938	3	1.3725	2.6143	20.84%	0.7067	0.1459	1.0582	1.2500	620147001.1	DUP	49.0%			
13	0.8948	0.6318	3	1.4548	67.8730	4.16%	17.7433	0.5530	4.1461	17.7539		LCS			80.4789	84.3%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
620147001	2C	60	20	101	5/25/2023 11:51	5/25/2023 12:51	PIC	2423921
620147002	5B	60	19	69	5/25/2023 11:52	5/25/2023 12:52	PIC	2423921
620147003	5C	60	12	25	5/25/2023 11:52	5/25/2023 12:52	PIC	2423921
620147004	5D	60	13	73	5/25/2023 11:52	5/25/2023 12:52	PIC	2423921
620147005	6A	60	9	46	5/25/2023 11:52	5/25/2023 12:52	PIC	2423921
620147006	7A	60	12	50	5/25/2023 11:52	5/25/2023 12:52	PIC	2423921
620562001	8B	60	3	76	5/25/2023 11:52	5/25/2023 12:52	PIC	2423921
620562002	8D	60	8	100	5/25/2023 11:52	5/25/2023 12:52	PIC	2423921
620562003	9D	60	10	41	5/25/2023 11:52	5/25/2023 12:52	PIC	2423921
620562004	10D	60	15	61	5/25/2023 11:52	5/25/2023 12:52	PIC	2423921
1205394668	5A	70	12	104	5/25/2023 11:52	5/25/2023 13:02	PIC	2423921
1205394669	11C	60	13	73	5/25/2023 11:50	5/25/2023 12:50	PIC	2423921
1205394670	11D	60	13	1097	5/25/2023 11:50	5/25/2023 12:50	PIC	2423921

ASSAY 25-May-23 10:07:52
 Wizard 2480 s/n 46190630
 Protocol id 8 Ba-133
 Time limit
 Count limit
 Isotope Ba-133
 Protocol date 5/25/2023
 Run id. 6694

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	95	1	180	3521.28	1173.56	1.69	10:07:52
620147001	2	95	2	180	3079	1026.11	1.8	87.44	10:11:06
620147002	3	95	3	180	2886.28	961.92	1.86	81.97	10:14:20
620147003	4	95	4	180	2745	914.84	1.91	77.95	10:17:33
620147004	5	95	5	180	2647	882.17	1.94	75.17	10:20:48
620147005	1	10	1	180	3089.28	1029.5	1.8	87.72	10:24:20
620147006	2	10	2	180	2594.28	864.62	1.96	73.67	10:27:34
620562001	3	10	3	180	3261	1086.75	1.75	92.60	10:30:48
620562002	4	10	4	180	2701	900.18	1.92	76.71	10:34:01
620562003	5	10	5	180	2955.57	985.03	1.84	83.94	10:37:16
620562004	1	14	1	180	2754	917.84	1.91	78.21	10:40:51
1205394668	2	14	2	180	1914	637.82	2.29	54.35	10:44:05
1205394669	3	14	3	180	3039	1012.82	1.81	86.30	10:47:19
1205394670	4	14	4	180	2824.57	941.33	1.88	80.21	10:50:33

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 25-May-2023

Detectors LB4100 A1 through I4 and PIC 1A through 14D and G5400W 1W through 1Z and LB4200 GA1 through OD4

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	Above	Beta bkg	25-May 04:14	60	2.317	1.385	3.072	+0.31
LB4100F1	Above	Beta bkg	25-May 04:14	60	2.600	0.188	2.691	+2.78
LB4100F2	Above	Beta bkg	25-May 04:14	60	3.383	1.173	1.833	+17.09
LB4100F4	need 2nd	Alpha bkg	25-May 04:14	60	0.217	-2.75E-2	0.313	+1.30
LB4100F4	Above	Beta bkg	25-May 04:14	60	2.917	-7.15E-2	3.199	+2.48
LB4100G1	Above	Alpha XTalk	25-May 05:17	5	0.753	0.088	0.447	+8.12
LB4100G1	Above	Beta bkg	25-May 04:14	60	3779	0.380	1.675	+17,505.51
LB4100G1	Above	Beta eff	25-May 05:24	5	19912	12880	18320	+4.76
LB4100H2	Above	Alpha bkg	25-May 12:24	60	0.300	-1.10E-1	0.243	+3.96
LB4200OA1	need 2nd	Alpha eff	25-May 06:11	5	11290	11120	11630	-1.00
LB4200OA1	need 2nd	Beta bkg	25-May 08:33	60	1.267	-9.98E-2	1.494	+2.14
LB4200OA2	Above	Beta bkg	25-May 03:17	60	1.983	0.241	1.025	+10.33
LB4200OA3	Above	Alpha bkg	25-May 03:17	60	0.417	0.014	0.814	+0.02
LB4200OA3	Below	Alpha eff	25-May 06:11	5	9678	9726	9942	-4.33
LB4200OA3	Above	Beta XTalk	25-May 07:53	5	0.002	7.71E-4	0.002	+4.51
LB4200OA4	Above	Beta bkg	25-May 08:33	60	1.500	0.044	1.346	+3.71
LB4200OA4	need 2nd	Beta eff	25-May 07:53	5	16972	16800	17680	-1.83
LB4200OA4	Above	Beta XTalk	25-May 07:53	5	0.002	7.19E-4	0.002	+3.72
LB4200OB1	need 2nd	Beta XTalk	25-May 07:53	5	0.003	0.001	0.004	+2.62
LB4200OB2	Above	Alpha bkg	25-May 03:17	60	0.383	0.049	0.542	+1.07
LB4200OB2	Below	Alpha eff	25-May 06:11	5	9645	9676	10040	-3.50
LB4200OB2	Above	Beta bkg	25-May 03:17	60	1.433	0.176	1.400	+3.16
LB4200OB3	Above	Alpha bkg	25-May 03:17	60	0.550	-2.51E-1	0.957	+0.98
LB4200OB3	need 2nd	Alpha eff	25-May 06:11	5	21500	21460	22180	-2.67
LB4200OB3	Above	Beta bkg	25-May 03:17	60	1.817	0.031	1.553	+4.04
LB4200OC1	Above	Alpha bkg	25-May 03:17	60	0.650	-3.01E-1	1.067	+1.17
LB4200OC1	Below	Alpha eff	25-May 07:38	5	11063	11120	11520	-3.85
LB4200OC1	Above	Alpha XTalk	25-May 07:38	5	0.207	0.183	0.203	+4.23
LB4200OC1	Above	Beta bkg	25-May 03:17	60	1.500	0.288	1.060	+6.42
LB4200OC2	Above	Beta bkg	25-May 08:33	60	2.133	0.275	1.220	+8.80

LB4200OC3	Above	Alpha bkg	25-May 03:17	60	0.833	-2.99E-1	1.153	+1.68
LB4200OC3	Below	Alpha eff	25-May 07:38	5	9597	9651	9914	-4.24
LB4200OC3	Above	Beta bkg	25-May 03:17	60	1.400	0.316	1.139	+4.90
LB4200OC3	Above	Beta XTalk	25-May 06:11	5	0.003	0.001	0.003	+5.09
LB4200OD1	Above	Beta XTalk	25-May 06:11	5	0.002	5.69E-4	0.002	+3.94
LB4200OD2	Above	Alpha bkg	25-May 03:17	60	0.417	-2.30E-1	0.829	+0.66
LB4200OD2	Above	Alpha XTalk	25-May 07:38	5	0.215	0.185	0.211	+3.89
LB4200OD3	Above	Alpha bkg	25-May 03:17	60	0.367	-3.01E-1	1.146	-0.23
LB4200OD3	Below	Alpha eff	25-May 07:38	5	21694	21710	22170	-3.21
LB4200OD4	Below	Alpha eff	25-May 07:38	5	17957	18070	18550	-4.41
PIC4A	Above	Alpha bkg	25-May 13:41	60	0.383	-5.84E-2	0.311	+4.17
PIC4B	Above	Alpha bkg	25-May 04:45	60	1.033	-8.41E-1	2.241	+0.65
PIC4B	need 2nd	Beta eff	25-May 04:37	5	13841	10440	27300	-1.79
PIC6B	Above	Alpha eff	25-May 12:23	5	9686	8319	9448	+4.26
PIC6B	Below	Beta eff	25-May 14:03	5	16495	16860	22460	-3.39
PIC7B	Above	Beta bkg	25-May 07:30	60	2.483	0.146	1.265	+9.53
PIC7C	need 2nd	Beta eff	25-May 14:03	5	19514	19410	21710	-2.73
PIC10C	Above	Alpha bkg	25-May 05:05	60	0.717	-1.05E-1	0.324	+8.49
PIC10C	Above	Beta bkg	25-May 05:05	60	9.117	-3.39E-1	2.310	+18.42
PIC10C	Above	Beta XTalk	25-May 04:59	5	6.46E-4	9.29E-5	6.05E-4	+3.49
PIC12B	Above	Alpha bkg	25-May 08:46	60	0.333	-8.27E-2	0.413	+2.03
PIC12B	Above	Beta bkg	25-May 08:46	60	2.817	-5.75E-1	2.641	+3.33
PIC14B	Above	Alpha eff	25-May 05:00	5	9390	8571	9265	+4.08
PIC14B	Above	Beta bkg	25-May 05:19	60	6.800	-4.03E-1	2.348	+12.71

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

LB4100A1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100A3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100C4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4100I3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

LB4100I4

Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by Lois Buist

Date 5/25/23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2423921

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205394669	DUP	JE1	PIC11C	MAY-25-23 11:50:42	DONE	25mm Filter	01-JUN-22 00:00
1205394670	LCS	JE1	PIC11D	MAY-25-23 11:50:42	DONE	25mm Filter	01-JUN-22 00:00
620147001	SAMPLE	JE1	PIC2C	MAY-25-23 11:51:28	DONE	25mm Filter	01-JUN-22 00:00
620562001	SAMPLE	JE1	PIC8B	MAY-25-23 11:52:25	DONE	25mm Filter	01-JUN-22 00:00
620562002	SAMPLE	JE1	PIC8D	MAY-25-23 11:52:31	DONE	25mm Filter	01-JUN-22 00:00
620562003	SAMPLE	JE1	PIC9D	MAY-25-23 11:52:38	DONE	25mm Filter	01-JUN-22 00:00
620147002	SAMPLE	JE1	PIC5B	MAY-25-23 11:52:48	DONE	25mm Filter	01-JUN-22 00:00
620147003	SAMPLE	JE1	PIC5C	MAY-25-23 11:52:48	DONE	25mm Filter	01-JUN-22 00:00
620147004	SAMPLE	JE1	PIC5D	MAY-25-23 11:52:48	DONE	25mm Filter	01-JUN-22 00:00
620147005	SAMPLE	JE1	PIC6A	MAY-25-23 11:52:48	DONE	25mm Filter	01-JUN-22 00:00
1205394668	MB	JE1	PIC5A	MAY-25-23 11:52:48	DONE	25mm Filter	01-JUN-22 00:00
620147006	SAMPLE	JE1	PIC7A	MAY-25-23 11:52:52	DONE	25mm Filter	01-JUN-22 00:00
620562004	SAMPLE	JE1	PIC10D	MAY-25-23 11:52:53	DONE	25mm Filter	01-JUN-22 00:00

Lucas Cell Raw Data

Batch 2423881 Check-list

This check-list was completed on 23-MAY-23 by Lyndsey Pace

This batch was reviewed by Elizabeth Krouse on 23-MAY-23 and Lyndsey Pace on 23-MAY-23.

Batch ID:
2423881

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2423881
Analyst: Lyndsey Pace (LXP1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: LUCAS-C202389980

Due Dates for Lab: 23-MAY-2023			Package: 25-MAY-2023		SDG: 26-MAY-2023	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
MS	1205394585	Radium-226 SPIKE	1715-G	.1	mL	
LCS	1205394586	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	620147001	16-MAY-2023	1	502.48	502.48	05/19/23 10:02	402	05/23/23 05:29	05/23/23 09:01	5	12
2	620147002	16-MAY-2023	1	501.8	501.8	05/19/23 10:02	503	05/23/23 05:29	05/23/23 09:01	3	10
3	620147003	16-MAY-2023	1	504.59	504.59	05/19/23 10:02	608	05/23/23 05:29	05/23/23 09:01	4	9
4	620147004	16-MAY-2023	1	502.3	502.3	05/19/23 10:02	703	05/23/23 05:29	05/23/23 09:01	3	31
5	620147005	16-MAY-2023	1	501.49	501.49	05/19/23 10:02	805	05/23/23 05:29	05/23/23 09:01	6	12
6	620147006	16-MAY-2023	1	501.43	501.43	05/19/23 10:02	107	05/23/23 05:56	05/23/23 09:37	1	5
7	620562001	16-MAY-2023	1	501.97	501.97	05/19/23 10:02	205	05/23/23 05:56	05/23/23 09:37	2	5
8	620562002	16-MAY-2023	1	502.6	502.6	05/19/23 10:02	303	05/23/23 05:56	05/23/23 09:37	5	9
9	620562003	16-MAY-2023	1	500.34	500.34	05/19/23 10:02	408	05/23/23 05:56	05/23/23 09:37	1	16
10	620562004	16-MAY-2023	1	500.56	500.56	05/19/23 10:02	506	05/23/23 05:56	05/23/23 09:37	4	5
11	1205394583 MB	16-MAY-2023	1		506.02	05/19/23 10:02	601	05/23/23 05:56	05/23/23 09:37	4	1
12	1205394584 DUP (620147001)	16-MAY-2023	1	506.02	506.02	05/19/23 10:02	708	05/23/23 05:56	05/23/23 09:36	4	11
13	1205394585 MS (620147001)	16-MAY-2023	1	100.04	100.04	05/19/23 10:02	801	05/23/23 05:56	05/23/23 09:36	8	290
14	1205394586 LCS	16-MAY-2023	1		506.02	05/19/23 10:02	105	05/23/23 06:21	05/23/23 10:11	4	354

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 16-MAY-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Procedure Code : LUC26RAL
 Parmname : Radium-226
 Required MDA : 1 pCi/L
 Halflife of Ra-226 : 1600 years
 Ra-226 Abundance : 1.00
 Halflife of Rn-222 : 3.8235 days

Batch : 2423881
 Analyst : LIN01615
 Prep Date : 5/16/2023
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Counting		Gross Counts	Gross CPM	Background Counts	Background CPM	Background Count Time (min.)	Cell Efficiency (cpm/dpm)
					Cell Number	Time (min.)						
1	620147001.1	0.5025	2.0266E-05	4/25/2023 12:36	402	15	12	0.800	5	0.167	30	1.4980
2	620147002.1	0.5018	2.0263E-05	4/25/2023 14:32	503	15	10	0.667	3	0.100	30	2.1390
3	620147003.1	0.5046	2.0275E-05	4/25/2023 15:54	608	15	9	0.600	4	0.133	30	1.7970
4	620147004.1	0.5023	2.0265E-05	4/25/2023 11:39	703	15	31	2.067	3	0.100	30	1.6440
5	620147005.1	0.5015	2.0262E-05	4/25/2023 12:36	805	15	12	0.800	6	0.200	30	1.5410
6	620147006.1	0.5014	2.0262E-05	4/25/2023 9:25	107	15	5	0.333	1	0.033	30	1.7160
7	620562001.1	0.5020	2.0264E-05	4/28/2023 11:42	205	15	5	0.333	2	0.067	30	1.8920
8	620562002.1	0.5026	2.0266E-05	4/28/2023 13:54	303	15	9	0.600	5	0.167	30	1.7210
9	620562003.1	0.5003	2.0257E-05	4/28/2023 11:42	408	15	16	1.067	1	0.033	30	1.5020
10	620562004.1	0.5006	2.0258E-05	4/28/2023 10:30	506	15	5	0.333	4	0.133	30	1.7710
11	1205394583.1	0.5060	2.0280E-05	5/16/2023 0:00	601	15	1	0.067	4	0.133	30	1.7610
12	1205394584.1	0.5060	2.0280E-05	4/25/2023 12:36	708	15	11	0.733	4	0.133	30	1.6020
13	1205394585.1	0.1000	1.1373E-05	4/25/2023 12:36	801	15	290	19.333	8	0.267	30	1.4200
14	1205394586.1	0.5060	2.0280E-05	5/16/2023 0:00	105	15	354	23.600	4	0.133	30	1.5340

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrowth End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
5.300%	2/1/2023	1/31/2024	5/19/2023 10:02	5/23/2023 5:29	5/23/2023 9:01	0.499	0.974	1.001	1.000
5.000%	6/1/2022	5/31/2023	5/19/2023 10:02	5/23/2023 5:29	5/23/2023 9:01	0.499	0.974	1.001	1.000
6.300%	7/1/2022	6/30/2023	5/19/2023 10:02	5/23/2023 5:29	5/23/2023 9:01	0.499	0.974	1.001	1.000
9.000%	11/1/2022	10/31/2023	5/19/2023 10:02	5/23/2023 5:29	5/23/2023 9:01	0.499	0.974	1.001	1.000
9.600%	4/8/2023	3/31/2024	5/19/2023 10:02	5/23/2023 5:29	5/23/2023 9:01	0.499	0.974	1.001	1.000
8.100%	5/1/2023	4/30/2024	5/19/2023 10:02	5/23/2023 5:56	5/23/2023 9:37	0.501	0.973	1.001	1.000
3.900%	8/1/2022	7/31/2023	5/19/2023 10:02	5/23/2023 5:56	5/23/2023 9:37	0.501	0.973	1.001	1.000
7.400%	10/25/2022	10/31/2023	5/19/2023 10:02	5/23/2023 5:56	5/23/2023 9:37	0.501	0.973	1.001	1.000
7.000%	2/1/2023	1/31/2024	5/19/2023 10:02	5/23/2023 5:56	5/23/2023 9:37	0.501	0.973	1.001	1.000
5.300%	6/1/2022	5/31/2023	5/19/2023 10:02	5/23/2023 5:56	5/23/2023 9:37	0.501	0.973	1.001	1.000
9.400%	7/1/2022	6/30/2023	5/19/2023 10:02	5/23/2023 5:56	5/23/2023 9:37	0.501	0.973	1.001	1.000
7.700%	11/1/2022	10/31/2023	5/19/2023 10:02	5/23/2023 5:56	5/23/2023 9:36	0.501	0.973	1.001	1.000
3.200%	4/8/2023	3/31/2024	5/19/2023 10:02	5/23/2023 5:56	5/23/2023 9:36	0.501	0.973	1.001	1.000
7.900%	5/1/2023	4/30/2024	5/19/2023 10:02	5/23/2023 6:21	5/23/2023 10:11	0.502	0.971	1.001	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-G
Spike Exp Date : 9/8/2023
Spike Activity (dpm/ml): 297.41
Spike Volume Added: 0.10

LCS S/N : 1715-G
LCS Exp Date : 9/8/2023
LCS Activity (dpm/ml): 297.41
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.3710	0.2619	1	0.7705	0.7811	38.68%	0.6333	0.2427	0.5866	0.6029		SAMPLE				
2	0.2015	0.1423	1	0.4575	0.4901	38.90%	0.5667	0.2186	0.3706	0.3803		SAMPLE				
3	0.2755	0.1945	1	0.5937	0.4778	45.61%	0.4667	0.2108	0.4231	0.4327		SAMPLE				
4	0.2619	0.1849	1	0.5947	2.2110	21.11%	1.9667	0.3756	0.8277	0.9691		SAMPLE				
5	0.3958	0.2795	1	0.7992	0.7208	41.94%	0.6000	0.2449	0.5768	0.6016		SAMPLE				
6	0.1448	0.1022	1	0.4198	0.3229	51.56%	0.3000	0.1528	0.3223	0.3297		SAMPLE				
7	0.1855	0.1310	1	0.4571	0.2601	58.76%	0.2667	0.1563	0.2989	0.3019		SAMPLE				
8	0.3221	0.2274	1	0.6690	0.4640	49.81%	0.4333	0.2134	0.4480	0.4579		SAMPLE				
9	0.1658	0.1171	1	0.4806	1.2736	26.93%	1.0333	0.2687	0.6492	0.6970		SAMPLE				
10	0.2811	0.1985	1	0.6059	0.2090	81.82%	0.2000	0.1633	0.3344	0.3365		SAMPLE				
11	0.2797	0.1974	1	0.6028	-0.0693	141.73%	-0.0667	0.0943	0.1921	0.1922		MB				
12	0.3074	0.2170	1	0.6625	0.6855	39.25%	0.6000	0.2309	0.5171	0.5366	620147001.1	DUP	13.0%			
13	2.4806	1.7513	1	4.8066	124.3068	6.78%	19.0667	1.1392	14.5571	24.3859	620147001.1	MS			133.9165	92.2%
14	0.3204	0.2262	1	0.6906	27.9458	9.54%	23.4667	1.2561	2.9319	6.6025		LCS			26.4746	105.6%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 23-MAY-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:52	1	1.19E+05	118574	-1.26		
LUCAS2	EFF	07:51	1	1.33E+05	133145	-0.43		
LUCAS3	EFF	07:50	1	95454	95454	-1.81		
LUCAS4	EFF	07:48	1	1.29E+05	128812	1.38		
LUCAS5	EFF	07:47	1	1.34E+05	133702	1.1		
LUCAS6	EFF	07:46	1	1.30E+05	129668	-0.3		
LUCAS7	EFF	07:45	1	1.34E+05	134068	1.4		
LUCAS8	EFF	07:44	1	1.22E+05	121738	-1.47		

Reviewed by:


Lyndsey Pace

Date: 23-MAY-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2423881

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
620147001	SAMPLE	LXP1	LUCAS4	MAY-23-23 09:01:00	DONE	Lucas Cell	01-FEB-23 00:00
620147002	SAMPLE	LXP1	LUCAS5	MAY-23-23 09:01:00	DONE	Lucas Cell	01-JUN-22 00:00
620147003	SAMPLE	LXP1	LUCAS6	MAY-23-23 09:01:00	DONE	Lucas Cell	01-JUL-22 00:00
620147004	SAMPLE	LXP1	LUCAS7	MAY-23-23 09:01:00	DONE	Lucas Cell	01-NOV-22 00:00
620147005	SAMPLE	LXP1	LUCAS8	MAY-23-23 09:01:00	DONE	Lucas Cell	08-APR-23 00:00
1205394584	DUP	LXP1	LUCAS7	MAY-23-23 09:36:00	DONE	Lucas Cell	01-NOV-22 00:00
1205394585	MS	LXP1	LUCAS8	MAY-23-23 09:36:00	DONE	Lucas Cell	08-APR-23 00:00
620147006	SAMPLE	LXP1	LUCAS1	MAY-23-23 09:37:00	DONE	Lucas Cell	01-MAY-23 00:00
620562001	SAMPLE	LXP1	LUCAS2	MAY-23-23 09:37:00	DONE	Lucas Cell	01-AUG-22 00:00
620562002	SAMPLE	LXP1	LUCAS3	MAY-23-23 09:37:00	DONE	Lucas Cell	25-OCT-22 00:00
620562003	SAMPLE	LXP1	LUCAS4	MAY-23-23 09:37:00	DONE	Lucas Cell	01-FEB-23 00:00
620562004	SAMPLE	LXP1	LUCAS5	MAY-23-23 09:37:00	DONE	Lucas Cell	01-JUN-22 00:00
1205394583	MB	LXP1	LUCAS6	MAY-23-23 09:37:00	DONE	Lucas Cell	01-JUL-22 00:00
1205394586	LCS	LXP1	LUCAS1	MAY-23-23 10:11:00	DONE	Lucas Cell	01-MAY-23 00:00



Data Verification & Validation Report

Lansing Board of Water & Light – Erickson Power Station

Sampling Event (dates and purpose): New Wells: MW-16A/B/C/D – Background Round 4 – May 2023

Data Package Number: S49138.01

Lab Report Date: 07/14/2023 Revised 07/26/2023

Data Validator: Aryka Thomson

Data Validation Completion Date: 07/26/2023

General Overall Assessment:

Data are usable without qualification.

Data are usable with qualification (as noted below).

Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	
MW-7C	
MW-8	
MW-9	
MW-10	
MW-11	
MW-11B	
MW-12	
MW-12B	
MW-13	
MW-14	
MW-15	
MW-16A	X
MW-16B	X
MW-16C	X
MW-16D	X

Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-16A	GW	S49138.01	05/30/2023	X	X	X	X	X	X	
MW-16B	GW	S49138.02	05/30/2023	X	X	X	X	X	X	
MW-16C	GW	S49138.03	05/30/2023	X	X	X	X	X	X	
MW-16D	GW	S49138.04	05/30/2023	X	X	X	X	X	X	
MWT-16A	QC	S49138.05	05/30/2023	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO₃, CO₃, hardness

Any planned sampling or analysis NOT completed? If yes, explain: _____

Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Field Data							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	X		Record of decontamination for non-dedicated sampling equipment	X			
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
Analytical Data Package							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies across samples for chloride and sulfate
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Holding Times	X		Analyses performed within allowed holding time	X			
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested		X		RLs for chloride, sulfate, and TDS were not met
			MDLs<RLs		X		RL=MDL for carbonate
			MDLs<GPS			X	
QC Validation							
Evaluate Accuracy							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Evaluate Precision							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Rad-226, Rad-228 and Combined Radium 226+228 RPD 38%, 114%, 80% respectively
Evaluate Representativeness							
Equipment Blanks (if applicable)	X		Non-detect (<RL)	X			
QC Verification							
Verify Instrument Calibration & Analytical Process							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	As and K had recoveries outside control limits
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
Evaluate Completeness (# usable measurements/ # unusable measurements)							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

Sample 1205423417 (LCS) was recounted due to low recovery. The recount is reported.

TSS in MW-16B was qualified by the laboratory as non-detect (U) because it was detected at a level less than reporting limit, but greater than MDL.

Comments:

The RPDs for Rad-226, Rad-228, and Combined Radium 226+228 RPD were 38%, 114%, and 80%, respectively. Rad-226 required qualification as estimated with high bias (J+) in the parent sample MW-16A and as estimated but not detected (UJ) in the duplicate MWT-16A. Rad-228 required qualification as estimated but not detected (UJ) in the parent sample MW-16A and as estimated with high bias (J+) in the duplicate MWT-16A. Combined Radium 226+228 required qualification as estimated with low bias (J-) in the parent sample MW-16A and as estimated with high bias (J+) in field duplicate MWT-16A.

Sample ID S49138.05 was incorrectly tagged as MW-16A. A revision was requested on 7/24 to revise the sample tag to MWT-16A. A revised lab report and EDD was received 7/26.



Report ID: S49138.01(03)
Generated on 07/26/2023
Replaces report S49138.01(02) generated on 07/05/2023

Report to
Attention: Jennifer Caporale
Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

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Report Summary
Lab Sample ID(s): S49138.01-S49138.06
Project: Erickson AM MI Wells 16A-16D
Collected Date(s): 05/30/2023
Submitted Date/Time: 05/31/2023 09:24
Sampled by: Marc Wahrer
P.O. #:

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Maya Murshak
Technical Director



General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

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Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

Report Narrative

Sample tag for .05 corrected to match COC



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP & ISO/IEC 17025:2017	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



Sample Summary (6 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S49138.01	MW-16A L305259-01	Groundwater	05/30/23 11:08
S49138.02	MW-16B L305259-02	Groundwater	05/30/23 13:10
S49138.03	MW-16C L305259-03	Groundwater	05/30/23 15:11
S49138.04	MW-16D L305259-04	Groundwater	05/30/23 12:16
S49138.05	MWT-16A L305259-05	Groundwater	05/30/23 11:08
S49138.06	Field Blank L305259-06	Water	05/30/23 09:30



Analytical Laboratory Report

Revised Report

Lab Sample ID: S49138.01

Sample Tag: MW-16A L305259-01

Collected Date/Time: 05/30/2023 11:08

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.6	IR
2	1L Plastic	None	Yes	1.6	IR
1	250ml Plastic	HNO3	Yes	1.6	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	06/01/23 12:07	CTV	
Metal Digestion	Completed	SW3015A	06/01/23 10:20	CCM	

Inorganics

Method: E300.0, Run Date: 06/01/23 09:31, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 06/01/23 10:32, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	401	50	0.65	mg/L	50	16887-00-6	
Sulfate	132	50	5.2	mg/L	50	14808-79-8	

Method: SM2320B, Run Date: 06/02/23 14:40, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	440	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 06/01/23 11:35, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	570	10	2.4	mg/L	1		

Method: SM2540C, Run Date: 05/31/23 19:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,260	50	6	mg/L	2		

Method: SM2540D, Run Date: 06/02/23 10:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	5.7	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 06/01/23 11:58, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.002	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.126	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.10	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Revised Report

Lab Sample ID: S49138.01 (continued)

Sample Tag: MW-16A L305259-01

Method: E200.8, Run Date: 06/01/23 11:58, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	2.59	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 06/01/23 14:33, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	172	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	37.2	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.16	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	241	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 06/01/23 12:41, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 06/29/23 08:19, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Revised Report

Lab Sample ID: S49138.02

Sample Tag: MW-16B L305259-02

Collected Date/Time: 05/30/2023 13:10

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.6	IR
2	1L Plastic	None	Yes	1.6	IR
1	250ml Plastic	HNO3	Yes	1.6	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	06/01/23 12:07	CTV	
Metal Digestion	Completed	SW3015A	06/01/23 10:20	CCM	

Inorganics

Method: E300.0, Run Date: 06/01/23 09:42, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	15	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 06/02/23 14:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	420	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 06/01/23 11:40, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	324	10	2.4	mg/L	1		

Method: SM2540C, Run Date: 05/31/23 19:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	358	50	6	mg/L	2		

Method: SM2540D, Run Date: 06/02/23 10:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	2.4	3	1	mg/L	1		b

Metals

Method: E200.8, Run Date: 06/01/23 12:01, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.082	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.13	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL



Analytical Laboratory Report

Revised Report

Lab Sample ID: S49138.02 (continued)

Sample Tag: MW-16B L305259-02

Method: E200.8, Run Date: 06/01/23 12:01, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	0.67	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.022	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.005	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 06/01/23 14:35, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	79.5	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	32.6	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	2.89	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	12.2	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 06/01/23 12:51, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 06/29/23 08:19, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Revised Report

Lab Sample ID: S49138.03

Sample Tag: MW-16C L305259-03

Collected Date/Time: 05/30/2023 15:11

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.6	IR
2	1L Plastic	None	Yes	1.6	IR
1	250ml Plastic	HNO3	Yes	1.6	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	06/01/23 12:07	CTV	
Metal Digestion	Completed	SW3015A	06/01/23 10:20	CCM	

Inorganics

Method: E300.0, Run Date: 06/01/23 09:52, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	7	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 06/02/23 16:05, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	470	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 06/01/23 11:55, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	292	10	2.4	mg/L	1		

Method: SM2540C, Run Date: 05/31/23 19:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	344	50	6	mg/L	2		

Method: SM2540D, Run Date: 06/02/23 10:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	5.8	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 06/01/23 12:04, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.041	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.40	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.61	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Revised Report

Lab Sample ID: S49138.03 (continued)

Sample Tag: MW-16C L305259-03

Method: E200.8, Run Date: 06/01/23 12:04, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.026	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 06/01/23 14:37, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	70.5	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	27.0	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	4.08	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	25.4	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 06/01/23 12:54, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 06/29/23 08:19, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Revised Report

Lab Sample ID: S49138.04

Sample Tag: MW-16D L305259-04

Collected Date/Time: 05/30/2023 12:16

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.6	IR
2	1L Plastic	None	Yes	1.6	IR
1	250ml Plastic	HNO3	Yes	1.6	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	06/01/23 12:07	CTV	
Metal Digestion	Completed	SW3015A	06/01/23 10:20	CCM	

Inorganics

Method: E300.0, Run Date: 06/01/23 10:02, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	8	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	7	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 06/02/23 16:10, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	430	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 06/01/23 12:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	101	10	2.4	mg/L	1		

Method: SM2540C, Run Date: 05/31/23 19:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	396	50	6	mg/L	2		

Method: SM2540D, Run Date: 06/02/23 10:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	14.0	3	2	mg/L	2		

Metals

Method: E200.8, Run Date: 06/01/23 12:05, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.003	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.037	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	4.70	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.38	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Revised Report

Lab Sample ID: S49138.04 (continued)

Sample Tag: MW-16D L305259-04

Method: E200.8, Run Date: 06/01/23 12:05, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.026	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.010	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.036	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 06/01/23 14:38, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	28.9	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	7.41	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	9.90	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	115	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 06/01/23 12:57, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 06/29/23 08:19, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Revised Report

Lab Sample ID: S49138.05

Sample Tag: MWT-16A L305259-05

Collected Date/Time: 05/30/2023 11:08

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.6	IR
2	1L Plastic	None	Yes	1.6	IR
1	250ml Plastic	HNO3	Yes	1.6	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	06/01/23 12:07	CTV	
Metal Digestion	Completed	SW3015A	06/01/23 10:20	CCM	

Inorganics

Method: E300.0, Run Date: 06/01/23 10:12, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 06/01/23 11:12, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	400	50	0.65	mg/L	50	16887-00-6	
Sulfate	132	50	5.2	mg/L	50	14808-79-8	

Method: SM2320B, Run Date: 06/02/23 16:15, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	430	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 06/01/23 12:05, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	576	10	2.4	mg/L	1		

Method: SM2540C, Run Date: 05/31/23 19:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,270	50	6	mg/L	2		

Method: SM2540D, Run Date: 06/02/23 10:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	5.2	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 06/01/23 12:09, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.002	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.121	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.11	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Revised Report

Lab Sample ID: S49138.05 (continued)

Sample Tag: MWT-16A L305259-05

Method: E200.8, Run Date: 06/01/23 12:09, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	2.52	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 06/01/23 14:40, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	171	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	36.6	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.04	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	240	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 06/01/23 13:01, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 06/29/23 08:19, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Revised Report

Lab Sample ID: S49138.06

Sample Tag: Field Blank L305259-06

Collected Date/Time: 05/30/2023 09:30

Matrix: Water

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.6	IR
2	1L Plastic	None	Yes	1.6	IR
1	250ml Plastic	HNO3	Yes	1.6	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	06/01/23 12:07	CTV	
Metal Digestion	Completed	SW3015A	06/01/23 10:20	CCM	

Inorganics

Method: E300.0, Run Date: 06/01/23 10:22, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.03	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.04	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.26	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 06/02/23 16:20, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 06/01/23 12:10, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.4	mg/L	1		

Method: SM2540C, Run Date: 05/31/23 19:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	6	mg/L	2		

Method: SM2540D, Run Date: 06/02/23 10:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 06/01/23 11:49, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



Analytical Laboratory Report

Revised Report

Lab Sample ID: S49138.06 (continued)

Sample Tag: Field Blank L305259-06

Method: E200.8, Run Date: 06/01/23 11:49, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 06/01/23 14:28, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 06/01/23 13:04, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 06/29/23 08:19, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

Merit Laboratories Login Checklist

Lab Set ID:S49138

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 16A-16D

Submitted:05/31/2023 09:24 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Selection	Description	Note
Sample Receiving		
01.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples are received at 4C +/- 2C Thermometer # IR 1.6
02.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Received on ice/ cooling process begun
03.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples shipped
04.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples left in 24 hr. drop box
05.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Are there custody seals/tape or is the drop box locked
Chain of Custody		
06.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC adequately filled out
07.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC signed and relinquished to the lab
08.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sample tag on bottles match COC
09.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Subcontracting needed? Subcontracted to: GEL
Preservation		
10.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Do sample have correct chemical preservation
11.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Completed pH checks on preserved samples? (no VOAs)
12.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Did any samples need to be preserved in the lab?
Bottle Conditions		
13.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	All bottles intact
14.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Appropriate analytical bottles are used
15.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Merit bottles used
16.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sufficient sample volume received
17.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples require laboratory filtration
18.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples submitted within holding time
19.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S49138 Submitted: 05/31/2023 09:24

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 16A-16D

Attention: Jennifer Caporale
Address: Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Initial Preservation Check: 05/31/2023 09:46 MMC

Preservation Recheck (E200.8): N/A

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S49138.01	1L Plastic HNO3	<2			
S49138.01	1L Plastic HNO3	<2			
S49138.01	250ml Plastic HNO3	<2			
S49138.02	1L Plastic HNO3	<2			
S49138.02	1L Plastic HNO3	<2			
S49138.02	250ml Plastic HNO3	<2			
S49138.03	1L Plastic HNO3	<2			
S49138.03	1L Plastic HNO3	<2			
S49138.03	250ml Plastic HNO3	<2			
S49138.04	1L Plastic HNO3	<2			
S49138.04	1L Plastic HNO3	<2			
S49138.04	250ml Plastic HNO3	<2			
S49138.05	1L Plastic HNO3	<2			
S49138.05	1L Plastic HNO3	<2			
S49138.05	250ml Plastic HNO3	<2			
S49138.06	1L Plastic HNO3	<2			
S49138.06	1L Plastic HNO3	<2			
S49138.06	250ml Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823
 Phone (517) 332-0167 Fax (517) 332-4034
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

REPORT TO **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME **Jennifer Caporale**
 COMPANY **Lansing Board of Water and Light**
 ADDRESS **PO Box 13007 48901-3007**
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**
 PHONE NO. **517-702-6372** FAX NO. _____ P.O. NO. _____
 E-MAIL ADDRESS **Environmental_Laboratory@lbwl.com** QUOTE NO. _____

CONTACT NAME **Beth Zimpfer** SAME
 COMPANY _____
 ADDRESS _____
 CITY _____ STATE _____ ZIP CODE _____
 PHONE NO. _____ E-MAIL ADDRESS **Beth.Zimpfer@lbwl.com**

PROJECT NO./NAME **Erickson AM MI Wells 16A-16D** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**
 TURNAROUND TIME REQUIRED 1 DAY 2 DAYS 3 DAYS STANDARD OTHER **ASAP**
 DELIVERABLES REQUIRED STD LEVEL II LEVEL III LEVEL IV EDD OTHER _____

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE
 # Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO ₃	H ₂ SO ₄	NaOH	MeOH	OTHER	Total Metals	F- undistilled, Cl ⁻ , SO ₄ , TDS	Radium 226	Radium 228	TSS	HCO ₃ , CO ₃ , Hardness	Certifications		Project Locations		Special Instructions
	DATE	TIME																	<input type="checkbox"/> OHIO VAP	<input type="checkbox"/> Drinking Water	<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES	
49138.01	5/30/23	1108	MW-16A L305259-01	GW	5	2	3						✓	✓	✓	✓	✓	✓					Metals to analyse: Na, Mg, K
.02		1310	MW-16B -02	GW	5	2	3						✓	✓	✓	✓	✓	✓					B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03		1511	MW-16C -03	GW	5	2	3						✓	✓	✓	✓	✓	✓					Co, Li, Hg, Mo, Pb, Se, Tl,
.04		1216	MW16-D -04	GW	5	2	3						✓	✓	✓	✓	✓	✓					Fe, Cu, Ni, Ag, V, Zn
.05		1108	MWT-16A -05	GW	5	2	3						✓	✓	✓	✓	✓	✓					Please send a preliminary report
.06		0930	Field Blank -06	DI	5	2	3						✓	✓	✓	✓	✓	✓					

RELINQUISHED BY: SIGNATURE/ORGANIZATION *[Signature]* DATE **5-31-23** TIME **0924**
 RECEIVED BY: SIGNATURE/ORGANIZATION *[Signature]* DATE **5/31/23** TIME **0924**
 RELINQUISHED BY: SIGNATURE/ORGANIZATION _____ DATE _____ TIME _____
 RECEIVED BY: SIGNATURE/ORGANIZATION _____ DATE _____ TIME _____

RELINQUISHED BY: SIGNATURE/ORGANIZATION _____ DATE _____ TIME _____
 RECEIVED BY: SIGNATURE/ORGANIZATION _____ DATE _____ TIME _____
 SEAL NO. SEAL INTACT INITIALS
 YES NO
 SEAL NO. SEAL INTACT INITIALS
 YES NO
 NOTES: TEMP. ON ARRIVAL **1.6**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6mos	0.150
Be, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005



June 27, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 624477
SDG: S49138

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on June 02, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Jordan Melton for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S49138
Work Order: 624477**

June 27, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on June 02, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

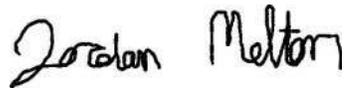
Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
624477001	S49138.01
624477002	S49138.02
624477003	S49138.03
624477004	S49138.04
624477005	S49138.05
624477006	S49138.06 Field Blank

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Jordan Melton". The signature is written in a cursive style with a large initial "J" and "M".

Jordan Melton for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

Ce 24477

C.O.C. PAGE # 1 OF 1

2680 East Lansing Dr., East Lansing, MI 48823
 Phone (517) 332-0167 Fax (517) 332-4034
 www.meritlabs.com



REPORT TO		CHAIN OF CUSTODY RECORD		INVOICE TO	
CONTACT NAME Project Management Team		CONTACT NAME Julie Teague		E-NAME	
COMPANY Merit Laboratories		COMPANY Merit Laboratories			
ADDRESS 2680 East Lansing Drive		ADDRESS 2680 East Lansing Drive		ZIP CODE 48823	
CITY East Lansing		CITY East Lansing		STATE MI	
PHONE NO. 517-332-0167		PHONE NO. 517-332-0167		E-MAIL ADDRESS juliet@meritlabs.com	
E-MAIL ADDRESS results@meritlabs.com		E-MAIL ADDRESS juliet@meritlabs.com			
PROJECT NO./NAME S49138		ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)			
TURNAROUND TIME REQUIRED <input type="checkbox"/> 1 DAY <input type="checkbox"/> 2 DAYS <input type="checkbox"/> 3 DAYS <input checked="" type="checkbox"/> STANDARD <input type="checkbox"/> OTHER					
DELIVERABLES REQUIRED <input type="checkbox"/> STD <input type="checkbox"/> LEVEL II <input type="checkbox"/> LEVEL III <input checked="" type="checkbox"/> LEVEL IV <input type="checkbox"/> EDD <input type="checkbox"/> OTHER					
MATRIX CODE GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE		SAMPLER(S) - PLEASE PRINT/SIGN NAME			
YEAR		DATE		TIME	
5/31/23		1108		S49138.01	
5/31/23		1310		S49138.02	
5/31/23		1511		S49138.03	
5/31/23		1216		S49138.04	
5/31/23		1108		S49138.05	
5/31/23		0930		S49138.06 Field Blank	
MATRIX		# OF BOTTLES		# Containers & Preservatives	
GW		2		H ₂ O	
GW		2		H ₂ SO ₄	
GW		2		NaOH	
GW		2		MCH	
GW		2		OTHER	
DI		2			
Radium 226*		✓		Radium 226*	
Radium 228**		✓		Radium 228**	
* E903.1 Mod.				Certifications	
** E904.0/SW 9320 Mod.				<input type="checkbox"/> OHIO VAP <input type="checkbox"/> Drinking Water	
				<input type="checkbox"/> DoD <input type="checkbox"/> NPDES	
				Project Locations	
				<input type="checkbox"/> Detroit <input type="checkbox"/> New York	
				<input type="checkbox"/> Other	
				Special Instructions	
				* E903.1 Mod.	
				** E904.0/SW 9320 Mod.	
				Please use calculation product & provide Radium 226/228 combined results on the report	
				(No Ice needed)	
				** Subcontracted to	
				GEL Laboratories, Inc.	
				2040 Savage Road	
				Charleston, SC 29407	
RELINQUISHED BY: SIGNATURE/Organization		DATE 5/31/23		TIME 1700	
RECEIVED BY: SIGNATURE/Organization		DATE 5/31/23		TIME 1707	
RELINQUISHED BY: SIGNATURE/Organization		DATE 6-2-23		TIME 1000	
RECEIVED BY: SIGNATURE/Organization		DATE		TIME	
SEAL NO.		SEAL INTACT		INITIALS	
SEAL NO.		SEAL INTACT		INITIALS	
NOTES:		TEMP. ON ARRIVAL			

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

SAMPLE RECEIPT & REVIEW FORM

Client: <u>MERI</u>		SDG/AR/COC/Work Order: <u>624477</u>	
Received By: <u>QG</u>		Date Received: <u>6/2/23</u>	
Carrier and Tracking Number		FedEx Express FedEx Ground <u>UPS</u> Field Services Courier Other <u>12 466 477 03 6161 4825</u>	
Suspected Hazard Information		*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation. Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___	
A) Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No COC notation or radioactive stickers on containers equal client designation.	
B) Did the client designate the samples to be received as radioactive?		<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No COC notation or radioactive stickers on containers equal client designation.	
C) Did the RSO classify the samples as radioactive?		<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>00</u> CPM / mR/Hr Classified as: Rad 1 Rad 2 Rad 3	
D) Did the client designate samples as hazardous?		<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No COC notation or hazard labels on containers equal client designation.	
E) Did the RSO identify possible hazards?		<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No If D or E is yes, select Hazards below. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:	
Sample Receipt Criteria		Comments/Qualifiers (Required for Non-Conforming Items)	
1	Shipping containers received intact and sealed?	<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Preservation Method: Wet Ice Ice Packs Dry Ice <u>None</u> Other: *all temperatures are recorded in Celsius TEMP: <u>22°c</u>
4	Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Temperature Device Serial #: <u>1R2-20</u> Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer) Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No) Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected:
8	Samples received within holding time?	<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No	ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No	ID's and containers affected:
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
13	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Circle Applicable: Not relinquished Other (describe)
Comments (Use Continuation Form if needed):			

PM (or PMA) review: Initials JM Date 6-5-23 Page 1 of 1

Laboratory Certifications

List of current GEL Certifications as of 27 June 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S49138
Work Order #: 624477**

Product: Radium-226+Radium-228 Calculation

Analytical Method: Calculation

Analytical Procedure: GL-RAD-D-003 REV# 45

Analytical Batch: 2448552

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
624477001	S49138.01
624477002	S49138.02
624477003	S49138.03
624477004	S49138.04
624477005	S49138.05
624477006	S49138.06 Field Blank

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2438552

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
624477001	S49138.01
624477002	S49138.02
624477003	S49138.03
624477004	S49138.04
624477005	S49138.05
624477006	S49138.06 Field Blank
1205423459	Method Blank (MB)
1205423460	624477001(S49138.01) Sample Duplicate (DUP)
1205423461	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2438537

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
624477001	S49138.01
624477002	S49138.02
624477003	S49138.03
624477004	S49138.04
624477005	S49138.05
624477006	S49138.06 Field Blank
1205423414	Method Blank (MB)
1205423415	624477001(S49138.01) Sample Duplicate (DUP)
1205423416	624477001(S49138.01) Matrix Spike (MS)
1205423417	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts

Sample 1205423417 (LCS) was recounted due to low recovery. The recount is reported.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S49138 GEL Work Order: 624477

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 30 JUN 2023

Title: Analyst III - Data Validator

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: June 30, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S49138.01 Project: MERI00120
Sample ID: 624477001 Client ID: MERI001
Matrix: Ground Water
Collect Date: 31-MAY-23 11:08
Receive Date: 02-JUN-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	-0.313	+/-0.849	1.68	3.00	pCi/L		JE1	06/21/23	0926	2438552	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.585	+/-0.881			pCi/L		LXB3	06/29/23	1327	2448552	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.585	+/-0.233	0.172	1.00	pCi/L		LXP1	06/29/23	0819	2438537	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			90.5	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: June 30, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S49138.02 Project: MERI00120
Sample ID: 624477002 Client ID: MERI001
Matrix: Ground Water
Collect Date: 31-MAY-23 13:10
Receive Date: 02-JUN-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		1.81	+/-0.855	1.12	3.00	pCi/L		JE1	06/21/23	0926	2438552	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.97	+/-0.877			pCi/L		LXB3	06/29/23	1327	2448552	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.160	+/-0.196	0.330	1.00	pCi/L		LXP1	06/29/23	0819	2438537	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			88.9	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: June 30, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S49138.03 Project: MERI00120
Sample ID: 624477003 Client ID: MERI001
Matrix: Ground Water
Collect Date: 31-MAY-23 15:11
Receive Date: 02-JUN-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	-0.804	+/-0.965	2.00	3.00	pCi/L		JE1	06/21/23	0926	2438552	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.255	+/-0.993			pCi/L		LXB3	06/29/23	1327	2448552	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.255	+/-0.235	0.367	1.00	pCi/L		LXP1	06/29/23	0819	2438537	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			78	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: June 30, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S49138.04 Project: MERI00120
Sample ID: 624477004 Client ID: MERI001
Matrix: Ground Water
Collect Date: 31-MAY-23 12:16
Receive Date: 02-JUN-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	-0.743	+/-1.04	2.14	3.00	pCi/L		JE1	06/21/23	0926	2438552	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.515	+/-1.07			pCi/L		LXB3	06/29/23	1327	2448552	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.515	+/-0.266	0.300	1.00	pCi/L		LXP1	06/29/23	0819	2438537	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			69.8	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: June 30, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Lavery
 Project: Routine Analysis

Client Sample ID: S49138.05	Project: MERI00120
Sample ID: 624477005	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 31-MAY-23 11:08	
Receive Date: 02-JUN-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		4.94	+/-1.89	2.67	3.00	pCi/L		JE1	06/21/23	0927	2438552	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		5.20	+/-1.90			pCi/L		LXB3	06/29/23	1327	2448552	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.261	+/-0.200	0.291	1.00	pCi/L		LXP1	06/29/23	0819	2438537	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			80.2	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: June 30, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S49138.06 Field Blank
Sample ID: 624477006
Matrix: Ground Water
Collect Date: 31-MAY-23 09:30
Receive Date: 02-JUN-23
Collector: Client

Project: MERI00120
Client ID: MERI001

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.593	+/-0.803	1.38	3.00	pCi/L		JE1	06/21/23	0927	2438552	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.26	+/-0.855			pCi/L		LXB3	06/29/23	1327	2448552	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.667	+/-0.293	0.316	1.00	pCi/L		LXP1	06/29/23	0819	2438537	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			72.6	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration

Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: June 30, 2023

Page 1 of 2

Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan

Contact: John Laverty

Workorder: 624477

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2438552										
QC1205423460	624477001	DUP									
Radium-228	U	-0.313	U	1.07	pCi/L	N/A		N/A	JE1	06/21/23	09:26
	Uncertainty	+/-0.849		+/-0.785							
QC1205423461	LCS										
Radium-228	81.4			77.1	pCi/L		94.7	(75%-125%)		06/21/23	09:26
	Uncertainty			+/-4.64							
QC1205423459	MB										
Radium-228			U	0.429	pCi/L					06/21/23	09:26
	Uncertainty			+/-0.850							
Rad Ra-226											
Batch	2438537										
QC1205423415	624477001	DUP									
Radium-226		0.585		0.508	pCi/L	14.1		(0% - 100%)	LXP1	06/29/23	08:52
	Uncertainty	+/-0.233		+/-0.240							
QC1205423417	LCS										
Radium-226	26.6			23.2	pCi/L		87.1	(75%-125%)		06/29/23	11:00
	Uncertainty			+/-1.50							
QC1205423414	MB										
Radium-226			U	0.238	pCi/L					06/29/23	08:19
	Uncertainty			+/-0.260							
QC1205423416	624477001	MS									
Radium-226	26.7	0.585		22.2	pCi/L		80.8	(75%-125%)		06/29/23	08:52
	Uncertainty	+/-0.233		+/-1.38							

- Notes:**
- Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).
 - The Qualifiers in this report are defined as follows:
 - U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
 - J Value is estimated
 - X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
 - H Analytical holding time was exceeded
 - < Result is less than value reported
 - > Result is greater than value reported

GEL LABORATORIES LLC

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QC Summary

Workorder: 624477

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
NI											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2438552 Check-list

This check-list was completed on 21-JUN-23 by Nat Long

This batch was reviewed by Lois Buist on 21-JUN-23 and Nat Long on 21-JUN-23.

Batch ID:
2438552

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2438552
Analyst: Jacqueline Winston (JE1)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: ASP-33005595

Due Dates for Lab: 27-JUN-2023 **Package:** 29-JUN-2023 **SDG:** 30-JUN-2023

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205423461	228	2051-B	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	624477001	08-JUN-2023	3	302.2	302.2	06/09/23 14:10	06/21/23 07:10
2	624477002	08-JUN-2023	3	300.1	300.1	06/09/23 14:10	06/21/23 07:10
3	624477003	08-JUN-2023	3	302.3	302.3	06/09/23 14:10	06/21/23 07:10
4	624477004	08-JUN-2023	3	303	303	06/09/23 14:10	06/21/23 07:10
5	624477005	08-JUN-2023	3	300.4	300.4	06/09/23 14:10	06/21/23 07:10
6	624477006	08-JUN-2023	3	300.4	300.4	06/09/23 14:10	06/21/23 07:10
7	1205423459 MB	08-JUN-2023	3	303	303	06/09/23 14:10	06/21/23 07:10
8	1205423460 DUP (624477001)	08-JUN-2023	3	300	300	06/09/23 14:10	06/21/23 07:10
9	1205423461 LCS	08-JUN-2023	3		303	06/09/23 14:10	06/21/23 07:10

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-E	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 08-JUN-2023 00:00
REGNT 3922955	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3920952	RGF-1M Citric Acid	5 mL	
REGNT 3922885	2M HCl	20 mL	
REGNT 3916775	RGF-7M Nitric Acid	25 mL	
REGNT DGA051823	2432690	2 g	
REGNT 3885305.13	RGF-Hydrofluoric Acid	4 mL	
REGNT 3528714	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3887517	RGF-Neodymium Substrate	5 mL	
REGNT 3919982.4	Nitric Acid	5 mL	
REGNT 3920979	Barium Carrier Ra228 REG	1 mL	
REGNT 3923368	RGF-50% Potassium Carbonate	2 mL	
REGNT 3919381	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 1951-E
 Tracer Exp Date : 1/10/2024
 Tracer Volume Added: 0.10

Batch : 2438552
 Analyst : JAC02417
 Prep Date : 6/8/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 3 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	624477001.1	0.3022	1.8496E-05	5/31/2023 11:08	1163.0	1.69%	1052.2	1.78%	0.1	0.000200
2	624477002.1	0.3001	1.8461E-05	5/31/2023 13:10	1163.0	1.69%	1034.4	1.80%	0.1	0.000200
3	624477003.1	0.3023	1.8498E-05	5/31/2023 15:11	1163.0	1.69%	906.6	1.92%	0.1	0.000200
4	624477004.1	0.3030	1.8510E-05	5/31/2023 12:16	1163.0	1.69%	811.9	2.03%	0.1	0.000200
5	624477005.1	0.3004	1.8466E-05	5/31/2023 11:08	1163.0	1.69%	932.8	1.89%	0.1	0.000200
6	624477006.1	0.3004	1.8466E-05	5/31/2023 9:30	1163.0	1.69%	844.3	1.99%	0.1	0.000200
7	1205423459.1	0.3030	1.8510E-05	6/8/2023 0:00	1163.0	1.69%	885.6	1.94%	0.1	0.000200
8	1205423460.1	0.3000	1.8459E-05	5/31/2023 11:08	1163.0	1.69%	1014.3	1.81%	0.1	0.000200
9	1205423461.1	0.3030	1.8510E-05	6/8/2023 0:00	1163.0	1.69%	896.8	1.93%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
			Alpha	Beta										
1	7A	60	9	45	0.750	6/21/2023 9:26	6/9/2023 14:10	6/21/2023 7:10	0.993	0.774	1.000	1.057	90.5%	2.47%
2	7B	60	3	50	0.833	6/21/2023 9:26	6/9/2023 14:10	6/21/2023 7:10	0.993	0.774	1.000	1.057	88.9%	2.49%
3	8A	60	4	45	0.750	6/21/2023 9:26	6/9/2023 14:10	6/21/2023 7:10	0.993	0.773	1.000	1.057	78.0%	2.57%
4	9A	60	2	41	0.683	6/21/2023 9:26	6/9/2023 14:10	6/21/2023 7:10	0.993	0.773	1.000	1.057	69.8%	2.66%
5	8C	60	18	151	2.517	6/21/2023 9:27	6/9/2023 14:10	6/21/2023 7:10	0.993	0.773	1.000	1.057	80.2%	2.55%
6	9B	60	6	29	0.483	6/21/2023 9:27	6/9/2023 14:10	6/21/2023 7:10	0.993	0.773	1.000	1.057	72.6%	2.63%
7	9D	60	7	34	0.567	6/21/2023 9:26	6/9/2023 14:10	6/21/2023 7:10	0.996	0.774	1.000	1.057	76.1%	2.59%
8	10A	60	5	39	0.650	6/21/2023 9:26	6/9/2023 14:10	6/21/2023 7:10	0.993	0.774	1.000	1.057	87.2%	2.49%
9	10B	60	7	1132	18.867	6/21/2023 9:26	6/9/2023 14:10	6/21/2023 7:10	0.996	0.774	1.000	1.057	77.1%	2.58%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2023	5/31/2024	0.6229	0.00594	0.836	6/16/2023 18:28	500
2	PIC	6/1/2023	5/31/2024	0.6423	0.00627	0.332	6/16/2023 18:28	500
3	PIC	6/1/2023	5/31/2024	0.6413	0.01579	0.946	6/16/2023 18:29	500
4	PIC	6/1/2023	5/31/2024	0.6343	0.00758	0.844	6/16/2023 18:40	500
5	PIC	6/1/2023	5/31/2024	0.5662	0.01955	1.430	6/16/2023 18:29	500
6	PIC	6/1/2023	5/31/2024	0.6496	0.00754	0.348	6/16/2023 18:29	500
7	PIC	6/1/2023	5/31/2024	0.6292	0.02610	0.466	6/16/2023 18:29	500
8	PIC	6/1/2023	5/31/2024	0.6356	0.00651	0.364	6/16/2023 18:29	500
9	PIC	6/1/2023	5/31/2024	0.6282	0.00652	0.562	6/16/2023 18:30	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

* - RPD changed to 0% due to sample & dup activity below MDA

LCS S/N : 2051-B
LCS Exp Date : 3/27/2024
LCS Activity (dpm/ml): 547.73
LCS Volume Added: 0.10

Results														2 SIGMA	2 SIGMA		
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery	
1	1.0595	0.7480	3	1.6780	-0.3130	138.45%	-0.0860	0.1190	0.8493	0.8495		SAMPLE					
2	0.6634	0.4683	3	1.1175	1.8131	24.20%	0.5013	0.1206	0.8551	0.9708		SAMPLE					
3	1.2703	0.8969	3	1.9989	-0.8042	61.28%	-0.1960	0.1200	0.9647	0.9649		SAMPLE					
4	1.3517	0.9543	3	2.1397	-0.7426	71.23%	-0.1607	0.1144	1.0359	1.0361		SAMPLE					
5	1.7311	1.2222	3	2.6717	4.9415	19.74%	1.0867	0.2117	1.8866	2.2725		SAMPLE					
6	0.8225	0.5807	3	1.3803	0.5927	69.18%	0.1353	0.0935	0.8030	0.8171		SAMPLE					
7	0.9254	0.6533	3	1.5196	0.4287	101.26%	0.1007	0.1019	0.8502	0.8574		MB					
8	0.7157	0.5053	3	1.1970	1.0658	37.68%	0.2860	0.1075	0.7854	0.8306	624477001.1	DUP	* 0.0%				
9	1.0053	0.7097	3	1.6301	77.1064	4.06%	18.3047	0.5618	4.6380	20.1226		LCS			81.4282	94.7%	

ASSAY 21-Jun-23 8:40:55
 Wizard 2480 s/n 46190630
 Protocol id 9 Ba-133_1
 Time limit
 Count limit
 Isotope Ba-133_1
 Protocol date 6/21/2023
 Run id. 6814

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	94	1	180	3489.28	1162.95	1.69	08:40:55
624477001	2	94	2	180	3157	1052.2	1.78	90.48	08:44:09
624477002	3	94	3	180	3103.57	1034.39	1.8	88.95	08:47:23
624477003	4	94	4	180	2720	906.57	1.92	77.95	08:50:37
624477004	5	94	5	180	2436	811.92	2.03	69.82	08:53:51
624477005	1	21	1	180	2799	932.83	1.89	80.21	08:57:26
624477006	2	21	2	180	2533.28	844.27	1.99	72.60	09:00:40
1205423459	3	21	3	180	2657.13	885.55	1.94	76.15	09:03:55
1205423460	4	21	4	180	3043.57	1014.34	1.81	87.22	09:07:08
1205423461	5	21	5	180	2691	896.83	1.93	77.12	09:10:22

END OF ASSAY

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
624477001	7A	60	9	45	6/21/2023 9:26	6/21/2023 10:26	PIC	2438552
624477002	7B	60	3	50	6/21/2023 9:26	6/21/2023 10:26	PIC	2438552
624477003	8A	60	4	45	6/21/2023 9:26	6/21/2023 10:26	PIC	2438552
624477004	9A	60	2	41	6/21/2023 9:26	6/21/2023 10:26	PIC	2438552
624477005	8C	60	18	151	6/21/2023 9:27	6/21/2023 10:27	PIC	2438552
624477006	9B	60	6	29	6/21/2023 9:27	6/21/2023 10:27	PIC	2438552
1205423459	9D	60	7	34	6/21/2023 9:26	6/21/2023 10:26	PIC	2438552
1205423460	10A	60	5	39	6/21/2023 9:26	6/21/2023 10:26	PIC	2438552
1205423461	10B	60	7	1132	6/21/2023 9:26	6/21/2023 10:26	PIC	2438552

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 21-Jun-2023

Detectors LB4100 E1 through H4 and PIC 1A through 14D and G5400W 1W through 1Z and LB4200 GA1 through OD4

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E1	need 2nd	Beta bkg	21-Jun 05:24	60	1.167	0.758	2.201	-1.30
LB4100E2	Above	Alpha eff	21-Jun 05:10	5	9877	6589	9855	+3.04
LB4100E2	Above	Beta bkg	21-Jun 05:24	60	3.483	1.385	3.072	+4.46
LB4100E2	Below	Beta eff	21-Jun 05:17	5	13977	14120	15200	-3.79
LB4100E4	Above	Beta bkg	21-Jun 05:24	60	2.017	1.058	2.464	+1.09
LB4100F1	Above	Beta bkg	21-Jun 05:24	60	7.783	0.188	2.691	+15.21
LB4100F2	Below	Alpha eff	21-Jun 05:10	5	6522	6533	7372	-3.08
LB4100F2	Above	Alpha XTalk	21-Jun 05:10	5	0.368	0.318	0.366	+3.34
LB4100F2	Above	Beta bkg	21-Jun 05:24	60	4.700	1.173	1.833	+29.06
LB4100F4	Above	Alpha bkg	21-Jun 05:24	60	0.367	-2.75E-2	0.313	+3.94
LB4100F4	Above	Alpha eff	21-Jun 05:10	5	10728	6281	10700	+3.04
LB4100F4	Above	Beta bkg	21-Jun 05:24	60	3.250	-7.15E-2	3.199	+3.09
LB4100G1	need 2nd	Alpha XTalk	21-Jun 05:03	5	0.373	0.088	0.447	+1.77
LB4100G1	Above	Beta bkg	21-Jun 05:24	60	1515	0.380	1.675	+7,015.55
LB4100G3	Above	Beta bkg	21-Jun 05:24	60	2.867	0.987	2.738	+3.44
LB4100G4	Below	Alpha eff	21-Jun 06:36	5	7946	9065	10710	-7.08
LB4100G4	Above	Alpha XTalk	21-Jun 06:36	5	0.314	0.222	0.274	+7.65
LB4100H2	Above	Alpha bkg	21-Jun 07:40	60	0.300	-1.21E-1	0.268	+3.50
PIC2B	Above	Alpha eff	21-Jun 06:35	5	9337	7959	9293	+3.20
PIC2B	Above	Beta XTalk	21-Jun 04:29	5	0.002	4.42E-4	0.002	+3.79
PIC12C	Above	Alpha bkg	21-Jun 05:07	60	0.650	-8.79E-2	0.500	+4.53
PIC14B	Above	Beta XTalk	21-Jun 13:42	5	0.002	7.18E-6	0.001	+3.24
PIC14C	Above	Alpha bkg	21-Jun 05:12	60	0.633	-9.08E-2	0.365	+6.53
PIC14C	Above	Beta bkg	21-Jun 05:12	60	3.383	-3.38E-2	2.377	+5.50
PIC14C	Above	Beta XTalk	21-Jun 05:05	5	7.03E-4	7.54E-5	5.97E-4	+4.22

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

PIC4B Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by Jc Poparad

Date 6/21/23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2438552

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205423459	MB	JE1	PIC9D	JUN-21-23 09:26:26	DONE	25mm Filter	01-JUN-23 00:00
1205423460	DUP	JE1	PIC10A	JUN-21-23 09:26:29	DONE	25mm Filter	01-JUN-23 00:00
1205423461	LCS	JE1	PIC10B	JUN-21-23 09:26:34	DONE	25mm Filter	01-JUN-23 00:00
624477001	SAMPLE	JE1	PIC7A	JUN-21-23 09:26:39	DONE	25mm Filter	01-JUN-23 00:00
624477002	SAMPLE	JE1	PIC7B	JUN-21-23 09:26:41	DONE	25mm Filter	01-JUN-23 00:00
624477003	SAMPLE	JE1	PIC8A	JUN-21-23 09:26:46	DONE	25mm Filter	01-JUN-23 00:00
624477004	SAMPLE	JE1	PIC9A	JUN-21-23 09:26:51	DONE	25mm Filter	01-JUN-23 00:00
624477005	SAMPLE	JE1	PIC8C	JUN-21-23 09:27:00	DONE	25mm Filter	01-JUN-23 00:00
624477006	SAMPLE	JE1	PIC9B	JUN-21-23 09:27:04	DONE	25mm Filter	01-JUN-23 00:00

Lucas Cell Raw Data

Batch 2438537 Check-list

This check-list was completed on 29-JUN-23 by Lyndsey Pace

This batch was reviewed by Gregory Ramsay on 29-JUN-23 and Lyndsey Pace on 29-JUN-23.

Batch ID:
2438537

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2438537
Analyst: Lyndsey Pace (LXP1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: ASP-33005595

Due Dates for Lab: 27-JUN-2023			Package: 29-JUN-2023		SDG: 30-JUN-2023	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205423417	Radium-226 SPIKE	1715-G	.1	mL	
MS	1205423416	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	624477001	08-JUN-2023	1	500.5	500.5	06/21/23 11:50	101	06/29/23 05:20	06/29/23 08:19	1	27
2	624477002	08-JUN-2023	1	502.8	502.8	06/21/23 11:50	208	06/29/23 05:20	06/29/23 08:19	6	13
3	624477003	08-JUN-2023	1	501	501	06/21/23 11:50	308	06/29/23 05:20	06/29/23 08:19	6	16
4	624477004	08-JUN-2023	1	501.2	501.2	06/21/23 11:50	408	06/29/23 05:20	06/29/23 08:19	3	22
5	624477005	08-JUN-2023	1	500.4	500.4	06/21/23 11:50	506	06/29/23 05:20	06/29/23 08:19	5	17
6	624477006	08-JUN-2023	1	501.2	501.2	06/21/23 11:50	704	06/29/23 05:20	06/29/23 08:19	4	30
7	1205423414 MB	08-JUN-2023	1	502.8	502.8	06/21/23 11:50	802	06/29/23 05:20	06/29/23 08:19	8	17
8	1205423415 DUP (624477001)	08-JUN-2023	1	500.4	500.4	06/21/23 11:50	106	06/29/23 05:48	06/29/23 08:52	1	20
9	1205423416 MS (624477001)	08-JUN-2023	1	500.9	500.9	06/21/23 11:50	202	06/29/23 05:48	06/29/23 08:52	1	1001
10	1205423417 LCS	08-JUN-2023	1		502.8	06/21/23 11:50	301	06/29/23 05:48	06/29/23 11:00	3	928

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 08-JUN-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Batch : 2438537
Analyst : LIN01615
Prep Date : 6/8/2023
Ra-226 Method Uncertainty : 0.073648

Procedure Code : LUC26RAL
Parmname : Radium-226
Required MDA : 1 pCi/L
Halfife of Ra-226 : 1600 years
Ra-226 Abundance : 1.00
Halfife of Rn-222 : 3.8235 days

Batch counted on : LUCAS CELL DETECTOR
BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	624477001.1	0.5005	2.0258E-05	5/31/2023 11:08	101	30	27	0.900	1	0.033	30	1.8120
2	624477002.1	0.5028	2.0267E-05	5/31/2023 13:10	208	30	13	0.433	6	0.200	30	1.7740
3	624477003.1	0.5010	2.0260E-05	5/31/2023 15:11	308	30	16	0.533	6	0.200	30	1.5970
4	624477004.1	0.5012	2.0261E-05	5/31/2023 12:16	408	30	22	0.733	3	0.100	30	1.5020
5	624477005.1	0.5004	2.0258E-05	5/31/2023 11:08	506	30	17	0.567	5	0.167	30	1.8780
6	624477006.1	0.5012	2.0261E-05	5/31/2023 9:30	704	30	30	1.000	4	0.133	30	1.5870
7	1205423414.1	0.5028	2.0267E-05	6/8/2023 0:00	802	30	17	0.567	8	0.267	30	1.5330
8	1205423415.1	0.5004	2.0258E-05	5/31/2023 11:08	106	30	20	0.667	1	0.033	30	1.5250
9	1205423416.1	0.5009	2.0260E-05	5/31/2023 11:08	202	30	1001	33.367	1	0.033	30	1.8360
10	1205423417.1	0.5028	2.0267E-05	6/8/2023 0:00	301	30	928	30.933	3	0.100	30	1.6430

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrowth End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
4.500%	5/1/2023	4/30/2024	6/21/2023 11:50	6/29/2023 5:20	6/29/2023 8:19	0.754	0.978	1.002	1.000
5.500%	8/1/2022	7/31/2023	6/21/2023 11:50	6/29/2023 5:20	6/29/2023 8:19	0.754	0.978	1.002	1.000
9.600%	10/25/2022	10/31/2023	6/21/2023 11:50	6/29/2023 5:20	6/29/2023 8:19	0.754	0.978	1.002	1.000
7.000%	2/1/2023	1/31/2024	6/21/2023 11:50	6/29/2023 5:20	6/29/2023 8:19	0.754	0.978	1.002	1.000
1.400%	6/1/2023	5/31/2024	6/21/2023 11:50	6/29/2023 5:20	6/29/2023 8:19	0.754	0.978	1.002	1.000
4.200%	11/1/2022	10/31/2023	6/21/2023 11:50	6/29/2023 5:20	6/29/2023 8:19	0.754	0.978	1.002	1.000
6.100%	4/8/2023	3/31/2024	6/21/2023 11:50	6/29/2023 5:20	6/29/2023 8:19	0.754	0.978	1.002	1.000
3.400%	5/1/2023	4/30/2024	6/21/2023 11:50	6/29/2023 5:48	6/29/2023 8:52	0.755	0.977	1.002	1.000
5.100%	8/1/2022	7/31/2023	6/21/2023 11:50	6/29/2023 5:48	6/29/2023 8:52	0.755	0.977	1.002	1.000
4.500%	10/25/2022	10/31/2023	6/21/2023 11:50	6/29/2023 5:48	6/29/2023 11:00	0.755	0.961	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-G
Spike Exp Date : 9/8/2023
Spike Activity (dpm/ml): 297.40
Spike Volume Added: 0.10

LCS S/N : 1715-G
LCS Exp Date : 9/8/2023
LCS Activity (dpm/ml): 297.40
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.0742	0.0524	1	0.1723	0.5853	20.84%	0.8667	0.1764	0.2335	0.2536		SAMPLE				
2	0.1847	0.1304	1	0.3295	0.1602	62.51%	0.2333	0.1453	0.1955	0.1977		SAMPLE				
3	0.2059	0.1454	1	0.3673	0.2552	47.88%	0.3333	0.1563	0.2346	0.2422		SAMPLE				
4	0.1548	0.1093	1	0.2999	0.5153	27.23%	0.6333	0.1667	0.2658	0.2849		SAMPLE				
5	0.1601	0.1130	1	0.2912	0.2607	39.11%	0.4000	0.1563	0.1997	0.2034		SAMPLE				
6	0.1691	0.1194	1	0.3158	0.6673	22.82%	0.8667	0.1944	0.2933	0.3136		SAMPLE				
7	0.2468	0.1743	1	0.4280	0.2384	55.89%	0.3000	0.1667	0.2596	0.2634		MB				
8	0.0881	0.0622	1	0.2046	0.5080	24.36%	0.6333	0.1528	0.2402	0.2534	624477001.1	DUP	14.1%			
9	0.0731	0.0516	1	0.1698	22.1869	6.00%	33.3333	1.0551	1.3765	4.1317	624477001.1	MS			26.7447	80.8%
10	0.1433	0.1011	1	0.2776	23.2180	5.58%	30.8333	1.0171	1.5011	4.2047		LCS			26.6434	87.1%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 29-JUN-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	08:03	1	1.16E+05	115771	-2.6		
LUCAS2	EFF	07:53	1	1.33E+05	132619	-0.84		
LUCAS3	EFF	07:51	1	94244	94244	-1.37		
LUCAS4	EFF	07:46	1	1.27E+05	126911	-1.5		
LUCAS5	EFF	07:41	1	1.31E+05	131262	-1.33		
LUCAS6	EFF	07:39	1	1.29E+05	128957	-1.21		
LUCAS7	EFF	07:36	1	1.34E+05	133888	1.11		
LUCAS8	EFF	07:32	1	1.21E+05	121415	-0.64		

Reviewed by: 
Lyndsey Pace

Date: 29-JUN-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2438537

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
624477001	SAMPLE	LXP1	LUCAS1	JUN-29-23 08:19:00	DONE	Lucas Cell	01-MAY-23 00:00
624477002	SAMPLE	LXP1	LUCAS2	JUN-29-23 08:19:00	DONE	Lucas Cell	01-AUG-22 00:00
624477003	SAMPLE	LXP1	LUCAS3	JUN-29-23 08:19:00	DONE	Lucas Cell	25-OCT-22 00:00
624477004	SAMPLE	LXP1	LUCAS4	JUN-29-23 08:19:00	DONE	Lucas Cell	01-FEB-23 00:00
624477005	SAMPLE	LXP1	LUCAS5	JUN-29-23 08:19:00	DONE	Lucas Cell	01-JUN-23 00:00
624477006	SAMPLE	LXP1	LUCAS7	JUN-29-23 08:19:00	DONE	Lucas Cell	01-NOV-22 00:00
1205423414	MB	LXP1	LUCAS8	JUN-29-23 08:19:00	DONE	Lucas Cell	08-APR-23 00:00
1205423415	DUP	LXP1	LUCAS1	JUN-29-23 08:52:00	DONE	Lucas Cell	01-MAY-23 00:00
1205423416	MS	LXP1	LUCAS2	JUN-29-23 08:52:00	DONE	Lucas Cell	01-AUG-22 00:00
1205423417	LCS	LXP1	LUCAS3	JUN-29-23 11:00:00	DONE	Lucas Cell	25-OCT-22 00:00



Data Verification & Validation Report

Lansing Board of Water & Light – Erickson Power Station

Sampling Event (dates and purpose): New Wells: MW-14-15 – Background Round 5 – June 2023

Data Package Number: S49283.01

Lab Report Date: 07/14/2023

Data Validator: Aryka Thomson

Data Validation Completion Date: 07/24/2023

General Overall Assessment:

Data are usable without qualification.

Data are usable with qualification (as noted below).

Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	
MW-7C	
MW-8	
MW-9	
MW-10	
MW-11	
MW-11B	
MW-12	
MW-12B	
MW-13	
MW-14	X
MW-15	X
MW-16A	
MW-16B	
MW-16C	
MW-16D	

Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-14	GW	S49283.01	06/02/2023	X	X	X	X	X	X	
MW-15	GW	S49283.02	06/02/2023	X	X	X	X	X	X	
MWT-14	QC	S49283.03	06/02/2023	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO₃, CO₃, hardness

Any planned sampling or analysis NOT completed? If yes, explain: _____

Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Field Data							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
Analytical Data Package							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies across samples for chloride and TSS
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Holding Times	X		Analyses performed within allowed holding time	X			
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested		X		RLs for TDS were not met
			MDLs<RLs		X		RL=MDL for carbonate
			MDLs<GPS			X	
QC Validation							
Evaluate Accuracy							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table		X		Ca recovered outside control limits in one sample
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Evaluate Precision							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Rad-228 RPD outside control limits at 24%
Evaluate Representativeness							
Equipment Blanks (if applicable)	X		Non-detect (<RL)	X			
QC Verification							
Verify Instrument Calibration & Analytical Process							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	Al, As, Mo, and Se had recoveries outside control limits
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
Evaluate Completeness (# usable measurements/ # unusable measurements)							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

The matrix spike (49283.01) associated with Run Batch MT5-23-0605B had a low recovery for calcium. MW-14 required qualification as estimated (J) for calcium.

TSS in MW-15 was qualified by the laboratory as non-detect (U) because it was detected at a level less than reporting limit, but greater than MDL.

Comments:

Rad-228 RPD was outside control limits at 24%. Rad-226 and consequently combined radium in parent sample MW-14 required qualification as estimated with low bias (J-) and as estimated with high bias (J+) in field duplicate MWT-14.



Analytical Laboratory Report

Revised Report

Report ID: S49283.01(03)
Generated on 07/06/2023
Replaces report S49283.01(02) generated on 07/06/2023

Report to
Attention: Jennifer Caporale
Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Report produced by
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Report Summary

Lab Sample ID(s): S49283.01-S49283.04
Project: Erickson AM MI Wells 14-15
Collected Date(s): 06/02/2023
Submitted Date/Time: 06/02/2023 15:13
Sampled by: Marc Wahrer
P.O. #:

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Maya Murshak
Technical Director



General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

Report Narrative

Subcontracting results attached



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



Sample Summary (4 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S49283.01	MW-14 L306194-01	Groundwater	06/02/23 11:06
S49283.02	MW-15 L306194-02	Groundwater	06/02/23 13:31
S49283.03	MWT-14 L306194-03	Groundwater	06/02/23 11:06
S49283.04	Field Blank L306194-04	Water	06/02/23 10:29



Analytical Laboratory Report

Revised Report

Lab Sample ID: S49283.01

Sample Tag: MW-14 L306194-01

Collected Date/Time: 06/02/2023 11:06

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	5.3	IR
2	1L Plastic	None	Yes	5.3	IR
1	250ml Plastic	HNO3	Yes	5.3	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	06/05/23 12:16	CTV	
Metal Digestion	Completed	SW3015A	06/05/23 11:15	JRH	

Inorganics

Method: E300.0, Run Date: 06/06/23 09:44, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	114	10	0.13	mg/L	10	16887-00-6	

Method: E300.0, Run Date: 06/06/23 09:04, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	19	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 06/05/23 17:40, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	630	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 06/06/23 15:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	540	10	8.3	mg/L	10		

Method: SM2540C, Run Date: 06/02/23 18:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	792	50	6	mg/L	2		

Method: SM2540D, Run Date: 06/05/23 10:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	26.0	3	2	mg/L	2		

Metals

Method: E200.8, Run Date: 06/05/23 12:26, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.0026	mg/L	5	7440-36-0	
Arsenic	0.005	0.002	0.00026	mg/L	5	7440-38-2	
Barium	0.126	0.005	0.00016	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.00022	mg/L	5	7440-41-7	
Boron	2.06	0.04	0.0018	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.00019	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000097	mg/L	5	7440-47-3	



Analytical Laboratory Report

Revised Report

Lab Sample ID: S49283.01 (continued)

Sample Tag: MW-14 L306194-01

Method: E200.8, Run Date: 06/05/23 12:26, Analyst: JRH (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.00011	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.00038	mg/L	5	7440-50-8	
Iron	11.5	0.02	0.0019	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.00019	mg/L	5	7439-92-1	
Lithium*	0.106	0.005	0.0016	mg/L	5	7439-93-2	
Molybdenum	0.014	0.005	0.00022	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00025	mg/L	5	7440-02-0	
Selenium	0.009	0.005	0.0021	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000068	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000086	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00014	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00073	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 06/05/23 15:29, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	141	0.50	0.044	mg/L	5	7440-70-2	
Magnesium	40.0	0.50	0.012	mg/L	5	7439-95-4	
Potassium	4.65	0.50	0.023	mg/L	5	7440-09-7	
Sodium	73.7	0.50	0.0085	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 06/05/23 13:13, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 07/05/23 16:43, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Revised Report

Lab Sample ID: S49283.02

Sample Tag: MW-15 L306194-02

Collected Date/Time: 06/02/2023 13:31

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	5.3	IR
2	1L Plastic	None	Yes	5.3	IR
1	250ml Plastic	HNO3	Yes	5.3	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	06/05/23 12:16	CTV	
Metal Digestion	Completed	SW3015A	06/05/23 11:15	JRH	

Inorganics

Method: E300.0, Run Date: 06/06/23 09:14, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	59	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	109	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 06/05/23 17:50, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	350	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 06/06/23 16:02, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	420	10	8.3	mg/L	10		

Method: SM2540C, Run Date: 06/02/23 18:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	578	50	6	mg/L	2		

Method: SM2540D, Run Date: 06/05/23 10:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	1.8	3	1	mg/L	1		b

Metals

Method: E200.8, Run Date: 06/05/23 12:28, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.0026	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.00026	mg/L	5	7440-38-2	
Barium	0.049	0.005	0.00016	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.00022	mg/L	5	7440-41-7	
Boron	0.35	0.04	0.0018	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.00019	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000097	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.00011	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.00038	mg/L	5	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL



Analytical Laboratory Report

Revised Report

Lab Sample ID: S49283.02 (continued)

Sample Tag: MW-15 L306194-02

Method: E200.8, Run Date: 06/05/23 12:28, Analyst: JRH (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	0.11	0.02	0.0019	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.00019	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.0016	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.00022	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00025	mg/L	5	7440-02-0	
Selenium	0.011	0.005	0.0021	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000068	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000086	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00014	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00073	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 06/05/23 15:30, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	115	0.50	0.044	mg/L	5	7440-70-2	
Magnesium	28.9	0.50	0.012	mg/L	5	7439-95-4	
Potassium	Not detected	0.50	0.023	mg/L	5	7440-09-7	
Sodium	27.4	0.50	0.0085	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 06/05/23 13:16, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 07/05/23 16:43, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Revised Report

Lab Sample ID: S49283.03

Sample Tag: MWT-14 L306194-03

Collected Date/Time: 06/02/2023 11:06

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	5.3	IR
2	1L Plastic	None	Yes	5.3	IR
1	250ml Plastic	HNO3	Yes	5.3	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	06/05/23 12:16	CTV	
Metal Digestion	Completed	SW3015A	06/05/23 11:15	JRH	

Inorganics

Method: E300.0, Run Date: 06/06/23 09:54, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	114	10	0.13	mg/L	10	16887-00-6	

Method: E300.0, Run Date: 06/06/23 09:24, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	19	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 06/05/23 17:55, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	630	10	0.5	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 06/06/23 16:37, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	550	10	8.3	mg/L	10		

Method: SM2540C, Run Date: 06/02/23 18:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	784	50	6	mg/L	2		

Method: SM2540D, Run Date: 06/05/23 10:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	26.0	3	2	mg/L	2		

Metals

Method: E200.8, Run Date: 06/05/23 12:30, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.0026	mg/L	5	7440-36-0	
Arsenic	0.006	0.002	0.00026	mg/L	5	7440-38-2	
Barium	0.128	0.005	0.00016	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.00022	mg/L	5	7440-41-7	
Boron	2.02	0.04	0.0018	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.00019	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000097	mg/L	5	7440-47-3	



Analytical Laboratory Report

Revised Report

Lab Sample ID: S49283.03 (continued)

Sample Tag: MWT-14 L306194-03

Method: E200.8, Run Date: 06/05/23 12:30, Analyst: JRH (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.00011	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.00038	mg/L	5	7440-50-8	
Iron	11.8	0.02	0.0019	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.00019	mg/L	5	7439-92-1	
Lithium*	0.106	0.005	0.0016	mg/L	5	7439-93-2	
Molybdenum	0.015	0.005	0.00022	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00025	mg/L	5	7440-02-0	
Selenium	0.009	0.005	0.0021	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000068	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000086	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00014	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00073	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 06/05/23 15:31, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	141	0.50	0.044	mg/L	5	7440-70-2	
Magnesium	39.5	0.50	0.012	mg/L	5	7439-95-4	
Potassium	4.72	0.50	0.023	mg/L	5	7440-09-7	
Sodium	73.9	0.50	0.0085	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 06/05/23 13:19, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 07/05/23 16:43, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Revised Report

Lab Sample ID: S49283.04

Sample Tag: Field Blank L306194-04

Collected Date/Time: 06/02/2023 10:29

Matrix: Water

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	5.3	IR
2	1L Plastic	None	Yes	5.3	IR
1	250ml Plastic	HNO3	Yes	5.3	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	06/05/23 12:16	CTV	
Metal Digestion	Completed	SW3015A	06/05/23 11:15	JRH	

Inorganics

Method: E300.0, Run Date: 06/06/23 09:34, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.03	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.04	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.26	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 06/05/23 18:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	7	10	0.5	mg/L	1	71-52-3	b
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 06/06/23 16:41, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	8.3	mg/L	10		

Method: SM2540C, Run Date: 06/02/23 18:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	6	mg/L	2		

Method: SM2540D, Run Date: 06/05/23 10:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 06/05/23 12:21, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.0010	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.00010	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.000065	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.000086	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.00070	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.000076	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.000039	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.000043	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.00015	mg/L	2	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL



Analytical Laboratory Report

Revised Report

Lab Sample ID: S49283.04 (continued)

Sample Tag: Field Blank L306194-04

Method: E200.8, Run Date: 06/05/23 12:21, Analyst: JRH (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	Not detected	0.02	0.00077	mg/L	2	7439-89-6	
Lead	Not detected	0.003	0.000076	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.00065	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.000087	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.00010	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.00084	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.000027	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.000034	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.000056	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.00029	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 06/05/23 15:32, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.017	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.0048	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.0092	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.0034	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 06/05/23 13:23, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 07/05/23 16:43, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

Merit Laboratories Login Checklist

Lab Set ID:S49283

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 14-15

Submitted:06/02/2023 15:13 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Selection	Description	Note
Sample Receiving		
01.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples are received at 4C +/- 2C Thermometer # IR 5.3
02.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Received on ice/ cooling process begun
03.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples shipped
04.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples left in 24 hr. drop box
05.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Are there custody seals/tape or is the drop box locked
Chain of Custody		
06.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC adequately filled out
07.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC signed and relinquished to the lab
08.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sample tag on bottles match COC
09.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Subcontracting needed? Subcontracted to: GEL
Preservation		
10.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Do sample have correct chemical preservation
11.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Completed pH checks on preserved samples? (no VOAs)
12.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Did any samples need to be preserved in the lab?
Bottle Conditions		
13.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	All bottles intact
14.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Appropriate analytical bottles are used
15.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Merit bottles used
16.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sufficient sample volume received
17.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples require laboratory filtration
18.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples submitted within holding time
19.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S49283 Submitted: 06/02/2023 15:13

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 14-15

Attention: Jennifer Caporale
Address: Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Initial Preservation Check: 06/02/2023 15:33 MMC

Preservation Recheck (E200.8): N/A

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S49283.01	1L Plastic HNO3	<2			
S49283.01	1L Plastic HNO3	<2			
S49283.01	250ml Plastic HNO3	<2			
S49283.02	1L Plastic HNO3	<2			
S49283.02	1L Plastic HNO3	<2			
S49283.02	250ml Plastic HNO3	<2			
S49283.03	1L Plastic HNO3	<2			
S49283.03	1L Plastic HNO3	<2			
S49283.03	250ml Plastic HNO3	<2			
S49283.04	1L Plastic HNO3	<2			
S49283.04	1L Plastic HNO3	<2			
S49283.04	250ml Plastic HNO3	<2			



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 Phone (517) 332-0167 Fax (517) 332-4034
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

REPORT TO

CHAIN OF CUSTODY RECORD

INVOICE TO

CONTACT NAME **Jennifer Caporale**
 COMPANY **Lansing Board of Water and Light**
 ADDRESS **PO Box 13007 48901-3007**
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**
 PHONE NO. **517-702-6372** FAX NO. P.O. NO.
 E-MAIL ADDRESS **Environmental_Laboratory@lbwl.com** QUOTE NO.

CONTACT NAME **Beth Zimpfer** SAME
 COMPANY
 ADDRESS
 CITY STATE ZIP CODE
 PHONE NO. E-MAIL ADDRESS **Beth.Zimpfer@lbwl.com**

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

PROJECT NO./NAME **Erickson AM MI Wells 14-15** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**

TURNAROUND TIME REQUIRED 1 DAY 2 DAYS 3 DAYS STANDARD OTHER **ASAP**

DELIVERABLES REQUIRED STD LEVEL II LEVEL III LEVEL IV EDD OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIFE A=AIR W=WASTE

Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO ₃	H ₂ SO ₄	NaOH	MeOH	OTHER	Total Metals	F- undistilled, Cl-, SO ₄ , TDS	Radium 226	Radium 228	TSS	HCO ₃ , CO ₃ , Hardness	Certifications		Project Locations	Special Instructions	
	DATE	TIME																	<input type="checkbox"/> OHIO VAP	<input type="checkbox"/> Drinking Water			
49283.01	06/02/23	1106	MW-14 L306194-01	GW	5	2	3						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES	<input type="checkbox"/> Detroit <input type="checkbox"/> New York	Metals to analyse: Na, Mg, K
.02	↓	1331	MW-15 L306194-02	GW	5	2	3						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Other	B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03	↓	1106	MWT-14 L306194-03	GW	5	2	3						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Co, Li, Hg, Mo, Pb, Se, Tl,
.04	↓	1029	Field Blank L306194-04	di	5	2	3						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Fe, Cu, Ni, Ag, V, Zn
																							Please send a preliminary report

RELINQUISHED BY: *[Signature]* Sampler DATE **6-2-23** TIME **1513**
 RECEIVED BY: *[Signature]* DATE **6/2/23** TIME **1513**
 RELINQUISHED BY: DATE TIME
 RECEIVED BY: DATE TIME

RELINQUISHED BY: DATE TIME
 RECEIVED BY: DATE TIME
 SEAL NO. SEAL INTACT YES NO INITIALS
 SEAL NO. SEAL INTACT YES NO INITIALS
 NOTES: TEMP. ON ARRIVAL **5.3**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total		250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005



July 03, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 625000
SDG: S49283

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on June 07, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S49283
Work Order: 625000**

July 03, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on June 07, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

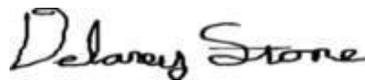
Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
625000001	S49283.01
625000002	S49283.02
625000003	S49283.03
625000004	S49283.04 Field Blank

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.



Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

625000

C.O.C. PAGE # 1 OF 1

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 Phone (517) 332-0167 Fax (517) 332-4034
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REPORT TO

CHAIN OF CUSTODY RECORD

INVOICE TO

CONTACT NAME: **Project Management Team** CONTACT NAME: **Julie Teague** CONTACT NAME: **Julie Teague**

COMPANY: **Merit Laboratories** COMPANY: **Merit Laboratories** COMPANY: **Merit Laboratories**

ADDRESS: **2680 East Lansing Drive** ADDRESS: **2680 East Lansing Drive** ADDRESS: **2680 East Lansing Drive**

CITY: **East Lansing** CITY: **East Lansing** CITY: **East Lansing**

STATE: **MI** STATE: **MI** STATE: **MI**

ZIP CODE: **48823** ZIP CODE: **48823** ZIP CODE: **48823**

PHONE NO.: **517-332-0167** PHONE NO.: **517-332-0167** PHONE NO.: **517-332-0167**

FAX NO.: **results@meritlabs.com** E-MAIL ADDRESS: **results@meritlabs.com** E-MAIL ADDRESS: **results@meritlabs.com**

PROJECT NO./NAME: **S49283** ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

TURNAROUND TIME REQUIRED: 1 DAY 2 DAYS 3 DAYS STANDARD OTHER

DELIVERABLES REQUIRED: STD LEVEL II LEVEL III LEVEL IV EDD OTHER

SAMPLER(S) - PLEASE PRINT/SIGN NAME

MATRIX CODE	GW=GROUNDWATER	WW=WASTEWATER	S=SOIL	L=LIQUID	SD=SOLID	SL=SLUDGE	DW=DRINKING WATER	O=OIL	WP=WPE	A=AIR	W=WASTE
6/2/23	1106	S49283.01	GW	2	2	2	2	2	2	2	2
6/2/23	1331	S49283.02	GW	2	2	2	2	2	2	2	2
6/2/23	1106	S49283.03	GW	2	2	2	2	2	2	2	2
6/2/23	1029	S49283.04 Field Blank	DI	2	2	2	2	2	2	2	2

YEAR	DATE	TIME	IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HC	HCN	H ₂ O	NaOH	MnOH	OTHER
	6/2/23	1106	S49283.01	GW	2	2	2	2	2	2	2	2
	6/2/23	1331	S49283.02	GW	2	2	2	2	2	2	2	2
	6/2/23	1106	S49283.03	GW	2	2	2	2	2	2	2	2
	6/2/23	1029	S49283.04 Field Blank	DI	2	2	2	2	2	2	2	2

SEAL INTACT	INITIALS	NOTES
YES <input type="checkbox"/> NO <input type="checkbox"/>	YES <input type="checkbox"/> NO <input type="checkbox"/>	TEMP. ON ARRIVAL
YES <input type="checkbox"/> NO <input type="checkbox"/>	YES <input type="checkbox"/> NO <input type="checkbox"/>	DATE
YES <input type="checkbox"/> NO <input type="checkbox"/>	YES <input type="checkbox"/> NO <input type="checkbox"/>	DATE

RELINQUISHED BY:	DATE	TIME
SIGNATURE/Organization	6/5/23	1700
SIGNATURE/Organization	6/5/23	1701
SIGNATURE/Organization	6/5/23	1701
SIGNATURE/Organization	6/5/23	1701

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

SAMPLE RECEIPT & REVIEW FORM

PS

Client: <u>MERI</u>		SDG/AR/COC/Work Order: <u>625000</u>		
Received By: <u>QG</u>		Date Received: <u>6/7/23</u>		
Carrier and Tracking Number		Circle Applicable: FedEx Express FedEx Ground <u>UPS</u> Field Services Courier Other <u>12 464 477 03 6137 5567</u>		
Suspected Hazard Information		*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation. <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
A) Shipped as a DOT Hazardous?		Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___		
B) Did the client designate the samples are to be received as radioactive?		<input checked="" type="checkbox"/> COC notation or radioactive stickers on containers equal client designation.		
C) Did the RSO classify the samples as radioactive?		Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> <u>CPM</u> / mR/Hr Classified as: <u>Rad 1</u> <u>Rad 2</u> <u>Rad 3</u>		
D) Did the client designate samples are hazardous?		<input checked="" type="checkbox"/> COC notation or hazard labels on containers equal client designation.		
E) Did the RSO identify possible hazards?		If D or E is yes, select Hazards below. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:		
Sample Receipt Criteria		Yes	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Preservation Method: Wet Ice Ice Packs Dry ice <u>None</u> Other: *all temperatures are recorded in Celsius TEMP: <u>23°C</u>
4	Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Temperature Device Serial #: <u>IR2-20</u> Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer)
				Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No)
				Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected:
8	Samples received within holding time?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ID's and containers affected:
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
13	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Circle Applicable: Not relinquished Other (describe)
Comments (Use Continuation Form if needed):				

PM (or PMA) review: Initials JM Date 6-8-23 Page 1 of 1

Laboratory Certifications

List of current GEL Certifications as of 03 July 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S49283
Work Order #: 625000**

Product: Radium-226+Radium-228 Calculation

Analytical Method: Calculation

Analytical Procedure: GL-RAD-D-003 REV# 45

Analytical Batch: 2448593

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
625000001	S49283.01
625000002	S49283.02
625000003	S49283.03
625000004	S49283.04 Field Blank

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2442121

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
625000001	S49283.01
625000002	S49283.02
625000003	S49283.03
625000004	S49283.04 Field Blank
1205429934	Method Blank (MB)
1205429935	625000001(S49283.01) Sample Duplicate (DUP)
1205429936	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2442108

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
625000001	S49283.01
625000002	S49283.02
625000003	S49283.03
625000004	S49283.04 Field Blank
1205429898	Method Blank (MB)
1205429899	625000001(S49283.01) Sample Duplicate (DUP)
1205429900	625000001(S49283.01) Matrix Spike (MS)
1205429901	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

The matrix spike, 1205429900 (S49283.01MS), aliquot was reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

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Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S49283 GEL Work Order: 625000

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Kate Gellatly

Date: 06 JUL 2023

Title: Analyst 1 PT

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: July 6, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S49283.01 Project: MERI00120
Sample ID: 625000001 Client ID: MERI001
Matrix: Ground Water
Collect Date: 02-JUN-23 11:06
Receive Date: 07-JUN-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.601	+/-1.41	2.48	3.00	pCi/L		JE1	06/27/23	1458	2442121	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.876	+/-1.45			pCi/L		1 LXB3	07/05/23	1643	2448593	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.275	+/-0.311	0.484	1.00	pCi/L		LXP1	07/05/23	0925	2442108	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			87.1	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: July 6, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S49283.02 Project: MERI00120
Sample ID: 625000002 Client ID: MERI001
Matrix: Ground Water
Collect Date: 02-JUN-23 13:31
Receive Date: 07-JUN-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	-0.108	+/-0.992	1.89	3.00	pCi/L			JE1	06/27/23	1458 2442121	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.876	+/-1.15			pCi/L		1	LXB3	07/05/23	1643 2448593	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.876	+/-0.578	0.738	1.00	pCi/L			LXP1	07/05/23	0925 2442108	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			85.6	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: July 6, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S49283.03	Project: MERI00120
Sample ID: 625000003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 02-JUN-23 11:06	
Receive Date: 07-JUN-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method	
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.983	+/-1.23	2.09	3.00	pCi/L		JE1	06/27/23	1458	2442121	1	
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.25	+/-1.28			pCi/L		1	LXB3	07/05/23	1643	2448593	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.271	+/-0.339	0.564	1.00	pCi/L		LXP1	07/05/23	0925	2442108	3	

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			88.3	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: July 6, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S49283.04 Field Blank	Project: MERI00120
Sample ID: 625000004	Client ID: MERI001
Matrix: Water	
Collect Date: 02-JUN-23 10:29	
Receive Date: 07-JUN-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method	
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.460	+/-1.51	2.68	3.00	pCi/L		JE1	06/27/23	1458	2442121	1	
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.711	+/-1.54			pCi/L		1	LXB3	07/05/23	1643	2448593	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.250	+/-0.283	0.442	1.00	pCi/L		LXP1	07/05/23	0925	2442108	3	

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			80	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

Quality Control Data

GEL LABORATORIES LLC

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QC Summary

Report Date: July 6, 2023

Page 1 of 2

Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan
Contact: John Laverty

Workorder: 625000

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2442121										
QC1205429935	625000001	DUP									
Radium-228	U	0.601	U	0.161	pCi/L	N/A		N/A	JE1	06/27/23	14:58
	Uncertainty	+/-1.41		+/-0.951							
QC1205429936	LCS										
Radium-228	81.2			77.2	pCi/L		95.1	(75%-125%)		06/27/23	14:57
	Uncertainty			+/-4.33							
QC1205429934	MB										
Radium-228			U	-0.382	pCi/L					06/27/23	14:58
	Uncertainty			+/-0.883							
Rad Ra-226											
Batch	2442108										
QC1205429899	625000001	DUP									
Radium-226	U	0.275	U	0.111	pCi/L	N/A		N/A	LXP1	07/05/23	10:07
	Uncertainty	+/-0.311		+/-0.243							
QC1205429901	LCS										
Radium-226	26.7			22.2	pCi/L		83.2	(75%-125%)		07/05/23	10:07
	Uncertainty			+/-2.18							
QC1205429898	MB										
Radium-226			U	0.152	pCi/L					07/05/23	10:07
	Uncertainty			+/-0.333							
QC1205429900	625000001	MS									
Radium-226	130 U	0.275		131	pCi/L		101	(75%-125%)		07/05/23	10:07
	Uncertainty	+/-0.311		+/-13.4							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- H Analytical holding time was exceeded
- < Result is less than value reported
- > Result is greater than value reported

GEL LABORATORIES LLC

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QC Summary

Workorder: 625000

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
NI											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2442121 Check-list

This check-list was completed on 28-JUN-23 by Rhonda Birch

This batch was reviewed by Kenshalla Oston on 28-JUN-23 and Rhonda Birch on 28-JUN-23.

Batch ID:
2442121

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2442121
Analyst: Jacqueline Winston (JE1)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: SP-C018367602

Due Dates for Lab: 03-JUL-2023 **Package:** 05-JUL-2023 **SDG:** 06-JUL-2023

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205429936	228	2051-B	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	625000001	14-JUN-2023	3	300.8	300.8	06/15/23 16:44	06/27/23 12:28
2	625000002	14-JUN-2023	3	302.4	302.4	06/15/23 16:44	06/27/23 12:28
3	625000003	14-JUN-2023	3	301.5	301.5	06/15/23 16:44	06/27/23 12:28
4	625000004	14-JUN-2023	3	301.4	301.4	06/15/23 16:44	06/27/23 12:28
5	625165001	14-JUN-2023	3	300.1	300.1	06/15/23 16:44	06/27/23 12:28
6	625165002	14-JUN-2023	3	302.5	302.5	06/15/23 16:44	06/27/23 12:28
7	625165003	14-JUN-2023	3	303.2	303.2	06/15/23 16:44	06/27/23 12:28
8	625165004	14-JUN-2023	3	301.3	301.3	06/15/23 16:44	06/27/23 12:28
9	625165005	14-JUN-2023	3	301.2	301.2	06/15/23 16:44	06/27/23 12:28
10	625165006	14-JUN-2023	3	300.8	300.8	06/15/23 16:44	06/27/23 12:28
11	1205429934 MB	14-JUN-2023	3		303.2	06/15/23 16:44	06/27/23 12:28
12	1205429935 DUP (625000001)	14-JUN-2023	3	302.5	302.5	06/15/23 16:44	06/27/23 12:28
13	1205429936 LCS	14-JUN-2023	3		303.2	06/15/23 16:44	06/27/23 12:28

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-E	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 14-JUN-2023 00:00
REGNT 3924648	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3924633	RGF-1M Citric Acid	5 mL	
REGNT 3922885	2M HCl	20 mL	
REGNT 3916775	RGF-7M Nitric Acid	25 mL	
REGNT DGA051823	2432690	2 g	
REGNT 3885305.13	RGF-Hydrofluoric Acid	4 mL	
REGNT 3528714	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3887517	RGF-Neodymium Substrate	5 mL	
REGNT 3919982.4	Nitric Acid	5 mL	
REGNT 3920979	Barium Carrier Ra228 REG	1 mL	
REGNT 3923368	RGF-50% Potassium Carbonate	2 mL	
REGNT 3919381	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 1951-E
 Tracer Exp Date : 9/16/2023
 Tracer Volume Added: 0.10

Batch : 2442121
 Analyst : JAC02417
 Prep Date : 6/14/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 3 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	625000001.1	0.3008	1.8473E-05	6/2/2023 11:06	1140.6	1.71%	993.1	1.83%	0.1	0.000200
2	625000002.1	0.3024	1.8500E-05	6/2/2023 13:31	1140.6	1.71%	975.9	1.85%	0.1	0.000200
3	625000003.1	0.3015	1.8484E-05	6/2/2023 11:06	1140.6	1.71%	1007.3	1.82%	0.1	0.000200
4	625000004.1	0.3014	1.8483E-05	6/2/2023 10:29	1140.6	1.71%	913.0	1.91%	0.1	0.000200
5	625165001.1	0.3001	1.8461E-05	6/5/2023 15:15	1140.6	1.71%	888.2	1.94%	0.1	0.000200
6	625165002.1	0.3025	1.8501E-05	6/5/2023 11:29	1140.6	1.71%	957.2	1.87%	0.1	0.000200
7	625165003.1	0.3032	1.8513E-05	6/5/2023 13:44	1140.6	1.71%	992.9	1.83%	0.1	0.000200
8	625165004.1	0.3013	1.8481E-05	6/5/2023 15:06	1140.6	1.71%	983.5	1.84%	0.1	0.000200
9	625165005.1	0.3012	1.8479E-05	6/5/2023 11:29	1140.6	1.71%	960.2	1.86%	0.1	0.000200
10	625165006.1	0.3008	1.8473E-05	6/5/2023 9:45	1140.6	1.71%	843.9	1.99%	0.1	0.000200
11	1205429934.1	0.3032	1.8513E-05	6/14/2023 0:00	1140.6	1.71%	955.8	1.87%	0.1	0.000200
12	1205429935.1	0.3025	1.8501E-05	6/2/2023 11:06	1140.6	1.71%	970.7	1.85%	0.1	0.000200
13	1205429936.1	0.3032	1.8513E-05	6/14/2023 0:00	1140.6	1.71%	1009.5	1.82%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
			Alpha	Beta										
1	1A	70	28	106	1.514	6/27/2023 14:58	6/15/2023 16:44	6/27/2023 12:28	0.992	0.754	1.000	1.067	87.1%	2.52%
2	1C	60	7	50	0.833	6/27/2023 14:58	6/15/2023 16:44	6/27/2023 12:28	0.992	0.754	1.000	1.057	85.6%	2.54%
3	2A	60	9	84	1.400	6/27/2023 14:58	6/15/2023 16:44	6/27/2023 12:28	0.992	0.754	1.000	1.057	88.3%	2.51%
4	2C	60	9	102	1.700	6/27/2023 14:58	6/15/2023 16:44	6/27/2023 12:28	0.992	0.754	1.000	1.057	80.0%	2.58%
5	2D	60	6	85	1.417	6/27/2023 14:58	6/15/2023 16:44	6/27/2023 12:28	0.993	0.754	1.000	1.057	77.9%	2.60%
6	3C	60	12	99	1.650	6/27/2023 14:58	6/15/2023 16:44	6/27/2023 12:28	0.993	0.754	1.000	1.057	83.9%	2.55%
7	4A	60	12	31	0.517	6/27/2023 14:58	6/15/2023 16:44	6/27/2023 12:28	0.993	0.753	1.000	1.057	87.1%	2.52%
8	4D	60	19	116	1.933	6/27/2023 14:58	6/15/2023 16:44	6/27/2023 12:28	0.993	0.753	1.000	1.057	86.2%	2.53%
9	6A	60	13	69	1.150	6/27/2023 14:58	6/15/2023 16:44	6/27/2023 12:28	0.993	0.753	1.000	1.057	84.2%	2.54%
10	6C	60	14	65	1.083	6/27/2023 14:59	6/15/2023 16:44	6/27/2023 12:28	0.993	0.753	1.000	1.057	74.0%	2.64%
11	7A	60	5	40	0.667	6/27/2023 14:58	6/15/2023 16:44	6/27/2023 12:28	0.996	0.754	1.000	1.057	83.8%	2.55%
12	9A	60	8	50	0.833	6/27/2023 14:58	6/15/2023 16:44	6/27/2023 12:28	0.992	0.754	1.000	1.057	85.1%	2.54%
13	11B	60	7	1304	21.733	6/27/2023 14:57	6/15/2023 16:44	6/27/2023 12:28	0.996	0.755	1.000	1.057	88.5%	2.51%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2023	5/31/2024	0.5320	0.00738	1.384	6/23/2023 17:49	500
2	PIC	6/1/2023	5/31/2024	0.6077	0.00847	0.860	6/23/2023 17:49	500
3	PIC	6/1/2023	5/31/2024	0.6083	0.01914	1.150	6/23/2023 17:49	500
4	PIC	6/1/2023	5/31/2024	0.6085	0.01274	1.594	6/23/2023 17:49	500
5	PIC	6/1/2023	5/31/2024	0.6206	0.00745	1.044	6/23/2023 17:49	500
6	PIC	6/1/2023	5/31/2024	0.6245	0.00988	1.248	6/23/2023 17:50	500
7	PIC	6/1/2023	5/31/2024	0.6074	0.01123	0.594	6/23/2023 17:50	500
8	PIC	6/1/2023	5/31/2024	0.6412	0.00773	0.742	6/23/2023 17:50	500
9	PIC	6/1/2023	5/31/2024	0.6444	0.02228	0.764	6/23/2023 17:51	500
10	PIC	6/1/2023	5/31/2024	0.6167	0.01970	0.938	6/23/2023 17:51	500
11	PIC	6/1/2023	5/31/2024	0.6229	0.00594	0.762	6/23/2023 17:51	500
12	PIC	6/1/2023	5/31/2024	0.6343	0.00758	0.792	6/23/2023 17:52	500
13	PIC	6/1/2023	5/31/2024	0.6453	0.00697	0.646	6/23/2023 17:51	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

* - RPD changed to 0% due to sample & dup activity below MDA

LCS S/N : 2051-B
LCS Exp Date : 3/27/2024
LCS Activity (dpm/ml): 546.65
LCS Volume Added: 0.10

Results														2 SIGMA		2 SIGMA	
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery	
1	1.6138	1.1393	3	2.4764	0.6010	119.92%	0.1303	0.1562	1.4124	1.4206		SAMPLE					
2	1.1960	0.8444	3	1.8914	-0.1080	468.52%	-0.0267	0.1249	0.9921	0.9922		SAMPLE					
3	1.3427	0.9480	3	2.0926	0.9833	64.12%	0.2500	0.1601	1.2343	1.2597		SAMPLE					
4	1.7446	1.2317	3	2.6805	0.4601	167.52%	0.1060	0.1775	1.5105	1.5151		SAMPLE					
5	1.4278	1.0080	3	2.2355	1.6359	43.10%	0.3727	0.1603	1.3792	1.4405		SAMPLE					
6	1.4285	1.0085	3	2.2179	1.6147	43.17%	0.4020	0.1732	1.3635	1.4240		SAMPLE					
7	0.9747	0.6881	3	1.5749	-0.3072	128.03%	-0.0773	0.0990	0.7708	0.7709		SAMPLE					
8	1.0485	0.7402	3	1.6716	4.5551	15.64%	1.1913	0.1836	1.3759	1.7973		SAMPLE					
9	1.0849	0.7659	3	1.7268	1.5050	37.42%	0.3860	0.1439	1.0993	1.1655		SAMPLE					
10	1.4312	1.0104	3	2.2529	0.6746	97.20%	0.1453	0.1412	1.2845	1.2961		SAMPLE					
11	1.1137	0.7863	3	1.7730	-0.3821	117.94%	-0.0953	0.1124	0.8830	0.8832		MB					
12	1.1048	0.7800	3	1.7549	0.1612	300.96%	0.0413	0.1244	0.9507	0.9516	625000001.1	DUP	* 0.0%				
13	0.9367	0.6613	3	1.5056	77.1963	3.87%	21.0873	0.6029	4.3261	20.0591		LCS			81.2135	95.1%	

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
625000001	1A	70	28	106	6/27/2023 14:58	6/27/2023 16:08	PIC	2442121
625000002	1C	60	7	50	6/27/2023 14:58	6/27/2023 15:58	PIC	2442121
625000003	2A	60	9	84	6/27/2023 14:58	6/27/2023 15:58	PIC	2442121
625000004	2C	60	9	102	6/27/2023 14:58	6/27/2023 15:58	PIC	2442121
625165001	2D	60	6	85	6/27/2023 14:58	6/27/2023 15:58	PIC	2442121
625165002	3C	60	12	99	6/27/2023 14:58	6/27/2023 15:58	PIC	2442121
625165003	4A	60	12	31	6/27/2023 14:58	6/27/2023 15:58	PIC	2442121
625165004	4D	60	19	116	6/27/2023 14:58	6/27/2023 15:58	PIC	2442121
625165005	6A	60	13	69	6/27/2023 14:58	6/27/2023 15:58	PIC	2442121
625165006	6C	60	14	65	6/27/2023 14:59	6/27/2023 15:59	PIC	2442121
1205429934	7A	60	5	40	6/27/2023 14:58	6/27/2023 15:58	PIC	2442121
1205429935	9A	60	8	50	6/27/2023 14:58	6/27/2023 15:58	PIC	2442121
1205429936	11B	60	7	1304	6/27/2023 14:57	6/27/2023 15:57	PIC	2442121

ASSAY 27-Jun-23 12:58:42
 Wizard 2480 s/n 46190630
 Protocol id 8 Ba-133
 Time limit
 Count limit
 Isotope Ba-133
 Protocol date 6/27/2023
 Run id. 6856

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	87	1	180	3422.57	1140.59	1.71	12:58:42
625000001	2	87	2	180	2980	993.13	1.83	87.07	01:01:56
625000002	3	87	3	180	2928.28	975.86	1.85	85.56	01:05:10
625000003	4	87	4	180	3022.57	1007.34	1.82	88.32	01:08:24
625000004	5	87	5	180	2739.57	913.02	1.91	80.05	01:11:38
625165001	1	10	1	180	2665.28	888.21	1.94	77.87	01:15:14
625165002	2	10	2	180	2872	957.15	1.87	83.92	01:18:28
625165003	3	10	3	180	2979.28	992.9	1.83	87.05	01:21:42
625165004	4	10	4	180	2951	983.48	1.84	86.23	01:24:56
625165005	5	10	5	180	2881	960.18	1.86	84.18	01:28:10
625165006	1	11	1	180	2532.28	843.93	1.99	73.99	01:31:47
1205429934	2	11	2	180	2868	955.81	1.87	83.80	01:35:01
1205429935	3	11	3	180	2913	970.74	1.85	85.11	01:38:15
1205429936	4	11	4	180	3029	1009.48	1.82	88.51	01:41:29

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 27-Jun-2023

Detectors LB4100 E1 through H4 and PIC 1A through 14D and G5400W 1W through 1Z and LB4200 GA1 through OD4

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	Above	Alpha eff	27-Jun 04:18	5	9879	6589	9855	+3.04
LB4100E2	Above	Beta bkg	27-Jun 04:39	60	2.333	1.385	3.072	+0.37
LB4100E2	need 2nd	Beta eff	27-Jun 04:25	5	14131	14120	15200	-2.94
LB4100F1	Above	Beta bkg	27-Jun 04:39	60	6.983	0.188	2.691	+13.29
LB4100F2	Below	Alpha eff	27-Jun 04:18	5	6399	6533	7372	-3.96
LB4100F2	Above	Alpha XTalk	27-Jun 04:18	5	0.366	0.318	0.366	+3.10
LB4100F2	Above	Beta bkg	27-Jun 04:39	60	4.800	1.173	1.833	+29.97
LB4100F2	need 2nd	Beta eff	27-Jun 04:26	5	15192	15040	15710	-1.64
LB4100F3	Above	Beta bkg	27-Jun 06:33	60	2.033	0.469	2.435	+1.77
LB4100F4	Above	Beta bkg	27-Jun 04:39	60	2.667	-7.15E-2	3.199	+2.02
LB4100G1	Below	Alpha eff	27-Jun 04:26	5	5894	7975	12090	-6.03
LB4100G1	Above	Alpha XTalk	27-Jun 04:26	5	0.635	0.088	0.447	+6.14
LB4100G1	Above	Beta bkg	27-Jun 04:41	60	1388	0.380	1.675	+6,428.51
LB4100G2	Above	Alpha XTalk	27-Jun 04:26	5	0.429	0.236	0.424	+3.16
LB4100G3	Above	Alpha XTalk	27-Jun 04:26	5	0.402	0.275	0.391	+3.54
LB4100G3	Above	Beta bkg	27-Jun 04:41	60	2.633	0.987	2.738	+2.64
LB4100G4	Below	Alpha eff	27-Jun 04:26	5	7839	9065	10710	-7.47
LB4100G4	Above	Alpha XTalk	27-Jun 04:26	5	0.318	0.222	0.274	+8.17
PIC1B	Above	Alpha bkg	27-Jun 07:24	60	0.333	-8.32E-2	0.284	+3.81
PIC1B	Above	Beta XTalk	27-Jun 06:39	5	6.58E-4	1.46E-4	5.83E-4	+4.02
PIC8C	Above	Alpha bkg	27-Jun 07:25	60	0.617	-1.90E-2	0.413	+5.82
PIC8C	Above	Beta bkg	27-Jun 07:25	60	3.017	0.415	2.497	+4.50
PIC10D	Above	Beta bkg	27-Jun 04:53	60	2.417	-5.50E-2	2.427	+2.98
PIC11A	Above	Alpha bkg	27-Jun 07:37	60	0.617	-3.66E-2	0.395	+6.09
PIC11A	Above	Beta bkg	27-Jun 07:37	60	2.033	0.015	2.252	+2.41
PIC14A	Above	Alpha XTalk	27-Jun 08:45	5	0.300	0.256	0.294	+4.02

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

PIC4B

Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by Jasmine Conley

Date 6/27/23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2442121

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205429936	LCS	JE1	PIC11B	JUN-27-23 14:57:46	DONE	25mm Filter	01-JUN-23 00:00
1205429934	MB	JE1	PIC7A	JUN-27-23 14:58:08	DONE	25mm Filter	01-JUN-23 00:00
1205429935	DUP	JE1	PIC9A	JUN-27-23 14:58:12	DONE	25mm Filter	01-JUN-23 00:00
625000001	SAMPLE	JE1	PIC1A	JUN-27-23 14:58:17	DONE	25mm Filter	01-JUN-23 00:00
625000002	SAMPLE	JE1	PIC1C	JUN-27-23 14:58:23	DONE	25mm Filter	01-JUN-23 00:00
625000003	SAMPLE	JE1	PIC2A	JUN-27-23 14:58:26	DONE	25mm Filter	01-JUN-23 00:00
625000004	SAMPLE	JE1	PIC2C	JUN-27-23 14:58:32	DONE	25mm Filter	01-JUN-23 00:00
625165001	SAMPLE	JE1	PIC2D	JUN-27-23 14:58:36	DONE	25mm Filter	01-JUN-23 00:00
625165002	SAMPLE	JE1	PIC3C	JUN-27-23 14:58:39	DONE	25mm Filter	01-JUN-23 00:00
625165003	SAMPLE	JE1	PIC4A	JUN-27-23 14:58:45	DONE	25mm Filter	01-JUN-23 00:00
625165004	SAMPLE	JE1	PIC4D	JUN-27-23 14:58:51	DONE	25mm Filter	01-JUN-23 00:00
625165005	SAMPLE	JE1	PIC6A	JUN-27-23 14:58:54	DONE	25mm Filter	01-JUN-23 00:00
625165006	SAMPLE	JE1	PIC6C	JUN-27-23 14:59:00	DONE	25mm Filter	01-JUN-23 00:00

Lucas Cell Raw Data

Batch 2442108 Check-list

This check-list was completed on 05-JUL-23 by Lyndsey Pace

This batch was reviewed by Gregory Ramsay on 05-JUL-23 and Lyndsey Pace on 05-JUL-23.

Batch ID:
2442108

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2442108
Analyst: Lyndsey Pace (LXP1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: BAL-C236871727

Due Dates for Lab: 03-JUL-2023			Package: 05-JUL-2023		SDG: 06-JUL-2023	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205429901	Radium-226 SPIKE	1715-G	.1	mL	
MS	1205429900	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	625000001	29-JUN-2023	1	500.28	500.28	06/30/23 08:36	303	07/05/23 05:52	07/05/23 09:25	3	6
2	625000002	29-JUN-2023	1	500.73	500.73	06/30/23 08:36	402	07/05/23 05:52	07/05/23 09:25	7	16
3	625000003	29-JUN-2023	1	500.07	500.07	06/30/23 08:36	505	07/05/23 05:52	07/05/23 09:25	5	7
4	625000004	29-JUN-2023	1	500.34	500.34	06/30/23 08:36	601	07/05/23 05:52	07/05/23 09:25	3	6
5	625152001	29-JUN-2023	1	500.58	500.58	06/30/23 08:36	707	07/05/23 05:52	07/05/23 09:25	4	19
6	625152002	29-JUN-2023	1	500.09	500.09	06/30/23 08:36	805	07/05/23 05:52	07/05/23 09:25	2	146
7	625152003	29-JUN-2023	1	500.23	500.23	06/30/23 08:36	106	07/05/23 06:18	07/05/23 09:48	3	11
8	625152004	29-JUN-2023	1	500.16	500.16	06/30/23 08:36	206	07/05/23 06:18	07/05/23 09:48	2	52
9	625152005	29-JUN-2023	1	500.83	500.83	06/30/23 08:36	308	07/05/23 06:18	07/05/23 09:47	4	8
10	625165001	29-JUN-2023	1	500.08	500.08	06/30/23 08:36	403	07/05/23 06:18	07/05/23 09:47	7	16
11	625165002	29-JUN-2023	1	500.87	500.87	06/30/23 08:36	501	07/05/23 06:18	07/05/23 09:47	2	10
12	625165003	29-JUN-2023	1	500.5	500.5	06/30/23 08:36	602	07/05/23 06:18	07/05/23 09:47	2	12
13	625165004	29-JUN-2023	1	500.9	500.9	06/30/23 08:36	703	07/05/23 06:18	07/05/23 09:47	2	9
14	625165005	29-JUN-2023	1	500.22	500.22	06/30/23 08:36	801	07/05/23 06:18	07/05/23 09:47	6	7
15	625165006	29-JUN-2023	1	500.62	500.62	06/30/23 08:36	101	07/05/23 06:44	07/05/23 10:08	4	6
16	1205429898 MB	29-JUN-2023	1		500.9	06/30/23 08:36	201	07/05/23 06:44	07/05/23 10:07	7	6
17	1205429899 DUP (625000001)	29-JUN-2023	1	500.2	500.2	06/30/23 08:36	304	07/05/23 06:44	07/05/23 10:07	4	4
18	1205429900 MS (625000001)	29-JUN-2023	1	102.82	102.82	06/30/23 08:36	407	07/05/23 06:44	07/05/23 10:07	4	373
19	1205429901 LCS	29-JUN-2023	1		500.9	06/30/23 08:36	506	07/05/23 06:44	07/05/23 10:07	3	402

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 29-JUN-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Procedure Code : LUC26RAL
 Parmname : Radium-226
 Required MDA : 1 pCi/L
 Halflife of Ra-226 : 1600 years
 Ra-226 Abundance : 1.00
 Halflife of Rn-222 : 3.8235 days

Batch : 2442108
 Analyst : LIN01615
 Prep Date : 6/29/2023
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Counting		Gross Counts	Gross CPM	Background Counts	Background CPM	Background Count Time (min.)	Cell Efficiency (cpm/dpm)
					Cell Number	Time (min.)						
1	625000001.1	0.5003	2.0257E-05	6/2/2023 11:06	303	15	6	0.400	3	0.100	30	1.7210
2	625000002.1	0.5007	2.0259E-05	6/2/2023 13:31	402	15	16	1.067	7	0.233	30	1.4980
3	625000003.1	0.5001	2.0256E-05	6/2/2023 11:06	505	15	7	0.467	5	0.167	30	1.7470
4	625000004.1	0.5003	2.0257E-05	6/2/2023 10:29	601	15	6	0.400	3	0.100	30	1.8870
5	625152001.1	0.5006	2.0258E-05	6/7/2023 8:00	707	15	19	1.267	4	0.133	30	1.7280
6	625152002.1	0.5001	2.0256E-05	6/7/2023 7:44	805	15	146	9.733	2	0.067	30	1.5410
7	625152003.1	0.5002	2.0257E-05	6/7/2023 7:17	106	15	11	0.733	3	0.100	30	1.5250
8	625152004.1	0.5002	2.0257E-05	6/7/2023 6:55	206	15	52	3.467	2	0.067	30	1.8770
9	625152005.1	0.5008	2.0259E-05	6/7/2023 6:31	308	15	8	0.533	4	0.133	30	1.5970
10	625165001.1	0.5001	2.0256E-05	6/5/2023 15:15	403	15	16	1.067	7	0.233	30	1.5070
11	625165002.1	0.5009	2.0259E-05	6/5/2023 11:29	501	15	10	0.667	2	0.067	30	1.7160
12	625165003.1	0.5005	2.0258E-05	6/5/2023 13:44	602	15	12	0.800	2	0.067	30	1.7010
13	625165004.1	0.5009	2.0260E-05	6/5/2023 15:06	703	15	9	0.600	2	0.067	30	1.6440
14	625165005.1	0.5002	2.0257E-05	6/5/2023 11:29	801	15	7	0.467	6	0.200	30	1.4200
15	625165006.1	0.5006	2.0258E-05	6/5/2023 9:45	101	15	6	0.400	4	0.133	30	1.8120
16	1205429898.1	0.5009	2.0260E-05	6/29/2023 0:00	201	15	6	0.400	7	0.233	30	1.7110
17	1205429899.1	0.5002	2.0257E-05	6/2/2023 11:06	304	15	4	0.267	4	0.133	30	1.8850
18	1205429900.1	0.1028	1.1542E-05	6/2/2023 11:06	407	15	373	24.867	4	0.133	30	1.4390
19	1205429901.1	0.5009	2.0260E-05	6/29/2023 0:00	506	15	402	26.800	3	0.100	30	1.8780

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
7.400%	10/25/2022	10/31/2023	6/30/2023 8:36	7/5/2023 5:52	7/5/2023 9:25	0.588	0.974	1.001	1.000
5.300%	2/1/2023	1/31/2024	6/30/2023 8:36	7/5/2023 5:52	7/5/2023 9:25	0.588	0.974	1.001	1.000
8.200%	6/1/2023	5/31/2024	6/30/2023 8:36	7/5/2023 5:52	7/5/2023 9:25	0.588	0.974	1.001	1.000
6.700%	7/1/2023	6/30/2024	6/30/2023 8:36	7/5/2023 5:52	7/5/2023 9:25	0.588	0.974	1.001	1.000
2.200%	11/1/2022	10/31/2023	6/30/2023 8:36	7/5/2023 5:52	7/5/2023 9:25	0.588	0.974	1.001	1.000
9.600%	4/8/2023	3/31/2024	6/30/2023 8:36	7/5/2023 5:52	7/5/2023 9:25	0.588	0.974	1.001	1.000
3.400%	5/1/2023	4/30/2024	6/30/2023 8:36	7/5/2023 6:18	7/5/2023 9:48	0.589	0.974	1.001	1.000
2.800%	8/1/2022	7/31/2023	6/30/2023 8:36	7/5/2023 6:18	7/5/2023 9:48	0.589	0.974	1.001	1.000
9.600%	10/25/2022	10/31/2023	6/30/2023 8:36	7/5/2023 6:18	7/5/2023 9:47	0.589	0.974	1.001	1.000
6.100%	2/1/2023	1/31/2024	6/30/2023 8:36	7/5/2023 6:18	7/5/2023 9:47	0.589	0.974	1.001	1.000
5.500%	6/1/2023	5/31/2024	6/30/2023 8:36	7/5/2023 6:18	7/5/2023 9:47	0.589	0.974	1.001	1.000
9.900%	7/1/2023	6/30/2024	6/30/2023 8:36	7/5/2023 6:18	7/5/2023 9:47	0.589	0.974	1.001	1.000
9.000%	11/1/2022	10/31/2023	6/30/2023 8:36	7/5/2023 6:18	7/5/2023 9:47	0.589	0.974	1.001	1.000
3.200%	4/8/2023	3/31/2024	6/30/2023 8:36	7/5/2023 6:18	7/5/2023 9:47	0.589	0.974	1.001	1.000
4.500%	5/1/2023	4/30/2024	6/30/2023 8:36	7/5/2023 6:44	7/5/2023 10:08	0.590	0.975	1.001	1.000
8.900%	8/1/2022	7/31/2023	6/30/2023 8:36	7/5/2023 6:44	7/5/2023 10:07	0.590	0.975	1.001	1.000
8.900%	10/25/2022	10/31/2023	6/30/2023 8:36	7/5/2023 6:44	7/5/2023 10:07	0.590	0.975	1.001	1.000
5.800%	2/1/2023	1/31/2024	6/30/2023 8:36	7/5/2023 6:44	7/5/2023 10:07	0.590	0.975	1.001	1.000
1.400%	6/1/2023	5/31/2024	6/30/2023 8:36	7/5/2023 6:44	7/5/2023 10:07	0.590	0.975	1.001	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-G
Spike Exp Date : 9/8/2023
Spike Activity (dpm/ml): 297.39
Spike Volume Added: 0.10

* - RPD changed to 0% due to sample & dup activity below MDA

LCS S/N : 1715-G
LCS Exp Date : 9/8/2023
LCS Activity (dpm/ml): 297.39
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.2133	0.1506	1	0.4843	0.2746	58.21%	0.3000	0.1732	0.3108	0.3158		SAMPLE				
2	0.3740	0.2640	1	0.7382	0.8757	34.12%	0.8333	0.2809	0.5785	0.5991		SAMPLE				
3	0.2714	0.1916	1	0.5636	0.2707	64.35%	0.3000	0.1915	0.3386	0.3436		SAMPLE				
4	0.1945	0.1373	1	0.4416	0.2504	58.12%	0.3000	0.1732	0.2834	0.2876		SAMPLE				
5	0.2452	0.1731	1	0.5284	1.0327	26.40%	1.1333	0.2981	0.5325	0.5547		SAMPLE				
6	0.1946	0.1374	1	0.4793	9.8867	12.72%	9.6667	0.8069	1.6176	2.8485		SAMPLE				
7	0.2401	0.1695	1	0.5451	0.6526	36.24%	0.6333	0.2285	0.4615	0.4731		SAMPLE				
8	0.1593	0.1125	1	0.3924	2.8469	14.48%	3.4000	0.4830	0.7928	0.9065		SAMPLE				
9	0.2644	0.1867	1	0.5699	0.3931	50.91%	0.4000	0.2000	0.3852	0.3963		SAMPLE				
10	0.3712	0.2621	1	0.7327	0.8691	34.25%	0.8333	0.2809	0.5741	0.5968		SAMPLE				
11	0.1740	0.1228	1	0.4285	0.5487	36.42%	0.6000	0.2160	0.3872	0.3996		SAMPLE				
12	0.1756	0.1240	1	0.4326	0.6770	33.63%	0.7333	0.2357	0.4265	0.4569		SAMPLE				
13	0.1816	0.1282	1	0.4473	0.5090	39.56%	0.5333	0.2055	0.3844	0.4015		SAMPLE				
14	0.3646	0.2574	1	0.7361	0.2951	72.96%	0.2667	0.1944	0.4215	0.4241		SAMPLE				
15	0.2324	0.1641	1	0.5010	0.2304	66.30%	0.2667	0.1764	0.2987	0.3012		SAMPLE				
16	0.3254	0.2297	1	0.6423	0.1524	111.71%	0.1667	0.1856	0.3326	0.3344		MB				
17	0.2236	0.1579	1	0.4819	0.1108	112.16%	0.1333	0.1491	0.2428	0.2441	625000001.1	DUP	*	0.0%		
18	1.4249	1.0060	1	3.0712	130.9911	7.80%	24.7333	1.2893	13.3832	27.5389	625000001.1	MS			130.2899	100.5%
19	0.1941	0.1370	1	0.4406	22.2407	5.20%	26.7000	1.3379	2.1843	3.9307		LCS			26.7438	83.2%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 05-JUL-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	05:18	1	1.16E+05	115589	-2.77		
LUCAS2	EFF	05:15	1	1.32E+05	131675	-1.57		
LUCAS3	EFF	05:23	1	92842	92842	-2.83		
LUCAS4	EFF	05:12	1	1.26E+05	126322	-2.39		
LUCAS5	EFF	05:09	1	1.30E+05	129882	-2.71		
LUCAS6	EFF	05:05	1	1.30E+05	129619	-0.36		
LUCAS7	EFF	05:21	1	1.32E+05	132145	-1.7		
LUCAS8	EFF	05:00	1	1.09E+05	108686	-2.67		

Reviewed by: 
Lyndsey Pace

Date: 05-JUL-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2442108

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
625000001	SAMPLE	LXP1	LUCAS3	JUL-05-23 09:25:00	DONE	Lucas Cell	25-OCT-22 00:00
625000002	SAMPLE	LXP1	LUCAS4	JUL-05-23 09:25:00	DONE	Lucas Cell	01-FEB-23 00:00
625000003	SAMPLE	LXP1	LUCAS5	JUL-05-23 09:25:00	DONE	Lucas Cell	01-JUN-23 00:00
625000004	SAMPLE	LXP1	LUCAS6	JUL-05-23 09:25:00	DONE	Lucas Cell	01-JUL-23 00:00
625152001	SAMPLE	LXP1	LUCAS7	JUL-05-23 09:25:00	DONE	Lucas Cell	01-NOV-22 00:00
625152002	SAMPLE	LXP1	LUCAS8	JUL-05-23 09:25:00	DONE	Lucas Cell	08-APR-23 00:00
625152005	SAMPLE	LXP1	LUCAS3	JUL-05-23 09:47:00	DONE	Lucas Cell	25-OCT-22 00:00
625165001	SAMPLE	LXP1	LUCAS4	JUL-05-23 09:47:00	DONE	Lucas Cell	01-FEB-23 00:00
625165002	SAMPLE	LXP1	LUCAS5	JUL-05-23 09:47:00	DONE	Lucas Cell	01-JUN-23 00:00
625165003	SAMPLE	LXP1	LUCAS6	JUL-05-23 09:47:00	DONE	Lucas Cell	01-JUL-23 00:00
625165004	SAMPLE	LXP1	LUCAS7	JUL-05-23 09:47:00	DONE	Lucas Cell	01-NOV-22 00:00
625165005	SAMPLE	LXP1	LUCAS8	JUL-05-23 09:47:00	DONE	Lucas Cell	08-APR-23 00:00
625152003	SAMPLE	LXP1	LUCAS1	JUL-05-23 09:48:00	DONE	Lucas Cell	01-MAY-23 00:00
625152004	SAMPLE	LXP1	LUCAS2	JUL-05-23 09:48:00	DONE	Lucas Cell	01-AUG-22 00:00
1205429898	MB	LXP1	LUCAS2	JUL-05-23 10:07:00	DONE	Lucas Cell	01-AUG-22 00:00
1205429899	DUP	LXP1	LUCAS3	JUL-05-23 10:07:00	DONE	Lucas Cell	25-OCT-22 00:00
1205429900	MS	LXP1	LUCAS4	JUL-05-23 10:07:00	DONE	Lucas Cell	01-FEB-23 00:00
1205429901	LCS	LXP1	LUCAS5	JUL-05-23 10:07:00	DONE	Lucas Cell	01-JUN-23 00:00
625165006	SAMPLE	LXP1	LUCAS1	JUL-05-23 10:08:00	DONE	Lucas Cell	01-MAY-23 00:00

Data Verification & Validation Report

Lansing Board of Water & Light – Erickson Power Station

Sampling Event (dates and purpose): New Wells: MW-100ABCD – Background Round 1 – June 2023

Data Package Number: S49324.01

Lab Report Date: 07/14/2023

Data Validator: Aryka Thomson

Data Validation Completion Date: 07/24/2023

General Overall Assessment:

Data are usable without qualification.

Data are usable with qualification (as noted below).

Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	
MW-7C	
MW-8	
MW-9	
MW-10	
MW-11	
MW-11B	
MW-12	
MW-12B	
MW-13	
MW-14	
MW-15	
MW-16A	
MW-16B	
MW-16C	
MW-16D	
MW-100A	X
MW-100B	X
MW-100C	X
MW-100D	X

Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-100A	GW	S49324.01	06/05/2023	X	X	X	X	X	X	
MW-100B	GW	S49324.02	06/05/2023	X	X	X	X	X	X	
MW-100C	GW	S49324.03	06/05/2023	X	X	X	X	X	X	
MW-100D	GW	S49324.04	06/05/2023	X	X	X	X	X	X	
MWT-100B	QC	S49324.05	06/05/2023	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO₃, CO₃, hardness

Any planned sampling or analysis NOT completed? If yes, explain: _____

Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Field Data							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	X		Record of decontamination for non-dedicated sampling equipment	X			
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
Analytical Data Package							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies across samples for sulfate
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested		X		RLs for sulfate and TDS were not met
			MDLs<RLs		X		RL=MDL for carbonate
			MDLs<GPS			X	
QC Validation							
Evaluate Accuracy							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Evaluate Precision							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Rad-226 RPD 30%
Evaluate Representativeness							
Equipment Blanks (if applicable)	X		Non-detect (<RL)	X			
QC Verification							
Verify Instrument Calibration & Analytical Process							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	As, B, Li, and Mo had recoveries outside control limits
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
Evaluate Completeness (# usable measurements/ # unusable measurements)							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

TSS in MW-100C, MW-100D, and MWT-100B were qualified by the laboratory as non-detect (U) because it was detected at a level less than reporting limit, but greater than MDL.

Comments:

The RPD for Rad-226 was 30%. Rad-226 required qualification as estimated with high bias (J+) in the parent sample MW-100B and as estimated with low bias (J-) in the duplicate MWT-100B. Combined Radium 226+228 required qualification as estimated (J) in both samples.



Report ID: S49324.01(02)
Generated on 07/07/2023
Replaces report S49324.01(01) generated on 06/08/2023

Report to
Attention: Jennifer Caporale
Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

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Contacts for report questions:
John Lavery (johnlavery@meritlabs.com)
Barbara Ball (bball@meritlabs.com)

Report Summary
Lab Sample ID(s): S49324.01-S49324.06
Project: Erickson Well Project 100A-100D
Collected Date(s): 06/05/2023
Submitted Date/Time: 06/06/2023 08:38
Sampled by: Marc Wahrer
P.O. #:

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Maya Murshak
Technical Director



General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

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Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

Report Narrative

All analyses completed



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



Sample Summary (6 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S49324.01	MW-100A L306198-01	Groundwater	06/05/23 15:15
S49324.02	MW-100B L306198-02	Groundwater	06/05/23 11:29
S49324.03	MW-100C L306198-03	Groundwater	06/05/23 13:44
S49324.04	MW-100D L306198-04	Groundwater	06/05/23 15:06
S49324.05	MWT-100B L306198-05	Groundwater	06/05/23 11:29
S49324.06	Field Blank L306198-06	Water	06/05/23 09:45



Analytical Laboratory Report

Lab Sample ID: S49324.01

Sample Tag: MW-100A L306198-01

Collected Date/Time: 06/05/2023 15:15

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.3	IR
2	1L Plastic	None	Yes	2.3	IR
1	250ml Plastic	HNO3	Yes	2.3	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	06/06/23 13:49	CTV	
Metal Digestion	Completed	SW3015A	06/07/23 10:15	CCM	

Inorganics

Method: E300.0, Run Date: 06/06/23 10:45, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	10	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	35	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 06/08/23 16:06, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	450	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 06/06/23 16:50, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	390	10	8.3	mg/L	10		

Method: SM2540C, Run Date: 06/06/23 17:15, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	418	50	12	mg/L	2		

Method: SM2540D, Run Date: 06/06/23 17:15, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 06/07/23 13:50, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	

Method: E200.8, Run Date: 06/07/23 12:01, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.009	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.206	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.04	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	



Analytical Laboratory Report

Final Report

Lab Sample ID: S49324.01 (continued)

Sample Tag: MW-100A L306198-01

Method: E200.8, Run Date: 06/07/23 12:01, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.63	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.017	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.012	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 06/07/23 14:35, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	92.3	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	38.4	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	2.35	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	12.6	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 06/06/23 15:38, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 07/05/23 16:43, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Lab Sample ID: S49324.02

Sample Tag: MW-100B L306198-02

Collected Date/Time: 06/05/2023 11:29

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.3	IR
2	1L Plastic	None	Yes	2.3	IR
1	250ml Plastic	HNO3	Yes	2.3	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	06/06/23 13:49	CTV	
Metal Digestion	Completed	SW3015A	06/07/23 10:15	CCM	

Inorganics

Method: E300.0, Run Date: 06/06/23 11:48, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfate	136	10	1.0	mg/L	10	14808-79-8	

Method: E300.0, Run Date: 06/06/23 10:55, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	22	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	

Method: SM2320B, Run Date: 06/08/23 16:08, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	350	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 06/06/23 16:56, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	410	10	8.3	mg/L	10		

Method: SM2540C, Run Date: 06/06/23 17:15, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	538	50	12	mg/L	2		

Method: SM2540D, Run Date: 06/06/23 17:15, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	3	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 06/07/23 13:51, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	

Method: E200.8, Run Date: 06/07/23 12:04, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.009	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.164	0.005	0.000162	mg/L	5	7440-39-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S49324.02 (continued)

Sample Tag: MW-100B L306198-02

Method: E200.8, Run Date: 06/07/23 12:04, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.21	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	1.77	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.017	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.009	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 06/07/23 14:36, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	108	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	35.7	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	3.34	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	23.2	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 06/06/23 15:41, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 07/05/23 16:43, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Lab Sample ID: S49324.03

Sample Tag: MW-100C L306198-03

Collected Date/Time: 06/05/2023 13:44

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.3	IR
2	1L Plastic	None	Yes	2.3	IR
1	250ml Plastic	HNO3	Yes	2.3	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	06/06/23 13:49	CTV	
Metal Digestion	Completed	SW3015A	06/07/23 10:15	CCM	

Inorganics

Method: E300.0, Run Date: 06/06/23 11:05, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	14	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	27	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 06/08/23 16:10, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	310	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 06/06/23 17:14, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	200	10	8.3	mg/L	10		

Method: SM2540C, Run Date: 06/06/23 17:15, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	310	50	12	mg/L	2		

Method: SM2540D, Run Date: 06/06/23 17:15, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	1.8	3	1	mg/L	1		b

Metals

Method: E200.8, Run Date: 06/07/23 13:51, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	

Method: E200.8, Run Date: 06/07/23 12:05, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.067	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	1.54	0.04	0.00175	mg/L	5	7440-42-8	

b-Value detected less than reporting limit, but greater than MDL



Analytical Laboratory Report

Final Report

Lab Sample ID: S49324.03 (continued)

Sample Tag: MW-100C L306198-03

Method: E200.8, Run Date: 06/07/23 12:05, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.31	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.029	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.009	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 06/07/23 14:38, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	55.9	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	18.1	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	6.40	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	44.1	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 06/06/23 15:44, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 07/05/23 16:43, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S49324.04

Sample Tag: MW-100D L306198-04

Collected Date/Time: 06/05/2023 15:06

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.3	IR
2	1L Plastic	None	Yes	2.3	IR
1	250ml Plastic	HNO3	Yes	2.3	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	06/06/23 13:49	CTV	
Metal Digestion	Completed	SW3015A	06/07/23 10:15	CCM	

Inorganics

Method: E300.0, Run Date: 06/06/23 11:15, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 06/08/23 16:12, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	390	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 06/06/23 17:24, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	30	10	8.3	mg/L	10		

Method: SM2540C, Run Date: 06/06/23 17:15, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	366	50	12	mg/L	2		

Method: SM2540D, Run Date: 06/06/23 17:15, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	2.7	3	1	mg/L	1		b

Metals

Method: E200.8, Run Date: 06/07/23 13:52, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	

Method: E200.8, Run Date: 06/07/23 12:07, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.010	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	3.45	0.04	0.00175	mg/L	5	7440-42-8	

b-Value detected less than reporting limit, but greater than MDL



Analytical Laboratory Report

Final Report

Lab Sample ID: S49324.04 (continued)

Sample Tag: MW-100D L306198-04

Method: E200.8, Run Date: 06/07/23 12:07, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.24	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.031	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 06/07/23 14:39, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	7.77	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	2.03	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	4.92	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	147	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 06/06/23 15:48, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 07/05/23 16:43, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S49324.05

Sample Tag: MWT-100B L306198-05

Collected Date/Time: 06/05/2023 11:29

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.3	IR
2	1L Plastic	None	Yes	2.3	IR
1	250ml Plastic	HNO3	Yes	2.3	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	06/06/23 13:49	CTV	
Metal Digestion	Completed	SW3015A	06/07/23 10:15	CCM	

Inorganics

Method: E300.0, Run Date: 06/06/23 12:00, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfate	135	10	1.0	mg/L	10	14808-79-8	

Method: E300.0, Run Date: 06/06/23 11:25, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	22	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	

Method: SM2320B, Run Date: 06/08/23 16:14, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	360	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 06/06/23 17:32, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	410	10	8.3	mg/L	10		

Method: SM2540C, Run Date: 06/06/23 17:15, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	534	50	12	mg/L	2		

Method: SM2540D, Run Date: 06/06/23 17:15, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	2.3	3	1	mg/L	1		b

Metals

Method: E200.8, Run Date: 06/07/23 13:53, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	

Method: E200.8, Run Date: 06/07/23 12:14, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.008	0.002	0.000255	mg/L	5	7440-38-2	

b-Value detected less than reporting limit, but greater than MDL



Analytical Laboratory Report

Final Report

Lab Sample ID: S49324.05 (continued)

Sample Tag: MWT-100B L306198-05

Method: E200.8, Run Date: 06/07/23 12:14, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Barium	0.163	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.23	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	1.79	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.018	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.008	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 06/07/23 14:41, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	106	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	38.0	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	3.35	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	23.0	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 06/06/23 15:51, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 07/05/23 16:43, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Lab Sample ID: S49324.06

Sample Tag: Field Blank L306198-06

Collected Date/Time: 06/05/2023 09:45

Matrix: Water

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.3	IR
2	1L Plastic	None	Yes	2.3	IR
1	250ml Plastic	HNO3	Yes	2.3	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	06/06/23 13:49	CTV	
Metal Digestion	Completed	SW3015A	06/07/23 10:15	CCM	

Inorganics

Method: E300.0, Run Date: 06/06/23 11:35, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.03	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.04	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.26	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 06/08/23 16:18, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	

Method: SM2320B, Run Date: 06/08/23 16:16, Analyst: SSM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 06/06/23 17:36, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	8.3	mg/L	10		

Method: SM2540C, Run Date: 06/06/23 17:15, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	12	mg/L	2		

Method: SM2540D, Run Date: 06/06/23 17:15, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 06/07/23 13:49, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	

Method: E200.8, Run Date: 06/07/23 11:56, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S49324.06 (continued)

Sample Tag: Field Blank L306198-06

Method: E200.8, Run Date: 06/07/23 11:56, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 06/07/23 14:33, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 06/06/23 15:54, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 07/05/23 16:43, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

Merit Laboratories Login Checklist

Lab Set ID:S49324

Client:BWL01 (Board of Water & Light)

Project: Erickson Well Project 100A-100D

Submitted:06/06/2023 08:38 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Selection	Description	Note
Sample Receiving		
01.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples are received at 4C +/- 2C Thermometer # IR 2.3
02.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Received on ice/ cooling process begun
03.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples shipped
04.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples left in 24 hr. drop box
05.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Are there custody seals/tape or is the drop box locked
Chain of Custody		
06.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC adequately filled out
07.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC signed and relinquished to the lab
08.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sample tag on bottles match COC
09.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Subcontracting needed? Subcontracted to: GEL
Preservation		
10.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Do sample have correct chemical preservation
11.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Completed pH checks on preserved samples? (no VOAs)
12.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Did any samples need to be preserved in the lab?
Bottle Conditions		
13.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	All bottles intact
14.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Appropriate analytical bottles are used
15.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Merit bottles used
16.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sufficient sample volume received
17.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples require laboratory filtration
18.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples submitted within holding time
19.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S49324 Submitted: 06/06/2023 08:38

Client: BWL01 (Board of Water & Light)

Project: Erickson Well Project 100A-100D

Attention: Jennifer Caporale
Address: Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Initial Preservation Check: 06/06/2023 08:47 MMC

Preservation Recheck (E200.8): N/A

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S49324.01	1L Plastic HNO3	<2			
S49324.01	1L Plastic HNO3	<2			
S49324.01	250ml Plastic HNO3	<2			
S49324.02	1L Plastic HNO3	<2			
S49324.02	1L Plastic HNO3	<2			
S49324.02	250ml Plastic HNO3	<2			
S49324.03	1L Plastic HNO3	<2			
S49324.03	1L Plastic HNO3	<2			
S49324.03	250ml Plastic HNO3	<2			
S49324.04	1L Plastic HNO3	<2			
S49324.04	1L Plastic HNO3	<2			
S49324.04	250ml Plastic HNO3	<2			
S49324.05	1L Plastic HNO3	<2			
S49324.05	1L Plastic HNO3	<2			
S49324.05	250ml Plastic HNO3	<2			
S49324.06	1L Plastic HNO3	<2			
S49324.06	1L Plastic HNO3	<2			
S49324.06	250ml Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823
 Phone (517) 332-0167 Fax (517) 332-4034
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

REPORT TO

CHAIN OF CUSTODY RECORD

INVOICE TO

CONTACT NAME Jennifer Caporale
 COMPANY Lansing Board of Water and Light
 ADDRESS PO Box 13007 48901-3007
 CITY Lansing STATE Mi ZIP CODE 48901
 PHONE NO. 517-702-6372 FAX NO. _____ P.O. NO. _____
 E-MAIL ADDRESS Environmental_Laboratory@lbwl.com QUOTE NO. _____

CONTACT NAME Beth Zimpfer SAME
 COMPANY _____
 ADDRESS _____
 CITY _____ STATE _____ ZIP CODE _____
 PHONE NO. _____ E-MAIL ADDRESS Beth.Zimpfer@lbwl.com

PROJECT NO./NAME Erickson Well Project 100A-100D SAMPLER(S) - PLEASE PRINT/SIGN NAME Marc Wahrer
 TURNAROUND TIME REQUIRED 1 DAY 2 DAYS 3 DAYS STANDARD OTHER ASAP
 DELIVERABLES REQUIRED STD LEVEL II LEVEL III LEVEL IV EDD OTHER _____

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE
 # Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO ₃	H ₂ SO ₄	NaOH	MeOH	OTHER	Total Metals	F- undissisted, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO ₃ , CO ₃ , Hardness	Certifications		Project Locations		Special Instructions
	DATE	TIME																	<input type="checkbox"/> OHIO VAP	<input type="checkbox"/> Drinking Water	<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES	
49324.01	06/5/23	1515	MW-100A L306198-01	GW	5	2	3						✓	✓	✓	✓	✓	✓					Metals to analyse:Na, Mg, K
.02		1129	MW-100B L306198-02	GW	5	2	3						✓	✓	✓	✓	✓	✓					B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03		1344	MW-100C L306198-03	GW	5	2	3						✓	✓	✓	✓	✓	✓					Co, Li, Hg, Mo,Pb,Se, Tl,
.04		1506	MW100D L306198-04	GW	5	2	3						✓	✓	✓	✓	✓	✓					Fe, Cu, Ni, Ag, V, Zn
.05		1129	MWT-100B L306198-05	GW	5	2	3						✓	✓	✓	✓	✓	✓					Please send a preliminary report
06		0945	Field Blank L306198-06	DI	5	2	3						✓	✓	✓	✓	✓	✓					

RELINQUISHED BY: Julie Shell Sampler DATE 6/6/23 TIME 0838
 RECEIVED BY: Johanna Murray DATE 6/16/23 TIME 0838
 RELINQUISHED BY: _____ DATE _____ TIME _____
 RECEIVED BY: _____ DATE _____ TIME _____

RELINQUISHED BY: _____ DATE _____ TIME _____
 RECEIVED BY: _____ DATE _____ TIME _____
 SEAL NO. _____ SEAL INTACT YES NO INITIALS _____
 SEAL NO. _____ SEAL INTACT YES NO INITIALS _____
 NOTES: TEMP. ON ARRIVAL 2.3

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total		250 mL plastic	mg/L	Nitric Acid	200.8	6mos	0.150
Be, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005



July 03, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 625165
SDG: S49324

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on June 08, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S49324
Work Order: 625165**

July 03, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on June 08, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

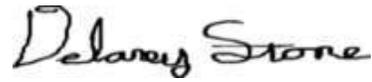
Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
625165001	S49324.01
625165002	S49324.02
625165003	S49324.03
625165004	S49324.04
625165005	S49324.05
625165006	S49324.06 Field Blank

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Delaney Stone". The signature is written in a cursive, slightly slanted style.

Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

SAMPLE RECEIPT & REVIEW FORM

Client: <u>MEPI</u>		SDG/AR/COC/Work Order: <u>625-165</u>	
Received By: <u>QG</u>		Date Received: <u>6/8/23</u>	
Carrier and Tracking Number		Circle Applicable: FedEx Express FedEx Ground <u>UPS</u> Field Services Courier Other	
		<u>12 464 427 03 6334 4484</u>	
Suspected Hazard Information		Yes	No
A) Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
B) Did the client designate the samples are to be received as radioactive?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
C) Did the RSO classify the samples as radioactive?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
D) Did the client designate samples are hazardous?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
E) Did the RSO identify possible hazards?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Sample Receipt Criteria		Yes	No
Comments/Qualifiers (Required for Non-Conforming Items)			
1	Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4	Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
5	Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6	Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
7	Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
8	Samples received within holding time?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
12	Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
13	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Comments (Use Continuation Form if needed):			

PM (or PMA) review: Initials Am Date 6/8/23 Page 1 of 1

Laboratory Certifications

List of current GEL Certifications as of 03 July 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S49324
Work Order #: 625165**

Product: Radium-226+Radium-228 Calculation

Analytical Method: Calculation

Analytical Procedure: GL-RAD-D-003 REV# 45

Analytical Batch: 2448593

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
625165001	S49324.01
625165002	S49324.02
625165003	S49324.03
625165004	S49324.04
625165005	S49324.05
625165006	S49324.06 Field Blank

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2442121

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
625165001	S49324.01
625165002	S49324.02
625165003	S49324.03
625165004	S49324.04
625165005	S49324.05
625165006	S49324.06 Field Blank
1205429934	Method Blank (MB)
1205429935	625000001(S49283.01) Sample Duplicate (DUP)
1205429936	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2442108

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
625165001	S49324.01
625165002	S49324.02
625165003	S49324.03
625165004	S49324.04
625165005	S49324.05
625165006	S49324.06 Field Blank
1205429898	Method Blank (MB)
1205429899	625000001(S49283.01) Sample Duplicate (DUP)
1205429900	625000001(S49283.01) Matrix Spike (MS)
1205429901	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

The matrix spike, 1205429900 (S49283.01MS), aliquot was reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

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Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S49324 GEL Work Order: 625165

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 06 JUL 2023

Title: Analyst III - Data Validator

Sample Data Summary

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: July 5, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S49324.01 Project: MERI00120
Sample ID: 625165001 Client ID: MERI001
Matrix: Ground Water
Collect Date: 05-JUN-23 15:15
Receive Date: 08-JUN-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.64	+/-1.38	2.24	3.00	pCi/L		JE1	06/27/23	1458	2442121		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		2.50	+/-1.49			pCi/L		1 LXB3	07/05/23	1643	2448593		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.869	+/-0.574	0.733	1.00	pCi/L		LXP1	07/05/23	0947	2442108		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			77.9	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: July 5, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive
 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S49324.02	Project: MERI00120
Sample ID: 625165002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 05-JUN-23 11:29	
Receive Date: 08-JUN-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.61	+/-1.36	2.22	3.00	pCi/L			JE1	06/27/23	1458	2442121	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		2.16	+/-1.42			pCi/L		1	LXB3	07/05/23	1643	2448593	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.549	+/-0.387	0.429	1.00	pCi/L			LXP1	07/05/23	0947	2442108	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			83.9	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: July 5, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S49324.03 Project: MERI00120
Sample ID: 625165003 Client ID: MERI001
Matrix: Ground Water
Collect Date: 05-JUN-23 13:44
Receive Date: 08-JUN-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	-0.307	+/-0.771	1.57	3.00	pCi/L			JE1	06/27/23	1458	2442121	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.677	+/-0.881			pCi/L		1	LXB3	07/05/23	1643	2448593	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.677	+/-0.427	0.433	1.00	pCi/L			LXP1	07/05/23	0947	2442108	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			87.1	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: July 5, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S49324.04 Project: MERI00120
Sample ID: 625165004 Client ID: MERI001
Matrix: Ground Water
Collect Date: 05-JUN-23 15:06
Receive Date: 08-JUN-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		4.56	+/-1.38	1.67	3.00	pCi/L		JE1	06/27/23	1458	2442121	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		5.06	+/-1.43			pCi/L		1 LXB3	07/05/23	1643	2448593	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.509	+/-0.384	0.447	1.00	pCi/L		LXP1	07/05/23	0947	2442108	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			86.2	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: July 5, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S49324.05	Project: MERI00120
Sample ID: 625165005	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 05-JUN-23 11:29	
Receive Date: 08-JUN-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.50	+/-1.10	1.73	3.00	pCi/L		JE1	06/27/23	1458	2442121		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.80	+/-1.18			pCi/L		1	LXB3	07/05/23	1643	2448593	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.295	+/-0.422	0.736	1.00	pCi/L		LXP1	07/05/23	0947	2442108		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			84.2	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: July 5, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S49324.06 Field Blank	Project: MERI00120
Sample ID: 625165006	Client ID: MERI001
Matrix: Water	
Collect Date: 05-JUN-23 09:45	
Receive Date: 08-JUN-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.675	+/-1.28	2.25	3.00	pCi/L		JE1	06/27/23	1459	2442121		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.905	+/-1.32			pCi/L		1	LXB3	07/05/23	1643	2448593	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.230	+/-0.299	0.501	1.00	pCi/L		LXP1	07/05/23	1008	2442108		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			74	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Quality Control Data

GEL LABORATORIES LLC

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QC Summary

Report Date: July 5, 2023

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Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan
Contact: John Laverty

Workorder: 625165

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2442121										
QC1205429935	625000001	DUP									
Radium-228	U	0.601	U	0.161	pCi/L	N/A		N/A	JE1	06/27/23	14:58
	Uncertainty	+/-1.41		+/-0.951							
QC1205429936	LCS										
Radium-228	81.2			77.2	pCi/L		95.1	(75%-125%)		06/27/23	14:57
	Uncertainty			+/-4.33							
QC1205429934	MB										
Radium-228			U	-0.382	pCi/L					06/27/23	14:58
	Uncertainty			+/-0.883							
Rad Ra-226											
Batch	2442108										
QC1205429899	625000001	DUP									
Radium-226	U	0.275	U	0.111	pCi/L	N/A		N/A	LXP1	07/05/23	10:07
	Uncertainty	+/-0.311		+/-0.243							
QC1205429901	LCS										
Radium-226	26.7			22.2	pCi/L		83.2	(75%-125%)		07/05/23	10:07
	Uncertainty			+/-2.18							
QC1205429898	MB										
Radium-226			U	0.152	pCi/L					07/05/23	10:07
	Uncertainty			+/-0.333							
QC1205429900	625000001	MS									
Radium-226	130 U	0.275		131	pCi/L		101	(75%-125%)		07/05/23	10:07
	Uncertainty	+/-0.311		+/-13.4							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- H Analytical holding time was exceeded
- < Result is less than value reported
- > Result is greater than value reported

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QC Summary

Workorder: 625165

Page 2 of 2

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
NI											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2442121 Check-list

This check-list was completed on 28-JUN-23 by Rhonda Birch

This batch was reviewed by Kenshalla Oston on 28-JUN-23 and Rhonda Birch on 28-JUN-23.

Batch ID:
2442121

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2442121
Analyst: Jacqueline Winston (JE1)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: SP-C018367602

Due Dates for Lab: 03-JUL-2023 **Package:** 05-JUL-2023 **SDG:** 06-JUL-2023

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205429936	228	2051-B	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	625000001	14-JUN-2023	3	300.8	300.8	06/15/23 16:44	06/27/23 12:28
2	625000002	14-JUN-2023	3	302.4	302.4	06/15/23 16:44	06/27/23 12:28
3	625000003	14-JUN-2023	3	301.5	301.5	06/15/23 16:44	06/27/23 12:28
4	625000004	14-JUN-2023	3	301.4	301.4	06/15/23 16:44	06/27/23 12:28
5	625165001	14-JUN-2023	3	300.1	300.1	06/15/23 16:44	06/27/23 12:28
6	625165002	14-JUN-2023	3	302.5	302.5	06/15/23 16:44	06/27/23 12:28
7	625165003	14-JUN-2023	3	303.2	303.2	06/15/23 16:44	06/27/23 12:28
8	625165004	14-JUN-2023	3	301.3	301.3	06/15/23 16:44	06/27/23 12:28
9	625165005	14-JUN-2023	3	301.2	301.2	06/15/23 16:44	06/27/23 12:28
10	625165006	14-JUN-2023	3	300.8	300.8	06/15/23 16:44	06/27/23 12:28
11	1205429934 MB	14-JUN-2023	3		303.2	06/15/23 16:44	06/27/23 12:28
12	1205429935 DUP (625000001)	14-JUN-2023	3	302.5	302.5	06/15/23 16:44	06/27/23 12:28
13	1205429936 LCS	14-JUN-2023	3		303.2	06/15/23 16:44	06/27/23 12:28

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-E	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 14-JUN-2023 00:00
REGNT 3924648	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3924633	RGF-1M Citric Acid	5 mL	
REGNT 3922885	2M HCl	20 mL	
REGNT 3916775	RGF-7M Nitric Acid	25 mL	
REGNT DGA051823	2432690	2 g	
REGNT 3885305.13	RGF-Hydrofluoric Acid	4 mL	
REGNT 3528714	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3887517	RGF-Neodymium Substrate	5 mL	
REGNT 3919982.4	Nitric Acid	5 mL	
REGNT 3920979	Barium Carrier Ra228 REG	1 mL	
REGNT 3923368	RGF-50% Potassium Carbonate	2 mL	
REGNT 3919381	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 1951-E
 Tracer Exp Date : 9/16/2023
 Tracer Volume Added: 0.10

Batch : 2442121
 Analyst : JAC02417
 Prep Date : 6/14/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 3 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	625000001.1	0.3008	1.8473E-05	6/2/2023 11:06	1140.6	1.71%	993.1	1.83%	0.1	0.000200
2	625000002.1	0.3024	1.8500E-05	6/2/2023 13:31	1140.6	1.71%	975.9	1.85%	0.1	0.000200
3	625000003.1	0.3015	1.8484E-05	6/2/2023 11:06	1140.6	1.71%	1007.3	1.82%	0.1	0.000200
4	625000004.1	0.3014	1.8483E-05	6/2/2023 10:29	1140.6	1.71%	913.0	1.91%	0.1	0.000200
5	625165001.1	0.3001	1.8461E-05	6/5/2023 15:15	1140.6	1.71%	888.2	1.94%	0.1	0.000200
6	625165002.1	0.3025	1.8501E-05	6/5/2023 11:29	1140.6	1.71%	957.2	1.87%	0.1	0.000200
7	625165003.1	0.3032	1.8513E-05	6/5/2023 13:44	1140.6	1.71%	992.9	1.83%	0.1	0.000200
8	625165004.1	0.3013	1.8481E-05	6/5/2023 15:06	1140.6	1.71%	983.5	1.84%	0.1	0.000200
9	625165005.1	0.3012	1.8479E-05	6/5/2023 11:29	1140.6	1.71%	960.2	1.86%	0.1	0.000200
10	625165006.1	0.3008	1.8473E-05	6/5/2023 9:45	1140.6	1.71%	843.9	1.99%	0.1	0.000200
11	1205429934.1	0.3032	1.8513E-05	6/14/2023 0:00	1140.6	1.71%	955.8	1.87%	0.1	0.000200
12	1205429935.1	0.3025	1.8501E-05	6/2/2023 11:06	1140.6	1.71%	970.7	1.85%	0.1	0.000200
13	1205429936.1	0.3032	1.8513E-05	6/14/2023 0:00	1140.6	1.71%	1009.5	1.82%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
			Alpha	Beta										
1	1A	70	28	106	1.514	6/27/2023 14:58	6/15/2023 16:44	6/27/2023 12:28	0.992	0.754	1.000	1.067	87.1%	2.52%
2	1C	60	7	50	0.833	6/27/2023 14:58	6/15/2023 16:44	6/27/2023 12:28	0.992	0.754	1.000	1.057	85.6%	2.54%
3	2A	60	9	84	1.400	6/27/2023 14:58	6/15/2023 16:44	6/27/2023 12:28	0.992	0.754	1.000	1.057	88.3%	2.51%
4	2C	60	9	102	1.700	6/27/2023 14:58	6/15/2023 16:44	6/27/2023 12:28	0.992	0.754	1.000	1.057	80.0%	2.58%
5	2D	60	6	85	1.417	6/27/2023 14:58	6/15/2023 16:44	6/27/2023 12:28	0.993	0.754	1.000	1.057	77.9%	2.60%
6	3C	60	12	99	1.650	6/27/2023 14:58	6/15/2023 16:44	6/27/2023 12:28	0.993	0.754	1.000	1.057	83.9%	2.55%
7	4A	60	12	31	0.517	6/27/2023 14:58	6/15/2023 16:44	6/27/2023 12:28	0.993	0.753	1.000	1.057	87.1%	2.52%
8	4D	60	19	116	1.933	6/27/2023 14:58	6/15/2023 16:44	6/27/2023 12:28	0.993	0.753	1.000	1.057	86.2%	2.53%
9	6A	60	13	69	1.150	6/27/2023 14:58	6/15/2023 16:44	6/27/2023 12:28	0.993	0.753	1.000	1.057	84.2%	2.54%
10	6C	60	14	65	1.083	6/27/2023 14:59	6/15/2023 16:44	6/27/2023 12:28	0.993	0.753	1.000	1.057	74.0%	2.64%
11	7A	60	5	40	0.667	6/27/2023 14:58	6/15/2023 16:44	6/27/2023 12:28	0.996	0.754	1.000	1.057	83.8%	2.55%
12	9A	60	8	50	0.833	6/27/2023 14:58	6/15/2023 16:44	6/27/2023 12:28	0.992	0.754	1.000	1.057	85.1%	2.54%
13	11B	60	7	1304	21.733	6/27/2023 14:57	6/15/2023 16:44	6/27/2023 12:28	0.996	0.755	1.000	1.057	88.5%	2.51%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2023	5/31/2024	0.5320	0.00738	1.384	6/23/2023 17:49	500
2	PIC	6/1/2023	5/31/2024	0.6077	0.00847	0.860	6/23/2023 17:49	500
3	PIC	6/1/2023	5/31/2024	0.6083	0.01914	1.150	6/23/2023 17:49	500
4	PIC	6/1/2023	5/31/2024	0.6085	0.01274	1.594	6/23/2023 17:49	500
5	PIC	6/1/2023	5/31/2024	0.6206	0.00745	1.044	6/23/2023 17:49	500
6	PIC	6/1/2023	5/31/2024	0.6245	0.00988	1.248	6/23/2023 17:50	500
7	PIC	6/1/2023	5/31/2024	0.6074	0.01123	0.594	6/23/2023 17:50	500
8	PIC	6/1/2023	5/31/2024	0.6412	0.00773	0.742	6/23/2023 17:50	500
9	PIC	6/1/2023	5/31/2024	0.6444	0.02228	0.764	6/23/2023 17:51	500
10	PIC	6/1/2023	5/31/2024	0.6167	0.01970	0.938	6/23/2023 17:51	500
11	PIC	6/1/2023	5/31/2024	0.6229	0.00594	0.762	6/23/2023 17:51	500
12	PIC	6/1/2023	5/31/2024	0.6343	0.00758	0.792	6/23/2023 17:52	500
13	PIC	6/1/2023	5/31/2024	0.6453	0.00697	0.646	6/23/2023 17:51	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

* - RPD changed to 0% due to sample & dup activity below MDA

LCS S/N : 2051-B
LCS Exp Date : 3/27/2024
LCS Activity (dpm/ml): 546.65
LCS Volume Added: 0.10

Results														2 SIGMA		2 SIGMA	
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery	
1	1.6138	1.1393	3	2.4764	0.6010	119.92%	0.1303	0.1562	1.4124	1.4206		SAMPLE					
2	1.1960	0.8444	3	1.8914	-0.1080	468.52%	-0.0267	0.1249	0.9921	0.9922		SAMPLE					
3	1.3427	0.9480	3	2.0926	0.9833	64.12%	0.2500	0.1601	1.2343	1.2597		SAMPLE					
4	1.7446	1.2317	3	2.6805	0.4601	167.52%	0.1060	0.1775	1.5105	1.5151		SAMPLE					
5	1.4278	1.0080	3	2.2355	1.6359	43.10%	0.3727	0.1603	1.3792	1.4405		SAMPLE					
6	1.4285	1.0085	3	2.2179	1.6147	43.17%	0.4020	0.1732	1.3635	1.4240		SAMPLE					
7	0.9747	0.6881	3	1.5749	-0.3072	128.03%	-0.0773	0.0990	0.7708	0.7709		SAMPLE					
8	1.0485	0.7402	3	1.6716	4.5551	15.64%	1.1913	0.1836	1.3759	1.7973		SAMPLE					
9	1.0849	0.7659	3	1.7268	1.5050	37.42%	0.3860	0.1439	1.0993	1.1655		SAMPLE					
10	1.4312	1.0104	3	2.2529	0.6746	97.20%	0.1453	0.1412	1.2845	1.2961		SAMPLE					
11	1.1137	0.7863	3	1.7730	-0.3821	117.94%	-0.0953	0.1124	0.8830	0.8832		MB					
12	1.1048	0.7800	3	1.7549	0.1612	300.96%	0.0413	0.1244	0.9507	0.9516	625000001.1	DUP	* 0.0%				
13	0.9367	0.6613	3	1.5056	77.1963	3.87%	21.0873	0.6029	4.3261	20.0591		LCS			81.2135	95.1%	

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
625000001	1A	70	28	106	6/27/2023 14:58	6/27/2023 16:08	PIC	2442121
625000002	1C	60	7	50	6/27/2023 14:58	6/27/2023 15:58	PIC	2442121
625000003	2A	60	9	84	6/27/2023 14:58	6/27/2023 15:58	PIC	2442121
625000004	2C	60	9	102	6/27/2023 14:58	6/27/2023 15:58	PIC	2442121
625165001	2D	60	6	85	6/27/2023 14:58	6/27/2023 15:58	PIC	2442121
625165002	3C	60	12	99	6/27/2023 14:58	6/27/2023 15:58	PIC	2442121
625165003	4A	60	12	31	6/27/2023 14:58	6/27/2023 15:58	PIC	2442121
625165004	4D	60	19	116	6/27/2023 14:58	6/27/2023 15:58	PIC	2442121
625165005	6A	60	13	69	6/27/2023 14:58	6/27/2023 15:58	PIC	2442121
625165006	6C	60	14	65	6/27/2023 14:59	6/27/2023 15:59	PIC	2442121
1205429934	7A	60	5	40	6/27/2023 14:58	6/27/2023 15:58	PIC	2442121
1205429935	9A	60	8	50	6/27/2023 14:58	6/27/2023 15:58	PIC	2442121
1205429936	11B	60	7	1304	6/27/2023 14:57	6/27/2023 15:57	PIC	2442121

ASSAY 27-Jun-23 12:58:42
 Wizard 2480 s/n 46190630
 Protocol id 8 Ba-133
 Time limit
 Count limit
 Isotope Ba-133
 Protocol date 6/27/2023
 Run id. 6856

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	87	1	180	3422.57	1140.59	1.71	12:58:42
625000001	2	87	2	180	2980	993.13	1.83	87.07	01:01:56
625000002	3	87	3	180	2928.28	975.86	1.85	85.56	01:05:10
625000003	4	87	4	180	3022.57	1007.34	1.82	88.32	01:08:24
625000004	5	87	5	180	2739.57	913.02	1.91	80.05	01:11:38
625165001	1	10	1	180	2665.28	888.21	1.94	77.87	01:15:14
625165002	2	10	2	180	2872	957.15	1.87	83.92	01:18:28
625165003	3	10	3	180	2979.28	992.9	1.83	87.05	01:21:42
625165004	4	10	4	180	2951	983.48	1.84	86.23	01:24:56
625165005	5	10	5	180	2881	960.18	1.86	84.18	01:28:10
625165006	1	11	1	180	2532.28	843.93	1.99	73.99	01:31:47
1205429934	2	11	2	180	2868	955.81	1.87	83.80	01:35:01
1205429935	3	11	3	180	2913	970.74	1.85	85.11	01:38:15
1205429936	4	11	4	180	3029	1009.48	1.82	88.51	01:41:29

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 27-Jun-2023

Detectors LB4100 E1 through H4 and PIC 1A through 14D and G5400W 1W through 1Z and LB4200 GA1 through OD4

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E2	Above	Alpha eff	27-Jun 04:18	5	9879	6589	9855	+3.04
LB4100E2	Above	Beta bkg	27-Jun 04:39	60	2.333	1.385	3.072	+0.37
LB4100E2	need 2nd	Beta eff	27-Jun 04:25	5	14131	14120	15200	-2.94
LB4100F1	Above	Beta bkg	27-Jun 04:39	60	6.983	0.188	2.691	+13.29
LB4100F2	Below	Alpha eff	27-Jun 04:18	5	6399	6533	7372	-3.96
LB4100F2	Above	Alpha XTalk	27-Jun 04:18	5	0.366	0.318	0.366	+3.10
LB4100F2	Above	Beta bkg	27-Jun 04:39	60	4.800	1.173	1.833	+29.97
LB4100F2	need 2nd	Beta eff	27-Jun 04:26	5	15192	15040	15710	-1.64
LB4100F3	Above	Beta bkg	27-Jun 06:33	60	2.033	0.469	2.435	+1.77
LB4100F4	Above	Beta bkg	27-Jun 04:39	60	2.667	-7.15E-2	3.199	+2.02
LB4100G1	Below	Alpha eff	27-Jun 04:26	5	5894	7975	12090	-6.03
LB4100G1	Above	Alpha XTalk	27-Jun 04:26	5	0.635	0.088	0.447	+6.14
LB4100G1	Above	Beta bkg	27-Jun 04:41	60	1388	0.380	1.675	+6,428.51
LB4100G2	Above	Alpha XTalk	27-Jun 04:26	5	0.429	0.236	0.424	+3.16
LB4100G3	Above	Alpha XTalk	27-Jun 04:26	5	0.402	0.275	0.391	+3.54
LB4100G3	Above	Beta bkg	27-Jun 04:41	60	2.633	0.987	2.738	+2.64
LB4100G4	Below	Alpha eff	27-Jun 04:26	5	7839	9065	10710	-7.47
LB4100G4	Above	Alpha XTalk	27-Jun 04:26	5	0.318	0.222	0.274	+8.17
PIC1B	Above	Alpha bkg	27-Jun 07:24	60	0.333	-8.32E-2	0.284	+3.81
PIC1B	Above	Beta XTalk	27-Jun 06:39	5	6.58E-4	1.46E-4	5.83E-4	+4.02
PIC8C	Above	Alpha bkg	27-Jun 07:25	60	0.617	-1.90E-2	0.413	+5.82
PIC8C	Above	Beta bkg	27-Jun 07:25	60	3.017	0.415	2.497	+4.50
PIC10D	Above	Beta bkg	27-Jun 04:53	60	2.417	-5.50E-2	2.427	+2.98
PIC11A	Above	Alpha bkg	27-Jun 07:37	60	0.617	-3.66E-2	0.395	+6.09
PIC11A	Above	Beta bkg	27-Jun 07:37	60	2.033	0.015	2.252	+2.41
PIC14A	Above	Alpha XTalk	27-Jun 08:45	5	0.300	0.256	0.294	+4.02

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

PIC4B

Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by Jasmine Conley

Date 6/27/23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2442121

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205429936	LCS	JE1	PIC11B	JUN-27-23 14:57:46	DONE	25mm Filter	01-JUN-23 00:00
1205429934	MB	JE1	PIC7A	JUN-27-23 14:58:08	DONE	25mm Filter	01-JUN-23 00:00
1205429935	DUP	JE1	PIC9A	JUN-27-23 14:58:12	DONE	25mm Filter	01-JUN-23 00:00
625000001	SAMPLE	JE1	PIC1A	JUN-27-23 14:58:17	DONE	25mm Filter	01-JUN-23 00:00
625000002	SAMPLE	JE1	PIC1C	JUN-27-23 14:58:23	DONE	25mm Filter	01-JUN-23 00:00
625000003	SAMPLE	JE1	PIC2A	JUN-27-23 14:58:26	DONE	25mm Filter	01-JUN-23 00:00
625000004	SAMPLE	JE1	PIC2C	JUN-27-23 14:58:32	DONE	25mm Filter	01-JUN-23 00:00
625165001	SAMPLE	JE1	PIC2D	JUN-27-23 14:58:36	DONE	25mm Filter	01-JUN-23 00:00
625165002	SAMPLE	JE1	PIC3C	JUN-27-23 14:58:39	DONE	25mm Filter	01-JUN-23 00:00
625165003	SAMPLE	JE1	PIC4A	JUN-27-23 14:58:45	DONE	25mm Filter	01-JUN-23 00:00
625165004	SAMPLE	JE1	PIC4D	JUN-27-23 14:58:51	DONE	25mm Filter	01-JUN-23 00:00
625165005	SAMPLE	JE1	PIC6A	JUN-27-23 14:58:54	DONE	25mm Filter	01-JUN-23 00:00
625165006	SAMPLE	JE1	PIC6C	JUN-27-23 14:59:00	DONE	25mm Filter	01-JUN-23 00:00

Lucas Cell Raw Data

Batch 2442108 Check-list

This check-list was completed on 05-JUL-23 by Lyndsey Pace

This batch was reviewed by Gregory Ramsay on 05-JUL-23 and Lyndsey Pace on 05-JUL-23.

Batch ID:
2442108

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2442108
Analyst: Lyndsey Pace (LXP1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: BAL-C236871727

Due Dates for Lab: 03-JUL-2023			Package: 05-JUL-2023		SDG: 06-JUL-2023	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205429901	Radium-226 SPIKE	1715-G	.1	mL	
MS	1205429900	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	625000001	29-JUN-2023	1	500.28	500.28	06/30/23 08:36	303	07/05/23 05:52	07/05/23 09:25	3	6
2	625000002	29-JUN-2023	1	500.73	500.73	06/30/23 08:36	402	07/05/23 05:52	07/05/23 09:25	7	16
3	625000003	29-JUN-2023	1	500.07	500.07	06/30/23 08:36	505	07/05/23 05:52	07/05/23 09:25	5	7
4	625000004	29-JUN-2023	1	500.34	500.34	06/30/23 08:36	601	07/05/23 05:52	07/05/23 09:25	3	6
5	625152001	29-JUN-2023	1	500.58	500.58	06/30/23 08:36	707	07/05/23 05:52	07/05/23 09:25	4	19
6	625152002	29-JUN-2023	1	500.09	500.09	06/30/23 08:36	805	07/05/23 05:52	07/05/23 09:25	2	146
7	625152003	29-JUN-2023	1	500.23	500.23	06/30/23 08:36	106	07/05/23 06:18	07/05/23 09:48	3	11
8	625152004	29-JUN-2023	1	500.16	500.16	06/30/23 08:36	206	07/05/23 06:18	07/05/23 09:48	2	52
9	625152005	29-JUN-2023	1	500.83	500.83	06/30/23 08:36	308	07/05/23 06:18	07/05/23 09:47	4	8
10	625165001	29-JUN-2023	1	500.08	500.08	06/30/23 08:36	403	07/05/23 06:18	07/05/23 09:47	7	16
11	625165002	29-JUN-2023	1	500.87	500.87	06/30/23 08:36	501	07/05/23 06:18	07/05/23 09:47	2	10
12	625165003	29-JUN-2023	1	500.5	500.5	06/30/23 08:36	602	07/05/23 06:18	07/05/23 09:47	2	12
13	625165004	29-JUN-2023	1	500.9	500.9	06/30/23 08:36	703	07/05/23 06:18	07/05/23 09:47	2	9
14	625165005	29-JUN-2023	1	500.22	500.22	06/30/23 08:36	801	07/05/23 06:18	07/05/23 09:47	6	7
15	625165006	29-JUN-2023	1	500.62	500.62	06/30/23 08:36	101	07/05/23 06:44	07/05/23 10:08	4	6
16	1205429898 MB	29-JUN-2023	1		500.9	06/30/23 08:36	201	07/05/23 06:44	07/05/23 10:07	7	6
17	1205429899 DUP (625000001)	29-JUN-2023	1	500.2	500.2	06/30/23 08:36	304	07/05/23 06:44	07/05/23 10:07	4	4
18	1205429900 MS (625000001)	29-JUN-2023	1	102.82	102.82	06/30/23 08:36	407	07/05/23 06:44	07/05/23 10:07	4	373
19	1205429901 LCS	29-JUN-2023	1		500.9	06/30/23 08:36	506	07/05/23 06:44	07/05/23 10:07	3	402

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 29-JUN-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Procedure Code : LUC26RAL
 Parmname : Radium-226
 Required MDA : 1 pCi/L
 Halflife of Ra-226 : 1600 years
 Ra-226 Abundance : 1.00
 Halflife of Rn-222 : 3.8235 days

Batch : 2442108
 Analyst : LIN01615
 Prep Date : 6/29/2023
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	625000001.1	0.5003	2.0257E-05	6/2/2023 11:06	303	15	6	0.400	3	0.100	30	1.7210
2	625000002.1	0.5007	2.0259E-05	6/2/2023 13:31	402	15	16	1.067	7	0.233	30	1.4980
3	625000003.1	0.5001	2.0256E-05	6/2/2023 11:06	505	15	7	0.467	5	0.167	30	1.7470
4	625000004.1	0.5003	2.0257E-05	6/2/2023 10:29	601	15	6	0.400	3	0.100	30	1.8870
5	625152001.1	0.5006	2.0258E-05	6/7/2023 8:00	707	15	19	1.267	4	0.133	30	1.7280
6	625152002.1	0.5001	2.0256E-05	6/7/2023 7:44	805	15	146	9.733	2	0.067	30	1.5410
7	625152003.1	0.5002	2.0257E-05	6/7/2023 7:17	106	15	11	0.733	3	0.100	30	1.5250
8	625152004.1	0.5002	2.0257E-05	6/7/2023 6:55	206	15	52	3.467	2	0.067	30	1.8770
9	625152005.1	0.5008	2.0259E-05	6/7/2023 6:31	308	15	8	0.533	4	0.133	30	1.5970
10	625165001.1	0.5001	2.0256E-05	6/5/2023 15:15	403	15	16	1.067	7	0.233	30	1.5070
11	625165002.1	0.5009	2.0259E-05	6/5/2023 11:29	501	15	10	0.667	2	0.067	30	1.7160
12	625165003.1	0.5005	2.0258E-05	6/5/2023 13:44	602	15	12	0.800	2	0.067	30	1.7010
13	625165004.1	0.5009	2.0260E-05	6/5/2023 15:06	703	15	9	0.600	2	0.067	30	1.6440
14	625165005.1	0.5002	2.0257E-05	6/5/2023 11:29	801	15	7	0.467	6	0.200	30	1.4200
15	625165006.1	0.5006	2.0258E-05	6/5/2023 9:45	101	15	6	0.400	4	0.133	30	1.8120
16	1205429898.1	0.5009	2.0260E-05	6/29/2023 0:00	201	15	6	0.400	7	0.233	30	1.7110
17	1205429899.1	0.5002	2.0257E-05	6/2/2023 11:06	304	15	4	0.267	4	0.133	30	1.8850
18	1205429900.1	0.1028	1.1542E-05	6/2/2023 11:06	407	15	373	24.867	4	0.133	30	1.4390
19	1205429901.1	0.5009	2.0260E-05	6/29/2023 0:00	506	15	402	26.800	3	0.100	30	1.8780

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
7.400%	10/25/2022	10/31/2023	6/30/2023 8:36	7/5/2023 5:52	7/5/2023 9:25	0.588	0.974	1.001	1.000
5.300%	2/1/2023	1/31/2024	6/30/2023 8:36	7/5/2023 5:52	7/5/2023 9:25	0.588	0.974	1.001	1.000
8.200%	6/1/2023	5/31/2024	6/30/2023 8:36	7/5/2023 5:52	7/5/2023 9:25	0.588	0.974	1.001	1.000
6.700%	7/1/2023	6/30/2024	6/30/2023 8:36	7/5/2023 5:52	7/5/2023 9:25	0.588	0.974	1.001	1.000
2.200%	11/1/2022	10/31/2023	6/30/2023 8:36	7/5/2023 5:52	7/5/2023 9:25	0.588	0.974	1.001	1.000
9.600%	4/8/2023	3/31/2024	6/30/2023 8:36	7/5/2023 5:52	7/5/2023 9:25	0.588	0.974	1.001	1.000
3.400%	5/1/2023	4/30/2024	6/30/2023 8:36	7/5/2023 6:18	7/5/2023 9:48	0.589	0.974	1.001	1.000
2.800%	8/1/2022	7/31/2023	6/30/2023 8:36	7/5/2023 6:18	7/5/2023 9:48	0.589	0.974	1.001	1.000
9.600%	10/25/2022	10/31/2023	6/30/2023 8:36	7/5/2023 6:18	7/5/2023 9:47	0.589	0.974	1.001	1.000
6.100%	2/1/2023	1/31/2024	6/30/2023 8:36	7/5/2023 6:18	7/5/2023 9:47	0.589	0.974	1.001	1.000
5.500%	6/1/2023	5/31/2024	6/30/2023 8:36	7/5/2023 6:18	7/5/2023 9:47	0.589	0.974	1.001	1.000
9.900%	7/1/2023	6/30/2024	6/30/2023 8:36	7/5/2023 6:18	7/5/2023 9:47	0.589	0.974	1.001	1.000
9.000%	11/1/2022	10/31/2023	6/30/2023 8:36	7/5/2023 6:18	7/5/2023 9:47	0.589	0.974	1.001	1.000
3.200%	4/8/2023	3/31/2024	6/30/2023 8:36	7/5/2023 6:18	7/5/2023 9:47	0.589	0.974	1.001	1.000
4.500%	5/1/2023	4/30/2024	6/30/2023 8:36	7/5/2023 6:44	7/5/2023 10:08	0.590	0.975	1.001	1.000
8.900%	8/1/2022	7/31/2023	6/30/2023 8:36	7/5/2023 6:44	7/5/2023 10:07	0.590	0.975	1.001	1.000
8.900%	10/25/2022	10/31/2023	6/30/2023 8:36	7/5/2023 6:44	7/5/2023 10:07	0.590	0.975	1.001	1.000
5.800%	2/1/2023	1/31/2024	6/30/2023 8:36	7/5/2023 6:44	7/5/2023 10:07	0.590	0.975	1.001	1.000
1.400%	6/1/2023	5/31/2024	6/30/2023 8:36	7/5/2023 6:44	7/5/2023 10:07	0.590	0.975	1.001	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-G
Spike Exp Date : 9/8/2023
Spike Activity (dpm/ml): 297.39
Spike Volume Added: 0.10

* - RPD changed to 0% due to sample & dup activity below MDA

LCS S/N : 1715-G
LCS Exp Date : 9/8/2023
LCS Activity (dpm/ml): 297.39
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.2133	0.1506	1	0.4843	0.2746	58.21%	0.3000	0.1732	0.3108	0.3158		SAMPLE				
2	0.3740	0.2640	1	0.7382	0.8757	34.12%	0.8333	0.2809	0.5785	0.5991		SAMPLE				
3	0.2714	0.1916	1	0.5636	0.2707	64.35%	0.3000	0.1915	0.3386	0.3436		SAMPLE				
4	0.1945	0.1373	1	0.4416	0.2504	58.12%	0.3000	0.1732	0.2834	0.2876		SAMPLE				
5	0.2452	0.1731	1	0.5284	1.0327	26.40%	1.1333	0.2981	0.5325	0.5547		SAMPLE				
6	0.1946	0.1374	1	0.4793	9.8867	12.72%	9.6667	0.8069	1.6176	2.8485		SAMPLE				
7	0.2401	0.1695	1	0.5451	0.6526	36.24%	0.6333	0.2285	0.4615	0.4731		SAMPLE				
8	0.1593	0.1125	1	0.3924	2.8469	14.48%	3.4000	0.4830	0.7928	0.9065		SAMPLE				
9	0.2644	0.1867	1	0.5699	0.3931	50.91%	0.4000	0.2000	0.3852	0.3963		SAMPLE				
10	0.3712	0.2621	1	0.7327	0.8691	34.25%	0.8333	0.2809	0.5741	0.5968		SAMPLE				
11	0.1740	0.1228	1	0.4285	0.5487	36.42%	0.6000	0.2160	0.3872	0.3996		SAMPLE				
12	0.1756	0.1240	1	0.4326	0.6770	33.63%	0.7333	0.2357	0.4265	0.4569		SAMPLE				
13	0.1816	0.1282	1	0.4473	0.5090	39.56%	0.5333	0.2055	0.3844	0.4015		SAMPLE				
14	0.3646	0.2574	1	0.7361	0.2951	72.96%	0.2667	0.1944	0.4215	0.4241		SAMPLE				
15	0.2324	0.1641	1	0.5010	0.2304	66.30%	0.2667	0.1764	0.2987	0.3012		SAMPLE				
16	0.3254	0.2297	1	0.6423	0.1524	111.71%	0.1667	0.1856	0.3326	0.3344		MB				
17	0.2236	0.1579	1	0.4819	0.1108	112.16%	0.1333	0.1491	0.2428	0.2441	625000001.1	DUP	*	0.0%		
18	1.4249	1.0060	1	3.0712	130.9911	7.80%	24.7333	1.2893	13.3832	27.5389	625000001.1	MS			130.2899	100.5%
19	0.1941	0.1370	1	0.4406	22.2407	5.20%	26.7000	1.3379	2.1843	3.9307		LCS			26.7438	83.2%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 05-JUL-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	05:18	1	1.16E+05	115589	-2.77		
LUCAS2	EFF	05:15	1	1.32E+05	131675	-1.57		
LUCAS3	EFF	05:23	1	92842	92842	-2.83		
LUCAS4	EFF	05:12	1	1.26E+05	126322	-2.39		
LUCAS5	EFF	05:09	1	1.30E+05	129882	-2.71		
LUCAS6	EFF	05:05	1	1.30E+05	129619	-0.36		
LUCAS7	EFF	05:21	1	1.32E+05	132145	-1.7		
LUCAS8	EFF	05:00	1	1.09E+05	108686	-2.67		

Reviewed by: 
Lyndsey Pace

Date: 05-JUL-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2442108

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
625000001	SAMPLE	LXP1	LUCAS3	JUL-05-23 09:25:00	DONE	Lucas Cell	25-OCT-22 00:00
625000002	SAMPLE	LXP1	LUCAS4	JUL-05-23 09:25:00	DONE	Lucas Cell	01-FEB-23 00:00
625000003	SAMPLE	LXP1	LUCAS5	JUL-05-23 09:25:00	DONE	Lucas Cell	01-JUN-23 00:00
625000004	SAMPLE	LXP1	LUCAS6	JUL-05-23 09:25:00	DONE	Lucas Cell	01-JUL-23 00:00
625152001	SAMPLE	LXP1	LUCAS7	JUL-05-23 09:25:00	DONE	Lucas Cell	01-NOV-22 00:00
625152002	SAMPLE	LXP1	LUCAS8	JUL-05-23 09:25:00	DONE	Lucas Cell	08-APR-23 00:00
625152005	SAMPLE	LXP1	LUCAS3	JUL-05-23 09:47:00	DONE	Lucas Cell	25-OCT-22 00:00
625165001	SAMPLE	LXP1	LUCAS4	JUL-05-23 09:47:00	DONE	Lucas Cell	01-FEB-23 00:00
625165002	SAMPLE	LXP1	LUCAS5	JUL-05-23 09:47:00	DONE	Lucas Cell	01-JUN-23 00:00
625165003	SAMPLE	LXP1	LUCAS6	JUL-05-23 09:47:00	DONE	Lucas Cell	01-JUL-23 00:00
625165004	SAMPLE	LXP1	LUCAS7	JUL-05-23 09:47:00	DONE	Lucas Cell	01-NOV-22 00:00
625165005	SAMPLE	LXP1	LUCAS8	JUL-05-23 09:47:00	DONE	Lucas Cell	08-APR-23 00:00
625152003	SAMPLE	LXP1	LUCAS1	JUL-05-23 09:48:00	DONE	Lucas Cell	01-MAY-23 00:00
625152004	SAMPLE	LXP1	LUCAS2	JUL-05-23 09:48:00	DONE	Lucas Cell	01-AUG-22 00:00
1205429898	MB	LXP1	LUCAS2	JUL-05-23 10:07:00	DONE	Lucas Cell	01-AUG-22 00:00
1205429899	DUP	LXP1	LUCAS3	JUL-05-23 10:07:00	DONE	Lucas Cell	25-OCT-22 00:00
1205429900	MS	LXP1	LUCAS4	JUL-05-23 10:07:00	DONE	Lucas Cell	01-FEB-23 00:00
1205429901	LCS	LXP1	LUCAS5	JUL-05-23 10:07:00	DONE	Lucas Cell	01-JUN-23 00:00
625165006	SAMPLE	LXP1	LUCAS1	JUL-05-23 10:08:00	DONE	Lucas Cell	01-MAY-23 00:00



Data Verification & Validation Report

Lansing Board of Water & Light – Erickson Power Station

Sampling Event (dates and purpose): New Wells: MW-14-15 – Background Round 6 – July 2023

Data Package Number: S50700.01

Lab Report Date: 08/21/2023

Data Validator: Aryka Thomson

Data Validation Completion Date: 08/29/2023

General Overall Assessment:

Data are usable without qualification.

Data are usable with qualification (as noted below).

Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	
MW-7C	
MW-8	
MW-9	
MW-10	
MW-11	
MW-11B	
MW-12	
MW-12B	
MW-13	
MW-14	X
MW-15	X
MW-16A	
MW-16B	
MW-16C	
MW-16D	

Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-14	GW	S50700.01	07/07/2023	X	X	X	X	X	X	
MW-15	GW	S50700.02	07/07/2023	X	X	X	X	X	X	
MWT-14	QC	S50700.03	07/07/2023	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO₃, CO₃, hardness

Any planned sampling or analysis NOT completed? If yes, explain: _____

Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Field Data							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
Analytical Data Package							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies across samples for chloride
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits			RLs as requested		X		RLs for hardness, TDS were not met
	X		MDLs<RLs		X		RL=MDL for carbonate
			MDLs<MCLs	X			
			MDLs<GPS			X	
QC Validation							
Evaluate Accuracy							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table		X		Fe recovered outside control limits in one sample
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Evaluate Precision							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Ni and V detected in field duplicate and non-detect in parent sample; Rad-228 and Combined Radium RPDs outside control limits at 85% and 43%, respectively
Evaluate Representativeness							
Equipment Blanks (if applicable)	X		Non-detect (<RL)	X			
QC Verification							
Verify Instrument Calibration & Analytical Process							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	As, Ba, and Se had recoveries outside control limits
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
Evaluate Completeness (# usable measurements/ # unusable measurements)							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

The matrix spike (50700.03) associated with Run Batch MT5-23-0710A had a high recovery for iron. MWT-14 required qualification as estimated (J) for iron.

TSS in MW-15 was qualified by the laboratory as non-detect (U) because it was detected at a level less than reporting limit, but greater than MDL.

Comments:

Nickel and vanadium were detected in the field duplicate and not detected in the parent sample. Parent sample MW-14 required qualification as estimated but not detected (UJ) and field duplicate MWT-14 required qualification as estimated with high bias (J+).

Rad-228 and Combined Radium RPDs were outside control limits at 85% and 43%, respectively. Rad-228 and Combined Radium in parent sample MW-14 required qualification as estimated with low bias (J-) and as estimated with high bias (J+) in field duplicate MWT-14.



Report ID: S50700.01(03)
Generated on 08/08/2023
Replaces report S50700.01(02) generated on 07/12/2023

Report to
Attention: Jennifer Caporale
Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Report produced by
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Contacts for report questions:
John Lavery (johnlavery@meritlabs.com)
Barbara Ball (bball@meritlabs.com)

Report Summary

Lab Sample ID(s): S50700.01-S50700.04
Project: Erickson AM MI Wells 14-15
Collected Date(s): 07/07/2023
Submitted Date/Time: 07/07/2023 15:50
Sampled by: Marc Wahrer
P.O. #:

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Maya Murshak
Technical Director



General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

Report Narrative

All analyses completed



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP & ISO/IEC 17025:2017	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



Sample Summary (4 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S50700.01	MW-14 L307209-01	Groundwater	07/07/23 11:38
S50700.02	MW-15 L307209-02	Groundwater	07/07/23 14:10
S50700.03	MWT-14 L307209-03	Groundwater	07/07/23 11:38
S50700.04	Field Blank L307209-04	Water	07/07/23 10:40



Analytical Laboratory Report

Final Report

Lab Sample ID: S50700.01

Sample Tag: MW-14 L307209-01

Collected Date/Time: 07/07/2023 11:38

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.1	IR
2	1L Plastic	None	Yes	4.1	IR
1	250ml Plastic	HNO3	Yes	4.1	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	07/10/23 10:05	JRH	
Metal Digestion	Completed	SW3015A	07/10/23 08:40	JRH	

Inorganics

Method: E300.0, Run Date: 07/10/23 10:06, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	113	10	0.16	mg/L	10	16887-00-6	

Method: E300.0, Run Date: 07/10/23 09:14, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	20	5	0.08	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 07/07/23 17:06, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	640	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 07/07/23 16:38, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	536	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 07/10/23 18:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	784	50	12	mg/L	2		

Method: SM2540D, Run Date: 07/10/23 18:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	24.8	3	1	mg/L	1.3		

Metals

Method: E200.8, Run Date: 07/10/23 11:33, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.0026	mg/L	5	7440-36-0	
Arsenic	0.007	0.002	0.00026	mg/L	5	7440-38-2	
Barium	0.134	0.005	0.00016	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.00022	mg/L	5	7440-41-7	
Boron	2.16	0.04	0.0018	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.00019	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000097	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S50700.01 (continued)

Sample Tag: MW-14 L307209-01

Method: E200.8, Run Date: 07/10/23 11:33, Analyst: JRH (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.00011	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.00038	mg/L	5	7440-50-8	
Iron	11.4	0.02	0.0019	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.00019	mg/L	5	7439-92-1	
Lithium*	0.108	0.005	0.0016	mg/L	5	7439-93-2	
Molybdenum	0.016	0.005	0.00022	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00025	mg/L	5	7440-02-0	
Selenium	0.013	0.005	0.0021	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000068	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000086	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00014	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00073	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 07/11/23 11:04, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	148	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	41.9	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	5.03	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	79.0	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 07/10/23 14:09, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 08/03/23 15:15, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S50700.02

Sample Tag: MW-15 L307209-02

Collected Date/Time: 07/07/2023 14:10

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.1	IR
2	1L Plastic	None	Yes	4.1	IR
1	250ml Plastic	HNO3	Yes	4.1	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	07/10/23 10:05	JRH	
Metal Digestion	Completed	SW3015A	07/10/23 08:40	JRH	

Inorganics

Method: E300.0, Run Date: 07/10/23 09:27, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	65	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	117	5	0.08	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 07/07/23 17:10, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	380	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 07/07/23 16:42, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	460	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 07/10/23 18:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	638	50	12	mg/L	2		

Method: SM2540D, Run Date: 07/10/23 18:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	1.6	3	1	mg/L	1		b

Metals

Method: E200.8, Run Date: 07/10/23 11:35, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.0026	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.00026	mg/L	5	7440-38-2	
Barium	0.061	0.005	0.00016	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.00022	mg/L	5	7440-41-7	
Boron	0.40	0.04	0.0018	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.00019	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000097	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.00011	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.00038	mg/L	5	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL



Analytical Laboratory Report

Final Report

Lab Sample ID: S50700.02 (continued)

Sample Tag: MW-15 L307209-02

Method: E200.8, Run Date: 07/10/23 11:35, Analyst: JRH (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	0.11	0.02	0.0019	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.00019	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.0016	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.00022	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00025	mg/L	5	7440-02-0	
Selenium	0.009	0.005	0.0021	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000068	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000086	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00014	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00073	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 07/11/23 11:05, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	133	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	32.2	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	Not detected	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	28.5	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 07/10/23 14:19, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 08/03/23 15:15, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S50700.03

Sample Tag: MWT-14 L307209-03

Collected Date/Time: 07/07/2023 11:38

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.1	IR
2	1L Plastic	None	Yes	4.1	IR
1	250ml Plastic	HNO3	Yes	4.1	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	07/10/23 10:05	JRH	
Metal Digestion	Completed	SW3015A	07/10/23 08:40	JRH	

Inorganics

Method: E300.0, Run Date: 07/10/23 10:18, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	114	10	0.16	mg/L	10	16887-00-6	

Method: E300.0, Run Date: 07/10/23 09:40, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	19	5	0.08	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 07/07/23 17:16, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	650	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 07/07/23 16:48, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	548	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 07/10/23 18:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	774	50	12	mg/L	2		

Method: SM2540D, Run Date: 07/10/23 18:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	26.3	3	1.3	mg/L	1.3		

Metals

Method: E200.8, Run Date: 07/10/23 11:38, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.0026	mg/L	5	7440-36-0	
Arsenic	0.008	0.002	0.00026	mg/L	5	7440-38-2	
Barium	0.131	0.005	0.00016	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.00022	mg/L	5	7440-41-7	
Boron	2.14	0.04	0.0018	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.00019	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000097	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S50700.03 (continued)

Sample Tag: MWT-14 L307209-03

Method: E200.8, Run Date: 07/10/23 11:38, Analyst: JRH (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.00011	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.00038	mg/L	5	7440-50-8	
Iron	11.5	0.02	0.0019	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.00019	mg/L	5	7439-92-1	
Lithium*	0.106	0.005	0.0016	mg/L	5	7439-93-2	
Molybdenum	0.016	0.005	0.00022	mg/L	5	7439-98-7	
Nickel	0.005	0.005	0.00025	mg/L	5	7440-02-0	
Selenium	0.012	0.005	0.0021	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000068	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000086	mg/L	5	7440-28-0	
Vanadium	0.005	0.005	0.00014	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00073	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 07/11/23 11:07, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	148	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	41.0	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	5.08	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	77.0	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 07/10/23 14:22, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 08/03/23 15:15, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S50700.04

Sample Tag: Field Blank L307209-04

Collected Date/Time: 07/07/2023 10:40

Matrix: Water

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	4.1	IR
2	1L Plastic	None	Yes	4.1	IR
1	250ml Plastic	HNO3	Yes	4.1	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	07/10/23 10:05	JRH	
Metal Digestion	Completed	SW3015A	07/10/23 08:40	JRH	

Inorganics

Method: E300.0, Run Date: 07/10/23 09:53, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 07/07/23 17:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 07/07/23 16:50, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 07/10/23 18:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	12	mg/L	2		

Method: SM2540D, Run Date: 07/10/23 18:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 07/10/23 11:26, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.0010	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.00010	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.000065	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.000086	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.00070	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.000076	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.000039	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.000043	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.00015	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.00077	mg/L	2	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S50700.04 (continued)

Sample Tag: Field Blank L307209-04

Method: E200.8, Run Date: 07/10/23 11:26, Analyst: JRH (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000076	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.00065	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.000087	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.00010	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.00084	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.000027	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.000034	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.000056	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.00029	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 07/11/23 11:00, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 07/10/23 14:26, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 08/03/23 15:15, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

Merit Laboratories Login Checklist

Lab Set ID:S50700

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 14-15

Submitted:07/07/2023 15:50 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Selection	Description	Note
Sample Receiving		
01.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples are received at 4C +/- 2C Thermometer # IR 4.1
02.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Received on ice/ cooling process begun
03.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples shipped
04.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples left in 24 hr. drop box
05.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Are there custody seals/tape or is the drop box locked
Chain of Custody		
06.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC adequately filled out
07.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC signed and relinquished to the lab
08.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sample tag on bottles match COC
09.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Subcontracting needed? Subcontracted to: GEL
Preservation		
10.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Do sample have correct chemical preservation
11.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Completed pH checks on preserved samples? (no VOAs)
12.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Did any samples need to be preserved in the lab?
Bottle Conditions		
13.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	All bottles intact
14.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Appropriate analytical bottles are used
15.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Merit bottles used
16.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sufficient sample volume received
17.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples require laboratory filtration
18.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples submitted within holding time
19.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S50700 Submitted: 07/07/2023 15:50

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 14-15

Attention: Jennifer Caporale
Address: Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Initial Preservation Check: 07/07/2023 16:04 MMC

Preservation Recheck (E200.8): N/A

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S50700.01	1L Plastic HNO3	<2			
S50700.01	1L Plastic HNO3	<2			
S50700.01	250ml Plastic HNO3	<2			
S50700.02	1L Plastic HNO3	<2			
S50700.02	1L Plastic HNO3	<2			
S50700.02	250ml Plastic HNO3	<2			
S50700.03	1L Plastic HNO3	<2			
S50700.03	1L Plastic HNO3	<2			
S50700.03	250ml Plastic HNO3	<2			
S50700.04	1L Plastic HNO3	<2			
S50700.04	1L Plastic HNO3	<2			
S50700.04	250ml Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823
 Phone (517) 332-0167 Fax (517) 332-4034
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

REPORT TO **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME **Jennifer Caporale**
 COMPANY **Lansing Board of Water and Light**
 ADDRESS **PO Box 13007 48901-3007**
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**
 PHONE NO. **517-702-6372** FAX NO. P.O. NO.
 E-MAIL ADDRESS **Environmental_Laboratory@lbwl.com** QUOTE NO.

CONTACT NAME **Beth Zimpfer** SAME
 COMPANY
 ADDRESS
 CITY STATE ZIP CODE
 PHONE NO. E-MAIL ADDRESS **Beth.Zimpfer@lbwl.com**

PROJECT NO./NAME **Erickson AM MI Wells 14-15** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**
 TURNAROUND TIME REQUIRED 1 DAY 2 DAYS 3 DAYS STANDARD OTHER **ASAP**
 DELIVERABLES REQUIRED STD LEVEL II LEVEL III LEVEL IV EDD OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE
 # Containers & Preservatives

MERIT LAB NO. FOR LAB USE ONLY	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO ₃	H ₂ SO ₄	NaOH	MeOH	OTHER	Total Metals	F- undistilled, Cl ⁻ , SO ₄ , TDS	Radium 226	Radium 228	TSS	HCO ₃ , CO ₃ , Hardness	Certifications		Project Locations		Special Instructions
	DATE	TIME																	<input type="checkbox"/> OHIO VAP	<input type="checkbox"/> Drinking Water	<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES	
50700.01	7.7.23	1138	MW-14 L307209-01	GW	5	2	3						✓	✓	✓	✓	✓	✓					Metals to analyse: Na, Mg, K
.02	↓	1410	MW-15 -02	GW	5	2	3						✓	✓	✓	✓	✓	✓					B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03	↓	1138	MWT-14 -03	GW	5	2	3						✓	✓	✓	✓	✓	✓					Co, Li, Hg, Mo, Pb, Se, Tl,
.04	↓	1040	Field Blank -04	di	5	2	3						✓	✓	✓	✓	✓	✓					Fe, Cu, Ni, Ag, V, Zn
																							Please send a preliminary report

RELINQUISHED BY: *[Signature]* ^{Sampler} DATE **7-7-23** TIME **1550**
 RECEIVED BY: *[Signature]* DATE **7/7/23** TIME **1550**
 RELINQUISHED BY: DATE TIME
 RECEIVED BY: DATE TIME

RELINQUISHED BY: DATE TIME
 RECEIVED BY: DATE TIME
 SEAL NO. SEAL INTACT INITIALS
 YES NO
 SEAL NO. SEAL INTACT INITIALS
 YES NO
 NOTES: TEMP. ON ARRIVAL **4.1**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total		250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005

August 03, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 628839
SDG: S50700

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on July 12, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Jordan Melton for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S50700
Work Order: 628839**

August 03, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on July 12, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

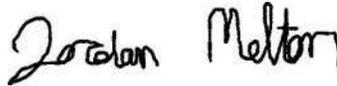
Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
628839001	S50700.01
628839002	S50700.02
628839003	S50700.03
628839004	S50700.04 Field Blank

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.



Jordan Melton for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

Laboratory Certifications

List of current GEL Certifications as of 03 August 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S50700
Work Order #: 628839**

Product: Radium-226+Radium-228 Calculation

Analytical Method: Calculation

Analytical Procedure: GL-RAD-D-003 REV# 45

Analytical Batch: 2458011

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
628839001	S50700.01
628839002	S50700.02
628839003	S50700.03
628839004	S50700.04 Field Blank

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2458012

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
628839001	S50700.01
628839002	S50700.02
628839003	S50700.03
628839004	S50700.04 Field Blank
1205456469	Method Blank (MB)
1205456470	628839001(S50700.01) Sample Duplicate (DUP)
1205456471	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2457992

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
628839001	S50700.01
628839002	S50700.02
628839003	S50700.03
628839004	S50700.04 Field Blank
1205456422	Method Blank (MB)
1205456423	626949001(NonSDG) Sample Duplicate (DUP)
1205456424	626949001(NonSDG) Matrix Spike (MS)
1205456425	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

The matrix spike, 1205456424 (Non SDG 626949001MS), aliquot was reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S50700 GEL Work Order: 628839

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: John Petrovic

Date: 07 AUG 2023

Title: Data Validator

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: August 7, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S50700.01 Project: MERI00120
Sample ID: 628839001 Client ID: MERI001
Matrix: Ground Water
Collect Date: 07-JUL-23 11:38
Receive Date: 12-JUL-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.0761	+/-0.643	1.24	3.00	pCi/L			JE1	07/27/23	1236	2458012	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.464	+/-0.683			pCi/L		1	TON1	08/03/23	1515	2458011	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.388	+/-0.232	0.286	1.00	pCi/L			LXP1	08/02/23	0838	2457992	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			81.3	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: August 7, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S50700.02 Project: MERI00120
Sample ID: 628839002 Client ID: MERI001
Matrix: Ground Water
Collect Date: 07-JUL-23 14:10
Receive Date: 12-JUL-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	-0.119	+/-0.647	1.34	3.00	pCi/L			JE1	07/27/23	1236	2458012	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.525	+/-0.685			pCi/L		1	TON1	08/03/23	1515	2458011	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.525	+/-0.224	0.175	1.00	pCi/L			LXP1	08/02/23	0838	2457992	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			75.8	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: August 7, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S50700.03 Project: MERI00120
Sample ID: 628839003 Client ID: MERI001
Matrix: Ground Water
Collect Date: 07-JUL-23 11:38
Receive Date: 12-JUL-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.915	+/-0.803	1.28	3.00	pCi/L			JE1	07/27/23	1236	2458012	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.16	+/-0.856			pCi/L		1	TON1	08/03/23	1515	2458011	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.244	+/-0.298	0.501	1.00	pCi/L			LXP1	08/02/23	0838	2457992	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			88.7	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: August 7, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S50700.04 Field Blank Project: MERI00120
Sample ID: 628839004 Client ID: MERI001
Matrix: Water
Collect Date: 07-JUL-23 10:40
Receive Date: 12-JUL-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.299	+/-1.44	2.65	3.00	pCi/L		JE1	07/27/23	1237	2458012	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.484	+/-1.45			pCi/L		1 TON1	08/03/23	1515	2458011	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.185	+/-0.192	0.310	1.00	pCi/L		LXP1	08/02/23	0838	2457992	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			50.9	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: August 7, 2023

Page 1 of 2

Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan

Contact: John Laverty

Workorder: 628839

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2458012										
QC1205456470	628839001	DUP									
Radium-228	U	0.0761	U	0.408	pCi/L	N/A		N/A	JE1	07/27/23	12:36
	Uncertainty	+/-0.643		+/-0.649							
QC1205456471	LCS										
Radium-228	79.8			65.3	pCi/L		81.9	(75%-125%)		07/27/23	12:36
	Uncertainty			+/-3.93							
QC1205456469	MB										
Radium-228			U	0.562	pCi/L					07/27/23	12:36
	Uncertainty			+/-0.685							
Rad Ra-226											
Batch	2457992										
QC1205456423	626949001	DUP									
Radium-226	U	0.116	U	0.238	pCi/L	N/A		N/A	LXP1	08/02/23	08:38
	Uncertainty	+/-0.126		+/-0.182							
QC1205456425	LCS										
Radium-226	16.7			13.3	pCi/L		79.7	(75%-125%)		08/02/23	09:10
	Uncertainty			+/-0.918							
QC1205456422	MB										
Radium-226			U	0.125	pCi/L					08/02/23	08:38
	Uncertainty			+/-0.150							
QC1205456424	626949001	MS									
Radium-226	133 U	0.116		110	pCi/L		83	(75%-125%)		08/02/23	08:38
	Uncertainty	+/-0.126		+/-7.84							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- H Analytical holding time was exceeded
- < Result is less than value reported
- > Result is greater than value reported

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Workorder: 628839

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
NI											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2458012 Check-list

This check-list was completed on 27-JUL-23 by Nat Long

This batch was reviewed by Kenshalla Oston on 27-JUL-23 and Nat Long on 27-JUL-23.

Batch ID:
2458012

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2458012
Analyst: Jacqueline Winston (JE1)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: SP-C018367602

Due Dates for Lab: 06-AUG-2023			Package: 08-AUG-2023	SDG: 09-AUG-2023		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205456471	228	2051-B	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	628839001	21-JUL-2023	3	302.8	302.8	07/25/23 17:01	07/27/23 10:45
2	628839002	21-JUL-2023	3	302.7	302.7	07/25/23 17:01	07/27/23 10:45
3	628839003	21-JUL-2023	3	304.9	304.9	07/25/23 17:01	07/27/23 10:45
4	628839004	21-JUL-2023	3	300.8	300.8	07/25/23 17:01	07/27/23 10:45
5	1205456469 MB	21-JUL-2023	3		304.9	07/25/23 17:01	07/27/23 10:45
6	1205456470 DUP (628839001)	21-JUL-2023	3	300.4	300.4	07/25/23 17:01	07/27/23 10:45
7	1205456471 LCS	21-JUL-2023	3		304.9	07/25/23 17:01	07/27/23 10:45

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-E	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419
REGNT 3943473	RGF-1.5M Ammonium Sulfate	10 mL	Data Entry Date2: 24-JUL-2023 14:25 SP-C018367602 Jacqueline Winston
REGNT 3942486	RGF-1M Citric Acid	5 mL	Data Entry Date3: 21-JUL-2023 00:00
REGNT 3941967	2M HCl	20 mL	
REGNT 3916775	RGF-7M Nitric Acid	25 mL	
REGNT DGA070123	2456664	2 g	
REGNT 3885305.13	RGF-Hydrofluoric Acid	4 mL	
REGNT 3940152	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3939217	RGF-Neodymium Substrate	5 mL	
REGNT 3938752.3	Nitric Acid	5 mL	
REGNT 3940529	Barium Carrier Ra228 REG	1 mL	
REGNT 3939221	RGF-50% Potassium Carbonate	2 mL	
REGNT 3928521.5	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 1951-E
 Tracer Exp Date : 1/10/2024
 Tracer Volume Added: 0.10

Batch : 2458012
 Analyst : JAC02417
 Prep Date : 7/21/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 3 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	628839001.1	0.3028	1.8506E-05	7/7/2023 11:38	1121.6	1.72%	912.3	1.91%	0.1	0.000200
2	628839002.1	0.3027	1.8505E-05	7/7/2023 14:10	1121.6	1.72%	849.9	1.98%	0.1	0.000200
3	628839003.1	0.3049	1.8541E-05	7/7/2023 11:38	1121.6	1.72%	995.3	1.83%	0.1	0.000200
4	628839004.1	0.3008	1.8473E-05	7/7/2023 10:40	1121.6	1.72%	571.0	2.42%	0.1	0.000200
5	1205456469.1	0.3049	1.8541E-05	7/21/2023 0:00	1121.6	1.72%	989.2	1.84%	0.1	0.000200
6	1205456470.1	0.3004	1.8466E-05	7/7/2023 11:38	1121.6	1.72%	980.9	1.84%	0.1	0.000200
7	1205456471.1	0.3049	1.8541E-05	7/21/2023 0:00	1121.6	1.72%	969.6	1.85%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated Sample Recovery %	Sample Recovery Error %
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction		
1	7C	60	14	24	0.400	7/27/2023 12:36	7/25/2023 17:01	7/27/2023 10:45	0.993	0.811	0.991	1.057	81.3%	2.59%
2	7D	60	12	20	0.333	7/27/2023 12:36	7/25/2023 17:01	7/27/2023 10:45	0.993	0.810	0.991	1.057	75.8%	2.64%
3	8C	60	16	37	0.617	7/27/2023 12:36	7/25/2023 17:01	7/27/2023 10:45	0.993	0.810	0.991	1.057	88.7%	2.53%
4	9A	60	14	46	0.767	7/27/2023 12:37	7/25/2023 17:01	7/27/2023 10:45	0.993	0.810	0.991	1.057	50.9%	2.98%
5	9B	60	9	35	0.583	7/27/2023 12:36	7/25/2023 17:01	7/27/2023 10:45	0.998	0.811	0.991	1.057	88.2%	2.53%
6	9C	60	10	29	0.483	7/27/2023 12:36	7/25/2023 17:01	7/27/2023 10:45	0.993	0.811	0.991	1.057	87.5%	2.53%
7	9D	60	10	1124	18.733	7/27/2023 12:36	7/25/2023 17:01	7/27/2023 10:45	0.998	0.811	0.991	1.057	86.4%	2.54%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2023	5/31/2024	0.6369	0.00790	0.380	7/21/2023 16:28	500
2	PIC	6/1/2023	5/31/2024	0.6247	0.01113	0.362	7/21/2023 16:28	500
3	PIC	6/1/2023	5/31/2024	0.5662	0.01955	0.382	7/21/2023 16:29	500
4	PIC	6/1/2023	5/31/2024	0.6343	0.00758	0.718	7/21/2023 16:29	500
5	PIC	6/1/2023	5/31/2024	0.6496	0.00754	0.418	7/21/2023 16:29	500
6	PIC	6/1/2023	5/31/2024	0.6429	0.00584	0.368	7/21/2023 16:29	500
7	PIC	6/1/2023	5/31/2024	0.6292	0.02610	0.506	7/21/2023 16:30	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

* - RPD changed to 0% due to sample & dup activity below MDA

LCS S/N : 2051-B
LCS Exp Date : 3/27/2024
LCS Activity (dpm/ml): 540.02
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.7468	0.5273	3	1.2448	0.0761	430.90%	0.0200	0.0862	0.6428	0.6431		SAMPLE				
2	0.7979	0.5634	3	1.3350	-0.1194	276.45%	-0.0287	0.0792	0.6471	0.6473		SAMPLE				
3	0.7670	0.5415	3	1.2778	0.9147	44.89%	0.2347	0.1051	0.8028	0.8364		SAMPLE				
4	1.6585	1.1709	3	2.6492	0.2992	245.00%	0.0487	0.1192	1.4367	1.4387		SAMPLE				
5	0.6999	0.4942	3	1.1583	0.5623	62.21%	0.1653	0.1028	0.6849	0.6996		MB				
6	0.6824	0.4818	3	1.1402	0.4075	81.34%	0.1153	0.0938	0.6494	0.6576	628839001.1	DUP	* 0.0%			
7	0.8115	0.5729	3	1.3250	65.3166	4.76%	18.2273	0.5597	3.9309	17.3410		LCS			79.7804	81.9%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
628839001	7C	60	14	24	7/27/2023 12:36	7/27/2023 13:36	PIC	2458012
628839002	7D	60	12	20	7/27/2023 12:36	7/27/2023 13:36	PIC	2458012
628839003	8C	60	16	37	7/27/2023 12:36	7/27/2023 13:36	PIC	2458012
628839004	9A	60	14	46	7/27/2023 12:37	7/27/2023 13:37	PIC	2458012
1205456469	9B	60	9	35	7/27/2023 12:36	7/27/2023 13:36	PIC	2458012
1205456470	9C	60	10	29	7/27/2023 12:36	7/27/2023 13:36	PIC	2458012
1205456471	9D	60	10	1124	7/27/2023 12:36	7/27/2023 13:36	PIC	2458012

ASSAY 27-Jul-23 12:13:48
 Wizard 2480 s/n 46190630
 Protocol id 9 Ba-133_1
 Time limit
 Count limit
 Isotope Ba-133_1
 Protocol date 7/27/2023
 Run id. 7027

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME	
REF		1	92	1	180	3365.57	1121.61	1.72	12:13:48	
	628839001	2	92	2	180	2737.28	912.25	1.91	81.33	12:17:02
	628839002	3	92	3	180	2550	849.92	1.98	75.78	12:20:16
	628839003	4	92	4	180	2986.57	995.31	1.83	88.74	12:23:30
	628839004	5	92	5	180	1713.28	570.96	2.42	50.91	12:26:43
	1205456469	1	19	1	180	2968.28	989.21	1.84	88.20	12:30:29
	1205456470	2	19	2	180	2943.28	980.88	1.84	87.45	12:33:43
	1205456471	3	19	3	180	2909.28	969.55	1.85	86.44	12:36:57

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 27-Jul-2023

Detectors LB4100 E1 through H4 and PIC 1A through 14D and G5400W 1W through 1Z and LB4200 GA1 through OD4

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100H1	Above	Alpha bkg	27-Jul 04:53	60	0.300	-5.70E-2	0.192	+5.61
LB4100H1	Below	Alpha XTalk	27-Jul 06:02	5	0.182	0.186	0.361	-3.12
LB4100H1	Above	Beta bkg	27-Jul 04:53	60	2.833	0.216	2.462	+3.99
LB4200GA3	Above	Alpha bkg	27-Jul 09:45	60	0.317	-8.27E-2	0.264	+3.91
LB4200GB2	Above	Beta bkg	27-Jul 08:22	60	177	0.129	1.304	+897.66
LB4200GB4	Above	Alpha bkg	27-Jul 08:22	60	0.317	-1.07E-1	0.333	+2.78
LB4200OA4	Above	Beta bkg	27-Jul 08:21	60	21.183	-2.11E-2	1.438	+84.20
PIC7A	need 2nd	Beta eff	27-Jul 17:06	5	20680	19860	20800	+2.24

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

Reviewed by Jc Poparad

Date 7/27/23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2458012

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205456469	MB	JE1	PIC9B	JUL-27-23 12:36:37	DONE	25mm Filter	01-JUN-23 00:00
1205456470	DUP	JE1	PIC9C	JUL-27-23 12:36:40	DONE	25mm Filter	01-JUN-23 00:00
1205456471	LCS	JE1	PIC9D	JUL-27-23 12:36:46	DONE	25mm Filter	01-JUN-23 00:00
628839001	SAMPLE	JE1	PIC7C	JUL-27-23 12:36:50	DONE	25mm Filter	01-JUN-23 00:00
628839002	SAMPLE	JE1	PIC7D	JUL-27-23 12:36:53	DONE	25mm Filter	01-JUN-23 00:00
628839003	SAMPLE	JE1	PIC8C	JUL-27-23 12:36:59	DONE	25mm Filter	01-JUN-23 00:00
628839004	SAMPLE	JE1	PIC9A	JUL-27-23 12:37:01	DONE	25mm Filter	01-JUN-23 00:00

Lucas Cell Raw Data

Batch 2457992 Check-list

This check-list was completed on 02-AUG-23 by Lyndsey Pace

This batch was reviewed by Elizabeth Krouse on 02-AUG-23 and Lyndsey Pace on 02-AUG-23.

Batch ID:
2457992

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2457992
Analyst: Lyndsey Pace (LXP1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: BAL-C236761727

Due Dates for Lab: 04-AUG-2023			Package: 05-AUG-2023	SDG: 06-AUG-2023		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
MS	1205456424	Radium-226 SPIKE	1715-G	.1	mL	
LCS	1205456425	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	626949001	21-JUL-2023	.5	801.56	801.56	07/26/23 08:20	804	08/02/23 05:08	08/02/23 08:02	4	11
2	628768001	21-JUL-2023	1	502.43	502.43	07/26/23 08:20	105	08/02/23 05:34	08/02/23 08:38	5	22
3	628839001	21-JUL-2023	1	501.25	501.25	07/26/23 08:20	201	08/02/23 05:34	08/02/23 08:38	3	18
4	628839002	21-JUL-2023	1	502.23	502.23	07/26/23 08:20	304	08/02/23 05:34	08/02/23 08:38	1	24
5	628839003	21-JUL-2023	1	500.37	500.37	07/26/23 08:20	401	08/02/23 05:34	08/02/23 08:38	6	13
6	628839004	21-JUL-2023	1	502.61	502.61	07/26/23 08:20	502	08/02/23 05:34	08/02/23 08:38	5	13
7	1205456422 MB	21-JUL-2023	.5	801.56	801.56	07/26/23 08:20	604	08/02/23 05:34	08/02/23 08:38	8	16
8	1205456423 DUP (626949001)	21-JUL-2023	.5	800.39	800.39	07/26/23 08:20	706	08/02/23 05:34	08/02/23 08:38	8	22
9	1205456424 MS (626949001)	21-JUL-2023	.5	100.93	100.93	07/26/23 08:20	803	08/02/23 05:34	08/02/23 08:38	1	761
10	1205456425 LCS	21-JUL-2023	.5		801.56	07/26/23 08:20	103	08/02/23 05:59	08/02/23 09:10	1	812

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 21-JUL-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Procedure Code : LUC26RAL
 Parmname : Radium-226
 Required MDA : 0.5 pCi/L
 Halflife of Ra-226 : 1600 years
 Ra-226 Abundance : 1.00
 Halflife of Rn-222 : 3.8235 days

Batch : 2457992
 Analyst : LIN01615
 Prep Date : 7/21/2023
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	626949001.1	0.8016	2.0861E-05	6/5/2023 9:30	804	30	11	0.367	4	0.133	30	1.6240
2	628768001.1	0.5024	2.0266E-05	7/11/2023 10:15	105	30	22	0.733	5	0.167	30	1.5340
3	628839001.1	0.5013	2.0261E-05	7/7/2023 11:38	201	30	18	0.600	3	0.100	30	1.6670
4	628839002.1	0.5022	2.0265E-05	7/7/2023 14:10	304	30	24	0.800	1	0.033	30	1.8850
5	628839003.1	0.5004	2.0257E-05	7/7/2023 11:38	401	30	13	0.433	6	0.200	30	1.2390
6	628839004.1	0.5026	2.0267E-05	7/7/2023 10:40	502	30	13	0.433	5	0.167	30	1.8590
7	1205456422.1	0.8016	2.0861E-05	7/21/2023 0:00	604	30	16	0.533	8	0.267	30	1.7290
8	1205456423.1	0.8004	2.0861E-05	6/5/2023 9:30	706	30	22	0.733	8	0.267	30	1.5900
9	1205456424.1	0.1009	1.1427E-05	6/5/2023 9:30	803	30	761	25.367	1	0.033	30	1.4760
10	1205456425.1	0.8016	2.0861E-05	7/21/2023 0:00	103	30	812	27.067	1	0.033	30	1.6400

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrowth End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
6.100%	4/8/2023	3/31/2024	7/26/2023 8:20	8/2/2023 5:08	8/2/2023 8:02	0.712	0.978	1.002	1.000
7.900%	5/1/2023	4/30/2024	7/26/2023 8:20	8/2/2023 5:34	8/2/2023 8:38	0.713	0.977	1.002	1.000
7.400%	8/1/2023	7/31/2024	7/26/2023 8:20	8/2/2023 5:34	8/2/2023 8:38	0.713	0.977	1.002	1.000
8.900%	10/25/2022	10/31/2023	7/26/2023 8:20	8/2/2023 5:34	8/2/2023 8:38	0.713	0.977	1.002	1.000
3.100%	2/1/2023	1/31/2024	7/26/2023 8:20	8/2/2023 5:34	8/2/2023 8:38	0.713	0.977	1.002	1.000
7.700%	6/1/2023	5/31/2024	7/26/2023 8:20	8/2/2023 5:34	8/2/2023 8:38	0.713	0.977	1.002	1.000
2.300%	7/1/2023	6/30/2024	7/26/2023 8:20	8/2/2023 5:34	8/2/2023 8:38	0.713	0.977	1.002	1.000
2.900%	11/1/2022	10/31/2023	7/26/2023 8:20	8/2/2023 5:34	8/2/2023 8:38	0.713	0.977	1.002	1.000
4.700%	4/8/2023	3/31/2024	7/26/2023 8:20	8/2/2023 5:34	8/2/2023 8:38	0.713	0.977	1.002	1.000
9.600%	5/1/2023	4/30/2024	7/26/2023 8:20	8/2/2023 5:59	8/2/2023 9:10	0.714	0.976	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-G
Spike Exp Date : 9/8/2023
Spike Activity (dpm/ml): 297.38
Spike Volume Added: 0.10

* - RPD changed to 0% due to sample & dup activity below MDA

LCS S/N : 1715-G
LCS Exp Date : 9/8/2023
LCS Activity (dpm/ml): 297.38
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.1093	0.0772	0.5	0.2042	0.1161	55.66%	0.2333	0.1291	0.1259	0.1278		SAMPLE				
2	0.2064	0.1458	1	0.3756	0.4763	31.57%	0.5667	0.1732	0.2854	0.3026		SAMPLE				
3	0.1475	0.1041	1	0.2858	0.3877	31.43%	0.5000	0.1528	0.2321	0.2453		SAMPLE				
4	0.0752	0.0531	1	0.1746	0.5246	23.49%	0.7667	0.1667	0.2235	0.2531		SAMPLE				
5	0.2812	0.1985	1	0.5015	0.2438	62.35%	0.2333	0.1453	0.2976	0.3000		SAMPLE				
6	0.1703	0.1202	1	0.3098	0.1849	53.59%	0.2667	0.1414	0.1922	0.1960		SAMPLE				
7	0.1452	0.1025	0.5	0.2518	0.1247	61.28%	0.2667	0.1633	0.1496	0.1508		MB				
8	0.1582	0.1117	0.5	0.2742	0.2376	39.23%	0.4667	0.1826	0.1822	0.1859	626949001.1	DUP	*	0.0%		
9	0.4777	0.3372	0.5	1.1094	110.1740	5.94%	25.3333	0.9201	7.8433	20.4316	626949001.1	MS			132.7292	83.0%
10	0.0541	0.0382	0.5	0.1257	13.3175	10.22%	27.0333	0.9504	0.9177	3.2889		LCS			16.7120	79.7%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 02-AUG-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:25	1	1.16E+05	115849	-1.29		
LUCAS2	EFF	07:23	1	1.32E+05	132204	-1.16		
LUCAS3	EFF	07:22	1	92157	92157	-1.78		
LUCAS4	EFF	07:20	1	1.27E+05	126731	-1.77		
LUCAS5	EFF	07:19	1	1.31E+05	130617	-1.98		
LUCAS6	EFF	07:16	1	1.28E+05	128129	-2.27		
LUCAS7	EFF	07:11	1	1.31E+05	130730	-2.86		
LUCAS8	EFF	07:09	1	1.19E+05	119464	-0.95		

Reviewed by: 
Lyndsey Pace

Date: 02-AUG-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2457992

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
626949001	SAMPLE	LXP1	LUCAS8	AUG-02-23 08:02:00	DONE	Lucas Cell	08-APR-23 00:00
628768001	SAMPLE	LXP1	LUCAS1	AUG-02-23 08:38:00	DONE	Lucas Cell	01-MAY-23 00:00
628839001	SAMPLE	LXP1	LUCAS2	AUG-02-23 08:38:00	DONE	Lucas Cell	01-AUG-23 00:00
628839002	SAMPLE	LXP1	LUCAS3	AUG-02-23 08:38:00	DONE	Lucas Cell	25-OCT-22 00:00
628839003	SAMPLE	LXP1	LUCAS4	AUG-02-23 08:38:00	DONE	Lucas Cell	01-FEB-23 00:00
628839004	SAMPLE	LXP1	LUCAS5	AUG-02-23 08:38:00	DONE	Lucas Cell	01-JUN-23 00:00
1205456422	MB	LXP1	LUCAS6	AUG-02-23 08:38:00	DONE	Lucas Cell	01-JUL-23 00:00
1205456423	DUP	LXP1	LUCAS7	AUG-02-23 08:38:00	DONE	Lucas Cell	01-NOV-22 00:00
1205456424	MS	LXP1	LUCAS8	AUG-02-23 08:38:00	DONE	Lucas Cell	08-APR-23 00:00
1205456425	LCS	LXP1	LUCAS1	AUG-02-23 09:10:00	DONE	Lucas Cell	01-MAY-23 00:00

August 03, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 628839
SDG: S50700

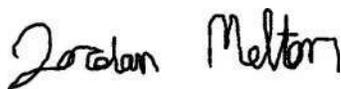
Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on July 12, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,



Jordan Melton for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S50700
Work Order: 628839**

August 03, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on July 12, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

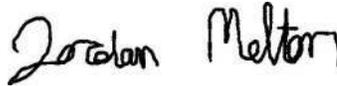
Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
628839001	S50700.01
628839002	S50700.02
628839003	S50700.03
628839004	S50700.04 Field Blank

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.



Jordan Melton for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

Laboratory Certifications

List of current GEL Certifications as of 03 August 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S50700
Work Order #: 628839**

Product: Radium-226+Radium-228 Calculation

Analytical Method: Calculation

Analytical Procedure: GL-RAD-D-003 REV# 45

Analytical Batch: 2458011

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
628839001	S50700.01
628839002	S50700.02
628839003	S50700.03
628839004	S50700.04 Field Blank

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2458012

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
628839001	S50700.01
628839002	S50700.02
628839003	S50700.03
628839004	S50700.04 Field Blank
1205456469	Method Blank (MB)
1205456470	628839001(S50700.01) Sample Duplicate (DUP)
1205456471	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2457992

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
628839001	S50700.01
628839002	S50700.02
628839003	S50700.03
628839004	S50700.04 Field Blank
1205456422	Method Blank (MB)
1205456423	626949001(NonSDG) Sample Duplicate (DUP)
1205456424	626949001(NonSDG) Matrix Spike (MS)
1205456425	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

The matrix spike, 1205456424 (Non SDG 626949001MS), aliquot was reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S50700 GEL Work Order: 628839

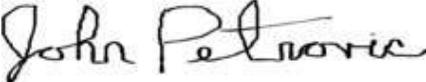
The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: John Petrovic

Date: 07 AUG 2023

Title: Data Validator

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: August 7, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S50700.01 Project: MERI00120
Sample ID: 628839001 Client ID: MERI001
Matrix: Ground Water
Collect Date: 07-JUL-23 11:38
Receive Date: 12-JUL-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.0761	+/-0.643	1.24	3.00	pCi/L			JE1	07/27/23	1236	2458012	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.464	+/-0.683			pCi/L		1	TON1	08/03/23	1515	2458011	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.388	+/-0.232	0.286	1.00	pCi/L			LXP1	08/02/23	0838	2457992	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			81.3	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: August 7, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S50700.02 Project: MERI00120
Sample ID: 628839002 Client ID: MERI001
Matrix: Ground Water
Collect Date: 07-JUL-23 14:10
Receive Date: 12-JUL-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	-0.119	+/-0.647	1.34	3.00	pCi/L			JE1	07/27/23	1236	2458012	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.525	+/-0.685			pCi/L		1	TON1	08/03/23	1515	2458011	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.525	+/-0.224	0.175	1.00	pCi/L			LXP1	08/02/23	0838	2457992	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			75.8	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: August 7, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S50700.03 Project: MERI00120
Sample ID: 628839003 Client ID: MERI001
Matrix: Ground Water
Collect Date: 07-JUL-23 11:38
Receive Date: 12-JUL-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.915	+/-0.803	1.28	3.00	pCi/L			JE1	07/27/23	1236	2458012	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.16	+/-0.856			pCi/L		1	TON1	08/03/23	1515	2458011	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.244	+/-0.298	0.501	1.00	pCi/L			LXP1	08/02/23	0838	2457992	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			88.7	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: August 7, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S50700.04 Field Blank Project: MERI00120
Sample ID: 628839004 Client ID: MERI001
Matrix: Water
Collect Date: 07-JUL-23 10:40
Receive Date: 12-JUL-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.299	+/-1.44	2.65	3.00	pCi/L		JE1	07/27/23	1237	2458012	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.484	+/-1.45			pCi/L		1 TON1	08/03/23	1515	2458011	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.185	+/-0.192	0.310	1.00	pCi/L		LXP1	08/02/23	0838	2457992	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			50.9	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: August 7, 2023

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Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan

Contact: John Laverty

Workorder: 628839

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2458012										
QC1205456470	628839001	DUP									
Radium-228	U	0.0761	U	0.408	pCi/L	N/A		N/A	JE1	07/27/23	12:36
	Uncertainty	+/-0.643		+/-0.649							
QC1205456471	LCS										
Radium-228	79.8			65.3	pCi/L		81.9	(75%-125%)		07/27/23	12:36
	Uncertainty			+/-3.93							
QC1205456469	MB										
Radium-228			U	0.562	pCi/L					07/27/23	12:36
	Uncertainty			+/-0.685							
Rad Ra-226											
Batch	2457992										
QC1205456423	626949001	DUP									
Radium-226	U	0.116	U	0.238	pCi/L	N/A		N/A	LXP1	08/02/23	08:38
	Uncertainty	+/-0.126		+/-0.182							
QC1205456425	LCS										
Radium-226	16.7			13.3	pCi/L		79.7	(75%-125%)		08/02/23	09:10
	Uncertainty			+/-0.918							
QC1205456422	MB										
Radium-226			U	0.125	pCi/L					08/02/23	08:38
	Uncertainty			+/-0.150							
QC1205456424	626949001	MS									
Radium-226	133 U	0.116		110	pCi/L		83	(75%-125%)		08/02/23	08:38
	Uncertainty	+/-0.126		+/-7.84							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- H Analytical holding time was exceeded
- < Result is less than value reported
- > Result is greater than value reported

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Workorder: 628839

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
NI											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2458012 Check-list

This check-list was completed on 27-JUL-23 by Nat Long

This batch was reviewed by Kenshalla Oston on 27-JUL-23 and Nat Long on 27-JUL-23.

Batch ID:
2458012

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2458012
Analyst: Jacqueline Winston (JE1)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: SP-C018367602

Due Dates for Lab: 06-AUG-2023			Package: 08-AUG-2023		SDG: 09-AUG-2023	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205456471	228	2051-B	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	628839001	21-JUL-2023	3	302.8	302.8	07/25/23 17:01	07/27/23 10:45
2	628839002	21-JUL-2023	3	302.7	302.7	07/25/23 17:01	07/27/23 10:45
3	628839003	21-JUL-2023	3	304.9	304.9	07/25/23 17:01	07/27/23 10:45
4	628839004	21-JUL-2023	3	300.8	300.8	07/25/23 17:01	07/27/23 10:45
5	1205456469 MB	21-JUL-2023	3		304.9	07/25/23 17:01	07/27/23 10:45
6	1205456470 DUP (628839001)	21-JUL-2023	3	300.4	300.4	07/25/23 17:01	07/27/23 10:45
7	1205456471 LCS	21-JUL-2023	3		304.9	07/25/23 17:01	07/27/23 10:45

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-E	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419
REGNT 3943473	RGF-1.5M Ammonium Sulfate	10 mL	Data Entry Date2: 24-JUL-2023 14:25 SP-C018367602 Jacqueline Winston
REGNT 3942486	RGF-1M Citric Acid	5 mL	Data Entry Date3: 21-JUL-2023 00:00
REGNT 3941967	2M HCl	20 mL	
REGNT 3916775	RGF-7M Nitric Acid	25 mL	
REGNT DGA070123	2456664	2 g	
REGNT 3885305.13	RGF-Hydrofluoric Acid	4 mL	
REGNT 3940152	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3939217	RGF-Neodymium Substrate	5 mL	
REGNT 3938752.3	Nitric Acid	5 mL	
REGNT 3940529	Barium Carrier Ra228 REG	1 mL	
REGNT 3939221	RGF-50% Potassium Carbonate	2 mL	
REGNT 3928521.5	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 1951-E
 Tracer Exp Date : 1/10/2024
 Tracer Volume Added: 0.10

Batch : 2458012
 Analyst : JAC02417
 Prep Date : 7/21/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 3 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	628839001.1	0.3028	1.8506E-05	7/7/2023 11:38	1121.6	1.72%	912.3	1.91%	0.1	0.000200
2	628839002.1	0.3027	1.8505E-05	7/7/2023 14:10	1121.6	1.72%	849.9	1.98%	0.1	0.000200
3	628839003.1	0.3049	1.8541E-05	7/7/2023 11:38	1121.6	1.72%	995.3	1.83%	0.1	0.000200
4	628839004.1	0.3008	1.8473E-05	7/7/2023 10:40	1121.6	1.72%	571.0	2.42%	0.1	0.000200
5	1205456469.1	0.3049	1.8541E-05	7/21/2023 0:00	1121.6	1.72%	989.2	1.84%	0.1	0.000200
6	1205456470.1	0.3004	1.8466E-05	7/7/2023 11:38	1121.6	1.72%	980.9	1.84%	0.1	0.000200
7	1205456471.1	0.3049	1.8541E-05	7/21/2023 0:00	1121.6	1.72%	969.6	1.85%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data														Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Error %	
			Alpha	Beta											
1	7C	60	14	24	0.400	7/27/2023 12:36	7/25/2023 17:01	7/27/2023 10:45	0.993	0.811	0.991	1.057	81.3%	2.59%	
2	7D	60	12	20	0.333	7/27/2023 12:36	7/25/2023 17:01	7/27/2023 10:45	0.993	0.810	0.991	1.057	75.8%	2.64%	
3	8C	60	16	37	0.617	7/27/2023 12:36	7/25/2023 17:01	7/27/2023 10:45	0.993	0.810	0.991	1.057	88.7%	2.53%	
4	9A	60	14	46	0.767	7/27/2023 12:37	7/25/2023 17:01	7/27/2023 10:45	0.993	0.810	0.991	1.057	50.9%	2.98%	
5	9B	60	9	35	0.583	7/27/2023 12:36	7/25/2023 17:01	7/27/2023 10:45	0.998	0.811	0.991	1.057	88.2%	2.53%	
6	9C	60	10	29	0.483	7/27/2023 12:36	7/25/2023 17:01	7/27/2023 10:45	0.993	0.811	0.991	1.057	87.5%	2.53%	
7	9D	60	10	1124	18.733	7/27/2023 12:36	7/25/2023 17:01	7/27/2023 10:45	0.998	0.811	0.991	1.057	86.4%	2.54%	

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2023	5/31/2024	0.6369	0.00790	0.380	7/21/2023 16:28	500
2	PIC	6/1/2023	5/31/2024	0.6247	0.01113	0.362	7/21/2023 16:28	500
3	PIC	6/1/2023	5/31/2024	0.5662	0.01955	0.382	7/21/2023 16:29	500
4	PIC	6/1/2023	5/31/2024	0.6343	0.00758	0.718	7/21/2023 16:29	500
5	PIC	6/1/2023	5/31/2024	0.6496	0.00754	0.418	7/21/2023 16:29	500
6	PIC	6/1/2023	5/31/2024	0.6429	0.00584	0.368	7/21/2023 16:29	500
7	PIC	6/1/2023	5/31/2024	0.6292	0.02610	0.506	7/21/2023 16:30	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

* - RPD changed to 0% due to sample & dup activity below MDA

LCS S/N : 2051-B
LCS Exp Date : 3/27/2024
LCS Activity (dpm/ml): 540.02
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.7468	0.5273	3	1.2448	0.0761	430.90%	0.0200	0.0862	0.6428	0.6431		SAMPLE				
2	0.7979	0.5634	3	1.3350	-0.1194	276.45%	-0.0287	0.0792	0.6471	0.6473		SAMPLE				
3	0.7670	0.5415	3	1.2778	0.9147	44.89%	0.2347	0.1051	0.8028	0.8364		SAMPLE				
4	1.6585	1.1709	3	2.6492	0.2992	245.00%	0.0487	0.1192	1.4367	1.4387		SAMPLE				
5	0.6999	0.4942	3	1.1583	0.5623	62.21%	0.1653	0.1028	0.6849	0.6996		MB				
6	0.6824	0.4818	3	1.1402	0.4075	81.34%	0.1153	0.0938	0.6494	0.6576	628839001.1	DUP	* 0.0%			
7	0.8115	0.5729	3	1.3250	65.3166	4.76%	18.2273	0.5597	3.9309	17.3410		LCS			79.7804	81.9%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
628839001	7C	60	14	24	7/27/2023 12:36	7/27/2023 13:36	PIC	2458012
628839002	7D	60	12	20	7/27/2023 12:36	7/27/2023 13:36	PIC	2458012
628839003	8C	60	16	37	7/27/2023 12:36	7/27/2023 13:36	PIC	2458012
628839004	9A	60	14	46	7/27/2023 12:37	7/27/2023 13:37	PIC	2458012
1205456469	9B	60	9	35	7/27/2023 12:36	7/27/2023 13:36	PIC	2458012
1205456470	9C	60	10	29	7/27/2023 12:36	7/27/2023 13:36	PIC	2458012
1205456471	9D	60	10	1124	7/27/2023 12:36	7/27/2023 13:36	PIC	2458012

ASSAY 27-Jul-23 12:13:48
 Wizard 2480 s/n 46190630
 Protocol id 9 Ba-133_1
 Time limit
 Count limit
 Isotope Ba-133_1
 Protocol date 7/27/2023
 Run id. 7027

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME	
REF		1	92	1	180	3365.57	1121.61	1.72	12:13:48	
	628839001	2	92	2	180	2737.28	912.25	1.91	81.33	12:17:02
	628839002	3	92	3	180	2550	849.92	1.98	75.78	12:20:16
	628839003	4	92	4	180	2986.57	995.31	1.83	88.74	12:23:30
	628839004	5	92	5	180	1713.28	570.96	2.42	50.91	12:26:43
	1205456469	1	19	1	180	2968.28	989.21	1.84	88.20	12:30:29
	1205456470	2	19	2	180	2943.28	980.88	1.84	87.45	12:33:43
	1205456471	3	19	3	180	2909.28	969.55	1.85	86.44	12:36:57

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 27-Jul-2023

Detectors LB4100 E1 through H4 and PIC 1A through 14D and G5400W 1W through 1Z and LB4200 GA1 through OD4

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100H1	Above	Alpha bkg	27-Jul 04:53	60	0.300	-5.70E-2	0.192	+5.61
LB4100H1	Below	Alpha XTalk	27-Jul 06:02	5	0.182	0.186	0.361	-3.12
LB4100H1	Above	Beta bkg	27-Jul 04:53	60	2.833	0.216	2.462	+3.99
LB4200GA3	Above	Alpha bkg	27-Jul 09:45	60	0.317	-8.27E-2	0.264	+3.91
LB4200GB2	Above	Beta bkg	27-Jul 08:22	60	177	0.129	1.304	+897.66
LB4200GB4	Above	Alpha bkg	27-Jul 08:22	60	0.317	-1.07E-1	0.333	+2.78
LB4200OA4	Above	Beta bkg	27-Jul 08:21	60	21.183	-2.11E-2	1.438	+84.20
PIC7A	need 2nd	Beta eff	27-Jul 17:06	5	20680	19860	20800	+2.24

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

Reviewed by Jc Poparad

Date 7/27/23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2458012

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205456469	MB	JE1	PIC9B	JUL-27-23 12:36:37	DONE	25mm Filter	01-JUN-23 00:00
1205456470	DUP	JE1	PIC9C	JUL-27-23 12:36:40	DONE	25mm Filter	01-JUN-23 00:00
1205456471	LCS	JE1	PIC9D	JUL-27-23 12:36:46	DONE	25mm Filter	01-JUN-23 00:00
628839001	SAMPLE	JE1	PIC7C	JUL-27-23 12:36:50	DONE	25mm Filter	01-JUN-23 00:00
628839002	SAMPLE	JE1	PIC7D	JUL-27-23 12:36:53	DONE	25mm Filter	01-JUN-23 00:00
628839003	SAMPLE	JE1	PIC8C	JUL-27-23 12:36:59	DONE	25mm Filter	01-JUN-23 00:00
628839004	SAMPLE	JE1	PIC9A	JUL-27-23 12:37:01	DONE	25mm Filter	01-JUN-23 00:00

Lucas Cell Raw Data

Batch 2457992 Check-list

This check-list was completed on 02-AUG-23 by Lyndsey Pace

This batch was reviewed by Elizabeth Krouse on 02-AUG-23 and Lyndsey Pace on 02-AUG-23.

Batch ID:
2457992

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2457992
Analyst: Lyndsey Pace (LXP1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: BAL-C236761727

Due Dates for Lab: 04-AUG-2023			Package: 05-AUG-2023		SDG: 06-AUG-2023	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
MS	1205456424	Radium-226 SPIKE	1715-G	.1	mL	
LCS	1205456425	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	626949001	21-JUL-2023	.5	801.56	801.56	07/26/23 08:20	804	08/02/23 05:08	08/02/23 08:02	4	11
2	628768001	21-JUL-2023	1	502.43	502.43	07/26/23 08:20	105	08/02/23 05:34	08/02/23 08:38	5	22
3	628839001	21-JUL-2023	1	501.25	501.25	07/26/23 08:20	201	08/02/23 05:34	08/02/23 08:38	3	18
4	628839002	21-JUL-2023	1	502.23	502.23	07/26/23 08:20	304	08/02/23 05:34	08/02/23 08:38	1	24
5	628839003	21-JUL-2023	1	500.37	500.37	07/26/23 08:20	401	08/02/23 05:34	08/02/23 08:38	6	13
6	628839004	21-JUL-2023	1	502.61	502.61	07/26/23 08:20	502	08/02/23 05:34	08/02/23 08:38	5	13
7	1205456422 MB	21-JUL-2023	.5	801.56	801.56	07/26/23 08:20	604	08/02/23 05:34	08/02/23 08:38	8	16
8	1205456423 DUP (626949001)	21-JUL-2023	.5	800.39	800.39	07/26/23 08:20	706	08/02/23 05:34	08/02/23 08:38	8	22
9	1205456424 MS (626949001)	21-JUL-2023	.5	100.93	100.93	07/26/23 08:20	803	08/02/23 05:34	08/02/23 08:38	1	761
10	1205456425 LCS	21-JUL-2023	.5		801.56	07/26/23 08:20	103	08/02/23 05:59	08/02/23 09:10	1	812

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 21-JUL-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Procedure Code : LUC26RAL
 Parmname : Radium-226
 Required MDA : 0.5 pCi/L
 Halflife of Ra-226 : 1600 years
 Ra-226 Abundance : 1.00
 Halflife of Rn-222 : 3.8235 days

Batch : 2457992
 Analyst : LIN01615
 Prep Date : 7/21/2023
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	626949001.1	0.8016	2.0861E-05	6/5/2023 9:30	804	30	11	0.367	4	0.133	30	1.6240
2	628768001.1	0.5024	2.0266E-05	7/11/2023 10:15	105	30	22	0.733	5	0.167	30	1.5340
3	628839001.1	0.5013	2.0261E-05	7/7/2023 11:38	201	30	18	0.600	3	0.100	30	1.6670
4	628839002.1	0.5022	2.0265E-05	7/7/2023 14:10	304	30	24	0.800	1	0.033	30	1.8850
5	628839003.1	0.5004	2.0257E-05	7/7/2023 11:38	401	30	13	0.433	6	0.200	30	1.2390
6	628839004.1	0.5026	2.0267E-05	7/7/2023 10:40	502	30	13	0.433	5	0.167	30	1.8590
7	1205456422.1	0.8016	2.0861E-05	7/21/2023 0:00	604	30	16	0.533	8	0.267	30	1.7290
8	1205456423.1	0.8004	2.0861E-05	6/5/2023 9:30	706	30	22	0.733	8	0.267	30	1.5900
9	1205456424.1	0.1009	1.1427E-05	6/5/2023 9:30	803	30	761	25.367	1	0.033	30	1.4760
10	1205456425.1	0.8016	2.0861E-05	7/21/2023 0:00	103	30	812	27.067	1	0.033	30	1.6400

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrowth End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
6.100%	4/8/2023	3/31/2024	7/26/2023 8:20	8/2/2023 5:08	8/2/2023 8:02	0.712	0.978	1.002	1.000
7.900%	5/1/2023	4/30/2024	7/26/2023 8:20	8/2/2023 5:34	8/2/2023 8:38	0.713	0.977	1.002	1.000
7.400%	8/1/2023	7/31/2024	7/26/2023 8:20	8/2/2023 5:34	8/2/2023 8:38	0.713	0.977	1.002	1.000
8.900%	10/25/2022	10/31/2023	7/26/2023 8:20	8/2/2023 5:34	8/2/2023 8:38	0.713	0.977	1.002	1.000
3.100%	2/1/2023	1/31/2024	7/26/2023 8:20	8/2/2023 5:34	8/2/2023 8:38	0.713	0.977	1.002	1.000
7.700%	6/1/2023	5/31/2024	7/26/2023 8:20	8/2/2023 5:34	8/2/2023 8:38	0.713	0.977	1.002	1.000
2.300%	7/1/2023	6/30/2024	7/26/2023 8:20	8/2/2023 5:34	8/2/2023 8:38	0.713	0.977	1.002	1.000
2.900%	11/1/2022	10/31/2023	7/26/2023 8:20	8/2/2023 5:34	8/2/2023 8:38	0.713	0.977	1.002	1.000
4.700%	4/8/2023	3/31/2024	7/26/2023 8:20	8/2/2023 5:34	8/2/2023 8:38	0.713	0.977	1.002	1.000
9.600%	5/1/2023	4/30/2024	7/26/2023 8:20	8/2/2023 5:59	8/2/2023 9:10	0.714	0.976	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-G
Spike Exp Date : 9/8/2023
Spike Activity (dpm/ml): 297.38
Spike Volume Added: 0.10

* - RPD changed to 0% due to sample & dup activity below MDA

LCS S/N : 1715-G
LCS Exp Date : 9/8/2023
LCS Activity (dpm/ml): 297.38
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.1093	0.0772	0.5	0.2042	0.1161	55.66%	0.2333	0.1291	0.1259	0.1278		SAMPLE				
2	0.2064	0.1458	1	0.3756	0.4763	31.57%	0.5667	0.1732	0.2854	0.3026		SAMPLE				
3	0.1475	0.1041	1	0.2858	0.3877	31.43%	0.5000	0.1528	0.2321	0.2453		SAMPLE				
4	0.0752	0.0531	1	0.1746	0.5246	23.49%	0.7667	0.1667	0.2235	0.2531		SAMPLE				
5	0.2812	0.1985	1	0.5015	0.2438	62.35%	0.2333	0.1453	0.2976	0.3000		SAMPLE				
6	0.1703	0.1202	1	0.3098	0.1849	53.59%	0.2667	0.1414	0.1922	0.1960		SAMPLE				
7	0.1452	0.1025	0.5	0.2518	0.1247	61.28%	0.2667	0.1633	0.1496	0.1508		MB				
8	0.1582	0.1117	0.5	0.2742	0.2376	39.23%	0.4667	0.1826	0.1822	0.1859	626949001.1	DUP	*	0.0%		
9	0.4777	0.3372	0.5	1.1094	110.1740	5.94%	25.3333	0.9201	7.8433	20.4316	626949001.1	MS			132.7292	83.0%
10	0.0541	0.0382	0.5	0.1257	13.3175	10.22%	27.0333	0.9504	0.9177	3.2889		LCS			16.7120	79.7%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 02-AUG-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:25	1	1.16E+05	115849	-1.29		
LUCAS2	EFF	07:23	1	1.32E+05	132204	-1.16		
LUCAS3	EFF	07:22	1	92157	92157	-1.78		
LUCAS4	EFF	07:20	1	1.27E+05	126731	-1.77		
LUCAS5	EFF	07:19	1	1.31E+05	130617	-1.98		
LUCAS6	EFF	07:16	1	1.28E+05	128129	-2.27		
LUCAS7	EFF	07:11	1	1.31E+05	130730	-2.86		
LUCAS8	EFF	07:09	1	1.19E+05	119464	-0.95		

Reviewed by: 
Lyndsey Pace

Date: 02-AUG-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2457992

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
626949001	SAMPLE	LXP1	LUCAS8	AUG-02-23 08:02:00	DONE	Lucas Cell	08-APR-23 00:00
628768001	SAMPLE	LXP1	LUCAS1	AUG-02-23 08:38:00	DONE	Lucas Cell	01-MAY-23 00:00
628839001	SAMPLE	LXP1	LUCAS2	AUG-02-23 08:38:00	DONE	Lucas Cell	01-AUG-23 00:00
628839002	SAMPLE	LXP1	LUCAS3	AUG-02-23 08:38:00	DONE	Lucas Cell	25-OCT-22 00:00
628839003	SAMPLE	LXP1	LUCAS4	AUG-02-23 08:38:00	DONE	Lucas Cell	01-FEB-23 00:00
628839004	SAMPLE	LXP1	LUCAS5	AUG-02-23 08:38:00	DONE	Lucas Cell	01-JUN-23 00:00
1205456422	MB	LXP1	LUCAS6	AUG-02-23 08:38:00	DONE	Lucas Cell	01-JUL-23 00:00
1205456423	DUP	LXP1	LUCAS7	AUG-02-23 08:38:00	DONE	Lucas Cell	01-NOV-22 00:00
1205456424	MS	LXP1	LUCAS8	AUG-02-23 08:38:00	DONE	Lucas Cell	08-APR-23 00:00
1205456425	LCS	LXP1	LUCAS1	AUG-02-23 09:10:00	DONE	Lucas Cell	01-MAY-23 00:00



Data Verification & Validation Report

Lansing Board of Water & Light – Erickson Power Station

Sampling Event (dates and purpose): New Wells: MW-16A/B/C/D – Background Round 5 – July 2023

Data Package Number: S50581.01

Lab Report Date: 08/09/2023

Data Validator: Aryka Thomson

Data Validation Completion Date: 08/20/2023

General Overall Assessment:

Data are usable without qualification.

Data are usable with qualification (as noted below).

Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	
MW-7C	
MW-8	
MW-9	
MW-10	
MW-11	
MW-11B	
MW-12	
MW-12B	
MW-13	
MW-14	
MW-15	
MW-16A	X
MW-16B	X
MW-16C	X
MW-16D	X

Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-16A	GW	S50581.01	07/05/2023	X	X	X	X	X	X	
MW-16B	GW	S50581.02	07/05/2023	X	X	X	X	X	X	
MW-16C	GW	S50581.03	07/05/2023	X	X	X	X	X	X	
MW-16D	GW	S50581.04	07/05/2023	X	X	X	X	X	X	
MWT-16A	QC	S50581.05	07/05/2023	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO₃, CO₃, hardness

Any planned sampling or analysis NOT completed? If yes, explain: _____

Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Field Data							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	X		Record of decontamination for non-dedicated sampling equipment	X			
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
Analytical Data Package							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies across samples for chloride and sulfate
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Holding Times	X		Analyses performed within allowed holding time	X			
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested		X		RLs for chloride, sulfate and TDS were not met
			MDLs<RLs		X		RL=MDL for carbonate
			MDLs<MCLs	X			
			MDLs<GPS			X	
QC Validation							
Evaluate Accuracy							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Evaluate Precision							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Rad-226, Rad-228 and Combined Radium 226+228 RPD 68%, 132%, 73% respectively
Evaluate Representativeness							
Equipment Blanks (if applicable)	X		Non-detect (<RL)	X			
QC Verification							
Verify Instrument Calibration & Analytical Process							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	TSS outside control limits
Method Blanks	X		Laboratory-determined	-	-	-	
Evaluate Completeness (# usable measurements/ # unusable measurements)							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

The laboratory-generated sample associated with run batch TSS230706 had a high RPD for TSS. This sample was not associated with project samples, so no qualification was required.

TSS in MW-16A, MW-16B, MW-16C, and MWT-16A were qualified by the laboratory as estimated (J) because it was detected at a level less than reporting limit, but greater than MDL. These samples were qualified instead as non-detect (U) for consistency with project qualification procedure.

Comments:

The RPDs for Rad-226, Rad-228, and Combined Radium 226+228 RPD were 68%, 132%, and 73%, respectively. Rad-226 and Combined Radium 226+228 required qualification as estimated with high bias (J+) in the parent sample MW-16A and as estimated with low bias (J-) in the duplicate MWT-16A. Rad-228 required qualification as estimated with high bias (J+) in the parent sample MW-16A and as estimated but not detected (UJ) in the duplicate MWT-16A.



Report ID: S50581.01(02)
Generated on 08/04/2023
Replaces report S50581.01(01) generated on 07/10/2023

Report to
Attention: Jennifer Caporale
Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

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Report Summary
Lab Sample ID(s): S50581.01-S50581.06
Project: Erickson AM MI Wells 16A-16D
Collected Date(s): 07/05/2023
Submitted Date/Time: 07/06/2023 09:21
Sampled by: Marc Wahrer
P.O. #:

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Maya Murshak
Technical Director



General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

Report Narrative

All analyses completed



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP & ISO/IEC 17025:2017	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



Sample Summary (6 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S50581.01	MW-16A L307210-01	Groundwater	07/05/23 10:35
S50581.02	MW-16B L307210-02	Groundwater	07/05/23 12:37
S50581.03	MW-16C L307210-03	Groundwater	07/05/23 14:08
S50581.04	MW-16D L307210-04	Groundwater	07/05/23 11:17
S50581.05	MWT-16A L307210-05	Groundwater	07/05/23 10:35
S50581.06	Field Blank L307210-06	Water	07/05/23 08:30



Analytical Laboratory Report

Final Report

Lab Sample ID: S50581.01

Sample Tag: MW-16A L307210-01

Collected Date/Time: 07/05/2023 10:35

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.4	IR
2	1L Plastic	None	Yes	3.4	IR
1	250ml Plastic	HNO3	Yes	3.4	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	07/06/23 14:57	CTV	
Metal Digestion	Completed	SW3015A	07/07/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 07/06/23 11:15, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 07/06/23 13:11, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	436	50	0.80	mg/L	50	16887-00-6	
Sulfate	151	50	3.0	mg/L	50	14808-79-8	

Method: SM2320B, Run Date: 07/06/23 10:46, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	460	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 07/06/23 12:08, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	598	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 07/06/23 11:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,370	50	6	mg/L	2		

Method: SM2540D, Run Date: 07/06/23 17:10, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	2.5	3	1	mg/L	1		J

Metals

Method: E200.8, Run Date: 07/07/23 11:41, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.003	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.136	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.11	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	

J-Estimated value less than reporting limit, but greater than MDL



Analytical Laboratory Report

Lab Sample ID: S50581.01 (continued)

Sample Tag: MW-16A L307210-01

Method: E200.8, Run Date: 07/07/23 11:41, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	2.69	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 07/07/23 14:01, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	173	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	39.9	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.24	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	253	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 07/06/23 16:07, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 08/03/23 15:22, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S50581.02

Sample Tag: MW-16B L307210-02

Collected Date/Time: 07/05/2023 12:37

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.4	IR
2	1L Plastic	None	Yes	3.4	IR
1	250ml Plastic	HNO3	Yes	3.4	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	07/06/23 14:57	CTV	
Metal Digestion	Completed	SW3015A	07/07/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 07/06/23 11:28, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	17	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 07/06/23 10:48, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	410	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 07/06/23 12:12, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	334	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 07/06/23 11:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	366	50	6	mg/L	2		

Method: SM2540D, Run Date: 07/06/23 17:10, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	1.0	3	1	mg/L	1		J

Metals

Method: E200.8, Run Date: 07/07/23 11:44, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.089	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.11	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	

J-Estimated value less than reporting limit, but greater than MDL



Analytical Laboratory Report

Final Report

Lab Sample ID: S50581.02 (continued)

Sample Tag: MW-16B L307210-02

Method: E200.8, Run Date: 07/07/23 11:44, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	0.43	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.019	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.006	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 07/07/23 14:04, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	80.8	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	35.6	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	2.97	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	11.1	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 07/06/23 16:10, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 08/03/23 15:22, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S50581.03

Sample Tag: MW-16C L307210-03

Collected Date/Time: 07/05/2023 14:08

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.4	IR
2	1L Plastic	None	Yes	3.4	IR
1	250ml Plastic	HNO3	Yes	3.4	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	07/06/23 14:57	CTV	
Metal Digestion	Completed	SW3015A	07/07/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 07/06/23 11:41, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	8	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 07/06/23 10:50, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	410	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 07/06/23 12:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	293	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 07/06/23 11:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	320	50	6	mg/L	2		

Method: SM2540D, Run Date: 07/06/23 17:10, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	1.2	3	1	mg/L	1		J

Metals

Method: E200.8, Run Date: 07/07/23 11:48, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.035	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.39	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	

J-Estimated value less than reporting limit, but greater than MDL



Analytical Laboratory Report

Final Report

Lab Sample ID: S50581.03 (continued)

Sample Tag: MW-16C L307210-03

Method: E200.8, Run Date: 07/07/23 11:48, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	0.51	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.026	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 07/07/23 14:06, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	73.4	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	29.9	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	4.86	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	17.2	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 07/06/23 16:13, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 08/03/23 15:22, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S50581.04

Sample Tag: MW-16D L307210-04

Collected Date/Time: 07/05/2023 11:17

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.4	IR
2	1L Plastic	None	Yes	3.4	IR
1	250ml Plastic	HNO3	Yes	3.4	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	07/06/23 14:57	CTV	
Metal Digestion	Completed	SW3015A	07/07/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 07/06/23 11:54, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	8	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	7	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 07/06/23 10:52, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	400	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 07/06/23 12:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	97	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 07/06/23 11:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	374	50	6	mg/L	2		

Method: SM2540D, Run Date: 07/06/23 17:10, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	6.4	3	2	mg/L	2		

Metals

Method: E200.8, Run Date: 07/07/23 11:51, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.003	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.036	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	4.39	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.25	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S50581.04 (continued)

Sample Tag: MW-16D L307210-04

Method: E200.8, Run Date: 07/07/23 11:51, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.028	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.011	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.025	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 07/07/23 14:07, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	28.5	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	7.39	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	9.38	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	112	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 07/06/23 16:17, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 08/03/23 15:22, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S50581.05

Sample Tag: MWT-16A L307210-05

Collected Date/Time: 07/05/2023 10:35

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.4	IR
2	1L Plastic	None	Yes	3.4	IR
1	250ml Plastic	HNO3	Yes	3.4	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	07/06/23 14:57	CTV	
Metal Digestion	Completed	SW3015A	07/07/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 07/06/23 12:06, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 07/06/23 13:24, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	439	50	0.80	mg/L	50	16887-00-6	
Sulfate	154	50	3.0	mg/L	50	14808-79-8	

Method: SM2320B, Run Date: 07/06/23 10:54, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	470	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 07/06/23 12:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	600	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 07/06/23 11:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,340	50	6	mg/L	2		

Method: SM2540D, Run Date: 07/06/23 17:10, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	2.0	3	1	mg/L	1		J

Metals

Method: E200.8, Run Date: 07/07/23 11:58, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.004	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.138	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.11	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	

J-Estimated value less than reporting limit, but greater than MDL



Analytical Laboratory Report

Final Report

Lab Sample ID: S50581.05 (continued)

Sample Tag: MWT-16A L307210-05

Method: E200.8, Run Date: 07/07/23 11:58, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	2.72	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 07/07/23 14:09, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	174	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	38.5	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.23	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	258	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 07/06/23 16:27, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 08/03/23 15:22, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S50581.06

Sample Tag: Field Blank L307210-06

Collected Date/Time: 07/05/2023 08:30

Matrix: Water

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.4	IR
2	1L Plastic	None	Yes	3.4	IR
1	250ml Plastic	HNO3	Yes	3.4	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	07/06/23 14:57	CTV	
Metal Digestion	Completed	SW3015A	07/07/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 07/06/23 12:19, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 07/06/23 10:56, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 07/06/23 12:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 07/06/23 11:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	6	mg/L	2		

Method: SM2540D, Run Date: 07/06/23 17:10, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 07/07/23 11:34, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S50581.06 (continued)

Sample Tag: Field Blank L307210-06

Method: E200.8, Run Date: 07/07/23 11:34, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 07/07/23 13:58, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 07/06/23 16:30, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 08/03/23 15:22, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

Merit Laboratories Login Checklist

Lab Set ID:S50581

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 16A-16D

Submitted:07/06/2023 09:21 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Selection	Description	Note
Sample Receiving		
01.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples are received at 4C +/- 2C Thermometer # IR 3.4
02.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Received on ice/ cooling process begun
03.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples shipped
04.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples left in 24 hr. drop box
05.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Are there custody seals/tape or is the drop box locked
Chain of Custody		
06.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC adequately filled out
07.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC signed and relinquished to the lab
08.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sample tag on bottles match COC
09.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Subcontracting needed? Subcontracted to: GEL
Preservation		
10.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Do sample have correct chemical preservation
11.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Completed pH checks on preserved samples? (no VOAs)
12.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Did any samples need to be preserved in the lab?
Bottle Conditions		
13.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	All bottles intact
14.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Appropriate analytical bottles are used
15.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Merit bottles used
16.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sufficient sample volume received
17.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples require laboratory filtration
18.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples submitted within holding time
19.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S50581 Submitted: 07/06/2023 09:21

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 16A-16D

Attention: Jennifer Caporale
Address: Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Initial Preservation Check: 07/06/2023 10:04 MMC

Preservation Recheck (E200.8): N/A

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S50581.01	1L Plastic HNO3	<2			
S50581.01	1L Plastic HNO3	<2			
S50581.01	250ml Plastic HNO3	<2			
S50581.02	1L Plastic HNO3	<2			
S50581.02	1L Plastic HNO3	<2			
S50581.02	250ml Plastic HNO3	<2			
S50581.03	1L Plastic HNO3	<2			
S50581.03	1L Plastic HNO3	<2			
S50581.03	250ml Plastic HNO3	<2			
S50581.04	1L Plastic HNO3	<2			
S50581.04	1L Plastic HNO3	<2			
S50581.04	250ml Plastic HNO3	<2			
S50581.05	1L Plastic HNO3	<2			
S50581.05	1L Plastic HNO3	<2			
S50581.05	250ml Plastic HNO3	<2			
S50581.06	1L Plastic HNO3	<2			
S50581.06	1L Plastic HNO3	<2			
S50581.06	250ml Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823
 Phone (517) 332-0167 Fax (517) 332-4034
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

REPORT TO

CHAIN OF CUSTODY RECORD

INVOICE TO

CONTACT NAME **Jennifer Caporale**
 COMPANY **Lansing Board of Water and Light**
 ADDRESS **PO Box 13007 48901-3007**
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**
 PHONE NO. **517-702-6372** FAX NO. P.O. NO.
 E-MAIL ADDRESS **Environmental_Laboratory@lbwl.com** QUOTE NO.

CONTACT NAME **Beth Zimpfer** SAME
 COMPANY
 ADDRESS
 CITY STATE ZIP CODE
 PHONE NO. E-MAIL ADDRESS **Beth.Zimpfer@lbwl.com**

PROJECT NO./NAME **Erickson AM MI Wells 16A-16D** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**
 TURNAROUND TIME REQUIRED 1 DAY 2 DAYS 3 DAYS STANDARD OTHER **ASAP**
 DELIVERABLES REQUIRED STD LEVEL II LEVEL III LEVEL IV EDD OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIFE A=AIR W=WASTE
 # Containers & Preservatives

MERIT LAB NO. FOR LAB USE ONLY	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO ₃	H ₂ SO ₄	NaOH	MeOH	OTHER	Total Metals	F- undistilled, Cl ⁻ , SO ₄ , TDS	Radium 226	Radium 228	TSS	HCO ₃ , CO ₃ , Hardness	Certifications		Project Locations		Special Instructions
	DATE	TIME																	<input type="checkbox"/> OHIO VAP	<input type="checkbox"/> Drinking Water	<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES	
50581.01	7.5.23	1035	MW-16A L307210-01	GW	5	2	3						✓	✓	✓	✓	✓	✓					Metals to analyse: Na, Mg, K
.02		1237	MW-16B -02	GW	5	2	3						✓	✓	✓	✓	✓	✓					B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03		1408	MW-16C -03	GW	5	2	3						✓	✓	✓	✓	✓	✓					Co, Li, Hg, Mo, Pb, Se, Tl,
.04		1117	MW16-D -04	GW	5	2	3						✓	✓	✓	✓	✓	✓					Fe, Cu, Ni, Ag, V, Zn
.05		1035	MWT- 16A -05	GW	5	2	3						✓	✓	✓	✓	✓	✓					Please send a preliminary report
.06		0830	Field Blank -06	DI	5	2	3						✓	✓	✓	✓	✓	✓					

RELINQUISHED BY: **7-6-23 0921** *Sampler
 RECEIVED BY: **7/6/23 0921**
 SIGNATURE/ORGANIZATION
 DATE TIME

RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
 RECEIVED BY: SIGNATURE/ORGANIZATION DATE TIME
 SEAL NO. SEAL INTACT YES NO INITIALS
 NOTES: TEMP. ON ARRIVAL **3.4**
 SEAL NO. SEAL INTACT YES NO INITIALS

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total		250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	Nitric Acid	200.8	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	SM 7500	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Ti, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005



August 03, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 628531
SDG: S50581

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on July 10, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S50581
Work Order: 628531**

August 03, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on July 10, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. The containers received did not have collect times on them.

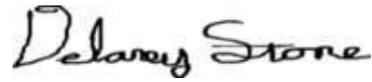
Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
628531001	S50581.01
628531002	S50581.02
628531003	S50581.03
628531004	S50581.04
628531005	S50581.05
628531006	S50581.06 Field Blank

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Delaney Stone". The signature is written in a cursive, slightly slanted style.

Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

SAMPLE RECEIPT & REVIEW FORM

Client: MER 1 SDG/AR/COC/Work Order: 028531 DS
 Received By: MVH Date Received: 07-10-2023

Carrier and Tracking Number
 FedEx Express FedEx Ground UPS Field Services Courier Other
124664770362547316

Suspected Hazard Information	Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
A) Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples are to be received as radioactive?		<input checked="" type="checkbox"/>	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?		<input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM/mR/Hr Classified as: Rad 1 Rad 2 Rad 3
D) Did the client designate samples are hazardous?		<input checked="" type="checkbox"/>	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?		<input checked="" type="checkbox"/>	If D or E is yes, select Hazards below. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:

Sample Receipt Criteria		Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Preservation Method: Wet Ice Ice Packs Dry ice <u>None</u> Other: _____ *all temperatures are recorded in Celsius TEMP: <u>23</u>
4	Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Temperature Device Serial #: <u>IR2-21</u> Secondary Temperature Device Serial # (If Applicable): _____
5	Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Sample ID's and Containers Affected: _____ If Preservation added, Lot#: _____
7	Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer) Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No) Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected: _____
8	Samples received within holding time?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		ID's and tests affected: _____
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		ID's and containers affected: _____
10	Date & time on COC match date & time on bottles?		<input checked="" type="checkbox"/>		Circle Applicable: No dates on containers No times on containers <u>0</u> COC missing info Other (describe)
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
13	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials JM Date 7-11-23 Page 1 of 1

Laboratory Certifications

List of current GEL Certifications as of 03 August 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S50581
Work Order #: 628531**

Product: Radium-226+Radium-228 Calculation

Analytical Method: Calculation

Analytical Procedure: GL-RAD-D-003 REV# 45

Analytical Batch: 2456016

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
628531001	S50581.01
628531002	S50581.02
628531003	S50581.03
628531004	S50581.04
628531005	S50581.05
628531006	S50581.06 Field Blank

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2456015

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
628531001	S50581.01
628531002	S50581.02
628531003	S50581.03
628531004	S50581.04
628531005	S50581.05
628531006	S50581.06 Field Blank
1205453715	Method Blank (MB)
1205453716	628531001(S50581.01) Sample Duplicate (DUP)
1205453717	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2456017

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
628531001	S50581.01
628531002	S50581.02
628531003	S50581.03
628531004	S50581.04
628531005	S50581.05
628531006	S50581.06 Field Blank
1205453718	Method Blank (MB)
1205453719	628531001(S50581.01) Sample Duplicate (DUP)
1205453720	628531001(S50581.01) Matrix Spike (MS)
1205453721	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

The matrix spike, 1205453720 (S50581.01MS), aliquot was reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S50581 GEL Work Order: 628531

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 03 AUG 2023

Title: Analyst III - Data Validator

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: August 3, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S50581.01	Project: MERI00120
Sample ID: 628531001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 05-JUL-23 10:35	
Receive Date: 10-JUL-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228		1.33	+/-0.800	1.14	3.00	pCi/L			JE1	07/17/23	1509	2456015	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		7.46	+/-1.37			pCi/L		1	TON1	08/03/23	1522	2456016	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		6.13	+/-1.11	0.394	1.00	pCi/L			LXP1	08/03/23	0803	2456017	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			85.6	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: August 3, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S50581.02 Project: MERI00120
Sample ID: 628531002 Client ID: MERI001
Matrix: Ground Water
Collect Date: 05-JUL-23 12:37
Receive Date: 10-JUL-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.07	+/-1.11	1.85	3.00	pCi/L		JE1	07/17/23	1509	2456015		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		4.09	+/-1.35			pCi/L		1 TON1	08/03/23	1522	2456016		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		3.03	+/-0.764	0.453	1.00	pCi/L		LXP1	08/03/23	0803	2456017		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			70.5	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: August 3, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S50581.03 Project: MERI00120
Sample ID: 628531003 Client ID: MERI001
Matrix: Ground Water
Collect Date: 05-JUL-23 14:08
Receive Date: 10-JUL-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	1.39	+/-0.923	1.39	3.00	pCi/L			JE1	07/17/23	1509 2456015	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		2.52	+/-1.07			pCi/L		1	TON1	08/03/23	1522 2456016	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		1.14	+/-0.541	0.635	1.00	pCi/L			LXP1	08/03/23	0803 2456017	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			81.4	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: August 3, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S50581.04 Project: MERI00120
Sample ID: 628531004 Client ID: MERI001
Matrix: Ground Water
Collect Date: 05-JUL-23 11:17
Receive Date: 10-JUL-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.128	+/-1.13	2.06	3.00	pCi/L		JE1	07/17/23	1509	2456015	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.33	+/-1.25			pCi/L		1 TON1	08/03/23	1522	2456016	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		1.21	+/-0.526	0.420	1.00	pCi/L		LXP1	08/03/23	0803	2456017	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			84.2	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: August 3, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S50581.05 Project: MERI00120
Sample ID: 628531005 Client ID: MERI001
Matrix: Ground Water
Collect Date: 05-JUL-23 10:35
Receive Date: 10-JUL-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	-0.181	+/-0.490	1.07	3.00	pCi/L			JE1	07/17/23	1509	2456015	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.17	+/-0.684			pCi/L		1	TON1	08/03/23	1522	2456016	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		1.17	+/-0.477	0.461	1.00	pCi/L			LXP1	08/03/23	0803	2456017	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			84.8	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: August 3, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S50581.06 Field Blank Project: MERI00120
Sample ID: 628531006 Client ID: MERI001
Matrix: Water
Collect Date: 05-JUL-23 08:30
Receive Date: 10-JUL-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.469	+/-0.695	1.21	3.00	pCi/L		JE1	07/17/23	1510	2456015	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.45	+/-0.815			pCi/L		1 TON1	08/03/23	1522	2456016	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.983	+/-0.425	0.393	1.00	pCi/L		LXP1	08/03/23	0803	2456017	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			76.4	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: August 3, 2023

Page 1 of 2

Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan

Contact: John Laverty

Workorder: 628531

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2456015										
QC1205453716	628531001	DUP									
Radium-228		1.33	U	0.833	pCi/L	46		(0% - 100%)	JE1	07/17/23	15:09
	Uncertainty	+/-0.800		+/-0.833							
QC1205453717	LCS										
Radium-228		78.1		66.5	pCi/L		85.2	(75%-125%)		07/17/23	15:09
	Uncertainty			+/-4.08							
QC1205453715	MB										
Radium-228			U	1.67	pCi/L					07/17/23	15:09
	Uncertainty			+/-1.34							
Rad Ra-226											
Batch	2456017										
QC1205453719	628531001	DUP									
Radium-226		6.13		6.66	pCi/L	8.18		(0%-20%)	LXP1	08/03/23	08:03
	Uncertainty	+/-1.11		+/-1.14							
QC1205453721	LCS										
Radium-226		26.3		21.0	pCi/L		79.7	(75%-125%)		08/03/23	08:37
	Uncertainty			+/-1.98							
QC1205453718	MB										
Radium-226			U	0.490	pCi/L					08/03/23	08:03
	Uncertainty			+/-0.454							
QC1205453720	628531001	MS									
Radium-226		124		147	pCi/L		113	(75%-125%)		08/03/23	08:37
	Uncertainty	+/-1.11		+/-11.6							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- H Analytical holding time was exceeded
- < Result is less than value reported
- > Result is greater than value reported

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Workorder: 628531

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
NI											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2456015 Check-list

This check-list was completed on 18-JUL-23 by Nat Long

This batch was reviewed by Nat Long on 18-JUL-23 and Kenshalla Oston on 20-JUL-23.

Batch ID:
2456015

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2456015
Analyst: Jacqueline Winston (JE1)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: BAL-C236761727

Due Dates for Lab: 04-AUG-2023			Package: 06-AUG-2023	SDG: 07-AUG-2023		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205453717	228	2051-B	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	628531001	11-JUL-2023	3	302.27	302.27	07/12/23 13:23	07/17/23 13:27
2	628531002	11-JUL-2023	3	312.56	312.56	07/12/23 13:23	07/17/23 13:27
3	628531003	11-JUL-2023	3	306.65	306.65	07/12/23 13:23	07/17/23 13:27
4	628531004	11-JUL-2023	3	300.17	300.17	07/12/23 13:23	07/17/23 13:27
5	628531005	11-JUL-2023	3	302.07	302.07	07/12/23 13:23	07/17/23 13:27
6	628531006	11-JUL-2023	3	312.05	312.05	07/12/23 13:23	07/17/23 13:27
7	1205453715 MB	11-JUL-2023	3		312.56	07/12/23 13:23	07/17/23 13:27
8	1205453716 DUP (628531001)	11-JUL-2023	3	301.62	301.62	07/12/23 13:23	07/17/23 13:27
9	1205453717 LCS	11-JUL-2023	3		312.56	07/12/23 13:23	07/17/23 13:27

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-E	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 11-JUL-2023 00:00
REGNT 3935250	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3932364	RGF-1M Citric Acid	5 mL	
REGNT 3932933	2M HCl	20 mL	
REGNT 3916775	RGF-7M Nitric Acid	25 mL	
REGNT 3885305.13	RGF-Hydrofluoric Acid	4 mL	
REGNT 3528714	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3887517	RGF-Neodymium Substrate	5 mL	
REGNT 3931700.14	Nitric Acid	5 mL	
REGNT 3929343	Barium Carrier Ra228 REG	1 mL	
REGNT 3935372	RGF-50% Potassium Carbonate	2 mL	
REGNT 3928521.5	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT DGA060123	2438861	2 g	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 1951-E
 Tracer Exp Date : 1/10/2024
 Tracer Volume Added: 0.10

Batch : 2456015
 Analyst : JAC02417
 Prep Date : 7/11/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 3 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	628531001.1	0.3023	1.8497E-05	7/5/2023 10:35	1113.8	1.73%	953.8	1.87%	0.1	0.000200
2	628531002.1	0.3126	1.8664E-05	7/5/2023 12:37	1113.8	1.73%	785.4	2.06%	0.1	0.000200
3	628531003.1	0.3067	1.8570E-05	7/5/2023 14:08	1113.8	1.73%	906.7	1.92%	0.1	0.000200
4	628531004.1	0.3002	1.8462E-05	7/5/2023 11:17	1113.8	1.73%	937.4	1.89%	0.1	0.000200
5	628531005.1	0.3021	1.8494E-05	7/5/2023 10:35	1113.8	1.73%	944.9	1.88%	0.1	0.000200
6	628531006.1	0.3121	1.8656E-05	7/5/2023 8:30	1113.8	1.73%	850.9	1.98%	0.1	0.000200
7	1205453715.1	0.3126	1.8664E-05	7/11/2023 0:00	1113.8	1.73%	807.7	2.03%	0.1	0.000200
8	1205453716.1	0.3016	1.8486E-05	7/5/2023 10:35	1113.8	1.73%	946.7	1.88%	0.1	0.000200
9	1205453717.1	0.3126	1.8664E-05	7/11/2023 0:00	1113.8	1.73%	933.9	1.89%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
			Alpha	Beta										
1	1B	60	5	42	0.700	7/17/2023 15:09	7/12/2023 13:23	7/17/2023 13:27	0.996	0.825	1.000	1.057	85.6%	2.56%
2	1C	60	13	57	0.950	7/17/2023 15:09	7/12/2023 13:23	7/17/2023 13:27	0.996	0.825	1.000	1.057	70.5%	2.70%
3	1D	60	7	51	0.850	7/17/2023 15:09	7/12/2023 13:23	7/17/2023 13:27	0.996	0.824	1.000	1.057	81.4%	2.60%
4	2A	60	9	75	1.250	7/17/2023 15:09	7/12/2023 13:23	7/17/2023 13:27	0.996	0.824	1.000	1.057	84.2%	2.58%
5	2B	60	4	15	0.250	7/17/2023 15:09	7/12/2023 13:23	7/17/2023 13:27	0.996	0.824	1.000	1.057	84.8%	2.57%
6	2C	60	9	26	0.433	7/17/2023 15:10	7/12/2023 13:23	7/17/2023 13:27	0.996	0.824	1.000	1.057	76.4%	2.64%
7	2D	60	19	92	1.533	7/17/2023 15:09	7/12/2023 13:23	7/17/2023 13:27	0.998	0.825	1.000	1.057	72.5%	2.68%
8	3B	60	7	46	0.767	7/17/2023 15:09	7/12/2023 13:23	7/17/2023 13:27	0.996	0.825	1.000	1.057	85.0%	2.57%
9	3C	60	31	1232	20.533	7/17/2023 15:09	7/12/2023 13:23	7/17/2023 13:27	0.998	0.825	1.000	1.057	83.8%	2.58%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2023	5/31/2024	0.6098	0.00711	0.338	7/14/2023 17:57	500
2	PIC	6/1/2023	5/31/2024	0.6077	0.00847	0.704	7/14/2023 17:57	500
3	PIC	6/1/2023	5/31/2024	0.6071	0.00692	0.488	7/14/2023 17:57	500
4	PIC	6/1/2023	5/31/2024	0.6083	0.01914	1.216	7/14/2023 17:57	500
5	PIC	6/1/2023	5/31/2024	0.6253	0.02111	0.300	7/14/2023 17:57	500
6	PIC	6/1/2023	5/31/2024	0.6085	0.01274	0.316	7/14/2023 17:58	500
7	PIC	6/1/2023	5/31/2024	0.6206	0.00745	1.128	7/14/2023 17:58	500
8	PIC	6/1/2023	5/31/2024	0.6266	0.01614	0.536	7/14/2023 17:58	500
9	PIC	6/1/2023	5/31/2024	0.6245	0.00988	1.726	7/14/2023 17:58	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 2051-B
LCS Exp Date : 3/27/2024
LCS Activity (dpm/ml): 541.80
LCS Volume Added: 0.10

Results Pos.	Decision	Critical	Required	Sample Act.		Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
	Level pCi/L	Level pCi/L	MDA pCi/L	MDA pCi/L	Conc. pCi/L	Error %	Rate CPM	Rate Error CPM	Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L						
1	0.6800	0.4801	3	1.1438	1.3300	30.80%	0.3620	0.1111	0.8000	0.8684		SAMPLE				
2	1.1566	0.8165	3	1.8496	1.0652	53.45%	0.2460	0.1313	1.1144	1.1469		SAMPLE				
3	0.8511	0.6009	3	1.3932	1.3855	34.10%	0.3620	0.1231	0.9231	0.9880		SAMPLE				
4	1.3252	0.9356	3	2.0599	0.1283	448.63%	0.0340	0.1525	1.1285	1.1290		SAMPLE				
5	0.6314	0.4458	3	1.0726	-0.1811	138.12%	-0.0500	0.0690	0.4900	0.4903		SAMPLE				
6	0.7159	0.5054	3	1.2109	0.4694	75.59%	0.1173	0.0886	0.6949	0.7052		SAMPLE				
7	1.3909	0.9820	3	2.1696	1.6674	41.24%	0.4053	0.1668	1.3446	1.4100		MB				
8	0.8412	0.5939	3	1.3683	0.8326	51.11%	0.2307	0.1177	0.8326	0.8593	628531001.1	DUP	46.0%			
9	1.4791	1.0442	3	2.2653	66.5132	4.17%	18.8073	0.5879	4.0754	17.4015		LCS			78.0825	85.2%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
628531001	1B	60	5	42	7/17/2023 15:09	7/17/2023 16:09	PIC	2456015
628531002	1C	60	13	57	7/17/2023 15:09	7/17/2023 16:09	PIC	2456015
628531003	1D	60	7	51	7/17/2023 15:09	7/17/2023 16:09	PIC	2456015
628531004	2A	60	9	75	7/17/2023 15:09	7/17/2023 16:09	PIC	2456015
628531005	2B	60	4	15	7/17/2023 15:09	7/17/2023 16:09	PIC	2456015
628531006	2C	60	9	26	7/17/2023 15:10	7/17/2023 16:10	PIC	2456015
1205453715	2D	60	19	92	7/17/2023 15:09	7/17/2023 16:09	PIC	2456015
1205453716	3B	60	7	46	7/17/2023 15:09	7/17/2023 16:09	PIC	2456015
1205453717	3C	60	31	1232	7/17/2023 15:09	7/17/2023 16:09	PIC	2456015

ASSAY 17-Jul-23 15:14:12
 Wizard 2480 s/n 46190630
 Protocol id 9 Ba-133_1
 Time limit
 Count limit
 Isotope Ba-133_1
 Protocol date 7/17/2023
 Run id. 6967

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	94	1	180	3342	1113.78	1.73	03:14:12
	628531001	2	94	2	180	2862	953.8	1.87	85.64 03:17:26
	628531002	3	94	3	180	2356.57	785.35	2.06	70.51 03:20:40
	628531003	4	94	4	180	2720.57	906.69	1.92	81.41 03:23:54
	628531004	5	94	5	180	2813	937.41	1.89	84.16 03:27:08
	628531005	1	2	1	180	2835	944.87	1.88	84.83 03:30:56
	628531006	2	2	2	180	2553.28	850.92	1.98	76.40 03:34:10
	1205453715	3	2	3	180	2423.57	807.7	2.03	72.52 03:37:24
	1205453716	4	2	4	180	2840.28	946.66	1.88	85.00 03:40:38
	1205453717	5	2	5	180	2802	933.87	1.89	83.85 03:43:52

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 17-Jul-2023

Detectors LB4100 E1 through H4 and PIC 1A through 14D and G5400W 1W through 1Z and LB4200 GA1 through OD4

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E1	Below	Alpha XTalk	17-Jul 05:58	5	0.189	0.192	0.252	-3.23
LB4100E2	Above	Alpha eff	17-Jul 05:58	5	13061	6589	9855	+8.89
LB4100E2	Below	Alpha XTalk	17-Jul 05:58	5	0.173	0.244	0.547	-4.41
LB4100E2	Below	Beta bkg	17-Jul 04:35	60	1.317	1.385	3.072	-3.24
LB4100E2	Below	Beta eff	17-Jul 06:06	5	13832	14120	15200	-4.60
LB4100E3	Above	Alpha eff	17-Jul 05:58	5	9349	7455	9321	+3.09
LB4100E3	Below	Alpha XTalk	17-Jul 05:58	5	0.166	0.206	0.302	-5.49
LB4100E4	Above	Alpha eff	17-Jul 05:58	5	10998	8193	10600	+3.99
LB4100E4	Below	Alpha XTalk	17-Jul 05:58	5	0.181	0.231	0.304	-7.10
LB4100E4	Below	Beta bkg	17-Jul 04:35	60	0.850	1.058	2.464	-3.89
LB4100F1	Below	Alpha XTalk	17-Jul 05:58	5	0.212	0.247	0.291	-7.69
LB4100F1	need 2nd	Beta bkg	17-Jul 04:35	60	1.567	0.188	2.691	+0.30
LB4100F2	Above	Alpha eff	17-Jul 05:58	5	9759	6533	7372	+20.07
LB4100F2	Below	Alpha XTalk	17-Jul 05:58	5	0.183	0.318	0.366	-19.89
LB4100F2	Below	Beta bkg	17-Jul 04:35	60	1.150	1.173	1.833	-3.21
LB4100F2	Below	Beta eff	17-Jul 06:06	5	14584	15040	15710	-7.08
LB4100F3	Above	Alpha eff	17-Jul 05:58	5	21597	11900	20820	+3.52
LB4100F4	Above	Alpha eff	17-Jul 05:58	5	17763	6281	10700	+12.59
LB4100F4	Below	Alpha XTalk	17-Jul 05:58	5	0.178	0.363	0.644	-6.96
LB4100G2	Above	Alpha eff	17-Jul 06:06	5	12871	7303	10980	+6.09
LB4100G2	Below	Alpha XTalk	17-Jul 06:06	5	0.193	0.236	0.424	-4.36
LB4100G3	Above	Alpha eff	17-Jul 06:06	5	9313	5785	8229	+5.66
LB4100G3	Below	Alpha XTalk	17-Jul 06:06	5	0.240	0.275	0.391	-4.79
LB4100G3	Above	Beta bkg	17-Jul 04:35	60	2.050	0.987	2.738	+0.64
LB4100H1	Above	Alpha bkg	17-Jul 04:35	60	0.283	-5.70E-2	0.192	+5.21
LB4100H1	Below	Alpha XTalk	17-Jul 06:06	5	0.181	0.186	0.361	-3.17
LB4100H1	Above	Beta bkg	17-Jul 04:35	60	3.217	0.216	2.462	+5.02
LB4100H1	Above	Beta XTalk	17-Jul 05:58	5	2.42E-4	2.30E-5	2.25E-4	+3.51
LB4100H4	Above	Alpha eff	17-Jul 06:06	5	16851	7833	14050	+5.70
LB4100H4	Below	Alpha XTalk	17-Jul 06:06	5	0.224	0.261	0.487	-3.99
LB4200GA2	Above	Alpha bkg	17-Jul 04:01	60	0.400	-8.34E-2	0.256	+5.55
LB4200GA3	need 2nd	Alpha bkg	17-Jul 04:01	60	0.250	-8.27E-2	0.264	+2.76

LB4200GA4	Above	Alpha bkg	17-Jul 04:01	60	0.250	-6.25E-2	0.182	+4.67
LB4200GA4	Above	Alpha eff	17-Jul 06:36	5	11620	11180	11590	+3.44
LB4200GB1	Below	Alpha eff	17-Jul 06:36	5	10554	10570	10990	-3.22
LB4200GB2	need 2nd	Alpha eff	17-Jul 06:36	5	9606	9528	9856	-1.57
LB4200GB2	Above	Alpha XTalk	17-Jul 06:36	5	0.258	0.197	0.250	+3.87
LB4200GB2	Above	Beta bkg	17-Jul 04:02	60	228	0.129	1.304	+1,158.91
LB4200GB4	Above	Alpha bkg	17-Jul 04:02	60	0.383	-1.01E-1	0.318	+3.94
LB4200GD4	Below	Beta eff	17-Jul 06:36	5	27981	28020	28710	-3.34
LB4200OA4	Above	Beta bkg	17-Jul 03:31	60	200	-3.08E-2	1.453	+804.16
LB4200OA4	need 2nd	Beta eff	17-Jul 06:23	5	17596	16660	17740	+2.20
PIC1A	Above	Alpha bkg	17-Jul 06:28	60	0.317	-6.68E-2	0.420	+1.72
PIC14B	Below	Alpha eff	17-Jul 08:45	5	7574	8407	9561	-7.33
PIC14B	Above	Alpha XTalk	17-Jul 08:45	5	0.561	0.251	0.307	+30.54
PIC14B	Below	Beta eff	17-Jul 05:49	5	18906	20240	22150	-7.19
PIC14C	Above	Alpha XTalk	17-Jul 08:45	5	0.399	0.274	0.383	+3.84

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

PIC4B Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by Jasmine Conley

Date 7/17/23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2456015

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205453715	MB	JE1	PIC2D	JUL-17-23 15:09:29	DONE	25mm Filter	01-JUN-23 00:00
1205453716	DUP	JE1	PIC3B	JUL-17-23 15:09:33	DONE	25mm Filter	01-JUN-23 00:00
1205453717	LCS	JE1	PIC3C	JUL-17-23 15:09:34	DONE	25mm Filter	01-JUN-23 00:00
628531001	SAMPLE	JE1	PIC1B	JUL-17-23 15:09:37	DONE	25mm Filter	01-JUN-23 00:00
628531002	SAMPLE	JE1	PIC1C	JUL-17-23 15:09:42	DONE	25mm Filter	01-JUN-23 00:00
628531003	SAMPLE	JE1	PIC1D	JUL-17-23 15:09:46	DONE	25mm Filter	01-JUN-23 00:00
628531004	SAMPLE	JE1	PIC2A	JUL-17-23 15:09:51	DONE	25mm Filter	01-JUN-23 00:00
628531005	SAMPLE	JE1	PIC2B	JUL-17-23 15:09:55	DONE	25mm Filter	01-JUN-23 00:00
628531006	SAMPLE	JE1	PIC2C	JUL-17-23 15:10:00	DONE	25mm Filter	01-JUN-23 00:00

Lucas Cell Raw Data

Batch 2456017 Check-list

This check-list was completed on 03-AUG-23 by Lyndsey Pace

This batch was reviewed by Elizabeth Krouse on 03-AUG-23 and Lyndsey Pace on 03-AUG-23.

Batch ID:
2456017

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2456017
Analyst: Lyndsey Pace (LXP1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: BAL-C236761727

Due Dates for Lab: 04-AUG-2023			Package: 06-AUG-2023	SDG: 07-AUG-2023		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
MS	1205453720	Radium-226 SPIKE	1715-G	.1	mL	
LCS	1205453721	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	628531001	12-JUL-2023	1	500.6	500.6	07/31/23 11:55	105	08/03/23 05:05	08/03/23 08:03	1	120
2	628531002	12-JUL-2023	1	501.97	501.97	07/31/23 11:55	201	08/03/23 05:05	08/03/23 08:03	2	66
3	628531003	12-JUL-2023	1	508.58	508.58	07/31/23 11:55	301	08/03/23 05:05	08/03/23 08:03	5	29
4	628531004	12-JUL-2023	1	501.58	501.58	07/31/23 11:55	407	08/03/23 05:05	08/03/23 08:03	1	23
5	628531005	12-JUL-2023	1	503.47	503.47	07/31/23 11:55	503	08/03/23 05:05	08/03/23 08:03	3	31
6	628531006	12-JUL-2023	1	509.18	509.18	07/31/23 11:55	603	08/03/23 05:05	08/03/23 08:03	2	26
7	1205453718 MB	12-JUL-2023	1	509.35	509.35	07/31/23 11:55	701	08/03/23 05:05	08/03/23 08:03	8	19
8	1205453719 DUP (628531001)	12-JUL-2023	1	509.35	509.35	07/31/23 11:55	805	08/03/23 05:05	08/03/23 08:03	1	133
9	1205453720 MS (628531001)	12-JUL-2023	1	107.61	107.61	07/31/23 11:55	106	08/03/23 05:35	08/03/23 08:37	1	613
10	1205453721 LCS	12-JUL-2023	1		509.35	07/31/23 11:55	204	08/03/23 05:35	08/03/23 08:37	2	435

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 12-JUL-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Procedure Code : LUC26RAL
 Parmname : Radium-226
 Required MDA : 1 pCi/L
 Halflife of Ra-226 : 1600 years
 Ra-226 Abundance : 1.00
 Halflife of Rn-222 : 3.8235 days

Batch : 2456017
 Analyst : LIN01615
 Prep Date : 7/12/2023
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	628531001.1	0.5006	2.0258E-05	7/5/2023 10:35	105	30	120	4.000	1	0.033	30	1.5340
2	628531002.1	0.5020	2.0264E-05	7/5/2023 12:37	201	30	66	2.200	2	0.067	30	1.6670
3	628531003.1	0.5086	2.0290E-05	7/5/2023 14:08	301	30	29	0.967	5	0.167	30	1.6430
4	628531004.1	0.5016	2.0262E-05	7/5/2023 11:17	407	30	23	0.767	1	0.033	30	1.4390
5	628531005.1	0.5035	2.0270E-05	7/5/2023 10:35	503	30	31	1.033	3	0.100	30	1.8840
6	628531006.1	0.5092	2.0293E-05	7/5/2023 8:30	603	30	26	0.867	2	0.067	30	1.8970
7	1205453718.1	0.5094	2.0293E-05	7/12/2023 0:00	701	30	19	0.633	8	0.267	30	1.7440
8	1205453719.1	0.5094	2.0293E-05	7/5/2023 10:35	805	30	133	4.433	1	0.033	30	1.5410
9	1205453720.1	0.1076	1.1827E-05	7/5/2023 10:35	106	30	613	20.433	1	0.033	30	1.5250
10	1205453721.1	0.5094	2.0293E-05	7/12/2023 0:00	204	30	435	14.500	2	0.067	30	1.5970

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrowth End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
7.900%	5/1/2023	4/30/2024	7/31/2023 11:55	8/3/2023 5:05	8/3/2023 8:03	0.389	0.978	1.002	1.000
7.400%	8/1/2023	7/31/2024	7/31/2023 11:55	8/3/2023 5:05	8/3/2023 8:03	0.389	0.978	1.002	1.000
4.500%	10/25/2022	10/31/2023	7/31/2023 11:55	8/3/2023 5:05	8/3/2023 8:03	0.389	0.978	1.002	1.000
5.800%	2/1/2023	1/31/2024	7/31/2023 11:55	8/3/2023 5:05	8/3/2023 8:03	0.389	0.978	1.002	1.000
8.800%	6/1/2023	5/31/2024	7/31/2023 11:55	8/3/2023 5:05	8/3/2023 8:03	0.389	0.978	1.002	1.000
3.500%	7/1/2023	6/30/2024	7/31/2023 11:55	8/3/2023 5:05	8/3/2023 8:03	0.389	0.978	1.002	1.000
6.200%	11/1/2022	10/31/2023	7/31/2023 11:55	8/3/2023 5:05	8/3/2023 8:03	0.389	0.978	1.002	1.000
9.600%	4/8/2023	3/31/2024	7/31/2023 11:55	8/3/2023 5:05	8/3/2023 8:03	0.389	0.978	1.002	1.000
3.400%	5/1/2023	4/30/2024	7/31/2023 11:55	8/3/2023 5:35	8/3/2023 8:37	0.391	0.977	1.002	1.000
2.600%	8/1/2023	7/31/2024	7/31/2023 11:55	8/3/2023 5:35	8/3/2023 8:37	0.391	0.977	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-G
Spike Exp Date : 9/8/2023
Spike Activity (dpm/ml): 297.39
Spike Volume Added: 0.10

LCS S/N : 1715-G
LCS Exp Date : 9/8/2023
LCS Activity (dpm/ml): 297.39
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.1698	0.1199	1	0.3944	6.1328	12.16%	3.9667	0.3667	1.1111	1.7088		SAMPLE				
2	0.2204	0.1556	1	0.4531	3.0269	14.86%	2.1333	0.2749	0.7644	0.9838		SAMPLE				
3	0.3490	0.2464	1	0.6348	1.1367	24.71%	0.8000	0.1944	0.5413	0.5744		SAMPLE				
4	0.1807	0.1276	1	0.4196	1.2063	23.01%	0.7333	0.1633	0.5265	0.5712		SAMPLE				
5	0.2381	0.1681	1	0.4614	1.1682	22.61%	0.9333	0.1944	0.4768	0.5444		SAMPLE				
6	0.1909	0.1348	1	0.3925	0.9833	22.32%	0.8000	0.1764	0.4249	0.4531		SAMPLE				
7	0.4152	0.2931	1	0.7199	0.4901	47.64%	0.3667	0.1732	0.4537	0.4631		MB				
8	0.1661	0.1173	1	0.3859	6.6555	13.00%	4.4000	0.3859	1.1440	1.9493	628531001.1	DUP	8.2%			
9	0.7904	0.5580	1	1.8356	146.7935	5.29%	20.4000	0.8260	11.6492	26.0845	628531001.1	MS			124.4855	113.0%
10	0.2255	0.1592	1	0.4636	20.9528	5.48%	14.4333	0.6968	1.9827	3.7708		LCS			26.2997	79.7%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 03-AUG-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:31	1	1.15E+05	114632	-2.66		
LUCAS2	EFF	06:51	1	1.32E+05	132432	-0.98		
LUCAS3	EFF	07:20	1	91190	91190	-2.72		
LUCAS4	EFF	06:47	1	1.27E+05	126639	-1.91		
LUCAS5	EFF	06:46	1	1.30E+05	130162	-2.43		
LUCAS6	EFF	06:43	1	1.29E+05	128802	-1.4		
LUCAS7	EFF	07:09	1	1.31E+05	131182	-2.31		
LUCAS8	EFF	06:15	1	1.19E+05	119433	-0.95		

Reviewed by:



Elizabeth Krouse

Date: 03-AUG-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2456017

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
628531001	SAMPLE	LXP1	LUCAS1	AUG-03-23 08:03:00	DONE	Lucas Cell	01-MAY-23 00:00
628531002	SAMPLE	LXP1	LUCAS2	AUG-03-23 08:03:00	DONE	Lucas Cell	01-AUG-23 00:00
628531003	SAMPLE	LXP1	LUCAS3	AUG-03-23 08:03:00	DONE	Lucas Cell	25-OCT-22 00:00
628531004	SAMPLE	LXP1	LUCAS4	AUG-03-23 08:03:00	DONE	Lucas Cell	01-FEB-23 00:00
628531005	SAMPLE	LXP1	LUCAS5	AUG-03-23 08:03:00	DONE	Lucas Cell	01-JUN-23 00:00
628531006	SAMPLE	LXP1	LUCAS6	AUG-03-23 08:03:00	DONE	Lucas Cell	01-JUL-23 00:00
1205453718	MB	LXP1	LUCAS7	AUG-03-23 08:03:00	DONE	Lucas Cell	01-NOV-22 00:00
1205453719	DUP	LXP1	LUCAS8	AUG-03-23 08:03:00	DONE	Lucas Cell	08-APR-23 00:00
1205453720	MS	LXP1	LUCAS1	AUG-03-23 08:37:00	DONE	Lucas Cell	01-MAY-23 00:00
1205453721	LCS	LXP1	LUCAS2	AUG-03-23 08:37:00	DONE	Lucas Cell	01-AUG-23 00:00



Data Verification & Validation Report

Lansing Board of Water & Light – Erickson Power Station

Sampling Event (dates and purpose): New Wells: MW-100ABCD – Background Round 2 – July 2023

Data Package Number: S50741.01

Lab Report Date: 08/22/2023

Data Validator: Aryka Thomson

Data Validation Completion Date: 08/24/2023

General Overall Assessment:

Data are usable without qualification.

Data are usable with qualification (as noted below).

Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	
MW-7C	
MW-8	
MW-9	
MW-10	
MW-11	
MW-11B	
MW-12	
MW-12B	
MW-13	
MW-14	
MW-15	
MW-16A	
MW-16B	
MW-16C	
MW-16D	
MW-100A	X
MW-100B	X
MW-100C	X
MW-100D	X

Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-100A	GW	S50741.01	07/10/2023	X	X	X	X	X	X	
MW-100B	GW	S50741.02	07/10/2023	X	X	X	X	X	X	
MW-100C	GW	S50741.03	07/10/2023	X	X	X	X	X	X	
MW-100D	GW	S50741.04	07/10/2023	X	X	X	X	X	X	
MWT-100B	QC	S50741.05	07/10/2023	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO₃, CO₃, hardness

Any planned sampling or analysis NOT completed? If yes, explain: _____

Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Field Data							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	X		Record of decontamination for non-dedicated sampling equipment	X			
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
Analytical Data Package							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies across samples for sulfate and TSS
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Holding Times	X		Analyses performed within allowed holding time	X			
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested		X		RLs for sulfate and TDS were not met
			MDLs<RLs		X		RL=MDL for carbonate
			MDLs<MCLs	X			
			MDLs<GPS			X	
QC Validation							
Evaluate Accuracy							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Evaluate Precision							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Rad-226, Rad-228, and combined radium RPDs 43%, 24%, and 34% respectively
Evaluate Representativeness							
Equipment Blanks (if applicable)	X		Non-detect (<RL)	X			
QC Verification							
Verify Instrument Calibration & Analytical Process							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	Mo had recoveries outside control limits
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
Evaluate Completeness (# usable measurements/ # unusable measurements)							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

TSS in MW-100C and MW-100D were qualified by the laboratory as non-detect (U) because it was detected at a level less than reporting limit, but greater than MDL.

Comments:

The RPD for Rad-226, Rad-228, and combined radium were 43%, 24%, and 34%, respectively. Rad-226 and combined radium required qualification as estimated with high bias (J+) in the parent sample MW-100B. Rad-228 required qualification as estimated but not detected (UJ). Rad-226 and Rad-228 required qualification as estimated but not detected (UJ) in field duplicate MWT-100B. Combined radium required qualification as estimated with low bias (J-).



Report ID: S50741.01(02)
Generated on 08/10/2023
Replaces report S50741.01(01) generated on 07/13/2023

Report to
Attention: Jennifer Caporale
Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

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Report Summary

Lab Sample ID(s): S50741.01-S50741.06
Project: Erickson Well Project 100A-100D
Collected Date(s): 07/10/2023
Submitted Date/Time: 07/11/2023 09:31
Sampled by: Marc Wahrer
P.O. #:

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Maya Murshak
Technical Director



General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

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Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

Report Narrative

All analyses completed



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP & ISO/IEC 17025:2017	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



Sample Summary (6 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S50741.01	MW-100A L307211-01	Groundwater	07/10/23 14:55
S50741.02	MW-100B L307211-02	Groundwater	07/10/23 11:11
S50741.03	MW-100C L307211-03	Groundwater	07/10/23 13:00
S50741.04	MW100D L307211-04	Groundwater	07/10/23 14:31
S50741.05	MWT-100B L307211-05	Groundwater	07/10/23 11:11
S50741.06	Field Blank L307211-06	Water	07/10/23 09:25

**Lab Sample ID: S50741.01**

Sample Tag: MW-100A L307211-01

Collected Date/Time: 07/10/2023 14:55

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.4	IR
2	1L Plastic	None	Yes	2.4	IR
1	250ml Plastic	HNO3	Yes	2.4	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	07/12/23 10:50	JRH	
Metal Digestion	Completed	SW3015A	07/12/23 09:45	CCM	

Inorganics**Method: E300.0, Run Date: 07/12/23 09:04, Analyst: JDP**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	10	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	38	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 07/12/23 10:06, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	430	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 07/12/23 12:08, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	393	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 07/12/23 14:15, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	434	50	6	mg/L	2		

Method: SM2540D, Run Date: 07/12/23 14:15, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	25	25	10	mg/L	10		

Metals**Method: E200.8, Run Date: 07/12/23 11:30, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.010	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.202	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.05	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	1.25	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S50741.01 (continued)

Sample Tag: MW-100A L307211-01

Method: E200.8, Run Date: 07/12/23 11:30, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.018	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.012	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 07/12/23 13:20, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	95.3	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	40.3	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	2.62	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	11.8	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 07/12/23 15:47, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 08/10/23 10:12, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S50741.02

Sample Tag: MW-100B L307211-02

Collected Date/Time: 07/10/2023 11:11

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.4	IR
2	1L Plastic	None	Yes	2.4	IR
1	250ml Plastic	HNO3	Yes	2.4	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	07/12/23 10:50	JRH	
Metal Digestion	Completed	SW3015A	07/12/23 09:45	CCM	

Inorganics

Method: E300.0, Run Date: 07/12/23 11:00, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfate	126	10	0.59	mg/L	10	14808-79-8	

Method: E300.0, Run Date: 07/12/23 09:17, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	23	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: SM2320B, Run Date: 07/12/23 10:10, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	440	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 07/12/23 12:12, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	397	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 07/12/23 14:15, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	534	50	6	mg/L	2		

Method: SM2540D, Run Date: 07/12/23 14:15, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	7.1	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 07/12/23 11:34, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.010	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.159	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.23	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S50741.02 (continued)

Sample Tag: MW-100B L307211-02

Method: E200.8, Run Date: 07/12/23 11:34, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	3.54	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.016	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.011	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 07/12/23 13:22, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	102	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	35.0	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	3.50	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	26.9	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 07/12/23 15:50, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 08/10/23 10:12, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S50741.03

Sample Tag: MW-100C L307211-03

Collected Date/Time: 07/10/2023 13:00

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.4	IR
2	1L Plastic	None	Yes	2.4	IR
1	250ml Plastic	HNO3	Yes	2.4	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	07/12/23 10:50	JRH	
Metal Digestion	Completed	SW3015A	07/12/23 09:45	CCM	

Inorganics

Method: E300.0, Run Date: 07/12/23 09:29, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	10	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	14	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 07/12/23 10:16, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	100	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 07/12/23 12:14, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	204	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 07/12/23 14:15, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	300	50	6	mg/L	2		

Method: SM2540D, Run Date: 07/12/23 14:15, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	1.4	3	1	mg/L	1		b

Metals

Method: E200.8, Run Date: 07/12/23 11:37, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.082	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	1.68	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL



Analytical Laboratory Report

Final Report

Lab Sample ID: S50741.03 (continued)

Sample Tag: MW-100C L307211-03

Method: E200.8, Run Date: 07/12/23 11:37, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	1.00	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.028	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.009	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 07/12/23 13:23, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	56.3	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	18.1	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	6.59	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	38.2	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 07/12/23 15:53, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 08/10/23 10:12, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S50741.04

Sample Tag: MW100D L307211-04

Collected Date/Time: 07/10/2023 14:31

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.4	IR
2	1L Plastic	None	Yes	2.4	IR
1	250ml Plastic	HNO3	Yes	2.4	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	07/12/23 10:50	JRH	
Metal Digestion	Completed	SW3015A	07/12/23 09:45	CCM	

Inorganics

Method: E300.0, Run Date: 07/12/23 09:42, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	6	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 07/12/23 10:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	390	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 07/12/23 12:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	32	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 07/12/23 14:15, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	392	50	6	mg/L	2		

Method: SM2540D, Run Date: 07/12/23 14:15, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	2.7	3	1	mg/L	1		b

Metals

Method: E200.8, Run Date: 07/12/23 11:41, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.011	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	3.23	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL



Analytical Laboratory Report

Final Report

Lab Sample ID: S50741.04 (continued)

Sample Tag: MW100D L307211-04

Method: E200.8, Run Date: 07/12/23 11:41, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	0.64	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.016	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.010	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 07/12/23 13:25, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	7.18	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	1.81	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	4.62	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	152	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 07/12/23 15:57, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 08/10/23 10:12, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Lab Sample ID: S50741.05

Sample Tag: MWT-100B L307211-05

Collected Date/Time: 07/10/2023 11:11

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.4	IR
2	1L Plastic	None	Yes	2.4	IR
1	250ml Plastic	HNO3	Yes	2.4	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	07/12/23 10:50	JRH	
Metal Digestion	Completed	SW3015A	07/12/23 09:45	CCM	

Inorganics

Method: E300.0, Run Date: 07/12/23 11:12, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfate	126	10	0.59	mg/L	10	14808-79-8	

Method: E300.0, Run Date: 07/12/23 09:55, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	23	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: SM2320B, Run Date: 07/12/23 10:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	350	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 07/12/23 12:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	393	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 07/12/23 14:15, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	526	50	6	mg/L	2		

Method: SM2540D, Run Date: 07/12/23 14:15, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	6.7	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 07/12/23 11:44, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.010	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.156	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.23	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S50741.05 (continued)

Sample Tag: MWT-100B L307211-05

Method: E200.8, Run Date: 07/12/23 11:44, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	3.43	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.016	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.011	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 07/12/23 13:26, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	101	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	34.9	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	3.54	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	27.1	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 07/12/23 16:00, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 08/10/23 10:12, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S50741.06

Sample Tag: Field Blank L307211-06

Collected Date/Time: 07/10/2023 09:25

Matrix: Water

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.4	IR
2	1L Plastic	None	Yes	2.4	IR
1	250ml Plastic	HNO3	Yes	2.4	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	07/12/23 10:50	JRH	
Metal Digestion	Completed	SW3015A	07/12/23 09:45	CCM	

Inorganics

Method: E300.0, Run Date: 07/12/23 10:08, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 07/12/23 10:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 07/12/23 12:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 07/12/23 14:15, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	6	mg/L	2		

Method: SM2540D, Run Date: 07/12/23 14:15, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 07/12/23 11:25, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S50741.06 (continued)

Sample Tag: Field Blank L307211-06

Method: E200.8, Run Date: 07/12/23 11:25, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 07/12/23 13:14, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 07/12/23 16:03, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 08/10/23 10:12, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

Merit Laboratories Login Checklist

Lab Set ID:S50741

Client:BWL01 (Board of Water & Light)

Project: Erickson Well Project 100A-100D

Submitted:07/11/2023 09:31 Login User: PFD

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Selection	Description	Note
Sample Receiving		
01.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples are received at 4C +/- 2C Thermometer # IR 2.4
02.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Received on ice/ cooling process begun
03.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples shipped
04.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples left in 24 hr. drop box
05.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Are there custody seals/tape or is the drop box locked
Chain of Custody		
06.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC adequately filled out
07.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC signed and relinquished to the lab
08.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sample tag on bottles match COC
09.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Subcontracting needed? Subcontracted to: GEL
Preservation		
10.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Do sample have correct chemical preservation
11.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Completed pH checks on preserved samples? (no VOAs)
12.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Did any samples need to be preserved in the lab?
Bottle Conditions		
13.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	All bottles intact
14.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Appropriate analytical bottles are used
15.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Merit bottles used
16.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sufficient sample volume received
17.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples require laboratory filtration
18.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples submitted within holding time
19.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S50741 Submitted: 07/11/2023 09:31

Client: BWL01 (Board of Water & Light)

Project: Erickson Well Project 100A-100D

Initial Preservation Check: 07/11/2023 10:00 PFD

Preservation Recheck (E200.8): N/A

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S50741.01	1L Plastic HNO3	<2			
S50741.01	1L Plastic HNO3	<2			
S50741.01	250ml Plastic HNO3	<2			
S50741.02	1L Plastic HNO3	<2			
S50741.02	1L Plastic HNO3	<2			
S50741.02	250ml Plastic HNO3	<2			
S50741.03	1L Plastic HNO3	<2			
S50741.03	1L Plastic HNO3	<2			
S50741.03	250ml Plastic HNO3	<2			
S50741.04	1L Plastic HNO3	<2			
S50741.04	1L Plastic HNO3	<2			
S50741.04	250ml Plastic HNO3	<2			
S50741.05	1L Plastic HNO3	<2			
S50741.05	1L Plastic HNO3	<2			
S50741.05	250ml Plastic HNO3	<2			
S50741.06	1L Plastic HNO3	<2			
S50741.06	1L Plastic HNO3	<2			
S50741.06	250ml Plastic HNO3	<2			

Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005



August 10, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 629302
SDG: S50741

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on July 14, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Jordan Melton for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S50741
Work Order: 629302**

August 10, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on July 14, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

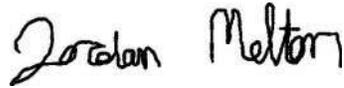
Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
629302001	S50741.01
629302002	S50741.02
629302003	S50741.03
629302004	S50741.04
629302005	S50741.05
629302006	S50741.06 Field Blank

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Jordan Melton". The signature is written in a cursive, slightly slanted style.

Jordan Melton for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

SAMPLE RECEIPT & REVIEW FORM

Client: MERI		SDG/AR/COC/Work Order: 629302	
Received By: QG		Date Received: 7/14/23	
Carrier and Tracking Number		FedEx Express FedEx Ground <u>(UPS)</u> Field Services Courier Other 12 466 477 03 6219 7696	
Suspected Hazard Information		Yes	No
A) Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
B) Did the client designate the samples are to be received as radioactive?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
C) Did the RSO classify the samples as radioactive?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
D) Did the client designate samples are hazardous?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
E) Did the RSO identify possible hazards?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Sample Receipt Criteria		Yes	No
1 Shipping containers received intact and sealed?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2 Chain of custody documents included with shipment?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4 Daily check performed and passed on IR temperature gun?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
5 Sample containers intact and sealed?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6 Samples requiring chemical preservation at proper pH?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
7 Do any samples require Volatile Analysis?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
8 Samples received within holding time?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
9 Sample ID's on COC match ID's on bottles?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
10 Date & time on COC match date & time on bottles?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
11 Number of containers received match number indicated on COC?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
12 Are sample containers identifiable as GEL provided by use of GEL labels?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
13 COC form is properly signed in relinquished/received sections?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Comments (Use Continuation Form if needed):			

PM (or PMA) review: Initials AM Date 7/17/23 Page 1 of 1

Laboratory Certifications

List of current GEL Certifications as of 10 August 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S50741
Work Order #: 629302**

Product: Radium-226+Radium-228 Calculation

Analytical Method: Calculation

Analytical Procedure: GL-RAD-D-003 REV# 45

Analytical Batch: 2460566

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
629302001	S50741.01
629302002	S50741.02
629302003	S50741.03
629302004	S50741.04
629302005	S50741.05
629302006	S50741.06 Field Blank

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2472079

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
629302001	S50741.01
629302002	S50741.02
629302003	S50741.03
629302004	S50741.04
629302005	S50741.05
629302006	S50741.06 Field Blank
1205480717	Method Blank (MB)
1205480718	629166001(NonSDG) Sample Duplicate (DUP)
1205480719	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Sample Re-prep/Re-analysis

Samples were reprepared due to high blank activity. The re-analysis is being reported.

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2460565

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
629302001	S50741.01
629302002	S50741.02
629302003	S50741.03
629302004	S50741.04
629302005	S50741.05
629302006	S50741.06 Field Blank
1205460770	Method Blank (MB)
1205460771	629166001(NonSDG) Sample Duplicate (DUP)
1205460772	629166001(NonSDG) Matrix Spike (MS)
1205460773	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

The matrix spike, 1205460772 (Non SDG 629166001MS), aliquot was reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S50741 GEL Work Order: 629302

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 10 AUG 2023

Title: Analyst III - Data Validator

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: August 10, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S50741.01 Project: MERI00120
Sample ID: 629302001 Client ID: MERI001
Matrix: Ground Water
Collect Date: 10-JUL-23 14:55
Receive Date: 14-JUL-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	-0.260	+/-0.716	1.50	3.00	pCi/L		JE1	08/10/23	1012	2472079	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.650	+/-0.857			pCi/L		NXL1	08/10/23	1234	2460566	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.650	+/-0.470	0.671	1.00	pCi/L		LXP1	08/04/23	0826	2460565	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			74.2	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: August 10, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S50741.03 Project: MERI00120
Sample ID: 629302003 Client ID: MERI001
Matrix: Ground Water
Collect Date: 10-JUL-23 13:00
Receive Date: 14-JUL-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	-0.136	+/-0.827	1.65	3.00	pCi/L		JE1	08/10/23	1012	2472079	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.872	+/-0.977			pCi/L		NXL1	08/10/23	1234	2460566	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.872	+/-0.520	0.697	1.00	pCi/L		LXP1	08/04/23	0919	2460565	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			71.7	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: August 10, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S50741.04 Project: MERI00120
Sample ID: 629302004 Client ID: MERI001
Matrix: Ground Water
Collect Date: 10-JUL-23 14:31
Receive Date: 14-JUL-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	1.06	+/-0.921	1.46	3.00	pCi/L		JE1	08/10/23	1012	2472079	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.54	+/-1.01			pCi/L		NXL1	08/10/23	1234	2460566	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.486	+/-0.426	0.651	1.00	pCi/L		LXP1	08/04/23	0919	2460565	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			76.1	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: August 10, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive
 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S50741.05	Project: MERI00120
Sample ID: 629302005	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 10-JUL-23 11:11	
Receive Date: 14-JUL-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.611	+/-1.17	2.06	3.00	pCi/L		JE1	08/10/23	1012	2472079	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.08	+/-1.23			pCi/L		NXL1	08/10/23	1234	2460566	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.469	+/-0.395	0.576	1.00	pCi/L		LXP1	08/04/23	0919	2460565	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			70.4	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: August 10, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S50741.06 Field Blank Project: MERI00120
Sample ID: 629302006 Client ID: MERI001
Matrix: Water
Collect Date: 10-JUL-23 09:25
Receive Date: 14-JUL-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		1.73	+/-1.11	1.65	3.00	pCi/L		JE1	08/10/23	1012	2472079	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		2.26	+/-1.15			pCi/L		NXL1	08/10/23	1234	2460566	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.535	+/-0.312	0.315	1.00	pCi/L		LXP1	08/04/23	0919	2460565	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			63.9	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: August 10, 2023

Page 1 of 2

Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan

Contact: John Laverty

Workorder: 629302

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2472079										
QC1205480718	629166001	DUP									
Radium-228	U	1.02	U	1.74	pCi/L	N/A		N/A	JE1	08/10/23	10:11
	Uncertainty	+/-1.03		+/-1.50							
QC1205480719	LCS										
Radium-228	79.3			91.4	pCi/L		115	(75%-125%)		08/10/23	10:11
	Uncertainty			+/-5.03							
QC1205480717	MB										
Radium-228			U	0.693	pCi/L					08/10/23	10:11
	Uncertainty			+/-1.01							
Rad Ra-226											
Batch	2460565										
QC1205460771	629166001	DUP									
Radium-226	U	0.223	U	0.370	pCi/L	N/A		N/A	LXP1	08/04/23	09:19
	Uncertainty	+/-0.409		+/-0.567							
QC1205460773	LCS										
Radium-226	26.3			28.1	pCi/L		107	(75%-125%)		08/04/23	09:58
	Uncertainty			+/-2.18							
QC1205460770	MB										
Radium-226			U	0.341	pCi/L					08/04/23	09:19
	Uncertainty			+/-0.393							
QC1205460772	629166001	MS									
Radium-226	132 U	0.223		155	pCi/L		118	(75%-125%)		08/04/23	09:58
	Uncertainty	+/-0.409		+/-11.9							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- H Analytical holding time was exceeded
- < Result is less than value reported
- > Result is greater than value reported

GEL LABORATORIES LLC

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QC Summary

Workorder: 629302

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
NI											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2472079 Check-list

This check-list was completed on 10-AUG-23 by Nat Long

This batch was reviewed by Kenshalla Oston on 10-AUG-23 and Nat Long on 10-AUG-23.

Batch ID:
2472079

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2472079
Analyst: Jacqueline Winston (JE1)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: BAL-C236761727

Due Dates for Lab: 08-AUG-2023			Package: 10-AUG-2023	SDG: 11-AUG-2023		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205480719	228	2051-B	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	629166001 - 2	07-AUG-2023	3	301.17	301.17	08/08/23 14:50	08/10/23 08:22
2	629251001 - 2	07-AUG-2023	3	304.21	304.21	08/08/23 14:50	08/10/23 08:22
3	629302001 - 2	07-AUG-2023	3	302.26	302.26	08/08/23 14:50	08/10/23 08:22
4	629302002 - 2	07-AUG-2023	3	304.53	304.53	08/08/23 14:50	08/10/23 08:22
5	629302003 - 2	07-AUG-2023	3	300.38	300.38	08/08/23 14:50	08/10/23 08:22
6	629302004 - 2	07-AUG-2023	3	300.47	300.47	08/08/23 14:50	08/10/23 08:22
7	629302005 - 2	07-AUG-2023	3	304.51	304.51	08/08/23 14:50	08/10/23 08:22
8	629302006 - 2	07-AUG-2023	3	304.88	304.88	08/08/23 14:50	08/10/23 08:22
9	629388001 - 2	07-AUG-2023	3	302.97	302.97	08/08/23 14:50	08/10/23 08:22
10	1205480717 MB	07-AUG-2023	3		304.88	08/08/23 14:50	08/10/23 08:22
11	1205480718 - 2 DUP (629166001)	07-AUG-2023	3	301.41	301.41	08/08/23 14:50	08/10/23 08:22
12	1205480719 LCS	07-AUG-2023	3		304.88	08/08/23 14:50	08/10/23 08:22

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 1951-E	Ba-133	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 07-AUG-2023 00:00
REGNT 3948399	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3945603	RGF-1M Citric Acid	5 mL	
REGNT 3947239	2M HCl	20 mL	
REGNT 3950136	RGF-7M Nitric Acid	25 mL	
REGNT DGA070123	2456664	2 g	
REGNT 3885305.13	RGF-Hydrofluoric Acid	4 mL	
REGNT 3940152	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3939217	RGF-Neodymium Substrate	5 mL	
REGNT 3946607.6	Nitric Acid	5 mL	
REGNT 3940529	Barium Carrier Ra228 REG	1 mL	
REGNT 3946262	RGF-50% Potassium Carbonate	2 mL	
REGNT 3928521.5	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 1951-E
 Tracer Exp Date : 1/10/2024
 Tracer Volume Added: 0.10

Batch : 2472079
 Analyst : JAC02417
 Prep Date : 8/7/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 3 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	629166001.2	0.3012	1.8479E-05	7/11/2023 7:00	1149.5	1.70%	725.2	2.14%	0.1	0.000200
2	629251001.2	0.3042	1.8530E-05	7/13/2023 6:00	1149.5	1.70%	830.8	2.00%	0.1	0.000200
3	629302001.2	0.3023	1.8497E-05	7/10/2023 14:55	1149.5	1.70%	852.8	1.98%	0.1	0.000200
4	629302002.2	0.3045	1.8535E-05	7/10/2023 11:11	1149.5	1.70%	769.9	2.08%	0.1	0.000200
5	629302003.2	0.3004	1.8465E-05	7/10/2023 13:00	1149.5	1.70%	824.2	2.01%	0.1	0.000200
6	629302004.2	0.3005	1.8467E-05	7/10/2023 14:31	1149.5	1.70%	875.2	1.95%	0.1	0.000200
7	629302005.2	0.3045	1.8535E-05	7/10/2023 11:11	1149.5	1.70%	809.3	2.03%	0.1	0.000200
8	629302006.2	0.3049	1.8541E-05	7/10/2023 9:25	1149.5	1.70%	734.8	2.13%	0.1	0.000200
9	629388001.2	0.3030	1.8509E-05	7/11/2023 8:15	1149.5	1.70%	566.7	2.42%	0.1	0.000200
10	1205480717.1	0.3049	1.8541E-05	8/7/2023 0:00	1149.5	1.70%	944.4	1.88%	0.1	0.000200
11	1205480718.2	0.3014	1.8483E-05	7/11/2023 7:00	1149.5	1.70%	655.6	2.25%	0.1	0.000200
12	1205480719.1	0.3049	1.8541E-05	8/7/2023 0:00	1149.5	1.70%	906.4	1.92%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
			Alpha	Beta										
1	1B	60	6	35	0.583	8/10/2023 10:12	8/8/2023 14:50	8/10/2023 8:22	0.990	0.813	0.991	1.057	63.1%	2.75%
2	1C	60	12	53	0.883	8/10/2023 10:12	8/8/2023 14:50	8/10/2023 8:22	0.991	0.813	0.991	1.057	72.3%	2.64%
3	2C	60	11	22	0.367	8/10/2023 10:12	8/8/2023 14:50	8/10/2023 8:22	0.990	0.813	0.991	1.057	74.2%	2.62%
4	2D	60	5	88	1.467	8/10/2023 10:12	8/8/2023 14:50	8/10/2023 8:22	0.990	0.813	0.991	1.057	67.0%	2.70%
5	3B	60	9	29	0.483	8/10/2023 10:12	8/8/2023 14:50	8/10/2023 8:22	0.990	0.813	0.991	1.057	71.7%	2.65%
6	3D	60	10	35	0.583	8/10/2023 10:12	8/8/2023 14:50	8/10/2023 8:22	0.990	0.813	0.991	1.057	76.1%	2.60%
7	5B	60	15	58	0.967	8/10/2023 10:12	8/8/2023 14:50	8/10/2023 8:22	0.990	0.813	0.991	1.057	70.4%	2.66%
8	5C	60	20	48	0.800	8/10/2023 10:12	8/8/2023 14:50	8/10/2023 8:22	0.990	0.813	0.991	1.057	63.9%	2.74%
9	1D	60	13	37	0.617	8/10/2023 10:12	8/8/2023 14:50	8/10/2023 8:22	0.990	0.812	0.991	1.057	49.3%	2.97%
10	5D	60	14	67	1.117	8/10/2023 10:11	8/8/2023 14:50	8/10/2023 8:22	0.999	0.814	0.991	1.057	82.2%	2.55%
11	6A	60	16	67	1.117	8/10/2023 10:11	8/8/2023 14:50	8/10/2023 8:22	0.990	0.814	0.991	1.057	57.0%	2.83%
12	6B	60	9	1385	23.083	8/10/2023 10:11	8/8/2023 14:50	8/10/2023 8:22	0.999	0.813	0.991	1.057	78.9%	2.58%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2023	5/31/2024	0.6098	0.00711	0.386	8/4/2023 18:31	500
2	PIC	6/1/2023	5/31/2024	0.6077	0.00847	0.822	8/4/2023 18:31	500
3	PIC	6/1/2023	5/31/2024	0.6085	0.01274	0.426	8/4/2023 18:31	500
4	PIC	6/1/2023	5/31/2024	0.6206	0.00745	1.256	8/4/2023 18:31	500
5	PIC	6/1/2023	5/31/2024	0.6266	0.01614	0.514	8/4/2023 18:31	500
6	PIC	6/1/2023	5/31/2024	0.5677	0.02297	0.354	8/4/2023 18:31	500
7	PIC	6/1/2023	5/31/2024	0.6230	0.00426	0.830	8/4/2023 18:32	500
8	PIC	6/1/2023	5/31/2024	0.6454	0.00657	0.436	8/4/2023 18:32	500
9	PIC	6/1/2023	5/31/2024	0.6071	0.00692	0.594	8/4/2023 18:31	500
10	PIC	6/1/2023	5/31/2024	0.6566	0.00925	0.924	8/4/2023 18:34	500
11	PIC	6/1/2023	5/31/2024	0.6444	0.02228	0.794	8/4/2023 18:29	500
12	PIC	6/1/2023	5/31/2024	0.5957	0.00851	0.966	8/4/2023 18:29	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

* - RPD changed to 0% due to sample & dup activity below MDA

LCS S/N : 2051-B
LCS Exp Date : 3/27/2024
LCS Activity (dpm/ml): 536.99
LCS Volume Added: 0.10

Results														2 SIGMA	2 SIGMA		
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery	
1	1.0192	0.7195	3	1.6968	1.0169	51.99%	0.1973	0.1024	1.0347	1.0666		SAMPLE					
2	1.2888	0.9099	3	2.0431	0.2739	208.60%	0.0613	0.1279	1.1197	1.1219		SAMPLE					
3	0.9095	0.6421	3	1.5031	-0.2597	140.67%	-0.0593	0.0834	0.7159	0.7162		SAMPLE					
4	1.6836	1.1886	3	2.6132	0.9941	77.99%	0.2107	0.1642	1.5186	1.5395		SAMPLE					
5	1.0104	0.7133	3	1.6480	-0.1358	310.80%	-0.0307	0.0953	0.8270	0.8272		SAMPLE					
6	0.8714	0.6152	3	1.4605	1.0551	44.67%	0.2293	0.1021	0.9210	0.9602		SAMPLE					
7	1.2976	0.9161	3	2.0560	0.6115	97.58%	0.1367	0.1333	1.1690	1.1793		SAMPLE					
8	0.9988	0.7052	3	1.6479	1.7296	32.86%	0.3640	0.1192	1.1100	1.1942		SAMPLE					
9	1.6169	1.1416	3	2.6127	0.1494	472.41%	0.0227	0.1071	1.3832	1.3837		SAMPLE					
10	1.1004	0.7769	3	1.7336	0.6928	74.29%	0.1927	0.1430	1.0082	1.0234		MB					
11	1.5283	1.0790	3	2.4274	1.7385	44.19%	0.3227	0.1421	1.5009	1.5666	629166001.2	DUP	* 0.0%				
12	1.2925	0.9125	3	2.0316	91.3664	3.91%	22.1173	0.6218	5.0347	23.7620		LCS			79.3393	115.2%	

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
629166001	1B	60	6	35	8/10/2023 10:12	8/10/2023 11:12	PIC	2472079
629251001	1C	60	12	53	8/10/2023 10:12	8/10/2023 11:12	PIC	2472079
629302001	2C	60	11	22	8/10/2023 10:12	8/10/2023 11:12	PIC	2472079
629302002	2D	60	5	88	8/10/2023 10:12	8/10/2023 11:12	PIC	2472079
629302003	3B	60	9	29	8/10/2023 10:12	8/10/2023 11:12	PIC	2472079
629302004	3D	60	10	35	8/10/2023 10:12	8/10/2023 11:12	PIC	2472079
629302005	5B	60	15	58	8/10/2023 10:12	8/10/2023 11:12	PIC	2472079
629302006	5C	60	20	48	8/10/2023 10:12	8/10/2023 11:12	PIC	2472079
629388001	1D	60	13	37	8/10/2023 10:12	8/10/2023 11:12	PIC	2472079
1205480717	5D	60	14	67	8/10/2023 10:11	8/10/2023 11:11	PIC	2472079
1205480718	6A	60	16	67	8/10/2023 10:11	8/10/2023 11:11	PIC	2472079
1205480719	6B	60	9	1385	8/10/2023 10:11	8/10/2023 11:11	PIC	2472079

ASSAY 10-Aug-23 8:54:15
 Wizard 2480 s/n 46190630
 Protocol id 8 Ba-133
 Time limit
 Count limit
 Isotope Ba-133
 Protocol date 8/10/2023
 Run id. 7123

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	95	1	180	3449	1149.45	1.7	08:54:15
629166001	2	95	2	180	2176	725.19	2.14	63.09	08:57:29
629251001	3	95	3	180	2493	830.83	2	72.28	09:00:43
629302001	4	95	4	180	2559	852.82	1.98	74.19	09:03:56
629302002	5	95	5	180	2310.28	769.94	2.08	66.98	09:07:11
629302003	1	98	1	180	2473	824.2	2.01	71.70	09:10:46
629302004	2	98	2	180	2626	875.18	1.95	76.14	09:14:00
629302005	3	98	3	180	2428.28	809.26	2.03	70.40	09:17:14
629302006	4	98	4	180	2205	734.84	2.13	63.93	09:20:28
629388001	5	98	5	180	1700.57	566.73	2.42	49.30	09:23:42
1205480717	1	14	1	180	2834	944.42	1.88	82.16	09:27:18
1205480718	2	14	2	180	1967	655.55	2.25	57.03	09:30:32
1205480719	3	14	3	180	2720	906.43	1.92	78.86	09:33:46

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 10-Aug-2023

Detectors LB4100 E1 through H4 and PIC 1A through 14D and G5400W 1W through 1Z and LB4200 GA1 through OD4

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100G3	Above	Beta bkg	10-Aug 04:14	60	2.900	0.785	2.444	+4.65
LB4100H1	Above	Alpha bkg	10-Aug 04:13	60	0.283	-5.70E-2	0.192	+5.21
LB4100H1	Below	Alpha XTalk	10-Aug 05:16	5	0.183	0.186	0.361	-3.09
LB4100H1	Above	Beta bkg	10-Aug 04:13	60	2.567	0.216	2.462	+3.28
LB4200GA1	Below	Alpha XTalk	10-Aug 08:00	5	0.193	0.195	0.228	-3.26
LB4200GB2	Above	Beta bkg	10-Aug 03:17	60	119	0.129	1.304	+602.30
LB4200GB4	Below	Alpha eff	10-Aug 05:43	5	17497	17570	18140	-3.77
LB4200GB4	Below	Beta eff	10-Aug 05:33	5	27522	27810	28780	-4.78
LB4200GD4	Above	Alpha bkg	10-Aug 06:40	60	0.250	-5.85E-2	0.245	+3.10
LB4200OB2	Above	Beta bkg	10-Aug 06:37	60	1.767	0.211	1.301	+5.56
LB4200OC3	Above	Beta eff	10-Aug 08:00	5	14840	13860	14800	+3.25
PIC2B	Below	Beta eff	10-Aug 06:27	5	20100	20210	21520	-3.50
PIC12D	Above	Beta bkg	10-Aug 07:30	60	2.050	-2.51E-1	2.232	+2.56
PIC14D	Above	Alpha bkg	10-Aug 07:43	60	0.367	-6.92E-2	0.436	+2.17
PIC14D	Above	Beta bkg	10-Aug 07:43	60	2.517	-2.45E-1	2.368	+3.34

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

PIC5A Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by Jasmine Conley

Date 8/10/23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2472079

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205480717	MB	JE1	PIC5D	AUG-10-23 10:11:42	DONE	25mm Filter	01-JUN-23 00:00
1205480718	DUP	JE1	PIC6A	AUG-10-23 10:11:49	DONE	25mm Filter	01-JUN-23 00:00
1205480719	LCS	JE1	PIC6B	AUG-10-23 10:11:53	DONE	25mm Filter	01-JUN-23 00:00
629166001	SAMPLE	JE1	PIC1B	AUG-10-23 10:12:01	DONE	25mm Filter	01-JUN-23 00:00
629251001	SAMPLE	JE1	PIC1C	AUG-10-23 10:12:05	DONE	25mm Filter	01-JUN-23 00:00
629302001	SAMPLE	JE1	PIC2C	AUG-10-23 10:12:09	DONE	25mm Filter	01-JUN-23 00:00
629302002	SAMPLE	JE1	PIC2D	AUG-10-23 10:12:12	DONE	25mm Filter	01-JUN-23 00:00
629302003	SAMPLE	JE1	PIC3B	AUG-10-23 10:12:16	DONE	25mm Filter	01-JUN-23 00:00
629302004	SAMPLE	JE1	PIC3D	AUG-10-23 10:12:19	DONE	25mm Filter	01-JUN-23 00:00
629302005	SAMPLE	JE1	PIC5B	AUG-10-23 10:12:23	DONE	25mm Filter	01-JUN-23 00:00
629302006	SAMPLE	JE1	PIC5C	AUG-10-23 10:12:27	DONE	25mm Filter	01-JUN-23 00:00
629388001	SAMPLE	JE1	PIC1D	AUG-10-23 10:12:34	DONE	25mm Filter	01-JUN-23 00:00

Lucas Cell Raw Data

Batch 2460565 Check-list

This check-list was completed on 04-AUG-23 by Elizabeth Krouse

This batch was reviewed by Elizabeth Krouse on 04-AUG-23 and Gregory Ramsay on 04-AUG-23.

Batch ID:
2460565

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2460565
Analyst: Lyndsey Pace (LXP1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: LUCAS-C202389980

Due Dates for Lab: 09-AUG-2023			Package: 10-AUG-2023	SDG: 11-AUG-2023		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
MS	1205460772	Radium-226 SPIKE	1715-G	.1	mL	
LCS	1205460773	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	629166001	01-AUG-2023	1	405.25	405.25	08/01/23 11:50	701	08/04/23 05:26	08/04/23 08:26	5	9
2	629302001	01-AUG-2023	1	509.24	509.24	08/01/23 11:50	802	08/04/23 05:52	08/04/23 08:26	5	18
3	629302002	01-AUG-2023	1	504.27	504.27	08/01/23 11:50	106	08/04/23 05:52	08/04/23 09:19	5	28
4	629302003	01-AUG-2023	1	508.28	508.28	08/01/23 11:50	204	08/04/23 05:52	08/04/23 09:19	6	24
5	629302004	01-AUG-2023	1	506.93	506.93	08/01/23 11:50	308	08/04/23 05:52	08/04/23 09:19	5	15
6	629302005	01-AUG-2023	1	502.51	502.51	08/01/23 11:50	408	08/04/23 05:52	08/04/23 09:19	3	12
7	629302006	01-AUG-2023	1	507.07	507.07	08/01/23 11:50	503	08/04/23 05:52	08/04/23 09:19	1	14
8	629388001	01-AUG-2023	1	507.57	507.57	08/01/23 11:50	608	08/04/23 05:52	08/04/23 09:19	1	20
9	1205460770 MB	01-AUG-2023	1		509.24	08/01/23 11:50	704	08/04/23 05:52	08/04/23 09:19	5	12
10	1205460771 DUP (629166001)	01-AUG-2023	1	413.79	413.79	08/01/23 11:50	805	08/04/23 05:52	08/04/23 09:19	8	14
11	1205460772 MS (629166001)	01-AUG-2023	1	101.7	101.7	08/01/23 11:50	103	08/04/23 06:21	08/04/23 09:58	1	663
12	1205460773 LCS	01-AUG-2023	1		509.24	08/01/23 11:50	205	08/04/23 06:21	08/04/23 09:58	2	644

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 01-AUG-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Procedure Code : LUC26RAL
 Parmname : Radium-226
 Required MDA : 1 pCi/L
 Halflife of Ra-226 : 1600 years
 Ra-226 Abundance : 1.00
 Halflife of Rn-222 : 3.8235 days

Batch : 2460565
 Analyst : LIN01615
 Prep Date : 8/1/2023
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	629166001.1	0.4053	1.9711E-05	7/11/2023 7:00	701	30	9	0.300	5	0.167	30	1.7440
2	629302001.1	0.5092	2.0293E-05	7/10/2023 14:55	802	30	18	0.600	5	0.167	30	1.5330
3	629302002.1	0.5043	2.0273E-05	7/10/2023 11:11	106	30	28	0.933	5	0.167	30	1.5250
4	629302003.1	0.5083	2.0289E-05	7/10/2023 13:00	204	30	24	0.800	6	0.200	30	1.5970
5	629302004.1	0.5069	2.0284E-05	7/10/2023 14:31	308	30	15	0.500	5	0.167	30	1.5970
6	629302005.1	0.5025	2.0266E-05	7/10/2023 11:11	408	30	12	0.400	3	0.100	30	1.5020
7	629302006.1	0.5071	2.0284E-05	7/10/2023 9:25	503	30	14	0.467	1	0.033	30	1.8840
8	629388001.1	0.5076	2.0286E-05	7/11/2023 8:15	608	30	20	0.667	1	0.033	30	1.8960
9	1205460770.1	0.5092	2.0293E-05	8/1/2023 0:00	704	30	12	0.400	5	0.167	30	1.5870
10	1205460771.1	0.4138	1.9777E-05	7/11/2023 7:00	805	30	14	0.467	8	0.267	30	1.5410
11	1205460772.1	0.1017	1.1474E-05	7/11/2023 7:00	103	30	663	22.100	1	0.033	30	1.6400
12	1205460773.1	0.5092	2.0293E-05	8/1/2023 0:00	205	30	644	21.467	2	0.067	30	1.7590

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrowth End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
6.200%	11/1/2022	10/31/2023	8/1/2023 11:50	8/4/2023 5:26	8/4/2023 8:26	0.391	0.978	1.002	1.000
6.100%	4/8/2023	3/31/2024	8/1/2023 11:50	8/4/2023 5:52	8/4/2023 8:26	0.393	0.981	1.002	1.000
3.400%	5/1/2023	4/30/2024	8/1/2023 11:50	8/4/2023 5:52	8/4/2023 9:19	0.393	0.974	1.002	1.000
2.600%	8/1/2023	7/31/2024	8/1/2023 11:50	8/4/2023 5:52	8/4/2023 9:19	0.393	0.974	1.002	1.000
9.600%	10/25/2022	10/31/2023	8/1/2023 11:50	8/4/2023 5:52	8/4/2023 9:19	0.393	0.974	1.002	1.000
7.000%	2/1/2023	1/31/2024	8/1/2023 11:50	8/4/2023 5:52	8/4/2023 9:19	0.393	0.974	1.002	1.000
8.800%	6/1/2023	5/31/2024	8/1/2023 11:50	8/4/2023 5:52	8/4/2023 9:19	0.393	0.974	1.002	1.000
7.800%	7/1/2023	6/30/2024	8/1/2023 11:50	8/4/2023 5:52	8/4/2023 9:19	0.393	0.974	1.002	1.000
4.200%	11/1/2022	10/31/2023	8/1/2023 11:50	8/4/2023 5:52	8/4/2023 9:19	0.393	0.974	1.002	1.000
9.600%	4/8/2023	3/31/2024	8/1/2023 11:50	8/4/2023 5:52	8/4/2023 9:19	0.393	0.974	1.002	1.000
9.600%	5/1/2023	4/30/2024	8/1/2023 11:50	8/4/2023 6:21	8/4/2023 9:58	0.395	0.973	1.002	1.000
9.200%	8/1/2023	7/31/2024	8/1/2023 11:50	8/4/2023 6:21	8/4/2023 9:58	0.395	0.973	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-G
Spike Exp Date : 9/8/2023
Spike Activity (dpm/ml): 297.38
Spike Volume Added: 0.10

LCS S/N : 1715-G
LCS Exp Date : 9/8/2023
LCS Activity (dpm/ml): 297.38
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.4106	0.2899	1	0.7469	0.2229	93.75%	0.1333	0.1247	0.4087	0.4108		SAMPLE				
2	0.3686	0.2602	1	0.6706	0.6504	37.39%	0.4333	0.1599	0.4703	0.4858		SAMPLE				
3	0.3767	0.2660	1	0.6853	1.1759	25.21%	0.7667	0.1915	0.5756	0.6052		SAMPLE				
4	0.3909	0.2760	1	0.6973	0.8718	30.54%	0.6000	0.1826	0.5200	0.5368		SAMPLE				
5	0.3578	0.2526	1	0.6510	0.4856	45.74%	0.3333	0.1491	0.4257	0.4410		SAMPLE				
6	0.2973	0.2099	1	0.5761	0.4688	43.60%	0.3000	0.1291	0.3954	0.4063		SAMPLE				
7	0.1356	0.0957	1	0.3150	0.5350	31.06%	0.4333	0.1291	0.3124	0.3348		SAMPLE				
8	0.1346	0.0950	1	0.3127	0.7762	25.35%	0.6333	0.1528	0.3670	0.4016		SAMPLE				
9	0.3584	0.2531	1	0.6521	0.3405	59.05%	0.2333	0.1374	0.3931	0.3972		MB				
10	0.5747	0.4057	1	0.9964	0.3700	78.76%	0.2000	0.1563	0.5668	0.5736	629166001.1	DUP	49.6%			
11	0.7734	0.5460	1	1.7961	155.3729	10.36%	22.0667	0.8589	11.8538	38.7068	629166001.1	MS			131.7187	118.0%
12	0.2036	0.1438	1	0.4186	28.0555	10.02%	21.4000	0.8472	2.1770	6.8362		LCS			26.3048	106.7%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 04-AUG-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:07	1	1.14E+05	114358	-2.97		
LUCAS2	EFF	06:38	1	1.30E+05	130156	-2.75		
LUCAS3	EFF	07:27	1	92066	92066	-1.86		
LUCAS4	EFF	07:11	1	1.27E+05	126840	-1.61		
LUCAS5	EFF	06:44	1	1.30E+05	129985	-2.6		
LUCAS6	EFF	07:18	1	1.28E+05	128193	-2.18		
LUCAS7	EFF	06:53	1	1.31E+05	131290	-2.18		
LUCAS8	EFF	06:54	1	1.31E+05	130793	0.86		

Reviewed by:



Elizabeth Krouse

Date: 04-AUG-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2460565

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
629166001	SAMPLE	LXP1	LUCAS7	AUG-04-23 08:26:00	DONE	Lucas Cell	01-NOV-22 00:00
629302001	SAMPLE	LXP1	LUCAS8	AUG-04-23 08:26:00	DONE	Lucas Cell	08-APR-23 00:00
629302002	SAMPLE	LXP1	LUCAS1	AUG-04-23 09:19:00	DONE	Lucas Cell	01-MAY-23 00:00
629302003	SAMPLE	LXP1	LUCAS2	AUG-04-23 09:19:00	DONE	Lucas Cell	01-AUG-23 00:00
629302004	SAMPLE	LXP1	LUCAS3	AUG-04-23 09:19:00	DONE	Lucas Cell	25-OCT-22 00:00
629302005	SAMPLE	LXP1	LUCAS4	AUG-04-23 09:19:00	DONE	Lucas Cell	01-FEB-23 00:00
629302006	SAMPLE	LXP1	LUCAS5	AUG-04-23 09:19:00	DONE	Lucas Cell	01-JUN-23 00:00
629388001	SAMPLE	LXP1	LUCAS6	AUG-04-23 09:19:00	DONE	Lucas Cell	01-JUL-23 00:00
1205460770	MB	LXP1	LUCAS7	AUG-04-23 09:19:00	DONE	Lucas Cell	01-NOV-22 00:00
1205460771	DUP	LXP1	LUCAS8	AUG-04-23 09:19:00	DONE	Lucas Cell	08-APR-23 00:00
1205460772	MS	LXP1	LUCAS1	AUG-04-23 09:58:00	DONE	Lucas Cell	01-MAY-23 00:00
1205460773	LCS	LXP1	LUCAS2	AUG-04-23 09:58:00	DONE	Lucas Cell	01-AUG-23 00:00

Data Verification & Validation Report

Lansing Board of Water & Light – Erickson Power Station

Sampling Event (dates and purpose): August 2023 Semi-Annual Sampling

Data Package Number:	Lab Report Date:
S51686.01	9/6/2023
S51747.01	9/6/2023
S51803.01	9/6/2023
S51950.01	9/11/2023
S52163.01	9/13/2023
S52209.01	9/12/2023

Data Validator: Andrew Byks

Data Validation Completion Date: 11/6/2023

General Overall Assessment:

- Data are usable without qualification.
- Data are usable with qualification (as noted below).
- Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	X
MW-2	X
MW-3	X
MW-4	X
MW-5	X
MW-6	X
MW-7	X
MW-7B	X
MW-7C	X
MW-8	X
MW-9	X
MW-10	X
MW-11	X
MW-11B	X
MW-12	X
MW-12B	X
MW-13	X
MW-14	X
MW-15	X
MW-16A	X
MW-16B	X
MW-16C	X
MW-16D	X
MW-100A	X
MW-100B	X
MW-100C	X
MW-100D	X

Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-1	GW	S51686.01	8/1/2023	X	X	X	X	X	X	
MW-2	GW	S51686.02	8/1/2023	X	X	X	X	X	X	
MW-3	GW	S51686.03	8/1/2023	X	X	X	X	X	X	
MW-4	GW	S51686.04	8/1/2023	X	X	X	X	X	X	
MW-5	GW	S51686.05	8/1/2023	X	X	X	X	X	X	X
MW-6	GW	S51686.06	8/1/2023	X	X	X	X	X	X	
MWT-4	GW	S51686.07	8/1/2023	X	X	X	X	X	X	
MW-7	GW	S51747.01	8/2/2023	X	X	X	X	X	X	
MW-8	GW	S51747.02	8/2/2023	X	X	X	X	X	X	
MW-9	GW	S51747.03	8/2/2023	X	X	X	X	X	X	
MW-10	GW	S51747.04	8/2/2023	X	X	X	X	X	X	
MW-7B	GW	S51747.05	8/2/2023	X	X	X	X	X	X	
MW-7C	GW	S51747.06	8/2/2023	X	X	X	X	X	X	
MWT-10	GW	S51747.07	8/2/2023	X	X	X	X	X	X	
MW-13	GW	S51747.09	8/2/2023	X	X	X	X	X	X	
MW-11	GW	S51803.01	8/3/2023	X	X	X	X	X	X	
MW-12	GW	S51803.02	8/3/2023	X	X	X	X	X	X	X
MW-11B	GW	S51803.03	8/3/2023	X	X	X	X	X	X	
MW-12B	GW	S51803.04	8/3/2023	X	X	X	X	X	X	
MWT-12B	GW	S51803.05	8/3/2023	X	X	X	X	X	X	
MW-16A	GW	S51950.01	8/8/2023	X	X	X	X	X	X	
MW-16B	GW	S51950.02	8/8/2023	X	X	X	X	X	X	
MW-16C	GW	S51950.03	8/8/2023	X	X	X	X	X	X	
MW-16D	GW	S51950.04	8/8/2023	X	X	X	X	X	X	
MWT-16A	GW	S51950.05	8/8/2023	X	X	X	X	X	X	
MW-14	GW	S52163.01	8/11/2023	X	X	X	X	X	X	
MW-15	GW	S52163.02	8/11/2023	X	X	X	X	X	X	
MWT-14	GW	S52163.03	8/11/2023	X	X	X	X	X	X	
MW-100A	GW	S52209.01	8/14/2023	X	X	X	X	X	X	
MW-100B	GW	S52209.02	8/14/2023	X	X	X	X	X	X	
MW-100C	GW	S52209.03	8/14/2023	X	X	X	X	X	X	
MW-100D	GW	S52209.04	8/14/2023	X	X	X	X	X	X	
MWT-100B	GW	S52209.05	8/14/2023	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO₃, CO₃, hardness

Any planned sampling or analysis NOT completed? If yes, explain: _____

Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Field Data							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	X		Record of decontamination for non-dedicated sampling equipment	X			
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
Analytical Data Package							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies across samples for chloride, fluoride, hardness, sulfate, TSS, Rad-226, Rad-228
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Holding Times	X		Analyses performed within allowed holding time	X			
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested		X		RLs for chloride, fluoride, hardness, sulfate, TSS, and Rad-228 were not met
			MDLs<RLs		X		RL=MDL for bicarbonate, carbonate
			MDLs<MCLs	X			
			MDLs<GPS		X		If MDL>GPS, analyte detected was >GPS
QC Validation							
Evaluate Accuracy							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Evaluate Precision							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Field duplicates for TSS, Rad-226, and Rad-228 not met; see below
Evaluate Representativeness							
Equipment Blanks (if applicable)	X		Non-detect (<RL)		X		Rad-226 detected in two field blanks, Rad-228 detected in one field blank
QC Verification							
Verify Instrument Calibration & Analytical Process							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
Evaluate Completeness (# usable measurements/ # unusable measurements)							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

None.

Comments:

The RPDs for Rad-228 and Combined Radium 226+228 between parent sample MW-4 and field duplicate MWT-4 were 91% and 50, respectively. Rad-228 and Combined Radium 226+228 required qualification as estimated with high bias (J+) in parent sample MW-4 and as estimated with low bias (J-) in field duplicate MWT-4.

The RPDs for Rad-226, Rad-228, and Combined Radium 226+228 between parent sample MW-10 and field duplicate MWT-10 were 24%, -438%, and 44%, respectively. Rad-226, Rad-228, and Combined Radium 226+228 required qualification as estimated with low bias (J-) in parent sample MW-10 and as estimated with high bias (J+) in field duplicate MWT-10.

The RPDs for Rad-228 and Combined Radium 226+228 between parent sample MW-12B and field duplicate MWT-12B were 57% and 44%, respectively. Rad-228 and Combined Radium 226+228 required qualification as estimated with low bias (J-) in parent sample MW-12B and as estimated with high bias (J+) in field duplicate MWT-12B.

The RPD for TSS between parent sample MW-16A and field duplicate MWT-16A was 27%. TSS required qualification as estimated with high bias (J+) in parent sample MW-16A and as estimated with low bias (J-) in field duplicate MWT-16A.

The RPDs for Rad-226 and Combined Radium 226+228 between parent sample MW-16A and field duplicate MWT-16A were 67% and 30%, respectively. Rad-226 and Combined Radium 226+228 required qualification as estimated with low bias (J-) in parent sample MW-16A and as estimated with high bias (J+) in field duplicate MWT-16A.

The RPDs of Rad-228 and Combined Radium 226+228 between parent sample MW-14 and field duplicate MWT-14 were 38% and 22%, respectively. Rad-228 and Combined Radium 226+228 required qualification as estimated with high bias (J+) in parent sample MW-14 and as estimated with low bias (J-) in field duplicate MWT-14.

The RPDs of Rad-226 and Combined Radium 226+228 between parent sample MW-100B and field duplicate MWT-100B were 74% and 26%, respectively. Rad-226 and Combined Radium 226+228 required qualification as estimated with high bias (J+) in parent sample MW-100B and as estimated with low bias (J-) in field duplicate MWT-100B.

Rad-226 results in samples MW-16D and MW-100A required qualification as estimated with high bias (J+) due to Rad-226 detection in the associated field blanks.

Rad-228 results in sample MW-12 required qualification as estimated with high bias (J+) due to Rad-228 detection in the associated project field blank.



Report ID: S51686.01(02)
Generated on 09/06/2023
Replaces report S51686.01(01) generated on 08/04/2023

Report to

Attention: Jennifer Caporale
Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

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Report Summary

Lab Sample ID(s): S51686.01-S51686.08
Project: Erickson AM MI Wells 1-6
Collected Date(s): 08/01/2023
Submitted Date/Time: 08/02/2023 09:07
Sampled by: Marc Wahrer
P.O. #:

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Maya Murshak
Technical Director



General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

Report Narrative

All analyses completed



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP & ISO/IEC 17025:2017	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



Sample Summary (8 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S51686.01	MW-1 L308172-01	Groundwater	08/01/23 14:43
S51686.02	MW-2 L308172-02	Groundwater	08/01/23 17:59
S51686.03	MW-3 L308172-03	Groundwater	08/01/23 10:51
S51686.04	MW-4 L308172-04	Groundwater	08/01/23 12:24
S51686.05	MW-5 L308172-05	Groundwater	08/01/23 18:40
S51686.06	MW-6 L308172-06	Groundwater	08/01/23 16:37
S51686.07	MWT-4 L308172-07	Groundwater	08/01/23 12:24
S51686.08	Field Blank L308172-08	Water	08/01/23 08:15



Lab Sample ID: S51686.01

Sample Tag: MW-1 L308172-01

Collected Date/Time: 08/01/2023 14:43

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.4	IR
2	1L Plastic	None	Yes	2.4	IR
1	125ml Plastic	HNO3	Yes	2.4	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/03/23 12:10	CTV	
Metal Digestion	Completed	SW3015A	08/03/23 10:15	CCM	

Inorganics

Method: E300.0, Run Date: 08/02/23 11:44, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	42	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	54	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/02/23 11:36, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	690	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/03/23 11:12, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	638	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 08/02/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	746	50	12	mg/L	2		

Method: SM2540D, Run Date: 08/02/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	19.4	5	2	mg/L	2		

Metals

Method: E200.8, Run Date: 08/03/23 12:11, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.007	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.110	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.16	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	7.21	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51686.01 (continued)

Sample Tag: MW-1 L308172-01

Method: E200.8, Run Date: 08/03/23 12:11, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.014	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/03/23 15:27, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	169	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	52.7	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	0.96	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	30.9	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/03/23 13:45, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/05/23 12:01, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51686.02

Sample Tag: MW-2 L308172-02

Collected Date/Time: 08/01/2023 17:59

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.4	IR
2	1L Plastic	None	Yes	2.4	IR
1	125ml Plastic	HNO3	Yes	2.4	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/03/23 12:10	CTV	
Metal Digestion	Completed	SW3015A	08/03/23 10:15	CCM	

Inorganics

Method: E300.0, Run Date: 08/02/23 11:57, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 08/02/23 14:05, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	82	25	0.40	mg/L	25	16887-00-6	
Sulfate	278	25	1.5	mg/L	25	14808-79-8	

Method: SM2320B, Run Date: 08/02/23 11:40, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	470	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/03/23 11:14, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	680	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 08/02/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,010	50	12	mg/L	2		

Method: SM2540D, Run Date: 08/02/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	34.1	3	1.2	mg/L	1.2		

Metals

Method: E200.8, Run Date: 08/03/23 12:18, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.003	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.034	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	4.44	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51686.02 (continued)

Sample Tag: MW-2 L308172-02

Method: E200.8, Run Date: 08/03/23 12:18, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.79	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.049	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.014	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.017	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/03/23 15:29, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	198	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	50.6	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	0.86	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	64.5	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/03/23 13:55, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/05/23 12:01, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Lab Sample ID: S51686.03

Sample Tag: MW-3 L308172-03

Collected Date/Time: 08/01/2023 10:51

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.4	IR
2	1L Plastic	None	Yes	2.4	IR
1	125ml Plastic	HNO3	Yes	2.4	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/03/23 12:10	CTV	
Metal Digestion	Completed	SW3015A	08/03/23 10:15	CCM	

Inorganics

Method: E300.0, Run Date: 08/02/23 12:10, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 08/02/23 14:18, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	99	50	0.80	mg/L	50	16887-00-6	
Sulfate	675	50	3.0	mg/L	50	14808-79-8	

Method: SM2320B, Run Date: 08/02/23 11:46, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	210	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/03/23 11:16, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	794	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 08/02/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,440	50	12	mg/L	2		

Method: SM2540D, Run Date: 08/02/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	3.3	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 08/03/23 12:24, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.004	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.019	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	5.67	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51686.03 (continued)

Sample Tag: MW-3 L308172-03

Method: E200.8, Run Date: 08/03/23 12:24, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	1.70	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.079	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.166	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/03/23 15:31, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	253	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	49.8	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.73	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	121	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/03/23 13:58, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/05/23 12:01, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Lab Sample ID: S51686.04

Sample Tag: MW-4 L308172-04

Collected Date/Time: 08/01/2023 12:24

Matrix: Groundwater

COC Reference:

Sample Containers

Table with 6 columns: #, Type, Preservative(s), Refrigerated?, Arrival Temp. (C), Thermometer #. Rows include 1L Plastic and 125ml Plastic containers.

Extraction / Prep.

Table with 6 columns: Parameter, Result, Method, Run Date, Analyst, Flags. Rows include Mercury Digestion and Metal Digestion.

Inorganics

Method: E300.0, Run Date: 08/02/23 12:22, Analyst: JDP

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Chloride, Fluoride (Undistilled), and Sulfate.

Method: SM2320B, Run Date: 08/02/23 11:48, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Bicarbonate* and Carbonate*.

Method: SM2340C, Run Date: 08/03/23 11:18, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Hardness.

Method: SM2540C, Run Date: 08/02/23 17:30, Analyst: MDG

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Dissolved Solids.

Method: SM2540D, Run Date: 08/02/23 17:30, Analyst: MDG

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Suspended Solids.

Metals

Method: E200.8, Run Date: 08/03/23 12:29, Analyst: CCM

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Antimony*, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, and Copper.

b-Value detected less than reporting limit, but greater than MDL



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51686.04 (continued)

Sample Tag: MW-4 L308172-04

Method: E200.8, Run Date: 08/03/23 12:29, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	1.39	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.009	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/03/23 15:32, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	112	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	39.6	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.45	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	31.2	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/03/23 14:02, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/05/23 12:01, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

**Lab Sample ID: S51686.05**

Sample Tag: MW-5 L308172-05

Collected Date/Time: 08/01/2023 18:40

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.4	IR
2	1L Plastic	None	Yes	2.4	IR
1	125ml Plastic	HNO3	Yes	2.4	IR
1	250ml Plastic	None	Yes	2.4	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/03/23 12:10	CTV	
Mercury Digestion	Completed	E245.1	08/04/23 12:55	CTV	
Metal Digestion	Completed	SW3015A	08/03/23 10:15	CCM	
Metal Digestion	Completed	SW3015A	08/03/23 10:15	CCM	

Inorganics**Method: E300.0, Run Date: 08/02/23 14:44, Analyst: JDP**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfate	288	25	1.5	mg/L	25	14808-79-8	

Method: E300.0, Run Date: 08/02/23 12:35, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	51	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: SM2320B, Run Date: 08/02/23 11:50, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	290	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/03/23 11:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	530	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 08/02/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	792	50	12	mg/L	2		

Method: SM2540D, Run Date: 08/02/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	8.6	3	1	mg/L	1		

Metals**Method: E200.8, Run Date: 08/03/23 12:32, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.047	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51686.05 (continued)

Sample Tag: MW-5 L308172-05

Method: E200.8, Run Date: 08/03/23 12:32, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Boron	2.77	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	1.25	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.085	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.072	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.006	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.006	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/03/23 12:35, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony, Dissolved*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	f
Arsenic, Dissolved	Not detected	0.002	0.000255	mg/L	5	7440-38-2	f
Barium, Dissolved	0.041	0.005	0.000162	mg/L	5	7440-39-3	f
Beryllium, Dissolved	Not detected	0.001	0.000215	mg/L	5	7440-41-7	f
Boron, Dissolved	2.67	0.04	0.00175	mg/L	5	7440-42-8	f
Cadmium, Dissolved	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	f
Chromium, Dissolved	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	f
Cobalt, Dissolved	Not detected	0.005	0.000108	mg/L	5	7440-48-4	f
Copper, Dissolved	Not detected	0.005	0.000377	mg/L	5	7440-50-8	f
Iron, Dissolved	Not detected	0.02	0.00192	mg/L	5	7439-89-6	f
Lead, Dissolved	Not detected	0.003	0.000190	mg/L	5	7439-92-1	f
Lithium, Dissolved*	0.081	0.005	0.00163	mg/L	5	7439-93-2	f
Molybdenum, Dissolved	0.070	0.005	0.000217	mg/L	5	7439-98-7	f
Nickel, Dissolved	Not detected	0.005	0.000250	mg/L	5	7440-02-0	f
Selenium, Dissolved	Not detected	0.005	0.00209	mg/L	5	7782-49-2	f
Silver, Dissolved	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	f
Thallium, Dissolved	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	f
Vanadium, Dissolved	Not detected	0.005	0.000139	mg/L	5	7440-62-2	f
Zinc, Dissolved	Not detected	0.005	0.000730	mg/L	5	7440-66-6	f

Method: E200.8, Run Date: 08/03/23 15:34, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	173	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	38.1	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	4.61	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	47.8	0.50	0.00850	mg/L	5	7440-23-5	

Method: E200.8, Run Date: 08/03/23 15:35, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium, Dissolved*	162	0.50	0.0435	mg/L	5	7440-70-2	f
Magnesium, Dissolved	34.5	0.50	0.0120	mg/L	5	7439-95-4	f

f-Filtered and preserved in lab



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51686.05 (continued)

Sample Tag: MW-5 L308172-05

Method: E200.8, Run Date: 08/03/23 15:35, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Potassium, Dissolved	4.22	0.50	0.0230	mg/L	5	7440-09-7	f
Sodium, Dissolved	44.1	0.50	0.00850	mg/L	5	7440-23-5	f

Method: E245.1, Run Date: 08/04/23 14:18, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury, Dissolved	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Method: E245.1, Run Date: 08/03/23 14:05, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/05/23 12:01, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

f-Filtered and preserved in lab

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51686.06

Sample Tag: MW-6 L308172-06

Collected Date/Time: 08/01/2023 16:37

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.4	IR
2	1L Plastic	None	Yes	2.4	IR
1	125ml Plastic	HNO3	Yes	2.4	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/03/23 12:10	CTV	
Metal Digestion	Completed	SW3015A	08/03/23 10:15	CCM	

Inorganics

Method: E300.0, Run Date: 08/02/23 14:57, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfate	185	10	0.59	mg/L	10	14808-79-8	

Method: E300.0, Run Date: 08/02/23 12:48, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	39	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: SM2320B, Run Date: 08/02/23 11:52, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	530	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/03/23 11:26, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	616	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 08/02/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	822	50	12	mg/L	2		

Method: SM2540D, Run Date: 08/02/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	1.4	3	1	mg/L	1		b

Metals

Method: E200.8, Run Date: 08/03/23 12:40, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.050	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.85	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	

b-Value detected less than reporting limit, but greater than MDL



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51686.06 (continued)

Sample Tag: MW-6 L308172-06

Method: E200.8, Run Date: 08/03/23 12:40, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.03	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.049	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.021	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/03/23 15:37, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	189	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	40.3	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	7.02	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	34.3	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/03/23 14:08, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/05/23 12:01, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Lab Sample ID: S51686.07

Sample Tag: MWT-4 L308172-07

Collected Date/Time: 08/01/2023 12:24

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.4	IR
2	1L Plastic	None	Yes	2.4	IR
1	125ml Plastic	HNO3	Yes	2.4	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/03/23 12:10	CTV	
Metal Digestion	Completed	SW3015A	08/03/23 10:15	CCM	

Inorganics

Method: E300.0, Run Date: 08/02/23 13:01, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	77	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	52	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/02/23 11:54, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	400	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/03/23 11:28, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	434	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 08/02/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	572	50	12	mg/L	2		

Method: SM2540D, Run Date: 08/02/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	2.1	3	1	mg/L	1		b

Metals

Method: E200.8, Run Date: 08/03/23 12:43, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.008	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.166	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.06	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL



Lab Sample ID: S51686.07 (continued)

Sample Tag: MWT-4 L308172-07

Method: E200.8, Run Date: 08/03/23 12:43, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	1.44	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.010	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/03/23 15:38, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	114	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	40.5	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.49	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	31.7	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/03/23 14:12, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/05/23 12:01, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51686.08

Sample Tag: Field Blank L308172-08

Collected Date/Time: 08/01/2023 08:15

Matrix: Water

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.4	IR
2	1L Plastic	None	Yes	2.4	IR
1	125ml Plastic	HNO3	Yes	2.4	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/03/23 12:10	CTV	
Metal Digestion	Completed	SW3015A	08/03/23 10:15	CCM	

Inorganics

Method: E300.0, Run Date: 08/02/23 13:14, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 08/02/23 11:56, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/03/23 11:30, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 08/02/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	12	mg/L	2		

Method: SM2540D, Run Date: 08/02/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 08/03/23 12:04, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51686.08 (continued)

Sample Tag: Field Blank L308172-08

Method: E200.8, Run Date: 08/03/23 12:04, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 08/03/23 15:25, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 08/03/23 14:15, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/05/23 12:01, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

Merit Laboratories Login Checklist

Lab Set ID:S51686

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 1-6

Submitted:08/02/2023 09:07 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

Sample Receiving

- | | | |
|-----|---|--------|
| 01. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Samples are received at 4C +/- 2C Thermometer # | IR 2.4 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Received on ice/ cooling process begun | |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A Samples shipped | |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A Samples left in 24 hr. drop box | |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A Are there custody seals/tape or is the drop box locked | |

Chain of Custody

- | | | |
|-----|---|-----|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A COC adequately filled out | |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A COC signed and relinquished to the lab | |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Sample tag on bottles match COC | |
| 09. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Subcontracting needed? Subcontracted to: | GEL |

Preservation

- | | | |
|-----|--|-----------------|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Do sample have correct chemical preservation | |
| 11. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Completed pH checks on preserved samples? (no VOAs) | |
| 12. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Did any samples need to be preserved in the lab? | .05 Diss Metals |

Bottle Conditions

- | | | |
|-----|--|-----------------|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A All bottles intact | |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Appropriate analytical bottles are used | |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Merit bottles used | |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Sufficient sample volume received | |
| 17. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Samples require laboratory filtration | .05 Diss Metals |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Samples submitted within holding time | |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A Do water VOC or TOX bottles contain headspace | |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S51686 Submitted: 08/02/2023 09:07

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 1-6

Initial Preservation Check: 08/02/2023 09:48 MMC

Preservation Recheck (E200.8): N/A

Attention: Jennifer Caporale
Address: Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S51686.01	125ml Plastic HNO3	<2			
S51686.01	1L Plastic HNO3	<2			
S51686.01	1L Plastic HNO3	<2			
S51686.02	125ml Plastic HNO3	<2			
S51686.02	1L Plastic HNO3	<2			
S51686.02	1L Plastic HNO3	<2			
S51686.03	125ml Plastic HNO3	<2			
S51686.03	1L Plastic HNO3	<2			
S51686.03	1L Plastic HNO3	<2			
S51686.04	125ml Plastic HNO3	<2			
S51686.04	1L Plastic HNO3	<2			
S51686.04	1L Plastic HNO3	<2			
S51686.05	125ml Plastic HNO3	<2			
S51686.05	1L Plastic HNO3	<2			
S51686.05	1L Plastic HNO3	<2			
S51686.06	125ml Plastic HNO3	<2			
S51686.06	1L Plastic HNO3	<2			
S51686.06	1L Plastic HNO3	<2			
S51686.07	125ml Plastic HNO3	<2			
S51686.07	1L Plastic HNO3	<2			
S51686.07	1L Plastic HNO3	<2			
S51686.08	125ml Plastic HNO3	<2			
S51686.08	1L Plastic HNO3	<2			
S51686.08	1L Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823
 Phone (517) 332-0167 Fax (517) 332-4034
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

REPORT TO **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME **Jennifer Caporale**
 COMPANY **Lansing Board of Water and Light**
 ADDRESS **PO Box 13007 48901-3007**
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**
 PHONE NO. **517-702-6372** FAX NO. P.O. NO.
 E-MAIL ADDRESS **Environmental_Laboratory@lbwl.com** QUOTE NO.

CONTACT NAME **Beth Zimpfer** SAME
 COMPANY
 ADDRESS
 CITY STATE ZIP CODE
 PHONE NO. E-MAIL ADDRESS **Beth.Zimpfer@lbwl.com**

PROJECT NO./NAME **Erickson AM MI Wells 1-6** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**
 TURNAROUND TIME REQUIRED 1 DAY 2 DAYS 3 DAYS STANDARD OTHER **ASAP**
 DELIVERABLES REQUIRED STD LEVEL II LEVEL III LEVEL IV EDD OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIFE A=AIR W=WASTE
 # Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO ₃	H ₂ SO ₄	NiOH	MeOH	OTHER	Total Metals	F- undistilled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO ₃ , CO ₃ , Hardness	dissolved Metals	Certifications		Project Locations		Special Instructions
	DATE	TIME																		<input type="checkbox"/> OHIO VAP	<input type="checkbox"/> Drinking Water	<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES	
51686.01	08/01/23	1443	MW-1 1308172-01	GW	5	2	3						✓	✓	✓	✓	✓	✓			<input type="checkbox"/>	<input type="checkbox"/>	Metals to analyse: Na, Mg, K	
.02		1759	MW-2 -02	GW	5	2	3						✓	✓	✓	✓	✓	✓			<input type="checkbox"/>	<input checked="" type="checkbox"/>	B, Ca, Sb, As, Ba, Be, Cd, Cr,	
.03		1051	MW-3 -03	GW	5	2	3						✓	✓	✓	✓	✓	✓			<input type="checkbox"/>	<input type="checkbox"/>	Co, Li, Hg, Mo, Pb, Se, Tl,	
.04		1224	MW-4 -04	GW	5	2	3						✓	✓	✓	✓	✓	✓			<input type="checkbox"/>	<input type="checkbox"/>	Fe, Cu, Ni, Ag, V, Zn	
.05		1840	MW-5 -05	GW	5	2	3						✓	✓	✓	✓	✓	✓	✓		<input type="checkbox"/>	<input type="checkbox"/>	Please send a preliminary report	
.06		1637	MW-6 -06	GW	5	2	3						✓	✓	✓	✓	✓	✓			<input type="checkbox"/>	<input type="checkbox"/>		
.07		1224	MWT-4 -07	GW	5	2	3						✓	✓	✓	✓	✓	✓			<input type="checkbox"/>	<input type="checkbox"/>	Dissolved metals are the same as total.	
.08		0815	Field Blank -08	DI	5	2	3						✓	✓	✓	✓	✓	✓			<input type="checkbox"/>	<input type="checkbox"/>		

RELINQUISHED BY: *Julie Schell* Sampler DATE **8/2/23** TIME **0907**
 RECEIVED BY: *John Murray* DATE **8/2/23** TIME **0907**
 RELINQUISHED BY: DATE TIME
 RECEIVED BY: DATE TIME

RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
 RECEIVED BY: SIGNATURE/ORGANIZATION DATE TIME
 SEAL NO. SEAL INTACT INITIALS
 YES NO
 SEAL NO. SEAL INTACT INITIALS
 YES NO
 NOTES: TEMP. ON ARRIVAL **2.4**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total		250 mL plastic	mg/L	Nitric Acid	200.8	6mos	0.150
Be, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005

September 01, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 632334
SDG: S51686

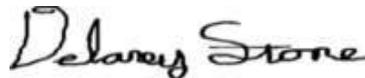
Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on August 07, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,



Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S51686
Work Order: 632334**

September 01, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on August 07, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

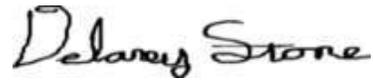
Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
632334001	S51686.01
632334002	S51686.02
632334003	S51686.03
632334004	S51686.04
632334005	S51686.05
632334006	S51686.06
632334007	S51686.07
632334008	S51686.08 Field Blank

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Delaney Stone". The signature is written in a cursive style with a large initial 'D'.

Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

SAMPLE RECEIPT & REVIEW FORM

Client: MER		SDG/AR/COC/Work Order: 632332 632334 633237	
Received By: MVH		Date Received: 8/07/2023	
Carrier and Tracking Number		Circle Applicable: <input checked="" type="checkbox"/> FedEx Express <input checked="" type="checkbox"/> FedEx Ground <input checked="" type="checkbox"/> UPS <input type="checkbox"/> Field Services <input type="checkbox"/> Courier <input type="checkbox"/> Other 124604770361329232 12460477036337827	
Suspected Hazard Information		Yes	No
A) Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
B) Did the client designate the samples are to be received as radioactive?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
C) Did the RSO classify the samples as radioactive?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
D) Did the client designate samples are hazardous?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
E) Did the RSO identify possible hazards?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Sample Receipt Criteria		Yes	NA
1 Shipping containers received intact and sealed?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
2 Chain of custody documents included with shipment?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		<input checked="" type="checkbox"/>	<input type="checkbox"/>
4 Daily check performed and passed on IR temperature gun?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
5 Sample containers intact and sealed?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
6 Samples requiring chemical preservation at proper pH?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
7 Do any samples require Volatile Analysis?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
8 Samples received within holding time?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
9 Sample ID's on COC match ID's on bottles?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
10 Date & time on COC match date & time on bottles?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
11 Number of containers received match number indicated on COC?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
12 Are sample containers identifiable as GBL provided by use of GEL labels?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
13 COC form is properly signed in relinquished/received sections?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Comments (Use Continuation Form if needed): S51686.02(x2), S51686.04(x2), S51686.06(x2), S51686.07(x2).			

PM (or PMA) review: Initials **Am** Date **8/8/23** Page **1** of **1**

Laboratory Certifications

List of current GEL Certifications as of 01 September 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S51686
Work Order #: 632334

Product: Radium-226+Radium-228 Calculation

Analytical Method: Calculation

Analytical Procedure: GL-RAD-D-003 REV# 45

Analytical Batch: 2475370

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
632334001	S51686.01
632334002	S51686.02
632334003	S51686.03
632334004	S51686.04
632334005	S51686.05
632334006	S51686.06
632334007	S51686.07
632334008	S51686.08 Field Blank

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2473355

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
632334001	S51686.01
632334002	S51686.02
632334003	S51686.03
632334004	S51686.04
632334005	S51686.05
632334006	S51686.06
632334007	S51686.07
632334008	S51686.08 Field Blank
1205483016	Method Blank (MB)
1205483017	632334001(S51686.01) Sample Duplicate (DUP)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts

Samples 1205483017 (S51686.01DUP) and 632334001 (S51686.01) were recounted due to high relative percent difference/relative error ratio. The recounts are reported.

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2473320

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
632334001	S51686.01
632334002	S51686.02
632334003	S51686.03
632334004	S51686.04
632334005	S51686.05
632334006	S51686.06
632334007	S51686.07
632334008	S51686.08 Field Blank
1205482934	Method Blank (MB)
1205482935	632334001(S51686.01) Sample Duplicate (DUP)
1205482936	632334001(S51686.01) Matrix Spike (MS)
1205482937	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

The matrix spike, 1205482936 (S51686.01MS), aliquot was reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S51686 GEL Work Order: 632334

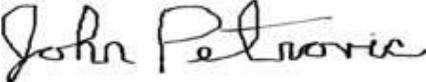
The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: John Petrovic

Date: 05 SEP 2023

Title: Data Validator

Sample Data Summary

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: September 5, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S51686.01	Project: MERI00120
Sample ID: 632334001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 01-AUG-23 14:43	
Receive Date: 07-AUG-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.576	+/-1.19	2.13	3.00	pCi/L		JE1	08/22/23	1521	2473355		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.641	+/-1.21			pCi/L		NXL1	09/05/23	1201	2475370		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.0656	+/-0.203	0.461	1.00	pCi/L		LXP1	09/05/23	0912	2473320		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			85.8	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: September 5, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S51686.02 Project: MERI00120
Sample ID: 632334002 Client ID: MERI001
Matrix: Ground Water
Collect Date: 01-AUG-23 17:59
Receive Date: 07-AUG-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.623	+/-0.683	1.13	3.00	pCi/L		JE1	08/22/23	1118	2473355	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.05	+/-0.780			pCi/L		NXL1	09/05/23	1201	2475370	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.423	+/-0.377	0.450	1.00	pCi/L		LXP1	09/05/23	0912	2473320	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			87.1	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: September 5, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive
 East Lansing, Michigan 48823
 Contact: John Lavery
 Project: Routine Analysis

Client Sample ID: S51686.03	Project: MERI00120
Sample ID: 632334003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 01-AUG-23 10:51	
Receive Date: 07-AUG-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.236	+/-0.794	1.46	3.00	pCi/L		JE1	08/22/23	1118	2473355		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.412	+/-0.882			pCi/L		NXL1	09/05/23	1201	2475370		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.176	+/-0.385	0.764	1.00	pCi/L		LXP1	09/05/23	0912	2473320		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			82.7	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

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Certificate of Analysis

Report Date: September 5, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S51686.04 Project: MERI00120
Sample ID: 632334004 Client ID: MERI001
Matrix: Ground Water
Collect Date: 01-AUG-23 12:24
Receive Date: 07-AUG-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.877	+/-0.798	1.29	3.00	pCi/L		JE1	08/22/23	1118	2473355	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.62	+/-0.955			pCi/L		NXL1	09/05/23	1201	2475370	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.744	+/-0.525	0.581	1.00	pCi/L		LXP1	09/05/23	0949	2473320	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			87.2	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: September 5, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S51686.05 Project: MERI00120
Sample ID: 632334005 Client ID: MERI001
Matrix: Ground Water
Collect Date: 01-AUG-23 18:40
Receive Date: 07-AUG-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	1.24	+/-1.14	1.86	3.00	pCi/L		JE1	08/22/23	1118	2473355	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.65	+/-1.21			pCi/L		NXL1	09/05/23	1201	2475370	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.409	+/-0.408	0.574	1.00	pCi/L		LXP1	09/05/23	0949	2473320	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			73.8	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: September 5, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Lavery
 Project: Routine Analysis

Client Sample ID: S51686.06	Project: MERI00120
Sample ID: 632334006	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 01-AUG-23 16:37	
Receive Date: 07-AUG-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.201	+/-0.800	1.47	3.00	pCi/L		JE1	08/22/23	1118	2473355		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.663	+/-0.885			pCi/L		NXL1	09/05/23	1201	2475370		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.462	+/-0.377	0.464	1.00	pCi/L		LXP1	09/05/23	0949	2473320		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			87.2	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

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Certificate of Analysis

Report Date: September 5, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S51686.07	Project: MERI00120
Sample ID: 632334007	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 01-AUG-23 12:24	
Receive Date: 07-AUG-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.0402	+/-0.547	1.08	3.00	pCi/L		JE1	08/22/23	1118	2473355	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.541	+/-0.735			pCi/L		NXL1	09/05/23	1201	2475370	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.501	+/-0.491	0.727	1.00	pCi/L		LXP1	09/05/23	0949	2473320	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			85.1	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: September 5, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S51686.08 Field Blank	Project: MERI00120
Sample ID: 632334008	Client ID: MERI001
Matrix: Water	
Collect Date: 01-AUG-23 08:15	
Receive Date: 07-AUG-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.511	+/-0.783	1.37	3.00	pCi/L		JE1	08/22/23	1118	2473355	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.772	+/-0.853			pCi/L		NXL1	09/05/23	1201	2475370	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.261	+/-0.338	0.568	1.00	pCi/L		LXP1	09/05/23	0949	2473320	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			73.8	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: September 5, 2023

Page 1 of 2

Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan

Contact: John Laverty

Workorder: 632334

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2473355										
QC1205483017	632334001	DUP									
Radium-228	U	0.576	U	0.768	pCi/L	N/A		N/A	JE1	08/22/23	15:21
	Uncertainty	+/-1.19		+/-1.27							
QC1205483018	LCS										
Radium-228	78.5			75.6	pCi/L		96.3	(75%-125%)		08/22/23	11:19
	Uncertainty			+/-4.06							
QC1205483016	MB										
Radium-228			U	0.775	pCi/L					08/22/23	11:19
	Uncertainty			+/-0.636							
Rad Ra-226											
Batch	2473320										
QC1205482935	632334001	DUP									
Radium-226	U	0.0656	U	0.119	pCi/L	N/A		N/A	LXP1	09/05/23	10:24
	Uncertainty	+/-0.203		+/-0.355							
QC1205482937	LCS										
Radium-226	52.5			55.9	pCi/L		107	(75%-125%)		09/05/23	10:41
	Uncertainty			+/-3.85							
QC1205482934	MB										
Radium-226			U	0.593	pCi/L					09/05/23	10:24
	Uncertainty			+/-0.543							
QC1205482936	632334001	MS									
Radium-226	116	U	0.0656	106	pCi/L		91.7	(75%-125%)		09/05/23	10:41
	Uncertainty		+/-0.203	+/-11.0							

- Notes:**
- Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).
 - The Qualifiers in this report are defined as follows:
 - U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
 - J Value is estimated
 - X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
 - H Analytical holding time was exceeded
 - < Result is less than value reported
 - > Result is greater than value reported

GEL LABORATORIES LLC

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QC Summary

Workorder: 632334

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
NI											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2473355 Check-list

This check-list was completed on 24-AUG-23 by Nat Long

This batch was reviewed by Kenshalla Oston on 24-AUG-23 and Nat Long on 24-AUG-23.

Batch ID:
2473355

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2473355
Analyst: Jacqueline Winston (JE1)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: SP-C018367602

Due Dates for Lab: 01-SEP-2023			Package: 03-SEP-2023	SDG: 04-SEP-2023		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205483018	228	2051-B	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	632334001	15-AUG-2023	3	301	301	08/17/23 15:05	08/22/23 09:48
2	632334002	15-AUG-2023	3	301.2	301.2	08/17/23 15:05	08/22/23 09:48
3	632334003	15-AUG-2023	3	306.5	306.5	08/17/23 15:05	08/22/23 09:48
4	632334004	15-AUG-2023	3	302.4	302.4	08/17/23 15:05	08/22/23 09:48
5	632334005	15-AUG-2023	3	300.6	300.6	08/17/23 15:05	08/22/23 09:48
6	632334006	15-AUG-2023	3	303.6	303.6	08/17/23 15:05	08/22/23 09:48
7	632334007	15-AUG-2023	3	302.2	302.2	08/17/23 15:05	08/22/23 09:48
8	632334008	15-AUG-2023	3	301.6	301.6	08/17/23 15:05	08/22/23 09:48
9	632337001	15-AUG-2023	3	305.4	305.4	08/17/23 15:05	08/22/23 09:48
10	632337002	15-AUG-2023	3	306.5	306.5	08/17/23 15:05	08/22/23 09:48
11	632337003	15-AUG-2023	3	301.6	301.6	08/17/23 15:05	08/22/23 09:48
12	632337004	15-AUG-2023	3	302.9	302.9	08/17/23 15:05	08/22/23 09:48
13	632337005	15-AUG-2023	3	300.3	300.3	08/17/23 15:05	08/22/23 09:48
14	632337006	15-AUG-2023	3	300.8	300.8	08/17/23 15:05	08/22/23 09:48
15	632337007	15-AUG-2023	3	301.6	301.6	08/17/23 15:05	08/22/23 09:48
16	632337008	15-AUG-2023	3	302.6	302.6	08/17/23 15:05	08/22/23 09:48
17	632337009	15-AUG-2023	3	300.1	300.1	08/17/23 15:05	08/22/23 09:48
18	1205483016 MB	15-AUG-2023	3		307.2	08/17/23 15:05	08/22/23 09:48
19	1205483017 DUP (632334001)	15-AUG-2023	3	307.2	307.2	08/17/23 15:05	08/22/23 09:48
20	1205483018 LCS	15-AUG-2023	3		307.2	08/17/23 15:05	08/22/23 09:48

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 2097-B	Ba-133 Tracer	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 16-AUG-2023 12:01 SP-C018367602 Jacqueline Winston Data Entry Date3: 15-AUG-2023 00:00
REGNT 3953532	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3940529	Barium Carrier Ra228 REG	1 mL	
REGNT 3954868	RGF-1M Citric Acid	5 mL	
REGNT 3947239	2M HCl	20 mL	
REGNT 3953880	RGF-50% Potassium Carbonate	2 mL	
REGNT 3953517	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT DGA071323	2472106	2 g	
REGNT 3946961.4	RGF-Hydrofluoric Acid	4 mL	
REGNT 3940152	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3939217	RGF-Neodymium Substrate	5 mL	
REGNT 3946607.6	Nitric Acid	5 mL	
REGNT 3950136	RGF-7M Nitric Acid	25 mL	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 2097-B
 Tracer Exp Date : 7/12/2024
 Tracer Volume Added: 0.10

Batch : 2473355
 Analyst : JAC02417
 Prep Date : 8/15/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 3 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	632334001.1	0.3010	1.8476E-05	8/1/2023 14:43	1073.9	1.76%	921.2	1.90%	0.1	0.000200
2	632334002.1	0.3012	1.8479E-05	8/1/2023 17:59	1073.9	1.76%	935.0	1.89%	0.1	0.000200
3	632334003.1	0.3065	1.8567E-05	8/1/2023 10:51	1073.9	1.76%	887.9	1.94%	0.1	0.000200
4	632334004.1	0.3024	1.8500E-05	8/1/2023 12:24	1073.9	1.76%	936.5	1.89%	0.1	0.000200
5	632334005.1	0.3006	1.8469E-05	8/1/2023 18:40	1073.9	1.76%	793.0	2.05%	0.1	0.000200
6	632334006.1	0.3036	1.8520E-05	8/1/2023 16:37	1073.9	1.76%	937.0	1.89%	0.1	0.000200
7	632334007.1	0.3022	1.8496E-05	8/1/2023 12:24	1073.9	1.76%	913.8	1.91%	0.1	0.000200
8	632334008.1	0.3016	1.8486E-05	8/1/2023 8:15	1073.9	1.76%	792.2	2.05%	0.1	0.000200
9	632337001.1	0.3054	1.8549E-05	8/2/2023 14:53	1073.9	1.76%	979.6	1.84%	0.1	0.000200
10	632337002.1	0.3065	1.8567E-05	8/2/2023 13:30	1073.9	1.76%	858.8	1.97%	0.1	0.000200
11	632337003.1	0.3016	1.8486E-05	8/2/2023 12:09	1073.9	1.76%	904.5	1.92%	0.1	0.000200
12	632337004.1	0.3029	1.8508E-05	8/2/2023 10:31	1073.9	1.76%	935.9	1.89%	0.1	0.000200
13	632337005.1	0.3003	1.8464E-05	8/2/2023 16:06	1073.9	1.76%	828.6	2.01%	0.1	0.000200
14	632337006.1	0.3008	1.8473E-05	8/2/2023 17:22	1073.9	1.76%	916.2	1.91%	0.1	0.000200
15	632337007.1	0.3016	1.8486E-05	8/2/2023 10:31	1073.9	1.76%	927.2	1.90%	0.1	0.000200
16	632337008.1	0.3026	1.8503E-05	8/2/2023 9:30	1073.9	1.76%	807.0	2.03%	0.1	0.000200
17	632337009.1	0.3001	1.8461E-05	8/2/2023 18:46	1073.9	1.76%	882.5	1.94%	0.1	0.000200
18	1205483016.1	0.3072	1.8579E-05	8/15/2023 0:00	1073.9	1.76%	911.1	1.91%	0.1	0.000200
19	1205483017.1	0.3072	1.8579E-05	8/1/2023 14:43	1073.9	1.76%	920.8	1.90%	0.1	0.000200
20	1205483018.1	0.3072	1.8579E-05	8/15/2023 0:00	1073.9	1.76%	957.1	1.87%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated Sample Recovery %	Sample Recovery Error %
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction		
1	4A	60	2	37	0.617	8/22/2023 15:21	8/17/2023 15:05	8/22/2023 9:48	0.993	0.535	1.000	1.057	85.8%	2.61%
2	1B	60	10	32	0.533	8/22/2023 11:18	8/17/2023 15:05	8/22/2023 9:48	0.993	0.844	1.000	1.057	87.1%	2.60%
3	1D	60	15	39	0.650	8/22/2023 11:18	8/17/2023 15:05	8/22/2023 9:48	0.993	0.844	1.000	1.057	82.7%	2.63%
4	2A	60	12	44	0.733	8/22/2023 11:18	8/17/2023 15:05	8/22/2023 9:48	0.993	0.844	1.000	1.057	87.2%	2.60%
5	2C	60	3	63	1.050	8/22/2023 11:18	8/17/2023 15:05	8/22/2023 9:48	0.993	0.844	1.000	1.057	73.8%	2.72%
6	3B	60	8	46	0.767	8/22/2023 11:18	8/17/2023 15:05	8/22/2023 9:48	0.993	0.843	1.000	1.057	87.2%	2.60%
7	3C	60	6	20	0.333	8/22/2023 11:18	8/17/2023 15:05	8/22/2023 9:48	0.993	0.843	1.000	1.057	85.1%	2.61%
8	3D	60	12	26	0.433	8/22/2023 11:18	8/17/2023 15:05	8/22/2023 9:48	0.993	0.843	1.000	1.057	73.8%	2.72%
9	4A	60	5	52	0.867	8/22/2023 11:18	8/17/2023 15:05	8/22/2023 9:48	0.993	0.843	1.000	1.057	91.2%	2.56%
10	4C	60	12	121	2.017	8/22/2023 11:18	8/17/2023 15:05	8/22/2023 9:48	0.993	0.843	1.000	1.057	80.0%	2.66%
11	4D	60	13	33	0.550	8/22/2023 11:18	8/17/2023 15:05	8/22/2023 9:48	0.993	0.843	1.000	1.057	84.2%	2.62%
12	5A	60	7	51	0.850	8/22/2023 11:19	8/17/2023 15:05	8/22/2023 9:48	0.993	0.842	1.000	1.057	87.1%	2.60%
13	5B	60	12	65	1.083	8/22/2023 11:19	8/17/2023 15:05	8/22/2023 9:48	0.993	0.842	1.000	1.057	77.2%	2.69%
14	5C	60	15	44	0.733	8/22/2023 11:19	8/17/2023 15:05	8/22/2023 9:48	0.993	0.842	1.000	1.057	85.3%	2.61%
15	5D	60	17	58	0.967	8/22/2023 11:19	8/17/2023 15:05	8/22/2023 9:48	0.993	0.842	1.000	1.057	86.3%	2.61%
16	6B	60	4	47	0.783	8/22/2023 11:19	8/17/2023 15:05	8/22/2023 9:48	0.993	0.843	1.000	1.057	75.1%	2.70%
17	4C	60	13	43	0.717	8/22/2023 15:21	8/17/2023 15:05	8/22/2023 9:48	0.993	0.535	1.000	1.057	82.2%	2.63%
18	7B	60	4	31	0.517	8/22/2023 11:19	8/17/2023 15:05	8/22/2023 9:48	0.998	0.842	1.000	1.057	84.8%	2.61%
19	4D	60	14	49	0.817	8/22/2023 15:21	8/17/2023 15:05	8/22/2023 9:48	0.993	0.535	1.000	1.057	85.7%	2.61%
20	7D	60	18	1402	23.367	8/22/2023 11:19	8/17/2023 15:05	8/22/2023 9:48	0.998	0.842	1.000	1.057	89.1%	2.58%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2023	5/31/2024	0.6074	0.01123	0.516	8/18/2023 18:34	500
2	PIC	6/1/2023	5/31/2024	0.6098	0.00711	0.358	8/18/2023 18:33	500
3	PIC	6/1/2023	5/31/2024	0.6071	0.00692	0.586	8/18/2023 18:33	500
4	PIC	6/1/2023	5/31/2024	0.6083	0.01914	0.486	8/18/2023 18:33	500
5	PIC	6/1/2023	5/31/2024	0.6085	0.01274	0.756	8/18/2023 18:33	500
6	PIC	6/1/2023	5/31/2024	0.6266	0.01614	0.708	8/18/2023 18:34	500
7	PIC	6/1/2023	5/31/2024	0.6245	0.00988	0.322	8/18/2023 18:34	500
8	PIC	6/1/2023	5/31/2024	0.5677	0.02297	0.320	8/18/2023 18:34	500
9	PIC	6/1/2023	5/31/2024	0.6074	0.01123	0.516	8/18/2023 18:34	500
10	PIC	6/1/2023	5/31/2024	0.6376	0.00889	0.834	8/18/2023 18:34	500
11	PIC	6/1/2023	5/31/2024	0.6412	0.00773	0.672	8/18/2023 18:34	500
12	PIC	6/1/2023	5/31/2024	0.6366	0.00851	1.086	8/18/2023 18:34	500
13	PIC	6/1/2023	5/31/2024	0.6230	0.00426	0.796	8/18/2023 18:34	500
14	PIC	6/1/2023	5/31/2024	0.6454	0.00657	0.602	8/18/2023 18:43	500
15	PIC	6/1/2023	5/31/2024	0.6566	0.00925	0.816	8/18/2023 18:35	500
16	PIC	6/1/2023	5/31/2024	0.5957	0.00851	0.716	8/18/2023 18:31	500
17	PIC	6/1/2023	5/31/2024	0.6376	0.00889	0.834	8/18/2023 18:34	500
18	PIC	6/1/2023	5/31/2024	0.6423	0.00627	0.288	8/18/2023 18:31	500
19	PIC	6/1/2023	5/31/2024	0.6412	0.00773	0.672	8/18/2023 18:34	500
20	PIC	6/1/2023	5/31/2024	0.6247	0.01113	0.558	8/18/2023 18:31	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

* - RPD changed to 0% due to sample & dup activity below MDA

LCS S/N : 2051-B
LCS Exp Date : 3/27/2024
LCS Activity (dpm/ml): 535.58
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	1.3080	0.9234	3	2.1329	0.5758	105.68%	0.1007	0.1063	1.1923	1.2012		SAMPLE				
2	0.6770	0.4780	3	1.1336	0.6232	55.96%	0.1753	0.0980	0.6827	0.7008		SAMPLE				
3	0.9004	0.6357	3	1.4562	0.2365	171.22%	0.0640	0.1096	0.7935	0.7958		SAMPLE				
4	0.7865	0.5553	3	1.2878	0.8766	46.55%	0.2473	0.1149	0.7979	0.8290		SAMPLE				
5	1.1651	0.8226	3	1.8557	1.2376	47.00%	0.2940	0.1379	1.1376	1.1807		SAMPLE				
6	0.9179	0.6481	3	1.4675	0.2010	203.10%	0.0587	0.1191	0.8002	0.8019		SAMPLE				
7	0.6400	0.4518	3	1.0808	0.0402	694.75%	0.0113	0.0787	0.5468	0.5470		SAMPLE				
8	0.8112	0.5727	3	1.3707	0.5106	78.32%	0.1133	0.0887	0.7829	0.7939		SAMPLE				
9	0.7683	0.5424	3	1.2529	1.1782	35.59%	0.3507	0.1244	0.8193	0.8724		SAMPLE				
10	1.0576	0.7467	3	1.6752	4.3023	16.13%	1.1827	0.1878	1.3392	1.7299		SAMPLE				
11	0.9108	0.6431	3	1.4606	-0.4258	84.08%	-0.1220	0.1025	0.7014	0.7015		SAMPLE				
12	1.1236	0.7933	3	1.7559	-0.7993	54.23%	-0.2360	0.1278	0.8485	0.8487		SAMPLE				
13	1.1197	0.7905	3	1.7781	1.1327	48.86%	0.2873	0.1402	1.0831	1.1207		SAMPLE				
14	0.8486	0.5992	3	1.3701	0.4512	88.27%	0.1313	0.1159	0.7803	0.7887		SAMPLE				
15	0.9573	0.6758	3	1.5181	0.5015	88.45%	0.1507	0.1332	0.8691	0.8784		SAMPLE				
16	1.1313	0.7987	3	1.8074	0.2828	178.78%	0.0673	0.1204	0.9908	0.9934		SAMPLE				
17	1.6580	1.1706	3	2.6263	-0.6692	99.48%	-0.1173	0.1167	1.3042	1.3044		SAMPLE				
18	0.5787	0.4085	3	0.9865	0.7745	42.00%	0.2287	0.0958	0.6363	0.6661		MB				
19	1.3857	0.9783	3	2.2222	0.7682	84.58%	0.1447	0.1223	1.2728	1.2877	632334001.1	DUP	* 0.0%			
20	0.7883	0.5565	3	1.2788	75.6068	3.93%	22.8087	0.6249	4.0603	19.6709		LCS			78.5325	96.3%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
632334001	4A	60	2	37	8/22/2023 15:21	8/22/2023 16:21	PIC	2473355
632334002	1B	60	10	32	8/22/2023 11:18	8/22/2023 12:18	PIC	2473355
632334003	1D	60	15	39	8/22/2023 11:18	8/22/2023 12:18	PIC	2473355
632334004	2A	60	12	44	8/22/2023 11:18	8/22/2023 12:18	PIC	2473355
632334005	2C	60	3	63	8/22/2023 11:18	8/22/2023 12:18	PIC	2473355
632334006	3B	60	8	46	8/22/2023 11:18	8/22/2023 12:18	PIC	2473355
632334007	3C	60	6	20	8/22/2023 11:18	8/22/2023 12:18	PIC	2473355
632334008	3D	60	12	26	8/22/2023 11:18	8/22/2023 12:18	PIC	2473355
632337001	4A	60	5	52	8/22/2023 11:18	8/22/2023 12:18	PIC	2473355
632337002	4C	60	12	121	8/22/2023 11:18	8/22/2023 12:18	PIC	2473355
632337003	4D	60	13	33	8/22/2023 11:18	8/22/2023 12:18	PIC	2473355
632337004	5A	60	7	51	8/22/2023 11:19	8/22/2023 12:19	PIC	2473355
632337005	5B	60	12	65	8/22/2023 11:19	8/22/2023 12:19	PIC	2473355
632337006	5C	60	15	44	8/22/2023 11:19	8/22/2023 12:19	PIC	2473355
632337007	5D	60	17	58	8/22/2023 11:19	8/22/2023 12:19	PIC	2473355
632337008	6B	60	4	47	8/22/2023 11:19	8/22/2023 12:19	PIC	2473355
632337009	4C	60	13	43	8/22/2023 15:21	8/22/2023 16:21	PIC	2473355
1205483016	7B	60	4	31	8/22/2023 11:19	8/22/2023 12:19	PIC	2473355
1205483017	4D	60	14	49	8/22/2023 15:21	8/22/2023 16:21	PIC	2473355
1205483018	7D	60	18	1402	8/22/2023 11:19	8/22/2023 12:19	PIC	2473355

ASSAY 22-Aug-23 10:14:17
 Wizard 2480 s/n 46190630
 Protocol id 8 Ba-133
 Time limit
 Count limit
 Isotope Ba-133
 Protocol date 8/22/2023
 Run id. 7191

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	1	1	180	3222.28	1073.92	1.76	10:14:17
632334001	2	1	2	180	2764	921.18	1.9	85.78	10:17:31
632334002	3	1	3	180	2805.57	935.04	1.89	87.07	10:20:45
632334003	4	1	4	180	2664	887.88	1.94	82.68	10:23:59
632334004	5	1	5	180	2810	936.51	1.89	87.20	10:27:13
632334005	1	19	1	180	2379.28	792.97	2.05	73.84	10:30:49
632334006	2	19	2	180	2811.28	936.95	1.89	87.25	10:34:03
632334007	3	19	3	180	2742	913.75	1.91	85.09	10:37:17
632334008	4	19	4	180	2377	792.24	2.05	73.77	10:40:31
632337001	5	19	5	180	2939.28	979.6	1.84	91.22	10:43:45
632337002	1	5	1	180	2577	858.83	1.97	79.97	10:47:21
632337003	2	5	2	180	2714	904.51	1.92	84.23	10:50:35
632337004	3	5	3	180	2808	935.85	1.89	87.14	10:53:49
632337005	4	5	4	180	2486.28	828.6	2.01	77.16	10:57:02
632337006	5	5	5	180	2749.28	916.23	1.91	85.32	11:00:17
632337007	1	2	1	180	2782	927.22	1.9	86.34	11:04:06
632337008	2	2	2	180	2421.28	806.99	2.03	75.14	11:07:20
632337009	3	2	3	180	2647.85	882.51	1.94	82.18	11:10:33
1205483016	4	2	4	180	2734	911.1	1.91	84.84	11:13:47
1205483017	5	2	5	180	2763	920.81	1.9	85.74	11:17:02
1205483018	1	98	1	180	2871.85	957.13	1.87	89.12	11:20:49

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 22-Aug-2023

Detectors LB4100 E1 through H4 and PIC 1A through 14D and G5400W 1W through 1Z and LB4200 GA1 through OD4

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E3	Above	Alpha bkg	22-Aug 05:42	60	0.733	-1.16E-1	0.399	+6.90
LB4100E3	Above	Beta bkg	22-Aug 05:42	60	2.067	0.736	2.329	+2.01
LB4100G3	Above	Beta bkg	22-Aug 04:21	60	2.183	0.785	2.444	+2.06
LB4100H1	Above	Beta bkg	22-Aug 04:21	60	3.367	-5.15E-1	3.743	+2.47
LB4200GA2	Above	Alpha bkg	22-Aug 06:59	60	0.450	-1.34E-1	0.379	+3.83
LB4200GB2	Above	Beta bkg	22-Aug 03:28	60	118	0.129	1.304	+599.32
LB4200GD4	Above	Alpha bkg	22-Aug 03:28	60	0.517	-1.07E-1	0.314	+5.90
LB4200OA4	Below	Alpha eff	22-Aug 05:55	5	11163	11260	11830	-4.02

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

Reviewed by Jc Poparad

Date 8/22/23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2473355

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
632334002	SAMPLE	JE1	PIC1B	AUG-22-23 11:18:25	DONE	25mm Filter	01-JUN-23 00:00
632334003	SAMPLE	JE1	PIC1D	AUG-22-23 11:18:25	DONE	25mm Filter	01-JUN-23 00:00
632334004	SAMPLE	JE1	PIC2A	AUG-22-23 11:18:33	DONE	25mm Filter	01-JUN-23 00:00
632334005	SAMPLE	JE1	PIC2C	AUG-22-23 11:18:34	DONE	25mm Filter	01-JUN-23 00:00
632337001	SAMPLE	JE1	PIC4A	AUG-22-23 11:18:42	DONE	25mm Filter	01-JUN-23 00:00
632337002	SAMPLE	JE1	PIC4C	AUG-22-23 11:18:42	DONE	25mm Filter	01-JUN-23 00:00
632337003	SAMPLE	JE1	PIC4D	AUG-22-23 11:18:42	DONE	25mm Filter	01-JUN-23 00:00
632334006	SAMPLE	JE1	PIC3B	AUG-22-23 11:18:49	DONE	25mm Filter	01-JUN-23 00:00
632334007	SAMPLE	JE1	PIC3C	AUG-22-23 11:18:52	DONE	25mm Filter	01-JUN-23 00:00
632334008	SAMPLE	JE1	PIC3D	AUG-22-23 11:18:56	DONE	25mm Filter	01-JUN-23 00:00
632337008	SAMPLE	JE1	PIC6B	AUG-22-23 11:19:03	DONE	25mm Filter	01-JUN-23 00:00
632337004	SAMPLE	JE1	PIC5A	AUG-22-23 11:19:15	DONE	25mm Filter	01-JUN-23 00:00
632337005	SAMPLE	JE1	PIC5B	AUG-22-23 11:19:15	DONE	25mm Filter	01-JUN-23 00:00
632337006	SAMPLE	JE1	PIC5C	AUG-22-23 11:19:15	DONE	25mm Filter	01-JUN-23 00:00
632337007	SAMPLE	JE1	PIC5D	AUG-22-23 11:19:16	DONE	25mm Filter	01-JUN-23 00:00
1205483016	MB	JE1	PIC7B	AUG-22-23 11:19:27	DONE	25mm Filter	01-JUN-23 00:00
1205483018	LCS	JE1	PIC7D	AUG-22-23 11:19:28	DONE	25mm Filter	01-JUN-23 00:00
1205483017	DUP	JE1	PIC4D	AUG-22-23 15:21:12	DONE	25mm Filter	01-JUN-23 00:00
632334001	SAMPLE	JE1	PIC4A	AUG-22-23 15:21:16	DONE	25mm Filter	01-JUN-23 00:00
632337009	SAMPLE	JE1	PIC4C	AUG-22-23 15:21:20	DONE	25mm Filter	01-JUN-23 00:00

Lucas Cell Raw Data

Batch 2473320 Check-list

This check-list was completed on 05-SEP-23 by Lyndsey Pace

This batch was reviewed by Elizabeth Krouse on 05-SEP-23 and Lyndsey Pace on 05-SEP-23.

Batch ID:
2473320

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2473320
Analyst: Lyndsey Pace (LXP1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: LUCAS-C202389980

Due Dates for Lab: 02-SEP-2023			Package: 04-SEP-2023		SDG: 05-SEP-2023	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
MS	1205482936	Radium-226 SPIKE	1715-G	.1	mL	
LCS	1205482937	Radium-226 SPIKE	1715-G	.2	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	632334001	01-SEP-2023	1	501.11	501.11	09/01/23 11:15	603	09/05/23 05:40	09/05/23 09:12	2	2
2	632334002	01-SEP-2023	1	506.7	506.7	09/01/23 11:15	708	09/05/23 05:40	09/05/23 09:12	1	6
3	632334003	01-SEP-2023	1	499.97	499.97	09/01/23 11:15	801	09/05/23 05:40	09/05/23 09:12	4	4
4	632334004	01-SEP-2023	1	507.1	507.1	09/01/23 11:15	102	09/05/23 06:04	09/05/23 09:49	2	10
5	632334005	01-SEP-2023	1	508.99	508.99	09/01/23 11:15	202	09/05/23 06:04	09/05/23 09:49	2	6
6	632334006	01-SEP-2023	1	500.95	500.95	09/01/23 11:15	304	09/05/23 06:04	09/05/23 09:49	2	8
7	632334007	01-SEP-2023	1	509	509	09/01/23 11:15	406	09/05/23 06:04	09/05/23 09:49	4	8
8	632334008	01-SEP-2023	1	508.32	508.32	09/01/23 11:15	506	09/05/23 06:04	09/05/23 09:49	4	6
9	632337001	01-SEP-2023	1	502.59	502.59	09/01/23 11:15	602	09/05/23 06:04	09/05/23 09:49	1	9
10	632337002	01-SEP-2023	1	510.46	510.46	09/01/23 11:15	701	09/05/23 06:04	09/05/23 09:49	3	5
11	632337003	01-SEP-2023	1	503.55	503.55	09/01/23 11:15	804	09/05/23 06:04	09/05/23 09:49	2	5
12	632337004	01-SEP-2023	1	510.65	510.65	09/01/23 11:15	106	09/05/23 06:28	09/05/23 10:24	1	7
13	632337005	01-SEP-2023	1	501.96	501.96	09/01/23 11:15	208	09/05/23 06:28	09/05/23 10:24	4	8
14	632337006	01-SEP-2023	1	500.24	500.24	09/01/23 11:15	302	09/05/23 06:28	09/05/23 10:24	1	12
15	632337007	01-SEP-2023	1	507.92	507.92	09/01/23 11:15	401	09/05/23 06:28	09/05/23 10:24	3	10
16	632337008	01-SEP-2023	1	506.55	506.55	09/01/23 11:15	505	09/05/23 06:28	09/05/23 10:24	3	14
17	632337009	01-SEP-2023	1	501.26	501.26	09/01/23 11:15	607	09/05/23 06:28	09/05/23 10:24	4	3
18	1205482934 MB	01-SEP-2023	1	510.65	510.65	09/01/23 11:15	703	09/05/23 06:28	09/05/23 10:24	8	12
19	1205482935 DUP (632334001)	01-SEP-2023	1	509.85	509.85	09/01/23 11:15	805	09/05/23 06:28	09/05/23 10:24	5	4
20	1205482936 MS (632334001)	01-SEP-2023	1	115.86	115.86	09/01/23 11:15	101	09/05/23 06:53	09/05/23 10:41	3	361
21	1205482937 LCS	01-SEP-2023	1		510.65	09/01/23 11:15	205	09/05/23 06:53	09/05/23 10:41	1	811

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 01-SEP-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Batch : 2473320
 Analyst : LIN01615
 Prep Date : 9/1/2023

Ra-226 Method Uncertainty : 0.073648

Procedure Code : LUC26RAL
 Parmname : Radium-226
 Required MDA : 1 pCi/L
 Halflife of Ra-226 : 1600 years
 Ra-226 Abundance : 1.00
 Halflife of Rn-222 : 3.8235 days

Batch counted on : LUCAS CELL DETECTOR
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	632334001.1	0.5011	2.0260E-05	8/1/2023 14:43	603	15	2	0.133	2	0.067	30	1.8970
2	632334002.1	0.5067	2.0283E-05	8/1/2023 17:59	708	15	6	0.400	1	0.033	30	1.6020
3	632334003.1	0.5000	2.0256E-05	8/1/2023 10:51	801	15	4	0.267	4	0.133	30	1.4200
4	632334004.1	0.5071	2.0284E-05	8/1/2023 12:24	102	15	10	0.667	2	0.067	30	1.4860
5	632334005.1	0.5090	2.0292E-05	8/1/2023 18:40	202	15	6	0.400	2	0.067	30	1.4980
6	632334006.1	0.5010	2.0260E-05	8/1/2023 16:37	304	15	8	0.533	2	0.067	30	1.8850
7	632334007.1	0.5090	2.0292E-05	8/1/2023 12:24	406	15	8	0.533	4	0.133	30	1.4650
8	632334008.1	0.5083	2.0289E-05	8/1/2023 8:15	506	15	6	0.400	4	0.133	30	1.8780
9	632337001.1	0.5026	2.0266E-05	8/2/2023 14:53	602	15	9	0.600	1	0.033	30	1.7010
10	632337002.1	0.5105	2.0298E-05	8/2/2023 13:30	701	15	5	0.333	3	0.100	30	1.7440
11	632337003.1	0.5036	2.0270E-05	8/2/2023 12:09	804	15	5	0.333	2	0.067	30	1.6240
12	632337004.1	0.5107	2.0298E-05	8/2/2023 10:31	106	15	7	0.467	1	0.033	30	1.5250
13	632337005.1	0.5020	2.0264E-05	8/2/2023 16:06	208	15	8	0.533	4	0.133	30	1.7130
14	632337006.1	0.5002	2.0257E-05	8/2/2023 17:22	302	15	12	0.800	1	0.033	30	1.7980
15	632337007.1	0.5079	2.0288E-05	8/2/2023 10:31	401	15	10	0.667	3	0.100	30	1.2390
16	632337008.1	0.5066	2.0282E-05	8/2/2023 9:30	505	15	14	0.933	3	0.100	30	1.7470
17	632337009.1	0.5013	2.0261E-05	8/2/2023 18:46	607	15	3	0.200	4	0.133	30	1.7750
18	1205482934.1	0.5107	2.0298E-05	9/1/2023 0:00	703	15	12	0.800	8	0.267	30	1.6440
19	1205482935.1	0.5099	2.0295E-05	8/1/2023 14:43	805	15	4	0.267	5	0.167	30	1.5410
20	1205482936.1	0.1159	1.2301E-05	8/1/2023 14:43	101	15	361	24.067	3	0.100	30	1.8120
21	1205482937.1	0.5107	2.0298E-05	9/1/2023 0:00	205	15	811	54.067	1	0.033	30	1.7590

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
3.500%	7/1/2023	6/30/2024	9/1/2023 11:15	9/5/2023 5:40	9/5/2023 9:12	0.495	0.974	1.001	1.000
7.700%	11/1/2022	10/31/2023	9/1/2023 11:15	9/5/2023 5:40	9/5/2023 9:12	0.495	0.974	1.001	1.000
3.200%	4/8/2023	3/31/2024	9/1/2023 11:15	9/5/2023 5:40	9/5/2023 9:12	0.495	0.974	1.001	1.000
2.300%	5/1/2023	4/30/2024	9/1/2023 11:15	9/5/2023 6:04	9/5/2023 9:49	0.496	0.972	1.001	1.000
1.400%	8/1/2023	7/31/2024	9/1/2023 11:15	9/5/2023 6:04	9/5/2023 9:49	0.496	0.972	1.001	1.000
8.900%	10/25/2022	10/31/2023	9/1/2023 11:15	9/5/2023 6:04	9/5/2023 9:49	0.496	0.972	1.001	1.000
2.900%	2/1/2023	1/31/2024	9/1/2023 11:15	9/5/2023 6:04	9/5/2023 9:49	0.496	0.972	1.001	1.000
1.400%	6/1/2023	5/31/2024	9/1/2023 11:15	9/5/2023 6:04	9/5/2023 9:49	0.496	0.972	1.001	1.000
9.900%	7/1/2023	6/30/2024	9/1/2023 11:15	9/5/2023 6:04	9/5/2023 9:49	0.496	0.972	1.001	1.000
6.200%	11/1/2022	10/31/2023	9/1/2023 11:15	9/5/2023 6:04	9/5/2023 9:49	0.496	0.972	1.001	1.000
6.100%	4/8/2023	3/31/2024	9/1/2023 11:15	9/5/2023 6:04	9/5/2023 9:49	0.496	0.972	1.001	1.000
3.400%	5/1/2023	4/30/2024	9/1/2023 11:15	9/5/2023 6:28	9/5/2023 10:24	0.498	0.971	1.001	1.000
4.400%	8/1/2023	7/31/2024	9/1/2023 11:15	9/5/2023 6:28	9/5/2023 10:24	0.498	0.971	1.001	1.000
3.300%	10/25/2022	10/31/2023	9/1/2023 11:15	9/5/2023 6:28	9/5/2023 10:24	0.498	0.971	1.001	1.000
3.100%	2/1/2023	1/31/2024	9/1/2023 11:15	9/5/2023 6:28	9/5/2023 10:24	0.498	0.971	1.001	1.000
8.200%	6/1/2023	5/31/2024	9/1/2023 11:15	9/5/2023 6:28	9/5/2023 10:24	0.498	0.971	1.001	1.000
6.800%	7/1/2023	6/30/2024	9/1/2023 11:15	9/5/2023 6:28	9/5/2023 10:24	0.498	0.971	1.001	1.000
9.000%	11/1/2022	10/31/2023	9/1/2023 11:15	9/5/2023 6:28	9/5/2023 10:24	0.498	0.971	1.001	1.000
9.600%	4/8/2023	3/31/2024	9/1/2023 11:15	9/5/2023 6:28	9/5/2023 10:24	0.498	0.971	1.001	1.000
4.500%	5/1/2023	4/30/2024	9/1/2023 11:15	9/5/2023 6:53	9/5/2023 10:41	0.500	0.972	1.001	1.000
9.200%	8/1/2023	7/31/2024	9/1/2023 11:15	9/5/2023 6:53	9/5/2023 10:41	0.500	0.972	1.001	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-G
Spike Exp Date : 9/8/2023
Spike Activity (dpm/ml): 297.37
Spike Volume Added: 0.10

* - RPD changed to 0% due to sample & dup activity below MDA

LCS S/N : 1715-G
LCS Exp Date : 9/8/2023
LCS Activity (dpm/ml): 297.37
LCS Volume Added: 0.20

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.1873	0.1322	1	0.4613	0.0656	158.15%	0.0667	0.1054	0.2034	0.2036		SAMPLE				
2	0.1551	0.1095	1	0.4495	0.4227	46.10%	0.3667	0.1667	0.3766	0.3868		SAMPLE				
3	0.3546	0.2504	1	0.7643	0.1757	111.85%	0.1333	0.1491	0.3851	0.3861		SAMPLE				
4	0.2359	0.1665	1	0.5811	0.7440	36.08%	0.6000	0.2160	0.5250	0.5369		SAMPLE				
5	0.2331	0.1646	1	0.5743	0.4085	51.01%	0.3333	0.1700	0.4083	0.4126		SAMPLE				
6	0.1883	0.1329	1	0.4637	0.4618	42.59%	0.4667	0.1944	0.3770	0.3912		SAMPLE				
7	0.3371	0.2380	1	0.7267	0.5012	50.08%	0.4000	0.2000	0.4912	0.4973		SAMPLE				
8	0.2633	0.1859	1	0.5676	0.2610	66.16%	0.2667	0.1764	0.3384	0.3406		SAMPLE				
9	0.1470	0.1038	1	0.4262	0.6194	37.13%	0.5667	0.2028	0.4344	0.4595		SAMPLE				
10	0.2446	0.1727	1	0.5552	0.2449	68.79%	0.2333	0.1599	0.3289	0.3321		SAMPLE				
11	0.2174	0.1535	1	0.5355	0.3047	58.95%	0.2667	0.1563	0.3501	0.3548		SAMPLE				
12	0.1611	0.1138	1	0.4671	0.5191	41.56%	0.4333	0.1795	0.4215	0.4295		SAMPLE				
13	0.2919	0.2061	1	0.6291	0.4340	50.19%	0.4000	0.2000	0.4253	0.4315		SAMPLE				
14	0.1395	0.0985	1	0.4044	0.7951	30.61%	0.7667	0.2333	0.4743	0.4907		SAMPLE				
15	0.3454	0.2438	1	0.7841	0.8400	38.70%	0.5667	0.2186	0.6351	0.6485		SAMPLE				
16	0.2456	0.1734	1	0.5576	0.8784	31.80%	0.8333	0.2560	0.5290	0.5620		SAMPLE				
17	0.2821	0.1992	1	0.6080	0.0699	200.12%	0.0667	0.1333	0.2740	0.2743		SAMPLE				
18	0.4228	0.2985	1	0.8192	0.5926	47.63%	0.5333	0.2494	0.5432	0.5598		MB				
19	0.3571	0.2521	1	0.7418	0.1187	153.05%	0.1000	0.1528	0.3555	0.3566	632334001.1	DUP	*	0.0%		
20	1.0310	0.7279	1	2.3408	106.0507	6.95%	23.9667	1.2680	10.9970	21.0422	632334001.1	MS			115.6175	91.7%
21	0.1391	0.0982	1	0.4033	55.8798	9.85%	54.0333	1.8988	3.8489	13.4688		LCS			52.4624	106.5%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 05-SEP-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	08:00	1	1.15E+05	114505	-1.43		
LUCAS2	EFF	07:59	1	1.32E+05	131993	-1.32		
LUCAS3	EFF	07:58	1	91577	91577	-2.34		
LUCAS4	EFF	07:57	1	1.28E+05	128144	0.37		
LUCAS5	EFF	07:56	1	1.32E+05	132464	-0.14		
LUCAS6	EFF	07:54	1	1.29E+05	129373	-0.67		
LUCAS7	EFF	07:53	1	1.32E+05	132421	2.21		
LUCAS8	EFF	07:52	1	1.19E+05	119059	-1.01		

Reviewed by: 
Lyndsey Pace

Date: 05-SEP-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2473320

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
632334001	SAMPLE	LXP1	LUCAS6	SEP-05-23 09:12:00	DONE	Lucas Cell	01-JUL-23 00:00
632334002	SAMPLE	LXP1	LUCAS7	SEP-05-23 09:12:00	DONE	Lucas Cell	01-NOV-22 00:00
632334003	SAMPLE	LXP1	LUCAS8	SEP-05-23 09:12:00	DONE	Lucas Cell	08-APR-23 00:00
632334004	SAMPLE	LXP1	LUCAS1	SEP-05-23 09:49:00	DONE	Lucas Cell	01-MAY-23 00:00
632334005	SAMPLE	LXP1	LUCAS2	SEP-05-23 09:49:00	DONE	Lucas Cell	01-AUG-23 00:00
632334006	SAMPLE	LXP1	LUCAS3	SEP-05-23 09:49:00	DONE	Lucas Cell	25-OCT-22 00:00
632334007	SAMPLE	LXP1	LUCAS4	SEP-05-23 09:49:00	DONE	Lucas Cell	01-FEB-23 00:00
632334008	SAMPLE	LXP1	LUCAS5	SEP-05-23 09:49:00	DONE	Lucas Cell	01-JUN-23 00:00
632337001	SAMPLE	LXP1	LUCAS6	SEP-05-23 09:49:00	DONE	Lucas Cell	01-JUL-23 00:00
632337002	SAMPLE	LXP1	LUCAS7	SEP-05-23 09:49:00	DONE	Lucas Cell	01-NOV-22 00:00
632337003	SAMPLE	LXP1	LUCAS8	SEP-05-23 09:49:00	DONE	Lucas Cell	08-APR-23 00:00
632337004	SAMPLE	LXP1	LUCAS1	SEP-05-23 10:24:00	DONE	Lucas Cell	01-MAY-23 00:00
632337005	SAMPLE	LXP1	LUCAS2	SEP-05-23 10:24:00	DONE	Lucas Cell	01-AUG-23 00:00
632337006	SAMPLE	LXP1	LUCAS3	SEP-05-23 10:24:00	DONE	Lucas Cell	25-OCT-22 00:00
632337007	SAMPLE	LXP1	LUCAS4	SEP-05-23 10:24:00	DONE	Lucas Cell	01-FEB-23 00:00
632337008	SAMPLE	LXP1	LUCAS5	SEP-05-23 10:24:00	DONE	Lucas Cell	01-JUN-23 00:00
632337009	SAMPLE	LXP1	LUCAS6	SEP-05-23 10:24:00	DONE	Lucas Cell	01-JUL-23 00:00
1205482934	MB	LXP1	LUCAS7	SEP-05-23 10:24:00	DONE	Lucas Cell	01-NOV-22 00:00
1205482935	DUP	LXP1	LUCAS8	SEP-05-23 10:24:00	DONE	Lucas Cell	08-APR-23 00:00
1205482936	MS	LXP1	LUCAS1	SEP-05-23 10:41:00	DONE	Lucas Cell	01-MAY-23 00:00
1205482937	LCS	LXP1	LUCAS2	SEP-05-23 10:41:00	DONE	Lucas Cell	01-AUG-23 00:00



Report ID: S51747.01(02)
Generated on 09/06/2023
Replaces report S51747.01(01) generated on 08/08/2023

Report to
Attention: Jennifer Caporale
Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Phone: 517-702-6372 FAX:
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Report Summary
Lab Sample ID(s): S51747.01-S51747.09
Project: Erickson AM MI New Wells 7-10
Collected Date(s): 08/02/2023
Submitted Date/Time: 08/03/2023 08:43
Sampled by: Marc Wahrer
P.O. #:

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Maya Murshak
Technical Director



General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

Report Narrative

All analyses completed



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP & ISO/IEC 17025:2017	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



Sample Summary (9 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S51747.01	MW-7 L307304-01	Groundwater	08/02/23 14:53
S51747.02	MW-8 L307304-02	Groundwater	08/02/23 13:30
S51747.03	MW-9 L307304-03	Groundwater	08/02/23 12:09
S51747.04	MW-10 L307304-04	Groundwater	08/02/23 10:31
S51747.05	MW-7B L307304-05	Groundwater	08/02/23 16:06
S51747.06	MW-7C L307304-06	Groundwater	08/02/23 17:22
S51747.07	MWT-10 L307304-07	Groundwater	08/02/23 10:31
S51747.08	Field Blank L307304-08	Water	08/02/23 09:30
S51747.09	MW-13 L307304-09	Groundwater	08/02/23 18:46



Lab Sample ID: S51747.01

Sample Tag: MW-7 L307304-01

Collected Date/Time: 08/02/2023 14:53

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.1	IR
2	1L Plastic	None	Yes	3.1	IR
1	125ml Plastic	HNO3	Yes	3.1	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/04/23 12:55	CTV	
Metal Digestion	Completed	SW3015A	08/03/23 10:15	CCM	

Inorganics

Method: E300.0, Run Date: 08/03/23 13:49, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 08/03/23 14:54, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	81	25	0.40	mg/L	25	16887-00-6	
Sulfate	172	25	1.5	mg/L	25	14808-79-8	

Method: SM2320B, Run Date: 08/03/23 14:06, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	150	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/03/23 11:32, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	289	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 08/04/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	548	50	12	mg/L	2		

Method: SM2540D, Run Date: 08/04/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 08/03/23 13:02, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.006	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.050	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	1.08	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51747.01 (continued)

Sample Tag: MW-7 L307304-01

Method: E200.8, Run Date: 08/03/23 13:02, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	1.04	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.063	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.156	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/03/23 15:43, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	97.2	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	12.1	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	9.44	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	68.1	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/04/23 14:31, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/05/23 12:01, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Lab Sample ID: S51747.02

Sample Tag: MW-8 L307304-02

Collected Date/Time: 08/02/2023 13:30

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.1	IR
2	1L Plastic	None	Yes	3.1	IR
1	125ml Plastic	HNO3	Yes	3.1	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/04/23 12:55	CTV	
Metal Digestion	Completed	SW3015A	08/03/23 10:15	CCM	

Inorganics

Method: E300.0, Run Date: 08/03/23 14:02, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	66	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	52	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/03/23 14:14, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	320	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/03/23 11:34, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	326	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 08/04/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	460	50	12	mg/L	2		

Method: SM2540D, Run Date: 08/04/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 08/03/23 13:11, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.026	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.14	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	Not detected	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51747.02 (continued)

Sample Tag: MW-8 L307304-02

Method: E200.8, Run Date: 08/03/23 13:11, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.009	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/03/23 15:45, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	86.9	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	25.3	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	0.76	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	40.9	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/04/23 14:35, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/05/23 12:01, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Lab Sample ID: S51747.03

Sample Tag: MW-9 L307304-03

Collected Date/Time: 08/02/2023 12:09

Matrix: Groundwater

COC Reference:

Sample Containers

Table with 6 columns: #, Type, Preservative(s), Refrigerated?, Arrival Temp. (C), Thermometer #. Rows include 1L Plastic and 125ml Plastic containers.

Extraction / Prep.

Table with 6 columns: Parameter, Result, Method, Run Date, Analyst, Flags. Rows include Mercury Digestion and Metal Digestion.

Inorganics

Method: E300.0, Run Date: 08/03/23 14:15, Analyst: JDP

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Chloride, Fluoride (Undistilled), and Sulfate.

Method: SM2320B, Run Date: 08/03/23 14:16, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Bicarbonate* and Carbonate*.

Method: SM2340C, Run Date: 08/03/23 11:36, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Hardness.

Method: SM2540C, Run Date: 08/04/23 17:30, Analyst: MDG

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Dissolved Solids.

Method: SM2540D, Run Date: 08/04/23 17:30, Analyst: MDG

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Suspended Solids.

Metals

Method: E200.8, Run Date: 08/03/23 13:15, Analyst: CCM

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Antimony*, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, and Iron.



Lab Sample ID: S51747.03 (continued)

Sample Tag: MW-9 L307304-03

Method: E200.8, Run Date: 08/03/23 13:15, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/03/23 15:46, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	75.7	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	19.5	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.28	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	3.84	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/04/23 14:38, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/05/23 12:01, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Lab Sample ID: S51747.04

Sample Tag: MW-10 L307304-04

Collected Date/Time: 08/02/2023 10:31

Matrix: Groundwater

COC Reference:

Sample Containers

Table with 6 columns: #, Type, Preservative(s), Refrigerated?, Arrival Temp. (C), Thermometer #. Rows include 1L Plastic and 125ml Plastic containers.

Extraction / Prep.

Table with 6 columns: Parameter, Result, Method, Run Date, Analyst, Flags. Rows include Mercury Digestion and Metal Digestion.

Inorganics

Method: E300.0, Run Date: 08/03/23 14:28, Analyst: JDP

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Chloride, Fluoride (Undistilled), and Sulfate.

Method: SM2320B, Run Date: 08/03/23 14:18, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Bicarbonate* and Carbonate*.

Method: SM2340C, Run Date: 08/03/23 11:38, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Hardness.

Method: SM2540C, Run Date: 08/04/23 17:30, Analyst: MDG

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Dissolved Solids.

Method: SM2540D, Run Date: 08/04/23 17:30, Analyst: MDG

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Suspended Solids.

Metals

Method: E200.8, Run Date: 08/03/23 13:19, Analyst: CCM

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Antimony*, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, and Iron.



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51747.04 (continued)

Sample Tag: MW-10 L307304-04

Method: E200.8, Run Date: 08/03/23 13:19, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/03/23 15:48, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	131	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	25.8	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	0.68	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	4.55	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/04/23 14:41, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/05/23 12:01, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Lab Sample ID: S51747.05

Sample Tag: MW-7B L307304-05

Collected Date/Time: 08/02/2023 16:06

Matrix: Groundwater

COC Reference:

Sample Containers

Table with 6 columns: #, Type, Preservative(s), Refrigerated?, Arrival Temp. (C), Thermometer #. Rows include 1L Plastic and 125ml Plastic containers.

Extraction / Prep.

Table with 6 columns: Parameter, Result, Method, Run Date, Analyst, Flags. Rows include Mercury Digestion and Metal Digestion.

Inorganics

Method: E300.0, Run Date: 08/03/23 14:41, Analyst: JDP

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Chloride, Fluoride (Undistilled), and Sulfate.

Method: SM2320B, Run Date: 08/03/23 14:20, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Bicarbonate* and Carbonate*.

Method: SM2340C, Run Date: 08/03/23 11:40, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Hardness.

Method: SM2540C, Run Date: 08/04/23 17:30, Analyst: MDG

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Dissolved Solids.

Method: SM2540D, Run Date: 08/04/23 17:30, Analyst: MDG

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Suspended Solids.

Metals

Method: E200.8, Run Date: 08/03/23 13:22, Analyst: CCM

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Antimony*, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, and Iron.



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51747.05 (continued)

Sample Tag: MW-7B L307304-05

Method: E200.8, Run Date: 08/03/23 13:22, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.031	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/03/23 15:49, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	9.36	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	2.81	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	5.78	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	146	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/04/23 14:45, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/05/23 12:01, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51747.06

Sample Tag: MW-7C L307304-06

Collected Date/Time: 08/02/2023 17:22

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.1	IR
2	1L Plastic	None	Yes	3.1	IR
1	125ml Plastic	HNO3	Yes	3.1	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/04/23 12:55	CTV	
Metal Digestion	Completed	SW3015A	08/03/23 10:15	CCM	

Inorganics

Method: E300.0, Run Date: 08/04/23 08:48, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 08/04/23 09:39, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	93	50	0.80	mg/L	50	16887-00-6	
Sulfate	656	50	3.0	mg/L	50	14808-79-8	

Method: SM2320B, Run Date: 08/03/23 14:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	170	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/03/23 11:42, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	779	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 08/04/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,350	50	12	mg/L	2		

Method: SM2540D, Run Date: 08/04/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	7.4	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 08/03/23 13:26, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.007	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.044	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	6.68	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51747.06 (continued)

Sample Tag: MW-7C L307304-06

Method: E200.8, Run Date: 08/03/23 13:26, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	4.02	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.126	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.397	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.007	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/03/23 15:51, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	235	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	41.5	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	5.79	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	96.6	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/04/23 14:48, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/05/23 12:01, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Lab Sample ID: S51747.07

Sample Tag: MWT-10 L307304-07

Collected Date/Time: 08/02/2023 10:31

Matrix: Groundwater

COC Reference:

Sample Containers

Table with 6 columns: #, Type, Preservative(s), Refrigerated?, Arrival Temp. (C), Thermometer #. Rows include 1L Plastic and 125ml Plastic containers.

Extraction / Prep.

Table with 6 columns: Parameter, Result, Method, Run Date, Analyst, Flags. Rows include Mercury Digestion and Metal Digestion.

Inorganics

Method: E300.0, Run Date: 08/04/23 09:01, Analyst: JDP

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Chloride, Fluoride (Undistilled), and Sulfate.

Method: SM2320B, Run Date: 08/03/23 14:24, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Bicarbonate* and Carbonate*.

Method: SM2340C, Run Date: 08/03/23 11:44, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Hardness.

Method: SM2540C, Run Date: 08/04/23 17:30, Analyst: MDG

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Dissolved Solids.

Method: SM2540D, Run Date: 08/04/23 17:30, Analyst: MDG

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Suspended Solids.

Metals

Method: E200.8, Run Date: 08/03/23 13:33, Analyst: CCM

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Antimony*, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, and Iron.



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51747.07 (continued)

Sample Tag: MWT-10 L307304-07

Method: E200.8, Run Date: 08/03/23 13:33, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/03/23 15:52, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	129	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	25.6	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	0.68	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	4.64	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/04/23 14:51, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/05/23 12:01, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Lab Sample ID: S51747.08

Sample Tag: Field Blank L307304-08

Collected Date/Time: 08/02/2023 09:30

Matrix: Water

COC Reference:

Sample Containers

Table with 6 columns: #, Type, Preservative(s), Refrigerated?, Arrival Temp. (C), Thermometer #. Rows include 1L Plastic and 125ml Plastic containers.

Extraction / Prep.

Table with 6 columns: Parameter, Result, Method, Run Date, Analyst, Flags. Rows include Mercury Digestion and Metal Digestion.

Inorganics

Method: E300.0, Run Date: 08/04/23 09:14, Analyst: JDP

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Chloride, Fluoride (Undistilled), and Sulfate.

Method: SM2320B, Run Date: 08/03/23 14:26, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Bicarbonate* and Carbonate*.

Method: SM2340C, Run Date: 08/03/23 11:46, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Hardness.

Method: SM2540C, Run Date: 08/04/23 17:30, Analyst: MDG

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Dissolved Solids.

Method: SM2540D, Run Date: 08/04/23 17:30, Analyst: MDG

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Suspended Solids.

Metals

Method: E200.8, Run Date: 08/03/23 12:06, Analyst: CCM

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Antimony*, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, and Iron.



Lab Sample ID: S51747.08 (continued)

Sample Tag: Field Blank L307304-08

Method: E200.8, Run Date: 08/03/23 12:06, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 08/03/23 15:26, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 08/04/23 14:54, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/05/23 12:01, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

**Lab Sample ID: S51747.09**

Sample Tag: MW-13 L307304-09

Collected Date/Time: 08/02/2023 18:46

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.1	IR
2	1L Plastic	None	Yes	3.1	IR
1	125ml Plastic	HNO3	Yes	3.1	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/04/23 12:55	CTV	
Metal Digestion	Completed	SW3015A	08/03/23 10:15	CCM	

Inorganics**Method: E300.0, Run Date: 08/04/23 09:26, Analyst: JDP**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	45	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	87	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/03/23 14:28, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	330	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/03/23 11:48, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	428	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 08/04/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	492	50	12	mg/L	2		

Method: SM2540D, Run Date: 08/04/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals**Method: E200.8, Run Date: 08/03/23 13:38, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.004	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.034	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.17	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.16	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51747.09 (continued)

Sample Tag: MW-13 L307304-09

Method: E200.8, Run Date: 08/03/23 13:38, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/03/23 15:54, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	124	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	26.9	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	0.94	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	8.34	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/04/23 15:04, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/05/23 12:01, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

Merit Laboratories Login Checklist

Lab Set ID:S51747

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 7-10

Submitted:08/03/2023 08:43 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Selection	Description	Note
Sample Receiving		
01.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples are received at 4C +/- 2C Thermometer # IR 3.1
02.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Received on ice/ cooling process begun
03.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples shipped
04.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples left in 24 hr. drop box
05.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Are there custody seals/tape or is the drop box locked
Chain of Custody		
06.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC adequately filled out
07.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC signed and relinquished to the lab
08.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sample tag on bottles match COC
09.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Subcontracting needed? Subcontracted to: GEL
Preservation		
10.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Do sample have correct chemical preservation
11.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Completed pH checks on preserved samples? (no VOAs)
12.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Did any samples need to be preserved in the lab?
Bottle Conditions		
13.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	All bottles intact
14.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Appropriate analytical bottles are used
15.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Merit bottles used
16.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sufficient sample volume received
17.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples require laboratory filtration
18.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples submitted within holding time
19.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S51747 Submitted: 08/03/2023 08:43

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 7-10

Initial Preservation Check: 08/03/2023 09:31 MMC

Preservation Recheck (E200.8): N/A

Attention: Jennifer Caporale
Address: Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S51747.01	125ml Plastic HNO3	<2			
S51747.01	1L Plastic HNO3	<2			
S51747.01	1L Plastic HNO3	<2			
S51747.02	125ml Plastic HNO3	<2			
S51747.02	1L Plastic HNO3	<2			
S51747.02	1L Plastic HNO3	<2			
S51747.03	125ml Plastic HNO3	<2			
S51747.03	1L Plastic HNO3	<2			
S51747.03	1L Plastic HNO3	<2			
S51747.04	125ml Plastic HNO3	<2			
S51747.04	1L Plastic HNO3	<2			
S51747.04	1L Plastic HNO3	<2			
S51747.05	125ml Plastic HNO3	<2			
S51747.05	1L Plastic HNO3	<2			
S51747.05	1L Plastic HNO3	<2			
S51747.06	125ml Plastic HNO3	<2			
S51747.06	1L Plastic HNO3	<2			
S51747.06	1L Plastic HNO3	<2			
S51747.07	125ml Plastic HNO3	<2			
S51747.07	1L Plastic HNO3	<2			
S51747.07	1L Plastic HNO3	<2			
S51747.08	125ml Plastic HNO3	<2			
S51747.08	1L Plastic HNO3	<2			
S51747.08	1L Plastic HNO3	<2			
S51747.09	125ml Plastic HNO3	<2			
S51747.09	1L Plastic HNO3	<2			
S51747.09	1L Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823
 Phone (517) 332-0167 Fax (517) 332-4034
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

REPORT TO

CHAIN OF CUSTODY RECORD

INVOICE TO

CONTACT NAME **Jennifer Caporale**
 COMPANY **Lansing Board of Water and Light**
 ADDRESS **PO Box 13007 48901-3007**
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**
 PHONE NO. **517-702-6372** FAX NO. P.O. NO.
 E-MAIL ADDRESS **Environmental_Laboratory@lbwl.com** QUOTE NO.

CONTACT NAME **Beth Zimpfer** SAME
 COMPANY
 ADDRESS
 CITY STATE ZIP CODE
 PHONE NO. E-MAIL ADDRESS **Beth.Zimpfer@lbwl.com**

PROJECT NO./NAME **Erickson AM MI Wells 7-10** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**
 TURNAROUND TIME REQUIRED 1 DAY 2 DAYS 3 DAYS STANDARD OTHER **ASAP**
 DELIVERABLES REQUIRED STD LEVEL II LEVEL III LEVEL IV EDD OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE
 # Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO ₃	H ₂ SO ₄	NaOH	MeOH	OTHER	Total Metals	F- undistilled, Cl ⁻ , SO ₄ , TDS	Radium 226	Radium 228	TSS	HCO ₃ , CO ₃ , Hardness	Certifications		Project Locations		Special Instructions
	DATE	TIME																	<input type="checkbox"/> OHIO VAP	<input type="checkbox"/> Drinking Water	<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES	
51747.01	8/2/23	1453	MW-7 L307304-01	GW	5	2	3						✓	✓	✓	✓	✓	✓					Metals to analyse: Na, Mg, K
.02		1330	MW-8 L307304-02	GW	5	2	3						✓	✓	✓	✓	✓	✓					B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03		1209	MW-9 L307304-03	GW	5	2	3						✓	✓	✓	✓	✓	✓					Co, Li, Hg, Mo, Pb, Se, Tl,
.04		1031	MW-10 L307304-04	GW	5	2	3						✓	✓	✓	✓	✓	✓					Fe, Cu, Ni, Ag, V, Zn
.05		1606	MW-7B L307304-05	GW	5	2	3						✓	✓	✓	✓	✓	✓					Please send a preliminary report
.06		1722	MW-7C L307304-06	GW	5	2	3						✓	✓	✓	✓	✓	✓					
.07		1031	MWT-10 L307304-07	GW	5	2	3						✓	✓	✓	✓	✓	✓					
.08		0930	Field Blank L307304-08	DI	5	2	3						✓	✓	✓	✓	✓	✓					
.09		1846	MW-13 L307304-09	GW	5	2	3						✓	✓	✓	✓	✓	✓					

RELINQUISHED BY: *Julie Maltby* Sampler DATE **8/3/23** TIME **0843**
 RECEIVED BY: *John Murray* DATE **8/3/23** TIME **0843**
 SIGNATURE/ORGANIZATION
 DATE TIME

RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
 RECEIVED BY: SIGNATURE/ORGANIZATION DATE TIME
 SEAL NO. SEAL INTACT YES NO INITIALS
 NOTES: TEMP. ON ARRIVAL **3.1**
 SEAL NO. SEAL INTACT YES NO INITIALS

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total		250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005

September 01, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 632337
SDG: S51747

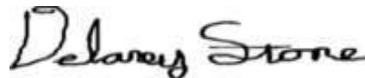
Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on August 07, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,



Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S51747
Work Order: 632337**

September 01, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on August 07, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
632337001	S51747.01
632337002	S51747.02
632337003	S51747.03
632337004	S51747.04
632337005	S51747.05
632337006	S51747.06
632337007	S51747.07
632337008	S51747.08
632337009	S51747.09 Field Blank

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Delaney Stone". The signature is written in a cursive, slightly slanted style.

Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

SAMPLE RECEIPT & REVIEW FORM

632337
MB

Client: MER	SDG/AR/COC/Work Order: 632332 632334
Received By: MVH	Date Received: 8-07-2023
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground UPS Field Services Courier Other 124664770361329232 12466477036337827

Suspected Hazard Information	Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
A) Shipped as a DOT Hazardous?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples are to be received as radioactive?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): 00 CPM/mR/Hr Classified as: Rad 1 Rad 2 Rad 3
D) Did the client designate samples are hazardous?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	If D or E is yes, select Hazards below. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other: _____

Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Client contacted and provided COC COC created upon receipt
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Preservation Method: Wet Ice Ice Packs Dry ice None Other: _____ *all temperatures are recorded in Celsius TEMP: 23
4 Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Temperature Device Serial #: IR2-21 Secondary Temperature Device Serial # (If Applicable): _____
5 Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6 Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sample ID's and Containers Affected: If Preservation added, Lot#: 551686.01(x2), 551686.05(x1),
7 Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer) Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No) Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected:
8 Samples received within holding time?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ID's and tests affected:
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ID's and containers affected:
10 Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No container count on COC Other (describe)
12 Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
13 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):
551686.02(x2), 551686.04(x2), 551686.06(x2), 551686.07(x2).

PM (or PMA) review: Initials **Am** Date **8/8/23** Page **1** of **1**

Laboratory Certifications

List of current GEL Certifications as of 01 September 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S51747
Work Order #: 632337**

Product: Radium-226+Radium-228 Calculation

Analytical Method: Calculation

Analytical Procedure: GL-RAD-D-003 REV# 45

Analytical Batch: 2475370

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
632337001	S51747.01
632337002	S51747.02
632337003	S51747.03
632337004	S51747.04
632337005	S51747.05
632337006	S51747.06
632337007	S51747.07
632337008	S51747.08
632337009	S51747.09 Field Blank

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2473355

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
632337001	S51747.01
632337002	S51747.02
632337003	S51747.03
632337004	S51747.04
632337005	S51747.05
632337006	S51747.06
632337007	S51747.07
632337008	S51747.08
632337009	S51747.09 Field Blank

1205483016	Method Blank (MB)
1205483017	632334001(S51686.01) Sample Duplicate (DUP)
1205483018	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts

Sample 1205483017 (S51686.01DUP) was recounted due to high relative percent difference/relative error ratio. The recount is reported. Sample 632337009 (S51747.09 Field Blank) was recounted due to results more negative than the three sigma TPU. The second count is reported.

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2473320

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
632337001	S51747.01
632337002	S51747.02
632337003	S51747.03
632337004	S51747.04
632337005	S51747.05
632337006	S51747.06
632337007	S51747.07
632337008	S51747.08
632337009	S51747.09 Field Blank
1205482934	Method Blank (MB)
1205482935	632334001(S51686.01) Sample Duplicate (DUP)
1205482936	632334001(S51686.01) Matrix Spike (MS)
1205482937	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

The matrix spike, 1205482936 (S51686.01MS), aliquot was reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S51747 GEL Work Order: 632337

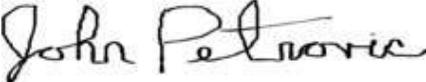
The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: John Petrovic

Date: 05 SEP 2023

Title: Data Validator

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: September 5, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S51747.01 Project: MERI00120
Sample ID: 632337001 Client ID: MERI001
Matrix: Ground Water
Collect Date: 02-AUG-23 14:53
Receive Date: 07-AUG-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	1.18	+/-0.819	1.25	3.00	pCi/L		JE1	08/22/23	1118	2473355	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.80	+/-0.927			pCi/L		NXL1	09/05/23	1201	2475370	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.619	+/-0.434	0.426	1.00	pCi/L		LXP1	09/05/23	0949	2473320	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			91.2	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: September 5, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S51747.02 Project: MERI00120
Sample ID: 632337002 Client ID: MERI001
Matrix: Ground Water
Collect Date: 02-AUG-23 13:30
Receive Date: 07-AUG-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		4.30	+/-1.34	1.68	3.00	pCi/L		JE1	08/22/23	1118	2473355	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		4.55	+/-1.38			pCi/L		NXL1	09/05/23	1201	2475370	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.245	+/-0.329	0.555	1.00	pCi/L		LXP1	09/05/23	0949	2473320	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			80	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: September 5, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Lavery
 Project: Routine Analysis

Client Sample ID: S51747.03	Project: MERI00120
Sample ID: 632337003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 02-AUG-23 12:09	
Receive Date: 07-AUG-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	-0.426	+/-0.701	1.46	3.00	pCi/L		JE1	08/22/23	1118	2473355		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.305	+/-0.784			pCi/L		NXL1	09/05/23	1201	2475370		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.305	+/-0.350	0.535	1.00	pCi/L		LXP1	09/05/23	0949	2473320		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			84.2	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: September 5, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Lavery
 Project: Routine Analysis

Client Sample ID: S51747.04	Project: MERI00120
Sample ID: 632337004	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 02-AUG-23 10:31	
Receive Date: 07-AUG-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	-0.799	+/-0.849	1.76	3.00	pCi/L		JE1	08/22/23	1119	2473355		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.519	+/-0.947			pCi/L		NXL1	09/05/23	1201	2475370		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.519	+/-0.421	0.467	1.00	pCi/L		LXP1	09/05/23	1024	2473320		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			87.1	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

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Report Date: September 5, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S51747.05	Project: MERI00120
Sample ID: 632337005	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 02-AUG-23 16:06	
Receive Date: 07-AUG-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.13	+/-1.08	1.78	3.00	pCi/L		JE1	08/22/23	1119	2473355		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.57	+/-1.16			pCi/L		NXL1	09/05/23	1201	2475370		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.434	+/-0.425	0.629	1.00	pCi/L		LXP1	09/05/23	1024	2473320		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			77.2	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

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Certificate of Analysis

Report Date: September 5, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S51747.06	Project: MERI00120
Sample ID: 632337006	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 02-AUG-23 17:22	
Receive Date: 07-AUG-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.451	+/-0.780	1.37	3.00	pCi/L		JE1	08/22/23	1119	2473355	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.25	+/-0.913			pCi/L		NXL1	09/05/23	1201	2475370	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.795	+/-0.474	0.404	1.00	pCi/L		LXP1	09/05/23	1024	2473320	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			85.3	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

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Certificate of Analysis

Report Date: September 5, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S51747.07 Project: MERI00120
Sample ID: 632337007 Client ID: MERI001
Matrix: Ground Water
Collect Date: 02-AUG-23 10:31
Receive Date: 07-AUG-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.502	+/-0.869	1.52	3.00	pCi/L		JE1	08/22/23	1119	2473355	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.34	+/-1.08			pCi/L		NXL1	09/05/23	1201	2475370	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.840	+/-0.635	0.784	1.00	pCi/L		LXP1	09/05/23	1024	2473320	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			86.3	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: September 5, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S51747.08 Project: MERI00120
Sample ID: 632337008 Client ID: MERI001
Matrix: Ground Water
Collect Date: 02-AUG-23 09:30
Receive Date: 07-AUG-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.283	+/-0.991	1.81	3.00	pCi/L		JE1	08/22/23	1119	2473355	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.16	+/-1.12			pCi/L		NXL1	09/05/23	1201	2475370	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.878	+/-0.529	0.558	1.00	pCi/L		LXP1	09/05/23	1024	2473320	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			75.1	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: September 5, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S51747.09 Field Blank	Project: MERI00120
Sample ID: 632337009	Client ID: MERI001
Matrix: Water	
Collect Date: 02-AUG-23 18:46	
Receive Date: 07-AUG-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	-0.669	+/-1.30	2.63	3.00	pCi/L		JE1	08/22/23	1521	2473355	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.0699	+/-1.33			pCi/L		NXL1	09/05/23	1201	2475370	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.0699	+/-0.274	0.608	1.00	pCi/L		LXP1	09/05/23	1024	2473320	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			82.2	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: September 5, 2023

Page 1 of 2

Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan

Contact: John Laverty

Workorder: 632337

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch 2473355											
QC1205483017	632334001	DUP									
Radium-228	U	0.576	U	0.768	pCi/L	N/A		N/A	JE1	08/22/23	15:21
	Uncertainty	+/-1.19		+/-1.27							
QC1205483018	LCS										
Radium-228	78.5			75.6	pCi/L		96.3	(75%-125%)		08/22/23	11:19
	Uncertainty			+/-4.06							
QC1205483016	MB										
Radium-228			U	0.775	pCi/L					08/22/23	11:19
	Uncertainty			+/-0.636							
Rad Ra-226											
Batch 2473320											
QC1205482935	632334001	DUP									
Radium-226	U	0.0656	U	0.119	pCi/L	N/A		N/A	LXP1	09/05/23	10:24
	Uncertainty	+/-0.203		+/-0.355							
QC1205482937	LCS										
Radium-226	52.5			55.9	pCi/L		107	(75%-125%)		09/05/23	10:41
	Uncertainty			+/-3.85							
QC1205482934	MB										
Radium-226			U	0.593	pCi/L					09/05/23	10:24
	Uncertainty			+/-0.543							
QC1205482936	632334001	MS									
Radium-226	116 U	0.0656		106	pCi/L		91.7	(75%-125%)		09/05/23	10:41
	Uncertainty	+/-0.203		+/-11.0							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- H Analytical holding time was exceeded
- < Result is less than value reported
- > Result is greater than value reported

GEL LABORATORIES LLC

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QC Summary

Workorder: 632337

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
NI											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2473355 Check-list

This check-list was completed on 24-AUG-23 by Nat Long

This batch was reviewed by Kenshalla Oston on 24-AUG-23 and Nat Long on 24-AUG-23.

Batch ID:
2473355

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2473355
Analyst: Jacqueline Winston (JE1)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: SP-C018367602

Due Dates for Lab: 01-SEP-2023			Package: 03-SEP-2023	SDG: 04-SEP-2023		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205483018	228	2051-B	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	632334001	15-AUG-2023	3	301	301	08/17/23 15:05	08/22/23 09:48
2	632334002	15-AUG-2023	3	301.2	301.2	08/17/23 15:05	08/22/23 09:48
3	632334003	15-AUG-2023	3	306.5	306.5	08/17/23 15:05	08/22/23 09:48
4	632334004	15-AUG-2023	3	302.4	302.4	08/17/23 15:05	08/22/23 09:48
5	632334005	15-AUG-2023	3	300.6	300.6	08/17/23 15:05	08/22/23 09:48
6	632334006	15-AUG-2023	3	303.6	303.6	08/17/23 15:05	08/22/23 09:48
7	632334007	15-AUG-2023	3	302.2	302.2	08/17/23 15:05	08/22/23 09:48
8	632334008	15-AUG-2023	3	301.6	301.6	08/17/23 15:05	08/22/23 09:48
9	632337001	15-AUG-2023	3	305.4	305.4	08/17/23 15:05	08/22/23 09:48
10	632337002	15-AUG-2023	3	306.5	306.5	08/17/23 15:05	08/22/23 09:48
11	632337003	15-AUG-2023	3	301.6	301.6	08/17/23 15:05	08/22/23 09:48
12	632337004	15-AUG-2023	3	302.9	302.9	08/17/23 15:05	08/22/23 09:48
13	632337005	15-AUG-2023	3	300.3	300.3	08/17/23 15:05	08/22/23 09:48
14	632337006	15-AUG-2023	3	300.8	300.8	08/17/23 15:05	08/22/23 09:48
15	632337007	15-AUG-2023	3	301.6	301.6	08/17/23 15:05	08/22/23 09:48
16	632337008	15-AUG-2023	3	302.6	302.6	08/17/23 15:05	08/22/23 09:48
17	632337009	15-AUG-2023	3	300.1	300.1	08/17/23 15:05	08/22/23 09:48
18	1205483016 MB	15-AUG-2023	3		307.2	08/17/23 15:05	08/22/23 09:48
19	1205483017 DUP (632334001)	15-AUG-2023	3	307.2	307.2	08/17/23 15:05	08/22/23 09:48
20	1205483018 LCS	15-AUG-2023	3		307.2	08/17/23 15:05	08/22/23 09:48

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 2097-B	Ba-133 Tracer	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 16-AUG-2023 12:01 SP-C018367602 Jacqueline Winston Data Entry Date3: 15-AUG-2023 00:00
REGNT 3953532	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3940529	Barium Carrier Ra228 REG	1 mL	
REGNT 3954868	RGF-1M Citric Acid	5 mL	
REGNT 3947239	2M HCl	20 mL	
REGNT 3953880	RGF-50% Potassium Carbonate	2 mL	
REGNT 3953517	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT DGA071323	2472106	2 g	
REGNT 3946961.4	RGF-Hydrofluoric Acid	4 mL	
REGNT 3940152	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3939217	RGF-Neodymium Substrate	5 mL	
REGNT 3946607.6	Nitric Acid	5 mL	
REGNT 3950136	RGF-7M Nitric Acid	25 mL	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 2097-B
 Tracer Exp Date : 7/12/2024
 Tracer Volume Added: 0.10

Batch : 2473355
 Analyst : JAC02417
 Prep Date : 8/15/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 3 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	632334001.1	0.3010	1.8476E-05	8/1/2023 14:43	1073.9	1.76%	921.2	1.90%	0.1	0.000200
2	632334002.1	0.3012	1.8479E-05	8/1/2023 17:59	1073.9	1.76%	935.0	1.89%	0.1	0.000200
3	632334003.1	0.3065	1.8567E-05	8/1/2023 10:51	1073.9	1.76%	887.9	1.94%	0.1	0.000200
4	632334004.1	0.3024	1.8500E-05	8/1/2023 12:24	1073.9	1.76%	936.5	1.89%	0.1	0.000200
5	632334005.1	0.3006	1.8469E-05	8/1/2023 18:40	1073.9	1.76%	793.0	2.05%	0.1	0.000200
6	632334006.1	0.3036	1.8520E-05	8/1/2023 16:37	1073.9	1.76%	937.0	1.89%	0.1	0.000200
7	632334007.1	0.3022	1.8496E-05	8/1/2023 12:24	1073.9	1.76%	913.8	1.91%	0.1	0.000200
8	632334008.1	0.3016	1.8486E-05	8/1/2023 8:15	1073.9	1.76%	792.2	2.05%	0.1	0.000200
9	632337001.1	0.3054	1.8549E-05	8/2/2023 14:53	1073.9	1.76%	979.6	1.84%	0.1	0.000200
10	632337002.1	0.3065	1.8567E-05	8/2/2023 13:30	1073.9	1.76%	858.8	1.97%	0.1	0.000200
11	632337003.1	0.3016	1.8486E-05	8/2/2023 12:09	1073.9	1.76%	904.5	1.92%	0.1	0.000200
12	632337004.1	0.3029	1.8508E-05	8/2/2023 10:31	1073.9	1.76%	935.9	1.89%	0.1	0.000200
13	632337005.1	0.3003	1.8464E-05	8/2/2023 16:06	1073.9	1.76%	828.6	2.01%	0.1	0.000200
14	632337006.1	0.3008	1.8473E-05	8/2/2023 17:22	1073.9	1.76%	916.2	1.91%	0.1	0.000200
15	632337007.1	0.3016	1.8486E-05	8/2/2023 10:31	1073.9	1.76%	927.2	1.90%	0.1	0.000200
16	632337008.1	0.3026	1.8503E-05	8/2/2023 9:30	1073.9	1.76%	807.0	2.03%	0.1	0.000200
17	632337009.1	0.3001	1.8461E-05	8/2/2023 18:46	1073.9	1.76%	882.5	1.94%	0.1	0.000200
18	1205483016.1	0.3072	1.8579E-05	8/15/2023 0:00	1073.9	1.76%	911.1	1.91%	0.1	0.000200
19	1205483017.1	0.3072	1.8579E-05	8/1/2023 14:43	1073.9	1.76%	920.8	1.90%	0.1	0.000200
20	1205483018.1	0.3072	1.8579E-05	8/15/2023 0:00	1073.9	1.76%	957.1	1.87%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated Sample Recovery %	Sample Recovery Error %
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction		
1	4A	60	2	37	0.617	8/22/2023 15:21	8/17/2023 15:05	8/22/2023 9:48	0.993	0.535	1.000	1.057	85.8%	2.61%
2	1B	60	10	32	0.533	8/22/2023 11:18	8/17/2023 15:05	8/22/2023 9:48	0.993	0.844	1.000	1.057	87.1%	2.60%
3	1D	60	15	39	0.650	8/22/2023 11:18	8/17/2023 15:05	8/22/2023 9:48	0.993	0.844	1.000	1.057	82.7%	2.63%
4	2A	60	12	44	0.733	8/22/2023 11:18	8/17/2023 15:05	8/22/2023 9:48	0.993	0.844	1.000	1.057	87.2%	2.60%
5	2C	60	3	63	1.050	8/22/2023 11:18	8/17/2023 15:05	8/22/2023 9:48	0.993	0.844	1.000	1.057	73.8%	2.72%
6	3B	60	8	46	0.767	8/22/2023 11:18	8/17/2023 15:05	8/22/2023 9:48	0.993	0.843	1.000	1.057	87.2%	2.60%
7	3C	60	6	20	0.333	8/22/2023 11:18	8/17/2023 15:05	8/22/2023 9:48	0.993	0.843	1.000	1.057	85.1%	2.61%
8	3D	60	12	26	0.433	8/22/2023 11:18	8/17/2023 15:05	8/22/2023 9:48	0.993	0.843	1.000	1.057	73.8%	2.72%
9	4A	60	5	52	0.867	8/22/2023 11:18	8/17/2023 15:05	8/22/2023 9:48	0.993	0.843	1.000	1.057	91.2%	2.56%
10	4C	60	12	121	2.017	8/22/2023 11:18	8/17/2023 15:05	8/22/2023 9:48	0.993	0.843	1.000	1.057	80.0%	2.66%
11	4D	60	13	33	0.550	8/22/2023 11:18	8/17/2023 15:05	8/22/2023 9:48	0.993	0.843	1.000	1.057	84.2%	2.62%
12	5A	60	7	51	0.850	8/22/2023 11:19	8/17/2023 15:05	8/22/2023 9:48	0.993	0.842	1.000	1.057	87.1%	2.60%
13	5B	60	12	65	1.083	8/22/2023 11:19	8/17/2023 15:05	8/22/2023 9:48	0.993	0.842	1.000	1.057	77.2%	2.69%
14	5C	60	15	44	0.733	8/22/2023 11:19	8/17/2023 15:05	8/22/2023 9:48	0.993	0.842	1.000	1.057	85.3%	2.61%
15	5D	60	17	58	0.967	8/22/2023 11:19	8/17/2023 15:05	8/22/2023 9:48	0.993	0.842	1.000	1.057	86.3%	2.61%
16	6B	60	4	47	0.783	8/22/2023 11:19	8/17/2023 15:05	8/22/2023 9:48	0.993	0.843	1.000	1.057	75.1%	2.70%
17	4C	60	13	43	0.717	8/22/2023 15:21	8/17/2023 15:05	8/22/2023 9:48	0.993	0.535	1.000	1.057	82.2%	2.63%
18	7B	60	4	31	0.517	8/22/2023 11:19	8/17/2023 15:05	8/22/2023 9:48	0.998	0.842	1.000	1.057	84.8%	2.61%
19	4D	60	14	49	0.817	8/22/2023 15:21	8/17/2023 15:05	8/22/2023 9:48	0.993	0.535	1.000	1.057	85.7%	2.61%
20	7D	60	18	1402	23.367	8/22/2023 11:19	8/17/2023 15:05	8/22/2023 9:48	0.998	0.842	1.000	1.057	89.1%	2.58%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2023	5/31/2024	0.6074	0.01123	0.516	8/18/2023 18:34	500
2	PIC	6/1/2023	5/31/2024	0.6098	0.00711	0.358	8/18/2023 18:33	500
3	PIC	6/1/2023	5/31/2024	0.6071	0.00692	0.586	8/18/2023 18:33	500
4	PIC	6/1/2023	5/31/2024	0.6083	0.01914	0.486	8/18/2023 18:33	500
5	PIC	6/1/2023	5/31/2024	0.6085	0.01274	0.756	8/18/2023 18:33	500
6	PIC	6/1/2023	5/31/2024	0.6266	0.01614	0.708	8/18/2023 18:34	500
7	PIC	6/1/2023	5/31/2024	0.6245	0.00988	0.322	8/18/2023 18:34	500
8	PIC	6/1/2023	5/31/2024	0.5677	0.02297	0.320	8/18/2023 18:34	500
9	PIC	6/1/2023	5/31/2024	0.6074	0.01123	0.516	8/18/2023 18:34	500
10	PIC	6/1/2023	5/31/2024	0.6376	0.00889	0.834	8/18/2023 18:34	500
11	PIC	6/1/2023	5/31/2024	0.6412	0.00773	0.672	8/18/2023 18:34	500
12	PIC	6/1/2023	5/31/2024	0.6366	0.00851	1.086	8/18/2023 18:34	500
13	PIC	6/1/2023	5/31/2024	0.6230	0.00426	0.796	8/18/2023 18:34	500
14	PIC	6/1/2023	5/31/2024	0.6454	0.00657	0.602	8/18/2023 18:43	500
15	PIC	6/1/2023	5/31/2024	0.6566	0.00925	0.816	8/18/2023 18:35	500
16	PIC	6/1/2023	5/31/2024	0.5957	0.00851	0.716	8/18/2023 18:31	500
17	PIC	6/1/2023	5/31/2024	0.6376	0.00889	0.834	8/18/2023 18:34	500
18	PIC	6/1/2023	5/31/2024	0.6423	0.00627	0.288	8/18/2023 18:31	500
19	PIC	6/1/2023	5/31/2024	0.6412	0.00773	0.672	8/18/2023 18:34	500
20	PIC	6/1/2023	5/31/2024	0.6247	0.01113	0.558	8/18/2023 18:31	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

* - RPD changed to 0% due to sample & dup activity below MDA

LCS S/N : 2051-B
LCS Exp Date : 3/27/2024
LCS Activity (dpm/ml): 535.58
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	1.3080	0.9234	3	2.1329	0.5758	105.68%	0.1007	0.1063	1.1923	1.2012		SAMPLE				
2	0.6770	0.4780	3	1.1336	0.6232	55.96%	0.1753	0.0980	0.6827	0.7008		SAMPLE				
3	0.9004	0.6357	3	1.4562	0.2365	171.22%	0.0640	0.1096	0.7935	0.7958		SAMPLE				
4	0.7865	0.5553	3	1.2878	0.8766	46.55%	0.2473	0.1149	0.7979	0.8290		SAMPLE				
5	1.1651	0.8226	3	1.8557	1.2376	47.00%	0.2940	0.1379	1.1376	1.1807		SAMPLE				
6	0.9179	0.6481	3	1.4675	0.2010	203.10%	0.0587	0.1191	0.8002	0.8019		SAMPLE				
7	0.6400	0.4518	3	1.0808	0.0402	694.75%	0.0113	0.0787	0.5468	0.5470		SAMPLE				
8	0.8112	0.5727	3	1.3707	0.5106	78.32%	0.1133	0.0887	0.7829	0.7939		SAMPLE				
9	0.7683	0.5424	3	1.2529	1.1782	35.59%	0.3507	0.1244	0.8193	0.8724		SAMPLE				
10	1.0576	0.7467	3	1.6752	4.3023	16.13%	1.1827	0.1878	1.3392	1.7299		SAMPLE				
11	0.9108	0.6431	3	1.4606	-0.4258	84.08%	-0.1220	0.1025	0.7014	0.7015		SAMPLE				
12	1.1236	0.7933	3	1.7559	-0.7993	54.23%	-0.2360	0.1278	0.8485	0.8487		SAMPLE				
13	1.1197	0.7905	3	1.7781	1.1327	48.86%	0.2873	0.1402	1.0831	1.1207		SAMPLE				
14	0.8486	0.5992	3	1.3701	0.4512	88.27%	0.1313	0.1159	0.7803	0.7887		SAMPLE				
15	0.9573	0.6758	3	1.5181	0.5015	88.45%	0.1507	0.1332	0.8691	0.8784		SAMPLE				
16	1.1313	0.7987	3	1.8074	0.2828	178.78%	0.0673	0.1204	0.9908	0.9934		SAMPLE				
17	1.6580	1.1706	3	2.6263	-0.6692	99.48%	-0.1173	0.1167	1.3042	1.3044		SAMPLE				
18	0.5787	0.4085	3	0.9865	0.7745	42.00%	0.2287	0.0958	0.6363	0.6661		MB				
19	1.3857	0.9783	3	2.2222	0.7682	84.58%	0.1447	0.1223	1.2728	1.2877	632334001.1	DUP	* 0.0%			
20	0.7883	0.5565	3	1.2788	75.6068	3.93%	22.8087	0.6249	4.0603	19.6709		LCS			78.5325	96.3%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
632334001	4A	60	2	37	8/22/2023 15:21	8/22/2023 16:21	PIC	2473355
632334002	1B	60	10	32	8/22/2023 11:18	8/22/2023 12:18	PIC	2473355
632334003	1D	60	15	39	8/22/2023 11:18	8/22/2023 12:18	PIC	2473355
632334004	2A	60	12	44	8/22/2023 11:18	8/22/2023 12:18	PIC	2473355
632334005	2C	60	3	63	8/22/2023 11:18	8/22/2023 12:18	PIC	2473355
632334006	3B	60	8	46	8/22/2023 11:18	8/22/2023 12:18	PIC	2473355
632334007	3C	60	6	20	8/22/2023 11:18	8/22/2023 12:18	PIC	2473355
632334008	3D	60	12	26	8/22/2023 11:18	8/22/2023 12:18	PIC	2473355
632337001	4A	60	5	52	8/22/2023 11:18	8/22/2023 12:18	PIC	2473355
632337002	4C	60	12	121	8/22/2023 11:18	8/22/2023 12:18	PIC	2473355
632337003	4D	60	13	33	8/22/2023 11:18	8/22/2023 12:18	PIC	2473355
632337004	5A	60	7	51	8/22/2023 11:19	8/22/2023 12:19	PIC	2473355
632337005	5B	60	12	65	8/22/2023 11:19	8/22/2023 12:19	PIC	2473355
632337006	5C	60	15	44	8/22/2023 11:19	8/22/2023 12:19	PIC	2473355
632337007	5D	60	17	58	8/22/2023 11:19	8/22/2023 12:19	PIC	2473355
632337008	6B	60	4	47	8/22/2023 11:19	8/22/2023 12:19	PIC	2473355
632337009	4C	60	13	43	8/22/2023 15:21	8/22/2023 16:21	PIC	2473355
1205483016	7B	60	4	31	8/22/2023 11:19	8/22/2023 12:19	PIC	2473355
1205483017	4D	60	14	49	8/22/2023 15:21	8/22/2023 16:21	PIC	2473355
1205483018	7D	60	18	1402	8/22/2023 11:19	8/22/2023 12:19	PIC	2473355

ASSAY 22-Aug-23 10:14:17
 Wizard 2480 s/n 46190630
 Protocol id 8 Ba-133
 Time limit
 Count limit
 Isotope Ba-133
 Protocol date 8/22/2023
 Run id. 7191

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	1	1	180	3222.28	1073.92	1.76	10:14:17
632334001	2	1	2	180	2764	921.18	1.9	85.78	10:17:31
632334002	3	1	3	180	2805.57	935.04	1.89	87.07	10:20:45
632334003	4	1	4	180	2664	887.88	1.94	82.68	10:23:59
632334004	5	1	5	180	2810	936.51	1.89	87.20	10:27:13
632334005	1	19	1	180	2379.28	792.97	2.05	73.84	10:30:49
632334006	2	19	2	180	2811.28	936.95	1.89	87.25	10:34:03
632334007	3	19	3	180	2742	913.75	1.91	85.09	10:37:17
632334008	4	19	4	180	2377	792.24	2.05	73.77	10:40:31
632337001	5	19	5	180	2939.28	979.6	1.84	91.22	10:43:45
632337002	1	5	1	180	2577	858.83	1.97	79.97	10:47:21
632337003	2	5	2	180	2714	904.51	1.92	84.23	10:50:35
632337004	3	5	3	180	2808	935.85	1.89	87.14	10:53:49
632337005	4	5	4	180	2486.28	828.6	2.01	77.16	10:57:02
632337006	5	5	5	180	2749.28	916.23	1.91	85.32	11:00:17
632337007	1	2	1	180	2782	927.22	1.9	86.34	11:04:06
632337008	2	2	2	180	2421.28	806.99	2.03	75.14	11:07:20
632337009	3	2	3	180	2647.85	882.51	1.94	82.18	11:10:33
1205483016	4	2	4	180	2734	911.1	1.91	84.84	11:13:47
1205483017	5	2	5	180	2763	920.81	1.9	85.74	11:17:02
1205483018	1	98	1	180	2871.85	957.13	1.87	89.12	11:20:49

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 22-Aug-2023

Detectors LB4100 E1 through H4 and PIC 1A through 14D and G5400W 1W through 1Z and LB4200 GA1 through OD4

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E3	Above	Alpha bkg	22-Aug 05:42	60	0.733	-1.16E-1	0.399	+6.90
LB4100E3	Above	Beta bkg	22-Aug 05:42	60	2.067	0.736	2.329	+2.01
LB4100G3	Above	Beta bkg	22-Aug 04:21	60	2.183	0.785	2.444	+2.06
LB4100H1	Above	Beta bkg	22-Aug 04:21	60	3.367	-5.15E-1	3.743	+2.47
LB4200GA2	Above	Alpha bkg	22-Aug 06:59	60	0.450	-1.34E-1	0.379	+3.83
LB4200GB2	Above	Beta bkg	22-Aug 03:28	60	118	0.129	1.304	+599.32
LB4200GD4	Above	Alpha bkg	22-Aug 03:28	60	0.517	-1.07E-1	0.314	+5.90
LB4200OA4	Below	Alpha eff	22-Aug 05:55	5	11163	11260	11830	-4.02

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

Reviewed by Jc Poparad

Date 8/22/23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2473355

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
632334002	SAMPLE	JE1	PIC1B	AUG-22-23 11:18:25	DONE	25mm Filter	01-JUN-23 00:00
632334003	SAMPLE	JE1	PIC1D	AUG-22-23 11:18:25	DONE	25mm Filter	01-JUN-23 00:00
632334004	SAMPLE	JE1	PIC2A	AUG-22-23 11:18:33	DONE	25mm Filter	01-JUN-23 00:00
632334005	SAMPLE	JE1	PIC2C	AUG-22-23 11:18:34	DONE	25mm Filter	01-JUN-23 00:00
632337001	SAMPLE	JE1	PIC4A	AUG-22-23 11:18:42	DONE	25mm Filter	01-JUN-23 00:00
632337002	SAMPLE	JE1	PIC4C	AUG-22-23 11:18:42	DONE	25mm Filter	01-JUN-23 00:00
632337003	SAMPLE	JE1	PIC4D	AUG-22-23 11:18:42	DONE	25mm Filter	01-JUN-23 00:00
632334006	SAMPLE	JE1	PIC3B	AUG-22-23 11:18:49	DONE	25mm Filter	01-JUN-23 00:00
632334007	SAMPLE	JE1	PIC3C	AUG-22-23 11:18:52	DONE	25mm Filter	01-JUN-23 00:00
632334008	SAMPLE	JE1	PIC3D	AUG-22-23 11:18:56	DONE	25mm Filter	01-JUN-23 00:00
632337008	SAMPLE	JE1	PIC6B	AUG-22-23 11:19:03	DONE	25mm Filter	01-JUN-23 00:00
632337004	SAMPLE	JE1	PIC5A	AUG-22-23 11:19:15	DONE	25mm Filter	01-JUN-23 00:00
632337005	SAMPLE	JE1	PIC5B	AUG-22-23 11:19:15	DONE	25mm Filter	01-JUN-23 00:00
632337006	SAMPLE	JE1	PIC5C	AUG-22-23 11:19:15	DONE	25mm Filter	01-JUN-23 00:00
632337007	SAMPLE	JE1	PIC5D	AUG-22-23 11:19:16	DONE	25mm Filter	01-JUN-23 00:00
1205483016	MB	JE1	PIC7B	AUG-22-23 11:19:27	DONE	25mm Filter	01-JUN-23 00:00
1205483018	LCS	JE1	PIC7D	AUG-22-23 11:19:28	DONE	25mm Filter	01-JUN-23 00:00
1205483017	DUP	JE1	PIC4D	AUG-22-23 15:21:12	DONE	25mm Filter	01-JUN-23 00:00
632334001	SAMPLE	JE1	PIC4A	AUG-22-23 15:21:16	DONE	25mm Filter	01-JUN-23 00:00
632337009	SAMPLE	JE1	PIC4C	AUG-22-23 15:21:20	DONE	25mm Filter	01-JUN-23 00:00

Lucas Cell Raw Data

Batch 2473320 Check-list

This check-list was completed on 05-SEP-23 by Lyndsey Pace

This batch was reviewed by Elizabeth Krouse on 05-SEP-23 and Lyndsey Pace on 05-SEP-23.

Batch ID:
2473320

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2473320
Analyst: Lyndsey Pace (LXP1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: LUCAS-C202389980

Due Dates for Lab: 02-SEP-2023			Package: 04-SEP-2023		SDG: 05-SEP-2023	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
MS	1205482936	Radium-226 SPIKE	1715-G	.1	mL	
LCS	1205482937	Radium-226 SPIKE	1715-G	.2	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	632334001	01-SEP-2023	1	501.11	501.11	09/01/23 11:15	603	09/05/23 05:40	09/05/23 09:12	2	2
2	632334002	01-SEP-2023	1	506.7	506.7	09/01/23 11:15	708	09/05/23 05:40	09/05/23 09:12	1	6
3	632334003	01-SEP-2023	1	499.97	499.97	09/01/23 11:15	801	09/05/23 05:40	09/05/23 09:12	4	4
4	632334004	01-SEP-2023	1	507.1	507.1	09/01/23 11:15	102	09/05/23 06:04	09/05/23 09:49	2	10
5	632334005	01-SEP-2023	1	508.99	508.99	09/01/23 11:15	202	09/05/23 06:04	09/05/23 09:49	2	6
6	632334006	01-SEP-2023	1	500.95	500.95	09/01/23 11:15	304	09/05/23 06:04	09/05/23 09:49	2	8
7	632334007	01-SEP-2023	1	509	509	09/01/23 11:15	406	09/05/23 06:04	09/05/23 09:49	4	8
8	632334008	01-SEP-2023	1	508.32	508.32	09/01/23 11:15	506	09/05/23 06:04	09/05/23 09:49	4	6
9	632337001	01-SEP-2023	1	502.59	502.59	09/01/23 11:15	602	09/05/23 06:04	09/05/23 09:49	1	9
10	632337002	01-SEP-2023	1	510.46	510.46	09/01/23 11:15	701	09/05/23 06:04	09/05/23 09:49	3	5
11	632337003	01-SEP-2023	1	503.55	503.55	09/01/23 11:15	804	09/05/23 06:04	09/05/23 09:49	2	5
12	632337004	01-SEP-2023	1	510.65	510.65	09/01/23 11:15	106	09/05/23 06:28	09/05/23 10:24	1	7
13	632337005	01-SEP-2023	1	501.96	501.96	09/01/23 11:15	208	09/05/23 06:28	09/05/23 10:24	4	8
14	632337006	01-SEP-2023	1	500.24	500.24	09/01/23 11:15	302	09/05/23 06:28	09/05/23 10:24	1	12
15	632337007	01-SEP-2023	1	507.92	507.92	09/01/23 11:15	401	09/05/23 06:28	09/05/23 10:24	3	10
16	632337008	01-SEP-2023	1	506.55	506.55	09/01/23 11:15	505	09/05/23 06:28	09/05/23 10:24	3	14
17	632337009	01-SEP-2023	1	501.26	501.26	09/01/23 11:15	607	09/05/23 06:28	09/05/23 10:24	4	3
18	1205482934 MB	01-SEP-2023	1	510.65	510.65	09/01/23 11:15	703	09/05/23 06:28	09/05/23 10:24	8	12
19	1205482935 DUP (632334001)	01-SEP-2023	1	509.85	509.85	09/01/23 11:15	805	09/05/23 06:28	09/05/23 10:24	5	4
20	1205482936 MS (632334001)	01-SEP-2023	1	115.86	115.86	09/01/23 11:15	101	09/05/23 06:53	09/05/23 10:41	3	361
21	1205482937 LCS	01-SEP-2023	1		510.65	09/01/23 11:15	205	09/05/23 06:53	09/05/23 10:41	1	811

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 01-SEP-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Batch : 2473320
 Analyst : LIN01615
 Prep Date : 9/1/2023

Ra-226 Method Uncertainty : 0.073648

Procedure Code : LUC26RAL

Parmname : Radium-226

Required MDA : 1 pCi/L
 Halflife of Ra-226 : 1600 years
 Ra-226 Abundance : 1.00
 Halflife of Rn-222 : 3.8235 days

Batch counted on : LUCAS CELL DETECTOR

BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	632334001.1	0.5011	2.0260E-05	8/1/2023 14:43	603	15	2	0.133	2	0.067	30	1.8970
2	632334002.1	0.5067	2.0283E-05	8/1/2023 17:59	708	15	6	0.400	1	0.033	30	1.6020
3	632334003.1	0.5000	2.0256E-05	8/1/2023 10:51	801	15	4	0.267	4	0.133	30	1.4200
4	632334004.1	0.5071	2.0284E-05	8/1/2023 12:24	102	15	10	0.667	2	0.067	30	1.4860
5	632334005.1	0.5090	2.0292E-05	8/1/2023 18:40	202	15	6	0.400	2	0.067	30	1.4980
6	632334006.1	0.5010	2.0260E-05	8/1/2023 16:37	304	15	8	0.533	2	0.067	30	1.8850
7	632334007.1	0.5090	2.0292E-05	8/1/2023 12:24	406	15	8	0.533	4	0.133	30	1.4650
8	632334008.1	0.5083	2.0289E-05	8/1/2023 8:15	506	15	6	0.400	4	0.133	30	1.8780
9	632337001.1	0.5026	2.0266E-05	8/2/2023 14:53	602	15	9	0.600	1	0.033	30	1.7010
10	632337002.1	0.5105	2.0298E-05	8/2/2023 13:30	701	15	5	0.333	3	0.100	30	1.7440
11	632337003.1	0.5036	2.0270E-05	8/2/2023 12:09	804	15	5	0.333	2	0.067	30	1.6240
12	632337004.1	0.5107	2.0298E-05	8/2/2023 10:31	106	15	7	0.467	1	0.033	30	1.5250
13	632337005.1	0.5020	2.0264E-05	8/2/2023 16:06	208	15	8	0.533	4	0.133	30	1.7130
14	632337006.1	0.5002	2.0257E-05	8/2/2023 17:22	302	15	12	0.800	1	0.033	30	1.7980
15	632337007.1	0.5079	2.0288E-05	8/2/2023 10:31	401	15	10	0.667	3	0.100	30	1.2390
16	632337008.1	0.5066	2.0282E-05	8/2/2023 9:30	505	15	14	0.933	3	0.100	30	1.7470
17	632337009.1	0.5013	2.0261E-05	8/2/2023 18:46	607	15	3	0.200	4	0.133	30	1.7750
18	1205482934.1	0.5107	2.0298E-05	9/1/2023 0:00	703	15	12	0.800	8	0.267	30	1.6440
19	1205482935.1	0.5099	2.0295E-05	8/1/2023 14:43	805	15	4	0.267	5	0.167	30	1.5410
20	1205482936.1	0.1159	1.2301E-05	8/1/2023 14:43	101	15	361	24.067	3	0.100	30	1.8120
21	1205482937.1	0.5107	2.0298E-05	9/1/2023 0:00	205	15	811	54.067	1	0.033	30	1.7590

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
3.500%	7/1/2023	6/30/2024	9/1/2023 11:15	9/5/2023 5:40	9/5/2023 9:12	0.495	0.974	1.001	1.000
7.700%	11/1/2022	10/31/2023	9/1/2023 11:15	9/5/2023 5:40	9/5/2023 9:12	0.495	0.974	1.001	1.000
3.200%	4/8/2023	3/31/2024	9/1/2023 11:15	9/5/2023 5:40	9/5/2023 9:12	0.495	0.974	1.001	1.000
2.300%	5/1/2023	4/30/2024	9/1/2023 11:15	9/5/2023 6:04	9/5/2023 9:49	0.496	0.972	1.001	1.000
1.400%	8/1/2023	7/31/2024	9/1/2023 11:15	9/5/2023 6:04	9/5/2023 9:49	0.496	0.972	1.001	1.000
8.900%	10/25/2022	10/31/2023	9/1/2023 11:15	9/5/2023 6:04	9/5/2023 9:49	0.496	0.972	1.001	1.000
2.900%	2/1/2023	1/31/2024	9/1/2023 11:15	9/5/2023 6:04	9/5/2023 9:49	0.496	0.972	1.001	1.000
1.400%	6/1/2023	5/31/2024	9/1/2023 11:15	9/5/2023 6:04	9/5/2023 9:49	0.496	0.972	1.001	1.000
9.900%	7/1/2023	6/30/2024	9/1/2023 11:15	9/5/2023 6:04	9/5/2023 9:49	0.496	0.972	1.001	1.000
6.200%	11/1/2022	10/31/2023	9/1/2023 11:15	9/5/2023 6:04	9/5/2023 9:49	0.496	0.972	1.001	1.000
6.100%	4/8/2023	3/31/2024	9/1/2023 11:15	9/5/2023 6:04	9/5/2023 9:49	0.496	0.972	1.001	1.000
3.400%	5/1/2023	4/30/2024	9/1/2023 11:15	9/5/2023 6:28	9/5/2023 10:24	0.498	0.971	1.001	1.000
4.400%	8/1/2023	7/31/2024	9/1/2023 11:15	9/5/2023 6:28	9/5/2023 10:24	0.498	0.971	1.001	1.000
3.300%	10/25/2022	10/31/2023	9/1/2023 11:15	9/5/2023 6:28	9/5/2023 10:24	0.498	0.971	1.001	1.000
3.100%	2/1/2023	1/31/2024	9/1/2023 11:15	9/5/2023 6:28	9/5/2023 10:24	0.498	0.971	1.001	1.000
8.200%	6/1/2023	5/31/2024	9/1/2023 11:15	9/5/2023 6:28	9/5/2023 10:24	0.498	0.971	1.001	1.000
6.800%	7/1/2023	6/30/2024	9/1/2023 11:15	9/5/2023 6:28	9/5/2023 10:24	0.498	0.971	1.001	1.000
9.000%	11/1/2022	10/31/2023	9/1/2023 11:15	9/5/2023 6:28	9/5/2023 10:24	0.498	0.971	1.001	1.000
9.600%	4/8/2023	3/31/2024	9/1/2023 11:15	9/5/2023 6:28	9/5/2023 10:24	0.498	0.971	1.001	1.000
4.500%	5/1/2023	4/30/2024	9/1/2023 11:15	9/5/2023 6:53	9/5/2023 10:41	0.500	0.972	1.001	1.000
9.200%	8/1/2023	7/31/2024	9/1/2023 11:15	9/5/2023 6:53	9/5/2023 10:41	0.500	0.972	1.001	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-G
Spike Exp Date : 9/8/2023
Spike Activity (dpm/ml): 297.37
Spike Volume Added: 0.10

* - RPD changed to 0% due to sample & dup activity below MDA

LCS S/N : 1715-G
LCS Exp Date : 9/8/2023
LCS Activity (dpm/ml): 297.37
LCS Volume Added: 0.20

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.1873	0.1322	1	0.4613	0.0656	158.15%	0.0667	0.1054	0.2034	0.2036		SAMPLE				
2	0.1551	0.1095	1	0.4495	0.4227	46.10%	0.3667	0.1667	0.3766	0.3868		SAMPLE				
3	0.3546	0.2504	1	0.7643	0.1757	111.85%	0.1333	0.1491	0.3851	0.3861		SAMPLE				
4	0.2359	0.1665	1	0.5811	0.7440	36.08%	0.6000	0.2160	0.5250	0.5369		SAMPLE				
5	0.2331	0.1646	1	0.5743	0.4085	51.01%	0.3333	0.1700	0.4083	0.4126		SAMPLE				
6	0.1883	0.1329	1	0.4637	0.4618	42.59%	0.4667	0.1944	0.3770	0.3912		SAMPLE				
7	0.3371	0.2380	1	0.7267	0.5012	50.08%	0.4000	0.2000	0.4912	0.4973		SAMPLE				
8	0.2633	0.1859	1	0.5676	0.2610	66.16%	0.2667	0.1764	0.3384	0.3406		SAMPLE				
9	0.1470	0.1038	1	0.4262	0.6194	37.13%	0.5667	0.2028	0.4344	0.4595		SAMPLE				
10	0.2446	0.1727	1	0.5552	0.2449	68.79%	0.2333	0.1599	0.3289	0.3321		SAMPLE				
11	0.2174	0.1535	1	0.5355	0.3047	58.95%	0.2667	0.1563	0.3501	0.3548		SAMPLE				
12	0.1611	0.1138	1	0.4671	0.5191	41.56%	0.4333	0.1795	0.4215	0.4295		SAMPLE				
13	0.2919	0.2061	1	0.6291	0.4340	50.19%	0.4000	0.2000	0.4253	0.4315		SAMPLE				
14	0.1395	0.0985	1	0.4044	0.7951	30.61%	0.7667	0.2333	0.4743	0.4907		SAMPLE				
15	0.3454	0.2438	1	0.7841	0.8400	38.70%	0.5667	0.2186	0.6351	0.6485		SAMPLE				
16	0.2456	0.1734	1	0.5576	0.8784	31.80%	0.8333	0.2560	0.5290	0.5620		SAMPLE				
17	0.2821	0.1992	1	0.6080	0.0699	200.12%	0.0667	0.1333	0.2740	0.2743		SAMPLE				
18	0.4228	0.2985	1	0.8192	0.5926	47.63%	0.5333	0.2494	0.5432	0.5598		MB				
19	0.3571	0.2521	1	0.7418	0.1187	153.05%	0.1000	0.1528	0.3555	0.3566	632334001.1	DUP	*	0.0%		
20	1.0310	0.7279	1	2.3408	106.0507	6.95%	23.9667	1.2680	10.9970	21.0422	632334001.1	MS			115.6175	91.7%
21	0.1391	0.0982	1	0.4033	55.8798	9.85%	54.0333	1.8988	3.8489	13.4688		LCS			52.4624	106.5%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 05-SEP-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	08:00	1	1.15E+05	114505	-1.43		
LUCAS2	EFF	07:59	1	1.32E+05	131993	-1.32		
LUCAS3	EFF	07:58	1	91577	91577	-2.34		
LUCAS4	EFF	07:57	1	1.28E+05	128144	0.37		
LUCAS5	EFF	07:56	1	1.32E+05	132464	-0.14		
LUCAS6	EFF	07:54	1	1.29E+05	129373	-0.67		
LUCAS7	EFF	07:53	1	1.32E+05	132421	2.21		
LUCAS8	EFF	07:52	1	1.19E+05	119059	-1.01		

Reviewed by: 
Lyndsey Pace

Date: 05-SEP-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2473320

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
632334001	SAMPLE	LXP1	LUCAS6	SEP-05-23 09:12:00	DONE	Lucas Cell	01-JUL-23 00:00
632334002	SAMPLE	LXP1	LUCAS7	SEP-05-23 09:12:00	DONE	Lucas Cell	01-NOV-22 00:00
632334003	SAMPLE	LXP1	LUCAS8	SEP-05-23 09:12:00	DONE	Lucas Cell	08-APR-23 00:00
632334004	SAMPLE	LXP1	LUCAS1	SEP-05-23 09:49:00	DONE	Lucas Cell	01-MAY-23 00:00
632334005	SAMPLE	LXP1	LUCAS2	SEP-05-23 09:49:00	DONE	Lucas Cell	01-AUG-23 00:00
632334006	SAMPLE	LXP1	LUCAS3	SEP-05-23 09:49:00	DONE	Lucas Cell	25-OCT-22 00:00
632334007	SAMPLE	LXP1	LUCAS4	SEP-05-23 09:49:00	DONE	Lucas Cell	01-FEB-23 00:00
632334008	SAMPLE	LXP1	LUCAS5	SEP-05-23 09:49:00	DONE	Lucas Cell	01-JUN-23 00:00
632337001	SAMPLE	LXP1	LUCAS6	SEP-05-23 09:49:00	DONE	Lucas Cell	01-JUL-23 00:00
632337002	SAMPLE	LXP1	LUCAS7	SEP-05-23 09:49:00	DONE	Lucas Cell	01-NOV-22 00:00
632337003	SAMPLE	LXP1	LUCAS8	SEP-05-23 09:49:00	DONE	Lucas Cell	08-APR-23 00:00
632337004	SAMPLE	LXP1	LUCAS1	SEP-05-23 10:24:00	DONE	Lucas Cell	01-MAY-23 00:00
632337005	SAMPLE	LXP1	LUCAS2	SEP-05-23 10:24:00	DONE	Lucas Cell	01-AUG-23 00:00
632337006	SAMPLE	LXP1	LUCAS3	SEP-05-23 10:24:00	DONE	Lucas Cell	25-OCT-22 00:00
632337007	SAMPLE	LXP1	LUCAS4	SEP-05-23 10:24:00	DONE	Lucas Cell	01-FEB-23 00:00
632337008	SAMPLE	LXP1	LUCAS5	SEP-05-23 10:24:00	DONE	Lucas Cell	01-JUN-23 00:00
632337009	SAMPLE	LXP1	LUCAS6	SEP-05-23 10:24:00	DONE	Lucas Cell	01-JUL-23 00:00
1205482934	MB	LXP1	LUCAS7	SEP-05-23 10:24:00	DONE	Lucas Cell	01-NOV-22 00:00
1205482935	DUP	LXP1	LUCAS8	SEP-05-23 10:24:00	DONE	Lucas Cell	08-APR-23 00:00
1205482936	MS	LXP1	LUCAS1	SEP-05-23 10:41:00	DONE	Lucas Cell	01-MAY-23 00:00
1205482937	LCS	LXP1	LUCAS2	SEP-05-23 10:41:00	DONE	Lucas Cell	01-AUG-23 00:00



Report ID: S51803.01(02)
Generated on 09/06/2023
Replaces report S51803.01(01) generated on 08/11/2023

Report to
Attention: Jennifer Caporale
Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

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Barbara Ball (bball@meritlabs.com)

Report Summary
Lab Sample ID(s): S51803.01-S51803.06
Project: Erickson AM MI Wells 11-12
Collected Date(s): 08/03/2023
Submitted Date/Time: 08/04/2023 09:27
Sampled by: Marc Wahrer
P.O. #:

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Maya Murshak
Technical Director



General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

Report Narrative

All analyses completed



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP & ISO/IEC 17025:2017	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



Sample Summary (6 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S51803.01	MW-11 L307307-01	Groundwater	08/03/23 11:07
S51803.02	MW-12 L307307-02	Groundwater	08/03/23 15:16
S51803.03	MW-11B L307307-03	Groundwater	08/03/23 12:28
S51803.04	MW-12B L307307-04	Groundwater	08/03/23 14:21
S51803.05	MWT-12B L307307-05	Groundwater	08/03/23 14:21
S51803.06	Field Blank L307307-06	Water	08/03/23 09:00



Lab Sample ID: S51803.01

Sample Tag: MW-11 L307307-01

Collected Date/Time: 08/03/2023 11:07

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.9	IR
2	1L Plastic	None	Yes	1.9	IR
1	125ml Plastic	HNO3	Yes	1.9	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/08/23 12:13	CTV	
Metal Digestion	Completed	SW3015A	08/10/23 10:00	CCM	

Inorganics

Method: E300.0, Run Date: 08/04/23 10:47, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	62	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/09/23 11:06, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	630	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/09/23 13:08, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	538	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 08/04/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	682	50	12	mg/L	2		

Method: SM2540D, Run Date: 08/04/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	19.8	5	2	mg/L	2		

Metals

Method: E200.8, Run Date: 08/10/23 12:37, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.017	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.170	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.20	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	24.3	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51803.01 (continued)

Sample Tag: MW-11 L307307-01

Method: E200.8, Run Date: 08/10/23 12:37, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.007	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/10/23 14:17, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	140	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	41.2	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	3.01	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	37.4	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/08/23 15:15, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/01/23 10:03, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Lab Sample ID: S51803.02

Sample Tag: MW-12 L307307-02

Collected Date/Time: 08/03/2023 15:16

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.9	IR
2	1L Plastic	None	Yes	1.9	IR
1	125ml Plastic	HNO3	Yes	1.9	IR
1	250ml Plastic	None	Yes	1.9	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/08/23 12:13	CTV	
Mercury Digestion	Completed	E245.1	08/09/23 12:42	CTV	f
Metal Digestion	Completed	SW3015A	08/10/23 10:00	CCM	
Metal Digestion	Completed	SW3015A	08/10/23 10:00	CCM	f

Inorganics

Method: E300.0, Run Date: 08/04/23 12:04, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sulfate	184	10	0.59	mg/L	10	14808-79-8	

Method: E300.0, Run Date: 08/04/23 10:59, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	70	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: SM2320B, Run Date: 08/09/23 11:10, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	700	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/09/23 13:12, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	628	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 08/04/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	928	50	12	mg/L	2		

Method: SM2540D, Run Date: 08/04/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	8.4	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 08/10/23 11:58, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.002	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.052	0.005	0.000162	mg/L	5	7440-39-3	

f-Filtered and preserved in lab



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51803.02 (continued)

Sample Tag: MW-12 L307307-02

Method: E200.8, Run Date: 08/10/23 11:58, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.06	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.74	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.020	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.007	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	0.015	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.005	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/10/23 12:02, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony, Dissolved*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	f
Arsenic, Dissolved	Not detected	0.002	0.000255	mg/L	5	7440-38-2	f
Barium, Dissolved	0.049	0.005	0.000162	mg/L	5	7440-39-3	f
Beryllium, Dissolved	Not detected	0.001	0.000215	mg/L	5	7440-41-7	f
Boron, Dissolved	0.06	0.04	0.00175	mg/L	5	7440-42-8	f
Cadmium, Dissolved	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	f
Chromium, Dissolved	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	f
Cobalt, Dissolved	Not detected	0.005	0.000108	mg/L	5	7440-48-4	f
Copper, Dissolved	Not detected	0.005	0.000377	mg/L	5	7440-50-8	f
Iron, Dissolved	Not detected	0.02	0.00192	mg/L	5	7439-89-6	f
Lead, Dissolved	Not detected	0.003	0.000190	mg/L	5	7439-92-1	f
Lithium, Dissolved*	0.020	0.005	0.00163	mg/L	5	7439-93-2	f
Molybdenum, Dissolved	0.007	0.005	0.000217	mg/L	5	7439-98-7	f
Nickel, Dissolved	0.015	0.005	0.000250	mg/L	5	7440-02-0	f
Selenium, Dissolved	Not detected	0.005	0.00209	mg/L	5	7782-49-2	f
Silver, Dissolved	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	f
Thallium, Dissolved	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	f
Vanadium, Dissolved	Not detected	0.005	0.000139	mg/L	5	7440-62-2	f
Zinc, Dissolved	Not detected	0.005	0.000730	mg/L	5	7440-66-6	f

Method: E200.8, Run Date: 08/10/23 14:06, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	156	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	64.2	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	2.74	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	109	0.50	0.00850	mg/L	5	7440-23-5	

f-Filtered and preserved in lab



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51803.02 (continued)

Sample Tag: MW-12 L307307-02

Method: E200.8, Run Date: 08/10/23 14:08, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium, Dissolved*	151	0.50	0.0435	mg/L	5	7440-70-2	f
Magnesium, Dissolved	60.0	0.50	0.0120	mg/L	5	7439-95-4	f
Potassium, Dissolved	2.65	0.50	0.0230	mg/L	5	7440-09-7	f
Sodium, Dissolved	101	0.50	0.00850	mg/L	5	7440-23-5	f

Method: E245.1, Run Date: 08/09/23 13:58, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury, Dissolved	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	f

Method: E245.1, Run Date: 08/08/23 15:18, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/01/23 10:03, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

f-Filtered and preserved in lab

O-Analysis performed by outside laboratory. See attached report.

**Lab Sample ID: S51803.03**

Sample Tag: MW-11B L307307-03

Collected Date/Time: 08/03/2023 12:28

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.9	IR
2	1L Plastic	None	Yes	1.9	IR
1	125ml Plastic	HNO3	Yes	1.9	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/08/23 12:13	CTV	
Metal Digestion	Completed	SW3015A	08/10/23 10:00	CCM	

Inorganics**Method: E300.0, Run Date: 08/04/23 11:12, Analyst: JDP**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/09/23 11:16, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	370	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/09/23 13:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	258	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 08/04/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	298	50	12	mg/L	2		

Method: SM2540D, Run Date: 08/04/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	2.4	3	1	mg/L	1		b

Metals**Method: E200.8, Run Date: 08/10/23 12:05, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.006	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.064	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.85	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51803.03 (continued)

Sample Tag: MW-11B L307307-03

Method: E200.8, Run Date: 08/10/23 12:05, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	1.10	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.032	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/10/23 14:09, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	65.6	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	23.9	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	6.37	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	16.5	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/08/23 15:22, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/01/23 10:03, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Lab Sample ID: S51803.04

Sample Tag: MW-12B L307307-04

Collected Date/Time: 08/03/2023 14:21

Matrix: Groundwater

COC Reference:

Sample Containers

Table with 6 columns: #, Type, Preservative(s), Refrigerated?, Arrival Temp. (C), Thermometer #. Rows include 1L Plastic and 125ml Plastic containers.

Extraction / Prep.

Table with 6 columns: Parameter, Result, Method, Run Date, Analyst, Flags. Rows include Mercury Digestion and Metal Digestion.

Inorganics

Method: E300.0, Run Date: 08/04/23 11:25, Analyst: JDP

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Chloride, Fluoride (Undistilled), and Sulfate.

Method: SM2320B, Run Date: 08/09/23 11:18, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Bicarbonate* and Carbonate*.

Method: SM2340C, Run Date: 08/09/23 13:20, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Hardness.

Method: SM2540C, Run Date: 08/04/23 17:30, Analyst: MDG

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Dissolved Solids.

Method: SM2540D, Run Date: 08/04/23 17:30, Analyst: MDG

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Suspended Solids.

Metals

Method: E200.8, Run Date: 08/10/23 12:10, Analyst: CCM

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Antimony*, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, and Copper.

b-Value detected less than reporting limit, but greater than MDL



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51803.04 (continued)

Sample Tag: MW-12B L307307-04

Method: E200.8, Run Date: 08/10/23 12:10, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	0.26	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.040	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/10/23 14:11, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	25.8	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	8.48	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	8.19	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	117	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/08/23 15:25, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/01/23 10:03, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51803.05

Sample Tag: MWT-12B L307307-05

Collected Date/Time: 08/03/2023 14:21

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.9	IR
2	1L Plastic	None	Yes	1.9	IR
1	125ml Plastic	HNO3	Yes	1.9	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/08/23 12:13	CTV	
Metal Digestion	Completed	SW3015A	08/10/23 10:00	CCM	

Inorganics

Method: E300.0, Run Date: 08/04/23 11:38, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/09/23 11:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	390	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/09/23 13:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	110	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 08/04/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	362	50	12	mg/L	2		

Method: SM2540D, Run Date: 08/04/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	1.2	3	1	mg/L	1		b

Metals

Method: E200.8, Run Date: 08/10/23 12:13, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.025	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	3.38	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL



Lab Sample ID: S51803.05 (continued)

Sample Tag: MWT-12B L307307-05

Method: E200.8, Run Date: 08/10/23 12:13, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	0.25	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.041	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/10/23 14:12, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	25.9	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	8.52	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	8.15	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	114	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/08/23 15:28, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/01/23 10:03, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Lab Sample ID: S51803.06

Sample Tag: Field Blank L307307-06

Collected Date/Time: 08/03/2023 09:00

Matrix: Water

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.9	IR
2	1L Plastic	None	Yes	1.9	IR
1	125ml Plastic	HNO3	Yes	1.9	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/08/23 12:13	CTV	
Metal Digestion	Completed	SW3015A	08/10/23 10:00	CCM	

Inorganics

Method: E300.0, Run Date: 08/04/23 11:51, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 08/09/23 11:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/09/23 13:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 08/04/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	12	mg/L	2		

Method: SM2540D, Run Date: 08/04/23 17:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 08/10/23 11:54, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



Lab Sample ID: S51803.06 (continued)

Sample Tag: Field Blank L307307-06

Method: E200.8, Run Date: 08/10/23 11:54, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 08/10/23 14:03, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 08/08/23 15:32, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/01/23 10:03, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

Merit Laboratories Login Checklist

Lab Set ID:S51803

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 11-12

Submitted:08/04/2023 09:27 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Selection	Description	Note
Sample Receiving		
01.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples are received at 4C +/- 2C Thermometer # IR 1.9
02.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Received on ice/ cooling process begun
03.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples shipped
04.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples left in 24 hr. drop box
05.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Are there custody seals/tape or is the drop box locked
Chain of Custody		
06.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC adequately filled out
07.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC signed and relinquished to the lab
08.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sample tag on bottles match COC
09.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Subcontracting needed? Subcontracted to: GEL
Preservation		
10.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Do sample have correct chemical preservation
11.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Completed pH checks on preserved samples? (no VOAs)
12.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Did any samples need to be preserved in the lab? .02 Diss Metals
Bottle Conditions		
13.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	All bottles intact
14.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Appropriate analytical bottles are used
15.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Merit bottles used
16.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sufficient sample volume received
17.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples require laboratory filtration .02 Diss Metals
18.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples submitted within holding time
19.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S51803 Submitted: 08/04/2023 09:27

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 11-12

Initial Preservation Check: 08/04/2023 09:55 MMC

Preservation Recheck (E200.8): N/A

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S51803.01	125ml Plastic HNO3	<2			
S51803.01	1L Plastic HNO3	<2			
S51803.01	1L Plastic HNO3	<2			
S51803.02	125ml Plastic HNO3	<2			
S51803.02	1L Plastic HNO3	<2			
S51803.02	1L Plastic HNO3	<2			
S51803.03	125ml Plastic HNO3	<2			
S51803.03	1L Plastic HNO3	<2			
S51803.03	1L Plastic HNO3	<2			
S51803.04	125ml Plastic HNO3	<2			
S51803.04	1L Plastic HNO3	<2			
S51803.04	1L Plastic HNO3	<2			
S51803.05	125ml Plastic HNO3	<2			
S51803.05	1L Plastic HNO3	<2			
S51803.05	1L Plastic HNO3	<2			
S51803.06	125ml Plastic HNO3	<2			
S51803.06	1L Plastic HNO3	<2			
S51803.06	1L Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823
 Phone (517) 332-0167 Fax (517) 332-4034
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

REPORT TO

CHAIN OF CUSTODY RECORD

INVOICE TO

CONTACT NAME **Jennifer Caporale**
 COMPANY **Lansing Board of Water and Light**
 ADDRESS **PO Box 13007 48901-3007**
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**
 PHONE NO. **517-702-6372** FAX NO. P.O. NO.
 E-MAIL ADDRESS **Environmental_Laboratory@lbwl.com** QUOTE NO.

CONTACT NAME **Beth Zimpfer** SAME
 COMPANY
 ADDRESS
 CITY STATE ZIP CODE
 PHONE NO. E-MAIL ADDRESS **Beth.Zimpfer@lbwl.com**

PROJECT NO./NAME **Erickson AM MI Wells 11-12** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**
 TURNAROUND TIME REQUIRED 1 DAY 2 DAYS 3 DAYS STANDARD OTHER **ASAP**
 DELIVERABLES REQUIRED STD LEVEL II LEVEL III LEVEL IV EDD OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WPE A=AIR W=WASTE
 # Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO ₃	H ₂ SO ₄	NaOH	MeOH	OTHER	Total Metals	F- undistilled, Cl ⁻ , SO ₄ , TDS	Radium 226	Radium 228	TSS	Dissolved Metals	HCO ₃ , CO ₃ , Hardness	Certifications		Project Locations		Special Instructions
	DATE	TIME																		<input type="checkbox"/> OHIO VAP	<input type="checkbox"/> Drinking Water	<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES	
51803.01	08/03/23	1107	MW-11 L307307-01	GW	6	2	3						✓	✓	✓	✓	✓	✓	✓		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Metals to analyse: Na, Mg, K
.02		1516	MW-12 L307307-02	GW	6	3	3						✓	✓	✓	✓	✓	✓	✓		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03		1228	MW-11B L307307-03	GW	5	2	3						✓	✓	✓	✓	✓	✓	✓		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Co, Li, Hg, Mo, Pb, Se, Tl,
.04		1421	MW-12B L307307-04	GW	5	2	3						✓	✓	✓	✓	✓	✓	✓		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Fe, Cu, Ni, Ag, V, Zn
.05		1421	MWT-12B L307307-05	GW	5	2	3						✓	✓	✓	✓	✓	✓	✓		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Please send a preliminary report
.06		0900	Field Blank L307307-06	DI	5	2	3						✓	✓	✓	✓	✓	✓	✓		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The analytes for dissolved metals are same metals that are analysed for total.

MW-11 does not need dissolved metals. JSC 08/03/23

RELINQUISHED BY: *[Signature]* Sampler DATE **8-4-23** TIME **0927**
 RECEIVED BY: *[Signature]* DATE **8/4/23** TIME **0927**
 SIGNATURE/ORGANIZATION

RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
 RECEIVED BY: SIGNATURE/ORGANIZATION DATE TIME
 SEAL NO. SEAL INTACT YES NO INITIALS
 SEAL NO. SEAL INTACT YES NO INITIALS
 NOTES: TEMP. ON ARRIVAL **1.9**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

September 01, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 632661
SDG: S51803

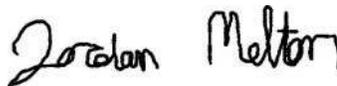
Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on August 09, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,



Jordan Melton for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S51803
Work Order: 632661**

September 01, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on August 09, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

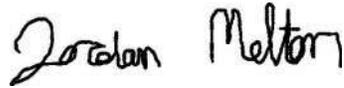
Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
632661001	S51803.01
632661002	S51803.02
632661003	S51803.03
632661004	S51803.04
632661005	S51803.05
632661006	S51803.06 Field Blank

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Jordan Melton". The signature is written in a cursive style with a large, prominent "J" and "M".

Jordan Melton for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

SAMPLE RECEIPT & REVIEW FORM

Client: <u>MERI</u>		SDG/AR/COC/Work Order: <u>632661</u>	
Received By: <u>MVH</u>		Date Received: <u>8-09-2023</u>	
Carrier and Tracking Number		Circle Applicable: FedEx Express FedEx Ground <u>UPS</u> Field Services Courier Other <u>124664770363488692</u>	
Suspected Hazard Information		Yes	No
A) Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
B) Did the client designate the samples are to be received as radioactive?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
C) Did the RSO classify the samples as radioactive?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
D) Did the client designate samples are hazardous?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
E) Did the RSO identify possible hazards?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Sample Receipt Criteria		Yes	NA
1 Shipping containers received intact and sealed?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
2 Chain of custody documents included with shipment?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		<input checked="" type="checkbox"/>	<input type="checkbox"/>
4 Daily check performed and passed on IR temperature gun?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
5 Sample containers intact and sealed?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
6 Samples requiring chemical preservation at proper pH?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
7 Do any samples require Volatile Analysis?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
8 Samples received within holding time?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
9 Sample ID's on COC match ID's on bottles?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
10 Date & time on COC match date & time on bottles?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
11 Number of containers received match number indicated on COC?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
12 Are sample containers identifiable as GEL provided by use of GEL labels?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
13 COC form is properly signed in relinquished/received sections?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Comments (Use Continuation Form if needed):			

PM (or PMA) review: Initials JM Date 8-11-23 Page 1 of 1

Laboratory Certifications

List of current GEL Certifications as of 01 September 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S51803
Work Order #: 632661**

Product: Radium-226+Radium-228 Calculation

Analytical Method: Calculation

Analytical Procedure: GL-RAD-D-003 REV# 45

Analytical Batch: 2476915

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
632661001	S51803.01
632661002	S51803.02
632661003	S51803.03
632661004	S51803.04
632661005	S51803.05
632661006	S51803.06 Field Blank

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2475719

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
632661001	S51803.01
632661002	S51803.02
632661003	S51803.03
632661004	S51803.04
632661005	S51803.05
632661006	S51803.06 Field Blank
1205486932	Method Blank (MB)
1205486933	632661001(S51803.01) Sample Duplicate (DUP)
1205486934	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts

Sample 1205486932 (MB) was recounted due to a suspected blank false positive. The recount is reported.

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2475704

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
632661001	S51803.01
632661002	S51803.02
632661003	S51803.03
632661004	S51803.04
632661005	S51803.05
632661006	S51803.06 Field Blank
1205486899	Method Blank (MB)
1205486900	632661001(S51803.01) Sample Duplicate (DUP)
1205486901	632661001(S51803.01) Matrix Spike (MS)
1205486902	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

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Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S51803 GEL Work Order: 632661

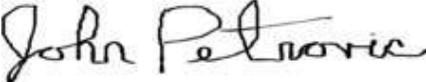
The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: John Petrovic

Date: 05 SEP 2023

Title: Data Validator

Sample Data Summary

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: September 5, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S51803.01	Project: MERI00120
Sample ID: 632661001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 03-AUG-23 11:07	
Receive Date: 09-AUG-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		1.58	+/-0.923	1.39	3.00	pCi/L		JE1	08/21/23	0816	2475719	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		3.16	+/-1.07			pCi/L		NXL1	09/01/23	1003	2476915	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		1.58	+/-0.545	0.421	1.00	pCi/L		LXP1	08/24/23	1013	2475704	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			90.3	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: September 5, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S51803.02	Project: MERI00120
Sample ID: 632661002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 03-AUG-23 15:16	
Receive Date: 09-AUG-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.731	+/-1.32	2.29	3.00	pCi/L		JE1	08/21/23	0816	2475719	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.39	+/-1.38			pCi/L		NXL1	09/01/23	1003	2476915	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.663	+/-0.415	0.524	1.00	pCi/L		LXP1	08/24/23	1013	2475704	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			81.9	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: September 5, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S51803.03 Project: MERI00120
Sample ID: 632661003 Client ID: MERI001
Matrix: Ground Water
Collect Date: 03-AUG-23 12:28
Receive Date: 09-AUG-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		3.26	+/-1.07	1.15	3.00	pCi/L		JE1	08/21/23	0816	2475719	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		4.70	+/-1.21			pCi/L		NXL1	09/01/23	1003	2476915	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		1.43	+/-0.568	0.491	1.00	pCi/L		LXP1	08/24/23	1013	2475704	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			75.3	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: September 5, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S51803.04 Project: MERI00120
Sample ID: 632661004 Client ID: MERI001
Matrix: Ground Water
Collect Date: 03-AUG-23 14:21
Receive Date: 09-AUG-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.848	+/-0.709	1.11	3.00	pCi/L		JE1	08/21/23	0816	2475719	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.98	+/-0.831			pCi/L		NXL1	09/01/23	1003	2476915	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		1.13	+/-0.434	0.309	1.00	pCi/L		LXP1	08/24/23	1013	2475704	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			79.9	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: September 5, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S51803.05	Project: MERI00120
Sample ID: 632661005	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 03-AUG-23 14:21	
Receive Date: 09-AUG-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		2.68	+/-1.31	1.94	3.00	pCi/L		JE1	08/21/23	0816	2475719	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		3.56	+/-1.37			pCi/L		NXL1	09/01/23	1003	2476915	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.880	+/-0.384	0.306	1.00	pCi/L		LXP1	08/24/23	1013	2475704	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			79.7	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

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Certificate of Analysis

Report Date: September 5, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S51803.06 Field Blank	Project: MERI00120
Sample ID: 632661006	Client ID: MERI001
Matrix: Water	
Collect Date: 03-AUG-23 09:00	
Receive Date: 09-AUG-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		1.76	+/-1.09	1.63	3.00	pCi/L		JE1	08/21/23	0816	2475719	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		2.03	+/-1.14			pCi/L		NXL1	09/01/23	1003	2476915	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.276	+/-0.312	0.508	1.00	pCi/L		LXP1	08/24/23	1013	2475704	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			68.1	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: September 5, 2023

Page 1 of 2

Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan

Contact: John Laverty

Workorder: 632661

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch 2475719											
QC1205486933	632661001	DUP									
Radium-228		1.58	U	0.933	pCi/L	51.3		(0% - 100%)	JE1	08/21/23	08:16
		Uncertainty		+/-1.28							
		+/-0.923									
QC1205486934	LCS										
Radium-228		75.8		81.6	pCi/L		108	(75%-125%)		08/21/23	08:16
		Uncertainty		+/-4.39							
QC1205486932	MB										
Radium-228			U	0.254	pCi/L					08/21/23	11:57
		Uncertainty		+/-1.04							
Rad Ra-226											
Batch 2475704											
QC1205486900	632661001	DUP									
Radium-226		1.58		0.995	pCi/L	45.6		(0% - 100%)	LXP1	08/24/23	10:54
		Uncertainty		+/-0.532							
		+/-0.545									
QC1205486902	LCS										
Radium-226		26.5		27.4	pCi/L		103	(75%-125%)		08/24/23	10:53
		Uncertainty		+/-2.06							
QC1205486899	MB										
Radium-226			U	0.342	pCi/L					08/24/23	10:54
		Uncertainty		+/-0.317							
QC1205486901	632661001	MS									
Radium-226		126		140	pCi/L		110	(75%-125%)		08/24/23	10:53
		Uncertainty		+/-11.3							
		+/-0.545									

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- H Analytical holding time was exceeded
- < Result is less than value reported
- > Result is greater than value reported

GEL LABORATORIES LLC

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QC Summary

Workorder: 632661

Page 2 of 2

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
NI											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2475719 Check-list

This check-list was completed on 21-AUG-23 by Nat Long

This batch was reviewed by Nat Long on 21-AUG-23 and Kenshalla Oston on 22-AUG-23.

Batch ID:
2475719

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2475719
Analyst: Jacqueline Winston (JE1)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: BAL-C236761727

Due Dates for Lab: 23-AUG-2023			Package: 05-SEP-2023	SDG: 25-AUG-2023		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205486934	228	2051-B	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	632661001	16-AUG-2023	3	318.16	318.16	08/17/23 15:05	08/21/23 06:39
2	632661002	16-AUG-2023	3	309.7	309.7	08/17/23 15:05	08/21/23 06:39
3	632661003	16-AUG-2023	3	302.22	302.22	08/17/23 15:05	08/21/23 06:39
4	632661004	16-AUG-2023	3	309.63	309.63	08/17/23 15:05	08/21/23 06:39
5	632661005	16-AUG-2023	3	310.05	310.05	08/17/23 15:05	08/21/23 06:39
6	632661006	16-AUG-2023	3	308.75	308.75	08/17/23 15:05	08/21/23 06:39
7	633010005	16-AUG-2023	2	302.06	302.06	08/17/23 15:05	08/21/23 06:39
8	1205486932 MB	16-AUG-2023	2		318.16	08/17/23 15:05	08/21/23 06:39
9	1205486933 DUP (632661001)	16-AUG-2023	3	303.28	303.28	08/17/23 15:05	08/21/23 06:39
10	1205486934 LCS	16-AUG-2023	2		318.16	08/17/23 15:05	08/21/23 06:39

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 2097-B	Ba-133 Tracer	.1 mL	Pipet Id: RAD-GFC-1795419
REGNT 3953532	RGF-1.5M Ammonium Sulfate	10 mL	Data Entry Date2: 16-AUG-2023 12:05 BAL-C236761727 Jacqueline Winston
REGNT 3940529	Barium Carrier Ra228 REG	1 mL	Data Entry Date3: 16-AUG-2023 00:00
REGNT 3954868	RGF-1M Citric Acid	5 mL	
REGNT 3947239	2M HCl	20 mL	
REGNT 3953880	RGF-50% Potassium Carbonate	2 mL	
REGNT 3950136	RGF-7M Nitric Acid	25 mL	
REGNT 3953517	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT DGA071323	2472106	2 g	
REGNT 3946961.4	RGF-Hydrofluoric Acid	4 mL	
REGNT 3940152	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3939217	RGF-Neodymium Substrate	5 mL	
REGNT 3946607.6	Nitric Acid	5 mL	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 2097-B
 Tracer Exp Date : 7/12/2024
 Tracer Volume Added: 0.10

Batch : 2475719
 Analyst : JAC02417
 Prep Date : 8/16/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 2 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	632661001.1	0.3182	1.8749E-05	8/3/2023 11:07	1088.9	1.75%	983.1	1.84%	0.1	0.000200
2	632661002.1	0.3097	1.8619E-05	8/3/2023 15:16	1088.9	1.75%	891.5	1.93%	0.1	0.000200
3	632661003.1	0.3022	1.8497E-05	8/3/2023 12:28	1088.9	1.75%	820.0	2.02%	0.1	0.000200
4	632661004.1	0.3096	1.8618E-05	8/3/2023 14:21	1088.9	1.75%	869.7	1.96%	0.1	0.000200
5	632661005.1	0.3101	1.8624E-05	8/3/2023 14:21	1088.9	1.75%	867.5	1.96%	0.1	0.000200
6	632661006.1	0.3088	1.8603E-05	8/3/2023 9:00	1088.9	1.75%	741.5	2.12%	0.1	0.000200
7	633010005.1	0.3021	1.8494E-05	8/7/2023 8:25	1088.9	1.75%	906.2	1.92%	0.1	0.000200
8	1205486932.1	0.3182	1.8749E-05	8/16/2023 0:00	1088.9	1.75%	852.6	1.98%	0.1	0.000200
9	1205486933.1	0.3033	1.8514E-05	8/3/2023 11:07	1088.9	1.75%	840.2	1.99%	0.1	0.000200
10	1205486934.1	0.3182	1.8749E-05	8/16/2023 0:00	1088.9	1.75%	881.3	1.94%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
			Alpha	Beta										
1	5D	60	16	80	1.333	8/21/2023 8:16	8/17/2023 15:05	8/21/2023 6:39	0.994	0.833	1.000	1.057	90.3%	2.56%
2	6C	60	15	109	1.817	8/21/2023 8:16	8/17/2023 15:05	8/21/2023 6:39	0.994	0.833	1.000	1.057	81.9%	2.62%
3	7B	60	27	67	1.117	8/21/2023 8:16	8/17/2023 15:05	8/21/2023 6:39	0.994	0.833	1.000	1.057	75.3%	2.69%
4	7C	60	10	33	0.550	8/21/2023 8:16	8/17/2023 15:05	8/21/2023 6:39	0.994	0.833	1.000	1.057	79.9%	2.64%
5	8A	60	22	114	1.900	8/21/2023 8:16	8/17/2023 15:05	8/21/2023 6:39	0.994	0.833	1.000	1.057	79.7%	2.64%
6	8B	60	13	55	0.917	8/21/2023 8:16	8/17/2023 15:05	8/21/2023 6:39	0.994	0.832	1.000	1.057	68.1%	2.76%
7	8C	60	22	51	0.850	8/21/2023 8:16	8/17/2023 15:05	8/21/2023 6:39	0.995	0.832	1.000	1.057	83.2%	2.61%
8	14C	60	3	30	0.500	8/21/2023 11:57	8/17/2023 15:05	8/21/2023 6:39	0.998	0.550	1.000	1.057	78.3%	2.66%
9	10B	60	10	91	1.517	8/21/2023 8:16	8/17/2023 15:05	8/21/2023 6:39	0.994	0.833	1.000	1.057	77.2%	2.67%
10	10C	60	17	1473	24.550	8/21/2023 8:16	8/17/2023 15:05	8/21/2023 6:39	0.998	0.833	1.000	1.057	80.9%	2.63%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2023	5/31/2024	0.6566	0.00925	0.816	8/18/2023 18:35	500
2	PIC	6/1/2023	5/31/2024	0.6167	0.01970	1.618	8/18/2023 18:35	500
3	PIC	6/1/2023	5/31/2024	0.6423	0.00627	0.288	8/18/2023 18:31	500
4	PIC	6/1/2023	5/31/2024	0.6369	0.00790	0.318	8/18/2023 18:31	500
5	PIC	6/1/2023	5/31/2024	0.6413	0.01579	1.162	8/18/2023 18:31	500
6	PIC	6/1/2023	5/31/2024	0.6270	0.02148	0.514	8/18/2023 18:31	500
7	PIC	6/1/2023	5/31/2024	0.5662	0.01955	0.478	8/18/2023 18:31	500
8	PIC	6/1/2023	5/31/2024	0.6309	0.01828	0.454	8/18/2023 18:29	500
9	PIC	6/1/2023	5/31/2024	0.6282	0.00652	1.278	8/18/2023 18:32	500
10	PIC	6/1/2023	5/31/2024	0.6368	0.00638	1.174	8/18/2023 18:32	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 2051-B
LCS Exp Date : 3/27/2024
LCS Activity (dpm/ml): 535.40
LCS Volume Added: 0.10

Results Pos.	Decision	Critical	Required	Sample Act.		Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
	Level pCi/L	Level pCi/L	MDA pCi/L	MDA pCi/L	Conc. pCi/L	Error %	Rate CPM	Rate Error CPM	Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L						
1	0.8771	0.6193	3	1.3910	1.5780	29.98%	0.5173	0.1544	0.9233	1.0067		SAMPLE				
2	1.4897	1.0517	3	2.2874	0.7309	92.21%	0.1987	0.1831	1.3200	1.3333		SAMPLE				
3	0.6725	0.4748	3	1.1464	3.2619	16.94%	0.8287	0.1385	1.0687	1.3529		SAMPLE				
4	0.6558	0.4630	3	1.1087	0.8476	42.77%	0.2320	0.0990	0.7089	0.7410		SAMPLE				
5	1.2466	0.8801	3	1.9419	2.6810	25.17%	0.7380	0.1844	1.3127	1.4810		SAMPLE				
6	0.9965	0.7035	3	1.6254	1.7581	31.90%	0.4027	0.1277	1.0928	1.1830		SAMPLE				
7	0.8891	0.6277	2	1.4574	1.5028	33.22%	0.3720	0.1230	0.9737	1.0473		SAMPLE				
8	1.1842	0.8361	2	1.9482	0.2540	209.01%	0.0460	0.0961	1.0402	1.0423		MB				
9	1.4075	0.9937	3	2.1830	0.9335	69.96%	0.2387	0.1668	1.2789	1.3008	632661001.1	DUP	51.3%			
10	1.2046	0.8505	2	1.8756	81.6404	3.85%	23.3760	0.6415	4.3912	21.2058		LCS			75.8022	107.7%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
632661001	5D	60	16	80	8/21/2023 8:16	8/21/2023 9:16	PIC	2475719
632661002	6C	60	15	109	8/21/2023 8:16	8/21/2023 9:16	PIC	2475719
632661003	7B	60	27	67	8/21/2023 8:16	8/21/2023 9:16	PIC	2475719
632661004	7C	60	10	33	8/21/2023 8:16	8/21/2023 9:16	PIC	2475719
632661005	8A	60	22	114	8/21/2023 8:16	8/21/2023 9:16	PIC	2475719
632661006	8B	60	13	55	8/21/2023 8:16	8/21/2023 9:16	PIC	2475719
633010005	8C	60	22	51	8/21/2023 8:16	8/21/2023 9:16	PIC	2475719
1205486932	14C	60	3	30	8/21/2023 11:57	8/21/2023 12:57	PIC	2475719
1205486933	10B	60	10	91	8/21/2023 8:16	8/21/2023 9:16	PIC	2475719
1205486934	10C	60	17	1473	8/21/2023 8:16	8/21/2023 9:16	PIC	2475719

ASSAY 21-Aug-23 7:44:08
 Wizard 2480 s/n 46190630
 Protocol id 9 Ba-133_1
 Time limit
 Count limit
 Isotope Ba-133_1
 Protocol date 8/21/2023
 Run id. 7181

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	94	1	180	3267.13	1088.93	1.75	07:44:08
	632661001	2	94	2	180	2949.57	983.07	1.84	90.28 07:47:22
	632661002	3	94	3	180	2675	891.48	1.93	81.87 07:50:37
	632661003	4	94	4	180	2460.28	819.98	2.02	75.30 07:53:50
	632661004	5	94	5	180	2609.57	869.67	1.96	79.86 07:57:04
	632661005	1	5	1	180	2603	867.48	1.96	79.66 08:00:40
	632661006	2	5	2	180	2225.13	741.52	2.12	68.10 08:03:54
	633010005	3	5	3	180	2719	906.18	1.92	83.22 08:07:08
	1205486932	4	5	4	180	2558.28	852.61	1.98	78.30 08:10:22
	1205486933	5	5	5	180	2521	840.19	1.99	77.16 08:13:36
	1205486934	1	98	1	180	2644.28	881.28	1.94	80.93 08:17:20

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 21-Aug-2023

Detectors LB4100 E1 through H4 and PIC 1A through 14D and G5400W 1W through 1Z and LB4200 GA1 through OD4

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100E3	Above	Beta bkg	21-Aug 09:05	60	2.200	0.736	2.329	+2.51
LB4100G3	Above	Beta bkg	21-Aug 04:48	60	2.800	0.785	2.444	+4.29
LB4100H1	need 2nd	Alpha bkg	21-Aug 04:45	60	0.217	-8.08E-2	0.225	+2.83
LB4100H1	Above	Beta bkg	21-Aug 04:45	60	3.267	-5.15E-1	3.743	+2.33
LB4200GA2	Above	Alpha bkg	21-Aug 08:29	60	0.350	-1.34E-1	0.379	+2.66
LB4200GB2	Above	Beta bkg	21-Aug 03:38	60	109	0.129	1.304	+550.58
LB4200GD4	Above	Alpha bkg	21-Aug 03:38	60	0.383	-1.07E-1	0.314	+3.99
LB4200OA4	need 2nd	Beta bkg	21-Aug 03:39	60	0.633	-2.11E-2	1.438	-0.31
LB4200OC4	Above	Beta bkg	20-Aug 23:19	500	2.690	0.298	1.134	+14.16

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

Reviewed by Jc Poparad

Date 8/21/23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2475719

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205486933	DUP	JE1	PIC10B	AUG-21-23 08:16:01	DONE	25mm Filter	01-JUN-23 00:00
1205486934	LCS	JE1	PIC10C	AUG-21-23 08:16:05	DONE	25mm Filter	01-JUN-23 00:00
632661001	SAMPLE	JE1	PIC5D	AUG-21-23 08:16:17	DONE	25mm Filter	01-JUN-23 00:00
632661002	SAMPLE	JE1	PIC6C	AUG-21-23 08:16:21	DONE	25mm Filter	01-JUN-23 00:00
632661003	SAMPLE	JE1	PIC7B	AUG-21-23 08:16:24	DONE	25mm Filter	01-JUN-23 00:00
632661004	SAMPLE	JE1	PIC7C	AUG-21-23 08:16:28	DONE	25mm Filter	01-JUN-23 00:00
632661005	SAMPLE	JE1	PIC8A	AUG-21-23 08:16:31	DONE	25mm Filter	01-JUN-23 00:00
632661006	SAMPLE	JE1	PIC8B	AUG-21-23 08:16:37	DONE	25mm Filter	01-JUN-23 00:00
633010005	SAMPLE	JE1	PIC8C	AUG-21-23 08:16:41	DONE	25mm Filter	01-JUN-23 00:00
1205486932	MB	JE1	PIC14C	AUG-21-23 11:57:16	DONE	25mm Filter	01-JUN-23 00:00

Lucas Cell Raw Data

Batch 2475704 Check-list

This check-list was completed on 24-AUG-23 by Gregory Ramsay

This batch was reviewed by Gregory Ramsay on 24-AUG-23 and Lois Buist on 24-AUG-23.

Batch ID:
2475704

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2475704
Analyst: Lyndsey Pace (LXP1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: LUCAS-C202389980

Due Dates for Lab: 24-AUG-2023			Package: 05-SEP-2023		SDG: 25-AUG-2023	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
MS	1205486901	Radium-226 SPIKE	1715-G	.1	mL	
LCS	1205486902	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	632661001	17-AUG-2023	1	504.16	504.16	08/21/23 08:50	208	08/24/23 06:15	08/24/23 10:13	2	38
2	632661002	17-AUG-2023	1	502.39	502.39	08/21/23 08:50	308	08/24/23 06:15	08/24/23 10:13	3	17
3	632661003	17-AUG-2023	1	506.19	506.19	08/21/23 08:50	406	08/24/23 06:15	08/24/23 10:13	2	30
4	632661004	17-AUG-2023	1	500.9	500.9	08/21/23 08:50	506	08/24/23 06:15	08/24/23 10:13	1	29
5	632661005	17-AUG-2023	1	500.66	500.66	08/21/23 08:50	608	08/24/23 06:15	08/24/23 10:13	1	23
6	632661006	17-AUG-2023	1	503.23	503.23	08/21/23 08:50	703	08/24/23 06:15	08/24/23 10:13	3	9
7	633010005	17-AUG-2023	2	500.9	500.9	08/21/23 08:50	806	08/24/23 06:15	08/24/23 10:13	6	30
8	1205486899 MB	17-AUG-2023	1		506.19	08/21/23 08:50	105	08/24/23 06:40	08/24/23 10:54	2	9
9	1205486900 DUP (632661001)	17-AUG-2023	1	502.44	502.44	08/21/23 08:50	201	08/24/23 06:40	08/24/23 10:54	7	29
10	1205486901 MS (632661001)	17-AUG-2023	1	106.21	106.21	08/21/23 08:50	403	08/24/23 06:40	08/24/23 10:53	2	594
11	1205486902 LCS	17-AUG-2023	1		506.19	08/21/23 08:50	503	08/24/23 06:40	08/24/23 10:53	7	696

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 17-AUG-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Procedure Code : LUC26RAL
 Parmname : Radium-226
 Required MDA : 1 pCi/L
 Halflife of Ra-226 : 1600 years
 Ra-226 Abundance : 1.00
 Halflife of Rn-222 : 3.8235 days

Batch : 2475704
 Analyst : LIN01615
 Prep Date : 8/17/2023
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	632661001.1	0.5042	2.0273E-05	8/3/2023 11:07	208	30	38	1.267	2	0.067	30	1.7130
2	632661002.1	0.5024	2.0266E-05	8/3/2023 15:16	308	30	17	0.567	3	0.100	30	1.5970
3	632661003.1	0.5062	2.0281E-05	8/3/2023 12:28	406	30	30	1.000	2	0.067	30	1.4650
4	632661004.1	0.5009	2.0260E-05	8/3/2023 14:21	506	30	29	0.967	1	0.033	30	1.8780
5	632661005.1	0.5007	2.0259E-05	8/3/2023 14:21	608	30	23	0.767	1	0.033	30	1.8960
6	632661006.1	0.5032	2.0269E-05	8/3/2023 9:00	703	30	9	0.300	3	0.100	30	1.6440
7	633010005.1	0.5009	2.0260E-05	8/7/2023 8:25	806	30	30	1.000	6	0.200	30	1.6560
8	1205486899.1	0.5062	2.0281E-05	8/17/2023 0:00	105	30	9	0.300	2	0.067	30	1.5340
9	1205486900.1	0.5024	2.0266E-05	8/3/2023 11:07	201	30	29	0.967	7	0.233	30	1.6670
10	1205486901.1	0.1062	1.1745E-05	8/3/2023 11:07	403	30	594	19.800	2	0.067	30	1.5070
11	1205486902.1	0.5062	2.0281E-05	8/17/2023 0:00	503	30	696	23.200	7	0.233	30	1.8840

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrowth End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
4.400%	8/1/2023	7/31/2024	8/21/2023 8:50	8/24/2023 6:15	8/24/2023 10:13	0.408	0.970	1.002	1.000
9.600%	10/25/2022	10/31/2023	8/21/2023 8:50	8/24/2023 6:15	8/24/2023 10:13	0.408	0.970	1.002	1.000
2.900%	2/1/2023	1/31/2024	8/21/2023 8:50	8/24/2023 6:15	8/24/2023 10:13	0.408	0.970	1.002	1.000
1.400%	6/1/2023	5/31/2024	8/21/2023 8:50	8/24/2023 6:15	8/24/2023 10:13	0.408	0.970	1.002	1.000
7.800%	7/1/2023	6/30/2024	8/21/2023 8:50	8/24/2023 6:15	8/24/2023 10:13	0.408	0.970	1.002	1.000
9.000%	11/1/2022	10/31/2023	8/21/2023 8:50	8/24/2023 6:15	8/24/2023 10:13	0.408	0.970	1.002	1.000
1.900%	4/8/2023	3/31/2024	8/21/2023 8:50	8/24/2023 6:15	8/24/2023 10:13	0.408	0.970	1.002	1.000
7.900%	5/1/2023	4/30/2024	8/21/2023 8:50	8/24/2023 6:40	8/24/2023 10:54	0.410	0.969	1.002	1.000
7.400%	8/1/2023	7/31/2024	8/21/2023 8:50	8/24/2023 6:40	8/24/2023 10:54	0.410	0.969	1.002	1.000
6.100%	2/1/2023	1/31/2024	8/21/2023 8:50	8/24/2023 6:40	8/24/2023 10:53	0.410	0.969	1.002	1.000
8.800%	6/1/2023	5/31/2024	8/21/2023 8:50	8/24/2023 6:40	8/24/2023 10:53	0.410	0.969	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-G
Spike Exp Date : 9/8/2023
Spike Activity (dpm/ml): 297.37
Spike Volume Added: 0.10

LCS S/N : 1715-G
LCS Exp Date : 9/8/2023
LCS Activity (dpm/ml): 297.37
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.2050	0.1447	1	0.4214	1.5835	18.11%	1.2000	0.2108	0.5453	0.6068		SAMPLE				
2	0.2702	0.1908	1	0.5236	0.6629	33.36%	0.4667	0.1491	0.4150	0.4438		SAMPLE				
3	0.2387	0.1685	1	0.4908	1.4343	20.41%	0.9333	0.1886	0.5680	0.6100		SAMPLE				
4	0.1331	0.0939	1	0.3090	1.1307	19.61%	0.9333	0.1826	0.4335	0.4643		SAMPLE				
5	0.1319	0.0931	1	0.3063	0.8804	23.59%	0.7333	0.1633	0.3843	0.4265		SAMPLE				
6	0.2621	0.1850	1	0.5078	0.2755	58.43%	0.2000	0.1155	0.3118	0.3180		SAMPLE				
7	0.3696	0.2610	2	0.6593	1.0991	25.07%	0.8000	0.2000	0.5386	0.5629		SAMPLE				
8	0.2274	0.1605	1	0.4675	0.3416	48.03%	0.2333	0.1106	0.3172	0.3254		MB				
9	0.3944	0.2785	1	0.6926	0.9953	28.26%	0.7333	0.2000	0.5320	0.5697	632661001.1	DUP	45.6%			
10	1.1031	0.7788	1	2.2677	140.1312	7.36%	19.7333	0.8138	11.3264	28.6034	632661001.1	MS			126.1220	109.9%
11	0.3463	0.2445	1	0.6082	27.3722	9.60%	22.9667	0.8838	2.0645	6.4933		LCS			26.4628	103.4%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 24-AUG-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	06:10	1	1.15E+05	114517	-1.41		
LUCAS2	EFF	06:09	1	1.33E+05	132653	-0.81		
LUCAS3	EFF	06:07	1	91267	91267	-2.65		
LUCAS4	EFF	05:47	1	1.27E+05	127018	-1.34		
LUCAS5	EFF	05:44	1	1.30E+05	130347	-2.24		
LUCAS6	EFF	05:43	1	1.29E+05	128945	-1.22		
LUCAS7	EFF	05:36	1	1.31E+05	131091	-0.98		
LUCAS8	EFF	05:35	1	1.10E+05	109732	-2.51		

Reviewed by:



Elizabeth Krouse

Date: 24-AUG-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2475704

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
632661001	SAMPLE	LXP1	LUCAS2	AUG-24-23 10:13:00	DONE	Lucas Cell	01-AUG-23 00:00
632661002	SAMPLE	LXP1	LUCAS3	AUG-24-23 10:13:00	DONE	Lucas Cell	25-OCT-22 00:00
632661003	SAMPLE	LXP1	LUCAS4	AUG-24-23 10:13:00	DONE	Lucas Cell	01-FEB-23 00:00
632661004	SAMPLE	LXP1	LUCAS5	AUG-24-23 10:13:00	DONE	Lucas Cell	01-JUN-23 00:00
632661005	SAMPLE	LXP1	LUCAS6	AUG-24-23 10:13:00	DONE	Lucas Cell	01-JUL-23 00:00
632661006	SAMPLE	LXP1	LUCAS7	AUG-24-23 10:13:00	DONE	Lucas Cell	01-NOV-22 00:00
633010005	SAMPLE	LXP1	LUCAS8	AUG-24-23 10:13:00	DONE	Lucas Cell	08-APR-23 00:00
1205486901	MS	LXP1	LUCAS4	AUG-24-23 10:53:00	DONE	Lucas Cell	01-FEB-23 00:00
1205486902	LCS	LXP1	LUCAS5	AUG-24-23 10:53:00	DONE	Lucas Cell	01-JUN-23 00:00
1205486899	MB	LXP1	LUCAS1	AUG-24-23 10:54:00	DONE	Lucas Cell	01-MAY-23 00:00
1205486900	DUP	LXP1	LUCAS2	AUG-24-23 10:54:00	DONE	Lucas Cell	01-AUG-23 00:00



Hometown People. Hometown Power.

Lansing Board of Water and Light
Environmental Services Laboratory (MI00079)
Cert ID:3760
1232 Haco Dr.
Lansing, Michigan 48901

13 September 2023

BWL - Erickson Station
Attn: Cheryl Loudon
3725 S. Canal
Lansing, MI 48917

Project: Erickson AM MI

Dear Cheryl Loudon,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

Work Order
L308169

Received
8/11/2023 3:32:00PM

Account Number

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



Analytical Report

Client: BWL - Erickson Station

Client Project Manager: Cheryl Louden

Report Date: 09/13/2023

Address: 3725 S. Canal
 Lansing MI, 48917

Sample Name: MW-14

Lab #: L308169-01 Ground Water

Collected: 11-Aug-23 09:53

By: Marc Wahrer

Analyte	Reporting		Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit							
Conductivity	1300	1.0	uS/cm	1		11-Aug-23 09:53	maw	SM 2510B	
Dissolved oxygen	ND	0.100	mg/L	1		11-Aug-23 09:53	maw	FIELD	
Milliliters Purged	190		ml/min	1		11-Aug-23 09:53	maw	FIELD	
Oxidation Reduction Potential	-116.2	-999.0	mV	1		11-Aug-23 09:53	maw	FIELD	
pH	7.0	7.0	pH Units	1		11-Aug-23 09:53	maw	SM 4500H+B	
Temperature	14		°C	1		11-Aug-23 09:53	maw	SM 2550B	
Turbidity	3.1	0.10	NTU	1		11-Aug-23 09:53	maw	SM 2130B	

Sample Name: MW-15

Lab #: L308169-02 Ground Water

Collected: 11-Aug-23 11:53

By: Marc Wahrer

Analyte	Reporting		Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit							
Conductivity	1000	1.0	uS/cm	1		11-Aug-23 11:53	maw	SM 2510B	
Dissolved oxygen	0.870	0.100	mg/L	1		11-Aug-23 11:53	maw	FIELD	
Milliliters Purged	190		ml/min	1		11-Aug-23 11:53	maw	FIELD	
Oxidation Reduction Potential	30.80	-999.0	mV	1		11-Aug-23 11:53	maw	FIELD	
pH	6.7	7.0	pH Units	1		11-Aug-23 11:53	maw	SM 4500H+B	
Temperature	14		°C	1		11-Aug-23 11:53	maw	SM 2550B	
Turbidity	3.3	0.10	NTU	1		11-Aug-23 11:53	maw	SM 2130B	



Analytical Report

Client: BWL - Erickson Station

Client Project Manager: Cheryl Louden

Report Date: 09/13/2023

Address: 3725 S. Canal
Lansing MI, 48917

Approved By:

Jennifer Caporale

Notes and Definitions

AL Action Level (Action Level = Regulatory Limit)
MCL Maximum Contaminant Level
PEL Permissible Exposure Limit (Permissible Exposure Limit = Regulatory Limit)
RPD Relative Percent Difference
OT Odor Threshold
ND Non Detect is less than the reporting limit value
All drinking water regulatory limits are MCL's with the exception of Lead and Copper unless otherwise noted.



Analytical Laboratory Report

Final Report

Report ID: S52163.01(04)
Generated on 09/13/2023
Replaces report S52163.01(03) generated on 08/24/2023

Report to
Attention: Jennifer Caporale
Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Report produced by
Merit Laboratories, Inc.
2680 East Lansing Drive
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:
John Lavery (johnlavery@meritlabs.com)
Barbara Ball (bball@meritlabs.com)

Report Summary
Lab Sample ID(s): S52163.01-S52163.04
Project: Erickson AM MI Wells 14-15
Collected Date(s): 08/11/2023
Submitted Date/Time: 08/11/2023 15:57
Sampled by: Marc Wahrer
P.O. #:

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Maya Murshak
Technical Director



General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

Report Narrative

All analyses completed



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP & ISO/IEC 17025:2017	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



Sample Summary (4 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S52163.01	MW-14 L308169-01	Groundwater	08/11/23 09:53
S52163.02	MW-15 L308169-02	Groundwater	08/11/23 11:53
S52163.03	MWT-14 L308169-03	Groundwater	08/11/23 09:53
S52163.04	Field Blank L308169-04	Water	08/11/23 08:55



Analytical Laboratory Report

Final Report

Lab Sample ID: S52163.01

Sample Tag: MW-14 L308169-01

Collected Date/Time: 08/11/2023 09:53

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.6	IR
2	1L Plastic	None	Yes	3.6	IR
1	250ml Plastic	HNO3	Yes	3.6	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/14/23 13:42	CTV	
Metal Digestion	Completed	SW3015A	08/15/23 10:20	CCM	

Inorganics

Method: E300.0, Run Date: 08/14/23 11:36, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	118	10	0.13	mg/L	10	16887-00-6	

Method: E300.0, Run Date: 08/14/23 10:26, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	16	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/14/23 11:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	690	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/14/23 11:28, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	588	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 08/11/23 17:50, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	804	50	12	mg/L	2		

Method: SM2540D, Run Date: 08/14/23 17:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	25.9	3	1.3	mg/L	1.3		

Metals

Method: E200.8, Run Date: 08/15/23 11:58, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.007	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.122	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	2.14	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S52163.01 (continued)

Sample Tag: MW-14 L308169-01

Method: E200.8, Run Date: 08/15/23 11:58, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	12.9	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.111	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.013	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/16/23 12:28, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	147	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	42.2	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	4.96	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	77.8	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/14/23 16:14, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/11/23 12:12, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S52163.02

Sample Tag: MW-15 L308169-02

Collected Date/Time: 08/11/2023 11:53

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.6	IR
2	1L Plastic	None	Yes	3.6	IR
1	250ml Plastic	HNO3	Yes	3.6	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/14/23 13:42	CTV	
Metal Digestion	Completed	SW3015A	08/15/23 10:20	CCM	

Inorganics

Method: E300.0, Run Date: 08/14/23 11:59, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	73	10	0.13	mg/L	10	16887-00-6	

Method: E300.0, Run Date: 08/14/23 10:36, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	117	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/14/23 11:26, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	430	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/14/23 11:30, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	512	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 08/11/23 17:50, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	670	50	12	mg/L	2		

Method: SM2540D, Run Date: 08/14/23 17:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 08/15/23 12:03, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.067	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.41	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S52163.02 (continued)

Sample Tag: MW-15 L308169-02

Method: E200.8, Run Date: 08/15/23 12:03, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.05	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/16/23 12:29, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	140	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	34.2	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	Not detected	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	29.7	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/14/23 16:17, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/11/23 12:12, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S52163.03

Sample Tag: MWT-14 L308169-03

Collected Date/Time: 08/11/2023 09:53

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.6	IR
2	1L Plastic	None	Yes	3.6	IR
1	250ml Plastic	HNO3	Yes	3.6	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/14/23 13:42	CTV	
Metal Digestion	Completed	SW3015A	08/15/23 10:20	CCM	

Inorganics

Method: E300.0, Run Date: 08/14/23 12:19, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	118	10	0.13	mg/L	10	16887-00-6	

Method: E300.0, Run Date: 08/14/23 10:46, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	16	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/14/23 11:28, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	680	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/14/23 11:32, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	630	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 08/11/23 17:50, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	804	50	12	mg/L	2		

Method: SM2540D, Run Date: 08/14/23 17:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	26.6	5	2	mg/L	2		

Metals

Method: E200.8, Run Date: 08/15/23 12:06, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.007	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.124	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	2.10	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S52163.03 (continued)

Sample Tag: MWT-14 L308169-03

Method: E200.8, Run Date: 08/15/23 12:06, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	12.7	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.109	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.014	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/16/23 12:31, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	149	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	42.1	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	5.07	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	78.3	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/14/23 16:20, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/11/23 12:12, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S52163.04

Sample Tag: Field Blank L308169-04

Collected Date/Time: 08/11/2023 08:55

Matrix: Water

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	3.6	IR
2	1L Plastic	None	Yes	3.6	IR
1	250ml Plastic	HNO3	Yes	3.6	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/14/23 13:42	CTV	
Metal Digestion	Completed	SW3015A	08/15/23 10:20	CCM	

Inorganics

Method: E300.0, Run Date: 08/14/23 10:56, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.03	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.04	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.26	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 08/14/23 11:30, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/14/23 11:34, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 08/11/23 17:50, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	12	mg/L	2		

Method: SM2540D, Run Date: 08/14/23 17:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 08/15/23 11:28, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S52163.04 (continued)

Sample Tag: Field Blank L308169-04

Method: E200.8, Run Date: 08/15/23 11:28, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 08/16/23 12:19, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 08/14/23 16:24, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/11/23 12:12, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

Merit Laboratories Login Checklist

Lab Set ID:S52163

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 14-15

Submitted:08/11/2023 15:57 Login User: BJB

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

Sample Receiving

- | | | |
|-----|--|--|
| 01. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples are received at 4C +/- 2C Thermometer # IR 3.6 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Received on ice/ cooling process begun |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples shipped |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples left in 24 hr. drop box |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Are there custody seals/tape or is the drop box locked |

Chain of Custody

- | | | |
|-----|--|--|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC adequately filled out |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC signed and relinquished to the lab |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sample tag on bottles match COC |
| 09. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Subcontracting needed? Subcontracted to: GEL |

Preservation

- | | | |
|-----|--|---|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Do sample have correct chemical preservation |
| 11. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Completed pH checks on preserved samples? (no VOAs) |
| 12. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Did any samples need to be preserved in the lab? |

Bottle Conditions

- | | | |
|-----|--|---|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | All bottles intact |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Appropriate analytical bottles are used |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Merit bottles used |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sufficient sample volume received |
| 17. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples require laboratory filtration |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples submitted within holding time |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Do water VOC or TOX bottles contain headspace |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S52163 Submitted: 08/11/2023 15:57

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 14-15

Initial Preservation Check: 08/11/2023 16:28 BJB

Preservation Recheck (E200.8): N/A

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S52163.01	1L Plastic HNO3	<2			
S52163.01	1L Plastic HNO3	<2			
S52163.01	250ml Plastic HNO3	<2			
S52163.02	1L Plastic HNO3	<2			
S52163.02	1L Plastic HNO3	<2			
S52163.02	250ml Plastic HNO3	<2			
S52163.03	1L Plastic HNO3	<2			
S52163.03	1L Plastic HNO3	<2			
S52163.03	250ml Plastic HNO3	<2			
S52163.04	1L Plastic HNO3	<2			
S52163.04	1L Plastic HNO3	<2			
S52163.04	250ml Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823
 Phone (517) 332-0167 Fax (517) 332-4034
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

REPORT TO

CHAIN OF CUSTODY RECORD

INVOICE TO

CONTACT NAME **Jennifer Caporale**
 COMPANY **Lansing Board of Water and Light**
 ADDRESS **PO Box 13007 48901-3007**
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**
 PHONE NO. **517-702-6372** FAX NO. P.O. NO.
 E-MAIL ADDRESS **Environmental_Laboratory@lbwl.com** QUOTE NO.

CONTACT NAME **Beth Zimpfer** SAME
 COMPANY
 ADDRESS
 CITY STATE ZIP CODE
 PHONE NO. E-MAIL ADDRESS **Beth.Zimpfer@lbwl.com**

PROJECT NO./NAME **Erickson AM MI Wells 14-15** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**
 TURNAROUND TIME REQUIRED 1 DAY 2 DAYS 3 DAYS STANDARD OTHER **ASAP**
 DELIVERABLES REQUIRED STD LEVEL II LEVEL III LEVEL IV EDD OTHER

MATRIX GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID
 CODE: SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIFE A=AIR W=WASTE

Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO ₃	H ₂ SO ₄	NaOH	MgOH	OTHER	Total Metals	F- undistilled, Cl-, SO ₄ , TDS	Radium 226	Radium 228	TSS	HCO ₃ , CO ₃ , Hardness								
	DATE	TIME																								
52163.01	08/11/23	1138	MW-14 L308169-01	GW	5	2	3						✓	✓	✓	✓	✓	✓								
.02		1410	MW-15 -02	GW	5	2	3						✓	✓	✓	✓	✓	✓								
.03		1138	MWT-14 -03	GW	5	2	3						✓	✓	✓	✓	✓	✓								
.04		1040	Field Blank -04	di	5	2	3						✓	✓	✓	✓	✓	✓								

Certifications
 OHIO VAP Drinking Water
 DoD NPDES
 Project Locations
 Detroit New York
 Other _____
 Special Instructions

Metals to analyse: Na, Mg, K
 B, Ca, Sb, As, Ba, Be, Cd, Cr,
 Co, Li, Hg, Mo, Pb, Se, Tl,
 Fe, Cu, Ni, Ag, V, Zn
 Please send a preliminary report

RELINQUISHED BY: Sampler DATE **8-11-23** TIME **1557**
 RECEIVED BY: DATE TIME
 SIGNATURE/ORGANIZATION
 RELINQUISHED BY: DATE TIME
 SIGNATURE/ORGANIZATION
 RECEIVED BY: DATE TIME
 SIGNATURE/ORGANIZATION

RELINQUISHED BY: DATE TIME
 SIGNATURE/ORGANIZATION DATE TIME
 RECEIVED BY: **8/11/2023 1557**
 SIGNATURE/ORGANIZATION
 SEAL NO. SEAL INTACT INITIALS NOTES: TEMP. ON ARRIVAL
 YES NO
 SEAL NO. SEAL INTACT INITIALS
 YES NO **3.6**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6mos	0.150
Be, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	2.5
Cl	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	10
Cr, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Fluoride	250 mL plastic	mg/L	None	9056	28 d	0.005
F	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	1.0
Fe, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.02
Pb, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Mercury	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Molybdenum	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	200.8	6 mos	2.0 combined
RA226/228	Selenium	250 mL plastic	mg/L	Nitric Acid	SM 7500	6 mos	0.005
Se, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Sulfate	250 mL plastic	mg/L	Chill	200.8	6 mos	0.0005
SO4	Thallium	250 mL plastic	mg/L	Nitric Acid	300.0	28 d	10
Tl, total	Total Dissolved Solids	1 L plastic	mg/L	None	200.8	6 mos	0.002
TDS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Vanadium	250 mL plastic	mg/L	Nitric Acid	SM 2540D	NA	3
V, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total				Nitric Acid	200.8	6 mos	0.005

September 13, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 633542
SDG: S52163

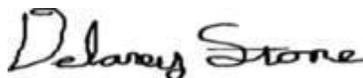
Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on August 16, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,



Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S52163
Work Order: 633542**

September 13, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on August 16, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage.

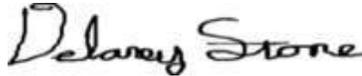
Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
633542001	S52163.01
633542002	S52163.02
633542003	S52163.03
633542004	S52163.04 Field Blank

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.



Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

SAMPLE RECEIPT & REVIEW FORM

Client: MERI		SDG/AR/COC/Work Order: 633542
Received By: EG		Date Received: 8/17/23
Carrier and Tracking Number		FedEx Express FedEx Ground <input checked="" type="radio"/> UPS Field Services Courier Other 12 466 477 03 6390 2359
Suspected Hazard Information	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	*If Not Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
A) Shipped as a DOT Hazardous?	<input checked="" type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples are to be received as radioactive?	<input checked="" type="checkbox"/>	COC location on all hazardous containers and all other designations
C) Did the RSO classify the samples as radioactive?	<input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM/mR/Hr Classified as: Rad 1 Rad 2 Rad 3
D) Did the client designate samples are hazardous?	<input checked="" type="checkbox"/>	COC location on all hazardous containers and all other designations
E) Did the RSO identify possible hazards?	<input checked="" type="checkbox"/>	IF D or B is yes, select Hazards below: PCBs Flammable Foreign Soil RCRA Asbestos Beryllium Other: _____

Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Client contacted and provided COC COC created upon receipt
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Preservation Method: Wet Ice Ice Packs Dry ice <input checked="" type="radio"/> None Other: _____ *all temperatures are recorded in Celsius TEMP: <u>23</u>
4 Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Temperature Device Serial #: <u>IR8-23</u> Secondary Temperature Device Serial # (If Applicable): _____
5 Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6 Samples requiring chemical preservation at proper pH?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sample ID's and Containers Affected: <u>552163.02 1 & 2 pH 7.2</u> If Preservation added, Lot#: _____
7 Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer)
				Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No)
8 Samples received within holding time?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected: _____
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ID's and tests affected: _____
10 Date & time on COC match date & time on bottles?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ID's and containers affected: _____
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No dates on containers No times on containers COC missing info Other (describe) <u>times dont match COC on containers</u>
12 Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No container count on COC Other (describe)
13 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):

Rev 01.

SAMPLE RECEIPT & REVIEW FORM

Client: MERI	SDG/AR/COC/Work Order: 655542
Received By: EG	Date Received: 8/17/23 8/16/23 8/12/23
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground UPS Field Services Courier Other 12 466 477 03 6390 2359

Suspected Hazard Information	Yes	No	*If Not Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
A) Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples are to be received as radioactive?		<input checked="" type="checkbox"/>	COC notation on individual containers or containers equal (if not used notation)
C) Did the RSO classify the samples as radioactive?		<input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM / mR/Hr Classified as: Rad 1 Rad 2 Rad 3
D) Did the client designate samples are hazardous?		<input checked="" type="checkbox"/>	COC notation on individual containers or containers equal (if not used notation)
E) Did the RSO identify possible hazards?		<input checked="" type="checkbox"/>	If D or E is yes, select Hazards below: PCBs Flammable Foreign Soil RCRA Asbestos Beryllium Other: _____

Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>			Circle Applicable: Client contacted and provided COC COC created upon receipt
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		<input checked="" type="checkbox"/>		Preservation Method: Wet Ice Ice Packs Dry ice None Other: *all temperatures are recorded in Celsius TEMP: 23
4 Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>			Temperature Device Serial #: IR6-23 Secondary Temperature Device Serial # (If Applicable):
5 Sample containers intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6 Samples requiring chemical preservation at proper pH?			<input checked="" type="checkbox"/>	Sample ID's and Containers Affected: 552163.02 1 & 2 pH 7.2 If Preservation added, Lot#:
7 Do any samples require Volatile Analysis?			<input checked="" type="checkbox"/>	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer)
			<input checked="" type="checkbox"/>	Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No)
			<input checked="" type="checkbox"/>	Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected:
8 Samples received within holding time?	<input checked="" type="checkbox"/>			ID's and tests affected:
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>			ID's and containers affected:
10 Date & time on COC match date & time on bottles?			<input checked="" type="checkbox"/>	Circle Applicable: No dates on containers No times on containers COC missing info Other (describe) times dont match COC on containers
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>			Circle Applicable: No container count on COC Other (describe)
12 Are sample containers identifiable as GEL provided by use of GEL labels?			<input checked="" type="checkbox"/>	
13 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>			Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):
 Rev 01: Receive dates were updated on final review of the data package. Scan history of UPS tracking confirms reception 8/16/23. *just*.

Laboratory Certifications

List of current GEL Certifications as of 12 September 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-23-21
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S52163
Work Order #: 633542**

Product: Radium-226+Radium-228 Calculation

Analytical Method: Calculation

Analytical Procedure: GL-RAD-D-003 REV# 45

Analytical Batch: 2479712

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
633542001	S52163.01
633542002	S52163.02
633542003	S52163.03
633542004	S52163.04 Field Blank

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2479427

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
633542001	S52163.01
633542002	S52163.02
633542003	S52163.03
633542004	S52163.04 Field Blank
1205493704	Method Blank (MB)
1205493705	633177001(S51950.01) Sample Duplicate (DUP)
1205493706	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2479421

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
633542001	S52163.01
633542002	S52163.02
633542003	S52163.03
633542004	S52163.04 Field Blank
1205493684	Method Blank (MB)
1205493685	633177001(S51950.01) Sample Duplicate (DUP)
1205493686	633177001(S51950.01) Matrix Spike (MS)
1205493687	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

The matrix spike, 1205493686 (S51950.01MS), aliquot was reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S52163 GEL Work Order: 633542

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 13 SEP 2023

Title: Analyst III - Data Validator

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: September 13, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S52163.01 Project: MERI00120
Sample ID: 633542001 Client ID: MERI001
Matrix: Ground Water
Collect Date: 11-AUG-23 09:53
Receive Date: 16-AUG-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.326	+/-1.06	1.90	3.00	pCi/L		JE1	09/05/23	1343	2479427	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.951	+/-1.18			pCi/L		1 TON1	09/11/23	1212	2479712	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.624	+/-0.509	0.661	1.00	pCi/L		LXP1	09/11/23	1010	2479421	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			91	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: September 13, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S52163.02 Project: MERI00120
Sample ID: 633542002 Client ID: MERI001
Matrix: Ground Water
Collect Date: 11-AUG-23 11:53
Receive Date: 16-AUG-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.470	+/-0.635	1.09	3.00	pCi/L		JE1	09/05/23	1343	2479427	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.22	+/-0.793			pCi/L		1 TON1	09/11/23	1212	2479712	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.750	+/-0.475	0.544	1.00	pCi/L		LXP1	09/11/23	1010	2479421	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			88	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: September 13, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S52163.03 Project: MERI00120
Sample ID: 633542003 Client ID: MERI001
Matrix: Ground Water
Collect Date: 14-AUG-23 09:53
Receive Date: 16-AUG-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.147	+/-0.563	1.07	3.00	pCi/L			JE1	09/05/23	1343 2479427	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.612	+/-0.679			pCi/L		1	TON1	09/11/23	1212 2479712	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.465	+/-0.380	0.467	1.00	pCi/L			LXP1	09/11/23	1010 2479421	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			88.7	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: September 13, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S52163.04 Field Blank Project: MERI00120
Sample ID: 633542004 Client ID: MERI001
Matrix: Ground Water
Collect Date: 11-AUG-23 08:55
Receive Date: 16-AUG-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.556	+/-0.846	1.47	3.00	pCi/L			JE1	09/05/23	1343 2479427	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.629	+/-0.909			pCi/L		1	TON1	09/11/23	1212 2479712	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.0725	+/-0.333	0.723	1.00	pCi/L			LXP1	09/11/23	1010 2479421	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			80.5	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: September 13, 2023

Page 1 of 2

Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan

Contact: John Laverty

Workorder: 633542

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2479427										
QC1205493705	633177001	DUP									
Radium-228	U	0.945		1.47	pCi/L	43.4		(0% - 100%)	JE1	09/05/23	13:43
	Uncertainty	+/-0.862		+/-0.765							
QC1205493706	LCS										
Radium-228	78.6			76.2	pCi/L		97	(75%-125%)		09/05/23	13:43
	Uncertainty			+/-4.23							
QC1205493704	MB										
Radium-228			U	0.294	pCi/L					09/05/23	13:43
	Uncertainty			+/-0.580							
Rad Ra-226											
Batch	2479421										
QC1205493685	633177001	DUP									
Radium-226	U	0.232	U	0.232	pCi/L	N/A		N/A	LXP1	09/11/23	10:43
	Uncertainty	+/-0.384		+/-0.416							
QC1205493687	LCS										
Radium-226	26.2			25.1	pCi/L		96.1	(75%-125%)		09/11/23	11:01
	Uncertainty			+/-2.65							
QC1205493684	MB										
Radium-226			U	-0.0776	pCi/L					09/11/23	10:43
	Uncertainty			+/-0.285							
QC1205493686	633177001	MS									
Radium-226	127 U	0.232		135	pCi/L		106	(75%-125%)		09/11/23	11:01
	Uncertainty	+/-0.384		+/-13.8							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- H Analytical holding time was exceeded
- < Result is less than value reported
- > Result is greater than value reported

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Workorder: 633542

Page 2 of 2

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
NI											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2479427 Check-list

This check-list was completed on 05-SEP-23 by Nat Long

This batch was reviewed by Nat Long on 05-SEP-23 and Kenshalla Oston on 06-SEP-23.

Batch ID:
2479427

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2479427
Analyst: Jacqueline Winston (JE1)
 Prep: Charles Hall (CH7)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: BAL-C236761727

Due Dates for Lab: 06-SEP-2023 **Package:** 10-SEP-2023 **SDG:** 08-SEP-2023

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205493706	228	2051-B	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	633177001	29-AUG-2023	3	301.35	301.35	08/31/23 13:57	09/05/23 12:07
2	633177002	29-AUG-2023	3	300.49	300.49	08/31/23 13:57	09/05/23 12:07
3	633177003	29-AUG-2023	3	302.58	302.58	08/31/23 13:57	09/05/23 12:07
4	633177004	29-AUG-2023	3	300.56	300.56	08/31/23 13:57	09/05/23 12:07
5	633177005	29-AUG-2023	3	302.65	302.65	08/31/23 13:57	09/05/23 12:07
6	633177006	29-AUG-2023	3	303.89	303.89	08/31/23 13:57	09/05/23 12:07
7	633542001	29-AUG-2023	3	302.12	302.12	08/31/23 13:57	09/05/23 12:07
8	633542002	29-AUG-2023	3	305.71	305.71	08/31/23 13:57	09/05/23 12:07
9	633542003	29-AUG-2023	3	303.26	303.26	08/31/23 13:57	09/05/23 12:07
10	633542004	29-AUG-2023	3	303.05	303.05	08/31/23 13:57	09/05/23 12:07
11	633612001	29-AUG-2023	3	301	301	08/31/23 13:57	09/05/23 12:07
12	633715001	29-AUG-2023	3	302.8	302.8	08/31/23 13:57	09/05/23 12:07
13	633715002	29-AUG-2023	3	300.9	300.9	08/31/23 13:57	09/05/23 12:07
14	633715003	29-AUG-2023	3	301.1	301.1	08/31/23 13:57	09/05/23 12:07
15	633715004	29-AUG-2023	3	304.4	304.4	08/31/23 13:57	09/05/23 12:07
16	633715005	29-AUG-2023	3	302.8	302.8	08/31/23 13:57	09/05/23 12:07
17	633715006	29-AUG-2023	3	300.6	300.6	08/31/23 13:57	09/05/23 12:07
18	1205493704 MB	29-AUG-2023	3		305.71	08/31/23 13:57	09/05/23 12:07
19	1205493705 DUP (633177001)	29-AUG-2023	3	300.46	300.46	08/31/23 13:57	09/05/23 12:07
20	1205493706 LCS	29-AUG-2023	3		305.71	08/31/23 13:57	09/05/23 12:07

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 2097-B	Ba-133 Tracer	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 29-AUG-2023 00:00
REGNT 3956035	Barium Carrier Ra228 REG	1 mL	
REGNT 3960868	RGF-1M Citric Acid	5 mL	
REGNT 3959817	2M HCl	20 mL	
REGNT 3955326	RGF-7M Nitric Acid	25 mL	
REGNT 3958741	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT DGA071323	2472106	2 g	
REGNT 3957480.5	RGF-Hydrofluoric Acid	4 mL	
REGNT 3940152	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3957910	RGF-Neodymium Substrate	5 mL	
REGNT 3954355.13	Nitric Acid	5 mL	
REGNT 3958747	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3946262	RGF-50% Potassium Carbonate	2 mL	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 2097-B
 Tracer Exp Date : 7/12/2024
 Tracer Volume Added: 0.10

Batch : 2479427
 Analyst : CHA00185
 Prep Date : 8/29/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 3 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	633177001.1	0.3014	1.8482E-05	8/8/2023 11:08	1057.8	1.77%	985.1	1.84%	0.1	0.000200
2	633177002.1	0.3005	1.8467E-05	8/8/2023 12:55	1057.8	1.77%	914.5	1.91%	0.1	0.000200
3	633177003.1	0.3026	1.8503E-05	8/8/2023 14:21	1057.8	1.77%	928.3	1.89%	0.1	0.000200
4	633177004.1	0.3006	1.8469E-05	8/8/2023 12:34	1057.8	1.77%	911.2	1.91%	0.1	0.000200
5	633177005.1	0.3027	1.8504E-05	8/8/2023 11:08	1057.8	1.77%	951.8	1.87%	0.1	0.000200
6	633177006.1	0.3039	1.8524E-05	8/8/2023 9:30	1057.8	1.77%	873.3	1.95%	0.1	0.000200
7	633542001.1	0.3021	1.8495E-05	8/11/2023 9:53	1057.8	1.77%	963.0	1.86%	0.1	0.000200
8	633542002.1	0.3057	1.8554E-05	8/11/2023 11:53	1057.8	1.77%	931.2	1.89%	0.1	0.000200
9	633542003.1	0.3033	1.8514E-05	8/14/2023 9:53	1057.8	1.77%	938.3	1.88%	0.1	0.000200
10	633542004.1	0.3031	1.8510E-05	8/11/2023 8:55	1057.8	1.77%	851.4	1.98%	0.1	0.000200
11	633612001.1	0.3010	1.8476E-05	8/11/2023 10:10	1057.8	1.77%	827.6	2.01%	0.1	0.000200
12	633715001.1	0.3028	1.8506E-05	8/14/2023 15:12	1057.8	1.77%	915.1	1.91%	0.1	0.000200
13	633715002.1	0.3009	1.8474E-05	8/14/2023 11:03	1057.8	1.77%	889.2	1.94%	0.1	0.000200
14	633715003.1	0.3011	1.8478E-05	8/14/2023 12:53	1057.8	1.77%	875.6	1.95%	0.1	0.000200
15	633715004.1	0.3044	1.8533E-05	8/14/2023 14:31	1057.8	1.77%	885.2	1.94%	0.1	0.000200
16	633715005.1	0.3028	1.8506E-05	8/14/2023 11:03	1057.8	1.77%	902.6	1.92%	0.1	0.000200
17	633715006.1	0.3006	1.8469E-05	8/14/2023 9:10	1057.8	1.77%	843.6	1.99%	0.1	0.000200
18	1205493704.1	0.3057	1.8554E-05	8/29/2023 0:00	1057.8	1.77%	934.2	1.89%	0.1	0.000200
19	1205493705.1	0.3005	1.8467E-05	8/8/2023 11:08	1057.8	1.77%	873.2	1.95%	0.1	0.000200
20	1205493706.1	0.3057	1.8554E-05	8/29/2023 0:00	1057.8	1.77%	865.0	1.96%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated Sample Recovery %	Sample Recovery Error %
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction		
1	1A	60	11	45	0.750	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.834	1.000	1.057	93.1%	2.57%
2	1B	60	2	30	0.500	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.834	1.000	1.057	86.4%	2.62%
3	1C	60	9	65	1.083	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.834	1.000	1.057	87.8%	2.60%
4	1D	60	3	41	0.683	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.834	1.000	1.057	86.1%	2.62%
5	2A	60	5	45	0.750	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.834	1.000	1.057	90.0%	2.59%
6	2B	60	2	44	0.733	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.834	1.000	1.057	82.6%	2.65%
7	2D	60	5	88	1.467	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.992	0.834	1.000	1.057	91.0%	2.58%
8	3B	60	2	31	0.517	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.992	0.834	1.000	1.057	88.0%	2.60%
9	3C	60	4	24	0.400	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.993	0.834	1.000	1.057	88.7%	2.60%
10	3D	60	10	37	0.617	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.992	0.833	1.000	1.057	80.5%	2.67%
11	4A	60	7	23	0.383	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.992	0.833	1.000	1.057	78.2%	2.69%
12	4C	60	4	54	0.900	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.993	0.833	1.000	1.057	86.5%	2.62%
13	4D	60	13	54	0.900	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.993	0.833	1.000	1.057	84.1%	2.64%
14	5A	60	7	60	1.000	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.993	0.833	1.000	1.057	82.8%	2.65%
15	5D	60	8	53	0.883	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.993	0.833	1.000	1.057	83.7%	2.64%
16	6A	60	12	62	1.033	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.993	0.833	1.000	1.057	85.3%	2.63%
17	6C	60	2	71	1.183	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.993	0.833	1.000	1.057	79.7%	2.68%
18	7A	60	9	26	0.433	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.997	0.835	1.000	1.057	88.3%	2.60%
19	7B	60	3	41	0.683	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.835	1.000	1.057	82.6%	2.65%
20	7C	60	6	1296	21.600	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.997	0.834	1.000	1.057	81.8%	2.66%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2023	5/31/2024	0.5320	0.00738	0.505	9/1/2023 18:12	1000
2	PIC	6/1/2023	5/31/2024	0.6098	0.00711	0.323	9/1/2023 18:12	1000
3	PIC	6/1/2023	5/31/2024	0.6077	0.00847	0.764	9/1/2023 18:12	1000
4	PIC	6/1/2023	5/31/2024	0.6071	0.00692	0.608	9/1/2023 18:12	1000
5	PIC	6/1/2023	5/31/2024	0.6083	0.01914	0.461	9/1/2023 18:12	1000
6	PIC	6/1/2023	5/31/2024	0.6253	0.02111	0.409	9/1/2023 18:12	1000
7	PIC	6/1/2023	5/31/2024	0.6206	0.00745	1.370	9/1/2023 18:12	1000
8	PIC	6/1/2023	5/31/2024	0.6266	0.01614	0.379	9/1/2023 18:12	1000
9	PIC	6/1/2023	5/31/2024	0.6245	0.00988	0.357	9/1/2023 18:12	1000
10	PIC	6/1/2023	5/31/2024	0.5677	0.02297	0.483	9/1/2023 18:12	1000
11	PIC	6/1/2023	5/31/2024	0.6074	0.01123	0.409	9/1/2023 18:12	1000
12	PIC	6/1/2023	5/31/2024	0.6376	0.00889	0.784	9/1/2023 18:13	1000
13	PIC	6/1/2023	5/31/2024	0.6412	0.00773	0.708	9/1/2023 18:13	1000
14	PIC	6/1/2023	5/31/2024	0.6366	0.00851	1.264	9/1/2023 18:13	1000
15	PIC	6/1/2023	5/31/2024	0.6566	0.00925	0.844	9/1/2023 18:32	1000
16	PIC	6/1/2023	5/31/2024	0.6444	0.02228	0.756	9/1/2023 18:09	1000
17	PIC	6/1/2023	5/31/2024	0.6167	0.01970	1.023	9/1/2023 18:10	1000
18	PIC	6/1/2023	5/31/2024	0.6229	0.00594	0.347	9/1/2023 18:09	1000
19	PIC	6/1/2023	5/31/2024	0.6423	0.00627	0.277	9/1/2023 18:10	1000
20	PIC	6/1/2023	5/31/2024	0.6369	0.00790	0.397	9/1/2023 18:10	1000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 2051-B
LCS Exp Date : 3/27/2024
LCS Activity (dpm/ml): 533.11
LCS Volume Added: 0.10

Results Pos.	Decision	Critical	Required	Sample Act.		Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
	Level pCi/L	Level pCi/L	MDA pCi/L	MDA pCi/L	Conc. pCi/L	Error %	Rate CPM	Rate Error CPM	Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L						
1	0.8492	0.5995	3	1.3920	0.9454	46.62%	0.2450	0.1140	0.8625	0.8953		SAMPLE				
2	0.6403	0.4520	3	1.0859	0.6439	52.63%	0.1770	0.0930	0.6633	0.6832		SAMPLE				
3	0.9667	0.6825	3	1.5435	1.1404	43.05%	0.3193	0.1372	0.9602	1.0030		SAMPLE				
4	0.8855	0.6252	3	1.4337	0.2762	145.42%	0.0753	0.1095	0.7872	0.7904		SAMPLE				
5	0.7317	0.5166	3	1.2071	1.0056	39.52%	0.2890	0.1138	0.7764	0.8181		SAMPLE				
6	0.7279	0.5139	3	1.2116	1.1920	34.82%	0.3243	0.1124	0.8096	0.8657		SAMPLE				
7	1.2233	0.8637	3	1.8960	0.3262	166.23%	0.0967	0.1607	1.0627	1.0660		SAMPLE				
8	0.6513	0.4598	3	1.0905	0.4703	68.94%	0.1377	0.0948	0.6349	0.6461		SAMPLE				
9	0.6341	0.4477	3	1.0667	0.1474	194.92%	0.0430	0.0838	0.5629	0.5641		SAMPLE				
10	0.8958	0.6324	3	1.4730	0.5563	77.69%	0.1337	0.1037	0.8462	0.8583		SAMPLE				
11	0.7980	0.5634	3	1.3283	-0.1034	321.24%	-0.0257	0.0824	0.6511	0.6514		SAMPLE				
12	0.9454	0.6674	3	1.5072	0.3999	108.34%	0.1160	0.1256	0.8489	0.8550		SAMPLE				
13	0.9253	0.6533	3	1.4841	0.6818	65.33%	0.1920	0.1253	0.8723	0.8893		SAMPLE				
14	1.2641	0.8924	3	1.9664	-0.9584	50.80%	-0.2640	0.1339	0.9528	0.9530		SAMPLE				
15	0.9800	0.6919	3	1.5560	0.1355	317.21%	0.0393	0.1248	0.8423	0.8430		SAMPLE				
16	0.9319	0.6579	3	1.4889	0.9598	48.47%	0.2773	0.1341	0.9095	0.9425		SAMPLE				
17	1.2210	0.8621	3	1.9190	0.6250	89.89%	0.1603	0.1440	1.1005	1.1121		SAMPLE				
18	0.6205	0.4381	3	1.0462	0.2936	100.81%	0.0863	0.0870	0.5800	0.5848		MB				
19	0.5894	0.4161	3	1.0130	1.4693	26.72%	0.4063	0.1080	0.7655	0.8517	633177001.1	DUP	43.4%			
20	0.7013	0.4951	3	1.1699	76.2032	3.96%	21.2030	0.6003	4.2289	19.8415		LCS			78.5514	97.0%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
633177001	1A	60	11	45	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633177002	1B	60	2	30	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633177003	1C	60	9	65	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633177004	1D	60	3	41	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633177005	2A	60	5	45	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633177006	2B	60	2	44	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633542001	2D	60	5	88	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633542002	3B	60	2	31	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633542003	3C	60	4	24	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633542004	3D	60	10	37	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633612001	4A	60	7	23	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
633715001	4C	60	4	54	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
633715002	4D	60	13	54	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
633715003	5A	60	7	60	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
633715004	5D	60	8	53	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
633715005	6A	60	12	62	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
633715006	6C	60	2	71	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
1205493704	7A	60	9	26	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
1205493705	7B	60	3	41	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
1205493706	7C	60	6	1296	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427

ASSAY 5-Sep-23 12:29:19
 Wizard 2480 s/n 46190630
 Protocol id 8 Ba-133
 Time limit
 Count limit
 Isotope Ba-133
 Protocol date 9/5/2023
 Run id. 7247

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	93	1	180	3174	1057.83	1.77	12:29:19
633177001	2	93	2	180	2956	985.13	1.84	93.13	12:32:33
633177002	3	93	3	180	2744	914.47	1.91	86.45	12:35:46
633177003	4	93	4	180	2785.28	928.26	1.89	87.75	12:39:00
633177004	5	93	5	180	2734	911.18	1.91	86.14	12:42:15
633177005	1	19	1	180	2856	951.8	1.87	89.98	12:45:50
633177006	2	19	2	180	2620.28	873.27	1.95	82.55	12:49:04
633542001	3	19	3	180	2889.57	962.95	1.86	91.03	12:52:18
633542002	4	19	4	180	2794	931.19	1.89	88.03	12:55:32
633542003	5	19	5	180	2815.57	938.29	1.88	88.70	12:58:46
633542004	1	2	1	180	2554.57	851.38	1.98	80.48	01:02:22
633612001	2	2	2	180	2483.28	827.61	2.01	78.24	01:05:36
633715001	3	2	3	180	2746	915.14	1.91	86.51	01:08:50
633715002	4	2	4	180	2668.28	889.24	1.94	84.06	01:12:03
633715003	5	2	5	180	2627.28	875.57	1.95	82.77	01:15:18
633715004	1	98	1	180	2656.28	885.24	1.94	83.68	01:19:06
633715005	2	98	2	180	2708.28	902.57	1.92	85.32	01:22:20
633715006	3	98	3	180	2531	843.56	1.99	79.74	01:25:34
1205493704	4	98	4	180	2803.28	934.23	1.89	88.32	01:28:48
1205493705	5	98	5	180	2620.28	873.24	1.95	82.55	01:32:02
1205493706	1	10	1	180	2595.28	864.95	1.96	81.77	01:35:50

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 05-Sep-2023

Detectors LB4100 E1 through H4 and PIC 1A through 14D and G5400W 1W through 1Z and LB4200 GA1 through OD4

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100G3	Above	Beta bkg	05-Sep 09:28	60	2.050	0.785	2.444	+1.57
LB4100H1	Above	Alpha bkg	05-Sep 05:45	60	0.283	-8.08E-2	0.225	+4.14
LB4100H1	Above	Beta bkg	05-Sep 05:45	60	2.800	-5.15E-1	3.743	+1.67
LB4200GA2	Above	Alpha bkg	05-Sep 07:45	60	1.150	-1.34E-1	0.379	+12.03
LB4200GA2	Above	Beta bkg	05-Sep 07:45	60	2.983	-3.66E-2	1.795	+6.89
LB4200GB2	Above	Beta bkg	05-Sep 04:50	60	120	0.129	1.304	+606.47
LB4200OC1	Above	Beta bkg	05-Sep 08:41	60	1.600	0.178	1.284	+4.71
PIC2C	Above	Alpha bkg	05-Sep 06:27	60	0.433	-1.83E-2	0.433	+3.00
PIC2C	Above	Beta bkg	05-Sep 06:27	60	21.050	0.030	2.148	+56.54
PIC6B	Above	Beta bkg	05-Sep 06:40	60	7.783	0.262	2.449	+17.64
PIC12B	Above	Alpha bkg	05-Sep 06:57	60	0.517	-8.27E-2	0.413	+4.25
PIC12B	Above	Beta bkg	05-Sep 06:57	60	13.833	-5.75E-1	2.641	+23.88
PIC14B	Above	Beta bkg	05-Sep 07:20	60	3.717	-1.06E-1	1.026	+17.26

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

Reviewed by Jc Poparad

Date 9/5/23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2479427

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205493704	MB	JE1	PIC7A	SEP-05-23 13:43:10	DONE	25mm Filter	01-JUN-23 00:00
1205493705	DUP	JE1	PIC7B	SEP-05-23 13:43:14	DONE	25mm Filter	01-JUN-23 00:00
1205493706	LCS	JE1	PIC7C	SEP-05-23 13:43:19	DONE	25mm Filter	01-JUN-23 00:00
633177001	SAMPLE	JE1	PIC1A	SEP-05-23 13:43:20	DONE	25mm Filter	01-JUN-23 00:00
633177002	SAMPLE	JE1	PIC1B	SEP-05-23 13:43:25	DONE	25mm Filter	01-JUN-23 00:00
633177003	SAMPLE	JE1	PIC1C	SEP-05-23 13:43:29	DONE	25mm Filter	01-JUN-23 00:00
633177004	SAMPLE	JE1	PIC1D	SEP-05-23 13:43:33	DONE	25mm Filter	01-JUN-23 00:00
633177005	SAMPLE	JE1	PIC2A	SEP-05-23 13:43:37	DONE	25mm Filter	01-JUN-23 00:00
633177006	SAMPLE	JE1	PIC2B	SEP-05-23 13:43:41	DONE	25mm Filter	01-JUN-23 00:00
633542001	SAMPLE	JE1	PIC2D	SEP-05-23 13:43:45	DONE	25mm Filter	01-JUN-23 00:00
633542002	SAMPLE	JE1	PIC3B	SEP-05-23 13:43:49	DONE	25mm Filter	01-JUN-23 00:00
633542003	SAMPLE	JE1	PIC3C	SEP-05-23 13:43:56	DONE	25mm Filter	01-JUN-23 00:00
633542004	SAMPLE	JE1	PIC3D	SEP-05-23 13:43:59	DONE	25mm Filter	01-JUN-23 00:00
633612001	SAMPLE	JE1	PIC4A	SEP-05-23 13:44:03	DONE	25mm Filter	01-JUN-23 00:00
633715001	SAMPLE	JE1	PIC4C	SEP-05-23 13:44:07	DONE	25mm Filter	01-JUN-23 00:00
633715002	SAMPLE	JE1	PIC4D	SEP-05-23 13:44:13	DONE	25mm Filter	01-JUN-23 00:00
633715003	SAMPLE	JE1	PIC5A	SEP-05-23 13:44:17	DONE	25mm Filter	01-JUN-23 00:00
633715004	SAMPLE	JE1	PIC5D	SEP-05-23 13:44:23	DONE	25mm Filter	01-JUN-23 00:00
633715005	SAMPLE	JE1	PIC6A	SEP-05-23 13:44:27	DONE	25mm Filter	01-JUN-23 00:00
633715006	SAMPLE	JE1	PIC6C	SEP-05-23 13:44:33	DONE	25mm Filter	01-JUN-23 00:00

Lucas Cell Raw Data

Batch 2479421 Check-list

This check-list was completed on 11-SEP-23 by Lyndsey Pace

This batch was reviewed by Gregory Ramsay on 11-SEP-23 and Lyndsey Pace on 11-SEP-23.

Batch ID:
2479421

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2479421
Analyst: Lyndsey Pace (LXP1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: LUCAS-C202389980

Due Dates for Lab: 06-SEP-2023			Package: 10-SEP-2023		SDG: 08-SEP-2023	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205493687	Radium-226 SPIKE	1715-G	.1	mL	
MS	1205493686	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	633177001	07-SEP-2023	1	507.1	507.1	09/07/23 12:36	601	09/11/23 05:26	09/11/23 09:19	7	7
2	633177002	07-SEP-2023	1	505.07	505.07	09/07/23 12:36	708	09/11/23 05:26	09/11/23 09:19	4	7
3	633177003	07-SEP-2023	1	502	502	09/07/23 12:36	805	09/11/23 05:26	09/11/23 09:19	3	7
4	633177004	07-SEP-2023	1	511.23	511.23	09/07/23 12:36	102	09/11/23 05:51	09/11/23 10:10	3	8
5	633177005	07-SEP-2023	1	502.96	502.96	09/07/23 12:36	205	09/11/23 05:51	09/11/23 10:10	1	17
6	633177006	07-SEP-2023	1	504.99	504.99	09/07/23 12:36	301	09/11/23 05:51	09/11/23 10:10	3	18
7	633542001	07-SEP-2023	1	504.78	504.78	09/07/23 12:36	403	09/11/23 05:51	09/11/23 10:10	3	9
8	633542002	07-SEP-2023	1	512.09	512.09	09/07/23 12:36	508	09/11/23 05:51	09/11/23 10:10	4	14
9	633542003	07-SEP-2023	1	502.38	502.38	09/07/23 12:36	603	09/11/23 05:51	09/11/23 10:10	2	8
10	633542004	07-SEP-2023	1	505.62	505.62	09/07/23 12:36	707	09/11/23 05:51	09/11/23 10:10	6	4
11	633612001	07-SEP-2023	1	508.06	508.06	09/07/23 12:36	803	09/11/23 05:51	09/11/23 10:10	1	8
12	633715001	07-SEP-2023	1	504.84	504.84	09/07/23 12:36	105	09/11/23 06:16	09/11/23 10:43	2	15
13	633715002	07-SEP-2023	1	505.73	505.73	09/07/23 12:36	201	09/11/23 06:16	09/11/23 10:43	3	19
14	633715003	07-SEP-2023	1	504.46	504.46	09/07/23 12:36	303	09/11/23 06:16	09/11/23 10:43	1	17
15	633715004	07-SEP-2023	1	506.34	506.34	09/07/23 12:36	406	09/11/23 06:16	09/11/23 10:43	1	16
16	633715005	07-SEP-2023	1	505.89	505.89	09/07/23 12:36	506	09/11/23 06:16	09/11/23 10:43	2	4
17	633715006	07-SEP-2023	1	500	500	09/07/23 12:36	607	09/11/23 06:16	09/11/23 10:43	2	9
18	1205493684 MB	07-SEP-2023	1	512.09	512.09	09/07/23 12:36	706	09/11/23 06:16	09/11/23 10:43	6	2
19	1205493685 DUP (633177001)	07-SEP-2023	1	502.39	502.39	09/07/23 12:36	804	09/11/23 06:16	09/11/23 10:43	6	6
20	1205493686 MS (633177001)	07-SEP-2023	1	105.09	105.09	09/07/23 12:36	103	09/11/23 06:40	09/11/23 11:01	4	371
21	1205493687 LCS	07-SEP-2023	1		512.09	09/07/23 12:36	208	09/11/23 06:40	09/11/23 11:01	7	354

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 07-SEP-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Procedure Code : LUC26RAL
 Parmname : Radium-226
 Required MDA : 1 pCi/L
 Halfife of Ra-226 : 1600 years
 Ra-226 Abundance : 1.00
 Halflife of Rn-222: 3.8235 days

Batch : 2479421
 Analyst : LIN01615
 Prep Date : 9/7/2023
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	633177001.1	0.5071	2.0284E-05	8/8/2023 11:08	601	15	7	0.467	7	0.233	30	1.8870
2	633177002.1	0.5051	2.0276E-05	8/8/2023 12:55	708	15	7	0.467	4	0.133	30	1.6020
3	633177003.1	0.5020	2.0264E-05	8/8/2023 14:21	805	15	7	0.467	3	0.100	30	1.5410
4	633177004.1	0.5112	2.0301E-05	8/8/2023 12:34	102	15	8	0.533	3	0.100	30	1.4860
5	633177005.1	0.5030	2.0268E-05	8/8/2023 11:08	205	15	17	1.133	1	0.033	30	1.7590
6	633177006.1	0.5050	2.0276E-05	8/8/2023 9:30	301	15	18	1.200	3	0.100	30	1.6430
7	633542001.1	0.5048	2.0275E-05	8/11/2023 9:53	403	15	9	0.600	3	0.100	30	1.5070
8	633542002.1	0.5121	2.0304E-05	8/11/2023 11:53	508	15	14	0.933	4	0.133	30	1.9780
9	633542003.1	0.5024	2.0266E-05	8/14/2023 9:53	603	15	8	0.533	2	0.067	30	1.8970
10	633542004.1	0.5056	2.0279E-05	8/11/2023 8:55	707	15	4	0.267	6	0.200	30	1.7280
11	633612001.1	0.5081	2.0288E-05	8/11/2023 10:10	803	15	8	0.533	1	0.033	30	1.4760
12	633715001.1	0.5048	2.0276E-05	8/14/2023 15:12	105	15	15	1.000	2	0.067	30	1.5340
13	633715002.1	0.5057	2.0279E-05	8/14/2023 11:03	201	15	19	1.267	3	0.100	30	1.6670
14	633715003.1	0.5045	2.0274E-05	8/14/2023 12:53	303	15	17	1.133	1	0.033	30	1.7210
15	633715004.1	0.5063	2.0281E-05	8/14/2023 14:31	406	15	16	1.067	1	0.033	30	1.4650
16	633715005.1	0.5059	2.0280E-05	8/14/2023 11:03	506	15	4	0.267	2	0.067	30	1.8780
17	633715006.1	0.5000	2.0256E-05	8/14/2023 9:10	607	15	9	0.600	2	0.067	30	1.7750
18	1205493684.1	0.5121	2.0304E-05	9/7/2023 0:00	706	15	2	0.133	6	0.200	30	1.5900
19	1205493685.1	0.5024	2.0266E-05	8/8/2023 11:08	804	15	6	0.400	6	0.200	30	1.6240
20	1205493686.1	0.1051	1.1678E-05	8/8/2023 11:08	103	15	371	24.733	4	0.133	30	1.6400
21	1205493687.1	0.5121	2.0304E-05	9/7/2023 0:00	208	15	354	23.600	7	0.233	30	1.7130

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
6.700%	7/1/2023	6/30/2024	9/7/2023 12:36	9/11/2023 5:26	9/11/2023 9:19	0.489	0.971	1.001	1.000
7.700%	11/1/2022	10/31/2023	9/7/2023 12:36	9/11/2023 5:26	9/11/2023 9:19	0.489	0.971	1.001	1.000
9.600%	4/8/2023	3/31/2024	9/7/2023 12:36	9/11/2023 5:26	9/11/2023 9:19	0.489	0.971	1.001	1.000
2.300%	5/1/2023	4/30/2024	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
9.200%	8/1/2023	7/31/2024	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
4.500%	10/25/2022	10/31/2023	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
6.100%	2/1/2023	1/31/2024	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
8.400%	6/1/2023	5/31/2024	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
3.500%	7/1/2023	6/30/2024	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
2.200%	11/1/2022	10/31/2023	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
4.700%	4/8/2023	3/31/2024	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
7.900%	5/1/2023	4/30/2024	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
7.400%	8/1/2023	7/31/2024	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
7.400%	10/25/2022	10/31/2023	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
2.900%	2/1/2023	1/31/2024	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
1.400%	6/1/2023	5/31/2024	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
6.800%	7/1/2023	6/30/2024	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
2.900%	11/1/2022	10/31/2023	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
6.100%	4/8/2023	3/31/2024	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
9.600%	5/1/2023	4/30/2024	9/7/2023 12:36	9/11/2023 6:40	9/11/2023 11:01	0.494	0.968	1.001	1.000
4.400%	8/1/2023	7/31/2024	9/7/2023 12:36	9/11/2023 6:40	9/11/2023 11:01	0.494	0.968	1.001	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-G
Spike Exp Date : 9/8/2023
Spike Activity (dpm/ml): 297.37
Spike Volume Added: 0.10

LCS S/N : 1715-G
LCS Exp Date : 9/8/2023
LCS Activity (dpm/ml): 297.37
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.3533	0.2494	1	0.6974	0.2316	84.78%	0.2333	0.1972	0.3837	0.3863		SAMPLE				
2	0.3159	0.2230	1	0.6808	0.3913	57.09%	0.3333	0.1886	0.4339	0.4415		SAMPLE				
3	0.2861	0.2020	1	0.6496	0.4502	51.52%	0.3667	0.1856	0.4467	0.4593		SAMPLE				
4	0.2913	0.2057	1	0.6614	0.5418	45.57%	0.4333	0.1972	0.4833	0.4902		SAMPLE				
5	0.1444	0.1020	1	0.4187	1.1810	26.80%	1.1000	0.2769	0.5827	0.6434		SAMPLE				
6	0.2668	0.1883	1	0.6056	1.2593	26.63%	1.1000	0.2887	0.6478	0.6819		SAMPLE				
7	0.2909	0.2054	1	0.6606	0.6243	42.08%	0.5000	0.2082	0.5095	0.5227		SAMPLE				
8	0.2523	0.1781	1	0.5438	0.7502	33.35%	0.8000	0.2582	0.4746	0.5022		SAMPLE				
9	0.1896	0.1339	1	0.4671	0.4651	41.80%	0.4667	0.1944	0.3797	0.3869		SAMPLE				
10	0.3582	0.2529	1	0.7233	0.0725	234.53%	0.0667	0.1563	0.3332	0.3333		SAMPLE				
11	0.1704	0.1203	1	0.4939	0.6333	38.58%	0.5000	0.1915	0.4754	0.4876		SAMPLE				
12	0.2328	0.1644	1	0.5735	1.1422	29.21%	0.9333	0.2625	0.6296	0.6744		SAMPLE				
13	0.2619	0.1849	1	0.5947	1.3115	26.45%	1.1667	0.2963	0.6528	0.7058		SAMPLE				
14	0.1469	0.1037	1	0.4257	1.2008	26.24%	1.1000	0.2769	0.5924	0.6414		SAMPLE				
15	0.1719	0.1213	1	0.4982	1.3202	26.17%	1.0333	0.2687	0.6730	0.7035		SAMPLE				
16	0.1898	0.1340	1	0.4675	0.1995	70.72%	0.2000	0.1414	0.2765	0.2781		SAMPLE				
17	0.2032	0.1434	1	0.5004	0.5695	39.12%	0.5333	0.2055	0.4301	0.4444		SAMPLE				
18	0.3835	0.2708	1	0.7743	-0.0776	187.11%	-0.0667	0.1247	0.2845	0.2846		MB				
19	0.3828	0.2702	1	0.7728	0.2323	91.49%	0.2000	0.1826	0.4157	0.4180	633177001.1	DUP	0.3%			
20	1.4738	1.0405	1	3.1766	134.7544	10.93%	24.6000	1.2858	13.8052	34.8117	633177001.1	MS			127.4654	105.7%
21	0.3830	0.2704	1	0.7561	25.1473	6.95%	23.3667	1.2574	2.6524	4.9915		LCS			26.1573	96.1%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 11-SEP-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	08:10	1	1.15E+05	115416	-0.12		
LUCAS2	EFF	08:09	1	1.32E+05	132307	-1.08		
LUCAS3	EFF	08:08	1	91119	91119	-2.79		
LUCAS4	EFF	08:07	1	1.29E+05	128693	1.2		
LUCAS5	EFF	08:05	1	1.32E+05	131887	-0.71		
LUCAS6	EFF	08:04	1	1.31E+05	130508	0.78		
LUCAS7	EFF	08:03	1	1.32E+05	131641	0.34		
LUCAS8	EFF	08:02	1	1.17E+05	117147	-1.32		

Reviewed by: 
Lyndsey Pace

Date: 11-SEP-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2479421

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
633177001	SAMPLE	LXP1	LUCAS6	SEP-11-23 09:19:00	DONE	Lucas Cell	01-JUL-23 00:00
633177002	SAMPLE	LXP1	LUCAS7	SEP-11-23 09:19:00	DONE	Lucas Cell	01-NOV-22 00:00
633177003	SAMPLE	LXP1	LUCAS8	SEP-11-23 09:19:00	DONE	Lucas Cell	08-APR-23 00:00
633177004	SAMPLE	LXP1	LUCAS1	SEP-11-23 10:10:00	DONE	Lucas Cell	01-MAY-23 00:00
633177005	SAMPLE	LXP1	LUCAS2	SEP-11-23 10:10:00	DONE	Lucas Cell	01-AUG-23 00:00
633177006	SAMPLE	LXP1	LUCAS3	SEP-11-23 10:10:00	DONE	Lucas Cell	25-OCT-22 00:00
633542001	SAMPLE	LXP1	LUCAS4	SEP-11-23 10:10:00	DONE	Lucas Cell	01-FEB-23 00:00
633542002	SAMPLE	LXP1	LUCAS5	SEP-11-23 10:10:00	DONE	Lucas Cell	01-JUN-23 00:00
633542003	SAMPLE	LXP1	LUCAS6	SEP-11-23 10:10:00	DONE	Lucas Cell	01-JUL-23 00:00
633542004	SAMPLE	LXP1	LUCAS7	SEP-11-23 10:10:00	DONE	Lucas Cell	01-NOV-22 00:00
633612001	SAMPLE	LXP1	LUCAS8	SEP-11-23 10:10:00	DONE	Lucas Cell	08-APR-23 00:00
633715001	SAMPLE	LXP1	LUCAS1	SEP-11-23 10:43:00	DONE	Lucas Cell	01-MAY-23 00:00
633715002	SAMPLE	LXP1	LUCAS2	SEP-11-23 10:43:00	DONE	Lucas Cell	01-AUG-23 00:00
633715003	SAMPLE	LXP1	LUCAS3	SEP-11-23 10:43:00	DONE	Lucas Cell	25-OCT-22 00:00
633715004	SAMPLE	LXP1	LUCAS4	SEP-11-23 10:43:00	DONE	Lucas Cell	01-FEB-23 00:00
633715005	SAMPLE	LXP1	LUCAS5	SEP-11-23 10:43:00	DONE	Lucas Cell	01-JUN-23 00:00
633715006	SAMPLE	LXP1	LUCAS6	SEP-11-23 10:43:00	DONE	Lucas Cell	01-JUL-23 00:00
1205493684	MB	LXP1	LUCAS7	SEP-11-23 10:43:00	DONE	Lucas Cell	01-NOV-22 00:00
1205493685	DUP	LXP1	LUCAS8	SEP-11-23 10:43:00	DONE	Lucas Cell	08-APR-23 00:00
1205493686	MS	LXP1	LUCAS1	SEP-11-23 11:01:00	DONE	Lucas Cell	01-MAY-23 00:00
1205493687	LCS	LXP1	LUCAS2	SEP-11-23 11:01:00	DONE	Lucas Cell	01-AUG-23 00:00

September 13, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 633542
SDG: S52163

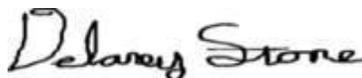
Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on August 16, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,



Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S52163
Work Order: 633542**

September 13, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on August 16, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage.

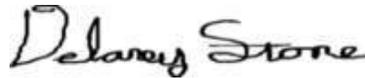
Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
633542001	S52163.01
633542002	S52163.02
633542003	S52163.03
633542004	S52163.04 Field Blank

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.



Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

633542

2680 East Lansing Dr., East Lansing, MI 48823
Phone (517) 332-0167 Fax (517) 332-4034
www.meritlabs.com



C.O.C. PAGE # 1 OF 1

REPORT TO

CHAIN OF CUSTODY RECORD

INVOICE TO

CONTACT NAME: **Project Management Team** CONTACT NAME: **Julie Teague** CONTACT NAME: **NAME**

COMPANY: **Merit Laboratories** COMPANY: **Merit Laboratories**

ADDRESS: **2680 East Lansing Drive** ADDRESS: **2680 East Lansing Drive**

CITY: **East Lansing** CITY: **East Lansing** CITY: **MI**

PHONE NO.: **517-332-0167** PHONE NO.: **517-332-0167** ZIP CODE: **48823**

FAX NO.: FAX NO. E-MAIL ADDRESS: **results@meritlabs.com** E-MAIL ADDRESS: **juliet@meritlabs.com**

PROJECT NO./NAME: **S52163**

TURNAROUND TIME REQUIRED 1 DAY 2 DAYS 3 DAYS STANDARD OTHER

DELIVERABLES REQUIRED STD LEVEL II LEVEL III LEVEL IV EDD OTHER

MATRIX CODE	YEAR	DATE	TIME	IDENTIFICATION-DESCRIPTION	# Containers & Preservatives								
					NONE	H ₂ O	HNO ₃	H ₂ SO ₄	NaOH	MeOH	OTHER		
	8/11/23	1138		S52163.01	2								
	8/11/23	1410		S52163.02	2								
	8/11/23	1138		S52163.03	2								
	8/11/23	1040		S52163.04 Field Blank	2								

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

Certifications
 OHIO VAP Drinking Water
 DoD NPDES
 Project Locations
 Detroit New York
 Other _____
 Special Instructions
 * E903.1 Mod.
 ** E904.0/SW 9320 Mod.

Seal Intact: Radium 226* YES NO
 Radium 228* YES NO
 Please use calculation product & provide Radium 226/228 combined results on the report

(No Ice needed)
 ** Subcontracted to
 GEL Laboratories, Inc.
 2040 Savage Road
 Charleston, SC 29407

RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
 RECEIVED BY: SIGNATURE/ORGANIZATION DATE TIME
 SEAL NO. SEAL INTACT YES NO INITIALS
 SEAL NO. SEAL INTACT YES NO INITIALS

RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
 RECEIVED BY: SIGNATURE/ORGANIZATION DATE TIME

RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
 RECEIVED BY: SIGNATURE/ORGANIZATION DATE TIME

RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
 RECEIVED BY: SIGNATURE/ORGANIZATION DATE TIME
 SEAL NO. SEAL INTACT YES NO INITIALS
 SEAL NO. SEAL INTACT YES NO INITIALS

RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
 RECEIVED BY: SIGNATURE/ORGANIZATION DATE TIME

RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
 RECEIVED BY: SIGNATURE/ORGANIZATION DATE TIME

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

SAMPLE RECEIPT & REVIEW FORM

Client: MERI		SDG/AR/COC/Work Order: 633542			
Received By: EG		Date Received: 8/17/23			
Carrier and Tracking Number		FedEx Express FedEx Ground <input checked="" type="radio"/> UPS Field Services Courier Other 12 466 477 03 6390 2359			
Suspected Hazard Information		*If Not Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.			
A) Shipped as a DOT Hazardous?		Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___			
B) Did the client designate the samples are to be received as radioactive?		COC location on all hazardous containers and all other designations: _____			
C) Did the RSO classify the samples as radioactive?		Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM/mR/Hr Classified as: Rad 1 Rad 2 Rad 3			
D) Did the client designate samples are hazardous?		COC location on all hazardous containers and all other designations: _____			
E) Did the RSO identify possible hazards?		IF D or B is yes, select Hazards below: PCBs Flammable Foreign Soil RCRA Asbestos Beryllium Other: _____			
Sample Receipt Criteria		Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Preservation Method: Wet Ice Ice Packs Dry ice <input checked="" type="radio"/> None Other: _____ *all temperatures are recorded in Celsius TEMP: 23
4	Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Temperature Device Serial #: <u>IR8-23</u> Secondary Temperature Device Serial # (If Applicable): _____
5	Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sample ID's and Containers Affected: <u>552163.02 1 & 2 pH 7.2</u> If Preservation added, Lot#: _____
7	Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer)
					Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No) Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected: _____
8	Samples received within holding time?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ID's and tests affected: _____
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ID's and containers affected: _____
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No dates on containers No times on containers COC missing info Other (describe) <u>times dont match COC on containers</u>
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
13	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Not relinquished Other (describe)
Comments (Use Continuation Form if needed):					

PM (or PMA) review: Initials AM Date 8/17/23 Page 1 of 1

Rev 01.

SAMPLE RECEIPT & REVIEW FORM

Client: MERI	SDG/AR/COC/Work Order: 655542
Received By: EG	Date Received: 8/17/23 8/16/23 8/12/23
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground UPS Field Services Courier Other 12 466 477 03 6390 2359

Suspected Hazard Information	Yes	No	*If Not Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
A) Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples are to be received as radioactive?		<input checked="" type="checkbox"/>	COC notation on individual containers or containers equal (if not used notation)
C) Did the RSO classify the samples as radioactive?		<input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM / mR/Hr Classified as: Rad 1 Rad 2 Rad 3
D) Did the client designate samples are hazardous?		<input checked="" type="checkbox"/>	COC notation on individual containers or containers equal (if not used notation)
E) Did the RSO identify possible hazards?		<input checked="" type="checkbox"/>	If D or E is yes, select Hazards below: PCBs Flammable Foreign Soil RCRA Asbestos Beryllium Other: _____

Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>			Circle Applicable: Client contacted and provided COC COC created upon receipt
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		<input checked="" type="checkbox"/>		Preservation Method: Wet Ice Ice Packs Dry ice None Other: *all temperatures are recorded in Celsius TEMP: 23
4 Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>			Temperature Device Serial #: IR6-23 Secondary Temperature Device Serial # (If Applicable):
5 Sample containers intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6 Samples requiring chemical preservation at proper pH?			<input checked="" type="checkbox"/>	Sample ID's and Containers Affected: 552163.02 1 & 2 pH 7.2 If Preservation added, Lot#:
7 Do any samples require Volatile Analysis?			<input checked="" type="checkbox"/>	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer)
			<input checked="" type="checkbox"/>	Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No)
			<input checked="" type="checkbox"/>	Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected:
8 Samples received within holding time?	<input checked="" type="checkbox"/>			ID's and tests affected:
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>			ID's and containers affected:
10 Date & time on COC match date & time on bottles?			<input checked="" type="checkbox"/>	Circle Applicable: No dates on containers No times on containers COC missing info Other (describe) times dont match COC on containers
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>			Circle Applicable: No container count on COC Other (describe)
12 Are sample containers identifiable as GEL provided by use of GEL labels?			<input checked="" type="checkbox"/>	
13 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>			Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):
 Rev 01: Receive dates were updated on final review of the data package. Scan history of UPS tracking confirms reception 8/16/23. *just*.

Laboratory Certifications

List of current GEL Certifications as of 12 September 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-23-21
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S52163
Work Order #: 633542**

Product: Radium-226+Radium-228 Calculation

Analytical Method: Calculation

Analytical Procedure: GL-RAD-D-003 REV# 45

Analytical Batch: 2479712

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
633542001	S52163.01
633542002	S52163.02
633542003	S52163.03
633542004	S52163.04 Field Blank

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2479427

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
633542001	S52163.01
633542002	S52163.02
633542003	S52163.03
633542004	S52163.04 Field Blank
1205493704	Method Blank (MB)
1205493705	633177001(S51950.01) Sample Duplicate (DUP)
1205493706	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2479421

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
633542001	S52163.01
633542002	S52163.02
633542003	S52163.03
633542004	S52163.04 Field Blank
1205493684	Method Blank (MB)
1205493685	633177001(S51950.01) Sample Duplicate (DUP)
1205493686	633177001(S51950.01) Matrix Spike (MS)
1205493687	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

The matrix spike, 1205493686 (S51950.01MS), aliquot was reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S52163 GEL Work Order: 633542

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 13 SEP 2023

Title: Analyst III - Data Validator

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: September 13, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S52163.01 Project: MERI00120
Sample ID: 633542001 Client ID: MERI001
Matrix: Ground Water
Collect Date: 11-AUG-23 09:53
Receive Date: 16-AUG-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.326	+/-1.06	1.90	3.00	pCi/L		JE1	09/05/23	1343	2479427	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.951	+/-1.18			pCi/L		1 TON1	09/11/23	1212	2479712	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.624	+/-0.509	0.661	1.00	pCi/L		LXP1	09/11/23	1010	2479421	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			91	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: September 13, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S52163.02 Project: MERI00120
Sample ID: 633542002 Client ID: MERI001
Matrix: Ground Water
Collect Date: 11-AUG-23 11:53
Receive Date: 16-AUG-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.470	+/-0.635	1.09	3.00	pCi/L		JE1	09/05/23	1343	2479427	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.22	+/-0.793			pCi/L		1 TON1	09/11/23	1212	2479712	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.750	+/-0.475	0.544	1.00	pCi/L		LXP1	09/11/23	1010	2479421	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			88	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: September 13, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S52163.03 Project: MERI00120
Sample ID: 633542003 Client ID: MERI001
Matrix: Ground Water
Collect Date: 14-AUG-23 09:53
Receive Date: 16-AUG-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.147	+/-0.563	1.07	3.00	pCi/L			JE1	09/05/23	1343 2479427	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.612	+/-0.679			pCi/L		1	TON1	09/11/23	1212 2479712	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.465	+/-0.380	0.467	1.00	pCi/L			LXP1	09/11/23	1010 2479421	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			88.7	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: September 13, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S52163.04 Field Blank Project: MERI00120
Sample ID: 633542004 Client ID: MERI001
Matrix: Ground Water
Collect Date: 11-AUG-23 08:55
Receive Date: 16-AUG-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.556	+/-0.846	1.47	3.00	pCi/L			JE1	09/05/23	1343 2479427	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.629	+/-0.909			pCi/L		1	TON1	09/11/23	1212 2479712	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.0725	+/-0.333	0.723	1.00	pCi/L			LXP1	09/11/23	1010 2479421	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			80.5	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: September 13, 2023

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Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan

Contact: John Laverty

Workorder: 633542

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2479427										
QC1205493705	633177001	DUP									
Radium-228	U	0.945		1.47	pCi/L	43.4		(0% - 100%)	JE1	09/05/23	13:43
	Uncertainty	+/-0.862		+/-0.765							
QC1205493706	LCS										
Radium-228	78.6			76.2	pCi/L		97	(75%-125%)		09/05/23	13:43
	Uncertainty			+/-4.23							
QC1205493704	MB										
Radium-228			U	0.294	pCi/L					09/05/23	13:43
	Uncertainty			+/-0.580							
Rad Ra-226											
Batch	2479421										
QC1205493685	633177001	DUP									
Radium-226	U	0.232	U	0.232	pCi/L	N/A		N/A	LXP1	09/11/23	10:43
	Uncertainty	+/-0.384		+/-0.416							
QC1205493687	LCS										
Radium-226	26.2			25.1	pCi/L		96.1	(75%-125%)		09/11/23	11:01
	Uncertainty			+/-2.65							
QC1205493684	MB										
Radium-226			U	-0.0776	pCi/L					09/11/23	10:43
	Uncertainty			+/-0.285							
QC1205493686	633177001	MS									
Radium-226	127 U	0.232		135	pCi/L		106	(75%-125%)		09/11/23	11:01
	Uncertainty	+/-0.384		+/-13.8							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- H Analytical holding time was exceeded
- < Result is less than value reported
- > Result is greater than value reported

GEL LABORATORIES LLC

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QC Summary

Workorder: 633542

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Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
NI											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2479427 Check-list

This check-list was completed on 05-SEP-23 by Nat Long

This batch was reviewed by Nat Long on 05-SEP-23 and Kenshalla Oston on 06-SEP-23.

Batch ID:
2479427

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2479427
Analyst: Jacqueline Winston (JE1)
 Prep: Charles Hall (CH7)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: BAL-C236761727

Due Dates for Lab: 06-SEP-2023 **Package:** 10-SEP-2023 **SDG:** 08-SEP-2023

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205493706	228	2051-B	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	633177001	29-AUG-2023	3	301.35	301.35	08/31/23 13:57	09/05/23 12:07
2	633177002	29-AUG-2023	3	300.49	300.49	08/31/23 13:57	09/05/23 12:07
3	633177003	29-AUG-2023	3	302.58	302.58	08/31/23 13:57	09/05/23 12:07
4	633177004	29-AUG-2023	3	300.56	300.56	08/31/23 13:57	09/05/23 12:07
5	633177005	29-AUG-2023	3	302.65	302.65	08/31/23 13:57	09/05/23 12:07
6	633177006	29-AUG-2023	3	303.89	303.89	08/31/23 13:57	09/05/23 12:07
7	633542001	29-AUG-2023	3	302.12	302.12	08/31/23 13:57	09/05/23 12:07
8	633542002	29-AUG-2023	3	305.71	305.71	08/31/23 13:57	09/05/23 12:07
9	633542003	29-AUG-2023	3	303.26	303.26	08/31/23 13:57	09/05/23 12:07
10	633542004	29-AUG-2023	3	303.05	303.05	08/31/23 13:57	09/05/23 12:07
11	633612001	29-AUG-2023	3	301	301	08/31/23 13:57	09/05/23 12:07
12	633715001	29-AUG-2023	3	302.8	302.8	08/31/23 13:57	09/05/23 12:07
13	633715002	29-AUG-2023	3	300.9	300.9	08/31/23 13:57	09/05/23 12:07
14	633715003	29-AUG-2023	3	301.1	301.1	08/31/23 13:57	09/05/23 12:07
15	633715004	29-AUG-2023	3	304.4	304.4	08/31/23 13:57	09/05/23 12:07
16	633715005	29-AUG-2023	3	302.8	302.8	08/31/23 13:57	09/05/23 12:07
17	633715006	29-AUG-2023	3	300.6	300.6	08/31/23 13:57	09/05/23 12:07
18	1205493704 MB	29-AUG-2023	3		305.71	08/31/23 13:57	09/05/23 12:07
19	1205493705 DUP (633177001)	29-AUG-2023	3	300.46	300.46	08/31/23 13:57	09/05/23 12:07
20	1205493706 LCS	29-AUG-2023	3		305.71	08/31/23 13:57	09/05/23 12:07

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 2097-B	Ba-133 Tracer	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 29-AUG-2023 00:00
REGNT 3956035	Barium Carrier Ra228 REG	1 mL	
REGNT 3960868	RGF-1M Citric Acid	5 mL	
REGNT 3959817	2M HCl	20 mL	
REGNT 3955326	RGF-7M Nitric Acid	25 mL	
REGNT 3958741	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT DGA071323	2472106	2 g	
REGNT 3957480.5	RGF-Hydrofluoric Acid	4 mL	
REGNT 3940152	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3957910	RGF-Neodymium Substrate	5 mL	
REGNT 3954355.13	Nitric Acid	5 mL	
REGNT 3958747	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3946262	RGF-50% Potassium Carbonate	2 mL	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 2097-B
 Tracer Exp Date : 7/12/2024
 Tracer Volume Added: 0.10

Batch : 2479427
 Analyst : CHA00185
 Prep Date : 8/29/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 3 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	633177001.1	0.3014	1.8482E-05	8/8/2023 11:08	1057.8	1.77%	985.1	1.84%	0.1	0.000200
2	633177002.1	0.3005	1.8467E-05	8/8/2023 12:55	1057.8	1.77%	914.5	1.91%	0.1	0.000200
3	633177003.1	0.3026	1.8503E-05	8/8/2023 14:21	1057.8	1.77%	928.3	1.89%	0.1	0.000200
4	633177004.1	0.3006	1.8469E-05	8/8/2023 12:34	1057.8	1.77%	911.2	1.91%	0.1	0.000200
5	633177005.1	0.3027	1.8504E-05	8/8/2023 11:08	1057.8	1.77%	951.8	1.87%	0.1	0.000200
6	633177006.1	0.3039	1.8524E-05	8/8/2023 9:30	1057.8	1.77%	873.3	1.95%	0.1	0.000200
7	633542001.1	0.3021	1.8495E-05	8/11/2023 9:53	1057.8	1.77%	963.0	1.86%	0.1	0.000200
8	633542002.1	0.3057	1.8554E-05	8/11/2023 11:53	1057.8	1.77%	931.2	1.89%	0.1	0.000200
9	633542003.1	0.3033	1.8514E-05	8/14/2023 9:53	1057.8	1.77%	938.3	1.88%	0.1	0.000200
10	633542004.1	0.3031	1.8510E-05	8/11/2023 8:55	1057.8	1.77%	851.4	1.98%	0.1	0.000200
11	633612001.1	0.3010	1.8476E-05	8/11/2023 10:10	1057.8	1.77%	827.6	2.01%	0.1	0.000200
12	633715001.1	0.3028	1.8506E-05	8/14/2023 15:12	1057.8	1.77%	915.1	1.91%	0.1	0.000200
13	633715002.1	0.3009	1.8474E-05	8/14/2023 11:03	1057.8	1.77%	889.2	1.94%	0.1	0.000200
14	633715003.1	0.3011	1.8478E-05	8/14/2023 12:53	1057.8	1.77%	875.6	1.95%	0.1	0.000200
15	633715004.1	0.3044	1.8533E-05	8/14/2023 14:31	1057.8	1.77%	885.2	1.94%	0.1	0.000200
16	633715005.1	0.3028	1.8506E-05	8/14/2023 11:03	1057.8	1.77%	902.6	1.92%	0.1	0.000200
17	633715006.1	0.3006	1.8469E-05	8/14/2023 9:10	1057.8	1.77%	843.6	1.99%	0.1	0.000200
18	1205493704.1	0.3057	1.8554E-05	8/29/2023 0:00	1057.8	1.77%	934.2	1.89%	0.1	0.000200
19	1205493705.1	0.3005	1.8467E-05	8/8/2023 11:08	1057.8	1.77%	873.2	1.95%	0.1	0.000200
20	1205493706.1	0.3057	1.8554E-05	8/29/2023 0:00	1057.8	1.77%	865.0	1.96%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated Sample Recovery %	Sample Recovery Error %
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction		
1	1A	60	11	45	0.750	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.834	1.000	1.057	93.1%	2.57%
2	1B	60	2	30	0.500	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.834	1.000	1.057	86.4%	2.62%
3	1C	60	9	65	1.083	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.834	1.000	1.057	87.8%	2.60%
4	1D	60	3	41	0.683	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.834	1.000	1.057	86.1%	2.62%
5	2A	60	5	45	0.750	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.834	1.000	1.057	90.0%	2.59%
6	2B	60	2	44	0.733	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.834	1.000	1.057	82.6%	2.65%
7	2D	60	5	88	1.467	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.992	0.834	1.000	1.057	91.0%	2.58%
8	3B	60	2	31	0.517	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.992	0.834	1.000	1.057	88.0%	2.60%
9	3C	60	4	24	0.400	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.993	0.834	1.000	1.057	88.7%	2.60%
10	3D	60	10	37	0.617	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.992	0.833	1.000	1.057	80.5%	2.67%
11	4A	60	7	23	0.383	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.992	0.833	1.000	1.057	78.2%	2.69%
12	4C	60	4	54	0.900	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.993	0.833	1.000	1.057	86.5%	2.62%
13	4D	60	13	54	0.900	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.993	0.833	1.000	1.057	84.1%	2.64%
14	5A	60	7	60	1.000	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.993	0.833	1.000	1.057	82.8%	2.65%
15	5D	60	8	53	0.883	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.993	0.833	1.000	1.057	83.7%	2.64%
16	6A	60	12	62	1.033	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.993	0.833	1.000	1.057	85.3%	2.63%
17	6C	60	2	71	1.183	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.993	0.833	1.000	1.057	79.7%	2.68%
18	7A	60	9	26	0.433	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.997	0.835	1.000	1.057	88.3%	2.60%
19	7B	60	3	41	0.683	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.835	1.000	1.057	82.6%	2.65%
20	7C	60	6	1296	21.600	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.997	0.834	1.000	1.057	81.8%	2.66%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2023	5/31/2024	0.5320	0.00738	0.505	9/1/2023 18:12	1000
2	PIC	6/1/2023	5/31/2024	0.6098	0.00711	0.323	9/1/2023 18:12	1000
3	PIC	6/1/2023	5/31/2024	0.6077	0.00847	0.764	9/1/2023 18:12	1000
4	PIC	6/1/2023	5/31/2024	0.6071	0.00692	0.608	9/1/2023 18:12	1000
5	PIC	6/1/2023	5/31/2024	0.6083	0.01914	0.461	9/1/2023 18:12	1000
6	PIC	6/1/2023	5/31/2024	0.6253	0.02111	0.409	9/1/2023 18:12	1000
7	PIC	6/1/2023	5/31/2024	0.6206	0.00745	1.370	9/1/2023 18:12	1000
8	PIC	6/1/2023	5/31/2024	0.6266	0.01614	0.379	9/1/2023 18:12	1000
9	PIC	6/1/2023	5/31/2024	0.6245	0.00988	0.357	9/1/2023 18:12	1000
10	PIC	6/1/2023	5/31/2024	0.5677	0.02297	0.483	9/1/2023 18:12	1000
11	PIC	6/1/2023	5/31/2024	0.6074	0.01123	0.409	9/1/2023 18:12	1000
12	PIC	6/1/2023	5/31/2024	0.6376	0.00889	0.784	9/1/2023 18:13	1000
13	PIC	6/1/2023	5/31/2024	0.6412	0.00773	0.708	9/1/2023 18:13	1000
14	PIC	6/1/2023	5/31/2024	0.6366	0.00851	1.264	9/1/2023 18:13	1000
15	PIC	6/1/2023	5/31/2024	0.6566	0.00925	0.844	9/1/2023 18:32	1000
16	PIC	6/1/2023	5/31/2024	0.6444	0.02228	0.756	9/1/2023 18:09	1000
17	PIC	6/1/2023	5/31/2024	0.6167	0.01970	1.023	9/1/2023 18:10	1000
18	PIC	6/1/2023	5/31/2024	0.6229	0.00594	0.347	9/1/2023 18:09	1000
19	PIC	6/1/2023	5/31/2024	0.6423	0.00627	0.277	9/1/2023 18:10	1000
20	PIC	6/1/2023	5/31/2024	0.6369	0.00790	0.397	9/1/2023 18:10	1000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
 Spike Exp Date : N/A
 Spike Activity (dpm/ml): N/A
 Spike Volume Added: N/A

LCS S/N : 2051-B
 LCS Exp Date : 3/27/2024
 LCS Activity (dpm/ml): 533.11
 LCS Volume Added: 0.10

Results Pos.	Decision	Critical	Required	Sample Act.		Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
	Level pCi/L	Level pCi/L	MDA pCi/L	MDA pCi/L	Conc. pCi/L	Error %	Rate CPM	Rate Error CPM	Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L						
1	0.8492	0.5995	3	1.3920	0.9454	46.62%	0.2450	0.1140	0.8625	0.8953		SAMPLE				
2	0.6403	0.4520	3	1.0859	0.6439	52.63%	0.1770	0.0930	0.6633	0.6832		SAMPLE				
3	0.9667	0.6825	3	1.5435	1.1404	43.05%	0.3193	0.1372	0.9602	1.0030		SAMPLE				
4	0.8855	0.6252	3	1.4337	0.2762	145.42%	0.0753	0.1095	0.7872	0.7904		SAMPLE				
5	0.7317	0.5166	3	1.2071	1.0056	39.52%	0.2890	0.1138	0.7764	0.8181		SAMPLE				
6	0.7279	0.5139	3	1.2116	1.1920	34.82%	0.3243	0.1124	0.8096	0.8657		SAMPLE				
7	1.2233	0.8637	3	1.8960	0.3262	166.23%	0.0967	0.1607	1.0627	1.0660		SAMPLE				
8	0.6513	0.4598	3	1.0905	0.4703	68.94%	0.1377	0.0948	0.6349	0.6461		SAMPLE				
9	0.6341	0.4477	3	1.0667	0.1474	194.92%	0.0430	0.0838	0.5629	0.5641		SAMPLE				
10	0.8958	0.6324	3	1.4730	0.5563	77.69%	0.1337	0.1037	0.8462	0.8583		SAMPLE				
11	0.7980	0.5634	3	1.3283	-0.1034	321.24%	-0.0257	0.0824	0.6511	0.6514		SAMPLE				
12	0.9454	0.6674	3	1.5072	0.3999	108.34%	0.1160	0.1256	0.8489	0.8550		SAMPLE				
13	0.9253	0.6533	3	1.4841	0.6818	65.33%	0.1920	0.1253	0.8723	0.8893		SAMPLE				
14	1.2641	0.8924	3	1.9664	-0.9584	50.80%	-0.2640	0.1339	0.9528	0.9530		SAMPLE				
15	0.9800	0.6919	3	1.5560	0.1355	317.21%	0.0393	0.1248	0.8423	0.8430		SAMPLE				
16	0.9319	0.6579	3	1.4889	0.9598	48.47%	0.2773	0.1341	0.9095	0.9425		SAMPLE				
17	1.2210	0.8621	3	1.9190	0.6250	89.89%	0.1603	0.1440	1.1005	1.1121		SAMPLE				
18	0.6205	0.4381	3	1.0462	0.2936	100.81%	0.0863	0.0870	0.5800	0.5848		MB				
19	0.5894	0.4161	3	1.0130	1.4693	26.72%	0.4063	0.1080	0.7655	0.8517	633177001.1	DUP	43.4%			
20	0.7013	0.4951	3	1.1699	76.2032	3.96%	21.2030	0.6003	4.2289	19.8415		LCS			78.5514	97.0%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
633177001	1A	60	11	45	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633177002	1B	60	2	30	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633177003	1C	60	9	65	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633177004	1D	60	3	41	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633177005	2A	60	5	45	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633177006	2B	60	2	44	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633542001	2D	60	5	88	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633542002	3B	60	2	31	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633542003	3C	60	4	24	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633542004	3D	60	10	37	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633612001	4A	60	7	23	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
633715001	4C	60	4	54	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
633715002	4D	60	13	54	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
633715003	5A	60	7	60	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
633715004	5D	60	8	53	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
633715005	6A	60	12	62	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
633715006	6C	60	2	71	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
1205493704	7A	60	9	26	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
1205493705	7B	60	3	41	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
1205493706	7C	60	6	1296	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427

ASSAY 5-Sep-23 12:29:19
 Wizard 2480 s/n 46190630
 Protocol id 8 Ba-133
 Time limit
 Count limit
 Isotope Ba-133
 Protocol date 9/5/2023
 Run id. 7247

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	93	1	180	3174	1057.83	1.77	12:29:19
633177001	2	93	2	180	2956	985.13	1.84	93.13	12:32:33
633177002	3	93	3	180	2744	914.47	1.91	86.45	12:35:46
633177003	4	93	4	180	2785.28	928.26	1.89	87.75	12:39:00
633177004	5	93	5	180	2734	911.18	1.91	86.14	12:42:15
633177005	1	19	1	180	2856	951.8	1.87	89.98	12:45:50
633177006	2	19	2	180	2620.28	873.27	1.95	82.55	12:49:04
633542001	3	19	3	180	2889.57	962.95	1.86	91.03	12:52:18
633542002	4	19	4	180	2794	931.19	1.89	88.03	12:55:32
633542003	5	19	5	180	2815.57	938.29	1.88	88.70	12:58:46
633542004	1	2	1	180	2554.57	851.38	1.98	80.48	01:02:22
633612001	2	2	2	180	2483.28	827.61	2.01	78.24	01:05:36
633715001	3	2	3	180	2746	915.14	1.91	86.51	01:08:50
633715002	4	2	4	180	2668.28	889.24	1.94	84.06	01:12:03
633715003	5	2	5	180	2627.28	875.57	1.95	82.77	01:15:18
633715004	1	98	1	180	2656.28	885.24	1.94	83.68	01:19:06
633715005	2	98	2	180	2708.28	902.57	1.92	85.32	01:22:20
633715006	3	98	3	180	2531	843.56	1.99	79.74	01:25:34
1205493704	4	98	4	180	2803.28	934.23	1.89	88.32	01:28:48
1205493705	5	98	5	180	2620.28	873.24	1.95	82.55	01:32:02
1205493706	1	10	1	180	2595.28	864.95	1.96	81.77	01:35:50

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 05-Sep-2023

Detectors LB4100 E1 through H4 and PIC 1A through 14D and G5400W 1W through 1Z and LB4200 GA1 through OD4

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100G3	Above	Beta bkg	05-Sep 09:28	60	2.050	0.785	2.444	+1.57
LB4100H1	Above	Alpha bkg	05-Sep 05:45	60	0.283	-8.08E-2	0.225	+4.14
LB4100H1	Above	Beta bkg	05-Sep 05:45	60	2.800	-5.15E-1	3.743	+1.67
LB4200GA2	Above	Alpha bkg	05-Sep 07:45	60	1.150	-1.34E-1	0.379	+12.03
LB4200GA2	Above	Beta bkg	05-Sep 07:45	60	2.983	-3.66E-2	1.795	+6.89
LB4200GB2	Above	Beta bkg	05-Sep 04:50	60	120	0.129	1.304	+606.47
LB4200OC1	Above	Beta bkg	05-Sep 08:41	60	1.600	0.178	1.284	+4.71
PIC2C	Above	Alpha bkg	05-Sep 06:27	60	0.433	-1.83E-2	0.433	+3.00
PIC2C	Above	Beta bkg	05-Sep 06:27	60	21.050	0.030	2.148	+56.54
PIC6B	Above	Beta bkg	05-Sep 06:40	60	7.783	0.262	2.449	+17.64
PIC12B	Above	Alpha bkg	05-Sep 06:57	60	0.517	-8.27E-2	0.413	+4.25
PIC12B	Above	Beta bkg	05-Sep 06:57	60	13.833	-5.75E-1	2.641	+23.88
PIC14B	Above	Beta bkg	05-Sep 07:20	60	3.717	-1.06E-1	1.026	+17.26

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

Reviewed by Jc Poparad

Date 9/5/23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2479427

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205493704	MB	JE1	PIC7A	SEP-05-23 13:43:10	DONE	25mm Filter	01-JUN-23 00:00
1205493705	DUP	JE1	PIC7B	SEP-05-23 13:43:14	DONE	25mm Filter	01-JUN-23 00:00
1205493706	LCS	JE1	PIC7C	SEP-05-23 13:43:19	DONE	25mm Filter	01-JUN-23 00:00
633177001	SAMPLE	JE1	PIC1A	SEP-05-23 13:43:20	DONE	25mm Filter	01-JUN-23 00:00
633177002	SAMPLE	JE1	PIC1B	SEP-05-23 13:43:25	DONE	25mm Filter	01-JUN-23 00:00
633177003	SAMPLE	JE1	PIC1C	SEP-05-23 13:43:29	DONE	25mm Filter	01-JUN-23 00:00
633177004	SAMPLE	JE1	PIC1D	SEP-05-23 13:43:33	DONE	25mm Filter	01-JUN-23 00:00
633177005	SAMPLE	JE1	PIC2A	SEP-05-23 13:43:37	DONE	25mm Filter	01-JUN-23 00:00
633177006	SAMPLE	JE1	PIC2B	SEP-05-23 13:43:41	DONE	25mm Filter	01-JUN-23 00:00
633542001	SAMPLE	JE1	PIC2D	SEP-05-23 13:43:45	DONE	25mm Filter	01-JUN-23 00:00
633542002	SAMPLE	JE1	PIC3B	SEP-05-23 13:43:49	DONE	25mm Filter	01-JUN-23 00:00
633542003	SAMPLE	JE1	PIC3C	SEP-05-23 13:43:56	DONE	25mm Filter	01-JUN-23 00:00
633542004	SAMPLE	JE1	PIC3D	SEP-05-23 13:43:59	DONE	25mm Filter	01-JUN-23 00:00
633612001	SAMPLE	JE1	PIC4A	SEP-05-23 13:44:03	DONE	25mm Filter	01-JUN-23 00:00
633715001	SAMPLE	JE1	PIC4C	SEP-05-23 13:44:07	DONE	25mm Filter	01-JUN-23 00:00
633715002	SAMPLE	JE1	PIC4D	SEP-05-23 13:44:13	DONE	25mm Filter	01-JUN-23 00:00
633715003	SAMPLE	JE1	PIC5A	SEP-05-23 13:44:17	DONE	25mm Filter	01-JUN-23 00:00
633715004	SAMPLE	JE1	PIC5D	SEP-05-23 13:44:23	DONE	25mm Filter	01-JUN-23 00:00
633715005	SAMPLE	JE1	PIC6A	SEP-05-23 13:44:27	DONE	25mm Filter	01-JUN-23 00:00
633715006	SAMPLE	JE1	PIC6C	SEP-05-23 13:44:33	DONE	25mm Filter	01-JUN-23 00:00

Lucas Cell Raw Data

Batch 2479421 Check-list

This check-list was completed on 11-SEP-23 by Lyndsey Pace

This batch was reviewed by Gregory Ramsay on 11-SEP-23 and Lyndsey Pace on 11-SEP-23.

Batch ID:
2479421

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2479421
Analyst: Lyndsey Pace (LXP1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: LUCAS-C202389980

Due Dates for Lab: 06-SEP-2023			Package: 10-SEP-2023	SDG: 08-SEP-2023		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205493687	Radium-226 SPIKE	1715-G	.1	mL	
MS	1205493686	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	633177001	07-SEP-2023	1	507.1	507.1	09/07/23 12:36	601	09/11/23 05:26	09/11/23 09:19	7	7
2	633177002	07-SEP-2023	1	505.07	505.07	09/07/23 12:36	708	09/11/23 05:26	09/11/23 09:19	4	7
3	633177003	07-SEP-2023	1	502	502	09/07/23 12:36	805	09/11/23 05:26	09/11/23 09:19	3	7
4	633177004	07-SEP-2023	1	511.23	511.23	09/07/23 12:36	102	09/11/23 05:51	09/11/23 10:10	3	8
5	633177005	07-SEP-2023	1	502.96	502.96	09/07/23 12:36	205	09/11/23 05:51	09/11/23 10:10	1	17
6	633177006	07-SEP-2023	1	504.99	504.99	09/07/23 12:36	301	09/11/23 05:51	09/11/23 10:10	3	18
7	633542001	07-SEP-2023	1	504.78	504.78	09/07/23 12:36	403	09/11/23 05:51	09/11/23 10:10	3	9
8	633542002	07-SEP-2023	1	512.09	512.09	09/07/23 12:36	508	09/11/23 05:51	09/11/23 10:10	4	14
9	633542003	07-SEP-2023	1	502.38	502.38	09/07/23 12:36	603	09/11/23 05:51	09/11/23 10:10	2	8
10	633542004	07-SEP-2023	1	505.62	505.62	09/07/23 12:36	707	09/11/23 05:51	09/11/23 10:10	6	4
11	633612001	07-SEP-2023	1	508.06	508.06	09/07/23 12:36	803	09/11/23 05:51	09/11/23 10:10	1	8
12	633715001	07-SEP-2023	1	504.84	504.84	09/07/23 12:36	105	09/11/23 06:16	09/11/23 10:43	2	15
13	633715002	07-SEP-2023	1	505.73	505.73	09/07/23 12:36	201	09/11/23 06:16	09/11/23 10:43	3	19
14	633715003	07-SEP-2023	1	504.46	504.46	09/07/23 12:36	303	09/11/23 06:16	09/11/23 10:43	1	17
15	633715004	07-SEP-2023	1	506.34	506.34	09/07/23 12:36	406	09/11/23 06:16	09/11/23 10:43	1	16
16	633715005	07-SEP-2023	1	505.89	505.89	09/07/23 12:36	506	09/11/23 06:16	09/11/23 10:43	2	4
17	633715006	07-SEP-2023	1	500	500	09/07/23 12:36	607	09/11/23 06:16	09/11/23 10:43	2	9
18	1205493684 MB	07-SEP-2023	1	512.09	512.09	09/07/23 12:36	706	09/11/23 06:16	09/11/23 10:43	6	2
19	1205493685 DUP (633177001)	07-SEP-2023	1	502.39	502.39	09/07/23 12:36	804	09/11/23 06:16	09/11/23 10:43	6	6
20	1205493686 MS (633177001)	07-SEP-2023	1	105.09	105.09	09/07/23 12:36	103	09/11/23 06:40	09/11/23 11:01	4	371
21	1205493687 LCS	07-SEP-2023	1		512.09	09/07/23 12:36	208	09/11/23 06:40	09/11/23 11:01	7	354

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 07-SEP-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Procedure Code : LUC26RAL
 Parmname : Radium-226
 Required MDA : 1 pCi/L
 Halflife of Ra-226 : 1600 years
 Ra-226 Abundance : 1.00
 Halflife of Rn-222 : 3.8235 days

Batch : 2479421
 Analyst : LIN01615
 Prep Date : 9/7/2023
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	633177001.1	0.5071	2.0284E-05	8/8/2023 11:08	601	15	7	0.467	7	0.233	30	1.8870
2	633177002.1	0.5051	2.0276E-05	8/8/2023 12:55	708	15	7	0.467	4	0.133	30	1.6020
3	633177003.1	0.5020	2.0264E-05	8/8/2023 14:21	805	15	7	0.467	3	0.100	30	1.5410
4	633177004.1	0.5112	2.0301E-05	8/8/2023 12:34	102	15	8	0.533	3	0.100	30	1.4860
5	633177005.1	0.5030	2.0268E-05	8/8/2023 11:08	205	15	17	1.133	1	0.033	30	1.7590
6	633177006.1	0.5050	2.0276E-05	8/8/2023 9:30	301	15	18	1.200	3	0.100	30	1.6430
7	633542001.1	0.5048	2.0275E-05	8/11/2023 9:53	403	15	9	0.600	3	0.100	30	1.5070
8	633542002.1	0.5121	2.0304E-05	8/11/2023 11:53	508	15	14	0.933	4	0.133	30	1.9780
9	633542003.1	0.5024	2.0266E-05	8/14/2023 9:53	603	15	8	0.533	2	0.067	30	1.8970
10	633542004.1	0.5056	2.0279E-05	8/11/2023 8:55	707	15	4	0.267	6	0.200	30	1.7280
11	633612001.1	0.5081	2.0288E-05	8/11/2023 10:10	803	15	8	0.533	1	0.033	30	1.4760
12	633715001.1	0.5048	2.0276E-05	8/14/2023 15:12	105	15	15	1.000	2	0.067	30	1.5340
13	633715002.1	0.5057	2.0279E-05	8/14/2023 11:03	201	15	19	1.267	3	0.100	30	1.6670
14	633715003.1	0.5045	2.0274E-05	8/14/2023 12:53	303	15	17	1.133	1	0.033	30	1.7210
15	633715004.1	0.5063	2.0281E-05	8/14/2023 14:31	406	15	16	1.067	1	0.033	30	1.4650
16	633715005.1	0.5059	2.0280E-05	8/14/2023 11:03	506	15	4	0.267	2	0.067	30	1.8780
17	633715006.1	0.5000	2.0256E-05	8/14/2023 9:10	607	15	9	0.600	2	0.067	30	1.7750
18	1205493684.1	0.5121	2.0304E-05	9/7/2023 0:00	706	15	2	0.133	6	0.200	30	1.5900
19	1205493685.1	0.5024	2.0266E-05	8/8/2023 11:08	804	15	6	0.400	6	0.200	30	1.6240
20	1205493686.1	0.1051	1.1678E-05	8/8/2023 11:08	103	15	371	24.733	4	0.133	30	1.6400
21	1205493687.1	0.5121	2.0304E-05	9/7/2023 0:00	208	15	354	23.600	7	0.233	30	1.7130

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
6.700%	7/1/2023	6/30/2024	9/7/2023 12:36	9/11/2023 5:26	9/11/2023 9:19	0.489	0.971	1.001	1.000
7.700%	11/1/2022	10/31/2023	9/7/2023 12:36	9/11/2023 5:26	9/11/2023 9:19	0.489	0.971	1.001	1.000
9.600%	4/8/2023	3/31/2024	9/7/2023 12:36	9/11/2023 5:26	9/11/2023 9:19	0.489	0.971	1.001	1.000
2.300%	5/1/2023	4/30/2024	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
9.200%	8/1/2023	7/31/2024	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
4.500%	10/25/2022	10/31/2023	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
6.100%	2/1/2023	1/31/2024	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
8.400%	6/1/2023	5/31/2024	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
3.500%	7/1/2023	6/30/2024	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
2.200%	11/1/2022	10/31/2023	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
4.700%	4/8/2023	3/31/2024	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
7.900%	5/1/2023	4/30/2024	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
7.400%	8/1/2023	7/31/2024	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
7.400%	10/25/2022	10/31/2023	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
2.900%	2/1/2023	1/31/2024	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
1.400%	6/1/2023	5/31/2024	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
6.800%	7/1/2023	6/30/2024	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
2.900%	11/1/2022	10/31/2023	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
6.100%	4/8/2023	3/31/2024	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
9.600%	5/1/2023	4/30/2024	9/7/2023 12:36	9/11/2023 6:40	9/11/2023 11:01	0.494	0.968	1.001	1.000
4.400%	8/1/2023	7/31/2024	9/7/2023 12:36	9/11/2023 6:40	9/11/2023 11:01	0.494	0.968	1.001	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-G
Spike Exp Date : 9/8/2023
Spike Activity (dpm/ml): 297.37
Spike Volume Added: 0.10

LCS S/N : 1715-G
LCS Exp Date : 9/8/2023
LCS Activity (dpm/ml): 297.37
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.3533	0.2494	1	0.6974	0.2316	84.78%	0.2333	0.1972	0.3837	0.3863		SAMPLE				
2	0.3159	0.2230	1	0.6808	0.3913	57.09%	0.3333	0.1886	0.4339	0.4415		SAMPLE				
3	0.2861	0.2020	1	0.6496	0.4502	51.52%	0.3667	0.1856	0.4467	0.4593		SAMPLE				
4	0.2913	0.2057	1	0.6614	0.5418	45.57%	0.4333	0.1972	0.4833	0.4902		SAMPLE				
5	0.1444	0.1020	1	0.4187	1.1810	26.80%	1.1000	0.2769	0.5827	0.6434		SAMPLE				
6	0.2668	0.1883	1	0.6056	1.2593	26.63%	1.1000	0.2887	0.6478	0.6819		SAMPLE				
7	0.2909	0.2054	1	0.6606	0.6243	42.08%	0.5000	0.2082	0.5095	0.5227		SAMPLE				
8	0.2523	0.1781	1	0.5438	0.7502	33.35%	0.8000	0.2582	0.4746	0.5022		SAMPLE				
9	0.1896	0.1339	1	0.4671	0.4651	41.80%	0.4667	0.1944	0.3797	0.3869		SAMPLE				
10	0.3582	0.2529	1	0.7233	0.0725	234.53%	0.0667	0.1563	0.3332	0.3333		SAMPLE				
11	0.1704	0.1203	1	0.4939	0.6333	38.58%	0.5000	0.1915	0.4754	0.4876		SAMPLE				
12	0.2328	0.1644	1	0.5735	1.1422	29.21%	0.9333	0.2625	0.6296	0.6744		SAMPLE				
13	0.2619	0.1849	1	0.5947	1.3115	26.45%	1.1667	0.2963	0.6528	0.7058		SAMPLE				
14	0.1469	0.1037	1	0.4257	1.2008	26.24%	1.1000	0.2769	0.5924	0.6414		SAMPLE				
15	0.1719	0.1213	1	0.4982	1.3202	26.17%	1.0333	0.2687	0.6730	0.7035		SAMPLE				
16	0.1898	0.1340	1	0.4675	0.1995	70.72%	0.2000	0.1414	0.2765	0.2781		SAMPLE				
17	0.2032	0.1434	1	0.5004	0.5695	39.12%	0.5333	0.2055	0.4301	0.4444		SAMPLE				
18	0.3835	0.2708	1	0.7743	-0.0776	187.11%	-0.0667	0.1247	0.2845	0.2846		MB				
19	0.3828	0.2702	1	0.7728	0.2323	91.49%	0.2000	0.1826	0.4157	0.4180	633177001.1	DUP	0.3%			
20	1.4738	1.0405	1	3.1766	134.7544	10.93%	24.6000	1.2858	13.8052	34.8117	633177001.1	MS			127.4654	105.7%
21	0.3830	0.2704	1	0.7561	25.1473	6.95%	23.3667	1.2574	2.6524	4.9915		LCS			26.1573	96.1%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 11-SEP-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	08:10	1	1.15E+05	115416	-0.12		
LUCAS2	EFF	08:09	1	1.32E+05	132307	-1.08		
LUCAS3	EFF	08:08	1	91119	91119	-2.79		
LUCAS4	EFF	08:07	1	1.29E+05	128693	1.2		
LUCAS5	EFF	08:05	1	1.32E+05	131887	-0.71		
LUCAS6	EFF	08:04	1	1.31E+05	130508	0.78		
LUCAS7	EFF	08:03	1	1.32E+05	131641	0.34		
LUCAS8	EFF	08:02	1	1.17E+05	117147	-1.32		

Reviewed by: 
Lyndsey Pace

Date: 11-SEP-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2479421

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
633177001	SAMPLE	LXP1	LUCAS6	SEP-11-23 09:19:00	DONE	Lucas Cell	01-JUL-23 00:00
633177002	SAMPLE	LXP1	LUCAS7	SEP-11-23 09:19:00	DONE	Lucas Cell	01-NOV-22 00:00
633177003	SAMPLE	LXP1	LUCAS8	SEP-11-23 09:19:00	DONE	Lucas Cell	08-APR-23 00:00
633177004	SAMPLE	LXP1	LUCAS1	SEP-11-23 10:10:00	DONE	Lucas Cell	01-MAY-23 00:00
633177005	SAMPLE	LXP1	LUCAS2	SEP-11-23 10:10:00	DONE	Lucas Cell	01-AUG-23 00:00
633177006	SAMPLE	LXP1	LUCAS3	SEP-11-23 10:10:00	DONE	Lucas Cell	25-OCT-22 00:00
633542001	SAMPLE	LXP1	LUCAS4	SEP-11-23 10:10:00	DONE	Lucas Cell	01-FEB-23 00:00
633542002	SAMPLE	LXP1	LUCAS5	SEP-11-23 10:10:00	DONE	Lucas Cell	01-JUN-23 00:00
633542003	SAMPLE	LXP1	LUCAS6	SEP-11-23 10:10:00	DONE	Lucas Cell	01-JUL-23 00:00
633542004	SAMPLE	LXP1	LUCAS7	SEP-11-23 10:10:00	DONE	Lucas Cell	01-NOV-22 00:00
633612001	SAMPLE	LXP1	LUCAS8	SEP-11-23 10:10:00	DONE	Lucas Cell	08-APR-23 00:00
633715001	SAMPLE	LXP1	LUCAS1	SEP-11-23 10:43:00	DONE	Lucas Cell	01-MAY-23 00:00
633715002	SAMPLE	LXP1	LUCAS2	SEP-11-23 10:43:00	DONE	Lucas Cell	01-AUG-23 00:00
633715003	SAMPLE	LXP1	LUCAS3	SEP-11-23 10:43:00	DONE	Lucas Cell	25-OCT-22 00:00
633715004	SAMPLE	LXP1	LUCAS4	SEP-11-23 10:43:00	DONE	Lucas Cell	01-FEB-23 00:00
633715005	SAMPLE	LXP1	LUCAS5	SEP-11-23 10:43:00	DONE	Lucas Cell	01-JUN-23 00:00
633715006	SAMPLE	LXP1	LUCAS6	SEP-11-23 10:43:00	DONE	Lucas Cell	01-JUL-23 00:00
1205493684	MB	LXP1	LUCAS7	SEP-11-23 10:43:00	DONE	Lucas Cell	01-NOV-22 00:00
1205493685	DUP	LXP1	LUCAS8	SEP-11-23 10:43:00	DONE	Lucas Cell	08-APR-23 00:00
1205493686	MS	LXP1	LUCAS1	SEP-11-23 11:01:00	DONE	Lucas Cell	01-MAY-23 00:00
1205493687	LCS	LXP1	LUCAS2	SEP-11-23 11:01:00	DONE	Lucas Cell	01-AUG-23 00:00



Report ID: S51950.01(02)
Generated on 09/11/2023
Replaces report S51950.01(01) generated on 08/11/2023

Report to
Attention: Jennifer Caporale
Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Report produced by
Merit Laboratories, Inc.
2680 East Lansing Drive
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:
John Lavery (johnlavery@meritlabs.com)
Barbara Ball (bball@meritlabs.com)

Report Summary
Lab Sample ID(s): S51950.01-S51950.06
Project: Erickson AM MI Wells 16A-16D
Collected Date(s): 08/08/2023
Submitted Date/Time: 08/09/2023 08:15
Sampled by: Marc Wahrer
P.O. #:

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Maya Murshak
Technical Director



General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

Report Narrative

All analyses completed



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP & ISO/IEC 17025:2017	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



Sample Summary (6 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S51950.01	MW-16A L308170-01	Groundwater	08/08/23 11:08
S51950.02	MW-16B L308170-02	Groundwater	08/08/23 12:55
S51950.03	MW-16C L308170-03	Groundwater	08/08/23 14:21
S51950.04	MW-16D L308170-04	Groundwater	08/08/23 12:34
S51950.05	MWT-16A L308170-05	Groundwater	08/08/23 11:08
S51950.06	Field Blank L308170-06	Water	08/08/23 09:30



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51950.01

Sample Tag: MW-16A L308170-01

Collected Date/Time: 08/08/2023 11:08

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.4	IR
2	1L Plastic	None	Yes	2.4	IR
1	250ml Plastic	HNO3	Yes	2.4	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/09/23 13:14	CTV	
Metal Digestion	Completed	SW3015A	08/10/23 10:00	CCM	

Inorganics

Method: E300.0, Run Date: 08/09/23 14:57, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	423	50	0.8	mg/L	50	16887-00-6	

Method: E300.0, Run Date: 08/09/23 14:31, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	2.0	0.52	mg/L	20	16984-48-8	
Sulfate	131	20	1.2	mg/L	20	14808-79-8	

Method: SM2320B, Run Date: 08/09/23 11:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	510	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/09/23 13:26, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	578	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 08/11/23 16:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,390	50	12	mg/L	2		

Method: SM2540D, Run Date: 08/09/23 16:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	2.1	3	1	mg/L	1		b

Metals

Method: E200.8, Run Date: 08/10/23 12:43, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.004	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.132	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.16	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	

b-Value detected less than reporting limit, but greater than MDL



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51950.01 (continued)

Sample Tag: MW-16A L308170-01

Method: E200.8, Run Date: 08/10/23 12:43, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	2.63	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/10/23 14:19, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	172	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	38.5	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.25	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	279	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/09/23 16:00, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/11/23 12:12, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

**Lab Sample ID: S51950.02**

Sample Tag: MW-16B L308170-02

Collected Date/Time: 08/08/2023 12:55

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.4	IR
2	1L Plastic	None	Yes	2.4	IR
1	250ml Plastic	HNO3	Yes	2.4	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/09/23 13:14	CTV	
Metal Digestion	Completed	SW3015A	08/10/23 10:00	CCM	

Inorganics**Method: E300.0, Run Date: 08/09/23 12:48, Analyst: ASB**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	3.7	5	0.08	mg/L	5	16887-00-6	b
Fluoride (Undistilled)	0.31	0.5	0.13	mg/L	5	16984-48-8	b
Sulfate	17	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/09/23 11:26, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	410	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/09/23 13:28, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	344	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 08/11/23 16:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	366	50	12	mg/L	2		

Method: SM2540D, Run Date: 08/09/23 16:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals**Method: E200.8, Run Date: 08/10/23 12:46, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.085	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.12	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL



Lab Sample ID: S51950.02 (continued)

Sample Tag: MW-16B L308170-02

Method: E200.8, Run Date: 08/10/23 12:46, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	0.42	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.022	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.006	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/10/23 14:20, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	81.7	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	35.0	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	2.91	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	11.1	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/09/23 16:03, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/11/23 12:12, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Lab Sample ID: S51950.03

Sample Tag: MW-16C L308170-03

Collected Date/Time: 08/08/2023 14:21

Matrix: Groundwater

COC Reference:

Sample Containers

Table with 6 columns: #, Type, Preservative(s), Refrigerated?, Arrival Temp. (C), Thermometer #. Rows include 1L Plastic and 250ml Plastic containers.

Extraction / Prep.

Table with 6 columns: Parameter, Result, Method, Run Date, Analyst, Flags. Rows include Mercury Digestion and Metal Digestion.

Inorganics

Method: E300.0, Run Date: 08/09/23 13:01, Analyst: ASB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Chloride, Fluoride (Undistilled), and Sulfate.

Method: SM2320B, Run Date: 08/09/23 11:28, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Bicarbonate* and Carbonate*.

Method: SM2340C, Run Date: 08/09/23 13:30, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Hardness.

Method: SM2540C, Run Date: 08/11/23 16:00, Analyst: MDG

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Dissolved Solids.

Method: SM2540D, Run Date: 08/09/23 16:00, Analyst: MDG

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Suspended Solids.

Metals

Method: E200.8, Run Date: 08/10/23 12:51, Analyst: CCM

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Antimony*, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, and Copper.

b-Value detected less than reporting limit, but greater than MDL



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51950.03 (continued)

Sample Tag: MW-16C L308170-03

Method: E200.8, Run Date: 08/10/23 12:51, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	0.48	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.029	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/10/23 14:22, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	73.9	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	31.1	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	4.65	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	15.6	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/09/23 16:06, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/11/23 12:12, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Lab Sample ID: S51950.04

Sample Tag: MW-16D L308170-04

Collected Date/Time: 08/08/2023 12:34

Matrix: Groundwater

COC Reference:

Sample Containers

Table with 6 columns: #, Type, Preservative(s), Refrigerated?, Arrival Temp. (C), Thermometer #. Rows include 1L Plastic and 250ml Plastic containers.

Extraction / Prep.

Table with 6 columns: Parameter, Result, Method, Run Date, Analyst, Flags. Rows include Mercury Digestion and Metal Digestion.

Inorganics

Method: E300.0, Run Date: 08/09/23 13:14, Analyst: ASB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Chloride, Fluoride (Undistilled), and Sulfate.

Method: SM2320B, Run Date: 08/09/23 11:30, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Bicarbonate* and Carbonate*.

Method: SM2340C, Run Date: 08/09/23 13:32, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Hardness.

Method: SM2540C, Run Date: 08/11/23 16:00, Analyst: MDG

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Dissolved Solids.

Method: SM2540D, Run Date: 08/09/23 16:00, Analyst: MDG

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Suspended Solids.

Metals

Method: E200.8, Run Date: 08/10/23 12:54, Analyst: CCM

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Antimony*, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, and Iron.



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51950.04 (continued)

Sample Tag: MW-16D L308170-04

Method: E200.8, Run Date: 08/10/23 12:54, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.030	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.011	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.011	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/10/23 14:23, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	29.3	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	7.33	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	9.21	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	108	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/09/23 16:10, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/11/23 12:12, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

**Lab Sample ID: S51950.05**

Sample Tag: MWT-16A L308170-05

Collected Date/Time: 08/08/2023 11:08

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.4	IR
2	1L Plastic	None	Yes	2.4	IR
1	250ml Plastic	HNO3	Yes	2.4	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/09/23 13:14	CTV	
Metal Digestion	Completed	SW3015A	08/10/23 10:00	CCM	

Inorganics**Method: E300.0, Run Date: 08/09/23 15:10, Analyst: ASB**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	442	50	0.8	mg/L	50	16887-00-6	

Method: E300.0, Run Date: 08/09/23 14:44, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	2.0	0.52	mg/L	20	16984-48-8	
Sulfate	130	20	1.0	mg/L	20	14808-79-8	

Method: SM2320B, Run Date: 08/09/23 11:32, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	500	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/09/23 13:34, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	568	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 08/11/23 16:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,390	50	12	mg/L	2		

Method: SM2540D, Run Date: 08/09/23 16:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	1.2	3	1	mg/L	1		b

Metals**Method: E200.8, Run Date: 08/10/23 13:00, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.004	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.135	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.17	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	

b-Value detected less than reporting limit, but greater than MDL



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51950.05 (continued)

Sample Tag: MWT-16A L308170-05

Method: E200.8, Run Date: 08/10/23 13:00, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	2.54	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/10/23 14:25, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	167	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	38.7	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.21	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	262	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/09/23 16:13, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/11/23 12:12, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51950.06

Sample Tag: Field Blank L308170-06

Collected Date/Time: 08/08/2023 09:30

Matrix: Water

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.4	IR
2	1L Plastic	None	Yes	2.4	IR
1	250ml Plastic	HNO3	Yes	2.4	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/09/23 13:14	CTV	
Metal Digestion	Completed	SW3015A	08/10/23 10:00	CCM	

Inorganics

Method: E300.0, Run Date: 08/09/23 13:40, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/09/23 11:34, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/09/23 13:36, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 08/11/23 16:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	12	mg/L	2		

Method: SM2540D, Run Date: 08/09/23 16:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 08/10/23 11:52, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S51950.06 (continued)

Sample Tag: Field Blank L308170-06

Method: E200.8, Run Date: 08/10/23 11:52, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 08/10/23 14:04, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 08/09/23 16:16, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/11/23 12:12, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

Merit Laboratories Login Checklist

Lab Set ID:S51950

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 16A-16D

Submitted:08/09/2023 08:15 Login User: PFD

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

Sample Receiving

01. Yes No N/A Samples are received at 4C +/- 2C Thermometer # IR 2.4

02. Yes No N/A Received on ice/ cooling process begun

03. Yes No N/A Samples shipped

04. Yes No N/A Samples left in 24 hr. drop box

05. Yes No N/A Are there custody seals/tape or is the drop box locked

Chain of Custody

06. Yes No N/A COC adequately filled out

07. Yes No N/A COC signed and relinquished to the lab

08. Yes No N/A Sample tag on bottles match COC

09. Yes No N/A Subcontracting needed? Subcontracted to:

Preservation

10. Yes No N/A Do sample have correct chemical preservation

11. Yes No N/A Completed pH checks on preserved samples? (no VOAs)

12. Yes No N/A Did any samples need to be preserved in the lab?

Bottle Conditions

13. Yes No N/A All bottles intact

14. Yes No N/A Appropriate analytical bottles are used

15. Yes No N/A Merit bottles used

16. Yes No N/A Sufficient sample volume received

17. Yes No N/A Samples require laboratory filtration

18. Yes No N/A Samples submitted within holding time

19. Yes No N/A Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S51950 Submitted: 08/09/2023 08:15

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 16A-16D

Attention: Jennifer Caporale
Address: Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Initial Preservation Check: 08/09/2023 08:50 PFD

Preservation Recheck (E200.8): N/A

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S51950.01	1L Plastic HNO3	<2			
S51950.01	1L Plastic HNO3	<2			
S51950.01	250ml Plastic HNO3	<2			
S51950.02	1L Plastic HNO3	<2			
S51950.02	1L Plastic HNO3	<2			
S51950.02	250ml Plastic HNO3	<2			
S51950.03	1L Plastic HNO3	<2			
S51950.03	1L Plastic HNO3	<2			
S51950.03	250ml Plastic HNO3	<2			
S51950.04	1L Plastic HNO3	<2			
S51950.04	1L Plastic HNO3	<2			
S51950.04	250ml Plastic HNO3	<2			
S51950.05	1L Plastic HNO3	<2			
S51950.05	1L Plastic HNO3	<2			
S51950.05	250ml Plastic HNO3	<2			
S51950.06	1L Plastic HNO3	<2			
S51950.06	1L Plastic HNO3	<2			
S51950.06	250ml Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823
 Phone (517) 332-0167 Fax (517) 332-4034
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

REPORT TO **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME **Jennifer Caporale**
 COMPANY **Lansing Board of Water and Light**
 ADDRESS **PO Box 13007 48901-3007**
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**
 PHONE NO. **517-702-6372** FAX NO. _____ P.O. NO. _____
 E-MAIL ADDRESS **Environmental_Laboratory@lbwl.com** QUOTE NO. _____

CONTACT NAME **Beth Zimpfer** SAME
 COMPANY _____
 ADDRESS _____
 CITY _____ STATE _____ ZIP CODE _____
 PHONE NO. _____ E-MAIL ADDRESS **Beth.Zimpfer@lbwl.com**

PROJECT NO./NAME **Erickson AM MI Wells 16A-16D** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**
 TURNAROUND TIME REQUIRED 1 DAY 2 DAYS 3 DAYS STANDARD OTHER **ASAP**
 DELIVERABLES REQUIRED STD LEVEL II LEVEL III LEVEL IV EDD OTHER _____

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives							Total Metals	F- undistilled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness	Certifications	Project Locations	Special Instructions
	DATE	TIME				NONE	HCl	HNO3	H2SO4	NaOH	MeOH	OTHER									
51950.01	08/08/23	1108	MW-16A L308170-01	GW	5	2	3											<input type="checkbox"/> OHIO VAP <input type="checkbox"/> Drinking Water	<input type="checkbox"/> Detroit <input type="checkbox"/> New York	Metals to analyse: Na, Mg, K	
.02		1235	MW-16B -02	GW	5	2	3											<input type="checkbox"/> DoD <input checked="" type="checkbox"/> NPDES		B, Ca, Sb, As, Ba, Be, Cd, Cr,	
.03		1421	MW-16C -03	GW	5	2	3													Co, Li, Hg, Mo, Pb, Se, Tl,	
.04		1234	MW16-D -04	GW	5	2	3													Fe, Cu, Ni, Ag, V, Zn	
.05		1108	MWT 16A -05	GW	5	2	3													Please send a preliminary report	
.06		0930	Field Blank -06	DI	5	2	3														

RELINQUISHED BY: DATE **8-23-23** TIME **0815**
 SIGNATURE/ORGANIZATION _____
 RECEIVED BY: DATE **8/23/23** TIME **0815**
 SIGNATURE/ORGANIZATION _____

RELINQUISHED BY: _____ DATE _____ TIME _____
 SIGNATURE/ORGANIZATION _____
 RECEIVED BY: _____ DATE _____ TIME _____
 SIGNATURE/ORGANIZATION _____

SEAL NO. _____ SEAL INTACT YES NO INITIALS _____
 SEAL NO. _____ SEAL INTACT YES NO INITIALS _____

NOTES: TEMP. ON ARRIVAL **2.4**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total		250 mL plastic	mg/L	Nitric Acid	200.8	6mos	0.150
Be, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005

September 08, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 633177
SDG: S51950

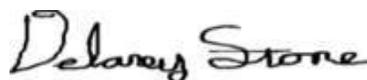
Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on August 14, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,



Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S51950
Work Order: 633177**

September 08, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on August 14, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

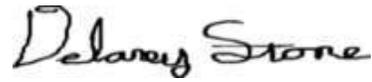
Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
633177001	S51950.01
633177002	S51950.02
633177003	S51950.03
633177004	S51950.04
633177005	S51950.05
633177006	S51950.06 Field Blank

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Delaney Stone". The signature is written in a cursive style with a large initial 'D'.

Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

633177

2680 East Lansing Dr., East Lansing, MI 48823
 Phone (517) 332-0167 Fax (517) 332-4034
 www.meritlabs.com



C.O.C. PAGE # 1 OF 1

REPORT TO		CHAIN OF CUSTODY RECORD		INVOICE TO	
CONTACT NAME Project Management Team		CONTACT NAME Julie Teague		COMPANY Merit Laboratories	
COMPANY Merit Laboratories		ADDRESS 2680 East Lansing Drive		CITY East Lansing	
STATE MI ZIP CODE 48823		PHONE NO. 517-332-0167		E-MAIL ADDRESS juliet@meritlabs.com	
PROJECT NO./NAME S51950		ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)			
TURNAROUND TIME REQUIRED <input type="checkbox"/> 1 DAY <input type="checkbox"/> 2 DAYS <input type="checkbox"/> 3 DAYS <input checked="" type="checkbox"/> STANDARD <input type="checkbox"/> OTHER					
DELIVERABLES REQUIRED <input type="checkbox"/> STD <input type="checkbox"/> LEVEL II <input type="checkbox"/> LEVEL III <input checked="" type="checkbox"/> LEVEL IV <input type="checkbox"/> EDD <input type="checkbox"/> OTHER					
MATRIX CODE GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE					
YEAR		DATE		TIME	
8/8/23		1108		S51950.01	
8/8/23		1255		S51950.02	
8/8/23		1421		S51950.03	
8/8/23		1234		S51950.04	
8/8/23		1108		S51950.05	
8/8/23		0930		S51950.06 Field Blank	
MATRIX		# OF BOTTLES		# Containers & Preservatives	
GW		2		H ₂ O	
GW		2		HNO ₃	
GW		2		H ₂ SO ₄	
GW		2		NaOH	
GW		2		MeOH	
DI		2		OTHER	
Radium 226 *		✓		Certifications	
Radium 228 *		✓		<input type="checkbox"/> OHIO VAP <input type="checkbox"/> Drinking Water	
		✓		<input type="checkbox"/> DoD <input type="checkbox"/> NPDES	
		✓		Project Locations	
		✓		<input type="checkbox"/> Detroit <input type="checkbox"/> New York	
		✓		<input type="checkbox"/> Other	
		✓		Special Instructions	
		✓		* E903.1 Mod.	
		✓		** E904.0/SW 9320 Mod.	
		✓		Please use calculation product & provide Radium 226/228 combined results on the report	
		✓		(No Ice needed)	
		✓		** Subcontracted to	
		✓		GEL Laboratories, Inc.	
		✓		2040 Savage Road	
		✓		Charleston, SC 29407	

RELINQUISHED BY: [Signature] DATE 8/10/23 TIME 17:00
 RECEIVED BY: [Signature] DATE 8/10/23 TIME 17:00
 SEAL NO. [Blank] SEAL INTACT YES NO
 INITIALS [Blank] INITIALS [Blank]
 NOTES: [Blank]
 TEMP. ON ARRIVAL [Blank]

RELEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

SAMPLE RECEIPT & REVIEW FORM

Client: MERI		SDG/AR/COC/Work Order: 033177	
Received By: Thyasia Tatum		Date Received: 8/19/23	
Carrier and Tracking Number		Circle Applicable: FedEx Express FedEx Ground (UPS) Field Services Courier Other 1Z4U00 477 03 0383 5219	
Suspected Hazard Information		Yes	No
		*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.	
A) Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples are to be received as radioactive?		<input checked="" type="checkbox"/>	COC notation or radioactive stickers on containers equal client designation
C) Did the RSO classify the samples as radioactive?		<input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): 0 CPM / mR/Hr Classified as: Rad 1 Rad 2 Rad 3
D) Did the client designate samples are hazardous?		<input checked="" type="checkbox"/>	COC notation or hazard labels on containers equal client designation
E) Did the RSO identify possible hazards?		<input checked="" type="checkbox"/>	If D or E is yes, select Hazards below. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:
Sample Receipt Criteria		Yes	NA
		Comments/Qualifiers (Required for Non-Conforming Items)	
1	Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ deg. C)?*	<input checked="" type="checkbox"/>	Preservation Method: Wet Ice Ice Packs Dry ice (None) Other: *all temperatures are recorded in Celsius TEMP: 10°C
4	Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	Temperature Device Serial #: IR2-23 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	<input checked="" type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	Sample ID's and Containers Affected: If preservation added, Lot#: _____
7	Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/> Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer)	
		<input checked="" type="checkbox"/> Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No)	
		Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected:	
8	Samples received within holding time?	<input checked="" type="checkbox"/>	ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	ID's and containers affected:
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	
13	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	Circle Applicable: Not relinquished Other (describe)
Comments (Use Continuation Form if needed):			

PM (or PMA) review: Initials **JM** Date **8-15-23** Page **1** of **1**

Laboratory Certifications

List of current GEL Certifications as of 08 September 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S51950
Work Order #: 633177**

Product: Radium-226+Radium-228 Calculation

Analytical Method: Calculation

Analytical Procedure: GL-RAD-D-003 REV# 45

Analytical Batch: 2479712

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
633177001	S51950.01
633177002	S51950.02
633177003	S51950.03
633177004	S51950.04
633177005	S51950.05
633177006	S51950.06 Field Blank

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2479427

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
633177001	S51950.01
633177002	S51950.02
633177003	S51950.03
633177004	S51950.04
633177005	S51950.05
633177006	S51950.06 Field Blank
1205493704	Method Blank (MB)
1205493705	633177001(S51950.01) Sample Duplicate (DUP)
1205493706	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2479421

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
633177001	S51950.01
633177002	S51950.02
633177003	S51950.03
633177004	S51950.04
633177005	S51950.05
633177006	S51950.06 Field Blank
1205493684	Method Blank (MB)
1205493685	633177001(S51950.01) Sample Duplicate (DUP)
1205493686	633177001(S51950.01) Matrix Spike (MS)
1205493687	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

The matrix spike, 1205493686 (S51950.01MS), aliquot was reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S51950 GEL Work Order: 633177

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 11 SEP 2023

Title: Analyst III - Data Validator

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: September 11, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S51950.01 Project: MERI00120
Sample ID: 633177001 Client ID: MERI001
Matrix: Ground Water
Collect Date: 08-AUG-23 11:08
Receive Date: 14-AUG-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.945	+/-0.862	1.39	3.00	pCi/L		JE1	09/05/23	1343	2479427		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.18	+/-0.944			pCi/L		1 TON1	09/11/23	1212	2479712		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.232	+/-0.384	0.697	1.00	pCi/L		LXP1	09/11/23	0919	2479421		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			93.1	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: September 11, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S51950.02	Project: MERI00120
Sample ID: 633177002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 08-AUG-23 12:55	
Receive Date: 14-AUG-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.644	+/-0.663	1.09	3.00	pCi/L			JE1	09/05/23	1343	2479427	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.04	+/-0.793			pCi/L		1	TON1	09/11/23	1212	2479712	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.391	+/-0.434	0.681	1.00	pCi/L			LXP1	09/11/23	0919	2479421	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			86.4	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

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Certificate of Analysis

Report Date: September 11, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S51950.03 Project: MERI00120
Sample ID: 633177003 Client ID: MERI001
Matrix: Ground Water
Collect Date: 08-AUG-23 14:21
Receive Date: 14-AUG-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.14	+/-0.960	1.54	3.00	pCi/L			JE1	09/05/23	1343	2479427	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.59	+/-1.06			pCi/L		1	TON1	09/11/23	1212	2479712	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.450	+/-0.447	0.650	1.00	pCi/L			LXP1	09/11/23	0919	2479421	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			87.8	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: September 11, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S51950.04 Project: MERI00120
Sample ID: 633177004 Client ID: MERI001
Matrix: Ground Water
Collect Date: 08-AUG-23 12:34
Receive Date: 14-AUG-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.276	+/-0.787	1.43	3.00	pCi/L		JE1	09/05/23	1343	2479427	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.818	+/-0.924			pCi/L		1 TON1	09/11/23	1212	2479712	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.542	+/-0.483	0.661	1.00	pCi/L		LXP1	09/11/23	1010	2479421	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			86.1	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: September 11, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S51950.05 Project: MERI00120
Sample ID: 633177005 Client ID: MERI001
Matrix: Ground Water
Collect Date: 08-AUG-23 11:08
Receive Date: 14-AUG-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	1.01	+/-0.776	1.21	3.00	pCi/L		JE1	09/05/23	1343	2479427	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		2.19	+/-0.971			pCi/L		1 TON1	09/11/23	1212	2479712	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		1.18	+/-0.583	0.419	1.00	pCi/L		LXP1	09/11/23	1010	2479421	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			90	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: September 11, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S51950.06 Field Blank	Project: MERI00120
Sample ID: 633177006	Client ID: MERI001
Matrix: Water	
Collect Date: 08-AUG-23 09:30	
Receive Date: 14-AUG-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	1.19	+/-0.810	1.21	3.00	pCi/L		JE1	09/05/23	1343	2479427	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		2.45	+/-1.04			pCi/L		1 TON1	09/11/23	1212	2479712	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		1.26	+/-0.648	0.606	1.00	pCi/L		LXP1	09/11/23	1010	2479421	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			82.6	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: September 11, 2023

Page 1 of 2

Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan

Contact: John Laverty

Workorder: 633177

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2479427										
QC1205493705	633177001	DUP									
Radium-228	U	0.945		1.47	pCi/L	43.4		(0% - 100%)	JE1	09/05/23	13:43
	Uncertainty	+/-0.862		+/-0.765							
QC1205493706	LCS										
Radium-228	78.6			76.2	pCi/L		97	(75%-125%)		09/05/23	13:43
	Uncertainty			+/-4.23							
QC1205493704	MB										
Radium-228			U	0.294	pCi/L					09/05/23	13:43
	Uncertainty			+/-0.580							
Rad Ra-226											
Batch	2479421										
QC1205493685	633177001	DUP									
Radium-226	U	0.232	U	0.232	pCi/L	N/A		N/A	LXP1	09/11/23	10:43
	Uncertainty	+/-0.384		+/-0.416							
QC1205493687	LCS										
Radium-226	26.2			25.1	pCi/L		96.1	(75%-125%)		09/11/23	11:01
	Uncertainty			+/-2.65							
QC1205493684	MB										
Radium-226			U	-0.0776	pCi/L					09/11/23	10:43
	Uncertainty			+/-0.285							
QC1205493686	633177001	MS									
Radium-226	127 U	0.232		135	pCi/L		106	(75%-125%)		09/11/23	11:01
	Uncertainty	+/-0.384		+/-13.8							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- H Analytical holding time was exceeded
- < Result is less than value reported
- > Result is greater than value reported

GEL LABORATORIES LLC

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QC Summary

Workorder: 633177

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
NI											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2479427 Check-list

This check-list was completed on 05-SEP-23 by Nat Long

This batch was reviewed by Nat Long on 05-SEP-23 and Kenshalla Oston on 06-SEP-23.

Batch ID:
2479427

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2479427
Analyst: Jacqueline Winston (JE1)
 Prep: Charles Hall (CH7)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: BAL-C236761727

Due Dates for Lab: 06-SEP-2023 **Package:** 10-SEP-2023 **SDG:** 08-SEP-2023

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205493706	228	2051-B	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	633177001	29-AUG-2023	3	301.35	301.35	08/31/23 13:57	09/05/23 12:07
2	633177002	29-AUG-2023	3	300.49	300.49	08/31/23 13:57	09/05/23 12:07
3	633177003	29-AUG-2023	3	302.58	302.58	08/31/23 13:57	09/05/23 12:07
4	633177004	29-AUG-2023	3	300.56	300.56	08/31/23 13:57	09/05/23 12:07
5	633177005	29-AUG-2023	3	302.65	302.65	08/31/23 13:57	09/05/23 12:07
6	633177006	29-AUG-2023	3	303.89	303.89	08/31/23 13:57	09/05/23 12:07
7	633542001	29-AUG-2023	3	302.12	302.12	08/31/23 13:57	09/05/23 12:07
8	633542002	29-AUG-2023	3	305.71	305.71	08/31/23 13:57	09/05/23 12:07
9	633542003	29-AUG-2023	3	303.26	303.26	08/31/23 13:57	09/05/23 12:07
10	633542004	29-AUG-2023	3	303.05	303.05	08/31/23 13:57	09/05/23 12:07
11	633612001	29-AUG-2023	3	301	301	08/31/23 13:57	09/05/23 12:07
12	633715001	29-AUG-2023	3	302.8	302.8	08/31/23 13:57	09/05/23 12:07
13	633715002	29-AUG-2023	3	300.9	300.9	08/31/23 13:57	09/05/23 12:07
14	633715003	29-AUG-2023	3	301.1	301.1	08/31/23 13:57	09/05/23 12:07
15	633715004	29-AUG-2023	3	304.4	304.4	08/31/23 13:57	09/05/23 12:07
16	633715005	29-AUG-2023	3	302.8	302.8	08/31/23 13:57	09/05/23 12:07
17	633715006	29-AUG-2023	3	300.6	300.6	08/31/23 13:57	09/05/23 12:07
18	1205493704 MB	29-AUG-2023	3		305.71	08/31/23 13:57	09/05/23 12:07
19	1205493705 DUP (633177001)	29-AUG-2023	3	300.46	300.46	08/31/23 13:57	09/05/23 12:07
20	1205493706 LCS	29-AUG-2023	3		305.71	08/31/23 13:57	09/05/23 12:07

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 2097-B	Ba-133 Tracer	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 29-AUG-2023 00:00
REGNT 3956035	Barium Carrier Ra228 REG	1 mL	
REGNT 3960868	RGF-1M Citric Acid	5 mL	
REGNT 3959817	2M HCl	20 mL	
REGNT 3955326	RGF-7M Nitric Acid	25 mL	
REGNT 3958741	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT DGA071323	2472106	2 g	
REGNT 3957480.5	RGF-Hydrofluoric Acid	4 mL	
REGNT 3940152	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3957910	RGF-Neodymium Substrate	5 mL	
REGNT 3954355.13	Nitric Acid	5 mL	
REGNT 3958747	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3946262	RGF-50% Potassium Carbonate	2 mL	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 2097-B
 Tracer Exp Date : 7/12/2024
 Tracer Volume Added: 0.10

Batch : 2479427
 Analyst : CHA00185
 Prep Date : 8/29/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 3 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	633177001.1	0.3014	1.8482E-05	8/8/2023 11:08	1057.8	1.77%	985.1	1.84%	0.1	0.000200
2	633177002.1	0.3005	1.8467E-05	8/8/2023 12:55	1057.8	1.77%	914.5	1.91%	0.1	0.000200
3	633177003.1	0.3026	1.8503E-05	8/8/2023 14:21	1057.8	1.77%	928.3	1.89%	0.1	0.000200
4	633177004.1	0.3006	1.8469E-05	8/8/2023 12:34	1057.8	1.77%	911.2	1.91%	0.1	0.000200
5	633177005.1	0.3027	1.8504E-05	8/8/2023 11:08	1057.8	1.77%	951.8	1.87%	0.1	0.000200
6	633177006.1	0.3039	1.8524E-05	8/8/2023 9:30	1057.8	1.77%	873.3	1.95%	0.1	0.000200
7	633542001.1	0.3021	1.8495E-05	8/11/2023 9:53	1057.8	1.77%	963.0	1.86%	0.1	0.000200
8	633542002.1	0.3057	1.8554E-05	8/11/2023 11:53	1057.8	1.77%	931.2	1.89%	0.1	0.000200
9	633542003.1	0.3033	1.8514E-05	8/14/2023 9:53	1057.8	1.77%	938.3	1.88%	0.1	0.000200
10	633542004.1	0.3031	1.8510E-05	8/11/2023 8:55	1057.8	1.77%	851.4	1.98%	0.1	0.000200
11	633612001.1	0.3010	1.8476E-05	8/11/2023 10:10	1057.8	1.77%	827.6	2.01%	0.1	0.000200
12	633715001.1	0.3028	1.8506E-05	8/14/2023 15:12	1057.8	1.77%	915.1	1.91%	0.1	0.000200
13	633715002.1	0.3009	1.8474E-05	8/14/2023 11:03	1057.8	1.77%	889.2	1.94%	0.1	0.000200
14	633715003.1	0.3011	1.8478E-05	8/14/2023 12:53	1057.8	1.77%	875.6	1.95%	0.1	0.000200
15	633715004.1	0.3044	1.8533E-05	8/14/2023 14:31	1057.8	1.77%	885.2	1.94%	0.1	0.000200
16	633715005.1	0.3028	1.8506E-05	8/14/2023 11:03	1057.8	1.77%	902.6	1.92%	0.1	0.000200
17	633715006.1	0.3006	1.8469E-05	8/14/2023 9:10	1057.8	1.77%	843.6	1.99%	0.1	0.000200
18	1205493704.1	0.3057	1.8554E-05	8/29/2023 0:00	1057.8	1.77%	934.2	1.89%	0.1	0.000200
19	1205493705.1	0.3005	1.8467E-05	8/8/2023 11:08	1057.8	1.77%	873.2	1.95%	0.1	0.000200
20	1205493706.1	0.3057	1.8554E-05	8/29/2023 0:00	1057.8	1.77%	865.0	1.96%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated Sample Recovery %	Sample Recovery Error %
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction		
1	1A	60	11	45	0.750	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.834	1.000	1.057	93.1%	2.57%
2	1B	60	2	30	0.500	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.834	1.000	1.057	86.4%	2.62%
3	1C	60	9	65	1.083	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.834	1.000	1.057	87.8%	2.60%
4	1D	60	3	41	0.683	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.834	1.000	1.057	86.1%	2.62%
5	2A	60	5	45	0.750	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.834	1.000	1.057	90.0%	2.59%
6	2B	60	2	44	0.733	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.834	1.000	1.057	82.6%	2.65%
7	2D	60	5	88	1.467	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.992	0.834	1.000	1.057	91.0%	2.58%
8	3B	60	2	31	0.517	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.992	0.834	1.000	1.057	88.0%	2.60%
9	3C	60	4	24	0.400	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.993	0.834	1.000	1.057	88.7%	2.60%
10	3D	60	10	37	0.617	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.992	0.833	1.000	1.057	80.5%	2.67%
11	4A	60	7	23	0.383	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.992	0.833	1.000	1.057	78.2%	2.69%
12	4C	60	4	54	0.900	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.993	0.833	1.000	1.057	86.5%	2.62%
13	4D	60	13	54	0.900	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.993	0.833	1.000	1.057	84.1%	2.64%
14	5A	60	7	60	1.000	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.993	0.833	1.000	1.057	82.8%	2.65%
15	5D	60	8	53	0.883	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.993	0.833	1.000	1.057	83.7%	2.64%
16	6A	60	12	62	1.033	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.993	0.833	1.000	1.057	85.3%	2.63%
17	6C	60	2	71	1.183	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.993	0.833	1.000	1.057	79.7%	2.68%
18	7A	60	9	26	0.433	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.997	0.835	1.000	1.057	88.3%	2.60%
19	7B	60	3	41	0.683	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.835	1.000	1.057	82.6%	2.65%
20	7C	60	6	1296	21.600	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.997	0.834	1.000	1.057	81.8%	2.66%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2023	5/31/2024	0.5320	0.00738	0.505	9/1/2023 18:12	1000
2	PIC	6/1/2023	5/31/2024	0.6098	0.00711	0.323	9/1/2023 18:12	1000
3	PIC	6/1/2023	5/31/2024	0.6077	0.00847	0.764	9/1/2023 18:12	1000
4	PIC	6/1/2023	5/31/2024	0.6071	0.00692	0.608	9/1/2023 18:12	1000
5	PIC	6/1/2023	5/31/2024	0.6083	0.01914	0.461	9/1/2023 18:12	1000
6	PIC	6/1/2023	5/31/2024	0.6253	0.02111	0.409	9/1/2023 18:12	1000
7	PIC	6/1/2023	5/31/2024	0.6206	0.00745	1.370	9/1/2023 18:12	1000
8	PIC	6/1/2023	5/31/2024	0.6266	0.01614	0.379	9/1/2023 18:12	1000
9	PIC	6/1/2023	5/31/2024	0.6245	0.00988	0.357	9/1/2023 18:12	1000
10	PIC	6/1/2023	5/31/2024	0.5677	0.02297	0.483	9/1/2023 18:12	1000
11	PIC	6/1/2023	5/31/2024	0.6074	0.01123	0.409	9/1/2023 18:12	1000
12	PIC	6/1/2023	5/31/2024	0.6376	0.00889	0.784	9/1/2023 18:13	1000
13	PIC	6/1/2023	5/31/2024	0.6412	0.00773	0.708	9/1/2023 18:13	1000
14	PIC	6/1/2023	5/31/2024	0.6366	0.00851	1.264	9/1/2023 18:13	1000
15	PIC	6/1/2023	5/31/2024	0.6566	0.00925	0.844	9/1/2023 18:32	1000
16	PIC	6/1/2023	5/31/2024	0.6444	0.02228	0.756	9/1/2023 18:09	1000
17	PIC	6/1/2023	5/31/2024	0.6167	0.01970	1.023	9/1/2023 18:10	1000
18	PIC	6/1/2023	5/31/2024	0.6229	0.00594	0.347	9/1/2023 18:09	1000
19	PIC	6/1/2023	5/31/2024	0.6423	0.00627	0.277	9/1/2023 18:10	1000
20	PIC	6/1/2023	5/31/2024	0.6369	0.00790	0.397	9/1/2023 18:10	1000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 2051-B
LCS Exp Date : 3/27/2024
LCS Activity (dpm/ml): 533.11
LCS Volume Added: 0.10

Results																
Pos.	Decision	Critical	Required	Sample Act.		Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA	Sample	Sample	RPD	RER	Nominal	Recovery
	Level	Level	MDA	MDA	Conc.	Error	Rate	Rate Error	Counting	Total Prop.						
	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	%	CPM	CPM	Uncertainty	Uncertainty						
1	0.8492	0.5995	3	1.3920	0.9454	46.62%	0.2450	0.1140	0.8625	0.8953		SAMPLE				
2	0.6403	0.4520	3	1.0859	0.6439	52.63%	0.1770	0.0930	0.6633	0.6832		SAMPLE				
3	0.9667	0.6825	3	1.5435	1.1404	43.05%	0.3193	0.1372	0.9602	1.0030		SAMPLE				
4	0.8855	0.6252	3	1.4337	0.2762	145.42%	0.0753	0.1095	0.7872	0.7904		SAMPLE				
5	0.7317	0.5166	3	1.2071	1.0056	39.52%	0.2890	0.1138	0.7764	0.8181		SAMPLE				
6	0.7279	0.5139	3	1.2116	1.1920	34.82%	0.3243	0.1124	0.8096	0.8657		SAMPLE				
7	1.2233	0.8637	3	1.8960	0.3262	166.23%	0.0967	0.1607	1.0627	1.0660		SAMPLE				
8	0.6513	0.4598	3	1.0905	0.4703	68.94%	0.1377	0.0948	0.6349	0.6461		SAMPLE				
9	0.6341	0.4477	3	1.0667	0.1474	194.92%	0.0430	0.0838	0.5629	0.5641		SAMPLE				
10	0.8958	0.6324	3	1.4730	0.5563	77.69%	0.1337	0.1037	0.8462	0.8583		SAMPLE				
11	0.7980	0.5634	3	1.3283	-0.1034	321.24%	-0.0257	0.0824	0.6511	0.6514		SAMPLE				
12	0.9454	0.6674	3	1.5072	0.3999	108.34%	0.1160	0.1256	0.8489	0.8550		SAMPLE				
13	0.9253	0.6533	3	1.4841	0.6818	65.33%	0.1920	0.1253	0.8723	0.8893		SAMPLE				
14	1.2641	0.8924	3	1.9664	-0.9584	50.80%	-0.2640	0.1339	0.9528	0.9530		SAMPLE				
15	0.9800	0.6919	3	1.5560	0.1355	317.21%	0.0393	0.1248	0.8423	0.8430		SAMPLE				
16	0.9319	0.6579	3	1.4889	0.9598	48.47%	0.2773	0.1341	0.9095	0.9425		SAMPLE				
17	1.2210	0.8621	3	1.9190	0.6250	89.89%	0.1603	0.1440	1.1005	1.1121		SAMPLE				
18	0.6205	0.4381	3	1.0462	0.2936	100.81%	0.0863	0.0870	0.5800	0.5848		MB				
19	0.5894	0.4161	3	1.0130	1.4693	26.72%	0.4063	0.1080	0.7655	0.8517	633177001.1	DUP	43.4%			
20	0.7013	0.4951	3	1.1699	76.2032	3.96%	21.2030	0.6003	4.2289	19.8415		LCS			78.5514	97.0%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
633177001	1A	60	11	45	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633177002	1B	60	2	30	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633177003	1C	60	9	65	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633177004	1D	60	3	41	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633177005	2A	60	5	45	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633177006	2B	60	2	44	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633542001	2D	60	5	88	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633542002	3B	60	2	31	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633542003	3C	60	4	24	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633542004	3D	60	10	37	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633612001	4A	60	7	23	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
633715001	4C	60	4	54	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
633715002	4D	60	13	54	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
633715003	5A	60	7	60	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
633715004	5D	60	8	53	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
633715005	6A	60	12	62	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
633715006	6C	60	2	71	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
1205493704	7A	60	9	26	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
1205493705	7B	60	3	41	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
1205493706	7C	60	6	1296	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427

ASSAY 5-Sep-23 12:29:19
 Wizard 2480 s/n 46190630
 Protocol id 8 Ba-133
 Time limit
 Count limit
 Isotope Ba-133
 Protocol date 9/5/2023
 Run id. 7247

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	93	1	180	3174	1057.83	1.77	12:29:19
633177001	2	93	2	180	2956	985.13	1.84	93.13	12:32:33
633177002	3	93	3	180	2744	914.47	1.91	86.45	12:35:46
633177003	4	93	4	180	2785.28	928.26	1.89	87.75	12:39:00
633177004	5	93	5	180	2734	911.18	1.91	86.14	12:42:15
633177005	1	19	1	180	2856	951.8	1.87	89.98	12:45:50
633177006	2	19	2	180	2620.28	873.27	1.95	82.55	12:49:04
633542001	3	19	3	180	2889.57	962.95	1.86	91.03	12:52:18
633542002	4	19	4	180	2794	931.19	1.89	88.03	12:55:32
633542003	5	19	5	180	2815.57	938.29	1.88	88.70	12:58:46
633542004	1	2	1	180	2554.57	851.38	1.98	80.48	01:02:22
633612001	2	2	2	180	2483.28	827.61	2.01	78.24	01:05:36
633715001	3	2	3	180	2746	915.14	1.91	86.51	01:08:50
633715002	4	2	4	180	2668.28	889.24	1.94	84.06	01:12:03
633715003	5	2	5	180	2627.28	875.57	1.95	82.77	01:15:18
633715004	1	98	1	180	2656.28	885.24	1.94	83.68	01:19:06
633715005	2	98	2	180	2708.28	902.57	1.92	85.32	01:22:20
633715006	3	98	3	180	2531	843.56	1.99	79.74	01:25:34
1205493704	4	98	4	180	2803.28	934.23	1.89	88.32	01:28:48
1205493705	5	98	5	180	2620.28	873.24	1.95	82.55	01:32:02
1205493706	1	10	1	180	2595.28	864.95	1.96	81.77	01:35:50

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 05-Sep-2023

Detectors LB4100 E1 through H4 and PIC 1A through 14D and G5400W 1W through 1Z and LB4200 GA1 through OD4

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100G3	Above	Beta bkg	05-Sep 09:28	60	2.050	0.785	2.444	+1.57
LB4100H1	Above	Alpha bkg	05-Sep 05:45	60	0.283	-8.08E-2	0.225	+4.14
LB4100H1	Above	Beta bkg	05-Sep 05:45	60	2.800	-5.15E-1	3.743	+1.67
LB4200GA2	Above	Alpha bkg	05-Sep 07:45	60	1.150	-1.34E-1	0.379	+12.03
LB4200GA2	Above	Beta bkg	05-Sep 07:45	60	2.983	-3.66E-2	1.795	+6.89
LB4200GB2	Above	Beta bkg	05-Sep 04:50	60	120	0.129	1.304	+606.47
LB4200OC1	Above	Beta bkg	05-Sep 08:41	60	1.600	0.178	1.284	+4.71
PIC2C	Above	Alpha bkg	05-Sep 06:27	60	0.433	-1.83E-2	0.433	+3.00
PIC2C	Above	Beta bkg	05-Sep 06:27	60	21.050	0.030	2.148	+56.54
PIC6B	Above	Beta bkg	05-Sep 06:40	60	7.783	0.262	2.449	+17.64
PIC12B	Above	Alpha bkg	05-Sep 06:57	60	0.517	-8.27E-2	0.413	+4.25
PIC12B	Above	Beta bkg	05-Sep 06:57	60	13.833	-5.75E-1	2.641	+23.88
PIC14B	Above	Beta bkg	05-Sep 07:20	60	3.717	-1.06E-1	1.026	+17.26

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

Reviewed by Jc Poparad

Date 9/5/23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2479427

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205493704	MB	JE1	PIC7A	SEP-05-23 13:43:10	DONE	25mm Filter	01-JUN-23 00:00
1205493705	DUP	JE1	PIC7B	SEP-05-23 13:43:14	DONE	25mm Filter	01-JUN-23 00:00
1205493706	LCS	JE1	PIC7C	SEP-05-23 13:43:19	DONE	25mm Filter	01-JUN-23 00:00
633177001	SAMPLE	JE1	PIC1A	SEP-05-23 13:43:20	DONE	25mm Filter	01-JUN-23 00:00
633177002	SAMPLE	JE1	PIC1B	SEP-05-23 13:43:25	DONE	25mm Filter	01-JUN-23 00:00
633177003	SAMPLE	JE1	PIC1C	SEP-05-23 13:43:29	DONE	25mm Filter	01-JUN-23 00:00
633177004	SAMPLE	JE1	PIC1D	SEP-05-23 13:43:33	DONE	25mm Filter	01-JUN-23 00:00
633177005	SAMPLE	JE1	PIC2A	SEP-05-23 13:43:37	DONE	25mm Filter	01-JUN-23 00:00
633177006	SAMPLE	JE1	PIC2B	SEP-05-23 13:43:41	DONE	25mm Filter	01-JUN-23 00:00
633542001	SAMPLE	JE1	PIC2D	SEP-05-23 13:43:45	DONE	25mm Filter	01-JUN-23 00:00
633542002	SAMPLE	JE1	PIC3B	SEP-05-23 13:43:49	DONE	25mm Filter	01-JUN-23 00:00
633542003	SAMPLE	JE1	PIC3C	SEP-05-23 13:43:56	DONE	25mm Filter	01-JUN-23 00:00
633542004	SAMPLE	JE1	PIC3D	SEP-05-23 13:43:59	DONE	25mm Filter	01-JUN-23 00:00
633612001	SAMPLE	JE1	PIC4A	SEP-05-23 13:44:03	DONE	25mm Filter	01-JUN-23 00:00
633715001	SAMPLE	JE1	PIC4C	SEP-05-23 13:44:07	DONE	25mm Filter	01-JUN-23 00:00
633715002	SAMPLE	JE1	PIC4D	SEP-05-23 13:44:13	DONE	25mm Filter	01-JUN-23 00:00
633715003	SAMPLE	JE1	PIC5A	SEP-05-23 13:44:17	DONE	25mm Filter	01-JUN-23 00:00
633715004	SAMPLE	JE1	PIC5D	SEP-05-23 13:44:23	DONE	25mm Filter	01-JUN-23 00:00
633715005	SAMPLE	JE1	PIC6A	SEP-05-23 13:44:27	DONE	25mm Filter	01-JUN-23 00:00
633715006	SAMPLE	JE1	PIC6C	SEP-05-23 13:44:33	DONE	25mm Filter	01-JUN-23 00:00

Lucas Cell Raw Data

Batch 2479421 Check-list

This check-list was completed on 11-SEP-23 by Lyndsey Pace

This batch was reviewed by Gregory Ramsay on 11-SEP-23 and Lyndsey Pace on 11-SEP-23.

Batch ID:
2479421

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2479421
Analyst: Lyndsey Pace (LXP1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: LUCAS-C202389980

Due Dates for Lab: 06-SEP-2023			Package: 10-SEP-2023	SDG: 08-SEP-2023		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205493687	Radium-226 SPIKE	1715-G	.1	mL	
MS	1205493686	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	633177001	07-SEP-2023	1	507.1	507.1	09/07/23 12:36	601	09/11/23 05:26	09/11/23 09:19	7	7
2	633177002	07-SEP-2023	1	505.07	505.07	09/07/23 12:36	708	09/11/23 05:26	09/11/23 09:19	4	7
3	633177003	07-SEP-2023	1	502	502	09/07/23 12:36	805	09/11/23 05:26	09/11/23 09:19	3	7
4	633177004	07-SEP-2023	1	511.23	511.23	09/07/23 12:36	102	09/11/23 05:51	09/11/23 10:10	3	8
5	633177005	07-SEP-2023	1	502.96	502.96	09/07/23 12:36	205	09/11/23 05:51	09/11/23 10:10	1	17
6	633177006	07-SEP-2023	1	504.99	504.99	09/07/23 12:36	301	09/11/23 05:51	09/11/23 10:10	3	18
7	633542001	07-SEP-2023	1	504.78	504.78	09/07/23 12:36	403	09/11/23 05:51	09/11/23 10:10	3	9
8	633542002	07-SEP-2023	1	512.09	512.09	09/07/23 12:36	508	09/11/23 05:51	09/11/23 10:10	4	14
9	633542003	07-SEP-2023	1	502.38	502.38	09/07/23 12:36	603	09/11/23 05:51	09/11/23 10:10	2	8
10	633542004	07-SEP-2023	1	505.62	505.62	09/07/23 12:36	707	09/11/23 05:51	09/11/23 10:10	6	4
11	633612001	07-SEP-2023	1	508.06	508.06	09/07/23 12:36	803	09/11/23 05:51	09/11/23 10:10	1	8
12	633715001	07-SEP-2023	1	504.84	504.84	09/07/23 12:36	105	09/11/23 06:16	09/11/23 10:43	2	15
13	633715002	07-SEP-2023	1	505.73	505.73	09/07/23 12:36	201	09/11/23 06:16	09/11/23 10:43	3	19
14	633715003	07-SEP-2023	1	504.46	504.46	09/07/23 12:36	303	09/11/23 06:16	09/11/23 10:43	1	17
15	633715004	07-SEP-2023	1	506.34	506.34	09/07/23 12:36	406	09/11/23 06:16	09/11/23 10:43	1	16
16	633715005	07-SEP-2023	1	505.89	505.89	09/07/23 12:36	506	09/11/23 06:16	09/11/23 10:43	2	4
17	633715006	07-SEP-2023	1	500	500	09/07/23 12:36	607	09/11/23 06:16	09/11/23 10:43	2	9
18	1205493684 MB	07-SEP-2023	1	512.09	512.09	09/07/23 12:36	706	09/11/23 06:16	09/11/23 10:43	6	2
19	1205493685 DUP (633177001)	07-SEP-2023	1	502.39	502.39	09/07/23 12:36	804	09/11/23 06:16	09/11/23 10:43	6	6
20	1205493686 MS (633177001)	07-SEP-2023	1	105.09	105.09	09/07/23 12:36	103	09/11/23 06:40	09/11/23 11:01	4	371
21	1205493687 LCS	07-SEP-2023	1		512.09	09/07/23 12:36	208	09/11/23 06:40	09/11/23 11:01	7	354

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 07-SEP-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Procedure Code : LUC26RAL
 Parmname : Radium-226
 Required MDA : 1 pCi/L
 Halfife of Ra-226 : 1600 years
 Ra-226 Abundance : 1.00
 Halflife of Rn-222: 3.8235 days

Batch : 2479421
 Analyst : LIN01615
 Prep Date : 9/7/2023
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	633177001.1	0.5071	2.0284E-05	8/8/2023 11:08	601	15	7	0.467	7	0.233	30	1.8870
2	633177002.1	0.5051	2.0276E-05	8/8/2023 12:55	708	15	7	0.467	4	0.133	30	1.6020
3	633177003.1	0.5020	2.0264E-05	8/8/2023 14:21	805	15	7	0.467	3	0.100	30	1.5410
4	633177004.1	0.5112	2.0301E-05	8/8/2023 12:34	102	15	8	0.533	3	0.100	30	1.4860
5	633177005.1	0.5030	2.0268E-05	8/8/2023 11:08	205	15	17	1.133	1	0.033	30	1.7590
6	633177006.1	0.5050	2.0276E-05	8/8/2023 9:30	301	15	18	1.200	3	0.100	30	1.6430
7	633542001.1	0.5048	2.0275E-05	8/11/2023 9:53	403	15	9	0.600	3	0.100	30	1.5070
8	633542002.1	0.5121	2.0304E-05	8/11/2023 11:53	508	15	14	0.933	4	0.133	30	1.9780
9	633542003.1	0.5024	2.0266E-05	8/14/2023 9:53	603	15	8	0.533	2	0.067	30	1.8970
10	633542004.1	0.5056	2.0279E-05	8/11/2023 8:55	707	15	4	0.267	6	0.200	30	1.7280
11	633612001.1	0.5081	2.0288E-05	8/11/2023 10:10	803	15	8	0.533	1	0.033	30	1.4760
12	633715001.1	0.5048	2.0276E-05	8/14/2023 15:12	105	15	15	1.000	2	0.067	30	1.5340
13	633715002.1	0.5057	2.0279E-05	8/14/2023 11:03	201	15	19	1.267	3	0.100	30	1.6670
14	633715003.1	0.5045	2.0274E-05	8/14/2023 12:53	303	15	17	1.133	1	0.033	30	1.7210
15	633715004.1	0.5063	2.0281E-05	8/14/2023 14:31	406	15	16	1.067	1	0.033	30	1.4650
16	633715005.1	0.5059	2.0280E-05	8/14/2023 11:03	506	15	4	0.267	2	0.067	30	1.8780
17	633715006.1	0.5000	2.0256E-05	8/14/2023 9:10	607	15	9	0.600	2	0.067	30	1.7750
18	1205493684.1	0.5121	2.0304E-05	9/7/2023 0:00	706	15	2	0.133	6	0.200	30	1.5900
19	1205493685.1	0.5024	2.0266E-05	8/8/2023 11:08	804	15	6	0.400	6	0.200	30	1.6240
20	1205493686.1	0.1051	1.1678E-05	8/8/2023 11:08	103	15	371	24.733	4	0.133	30	1.6400
21	1205493687.1	0.5121	2.0304E-05	9/7/2023 0:00	208	15	354	23.600	7	0.233	30	1.7130

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
6.700%	7/1/2023	6/30/2024	9/7/2023 12:36	9/11/2023 5:26	9/11/2023 9:19	0.489	0.971	1.001	1.000
7.700%	11/1/2022	10/31/2023	9/7/2023 12:36	9/11/2023 5:26	9/11/2023 9:19	0.489	0.971	1.001	1.000
9.600%	4/8/2023	3/31/2024	9/7/2023 12:36	9/11/2023 5:26	9/11/2023 9:19	0.489	0.971	1.001	1.000
2.300%	5/1/2023	4/30/2024	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
9.200%	8/1/2023	7/31/2024	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
4.500%	10/25/2022	10/31/2023	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
6.100%	2/1/2023	1/31/2024	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
8.400%	6/1/2023	5/31/2024	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
3.500%	7/1/2023	6/30/2024	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
2.200%	11/1/2022	10/31/2023	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
4.700%	4/8/2023	3/31/2024	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
7.900%	5/1/2023	4/30/2024	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
7.400%	8/1/2023	7/31/2024	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
7.400%	10/25/2022	10/31/2023	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
2.900%	2/1/2023	1/31/2024	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
1.400%	6/1/2023	5/31/2024	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
6.800%	7/1/2023	6/30/2024	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
2.900%	11/1/2022	10/31/2023	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
6.100%	4/8/2023	3/31/2024	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
9.600%	5/1/2023	4/30/2024	9/7/2023 12:36	9/11/2023 6:40	9/11/2023 11:01	0.494	0.968	1.001	1.000
4.400%	8/1/2023	7/31/2024	9/7/2023 12:36	9/11/2023 6:40	9/11/2023 11:01	0.494	0.968	1.001	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-G
Spike Exp Date : 9/8/2023
Spike Activity (dpm/ml): 297.37
Spike Volume Added: 0.10

LCS S/N : 1715-G
LCS Exp Date : 9/8/2023
LCS Activity (dpm/ml): 297.37
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.3533	0.2494	1	0.6974	0.2316	84.78%	0.2333	0.1972	0.3837	0.3863		SAMPLE				
2	0.3159	0.2230	1	0.6808	0.3913	57.09%	0.3333	0.1886	0.4339	0.4415		SAMPLE				
3	0.2861	0.2020	1	0.6496	0.4502	51.52%	0.3667	0.1856	0.4467	0.4593		SAMPLE				
4	0.2913	0.2057	1	0.6614	0.5418	45.57%	0.4333	0.1972	0.4833	0.4902		SAMPLE				
5	0.1444	0.1020	1	0.4187	1.1810	26.80%	1.1000	0.2769	0.5827	0.6434		SAMPLE				
6	0.2668	0.1883	1	0.6056	1.2593	26.63%	1.1000	0.2887	0.6478	0.6819		SAMPLE				
7	0.2909	0.2054	1	0.6606	0.6243	42.08%	0.5000	0.2082	0.5095	0.5227		SAMPLE				
8	0.2523	0.1781	1	0.5438	0.7502	33.35%	0.8000	0.2582	0.4746	0.5022		SAMPLE				
9	0.1896	0.1339	1	0.4671	0.4651	41.80%	0.4667	0.1944	0.3797	0.3869		SAMPLE				
10	0.3582	0.2529	1	0.7233	0.0725	234.53%	0.0667	0.1563	0.3332	0.3333		SAMPLE				
11	0.1704	0.1203	1	0.4939	0.6333	38.58%	0.5000	0.1915	0.4754	0.4876		SAMPLE				
12	0.2328	0.1644	1	0.5735	1.1422	29.21%	0.9333	0.2625	0.6296	0.6744		SAMPLE				
13	0.2619	0.1849	1	0.5947	1.3115	26.45%	1.1667	0.2963	0.6528	0.7058		SAMPLE				
14	0.1469	0.1037	1	0.4257	1.2008	26.24%	1.1000	0.2769	0.5924	0.6414		SAMPLE				
15	0.1719	0.1213	1	0.4982	1.3202	26.17%	1.0333	0.2687	0.6730	0.7035		SAMPLE				
16	0.1898	0.1340	1	0.4675	0.1995	70.72%	0.2000	0.1414	0.2765	0.2781		SAMPLE				
17	0.2032	0.1434	1	0.5004	0.5695	39.12%	0.5333	0.2055	0.4301	0.4444		SAMPLE				
18	0.3835	0.2708	1	0.7743	-0.0776	187.11%	-0.0667	0.1247	0.2845	0.2846		MB				
19	0.3828	0.2702	1	0.7728	0.2323	91.49%	0.2000	0.1826	0.4157	0.4180	633177001.1	DUP	0.3%			
20	1.4738	1.0405	1	3.1766	134.7544	10.93%	24.6000	1.2858	13.8052	34.8117	633177001.1	MS			127.4654	105.7%
21	0.3830	0.2704	1	0.7561	25.1473	6.95%	23.3667	1.2574	2.6524	4.9915		LCS			26.1573	96.1%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 11-SEP-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	08:10	1	1.15E+05	115416	-0.12		
LUCAS2	EFF	08:09	1	1.32E+05	132307	-1.08		
LUCAS3	EFF	08:08	1	91119	91119	-2.79		
LUCAS4	EFF	08:07	1	1.29E+05	128693	1.2		
LUCAS5	EFF	08:05	1	1.32E+05	131887	-0.71		
LUCAS6	EFF	08:04	1	1.31E+05	130508	0.78		
LUCAS7	EFF	08:03	1	1.32E+05	131641	0.34		
LUCAS8	EFF	08:02	1	1.17E+05	117147	-1.32		

Reviewed by: 
Lyndsey Pace

Date: 11-SEP-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2479421

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
633177001	SAMPLE	LXP1	LUCAS6	SEP-11-23 09:19:00	DONE	Lucas Cell	01-JUL-23 00:00
633177002	SAMPLE	LXP1	LUCAS7	SEP-11-23 09:19:00	DONE	Lucas Cell	01-NOV-22 00:00
633177003	SAMPLE	LXP1	LUCAS8	SEP-11-23 09:19:00	DONE	Lucas Cell	08-APR-23 00:00
633177004	SAMPLE	LXP1	LUCAS1	SEP-11-23 10:10:00	DONE	Lucas Cell	01-MAY-23 00:00
633177005	SAMPLE	LXP1	LUCAS2	SEP-11-23 10:10:00	DONE	Lucas Cell	01-AUG-23 00:00
633177006	SAMPLE	LXP1	LUCAS3	SEP-11-23 10:10:00	DONE	Lucas Cell	25-OCT-22 00:00
633542001	SAMPLE	LXP1	LUCAS4	SEP-11-23 10:10:00	DONE	Lucas Cell	01-FEB-23 00:00
633542002	SAMPLE	LXP1	LUCAS5	SEP-11-23 10:10:00	DONE	Lucas Cell	01-JUN-23 00:00
633542003	SAMPLE	LXP1	LUCAS6	SEP-11-23 10:10:00	DONE	Lucas Cell	01-JUL-23 00:00
633542004	SAMPLE	LXP1	LUCAS7	SEP-11-23 10:10:00	DONE	Lucas Cell	01-NOV-22 00:00
633612001	SAMPLE	LXP1	LUCAS8	SEP-11-23 10:10:00	DONE	Lucas Cell	08-APR-23 00:00
633715001	SAMPLE	LXP1	LUCAS1	SEP-11-23 10:43:00	DONE	Lucas Cell	01-MAY-23 00:00
633715002	SAMPLE	LXP1	LUCAS2	SEP-11-23 10:43:00	DONE	Lucas Cell	01-AUG-23 00:00
633715003	SAMPLE	LXP1	LUCAS3	SEP-11-23 10:43:00	DONE	Lucas Cell	25-OCT-22 00:00
633715004	SAMPLE	LXP1	LUCAS4	SEP-11-23 10:43:00	DONE	Lucas Cell	01-FEB-23 00:00
633715005	SAMPLE	LXP1	LUCAS5	SEP-11-23 10:43:00	DONE	Lucas Cell	01-JUN-23 00:00
633715006	SAMPLE	LXP1	LUCAS6	SEP-11-23 10:43:00	DONE	Lucas Cell	01-JUL-23 00:00
1205493684	MB	LXP1	LUCAS7	SEP-11-23 10:43:00	DONE	Lucas Cell	01-NOV-22 00:00
1205493685	DUP	LXP1	LUCAS8	SEP-11-23 10:43:00	DONE	Lucas Cell	08-APR-23 00:00
1205493686	MS	LXP1	LUCAS1	SEP-11-23 11:01:00	DONE	Lucas Cell	01-MAY-23 00:00
1205493687	LCS	LXP1	LUCAS2	SEP-11-23 11:01:00	DONE	Lucas Cell	01-AUG-23 00:00



Report ID: S52209.01(02)
Generated on 09/12/2023
Replaces report S52209.01(01) generated on 08/17/2023

Report to
Attention: Jennifer Caporale
Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Report produced by
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Contacts for report questions:
John Lavery (johnlavery@meritlabs.com)
Barbara Ball (bball@meritlabs.com)

Report Summary

Lab Sample ID(s): S52209.01-S52209.06
Project: Erickson AM MI Wells 100A-100D
Collected Date(s): 08/14/2023
Submitted Date/Time: 08/15/2023 08:16
Sampled by: Marc Wahrer
P.O. #:

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Maya Murshak
Technical Director



General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

Report Narrative

All analyses completed



Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP & ISO/IEC 17025:2017	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



Sample Summary (6 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S52209.01	MW-100A L308171-01	Groundwater	08/14/23 15:12
S52209.02	MW-100B L308171-02	Groundwater	08/14/23 11:03
S52209.03	MW-100C L308171-03	Groundwater	08/14/23 12:53
S52209.04	MW-100D L308171-04	Groundwater	08/14/23 14:31
S52209.05	MWT-100B L308171-05	Groundwater	08/14/23 11:03
S52209.06	Field Blank L308171-06	Water	08/14/23 09:10



Analytical Laboratory Report

Final Report

Lab Sample ID: S52209.01

Sample Tag: MW-100A L308171-01

Collected Date/Time: 08/14/2023 15:12

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.2	IR
2	1L Plastic	None	Yes	2.2	IR
1	250ml Plastic	HNO3	Yes	2.2	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/17/23 13:45	CTV	
Metal Digestion	Completed	SW3015A	08/15/23 10:20	CCM	

Inorganics

Method: E300.0, Run Date: 08/15/23 10:32, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	10	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	28	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/16/23 11:06, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	460	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/16/23 15:08, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	396	20	4.73	mg/L	20		

Method: SM2540C, Run Date: 08/15/23 16:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	424	50	12	mg/L	2		

Method: SM2540D, Run Date: 08/16/23 16:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	7.5	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 08/15/23 12:11, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.015	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.206	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.05	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	3.75	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S52209.01 (continued)

Sample Tag: MW-100A L308171-01

Method: E200.8, Run Date: 08/15/23 12:11, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.019	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.012	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/16/23 12:32, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	93.0	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	40.0	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	2.27	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	11.3	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/17/23 14:55, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/11/23 12:12, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S52209.02

Sample Tag: MW-100B L308171-02

Collected Date/Time: 08/14/2023 11:03

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.2	IR
2	1L Plastic	None	Yes	2.2	IR
1	250ml Plastic	HNO3	Yes	2.2	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/15/23 23:05	CTV	
Metal Digestion	Completed	SW3015A	08/15/23 10:20	CCM	

Inorganics

Method: E300.0, Run Date: 08/15/23 10:42, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	25	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	116	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/16/23 11:10, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	360	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/16/23 15:12, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	364	20	4.73	mg/L	20		

Method: SM2540C, Run Date: 08/15/23 16:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	508	50	12	mg/L	2		

Method: SM2540D, Run Date: 08/16/23 16:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	3.0	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 08/16/23 10:51, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.011	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.153	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.25	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	2.89	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S52209.02 (continued)

Sample Tag: MW-100B L308171-02

Method: E200.8, Run Date: 08/16/23 10:51, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.017	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.010	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/16/23 12:38, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	98.0	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	35.8	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	3.46	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	24.8	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/15/23 22:33, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/11/23 12:12, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Lab Sample ID: S52209.03

Sample Tag: MW-100C L308171-03

Collected Date/Time: 08/14/2023 12:53

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.2	IR
2	1L Plastic	None	Yes	2.2	IR
1	250ml Plastic	HNO3	Yes	2.2	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/15/23 23:05	CTV	
Metal Digestion	Completed	SW3015A	08/15/23 10:20	CCM	

Inorganics

Method: E300.0, Run Date: 08/15/23 10:52, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	8	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	13	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/16/23 11:16, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	340	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/16/23 15:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	218	20	4.73	mg/L	20		

Method: SM2540C, Run Date: 08/15/23 16:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	314	50	12	mg/L	2		

Method: SM2540D, Run Date: 08/16/23 16:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	8.9	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 08/16/23 10:55, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.082	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	1.81	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.97	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S52209.03 (continued)

Sample Tag: MW-100C L308171-03

Method: E200.8, Run Date: 08/16/23 10:55, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.031	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.007	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/16/23 12:40, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	55.2	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	18.5	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	6.49	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	36.4	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/15/23 22:37, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/11/23 12:12, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S52209.04

Sample Tag: MW-100D L308171-04

Collected Date/Time: 08/14/2023 14:31

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.2	IR
2	1L Plastic	None	Yes	2.2	IR
1	250ml Plastic	HNO3	Yes	2.2	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/15/23 23:05	CTV	
Metal Digestion	Completed	SW3015A	08/15/23 10:20	CCM	

Inorganics

Method: E300.0, Run Date: 08/15/23 11:02, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	5	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	14	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/16/23 11:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	390	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/16/23 15:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	19	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 08/15/23 16:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	414	50	12	mg/L	2		

Method: SM2540D, Run Date: 08/16/23 16:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	2.2	3	1	mg/L	1		b

Metals

Method: E200.8, Run Date: 08/16/23 10:58, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.003	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.010	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	3.39	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL



Analytical Laboratory Report

Final Report

Lab Sample ID: S52209.04 (continued)

Sample Tag: MW-100D L308171-04

Method: E200.8, Run Date: 08/16/23 10:58, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	0.45	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.016	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.012	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/16/23 12:41, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	6.27	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	1.47	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	4.22	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	151	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/15/23 22:41, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/11/23 12:12, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S52209.05

Sample Tag: MWT-100B L308171-05

Collected Date/Time: 08/14/2023 11:03

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.2	IR
2	1L Plastic	None	Yes	2.2	IR
1	250ml Plastic	HNO3	Yes	2.2	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/15/23 23:05	CTV	
Metal Digestion	Completed	SW3015A	08/15/23 10:20	CCM	

Inorganics

Method: E300.0, Run Date: 08/15/23 11:12, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	25	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	116	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/16/23 11:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	360	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/16/23 15:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	364	20	4.73	mg/L	20		

Method: SM2540C, Run Date: 08/15/23 16:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	510	50	12	mg/L	2		

Method: SM2540D, Run Date: 08/16/23 16:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	3.4	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 08/16/23 11:02, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.010	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.154	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.25	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	2.88	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S52209.05 (continued)

Sample Tag: MWT-100B L308171-05

Method: E200.8, Run Date: 08/16/23 11:02, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.017	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.010	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 08/16/23 12:43, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	99.2	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	35.5	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	3.54	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	24.9	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 08/15/23 22:45, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/11/23 12:12, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Lab Sample ID: S52209.06

Sample Tag: Field Blank L308171-06

Collected Date/Time: 08/14/2023 09:10

Matrix: Water

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.2	IR
2	1L Plastic	None	Yes	2.2	IR
1	250ml Plastic	HNO3	Yes	2.2	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	08/15/23 23:05	CTV	
Metal Digestion	Completed	SW3015A	08/15/23 10:20	CCM	

Inorganics

Method: E300.0, Run Date: 08/15/23 11:22, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.03	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.04	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.26	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 08/16/23 11:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 08/16/23 15:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 08/15/23 16:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	12	mg/L	2		

Method: SM2540D, Run Date: 08/16/23 16:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 08/15/23 11:30, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S52209.06 (continued)

Sample Tag: Field Blank L308171-06

Method: E200.8, Run Date: 08/15/23 11:30, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 08/16/23 12:20, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 08/15/23 22:49, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 09/11/23 12:12, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

Merit Laboratories Login Checklist

Lab Set ID:S52209

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 100A-100D

Submitted:08/15/2023 08:16 Login User: BJB

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Selection	Description	Note
Sample Receiving		
01.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples are received at 4C +/- 2C Thermometer # IR 2.2
02.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Received on ice/ cooling process begun
03.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples shipped
04.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples left in 24 hr. drop box
05.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Are there custody seals/tape or is the drop box locked
Chain of Custody		
06.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC adequately filled out
07.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC signed and relinquished to the lab
08.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sample tag on bottles match COC
09.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Subcontracting needed? Subcontracted to: GEL
Preservation		
10.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Do sample have correct chemical preservation
11.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Completed pH checks on preserved samples? (no VOAs)
12.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Did any samples need to be preserved in the lab?
Bottle Conditions		
13.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	All bottles intact
14.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Appropriate analytical bottles are used
15.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Merit bottles used
16.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sufficient sample volume received
17.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples require laboratory filtration
18.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples submitted within holding time
19.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S52209 Submitted: 08/15/2023 08:16

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 100A-100D

Attention: Jennifer Caporale
Address: Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Initial Preservation Check: 08/15/2023 08:35 BJB

Preservation Recheck (E200.8): N/A

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S52209.01	1L Plastic HNO3	<2			
S52209.01	1L Plastic HNO3	<2			
S52209.01	250ml Plastic HNO3	<2			
S52209.02	1L Plastic HNO3	<2			
S52209.02	1L Plastic HNO3	<2			
S52209.02	250ml Plastic HNO3	<2			
S52209.03	1L Plastic HNO3	<2			
S52209.03	1L Plastic HNO3	<2			
S52209.03	250ml Plastic HNO3	<2			
S52209.04	1L Plastic HNO3	<2			
S52209.04	1L Plastic HNO3	<2			
S52209.04	250ml Plastic HNO3	<2			
S52209.05	1L Plastic HNO3	<2			
S52209.05	1L Plastic HNO3	<2			
S52209.05	250ml Plastic HNO3	<2			
S52209.06	1L Plastic HNO3	<2			
S52209.06	1L Plastic HNO3	<2			
S52209.06	250ml Plastic HNO3	<2			

Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6mos	0.150
Be, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Chloride	250 mL plastic	mg/L	Chill	300.0	6 mos	2.5
Cl	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	28 d	10
Cr, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Fluoride	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Iron	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Lead	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Mercury	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Molybdenum	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Radium 226 and 228 combined	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Selenium	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Sulfate	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Thallium	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Total Dissolved Solids	1 L plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Vanadium	250 mL plastic	mg/L	None	SM 2540D	NA	3
V, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total				Nitric Acid	200.8	6 mos	0.005

September 08, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 633715
SDG: S52209

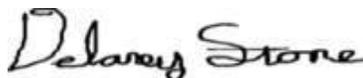
Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on August 17, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,



Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S52209
Work Order: 633715**

September 08, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on August 17, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

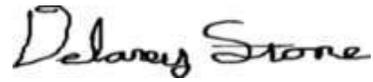
Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
633715001	S52209.01
633715002	S52209.02
633715003	S52209.03
633715004	S52209.04
633715005	S52209.05
633715006	S52209.06 Field Blank

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Delaney Stone". The signature is written in a cursive, slightly slanted style.

Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

Laboratory Certifications

List of current GEL Certifications as of 08 September 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S52209
Work Order #: 633715**

Product: Radium-226+Radium-228 Calculation

Analytical Method: Calculation

Analytical Procedure: GL-RAD-D-003 REV# 45

Analytical Batch: 2479712

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
633715001	S52209.01
633715002	S52209.02
633715003	S52209.03
633715004	S52209.04
633715005	S52209.05
633715006	S52209.06 Field Blank

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2479427

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
633715001	S52209.01
633715002	S52209.02
633715003	S52209.03
633715004	S52209.04
633715005	S52209.05
633715006	S52209.06 Field Blank
1205493704	Method Blank (MB)
1205493705	633177001(S51950.01) Sample Duplicate (DUP)
1205493706	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2479421

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
633715001	S52209.01
633715002	S52209.02
633715003	S52209.03
633715004	S52209.04
633715005	S52209.05
633715006	S52209.06 Field Blank
1205493684	Method Blank (MB)
1205493685	633177001(S51950.01) Sample Duplicate (DUP)
1205493686	633177001(S51950.01) Matrix Spike (MS)
1205493687	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

The matrix spike, 1205493686 (S51950.01MS), aliquot was reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S52209 GEL Work Order: 633715

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 12 SEP 2023

Title: Analyst III - Data Validator

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: September 11, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S52209.01 Project: MERI00120
Sample ID: 633715001 Client ID: MERI001
Matrix: Ground Water
Collect Date: 14-AUG-23 15:12
Receive Date: 17-AUG-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.400	+/-0.849	1.51	3.00	pCi/L			JE1	09/05/23	1344 2479427	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.54	+/-1.06			pCi/L		1	TON1	09/11/23	1212 2479712	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		1.14	+/-0.630	0.574	1.00	pCi/L			LXP1	09/11/23	1043 2479421	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			86.5	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: September 11, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S52209.02 Project: MERI00120
Sample ID: 633715002 Client ID: MERI001
Matrix: Ground Water
Collect Date: 14-AUG-23 11:03
Receive Date: 17-AUG-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.682	+/-0.872	1.48	3.00	pCi/L			JE1	09/05/23	1344 2479427	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.99	+/-1.09			pCi/L		1	TON1	09/11/23	1212 2479712	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		1.31	+/-0.653	0.595	1.00	pCi/L			LXP1	09/11/23	1043 2479421	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			84.1	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: September 11, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S52209.03 Project: MERI00120
Sample ID: 633715003 Client ID: MERI001
Matrix: Ground Water
Collect Date: 14-AUG-23 12:53
Receive Date: 17-AUG-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	-0.958	+/-0.953	1.97	3.00	pCi/L			JE1	09/05/23	1344 2479427	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.20	+/-1.12			pCi/L		1	TON1	09/11/23	1212 2479712	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		1.20	+/-0.592	0.426	1.00	pCi/L			LXP1	09/11/23	1043 2479421	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			82.8	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: September 11, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S52209.04 Project: MERI00120
Sample ID: 633715004 Client ID: MERI001
Matrix: Ground Water
Collect Date: 14-AUG-23 14:31
Receive Date: 17-AUG-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.135	+/-0.842	1.56	3.00	pCi/L			JE1	09/05/23	1344 2479427	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.46	+/-1.08			pCi/L		1	TON1	09/11/23	1212 2479712	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		1.32	+/-0.673	0.498	1.00	pCi/L			LXP1	09/11/23	1043 2479421	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			83.7	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: September 11, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S52209.05 Project: MERI00120
Sample ID: 633715005 Client ID: MERI001
Matrix: Ground Water
Collect Date: 14-AUG-23 11:03
Receive Date: 17-AUG-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.960	+/-0.910	1.49	3.00	pCi/L		JE1	09/05/23	1344	2479427		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.16	+/-0.951			pCi/L		1 TON1	09/11/23	1212	2479712		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.200	+/-0.277	0.467	1.00	pCi/L		LXP1	09/11/23	1043	2479421		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			85.3	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: September 11, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S52209.06 Field Blank	Project: MERI00120
Sample ID: 633715006	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 14-AUG-23 09:10	
Receive Date: 17-AUG-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.625	+/-1.10	1.92	3.00	pCi/L		JE1	09/05/23	1344	2479427	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.19	+/-1.18			pCi/L		1 TON1	09/11/23	1212	2479712	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.570	+/-0.430	0.500	1.00	pCi/L		LXP1	09/11/23	1043	2479421	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			79.7	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: September 11, 2023

Page 1 of 2

Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan

Contact: John Laverty

Workorder: 633715

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2479427										
QC1205493705	633177001	DUP									
Radium-228	U	0.945		1.47	pCi/L	43.4		(0% - 100%)	JE1	09/05/23	13:43
	Uncertainty	+/-0.862		+/-0.765							
QC1205493706	LCS										
Radium-228	78.6			76.2	pCi/L		97	(75%-125%)		09/05/23	13:43
	Uncertainty			+/-4.23							
QC1205493704	MB										
Radium-228			U	0.294	pCi/L					09/05/23	13:43
	Uncertainty			+/-0.580							
Rad Ra-226											
Batch	2479421										
QC1205493685	633177001	DUP									
Radium-226	U	0.232	U	0.232	pCi/L	N/A		N/A	LXP1	09/11/23	10:43
	Uncertainty	+/-0.384		+/-0.416							
QC1205493687	LCS										
Radium-226	26.2			25.1	pCi/L		96.1	(75%-125%)		09/11/23	11:01
	Uncertainty			+/-2.65							
QC1205493684	MB										
Radium-226			U	-0.0776	pCi/L					09/11/23	10:43
	Uncertainty			+/-0.285							
QC1205493686	633177001	MS									
Radium-226	127	U		0.232	pCi/L		106	(75%-125%)		09/11/23	11:01
	Uncertainty			+/-0.384							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- H Analytical holding time was exceeded
- < Result is less than value reported
- > Result is greater than value reported

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Workorder: 633715

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
NI											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2479427 Check-list

This check-list was completed on 05-SEP-23 by Nat Long

This batch was reviewed by Nat Long on 05-SEP-23 and Kenshalla Oston on 06-SEP-23.

Batch ID:
2479427

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2479427
Analyst: Jacqueline Winston (JE1)
 Prep: Charles Hall (CH7)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: BAL-C236761727

Due Dates for Lab: 06-SEP-2023			Package: 10-SEP-2023	SDG: 08-SEP-2023		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205493706	228	2051-B	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	633177001	29-AUG-2023	3	301.35	301.35	08/31/23 13:57	09/05/23 12:07
2	633177002	29-AUG-2023	3	300.49	300.49	08/31/23 13:57	09/05/23 12:07
3	633177003	29-AUG-2023	3	302.58	302.58	08/31/23 13:57	09/05/23 12:07
4	633177004	29-AUG-2023	3	300.56	300.56	08/31/23 13:57	09/05/23 12:07
5	633177005	29-AUG-2023	3	302.65	302.65	08/31/23 13:57	09/05/23 12:07
6	633177006	29-AUG-2023	3	303.89	303.89	08/31/23 13:57	09/05/23 12:07
7	633542001	29-AUG-2023	3	302.12	302.12	08/31/23 13:57	09/05/23 12:07
8	633542002	29-AUG-2023	3	305.71	305.71	08/31/23 13:57	09/05/23 12:07
9	633542003	29-AUG-2023	3	303.26	303.26	08/31/23 13:57	09/05/23 12:07
10	633542004	29-AUG-2023	3	303.05	303.05	08/31/23 13:57	09/05/23 12:07
11	633612001	29-AUG-2023	3	301	301	08/31/23 13:57	09/05/23 12:07
12	633715001	29-AUG-2023	3	302.8	302.8	08/31/23 13:57	09/05/23 12:07
13	633715002	29-AUG-2023	3	300.9	300.9	08/31/23 13:57	09/05/23 12:07
14	633715003	29-AUG-2023	3	301.1	301.1	08/31/23 13:57	09/05/23 12:07
15	633715004	29-AUG-2023	3	304.4	304.4	08/31/23 13:57	09/05/23 12:07
16	633715005	29-AUG-2023	3	302.8	302.8	08/31/23 13:57	09/05/23 12:07
17	633715006	29-AUG-2023	3	300.6	300.6	08/31/23 13:57	09/05/23 12:07
18	1205493704 MB	29-AUG-2023	3		305.71	08/31/23 13:57	09/05/23 12:07
19	1205493705 DUP (633177001)	29-AUG-2023	3	300.46	300.46	08/31/23 13:57	09/05/23 12:07
20	1205493706 LCS	29-AUG-2023	3		305.71	08/31/23 13:57	09/05/23 12:07

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 2097-B	Ba-133 Tracer	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 29-AUG-2023 00:00
REGNT 3956035	Barium Carrier Ra228 REG	1 mL	
REGNT 3960868	RGF-1M Citric Acid	5 mL	
REGNT 3959817	2M HCl	20 mL	
REGNT 3955326	RGF-7M Nitric Acid	25 mL	
REGNT 3958741	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT DGA071323	2472106	2 g	
REGNT 3957480.5	RGF-Hydrofluoric Acid	4 mL	
REGNT 3940152	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3957910	RGF-Neodymium Substrate	5 mL	
REGNT 3954355.13	Nitric Acid	5 mL	
REGNT 3958747	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3946262	RGF-50% Potassium Carbonate	2 mL	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 2097-B
 Tracer Exp Date : 7/12/2024
 Tracer Volume Added: 0.10

Batch : 2479427
 Analyst : CHA00185
 Prep Date : 8/29/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 3 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	633177001.1	0.3014	1.8482E-05	8/8/2023 11:08	1057.8	1.77%	985.1	1.84%	0.1	0.000200
2	633177002.1	0.3005	1.8467E-05	8/8/2023 12:55	1057.8	1.77%	914.5	1.91%	0.1	0.000200
3	633177003.1	0.3026	1.8503E-05	8/8/2023 14:21	1057.8	1.77%	928.3	1.89%	0.1	0.000200
4	633177004.1	0.3006	1.8469E-05	8/8/2023 12:34	1057.8	1.77%	911.2	1.91%	0.1	0.000200
5	633177005.1	0.3027	1.8504E-05	8/8/2023 11:08	1057.8	1.77%	951.8	1.87%	0.1	0.000200
6	633177006.1	0.3039	1.8524E-05	8/8/2023 9:30	1057.8	1.77%	873.3	1.95%	0.1	0.000200
7	633542001.1	0.3021	1.8495E-05	8/11/2023 9:53	1057.8	1.77%	963.0	1.86%	0.1	0.000200
8	633542002.1	0.3057	1.8554E-05	8/11/2023 11:53	1057.8	1.77%	931.2	1.89%	0.1	0.000200
9	633542003.1	0.3033	1.8514E-05	8/14/2023 9:53	1057.8	1.77%	938.3	1.88%	0.1	0.000200
10	633542004.1	0.3031	1.8510E-05	8/11/2023 8:55	1057.8	1.77%	851.4	1.98%	0.1	0.000200
11	633612001.1	0.3010	1.8476E-05	8/11/2023 10:10	1057.8	1.77%	827.6	2.01%	0.1	0.000200
12	633715001.1	0.3028	1.8506E-05	8/14/2023 15:12	1057.8	1.77%	915.1	1.91%	0.1	0.000200
13	633715002.1	0.3009	1.8474E-05	8/14/2023 11:03	1057.8	1.77%	889.2	1.94%	0.1	0.000200
14	633715003.1	0.3011	1.8478E-05	8/14/2023 12:53	1057.8	1.77%	875.6	1.95%	0.1	0.000200
15	633715004.1	0.3044	1.8533E-05	8/14/2023 14:31	1057.8	1.77%	885.2	1.94%	0.1	0.000200
16	633715005.1	0.3028	1.8506E-05	8/14/2023 11:03	1057.8	1.77%	902.6	1.92%	0.1	0.000200
17	633715006.1	0.3006	1.8469E-05	8/14/2023 9:10	1057.8	1.77%	843.6	1.99%	0.1	0.000200
18	1205493704.1	0.3057	1.8554E-05	8/29/2023 0:00	1057.8	1.77%	934.2	1.89%	0.1	0.000200
19	1205493705.1	0.3005	1.8467E-05	8/8/2023 11:08	1057.8	1.77%	873.2	1.95%	0.1	0.000200
20	1205493706.1	0.3057	1.8554E-05	8/29/2023 0:00	1057.8	1.77%	865.0	1.96%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated Sample Recovery %	Sample Recovery Error %
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction		
1	1A	60	11	45	0.750	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.834	1.000	1.057	93.1%	2.57%
2	1B	60	2	30	0.500	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.834	1.000	1.057	86.4%	2.62%
3	1C	60	9	65	1.083	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.834	1.000	1.057	87.8%	2.60%
4	1D	60	3	41	0.683	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.834	1.000	1.057	86.1%	2.62%
5	2A	60	5	45	0.750	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.834	1.000	1.057	90.0%	2.59%
6	2B	60	2	44	0.733	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.834	1.000	1.057	82.6%	2.65%
7	2D	60	5	88	1.467	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.992	0.834	1.000	1.057	91.0%	2.58%
8	3B	60	2	31	0.517	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.992	0.834	1.000	1.057	88.0%	2.60%
9	3C	60	4	24	0.400	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.993	0.834	1.000	1.057	88.7%	2.60%
10	3D	60	10	37	0.617	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.992	0.833	1.000	1.057	80.5%	2.67%
11	4A	60	7	23	0.383	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.992	0.833	1.000	1.057	78.2%	2.69%
12	4C	60	4	54	0.900	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.993	0.833	1.000	1.057	86.5%	2.62%
13	4D	60	13	54	0.900	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.993	0.833	1.000	1.057	84.1%	2.64%
14	5A	60	7	60	1.000	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.993	0.833	1.000	1.057	82.8%	2.65%
15	5D	60	8	53	0.883	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.993	0.833	1.000	1.057	83.7%	2.64%
16	6A	60	12	62	1.033	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.993	0.833	1.000	1.057	85.3%	2.63%
17	6C	60	2	71	1.183	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.993	0.833	1.000	1.057	79.7%	2.68%
18	7A	60	9	26	0.433	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.997	0.835	1.000	1.057	88.3%	2.60%
19	7B	60	3	41	0.683	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.835	1.000	1.057	82.6%	2.65%
20	7C	60	6	1296	21.600	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.997	0.834	1.000	1.057	81.8%	2.66%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2023	5/31/2024	0.5320	0.00738	0.505	9/1/2023 18:12	1000
2	PIC	6/1/2023	5/31/2024	0.6098	0.00711	0.323	9/1/2023 18:12	1000
3	PIC	6/1/2023	5/31/2024	0.6077	0.00847	0.764	9/1/2023 18:12	1000
4	PIC	6/1/2023	5/31/2024	0.6071	0.00692	0.608	9/1/2023 18:12	1000
5	PIC	6/1/2023	5/31/2024	0.6083	0.01914	0.461	9/1/2023 18:12	1000
6	PIC	6/1/2023	5/31/2024	0.6253	0.02111	0.409	9/1/2023 18:12	1000
7	PIC	6/1/2023	5/31/2024	0.6206	0.00745	1.370	9/1/2023 18:12	1000
8	PIC	6/1/2023	5/31/2024	0.6266	0.01614	0.379	9/1/2023 18:12	1000
9	PIC	6/1/2023	5/31/2024	0.6245	0.00988	0.357	9/1/2023 18:12	1000
10	PIC	6/1/2023	5/31/2024	0.5677	0.02297	0.483	9/1/2023 18:12	1000
11	PIC	6/1/2023	5/31/2024	0.6074	0.01123	0.409	9/1/2023 18:12	1000
12	PIC	6/1/2023	5/31/2024	0.6376	0.00889	0.784	9/1/2023 18:13	1000
13	PIC	6/1/2023	5/31/2024	0.6412	0.00773	0.708	9/1/2023 18:13	1000
14	PIC	6/1/2023	5/31/2024	0.6366	0.00851	1.264	9/1/2023 18:13	1000
15	PIC	6/1/2023	5/31/2024	0.6566	0.00925	0.844	9/1/2023 18:32	1000
16	PIC	6/1/2023	5/31/2024	0.6444	0.02228	0.756	9/1/2023 18:09	1000
17	PIC	6/1/2023	5/31/2024	0.6167	0.01970	1.023	9/1/2023 18:10	1000
18	PIC	6/1/2023	5/31/2024	0.6229	0.00594	0.347	9/1/2023 18:09	1000
19	PIC	6/1/2023	5/31/2024	0.6423	0.00627	0.277	9/1/2023 18:10	1000
20	PIC	6/1/2023	5/31/2024	0.6369	0.00790	0.397	9/1/2023 18:10	1000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 2051-B
LCS Exp Date : 3/27/2024
LCS Activity (dpm/ml): 533.11
LCS Volume Added: 0.10

Results Pos.	Decision	Critical	Required	Sample Act.		Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
	Level pCi/L	Level pCi/L	MDA pCi/L	MDA pCi/L	Conc. pCi/L	Error %	Rate CPM	Rate Error CPM	Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L						
1	0.8492	0.5995	3	1.3920	0.9454	46.62%	0.2450	0.1140	0.8625	0.8953		SAMPLE				
2	0.6403	0.4520	3	1.0859	0.6439	52.63%	0.1770	0.0930	0.6633	0.6832		SAMPLE				
3	0.9667	0.6825	3	1.5435	1.1404	43.05%	0.3193	0.1372	0.9602	1.0030		SAMPLE				
4	0.8855	0.6252	3	1.4337	0.2762	145.42%	0.0753	0.1095	0.7872	0.7904		SAMPLE				
5	0.7317	0.5166	3	1.2071	1.0056	39.52%	0.2890	0.1138	0.7764	0.8181		SAMPLE				
6	0.7279	0.5139	3	1.2116	1.1920	34.82%	0.3243	0.1124	0.8096	0.8657		SAMPLE				
7	1.2233	0.8637	3	1.8960	0.3262	166.23%	0.0967	0.1607	1.0627	1.0660		SAMPLE				
8	0.6513	0.4598	3	1.0905	0.4703	68.94%	0.1377	0.0948	0.6349	0.6461		SAMPLE				
9	0.6341	0.4477	3	1.0667	0.1474	194.92%	0.0430	0.0838	0.5629	0.5641		SAMPLE				
10	0.8958	0.6324	3	1.4730	0.5563	77.69%	0.1337	0.1037	0.8462	0.8583		SAMPLE				
11	0.7980	0.5634	3	1.3283	-0.1034	321.24%	-0.0257	0.0824	0.6511	0.6514		SAMPLE				
12	0.9454	0.6674	3	1.5072	0.3999	108.34%	0.1160	0.1256	0.8489	0.8550		SAMPLE				
13	0.9253	0.6533	3	1.4841	0.6818	65.33%	0.1920	0.1253	0.8723	0.8893		SAMPLE				
14	1.2641	0.8924	3	1.9664	-0.9584	50.80%	-0.2640	0.1339	0.9528	0.9530		SAMPLE				
15	0.9800	0.6919	3	1.5560	0.1355	317.21%	0.0393	0.1248	0.8423	0.8430		SAMPLE				
16	0.9319	0.6579	3	1.4889	0.9598	48.47%	0.2773	0.1341	0.9095	0.9425		SAMPLE				
17	1.2210	0.8621	3	1.9190	0.6250	89.89%	0.1603	0.1440	1.1005	1.1121		SAMPLE				
18	0.6205	0.4381	3	1.0462	0.2936	100.81%	0.0863	0.0870	0.5800	0.5848		MB				
19	0.5894	0.4161	3	1.0130	1.4693	26.72%	0.4063	0.1080	0.7655	0.8517	633177001.1	DUP	43.4%			
20	0.7013	0.4951	3	1.1699	76.2032	3.96%	21.2030	0.6003	4.2289	19.8415		LCS			78.5514	97.0%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
633177001	1A	60	11	45	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633177002	1B	60	2	30	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633177003	1C	60	9	65	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633177004	1D	60	3	41	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633177005	2A	60	5	45	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633177006	2B	60	2	44	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633542001	2D	60	5	88	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633542002	3B	60	2	31	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633542003	3C	60	4	24	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633542004	3D	60	10	37	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633612001	4A	60	7	23	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
633715001	4C	60	4	54	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
633715002	4D	60	13	54	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
633715003	5A	60	7	60	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
633715004	5D	60	8	53	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
633715005	6A	60	12	62	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
633715006	6C	60	2	71	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
1205493704	7A	60	9	26	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
1205493705	7B	60	3	41	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
1205493706	7C	60	6	1296	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427

ASSAY 5-Sep-23 12:29:19
 Wizard 2480 s/n 46190630
 Protocol id 8 Ba-133
 Time limit
 Count limit
 Isotope Ba-133
 Protocol date 9/5/2023
 Run id. 7247

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	93	1	180	3174	1057.83	1.77	12:29:19
633177001	2	93	2	180	2956	985.13	1.84	93.13	12:32:33
633177002	3	93	3	180	2744	914.47	1.91	86.45	12:35:46
633177003	4	93	4	180	2785.28	928.26	1.89	87.75	12:39:00
633177004	5	93	5	180	2734	911.18	1.91	86.14	12:42:15
633177005	1	19	1	180	2856	951.8	1.87	89.98	12:45:50
633177006	2	19	2	180	2620.28	873.27	1.95	82.55	12:49:04
633542001	3	19	3	180	2889.57	962.95	1.86	91.03	12:52:18
633542002	4	19	4	180	2794	931.19	1.89	88.03	12:55:32
633542003	5	19	5	180	2815.57	938.29	1.88	88.70	12:58:46
633542004	1	2	1	180	2554.57	851.38	1.98	80.48	01:02:22
633612001	2	2	2	180	2483.28	827.61	2.01	78.24	01:05:36
633715001	3	2	3	180	2746	915.14	1.91	86.51	01:08:50
633715002	4	2	4	180	2668.28	889.24	1.94	84.06	01:12:03
633715003	5	2	5	180	2627.28	875.57	1.95	82.77	01:15:18
633715004	1	98	1	180	2656.28	885.24	1.94	83.68	01:19:06
633715005	2	98	2	180	2708.28	902.57	1.92	85.32	01:22:20
633715006	3	98	3	180	2531	843.56	1.99	79.74	01:25:34
1205493704	4	98	4	180	2803.28	934.23	1.89	88.32	01:28:48
1205493705	5	98	5	180	2620.28	873.24	1.95	82.55	01:32:02
1205493706	1	10	1	180	2595.28	864.95	1.96	81.77	01:35:50

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 05-Sep-2023

Detectors LB4100 E1 through H4 and PIC 1A through 14D and G5400W 1W through 1Z and LB4200 GA1 through OD4

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100G3	Above	Beta bkg	05-Sep 09:28	60	2.050	0.785	2.444	+1.57
LB4100H1	Above	Alpha bkg	05-Sep 05:45	60	0.283	-8.08E-2	0.225	+4.14
LB4100H1	Above	Beta bkg	05-Sep 05:45	60	2.800	-5.15E-1	3.743	+1.67
LB4200GA2	Above	Alpha bkg	05-Sep 07:45	60	1.150	-1.34E-1	0.379	+12.03
LB4200GA2	Above	Beta bkg	05-Sep 07:45	60	2.983	-3.66E-2	1.795	+6.89
LB4200GB2	Above	Beta bkg	05-Sep 04:50	60	120	0.129	1.304	+606.47
LB4200OC1	Above	Beta bkg	05-Sep 08:41	60	1.600	0.178	1.284	+4.71
PIC2C	Above	Alpha bkg	05-Sep 06:27	60	0.433	-1.83E-2	0.433	+3.00
PIC2C	Above	Beta bkg	05-Sep 06:27	60	21.050	0.030	2.148	+56.54
PIC6B	Above	Beta bkg	05-Sep 06:40	60	7.783	0.262	2.449	+17.64
PIC12B	Above	Alpha bkg	05-Sep 06:57	60	0.517	-8.27E-2	0.413	+4.25
PIC12B	Above	Beta bkg	05-Sep 06:57	60	13.833	-5.75E-1	2.641	+23.88
PIC14B	Above	Beta bkg	05-Sep 07:20	60	3.717	-1.06E-1	1.026	+17.26

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

Reviewed by Jc Poparad

Date 9/5/23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2479427

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205493704	MB	JE1	PIC7A	SEP-05-23 13:43:10	DONE	25mm Filter	01-JUN-23 00:00
1205493705	DUP	JE1	PIC7B	SEP-05-23 13:43:14	DONE	25mm Filter	01-JUN-23 00:00
1205493706	LCS	JE1	PIC7C	SEP-05-23 13:43:19	DONE	25mm Filter	01-JUN-23 00:00
633177001	SAMPLE	JE1	PIC1A	SEP-05-23 13:43:20	DONE	25mm Filter	01-JUN-23 00:00
633177002	SAMPLE	JE1	PIC1B	SEP-05-23 13:43:25	DONE	25mm Filter	01-JUN-23 00:00
633177003	SAMPLE	JE1	PIC1C	SEP-05-23 13:43:29	DONE	25mm Filter	01-JUN-23 00:00
633177004	SAMPLE	JE1	PIC1D	SEP-05-23 13:43:33	DONE	25mm Filter	01-JUN-23 00:00
633177005	SAMPLE	JE1	PIC2A	SEP-05-23 13:43:37	DONE	25mm Filter	01-JUN-23 00:00
633177006	SAMPLE	JE1	PIC2B	SEP-05-23 13:43:41	DONE	25mm Filter	01-JUN-23 00:00
633542001	SAMPLE	JE1	PIC2D	SEP-05-23 13:43:45	DONE	25mm Filter	01-JUN-23 00:00
633542002	SAMPLE	JE1	PIC3B	SEP-05-23 13:43:49	DONE	25mm Filter	01-JUN-23 00:00
633542003	SAMPLE	JE1	PIC3C	SEP-05-23 13:43:56	DONE	25mm Filter	01-JUN-23 00:00
633542004	SAMPLE	JE1	PIC3D	SEP-05-23 13:43:59	DONE	25mm Filter	01-JUN-23 00:00
633612001	SAMPLE	JE1	PIC4A	SEP-05-23 13:44:03	DONE	25mm Filter	01-JUN-23 00:00
633715001	SAMPLE	JE1	PIC4C	SEP-05-23 13:44:07	DONE	25mm Filter	01-JUN-23 00:00
633715002	SAMPLE	JE1	PIC4D	SEP-05-23 13:44:13	DONE	25mm Filter	01-JUN-23 00:00
633715003	SAMPLE	JE1	PIC5A	SEP-05-23 13:44:17	DONE	25mm Filter	01-JUN-23 00:00
633715004	SAMPLE	JE1	PIC5D	SEP-05-23 13:44:23	DONE	25mm Filter	01-JUN-23 00:00
633715005	SAMPLE	JE1	PIC6A	SEP-05-23 13:44:27	DONE	25mm Filter	01-JUN-23 00:00
633715006	SAMPLE	JE1	PIC6C	SEP-05-23 13:44:33	DONE	25mm Filter	01-JUN-23 00:00

Lucas Cell Raw Data

Batch 2479421 Check-list

This check-list was completed on 11-SEP-23 by Lyndsey Pace

This batch was reviewed by Gregory Ramsay on 11-SEP-23 and Lyndsey Pace on 11-SEP-23.

Batch ID:
2479421

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2479421
Analyst: Lyndsey Pace (LXP1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: LUCAS-C202389980

Due Dates for Lab: 06-SEP-2023			Package: 10-SEP-2023	SDG: 08-SEP-2023		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205493687	Radium-226 SPIKE	1715-G	.1	mL	
MS	1205493686	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	633177001	07-SEP-2023	1	507.1	507.1	09/07/23 12:36	601	09/11/23 05:26	09/11/23 09:19	7	7
2	633177002	07-SEP-2023	1	505.07	505.07	09/07/23 12:36	708	09/11/23 05:26	09/11/23 09:19	4	7
3	633177003	07-SEP-2023	1	502	502	09/07/23 12:36	805	09/11/23 05:26	09/11/23 09:19	3	7
4	633177004	07-SEP-2023	1	511.23	511.23	09/07/23 12:36	102	09/11/23 05:51	09/11/23 10:10	3	8
5	633177005	07-SEP-2023	1	502.96	502.96	09/07/23 12:36	205	09/11/23 05:51	09/11/23 10:10	1	17
6	633177006	07-SEP-2023	1	504.99	504.99	09/07/23 12:36	301	09/11/23 05:51	09/11/23 10:10	3	18
7	633542001	07-SEP-2023	1	504.78	504.78	09/07/23 12:36	403	09/11/23 05:51	09/11/23 10:10	3	9
8	633542002	07-SEP-2023	1	512.09	512.09	09/07/23 12:36	508	09/11/23 05:51	09/11/23 10:10	4	14
9	633542003	07-SEP-2023	1	502.38	502.38	09/07/23 12:36	603	09/11/23 05:51	09/11/23 10:10	2	8
10	633542004	07-SEP-2023	1	505.62	505.62	09/07/23 12:36	707	09/11/23 05:51	09/11/23 10:10	6	4
11	633612001	07-SEP-2023	1	508.06	508.06	09/07/23 12:36	803	09/11/23 05:51	09/11/23 10:10	1	8
12	633715001	07-SEP-2023	1	504.84	504.84	09/07/23 12:36	105	09/11/23 06:16	09/11/23 10:43	2	15
13	633715002	07-SEP-2023	1	505.73	505.73	09/07/23 12:36	201	09/11/23 06:16	09/11/23 10:43	3	19
14	633715003	07-SEP-2023	1	504.46	504.46	09/07/23 12:36	303	09/11/23 06:16	09/11/23 10:43	1	17
15	633715004	07-SEP-2023	1	506.34	506.34	09/07/23 12:36	406	09/11/23 06:16	09/11/23 10:43	1	16
16	633715005	07-SEP-2023	1	505.89	505.89	09/07/23 12:36	506	09/11/23 06:16	09/11/23 10:43	2	4
17	633715006	07-SEP-2023	1	500	500	09/07/23 12:36	607	09/11/23 06:16	09/11/23 10:43	2	9
18	1205493684 MB	07-SEP-2023	1	512.09	512.09	09/07/23 12:36	706	09/11/23 06:16	09/11/23 10:43	6	2
19	1205493685 DUP (633177001)	07-SEP-2023	1	502.39	502.39	09/07/23 12:36	804	09/11/23 06:16	09/11/23 10:43	6	6
20	1205493686 MS (633177001)	07-SEP-2023	1	105.09	105.09	09/07/23 12:36	103	09/11/23 06:40	09/11/23 11:01	4	371
21	1205493687 LCS	07-SEP-2023	1		512.09	09/07/23 12:36	208	09/11/23 06:40	09/11/23 11:01	7	354

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 07-SEP-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Procedure Code : LUC26RAL
 Parmname : Radium-226
 Required MDA : 1 pCi/L
 Halflife of Ra-226 : 1600 years
 Ra-226 Abundance : 1.00
 Halflife of Rn-222 : 3.8235 days

Batch : 2479421
 Analyst : LIN01615
 Prep Date : 9/7/2023
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	633177001.1	0.5071	2.0284E-05	8/8/2023 11:08	601	15	7	0.467	7	0.233	30	1.8870
2	633177002.1	0.5051	2.0276E-05	8/8/2023 12:55	708	15	7	0.467	4	0.133	30	1.6020
3	633177003.1	0.5020	2.0264E-05	8/8/2023 14:21	805	15	7	0.467	3	0.100	30	1.5410
4	633177004.1	0.5112	2.0301E-05	8/8/2023 12:34	102	15	8	0.533	3	0.100	30	1.4860
5	633177005.1	0.5030	2.0268E-05	8/8/2023 11:08	205	15	17	1.133	1	0.033	30	1.7590
6	633177006.1	0.5050	2.0276E-05	8/8/2023 9:30	301	15	18	1.200	3	0.100	30	1.6430
7	633542001.1	0.5048	2.0275E-05	8/11/2023 9:53	403	15	9	0.600	3	0.100	30	1.5070
8	633542002.1	0.5121	2.0304E-05	8/11/2023 11:53	508	15	14	0.933	4	0.133	30	1.9780
9	633542003.1	0.5024	2.0266E-05	8/14/2023 9:53	603	15	8	0.533	2	0.067	30	1.8970
10	633542004.1	0.5056	2.0279E-05	8/11/2023 8:55	707	15	4	0.267	6	0.200	30	1.7280
11	633612001.1	0.5081	2.0288E-05	8/11/2023 10:10	803	15	8	0.533	1	0.033	30	1.4760
12	633715001.1	0.5048	2.0276E-05	8/14/2023 15:12	105	15	15	1.000	2	0.067	30	1.5340
13	633715002.1	0.5057	2.0279E-05	8/14/2023 11:03	201	15	19	1.267	3	0.100	30	1.6670
14	633715003.1	0.5045	2.0274E-05	8/14/2023 12:53	303	15	17	1.133	1	0.033	30	1.7210
15	633715004.1	0.5063	2.0281E-05	8/14/2023 14:31	406	15	16	1.067	1	0.033	30	1.4650
16	633715005.1	0.5059	2.0280E-05	8/14/2023 11:03	506	15	4	0.267	2	0.067	30	1.8780
17	633715006.1	0.5000	2.0256E-05	8/14/2023 9:10	607	15	9	0.600	2	0.067	30	1.7750
18	1205493684.1	0.5121	2.0304E-05	9/7/2023 0:00	706	15	2	0.133	6	0.200	30	1.5900
19	1205493685.1	0.5024	2.0266E-05	8/8/2023 11:08	804	15	6	0.400	6	0.200	30	1.6240
20	1205493686.1	0.1051	1.1678E-05	8/8/2023 11:08	103	15	371	24.733	4	0.133	30	1.6400
21	1205493687.1	0.5121	2.0304E-05	9/7/2023 0:00	208	15	354	23.600	7	0.233	30	1.7130

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
6.700%	7/1/2023	6/30/2024	9/7/2023 12:36	9/11/2023 5:26	9/11/2023 9:19	0.489	0.971	1.001	1.000
7.700%	11/1/2022	10/31/2023	9/7/2023 12:36	9/11/2023 5:26	9/11/2023 9:19	0.489	0.971	1.001	1.000
9.600%	4/8/2023	3/31/2024	9/7/2023 12:36	9/11/2023 5:26	9/11/2023 9:19	0.489	0.971	1.001	1.000
2.300%	5/1/2023	4/30/2024	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
9.200%	8/1/2023	7/31/2024	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
4.500%	10/25/2022	10/31/2023	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
6.100%	2/1/2023	1/31/2024	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
8.400%	6/1/2023	5/31/2024	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
3.500%	7/1/2023	6/30/2024	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
2.200%	11/1/2022	10/31/2023	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
4.700%	4/8/2023	3/31/2024	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
7.900%	5/1/2023	4/30/2024	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
7.400%	8/1/2023	7/31/2024	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
7.400%	10/25/2022	10/31/2023	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
2.900%	2/1/2023	1/31/2024	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
1.400%	6/1/2023	5/31/2024	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
6.800%	7/1/2023	6/30/2024	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
2.900%	11/1/2022	10/31/2023	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
6.100%	4/8/2023	3/31/2024	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
9.600%	5/1/2023	4/30/2024	9/7/2023 12:36	9/11/2023 6:40	9/11/2023 11:01	0.494	0.968	1.001	1.000
4.400%	8/1/2023	7/31/2024	9/7/2023 12:36	9/11/2023 6:40	9/11/2023 11:01	0.494	0.968	1.001	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-G
Spike Exp Date : 9/8/2023
Spike Activity (dpm/ml): 297.37
Spike Volume Added: 0.10

LCS S/N : 1715-G
LCS Exp Date : 9/8/2023
LCS Activity (dpm/ml): 297.37
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.3533	0.2494	1	0.6974	0.2316	84.78%	0.2333	0.1972	0.3837	0.3863		SAMPLE				
2	0.3159	0.2230	1	0.6808	0.3913	57.09%	0.3333	0.1886	0.4339	0.4415		SAMPLE				
3	0.2861	0.2020	1	0.6496	0.4502	51.52%	0.3667	0.1856	0.4467	0.4593		SAMPLE				
4	0.2913	0.2057	1	0.6614	0.5418	45.57%	0.4333	0.1972	0.4833	0.4902		SAMPLE				
5	0.1444	0.1020	1	0.4187	1.1810	26.80%	1.1000	0.2769	0.5827	0.6434		SAMPLE				
6	0.2668	0.1883	1	0.6056	1.2593	26.63%	1.1000	0.2887	0.6478	0.6819		SAMPLE				
7	0.2909	0.2054	1	0.6606	0.6243	42.08%	0.5000	0.2082	0.5095	0.5227		SAMPLE				
8	0.2523	0.1781	1	0.5438	0.7502	33.35%	0.8000	0.2582	0.4746	0.5022		SAMPLE				
9	0.1896	0.1339	1	0.4671	0.4651	41.80%	0.4667	0.1944	0.3797	0.3869		SAMPLE				
10	0.3582	0.2529	1	0.7233	0.0725	234.53%	0.0667	0.1563	0.3332	0.3333		SAMPLE				
11	0.1704	0.1203	1	0.4939	0.6333	38.58%	0.5000	0.1915	0.4754	0.4876		SAMPLE				
12	0.2328	0.1644	1	0.5735	1.1422	29.21%	0.9333	0.2625	0.6296	0.6744		SAMPLE				
13	0.2619	0.1849	1	0.5947	1.3115	26.45%	1.1667	0.2963	0.6528	0.7058		SAMPLE				
14	0.1469	0.1037	1	0.4257	1.2008	26.24%	1.1000	0.2769	0.5924	0.6414		SAMPLE				
15	0.1719	0.1213	1	0.4982	1.3202	26.17%	1.0333	0.2687	0.6730	0.7035		SAMPLE				
16	0.1898	0.1340	1	0.4675	0.1995	70.72%	0.2000	0.1414	0.2765	0.2781		SAMPLE				
17	0.2032	0.1434	1	0.5004	0.5695	39.12%	0.5333	0.2055	0.4301	0.4444		SAMPLE				
18	0.3835	0.2708	1	0.7743	-0.0776	187.11%	-0.0667	0.1247	0.2845	0.2846		MB				
19	0.3828	0.2702	1	0.7728	0.2323	91.49%	0.2000	0.1826	0.4157	0.4180	633177001.1	DUP	0.3%			
20	1.4738	1.0405	1	3.1766	134.7544	10.93%	24.6000	1.2858	13.8052	34.8117	633177001.1	MS			127.4654	105.7%
21	0.3830	0.2704	1	0.7561	25.1473	6.95%	23.3667	1.2574	2.6524	4.9915		LCS			26.1573	96.1%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 11-SEP-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	08:10	1	1.15E+05	115416	-0.12		
LUCAS2	EFF	08:09	1	1.32E+05	132307	-1.08		
LUCAS3	EFF	08:08	1	91119	91119	-2.79		
LUCAS4	EFF	08:07	1	1.29E+05	128693	1.2		
LUCAS5	EFF	08:05	1	1.32E+05	131887	-0.71		
LUCAS6	EFF	08:04	1	1.31E+05	130508	0.78		
LUCAS7	EFF	08:03	1	1.32E+05	131641	0.34		
LUCAS8	EFF	08:02	1	1.17E+05	117147	-1.32		

Reviewed by: 
Lyndsey Pace

Date: 11-SEP-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2479421

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
633177001	SAMPLE	LXP1	LUCAS6	SEP-11-23 09:19:00	DONE	Lucas Cell	01-JUL-23 00:00
633177002	SAMPLE	LXP1	LUCAS7	SEP-11-23 09:19:00	DONE	Lucas Cell	01-NOV-22 00:00
633177003	SAMPLE	LXP1	LUCAS8	SEP-11-23 09:19:00	DONE	Lucas Cell	08-APR-23 00:00
633177004	SAMPLE	LXP1	LUCAS1	SEP-11-23 10:10:00	DONE	Lucas Cell	01-MAY-23 00:00
633177005	SAMPLE	LXP1	LUCAS2	SEP-11-23 10:10:00	DONE	Lucas Cell	01-AUG-23 00:00
633177006	SAMPLE	LXP1	LUCAS3	SEP-11-23 10:10:00	DONE	Lucas Cell	25-OCT-22 00:00
633542001	SAMPLE	LXP1	LUCAS4	SEP-11-23 10:10:00	DONE	Lucas Cell	01-FEB-23 00:00
633542002	SAMPLE	LXP1	LUCAS5	SEP-11-23 10:10:00	DONE	Lucas Cell	01-JUN-23 00:00
633542003	SAMPLE	LXP1	LUCAS6	SEP-11-23 10:10:00	DONE	Lucas Cell	01-JUL-23 00:00
633542004	SAMPLE	LXP1	LUCAS7	SEP-11-23 10:10:00	DONE	Lucas Cell	01-NOV-22 00:00
633612001	SAMPLE	LXP1	LUCAS8	SEP-11-23 10:10:00	DONE	Lucas Cell	08-APR-23 00:00
633715001	SAMPLE	LXP1	LUCAS1	SEP-11-23 10:43:00	DONE	Lucas Cell	01-MAY-23 00:00
633715002	SAMPLE	LXP1	LUCAS2	SEP-11-23 10:43:00	DONE	Lucas Cell	01-AUG-23 00:00
633715003	SAMPLE	LXP1	LUCAS3	SEP-11-23 10:43:00	DONE	Lucas Cell	25-OCT-22 00:00
633715004	SAMPLE	LXP1	LUCAS4	SEP-11-23 10:43:00	DONE	Lucas Cell	01-FEB-23 00:00
633715005	SAMPLE	LXP1	LUCAS5	SEP-11-23 10:43:00	DONE	Lucas Cell	01-JUN-23 00:00
633715006	SAMPLE	LXP1	LUCAS6	SEP-11-23 10:43:00	DONE	Lucas Cell	01-JUL-23 00:00
1205493684	MB	LXP1	LUCAS7	SEP-11-23 10:43:00	DONE	Lucas Cell	01-NOV-22 00:00
1205493685	DUP	LXP1	LUCAS8	SEP-11-23 10:43:00	DONE	Lucas Cell	08-APR-23 00:00
1205493686	MS	LXP1	LUCAS1	SEP-11-23 11:01:00	DONE	Lucas Cell	01-MAY-23 00:00
1205493687	LCS	LXP1	LUCAS2	SEP-11-23 11:01:00	DONE	Lucas Cell	01-AUG-23 00:00

September 08, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 633715
SDG: S52209

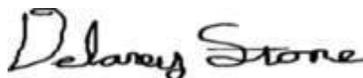
Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on August 17, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,



Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S52209
Work Order: 633715**

September 08, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on August 17, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

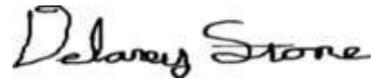
Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
633715001	S52209.01
633715002	S52209.02
633715003	S52209.03
633715004	S52209.04
633715005	S52209.05
633715006	S52209.06 Field Blank

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Delaney Stone". The signature is written in a cursive style with a large initial 'D'.

Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

633715

2680 East Lansing Dr., East Lansing, MI 48823
Phone (517) 332-0167 Fax (517) 332-4034
www.meritlabs.com

C.O.C. PAGE # 1 OF 1



REPORT TO		CHAIN OF CUSTODY RECORD		INVOICE TO								
CONTACT NAME Project Management Team		CONTACT NAME Julie Teague		E-NAME <input checked="" type="checkbox"/>								
COMPANY Merit Laboratories		COMPANY Merit Laboratories										
ADDRESS 2680 East Lansing Drive		ADDRESS 2680 East Lansing Drive										
CITY East Lansing		CITY East Lansing		STATE MI								
PHONE NO. 517-332-0167		PHONE NO. 517-332-0167		ZIP CODE 48823								
E-MAIL ADDRESS results@meritlabs.com		E-MAIL ADDRESS juliet@meritlabs.com										
PROJECT NO./NAME S52209		ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)										
SAMPLER(S) - PLEASE PRINT/SIGN NAME												
TURNAROUND TIME REQUIRED <input type="checkbox"/> 1 DAY <input type="checkbox"/> 2 DAYS <input type="checkbox"/> 3 DAYS <input checked="" type="checkbox"/> STANDARD <input type="checkbox"/> OTHER												
DELIVERABLES REQUIRED <input type="checkbox"/> STD <input type="checkbox"/> LEVEL I <input type="checkbox"/> LEVEL II <input type="checkbox"/> LEVEL III <input checked="" type="checkbox"/> LEVEL IV <input type="checkbox"/> EDD <input type="checkbox"/> OTHER												
MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID SL=SLUDGE DW=DRINKING WATER O=OIL WP=WPE A=AIR W=WASTE												
MERIT LAB NO.	YEAR	DATE	TIME	IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives		Radium 226 *		Radium 228 *	
		8/14/23	1512	S52209.01	GW	2	HCl	HNO ₃	H ₂ SO ₄	NaOH	MeOH	OTHER
		8/14/23	1103	S52209.02	GW	2						
		8/14/23	1253	S52209.03	GW	2						
		8/14/23	1431	S52209.04	GW	2						
		8/14/23	1103	S52209.05	GW	2						
		8/14/23	0910	S52209.06 Field Blank	DI	2						
RELINQUISHED BY: SIGNATURE/ORGANIZATION		DATE		TIME		RELINQUISHED BY: SIGNATURE/ORGANIZATION		DATE		TIME		
<i>[Signature]</i>		8/15/23		1700		<i>[Signature]</i>		8/15/23		1015		
RECEIVED BY: SIGNATURE/ORGANIZATION		DATE		TIME		RECEIVED BY: SIGNATURE/ORGANIZATION		DATE		TIME		
<i>[Signature]</i>		8/15/23		1700		<i>[Signature]</i>		8/15/23		1015		
RELINQUISHED BY: SIGNATURE/ORGANIZATION		DATE		TIME		RELINQUISHED BY: SIGNATURE/ORGANIZATION		DATE		TIME		
<i>[Signature]</i>		8/15/23		1700		<i>[Signature]</i>		8/15/23		1015		
RECEIVED BY: SIGNATURE/ORGANIZATION		DATE		TIME		RECEIVED BY: SIGNATURE/ORGANIZATION		DATE		TIME		
<i>[Signature]</i>		8/15/23		1700		<i>[Signature]</i>		8/15/23		1015		

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

Laboratory Certifications

List of current GEL Certifications as of 08 September 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122023-4
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-22-20
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S52209
Work Order #: 633715

Product: Radium-226+Radium-228 Calculation

Analytical Method: Calculation

Analytical Procedure: GL-RAD-D-003 REV# 45

Analytical Batch: 2479712

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
633715001	S52209.01
633715002	S52209.02
633715003	S52209.03
633715004	S52209.04
633715005	S52209.05
633715006	S52209.06 Field Blank

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2479427

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
633715001	S52209.01
633715002	S52209.02
633715003	S52209.03
633715004	S52209.04
633715005	S52209.05
633715006	S52209.06 Field Blank
1205493704	Method Blank (MB)
1205493705	633177001(S51950.01) Sample Duplicate (DUP)
1205493706	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2479421

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
633715001	S52209.01
633715002	S52209.02
633715003	S52209.03
633715004	S52209.04
633715005	S52209.05
633715006	S52209.06 Field Blank
1205493684	Method Blank (MB)
1205493685	633177001(S51950.01) Sample Duplicate (DUP)
1205493686	633177001(S51950.01) Matrix Spike (MS)
1205493687	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

The matrix spike, 1205493686 (S51950.01MS), aliquot was reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S52209 GEL Work Order: 633715

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 12 SEP 2023

Title: Analyst III - Data Validator

Sample Data Summary

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: September 11, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Lavery
 Project: Routine Analysis

Client Sample ID: S52209.01	Project: MERI00120
Sample ID: 633715001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 14-AUG-23 15:12	
Receive Date: 17-AUG-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.400	+/-0.849	1.51	3.00	pCi/L			JE1	09/05/23	1344 2479427	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.54	+/-1.06			pCi/L		1	TON1	09/11/23	1212 2479712	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		1.14	+/-0.630	0.574	1.00	pCi/L			LXP1	09/11/23	1043 2479421	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			86.5	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: September 11, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Lavery
 Project: Routine Analysis

Client Sample ID: S52209.02	Project: MERI00120
Sample ID: 633715002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 14-AUG-23 11:03	
Receive Date: 17-AUG-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.682	+/-0.872	1.48	3.00	pCi/L			JE1	09/05/23	1344	2479427	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.99	+/-1.09			pCi/L		1	TON1	09/11/23	1212	2479712	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		1.31	+/-0.653	0.595	1.00	pCi/L			LXP1	09/11/23	1043	2479421	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer	Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer		GFPC Ra228, Liquid "As Received"			84.1	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

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Certificate of Analysis

Report Date: September 11, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S52209.03 Project: MERI00120
Sample ID: 633715003 Client ID: MERI001
Matrix: Ground Water
Collect Date: 14-AUG-23 12:53
Receive Date: 17-AUG-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	-0.958	+/-0.953	1.97	3.00	pCi/L			JE1	09/05/23	1344 2479427	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.20	+/-1.12			pCi/L		1	TON1	09/11/23	1212 2479712	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		1.20	+/-0.592	0.426	1.00	pCi/L			LXP1	09/11/23	1043 2479421	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			82.8	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: September 11, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S52209.04 Project: MERI00120
Sample ID: 633715004 Client ID: MERI001
Matrix: Ground Water
Collect Date: 14-AUG-23 14:31
Receive Date: 17-AUG-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.135	+/-0.842	1.56	3.00	pCi/L			JE1	09/05/23	1344 2479427	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.46	+/-1.08			pCi/L		1	TON1	09/11/23	1212 2479712	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		1.32	+/-0.673	0.498	1.00	pCi/L			LXP1	09/11/23	1043 2479421	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			83.7	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: September 11, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S52209.05	Project: MERI00120
Sample ID: 633715005	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 14-AUG-23 11:03	
Receive Date: 17-AUG-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.960	+/-0.910	1.49	3.00	pCi/L		JE1	09/05/23	1344	2479427		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.16	+/-0.951			pCi/L		1 TON1	09/11/23	1212	2479712		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.200	+/-0.277	0.467	1.00	pCi/L		LXP1	09/11/23	1043	2479421		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			85.3	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

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Certificate of Analysis

Report Date: September 11, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S52209.06 Field Blank	Project: MERI00120
Sample ID: 633715006	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 14-AUG-23 09:10	
Receive Date: 17-AUG-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.625	+/-1.10	1.92	3.00	pCi/L		JE1	09/05/23	1344	2479427	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.19	+/-1.18			pCi/L		1 TON1	09/11/23	1212	2479712	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.570	+/-0.430	0.500	1.00	pCi/L		LXP1	09/11/23	1043	2479421	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			79.7	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: September 11, 2023

Page 1 of 2

Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan

Contact: John Laverty

Workorder: 633715

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2479427										
QC1205493705	633177001	DUP									
Radium-228	U	0.945		1.47	pCi/L	43.4		(0% - 100%)	JE1	09/05/23	13:43
	Uncertainty	+/-0.862		+/-0.765							
QC1205493706	LCS										
Radium-228	78.6			76.2	pCi/L		97	(75%-125%)		09/05/23	13:43
	Uncertainty			+/-4.23							
QC1205493704	MB										
Radium-228			U	0.294	pCi/L					09/05/23	13:43
	Uncertainty			+/-0.580							
Rad Ra-226											
Batch	2479421										
QC1205493685	633177001	DUP									
Radium-226	U	0.232	U	0.232	pCi/L	N/A		N/A	LXP1	09/11/23	10:43
	Uncertainty	+/-0.384		+/-0.416							
QC1205493687	LCS										
Radium-226	26.2			25.1	pCi/L		96.1	(75%-125%)		09/11/23	11:01
	Uncertainty			+/-2.65							
QC1205493684	MB										
Radium-226			U	-0.0776	pCi/L					09/11/23	10:43
	Uncertainty			+/-0.285							
QC1205493686	633177001	MS									
Radium-226	127 U	0.232		135	pCi/L		106	(75%-125%)		09/11/23	11:01
	Uncertainty	+/-0.384		+/-13.8							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- H Analytical holding time was exceeded
- < Result is less than value reported
- > Result is greater than value reported

GEL LABORATORIES LLC

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QC Summary

Workorder: 633715

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
NI											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2479427 Check-list

This check-list was completed on 05-SEP-23 by Nat Long

This batch was reviewed by Nat Long on 05-SEP-23 and Kenshalla Oston on 06-SEP-23.

Batch ID:
2479427

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2479427
Analyst: Jacqueline Winston (JE1)
 Prep: Charles Hall (CH7)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: BAL-C236761727

Due Dates for Lab: 06-SEP-2023			Package: 10-SEP-2023	SDG: 08-SEP-2023		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205493706	228	2051-B	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	633177001	29-AUG-2023	3	301.35	301.35	08/31/23 13:57	09/05/23 12:07
2	633177002	29-AUG-2023	3	300.49	300.49	08/31/23 13:57	09/05/23 12:07
3	633177003	29-AUG-2023	3	302.58	302.58	08/31/23 13:57	09/05/23 12:07
4	633177004	29-AUG-2023	3	300.56	300.56	08/31/23 13:57	09/05/23 12:07
5	633177005	29-AUG-2023	3	302.65	302.65	08/31/23 13:57	09/05/23 12:07
6	633177006	29-AUG-2023	3	303.89	303.89	08/31/23 13:57	09/05/23 12:07
7	633542001	29-AUG-2023	3	302.12	302.12	08/31/23 13:57	09/05/23 12:07
8	633542002	29-AUG-2023	3	305.71	305.71	08/31/23 13:57	09/05/23 12:07
9	633542003	29-AUG-2023	3	303.26	303.26	08/31/23 13:57	09/05/23 12:07
10	633542004	29-AUG-2023	3	303.05	303.05	08/31/23 13:57	09/05/23 12:07
11	633612001	29-AUG-2023	3	301	301	08/31/23 13:57	09/05/23 12:07
12	633715001	29-AUG-2023	3	302.8	302.8	08/31/23 13:57	09/05/23 12:07
13	633715002	29-AUG-2023	3	300.9	300.9	08/31/23 13:57	09/05/23 12:07
14	633715003	29-AUG-2023	3	301.1	301.1	08/31/23 13:57	09/05/23 12:07
15	633715004	29-AUG-2023	3	304.4	304.4	08/31/23 13:57	09/05/23 12:07
16	633715005	29-AUG-2023	3	302.8	302.8	08/31/23 13:57	09/05/23 12:07
17	633715006	29-AUG-2023	3	300.6	300.6	08/31/23 13:57	09/05/23 12:07
18	1205493704 MB	29-AUG-2023	3		305.71	08/31/23 13:57	09/05/23 12:07
19	1205493705 DUP (633177001)	29-AUG-2023	3	300.46	300.46	08/31/23 13:57	09/05/23 12:07
20	1205493706 LCS	29-AUG-2023	3		305.71	08/31/23 13:57	09/05/23 12:07

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 2097-B	Ba-133 Tracer	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 29-AUG-2023 00:00
REGNT 3956035	Barium Carrier Ra228 REG	1 mL	
REGNT 3960868	RGF-1M Citric Acid	5 mL	
REGNT 3959817	2M HCl	20 mL	
REGNT 3955326	RGF-7M Nitric Acid	25 mL	
REGNT 3958741	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT DGA071323	2472106	2 g	
REGNT 3957480.5	RGF-Hydrofluoric Acid	4 mL	
REGNT 3940152	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3957910	RGF-Neodymium Substrate	5 mL	
REGNT 3954355.13	Nitric Acid	5 mL	
REGNT 3958747	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3946262	RGF-50% Potassium Carbonate	2 mL	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 2097-B
 Tracer Exp Date : 7/12/2024
 Tracer Volume Added: 0.10

Batch : 2479427
 Analyst : CHA00185
 Prep Date : 8/29/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 3 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	633177001.1	0.3014	1.8482E-05	8/8/2023 11:08	1057.8	1.77%	985.1	1.84%	0.1	0.000200
2	633177002.1	0.3005	1.8467E-05	8/8/2023 12:55	1057.8	1.77%	914.5	1.91%	0.1	0.000200
3	633177003.1	0.3026	1.8503E-05	8/8/2023 14:21	1057.8	1.77%	928.3	1.89%	0.1	0.000200
4	633177004.1	0.3006	1.8469E-05	8/8/2023 12:34	1057.8	1.77%	911.2	1.91%	0.1	0.000200
5	633177005.1	0.3027	1.8504E-05	8/8/2023 11:08	1057.8	1.77%	951.8	1.87%	0.1	0.000200
6	633177006.1	0.3039	1.8524E-05	8/8/2023 9:30	1057.8	1.77%	873.3	1.95%	0.1	0.000200
7	633542001.1	0.3021	1.8495E-05	8/11/2023 9:53	1057.8	1.77%	963.0	1.86%	0.1	0.000200
8	633542002.1	0.3057	1.8554E-05	8/11/2023 11:53	1057.8	1.77%	931.2	1.89%	0.1	0.000200
9	633542003.1	0.3033	1.8514E-05	8/14/2023 9:53	1057.8	1.77%	938.3	1.88%	0.1	0.000200
10	633542004.1	0.3031	1.8510E-05	8/11/2023 8:55	1057.8	1.77%	851.4	1.98%	0.1	0.000200
11	633612001.1	0.3010	1.8476E-05	8/11/2023 10:10	1057.8	1.77%	827.6	2.01%	0.1	0.000200
12	633715001.1	0.3028	1.8506E-05	8/14/2023 15:12	1057.8	1.77%	915.1	1.91%	0.1	0.000200
13	633715002.1	0.3009	1.8474E-05	8/14/2023 11:03	1057.8	1.77%	889.2	1.94%	0.1	0.000200
14	633715003.1	0.3011	1.8478E-05	8/14/2023 12:53	1057.8	1.77%	875.6	1.95%	0.1	0.000200
15	633715004.1	0.3044	1.8533E-05	8/14/2023 14:31	1057.8	1.77%	885.2	1.94%	0.1	0.000200
16	633715005.1	0.3028	1.8506E-05	8/14/2023 11:03	1057.8	1.77%	902.6	1.92%	0.1	0.000200
17	633715006.1	0.3006	1.8469E-05	8/14/2023 9:10	1057.8	1.77%	843.6	1.99%	0.1	0.000200
18	1205493704.1	0.3057	1.8554E-05	8/29/2023 0:00	1057.8	1.77%	934.2	1.89%	0.1	0.000200
19	1205493705.1	0.3005	1.8467E-05	8/8/2023 11:08	1057.8	1.77%	873.2	1.95%	0.1	0.000200
20	1205493706.1	0.3057	1.8554E-05	8/29/2023 0:00	1057.8	1.77%	865.0	1.96%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated Sample Recovery %	Sample Recovery Error %
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction		
1	1A	60	11	45	0.750	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.834	1.000	1.057	93.1%	2.57%
2	1B	60	2	30	0.500	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.834	1.000	1.057	86.4%	2.62%
3	1C	60	9	65	1.083	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.834	1.000	1.057	87.8%	2.60%
4	1D	60	3	41	0.683	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.834	1.000	1.057	86.1%	2.62%
5	2A	60	5	45	0.750	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.834	1.000	1.057	90.0%	2.59%
6	2B	60	2	44	0.733	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.834	1.000	1.057	82.6%	2.65%
7	2D	60	5	88	1.467	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.992	0.834	1.000	1.057	91.0%	2.58%
8	3B	60	2	31	0.517	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.992	0.834	1.000	1.057	88.0%	2.60%
9	3C	60	4	24	0.400	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.993	0.834	1.000	1.057	88.7%	2.60%
10	3D	60	10	37	0.617	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.992	0.833	1.000	1.057	80.5%	2.67%
11	4A	60	7	23	0.383	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.992	0.833	1.000	1.057	78.2%	2.69%
12	4C	60	4	54	0.900	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.993	0.833	1.000	1.057	86.5%	2.62%
13	4D	60	13	54	0.900	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.993	0.833	1.000	1.057	84.1%	2.64%
14	5A	60	7	60	1.000	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.993	0.833	1.000	1.057	82.8%	2.65%
15	5D	60	8	53	0.883	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.993	0.833	1.000	1.057	83.7%	2.64%
16	6A	60	12	62	1.033	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.993	0.833	1.000	1.057	85.3%	2.63%
17	6C	60	2	71	1.183	9/5/2023 13:44	8/31/2023 13:57	9/5/2023 12:07	0.993	0.833	1.000	1.057	79.7%	2.68%
18	7A	60	9	26	0.433	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.997	0.835	1.000	1.057	88.3%	2.60%
19	7B	60	3	41	0.683	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.991	0.835	1.000	1.057	82.6%	2.65%
20	7C	60	6	1296	21.600	9/5/2023 13:43	8/31/2023 13:57	9/5/2023 12:07	0.997	0.834	1.000	1.057	81.8%	2.66%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2023	5/31/2024	0.5320	0.00738	0.505	9/1/2023 18:12	1000
2	PIC	6/1/2023	5/31/2024	0.6098	0.00711	0.323	9/1/2023 18:12	1000
3	PIC	6/1/2023	5/31/2024	0.6077	0.00847	0.764	9/1/2023 18:12	1000
4	PIC	6/1/2023	5/31/2024	0.6071	0.00692	0.608	9/1/2023 18:12	1000
5	PIC	6/1/2023	5/31/2024	0.6083	0.01914	0.461	9/1/2023 18:12	1000
6	PIC	6/1/2023	5/31/2024	0.6253	0.02111	0.409	9/1/2023 18:12	1000
7	PIC	6/1/2023	5/31/2024	0.6206	0.00745	1.370	9/1/2023 18:12	1000
8	PIC	6/1/2023	5/31/2024	0.6266	0.01614	0.379	9/1/2023 18:12	1000
9	PIC	6/1/2023	5/31/2024	0.6245	0.00988	0.357	9/1/2023 18:12	1000
10	PIC	6/1/2023	5/31/2024	0.5677	0.02297	0.483	9/1/2023 18:12	1000
11	PIC	6/1/2023	5/31/2024	0.6074	0.01123	0.409	9/1/2023 18:12	1000
12	PIC	6/1/2023	5/31/2024	0.6376	0.00889	0.784	9/1/2023 18:13	1000
13	PIC	6/1/2023	5/31/2024	0.6412	0.00773	0.708	9/1/2023 18:13	1000
14	PIC	6/1/2023	5/31/2024	0.6366	0.00851	1.264	9/1/2023 18:13	1000
15	PIC	6/1/2023	5/31/2024	0.6566	0.00925	0.844	9/1/2023 18:32	1000
16	PIC	6/1/2023	5/31/2024	0.6444	0.02228	0.756	9/1/2023 18:09	1000
17	PIC	6/1/2023	5/31/2024	0.6167	0.01970	1.023	9/1/2023 18:10	1000
18	PIC	6/1/2023	5/31/2024	0.6229	0.00594	0.347	9/1/2023 18:09	1000
19	PIC	6/1/2023	5/31/2024	0.6423	0.00627	0.277	9/1/2023 18:10	1000
20	PIC	6/1/2023	5/31/2024	0.6369	0.00790	0.397	9/1/2023 18:10	1000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 2051-B
LCS Exp Date : 3/27/2024
LCS Activity (dpm/ml): 533.11
LCS Volume Added: 0.10

Results Pos.	Decision	Critical	Required	Sample Act.		Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
	Level pCi/L	Level pCi/L	MDA pCi/L	MDA pCi/L	Conc. pCi/L	Error %	Rate CPM	Rate Error CPM	Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L						
1	0.8492	0.5995	3	1.3920	0.9454	46.62%	0.2450	0.1140	0.8625	0.8953		SAMPLE				
2	0.6403	0.4520	3	1.0859	0.6439	52.63%	0.1770	0.0930	0.6633	0.6832		SAMPLE				
3	0.9667	0.6825	3	1.5435	1.1404	43.05%	0.3193	0.1372	0.9602	1.0030		SAMPLE				
4	0.8855	0.6252	3	1.4337	0.2762	145.42%	0.0753	0.1095	0.7872	0.7904		SAMPLE				
5	0.7317	0.5166	3	1.2071	1.0056	39.52%	0.2890	0.1138	0.7764	0.8181		SAMPLE				
6	0.7279	0.5139	3	1.2116	1.1920	34.82%	0.3243	0.1124	0.8096	0.8657		SAMPLE				
7	1.2233	0.8637	3	1.8960	0.3262	166.23%	0.0967	0.1607	1.0627	1.0660		SAMPLE				
8	0.6513	0.4598	3	1.0905	0.4703	68.94%	0.1377	0.0948	0.6349	0.6461		SAMPLE				
9	0.6341	0.4477	3	1.0667	0.1474	194.92%	0.0430	0.0838	0.5629	0.5641		SAMPLE				
10	0.8958	0.6324	3	1.4730	0.5563	77.69%	0.1337	0.1037	0.8462	0.8583		SAMPLE				
11	0.7980	0.5634	3	1.3283	-0.1034	321.24%	-0.0257	0.0824	0.6511	0.6514		SAMPLE				
12	0.9454	0.6674	3	1.5072	0.3999	108.34%	0.1160	0.1256	0.8489	0.8550		SAMPLE				
13	0.9253	0.6533	3	1.4841	0.6818	65.33%	0.1920	0.1253	0.8723	0.8893		SAMPLE				
14	1.2641	0.8924	3	1.9664	-0.9584	50.80%	-0.2640	0.1339	0.9528	0.9530		SAMPLE				
15	0.9800	0.6919	3	1.5560	0.1355	317.21%	0.0393	0.1248	0.8423	0.8430		SAMPLE				
16	0.9319	0.6579	3	1.4889	0.9598	48.47%	0.2773	0.1341	0.9095	0.9425		SAMPLE				
17	1.2210	0.8621	3	1.9190	0.6250	89.89%	0.1603	0.1440	1.1005	1.1121		SAMPLE				
18	0.6205	0.4381	3	1.0462	0.2936	100.81%	0.0863	0.0870	0.5800	0.5848		MB				
19	0.5894	0.4161	3	1.0130	1.4693	26.72%	0.4063	0.1080	0.7655	0.8517	633177001.1	DUP	43.4%			
20	0.7013	0.4951	3	1.1699	76.2032	3.96%	21.2030	0.6003	4.2289	19.8415		LCS			78.5514	97.0%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
633177001	1A	60	11	45	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633177002	1B	60	2	30	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633177003	1C	60	9	65	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633177004	1D	60	3	41	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633177005	2A	60	5	45	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633177006	2B	60	2	44	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633542001	2D	60	5	88	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633542002	3B	60	2	31	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633542003	3C	60	4	24	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633542004	3D	60	10	37	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
633612001	4A	60	7	23	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
633715001	4C	60	4	54	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
633715002	4D	60	13	54	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
633715003	5A	60	7	60	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
633715004	5D	60	8	53	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
633715005	6A	60	12	62	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
633715006	6C	60	2	71	9/5/2023 13:44	9/5/2023 14:44	PIC	2479427
1205493704	7A	60	9	26	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
1205493705	7B	60	3	41	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427
1205493706	7C	60	6	1296	9/5/2023 13:43	9/5/2023 14:43	PIC	2479427

ASSAY 5-Sep-23 12:29:19
 Wizard 2480 s/n 46190630
 Protocol id 8 Ba-133
 Time limit
 Count limit
 Isotope Ba-133
 Protocol date 9/5/2023
 Run id. 7247

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	93	1	180	3174	1057.83	1.77	12:29:19
633177001	2	93	2	180	2956	985.13	1.84	93.13	12:32:33
633177002	3	93	3	180	2744	914.47	1.91	86.45	12:35:46
633177003	4	93	4	180	2785.28	928.26	1.89	87.75	12:39:00
633177004	5	93	5	180	2734	911.18	1.91	86.14	12:42:15
633177005	1	19	1	180	2856	951.8	1.87	89.98	12:45:50
633177006	2	19	2	180	2620.28	873.27	1.95	82.55	12:49:04
633542001	3	19	3	180	2889.57	962.95	1.86	91.03	12:52:18
633542002	4	19	4	180	2794	931.19	1.89	88.03	12:55:32
633542003	5	19	5	180	2815.57	938.29	1.88	88.70	12:58:46
633542004	1	2	1	180	2554.57	851.38	1.98	80.48	01:02:22
633612001	2	2	2	180	2483.28	827.61	2.01	78.24	01:05:36
633715001	3	2	3	180	2746	915.14	1.91	86.51	01:08:50
633715002	4	2	4	180	2668.28	889.24	1.94	84.06	01:12:03
633715003	5	2	5	180	2627.28	875.57	1.95	82.77	01:15:18
633715004	1	98	1	180	2656.28	885.24	1.94	83.68	01:19:06
633715005	2	98	2	180	2708.28	902.57	1.92	85.32	01:22:20
633715006	3	98	3	180	2531	843.56	1.99	79.74	01:25:34
1205493704	4	98	4	180	2803.28	934.23	1.89	88.32	01:28:48
1205493705	5	98	5	180	2620.28	873.24	1.95	82.55	01:32:02
1205493706	1	10	1	180	2595.28	864.95	1.96	81.77	01:35:50

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 05-Sep-2023

Detectors LB4100 E1 through H4 and PIC 1A through 14D and G5400W 1W through 1Z and LB4200 GA1 through OD4

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100G3	Above	Beta bkg	05-Sep 09:28	60	2.050	0.785	2.444	+1.57
LB4100H1	Above	Alpha bkg	05-Sep 05:45	60	0.283	-8.08E-2	0.225	+4.14
LB4100H1	Above	Beta bkg	05-Sep 05:45	60	2.800	-5.15E-1	3.743	+1.67
LB4200GA2	Above	Alpha bkg	05-Sep 07:45	60	1.150	-1.34E-1	0.379	+12.03
LB4200GA2	Above	Beta bkg	05-Sep 07:45	60	2.983	-3.66E-2	1.795	+6.89
LB4200GB2	Above	Beta bkg	05-Sep 04:50	60	120	0.129	1.304	+606.47
LB4200OC1	Above	Beta bkg	05-Sep 08:41	60	1.600	0.178	1.284	+4.71
PIC2C	Above	Alpha bkg	05-Sep 06:27	60	0.433	-1.83E-2	0.433	+3.00
PIC2C	Above	Beta bkg	05-Sep 06:27	60	21.050	0.030	2.148	+56.54
PIC6B	Above	Beta bkg	05-Sep 06:40	60	7.783	0.262	2.449	+17.64
PIC12B	Above	Alpha bkg	05-Sep 06:57	60	0.517	-8.27E-2	0.413	+4.25
PIC12B	Above	Beta bkg	05-Sep 06:57	60	13.833	-5.75E-1	2.641	+23.88
PIC14B	Above	Beta bkg	05-Sep 07:20	60	3.717	-1.06E-1	1.026	+17.26

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

Reviewed by Jc Poparad

Date 9/5/23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2479427

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205493704	MB	JE1	PIC7A	SEP-05-23 13:43:10	DONE	25mm Filter	01-JUN-23 00:00
1205493705	DUP	JE1	PIC7B	SEP-05-23 13:43:14	DONE	25mm Filter	01-JUN-23 00:00
1205493706	LCS	JE1	PIC7C	SEP-05-23 13:43:19	DONE	25mm Filter	01-JUN-23 00:00
633177001	SAMPLE	JE1	PIC1A	SEP-05-23 13:43:20	DONE	25mm Filter	01-JUN-23 00:00
633177002	SAMPLE	JE1	PIC1B	SEP-05-23 13:43:25	DONE	25mm Filter	01-JUN-23 00:00
633177003	SAMPLE	JE1	PIC1C	SEP-05-23 13:43:29	DONE	25mm Filter	01-JUN-23 00:00
633177004	SAMPLE	JE1	PIC1D	SEP-05-23 13:43:33	DONE	25mm Filter	01-JUN-23 00:00
633177005	SAMPLE	JE1	PIC2A	SEP-05-23 13:43:37	DONE	25mm Filter	01-JUN-23 00:00
633177006	SAMPLE	JE1	PIC2B	SEP-05-23 13:43:41	DONE	25mm Filter	01-JUN-23 00:00
633542001	SAMPLE	JE1	PIC2D	SEP-05-23 13:43:45	DONE	25mm Filter	01-JUN-23 00:00
633542002	SAMPLE	JE1	PIC3B	SEP-05-23 13:43:49	DONE	25mm Filter	01-JUN-23 00:00
633542003	SAMPLE	JE1	PIC3C	SEP-05-23 13:43:56	DONE	25mm Filter	01-JUN-23 00:00
633542004	SAMPLE	JE1	PIC3D	SEP-05-23 13:43:59	DONE	25mm Filter	01-JUN-23 00:00
633612001	SAMPLE	JE1	PIC4A	SEP-05-23 13:44:03	DONE	25mm Filter	01-JUN-23 00:00
633715001	SAMPLE	JE1	PIC4C	SEP-05-23 13:44:07	DONE	25mm Filter	01-JUN-23 00:00
633715002	SAMPLE	JE1	PIC4D	SEP-05-23 13:44:13	DONE	25mm Filter	01-JUN-23 00:00
633715003	SAMPLE	JE1	PIC5A	SEP-05-23 13:44:17	DONE	25mm Filter	01-JUN-23 00:00
633715004	SAMPLE	JE1	PIC5D	SEP-05-23 13:44:23	DONE	25mm Filter	01-JUN-23 00:00
633715005	SAMPLE	JE1	PIC6A	SEP-05-23 13:44:27	DONE	25mm Filter	01-JUN-23 00:00
633715006	SAMPLE	JE1	PIC6C	SEP-05-23 13:44:33	DONE	25mm Filter	01-JUN-23 00:00

Lucas Cell Raw Data

Batch 2479421 Check-list

This check-list was completed on 11-SEP-23 by Lyndsey Pace

This batch was reviewed by Gregory Ramsay on 11-SEP-23 and Lyndsey Pace on 11-SEP-23.

Batch ID:
2479421

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2479421
Analyst: Lyndsey Pace (LXP1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: LUCAS-C202389980

Due Dates for Lab: 06-SEP-2023			Package: 10-SEP-2023		SDG: 08-SEP-2023	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205493687	Radium-226 SPIKE	1715-G	.1	mL	
MS	1205493686	Radium-226 SPIKE	1715-G	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	633177001	07-SEP-2023	1	507.1	507.1	09/07/23 12:36	601	09/11/23 05:26	09/11/23 09:19	7	7
2	633177002	07-SEP-2023	1	505.07	505.07	09/07/23 12:36	708	09/11/23 05:26	09/11/23 09:19	4	7
3	633177003	07-SEP-2023	1	502	502	09/07/23 12:36	805	09/11/23 05:26	09/11/23 09:19	3	7
4	633177004	07-SEP-2023	1	511.23	511.23	09/07/23 12:36	102	09/11/23 05:51	09/11/23 10:10	3	8
5	633177005	07-SEP-2023	1	502.96	502.96	09/07/23 12:36	205	09/11/23 05:51	09/11/23 10:10	1	17
6	633177006	07-SEP-2023	1	504.99	504.99	09/07/23 12:36	301	09/11/23 05:51	09/11/23 10:10	3	18
7	633542001	07-SEP-2023	1	504.78	504.78	09/07/23 12:36	403	09/11/23 05:51	09/11/23 10:10	3	9
8	633542002	07-SEP-2023	1	512.09	512.09	09/07/23 12:36	508	09/11/23 05:51	09/11/23 10:10	4	14
9	633542003	07-SEP-2023	1	502.38	502.38	09/07/23 12:36	603	09/11/23 05:51	09/11/23 10:10	2	8
10	633542004	07-SEP-2023	1	505.62	505.62	09/07/23 12:36	707	09/11/23 05:51	09/11/23 10:10	6	4
11	633612001	07-SEP-2023	1	508.06	508.06	09/07/23 12:36	803	09/11/23 05:51	09/11/23 10:10	1	8
12	633715001	07-SEP-2023	1	504.84	504.84	09/07/23 12:36	105	09/11/23 06:16	09/11/23 10:43	2	15
13	633715002	07-SEP-2023	1	505.73	505.73	09/07/23 12:36	201	09/11/23 06:16	09/11/23 10:43	3	19
14	633715003	07-SEP-2023	1	504.46	504.46	09/07/23 12:36	303	09/11/23 06:16	09/11/23 10:43	1	17
15	633715004	07-SEP-2023	1	506.34	506.34	09/07/23 12:36	406	09/11/23 06:16	09/11/23 10:43	1	16
16	633715005	07-SEP-2023	1	505.89	505.89	09/07/23 12:36	506	09/11/23 06:16	09/11/23 10:43	2	4
17	633715006	07-SEP-2023	1	500	500	09/07/23 12:36	607	09/11/23 06:16	09/11/23 10:43	2	9
18	1205493684 MB	07-SEP-2023	1	512.09	512.09	09/07/23 12:36	706	09/11/23 06:16	09/11/23 10:43	6	2
19	1205493685 DUP (633177001)	07-SEP-2023	1	502.39	502.39	09/07/23 12:36	804	09/11/23 06:16	09/11/23 10:43	6	6
20	1205493686 MS (633177001)	07-SEP-2023	1	105.09	105.09	09/07/23 12:36	103	09/11/23 06:40	09/11/23 11:01	4	371
21	1205493687 LCS	07-SEP-2023	1		512.09	09/07/23 12:36	208	09/11/23 06:40	09/11/23 11:01	7	354

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 07-SEP-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Batch : 2479421
Analyst : LIN01615
Prep Date : 9/7/2023
Ra-226 Method Uncertainty : 0.073648

Procedure Code : LUC26RAL
Parmname : Radium-226
Required MDA : 1 pCi/L
Halfife of Ra-226 : 1600 years
Ra-226 Abundance : 1.00
Halfife of Rn-222 : 3.8235 days

Batch counted on : LUCAS CELL DETECTOR
BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	633177001.1	0.5071	2.0284E-05	8/8/2023 11:08	601	15	7	0.467	7	0.233	30	1.8870
2	633177002.1	0.5051	2.0276E-05	8/8/2023 12:55	708	15	7	0.467	4	0.133	30	1.6020
3	633177003.1	0.5020	2.0264E-05	8/8/2023 14:21	805	15	7	0.467	3	0.100	30	1.5410
4	633177004.1	0.5112	2.0301E-05	8/8/2023 12:34	102	15	8	0.533	3	0.100	30	1.4860
5	633177005.1	0.5030	2.0268E-05	8/8/2023 11:08	205	15	17	1.133	1	0.033	30	1.7590
6	633177006.1	0.5050	2.0276E-05	8/8/2023 9:30	301	15	18	1.200	3	0.100	30	1.6430
7	633542001.1	0.5048	2.0275E-05	8/11/2023 9:53	403	15	9	0.600	3	0.100	30	1.5070
8	633542002.1	0.5121	2.0304E-05	8/11/2023 11:53	508	15	14	0.933	4	0.133	30	1.9780
9	633542003.1	0.5024	2.0266E-05	8/14/2023 9:53	603	15	8	0.533	2	0.067	30	1.8970
10	633542004.1	0.5056	2.0279E-05	8/11/2023 8:55	707	15	4	0.267	6	0.200	30	1.7280
11	633612001.1	0.5081	2.0288E-05	8/11/2023 10:10	803	15	8	0.533	1	0.033	30	1.4760
12	633715001.1	0.5048	2.0276E-05	8/14/2023 15:12	105	15	15	1.000	2	0.067	30	1.5340
13	633715002.1	0.5057	2.0279E-05	8/14/2023 11:03	201	15	19	1.267	3	0.100	30	1.6670
14	633715003.1	0.5045	2.0274E-05	8/14/2023 12:53	303	15	17	1.133	1	0.033	30	1.7210
15	633715004.1	0.5063	2.0281E-05	8/14/2023 14:31	406	15	16	1.067	1	0.033	30	1.4650
16	633715005.1	0.5059	2.0280E-05	8/14/2023 11:03	506	15	4	0.267	2	0.067	30	1.8780
17	633715006.1	0.5000	2.0256E-05	8/14/2023 9:10	607	15	9	0.600	2	0.067	30	1.7750
18	1205493684.1	0.5121	2.0304E-05	9/7/2023 0:00	706	15	2	0.133	6	0.200	30	1.5900
19	1205493685.1	0.5024	2.0266E-05	8/8/2023 11:08	804	15	6	0.400	6	0.200	30	1.6240
20	1205493686.1	0.1051	1.1678E-05	8/8/2023 11:08	103	15	371	24.733	4	0.133	30	1.6400
21	1205493687.1	0.5121	2.0304E-05	9/7/2023 0:00	208	15	354	23.600	7	0.233	30	1.7130

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
6.700%	7/1/2023	6/30/2024	9/7/2023 12:36	9/11/2023 5:26	9/11/2023 9:19	0.489	0.971	1.001	1.000
7.700%	11/1/2022	10/31/2023	9/7/2023 12:36	9/11/2023 5:26	9/11/2023 9:19	0.489	0.971	1.001	1.000
9.600%	4/8/2023	3/31/2024	9/7/2023 12:36	9/11/2023 5:26	9/11/2023 9:19	0.489	0.971	1.001	1.000
2.300%	5/1/2023	4/30/2024	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
9.200%	8/1/2023	7/31/2024	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
4.500%	10/25/2022	10/31/2023	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
6.100%	2/1/2023	1/31/2024	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
8.400%	6/1/2023	5/31/2024	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
3.500%	7/1/2023	6/30/2024	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
2.200%	11/1/2022	10/31/2023	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
4.700%	4/8/2023	3/31/2024	9/7/2023 12:36	9/11/2023 5:51	9/11/2023 10:10	0.490	0.968	1.001	1.000
7.900%	5/1/2023	4/30/2024	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
7.400%	8/1/2023	7/31/2024	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
7.400%	10/25/2022	10/31/2023	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
2.900%	2/1/2023	1/31/2024	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
1.400%	6/1/2023	5/31/2024	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
6.800%	7/1/2023	6/30/2024	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
2.900%	11/1/2022	10/31/2023	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
6.100%	4/8/2023	3/31/2024	9/7/2023 12:36	9/11/2023 6:16	9/11/2023 10:43	0.492	0.967	1.001	1.000
9.600%	5/1/2023	4/30/2024	9/7/2023 12:36	9/11/2023 6:40	9/11/2023 11:01	0.494	0.968	1.001	1.000
4.400%	8/1/2023	7/31/2024	9/7/2023 12:36	9/11/2023 6:40	9/11/2023 11:01	0.494	0.968	1.001	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-G
Spike Exp Date : 9/8/2023
Spike Activity (dpm/ml): 297.37
Spike Volume Added: 0.10

LCS S/N : 1715-G
LCS Exp Date : 9/8/2023
LCS Activity (dpm/ml): 297.37
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.3533	0.2494	1	0.6974	0.2316	84.78%	0.2333	0.1972	0.3837	0.3863		SAMPLE				
2	0.3159	0.2230	1	0.6808	0.3913	57.09%	0.3333	0.1886	0.4339	0.4415		SAMPLE				
3	0.2861	0.2020	1	0.6496	0.4502	51.52%	0.3667	0.1856	0.4467	0.4593		SAMPLE				
4	0.2913	0.2057	1	0.6614	0.5418	45.57%	0.4333	0.1972	0.4833	0.4902		SAMPLE				
5	0.1444	0.1020	1	0.4187	1.1810	26.80%	1.1000	0.2769	0.5827	0.6434		SAMPLE				
6	0.2668	0.1883	1	0.6056	1.2593	26.63%	1.1000	0.2887	0.6478	0.6819		SAMPLE				
7	0.2909	0.2054	1	0.6606	0.6243	42.08%	0.5000	0.2082	0.5095	0.5227		SAMPLE				
8	0.2523	0.1781	1	0.5438	0.7502	33.35%	0.8000	0.2582	0.4746	0.5022		SAMPLE				
9	0.1896	0.1339	1	0.4671	0.4651	41.80%	0.4667	0.1944	0.3797	0.3869		SAMPLE				
10	0.3582	0.2529	1	0.7233	0.0725	234.53%	0.0667	0.1563	0.3332	0.3333		SAMPLE				
11	0.1704	0.1203	1	0.4939	0.6333	38.58%	0.5000	0.1915	0.4754	0.4876		SAMPLE				
12	0.2328	0.1644	1	0.5735	1.1422	29.21%	0.9333	0.2625	0.6296	0.6744		SAMPLE				
13	0.2619	0.1849	1	0.5947	1.3115	26.45%	1.1667	0.2963	0.6528	0.7058		SAMPLE				
14	0.1469	0.1037	1	0.4257	1.2008	26.24%	1.1000	0.2769	0.5924	0.6414		SAMPLE				
15	0.1719	0.1213	1	0.4982	1.3202	26.17%	1.0333	0.2687	0.6730	0.7035		SAMPLE				
16	0.1898	0.1340	1	0.4675	0.1995	70.72%	0.2000	0.1414	0.2765	0.2781		SAMPLE				
17	0.2032	0.1434	1	0.5004	0.5695	39.12%	0.5333	0.2055	0.4301	0.4444		SAMPLE				
18	0.3835	0.2708	1	0.7743	-0.0776	187.11%	-0.0667	0.1247	0.2845	0.2846		MB				
19	0.3828	0.2702	1	0.7728	0.2323	91.49%	0.2000	0.1826	0.4157	0.4180	633177001.1	DUP	0.3%			
20	1.4738	1.0405	1	3.1766	134.7544	10.93%	24.6000	1.2858	13.8052	34.8117	633177001.1	MS			127.4654	105.7%
21	0.3830	0.2704	1	0.7561	25.1473	6.95%	23.3667	1.2574	2.6524	4.9915		LCS			26.1573	96.1%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 11-SEP-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	08:10	1	1.15E+05	115416	-0.12		
LUCAS2	EFF	08:09	1	1.32E+05	132307	-1.08		
LUCAS3	EFF	08:08	1	91119	91119	-2.79		
LUCAS4	EFF	08:07	1	1.29E+05	128693	1.2		
LUCAS5	EFF	08:05	1	1.32E+05	131887	-0.71		
LUCAS6	EFF	08:04	1	1.31E+05	130508	0.78		
LUCAS7	EFF	08:03	1	1.32E+05	131641	0.34		
LUCAS8	EFF	08:02	1	1.17E+05	117147	-1.32		

Reviewed by: 
Lyndsey Pace

Date: 11-SEP-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2479421

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
633177001	SAMPLE	LXP1	LUCAS6	SEP-11-23 09:19:00	DONE	Lucas Cell	01-JUL-23 00:00
633177002	SAMPLE	LXP1	LUCAS7	SEP-11-23 09:19:00	DONE	Lucas Cell	01-NOV-22 00:00
633177003	SAMPLE	LXP1	LUCAS8	SEP-11-23 09:19:00	DONE	Lucas Cell	08-APR-23 00:00
633177004	SAMPLE	LXP1	LUCAS1	SEP-11-23 10:10:00	DONE	Lucas Cell	01-MAY-23 00:00
633177005	SAMPLE	LXP1	LUCAS2	SEP-11-23 10:10:00	DONE	Lucas Cell	01-AUG-23 00:00
633177006	SAMPLE	LXP1	LUCAS3	SEP-11-23 10:10:00	DONE	Lucas Cell	25-OCT-22 00:00
633542001	SAMPLE	LXP1	LUCAS4	SEP-11-23 10:10:00	DONE	Lucas Cell	01-FEB-23 00:00
633542002	SAMPLE	LXP1	LUCAS5	SEP-11-23 10:10:00	DONE	Lucas Cell	01-JUN-23 00:00
633542003	SAMPLE	LXP1	LUCAS6	SEP-11-23 10:10:00	DONE	Lucas Cell	01-JUL-23 00:00
633542004	SAMPLE	LXP1	LUCAS7	SEP-11-23 10:10:00	DONE	Lucas Cell	01-NOV-22 00:00
633612001	SAMPLE	LXP1	LUCAS8	SEP-11-23 10:10:00	DONE	Lucas Cell	08-APR-23 00:00
633715001	SAMPLE	LXP1	LUCAS1	SEP-11-23 10:43:00	DONE	Lucas Cell	01-MAY-23 00:00
633715002	SAMPLE	LXP1	LUCAS2	SEP-11-23 10:43:00	DONE	Lucas Cell	01-AUG-23 00:00
633715003	SAMPLE	LXP1	LUCAS3	SEP-11-23 10:43:00	DONE	Lucas Cell	25-OCT-22 00:00
633715004	SAMPLE	LXP1	LUCAS4	SEP-11-23 10:43:00	DONE	Lucas Cell	01-FEB-23 00:00
633715005	SAMPLE	LXP1	LUCAS5	SEP-11-23 10:43:00	DONE	Lucas Cell	01-JUN-23 00:00
633715006	SAMPLE	LXP1	LUCAS6	SEP-11-23 10:43:00	DONE	Lucas Cell	01-JUL-23 00:00
1205493684	MB	LXP1	LUCAS7	SEP-11-23 10:43:00	DONE	Lucas Cell	01-NOV-22 00:00
1205493685	DUP	LXP1	LUCAS8	SEP-11-23 10:43:00	DONE	Lucas Cell	08-APR-23 00:00
1205493686	MS	LXP1	LUCAS1	SEP-11-23 11:01:00	DONE	Lucas Cell	01-MAY-23 00:00
1205493687	LCS	LXP1	LUCAS2	SEP-11-23 11:01:00	DONE	Lucas Cell	01-AUG-23 00:00



Data Verification & Validation Report

Lansing Board of Water & Light – Erickson Power Station

Sampling Event (dates and purpose): Background Sampling

Data Package Number:
S53510.01

Lab Report Date:
10/20/2023

Data Validator: Andrew Byks

Data Validation Completion Date: 11/04/2023

General Overall Assessment:

- Data are usable without qualification.
 Data are usable with qualification (as noted below).
 Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	
MW-7C	
MW-8	
MW-9	
MW-10	
MW-11	
MW-11B	
MW-12	
MW-12B	
MW-13	
MW-14	
MW-15	
MW-16A	
MW-16B	
MW-16C	
MW-16D	
MW-100A	X
MW-100B	X
MW-100C	X
MW-100D	X

Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-100A	GW	S53510.01	9/18/2023	X	X	X	X	X	X	
MW-100B	GW	S53510.02	9/18/2023	X	X	X	X	X	X	
MW-100C	GW	S53510.03	9/18/2023	X	X	X	X	X	X	
MW-100D	GW	S53510.04	9/18/2023	X	X	X	X	X	X	
MWT-100B	GW	S53510.05	9/18/2023	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO₃, CO₃, hardness

Any planned sampling or analysis NOT completed? If yes, explain: _____

Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Field Data							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	X		Record of decontamination for non-dedicated sampling equipment	X			
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
Analytical Data Package							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies across samples for hardness, Rad-226, and Rad-228
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Holding Times	X		Analyses performed within allowed holding time	X			
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested		X		RLs for hardness, TDS, and Rad-228 were not met
			MDLs<RLs		X		RL=MDL for carbonate
			MDLs<MCLs	X			
			MDLs<GPS	X			
QC Validation							
Evaluate Accuracy							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Evaluate Precision							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Field duplicates for Rad-226 not met; see below
Evaluate Representativeness							
Equipment Blanks (if applicable)	X		Non-detect (<RL)		X		Rad-228 detected in one field blank
QC Verification							
Verify Instrument Calibration & Analytical Process							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
Evaluate Completeness (# usable measurements/ # unusable measurements)							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

None.

Comments:

The RPDs for Rad-226 and Rad-228 between parent sample MW-100B and field duplicate MWT-100B were 68% and 93%, respectively. Rad-226 required qualification as estimated with high bias (J+) in

parent sample MW-100B and as estimated with low bias (J-) in field duplicate MWT-100B. Rad-228 required qualification as estimated with low bias (J-) in parent sample MW-100B and as estimated with high bias (J+) in field duplicate MWT-100B.

Rad-226 results in samples MW-100A, MW-100B, MW-100C, MW-100D, and MWT-100B required qualification as estimated with high bias (J+) due to Rad-226 detection in the associated field blank.



Hometown People. Hometown Power.

Lansing Board of Water and Light
Environmental Services Laboratory (MI00079)
Cert ID:3760
1232 Haco Dr.
Lansing, Michigan 48901

20 October 2023

BWL - Erickson Station

Attn: Cheryl Loudon

3725 S. Canal

Lansing, MI 48917

Project: Erickson Well Project

Dear Cheryl Loudon,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

Work Order
L309174

Received
9/19/2023 8:40:00AM

Account Number

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



Analytical Report

Client: BWL - Erickson Station
Address: 3725 S. Canal
 Lansing MI, 48917

Client Project Manager: Cheryl Louden

Report Date: 10/20/2023

Sample Name: MW-100 A

Lab #: L309174-01 Ground Water

Collected: 18-Sep-23 15:15

By: Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	720	1.0	uS/cm	1		18-Sep-23 15:15	maw	SM 2510B	
Dissolved oxygen	0.980	0.100	mg/L	1		18-Sep-23 15:15	maw	FIELD	
Milliliters Purged	110		ml/min	1		18-Sep-23 15:15	maw	FIELD	
Oxidation Reduction Potential	-98.10	-999.0	mV	1		18-Sep-23 15:15	maw	FIELD	
pH	7.3	7.0	pH Units	1		18-Sep-23 15:15	maw	SM 4500H+B	
Temperature	17		°C	1		18-Sep-23 15:15	maw	SM 2550B	
Turbidity	4.2	0.10	NTU	1		18-Sep-23 15:15	maw	SM 2130B	

Sample Name: MW-100 B

Lab #: L309174-02 Ground Water

Collected: 18-Sep-23 11:52

By: Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	740	1.0	uS/cm	1		18-Sep-23 11:52	maw	SM 2510B	
Dissolved oxygen	ND	0.100	mg/L	1		18-Sep-23 11:52	maw	FIELD	
Milliliters Purged	200		ml/min	1		18-Sep-23 11:52	maw	FIELD	
Oxidation Reduction Potential	-149.9	-999.0	mV	1		18-Sep-23 11:52	maw	FIELD	
pH	7.3	7.0	pH Units	1		18-Sep-23 11:52	maw	SM 4500H+B	
Temperature	13		°C	1		18-Sep-23 11:52	maw	SM 2550B	
Turbidity	0.81	0.10	NTU	1		18-Sep-23 11:52	maw	SM 2130B	

Sample Name: MW-100 C

Lab #: L309174-03 Ground Water

Collected: 18-Sep-23 13:35

By: Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	520	1.0	uS/cm	1		18-Sep-23 13:35	maw	SM 2510B	
Dissolved oxygen	ND	0.100	mg/L	1		18-Sep-23 13:35	maw	FIELD	
Milliliters Purged	270		ml/min	1		18-Sep-23 13:35	maw	FIELD	
Oxidation Reduction Potential	-113.3	-999.0	mV	1		18-Sep-23 13:35	maw	FIELD	
pH	7.2	7.0	pH Units	1		18-Sep-23 13:35	maw	SM 4500H+B	
Temperature	13		°C	1		18-Sep-23 13:35	maw	SM 2550B	
Turbidity	0.81	0.10	NTU	1		18-Sep-23 13:35	maw	SM 2130B	



Analytical Report

Client: BWL - Erickson Station
Address: 3725 S. Canal
Lansing MI, 48917

Client Project Manager: Cheryl Louden

Report Date: 10/20/2023

Sample Name: MW-100 D

Lab #: L309174-04 Ground Water

Collected: 18-Sep-23 14:56

By: Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	600	1.0	uS/cm	1		18-Sep-23 14:56	maw	SM 2510B	
Dissolved oxygen	ND	0.100	mg/L	1		18-Sep-23 14:56	maw	FIELD	
Milliliters Purged	200		ml/min	1		18-Sep-23 14:56	maw	FIELD	
Oxidation Reduction Potential	-201.5	-999.0	mV	1		18-Sep-23 14:56	maw	FIELD	
pH	7.9	7.0	pH Units	1		18-Sep-23 14:56	maw	SM 4500H+B	
Temperature	13		°C	1		18-Sep-23 14:56	maw	SM 2550B	
Turbidity	5.6	0.10	NTU	1		18-Sep-23 14:56	maw	SM 2130B	



Analytical Report

Client: BWL - Erickson Station

Client Project Manager: Cheryl Louden

Report Date: 10/20/2023

Address: 3725 S. Canal
Lansing MI, 48917

Approved By:

Jennifer Caporale

Notes and Definitions

AL Action Level (Action Level = Regulatory Limit)
MCL Maximum Contaminant Level
PEL Permissible Exposure Limit (Permissible Exposure Limit = Regulatory Limit)
RPD Relative Percent Difference
OT Odor Threshold
ND Non Detect is less than the reporting limit value
All drinking water regulatory limits are MCL's with the exception of Lead and Copper unless otherwise noted.



Report ID: S53510.01(02)
Generated on 10/19/2023
Replaces report S53510.01(01) generated on 09/28/2023

Report to
Attention: Jennifer Caporale
Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Report produced by
Merit Laboratories, Inc.
2680 East Lansing Drive
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:
John Lavery (johnlavery@meritlabs.com)
Barbara Ball (bball@meritlabs.com)

Report Summary
Lab Sample ID(s): S53510.01-S53510.06
Project: Erickson AM MI Wells 100A-100D
Collected Date(s): 09/18/2023
Submitted Date/Time: 09/19/2023 09:16
Sampled by: Marc Wahrer
P.O. #:

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Maya Murshak
Technical Director



General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

All accreditations/certifications held by this laboratory are listed on page 3. Not all accreditations/certifications are applicable to this report.

Report Narrative

All analyses completed



Laboratory Accreditations

Authority	Accreditation ID
Michigan DEQ	#9956
DOD ELAP & ISO/IEC 17025:2017	#69699 PJLA Testing
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



Sample Summary (6 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S53510.01	MW-100A L309174-01	Groundwater	09/18/23 15:15
S53510.02	MW-100B L309174-02	Groundwater	09/18/23 11:52
S53510.03	MW-100C L309174-03	Groundwater	09/18/23 13:35
S53510.04	MW-100D L309174-04	Groundwater	09/18/23 14:56
S53510.05	MWT-100B L309174-05	Groundwater	09/18/23 11:52
S53510.06	Field Blank L309174-06	Water	09/18/23 10:10



Analytical Laboratory Report

Final Report

Lab Sample ID: S53510.01

Sample Tag: MW-100A L309174-01

Collected Date/Time: 09/18/2023 15:15

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.2	IR
2	1L Plastic	None	Yes	1.2	IR
1	250ml Plastic	HNO3	Yes	1.2	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	09/20/23 03:08	CTV	
Metal Digestion	Completed	SW3015A	09/21/23 09:50	CCM	

Inorganics

Method: E300.0, Run Date: 09/19/23 12:23, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	10	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	22	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 09/26/23 11:06, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	440	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 09/25/23 11:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	394	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 09/22/23 13:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	414	50	6	mg/L	2		

Method: SM2540D, Run Date: 09/21/23 14:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	7.4	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 09/21/23 11:55, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.017	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.207	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.05	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	3.59	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S53510.01 (continued)

Sample Tag: MW-100A L309174-01

Method: E200.8, Run Date: 09/21/23 11:55, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.020	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.013	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 09/21/23 14:08, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	94.0	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	39.0	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	2.23	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	11.6	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 09/21/23 02:25, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 10/18/23 13:49, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Lab Sample ID: S53510.02

Sample Tag: MW-100B L309174-02

Collected Date/Time: 09/18/2023 11:52

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.2	IR
2	1L Plastic	None	Yes	1.2	IR
1	250ml Plastic	HNO3	Yes	1.2	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	09/20/23 03:08	CTV	
Metal Digestion	Completed	SW3015A	09/21/23 09:50	CCM	

Inorganics

Method: E300.0, Run Date: 09/19/23 12:33, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	25	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	110	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 09/26/23 11:10, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	320	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 09/25/23 11:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	374	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 09/22/23 13:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	492	50	6	mg/L	2		

Method: SM2540D, Run Date: 09/21/23 14:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	3.7	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 09/21/23 11:24, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.011	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.154	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.25	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	2.34	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S53510.02 (continued)

Sample Tag: MW-100B L309174-02

Method: E200.8, Run Date: 09/21/23 11:24, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.019	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.009	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 09/21/23 13:56, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	97.8	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	32.7	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	3.51	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	25.9	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 09/21/23 02:29, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 10/18/23 13:49, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S53510.03

Sample Tag: MW-100C L309174-03

Collected Date/Time: 09/18/2023 13:35

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.2	IR
2	1L Plastic	None	Yes	1.2	IR
1	250ml Plastic	HNO3	Yes	1.2	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	09/20/23 03:08	CTV	
Metal Digestion	Completed	SW3015A	09/21/23 09:50	CCM	

Inorganics

Method: E300.0, Run Date: 09/19/23 12:43, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	6	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	8	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 09/26/23 11:16, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	340	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 09/25/23 11:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	232	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 09/22/23 13:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	302	50	6	mg/L	2		

Method: SM2540D, Run Date: 09/21/23 14:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	2.8	3	1	mg/L	1		b

Metals

Method: E200.8, Run Date: 09/21/23 11:28, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.002	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.092	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	1.83	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL



Analytical Laboratory Report

Final Report

Lab Sample ID: S53510.03 (continued)

Sample Tag: MW-100C L309174-03

Method: E200.8, Run Date: 09/21/23 11:28, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	0.76	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.035	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 09/21/23 13:58, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	59.8	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	19.1	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	6.67	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	30.5	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 09/21/23 02:33, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 10/18/23 13:49, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S53510.04

Sample Tag: MW-100D L309174-04

Collected Date/Time: 09/18/2023 14:56

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.2	IR
2	1L Plastic	None	Yes	1.2	IR
1	250ml Plastic	HNO3	Yes	1.2	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	09/20/23 03:08	CTV	
Metal Digestion	Completed	SW3015A	09/21/23 09:50	CCM	

Inorganics

Method: E300.0, Run Date: 09/19/23 12:53, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	11	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 09/26/23 11:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	380	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 09/25/23 11:26, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	17	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 09/22/23 13:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	396	50	6	mg/L	2		

Method: SM2540D, Run Date: 09/21/23 14:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	2.0	3	1	mg/L	1		b

Metals

Method: E200.8, Run Date: 09/21/23 11:31, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.003	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.010	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	3.35	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL



Analytical Laboratory Report

Final Report

Lab Sample ID: S53510.04 (continued)

Sample Tag: MW-100D L309174-04

Method: E200.8, Run Date: 09/21/23 11:31, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	0.38	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.017	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.010	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 09/21/23 13:59, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	6.21	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	1.46	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	4.48	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	158	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 09/21/23 02:37, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 10/18/23 13:49, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S53510.05

Sample Tag: MWT-100B L309174-05

Collected Date/Time: 09/18/2023 11:52

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.2	IR
2	1L Plastic	None	Yes	1.2	IR
1	250ml Plastic	HNO3	Yes	1.2	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	09/20/23 03:08	CTV	
Metal Digestion	Completed	SW3015A	09/21/23 09:50	CCM	

Inorganics

Method: E300.0, Run Date: 09/19/23 13:03, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	25	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	110	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 09/26/23 11:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	330	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 09/25/23 11:28, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	378	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 09/22/23 13:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	496	50	6	mg/L	2		

Method: SM2540D, Run Date: 09/21/23 14:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	4.7	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 09/21/23 11:35, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.012	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.159	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.24	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	2.36	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S53510.05 (continued)

Sample Tag: MWT-100B L309174-05

Method: E200.8, Run Date: 09/21/23 11:35, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.017	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.008	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 09/21/23 14:01, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	100	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	33.5	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	3.61	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	24.8	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 09/21/23 02:40, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 10/18/23 13:49, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Lab Sample ID: S53510.06

Sample Tag: Field Blank L309174-06

Collected Date/Time: 09/18/2023 10:10

Matrix: Water

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.2	IR
2	1L Plastic	None	Yes	1.2	IR
1	250ml Plastic	HNO3	Yes	1.2	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	09/20/23 03:08	CTV	
Metal Digestion	Completed	SW3015A	09/21/23 09:50	CCM	

Inorganics

Method: E300.0, Run Date: 09/19/23 13:13, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.03	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.04	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.26	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 09/26/23 11:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 09/25/23 11:30, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 09/22/23 13:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	6	mg/L	2		

Method: SM2540D, Run Date: 09/21/23 14:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 09/21/23 11:08, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S53510.06 (continued)

Sample Tag: Field Blank L309174-06

Method: E200.8, Run Date: 09/21/23 11:08, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 09/21/23 13:50, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 09/21/23 02:44, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 10/18/23 13:49, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

Merit Laboratories Login Checklist

Lab Set ID:S53510

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 100A-100D

Submitted:09/19/2023 09:16 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Selection	Description	Note
Sample Receiving		
01.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples are received at 4C +/- 2C Thermometer # IR 1.2
02.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Received on ice/ cooling process begun
03.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples shipped
04.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples left in 24 hr. drop box
05.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Are there custody seals/tape or is the drop box locked
Chain of Custody		
06.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC adequately filled out
07.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC signed and relinquished to the lab
08.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sample tag on bottles match COC
09.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Subcontracting needed? Subcontracted to: GEL
Preservation		
10.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Do sample have correct chemical preservation
11.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Completed pH checks on preserved samples? (no VOAs)
12.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Did any samples need to be preserved in the lab?
Bottle Conditions		
13.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	All bottles intact
14.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Appropriate analytical bottles are used
15.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Merit bottles used
16.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sufficient sample volume received
17.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples require laboratory filtration
18.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples submitted within holding time
19.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S53510 Submitted: 09/19/2023 09:16

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 100A-100D

Attention: Jennifer Caporale
Address: Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Initial Preservation Check: 09/19/2023 09:45 MMC

Preservation Recheck (E200.8): N/A

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S53510.01	1L Plastic HNO3	<2			
S53510.01	1L Plastic HNO3	<2			
S53510.01	250ml Plastic HNO3	<2			
S53510.02	1L Plastic HNO3	<2			
S53510.02	1L Plastic HNO3	<2			
S53510.02	250ml Plastic HNO3	<2			
S53510.03	1L Plastic HNO3	<2			
S53510.03	1L Plastic HNO3	<2			
S53510.03	250ml Plastic HNO3	<2			
S53510.04	1L Plastic HNO3	<2			
S53510.04	1L Plastic HNO3	<2			
S53510.04	250ml Plastic HNO3	<2			
S53510.05	1L Plastic HNO3	<2			
S53510.05	1L Plastic HNO3	<2			
S53510.05	250ml Plastic HNO3	<2			
S53510.06	1L Plastic HNO3	<2			
S53510.06	1L Plastic HNO3	<2			
S53510.06	250ml Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823
 Phone (517) 332-0167 Fax (517) 332-4034
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

REPORT TO

CHAIN OF CUSTODY RECORD

INVOICE TO

CONTACT NAME **Jennifer Caporale**
 COMPANY **Lansing Board of Water and Light**
 ADDRESS **PO Box 13007 48901-3007**
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**
 PHONE NO. **517-702-6372** FAX NO. P.O. NO.
 E-MAIL ADDRESS **Environmental_Laboratory@lbwl.com** QUOTE NO.

CONTACT NAME **Beth Zimpfer** SAME
 COMPANY
 ADDRESS
 CITY STATE ZIP CODE
 PHONE NO. E-MAIL ADDRESS **Beth.Zimpfer@lbwl.com**

PROJECT NO./NAME **Erickson Well Project 100A-100D** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**
 TURNAROUND TIME REQUIRED 1 DAY 2 DAYS 3 DAYS STANDARD OTHER **ASAP**
 DELIVERABLES REQUIRED STD LEVEL II LEVEL III LEVEL IV EDD OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE
 # Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO ₃	H ₂ SO ₄	NaOH	MeOH	OTHER	Total Metals	F- undissolved, Cl ⁻ , SO ₄ , TDS	Radium 226	Radium 228	TSS	HCO ₃ , CO ₃ , Hardness	Certifications		Project Locations		Special Instructions
	DATE	TIME																	<input type="checkbox"/> OHIO VAP	<input type="checkbox"/> Drinking Water	<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES	
53510.01	9.18.23	1515	MW-100A L30917A-01	GW	5	2	3						✓	✓	✓	✓	✓	✓					Metals to analyse: Na, Mg, K
.02		1152	MW-100B -02	GW	5	2	3						✓	✓	✓	✓	✓	✓					B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03		1335	MW-100C -03	GW	5	2	3						✓	✓	✓	✓	✓	✓					Co, Li, Hg, Mo, Pb, Se, Tl,
.04		1456	MW-100D -04	GW	5	2	3						✓	✓	✓	✓	✓	✓					Fe, Cu, Ni, Ag, V, Zn
.05		1152	MWT-100B -05	GW	5	2	3						✓	✓	✓	✓	✓	✓					Please send a preliminary report
.06		1010	Field Blank -06	DI	5	2	3						✓	✓	✓	✓	✓	✓					

RELINQUISHED BY: *Julie Malby* Sampler DATE **9/19/23** TIME **0916**
 RECEIVED BY: *M. Clitob* DATE **9/19/23** TIME **0916**
 RELINQUISHED BY: DATE TIME
 RECEIVED BY: DATE TIME

RELINQUISHED BY: DATE TIME
 RECEIVED BY: DATE TIME
 SEAL NO. SEAL INTACT YES NO INITIALS
 SEAL NO. SEAL INTACT YES NO INITIALS
 NOTES: TEMP. ON ARRIVAL **1.2**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total		250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005



Environmental Laboratory
 1232 Haco Drive
 Lansing
 Michigan, 48910

CHAIN OF CUSTODY

Page 1 of 1

Phone: (517)702-6372

Lab Work Order Number 1309174

Client Name BWL - Erickson Station		Project Name Erickson Well Project		Requested Analyses						Requested Turn Around	
Client Contact Chery Louden		Project Number [none]		Ag:: As:: B:: Ba:: Be:: Ca:: Cd:: Cr::Co:: Cu:: Fe:: Hg::Li:: Mo:: Ni:: Pb:: Sb:: Se:: Ti:: V:: Zn::Na::K::Mg	TSS, HCO3, CO3, Hardness	CLIC:: F:ISE:: SO4:: TDS	Radium 226 and Radium 228				Rush requests subject to additional charge Rush requests subject to lab approval
Address 3725 S. Canal		Project Description									
City Lansing		PO Number 30926 10021									
State/Zip MI, 48917		Shipped By									
Phone (517) 702-6396	Fax (517) 702-6373	Tracking Number									
Sampler Marc Wahrer											

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code				Sample	Comments
						b	a	a	b		
MW-100A	9.18.23	1515	G	GW	5	1	1	1	2		
MW-100B	↓	1152	G	GW	5	1	1	1	2		
MW-100C		1335	G	GW	5	1	1	1	2		
MW-100D		1456	G	GW	5	1	1	1	2		
MWT- 100B		1152	G	GW	5	1	1	1	2		
Field Blank		1010	G	DI	5	1	1	1	2		

Relinquished By 	Date/Time 9-18-23 1630	Received By 	Date/Time 9.19.23 0840	
Relinquished By	Date/Time	Received By	Date/Time	Comments
Relinquished By	Date/Time	Received By	Date/Time	
Cooler Numbers and Temperatures E076 3.4'C				

Matrix Codes: DI=Deionized Water, GW=Ground Water Preserv. Codes: a=None, b=0.5% HNO3



Data Verification & Validation Report

Lansing Board of Water & Light – Erickson Power Station

Sampling Event (dates and purpose): August 2023 Semi-Annual Sampling

Data Package Number:
S53272.01
S53439.01

Lab Report Date:
10/16/2023
10/16/2023

Data Validator: Andrew Byks

Data Validation Completion Date: 11/7/2023

General Overall Assessment:

- Data are usable without qualification.
 Data are usable with qualification (as noted below).
 Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	
MW-7C	
MW-8	
MW-9	
MW-10	
MW-11	
MW-11B	
MW-12	
MW-12B	
MW-13	
MW-14	X
MW-15	X
MW-16A	X
MW-16B	X
MW-16C	X
MW-16D	X
MW-100A	
MW-100B	
MW-100C	
MW-100D	

Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-16A	GW	S53272.01	9/12/2023	X	X	X	X	X	X	
MW-16B	GW	S53272.02	9/12/2023	X	X	X	X	X	X	
MW-16C	GW	S53272.03	9/12/2023	X	X	X	X	X	X	
MW-16D	GW	S53272.04	9/12/2023	X	X	X	X	X	X	
MWT-16A	GW	S53272.05	9/12/2023	X	X	X	X	X	X	
MW-14	GW	S53439.01	9/15/2023	X	X	X	X	X	X	
MW-15	GW	S53439.02	9/15/2023	X	X	X	X	X	X	
MWT-14	GW	S53439.03	9/15/2023	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO₃, CO₃, hardness

Any planned sampling or analysis NOT completed? If yes, explain: _____

Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Field Data							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	X		Record of decontamination for non-dedicated sampling equipment	X			
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
Analytical Data Package							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies across samples for Ca, chloride, hardness, Na, sulfate, TSS, Rad-226, and Rad-228
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Holding Times	X		Analyses performed within allowed holding time	X			
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested		X		RLs for Ca, chloride, hardness, Na, sulfate, TSS, and Rad-228 were not met RL=MDL for carbonate
			MDLs<RLs		X		
			MDLs<MCLs	X			
			MDLs<GPS	X			
QC Validation							
Evaluate Accuracy							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Evaluate Precision							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Field duplicates for selenium, Rad-226, and Rad-228 not met; see below
Evaluate Representativeness							
Equipment Blanks (if applicable)	X		Non-detect (<RL)		X		Rad-226 detected in one field blank
QC Verification							
Verify Instrument Calibration & Analytical Process							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
Evaluate Completeness (# usable measurements/ # unusable measurements)							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

None.

Comments:

Selenium was detected in parent sample MW-16A but not detected in field duplicate sample MWT-16A. Selenium in parent sample MW-16A required qualification as estimated with high bias (J+) and in field duplicate sample MWT-16A as estimated but not detected (UJ).

The RPDs for Rad-226, Rad-228, and Combined Radium 226+228 between parent sample MW-16 and field duplicate MWT-16A were 43%, 57%, and 50% respectively. Rad-226, Rad-228, and Combined Radium 226+228 required qualification as estimated with low bias (J-) in parent sample MW-16A and as estimated with high bias (J+) in field duplicate MWT-16A.

The RPDs for Rad-226, Rad-228, and Combined Radium 226+228 between parent sample MW-14 and field duplicate MWT-14 were 41%, 25%, and 33% respectively. Rad-226, Rad-228, and Combined Radium 226+228 required qualification as estimated with low bias (J-) in parent sample MW-14 and as estimated with high bias (J+) in field duplicate MWT-14.

Rad-226 results in samples MW-14 and MWT-14 required qualification as estimated with high bias (J+) due to Rad-226 detection in the associated field blank.



Hometown People. Hometown Power.

Lansing Board of Water and Light
Environmental Services Laboratory (MI00079)

Cert ID:3760

1232 Haco Dr.

Lansing, Michigan 48901

17 October 2023

BWL - Erickson Station

Attn: Cheryl Loudon

3725 S. Canal

Lansing, MI 48917

Project: Erickson AM MI

Dear Cheryl Loudon,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

Work Order

L309173

Received

9/15/2023 10:40:00AM

Account Number

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



Analytical Laboratory Report

Final Report

Report ID: S53439.01(02)

Generated on 10/16/2023

Replaces report S53439.01(01) generated on 09/26/2023

Report to

Attention: Jennifer Caporale

Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372 FAX:

Email: Environmental_Laboratory@LBWL.com

Report produced by

Merit Laboratories, Inc.

2680 East Lansing Drive

East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:

John Lavery (johnlavery@meritlabs.com)

Barbara Ball (bball@meritlabs.com)

Report Summary

Lab Sample ID(s): S53439.01-S53439.04

Project: Erickson AM MI Wells 14-15

Collected Date(s): 09/15/2023

Submitted Date/Time: 09/15/2023 12:38

Sampled by: Marc Wahrer

P.O. #:

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Maya Murshak

Technical Director



General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

All accreditations/certifications held by this laboratory are listed on page 3. Not all accreditations/certifications are applicable to this report.

Report Narrative

All analyses completed



Laboratory Accreditations

Authority	Accreditation ID
Michigan DEQ	#9956
DOD ELAP & ISO/IEC 17025:2017	#69699 PJLA Testing
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



Sample Summary (4 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S53439.01	MW-14 L309173-01	Groundwater	09/15/23 07:38
S53439.02	MW-15 L309173-02	Groundwater	09/15/23 09:43
S53439.03	MWT-14 L309173-03	Groundwater	09/15/23 07:38
S53439.04	Field Blank L309173-04	Groundwater	09/15/23 06:45



Analytical Laboratory Report

Final Report

Lab Sample ID: S53439.01

Sample Tag: MW-14 L309173-01

Collected Date/Time: 09/15/2023 07:38

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.2	IR
2	1L Plastic	None	Yes	2.2	IR
1	250ml Plastic	HNO3	Yes	2.2	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	09/20/23 03:08	CTV	
Metal Digestion	Completed	SW3015A	09/21/23 09:50	CCM	

Inorganics

Method: E300.0, Run Date: 09/19/23 10:00, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	111	10	0.16	mg/L	10	16887-00-6	

Method: E300.0, Run Date: 09/19/23 09:09, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	16	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 09/18/23 11:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	670	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 09/18/23 11:30, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	574	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 09/15/23 16:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	808	50	6	mg/L	2		

Method: SM2540D, Run Date: 09/18/23 12:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	24.8	6	1	mg/L	2.5		

Metals

Method: E200.8, Run Date: 09/21/23 11:13, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.008	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.132	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	2.17	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



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Lab Sample ID: S53439.01 (continued)

Sample Tag: MW-14 L309173-01

Method: E200.8, Run Date: 09/21/23 11:13, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	11.9	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.109	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.014	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 09/21/23 13:52, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	154	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	42.1	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	5.43	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	79.4	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 09/21/23 01:33, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 10/16/23 09:32, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S53439.02

Sample Tag: MW-15 L309173-02

Collected Date/Time: 09/15/2023 09:43

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.2	IR
2	1L Plastic	None	Yes	2.2	IR
1	250ml Plastic	HNO3	Yes	2.2	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	09/20/23 03:08	CTV	
Metal Digestion	Completed	SW3015A	09/21/23 09:50	CCM	

Inorganics

Method: E300.0, Run Date: 09/19/23 10:39, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	78	10	0.16	mg/L	10	16887-00-6	

Method: E300.0, Run Date: 09/19/23 09:21, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	109	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 09/18/23 11:26, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	440	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 09/18/23 11:32, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	506	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 09/15/23 16:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	680	50	6	mg/L	2		

Method: SM2540D, Run Date: 09/18/23 12:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 09/21/23 11:18, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.069	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.44	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S53439.02 (continued)

Sample Tag: MW-15 L309173-02

Method: E200.8, Run Date: 09/21/23 11:18, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.14	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 09/21/23 13:53, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	145	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	34.2	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	Not detected	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	38.8	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 09/21/23 01:37, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 10/16/23 09:32, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S53439.03

Sample Tag: MWT-14 L309173-03

Collected Date/Time: 09/15/2023 07:38

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.2	IR
2	1L Plastic	None	Yes	2.2	IR
1	250ml Plastic	HNO3	Yes	2.2	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	09/20/23 03:08	CTV	
Metal Digestion	Completed	SW3015A	09/21/23 09:50	CCM	

Inorganics

Method: E300.0, Run Date: 09/19/23 10:13, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	110	10	0.16	mg/L	10	16887-00-6	

Method: E300.0, Run Date: 09/19/23 09:34, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	16	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 09/18/23 11:28, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	660	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 09/18/23 11:34, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	584	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 09/15/23 16:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	824	50	6	mg/L	2		

Method: SM2540D, Run Date: 09/18/23 12:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	25.4	5	1	mg/L	2		

Metals

Method: E200.8, Run Date: 09/21/23 11:21, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.007	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.138	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	2.13	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S53439.03 (continued)

Sample Tag: MWT-14 L309173-03

Method: E200.8, Run Date: 09/21/23 11:21, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	11.7	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.112	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.014	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 09/21/23 13:55, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	155	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	43.8	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	5.58	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	80.4	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 09/21/23 01:41, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 10/16/23 09:32, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

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Lab Sample ID: S53439.04

Sample Tag: Field Blank L309173-04

Collected Date/Time: 09/15/2023 06:45

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.2	IR
2	1L Plastic	None	Yes	2.2	IR
1	250ml Plastic	HNO3	Yes	2.2	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	09/20/23 03:08	CTV	
Metal Digestion	Completed	SW3015A	09/21/23 09:50	CCM	

Inorganics

Method: E300.0, Run Date: 09/19/23 09:47, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.04	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.06	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.15	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 09/18/23 11:30, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 09/18/23 11:36, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 09/15/23 16:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	6	mg/L	2		

Method: SM2540D, Run Date: 09/18/23 12:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 09/21/23 11:05, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S53439.04 (continued)

Sample Tag: Field Blank L309173-04

Method: E200.8, Run Date: 09/21/23 11:05, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 09/21/23 13:49, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 09/21/23 01:45, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 10/16/23 09:32, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

Merit Laboratories Login Checklist

Lab Set ID:S53439

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 14-15

Submitted:09/15/2023 12:38 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Selection	Description	Note
Sample Receiving		
01.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples are received at 4C +/- 2C Thermometer # IR 2.2
02.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Received on ice/ cooling process begun
03.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples shipped
04.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples left in 24 hr. drop box
05.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Are there custody seals/tape or is the drop box locked
Chain of Custody		
06.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC adequately filled out
07.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC signed and relinquished to the lab
08.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sample tag on bottles match COC
09.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Subcontracting needed? Subcontracted to: GEL
Preservation		
10.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Do sample have correct chemical preservation
11.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Completed pH checks on preserved samples? (no VOAs)
12.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Did any samples need to be preserved in the lab?
Bottle Conditions		
13.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	All bottles intact
14.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Appropriate analytical bottles are used
15.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Merit bottles used
16.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sufficient sample volume received
17.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples require laboratory filtration
18.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples submitted within holding time
19.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S53439 Submitted: 09/15/2023 12:38

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 14-15

Attention: Jennifer Caporale
Address: Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Initial Preservation Check: 09/15/2023 15:04 MMC

Preservation Recheck (E200.8): N/A

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S53439.01	1L Plastic HNO3	<2			
S53439.01	1L Plastic HNO3	<2			
S53439.01	250ml Plastic HNO3	<2			
S53439.02	1L Plastic HNO3	<2			
S53439.02	1L Plastic HNO3	<2			
S53439.02	250ml Plastic HNO3	<2			
S53439.03	1L Plastic HNO3	<2			
S53439.03	1L Plastic HNO3	<2			
S53439.03	250ml Plastic HNO3	<2			
S53439.04	1L Plastic HNO3	<2			
S53439.04	1L Plastic HNO3	<2			
S53439.04	250ml Plastic HNO3	<2			

Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total		250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005

October 16, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 637728
SDG: S53439

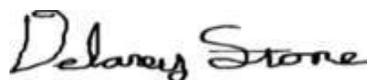
Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on September 19, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,



Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S53439
Work Order: 637728**

October 16, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on September 19, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

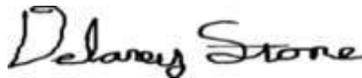
Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
637728001	S53439.01
637728002	S53439.02
637728003	S53439.03
637728004	S53439.04 Field blank

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.



Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

SAMPLE RECEIPT & REVIEW FORM

Client: MEPI	SDG/AR/COC/Work Order: 037728 037729 / 037728
Received By: QG	Date Received: 9/19/23 ^{03 9/20}
Carrier and Tracking Number	Circle Applicable: <input checked="" type="checkbox"/> FedEx Express <input type="checkbox"/> FedEx Ground <input checked="" type="checkbox"/> UPS <input type="checkbox"/> Field Services <input type="checkbox"/> Courier <input type="checkbox"/> Other 06 969

Suspected Hazard Information	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
A) Shipped as a DOT Hazardous?	<input checked="" type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples are to be received as radioactive?	<input checked="" type="checkbox"/>	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?	<input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM / mR/Hr Classified as: Rad 1 Rad 2 Rad 3
D) Did the client designate samples are hazardous?	<input checked="" type="checkbox"/>	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?	<input checked="" type="checkbox"/>	If D or E is yes, select Hazards below. PCBs Flammable Foreign Soil RCRA Asbestos Beryllium Other:

Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Client contacted and provided COC COC created upon receipt
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Preservation Method: Wet Ice Ice Packs Dry ice None Other: *all temperatures are recorded in Celsius TEMP: 20°C
4 Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Temperature Device Serial #: IR1-23 Secondary Temperature Device Serial # (If Applicable):
5 Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6 Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sample ID's and Containers Affected: comments below If Preservation added, Lot#: _____
7 Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer) Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No) Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected:
8 Samples received within holding time?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ID's and tests affected:
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ID's and containers affected:
10 Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No container count on COC Other (describe)
12 Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
13 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):
SS3439.01, SS3439.02, SS3439.03(+), SS3272.01, SS3272.02, SS3273.03, SS3274.04, SS3272.05

PM (or PMA) review: Initials **00** Date **9/20/23** Page **1** of **1**

Laboratory Certifications

List of current GEL Certifications as of 16 October 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-00651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	KY90129
Kentucky Wastewater	KY90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2023019
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122024-04
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-23-21
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S53439
Work Order #: 637728**

Product: Radium-226+Radium-228 Calculation

Analytical Method: Calculation

Analytical Procedure: GL-RAD-D-003 REV# 45

Analytical Batch: 2499134

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
637728001	S53439.01
637728002	S53439.02
637728003	S53439.03
637728004	S53439.04 Field blank

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2499132

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
637728001	S53439.01
637728002	S53439.02
637728003	S53439.03
637728004	S53439.04 Field blank
1205529514	Method Blank (MB)
1205529515	637728001(S53439.01) Sample Duplicate (DUP)
1205529516	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

Duplication Criteria between QC Sample and Duplicate Sample

The Sample and the Duplicate, (See Below), did not meet the relative percent difference requirement; however, they do meet the relative error ratio requirement with the value listed below.

Sample	Analyte	Value
1205529515 (S53439.01DUP)	Radium-228	RPD 124* (0.0%-100.0%) RER 2.38 (0-3)

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2496135

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
637728001	S53439.01
637728002	S53439.02
637728003	S53439.03
637728004	S53439.04 Field blank
1205524151	Method Blank (MB)
1205524152	637526001(NonSDG) Sample Duplicate (DUP)
1205524153	637526001(NonSDG) Matrix Spike (MS)
1205524154	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

The matrix spike, 1205524153 (Non SDG 637526001MS), aliquot was reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S53439 GEL Work Order: 637728

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Kate Gellatly

Date: 16 OCT 2023

Title: Analyst 1 PT

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: October 16, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S53439.01 Project: MERI00120
Sample ID: 637728001 Client ID: MERI001
Matrix: Ground Water
Collect Date: 15-SEP-23 07:38
Receive Date: 19-SEP-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.497	+/-0.688	1.19	3.00	pCi/L		JE1	10/06/23	1109	2499132		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.939	+/-0.757			pCi/L		LXB3	10/16/23	0932	2499134		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.442	+/-0.316	0.455	1.00	pCi/L		LXP1	10/15/23	0901	2496135		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			88.1	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: October 16, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S53439.02 Project: MERI00120
Sample ID: 637728002 Client ID: MERI001
Matrix: Ground Water
Collect Date: 15-SEP-23 09:43
Receive Date: 19-SEP-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.46	+/-1.05	1.65	3.00	pCi/L		JE1	10/06/23	1109	2499132		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.95	+/-1.09			pCi/L		LXB3	10/16/23	0932	2499134		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.491	+/-0.292	0.336	1.00	pCi/L		LXP1	10/15/23	0901	2496135		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			84.8	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: October 16, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S53439.03 Project: MERI00120
Sample ID: 637728003 Client ID: MERI001
Matrix: Ground Water
Collect Date: 15-SEP-23 07:38
Receive Date: 19-SEP-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.821	+/-0.841	1.39	3.00	pCi/L		JE1	10/06/23	1109	2499132		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.88	+/-0.958			pCi/L		LXB3	10/16/23	0932	2499134		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		1.06	+/-0.460	0.553	1.00	pCi/L		LXP1	10/15/23	0933	2496135		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			93.4	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: October 16, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S53439.04 Field blank Project: MERI00120
Sample ID: 637728004 Client ID: MERI001
Matrix: Water
Collect Date: 15-SEP-23 06:45
Receive Date: 19-SEP-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.622	+/-1.06	1.85	3.00	pCi/L		JE1	10/06/23	1109	2499132		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.14	+/-1.11			pCi/L		LXB3	10/16/23	0932	2499134		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.522	+/-0.341	0.466	1.00	pCi/L		LXP1	10/15/23	0933	2496135		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			73.1	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: October 16, 2023

Page 1 of 2

Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan

Contact: John Laverty

Workorder: 637728

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2499132										
QC1205529515	637728001 DUP										
Radium-228	U	0.497		2.13	pCi/L	124*		(0% - 100%)	JE1	10/06/23	11:08
	Uncertainty	+/-0.688		+/-1.01							
QC1205529516	LCS										
Radium-228	76.6			74.0	pCi/L		96.7	(75%-125%)		10/06/23	11:09
	Uncertainty			+/-4.04							
QC1205529514	MB										
Radium-228			U	0.495	pCi/L					10/06/23	11:08
	Uncertainty			+/-0.734							
Rad Ra-226											
Batch	2496135										
QC1205524152	637526001 DUP										
Radium-226		0.849		1.09	pCi/L	25.2		(0% - 100%)	LXP1	10/15/23	10:06
	Uncertainty	+/-0.380		+/-0.429							
QC1205524154	LCS										
Radium-226	26.9			20.9	pCi/L		77.8	(75%-125%)		10/15/23	10:06
	Uncertainty			+/-1.49							
QC1205524151	MB										
Radium-226			U	0.248	pCi/L					10/15/23	10:06
	Uncertainty			+/-0.243							
QC1205524153	637526001 MS										
Radium-226	137	0.849		104	pCi/L		75.2	(75%-125%)		10/15/23	10:06
	Uncertainty	+/-0.380		+/-7.80							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- H Analytical holding time was exceeded
- < Result is less than value reported
- > Result is greater than value reported

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Workorder: 637728

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
NI											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2499132 Check-list

This check-list was completed on 06-OCT-23 by Rhonda Birch

This batch was reviewed by Kenshalla Oston on 06-OCT-23 and Rhonda Birch on 06-OCT-23.

Batch ID:
2499132

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?		No	
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2499132
Analyst: Jacqueline Winston (JE1)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: ASP-33005595

Due Dates for Lab: 14-OCT-2023			Package: 16-OCT-2023		SDG: 17-OCT-2023	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205529516	228	2051-B	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	637728001	02-OCT-2023	3	301.4	301.4	10/03/23 12:19	10/06/23 09:30
2	637728002	02-OCT-2023	3	310.2	310.2	10/03/23 12:19	10/06/23 09:30
3	637728003	02-OCT-2023	3	306.4	306.4	10/03/23 12:19	10/06/23 09:30
4	637728004	02-OCT-2023	3	300.9	300.9	10/03/23 12:19	10/06/23 09:30
5	637729001	02-OCT-2023	3	306.4	306.4	10/03/23 12:19	10/06/23 09:30
6	637729002	02-OCT-2023	3	302.2	302.2	10/03/23 12:19	10/06/23 09:30
7	637729003	02-OCT-2023	3	300.4	300.4	10/03/23 12:19	10/06/23 09:30
8	637729004	02-OCT-2023	3	301.4	301.4	10/03/23 12:19	10/06/23 09:30
9	637729005	02-OCT-2023	3	305.3	305.3	10/03/23 12:19	10/06/23 09:30
10	637729006	02-OCT-2023	3	303	303	10/03/23 12:19	10/06/23 09:30
11	1205529514 MB	02-OCT-2023	3		310.2	10/03/23 12:19	10/06/23 09:30
12	1205529515 DUP (637728001)	02-OCT-2023	3	300.5	300.5	10/03/23 12:19	10/06/23 09:30
13	1205529516 LCS	02-OCT-2023	3		310.2	10/03/23 12:19	10/06/23 09:30

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 2097-B	Ba-133 Tracer	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 02-OCT-2023 14:18 ASP-33005595 Jacqueline Winston Data Entry Date3: 02-OCT-2023 00:00
REGNT 3976298	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3956035	Barium Carrier Ra228 REG	1 mL	
REGNT 3975318	RGF-1M Citric Acid	5 mL	
REGNT 3976304	2M HCl	20 mL	
REGNT 3968078	RGF-50% Potassium Carbonate	2 mL	
REGNT 3971997	RGF-7M Nitric Acid	25 mL	
REGNT 3973436.2	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3957480.5	RGF-Hydrofluoric Acid	4 mL	
REGNT 3963747	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3977914	RGF-Neodymium Subtrate	5 mL	
REGNT 3976856.12	Nitric Acid	5 mL	
REGNT DGA081923	2488570	2 g	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 2097-B
 Tracer Exp Date : 7/12/2024
 Tracer Volume Added: 0.10

Batch : 2499132
 Analyst : JAC02417
 Prep Date : 10/2/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 3 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	637728001.1	0.3014	1.8483E-05	9/15/2023 7:38	1026.0	1.80%	904.1	1.92%	0.1	0.000200
2	637728002.1	0.3102	1.8627E-05	9/15/2023 9:43	1026.0	1.80%	870.2	1.96%	0.1	0.000200
3	637728003.1	0.3064	1.8566E-05	9/15/2023 7:38	1026.0	1.80%	958.2	1.86%	0.1	0.000200
4	637728004.1	0.3009	1.8474E-05	9/15/2023 6:45	1026.0	1.80%	749.9	2.11%	0.1	0.000200
5	637729001.1	0.3064	1.8566E-05	9/12/2023 10:58	1026.0	1.80%	922.0	1.90%	0.1	0.000200
6	637729002.1	0.3022	1.8496E-05	9/12/2023 12:55	1026.0	1.80%	888.0	1.94%	0.1	0.000200
7	637729003.1	0.3004	1.8466E-05	9/12/2023 14:17	1026.0	1.80%	798.8	2.04%	0.1	0.000200
8	637729004.1	0.3014	1.8483E-05	9/12/2023 11:56	1026.0	1.80%	882.2	1.94%	0.1	0.000200
9	637729005.1	0.3053	1.8548E-05	9/12/2023 10:58	1026.0	1.80%	930.8	1.89%	0.1	0.000200
10	637729006.1	0.3030	1.8510E-05	9/12/2023 8:55	1026.0	1.80%	786.8	2.06%	0.1	0.000200
11	1205529514.1	0.3102	1.8627E-05	10/2/2023 0:00	1026.0	1.80%	873.2	1.95%	0.1	0.000200
12	1205529515.1	0.3005	1.8468E-05	9/15/2023 7:38	1026.0	1.80%	930.3	1.89%	0.1	0.000200
13	1205529516.1	0.3102	1.8627E-05	10/2/2023 0:00	1026.0	1.80%	905.2	1.92%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Sample Recovery Error %
			Alpha	Beta										
1	1B	60	13	32	0.533	10/6/2023 11:09	10/3/2023 12:19	10/6/2023 9:30	0.993	0.830	1.000	1.057	88.1%	2.65%
2	1C	60	17	73	1.217	10/6/2023 11:09	10/3/2023 12:19	10/6/2023 9:30	0.993	0.830	1.000	1.057	84.8%	2.68%
3	1D	60	12	55	0.917	10/6/2023 11:09	10/3/2023 12:19	10/6/2023 9:30	0.993	0.830	1.000	1.057	93.4%	2.60%
4	2A	60	7	51	0.850	10/6/2023 11:09	10/3/2023 12:19	10/6/2023 9:30	0.993	0.830	1.000	1.057	73.1%	2.79%
5	2B	60	20	61	1.017	10/6/2023 11:09	10/3/2023 12:19	10/6/2023 9:30	0.992	0.830	1.000	1.057	89.9%	2.63%
6	2C	60	22	37	0.617	10/6/2023 11:09	10/3/2023 12:19	10/6/2023 9:30	0.992	0.830	1.000	1.057	86.6%	2.66%
7	2D	60	15	101	1.683	10/6/2023 11:09	10/3/2023 12:19	10/6/2023 9:30	0.992	0.830	1.000	1.057	77.9%	2.74%
8	3B	60	10	34	0.567	10/6/2023 11:09	10/3/2023 12:19	10/6/2023 9:30	0.992	0.829	1.000	1.057	86.0%	2.66%
9	3C	60	9	40	0.667	10/6/2023 11:09	10/3/2023 12:19	10/6/2023 9:30	0.992	0.829	1.000	1.057	90.7%	2.63%
10	3D	60	16	27	0.450	10/6/2023 11:09	10/3/2023 12:19	10/6/2023 9:30	0.992	0.829	1.000	1.057	76.7%	2.75%
11	4A	60	7	36	0.600	10/6/2023 11:08	10/3/2023 12:19	10/6/2023 9:30	0.999	0.830	1.000	1.057	85.1%	2.67%
12	4C	60	13	81	1.350	10/6/2023 11:08	10/3/2023 12:19	10/6/2023 9:30	0.993	0.830	1.000	1.057	90.7%	2.63%
13	4D	60	30	1418	23.633	10/6/2023 11:09	10/3/2023 12:19	10/6/2023 9:30	0.999	0.830	1.000	1.057	88.2%	2.65%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2023	5/31/2024	0.6098	0.00711	0.394	9/29/2023 17:29	500
2	PIC	6/1/2023	5/31/2024	0.6077	0.00847	0.812	9/29/2023 17:29	500
3	PIC	6/1/2023	5/31/2024	0.6071	0.00692	0.670	9/29/2023 17:29	500
4	PIC	6/1/2023	5/31/2024	0.6083	0.01914	0.706	9/29/2023 17:29	500
5	PIC	6/1/2023	5/31/2024	0.6253	0.02111	0.932	9/29/2023 17:29	500
6	PIC	6/1/2023	5/31/2024	0.6085	0.01274	0.318	9/29/2023 17:29	500
7	PIC	6/1/2023	5/31/2024	0.6206	0.00745	1.560	9/29/2023 17:29	500
8	PIC	6/1/2023	5/31/2024	0.6266	0.01614	0.350	9/29/2023 17:29	500
9	PIC	6/1/2023	5/31/2024	0.6245	0.00988	0.354	9/29/2023 17:29	500
10	PIC	6/1/2023	5/31/2024	0.5677	0.02297	0.408	9/29/2023 17:29	500
11	PIC	6/1/2023	5/31/2024	0.6074	0.01123	0.462	9/29/2023 17:30	500
12	PIC	6/1/2023	5/31/2024	0.6376	0.00889	0.710	9/29/2023 17:30	500
13	PIC	6/1/2023	5/31/2024	0.6412	0.00773	1.028	9/29/2023 17:30	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 2051-B
LCS Exp Date : 3/27/2024
LCS Activity (dpm/ml): 527.16
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	Sample Act. MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.7132	0.5035	3	1.1854	0.4973	70.65%	0.1393	0.0984	0.6881	0.6997		SAMPLE				
2	1.0371	0.7322	3	1.6451	1.4630	36.68%	0.4047	0.1480	1.0487	1.1128		SAMPLE				
3	0.8671	0.6122	3	1.3907	0.8208	52.33%	0.2467	0.1289	0.8408	0.8663		SAMPLE				
4	1.1561	0.8162	3	1.8485	0.6224	86.74%	0.1440	0.1248	1.0574	1.0694		SAMPLE				
5	1.0333	0.7295	3	1.6271	0.2847	162.02%	0.0847	0.1371	0.9037	0.9067		SAMPLE				
6	0.6530	0.4610	3	1.1038	1.0863	35.10%	0.2987	0.1045	0.7448	0.7947		SAMPLE				
7	1.5858	1.1196	3	2.4386	0.4919	143.19%	0.1233	0.1766	1.3802	1.3859		SAMPLE				
8	0.6715	0.4741	3	1.1265	0.7725	46.59%	0.2167	0.1007	0.7039	0.7311		SAMPLE				
9	0.6341	0.4477	3	1.0628	1.0468	34.88%	0.3127	0.1087	0.7134	0.7615		SAMPLE				
10	0.8929	0.6304	3	1.4803	0.1844	217.15%	0.0420	0.0912	0.7848	0.7863		SAMPLE				
11	0.7754	0.5474	3	1.2741	0.4945	75.79%	0.1380	0.1045	0.7341	0.7449		MB				
12	0.8923	0.6300	3	1.4262	2.1289	24.32%	0.6400	0.1547	1.0084	1.1446	637728001.1	DUP	124.3%	2.3839		
13	1.0571	0.7463	3	1.6564	74.0359	3.92%	22.6053	0.6292	4.0393	19.2584		LCS			76.5506	96.7%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
637728001	1B	60	13	32	10/6/2023 11:09	10/6/2023 12:09	PIC	2499132
637728002	1C	60	17	73	10/6/2023 11:09	10/6/2023 12:09	PIC	2499132
637728003	1D	60	12	55	10/6/2023 11:09	10/6/2023 12:09	PIC	2499132
637728004	2A	60	7	51	10/6/2023 11:09	10/6/2023 12:09	PIC	2499132
637729001	2B	60	20	61	10/6/2023 11:09	10/6/2023 12:09	PIC	2499132
637729002	2C	60	22	37	10/6/2023 11:09	10/6/2023 12:09	PIC	2499132
637729003	2D	60	15	101	10/6/2023 11:09	10/6/2023 12:09	PIC	2499132
637729004	3B	60	10	34	10/6/2023 11:09	10/6/2023 12:09	PIC	2499132
637729005	3C	60	9	40	10/6/2023 11:09	10/6/2023 12:09	PIC	2499132
637729006	3D	60	16	27	10/6/2023 11:09	10/6/2023 12:09	PIC	2499132
1205529514	4A	60	7	36	10/6/2023 11:08	10/6/2023 12:08	PIC	2499132
1205529515	4C	60	13	81	10/6/2023 11:08	10/6/2023 12:08	PIC	2499132
1205529516	4D	60	30	1418	10/6/2023 11:09	10/6/2023 12:09	PIC	2499132

ASSAY 6-Oct-23 10:05:18
 Wizard 2480 s/n 46190630
 Protocol id 8 Ba-133
 Time limit
 Count limit
 Isotope Ba-133
 Protocol date 10/6/2023
 Run id. 7396

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	87	1	180	3078.57	1025.99	1.8	10:05:18
637728001	2	87	2	180	2712.57	904.08	1.92	88.12	10:08:32
637728002	3	87	3	180	2611	870.16	1.96	84.81	10:11:47
637728003	4	87	4	180	2875.28	958.23	1.86	93.40	10:15:01
637728004	5	87	5	180	2250.13	749.87	2.11	73.09	10:18:14
637729001	1	5	1	180	2766.28	921.98	1.9	89.86	10:21:51
637729002	2	5	2	180	2664.57	888.01	1.94	86.55	10:25:05
637729003	3	5	3	180	2397	798.82	2.04	77.86	10:28:19
637729004	4	5	4	180	2647	882.21	1.94	85.99	10:31:33
637729005	5	5	5	180	2793	930.81	1.89	90.72	10:34:47
637729006	1	19	1	180	2360.57	786.78	2.06	76.68	10:38:23
1205529514	2	19	2	180	2620	873.17	1.95	85.11	10:41:37
1205529515	3	19	3	180	2791	930.26	1.89	90.67	10:44:51
1205529516	4	19	4	180	2716	905.18	1.92	88.23	10:48:05

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 06-Oct-2023

Detectors LB4100 E1 through H4 and PIC 1A through 14D and G5400W 1W through 1Z and LB4200 GA1 through OD4

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100H1	Above	Alpha bkg	06-Oct 08:56	60	0.450	-8.08E-2	0.225	+7.40
LB4100H1	Above	Beta bkg	06-Oct 08:56	60	3.200	-5.15E-1	3.743	+2.23
LB4200GB2	Above	Beta bkg	06-Oct 09:46	500	87.700	0.129	1.304	+443.98
LB4200GD4	need 2nd	Alpha bkg	06-Oct 09:46	500	0.260	-1.07E-1	0.314	+2.23
LB4200GD4	Above	Beta bkg	06-Oct 09:46	500	1.540	0.283	1.056	+6.76
LB4200OC1	Missing	Alpha eff	06-Oct 05:57	5	11323	11030	11530	+0.51
LB4200OC1	Missing	Alpha XTalk	06-Oct 05:57	5	0.257	0.140	0.309	+1.14
LB4200OC1	Missing	Beta eff	06-Oct 08:53	5	14271	13430	14960	+0.30
LB4200OC1	Missing	Beta XTalk	06-Oct 08:53	5	4.20E-4	-9.72E-4	0.003	-1.12
LB4200OC2	Missing	Alpha eff	06-Oct 05:57	5	13478	13450	14200	-2.77
LB4200OC2	Missing	Alpha XTalk	06-Oct 05:57	5	0.242	0.159	0.264	+1.71
LB4200OC2	Missing	Beta eff	06-Oct 08:53	5	14738	14200	15120	+0.51
LB4200OC2	Missing	Beta XTalk	06-Oct 08:53	5	0.001	1.86E-4	0.003	-1.24
LB4200OC3	Missing	Alpha eff	06-Oct 05:57	5	9324	9408	9916	-4.00
LB4200OC3	Missing	Alpha XTalk	06-Oct 05:57	5	0.251	0.162	0.293	+1.06
LB4200OC3	Missing	Beta eff	06-Oct 08:53	5	14486	13600	15470	-0.16
LB4200OC3	Missing	Beta XTalk	06-Oct 08:53	5	7.18E-4	-1.06E-3	0.004	-0.77
LB4200OC4	Missing	Alpha eff	06-Oct 05:57	5	11507	11280	11980	-1.05
LB4200OC4	Missing	Alpha XTalk	06-Oct 05:57	5	0.215	0.174	0.231	+1.33
LB4200OC4	Missing	Beta eff	06-Oct 08:53	5	16841	16100	18020	-0.69
LB4200OC4	Missing	Beta XTalk	06-Oct 08:53	5	0.001	2.50E-4	0.004	-1.39

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

G5400W1W	Alpha eff, Alpha XTalk, Beta eff, Beta XTalk
G5400W1X	Alpha eff, Alpha XTalk, Beta eff, Beta XTalk
G5400W1Y	Alpha eff, Alpha XTalk, Beta eff, Beta XTalk
G5400W1Z	Alpha eff, Alpha XTalk, Beta eff, Beta XTalk
LB4200GA1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4200GA2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4200GA3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4200GA4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
PIC5B	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
PIC10B	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by Lois Buist

Date 10/11/2023

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2499132

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205529514	MB	JE1	PIC4A	OCT-06-23 11:08:53	DONE	25mm Filter	01-JUN-23 00:00
1205529515	DUP	JE1	PIC4C	OCT-06-23 11:08:57	DONE	25mm Filter	01-JUN-23 00:00
1205529516	LCS	JE1	PIC4D	OCT-06-23 11:09:00	DONE	25mm Filter	01-JUN-23 00:00
637728001	SAMPLE	JE1	PIC1B	OCT-06-23 11:09:04	DONE	25mm Filter	01-JUN-23 00:00
637728002	SAMPLE	JE1	PIC1C	OCT-06-23 11:09:08	DONE	25mm Filter	01-JUN-23 00:00
637728003	SAMPLE	JE1	PIC1D	OCT-06-23 11:09:10	DONE	25mm Filter	01-JUN-23 00:00
637728004	SAMPLE	JE1	PIC2A	OCT-06-23 11:09:17	DONE	25mm Filter	01-JUN-23 00:00
637729001	SAMPLE	JE1	PIC2B	OCT-06-23 11:09:21	DONE	25mm Filter	01-JUN-23 00:00
637729002	SAMPLE	JE1	PIC2C	OCT-06-23 11:09:24	DONE	25mm Filter	01-JUN-23 00:00
637729003	SAMPLE	JE1	PIC2D	OCT-06-23 11:09:27	DONE	25mm Filter	01-JUN-23 00:00
637729004	SAMPLE	JE1	PIC3B	OCT-06-23 11:09:32	DONE	25mm Filter	01-JUN-23 00:00
637729005	SAMPLE	JE1	PIC3C	OCT-06-23 11:09:35	DONE	25mm Filter	01-JUN-23 00:00
637729006	SAMPLE	JE1	PIC3D	OCT-06-23 11:09:40	DONE	25mm Filter	01-JUN-23 00:00

Lucas Cell Raw Data

Batch 2496135 Check-list

This check-list was completed on 16-OCT-23 by Lyndsey Pace

This batch was reviewed by Gregory Ramsay on 16-OCT-23 and Lyndsey Pace on 16-OCT-23.

Batch ID:
2496135

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2496135
Analyst: Lyndsey Pace (LXP1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: LUCAS-C202389980

Due Dates for Lab: 14-OCT-2023			Package: 16-OCT-2023		SDG: 16-OCT-2023	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
MS	1205524153	Ra-226 emanation spike	1715-I	.1	mL	
LCS	1205524154	Ra-226 emanation spike	1715-I	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	637526001	10-OCT-2023	.999	451.04	451.04	10/10/23 09:37	806	10/15/23 05:20	10/15/23 08:27	3	27
2	637527001	10-OCT-2023	.999	508.5	508.5	10/10/23 09:37	105	10/15/23 05:50	10/15/23 09:01	4	70
3	637528001	10-OCT-2023	.999	501.16	501.16	10/10/23 09:37	207	10/15/23 05:50	10/15/23 09:01	1	10
4	637528002	10-OCT-2023	.999	503.78	503.78	10/10/23 09:37	304	10/15/23 05:50	10/15/23 09:01	3	14
5	637530001	10-OCT-2023	.999	503.08	503.08	10/10/23 09:37	402	10/15/23 05:50	10/15/23 09:01	2	34
6	637530002	10-OCT-2023	.999	509.1	509.1	10/10/23 09:37	505	10/15/23 05:50	10/15/23 09:01	1	85
7	637530003	10-OCT-2023	.999	505.37	505.37	10/10/23 09:37	602	10/15/23 05:50	10/15/23 09:01	4	114
8	637728001	10-OCT-2023	1	508.03	508.03	10/10/23 09:37	703	10/15/23 05:50	10/15/23 09:01	6	20
9	637728002	10-OCT-2023	1	509.09	509.09	10/10/23 09:37	803	10/15/23 05:50	10/15/23 09:01	2	16
10	637728003	10-OCT-2023	1	504.43	504.43	10/10/23 09:37	106	10/15/23 06:20	10/15/23 09:33	8	39
11	637728004	10-OCT-2023	1	504.79	504.79	10/10/23 09:37	202	10/15/23 06:20	10/15/23 09:33	5	20
12	637729001	10-OCT-2023	1	509.01	509.01	10/10/23 09:37	308	10/15/23 06:20	10/15/23 09:33	5	18
13	637729002	10-OCT-2023	1	501.71	501.71	10/10/23 09:37	407	10/15/23 06:20	10/15/23 09:33	3	39
14	637729003	10-OCT-2023	1	506.52	506.52	10/10/23 09:37	506	10/15/23 06:20	10/15/23 09:33	4	15
15	637729004	10-OCT-2023	1	506.48	506.48	10/10/23 09:37	605	10/15/23 06:20	10/15/23 09:33	1	19
16	637729005	10-OCT-2023	1	502.21	502.21	10/10/23 09:37	704	10/15/23 06:20	10/15/23 09:33	2	34
17	637729006	10-OCT-2023	1	507.67	507.67	10/10/23 09:37	807	10/15/23 06:20	10/15/23 09:33	3	4
18	1205524151 MB	10-OCT-2023	.999		509.1	10/10/23 09:37	104	10/15/23 06:50	10/15/23 10:06	4	12
19	1205524152 DUP (637526001)	10-OCT-2023	.999	450.82	450.82	10/10/23 09:37	204	10/15/23 06:50	10/15/23 10:06	3	33
20	1205524153 MS (637526001)	10-OCT-2023	.999	100.11	100.11	10/10/23 09:37	303	10/15/23 06:50	10/15/23 10:06	1	682
21	1205524154 LCS	10-OCT-2023	.999		509.1	10/10/23 09:37	404	10/15/23 06:50	10/15/23 10:06	1	759

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 10-OCT-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Procedure Code : LUC26RAL
 Parmname : Radium-226
 Required MDA : 1 pCi/L
 Halflife of Ra-226 : 1600 years
 Ra-226 Abundance : 1.00
 Halflife of Rn-222 : 3.8235 days

Batch : 2496135
 Analyst : LIN01615
 Prep Date : 10/10/2023
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Counting		Gross Counts	Gross CPM	Background Counts	Background CPM	Background Count Time (min.)	Cell Efficiency (cpm/dpm)
					Cell Number	Time (min.)						
1	637526001.1	0.4510	2.0019E-05	9/5/2023 12:30	806	30	27	0.900	3	0.100	30	1.6560
2	637527001.1	0.5085	2.0290E-05	9/5/2023 17:25	105	30	70	2.333	4	0.133	30	1.5340
3	637528001.1	0.5012	2.0261E-05	9/5/2023 14:00	207	30	10	0.333	1	0.033	30	1.8080
4	637528002.1	0.5038	2.0271E-05	9/5/2023 15:30	304	30	14	0.467	3	0.100	30	1.8850
5	637530001.1	0.5031	2.0268E-05	9/8/2023 11:15	402	30	34	1.133	2	0.067	30	1.4980
6	637530002.1	0.5091	2.0292E-05	9/8/2023 15:10	505	30	85	2.833	1	0.033	30	1.7470
7	637530003.1	0.5054	2.0278E-05	9/8/2023 15:30	602	30	114	3.800	4	0.133	30	1.7010
8	637728001.1	0.5080	2.0288E-05	9/15/2023 7:38	703	30	20	0.667	6	0.200	30	1.6440
9	637728002.1	0.5091	2.0292E-05	9/15/2023 9:43	803	30	16	0.533	2	0.067	30	1.4760
10	637728003.1	0.5044	2.0274E-05	9/15/2023 7:38	106	30	39	1.300	8	0.267	30	1.5250
11	637728004.1	0.5048	2.0275E-05	9/15/2023 6:45	202	30	20	0.667	5	0.167	30	1.4980
12	637729001.1	0.5090	2.0292E-05	9/12/2023 10:58	308	30	18	0.600	5	0.167	30	1.5970
13	637729002.1	0.5017	2.0263E-05	9/12/2023 12:55	407	30	39	1.300	3	0.100	30	1.4390
14	637729003.1	0.5065	2.0282E-05	9/12/2023 14:17	506	30	15	0.500	4	0.133	30	1.8780
15	637729004.1	0.5065	2.0282E-05	9/12/2023 11:56	605	30	19	0.633	1	0.033	30	2.0280
16	637729005.1	0.5022	2.0265E-05	9/12/2023 10:58	704	30	34	1.133	2	0.067	30	1.5870
17	637729006.1	0.5077	2.0287E-05	9/12/2023 8:55	807	30	4	0.133	3	0.100	30	2.0260
18	1205524151.1	0.5091	2.0292E-05	10/10/2023 0:00	104	30	12	0.400	4	0.133	30	1.6640
19	1205524152.1	0.4508	2.0018E-05	9/5/2023 12:30	204	30	33	1.100	3	0.100	30	1.5970
20	1205524153.1	0.1001	1.1377E-05	9/5/2023 12:30	303	30	682	22.733	1	0.033	30	1.7210
21	1205524154.1	0.5091	2.0292E-05	10/10/2023 0:00	404	30	759	25.300	1	0.033	30	1.8660

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
1.900%	4/8/2023	3/31/2024	10/10/2023 9:37	10/15/2023 5:20	10/15/2023 8:27	0.583	0.977	1.002	1.000
7.900%	5/1/2023	4/30/2024	10/10/2023 9:37	10/15/2023 5:50	10/15/2023 9:01	0.584	0.976	1.002	1.000
4.000%	10/10/2023	7/31/2024	10/10/2023 9:37	10/15/2023 5:50	10/15/2023 9:01	0.584	0.976	1.002	1.000
8.900%	10/25/2022	10/31/2023	10/10/2023 9:37	10/15/2023 5:50	10/15/2023 9:01	0.584	0.976	1.002	1.000
5.300%	2/1/2023	1/31/2024	10/10/2023 9:37	10/15/2023 5:50	10/15/2023 9:01	0.584	0.976	1.002	1.000
8.200%	6/1/2023	5/31/2024	10/10/2023 9:37	10/15/2023 5:50	10/15/2023 9:01	0.584	0.976	1.002	1.000
9.900%	7/1/2023	6/30/2024	10/10/2023 9:37	10/15/2023 5:50	10/15/2023 9:01	0.584	0.976	1.002	1.000
9.000%	11/1/2022	10/31/2023	10/10/2023 9:37	10/15/2023 5:50	10/15/2023 9:01	0.584	0.976	1.002	1.000
4.700%	4/8/2023	3/31/2024	10/10/2023 9:37	10/15/2023 5:50	10/15/2023 9:01	0.584	0.976	1.002	1.000
3.400%	5/1/2023	4/30/2024	10/10/2023 9:37	10/15/2023 6:20	10/15/2023 9:33	0.586	0.976	1.002	1.000
1.400%	8/1/2023	7/31/2024	10/10/2023 9:37	10/15/2023 6:20	10/15/2023 9:33	0.586	0.976	1.002	1.000
9.600%	10/25/2022	10/31/2023	10/10/2023 9:37	10/15/2023 6:20	10/15/2023 9:33	0.586	0.976	1.002	1.000
5.800%	2/1/2023	1/31/2024	10/10/2023 9:37	10/15/2023 6:20	10/15/2023 9:33	0.586	0.976	1.002	1.000
1.400%	6/1/2023	5/31/2024	10/10/2023 9:37	10/15/2023 6:20	10/15/2023 9:33	0.586	0.976	1.002	1.000
2.300%	10/10/2023	6/30/2024	10/10/2023 9:37	10/15/2023 6:20	10/15/2023 9:33	0.586	0.976	1.002	1.000
4.200%	11/1/2022	10/31/2023	10/10/2023 9:37	10/15/2023 6:20	10/15/2023 9:33	0.586	0.976	1.002	1.000
9.200%	10/10/2023	3/31/2024	10/10/2023 9:37	10/15/2023 6:20	10/15/2023 9:33	0.586	0.976	1.002	1.000
6.700%	5/1/2023	4/30/2024	10/10/2023 9:37	10/15/2023 6:50	10/15/2023 10:06	0.587	0.976	1.002	1.000
2.600%	8/1/2023	7/31/2024	10/10/2023 9:37	10/15/2023 6:50	10/15/2023 10:06	0.587	0.976	1.002	1.000
7.400%	10/25/2022	10/31/2023	10/10/2023 9:37	10/15/2023 6:50	10/15/2023 10:06	0.587	0.976	1.002	1.000
6.800%	10/10/2023	1/31/2024	10/10/2023 9:37	10/15/2023 6:50	10/15/2023 10:06	0.587	0.976	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-I
Spike Exp Date : 8/29/2024
Spike Activity (dpm/ml): 304.20
Spike Volume Added: 0.10

LCS S/N : 1715-I
LCS Exp Date : 8/29/2024
LCS Activity (dpm/ml): 304.20
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.2020	0.1426	1	0.3913	0.8493	22.90%	0.8000	0.1826	0.3799	0.4004		SAMPLE				
2	0.2228	0.1573	1	0.4160	2.2314	15.24%	2.2000	0.2867	0.5700	0.7403		SAMPLE				
3	0.0959	0.0677	1	0.2227	0.2620	37.07%	0.3000	0.1106	0.1892	0.1940		SAMPLE				
4	0.1585	0.1119	1	0.3071	0.3055	38.52%	0.3667	0.1374	0.2244	0.2348		SAMPLE				
5	0.1631	0.1151	1	0.3352	1.1198	19.48%	1.0667	0.2000	0.4115	0.4572		SAMPLE				
6	0.0977	0.0690	1	0.2269	2.4908	13.75%	2.8000	0.3091	0.5390	0.7616		SAMPLE				
7	0.2022	0.1427	1	0.3775	3.3747	13.98%	3.6667	0.3621	0.6532	1.0453		SAMPLE				
8	0.2549	0.1799	1	0.4546	0.4421	37.52%	0.4667	0.1700	0.3156	0.3313		SAMPLE				
9	0.1636	0.1155	1	0.3362	0.4914	30.67%	0.4667	0.1414	0.2918	0.3037		SAMPLE				
10	0.3187	0.2250	1	0.5527	1.0602	22.37%	1.0333	0.2285	0.4595	0.4895		SAMPLE				
11	0.2563	0.1810	1	0.4663	0.5219	33.36%	0.5000	0.1667	0.3410	0.3495		SAMPLE				
12	0.2385	0.1684	1	0.4338	0.4207	38.12%	0.4333	0.1599	0.3042	0.3202		SAMPLE				
13	0.2080	0.1468	1	0.4030	1.3118	18.91%	1.2000	0.2160	0.4629	0.5219		SAMPLE				
14	0.1823	0.1287	1	0.3403	0.3042	39.65%	0.3667	0.1453	0.2363	0.2405		SAMPLE				
15	0.0844	0.0596	1	0.1960	0.4610	24.95%	0.6000	0.1491	0.2245	0.2351		SAMPLE				
16	0.1538	0.1086	1	0.3162	1.0563	19.21%	1.0667	0.2000	0.3882	0.4260		SAMPLE				
17	0.1460	0.1031	1	0.2829	0.0256	264.74%	0.0333	0.0882	0.1326	0.1328		SAMPLE				
18	0.2042	0.1442	1	0.3813	0.2479	50.45%	0.2667	0.1333	0.2429	0.2477		MB				
19	0.2081	0.1469	1	0.4032	1.0938	20.17%	1.0000	0.2000	0.4288	0.4603	637526001.1	DUP	25.2%			
20	0.5020	0.3544	1	1.1659	103.7517	8.34%	22.7000	0.8711	7.8040	22.6196	637526001.1	MS			136.8803	75.2%
21	0.0910	0.0643	1	0.2114	20.9432	7.71%	25.2667	0.9189	1.4929	4.3772		LCS			26.9152	77.8%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 15-OCT-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	06:57	1	1.14E+05	113616	-1.53		
LUCAS2	EFF	06:55	1	1.31E+05	131265	-1.89		
LUCAS3	EFF	06:44	1	92275	92275	0.09		
LUCAS4	EFF	06:43	1	1.27E+05	127194	-1.07		
LUCAS5	EFF	06:39	1	1.30E+05	130199	-2.39		
LUCAS6	EFF	06:37	1	1.29E+05	128572	-1.7		
LUCAS7	EFF	06:35	1	1.31E+05	131457	-0.1		
LUCAS8	EFF	06:34	1	1.15E+05	114824	-1.13		

Reviewed by: 
Lyndsey Pace

Date: 15-OCT-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2496135

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
637526001	SAMPLE	LXP1	LUCAS8	OCT-15-23 08:27:00	DONE	Lucas Cell	08-APR-23 00:00
637527001	SAMPLE	LXP1	LUCAS1	OCT-15-23 09:01:00	DONE	Lucas Cell	01-MAY-23 00:00
637528001	SAMPLE	LXP1	LUCAS2	OCT-15-23 09:01:00	DONE	Lucas Cell	01-AUG-23 00:00
637528002	SAMPLE	LXP1	LUCAS3	OCT-15-23 09:01:00	DONE	Lucas Cell	25-OCT-22 00:00
637530001	SAMPLE	LXP1	LUCAS4	OCT-15-23 09:01:00	DONE	Lucas Cell	01-FEB-23 00:00
637530002	SAMPLE	LXP1	LUCAS5	OCT-15-23 09:01:00	DONE	Lucas Cell	01-JUN-23 00:00
637530003	SAMPLE	LXP1	LUCAS6	OCT-15-23 09:01:00	DONE	Lucas Cell	01-JUL-23 00:00
637728001	SAMPLE	LXP1	LUCAS7	OCT-15-23 09:01:00	DONE	Lucas Cell	01-NOV-22 00:00
637728002	SAMPLE	LXP1	LUCAS8	OCT-15-23 09:01:00	DONE	Lucas Cell	08-APR-23 00:00
637728003	SAMPLE	LXP1	LUCAS1	OCT-15-23 09:33:00	DONE	Lucas Cell	01-MAY-23 00:00
637728004	SAMPLE	LXP1	LUCAS2	OCT-15-23 09:33:00	DONE	Lucas Cell	01-AUG-23 00:00
637729001	SAMPLE	LXP1	LUCAS3	OCT-15-23 09:33:00	DONE	Lucas Cell	25-OCT-22 00:00
637729002	SAMPLE	LXP1	LUCAS4	OCT-15-23 09:33:00	DONE	Lucas Cell	01-FEB-23 00:00
637729003	SAMPLE	LXP1	LUCAS5	OCT-15-23 09:33:00	DONE	Lucas Cell	01-JUN-23 00:00
637729004	SAMPLE	LXP1	LUCAS6	OCT-15-23 09:33:00	DONE	Lucas Cell	01-JUL-23 00:00
637729005	SAMPLE	LXP1	LUCAS7	OCT-15-23 09:33:00	DONE	Lucas Cell	01-NOV-22 00:00
637729006	SAMPLE	LXP1	LUCAS8	OCT-15-23 09:33:00	DONE	Lucas Cell	08-APR-23 00:00
1205524151	MB	LXP1	LUCAS1	OCT-15-23 10:06:00	DONE	Lucas Cell	01-MAY-23 00:00
1205524152	DUP	LXP1	LUCAS2	OCT-15-23 10:06:00	DONE	Lucas Cell	01-AUG-23 00:00
1205524153	MS	LXP1	LUCAS3	OCT-15-23 10:06:00	DONE	Lucas Cell	25-OCT-22 00:00
1205524154	LCS	LXP1	LUCAS4	OCT-15-23 10:06:00	DONE	Lucas Cell	01-FEB-23 00:00



Environmental Laboratory
 1232 Haco Drive
 Lansing
 Michigan, 48910

CHAIN OF CUSTODY

Phone: (517)702-6372

Page 1 of 1

Lab Work Order Number

L3091732 JSC
09/10/23

Client Name BWL - Erickson Station		Project Name Erickson AM MI Wells 14-15		Requested Analyses								Requested Turn Around			
Client Contact Cheryl Louden		Project Number [none]		Ag:: As:: B:: Ba:: Be:: Ca:: Cd:: Cr:: Co:: Cu:: Fe:: Hg:: Li:: Mo:: Ni:: Pb:: Sb:: Se:: Si:: Tl:: V:: Zn:: Na:: K:: Mg	TSS, HCO3, CO3, Hardness	Cl-IC:: F-ISE:: SO4:: TDS	Radium 226 and Radium 228							Rush requests subject to additional charge.	
Address 3725 S. Canal		Project Description												Rush requests subject to lab approval.	
City Lansing		PO Number 30926 10021													
State/Zip MI, 48917		Shipped By													
Phone (517) 702-6396	Fax (517) 702-6373	Tracking Number													
Sampler Marc Wahrer															

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code				Sample	Comments
						b	a	a	b		
MW-14	9.15.23	0738	G	GW	5	1	1	1	2		
MW-15		0943	G	GW	5	1	1	1	2		
MWT- 14	↓	0738	G	GW	5	1	1	1	2		
Field Blank		0645	G	DI	5	1	1	1	2		

Relinquished By 	Date/Time 9-15-23 1040	Received By Dawn Well	Date/Time 9.15.23 1040	
Relinquished By	Date/Time	Received By	Date/Time	Comments
Relinquished By	Date/Time	Received By	Date/Time	
Relinquished By	Date/Time	Received By	Date/Time	
Cooler Numbers and Temperatures E076 5.5C				

Matrix Codes: DI=Deionized Water, GW=Ground Water Preserv. Codes: a=None, b=0.5% HNO3



Hometown People. Hometown Power.

Lansing Board of Water and Light
Environmental Services Laboratory (MI00079)
Cert ID:3760
1232 Haco Dr.
Lansing, Michigan 48901

18 October 2023

BWL - Erickson Station
Attn: Cheryl Loudon
3725 S. Canal
Lansing, MI 48917

Project: Erickson AM MI

Dear Cheryl Loudon,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

Work Order
L309172

Received
9/12/2023 7:45:00AM

Account Number

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



Analytical Report

Client: BWL - Erickson Station
Address: 3725 S. Canal
 Lansing MI, 48917

Client Project Manager: Cheryl Louden

Report Date: 10/18/2023

Sample Name: MW-16A

Lab #: L309172-01 Ground Water

Collected: 12-Sep-23 10:58

By: Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	2600	1.0	uS/cm	1		12-Sep-23 10:58	maw	SM 2510B	
Dissolved oxygen	0.340	0.100	mg/L	1		12-Sep-23 10:58	maw	FIELD	
Milliliters Purged	200		ml/min	1		12-Sep-23 10:58	maw	FIELD	
Oxidation Reduction Potential	-59.80	-999.0	mV	1		12-Sep-23 10:58	maw	FIELD	
pH	6.8	7.0	pH Units	1		12-Sep-23 10:58	maw	SM 4500H+B	
Temperature	17		°C	1		12-Sep-23 10:58	maw	SM 2550B	
Turbidity	5.3	0.10	NTU	1		12-Sep-23 10:58	maw	SM 2130B	

Sample Name: MW-16B

Lab #: L309172-02 Ground Water

Collected: 12-Sep-23 12:55

By: Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	590	1.0	uS/cm	1		12-Sep-23 12:55	maw	SM 2510B	
Dissolved oxygen	ND	0.100	mg/L	1		12-Sep-23 12:55	maw	FIELD	
Milliliters Purged	230		ml/min	1		12-Sep-23 12:55	maw	FIELD	
Oxidation Reduction Potential	-136.1	-999.0	mV	1		12-Sep-23 12:55	maw	FIELD	
pH	7.3	7.0	pH Units	1		12-Sep-23 12:55	maw	SM 4500H+B	
Temperature	14		°C	1		12-Sep-23 12:55	maw	SM 2550B	
Turbidity	0.44	0.10	NTU	1		12-Sep-23 12:55	maw	SM 2130B	

Sample Name: MW-16C

Lab #: L309172-03 Ground Water

Collected: 12-Sep-23 14:17

By: Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	560	1.0	uS/cm	1		12-Sep-23 14:17	maw	SM 2510B	
Dissolved oxygen	ND	0.100	mg/L	1		12-Sep-23 14:17	maw	FIELD	
Milliliters Purged	225		ml/min	1		12-Sep-23 14:17	maw	FIELD	
Oxidation Reduction Potential	-139.6	-999.0	mV	1		12-Sep-23 14:17	maw	FIELD	
pH	7.2	7.0	pH Units	1		12-Sep-23 14:17	maw	SM 4500H+B	
Temperature	14		°C	1		12-Sep-23 14:17	maw	SM 2550B	
Turbidity	1.0	0.10	NTU	1		12-Sep-23 14:17	maw	SM 2130B	



Analytical Report

Client: BWL - Erickson Station
Address: 3725 S. Canal
Lansing MI, 48917

Client Project Manager: Cheryl Louden

Report Date: 10/18/2023

Sample Name: MW-16D

Lab #: L309172-04 Ground Water

Collected: 12-Sep-23 11:56

By: Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	590	1.0	uS/cm	1		12-Sep-23 11:56	maw	SM 2510B	
Dissolved oxygen	0.190	0.100	mg/L	1		12-Sep-23 11:56	maw	FIELD	
Milliliters Purged	50.0		ml/90sec	1		12-Sep-23 11:56	maw	FIELD	
Oxidation Reduction Potential	-141.5	-999.0	mV	1		12-Sep-23 11:56	maw	FIELD	
pH	7.5	7.0	pH Units	1		12-Sep-23 11:56	maw	SM 4500H+B	
Temperature	15		°C	1		12-Sep-23 11:56	maw	SM 2550B	
Turbidity	7.0	0.10	NTU	1		12-Sep-23 11:56	maw	SM 2130B	



Analytical Report

Client: BWL - Erickson Station

Client Project Manager: Cheryl Louden

Report Date: 10/18/2023

Address: 3725 S. Canal
Lansing MI, 48917

Approved By:

Jennifer Caporale

Notes and Definitions

AL Action Level (Action Level = Regulatory Limit)
MCL Maximum Contaminant Level
PEL Permissible Exposure Limit (Permissible Exposure Limit = Regulatory Limit)
RPD Relative Percent Difference
OT Odor Threshold
ND Non Detect is less than the reporting limit value
All drinking water regulatory limits are MCL's with the exception of Lead and Copper unless otherwise noted.



Report ID: S53272.01(02)
Generated on 10/16/2023
Replaces report S53272.01(01) generated on 09/22/2023

Report to
Attention: Jennifer Caporale
Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Report produced by
Merit Laboratories, Inc.
2680 East Lansing Drive
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:
John Lavery (johnlavery@meritlabs.com)
Barbara Ball (bball@meritlabs.com)

Report Summary
Lab Sample ID(s): S53272.01-S53272.06
Project: Erickson AM MI Wells 16A-16D
Collected Date(s): 09/12/2023
Submitted Date/Time: 09/13/2023 08:40
Sampled by: Marc Wahrer
P.O. #:

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Maya Murshak
Technical Director



General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

All accreditations/certifications held by this laboratory are listed on page 3. Not all accreditations/certifications are applicable to this report.

Report Narrative

All analyses completed



Laboratory Accreditations

Authority	Accreditation ID
Michigan DEQ	#9956
DOD ELAP & ISO/IEC 17025:2017	#69699 PJLA Testing
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



Sample Summary (6 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S53272.01	MW-16A L309172-01	Groundwater	09/12/23 10:58
S53272.02	MW-16B L309172-02	Groundwater	09/12/23 12:55
S53272.03	MW-16C L309172-03	Groundwater	09/12/23 14:17
S53272.04	MW-16-D L309172-04	Groundwater	09/12/23 11:56
S53272.05	MWT-16A L309172-05	Groundwater	09/12/23 10:58
S53272.06	Field Blank L309172-06	Water	09/12/23 08:55



Analytical Laboratory Report

Final Report

Lab Sample ID: S53272.01

Sample Tag: MW-16A L309172-01

Collected Date/Time: 09/12/2023 10:58

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.9	IR
2	1L Plastic	None	Yes	1.9	IR
1	250ml Plastic	HNO3	Yes	1.9	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	09/14/23 12:50	CTV	
Metal Digestion	Completed	SW3015A	09/15/23 10:00	JRH	

Inorganics

Method: E300.0, Run Date: 09/14/23 08:45, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 09/14/23 09:46, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	484	100	1.3	mg/L	100	16887-00-6	
Sulfate	239	100	10	mg/L	100	14808-79-8	

Method: SM2320B, Run Date: 09/18/23 11:06, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	520	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 09/13/23 13:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	840	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 09/15/23 16:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,640	50	6	mg/L	2		

Method: SM2540D, Run Date: 09/14/23 17:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	3.5	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 09/15/23 12:56, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.0026	mg/L	5	7440-36-0	
Arsenic	0.003	0.002	0.00026	mg/L	5	7440-38-2	
Barium	0.178	0.005	0.00016	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.00022	mg/L	5	7440-41-7	
Boron	0.23	0.04	0.0018	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.00019	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000097	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S53272.01 (continued)

Sample Tag: MW-16A L309172-01

Method: E200.8, Run Date: 09/15/23 12:56, Analyst: JRH (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.00011	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.00038	mg/L	5	7440-50-8	
Iron	4.13	0.02	0.0019	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.00019	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.0016	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.00022	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00025	mg/L	5	7440-02-0	
Selenium	0.005	0.005	0.0021	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000068	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000086	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00014	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00073	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 09/18/23 10:29, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Magnesium	52.2	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.40	0.50	0.0230	mg/L	5	7440-09-7	

Method: E200.8, Run Date: 09/18/23 10:34, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	220	12.5	1.08	mg/L	125	7440-70-2	
Sodium	307	10.0	0.212	mg/L	125	7440-23-5	

Method: E245.1, Run Date: 09/14/23 15:37, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 10/16/23 09:32, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Lab Sample ID: S53272.02

Sample Tag: MW-16B L309172-02

Collected Date/Time: 09/12/2023 12:55

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.9	IR
2	1L Plastic	None	Yes	1.9	IR
1	250ml Plastic	HNO3	Yes	1.9	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	09/14/23 12:50	CTV	
Metal Digestion	Completed	SW3015A	09/15/23 10:00	JRH	

Inorganics

Method: E300.0, Run Date: 09/14/23 08:55, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	18	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 09/18/23 11:10, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	400	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 09/13/23 13:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	380	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 09/15/23 16:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	366	50	6	mg/L	2		

Method: SM2540D, Run Date: 09/14/23 17:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 09/15/23 12:58, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.0026	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.00026	mg/L	5	7440-38-2	
Barium	0.086	0.005	0.00016	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.00022	mg/L	5	7440-41-7	
Boron	0.11	0.04	0.0018	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.00019	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000097	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.00011	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.00038	mg/L	5	7440-50-8	
Iron	0.41	0.02	0.0019	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S53272.02 (continued)

Sample Tag: MW-16B L309172-02

Method: E200.8, Run Date: 09/15/23 12:58, Analyst: JRH (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.00019	mg/L	5	7439-92-1	
Lithium*	0.021	0.005	0.0016	mg/L	5	7439-93-2	
Molybdenum	0.006	0.005	0.00022	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00025	mg/L	5	7440-02-0	
Selenium	0.006	0.005	0.0021	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000068	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000086	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00014	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00073	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 09/18/23 10:35, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	80.2	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	33.4	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	2.86	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	10.6	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 09/14/23 15:40, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 10/16/23 09:32, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S53272.03

Sample Tag: MW-16C L309172-03

Collected Date/Time: 09/12/2023 14:17

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.9	IR
2	1L Plastic	None	Yes	1.9	IR
1	250ml Plastic	HNO3	Yes	1.9	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	09/14/23 12:50	CTV	
Metal Digestion	Completed	SW3015A	09/15/23 10:00	JRH	

Inorganics

Method: E300.0, Run Date: 09/14/23 09:05, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	8	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 09/18/23 11:16, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	400	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 09/13/23 13:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	310	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 09/15/23 16:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	334	50	6	mg/L	2		

Method: SM2540D, Run Date: 09/14/23 17:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	1.1	3	1	mg/L	1		b

Metals

Method: E200.8, Run Date: 09/15/23 12:59, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.0026	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.00026	mg/L	5	7440-38-2	
Barium	0.033	0.005	0.00016	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.00022	mg/L	5	7440-41-7	
Boron	0.40	0.04	0.0018	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.00019	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000097	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.00011	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.00038	mg/L	5	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL



Analytical Laboratory Report

Final Report

Lab Sample ID: S53272.03 (continued)

Sample Tag: MW-16C L309172-03

Method: E200.8, Run Date: 09/15/23 12:59, Analyst: JRH (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	0.48	0.02	0.0019	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.00019	mg/L	5	7439-92-1	
Lithium*	0.027	0.005	0.0016	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.00022	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00025	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.0021	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000068	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000086	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00014	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00073	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 09/18/23 10:37, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	71.7	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	29.9	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	4.93	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	15.7	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 09/14/23 15:43, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 10/16/23 09:32, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S53272.04

Sample Tag: MW-16-D L309172-04

Collected Date/Time: 09/12/2023 11:56

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.9	IR
2	1L Plastic	None	Yes	1.9	IR
1	250ml Plastic	HNO3	Yes	1.9	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	09/14/23 12:50	CTV	
Metal Digestion	Completed	SW3015A	09/15/23 10:00	JRH	

Inorganics

Method: E300.0, Run Date: 09/14/23 09:15, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	7	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	6	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 09/18/23 11:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	400	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 09/13/23 13:26, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	100	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 09/15/23 16:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	376	50	6	mg/L	2		

Method: SM2540D, Run Date: 09/14/23 17:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	7.3	4	1.7	mg/L	1.7		

Metals

Method: E200.8, Run Date: 09/15/23 13:01, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.0026	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.00026	mg/L	5	7440-38-2	
Barium	0.036	0.005	0.00016	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.00022	mg/L	5	7440-41-7	
Boron	4.69	0.04	0.0018	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.00019	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000097	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.00011	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.00038	mg/L	5	7440-50-8	
Iron	0.34	0.02	0.0019	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S53272.04 (continued)

Sample Tag: MW-16-D L309172-04

Method: E200.8, Run Date: 09/15/23 13:01, Analyst: JRH (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.00019	mg/L	5	7439-92-1	
Lithium*	0.030	0.005	0.0016	mg/L	5	7439-93-2	
Molybdenum	0.010	0.005	0.00022	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00025	mg/L	5	7440-02-0	
Selenium	0.006	0.005	0.0021	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000068	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000086	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00014	mg/L	5	7440-62-2	
Zinc	0.008	0.005	0.00073	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 09/18/23 10:39, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	29.4	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	7.45	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	9.61	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	108	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 09/14/23 15:46, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 10/16/23 09:32, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S53272.05

Sample Tag: MWT-16A L309172-05

Collected Date/Time: 09/12/2023 10:58

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.9	IR
2	1L Plastic	None	Yes	1.9	IR
1	250ml Plastic	HNO3	Yes	1.9	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	09/14/23 12:50	CTV	
Metal Digestion	Completed	SW3015A	09/15/23 10:00	JRH	

Inorganics

Method: E300.0, Run Date: 09/14/23 09:26, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 09/14/23 09:56, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	493	100	1.3	mg/L	100	16887-00-6	
Sulfate	250	100	10	mg/L	100	14808-79-8	

Method: SM2320B, Run Date: 09/18/23 11:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	520	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 09/13/23 13:28, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	860	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 09/15/23 16:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,630	50	6	mg/L	2		

Method: SM2540D, Run Date: 09/14/23 17:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	3.9	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 09/15/23 13:19, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.0026	mg/L	5	7440-36-0	
Arsenic	0.004	0.002	0.00026	mg/L	5	7440-38-2	
Barium	0.172	0.005	0.00016	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.00022	mg/L	5	7440-41-7	
Boron	0.22	0.04	0.0018	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.00019	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000097	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S53272.05 (continued)

Sample Tag: MWT-16A L309172-05

Method: E200.8, Run Date: 09/15/23 13:19, Analyst: JRH (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.00011	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.00038	mg/L	5	7440-50-8	
Iron	4.11	0.02	0.0019	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.00019	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.0016	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.00022	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00025	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.0021	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000068	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000086	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00014	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00073	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 09/18/23 10:41, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Magnesium	52.2	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.44	0.50	0.0230	mg/L	5	7440-09-7	

Method: E200.8, Run Date: 09/18/23 10:42, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	219	12.5	1.08	mg/L	125	7440-70-2	
Sodium	308	10.0	0.212	mg/L	125	7440-23-5	

Method: E245.1, Run Date: 09/14/23 15:50, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 10/16/23 09:32, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Lab Sample ID: S53272.06

Sample Tag: Field Blank L309172-06

Collected Date/Time: 09/12/2023 08:55

Matrix: Water

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.9	IR
2	1L Plastic	None	Yes	1.9	IR
1	250ml Plastic	HNO3	Yes	1.9	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	09/14/23 12:50	CTV	
Metal Digestion	Completed	SW3015A	09/15/23 10:00	JRH	

Inorganics

Method: E300.0, Run Date: 09/14/23 09:36, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.03	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.04	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.26	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 09/18/23 11:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 09/13/23 13:30, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 09/15/23 16:30, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	6	mg/L	2		

Method: SM2540D, Run Date: 09/14/23 17:00, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 09/15/23 12:45, Analyst: JRH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.0010	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.00010	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.000065	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.000086	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.00070	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.000076	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.000039	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.000043	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.00015	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.00077	mg/L	2	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S53272.06 (continued)

Sample Tag: Field Blank L309172-06

Method: E200.8, Run Date: 09/15/23 12:45, Analyst: JRH (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000076	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.00065	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.000087	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.00010	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.00084	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.000027	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.000034	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.000056	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.00029	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 09/18/23 10:28, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 09/14/23 15:53, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 10/16/23 09:32, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

Merit Laboratories Login Checklist

Lab Set ID:S53272

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 16A-16D

Submitted:09/13/2023 08:40 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

Sample Receiving

- | | | |
|-----|--|--|
| 01. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples are received at 4C +/- 2C Thermometer # IR 1.9 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Received on ice/ cooling process begun |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples shipped |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples left in 24 hr. drop box |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Are there custody seals/tape or is the drop box locked |

Chain of Custody

- | | | |
|-----|--|--|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC adequately filled out |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC signed and relinquished to the lab |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sample tag on bottles match COC |
| 09. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Subcontracting needed? Subcontracted to: GEL |

Preservation

- | | | |
|-----|--|---|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Do sample have correct chemical preservation |
| 11. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Completed pH checks on preserved samples? (no VOAs) |
| 12. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Did any samples need to be preserved in the lab? |

Bottle Conditions

- | | | |
|-----|--|---|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | All bottles intact |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Appropriate analytical bottles are used |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Merit bottles used |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sufficient sample volume received |
| 17. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples require laboratory filtration |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples submitted within holding time |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Do water VOC or TOX bottles contain headspace |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S53272 Submitted: 09/13/2023 08:40

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 16A-16D

Attention: Jennifer Caporale
Address: Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Initial Preservation Check: 09/13/2023 09:37 MMC

Preservation Recheck (E200.8): N/A

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S53272.01	1L Plastic HNO3	<2			
S53272.01	1L Plastic HNO3	<2			
S53272.01	250ml Plastic HNO3	<2			
S53272.02	1L Plastic HNO3	<2			
S53272.02	1L Plastic HNO3	<2			
S53272.02	250ml Plastic HNO3	<2			
S53272.03	1L Plastic HNO3	<2			
S53272.03	1L Plastic HNO3	<2			
S53272.03	250ml Plastic HNO3	<2			
S53272.04	1L Plastic HNO3	<2			
S53272.04	1L Plastic HNO3	<2			
S53272.04	250ml Plastic HNO3	<2			
S53272.05	1L Plastic HNO3	<2			
S53272.05	1L Plastic HNO3	<2			
S53272.05	250ml Plastic HNO3	<2			
S53272.06	1L Plastic HNO3	<2			
S53272.06	1L Plastic HNO3	<2			
S53272.06	250ml Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823
 Phone (517) 332-0167 Fax (517) 332-4034
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

REPORT TO

CHAIN OF CUSTODY RECORD

INVOICE TO

CONTACT NAME **Jennifer Caporale**
 COMPANY **Lansing Board of Water and Light**
 ADDRESS **PO Box 13007 48901-3007**
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**
 PHONE NO. **517-702-6372** FAX NO. P.O. NO.
 E-MAIL ADDRESS **Environmental_Laboratory@lbwl.com** QUOTE NO.

CONTACT NAME **Beth Zimpfer** SAME
 COMPANY
 ADDRESS
 CITY STATE ZIP CODE
 PHONE NO. E-MAIL ADDRESS **Beth.Zimpfer@lbwl.com**

PROJECT NO./NAME **Erickson AM MI Wells 16A-16D** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**
 TURNAROUND TIME REQUIRED 1 DAY 2 DAYS 3 DAYS STANDARD OTHER **ASAP**
 DELIVERABLES REQUIRED STD LEVEL II LEVEL III LEVEL IV EDD OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE
 # Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO ₃	H ₂ SO ₄	NaOH	MeOH	OTHER	Total Metals	F- undissilted, Cl-, SO ₄ , TDS	Radium 226	Radium 228	TSS	HCO ₃ , CO ₃ , Hardness					
	DATE	TIME																					
53272.01	9/12/23	1058	MW-16A L309172-01	GW	5	2	3						✓	✓	✓	✓	✓	✓					
.02		1255	MW-16B -02	GW	5	2	3						✓	✓	✓	✓	✓	✓					
.03		1417	MW-16C -03	GW	5	2	3						✓	✓	✓	✓	✓	✓					
.04		1156	MW16-D -04	GW	5	2	3						✓	✓	✓	✓	✓	✓					
.05		1058	MWT- 16A -05	GW	5	2	3						✓	✓	✓	✓	✓	✓					
.06		0855	Field Blank -06	DI	5	2	3						✓	✓	✓	✓	✓	✓					

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

Certifications
 OHIO VAP Drinking Water
 DoD NPDES
 Project Locations
 Detroit New York
 Other _____
 Special Instructions
 Metals to analyse: Na, Mg, K
 B, Ca, Sb, As, Ba, Be, Cd, Cr,
 Co, Li, Hg, Mo, Pb, Se, Tl,
 Fe, Cu, Ni, Ag, V, Zn
 Please send a preliminary report

RELINQUISHED BY: *[Signature]* DATE **9/13/23** TIME **0840**
 SIGNATURE/ORGANIZATION
 RECEIVED BY: *M. Clitock* DATE **9/13/23** TIME **0840**
 SIGNATURE/ORGANIZATION
 RELINQUISHED BY: DATE TIME
 SIGNATURE/ORGANIZATION
 RECEIVED BY: DATE TIME
 SIGNATURE/ORGANIZATION

RELINQUISHED BY: DATE TIME
 SIGNATURE/ORGANIZATION
 RECEIVED BY: DATE TIME
 SIGNATURE/ORGANIZATION
 SEAL NO. SEAL INTACT YES NO INITIALS
 SEAL NO. SEAL INTACT YES NO INITIALS
 NOTES: TEMP. ON ARRIVAL **1.9**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005

October 16, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 637729
SDG: S53272

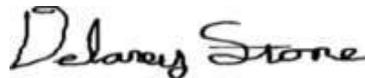
Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on September 19, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,



Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S53272
Work Order: 637729**

October 16, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on September 19, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

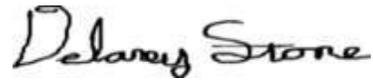
Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
637729001	S53272.01
637729002	S53272.02
637729003	S53272.03
637729004	S53272.04
637729005	S53272.05
637729006	S53272.06 Field Blank

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Delaney Stone". The signature is written in a cursive style with a large initial 'D'.

Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

SAMPLE RECEIPT & REVIEW FORM

Client: MEPI		SDG/AR/COC/Work Order: 037728 1037729 / 037728			
Received By: QG		Date Received: 9/19/23 ^{03 9/20}			
Carrier and Tracking Number		<input checked="" type="checkbox"/> FedEx Express <input checked="" type="checkbox"/> FedEx Ground <input checked="" type="checkbox"/> UPS <input type="checkbox"/> Field Services <input type="checkbox"/> Courier <input type="checkbox"/> Other Q6 969			
Suspected Hazard Information	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.			
A) Shipped as a DOT Hazardous?	<input checked="" type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___			
B) Did the client designate the samples are to be received as radioactive?	<input checked="" type="checkbox"/>	COC notation or radioactive stickers on containers equal client designation.			
C) Did the RSO classify the samples as radioactive?	<input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM/mR/hr Classified as: Rad 1 Rad 2 Rad 3			
D) Did the client designate samples are hazardous?	<input checked="" type="checkbox"/>	COC notation or hazard labels on containers equal client designation.			
E) Did the RSO identify possible hazards?	<input checked="" type="checkbox"/>	If D or E is yes, select Hazards below. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:			
Sample Receipt Criteria		Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Preservation Method: Wet Ice Ice Packs Dry ice None Other: *all temperatures are recorded in Celsius TEMP: 20°C
4	Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Temperature Device Serial #: IR1-23 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sample ID's and Containers Affected: comments If Preservation added, Lot#: below
7	Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer) Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No) Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected:
8	Samples received within holding time?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ID's and containers affected:
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
13	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Not relinquished Other (describe)
Comments (Use Continuation Form if needed): SS3439.01, SS3439.02, SS3439.03(1), SS3272.01, SS3272.02, SS3273.03, SS3274.04, SS3292.05					

PM (or PMA) review: Initials 00 Date 9/20/23 Page 1 of 1

Laboratory Certifications

List of current GEL Certifications as of 16 October 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-00651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	KY90129
Kentucky Wastewater	KY90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2023019
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122024-04
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2022-160
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-23-21
Utah NELAP	SC000122022-37
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S53272
Work Order #: 637729**

Product: Radium-226+Radium-228 Calculation

Analytical Method: Calculation

Analytical Procedure: GL-RAD-D-003 REV# 45

Analytical Batch: 2499134

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
637729001	S53272.01
637729002	S53272.02
637729003	S53272.03
637729004	S53272.04
637729005	S53272.05
637729006	S53272.06 Field Blank

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2499132

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
637729001	S53272.01
637729002	S53272.02
637729003	S53272.03
637729004	S53272.04
637729005	S53272.05
637729006	S53272.06 Field Blank
1205529514	Method Blank (MB)
1205529515	637728001(S53439.01) Sample Duplicate (DUP)
1205529516	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

Duplication Criteria between QC Sample and Duplicate Sample

The Sample and the Duplicate, (See Below), did not meet the relative percent difference requirement; however, they do meet the relative error ratio requirement with the value listed below.

Sample	Analyte	Value
1205529515 (S53439.01DUP)	Radium-228	RPD 124* (0.0%-100.0%) RER 2.38 (0-3)

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2496135

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
637729001	S53272.01
637729002	S53272.02
637729003	S53272.03
637729004	S53272.04
637729005	S53272.05
637729006	S53272.06 Field Blank
1205524151	Method Blank (MB)
1205524152	637526001(NonSDG) Sample Duplicate (DUP)
1205524153	637526001(NonSDG) Matrix Spike (MS)
1205524154	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

The matrix spike, 1205524153 (Non SDG 637526001MS), aliquot was reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S53272 GEL Work Order: 637729

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Kate Gellatly

Date: 16 OCT 2023

Title: Analyst 1 PT

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: October 16, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S53272.01 Project: MERI00120
Sample ID: 637729001 Client ID: MERI001
Matrix: Ground Water
Collect Date: 12-SEP-23 10:58
Receive Date: 19-SEP-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.285	+/-0.904	1.63	3.00	pCi/L		JE1	10/06/23	1109	2499132	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.705	+/-0.954			pCi/L		LXB3	10/16/23	0932	2499134	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.421	+/-0.304	0.434	1.00	pCi/L		LXP1	10/15/23	0933	2496135	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			89.9	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 16, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S53272.02 Project: MERI00120
Sample ID: 637729002 Client ID: MERI001
Matrix: Ground Water
Collect Date: 12-SEP-23 12:55
Receive Date: 19-SEP-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.09	+/-0.745	1.10	3.00	pCi/L		JE1	10/06/23	1109	2499132		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		2.40	+/-0.877			pCi/L		LXB3	10/16/23	0932	2499134		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		1.31	+/-0.463	0.403	1.00	pCi/L		LXP1	10/15/23	0933	2496135		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			86.6	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 16, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S53272.03 Project: MERI00120
Sample ID: 637729003 Client ID: MERI001
Matrix: Ground Water
Collect Date: 12-SEP-23 14:17
Receive Date: 19-SEP-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.492	+/-1.38	2.44	3.00	pCi/L		JE1	10/06/23	1109	2499132	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.796	+/-1.40			pCi/L		LXB3	10/16/23	0932	2499134	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.304	+/-0.236	0.340	1.00	pCi/L		LXP1	10/15/23	0933	2496135	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			77.9	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: October 16, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S53272.04 Project: MERI00120
Sample ID: 637729004 Client ID: MERI001
Matrix: Ground Water
Collect Date: 12-SEP-23 11:56
Receive Date: 19-SEP-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.773	+/-0.704	1.13	3.00	pCi/L		JE1	10/06/23	1109	2499132	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.23	+/-0.739			pCi/L		LXB3	10/16/23	0932	2499134	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.461	+/-0.225	0.196	1.00	pCi/L		LXP1	10/15/23	0933	2496135	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			86	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 16, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S53272.05	Project: MERI00120
Sample ID: 637729005	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 12-SEP-23 10:58	
Receive Date: 19-SEP-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.05	+/-0.713	1.06	3.00	pCi/L		JE1	10/06/23	1109	2499132		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		2.10	+/-0.812			pCi/L		LXB3	10/16/23	0932	2499134		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		1.06	+/-0.388	0.316	1.00	pCi/L		LXP1	10/15/23	0933	2496135		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			90.7	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: October 16, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Lavery
 Project: Routine Analysis

Client Sample ID: S53272.06 Field Blank	Project: MERI00120
Sample ID: 637729006	Client ID: MERI001
Matrix: Water	
Collect Date: 12-SEP-23 08:55	
Receive Date: 19-SEP-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.184	+/-0.785	1.48	3.00	pCi/L		JE1	10/06/23	1109	2499132		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.210	+/-0.796			pCi/L		LXB3	10/16/23	0932	2499134		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.0256	+/-0.133	0.283	1.00	pCi/L		LXP1	10/15/23	0933	2496135		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			76.7	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: October 16, 2023

Page 1 of 2

Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan

Contact: John Laverty

Workorder: 637729

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2499132										
QC1205529515	637728001 DUP										
Radium-228	U	0.497		2.13	pCi/L	124*		(0% - 100%)	JE1	10/06/23	11:08
	Uncertainty	+/-0.688		+/-1.01							
QC1205529516	LCS										
Radium-228	76.6			74.0	pCi/L		96.7	(75%-125%)		10/06/23	11:09
	Uncertainty			+/-4.04							
QC1205529514	MB										
Radium-228			U	0.495	pCi/L					10/06/23	11:08
	Uncertainty			+/-0.734							
Rad Ra-226											
Batch	2496135										
QC1205524152	637526001 DUP										
Radium-226		0.849		1.09	pCi/L	25.2		(0% - 100%)	LXP1	10/15/23	10:06
	Uncertainty	+/-0.380		+/-0.429							
QC1205524154	LCS										
Radium-226	26.9			20.9	pCi/L		77.8	(75%-125%)		10/15/23	10:06
	Uncertainty			+/-1.49							
QC1205524151	MB										
Radium-226			U	0.248	pCi/L					10/15/23	10:06
	Uncertainty			+/-0.243							
QC1205524153	637526001 MS										
Radium-226	137	0.849		104	pCi/L		75.2	(75%-125%)		10/15/23	10:06
	Uncertainty	+/-0.380		+/-7.80							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- H Analytical holding time was exceeded
- < Result is less than value reported
- > Result is greater than value reported

GEL LABORATORIES LLC

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QC Summary

Workorder: 637729

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
NI											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2499132 Check-list

This check-list was completed on 06-OCT-23 by Rhonda Birch

This batch was reviewed by Kenshalla Oston on 06-OCT-23 and Rhonda Birch on 06-OCT-23.

Batch ID:
2499132

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?		No	
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2499132
Analyst: Jacqueline Winston (JE1)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: ASP-33005595

Due Dates for Lab: 14-OCT-2023 **Package:** 16-OCT-2023

SDG: 17-OCT-2023

Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
LCS	1205529516	228	2051-B	.1	mL

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	637728001	02-OCT-2023	3	301.4	301.4	10/03/23 12:19	10/06/23 09:30
2	637728002	02-OCT-2023	3	310.2	310.2	10/03/23 12:19	10/06/23 09:30
3	637728003	02-OCT-2023	3	306.4	306.4	10/03/23 12:19	10/06/23 09:30
4	637728004	02-OCT-2023	3	300.9	300.9	10/03/23 12:19	10/06/23 09:30
5	637729001	02-OCT-2023	3	306.4	306.4	10/03/23 12:19	10/06/23 09:30
6	637729002	02-OCT-2023	3	302.2	302.2	10/03/23 12:19	10/06/23 09:30
7	637729003	02-OCT-2023	3	300.4	300.4	10/03/23 12:19	10/06/23 09:30
8	637729004	02-OCT-2023	3	301.4	301.4	10/03/23 12:19	10/06/23 09:30
9	637729005	02-OCT-2023	3	305.3	305.3	10/03/23 12:19	10/06/23 09:30
10	637729006	02-OCT-2023	3	303	303	10/03/23 12:19	10/06/23 09:30
11	1205529514 MB	02-OCT-2023	3		310.2	10/03/23 12:19	10/06/23 09:30
12	1205529515 DUP (637728001)	02-OCT-2023	3	300.5	300.5	10/03/23 12:19	10/06/23 09:30
13	1205529516 LCS	02-OCT-2023	3		310.2	10/03/23 12:19	10/06/23 09:30

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 2097-B	Ba-133 Tracer	.1 mL	Pipet Id: RAD-GFC-1795419
REGNT 3976298	RGF-1.5M Ammonium Sulfate	10 mL	Data Entry Date2: 02-OCT-2023 14:18 ASP-33005595 Jacqueline Winston
REGNT 3956035	Barium Carrier Ra228 REG	1 mL	Data Entry Date3: 02-OCT-2023 00:00
REGNT 3975318	RGF-1M Citric Acid	5 mL	
REGNT 3976304	2M HCl	20 mL	
REGNT 3968078	RGF-50% Potassium Carbonate	2 mL	
REGNT 3971997	RGF-7M Nitric Acid	25 mL	
REGNT 3973436.2	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3957480.5	RGF-Hydrofluoric Acid	4 mL	
REGNT 3963747	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3977914	RGF-Neodymium Subtrate	5 mL	
REGNT 3976856.12	Nitric Acid	5 mL	
REGNT DGA081923	2488570	2 g	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 2097-B
 Tracer Exp Date : 7/12/2024
 Tracer Volume Added: 0.10

Batch : 2499132
 Analyst : JAC02417
 Prep Date : 10/2/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 3 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	637728001.1	0.3014	1.8483E-05	9/15/2023 7:38	1026.0	1.80%	904.1	1.92%	0.1	0.000200
2	637728002.1	0.3102	1.8627E-05	9/15/2023 9:43	1026.0	1.80%	870.2	1.96%	0.1	0.000200
3	637728003.1	0.3064	1.8566E-05	9/15/2023 7:38	1026.0	1.80%	958.2	1.86%	0.1	0.000200
4	637728004.1	0.3009	1.8474E-05	9/15/2023 6:45	1026.0	1.80%	749.9	2.11%	0.1	0.000200
5	637729001.1	0.3064	1.8566E-05	9/12/2023 10:58	1026.0	1.80%	922.0	1.90%	0.1	0.000200
6	637729002.1	0.3022	1.8496E-05	9/12/2023 12:55	1026.0	1.80%	888.0	1.94%	0.1	0.000200
7	637729003.1	0.3004	1.8466E-05	9/12/2023 14:17	1026.0	1.80%	798.8	2.04%	0.1	0.000200
8	637729004.1	0.3014	1.8483E-05	9/12/2023 11:56	1026.0	1.80%	882.2	1.94%	0.1	0.000200
9	637729005.1	0.3053	1.8548E-05	9/12/2023 10:58	1026.0	1.80%	930.8	1.89%	0.1	0.000200
10	637729006.1	0.3030	1.8510E-05	9/12/2023 8:55	1026.0	1.80%	786.8	2.06%	0.1	0.000200
11	1205529514.1	0.3102	1.8627E-05	10/2/2023 0:00	1026.0	1.80%	873.2	1.95%	0.1	0.000200
12	1205529515.1	0.3005	1.8468E-05	9/15/2023 7:38	1026.0	1.80%	930.3	1.89%	0.1	0.000200
13	1205529516.1	0.3102	1.8627E-05	10/2/2023 0:00	1026.0	1.80%	905.2	1.92%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Sample Recovery Error %
			Alpha	Beta										
1	1B	60	13	32	0.533	10/6/2023 11:09	10/3/2023 12:19	10/6/2023 9:30	0.993	0.830	1.000	1.057	88.1%	2.65%
2	1C	60	17	73	1.217	10/6/2023 11:09	10/3/2023 12:19	10/6/2023 9:30	0.993	0.830	1.000	1.057	84.8%	2.68%
3	1D	60	12	55	0.917	10/6/2023 11:09	10/3/2023 12:19	10/6/2023 9:30	0.993	0.830	1.000	1.057	93.4%	2.60%
4	2A	60	7	51	0.850	10/6/2023 11:09	10/3/2023 12:19	10/6/2023 9:30	0.993	0.830	1.000	1.057	73.1%	2.79%
5	2B	60	20	61	1.017	10/6/2023 11:09	10/3/2023 12:19	10/6/2023 9:30	0.992	0.830	1.000	1.057	89.9%	2.63%
6	2C	60	22	37	0.617	10/6/2023 11:09	10/3/2023 12:19	10/6/2023 9:30	0.992	0.830	1.000	1.057	86.6%	2.66%
7	2D	60	15	101	1.683	10/6/2023 11:09	10/3/2023 12:19	10/6/2023 9:30	0.992	0.830	1.000	1.057	77.9%	2.74%
8	3B	60	10	34	0.567	10/6/2023 11:09	10/3/2023 12:19	10/6/2023 9:30	0.992	0.829	1.000	1.057	86.0%	2.66%
9	3C	60	9	40	0.667	10/6/2023 11:09	10/3/2023 12:19	10/6/2023 9:30	0.992	0.829	1.000	1.057	90.7%	2.63%
10	3D	60	16	27	0.450	10/6/2023 11:09	10/3/2023 12:19	10/6/2023 9:30	0.992	0.829	1.000	1.057	76.7%	2.75%
11	4A	60	7	36	0.600	10/6/2023 11:08	10/3/2023 12:19	10/6/2023 9:30	0.999	0.830	1.000	1.057	85.1%	2.67%
12	4C	60	13	81	1.350	10/6/2023 11:08	10/3/2023 12:19	10/6/2023 9:30	0.993	0.830	1.000	1.057	90.7%	2.63%
13	4D	60	30	1418	23.633	10/6/2023 11:09	10/3/2023 12:19	10/6/2023 9:30	0.999	0.830	1.000	1.057	88.2%	2.65%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2023	5/31/2024	0.6098	0.00711	0.394	9/29/2023 17:29	500
2	PIC	6/1/2023	5/31/2024	0.6077	0.00847	0.812	9/29/2023 17:29	500
3	PIC	6/1/2023	5/31/2024	0.6071	0.00692	0.670	9/29/2023 17:29	500
4	PIC	6/1/2023	5/31/2024	0.6083	0.01914	0.706	9/29/2023 17:29	500
5	PIC	6/1/2023	5/31/2024	0.6253	0.02111	0.932	9/29/2023 17:29	500
6	PIC	6/1/2023	5/31/2024	0.6085	0.01274	0.318	9/29/2023 17:29	500
7	PIC	6/1/2023	5/31/2024	0.6206	0.00745	1.560	9/29/2023 17:29	500
8	PIC	6/1/2023	5/31/2024	0.6266	0.01614	0.350	9/29/2023 17:29	500
9	PIC	6/1/2023	5/31/2024	0.6245	0.00988	0.354	9/29/2023 17:29	500
10	PIC	6/1/2023	5/31/2024	0.5677	0.02297	0.408	9/29/2023 17:29	500
11	PIC	6/1/2023	5/31/2024	0.6074	0.01123	0.462	9/29/2023 17:30	500
12	PIC	6/1/2023	5/31/2024	0.6376	0.00889	0.710	9/29/2023 17:30	500
13	PIC	6/1/2023	5/31/2024	0.6412	0.00773	1.028	9/29/2023 17:30	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

LCS S/N : 2051-B
LCS Exp Date : 3/27/2024
LCS Activity (dpm/ml): 527.16
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	Sample Act. MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.7132	0.5035	3	1.1854	0.4973	70.65%	0.1393	0.0984	0.6881	0.6997		SAMPLE				
2	1.0371	0.7322	3	1.6451	1.4630	36.68%	0.4047	0.1480	1.0487	1.1128		SAMPLE				
3	0.8671	0.6122	3	1.3907	0.8208	52.33%	0.2467	0.1289	0.8408	0.8663		SAMPLE				
4	1.1561	0.8162	3	1.8485	0.6224	86.74%	0.1440	0.1248	1.0574	1.0694		SAMPLE				
5	1.0333	0.7295	3	1.6271	0.2847	162.02%	0.0847	0.1371	0.9037	0.9067		SAMPLE				
6	0.6530	0.4610	3	1.1038	1.0863	35.10%	0.2987	0.1045	0.7448	0.7947		SAMPLE				
7	1.5858	1.1196	3	2.4386	0.4919	143.19%	0.1233	0.1766	1.3802	1.3859		SAMPLE				
8	0.6715	0.4741	3	1.1265	0.7725	46.59%	0.2167	0.1007	0.7039	0.7311		SAMPLE				
9	0.6341	0.4477	3	1.0628	1.0468	34.88%	0.3127	0.1087	0.7134	0.7615		SAMPLE				
10	0.8929	0.6304	3	1.4803	0.1844	217.15%	0.0420	0.0912	0.7848	0.7863		SAMPLE				
11	0.7754	0.5474	3	1.2741	0.4945	75.79%	0.1380	0.1045	0.7341	0.7449		MB				
12	0.8923	0.6300	3	1.4262	2.1289	24.32%	0.6400	0.1547	1.0084	1.1446	637728001.1	DUP	124.3%	2.3839		
13	1.0571	0.7463	3	1.6564	74.0359	3.92%	22.6053	0.6292	4.0393	19.2584		LCS			76.5506	96.7%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
637728001	1B	60	13	32	10/6/2023 11:09	10/6/2023 12:09	PIC	2499132
637728002	1C	60	17	73	10/6/2023 11:09	10/6/2023 12:09	PIC	2499132
637728003	1D	60	12	55	10/6/2023 11:09	10/6/2023 12:09	PIC	2499132
637728004	2A	60	7	51	10/6/2023 11:09	10/6/2023 12:09	PIC	2499132
637729001	2B	60	20	61	10/6/2023 11:09	10/6/2023 12:09	PIC	2499132
637729002	2C	60	22	37	10/6/2023 11:09	10/6/2023 12:09	PIC	2499132
637729003	2D	60	15	101	10/6/2023 11:09	10/6/2023 12:09	PIC	2499132
637729004	3B	60	10	34	10/6/2023 11:09	10/6/2023 12:09	PIC	2499132
637729005	3C	60	9	40	10/6/2023 11:09	10/6/2023 12:09	PIC	2499132
637729006	3D	60	16	27	10/6/2023 11:09	10/6/2023 12:09	PIC	2499132
1205529514	4A	60	7	36	10/6/2023 11:08	10/6/2023 12:08	PIC	2499132
1205529515	4C	60	13	81	10/6/2023 11:08	10/6/2023 12:08	PIC	2499132
1205529516	4D	60	30	1418	10/6/2023 11:09	10/6/2023 12:09	PIC	2499132

ASSAY 6-Oct-23 10:05:18
 Wizard 2480 s/n 46190630
 Protocol id 8 Ba-133
 Time limit
 Count limit
 Isotope Ba-133
 Protocol date 10/6/2023
 Run id. 7396

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	87	1	180	3078.57	1025.99	1.8	10:05:18
637728001	2	87	2	180	2712.57	904.08	1.92	88.12	10:08:32
637728002	3	87	3	180	2611	870.16	1.96	84.81	10:11:47
637728003	4	87	4	180	2875.28	958.23	1.86	93.40	10:15:01
637728004	5	87	5	180	2250.13	749.87	2.11	73.09	10:18:14
637729001	1	5	1	180	2766.28	921.98	1.9	89.86	10:21:51
637729002	2	5	2	180	2664.57	888.01	1.94	86.55	10:25:05
637729003	3	5	3	180	2397	798.82	2.04	77.86	10:28:19
637729004	4	5	4	180	2647	882.21	1.94	85.99	10:31:33
637729005	5	5	5	180	2793	930.81	1.89	90.72	10:34:47
637729006	1	19	1	180	2360.57	786.78	2.06	76.68	10:38:23
1205529514	2	19	2	180	2620	873.17	1.95	85.11	10:41:37
1205529515	3	19	3	180	2791	930.26	1.89	90.67	10:44:51
1205529516	4	19	4	180	2716	905.18	1.92	88.23	10:48:05

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 06-Oct-2023

Detectors LB4100 E1 through H4 and PIC 1A through 14D and G5400W 1W through 1Z and LB4200 GA1 through OD4

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100H1	Above	Alpha bkg	06-Oct 08:56	60	0.450	-8.08E-2	0.225	+7.40
LB4100H1	Above	Beta bkg	06-Oct 08:56	60	3.200	-5.15E-1	3.743	+2.23
LB4200GB2	Above	Beta bkg	06-Oct 09:46	500	87.700	0.129	1.304	+443.98
LB4200GD4	need 2nd	Alpha bkg	06-Oct 09:46	500	0.260	-1.07E-1	0.314	+2.23
LB4200GD4	Above	Beta bkg	06-Oct 09:46	500	1.540	0.283	1.056	+6.76
LB4200OC1	Missing	Alpha eff	06-Oct 05:57	5	11323	11030	11530	+0.51
LB4200OC1	Missing	Alpha XTalk	06-Oct 05:57	5	0.257	0.140	0.309	+1.14
LB4200OC1	Missing	Beta eff	06-Oct 08:53	5	14271	13430	14960	+0.30
LB4200OC1	Missing	Beta XTalk	06-Oct 08:53	5	4.20E-4	-9.72E-4	0.003	-1.12
LB4200OC2	Missing	Alpha eff	06-Oct 05:57	5	13478	13450	14200	-2.77
LB4200OC2	Missing	Alpha XTalk	06-Oct 05:57	5	0.242	0.159	0.264	+1.71
LB4200OC2	Missing	Beta eff	06-Oct 08:53	5	14738	14200	15120	+0.51
LB4200OC2	Missing	Beta XTalk	06-Oct 08:53	5	0.001	1.86E-4	0.003	-1.24
LB4200OC3	Missing	Alpha eff	06-Oct 05:57	5	9324	9408	9916	-4.00
LB4200OC3	Missing	Alpha XTalk	06-Oct 05:57	5	0.251	0.162	0.293	+1.06
LB4200OC3	Missing	Beta eff	06-Oct 08:53	5	14486	13600	15470	-0.16
LB4200OC3	Missing	Beta XTalk	06-Oct 08:53	5	7.18E-4	-1.06E-3	0.004	-0.77
LB4200OC4	Missing	Alpha eff	06-Oct 05:57	5	11507	11280	11980	-1.05
LB4200OC4	Missing	Alpha XTalk	06-Oct 05:57	5	0.215	0.174	0.231	+1.33
LB4200OC4	Missing	Beta eff	06-Oct 08:53	5	16841	16100	18020	-0.69
LB4200OC4	Missing	Beta XTalk	06-Oct 08:53	5	0.001	2.50E-4	0.004	-1.39

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

G5400W1W	Alpha eff, Alpha XTalk, Beta eff, Beta XTalk
G5400W1X	Alpha eff, Alpha XTalk, Beta eff, Beta XTalk
G5400W1Y	Alpha eff, Alpha XTalk, Beta eff, Beta XTalk
G5400W1Z	Alpha eff, Alpha XTalk, Beta eff, Beta XTalk
LB4200GA1	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4200GA2	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4200GA3	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
LB4200GA4	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
PIC5B	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
PIC10B	Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by Lois Buist

Date 10/11/2023

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2499132

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205529514	MB	JE1	PIC4A	OCT-06-23 11:08:53	DONE	25mm Filter	01-JUN-23 00:00
1205529515	DUP	JE1	PIC4C	OCT-06-23 11:08:57	DONE	25mm Filter	01-JUN-23 00:00
1205529516	LCS	JE1	PIC4D	OCT-06-23 11:09:00	DONE	25mm Filter	01-JUN-23 00:00
637728001	SAMPLE	JE1	PIC1B	OCT-06-23 11:09:04	DONE	25mm Filter	01-JUN-23 00:00
637728002	SAMPLE	JE1	PIC1C	OCT-06-23 11:09:08	DONE	25mm Filter	01-JUN-23 00:00
637728003	SAMPLE	JE1	PIC1D	OCT-06-23 11:09:10	DONE	25mm Filter	01-JUN-23 00:00
637728004	SAMPLE	JE1	PIC2A	OCT-06-23 11:09:17	DONE	25mm Filter	01-JUN-23 00:00
637729001	SAMPLE	JE1	PIC2B	OCT-06-23 11:09:21	DONE	25mm Filter	01-JUN-23 00:00
637729002	SAMPLE	JE1	PIC2C	OCT-06-23 11:09:24	DONE	25mm Filter	01-JUN-23 00:00
637729003	SAMPLE	JE1	PIC2D	OCT-06-23 11:09:27	DONE	25mm Filter	01-JUN-23 00:00
637729004	SAMPLE	JE1	PIC3B	OCT-06-23 11:09:32	DONE	25mm Filter	01-JUN-23 00:00
637729005	SAMPLE	JE1	PIC3C	OCT-06-23 11:09:35	DONE	25mm Filter	01-JUN-23 00:00
637729006	SAMPLE	JE1	PIC3D	OCT-06-23 11:09:40	DONE	25mm Filter	01-JUN-23 00:00

Lucas Cell Raw Data

Batch 2496135 Check-list

This check-list was completed on 16-OCT-23 by Lyndsey Pace

This batch was reviewed by Gregory Ramsay on 16-OCT-23 and Lyndsey Pace on 16-OCT-23.

Batch ID:
2496135

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2496135
Analyst: Lyndsey Pace (LXP1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: LUCAS-C202389980

Due Dates for Lab: 14-OCT-2023			Package: 16-OCT-2023		SDG: 16-OCT-2023	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
MS	1205524153	Ra-226 emanation spike	1715-I	.1	mL	
LCS	1205524154	Ra-226 emanation spike	1715-I	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	637526001	10-OCT-2023	.999	451.04	451.04	10/10/23 09:37	806	10/15/23 05:20	10/15/23 08:27	3	27
2	637527001	10-OCT-2023	.999	508.5	508.5	10/10/23 09:37	105	10/15/23 05:50	10/15/23 09:01	4	70
3	637528001	10-OCT-2023	.999	501.16	501.16	10/10/23 09:37	207	10/15/23 05:50	10/15/23 09:01	1	10
4	637528002	10-OCT-2023	.999	503.78	503.78	10/10/23 09:37	304	10/15/23 05:50	10/15/23 09:01	3	14
5	637530001	10-OCT-2023	.999	503.08	503.08	10/10/23 09:37	402	10/15/23 05:50	10/15/23 09:01	2	34
6	637530002	10-OCT-2023	.999	509.1	509.1	10/10/23 09:37	505	10/15/23 05:50	10/15/23 09:01	1	85
7	637530003	10-OCT-2023	.999	505.37	505.37	10/10/23 09:37	602	10/15/23 05:50	10/15/23 09:01	4	114
8	637728001	10-OCT-2023	1	508.03	508.03	10/10/23 09:37	703	10/15/23 05:50	10/15/23 09:01	6	20
9	637728002	10-OCT-2023	1	509.09	509.09	10/10/23 09:37	803	10/15/23 05:50	10/15/23 09:01	2	16
10	637728003	10-OCT-2023	1	504.43	504.43	10/10/23 09:37	106	10/15/23 06:20	10/15/23 09:33	8	39
11	637728004	10-OCT-2023	1	504.79	504.79	10/10/23 09:37	202	10/15/23 06:20	10/15/23 09:33	5	20
12	637729001	10-OCT-2023	1	509.01	509.01	10/10/23 09:37	308	10/15/23 06:20	10/15/23 09:33	5	18
13	637729002	10-OCT-2023	1	501.71	501.71	10/10/23 09:37	407	10/15/23 06:20	10/15/23 09:33	3	39
14	637729003	10-OCT-2023	1	506.52	506.52	10/10/23 09:37	506	10/15/23 06:20	10/15/23 09:33	4	15
15	637729004	10-OCT-2023	1	506.48	506.48	10/10/23 09:37	605	10/15/23 06:20	10/15/23 09:33	1	19
16	637729005	10-OCT-2023	1	502.21	502.21	10/10/23 09:37	704	10/15/23 06:20	10/15/23 09:33	2	34
17	637729006	10-OCT-2023	1	507.67	507.67	10/10/23 09:37	807	10/15/23 06:20	10/15/23 09:33	3	4
18	1205524151 MB	10-OCT-2023	.999		509.1	10/10/23 09:37	104	10/15/23 06:50	10/15/23 10:06	4	12
19	1205524152 DUP (637526001)	10-OCT-2023	.999	450.82	450.82	10/10/23 09:37	204	10/15/23 06:50	10/15/23 10:06	3	33
20	1205524153 MS (637526001)	10-OCT-2023	.999	100.11	100.11	10/10/23 09:37	303	10/15/23 06:50	10/15/23 10:06	1	682
21	1205524154 LCS	10-OCT-2023	.999		509.1	10/10/23 09:37	404	10/15/23 06:50	10/15/23 10:06	1	759

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 10-OCT-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Procedure Code : LUC26RAL
 Parmname : Radium-226
 Required MDA : 1 pCi/L
 Halflife of Ra-226 : 1600 years
 Ra-226 Abundance : 1.00
 Halflife of Rn-222 : 3.8235 days

Batch : 2496135
 Analyst : LIN01615
 Prep Date : 10/10/2023
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	637526001.1	0.4510	2.0019E-05	9/5/2023 12:30	806	30	27	0.900	3	0.100	30	1.6560
2	637527001.1	0.5085	2.0290E-05	9/5/2023 17:25	105	30	70	2.333	4	0.133	30	1.5340
3	637528001.1	0.5012	2.0261E-05	9/5/2023 14:00	207	30	10	0.333	1	0.033	30	1.8080
4	637528002.1	0.5038	2.0271E-05	9/5/2023 15:30	304	30	14	0.467	3	0.100	30	1.8850
5	637530001.1	0.5031	2.0268E-05	9/8/2023 11:15	402	30	34	1.133	2	0.067	30	1.4980
6	637530002.1	0.5091	2.0292E-05	9/8/2023 15:10	505	30	85	2.833	1	0.033	30	1.7470
7	637530003.1	0.5054	2.0278E-05	9/8/2023 15:30	602	30	114	3.800	4	0.133	30	1.7010
8	637728001.1	0.5080	2.0288E-05	9/15/2023 7:38	703	30	20	0.667	6	0.200	30	1.6440
9	637728002.1	0.5091	2.0292E-05	9/15/2023 9:43	803	30	16	0.533	2	0.067	30	1.4760
10	637728003.1	0.5044	2.0274E-05	9/15/2023 7:38	106	30	39	1.300	8	0.267	30	1.5250
11	637728004.1	0.5048	2.0275E-05	9/15/2023 6:45	202	30	20	0.667	5	0.167	30	1.4980
12	637729001.1	0.5090	2.0292E-05	9/12/2023 10:58	308	30	18	0.600	5	0.167	30	1.5970
13	637729002.1	0.5017	2.0263E-05	9/12/2023 12:55	407	30	39	1.300	3	0.100	30	1.4390
14	637729003.1	0.5065	2.0282E-05	9/12/2023 14:17	506	30	15	0.500	4	0.133	30	1.8780
15	637729004.1	0.5065	2.0282E-05	9/12/2023 11:56	605	30	19	0.633	1	0.033	30	2.0280
16	637729005.1	0.5022	2.0265E-05	9/12/2023 10:58	704	30	34	1.133	2	0.067	30	1.5870
17	637729006.1	0.5077	2.0287E-05	9/12/2023 8:55	807	30	4	0.133	3	0.100	30	2.0260
18	1205524151.1	0.5091	2.0292E-05	10/10/2023 0:00	104	30	12	0.400	4	0.133	30	1.6640
19	1205524152.1	0.4508	2.0018E-05	9/5/2023 12:30	204	30	33	1.100	3	0.100	30	1.5970
20	1205524153.1	0.1001	1.1377E-05	9/5/2023 12:30	303	30	682	22.733	1	0.033	30	1.7210
21	1205524154.1	0.5091	2.0292E-05	10/10/2023 0:00	404	30	759	25.300	1	0.033	30	1.8660

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
1.900%	4/8/2023	3/31/2024	10/10/2023 9:37	10/15/2023 5:20	10/15/2023 8:27	0.583	0.977	1.002	1.000
7.900%	5/1/2023	4/30/2024	10/10/2023 9:37	10/15/2023 5:50	10/15/2023 9:01	0.584	0.976	1.002	1.000
4.000%	10/10/2023	7/31/2024	10/10/2023 9:37	10/15/2023 5:50	10/15/2023 9:01	0.584	0.976	1.002	1.000
8.900%	10/25/2022	10/31/2023	10/10/2023 9:37	10/15/2023 5:50	10/15/2023 9:01	0.584	0.976	1.002	1.000
5.300%	2/1/2023	1/31/2024	10/10/2023 9:37	10/15/2023 5:50	10/15/2023 9:01	0.584	0.976	1.002	1.000
8.200%	6/1/2023	5/31/2024	10/10/2023 9:37	10/15/2023 5:50	10/15/2023 9:01	0.584	0.976	1.002	1.000
9.900%	7/1/2023	6/30/2024	10/10/2023 9:37	10/15/2023 5:50	10/15/2023 9:01	0.584	0.976	1.002	1.000
9.000%	11/1/2022	10/31/2023	10/10/2023 9:37	10/15/2023 5:50	10/15/2023 9:01	0.584	0.976	1.002	1.000
4.700%	4/8/2023	3/31/2024	10/10/2023 9:37	10/15/2023 5:50	10/15/2023 9:01	0.584	0.976	1.002	1.000
3.400%	5/1/2023	4/30/2024	10/10/2023 9:37	10/15/2023 6:20	10/15/2023 9:33	0.586	0.976	1.002	1.000
1.400%	8/1/2023	7/31/2024	10/10/2023 9:37	10/15/2023 6:20	10/15/2023 9:33	0.586	0.976	1.002	1.000
9.600%	10/25/2022	10/31/2023	10/10/2023 9:37	10/15/2023 6:20	10/15/2023 9:33	0.586	0.976	1.002	1.000
5.800%	2/1/2023	1/31/2024	10/10/2023 9:37	10/15/2023 6:20	10/15/2023 9:33	0.586	0.976	1.002	1.000
1.400%	6/1/2023	5/31/2024	10/10/2023 9:37	10/15/2023 6:20	10/15/2023 9:33	0.586	0.976	1.002	1.000
2.300%	10/10/2023	6/30/2024	10/10/2023 9:37	10/15/2023 6:20	10/15/2023 9:33	0.586	0.976	1.002	1.000
4.200%	11/1/2022	10/31/2023	10/10/2023 9:37	10/15/2023 6:20	10/15/2023 9:33	0.586	0.976	1.002	1.000
9.200%	10/10/2023	3/31/2024	10/10/2023 9:37	10/15/2023 6:20	10/15/2023 9:33	0.586	0.976	1.002	1.000
6.700%	5/1/2023	4/30/2024	10/10/2023 9:37	10/15/2023 6:50	10/15/2023 10:06	0.587	0.976	1.002	1.000
2.600%	8/1/2023	7/31/2024	10/10/2023 9:37	10/15/2023 6:50	10/15/2023 10:06	0.587	0.976	1.002	1.000
7.400%	10/25/2022	10/31/2023	10/10/2023 9:37	10/15/2023 6:50	10/15/2023 10:06	0.587	0.976	1.002	1.000
6.800%	10/10/2023	1/31/2024	10/10/2023 9:37	10/15/2023 6:50	10/15/2023 10:06	0.587	0.976	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-I
Spike Exp Date : 8/29/2024
Spike Activity (dpm/ml): 304.20
Spike Volume Added: 0.10

LCS S/N : 1715-I
LCS Exp Date : 8/29/2024
LCS Activity (dpm/ml): 304.20
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.2020	0.1426	1	0.3913	0.8493	22.90%	0.8000	0.1826	0.3799	0.4004		SAMPLE				
2	0.2228	0.1573	1	0.4160	2.2314	15.24%	2.2000	0.2867	0.5700	0.7403		SAMPLE				
3	0.0959	0.0677	1	0.2227	0.2620	37.07%	0.3000	0.1106	0.1892	0.1940		SAMPLE				
4	0.1585	0.1119	1	0.3071	0.3055	38.52%	0.3667	0.1374	0.2244	0.2348		SAMPLE				
5	0.1631	0.1151	1	0.3352	1.1198	19.48%	1.0667	0.2000	0.4115	0.4572		SAMPLE				
6	0.0977	0.0690	1	0.2269	2.4908	13.75%	2.8000	0.3091	0.5390	0.7616		SAMPLE				
7	0.2022	0.1427	1	0.3775	3.3747	13.98%	3.6667	0.3621	0.6532	1.0453		SAMPLE				
8	0.2549	0.1799	1	0.4546	0.4421	37.52%	0.4667	0.1700	0.3156	0.3313		SAMPLE				
9	0.1636	0.1155	1	0.3362	0.4914	30.67%	0.4667	0.1414	0.2918	0.3037		SAMPLE				
10	0.3187	0.2250	1	0.5527	1.0602	22.37%	1.0333	0.2285	0.4595	0.4895		SAMPLE				
11	0.2563	0.1810	1	0.4663	0.5219	33.36%	0.5000	0.1667	0.3410	0.3495		SAMPLE				
12	0.2385	0.1684	1	0.4338	0.4207	38.12%	0.4333	0.1599	0.3042	0.3202		SAMPLE				
13	0.2080	0.1468	1	0.4030	1.3118	18.91%	1.2000	0.2160	0.4629	0.5219		SAMPLE				
14	0.1823	0.1287	1	0.3403	0.3042	39.65%	0.3667	0.1453	0.2363	0.2405		SAMPLE				
15	0.0844	0.0596	1	0.1960	0.4610	24.95%	0.6000	0.1491	0.2245	0.2351		SAMPLE				
16	0.1538	0.1086	1	0.3162	1.0563	19.21%	1.0667	0.2000	0.3882	0.4260		SAMPLE				
17	0.1460	0.1031	1	0.2829	0.0256	264.74%	0.0333	0.0882	0.1326	0.1328		SAMPLE				
18	0.2042	0.1442	1	0.3813	0.2479	50.45%	0.2667	0.1333	0.2429	0.2477		MB				
19	0.2081	0.1469	1	0.4032	1.0938	20.17%	1.0000	0.2000	0.4288	0.4603	637526001.1	DUP	25.2%			
20	0.5020	0.3544	1	1.1659	103.7517	8.34%	22.7000	0.8711	7.8040	22.6196	637526001.1	MS			136.8803	75.2%
21	0.0910	0.0643	1	0.2114	20.9432	7.71%	25.2667	0.9189	1.4929	4.3772		LCS			26.9152	77.8%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 15-OCT-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	06:57	1	1.14E+05	113616	-1.53		
LUCAS2	EFF	06:55	1	1.31E+05	131265	-1.89		
LUCAS3	EFF	06:44	1	92275	92275	0.09		
LUCAS4	EFF	06:43	1	1.27E+05	127194	-1.07		
LUCAS5	EFF	06:39	1	1.30E+05	130199	-2.39		
LUCAS6	EFF	06:37	1	1.29E+05	128572	-1.7		
LUCAS7	EFF	06:35	1	1.31E+05	131457	-0.1		
LUCAS8	EFF	06:34	1	1.15E+05	114824	-1.13		

Reviewed by: 
Lyndsey Pace

Date: 15-OCT-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2496135

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
637526001	SAMPLE	LXP1	LUCAS8	OCT-15-23 08:27:00	DONE	Lucas Cell	08-APR-23 00:00
637527001	SAMPLE	LXP1	LUCAS1	OCT-15-23 09:01:00	DONE	Lucas Cell	01-MAY-23 00:00
637528001	SAMPLE	LXP1	LUCAS2	OCT-15-23 09:01:00	DONE	Lucas Cell	01-AUG-23 00:00
637528002	SAMPLE	LXP1	LUCAS3	OCT-15-23 09:01:00	DONE	Lucas Cell	25-OCT-22 00:00
637530001	SAMPLE	LXP1	LUCAS4	OCT-15-23 09:01:00	DONE	Lucas Cell	01-FEB-23 00:00
637530002	SAMPLE	LXP1	LUCAS5	OCT-15-23 09:01:00	DONE	Lucas Cell	01-JUN-23 00:00
637530003	SAMPLE	LXP1	LUCAS6	OCT-15-23 09:01:00	DONE	Lucas Cell	01-JUL-23 00:00
637728001	SAMPLE	LXP1	LUCAS7	OCT-15-23 09:01:00	DONE	Lucas Cell	01-NOV-22 00:00
637728002	SAMPLE	LXP1	LUCAS8	OCT-15-23 09:01:00	DONE	Lucas Cell	08-APR-23 00:00
637728003	SAMPLE	LXP1	LUCAS1	OCT-15-23 09:33:00	DONE	Lucas Cell	01-MAY-23 00:00
637728004	SAMPLE	LXP1	LUCAS2	OCT-15-23 09:33:00	DONE	Lucas Cell	01-AUG-23 00:00
637729001	SAMPLE	LXP1	LUCAS3	OCT-15-23 09:33:00	DONE	Lucas Cell	25-OCT-22 00:00
637729002	SAMPLE	LXP1	LUCAS4	OCT-15-23 09:33:00	DONE	Lucas Cell	01-FEB-23 00:00
637729003	SAMPLE	LXP1	LUCAS5	OCT-15-23 09:33:00	DONE	Lucas Cell	01-JUN-23 00:00
637729004	SAMPLE	LXP1	LUCAS6	OCT-15-23 09:33:00	DONE	Lucas Cell	01-JUL-23 00:00
637729005	SAMPLE	LXP1	LUCAS7	OCT-15-23 09:33:00	DONE	Lucas Cell	01-NOV-22 00:00
637729006	SAMPLE	LXP1	LUCAS8	OCT-15-23 09:33:00	DONE	Lucas Cell	08-APR-23 00:00
1205524151	MB	LXP1	LUCAS1	OCT-15-23 10:06:00	DONE	Lucas Cell	01-MAY-23 00:00
1205524152	DUP	LXP1	LUCAS2	OCT-15-23 10:06:00	DONE	Lucas Cell	01-AUG-23 00:00
1205524153	MS	LXP1	LUCAS3	OCT-15-23 10:06:00	DONE	Lucas Cell	25-OCT-22 00:00
1205524154	LCS	LXP1	LUCAS4	OCT-15-23 10:06:00	DONE	Lucas Cell	01-FEB-23 00:00



Environmental Laboratory
 1232 Haco Drive
 Lansing
 Michigan, 48910

CHAIN OF CUSTODY

Phone: (517)702-6372

Lab Work Order Number _____

Client Name BWL - Erickson Station		Project Name Erickson AM MI Wells 16A-D		Requested Analyses								Requested Turn Around	
Client Contact Cheryl Louden		Project Number [none]		Ag: As: B: Ba: Be: Ca: Cd: Cr: Co: Cu: Fe: Hg: Li: Mo: Ni: Pb: Sb: Se: Ti: V: Zn: Na: K: Mg	TSS, HCO3, CO3, Hardness	Cl-IC: F-ISE: SO4: TDS	Radium 226 and Radium 228						Rush requests subject to additional charge. Rush requests subject to lab approval.
Address 3725 S. Canal		Project Description											
City Lansing		PO Number 30926 10021											
State/Zip MI, 48917		Shipped By											
Phone (517) 702-6396	Fax (517) 702-6373	Tracking Number											
Sampler Marc Wahrer													

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code				Sample	Comments
						b	a	a	b		
MW-16A	9/12/23	1058	G	GW	5	1	1	1	2		
MW-16B	↓	1255	G	GW	5	1	1	1	2		
MW-16C		1417	G	GW	5	1	1	1	2		
MW-16D		1156	G	GW	5	1	1	1	2		
MWT- 16A		1058	G	GW	5	1	1	1	2		
Field Blank		0855	G	DI	5	1	1	1	2		

Relinquished By 	Date/Time 9-12-23 1015	Received By 	Date/Time 9.13.23 0745	
Relinquished By	Date/Time	Received By	Date/Time	Comments
	Date/Time	Received By	Date/Time	
Coo.				

Matrix Codes:

Data Verification & Validation Report

Lansing Board of Water & Light – Erickson Power Station

Sampling Event (dates and purpose): Background Sampling

Data Package Number:
S54642.01
S54888.01

Lab Report Date:
11/17/2023
11/21/2023

Data Validator: Andrew Byks

Data Validation Completion Date: 12/30/2023

General Overall Assessment:

- Data are usable without qualification.
 Data are usable with qualification (as noted below).
 Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	
MW-7C	
MW-8	
MW-9	
MW-10	
MW-11	
MW-11B	
MW-12	
MW-12B	
MW-13	
MW-14	
MW-15	
MW-16A	X
MW-16B	X
MW-16C	X
MW-16D	X
MW-100A	X
MW-100B	X
MW-100C	X
MW-100D	X

Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-16A	GW	S54642.01	10/17/2023	X	X	X	X	X	X	
MW-16B	GW	S54642.02	10/17/2023	X	X	X	X	X	X	
MW-16C	GW	S54642.03	10/17/2023	X	X	X	X	X	X	
MW-16D	GW	S54642.04	10/17/2023	X	X	X	X	X	X	
MWT-16A	GW	S54642.05	10/17/2023	X	X	X	X	X	X	
MW-100A	GW	S54888.01	10/23/2023	X	X	X	X	X	X	
MW-100B	GW	S54888.02	10/23/2023	X	X	X	X	X	X	
MW-100C	GW	S54888.03	10/23/2023	X	X	X	X	X	X	
MW-100D	GW	S54888.04	10/23/2023	X	X	X	X	X	X	
MWT-100C	GW	S54888.05	10/23/2023	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO₃, CO₃, hardness

Any planned sampling or analysis NOT completed? If yes, explain: _____

Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Field Data							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	X		Record of decontamination for non-dedicated sampling equipment	X			
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
Analytical Data Package							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies across samples for chloride, fluoride, hardness, sulfate, Rad-226, and Rad-228
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Holding Times	X		Analyses performed within allowed holding time	X			
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested		X		RLs for chloride, hardness, sulfate, and Rad-228 were not met
			MDLs<RLs		X		RL=MDL for carbonate
			MDLs<MCLs	X			
			MDLs<GPS	X			
QC Validation							
Evaluate Accuracy							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Evaluate Precision							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Field duplicates for Rad-226 not met; see below
Evaluate Representativeness							
Equipment Blanks (if applicable)	X		Non-detect (<RL)		X		Rad-228 detected in one field blank
QC Verification							
Verify Instrument Calibration & Analytical Process							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
Evaluate Completeness (# usable measurements/ # unusable measurements)							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

None.

Comments:

The RPDs for Rad-226 between parent sample MW-100C and field duplicate MWT-100C was 33%. Rad-226 required qualification as estimated with low bias (J-) in parent sample MW-100C and as estimated with high bias (J+) in field duplicate MWT-100C.

Rad-228 results in samples MW-100A, MW-100B, MW-100C, MW-100D, and MWT-100C required qualification as estimated with high bias (J+) due to Rad-226 detection in the associated field blank.



Lansing Board of Water and Light
Environmental Services Laboratory
1232 Haco Dr.
Lansing, Michigan 48901

20 November 2023

BWL - Erickson Station
Attn: Cheryl Loudon
3725 S. Canal
Lansing, MI 48917

Project: Erickson AM MI

Dear Cheryl Loudon,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

Work Order	Received	Account Number
L310247	10/17/2023 3:40:00PM	

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



Analytical Report

Client: BWL - Erickson Station
Address: 3725 S. Canal
 Lansing MI, 48917

Client Project Manager: Cheryl Louden

Report Date: 11/20/2023

Sample Name: MW-16A

Lab #: L310247-01 Ground Water

Collected: 17-Oct-23 10:46

By: Marc Wahrer

Analyte	Reporting		Units	Dilution	Regulatory	Analysis	By	Method	Notes
	Result	Limit			Limit				
Conductivity	2600	1.0	uS/cm	1		17-Oct-23 10:46	maw	FIELD	
Dissolved oxygen	ND	0.100	mg/L	1		17-Oct-23 10:46	maw	FIELD	
Milliliters Purged	200		ml/min	1		17-Oct-23 10:46	maw	FIELD	
Oxidation Reduction Potential	-3.100	-999.0	mV	1		17-Oct-23 10:46	maw	FIELD	
pH	6.8	7.0	pH Units	1		17-Oct-23 10:46	maw	FIELD	
Temperature	16		°C	1		17-Oct-23 10:46	maw	FIELD	
Turbidity	6.4	0.10	NTU	1		17-Oct-23 10:46	maw	FIELD	

Sample Name: MW-16B

Lab #: L310247-02 Ground Water

Collected: 17-Oct-23 12:36

By: Marc Wahrer

Analyte	Reporting		Units	Dilution	Regulatory	Analysis	By	Method	Notes
	Result	Limit			Limit				
Conductivity	6.3	1.0	uS/cm	1		17-Oct-23 12:36	maw	FIELD	
Dissolved oxygen	ND	0.100	mg/L	1		17-Oct-23 12:36	maw	FIELD	
Milliliters Purged	230		ml/min	1		17-Oct-23 12:36	maw	FIELD	
Oxidation Reduction Potential	-63.30	-999.0	mV	1		17-Oct-23 12:36	maw	FIELD	
pH	7.5	7.0	pH Units	1		17-Oct-23 12:36	maw	FIELD	
Temperature	14		°C	1		17-Oct-23 12:36	maw	FIELD	
Turbidity	1.3	0.10	NTU	1		17-Oct-23 12:36	maw	FIELD	

Sample Name: MW-16C

Lab #: L310247-03 Ground Water

Collected: 17-Oct-23 13:57

By: Marc Wahrer

Analyte	Reporting		Units	Dilution	Regulatory	Analysis	By	Method	Notes
	Result	Limit			Limit				
Conductivity	590	1.0	uS/cm	1		17-Oct-23 13:57	maw	FIELD	
Dissolved oxygen	ND	0.100	mg/L	1		17-Oct-23 13:57	maw	FIELD	
Milliliters Purged	230		ml/min	1		17-Oct-23 13:57	maw	FIELD	
Oxidation Reduction Potential	-92.60	-999.0	mV	1		17-Oct-23 13:57	maw	FIELD	
pH	7.4	7.0	pH Units	1		17-Oct-23 13:57	maw	FIELD	
Temperature	14		°C	1		17-Oct-23 13:57	maw	FIELD	
Turbidity	4.0	0.10	NTU	1		17-Oct-23 13:57	maw	FIELD	



Analytical Report

Client: BWL - Erickson Station
Address: 3725 S. Canal
 Lansing MI, 48917

Client Project Manager: Cheryl Louden

Report Date: 11/20/2023

Sample Name: MW-16D

Lab #: L310247-04 Ground Water

Collected: 17-Oct-23 11:47

By: Marc Wahrer

Analyte	Reporting		Units	Dilution	Regulatory	Analysis	By	Method	Notes
	Result	Limit			Limit	Date/Time			
Conductivity	610	1.0	uS/cm	1		17-Oct-23 11:47	maw	FIELD	
Dissolved oxygen	0.170	0.100	mg/L	1		17-Oct-23 11:47	maw	FIELD	
Milliliters Purged	50.0		ml/90sec	1		17-Oct-23 11:47	maw	FIELD	
Oxidation Reduction Potential	-103.6	-999.0	mV	1		17-Oct-23 11:47	maw	FIELD	
pH	7.5	7.0	pH Units	1		17-Oct-23 11:47	maw	FIELD	
Temperature	12		°C	1		17-Oct-23 11:47	maw	FIELD	
Turbidity	8.0	0.10	NTU	1		17-Oct-23 11:47	maw	FIELD	



Analytical Report

Client: BWL - Erickson Station

Client Project Manager: Cheryl Louden

Report Date: 11/20/2023

Address: 3725 S. Canal
Lansing MI, 48917

Approved By:

Jennifer Caporale

Notes and Definitions

- AL Action Level (Action Level = Regulatory Limit)
 - MCL Maximum Contaminant Level
 - PEL Permissible Exposure Limit (Permissible Exposure Limit = Regulatory Limit)
 - RPD Relative Percent Difference
 - OT Odor Threshold
 - ND Non Detect is less than the reporting limit value
- All drinking water regulatory limits are MCL's with the exception of Lead and Copper unless otherwise noted.



Report ID: S54642.01(03)
Generated on 11/17/2023
Replaces report S54642.01(02) generated on 10/20/2023

Report to
Attention: Jennifer Caporale
Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Report produced by
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Contacts for report questions:
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Report Summary
Lab Sample ID(s): S54642.01-S54642.06
Project: Erickson AM MI Wells 16A-16D
Collected Date(s): 10/17/2023
Submitted Date/Time: 10/18/2023 08:34
Sampled by: Marc Wahrer
P.O. #:

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Maya Murshak
Technical Director



General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

All accreditations/certifications held by this laboratory are listed on page 3. Not all accreditations/certifications are applicable to this report.

For a specific list of accredited analytes, please feel free to contact the laboratory or visit <https://www.meritlabs.com/certifications>.

Report Narrative

All analyses completed



Laboratory Accreditations

Authority	Accreditation ID
Michigan DEQ	#9956
DOD ELAP & ISO/IEC 17025:2017	#69699 PJLA Testing
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



Sample Summary (6 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S54642.01	MW-16A L310247-01	Groundwater	10/17/23 10:46
S54642.02	MW-16B L310247-02	Groundwater	10/17/23 12:36
S54642.03	MW-16C L310247-03	Groundwater	10/17/23 13:57
S54642.04	MW-16-D L310247-04	Groundwater	10/17/23 11:47
S54642.05	MWT-16A L310247-05	Groundwater	10/17/23 10:46
S54642.06	Field Blank L310247-06	Water	10/17/23 08:45



Analytical Laboratory Report

Lab Sample ID: S54642.01

Sample Tag: MW-16A L310247-01

Collected Date/Time: 10/17/2023 10:46

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.8	IR
2	1L Plastic	None	Yes	1.8	IR
1	250ml Plastic	HNO3	Yes	1.8	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	10/19/23 12:30	CTV	
Metal Digestion	Completed	SW3015A	10/19/23 11:10	CCM	

Inorganics

Method: E300.0, Run Date: 10/18/23 13:28, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 10/18/23 15:24, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	505	50	0.80	mg/L	50	16887-00-6	
Sulfate	257	50	3.0	mg/L	50	14808-79-8	

Method: SM2320B, Run Date: 10/18/23 15:10, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	520	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 10/19/23 15:12, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	732	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 10/18/23 20:20, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,720	50	12	mg/L	2		

Method: SM2540D, Run Date: 10/19/23 20:40, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	4.5	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 10/19/23 12:46, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.004	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.177	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.21	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S54642.01 (continued)

Sample Tag: MW-16A L310247-01

Method: E200.8, Run Date: 10/19/23 12:46, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	3.78	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 10/19/23 14:49, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	226	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	51.1	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.45	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	324	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 10/19/23 13:51, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 11/13/23 10:38, Analyst: EF

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S54642.02

Sample Tag: MW-16B L310247-02

Collected Date/Time: 10/17/2023 12:36

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.8	IR
2	1L Plastic	None	Yes	1.8	IR
1	250ml Plastic	HNO3	Yes	1.8	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	10/19/23 12:30	CTV	
Metal Digestion	Completed	SW3015A	10/19/23 11:10	CCM	

Inorganics

Method: E300.0, Run Date: 10/18/23 13:41, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	18	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 10/18/23 15:16, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	400	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 10/19/23 15:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	348	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 10/18/23 20:20, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	378	50	12	mg/L	2		

Method: SM2540D, Run Date: 10/19/23 20:40, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 10/19/23 12:50, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.089	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.11	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.45	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S54642.02 (continued)

Sample Tag: MW-16B L310247-02

Method: E200.8, Run Date: 10/19/23 12:50, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.020	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.007	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 10/19/23 14:51, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	85.4	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	34.5	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	2.80	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	11.1	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 10/19/23 13:54, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 11/13/23 10:38, Analyst: EF

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S54642.03

Sample Tag: MW-16C L310247-03

Collected Date/Time: 10/17/2023 13:57

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.8	IR
2	1L Plastic	None	Yes	1.8	IR
1	250ml Plastic	HNO3	Yes	1.8	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	10/19/23 12:30	CTV	
Metal Digestion	Completed	SW3015A	10/19/23 11:10	CCM	

Inorganics

Method: E300.0, Run Date: 10/18/23 13:54, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	8	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 10/18/23 15:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	410	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 10/19/23 15:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	304	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 10/18/23 20:20, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	332	50	12	mg/L	2		

Method: SM2540D, Run Date: 10/19/23 20:40, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	1.4	3	1	mg/L	1		b

Metals

Method: E200.8, Run Date: 10/19/23 12:53, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.031	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.40	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL



Analytical Laboratory Report

Final Report

Lab Sample ID: S54642.03 (continued)

Sample Tag: MW-16C L310247-03

Method: E200.8, Run Date: 10/19/23 12:53, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	0.47	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.026	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 10/19/23 14:52, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	77.1	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	30.5	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	4.75	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	15.7	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 10/19/23 13:58, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 11/13/23 10:38, Analyst: EF

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Lab Sample ID: S54642.04

Sample Tag: MW-16-D L310247-04

Collected Date/Time: 10/17/2023 11:47

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.8	IR
2	1L Plastic	None	Yes	1.8	IR
1	250ml Plastic	HNO3	Yes	1.8	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	10/19/23 12:30	CTV	
Metal Digestion	Completed	SW3015A	10/19/23 11:10	CCM	

Inorganics

Method: E300.0, Run Date: 10/18/23 14:07, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	7	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	5	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 10/18/23 15:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	390	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 10/19/23 15:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	105	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 10/18/23 20:20, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	380	50	12	mg/L	2		

Method: SM2540D, Run Date: 10/19/23 20:40, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	12.0	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 10/19/23 12:56, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.004	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.035	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	4.62	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	0.45	0.02	0.00192	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S54642.04 (continued)

Sample Tag: MW-16-D L310247-04

Method: E200.8, Run Date: 10/19/23 12:56, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	0.030	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	0.011	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	0.023	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 10/19/23 14:54, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	30.5	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	7.69	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	9.18	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	116	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 10/19/23 14:08, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 11/13/23 10:38, Analyst: EF

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Lab Sample ID: S54642.05

Sample Tag: MWT-16A L310247-05

Collected Date/Time: 10/17/2023 10:46

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.8	IR
2	1L Plastic	None	Yes	1.8	IR
1	250ml Plastic	HNO3	Yes	1.8	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	10/19/23 12:30	CTV	
Metal Digestion	Completed	SW3015A	10/19/23 11:10	CCM	

Inorganics

Method: E300.0, Run Date: 10/18/23 14:19, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 10/18/23 15:37, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	505	50	0.80	mg/L	50	16887-00-6	
Sulfate	257	50	3.0	mg/L	50	14808-79-8	

Method: SM2320B, Run Date: 10/18/23 15:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	510	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 10/19/23 15:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	724	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 10/18/23 20:20, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,730	50	12	mg/L	2		

Method: SM2540D, Run Date: 10/19/23 20:40, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	4.5	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 10/19/23 13:00, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.004	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.181	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.21	0.04	0.00175	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000190	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.0000965	mg/L	5	7440-47-3	



Analytical Laboratory Report

Final Report

Lab Sample ID: S54642.05 (continued)

Sample Tag: MWT-16A L310247-05

Method: E200.8, Run Date: 10/19/23 13:00, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Cobalt	Not detected	0.005	0.000108	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000377	mg/L	5	7440-50-8	
Iron	3.81	0.02	0.00192	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000190	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00163	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.000217	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.000250	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00209	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.0000675	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.0000855	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.000139	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.000730	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 10/19/23 14:55, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	226	0.50	0.0435	mg/L	5	7440-70-2	
Magnesium	51.7	0.50	0.0120	mg/L	5	7439-95-4	
Potassium	1.40	0.50	0.0230	mg/L	5	7440-09-7	
Sodium	322	0.50	0.00850	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 10/19/23 14:11, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 11/13/23 10:38, Analyst: EF

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S54642.06

Sample Tag: Field Blank L310247-06

Collected Date/Time: 10/17/2023 08:45

Matrix: Water

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.8	IR
2	1L Plastic	None	Yes	1.8	IR
1	250ml Plastic	HNO3	Yes	1.8	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	10/19/23 12:30	CTV	
Metal Digestion	Completed	SW3015A	10/19/23 11:10	CCM	

Inorganics

Method: E300.0, Run Date: 10/18/23 14:32, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 10/18/23 15:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 10/19/23 15:26, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 10/18/23 20:20, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	12	mg/L	2		

Method: SM2540D, Run Date: 10/19/23 20:40, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 10/19/23 12:43, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00102	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000102	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.0000648	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000862	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.000702	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.0000760	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.0000386	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.0000434	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000150	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.000768	mg/L	2	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S54642.06 (continued)

Sample Tag: Field Blank L310247-06

Method: E200.8, Run Date: 10/19/23 12:43, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.0000760	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000654	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.0000868	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000100	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.000838	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.0000270	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.0000342	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.0000558	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.000292	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 10/19/23 14:48, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0174	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.00480	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.00920	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.00340	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 10/19/23 14:14, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 11/13/23 10:38, Analyst: EF

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

Merit Laboratories Login Checklist

Lab Set ID:S54642

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 16A-16D

Submitted: 10/18/2023 08:34 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Selection	Description	Note
Sample Receiving		
01.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples are received at 4C +/- 2C Thermometer # IR 1.8
02.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Received on ice/ cooling process begun
03.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples shipped
04.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples left in 24 hr. drop box
05.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Are there custody seals/tape or is the drop box locked
Chain of Custody		
06.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC adequately filled out
07.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	COC signed and relinquished to the lab
08.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sample tag on bottles match COC
09.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Subcontracting needed? Subcontracted to: GEL
Preservation		
10.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Do sample have correct chemical preservation
11.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Completed pH checks on preserved samples? (no VOAs)
12.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Did any samples need to be preserved in the lab?
Bottle Conditions		
13.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	All bottles intact
14.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Appropriate analytical bottles are used
15.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Merit bottles used
16.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Sufficient sample volume received
17.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	Samples require laboratory filtration
18.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Samples submitted within holding time
19.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S54642 Submitted: 10/18/2023 08:34

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 16A-16D

Attention: Jennifer Caporale
Address: Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Initial Preservation Check: 10/18/2023 11:53 MMC

Preservation Recheck (E200.8): N/A

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S54642.01	1L Plastic HNO3	<2			
S54642.01	1L Plastic HNO3	<2			
S54642.01	250ml Plastic HNO3	<2			
S54642.02	1L Plastic HNO3	<2			
S54642.02	1L Plastic HNO3	<2			
S54642.02	250ml Plastic HNO3	<2			
S54642.03	1L Plastic HNO3	<2			
S54642.03	1L Plastic HNO3	<2			
S54642.03	250ml Plastic HNO3	<2			
S54642.04	1L Plastic HNO3	<2			
S54642.04	1L Plastic HNO3	<2			
S54642.04	250ml Plastic HNO3	<2			
S54642.05	1L Plastic HNO3	<2			
S54642.05	1L Plastic HNO3	<2			
S54642.05	250ml Plastic HNO3	<2			
S54642.06	1L Plastic HNO3	<2			
S54642.06	1L Plastic HNO3	<2			
S54642.06	250ml Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823
 Phone (517) 332-0167 Fax (517) 332-4034
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

REPORT TO **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME **Jennifer Caporale**
 COMPANY **Lansing Board of Water and Light**
 ADDRESS **PO Box 13007 48901-3007**
 CITY **Lansing** STATE **MI** ZIP CODE **48901**
 PHONE NO. **517-702-6372** FAX NO. P.O. NO.
 E-MAIL ADDRESS **Environmental_Laboratory@lbwl.com** QUOTE NO.

CONTACT NAME **Beth Zimpfer** SAME
 COMPANY
 ADDRESS
 CITY STATE ZIP CODE
 PHONE NO. E-MAIL ADDRESS **Beth.Zimpfer@lbwl.com**

PROJECT NO./NAME **Erickson AM MI Wells 16A-16D** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**
 TURNAROUND TIME REQUIRED 1 DAY 2 DAYS 3 DAYS STANDARD OTHER **ASAP**
 DELIVERABLES REQUIRED STD LEVEL II LEVEL III LEVEL IV EDD OTHER

MATRIX GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID
 CODE: SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO ₃	H ₂ SO ₄	NaOH	MeOH	OTHER	Total Metals	F- undistilled, Cl-, SO ₄ , TDS	Radium 226	Radium 228	TSS	HCO ₃ , CO ₃ , Hardness	Certifications		Project Locations		Special Instructions
	DATE	TIME																	<input type="checkbox"/> OHIO VAP	<input type="checkbox"/> Drinking Water	<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES	
54642.01	10/17/23	1046	MW-16A L310247-01	GW	5	2	3						✓	✓	✓	✓	✓	✓		<input type="checkbox"/>	<input type="checkbox"/>	Metals to analyse: Na, Mg, K	
02	10/17/23	1236	MW-16B L310247-02	GW	5	2	3						✓	✓	✓	✓	✓	✓		<input type="checkbox"/>	<input type="checkbox"/>	B, Ca, Sb, As, Ba, Be, Cd, Cr,	
03	10/17/23	1357	MW-16C L310247-03	GW	5	2	3						✓	✓	✓	✓	✓	✓		<input type="checkbox"/>	<input type="checkbox"/>	Co, Li, Hg, Mo, Pb, Se, Tl,	
04	10/17/23	1147	MW16-D L310247-04	GW	5	2	3						✓	✓	✓	✓	✓	✓		<input type="checkbox"/>	<input type="checkbox"/>	Fe, Cu, Ni, Ag, V, Zn	
05	10/17/23	1046	MWT-16A L310247-05	GW	5	2	3						✓	✓	✓	✓	✓	✓		<input type="checkbox"/>	<input type="checkbox"/>	Please send a preliminary report	
06	10/17/23	0845	Field Blank L310247-06	DI	5	2	3						✓	✓	✓	✓	✓	✓		<input type="checkbox"/>	<input type="checkbox"/>		

RELINQUISHED BY: *Julie Mahoney* Sampler DATE **10/18/23** TIME **0831**
 SIGNATURE/ORGANIZATION
 RECEIVED BY: *M. Dilco* DATE **10/18/23** TIME **0834**
 SIGNATURE/ORGANIZATION

RELINQUISHED BY: DATE TIME
 SIGNATURE/ORGANIZATION
 RECEIVED BY: DATE TIME
 SIGNATURE/ORGANIZATION

SEAL NO. SEAL INTACT INITIALS
 YES NO

SEAL NO. SEAL INTACT INITIALS
 YES NO

NOTES: TEMP. ON ARRIVAL **1.8**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total		250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005

November 13, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 642209
SDG: S54642

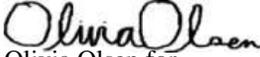
Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on October 20, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,


Olivia Olsen for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S54642
Work Order: 642209**

November 13, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on October 20, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
642209001	S54642.01
642209002	S54642.02
642209003	S54642.03
642209004	S54642.04
642209005	S54642.05
642209006	S54642.06 Field Blank

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.


Olivia Olsen for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

SAMPLE RECEIPT & REVIEW FORM

DS

Client: <u>MERI</u>		SDG/AR/COC/Work Order: <u>642209</u>
Received By: <u>JW</u>		Date Received: <u>10-20-23</u>
Carrier and Tracking Number		Circle Applicable: FedEx Express FedEx Ground <u>UPS</u> Field Services Courier Other <u>1246647703 63864034</u>
Suspected Hazard Information	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
A) Shipped as a DOT Hazardous?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples are to be received as radioactive?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM mR/hr Classified as: Rad 1 Rad 2 Rad 3
D) Did the client designate samples are hazardous?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	If D or E is yes, select Hazards below. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other: _____
Sample Receipt Criteria		Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA <input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA <input type="checkbox"/>	Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?* <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA <input type="checkbox"/>	Preservation Method: Wet Ice Ice Packs Dry Ice <u>None</u> Other: _____ *all temperatures are recorded in Celsius TEMP: <u>19</u>
4	Daily check performed and passed on IR temperature gun? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA <input type="checkbox"/>	Temperature Device Serial #: <u>FE2-63</u> Secondary Temperature Device Serial # (If Applicable): _____
5	Sample containers intact and sealed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA <input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA <input type="checkbox"/>	Sample ID's and Containers Affected: <u>354642.01 (2 containers) 354642.06 (1 container)</u>
7	Do any samples require Volatile Analysis? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA <input type="checkbox"/>	If Yes, are Enclosures or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer) Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (if unknown, select No) Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected: _____
8	Samples received within holding time? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA <input type="checkbox"/>	ID's and tests affected: _____
9	Sample ID's on COC match ID's on bottles? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA <input type="checkbox"/>	ID's and containers affected: _____
10	Date & time on COC match date & time on bottles? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA <input type="checkbox"/>	Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
11	Number of containers received match number indicated on COC? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA <input type="checkbox"/>	Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA <input type="checkbox"/>	
13	COC form is properly signed in relinquished/received sections? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA <input type="checkbox"/>	Circle Applicable: Not relinquished Other (describe)
Comments: (Use Continuation Form if needed):		

PM (or PMA) review Initials 00 Date 10/23/23 Page 1 of 1

Laboratory Certifications

List of current GEL Certifications as of 13 November 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-00651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	KY90129
Kentucky Wastewater	KY90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2023019
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122024-04
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2023-152
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-23-21
Utah NELAP	SC000122023-38
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S54642
Work Order #: 642209**

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2515277

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
642209001	S54642.01
642209002	S54642.02
642209003	S54642.03
642209004	S54642.04
642209005	S54642.05
642209006	S54642.06 Field Blank
1205558585	Method Blank (MB)
1205558586	642149001(NonSDG) Sample Duplicate (DUP)
1205558587	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

Method Blank Criteria

The blank result (See Below) is greater than the MDC but less than the required detection limit.

Sample	Analyte	Value
1205558585 (MB)	Radium-228	Result: 0.671 pCi/L > MDA: 0.645 pCi/L <= RDL: 3.00 pCi/L

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2515281

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
642209001	S54642.01
642209002	S54642.02
642209003	S54642.03
642209004	S54642.04
642209005	S54642.05
642209006	S54642.06 Field Blank
1205558596	Method Blank (MB)
1205558597	642149001(NonSDG) Sample Duplicate (DUP)
1205558598	642149001(NonSDG) Matrix Spike (MS)
1205558599	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

The matrix spike, 1205558598 (Non SDG 642149001MS), aliquot was reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S54642 GEL Work Order: 642209

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Kate Gellatly

Date: 17 NOV 2023

Title: Analyst 1 PT

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 17, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S54642.01 Project: MERI00120
Sample ID: 642209001 Client ID: MERI001
Matrix: Ground Water
Collect Date: 17-OCT-23 10:46
Receive Date: 20-OCT-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		2.26	+/-1.42	2.16	3.00	pCi/L		JE1	11/06/23	0837	2515277	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		3.15	+/-1.48			pCi/L		NXL1	11/13/23	1038	2522341	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.892	+/-0.399	0.411	1.00	pCi/L		LXP1	11/07/23	1007	2515281	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			62.2	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 17, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S54642.02 Project: MERI00120
Sample ID: 642209002 Client ID: MERI001
Matrix: Ground Water
Collect Date: 17-OCT-23 12:36
Receive Date: 20-OCT-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		4.87	+/-1.60	1.99	3.00	pCi/L		JE1	11/06/23	0837	2515277	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		6.43	+/-1.67			pCi/L		NXL1	11/13/23	1038	2522341	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		1.56	+/-0.476	0.277	1.00	pCi/L		LXP1	11/07/23	1007	2515281	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			65.8	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 17, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S54642.03 Project: MERI00120
Sample ID: 642209003 Client ID: MERI001
Matrix: Ground Water
Collect Date: 17-OCT-23 13:57
Receive Date: 20-OCT-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		2.16	+/-1.30	1.93	3.00	pCi/L		JE1	11/06/23	0837	2515277	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		2.26	+/-1.31			pCi/L		NXL1	11/13/23	1038	2522341	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.101	+/-0.147	0.257	1.00	pCi/L		LXP1	11/07/23	1046	2515281	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			64.4	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 17, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S54642.04	Project: MERI00120
Sample ID: 642209004	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 17-OCT-23 11:47	
Receive Date: 20-OCT-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		2.25	+/-1.05	1.37	3.00	pCi/L		JE1	11/06/23	0837	2515277	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		2.85	+/-1.11			pCi/L		NXL1	11/13/23	1038	2522341	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.593	+/-0.368	0.502	1.00	pCi/L		LXP1	11/07/23	1046	2515281	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			72.8	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 17, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S54642.05 Project: MERI00120
Sample ID: 642209005 Client ID: MERI001
Matrix: Ground Water
Collect Date: 17-OCT-23 10:46
Receive Date: 20-OCT-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228		2.85	+/-1.20	1.54	3.00	pCi/L		JE1		11/06/23	0837	2515277	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		3.53	+/-1.24			pCi/L		NXL1		11/13/23	1038	2522341	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.682	+/-0.332	0.290	1.00	pCi/L		LXP1		11/07/23	1046	2515281	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			67.9	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 17, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S54642.06 Field Blank Project: MERI00120
Sample ID: 642209006 Client ID: MERI001
Matrix: Ground Water
Collect Date: 17-OCT-23 08:45
Receive Date: 20-OCT-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	2.18	+/-1.51	2.40	3.00	pCi/L		JE1	11/06/23	0837	2515277		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		2.43	+/-1.54			pCi/L		NXL1	11/13/23	1038	2522341		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.248	+/-0.325	0.555	1.00	pCi/L		LXP1	11/07/23	1046	2515281		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			76.2	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: November 17, 2023

Page 1 of 2

Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan

Contact: John Laverty

Workorder: 642209

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2515277										
QC1205558586	642149001	DUP									
Radium-228		2.29		2.08	pCi/L	9.2		(0% - 100%)	JE1	11/06/23	08:37
	Uncertainty	+/-1.09		+/-1.17							
QC1205558587	LCS										
Radium-228	26.1			24.7	pCi/L		94.6	(75%-125%)		11/06/23	08:37
	Uncertainty			+/-1.44							
QC1205558585	MB										
Radium-228				0.671	pCi/L					11/06/23	08:36
	Uncertainty			+/-0.424							
Rad Ra-226											
Batch	2515281										
QC1205558597	642149001	DUP									
Radium-226		0.308		0.478	pCi/L	43.4		(0% - 100%)	LXP1	11/07/23	10:46
	Uncertainty	+/-0.222		+/-0.297							
QC1205558599	LCS										
Radium-226	27.0			25.9	pCi/L		95.9	(75%-125%)		11/07/23	11:28
	Uncertainty			+/-1.94							
QC1205558596	MB										
Radium-226			U	0.176	pCi/L					11/07/23	10:46
	Uncertainty			+/-0.182							
QC1205558598	642149001	MS									
Radium-226	127	0.308		106	pCi/L		83.7	(75%-125%)		11/07/23	11:28
	Uncertainty	+/-0.222		+/-7.92							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- H Analytical holding time was exceeded
- < Result is less than value reported
- > Result is greater than value reported

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QC Summary

Workorder: 642209

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Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
NI											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2515277 Check-list

This check-list was completed on 06-NOV-23 by Nat Long

This batch was reviewed by Kenshalla Oston on 06-NOV-23 and Nat Long on 06-NOV-23.

Batch ID:
2515277

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?		No	
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
11	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
12	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2515277
Analyst: Jacqueline Winston (JE1)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: SP-C018367602

Due Dates for Lab: 12-NOV-2023			Package: 16-NOV-2023	SDG: 14-NOV-2023		
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205558587	Radium 228	2051-D	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	642149001	02-NOV-2023	3	301.9	301.9	11/03/23 12:07	11/06/23 06:43
2	642149002	02-NOV-2023	3	300.4	300.4	11/03/23 12:07	11/06/23 06:43
3	642209001	02-NOV-2023	3	301.9	301.9	11/03/23 12:07	11/06/23 06:43
4	642209002	02-NOV-2023	3	302.6	302.6	11/03/23 12:07	11/06/23 06:43
5	642209003	02-NOV-2023	3	303.1	303.1	11/03/23 12:07	11/06/23 06:43
6	642209004	02-NOV-2023	3	301.9	301.9	11/03/23 12:07	11/06/23 06:43
7	642209005	02-NOV-2023	3	306.1	306.1	11/03/23 12:07	11/06/23 06:43
8	642209006	02-NOV-2023	3	302.8	302.8	11/03/23 12:07	11/06/23 06:43
9	642355001	02-NOV-2023	1	902	902	11/03/23 12:07	11/06/23 06:43
10	642902001	02-NOV-2023	3	308.2	308.2	11/03/23 12:07	11/06/23 06:43
11	1205558585 MB	02-NOV-2023	1		902	11/03/23 12:07	11/06/23 06:43
12	1205558586 DUP (642149001)	02-NOV-2023	3	300.8	300.8	11/03/23 12:07	11/06/23 06:43
13	1205558587 LCS	02-NOV-2023	1		902	11/03/23 12:07	11/06/23 06:43

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 2097-B	Ba-133 Tracer	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 02-NOV-2023 00:00
REGNT 4051445	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3956035	Barium Carrier Ra228 REG	1 mL	
REGNT 3975318	RGF-1M Citric Acid	5 mL	
REGNT 4046036	2M HCl	20 mL	
REGNT 4047477	RGF-50% Potassium Carbonate	2 mL	
REGNT 4052116	RGF-7M Nitric Acid	25 mL	
REGNT 4047695.1	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3973411.6	RGF-Hydrofluoric Acid	4 mL	
REGNT 3963747	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3979805	RGF-Neodymium Substrate	5 mL	
REGNT 4049676	Nitric Acid	5 mL	
REGNT DGA092223	2503404	2 g	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 2097-B
 Tracer Exp Date : 7/12/2024
 Tracer Volume Added: 0.10

Batch : 2515277
 Analyst : JAC02417
 Prep Date : 11/2/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 1 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	642149001.1	0.3019	1.8491E-05	10/17/2023 13:30	1031.0	1.80%	906.7	1.92%	0.1	0.000200
2	642149002.1	0.3004	1.8466E-05	10/17/2023 14:05	1031.0	1.80%	639.0	2.28%	0.1	0.000200
3	642209001.1	0.3019	1.8491E-05	10/17/2023 10:46	1031.0	1.80%	640.9	2.28%	0.1	0.000200
4	642209002.1	0.3026	1.8503E-05	10/17/2023 12:36	1031.0	1.80%	678.6	2.22%	0.1	0.000200
5	642209003.1	0.3031	1.8511E-05	10/17/2023 13:57	1031.0	1.80%	663.9	2.24%	0.1	0.000200
6	642209004.1	0.3019	1.8491E-05	10/17/2023 11:47	1031.0	1.80%	750.7	2.11%	0.1	0.000200
7	642209005.1	0.3061	1.8561E-05	10/17/2023 10:46	1031.0	1.80%	700.2	2.18%	0.1	0.000200
8	642209006.1	0.3028	1.8506E-05	10/17/2023 8:45	1031.0	1.80%	785.3	2.06%	0.1	0.000200
9	642355001.1	0.9020	2.0763E-05	10/19/2023 10:45	1031.0	1.80%	719.2	2.15%	0.1	0.000200
10	642902001.1	0.3082	1.8595E-05	10/24/2023 9:10	1031.0	1.80%	746.6	2.11%	0.1	0.000200
11	1205558585.1	0.9020	2.0763E-05	11/2/2023 0:00	1031.0	1.80%	719.3	2.15%	0.1	0.000200
12	1205558586.1	0.3008	1.8473E-05	10/17/2023 13:30	1031.0	1.80%	731.5	2.13%	0.1	0.000200
13	1205558587.1	0.9020	2.0763E-05	11/2/2023 0:00	1031.0	1.80%	817.4	2.02%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
			Alpha	Beta										
1	8B	60	21	85	1.417	11/6/2023 8:37	11/3/2023 12:07	11/6/2023 6:43	0.993	0.806	0.999	1.057	87.9%	2.65%
2	8C	60	15	78	1.300	11/6/2023 8:37	11/3/2023 12:07	11/6/2023 6:43	0.993	0.806	0.999	1.057	62.0%	2.92%
3	9A	60	19	73	1.217	11/6/2023 8:37	11/3/2023 12:07	11/6/2023 6:43	0.993	0.806	0.999	1.057	62.2%	2.92%
4	9C	60	20	108	1.800	11/6/2023 8:37	11/3/2023 12:07	11/6/2023 6:43	0.993	0.806	0.999	1.057	65.8%	2.87%
5	9D	60	22	65	1.083	11/6/2023 8:37	11/3/2023 12:07	11/6/2023 6:43	0.993	0.806	0.999	1.057	64.4%	2.89%
6	10A	60	15	55	0.917	11/6/2023 8:37	11/3/2023 12:07	11/6/2023 6:43	0.993	0.806	0.999	1.057	72.8%	2.79%
7	10C	60	14	65	1.083	11/6/2023 8:37	11/3/2023 12:07	11/6/2023 6:43	0.993	0.806	0.999	1.057	67.9%	2.84%
8	10D	60	12	126	2.100	11/6/2023 8:37	11/3/2023 12:07	11/6/2023 6:43	0.993	0.806	0.999	1.057	76.2%	2.75%
9	12A	60	12	92	1.533	11/6/2023 8:37	11/3/2023 12:07	11/6/2023 6:43	0.994	0.807	0.999	1.057	69.8%	2.82%
10	12C	60	16	87	1.450	11/6/2023 8:37	11/3/2023 12:07	11/6/2023 6:43	0.996	0.807	0.999	1.057	72.4%	2.79%
11	13A	60	13	72	1.200	11/6/2023 8:36	11/3/2023 12:07	11/6/2023 6:43	0.999	0.807	0.999	1.057	69.8%	2.82%
12	13B	60	23	66	1.100	11/6/2023 8:37	11/3/2023 12:07	11/6/2023 6:43	0.993	0.807	0.999	1.057	71.0%	2.80%
13	14A	60	8	1187	19.783	11/6/2023 8:37	11/3/2023 12:07	11/6/2023 6:43	0.999	0.807	0.999	1.057	79.3%	2.72%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2023	5/31/2024	0.6270	0.02148	0.777	11/3/2023 18:35	1000
2	PIC	6/1/2023	5/31/2024	0.5662	0.01955	0.579	11/3/2023 18:35	1000
3	PIC	6/1/2023	5/31/2024	0.6343	0.00758	0.765	11/3/2023 18:35	1000
4	PIC	6/1/2023	5/31/2024	0.6429	0.00584	0.752	11/3/2023 18:35	1000
5	PIC	6/1/2023	5/31/2024	0.6292	0.02610	0.637	11/3/2023 18:35	1000
6	PIC	6/1/2023	5/31/2024	0.6356	0.00651	0.388	11/3/2023 18:35	1000
7	PIC	6/1/2023	5/31/2024	0.6368	0.00638	0.450	11/3/2023 18:35	1000
8	PIC	6/1/2023	5/31/2024	0.6415	0.00557	1.559	11/3/2023 18:35	1000
9	PIC	6/1/2023	5/31/2024	0.6537	0.01964	1.020	11/3/2023 18:50	1000
10	PIC	6/1/2023	5/31/2024	0.6434	0.01666	0.500	11/3/2023 18:50	1000
11	PIC	6/1/2023	5/31/2024	0.6259	0.00714	0.753	11/3/2023 18:50	1000
12	PIC	6/1/2023	5/31/2024	0.6399	0.00967	0.621	11/3/2023 18:50	1000
13	PIC	6/1/2023	5/31/2024	0.6482	0.02119	0.412	11/3/2023 18:50	1000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
 Spike Exp Date : N/A
 Spike Activity (dpm/ml): N/A
 Spike Volume Added: N/A

LCS S/N : 2051-D
 LCS Exp Date : 7/12/2024
 LCS Activity (dpm/ml): 523.00
 LCS Volume Added: 0.10

Results																	
Pos.	Decision	Critical	Required	Sample Act.		Net Count	Net Count	2 SIGMA		2 SIGMA		Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
	Level pCi/L	Level pCi/L	MDA pCi/L	MDA pCi/L	Conc. pCi/L	Error %	Rate CPM	Rate Error CPM	Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L							
1	0.9753	0.6886	3	1.5558	2.2853	24.65%	0.6397	0.1562	1.0935	1.2417		SAMPLE					
2	1.3299	0.9390	3	2.1601	4.0691	20.98%	0.7210	0.1491	1.6498	1.9553		SAMPLE					
3	1.3539	0.9558	3	2.1616	2.2575	32.26%	0.4517	0.1451	1.4211	1.5336		SAMPLE					
4	1.2481	0.8812	3	1.9947	4.8704	16.99%	1.0480	0.1754	1.5973	2.0236		SAMPLE					
5	1.1979	0.8457	3	1.9338	2.1631	30.88%	0.4463	0.1367	1.2987	1.4152		SAMPLE					
6	0.8219	0.5803	3	1.3735	2.2524	23.85%	0.5287	0.1252	1.0452	1.1924		SAMPLE					
7	0.9342	0.6596	3	1.5440	2.8480	21.68%	0.6333	0.1360	1.1990	1.4018		SAMPLE					
8	1.5561	1.0987	3	2.3985	2.1772	35.45%	0.5410	0.1912	1.5082	1.6068		SAMPLE					
9	0.4518	0.3190	1	0.7101	0.7415	31.94%	0.5133	0.1630	0.4615	0.4994		SAMPLE					
10	0.9047	0.6387	3	1.4840	3.9247	16.85%	0.9500	0.1571	1.2717	1.6221		SAMPLE					
11	0.4033	0.2847	1	0.6445	0.6708	32.36%	0.4470	0.1441	0.4237	0.4570		MB					
12	1.0619	0.7497	3	1.7171	2.0843	28.89%	0.4790	0.1377	1.1742	1.2891	642149001.1	DUP	9.2%				
13	0.2536	0.1790	1	0.4219	24.7128	4.55%	19.3713	0.5746	1.4367	6.5250		LCS			26.1181	94.6%	

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
642149001	8B	60	21	85	11/6/2023 8:37	11/6/2023 9:37	PIC	2515277
642149002	8C	60	15	78	11/6/2023 8:37	11/6/2023 9:37	PIC	2515277
642209001	9A	60	19	73	11/6/2023 8:37	11/6/2023 9:37	PIC	2515277
642209002	9C	60	20	108	11/6/2023 8:37	11/6/2023 9:37	PIC	2515277
642209003	9D	60	22	65	11/6/2023 8:37	11/6/2023 9:37	PIC	2515277
642209004	10A	60	15	55	11/6/2023 8:37	11/6/2023 9:37	PIC	2515277
642209005	10C	60	14	65	11/6/2023 8:37	11/6/2023 9:37	PIC	2515277
642209006	10D	60	12	126	11/6/2023 8:37	11/6/2023 9:37	PIC	2515277
642355001	12A	60	12	92	11/6/2023 8:37	11/6/2023 9:37	PIC	2515277
642902001	12C	60	16	87	11/6/2023 8:37	11/6/2023 9:37	PIC	2515277
1205558585	13A	60	13	72	11/6/2023 8:36	11/6/2023 9:36	PIC	2515277
1205558586	13B	60	23	66	11/6/2023 8:37	11/6/2023 9:37	PIC	2515277
1205558587	14A	60	8	1187	11/6/2023 8:37	11/6/2023 9:37	PIC	2515277

ASSAY 6-Nov-23 7:16:16
 Wizard 2480 s/n 46190630
 Protocol id 8 Ba-133
 Time limit
 Count limit
 Isotope Ba-133
 Protocol date 11/6/2023
 Run id. 7515

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	87	1	180	3093.28	1030.99	1.8	07:16:16
642149001	2	87	2	180	2720.57	906.73	1.92	87.95	07:19:30
642149002	3	87	3	180	1917.28	638.97	2.28	61.98	07:22:46
642209001	4	87	4	180	1923	640.9	2.28	62.16	07:26:00
642209002	5	87	5	180	2036.28	678.62	2.22	65.82	07:29:14
642209003	1	18	1	180	1992	663.89	2.24	64.39	07:32:50
642209004	2	18	2	180	2252.28	750.66	2.11	72.81	07:36:04
642209005	3	18	3	180	2101	700.24	2.18	67.92	07:39:17
642209006	4	18	4	180	2356.28	785.26	2.06	76.17	07:42:31
642355001	5	18	5	180	2158	719.16	2.15	69.75	07:45:46
642902001	1	14	1	180	2240.28	746.62	2.11	72.42	07:49:21
1205558585	2	14	2	180	2158	719.26	2.15	69.76	07:52:35
1205558586	3	14	3	180	2195	731.53	2.13	70.95	07:55:49
1205558587	4	14	4	180	2452.57	817.37	2.02	79.28	07:59:03

END OF ASSAY

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 06-Nov-2023

Detectors LB4100 E1 through H4 and PIC 1A through 14D and G5400W 1W through 1Z and LB4200 GA1 through OD4

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100F3	need 2nd	Beta bkg	06-Nov 04:44	60	1.683	0.391	2.943	+0.04
LB4100H1	Above	Alpha bkg	06-Nov 04:44	60	0.317	-8.08E-2	0.225	+4.79
LB4100H1	Above	Beta bkg	06-Nov 04:44	60	3.033	-5.15E-1	3.743	+2.00
LB4200GB2	Below	Alpha eff	06-Nov 06:50	5	9424	9443	9898	-3.26
LB4200GB2	Above	Beta bkg	06-Nov 13:21	60	57.317	0.129	1.304	+288.90
LB4200GD4	Above	Alpha bkg	06-Nov 07:51	60	0.550	-1.32E-1	0.391	+4.82
LB4200GD4	Above	Beta bkg	06-Nov 07:51	60	2.000	-1.41E-1	1.764	+3.74
LB4200OA1	Above	Alpha bkg	06-Nov 14:59	60	1.150	-7.38E-2	0.224	+21.64
LB4200OA1	Above	Beta bkg	06-Nov 14:59	60	3.367	0.072	1.280	+13.37
LB4200OA2	Above	Alpha bkg	06-Nov 14:59	60	1.000	-1.24E-1	0.312	+12.46
LB4200OA2	Above	Beta bkg	06-Nov 14:59	60	2.900	-9.49E-2	1.579	+7.73
LB4200OA3	Above	Alpha bkg	06-Nov 14:59	60	0.817	-1.47E-1	0.374	+8.09
LB4200OA3	Above	Beta bkg	06-Nov 14:59	60	2.333	-6.11E-2	1.607	+5.61
LB4200OA4	Above	Alpha bkg	06-Nov 14:59	60	0.700	-1.17E-1	0.332	+7.91
LB4200OA4	Above	Beta bkg	06-Nov 14:59	60	2.050	0.068	1.430	+5.73
LB4200OB1	Above	Alpha bkg	06-Nov 14:59	60	0.317	-4.15E-2	0.271	+3.87
LB4200OB2	Above	Alpha bkg	06-Nov 14:59	60	0.517	-1.07E-1	0.326	+5.64
LB4200OC2	Above	Alpha bkg	06-Nov 13:16	60	0.383	-1.16E-1	0.389	+2.94
LB4200OC2	Above	Beta bkg	06-Nov 13:16	60	2.633	0.016	2.057	+4.69
PIC11B	Above	Alpha XTalk	06-Nov 15:20	5	0.307	0.260	0.302	+3.72
PIC11B	Below	Beta eff	06-Nov 15:07	5	19690	20200	22170	-4.55
PIC11C	Above	Alpha XTalk	06-Nov 15:20	5	0.332	0.273	0.298	+11.53
PIC11C	Below	Beta eff	06-Nov 15:07	5	19941	20420	21770	-5.13
PIC12B	Above	Alpha bkg	06-Nov 06:35	60	0.417	-8.27E-2	0.413	+3.04
PIC12B	Above	Beta bkg	06-Nov 06:35	60	18.833	-5.75E-1	2.641	+33.21

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

PIC5B Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

PIC10B

Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by Jc Poparad

Date 11/6/23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2515277

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
1205558585	MB	JE1	PIC13A	NOV-06-23 08:36:51	DONE	25mm Filter	01-JUN-23 00:00
1205558586	DUP	JE1	PIC13B	NOV-06-23 08:37:03	DONE	25mm Filter	01-JUN-23 00:00
1205558587	LCS	JE1	PIC14A	NOV-06-23 08:37:06	DONE	25mm Filter	01-JUN-23 00:00
642355001	SAMPLE	JE1	PIC12A	NOV-06-23 08:37:13	DONE	25mm Filter	01-JUN-23 00:00
642902001	SAMPLE	JE1	PIC12C	NOV-06-23 08:37:18	DONE	25mm Filter	01-JUN-23 00:00
642149001	SAMPLE	JE1	PIC8B	NOV-06-23 08:37:30	DONE	25mm Filter	01-JUN-23 00:00
642149002	SAMPLE	JE1	PIC8C	NOV-06-23 08:37:35	DONE	25mm Filter	01-JUN-23 00:00
642209001	SAMPLE	JE1	PIC9A	NOV-06-23 08:37:39	DONE	25mm Filter	01-JUN-23 00:00
642209002	SAMPLE	JE1	PIC9C	NOV-06-23 08:37:44	DONE	25mm Filter	01-JUN-23 00:00
642209003	SAMPLE	JE1	PIC9D	NOV-06-23 08:37:48	DONE	25mm Filter	01-JUN-23 00:00
642209004	SAMPLE	JE1	PIC10A	NOV-06-23 08:37:52	DONE	25mm Filter	01-JUN-23 00:00
642209005	SAMPLE	JE1	PIC10C	NOV-06-23 08:37:56	DONE	25mm Filter	01-JUN-23 00:00
642209006	SAMPLE	JE1	PIC10D	NOV-06-23 08:37:59	DONE	25mm Filter	01-JUN-23 00:00

Lucas Cell Raw Data

Batch 2515281 Check-list

This check-list was completed on 11-NOV-23 by Elizabeth Krouse

This batch was reviewed by Elizabeth Krouse on 11-NOV-23 and Lyndsey Pace on 12-NOV-23.

Batch ID:
2515281

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2515281
Analyst: Lyndsey Pace (LXP1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: LUCAS-C202389980

Due Dates for Lab: 12-NOV-2023			Package: 16-NOV-2023		SDG: 14-NOV-2023	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
MS	1205558598	Ra-226 emanation spike	1715-I	.1	mL	
LCS	1205558599	Ra-226 emanation spike	1715-I	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	642149001	02-NOV-2023	1	502.07	502.07	11/03/23 06:45	505	11/07/23 06:35	11/07/23 10:07	1	10
2	642149002	02-NOV-2023	1	501.21	501.21	11/03/23 06:45	607	11/07/23 06:35	11/07/23 10:07	3	26
3	642209001	02-NOV-2023	1	505.08	505.08	11/03/23 06:45	701	11/07/23 06:35	11/07/23 10:07	3	27
4	642209002	02-NOV-2023	1	500.54	500.54	11/03/23 06:45	806	11/07/23 06:35	11/07/23 10:07	1	44
5	642209003	02-NOV-2023	1	506.87	506.87	11/03/23 06:45	108	11/07/23 07:00	11/07/23 10:46	1	4
6	642209004	02-NOV-2023	1	501.54	501.54	11/03/23 06:45	208	11/07/23 07:00	11/07/23 10:46	6	23
7	642209005	02-NOV-2023	1	504.1	504.1	11/03/23 06:45	309	11/07/23 07:00	11/07/23 10:46	1	19
8	642209006	02-NOV-2023	1	502.74	502.74	11/03/23 06:45	407	11/07/23 07:00	11/07/23 10:46	5	11
9	642355001	02-NOV-2023	1	505.38	505.38	11/03/23 06:45	502	11/07/23 07:00	11/07/23 10:46	1	32
10	642902001	02-NOV-2023	1	502.23	502.23	11/03/23 06:45	602	11/07/23 07:00	11/07/23 10:46	3	32
11	1205558596 MB	02-NOV-2023	1		506.87	11/03/23 06:45	702	11/07/23 07:00	11/07/23 10:46	1	6
12	1205558597 DUP (642149001)	02-NOV-2023	1	501.35	501.35	11/03/23 06:45	804	11/07/23 07:00	11/07/23 10:46	2	15
13	1205558598 MS (642149001)	02-NOV-2023	1	108.03	108.03	11/03/23 06:45	101	11/07/23 07:23	11/07/23 11:28	1	697
14	1205558599 LCS	02-NOV-2023	1		506.87	11/03/23 06:45	206	11/07/23 07:23	11/07/23 11:28	7	704

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 02-NOV-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Procedure Code : LUC26RAL
 Parmname : Radium-226
 Required MDA : 1 pCi/L
 Halflife of Ra-226 : 1600 years
 Ra-226 Abundance : 1.00
 Halflife of Rn-222 : 3.8235 days

Batch : 2515281
 Analyst : LIN01615
 Prep Date : 11/2/2023
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Counting		Gross Counts	Gross CPM	Background Counts	Background CPM	Background Count Time (min.)	Cell Efficiency (cpm/dpm)
					Cell Number	Time (min.)						
1	642149001.1	0.5021	2.0264E-05	10/17/2023 13:30	505	30	10	0.333	1	0.033	30	1.7470
2	642149002.1	0.5012	2.0261E-05	10/17/2023 14:05	607	30	26	0.867	3	0.100	30	1.7750
3	642209001.1	0.5051	2.0276E-05	10/17/2023 10:46	701	30	27	0.900	3	0.100	30	1.5970
4	642209002.1	0.5005	2.0258E-05	10/17/2023 12:36	806	30	44	1.467	1	0.033	30	1.6560
5	642209003.1	0.5069	2.0284E-05	10/17/2023 13:57	108	30	4	0.133	1	0.033	30	1.7570
6	642209004.1	0.5015	2.0262E-05	10/17/2023 11:47	208	30	23	0.767	6	0.200	30	1.7130
7	642209005.1	0.5041	2.0273E-05	10/17/2023 10:46	309	30	19	0.633	1	0.033	30	1.5690
8	642209006.1	0.5027	2.0267E-05	10/17/2023 8:45	407	30	11	0.367	5	0.167	30	1.4390
9	642355001.1	0.5054	2.0278E-05	10/19/2023 10:45	502	30	32	1.067	1	0.033	30	1.8590
10	642902001.1	0.5022	2.0265E-05	10/24/2023 9:10	602	30	32	1.067	3	0.100	30	1.7010
11	1205558596.1	0.5069	2.0284E-05	11/2/2023 0:00	702	30	6	0.200	1	0.033	30	1.6810
12	1205558597.1	0.5014	2.0261E-05	10/17/2023 13:30	804	30	15	0.500	2	0.067	30	1.6240
13	1205558598.1	0.1080	1.1852E-05	10/17/2023 13:30	101	30	697	23.233	1	0.033	30	1.8120
14	1205558599.1	0.5069	2.0284E-05	11/2/2023 0:00	206	30	704	23.467	7	0.233	30	1.5880

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
8.200%	6/1/2023	5/31/2024	11/3/2023 6:45	11/7/2023 6:35	11/7/2023 10:07	0.515	0.974	1.002	1.000
6.800%	7/1/2023	6/30/2024	11/3/2023 6:45	11/7/2023 6:35	11/7/2023 10:07	0.515	0.974	1.002	1.000
5.900%	11/1/2023	10/31/2024	11/3/2023 6:45	11/7/2023 6:35	11/7/2023 10:07	0.515	0.974	1.002	1.000
1.900%	4/8/2023	3/31/2024	11/3/2023 6:45	11/7/2023 6:35	11/7/2023 10:07	0.515	0.974	1.002	1.000
4.600%	10/10/2023	4/30/2024	11/3/2023 6:45	11/7/2023 7:00	11/7/2023 10:46	0.517	0.972	1.002	1.000
4.400%	8/1/2023	7/31/2024	11/3/2023 6:45	11/7/2023 7:00	11/7/2023 10:46	0.517	0.972	1.002	1.000
9.100%	11/1/2023	10/31/2024	11/3/2023 6:45	11/7/2023 7:00	11/7/2023 10:46	0.517	0.972	1.002	1.000
5.800%	2/1/2023	1/31/2024	11/3/2023 6:45	11/7/2023 7:00	11/7/2023 10:46	0.517	0.972	1.002	1.000
7.700%	6/1/2023	5/31/2024	11/3/2023 6:45	11/7/2023 7:00	11/7/2023 10:46	0.517	0.972	1.002	1.000
9.900%	7/1/2023	6/30/2024	11/3/2023 6:45	11/7/2023 7:00	11/7/2023 10:46	0.517	0.972	1.002	1.000
2.000%	11/1/2023	10/31/2024	11/3/2023 6:45	11/7/2023 7:00	11/7/2023 10:46	0.517	0.972	1.002	1.000
6.100%	4/8/2023	3/31/2024	11/3/2023 6:45	11/7/2023 7:00	11/7/2023 10:46	0.517	0.972	1.002	1.000
4.500%	5/1/2023	4/30/2024	11/3/2023 6:45	11/7/2023 7:23	11/7/2023 11:28	0.518	0.970	1.002	1.000
8.600%	8/1/2023	7/31/2024	11/3/2023 6:45	11/7/2023 7:23	11/7/2023 11:28	0.518	0.970	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-I
Spike Exp Date : 8/29/2024
Spike Activity (dpm/ml): 304.19
Spike Volume Added: 0.10

LCS S/N : 1715-I
LCS Exp Date : 8/29/2024
LCS Activity (dpm/ml): 304.19
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.1127	0.0796	1	0.2617	0.3078	37.75%	0.3000	0.1106	0.2223	0.2320		SAMPLE				
2	0.1924	0.1358	1	0.3728	0.7754	24.38%	0.7667	0.1795	0.3558	0.3871		SAMPLE				
3	0.2122	0.1498	1	0.4112	0.8924	23.57%	0.8000	0.1826	0.3992	0.4320		SAMPLE				
4	0.1192	0.0842	1	0.2769	1.5559	15.72%	1.4333	0.2236	0.4758	0.5293		SAMPLE				
5	0.1108	0.0783	1	0.2574	0.1009	74.68%	0.1000	0.0745	0.1474	0.1484		SAMPLE				
6	0.2814	0.1987	1	0.5020	0.5928	31.98%	0.5667	0.1795	0.3680	0.3813		SAMPLE				
7	0.1248	0.0881	1	0.2899	0.6818	26.46%	0.6000	0.1491	0.3320	0.3670		SAMPLE				
8	0.3051	0.2154	1	0.5551	0.2485	66.92%	0.2000	0.1333	0.3247	0.3278		SAMPLE				
9	0.1051	0.0742	1	0.2440	0.9885	20.07%	1.0333	0.1915	0.3590	0.4141		SAMPLE				
10	0.2001	0.1413	1	0.3878	1.0169	22.68%	0.9667	0.1972	0.4066	0.4752		SAMPLE				
11	0.1159	0.0818	1	0.2691	0.1758	52.95%	0.1667	0.0882	0.1823	0.1842		MB				
12	0.1715	0.1211	1	0.3525	0.4783	32.30%	0.4333	0.1374	0.2973	0.3106	642149001.1	DUP	43.4%			
13	0.5041	0.3559	1	1.1708	106.4827	5.89%	23.2000	0.8807	7.9223	19.6782	642149001.1	MS			126.8389	83.7%
14	0.3244	0.2290	1	0.5696	25.9329	9.41%	23.2333	0.8888	1.9445	6.0747		LCS			27.0329	95.9%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 07-NOV-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:26	1	1.13E+05	112922	-2.74		
LUCAS2	EFF	07:28	1	1.28E+05	128400	-2.56		
LUCAS3	EFF	07:30	1	91627	91627	-0.53		
LUCAS4	EFF	07:31	1	1.26E+05	125997	-2.88		
LUCAS5	EFF	07:33	1	1.30E+05	130152	-2.44		
LUCAS6	EFF	07:45	1	1.28E+05	127606	-2.93		
LUCAS7	EFF	07:36	1	1.31E+05	130682	-0.93		
LUCAS8	EFF	07:38	1	1.29E+05	128761	1.07		

Reviewed by:



Gregory Ramsay

Date: 07-NOV-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2515281

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
642149001	SAMPLE	LXP1	LUCAS5	NOV-07-23 10:07:00	DONE	Lucas Cell	01-JUN-23 00:00
642149002	SAMPLE	LXP1	LUCAS6	NOV-07-23 10:07:00	DONE	Lucas Cell	01-JUL-23 00:00
642209001	SAMPLE	LXP1	LUCAS7	NOV-07-23 10:07:00	DONE	Lucas Cell	01-NOV-23 00:00
642209002	SAMPLE	LXP1	LUCAS8	NOV-07-23 10:07:00	DONE	Lucas Cell	08-APR-23 00:00
642209003	SAMPLE	LXP1	LUCAS1	NOV-07-23 10:46:00	DONE	Lucas Cell	01-MAY-23 00:00
642209004	SAMPLE	LXP1	LUCAS2	NOV-07-23 10:46:00	DONE	Lucas Cell	01-AUG-23 00:00
642209005	SAMPLE	LXP1	LUCAS3	NOV-07-23 10:46:00	DONE	Lucas Cell	01-NOV-23 00:00
642209006	SAMPLE	LXP1	LUCAS4	NOV-07-23 10:46:00	DONE	Lucas Cell	01-FEB-23 00:00
642355001	SAMPLE	LXP1	LUCAS5	NOV-07-23 10:46:00	DONE	Lucas Cell	01-JUN-23 00:00
642902001	SAMPLE	LXP1	LUCAS6	NOV-07-23 10:46:00	DONE	Lucas Cell	01-JUL-23 00:00
1205558596	MB	LXP1	LUCAS7	NOV-07-23 10:46:00	DONE	Lucas Cell	01-NOV-23 00:00
1205558597	DUP	LXP1	LUCAS8	NOV-07-23 10:46:00	DONE	Lucas Cell	08-APR-23 00:00
1205558598	MS	LXP1	LUCAS1	NOV-07-23 11:28:00	DONE	Lucas Cell	01-MAY-23 00:00
1205558599	LCS	LXP1	LUCAS2	NOV-07-23 11:28:00	DONE	Lucas Cell	01-AUG-23 00:00



Environmental Laboratory
 1232 Haco Drive
 Lansing
 Michigan, 48910

CHAIN OF CUSTODY

Phone: (517)702-6372

Lab Work Order Number 47

Client Name BWL - Erickson Station		Project Name Erickson AM MI Wells 16A-D		Requested Analyses						Requested Turn Around	
Client Contact Cheryl Louden		Project Number [none]		Ag:: As:: B:: Ba:: Be:: Ca:: Cd:: Cr:: Co:: Cu:: Fe:: Hg:: Li:: Mo:: Ni:: Pb:: Sb:: Se:: Tl:: V:: Zn:: Na:: K:: Mg	TSS, HCO3, CO3, Hardness	Cl-IC:: F-ISE:: SO4:: TDS	Radium 226 and Radium 228				Rush requests subject to additional charge. Rush requests subject to lab approval.
Address 3725 S. Canal		Project Description									
City Lansing		PO Number 30926 10021									
State/Zip MI, 48917		Shipped By									
Phone (517) 702-6396	Fax (517) 702-6373	Tracking Number									
Sampler Marc Wahrer											

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code								Sample	Comments
						b	a	a	b						
MW-16A	10/17/2023	1046	G	GW	5	1	1	1	2						
MW-16B	10/17/2023	1236	G	GW	5	1	1	1	2						
MW-16C	10/17/2023	1357	G	GW	5	1	1	1	2						
MW-16D	10/17/2023	1147	G	GW	5	1	1	1	2						
MWT-16A	10/17/2023	1046	G	GW	5	1	1	1	2						
Field Blank	10/17/2023	0845	G	DI	5	1	1	1	2						

Relinquished By 	Date/Time 10-17-23 1540	Received By apm	Date/Time 840	Comments
Relinquished By	Date/Time	Received By	Date/Time	
Relinquished By	Date/Time	Received By	Date/Time	
Cooler Numbers and Temperatures				

Matrix Codes: DI=Deionized Water, GW=Ground Water Preserv. Codes: a=None, b=0.5% HNO3



Hometown People. Hometown Power.

Lansing Board of Water and Light
Environmental Services Laboratory (MI00079)

Cert ID:3760

1232 Haco Dr.

Lansing, Michigan 48901

21 November 2023

BWL - Erickson Station

Attn: Cheryl Loudon

3725 S. Canal

Lansing, MI 48917

Project: Erickson Well Project

Dear Cheryl Loudon,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

Work Order

L310270

Received

10/24/2023 8:25:00AM

Account Number

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



Analytical Report

Client: BWL - Erickson Station
Address: 3725 S. Canal
Lansing MI, 48917

Client Project Manager: Cheryl Louden

Report Date: 11/21/2023

Sample Name: MW-100 A

Lab #: L310270-01 Ground Water

Collected: 23-Oct-23 15:20

By: Marc Wahrer

Analyte	Reporting		Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit							
Conductivity	720	1.0	uS/cm	1		23-Oct-23 15:20	maw	FIELD	
Dissolved oxygen	0.450	0.100	mg/L	1		23-Oct-23 15:20	maw	FIELD	
Milliliters Purged	120		ml/min	1		23-Oct-23 15:20	maw	FIELD	
Oxidation Reduction Potential	-117.7	-999.0	mV	1		23-Oct-23 15:20	maw	FIELD	
pH	7.3	7.0	pH Units	1		23-Oct-23 15:20	maw	FIELD	
Temperature	15		°C	1		23-Oct-23 15:20	maw	FIELD	
Turbidity	7.4	0.10	NTU	1		23-Oct-23 15:20	maw	FIELD	

Sample Name: MW-100 B

Lab #: L310270-02 Ground Water

Collected: 23-Oct-23 11:57

By: Marc Wahrer

Analyte	Reporting		Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit							
Conductivity	750	1.0	uS/cm	1		23-Oct-23 11:57	maw	FIELD	
Dissolved oxygen	ND	0.100	mg/L	1		23-Oct-23 11:57	maw	FIELD	
Milliliters Purged	200		ml/min	1		23-Oct-23 11:57	maw	FIELD	
Oxidation Reduction Potential	-154.8	-999.0	mV	1		23-Oct-23 11:57	maw	FIELD	
pH	7.4	7.0	pH Units	1		23-Oct-23 11:57	maw	FIELD	
Temperature	12		°C	1		23-Oct-23 11:57	maw	FIELD	
Turbidity	5.2	0.10	NTU	1		23-Oct-23 11:57	maw	FIELD	

Sample Name: MW-100 C

Lab #: L310270-03 Ground Water

Collected: 23-Oct-23 13:14

By: Marc Wahrer

Analyte	Reporting		Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit							
Conductivity	540	1.0	uS/cm	1		23-Oct-23 13:14	maw	FIELD	
Dissolved oxygen	ND	0.100	mg/L	1		23-Oct-23 13:14	maw	FIELD	
Milliliters Purged	270		ml/min	1		23-Oct-23 13:14	maw	FIELD	
Oxidation Reduction Potential	-115.8	-999.0	mV	1		23-Oct-23 13:14	maw	FIELD	
pH	7.3	7.0	pH Units	1		23-Oct-23 13:14	maw	FIELD	
Temperature	12		°C	1		23-Oct-23 13:14	maw	FIELD	
Turbidity	5.2	0.10	NTU	1		23-Oct-23 13:14	maw	FIELD	



Analytical Report

Client: BWL - Erickson Station
Address: 3725 S. Canal
Lansing MI, 48917

Client Project Manager: Cheryl Louden

Report Date: 11/21/2023

Sample Name: MW-100 D

Lab #: L310270-04 Ground Water

Collected: 23-Oct-23 14:46

By: Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	ND	1.0	uS/cm	1		23-Oct-23 14:46	maw	FIELD	
Dissolved oxygen	ND	0.100	mg/L	1		23-Oct-23 14:46	maw	FIELD	
Milliliters Purged	200		ml/min	1		23-Oct-23 14:46	maw	FIELD	
Oxidation Reduction Potential	-182.6	-999.0	mV	1		23-Oct-23 14:46	maw	FIELD	
pH	8.0	7.0	pH Units	1		23-Oct-23 14:46	maw	FIELD	
Temperature	13		°C	1		23-Oct-23 14:46	maw	FIELD	
Turbidity	5.0	0.10	NTU	1		23-Oct-23 14:46	maw	FIELD	



Analytical Report

Client: BWL - Erickson Station

Client Project Manager: Cheryl Louden

Report Date: 11/21/2023

Address: 3725 S. Canal
Lansing MI, 48917

Approved By:

Jennifer Caporale

Notes and Definitions

AL Action Level (Action Level = Regulatory Limit)
MCL Maximum Contaminant Level
PEL Permissible Exposure Limit (Permissible Exposure Limit = Regulatory Limit)
RPD Relative Percent Difference
OT Odor Threshold
ND Non Detect is less than the reporting limit value
All drinking water regulatory limits are MCL's with the exception of Lead and Copper unless otherwise noted.



Report ID: S54888.01(02)
Generated on 11/21/2023
Replaces report S54888.01(01) generated on 10/26/2023

Report to
Attention: Jennifer Caporale
Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

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Report Summary
Lab Sample ID(s): S54888.01-S54888.06
Project: Erickson Well Project 100A-100D
Collected Date(s): 10/23/2023
Submitted Date/Time: 10/24/2023 09:00
Sampled by: Marc Wahrer
P.O. #:

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Maya Murshak
Technical Director



General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Starred (*) analytes are not NY NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

All accreditations/certifications held by this laboratory are listed on page 3. Not all accreditations/certifications are applicable to this report.

For a specific list of accredited analytes, please feel free to contact the laboratory or visit <https://www.meritlabs.com/certifications>.

Report Narrative

All analyses completed



Laboratory Accreditations

Authority	Accreditation ID
Michigan DEQ	#9956
DOD ELAP & ISO/IEC 17025:2017	#69699 PJLA Testing
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



Sample Summary (6 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S54888.01	MW-100A L310270-01	Groundwater	10/23/23 15:20
S54888.02	MW-100B L310270-02	Groundwater	10/23/23 11:57
S54888.03	MW-100C L310270-03	Groundwater	10/23/23 13:14
S54888.04	MW-100D L310270-04	Groundwater	10/23/23 14:46
S54888.05	MWT-100C L310270-05	Groundwater	10/23/23 13:14
S54888.06	Field Blank L310270-06	Water	10/23/23 10:15



Analytical Laboratory Report

Lab Sample ID: S54888.01

Sample Tag: MW-100A L310270-01

Collected Date/Time: 10/23/2023 15:20

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	250ml Plastic	HNO3	Yes	2.0	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	10/25/23 11:34	CTV	
Metal Digestion	Completed	SW3015A	10/24/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 10/25/23 08:49, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	10	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	21	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 10/26/23 14:36, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	450	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 10/26/23 11:12, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	398	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 10/24/23 18:15, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	416	50	12	mg/L	2		

Method: SM2540D, Run Date: 10/24/23 18:15, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	4.9	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 10/24/23 11:35, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00225	mg/L	5	7440-36-0	
Arsenic	0.016	0.002	0.00145	mg/L	5	7440-38-2	
Barium	0.201	0.005	0.000900	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000200	mg/L	5	7440-41-7	
Boron	0.05	0.04	0.0159	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000350	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000750	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000450	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000800	mg/L	5	7440-50-8	
Iron	3.04	0.02	0.0142	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S54888.01 (continued)

Sample Tag: MW-100A L310270-01

Method: E200.8, Run Date: 10/24/23 11:35, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000450	mg/L	5	7439-92-1	
Lithium*	0.018	0.005	0.00135	mg/L	5	7439-93-2	
Molybdenum	0.011	0.005	0.00420	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00115	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00435	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000250	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000350	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00205	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00325	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 10/24/23 14:42, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	92.8	0.50	0.218	mg/L	5	7440-70-2	
Magnesium	38.9	0.50	0.0579	mg/L	5	7439-95-4	
Potassium	2.16	0.50	0.119	mg/L	5	7440-09-7	
Sodium	11.0	0.50	0.109	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 10/25/23 14:35, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 11/15/23 12:31, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Lab Sample ID: S54888.02

Sample Tag: MW-100B L310270-02

Collected Date/Time: 10/23/2023 11:57

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	250ml Plastic	HNO3	Yes	2.0	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	10/25/23 11:34	CTV	
Metal Digestion	Completed	SW3015A	10/24/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 10/25/23 09:00, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	24	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	108	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 10/26/23 14:40, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	330	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 10/26/23 11:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	364	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 10/24/23 18:15, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	490	50	12	mg/L	2		

Method: SM2540D, Run Date: 10/24/23 18:15, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	4.1	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 10/24/23 11:40, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00225	mg/L	5	7440-36-0	
Arsenic	0.010	0.002	0.00145	mg/L	5	7440-38-2	
Barium	0.145	0.005	0.000900	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000200	mg/L	5	7440-41-7	
Boron	0.26	0.04	0.0159	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000350	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000750	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000450	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000800	mg/L	5	7440-50-8	
Iron	2.33	0.02	0.0142	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S54888.02 (continued)

Sample Tag: MW-100B L310270-02

Method: E200.8, Run Date: 10/24/23 11:40, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000450	mg/L	5	7439-92-1	
Lithium*	0.017	0.005	0.00135	mg/L	5	7439-93-2	
Molybdenum	0.009	0.005	0.00420	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00115	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00435	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000250	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000350	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00205	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00325	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 10/24/23 14:44, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	95.9	0.50	0.218	mg/L	5	7440-70-2	
Magnesium	33.2	0.50	0.0579	mg/L	5	7439-95-4	
Potassium	3.69	0.50	0.119	mg/L	5	7440-09-7	
Sodium	27.4	0.50	0.109	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 10/25/23 14:38, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 11/15/23 12:31, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Final Report

Lab Sample ID: S54888.03

Sample Tag: MW-100C L310270-03

Collected Date/Time: 10/23/2023 13:14

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	250ml Plastic	HNO3	Yes	2.0	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	10/25/23 11:34	CTV	
Metal Digestion	Completed	SW3015A	10/24/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 10/25/23 09:10, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	5	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	7	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 10/26/23 14:46, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	340	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 10/26/23 11:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	232	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 10/24/23 18:15, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	302	50	12	mg/L	2		

Method: SM2540D, Run Date: 10/24/23 18:15, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 10/24/23 11:43, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00225	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.00145	mg/L	5	7440-38-2	
Barium	0.082	0.005	0.000900	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000200	mg/L	5	7440-41-7	
Boron	1.76	0.04	0.0159	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000350	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000750	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000450	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000800	mg/L	5	7440-50-8	
Iron	0.66	0.02	0.0142	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S54888.03 (continued)

Sample Tag: MW-100C L310270-03

Method: E200.8, Run Date: 10/24/23 11:43, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000450	mg/L	5	7439-92-1	
Lithium*	0.034	0.005	0.00135	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.00420	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00115	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00435	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000250	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000350	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00205	mg/L	5	7440-62-2	
Zinc	0.010	0.005	0.00325	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 10/24/23 14:46, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	61.2	0.50	0.218	mg/L	5	7440-70-2	
Magnesium	19.5	0.50	0.0579	mg/L	5	7439-95-4	
Potassium	6.83	0.50	0.119	mg/L	5	7440-09-7	
Sodium	29.2	0.50	0.109	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 10/25/23 14:41, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 11/15/23 12:31, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Lab Sample ID: S54888.04

Sample Tag: MW-100D L310270-04

Collected Date/Time: 10/23/2023 14:46

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	250ml Plastic	HNO3	Yes	2.0	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	10/25/23 11:34	CTV	
Metal Digestion	Completed	SW3015A	10/24/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 10/25/23 09:20, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	10	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 10/26/23 14:48, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	390	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 10/26/23 11:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	19	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 10/24/23 18:15, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	390	50	12	mg/L	2		

Method: SM2540D, Run Date: 10/24/23 18:15, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 10/24/23 11:46, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00225	mg/L	5	7440-36-0	
Arsenic	0.003	0.002	0.00145	mg/L	5	7440-38-2	
Barium	0.008	0.005	0.000900	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000200	mg/L	5	7440-41-7	
Boron	3.22	0.04	0.0159	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000350	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000750	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000450	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000800	mg/L	5	7440-50-8	
Iron	0.15	0.02	0.0142	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S54888.04 (continued)

Sample Tag: MW-100D L310270-04

Method: E200.8, Run Date: 10/24/23 11:46, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000450	mg/L	5	7439-92-1	
Lithium*	0.017	0.005	0.00135	mg/L	5	7439-93-2	
Molybdenum	0.009	0.005	0.00420	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00115	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00435	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000250	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000350	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00205	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00325	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 10/24/23 14:47, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	5.86	0.50	0.218	mg/L	5	7440-70-2	
Magnesium	1.28	0.50	0.0579	mg/L	5	7439-95-4	
Potassium	4.35	0.50	0.119	mg/L	5	7440-09-7	
Sodium	148	0.50	0.109	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 10/25/23 14:45, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 11/15/23 12:31, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Lab Sample ID: S54888.05

Sample Tag: MWT-100C L310270-05

Collected Date/Time: 10/23/2023 13:14

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	250ml Plastic	HNO3	Yes	2.0	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	10/25/23 11:34	CTV	
Metal Digestion	Completed	SW3015A	10/24/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 10/25/23 09:30, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	5	5	0.06	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.08	mg/L	5	16984-48-8	
Sulfate	6	5	0.52	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 10/26/23 14:50, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	340	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 10/26/23 11:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	238	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 10/24/23 18:15, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	298	50	12	mg/L	2		

Method: SM2540D, Run Date: 10/24/23 18:15, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 10/24/23 11:50, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00225	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.00145	mg/L	5	7440-38-2	
Barium	0.083	0.005	0.000900	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000200	mg/L	5	7440-41-7	
Boron	1.76	0.04	0.0159	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000350	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000750	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000450	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000800	mg/L	5	7440-50-8	
Iron	0.66	0.02	0.0142	mg/L	5	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S54888.05 (continued)

Sample Tag: MWT-100C L310270-05

Method: E200.8, Run Date: 10/24/23 11:50, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000450	mg/L	5	7439-92-1	
Lithium*	0.032	0.005	0.00135	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.00420	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00115	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00435	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000250	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000350	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00205	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00325	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 10/24/23 14:49, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	61.5	0.50	0.218	mg/L	5	7440-70-2	
Magnesium	19.2	0.50	0.0579	mg/L	5	7439-95-4	
Potassium	6.90	0.50	0.119	mg/L	5	7440-09-7	
Sodium	29.1	0.50	0.109	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 10/25/23 14:48, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 11/15/23 12:31, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Lab Sample ID: S54888.06

Sample Tag: Field Blank L310270-06

Collected Date/Time: 10/23/2023 10:15

Matrix: Water

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.0	IR
2	1L Plastic	None	Yes	2.0	IR
1	250ml Plastic	HNO3	Yes	2.0	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	10/25/23 11:34	CTV	
Metal Digestion	Completed	SW3015A	10/24/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 10/25/23 09:40, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	2.5	0.03	mg/L	2.5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.04	mg/L	2.5	16984-48-8	
Sulfate	Not detected	2.5	0.26	mg/L	2.5	14808-79-8	

Method: SM2320B, Run Date: 10/26/23 14:52, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 10/26/23 11:26, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 10/24/23 18:15, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	12	mg/L	2		

Method: SM2540D, Run Date: 10/24/23 18:15, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 10/24/23 11:28, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.000900	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000580	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.000360	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000800	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.00636	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.000140	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.000300	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.000180	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000320	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.00568	mg/L	2	7439-89-6	



Analytical Laboratory Report

Final Report

Lab Sample ID: S54888.06 (continued)

Sample Tag: Field Blank L310270-06

Method: E200.8, Run Date: 10/24/23 11:28, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000180	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000540	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.00168	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000460	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.00174	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.000100	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.000140	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.000820	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.00130	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 10/24/23 14:39, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0874	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.0231	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.0479	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.0436	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 10/25/23 14:51, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.000016	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 11/15/23 12:31, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

Merit Laboratories Login Checklist

Lab Set ID:S54888

Attention: Jennifer Caporale
Address: Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Client:BWL01 (Board of Water & Light)

Project: Erickson Well Project 100A-100D

Submitted: 10/24/2023 09:00 Login User: MMC

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

Sample Receiving

- | | | |
|-----|--|--|
| 01. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples are received at 4C +/- 2C Thermometer # IR 2.0 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Received on ice/ cooling process begun |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples shipped |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples left in 24 hr. drop box |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Are there custody seals/tape or is the drop box locked |

Chain of Custody

- | | | |
|-----|--|--|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC adequately filled out |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC signed and relinquished to the lab |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sample tag on bottles match COC |
| 09. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Subcontracting needed? Subcontracted to: GEL |

Preservation

- | | | |
|-----|--|---|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Do sample have correct chemical preservation |
| 11. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Completed pH checks on preserved samples? (no VOAs) |
| 12. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Did any samples need to be preserved in the lab? |

Bottle Conditions

- | | | |
|-----|--|---|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | All bottles intact |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Appropriate analytical bottles are used |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Merit bottles used |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sufficient sample volume received |
| 17. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples require laboratory filtration |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples submitted within holding time |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Do water VOC or TOX bottles contain headspace |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S54888 Submitted: 10/24/2023 09:00

Client: BWL01 (Board of Water & Light)

Project: Erickson Well Project 100A-100D

Attention: Jennifer Caporale
Address: Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Initial Preservation Check: 10/24/2023 09:45 MMC

Preservation Recheck (E200.8): N/A

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S54888.01	1L Plastic HNO3	<2			
S54888.01	1L Plastic HNO3	<2			
S54888.01	250ml Plastic HNO3	<2			
S54888.02	1L Plastic HNO3	<2			
S54888.02	1L Plastic HNO3	<2			
S54888.02	250ml Plastic HNO3	<2			
S54888.03	1L Plastic HNO3	<2			
S54888.03	1L Plastic HNO3	<2			
S54888.03	250ml Plastic HNO3	<2			
S54888.04	1L Plastic HNO3	<2			
S54888.04	1L Plastic HNO3	<2			
S54888.04	250ml Plastic HNO3	<2			
S54888.05	1L Plastic HNO3	<2			
S54888.05	1L Plastic HNO3	<2			
S54888.05	250ml Plastic HNO3	<2			
S54888.06	1L Plastic HNO3	<2			
S54888.06	1L Plastic HNO3	<2			
S54888.06	250ml Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823
 Phone (517) 332-0167 Fax (517) 332-4034
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

REPORT TO **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME **Jennifer Caporale**
 COMPANY **Lansing Board of Water and Light**
 ADDRESS **PO Box 13007 48901-3007**
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**
 PHONE NO. **517-702-6372** FAX NO. _____ P.O. NO. _____
 E-MAIL ADDRESS **Environmental_Laboratory@lbwl.com** QUOTE NO. _____

CONTACT NAME **Beth Zimpfer** SAME
 COMPANY _____
 ADDRESS _____
 CITY _____ STATE _____ ZIP CODE _____
 PHONE NO. _____ E-MAIL ADDRESS **Beth.Zimpfer@lbwl.com**

PROJECT NO./NAME **Erickson Well Project 100A-100D** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**
 TURNAROUND TIME REQUIRED 1 DAY 2 DAYS 3 DAYS STANDARD OTHER **ASAP**
 DELIVERABLES REQUIRED STD LEVEL II LEVEL III LEVEL IV EDD OTHER _____

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO ₃	H ₂ SO ₄	NaOH	MeOH	OTHER	Total Metals	F- undissolved, Cl-, SO ₄ , TDS	Radium 226	Radium 228	TSS	HCO ₃ , CO ₃ , Hardness	Certifications		Project Locations		Special Instructions
	DATE	TIME																	<input type="checkbox"/> OHIO VAP	<input type="checkbox"/> Drinking Water	<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES	
54888.01	10/23/23	1520	MW-100A L310270-01	GW	5	2	3						✓	✓	✓	✓	✓	✓					Metals to analyse: Na, Mg, K
.02	10/23/23	1157	MW-100B L310270-02	GW	5	2	3						✓	✓	✓	✓	✓	✓					B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03	10/23/23	1314	MW-100C L310270-03	GW	5	2	3						✓	✓	✓	✓	✓	✓					Co, Li, Hg, Mo, Pb, Se, Tl,
.04	10/23/23	1446	MW-100D L310270-04	GW	5	2	3						✓	✓	✓	✓	✓	✓					Fe, Cu, Ni, Ag, V, Zn
.05	10/23/23	1314	MWT- 100C L310270-05	GW	5	2	3						✓	✓	✓	✓	✓	✓					Please send a preliminary report
.06	10/23/23	1015	Field Blank L310270-06	DI	5	2	3						✓	✓	✓	✓	✓	✓					

RELINQUISHED BY: _____ DATE **10-27-23** TIME **0900**
 SIGNATURE/ORGANIZATION *[Signature]*
 RECEIVED BY: **M. Chilcote** DATE **10/24/23** TIME **0900**
 SIGNATURE/ORGANIZATION _____

RELINQUISHED BY: _____ DATE _____ TIME _____
 SIGNATURE/ORGANIZATION _____
 RECEIVED BY: _____ DATE _____ TIME _____
 SIGNATURE/ORGANIZATION _____

SEAL NO. _____ SEAL INTACT YES NO INITIALS _____
 SEAL NO. _____ SEAL INTACT YES NO INITIALS _____

NOTES: TEMP. ON ARRIVAL **2.0**

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Chloride	250 mL plastic	mg/L	Chill	300.0	6 mos	2.5
Cl	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	28 d	10
Cr, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Fluoride	250 mL plastic	mg/L	None	9056	6 mos	0.005
F	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	28 d	1.0
Fe, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.02
Pb, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Mercury	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Molybdenum	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Radium 226 and 228 combined	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Selenium	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Sulfate	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Thallium	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Total Dissolved Solids	1 L plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Vanadium	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total		250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005

November 15, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 642811
SDG: S54888

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on October 26, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,



Olivia Olsen for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S54888
Work Order: 642811**

November 15, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on October 26, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
642811001	S54888.01
642811002	S54888.02
642811003	S54888.03
642811004	S54888.04
642811005	S54888.05
642811006	S54888.06 Field Blank

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Olivia Olsen". The signature is written in a cursive style with a large, prominent "O" at the beginning.

Olivia Olsen for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

SAMPLE RECEIPT & REVIEW FORM

Client: <u>MEI</u>		SDG/AR/COC/Work Order: <u>642811</u>		
Received By: <u>Thyasia Tatum</u>		Date Received: <u>10/20/23</u>		
Carrier and Tracking Number		FedEx Express FedEx Ground <u>UPS</u> Field Services Courier Other <u>12 4000 477 03 0159 2840</u>		
Suspected Hazard Information	Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.	
A) Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___	
B) Did the client designate the samples are to be received as radioactive?		<input checked="" type="checkbox"/>	COC notation or radioactive stickers on containers equal client designation.	
C) Did the RSO classify the samples as radioactive?		<input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM / mR/Hr Classified as: <u>Rad 1 Rad 2 Rad 3</u>	
D) Did the client designate samples are hazardous?		<input checked="" type="checkbox"/>	COC notation or hazard labels on containers equal client designation.	
E) Did the RSO identify possible hazards?		<input checked="" type="checkbox"/>	If D or E is yes, select Hazards below. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other: _____	
Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>			Circle Applicable: Client contacted and provided COC COC created upon receipt
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>			Preservation Method: Wet Ice Ice Packs Dry ice <u>None</u> Other: _____ *all temperatures are recorded in Celsius TEMP: <u>10°C</u>
4 Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>			Temperature Device Serial #: <u>IR2-23</u> Secondary Temperature Device Serial # (If Applicable): _____
5 Sample containers intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6 Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>			Sample ID's and Containers Affected: _____ If Preservation added, Lot#: _____
7 Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>			If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer)
				Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No)
				Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___
8 Samples received within holding time?	<input checked="" type="checkbox"/>			Sample ID's and containers affected: _____
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>			ID's and containers affected: _____
10 Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>			Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>			Circle Applicable: No container count on COC Other (describe)
12 Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>			
13 COC form is properly signed in relinquished/received-sections?	<input checked="" type="checkbox"/>			Circle Applicable: Not relinquished Other (describe)
Comments (Use Continuation Form if needed):				

PM (or PMA) review: Initials 00 Date 10/27/23 Page 1 of 1

Laboratory Certifications

List of current GEL Certifications as of 15 November 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-00651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	KY90129
Kentucky Wastewater	KY90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2023019
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122024-04
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2023-152
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-23-21
Utah NELAP	SC000122023-38
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S54888
Work Order #: 642811

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2516028

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
642811001	S54888.01
642811002	S54888.02
642811003	S54888.03
642811004	S54888.04
642811005	S54888.05
642811006	S54888.06 Field Blank
1205559742	Method Blank (MB)
1205559743	643075002(NonSDG) Sample Duplicate (DUP)
1205559744	643075002(NonSDG) Matrix Spike (MS)
1205559745	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts

Sample 1205559743 (Non SDG 643075002DUP) was recounted due to high relative percent difference/relative error ratio. The recount is reported.

Miscellaneous Information

Additional Comments

The matrix spike, 1205559744 (Non SDG 643075002MS), aliquot was reduced to conserve sample volume.

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2516021

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
642811001	S54888.01
642811002	S54888.02
642811003	S54888.03
642811004	S54888.04
642811005	S54888.05
642811006	S54888.06 Field Blank
1205559715	Method Blank (MB)
1205559716	643075002(NonSDG) Sample Duplicate (DUP)
1205559717	643075002(NonSDG) Matrix Spike (MS)
1205559718	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

The matrix spike, 1205559717 (Non SDG 643075002MS), aliquot was reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S54888 GEL Work Order: 642811

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 20 NOV 2023

Title: Analyst III - Data Validator

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 20, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S54888.01 Project: MERI00120
Sample ID: 642811001 Client ID: MERI001
Matrix: Ground Water
Collect Date: 23-OCT-23 15:20
Receive Date: 26-OCT-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.527	+/-0.641	1.08	3.00	pCi/L		JE1	11/07/23	1010	2516028	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		0.527	+/-0.699			pCi/L		NXL1	11/15/23	1231	2523981	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	-0.164	+/-0.278	0.662	1.00	pCi/L		LXP1	11/13/23	1040	2516021	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			90.4	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 20, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S54888.02 Project: MERI00120
Sample ID: 642811002 Client ID: MERI001
Matrix: Ground Water
Collect Date: 23-OCT-23 11:57
Receive Date: 26-OCT-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.613	+/-0.742	1.25	3.00	pCi/L		JE1	11/07/23	1010	2516028	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.35	+/-0.862			pCi/L		NXL1	11/15/23	1231	2523981	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.732	+/-0.439	0.577	1.00	pCi/L		LXP1	11/13/23	1041	2516021	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			83.4	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 20, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S54888.03	Project: MERI00120
Sample ID: 642811003	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 23-OCT-23 13:14	
Receive Date: 26-OCT-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.836	+/-0.825	1.35	3.00	pCi/L		JE1	11/07/23	1010	2516028	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.38	+/-0.926			pCi/L		NXL1	11/15/23	1231	2523981	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	0.542	+/-0.421	0.606	1.00	pCi/L		LXP1	11/13/23	1041	2516021	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			83.5	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 20, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S54888.04 Project: MERI00120
Sample ID: 642811004 Client ID: MERI001
Matrix: Ground Water
Collect Date: 23-OCT-23 14:46
Receive Date: 26-OCT-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.947	+/-0.970	1.61	3.00	pCi/L		JE1	11/07/23	1010	2516028	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.60	+/-1.04			pCi/L		NXL1	11/15/23	1231	2523981	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.649	+/-0.379	0.382	1.00	pCi/L		LXP1	11/13/23	1041	2516021	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			82.4	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 20, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S54888.05 Project: MERI00120
Sample ID: 642811005 Client ID: MERI001
Matrix: Ground Water
Collect Date: 23-OCT-23 13:14
Receive Date: 26-OCT-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	1.02	+/-1.25	2.11	3.00	pCi/L		JE1	11/07/23	1010	2516028	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		2.09	+/-1.34			pCi/L		NXL1	11/15/23	1231	2523981	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		1.07	+/-0.490	0.513	1.00	pCi/L		LXP1	11/13/23	1111	2516021	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			85.8	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 20, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S54888.06 Field Blank	Project: MERI00120
Sample ID: 642811006	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 23-OCT-23 10:15	
Receive Date: 26-OCT-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228		1.59	+/-0.867	1.23	3.00	pCi/L		JE1	11/07/23	1010	2516028	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.59	+/-0.887			pCi/L		NXL1	11/15/23	1231	2523981	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226	U	-0.0422	+/-0.185	0.466	1.00	pCi/L		LXP1	11/13/23	1111	2516021	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			85.2	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: November 20, 2023

Page 1 of 2

Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan

Contact: John Laverty

Workorder: 642811

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2516028										
QC1205559743	643075002	DUP									
Radium-228		1.19		0.972	pCi/L	20.2		(0% - 100%)	JE1	11/07/23	12:21
	Uncertainty	+/-0.573		+/-0.572							
QC1205559745	LCS										
Radium-228	26.1			23.8	pCi/L		91.2	(75%-125%)		11/07/23	10:11
	Uncertainty			+/-1.33							
QC1205559742	MB										
Radium-228			U	0.179	pCi/L					11/07/23	10:10
	Uncertainty			+/-0.424							
QC1205559744	643075002	MS									
Radium-228	76.7	1.19		71.4	pCi/L		91.5	(75%-125%)		11/07/23	10:10
	Uncertainty	+/-0.573		+/-3.87							
Rad Ra-226											
Batch	2516021										
QC1205559716	643075002	DUP									
Radium-226		1.13		0.821	pCi/L	31.3		(0% - 100%)	LXP1	11/13/23	11:11
	Uncertainty	+/-0.546		+/-0.454							
QC1205559718	LCS										
Radium-226	27.0			26.1	pCi/L		96.9	(75%-125%)		11/13/23	11:11
	Uncertainty			+/-1.95							
QC1205559715	MB										
Radium-226			U	0.161	pCi/L					11/13/23	11:11
	Uncertainty			+/-0.273							
QC1205559717	643075002	MS									
Radium-226	135	1.13		153	pCi/L		112	(75%-125%)		11/13/23	11:11
	Uncertainty	+/-0.546		+/-11.5							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Workorder: 642811

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
H											
<											
>											
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
N1											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2516028 Check-list

This check-list was completed on 07-NOV-23 by Nat Long

This batch was reviewed by Nat Long on 07-NOV-23 and Kenshalla Oston on 09-NOV-23.

Batch ID:
2516028

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Is the blank result less than 1.65 times the CSU?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
12	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
13	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2516028
Analyst: Jacqueline Winston (JE1)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: SP-C018367602

Due Dates for Lab: 21-NOV-2023			Package: 23-NOV-2023		SDG: 24-NOV-2023	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
MS	1205559744	Radium 228	2051-D	.1	mL	
LCS	1205559745	Radium 228	2051-D	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	642811001	31-OCT-2023	3	301.8	301.8	11/02/23 10:59	11/07/23 08:21
2	642811002	31-OCT-2023	3	300.3	300.3	11/02/23 10:59	11/07/23 08:21
3	642811003	31-OCT-2023	3	303.5	303.5	11/02/23 10:59	11/07/23 08:21
4	642811004	31-OCT-2023	3	301	301	11/02/23 10:59	11/07/23 08:21
5	642811005	31-OCT-2023	3	300.3	300.3	11/02/23 10:59	11/07/23 08:21
6	642811006	31-OCT-2023	3	300.7	300.7	11/02/23 10:59	11/07/23 08:21
7	643075001	31-OCT-2023	1	903.5	903.5	11/02/23 10:59	11/07/23 08:21
8	643075002	31-OCT-2023	1	902	902	11/02/23 10:59	11/07/23 08:21
9	1205559742 MB	31-OCT-2023	1		904.4	11/02/23 10:59	11/07/23 08:21
10	1205559743 DUP (643075002)	31-OCT-2023	1	904.4	904.4	11/02/23 10:59	11/07/23 08:21
11	1205559744 MS (643075002)	31-OCT-2023	1	307.7	307.7	11/02/23 10:59	11/07/23 08:21
12	1205559745 LCS	31-OCT-2023	1		904.4	11/02/23 10:59	11/07/23 08:21

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 2097-B	Ba-133 Tracer	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date: 31-OCT-2023 00:00
REGNT 3956035	Barium Carrier Ra228 REG	1 mL	
REGNT 3975318	RGF-1M Citric Acid	5 mL	
REGNT 4046036	2M HCl	20 mL	
REGNT 4047477	RGF-50% Potassium Carbonate	2 mL	
REGNT 3979186	RGF-7M Nitric Acid	25 mL	
REGNT 4047705.6	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 3973411.6	RGF-Hydrofluoric Acid	4 mL	
REGNT 3963747	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 3979805	RGF-Neodymium Substrate	5 mL	
REGNT 4049676	Nitric Acid	5 mL	
REGNT 4051445	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT DGA092223	2503404	2 g	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 2097-B
 Tracer Exp Date : 7/12/2024
 Tracer Volume Added: 0.10

Batch : 2516028
 Analyst : JAC02417
 Prep Date : 10/31/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 1 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	642811001.1	0.3018	1.8489E-05	10/23/2023 15:20	1032.6	1.80%	933.1	1.89%	0.1	0.000200
2	642811002.1	0.3003	1.8464E-05	10/23/2023 11:57	1032.6	1.80%	861.2	1.97%	0.1	0.000200
3	642811003.1	0.3035	1.8518E-05	10/23/2023 13:14	1032.6	1.80%	862.3	1.97%	0.1	0.000200
4	642811004.1	0.3010	1.8476E-05	10/23/2023 14:46	1032.6	1.80%	850.6	1.98%	0.1	0.000200
5	642811005.1	0.3003	1.8464E-05	10/23/2023 13:14	1032.6	1.80%	885.8	1.94%	0.1	0.000200
6	642811006.1	0.3007	1.8471E-05	10/23/2023 10:15	1032.6	1.80%	879.2	1.95%	0.1	0.000200
7	643075001.1	0.9035	2.0760E-05	10/26/2023 9:29	1032.6	1.80%	865.1	1.96%	0.1	0.000200
8	643075002.1	0.9020	2.0763E-05	10/26/2023 9:29	1032.6	1.80%	936.7	1.89%	0.1	0.000200
9	1205559742.1	0.9044	2.0758E-05	10/31/2023 0:00	1032.6	1.80%	810.5	2.03%	0.1	0.000200
10	1205559743.1	0.9044	2.0758E-05	10/26/2023 9:29	1032.6	1.80%	889.8	1.94%	0.1	0.000200
11	1205559744.1	0.3077	1.8587E-05	10/26/2023 9:29	1032.6	1.80%	957.8	1.87%	0.1	0.000200
12	1205559745.1	0.9044	2.0758E-05	10/31/2023 0:00	1032.6	1.80%	912.9	1.91%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
			Alpha	Beta										
1	3C	60	17	31	0.517	11/7/2023 10:10	11/2/2023 10:59	11/7/2023 8:21	0.995	0.814	1.000	1.057	90.4%	2.63%
2	3D	60	3	29	0.483	11/7/2023 10:10	11/2/2023 10:59	11/7/2023 8:21	0.995	0.814	1.000	1.057	83.4%	2.68%
3	4A	60	6	42	0.700	11/7/2023 10:10	11/2/2023 10:59	11/7/2023 8:21	0.995	0.814	1.000	1.057	83.5%	2.68%
4	4C	60	15	61	1.017	11/7/2023 10:10	11/2/2023 10:59	11/7/2023 8:21	0.995	0.814	1.000	1.057	82.4%	2.69%
5	4D	60	22	110	1.833	11/7/2023 10:10	11/2/2023 10:59	11/7/2023 8:21	0.995	0.814	1.000	1.057	85.8%	2.66%
6	5C	60	16	54	0.900	11/7/2023 10:10	11/2/2023 10:59	11/7/2023 8:21	0.995	0.814	1.000	1.057	85.2%	2.67%
7	5D	60	11	64	1.067	11/7/2023 10:10	11/2/2023 10:59	11/7/2023 8:21	0.996	0.814	1.000	1.057	83.8%	2.68%
8	2B	60	19	137	2.283	11/7/2023 12:21	11/2/2023 10:59	11/7/2023 8:21	0.996	0.636	1.000	1.057	90.7%	2.63%
9	6C	60	11	89	1.483	11/7/2023 10:10	11/2/2023 10:59	11/7/2023 8:21	0.998	0.814	1.000	1.057	78.5%	2.73%
10	2D	60	8	122	2.033	11/7/2023 12:21	11/2/2023 10:59	11/7/2023 8:21	0.996	0.636	1.000	1.057	86.2%	2.66%
11	7B	60	9	1365	22.750	11/7/2023 10:10	11/2/2023 10:59	11/7/2023 8:21	0.996	0.813	1.000	1.057	92.8%	2.61%
12	7C	60	9	1255	20.917	11/7/2023 10:11	11/2/2023 10:59	11/7/2023 8:21	0.998	0.813	1.000	1.057	88.4%	2.64%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2023	5/31/2024	0.6245	0.00988	0.364	11/3/2023 18:38	1000
2	PIC	6/1/2023	5/31/2024	0.5677	0.02297	0.335	11/3/2023 18:38	1000
3	PIC	6/1/2023	5/31/2024	0.6074	0.01123	0.481	11/3/2023 18:38	1000
4	PIC	6/1/2023	5/31/2024	0.6376	0.00889	0.762	11/3/2023 18:38	1000
5	PIC	6/1/2023	5/31/2024	0.6412	0.00773	1.546	11/3/2023 18:38	1000
6	PIC	6/1/2023	5/31/2024	0.6454	0.00657	0.453	11/3/2023 18:38	1000
7	PIC	6/1/2023	5/31/2024	0.6566	0.00925	0.459	11/3/2023 18:38	1000
8	PIC	6/1/2023	5/31/2024	0.6253	0.02111	1.473	11/3/2023 18:37	1000
9	PIC	6/1/2023	5/31/2024	0.6167	0.01970	1.350	11/3/2023 18:34	1000
10	PIC	6/1/2023	5/31/2024	0.6206	0.00745	1.408	11/3/2023 18:37	1000
11	PIC	6/1/2023	5/31/2024	0.6423	0.00627	0.478	11/3/2023 18:35	1000
12	PIC	6/1/2023	5/31/2024	0.6369	0.00790	0.294	11/3/2023 18:55	1000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 2051-D
Spike Exp Date : 7/12/2024
Spike Activity (dpm/ml): 523.34
Spike Volume Added: 0.10

LCS S/N : 2051-D
LCS Exp Date : 7/12/2024
LCS Activity (dpm/ml): 523.34
LCS Volume Added: 0.10

Results																
Pos.	Decision	Critical	Required		Sample Act.	Sample Act.	Net Count	Net Count	2 SIGMA	2 SIGMA	Sample	Sample	RPD	RER	Nominal	Recovery
	Level	Level	MDA	MDA	Conc.	Error	Rate	Rate Error	Counting	Total Prop.						
	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	%	CPM	CPM	Uncertainty	Uncertainty						
1	0.6449	0.4553	3	1.0831	0.5269	62.12%	0.1527	0.0947	0.6409	0.6547		SAMPLE				
2	0.7411	0.5233	3	1.2532	0.6133	61.85%	0.1483	0.0916	0.7423	0.7590		SAMPLE				
3	0.8203	0.5792	3	1.3493	0.8364	50.41%	0.2190	0.1102	0.8251	0.8522		SAMPLE				
4	1.0055	0.7099	3	1.6058	0.9472	52.33%	0.2547	0.1331	0.9701	0.9996		SAMPLE				
5	1.3709	0.9679	3	2.1137	1.0229	62.42%	0.2873	0.1792	1.2502	1.2770		SAMPLE				
6	0.7419	0.5238	3	1.2256	1.5911	27.95%	0.4470	0.1243	0.8673	0.9570		SAMPLE				
7	0.2481	0.1752	1	0.4094	0.7185	22.40%	0.6077	0.1350	0.3130	0.3625		SAMPLE				
8	0.5524	0.3900	1	0.8535	1.1909	24.77%	0.8103	0.1988	0.5727	0.6494		SAMPLE				
9	0.4823	0.3405	1	0.7481	0.1787	121.15%	0.1333	0.1615	0.4242	0.4267		MB				
10	0.5713	0.4033	1	0.8844	0.9721	30.17%	0.6253	0.1879	0.5725	0.6236	643075002.1	DUP	20.2%			
11	0.6867	0.4848	1	1.1300	71.4334	3.86%	22.2720	0.6162	3.8734	18.5557	643075002.1	MS			76.7302	91.5%
12	0.1936	0.1367	1	0.3310	23.7740	3.97%	20.6227	0.5907	1.3346	6.1919		LCS			26.0659	91.2%

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
642811001	3C	60	17	31	11/7/2023 10:10	11/7/2023 11:10	PIC	2516028
642811002	3D	60	3	29	11/7/2023 10:10	11/7/2023 11:10	PIC	2516028
642811003	4A	60	6	42	11/7/2023 10:10	11/7/2023 11:10	PIC	2516028
642811004	4C	60	15	61	11/7/2023 10:10	11/7/2023 11:10	PIC	2516028
642811005	4D	60	22	110	11/7/2023 10:10	11/7/2023 11:10	PIC	2516028
642811006	5C	60	16	54	11/7/2023 10:10	11/7/2023 11:10	PIC	2516028
643075001	5D	60	11	64	11/7/2023 10:10	11/7/2023 11:10	PIC	2516028
643075002	2B	60	19	137	11/7/2023 12:21	11/7/2023 13:21	PIC	2516028
1205559742	6C	60	11	89	11/7/2023 10:10	11/7/2023 11:10	PIC	2516028
1205559743	2D	60	8	122	11/7/2023 12:21	11/7/2023 13:21	PIC	2516028
1205559744	7B	60	9	1365	11/7/2023 10:10	11/7/2023 11:10	PIC	2516028
1205559745	7C	60	9	1255	11/7/2023 10:11	11/7/2023 11:11	PIC	2516028

Continuing Calibration Data

Gas Flow Proportional Counter Checks for 07-Nov-2023

Detectors LB4100 E1 through H4 and PIC 1A through 14D and G5400W 1W through 1Z and LB4200 GA1 through OD4

Short Name	Status	Parmname	Run Time	Count Time	CPM or dec	Low Limit	High Limit	Stdev
LB4100H1	Above	Alpha bkg	07-Nov 09:18	60	0.250	-8.08E-2	0.225	+3.48
LB4100H1	Above	Beta bkg	07-Nov 09:18	60	2.817	-5.15E-1	3.743	+1.69
LB4200GB2	need 2nd	Alpha eff	07-Nov 05:22	5	9558	9443	9898	-1.48
LB4200GB2	Above	Beta bkg	07-Nov 09:19	60	62.783	0.129	1.304	+316.80
PIC11B	Above	Alpha XTalk	07-Nov 09:16	5	0.319	0.260	0.302	+5.38
PIC11B	Below	Beta eff	07-Nov 07:29	5	19618	20200	22170	-4.77
PIC11C	Above	Alpha XTalk	07-Nov 09:16	5	0.328	0.273	0.298	+10.69
PIC11C	Below	Beta eff	07-Nov 07:35	5	20103	20420	21770	-4.41
PIC12B	Above	Beta bkg	07-Nov 09:01	60	17.400	-5.75E-1	2.641	+30.54

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

The following detectors may not have properly transferred to the LIMS system

PIC5B Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk
 PIC10B Alpha bkg, Alpha eff, Alpha XTalk, Beta bkg, Beta eff, Beta XTalk

Reviewed by Jc Poparad

Date 11/7/23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2516028

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
642811001	SAMPLE	JE1	PIC3C	NOV-07-23 10:10:21	DONE	25mm Filter	01-JUN-23 00:00
642811002	SAMPLE	JE1	PIC3D	NOV-07-23 10:10:24	DONE	25mm Filter	01-JUN-23 00:00
642811003	SAMPLE	JE1	PIC4A	NOV-07-23 10:10:29	DONE	25mm Filter	01-JUN-23 00:00
642811004	SAMPLE	JE1	PIC4C	NOV-07-23 10:10:32	DONE	25mm Filter	01-JUN-23 00:00
642811005	SAMPLE	JE1	PIC4D	NOV-07-23 10:10:37	DONE	25mm Filter	01-JUN-23 00:00
642811006	SAMPLE	JE1	PIC5C	NOV-07-23 10:10:41	DONE	25mm Filter	01-JUN-23 00:00
643075001	SAMPLE	JE1	PIC5D	NOV-07-23 10:10:46	DONE	25mm Filter	01-JUN-23 00:00
1205559742	MB	JE1	PIC6C	NOV-07-23 10:10:48	DONE	25mm Filter	01-JUN-23 00:00
1205559744	MS	JE1	PIC7B	NOV-07-23 10:10:59	DONE	25mm Filter	01-JUN-23 00:00
1205559745	LCS	JE1	PIC7C	NOV-07-23 10:11:01	DONE	25mm Filter	01-JUN-23 00:00
1205559743	DUP	JE1	PIC2D	NOV-07-23 12:21:54	DONE	25mm Filter	01-JUN-23 00:00
643075002	SAMPLE	JE1	PIC2B	NOV-07-23 12:21:56	DONE	25mm Filter	01-JUN-23 00:00

Lucas Cell Raw Data

Batch 2516021 Check-list

This check-list was completed on 13-NOV-23 by Lyndsey Pace

This batch was reviewed by Lyndsey Pace on 13-NOV-23 and Elizabeth Krouse on 14-NOV-23.

Batch ID:
2516021

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Is the blank result less than 1.65 times the CSU?	Yes		
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
12	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
13	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
14	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2516021
Analyst: Lyndsey Pace (LXP1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: LUCAS-C202389980

Due Dates for Lab: 21-NOV-2023			Package: 23-NOV-2023		SDG: 24-NOV-2023	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205559718	Ra-226 emanation spike	1715-I	.1	mL	
MS	1205559717	Ra-226 emanation spike	1715-I	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	642811001	08-NOV-2023	1	506.49	506.49	11/10/23 11:25	502	11/13/23 07:09	11/13/23 10:40	8	4
2	642811002	08-NOV-2023	1	504.77	504.77	11/10/23 11:25	607	11/13/23 07:09	11/13/23 10:41	5	22
3	642811003	08-NOV-2023	1	505.39	505.39	11/10/23 11:25	707	11/13/23 07:09	11/13/23 10:41	4	15
4	642811004	08-NOV-2023	1	501.65	501.65	11/10/23 11:25	805	11/13/23 07:09	11/13/23 10:41	1	14
5	642811005	08-NOV-2023	1	504.79	504.79	11/10/23 11:25	103	11/13/23 07:34	11/13/23 11:11	3	26
6	642811006	08-NOV-2023	1	503.81	503.81	11/10/23 11:25	207	11/13/23 07:34	11/13/23 11:11	3	2
7	643075001	08-NOV-2023	1	508.33	508.33	11/10/23 11:25	304	11/13/23 07:34	11/13/23 11:11	2	11
8	643075002	08-NOV-2023	1	475.9	475.9	11/10/23 11:25	403	11/13/23 07:34	11/13/23 11:11	3	24
9	1205559715 MB	08-NOV-2023	1		508.33	11/10/23 11:25	506	11/13/23 07:34	11/13/23 11:11	4	8
10	1205559716 DUP (643075002)	08-NOV-2023	1	460.37	460.37	11/10/23 11:25	604	11/13/23 07:34	11/13/23 11:11	3	20
11	1205559717 MS (643075002)	08-NOV-2023	1	101.43	101.43	11/10/23 11:25	702	11/13/23 07:34	11/13/23 11:11	2	680
12	1205559718 LCS	08-NOV-2023	1		508.33	11/10/23 11:25	807	11/13/23 07:34	11/13/23 11:11	5	705

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 08-NOV-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Procedure Code : LUC26RAL
 Parmname : Radium-226
 Required MDA : 1 pCi/L
 Halfife of Ra-226 : 1600 years
 Ra-226 Abundance : 1.00
 Halfife of Rn-222: 3.8235 days

Batch : 2516021
 Analyst : LIN01615
 Prep Date : 11/8/2023
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Count Time (min.)	Cell Efficiency (cpm/dpm)
1	642811001.1	0.5065	2.0282E-05	10/23/2023 15:20	502	30	4	0.133	8	0.267	30	1.8590
2	642811002.1	0.5048	2.0275E-05	10/23/2023 11:57	607	30	22	0.733	5	0.167	30	1.7750
3	642811003.1	0.5054	2.0278E-05	10/23/2023 13:14	707	30	15	0.500	4	0.133	30	1.5500
4	642811004.1	0.5017	2.0263E-05	10/23/2023 14:46	805	30	14	0.467	1	0.033	30	1.5410
5	642811005.1	0.5048	2.0275E-05	10/23/2023 13:14	103	30	26	0.867	3	0.100	30	1.6400
6	642811006.1	0.5038	2.0271E-05	10/23/2023 10:15	207	30	2	0.067	3	0.100	30	1.8080
7	643075001.1	0.5083	2.0289E-05	10/26/2023 9:29	304	30	11	0.367	2	0.067	30	1.4940
8	643075002.1	0.4759	2.0149E-05	10/26/2023 9:29	403	30	24	0.800	3	0.100	30	1.5070
9	1205559715.1	0.5083	2.0289E-05	11/8/2023 0:00	506	30	8	0.267	4	0.133	30	1.8780
10	1205559716.1	0.4604	2.0070E-05	10/26/2023 9:29	604	30	20	0.667	3	0.100	30	1.7290
11	1205559717.1	0.1014	1.1458E-05	10/26/2023 9:29	702	30	680	22.667	2	0.067	30	1.6810
12	1205559718.1	0.5083	2.0289E-05	11/8/2023 0:00	807	30	705	23.500	5	0.167	30	2.0260

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
7.700%	6/1/2023	5/31/2024	11/10/2023 11:25	11/13/2023 7:09	11/13/2023 10:40	0.400	0.974	1.002	1.000
6.800%	7/1/2023	6/30/2024	11/10/2023 11:25	11/13/2023 7:09	11/13/2023 10:41	0.400	0.974	1.002	1.000
5.800%	11/1/2023	10/31/2024	11/10/2023 11:25	11/13/2023 7:09	11/13/2023 10:41	0.400	0.974	1.002	1.000
9.600%	4/8/2023	3/31/2024	11/10/2023 11:25	11/13/2023 7:09	11/13/2023 10:41	0.400	0.974	1.002	1.000
9.600%	5/1/2023	4/30/2024	11/10/2023 11:25	11/13/2023 7:34	11/13/2023 11:11	0.402	0.973	1.002	1.000
4.000%	10/10/2023	7/31/2024	11/10/2023 11:25	11/13/2023 7:34	11/13/2023 11:11	0.402	0.973	1.002	1.000
2.100%	11/1/2023	10/31/2024	11/10/2023 11:25	11/13/2023 7:34	11/13/2023 11:11	0.402	0.973	1.002	1.000
6.100%	2/1/2023	1/31/2024	11/10/2023 11:25	11/13/2023 7:34	11/13/2023 11:11	0.402	0.973	1.002	1.000
1.400%	6/1/2023	5/31/2024	11/10/2023 11:25	11/13/2023 7:34	11/13/2023 11:11	0.402	0.973	1.002	1.000
2.300%	7/1/2023	6/30/2024	11/10/2023 11:25	11/13/2023 7:34	11/13/2023 11:11	0.402	0.973	1.002	1.000
2.000%	11/1/2023	10/31/2024	11/10/2023 11:25	11/13/2023 7:34	11/13/2023 11:11	0.402	0.973	1.002	1.000
9.200%	10/10/2023	3/31/2024	11/10/2023 11:25	11/13/2023 7:34	11/13/2023 11:11	0.402	0.973	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-I
Spike Exp Date : 8/29/2024
Spike Activity (dpm/ml): 304.19
Spike Volume Added: 0.10

LCS S/N : 1715-I
LCS Exp Date : 8/29/2024
LCS Activity (dpm/ml): 304.19
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.3818	0.2696	1	0.6621	-0.1639	86.94%	-0.1333	0.1155	0.2782	0.2783		SAMPLE				
2	0.3173	0.2240	1	0.5772	0.7320	31.31%	0.5667	0.1732	0.4385	0.4615		SAMPLE				
3	0.3246	0.2291	1	0.6060	0.5417	40.05%	0.3667	0.1453	0.4208	0.4324		SAMPLE				
4	0.1644	0.1161	1	0.3819	0.6488	31.30%	0.4333	0.1291	0.3788	0.4089		SAMPLE				
5	0.2649	0.1870	1	0.5133	1.0675	25.31%	0.7667	0.1795	0.4899	0.5514		SAMPLE				
6	0.2407	0.1700	1	0.4665	-0.0422	223.64%	-0.0333	0.0745	0.1849	0.1850		SAMPLE				
7	0.2358	0.1665	1	0.4847	0.4553	40.12%	0.3000	0.1202	0.3575	0.3640		SAMPLE				
8	0.3058	0.2159	1	0.5925	1.1251	25.48%	0.7000	0.1732	0.5456	0.5850		SAMPLE				
9	0.2652	0.1873	1	0.4953	0.1610	86.61%	0.1333	0.1155	0.2733	0.2743		MB				
10	0.2755	0.1945	1	0.5338	0.8206	28.30%	0.5667	0.1599	0.4537	0.4704	643075002.1	DUP	31.3%			
11	1.0501	0.7414	1	2.1589	152.7890	4.34%	22.6000	0.8705	11.5348	25.5999	643075002.1	MS			135.0908	112.3%
12	0.2749	0.1941	1	0.5001	26.1158	9.96%	23.3333	0.8882	1.9485	6.3391		LCS			26.9550	96.9%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 13-NOV-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	04:29	1	1.14E+05	113620	-1.53		
LUCAS2	EFF	04:28	1	1.31E+05	131253	-0.64		
LUCAS3	EFF	04:26	1	91896	91896	-0.27		
LUCAS4	EFF	05:06	1	1.27E+05	127234	-1.01		
LUCAS5	EFF	05:04	1	1.31E+05	131340	-1.25		
LUCAS6	EFF	04:16	1	1.29E+05	128807	-1.4		
LUCAS7	EFF	04:14	1	1.31E+05	130836	-0.65		
LUCAS8	EFF	04:09	1	1.08E+05	108063	-2.2		

Reviewed by: 
Lyndsey Pace

Date: 13-NOV-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2516021

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
642811001	SAMPLE	LXP1	LUCAS5	NOV-13-23 10:40:00	DONE	Lucas Cell	01-JUN-23 00:00
642811002	SAMPLE	LXP1	LUCAS6	NOV-13-23 10:41:00	DONE	Lucas Cell	01-JUL-23 00:00
642811003	SAMPLE	LXP1	LUCAS7	NOV-13-23 10:41:00	DONE	Lucas Cell	01-NOV-23 00:00
642811004	SAMPLE	LXP1	LUCAS8	NOV-13-23 10:41:00	DONE	Lucas Cell	08-APR-23 00:00
642811005	SAMPLE	LXP1	LUCAS1	NOV-13-23 11:11:00	DONE	Lucas Cell	01-MAY-23 00:00
642811006	SAMPLE	LXP1	LUCAS2	NOV-13-23 11:11:00	DONE	Lucas Cell	01-AUG-23 00:00
643075001	SAMPLE	LXP1	LUCAS3	NOV-13-23 11:11:00	DONE	Lucas Cell	01-NOV-23 00:00
643075002	SAMPLE	LXP1	LUCAS4	NOV-13-23 11:11:00	DONE	Lucas Cell	01-FEB-23 00:00
1205559715	MB	LXP1	LUCAS5	NOV-13-23 11:11:00	DONE	Lucas Cell	01-JUN-23 00:00
1205559716	DUP	LXP1	LUCAS6	NOV-13-23 11:11:00	DONE	Lucas Cell	01-JUL-23 00:00
1205559717	MS	LXP1	LUCAS7	NOV-13-23 11:11:00	DONE	Lucas Cell	01-NOV-23 00:00
1205559718	LCS	LXP1	LUCAS8	NOV-13-23 11:11:00	DONE	Lucas Cell	08-APR-23 00:00

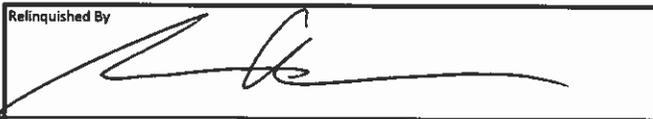


Environmental Laboratory
 1232 Haco Drive
 Lansing
 Michigan, 48910

CHAIN OF CUSTODY

Client Name BWL - Erickson Station		Project Name Erickson Well Project 100A-100D		Requested Analyses						Requested Turn Around				
Client Contact Cheryl Loudon		Project Number [none]		Ag: As: B: Ba: Be: Ca: Cd: Cr: Cu: Fe: K: Li: Mg: Mo: Na: Ni: CHC: F-ISE: Hard, T: p-Alk: SO4: T-Alk: TDS: TSS									Rush requests subject to additional charge. Rush requests subject to lab approval.	
Address 3725 S. Canal		Project Description Erickson GW Sampling Part 115												
City Lansing		PO Number												
State/Zip MI, 48917		Shipped By												
Phone (517) 702-6396	Fax (517) 702-6373	Tracking Number												
Sampler Marc Wahrer														

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code						Sample	Comments
						b	a						
MW-100 A	10/23/2023	5	G	GW	5	3	2						
MW-100 B	10/23/2023	115	G	GW	5	3	2						
MW-100 C	10/23/2023	3	G	GW	5	3	2						
MW-100 D	10/23/2023		G	GW	5	3	2						
MWT- 100 C	10/23/2023	1	G	GW	5	3	2						
Field Blank	10/23/2023	5	G	DI	5	3	2						

Relinquished By 	Date/Time 10-23-23 1630	Received By am	Date/Time	
Relinquished By	Date/Time	Received By	Date/Time	Comments
Relinquished By	Date/Time	Received By	Date/Time	
Cooler Numbers and Temperatures				

Matrix Codes: DI=Deionized Water, GW=Ground Water Preserv. Codes: a=None, b=0.5% HNO3



Data Verification & Validation Report

Lansing Board of Water & Light – Erickson Power Station

Sampling Event (dates and purpose): Background Sampling

Data Package Number:
S56029.01
S56117.01

Lab Report Date:
12/27/2023
12/29/2023

Data Validator: Andrew Byks

Data Validation Completion Date: 1/3/2024

General Overall Assessment:

- Data are usable without qualification.
 Data are usable with qualification (as noted below).
 Some or all data are unusable (as noted below).

Wells planned for sampling:

Well ID	Planned for Sampling
MW-1	
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	
MW-7	
MW-7B	
MW-7C	
MW-8	
MW-9	
MW-10	
MW-11	
MW-11B	
MW-12	
MW-12B	
MW-13	
MW-14	
MW-15	
MW-16A	X
MW-16B	X
MW-16C	X
MW-16D	X
MW-100A	X
MW-100B	X
MW-100C	X
MW-100D	X

Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-16A	GW	S56029.01	11/21/2023	X	X	X	X	X	X	
MW-16B	GW	S56029.02	11/21/2023	X	X	X	X	X	X	
MW-16C	GW	S56029.03	11/21/2023	X	X	X	X	X	X	
MW-16D	GW	S56029.04	11/21/2023	X	X	X	X	X	X	
MWT-16A	GW	S56029.05	11/21/2023	X	X	X	X	X	X	
MW-100A	GW	S53510.01	11/27/2023	X	X	X	X	X	X	
MW-100B	GW	S53510.02	11/27/2023	X	X	X	X	X	X	
MW-100C	GW	S53510.03	11/27/2023	X	X	X	X	X	X	
MW-100D	GW	S53510.04	11/27/2023	X	X	X	X	X	X	
MWT-100B	GW	S53510.05	11/27/2023	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO₃, CO₃, hardness

Any planned sampling or analysis NOT completed? If yes, explain: _____

Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Field Data							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	X		Record of decontamination for non-dedicated sampling equipment	X			
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
Analytical Data Package							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies across samples for chloride, sulfate, hardness, Rad-226, and Rad-228
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Holding Times	X		Analyses performed within allowed holding time	X			
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested		X		RLs for chloride, sulfate hardness, TDS, and Rad-228 were not met
			MDLs<RLs		X		RL=MDL for carbonate
			MDLs<MCLs	X			
			MDLs<GPS	X			
QC Validation							
Evaluate Accuracy							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Evaluate Precision							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Field duplicates for Rad-226 not met; see below
Evaluate Representativeness							
Equipment Blanks (if applicable)	X		Non-detect (<RL)		X		Rad-226 detected in one field blank
QC Verification							
Verify Instrument Calibration & Analytical Process							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
Evaluate Completeness (# usable measurements/ # unusable measurements)							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

None.

Comments:

TSS was detected in parent sample MW-16A but not detected in field duplicate MWT-16A. TSS in parent sample MW-16A required qualification as estimated with high bias (J+) and in field duplicate MWT-16A as estimated but not detected.

The RPD for Rad-228 between parent sample MW-16A and field duplicate MWT-16A were 38%. Rad-228 required qualification as estimated with low bias (J-) in parent sample MW-16A and as estimated with high bias (J+) in field duplicate MWT-16A.

Fluoride and TSS were detected in parent sample MW-100C, but not detected in field duplicate MWT-100C. Fluoride and TSS in parent sample MW-100C required qualification as estimated with high bias (J+) and in field duplicate MWT-100C as estimated but not detected (UJ).

The RPDs for Rad-226 and Rad-228 between parent sample MW-100C and field duplicate MWT-100C were 58% and 196%, respectively. Rad-226 in parent sample MW-100C required qualification as estimated with high bias (J+) and in field duplicate MWT-100C as estimated with low bias (J-). Rad-228 in parent sample MW-100C required qualification as estimated with low bias (J-) and in field duplicate MWT-100C as estimated with high bias (J+).

Rad-226 results in samples MW-100A, MW-100B, MW-100C, MW-100D, and MWT-100C required qualification as estimated with high bias (J+) due to Rad-226 detection in the associated field blank.



Hometown People. Hometown Power.

Lansing Board of Water and Light
Environmental Services Laboratory (MI00079)

Cert ID:3760

1232 Haco Dr.

Lansing, Michigan 48901

27 December 2023

BWL - Erickson Station

Attn: Cheryl Loudon

3725 S. Canal

Lansing, MI 48917

Project: Erickson AM MI

Dear Cheryl Loudon,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

Work Order

L311201

Received

11/22/2023 7:40:00AM

Account Number

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



Analytical Report

Client: BWL - Erickson Station
Address: 3725 S. Canal
 Lansing MI, 48917

Client Project Manager: Cheryl Louden

Report Date: 12/27/2023

Sample Name: MW-16A

Lab #: L311201-01 Ground Water

Collected: 21-Nov-23 11:26

By: Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	2400	1.0	uS/cm	1		21-Nov-23 11:26	maw	FIELD	
Dissolved oxygen	ND	0.100	mg/L	1		21-Nov-23 11:26	maw	FIELD	
Milliliters Purged	200		ml/min	1		21-Nov-23 11:26	maw	FIELD	
Oxidation Reduction Potential	-43.90	-999.0	mV	1		21-Nov-23 11:26	maw	FIELD	
pH	6.8	7.0	pH Units	1		21-Nov-23 11:26	maw	FIELD	
Temperature	14		°C	1		21-Nov-23 11:26	maw	FIELD	
Turbidity	4.4	0.10	NTU	1		21-Nov-23 11:26	maw	FIELD	

Sample Name: MW-16B

Lab #: L311201-02 Ground Water

Collected: 21-Nov-23 13:41

By: Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	620	1.0	uS/cm	1		21-Nov-23 13:41	maw	FIELD	
Dissolved oxygen	ND	0.100	mg/L	1		21-Nov-23 13:41	maw	FIELD	
Milliliters Purged	230		ml/min	1		21-Nov-23 13:41	maw	FIELD	
Oxidation Reduction Potential	-127.7	-999.0	mV	1		21-Nov-23 13:41	maw	FIELD	
pH	7.5	7.0	pH Units	1		21-Nov-23 13:41	maw	FIELD	
Temperature	13		°C	1		21-Nov-23 13:41	maw	FIELD	
Turbidity	6.3	0.10	NTU	1		21-Nov-23 13:41	maw	FIELD	

Sample Name: MW-16C

Lab #: L311201-03 Ground Water

Collected: 21-Nov-23 14:56

By: Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	590	1.0	uS/cm	1		21-Nov-23 14:56	maw	FIELD	
Dissolved oxygen	ND	0.100	mg/L	1		21-Nov-23 14:56	maw	FIELD	
Milliliters Purged	230		ml/min	1		21-Nov-23 14:56	maw	FIELD	
Oxidation Reduction Potential	-145.6	-999.0	mV	1		21-Nov-23 14:56	maw	FIELD	
pH	7.4	7.0	pH Units	1		21-Nov-23 14:56	maw	FIELD	
Temperature	13		°C	1		21-Nov-23 14:56	maw	FIELD	
Turbidity	6.0	0.10	NTU	1		21-Nov-23 14:56	maw	FIELD	



Analytical Report

Client: BWL - Erickson Station
Address: 3725 S. Canal
 Lansing MI, 48917

Client Project Manager: Cheryl Louden

Report Date: 12/27/2023

Sample Name: MW-16D

Lab #: L311201-04 Ground Water

Collected: 21-Nov-23 12:34

By: Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	600	1.0	uS/cm	1		21-Nov-23 12:34	maw	FIELD	
Dissolved oxygen	ND	0.100	mg/L	1		21-Nov-23 12:34	maw	FIELD	
Milliliters Purged	50.0		ml/90sec	1		21-Nov-23 12:34	maw	FIELD	
Oxidation Reduction Potential	-122.4	-999.0	mV	1		21-Nov-23 12:34	maw	FIELD	
pH	7.4	7.0	pH Units	1		21-Nov-23 12:34	maw	FIELD	
Temperature	11		°C	1		21-Nov-23 12:34	maw	FIELD	
Turbidity	6.0	0.10	NTU	1		21-Nov-23 12:34	maw	FIELD	



Analytical Report

Client: BWL - Erickson Station

Client Project Manager: Cheryl Louden

Report Date: 12/27/2023

Address: 3725 S. Canal
Lansing MI, 48917

Approved By: _____

Jennifer Caporale

Notes and Definitions

AL Action Level (Action Level = Regulatory Limit)
MCL Maximum Contaminant Level
PEL Permissible Exposure Limit (Permissible Exposure Limit = Regulatory Limit)
RPD Relative Percent Difference
OT Odor Threshold
ND Non Detect is less than the reporting limit value
All drinking water regulatory limits are MCL's with the exception of Lead and Copper unless otherwise noted.



Report ID: S56029.01(02)
Generated on 12/27/2023
Replaces report S56029.01(01) generated on 11/28/2023

Report to
Attention: Jennifer Caporale
Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Report produced by
Merit Laboratories, Inc.
2680 East Lansing Drive
East Lansing, MI 48823

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Contacts for report questions:
John Lavery (johnlavery@meritlabs.com)
Barbara Ball (bball@meritlabs.com)

Report Summary
Lab Sample ID(s): S56029.01-S56029.06
Project: Erickson AM MI Wells 16A-16D
Collected Date(s): 11/21/2023
Submitted Date/Time: 11/22/2023 08:08
Sampled by: Marc Wahrer
P.O. #:

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Maya Murshak
Technical Director



General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Starred (*) analytes are not NY NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

All accreditations/certifications held by this laboratory are listed on page 3. Not all accreditations/certifications are applicable to this report.

For a specific list of accredited analytes, please feel free to contact the laboratory or visit <https://www.meritlabs.com/certifications>.

Report Narrative

All analyses completed



Laboratory Accreditations (For Reference Only)

Authority	Accreditation ID
Michigan DEQ	#9956
DOD ELAP & ISO/IEC 17025:2017	#69699 PJLA Testing
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



Sample Summary (6 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S56029.01	MW-16A L311201-01	Groundwater	11/21/23 11:26
S56029.02	MW-16B L311201-02	Groundwater	11/21/23 13:41
S56029.03	MW-16C L311201-03	Groundwater	11/21/23 14:56
S56029.04	MW-16-D L311201-04	Groundwater	11/21/23 12:34
S56029.05	MWT-16A L311201-05	Groundwater	11/21/23 11:26
S56029.06	Field Blank L311201-06	Water	11/21/23 09:25



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S56029.01

Sample Tag: MW-16A L311201-01

Collected Date/Time: 11/21/2023 11:26

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.8	IR
2	1L Plastic	None	Yes	1.8	IR
1	250ml Plastic	HNO3	Yes	1.8	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	11/27/23 13:57	CTV	
Metal Digestion	Completed	SW3015A	11/22/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 11/22/23 12:40, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 11/22/23 14:04, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	459	50	0.80	mg/L	50	16887-00-6	
Sulfate	264	50	3.0	mg/L	50	14808-79-8	

Method: SM2320B, Run Date: 11/22/23 14:36, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	510	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 11/22/23 13:08, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	754	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 11/22/23 13:58, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,580	50	6	mg/L	2		

Method: SM2540D, Run Date: 11/22/23 13:58, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	1.2	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 11/22/23 13:59, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sodium	312	2.5	0.545	mg/L	25	7440-23-5	

Method: E200.8, Run Date: 11/22/23 11:52, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00225	mg/L	5	7440-36-0	
Arsenic	0.004	0.002	0.00145	mg/L	5	7440-38-2	
Barium	0.163	0.005	0.000900	mg/L	5	7440-39-3	



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S56029.01 (continued)

Sample Tag: MW-16A L311201-01

Method: E200.8, Run Date: 11/22/23 11:52, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Beryllium	Not detected	0.001	0.000200	mg/L	5	7440-41-7	
Boron	0.19	0.04	0.0159	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000350	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000750	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000450	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000800	mg/L	5	7440-50-8	
Iron	3.08	0.02	0.0142	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000450	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00135	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.00420	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00115	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00435	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000250	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000350	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00205	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00325	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 11/22/23 14:00, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	210	0.50	0.218	mg/L	5	7440-70-2	
Magnesium	52.4	0.50	0.0579	mg/L	5	7439-95-4	
Potassium	1.49	0.50	0.119	mg/L	5	7440-09-7	

Method: E245.1, Run Date: 11/27/23 15:10, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 12/19/23 14:58, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

**Lab Sample ID: S56029.02**

Sample Tag: MW-16B L311201-02

Collected Date/Time: 11/21/2023 13:41

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.8	IR
2	1L Plastic	None	Yes	1.8	IR
1	250ml Plastic	HNO3	Yes	1.8	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	11/27/23 13:57	CTV	
Metal Digestion	Completed	SW3015A	11/22/23 10:10	CCM	

Inorganics**Method: E300.0, Run Date: 11/22/23 12:53, Analyst: ASB**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	3.1	5	0.08	mg/L	5	16887-00-6	b
Fluoride (Undistilled)	0.58	1.0	0.13	mg/L	5	16984-48-8	b
Sulfate	17.8	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 11/22/23 14:40, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	400	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 11/22/23 13:12, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	355	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 11/22/23 13:58, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	370	50	6	mg/L	2		

Method: SM2540D, Run Date: 11/22/23 13:58, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals**Method: E200.8, Run Date: 11/22/23 11:55, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00225	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.00145	mg/L	5	7440-38-2	
Barium	0.091	0.005	0.000900	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000200	mg/L	5	7440-41-7	
Boron	0.12	0.04	0.0159	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000350	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000750	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000450	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000800	mg/L	5	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S56029.02 (continued)

Sample Tag: MW-16B L311201-02

Method: E200.8, Run Date: 11/22/23 11:55, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	0.39	0.02	0.0142	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000450	mg/L	5	7439-92-1	
Lithium*	0.021	0.005	0.00135	mg/L	5	7439-93-2	
Molybdenum	0.006	0.005	0.00420	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00115	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00435	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000250	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000350	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00205	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00325	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 11/22/23 14:04, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	83.9	0.50	0.218	mg/L	5	7440-70-2	
Magnesium	36.4	0.50	0.0579	mg/L	5	7439-95-4	
Potassium	3.02	0.50	0.119	mg/L	5	7440-09-7	
Sodium	11.0	0.50	0.109	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 11/27/23 15:13, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 12/19/23 14:58, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Lab Sample ID: S56029.03

Sample Tag: MW-16C L311201-03

Collected Date/Time: 11/21/2023 14:56

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.8	IR
2	1L Plastic	None	Yes	1.8	IR
1	250ml Plastic	HNO3	Yes	1.8	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	11/27/23 13:57	CTV	
Metal Digestion	Completed	SW3015A	11/22/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 11/22/23 13:06, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	2.2	5	0.08	mg/L	5	16887-00-6	b
Fluoride (Undistilled)	0.20	1.0	0.13	mg/L	5	16984-48-8	b
Sulfate	7.90	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 11/22/23 14:46, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	390	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 11/22/23 13:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	318	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 11/22/23 13:58, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	340	50	6	mg/L	2		

Method: SM2540D, Run Date: 11/22/23 13:58, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 11/22/23 11:59, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00225	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.00145	mg/L	5	7440-38-2	
Barium	0.030	0.005	0.000900	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000200	mg/L	5	7440-41-7	
Boron	0.43	0.04	0.0159	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000350	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000750	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000450	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000800	mg/L	5	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL



Lab Sample ID: S56029.03 (continued)

Sample Tag: MW-16C L311201-03

Method: E200.8, Run Date: 11/22/23 11:59, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	0.45	0.02	0.0142	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000450	mg/L	5	7439-92-1	
Lithium*	0.029	0.005	0.00135	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.00420	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00115	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00435	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000250	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000350	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00205	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00325	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 11/22/23 14:06, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	76.8	0.50	0.218	mg/L	5	7440-70-2	
Magnesium	31.4	0.50	0.0579	mg/L	5	7439-95-4	
Potassium	5.11	0.50	0.119	mg/L	5	7440-09-7	
Sodium	15.7	0.50	0.109	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 11/27/23 15:16, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 12/19/23 14:58, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Lab Sample ID: S56029.04

Sample Tag: MW-16-D L311201-04

Collected Date/Time: 11/21/2023 12:34

Matrix: Groundwater

COC Reference:

Sample Containers

Table with 6 columns: #, Type, Preservative(s), Refrigerated?, Arrival Temp. (C), Thermometer #. Rows include 1L Plastic and 250ml Plastic containers.

Extraction / Prep.

Table with 6 columns: Parameter, Result, Method, Run Date, Analyst, Flags. Rows include Mercury Digestion and Metal Digestion.

Inorganics

Method: E300.0, Run Date: 11/22/23 13:19, Analyst: ASB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Chloride, Fluoride (Undistilled), and Sulfate.

Method: SM2320B, Run Date: 11/22/23 14:48, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Bicarbonate* and Carbonate*.

Method: SM2340C, Run Date: 11/22/23 13:20, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Hardness.

Method: SM2540C, Run Date: 11/22/23 13:58, Analyst: MDG

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Dissolved Solids.

Method: SM2540D, Run Date: 11/22/23 13:58, Analyst: MDG

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Suspended Solids.

Metals

Method: E200.8, Run Date: 11/22/23 12:02, Analyst: CCM

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Antimony*, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, and Copper.

b-Value detected less than reporting limit, but greater than MDL



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S56029.04 (continued)

Sample Tag: MW-16-D L311201-04

Method: E200.8, Run Date: 11/22/23 12:02, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	0.28	0.02	0.0142	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000450	mg/L	5	7439-92-1	
Lithium*	0.031	0.005	0.00135	mg/L	5	7439-93-2	
Molybdenum	0.010	0.005	0.00420	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00115	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00435	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000250	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000350	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00205	mg/L	5	7440-62-2	
Zinc	0.014	0.005	0.00325	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 11/22/23 14:09, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	30.0	0.50	0.218	mg/L	5	7440-70-2	
Magnesium	7.68	0.50	0.0579	mg/L	5	7439-95-4	
Potassium	9.83	0.50	0.119	mg/L	5	7440-09-7	
Sodium	114	0.50	0.109	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 11/27/23 15:20, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 12/19/23 14:58, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S56029.05

Sample Tag: MWT-16A L311201-05

Collected Date/Time: 11/21/2023 11:26

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.8	IR
2	1L Plastic	None	Yes	1.8	IR
1	250ml Plastic	HNO3	Yes	1.8	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	11/27/23 13:57	CTV	
Metal Digestion	Completed	SW3015A	11/22/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 11/22/23 13:32, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	

Method: E300.0, Run Date: 11/22/23 14:17, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	455	50	0.80	mg/L	50	16887-00-6	
Sulfate	257	50	3.0	mg/L	50	14808-79-8	

Method: SM2320B, Run Date: 11/22/23 14:50, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	510	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 11/22/23 13:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	766	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 11/22/23 13:58, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	1,590	50	6	mg/L	2		

Method: SM2540D, Run Date: 11/22/23 13:58, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 11/22/23 14:14, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Sodium	294	5.0	1.09	mg/L	50	7440-23-5	

Method: E200.8, Run Date: 11/22/23 12:06, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00225	mg/L	5	7440-36-0	
Arsenic	0.003	0.002	0.00145	mg/L	5	7440-38-2	
Barium	0.166	0.005	0.000900	mg/L	5	7440-39-3	



Lab Sample ID: S56029.05 (continued)

Sample Tag: MWT-16A L311201-05

Method: E200.8, Run Date: 11/22/23 12:06, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Beryllium	Not detected	0.001	0.000200	mg/L	5	7440-41-7	
Boron	0.20	0.04	0.0159	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000350	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000750	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000450	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000800	mg/L	5	7440-50-8	
Iron	3.04	0.02	0.0142	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000450	mg/L	5	7439-92-1	
Lithium*	Not detected	0.005	0.00135	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.00420	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00115	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00435	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000250	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000350	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00205	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00325	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 11/22/23 14:10, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	211	0.50	0.218	mg/L	5	7440-70-2	
Magnesium	52.1	0.50	0.0579	mg/L	5	7439-95-4	
Potassium	1.49	0.50	0.119	mg/L	5	7440-09-7	

Method: E245.1, Run Date: 11/27/23 15:23, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 12/19/23 14:58, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Lab Sample ID: S56029.06

Sample Tag: Field Blank L311201-06

Collected Date/Time: 11/21/2023 09:25

Matrix: Water

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	1.8	IR
2	1L Plastic	None	Yes	1.8	IR
1	250ml Plastic	HNO3	Yes	1.8	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	11/27/23 13:57	CTV	
Metal Digestion	Completed	SW3015A	11/22/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 11/22/23 13:45, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 11/22/23 14:52, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 11/22/23 13:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 11/22/23 13:58, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	6	mg/L	2		

Method: SM2540D, Run Date: 11/22/23 13:58, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 11/22/23 11:34, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.000900	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000580	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.000360	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000800	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.00636	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.000140	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.000300	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.000180	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000320	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.00568	mg/L	2	7439-89-6	



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S56029.06 (continued)

Sample Tag: Field Blank L311201-06

Method: E200.8, Run Date: 11/22/23 11:34, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000180	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000540	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.00168	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000460	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.00174	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.000100	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.000140	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.000820	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.00130	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 11/22/23 13:58, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0874	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.0231	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.0479	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.0436	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 11/27/23 15:26, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 12/19/23 14:58, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

Merit Laboratories Login Checklist

Lab Set ID:S56029

Client:BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 16A-16D

Submitted: 11/22/2023 08:08 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

Sample Receiving

- | | | |
|-----|--|--|
| 01. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples are received at 4C +/- 2C Thermometer # IR 1.8 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Received on ice/ cooling process begun |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples shipped |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples left in 24 hr. drop box |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Are there custody seals/tape or is the drop box locked |

Chain of Custody

- | | | |
|-----|--|--|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC adequately filled out |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC signed and relinquished to the lab |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sample tag on bottles match COC |
| 09. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Subcontracting needed? Subcontracted to: GEL |

Preservation

- | | | |
|-----|--|---|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Do sample have correct chemical preservation |
| 11. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Completed pH checks on preserved samples? (no VOAs) |
| 12. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Did any samples need to be preserved in the lab? |

Bottle Conditions

- | | | |
|-----|--|---|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | All bottles intact |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Appropriate analytical bottles are used |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Merit bottles used |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sufficient sample volume received |
| 17. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples require laboratory filtration |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples submitted within holding time |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Do water VOC or TOX bottles contain headspace |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S56029 Submitted: 11/22/2023 08:08

Attention: Jennifer Caporale
Address: Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 16A-16D

Initial Preservation Check: 11/22/2023 08:52 MMC

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Preservation Recheck (E200.8): N/A

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S56029.01	1L Plastic HNO3	<2			
S56029.01	1L Plastic HNO3	<2			
S56029.01	250ml Plastic HNO3	<2			
S56029.02	1L Plastic HNO3	<2			
S56029.02	1L Plastic HNO3	<2			
S56029.02	250ml Plastic HNO3	<2			
S56029.03	1L Plastic HNO3	<2			
S56029.03	1L Plastic HNO3	<2			
S56029.03	250ml Plastic HNO3	<2			
S56029.04	1L Plastic HNO3	<2			
S56029.04	1L Plastic HNO3	<2			
S56029.04	250ml Plastic HNO3	<2			
S56029.05	1L Plastic HNO3	<2			
S56029.05	1L Plastic HNO3	<2			
S56029.05	250ml Plastic HNO3	<2			
S56029.06	1L Plastic HNO3	<2			
S56029.06	1L Plastic HNO3	<2			
S56029.06	250ml Plastic HNO3	<2			



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 Phone (517) 332-0167 Fax (517) 332-4034
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

REPORT TO

CHAIN OF CUSTODY RECORD

INVOICE TO

CONTACT NAME **Jennifer Caporale**
 COMPANY **Lansing Board of Water and Light**
 ADDRESS **PO Box 13007 48901-3007**
 CITY **Lansing** STATE **Mi** ZIP CODE **48901**
 PHONE NO. **517-702-6372** FAX NO. P.O. NO.
 E-MAIL ADDRESS **Environmental_Laboratory@lbwl.com** QUOTE NO.

CONTACT NAME **Beth Zimpfer** SAME
 COMPANY
 ADDRESS
 CITY STATE ZIP CODE
 PHONE NO. E-MAIL ADDRESS **Beth.Zimpfer@lbwl.com**

PROJECT NO./NAME **Erickson AM MI Wells 16A-16D** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Marc Wahrer**
 TURNAROUND TIME REQUIRED 1 DAY 2 DAYS 3 DAYS STANDARD OTHER **ASAP**
 DELIVERABLES REQUIRED STD LEVEL II LEVEL III LEVEL IV EDD OTHER

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE
 # Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO ₃	H ₂ SO ₄	NaOH	MeOH	OTHER	Total Metals	F- undissisted, Cl-, SO ₄ , TDS	Radium 226	Radium 228	TSS	HCO ₃ , CO ₃ , Hardness	Certifications		Project Locations		Special Instructions
	DATE	TIME																	<input type="checkbox"/> OHIO VAP	<input type="checkbox"/> Drinking Water	<input type="checkbox"/> DoD	<input checked="" type="checkbox"/> NPDES	
56029.01	11.21.23	1126	MW-16A L311201-01	GW	5	2	3						✓	✓	✓	✓	✓	✓					Metals to analyse: Na, Mg, K
.02		1341	MW-16B -02	GW	5	2	3						✓	✓	✓	✓	✓	✓					B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03		1456	MW-16C -03	GW	5	2	3						✓	✓	✓	✓	✓	✓					Co, Li, Hg, Mo, Pb, Se, Tl,
.04		1234	MW16-D -04	GW	5	2	3						✓	✓	✓	✓	✓	✓					Fe, Cu, Ni, Ag, V, Zn
.05		1126	MWT- 16A -05	GW	5	2	3						✓	✓	✓	✓	✓	✓					Please send a preliminary report
.06		0925	Field Blank -06	DI	5	2	3						✓	✓	✓	✓	✓	✓					

RELINQUISHED BY: *[Signature]* ^{Sampler} DATE **11-22-23** TIME **0808**
 RECEIVED BY: *M. Ailcock* DATE **11/22/23** TIME **0808**
 SIGNATURE/ORGANIZATION
 RELINQUISHED BY: DATE TIME
 RECEIVED BY: DATE TIME
 SIGNATURE/ORGANIZATION

RELINQUISHED BY: DATE TIME
 SIGNATURE/ORGANIZATION
 RECEIVED BY: DATE TIME
 SIGNATURE/ORGANIZATION
 SEAL NO. SEAL INTACT YES NO INITIALS
 NOTES: TEMP. ON ARRIVAL **1.8**
 SEAL NO. SEAL INTACT YES NO INITIALS

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total		250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005

December 19, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 646851
SDG: S56029

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on November 29, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,



Delaney Stonesmith
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S56029
Work Order: 646851**

December 19, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on November 29, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
646851001	S56029.01
646851002	S56029.02
646851003	S56029.03
646851004	S56029.04
646851005	S56029.05
646851006	S56029.06 Field Blank

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Delaney Stonesmith". The signature is written in a cursive style with a large initial 'D'.

Delaney Stonesmith
Project Manager

Chain of Custody and Supporting Documentation

SAMPLE RECEIPT & REVIEW FORM

Client: <u>MEKI</u>		SDG/AR/COC/Work Order: <u>64685</u>		D.S.	
Received By: <u>Thyasia Tatum</u>		Date Received: <u>11-29-23</u>			
Carrier and Tracking Number		Circle Applicable: FedEx Express FedEx Ground <u>UPS</u> Field Services Courier Other <u>1246604770301859866</u>			
Suspected Hazard Information		Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.	
A) Shipped as a DOT Hazardous?			<input checked="" type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___	
B) Did the client designate the samples are to be received as radioactive?			<input checked="" type="checkbox"/>	COC notation on radioactive stickers on containers equal client designation	
C) Did the RSO classify the samples as radioactive?			<input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM / mR/hr Classified as: Rad 1 Rad 2 Rad 3	
D) Did the client designate samples are hazardous?			<input checked="" type="checkbox"/>	COC notation on hazardous labels on containers equal client designation	
E) Did the RSO identify possible hazards?			<input checked="" type="checkbox"/>	If D or E is yes, select Hazards below. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other: _____	
Sample Receipt Criteria		Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ deg. C)?*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Preservation Method: Wet Ice Ice Packs Dry ice <u>None</u> Other: _____ *all temperatures are recorded in Celsius TEMP: <u>10°C</u>
4	Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Temperature Device Serial #: <u>IR2-23</u> Secondary Temperature Device Serial # (If Applicable): _____
5	Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Sample ID's and Containers Affected: If Preservation added, Lot#: _____
7	Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer)
					Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No)
					Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___
8	Samples received within holding time?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		ID's and containers affected:
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
13	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Circle Applicable: Not relinquished Other (describe)
Comments (Use Continuation Form if needed):					

PM (or PMA) review: Initials OO Date 11/30/23 Page 1 of 1

11/30/23

Laboratory Certifications

List of current GEL Certifications as of 19 December 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-00651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	KY90129
Kentucky Wastewater	KY90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2023019
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122024-05
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2023-152
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-23-21
Utah NELAP	SC000122023-38
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S56029
Work Order #: 646851**

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2533748

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
646851001	S56029.01
646851002	S56029.02
646851003	S56029.03
646851004	S56029.04
646851005	S56029.05
646851006	S56029.06 Field Blank
1205589429	Method Blank (MB)
1205589430	646851001(S56029.01) Sample Duplicate (DUP)
1205589431	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2532924

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
646851001	S56029.01
646851002	S56029.02
646851003	S56029.03
646851004	S56029.04
646851005	S56029.05
646851006	S56029.06 Field Blank
1205588134	Method Blank (MB)
1205588135	646878001(NonSDG) Sample Duplicate (DUP)
1205588136	646878001(NonSDG) Matrix Spike (MS)
1205588137	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

The matrix spike, 1205588136 (Non SDG 646878001MS), aliquot was reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S56029 GEL Work Order: 646851

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Theresa Austin

Date: 27 DEC 2023

Title: Analyst III - Data Validator

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: December 27, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S56029.01	Project: MERI00120
Sample ID: 646851001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 21-NOV-23 11:26	
Receive Date: 29-NOV-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.548	+/-0.887	1.55	3.00	pCi/L		JE1	12/13/23	0837	2533748	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		2.80	+/-1.13			pCi/L		NXL1	12/19/23	1458	2533998	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		2.26	+/-0.698	0.411	1.00	pCi/L		LXP1	12/10/23	0845	2532924	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			90.5	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: December 27, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Lavery
 Project: Routine Analysis

Client Sample ID: S56029.02	Project: MERI00120
Sample ID: 646851002	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 21-NOV-23 13:41	
Receive Date: 29-NOV-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.831	+/-0.946	1.59	3.00	pCi/L		JE1	12/13/23	0837	2533748		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.63	+/-1.02			pCi/L		NXL1	12/19/23	1458	2533998		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.804	+/-0.380	0.324	1.00	pCi/L		LXP1	12/10/23	0918	2532924		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			93.3	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: December 27, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S56029.03 Project: MERI00120
Sample ID: 646851003 Client ID: MERI001
Matrix: Ground Water
Collect Date: 21-NOV-23 14:56
Receive Date: 29-NOV-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.480	+/-0.908	1.60	3.00	pCi/L		JE1	12/13/23	0837	2533748	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.30	+/-1.05			pCi/L		NXL1	12/19/23	1458	2533998	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.821	+/-0.527	0.739	1.00	pCi/L		LXP1	12/10/23	0918	2532924	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			87.8	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: December 27, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S56029.04 Project: MERI00120
Sample ID: 646851004 Client ID: MERI001
Matrix: Ground Water
Collect Date: 21-NOV-23 12:34
Receive Date: 29-NOV-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.34	+/-0.989	1.55	3.00	pCi/L		JE1	12/13/23	0837	2533748		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.84	+/-1.05			pCi/L		NXL1	12/19/23	1458	2533998		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.500	+/-0.366	0.479	1.00	pCi/L		LXP1	12/10/23	0918	2532924		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			87.8	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: December 27, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823
Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S56029.05 Project: MERI00120
Sample ID: 646851005 Client ID: MERI001
Matrix: Ground Water
Collect Date: 21-NOV-23 11:26
Receive Date: 29-NOV-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	1.23	+/-1.12	1.83	3.00	pCi/L		JE1	12/13/23	0837	2533748		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		3.01	+/-1.27			pCi/L		NXL1	12/19/23	1458	2533998		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		1.78	+/-0.606	0.389	1.00	pCi/L		LXP1	12/10/23	0918	2532924		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			88.9	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: December 27, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Lavery
Project: Routine Analysis

Client Sample ID: S56029.06 Field Blank Project: MERI00120
Sample ID: 646851006 Client ID: MERI001
Matrix: Ground Water
Collect Date: 21-NOV-23 09:25
Receive Date: 29-NOV-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.915	+/-0.771	1.23	3.00	pCi/L		JE1	12/13/23	0837	2533748		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.05	+/-0.860			pCi/L		NXL1	12/19/23	1458	2533998		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226	U	0.134	+/-0.382	0.722	1.00	pCi/L		LXP1	12/10/23	0918	2532924		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			92.1	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: December 27, 2023

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Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan

Contact: John Laverty

Workorder: 646851

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2533748										
QC1205589430	646851001	DUP									
Radium-228	U	0.548	U	0.655	pCi/L	N/A		N/A	JE1	12/13/23	08:38
	Uncertainty	+/-0.887		+/-0.711							
QC1205589431	LCS										
Radium-228	74.6			72.0	pCi/L		96.5	(75%-125%)		12/13/23	08:38
	Uncertainty			+/-4.10							
QC1205589429	MB										
Radium-228			U	-0.200	pCi/L					12/13/23	08:38
	Uncertainty			+/-0.516							
Rad Ra-226											
Batch	2532924										
QC1205588135	646878001	DUP									
Radium-226				0.727	pCi/L	29.5		(0% - 100%)	LXP1	12/10/23	09:50
	Uncertainty			+/-0.366							
QC1205588137	LCS										
Radium-226	26.9			32.7	pCi/L		122	(75%-125%)		12/10/23	09:50
	Uncertainty			+/-2.40							
QC1205588134	MB										
Radium-226			U	0.330	pCi/L					12/10/23	09:50
	Uncertainty			+/-0.432							
QC1205588136	646878001	MS									
Radium-226	132	0.727		106	pCi/L		79.7	(75%-125%)		12/10/23	09:50
	Uncertainty	+/-0.366		+/-9.49							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- H Analytical holding time was exceeded
- < Result is less than value reported
- > Result is greater than value reported

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
NI											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2533748 Check-list

This check-list was completed on 13-DEC-23 by Rhonda Birch

This batch was reviewed by Kenshalla Oston on 13-DEC-23 and Rhonda Birch on 13-DEC-23.

Batch ID:
2533748

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?			
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2533748
Analyst: Jacqueline Winston (JE1)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: SP-C018367602

Due Dates for Lab: 25-DEC-2023			Package: 27-DEC-2023		SDG: 28-DEC-2023	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205589431	Radium 228	2051-D	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	646851001	04-DEC-2023	3	302.3	302.3	12/05/23 13:01	12/13/23 06:48
2	646851002	04-DEC-2023	3	309.4	309.4	12/05/23 13:01	12/13/23 06:48
3	646851003	04-DEC-2023	3	300.9	300.9	12/05/23 13:01	12/13/23 06:48
4	646851004	04-DEC-2023	3	300.8	300.8	12/05/23 13:01	12/13/23 06:48
5	646851005	04-DEC-2023	3	307.6	307.6	12/05/23 13:01	12/13/23 06:48
6	646851006	04-DEC-2023	3	301.3	301.3	12/05/23 13:01	12/13/23 06:48
7	646993001	04-DEC-2023	3	301	301	12/05/23 13:01	12/13/23 06:48
8	646993002	04-DEC-2023	3	312.3	312.3	12/05/23 13:01	12/13/23 06:48
9	646993003	04-DEC-2023	3	301.2	301.2	12/05/23 13:01	12/13/23 06:48
10	646993004	04-DEC-2023	3	306.5	306.5	12/05/23 13:01	12/13/23 06:48
11	646993005	04-DEC-2023	3	304.8	304.8	12/05/23 13:01	12/13/23 06:48
12	646993006	04-DEC-2023	3	302.3	302.3	12/05/23 13:01	12/13/23 06:48
13	1205589429 MB	04-DEC-2023	3		312.3	12/05/23 13:01	12/13/23 06:48
14	1205589430 DUP (646851001)	04-DEC-2023	3	302.9	302.9	12/05/23 13:01	12/13/23 06:48
15	1205589431 LCS	04-DEC-2023	3		312.3	12/05/23 13:01	12/13/23 06:48

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 2097-B	Ba-133 Tracer	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 04-DEC-2023 00:00
REGNT 4067319	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3956035	Barium Carrier Ra228 REG	1 mL	
REGNT 4067327	RGF-1M Citric Acid	5 mL	
REGNT 4063205	2M HCl	20 mL	
REGNT 4059822	RGF-50% Potassium Carbonate	2 mL	
REGNT 4067876	RGF-7M Nitric Acid	25 mL	
REGNT 3973438.3	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 4048362.6	RGF-Hydrofluoric Acid	4 mL	
REGNT 3963747	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 4061618	RGF-Neodymium Subtrate	5 mL	
REGNT 4059505.9	Nitric Acid	5 mL	
REGNT DGA110623	2517569	2 g	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 2097-B
 Tracer Exp Date : 7/12/2024
 Tracer Volume Added: 0.10

Batch : 2533748
 Analyst : JAC02417
 Prep Date : 12/4/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 3 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	646851001.1	0.3023	1.8498E-05	11/21/2023 11:26	757.6	2.10%	685.6	2.21%	0.1	0.000200
2	646851002.1	0.3094	1.8614E-05	11/21/2023 13:41	757.6	2.10%	706.9	2.17%	0.1	0.000200
3	646851003.1	0.3009	1.8474E-05	11/21/2023 14:56	757.6	2.10%	665.5	2.24%	0.1	0.000200
4	646851004.1	0.3008	1.8473E-05	11/21/2023 12:34	757.6	2.10%	664.8	2.24%	0.1	0.000200
5	646851005.1	0.3076	1.8585E-05	11/21/2023 11:26	757.6	2.10%	673.4	2.23%	0.1	0.000200
6	646851006.1	0.3013	1.8481E-05	11/21/2023 9:25	757.6	2.10%	698.1	2.19%	0.1	0.000200
7	646993001.1	0.3010	1.8476E-05	11/27/2023 15:33	757.6	2.10%	566.6	2.43%	0.1	0.000200
8	646993002.1	0.3123	1.8660E-05	11/27/2023 11:54	757.6	2.10%	660.1	2.25%	0.1	0.000200
9	646993003.1	0.3012	1.8479E-05	11/27/2023 13:16	757.6	2.10%	681.6	2.21%	0.1	0.000200
10	646993004.1	0.3065	1.8567E-05	11/27/2023 14:58	757.6	2.10%	617.4	2.32%	0.1	0.000200
11	646993005.1	0.3048	1.8539E-05	11/27/2023 13:16	757.6	2.10%	714.7	2.16%	0.1	0.000200
12	646993006.1	0.3023	1.8498E-05	11/27/2023 10:05	757.6	2.10%	680.6	2.21%	0.1	0.000200
13	1205589429.1	0.3123	1.8660E-05	12/4/2023 0:00	757.6	2.10%	703.9	2.18%	0.1	0.000200
14	1205589430.1	0.3029	1.8508E-05	11/21/2023 11:26	757.6	2.10%	668.2	2.23%	0.1	0.000200
15	1205589431.1	0.3123	1.8660E-05	12/4/2023 0:00	757.6	2.10%	661.5	2.25%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
			Alpha	Beta										
1	1A	60	13	41	0.683	12/13/2023 8:37	12/5/2023 13:01	12/13/2023 6:48	0.993	0.814	1.000	1.057	90.5%	3.06%
2	1C	60	12	68	1.133	12/13/2023 8:37	12/5/2023 13:01	12/13/2023 6:48	0.993	0.814	1.000	1.057	93.3%	3.03%
3	1D	60	12	52	0.867	12/13/2023 8:37	12/5/2023 13:01	12/13/2023 6:48	0.993	0.814	1.000	1.057	87.8%	3.08%
4	2A	60	18	63	1.050	12/13/2023 8:37	12/5/2023 13:01	12/13/2023 6:48	0.993	0.814	1.000	1.057	87.8%	3.08%
5	2D	60	15	89	1.483	12/13/2023 8:37	12/5/2023 13:01	12/13/2023 6:48	0.993	0.814	1.000	1.057	88.9%	3.08%
6	3B	60	5	45	0.750	12/13/2023 8:37	12/5/2023 13:01	12/13/2023 6:48	0.993	0.814	1.000	1.057	92.1%	3.05%
7	3C	60	1	27	0.450	12/13/2023 8:37	12/5/2023 13:01	12/13/2023 6:48	0.995	0.814	1.000	1.057	74.8%	3.22%
8	3D	60	9	36	0.600	12/13/2023 8:37	12/5/2023 13:01	12/13/2023 6:48	0.995	0.813	1.000	1.057	87.1%	3.09%
9	4C	60	16	42	0.700	12/13/2023 8:38	12/5/2023 13:01	12/13/2023 6:48	0.995	0.813	1.000	1.057	90.0%	3.06%
10	4D	60	27	53	0.883	12/13/2023 8:38	12/5/2023 13:01	12/13/2023 6:48	0.995	0.813	1.000	1.057	81.5%	3.14%
11	5D	60	10	51	0.850	12/13/2023 8:38	12/5/2023 13:01	12/13/2023 6:48	0.995	0.812	1.000	1.057	94.3%	3.03%
12	6C	60	6	81	1.350	12/13/2023 8:38	12/5/2023 13:01	12/13/2023 6:48	0.995	0.813	1.000	1.057	89.8%	3.06%
13	7B	60	7	22	0.367	12/13/2023 8:38	12/5/2023 13:01	12/13/2023 6:48	0.997	0.813	1.000	1.057	92.9%	3.04%
14	7D	60	7	35	0.583	12/13/2023 8:38	12/5/2023 13:01	12/13/2023 6:48	0.993	0.813	1.000	1.057	88.2%	3.08%
15	8B	60	8	1325	22.083	12/13/2023 8:38	12/5/2023 13:01	12/13/2023 6:48	0.997	0.813	1.000	1.057	87.3%	3.09%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2023	5/31/2024	0.5320	0.00738	0.548	12/8/2023 16:59	500
2	PIC	6/1/2023	5/31/2024	0.6077	0.00847	0.886	12/8/2023 16:59	500
3	PIC	6/1/2023	5/31/2024	0.6071	0.00692	0.736	12/8/2023 16:59	500
4	PIC	6/1/2023	5/31/2024	0.6083	0.01914	0.686	12/8/2023 16:59	500
5	PIC	6/1/2023	5/31/2024	0.6206	0.00745	1.130	12/8/2023 17:00	500
6	PIC	6/1/2023	5/31/2024	0.6266	0.01614	0.480	12/8/2023 17:00	500
7	PIC	6/1/2023	5/31/2024	0.6245	0.00988	0.436	12/8/2023 17:00	500
8	PIC	6/1/2023	5/31/2024	0.5677	0.02297	0.350	12/8/2023 17:00	500
9	PIC	6/1/2023	5/31/2024	0.6376	0.00889	0.786	12/8/2023 17:00	500
10	PIC	6/1/2023	5/31/2024	0.6412	0.00773	1.132	12/8/2023 17:00	500
11	PIC	6/1/2023	5/31/2024	0.6566	0.00925	0.560	12/8/2023 17:00	500
12	PIC	6/1/2023	5/31/2024	0.6167	0.01970	1.446	12/8/2023 16:58	500
13	PIC	6/1/2023	5/31/2024	0.6423	0.00627	0.430	12/8/2023 16:58	500
14	PIC	6/1/2023	5/31/2024	0.6247	0.01113	0.398	12/8/2023 16:58	500
15	PIC	6/1/2023	5/31/2024	0.6270	0.02148	1.126	12/8/2023 16:59	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
Spike Exp Date : N/A
Spike Activity (dpm/ml): N/A
Spike Volume Added: N/A

* - RPD changed to 0% due to sample & dup activity below MDA

LCS S/N : 2051-D
LCS Exp Date : 7/12/2024
LCS Activity (dpm/ml): 517.50
LCS Volume Added: 0.10

Results														2 SIGMA		2 SIGMA	
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	Sample Act. MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery	
1	0.9543	0.6737	3	1.5499	0.5480	82.62%	0.1353	0.1117	0.8868	0.8979		SAMPLE					
2	1.0067	0.7107	3	1.5894	0.8309	58.20%	0.2473	0.1437	0.9465	0.9701		SAMPLE					
3	1.0032	0.7083	3	1.6003	0.4800	96.60%	0.1307	0.1262	0.9084	0.9166		SAMPLE					
4	0.9681	0.6835	3	1.5505	1.3365	37.91%	0.3640	0.1374	0.9886	1.0473		SAMPLE					
5	1.1759	0.8302	3	1.8341	1.2278	46.60%	0.3533	0.1643	1.1187	1.1621		SAMPLE					
6	0.7476	0.5278	3	1.2251	0.9152	43.11%	0.2700	0.1160	0.7708	0.8060		SAMPLE					
7	0.8800	0.6213	3	1.4519	0.0586	653.57%	0.0140	0.0915	0.7508	0.7510		SAMPLE					
8	0.7177	0.5067	3	1.2039	0.9527	41.56%	0.2500	0.1034	0.7726	0.8112		SAMPLE					
9	0.9616	0.6789	3	1.5282	-0.2930	133.83%	-0.0860	0.1151	0.7684	0.7685		SAMPLE					
10	1.2450	0.8790	3	1.9418	-0.9141	52.51%	-0.2487	0.1303	0.9390	0.9392		SAMPLE					
11	0.7439	0.5252	3	1.2065	0.9055	42.75%	0.2900	0.1236	0.7567	0.7915		SAMPLE					
12	1.3465	0.9506	3	2.0772	-0.3377	166.03%	-0.0960	0.1593	1.0986	1.0987		SAMPLE					
13	0.6582	0.4647	3	1.0871	-0.1997	131.87%	-0.0633	0.0835	0.5160	0.5162		MB					
14	0.7101	0.5013	3	1.1795	0.6553	55.43%	0.1853	0.1026	0.7108	0.7304	646851001.1	DUP	* 0.0%				
15	1.1612	0.8198	3	1.8115	72.0432	4.75%	20.9573	0.6085	4.1001	19.1217		LCS			74.6429	96.5%	

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
646851001	1A	60	13	41	12/13/2023 8:37	12/13/2023 9:37	PIC	2533748
646851002	1C	60	12	68	12/13/2023 8:37	12/13/2023 9:37	PIC	2533748
646851003	1D	60	12	52	12/13/2023 8:37	12/13/2023 9:37	PIC	2533748
646851004	2A	60	18	63	12/13/2023 8:37	12/13/2023 9:37	PIC	2533748
646851005	2D	60	15	89	12/13/2023 8:37	12/13/2023 9:37	PIC	2533748
646851006	3B	60	5	45	12/13/2023 8:37	12/13/2023 9:37	PIC	2533748
646993001	3C	60	1	27	12/13/2023 8:37	12/13/2023 9:37	PIC	2533748
646993002	3D	60	9	36	12/13/2023 8:37	12/13/2023 9:37	PIC	2533748
646993003	4C	60	16	42	12/13/2023 8:38	12/13/2023 9:38	PIC	2533748
646993004	4D	60	27	53	12/13/2023 8:38	12/13/2023 9:38	PIC	2533748
646993005	5D	60	10	51	12/13/2023 8:38	12/13/2023 9:38	PIC	2533748
646993006	6C	60	6	81	12/13/2023 8:38	12/13/2023 9:38	PIC	2533748
1205589429	7B	60	7	22	12/13/2023 8:38	12/13/2023 9:38	PIC	2533748
1205589430	7D	60	7	35	12/13/2023 8:38	12/13/2023 9:38	PIC	2533748
1205589431	8B	60	8	1325	12/13/2023 8:38	12/13/2023 9:38	PIC	2533748

ASSAY 13-Dec-23 7:14:41
 Wizard 1480 s/n 4800440
 Protocol id 8 228_REC
 Time limit 180
 Count limit 50000
 Isotope Ba-133
 Protocol date 10-Jan-20 14:21:10
 Run id. 19

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	98	1	180	2272	757.6	2.1	07:14:48
646851001	2	98	2	180	2056	685.6	2.21	90.50	07:18:00
646851002	3	98	3	180	2120	706.9	2.17	93.31	07:21:11
646851003	4	98	4	180	1996	665.5	2.24	87.84	07:24:22
646851004	5	98	5	180	1994	664.8	2.24	87.75	07:27:34
646851005	6	51	6	180	2020	673.4	2.23	88.89	07:30:58
646851006	7	51	7	180	2094	698.1	2.19	92.15	07:34:10
646993001	8	51	8	180	1700	566.6	2.43	74.79	07:37:21
646993002	9	51	9	180	1980	660.1	2.25	87.13	07:40:33
646993003	10	51	10	180	2044	681.6	2.21	89.97	07:43:44
646993004	11	36	11	180	1852	617.4	2.32	81.49	07:47:09
646993005	12	36	12	180	2144	714.7	2.16	94.34	07:50:20
646993006	13	36	13	180	2041	680.6	2.21	89.84	07:53:32
1205589429	14	36	14	180	2111	703.9	2.18	92.91	07:56:43
1205589430	15	36	15	180	2004	668.2	2.23	88.20	07:59:54
1205589431	16	72	16	180	1984	661.5	2.25	87.32	08:03:19

END OF ASSAY

Continuing Calibration Data

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2533748

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
646851001	SAMPLE	JE1	PIC1A	DEC-13-23 08:37:33	DONE	25mm Filter	01-JUN-23 00:00
646851002	SAMPLE	JE1	PIC1C	DEC-13-23 08:37:37	DONE	25mm Filter	01-JUN-23 00:00
646851003	SAMPLE	JE1	PIC1D	DEC-13-23 08:37:39	DONE	25mm Filter	01-JUN-23 00:00
646851004	SAMPLE	JE1	PIC2A	DEC-13-23 08:37:43	DONE	25mm Filter	01-JUN-23 00:00
646851005	SAMPLE	JE1	PIC2D	DEC-13-23 08:37:46	DONE	25mm Filter	01-JUN-23 00:00
646851006	SAMPLE	JE1	PIC3B	DEC-13-23 08:37:49	DONE	25mm Filter	01-JUN-23 00:00
646993001	SAMPLE	JE1	PIC3C	DEC-13-23 08:37:52	DONE	25mm Filter	01-JUN-23 00:00
646993002	SAMPLE	JE1	PIC3D	DEC-13-23 08:37:56	DONE	25mm Filter	01-JUN-23 00:00
646993003	SAMPLE	JE1	PIC4C	DEC-13-23 08:38:00	DONE	25mm Filter	01-JUN-23 00:00
646993004	SAMPLE	JE1	PIC4D	DEC-13-23 08:38:04	DONE	25mm Filter	01-JUN-23 00:00
1205589429	MB	JE1	PIC7B	DEC-13-23 08:38:09	DONE	25mm Filter	01-JUN-23 00:00
1205589430	DUP	JE1	PIC7D	DEC-13-23 08:38:14	DONE	25mm Filter	01-JUN-23 00:00
1205589431	LCS	JE1	PIC8B	DEC-13-23 08:38:18	DONE	25mm Filter	01-JUN-23 00:00
646993006	SAMPLE	JE1	PIC6C	DEC-13-23 08:38:23	DONE	25mm Filter	01-JUN-23 00:00
646993005	SAMPLE	JE1	PIC5D	DEC-13-23 08:38:44	DONE	25mm Filter	01-JUN-23 00:00

Lucas Cell Raw Data

Batch 2532924 Check-list

This check-list was completed on 11-DEC-23 by Lyndsey Pace

This batch was reviewed by Lyndsey Pace on 11-DEC-23 and Elizabeth Krouse on 14-DEC-23.

Batch ID:
2532924

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2532924
Analyst: Lyndsey Pace (LXP1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: LUCAS-C202389980

Due Dates for Lab: 25-DEC-2023			Package: 27-DEC-2023		SDG: 28-DEC-2023	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205588137	Ra-226 emanation spike	1715-I	.1	mL	
MS	1205588136	Ra-226 emanation spike	1715-I	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	646851001	06-DEC-2023	1	509.61	509.61	12/07/23 11:00	801	12/10/23 05:45	12/10/23 08:45	1	43
2	646851002	06-DEC-2023	1	504.92	504.92	12/07/23 11:00	101	12/10/23 06:10	12/10/23 09:18	1	20
3	646851003	06-DEC-2023	1	504.84	504.84	12/07/23 11:00	206	12/10/23 06:10	12/10/23 09:18	7	24
4	646851004	06-DEC-2023	1	504.06	504.06	12/07/23 11:00	303	12/10/23 06:10	12/10/23 09:18	2	12
5	646851005	06-DEC-2023	1	508.16	508.16	12/07/23 11:00	402	12/10/23 06:10	12/10/23 09:18	1	36
6	646851006	06-DEC-2023	1	505.12	505.12	12/07/23 11:00	501	12/10/23 06:10	12/10/23 09:18	8	11
7	646878001	06-DEC-2023	.999	509.66	509.66	12/07/23 11:00	607	12/10/23 06:10	12/10/23 09:18	1	18
8	646993001	06-DEC-2023	1	504.37	504.37	12/07/23 11:00	708	12/10/23 06:10	12/10/23 09:18	1	23
9	646993002	06-DEC-2023	1	506.25	506.25	12/07/23 11:00	807	12/10/23 06:10	12/10/23 09:18	2	25
10	646993003	06-DEC-2023	1	506.46	506.46	12/07/23 11:00	102	12/10/23 06:40	12/10/23 09:50	1	34
11	646993004	06-DEC-2023	1	503.31	503.31	12/07/23 11:00	208	12/10/23 06:40	12/10/23 09:50	2	22
12	646993005	06-DEC-2023	1	504.19	504.19	12/07/23 11:00	305	12/10/23 06:40	12/10/23 09:50	1	10
13	646993006	06-DEC-2023	1	508.78	508.78	12/07/23 11:00	407	12/10/23 06:40	12/10/23 09:50	1	35
14	1205588134 MB	06-DEC-2023	.999		509.66	12/07/23 11:00	504	12/10/23 06:40	12/10/23 09:50	5	11
15	1205588135 DUP (646878001)	06-DEC-2023	.999	500.1	500.1	12/07/23 11:00	604	12/10/23 06:40	12/10/23 09:50	3	25
16	1205588136 MS (646878001)	06-DEC-2023	.999	103.84	103.84	12/07/23 11:00	702	12/10/23 06:40	12/10/23 09:50	1	481
17	1205588137 LCS	06-DEC-2023	.999		509.66	12/07/23 11:00	806	12/10/23 06:40	12/10/23 09:50	3	720

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 06-DEC-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Procedure Code : LUC26RAL
 Parmname : Radium-226
 Required MDA : 1 pCi/L
 Halflife of Ra-226 : 1600 years
 Ra-226 Abundance : 1.00
 Halflife of Rn-222 : 3.8235 days

Batch : 2532924
 Analyst : LIN01615
 Prep Date : 12/6/2023
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Background Count Time (min.)	Cell Efficiency (cpm/dpm)
2	646851002.1	0.5049	2.0276E-05	11/21/2023 13:41	101	30	20	0.667	1	0.033	30	1.8120
3	646851003.1	0.5048	2.0276E-05	11/21/2023 14:56	206	30	24	0.800	7	0.233	30	1.5880
4	646851004.1	0.5041	2.0272E-05	11/21/2023 12:34	303	30	12	0.400	2	0.067	30	1.5370
5	646851005.1	0.5082	2.0289E-05	11/21/2023 11:26	402	30	36	1.200	1	0.033	30	1.4980
6	646851006.1	0.5051	2.0277E-05	11/21/2023 9:25	501	30	11	0.367	8	0.267	30	1.7160
7	646878001.1	0.5097	2.0295E-05	11/15/2023 13:45	607	30	18	0.600	1	0.033	30	1.7750
8	646993001.1	0.5044	2.0274E-05	11/27/2023 15:33	708	30	23	0.767	1	0.033	30	1.5430
9	646993002.1	0.5063	2.0281E-05	11/27/2023 11:54	807	30	25	0.833	2	0.067	30	2.0260
10	646993003.1	0.5065	2.0282E-05	11/27/2023 13:16	102	30	34	1.133	1	0.033	30	1.4860
11	646993004.1	0.5033	2.0269E-05	11/27/2023 14:58	208	30	22	0.733	2	0.067	30	1.7130
12	646993005.1	0.5042	2.0273E-05	11/27/2023 13:16	305	30	10	0.333	1	0.033	30	1.5280
13	646993006.1	0.5088	2.0291E-05	11/27/2023 10:05	407	30	35	1.167	1	0.033	30	1.4390
14	1205588134.1	0.5097	2.0295E-05	12/6/2023 0:00	504	30	11	0.367	5	0.167	30	1.3720
15	1205588135.1	0.5001	2.0256E-05	11/15/2023 13:45	604	30	25	0.833	3	0.100	30	1.7290
16	1205588136.1	0.1038	1.1603E-05	11/15/2023 13:45	702	30	481	16.033	1	0.033	30	1.6810
17	1205588137.1	0.5097	2.0295E-05	12/6/2023 0:00	806	30	720	24.000	3	0.100	30	1.6560

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
3.200%	4/8/2023	3/31/2024	12/7/2023 11:00	12/10/2023 5:45	12/10/2023 8:45	0.396	0.978	1.002	1.000
4.500%	5/1/2023	4/30/2024	12/7/2023 11:00	12/10/2023 6:10	12/10/2023 9:18	0.398	0.977	1.002	1.000
8.600%	8/1/2023	7/31/2024	12/7/2023 11:00	12/10/2023 6:10	12/10/2023 9:18	0.398	0.977	1.002	1.000
6.800%	11/1/2023	10/31/2024	12/7/2023 11:00	12/10/2023 6:10	12/10/2023 9:18	0.398	0.977	1.002	1.000
5.300%	2/1/2023	1/31/2024	12/7/2023 11:00	12/10/2023 6:10	12/10/2023 9:18	0.398	0.977	1.002	1.000
5.500%	6/1/2023	5/31/2024	12/7/2023 11:00	12/10/2023 6:10	12/10/2023 9:18	0.398	0.977	1.002	1.000
6.800%	7/1/2023	6/30/2024	12/7/2023 11:00	12/10/2023 6:10	12/10/2023 9:18	0.398	0.977	1.002	1.000
5.200%	11/1/2023	10/31/2024	12/7/2023 11:00	12/10/2023 6:10	12/10/2023 9:18	0.398	0.977	1.002	1.000
9.200%	10/10/2023	3/31/2024	12/7/2023 11:00	12/10/2023 6:10	12/10/2023 9:18	0.398	0.977	1.002	1.000
2.300%	5/1/2023	4/30/2024	12/7/2023 11:00	12/10/2023 6:40	12/10/2023 9:50	0.400	0.976	1.002	1.000
4.400%	8/1/2023	7/31/2024	12/7/2023 11:00	12/10/2023 6:40	12/10/2023 9:50	0.400	0.976	1.002	1.000
7.000%	11/1/2023	10/31/2024	12/7/2023 11:00	12/10/2023 6:40	12/10/2023 9:50	0.400	0.976	1.002	1.000
5.800%	2/1/2023	1/31/2024	12/7/2023 11:00	12/10/2023 6:40	12/10/2023 9:50	0.400	0.976	1.002	1.000
1.100%	10/10/2023	5/31/2024	12/7/2023 11:00	12/10/2023 6:40	12/10/2023 9:50	0.400	0.976	1.002	1.000
2.300%	7/1/2023	6/30/2024	12/7/2023 11:00	12/10/2023 6:40	12/10/2023 9:50	0.400	0.976	1.002	1.000
2.000%	11/1/2023	10/31/2024	12/7/2023 11:00	12/10/2023 6:40	12/10/2023 9:50	0.400	0.976	1.002	1.000
1.900%	4/8/2023	3/31/2024	12/7/2023 11:00	12/10/2023 6:40	12/10/2023 9:50	0.400	0.976	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-I
Spike Exp Date : 8/29/2024
Spike Activity (dpm/ml): 304.18
Spike Volume Added: 0.10

LCS S/N : 1715-I
LCS Exp Date : 8/29/2024
LCS Activity (dpm/ml): 304.18
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.1769	0.1249	1	0.4109	2.2553	16.11%	1.4000	0.2211	0.6981	0.7832		SAMPLE				
2	0.1394	0.0984	1	0.3238	0.8039	24.54%	0.6333	0.1528	0.3800	0.4036		SAMPLE				
3	0.4210	0.2972	1	0.7393	0.8209	33.86%	0.5667	0.1856	0.5270	0.5576		SAMPLE				
4	0.2329	0.1644	1	0.4787	0.4997	38.03%	0.3333	0.1247	0.3664	0.3794		SAMPLE				
5	0.1676	0.1183	1	0.3892	1.7799	18.17%	1.1667	0.2028	0.6063	0.6840		SAMPLE				
6	0.4162	0.2939	1	0.7217	0.1340	145.40%	0.1000	0.1453	0.3816	0.3823		SAMPLE				
7	0.1410	0.0996	1	0.3275	0.7275	26.53%	0.5667	0.1453	0.3656	0.3925		SAMPLE				
8	0.1639	0.1157	1	0.3807	1.0943	22.87%	0.7333	0.1633	0.4776	0.5153		SAMPLE				
9	0.1759	0.1242	1	0.3616	0.8681	24.39%	0.7667	0.1732	0.3844	0.4335		SAMPLE				
10	0.1686	0.1190	1	0.3915	1.6882	18.07%	1.1000	0.1972	0.5932	0.6458		SAMPLE				
11	0.2081	0.1469	1	0.4278	0.8931	24.89%	0.6667	0.1633	0.4288	0.4543		SAMPLE				
12	0.1647	0.1163	1	0.3825	0.4498	37.51%	0.3000	0.1106	0.3249	0.3370		SAMPLE				
13	0.1733	0.1223	1	0.4024	1.7880	18.58%	1.1333	0.2000	0.6184	0.7003		SAMPLE				
14	0.4057	0.2864	1	0.7380	0.3304	66.68%	0.2000	0.1333	0.4317	0.4344		MB				
15	0.2541	0.1794	1	0.4924	0.9796	24.16%	0.7333	0.1764	0.4618	0.4850	646878001.1	DUP	29.5%			
16	0.7268	0.5131	1	1.6880	105.8762	4.99%	16.0000	0.7318	9.4915	18.4633	646878001.1	MS			131.9524	79.7%
17	0.2604	0.1838	1	0.5045	32.7082	4.20%	23.9000	0.8963	2.4042	5.4365		LCS			26.8838	121.7%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 10-DEC-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:17	1	1.12E+05	112073	-2.52		
LUCAS2	EFF	07:15	1	1.30E+05	130189	-0.38		
LUCAS3	EFF	07:11	1	90965	90965	-1.17		
LUCAS4	EFF	07:10	1	1.26E+05	126251	-1.48		
LUCAS5	EFF	07:09	1	1.29E+05	129068	-2.13		
LUCAS6	EFF	07:08	1	1.29E+05	128958	-0.39		
LUCAS7	EFF	07:06	1	1.30E+05	130493	-1.27		
LUCAS8	EFF	07:04	1	1.13E+05	112703	-1.2		

Reviewed by: 
Lyndsey Pace

Date: 10-DEC-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2532924

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
646851001	SAMPLE	LXP1	LUCAS8	DEC-10-23 08:45:00	DONE	Lucas Cell	08-APR-23 00:00
646851002	SAMPLE	LXP1	LUCAS1	DEC-10-23 09:18:00	DONE	Lucas Cell	01-MAY-23 00:00
646851003	SAMPLE	LXP1	LUCAS2	DEC-10-23 09:18:00	DONE	Lucas Cell	01-AUG-23 00:00
646851004	SAMPLE	LXP1	LUCAS3	DEC-10-23 09:18:00	DONE	Lucas Cell	01-NOV-23 00:00
646851005	SAMPLE	LXP1	LUCAS4	DEC-10-23 09:18:00	DONE	Lucas Cell	01-FEB-23 00:00
646851006	SAMPLE	LXP1	LUCAS5	DEC-10-23 09:18:00	DONE	Lucas Cell	01-JUN-23 00:00
646878001	SAMPLE	LXP1	LUCAS6	DEC-10-23 09:18:00	DONE	Lucas Cell	01-JUL-23 00:00
646993001	SAMPLE	LXP1	LUCAS7	DEC-10-23 09:18:00	DONE	Lucas Cell	01-NOV-23 00:00
646993002	SAMPLE	LXP1	LUCAS8	DEC-10-23 09:18:00	DONE	Lucas Cell	08-APR-23 00:00
646993003	SAMPLE	LXP1	LUCAS1	DEC-10-23 09:50:00	DONE	Lucas Cell	01-MAY-23 00:00
646993004	SAMPLE	LXP1	LUCAS2	DEC-10-23 09:50:00	DONE	Lucas Cell	01-AUG-23 00:00
646993005	SAMPLE	LXP1	LUCAS3	DEC-10-23 09:50:00	DONE	Lucas Cell	01-NOV-23 00:00
646993006	SAMPLE	LXP1	LUCAS4	DEC-10-23 09:50:00	DONE	Lucas Cell	01-FEB-23 00:00
1205588134	MB	LXP1	LUCAS5	DEC-10-23 09:50:00	DONE	Lucas Cell	01-JUN-23 00:00
1205588135	DUP	LXP1	LUCAS6	DEC-10-23 09:50:00	DONE	Lucas Cell	01-JUL-23 00:00
1205588136	MS	LXP1	LUCAS7	DEC-10-23 09:50:00	DONE	Lucas Cell	01-NOV-23 00:00
1205588137	LCS	LXP1	LUCAS8	DEC-10-23 09:50:00	DONE	Lucas Cell	08-APR-23 00:00



Environmental Laboratory
 1232 Haco Drive
 Lansing
 Michigan, 48910

CHAIN OF CUSTODY

Phone: (517)702-6372

Page 1 of 1

Lab Work Order Number L311201

Client Name BWL - Erickson Station		Project Name Erickson AM MI Wells 16A-D		Requested Analyses								Requested Turn Around			
Client Contact Cheryl Loudon		Project Number [none]		Ag:: As:: B:: Ba:: Be:: Ca:: Cd:: Cr:: Co:: Cu:: Fe:: Hg:: Li:: Mo:: Ni:: Pb:: Sb:: Se:: Si:: Tl:: V:: Zn:: Na:: K:: Mg	TSS, HCO3, CO3, Hardness	CHC:: F-ISE:: SO4:: TDS	Radium 226 and Radium 228							Rush requests subject to additional charge.	
Address 3725 S. Canal		Project Description												Rush requests subject to lab approval	
City Lansing		PO Number 30926 10021													
State/Zip MI, 48917		Shipped By													
Phone (517) 702-6396	Fax (517) 702-6373	Tracking Number													
Sampler Marc Wahrer															

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code				Sample	Comments
						b	a	a	b		
MW-16A	11-21-23	1126	G	GW	5	1	1	1	2		
MW-16B	↓	1341	G	GW	5	1	1	1	2		
MW-16C		1456	G	GW	5	1	1	1	2		
MW-16D		1254	G	GW	5	1	1	1	2		
MWT-16A		1126	G	GW	5	1	1	1	2		
Field Blank		0925	G	DI	5	1	1	1	2		

Relinquished By 	Date/Time 11-21-23 1600	Received By Dawn Williams	Date/Time 11-22-23 0740	Comments
Relinquished By	Date/Time	Received By	Date/Time	
Relinquished By	Date/Time	Received By	Date/Time	
Cooler Numbers and Temperatures E0716 1.6°C				

Matrix Codes: DI=Deionized Water, GW=Ground Water Preserv. Codes: a=None, b=0.5% HNO3



Hometown People. Hometown Power.

Lansing Board of Water and Light
Environmental Services Laboratory (MI00079)

Cert ID:3760

1232 Haco Dr.

Lansing, Michigan 48901

29 December 2023

BWL - Erickson Station

Attn: Cheryl Loudon

3725 S. Canal

Lansing, MI 48917

Project: Erickson Well Project

Dear Cheryl Loudon,

Enclosed is a copy of the laboratory report for the following work order(s) received by Lansing Board of Water and Light Environmental Services Laboratory:

Work Order

L311202

Received

11/28/2023 7:40:00AM

Account Number

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Jennifer Caporale".

Jennifer Caporale, Supervisor



Analytical Report

Client: BWL - Erickson Station
Address: 3725 S. Canal
 Lansing MI, 48917

Client Project Manager: Cheryl Louden

Report Date: 12/29/2023

Sample Name: MW-100 A

Lab #: L311202-01 Ground Water

Collected: 27-Nov-23 15:33

By: Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	680	1.0	uS/cm	1		27-Nov-23 15:33	maw	FIELD	
Dissolved oxygen	0.390	0.100	mg/L	1		27-Nov-23 15:33	maw	FIELD	
Milliliters Purged	120		ml/min	1		27-Nov-23 15:33	maw	FIELD	
Oxidation Reduction Potential	-98.90	-999.0	mV	1		27-Nov-23 15:33	maw	FIELD	
pH	7.1	7.0	pH Units	1		27-Nov-23 15:33	maw	FIELD	
Temperature	10		°C	1		27-Nov-23 15:33	maw	FIELD	
Turbidity	3.3	0.10	NTU	1		27-Nov-23 15:33	maw	FIELD	

Sample Name: MW-100 B

Lab #: L311202-02 Ground Water

Collected: 27-Nov-23 11:54

By: Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	710	1.0	uS/cm	1		27-Nov-23 11:54	maw	FIELD	
Dissolved oxygen	ND	0.100	mg/L	1		27-Nov-23 11:54	maw	FIELD	
Milliliters Purged	200		ml/min	1		27-Nov-23 11:54	maw	FIELD	
Oxidation Reduction Potential	-141.7	-999.0	mV	1		27-Nov-23 11:54	maw	FIELD	
pH	7.4	7.0	pH Units	1		27-Nov-23 11:54	maw	FIELD	
Temperature	11		°C	1		27-Nov-23 11:54	maw	FIELD	
Turbidity	5.0	0.10	NTU	1		27-Nov-23 11:54	maw	FIELD	

Sample Name: MW-100 C

Lab #: L311202-03 Ground Water

Collected: 27-Nov-23 13:16

By: Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	520	1.0	uS/cm	1		27-Nov-23 13:16	maw	FIELD	
Dissolved oxygen	ND	0.100	mg/L	1		27-Nov-23 13:16	maw	FIELD	
Milliliters Purged	270		ml/min	1		27-Nov-23 13:16	maw	FIELD	
Oxidation Reduction Potential	-107.2	-999.0	mV	1		27-Nov-23 13:16	maw	FIELD	
pH	7.3	7.0	pH Units	1		27-Nov-23 13:16	maw	FIELD	
Temperature	10		°C	1		27-Nov-23 13:16	maw	FIELD	
Turbidity	4.2	0.10	NTU	1		27-Nov-23 13:16	maw	FIELD	



Analytical Report

Client: BWL - Erickson Station
Address: 3725 S. Canal
Lansing MI, 48917

Client Project Manager: Cheryl Louden

Report Date: 12/29/2023

Sample Name: MW-100 D

Lab #: L311202-04 Ground Water

Collected: 27-Nov-23 14:58

By: Marc Wahrer

Analyte	Reporting			Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
	Result	Limit	Units						
Conductivity	590	1.0	uS/cm	1		27-Nov-23 14:58	maw	FIELD	
Dissolved oxygen	ND	0.100	mg/L	1		27-Nov-23 14:58	maw	FIELD	
Milliliters Purged	200		ml/min	1		27-Nov-23 14:58	maw	FIELD	
Oxidation Reduction Potential	-163.3	-999.0	mV	1		27-Nov-23 14:58	maw	FIELD	
pH	8.0	7.0	pH Units	1		27-Nov-23 14:58	maw	FIELD	
Temperature	9.9		°C	1		27-Nov-23 14:58	maw	FIELD	
Turbidity	5.0	0.10	NTU	1		27-Nov-23 14:58	maw	FIELD	



Analytical Report

Client: BWL - Erickson Station

Client Project Manager: Cheryl Louden

Report Date: 12/29/2023

Address: 3725 S. Canal
Lansing MI, 48917

Approved By:

Jennifer Caporale

Notes and Definitions

AL Action Level (Action Level = Regulatory Limit)
MCL Maximum Contaminant Level
PEL Permissible Exposure Limit (Permissible Exposure Limit = Regulatory Limit)
RPD Relative Percent Difference
OT Odor Threshold
ND Non Detect is less than the reporting limit value
All drinking water regulatory limits are MCL's with the exception of Lead and Copper unless otherwise noted.



Report ID: S56117.01(02)
Generated on 12/29/2023
Replaces report S56117.01(01) generated on 11/30/2023

Report to
Attention: Jennifer Caporale
Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Report produced by
Merit Laboratories, Inc.
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East Lansing, MI 48823

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Contacts for report questions:
John Lavery (johnlavery@meritlabs.com)
Barbara Ball (bball@meritlabs.com)

Report Summary
Lab Sample ID(s): S56117.01-S56117.06
Project: Erickson Well Project 100A-100D
Collected Date(s): 11/27/2023
Submitted Date/Time: 11/28/2023 08:05
Sampled by: Marc Wahrer
P.O. #:

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Maya Murshak
Technical Director



General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

When MDL results are provided, then 'Not detected' indicates that parameter was not found at a level equal to or greater than the MDL.

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile, and 2-chloroethylvinyl ether need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Starred (*) analytes are not NY NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

PFAS requirement: Section 9.3.8 of U.S. EPA Method 537.1 states "If the method analyte(s) found in the Field Sample is present in the

FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed."

Samples submitted without an accompanying FRB may not be acceptable for compliance purposes.

Wisconsin PFAs analysis: MDL = LOD; RL = LOQ. LOD and LOQ are adjusted for dilution.

All accreditations/certifications held by this laboratory are listed on page 3. Not all accreditations/certifications are applicable to this report.

For a specific list of accredited analytes, please feel free to contact the laboratory or visit <https://www.meritlabs.com/certifications>.

Report Narrative

All analyses completed



Laboratory Accreditations (For Reference Only)

Authority	Accreditation ID
Michigan DEQ	#9956
DOD ELAP & ISO/IEC 17025:2017	#69699 PJLA Testing
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Pennsylvania DEP	#68-05884
Wisconsin DNR	FID# 399147320

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Method Summary

Method	Version
E200.8	EPA Method 200.8 Revision 5.4
E245.1	EPA Method 245.1 Revision 3.0
E300.0	EPA Method 300.0 Revision 2.1 (1993)
SM2320B	Standard Method 2320 B 2011
SM2340C	Standard Method 2340 C 2011
SM2540C	Standard Method 2540 C 2015
SM2540D	Standard Method 2540 D 2015
SW3015A	SW 846 Method 3015A Revision 1 February 2007



Sample Summary (6 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S56117.01	MW-100A L311202-01	Groundwater	11/27/23 15:33
S56117.02	MW-100B L311202-02	Groundwater	11/27/23 11:54
S56117.03	MW-100C L311202-03	Groundwater	11/27/23 13:16
S56117.04	MW-100D L311202-04	Groundwater	11/27/23 14:58
S56117.05	MWT-100C L311202-05	Groundwater	11/27/23 13:16
S56117.06	Field Blank L311202-06	Water	11/27/23 10:05



Lab Sample ID: S56117.01

Sample Tag: MW-100A L311202-01

Collected Date/Time: 11/27/2023 15:33

Matrix: Groundwater

COC Reference:

Sample Containers

Table with 6 columns: #, Type, Preservative(s), Refrigerated?, Arrival Temp. (C), Thermometer #. Contains 3 rows of container data.

Extraction / Prep.

Table with 6 columns: Parameter, Result, Method, Run Date, Analyst, Flags. Contains 2 rows of extraction data.

Inorganics

Method: E300.0, Run Date: 11/28/23 11:08, Analyst: ASB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Contains 3 rows of inorganic data.

Method: SM2320B, Run Date: 11/29/23 14:06, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Contains 2 rows of inorganic data.

Method: SM2340C, Run Date: 11/29/23 12:08, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Contains 1 row of inorganic data.

Method: SM2540C, Run Date: 11/28/23 20:21, Analyst: MDG

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Contains 1 row of inorganic data.

Method: SM2540D, Run Date: 11/29/23 17:01, Analyst: MDG

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Contains 1 row of inorganic data.

Metals

Method: E200.8, Run Date: 11/28/23 11:42, Analyst: CCM

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Contains 11 rows of metal data.

b-Value detected less than reporting limit, but greater than MDL



Lab Sample ID: S56117.01 (continued)

Sample Tag: MW-100A L311202-01

Method: E200.8, Run Date: 11/28/23 11:42, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	2.88	0.02	0.0142	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000450	mg/L	5	7439-92-1	
Lithium*	0.016	0.005	0.00135	mg/L	5	7439-93-2	
Molybdenum	0.010	0.005	0.00420	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00115	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00435	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000250	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000350	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00205	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00325	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 11/28/23 13:59, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	92.1	0.50	0.218	mg/L	5	7440-70-2	
Magnesium	39.9	0.50	0.0579	mg/L	5	7439-95-4	
Potassium	2.19	0.50	0.119	mg/L	5	7440-09-7	
Sodium	11.3	0.50	0.109	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 11/30/23 14:01, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 12/19/23 14:58, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S56117.02

Sample Tag: MW-100B L311202-02

Collected Date/Time: 11/27/2023 11:54

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.1	IR
2	1L Plastic	None	Yes	2.1	IR
1	250ml Plastic	HNO3	Yes	2.1	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	11/30/23 10:47	CTV	
Metal Digestion	Completed	SW3015A	11/28/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 11/28/23 11:21, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	24.0	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	0.15	1.0	0.13	mg/L	5	16984-48-8	b
Sulfate	105	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 11/29/23 14:10, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	310	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 11/29/23 12:12, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	369	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 11/28/23 20:21, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	482	50	6	mg/L	2		

Method: SM2540D, Run Date: 11/29/23 17:01, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	2.5	3	1	mg/L	1		b

Metals

Method: E200.8, Run Date: 11/28/23 11:46, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00225	mg/L	5	7440-36-0	
Arsenic	0.010	0.002	0.00145	mg/L	5	7440-38-2	
Barium	0.147	0.005	0.000900	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000200	mg/L	5	7440-41-7	
Boron	0.29	0.04	0.0159	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000350	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000750	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000450	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000800	mg/L	5	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL



Lab Sample ID: S56117.02 (continued)

Sample Tag: MW-100B L311202-02

Method: E200.8, Run Date: 11/28/23 11:46, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	2.35	0.02	0.0142	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000450	mg/L	5	7439-92-1	
Lithium*	0.018	0.005	0.00135	mg/L	5	7439-93-2	
Molybdenum	0.009	0.005	0.00420	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00115	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00435	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000250	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000350	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00205	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00325	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 11/28/23 14:01, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	94.5	0.50	0.218	mg/L	5	7440-70-2	
Magnesium	32.5	0.50	0.0579	mg/L	5	7439-95-4	
Potassium	3.76	0.50	0.119	mg/L	5	7440-09-7	
Sodium	30.3	0.50	0.109	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 11/30/23 14:04, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 12/19/23 14:58, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Lab Sample ID: S56117.03

Sample Tag: MW-100C L311202-03

Collected Date/Time: 11/27/2023 13:16

Matrix: Groundwater

COC Reference:

Sample Containers

Table with 6 columns: #, Type, Preservative(s), Refrigerated?, Arrival Temp. (C), Thermometer #. Rows include 1L Plastic, 250ml Plastic containers with HNO3 and None preservatives.

Extraction / Prep.

Table with 6 columns: Parameter, Result, Method, Run Date, Analyst, Flags. Rows include Mercury Digestion and Metal Digestion.

Inorganics

Method: E300.0, Run Date: 11/28/23 11:33, Analyst: ASB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Chloride, Fluoride (Undistilled), Sulfate.

Method: SM2320B, Run Date: 11/29/23 14:16, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Bicarbonate*, Carbonate*.

Method: SM2340C, Run Date: 11/29/23 12:18, Analyst: JKB

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Hardness.

Method: SM2540C, Run Date: 11/28/23 20:21, Analyst: MDG

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Dissolved Solids.

Method: SM2540D, Run Date: 11/29/23 17:01, Analyst: MDG

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Row includes Total Suspended Solids.

Metals

Method: E200.8, Run Date: 11/28/23 11:50, Analyst: CCM

Table with 8 columns: Parameter, Result, RL, MDL, Units, Dilution, CAS#, Flags. Rows include Antimony*, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper.

b-Value detected less than reporting limit, but greater than MDL



Lab Sample ID: S56117.03 (continued)

Sample Tag: MW-100C L311202-03

Method: E200.8, Run Date: 11/28/23 11:50, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	0.64	0.02	0.0142	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000450	mg/L	5	7439-92-1	
Lithium*	0.032	0.005	0.00135	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.00420	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00115	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00435	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000250	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000350	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00205	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00325	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 11/28/23 14:02, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	61.1	0.50	0.218	mg/L	5	7440-70-2	
Magnesium	19.3	0.50	0.0579	mg/L	5	7439-95-4	
Potassium	6.56	0.50	0.119	mg/L	5	7440-09-7	
Sodium	28.3	0.50	0.109	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 11/30/23 14:08, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 12/19/23 14:58, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

**Lab Sample ID: S56117.04**

Sample Tag: MW-100D L311202-04

Collected Date/Time: 11/27/2023 14:58

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.1	IR
2	1L Plastic	None	Yes	2.1	IR
1	250ml Plastic	HNO3	Yes	2.1	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	11/30/23 10:47	CTV	
Metal Digestion	Completed	SW3015A	11/28/23 10:10	CCM	

Inorganics**Method: E300.0, Run Date: 11/28/23 11:46, Analyst: ASB**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	4.20	5	0.08	mg/L	5	16887-00-6	b
Fluoride (Undistilled)	0.50	1.0	0.13	mg/L	5	16984-48-8	b
Sulfate	9.17	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 11/29/23 14:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	370	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 11/29/23 12:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	49	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 11/28/23 20:21, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	388	50	6	mg/L	2		

Method: SM2540D, Run Date: 11/29/23 17:01, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals**Method: E200.8, Run Date: 11/28/23 11:53, Analyst: CCM**

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00225	mg/L	5	7440-36-0	
Arsenic	0.003	0.002	0.00145	mg/L	5	7440-38-2	
Barium	0.008	0.005	0.000900	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000200	mg/L	5	7440-41-7	
Boron	3.37	0.04	0.0159	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000350	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000750	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000450	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000800	mg/L	5	7440-50-8	

b-Value detected less than reporting limit, but greater than MDL



Lab Sample ID: S56117.04 (continued)

Sample Tag: MW-100D L311202-04

Method: E200.8, Run Date: 11/28/23 11:53, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Iron	0.12	0.02	0.0142	mg/L	5	7439-89-6	
Lead	Not detected	0.003	0.000450	mg/L	5	7439-92-1	
Lithium*	0.018	0.005	0.00135	mg/L	5	7439-93-2	
Molybdenum	0.008	0.005	0.00420	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00115	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00435	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000250	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000350	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00205	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00325	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 11/28/23 14:04, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	5.57	0.50	0.218	mg/L	5	7440-70-2	
Magnesium	1.27	0.50	0.0579	mg/L	5	7439-95-4	
Potassium	4.03	0.50	0.119	mg/L	5	7440-09-7	
Sodium	151	0.50	0.109	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 11/30/23 14:11, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 12/19/23 14:58, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S56117.05

Sample Tag: MWT-100C L311202-05

Collected Date/Time: 11/27/2023 13:16

Matrix: Groundwater

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.1	IR
2	1L Plastic	None	Yes	2.1	IR
1	250ml Plastic	HNO3	Yes	2.1	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	11/30/23 10:47	CTV	
Metal Digestion	Completed	SW3015A	11/28/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 11/28/23 11:59, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	5.04	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	5.66	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 11/29/23 14:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	340	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 11/29/23 12:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	237	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 11/28/23 20:21, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	302	50	6	mg/L	2		

Method: SM2540D, Run Date: 11/29/23 17:01, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 11/28/23 11:57, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00225	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.00145	mg/L	5	7440-38-2	
Barium	0.085	0.005	0.000900	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000200	mg/L	5	7440-41-7	
Boron	1.84	0.04	0.0159	mg/L	5	7440-42-8	
Cadmium	Not detected	0.0005	0.000350	mg/L	5	7440-43-9	
Chromium	Not detected	0.005	0.000750	mg/L	5	7440-47-3	
Cobalt	Not detected	0.005	0.000450	mg/L	5	7440-48-4	
Copper	Not detected	0.005	0.000800	mg/L	5	7440-50-8	
Iron	0.66	0.02	0.0142	mg/L	5	7439-89-6	



Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S56117.05 (continued)

Sample Tag: MWT-100C L311202-05

Method: E200.8, Run Date: 11/28/23 11:57, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000450	mg/L	5	7439-92-1	
Lithium*	0.032	0.005	0.00135	mg/L	5	7439-93-2	
Molybdenum	Not detected	0.005	0.00420	mg/L	5	7439-98-7	
Nickel	Not detected	0.005	0.00115	mg/L	5	7440-02-0	
Selenium	Not detected	0.005	0.00435	mg/L	5	7782-49-2	
Silver	Not detected	0.0005	0.000250	mg/L	5	7440-22-4	
Thallium	Not detected	0.002	0.000350	mg/L	5	7440-28-0	
Vanadium	Not detected	0.005	0.00205	mg/L	5	7440-62-2	
Zinc	Not detected	0.005	0.00325	mg/L	5	7440-66-6	

Method: E200.8, Run Date: 11/28/23 14:05, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	60.7	0.50	0.218	mg/L	5	7440-70-2	
Magnesium	19.7	0.50	0.0579	mg/L	5	7439-95-4	
Potassium	6.68	0.50	0.119	mg/L	5	7440-09-7	
Sodium	28.2	0.50	0.109	mg/L	5	7440-23-5	

Method: E245.1, Run Date: 11/30/23 14:21, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 12/19/23 14:58, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Lab Sample ID: S56117.06

Sample Tag: Field Blank L311202-06

Collected Date/Time: 11/27/2023 10:05

Matrix: Water

COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
2	1L Plastic	HNO3	Yes	2.1	IR
2	1L Plastic	None	Yes	2.1	IR
1	250ml Plastic	HNO3	Yes	2.1	IR

Extraction / Prep.

Parameter	Result	Method	Run Date	Analyst	Flags
Mercury Digestion	Completed	E245.1	11/30/23 10:47	CTV	
Metal Digestion	Completed	SW3015A	11/28/23 10:10	CCM	

Inorganics

Method: E300.0, Run Date: 11/28/23 12:12, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	Not detected	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	1.0	0.13	mg/L	5	16984-48-8	
Sulfate	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 11/29/23 14:22, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	Not detected	10	0.504	mg/L	1	71-52-3	
Carbonate*	Not detected	10		mg/L	1	3812-32-6	

Method: SM2340C, Run Date: 11/29/23 12:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	Not detected	10	2.38	mg/L	10		

Method: SM2540C, Run Date: 11/28/23 20:21, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	6	mg/L	2		

Method: SM2540D, Run Date: 11/29/23 17:01, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Suspended Solids	Not detected	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 11/28/23 11:39, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.000900	mg/L	2	7440-36-0	
Arsenic	Not detected	0.002	0.000580	mg/L	2	7440-38-2	
Barium	Not detected	0.005	0.000360	mg/L	2	7440-39-3	
Beryllium	Not detected	0.001	0.0000800	mg/L	2	7440-41-7	
Boron	Not detected	0.04	0.00636	mg/L	2	7440-42-8	
Cadmium	Not detected	0.0005	0.000140	mg/L	2	7440-43-9	
Chromium	Not detected	0.005	0.000300	mg/L	2	7440-47-3	
Cobalt	Not detected	0.005	0.000180	mg/L	2	7440-48-4	
Copper	Not detected	0.005	0.000320	mg/L	2	7440-50-8	
Iron	Not detected	0.02	0.00568	mg/L	2	7439-89-6	



Lab Sample ID: S56117.06 (continued)

Sample Tag: Field Blank L311202-06

Method: E200.8, Run Date: 11/28/23 11:39, Analyst: CCM (continued)

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Lead	Not detected	0.003	0.000180	mg/L	2	7439-92-1	
Lithium*	Not detected	0.005	0.000540	mg/L	2	7439-93-2	
Molybdenum	Not detected	0.005	0.00168	mg/L	2	7439-98-7	
Nickel	Not detected	0.005	0.000460	mg/L	2	7440-02-0	
Selenium	Not detected	0.005	0.00174	mg/L	2	7782-49-2	
Silver	Not detected	0.0005	0.000100	mg/L	2	7440-22-4	
Thallium	Not detected	0.002	0.000140	mg/L	2	7440-28-0	
Vanadium	Not detected	0.005	0.000820	mg/L	2	7440-62-2	
Zinc	Not detected	0.005	0.00130	mg/L	2	7440-66-6	

Method: E200.8, Run Date: 11/28/23 13:57, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Calcium*	Not detected	0.50	0.0874	mg/L	2	7440-70-2	
Magnesium	Not detected	0.50	0.0231	mg/L	2	7439-95-4	
Potassium	Not detected	0.50	0.0479	mg/L	2	7440-09-7	
Sodium	Not detected	0.50	0.0436	mg/L	2	7440-23-5	

Method: E245.1, Run Date: 11/30/23 14:24, Analyst: CTV

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Mercury	Not detected	0.0002	0.0000160	mg/L	1	7439-97-6	

Other / Misc.

Method: , Run Date: 12/19/23 14:58, Analyst: GEL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Radiological Analyses*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

Merit Laboratories Login Checklist

Lab Set ID:S56117

Client:BWL01 (Board of Water & Light)

Project: Erickson Well Project 100A-100D

Submitted: 11/28/2023 08:05 Login User: MMC

Attention: Jennifer Caporale

Address: Board of Water & Light

P.O. Box 13007

Lansing, MI 48901

Phone: 517-702-6372

FAX:

Email: Environmental_Laboratory@LBWL.com

Selection	Description	Note
-----------	-------------	------

Sample Receiving

- | | | | |
|-----|--|--|--------|
| 01. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples are received at 4C +/- 2C Thermometer # | IR 2.1 |
| 02. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Received on ice/ cooling process begun | |
| 03. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples shipped | |
| 04. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples left in 24 hr. drop box | |
| 05. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Are there custody seals/tape or is the drop box locked | |

Chain of Custody

- | | | | |
|-----|--|--|-----|
| 06. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC adequately filled out | |
| 07. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | COC signed and relinquished to the lab | |
| 08. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sample tag on bottles match COC | |
| 09. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Subcontracting needed? Subcontracted to: | GEL |

Preservation

- | | | | |
|-----|--|---|--|
| 10. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Do sample have correct chemical preservation | |
| 11. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Completed pH checks on preserved samples? (no VOAs) | |
| 12. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Did any samples need to be preserved in the lab? | |

Bottle Conditions

- | | | | |
|-----|--|---|--|
| 13. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | All bottles intact | |
| 14. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Appropriate analytical bottles are used | |
| 15. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Merit bottles used | |
| 16. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Sufficient sample volume received | |
| 17. | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | Samples require laboratory filtration | |
| 18. | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Samples submitted within holding time | |
| 19. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | Do water VOC or TOX bottles contain headspace | |

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____

Merit Laboratories Bottle Preservation Check

Lab Set ID: S56117 Submitted: 11/28/2023 08:05

Client: BWL01 (Board of Water & Light)

Project: Erickson Well Project 100A-100D

Attention: Jennifer Caporale
Address: Board of Water & Light
P.O. Box 13007
Lansing, MI 48901

Initial Preservation Check: 11/28/2023 08:39 MMC

Preservation Recheck (E200.8): N/A

Phone: 517-702-6372 FAX:
Email: Environmental_Laboratory@LBWL.com

Sample ID	Bottle / Preservation	pH (Orig)	Add ml	pH (New)	Notes
S56117.01	1L Plastic HNO3	<2			
S56117.01	1L Plastic HNO3	<2			
S56117.01	250ml Plastic HNO3	<2			
S56117.02	1L Plastic HNO3	<2			
S56117.02	1L Plastic HNO3	<2			
S56117.02	250ml Plastic HNO3	<2			
S56117.03	1L Plastic HNO3	<2			
S56117.03	1L Plastic HNO3	<2			
S56117.03	250ml Plastic HNO3	<2			
S56117.04	1L Plastic HNO3	<2			
S56117.04	1L Plastic HNO3	<2			
S56117.04	250ml Plastic HNO3	<2			
S56117.05	1L Plastic HNO3	<2			
S56117.05	1L Plastic HNO3	<2			
S56117.05	250ml Plastic HNO3	<2			
S56117.06	1L Plastic HNO3	<2			
S56117.06	1L Plastic HNO3	<2			
S56117.06	250ml Plastic HNO3	<2			



2680 East Lansing Dr., East Lansing, MI 48823
 Phone (517) 332-0167 Fax (517) 332-4034
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

REPORT TO

CHAIN OF CUSTODY RECORD

INVOICE TO

CONTACT NAME Jennifer Caporale
 COMPANY Lansing Board of Water and Light
 ADDRESS PO Box 13007 48901-3007
 CITY Lansing STATE Mi ZIP CODE 48901
 PHONE NO. 517-702-6372 FAX NO. _____ P.O. NO. _____
 E-MAIL ADDRESS Environmental_Laboratory@lbwl.com QUOTE NO. _____

CONTACT NAME Beth Zimpfer SAME
 COMPANY _____
 ADDRESS _____
 CITY _____ STATE _____ ZIP CODE _____
 PHONE NO. _____ E-MAIL ADDRESS Beth.Zimpfer@lbwl.com

PROJECT NO./NAME Erickson Well Project 100A-100D SAMPLER(S) - PLEASE PRINT/SIGN NAME Marc Wahrer
 TURNAROUND TIME REQUIRED 1 DAY 2 DAYS 3 DAYS STANDARD OTHER ASAP
 DELIVERABLES REQUIRED STD LEVEL II LEVEL III LEVEL IV EDD OTHER _____

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

Total Metals	F-undissilted, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness	Certifications
<input checked="" type="checkbox"/>	<input type="checkbox"/> OHIO VAP <input type="checkbox"/> Drinking Water					
						<input type="checkbox"/> DoD <input checked="" type="checkbox"/> NPDES
						Project Locations
						<input type="checkbox"/> Detroit <input type="checkbox"/> New York
						<input type="checkbox"/> Other _____
						Special Instructions

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO3	H2SO4	NH4OH	MeOH	OTHER	Total Metals	F-undissilted, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness							
	DATE	TIME																							
56117.01	11.21.23	1533	MW-100A L311202-01	GW	5	2	3						<input checked="" type="checkbox"/>							Metals to analyse: Na, Mg, K					
.02		1154	MW-100B -02	GW	5	2	3						<input checked="" type="checkbox"/>							B, Ca, Sb, As, Ba, Be, Cd, Cr,					
.03		1316	MW-100C -03	GW	5	2	3						<input checked="" type="checkbox"/>							Co, Li, Hg, Mo, Pb, Se, Tl,					
.04		1458	MW-100D -04	GW	5	2	3						<input checked="" type="checkbox"/>							Fe, Cu, Ni, Ag, V, Zn					
.05		1316	MWT-100C -05	GW	5	2	3						<input checked="" type="checkbox"/>							Please send a preliminary report					
.06		1005	Field Blank -06	DI	5	2	3						<input checked="" type="checkbox"/>												

RELINQUISHED BY: [Signature] ^{Sampler} DATE 11-28-23 TIME 0805
 RECEIVED BY: M Chilcote DATE 11/28/23 TIME 0805
 RELINQUISHED BY: _____ DATE _____ TIME _____
 RECEIVED BY: _____ DATE _____ TIME _____

RELINQUISHED BY: _____ DATE _____ TIME _____
 RECEIVED BY: _____ DATE _____ TIME _____
 SEAL NO. _____ SEAL INTACT YES NO INITIALS _____
 SEAL NO. _____ SEAL INTACT YES NO INITIALS _____
 NOTES: TEMP. ON ARRIVAL 2.1

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

Reporting Limits to go to Merit with COC

Sb, total	Antimony	250 mL plastic	mg/L	Nitric Acid	200.7	6 mos	0.005
As, total	Arsenic	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
Ba, total		250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.150
Be, total	Beryllium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.001
B, total	Boron	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.04
Cd, total	Cadmium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
Ca	Calcium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	2.5
Cl	Chloride	250 mL plastic	mg/L	Chill	300.0	28 d	10
Cr, total	Chromium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Co, total	Cobalt	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Cu, total	Copper	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
F	Fluoride	250 mL plastic	mg/L	None	9056	28 d	1.0
Fe, total	Iron	250 mL plastic	mg/L	Nitric Acid	300.0	6 mos	0.02
Pb, total	Lead	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.003
Li, total	Lithium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Hg, total	Mercury	250 mL plastic	mg/L	HNO3	245.1	28 d	0.0002
Mo, total	Molybdenum	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ni, total	Nickel	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
RA226/228	Radium 226 and 228 combined	(2) 1 L plastic	pCi/L	HNO3	SM 7500	6 mos	2.0 combined
Se, total	Selenium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Ag, total	Silver	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.0005
SO4	Sulfate	250 mL plastic	mg/L	Chill	300.0	28 d	10
Tl, total	Thallium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.002
TDS	Total Dissolved Solids	1 L plastic	mg/L	None	SM 2540C	NA	20
TSS	Total Suspended Solids	1 L plastic	mg/L	None	SM 2540D	NA	3
V, total	Vanadium	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005
Zn, total	Zinc	250 mL plastic	mg/L	Nitric Acid	200.8	6 mos	0.005

December 19, 2023

John Laverty
Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan 48823

Re: Routine Analysis
Work Order: 646993
SDG: S56117

Dear John Laverty:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on November 30, 2023. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1614.

Sincerely,

Olivia Olsen for
Delaney Stonesmith
Project Manager

Purchase Order: GELP20-0018
Enclosures



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Case Narrative

**Receipt Narrative
for
Merit Laboratories, Inc.
SDG: S56117
Work Order: 646993**

December 19, 2023

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on November 30, 2023 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
646993001	S56117.01
646993002	S56117.02
646993003	S56117.03
646993004	S56117.04
646993005	S56117.05
646993006	S56117.06 Field Blank

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

A handwritten signature in black ink that reads "Olivia Olsen". The signature is written in a cursive style with a large, prominent "O" at the beginning.

Olivia Olsen for
Delaney Stonesmith
Project Manager

Chain of Custody and Supporting Documentation

SAMPLE RECEIPT & REVIEW FORM

Client: <u>MER1</u>		SDG/AR/COC/Work Order: <u>0409931996</u>	
Received By: <u>Me'Shalia Mckelvey</u>		Date Received: <u>11/30/23</u>	
Carrier and Tracking Number		FedEx Express FedEx Ground <u>UPS</u> Field Services Courier Other <u>1Z 4002 477 03 6390 8900</u>	
Suspected Hazard Information		Yes	No
A) Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
B) Did the client designate the samples are to be received as radioactive?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
C) Did the RSO classify the samples as radioactive?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
D) Did the client designate samples are hazardous?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
E) Did the RSO identify possible hazards?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Sample Receipt Criteria		Yes	NA
1 Shipping containers received intact and sealed?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
2 Chain of custody documents included with shipment?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		<input checked="" type="checkbox"/>	<input type="checkbox"/>
4 Daily check performed and passed on IR temperature gun?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
5 Sample containers intact and sealed?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
6 Samples requiring chemical preservation at proper pH?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
7 Do any samples require Volatile Analysis?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
8 Samples received within holding time?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
9 Sample ID's on COC match ID's on bottles?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
10 Date & time on COC match date & time on bottles?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
11 Number of containers received match number indicated on COC?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
12 Are sample containers identifiable as GEL provided by use of GEL labels?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
13 COC form is properly signed in relinquished/received sections?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Comments (Use Continuation Form if needed):			

PM (or PMA) review: Initials OO Date 11/30/23 Page 1 of 1

Laboratory Certifications

List of current GEL Certifications as of 19 December 2023

State	Certification
Alabama	42200
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-00651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	KY90129
Kentucky Wastewater	KY90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2023019
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122024-05
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2023-152
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-23-21
Utah NELAP	SC000122023-38
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

**Radiochemistry
Technical Case Narrative
Merit Laboratories, Inc.
SDG #: S56117
Work Order #: 646993**

Product: GFPC Ra228, Liquid

Analytical Method: EPA 904.0/SW846 9320 Modified

Analytical Procedure: GL-RAD-A-063 REV# 5

Analytical Batch: 2533748

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
646993001	S56117.01
646993002	S56117.02
646993003	S56117.03
646993004	S56117.04
646993005	S56117.05
646993006	S56117.06 Field Blank
1205589429	Method Blank (MB)
1205589430	646851001(S56029.01) Sample Duplicate (DUP)
1205589431	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Lucas Cell, Ra226, Liquid

Analytical Method: EPA 903.1 Modified

Analytical Procedure: GL-RAD-A-008 REV# 15

Analytical Batch: 2532924

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
646993001	S56117.01
646993002	S56117.02
646993003	S56117.03
646993004	S56117.04
646993005	S56117.05
646993006	S56117.06 Field Blank
1205588134	Method Blank (MB)
1205588135	646878001(NonSDG) Sample Duplicate (DUP)
1205588136	646878001(NonSDG) Matrix Spike (MS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments

The matrix spike, 1205588136 (Non SDG 646878001MS), aliquot was reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

MERI001 Merit Laboratories, Inc.

Client SDG: S56117 GEL Work Order: 646993

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: John Petrovic

Date: 28 DEC 2023

Title: Data Validator

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: December 28, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S56117.01	Project: MERI00120
Sample ID: 646993001	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 27-NOV-23 15:33	
Receive Date: 30-NOV-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.0586	+/-0.751	1.45	3.00	pCi/L		JE1	12/13/23	0837	2533748		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.15	+/-0.890			pCi/L		NXL1	12/19/23	1458	2533998		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		1.09	+/-0.478	0.381	1.00	pCi/L		LXP1	12/10/23	0918	2532924		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			74.8	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: December 28, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S56117.02 Project: MERI00120
Sample ID: 646993002 Client ID: MERI001
Matrix: Ground Water
Collect Date: 27-NOV-23 11:54
Receive Date: 30-NOV-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gas Flow Proportional Counting												
GFPC Ra228, Liquid "As Received"												
Radium-228	U	0.953	+/-0.773	1.20	3.00	pCi/L		JE1	12/13/23	0837	2533748	1
Radium-226+Radium-228 Calculation "See Parent Products"												
Radium-226+228 Sum		1.82	+/-0.863			pCi/L		NXL1	12/19/23	1458	2533998	2
Rad Radium-226												
Lucas Cell, Ra226, Liquid "As Received"												
Radium-226		0.868	+/-0.384	0.362	1.00	pCi/L		LXP1	12/10/23	0918	2532924	3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			87.1	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: December 28, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S56117.03 Project: MERI00120
Sample ID: 646993003 Client ID: MERI001
Matrix: Ground Water
Collect Date: 27-NOV-23 13:16
Receive Date: 30-NOV-23
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	-0.293	+/-0.768	1.53	3.00	pCi/L		JE1	12/13/23	0838	2533748		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.69	+/-0.971			pCi/L		NXL1	12/19/23	1458	2533998		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		1.69	+/-0.593	0.392	1.00	pCi/L		LXP1	12/10/23	0950	2532924		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			90	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor Lc/LC: Critical Level
DL: Detection Limit PF: Prep Factor
MDA: Minimum Detectable Activity RL: Reporting Limit
MDC: Minimum Detectable Concentration SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: December 28, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S56117.04	Project: MERI00120
Sample ID: 646993004	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 27-NOV-23 14:58	
Receive Date: 30-NOV-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	-0.914	+/-0.939	1.94	3.00	pCi/L		JE1	12/13/23	0838	2533748		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		0.893	+/-1.03			pCi/L		NXL1	12/19/23	1458	2533998		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.893	+/-0.429	0.428	1.00	pCi/L		LXP1	12/10/23	0950	2532924		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			81.5	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: December 28, 2023

Company : Merit Laboratories Inc.
 Address : 2680 East Lansing Drive

 East Lansing, Michigan 48823
 Contact: John Laverty
 Project: Routine Analysis

Client Sample ID: S56117.05	Project: MERI00120
Sample ID: 646993005	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 27-NOV-23 13:16	
Receive Date: 30-NOV-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	0.906	+/-0.757	1.21	3.00	pCi/L		JE1	12/13/23	0838	2533748		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.36	+/-0.823			pCi/L		NXL1	12/19/23	1458	2533998		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		0.450	+/-0.325	0.382	1.00	pCi/L		LXP1	12/10/23	0950	2532924		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			94.3	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

- | | |
|---------------------------------------|--------------------------------|
| DF: Dilution Factor | Lc/LC: Critical Level |
| DL: Detection Limit | PF: Prep Factor |
| MDA: Minimum Detectable Activity | RL: Reporting Limit |
| MDC: Minimum Detectable Concentration | SQL: Sample Quantitation Limit |

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: December 28, 2023

Company : Merit Laboratories Inc.
Address : 2680 East Lansing Drive

East Lansing, Michigan 48823

Contact: John Laverty
Project: Routine Analysis

Client Sample ID: S56117.06 Field Blank	Project: MERI00120
Sample ID: 646993006	Client ID: MERI001
Matrix: Ground Water	
Collect Date: 27-NOV-23 10:05	
Receive Date: 30-NOV-23	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Ra228, Liquid "As Received"													
Radium-228	U	-0.338	+/-1.10	2.08	3.00	pCi/L		JE1	12/13/23	0838	2533748		1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		1.79	+/-1.26			pCi/L		NXL1	12/19/23	1458	2533998		2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		1.79	+/-0.618	0.402	1.00	pCi/L		LXP1	12/10/23	0950	2532924		3

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 904.0/SW846 9320 Modified	
2	Calculation	
3	EPA 903.1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	GFPC Ra228, Liquid "As Received"			89.8	(15%-125%)

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Quality Control Data

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: December 28, 2023

Page 1 of 2

Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan

Contact: John Laverty

Workorder: 646993

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	2533748										
QC1205589430	646851001	DUP									
Radium-228	U	0.548	U	0.655	pCi/L	N/A		N/A	JE1	12/13/23	08:38
	Uncertainty	+/-0.887		+/-0.711							
QC1205589431	LCS										
Radium-228	74.6			72.0	pCi/L		96.5	(75%-125%)		12/13/23	08:38
	Uncertainty			+/-4.10							
QC1205589429	MB										
Radium-228			U	-0.200	pCi/L					12/13/23	08:38
	Uncertainty			+/-0.516							
Rad Ra-226											
Batch	2532924										
QC1205588135	646878001	DUP									
Radium-226				0.727	pCi/L	29.5		(0% - 100%)	LXP1	12/10/23	09:50
	Uncertainty			+/-0.366							
QC1205588137	LCS										
Radium-226	26.9			32.7	pCi/L		122	(75%-125%)		12/10/23	09:50
	Uncertainty			+/-2.40							
QC1205588134	MB										
Radium-226			U	0.330	pCi/L					12/10/23	09:50
	Uncertainty			+/-0.432							
QC1205588136	646878001	MS									
Radium-226	132	0.727		106	pCi/L		79.7	(75%-125%)		12/10/23	09:50
	Uncertainty	+/-0.366		+/-9.49							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- J Value is estimated
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- H Analytical holding time was exceeded
- < Result is less than value reported
- > Result is greater than value reported

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Workorder: 646993

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
UI											
BD											
h											
R											
^											
N/A											
ND											
M											
NJ											
FA											
UJ											
Q											
K											
UL											
L											
NI											
Y											
**											
M											
J											

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Gas Flow Raw Data

Batch 2533748 Check-list

This check-list was completed on 13-DEC-23 by Rhonda Birch

This batch was reviewed by Kenshalla Oston on 13-DEC-23 and Rhonda Birch on 13-DEC-23.

Batch ID:
2533748

Product:
GFC28RAL

Description: Gas Flow Radium 228
GL-RAD-A-063

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were all tracer/carrier recoveries within the required acceptance limits?			
10	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-228 in Liquid

Batch ID: 2533748
Analyst: Jacqueline Winston (JE1)
Method: EPA 904.0/SW846 9320 Modified
Lab SOP: GL-RAD-A-063 REV# 5
Instrument: SP-C018367602

Due Dates for Lab: 25-DEC-2023			Package: 27-DEC-2023		SDG: 28-DEC-2023	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205589431	Radium 228	2051-D	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	Ac-228 Ingrow (date)	Ac-228 Separation (date)
1	646851001	04-DEC-2023	3	302.3	302.3	12/05/23 13:01	12/13/23 06:48
2	646851002	04-DEC-2023	3	309.4	309.4	12/05/23 13:01	12/13/23 06:48
3	646851003	04-DEC-2023	3	300.9	300.9	12/05/23 13:01	12/13/23 06:48
4	646851004	04-DEC-2023	3	300.8	300.8	12/05/23 13:01	12/13/23 06:48
5	646851005	04-DEC-2023	3	307.6	307.6	12/05/23 13:01	12/13/23 06:48
6	646851006	04-DEC-2023	3	301.3	301.3	12/05/23 13:01	12/13/23 06:48
7	646993001	04-DEC-2023	3	301	301	12/05/23 13:01	12/13/23 06:48
8	646993002	04-DEC-2023	3	312.3	312.3	12/05/23 13:01	12/13/23 06:48
9	646993003	04-DEC-2023	3	301.2	301.2	12/05/23 13:01	12/13/23 06:48
10	646993004	04-DEC-2023	3	306.5	306.5	12/05/23 13:01	12/13/23 06:48
11	646993005	04-DEC-2023	3	304.8	304.8	12/05/23 13:01	12/13/23 06:48
12	646993006	04-DEC-2023	3	302.3	302.3	12/05/23 13:01	12/13/23 06:48
13	1205589429 MB	04-DEC-2023	3		312.3	12/05/23 13:01	12/13/23 06:48
14	1205589430 DUP (646851001)	04-DEC-2023	3	302.9	302.9	12/05/23 13:01	12/13/23 06:48
15	1205589431 LCS	04-DEC-2023	3		312.3	12/05/23 13:01	12/13/23 06:48

Reagent/Solvent Lot ID	Description	Amount	Comments:
WORK 2097-B	Ba-133 Tracer	.1 mL	Pipet Id: RAD-GFC-1795419 Data Entry Date2: 04-DEC-2023 00:00
REGNT 4067319	RGF-1.5M Ammonium Sulfate	10 mL	
REGNT 3956035	Barium Carrier Ra228 REG	1 mL	
REGNT 4067327	RGF-1M Citric Acid	5 mL	
REGNT 4063205	2M HCl	20 mL	
REGNT 4059822	RGF-50% Potassium Carbonate	2 mL	
REGNT 4067876	RGF-7M Nitric Acid	25 mL	
REGNT 3973438.3	Acetic Acid Glacial ACS Poly Coated Bottle	10 mL	
REGNT 4048362.6	RGF-Hydrofluoric Acid	4 mL	
REGNT 3963747	500 mg/mL Neodymium Carrier	.2 mL	
REGNT 4061618	RGF-Neodymium Substrate	5 mL	
REGNT 4059505.9	Nitric Acid	5 mL	
REGNT DGA110623	2517569	2 g	

Radium-228 Liquid

Filename : RA228.XLS
 File type : Excel
 Version # : 1.4.3

Tracer S/N : 2097-B
 Tracer Exp Date : 7/12/2024
 Tracer Volume Added: 0.10

Batch : 2533748
 Analyst : JAC02417
 Prep Date : 12/4/2023
 Ra-228 Method Uncertainty : 0.1268

Procedure Code : GFC28RAL
 Parmname : Radium-228
 Required MDA : 3 pCi/L
 Ra-228 Abundance : 1.00
 Halflife of Ra-228 : 5.75 years
 Halflife of Ac-228 : 6.15 hours

Geometry: 25mm Filter

Sample Characteristics					Tracer Calculations		Tracer Samp.		Tracer	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Tracer Ref. Activity (CPM)	Tracer Ref. Count Uncertainty (%)	Tracer Samp. Activity (CPM)	Tracer Samp. Count Uncertainty (%)	Tracer Aliquot (mL)	Tracer Aliquot StDev. (mL)
1	646851001.1	0.3023	1.8498E-05	11/21/2023 11:26	757.6	2.10%	685.6	2.21%	0.1	0.000200
2	646851002.1	0.3094	1.8614E-05	11/21/2023 13:41	757.6	2.10%	706.9	2.17%	0.1	0.000200
3	646851003.1	0.3009	1.8474E-05	11/21/2023 14:56	757.6	2.10%	665.5	2.24%	0.1	0.000200
4	646851004.1	0.3008	1.8473E-05	11/21/2023 12:34	757.6	2.10%	664.8	2.24%	0.1	0.000200
5	646851005.1	0.3076	1.8585E-05	11/21/2023 11:26	757.6	2.10%	673.4	2.23%	0.1	0.000200
6	646851006.1	0.3013	1.8481E-05	11/21/2023 9:25	757.6	2.10%	698.1	2.19%	0.1	0.000200
7	646993001.1	0.3010	1.8476E-05	11/27/2023 15:33	757.6	2.10%	566.6	2.43%	0.1	0.000200
8	646993002.1	0.3123	1.8660E-05	11/27/2023 11:54	757.6	2.10%	660.1	2.25%	0.1	0.000200
9	646993003.1	0.3012	1.8479E-05	11/27/2023 13:16	757.6	2.10%	681.6	2.21%	0.1	0.000200
10	646993004.1	0.3065	1.8567E-05	11/27/2023 14:58	757.6	2.10%	617.4	2.32%	0.1	0.000200
11	646993005.1	0.3048	1.8539E-05	11/27/2023 13:16	757.6	2.10%	714.7	2.16%	0.1	0.000200
12	646993006.1	0.3023	1.8498E-05	11/27/2023 10:05	757.6	2.10%	680.6	2.21%	0.1	0.000200
13	1205589429.1	0.3123	1.8660E-05	12/4/2023 0:00	757.6	2.10%	703.9	2.18%	0.1	0.000200
14	1205589430.1	0.3029	1.8508E-05	11/21/2023 11:26	757.6	2.10%	668.2	2.23%	0.1	0.000200
15	1205589431.1	0.3123	1.8660E-05	12/4/2023 0:00	757.6	2.10%	661.5	2.25%	0.1	0.000200

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-063
 Instrument SOP: GL-RAD-I-016

Count raw Data													Calculated	Sample
Pos.	Detector ID	Counting Time (min.)	Gross Counts		Beta cpm	Count Start Date/Time	Ac-228 Ingrowth Date/Time	Ac-228 Decay Date/Time	Ra-228 Decay	Ac-228 Decay	Ac-228 Ingrowth	Ac-228 Count Correction	Recovery %	Recovery Error %
			Alpha	Beta										
1	1A	60	13	41	0.683	12/13/2023 8:37	12/5/2023 13:01	12/13/2023 6:48	0.993	0.814	1.000	1.057	90.5%	3.06%
2	1C	60	12	68	1.133	12/13/2023 8:37	12/5/2023 13:01	12/13/2023 6:48	0.993	0.814	1.000	1.057	93.3%	3.03%
3	1D	60	12	52	0.867	12/13/2023 8:37	12/5/2023 13:01	12/13/2023 6:48	0.993	0.814	1.000	1.057	87.8%	3.08%
4	2A	60	18	63	1.050	12/13/2023 8:37	12/5/2023 13:01	12/13/2023 6:48	0.993	0.814	1.000	1.057	87.8%	3.08%
5	2D	60	15	89	1.483	12/13/2023 8:37	12/5/2023 13:01	12/13/2023 6:48	0.993	0.814	1.000	1.057	88.9%	3.08%
6	3B	60	5	45	0.750	12/13/2023 8:37	12/5/2023 13:01	12/13/2023 6:48	0.993	0.814	1.000	1.057	92.1%	3.05%
7	3C	60	1	27	0.450	12/13/2023 8:37	12/5/2023 13:01	12/13/2023 6:48	0.995	0.814	1.000	1.057	74.8%	3.22%
8	3D	60	9	36	0.600	12/13/2023 8:37	12/5/2023 13:01	12/13/2023 6:48	0.995	0.813	1.000	1.057	87.1%	3.09%
9	4C	60	16	42	0.700	12/13/2023 8:38	12/5/2023 13:01	12/13/2023 6:48	0.995	0.813	1.000	1.057	90.0%	3.06%
10	4D	60	27	53	0.883	12/13/2023 8:38	12/5/2023 13:01	12/13/2023 6:48	0.995	0.813	1.000	1.057	81.5%	3.14%
11	5D	60	10	51	0.850	12/13/2023 8:38	12/5/2023 13:01	12/13/2023 6:48	0.995	0.812	1.000	1.057	94.3%	3.03%
12	6C	60	6	81	1.350	12/13/2023 8:38	12/5/2023 13:01	12/13/2023 6:48	0.995	0.813	1.000	1.057	89.8%	3.06%
13	7B	60	7	22	0.367	12/13/2023 8:38	12/5/2023 13:01	12/13/2023 6:48	0.997	0.813	1.000	1.057	92.9%	3.04%
14	7D	60	7	35	0.583	12/13/2023 8:38	12/5/2023 13:01	12/13/2023 6:48	0.993	0.813	1.000	1.057	88.2%	3.08%
15	8B	60	8	1325	22.083	12/13/2023 8:38	12/5/2023 13:01	12/13/2023 6:48	0.997	0.813	1.000	1.057	87.3%	3.09%

Calibration Data								
Pos.	Counted on	Calibration Date	Calibration Due Date	Detector Efficiency (cpm/dpm)	Detector Efficiency Error (cpm/dpm)	Bkg cpm	Weekly Bkg Count Start Date/Time	Bkg Count Time (min.)
1	PIC	6/1/2023	5/31/2024	0.5320	0.00738	0.548	12/8/2023 16:59	500
2	PIC	6/1/2023	5/31/2024	0.6077	0.00847	0.886	12/8/2023 16:59	500
3	PIC	6/1/2023	5/31/2024	0.6071	0.00692	0.736	12/8/2023 16:59	500
4	PIC	6/1/2023	5/31/2024	0.6083	0.01914	0.686	12/8/2023 16:59	500
5	PIC	6/1/2023	5/31/2024	0.6206	0.00745	1.130	12/8/2023 17:00	500
6	PIC	6/1/2023	5/31/2024	0.6266	0.01614	0.480	12/8/2023 17:00	500
7	PIC	6/1/2023	5/31/2024	0.6245	0.00988	0.436	12/8/2023 17:00	500
8	PIC	6/1/2023	5/31/2024	0.5677	0.02297	0.350	12/8/2023 17:00	500
9	PIC	6/1/2023	5/31/2024	0.6376	0.00889	0.786	12/8/2023 17:00	500
10	PIC	6/1/2023	5/31/2024	0.6412	0.00773	1.132	12/8/2023 17:00	500
11	PIC	6/1/2023	5/31/2024	0.6566	0.00925	0.560	12/8/2023 17:00	500
12	PIC	6/1/2023	5/31/2024	0.6167	0.01970	1.446	12/8/2023 16:58	500
13	PIC	6/1/2023	5/31/2024	0.6423	0.00627	0.430	12/8/2023 16:58	500
14	PIC	6/1/2023	5/31/2024	0.6247	0.01113	0.398	12/8/2023 16:58	500
15	PIC	6/1/2023	5/31/2024	0.6270	0.02148	1.126	12/8/2023 16:59	500

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : N/A
 Spike Exp Date : N/A
 Spike Activity (dpm/ml): N/A
 Spike Volume Added: N/A

* - RPD changed to 0% due to sample & dup activity below MDA

LCS S/N : 2051-D
 LCS Exp Date : 7/12/2024
 LCS Activity (dpm/ml): 517.50
 LCS Volume Added: 0.10

Results														2 SIGMA		2 SIGMA	
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	Counting Uncertainty pCi/L	Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery	
1	0.9543	0.6737	3	1.5499	0.5480	82.62%	0.1353	0.1117	0.8868	0.8979		SAMPLE					
2	1.0067	0.7107	3	1.5894	0.8309	58.20%	0.2473	0.1437	0.9465	0.9701		SAMPLE					
3	1.0032	0.7083	3	1.6003	0.4800	96.60%	0.1307	0.1262	0.9084	0.9166		SAMPLE					
4	0.9681	0.6835	3	1.5505	1.3365	37.91%	0.3640	0.1374	0.9886	1.0473		SAMPLE					
5	1.1759	0.8302	3	1.8341	1.2278	46.60%	0.3533	0.1643	1.1187	1.1621		SAMPLE					
6	0.7476	0.5278	3	1.2251	0.9152	43.11%	0.2700	0.1160	0.7708	0.8060		SAMPLE					
7	0.8800	0.6213	3	1.4519	0.0586	653.57%	0.0140	0.0915	0.7508	0.7510		SAMPLE					
8	0.7177	0.5067	3	1.2039	0.9527	41.56%	0.2500	0.1034	0.7726	0.8112		SAMPLE					
9	0.9616	0.6789	3	1.5282	-0.2930	133.83%	-0.0860	0.1151	0.7684	0.7685		SAMPLE					
10	1.2450	0.8790	3	1.9418	-0.9141	52.51%	-0.2487	0.1303	0.9390	0.9392		SAMPLE					
11	0.7439	0.5252	3	1.2065	0.9055	42.75%	0.2900	0.1236	0.7567	0.7915		SAMPLE					
12	1.3465	0.9506	3	2.0772	-0.3377	166.03%	-0.0960	0.1593	1.0986	1.0987		SAMPLE					
13	0.6582	0.4647	3	1.0871	-0.1997	131.87%	-0.0633	0.0835	0.5160	0.5162		MB					
14	0.7101	0.5013	3	1.1795	0.6553	55.43%	0.1853	0.1026	0.7108	0.7304	646851001.1	DUP	* 0.0%				
15	1.1612	0.8198	3	1.8115	72.0432	4.75%	20.9573	0.6085	4.1001	19.1217		LCS			74.6429	96.5%	

SampleID	Instr	Time (min.)	Alpha Counts	Beta Counts	Count Start Time	Count End Time	Machine	Batch ID
646851001	1A	60	13	41	12/13/2023 8:37	12/13/2023 9:37	PIC	2533748
646851002	1C	60	12	68	12/13/2023 8:37	12/13/2023 9:37	PIC	2533748
646851003	1D	60	12	52	12/13/2023 8:37	12/13/2023 9:37	PIC	2533748
646851004	2A	60	18	63	12/13/2023 8:37	12/13/2023 9:37	PIC	2533748
646851005	2D	60	15	89	12/13/2023 8:37	12/13/2023 9:37	PIC	2533748
646851006	3B	60	5	45	12/13/2023 8:37	12/13/2023 9:37	PIC	2533748
646993001	3C	60	1	27	12/13/2023 8:37	12/13/2023 9:37	PIC	2533748
646993002	3D	60	9	36	12/13/2023 8:37	12/13/2023 9:37	PIC	2533748
646993003	4C	60	16	42	12/13/2023 8:38	12/13/2023 9:38	PIC	2533748
646993004	4D	60	27	53	12/13/2023 8:38	12/13/2023 9:38	PIC	2533748
646993005	5D	60	10	51	12/13/2023 8:38	12/13/2023 9:38	PIC	2533748
646993006	6C	60	6	81	12/13/2023 8:38	12/13/2023 9:38	PIC	2533748
1205589429	7B	60	7	22	12/13/2023 8:38	12/13/2023 9:38	PIC	2533748
1205589430	7D	60	7	35	12/13/2023 8:38	12/13/2023 9:38	PIC	2533748
1205589431	8B	60	8	1325	12/13/2023 8:38	12/13/2023 9:38	PIC	2533748

ASSAY 13-Dec-23 7:14:41
 Wizard 1480 s/n 4800440
 Protocol id 8 228_REC
 Time limit 180
 Count limit 50000
 Isotope Ba-133
 Protocol date 10-Jan-20 14:21:10
 Run id. 19

Samp_ID	POS	RACK	BATCH	TIME	COUNTS	CPM	ERROR	% RECOVERY	COUNT TIME
REF		1	98	1	180	2272	757.6	2.1	07:14:48
646851001	2	98	2	180	2056	685.6	2.21	90.50	07:18:00
646851002	3	98	3	180	2120	706.9	2.17	93.31	07:21:11
646851003	4	98	4	180	1996	665.5	2.24	87.84	07:24:22
646851004	5	98	5	180	1994	664.8	2.24	87.75	07:27:34
646851005	6	51	6	180	2020	673.4	2.23	88.89	07:30:58
646851006	7	51	7	180	2094	698.1	2.19	92.15	07:34:10
646993001	8	51	8	180	1700	566.6	2.43	74.79	07:37:21
646993002	9	51	9	180	1980	660.1	2.25	87.13	07:40:33
646993003	10	51	10	180	2044	681.6	2.21	89.97	07:43:44
646993004	11	36	11	180	1852	617.4	2.32	81.49	07:47:09
646993005	12	36	12	180	2144	714.7	2.16	94.34	07:50:20
646993006	13	36	13	180	2041	680.6	2.21	89.84	07:53:32
1205589429	14	36	14	180	2111	703.9	2.18	92.91	07:56:43
1205589430	15	36	15	180	2004	668.2	2.23	88.20	07:59:54
1205589431	16	72	16	180	1984	661.5	2.25	87.32	08:03:19

END OF ASSAY

Continuing Calibration Data

Runlogs

Instrument Run Log

Instrument Type: GFPC

Batch ID: 2533748

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
646851001	SAMPLE	JE1	PIC1A	DEC-13-23 08:37:33	DONE	25mm Filter	01-JUN-23 00:00
646851002	SAMPLE	JE1	PIC1C	DEC-13-23 08:37:37	DONE	25mm Filter	01-JUN-23 00:00
646851003	SAMPLE	JE1	PIC1D	DEC-13-23 08:37:39	DONE	25mm Filter	01-JUN-23 00:00
646851004	SAMPLE	JE1	PIC2A	DEC-13-23 08:37:43	DONE	25mm Filter	01-JUN-23 00:00
646851005	SAMPLE	JE1	PIC2D	DEC-13-23 08:37:46	DONE	25mm Filter	01-JUN-23 00:00
646851006	SAMPLE	JE1	PIC3B	DEC-13-23 08:37:49	DONE	25mm Filter	01-JUN-23 00:00
646993001	SAMPLE	JE1	PIC3C	DEC-13-23 08:37:52	DONE	25mm Filter	01-JUN-23 00:00
646993002	SAMPLE	JE1	PIC3D	DEC-13-23 08:37:56	DONE	25mm Filter	01-JUN-23 00:00
646993003	SAMPLE	JE1	PIC4C	DEC-13-23 08:38:00	DONE	25mm Filter	01-JUN-23 00:00
646993004	SAMPLE	JE1	PIC4D	DEC-13-23 08:38:04	DONE	25mm Filter	01-JUN-23 00:00
1205589429	MB	JE1	PIC7B	DEC-13-23 08:38:09	DONE	25mm Filter	01-JUN-23 00:00
1205589430	DUP	JE1	PIC7D	DEC-13-23 08:38:14	DONE	25mm Filter	01-JUN-23 00:00
1205589431	LCS	JE1	PIC8B	DEC-13-23 08:38:18	DONE	25mm Filter	01-JUN-23 00:00
646993006	SAMPLE	JE1	PIC6C	DEC-13-23 08:38:23	DONE	25mm Filter	01-JUN-23 00:00
646993005	SAMPLE	JE1	PIC5D	DEC-13-23 08:38:44	DONE	25mm Filter	01-JUN-23 00:00

Lucas Cell Raw Data

Batch 2532924 Check-list

This check-list was completed on 11-DEC-23 by Lyndsey Pace

This batch was reviewed by Lyndsey Pace on 11-DEC-23 and Elizabeth Krouse on 14-DEC-23.

Batch ID:
2532924

Product:
LUC26RAL

Description: Lucas Cell Radium 226
GL-RAD-A-008

#	Criteria	Yes	No	Comments
Preparation Information				
1	Were all of the samples homogenous? Include sample description if not homogenous	Yes		
2	Was the preservation correct for this analysis?	Yes		
Internal Checklist Information				
3	Are instrument source checks within limits?	Yes		
4	Has an Aliquot Correction been completed for this batch?		No	
5	Have sample historical results been reviewed for this batch?	Yes		
Technical Information				
6	Were all the samples prepared/analyzed within the required holding time period?	Yes		
7	Are any sample results more negative than 3xTPU?		No	
Quality Control (QC) Information				
8	Was the method blank (MB) within the acceptance criteria?	Yes		
9	Were the laboratory control sample (LCS/LCSD) recoveries within the acceptance limits?	Yes		
10	Were the matrix spike (MS/MSD) recoveries within the acceptance limits?	Yes		
11	Were the relative percent differences and/or error (RPD/RER) between the sample and its duplicate within acceptable limits?	Yes		
12	Has the method required detection limit been met?	Yes		
Miscellaneous Information				
13	Are sample-specific MDA/MDC calculated and reported?	Yes		

Prep Logbook

Radium-226 in Liquid

Batch ID: 2532924
Analyst: Lyndsey Pace (LXP1)
Method: EPA 903.1 Modified
Lab SOP: GL-RAD-A-008 REV# 15
Instrument: LUCAS-C202389980

Due Dates for Lab: 25-DEC-2023			Package: 27-DEC-2023		SDG: 28-DEC-2023	
Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units	
LCS	1205588137	Ra-226 emanation spike	1715-I	.1	mL	
MS	1205588136	Ra-226 emanation spike	1715-I	.1	mL	

#	Sample ID	Prep Date	Min RDL (pCi/L)	Unadjusted Aliquot (g)	Aliquot (mL)	End Degas (date)	CELL #	End Transfer (date)	Start Count Time (date)	Background Counts	Total Counts
1	646851001	06-DEC-2023	1	509.61	509.61	12/07/23 11:00	801	12/10/23 05:45	12/10/23 08:45	1	43
2	646851002	06-DEC-2023	1	504.92	504.92	12/07/23 11:00	101	12/10/23 06:10	12/10/23 09:18	1	20
3	646851003	06-DEC-2023	1	504.84	504.84	12/07/23 11:00	206	12/10/23 06:10	12/10/23 09:18	7	24
4	646851004	06-DEC-2023	1	504.06	504.06	12/07/23 11:00	303	12/10/23 06:10	12/10/23 09:18	2	12
5	646851005	06-DEC-2023	1	508.16	508.16	12/07/23 11:00	402	12/10/23 06:10	12/10/23 09:18	1	36
6	646851006	06-DEC-2023	1	505.12	505.12	12/07/23 11:00	501	12/10/23 06:10	12/10/23 09:18	8	11
7	646878001	06-DEC-2023	.999	509.66	509.66	12/07/23 11:00	607	12/10/23 06:10	12/10/23 09:18	1	18
8	646993001	06-DEC-2023	1	504.37	504.37	12/07/23 11:00	708	12/10/23 06:10	12/10/23 09:18	1	23
9	646993002	06-DEC-2023	1	506.25	506.25	12/07/23 11:00	807	12/10/23 06:10	12/10/23 09:18	2	25
10	646993003	06-DEC-2023	1	506.46	506.46	12/07/23 11:00	102	12/10/23 06:40	12/10/23 09:50	1	34
11	646993004	06-DEC-2023	1	503.31	503.31	12/07/23 11:00	208	12/10/23 06:40	12/10/23 09:50	2	22
12	646993005	06-DEC-2023	1	504.19	504.19	12/07/23 11:00	305	12/10/23 06:40	12/10/23 09:50	1	10
13	646993006	06-DEC-2023	1	508.78	508.78	12/07/23 11:00	407	12/10/23 06:40	12/10/23 09:50	1	35
14	1205588134 MB	06-DEC-2023	.999		509.66	12/07/23 11:00	504	12/10/23 06:40	12/10/23 09:50	5	11
15	1205588135 DUP (646878001)	06-DEC-2023	.999	500.1	500.1	12/07/23 11:00	604	12/10/23 06:40	12/10/23 09:50	3	25
16	1205588136 MS (646878001)	06-DEC-2023	.999	103.84	103.84	12/07/23 11:00	702	12/10/23 06:40	12/10/23 09:50	1	481
17	1205588137 LCS	06-DEC-2023	.999		509.66	12/07/23 11:00	806	12/10/23 06:40	12/10/23 09:50	3	720

Reagent/Solvent Lot ID	Description	Amount	Comments:
			Data Entry Date2: 06-DEC-2023 00:00

Radium-226 Liquid

Filename : RA226.XLS
 File type : Excel
 Version # : 1.3.2

Procedure Code : LUC26RAL
 Parmname : Radium-226
 Required MDA : 1 pCi/L
 Halflife of Ra-226 : 1600 years
 Ra-226 Abundance : 1.00
 Halflife of Rn-222 : 3.8235 days

Batch : 2532924
 Analyst : LIN01615
 Prep Date : 12/6/2023
 Ra-226 Method Uncertainty : 0.073648

Batch counted on : LUCAS CELL DETECTOR
 BKG Count time : 30 min

Sample Characteristics					Count Raw Data						Background	
Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	Cell Number	Counting		Gross CPM	Background Counts	Background CPM	Background Count Time (min.)	Cell Efficiency (cpm/dpm)
						Time (min.)	Gross Counts					
1	646851001.1	0.5096	2.0294E-05	11/21/2023 11:26	801	30	43	1.433	1	0.033	30	1.4200
2	646851002.1	0.5049	2.0276E-05	11/21/2023 13:41	101	30	20	0.667	1	0.033	30	1.8120
3	646851003.1	0.5048	2.0276E-05	11/21/2023 14:56	206	30	24	0.800	7	0.233	30	1.5880
4	646851004.1	0.5041	2.0272E-05	11/21/2023 12:34	303	30	12	0.400	2	0.067	30	1.5370
5	646851005.1	0.5082	2.0289E-05	11/21/2023 11:26	402	30	36	1.200	1	0.033	30	1.4980
6	646851006.1	0.5051	2.0277E-05	11/21/2023 9:25	501	30	11	0.367	8	0.267	30	1.7160
7	646878001.1	0.5097	2.0295E-05	11/15/2023 13:45	607	30	18	0.600	1	0.033	30	1.7750
8	646993001.1	0.5044	2.0274E-05	11/27/2023 15:33	708	30	23	0.767	1	0.033	30	1.5430
9	646993002.1	0.5063	2.0281E-05	11/27/2023 11:54	807	30	25	0.833	2	0.067	30	2.0260
10	646993003.1	0.5065	2.0282E-05	11/27/2023 13:16	102	30	34	1.133	1	0.033	30	1.4860
11	646993004.1	0.5033	2.0269E-05	11/27/2023 14:58	208	30	22	0.733	2	0.067	30	1.7130
12	646993005.1	0.5042	2.0273E-05	11/27/2023 13:16	305	30	10	0.333	1	0.033	30	1.5280
13	646993006.1	0.5088	2.0291E-05	11/27/2023 10:05	407	30	35	1.167	1	0.033	30	1.4390
14	1205588134.1	0.5097	2.0295E-05	12/6/2023 0:00	504	30	11	0.367	5	0.167	30	1.3720
15	1205588135.1	0.5001	2.0256E-05	11/15/2023 13:45	604	30	25	0.833	3	0.100	30	1.7290
16	1205588136.1	0.1038	1.1603E-05	11/15/2023 13:45	702	30	481	16.033	1	0.033	30	1.6810
17	1205588137.1	0.5097	2.0295E-05	12/6/2023 0:00	806	30	720	24.000	3	0.100	30	1.6560

Pipet, 0.1 ml Stdev : +/- 0.000200 ml
 Pipet, 0.5 ml Stdev : +/- 0.001000 ml
 Pipet, 1 ml Stdev : +/- 0.002000 ml

Analytical SOP: GL-RAD-A-008
 Instrument SOP: GL-RAD-I-007

Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrowth End Date/Time	Count Start Date/Time	Rn-222 Corrections			Ra-226 Decay
						De-Gas to Ingrowth	Ingrowth to Count	During Count	
3.200%	4/8/2023	3/31/2024	12/7/2023 11:00	12/10/2023 5:45	12/10/2023 8:45	0.396	0.978	1.002	1.000
4.500%	5/1/2023	4/30/2024	12/7/2023 11:00	12/10/2023 6:10	12/10/2023 9:18	0.398	0.977	1.002	1.000
8.600%	8/1/2023	7/31/2024	12/7/2023 11:00	12/10/2023 6:10	12/10/2023 9:18	0.398	0.977	1.002	1.000
6.800%	11/1/2023	10/31/2024	12/7/2023 11:00	12/10/2023 6:10	12/10/2023 9:18	0.398	0.977	1.002	1.000
5.300%	2/1/2023	1/31/2024	12/7/2023 11:00	12/10/2023 6:10	12/10/2023 9:18	0.398	0.977	1.002	1.000
5.500%	6/1/2023	5/31/2024	12/7/2023 11:00	12/10/2023 6:10	12/10/2023 9:18	0.398	0.977	1.002	1.000
6.800%	7/1/2023	6/30/2024	12/7/2023 11:00	12/10/2023 6:10	12/10/2023 9:18	0.398	0.977	1.002	1.000
5.200%	11/1/2023	10/31/2024	12/7/2023 11:00	12/10/2023 6:10	12/10/2023 9:18	0.398	0.977	1.002	1.000
9.200%	10/10/2023	3/31/2024	12/7/2023 11:00	12/10/2023 6:10	12/10/2023 9:18	0.398	0.977	1.002	1.000
2.300%	5/1/2023	4/30/2024	12/7/2023 11:00	12/10/2023 6:40	12/10/2023 9:50	0.400	0.976	1.002	1.000
4.400%	8/1/2023	7/31/2024	12/7/2023 11:00	12/10/2023 6:40	12/10/2023 9:50	0.400	0.976	1.002	1.000
7.000%	11/1/2023	10/31/2024	12/7/2023 11:00	12/10/2023 6:40	12/10/2023 9:50	0.400	0.976	1.002	1.000
5.800%	2/1/2023	1/31/2024	12/7/2023 11:00	12/10/2023 6:40	12/10/2023 9:50	0.400	0.976	1.002	1.000
1.100%	10/10/2023	5/31/2024	12/7/2023 11:00	12/10/2023 6:40	12/10/2023 9:50	0.400	0.976	1.002	1.000
2.300%	7/1/2023	6/30/2024	12/7/2023 11:00	12/10/2023 6:40	12/10/2023 9:50	0.400	0.976	1.002	1.000
2.000%	11/1/2023	10/31/2024	12/7/2023 11:00	12/10/2023 6:40	12/10/2023 9:50	0.400	0.976	1.002	1.000
1.900%	4/8/2023	3/31/2024	12/7/2023 11:00	12/10/2023 6:40	12/10/2023 9:50	0.400	0.976	1.002	1.000

Notes:

- 1 - Results are decay corrected to Sample Date/Time
- 2 - Reference date for Spike Activity (dpm/ml) is the batch Prep Date
- 3 - Spike Nominals are decay corrected to Sample Date/Time

Spike S/N : 1715-I
Spike Exp Date : 8/29/2024
Spike Activity (dpm/ml): 304.18
Spike Volume Added: 0.10

LCS S/N : 1715-I
LCS Exp Date : 8/29/2024
LCS Activity (dpm/ml): 304.18
LCS Volume Added: 0.10

Results																
Pos.	Decision Level pCi/L	Critical Level pCi/L	Required MDA pCi/L	MDA pCi/L	Sample Act. Conc. pCi/L	Sample Act. Error %	Net Count Rate CPM	Net Count Rate Error CPM	2 SIGMA Counting Uncertainty pCi/L	2 SIGMA Total Prop. Uncertainty pCi/L	Sample QC	Sample Type	RPD	RER	Nominal pCi/L	Recovery
1	0.1769	0.1249	1	0.4109	2.2553	16.11%	1.4000	0.2211	0.6981	0.7832		SAMPLE				
2	0.1394	0.0984	1	0.3238	0.8039	24.54%	0.6333	0.1528	0.3800	0.4036		SAMPLE				
3	0.4210	0.2972	1	0.7393	0.8209	33.86%	0.5667	0.1856	0.5270	0.5576		SAMPLE				
4	0.2329	0.1644	1	0.4787	0.4997	38.03%	0.3333	0.1247	0.3664	0.3794		SAMPLE				
5	0.1676	0.1183	1	0.3892	1.7799	18.17%	1.1667	0.2028	0.6063	0.6840		SAMPLE				
6	0.4162	0.2939	1	0.7217	0.1340	145.40%	0.1000	0.1453	0.3816	0.3823		SAMPLE				
7	0.1410	0.0996	1	0.3275	0.7275	26.53%	0.5667	0.1453	0.3656	0.3925		SAMPLE				
8	0.1639	0.1157	1	0.3807	1.0943	22.87%	0.7333	0.1633	0.4776	0.5153		SAMPLE				
9	0.1759	0.1242	1	0.3616	0.8681	24.39%	0.7667	0.1732	0.3844	0.4335		SAMPLE				
10	0.1686	0.1190	1	0.3915	1.6882	18.07%	1.1000	0.1972	0.5932	0.6458		SAMPLE				
11	0.2081	0.1469	1	0.4278	0.8931	24.89%	0.6667	0.1633	0.4288	0.4543		SAMPLE				
12	0.1647	0.1163	1	0.3825	0.4498	37.51%	0.3000	0.1106	0.3249	0.3370		SAMPLE				
13	0.1733	0.1223	1	0.4024	1.7880	18.58%	1.1333	0.2000	0.6184	0.7003		SAMPLE				
14	0.4057	0.2864	1	0.7380	0.3304	66.68%	0.2000	0.1333	0.4317	0.4344		MB				
15	0.2541	0.1794	1	0.4924	0.9796	24.16%	0.7333	0.1764	0.4618	0.4850	646878001.1	DUP	29.5%			
16	0.7268	0.5131	1	1.6880	105.8762	4.99%	16.0000	0.7318	9.4915	18.4633	646878001.1	MS			131.9524	79.7%
17	0.2604	0.1838	1	0.5045	32.7082	4.20%	23.9000	0.8963	2.4042	5.4365		LCS			26.8838	121.7%

Continuing Calibration Data

Ludlum Alpha Scintillation Counter Checks for 10-DEC-2023

Short Name	Parmname	Run Time	Count Time	Counts	CPM	Stdev	Status	Comments
LUCAS1	EFF	07:17	1	1.12E+05	112073	-2.52		
LUCAS2	EFF	07:15	1	1.30E+05	130189	-0.38		
LUCAS3	EFF	07:11	1	90965	90965	-1.17		
LUCAS4	EFF	07:10	1	1.26E+05	126251	-1.48		
LUCAS5	EFF	07:09	1	1.29E+05	129068	-2.13		
LUCAS6	EFF	07:08	1	1.29E+05	128958	-0.39		
LUCAS7	EFF	07:06	1	1.30E+05	130493	-1.27		
LUCAS8	EFF	07:04	1	1.13E+05	112703	-1.2		

Reviewed by: 
Lyndsey Pace

Date: 10-DEC-23

GEL Laboratories LLC

Runlogs

Instrument Run Log

Instrument Type: LUCAS CELL DETECTOR

Batch ID: 2532924

Sample ID	Sample Type	Analyst	Instrument	Run Date	Status	Geometry	Calibration Date
646851001	SAMPLE	LXP1	LUCAS8	DEC-10-23 08:45:00	DONE	Lucas Cell	08-APR-23 00:00
646851002	SAMPLE	LXP1	LUCAS1	DEC-10-23 09:18:00	DONE	Lucas Cell	01-MAY-23 00:00
646851003	SAMPLE	LXP1	LUCAS2	DEC-10-23 09:18:00	DONE	Lucas Cell	01-AUG-23 00:00
646851004	SAMPLE	LXP1	LUCAS3	DEC-10-23 09:18:00	DONE	Lucas Cell	01-NOV-23 00:00
646851005	SAMPLE	LXP1	LUCAS4	DEC-10-23 09:18:00	DONE	Lucas Cell	01-FEB-23 00:00
646851006	SAMPLE	LXP1	LUCAS5	DEC-10-23 09:18:00	DONE	Lucas Cell	01-JUN-23 00:00
646878001	SAMPLE	LXP1	LUCAS6	DEC-10-23 09:18:00	DONE	Lucas Cell	01-JUL-23 00:00
646993001	SAMPLE	LXP1	LUCAS7	DEC-10-23 09:18:00	DONE	Lucas Cell	01-NOV-23 00:00
646993002	SAMPLE	LXP1	LUCAS8	DEC-10-23 09:18:00	DONE	Lucas Cell	08-APR-23 00:00
646993003	SAMPLE	LXP1	LUCAS1	DEC-10-23 09:50:00	DONE	Lucas Cell	01-MAY-23 00:00
646993004	SAMPLE	LXP1	LUCAS2	DEC-10-23 09:50:00	DONE	Lucas Cell	01-AUG-23 00:00
646993005	SAMPLE	LXP1	LUCAS3	DEC-10-23 09:50:00	DONE	Lucas Cell	01-NOV-23 00:00
646993006	SAMPLE	LXP1	LUCAS4	DEC-10-23 09:50:00	DONE	Lucas Cell	01-FEB-23 00:00
1205588134	MB	LXP1	LUCAS5	DEC-10-23 09:50:00	DONE	Lucas Cell	01-JUN-23 00:00
1205588135	DUP	LXP1	LUCAS6	DEC-10-23 09:50:00	DONE	Lucas Cell	01-JUL-23 00:00
1205588136	MS	LXP1	LUCAS7	DEC-10-23 09:50:00	DONE	Lucas Cell	01-NOV-23 00:00
1205588137	LCS	LXP1	LUCAS8	DEC-10-23 09:50:00	DONE	Lucas Cell	08-APR-23 00:00



Environmental Laboratory
1232 Haco Drive
Lansing
Michigan, 48910

CHAIN OF CUSTODY

Phone: (517)702-6372

Lab Work Order Number L311202

Client Name BWL - Erickson Station		Project Name Erickson Well Project		Requested Analyses						Requested Turn Around			
Client Contact Cheryl Loudon		Project Number [none]		Ag::As::B::Ba::Be::Ca::Cd::Cr::Co::Cu::Fe::Hg::Li::Mo::Ni::Pb::Sb::Se::Ti::V::Zn::Na::K::Mg TSS, HCO3, CO3, Hardness Cl:Cl:: F:ISE:: SO4:: TDS Radium 226 and Radium 228								Rush requests subject to additional charge.	
Address 3725 S. Canal		Project Description										Rush requests subject to lab approval.	
City Lansing		PO Number 30926 10021											
State/Zip MI, 48917		Shipped By											
Phone (517) 702-6396	Fax (517) 702-6373	Tracking Number											
Sampler Marc Wahrer													

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code				Sample	Comments
						b	a	a	b		
MW-100A	11.27.23	1533	G	GW	5	1	1	1	2		
MW-100B	↓	1154	G	GW	5	1	1	1	2		
MW-100C		1316	G	GW	5	1	1	1	2		
MW-100D		1458	G	GW	5	1	1	1	2		
MWT-100C		1316	G	GW	5	1	1	1	2		
Field Blank		1005	G	DI	5	1	1	1	2		

Relinquished By 	Date/Time 11-27-23 1645	Received By <i>Steve Wahrer</i>	Date/Time 11.28.23 0740	
Relinquished By	Date/Time	Received By	Date/Time	Comments
Relinquished By	Date/Time	Received By	Date/Time	
Relinquished By	Date/Time	Received By	Date/Time	
Cooler Numbers and Temperatures E0776 1.3°C not frozen				

Matrix Codes: DI=Deionized Water, GW=Ground Water Preserv. Codes: a=None, b=0.5% HNO3

Appendix D

Statistical Output Report

BWL Glacial - 95% Lower Confidence Limits for Assessment Monitoring

Downgradient wells as of November, 2023

Well	Type	Constituent	Unit	n	% NDs	Range of Sampling Period	Method	LCL
MW-2	Appendix IV	Fluoride	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	1.00
MW-2	Appendix IV	Antimony	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00500
MW-2	Appendix IV	Arsenic	mg/L	17	76%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00200
MW-2	Appendix IV	Barium	mg/L	17	0%	2020-04-28 to 2023-08-01	Normal LCL	0.0394
MW-2	Appendix IV	Beryllium	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00100
MW-2	Appendix IV	Cadmium	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.000500
MW-2	Appendix IV	Chromium	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00500
MW-2	Appendix IV	Cobalt	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00500
MW-2	Appendix IV	Lead	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00300
MW-2	Appendix IV	Lithium	mg/L	17	0%	2020-04-28 to 2023-08-01	Normal LCL	0.0553
MW-2	Appendix IV	Mercury	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.000200
MW-2	Appendix IV	Molybdenum	mg/L	17	0%	2020-04-28 to 2023-08-01	Normal LCL	0.0103
MW-2	Appendix IV	Radium-226/228	pCi/L	17	0%	2020-04-28 to 2023-08-01	Normal LCL	0.570
MW-2	Appendix IV	Selenium	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00500
MW-2	Appendix IV	Thallium	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00200
MW-3	Appendix IV	Fluoride	mg/L	6	100%	2021-05-04 to 2023-08-01	Nonparametric LCL around the Median	1.00
MW-3	Appendix IV	Antimony	mg/L	6	100%	2021-05-04 to 2023-08-01	Nonparametric LCL around the Median	0.00500
MW-3	Appendix IV	Arsenic	mg/L	6	0%	2021-05-04 to 2023-08-01	Nonparametric LCL around the Median	0.00300
MW-3	Appendix IV	Barium	mg/L	6	0%	2021-05-04 to 2023-08-01	Nonparametric LCL around the Median	0.0190
MW-3	Appendix IV	Beryllium	mg/L	6	100%	2021-05-04 to 2023-08-01	Nonparametric LCL around the Median	0.00100
MW-3	Appendix IV	Cadmium	mg/L	6	100%	2021-05-04 to 2023-08-01	Nonparametric LCL around the Median	0.000500
MW-3	Appendix IV	Chromium	mg/L	6	100%	2021-05-04 to 2023-08-01	Nonparametric LCL around the Median	0.00500
MW-3	Appendix IV	Cobalt	mg/L	6	100%	2021-05-04 to 2023-08-01	Nonparametric LCL around the Median	0.00500
MW-3	Appendix IV	Lead	mg/L	6	100%	2021-05-04 to 2023-08-01	Nonparametric LCL around the Median	0.00300
MW-3	Appendix IV	Lithium	mg/L	6	0%	2021-05-04 to 2023-08-01	Nonparametric LCL around the Median	0.0770
MW-3	Appendix IV	Mercury	mg/L	6	100%	2021-05-04 to 2023-08-01	Nonparametric LCL around the Median	0.000200
MW-3	Appendix IV	Molybdenum	mg/L	6	0%	2021-05-04 to 2023-08-01	Nonparametric LCL around the Median	0.153
MW-3	Appendix IV	Radium-226/228	pCi/L	6	0%	2021-05-04 to 2023-08-01	Nonparametric LCL around the Median	0.412
MW-3	Appendix IV	Selenium	mg/L	6	100%	2021-05-04 to 2023-08-01	Nonparametric LCL around the Median	0.00500
MW-3	Appendix IV	Thallium	mg/L	6	100%	2021-05-04 to 2023-08-01	Nonparametric LCL around the Median	0.00200
MW-5	Appendix IV	Fluoride	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	1.00
MW-5	Appendix IV	Antimony	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00500
MW-5	Appendix IV	Arsenic	mg/L	17	71%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00200
MW-5	Appendix IV	Barium	mg/L	17	0%	2020-04-28 to 2023-08-01	Normal LCL	0.0424
MW-5	Appendix IV	Beryllium	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00100
MW-5	Appendix IV	Cadmium	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.000500
MW-5	Appendix IV	Chromium	mg/L	17	88%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00500
MW-5	Appendix IV	Cobalt	mg/L	17	94%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00500
MW-5	Appendix IV	Lead	mg/L	17	82%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00300
MW-5	Appendix IV	Lithium	mg/L	17	0%	2020-04-28 to 2023-08-01	Normal LCL	0.0606
MW-5	Appendix IV	Mercury	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.000200
MW-5	Appendix IV	Molybdenum	mg/L	17	0%	2020-04-28 to 2023-08-01	Normal LCL	0.0428
MW-5	Appendix IV	Radium-226/228	pCi/L	17	0%	2020-04-28 to 2023-08-01	Normal LCL	1.12
MW-5	Appendix IV	Selenium	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00500
MW-5	Appendix IV	Thallium	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00200
MW-6	Appendix IV	Fluoride	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	1.00
MW-6	Appendix IV	Antimony	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00500
MW-6	Appendix IV	Arsenic	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00200
MW-6	Appendix IV	Barium	mg/L	17	0%	2020-04-28 to 2023-08-01	Normal LCL	0.0458
MW-6	Appendix IV	Beryllium	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00100
MW-6	Appendix IV	Cadmium	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.000500
MW-6	Appendix IV	Chromium	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00500
MW-6	Appendix IV	Cobalt	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00500
MW-6	Appendix IV	Lead	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00300
MW-6	Appendix IV	Lithium	mg/L	17	0%	2020-04-28 to 2023-08-01	Normal LCL	0.0447

MW-10	Appendix IV	Mercury	mg/L	11	91%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.000200
MW-10	Appendix IV	Molybdenum	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-10	Appendix IV	Radium-226/228	pCi/L	11	0%	2021-06-15 to 2023-08-02	Adjusted Gamma LCL	0.570
MW-10	Appendix IV	Selenium	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-10	Appendix IV	Thallium	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00200
MW-13	Appendix IV	Fluoride	mg/L	11	100%	2022-02-23 to 2023-08-02	Nonparametric LCL around the Median	1.00
MW-13	Appendix IV	Antimony	mg/L	11	100%	2022-02-23 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-13	Appendix IV	Arsenic	mg/L	11	91%	2022-02-23 to 2023-08-02	Nonparametric LCL around the Median	0.00200
MW-13	Appendix IV	Barium	mg/L	11	0%	2022-02-23 to 2023-08-02	Normal LCL	0.0241
MW-13	Appendix IV	Beryllium	mg/L	11	100%	2022-02-23 to 2023-08-02	Nonparametric LCL around the Median	0.00100
MW-13	Appendix IV	Cadmium	mg/L	11	100%	2022-02-23 to 2023-08-02	Nonparametric LCL around the Median	0.000500
MW-13	Appendix IV	Chromium	mg/L	11	100%	2022-02-23 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-13	Appendix IV	Cobalt	mg/L	11	100%	2022-02-23 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-13	Appendix IV	Lead	mg/L	11	100%	2022-02-23 to 2023-08-02	Nonparametric LCL around the Median	0.00300
MW-13	Appendix IV	Lithium	mg/L	11	100%	2022-02-23 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-13	Appendix IV	Mercury	mg/L	11	100%	2022-02-23 to 2023-08-02	Nonparametric LCL around the Median	0.000200
MW-13	Appendix IV	Molybdenum	mg/L	11	100%	2022-02-23 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-13	Appendix IV	Radium-226/228	pCi/L	11	0%	2022-02-23 to 2023-08-02	Adjusted Gamma LCL	0.508
MW-13	Appendix IV	Selenium	mg/L	11	100%	2022-02-23 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-13	Appendix IV	Thallium	mg/L	11	100%	2022-02-23 to 2023-08-02	Nonparametric LCL around the Median	0.00200
MW-14	Appendix IV	Fluoride	mg/L	8	100%	2023-01-12 to 2023-09-15	Nonparametric LCL around the Median	1.00
MW-14	Appendix IV	Antimony	mg/L	8	100%	2023-01-12 to 2023-09-15	Nonparametric LCL around the Median	0.00500
MW-14	Appendix IV	Arsenic	mg/L	8	0%	2023-01-12 to 2023-09-15	Normal LCL	0.00512
MW-14	Appendix IV	Barium	mg/L	8	0%	2023-01-12 to 2023-09-15	Nonparametric LCL around the Median	0.120
MW-14	Appendix IV	Beryllium	mg/L	8	100%	2023-01-12 to 2023-09-15	Nonparametric LCL around the Median	0.00100
MW-14	Appendix IV	Cadmium	mg/L	8	100%	2023-01-12 to 2023-09-15	Nonparametric LCL around the Median	0.000500
MW-14	Appendix IV	Chromium	mg/L	8	100%	2023-01-12 to 2023-09-15	Nonparametric LCL around the Median	0.00500
MW-14	Appendix IV	Cobalt	mg/L	8	100%	2023-01-12 to 2023-09-15	Nonparametric LCL around the Median	0.00500
MW-14	Appendix IV	Lead	mg/L	8	100%	2023-01-12 to 2023-09-15	Nonparametric LCL around the Median	0.00300
MW-14	Appendix IV	Lithium	mg/L	8	0%	2023-01-12 to 2023-09-15	Normal LCL	0.109
MW-14	Appendix IV	Mercury	mg/L	8	100%	2023-01-12 to 2023-09-15	Nonparametric LCL around the Median	0.000200
MW-14	Appendix IV	Molybdenum	mg/L	8	0%	2023-01-12 to 2023-09-15	Normal LCL	0.0130
MW-14	Appendix IV	Radium-226/228	pCi/L	8	0%	2023-01-12 to 2023-09-15	Normal LCL	0.594
MW-14	Appendix IV	Selenium	mg/L	8	75%	2023-01-12 to 2023-09-15	Nonparametric LCL around the Median	0.00500
MW-14	Appendix IV	Thallium	mg/L	8	100%	2023-01-12 to 2023-09-15	Nonparametric LCL around the Median	0.00200
MW-15	Appendix IV	Fluoride	mg/L	8	100%	0023-02-17 to 2023-09-15	Nonparametric LCL around the Median	1.00
MW-15	Appendix IV	Antimony	mg/L	8	100%	0023-02-17 to 2023-09-15	Nonparametric LCL around the Median	0.00500
MW-15	Appendix IV	Arsenic	mg/L	8	100%	0023-02-17 to 2023-09-15	Nonparametric LCL around the Median	0.00200
MW-15	Appendix IV	Barium	mg/L	8	0%	0023-02-17 to 2023-09-15	Normal LCL	0.0494
MW-15	Appendix IV	Beryllium	mg/L	8	100%	0023-02-17 to 2023-09-15	Nonparametric LCL around the Median	0.00100
MW-15	Appendix IV	Cadmium	mg/L	8	100%	0023-02-17 to 2023-09-15	Nonparametric LCL around the Median	0.000500
MW-15	Appendix IV	Chromium	mg/L	8	100%	0023-02-17 to 2023-09-15	Nonparametric LCL around the Median	0.00500
MW-15	Appendix IV	Cobalt	mg/L	8	100%	0023-02-17 to 2023-09-15	Nonparametric LCL around the Median	0.00500
MW-15	Appendix IV	Lead	mg/L	8	100%	0023-02-17 to 2023-09-15	Nonparametric LCL around the Median	0.00300
MW-15	Appendix IV	Lithium	mg/L	8	88%	0023-02-17 to 2023-09-15	Nonparametric LCL around the Median	0.00500
MW-15	Appendix IV	Mercury	mg/L	8	100%	0023-02-17 to 2023-09-15	Nonparametric LCL around the Median	0.000200
MW-15	Appendix IV	Molybdenum	mg/L	8	100%	0023-02-17 to 2023-09-15	Nonparametric LCL around the Median	0.00500
MW-15	Appendix IV	Radium-226/228	pCi/L	8	0%	0023-02-17 to 2023-09-15	Normal LCL	0.765
MW-15	Appendix IV	Selenium	mg/L	8	25%	0023-02-17 to 2023-09-15	Normal MLE LCL	0.00370
MW-15	Appendix IV	Thallium	mg/L	8	100%	0023-02-17 to 2023-09-15	Nonparametric LCL around the Median	0.00200
MW-16A	Appendix IV	Fluoride	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	1.00
MW-16A	Appendix IV	Antimony	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16A	Appendix IV	Arsenic	mg/L	9	0%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00300
MW-16A	Appendix IV	Barium	mg/L	9	0%	2023-02-02 to 2023-11-21	Normal LCL	0.128
MW-16A	Appendix IV	Beryllium	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00100
MW-16A	Appendix IV	Cadmium	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.000500
MW-16A	Appendix IV	Chromium	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16A	Appendix IV	Cobalt	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16A	Appendix IV	Lead	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00300
MW-16A	Appendix IV	Lithium	mg/L	9	89%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500

MW-16A	Appendix IV	Mercury	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.000200
MW-16A	Appendix IV	Molybdenum	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16A	Appendix IV	Radium-226/228	pCi/L	9	0%	2023-02-02 to 2023-11-21	Normal LCL	0.865
MW-16A	Appendix IV	Selenium	mg/L	9	89%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16A	Appendix IV	Thallium	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00200
MW-16B	Appendix IV	Fluoride	mg/L	9	89%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	1.00
MW-16B	Appendix IV	Antimony	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16B	Appendix IV	Arsenic	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00200
MW-16B	Appendix IV	Barium	mg/L	9	0%	2023-02-02 to 2023-11-21	Normal LCL	0.0850
MW-16B	Appendix IV	Beryllium	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00100
MW-16B	Appendix IV	Cadmium	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.000500
MW-16B	Appendix IV	Chromium	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16B	Appendix IV	Cobalt	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16B	Appendix IV	Lead	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00300
MW-16B	Appendix IV	Lithium	mg/L	9	0%	2023-02-02 to 2023-11-21	Normal LCL	0.0206
MW-16B	Appendix IV	Mercury	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.000200
MW-16B	Appendix IV	Molybdenum	mg/L	9	0%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00600
MW-16B	Appendix IV	Radium-226/228	pCi/L	9	0%	2023-02-02 to 2023-11-21	Adjusted Gamma LCL	1.81
MW-16B	Appendix IV	Selenium	mg/L	9	89%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16B	Appendix IV	Thallium	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00200
MW-7C	Appendix IV	Fluoride	mg/L	11	100%	2022-03-10 to 2023-08-02	Nonparametric LCL around the Median	1.00
MW-7C	Appendix IV	Antimony	mg/L	11	100%	2022-03-10 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-7C	Appendix IV	Arsenic	mg/L	11	0%	2022-03-10 to 2023-08-02	Nonparametric LCL around the Median	0.00600
MW-7C	Appendix IV	Barium	mg/L	11	0%	2022-03-10 to 2023-08-02	Normal LCL	0.0424
MW-7C	Appendix IV	Beryllium	mg/L	11	100%	2022-03-10 to 2023-08-02	Nonparametric LCL around the Median	0.00100
MW-7C	Appendix IV	Cadmium	mg/L	11	73%	2022-03-10 to 2023-08-02	Nonparametric LCL around the Median	0.000500
MW-7C	Appendix IV	Chromium	mg/L	11	100%	2022-03-10 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-7C	Appendix IV	Cobalt	mg/L	11	100%	2022-03-10 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-7C	Appendix IV	Lead	mg/L	11	100%	2022-03-10 to 2023-08-02	Nonparametric LCL around the Median	0.00300
MW-7C	Appendix IV	Lithium	mg/L	11	0%	2022-03-10 to 2023-08-02	Normal LCL	0.126
MW-7C	Appendix IV	Mercury	mg/L	11	100%	2022-03-10 to 2023-08-02	Nonparametric LCL around the Median	0.000200
MW-7C	Appendix IV	Molybdenum	mg/L	11	0%	2022-03-10 to 2023-08-02	Normal LCL	0.391
MW-7C	Appendix IV	Radium-226/228	pCi/L	11	0%	2022-03-10 to 2023-08-02	Normal LCL	1.58
MW-7C	Appendix IV	Selenium	mg/L	11	100%	2022-03-10 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-7C	Appendix IV	Thallium	mg/L	11	100%	2022-03-10 to 2023-08-02	Nonparametric LCL around the Median	0.00200



Table 1: Summary Statistics, Non-Detects Included

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit ^a	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
02_2_04	MW-2	Appendix IV	Fluoride	mg/L	17	17	100%	2020-04-28 to 2023-08-01		Nonparametric	1.00	1.00	1.00	1.00	0	0	0	NA	NA
02_2_08	MW-2	Appendix IV	Antimony	mg/L	17	17	100%	2020-04-28 to 2023-08-01		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
02_2_09	MW-2	Appendix IV	Arsenic	mg/L	17	13	76%	2020-04-28 to 2023-08-01		Nonparametric	0.00218	0.00200	0.00200	0.00400	0.000529	0.243	0	3.14	9.80
02_2_10	MW-2	Appendix IV	Barium	mg/L	17	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	0.0409	0.0410	0.0340	0.0480	0.00346	0.0847	0.00296	-0.000496	0.312
02_2_11	MW-2	Appendix IV	Beryllium	mg/L	17	17	100%	2020-04-28 to 2023-08-01		Nonparametric	0.00100	0.00100	0.00100	0.00100	0	0	0	NA	NA
02_2_12	MW-2	Appendix IV	Cadmium	mg/L	17	17	100%	2020-04-28 to 2023-08-01		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
02_2_13	MW-2	Appendix IV	Chromium	mg/L	17	17	100%	2020-04-28 to 2023-08-01		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
02_2_14	MW-2	Appendix IV	Cobalt	mg/L	17	17	100%	2020-04-28 to 2023-08-01		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
02_2_15	MW-2	Appendix IV	Lead	mg/L	17	17	100%	2020-04-28 to 2023-08-01		Nonparametric	0.00300	0.00300	0.00300	0.00300	0	0	0	NA	NA
02_2_16	MW-2	Appendix IV	Lithium	mg/L	17	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	0.0583	0.0580	0.0470	0.0700	0.00704	0.121	0.0104	0.0366	-1.20
02_2_17	MW-2	Appendix IV	Mercury	mg/L	17	17	100%	2020-04-28 to 2023-08-01		Nonparametric	0.000200	0.000200	0.000200	0.000200	0	0	0	NA	NA
02_2_18	MW-2	Appendix IV	Molybdenum	mg/L	17	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	0.0111	0.0110	0.00700	0.0150	0.00203	0.182	0.00148	-0.181	0.216
02_2_20	MW-2	Appendix IV	Radium-226/228	pCi/L	17	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	0.828	0.745	0.138	2.12	0.610	0.737	0.659	0.759	-0.383
02_2_22	MW-2	Appendix IV	Selenium	mg/L	17	17	100%	2020-04-28 to 2023-08-01		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
02_2_23	MW-2	Appendix IV	Thallium	mg/L	17	17	100%	2020-04-28 to 2023-08-01		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
03_2_04	MW-3	Appendix IV	Fluoride	mg/L	6	6	100%	2021-05-04 to 2023-08-01		Nonparametric	1.00	1.00	1.00	1.00	0	0	0	NA	NA
03_2_08	MW-3	Appendix IV	Antimony	mg/L	6	6	100%	2021-05-04 to 2023-08-01		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
03_2_09	MW-3	Appendix IV	Arsenic	mg/L	6	0	0%	2021-05-04 to 2023-08-01		Nonparametric	0.00317	0.00300	0.00300	0.00400	0.000408	0.129	0	2.45	6.00
03_2_10	MW-3	Appendix IV	Barium	mg/L	6	0	0%	2021-05-04 to 2023-08-01		Nonparametric	0.0198	0.0195	0.0190	0.0210	0.000983	0.0496	0.000741	0.456	-2.39
03_2_11	MW-3	Appendix IV	Beryllium	mg/L	6	6	100%	2021-05-04 to 2023-08-01		Nonparametric	0.00100	0.00100	0.00100	0.00100	0	0	0	NA	NA
03_2_12	MW-3	Appendix IV	Cadmium	mg/L	6	6	100%	2021-05-04 to 2023-08-01		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
03_2_13	MW-3	Appendix IV	Chromium	mg/L	6	6	100%	2021-05-04 to 2023-08-01		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
03_2_14	MW-3	Appendix IV	Cobalt	mg/L	6	6	100%	2021-05-04 to 2023-08-01		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
03_2_15	MW-3	Appendix IV	Lead	mg/L	6	6	100%	2021-05-04 to 2023-08-01		Nonparametric	0.00300	0.00300	0.00300	0.00300	0	0	0	NA	NA
03_2_16	MW-3	Appendix IV	Lithium	mg/L	6	0	0%	2021-05-04 to 2023-08-01	Gamma; Lognormal; Normal	Nonparametric	0.0835	0.0840	0.0770	0.0910	0.00517	0.0619	0.00519	0.183	-0.906
03_2_17	MW-3	Appendix IV	Mercury	mg/L	6	6	100%	2021-05-04 to 2023-08-01		Nonparametric	0.000200	0.000200	0.000200	0.000200	0	0	0	NA	NA
03_2_18	MW-3	Appendix IV	Molybdenum	mg/L	6	0	0%	2021-05-04 to 2023-08-01	Gamma; Lognormal; Normal	Nonparametric	0.165	0.163	0.153	0.182	0.00952	0.0577	0.00296	1.17	2.85
03_2_20	MW-3	Appendix IV	Radium-226/228	pCi/L	6	0	0%	2021-05-04 to 2023-08-01	Gamma; Lognormal; Normal	Nonparametric	1.71	1.69	0.412	2.92	0.953	0.556	0.993	-0.0979	-1.55
03_2_22	MW-3	Appendix IV	Selenium	mg/L	6	6	100%	2021-05-04 to 2023-08-01		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
03_2_23	MW-3	Appendix IV	Thallium	mg/L	6	6	100%	2021-05-04 to 2023-08-01		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
05_2_04	MW-5	Appendix IV	Fluoride	mg/L	17	17	100%	2020-04-28 to 2023-08-01		Nonparametric	1.00	1.00	1.00	1.00	0	0	0	NA	NA
05_2_08	MW-5	Appendix IV	Antimony	mg/L	17	17	100%	2020-04-28 to 2023-08-01		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
05_2_09	MW-5	Appendix IV	Arsenic	mg/L	17	12	71%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Nonparametric	0.00253	0.00200	0.00200	0.00700	0.00137	0.543	0	2.79	7.51
05_2_10	MW-5	Appendix IV	Barium	mg/L	17	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	0.0458	0.0430	0.0330	0.0640	0.00804	0.176	0.00593	0.761	0.157
05_2_11	MW-5	Appendix IV	Beryllium	mg/L	17	17	100%	2020-04-28 to 2023-08-01		Nonparametric	0.00100	0.00100	0.00100	0.00100	0	0	0	NA	NA
05_2_12	MW-5	Appendix IV	Cadmium	mg/L	17	17	100%	2020-04-28 to 2023-08-01		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
05_2_13	MW-5	Appendix IV	Chromium	mg/L	17	15	88%	2020-04-28 to 2023-08-01		Nonparametric	0.00541	0.00500	0.00500	0.0100	0.00128	0.236	0	3.38	11.7
05_2_14	MW-5	Appendix IV	Cobalt	mg/L	17	16	94%	2020-04-28 to 2023-08-01		Nonparametric	0.00506	0.00500	0.00500	0.00600	0.000243	0.0479	0	4.12	17.0
05_2_15	MW-5	Appendix IV	Lead	mg/L	17	14	82%	2020-04-28 to 2023-08-01		Nonparametric	0.00376	0.00300	0.00300	0.0140	0.00268	0.712	0	3.92	15.7
05_2_16	MW-5	Appendix IV	Lithium	mg/L	17	0	0%	2020-04-28 to 2023-08-01	Normal	Normal	0.0689	0.0740	0.0160	0.0910	0.0195	0.283	0.0163	-1.30	2.02
05_2_17	MW-5	Appendix IV	Mercury	mg/L	17	17	100%	2020-04-28 to 2023-08-01		Nonparametric	0.000200	0.000200	0.000200	0.000200	0	0	0	NA	NA
05_2_18	MW-5	Appendix IV	Molybdenum	mg/L	17	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	0.0506	0.0510	0.0100	0.0960	0.0186	0.368	0.0178	0.307	2.00

(Table continues on next page)

^a Non-detects are excluded from goodness-of-fit tests.

Table 1: Summary Statistics, Non-Detects Included (continued)

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit ^a	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
05_2_20	MW-5	Appendix IV	Radium-226/228	pCi/L	17	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	1.59	1.36	0.524	4.22	1.09	0.689	0.870	1.49	1.88
05_2_22	MW-5	Appendix IV	Selenium	mg/L	17	17	100%	2020-04-28 to 2023-08-01		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
05_2_23	MW-5	Appendix IV	Thallium	mg/L	17	17	100%	2020-04-28 to 2023-08-01		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
06_2_04	MW-6	Appendix IV	Fluoride	mg/L	17	17	100%	2020-04-28 to 2023-08-01		Nonparametric	1.00	1.00	1.00	1.00	0	0	0	NA	NA
06_2_08	MW-6	Appendix IV	Antimony	mg/L	17	17	100%	2020-04-28 to 2023-08-01		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
06_2_09	MW-6	Appendix IV	Arsenic	mg/L	17	17	100%	2020-04-28 to 2023-08-01		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
06_2_10	MW-6	Appendix IV	Barium	mg/L	17	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	0.0482	0.0500	0.0380	0.0570	0.00567	0.118	0.00741	-0.135	-1.29
06_2_11	MW-6	Appendix IV	Beryllium	mg/L	17	17	100%	2020-04-28 to 2023-08-01		Nonparametric	0.00100	0.00100	0.00100	0.00100	0	0	0	NA	NA
06_2_12	MW-6	Appendix IV	Cadmium	mg/L	17	17	100%	2020-04-28 to 2023-08-01		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
06_2_13	MW-6	Appendix IV	Chromium	mg/L	17	17	100%	2020-04-28 to 2023-08-01		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
06_2_14	MW-6	Appendix IV	Cobalt	mg/L	17	17	100%	2020-04-28 to 2023-08-01		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
06_2_15	MW-6	Appendix IV	Lead	mg/L	17	17	100%	2020-04-28 to 2023-08-01		Nonparametric	0.00300	0.00300	0.00300	0.00300	0	0	0	NA	NA
06_2_16	MW-6	Appendix IV	Lithium	mg/L	17	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	0.0476	0.0480	0.0370	0.0590	0.00695	0.146	0.00741	-0.0509	-0.912
06_2_17	MW-6	Appendix IV	Mercury	mg/L	17	17	100%	2020-04-28 to 2023-08-01		Nonparametric	0.000200	0.000200	0.000200	0.000200	0	0	0	NA	NA
06_2_18	MW-6	Appendix IV	Molybdenum	mg/L	17	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	0.0265	0.0270	0.0160	0.0360	0.00508	0.192	0.00444	-0.110	0.0354
06_2_20	MW-6	Appendix IV	Radium-226/228	pCi/L	17	0	0%	2020-04-28 to 2023-08-01	Normal	Normal	0.970	0.663	0	2.61	0.691	0.713	0.421	0.940	0.346
06_2_22	MW-6	Appendix IV	Selenium	mg/L	17	17	100%	2020-04-28 to 2023-08-01		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
06_2_23	MW-6	Appendix IV	Thallium	mg/L	17	17	100%	2020-04-28 to 2023-08-01		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
07_2_04	MW-7	Appendix IV	Fluoride	mg/L	11	10	91%	2021-06-15 to 2023-08-02		Nonparametric	0.940	1.00	0.338	1.00	0.200	0.212	0	-3.32	11.0
07_2_08	MW-7	Appendix IV	Antimony	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
07_2_09	MW-7	Appendix IV	Arsenic	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Nonparametric	Nonparametric	0.00555	0.00600	0.00400	0.00700	0.000934	0.168	0	-0.610	-0.239
07_2_10	MW-7	Appendix IV	Barium	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	0.0538	0.0540	0.0470	0.0620	0.00460	0.0855	0.00444	0.368	-0.493
07_2_11	MW-7	Appendix IV	Beryllium	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00100	0.00100	0.00100	0.00100	0	0	0	NA	NA
07_2_12	MW-7	Appendix IV	Cadmium	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
07_2_13	MW-7	Appendix IV	Chromium	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
07_2_14	MW-7	Appendix IV	Cobalt	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
07_2_15	MW-7	Appendix IV	Lead	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00300	0.00300	0.00300	0.00300	0	0	0	NA	NA
07_2_16	MW-7	Appendix IV	Lithium	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	0.0917	0.0960	0.0630	0.112	0.0137	0.149	0.00593	-0.959	0.964
07_2_17	MW-7	Appendix IV	Mercury	mg/L	11	10	91%	2021-06-15 to 2023-08-02		Nonparametric	0.000200	0.000200	0.000200	0.000200	0	0	0	NA	NA
07_2_18	MW-7	Appendix IV	Molybdenum	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Nonparametric	Nonparametric	0.246	0.276	0.146	0.296	0.0582	0.236	0.0252	-1.07	-0.705
07_2_20	MW-7	Appendix IV	Radium-226/228	pCi/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	2.48	2.11	0.676	5.44	1.54	0.621	1.20	0.896	0.0692
07_2_22	MW-7	Appendix IV	Selenium	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
07_2_23	MW-7	Appendix IV	Thallium	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
08_2_04	MW-8	Appendix IV	Fluoride	mg/L	11	10	91%	2021-06-15 to 2023-08-02		Nonparametric	0.914	1.00	0.0587	1.00	0.284	0.310	0	-3.32	11.0
08_2_08	MW-8	Appendix IV	Antimony	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
08_2_09	MW-8	Appendix IV	Arsenic	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
08_2_10	MW-8	Appendix IV	Barium	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	0.0219	0.0210	0.0170	0.0280	0.00348	0.159	0.00296	0.459	-0.625
08_2_11	MW-8	Appendix IV	Beryllium	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00100	0.00100	0.00100	0.00100	0	0	0	NA	NA
08_2_12	MW-8	Appendix IV	Cadmium	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
08_2_13	MW-8	Appendix IV	Chromium	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
08_2_14	MW-8	Appendix IV	Cobalt	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
08_2_15	MW-8	Appendix IV	Lead	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00300	0.00300	0.00300	0.00300	0	0	0	NA	NA

(Table continues on next page)

^a Non-detects are excluded from goodness-of-fit tests.



Table 1: Summary Statistics, Non-Detects Included (continued)

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit ^a	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
08_2_16	MW-8	Appendix IV	Lithium	mg/L	11	5	45%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	0.00718	0.00600	0.00500	0.0130	0.00271	0.378	0.00148	1.09	0.385
08_2_17	MW-8	Appendix IV	Mercury	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.000200	0.000200	0.000200	0.000200	0	0	0	NA	NA
08_2_18	MW-8	Appendix IV	Molybdenum	mg/L	11	9	82%	2021-06-15 to 2023-08-02		Nonparametric	0.00636	0.00500	0.00500	0.0130	0.00284	0.446	0	1.99	2.70
08_2_20	MW-8	Appendix IV	Radium-226/228	pCi/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Gamma	2.14	1.93	0.118	6.21	1.95	0.913	1.94	0.987	0.301
08_2_22	MW-8	Appendix IV	Selenium	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
08_2_23	MW-8	Appendix IV	Thallium	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
09_2_04	MW-9	Appendix IV	Fluoride	mg/L	11	10	91%	2021-06-15 to 2023-08-02		Nonparametric	0.912	1.00	0.0330	1.00	0.292	0.320	0	-3.32	11.0
09_2_08	MW-9	Appendix IV	Antimony	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
09_2_09	MW-9	Appendix IV	Arsenic	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
09_2_10	MW-9	Appendix IV	Barium	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	0.0141	0.0140	0.0130	0.0160	0.00104	0.0741	0.00148	0.431	-0.932
09_2_11	MW-9	Appendix IV	Beryllium	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00100	0.00100	0.00100	0.00100	0	0	0	NA	NA
09_2_12	MW-9	Appendix IV	Cadmium	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
09_2_13	MW-9	Appendix IV	Chromium	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
09_2_14	MW-9	Appendix IV	Cobalt	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
09_2_15	MW-9	Appendix IV	Lead	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00300	0.00300	0.00300	0.00300	0	0	0	NA	NA
09_2_16	MW-9	Appendix IV	Lithium	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00545	0.00500	0.00500	0.0100	0.00151	0.276	0	3.32	11.0
09_2_17	MW-9	Appendix IV	Mercury	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.000200	0.000200	0.000200	0.000200	0	0	0	NA	NA
09_2_18	MW-9	Appendix IV	Molybdenum	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
09_2_20	MW-9	Appendix IV	Radium-226/228	pCi/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	1.14	0.844	0.177	2.37	0.868	0.763	0.856	0.390	-1.74
09_2_22	MW-9	Appendix IV	Selenium	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
09_2_23	MW-9	Appendix IV	Thallium	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
10_2_04	MW-10	Appendix IV	Fluoride	mg/L	11	10	91%	2021-06-15 to 2023-08-02		Nonparametric	0.915	1.00	0.0660	1.00	0.282	0.308	0	-3.32	11.0
10_2_08	MW-10	Appendix IV	Antimony	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
10_2_09	MW-10	Appendix IV	Arsenic	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
10_2_10	MW-10	Appendix IV	Barium	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	0.0407	0.0410	0.0360	0.0470	0.00352	0.0865	0.00444	0.276	-0.903
10_2_11	MW-10	Appendix IV	Beryllium	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00100	0.00100	0.00100	0.00100	0	0	0	NA	NA
10_2_12	MW-10	Appendix IV	Cadmium	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
10_2_13	MW-10	Appendix IV	Chromium	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
10_2_14	MW-10	Appendix IV	Cobalt	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
10_2_15	MW-10	Appendix IV	Lead	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00300	0.00300	0.00300	0.00300	0	0	0	NA	NA
10_2_16	MW-10	Appendix IV	Lithium	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00545	0.00500	0.00500	0.0100	0.00151	0.276	0	3.32	11.0
10_2_17	MW-10	Appendix IV	Mercury	mg/L	11	10	91%	2021-06-15 to 2023-08-02		Nonparametric	0.000200	0.000200	0.000200	0.000200	0	0	0	NA	NA
10_2_18	MW-10	Appendix IV	Molybdenum	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
10_2_20	MW-10	Appendix IV	Radium-226/228	pCi/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal	Gamma	0.832	0.605	0.262	2.39	0.648	0.780	0.293	1.83	2.84
10_2_22	MW-10	Appendix IV	Selenium	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
10_2_23	MW-10	Appendix IV	Thallium	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
13_2_04	MW-13	Appendix IV	Fluoride	mg/L	11	11	100%	2022-02-23 to 2023-08-02		Nonparametric	1.00	1.00	1.00	1.00	0	0	0	NA	NA
13_2_08	MW-13	Appendix IV	Antimony	mg/L	11	11	100%	2022-02-23 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
13_2_09	MW-13	Appendix IV	Arsenic	mg/L	11	10	91%	2022-02-23 to 2023-08-02		Nonparametric	0.00218	0.00200	0.00200	0.00400	0.000603	0.276	0	3.32	11.0
13_2_10	MW-13	Appendix IV	Barium	mg/L	11	0	0%	2022-02-23 to 2023-08-02	Gamma; Lognormal; Normal	Normal	0.0265	0.0270	0.0190	0.0340	0.00437	0.165	0.00296	-0.332	0.0765
13_2_11	MW-13	Appendix IV	Beryllium	mg/L	11	11	100%	2022-02-23 to 2023-08-02		Nonparametric	0.00100	0.00100	0.00100	0.00100	0	0	0	NA	NA
13_2_12	MW-13	Appendix IV	Cadmium	mg/L	11	11	100%	2022-02-23 to 2023-08-02		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA

(Table continues on next page)

^a Non-detects are excluded from goodness-of-fit tests.



Table 1: Summary Statistics, Non-Detects Included (continued)

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit ^a	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
13_2_13	MW-13	Appendix IV	Chromium	mg/L	11	11	100%	2022-02-23 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
13_2_14	MW-13	Appendix IV	Cobalt	mg/L	11	11	100%	2022-02-23 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
13_2_15	MW-13	Appendix IV	Lead	mg/L	11	11	100%	2022-02-23 to 2023-08-02		Nonparametric	0.00300	0.00300	0.00300	0.00300	0	0	0	NA	NA
13_2_16	MW-13	Appendix IV	Lithium	mg/L	11	11	100%	2022-02-23 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
13_2_17	MW-13	Appendix IV	Mercury	mg/L	11	11	100%	2022-02-23 to 2023-08-02		Nonparametric	0.000200	0.000200	0.000200	0.000200	0	0	0	NA	NA
13_2_18	MW-13	Appendix IV	Molybdenum	mg/L	11	11	100%	2022-02-23 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
13_2_20	MW-13	Appendix IV	Radium-226/228	pCi/L	11	0	0%	2022-02-23 to 2023-08-02	Gamma; Lognormal	Gamma	0.853	0.410	0.0699	2.31	0.801	0.939	0.404	0.977	-0.598
13_2_22	MW-13	Appendix IV	Selenium	mg/L	11	11	100%	2022-02-23 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
13_2_23	MW-13	Appendix IV	Thallium	mg/L	11	11	100%	2022-02-23 to 2023-08-02		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
14_2_04	MW-14	Appendix IV	Fluoride	mg/L	8	8	100%	2023-01-12 to 2023-09-15		Nonparametric	1.00	1.00	1.00	1.00	0	0	0	NA	NA
14_2_08	MW-14	Appendix IV	Antimony	mg/L	8	8	100%	2023-01-12 to 2023-09-15		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
14_2_09	MW-14	Appendix IV	Arsenic	mg/L	8	0	0%	2023-01-12 to 2023-09-15	Gamma; Lognormal; Normal	Normal	0.00600	0.00600	0.00400	0.00800	0.00131	0.218	0.00148	0	-0.700
14_2_10	MW-14	Appendix IV	Barium	mg/L	8	0	0%	2023-01-12 to 2023-09-15	Nonparametric	Nonparametric	0.132	0.127	0.119	0.177	0.0189	0.143	0.00889	2.38	6.11
14_2_11	MW-14	Appendix IV	Beryllium	mg/L	8	8	100%	2023-01-12 to 2023-09-15		Nonparametric	0.00100	0.00100	0.00100	0.00100	0	0	0	NA	NA
14_2_12	MW-14	Appendix IV	Cadmium	mg/L	8	8	100%	2023-01-12 to 2023-09-15		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
14_2_13	MW-14	Appendix IV	Chromium	mg/L	8	8	100%	2023-01-12 to 2023-09-15		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
14_2_14	MW-14	Appendix IV	Cobalt	mg/L	8	8	100%	2023-01-12 to 2023-09-15		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
14_2_15	MW-14	Appendix IV	Lead	mg/L	8	8	100%	2023-01-12 to 2023-09-15		Nonparametric	0.00300	0.00300	0.00300	0.00300	0	0	0	NA	NA
14_2_16	MW-14	Appendix IV	Lithium	mg/L	8	0	0%	2023-01-12 to 2023-09-15	Gamma; Lognormal; Normal	Normal	0.113	0.111	0.106	0.125	0.00679	0.0600	0.00370	1.09	-0.116
14_2_17	MW-14	Appendix IV	Mercury	mg/L	8	8	100%	2023-01-12 to 2023-09-15		Nonparametric	0.000200	0.000200	0.000200	0.000200	0	0	0	NA	NA
14_2_18	MW-14	Appendix IV	Molybdenum	mg/L	8	0	0%	2023-01-12 to 2023-09-15	Gamma; Lognormal; Normal	Normal	0.0139	0.0140	0.0120	0.0160	0.00125	0.0898	0.00148	0.304	0.146
14_2_20	MW-14	Appendix IV	Radium-226/228	pCi/L	8	0	0%	2023-01-12 to 2023-09-15	Gamma; Lognormal; Normal	Normal	1.45	0.945	0.464	4.44	1.28	0.883	0.561	2.25	5.42
14_2_22	MW-14	Appendix IV	Selenium	mg/L	8	6	75%	2023-01-12 to 2023-09-15		Nonparametric	0.00650	0.00500	0.00500	0.0130	0.00298	0.458	0	1.95	3.20
14_2_23	MW-14	Appendix IV	Thallium	mg/L	8	8	100%	2023-01-12 to 2023-09-15		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
15_2_04	MW-15	Appendix IV	Fluoride	mg/L	8	8	100%	0023-02-17 to 2023-09-15		Nonparametric	1.00	1.00	1.00	1.00	0	0	0	NA	NA
15_2_08	MW-15	Appendix IV	Antimony	mg/L	8	8	100%	0023-02-17 to 2023-09-15		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
15_2_09	MW-15	Appendix IV	Arsenic	mg/L	8	8	100%	0023-02-17 to 2023-09-15		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
15_2_10	MW-15	Appendix IV	Barium	mg/L	8	0	0%	0023-02-17 to 2023-09-15	Gamma; Lognormal; Normal	Normal	0.0578	0.0555	0.0420	0.0770	0.0125	0.216	0.0148	0.302	-1.46
15_2_11	MW-15	Appendix IV	Beryllium	mg/L	8	8	100%	0023-02-17 to 2023-09-15		Nonparametric	0.00100	0.00100	0.00100	0.00100	0	0	0	NA	NA
15_2_12	MW-15	Appendix IV	Cadmium	mg/L	8	8	100%	0023-02-17 to 2023-09-15		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
15_2_13	MW-15	Appendix IV	Chromium	mg/L	8	8	100%	0023-02-17 to 2023-09-15		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
15_2_14	MW-15	Appendix IV	Cobalt	mg/L	8	8	100%	0023-02-17 to 2023-09-15		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
15_2_15	MW-15	Appendix IV	Lead	mg/L	8	8	100%	0023-02-17 to 2023-09-15		Nonparametric	0.00300	0.00300	0.00300	0.00300	0	0	0	NA	NA
15_2_16	MW-15	Appendix IV	Lithium	mg/L	8	7	88%	0023-02-17 to 2023-09-15		Nonparametric	0.00613	0.00500	0.00500	0.0140	0.00318	0.520	0	2.83	8.00
15_2_17	MW-15	Appendix IV	Mercury	mg/L	8	8	100%	0023-02-17 to 2023-09-15		Nonparametric	0.000200	0.000200	0.000200	0.000200	0	0	0	NA	NA
15_2_18	MW-15	Appendix IV	Molybdenum	mg/L	8	8	100%	0023-02-17 to 2023-09-15		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
15_2_20	MW-15	Appendix IV	Radium-226/228	pCi/L	8	0	0%	0023-02-17 to 2023-09-15	Gamma; Lognormal; Normal	Normal	1.23	1.05	0.334	2.06	0.688	0.561	0.916	0.137	-1.88
15_2_22	MW-15	Appendix IV	Selenium	mg/L	8	2	25%	0023-02-17 to 2023-09-15	Gamma; Lognormal; Normal	Normal	0.0151	0.0105	0.00500	0.0340	0.0107	0.705	0.00815	0.898	-0.499
15_2_23	MW-15	Appendix IV	Thallium	mg/L	8	8	100%	0023-02-17 to 2023-09-15		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
16A_2_04	MW-16A	Appendix IV	Fluoride	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	1.11	1.00	1.00	2.00	0.333	0.300	0	3.00	9.00
16A_2_08	MW-16A	Appendix IV	Antimony	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
16A_2_09	MW-16A	Appendix IV	Arsenic	mg/L	9	0	0%	2023-02-02 to 2023-11-21		Nonparametric	0.00322	0.00300	0.00200	0.00400	0.000667	0.207	0	-0.254	-0.0402

(Table continues on next page)

^a Non-detects are excluded from goodness-of-fit tests.

Table 1: Summary Statistics, Non-Detects Included (continued)

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit ^a	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
16A_2_10	MW-16A	Appendix IV	Barium	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	0.144	0.136	0.108	0.178	0.0259	0.180	0.0356	0.0954	-1.61
16A_2_11	MW-16A	Appendix IV	Beryllium	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.00100	0.00100	0.00100	0.00100	0	0	0	NA	NA
16A_2_12	MW-16A	Appendix IV	Cadmium	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
16A_2_13	MW-16A	Appendix IV	Chromium	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
16A_2_14	MW-16A	Appendix IV	Cobalt	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
16A_2_15	MW-16A	Appendix IV	Lead	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.00300	0.00300	0.00300	0.00300	0	0	0	NA	NA
16A_2_16	MW-16A	Appendix IV	Lithium	mg/L	9	8	89%	2023-02-02 to 2023-11-21		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
16A_2_17	MW-16A	Appendix IV	Mercury	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.000200	0.000200	0.000200	0.000200	0	0	0	NA	NA
16A_2_18	MW-16A	Appendix IV	Molybdenum	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
16A_2_20	MW-16A	Appendix IV	Radium-226/228	pCi/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	2.22	1.21	0.562	7.46	2.19	0.986	0.960	1.98	4.39
16A_2_22	MW-16A	Appendix IV	Selenium	mg/L	9	8	89%	2023-02-02 to 2023-11-21		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
16A_2_23	MW-16A	Appendix IV	Thallium	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
16B_2_04	MW-16B	Appendix IV	Fluoride	mg/L	9	8	89%	2023-02-02 to 2023-11-21		Nonparametric	0.923	1.00	0.310	1.00	0.230	0.249	0	-3.00	9.00
16B_2_08	MW-16B	Appendix IV	Antimony	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
16B_2_09	MW-16B	Appendix IV	Arsenic	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
16B_2_10	MW-16B	Appendix IV	Barium	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	0.0869	0.0860	0.0820	0.0910	0.00298	0.0343	0.00444	-0.118	-1.06
16B_2_11	MW-16B	Appendix IV	Beryllium	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.00100	0.00100	0.00100	0.00100	0	0	0	NA	NA
16B_2_12	MW-16B	Appendix IV	Cadmium	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
16B_2_13	MW-16B	Appendix IV	Chromium	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
16B_2_14	MW-16B	Appendix IV	Cobalt	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
16B_2_15	MW-16B	Appendix IV	Lead	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.00300	0.00300	0.00300	0.00300	0	0	0	NA	NA
16B_2_16	MW-16B	Appendix IV	Lithium	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	0.0214	0.0220	0.0190	0.0230	0.00133	0.0622	0.00148	-0.661	-0.153
16B_2_17	MW-16B	Appendix IV	Mercury	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.000200	0.000200	0.000200	0.000200	0	0	0	NA	NA
16B_2_18	MW-16B	Appendix IV	Molybdenum	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Nonparametric	Nonparametric	0.00622	0.00600	0.00500	0.00800	0.000833	0.134	0	1.17	2.43
16B_2_20	MW-16B	Appendix IV	Radium-226/228	pCi/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal	Gamma	2.64	1.97	1.04	6.43	1.66	0.628	0.637	1.81	3.26
16B_2_22	MW-16B	Appendix IV	Selenium	mg/L	9	8	89%	2023-02-02 to 2023-11-21		Nonparametric	0.00511	0.00500	0.00500	0.00600	0.000333	0.0652	0	3.00	9.0
16B_2_23	MW-16B	Appendix IV	Thallium	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
7C_2_04	MW-7C	Appendix IV	Fluoride	mg/L	11	11	100%	2022-03-10 to 2023-08-02		Nonparametric	1.00	1.00	1.00	1.00	0	0	0	NA	NA
7C_2_08	MW-7C	Appendix IV	Antimony	mg/L	11	11	100%	2022-03-10 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
7C_2_09	MW-7C	Appendix IV	Arsenic	mg/L	11	0	0%	2022-03-10 to 2023-08-02		Nonparametric	0.00627	0.00600	0.00500	0.00700	0.000647	0.103	0	-0.291	-0.208
7C_2_10	MW-7C	Appendix IV	Barium	mg/L	11	0	0%	2022-03-10 to 2023-08-02	Gamma; Lognormal; Normal	Normal	0.0436	0.0440	0.0410	0.0470	0.00220	0.0505	0.00296	0.0856	-1.47
7C_2_11	MW-7C	Appendix IV	Beryllium	mg/L	11	11	100%	2022-03-10 to 2023-08-02		Nonparametric	0.00100	0.00100	0.00100	0.00100	0	0	0	NA	NA
7C_2_12	MW-7C	Appendix IV	Cadmium	mg/L	11	8	73%	2022-03-10 to 2023-08-02		Nonparametric	0.000582	0.000500	0.000500	0.000900	0.000147	0.253	0	1.53	0.952
7C_2_13	MW-7C	Appendix IV	Chromium	mg/L	11	11	100%	2022-03-10 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
7C_2_14	MW-7C	Appendix IV	Cobalt	mg/L	11	11	100%	2022-03-10 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
7C_2_15	MW-7C	Appendix IV	Lead	mg/L	11	11	100%	2022-03-10 to 2023-08-02		Nonparametric	0.00300	0.00300	0.00300	0.00300	0	0	0	NA	NA
7C_2_16	MW-7C	Appendix IV	Lithium	mg/L	11	0	0%	2022-03-10 to 2023-08-02	Gamma; Lognormal; Normal	Normal	0.129	0.128	0.121	0.138	0.00515	0.0399	0.00444	0.596	-0.0720
7C_2_17	MW-7C	Appendix IV	Mercury	mg/L	11	11	100%	2022-03-10 to 2023-08-02		Nonparametric	0.000200	0.000200	0.000200	0.000200	0	0	0	NA	NA
7C_2_18	MW-7C	Appendix IV	Molybdenum	mg/L	11	0	0%	2022-03-10 to 2023-08-02	Gamma; Lognormal; Normal	Normal	0.399	0.402	0.377	0.422	0.0147	0.0369	0.0178	-0.163	-1.05
7C_2_20	MW-7C	Appendix IV	Radium-226/228	pCi/L	11	0	0%	2022-03-10 to 2023-08-02	Gamma; Lognormal; Normal	Normal	2.23	1.99	0.773	3.66	1.18	0.529	1.75	-0.00709	-1.96
7C_2_22	MW-7C	Appendix IV	Selenium	mg/L	11	11	100%	2022-03-10 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
7C_2_23	MW-7C	Appendix IV	Thallium	mg/L	11	11	100%	2022-03-10 to 2023-08-02		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA

^a Non-detects are excluded from goodness-of-fit tests.



Table 2: Summary Statistics, Non-Detects Excluded

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
02_2_09	MW-2	Appendix IV	Arsenic	mg/L	17	13	76%	2020-04-28 to 2023-08-01		Nonparametric	0.00275	0.00250	0.00200	0.00400	0.000957	0.348	0.000741	0.855	-1.29
02_2_10	MW-2	Appendix IV	Barium	mg/L	17	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	0.0409	0.0410	0.0340	0.0480	0.00346	0.0847	0.00296	-0.000496	0.312
02_2_16	MW-2	Appendix IV	Lithium	mg/L	17	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	0.0583	0.0580	0.0470	0.0700	0.00704	0.121	0.0104	0.0366	-1.20
02_2_18	MW-2	Appendix IV	Molybdenum	mg/L	17	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	0.0111	0.0110	0.00700	0.0150	0.00203	0.182	0.00148	-0.181	0.216
02_2_20	MW-2	Appendix IV	Radium-226/228	pCi/L	17	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	0.828	0.745	0.138	2.12	0.610	0.737	0.659	0.759	-0.383
03_2_09	MW-3	Appendix IV	Arsenic	mg/L	6	0	0%	2021-05-04 to 2023-08-01		Nonparametric	0.00317	0.00300	0.00300	0.00400	0.000408	0.129	0	2.45	6.00
03_2_10	MW-3	Appendix IV	Barium	mg/L	6	0	0%	2021-05-04 to 2023-08-01		Nonparametric	0.0198	0.0195	0.0190	0.0210	0.000983	0.0496	0.000741	0.456	-2.39
03_2_16	MW-3	Appendix IV	Lithium	mg/L	6	0	0%	2021-05-04 to 2023-08-01	Gamma; Lognormal; Normal	Nonparametric	0.0835	0.0840	0.0770	0.0910	0.00517	0.0619	0.00519	0.183	-0.906
03_2_18	MW-3	Appendix IV	Molybdenum	mg/L	6	0	0%	2021-05-04 to 2023-08-01	Gamma; Lognormal; Normal	Nonparametric	0.165	0.163	0.153	0.182	0.00952	0.0577	0.00296	1.17	2.85
03_2_20	MW-3	Appendix IV	Radium-226/228	pCi/L	6	0	0%	2021-05-04 to 2023-08-01	Gamma; Lognormal; Normal	Nonparametric	1.71	1.69	0.412	2.92	0.953	0.556	0.993	-0.0979	-1.55
05_2_09	MW-5	Appendix IV	Arsenic	mg/L	17	12	71%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Nonparametric	0.00380	0.00300	0.00200	0.00700	0.00217	0.571	0.00148	0.913	-0.738
05_2_10	MW-5	Appendix IV	Barium	mg/L	17	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	0.0458	0.0430	0.0330	0.0640	0.00804	0.176	0.00593	0.761	0.157
05_2_13	MW-5	Appendix IV	Chromium	mg/L	17	15	88%	2020-04-28 to 2023-08-01		Nonparametric	0.00850	0.00850	0.00700	0.0100	0.00212	0.250	0.00222	NA	NA
05_2_14	MW-5	Appendix IV	Cobalt	mg/L	17	16	94%	2020-04-28 to 2023-08-01		Nonparametric	0.00600	0.00600	0.00600	0.00600	NA	NA	0	NA	NA
05_2_15	MW-5	Appendix IV	Lead	mg/L	17	14	82%	2020-04-28 to 2023-08-01		Nonparametric	0.00733	0.00500	0.00300	0.0140	0.00586	0.799	0.00296	1.51	NA
05_2_16	MW-5	Appendix IV	Lithium	mg/L	17	0	0%	2020-04-28 to 2023-08-01	Normal	Normal	0.0689	0.0740	0.0160	0.0910	0.0195	0.283	0.0163	-1.30	2.02
05_2_18	MW-5	Appendix IV	Molybdenum	mg/L	17	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	0.0506	0.0510	0.0100	0.0960	0.0186	0.368	0.0178	0.307	2.00
05_2_20	MW-5	Appendix IV	Radium-226/228	pCi/L	17	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	1.59	1.36	0.524	4.22	1.09	0.689	0.870	1.49	1.88
06_2_10	MW-6	Appendix IV	Barium	mg/L	17	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	0.0482	0.0500	0.0380	0.0570	0.00567	0.118	0.00741	-0.135	-1.29
06_2_16	MW-6	Appendix IV	Lithium	mg/L	17	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	0.0476	0.0480	0.0370	0.0590	0.00695	0.146	0.00741	-0.0509	-0.912
06_2_18	MW-6	Appendix IV	Molybdenum	mg/L	17	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	0.0265	0.0270	0.0160	0.0360	0.00508	0.192	0.00444	-0.110	0.0354
06_2_20	MW-6	Appendix IV	Radium-226/228	pCi/L	17	0	0%	2020-04-28 to 2023-08-01	Normal	Normal	0.970	0.663	0	2.61	0.691	0.713	0.421	0.940	0.346
07_2_04	MW-7	Appendix IV	Fluoride	mg/L	11	10	91%	2021-06-15 to 2023-08-02		Nonparametric	0.338	0.338	0.338	0.338	NA	NA	0	NA	NA
07_2_09	MW-7	Appendix IV	Arsenic	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Nonparametric	Nonparametric	0.00555	0.00600	0.00400	0.00700	0.000934	0.168	0	-0.610	-0.239
07_2_10	MW-7	Appendix IV	Barium	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	0.0538	0.0540	0.0470	0.0620	0.00460	0.0855	0.00444	0.368	-0.493
07_2_16	MW-7	Appendix IV	Lithium	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	0.0917	0.0960	0.0630	0.112	0.0137	0.149	0.00593	-0.959	0.964
07_2_17	MW-7	Appendix IV	Mercury	mg/L	11	10	91%	2021-06-15 to 2023-08-02		Nonparametric	0.000200	0.000200	0.000200	0.000200	NA	NA	0	NA	NA
07_2_18	MW-7	Appendix IV	Molybdenum	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Nonparametric	Nonparametric	0.246	0.276	0.146	0.296	0.0582	0.236	0.0252	-1.07	-0.705
07_2_20	MW-7	Appendix IV	Radium-226/228	pCi/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	2.48	2.11	0.676	5.44	1.54	0.621	1.20	0.896	0.0692
08_2_04	MW-8	Appendix IV	Fluoride	mg/L	11	10	91%	2021-06-15 to 2023-08-02		Nonparametric	0.0587	0.0587	0.0587	0.0587	NA	NA	0	NA	NA
08_2_10	MW-8	Appendix IV	Barium	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	0.0219	0.0210	0.0170	0.0280	0.00348	0.159	0.00296	0.459	-0.625
08_2_16	MW-8	Appendix IV	Lithium	mg/L	11	5	45%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	0.00817	0.00800	0.00500	0.0130	0.00286	0.350	0.00222	0.907	0.794
08_2_18	MW-8	Appendix IV	Molybdenum	mg/L	11	9	82%	2021-06-15 to 2023-08-02		Nonparametric	0.00950	0.00950	0.00600	0.0130	0.00495	0.521	0.00519	NA	NA
08_2_20	MW-8	Appendix IV	Radium-226/228	pCi/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Gamma	2.14	1.93	0.118	6.21	1.95	0.913	1.94	0.987	0.301
09_2_04	MW-9	Appendix IV	Fluoride	mg/L	11	10	91%	2021-06-15 to 2023-08-02		Nonparametric	0.0330	0.0330	0.0330	0.0330	NA	NA	0	NA	NA
09_2_10	MW-9	Appendix IV	Barium	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	0.0141	0.0140	0.0130	0.0160	0.00104	0.0741	0.00148	0.431	-0.932
09_2_20	MW-9	Appendix IV	Radium-226/228	pCi/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	1.14	0.844	0.177	2.37	0.868	0.763	0.856	0.390	-1.74
10_2_04	MW-10	Appendix IV	Fluoride	mg/L	11	10	91%	2021-06-15 to 2023-08-02		Nonparametric	0.0660	0.0660	0.0660	0.0660	NA	NA	0	NA	NA
10_2_10	MW-10	Appendix IV	Barium	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	0.0407	0.0410	0.0360	0.0470	0.00352	0.0865	0.00444	0.276	-0.903
10_2_17	MW-10	Appendix IV	Mercury	mg/L	11	10	91%	2021-06-15 to 2023-08-02		Nonparametric	0.000200	0.000200	0.000200	0.000200	NA	NA	0	NA	NA
10_2_20	MW-10	Appendix IV	Radium-226/228	pCi/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal	Gamma	0.832	0.605	0.262	2.39	0.648	0.780	0.293	1.83	2.84
13_2_09	MW-13	Appendix IV	Arsenic	mg/L	11	10	91%	2022-02-23 to 2023-08-02		Nonparametric	0.00400	0.00400	0.00400	0.00400	NA	NA	0	NA	NA
13_2_10	MW-13	Appendix IV	Barium	mg/L	11	0	0%	2022-02-23 to 2023-08-02	Gamma; Lognormal; Normal	Normal	0.0265	0.0270	0.0190	0.0340	0.00437	0.165	0.00296	-0.332	0.0765

(Table continues on next page)



Table 2: Summary Statistics, Non-Detects Excluded (continued)

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
13_2_20	MW-13	Appendix IV	Radium-226/228	pCi/L	11	0	0%	2022-02-23 to 2023-08-02	Gamma; Lognormal	Gamma	0.853	0.410	0.0699	2.31	0.801	0.939	0.404	0.977	-0.598
14_2_09	MW-14	Appendix IV	Arsenic	mg/L	8	0	0%	2023-01-12 to 2023-09-15	Gamma; Lognormal; Normal	Normal	0.00600	0.00600	0.00400	0.00800	0.00131	0.218	0.00148	0	-0.700
14_2_10	MW-14	Appendix IV	Barium	mg/L	8	0	0%	2023-01-12 to 2023-09-15	Nonparametric	Nonparametric	0.132	0.127	0.119	0.177	0.0189	0.143	0.00889	2.38	6.11
14_2_16	MW-14	Appendix IV	Lithium	mg/L	8	0	0%	2023-01-12 to 2023-09-15	Gamma; Lognormal; Normal	Normal	0.113	0.111	0.106	0.125	0.00679	0.0600	0.00370	1.09	-0.116
14_2_18	MW-14	Appendix IV	Molybdenum	mg/L	8	0	0%	2023-01-12 to 2023-09-15	Gamma; Lognormal; Normal	Normal	0.0139	0.0140	0.0120	0.0160	0.00125	0.0898	0.00148	0.304	0.146
14_2_20	MW-14	Appendix IV	Radium-226/228	pCi/L	8	0	0%	2023-01-12 to 2023-09-15	Gamma; Lognormal; Normal	Normal	1.45	0.945	0.464	4.44	1.28	0.883	0.561	2.25	5.42
14_2_22	MW-14	Appendix IV	Selenium	mg/L	8	6	75%	2023-01-12 to 2023-09-15		Nonparametric	0.0110	0.0110	0.00900	0.0130	0.00283	0.257	0.00296	NA	NA
15_2_10	MW-15	Appendix IV	Barium	mg/L	8	0	0%	0023-02-17 to 2023-09-15	Gamma; Lognormal; Normal	Normal	0.0578	0.0555	0.0420	0.0770	0.0125	0.216	0.0148	0.302	-1.46
15_2_16	MW-15	Appendix IV	Lithium	mg/L	8	7	88%	0023-02-17 to 2023-09-15		Nonparametric	0.0140	0.0140	0.0140	0.0140	NA	NA	0	NA	NA
15_2_20	MW-15	Appendix IV	Radium-226/228	pCi/L	8	0	0%	0023-02-17 to 2023-09-15	Gamma; Lognormal; Normal	Normal	1.23	1.05	0.334	2.06	0.688	0.561	0.916	0.137	-1.88
15_2_22	MW-15	Appendix IV	Selenium	mg/L	8	2	25%	0023-02-17 to 2023-09-15	Gamma; Lognormal; Normal	Normal	0.0185	0.0160	0.00900	0.0340	0.0102	0.552	0.00963	0.639	-1.27
16A_2_09	MW-16A	Appendix IV	Arsenic	mg/L	9	0	0%	2023-02-02 to 2023-11-21		Nonparametric	0.00322	0.00300	0.00200	0.00400	0.000667	0.207	0	-0.254	-0.0402
16A_2_10	MW-16A	Appendix IV	Barium	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	0.144	0.136	0.108	0.178	0.0259	0.180	0.0356	0.0954	-1.61
16A_2_16	MW-16A	Appendix IV	Lithium	mg/L	9	8	89%	2023-02-02 to 2023-11-21		Nonparametric	0.00500	0.00500	0.00500	0.00500	NA	NA	0	NA	NA
16A_2_20	MW-16A	Appendix IV	Radium-226/228	pCi/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	2.22	1.21	0.562	7.46	2.19	0.986	0.960	1.98	4.39
16A_2_22	MW-16A	Appendix IV	Selenium	mg/L	9	8	89%	2023-02-02 to 2023-11-21		Nonparametric	0.00500	0.00500	0.00500	0.00500	NA	NA	0	NA	NA
16B_2_04	MW-16B	Appendix IV	Fluoride	mg/L	9	8	89%	2023-02-02 to 2023-11-21		Nonparametric	0.310	0.310	0.310	0.310	NA	NA	0	NA	NA
16B_2_10	MW-16B	Appendix IV	Barium	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	0.0869	0.0860	0.0820	0.0910	0.00298	0.0343	0.00444	-0.118	-1.06
16B_2_16	MW-16B	Appendix IV	Lithium	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	0.0214	0.0220	0.0190	0.0230	0.00133	0.0622	0.00148	-0.661	-0.153
16B_2_18	MW-16B	Appendix IV	Molybdenum	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Nonparametric	Nonparametric	0.00622	0.00600	0.00500	0.00800	0.000833	0.134	0	1.17	2.43
16B_2_20	MW-16B	Appendix IV	Radium-226/228	pCi/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal	Gamma	2.64	1.97	1.04	6.43	1.66	0.628	0.637	1.81	3.26
16B_2_22	MW-16B	Appendix IV	Selenium	mg/L	9	8	89%	2023-02-02 to 2023-11-21		Nonparametric	0.00600	0.00600	0.00600	0.00600	NA	NA	0	NA	NA
7C_2_09	MW-7C	Appendix IV	Arsenic	mg/L	11	0	0%	2022-03-10 to 2023-08-02		Nonparametric	0.00627	0.00600	0.00500	0.00700	0.000647	0.103	0	-0.291	-0.208
7C_2_10	MW-7C	Appendix IV	Barium	mg/L	11	0	0%	2022-03-10 to 2023-08-02	Gamma; Lognormal; Normal	Normal	0.0436	0.0440	0.0410	0.0470	0.00220	0.0505	0.00296	0.0856	-1.47
7C_2_12	MW-7C	Appendix IV	Cadmium	mg/L	11	8	73%	2022-03-10 to 2023-08-02		Nonparametric	0.000800	0.000800	0.000700	0.000900	0.000100	0.125	0.000148	-0.00000000000000485	NA
7C_2_16	MW-7C	Appendix IV	Lithium	mg/L	11	0	0%	2022-03-10 to 2023-08-02	Gamma; Lognormal; Normal	Normal	0.129	0.128	0.121	0.138	0.00515	0.0399	0.00444	0.596	-0.0720
7C_2_18	MW-7C	Appendix IV	Molybdenum	mg/L	11	0	0%	2022-03-10 to 2023-08-02	Gamma; Lognormal; Normal	Normal	0.399	0.402	0.377	0.422	0.0147	0.0369	0.0178	-0.163	-1.05
7C_2_20	MW-7C	Appendix IV	Radium-226/228	pCi/L	11	0	0%	2022-03-10 to 2023-08-02	Gamma; Lognormal; Normal	Normal	2.23	1.99	0.773	3.66	1.18	0.529	1.75	-0.00709	-1.96



Table 3: Goodness-of-Fit Tests, Non-Detects Excluded

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Normal		Lognormal		Gamma				Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution				
								S-W		Lilliefors		S-W		Lilliefors					K-S		A-D	
								Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value				Stat.	p-Value	Stat.	p-Value
02_2_04	MW-2	Appendix IV	Fluoride	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric		
02_2_08	MW-2	Appendix IV	Antimony	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric		
02_2_09	MW-2	Appendix IV	Arsenic	mg/L	17	13	76%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.338	NA	Nonparametric		
02_2_10	MW-2	Appendix IV	Barium	mg/L	17	0	0%	0.974	0.888	0.161	0.289	0.971	0.838	0.176	0.172	0.172	>= 0.10	0.314	>= 0.10	0.085	Gamma; Lognormal; Normal	Normal
02_2_11	MW-2	Appendix IV	Beryllium	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
02_2_12	MW-2	Appendix IV	Cadmium	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
02_2_13	MW-2	Appendix IV	Chromium	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
02_2_14	MW-2	Appendix IV	Cobalt	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
02_2_15	MW-2	Appendix IV	Lead	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
02_2_16	MW-2	Appendix IV	Lithium	mg/L	17	0	0%	0.956	0.565	0.124	0.700	0.957	0.570	0.123	0.703	0.131	>= 0.10	0.306	>= 0.10	0.122	Gamma; Lognormal; Normal	Normal
02_2_17	MW-2	Appendix IV	Mercury	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
02_2_18	MW-2	Appendix IV	Molybdenum	mg/L	17	0	0%	0.970	0.818	0.155	0.339	0.946	0.400	0.160	0.297	0.157	>= 0.10	0.398	>= 0.10	0.192	Gamma; Lognormal; Normal	Normal
02_2_20	MW-2	Appendix IV	Radium-226/228	pCi/L	17	0	0%	0.912	0.108	0.167	0.239	0.950	0.453	0.133	0.584	0.114	>= 0.10	0.275	>= 0.10	0.856	Gamma; Lognormal; Normal	Normal
02_2_22	MW-2	Appendix IV	Selenium	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
02_2_23	MW-2	Appendix IV	Thallium	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
03_2_04	MW-3	Appendix IV	Fluoride	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
03_2_08	MW-3	Appendix IV	Antimony	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
03_2_09	MW-3	Appendix IV	Arsenic	mg/L	6	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.117	NA	Nonparametric	
03_2_10	MW-3	Appendix IV	Barium	mg/L	6	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.049	NA	Nonparametric	
03_2_11	MW-3	Appendix IV	Beryllium	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
03_2_12	MW-3	Appendix IV	Cadmium	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
03_2_13	MW-3	Appendix IV	Chromium	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
03_2_14	MW-3	Appendix IV	Cobalt	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
03_2_15	MW-3	Appendix IV	Lead	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
03_2_16	MW-3	Appendix IV	Lithium	mg/L	6	0	0%	0.960	0.818	0.186	0.744	0.961	0.828	0.193	0.693	0.207	>= 0.10	0.247	>= 0.10	0.062	Gamma; Lognormal; Normal	Nonparametric
03_2_17	MW-3	Appendix IV	Mercury	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
03_2_18	MW-3	Appendix IV	Molybdenum	mg/L	6	0	0%	0.879	0.262	0.285	0.133	0.891	0.325	0.274	0.168	0.273	>= 0.10	0.481	>= 0.10	0.057	Gamma; Lognormal; Normal	Nonparametric
03_2_20	MW-3	Appendix IV	Radium-226/228	pCi/L	6	0	0%	0.949	0.733	0.205	0.600	0.898	0.362	0.220	0.484	0.233	>= 0.10	0.321	>= 0.10	0.724	Gamma; Lognormal; Normal	Nonparametric
03_2_22	MW-3	Appendix IV	Selenium	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
03_2_23	MW-3	Appendix IV	Thallium	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
05_2_04	MW-5	Appendix IV	Fluoride	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
05_2_08	MW-5	Appendix IV	Antimony	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
05_2_09	MW-5	Appendix IV	Arsenic	mg/L	17	12	71%	0.871	0.272	0.244	0.423	0.890	0.357	0.222	0.578	0.242	>= 0.10	0.386	>= 0.10	0.559	Gamma; Lognormal; Normal	Nonparametric
05_2_10	MW-5	Appendix IV	Barium	mg/L	17	0	0%	0.937	0.279	0.175	0.180	0.963	0.683	0.148	0.419	0.159	>= 0.10	0.415	>= 0.10	0.170	Gamma; Lognormal; Normal	Normal
05_2_11	MW-5	Appendix IV	Beryllium	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
05_2_12	MW-5	Appendix IV	Cadmium	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
05_2_13	MW-5	Appendix IV	Chromium	mg/L	17	15	88%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.252	NA	Nonparametric	
05_2_14	MW-5	Appendix IV	Cobalt	mg/L	17	16	94%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
05_2_15	MW-5	Appendix IV	Lead	mg/L	17	14	82%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.785	NA	Nonparametric	

(Table continues on next page)

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.



Table 3: Goodness-of-Fit Tests, Non-Detects Excluded (continued)

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Normal		Lognormal		Gamma				Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution				
								S-W		Lilliefors		S-W		Lilliefors					K-S		A-D	
								Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value				Stat.	p-Value	Stat.	p-Value
05_2_16	MW-5	Appendix IV	Lithium	mg/L	17	0	0%	0.892	0.050	0.172	0.200	0.712	0.000	0.221	0.027	0.211	0.01 <= p < 0.05	1.111	< 0.01	0.416	Normal	Normal
05_2_17	MW-5	Appendix IV	Mercury	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
05_2_18	MW-5	Appendix IV	Molybdenum	mg/L	17	0	0%	0.952	0.497	0.172	0.197	0.814	0.003	0.207	0.051	0.189	>= 0.10	0.673	0.05 <= p < 0.10	0.481	Gamma; Lognormal; Normal	Normal
05_2_20	MW-5	Appendix IV	Radium-226/228	pCi/L	17	0	0%	0.825	0.005	0.191	0.103	0.948	0.429	0.099	0.929	0.112	>= 0.10	0.399	>= 0.10	0.641	Gamma; Lognormal; Normal	Normal
05_2_22	MW-5	Appendix IV	Selenium	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
05_2_23	MW-5	Appendix IV	Thallium	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
06_2_04	MW-6	Appendix IV	Fluoride	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
06_2_08	MW-6	Appendix IV	Antimony	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
06_2_09	MW-6	Appendix IV	Arsenic	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
06_2_10	MW-6	Appendix IV	Barium	mg/L	17	0	0%	0.932	0.236	0.184	0.131	0.929	0.209	0.174	0.187	0.187	>= 0.10	0.620	>= 0.10	0.120	Gamma; Lognormal; Normal	Normal
06_2_11	MW-6	Appendix IV	Beryllium	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
06_2_12	MW-6	Appendix IV	Cadmium	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
06_2_13	MW-6	Appendix IV	Chromium	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
06_2_14	MW-6	Appendix IV	Cobalt	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
06_2_15	MW-6	Appendix IV	Lead	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
06_2_16	MW-6	Appendix IV	Lithium	mg/L	17	0	0%	0.957	0.578	0.094	0.957	0.948	0.431	0.103	0.902	0.109	>= 0.10	0.281	>= 0.10	0.149	Gamma; Lognormal; Normal	Normal
06_2_17	MW-6	Appendix IV	Mercury	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
06_2_18	MW-6	Appendix IV	Molybdenum	mg/L	17	0	0%	0.982	0.976	0.095	0.952	0.959	0.615	0.115	0.799	0.111	>= 0.10	0.245	>= 0.10	0.202	Gamma; Lognormal; Normal	Normal
06_2_20	MW-6	Appendix IV	Radium-226/228	pCi/L	17	0	0%	0.907	0.087	0.209	0.048	NA	NA	NA	NA	NA	NA	NA	NA	NA	Normal	Normal
06_2_22	MW-6	Appendix IV	Selenium	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
06_2_23	MW-6	Appendix IV	Thallium	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
07_2_04	MW-7	Appendix IV	Fluoride	mg/L	11	10	91%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
07_2_08	MW-7	Appendix IV	Antimony	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
07_2_09	MW-7	Appendix IV	Arsenic	mg/L	11	0	0%	0.843	0.035	0.323	0.002	0.819	0.016	0.333	0.001	0.345	< 0.01	1.112	< 0.01	0.180	Nonparametric	Nonparametric
07_2_10	MW-7	Appendix IV	Barium	mg/L	11	0	0%	0.970	0.888	0.136	0.826	0.977	0.944	0.124	0.906	0.120	>= 0.10	0.180	>= 0.10	0.085	Gamma; Lognormal; Normal	Normal
07_2_11	MW-7	Appendix IV	Beryllium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
07_2_12	MW-7	Appendix IV	Cadmium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
07_2_13	MW-7	Appendix IV	Chromium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
07_2_14	MW-7	Appendix IV	Cobalt	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
07_2_15	MW-7	Appendix IV	Lead	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
07_2_16	MW-7	Appendix IV	Lithium	mg/L	11	0	0%	0.912	0.258	0.182	0.389	0.872	0.082	0.198	0.267	0.193	>= 0.10	0.635	0.05 <= p < 0.10	0.163	Gamma; Lognormal; Normal	Normal
07_2_17	MW-7	Appendix IV	Mercury	mg/L	11	10	91%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
07_2_18	MW-7	Appendix IV	Molybdenum	mg/L	11	0	0%	0.766	0.003	0.313	0.004	0.739	0.002	0.343	0.001	0.339	< 0.01	1.362	< 0.01	0.272	Nonparametric	Nonparametric
07_2_20	MW-7	Appendix IV	Radium-226/228	pCi/L	11	0	0%	0.913	0.264	0.174	0.461	0.961	0.783	0.149	0.711	0.108	>= 0.10	0.192	>= 0.10	0.666	Gamma; Lognormal; Normal	Normal
07_2_22	MW-7	Appendix IV	Selenium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
07_2_23	MW-7	Appendix IV	Thallium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
08_2_04	MW-8	Appendix IV	Fluoride	mg/L	11	10	91%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
08_2_08	MW-8	Appendix IV	Antimony	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
08_2_09	MW-8	Appendix IV	Arsenic	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric

(Table continues on next page)

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.



Table 3: Goodness-of-Fit Tests, Non-Detects Excluded (continued)

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Normal				Lognormal				Gamma				Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution
								S-W		Lilliefors		S-W		Lilliefors		K-S		A-D				
								Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value			
08_2_10	MW-8	Appendix IV	Barium	mg/L	11	0	0%	0.931	0.417	0.217	0.157	0.945	0.576	0.188	0.339	0.196	>= 0.10	0.377	>= 0.10	0.157	Gamma; Lognormal; Normal	Normal
08_2_11	MW-8	Appendix IV	Beryllium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
08_2_12	MW-8	Appendix IV	Cadmium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
08_2_13	MW-8	Appendix IV	Chromium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
08_2_14	MW-8	Appendix IV	Cobalt	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
08_2_15	MW-8	Appendix IV	Lead	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
08_2_16	MW-8	Appendix IV	Lithium	mg/L	11	5	45%	0.930	0.580	0.219	0.492	0.971	0.896	0.167	0.863	0.170	>= 0.10	0.241	>= 0.10	0.341	Gamma; Lognormal; Normal	Normal
08_2_17	MW-8	Appendix IV	Mercury	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
08_2_18	MW-8	Appendix IV	Molybdenum	mg/L	11	9	82%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.547	Gamma; Lognormal; Normal	Nonparametric
08_2_20	MW-8	Appendix IV	Radium-226/228	pCi/L	11	0	0%	0.890	0.141	0.224	0.127	0.944	0.567	0.181	0.402	0.196	>= 0.10	0.270	>= 0.10	1.212	Gamma; Lognormal; Normal	Gamma
08_2_22	MW-8	Appendix IV	Selenium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
08_2_23	MW-8	Appendix IV	Thallium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
09_2_04	MW-9	Appendix IV	Fluoride	mg/L	11	10	91%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
09_2_08	MW-9	Appendix IV	Antimony	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
09_2_09	MW-9	Appendix IV	Arsenic	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
09_2_10	MW-9	Appendix IV	Barium	mg/L	11	0	0%	0.871	0.079	0.216	0.164	0.870	0.078	0.220	0.144	0.228	>= 0.10	0.663	0.05 <= p < 0.10	0.073	Gamma; Lognormal; Normal	Normal
09_2_11	MW-9	Appendix IV	Beryllium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
09_2_12	MW-9	Appendix IV	Cadmium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
09_2_13	MW-9	Appendix IV	Chromium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
09_2_14	MW-9	Appendix IV	Cobalt	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
09_2_15	MW-9	Appendix IV	Lead	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
09_2_16	MW-9	Appendix IV	Lithium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
09_2_17	MW-9	Appendix IV	Mercury	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
09_2_18	MW-9	Appendix IV	Molybdenum	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
09_2_20	MW-9	Appendix IV	Radium-226/228	pCi/L	11	0	0%	0.863	0.063	0.196	0.281	0.911	0.247	0.189	0.334	0.203	>= 0.10	0.454	>= 0.10	0.945	Gamma; Lognormal; Normal	Normal
09_2_22	MW-9	Appendix IV	Selenium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
09_2_23	MW-9	Appendix IV	Thallium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
10_2_04	MW-10	Appendix IV	Fluoride	mg/L	11	10	91%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
10_2_08	MW-10	Appendix IV	Antimony	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
10_2_09	MW-10	Appendix IV	Arsenic	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
10_2_10	MW-10	Appendix IV	Barium	mg/L	11	0	0%	0.948	0.616	0.144	0.755	0.950	0.638	0.142	0.777	0.153	>= 0.10	0.296	>= 0.10	0.086	Gamma; Lognormal; Normal	Normal
10_2_11	MW-10	Appendix IV	Beryllium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
10_2_12	MW-10	Appendix IV	Cadmium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
10_2_13	MW-10	Appendix IV	Chromium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
10_2_14	MW-10	Appendix IV	Cobalt	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
10_2_15	MW-10	Appendix IV	Lead	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
10_2_16	MW-10	Appendix IV	Lithium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
10_2_17	MW-10	Appendix IV	Mercury	mg/L	11	10	91%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric
10_2_18	MW-10	Appendix IV	Molybdenum	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Gamma; Lognormal; Normal	Nonparametric

(Table continues on next page)

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.



Table 3: Goodness-of-Fit Tests, Non-Detects Excluded (continued)

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Normal		Lognormal		Gamma				Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution				
								S-W		Lilliefors		S-W		Lilliefors					K-S		A-D	
								Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value				Stat.	p-Value	Stat.	p-Value
10_2_20	MW-10	Appendix IV	Radium-226/228	pCi/L	11	0	0%	0.757	0.003	0.307	0.005	0.938	0.493	0.202	0.236	0.247	0.05 <= p < 0.10	0.621	>= 0.10	0.646	Gamma; Lognormal	Gamma
10_2_22	MW-10	Appendix IV	Selenium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
10_2_23	MW-10	Appendix IV	Thallium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
13_2_04	MW-13	Appendix IV	Fluoride	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
13_2_08	MW-13	Appendix IV	Antimony	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
13_2_09	MW-13	Appendix IV	Arsenic	mg/L	11	10	91%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
13_2_10	MW-13	Appendix IV	Barium	mg/L	11	0	0%	0.945	0.585	0.186	0.356	0.921	0.326	0.218	0.154	0.208	>= 0.10	0.460	>= 0.10	0.173	Gamma; Lognormal; Normal	Normal
13_2_11	MW-13	Appendix IV	Beryllium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
13_2_12	MW-13	Appendix IV	Cadmium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
13_2_13	MW-13	Appendix IV	Chromium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
13_2_14	MW-13	Appendix IV	Cobalt	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
13_2_15	MW-13	Appendix IV	Lead	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
13_2_16	MW-13	Appendix IV	Lithium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
13_2_17	MW-13	Appendix IV	Mercury	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
13_2_18	MW-13	Appendix IV	Molybdenum	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
13_2_20	MW-13	Appendix IV	Radium-226/228	pCi/L	11	0	0%	0.835	0.027	0.255	0.043	0.955	0.705	0.140	0.791	0.199	>= 0.10	0.350	>= 0.10	1.091	Gamma; Lognormal	Gamma
13_2_22	MW-13	Appendix IV	Selenium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
13_2_23	MW-13	Appendix IV	Thallium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
14_2_04	MW-14	Appendix IV	Fluoride	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
14_2_08	MW-14	Appendix IV	Antimony	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
14_2_09	MW-14	Appendix IV	Arsenic	mg/L	8	0	0%	0.965	0.857	0.152	0.844	0.957	0.779	0.163	0.765	0.172	>= 0.10	0.262	>= 0.10	0.226	Gamma; Lognormal; Normal	Normal
14_2_10	MW-14	Appendix IV	Barium	mg/L	8	0	0%	0.687	0.002	0.338	0.008	0.729	0.005	0.310	0.022	0.318	0.01 <= p < 0.05	0.970	< 0.01	0.128	Nonparametric	Nonparametric
14_2_11	MW-14	Appendix IV	Beryllium	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
14_2_12	MW-14	Appendix IV	Cadmium	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
14_2_13	MW-14	Appendix IV	Chromium	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
14_2_14	MW-14	Appendix IV	Cobalt	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
14_2_15	MW-14	Appendix IV	Lead	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
14_2_16	MW-14	Appendix IV	Lithium	mg/L	8	0	0%	0.856	0.110	0.257	0.123	0.867	0.140	0.247	0.160	0.250	>= 0.10	0.588	>= 0.10	0.059	Gamma; Lognormal; Normal	Normal
14_2_17	MW-14	Appendix IV	Mercury	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
14_2_18	MW-14	Appendix IV	Molybdenum	mg/L	8	0	0%	0.958	0.792	0.210	0.375	0.962	0.830	0.195	0.499	0.196	>= 0.10	0.287	>= 0.10	0.090	Gamma; Lognormal; Normal	Normal
14_2_20	MW-14	Appendix IV	Radium-226/228	pCi/L	8	0	0%	0.718	0.004	0.277	0.071	0.936	0.570	0.228	0.252	0.264	>= 0.10	0.521	>= 0.10	0.693	Gamma; Lognormal; Normal	Normal
14_2_22	MW-14	Appendix IV	Selenium	mg/L	8	6	75%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.260	NA	Nonparametric
14_2_23	MW-14	Appendix IV	Thallium	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
15_2_04	MW-15	Appendix IV	Fluoride	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
15_2_08	MW-15	Appendix IV	Antimony	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
15_2_09	MW-15	Appendix IV	Arsenic	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
15_2_10	MW-15	Appendix IV	Barium	mg/L	8	0	0%	0.931	0.526	0.232	0.230	0.937	0.583	0.216	0.331	0.236	>= 0.10	0.353	>= 0.10	0.216	Gamma; Lognormal; Normal	Normal
15_2_11	MW-15	Appendix IV	Beryllium	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
15_2_12	MW-15	Appendix IV	Cadmium	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric

(Table continues on next page)

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.



Table 3: Goodness-of-Fit Tests, Non-Detects Excluded (continued)

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Normal		Lognormal		Gamma				Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution				
								S-W		Lilliefors		S-W		Lilliefors					K-S		A-D	
								Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value				Stat.	p-Value	Stat.	p-Value
15_2_13	MW-15	Appendix IV	Chromium	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric		
15_2_14	MW-15	Appendix IV	Cobalt	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric		
15_2_15	MW-15	Appendix IV	Lead	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric		
15_2_16	MW-15	Appendix IV	Lithium	mg/L	8	7	88%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric		
15_2_17	MW-15	Appendix IV	Mercury	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric		
15_2_18	MW-15	Appendix IV	Molybdenum	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric		
15_2_20	MW-15	Appendix IV	Radium-226/228	pCi/L	8	0	0%	0.883	0.203	0.229	0.249	0.906	0.324	0.205	0.414	0.232	>= 0.10	0.390	>= 0.10	0.667	Gamma; Lognormal; Normal	Normal
15_2_22	MW-15	Appendix IV	Selenium	mg/L	8	2	25%	0.882	0.279	0.269	0.191	0.887	0.305	0.257	0.246	0.283	>= 0.10	0.433	>= 0.10	0.560	Gamma; Lognormal; Normal	Normal
15_2_23	MW-15	Appendix IV	Thallium	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16A_2_04	MW-16A	Appendix IV	Fluoride	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16A_2_08	MW-16A	Appendix IV	Antimony	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16A_2_09	MW-16A	Appendix IV	Arsenic	mg/L	9	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.221	NA	Nonparametric	
16A_2_10	MW-16A	Appendix IV	Barium	mg/L	9	0	0%	0.922	0.409	0.180	0.546	0.930	0.477	0.187	0.482	0.196	>= 0.10	0.355	>= 0.10	0.181	Gamma; Lognormal; Normal	Normal
16A_2_11	MW-16A	Appendix IV	Beryllium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16A_2_12	MW-16A	Appendix IV	Cadmium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16A_2_13	MW-16A	Appendix IV	Chromium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16A_2_14	MW-16A	Appendix IV	Cobalt	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16A_2_15	MW-16A	Appendix IV	Lead	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16A_2_16	MW-16A	Appendix IV	Lithium	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16A_2_17	MW-16A	Appendix IV	Mercury	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16A_2_18	MW-16A	Appendix IV	Molybdenum	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16A_2_20	MW-16A	Appendix IV	Radium-226/228	pCi/L	9	0	0%	0.763	0.008	0.234	0.168	0.930	0.477	0.166	0.675	0.211	>= 0.10	0.411	>= 0.10	0.883	Gamma; Lognormal; Normal	Normal
16A_2_22	MW-16A	Appendix IV	Selenium	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16A_2_23	MW-16A	Appendix IV	Thallium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16B_2_04	MW-16B	Appendix IV	Fluoride	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16B_2_08	MW-16B	Appendix IV	Antimony	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16B_2_09	MW-16B	Appendix IV	Arsenic	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16B_2_10	MW-16B	Appendix IV	Barium	mg/L	9	0	0%	0.924	0.425	0.205	0.335	0.923	0.420	0.207	0.324	0.220	>= 0.10	0.451	>= 0.10	0.034	Gamma; Lognormal; Normal	Normal
16B_2_11	MW-16B	Appendix IV	Beryllium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16B_2_12	MW-16B	Appendix IV	Cadmium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16B_2_13	MW-16B	Appendix IV	Chromium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16B_2_14	MW-16B	Appendix IV	Cobalt	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16B_2_15	MW-16B	Appendix IV	Lead	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16B_2_16	MW-16B	Appendix IV	Lithium	mg/L	9	0	0%	0.922	0.407	0.217	0.256	0.915	0.350	0.222	0.224	0.232	>= 0.10	0.399	>= 0.10	0.063	Gamma; Lognormal; Normal	Normal
16B_2_17	MW-16B	Appendix IV	Mercury	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16B_2_18	MW-16B	Appendix IV	Molybdenum	mg/L	9	0	0%	0.786	0.014	0.383	0.000	0.807	0.024	0.366	0.001	0.374	< 0.01	1.100	< 0.01	0.129	Nonparametric	Nonparametric
16B_2_20	MW-16B	Appendix IV	Radium-226/228	pCi/L	9	0	0%	0.795	0.018	0.297	0.022	0.941	0.589	0.197	0.401	0.232	>= 0.10	0.503	>= 0.10	0.535	Gamma; Lognormal	Gamma
16B_2_22	MW-16B	Appendix IV	Selenium	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16B_2_23	MW-16B	Appendix IV	Thallium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	

(Table continues on next page)

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.



Table 3: Goodness-of-Fit Tests, Non-Detects Excluded (continued)

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Normal		Lognormal		Gamma				Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution				
								S-W		Lilliefors		S-W		Lilliefors					K-S		A-D	
								Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value				Stat.	p-Value	Stat.	p-Value
7C_2_04	MW-7C	Appendix IV	Fluoride	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
7C_2_08	MW-7C	Appendix IV	Antimony	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric			
7C_2_09	MW-7C	Appendix IV	Arsenic	mg/L	11	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.105		Nonparametric			
7C_2_10	MW-7C	Appendix IV	Barium	mg/L	11	0	0%	0.910	0.245	0.157	0.630	0.908	0.233	0.160	0.601	0.170	>= 0.10	0.425	>= 0.10	0.050	Gamma; Lognormal; Normal	Normal
7C_2_11	MW-7C	Appendix IV	Beryllium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
7C_2_12	MW-7C	Appendix IV	Cadmium	mg/L	11	8	73%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.126		Nonparametric		
7C_2_13	MW-7C	Appendix IV	Chromium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
7C_2_14	MW-7C	Appendix IV	Cobalt	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
7C_2_15	MW-7C	Appendix IV	Lead	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
7C_2_16	MW-7C	Appendix IV	Lithium	mg/L	11	0	0%	0.942	0.539	0.143	0.762	0.948	0.616	0.136	0.825	0.135	>= 0.10	0.324	>= 0.10	0.040	Gamma; Lognormal; Normal	Normal
7C_2_17	MW-7C	Appendix IV	Mercury	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
7C_2_18	MW-7C	Appendix IV	Molybdenum	mg/L	11	0	0%	0.960	0.770	0.121	0.922	0.958	0.741	0.127	0.887	0.129	>= 0.10	0.247	>= 0.10	0.037	Gamma; Lognormal; Normal	Normal
7C_2_20	MW-7C	Appendix IV	Radium-226/228	pCi/L	11	0	0%	0.864	0.065	0.207	0.208	0.866	0.068	0.229	0.112	0.235	>= 0.10	0.623	0.05 <= p < 0.10	0.618	Gamma; Lognormal; Normal	Normal
7C_2_22	MW-7C	Appendix IV	Selenium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric
7C_2_23	MW-7C	Appendix IV	Thallium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.

Table 4: Autocorrelation Tests, Non-Detects Excluded

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Autocorrelation	Box-Ljung p-value	Sig.
02_2_09	MW-2	Appendix IV	Arsenic	mg/L	17	13	76%	-0.750	0.034	*
02_2_10	MW-2	Appendix IV	Barium	mg/L	17	0	0%	-0.121	0.587	
02_2_16	MW-2	Appendix IV	Lithium	mg/L	17	0	0%	0.677	0.002	**
02_2_18	MW-2	Appendix IV	Molybdenum	mg/L	17	0	0%	0.486	0.029	*
02_2_20	MW-2	Appendix IV	Radium-226/228	pCi/L	17	0	0%	-0.170	0.446	
03_2_09	MW-3	Appendix IV	Arsenic	mg/L	6	0	0%	-0.033	0.918	
03_2_10	MW-3	Appendix IV	Barium	mg/L	6	0	0%	0.580	0.072	
03_2_16	MW-3	Appendix IV	Lithium	mg/L	6	0	0%	0.032	0.921	
03_2_18	MW-3	Appendix IV	Molybdenum	mg/L	6	0	0%	0.038	0.907	
03_2_20	MW-3	Appendix IV	Radium-226/228	pCi/L	6	0	0%	0.157	0.627	
05_2_09	MW-5	Appendix IV	Arsenic	mg/L	17	12	71%	-0.268	0.428	
05_2_10	MW-5	Appendix IV	Barium	mg/L	17	0	0%	0.276	0.215	
05_2_13	MW-5	Appendix IV	Chromium	mg/L	17	15	88%	-0.500	0.157	
05_2_14	MW-5	Appendix IV	Cobalt	mg/L	17	16	94%	NA	NA	
05_2_15	MW-5	Appendix IV	Lead	mg/L	17	14	82%	-0.273	0.454	
05_2_16	MW-5	Appendix IV	Lithium	mg/L	17	0	0%	0.031	0.891	
05_2_18	MW-5	Appendix IV	Molybdenum	mg/L	17	0	0%	0.125	0.574	
05_2_20	MW-5	Appendix IV	Radium-226/228	pCi/L	17	0	0%	0.162	0.467	
06_2_10	MW-6	Appendix IV	Barium	mg/L	17	0	0%	0.540	0.015	*
06_2_16	MW-6	Appendix IV	Lithium	mg/L	17	0	0%	0.663	0.003	**
06_2_18	MW-6	Appendix IV	Molybdenum	mg/L	17	0	0%	-0.007	0.977	
06_2_20	MW-6	Appendix IV	Radium-226/228	pCi/L	17	0	0%	0.258	0.246	
07_2_04	MW-7	Appendix IV	Fluoride	mg/L	11	10	91%	NA	NA	
07_2_09	MW-7	Appendix IV	Arsenic	mg/L	11	0	0%	0.403	0.127	
07_2_10	MW-7	Appendix IV	Barium	mg/L	11	0	0%	0.071	0.789	
07_2_16	MW-7	Appendix IV	Lithium	mg/L	11	0	0%	0.467	0.077	
07_2_17	MW-7	Appendix IV	Mercury	mg/L	11	10	91%	NA	NA	
07_2_18	MW-7	Appendix IV	Molybdenum	mg/L	11	0	0%	0.555	0.036	*
07_2_20	MW-7	Appendix IV	Radium-226/228	pCi/L	11	0	0%	-0.456	0.085	
08_2_04	MW-8	Appendix IV	Fluoride	mg/L	11	10	91%	NA	NA	
08_2_10	MW-8	Appendix IV	Barium	mg/L	11	0	0%	0.240	0.365	
08_2_16	MW-8	Appendix IV	Lithium	mg/L	11	5	45%	0.289	0.370	
08_2_18	MW-8	Appendix IV	Molybdenum	mg/L	11	9	82%	-0.500	0.157	
08_2_20	MW-8	Appendix IV	Radium-226/228	pCi/L	11	0	0%	0.131	0.620	
09_2_04	MW-9	Appendix IV	Fluoride	mg/L	11	10	91%	NA	NA	
09_2_10	MW-9	Appendix IV	Barium	mg/L	11	0	0%	0.016	0.952	
09_2_20	MW-9	Appendix IV	Radium-226/228	pCi/L	11	0	0%	-0.037	0.890	
10_2_04	MW-10	Appendix IV	Fluoride	mg/L	11	10	91%	NA	NA	
10_2_10	MW-10	Appendix IV	Barium	mg/L	11	0	0%	0.470	0.075	
10_2_17	MW-10	Appendix IV	Mercury	mg/L	11	10	91%	NA	NA	
10_2_20	MW-10	Appendix IV	Radium-226/228	pCi/L	11	0	0%	0.420	0.112	
13_2_09	MW-13	Appendix IV	Arsenic	mg/L	11	10	91%	NA	NA	

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 4: Autocorrelation Tests, Non-Detects Excluded (*continued*)

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Autocorrelation	Box-Ljung p-value	Sig.
13_2_10	MW-13	Appendix IV	Barium	mg/L	11	0	0%	0.477	0.071	
13_2_20	MW-13	Appendix IV	Radium-226/228	pCi/L	11	0	0%	0.109	0.681	
14_2_09	MW-14	Appendix IV	Arsenic	mg/L	8	0	0%	0.167	0.573	
14_2_10	MW-14	Appendix IV	Barium	mg/L	8	0	0%	-0.174	0.556	
14_2_16	MW-14	Appendix IV	Lithium	mg/L	8	0	0%	0.545	0.066	
14_2_18	MW-14	Appendix IV	Molybdenum	mg/L	8	0	0%	-0.358	0.226	
14_2_20	MW-14	Appendix IV	Radium-226/228	pCi/L	8	0	0%	-0.114	0.700	
14_2_22	MW-14	Appendix IV	Selenium	mg/L	8	6	75%	-0.500	0.157	
15_2_10	MW-15	Appendix IV	Barium	mg/L	8	0	0%	-0.168	0.571	
15_2_16	MW-15	Appendix IV	Lithium	mg/L	8	7	88%	NA	NA	
15_2_20	MW-15	Appendix IV	Radium-226/228	pCi/L	8	0	0%	0.189	0.523	
15_2_22	MW-15	Appendix IV	Selenium	mg/L	8	2	25%	0.030	0.925	
16A_2_09	MW-16A	Appendix IV	Arsenic	mg/L	9	0	0%	0.205	0.471	
16A_2_10	MW-16A	Appendix IV	Barium	mg/L	9	0	0%	0.514	0.071	
16A_2_16	MW-16A	Appendix IV	Lithium	mg/L	9	8	89%	NA	NA	
16A_2_20	MW-16A	Appendix IV	Radium-226/228	pCi/L	9	0	0%	-0.313	0.271	
16A_2_22	MW-16A	Appendix IV	Selenium	mg/L	9	8	89%	NA	NA	
16B_2_04	MW-16B	Appendix IV	Fluoride	mg/L	9	8	89%	NA	NA	
16B_2_10	MW-16B	Appendix IV	Barium	mg/L	9	0	0%	0.015	0.957	
16B_2_16	MW-16B	Appendix IV	Lithium	mg/L	9	0	0%	0.135	0.636	
16B_2_18	MW-16B	Appendix IV	Molybdenum	mg/L	9	0	0%	-0.009	0.975	
16B_2_20	MW-16B	Appendix IV	Radium-226/228	pCi/L	9	0	0%	-0.316	0.266	
16B_2_22	MW-16B	Appendix IV	Selenium	mg/L	9	8	89%	NA	NA	
7C_2_09	MW-7C	Appendix IV	Arsenic	mg/L	11	0	0%	0.156	0.555	
7C_2_10	MW-7C	Appendix IV	Barium	mg/L	11	0	0%	-0.390	0.140	
7C_2_12	MW-7C	Appendix IV	Cadmium	mg/L	11	8	73%	0.000	1.000	
7C_2_16	MW-7C	Appendix IV	Lithium	mg/L	11	0	0%	0.256	0.332	
7C_2_18	MW-7C	Appendix IV	Molybdenum	mg/L	11	0	0%	-0.369	0.163	
7C_2_20	MW-7C	Appendix IV	Radium-226/228	pCi/L	11	0	0%	-0.099	0.708	

*** p < 0.001, ** p < 0.01, * p < 0.05



Table 5: Outlier Counts by Date

Date	Count
2021-12-07	1
2023-01-12	2
2023-08-01	1

Table 6: Outliers Identified at the 1% Significance Level, Non-Detects Excluded

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	No. Detects	Date	Value
03_2_09	MW-3	Appendix IV	Arsenic	mg/L	6	0	0%	6	2023-08-01	0.00400
10_2_20	MW-10	Appendix IV	Radium-226/228	pCi/L	11	0	0%	11	2021-12-07	2.39
14_2_10	MW-14	Appendix IV	Barium	mg/L	8	0	0%	8	2023-01-12	0.177
14_2_20	MW-14	Appendix IV	Radium-226/228	pCi/L	8	0	0%	8	2023-01-12	4.44



Table 7: Seasonality Tests

ID	Well	Constituent Type	Constituent	Unit	% NDs	Full							Without Non-Detects										
						Sample Size					p-Value		Sample Size					p-Value					
						Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA		
02_2_04	MW-2	Appendix IV	Fluoride	mg/L	100%	3	3	6	5	17	NA	0.200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
02_2_08	MW-2	Appendix IV	Antimony	mg/L	100%	3	3	6	5	17	NA	NA	0.200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
02_2_09	MW-2	Appendix IV	Arsenic	mg/L	76%	3	3	6	5	17	0.460	0.348	0.383	2	0	1	1	4	0.632	0.853	0.837		
02_2_10	MW-2	Appendix IV	Barium	mg/L	0%	3	3	6	5	17	0.994	0.940	0.939	3	3	6	5	17	0.994	0.940	0.939		
02_2_11	MW-2	Appendix IV	Beryllium	mg/L	100%	3	3	6	5	17	NA	NA	0.200	NA	NA	NA	NA	NA	NA	NA	NA	NA	
02_2_12	MW-2	Appendix IV	Cadmium	mg/L	100%	3	3	6	5	17	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
02_2_13	MW-2	Appendix IV	Chromium	mg/L	100%	3	3	6	5	17	NA	NA	0.200	NA	NA	NA	NA	NA	NA	NA	NA	NA	
02_2_14	MW-2	Appendix IV	Cobalt	mg/L	100%	3	3	6	5	17	NA	NA	0.200	NA	NA	NA	NA	NA	NA	NA	NA	NA	
02_2_15	MW-2	Appendix IV	Lead	mg/L	100%	3	3	6	5	17	NA	0.200	0.200	NA	NA	NA	NA	NA	NA	NA	NA	NA	
02_2_16	MW-2	Appendix IV	Lithium	mg/L	0%	3	3	6	5	17	0.034 *	0.008 **	0.012 *	3	3	6	5	17	0.034 *	0.008 **	0.012 *		
02_2_17	MW-2	Appendix IV	Mercury	mg/L	100%	3	3	6	5	17	NA	0.200	0.200	NA	NA	NA	NA	NA	NA	NA	NA	NA	
02_2_18	MW-2	Appendix IV	Molybdenum	mg/L	0%	3	3	6	5	17	0.166	0.227	0.221	3	3	6	5	17	0.166	0.227	0.221		
02_2_20	MW-2	Appendix IV	Radium-226/228	pCi/L	0%	3	3	6	5	17	0.961	0.874	0.963	3	3	6	5	17	0.961	0.874	0.963		
02_2_22	MW-2	Appendix IV	Selenium	mg/L	100%	3	3	6	5	17	NA	NA	0.200	NA	NA	NA	NA	NA	NA	NA	NA	NA	
02_2_23	MW-2	Appendix IV	Thallium	mg/L	100%	3	3	6	5	17	NA	NA	0.200	NA	NA	NA	NA	NA	NA	NA	NA	NA	
03_2_04	MW-3	Appendix IV	Fluoride	mg/L	100%	2	1	3	0	6	NA	0.000 ***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
03_2_08	MW-3	Appendix IV	Antimony	mg/L	100%	2	1	3	0	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
03_2_09	MW-3	Appendix IV	Arsenic	mg/L	0%	2	1	3	0	6	0.607	0.716	0.716	2	1	3	0	6	0.607	0.716	0.716		
03_2_10	MW-3	Appendix IV	Barium	mg/L	0%	2	1	3	0	6	0.447	0.530	0.535	2	1	3	0	6	0.447	0.530	0.535		
03_2_11	MW-3	Appendix IV	Beryllium	mg/L	100%	2	1	3	0	6	NA	NA	0.000 ***	NA	NA	NA	NA	NA	NA	NA	NA	NA	
03_2_12	MW-3	Appendix IV	Cadmium	mg/L	100%	2	1	3	0	6	NA	NA	0.000 ***	NA	NA	NA	NA	NA	NA	NA	NA	NA	
03_2_13	MW-3	Appendix IV	Chromium	mg/L	100%	2	1	3	0	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
03_2_14	MW-3	Appendix IV	Cobalt	mg/L	100%	2	1	3	0	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
03_2_15	MW-3	Appendix IV	Lead	mg/L	100%	2	1	3	0	6	NA	NA	0.000 ***	NA	NA	NA	NA	NA	NA	NA	NA	NA	
03_2_16	MW-3	Appendix IV	Lithium	mg/L	0%	2	1	3	0	6	0.322	0.470	0.453	2	1	3	0	6	0.322	0.470	0.453		
03_2_17	MW-3	Appendix IV	Mercury	mg/L	100%	2	1	3	0	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
03_2_18	MW-3	Appendix IV	Molybdenum	mg/L	0%	2	1	3	0	6	0.366	0.412	0.416	2	1	3	0	6	0.366	0.412	0.416		
03_2_20	MW-3	Appendix IV	Radium-226/228	pCi/L	0%	2	1	3	0	6	0.651	0.645	0.629	2	1	3	0	6	0.651	0.645	0.629		
03_2_22	MW-3	Appendix IV	Selenium	mg/L	100%	2	1	3	0	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
03_2_23	MW-3	Appendix IV	Thallium	mg/L	100%	2	1	3	0	6	NA	NA	0.000 ***	NA	NA	NA	NA	NA	NA	NA	NA	NA	
05_2_04	MW-5	Appendix IV	Fluoride	mg/L	100%	3	3	6	5	17	NA	0.200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
05_2_08	MW-5	Appendix IV	Antimony	mg/L	100%	3	3	6	5	17	NA	NA	0.200	NA	NA	NA	NA	NA	NA	NA	NA	NA	
05_2_09	MW-5	Appendix IV	Arsenic	mg/L	71%	3	3	6	5	17	0.524	0.335	0.386	1	3	1	0	5	0.325	0.319	0.449		
05_2_10	MW-5	Appendix IV	Barium	mg/L	0%	3	3	6	5	17	0.599	0.345	0.407	3	3	6	5	17	0.599	0.345	0.407		
05_2_11	MW-5	Appendix IV	Beryllium	mg/L	100%	3	3	6	5	17	NA	NA	0.200	NA	NA	NA	NA	NA	NA	NA	NA	NA	
05_2_12	MW-5	Appendix IV	Cadmium	mg/L	100%	3	3	6	5	17	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
05_2_13	MW-5	Appendix IV	Chromium	mg/L	88%	3	3	6	5	17	0.271	0.256	0.265	1	1	0	0	2	0.317	NA	NA	NA	
05_2_14	MW-5	Appendix IV	Cobalt	mg/L	94%	3	3	6	5	17	0.198	0.200	0.200	0	1	0	0	1	NA	NA	NA	NA	
05_2_15	MW-5	Appendix IV	Lead	mg/L	82%	3	3	6	5	17	0.271	0.226	0.247	1	1	1	0	3	0.368	NA	NA	NA	

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05



Table 7: Seasonality Tests (continued)

ID	Well	Constituent Type	Constituent	Unit	% NDs	Full							Without Non-Detects								
						Sample Size					p-Value		Sample Size					p-Value			
						Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA
05_2_16	MW-5	Appendix IV	Lithium	mg/L	0%	3	3	6	5	17	0.642	0.611	0.468	3	3	6	5	17	0.642	0.611	0.468
05_2_17	MW-5	Appendix IV	Mercury	mg/L	100%	3	3	6	5	17	NA	0.200	0.200	NA	NA	NA	NA	NA	NA	NA	NA
05_2_18	MW-5	Appendix IV	Molybdenum	mg/L	0%	3	3	6	5	17	0.204	0.149	0.195	3	3	6	5	17	0.204	0.149	0.195
05_2_20	MW-5	Appendix IV	Radium-226/228	pCi/L	0%	3	3	6	5	17	0.115	0.158	0.135	3	3	6	5	17	0.115	0.158	0.135
05_2_22	MW-5	Appendix IV	Selenium	mg/L	100%	3	3	6	5	17	NA	NA	0.200	NA	NA	NA	NA	NA	NA	NA	NA
05_2_23	MW-5	Appendix IV	Thallium	mg/L	100%	3	3	6	5	17	NA	NA	0.200	NA	NA	NA	NA	NA	NA	NA	NA
06_2_04	MW-6	Appendix IV	Fluoride	mg/L	100%	3	3	6	5	17	NA	0.200	NA	NA	NA	NA	NA	NA	NA	NA	NA
06_2_08	MW-6	Appendix IV	Antimony	mg/L	100%	3	3	6	5	17	NA	NA	0.200	NA	NA	NA	NA	NA	NA	NA	NA
06_2_09	MW-6	Appendix IV	Arsenic	mg/L	100%	3	3	6	5	17	NA	NA	0.200	NA	NA	NA	NA	NA	NA	NA	NA
06_2_10	MW-6	Appendix IV	Barium	mg/L	0%	3	3	6	5	17	0.022 *	0.014 *	0.019 *	3	3	6	5	17	0.022 *	0.014 *	0.019 *
06_2_11	MW-6	Appendix IV	Beryllium	mg/L	100%	3	3	6	5	17	NA	NA	0.200	NA	NA	NA	NA	NA	NA	NA	NA
06_2_12	MW-6	Appendix IV	Cadmium	mg/L	100%	3	3	6	5	17	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
06_2_13	MW-6	Appendix IV	Chromium	mg/L	100%	3	3	6	5	17	NA	NA	0.200	NA	NA	NA	NA	NA	NA	NA	NA
06_2_14	MW-6	Appendix IV	Cobalt	mg/L	100%	3	3	6	5	17	NA	NA	0.200	NA	NA	NA	NA	NA	NA	NA	NA
06_2_15	MW-6	Appendix IV	Lead	mg/L	100%	3	3	6	5	17	NA	0.200	0.200	NA	NA	NA	NA	NA	NA	NA	NA
06_2_16	MW-6	Appendix IV	Lithium	mg/L	0%	3	3	6	5	17	0.016 *	0.002 **	0.003 **	3	3	6	5	17	0.016 *	0.002 **	0.003 **
06_2_17	MW-6	Appendix IV	Mercury	mg/L	100%	3	3	6	5	17	NA	0.200	0.200	NA	NA	NA	NA	NA	NA	NA	NA
06_2_18	MW-6	Appendix IV	Molybdenum	mg/L	0%	3	3	6	5	17	0.075	0.076	0.089	3	3	6	5	17	0.075	0.076	0.089
06_2_20	MW-6	Appendix IV	Radium-226/228	pCi/L	0%	3	3	6	5	17	0.186	0.097	NA	3	3	6	5	17	0.186	0.097	NA
06_2_22	MW-6	Appendix IV	Selenium	mg/L	100%	3	3	6	5	17	NA	NA	0.200	NA	NA	NA	NA	NA	NA	NA	NA
06_2_23	MW-6	Appendix IV	Thallium	mg/L	100%	3	3	6	5	17	NA	NA	0.200	NA	NA	NA	NA	NA	NA	NA	NA
07_2_04	MW-7	Appendix IV	Fluoride	mg/L	91%	4	0	5	2	11	0.417	0.463	0.463	1	0	0	0	1	NA	NA	NA
07_2_08	MW-7	Appendix IV	Antimony	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
07_2_09	MW-7	Appendix IV	Arsenic	mg/L	0%	4	0	5	2	11	0.595	0.724	0.767	4	0	5	2	11	0.595	0.724	0.767
07_2_10	MW-7	Appendix IV	Barium	mg/L	0%	4	0	5	2	11	0.684	0.699	0.709	4	0	5	2	11	0.684	0.699	0.709
07_2_11	MW-7	Appendix IV	Beryllium	mg/L	100%	4	0	5	2	11	NA	0.600	0.600	NA	NA	NA	NA	NA	NA	NA	NA
07_2_12	MW-7	Appendix IV	Cadmium	mg/L	100%	4	0	5	2	11	NA	0.600	0.600	NA	NA	NA	NA	NA	NA	NA	NA
07_2_13	MW-7	Appendix IV	Chromium	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
07_2_14	MW-7	Appendix IV	Cobalt	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
07_2_15	MW-7	Appendix IV	Lead	mg/L	100%	4	0	5	2	11	NA	0.600	0.600	NA	NA	NA	NA	NA	NA	NA	NA
07_2_16	MW-7	Appendix IV	Lithium	mg/L	0%	4	0	5	2	11	0.128	0.412	0.452	4	0	5	2	11	0.128	0.412	0.452
07_2_17	MW-7	Appendix IV	Mercury	mg/L	91%	4	0	5	2	11	NA	NA	0.600	0	0	1	0	1	NA	NA	NA
07_2_18	MW-7	Appendix IV	Molybdenum	mg/L	0%	4	0	5	2	11	0.225	0.492	0.491	4	0	5	2	11	0.225	0.492	0.491
07_2_20	MW-7	Appendix IV	Radium-226/228	pCi/L	0%	4	0	5	2	11	0.851	0.859	0.873	4	0	5	2	11	0.851	0.859	0.873
07_2_22	MW-7	Appendix IV	Selenium	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
07_2_23	MW-7	Appendix IV	Thallium	mg/L	100%	4	0	5	2	11	NA	0.600	0.600	NA	NA	NA	NA	NA	NA	NA	NA
08_2_04	MW-8	Appendix IV	Fluoride	mg/L	91%	4	0	5	2	11	0.417	0.463	0.463	1	0	0	0	1	NA	NA	NA
08_2_08	MW-8	Appendix IV	Antimony	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
08_2_09	MW-8	Appendix IV	Arsenic	mg/L	100%	4	0	5	2	11	NA	0.600	0.600	NA	NA	NA	NA	NA	NA	NA	NA

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05



Table 7: Seasonality Tests (continued)

ID	Well	Constituent Type	Constituent	Unit	% NDs	Full						Without Non-Detects									
						Sample Size					p-Value			Sample Size					p-Value		
						Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA
08_2_10	MW-8	Appendix IV	Barium	mg/L	0%	4	0	5	2	11	0.265	0.236	0.219	4	0	5	2	11	0.265	0.236	0.219
08_2_11	MW-8	Appendix IV	Beryllium	mg/L	100%	4	0	5	2	11	NA	0.600	0.600	NA	NA	NA	NA	NA	NA	NA	NA
08_2_12	MW-8	Appendix IV	Cadmium	mg/L	100%	4	0	5	2	11	NA	0.600	0.600	NA	NA	NA	NA	NA	NA	NA	NA
08_2_13	MW-8	Appendix IV	Chromium	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
08_2_14	MW-8	Appendix IV	Cobalt	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
08_2_15	MW-8	Appendix IV	Lead	mg/L	100%	4	0	5	2	11	NA	0.600	0.600	NA	NA	NA	NA	NA	NA	NA	NA
08_2_16	MW-8	Appendix IV	Lithium	mg/L	45%	4	0	5	2	11	0.167	0.054	0.079	2	0	2	2	6	0.257	0.257	0.287
08_2_17	MW-8	Appendix IV	Mercury	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
08_2_18	MW-8	Appendix IV	Molybdenum	mg/L	82%	4	0	5	2	11	0.300	0.292	0.316	0	0	1	1	2	0.317	NA	NA
08_2_20	MW-8	Appendix IV	Radium-226/228	pCi/L	0%	4	0	5	2	11	0.851	0.658	0.962	4	0	5	2	11	0.851	0.658	0.962
08_2_22	MW-8	Appendix IV	Selenium	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
08_2_23	MW-8	Appendix IV	Thallium	mg/L	100%	4	0	5	2	11	NA	0.600	0.600	NA	NA	NA	NA	NA	NA	NA	NA
09_2_04	MW-9	Appendix IV	Fluoride	mg/L	91%	4	0	5	2	11	0.417	0.463	0.463	1	0	0	0	1	NA	NA	NA
09_2_08	MW-9	Appendix IV	Antimony	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
09_2_09	MW-9	Appendix IV	Arsenic	mg/L	100%	4	0	5	2	11	NA	0.600	0.600	NA	NA	NA	NA	NA	NA	NA	NA
09_2_10	MW-9	Appendix IV	Barium	mg/L	0%	4	0	5	2	11	0.372	0.405	0.411	4	0	5	2	11	0.372	0.405	0.411
09_2_11	MW-9	Appendix IV	Beryllium	mg/L	100%	4	0	5	2	11	NA	0.600	0.600	NA	NA	NA	NA	NA	NA	NA	NA
09_2_12	MW-9	Appendix IV	Cadmium	mg/L	100%	4	0	5	2	11	NA	0.600	0.600	NA	NA	NA	NA	NA	NA	NA	NA
09_2_13	MW-9	Appendix IV	Chromium	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
09_2_14	MW-9	Appendix IV	Cobalt	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
09_2_15	MW-9	Appendix IV	Lead	mg/L	100%	4	0	5	2	11	NA	0.600	0.600	NA	NA	NA	NA	NA	NA	NA	NA
09_2_16	MW-9	Appendix IV	Lithium	mg/L	100%	4	0	5	2	11	0.549	0.600	0.600	NA	NA	NA	NA	NA	NA	NA	NA
09_2_17	MW-9	Appendix IV	Mercury	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
09_2_18	MW-9	Appendix IV	Molybdenum	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
09_2_20	MW-9	Appendix IV	Radium-226/228	pCi/L	0%	4	0	5	2	11	0.113	0.145	0.198	4	0	5	2	11	0.113	0.145	0.198
09_2_22	MW-9	Appendix IV	Selenium	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
09_2_23	MW-9	Appendix IV	Thallium	mg/L	100%	4	0	5	2	11	NA	0.600	0.600	NA	NA	NA	NA	NA	NA	NA	NA
10_2_04	MW-10	Appendix IV	Fluoride	mg/L	91%	4	0	5	2	11	0.417	0.463	0.463	1	0	0	0	1	NA	NA	NA
10_2_08	MW-10	Appendix IV	Antimony	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
10_2_09	MW-10	Appendix IV	Arsenic	mg/L	100%	4	0	5	2	11	NA	0.600	0.600	NA	NA	NA	NA	NA	NA	NA	NA
10_2_10	MW-10	Appendix IV	Barium	mg/L	0%	4	0	5	2	11	0.440	0.573	0.569	4	0	5	2	11	0.440	0.573	0.569
10_2_11	MW-10	Appendix IV	Beryllium	mg/L	100%	4	0	5	2	11	NA	0.600	0.600	NA	NA	NA	NA	NA	NA	NA	NA
10_2_12	MW-10	Appendix IV	Cadmium	mg/L	100%	4	0	5	2	11	NA	0.600	0.600	NA	NA	NA	NA	NA	NA	NA	NA
10_2_13	MW-10	Appendix IV	Chromium	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
10_2_14	MW-10	Appendix IV	Cobalt	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
10_2_15	MW-10	Appendix IV	Lead	mg/L	100%	4	0	5	2	11	NA	0.600	0.600	NA	NA	NA	NA	NA	NA	NA	NA
10_2_16	MW-10	Appendix IV	Lithium	mg/L	100%	4	0	5	2	11	0.549	0.600	0.600	NA	NA	NA	NA	NA	NA	NA	NA
10_2_17	MW-10	Appendix IV	Mercury	mg/L	91%	4	0	5	2	11	NA	NA	0.600	0	0	1	0	1	NA	NA	NA
10_2_18	MW-10	Appendix IV	Molybdenum	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05



Table 7: Seasonality Tests (continued)

ID	Well	Constituent Type	Constituent	Unit	% NDs	Full							Without Non-Detects												
						Sample Size					p-Value		Sample Size					p-Value							
						Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA				
10_2_20	MW-10	Appendix IV	Radium-226/228	pCi/L	0%	4	0	5	2	11	0.121	0.113	0.117	4	0	5	2	11	0.121	0.113	0.117				
10_2_22	MW-10	Appendix IV	Selenium	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA				
10_2_23	MW-10	Appendix IV	Thallium	mg/L	100%	4	0	5	2	11	NA	0.600	0.600	NA	NA	NA	NA	NA	NA	NA	NA				
13_2_04	MW-13	Appendix IV	Fluoride	mg/L	100%	2	3	4	2	11	NA	0.217	NA	NA	NA	NA	NA	NA	NA	NA	NA				
13_2_08	MW-13	Appendix IV	Antimony	mg/L	100%	2	3	4	2	11	NA	NA	0.217	NA	NA	NA	NA	NA	NA	NA	NA				
13_2_09	MW-13	Appendix IV	Arsenic	mg/L	91%	2	3	4	2	11	0.626	0.697	0.697	0	0	1	0	1	NA	NA	NA				
13_2_10	MW-13	Appendix IV	Barium	mg/L	0%	2	3	4	2	11	0.133	0.153	0.124	2	3	4	2	11	0.133	0.153	0.124				
13_2_11	MW-13	Appendix IV	Beryllium	mg/L	100%	2	3	4	2	11	NA	0.217	0.217	NA	NA	NA	NA	NA	NA	NA	NA				
13_2_12	MW-13	Appendix IV	Cadmium	mg/L	100%	2	3	4	2	11	NA	0.217	0.217	NA	NA	NA	NA	NA	NA	NA	NA				
13_2_13	MW-13	Appendix IV	Chromium	mg/L	100%	2	3	4	2	11	NA	NA	0.217	NA	NA	NA	NA	NA	NA	NA	NA				
13_2_14	MW-13	Appendix IV	Cobalt	mg/L	100%	2	3	4	2	11	NA	NA	0.217	NA	NA	NA	NA	NA	NA	NA	NA				
13_2_15	MW-13	Appendix IV	Lead	mg/L	100%	2	3	4	2	11	NA	0.217	0.217	NA	NA	NA	NA	NA	NA	NA	NA				
13_2_16	MW-13	Appendix IV	Lithium	mg/L	100%	2	3	4	2	11	NA	NA	0.217	NA	NA	NA	NA	NA	NA	NA	NA				
13_2_17	MW-13	Appendix IV	Mercury	mg/L	100%	2	3	4	2	11	NA	NA	0.217	NA	NA	NA	NA	NA	NA	NA	NA				
13_2_18	MW-13	Appendix IV	Molybdenum	mg/L	100%	2	3	4	2	11	NA	NA	0.217	NA	NA	NA	NA	NA	NA	NA	NA				
13_2_20	MW-13	Appendix IV	Radium-226/228	pCi/L	0%	2	3	4	2	11	0.427	0.555	0.651	2	3	4	2	11	0.427	0.555	0.651				
13_2_22	MW-13	Appendix IV	Selenium	mg/L	100%	2	3	4	2	11	NA	NA	0.217	NA	NA	NA	NA	NA	NA	NA	NA				
13_2_23	MW-13	Appendix IV	Thallium	mg/L	100%	2	3	4	2	11	NA	0.217	0.217	NA	NA	NA	NA	NA	NA	NA	NA				
14_2_04	MW-14	Appendix IV	Fluoride	mg/L	100%	2	2	3	1	8	NA	0.479	NA	NA	NA	NA	NA	NA	NA	NA	NA				
14_2_08	MW-14	Appendix IV	Antimony	mg/L	100%	2	2	3	1	8	NA	NA	0.479	NA	NA	NA	NA	NA	NA	NA	NA				
14_2_09	MW-14	Appendix IV	Arsenic	mg/L	0%	2	2	3	1	8	0.290	0.293	0.365	2	2	3	1	8	0.290	0.293	0.365				
14_2_10	MW-14	Appendix IV	Barium	mg/L	0%	2	2	3	1	8	0.868	0.688	0.723	2	2	3	1	8	0.868	0.688	0.723				
14_2_11	MW-14	Appendix IV	Beryllium	mg/L	100%	2	2	3	1	8	NA	NA	0.479	NA	NA	NA	NA	NA	NA	NA	NA				
14_2_12	MW-14	Appendix IV	Cadmium	mg/L	100%	2	2	3	1	8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
14_2_13	MW-14	Appendix IV	Chromium	mg/L	100%	2	2	3	1	8	NA	NA	0.479	NA	NA	NA	NA	NA	NA	NA	NA				
14_2_14	MW-14	Appendix IV	Cobalt	mg/L	100%	2	2	3	1	8	NA	NA	0.479	NA	NA	NA	NA	NA	NA	NA	NA				
14_2_15	MW-14	Appendix IV	Lead	mg/L	100%	2	2	3	1	8	NA	0.479	0.479	NA	NA	NA	NA	NA	NA	NA	NA				
14_2_16	MW-14	Appendix IV	Lithium	mg/L	0%	2	2	3	1	8	0.131	0.006	**	0.007	**	2	2	3	1	8	0.131	0.006	**	0.007	**
14_2_17	MW-14	Appendix IV	Mercury	mg/L	100%	2	2	3	1	8	NA	0.479	0.479	NA	NA	NA	NA	NA	NA	NA	NA	NA			
14_2_18	MW-14	Appendix IV	Molybdenum	mg/L	0%	2	2	3	1	8	0.904	0.914	0.912	2	2	3	1	8	0.904	0.914	0.912				
14_2_20	MW-14	Appendix IV	Radium-226/228	pCi/L	0%	2	2	3	1	8	0.460	0.571	0.566	2	2	3	1	8	0.460	0.571	0.566				
14_2_22	MW-14	Appendix IV	Selenium	mg/L	75%	2	2	3	1	8	0.283	0.403	0.360	0	0	2	0	2	NA	NA	NA				
14_2_23	MW-14	Appendix IV	Thallium	mg/L	100%	2	2	3	1	8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
15_2_04	MW-15	Appendix IV	Fluoride	mg/L	100%	2	2	3	1	8	NA	0.479	NA	NA	NA	NA	NA	NA	NA	NA	NA				
15_2_08	MW-15	Appendix IV	Antimony	mg/L	100%	2	2	3	1	8	NA	NA	0.479	NA	NA	NA	NA	NA	NA	NA	NA				
15_2_09	MW-15	Appendix IV	Arsenic	mg/L	100%	2	2	3	1	8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
15_2_10	MW-15	Appendix IV	Barium	mg/L	0%	2	2	3	1	8	0.187	0.379	0.331	2	2	3	1	8	0.187	0.379	0.331				
15_2_11	MW-15	Appendix IV	Beryllium	mg/L	100%	2	2	3	1	8	NA	NA	0.479	NA	NA	NA	NA	NA	NA	NA	NA				
15_2_12	MW-15	Appendix IV	Cadmium	mg/L	100%	2	2	3	1	8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05



Table 7: Seasonality Tests (continued)

ID	Well	Constituent Type	Constituent	Unit	% NDs	Full							Without Non-Detects												
						Sample Size					p-Value		Sample Size					p-Value							
						Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA				
15_2_13	MW-15	Appendix IV	Chromium	mg/L	100%	2	2	3	1	8	NA	NA	0.479	NA	NA	NA	NA	NA	NA	NA	NA	NA			
15_2_14	MW-15	Appendix IV	Cobalt	mg/L	100%	2	2	3	1	8	NA	NA	0.479	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
15_2_15	MW-15	Appendix IV	Lead	mg/L	100%	2	2	3	1	8	NA	0.479	0.479	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
15_2_16	MW-15	Appendix IV	Lithium	mg/L	88%	2	2	3	1	8	0.392	0.479	0.479	1	0	0	0	1	NA	NA	NA	NA	NA		
15_2_17	MW-15	Appendix IV	Mercury	mg/L	100%	2	2	3	1	8	NA	0.479	0.479	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
15_2_18	MW-15	Appendix IV	Molybdenum	mg/L	100%	2	2	3	1	8	NA	NA	0.479	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
15_2_20	MW-15	Appendix IV	Radium-226/228	pCi/L	0%	2	2	3	1	8	0.848	0.672	0.741	2	2	3	1	8	0.848	0.672	0.741	0.848	0.672	0.741	
15_2_22	MW-15	Appendix IV	Selenium	mg/L	25%	2	2	3	1	8	0.182	0.142	0.106	2	2	2	0	6	0.276	0.264	0.232	0.276	0.264	0.232	
15_2_23	MW-15	Appendix IV	Thallium	mg/L	100%	2	2	3	1	8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
16A_2_04	MW-16A	Appendix IV	Fluoride	mg/L	100%	1	3	2	3	9	0.321	0.372	0.372	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
16A_2_08	MW-16A	Appendix IV	Antimony	mg/L	100%	1	3	2	3	9	NA	NA	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
16A_2_09	MW-16A	Appendix IV	Arsenic	mg/L	0%	1	3	2	3	9	0.274	0.308	0.326	1	3	2	3	9	0.274	0.308	0.326	0.274	0.308	0.326	
16A_2_10	MW-16A	Appendix IV	Barium	mg/L	0%	1	3	2	3	9	0.060	0.002	**	0.002	**	1	3	2	3	9	0.060	0.002	**	0.002	**
16A_2_11	MW-16A	Appendix IV	Beryllium	mg/L	100%	1	3	2	3	9	NA	0.000	***	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16A_2_12	MW-16A	Appendix IV	Cadmium	mg/L	100%	1	3	2	3	9	NA	0.000	***	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16A_2_13	MW-16A	Appendix IV	Chromium	mg/L	100%	1	3	2	3	9	NA	NA	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16A_2_14	MW-16A	Appendix IV	Cobalt	mg/L	100%	1	3	2	3	9	NA	NA	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16A_2_15	MW-16A	Appendix IV	Lead	mg/L	100%	1	3	2	3	9	NA	0.000	***	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16A_2_16	MW-16A	Appendix IV	Lithium	mg/L	89%	1	3	2	3	9	NA	NA	0.000	***	1	0	0	0	1	NA	NA	NA	NA	NA	NA
16A_2_17	MW-16A	Appendix IV	Mercury	mg/L	100%	1	3	2	3	9	NA	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16A_2_18	MW-16A	Appendix IV	Molybdenum	mg/L	100%	1	3	2	3	9	NA	NA	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16A_2_20	MW-16A	Appendix IV	Radium-226/228	pCi/L	0%	1	3	2	3	9	0.346	0.497	0.507	1	3	2	3	9	0.346	0.497	0.507	0.346	0.497	0.507	
16A_2_22	MW-16A	Appendix IV	Selenium	mg/L	89%	1	3	2	3	9	NA	NA	0.000	***	0	0	0	1	1	NA	NA	NA	NA	NA	NA
16A_2_23	MW-16A	Appendix IV	Thallium	mg/L	100%	1	3	2	3	9	NA	0.000	***	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16B_2_04	MW-16B	Appendix IV	Fluoride	mg/L	89%	1	3	2	3	9	0.321	0.372	0.372	0	0	1	0	1	NA	NA	NA	NA	NA	NA	NA
16B_2_08	MW-16B	Appendix IV	Antimony	mg/L	100%	1	3	2	3	9	NA	NA	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16B_2_09	MW-16B	Appendix IV	Arsenic	mg/L	100%	1	3	2	3	9	NA	0.000	***	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16B_2_10	MW-16B	Appendix IV	Barium	mg/L	0%	1	3	2	3	9	0.130	0.151	0.150	1	3	2	3	9	0.130	0.151	0.150	0.130	0.151	0.150	
16B_2_11	MW-16B	Appendix IV	Beryllium	mg/L	100%	1	3	2	3	9	NA	0.000	***	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16B_2_12	MW-16B	Appendix IV	Cadmium	mg/L	100%	1	3	2	3	9	NA	0.000	***	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16B_2_13	MW-16B	Appendix IV	Chromium	mg/L	100%	1	3	2	3	9	NA	NA	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16B_2_14	MW-16B	Appendix IV	Cobalt	mg/L	100%	1	3	2	3	9	NA	NA	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16B_2_15	MW-16B	Appendix IV	Lead	mg/L	100%	1	3	2	3	9	NA	0.000	***	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16B_2_16	MW-16B	Appendix IV	Lithium	mg/L	0%	1	3	2	3	9	0.142	0.184	0.200	1	3	2	3	9	0.142	0.184	0.200	0.142	0.184	0.200	
16B_2_17	MW-16B	Appendix IV	Mercury	mg/L	100%	1	3	2	3	9	NA	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16B_2_18	MW-16B	Appendix IV	Molybdenum	mg/L	0%	1	3	2	3	9	0.177	0.052	0.080	1	3	2	3	9	0.177	0.052	0.080	0.177	0.052	0.080	
16B_2_20	MW-16B	Appendix IV	Radium-226/228	pCi/L	0%	1	3	2	3	9	0.945	0.802	0.869	1	3	2	3	9	0.945	0.802	0.869	0.945	0.802	0.869	
16B_2_22	MW-16B	Appendix IV	Selenium	mg/L	89%	1	3	2	3	9	0.572	0.667	0.667	0	0	0	1	1	NA	NA	NA	NA	NA	NA	NA
16B_2_23	MW-16B	Appendix IV	Thallium	mg/L	100%	1	3	2	3	9	NA	0.000	***	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05



Table 7: Seasonality Tests (continued)

ID	Well	Constituent Type	Constituent	Unit	% NDs	Full						Without Non-Detects											
						Sample Size					p-Value			Sample Size					p-Value				
						Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA		
7C_2_04	MW-7C	Appendix IV	Fluoride	mg/L	100%	1	4	3	3	11	NA	0.697	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
7C_2_08	MW-7C	Appendix IV	Antimony	mg/L	100%	1	4	3	3	11	NA	NA	0.697	NA	NA	NA	NA	NA	NA	NA	NA	NA	
7C_2_09	MW-7C	Appendix IV	Arsenic	mg/L	0%	1	4	3	3	11	0.170	0.159	0.163	1	4	3	3	11	0.170	0.159	0.163		
7C_2_10	MW-7C	Appendix IV	Barium	mg/L	0%	1	4	3	3	11	0.261	0.270	0.264	1	4	3	3	11	0.261	0.270	0.264		
7C_2_11	MW-7C	Appendix IV	Beryllium	mg/L	100%	1	4	3	3	11	NA	0.697	0.697	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7C_2_12	MW-7C	Appendix IV	Cadmium	mg/L	73%	1	4	3	3	11	0.244	0.204	0.221	0	1	0	2	3	0.221	0.333	0.310		
7C_2_13	MW-7C	Appendix IV	Chromium	mg/L	100%	1	4	3	3	11	NA	NA	0.697	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7C_2_14	MW-7C	Appendix IV	Cobalt	mg/L	100%	1	4	3	3	11	NA	NA	0.697	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7C_2_15	MW-7C	Appendix IV	Lead	mg/L	100%	1	4	3	3	11	NA	0.697	0.697	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7C_2_16	MW-7C	Appendix IV	Lithium	mg/L	0%	1	4	3	3	11	0.736	0.839	0.841	1	4	3	3	11	0.736	0.839	0.841		
7C_2_17	MW-7C	Appendix IV	Mercury	mg/L	100%	1	4	3	3	11	NA	NA	0.697	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7C_2_18	MW-7C	Appendix IV	Molybdenum	mg/L	0%	1	4	3	3	11	0.204	0.193	0.197	1	4	3	3	11	0.204	0.193	0.197		
7C_2_20	MW-7C	Appendix IV	Radium-226/228	pCi/L	0%	1	4	3	3	11	0.437	0.382	0.485	1	4	3	3	11	0.437	0.382	0.485		
7C_2_22	MW-7C	Appendix IV	Selenium	mg/L	100%	1	4	3	3	11	NA	NA	0.697	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7C_2_23	MW-7C	Appendix IV	Thallium	mg/L	100%	1	4	3	3	11	NA	0.697	0.697	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

*** p < 0.001, ** p < 0.01, * p < 0.05



Table 8: Trend Tests: Lognormal MLE and MK

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Type	Method	Slope	p-value	Trend
02_2_10	MW-2	Appendix IV	Barium	mg/L	17	0	0%	Parametric	Lognormal MLE	-0.0000806	0.134	↔
02_2_16	MW-2	Appendix IV	Lithium	mg/L	17	0	0%	Parametric	Lognormal MLE	-0.000144	0.051	↔
02_2_18	MW-2	Appendix IV	Molybdenum	mg/L	17	0	0%	Parametric	Lognormal MLE	0.000346	0.000	↑
02_2_20	MW-2	Appendix IV	Radium-226/228	pCi/L	17	0	0%	Parametric	Lognormal MLE	-0.0000259	0.964	↔
05_2_10	MW-5	Appendix IV	Barium	mg/L	17	0	0%	Parametric	Lognormal MLE	-0.0000848	0.451	↔
05_2_16	MW-5	Appendix IV	Lithium	mg/L	17	0	0%	Parametric	Lognormal MLE	-0.0000153	0.956	↔
05_2_18	MW-5	Appendix IV	Molybdenum	mg/L	17	0	0%	Parametric	Lognormal MLE	-0.0000717	0.824	↔
05_2_20	MW-5	Appendix IV	Radium-226/228	pCi/L	17	0	0%	Parametric	Lognormal MLE	0.000200	0.640	↔
06_2_10	MW-6	Appendix IV	Barium	mg/L	17	0	0%	Parametric	Lognormal MLE	-0.0000931	0.226	↔
06_2_16	MW-6	Appendix IV	Lithium	mg/L	17	0	0%	Parametric	Lognormal MLE	0.000107	0.269	↔
06_2_18	MW-6	Appendix IV	Molybdenum	mg/L	17	0	0%	Parametric	Lognormal MLE	-0.000136	0.302	↔
07_2_09	MW-7	Appendix IV	Arsenic	mg/L	11	0	0%	Nonparametric	MK	-0.00000281	0.070	↔
07_2_10	MW-7	Appendix IV	Barium	mg/L	11	0	0%	Parametric	Lognormal MLE	-0.000193	0.024	↔
07_2_16	MW-7	Appendix IV	Lithium	mg/L	11	0	0%	Parametric	Lognormal MLE	-0.000527	0.000	↓
07_2_18	MW-7	Appendix IV	Molybdenum	mg/L	11	0	0%	Nonparametric	MK	-0.000125	0.696	↔
07_2_20	MW-7	Appendix IV	Radium-226/228	pCi/L	11	0	0%	Parametric	Lognormal MLE	0.000336	0.677	↔
08_2_10	MW-8	Appendix IV	Barium	mg/L	11	0	0%	Parametric	Lognormal MLE	0.0000124	0.948	↔
08_2_16	MW-8	Appendix IV	Lithium	mg/L	11	5	45%	Parametric	Lognormal MLE	0.000671	0.323	↔
08_2_20	MW-8	Appendix IV	Radium-226/228	pCi/L	11	0	0%	Parametric	Lognormal MLE	0.000783	0.591	↔
09_2_10	MW-9	Appendix IV	Barium	mg/L	11	0	0%	Parametric	Lognormal MLE	0.0000657	0.452	↔
09_2_20	MW-9	Appendix IV	Radium-226/228	pCi/L	11	0	0%	Parametric	Lognormal MLE	0.000374	0.745	↔
10_2_10	MW-10	Appendix IV	Barium	mg/L	11	0	0%	Parametric	Lognormal MLE	-0.000276	0.000	↓
10_2_20	MW-10	Appendix IV	Radium-226/228	pCi/L	11	0	0%	Parametric	Lognormal MLE	-0.000248	0.752	↔
13_2_10	MW-13	Appendix IV	Barium	mg/L	11	0	0%	Parametric	Lognormal MLE	0.000657	0.017	↔
13_2_20	MW-13	Appendix IV	Radium-226/228	pCi/L	11	0	0%	Parametric	Lognormal MLE	-0.00490	0.001	↓
14_2_09	MW-14	Appendix IV	Arsenic	mg/L	8	0	0%	Parametric	Lognormal MLE	0.00219	0.000	↑
14_2_10	MW-14	Appendix IV	Barium	mg/L	8	0	0%	Nonparametric	MK	0.0000157	0.902	↔
14_2_16	MW-14	Appendix IV	Lithium	mg/L	8	0	0%	Parametric	Lognormal MLE	-0.000548	0.000	↓
14_2_18	MW-14	Appendix IV	Molybdenum	mg/L	8	0	0%	Parametric	Lognormal MLE	0.000287	0.418	↔
14_2_20	MW-14	Appendix IV	Radium-226/228	pCi/L	8	0	0%	Parametric	Lognormal MLE	-0.00467	0.044	↔
15_2_10	MW-15	Appendix IV	Barium	mg/L	8	0	0%	Parametric	Lognormal MLE	0.000000282	0.165	↔
15_2_20	MW-15	Appendix IV	Radium-226/228	pCi/L	8	0	0%	Parametric	Lognormal MLE	0.00000119	0.033	↔
15_2_22	MW-15	Appendix IV	Selenium	mg/L	8	2	25%	Parametric	Lognormal MLE	-0.00000178	0.005	↓
16A_2_09	MW-16A	Appendix IV	Arsenic	mg/L	9	0	0%	Nonparametric	MK	0.00000366	0.098	↔
16A_2_10	MW-16A	Appendix IV	Barium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00104	0.041	↔
16A_2_20	MW-16A	Appendix IV	Radium-226/228	pCi/L	9	0	0%	Parametric	Lognormal MLE	0.00362	0.188	↔
16B_2_10	MW-16B	Appendix IV	Barium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.000105	0.348	↔
16B_2_16	MW-16B	Appendix IV	Lithium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.000411	0.013	↔
16B_2_18	MW-16B	Appendix IV	Molybdenum	mg/L	9	0	0%	Nonparametric	MK	0	1.000	↔
16B_2_20	MW-16B	Appendix IV	Radium-226/228	pCi/L	9	0	0%	Parametric	Lognormal MLE	0.00106	0.550	↔
7C_2_09	MW-7C	Appendix IV	Arsenic	mg/L	11	0	0%	Nonparametric	MK	0	0.184	↔
7C_2_10	MW-7C	Appendix IV	Barium	mg/L	11	0	0%	Parametric	Lognormal MLE	-0.0000884	0.349	↔
7C_2_16	MW-7C	Appendix IV	Lithium	mg/L	11	0	0%	Parametric	Lognormal MLE	-0.0000526	0.484	↔

(Table continues on next page)



Table 8: Trend Tests: Lognormal MLE and MK (continued)

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Type	Method	Slope	p-value	Trend
7C_2_18	MW-7C	Appendix IV	Molybdenum	mg/L	11	0	0%	Parametric	Lognormal MLE	-0.0000723	0.291	↔
7C_2_20	MW-7C	Appendix IV	Radium-226/228	pCi/L	11	0	0%	Parametric	Lognormal MLE	-0.00118	0.304	↔

Table 9: Trend Tests: Piecewise Linear-Linear

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Line 1			Line 2			Break 1	R-Squared	Overall Trend
								Slope	p-Value	Trend	Slope	p-Value	Trend			
02_2_09	MW-2	Appendix IV	Arsenic	mg/L	17	13	76%	0.0000147	0.188	↔	-0.00000588	0.630	↔	2022-01-31	0.311	↔
02_2_10	MW-2	Appendix IV	Barium	mg/L	17	0	0%	0.0000566	0.224	↔	-0.0000248	0.044	↔	2022-05-13	0.441	↔
02_2_16	MW-2	Appendix IV	Lithium	mg/L	17	0	0%	0.0000979	0.000	↑	-0.0000189	0.000	↓	2020-10-18	0.807	↔
02_2_18	MW-2	Appendix IV	Molybdenum	mg/L	17	0	0%	0.0000154	0.249	↔	0.00000305	0.032	↔	2020-09-27	0.562	↔
02_2_20	MW-2	Appendix IV	Radium-226/228	pCi/L	17	0	0%	-0.0182	0.583	↔	0.000194	0.688	↔	2020-06-12	0.108	↔
03_2_09	MW-3	Appendix IV	Arsenic	mg/L	6	0	0%	-0.0000000000000405	0.401	↔	0.00000571	0.000	↑	2023-02-06	1.000	↔
03_2_10	MW-3	Appendix IV	Barium	mg/L	6	0	0%	-0.00000466	0.019	↔	-0.0000000000000213	1.000	↔	2022-08-20	0.979	↔
03_2_16	MW-3	Appendix IV	Lithium	mg/L	6	0	0%	0.0000283	0.277	↔	-0.0000332	0.151	↔	2022-06-25	0.788	↔
03_2_20	MW-3	Appendix IV	Radium-226/228	pCi/L	6	0	0%	0.00498	0.153	↔	-0.00685	0.055	↔	2022-07-20	0.917	↔
05_2_09	MW-5	Appendix IV	Arsenic	mg/L	17	12	71%	-0.0000605	0.396	↔	0.00000660	0.523	↔	2020-06-09	0.200	↔
05_2_10	MW-5	Appendix IV	Barium	mg/L	17	0	0%	-0.000104	0.005	↓	0.00000780	0.299	↔	2020-11-06	0.541	↔
05_2_13	MW-5	Appendix IV	Chromium	mg/L	17	15	88%	-0.0000751	0.087	↔	0.000000456	0.456	↔	2020-06-22	0.678	↔
05_2_14	MW-5	Appendix IV	Cobalt	mg/L	17	16	94%	-0.0000357	0.000	↓	0.0000000000000763	0.383	↔	2020-05-26	1.000	↔
05_2_15	MW-5	Appendix IV	Lead	mg/L	17	14	82%	0.00000854	0.041	↔	-0.0000107	0.279	↔	2022-02-01	0.332	↔
05_2_16	MW-5	Appendix IV	Lithium	mg/L	17	0	0%	-0.0000416	0.329	↔	0.0000801	0.106	↔	2022-01-31	0.240	↔
05_2_18	MW-5	Appendix IV	Molybdenum	mg/L	17	0	0%	-0.0000584	0.114	↔	0.0000972	0.026	↔	2022-01-31	0.414	↔
05_2_20	MW-5	Appendix IV	Radium-226/228	pCi/L	17	0	0%	0.00747	0.208	↔	-0.000901	0.511	↔	2020-11-06	0.150	↔
06_2_10	MW-6	Appendix IV	Barium	mg/L	17	0	0%	0.0000671	0.142	↔	-0.0000922	0.051	↔	2020-09-15	0.361	↔
06_2_16	MW-6	Appendix IV	Lithium	mg/L	17	0	0%	0.000120	0.003	↑	-0.00000500	0.239	↔	2020-09-30	0.659	↔
06_2_18	MW-6	Appendix IV	Molybdenum	mg/L	17	0	0%	0.0000786	0.148	↔	-0.0000699	0.083	↔	2020-08-26	0.354	↔
06_2_20	MW-6	Appendix IV	Radium-226/228	pCi/L	17	0	0%	0.00547	0.030	↔	-0.00132	0.120	↔	2021-03-04	0.459	↔
07_2_04	MW-7	Appendix IV	Fluoride	mg/L	11	10	91%	-0.00136	0.507	↔	0.000393	0.355	↔	2021-12-06	0.189	↔
07_2_09	MW-7	Appendix IV	Arsenic	mg/L	11	0	0%	-0.00000535	0.014	↔	0.0000114	0.046	↔	2022-12-26	0.728	↔
07_2_10	MW-7	Appendix IV	Barium	mg/L	11	0	0%	-0.0000133	0.330	↔	0.00000571	0.880	↔	2023-01-29	0.324	↔
07_2_16	MW-7	Appendix IV	Lithium	mg/L	11	0	0%	0.0000596	0.028	↔	-0.0000851	0.000	↓	2022-02-16	0.940	↔
07_2_18	MW-7	Appendix IV	Molybdenum	mg/L	11	0	0%	0.000143	0.654	↔	-0.000256	0.004	↓	2021-11-26	0.764	↔
07_2_20	MW-7	Appendix IV	Radium-226/228	pCi/L	11	0	0%	-0.0102	0.531	↔	0.00238	0.477	↔	2021-11-02	0.126	↔
08_2_04	MW-8	Appendix IV	Fluoride	mg/L	11	10	91%	-0.00193	0.507	↔	0.000558	0.355	↔	2021-12-06	0.189	↔
08_2_10	MW-8	Appendix IV	Barium	mg/L	11	0	0%	-0.0000339	0.012	↔	0.0000191	0.066	↔	2022-03-25	0.701	↔
08_2_16	MW-8	Appendix IV	Lithium	mg/L	11	5	45%	-0.0000122	0.365	↔	0.0000110	0.358	↔	2022-06-08	0.216	↔
08_2_18	MW-8	Appendix IV	Molybdenum	mg/L	11	9	82%	-0.0000204	0.218	↔	0.0000000000000968	1.000	↔	2022-01-11	0.322	↔
08_2_20	MW-8	Appendix IV	Radium-226/228	pCi/L	11	0	0%	0.0179	0.100	↔	-0.00157	0.731	↔	2022-01-11	0.434	↔
09_2_04	MW-9	Appendix IV	Fluoride	mg/L	11	10	91%	-0.00198	0.507	↔	0.000574	0.355	↔	2021-12-06	0.189	↔
09_2_10	MW-9	Appendix IV	Barium	mg/L	11	0	0%	-0.00000426	0.103	↔	0.0000114	0.124	↔	2022-10-02	0.579	↔

(Table continues on next page)



Table 9: Trend Tests: Piecewise Linear-Linear (continued)

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Line 1			Line 2			Break 1	R-Squared	Overall Trend
								Slope	p-Value	Trend	Slope	p-Value	Trend			
09_2_16	MW-9	Appendix IV	Lithium	mg/L	11	11	100%	-0.000143	0.000	↓	0.00000000000000653	0.388	↔	2021-07-20	1.000	↔
09_2_20	MW-9	Appendix IV	Radium-226/228	pCi/L	11	0	0%	0.00359	0.155	↔	-0.00951	0.186	↔	2022-12-10	0.401	↔
10_2_04	MW-10	Appendix IV	Fluoride	mg/L	11	10	91%	-0.00191	0.507	↔	0.000554	0.355	↔	2021-12-06	0.189	↔
10_2_10	MW-10	Appendix IV	Barium	mg/L	11	0	0%	-0.0000185	0.024	↔	0.0000571	0.766	↔	2022-10-23	0.704	↔
10_2_16	MW-10	Appendix IV	Lithium	mg/L	11	11	100%	-0.000143	0.000	↓	0.00000000000000653	0.388	↔	2021-07-20	1.000	↔
10_2_20	MW-10	Appendix IV	Radium-226/228	pCi/L	11	0	0%	0.00714	0.202	↔	-0.00196	0.099	↔	2021-12-06	0.476	↔
13_2_09	MW-13	Appendix IV	Arsenic	mg/L	11	10	91%	-0.000000000000000172	0.104	↔	0.0000114	0.000	↑	2023-02-07	1.000	↔
13_2_10	MW-13	Appendix IV	Barium	mg/L	11	0	0%	-0.000114	0.300	↔	0.0000274	0.003	↑	2022-05-02	0.766	↔
14_2_09	MW-14	Appendix IV	Arsenic	mg/L	8	0	0%	0.00000716	0.532	↔	0.0000214	0.113	↔	2023-06-01	0.772	↔
14_2_16	MW-14	Appendix IV	Lithium	mg/L	8	0	0%	-0.000144	0.004	↓	0.0000343	0.233	↔	2023-05-23	0.955	↔
14_2_22	MW-14	Appendix IV	Selenium	mg/L	8	6	75%	0.0000380	0.155	↔	-0.0000884	0.145	↔	2023-07-06	0.623	↔
15_2_10	MW-15	Appendix IV	Barium	mg/L	8	0	0%	0.000000105	0.557	↔	0.000132	0.646	↔	2023-06-02	0.365	↔
15_2_16	MW-15	Appendix IV	Lithium	mg/L	8	7	88%	0.0000000902	1.000	↔	-0.0000347	0.044	↔	2023-01-11	0.693	↔
15_2_20	MW-15	Appendix IV	Radium-226/228	pCi/L	8	0	0%	0.0153	0.610	↔	-0.00262	0.496	↔	0316-03-15	0.436	↔
15_2_22	MW-15	Appendix IV	Selenium	mg/L	8	2	25%	-0.000000207	0.068	↔	-0.0000807	0.146	↔	2023-04-27	0.876	↔
16A_2_04	MW-16A	Appendix IV	Fluoride	mg/L	9	9	100%	0.00309	0.223	↔	-0.00506	0.497	↔	2023-08-08	0.340	↔
16A_2_09	MW-16A	Appendix IV	Arsenic	mg/L	9	0	0%	-0.0000466	0.478	↔	0.00000895	0.120	↔	2023-05-30	0.610	↔
16A_2_10	MW-16A	Appendix IV	Barium	mg/L	9	0	0%	-0.000894	0.090	↔	0.000316	0.009	↑	2023-04-03	0.813	↔
16A_2_20	MW-16A	Appendix IV	Radium-226/228	pCi/L	9	0	0%	0.0216	0.649	↔	-0.00169	0.928	↔	2023-05-22	0.126	↔
16B_2_04	MW-16B	Appendix IV	Fluoride	mg/L	9	8	89%	-0.00213	0.223	↔	0.00349	0.497	↔	2023-08-08	0.340	↔
16B_2_10	MW-16B	Appendix IV	Barium	mg/L	9	0	0%	-0.0000635	0.169	↔	0.0000378	0.062	↔	2023-05-13	0.626	↔
16B_2_16	MW-16B	Appendix IV	Lithium	mg/L	9	0	0%	-0.0000186	0.201	↔	0.00000168	0.872	↔	2023-07-04	0.579	↔
16B_2_18	MW-16B	Appendix IV	Molybdenum	mg/L	9	0	0%	-0.0000254	0.046	↔	0.00000656	0.147	↔	2023-05-10	0.719	↔
16B_2_22	MW-16B	Appendix IV	Selenium	mg/L	9	8	89%	0.00000264	0.198	↔	-0.00000707	0.631	↔	2023-09-12	0.339	↔
7C_2_09	MW-7C	Appendix IV	Arsenic	mg/L	11	0	0%	-0.00000600	0.018	↔	0.00000606	0.026	↔	2022-11-09	0.719	↔
7C_2_12	MW-7C	Appendix IV	Cadmium	mg/L	11	8	73%	0.00000856	0.182	↔	-0.00000940	0.454	↔	2022-11-10	0.301	↔
7C_2_16	MW-7C	Appendix IV	Lithium	mg/L	11	0	0%	0.0000342	0.445	↔	-0.0000234	0.284	↔	2022-07-28	0.227	↔
7C_2_18	MW-7C	Appendix IV	Molybdenum	mg/L	11	0	0%	-0.000166	0.360	↔	0.00000451	0.932	↔	2022-06-23	0.226	↔
7C_2_20	MW-7C	Appendix IV	Radium-226/228	pCi/L	11	0	0%	-0.0252	0.538	↔	0.0000563	0.985	↔	2022-05-18	0.372	↔

Table 10: Trend Tests: Piecewise Linear-Linear-Linear

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Line 1			Line 2			Line 3			Break 1	Break 2	R-Squared	Overall Trend
								Slope	p-Value	Trend	Slope	p-Value	Trend	Slope	p-Value	Trend				
02_2_09	MW-2	Appendix IV	Arsenic	mg/L	17	13	76%	-0.00000989	0.699	↔	0.00000280	0.466	↔	-0.00000113	0.368	↔	2020-12-22	2022-01-31	0.401	↔
02_2_16	MW-2	Appendix IV	Lithium	mg/L	17	0	0%	0.00000714	0.883	↔	0.000321	0.055	↔	-0.0000186	0.000	↓	2020-08-05	2020-09-16	0.878	↔
02_2_18	MW-2	Appendix IV	Molybdenum	mg/L	17	0	0%	0.0000197	0.023	↔	-0.0000244	0.309	↔	0.00000590	0.009	↑	2020-11-03	2021-02-11	0.706	↔
05_2_09	MW-5	Appendix IV	Arsenic	mg/L	17	12	71%	-0.0000260	0.222	↔	0.00000527	0.188	↔	-0.00000569	0.091	↔	2020-07-30	2022-01-31	0.426	↔
05_2_10	MW-5	Appendix IV	Barium	mg/L	17	0	0%	-0.000286	0.385	↔	-0.0000720	0.179	↔	0.00000650	0.402	↔	2020-06-13	2020-11-08	0.585	↔
05_2_13	MW-5	Appendix IV	Chromium	mg/L	17	15	88%	-0.000174	0.000	↓	0.00000202	0.102	↔	-0.00000222	0.065	↔	2020-05-28	2022-01-31	0.918	↔

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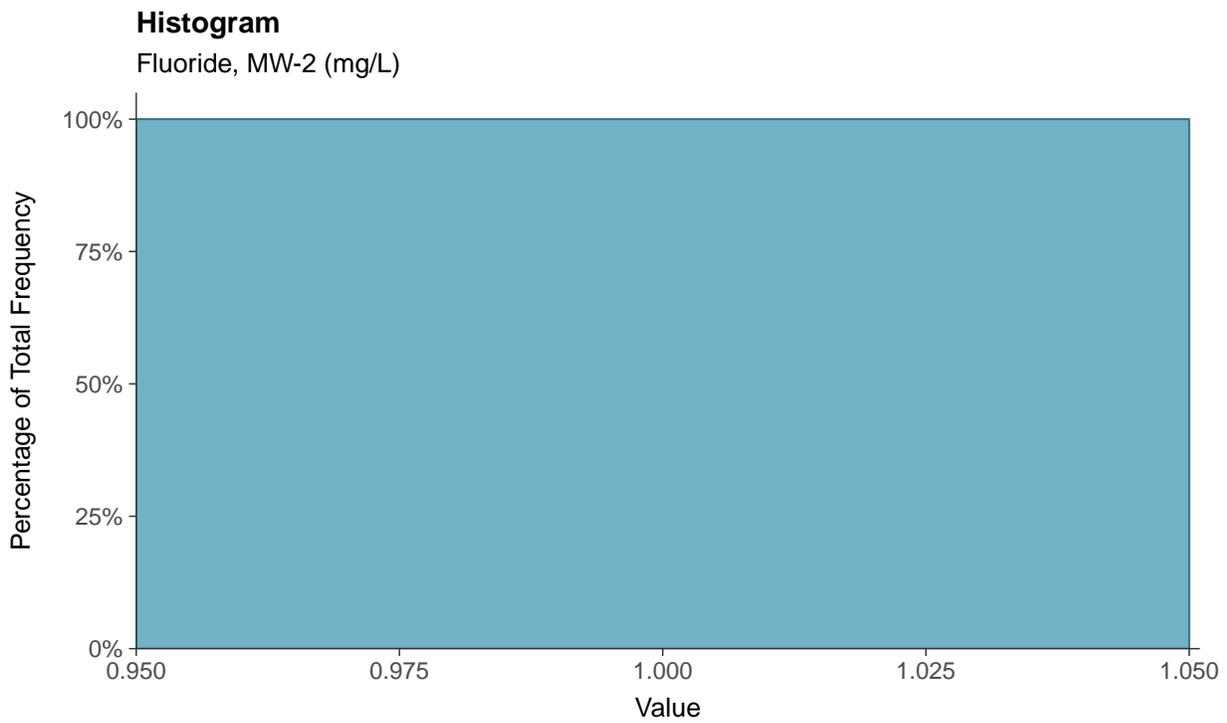
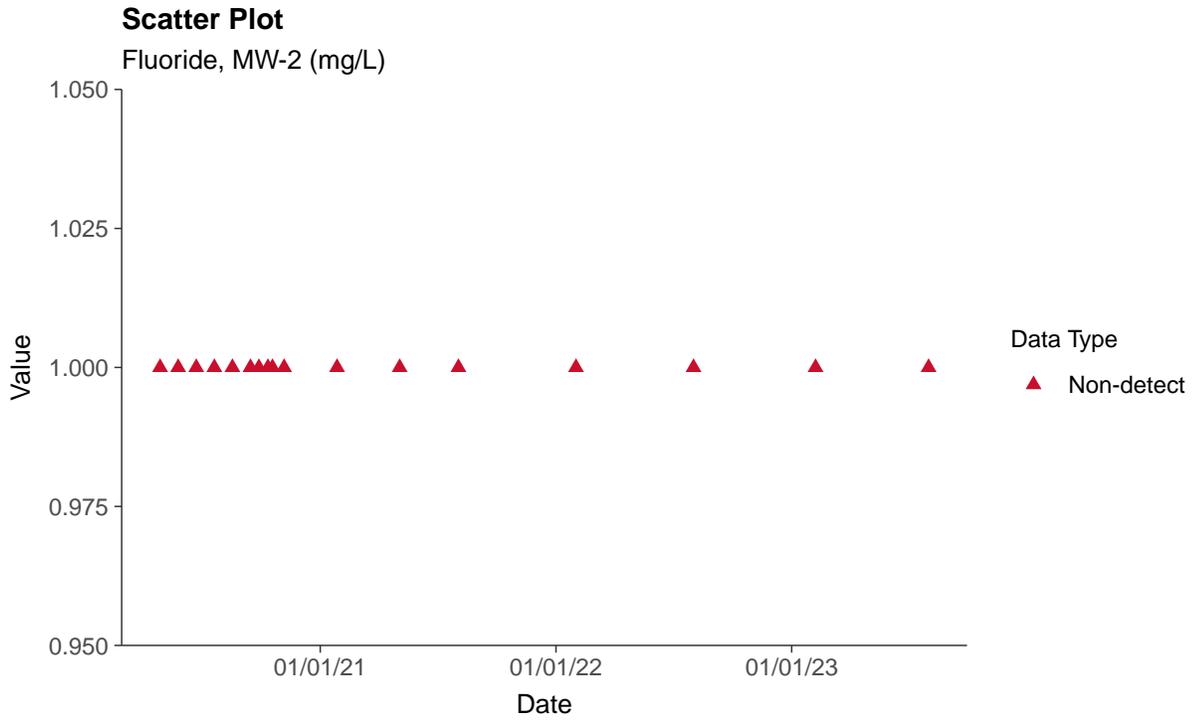
Table 10: Trend Tests: Piecewise Linear-Linear-Linear (continued)

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Line 1			Line 2			Line 3			Break 1	Break 2	R-Squared	Overall Trend
								Slope	p-Value	Trend	Slope	p-Value	Trend	Slope	p-Value	Trend				
05_2_14	MW-5	Appendix IV	Cobalt	mg/L	17	16	94%	-0.0000171	0.020	↔	0.00000135	0.511	↔	-0.000000123	0.910	↔	2020-06-22	2020-09-21	0.818	↔
05_2_15	MW-5	Appendix IV	Lead	mg/L	17	14	82%	-0.0000177	0.521	↔	0.0000126	0.125	↔	-0.0000129	0.048	↔	2020-09-04	2022-01-31	0.464	↔
05_2_18	MW-5	Appendix IV	Molybdenum	mg/L	17	0	0%	-0.000236	0.203	↔	-0.0000328	0.321	↔	0.0000830	0.194	↔	2020-08-29	2022-02-01	0.527	↔
06_2_10	MW-6	Appendix IV	Barium	mg/L	17	0	0%	0.0000781	0.024	↔	-0.0000258	0.005	↓	0.0000350	0.026	↔	2020-09-26	2022-07-10	0.740	↔
06_2_18	MW-6	Appendix IV	Molybdenum	mg/L	17	0	0%	0.0000777	0.184	↔	-0.0000253	0.839	↔	-0.00000470	0.434	↔	2020-09-10	2021-01-26	0.371	↔
07_2_04	MW-7	Appendix IV	Fluoride	mg/L	11	10	91%	-0.00187	0.422	↔	0.00185	0.707	↔	-0.000279	0.773	↔	2021-12-06	2022-06-04	0.298	↔
07_2_09	MW-7	Appendix IV	Arsenic	mg/L	11	0	0%	0.00000743	0.766	↔	-0.00000702	0.021	↔	0.0000116	0.058	↔	2021-08-23	2022-11-30	0.804	↔
07_2_10	MW-7	Appendix IV	Barium	mg/L	11	0	0%	-0.0000644	0.334	↔	0.0000695	0.730	↔	-0.0000159	0.165	↔	2021-09-29	2021-12-16	0.475	↔
07_2_18	MW-7	Appendix IV	Molybdenum	mg/L	11	0	0%	0.000338	0.164	↔	-0.000562	0.268	↔	-0.00000656	0.944	↔	2021-11-19	2022-08-01	0.922	↔
08_2_16	MW-8	Appendix IV	Lithium	mg/L	11	5	45%	0.0000257	0.530	↔	-0.0000571	0.386	↔	0.00000790	0.339	↔	2021-10-10	2022-01-19	0.396	↔
08_2_20	MW-8	Appendix IV	Radium-226/228	pCi/L	11	0	0%	0.00235	0.928	↔	0.0360	0.665	↔	-0.00274	0.527	↔	2021-10-13	2022-01-10	0.504	↔
09_2_10	MW-9	Appendix IV	Barium	mg/L	11	0	0%	0.00000218	0.847	↔	-0.0000163	0.183	↔	0.00000827	0.052	↔	2021-11-01	2022-04-13	0.678	↔
10_2_04	MW-10	Appendix IV	Fluoride	mg/L	11	10	91%	-0.00263	0.422	↔	0.00261	0.707	↔	-0.000394	0.773	↔	2021-12-06	2022-06-04	0.298	↔
10_2_10	MW-10	Appendix IV	Barium	mg/L	11	0	0%	0.0000000000000364	1.000	↔	-0.0000693	0.183	↔	-0.0000000750	0.994	↔	2021-11-28	2022-03-05	0.790	↔
13_2_09	MW-13	Appendix IV	Arsenic	mg/L	11	10	91%	0.0000000000000636	0.769	↔	-0.000000000000488	0.168	↔	0.0000114	0.000	↑	2022-04-22	2023-02-07	1.000	↔
14_2_09	MW-14	Appendix IV	Arsenic	mg/L	8	0	0%	0.0000458	0.313	↔	-0.00000477	0.905	↔	0.0000246	0.158	↔	2023-02-20	2023-05-27	0.874	↔
14_2_22	MW-14	Appendix IV	Selenium	mg/L	8	6	75%	-0.0000000000000300	1.000	↔	0.000114	0.345	↔	-0.000114	0.134	↔	2023-04-27	2023-07-01	0.828	↔
15_2_20	MW-15	Appendix IV	Radium-226/228	pCi/L	8	0	0%	0.00000200	0.047	↔	-0.0313	0.101	↔	0.0204	0.064	↔	2023-04-25	2023-06-22	0.957	↔
16A_2_04	MW-16A	Appendix IV	Fluoride	mg/L	9	9	100%	-0.00148	0.830	↔	0.00922	0.303	↔	-0.00727	0.401	↔	2023-05-22	2023-08-08	0.542	↔
16A_2_09	MW-16A	Appendix IV	Arsenic	mg/L	9	0	0%	-0.00000521	0.548	↔	0.0000102	0.510	↔	0.00000197	0.947	↔	2023-05-30	2023-10-13	0.623	↔
16A_2_10	MW-16A	Appendix IV	Barium	mg/L	9	0	0%	-0.000894	0.112	↔	0.000417	0.040	↔	-0.000400	0.511	↔	2023-04-09	2023-10-13	0.901	↔
16B_2_10	MW-16B	Appendix IV	Barium	mg/L	9	0	0%	-0.0000942	0.341	↔	0.0000171	0.662	↔	0.0000636	0.338	↔	2023-04-07	2023-09-10	0.675	↔
16B_2_22	MW-16B	Appendix IV	Selenium	mg/L	9	8	89%	-0.00000152	0.739	↔	0.00000744	0.386	↔	-0.0000105	0.520	↔	2023-06-02	2023-09-12	0.566	↔
7C_2_12	MW-7C	Appendix IV	Cadmium	mg/L	11	8	73%	0.00000102	0.874	↔	0.000000810	0.628	↔	-0.000000928	0.356	↔	2022-05-10	2022-11-09	0.302	↔



Appendix IV: Fluoride, MW-2

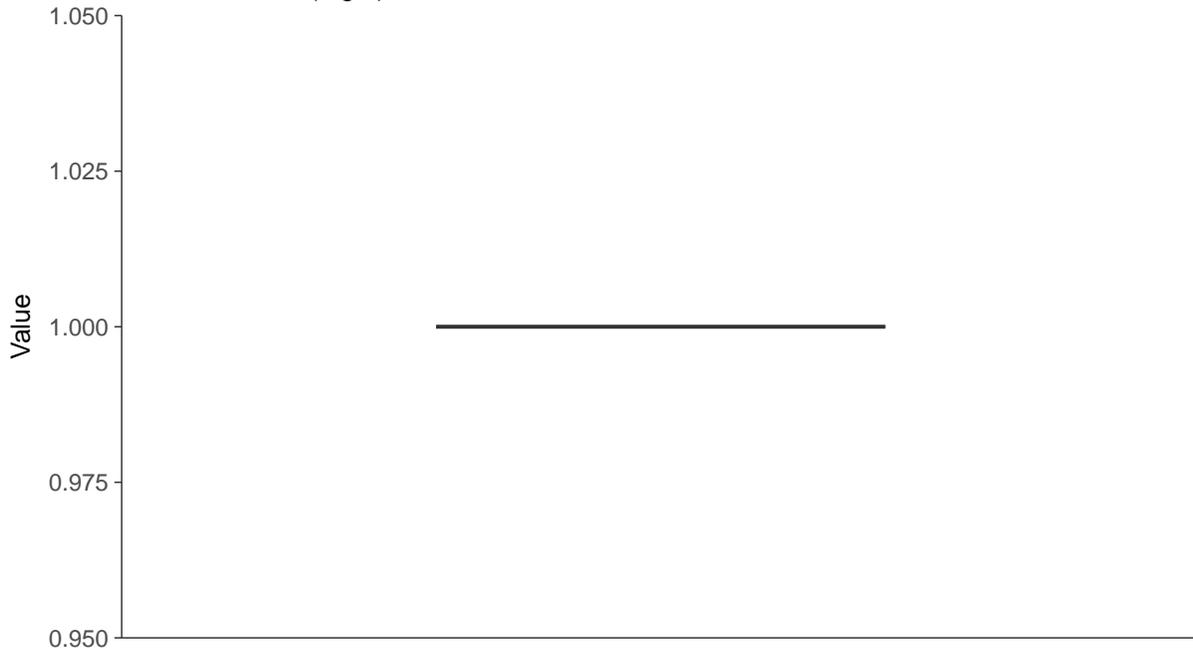
ID: 02_2_04





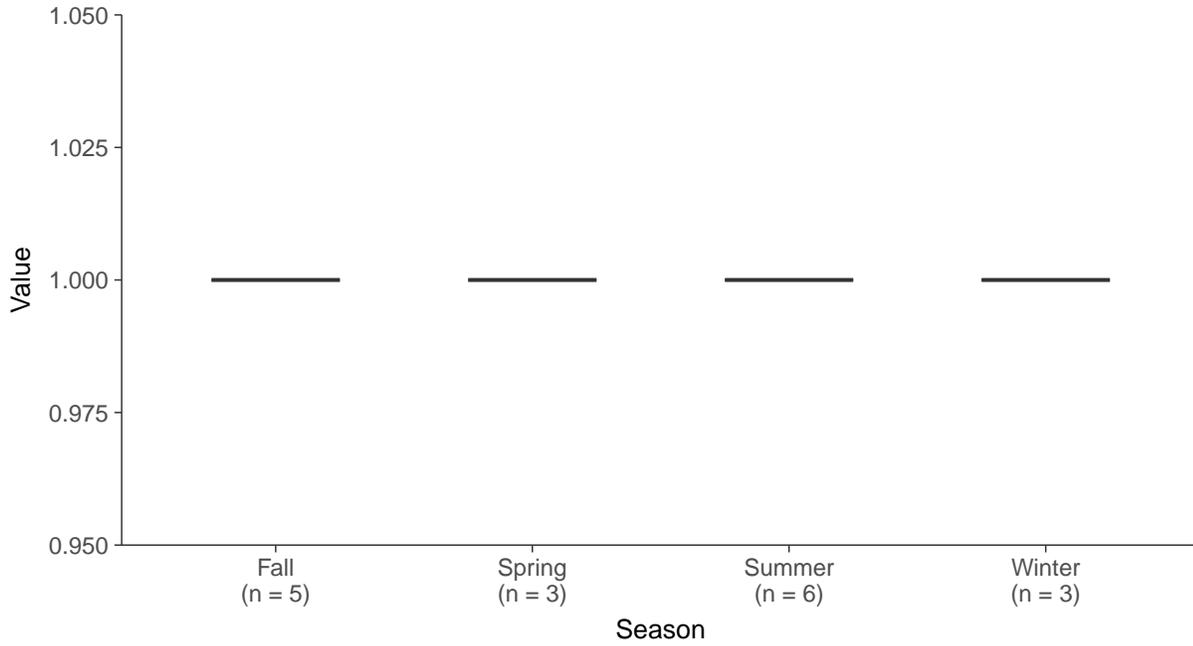
Boxplot

Fluoride, MW-2 (mg/L)



Boxplot by Season

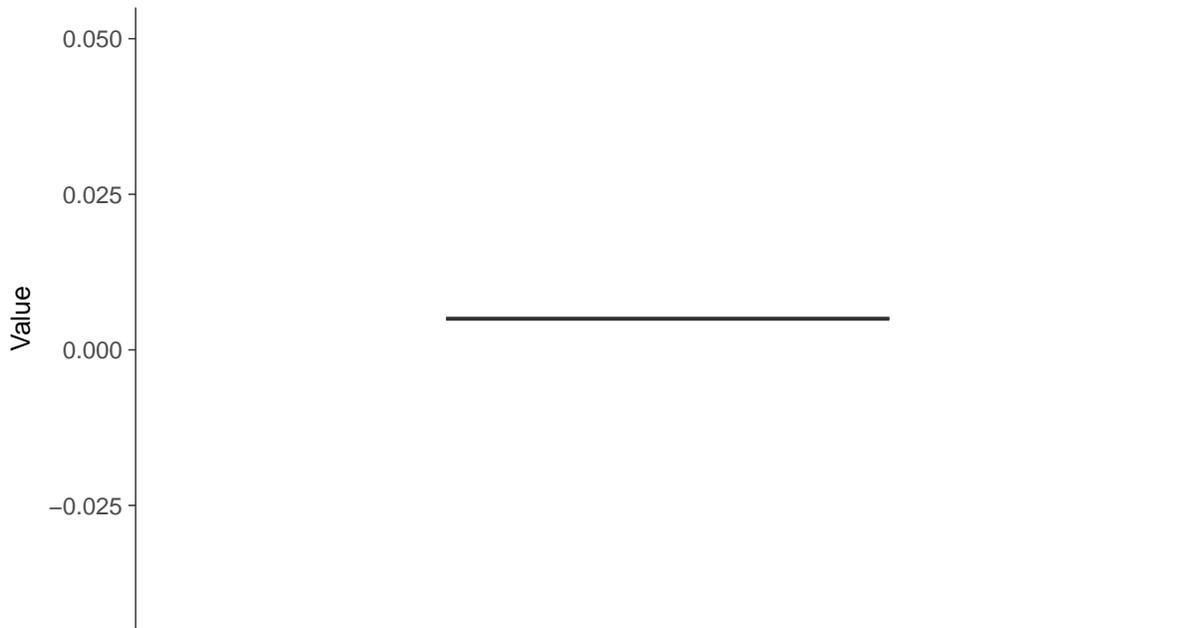
Fluoride, MW-2 (mg/L)





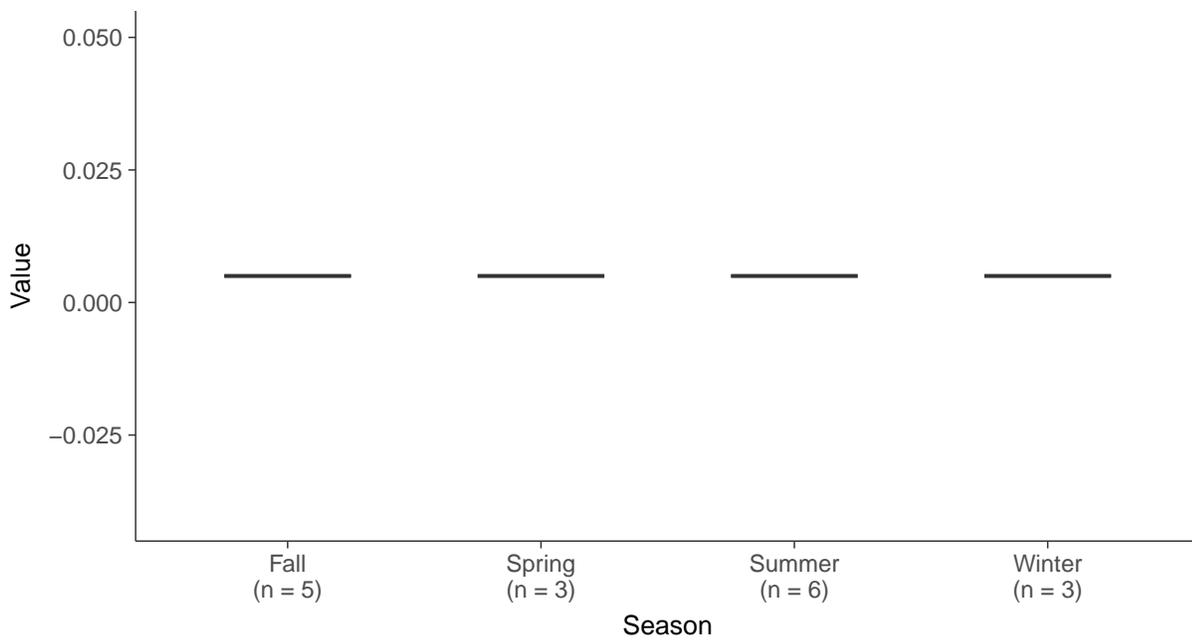
Boxplot

Antimony, MW-2 (mg/L)



Boxplot by Season

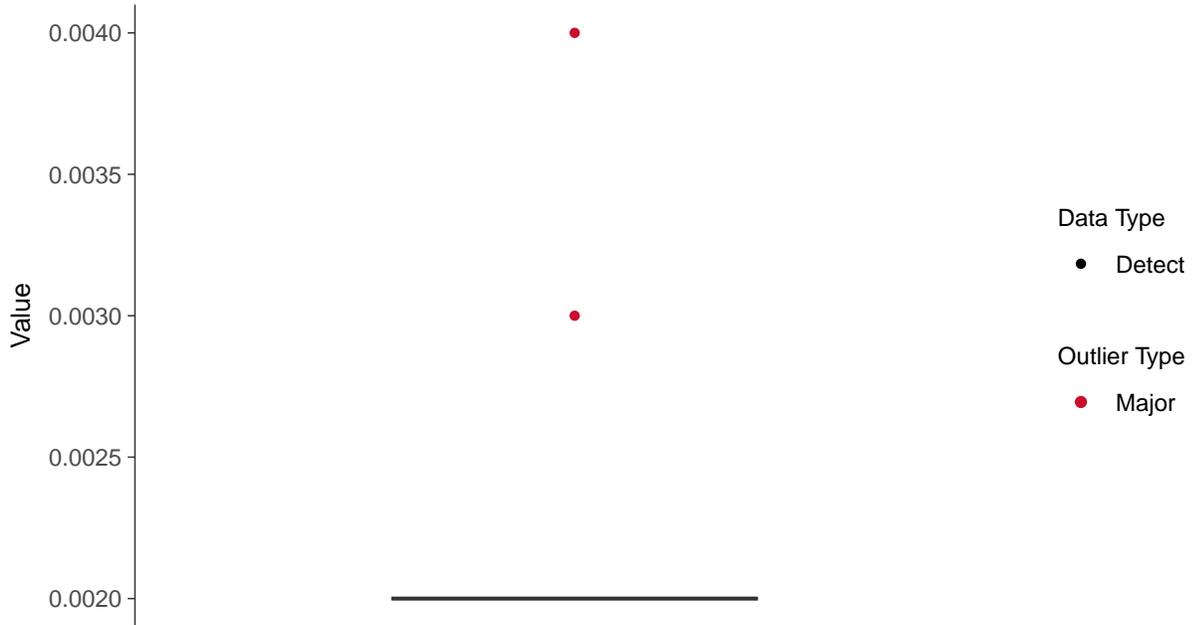
Antimony, MW-2 (mg/L)





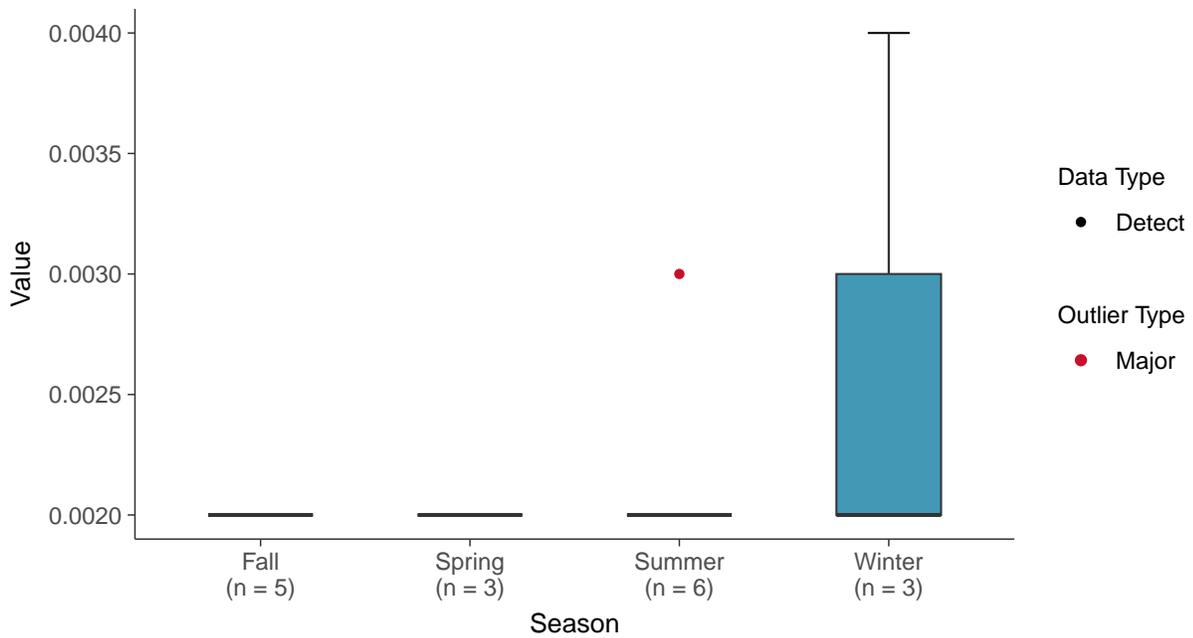
Boxplot

Arsenic, MW-2 (mg/L)



Boxplot by Season

Arsenic, MW-2 (mg/L)



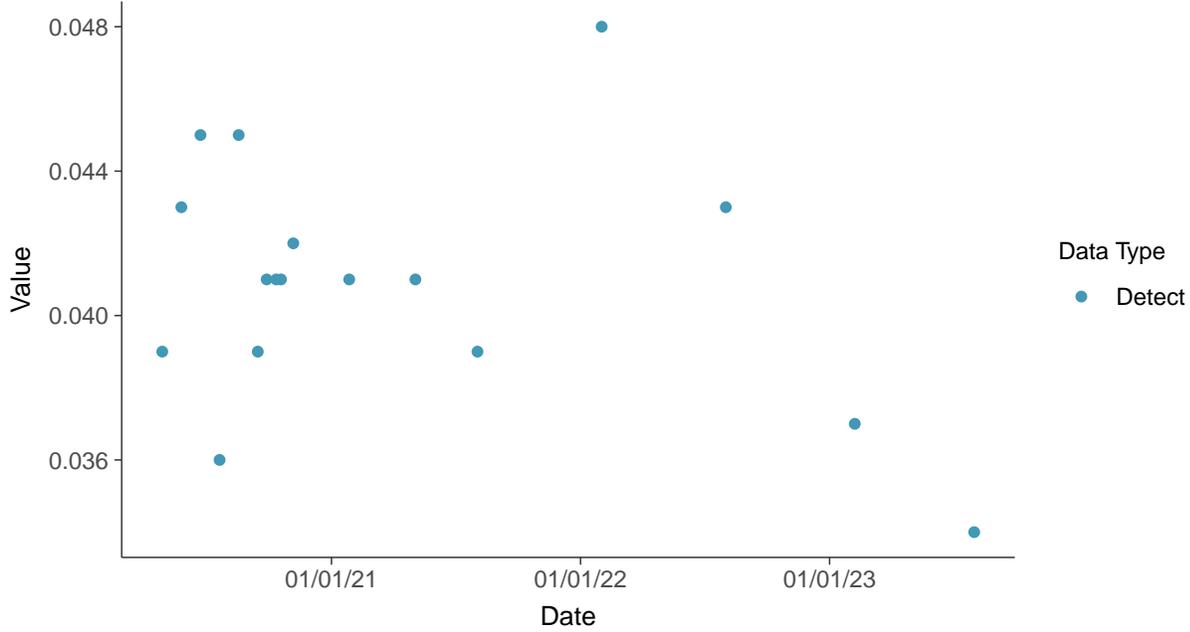


Appendix IV: Barium, MW-2

ID: 02_2_10

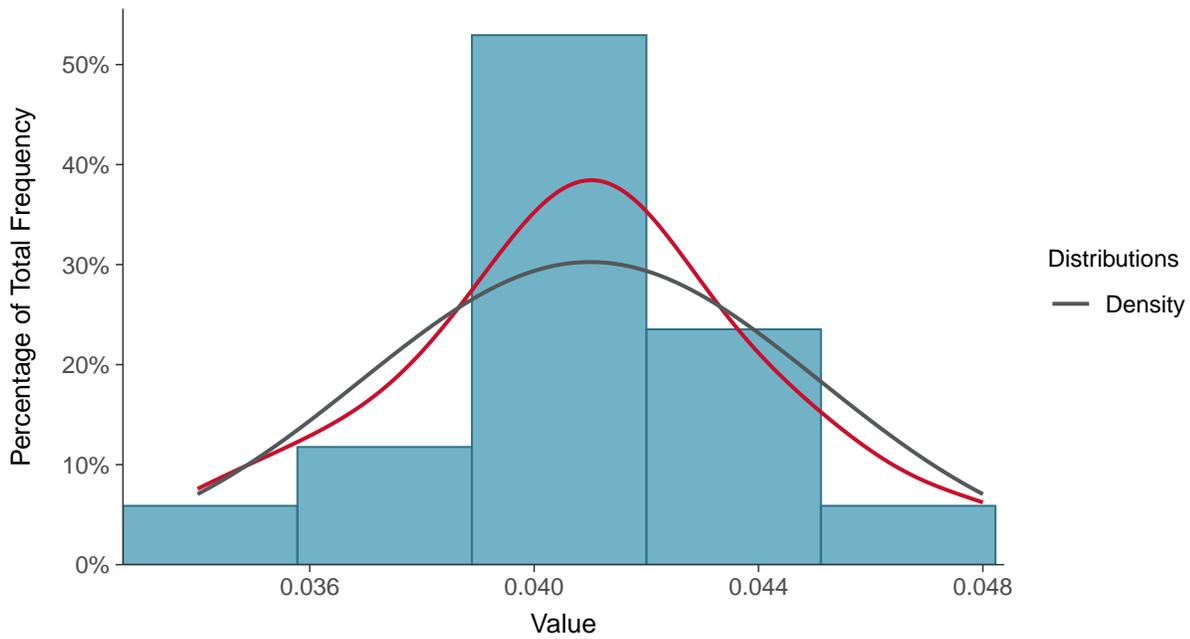
Scatter Plot

Barium, MW-2 (mg/L)



Histogram

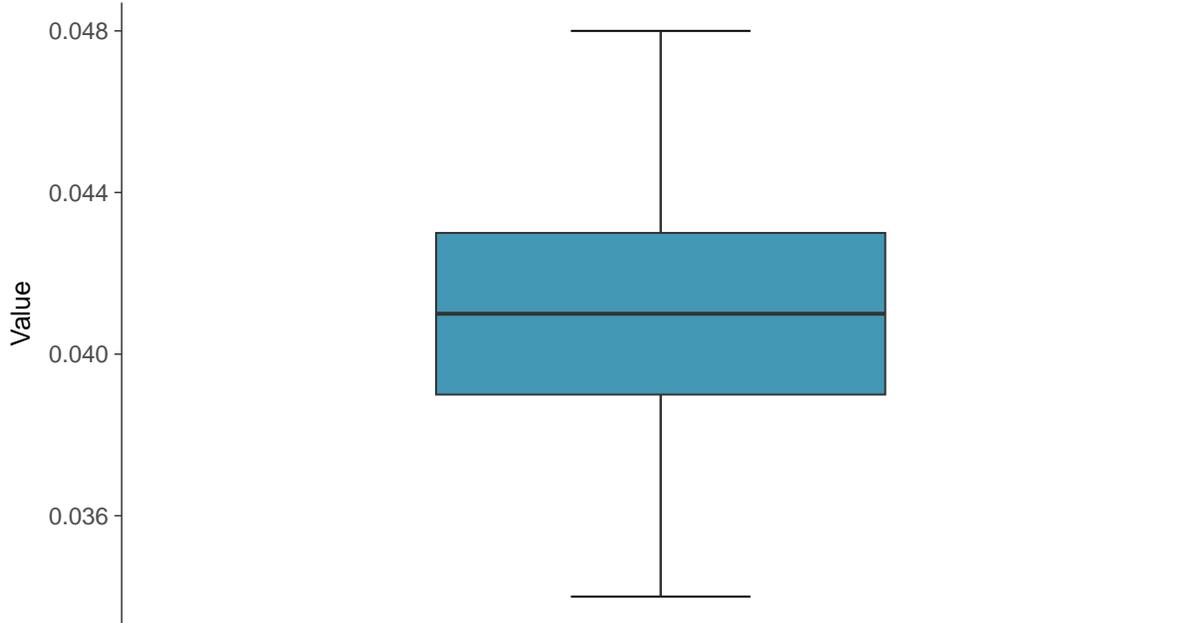
Barium, MW-2 (mg/L)





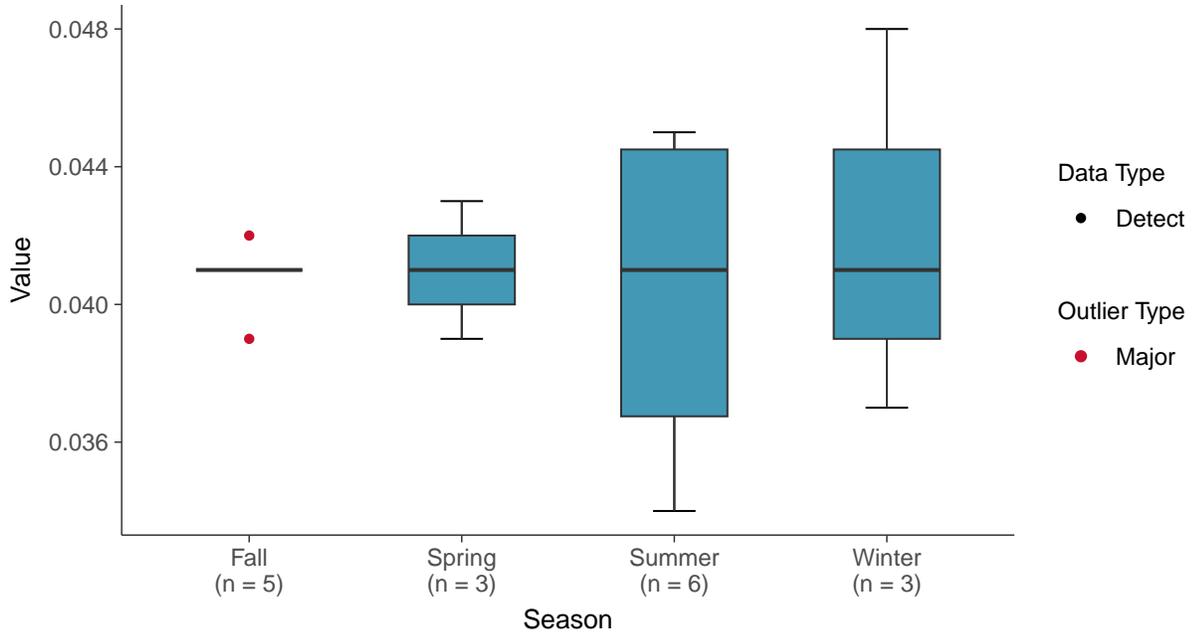
Boxplot

Barium, MW-2 (mg/L)



Boxplot by Season

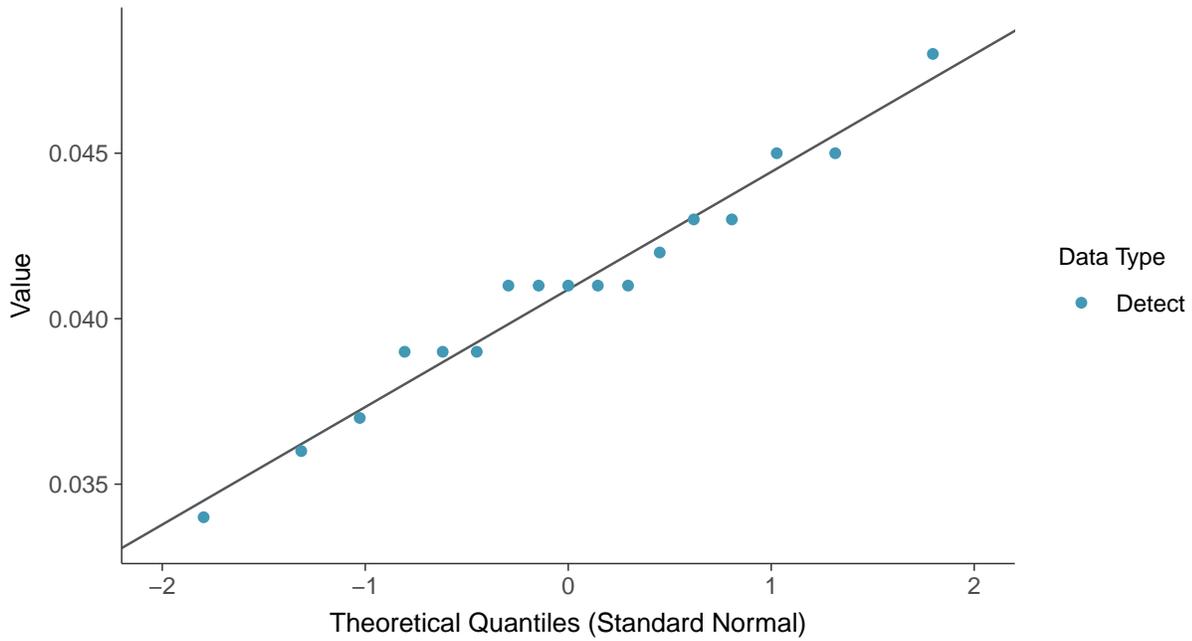
Barium, MW-2 (mg/L)





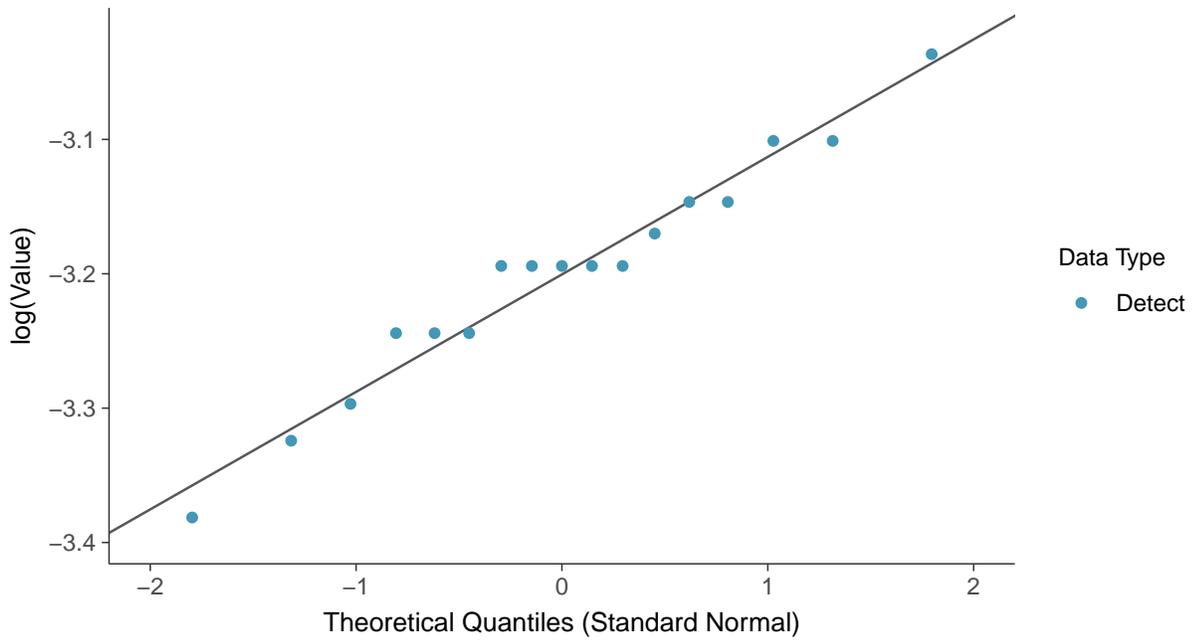
Normal Q-Q plot

Barium, MW-2 (mg/L)



Lognormal Q-Q plot

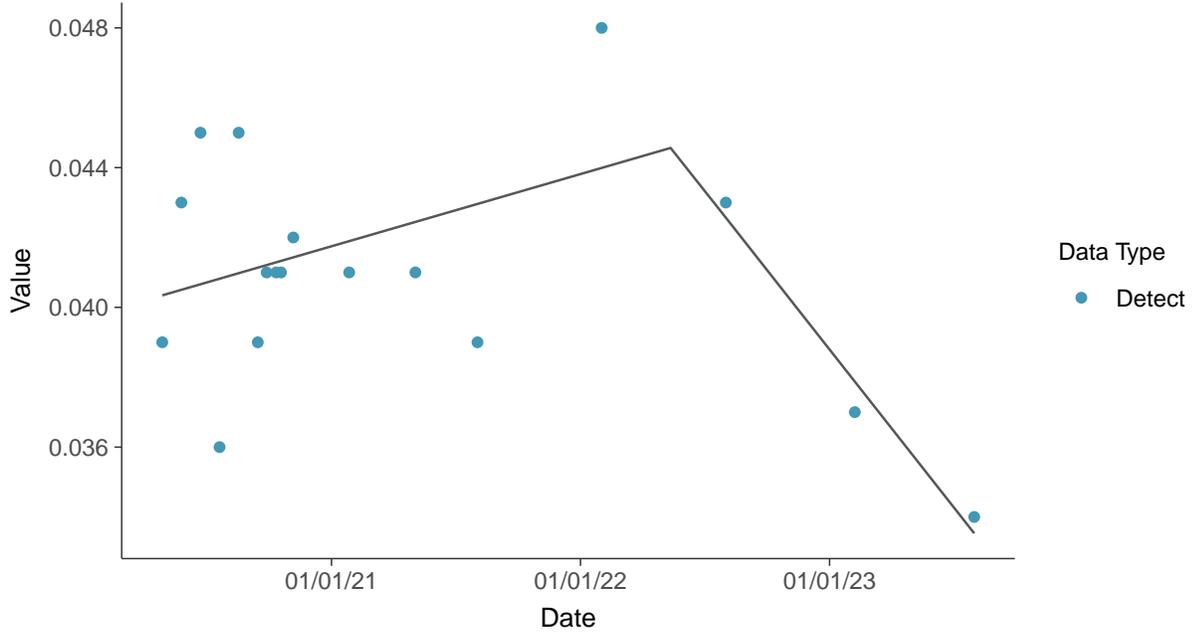
Barium, MW-2 (mg/L)





Trend Regression: Piecewise Linear-Linear

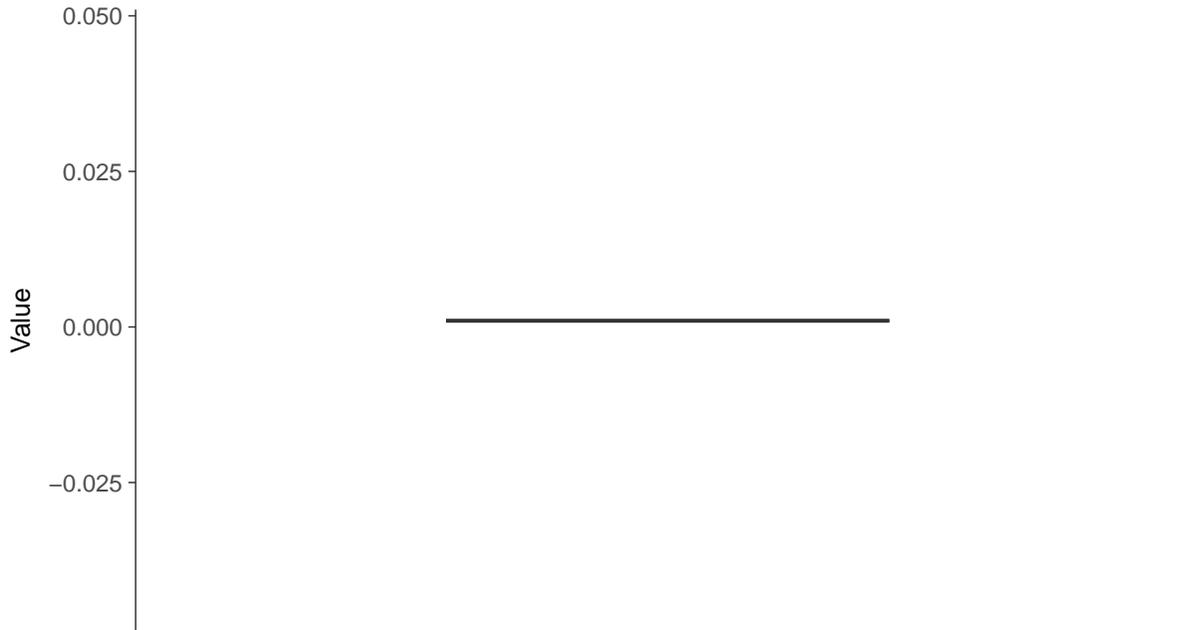
Barium, MW-2 (mg/L)





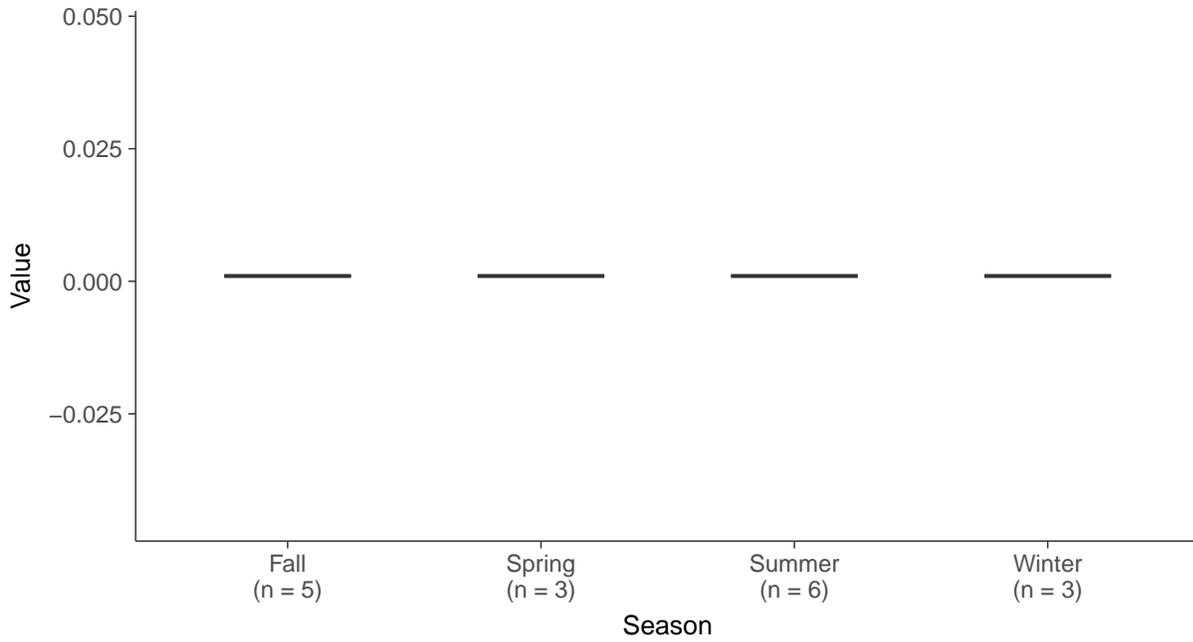
Boxplot

Beryllium, MW-2 (mg/L)



Boxplot by Season

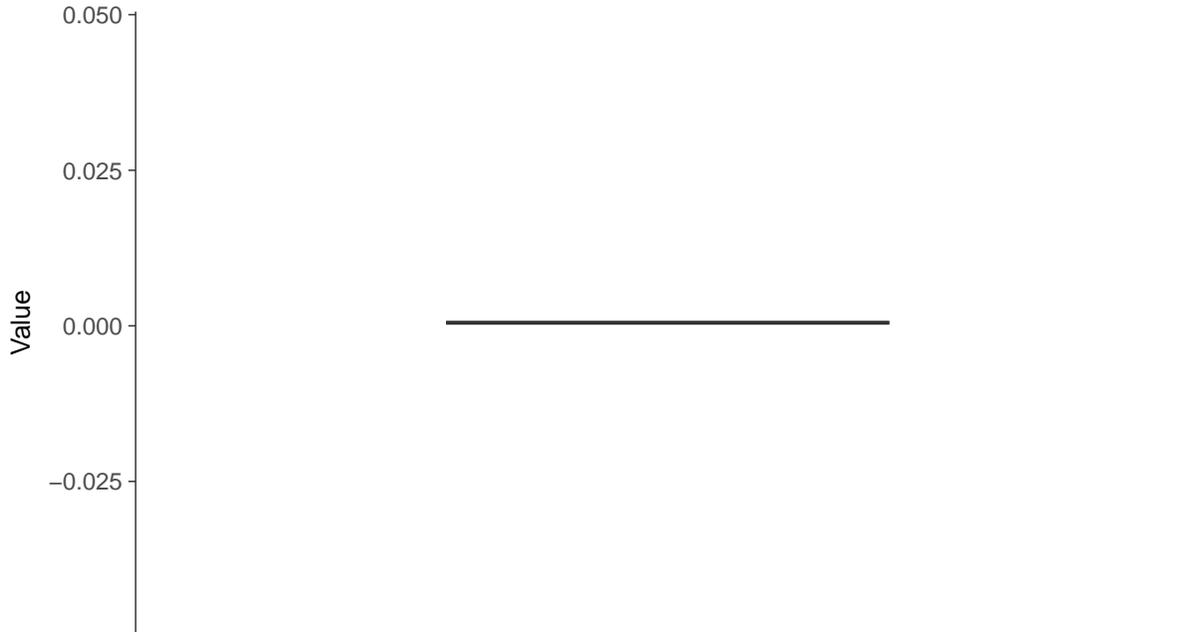
Beryllium, MW-2 (mg/L)





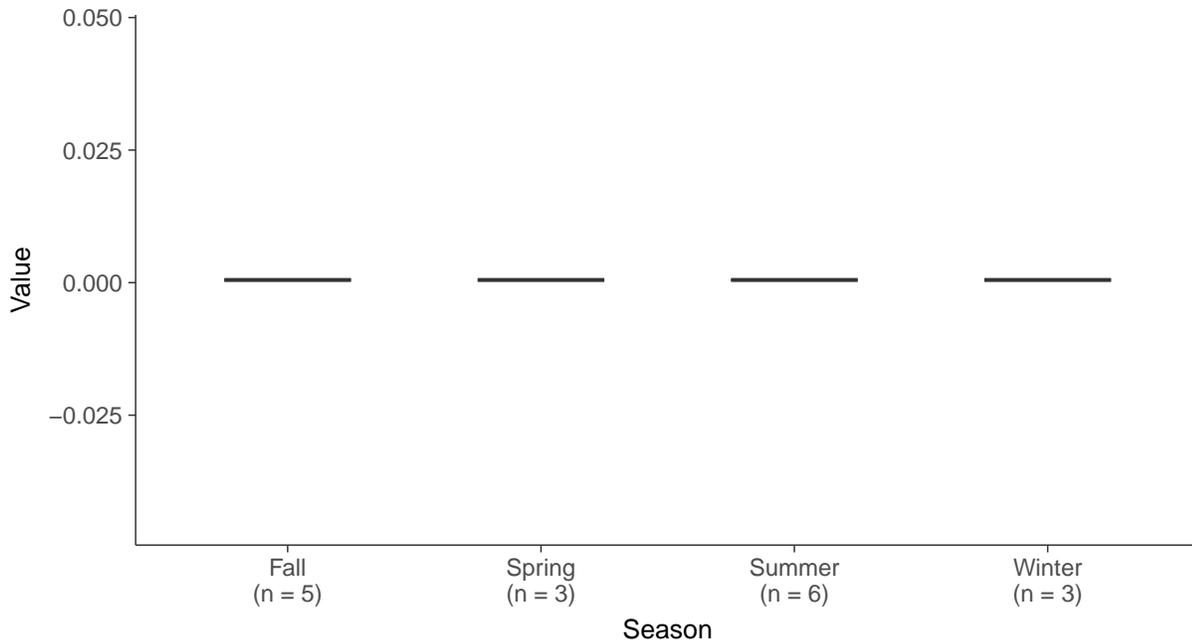
Boxplot

Cadmium, MW-2 (mg/L)



Boxplot by Season

Cadmium, MW-2 (mg/L)





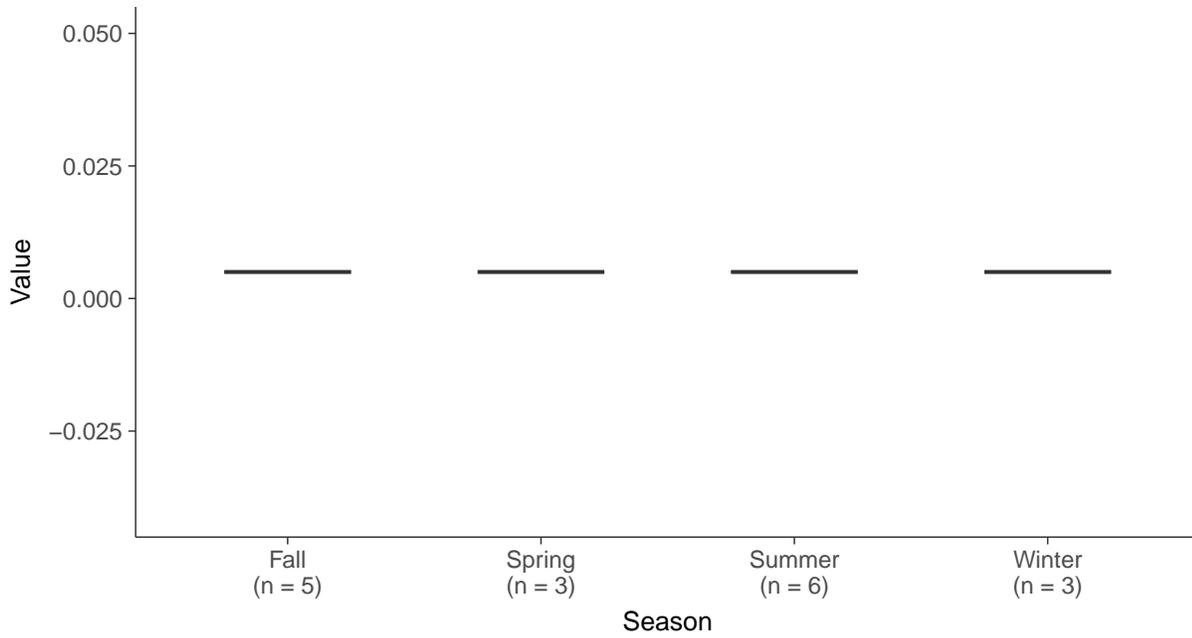
Boxplot

Chromium, MW-2 (mg/L)



Boxplot by Season

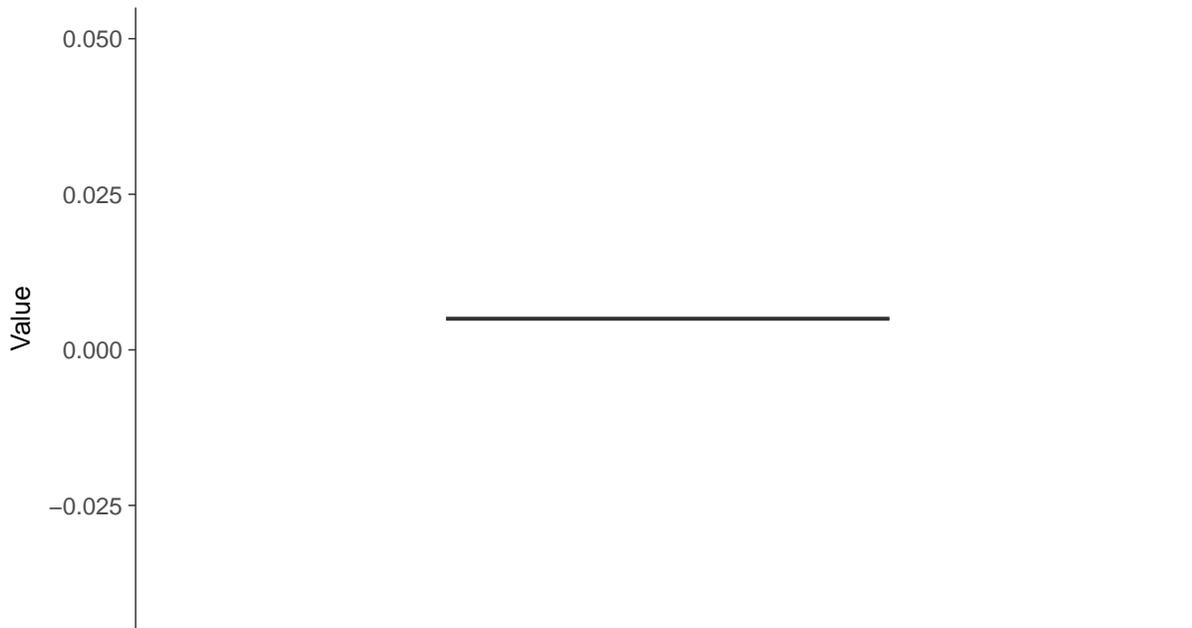
Chromium, MW-2 (mg/L)





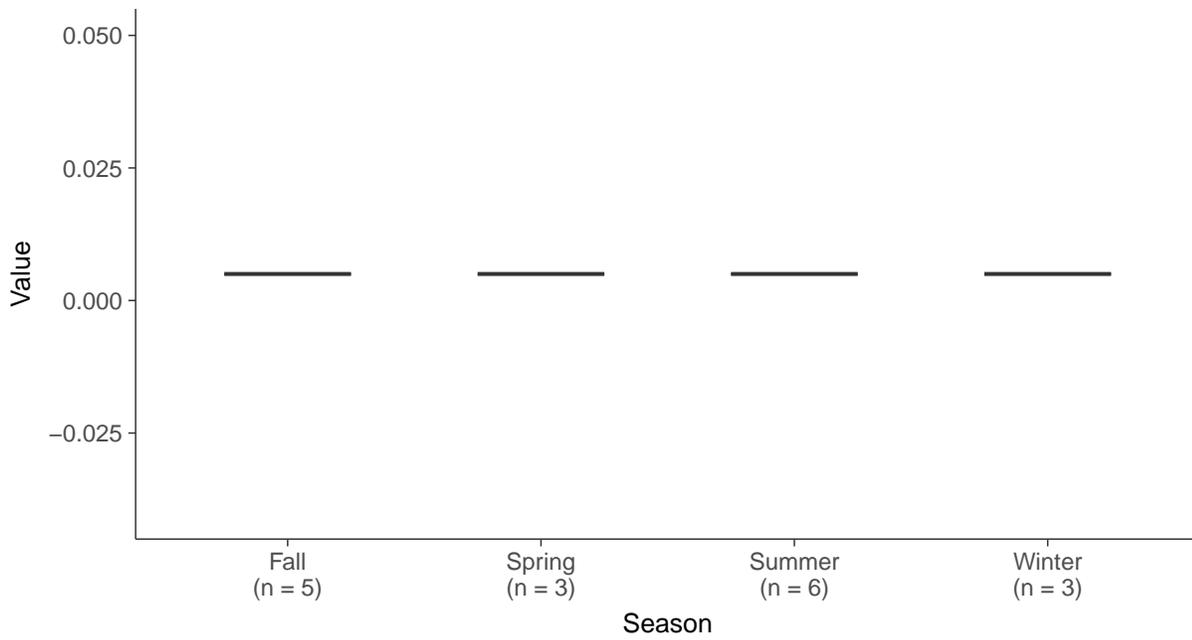
Boxplot

Cobalt, MW-2 (mg/L)



Boxplot by Season

Cobalt, MW-2 (mg/L)





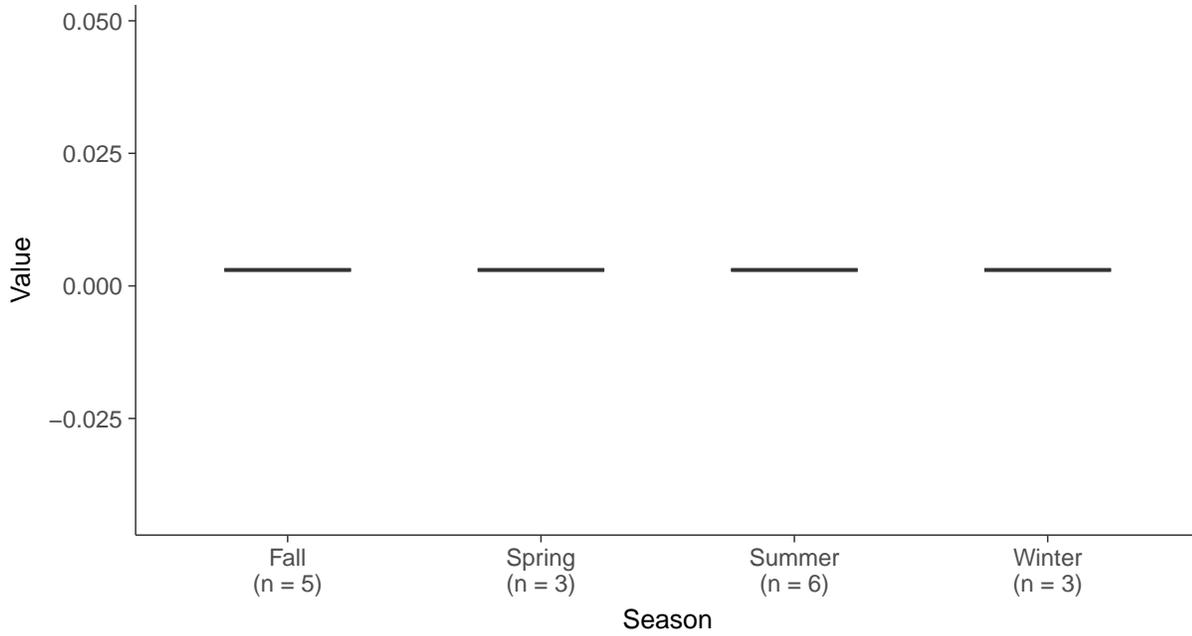
Boxplot

Lead, MW-2 (mg/L)



Boxplot by Season

Lead, MW-2 (mg/L)



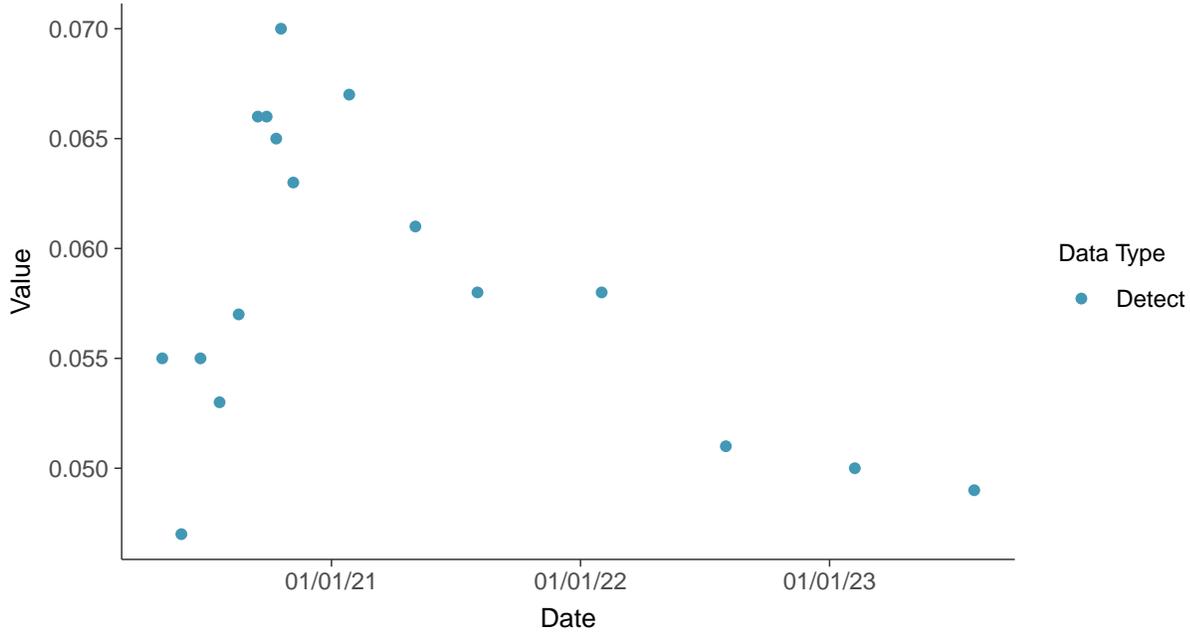


Appendix IV: Lithium, MW-2

ID: 02_2_16

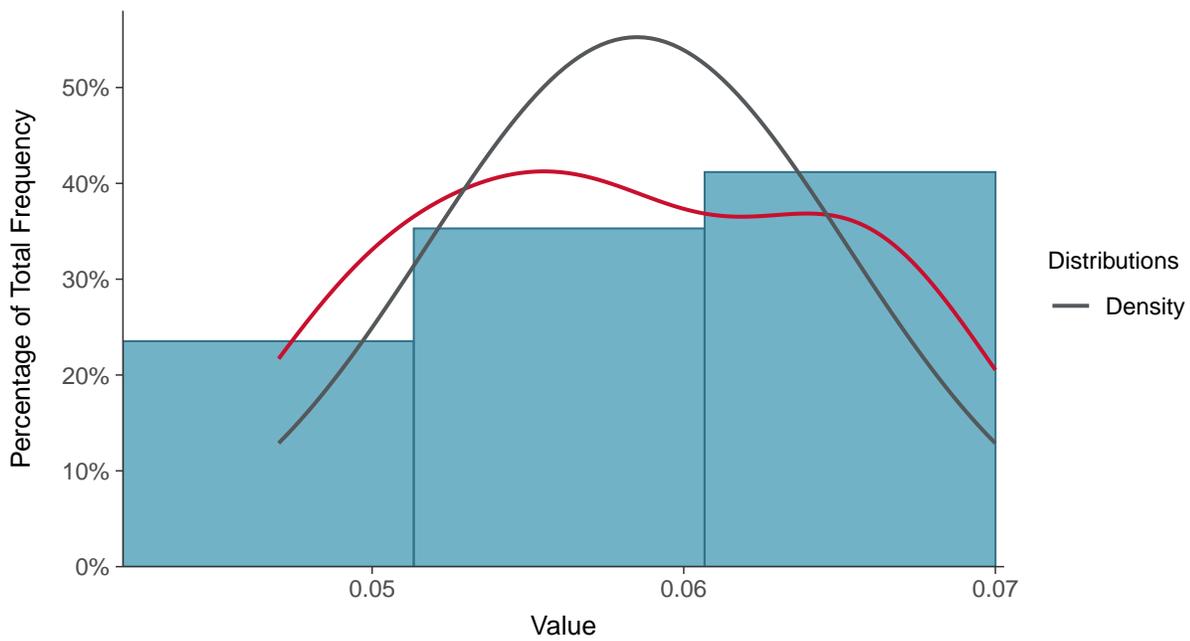
Scatter Plot

Lithium, MW-2 (mg/L)



Histogram

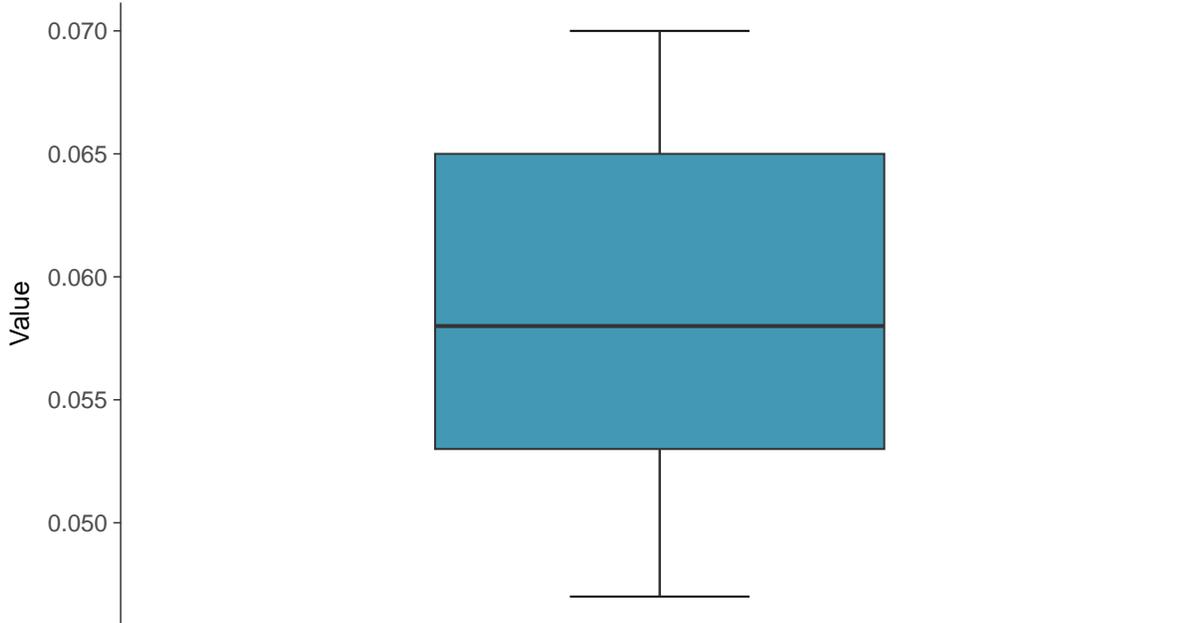
Lithium, MW-2 (mg/L)





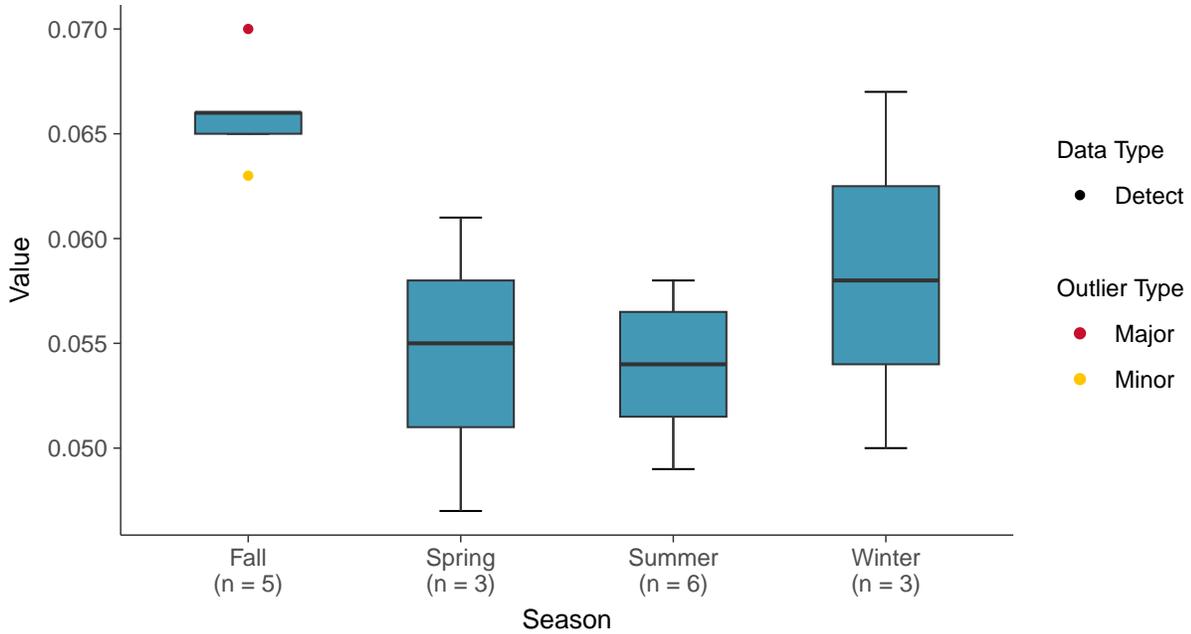
Boxplot

Lithium, MW-2 (mg/L)



Boxplot by Season

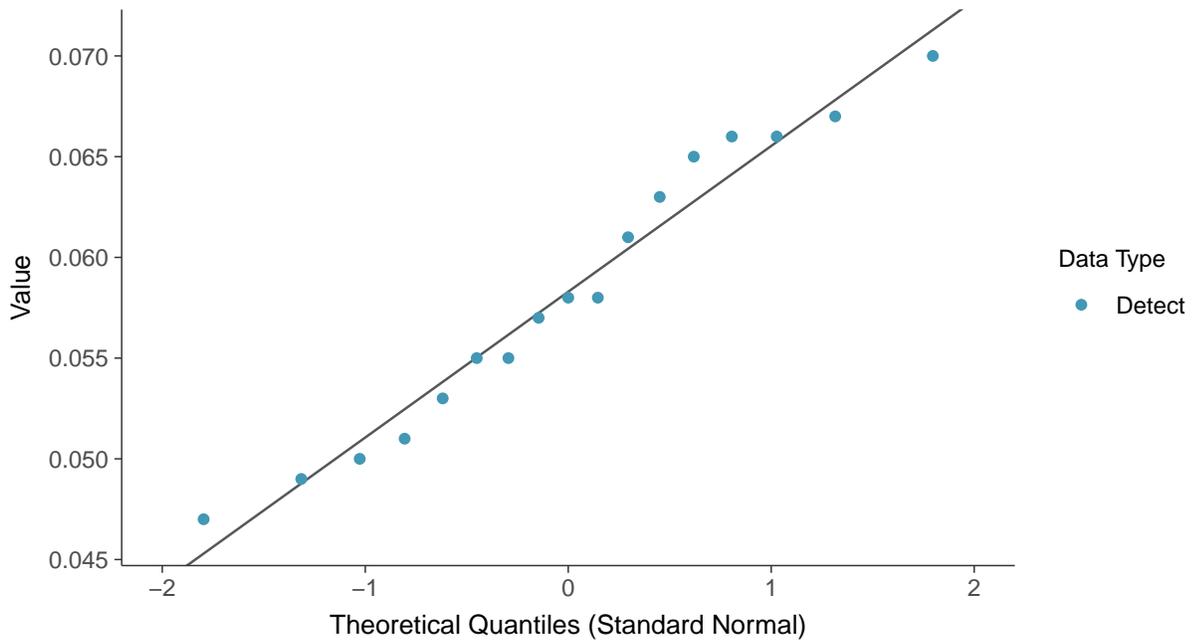
Lithium, MW-2 (mg/L)





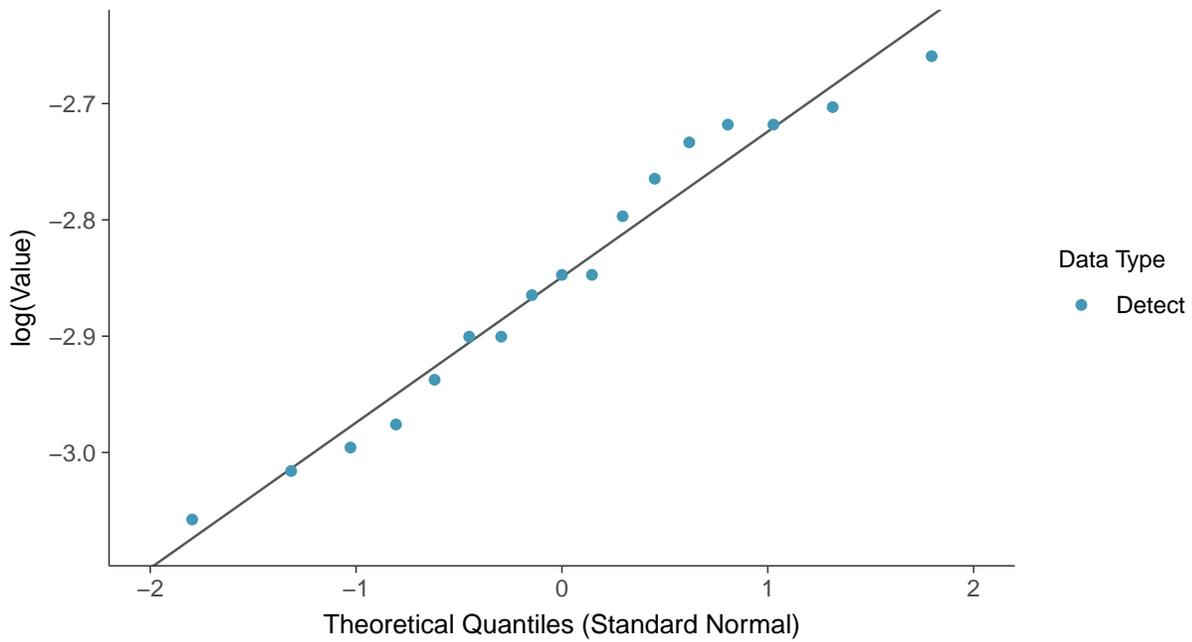
Normal Q-Q plot

Lithium, MW-2 (mg/L)



Lognormal Q-Q plot

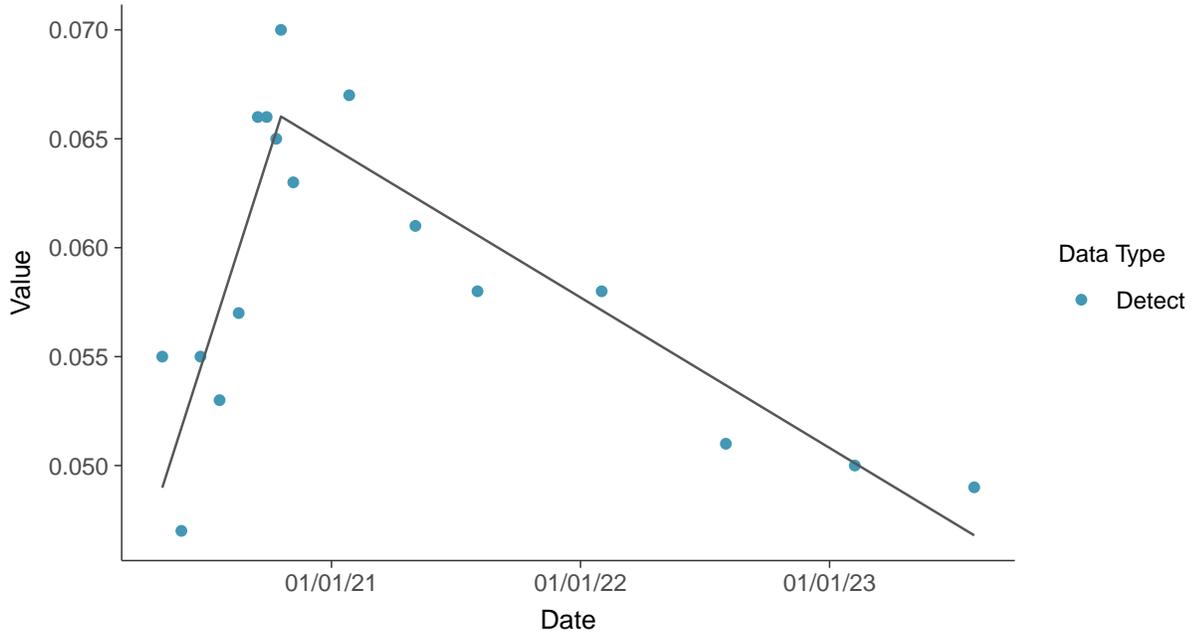
Lithium, MW-2 (mg/L)





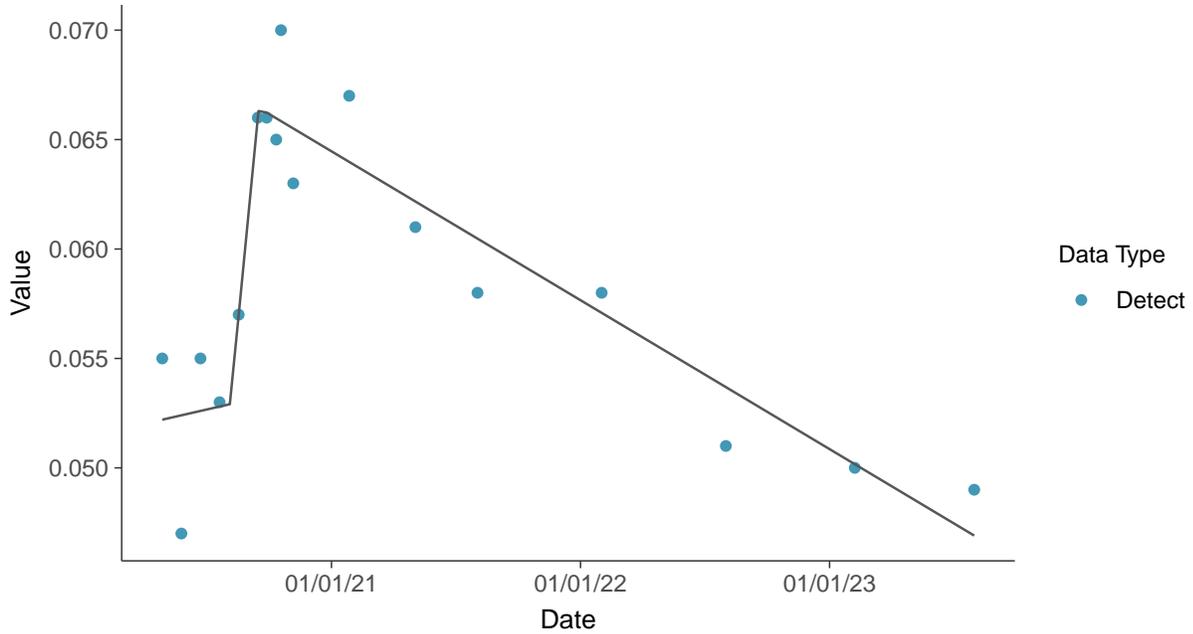
Trend Regression: Piecewise Linear-Linear

Lithium, MW-2 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

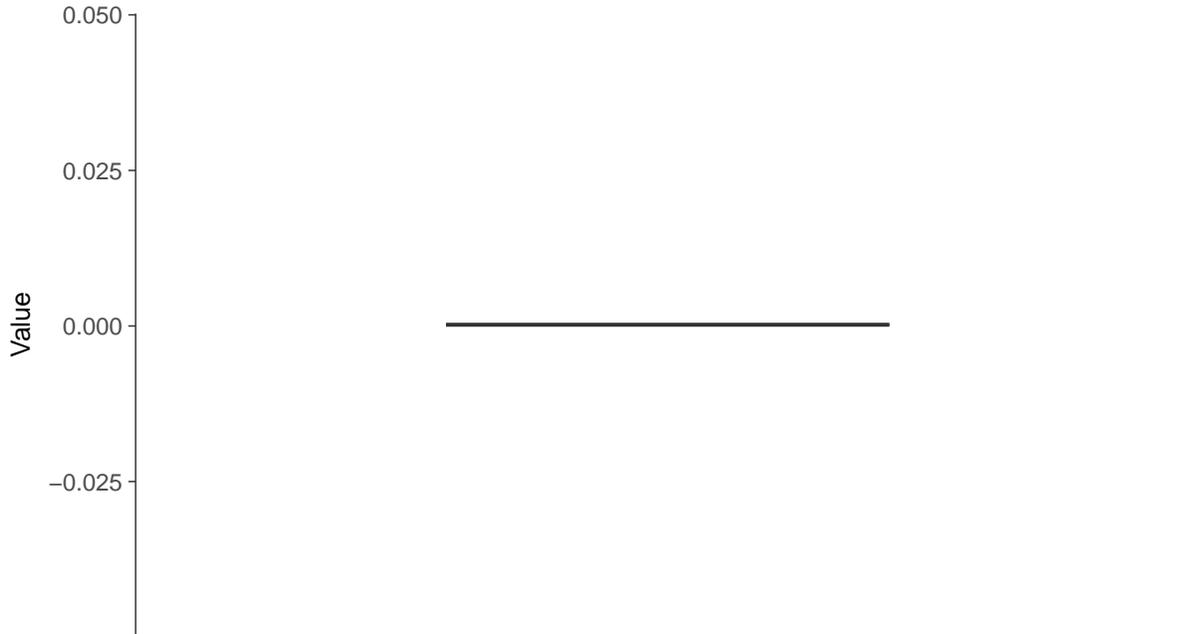
Lithium, MW-2 (mg/L)





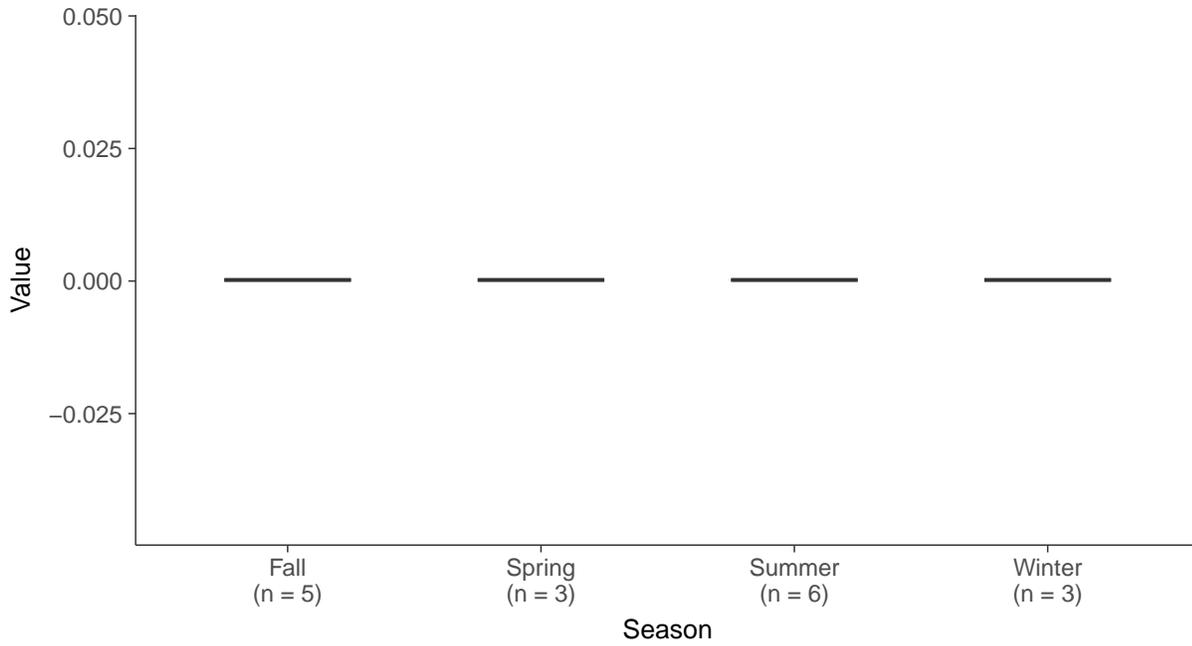
Boxplot

Mercury, MW-2 (mg/L)



Boxplot by Season

Mercury, MW-2 (mg/L)



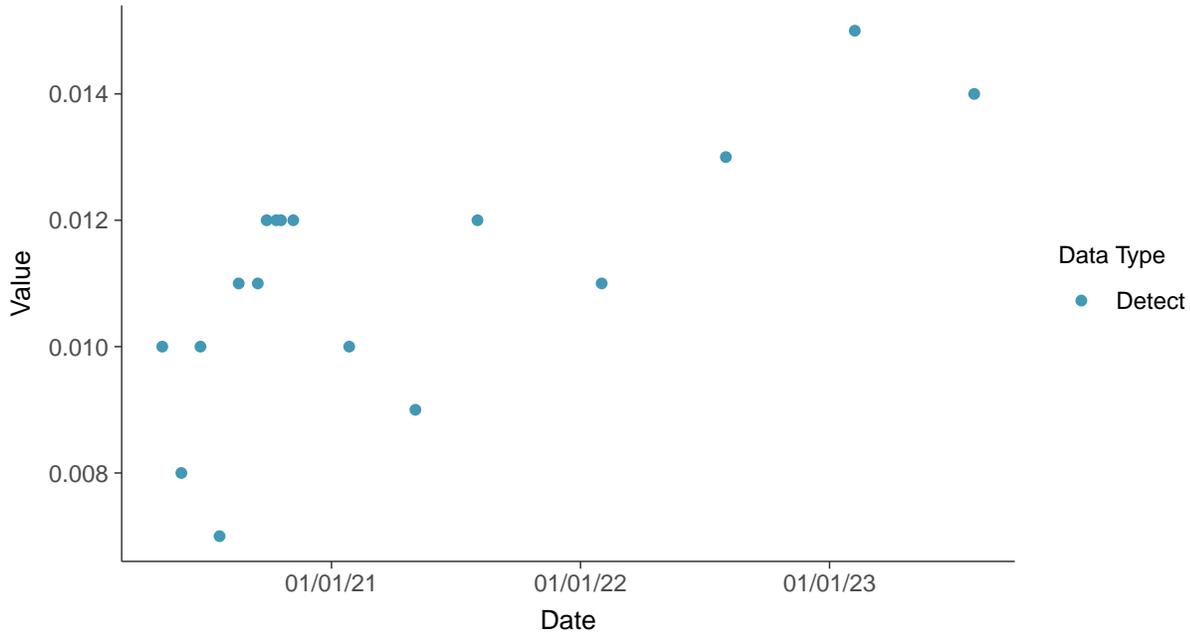


Appendix IV: Molybdenum, MW-2

ID: 02_2_18

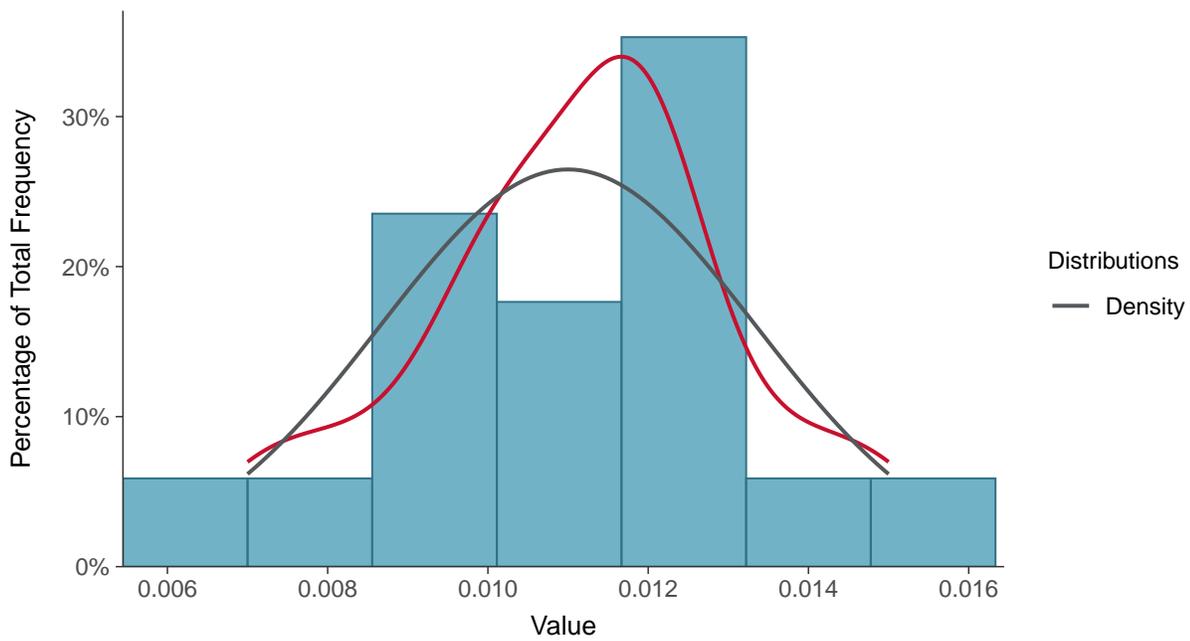
Scatter Plot

Molybdenum, MW-2 (mg/L)



Histogram

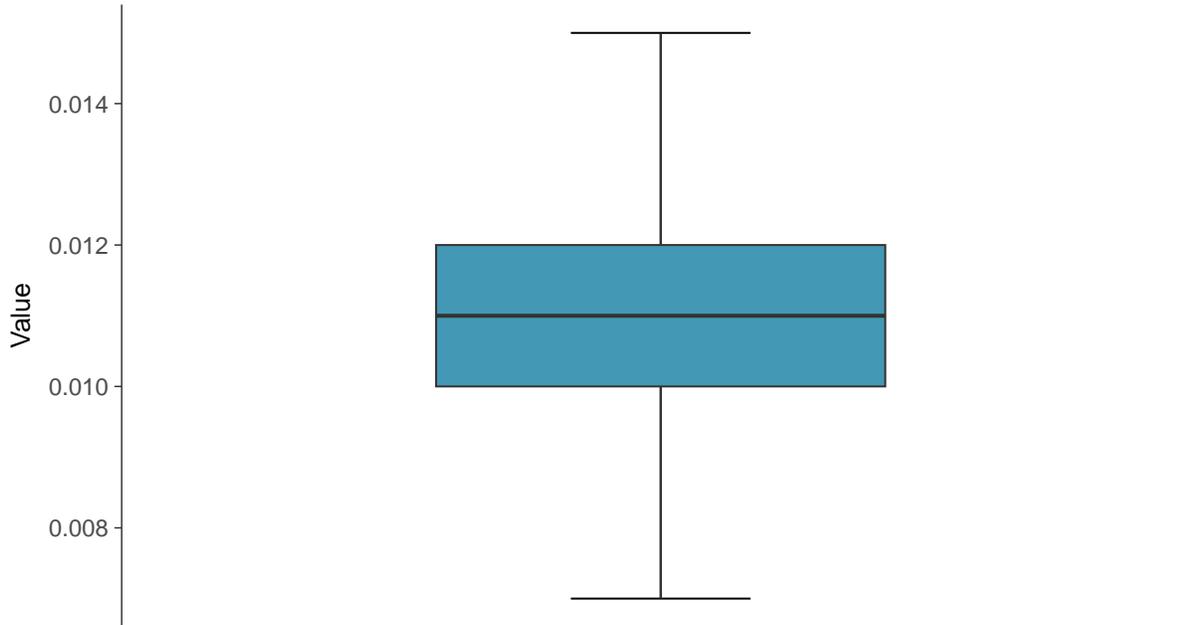
Molybdenum, MW-2 (mg/L)





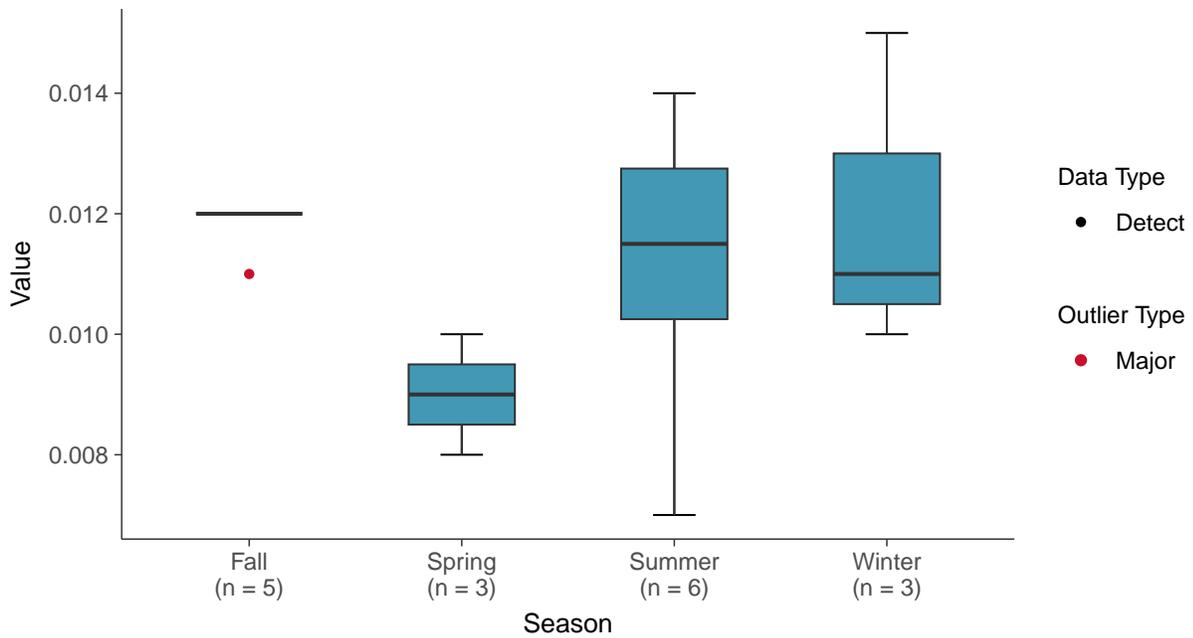
Boxplot

Molybdenum, MW-2 (mg/L)



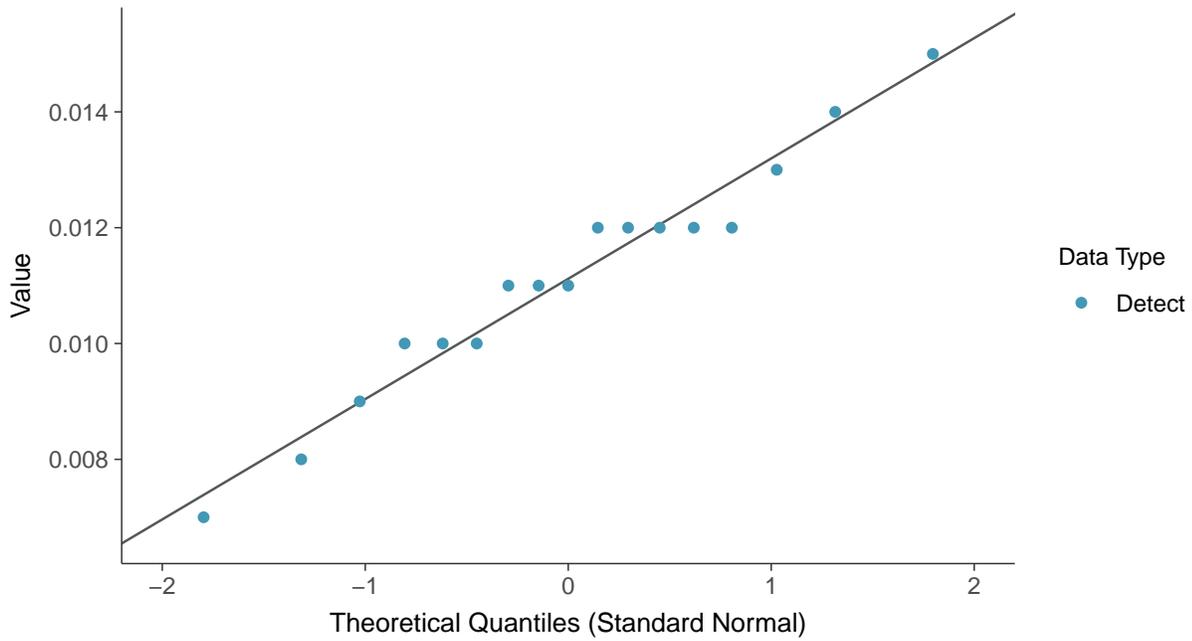
Boxplot by Season

Molybdenum, MW-2 (mg/L)

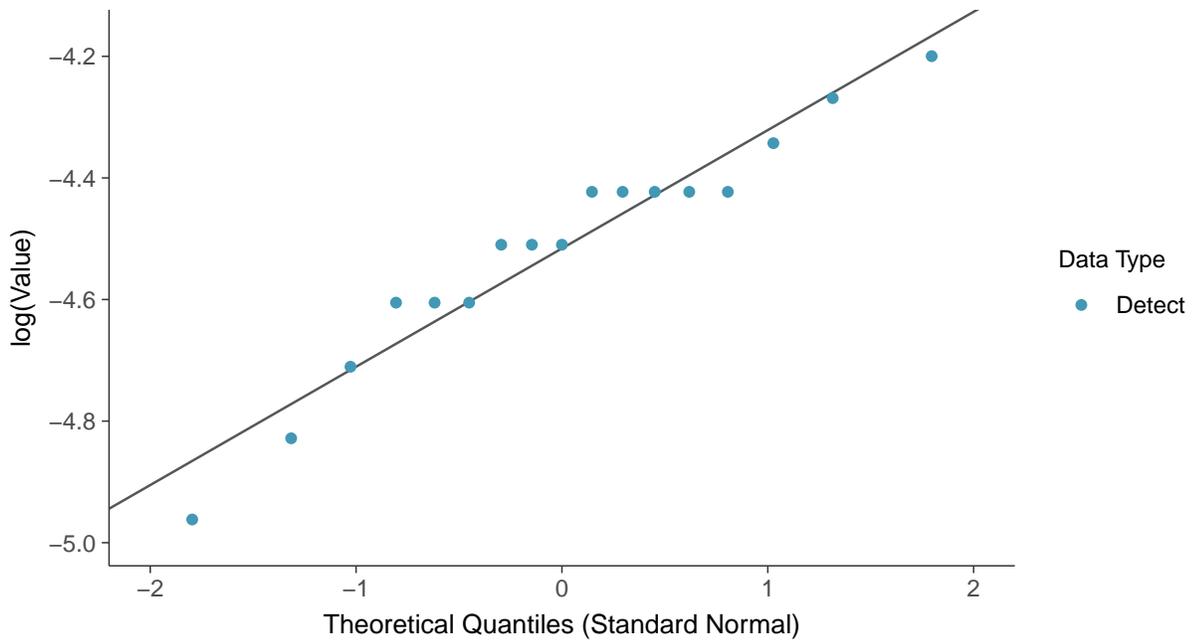




Normal Q-Q plot
Molybdenum, MW-2 (mg/L)

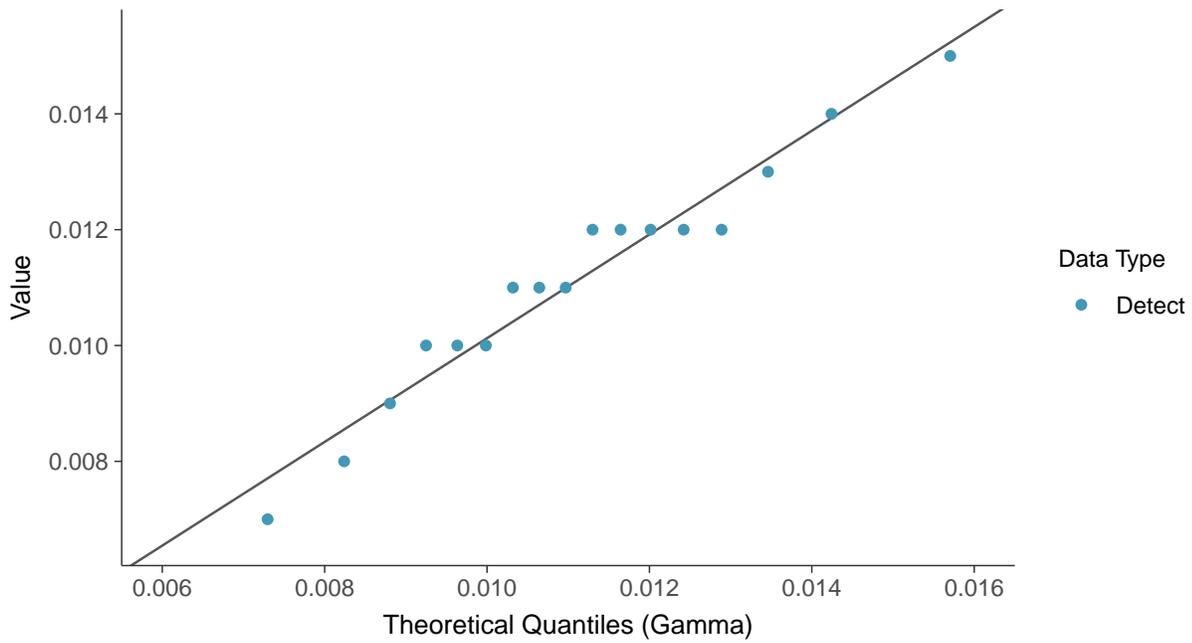


Lognormal Q-Q plot
Molybdenum, MW-2 (mg/L)

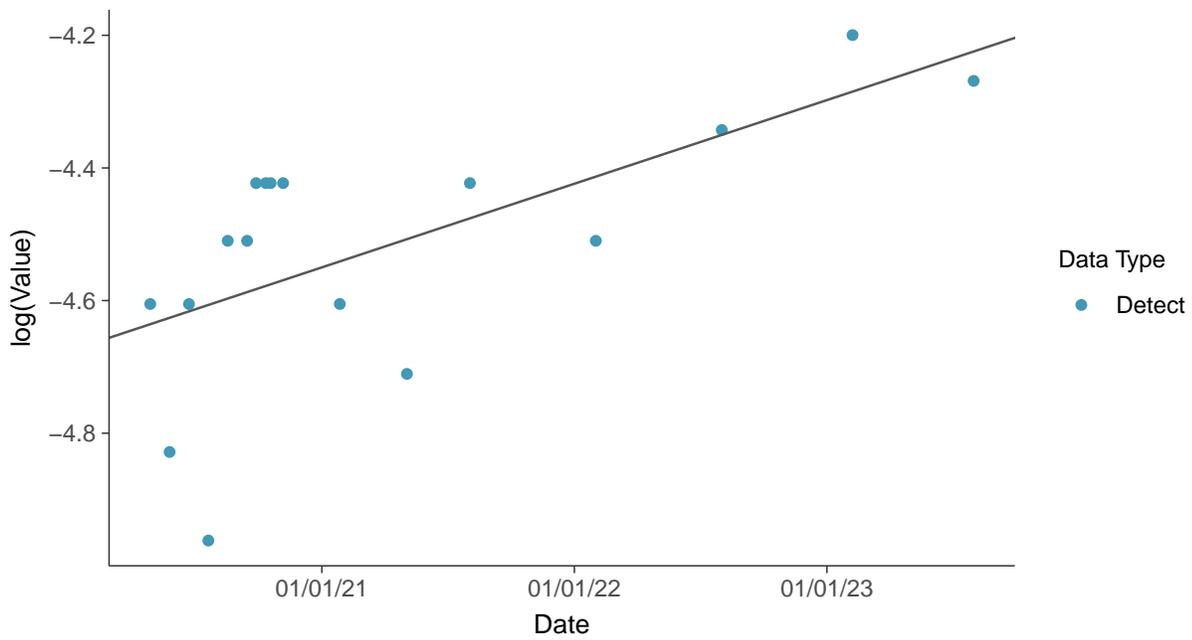




Gamma Q-Q plot
Molybdenum, MW-2 (mg/L)

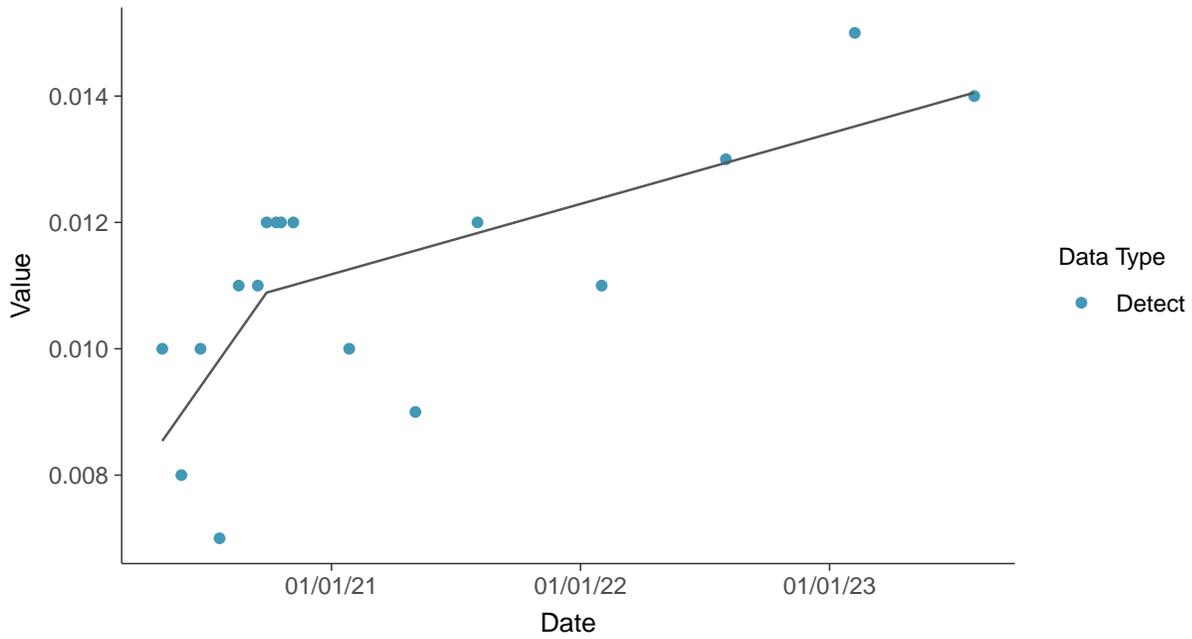


Trend Regression: Lognormal MLE
Molybdenum, MW-2 (mg/L)

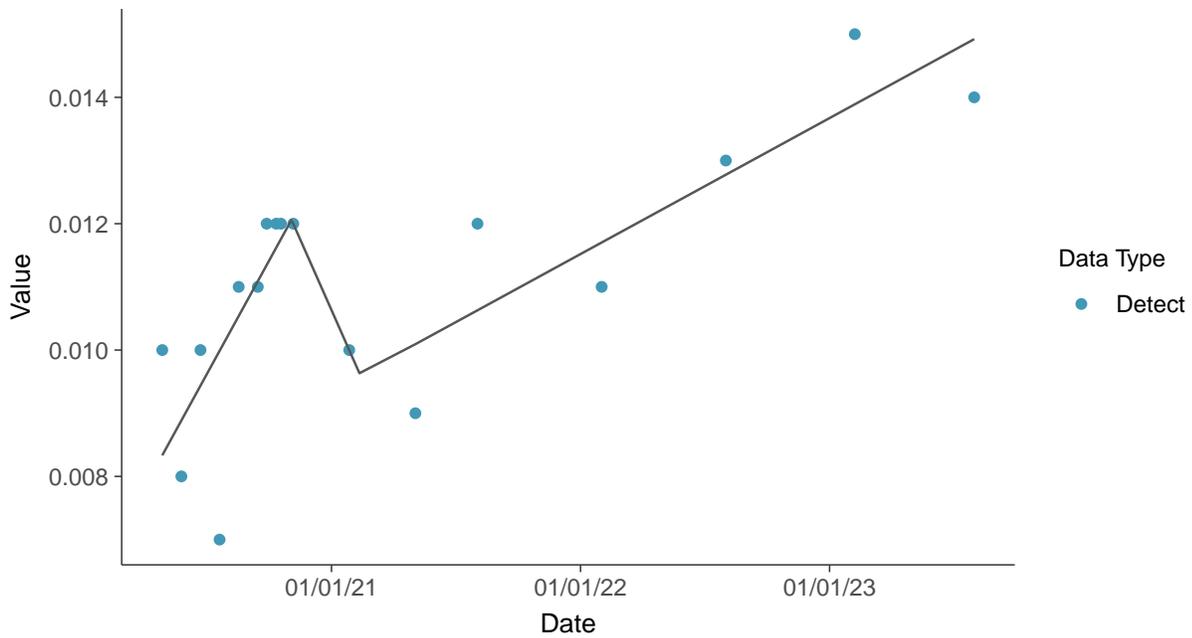




Trend Regression: Piecewise Linear-Linear
Molybdenum, MW-2 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear
Molybdenum, MW-2 (mg/L)



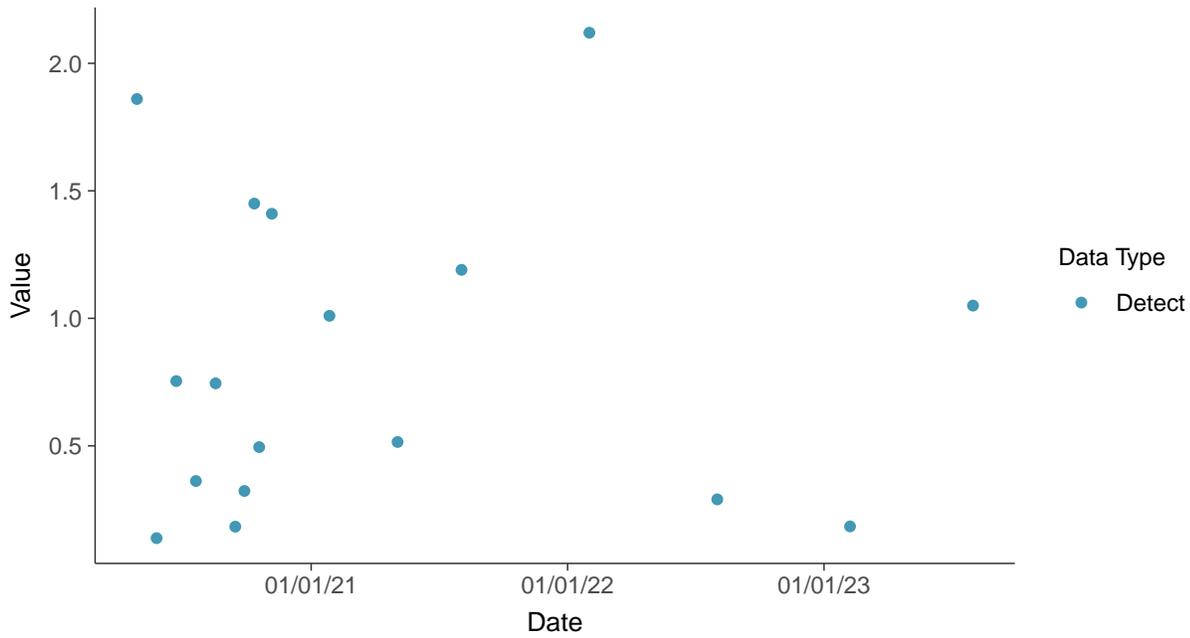


Appendix IV: Radium-226/228, MW-2

ID: 02_2_20

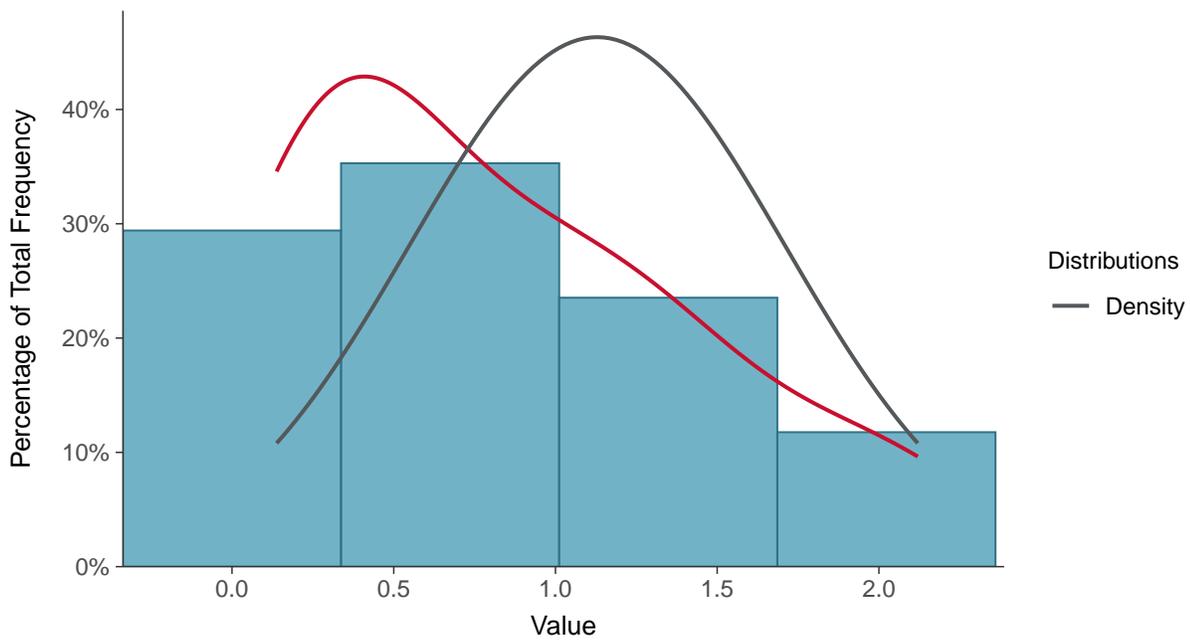
Scatter Plot

Radium-226/228, MW-2 (pCi/L)



Histogram

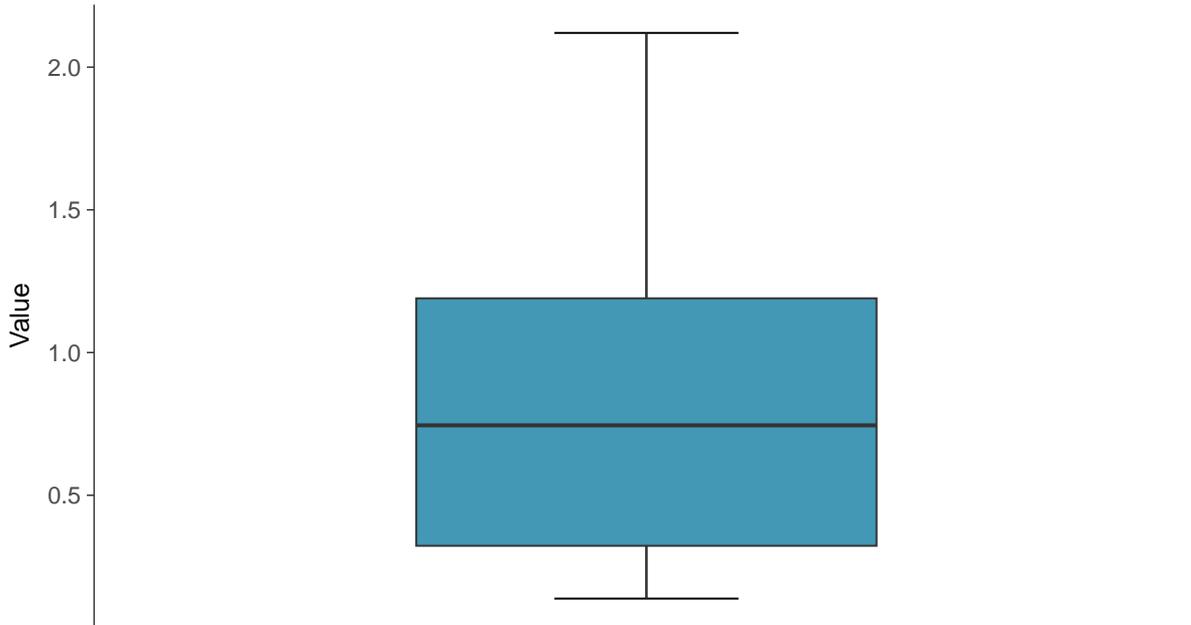
Radium-226/228, MW-2 (pCi/L)





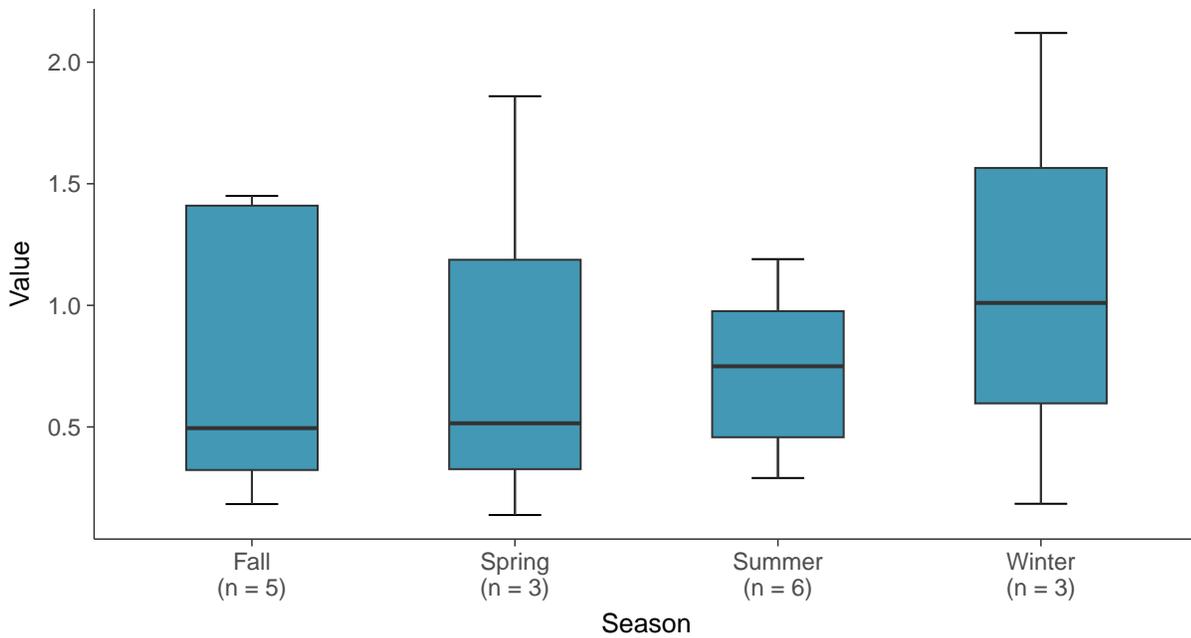
Boxplot

Radium-226/228, MW-2 (pCi/L)



Boxplot by Season

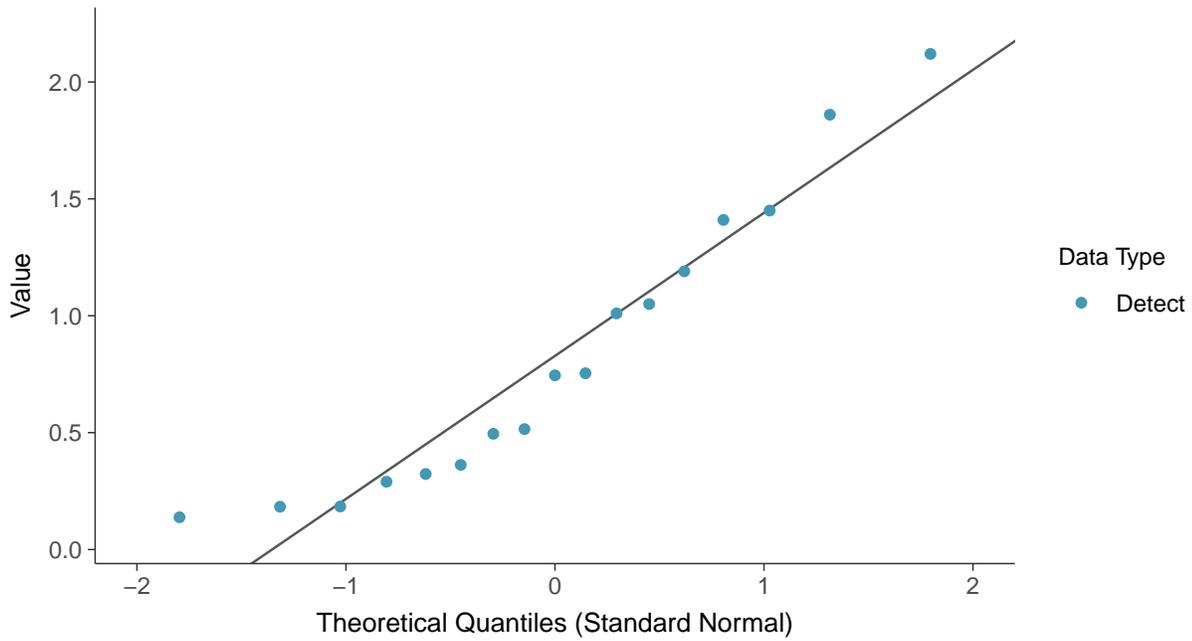
Radium-226/228, MW-2 (pCi/L)





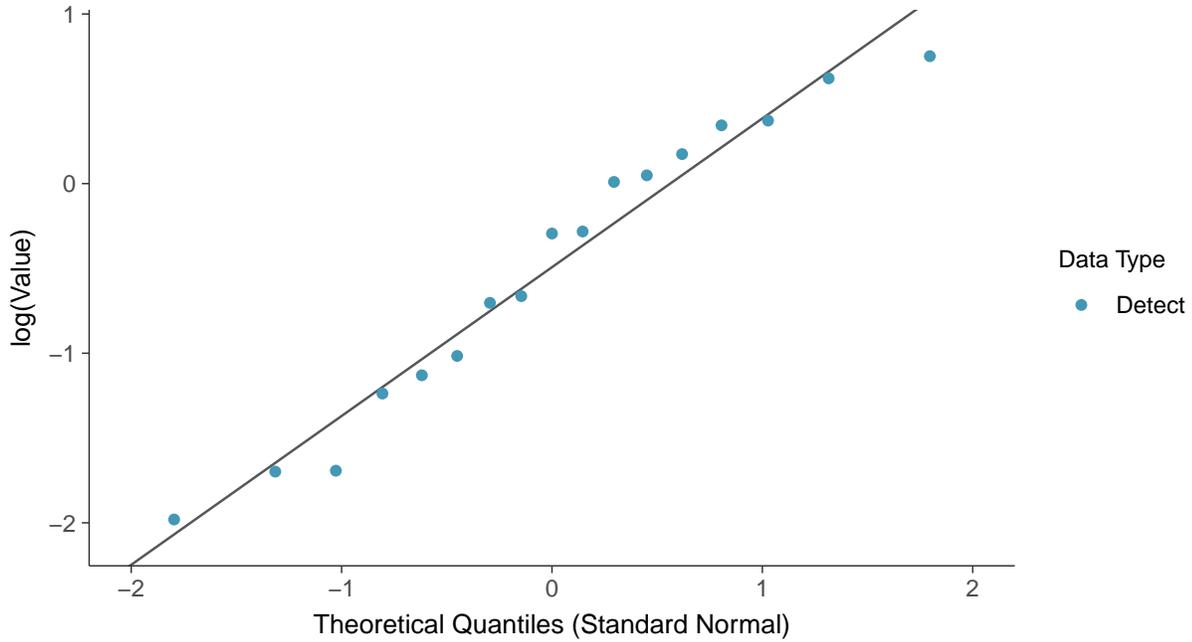
Normal Q-Q plot

Radium-226/228, MW-2 (pCi/L)



Lognormal Q-Q plot

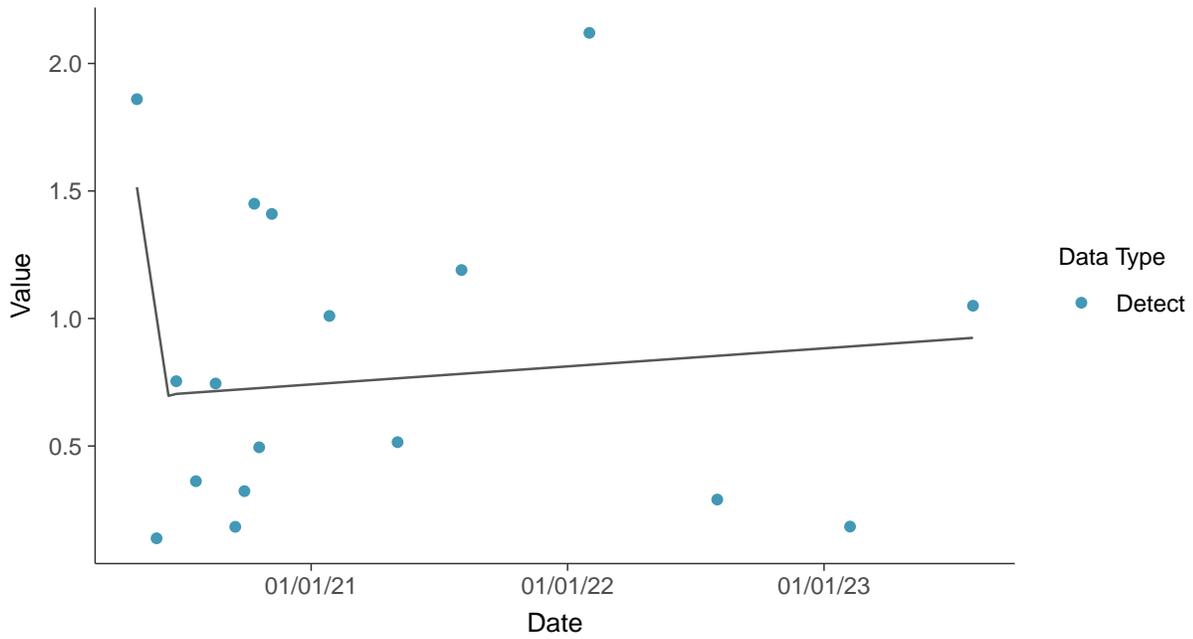
Radium-226/228, MW-2 (pCi/L)





Trend Regression: Piecewise Linear-Linear

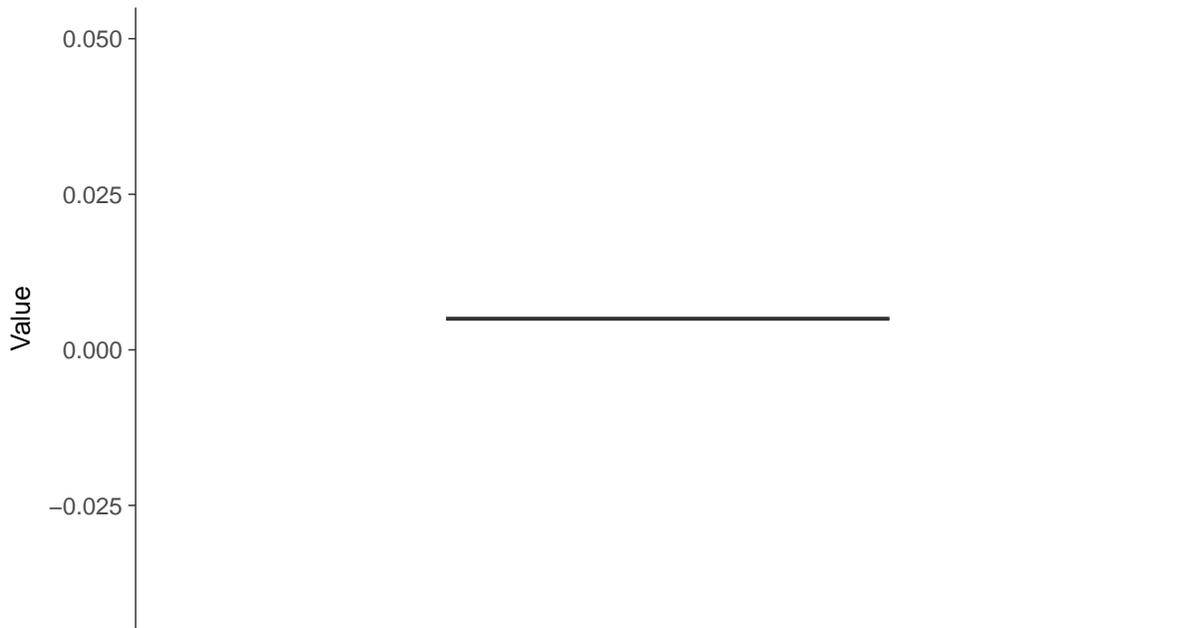
Radium-226/228, MW-2 (pCi/L)





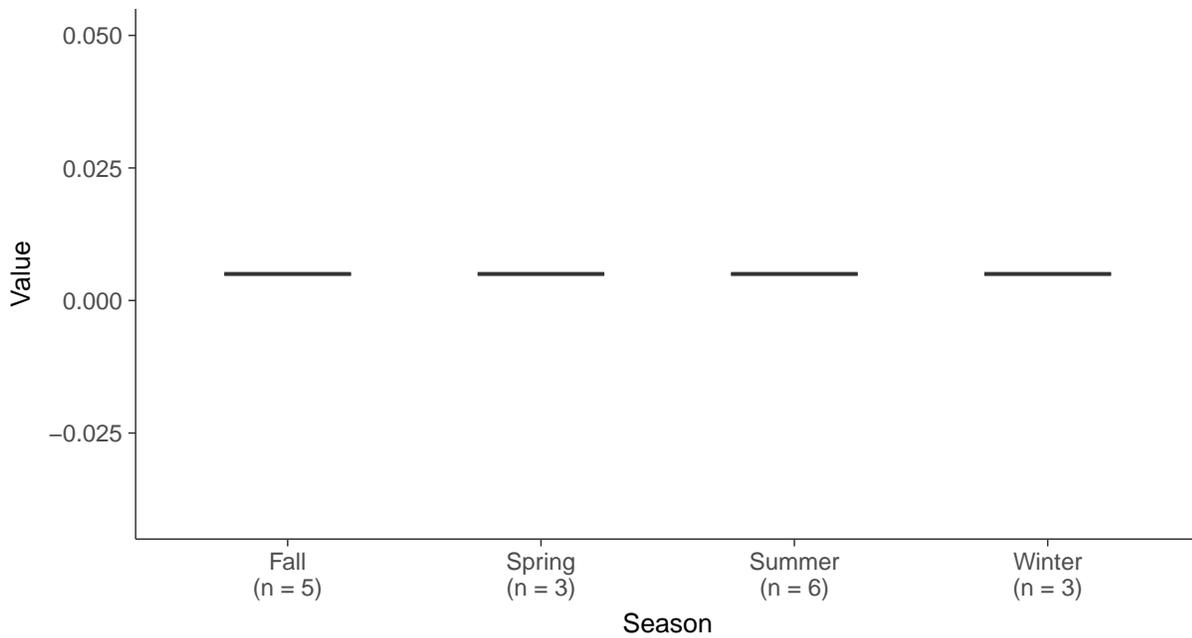
Boxplot

Selenium, MW-2 (mg/L)



Boxplot by Season

Selenium, MW-2 (mg/L)





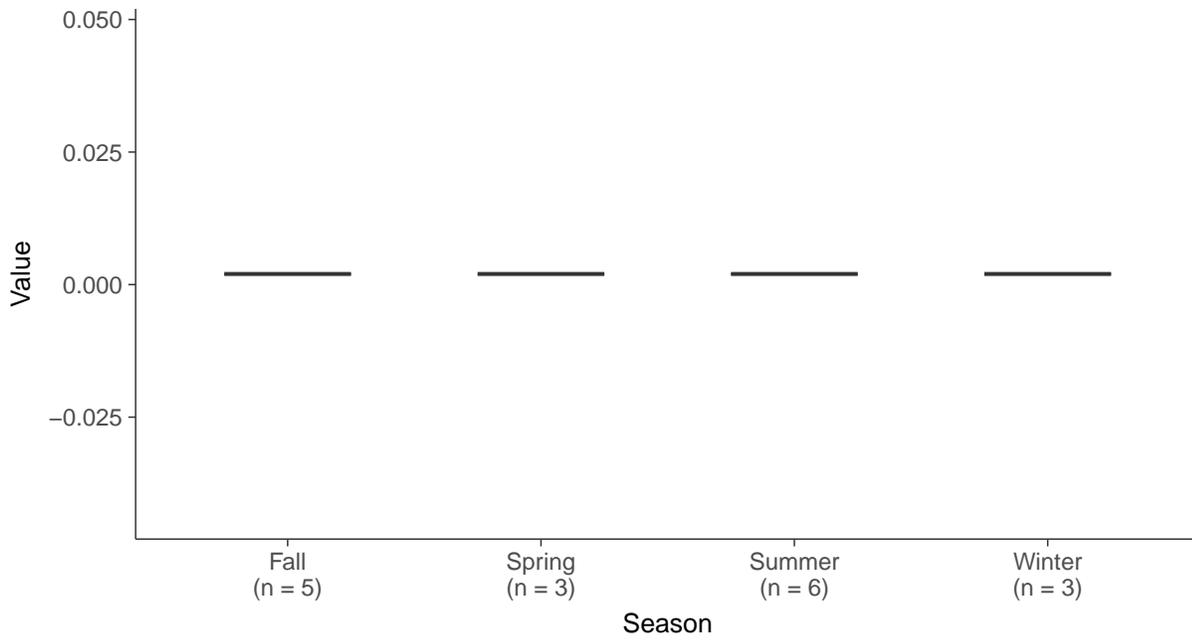
Boxplot

Thallium, MW-2 (mg/L)



Boxplot by Season

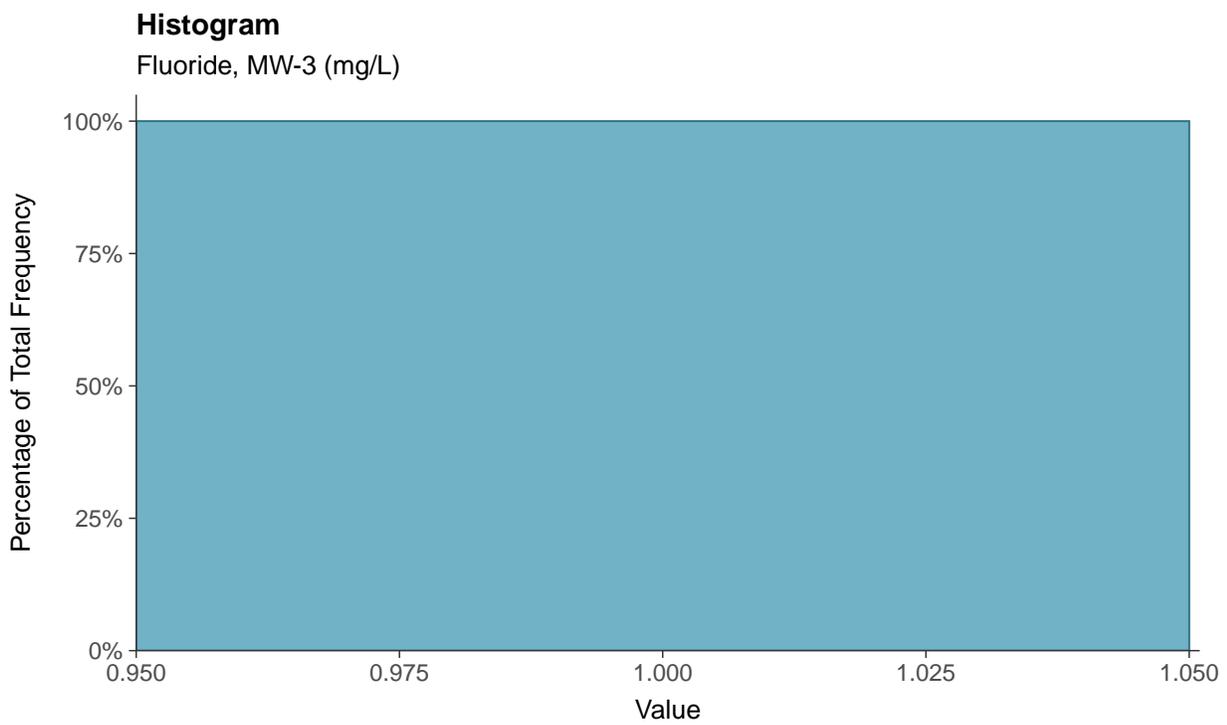
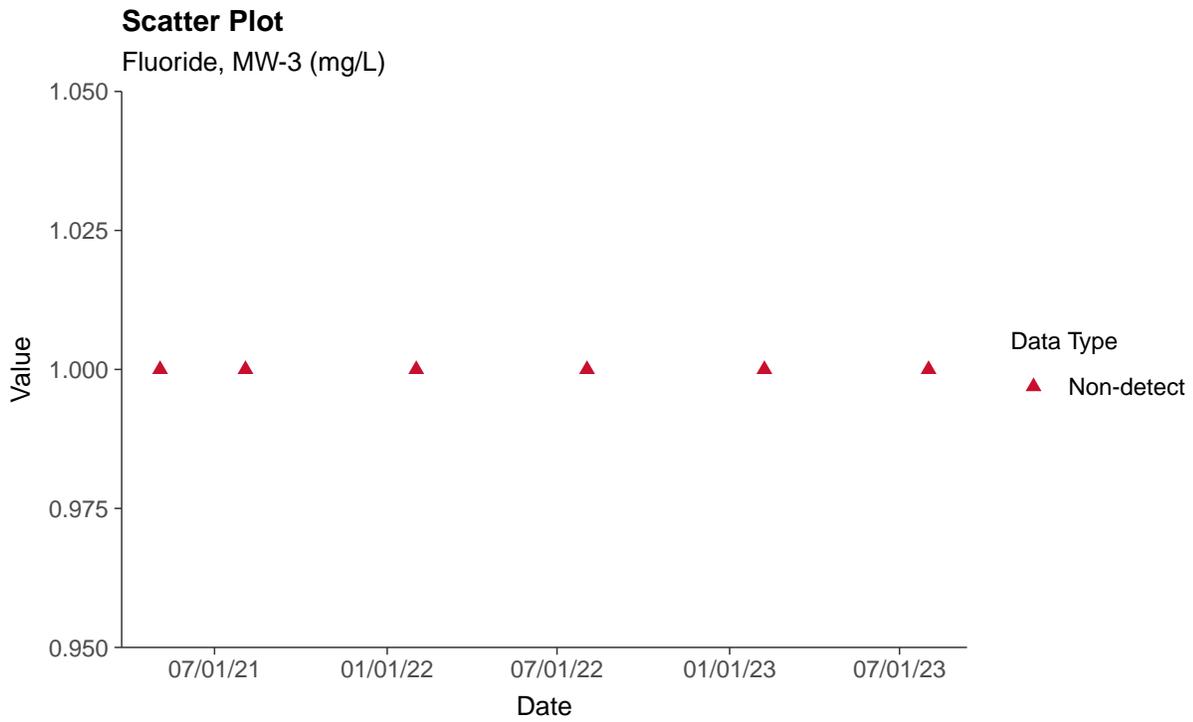
Thallium, MW-2 (mg/L)





Appendix IV: Fluoride, MW-3

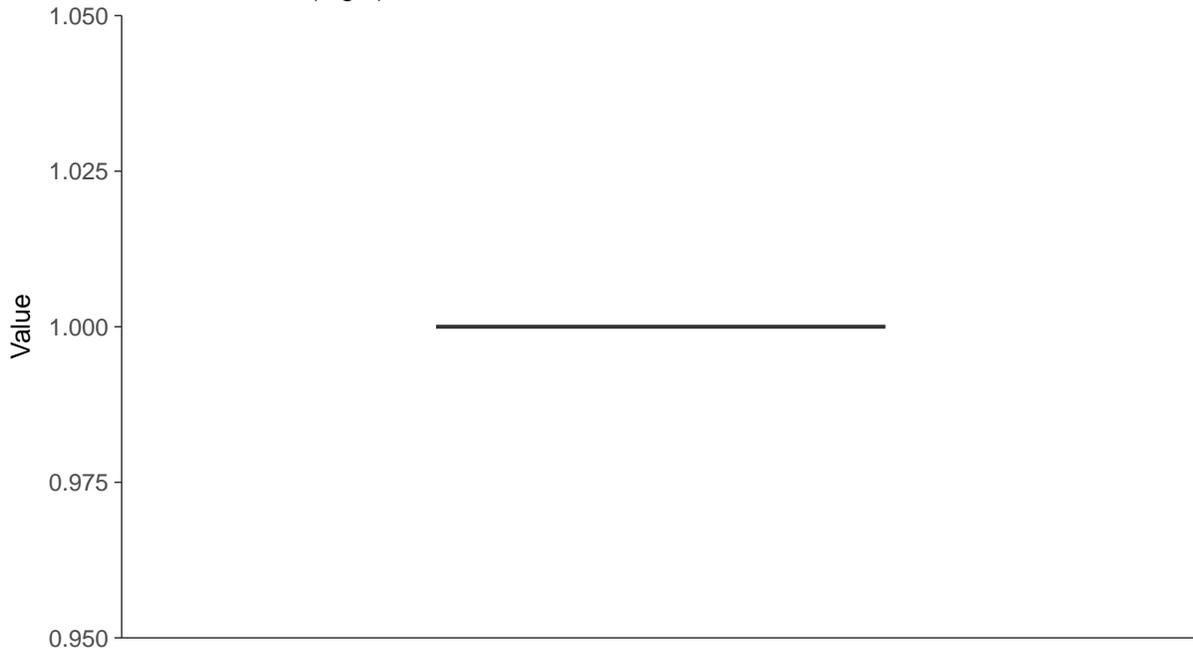
ID: 03_2_04





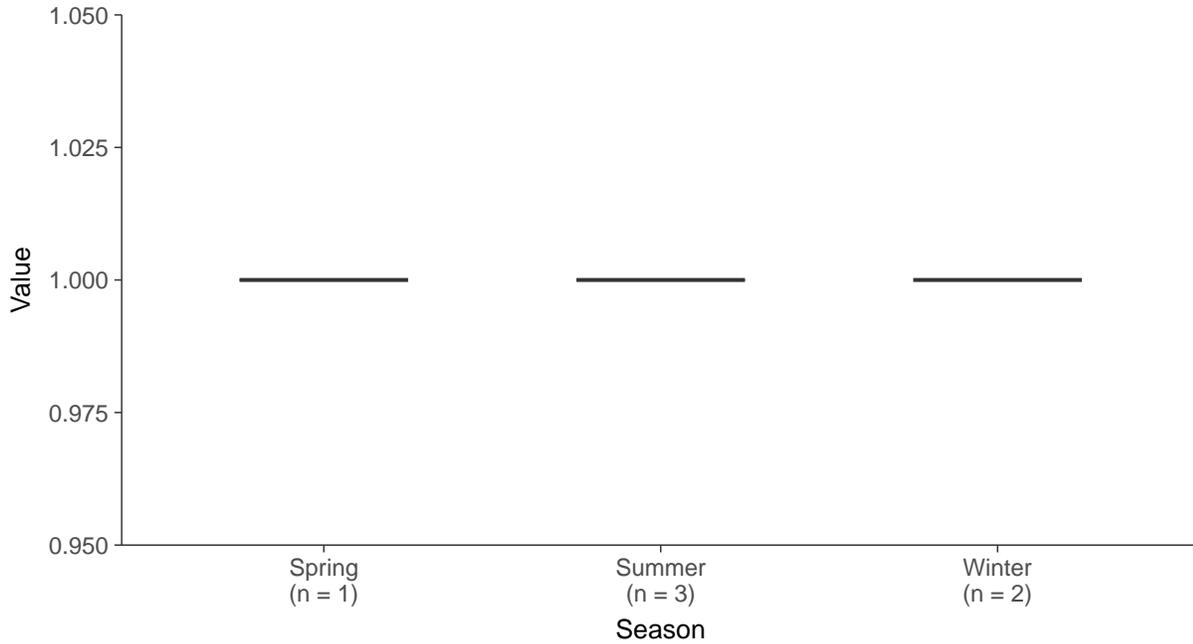
Boxplot

Fluoride, MW-3 (mg/L)



Boxplot by Season

Fluoride, MW-3 (mg/L)



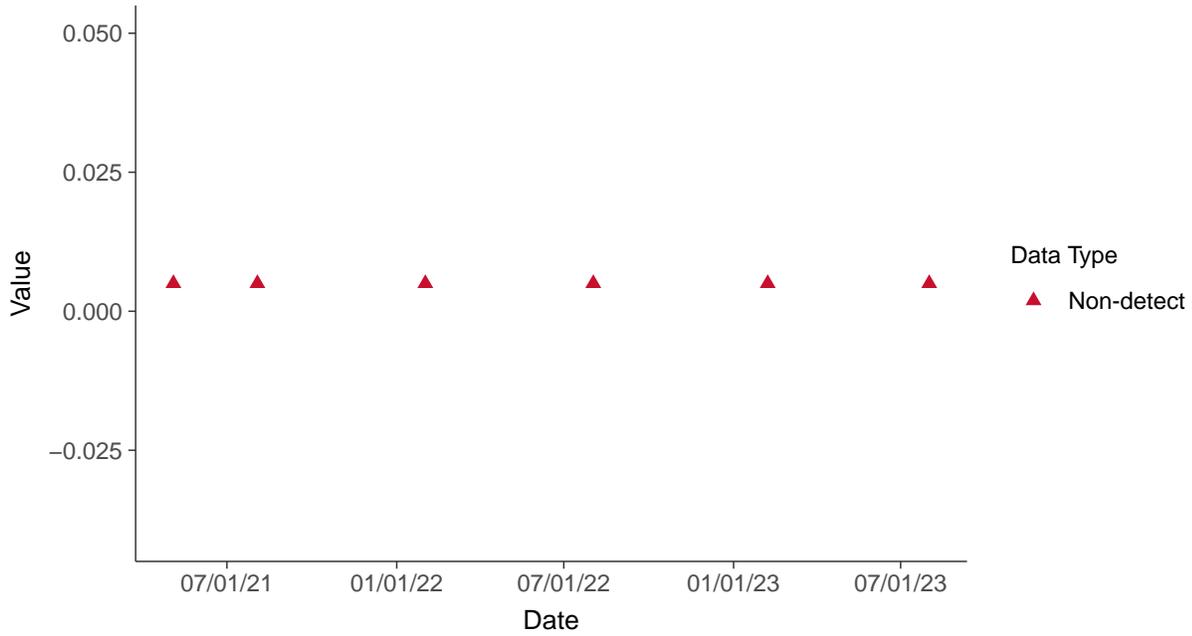


Appendix IV: Antimony, MW-3

ID: 03_2_08

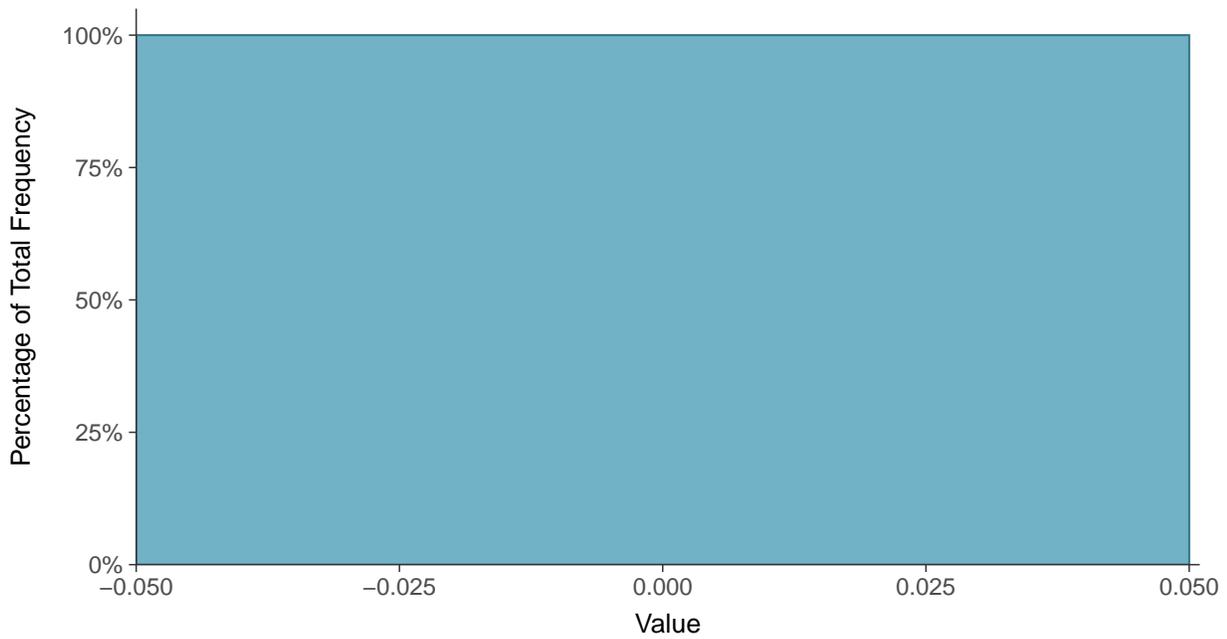
Scatter Plot

Antimony, MW-3 (mg/L)



Histogram

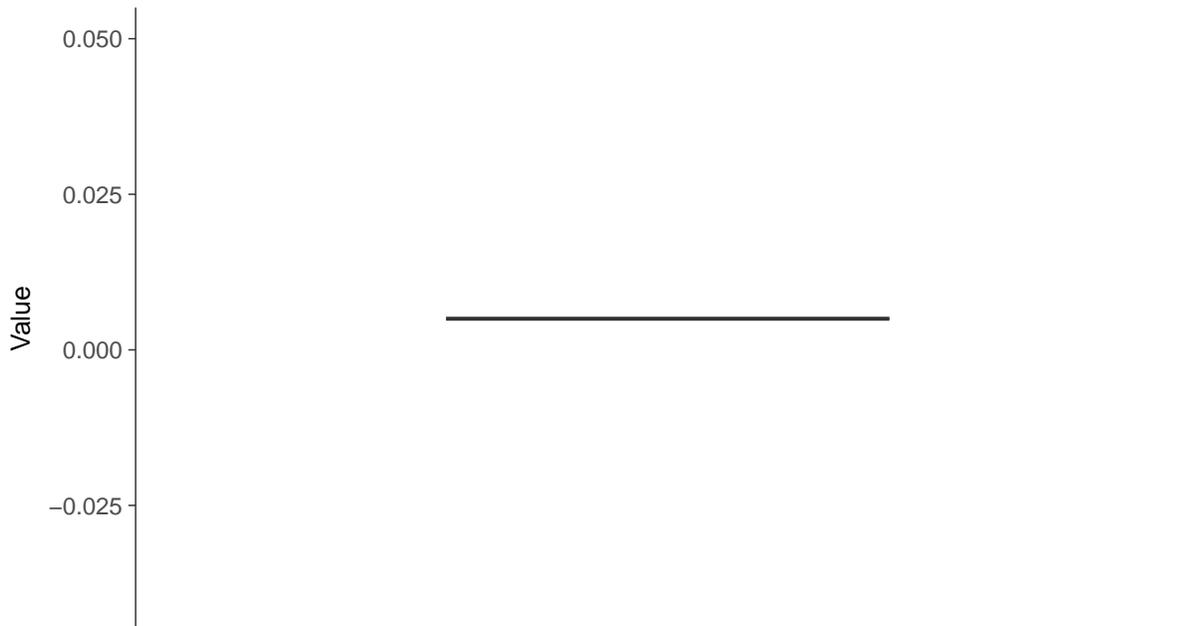
Antimony, MW-3 (mg/L)





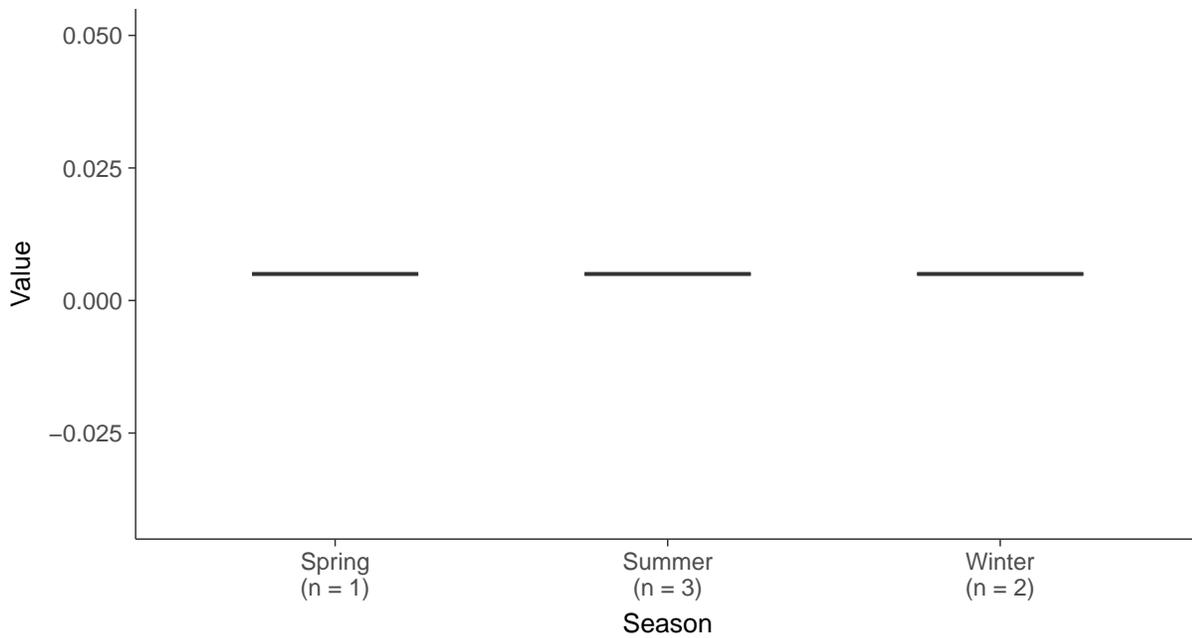
Boxplot

Antimony, MW-3 (mg/L)



Boxplot by Season

Antimony, MW-3 (mg/L)



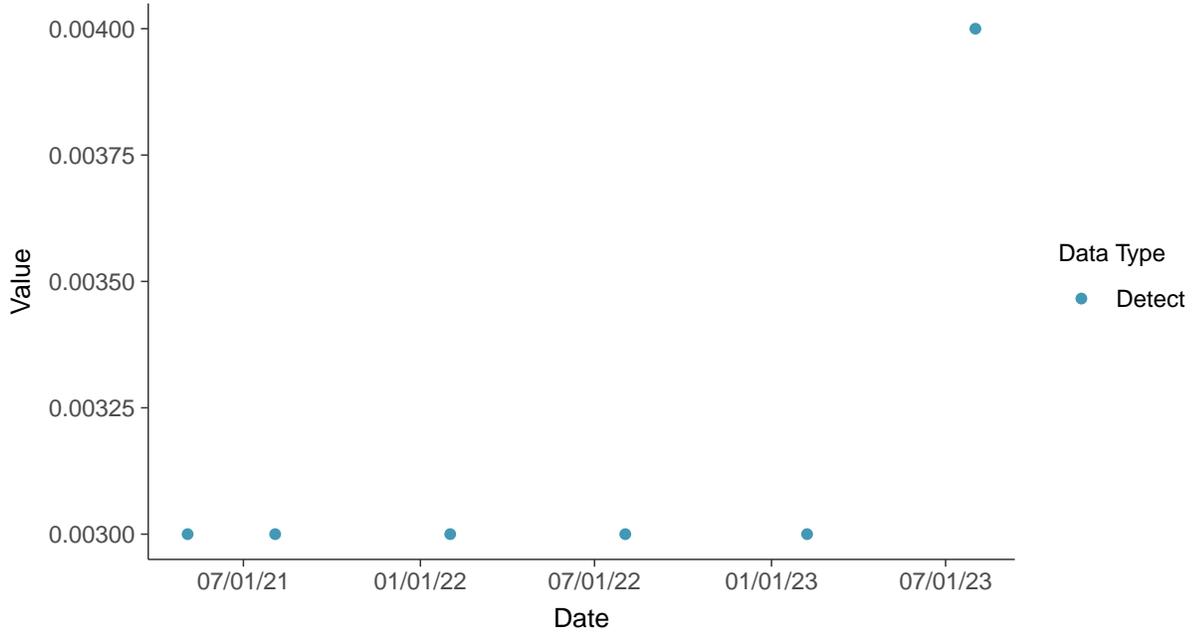


Appendix IV: Arsenic, MW-3

ID: 03_2_09

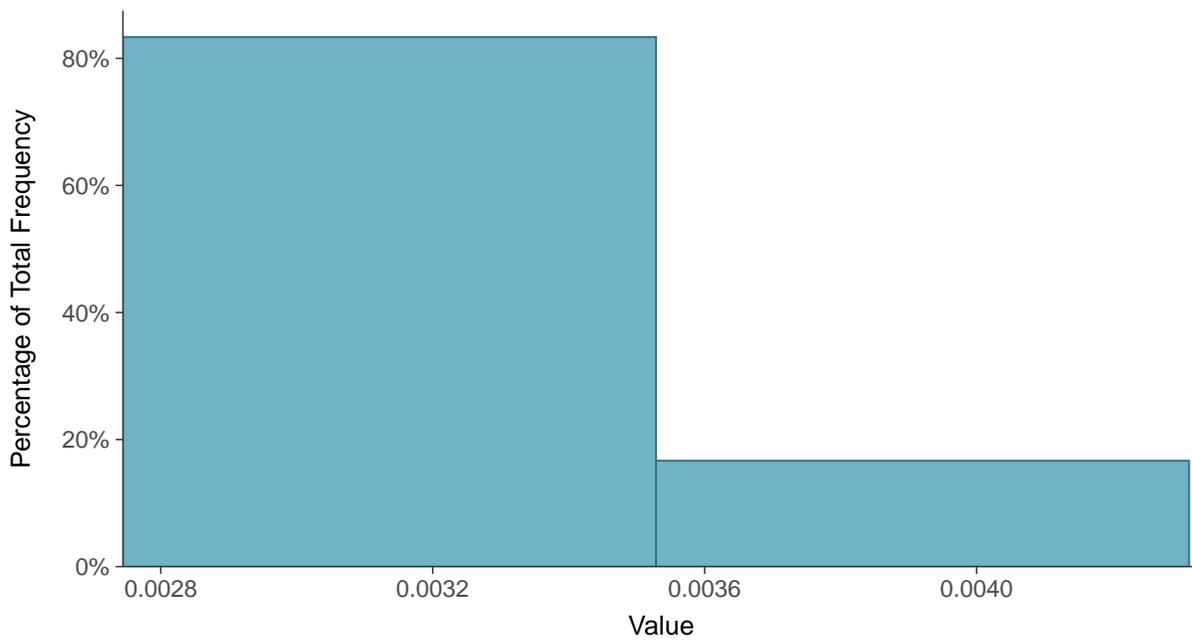
Scatter Plot

Arsenic, MW-3 (mg/L)



Histogram

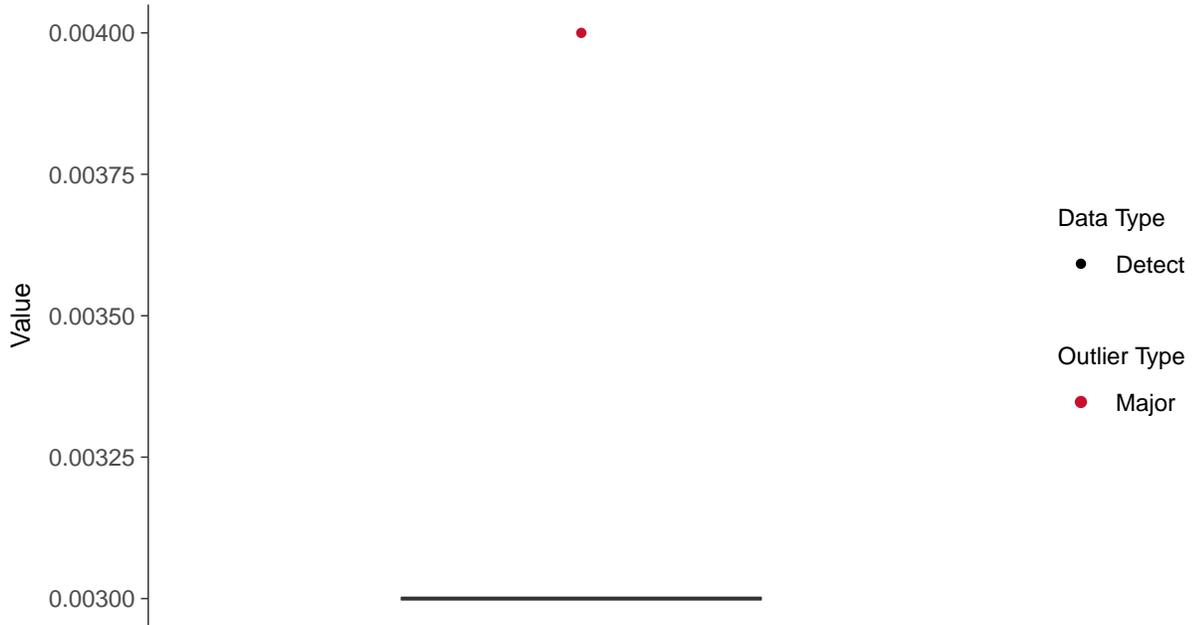
Arsenic, MW-3 (mg/L)





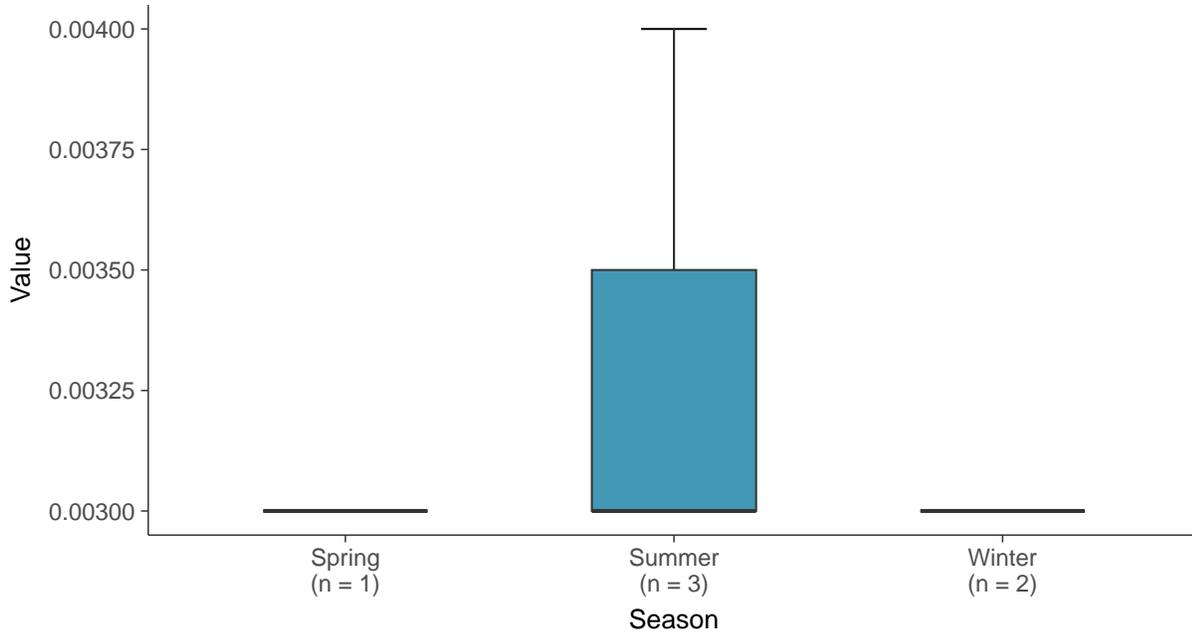
Boxplot

Arsenic, MW-3 (mg/L)



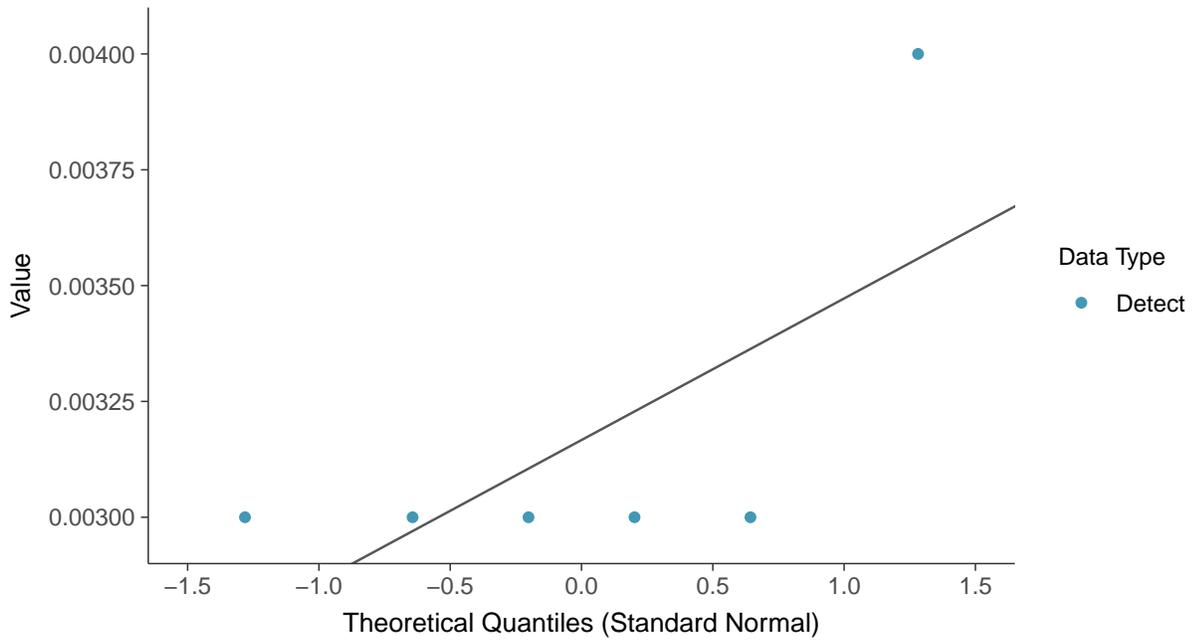
Boxplot by Season

Arsenic, MW-3 (mg/L)

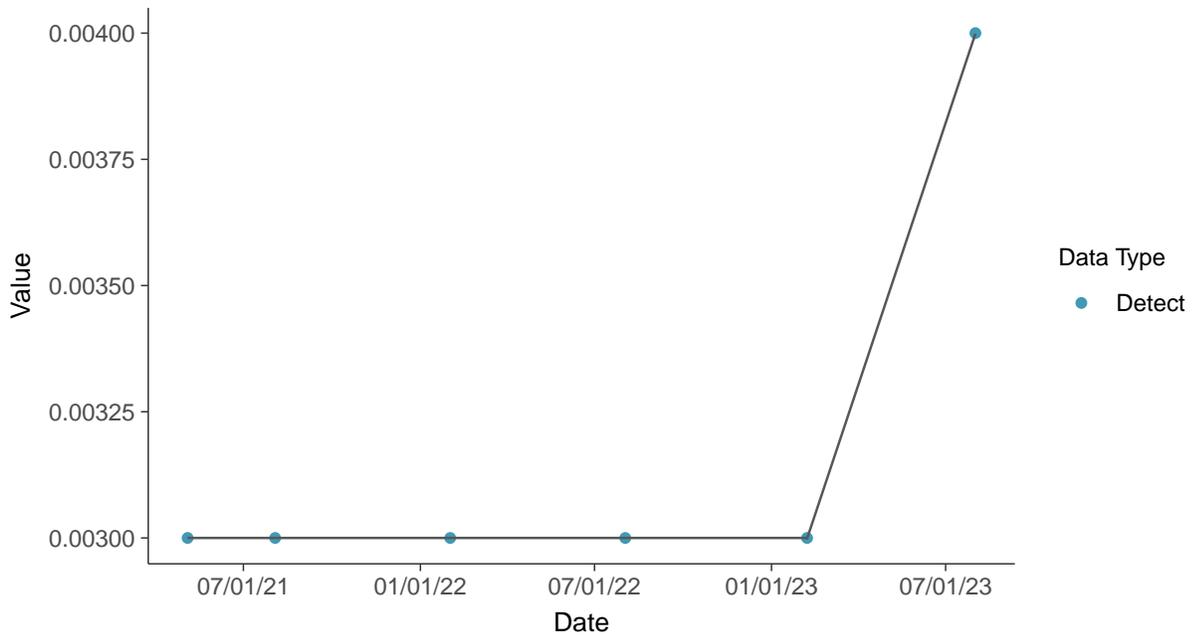




Normal Q-Q plot
Arsenic, MW-3 (mg/L)



Trend Regression: Piecewise Linear-Linear
Arsenic, MW-3 (mg/L)



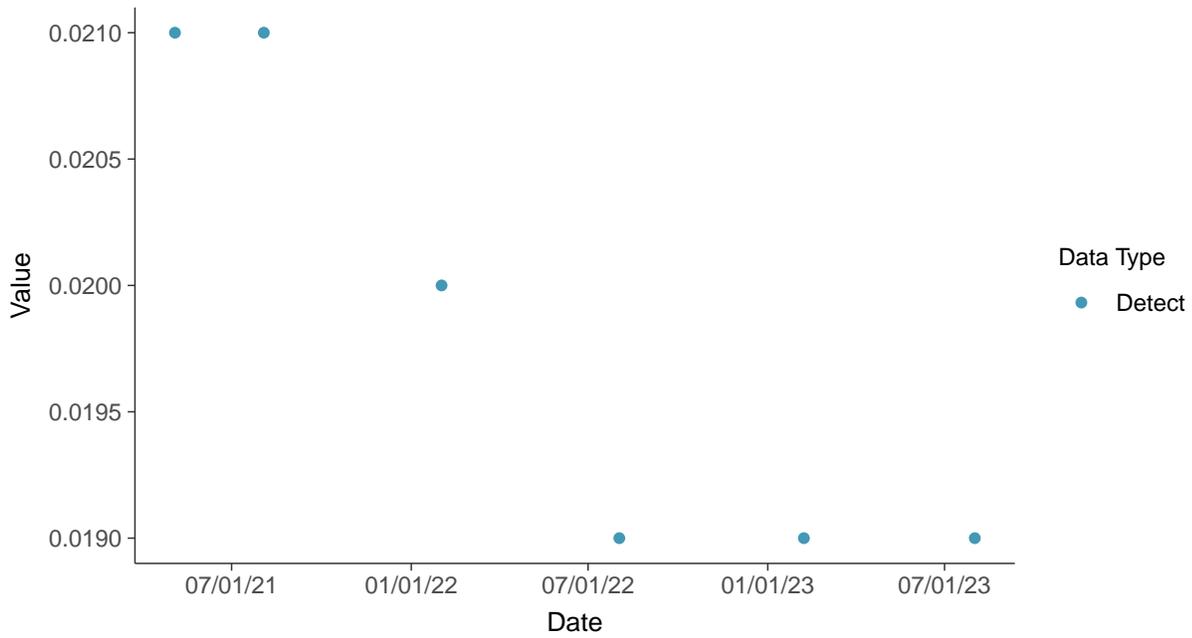


Appendix IV: Barium, MW-3

ID: 03_2_10

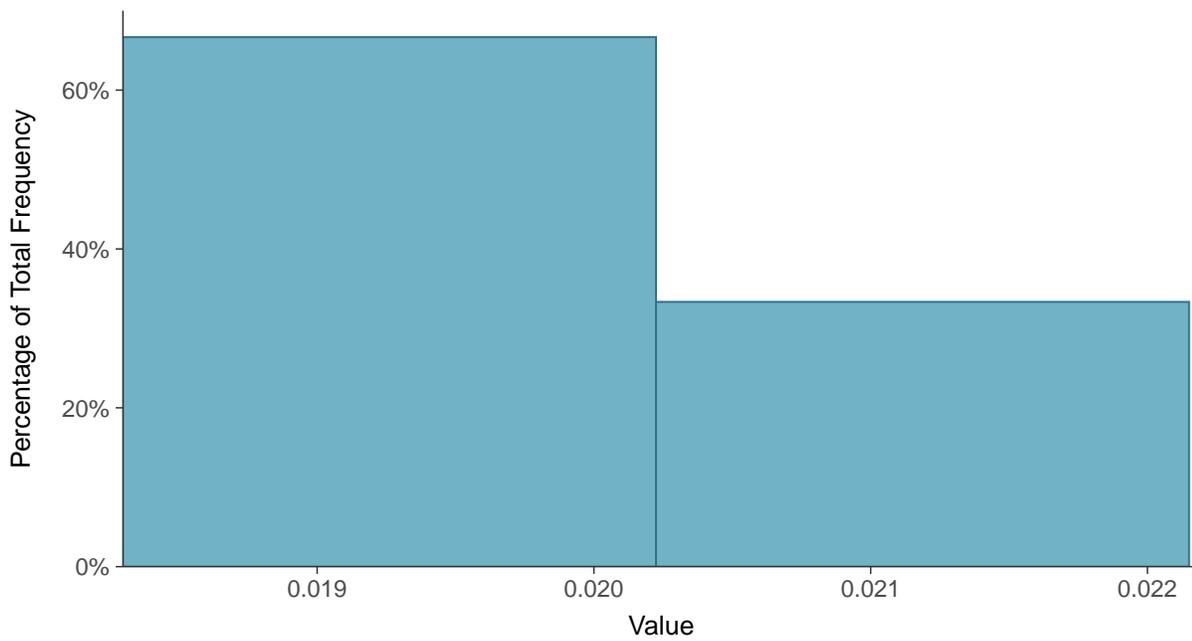
Scatter Plot

Barium, MW-3 (mg/L)



Histogram

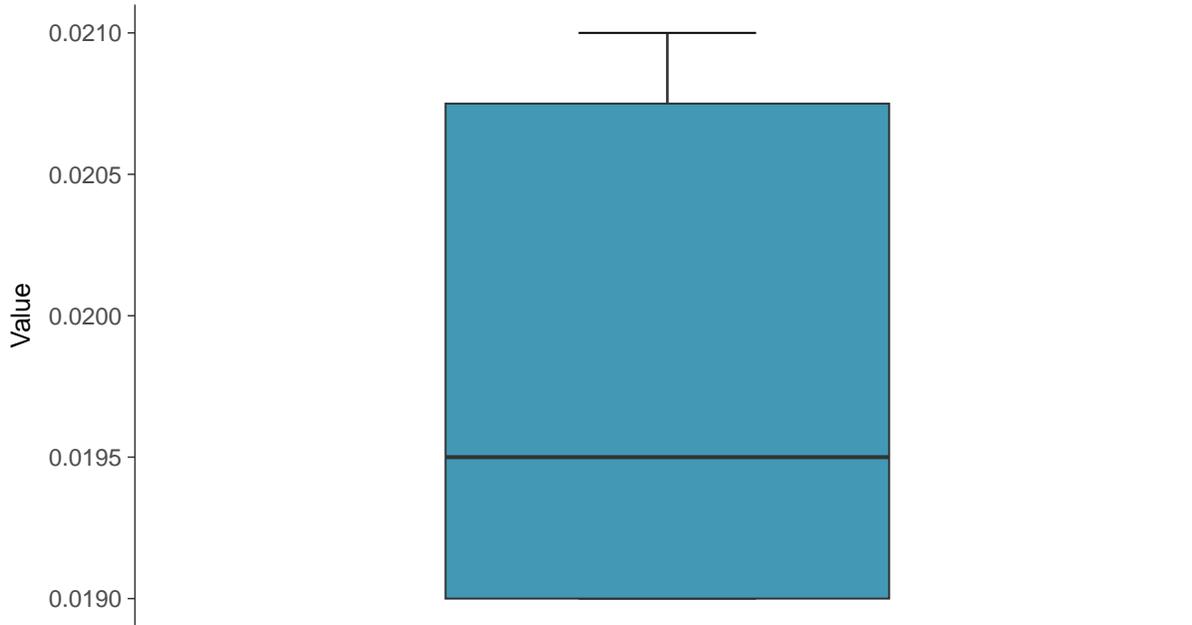
Barium, MW-3 (mg/L)





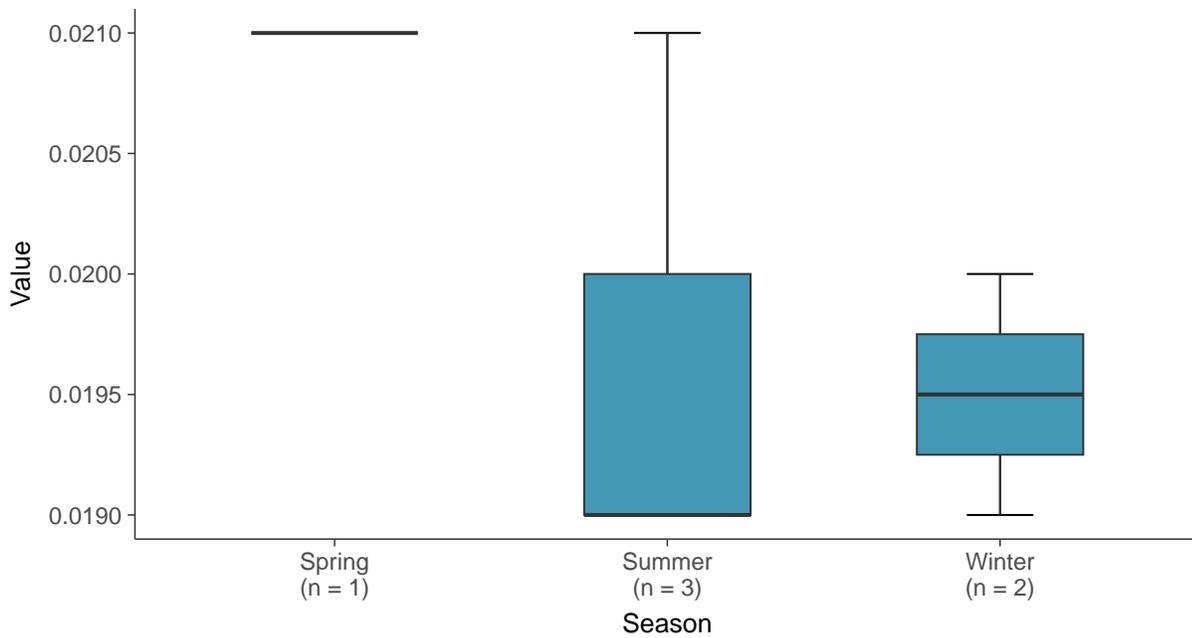
Boxplot

Barium, MW-3 (mg/L)



Boxplot by Season

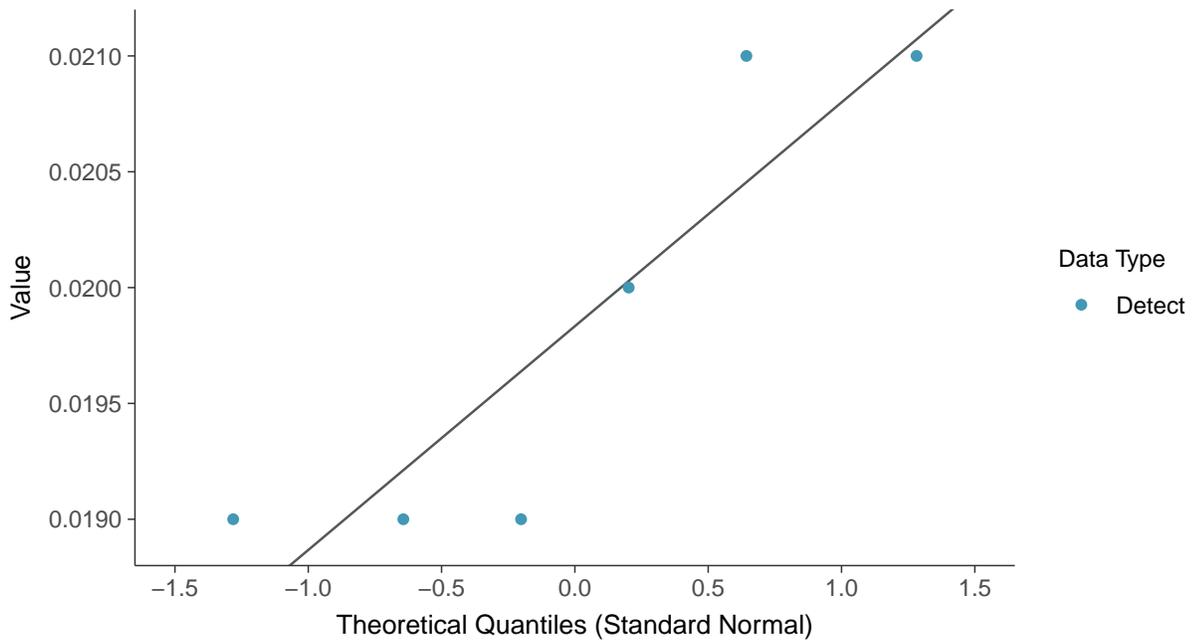
Barium, MW-3 (mg/L)





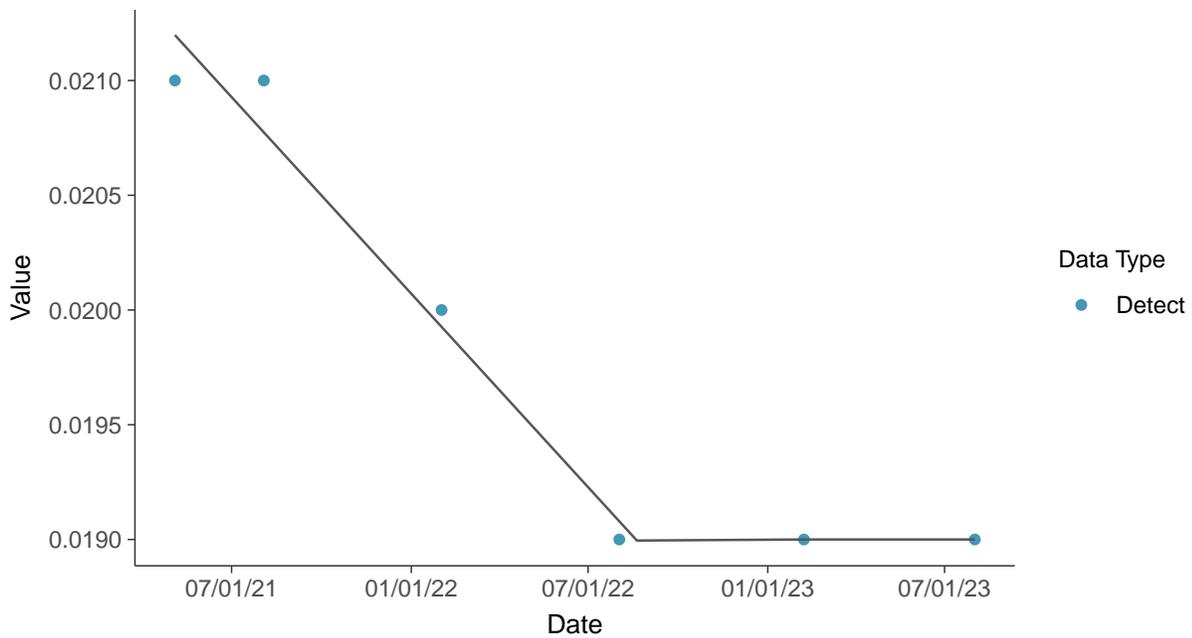
Normal Q-Q plot

Barium, MW-3 (mg/L)



Trend Regression: Piecewise Linear-Linear

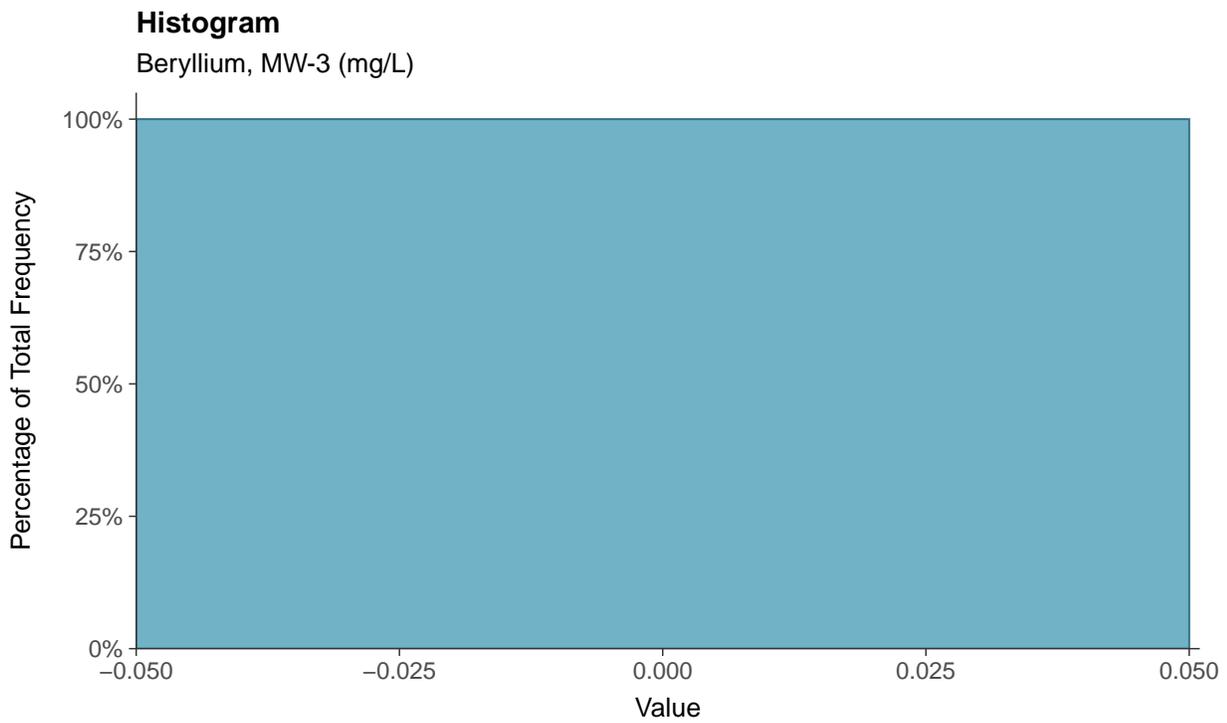
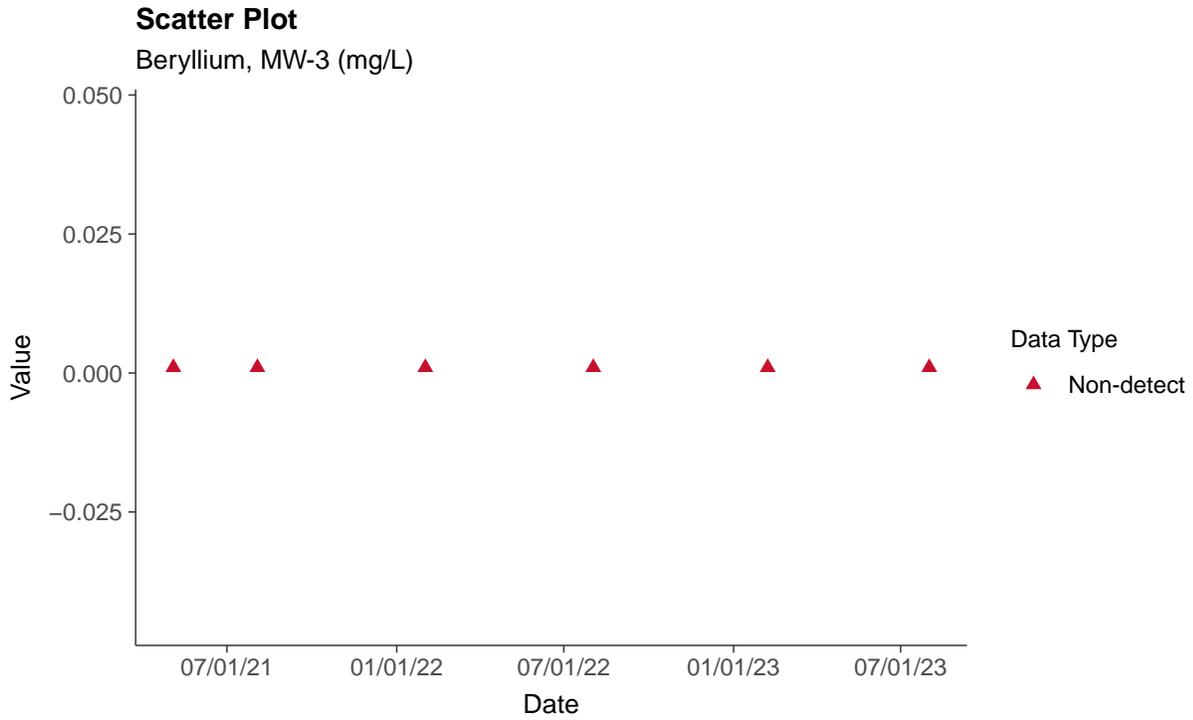
Barium, MW-3 (mg/L)





Appendix IV: Beryllium, MW-3

ID: 03_2_11





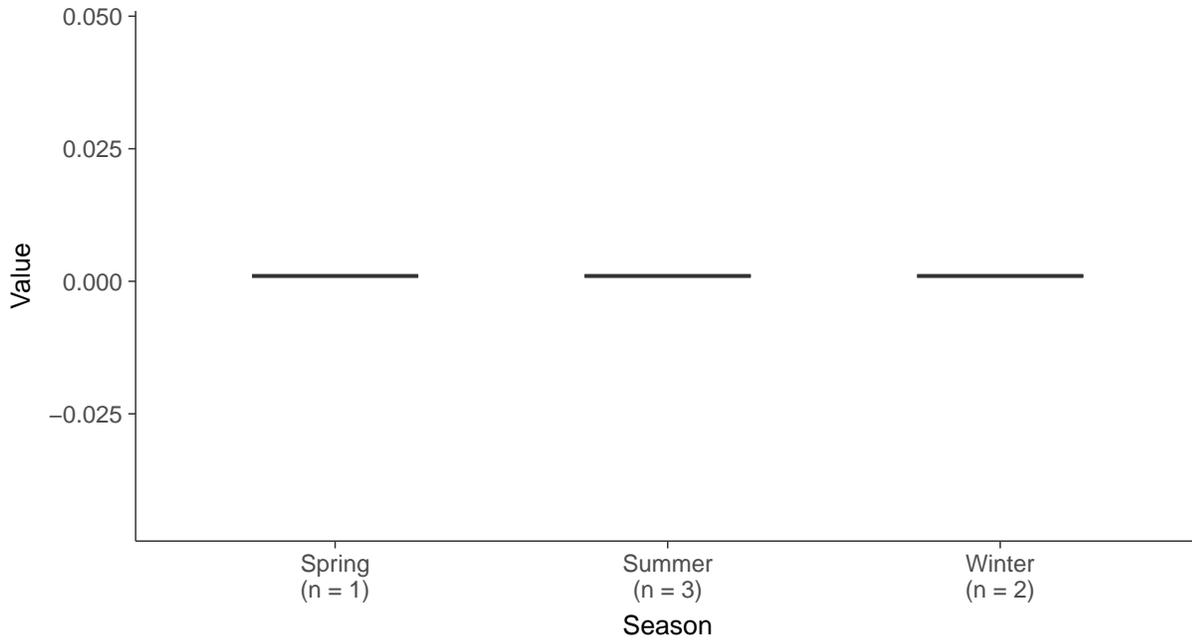
Boxplot

Beryllium, MW-3 (mg/L)



Boxplot by Season

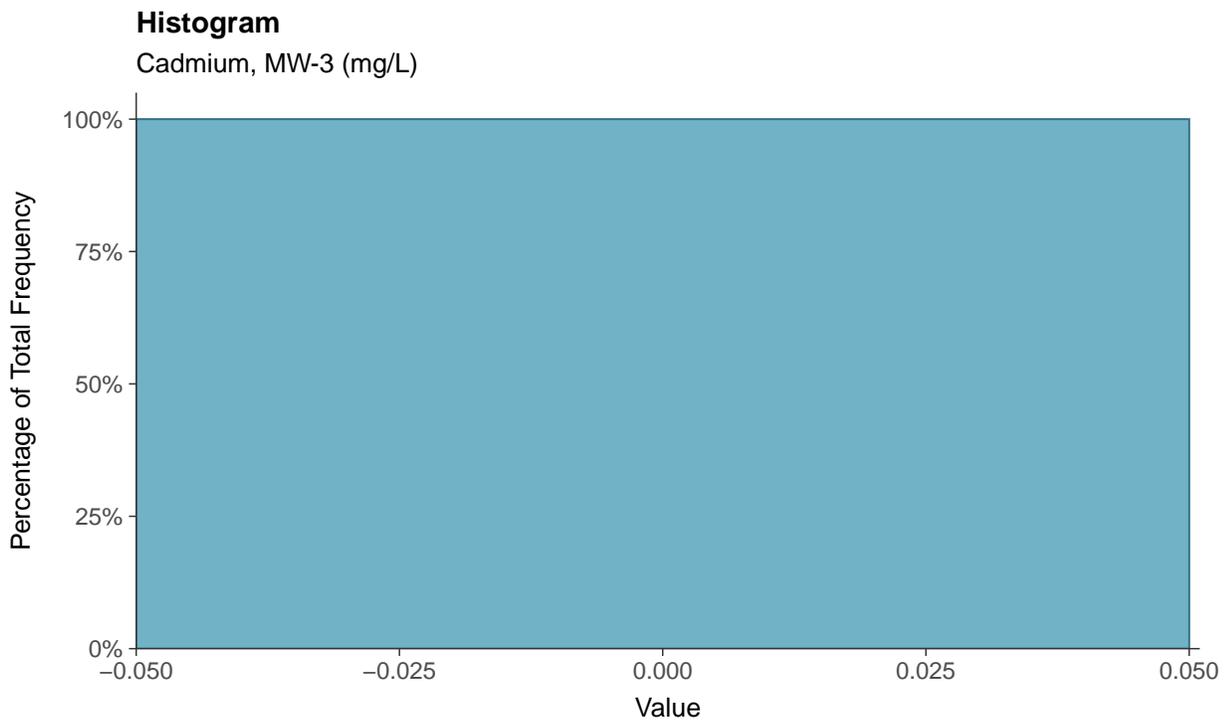
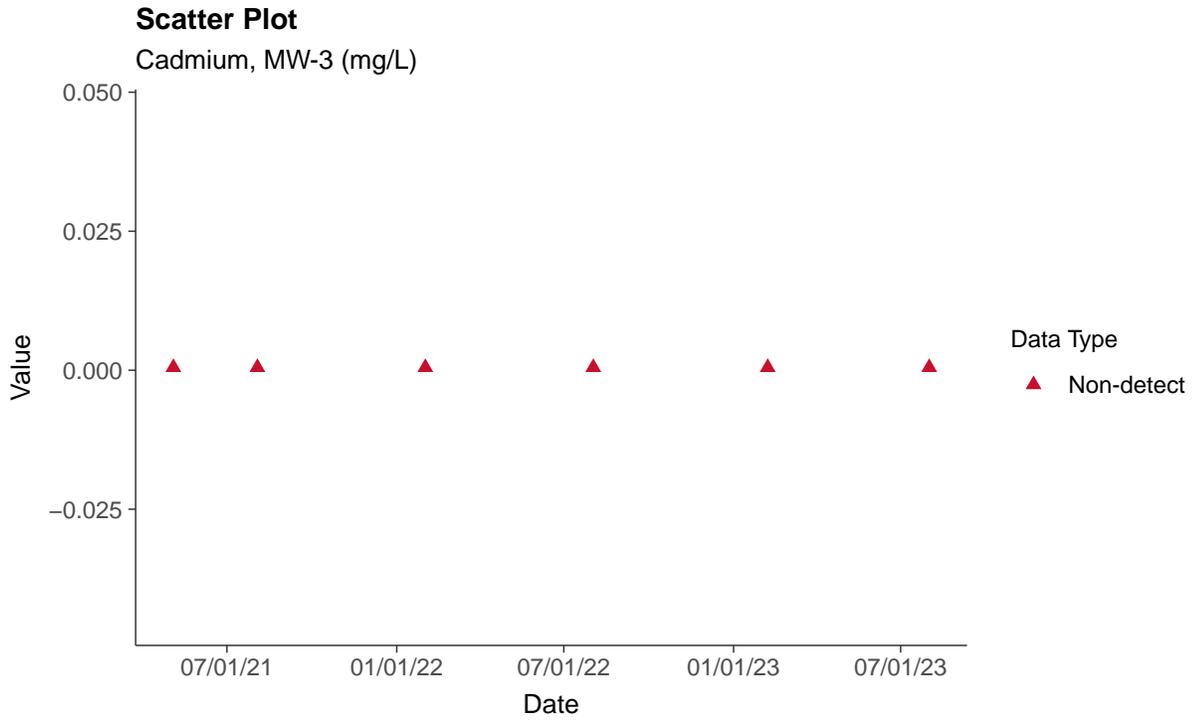
Beryllium, MW-3 (mg/L)





Appendix IV: Cadmium, MW-3

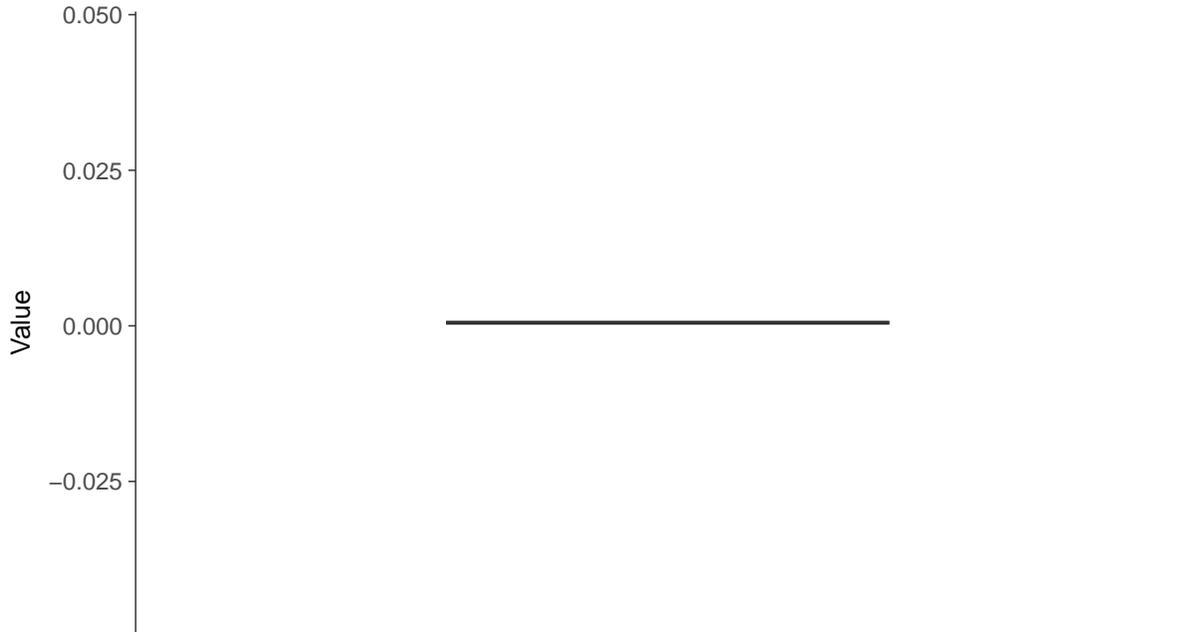
ID: 03_2_12





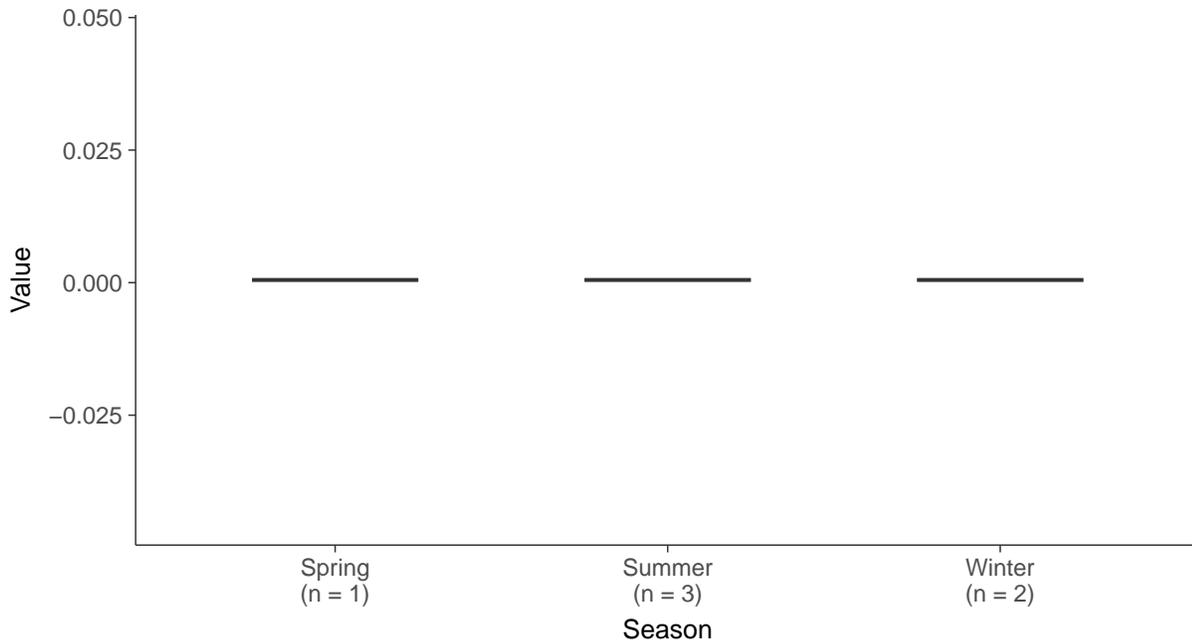
Boxplot

Cadmium, MW-3 (mg/L)



Boxplot by Season

Cadmium, MW-3 (mg/L)



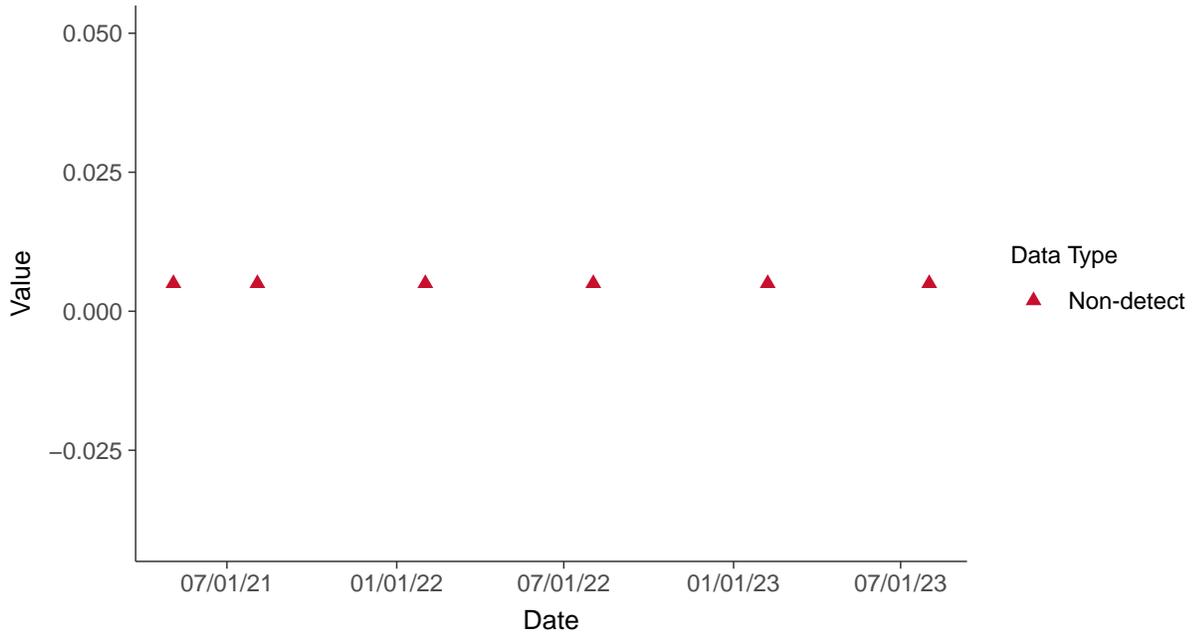


Appendix IV: Chromium, MW-3

ID: 03_2_13

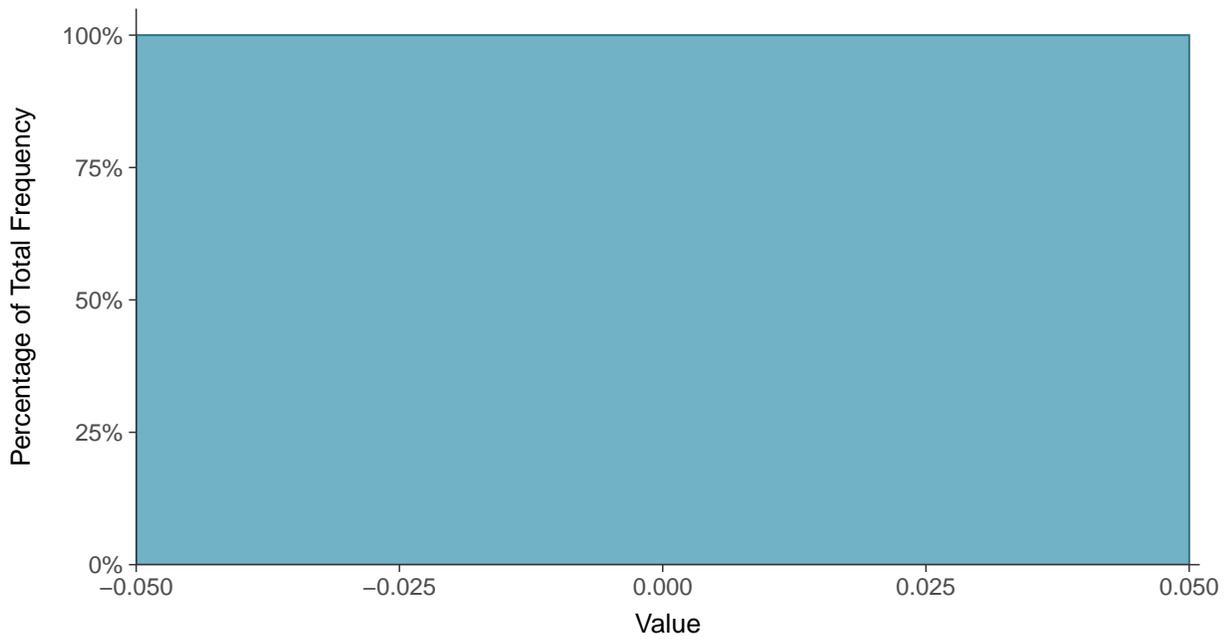
Scatter Plot

Chromium, MW-3 (mg/L)



Histogram

Chromium, MW-3 (mg/L)





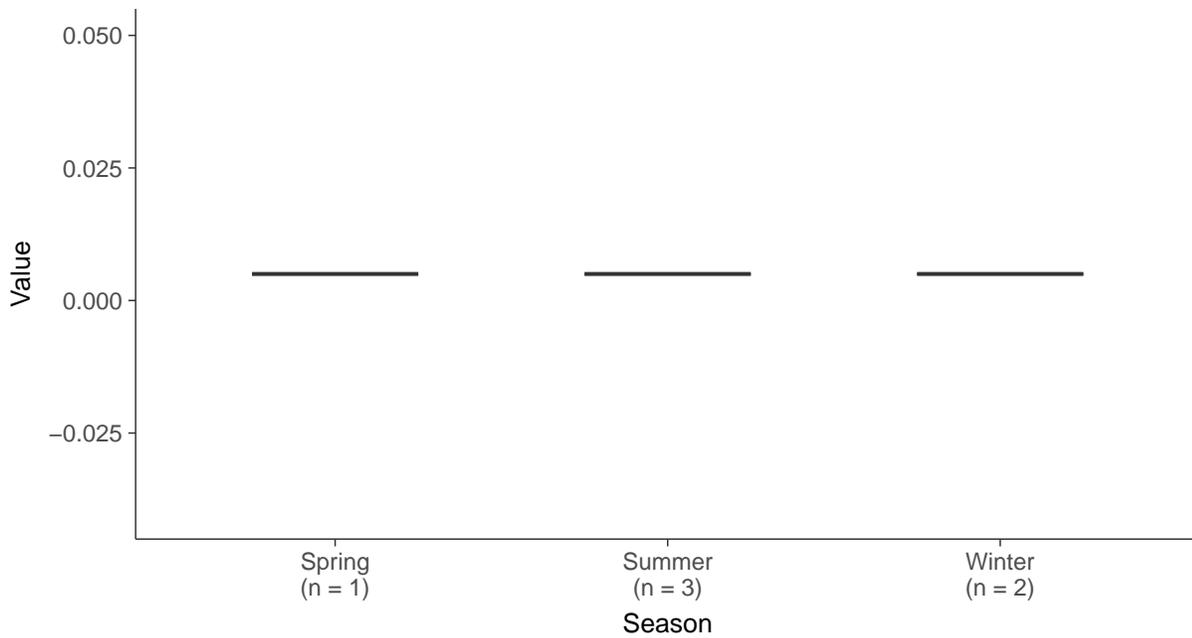
Boxplot

Chromium, MW-3 (mg/L)



Boxplot by Season

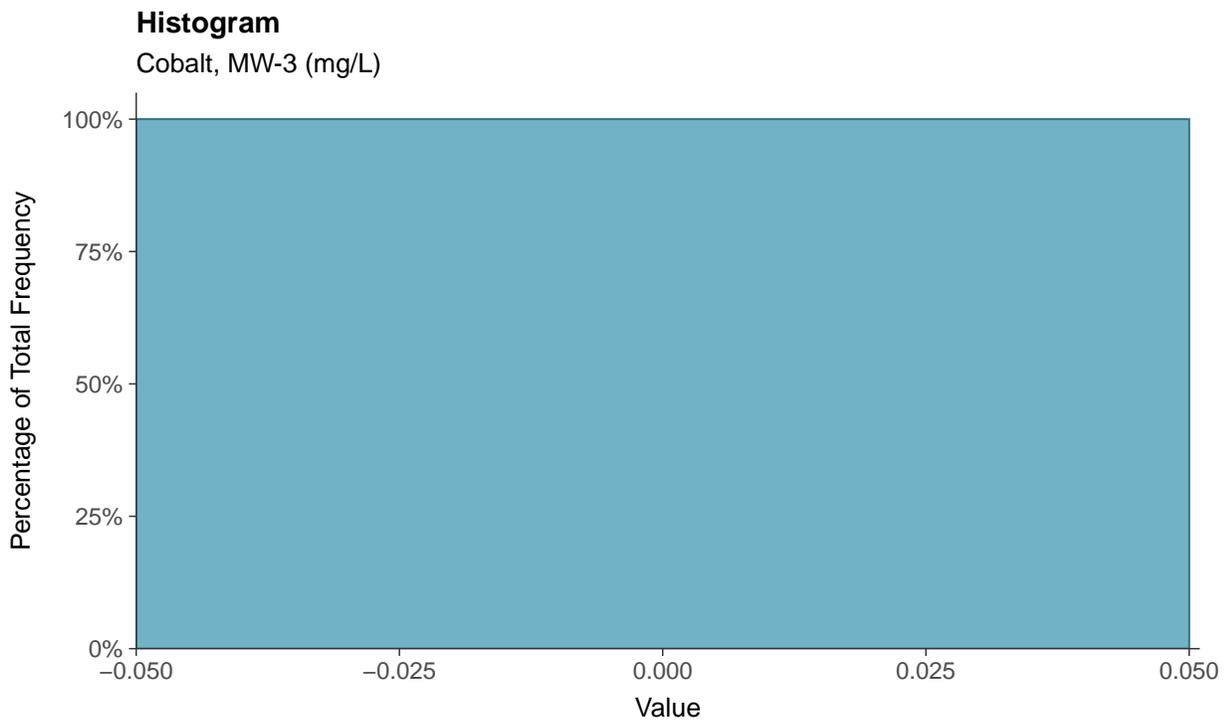
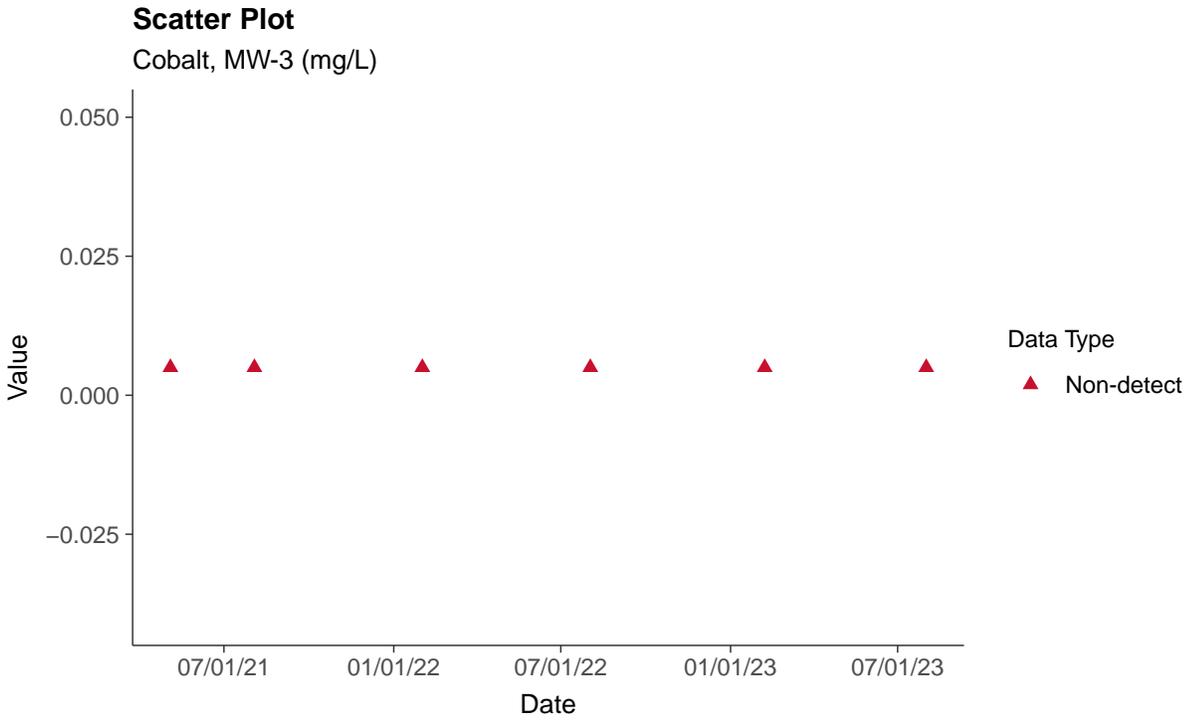
Chromium, MW-3 (mg/L)





Appendix IV: Cobalt, MW-3

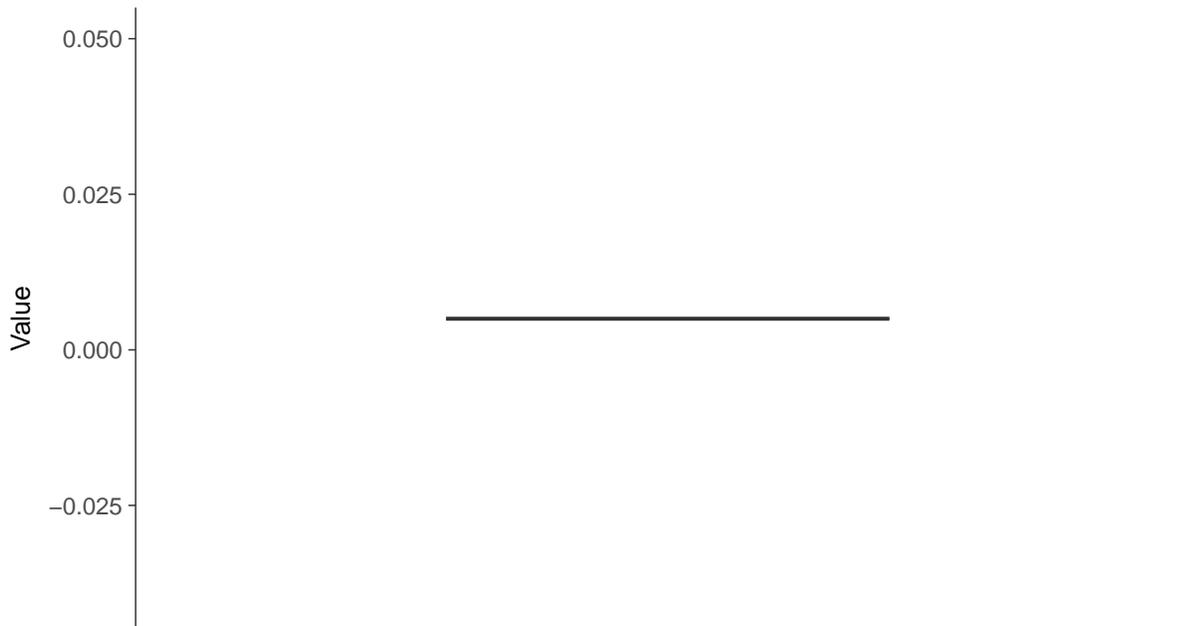
ID: 03_2_14





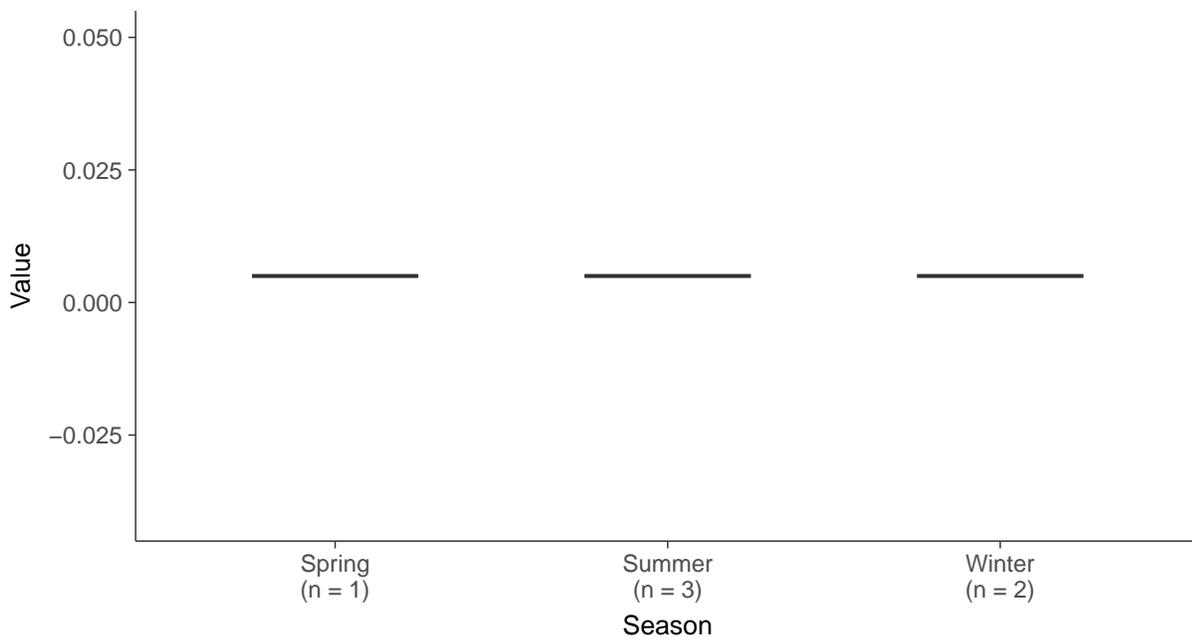
Boxplot

Cobalt, MW-3 (mg/L)



Boxplot by Season

Cobalt, MW-3 (mg/L)



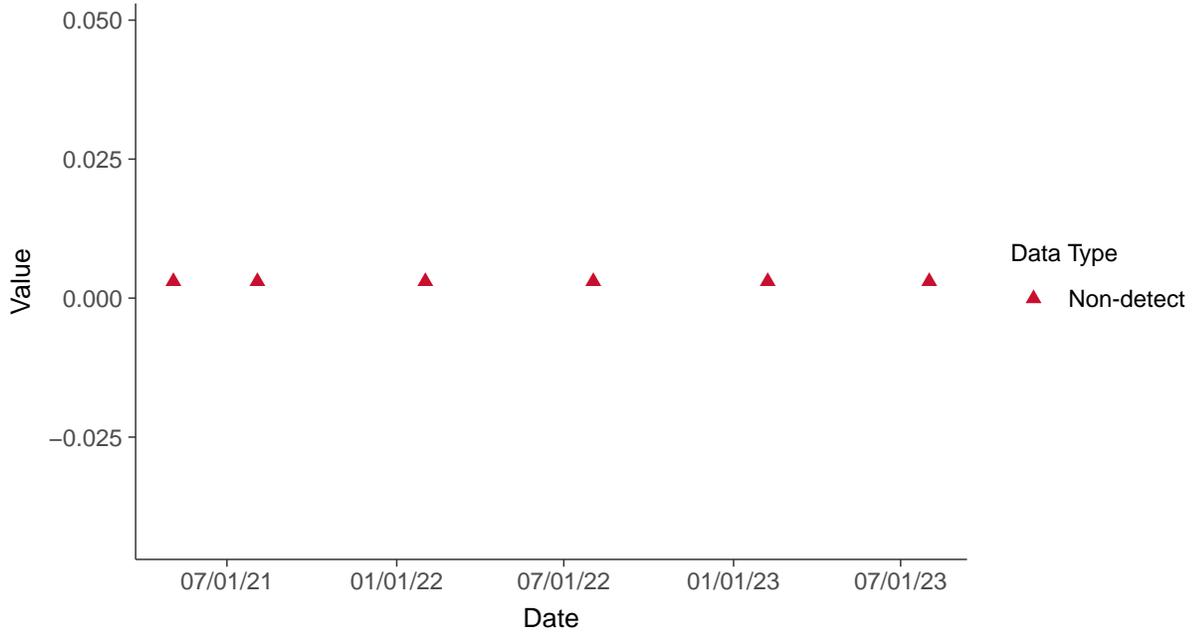


Appendix IV: Lead, MW-3

ID: 03_2_15

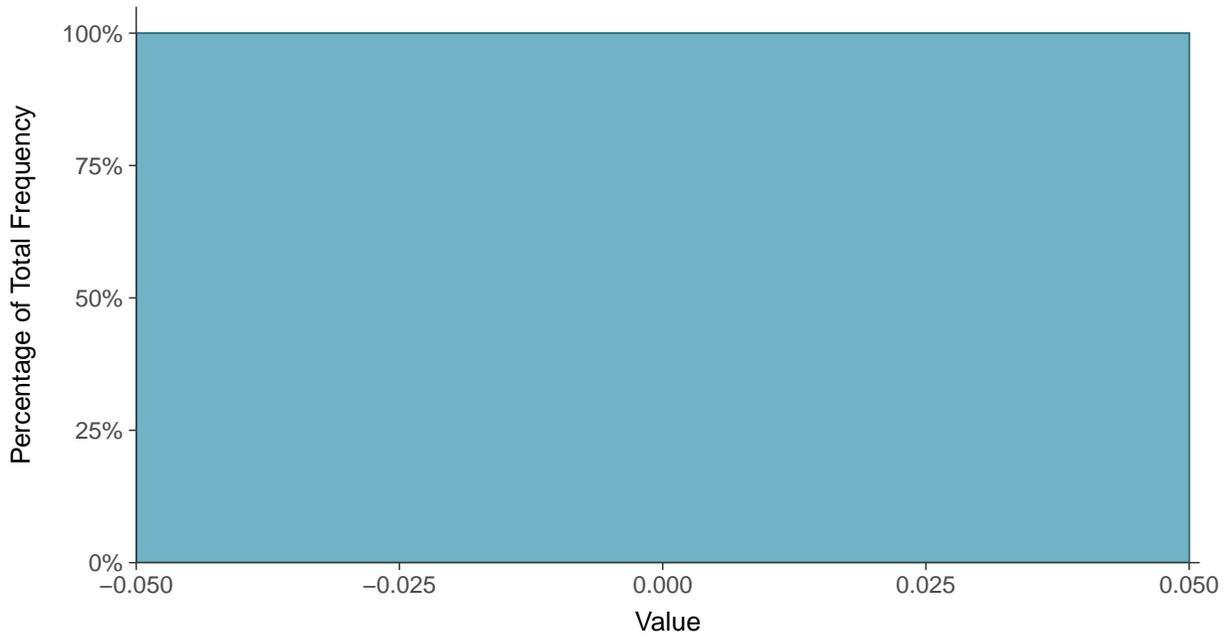
Scatter Plot

Lead, MW-3 (mg/L)



Histogram

Lead, MW-3 (mg/L)





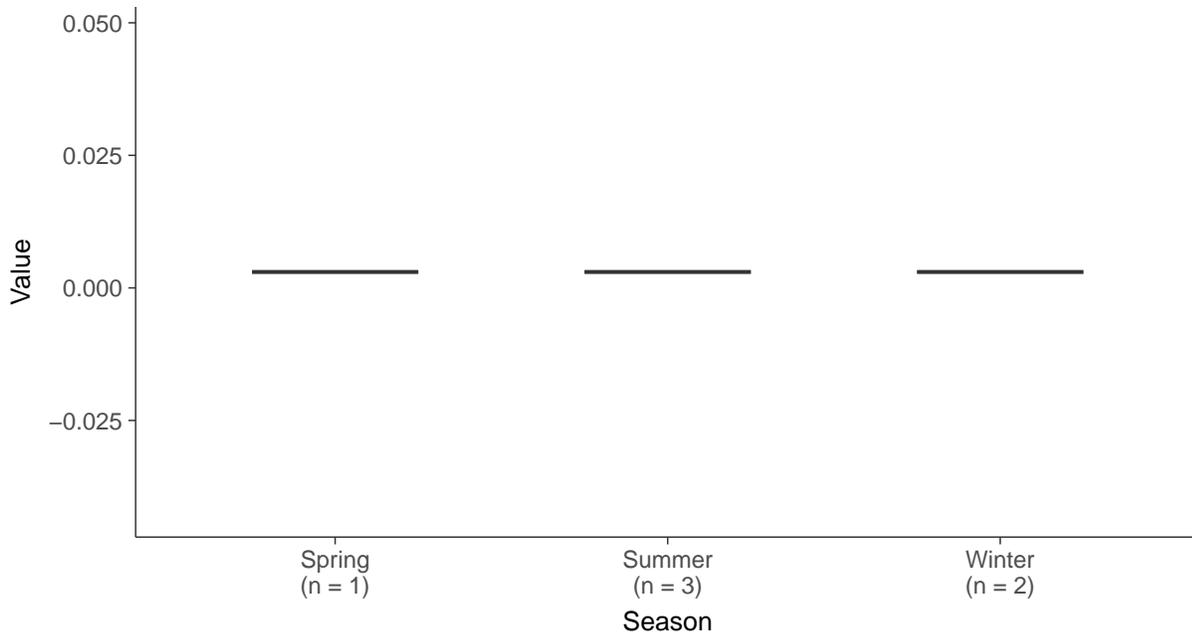
Boxplot

Lead, MW-3 (mg/L)



Boxplot by Season

Lead, MW-3 (mg/L)



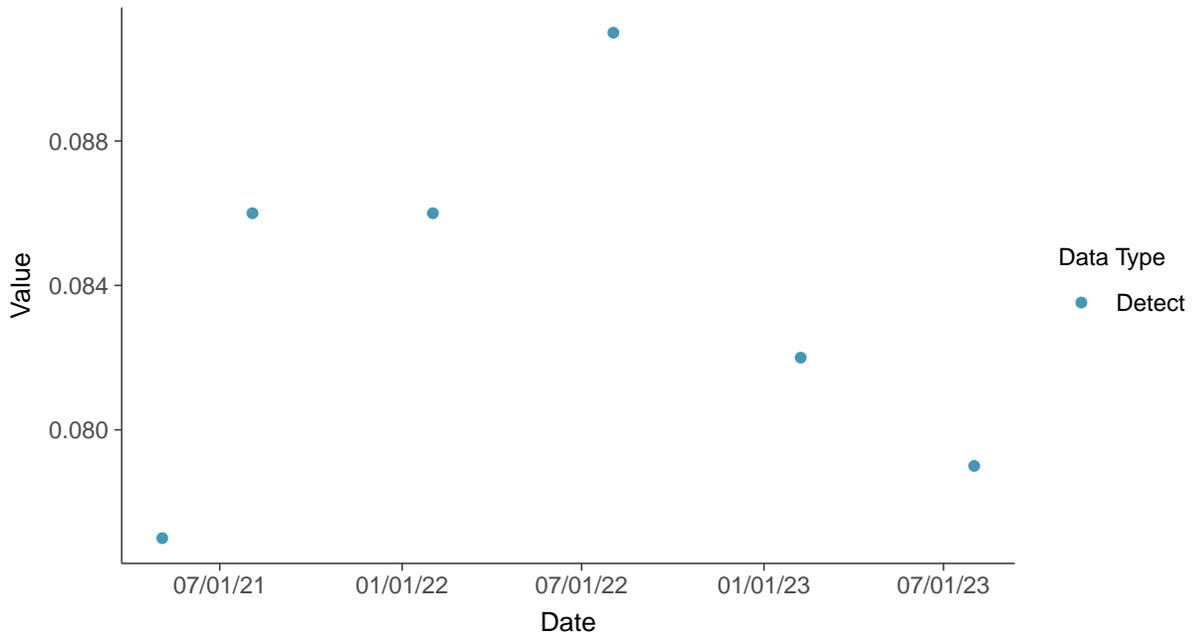


Appendix IV: Lithium, MW-3

ID: 03_2_16

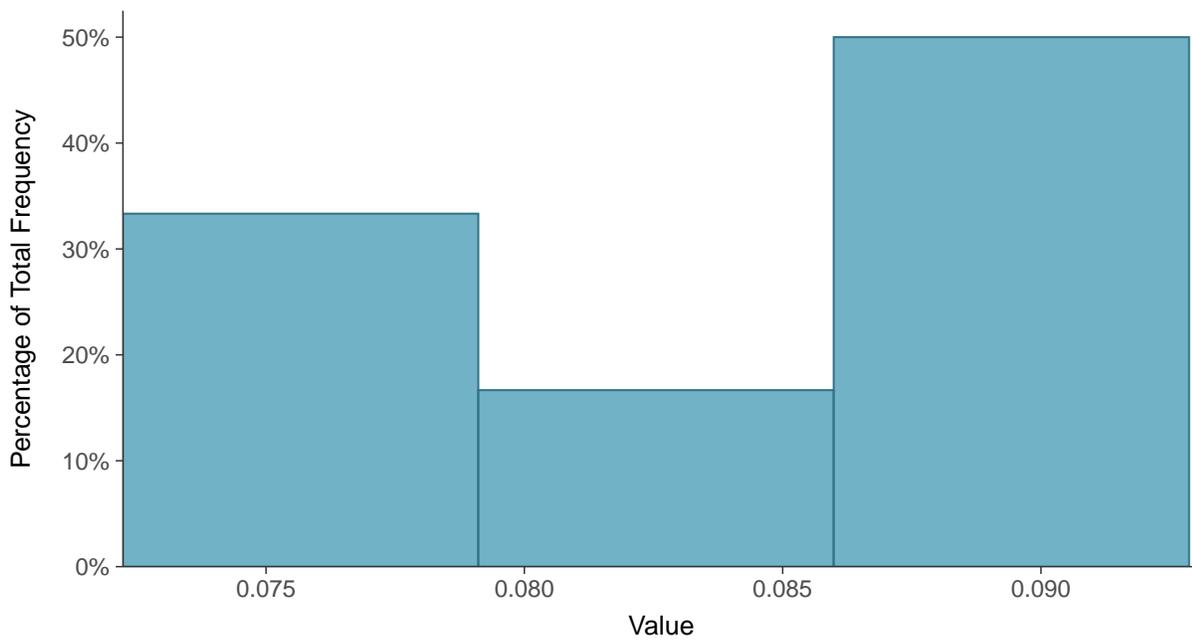
Scatter Plot

Lithium, MW-3 (mg/L)



Histogram

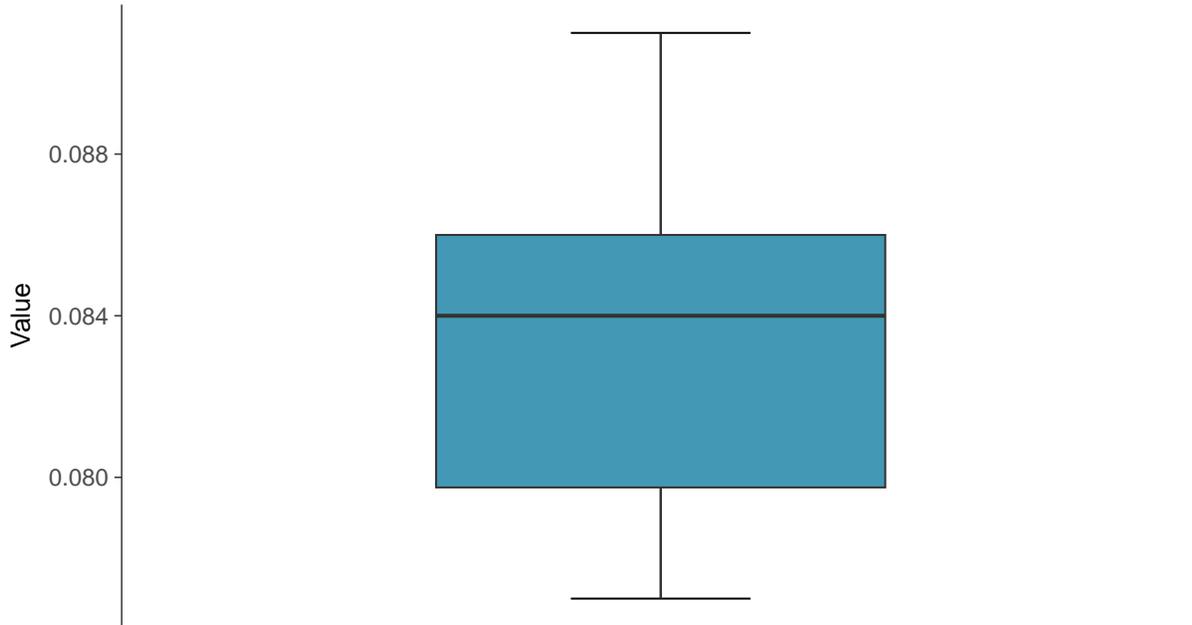
Lithium, MW-3 (mg/L)





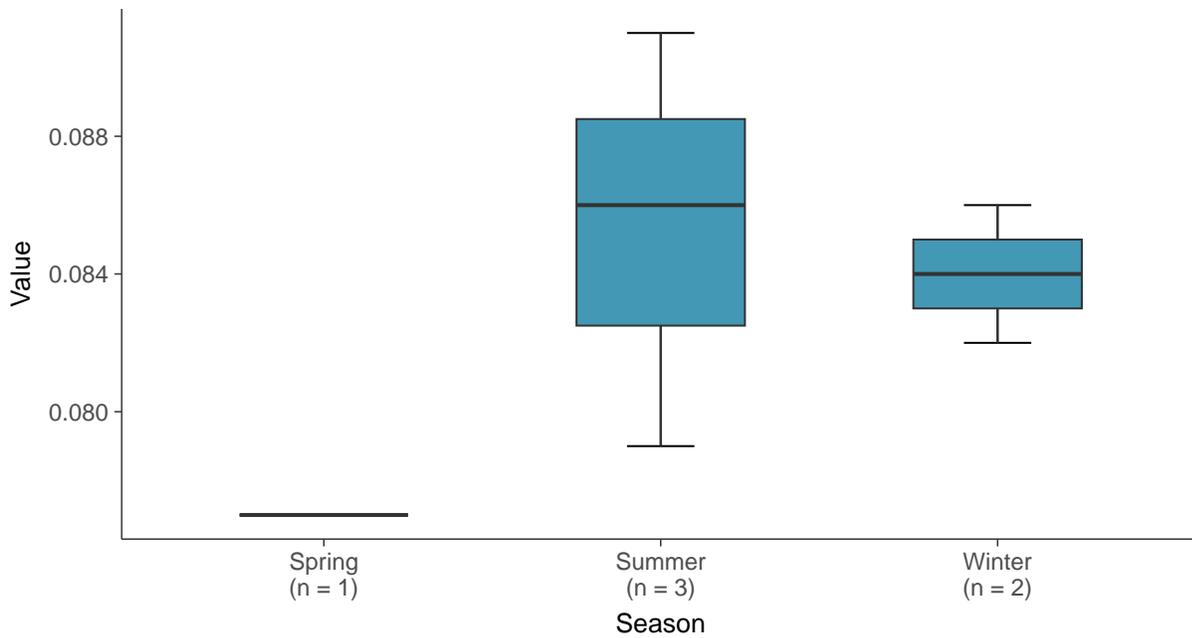
Boxplot

Lithium, MW-3 (mg/L)



Boxplot by Season

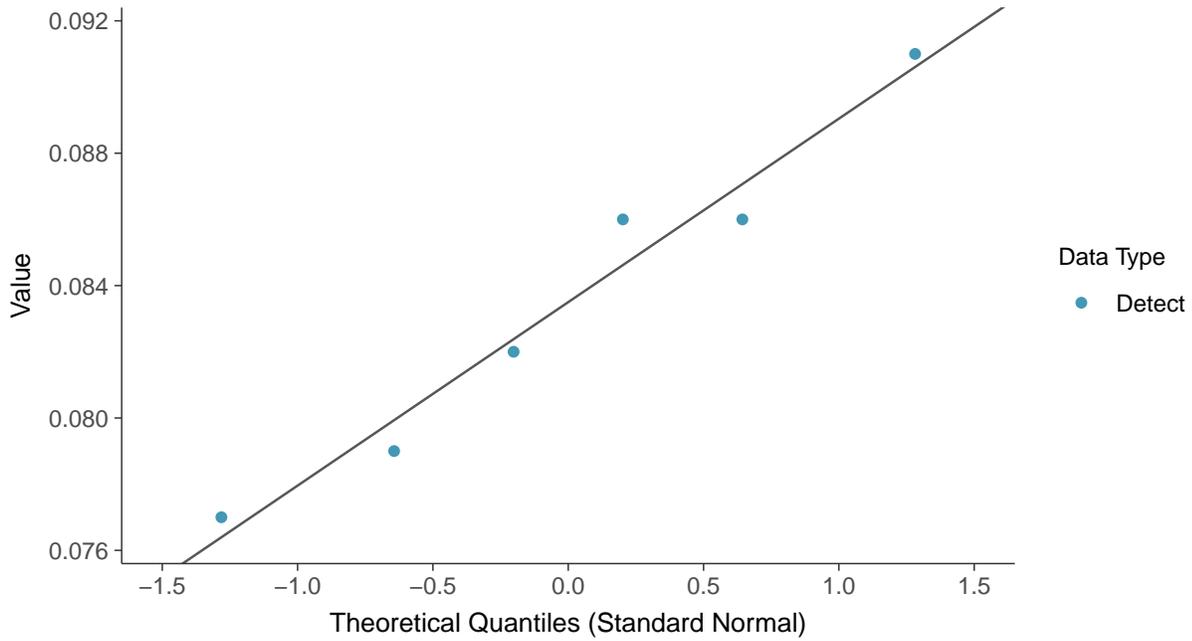
Lithium, MW-3 (mg/L)





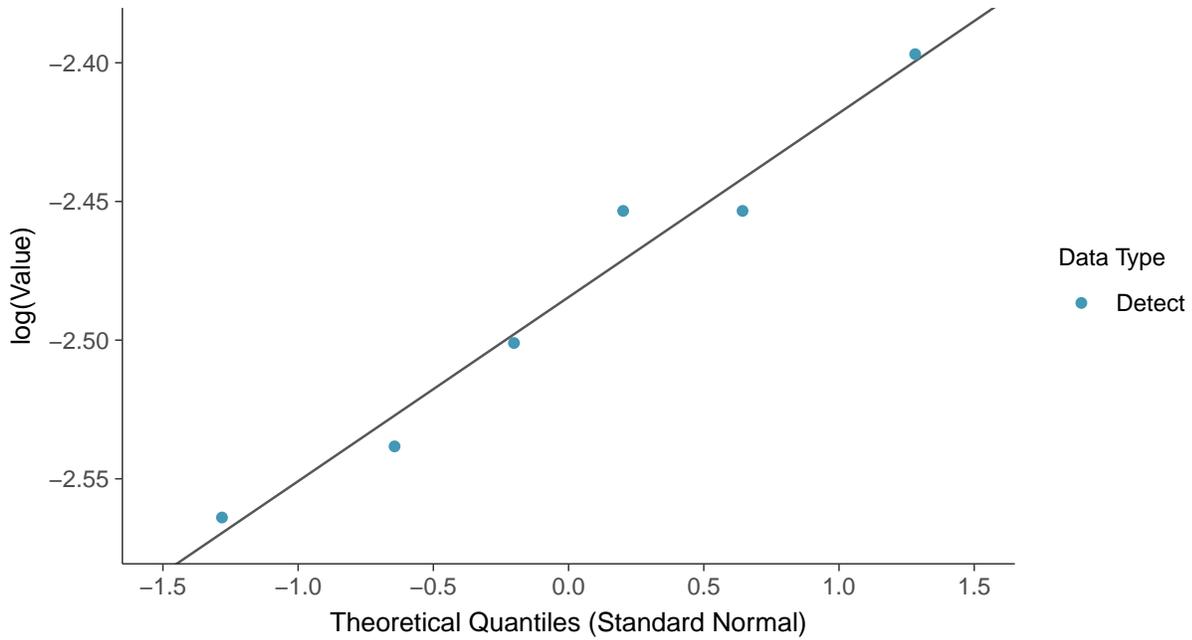
Normal Q-Q plot

Lithium, MW-3 (mg/L)



Lognormal Q-Q plot

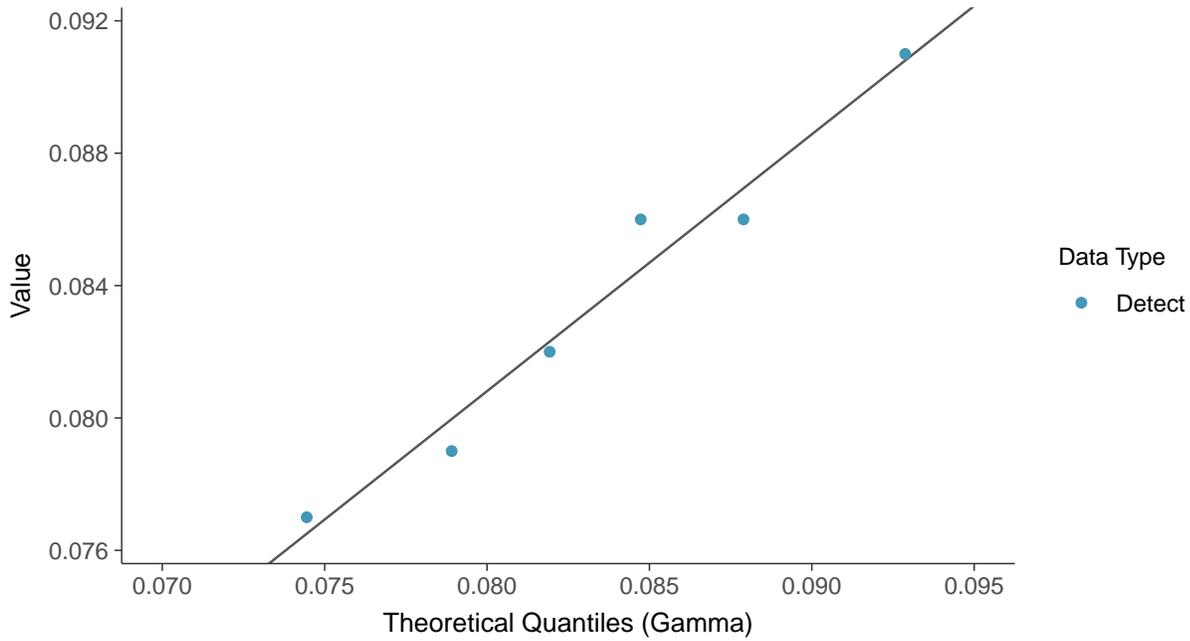
Lithium, MW-3 (mg/L)





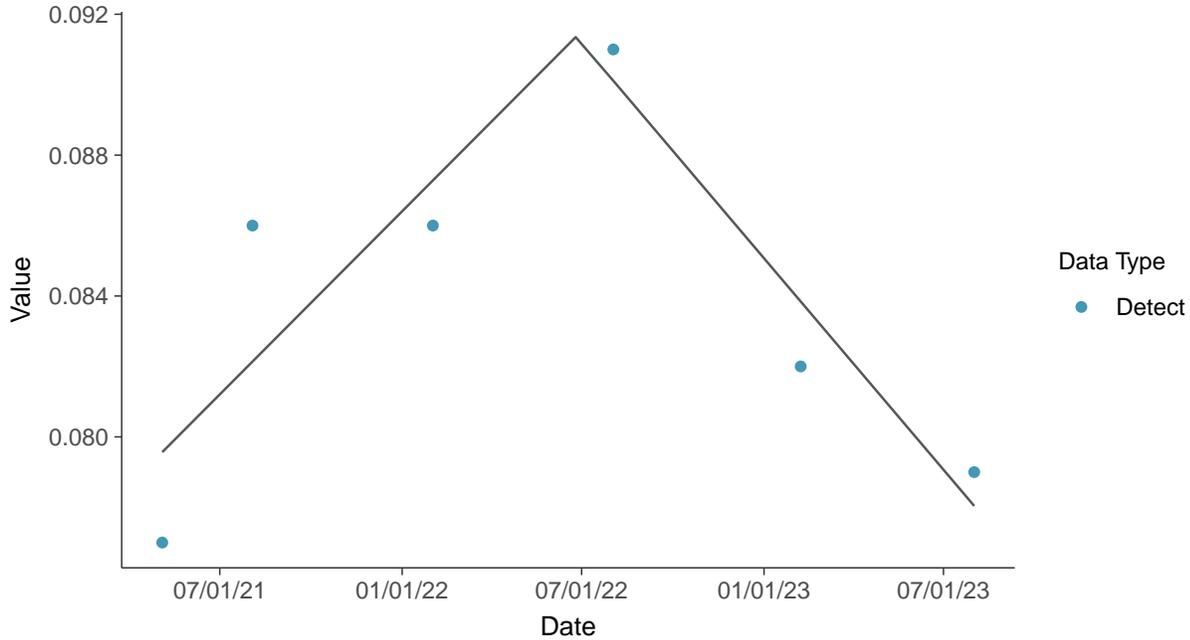
Gamma Q-Q plot

Lithium, MW-3 (mg/L)



Trend Regression: Piecewise Linear-Linear

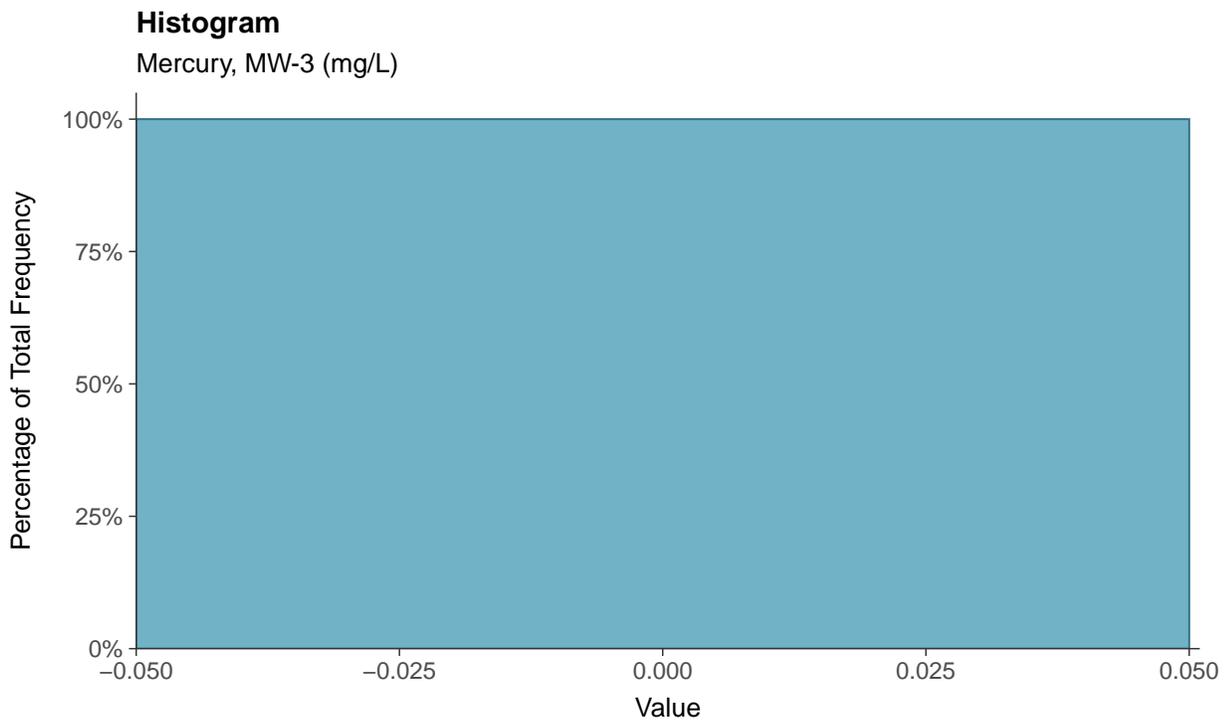
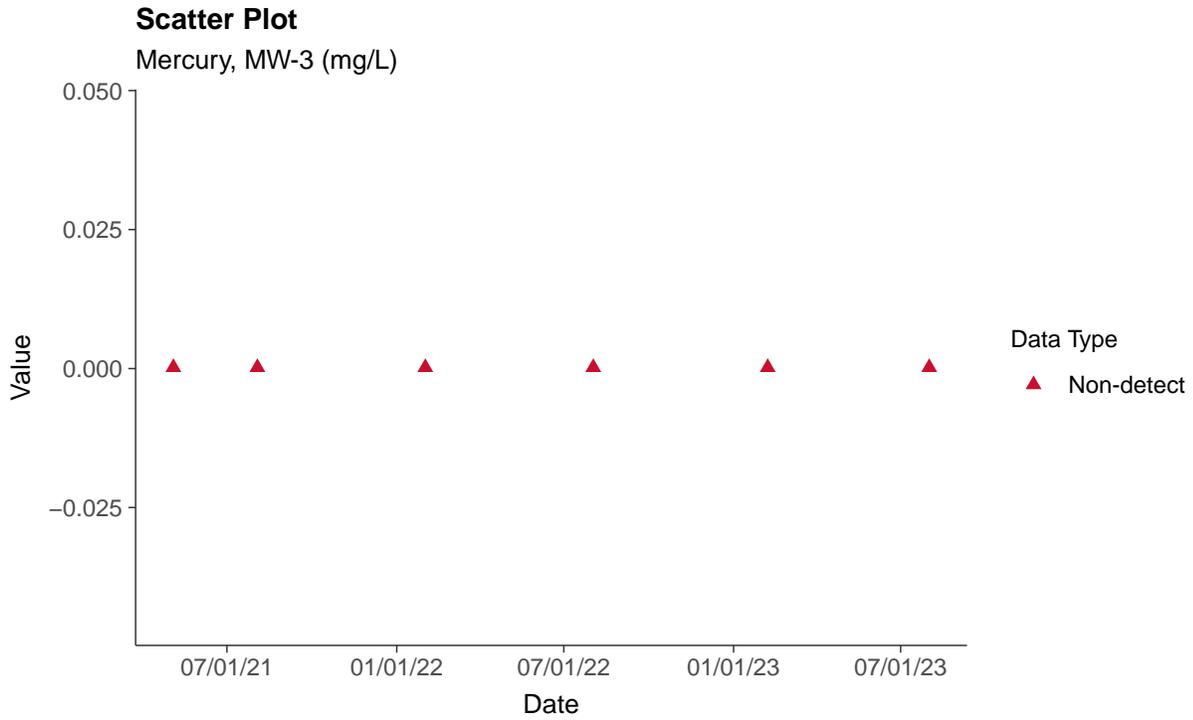
Lithium, MW-3 (mg/L)





Appendix IV: Mercury, MW-3

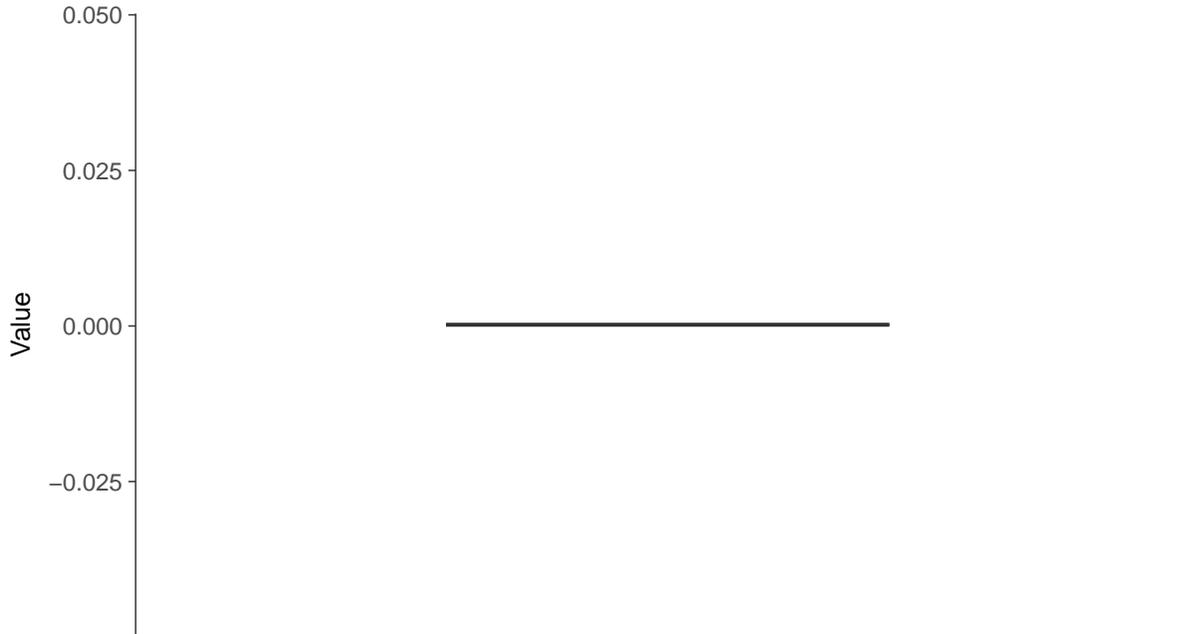
ID: 03_2_17





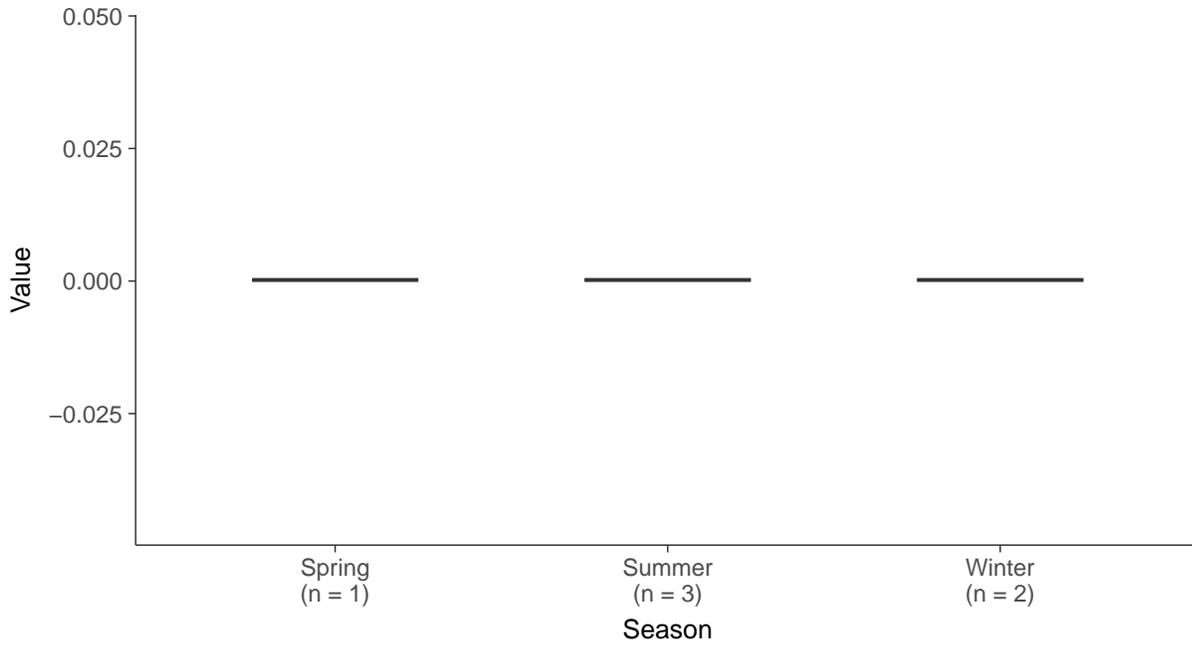
Boxplot

Mercury, MW-3 (mg/L)



Boxplot by Season

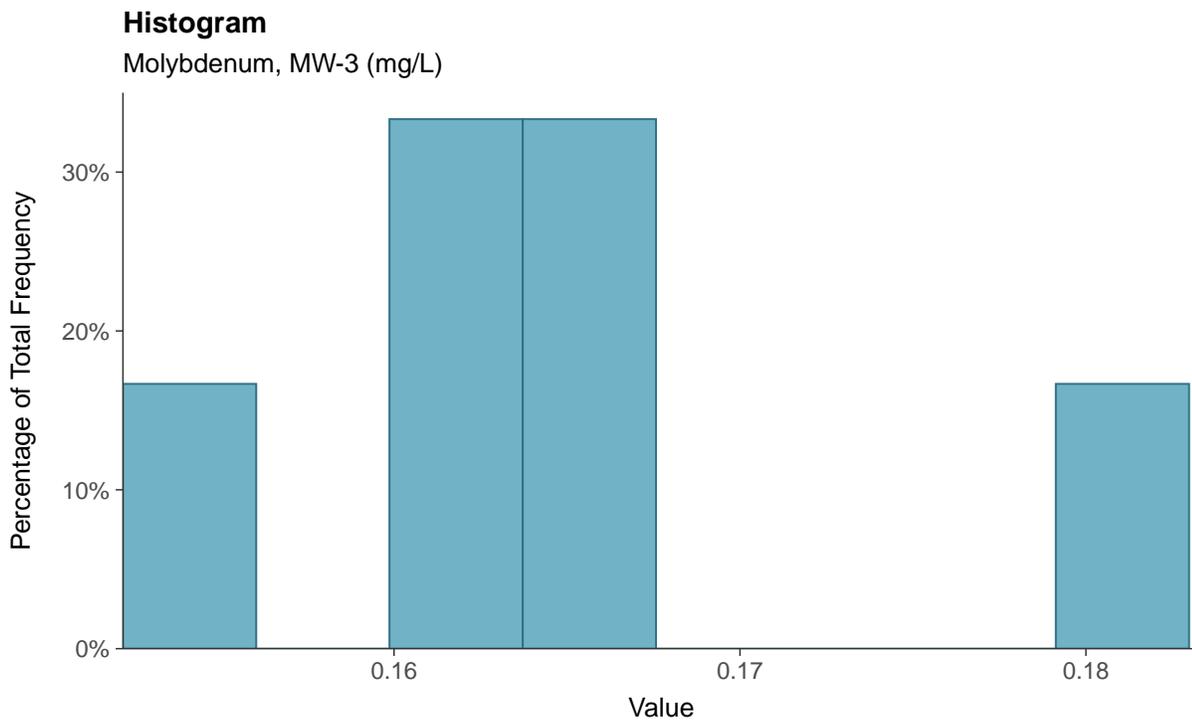
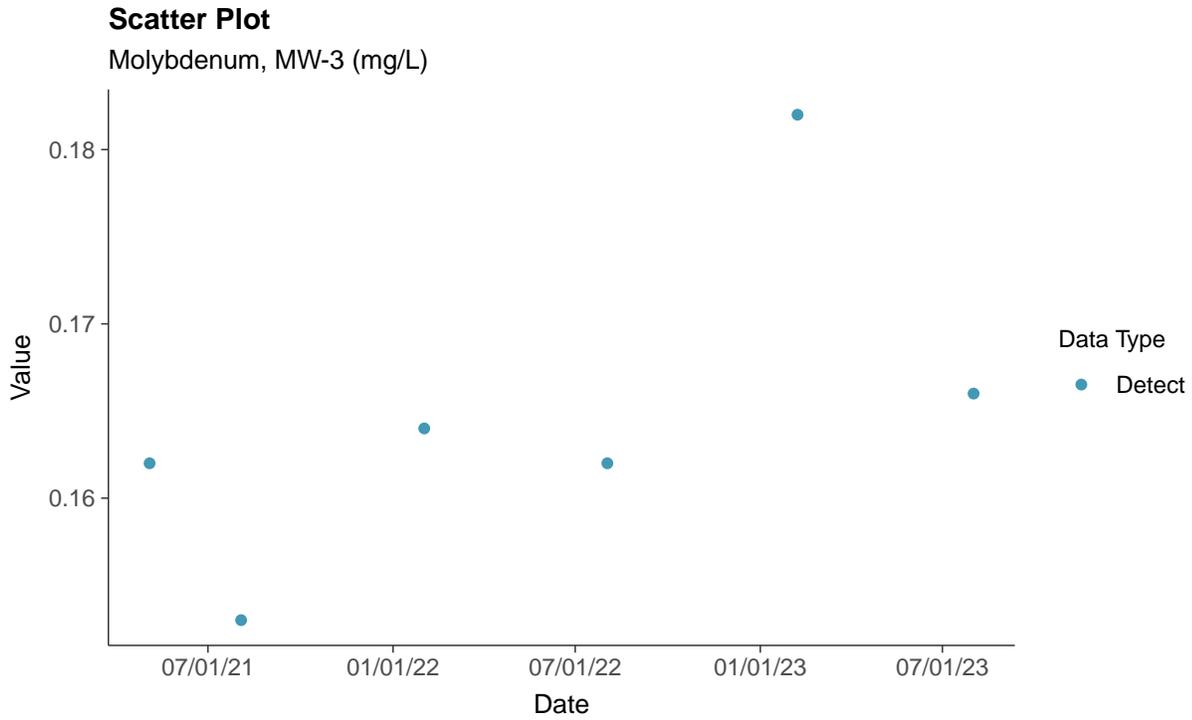
Mercury, MW-3 (mg/L)





Appendix IV: Molybdenum, MW-3

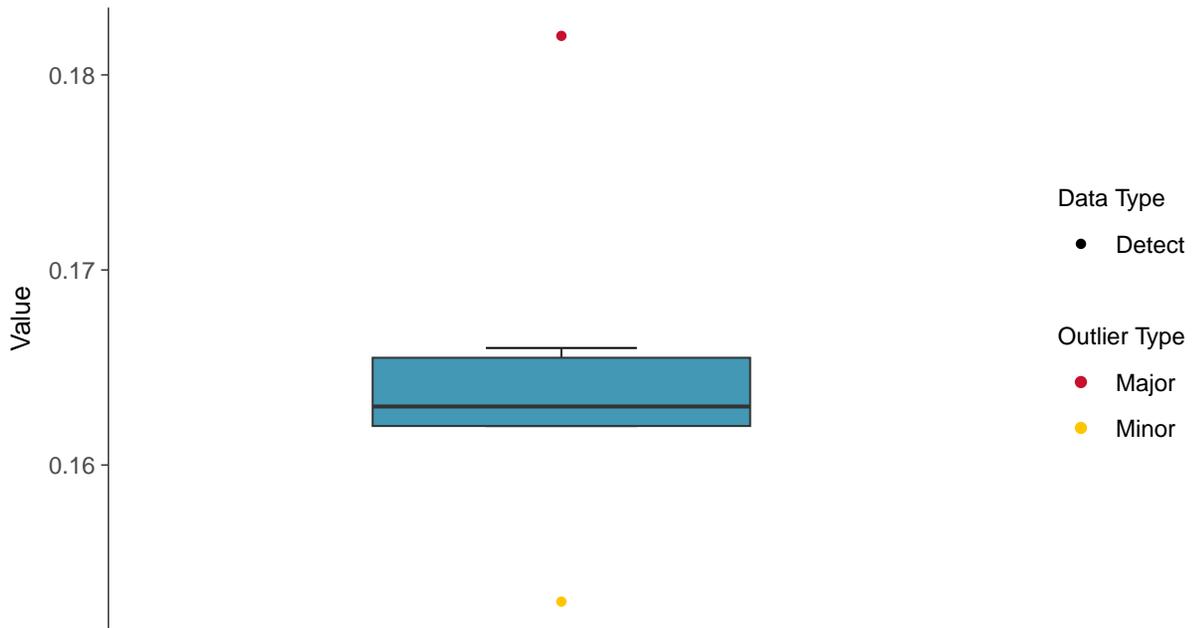
ID: 03_2_18





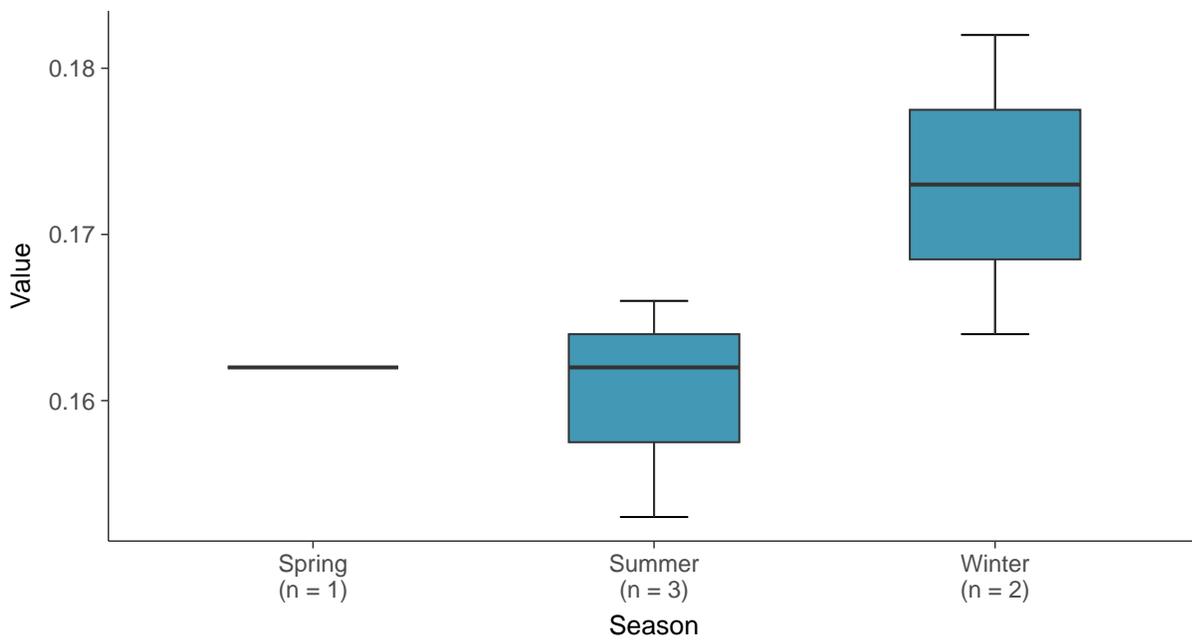
Boxplot

Molybdenum, MW-3 (mg/L)



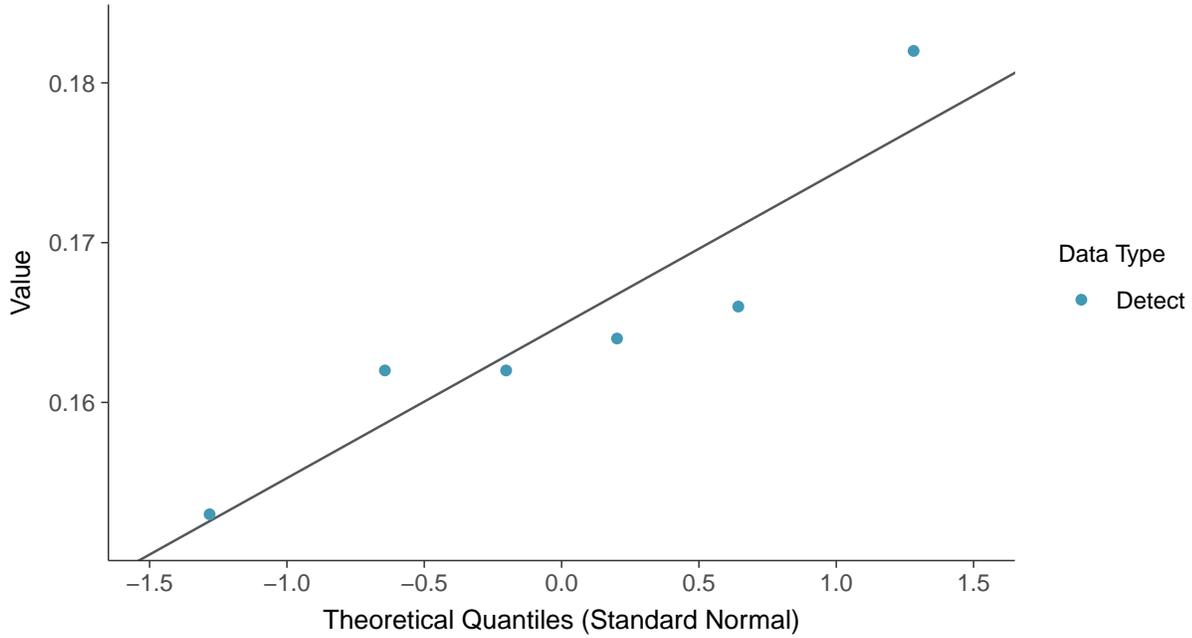
Boxplot by Season

Molybdenum, MW-3 (mg/L)

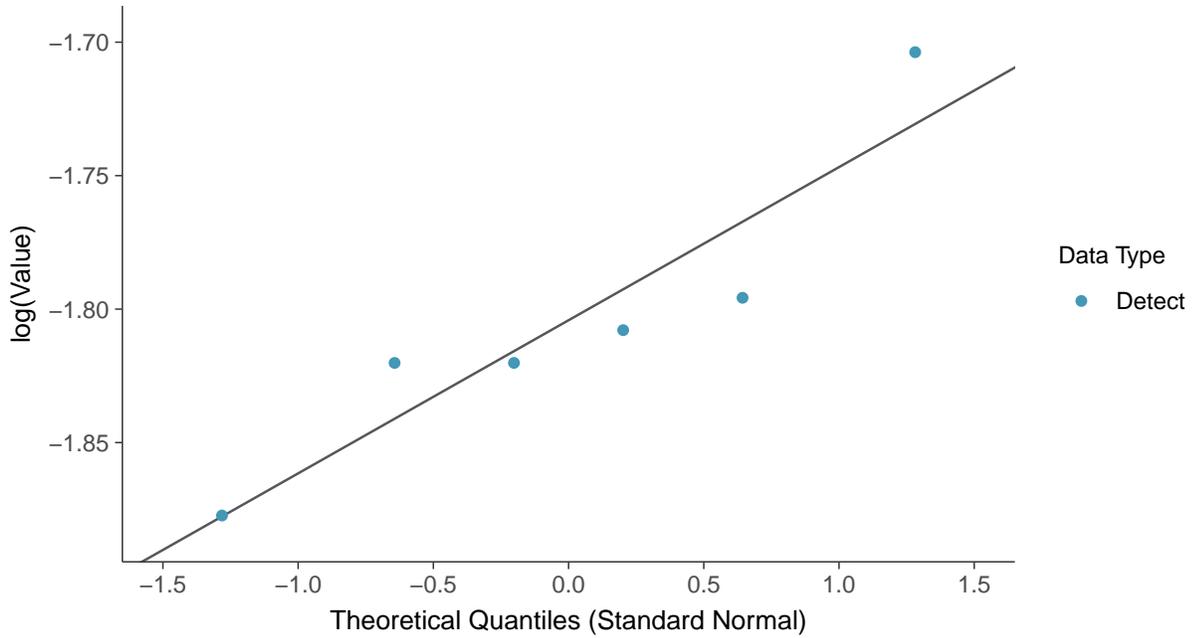




Normal Q-Q plot
Molybdenum, MW-3 (mg/L)

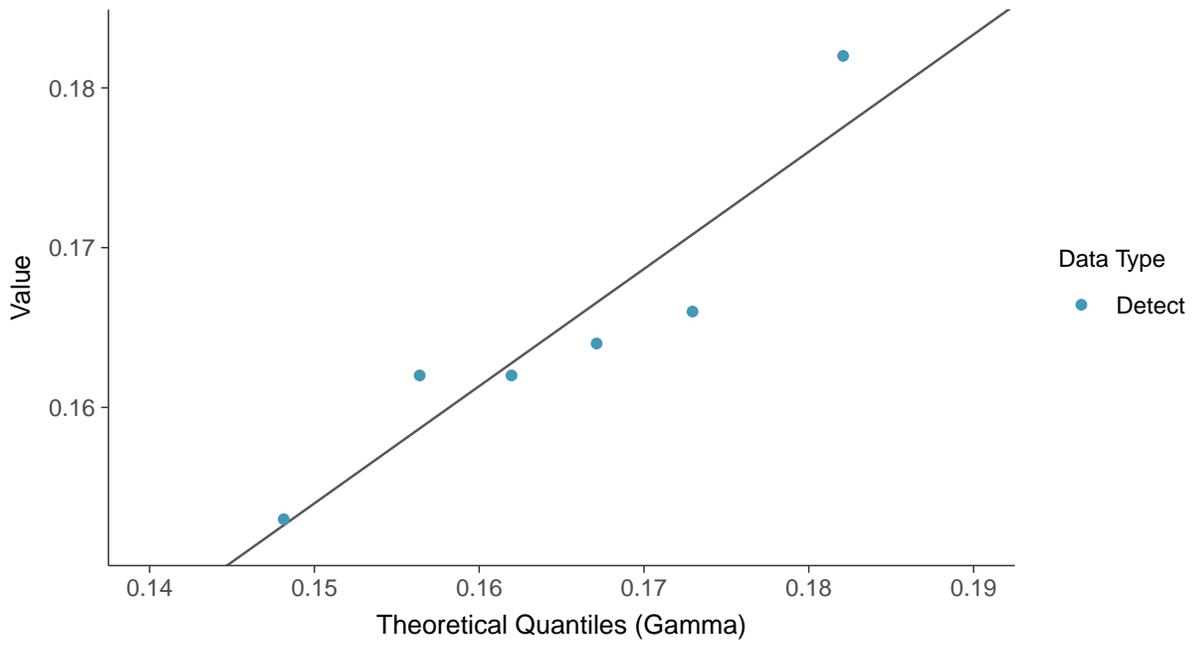


Lognormal Q-Q plot
Molybdenum, MW-3 (mg/L)





Gamma Q-Q plot
Molybdenum, MW-3 (mg/L)



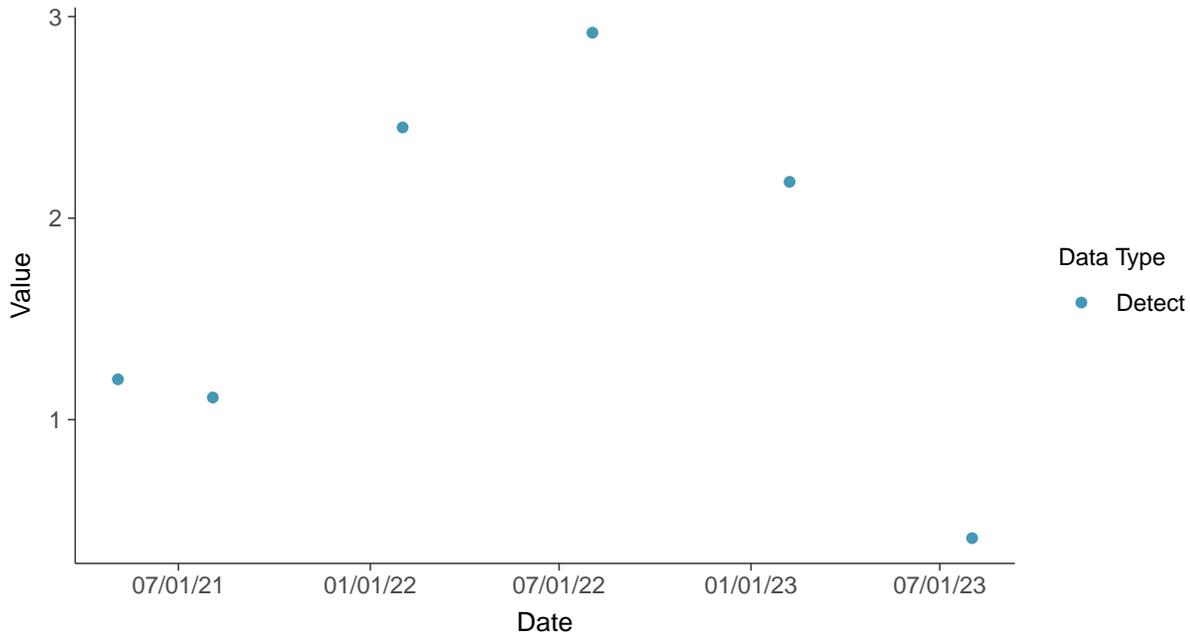


Appendix IV: Radium-226/228, MW-3

ID: 03_2_20

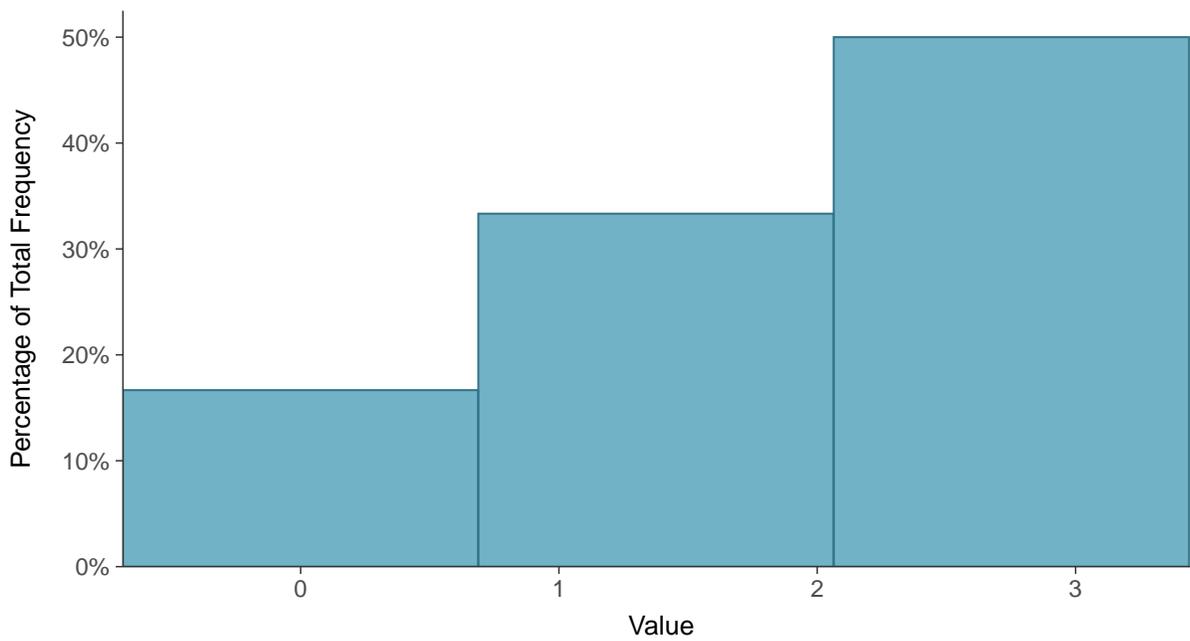
Scatter Plot

Radium-226/228, MW-3 (pCi/L)



Histogram

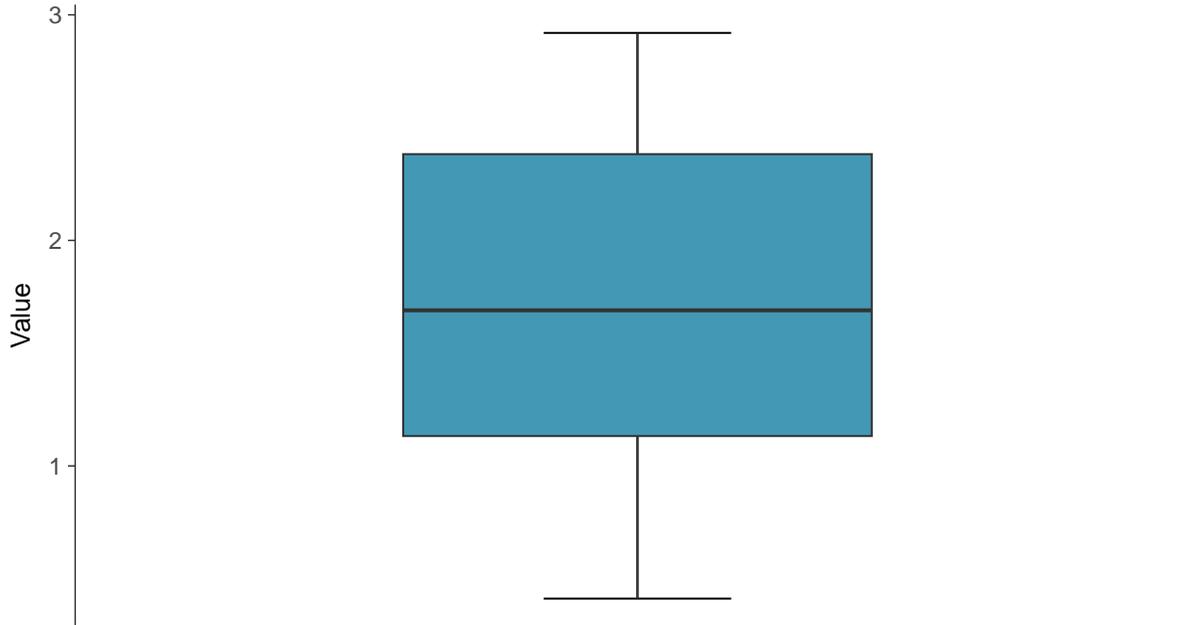
Radium-226/228, MW-3 (pCi/L)





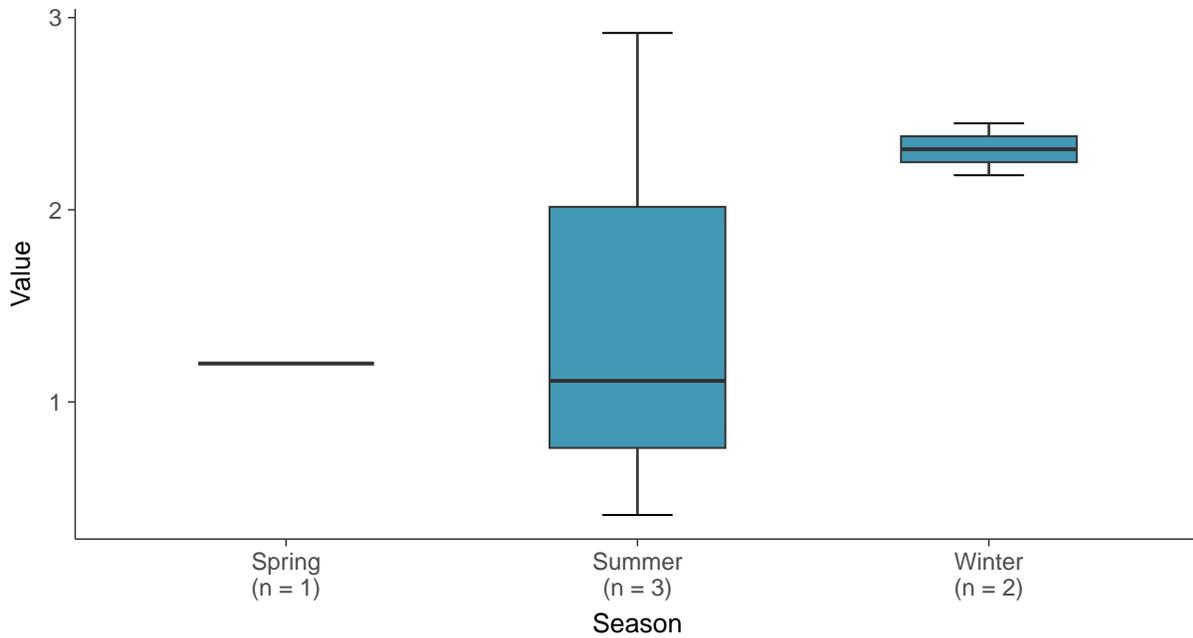
Boxplot

Radium-226/228, MW-3 (pCi/L)



Boxplot by Season

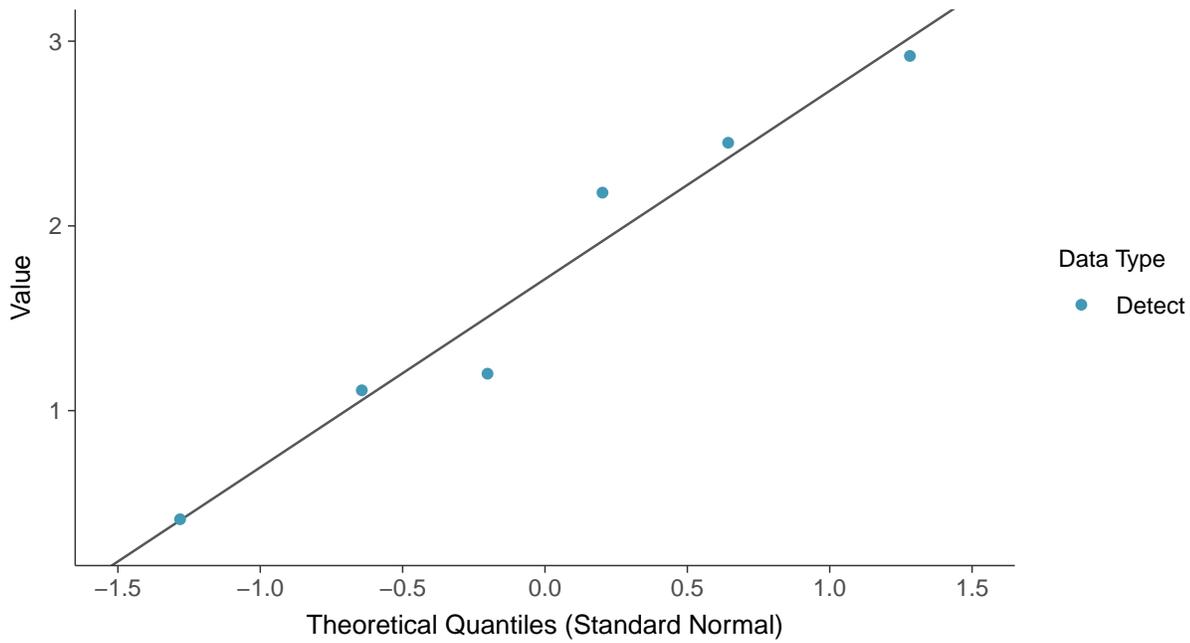
Radium-226/228, MW-3 (pCi/L)





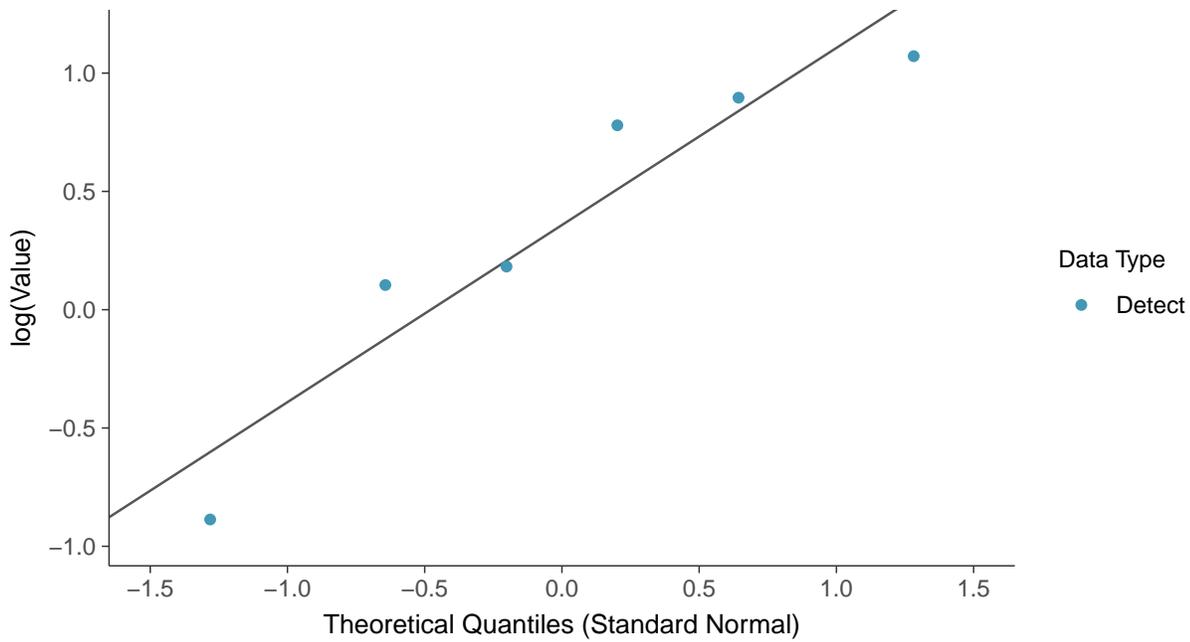
Normal Q-Q plot

Radium-226/228, MW-3 (pCi/L)



Lognormal Q-Q plot

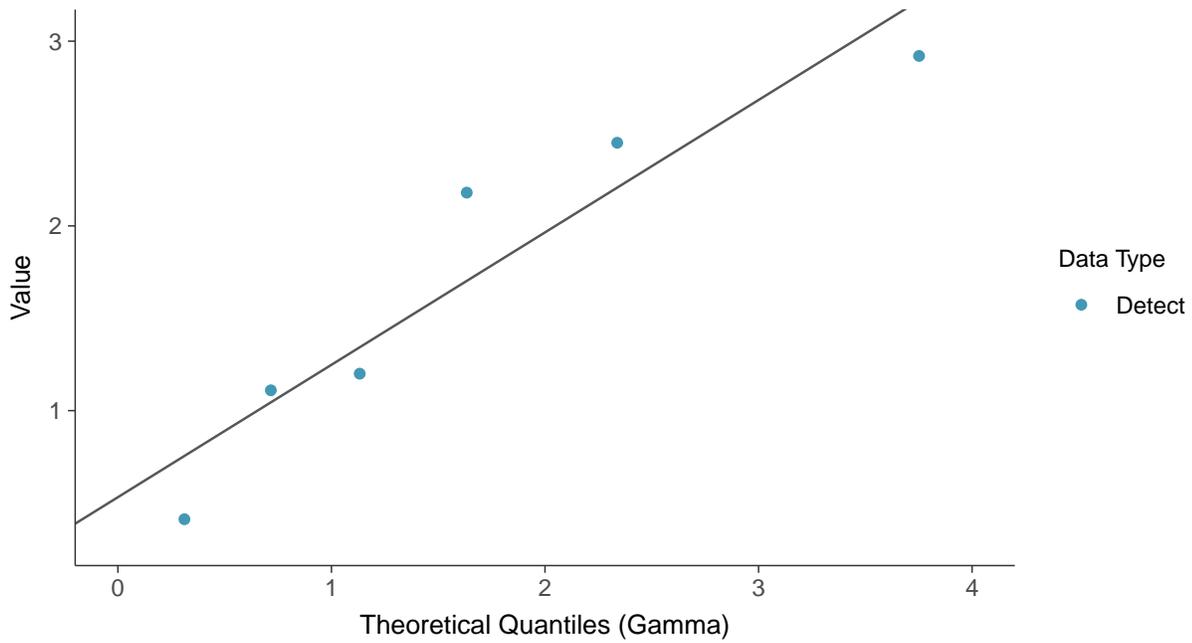
Radium-226/228, MW-3 (pCi/L)





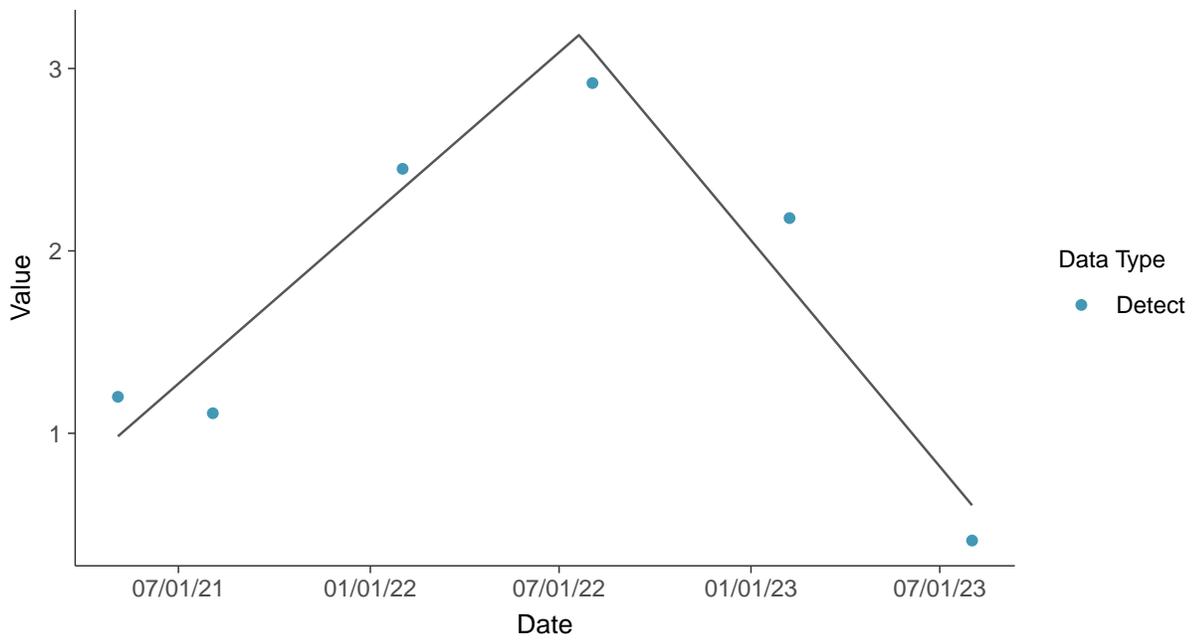
Gamma Q-Q plot

Radium-226/228, MW-3 (pCi/L)



Trend Regression: Piecewise Linear-Linear

Radium-226/228, MW-3 (pCi/L)



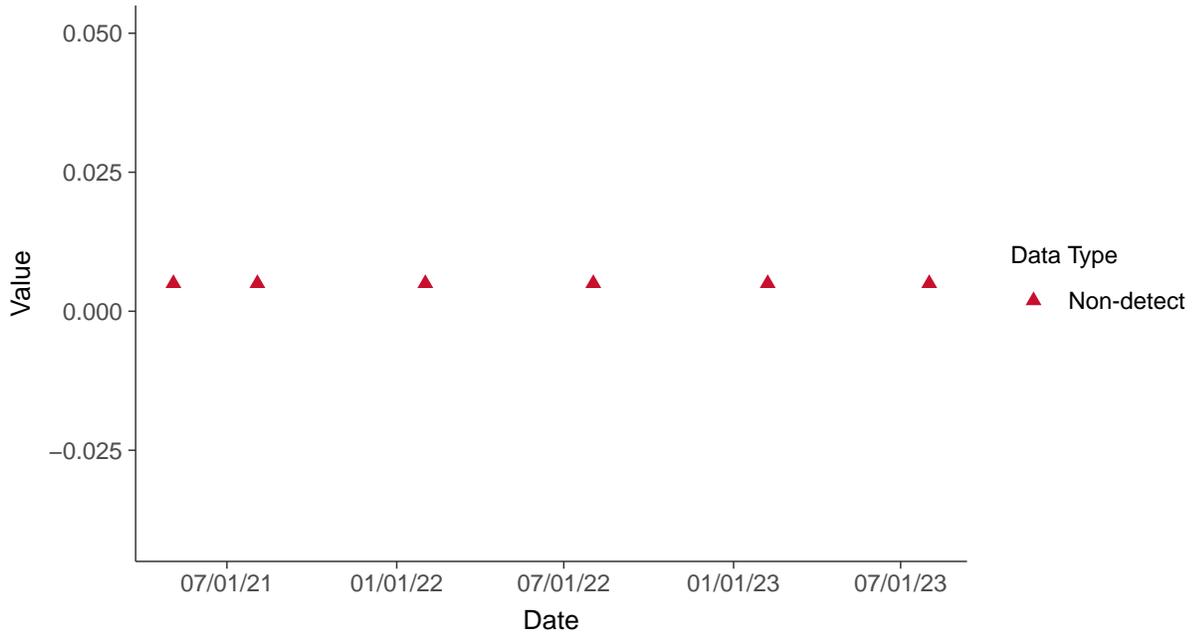


Appendix IV: Selenium, MW-3

ID: 03_2_22

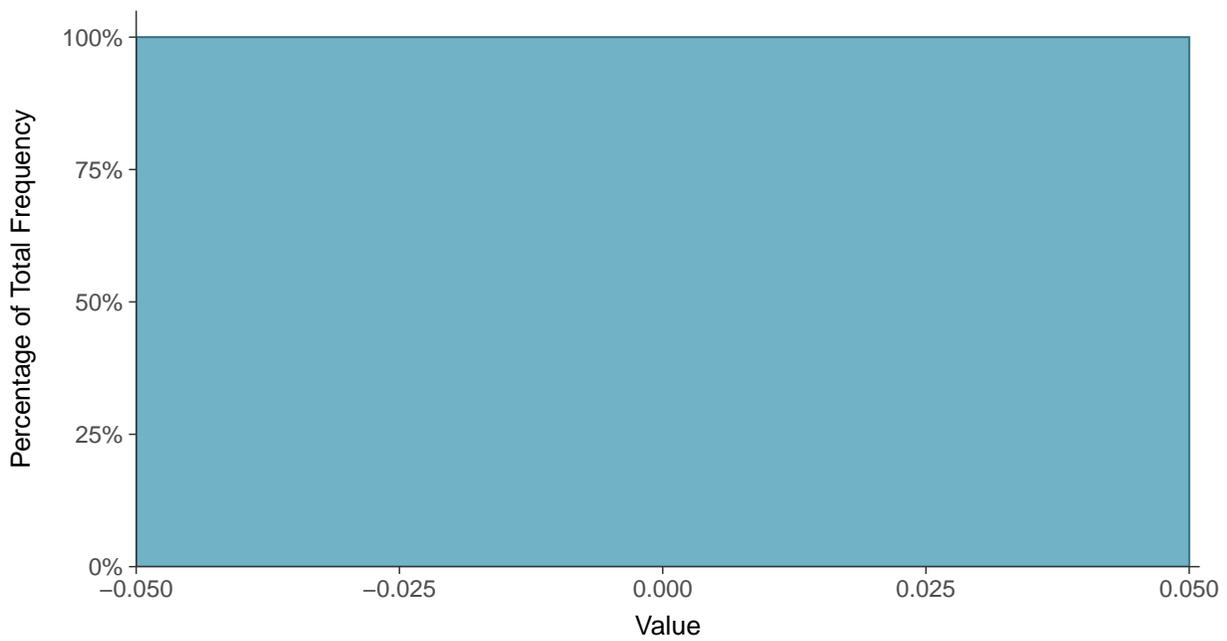
Scatter Plot

Selenium, MW-3 (mg/L)



Histogram

Selenium, MW-3 (mg/L)





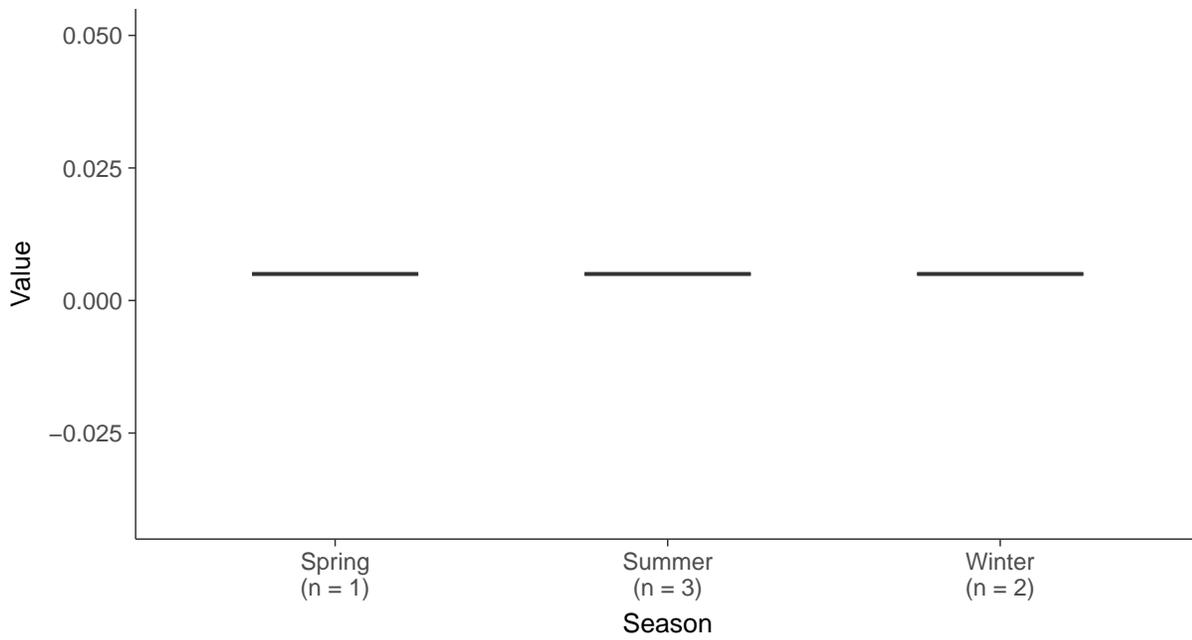
Boxplot

Selenium, MW-3 (mg/L)



Boxplot by Season

Selenium, MW-3 (mg/L)



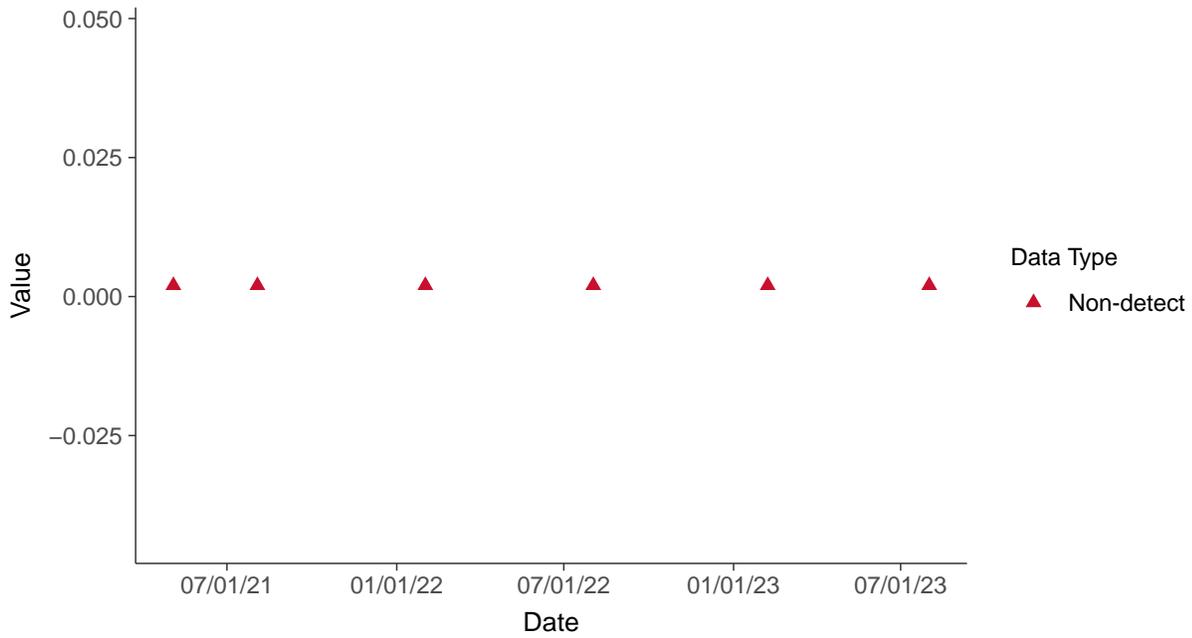


Appendix IV: Thallium, MW-3

ID: 03_2_23

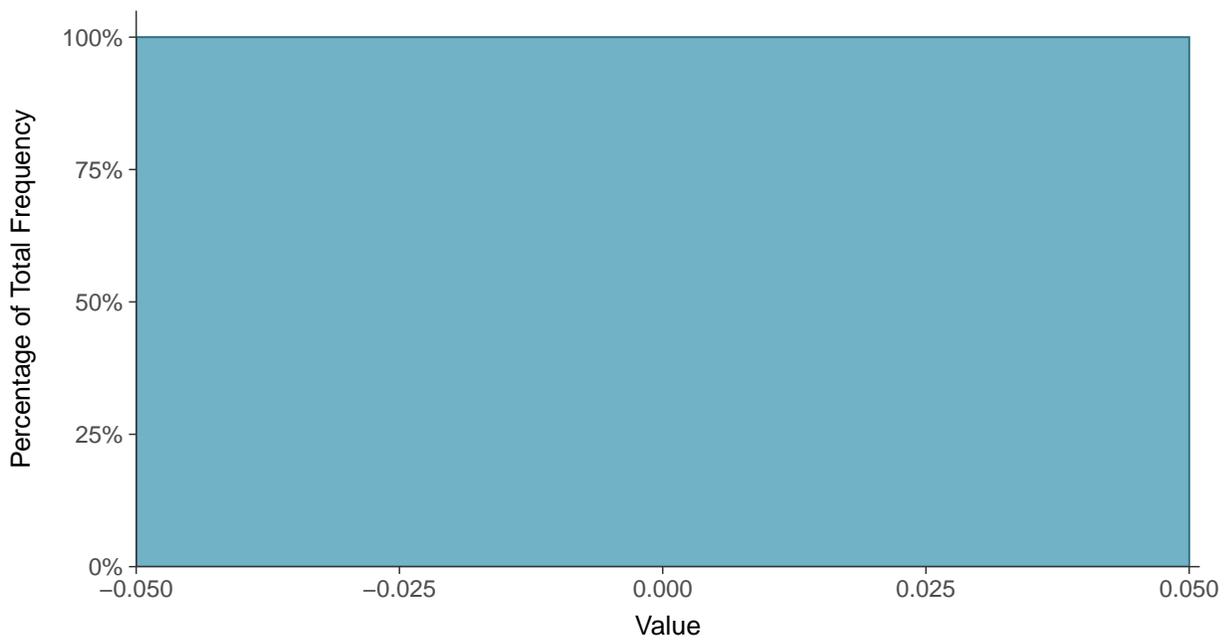
Scatter Plot

Thallium, MW-3 (mg/L)



Histogram

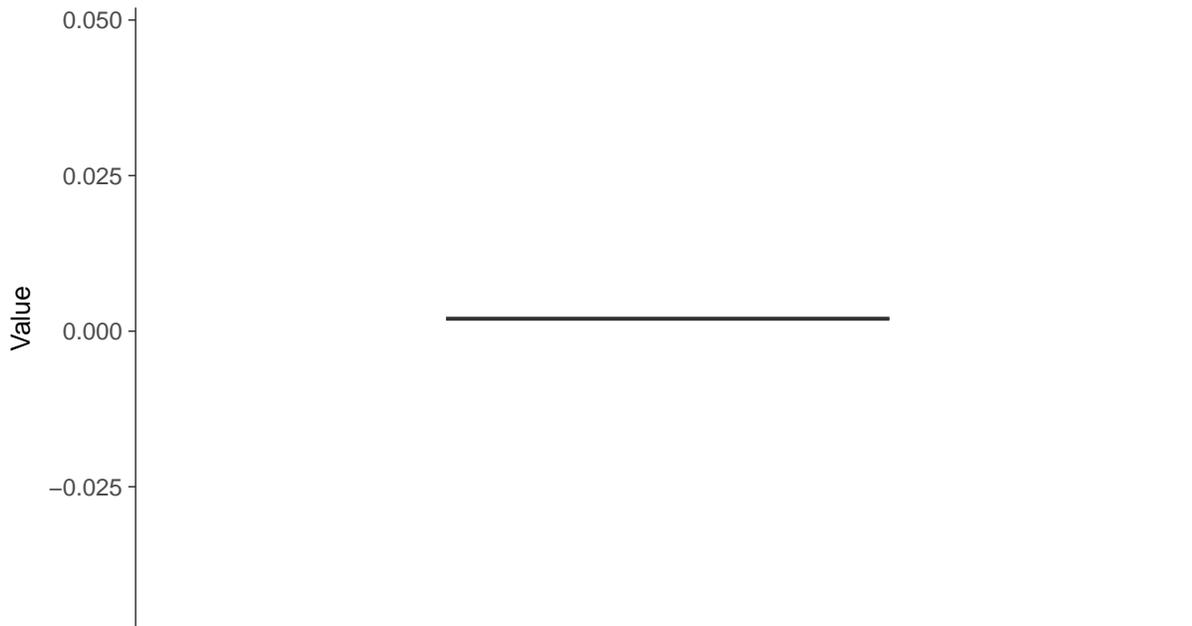
Thallium, MW-3 (mg/L)





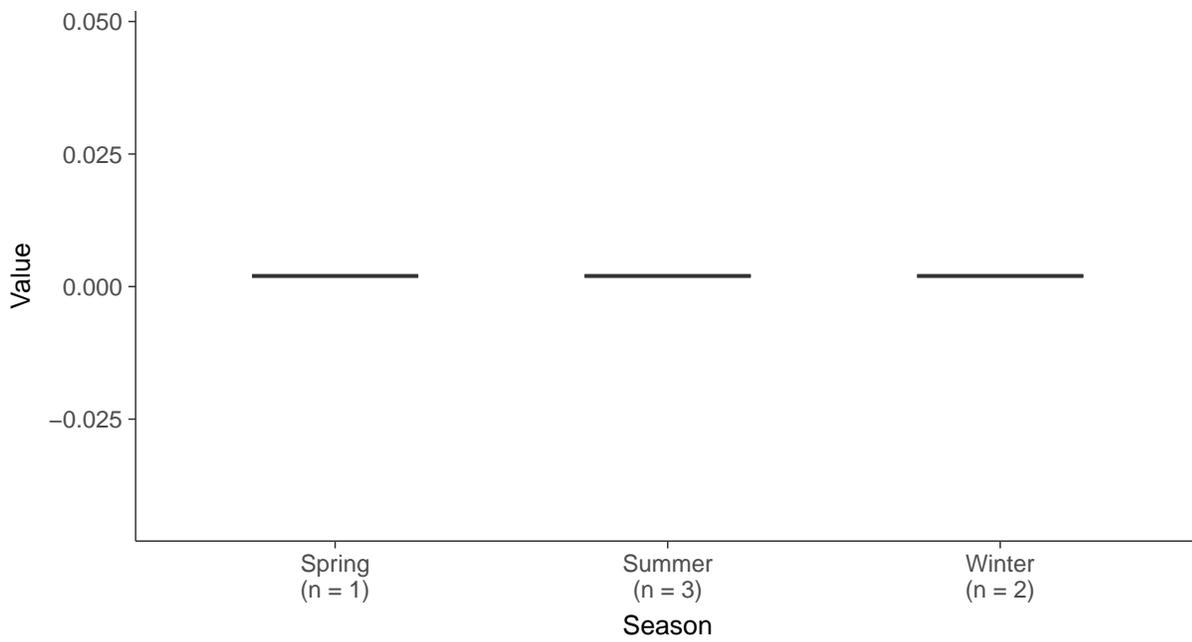
Boxplot

Thallium, MW-3 (mg/L)



Boxplot by Season

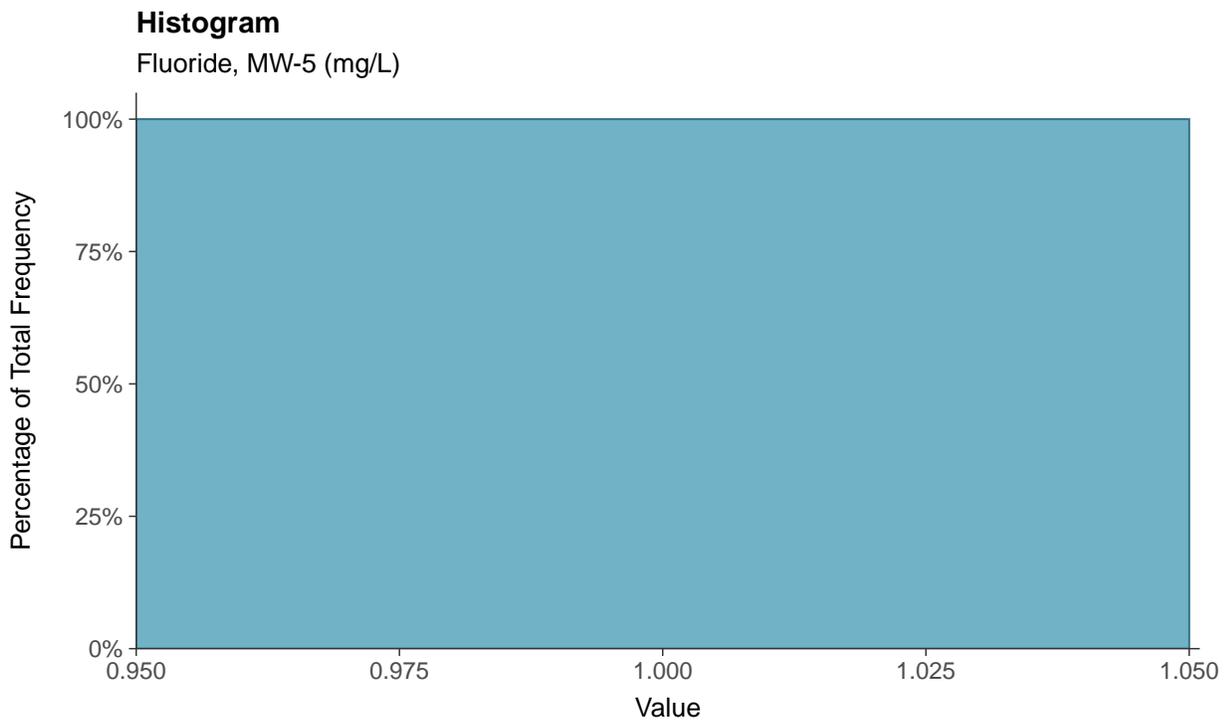
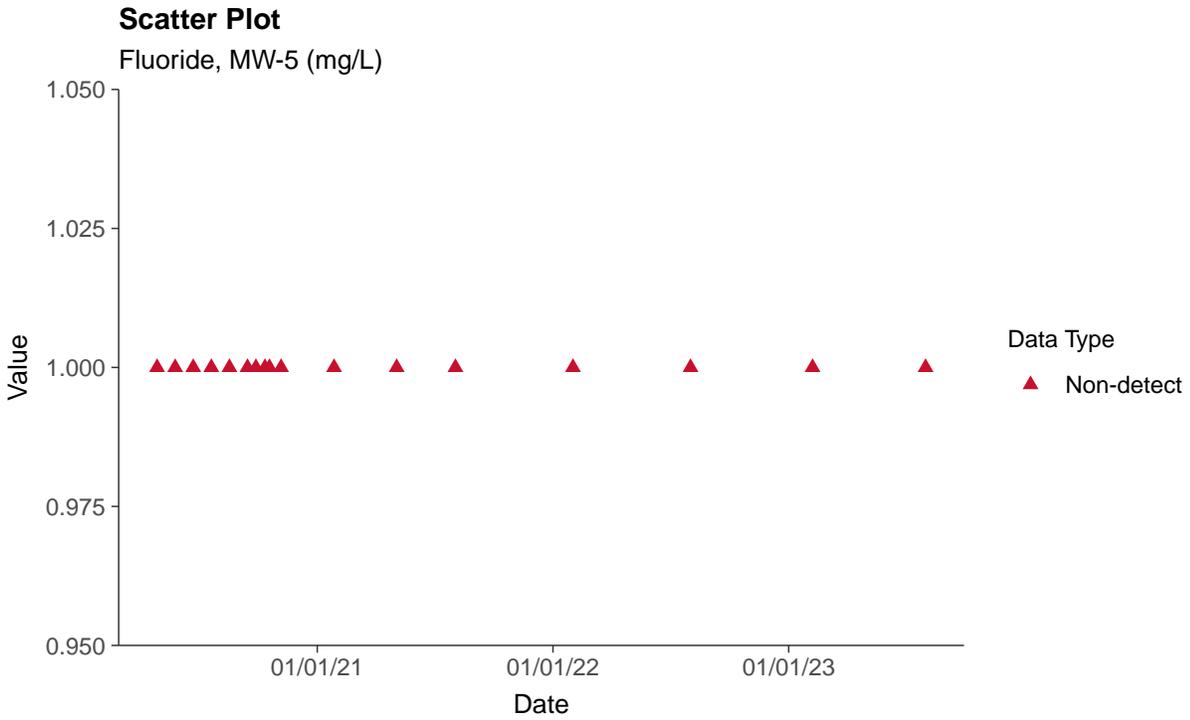
Thallium, MW-3 (mg/L)





Appendix IV: Fluoride, MW-5

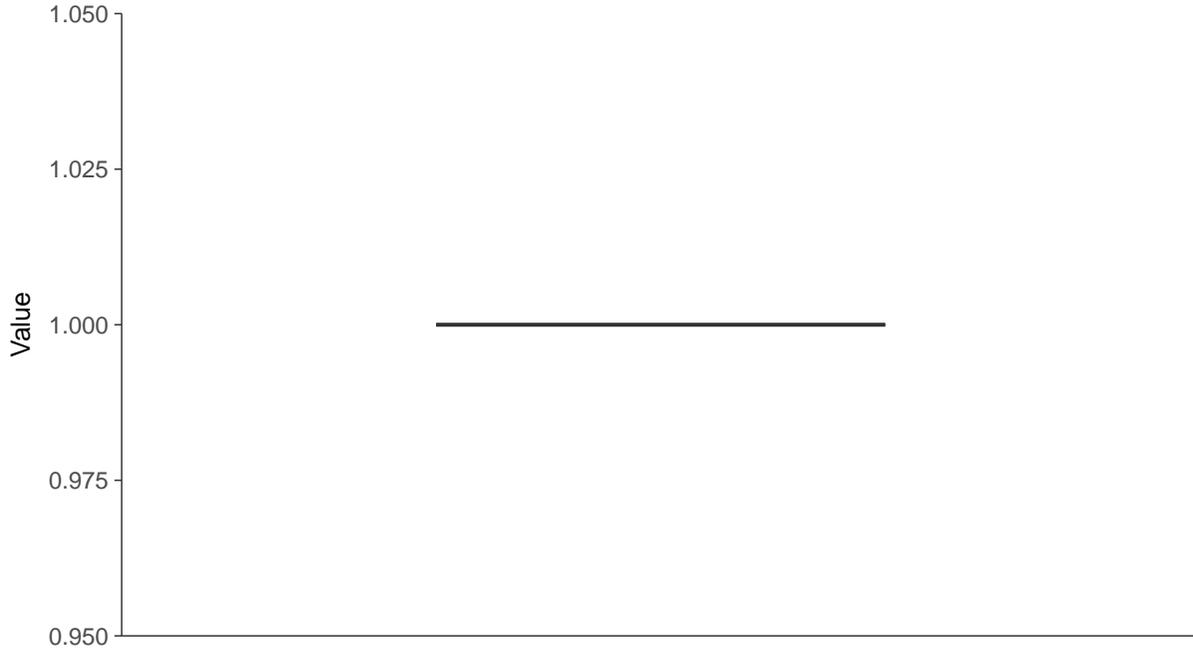
ID: 05_2_04





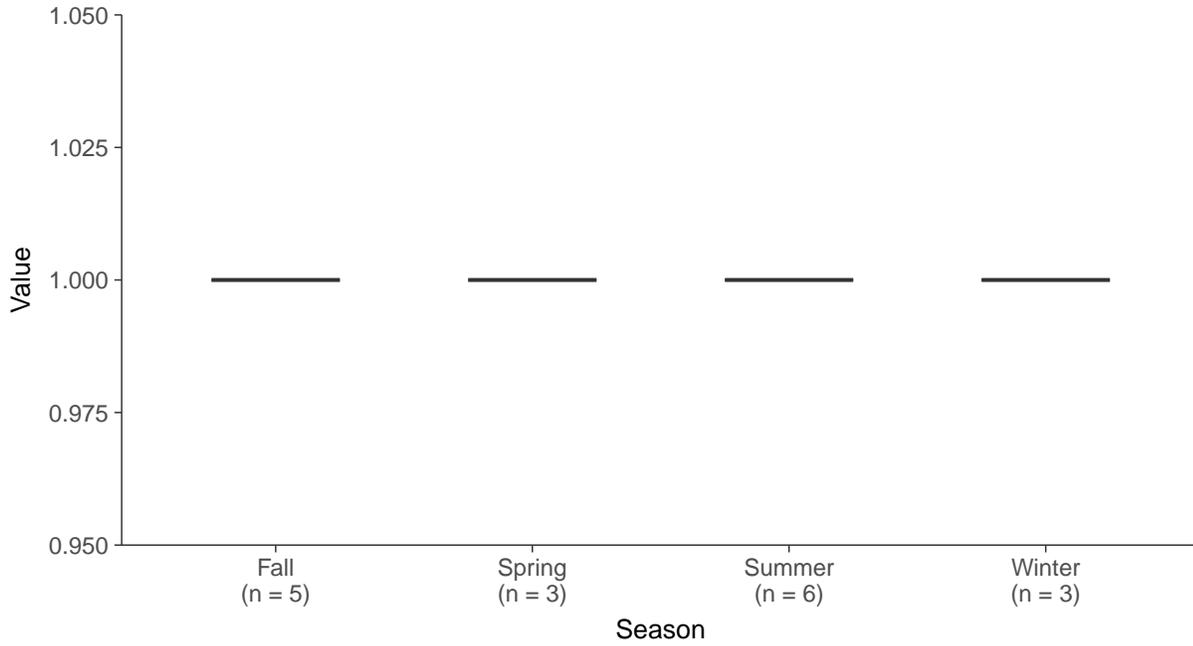
Boxplot

Fluoride, MW-5 (mg/L)



Boxplot by Season

Fluoride, MW-5 (mg/L)



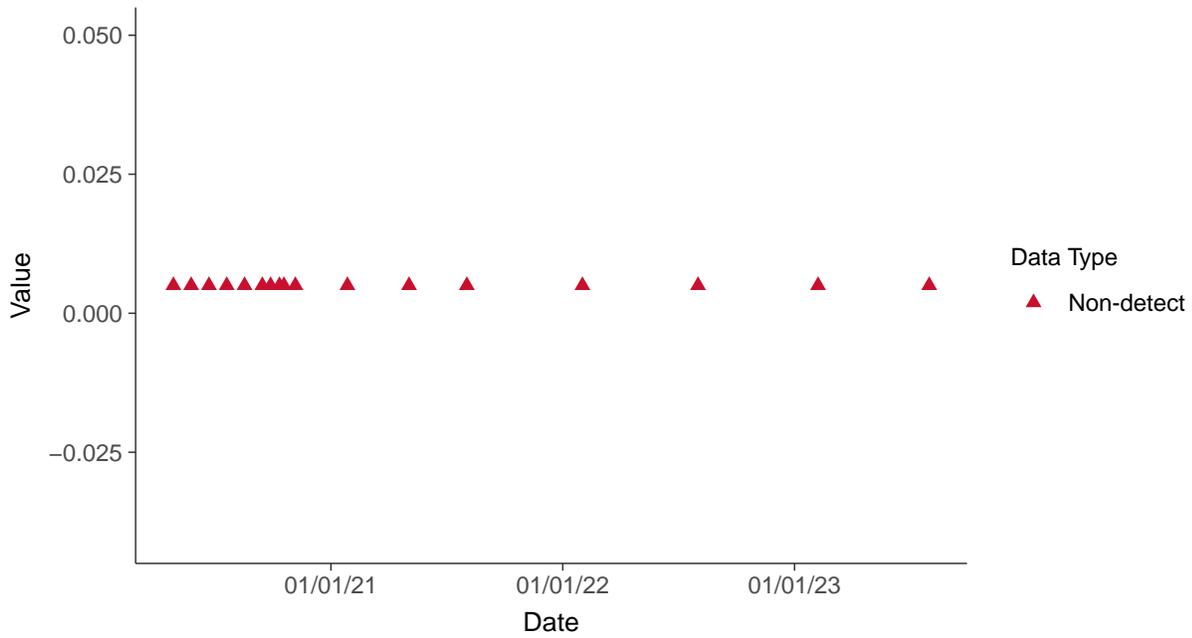


Appendix IV: Antimony, MW-5

ID: 05_2_08

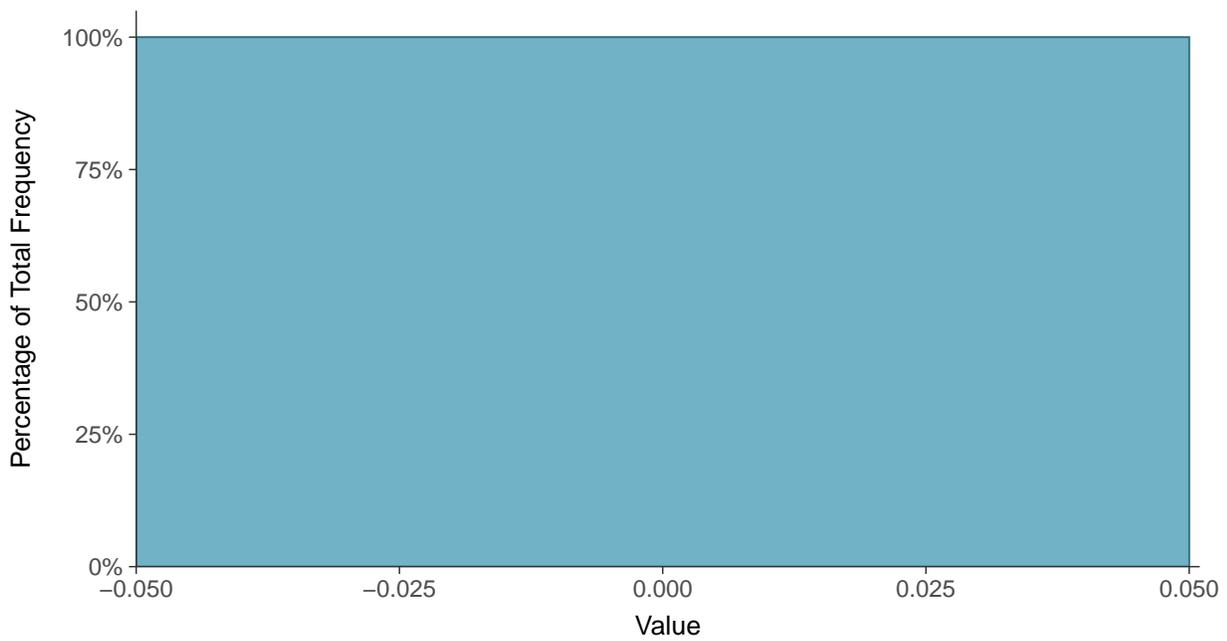
Scatter Plot

Antimony, MW-5 (mg/L)



Histogram

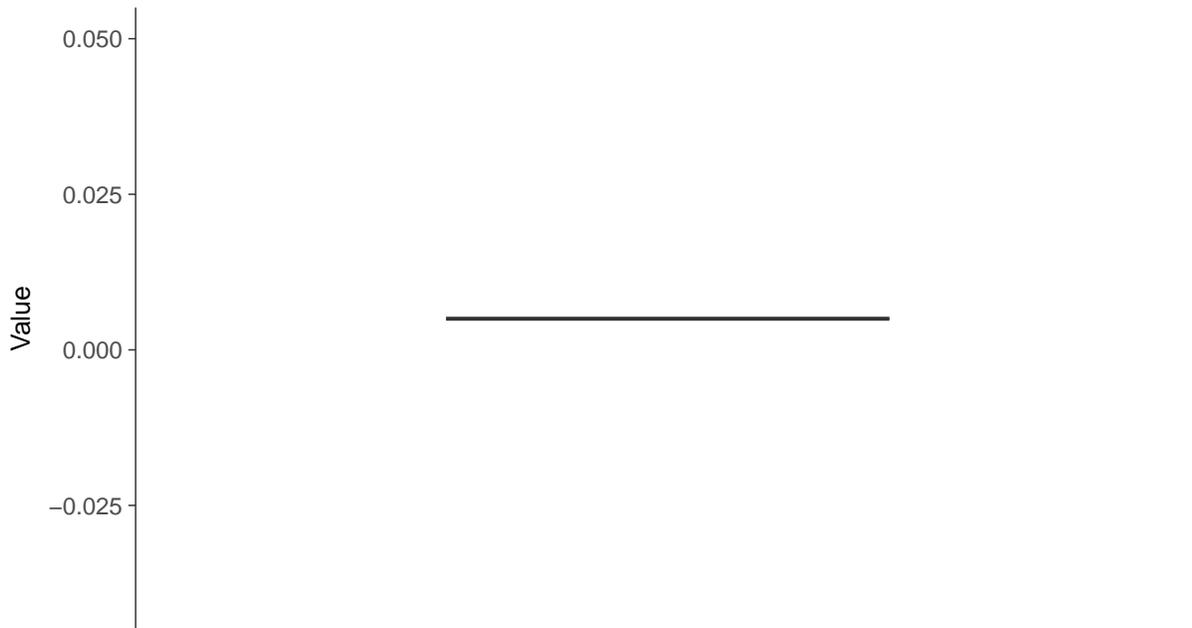
Antimony, MW-5 (mg/L)





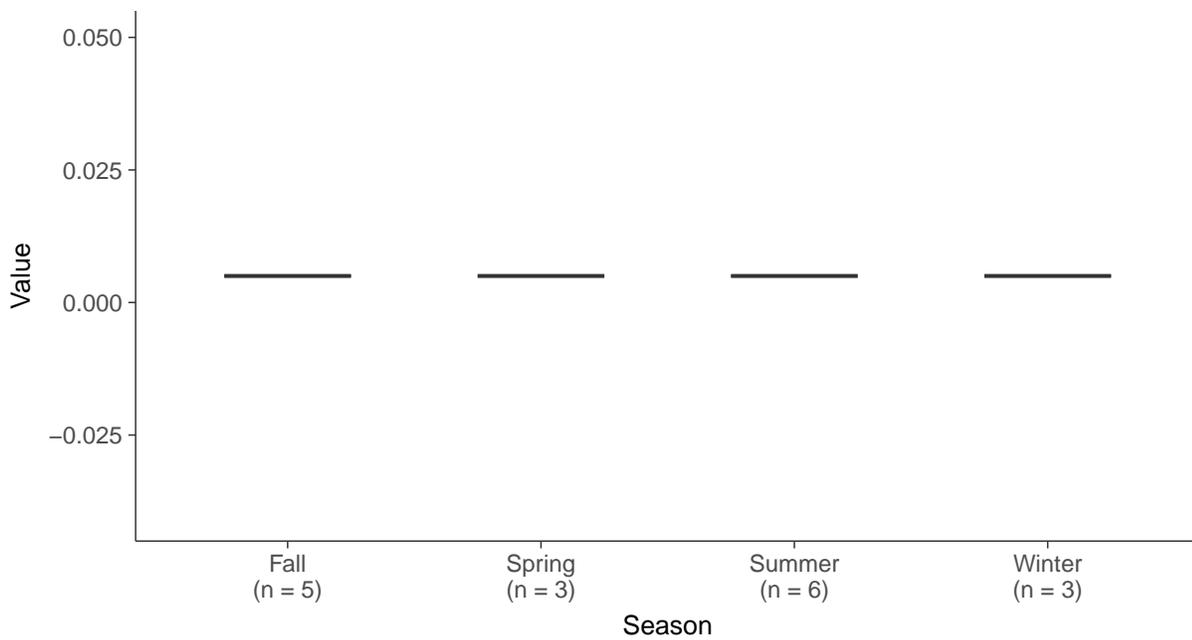
Boxplot

Antimony, MW-5 (mg/L)



Boxplot by Season

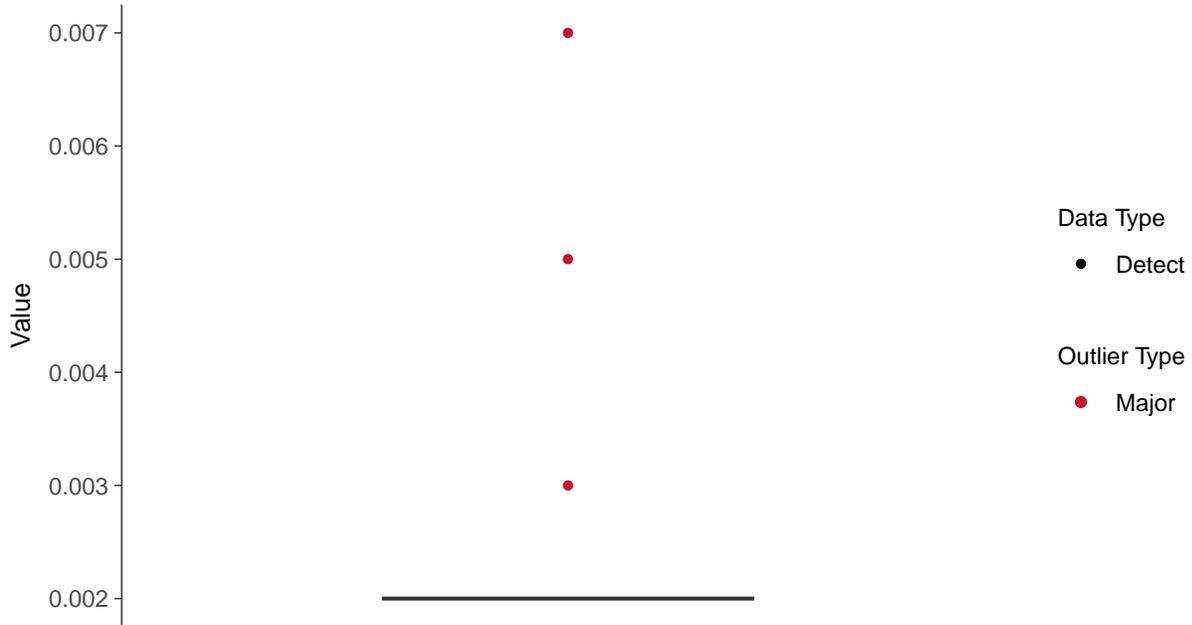
Antimony, MW-5 (mg/L)





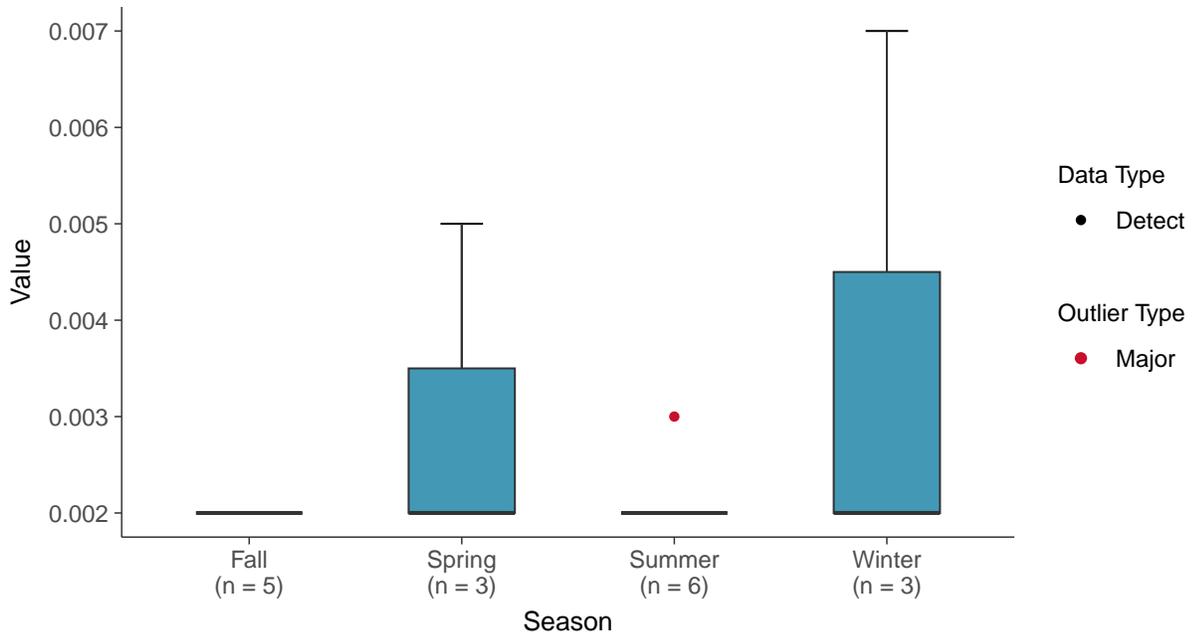
Boxplot

Arsenic, MW-5 (mg/L)



Boxplot by Season

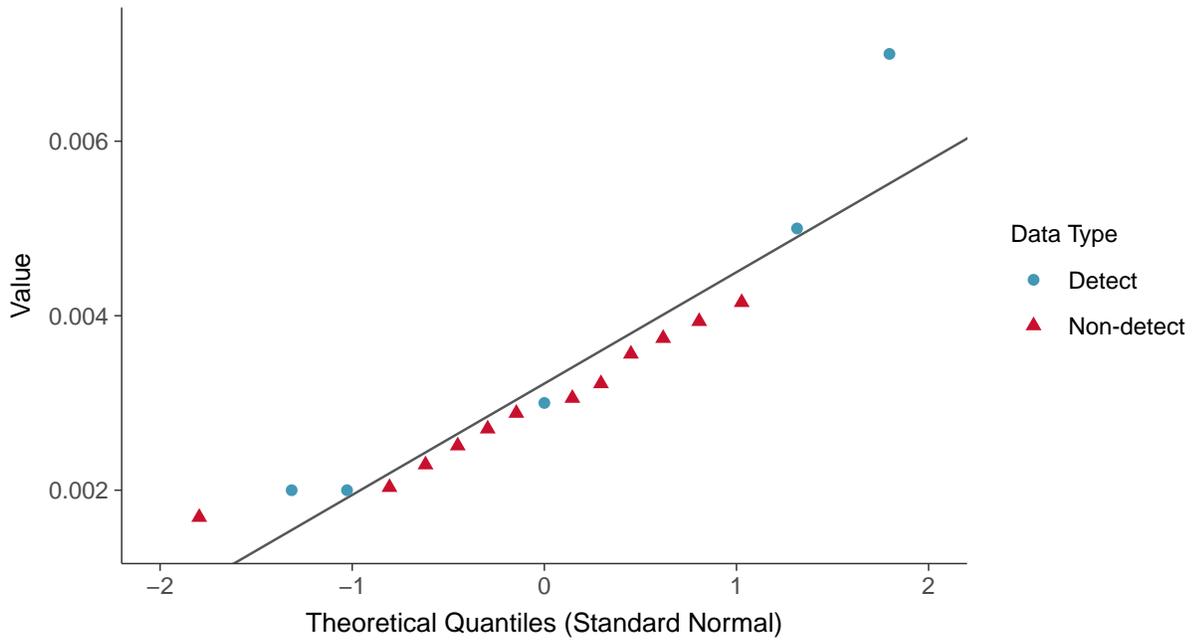
Arsenic, MW-5 (mg/L)





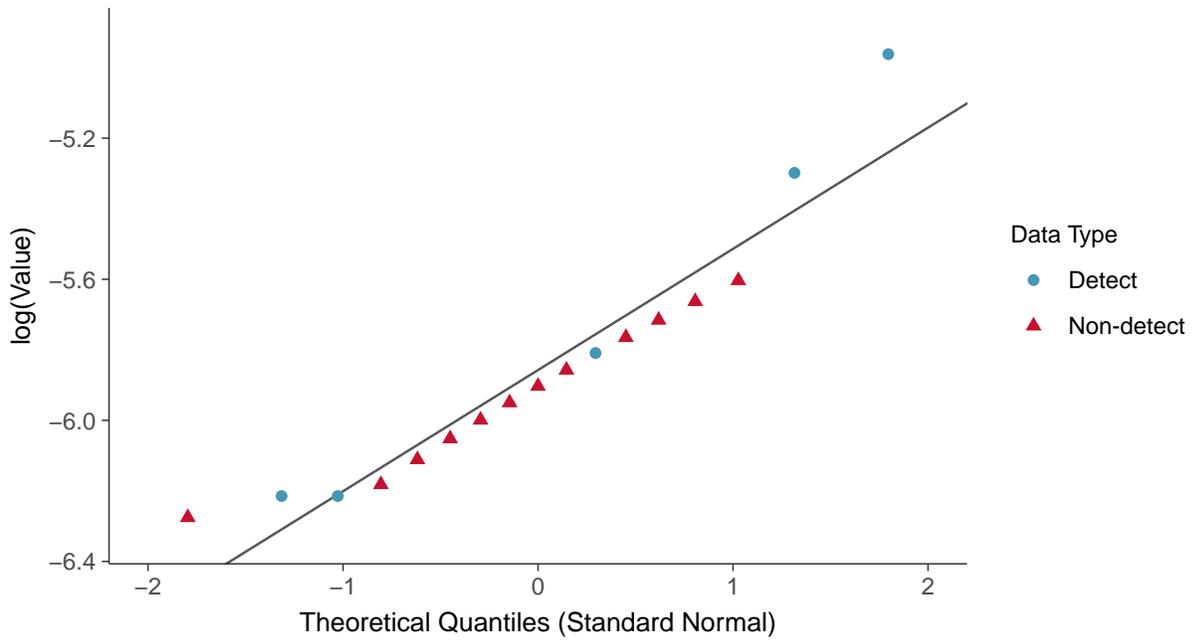
Normal Q-Q plot using ROS Imputed Estimates

Arsenic, MW-5 (mg/L)



Lognormal Q-Q plot using ROS Imputed Estimates

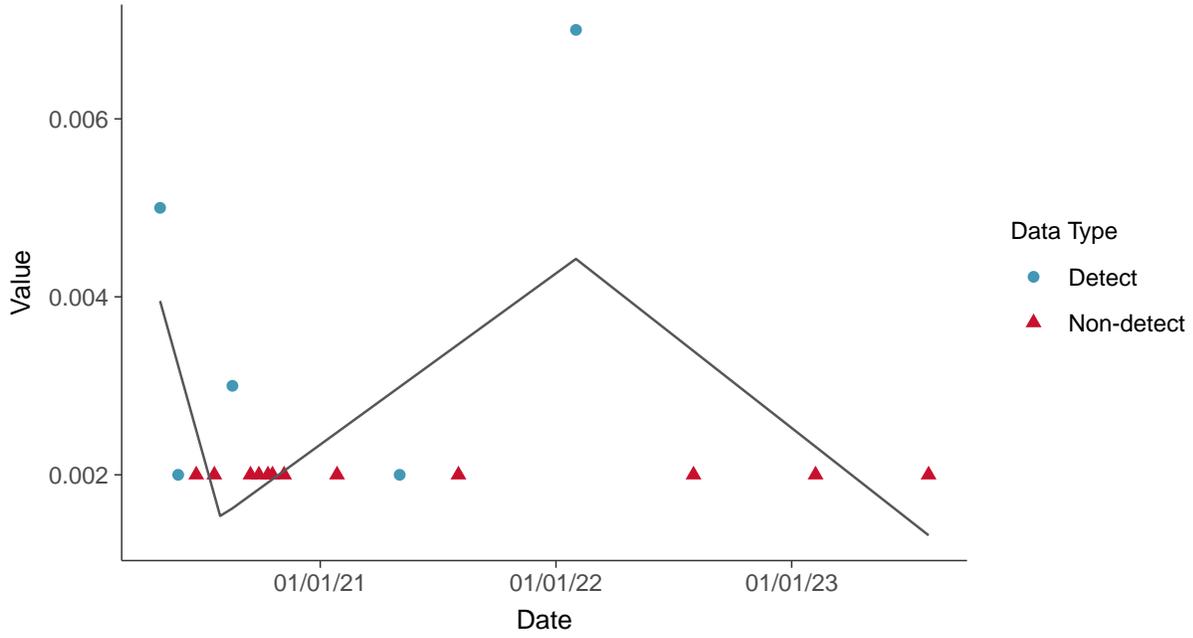
Arsenic, MW-5 (mg/L)





Trend Regression: Piecewise Linear-Linear-Linear

Arsenic, MW-5 (mg/L)



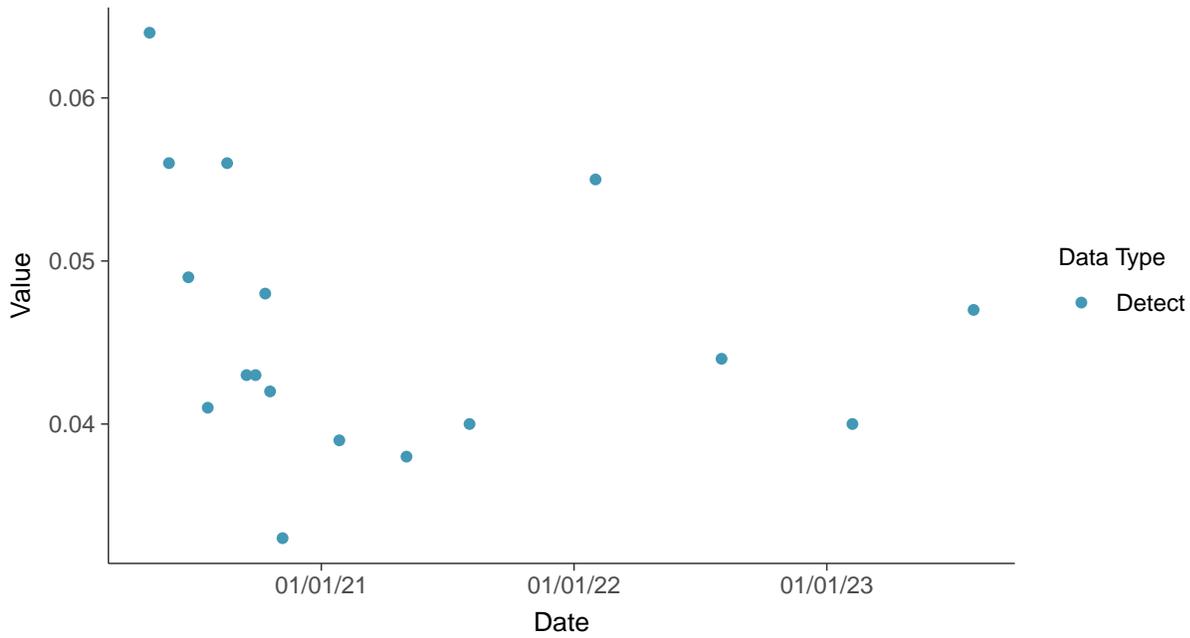


Appendix IV: Barium, MW-5

ID: 05_2_10

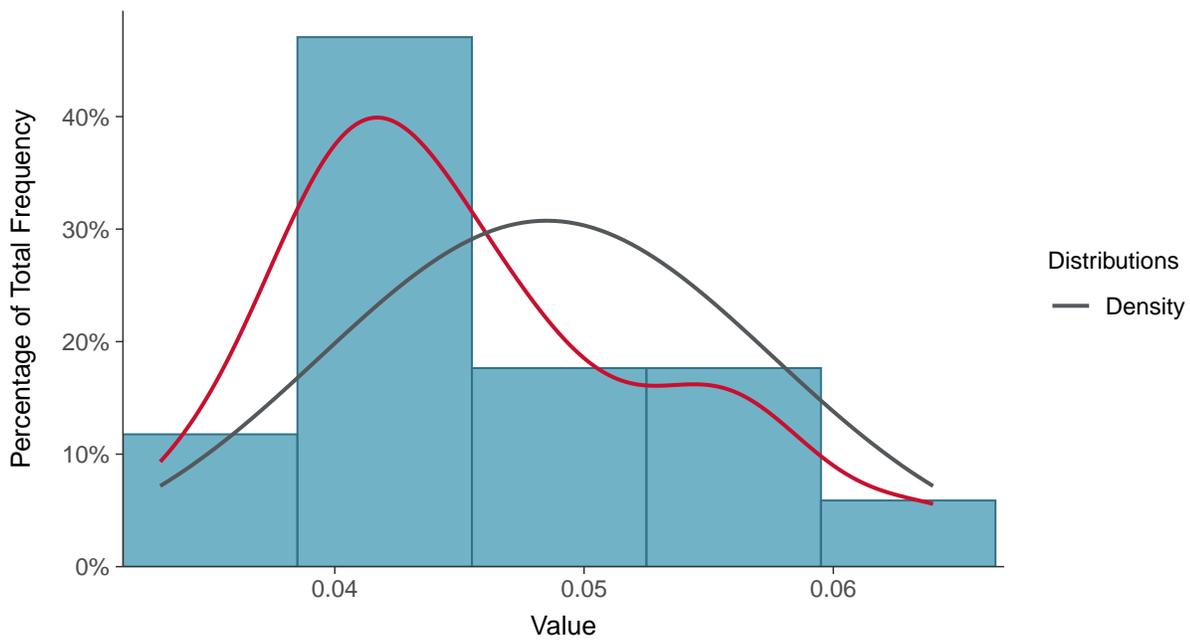
Scatter Plot

Barium, MW-5 (mg/L)



Histogram

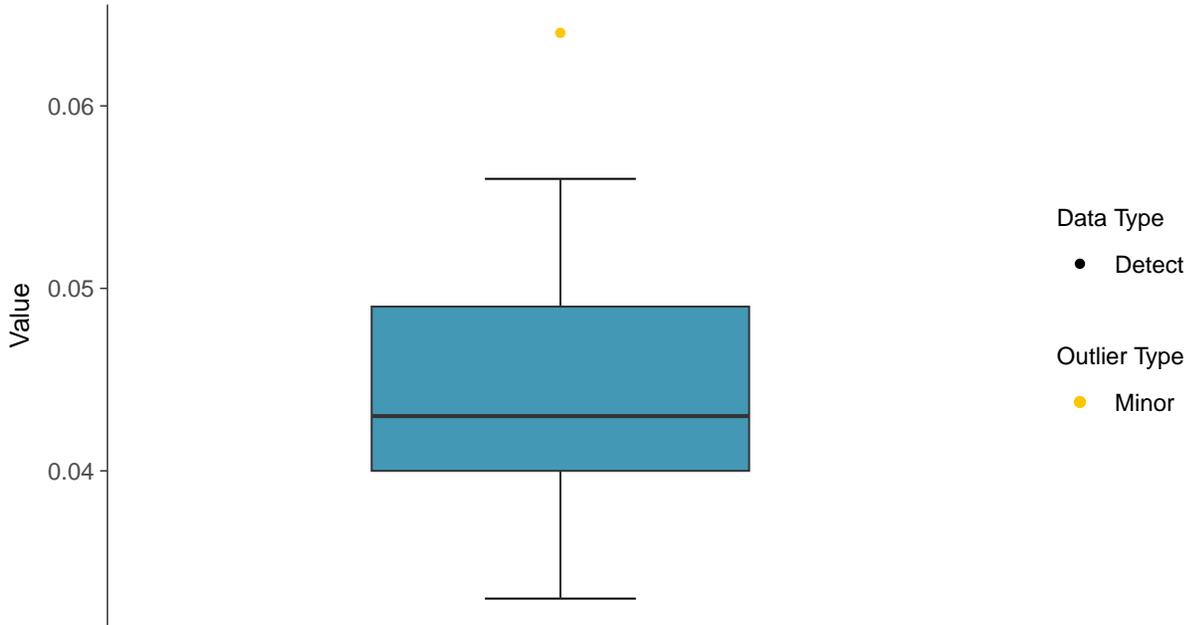
Barium, MW-5 (mg/L)





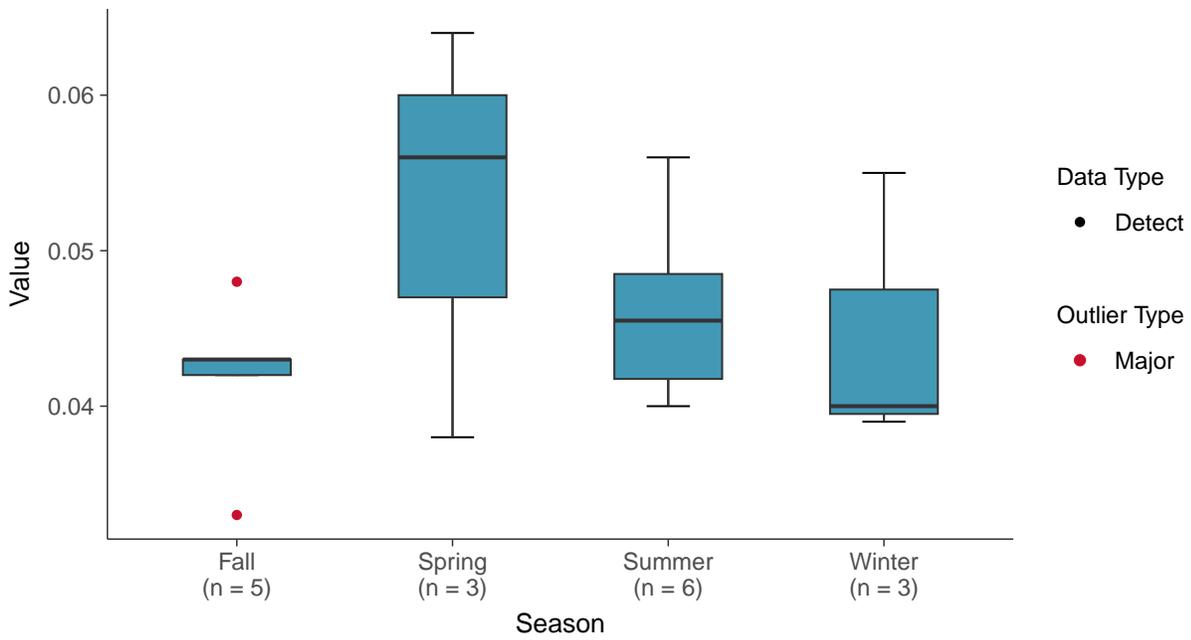
Boxplot

Barium, MW-5 (mg/L)



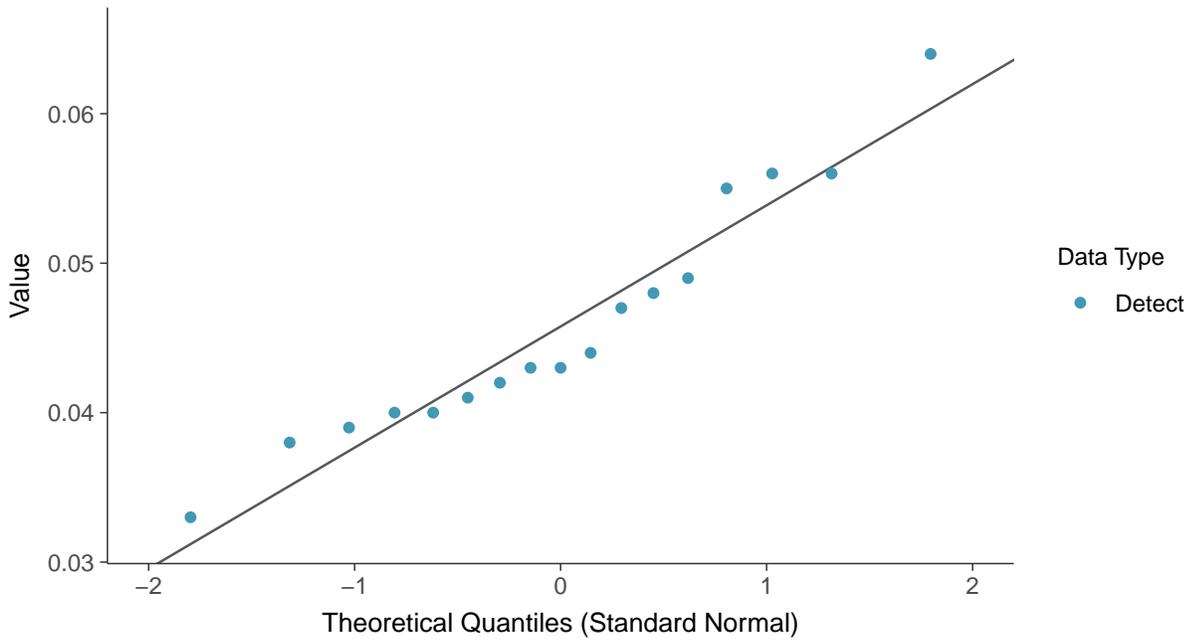
Boxplot by Season

Barium, MW-5 (mg/L)

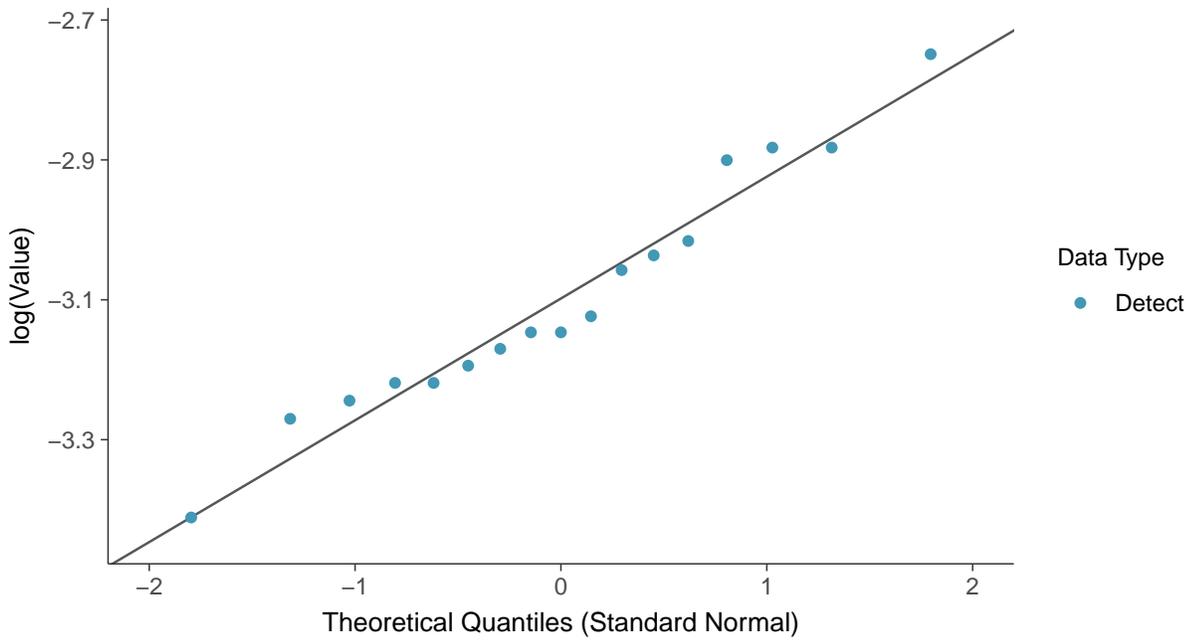




Normal Q-Q plot
Barium, MW-5 (mg/L)



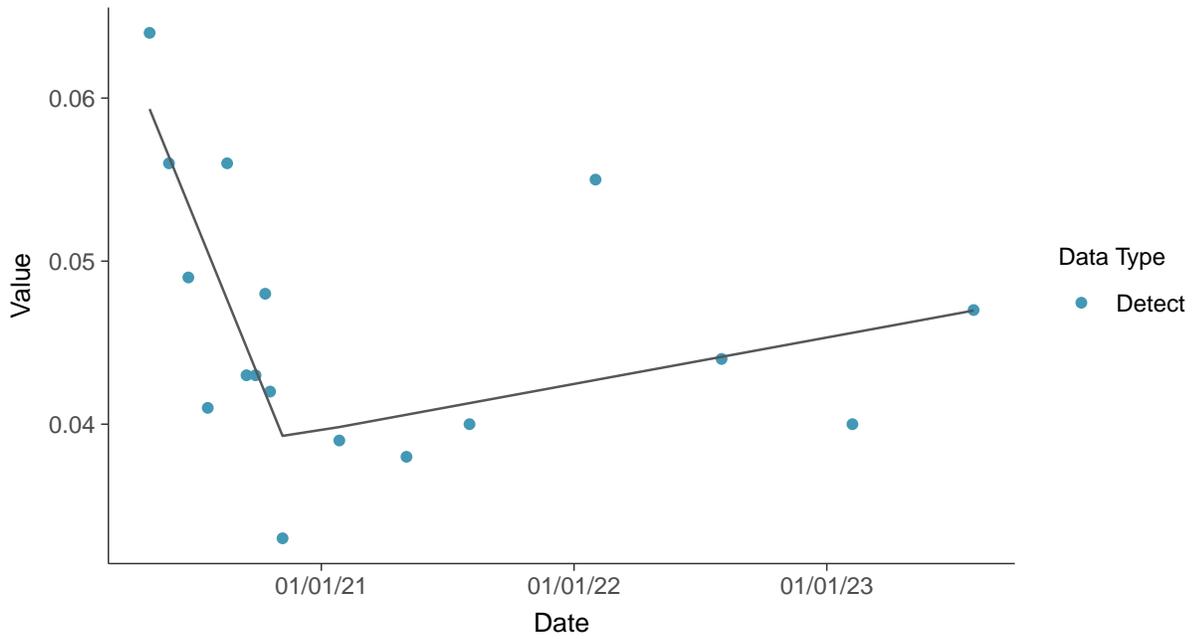
Lognormal Q-Q plot
Barium, MW-5 (mg/L)





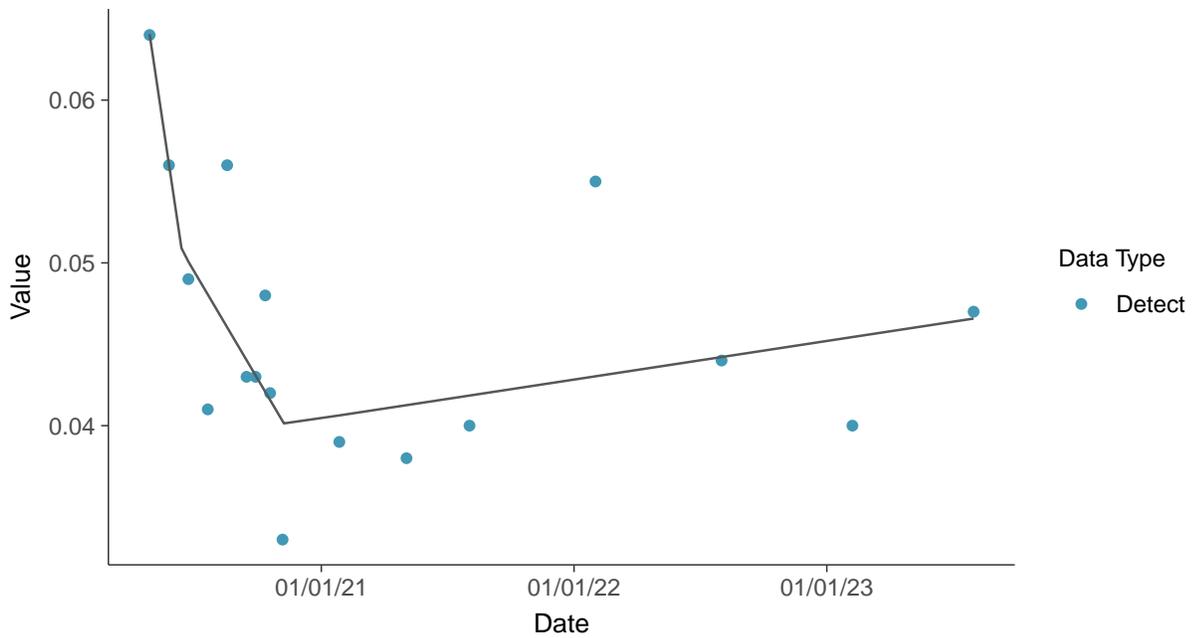
Trend Regression: Piecewise Linear-Linear

Barium, MW-5 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Barium, MW-5 (mg/L)



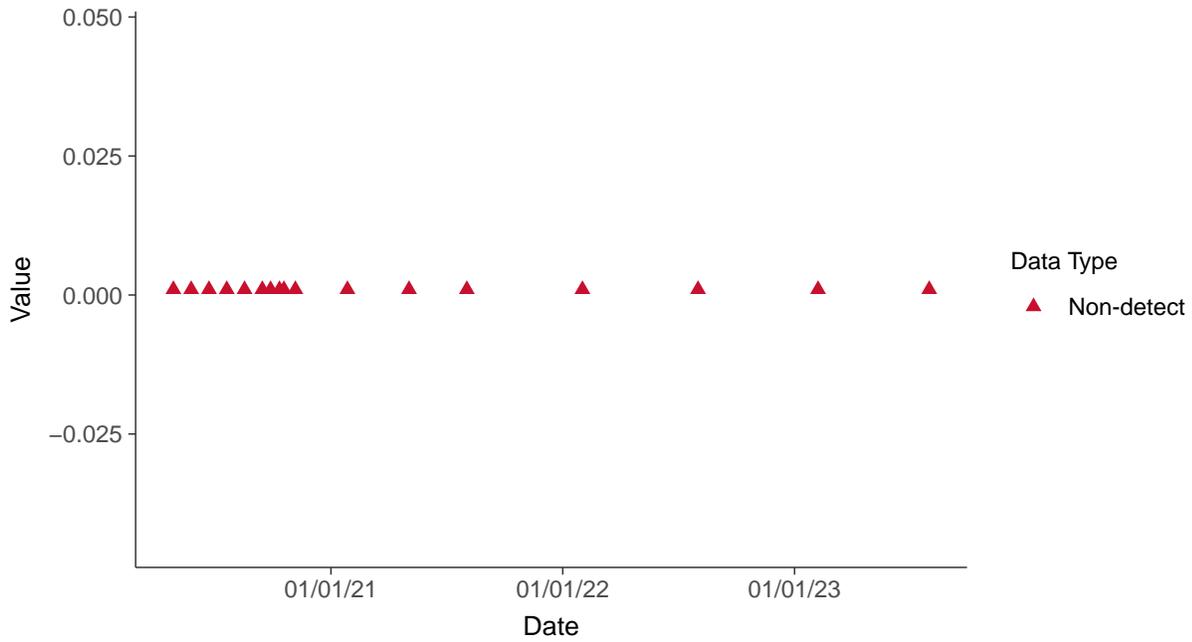


Appendix IV: Beryllium, MW-5

ID: 05_2_11

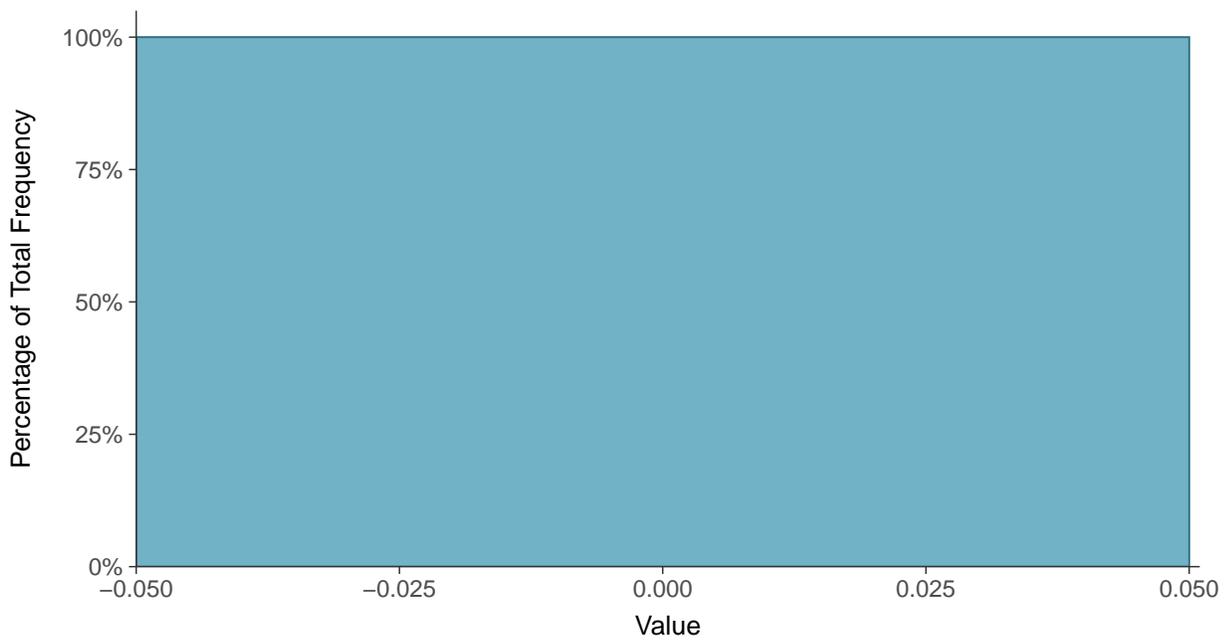
Scatter Plot

Beryllium, MW-5 (mg/L)



Histogram

Beryllium, MW-5 (mg/L)





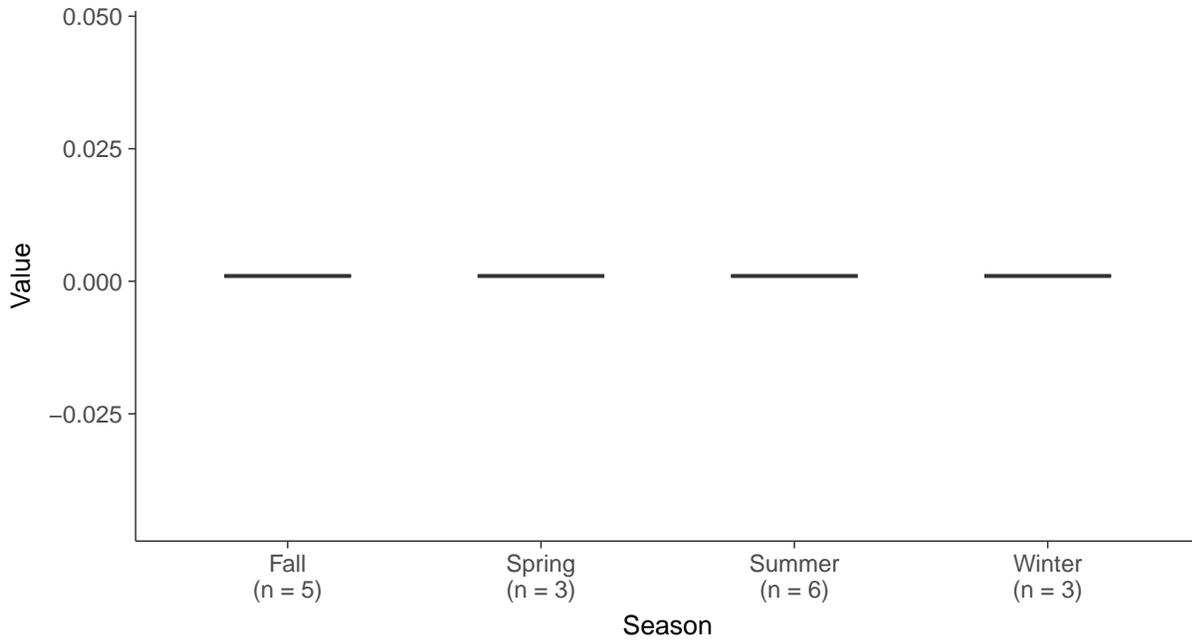
Boxplot

Beryllium, MW-5 (mg/L)



Boxplot by Season

Beryllium, MW-5 (mg/L)



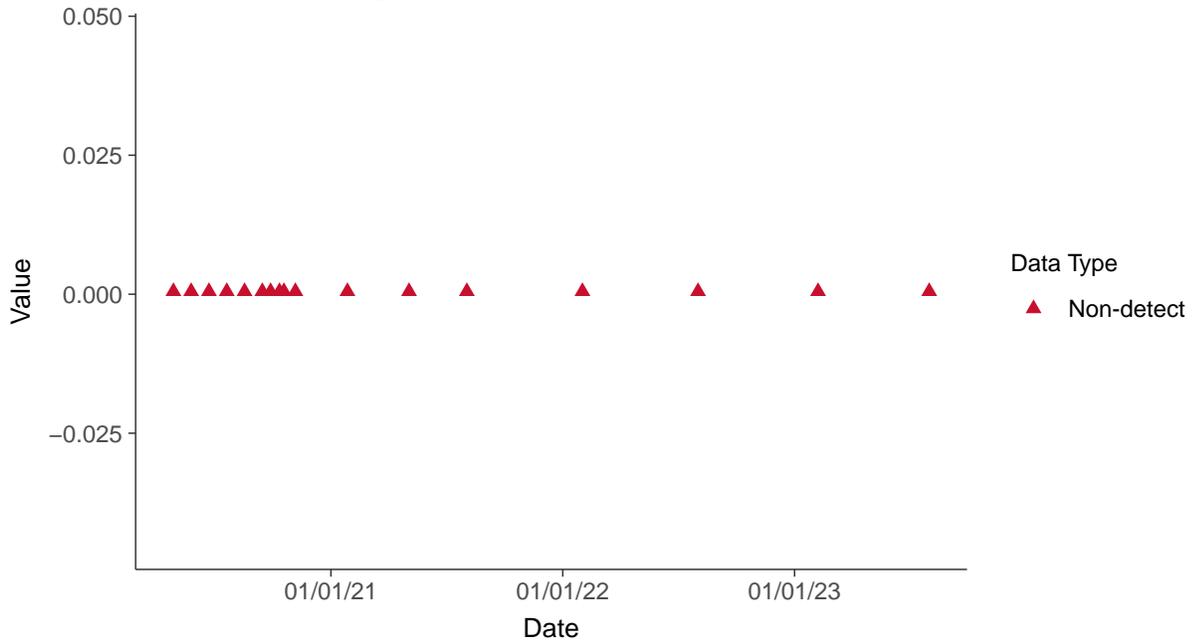


Appendix IV: Cadmium, MW-5

ID: 05_2_12

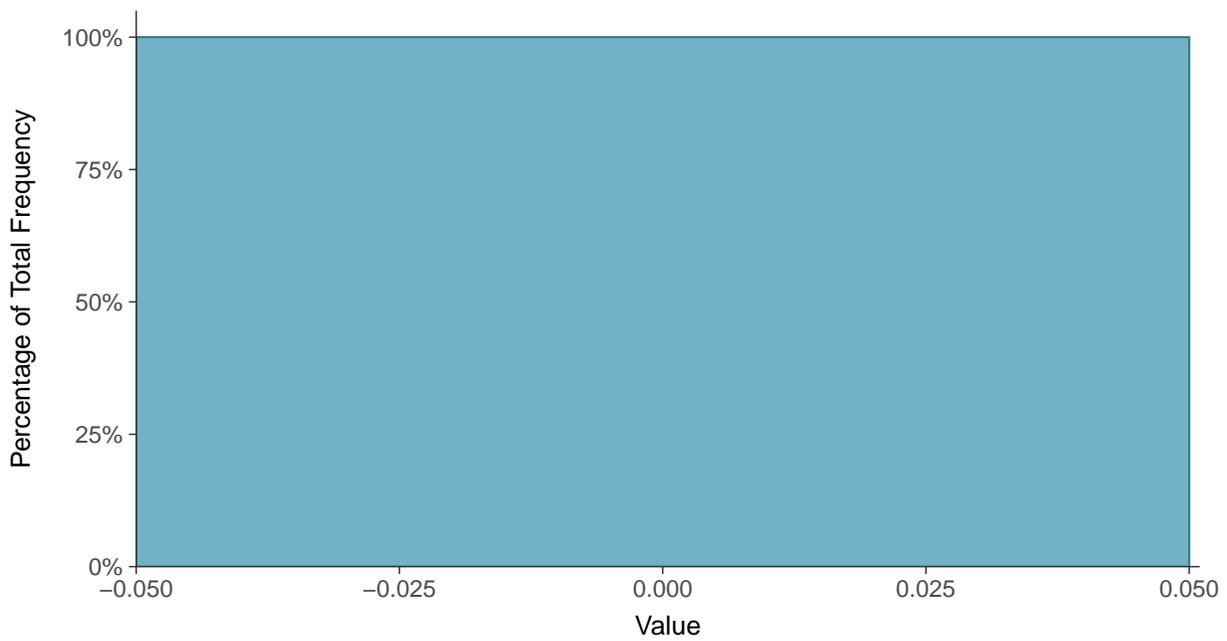
Scatter Plot

Cadmium, MW-5 (mg/L)



Histogram

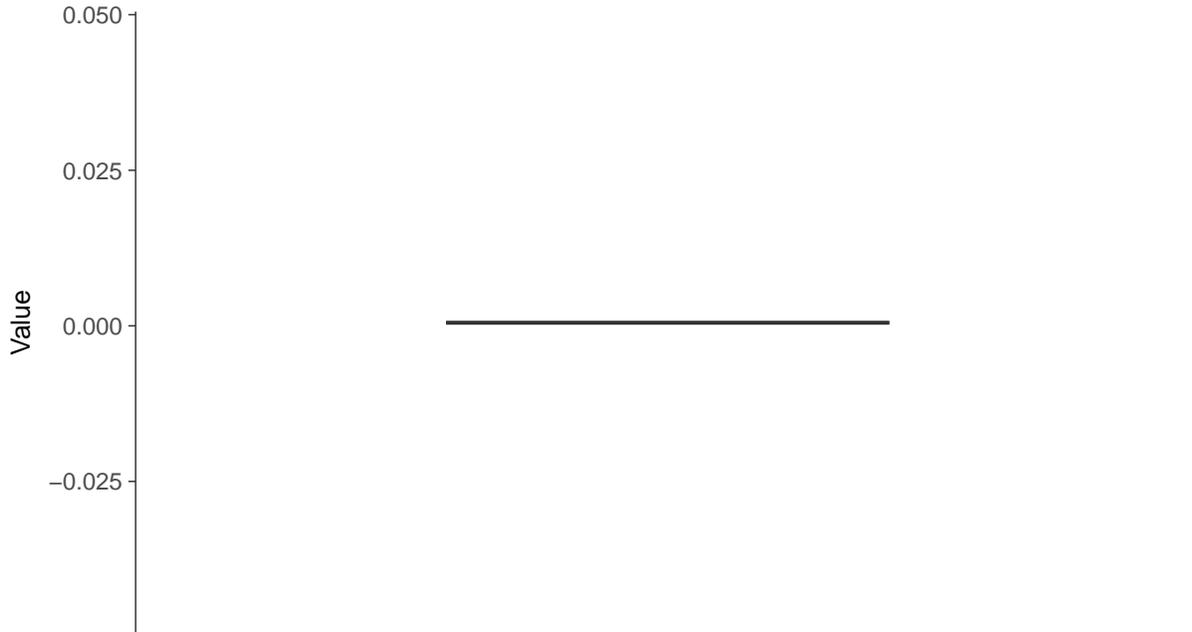
Cadmium, MW-5 (mg/L)





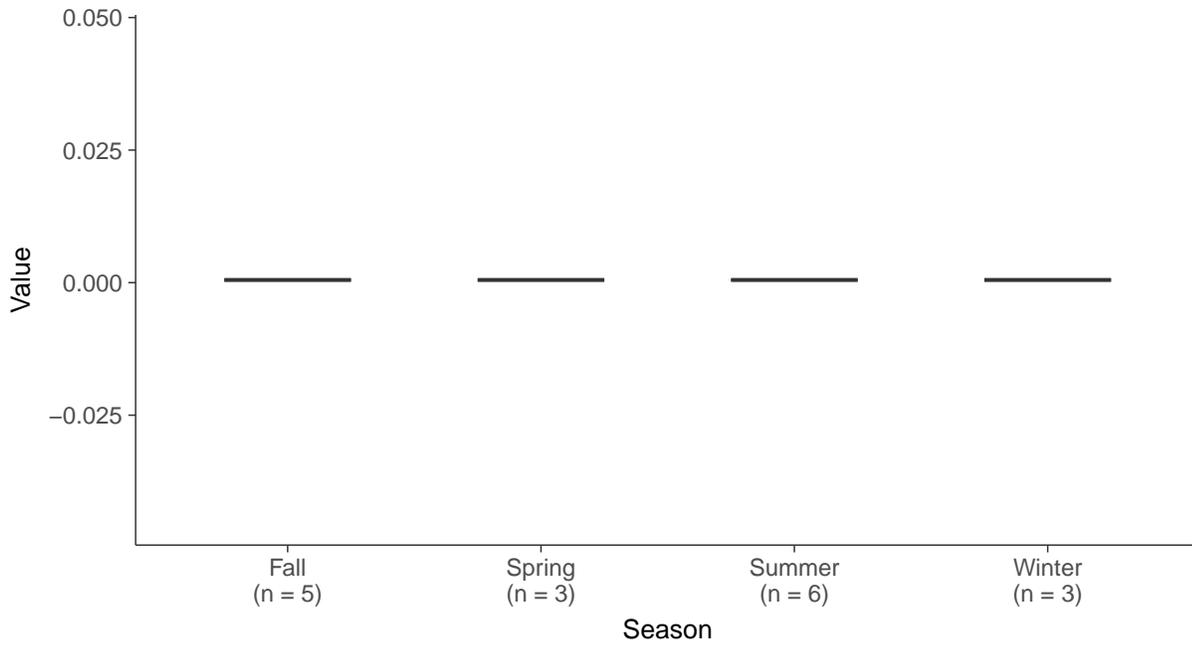
Boxplot

Cadmium, MW-5 (mg/L)



Boxplot by Season

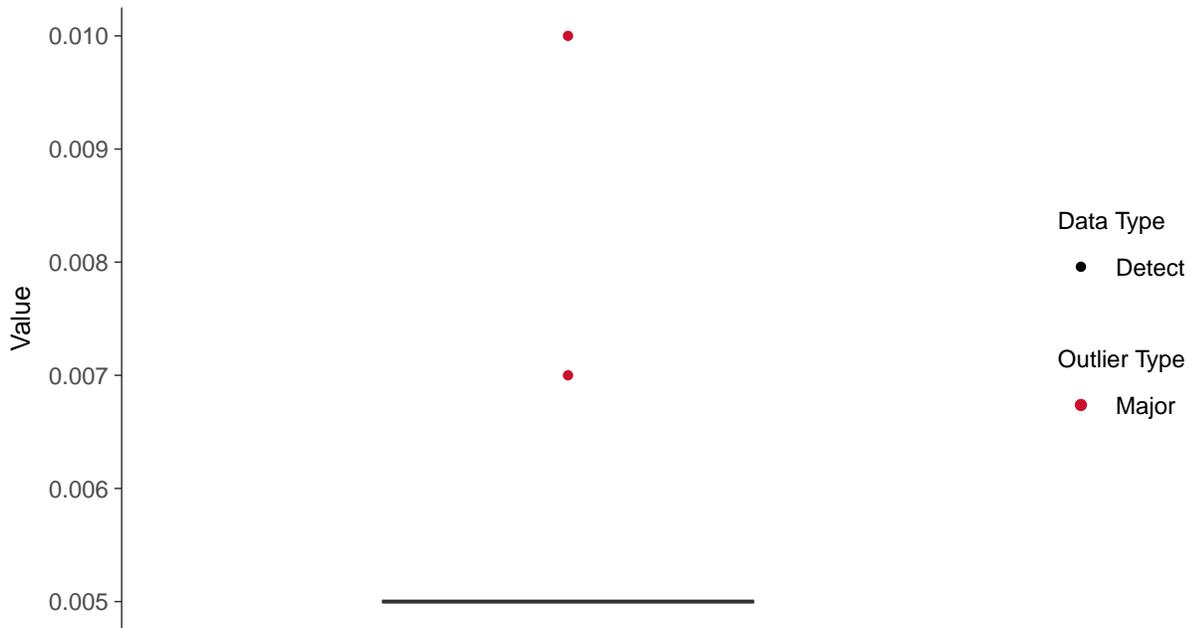
Cadmium, MW-5 (mg/L)





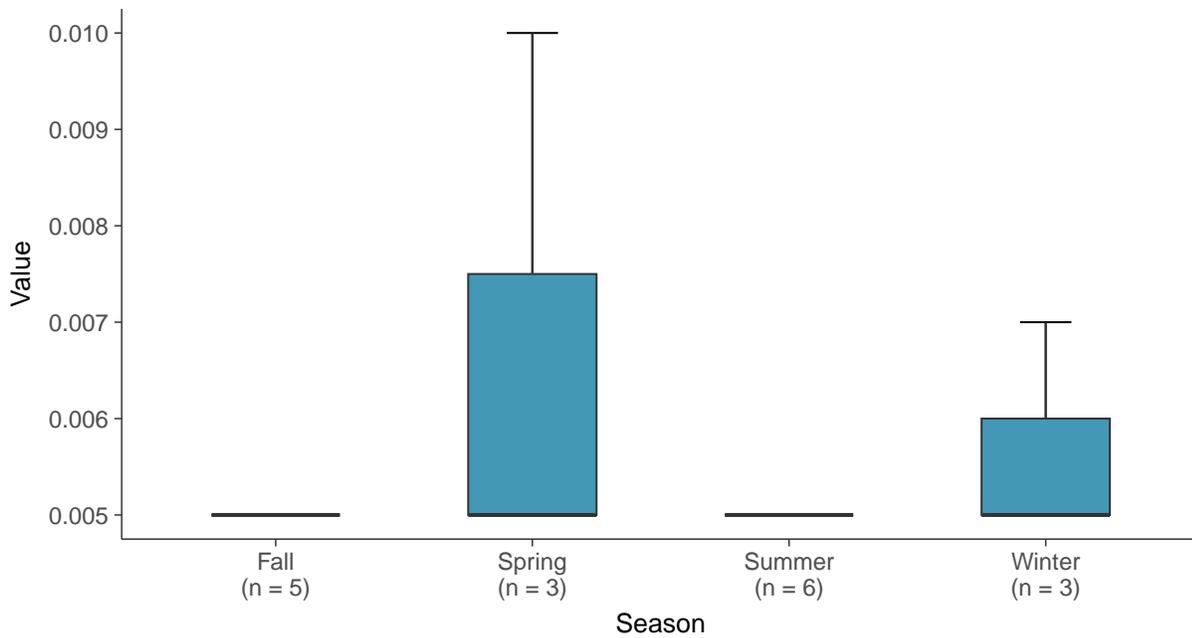
Boxplot

Chromium, MW-5 (mg/L)



Boxplot by Season

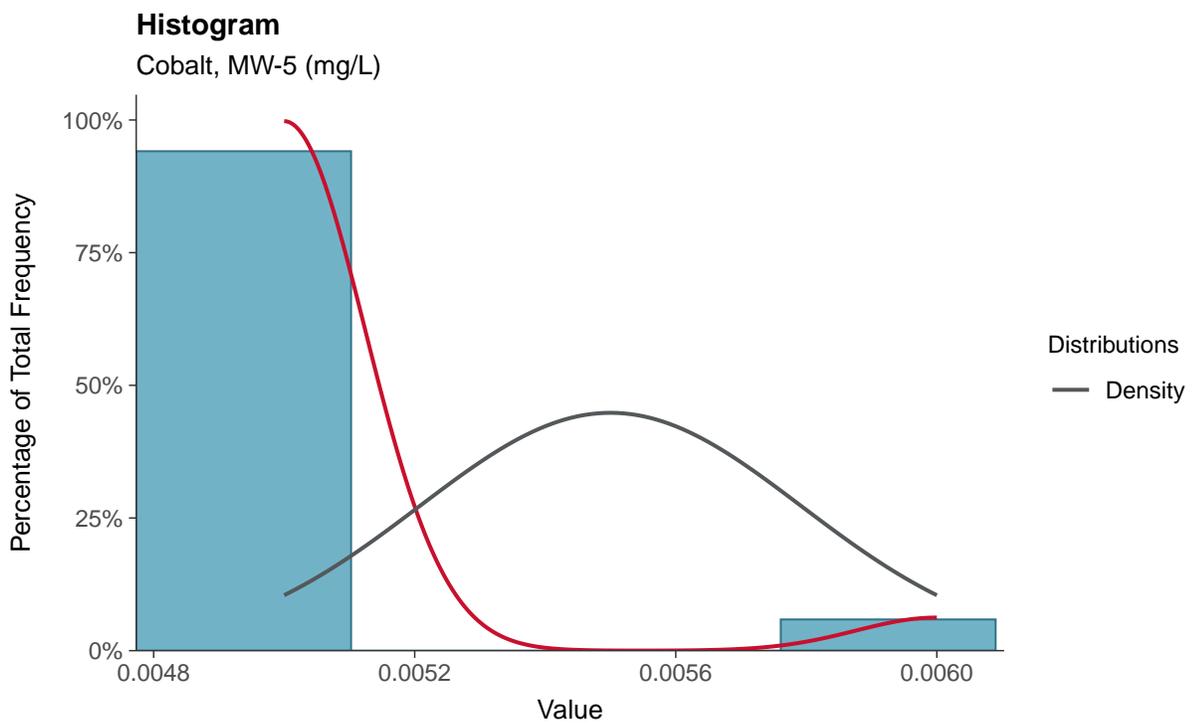
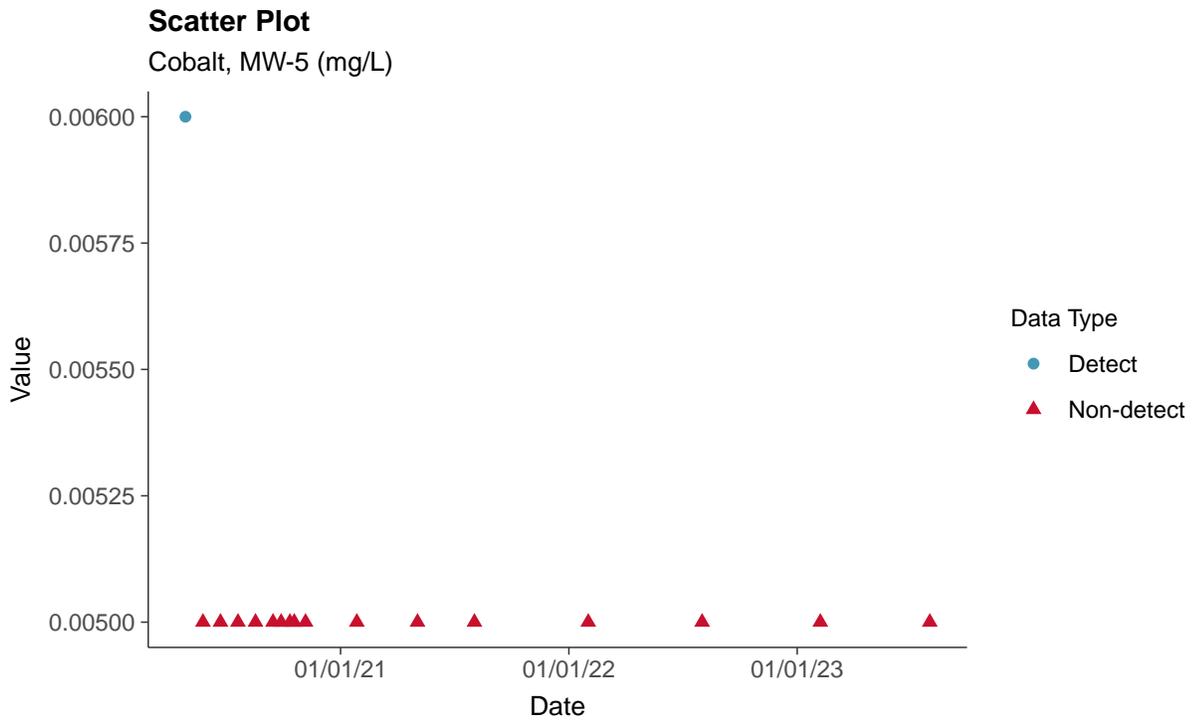
Chromium, MW-5 (mg/L)





Appendix IV: Cobalt, MW-5

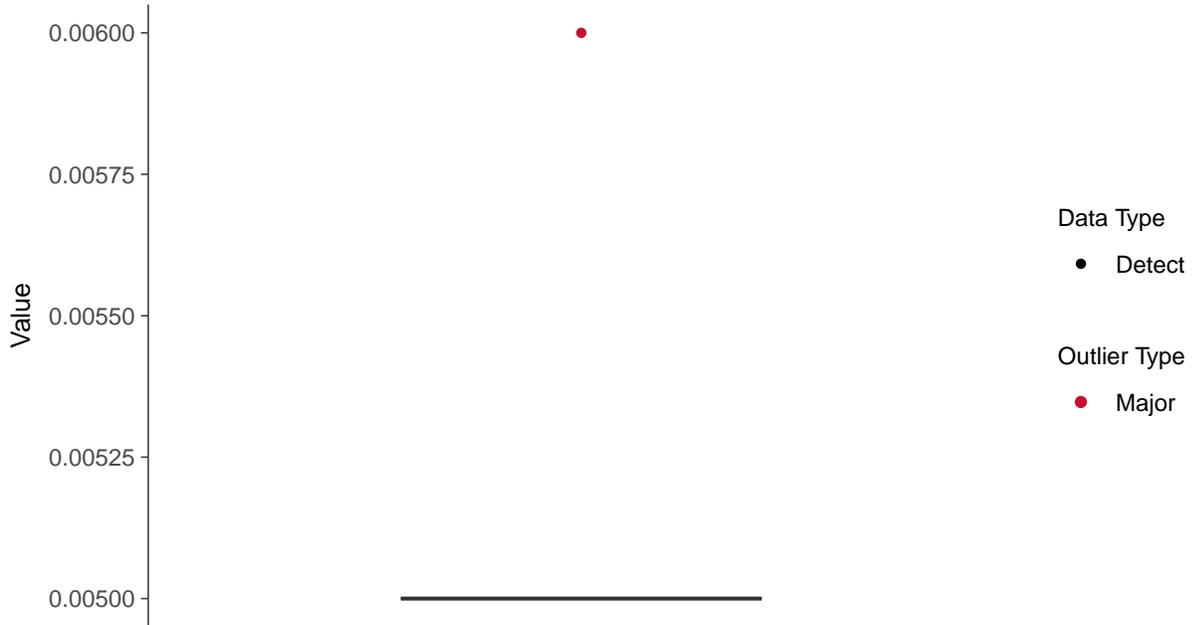
ID: 05_2_14





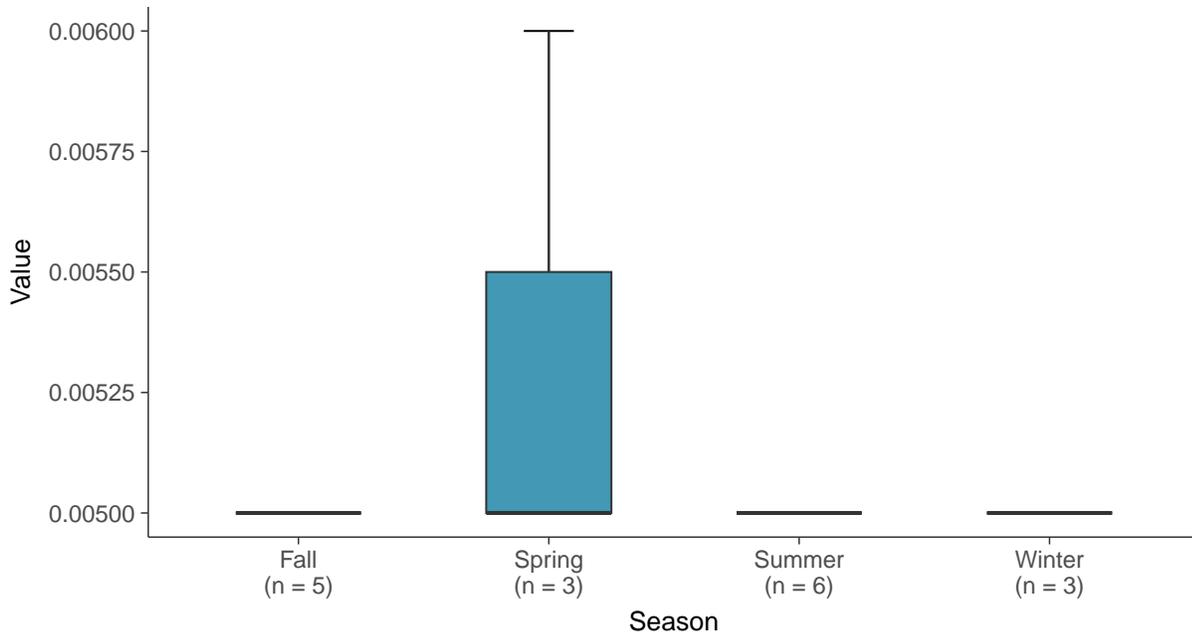
Boxplot

Cobalt, MW-5 (mg/L)



Boxplot by Season

Cobalt, MW-5 (mg/L)





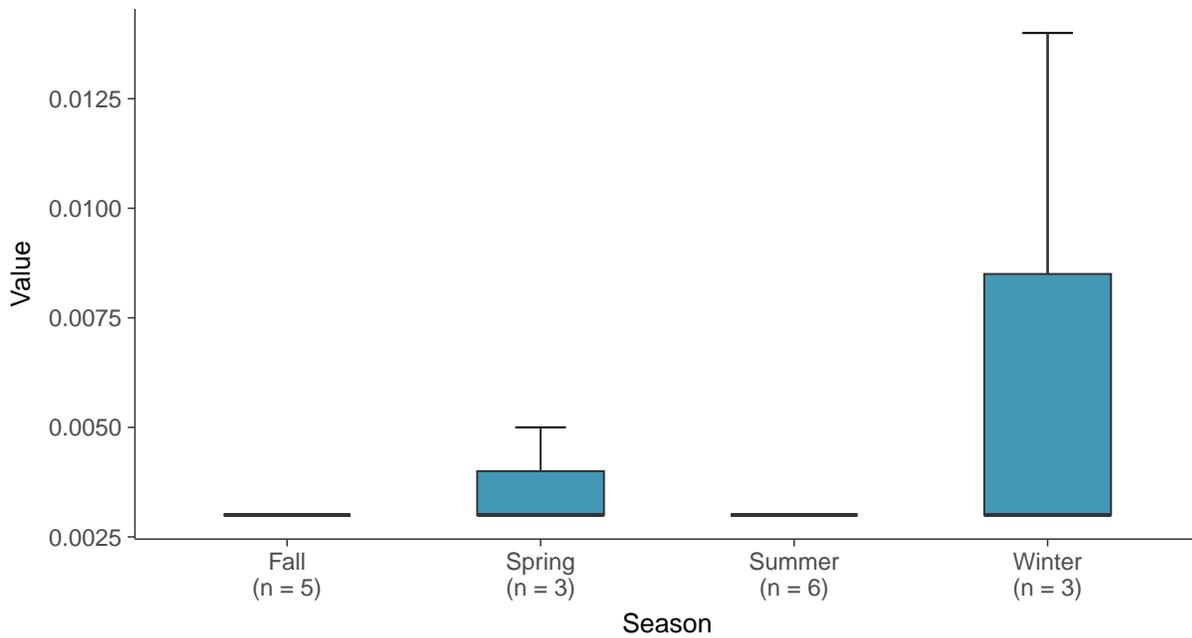
Boxplot

Lead, MW-5 (mg/L)



Boxplot by Season

Lead, MW-5 (mg/L)



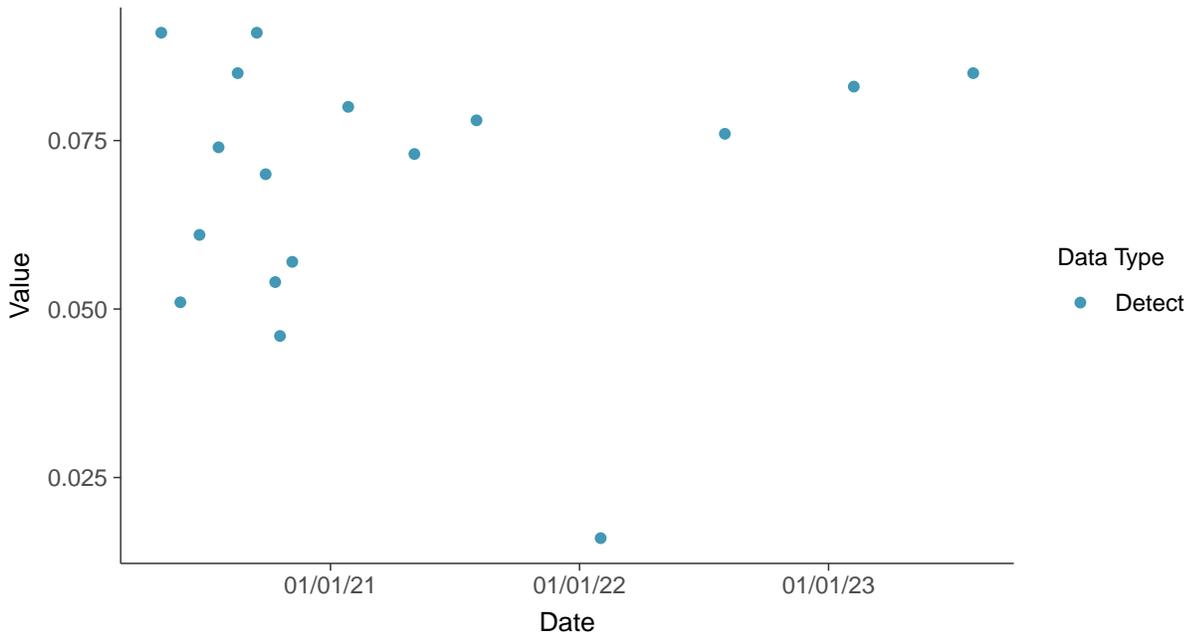


Appendix IV: Lithium, MW-5

ID: 05_2_16

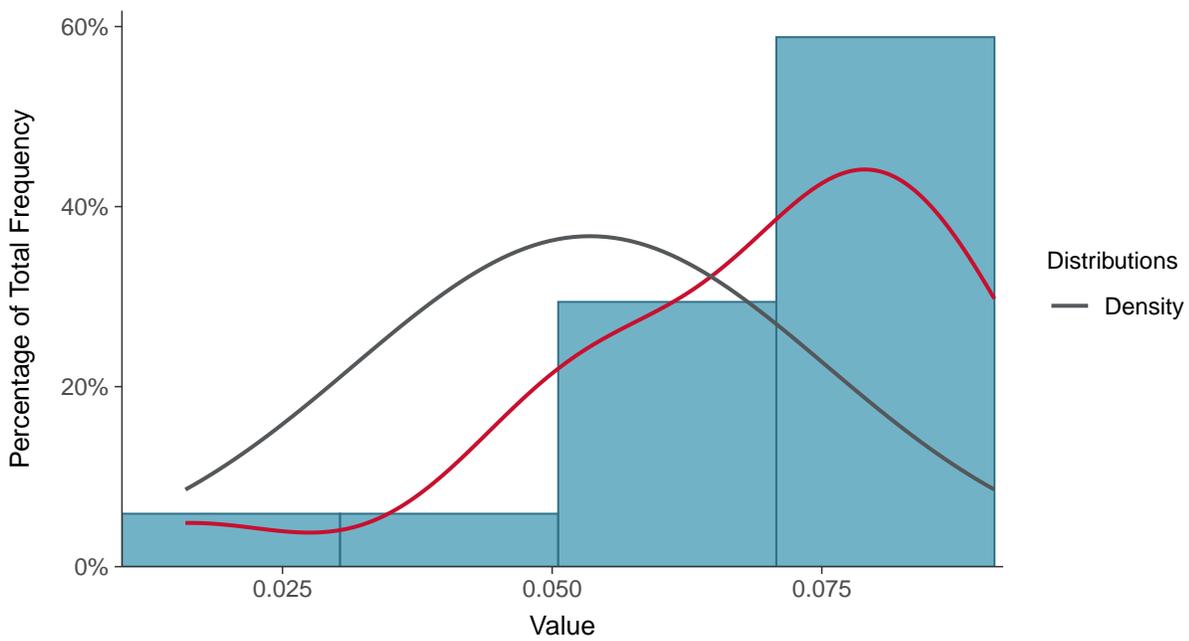
Scatter Plot

Lithium, MW-5 (mg/L)



Histogram

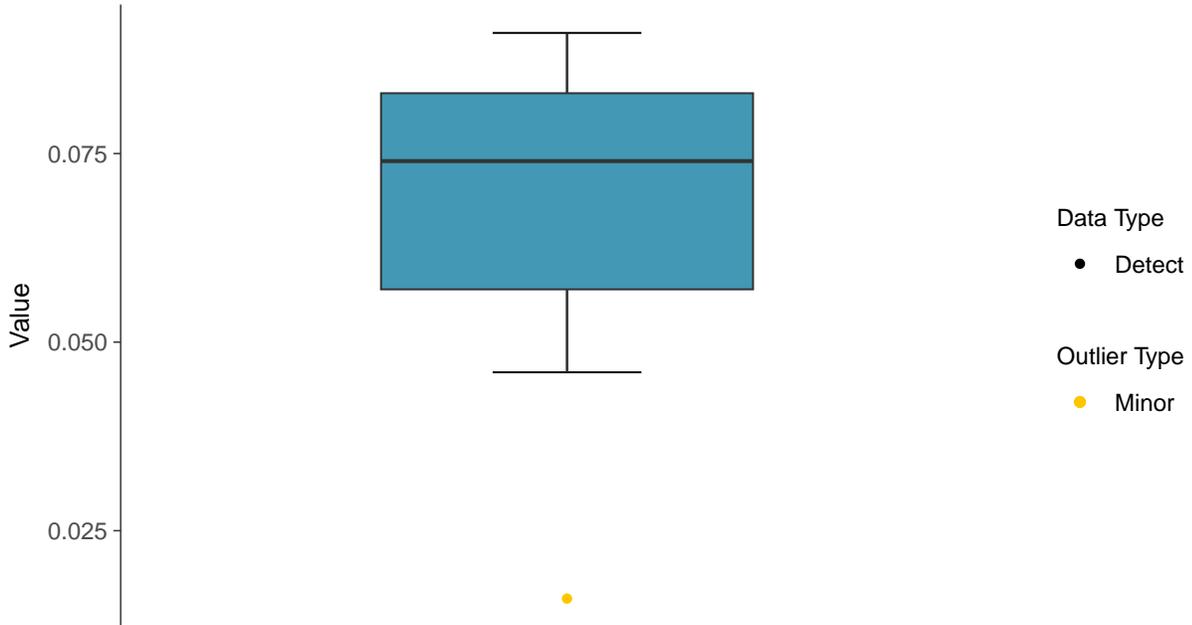
Lithium, MW-5 (mg/L)





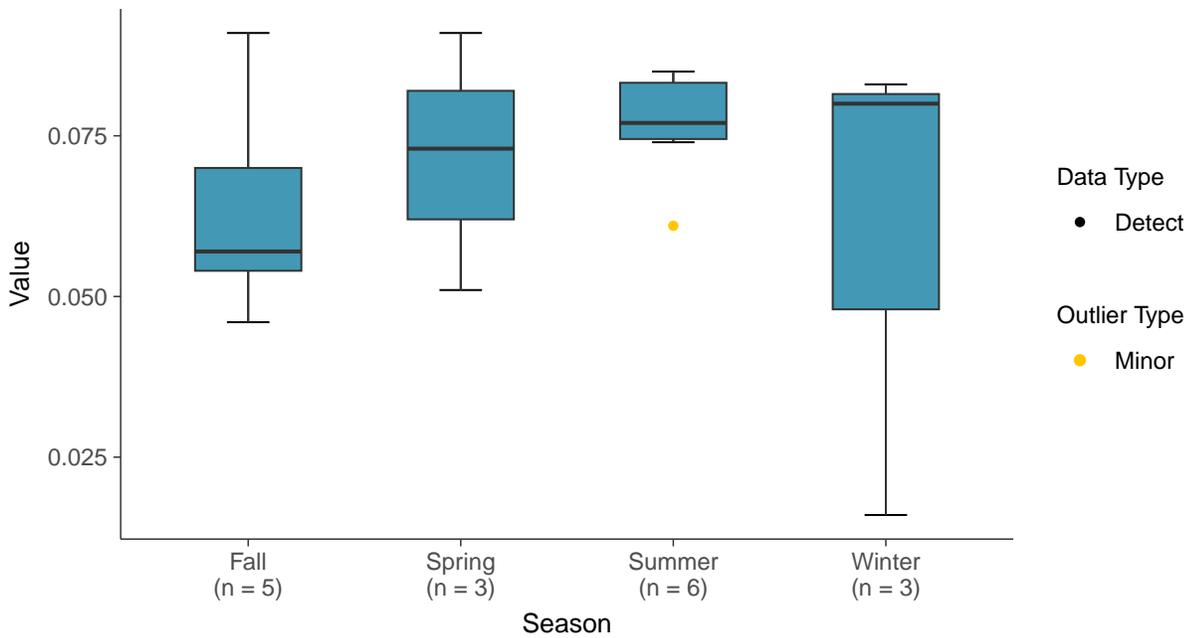
Boxplot

Lithium, MW-5 (mg/L)



Boxplot by Season

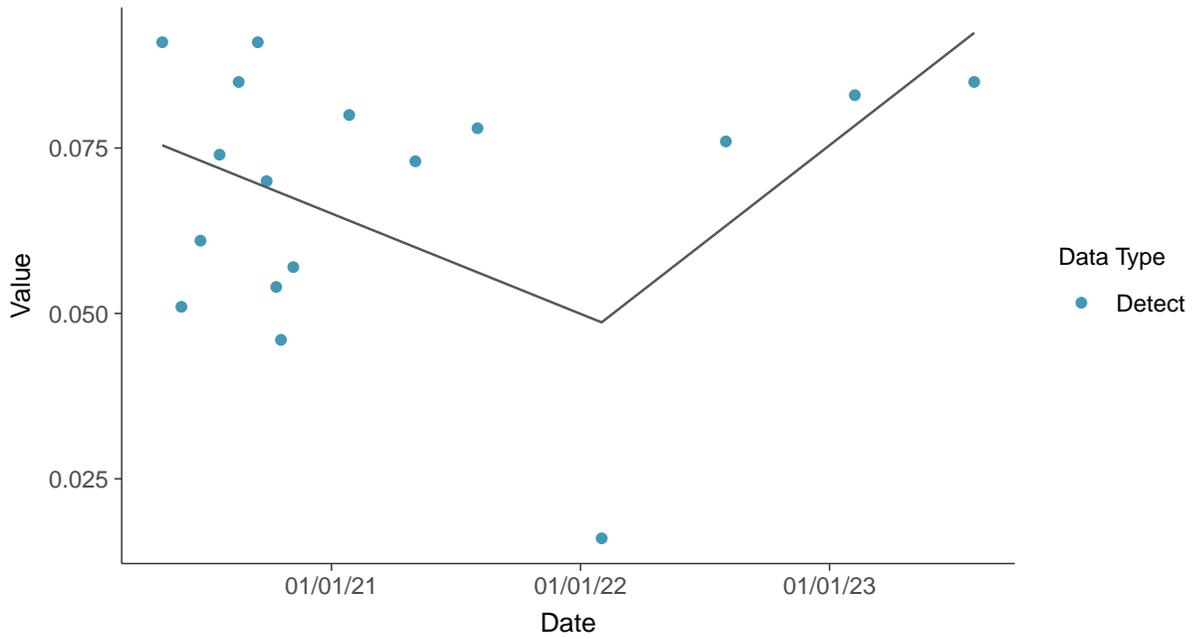
Lithium, MW-5 (mg/L)





Trend Regression: Piecewise Linear-Linear

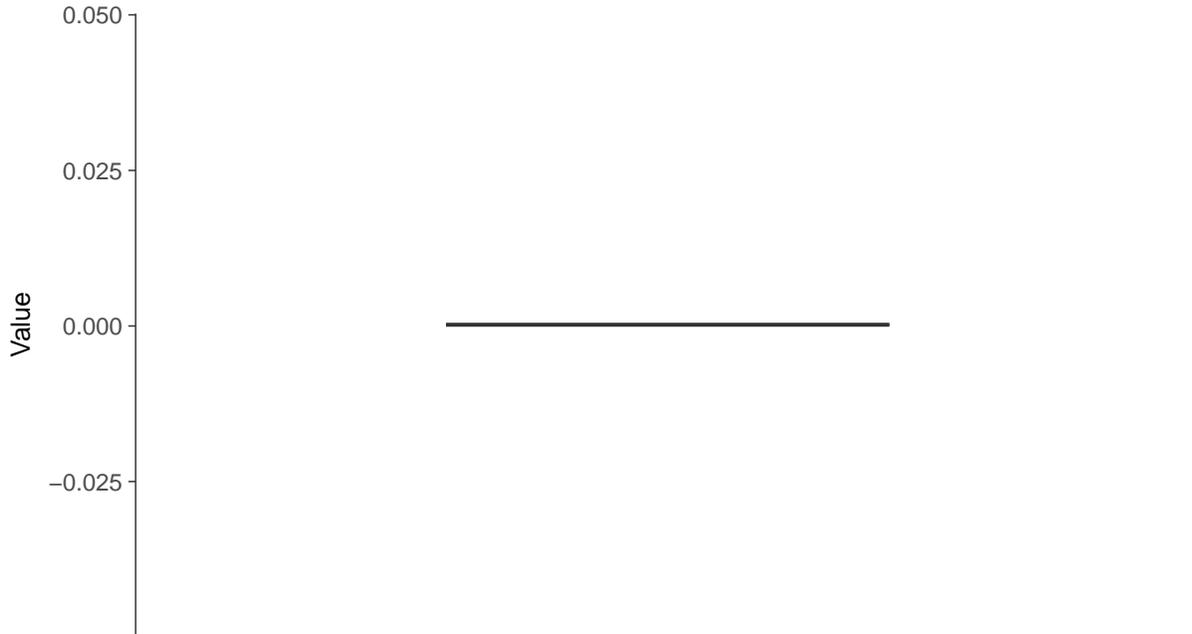
Lithium, MW-5 (mg/L)





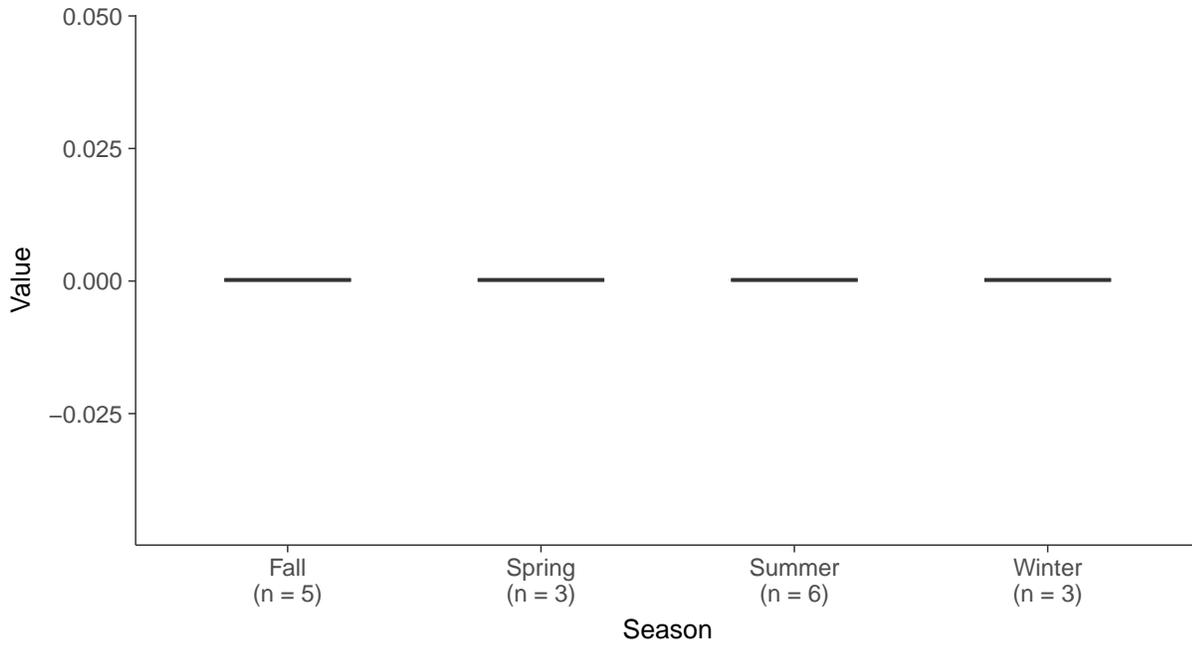
Boxplot

Mercury, MW-5 (mg/L)



Boxplot by Season

Mercury, MW-5 (mg/L)



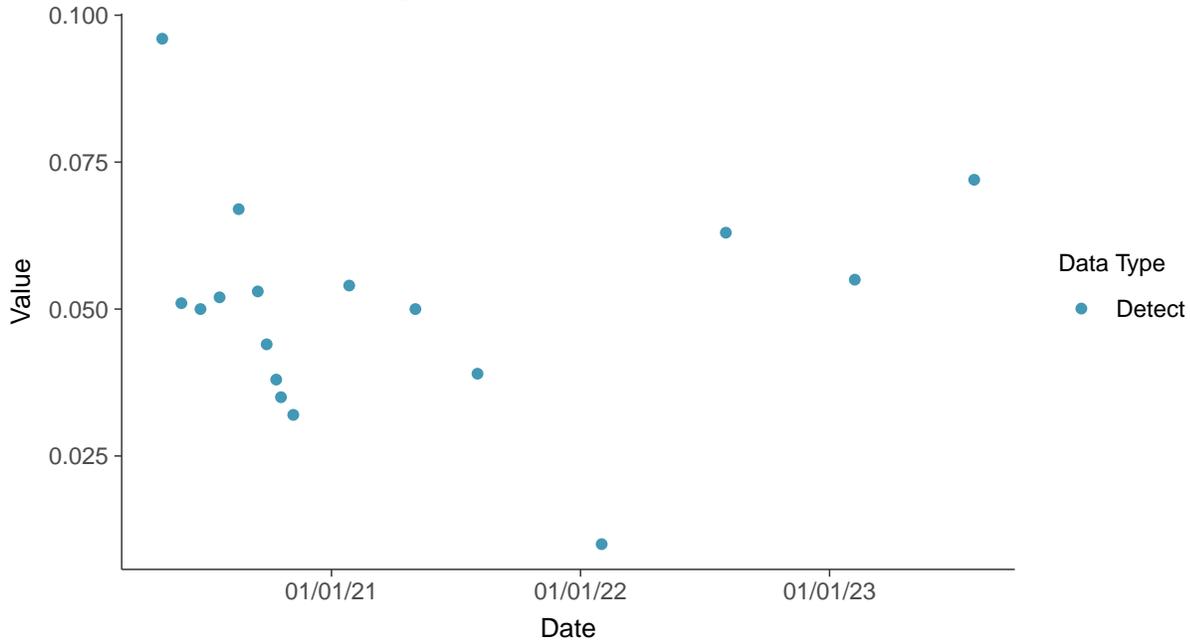


Appendix IV: Molybdenum, MW-5

ID: 05_2_18

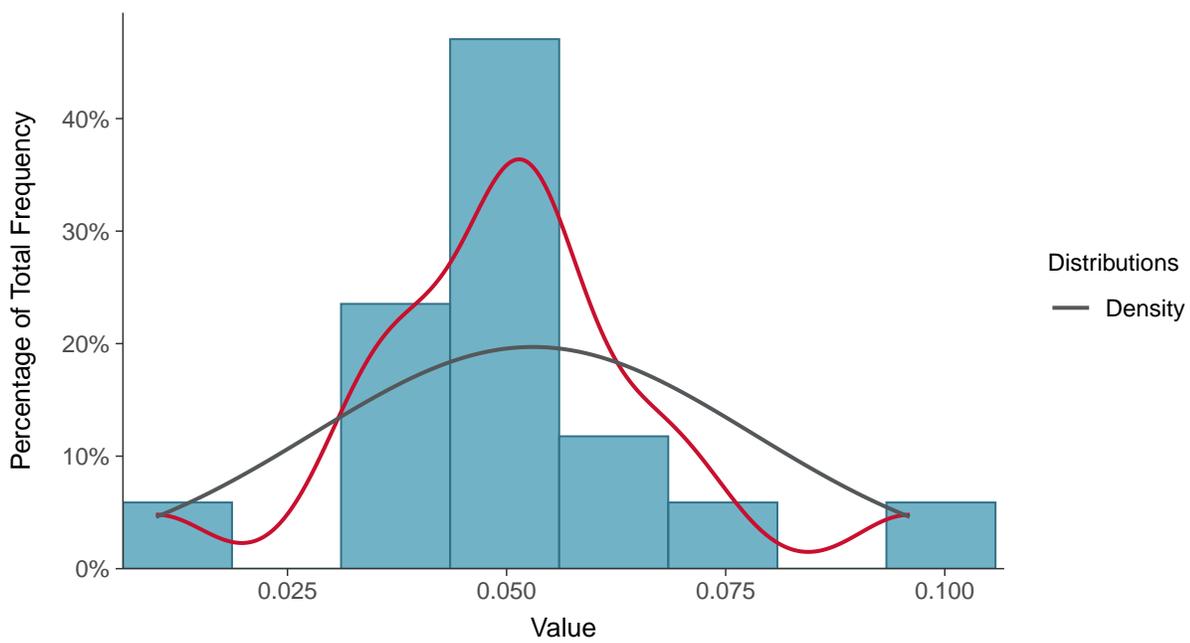
Scatter Plot

Molybdenum, MW-5 (mg/L)



Histogram

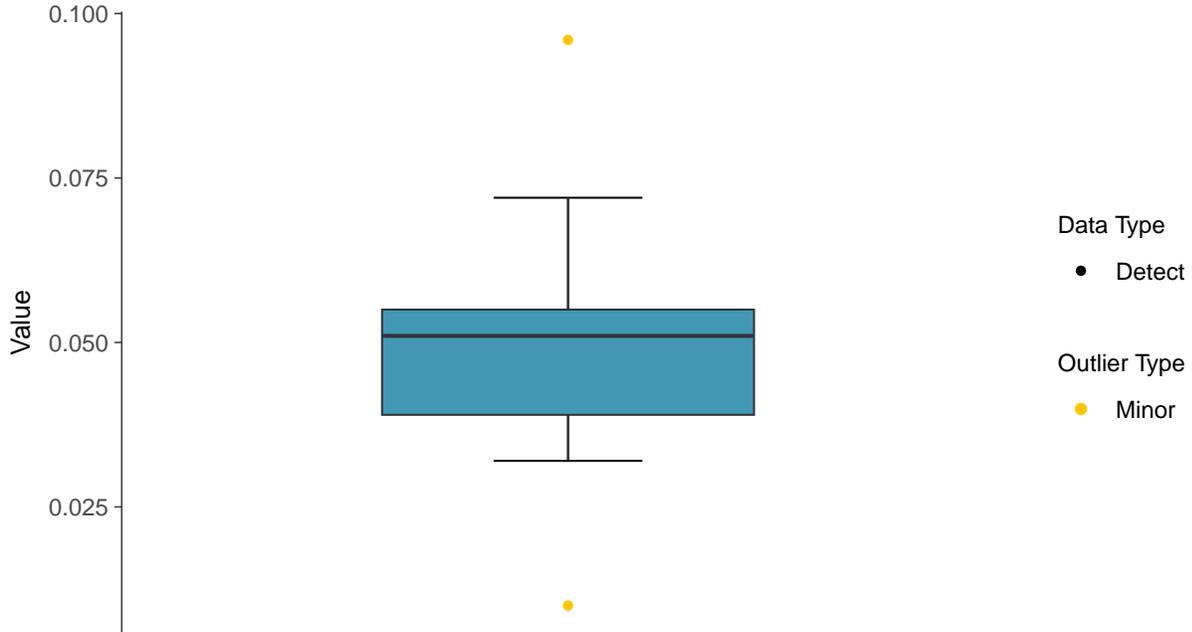
Molybdenum, MW-5 (mg/L)





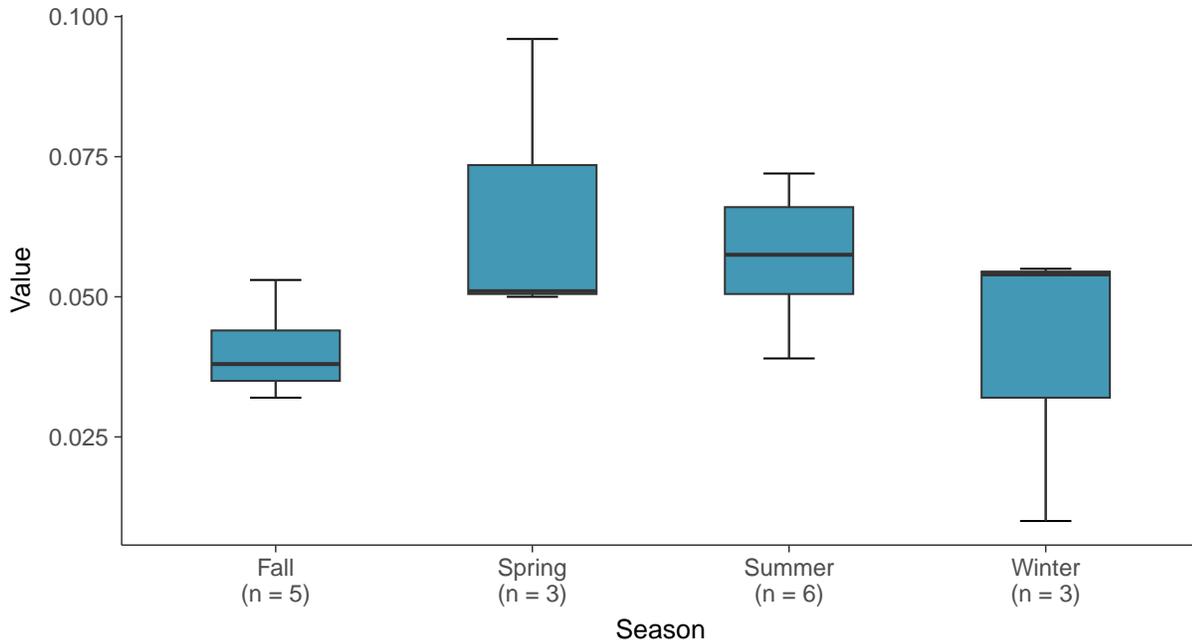
Boxplot

Molybdenum, MW-5 (mg/L)



Boxplot by Season

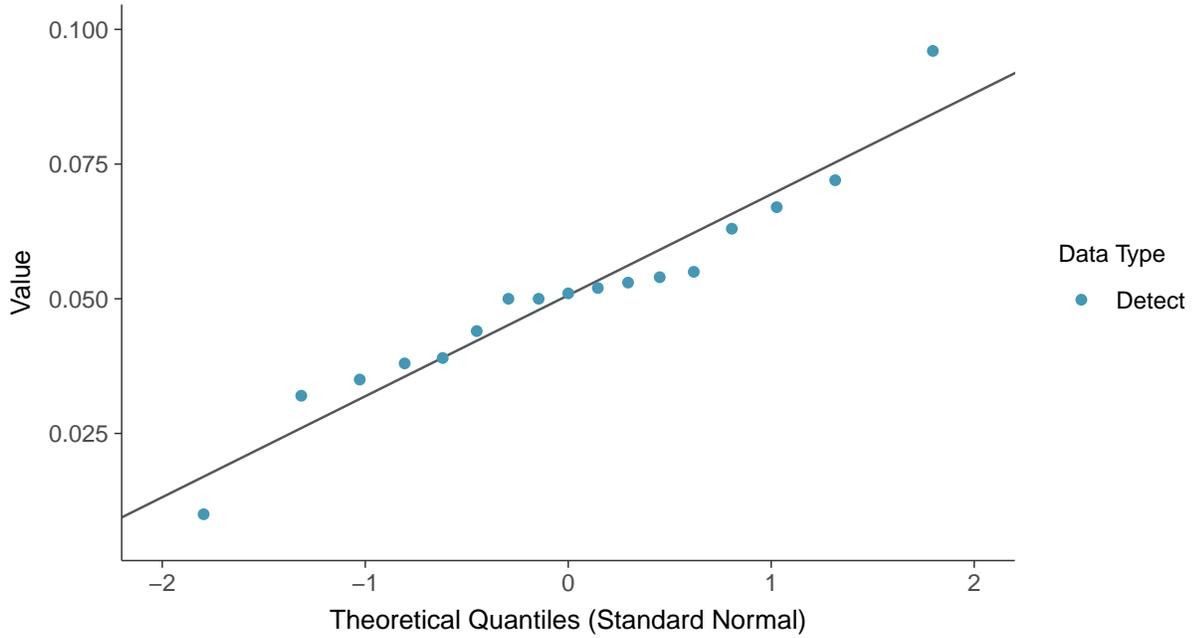
Molybdenum, MW-5 (mg/L)





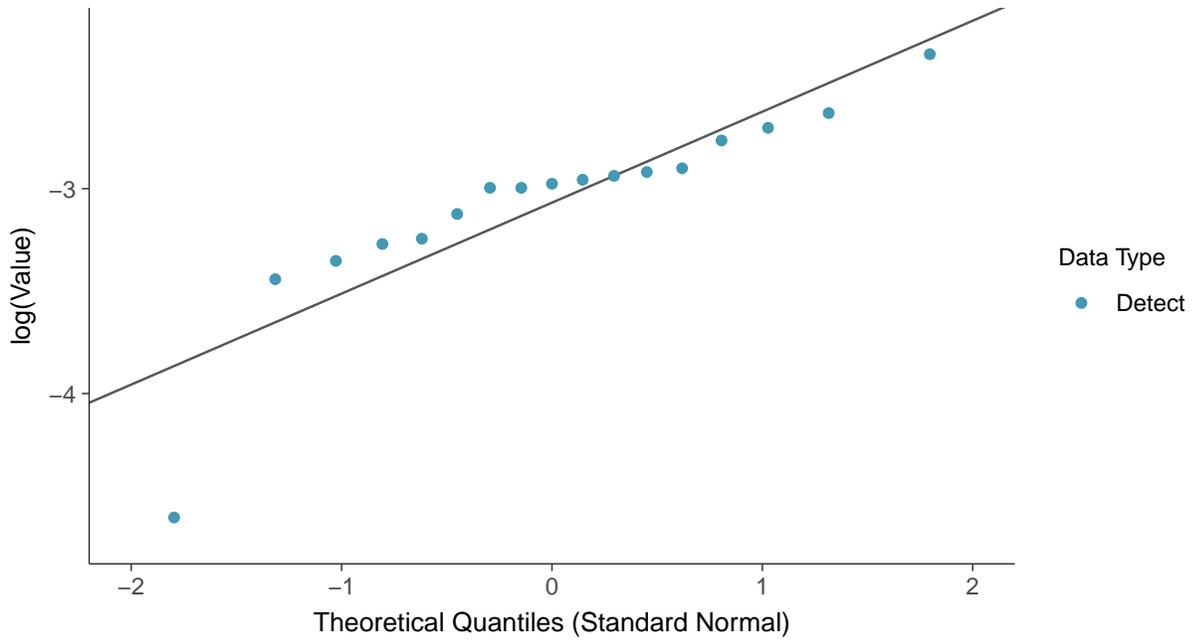
Normal Q-Q plot

Molybdenum, MW-5 (mg/L)



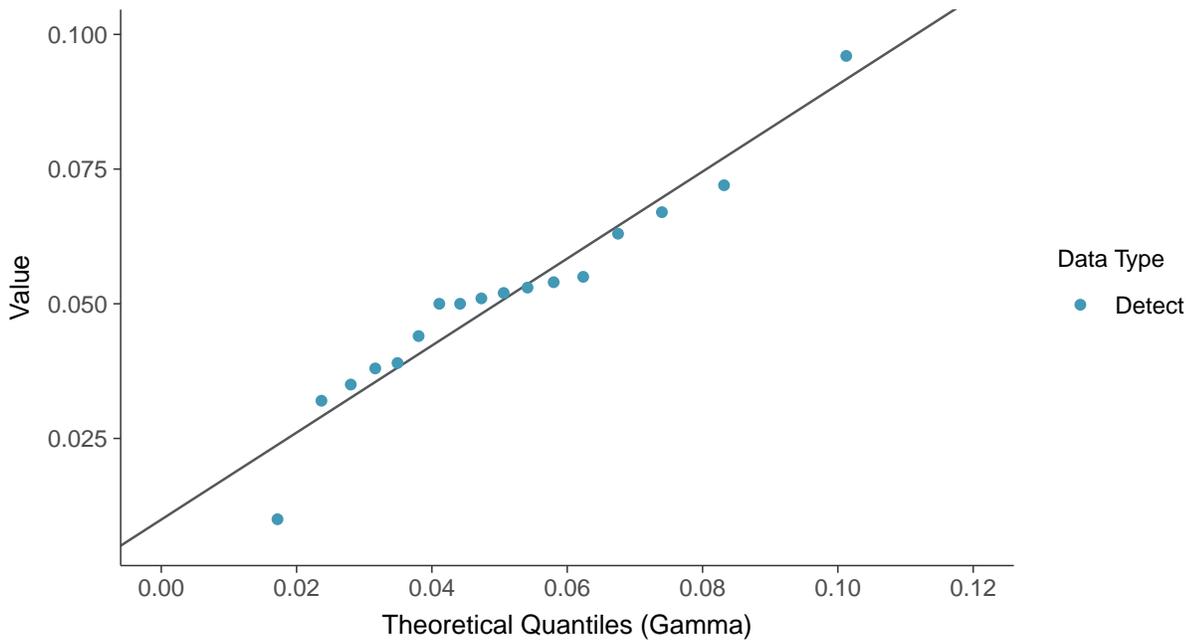
Lognormal Q-Q plot

Molybdenum, MW-5 (mg/L)

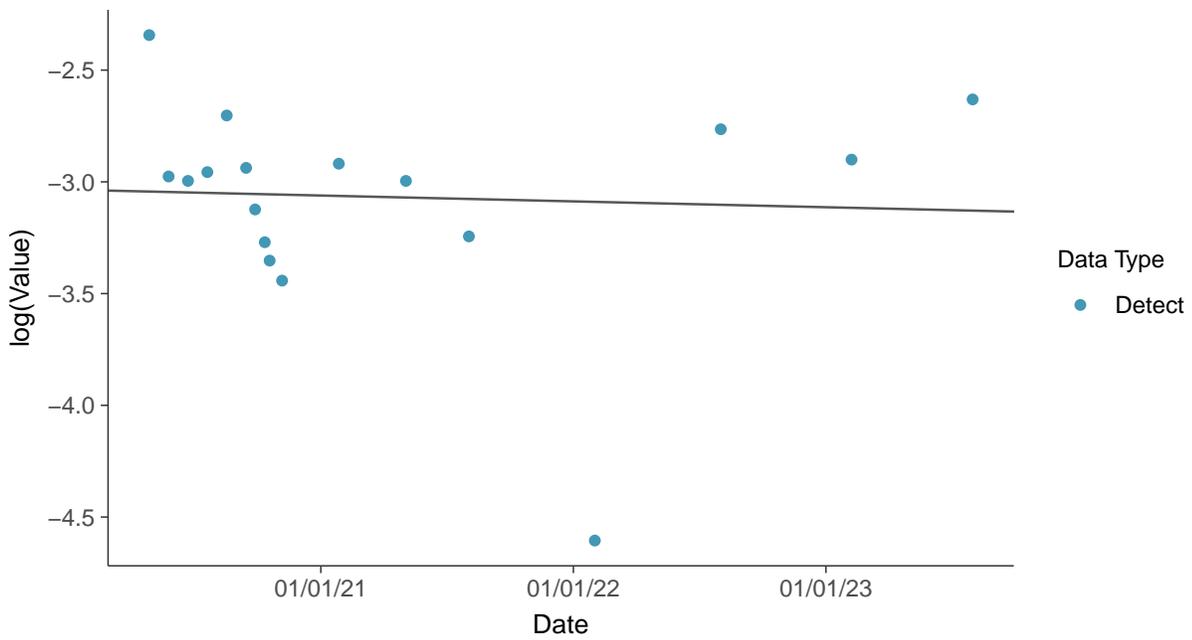




Gamma Q-Q plot
Molybdenum, MW-5 (mg/L)



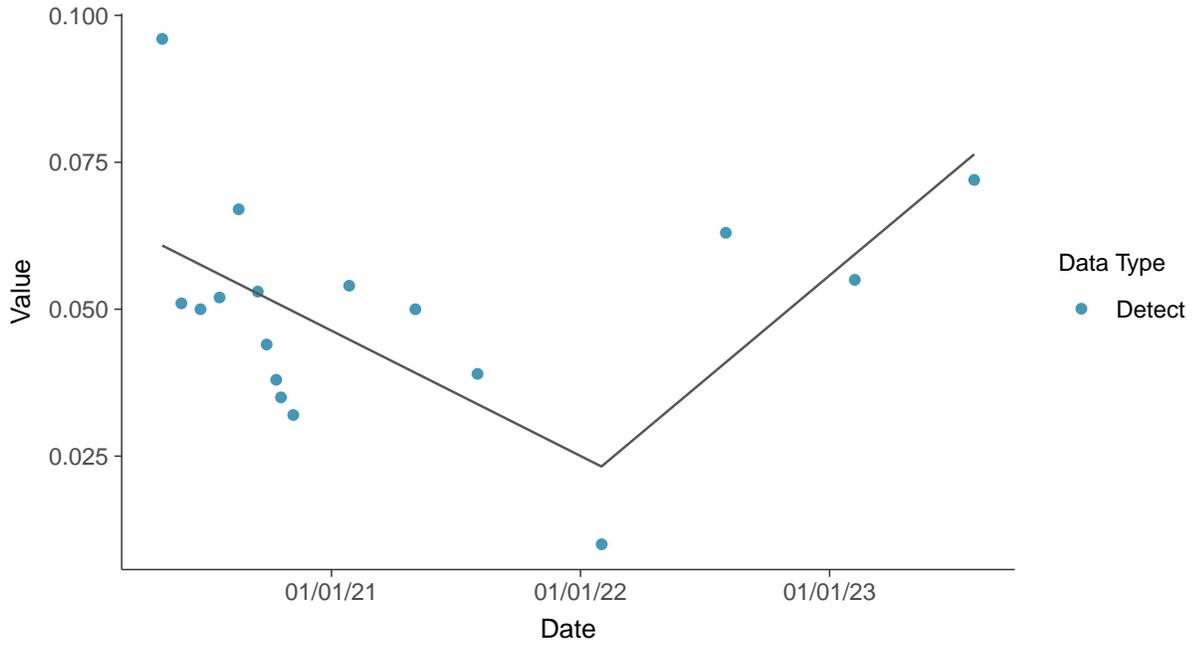
Trend Regression: Lognormal MLE
Molybdenum, MW-5 (mg/L)





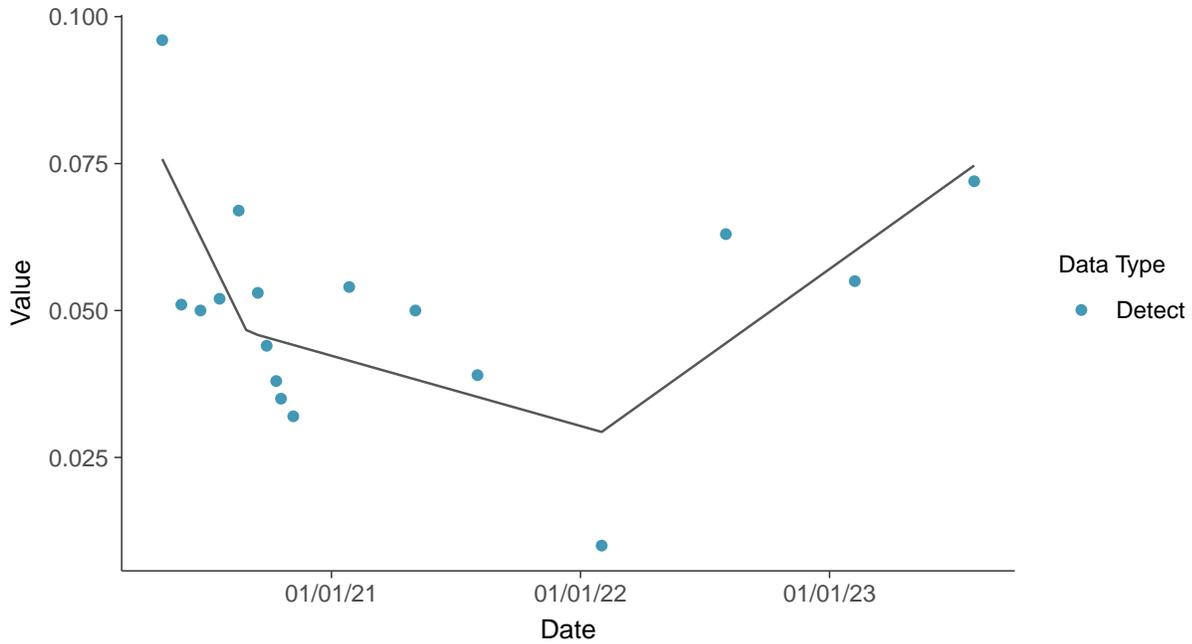
Trend Regression: Piecewise Linear-Linear

Molybdenum, MW-5 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Molybdenum, MW-5 (mg/L)



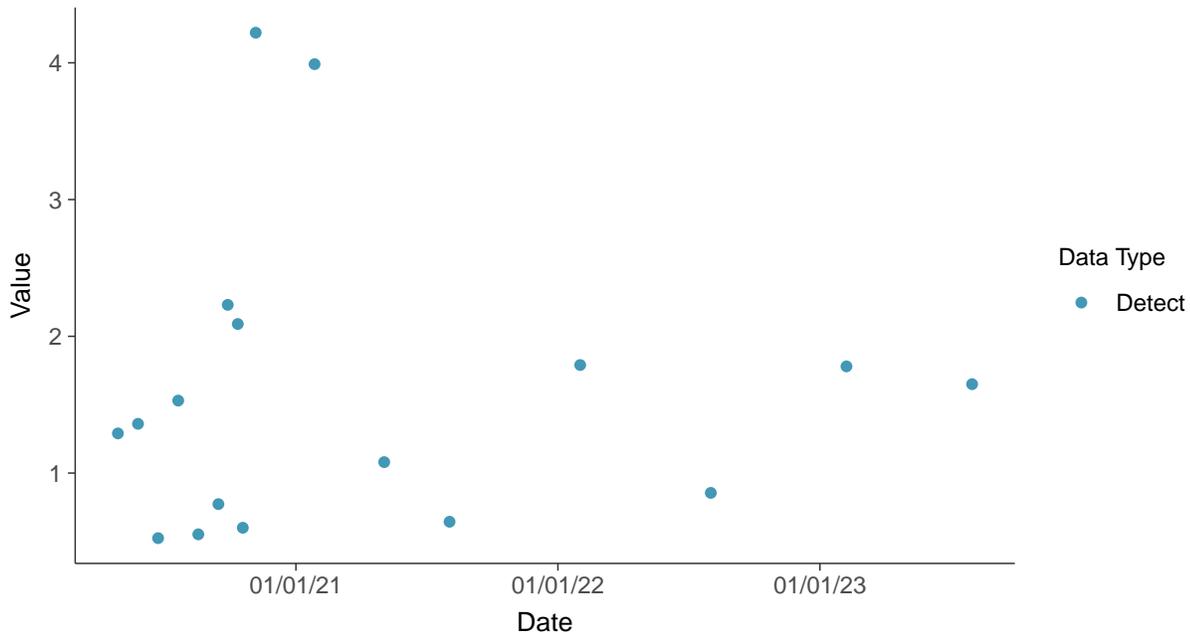


Appendix IV: Radium-226/228, MW-5

ID: 05_2_20

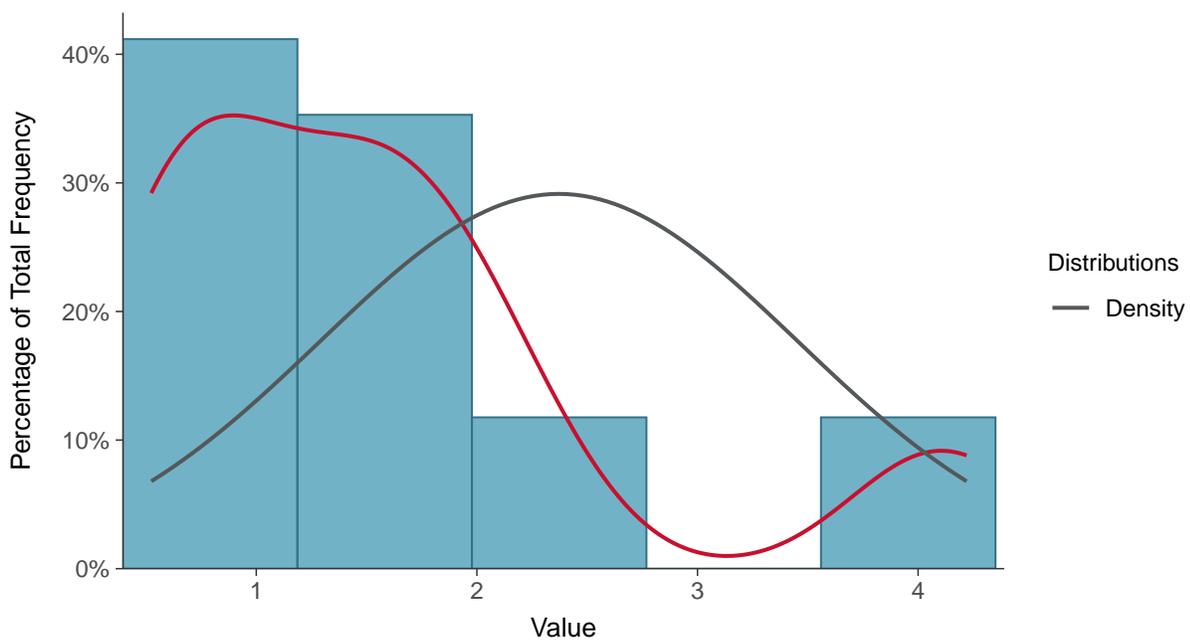
Scatter Plot

Radium-226/228, MW-5 (pCi/L)



Histogram

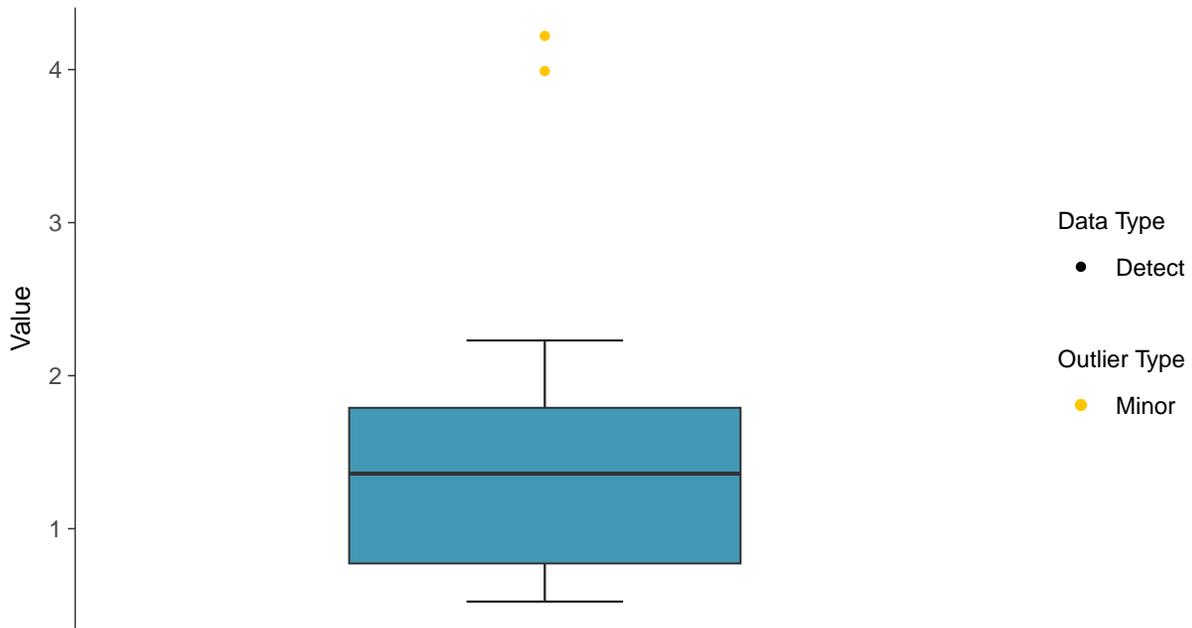
Radium-226/228, MW-5 (pCi/L)





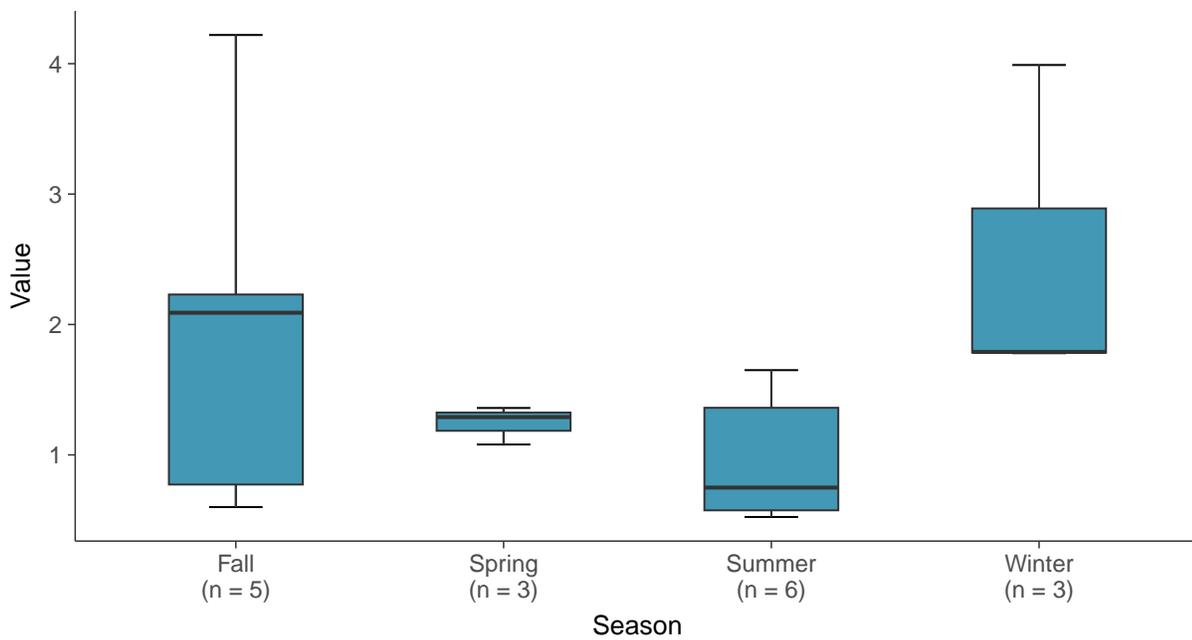
Boxplot

Radium-226/228, MW-5 (pCi/L)



Boxplot by Season

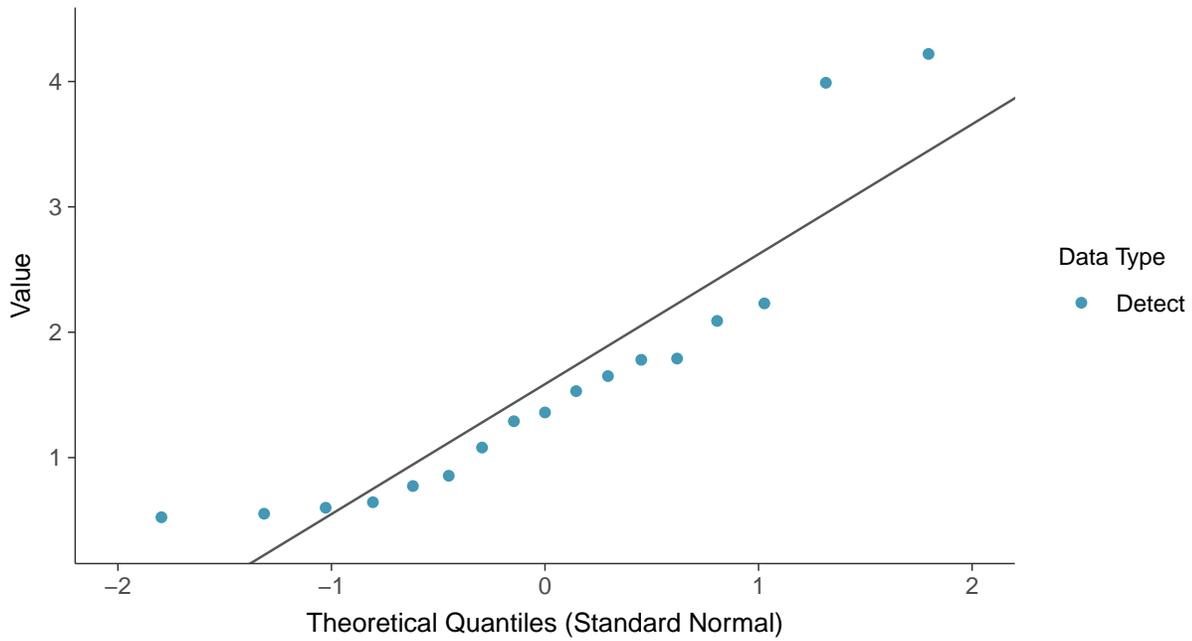
Radium-226/228, MW-5 (pCi/L)





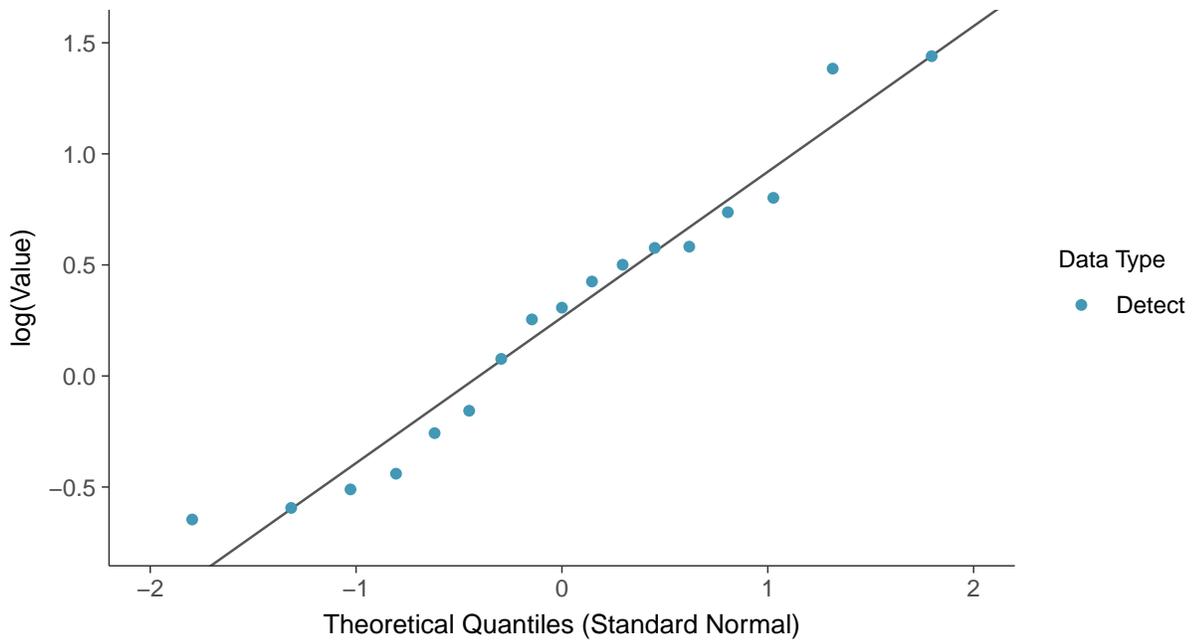
Normal Q-Q plot

Radium-226/228, MW-5 (pCi/L)



Lognormal Q-Q plot

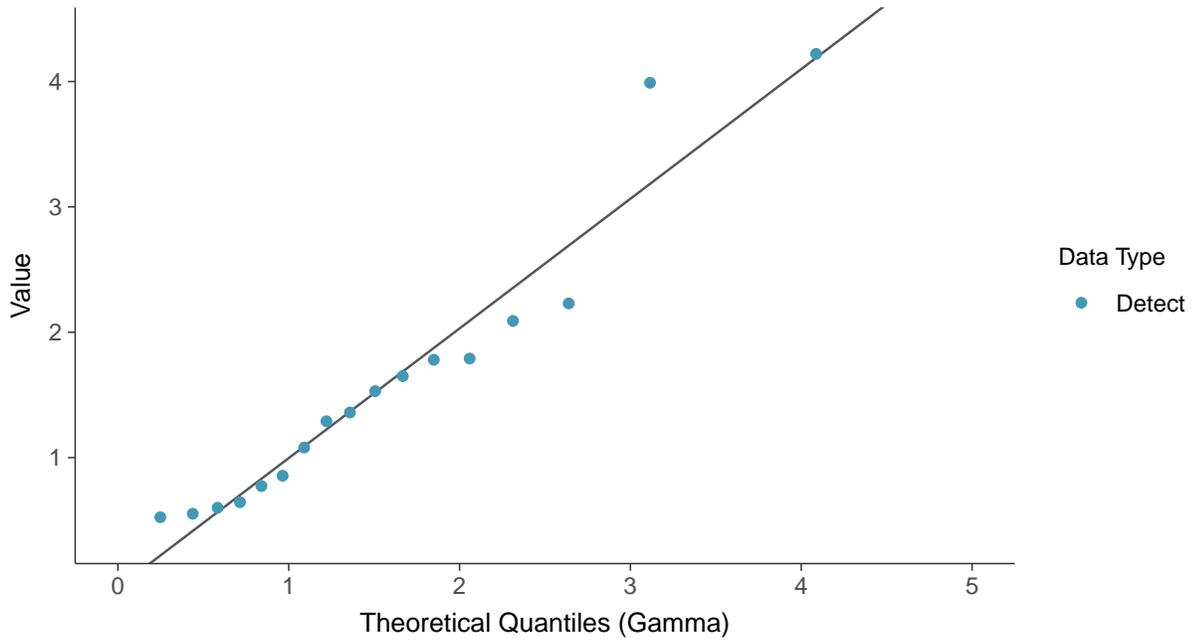
Radium-226/228, MW-5 (pCi/L)





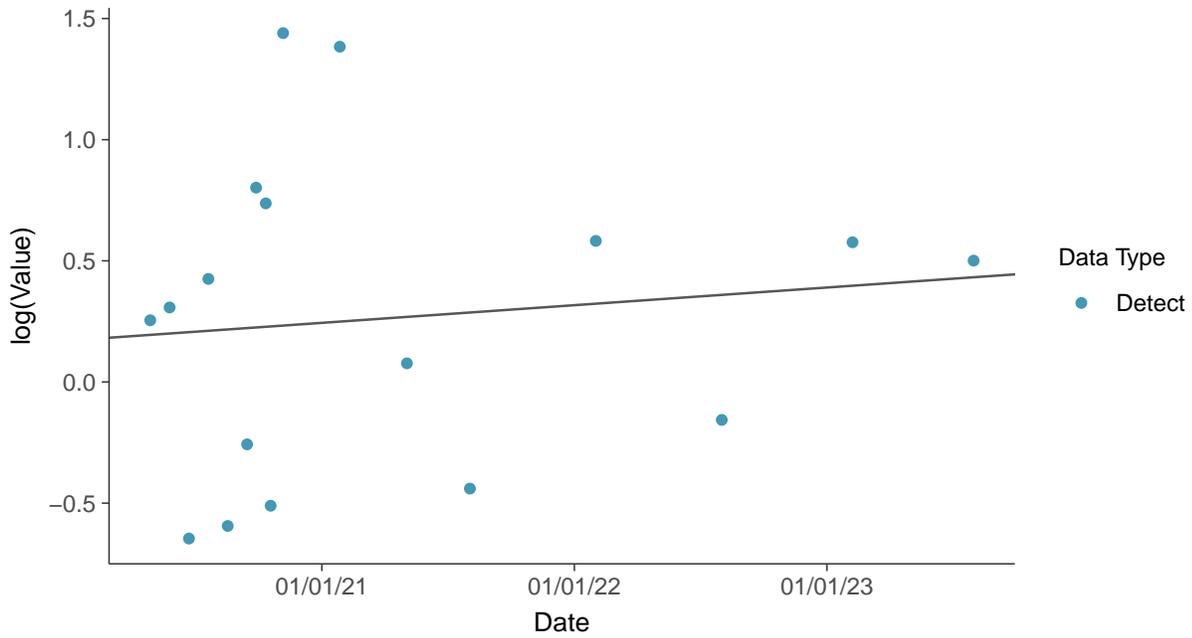
Gamma Q-Q plot

Radium-226/228, MW-5 (pCi/L)



Trend Regression: Lognormal MLE

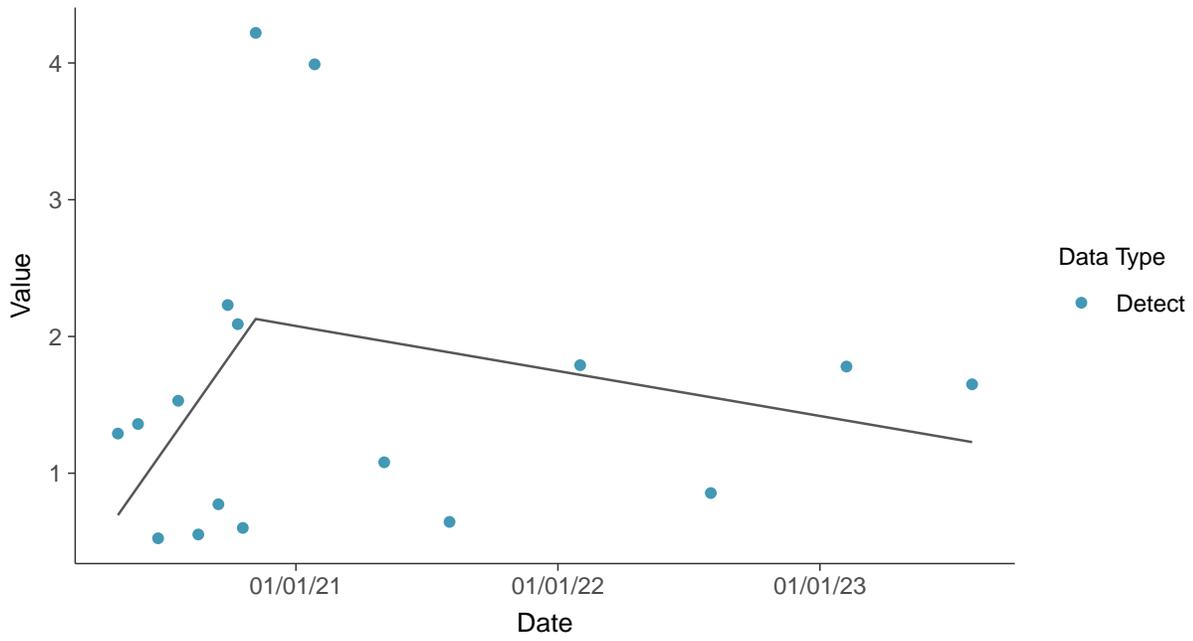
Radium-226/228, MW-5 (pCi/L)





Trend Regression: Piecewise Linear-Linear

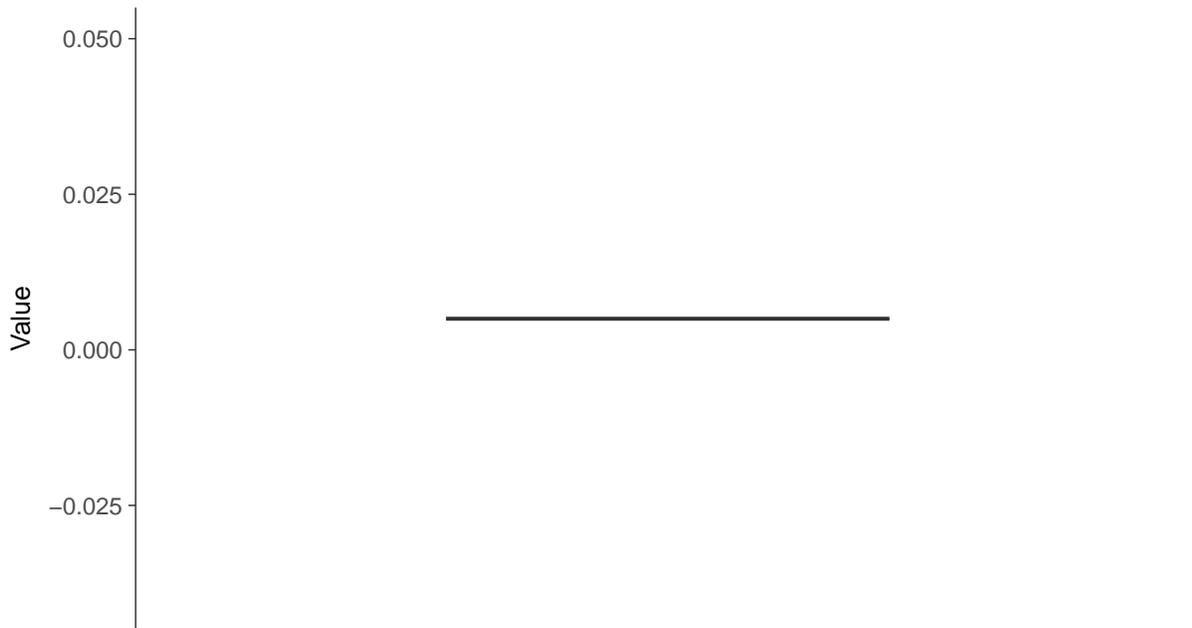
Radium-226/228, MW-5 (pCi/L)





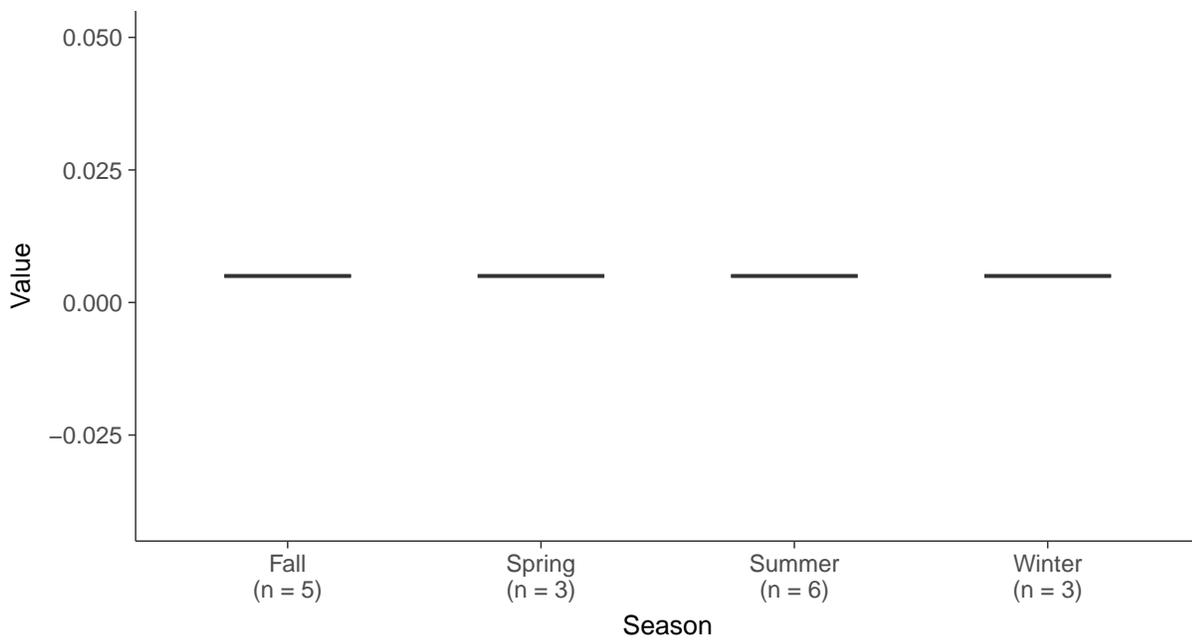
Boxplot

Selenium, MW-5 (mg/L)



Boxplot by Season

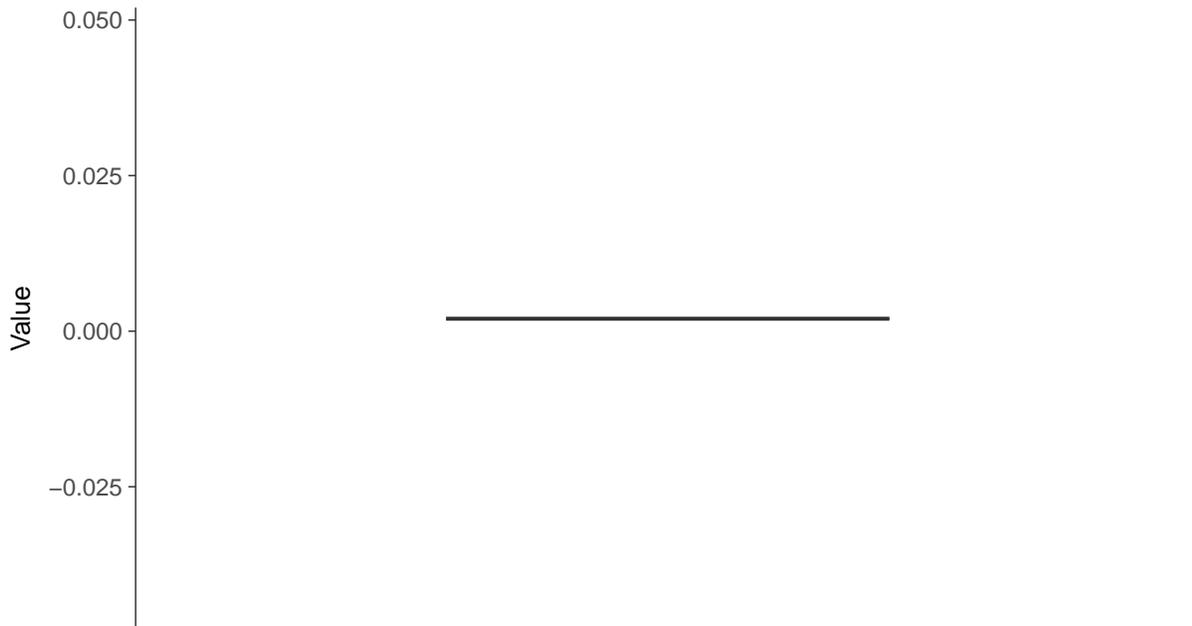
Selenium, MW-5 (mg/L)





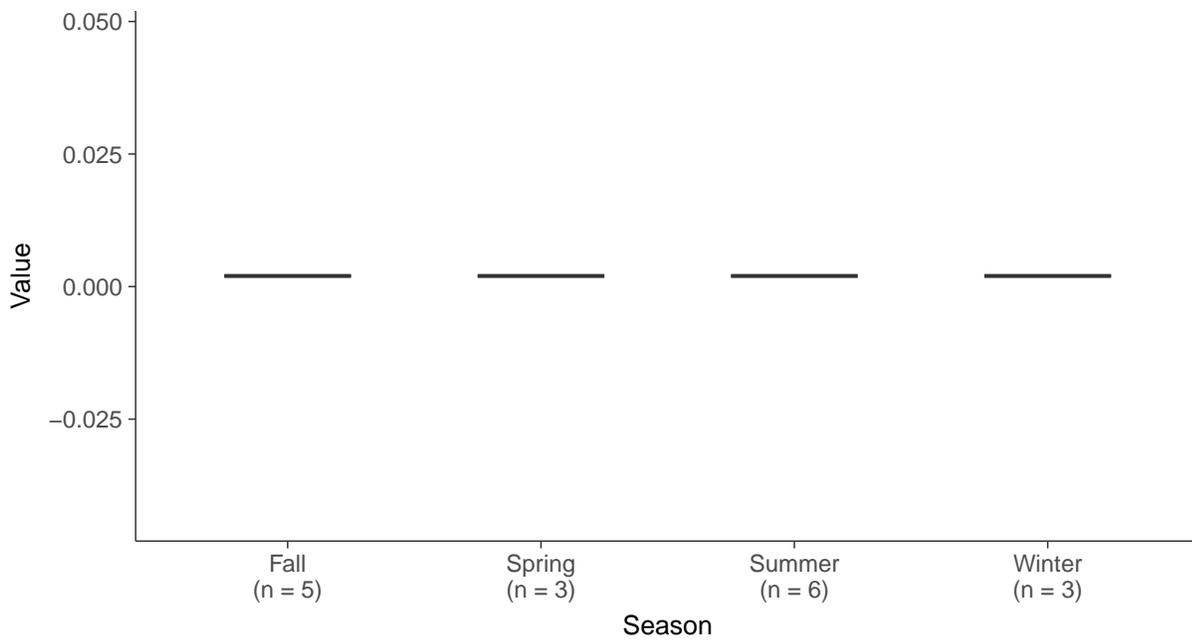
Boxplot

Thallium, MW-5 (mg/L)



Boxplot by Season

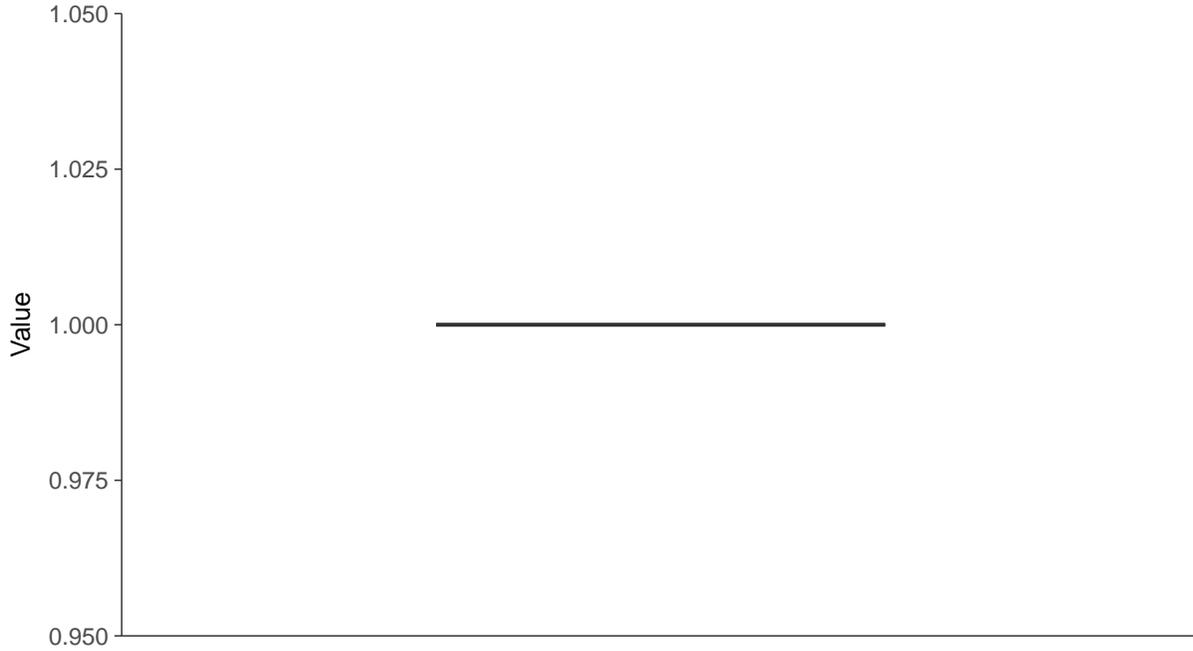
Thallium, MW-5 (mg/L)





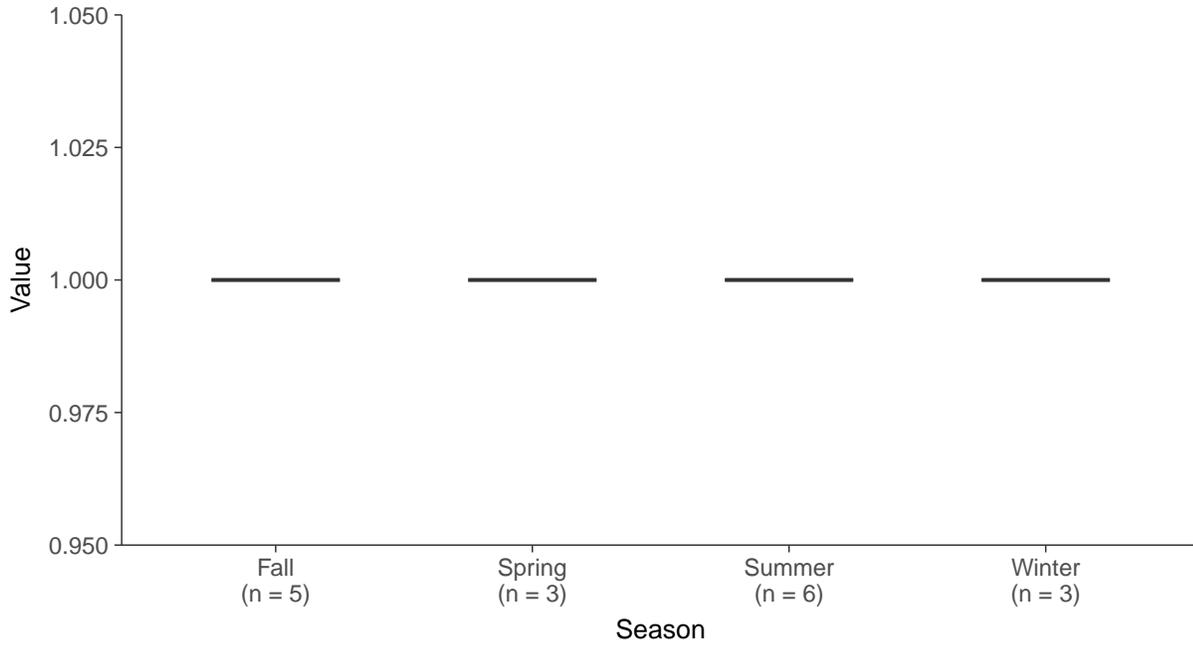
Boxplot

Fluoride, MW-6 (mg/L)



Boxplot by Season

Fluoride, MW-6 (mg/L)





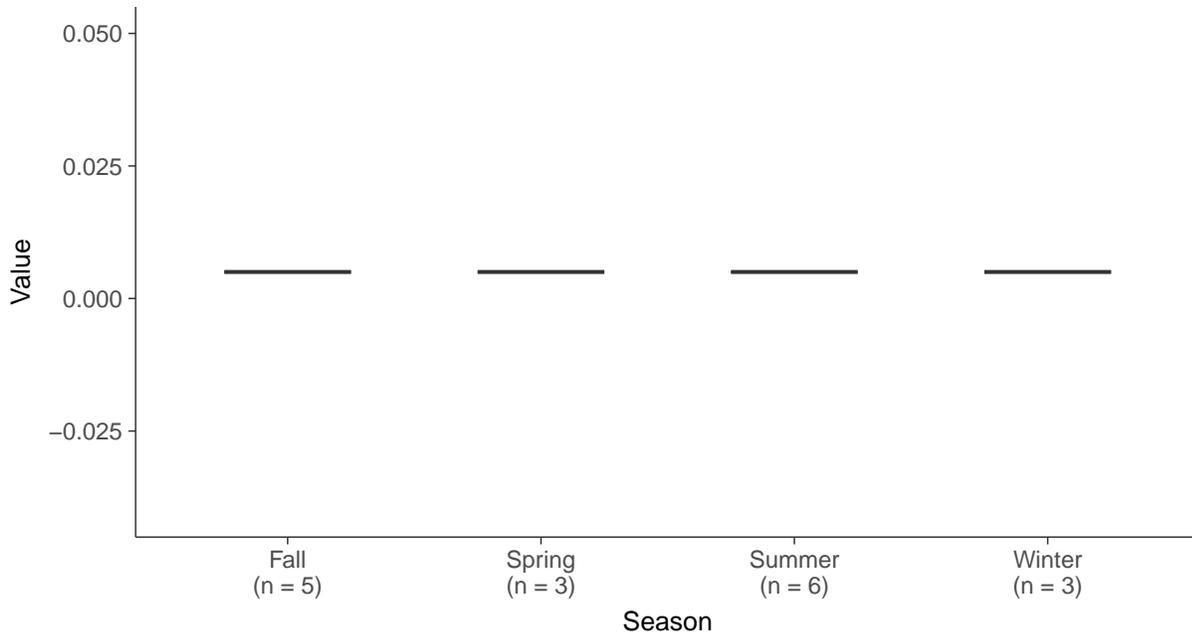
Boxplot

Antimony, MW-6 (mg/L)



Boxplot by Season

Antimony, MW-6 (mg/L)





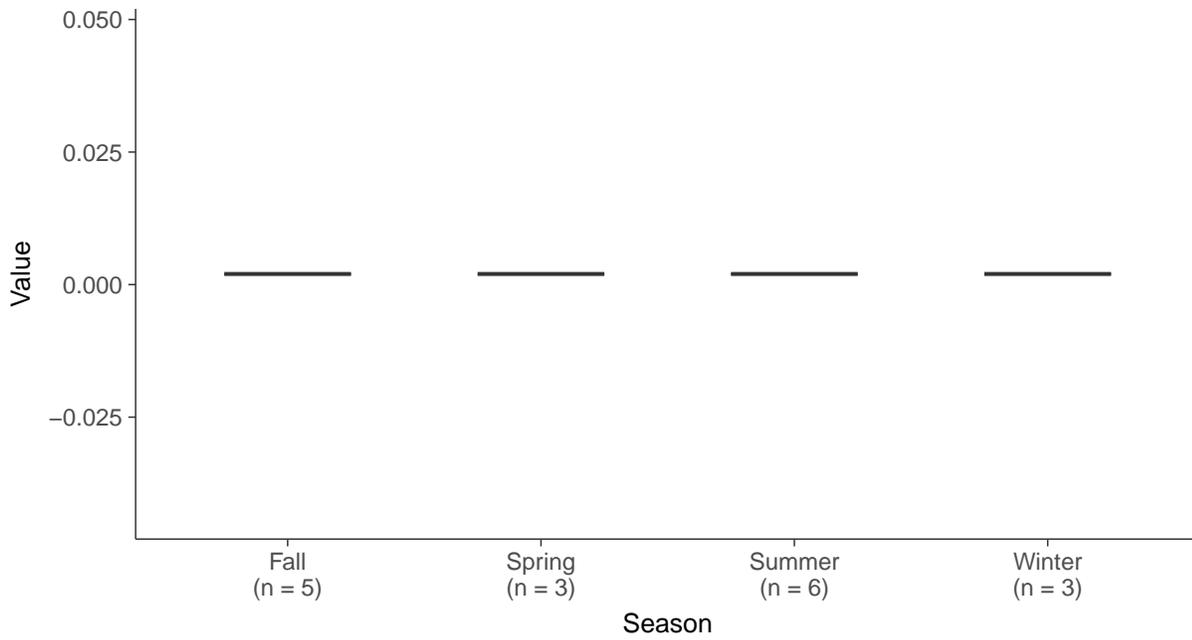
Boxplot

Arsenic, MW-6 (mg/L)



Boxplot by Season

Arsenic, MW-6 (mg/L)



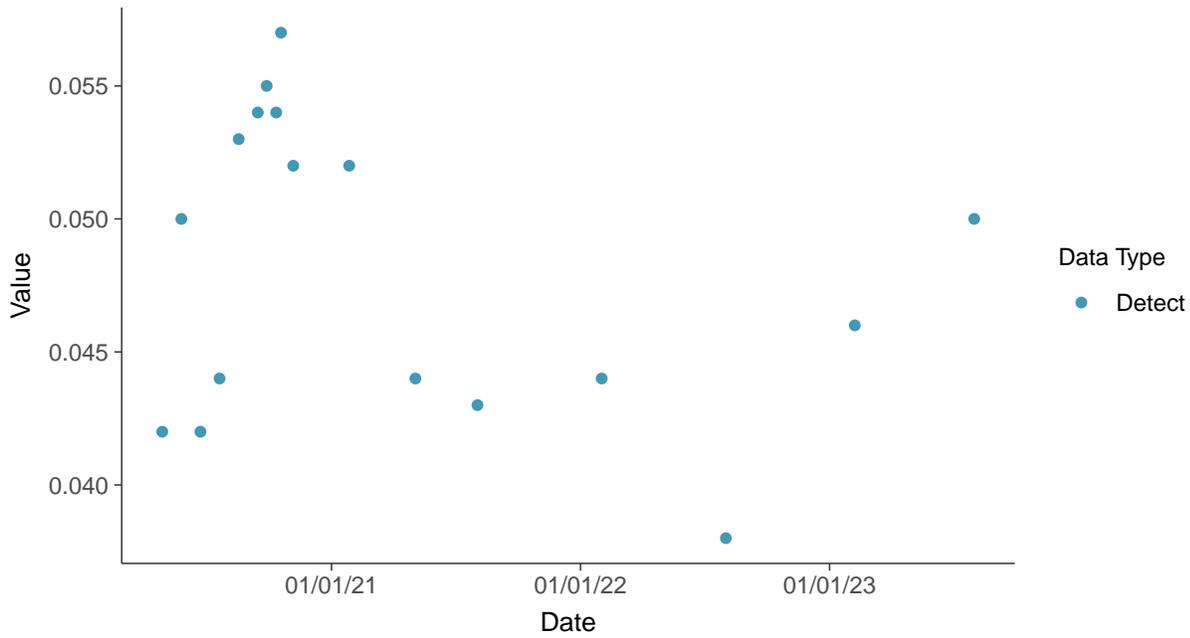


Appendix IV: Barium, MW-6

ID: 06_2_10

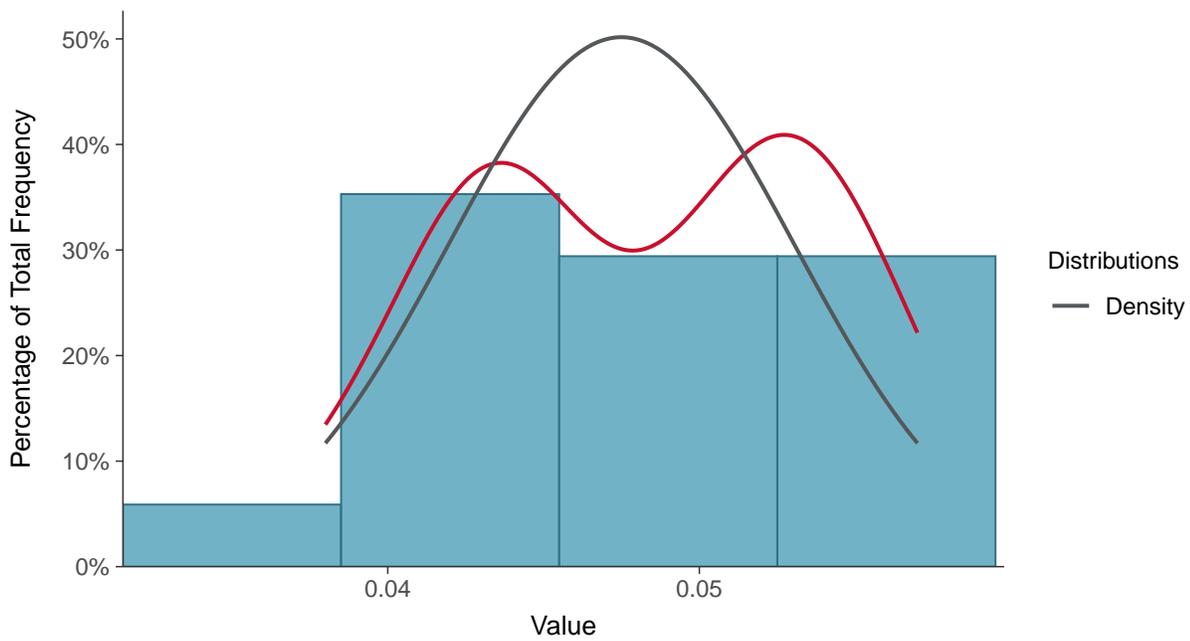
Scatter Plot

Barium, MW-6 (mg/L)



Histogram

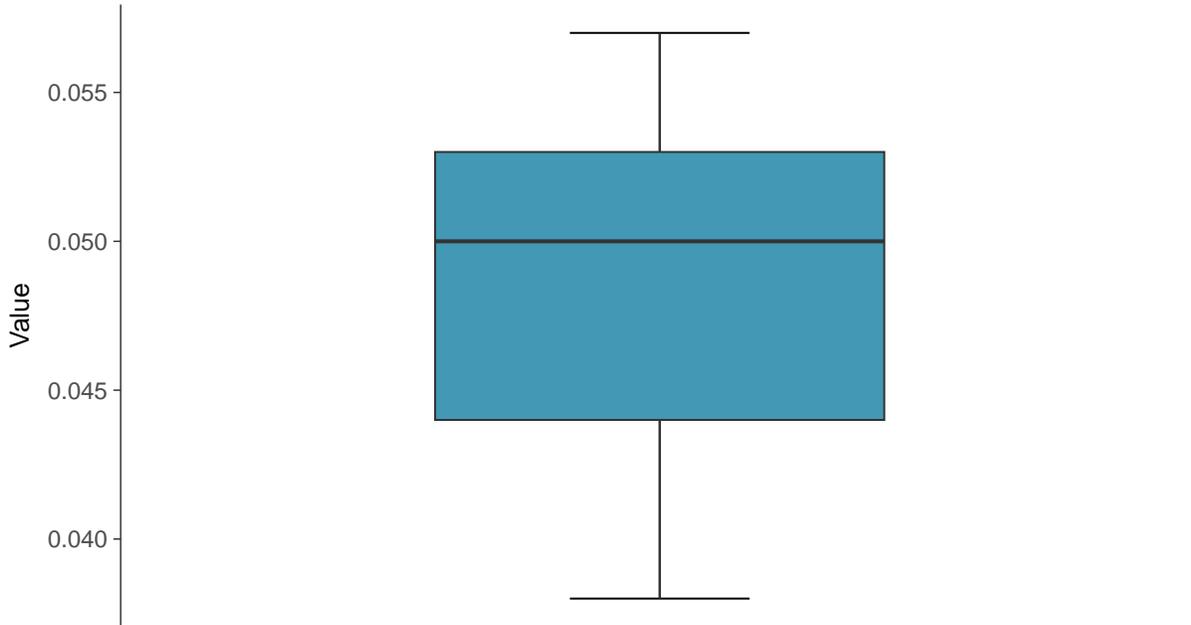
Barium, MW-6 (mg/L)





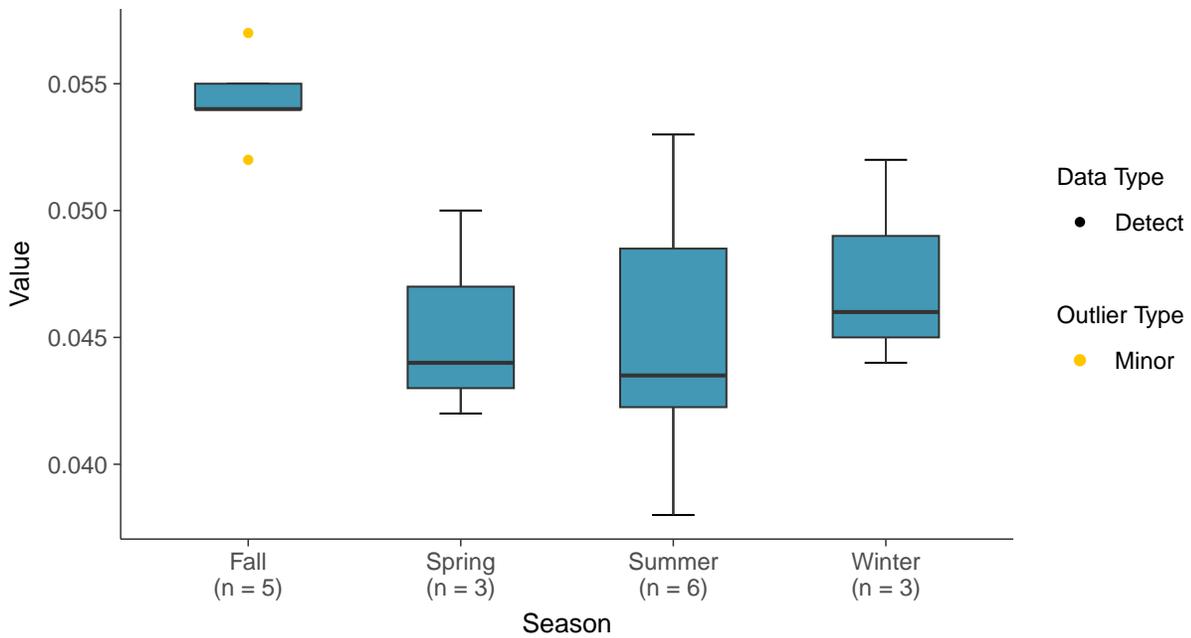
Boxplot

Barium, MW-6 (mg/L)



Boxplot by Season

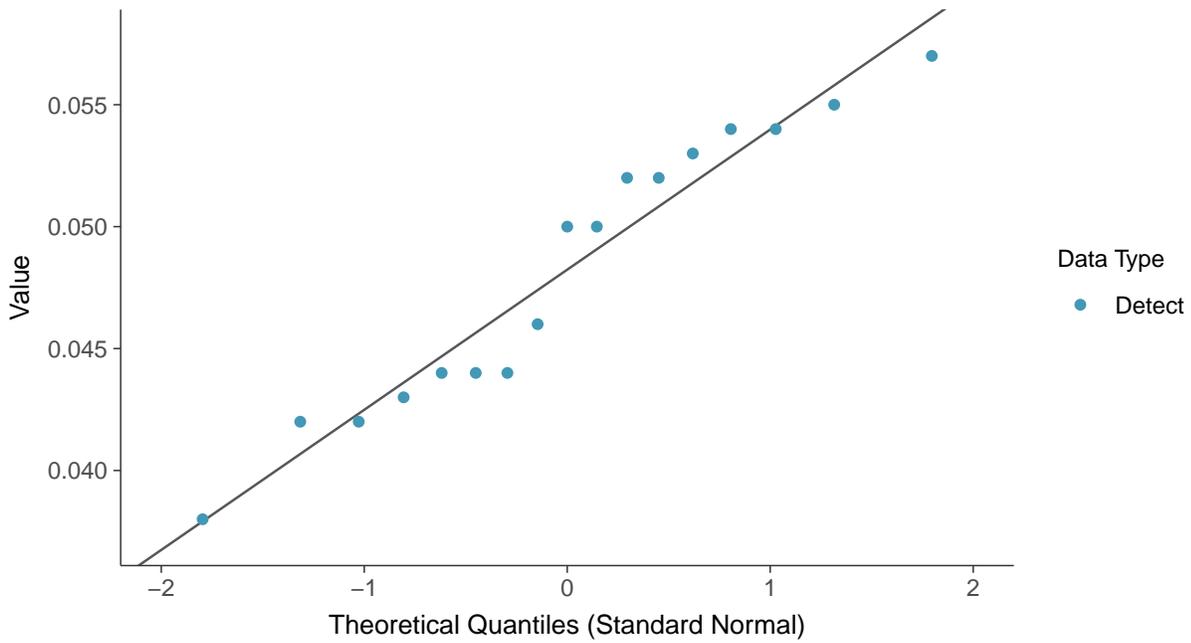
Barium, MW-6 (mg/L)





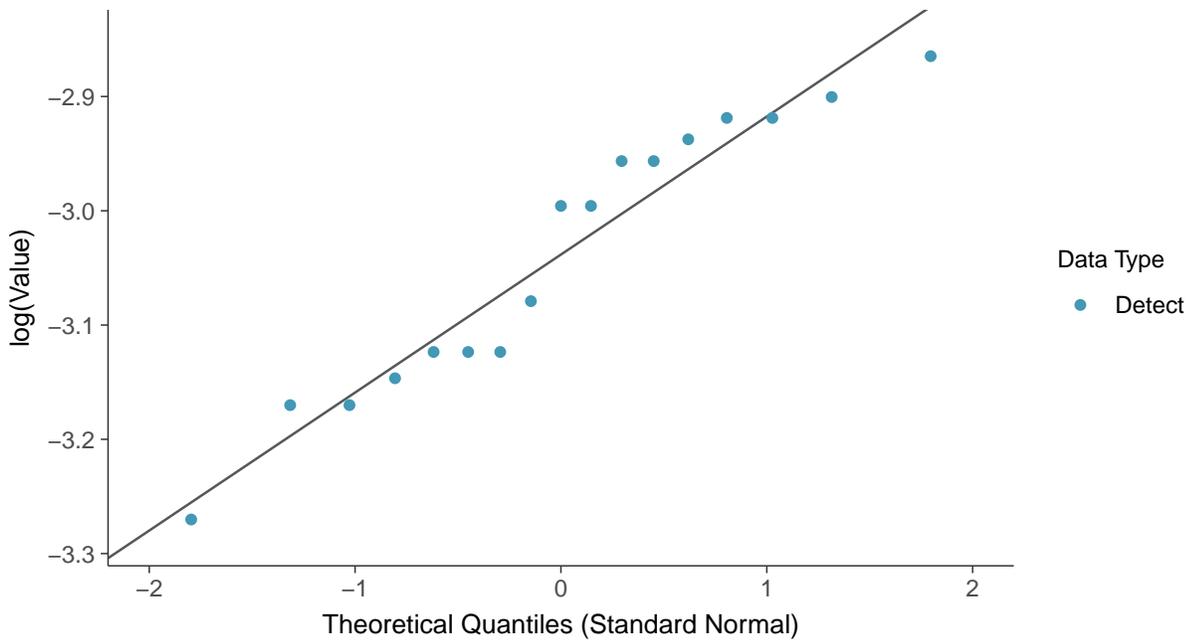
Normal Q-Q plot

Barium, MW-6 (mg/L)



Lognormal Q-Q plot

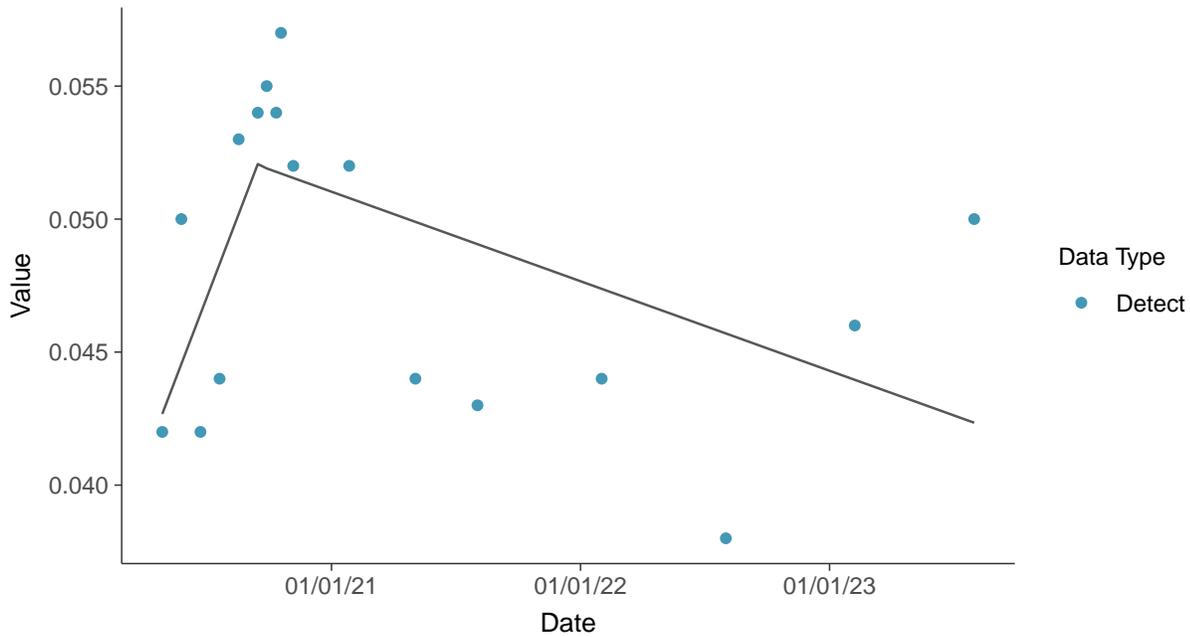
Barium, MW-6 (mg/L)





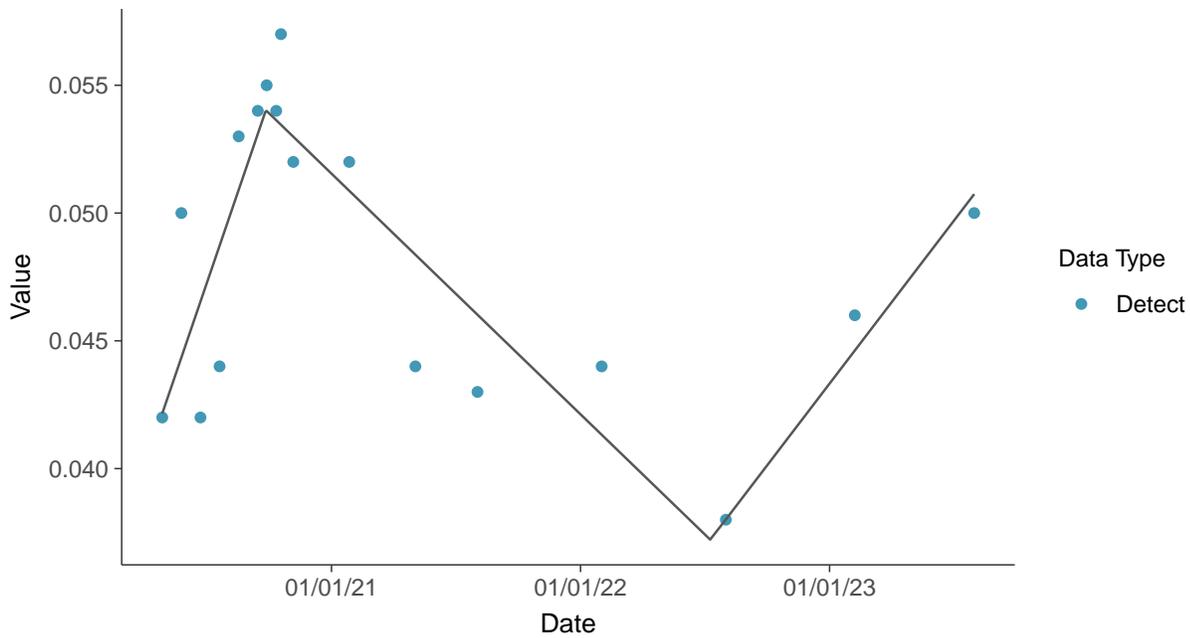
Trend Regression: Piecewise Linear-Linear

Barium, MW-6 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

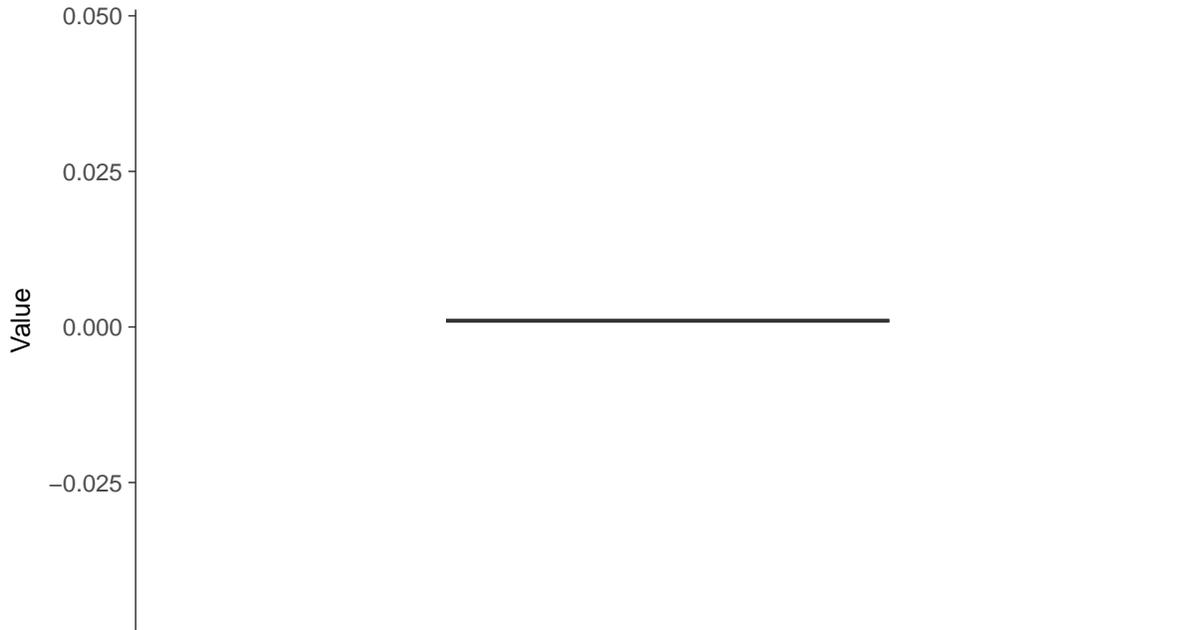
Barium, MW-6 (mg/L)





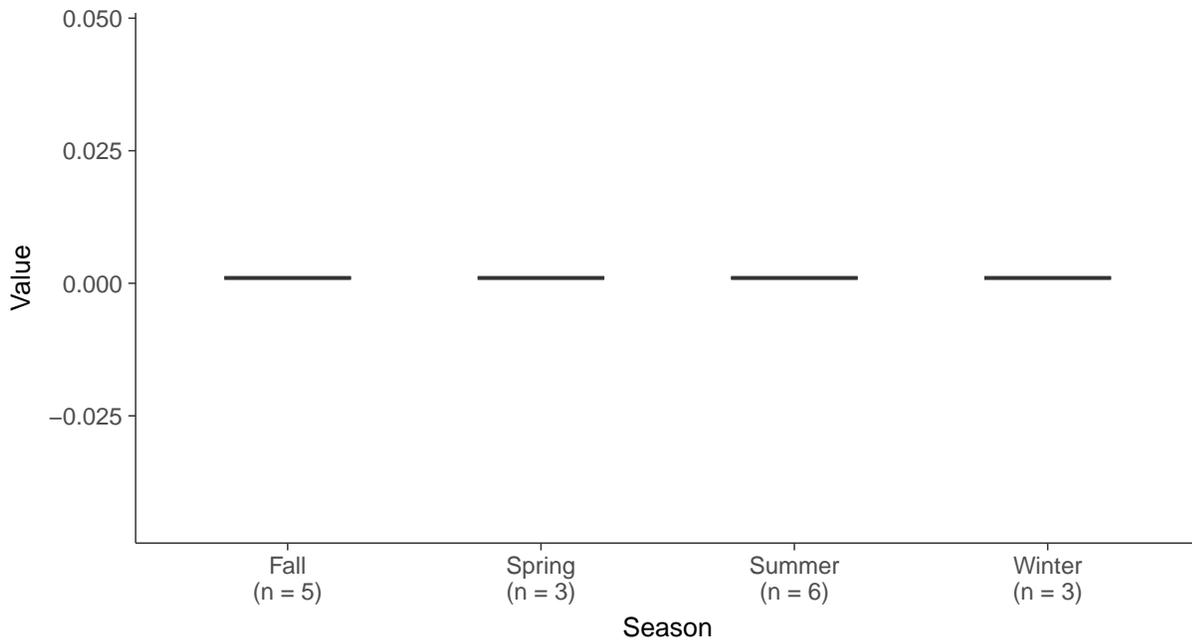
Boxplot

Beryllium, MW-6 (mg/L)



Boxplot by Season

Beryllium, MW-6 (mg/L)



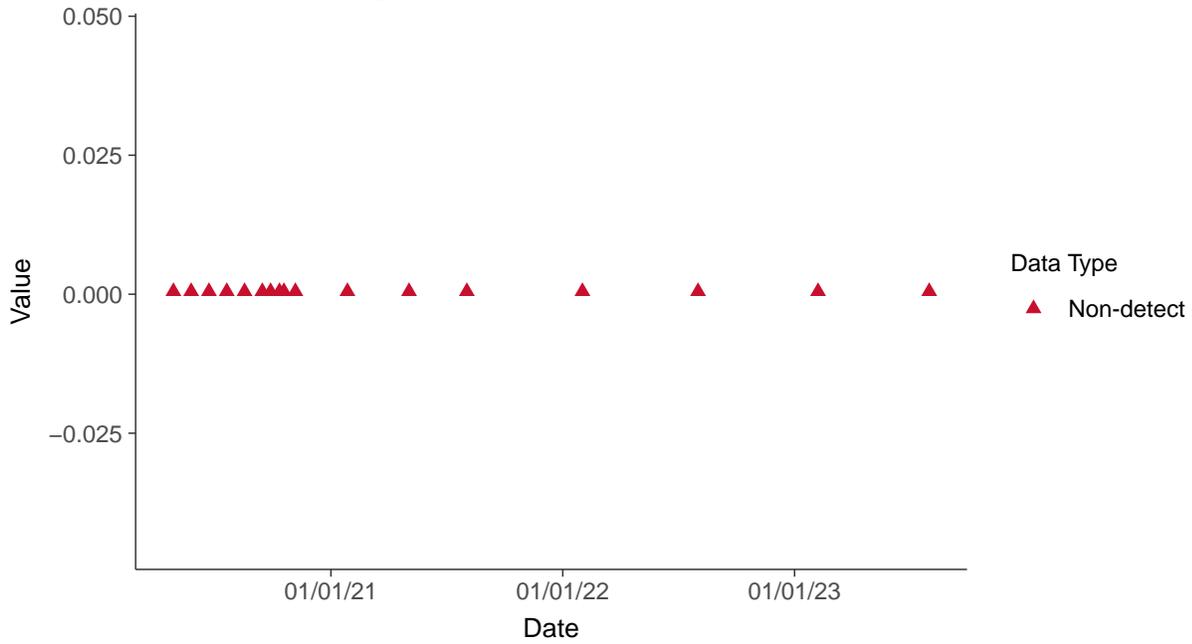


Appendix IV: Cadmium, MW-6

ID: 06_2_12

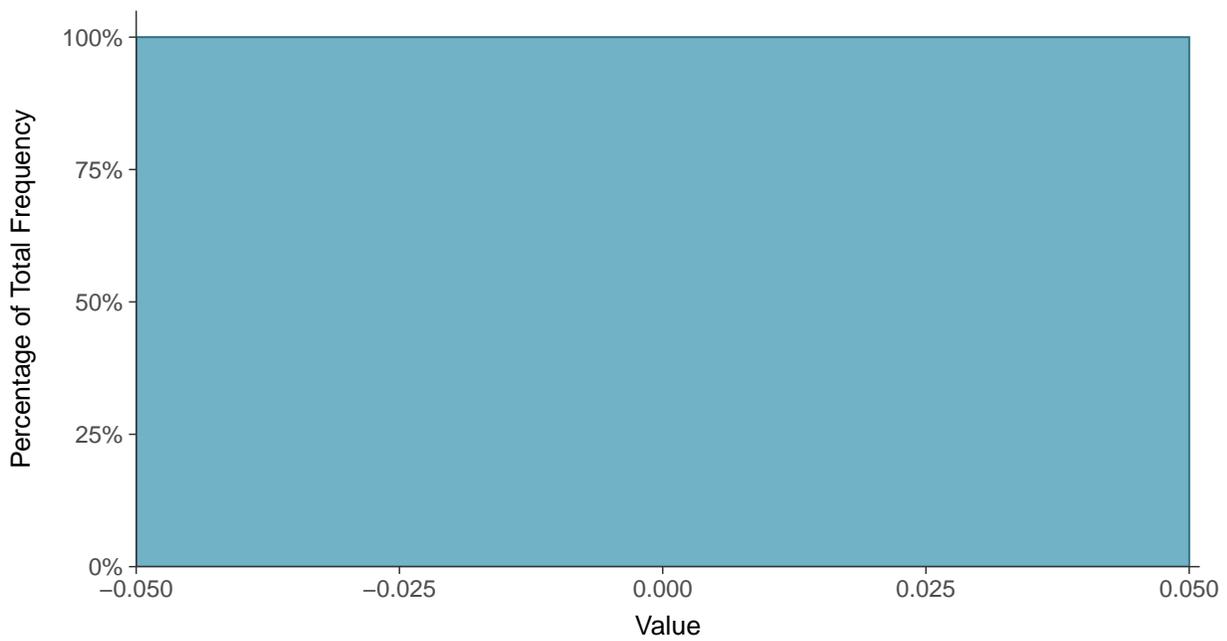
Scatter Plot

Cadmium, MW-6 (mg/L)



Histogram

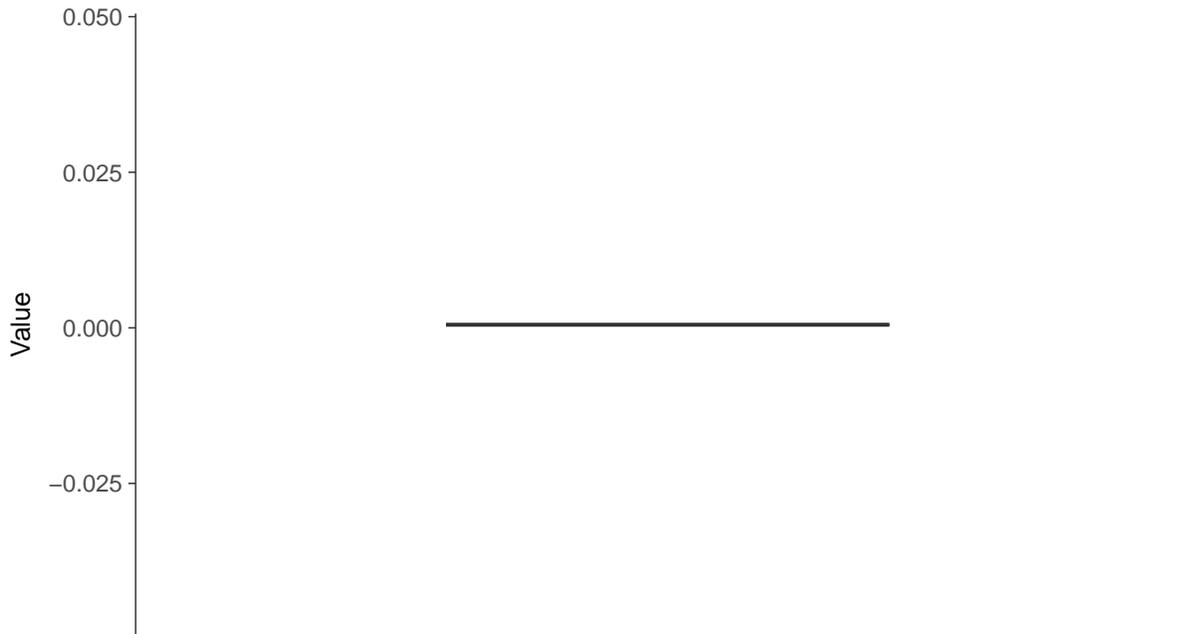
Cadmium, MW-6 (mg/L)





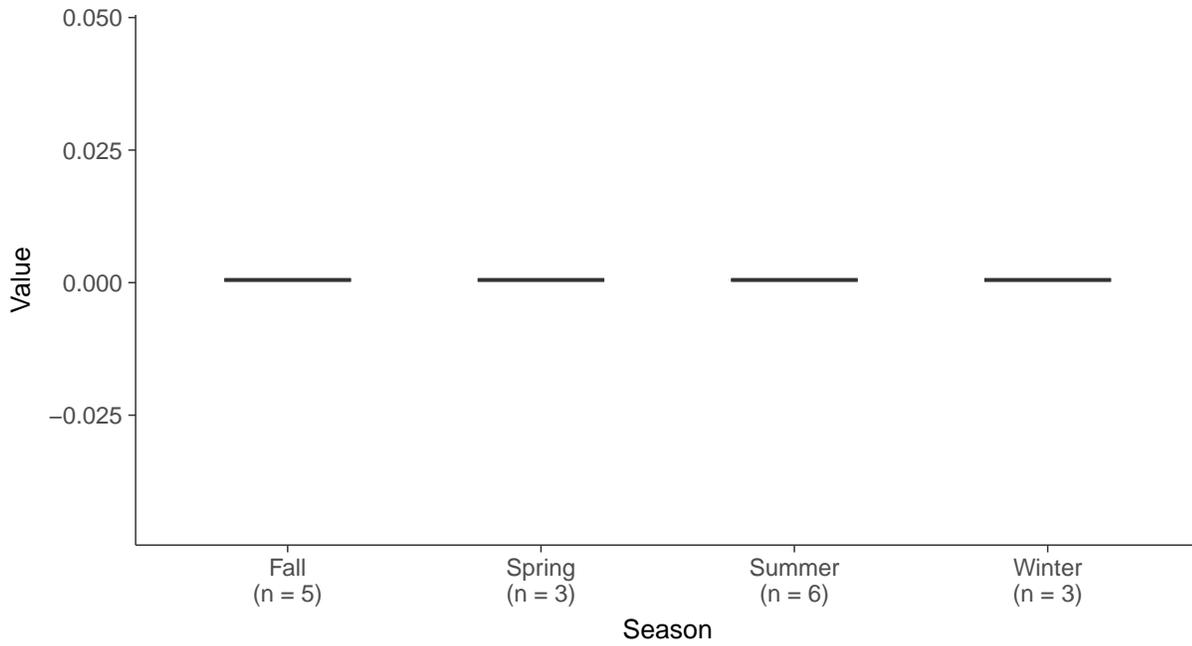
Boxplot

Cadmium, MW-6 (mg/L)



Boxplot by Season

Cadmium, MW-6 (mg/L)





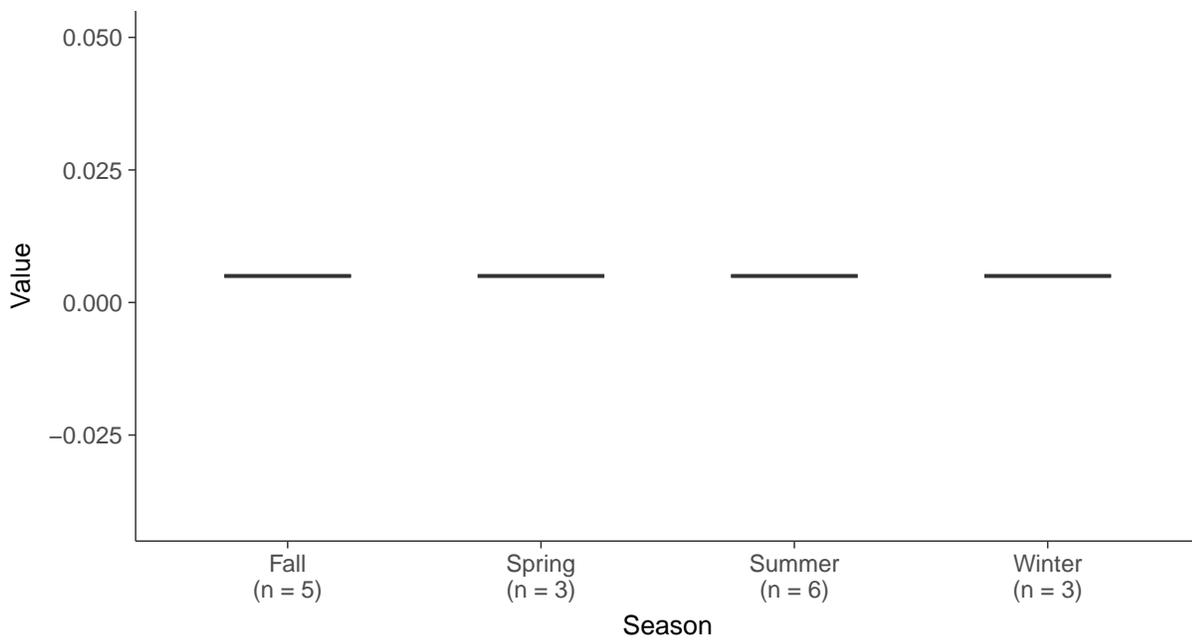
Boxplot

Chromium, MW-6 (mg/L)



Boxplot by Season

Chromium, MW-6 (mg/L)





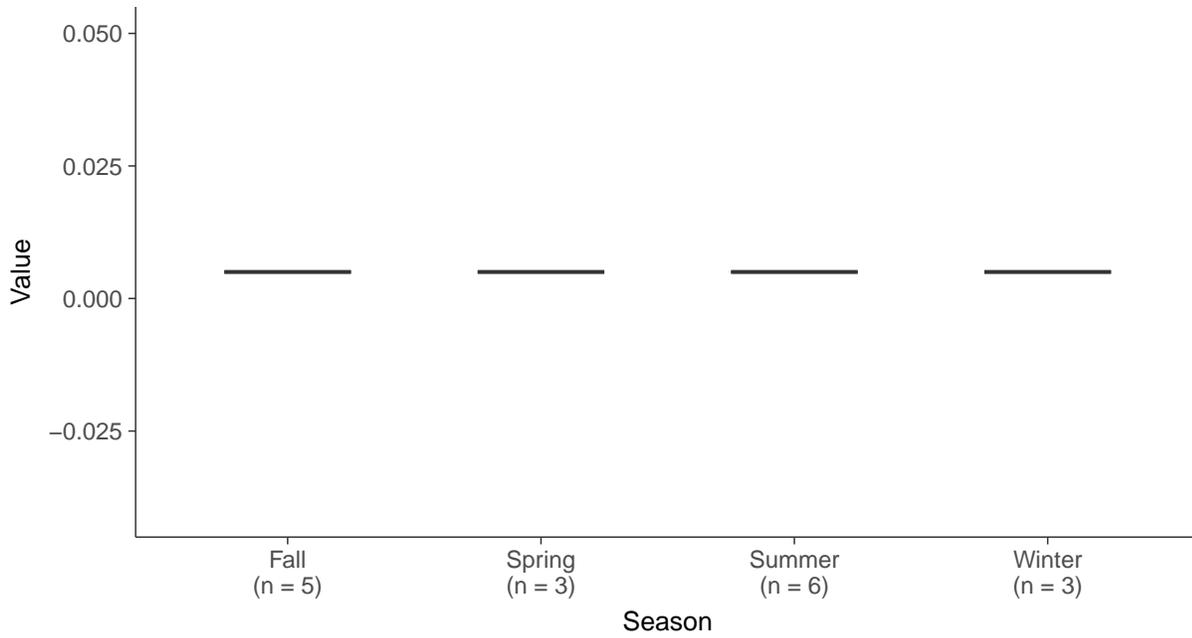
Boxplot

Cobalt, MW-6 (mg/L)



Boxplot by Season

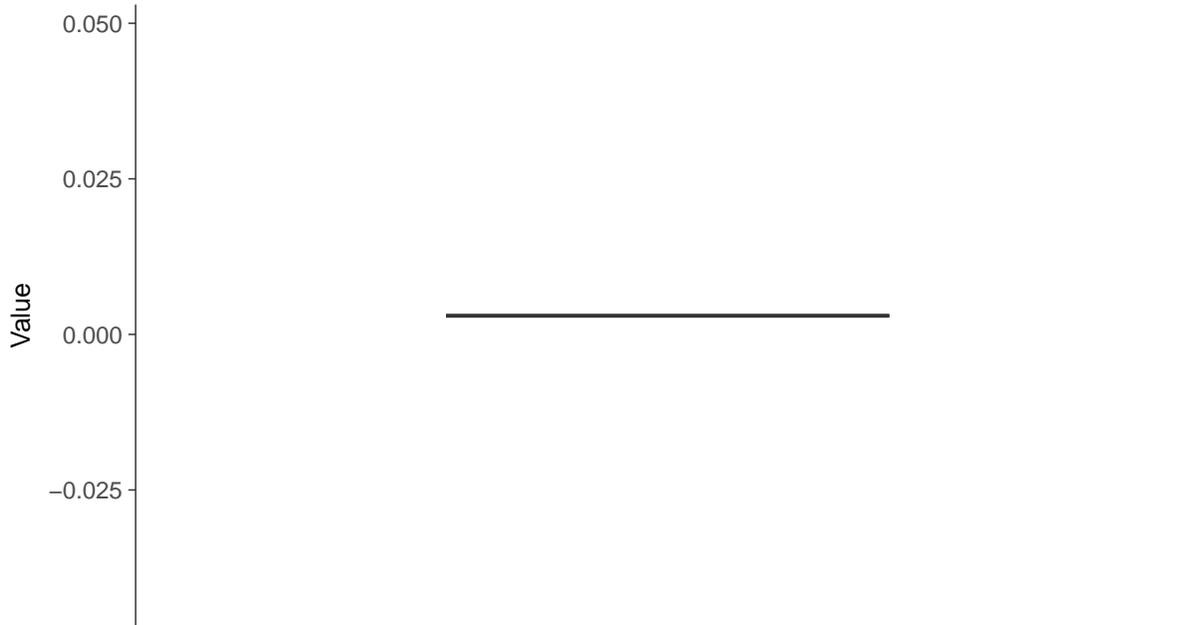
Cobalt, MW-6 (mg/L)





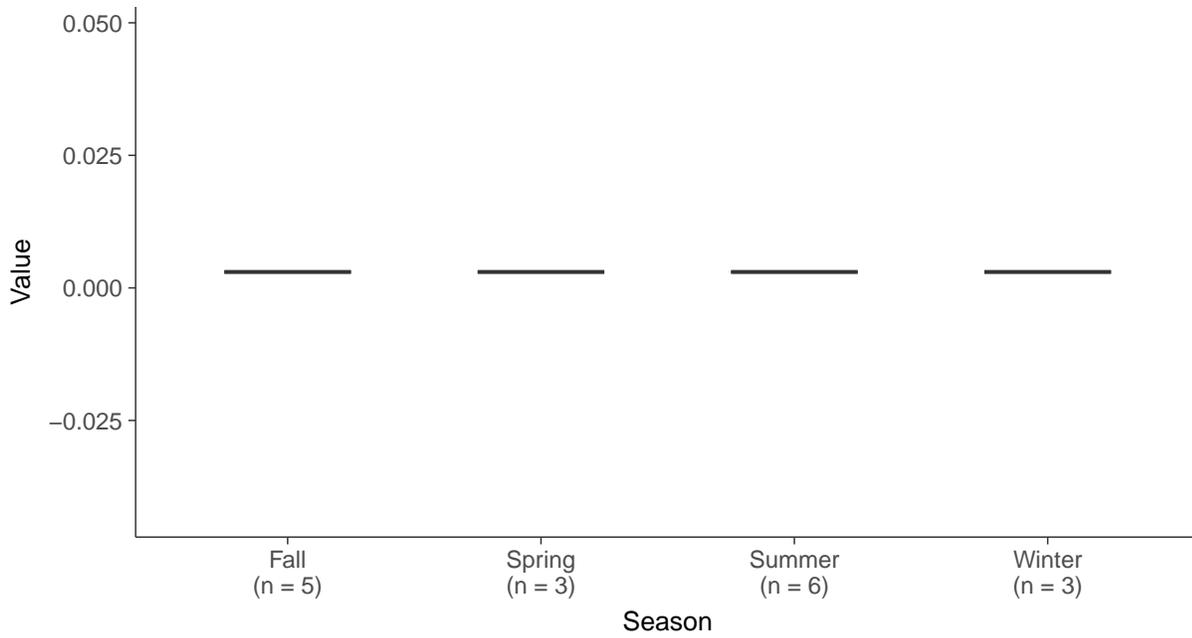
Boxplot

Lead, MW-6 (mg/L)



Boxplot by Season

Lead, MW-6 (mg/L)



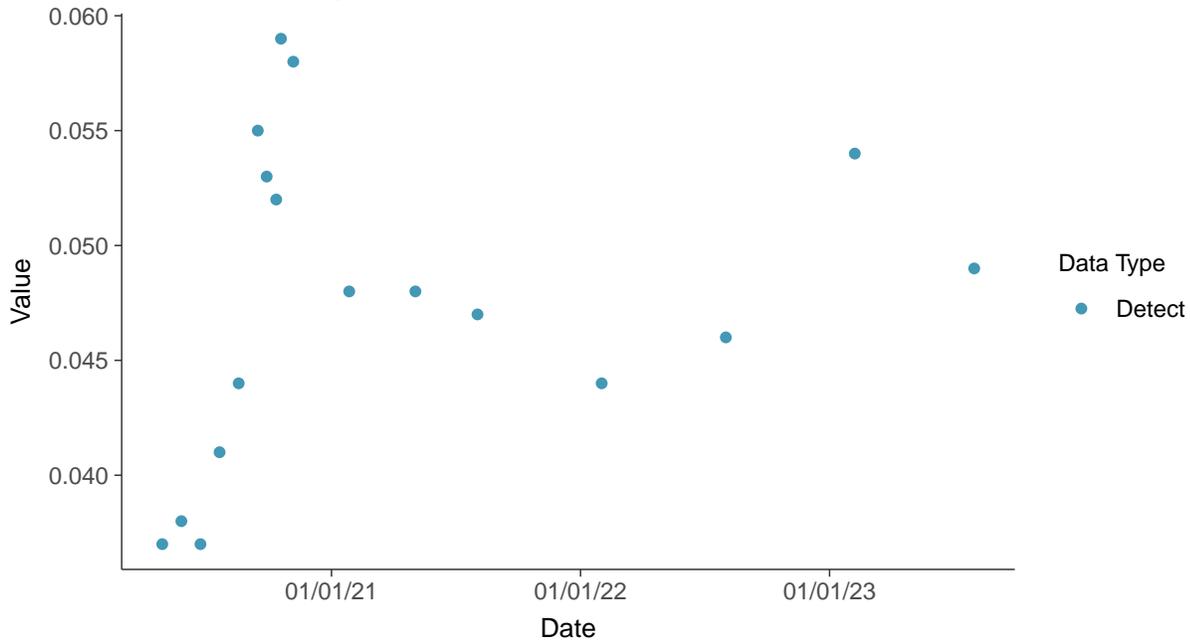


Appendix IV: Lithium, MW-6

ID: 06_2_16

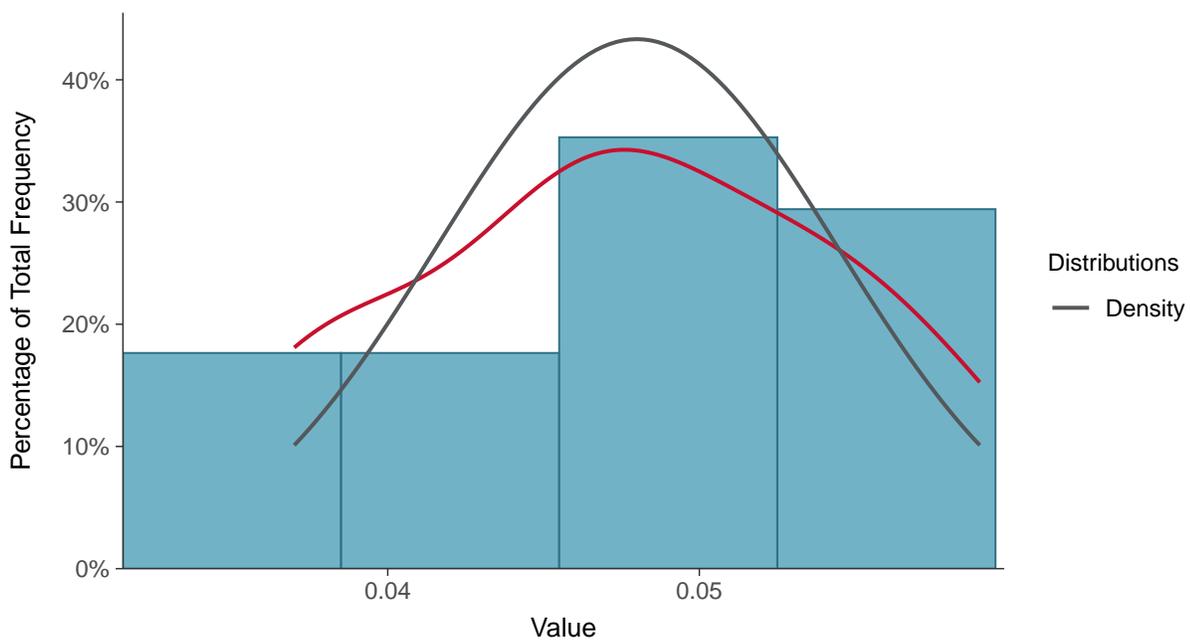
Scatter Plot

Lithium, MW-6 (mg/L)



Histogram

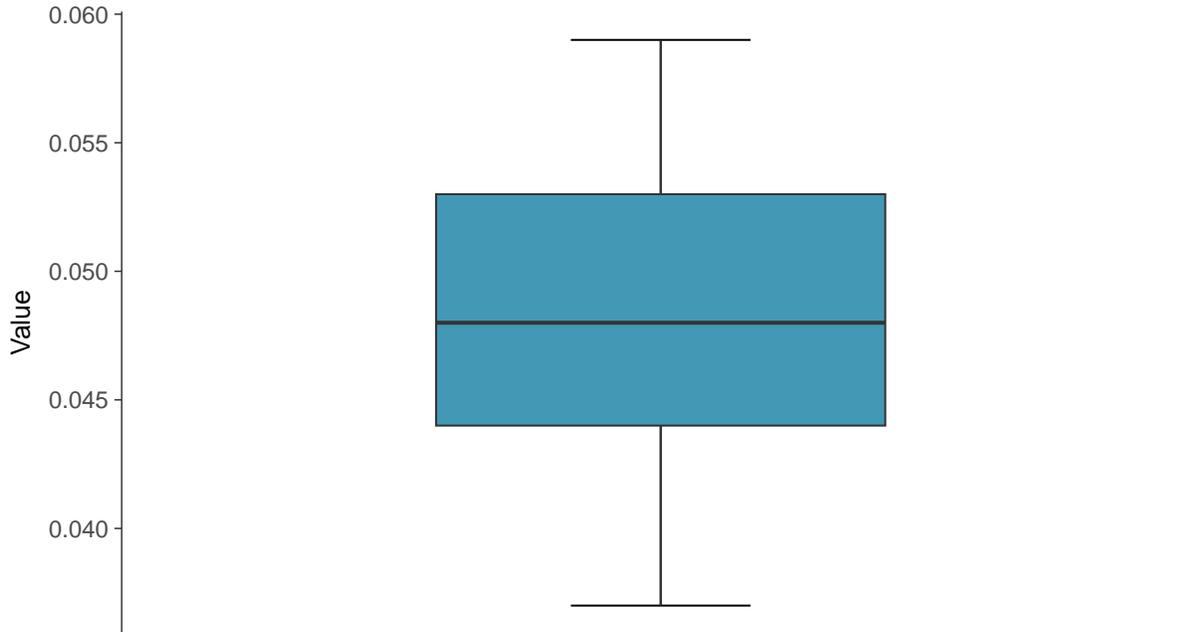
Lithium, MW-6 (mg/L)





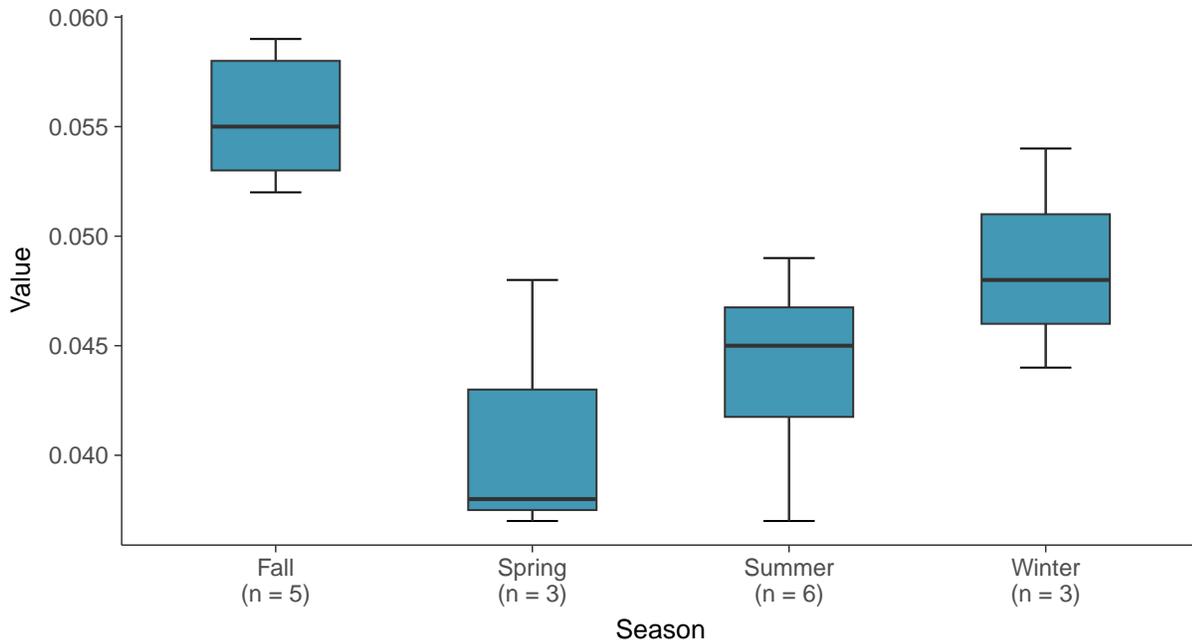
Boxplot

Lithium, MW-6 (mg/L)



Boxplot by Season

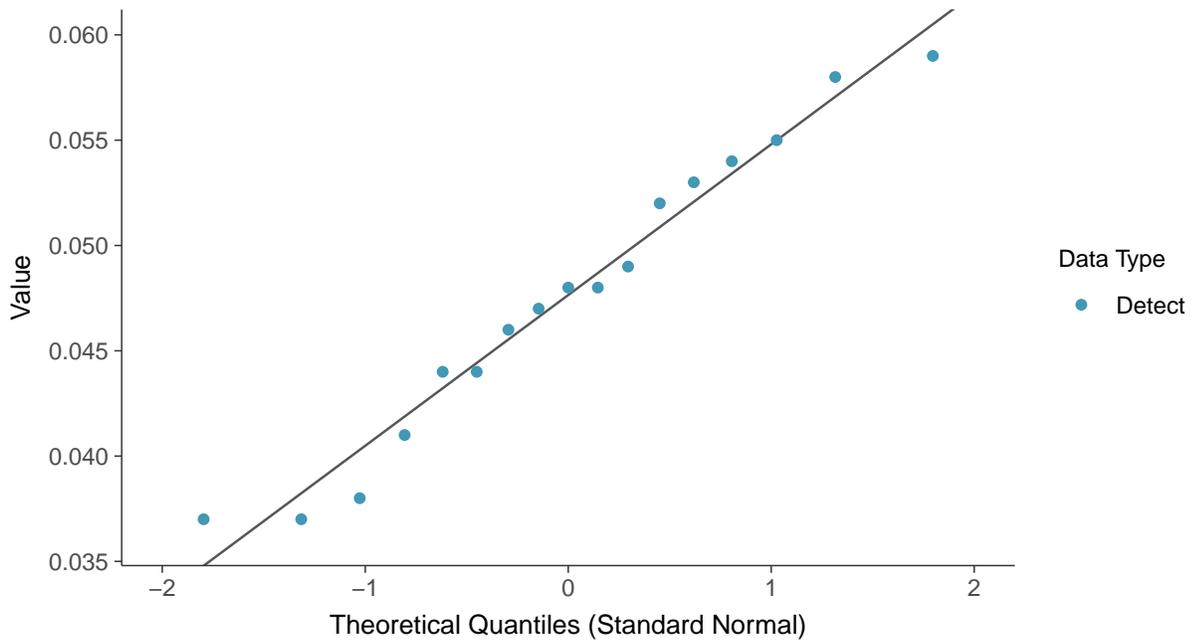
Lithium, MW-6 (mg/L)





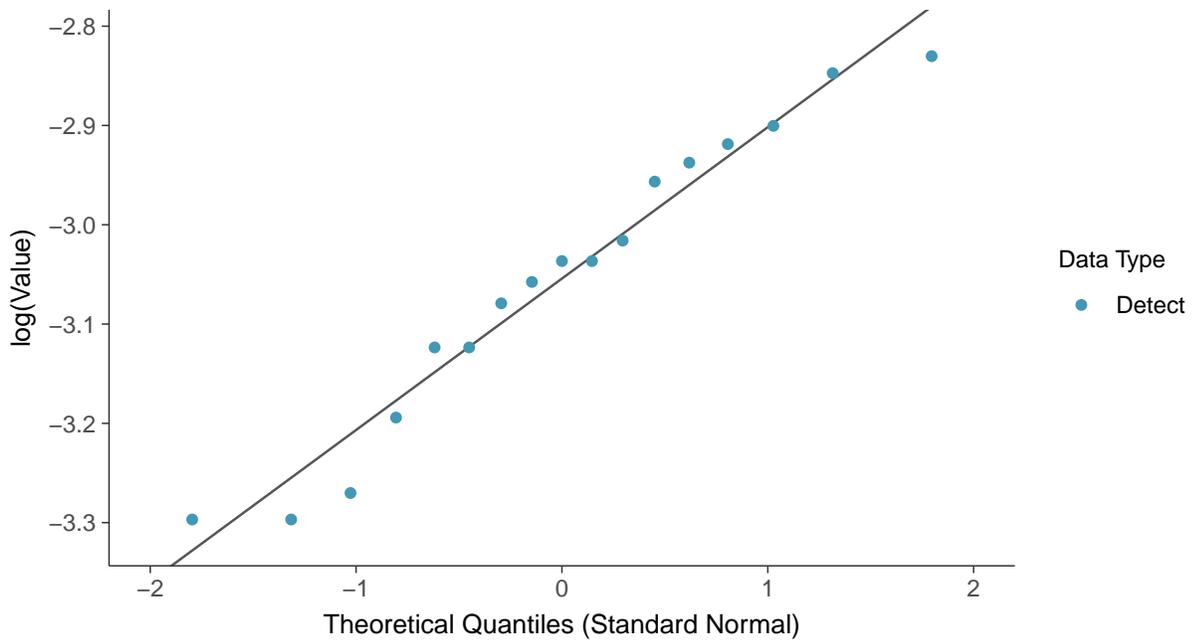
Normal Q-Q plot

Lithium, MW-6 (mg/L)



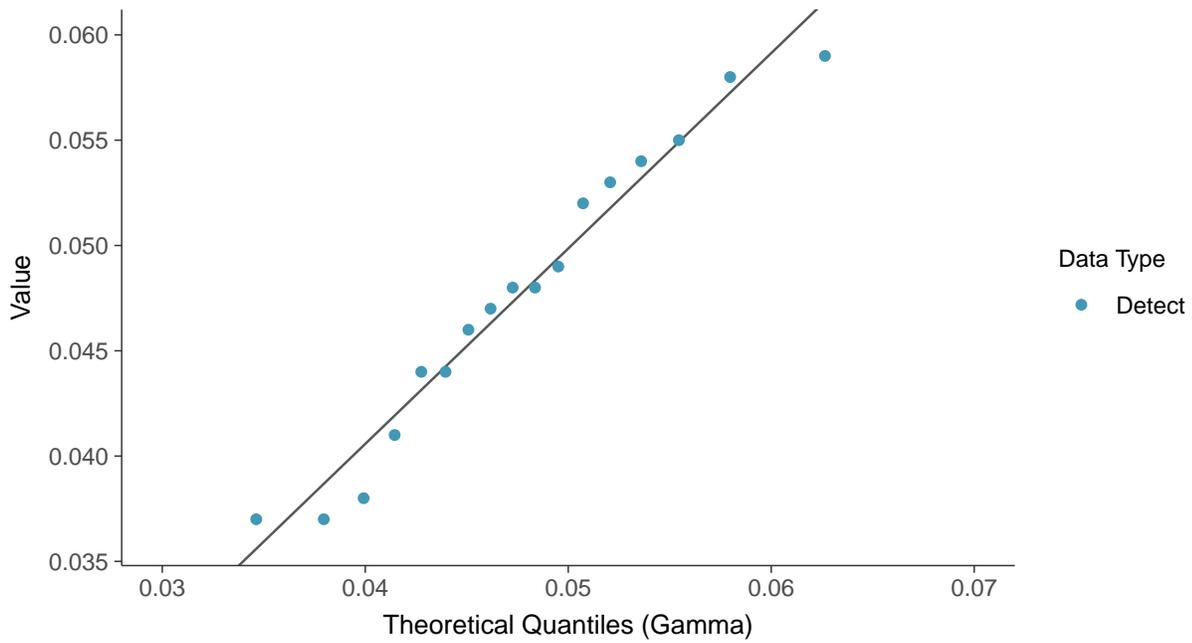
Lognormal Q-Q plot

Lithium, MW-6 (mg/L)

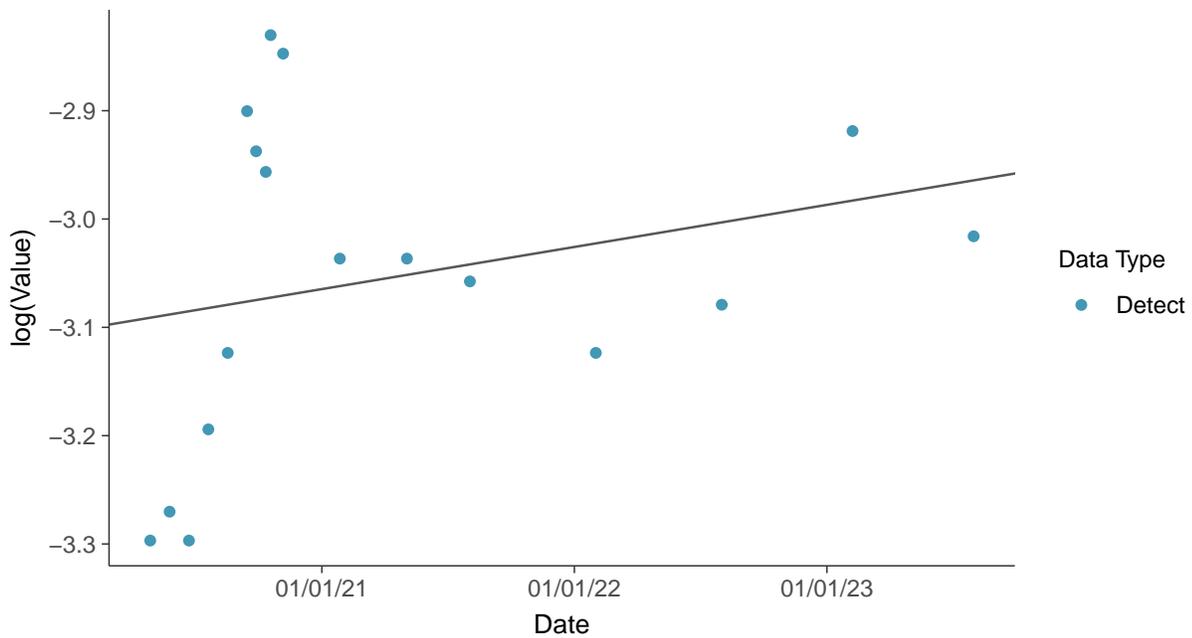




Gamma Q-Q plot
Lithium, MW-6 (mg/L)



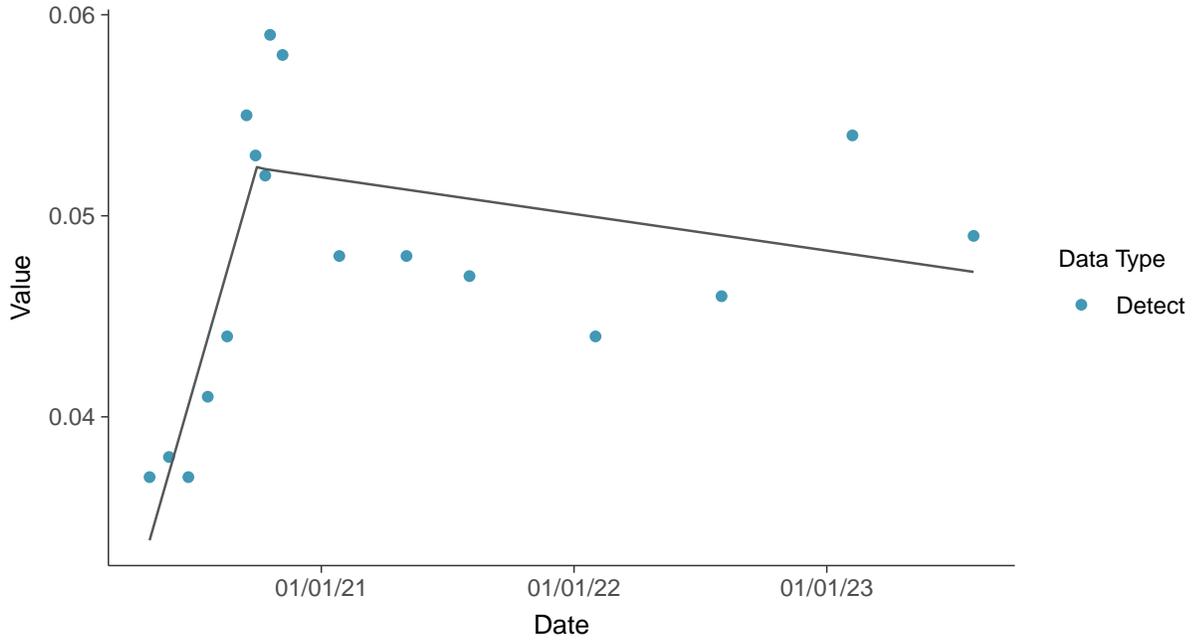
Trend Regression: Lognormal MLE
Lithium, MW-6 (mg/L)





Trend Regression: Piecewise Linear-Linear

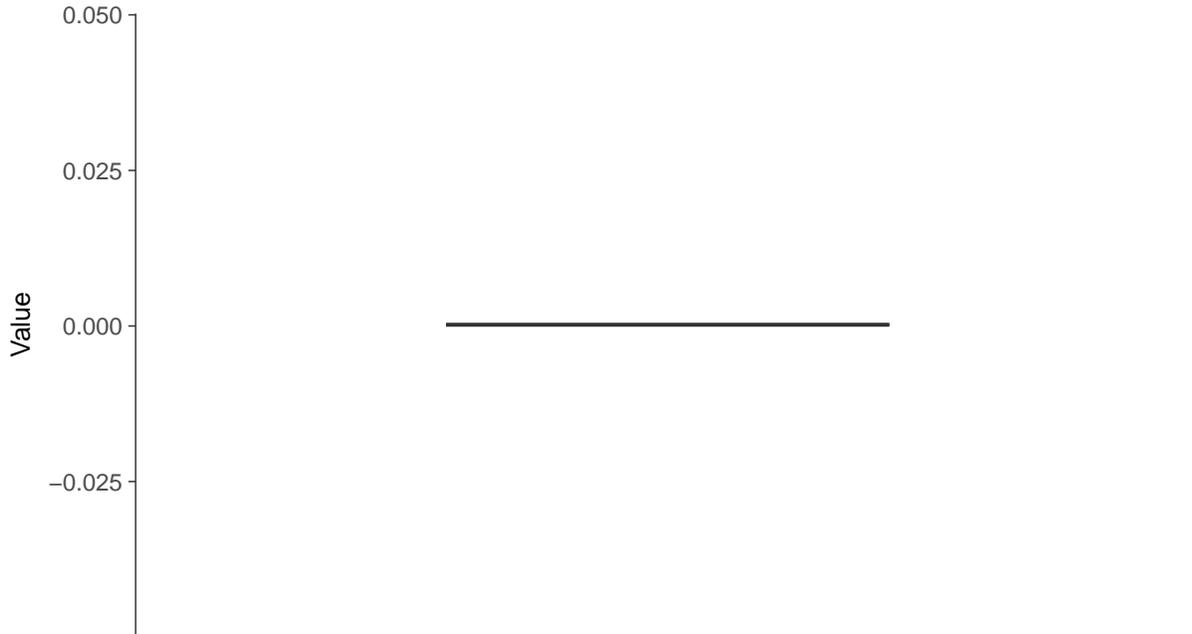
Lithium, MW-6 (mg/L)





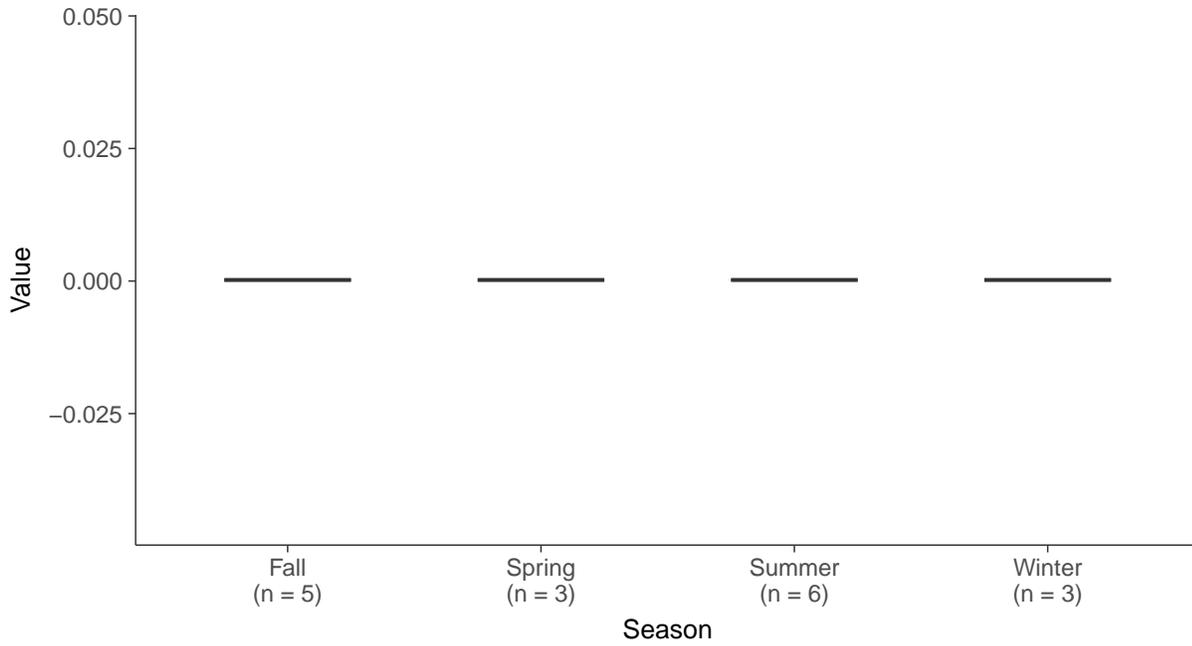
Boxplot

Mercury, MW-6 (mg/L)



Boxplot by Season

Mercury, MW-6 (mg/L)



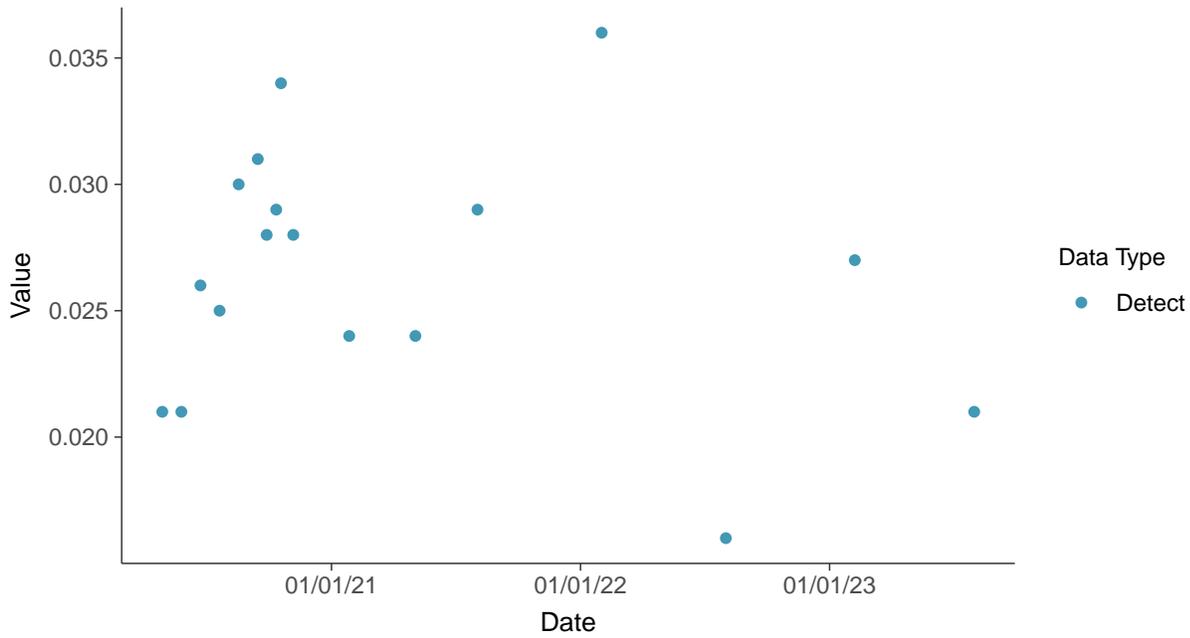


Appendix IV: Molybdenum, MW-6

ID: 06_2_18

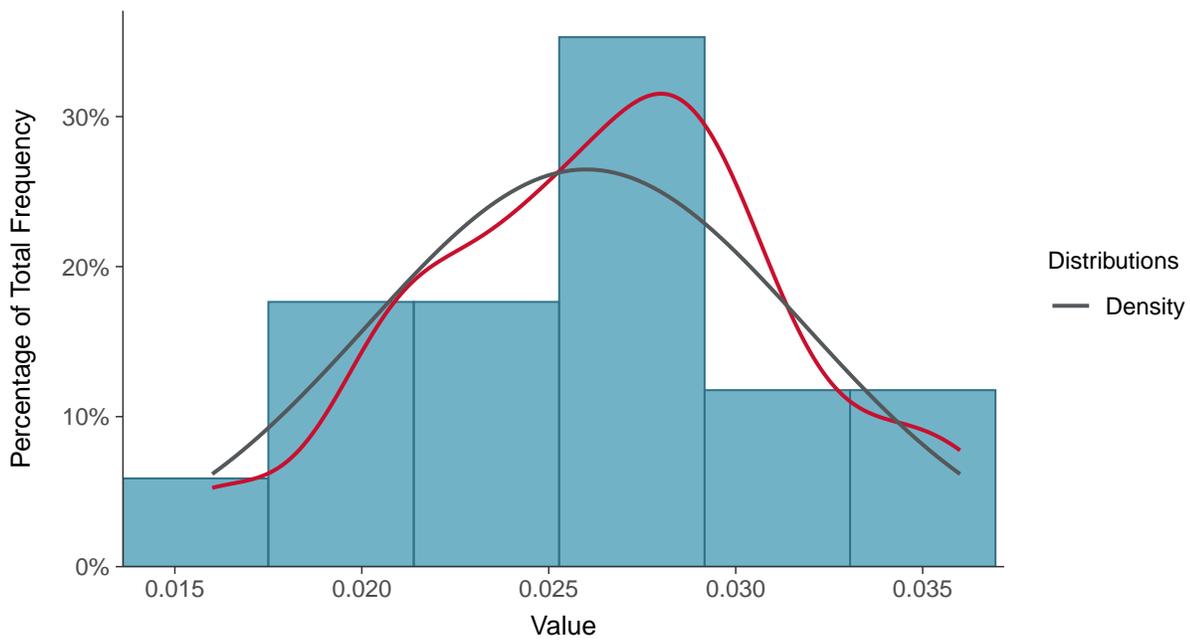
Scatter Plot

Molybdenum, MW-6 (mg/L)



Histogram

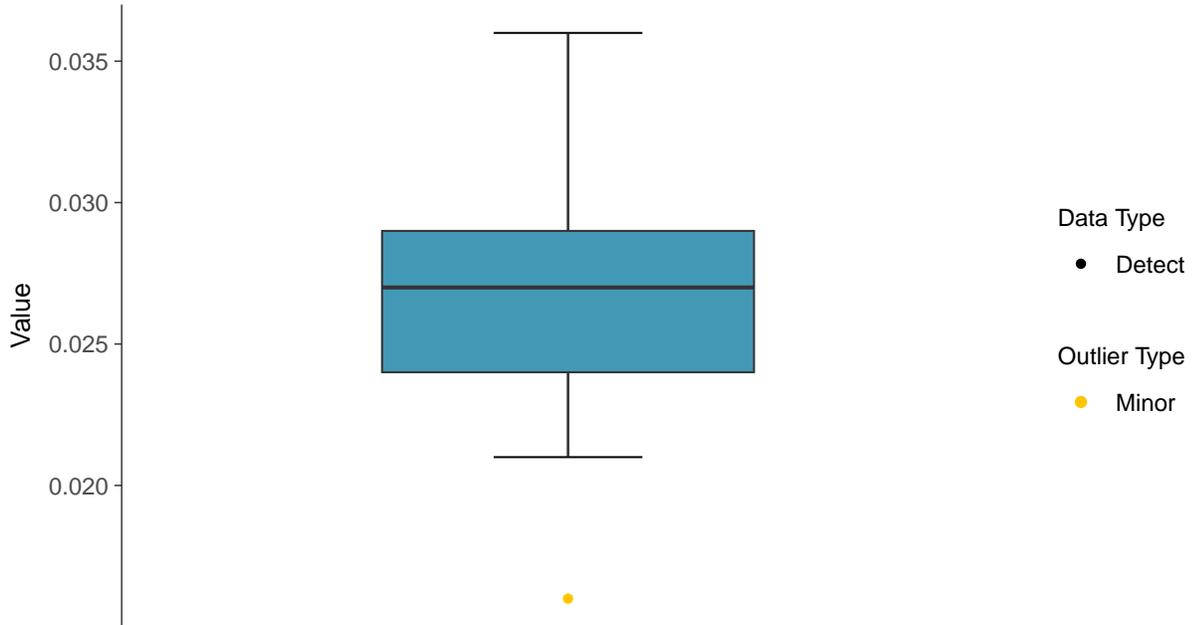
Molybdenum, MW-6 (mg/L)





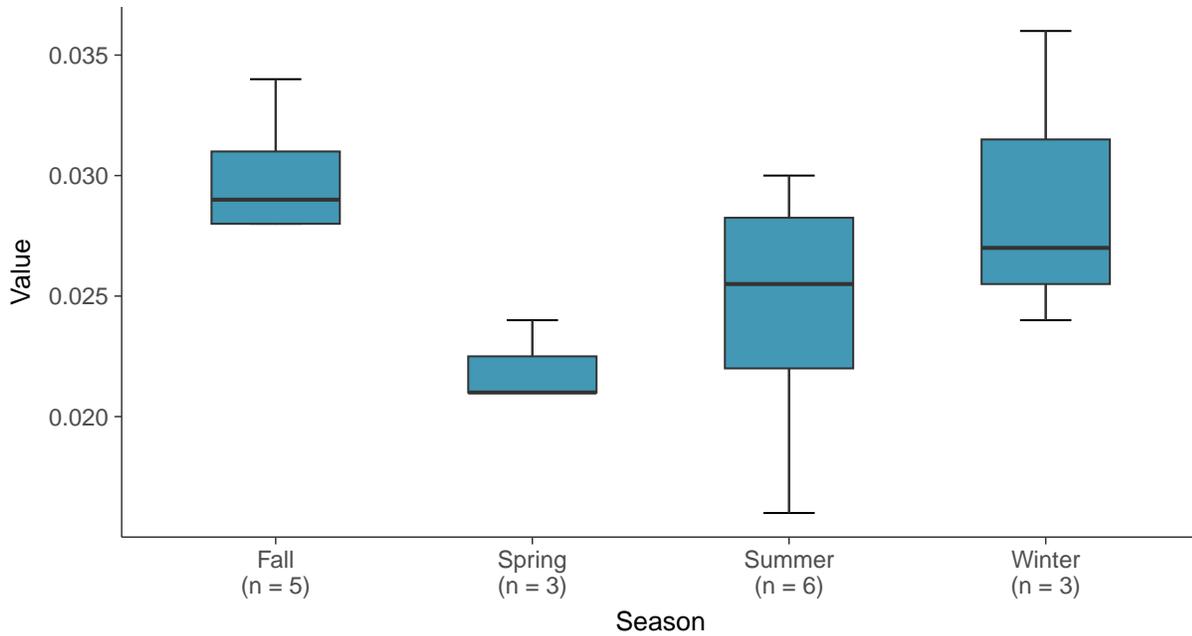
Boxplot

Molybdenum, MW-6 (mg/L)



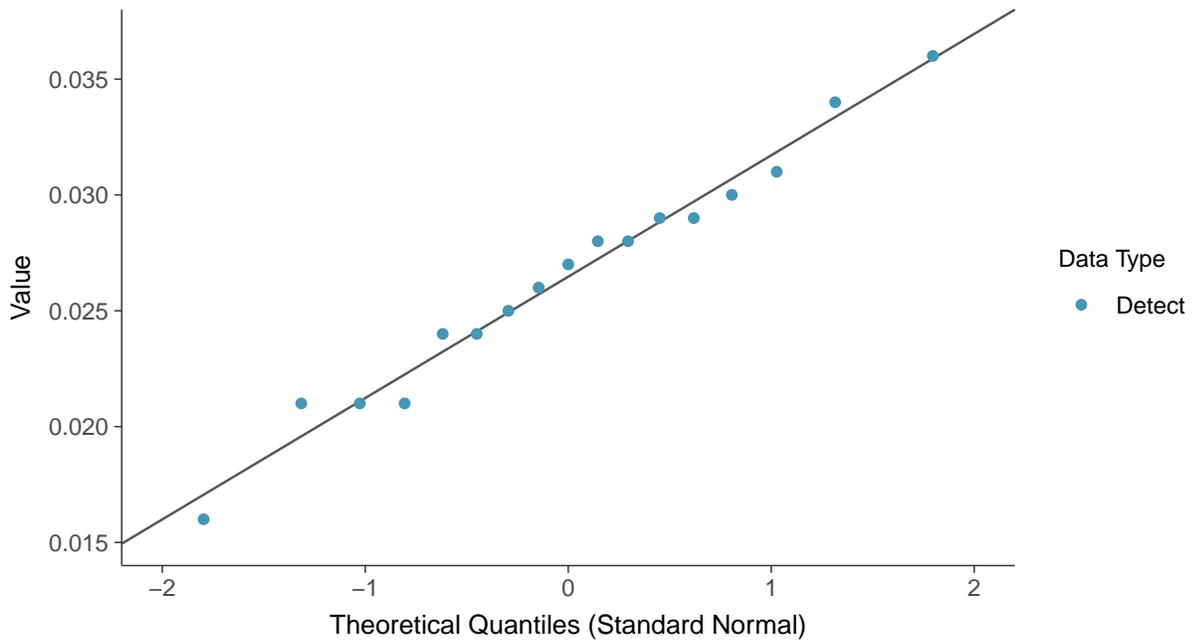
Boxplot by Season

Molybdenum, MW-6 (mg/L)

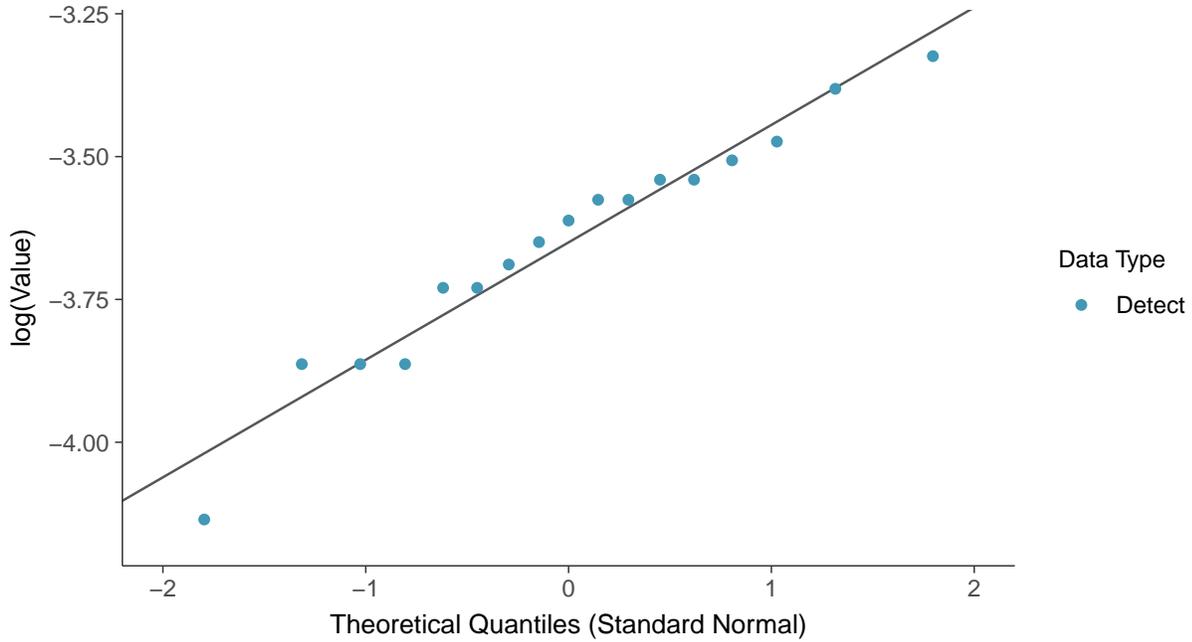




Normal Q-Q plot
Molybdenum, MW-6 (mg/L)



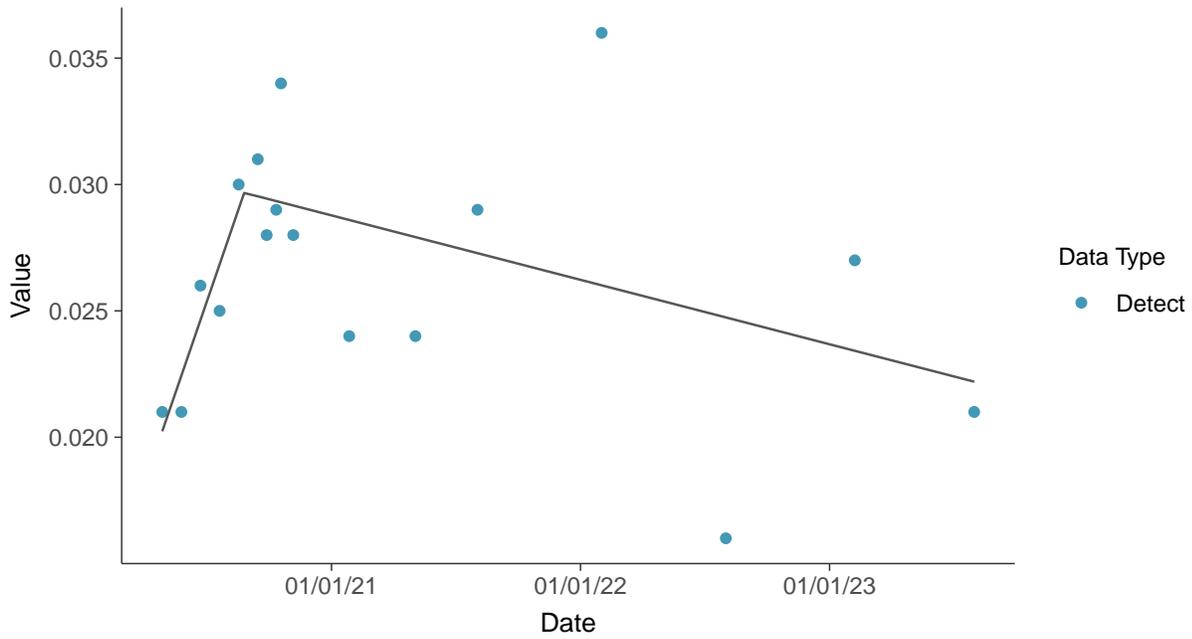
Lognormal Q-Q plot
Molybdenum, MW-6 (mg/L)





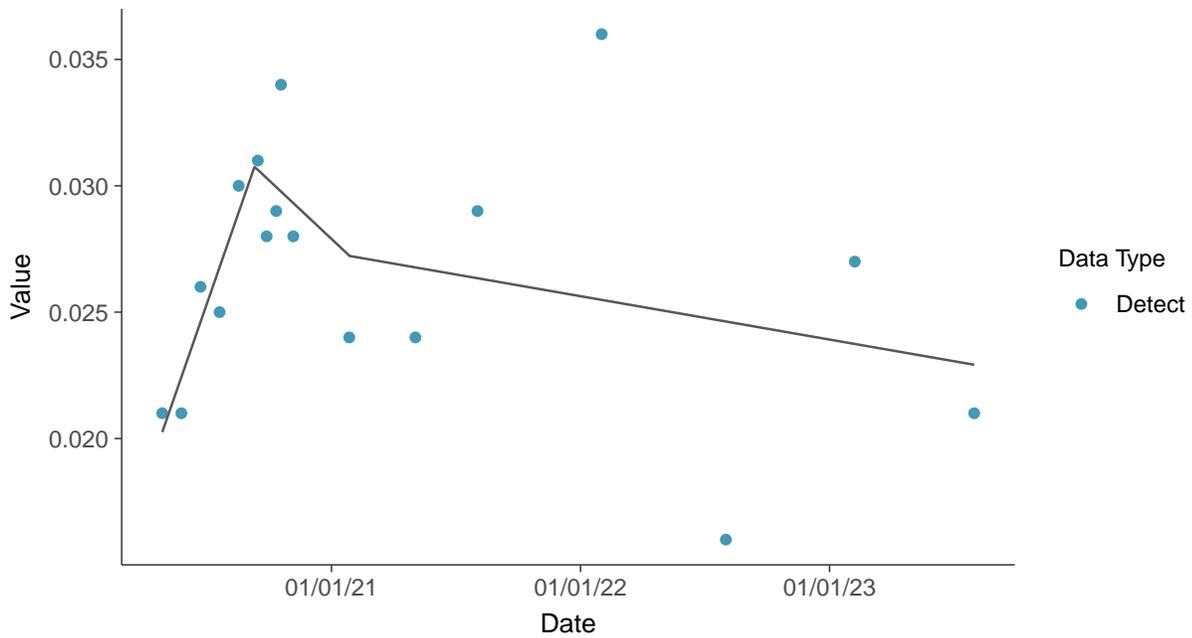
Trend Regression: Piecewise Linear-Linear

Molybdenum, MW-6 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Molybdenum, MW-6 (mg/L)



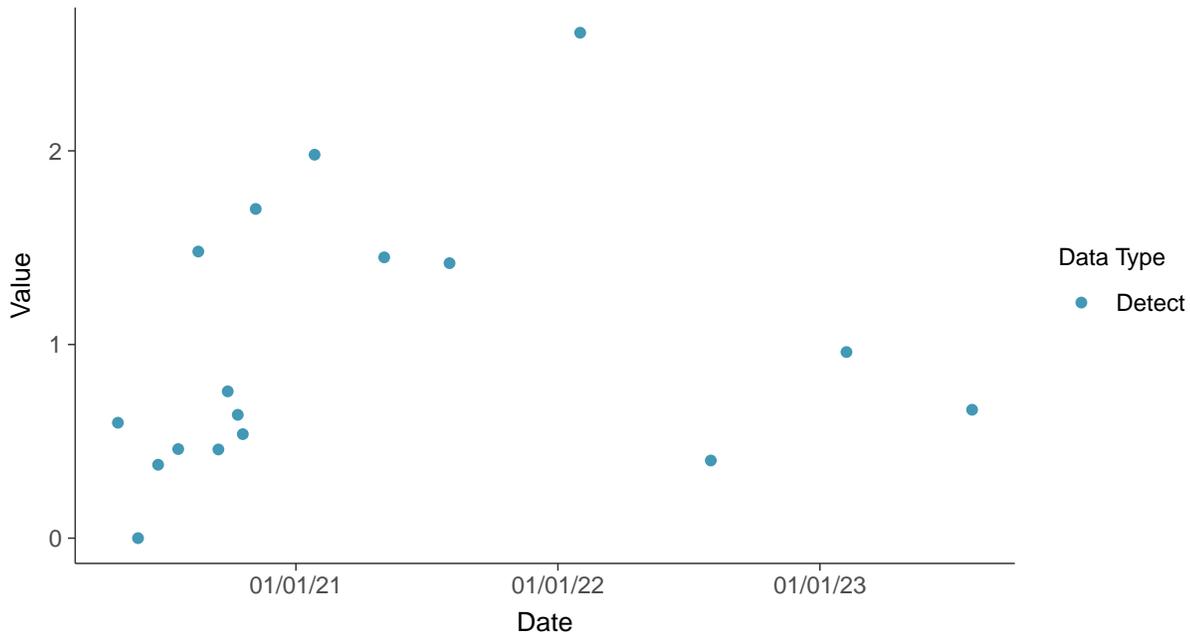


Appendix IV: Radium-226/228, MW-6

ID: 06_2_20

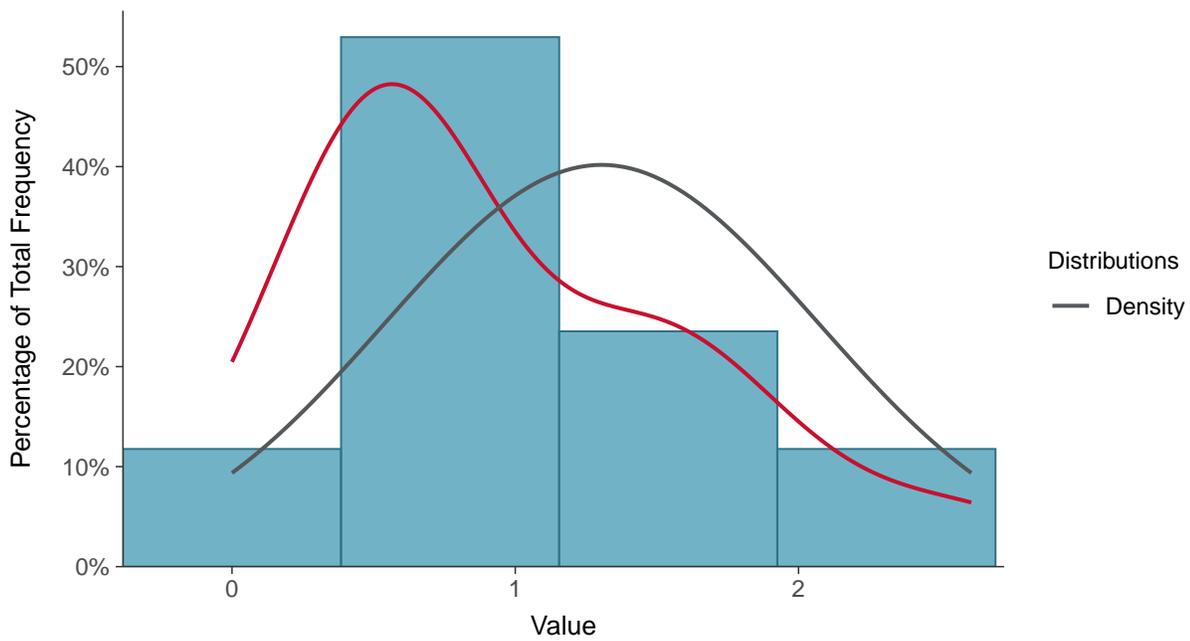
Scatter Plot

Radium-226/228, MW-6 (pCi/L)



Histogram

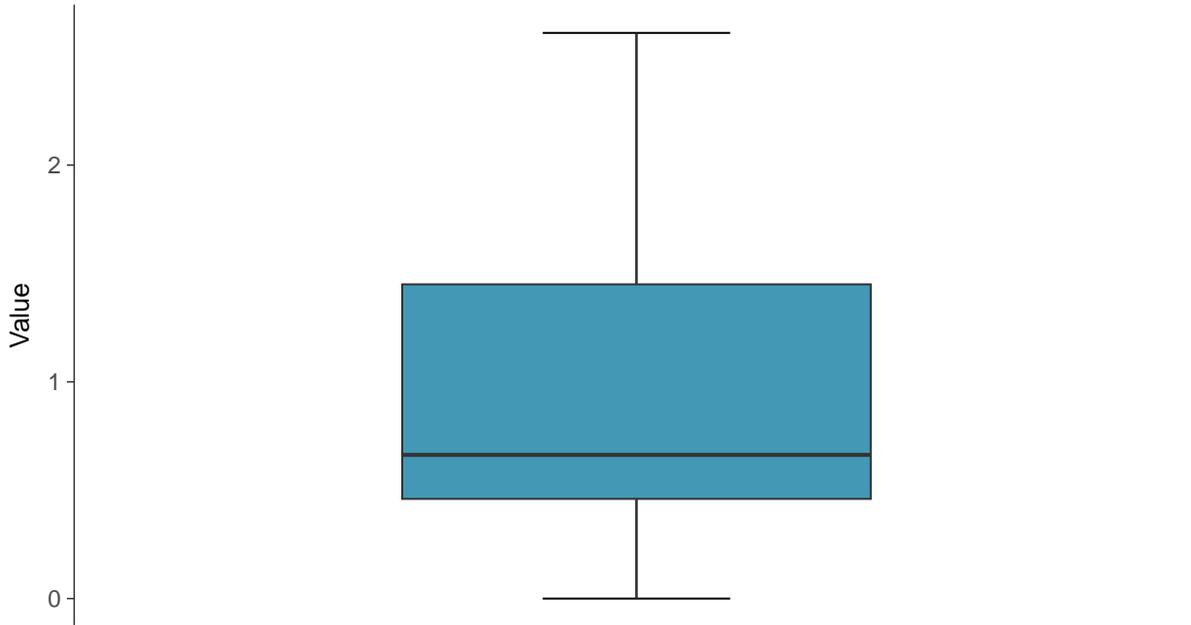
Radium-226/228, MW-6 (pCi/L)





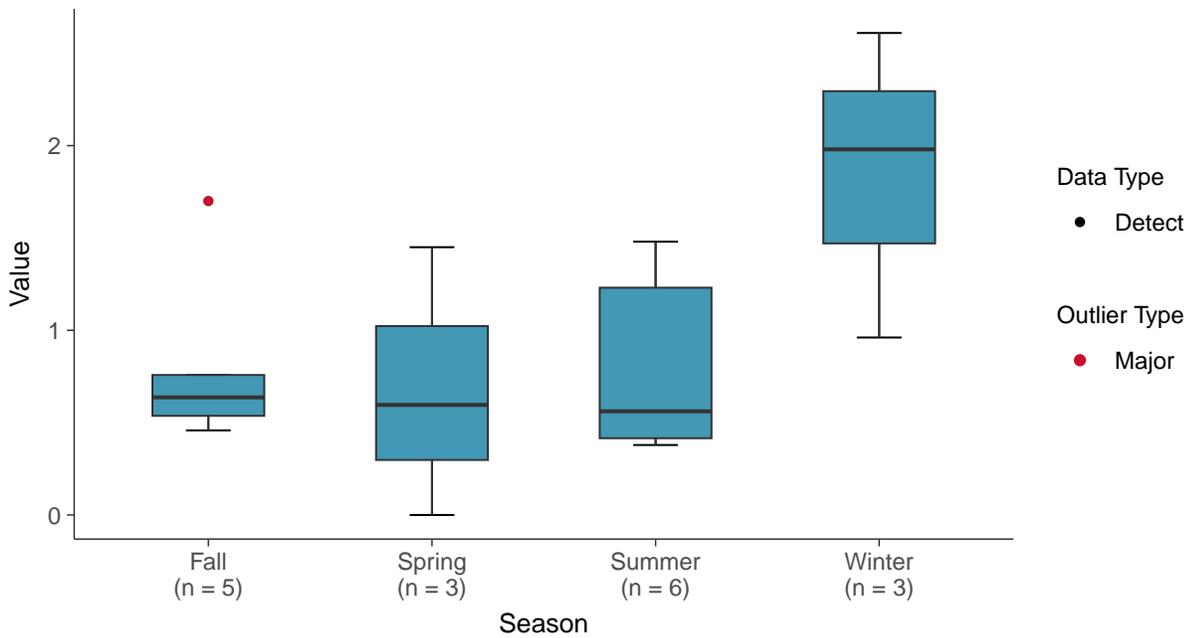
Boxplot

Radium-226/228, MW-6 (pCi/L)



Boxplot by Season

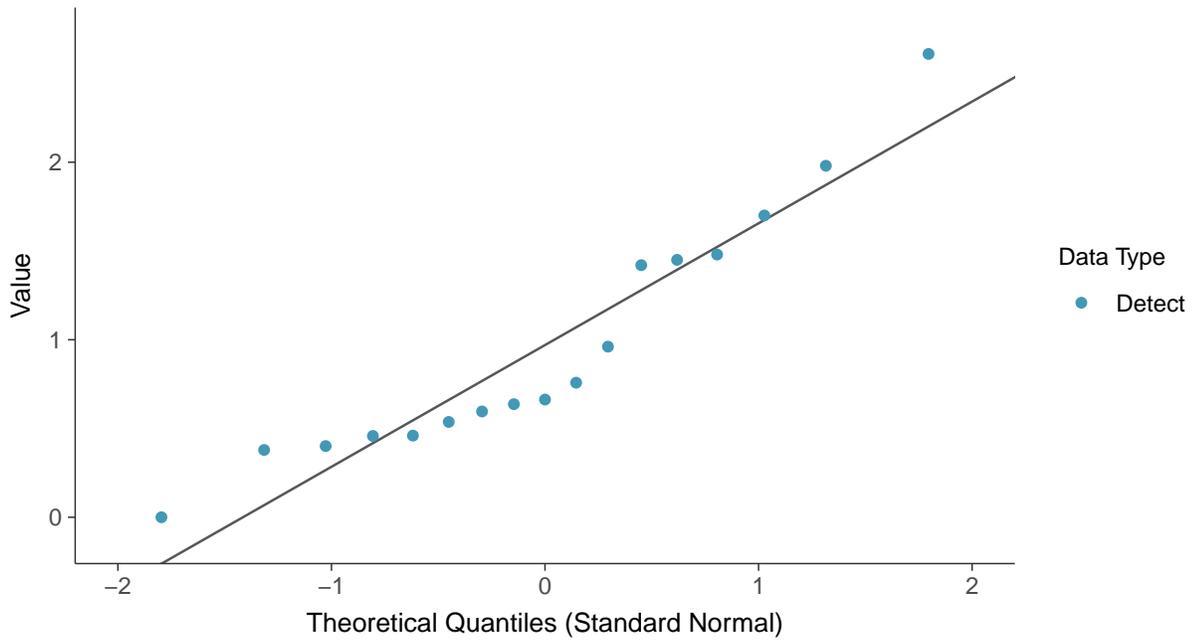
Radium-226/228, MW-6 (pCi/L)





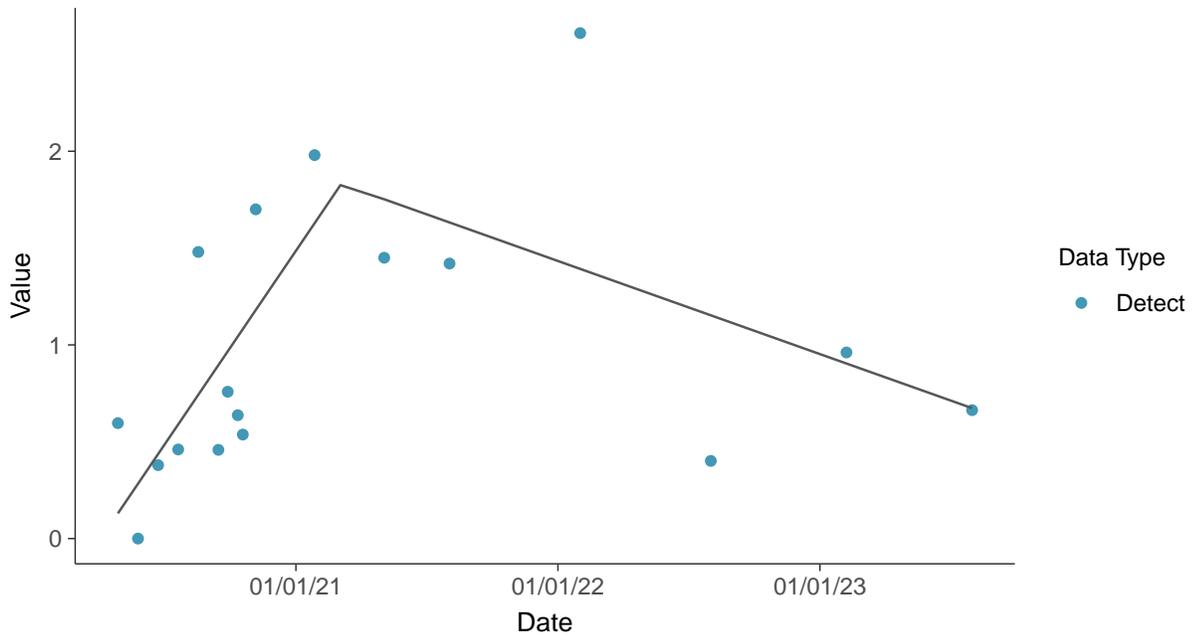
Normal Q-Q plot

Radium-226/228, MW-6 (pCi/L)



Trend Regression: Piecewise Linear-Linear

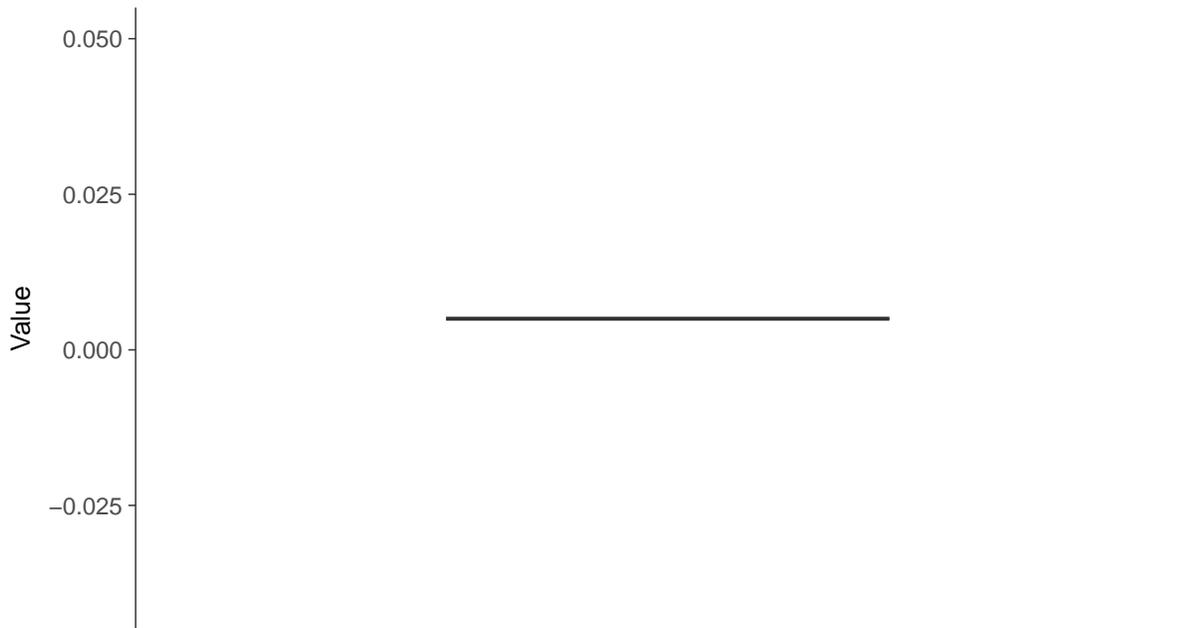
Radium-226/228, MW-6 (pCi/L)





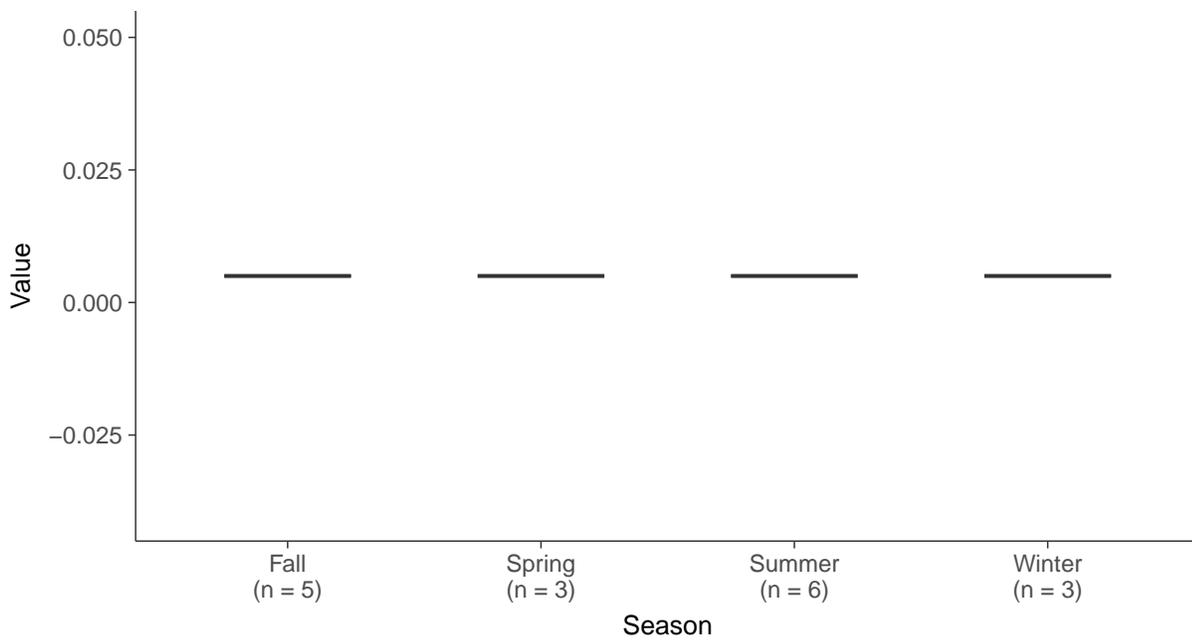
Boxplot

Selenium, MW-6 (mg/L)



Boxplot by Season

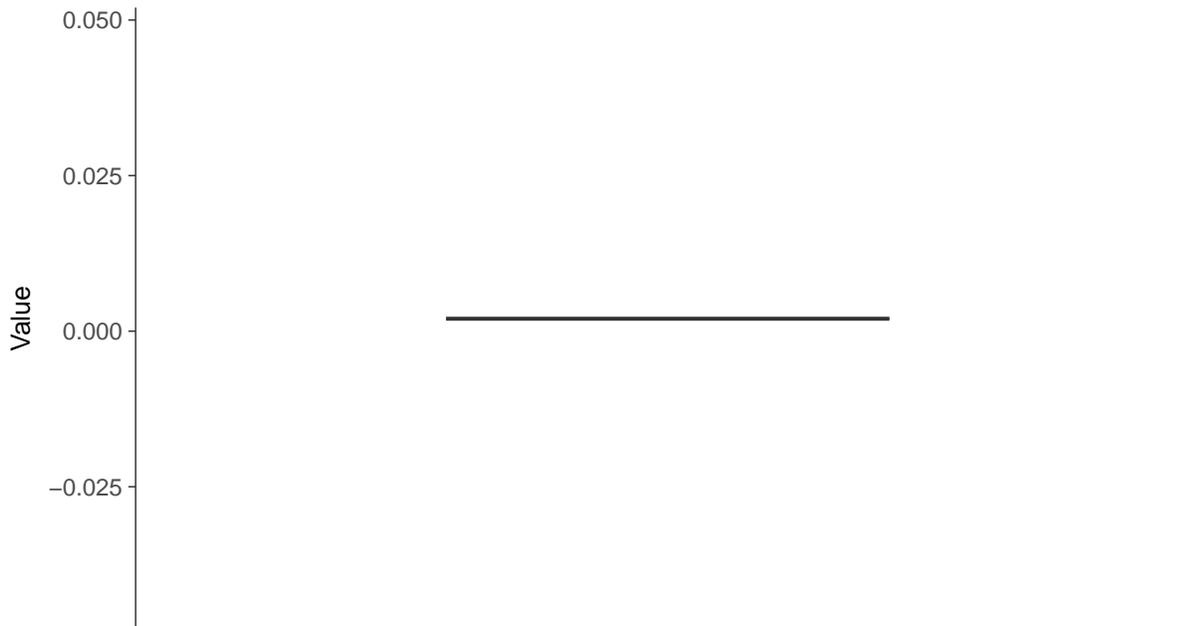
Selenium, MW-6 (mg/L)





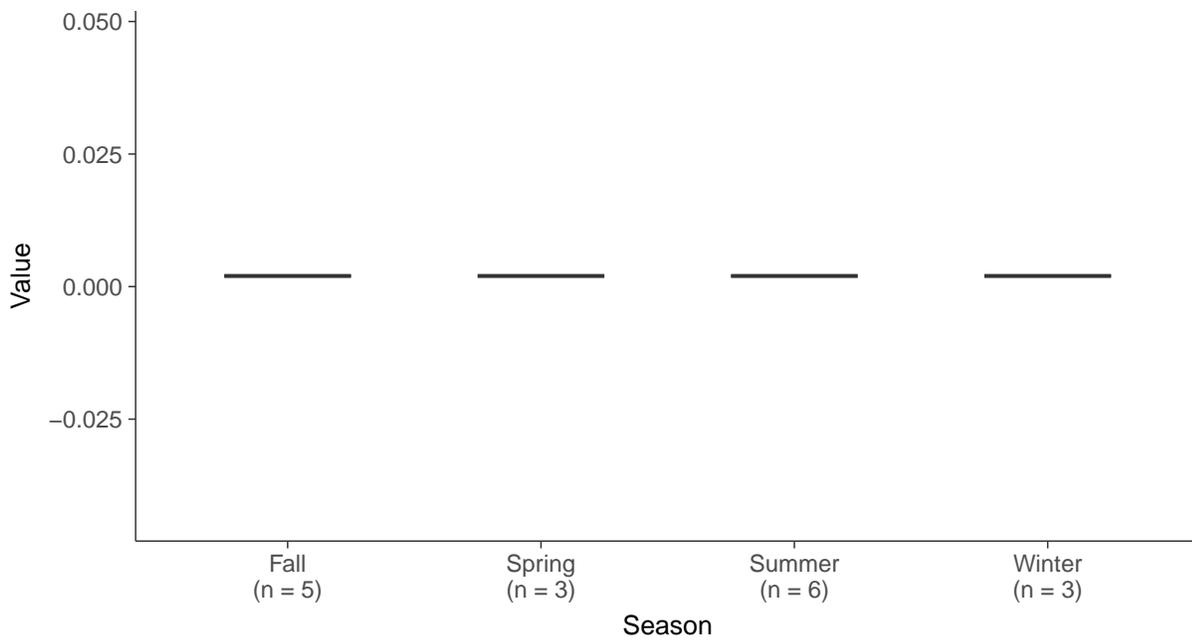
Boxplot

Thallium, MW-6 (mg/L)



Boxplot by Season

Thallium, MW-6 (mg/L)



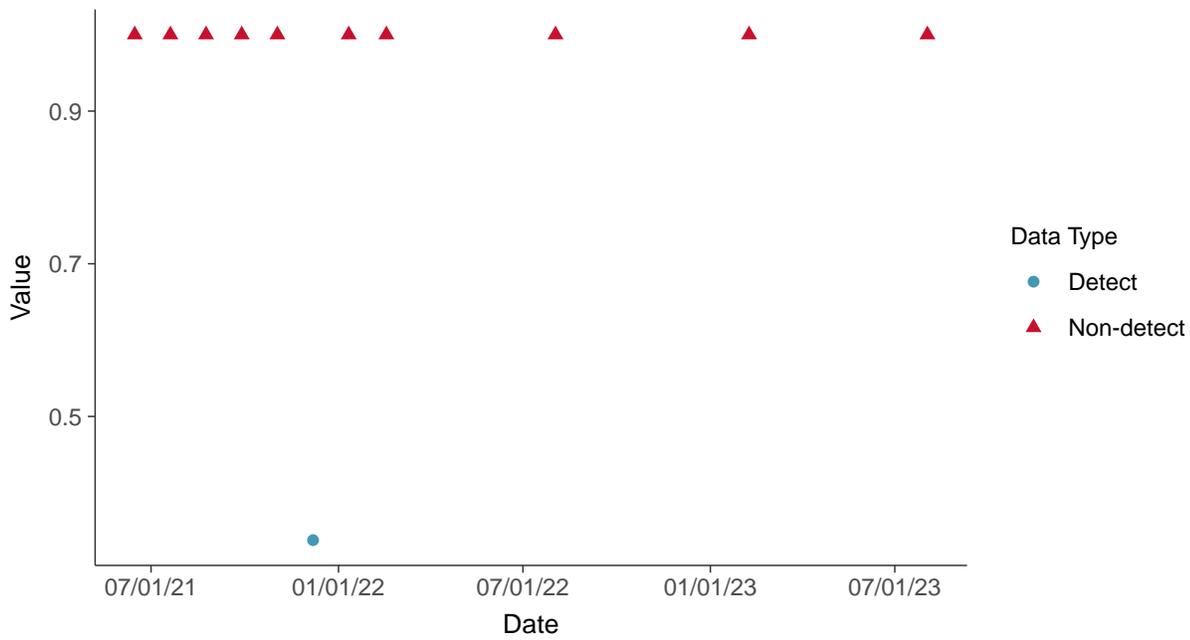


Appendix IV: Fluoride, MW-7

ID: 07_2_04

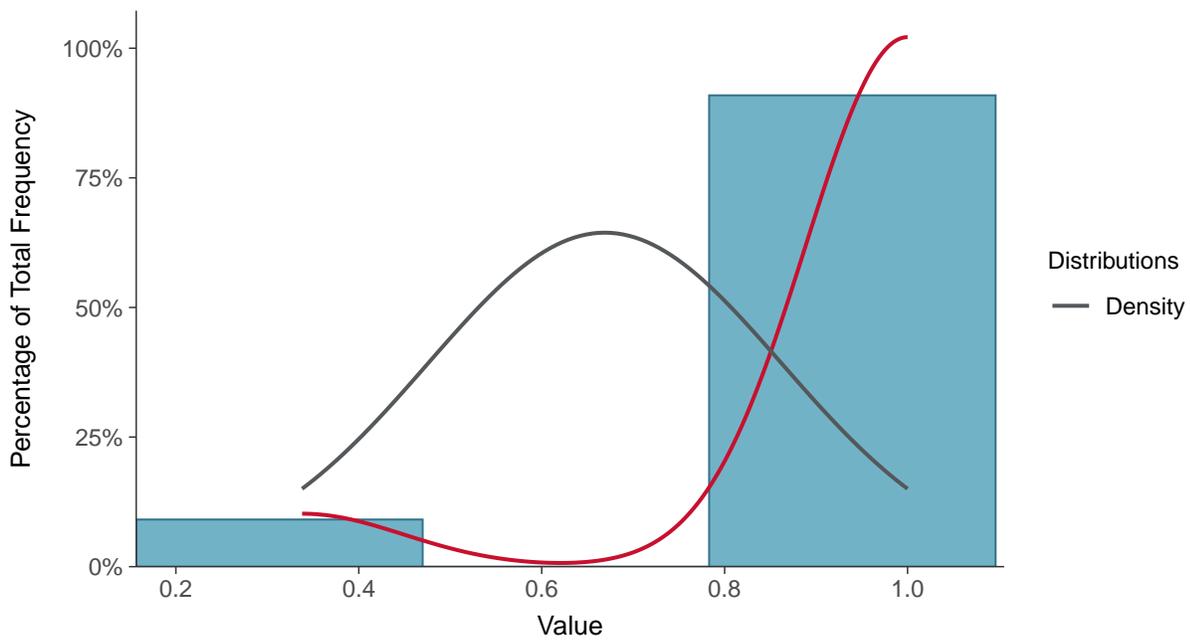
Scatter Plot

Fluoride, MW-7 (mg/L)



Histogram

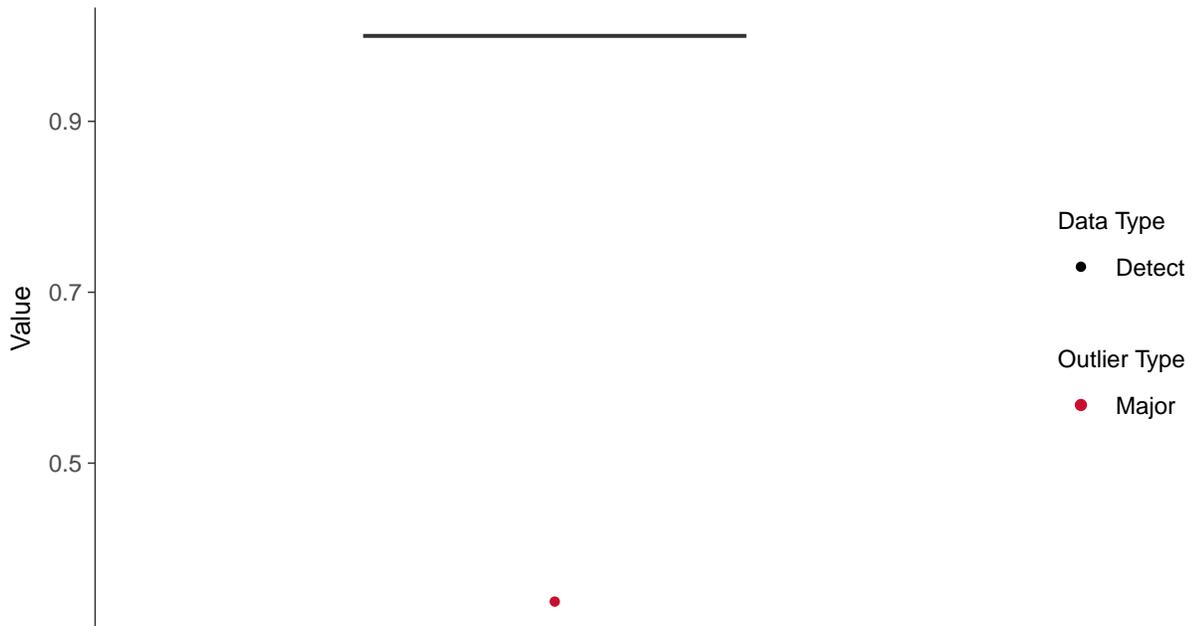
Fluoride, MW-7 (mg/L)





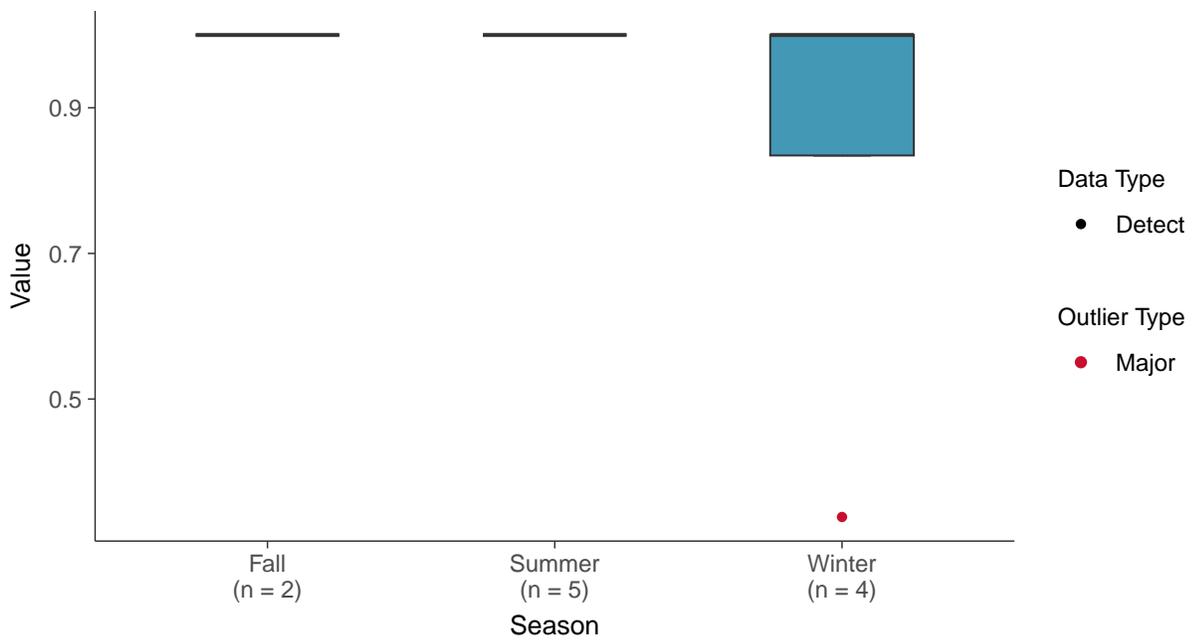
Boxplot

Fluoride, MW-7 (mg/L)



Boxplot by Season

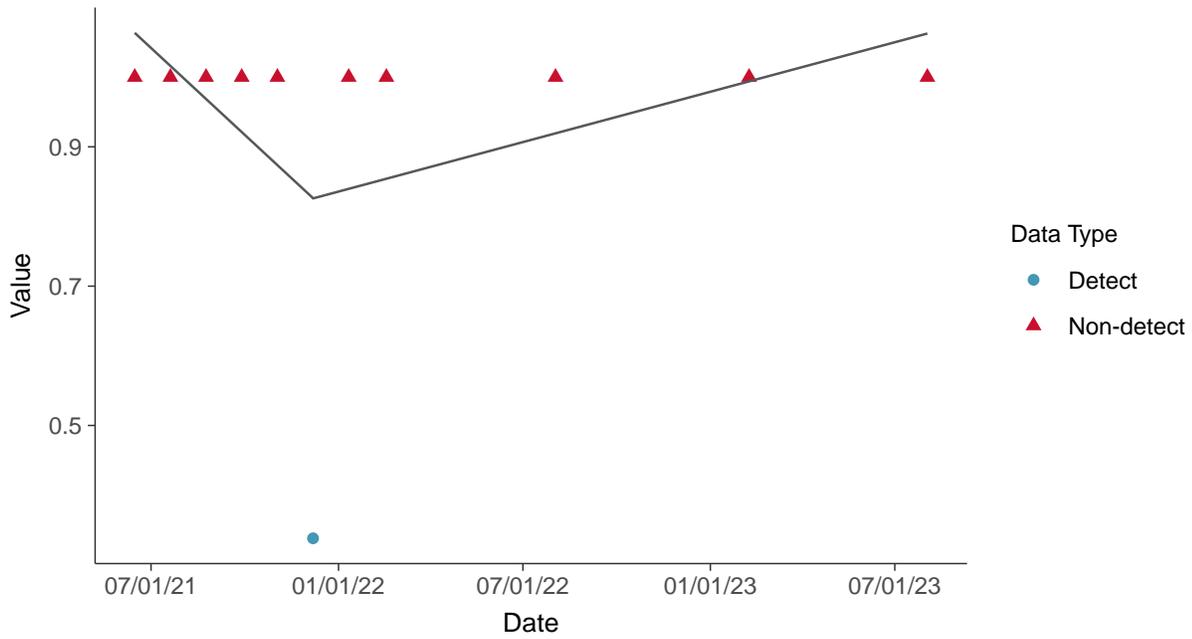
Fluoride, MW-7 (mg/L)





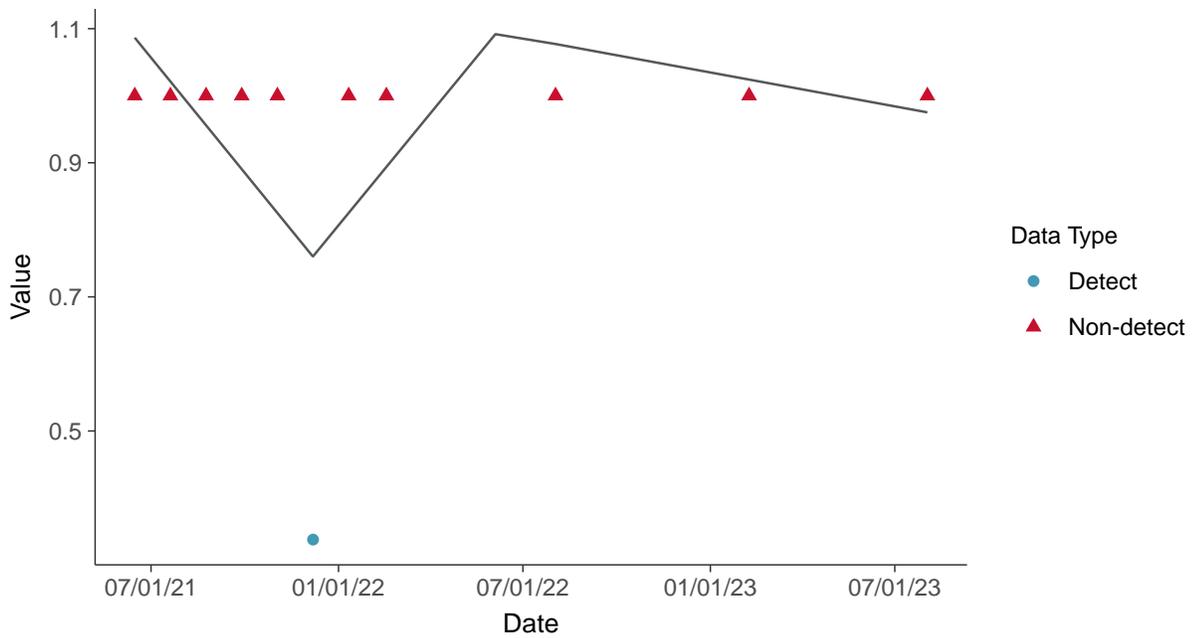
Trend Regression: Piecewise Linear-Linear

Fluoride, MW-7 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Fluoride, MW-7 (mg/L)



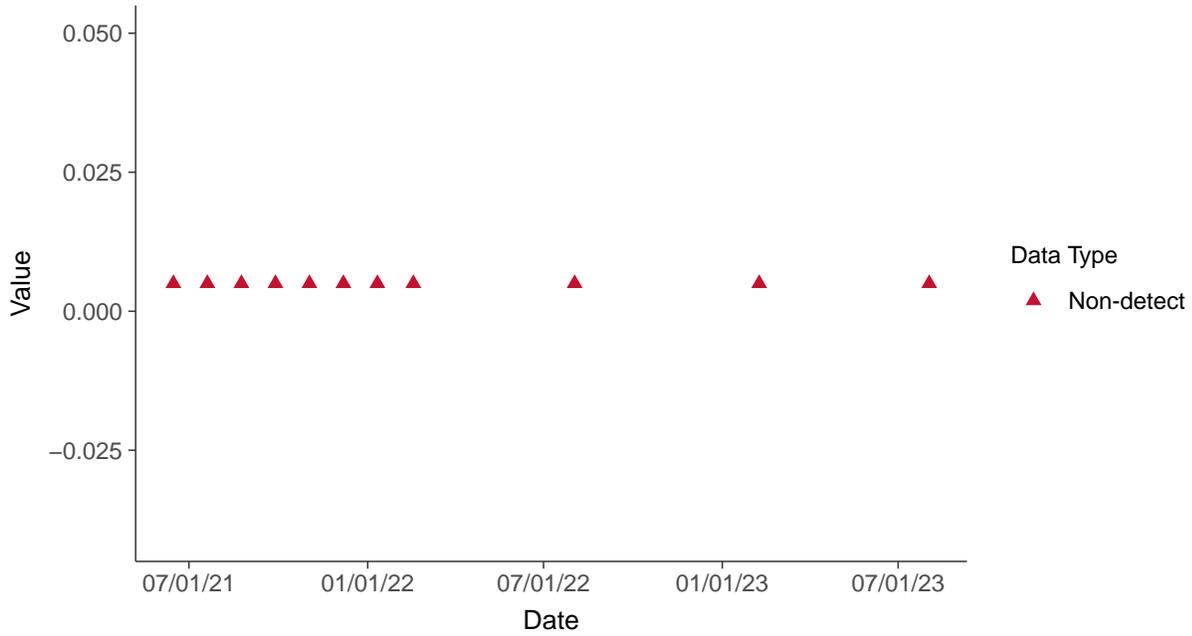


Appendix IV: Antimony, MW-7

ID: 07_2_08

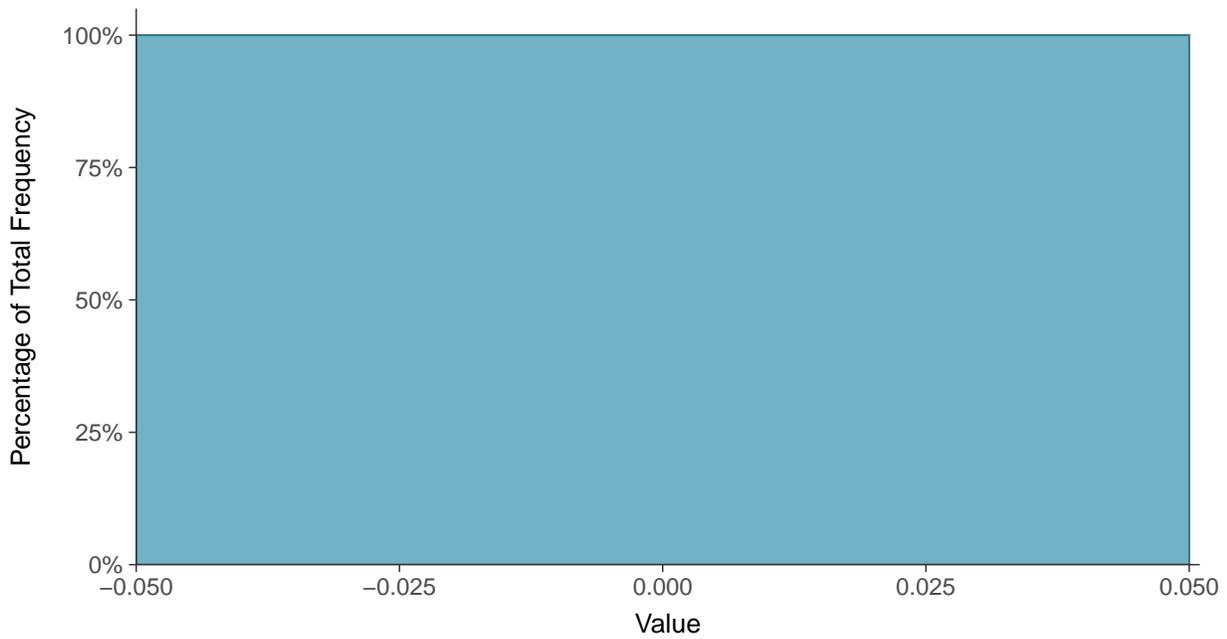
Scatter Plot

Antimony, MW-7 (mg/L)



Histogram

Antimony, MW-7 (mg/L)





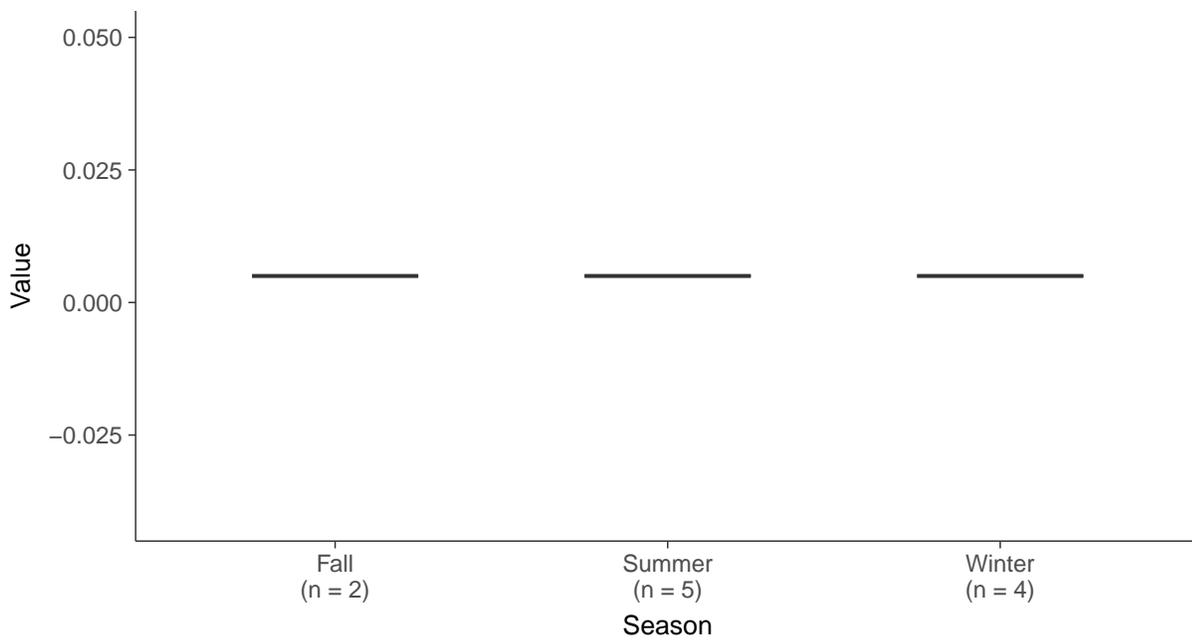
Boxplot

Antimony, MW-7 (mg/L)



Boxplot by Season

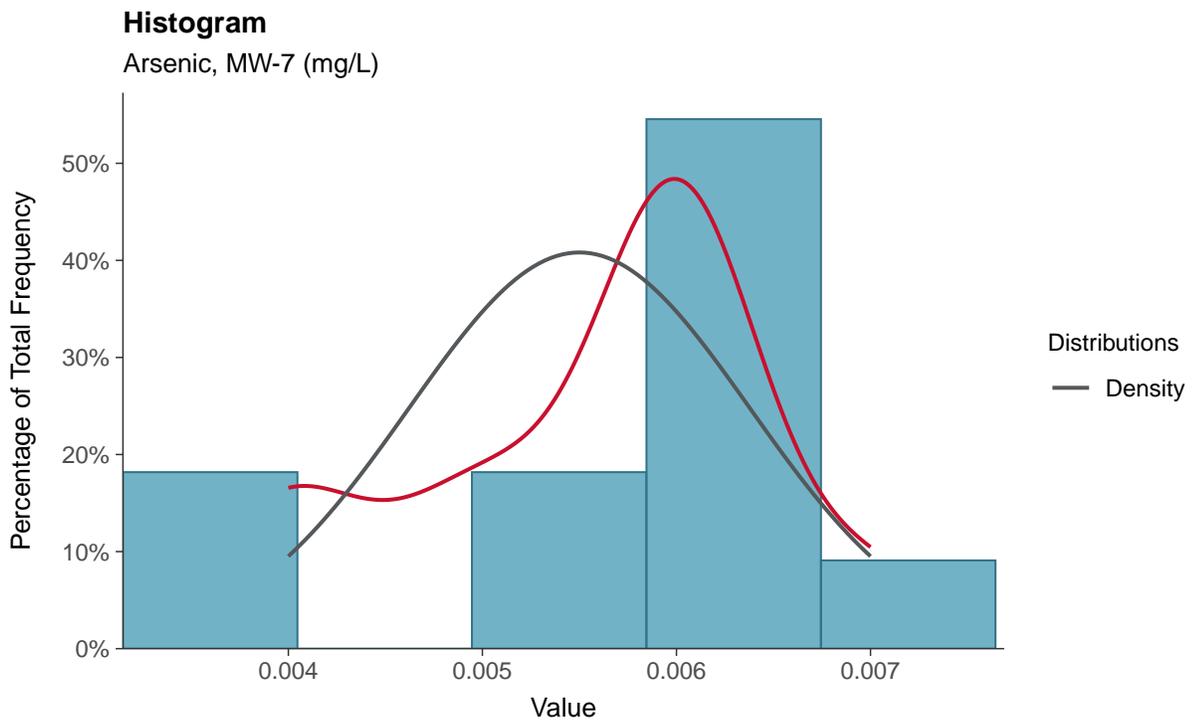
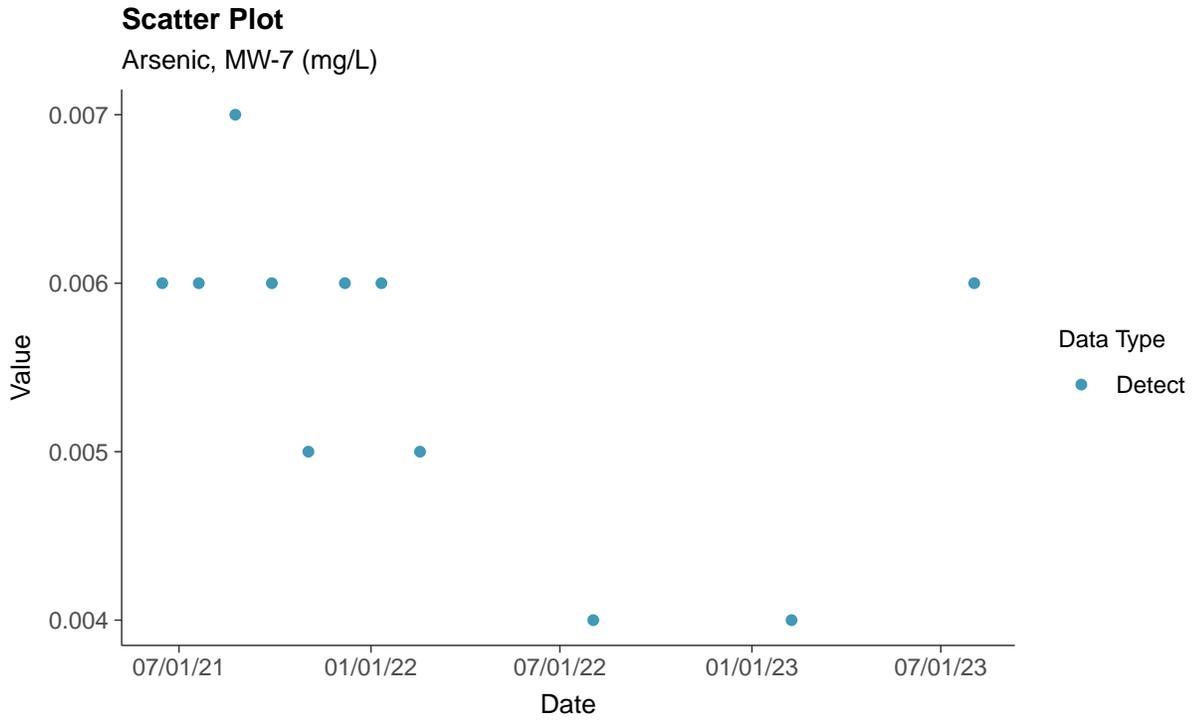
Antimony, MW-7 (mg/L)





Appendix IV: Arsenic, MW-7

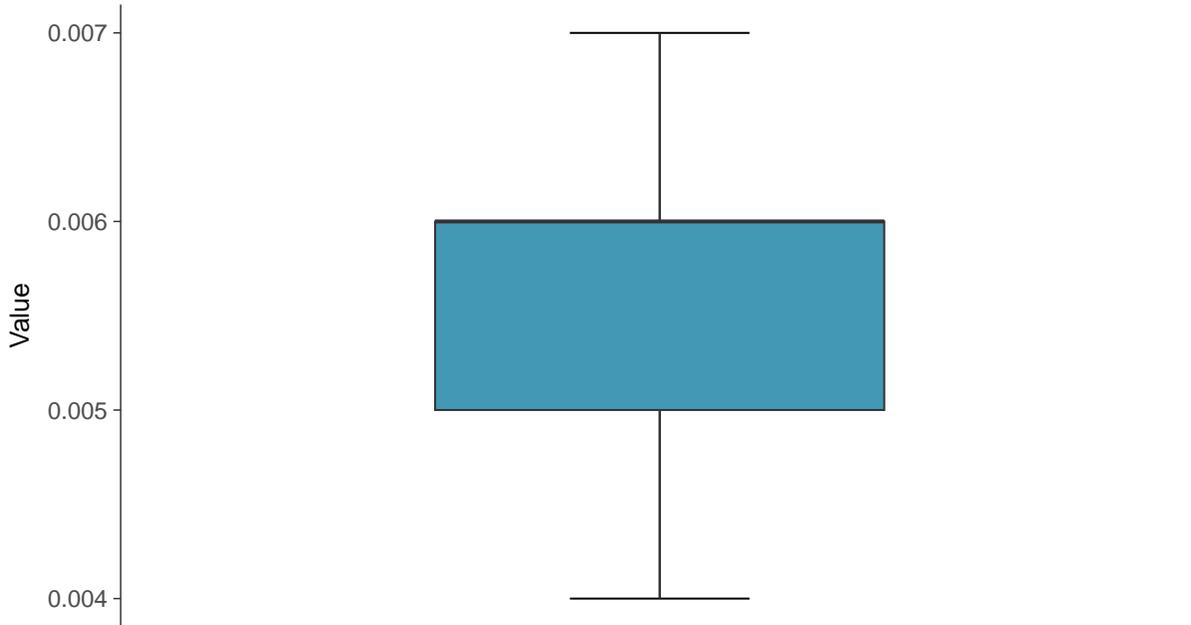
ID: 07_2_09





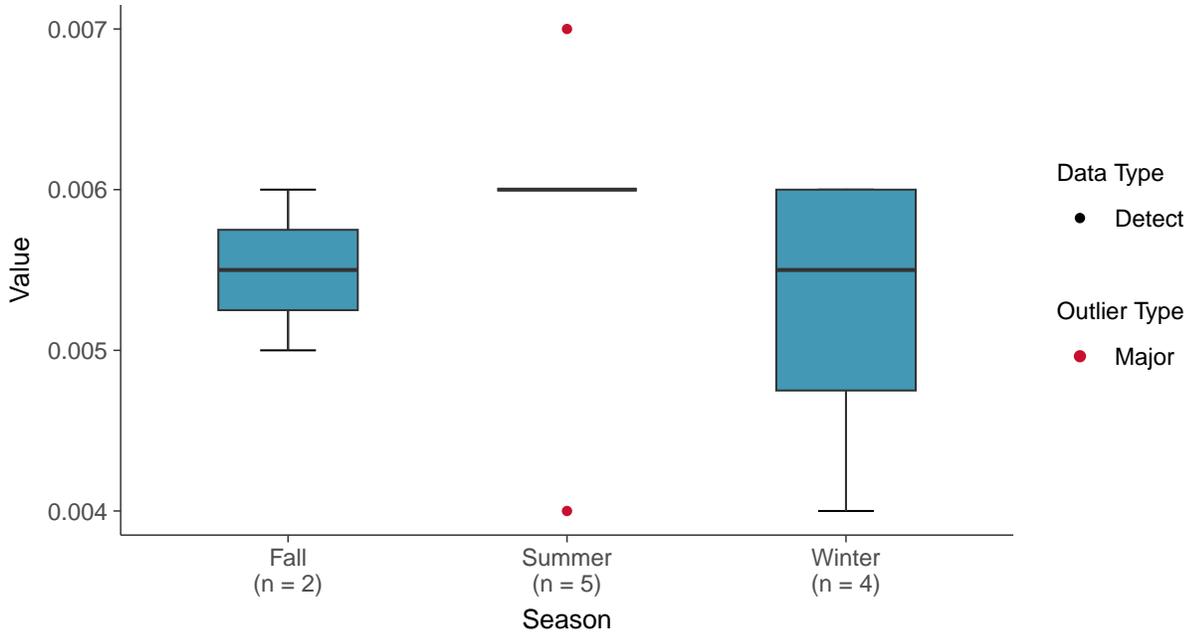
Boxplot

Arsenic, MW-7 (mg/L)



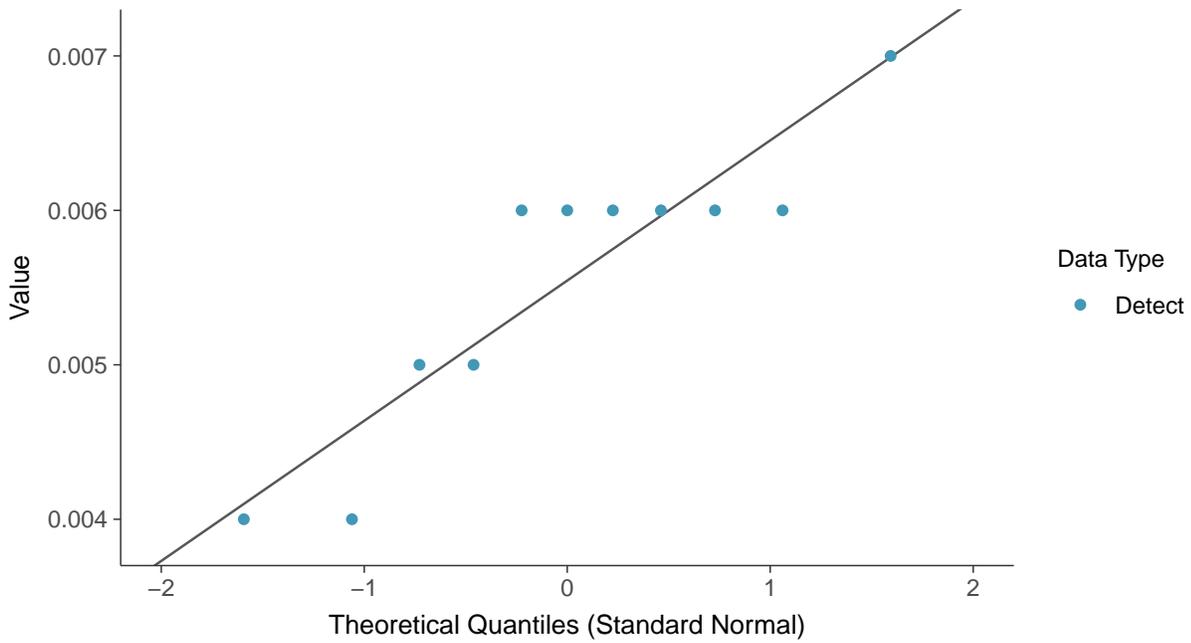
Boxplot by Season

Arsenic, MW-7 (mg/L)

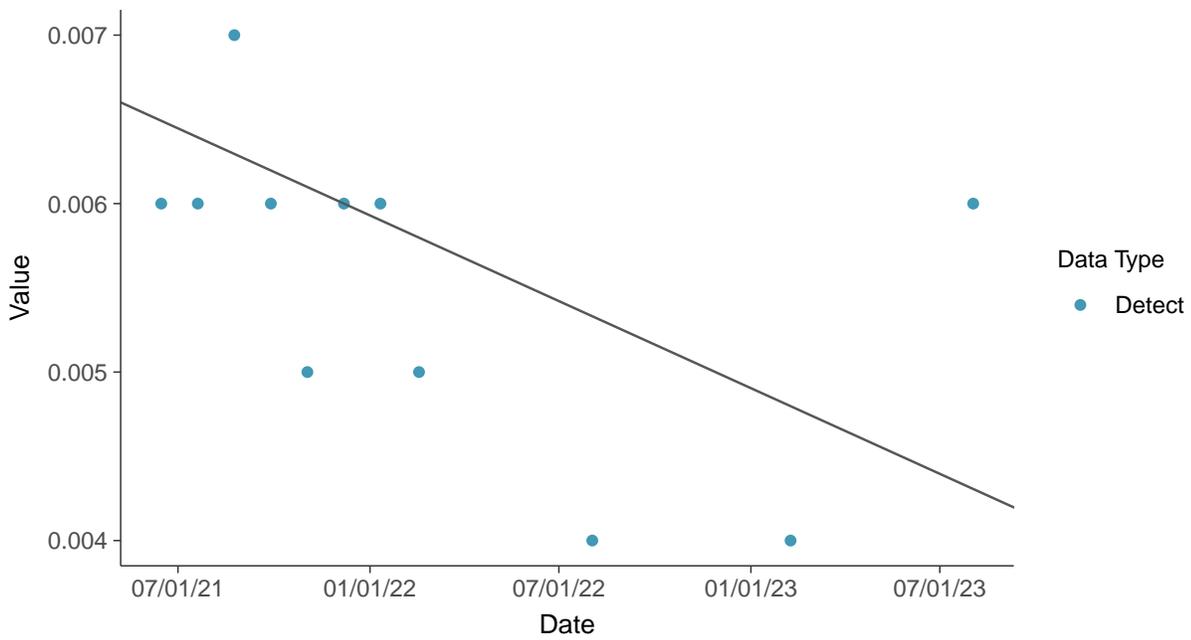




Normal Q-Q plot
Arsenic, MW-7 (mg/L)



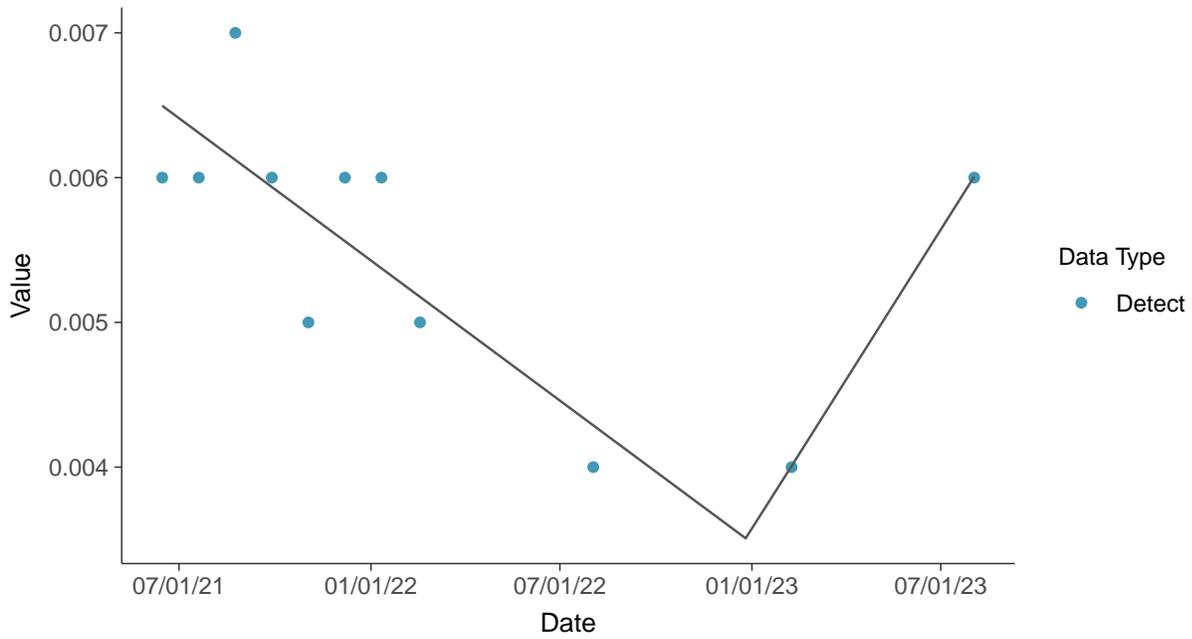
Trend Regression: Mann-Kendall/Theil-Sen Estimate
Arsenic, MW-7 (mg/L)





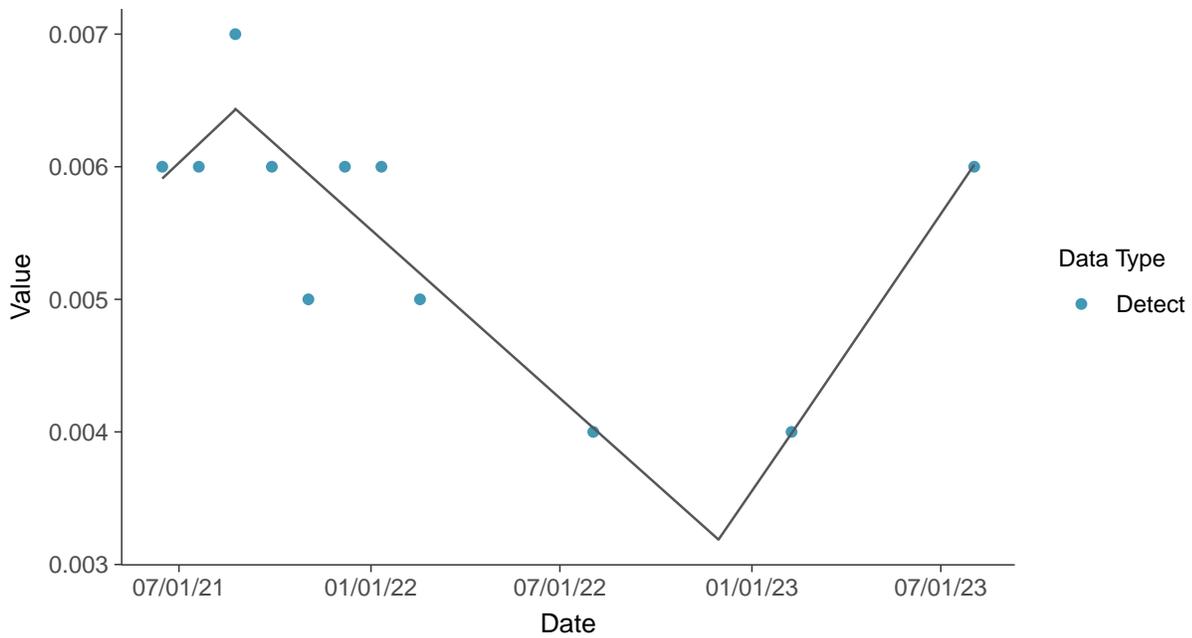
Trend Regression: Piecewise Linear-Linear

Arsenic, MW-7 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Arsenic, MW-7 (mg/L)



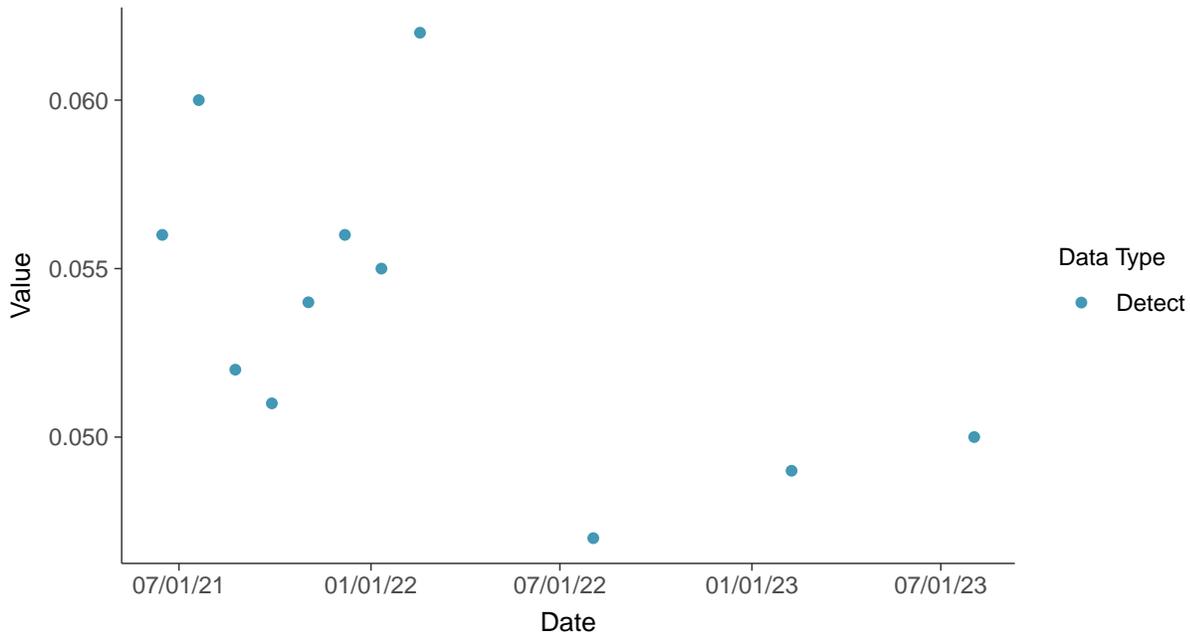


Appendix IV: Barium, MW-7

ID: 07_2_10

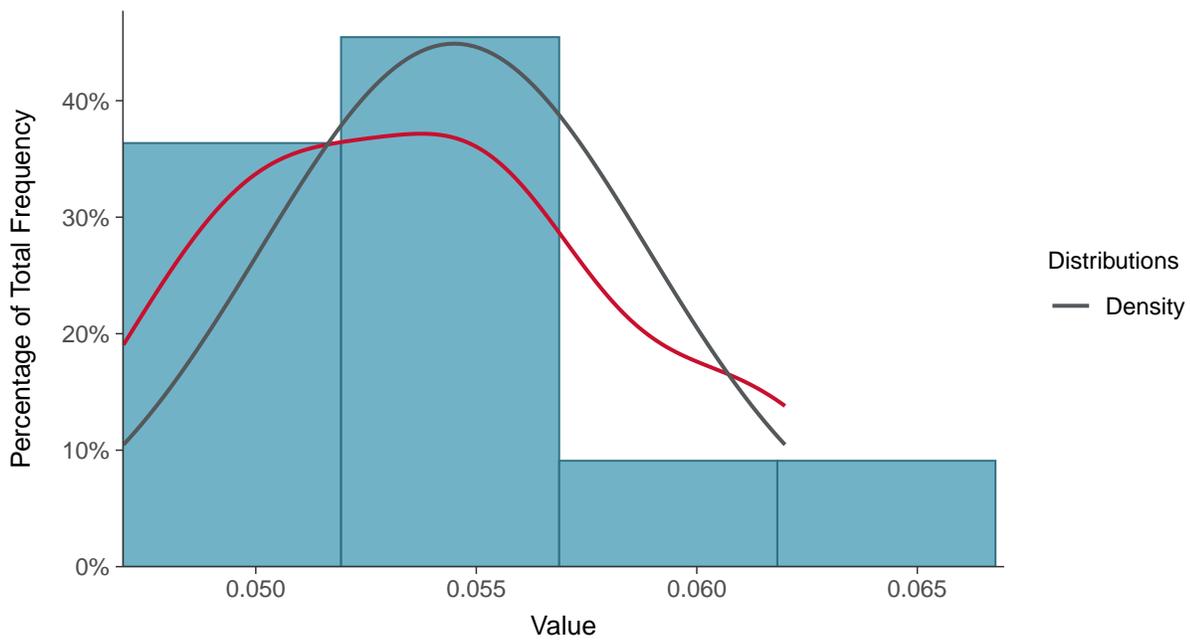
Scatter Plot

Barium, MW-7 (mg/L)



Histogram

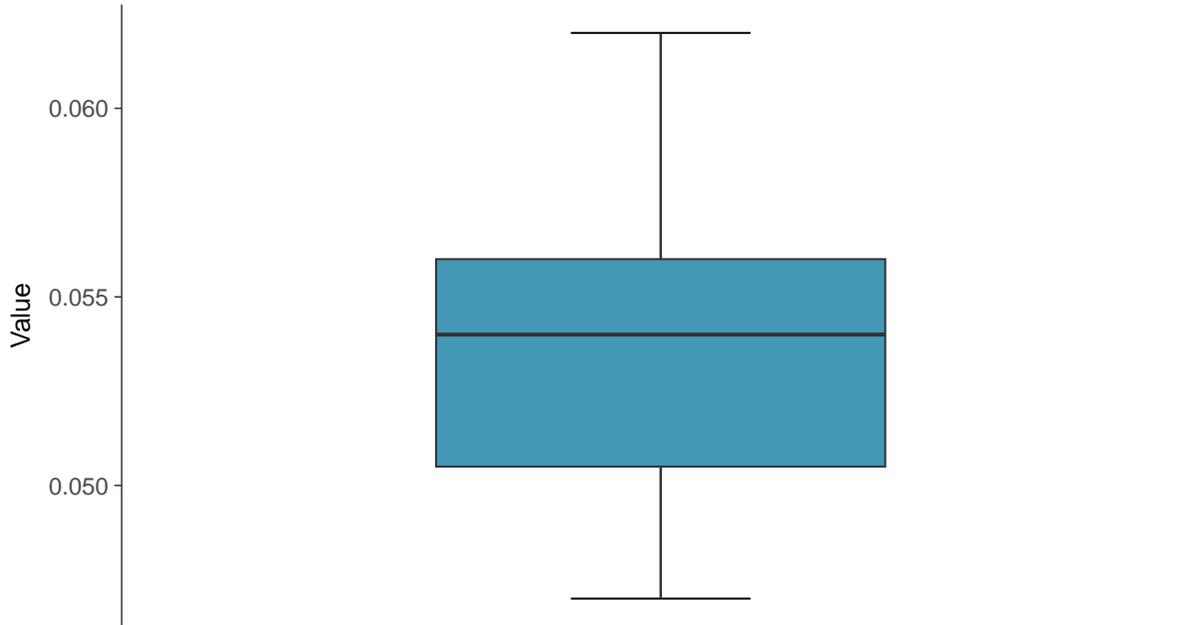
Barium, MW-7 (mg/L)





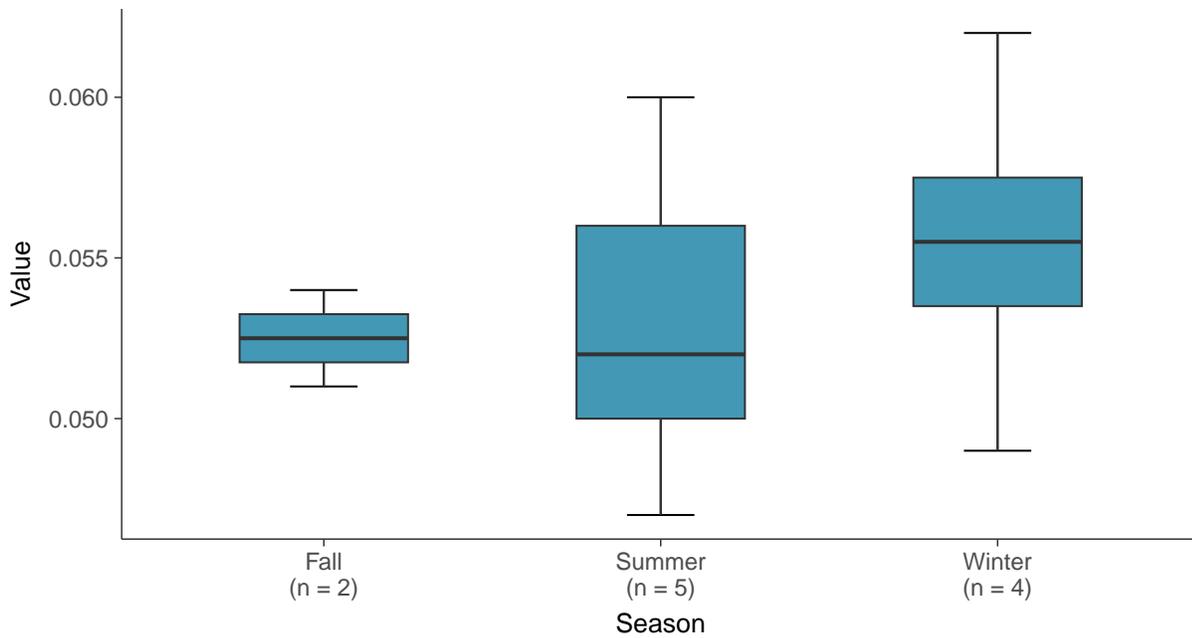
Boxplot

Barium, MW-7 (mg/L)



Boxplot by Season

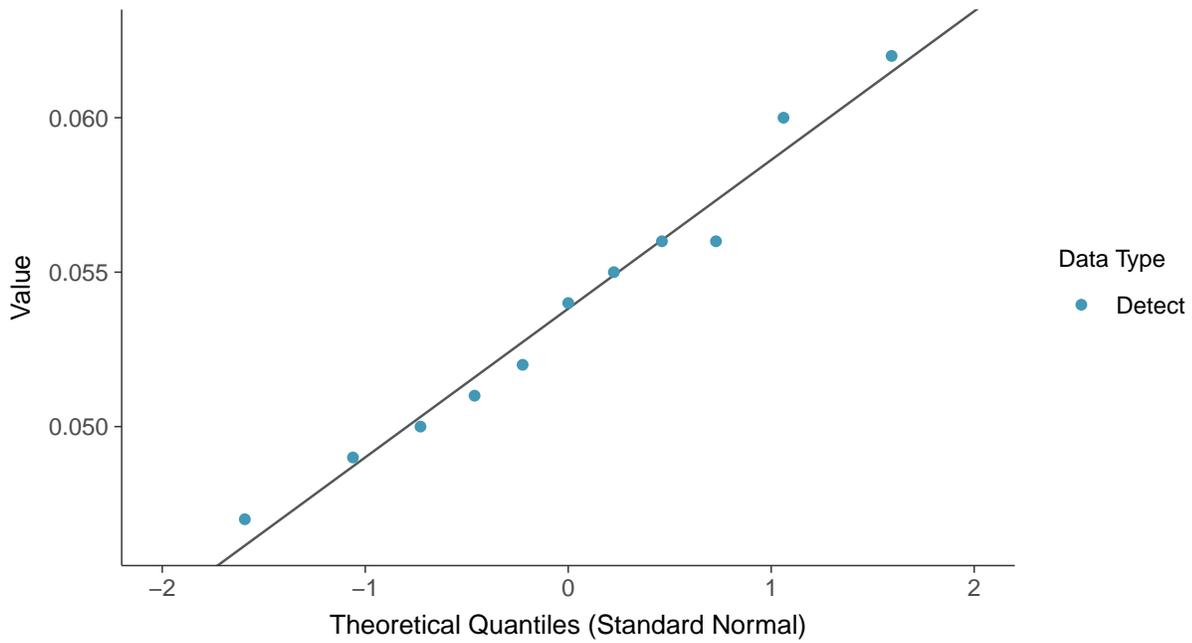
Barium, MW-7 (mg/L)





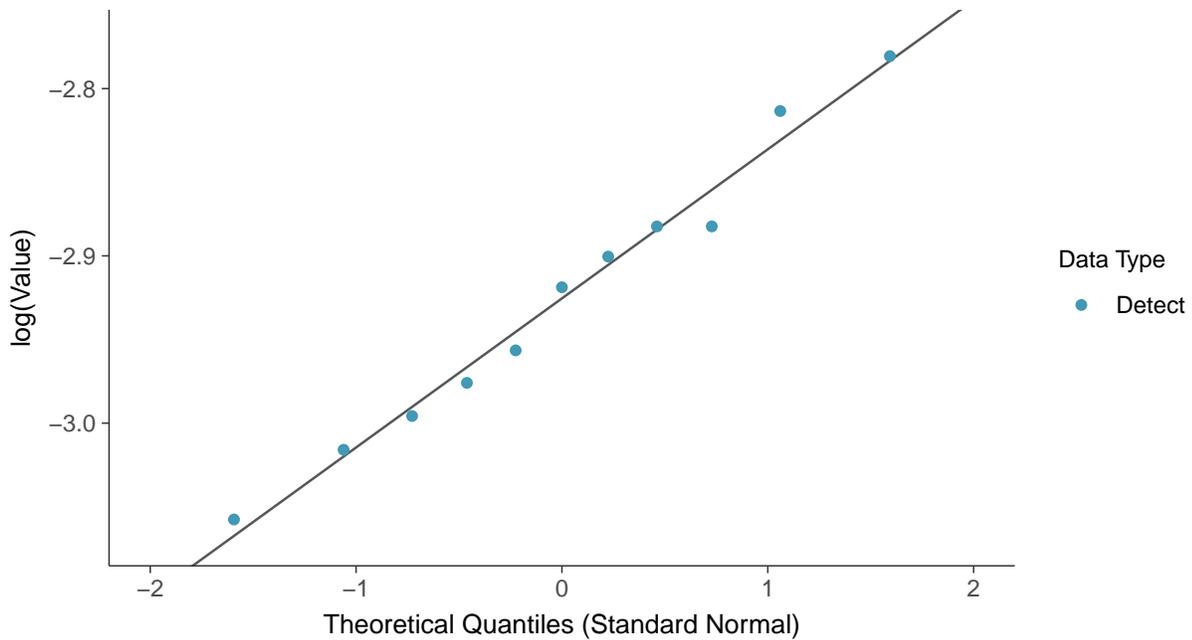
Normal Q-Q plot

Barium, MW-7 (mg/L)



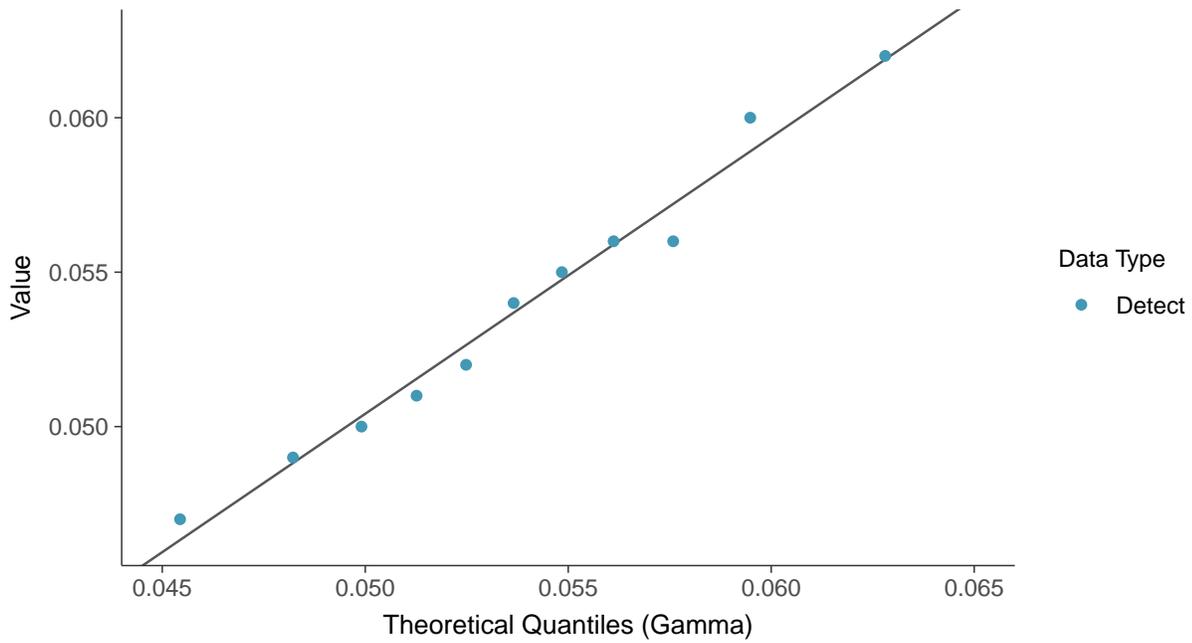
Lognormal Q-Q plot

Barium, MW-7 (mg/L)

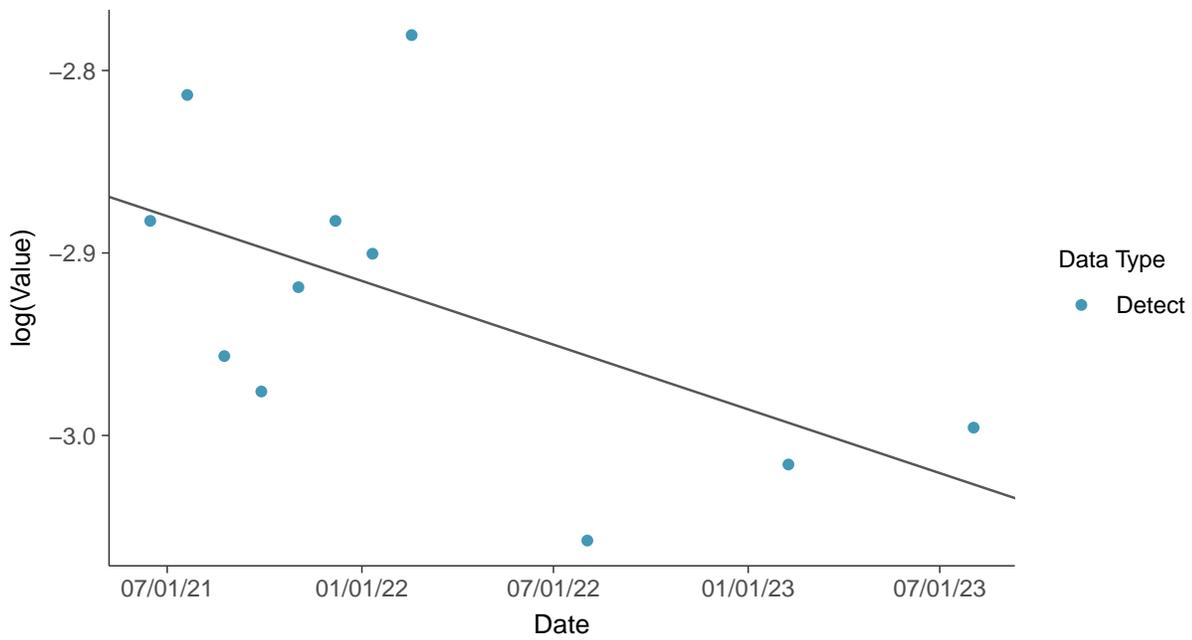




Gamma Q-Q plot
Barium, MW-7 (mg/L)



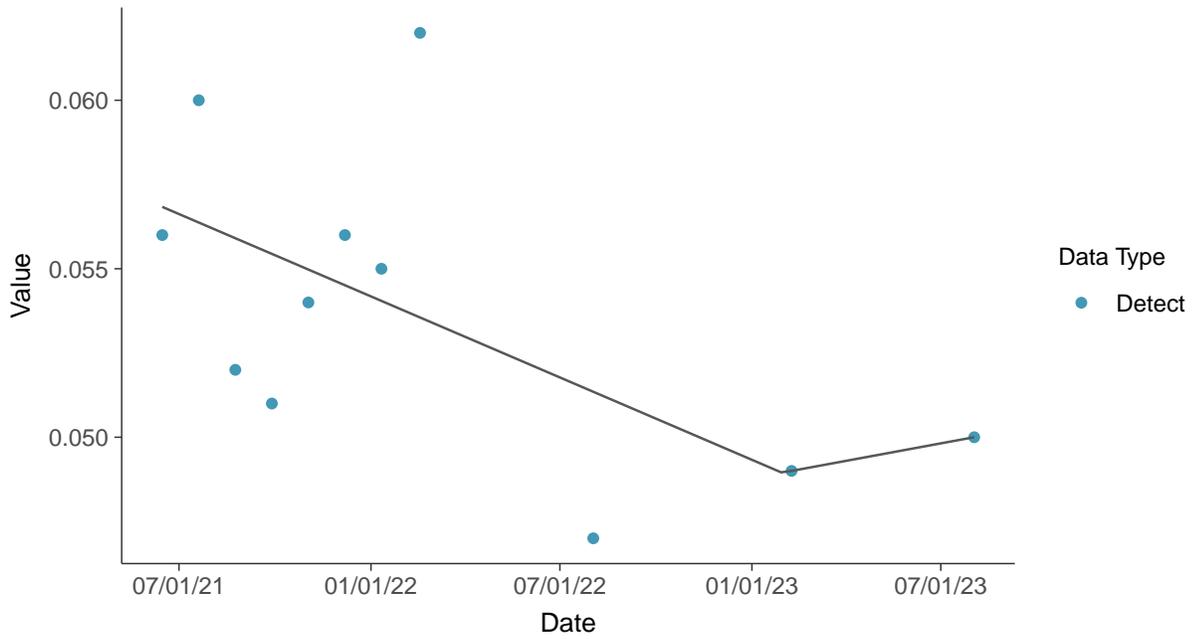
Trend Regression: Lognormal MLE
Barium, MW-7 (mg/L)





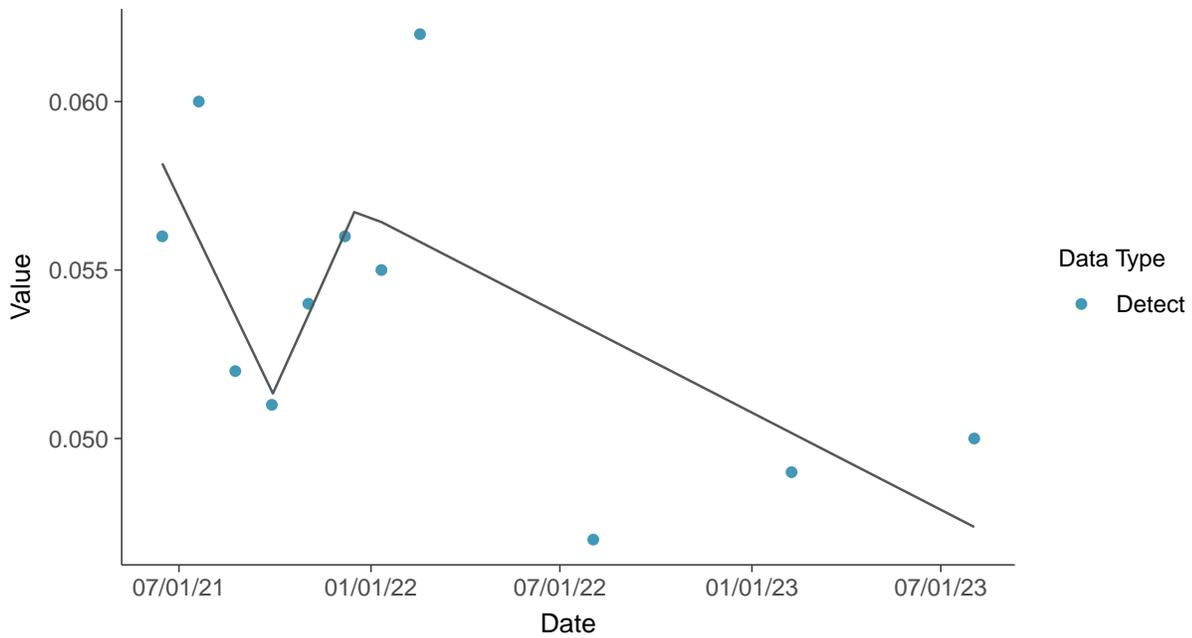
Trend Regression: Piecewise Linear-Linear

Barium, MW-7 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

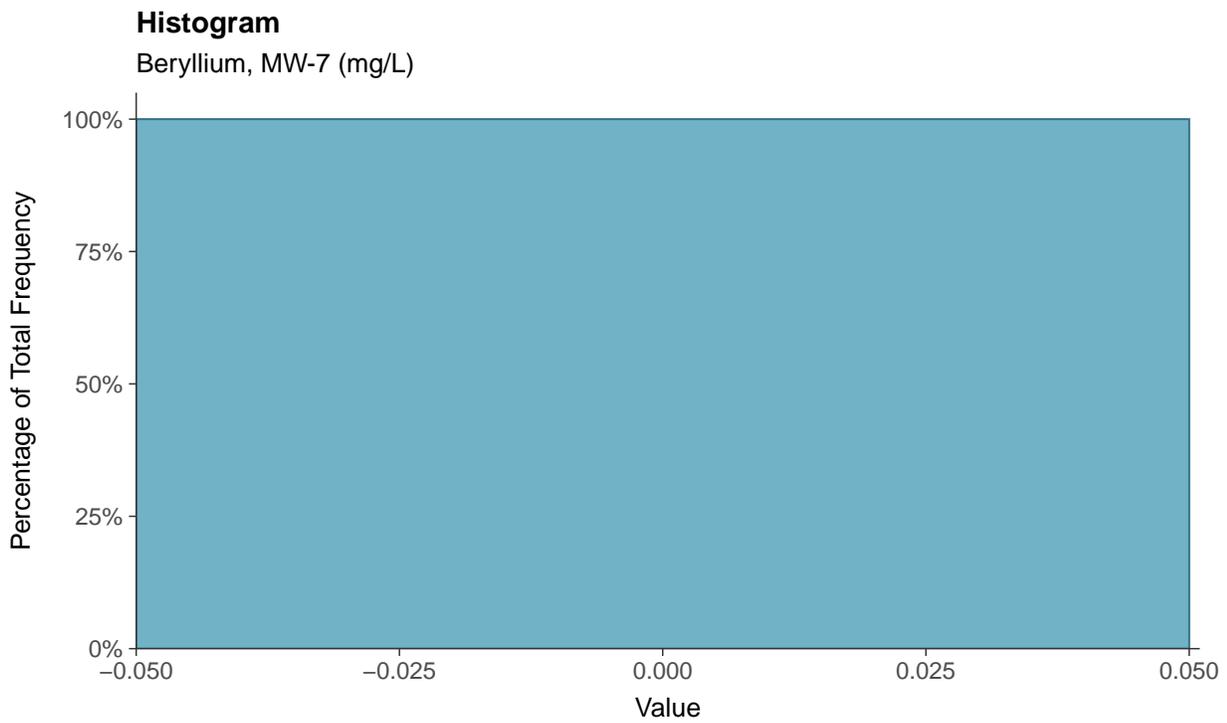
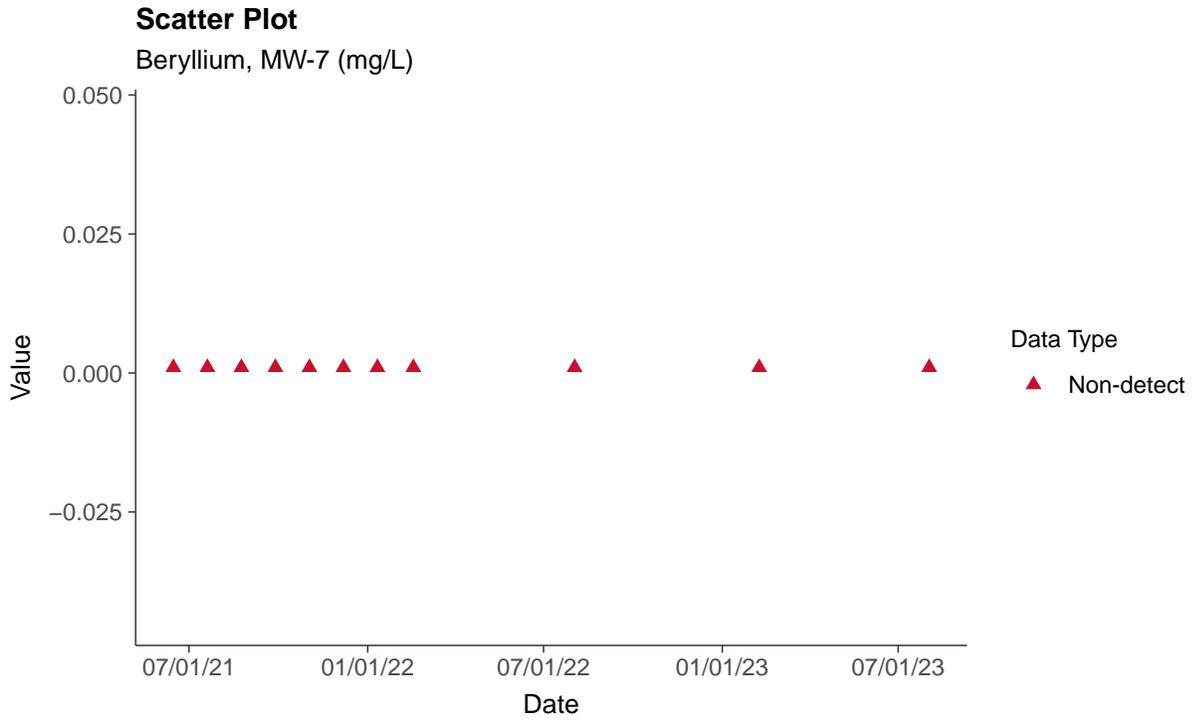
Barium, MW-7 (mg/L)





Appendix IV: Beryllium, MW-7

ID: 07_2_11





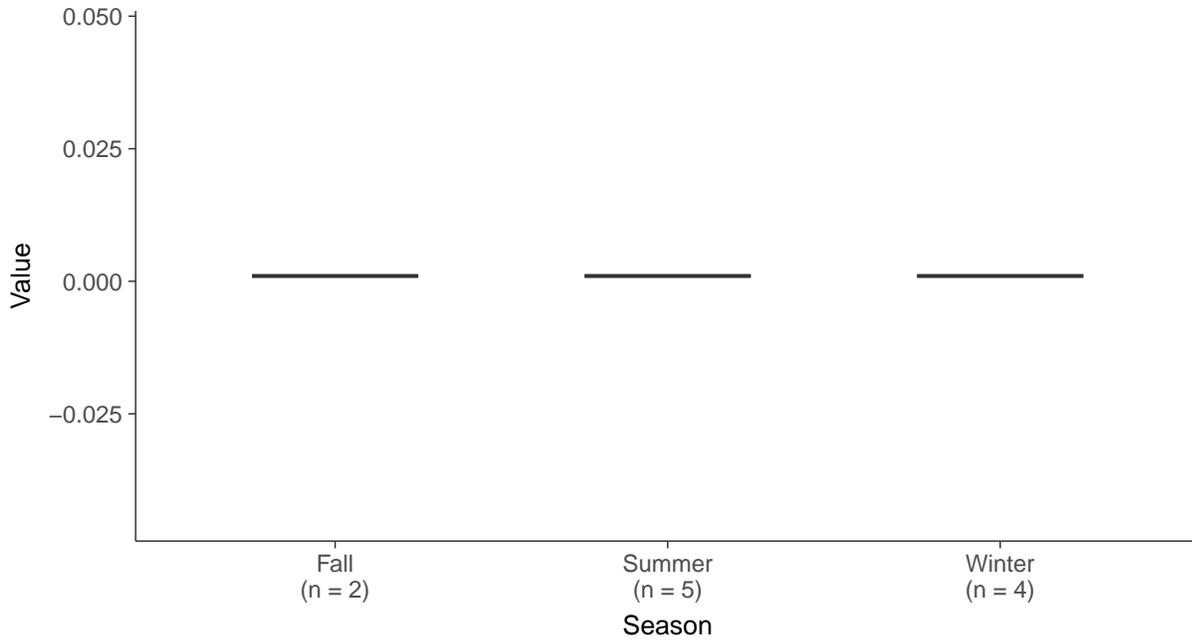
Boxplot

Beryllium, MW-7 (mg/L)



Boxplot by Season

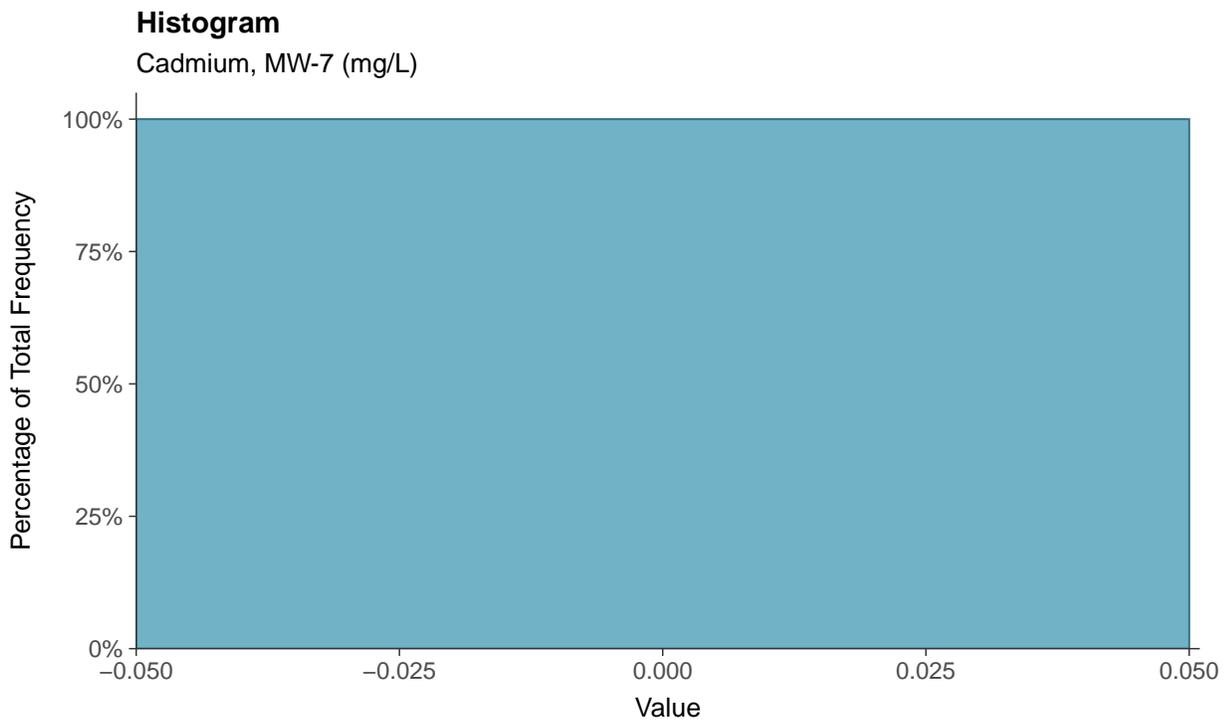
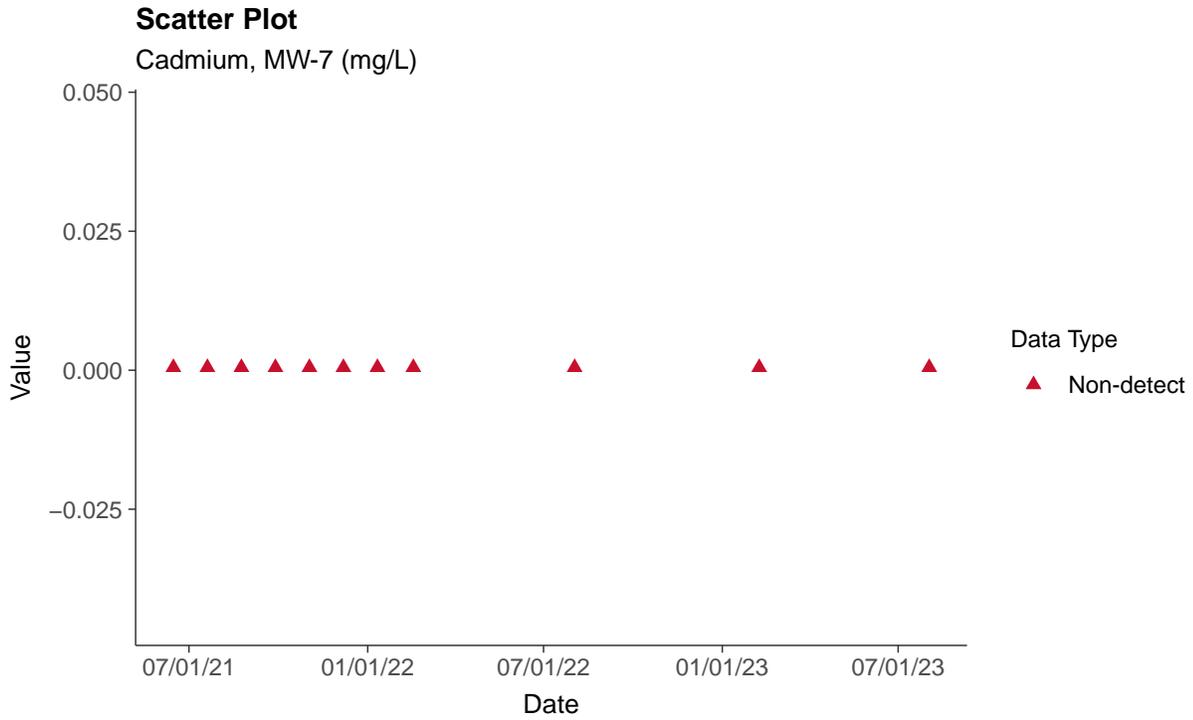
Beryllium, MW-7 (mg/L)





Appendix IV: Cadmium, MW-7

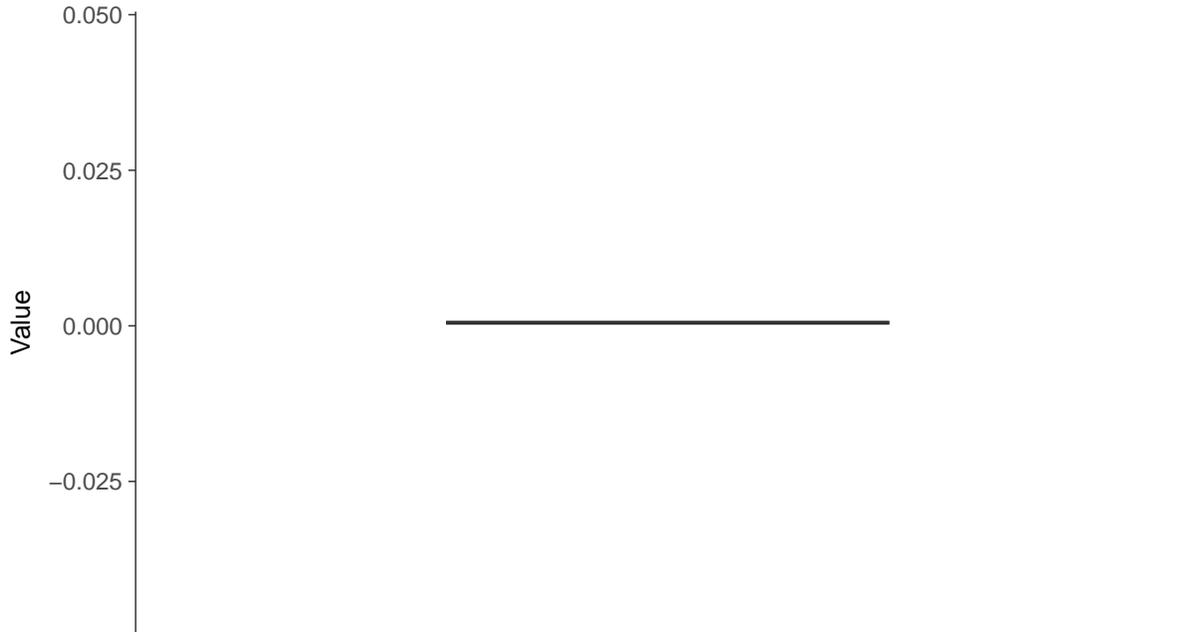
ID: 07_2_12





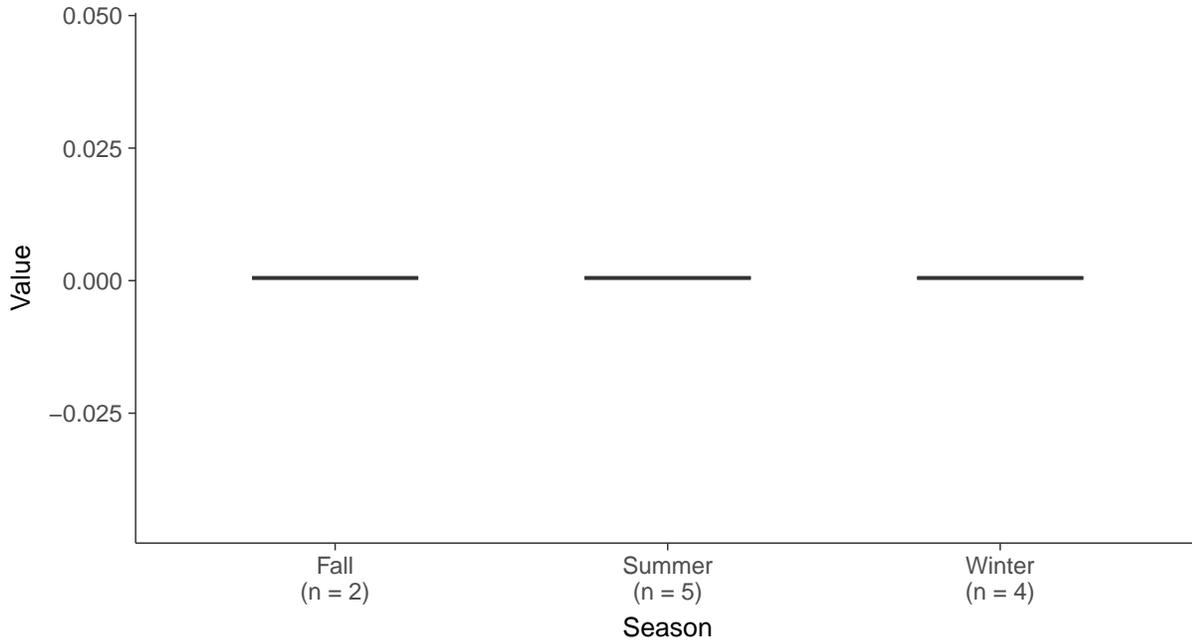
Boxplot

Cadmium, MW-7 (mg/L)



Boxplot by Season

Cadmium, MW-7 (mg/L)



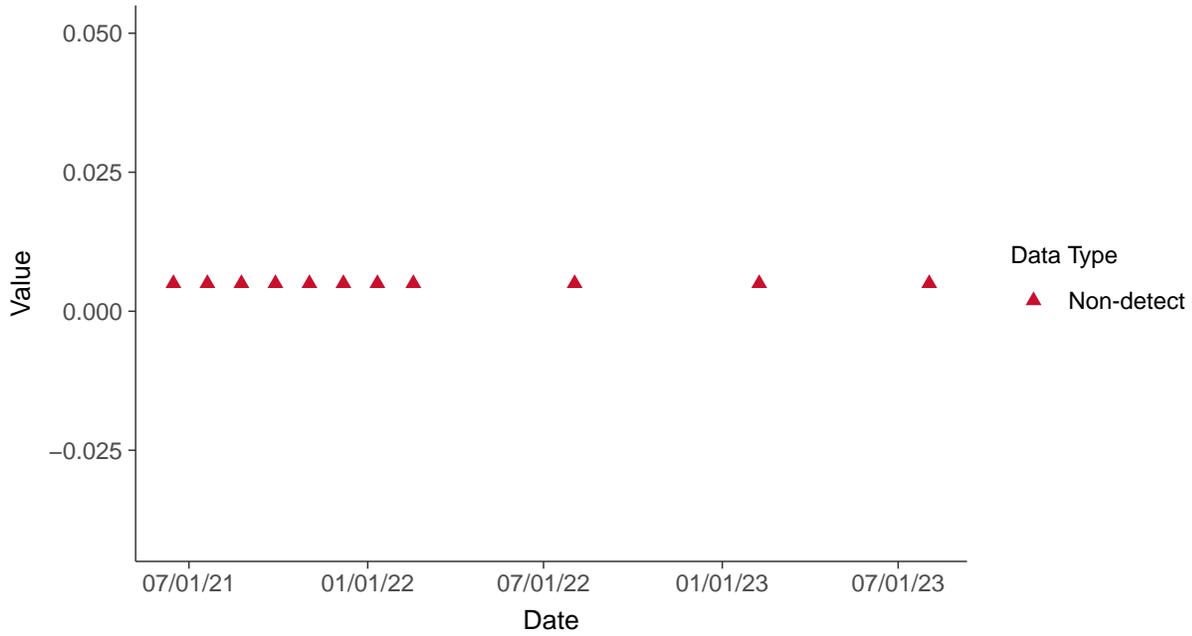


Appendix IV: Chromium, MW-7

ID: 07_2_13

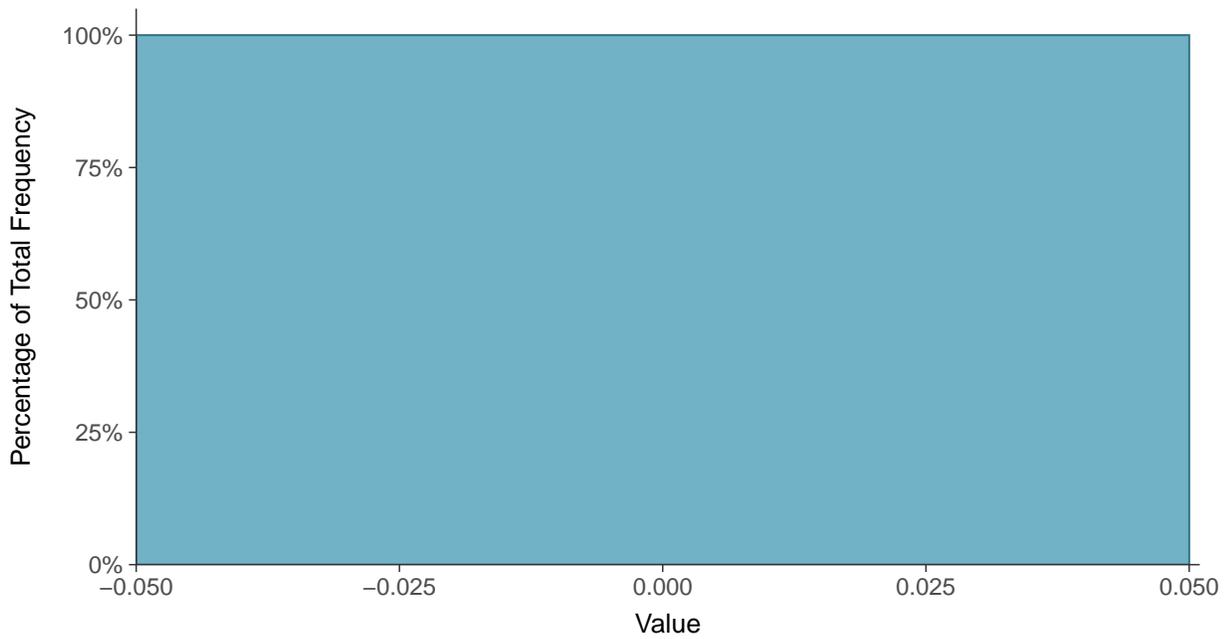
Scatter Plot

Chromium, MW-7 (mg/L)



Histogram

Chromium, MW-7 (mg/L)





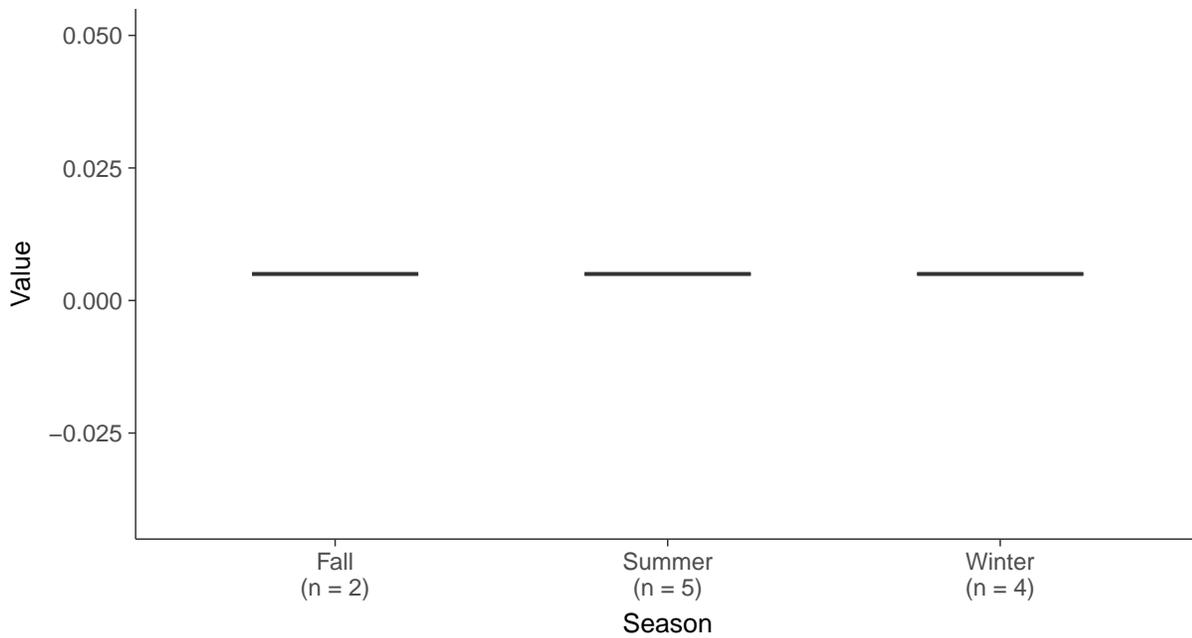
Boxplot

Chromium, MW-7 (mg/L)



Boxplot by Season

Chromium, MW-7 (mg/L)



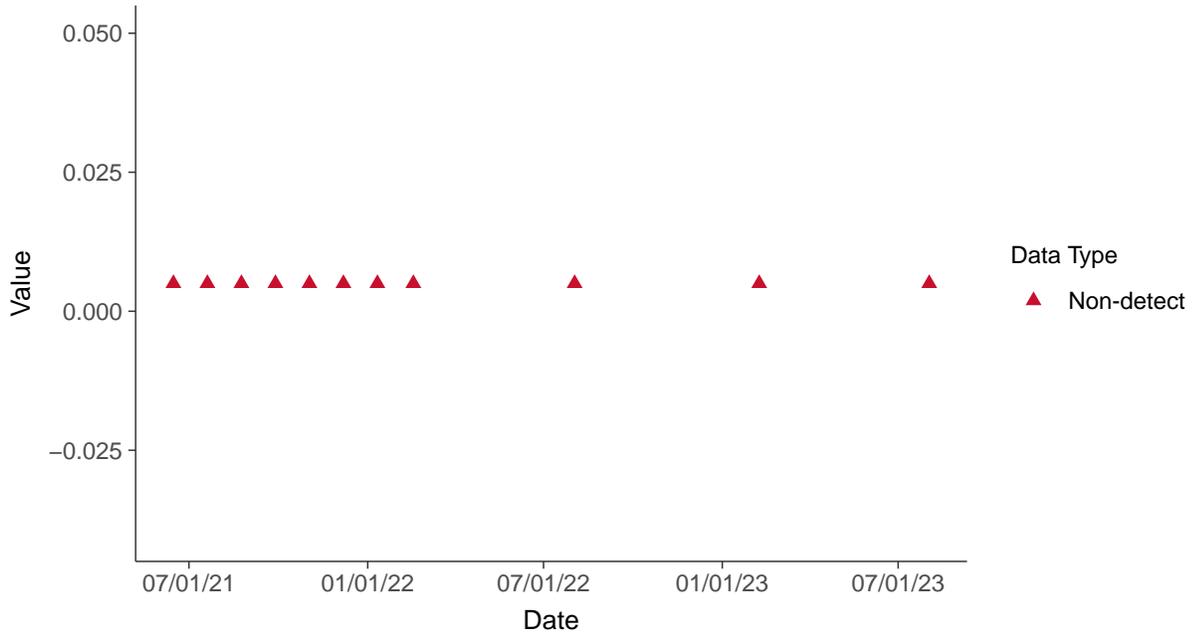


Appendix IV: Cobalt, MW-7

ID: 07_2_14

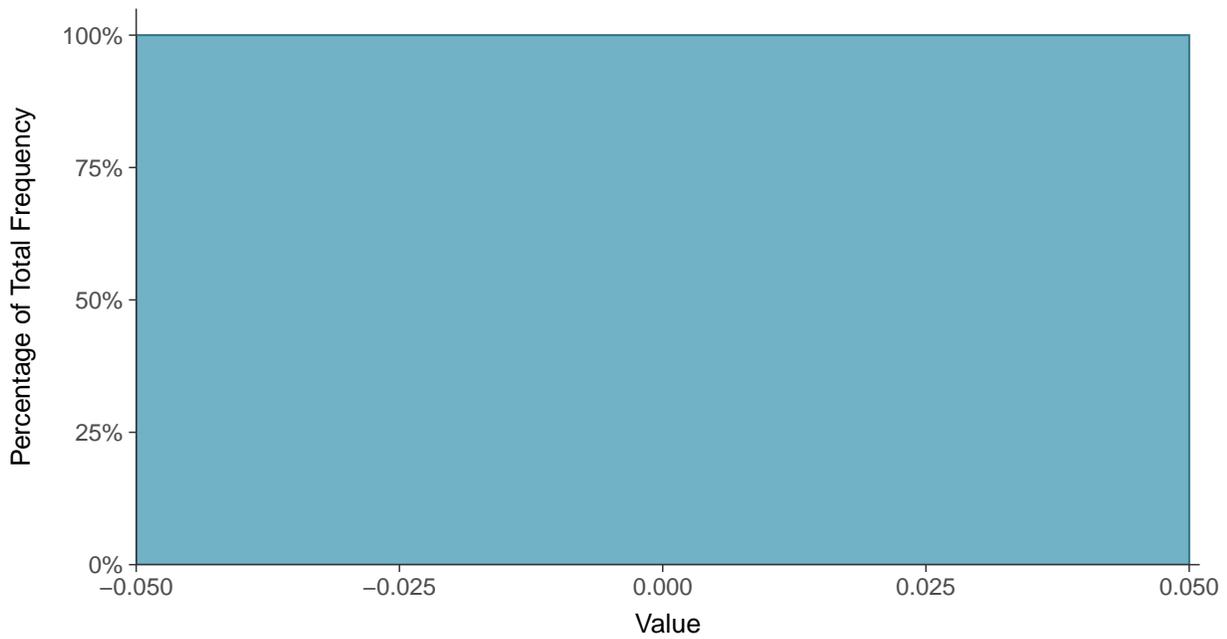
Scatter Plot

Cobalt, MW-7 (mg/L)



Histogram

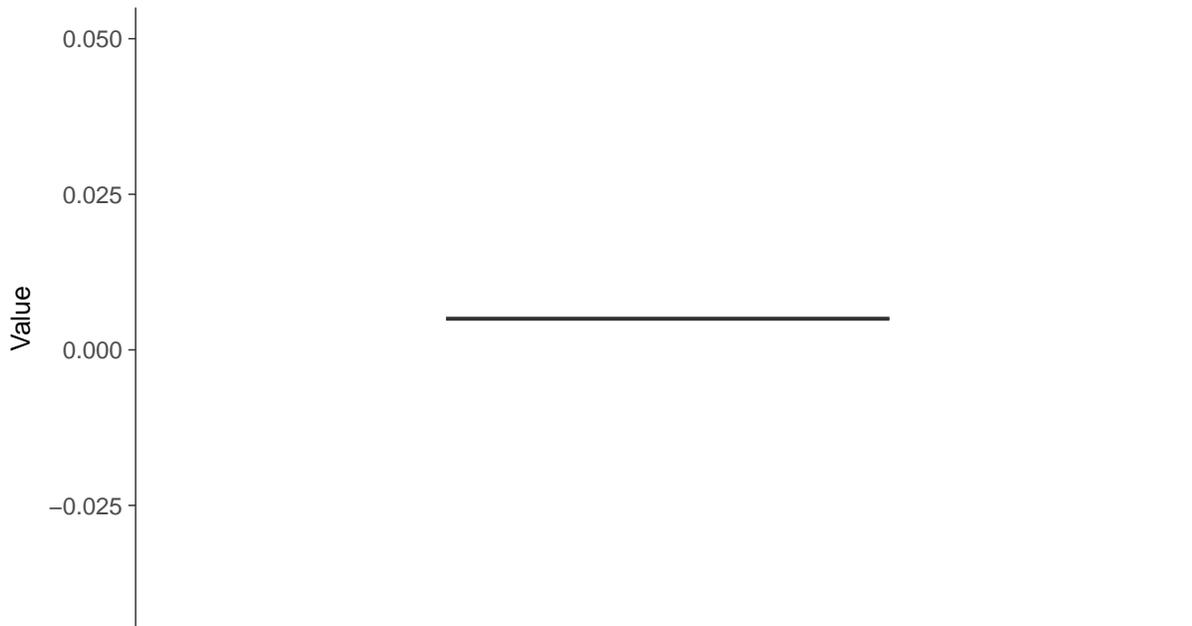
Cobalt, MW-7 (mg/L)





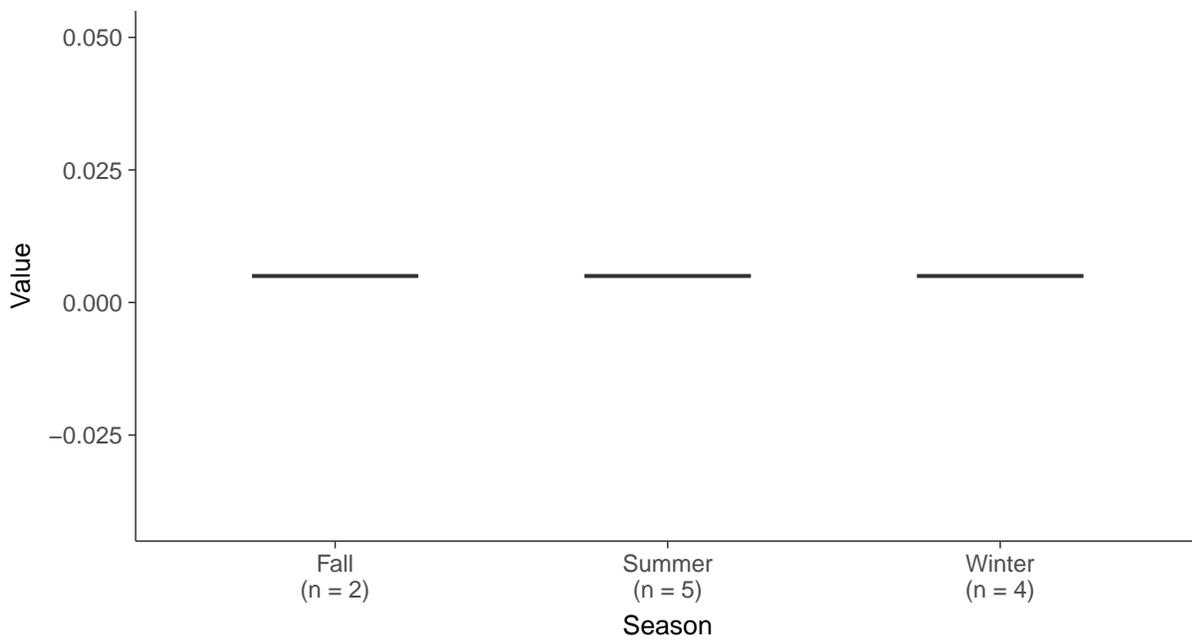
Boxplot

Cobalt, MW-7 (mg/L)



Boxplot by Season

Cobalt, MW-7 (mg/L)



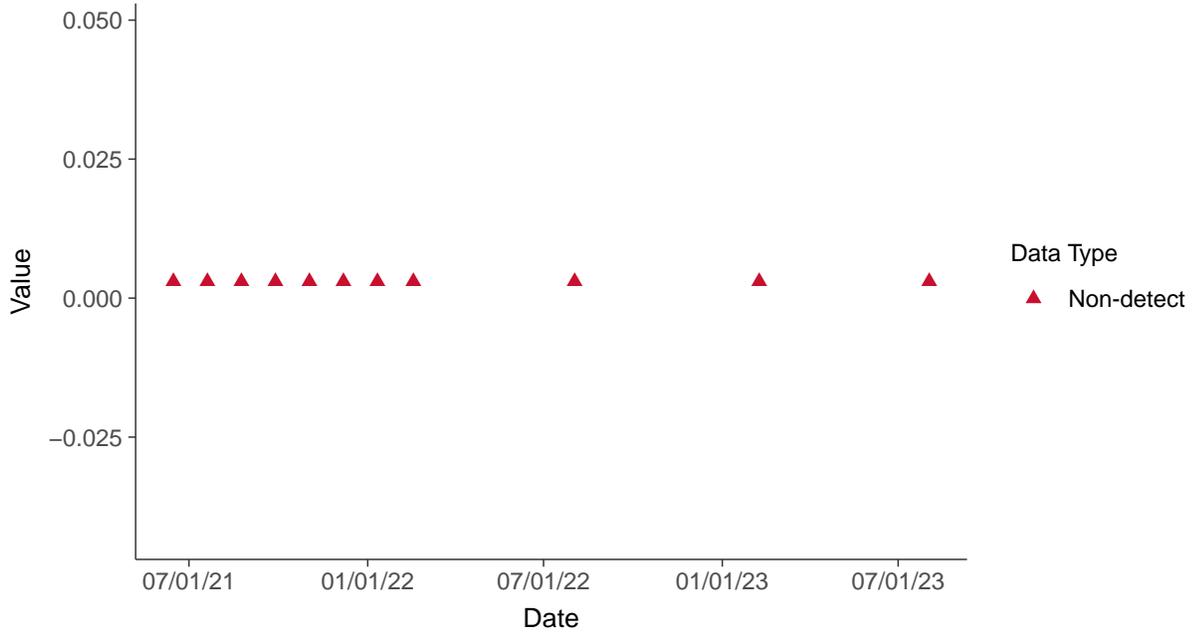


Appendix IV: Lead, MW-7

ID: 07_2_15

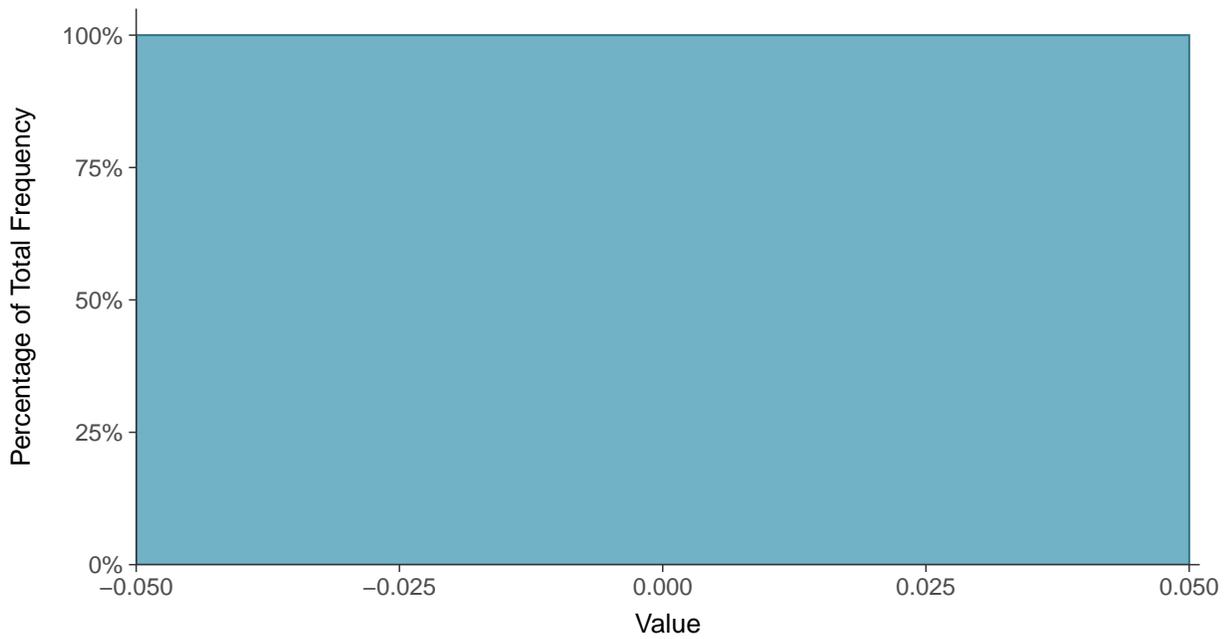
Scatter Plot

Lead, MW-7 (mg/L)



Histogram

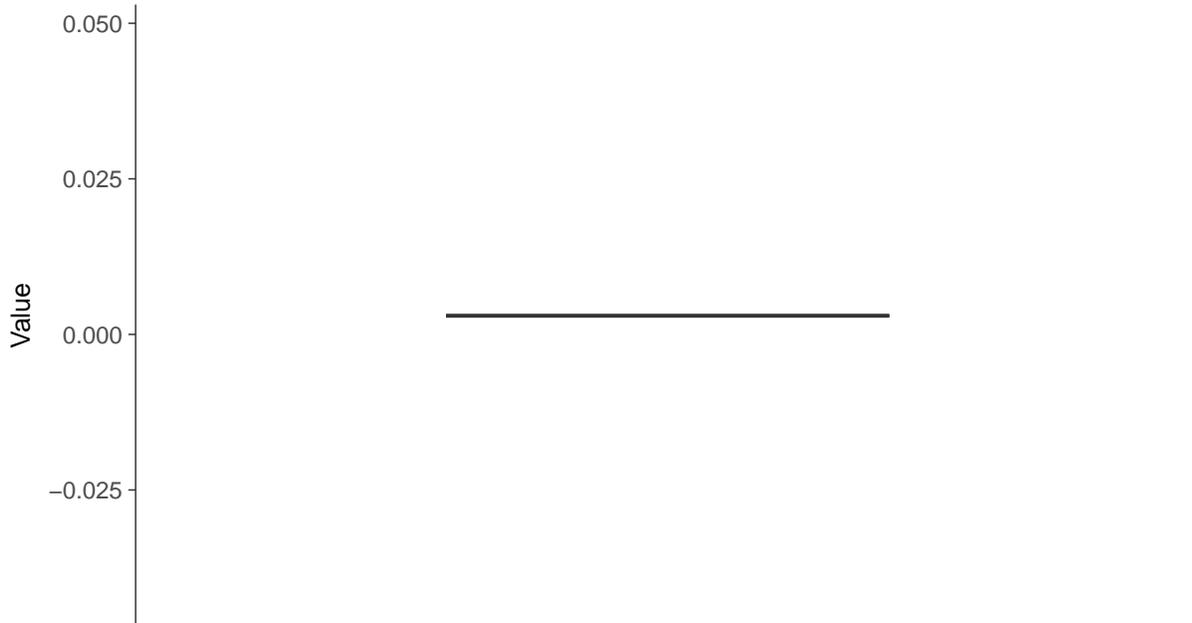
Lead, MW-7 (mg/L)





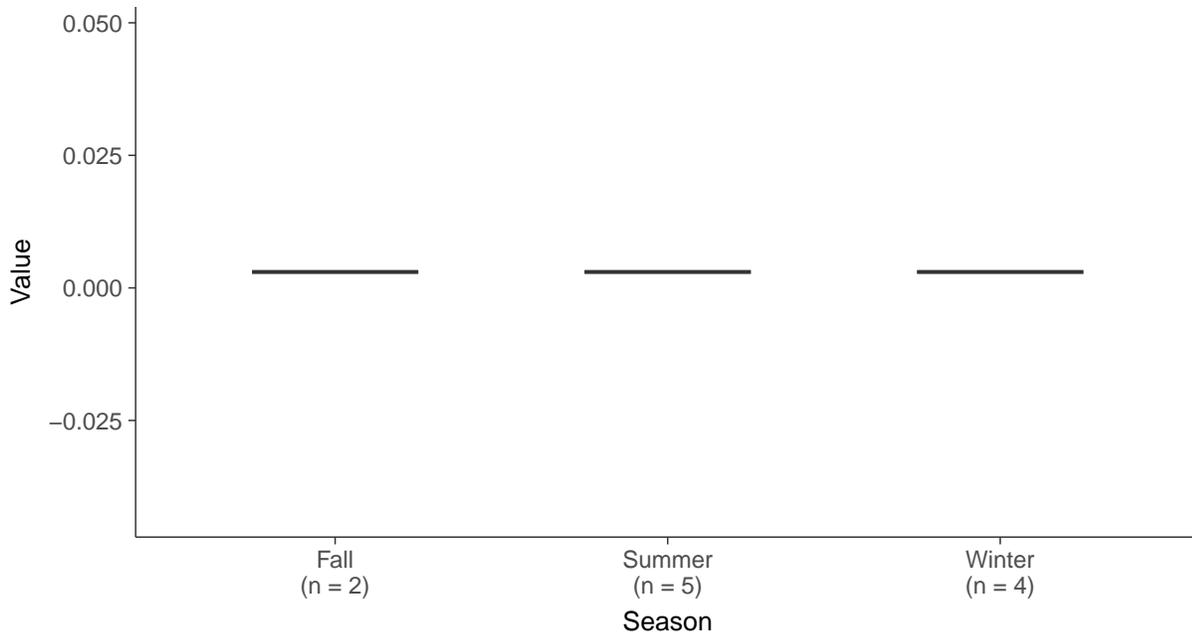
Boxplot

Lead, MW-7 (mg/L)



Boxplot by Season

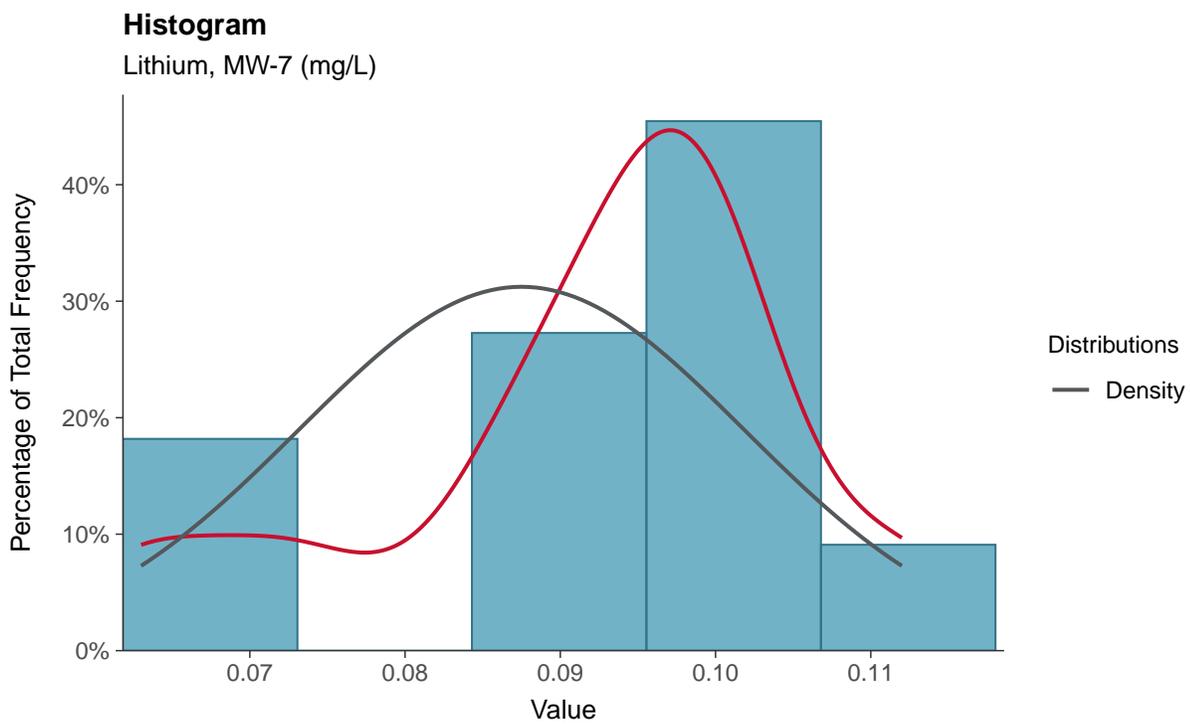
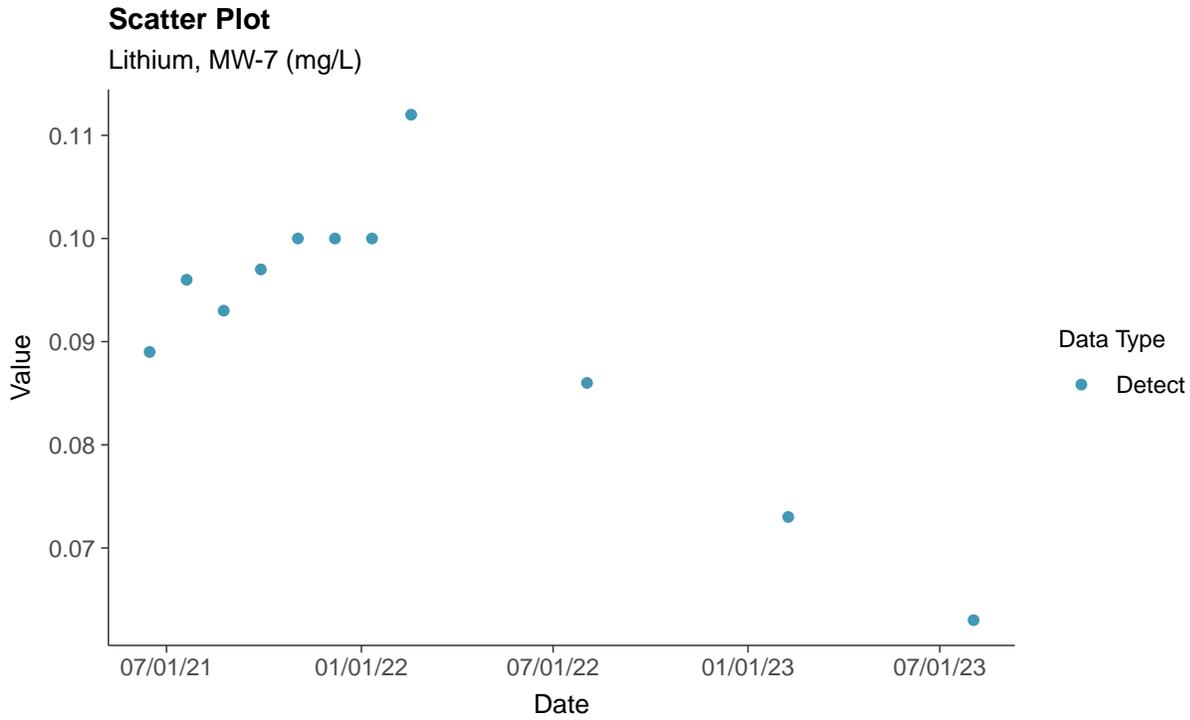
Lead, MW-7 (mg/L)





Appendix IV: Lithium, MW-7

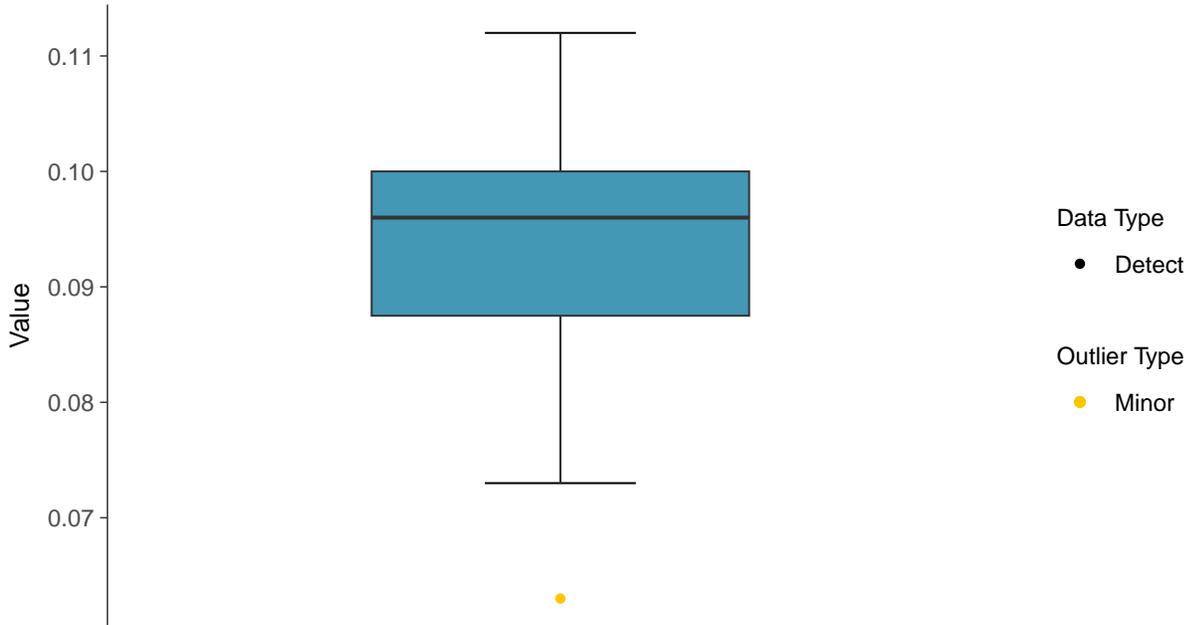
ID: 07_2_16





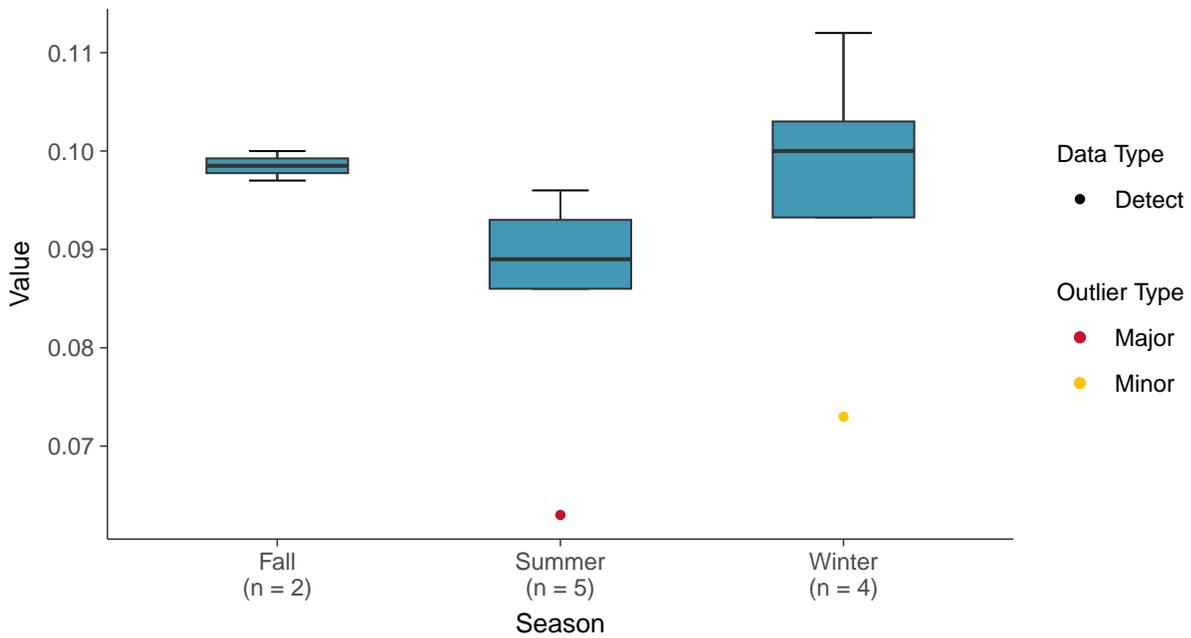
Boxplot

Lithium, MW-7 (mg/L)



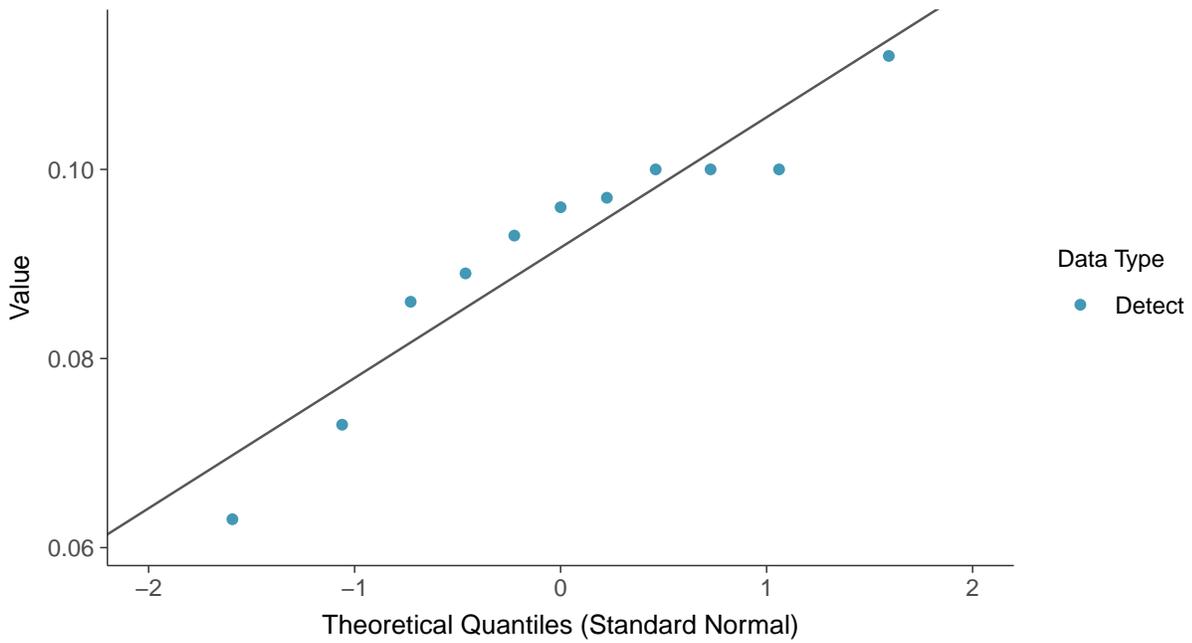
Boxplot by Season

Lithium, MW-7 (mg/L)

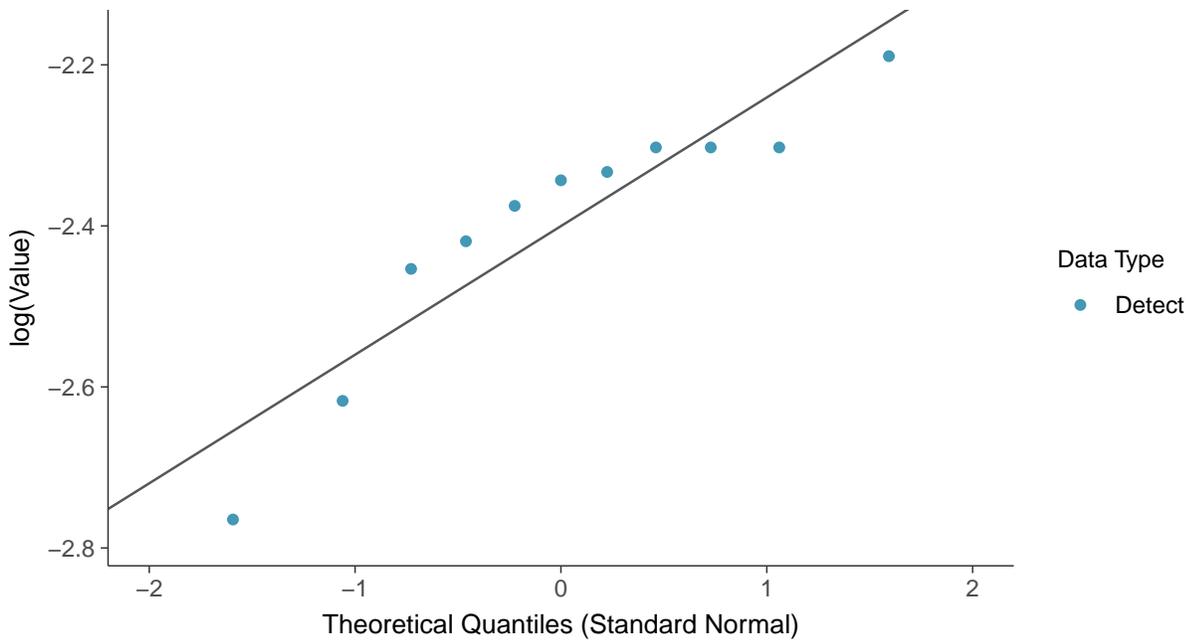




Normal Q-Q plot
Lithium, MW-7 (mg/L)

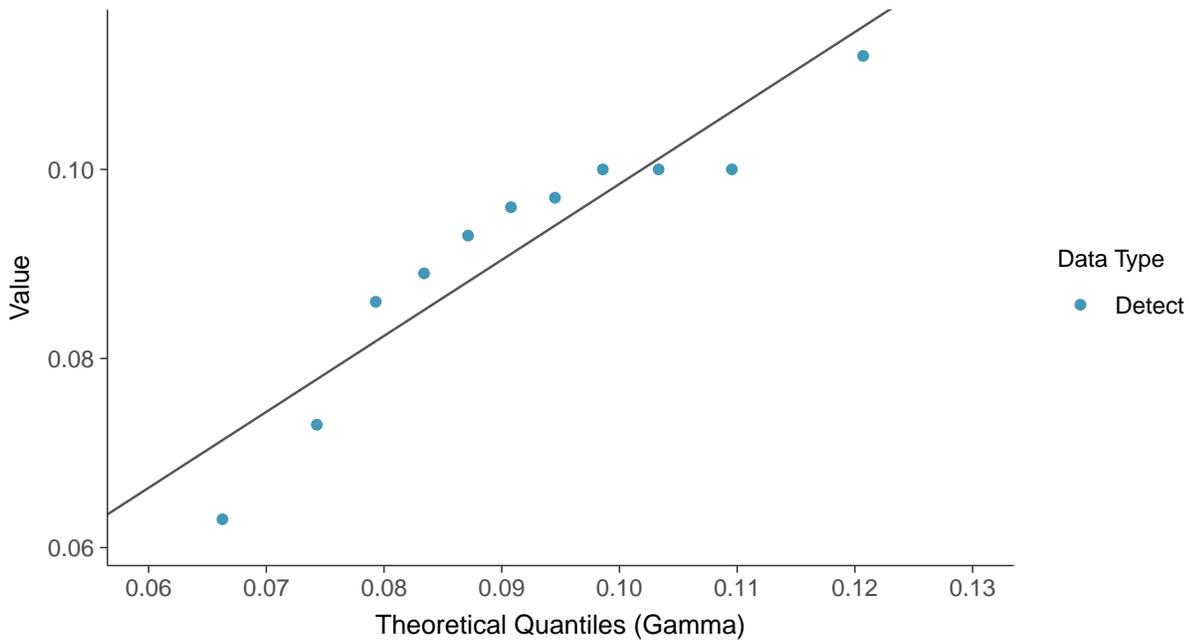


Lognormal Q-Q plot
Lithium, MW-7 (mg/L)

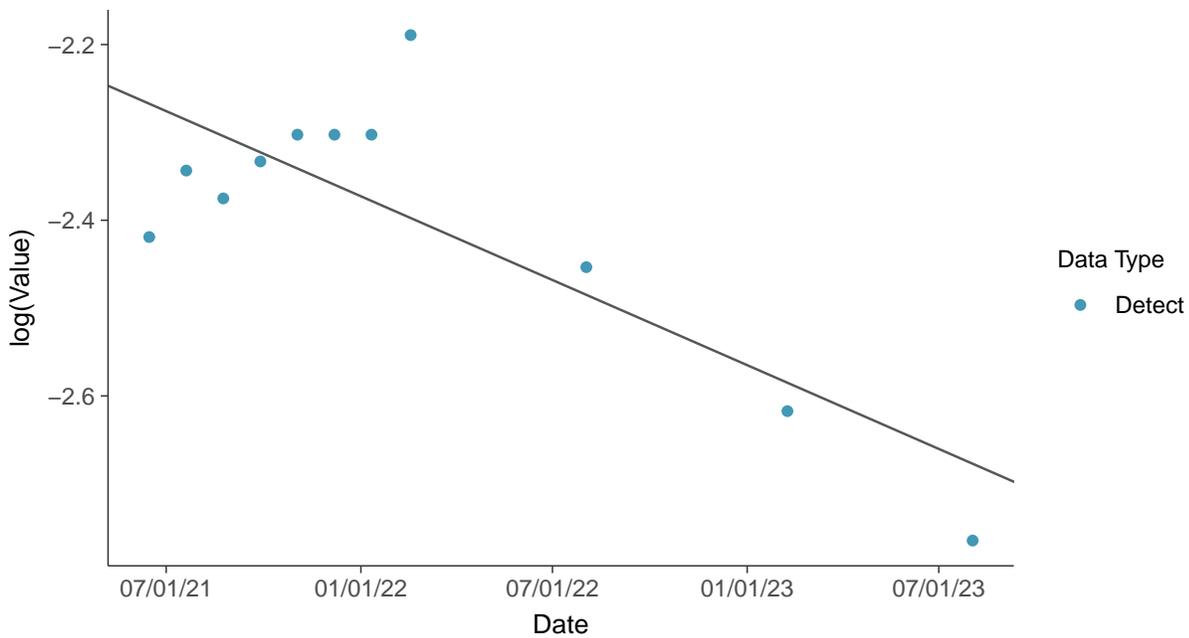




Gamma Q-Q plot
Lithium, MW-7 (mg/L)



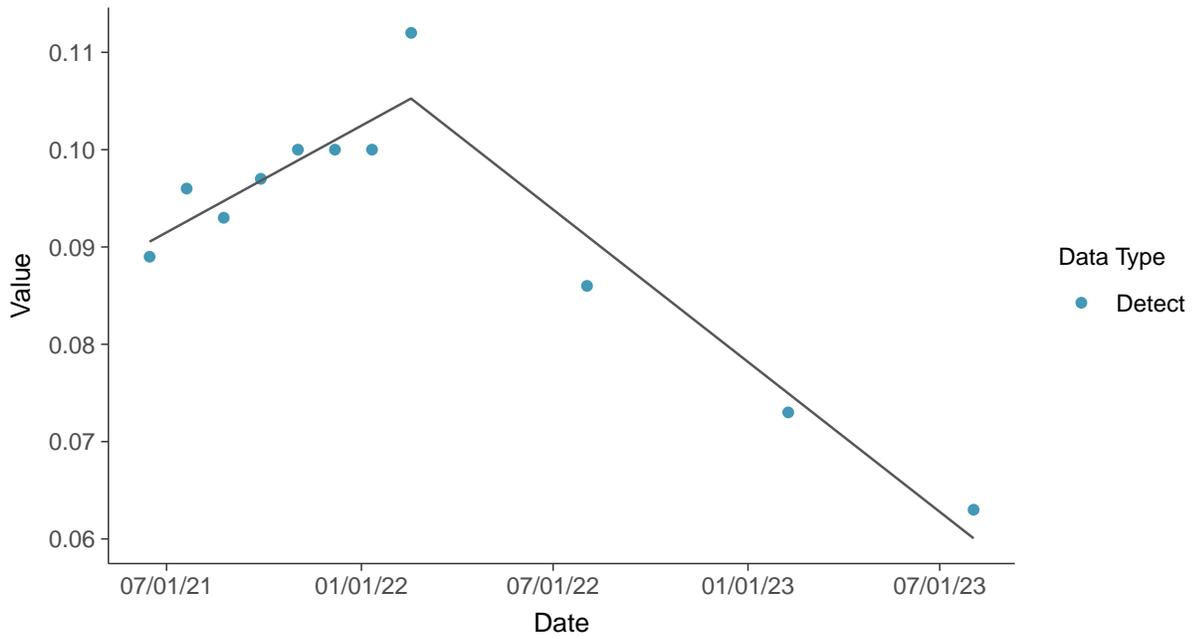
Trend Regression: Lognormal MLE
Lithium, MW-7 (mg/L)





Trend Regression: Piecewise Linear-Linear

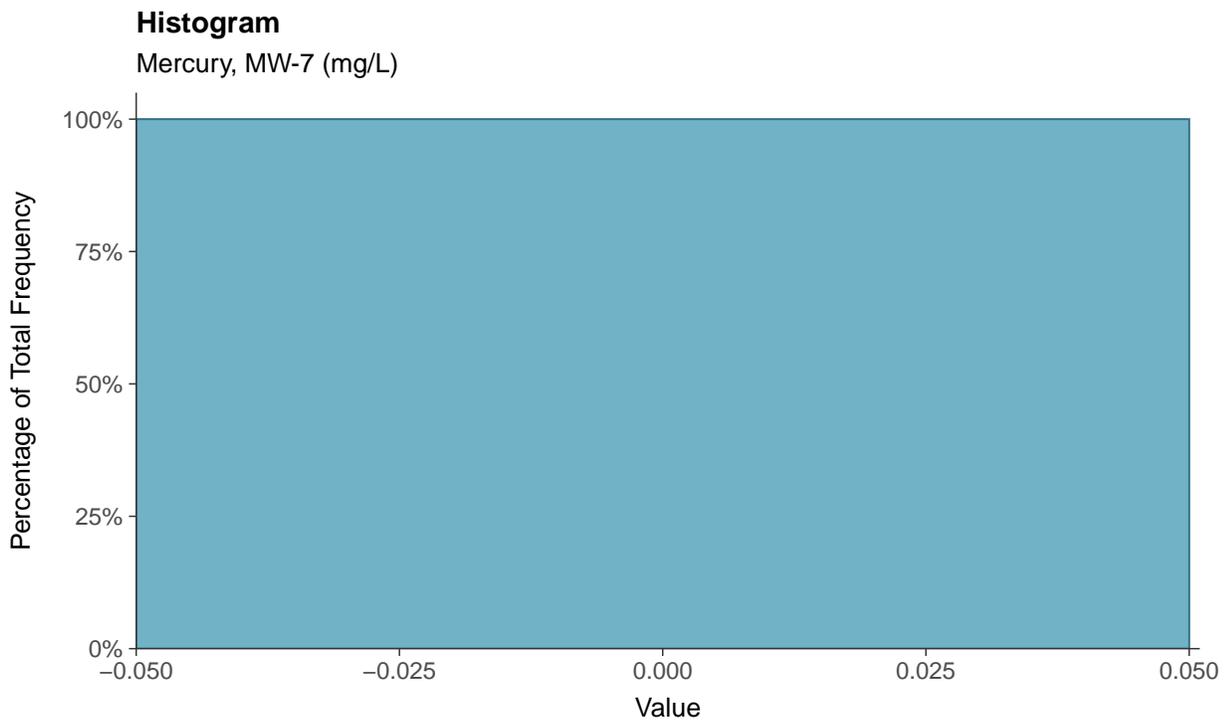
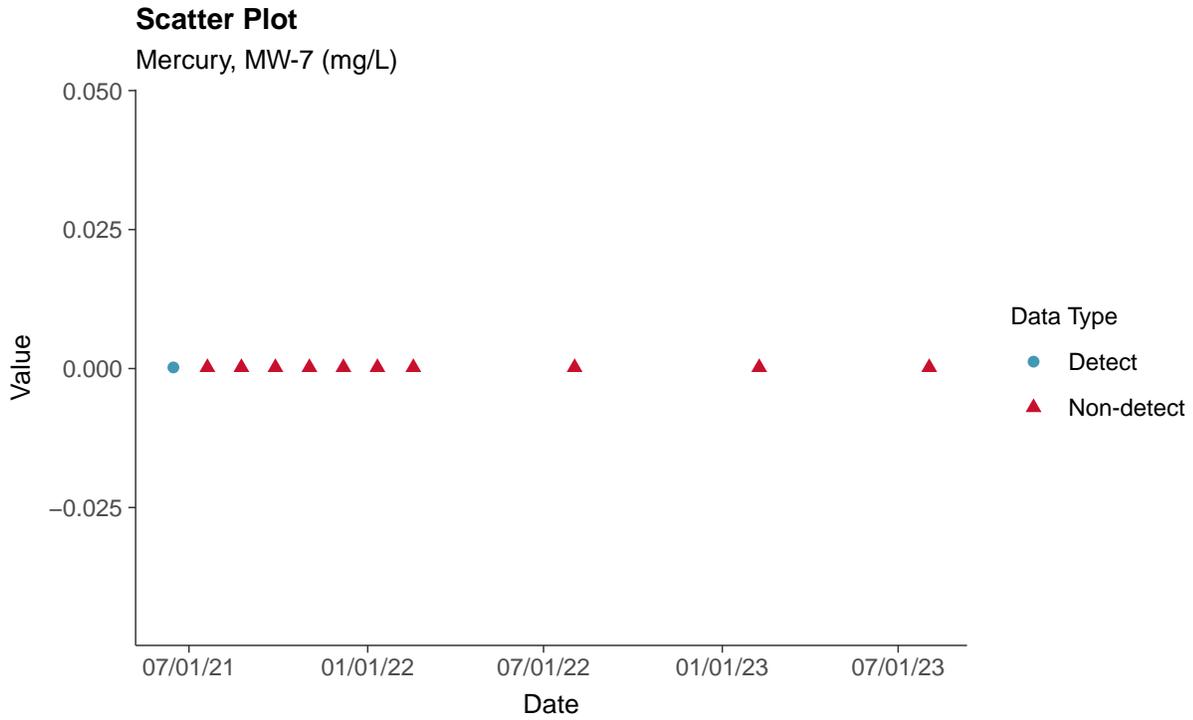
Lithium, MW-7 (mg/L)





Appendix IV: Mercury, MW-7

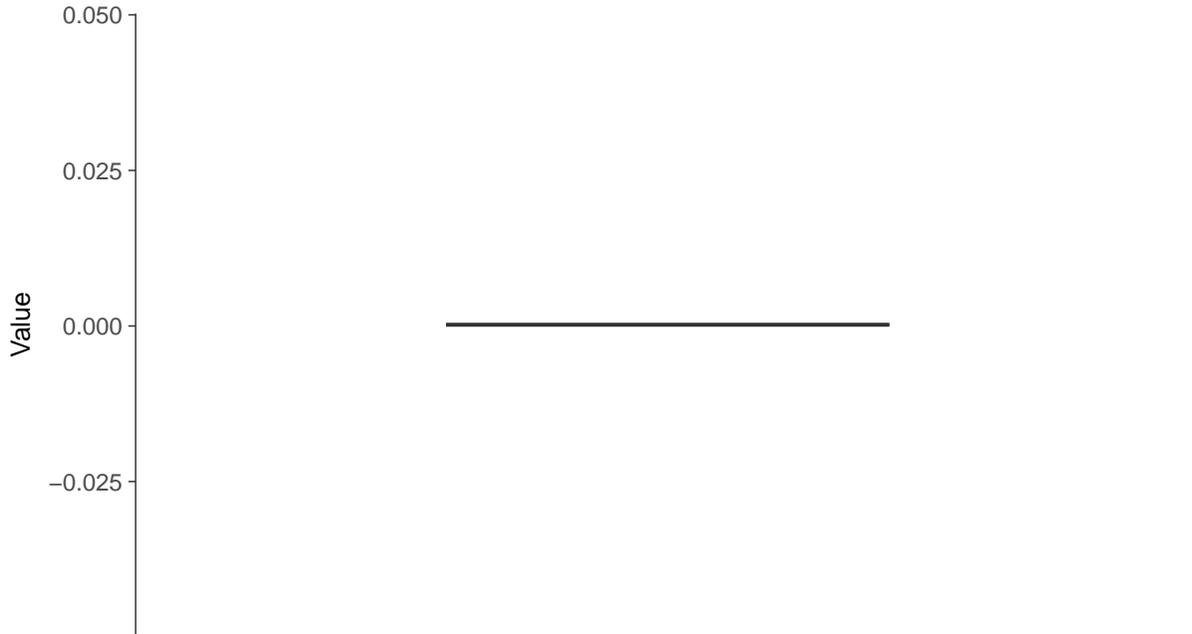
ID: 07_2_17





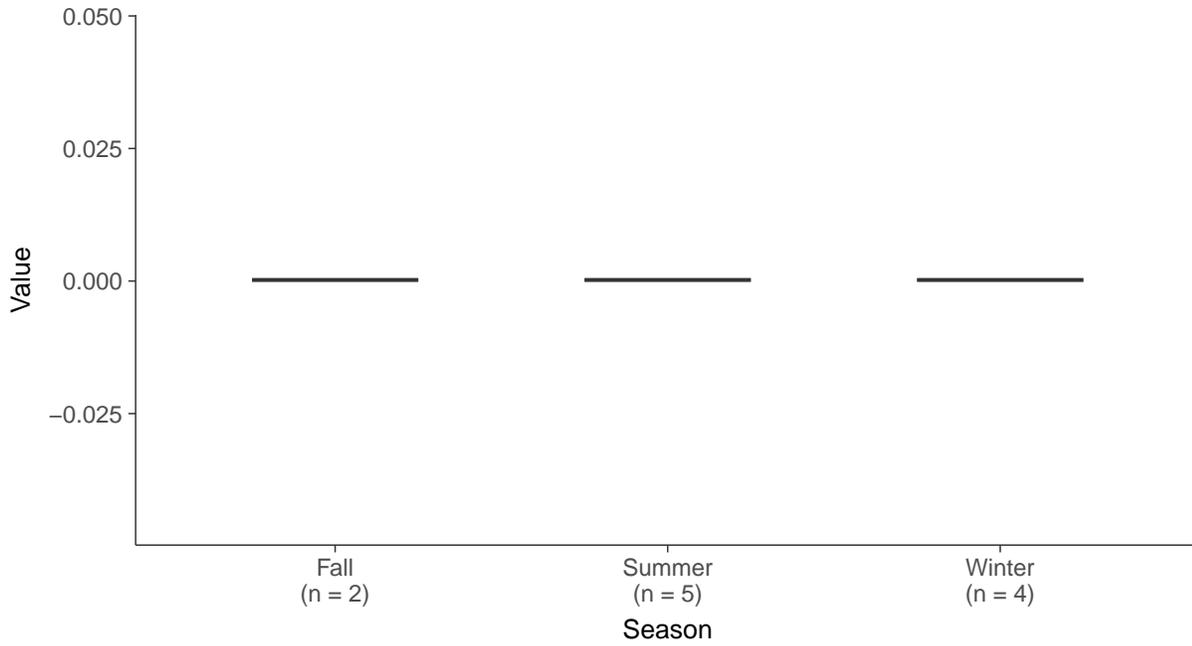
Boxplot

Mercury, MW-7 (mg/L)



Boxplot by Season

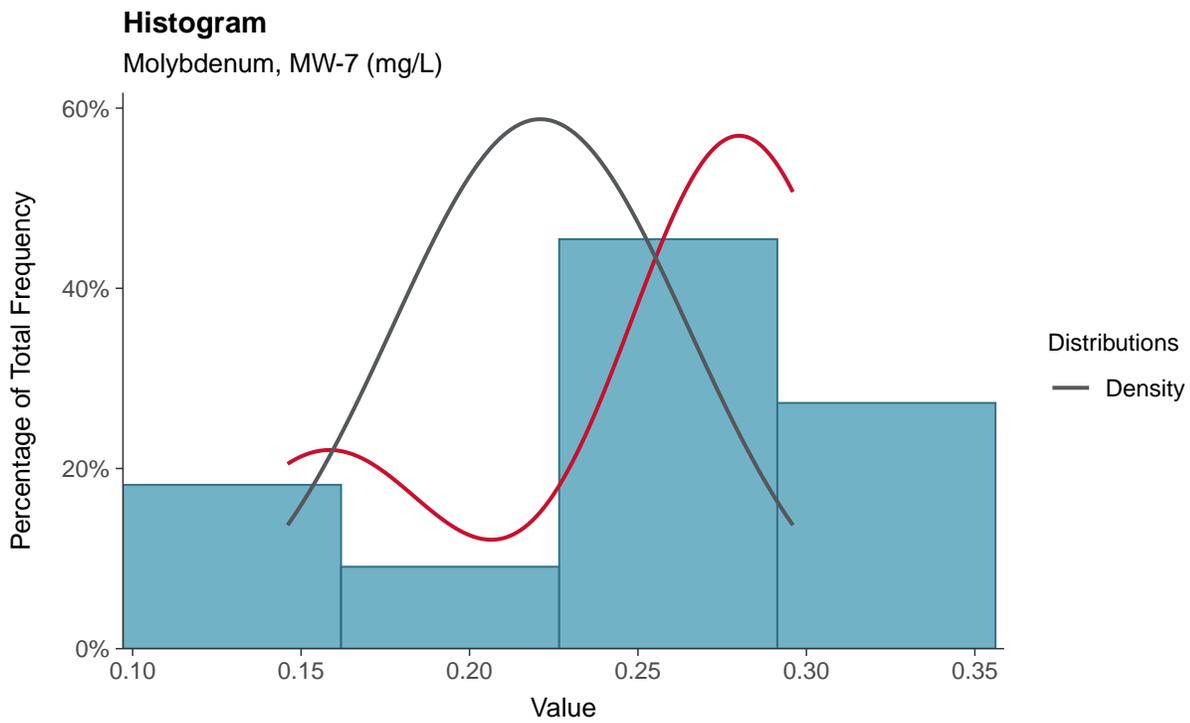
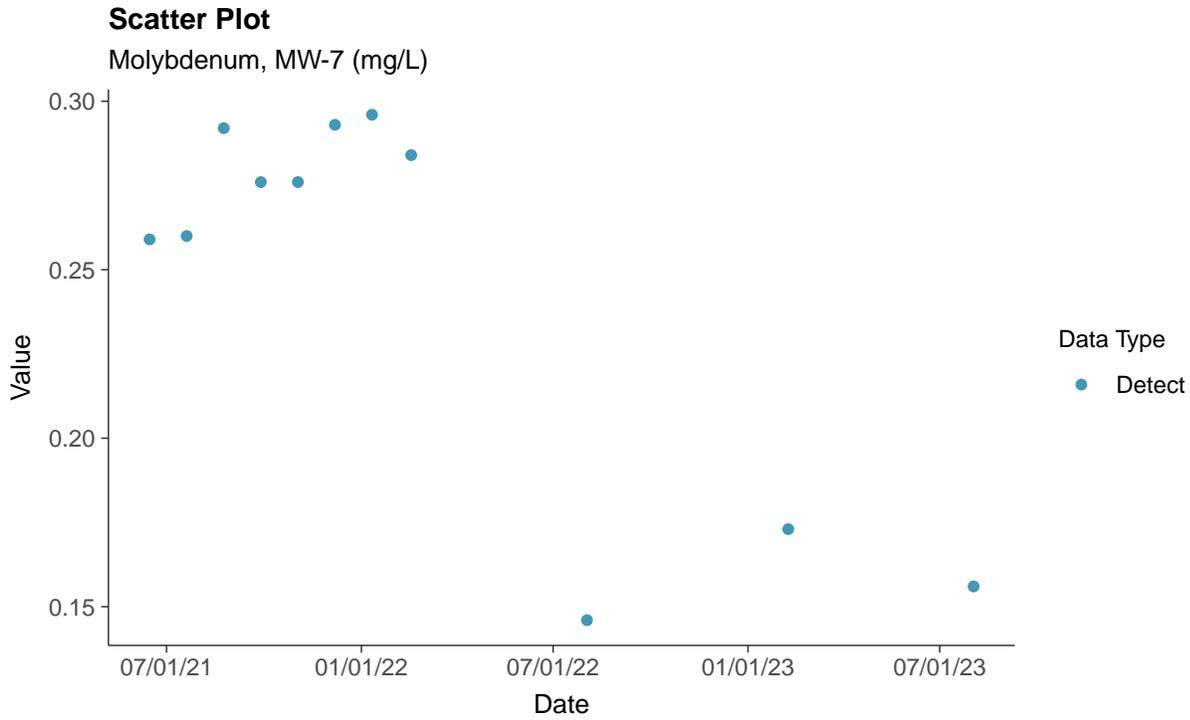
Mercury, MW-7 (mg/L)





Appendix IV: Molybdenum, MW-7

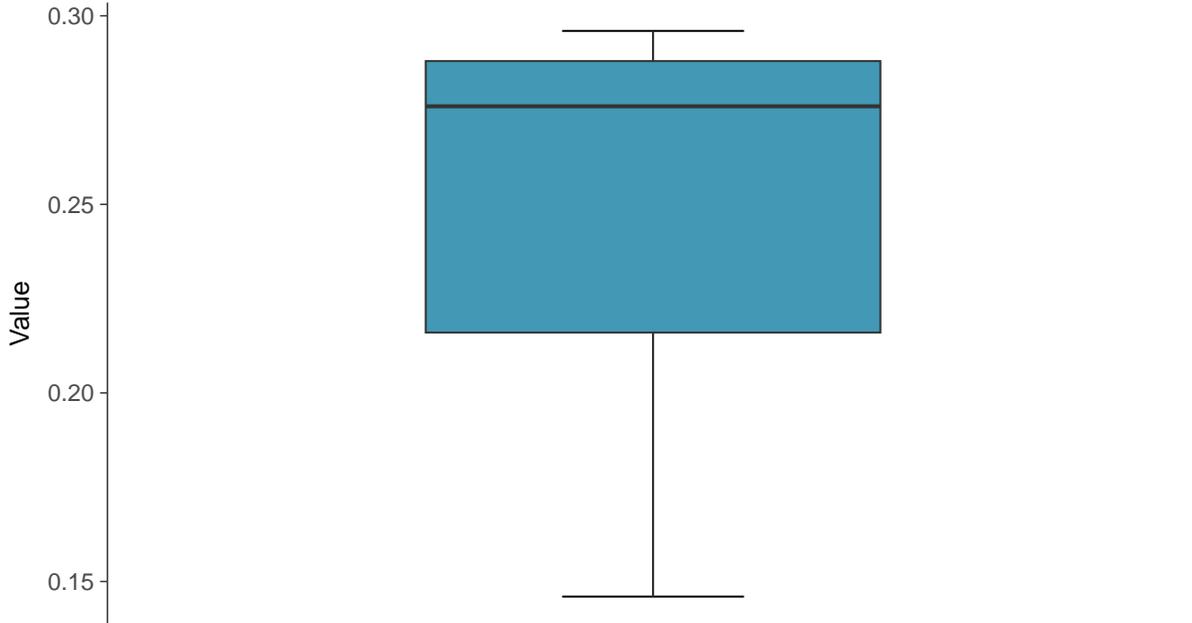
ID: 07_2_18





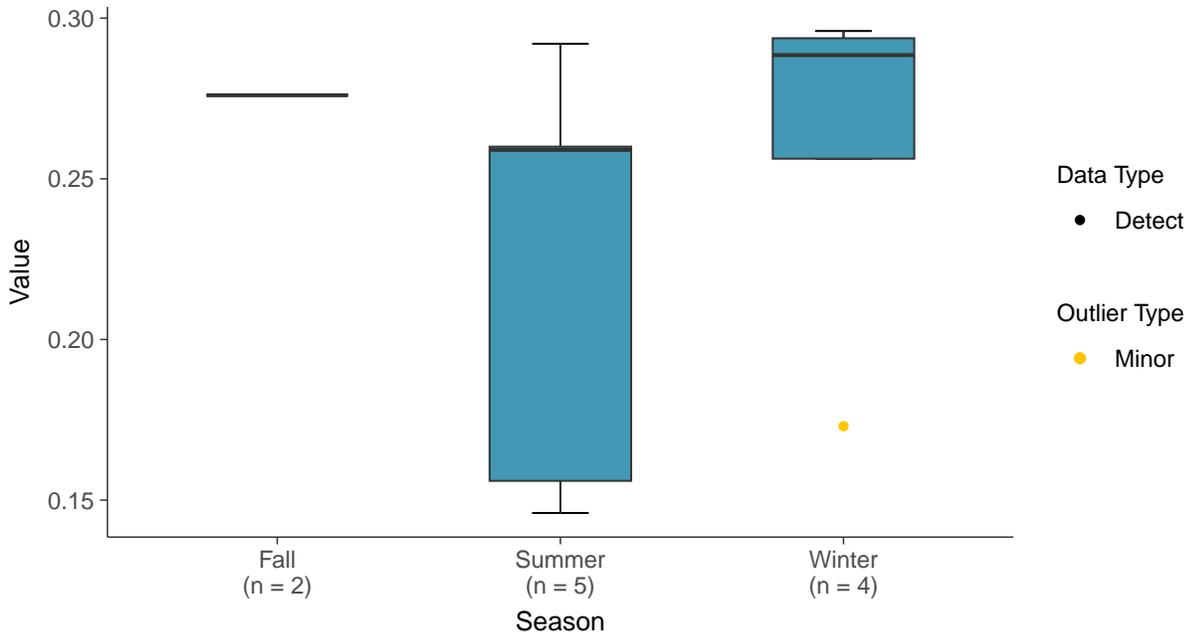
Boxplot

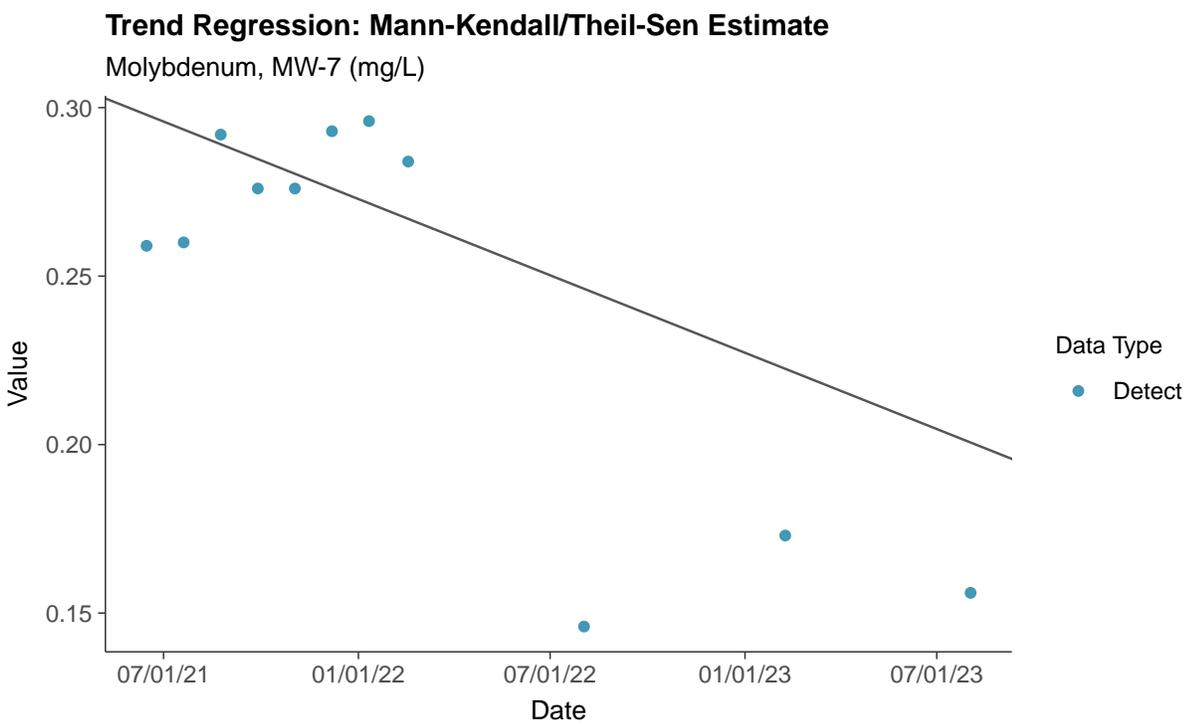
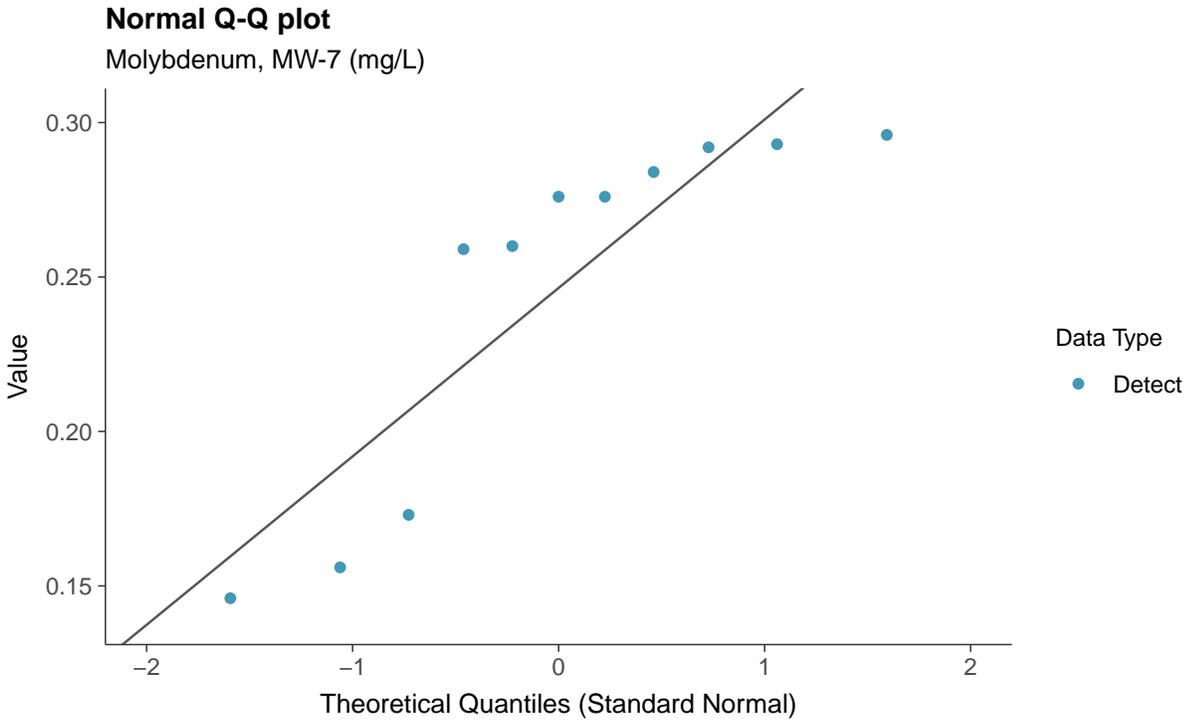
Molybdenum, MW-7 (mg/L)



Boxplot by Season

Molybdenum, MW-7 (mg/L)

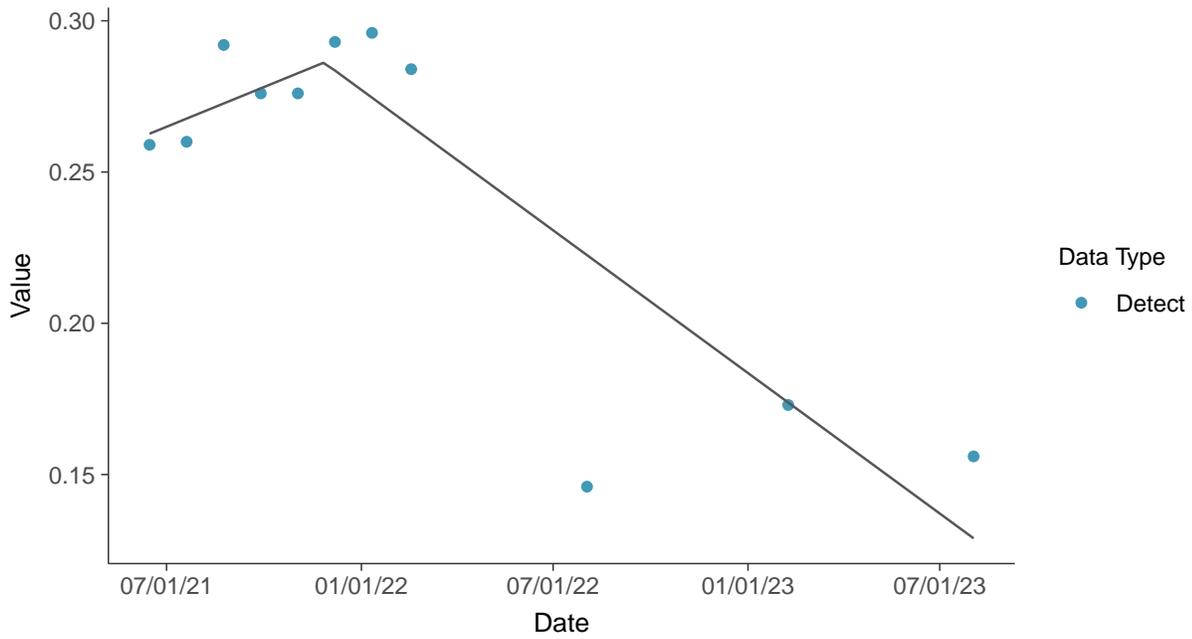






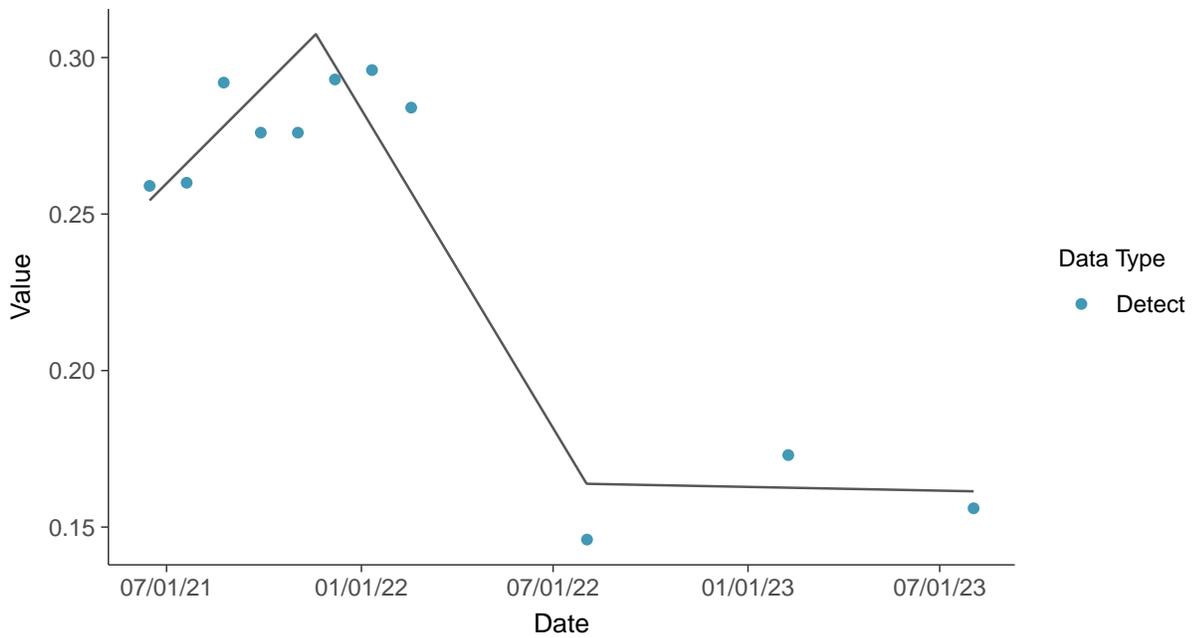
Trend Regression: Piecewise Linear-Linear

Molybdenum, MW-7 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Molybdenum, MW-7 (mg/L)



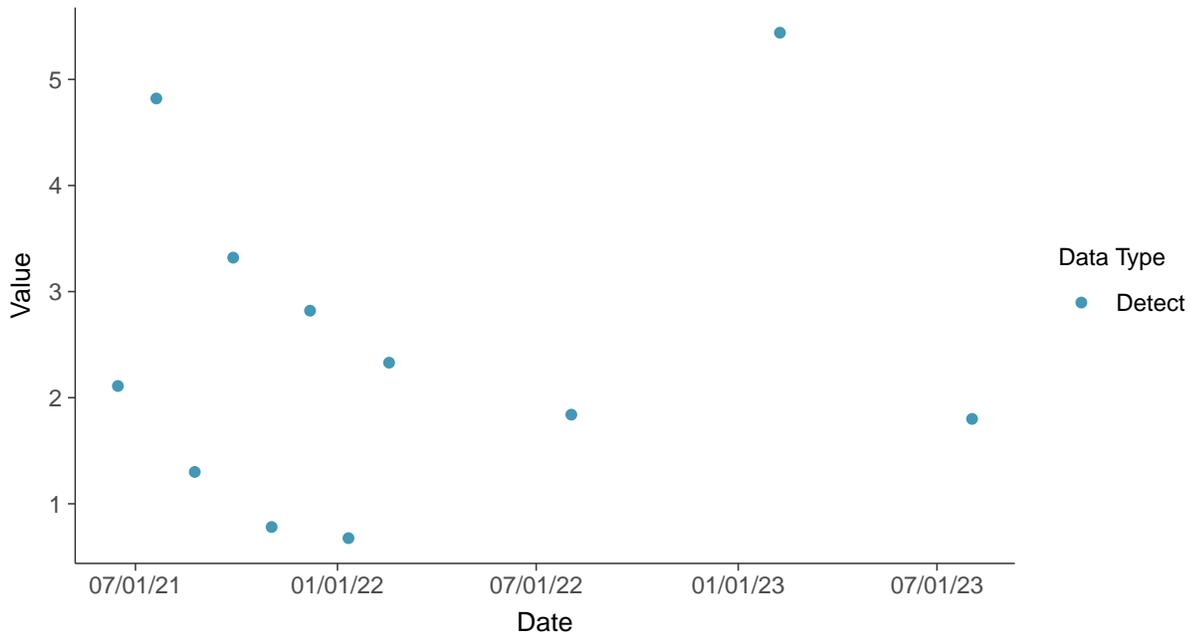


Appendix IV: Radium-226/228, MW-7

ID: 07_2_20

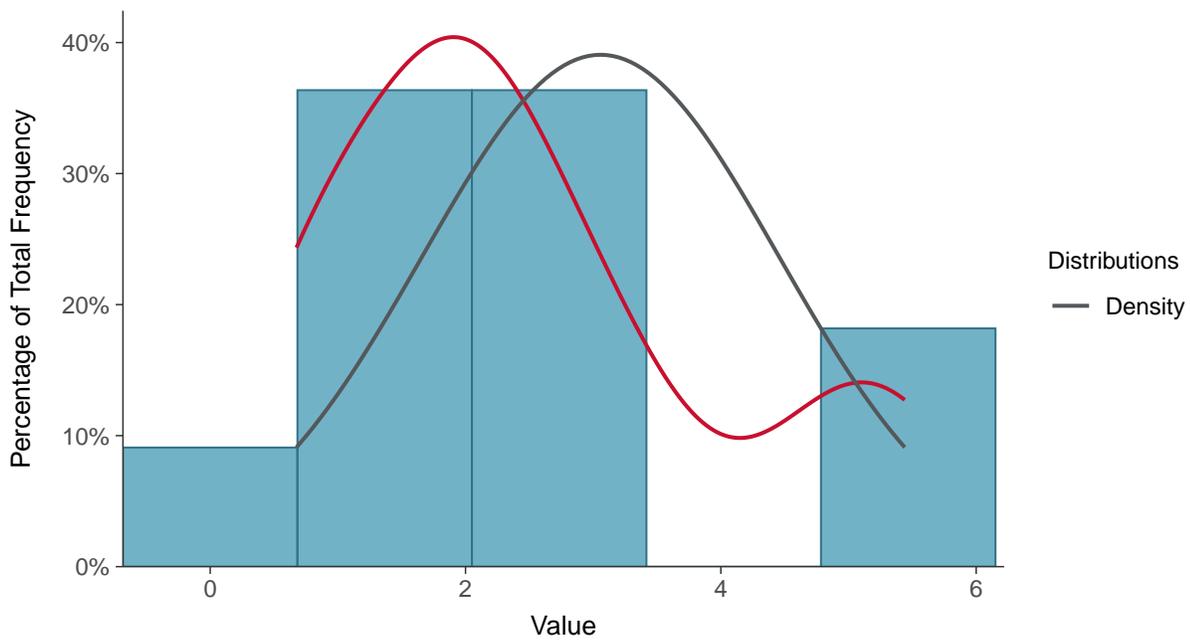
Scatter Plot

Radium-226/228, MW-7 (pCi/L)



Histogram

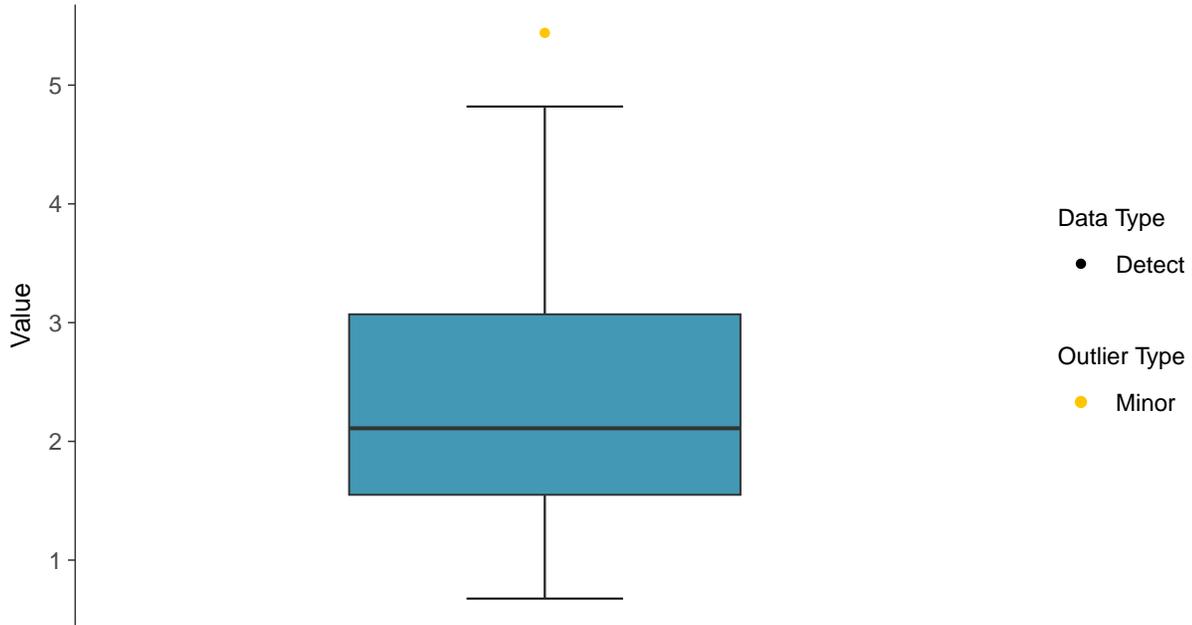
Radium-226/228, MW-7 (pCi/L)





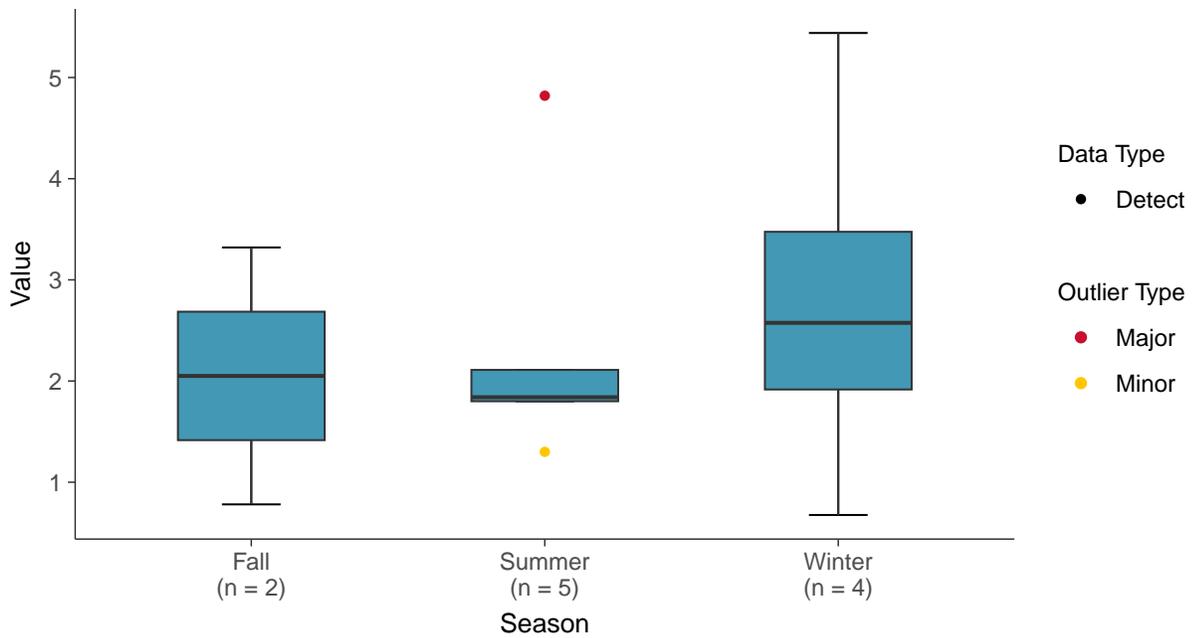
Boxplot

Radium-226/228, MW-7 (pCi/L)



Boxplot by Season

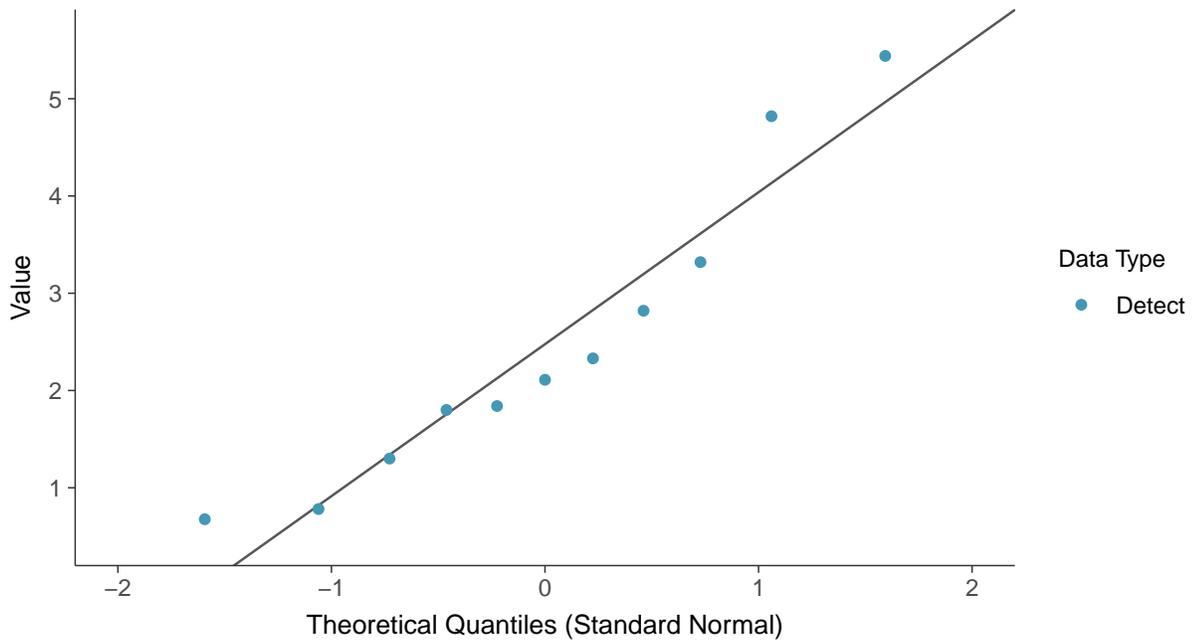
Radium-226/228, MW-7 (pCi/L)





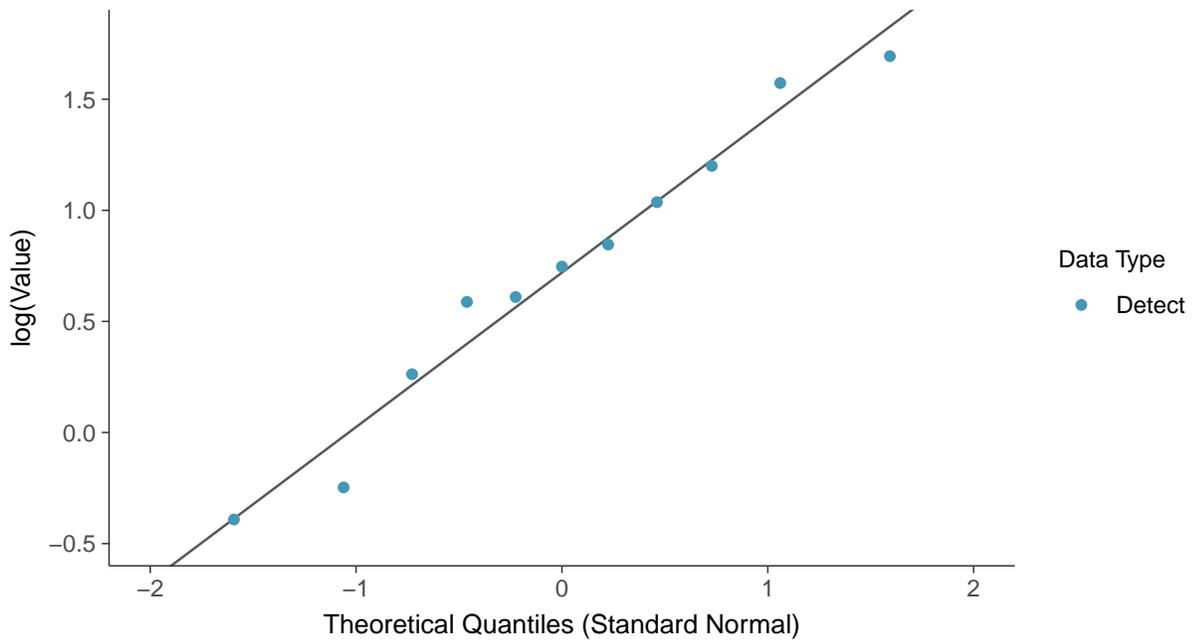
Normal Q-Q plot

Radium-226/228, MW-7 (pCi/L)



Lognormal Q-Q plot

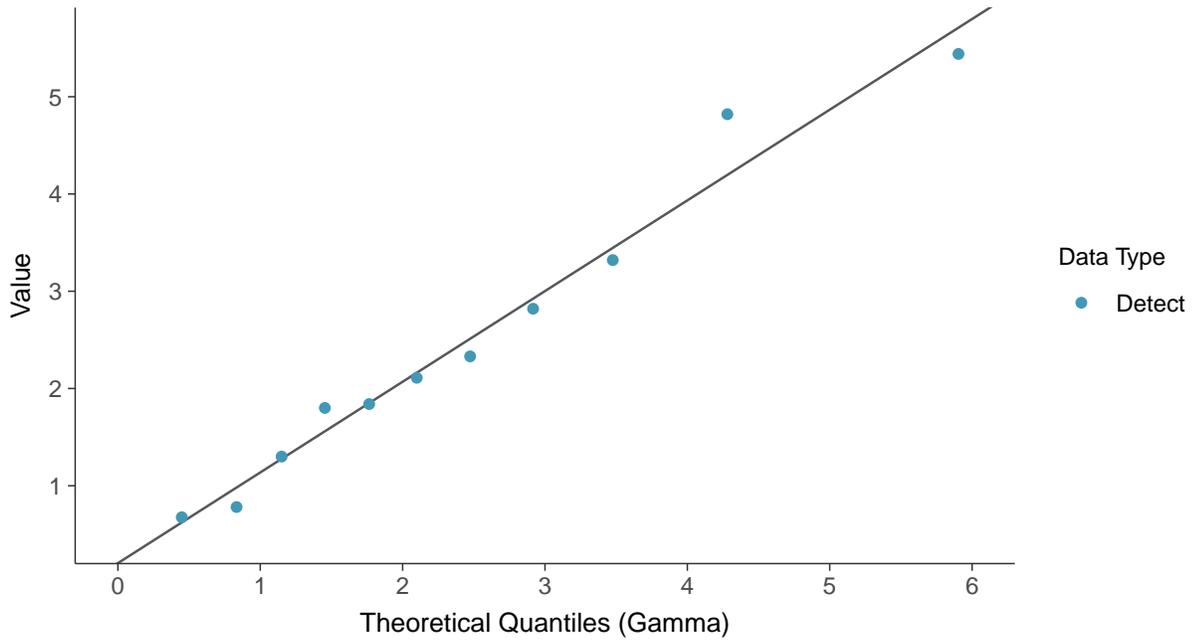
Radium-226/228, MW-7 (pCi/L)





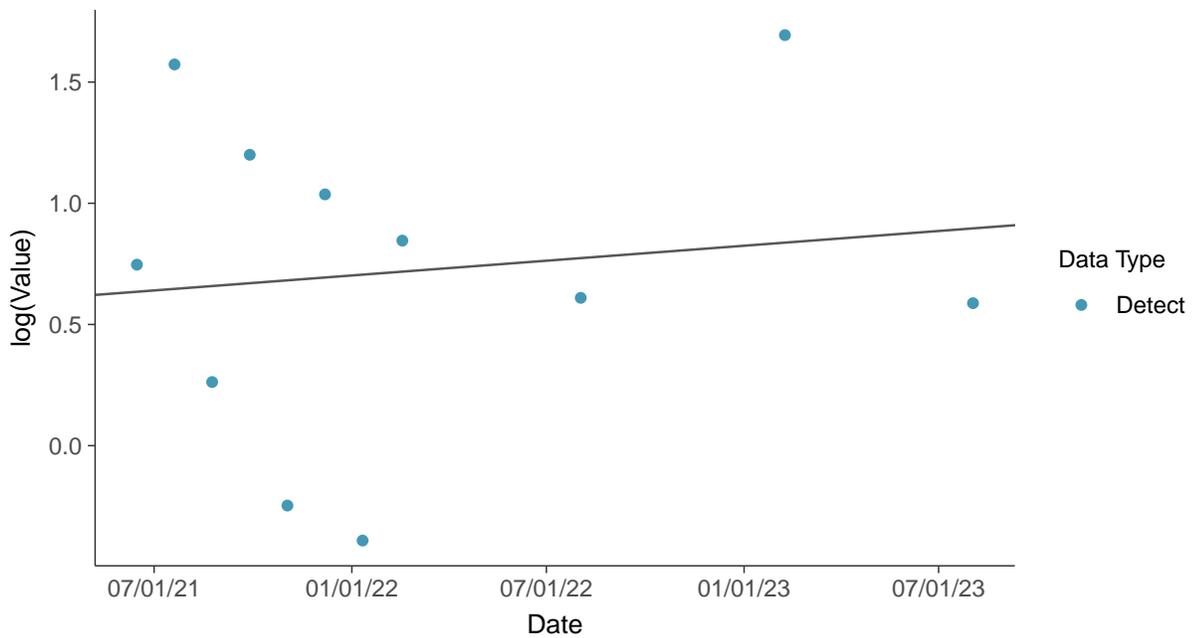
Gamma Q-Q plot

Radium-226/228, MW-7 (pCi/L)



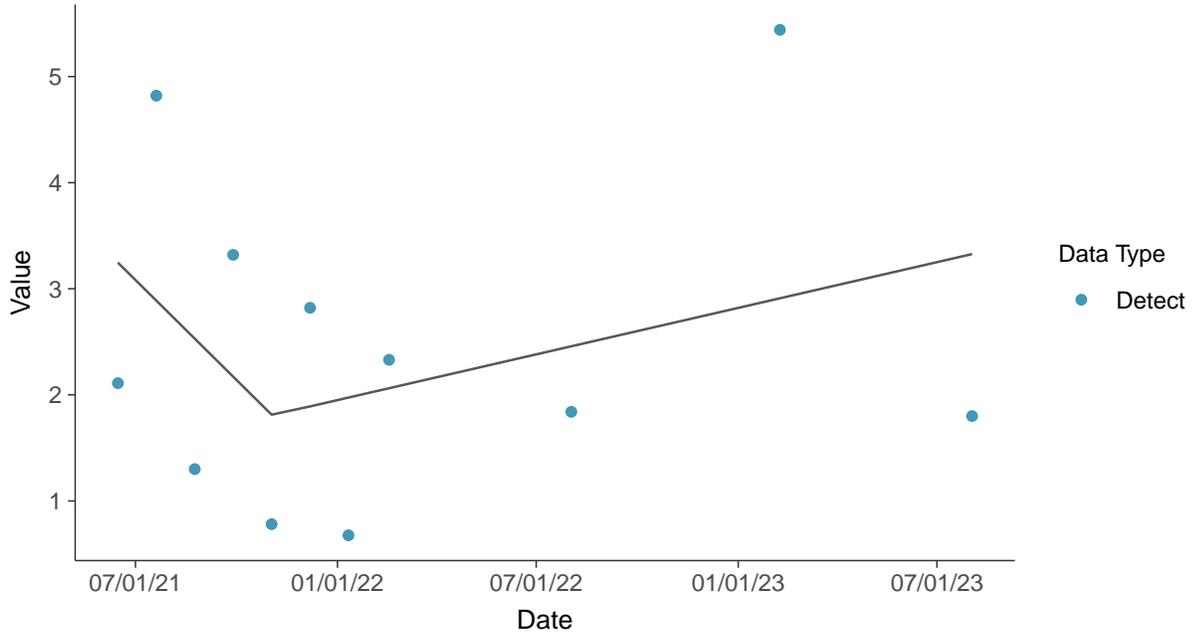
Trend Regression: Lognormal MLE

Radium-226/228, MW-7 (pCi/L)





Trend Regression: Piecewise Linear-Linear
Radium-226/228, MW-7 (pCi/L)





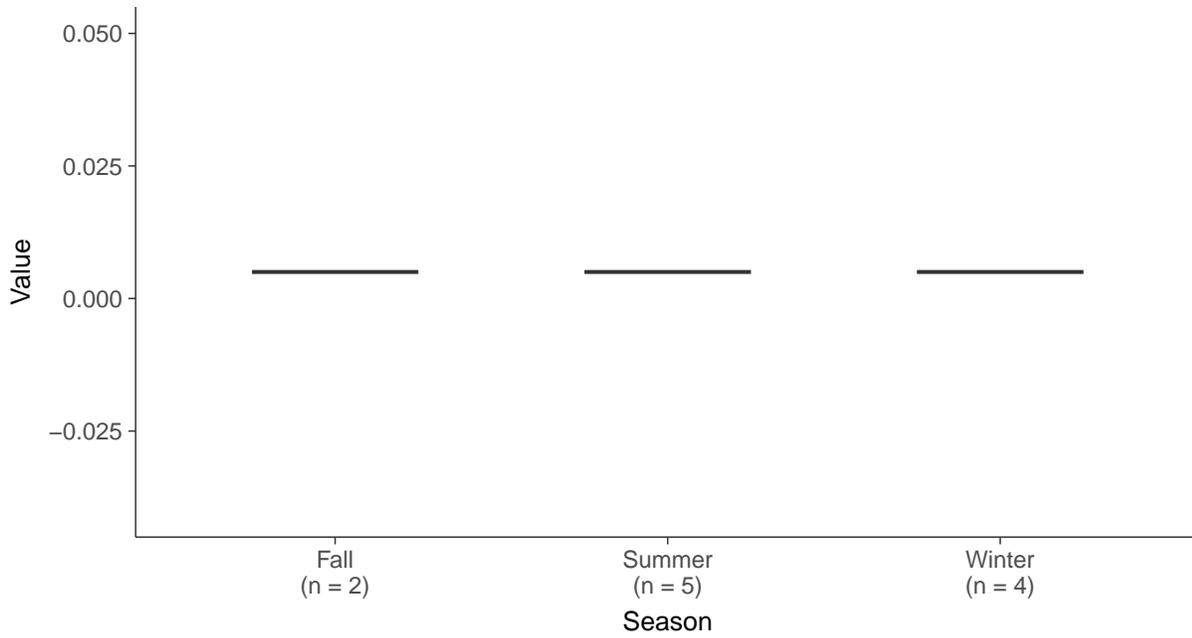
Boxplot

Selenium, MW-7 (mg/L)



Boxplot by Season

Selenium, MW-7 (mg/L)



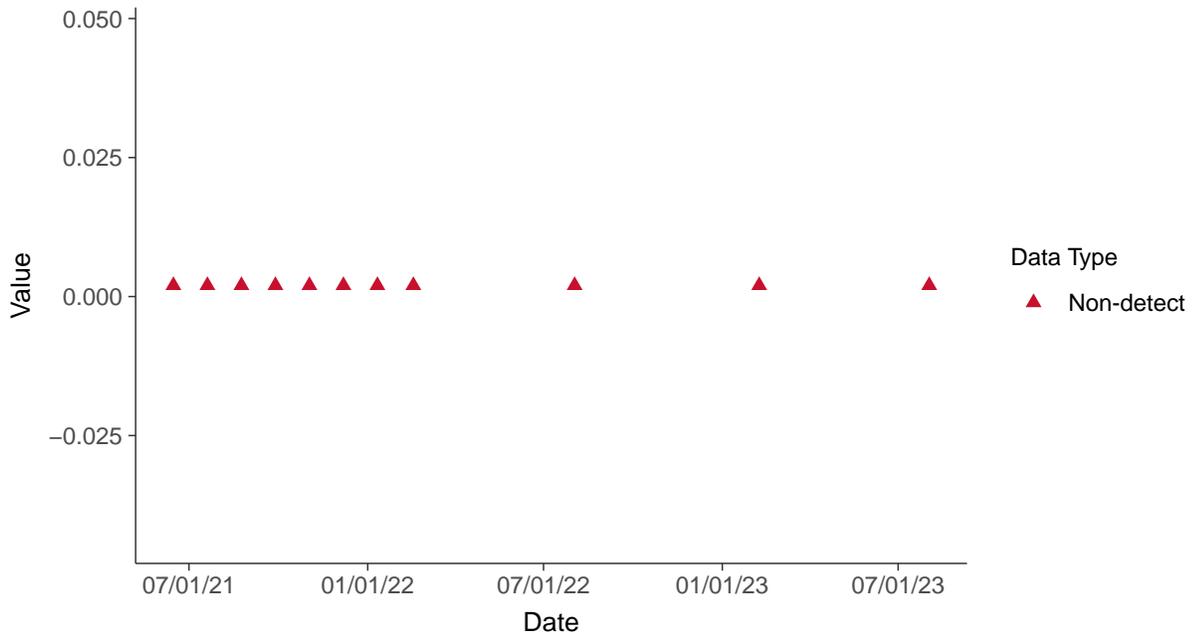


Appendix IV: Thallium, MW-7

ID: 07_2_23

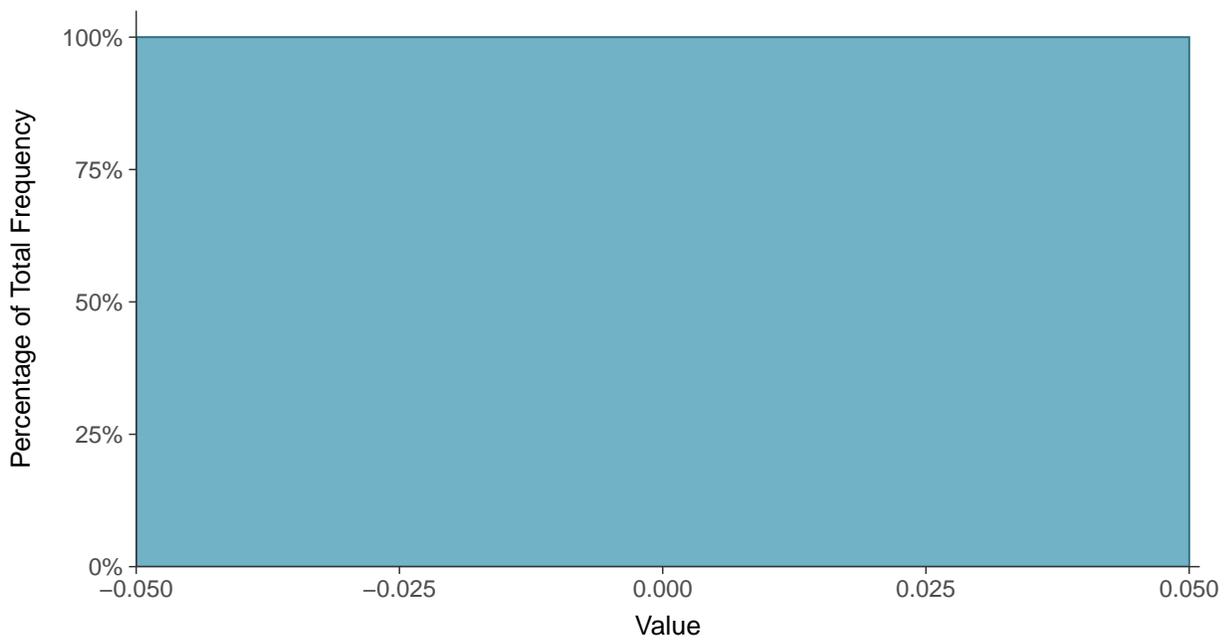
Scatter Plot

Thallium, MW-7 (mg/L)



Histogram

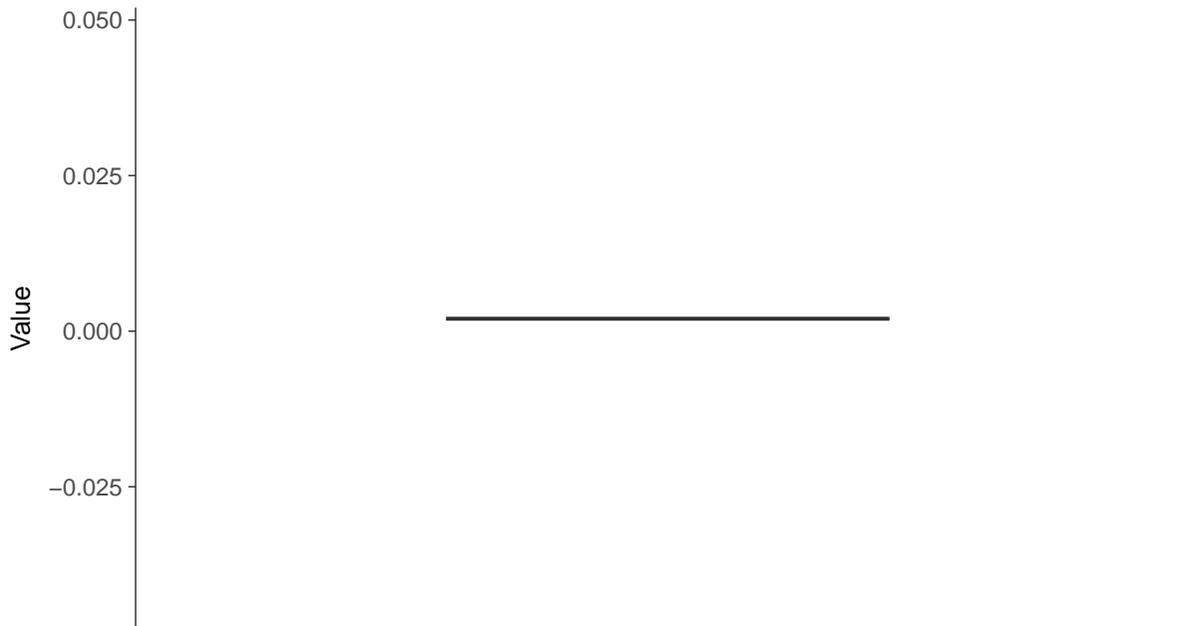
Thallium, MW-7 (mg/L)





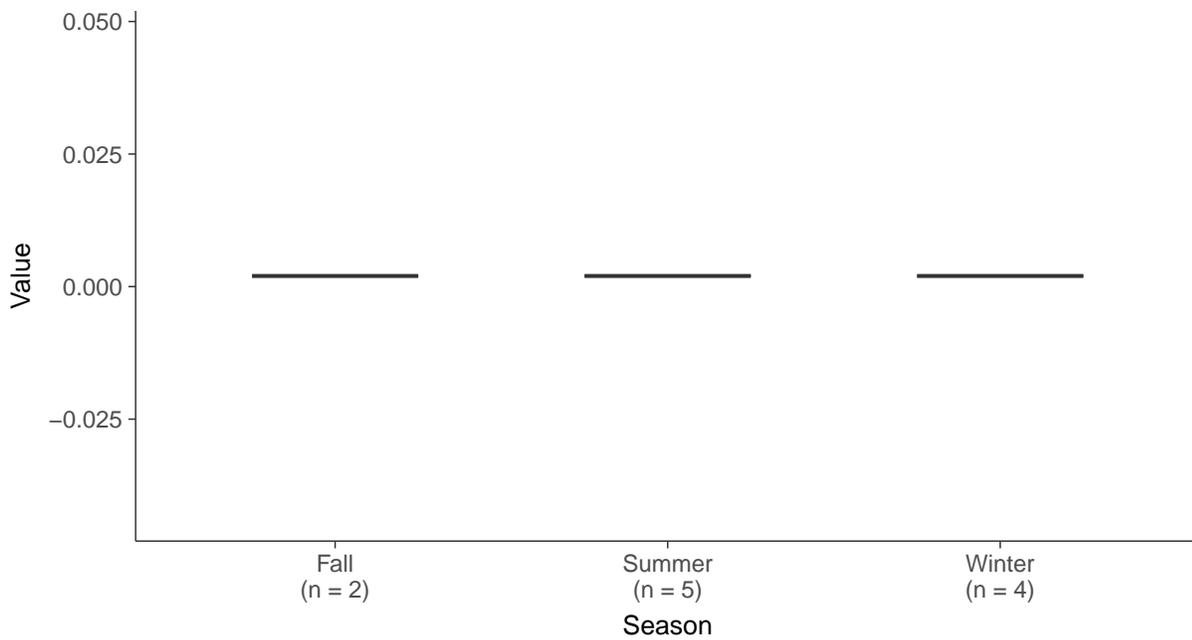
Boxplot

Thallium, MW-7 (mg/L)



Boxplot by Season

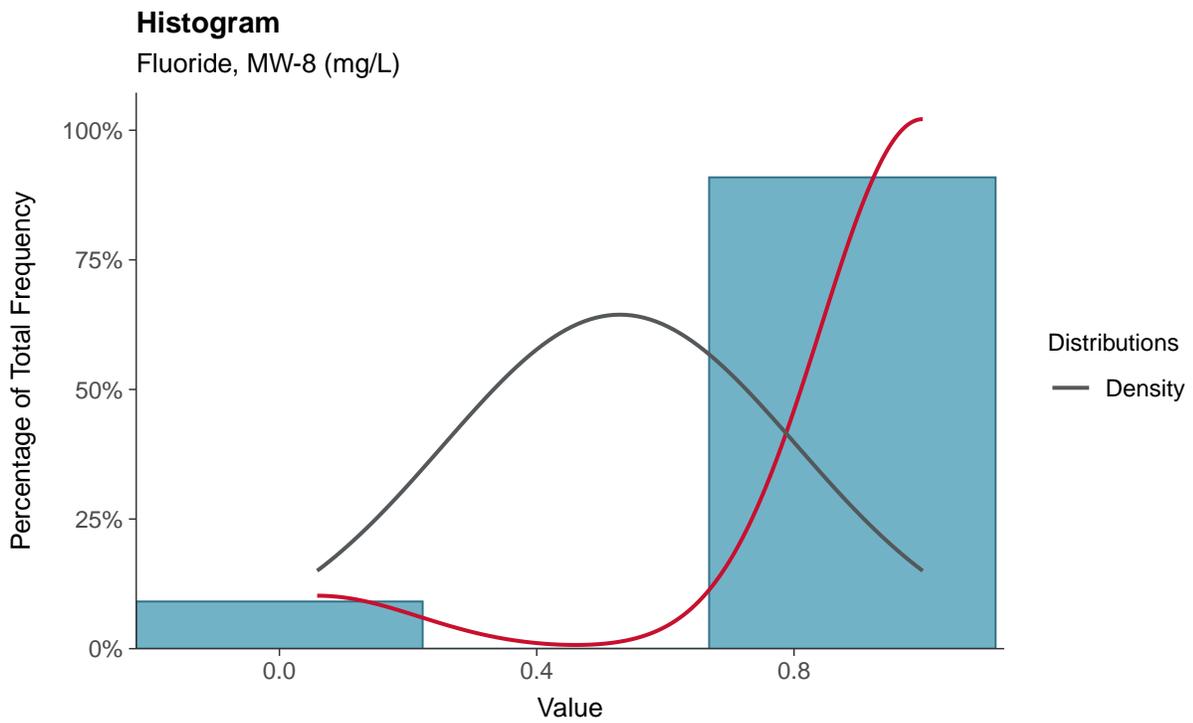
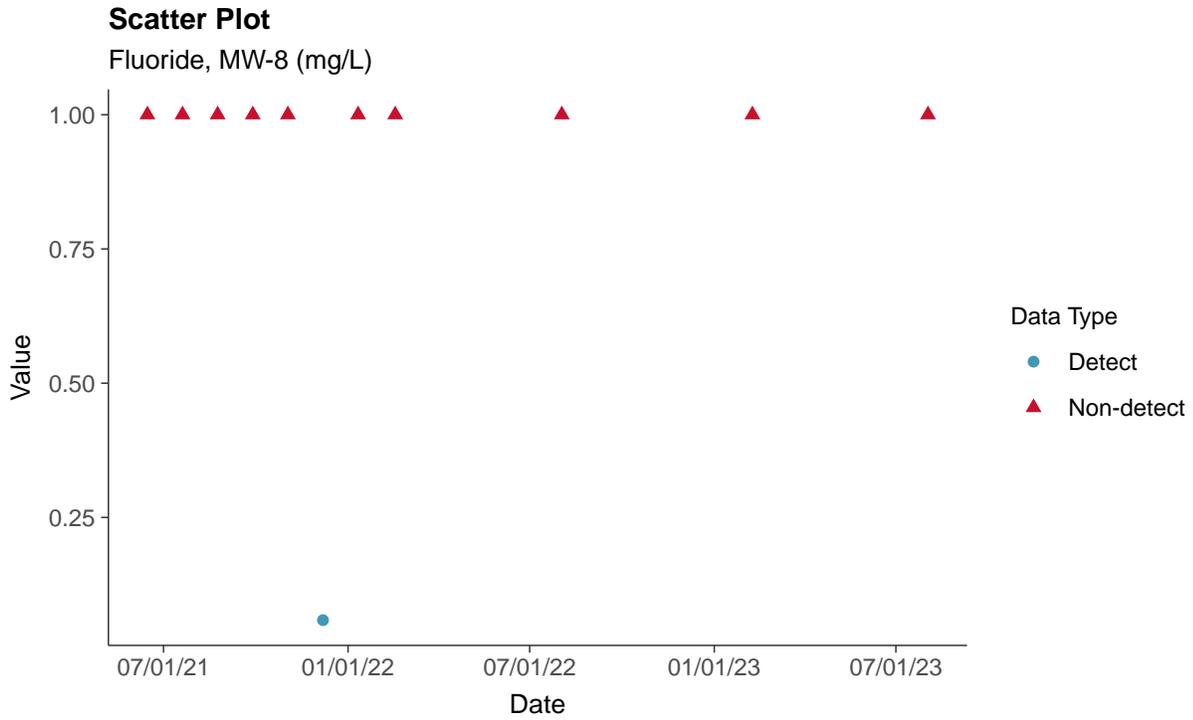
Thallium, MW-7 (mg/L)





Appendix IV: Fluoride, MW-8

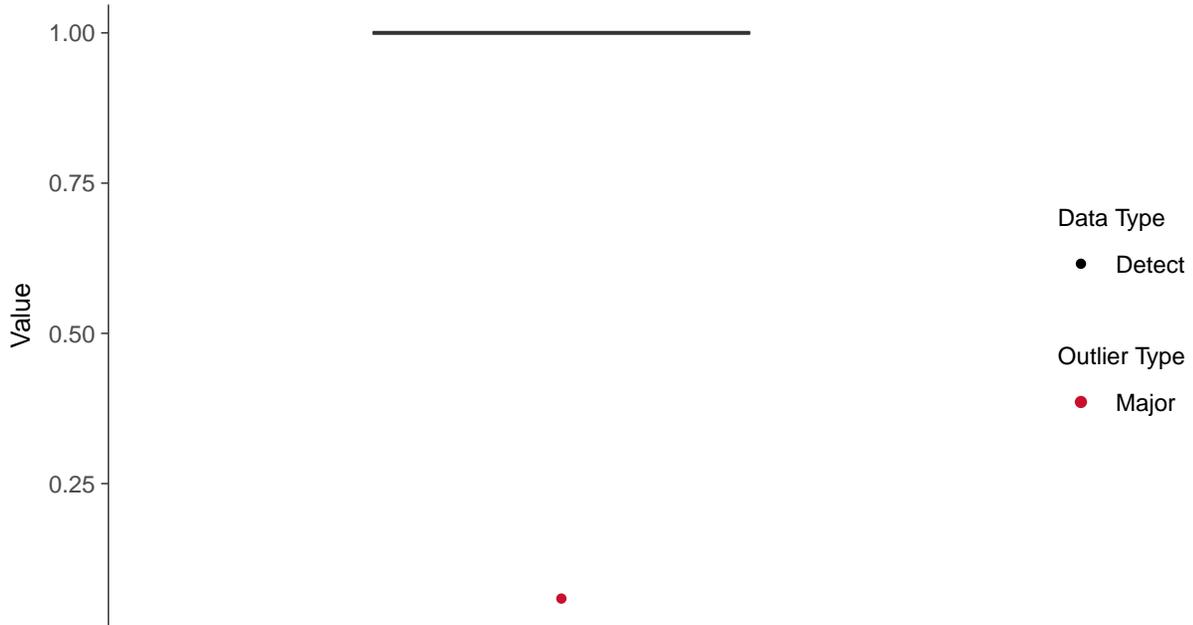
ID: 08_2_04





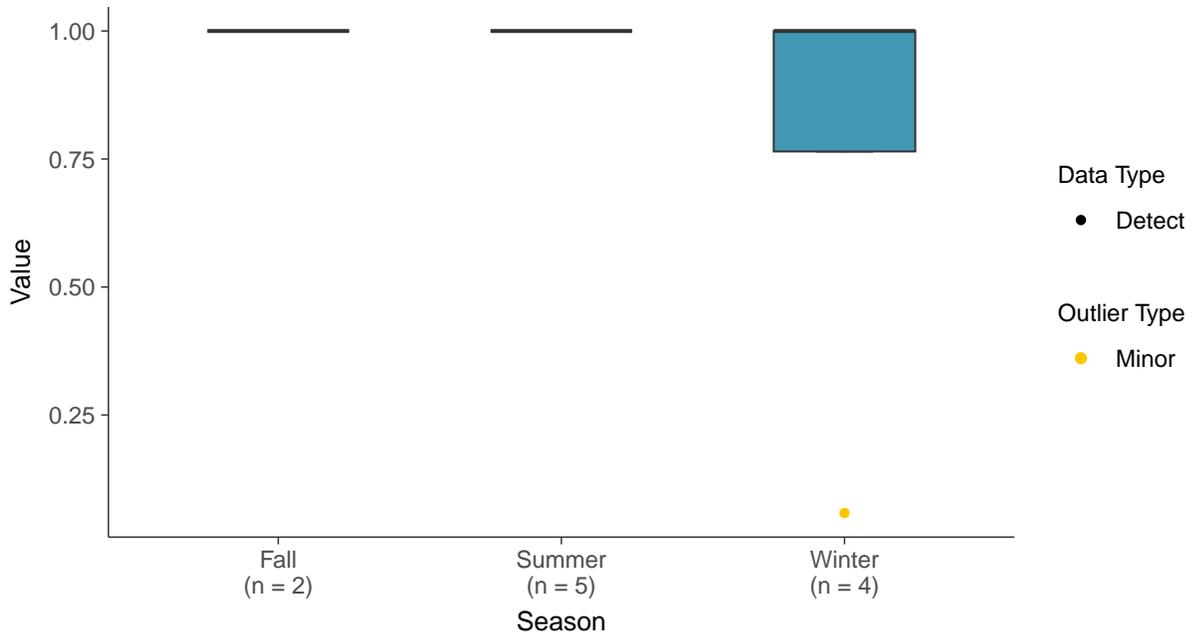
Boxplot

Fluoride, MW-8 (mg/L)



Boxplot by Season

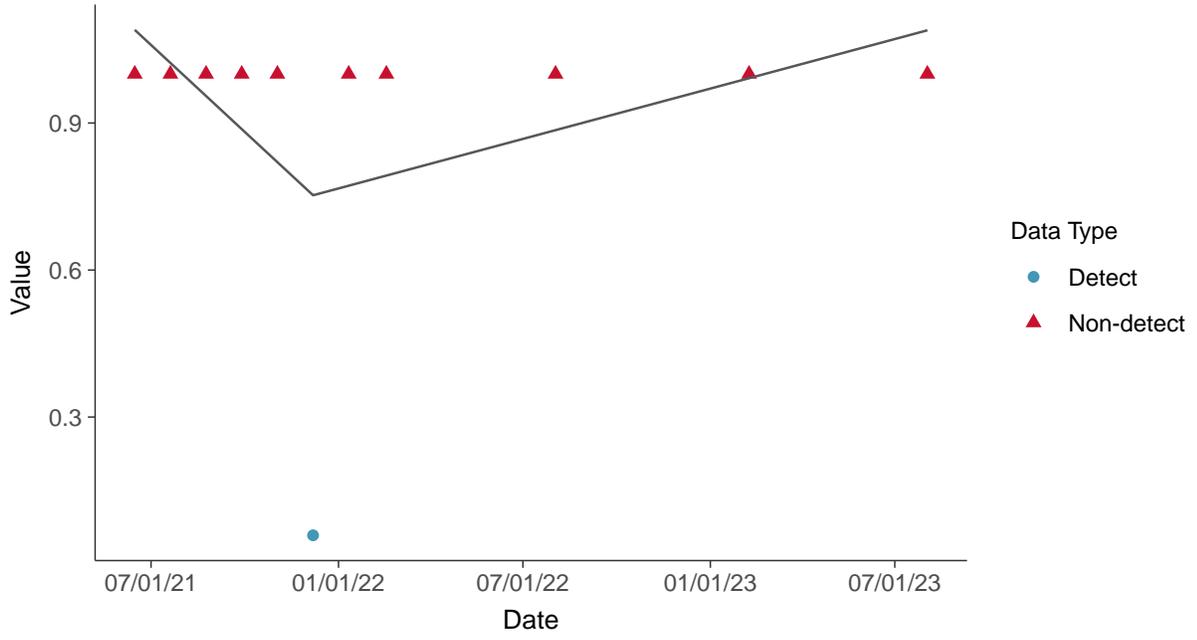
Fluoride, MW-8 (mg/L)





Trend Regression: Piecewise Linear-Linear

Fluoride, MW-8 (mg/L)



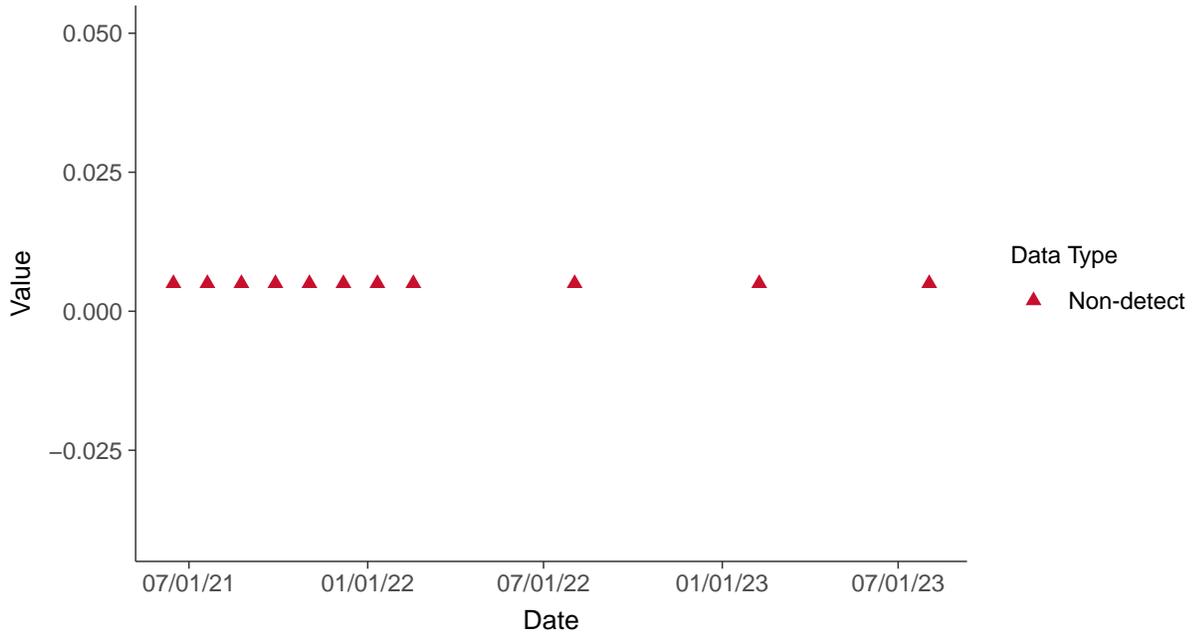


Appendix IV: Antimony, MW-8

ID: 08_2_08

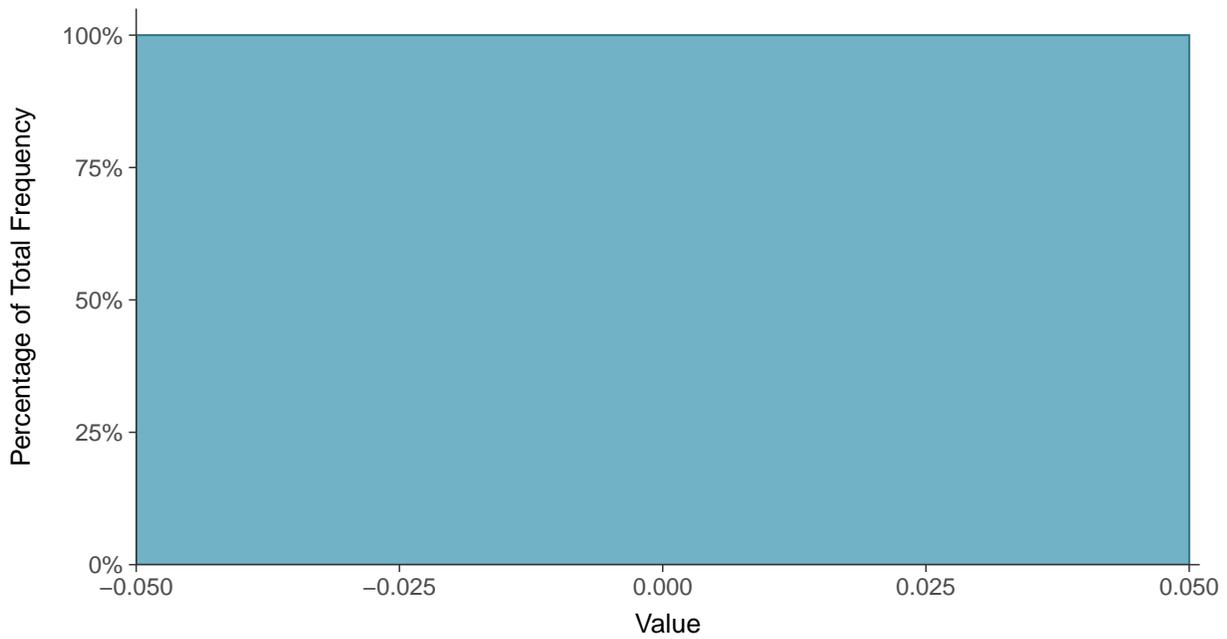
Scatter Plot

Antimony, MW-8 (mg/L)



Histogram

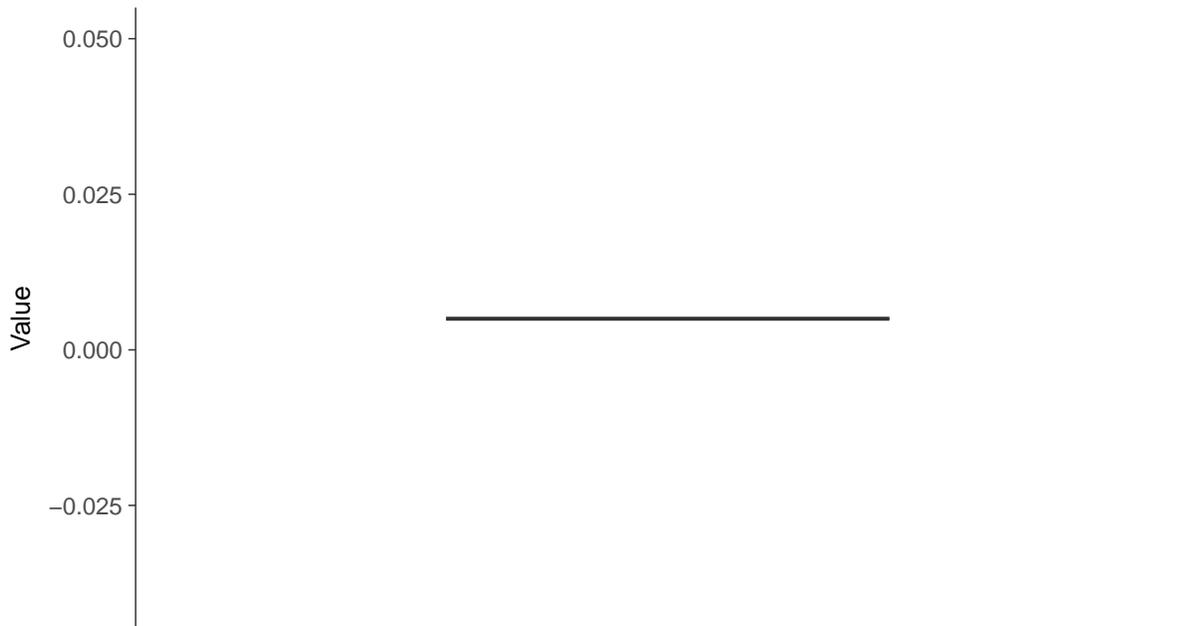
Antimony, MW-8 (mg/L)





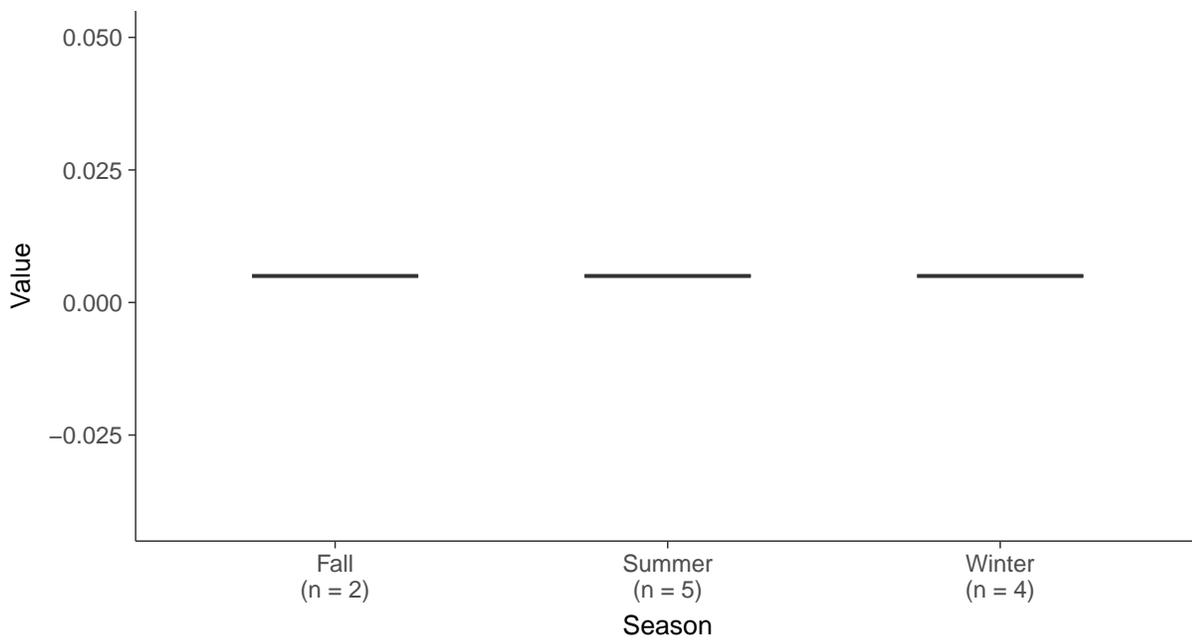
Boxplot

Antimony, MW-8 (mg/L)



Boxplot by Season

Antimony, MW-8 (mg/L)



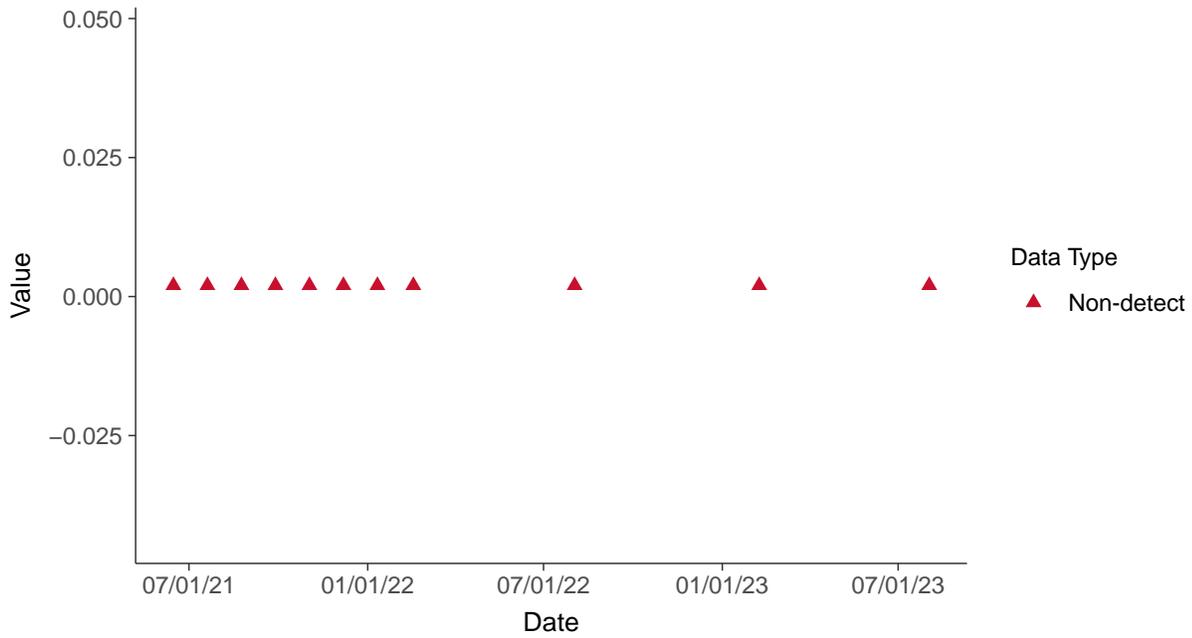


Appendix IV: Arsenic, MW-8

ID: 08_2_09

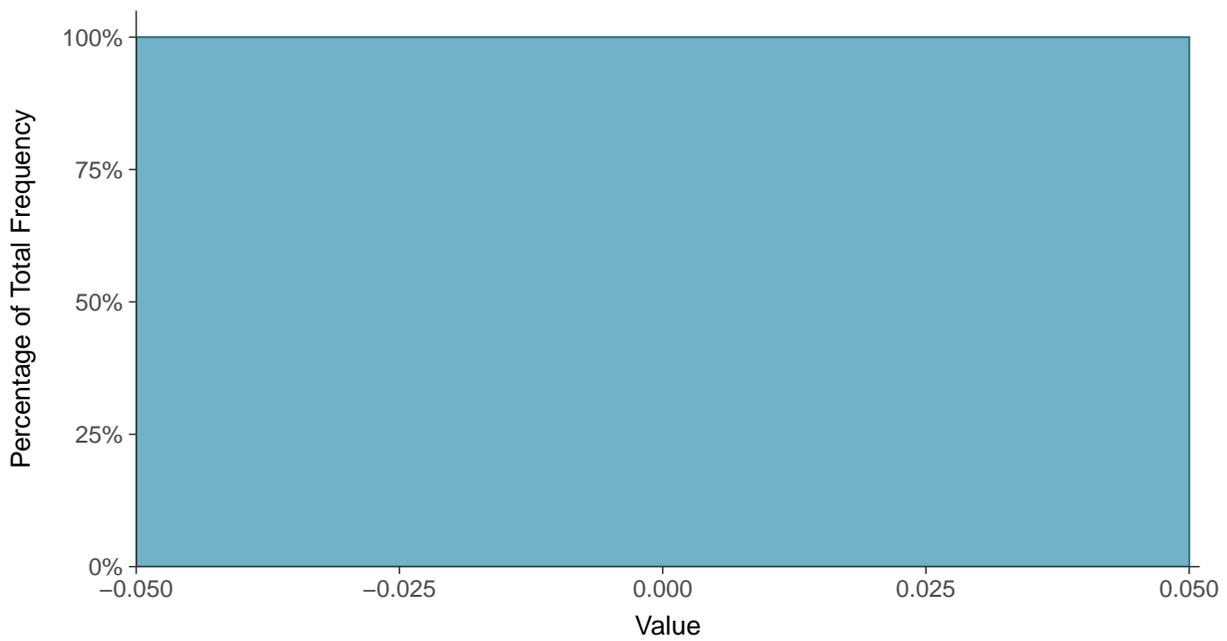
Scatter Plot

Arsenic, MW-8 (mg/L)



Histogram

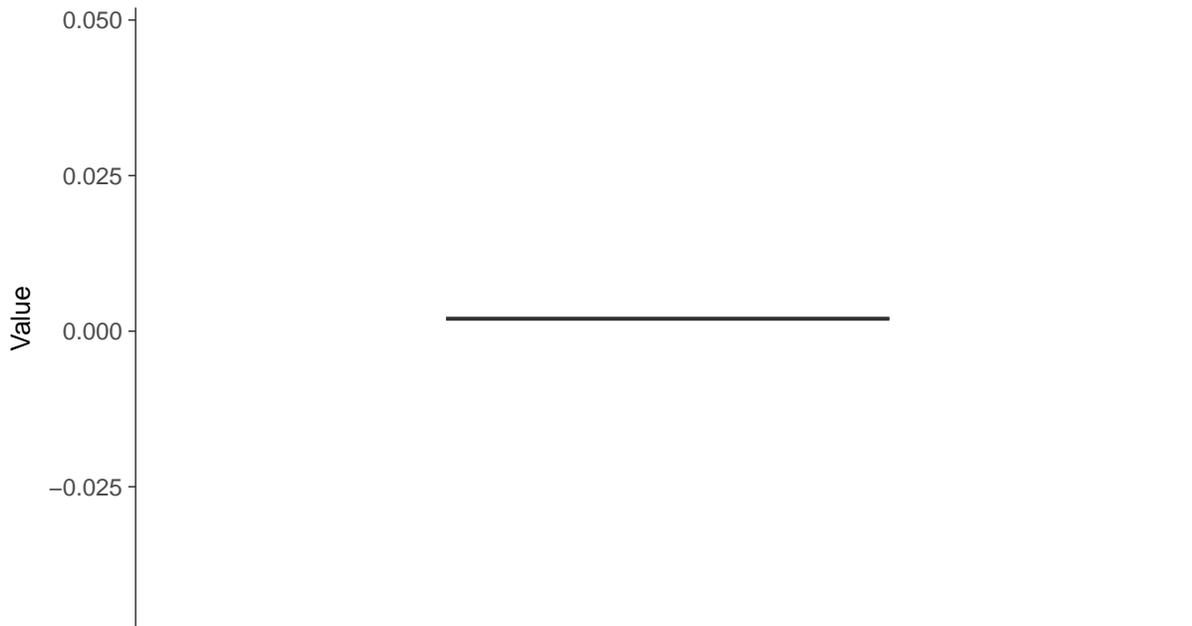
Arsenic, MW-8 (mg/L)





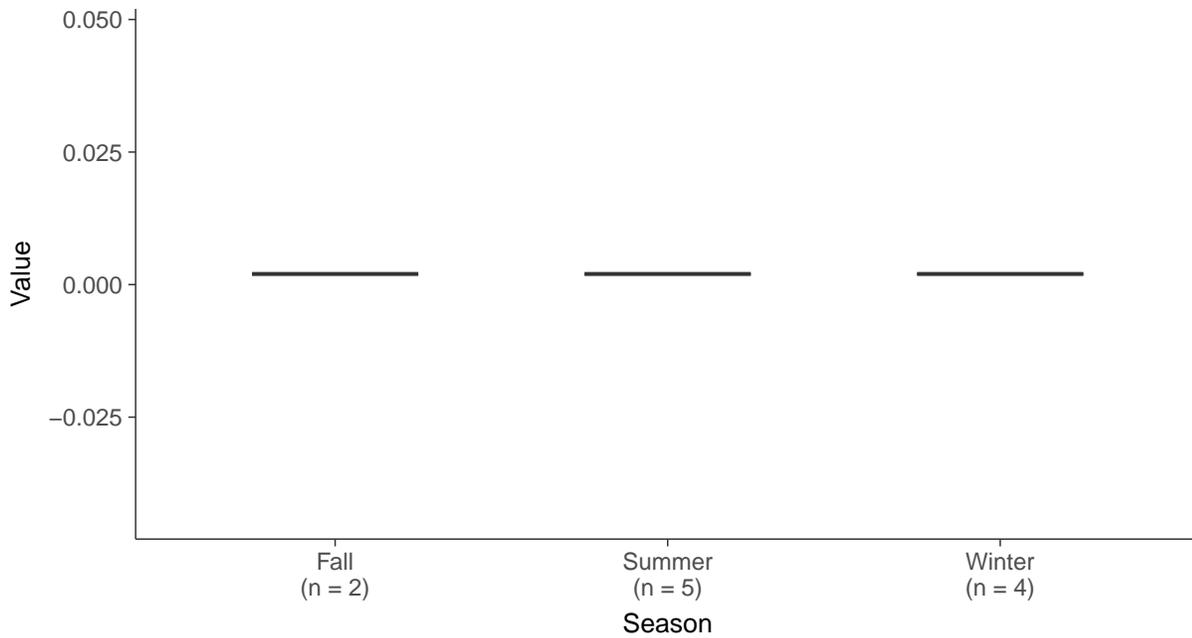
Boxplot

Arsenic, MW-8 (mg/L)



Boxplot by Season

Arsenic, MW-8 (mg/L)



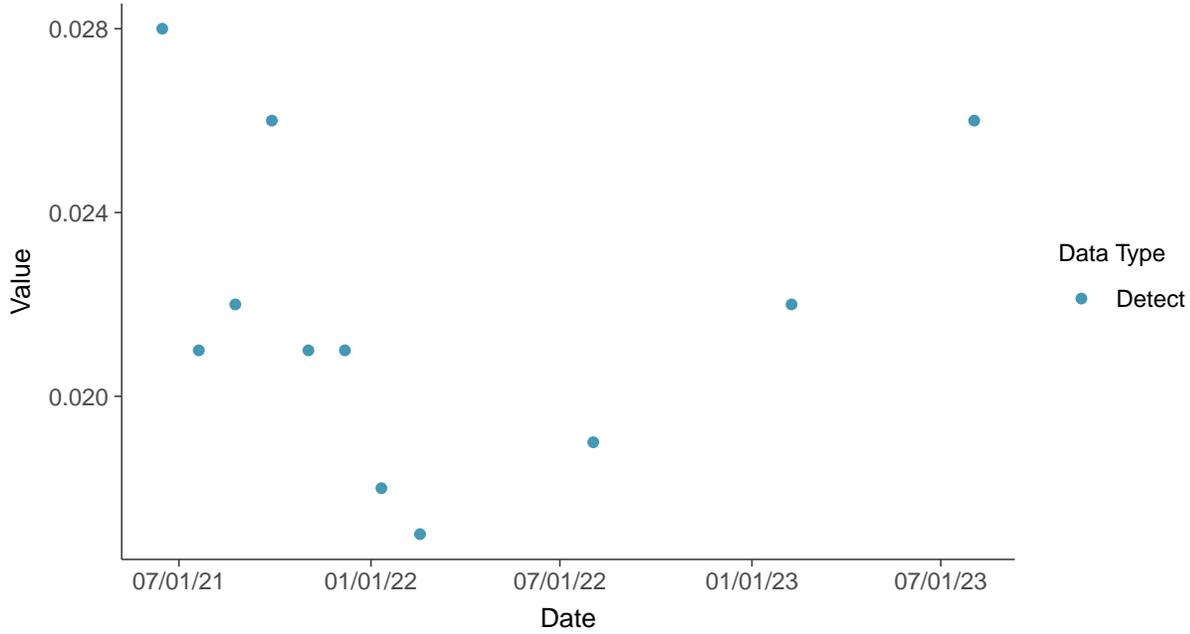


Appendix IV: Barium, MW-8

ID: 08_2_10

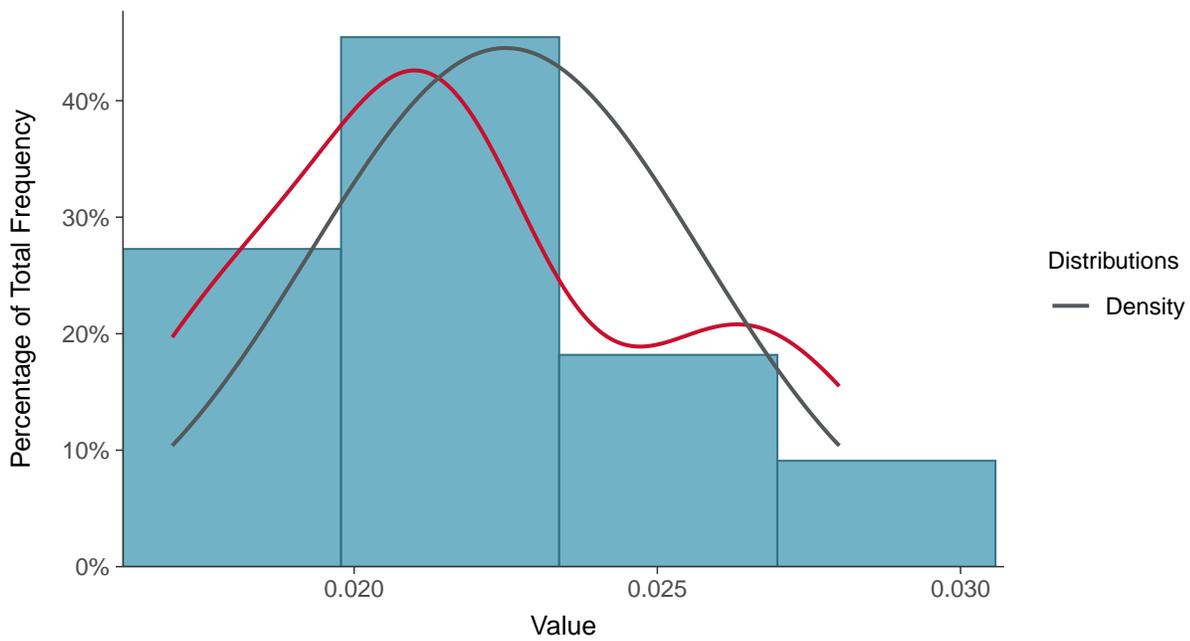
Scatter Plot

Barium, MW-8 (mg/L)



Histogram

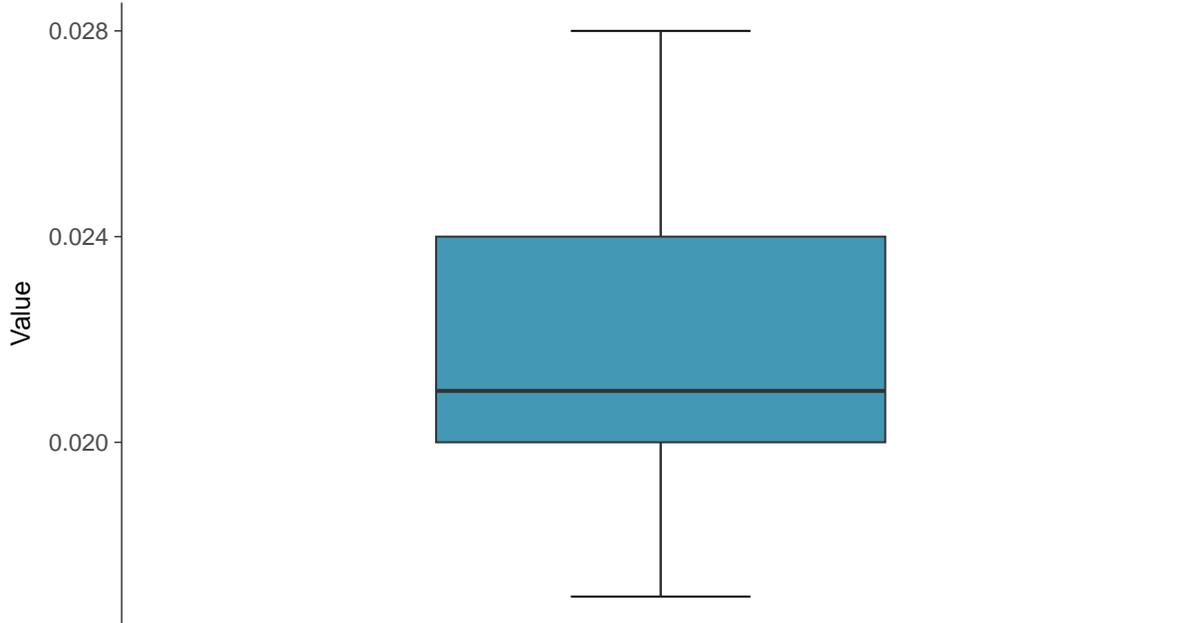
Barium, MW-8 (mg/L)





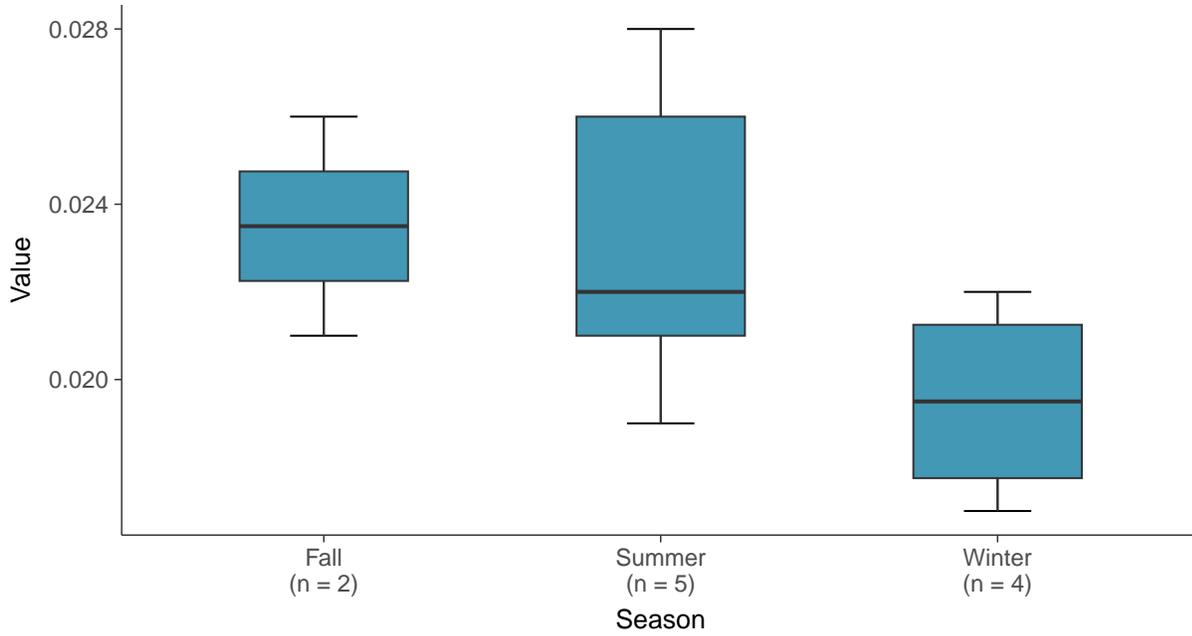
Boxplot

Barium, MW-8 (mg/L)



Boxplot by Season

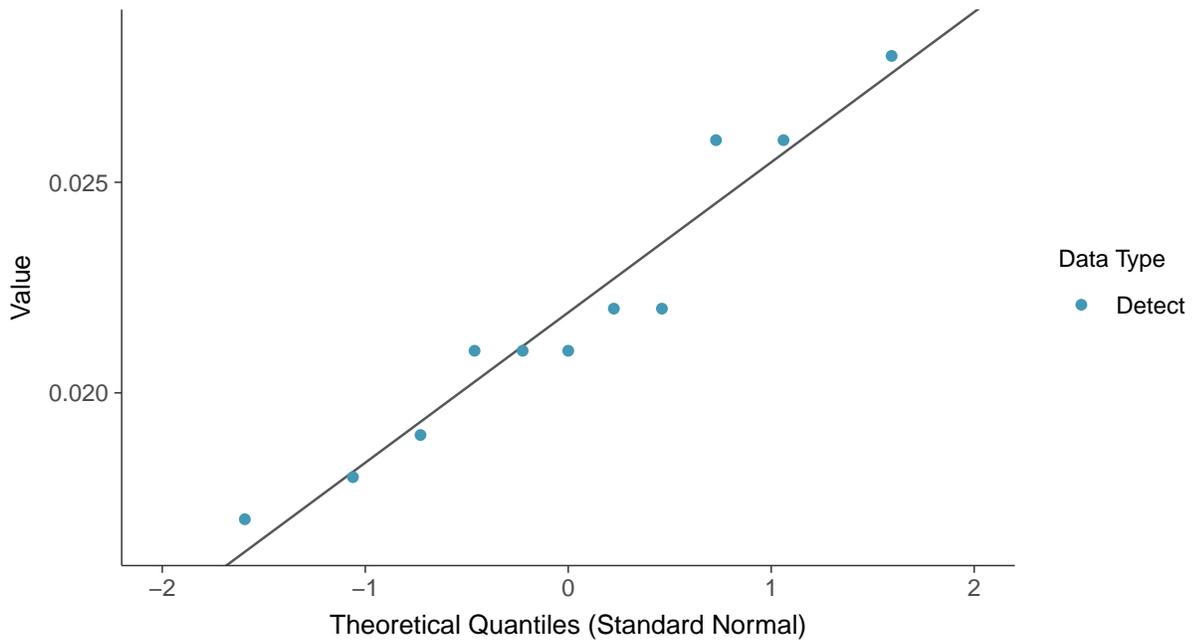
Barium, MW-8 (mg/L)





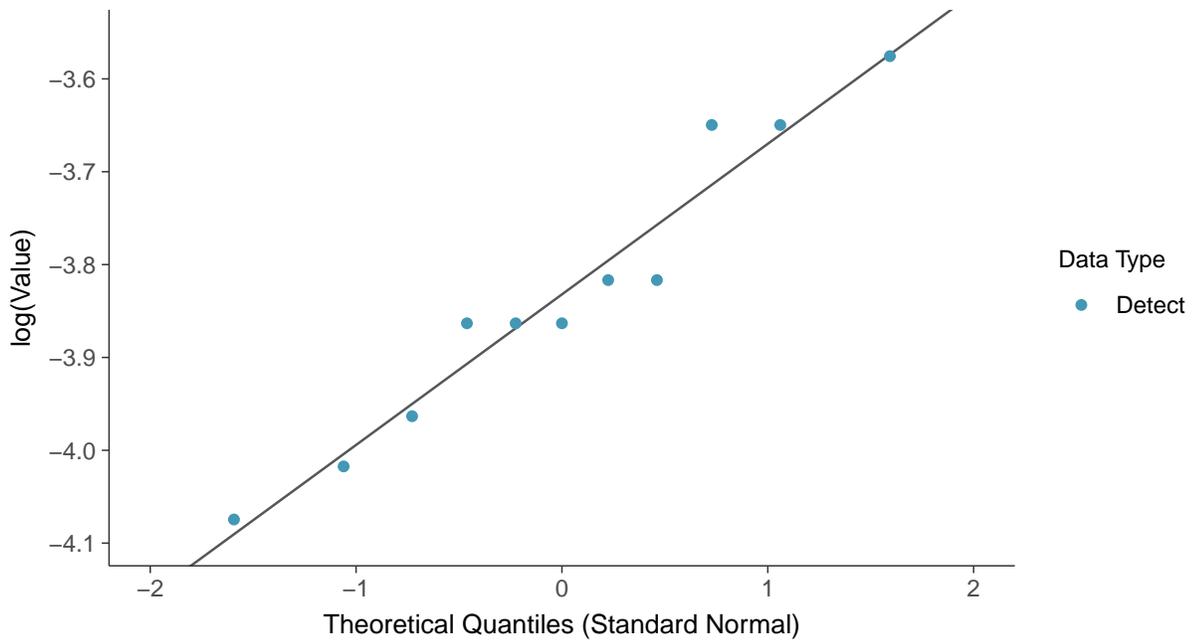
Normal Q-Q plot

Barium, MW-8 (mg/L)



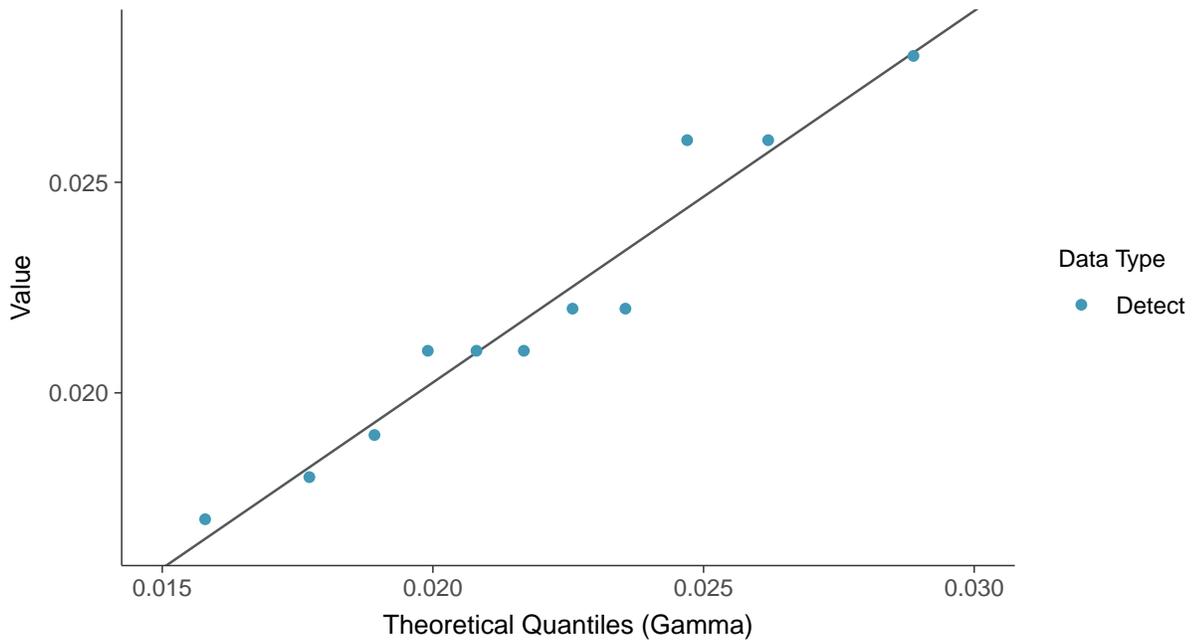
Lognormal Q-Q plot

Barium, MW-8 (mg/L)

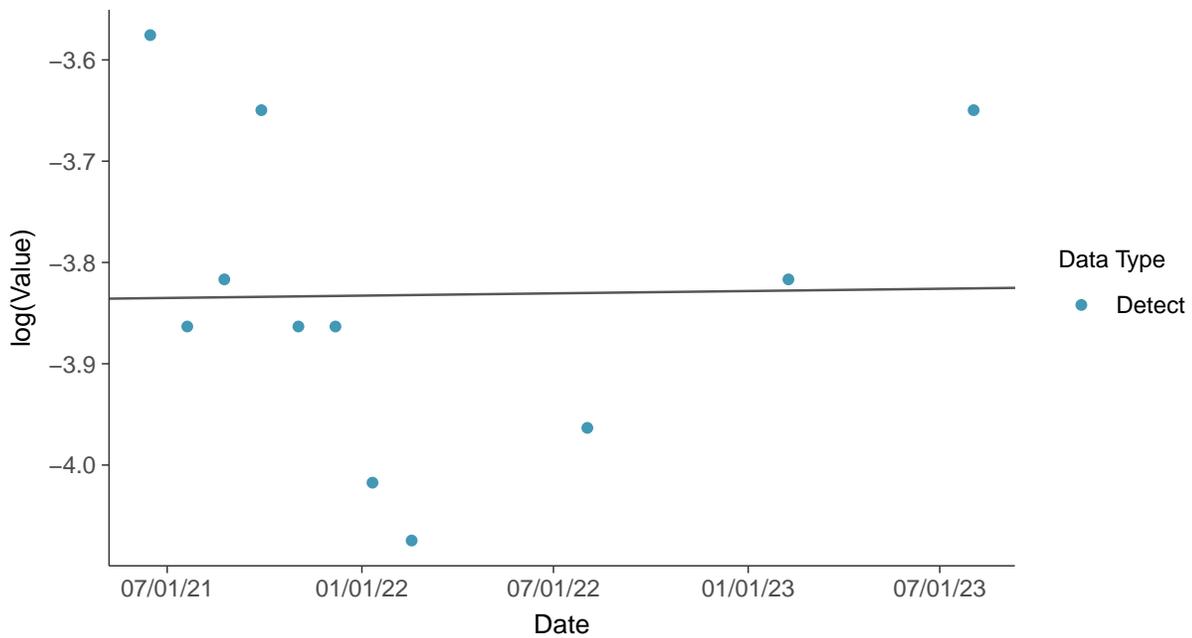




Gamma Q-Q plot
Barium, MW-8 (mg/L)



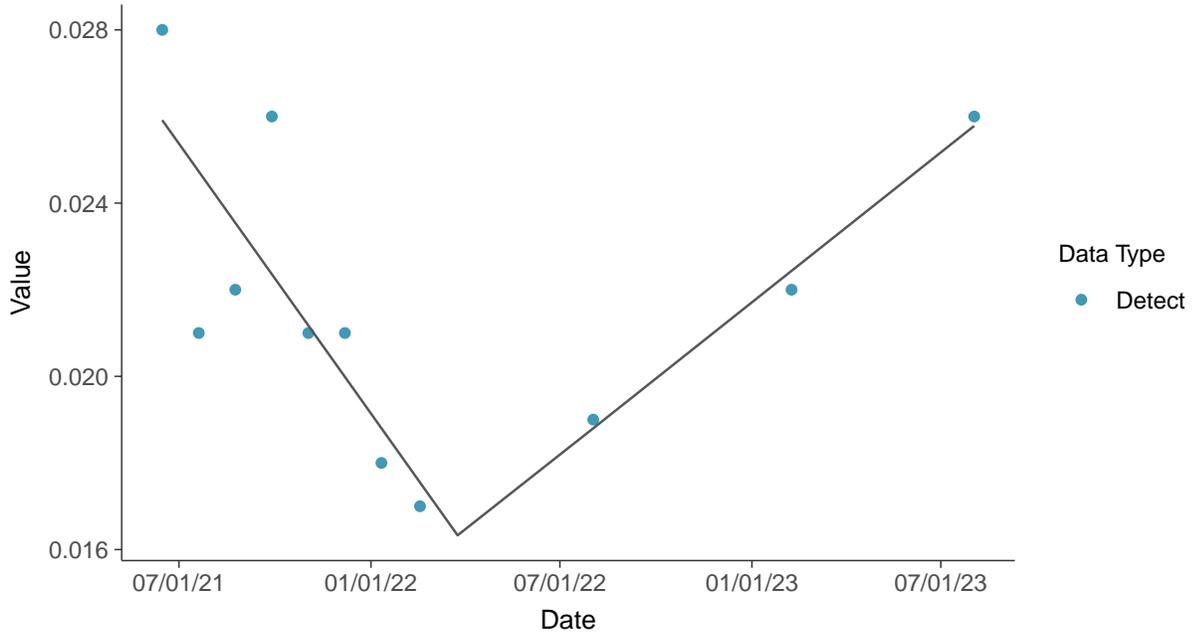
Trend Regression: Lognormal MLE
Barium, MW-8 (mg/L)





Trend Regression: Piecewise Linear-Linear

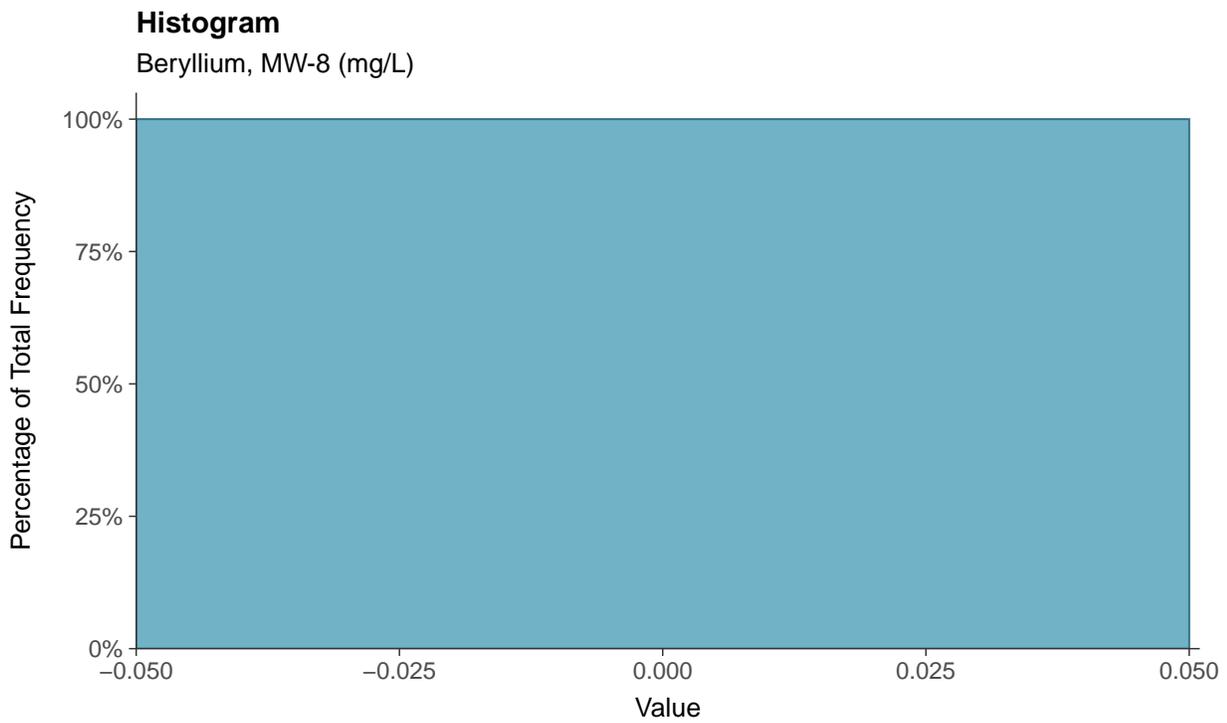
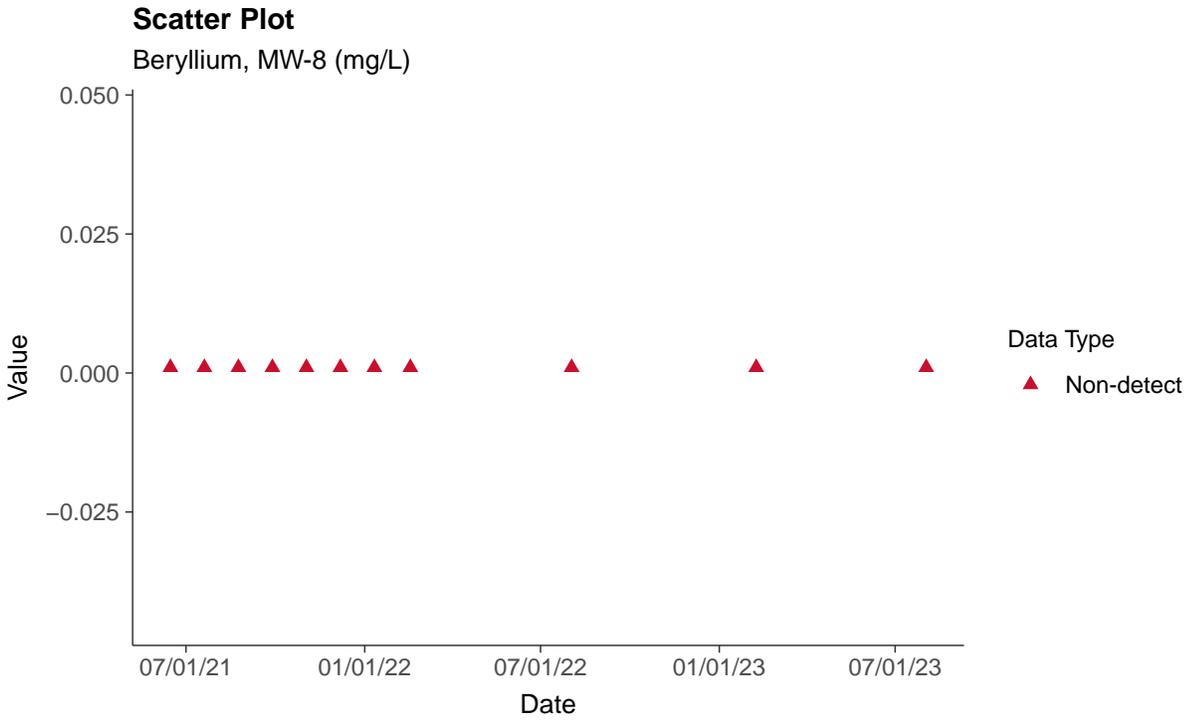
Barium, MW-8 (mg/L)





Appendix IV: Beryllium, MW-8

ID: 08_2_11





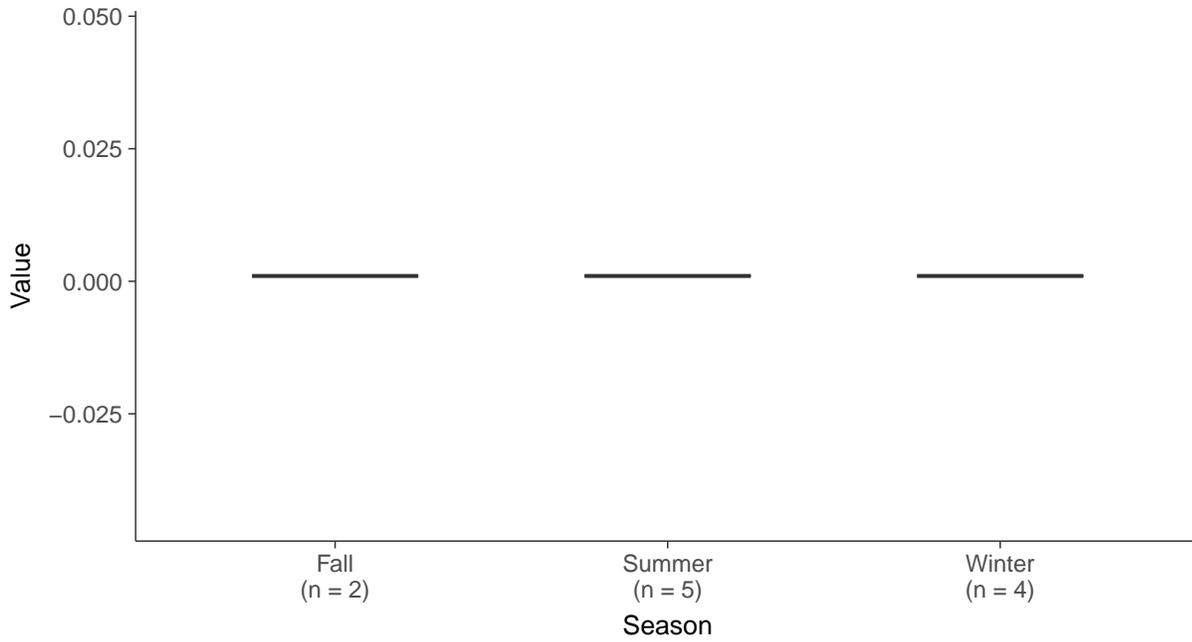
Boxplot

Beryllium, MW-8 (mg/L)



Boxplot by Season

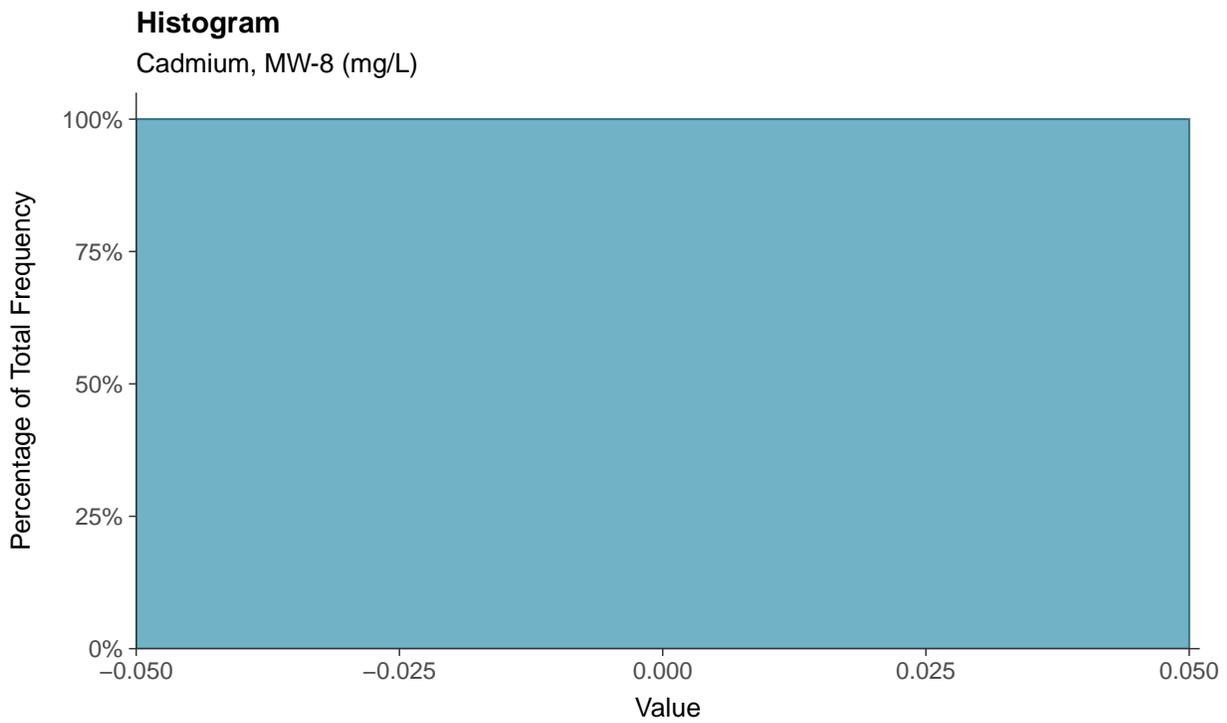
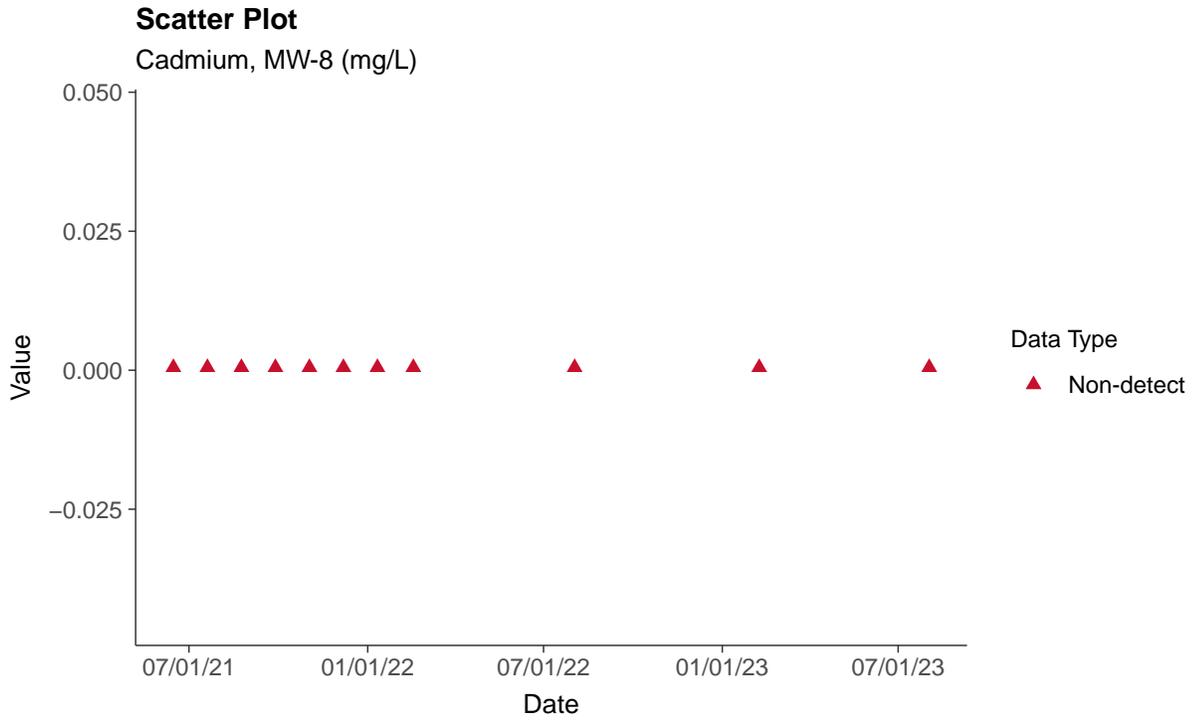
Beryllium, MW-8 (mg/L)





Appendix IV: Cadmium, MW-8

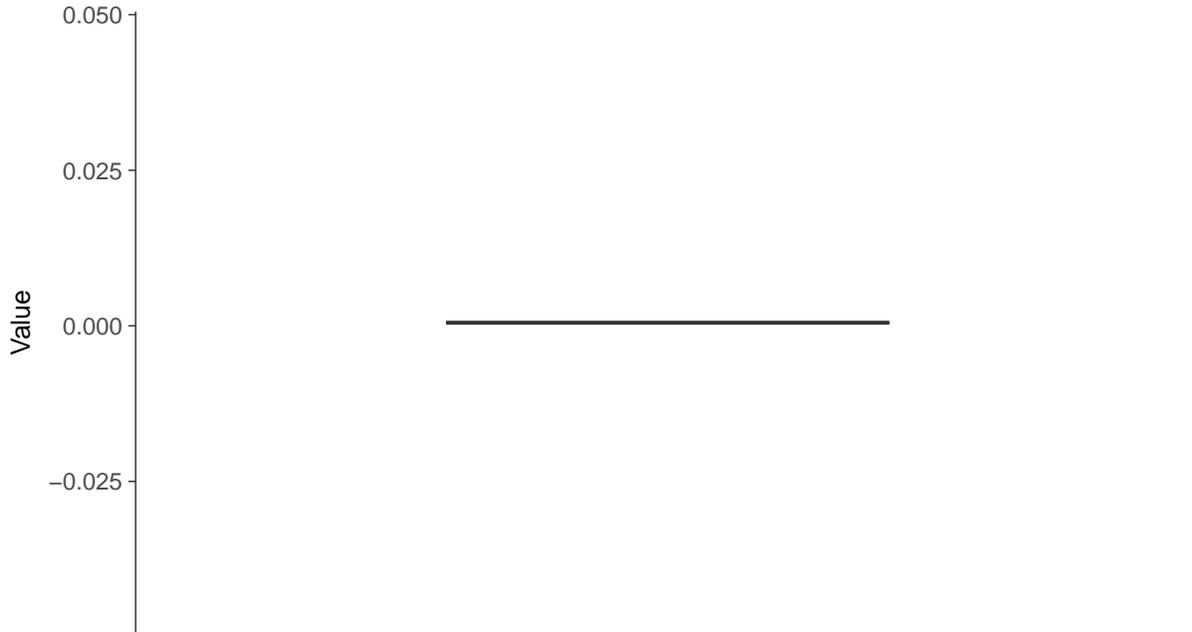
ID: 08_2_12





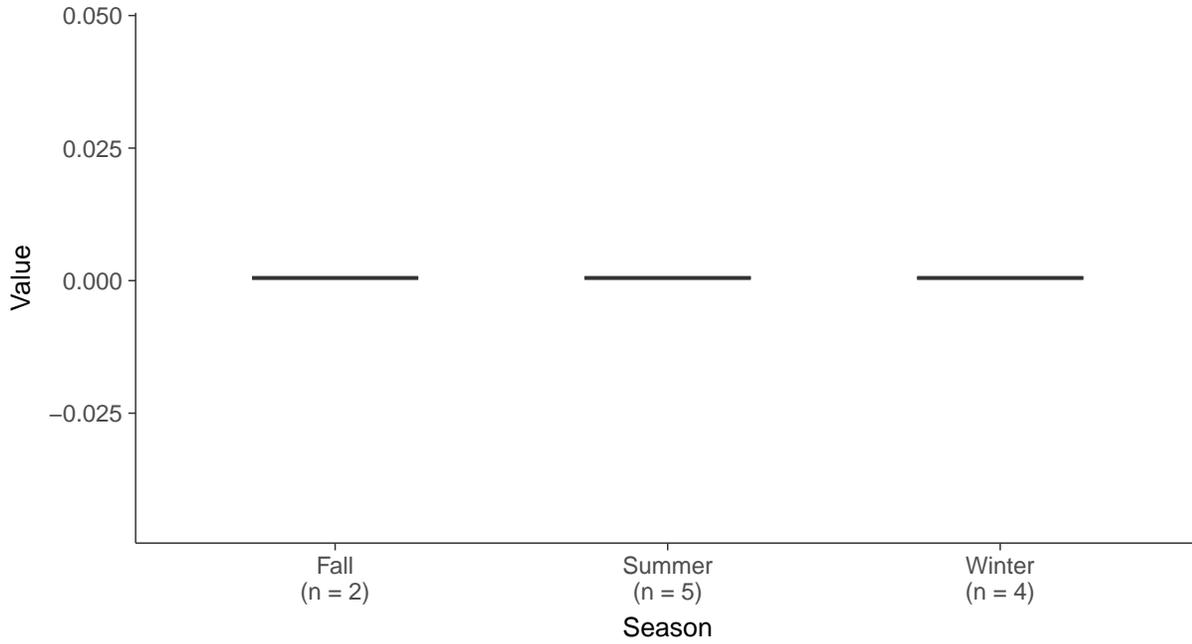
Boxplot

Cadmium, MW-8 (mg/L)



Boxplot by Season

Cadmium, MW-8 (mg/L)



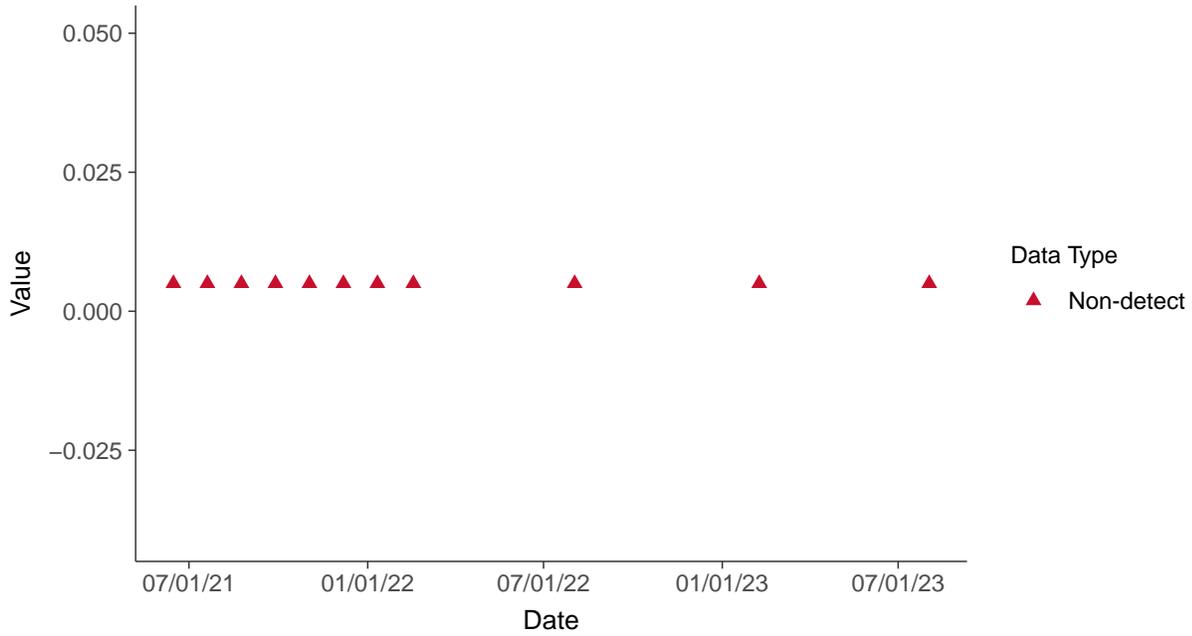


Appendix IV: Chromium, MW-8

ID: 08_2_13

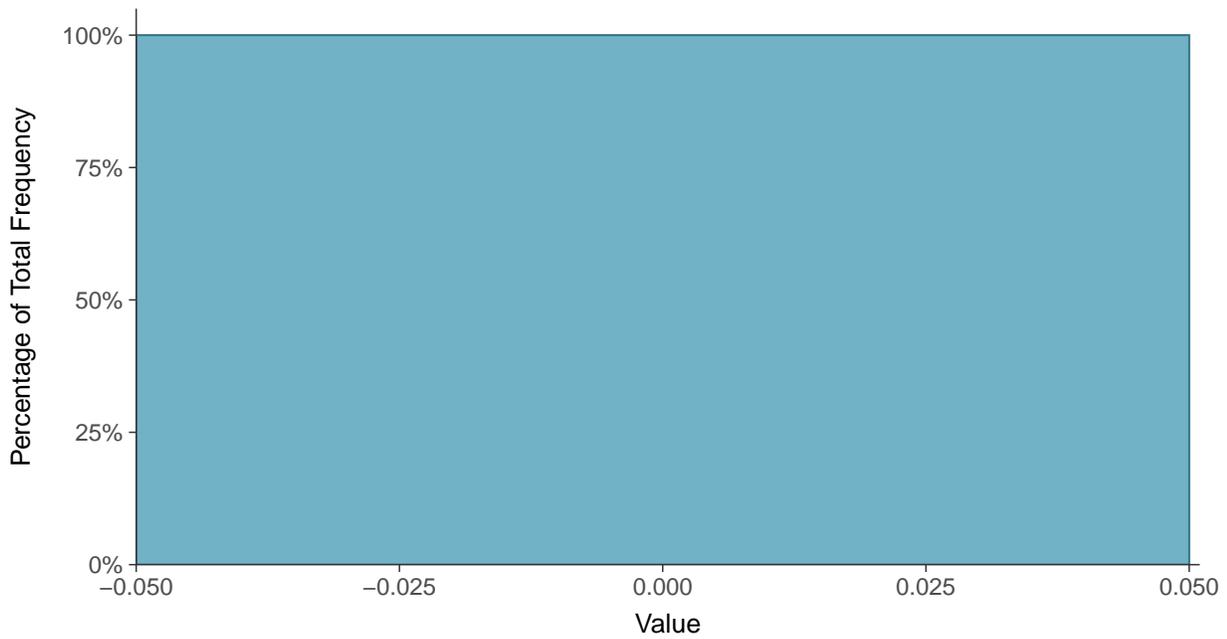
Scatter Plot

Chromium, MW-8 (mg/L)



Histogram

Chromium, MW-8 (mg/L)





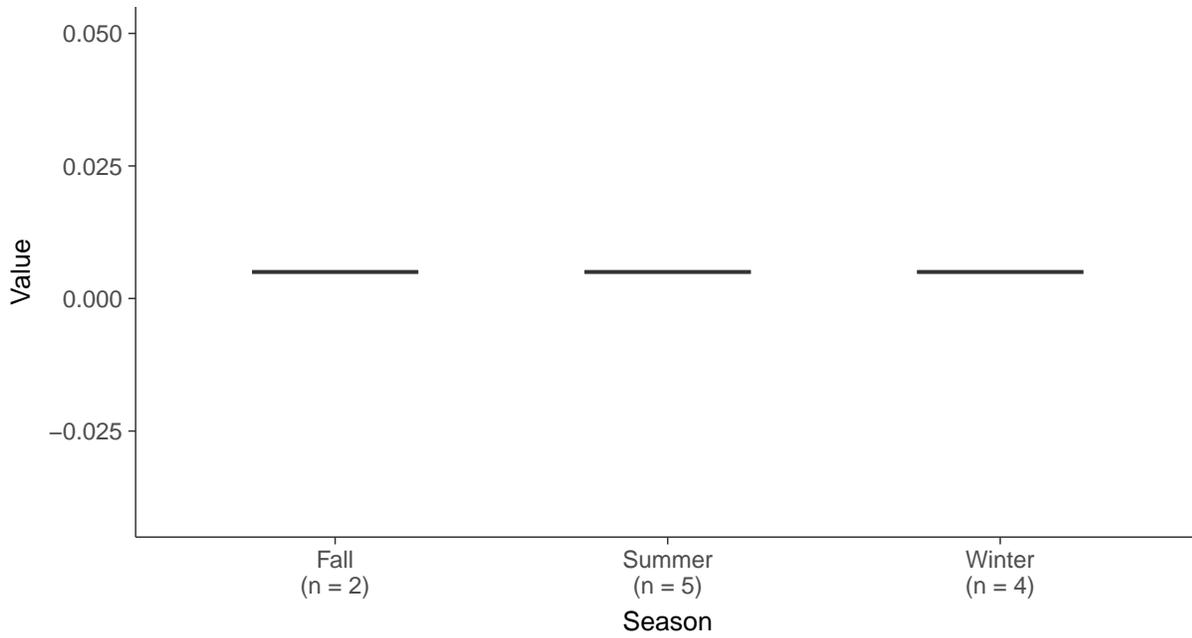
Boxplot

Chromium, MW-8 (mg/L)



Boxplot by Season

Chromium, MW-8 (mg/L)



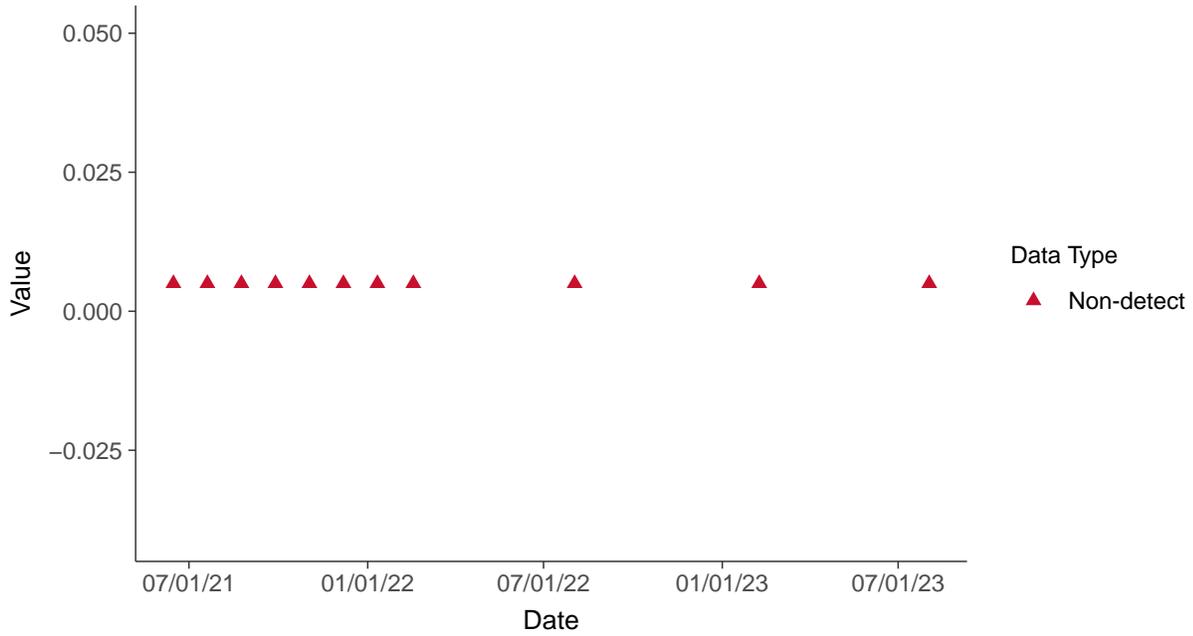


Appendix IV: Cobalt, MW-8

ID: 08_2_14

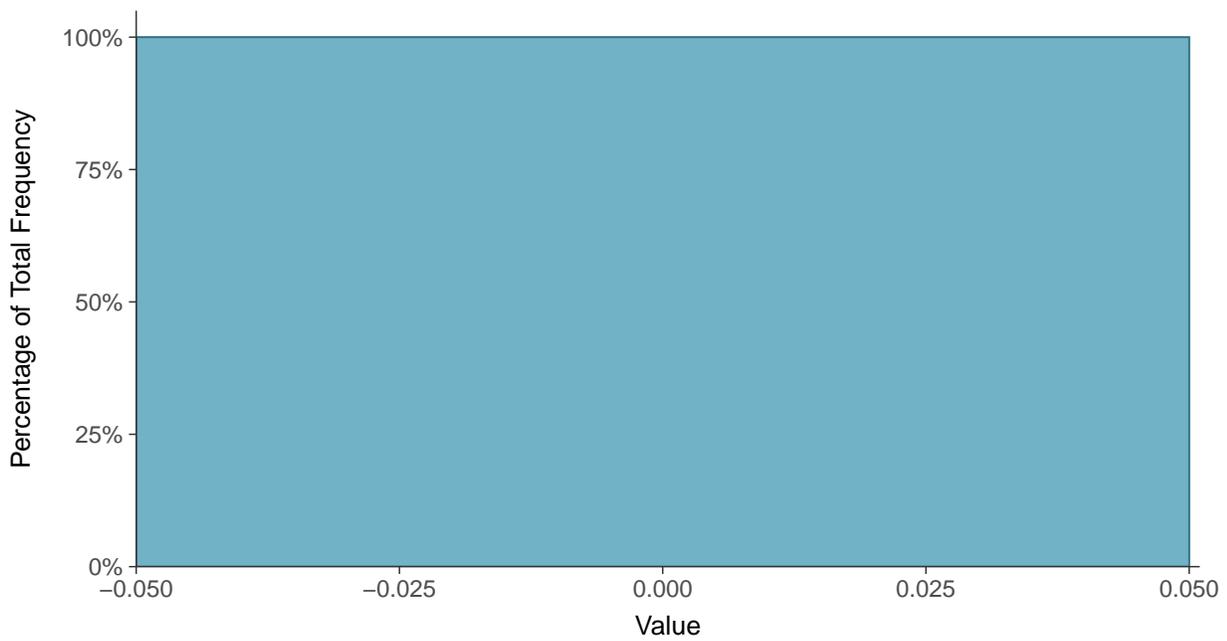
Scatter Plot

Cobalt, MW-8 (mg/L)



Histogram

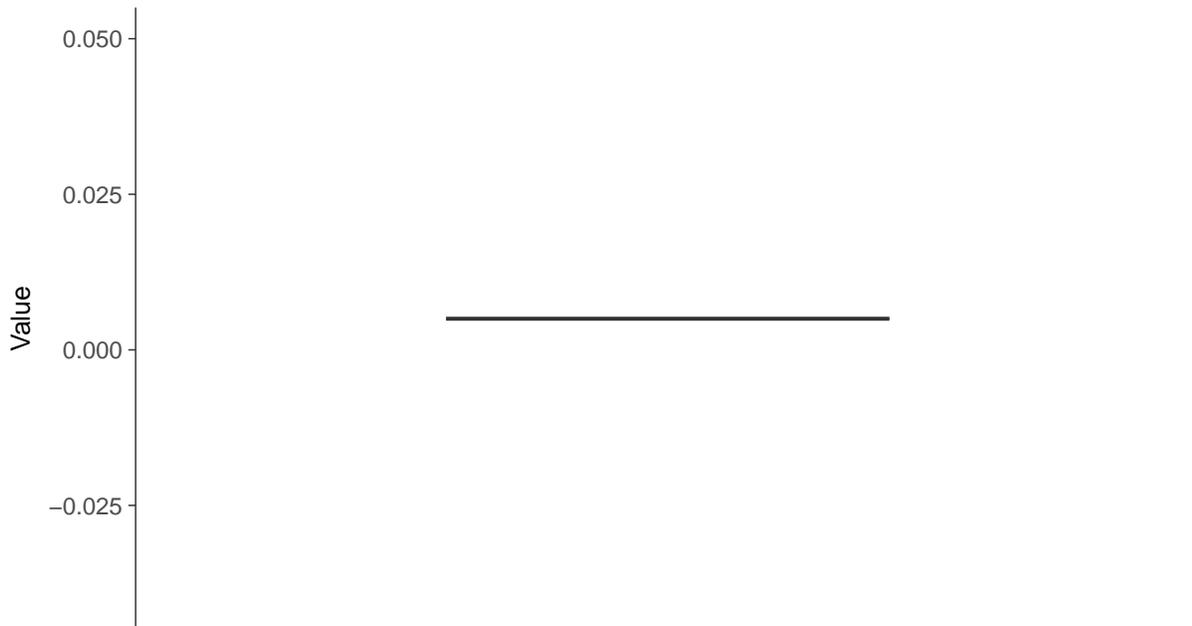
Cobalt, MW-8 (mg/L)





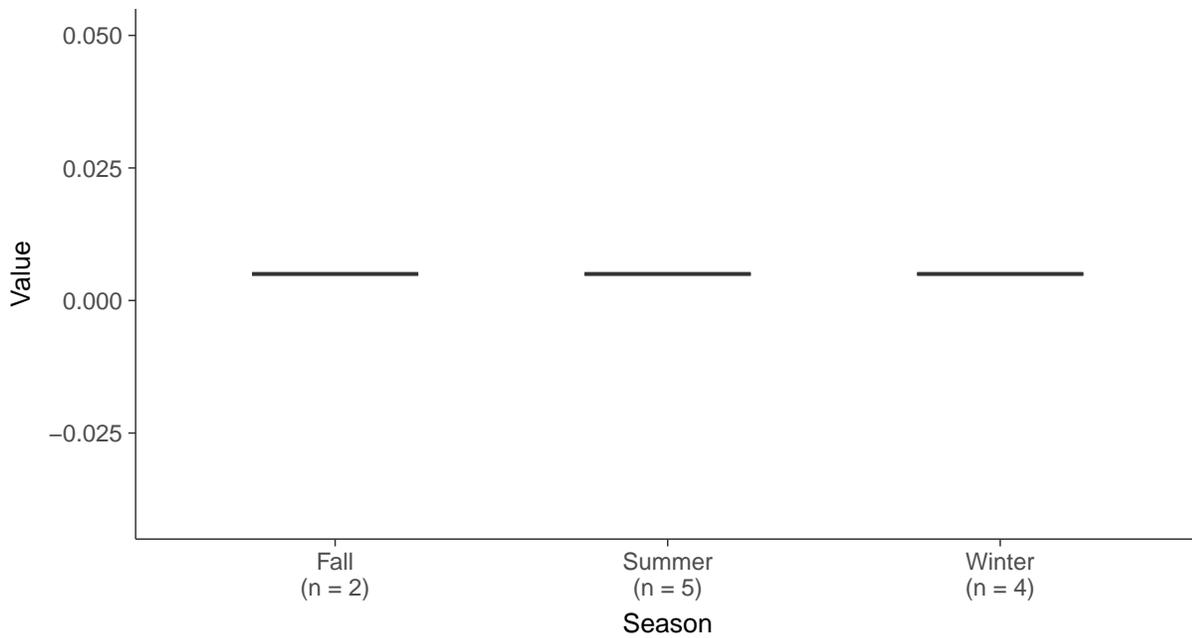
Boxplot

Cobalt, MW-8 (mg/L)



Boxplot by Season

Cobalt, MW-8 (mg/L)



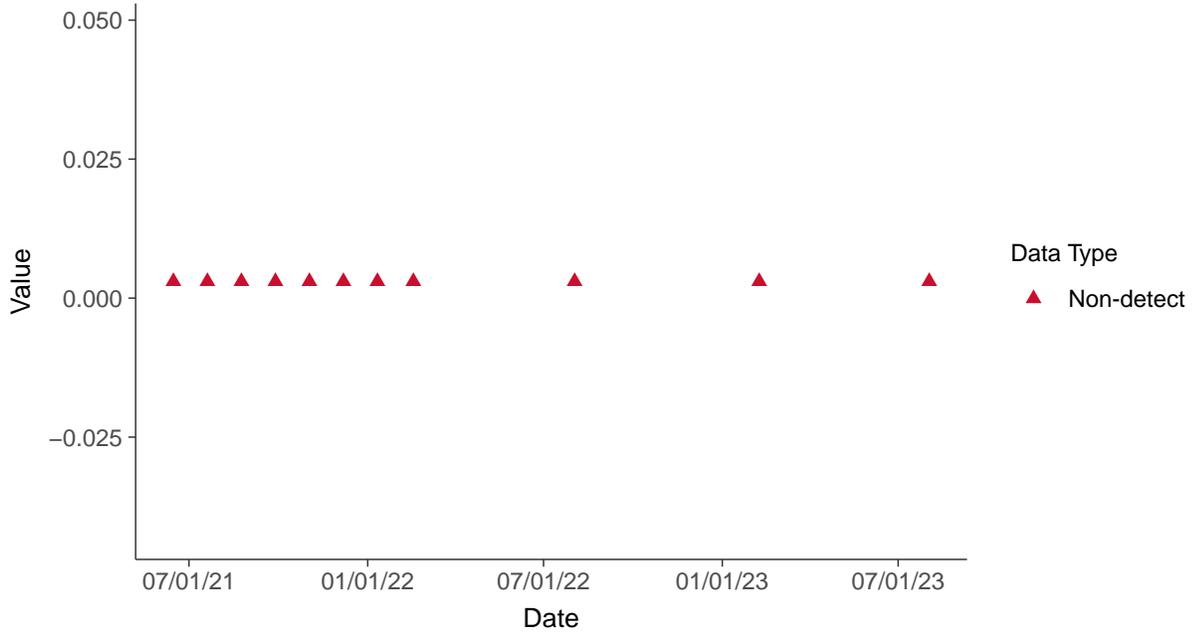


Appendix IV: Lead, MW-8

ID: 08_2_15

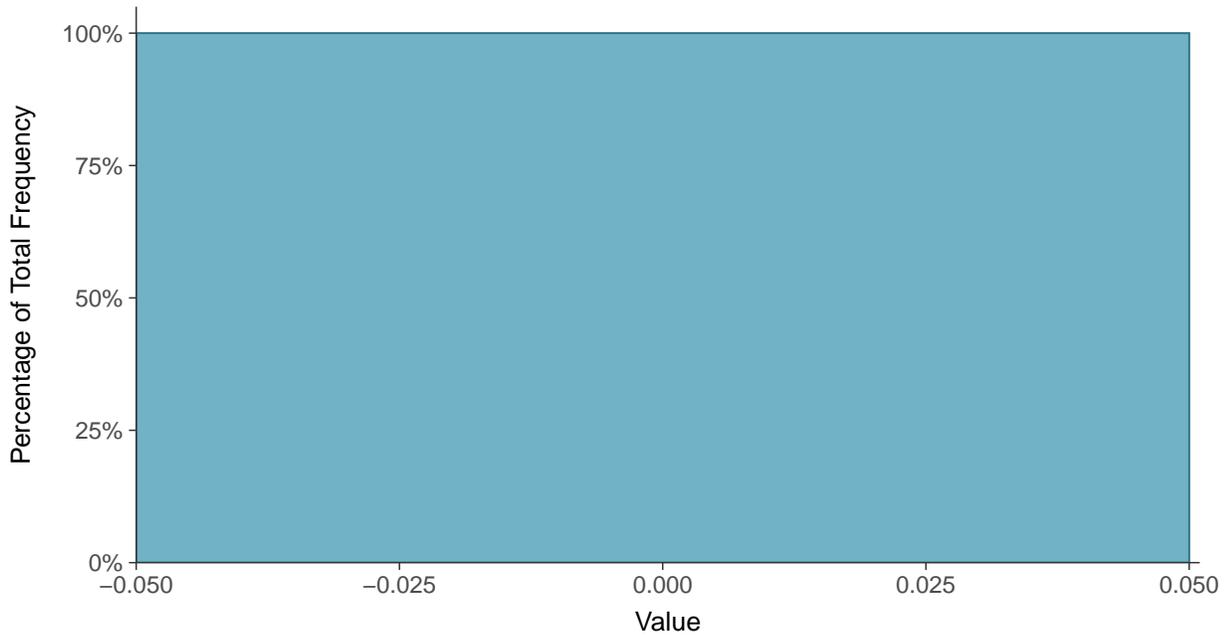
Scatter Plot

Lead, MW-8 (mg/L)



Histogram

Lead, MW-8 (mg/L)





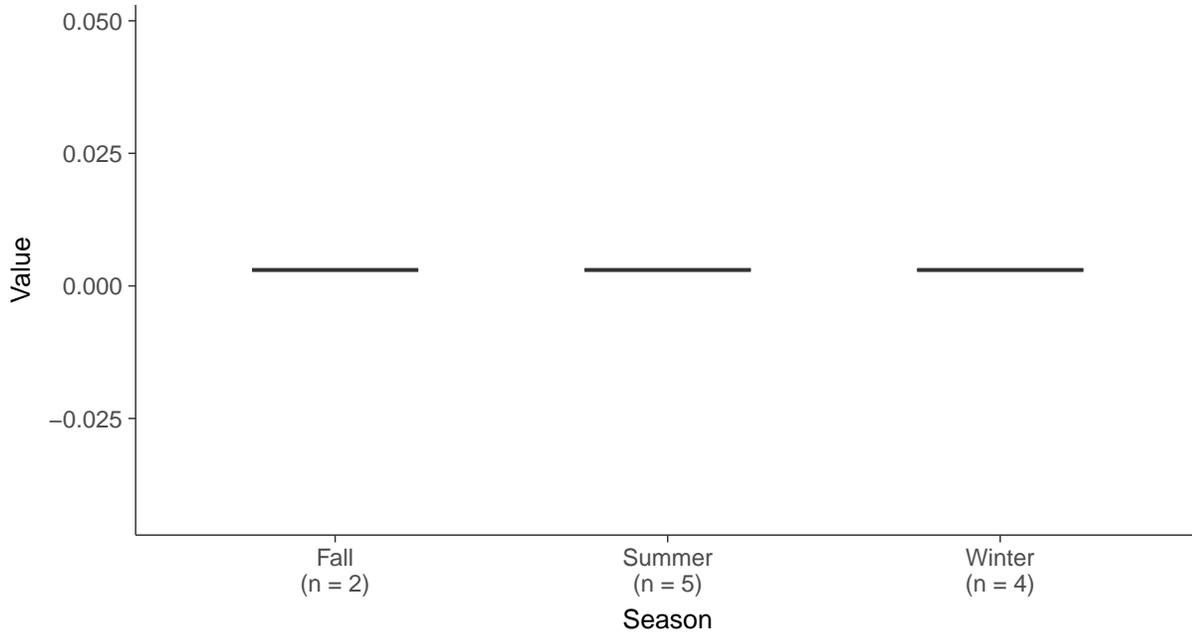
Boxplot

Lead, MW-8 (mg/L)



Boxplot by Season

Lead, MW-8 (mg/L)



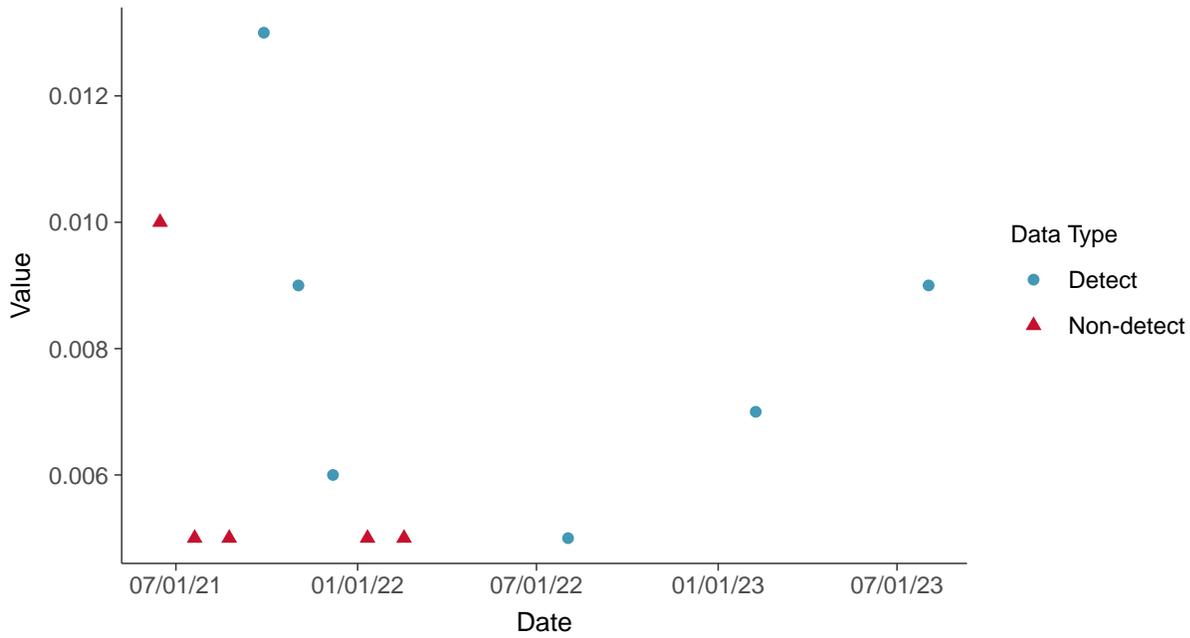


Appendix IV: Lithium, MW-8

ID: 08_2_16

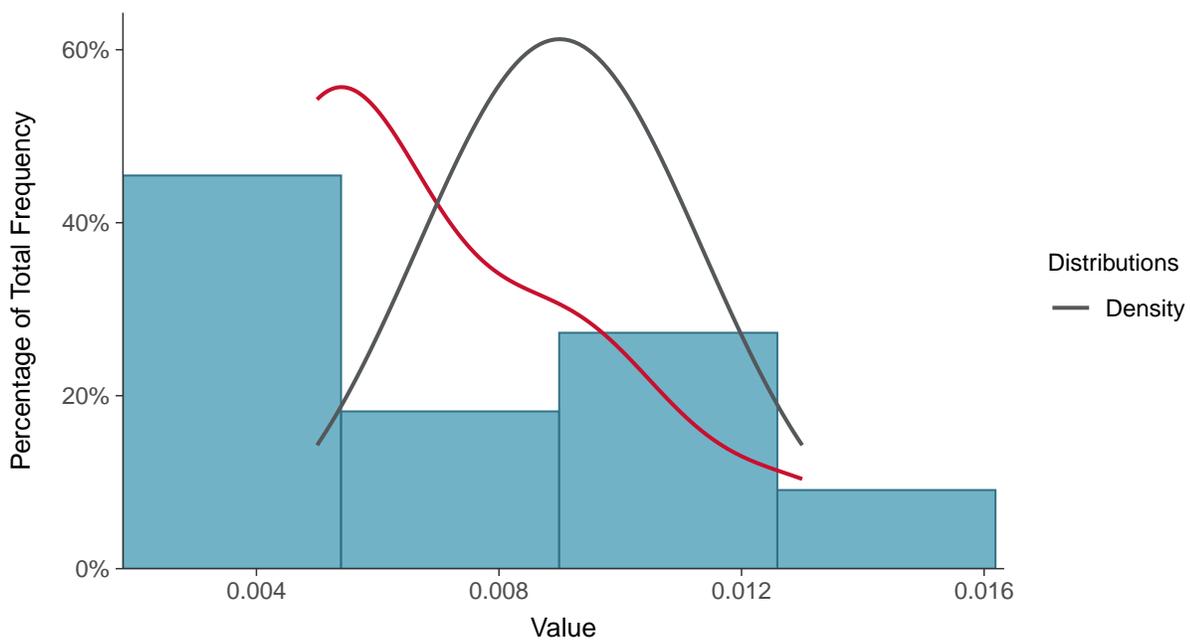
Scatter Plot

Lithium, MW-8 (mg/L)



Histogram

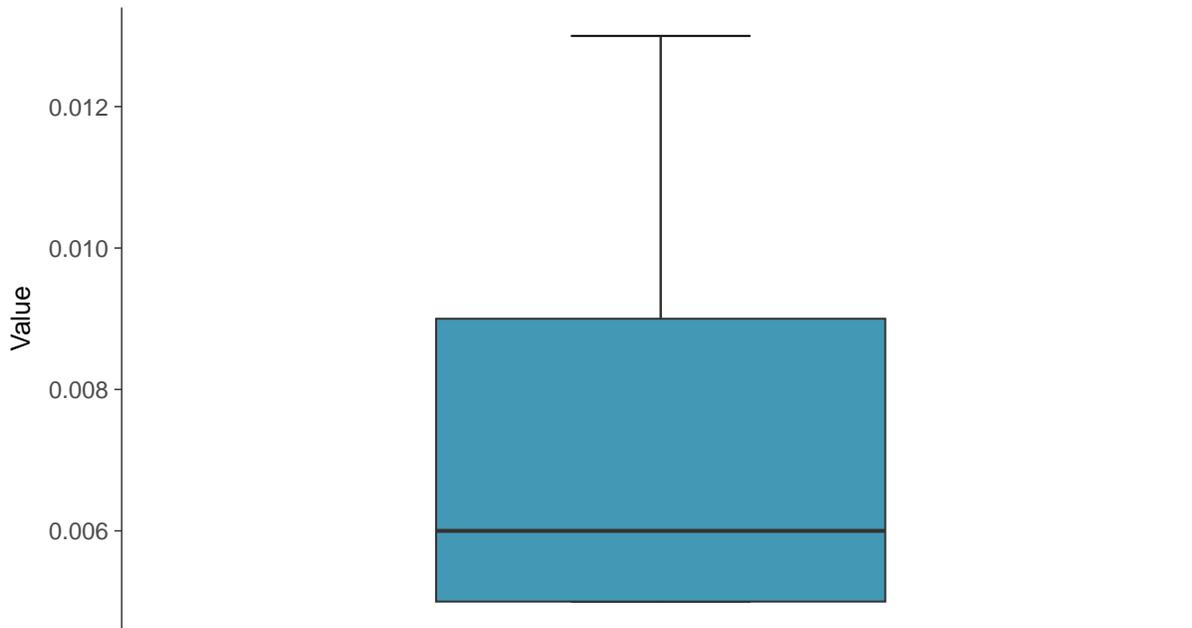
Lithium, MW-8 (mg/L)





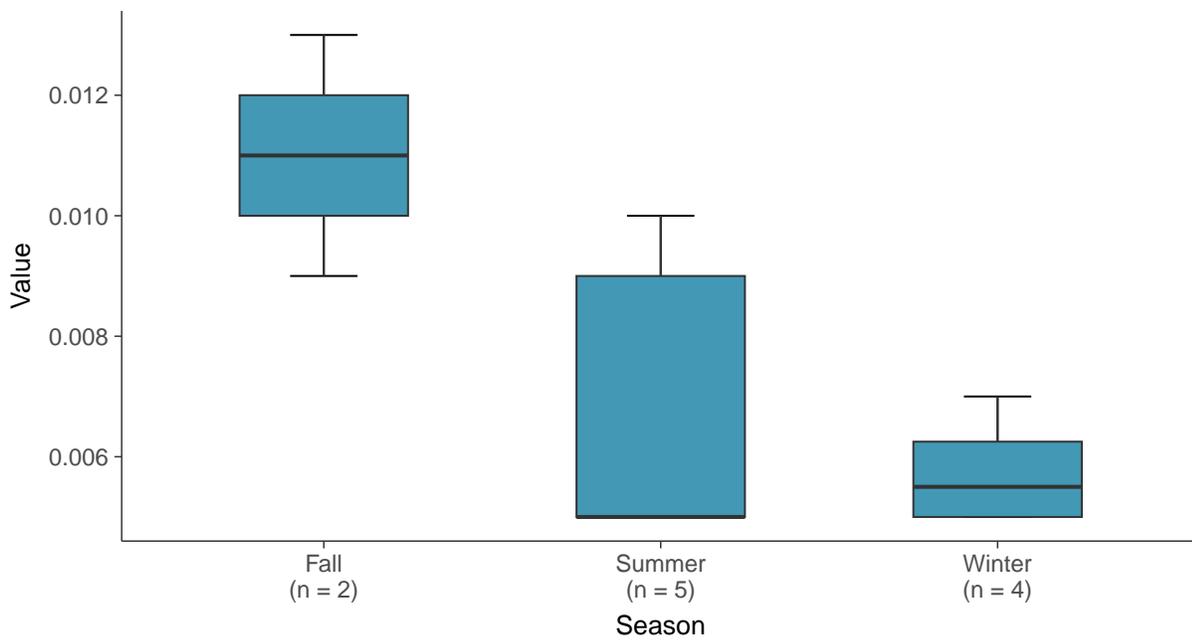
Boxplot

Lithium, MW-8 (mg/L)



Boxplot by Season

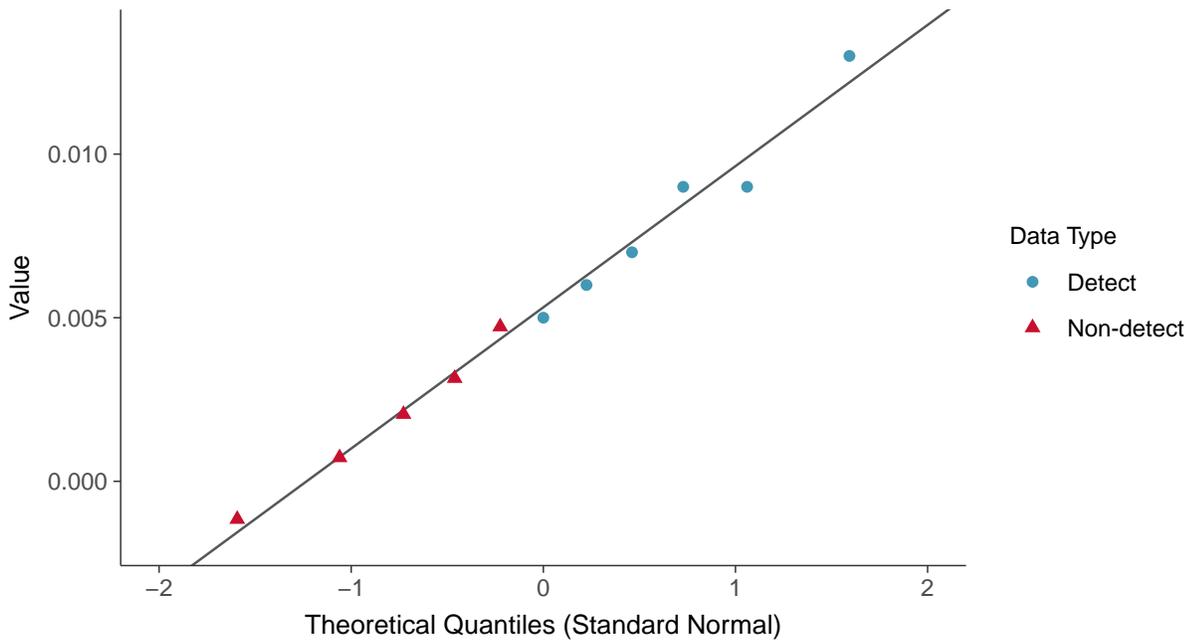
Lithium, MW-8 (mg/L)





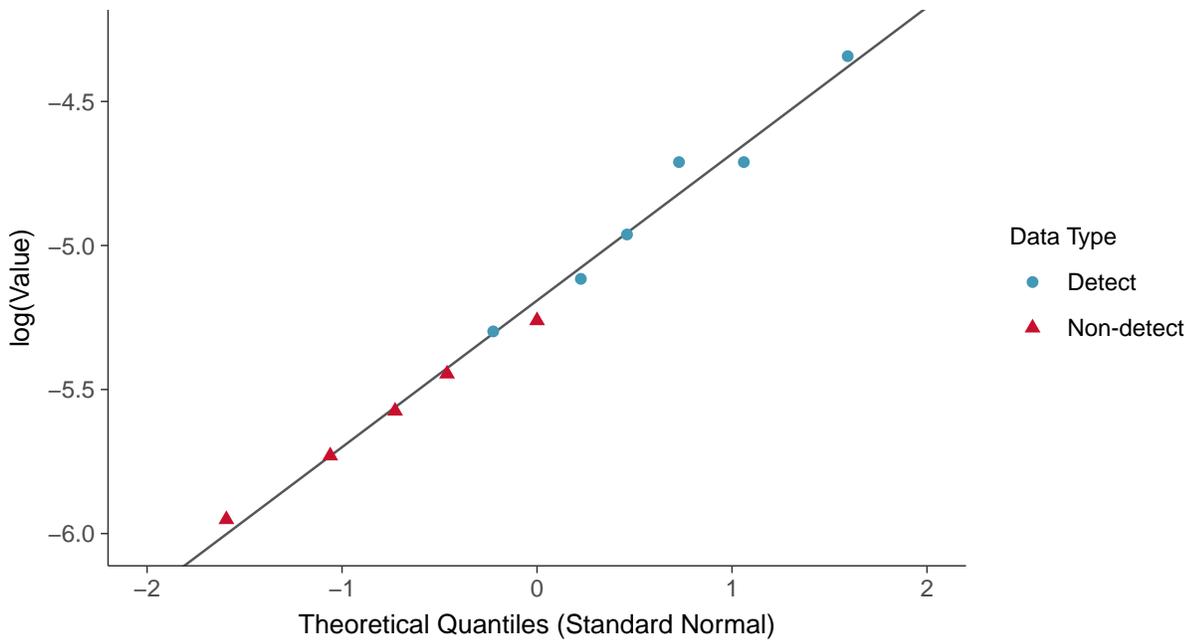
Normal Q-Q plot using ROS Imputed Estimates

Lithium, MW-8 (mg/L)



Lognormal Q-Q plot using ROS Imputed Estimates

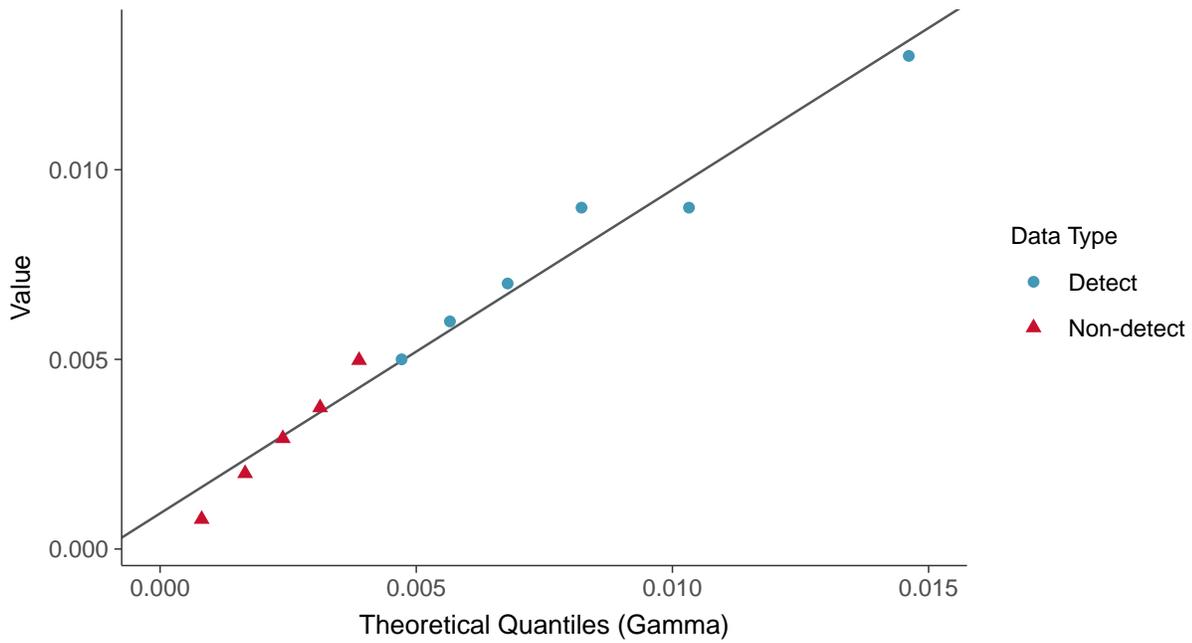
Lithium, MW-8 (mg/L)





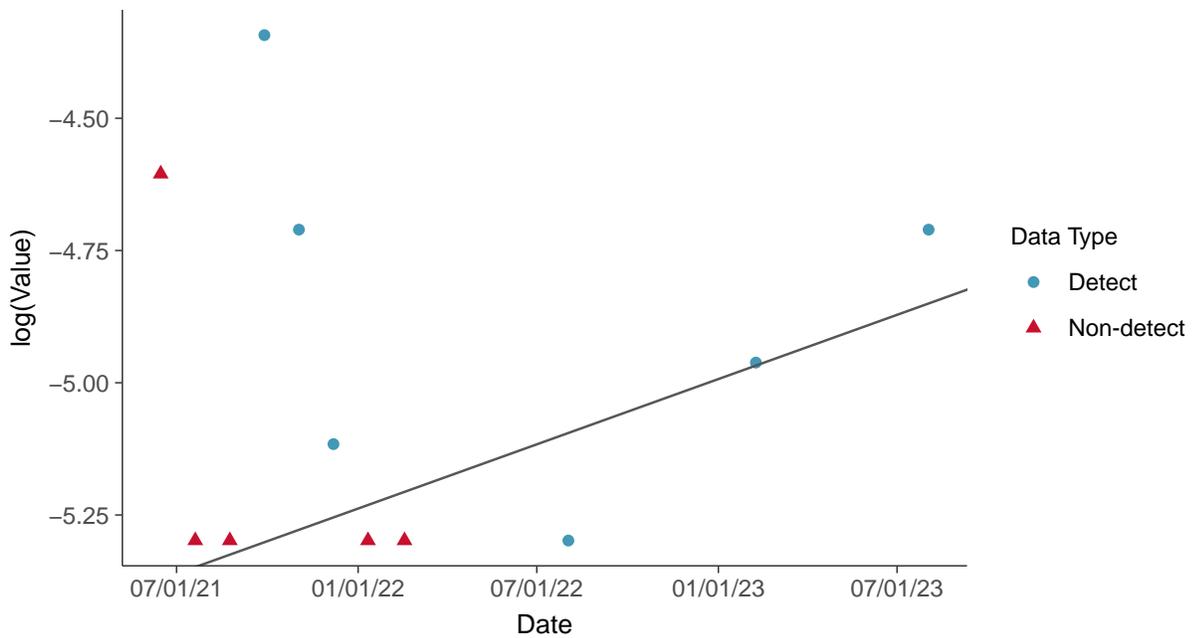
Gamma Q-Q plot using ROS Imputed Estimates

Lithium, MW-8 (mg/L)



Trend Regression: Lognormal MLE

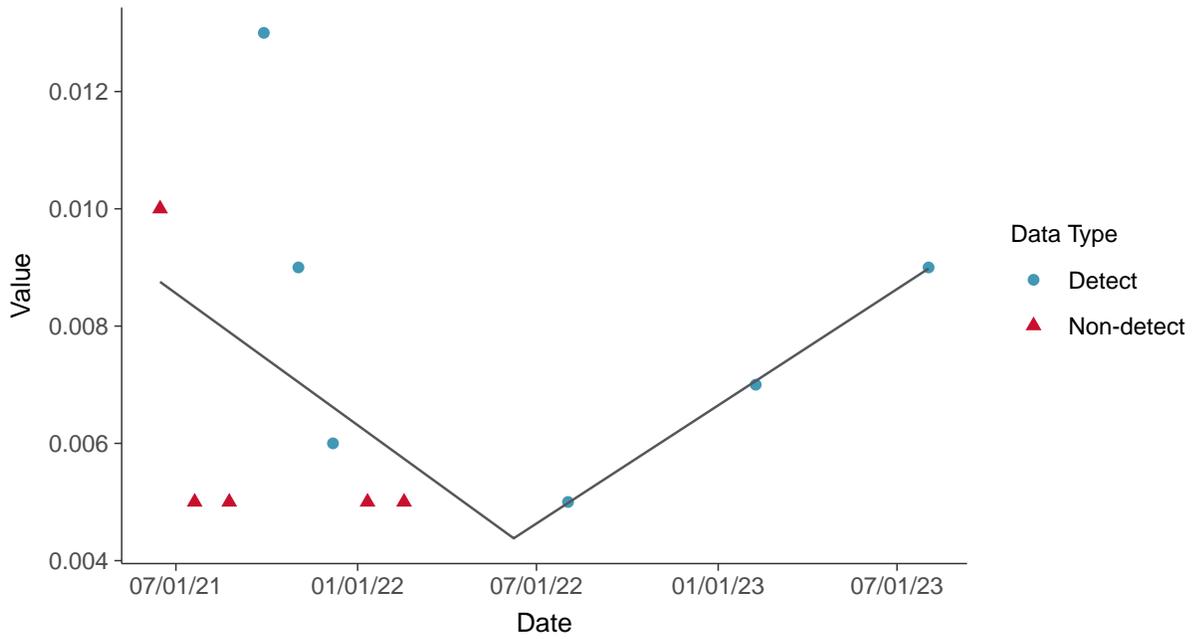
Lithium, MW-8 (mg/L)





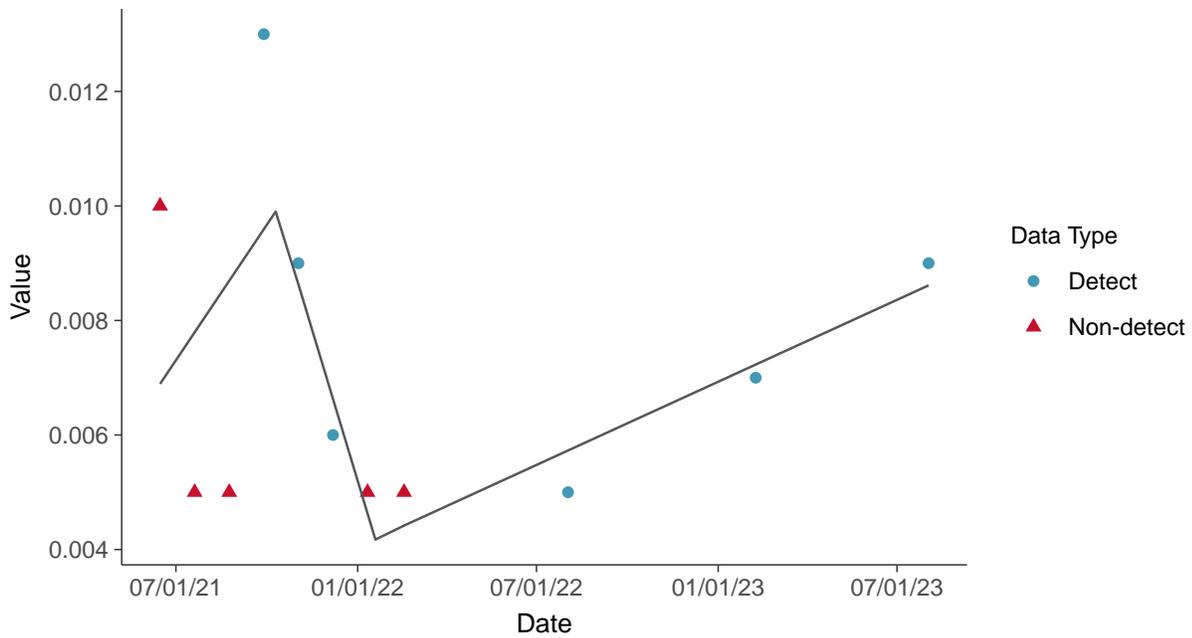
Trend Regression: Piecewise Linear-Linear

Lithium, MW-8 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

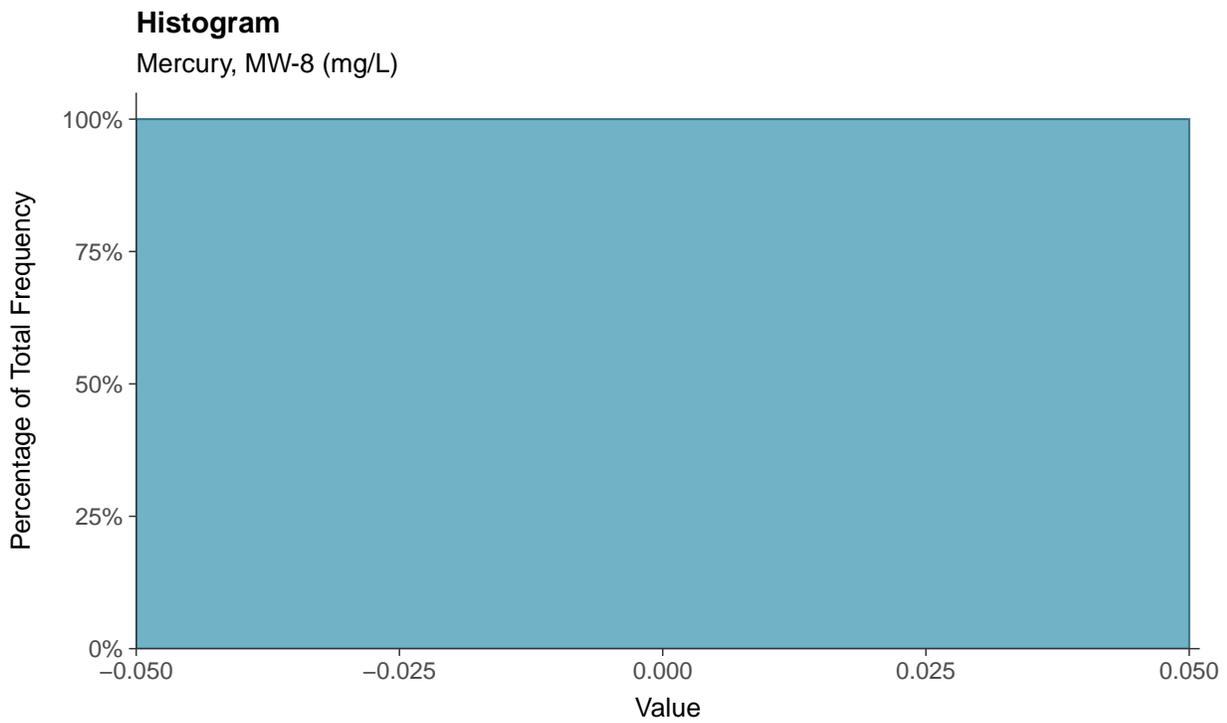
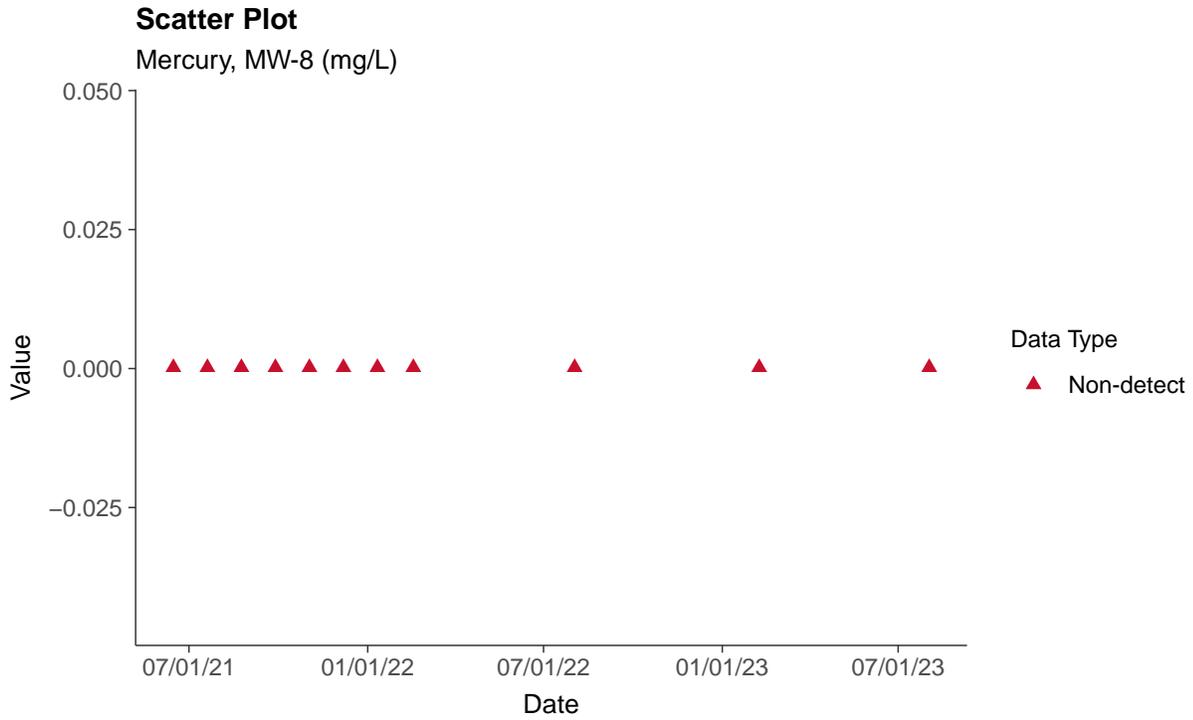
Lithium, MW-8 (mg/L)





Appendix IV: Mercury, MW-8

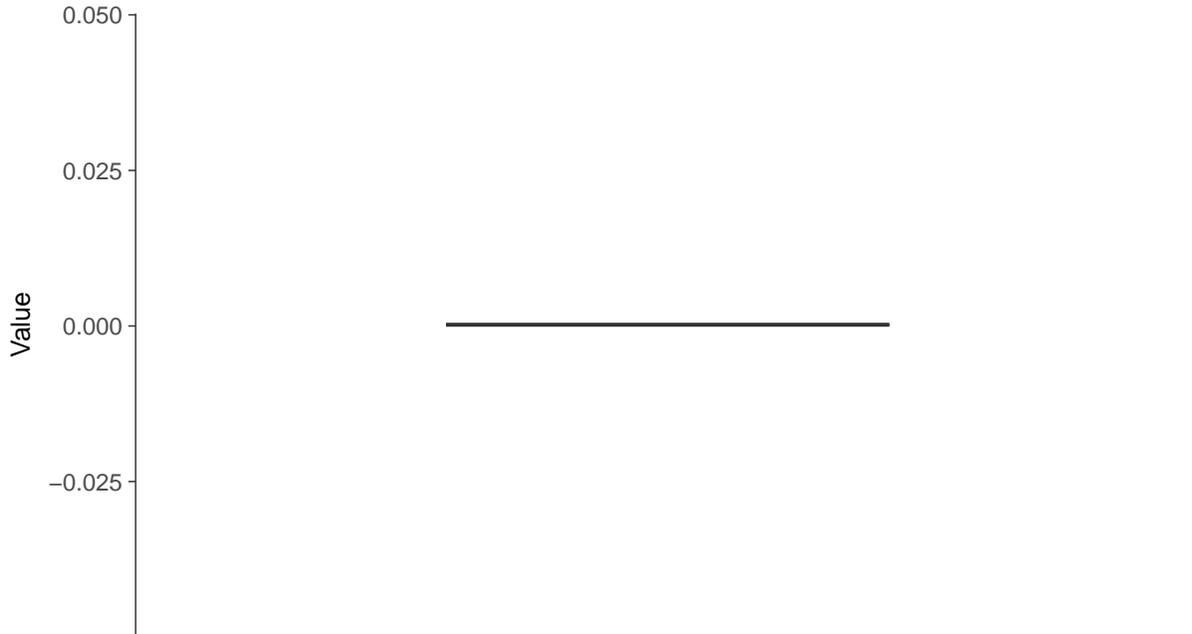
ID: 08_2_17





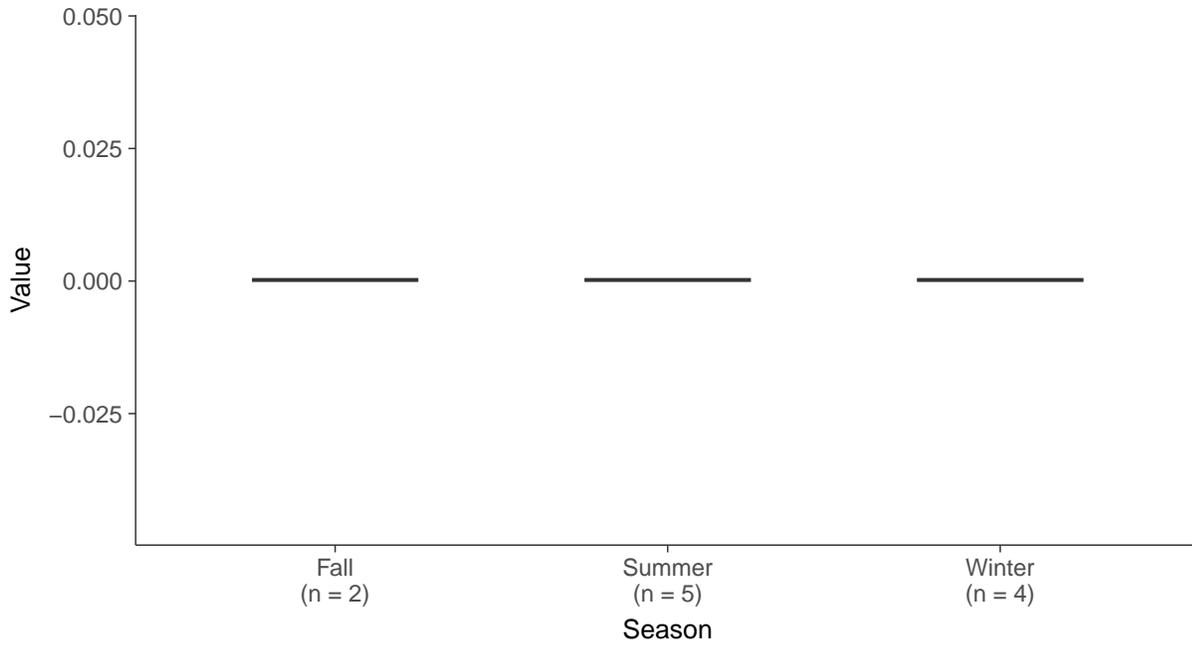
Boxplot

Mercury, MW-8 (mg/L)



Boxplot by Season

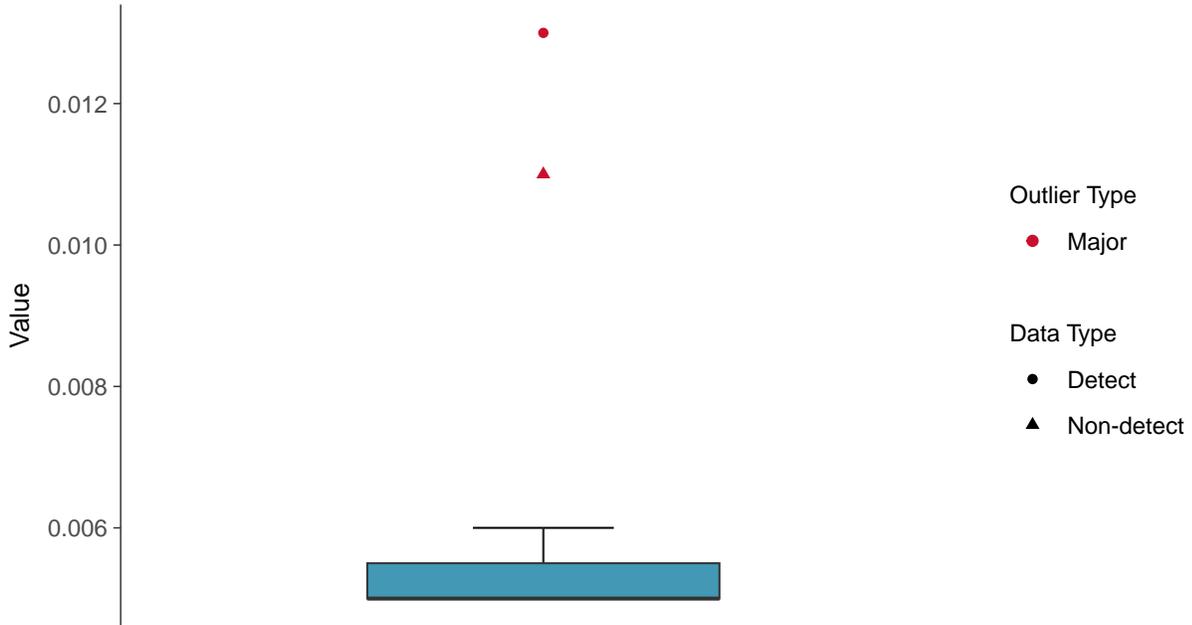
Mercury, MW-8 (mg/L)





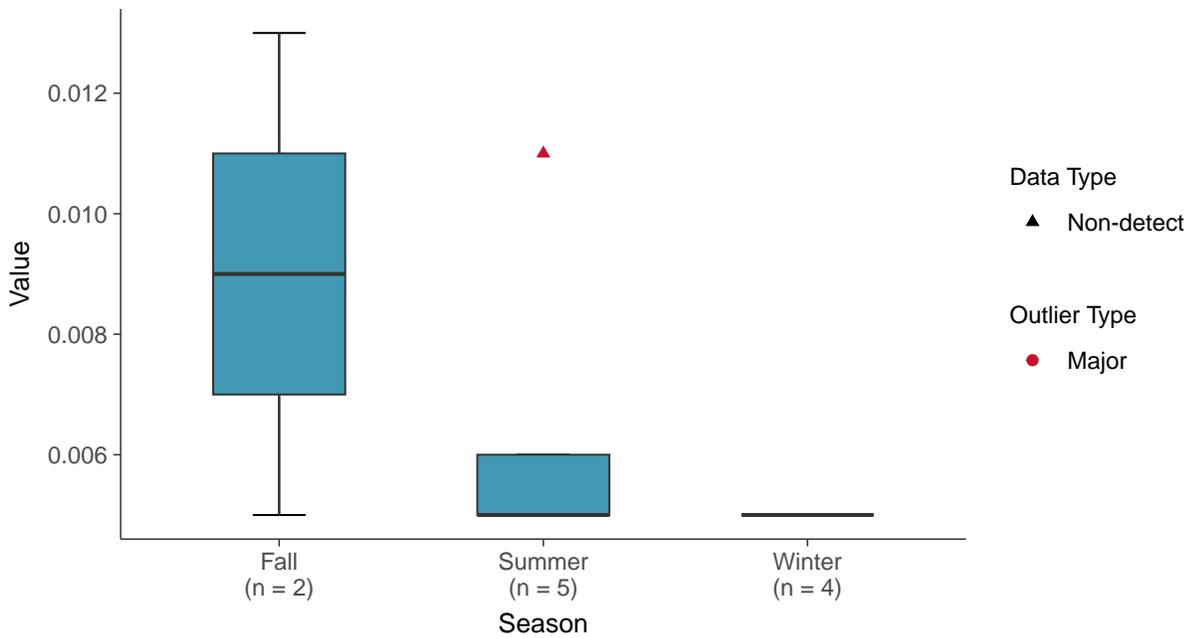
Boxplot

Molybdenum, MW-8 (mg/L)



Boxplot by Season

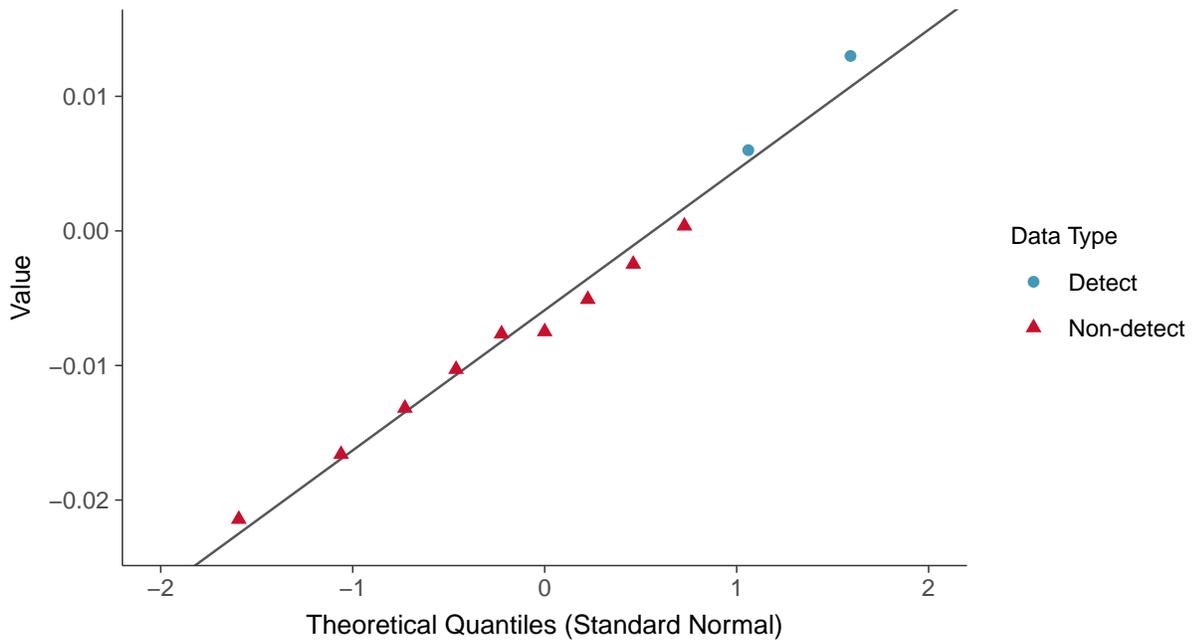
Molybdenum, MW-8 (mg/L)





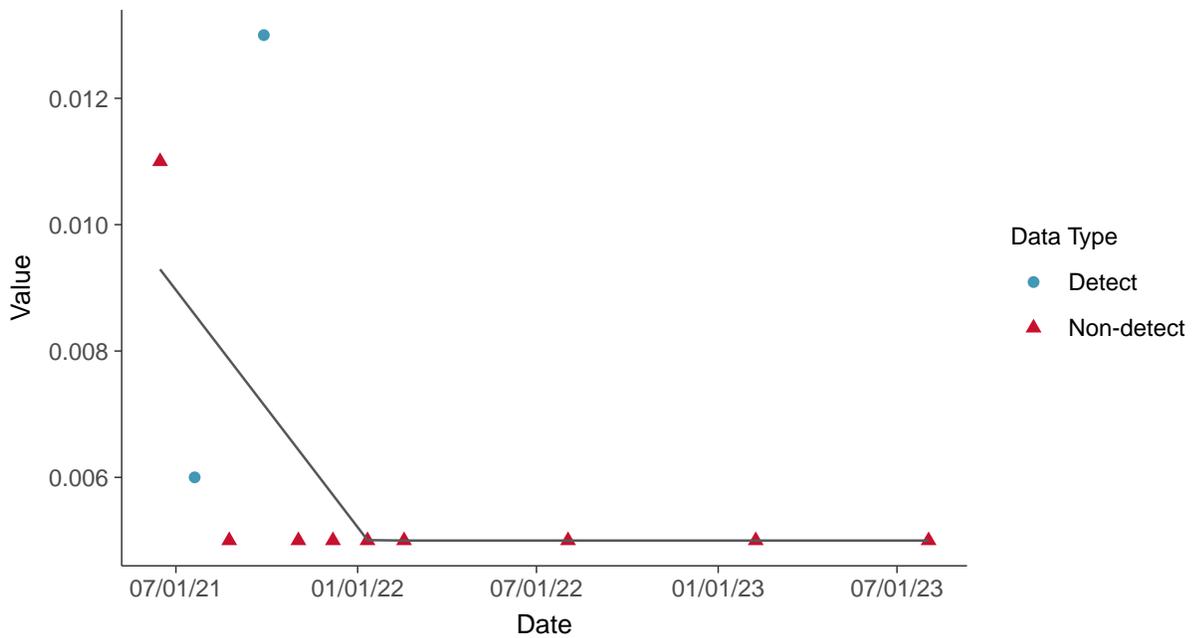
Normal Q-Q plot using ROS Imputed Estimates

Molybdenum, MW-8 (mg/L)



Trend Regression: Piecewise Linear-Linear

Molybdenum, MW-8 (mg/L)



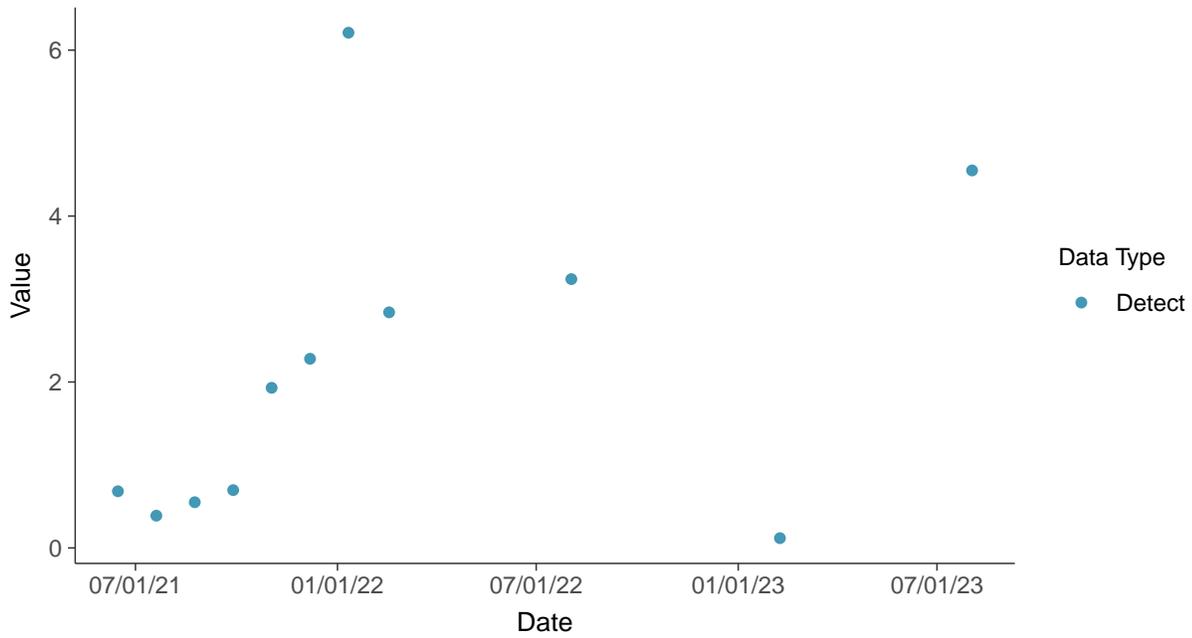


Appendix IV: Radium-226/228, MW-8

ID: 08_2_20

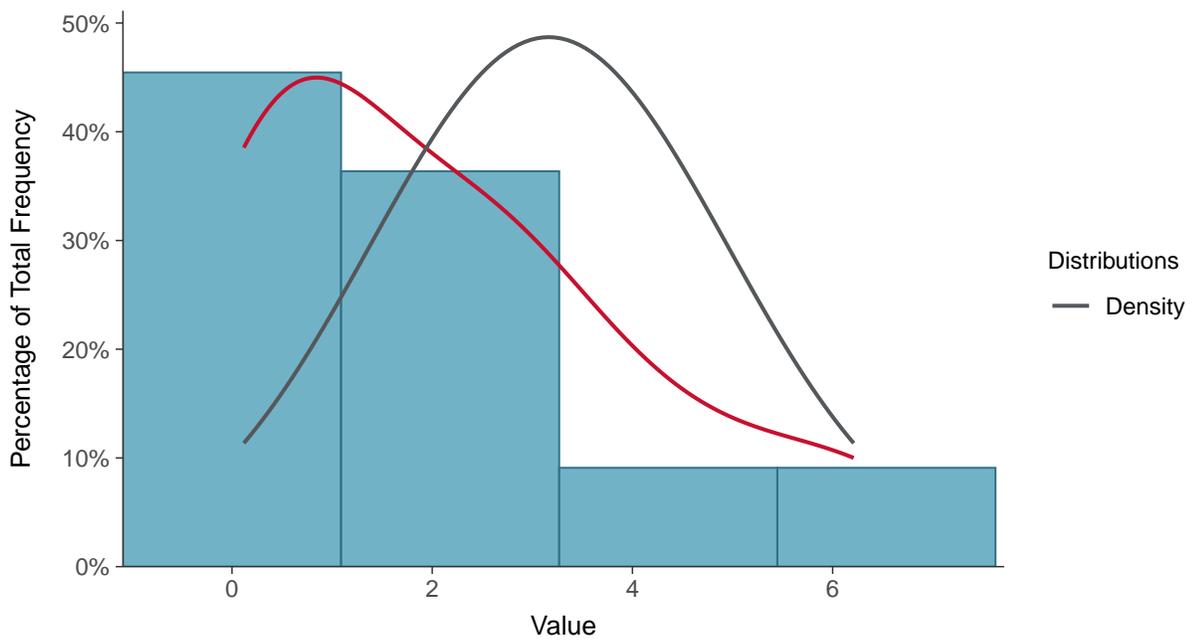
Scatter Plot

Radium-226/228, MW-8 (pCi/L)



Histogram

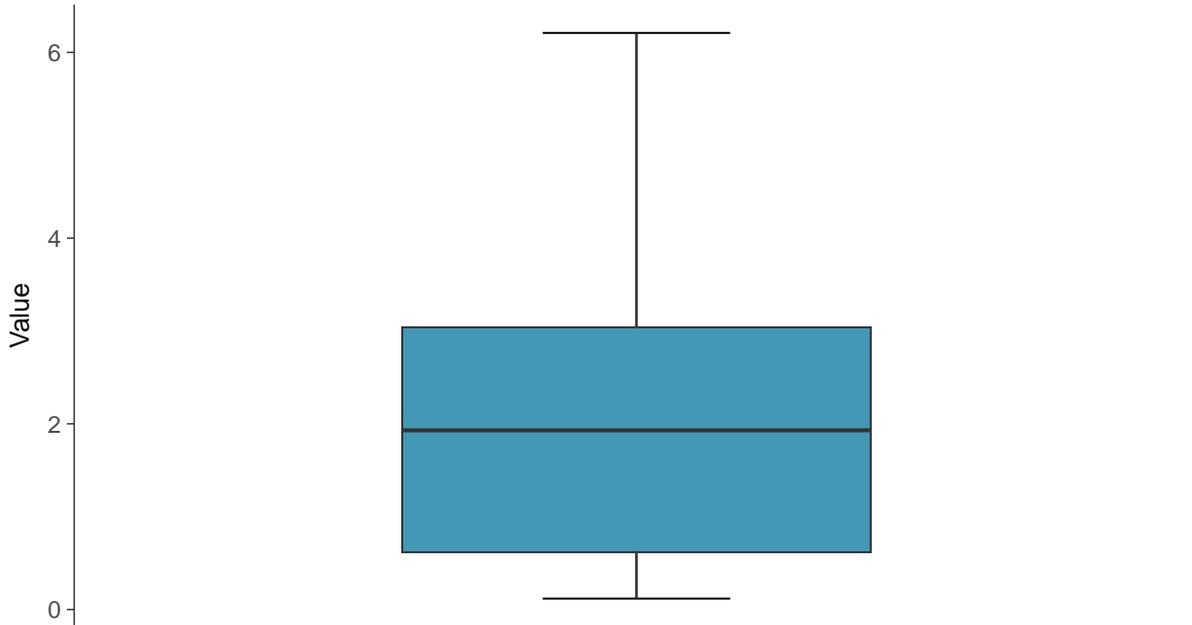
Radium-226/228, MW-8 (pCi/L)





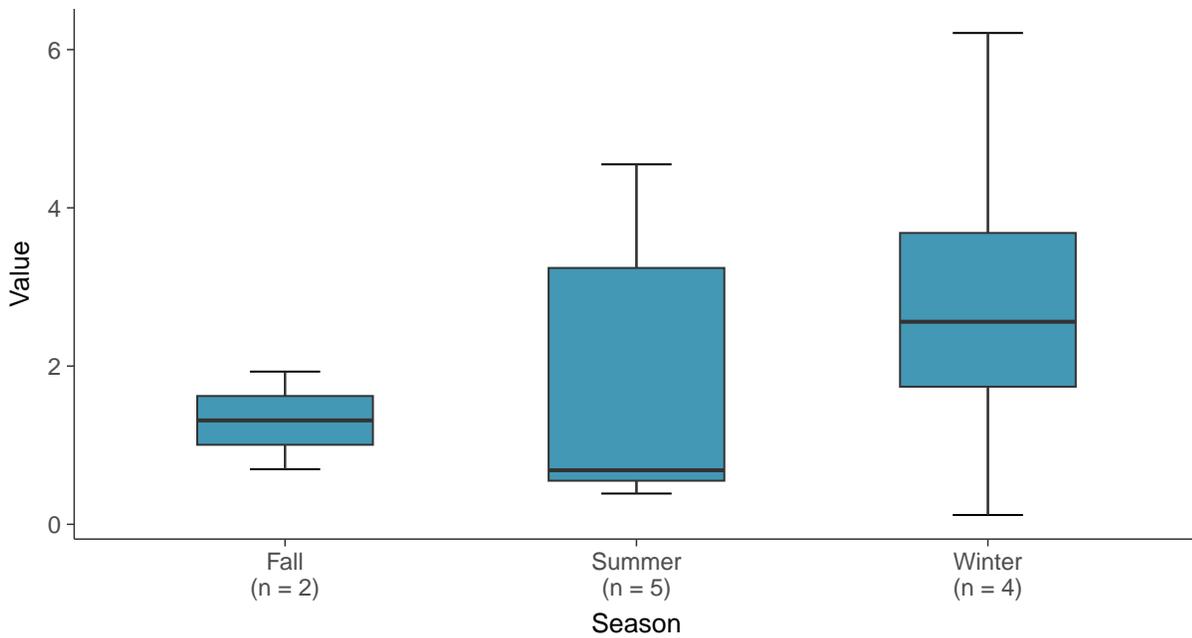
Boxplot

Radium-226/228, MW-8 (pCi/L)



Boxplot by Season

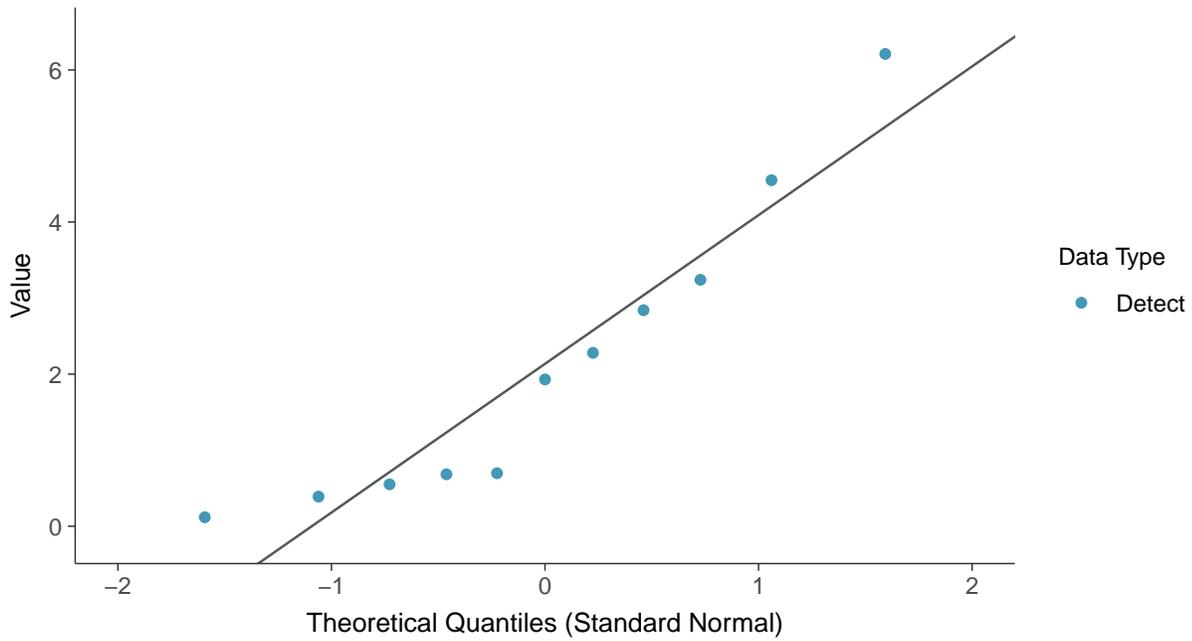
Radium-226/228, MW-8 (pCi/L)





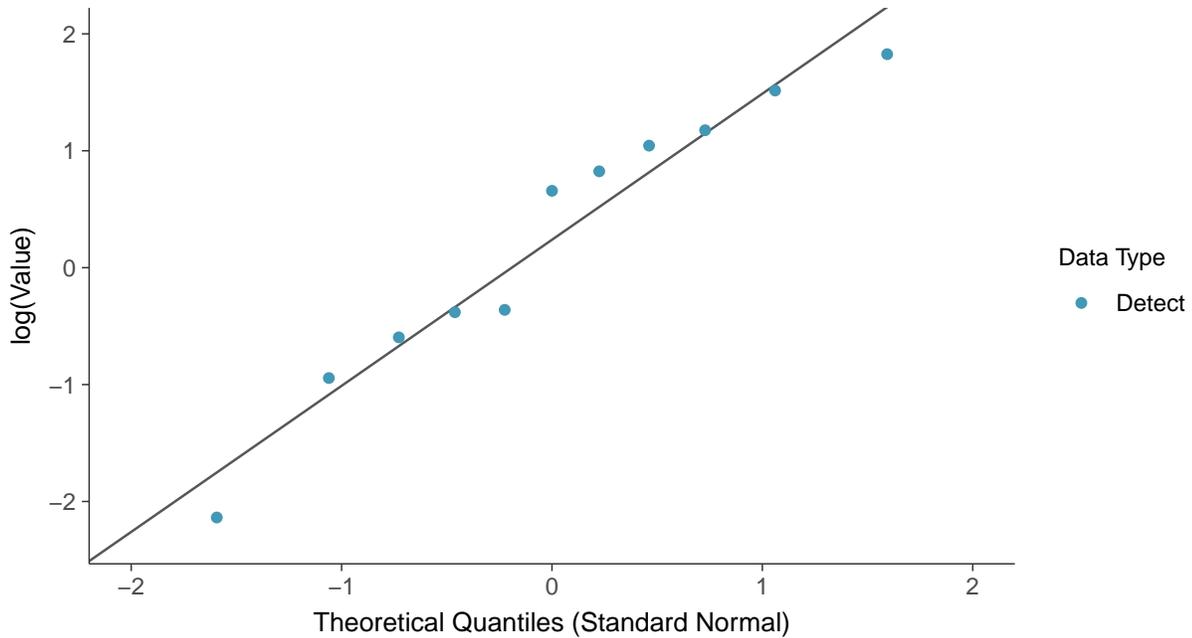
Normal Q-Q plot

Radium-226/228, MW-8 (pCi/L)



Lognormal Q-Q plot

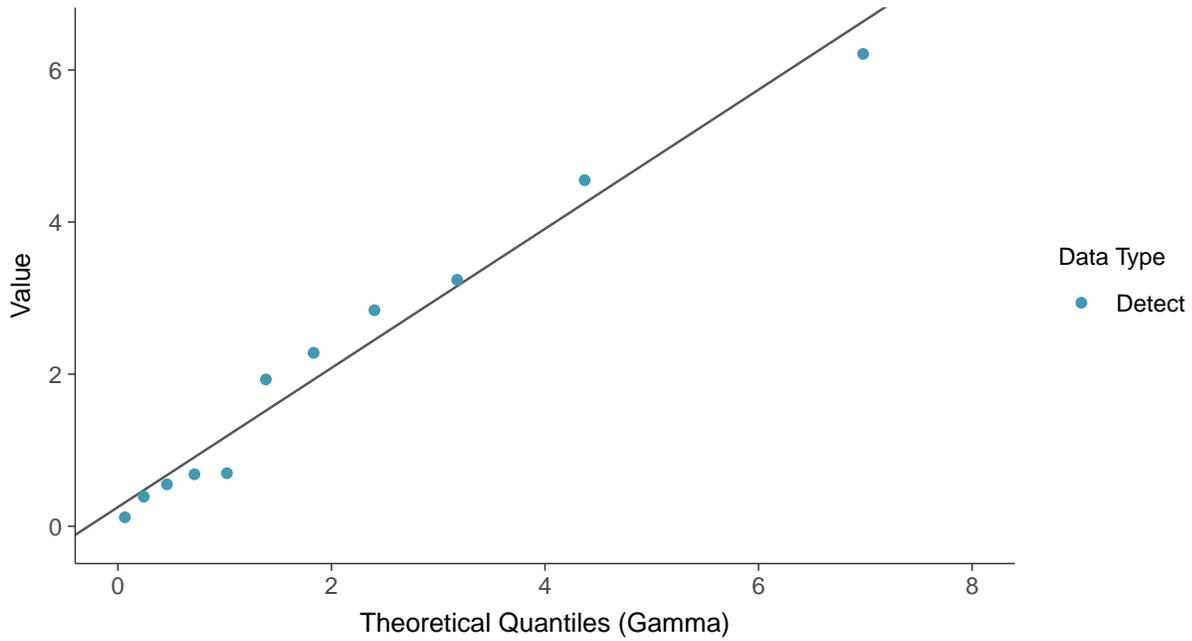
Radium-226/228, MW-8 (pCi/L)





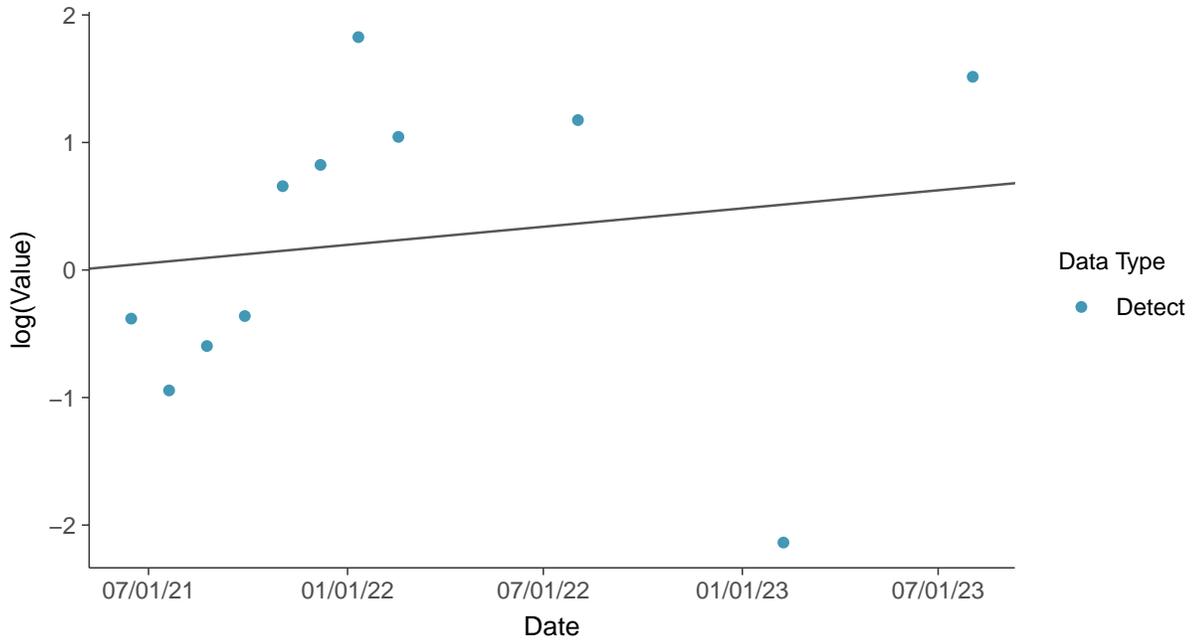
Gamma Q-Q plot

Radium-226/228, MW-8 (pCi/L)



Trend Regression: Lognormal MLE

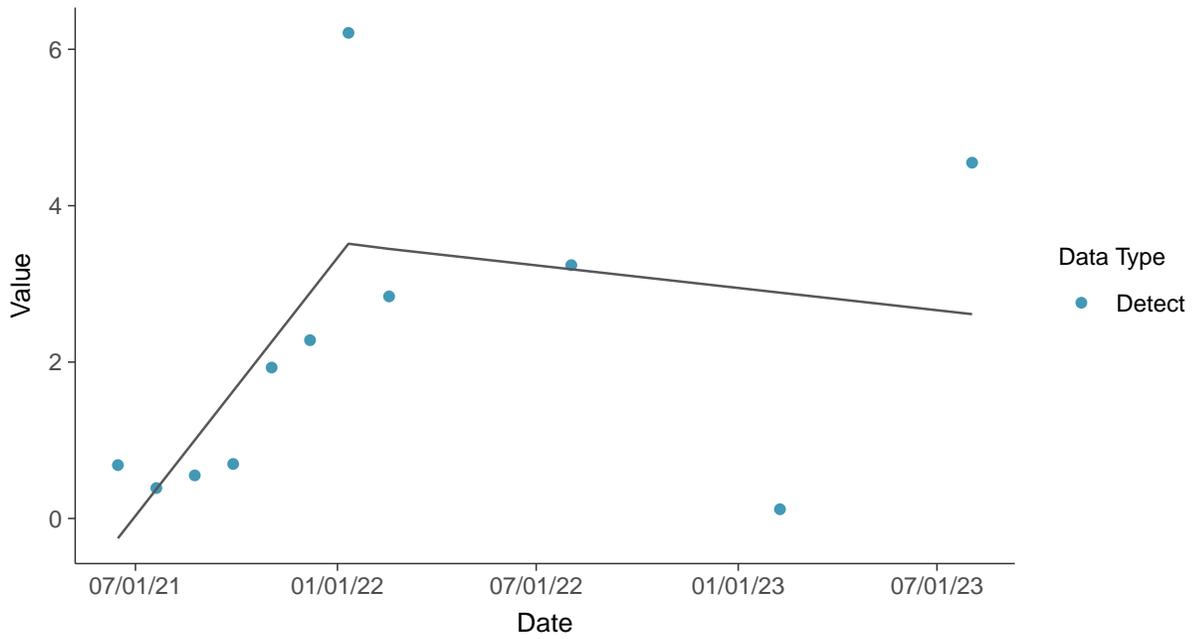
Radium-226/228, MW-8 (pCi/L)





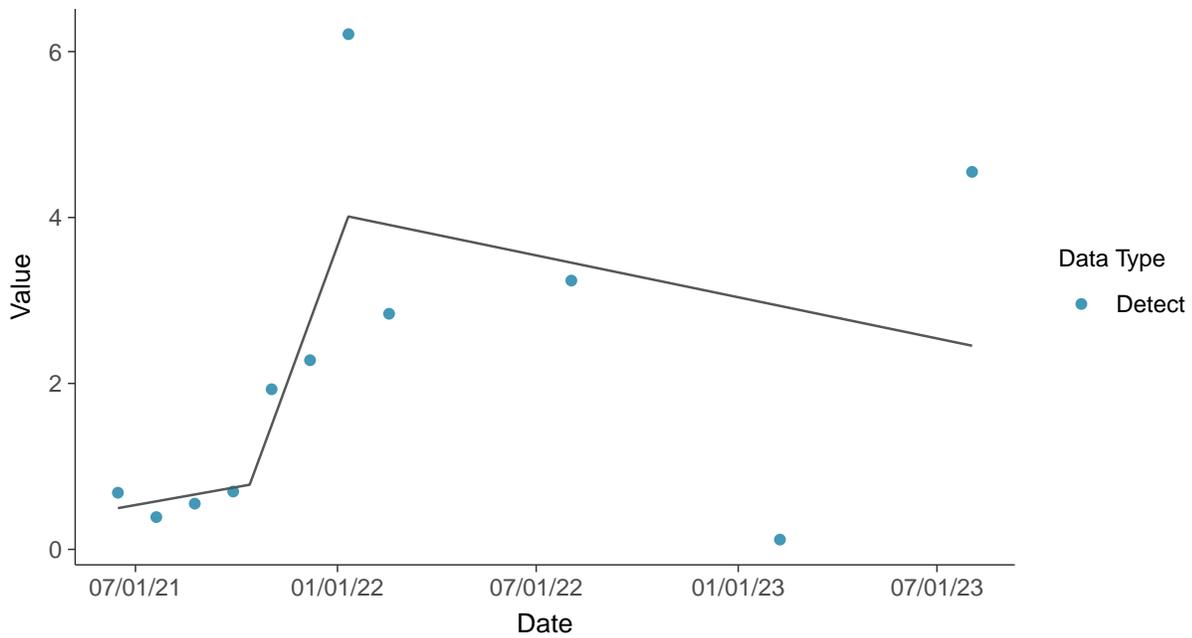
Trend Regression: Piecewise Linear-Linear

Radium-226/228, MW-8 (pCi/L)



Trend Regression: Piecewise Linear-Linear-Linear

Radium-226/228, MW-8 (pCi/L)



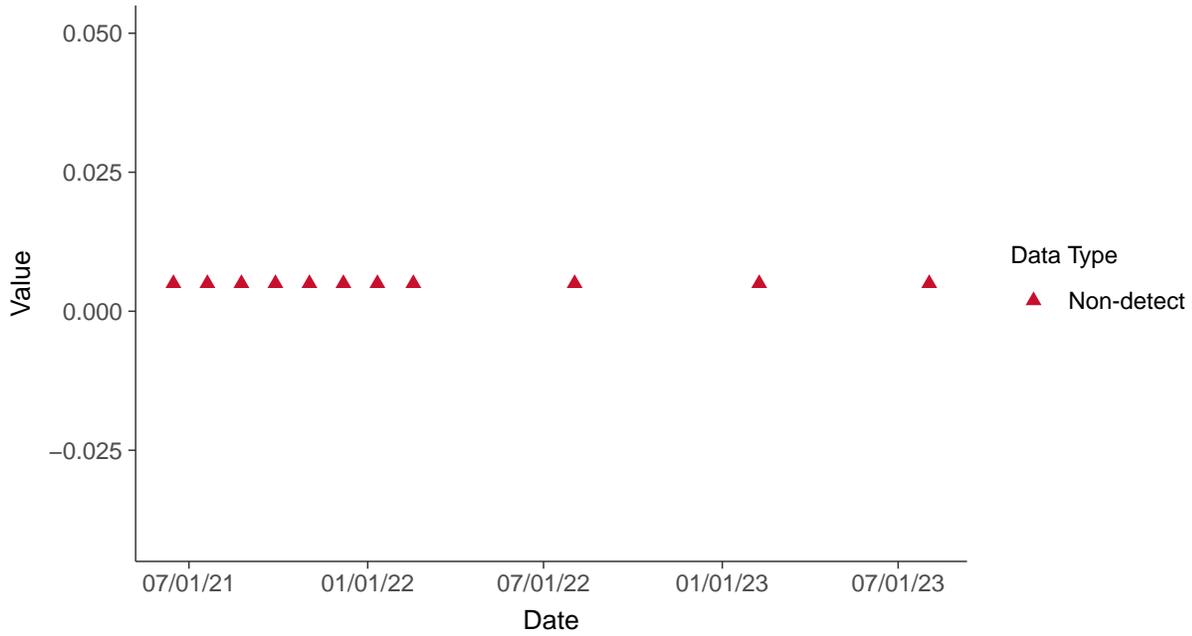


Appendix IV: Selenium, MW-8

ID: 08_2_22

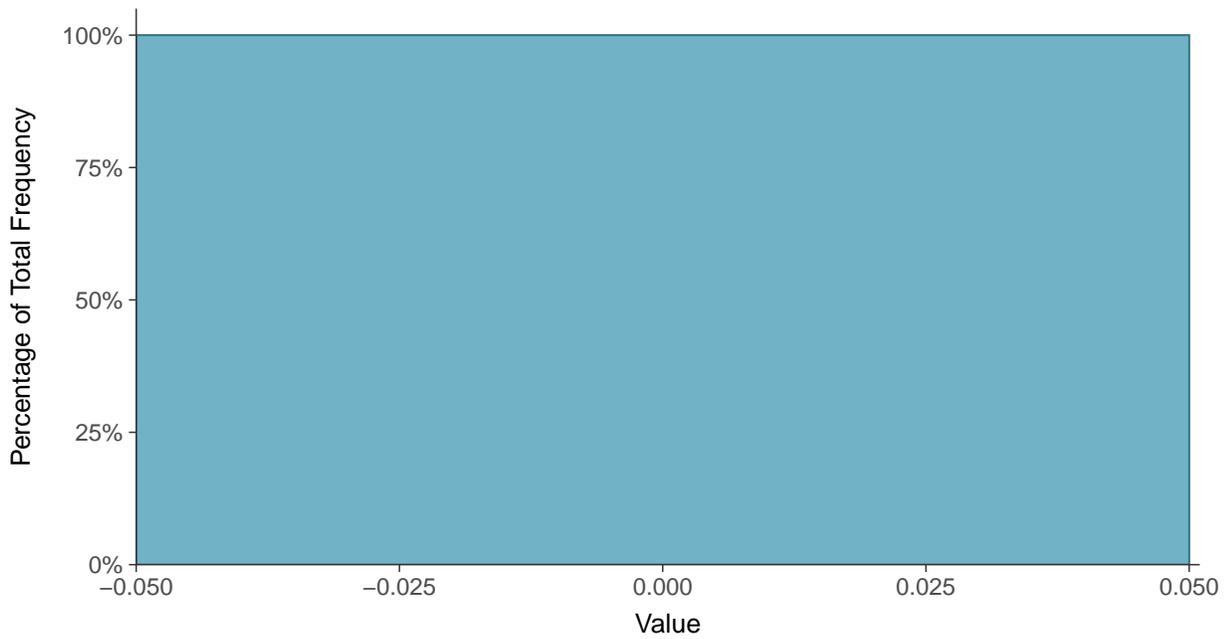
Scatter Plot

Selenium, MW-8 (mg/L)



Histogram

Selenium, MW-8 (mg/L)





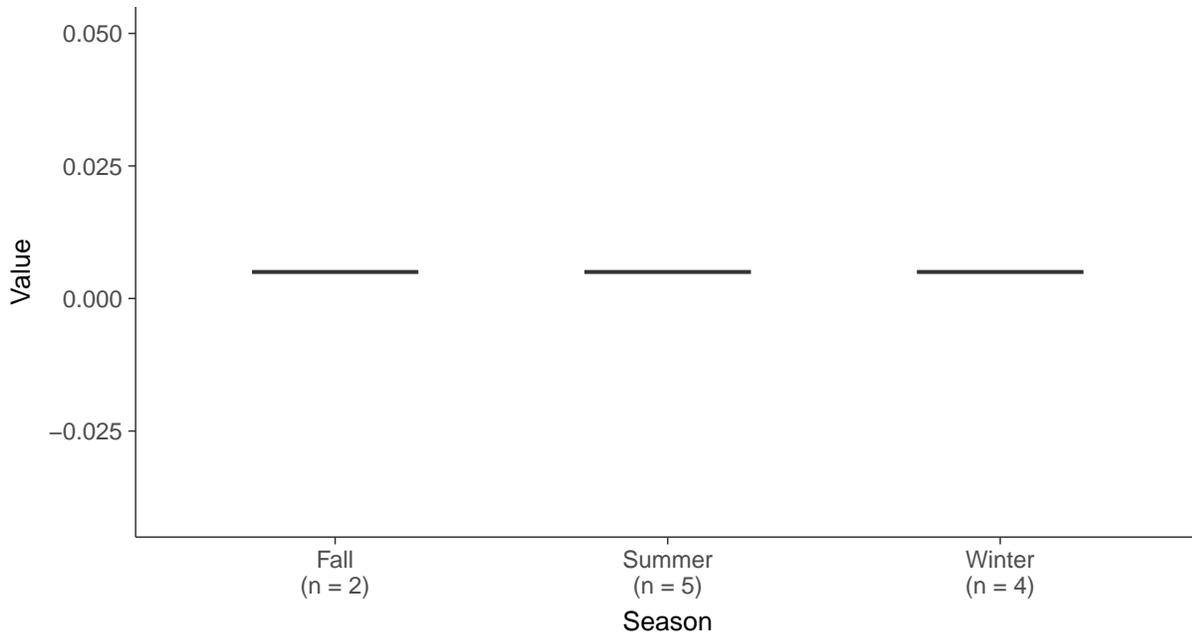
Boxplot

Selenium, MW-8 (mg/L)



Boxplot by Season

Selenium, MW-8 (mg/L)



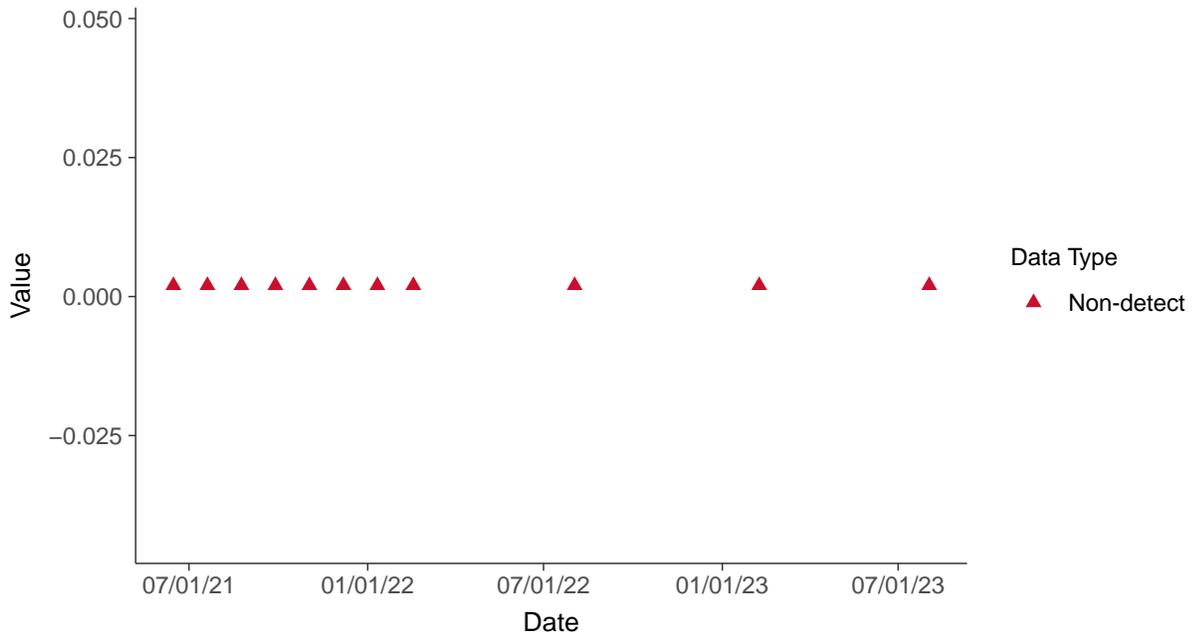


Appendix IV: Thallium, MW-8

ID: 08_2_23

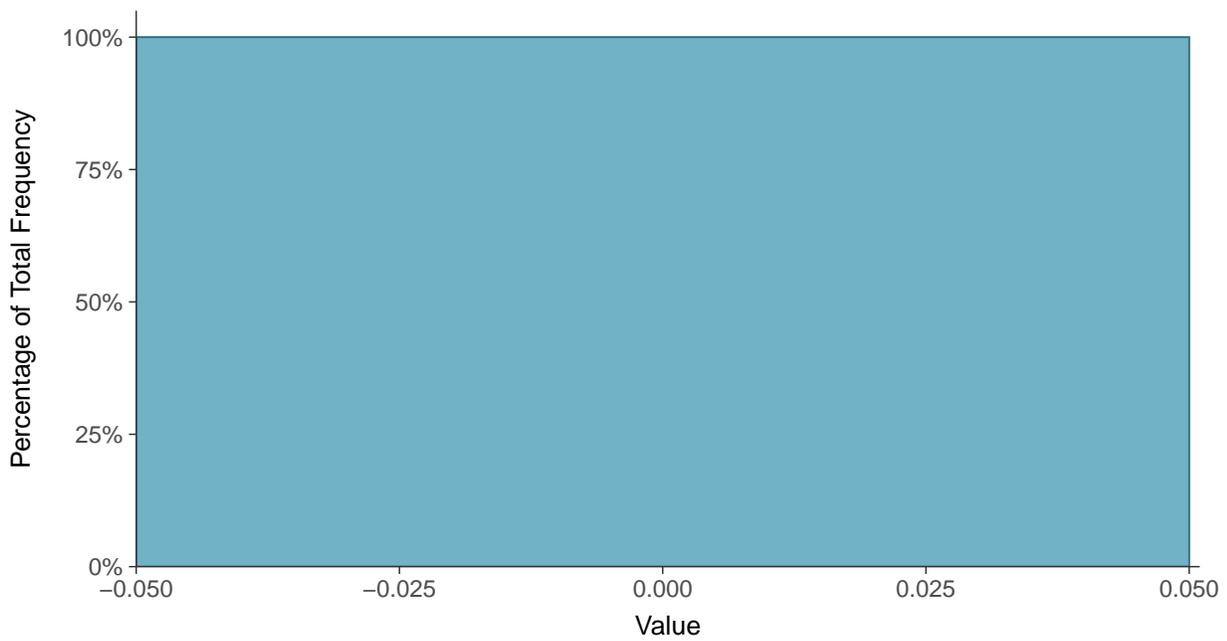
Scatter Plot

Thallium, MW-8 (mg/L)



Histogram

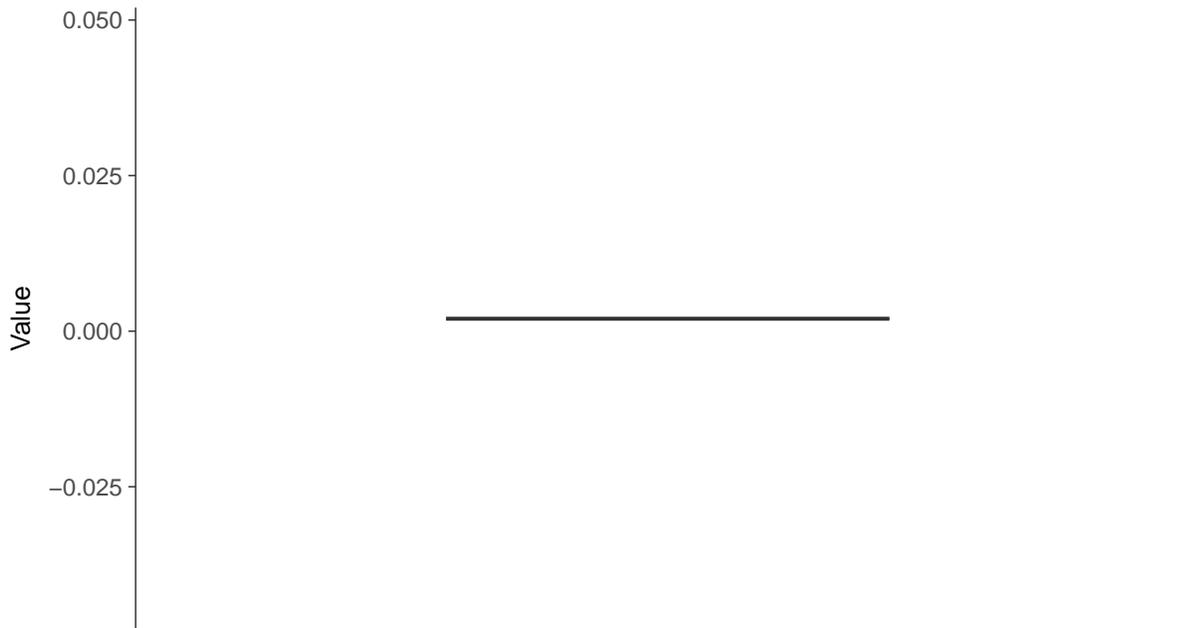
Thallium, MW-8 (mg/L)





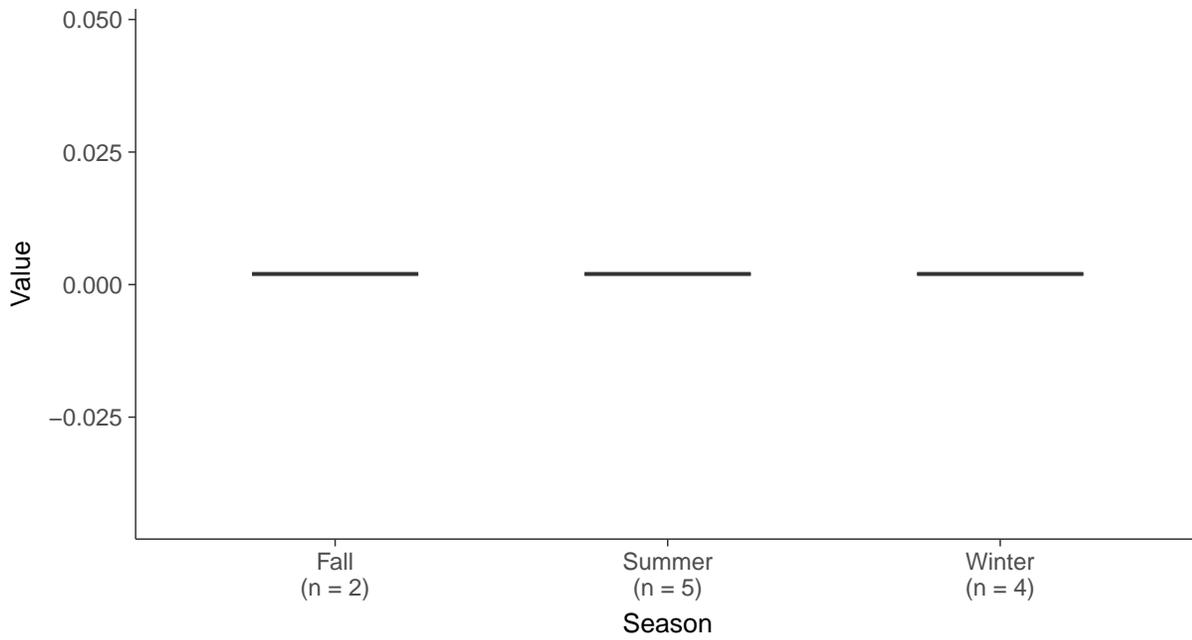
Boxplot

Thallium, MW-8 (mg/L)



Boxplot by Season

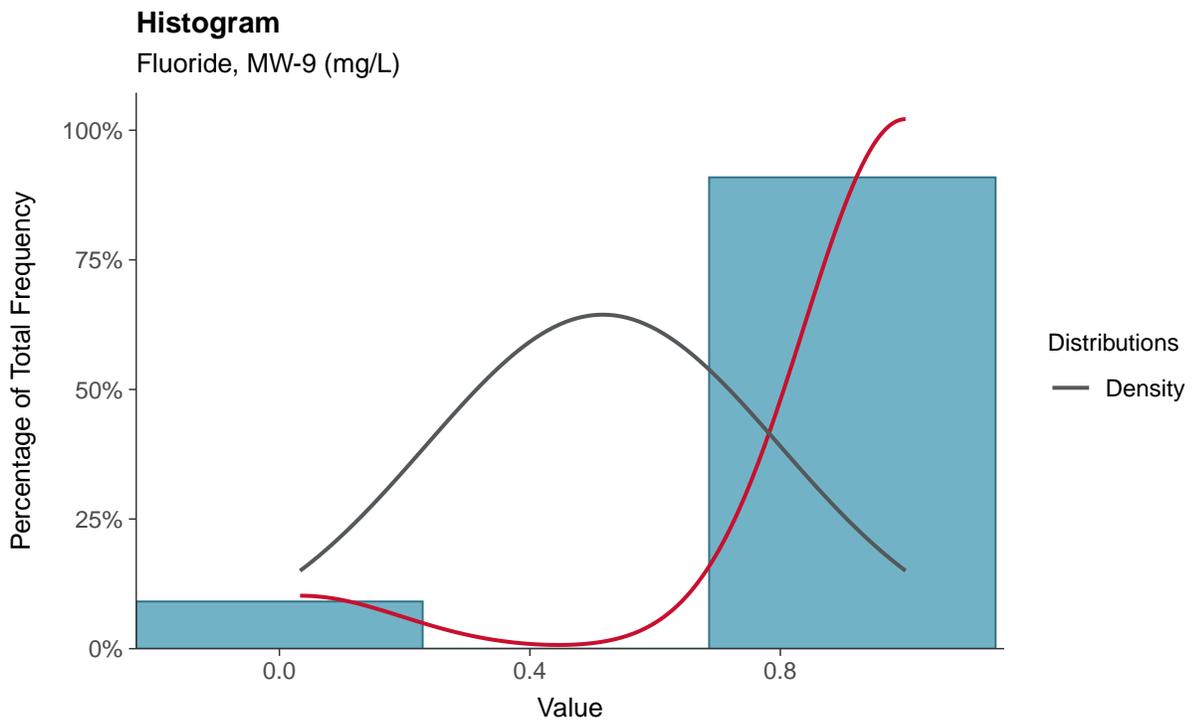
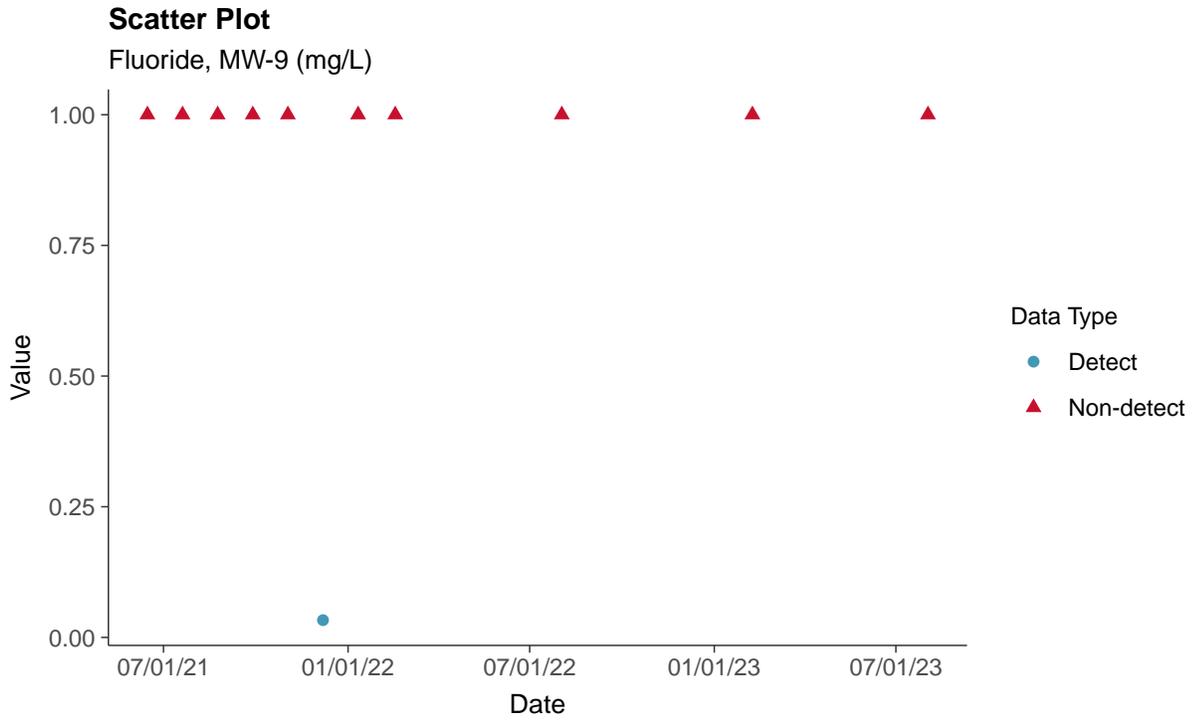
Thallium, MW-8 (mg/L)

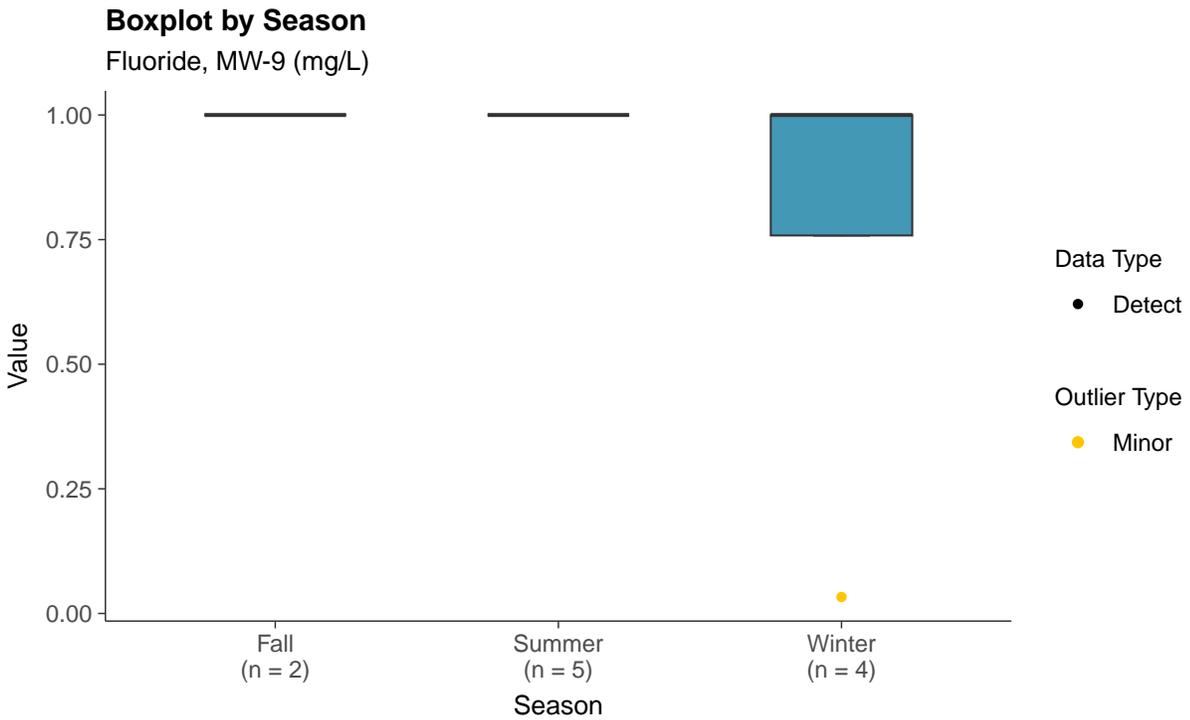
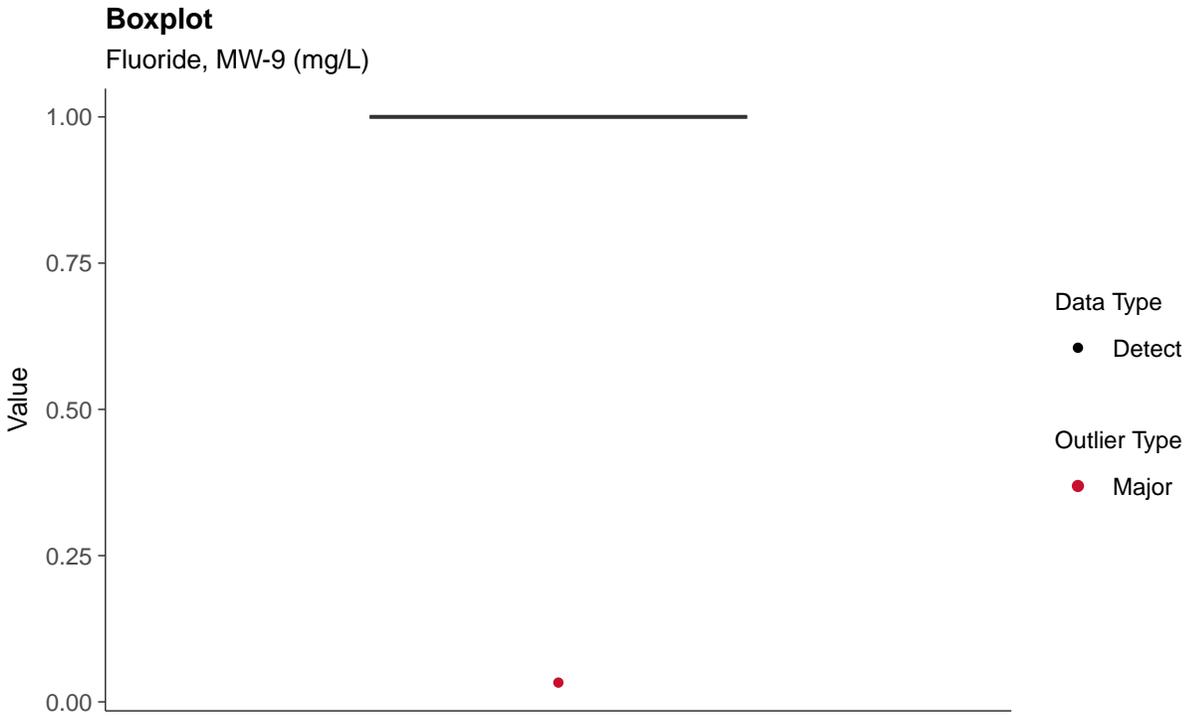




Appendix IV: Fluoride, MW-9

ID: 09_2_04

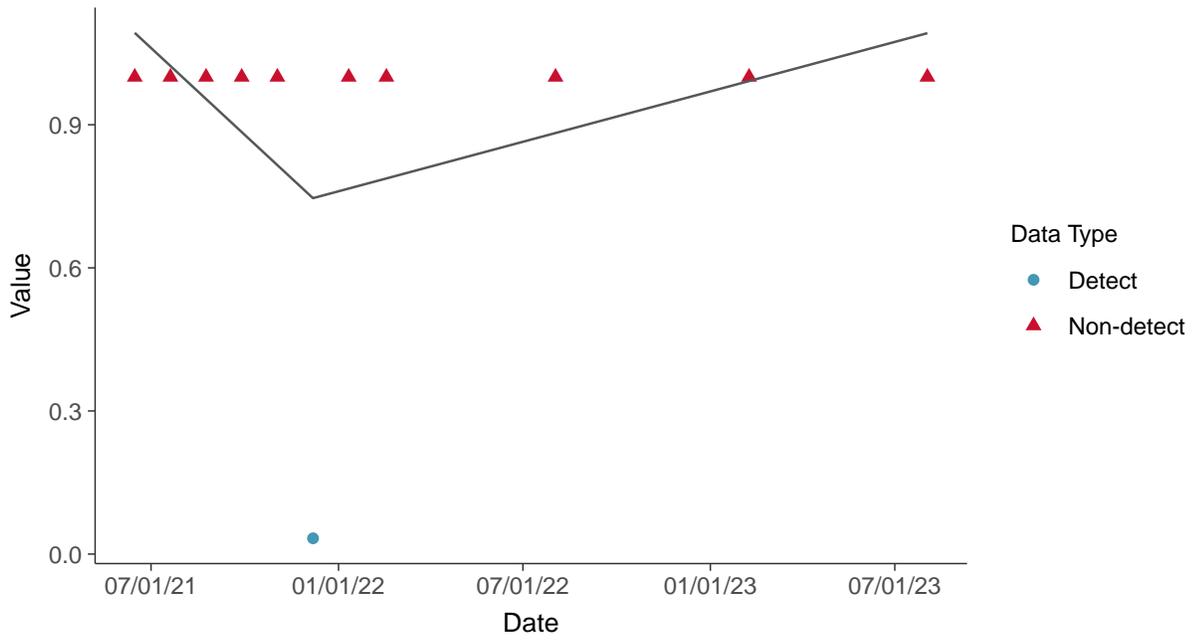






Trend Regression: Piecewise Linear-Linear

Fluoride, MW-9 (mg/L)



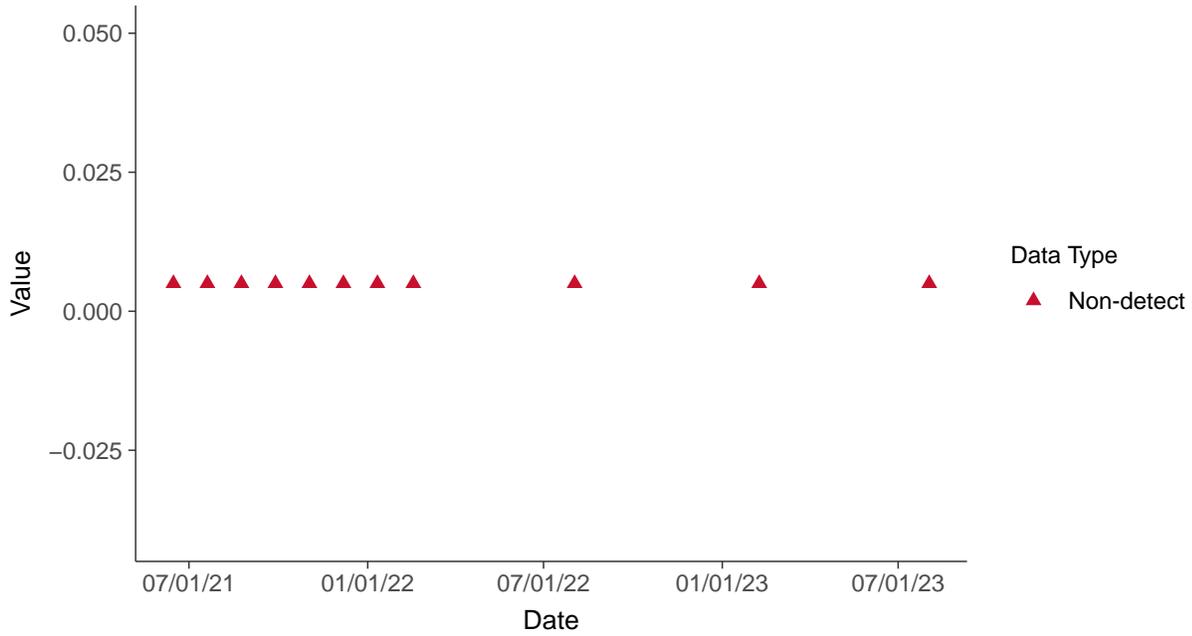


Appendix IV: Antimony, MW-9

ID: 09_2_08

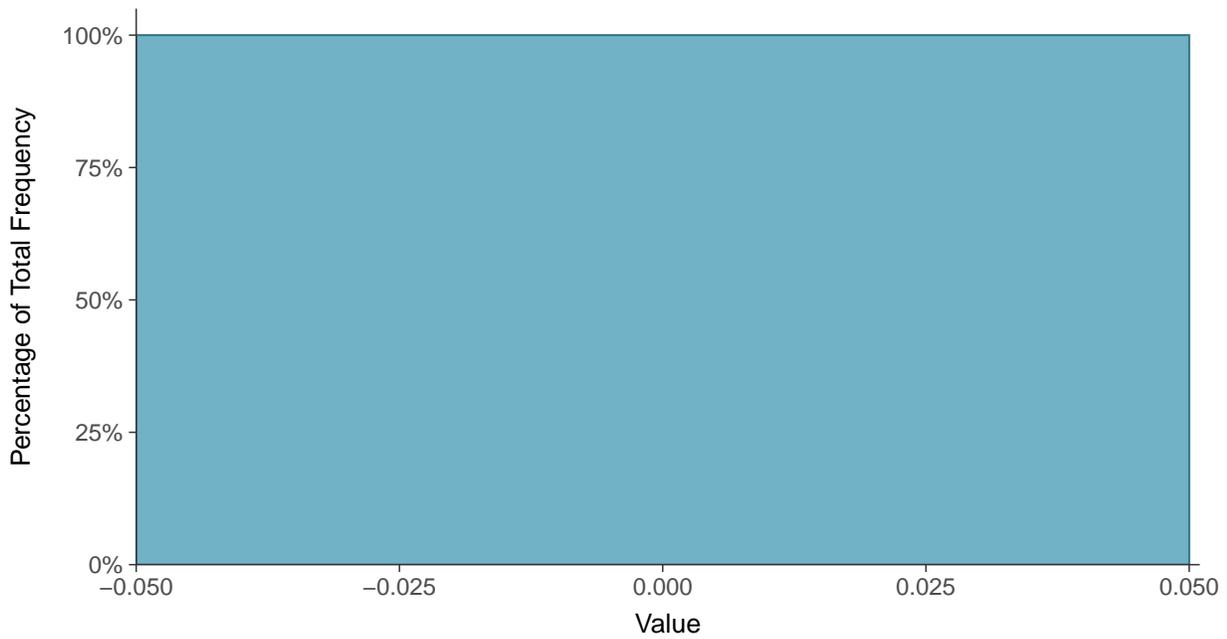
Scatter Plot

Antimony, MW-9 (mg/L)



Histogram

Antimony, MW-9 (mg/L)





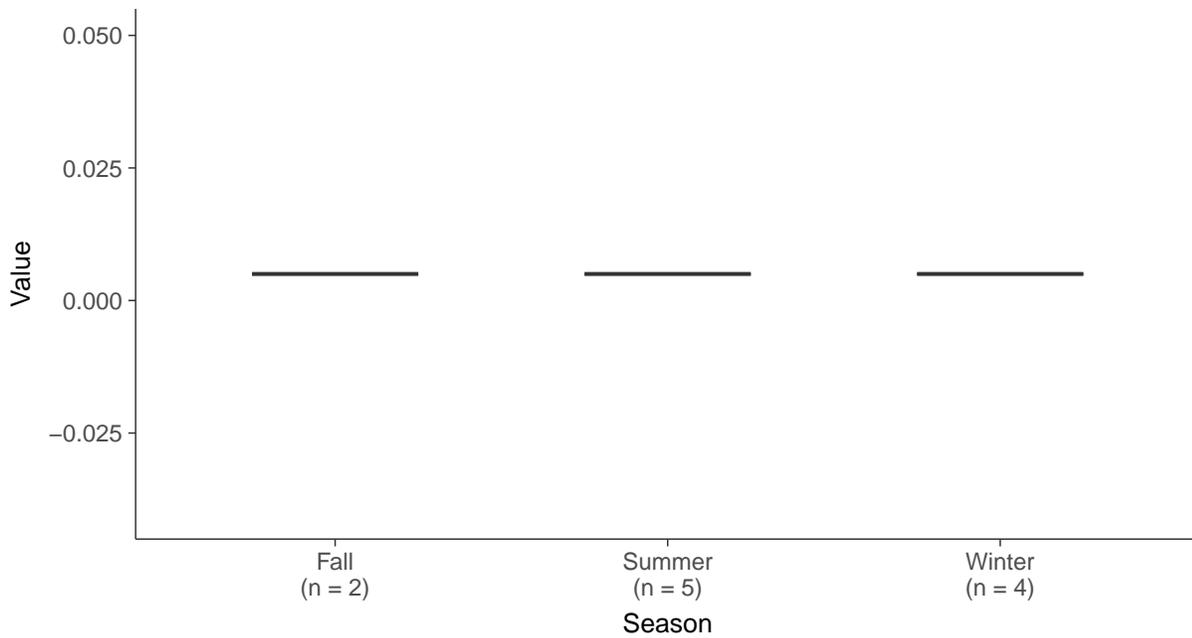
Boxplot

Antimony, MW-9 (mg/L)



Boxplot by Season

Antimony, MW-9 (mg/L)



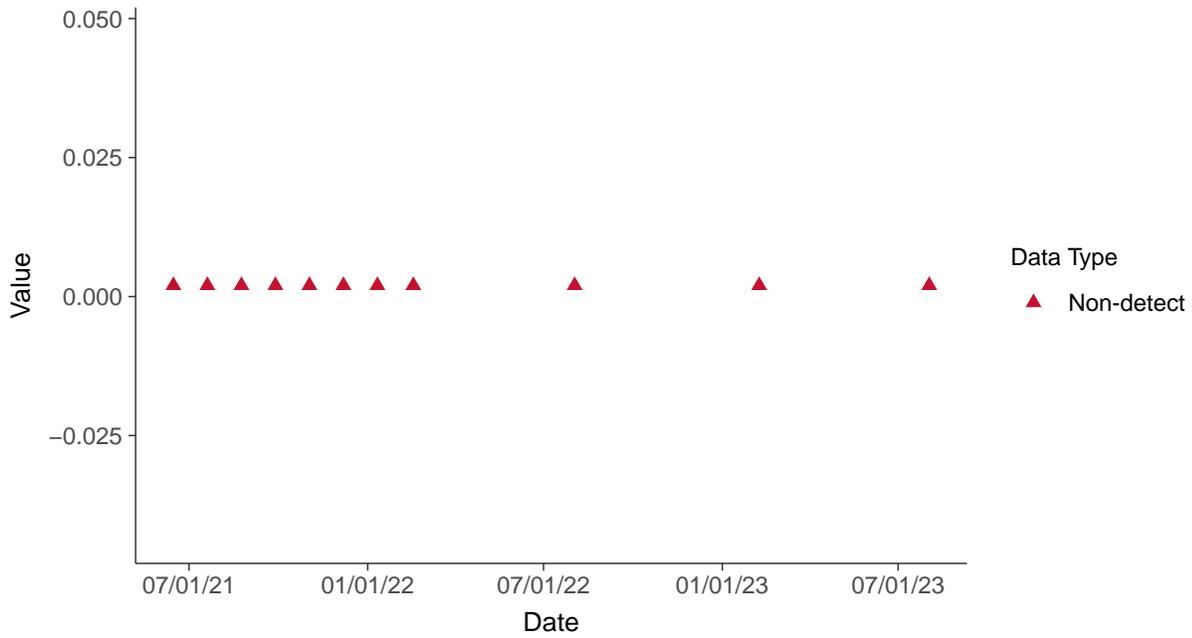


Appendix IV: Arsenic, MW-9

ID: 09_2_09

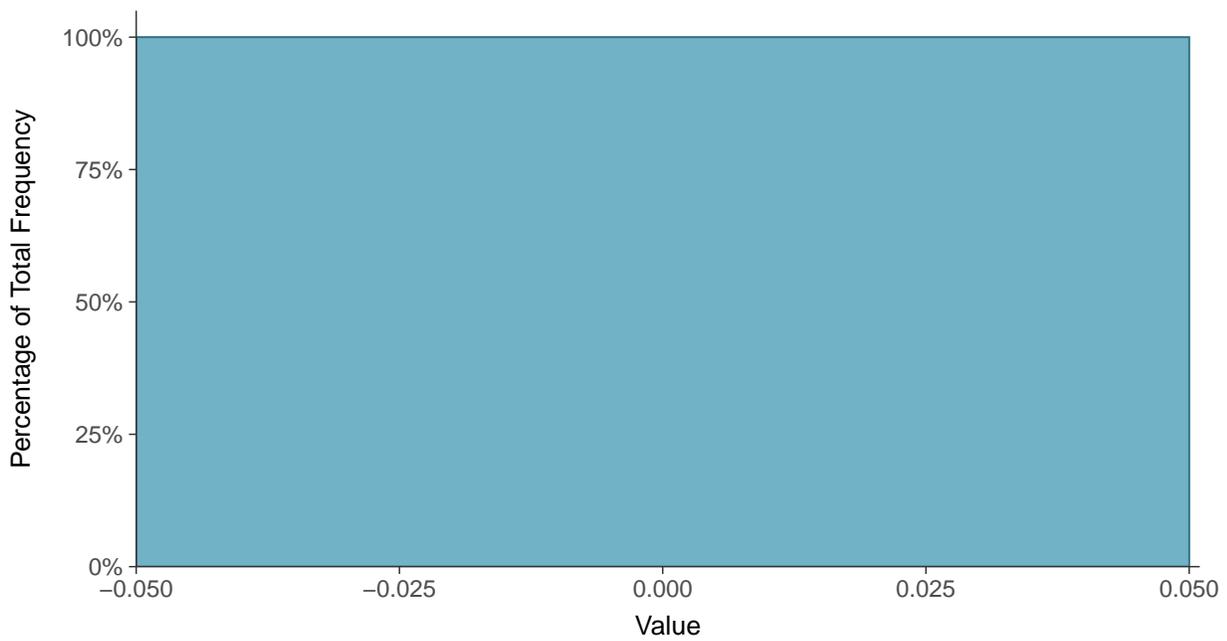
Scatter Plot

Arsenic, MW-9 (mg/L)



Histogram

Arsenic, MW-9 (mg/L)





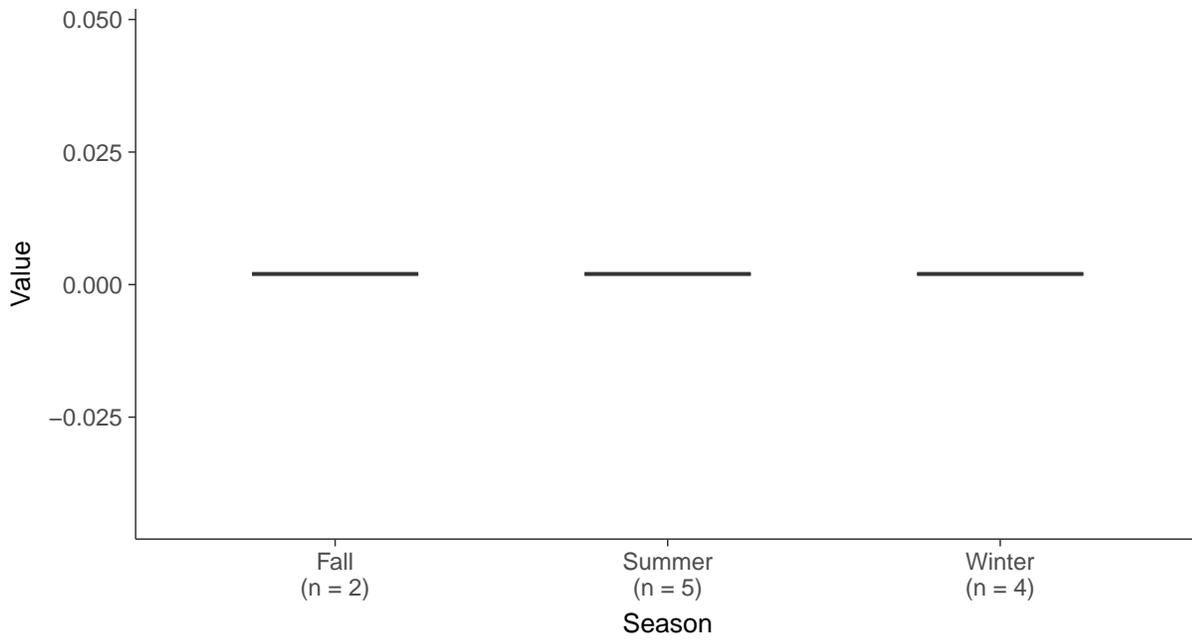
Boxplot

Arsenic, MW-9 (mg/L)



Boxplot by Season

Arsenic, MW-9 (mg/L)



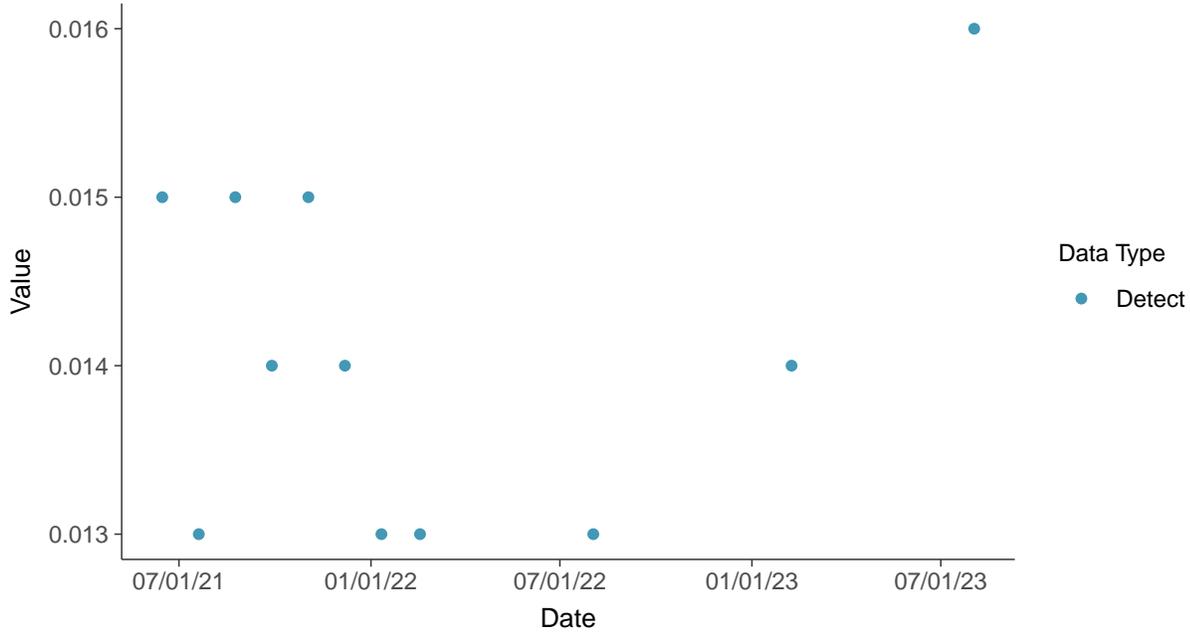


Appendix IV: Barium, MW-9

ID: 09_2_10

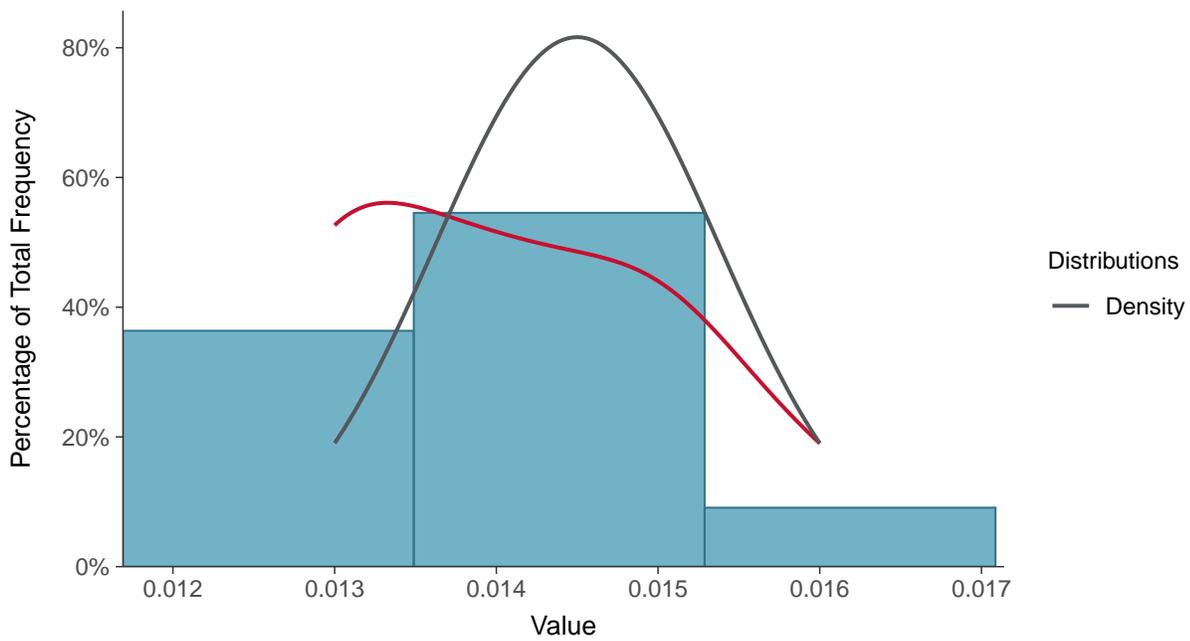
Scatter Plot

Barium, MW-9 (mg/L)



Histogram

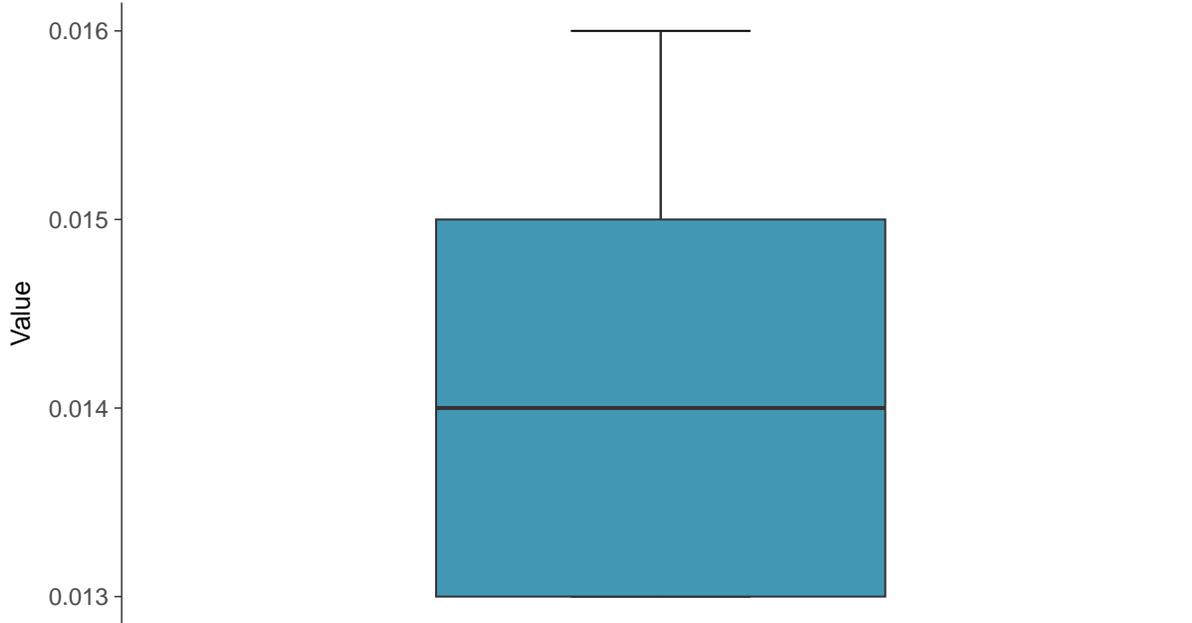
Barium, MW-9 (mg/L)





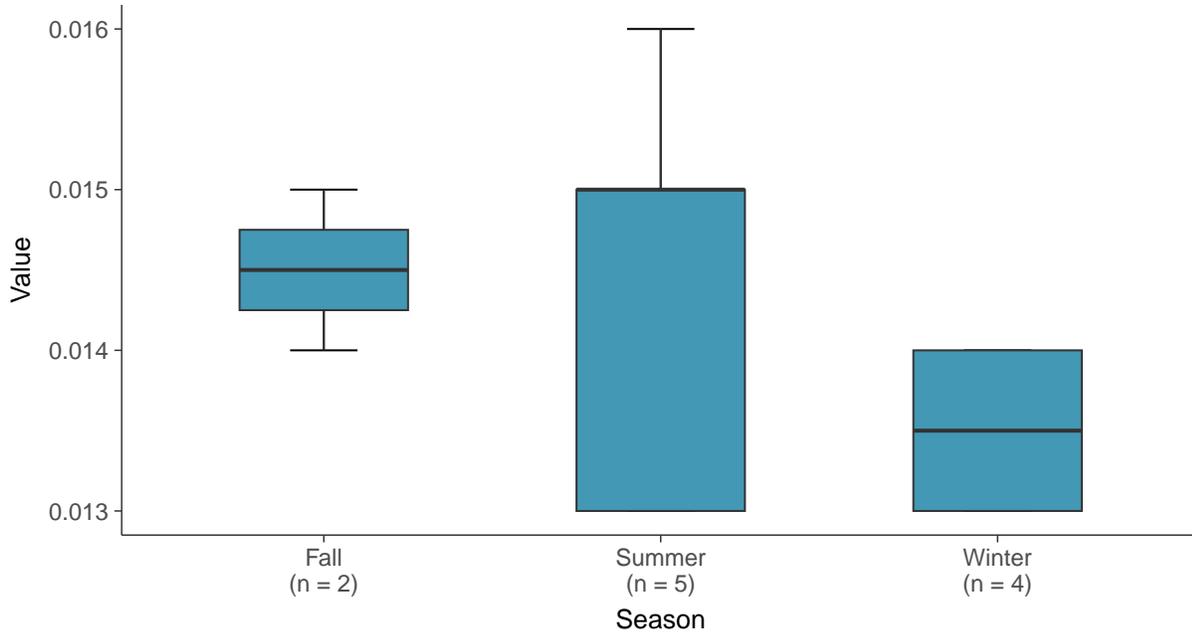
Boxplot

Barium, MW-9 (mg/L)



Boxplot by Season

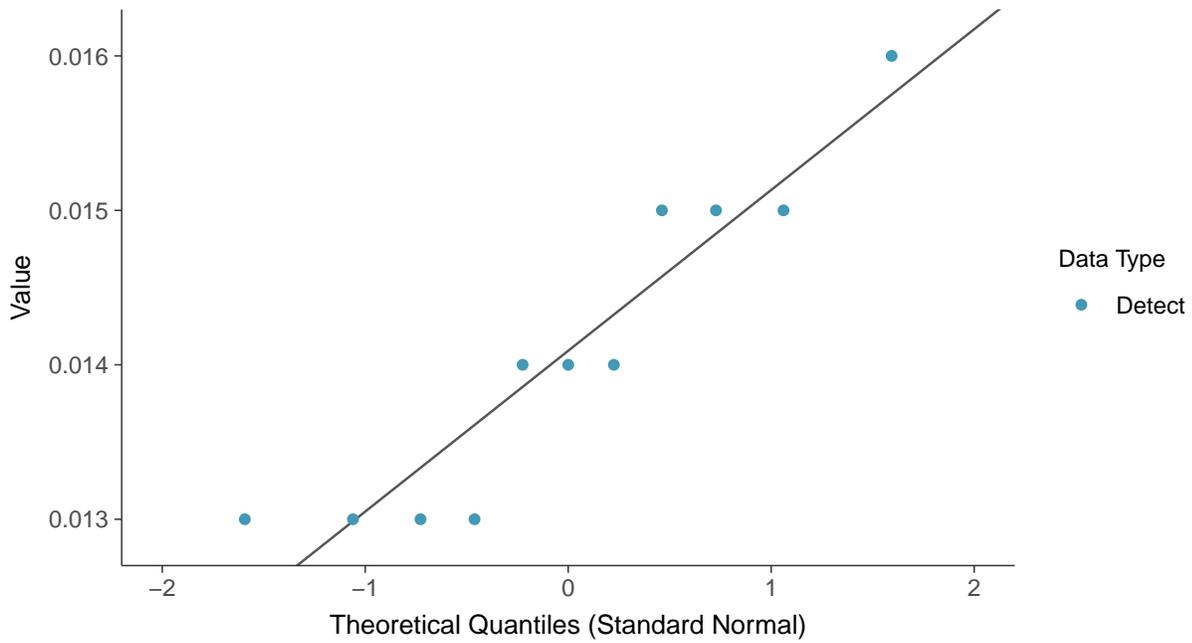
Barium, MW-9 (mg/L)





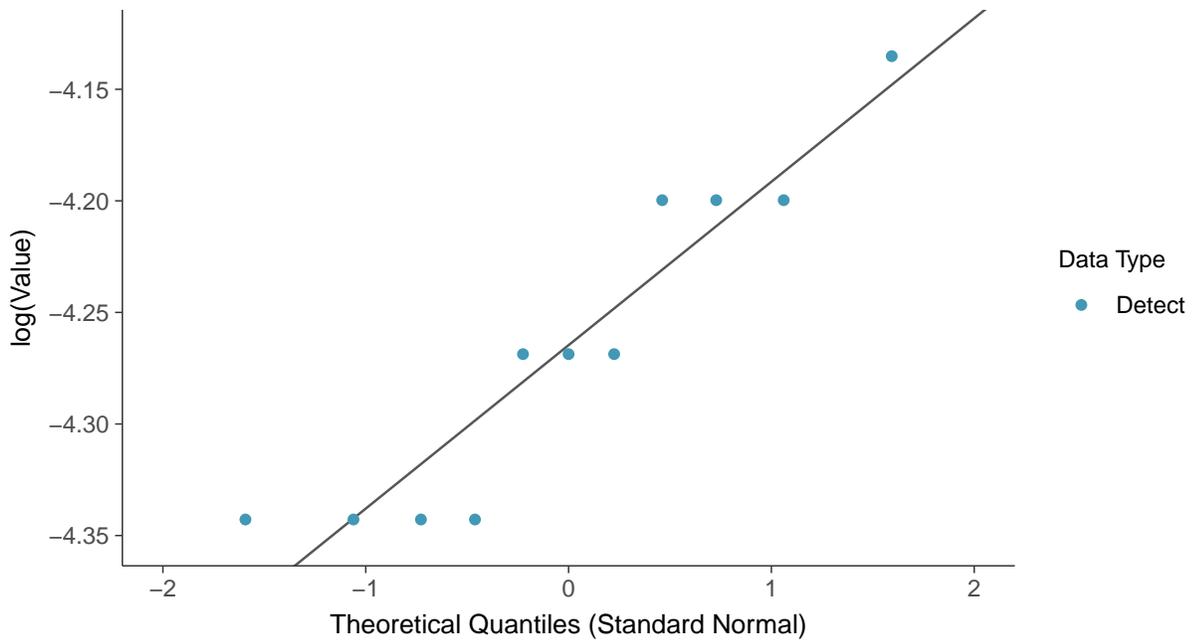
Normal Q-Q plot

Barium, MW-9 (mg/L)



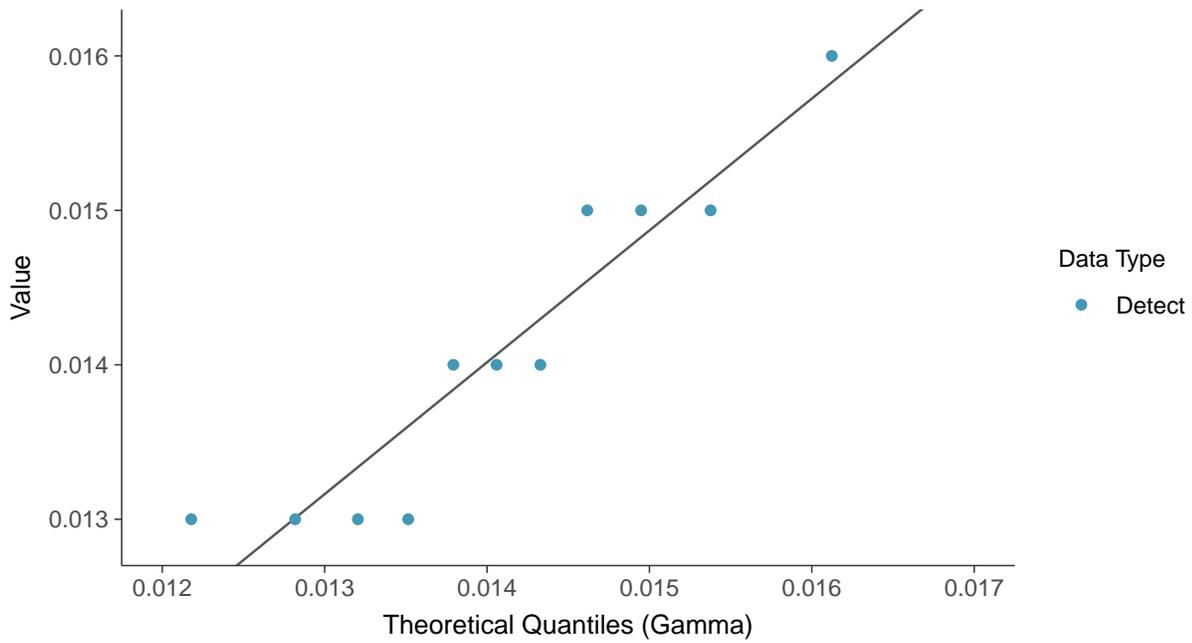
Lognormal Q-Q plot

Barium, MW-9 (mg/L)

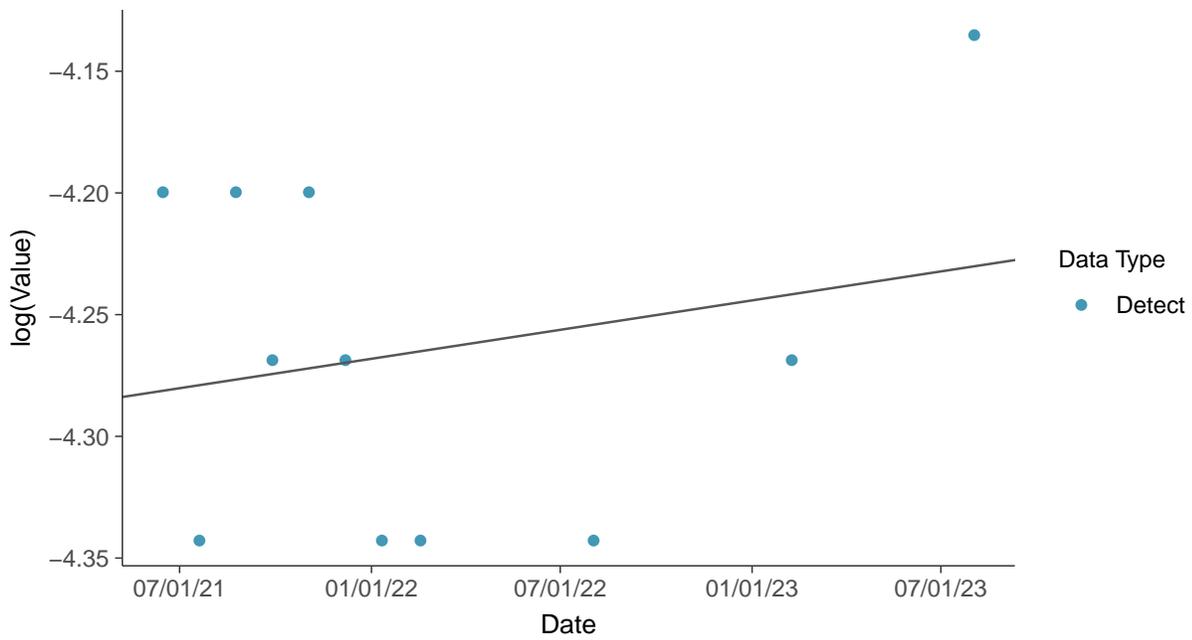




Gamma Q-Q plot
Barium, MW-9 (mg/L)



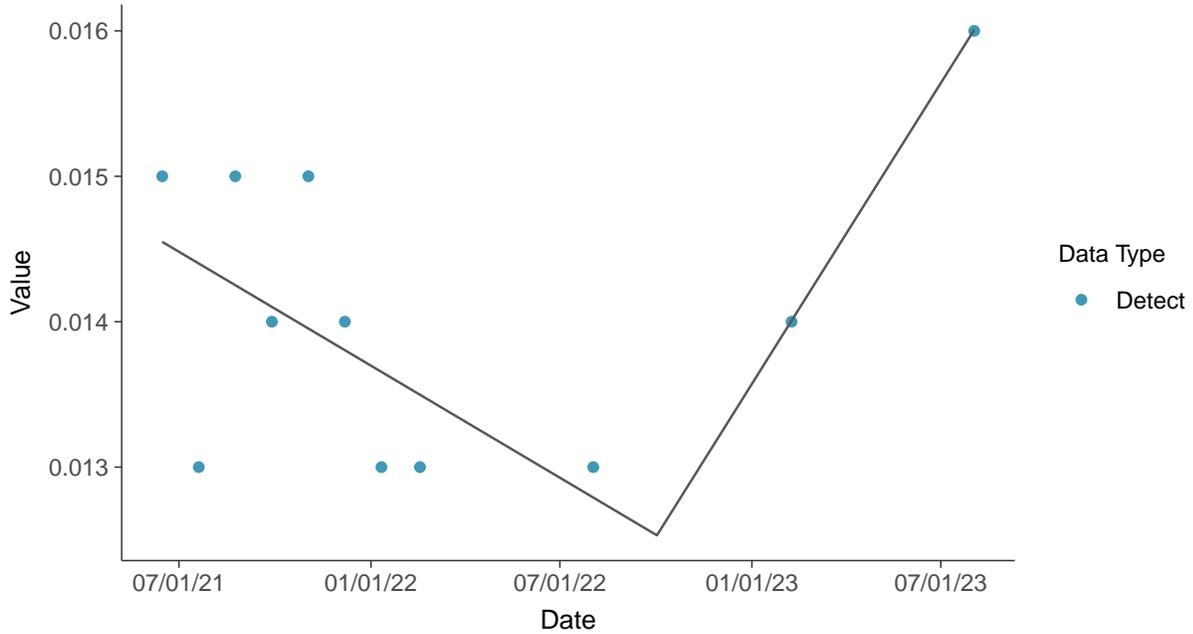
Trend Regression: Lognormal MLE
Barium, MW-9 (mg/L)





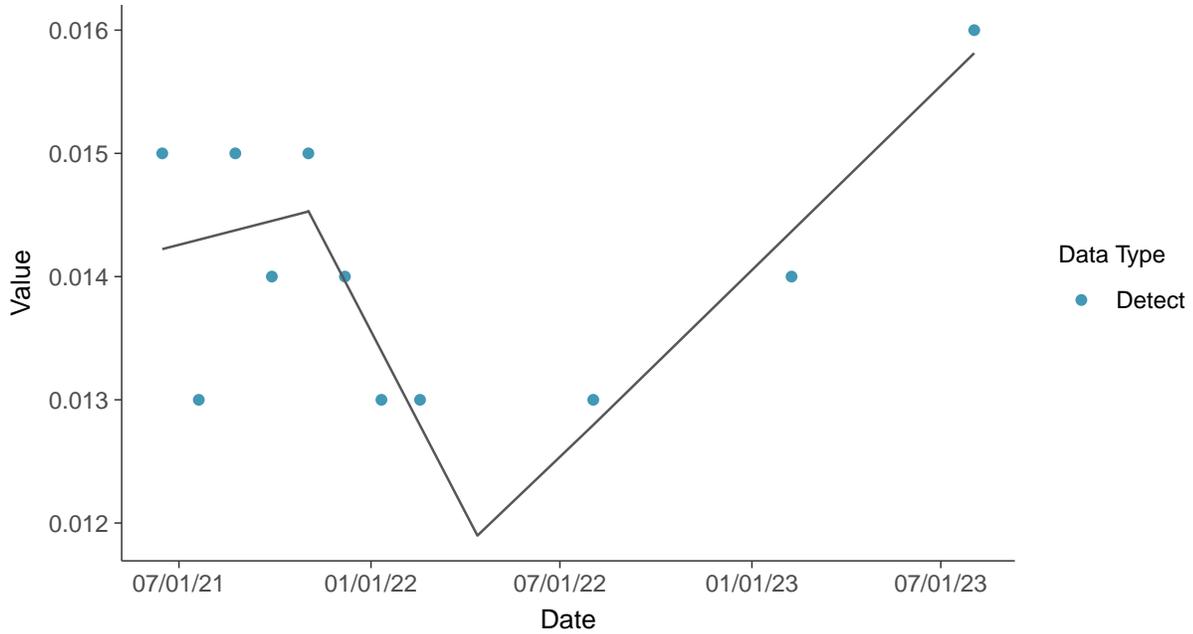
Trend Regression: Piecewise Linear-Linear

Barium, MW-9 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

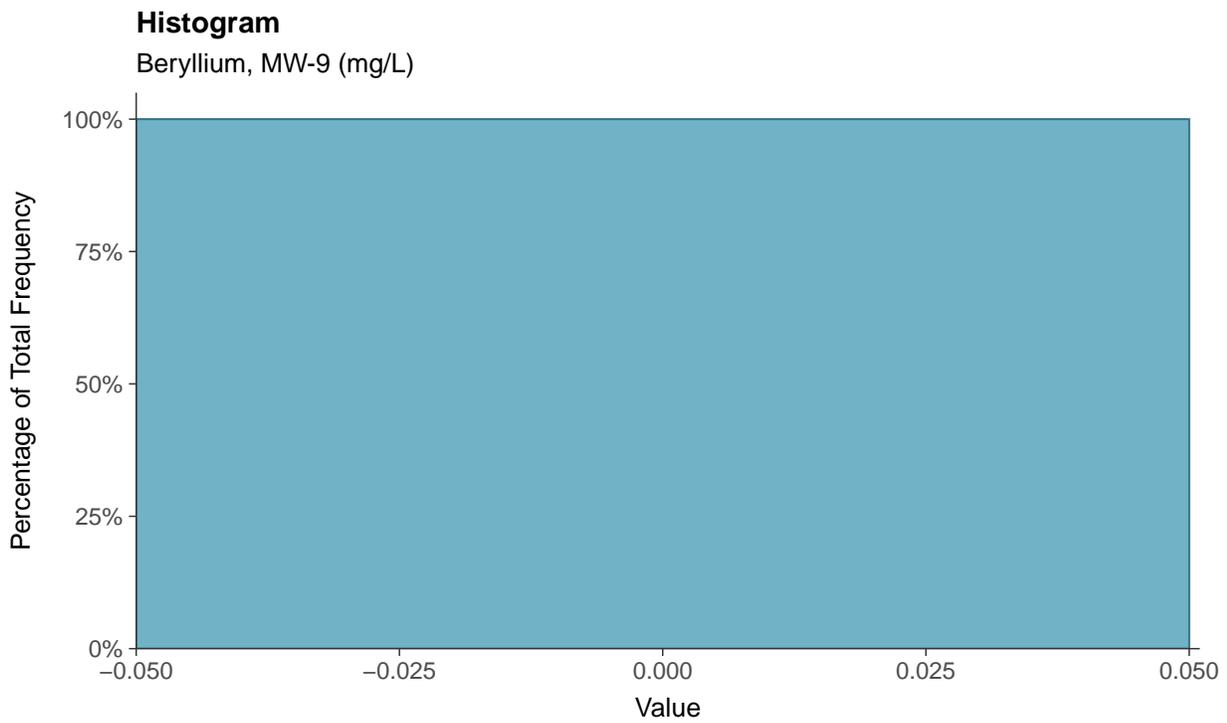
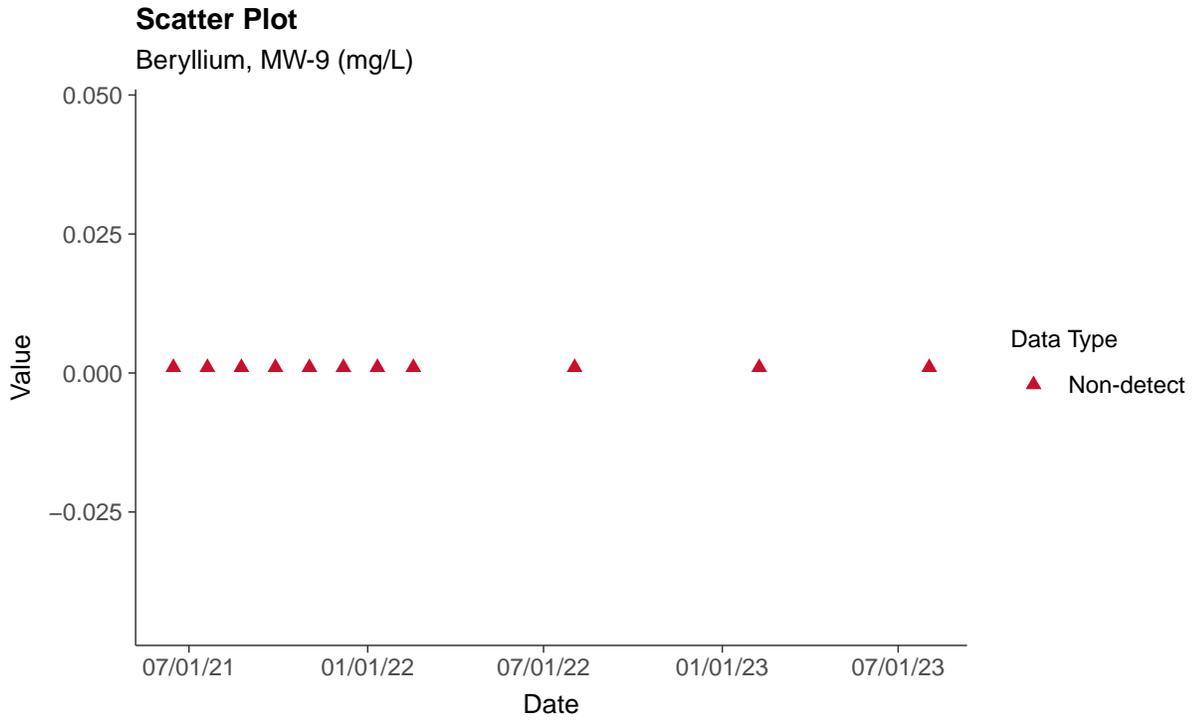
Barium, MW-9 (mg/L)





Appendix IV: Beryllium, MW-9

ID: 09_2_11





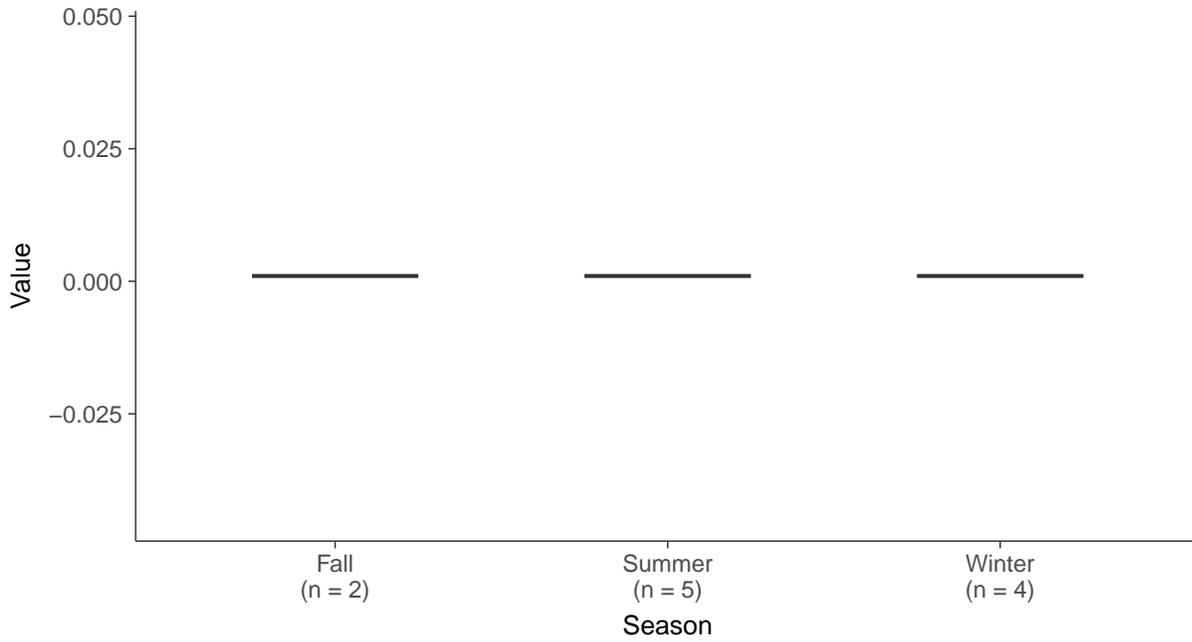
Boxplot

Beryllium, MW-9 (mg/L)



Boxplot by Season

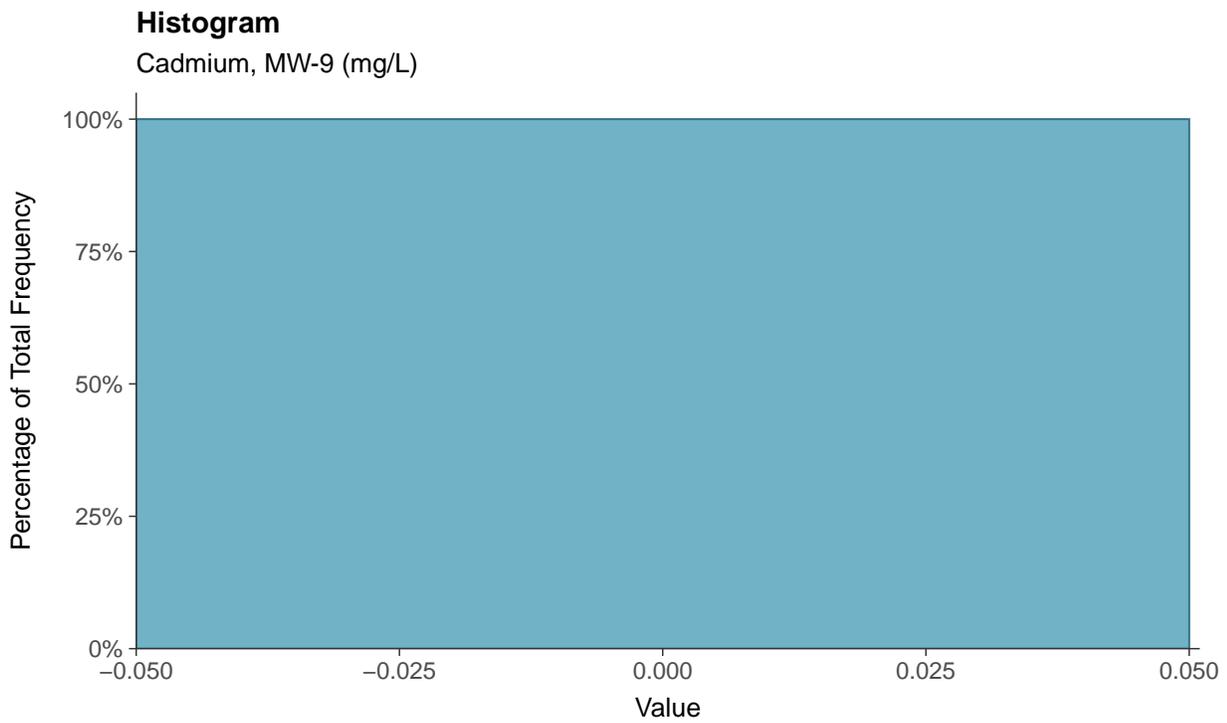
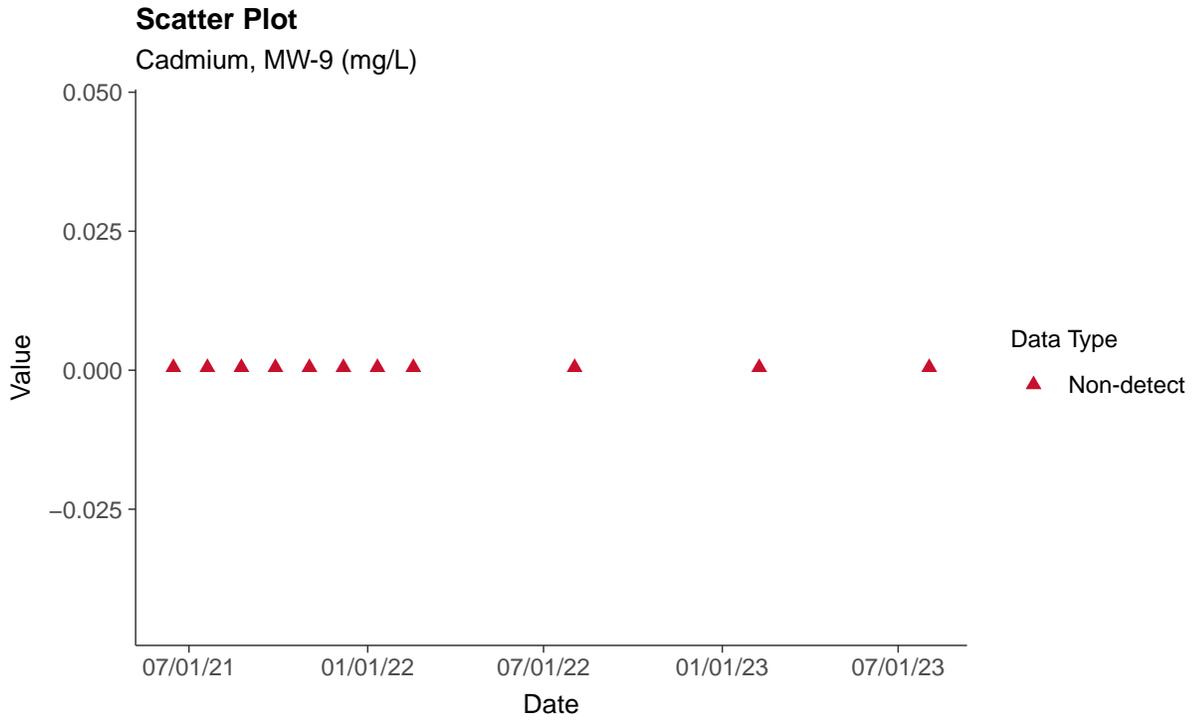
Beryllium, MW-9 (mg/L)





Appendix IV: Cadmium, MW-9

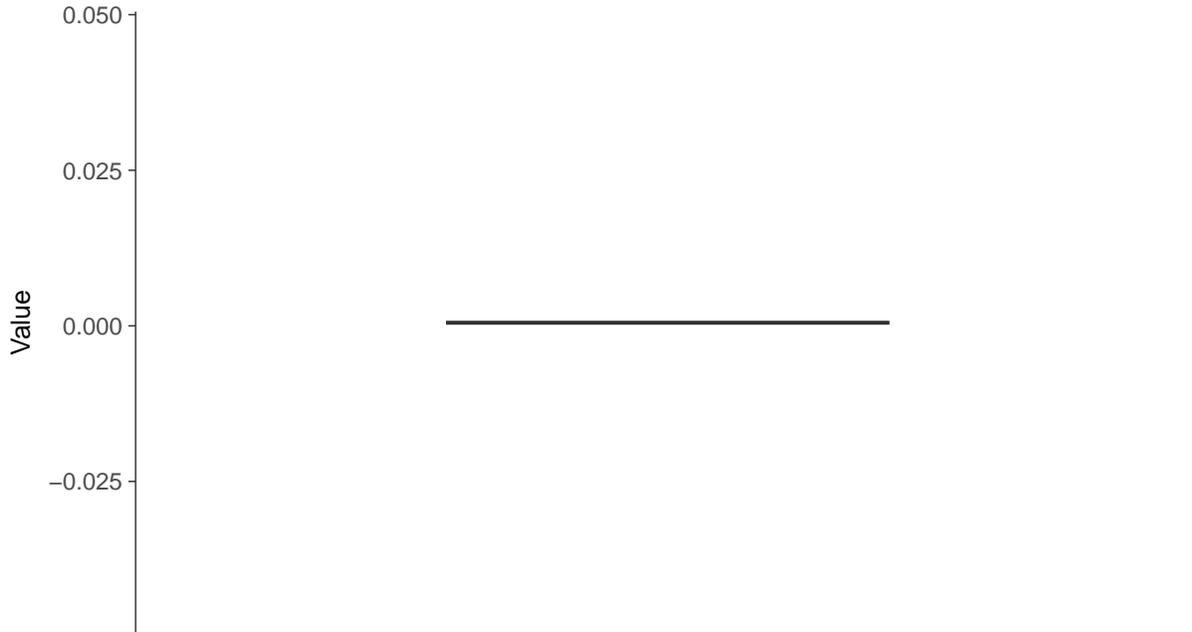
ID: 09_2_12





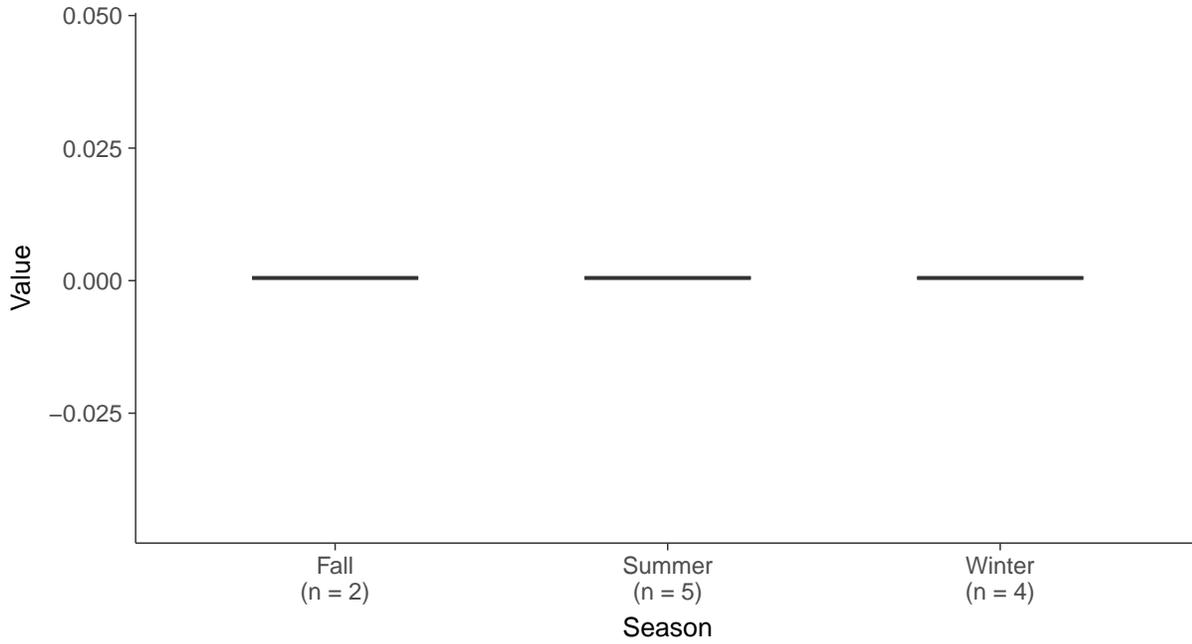
Boxplot

Cadmium, MW-9 (mg/L)



Boxplot by Season

Cadmium, MW-9 (mg/L)



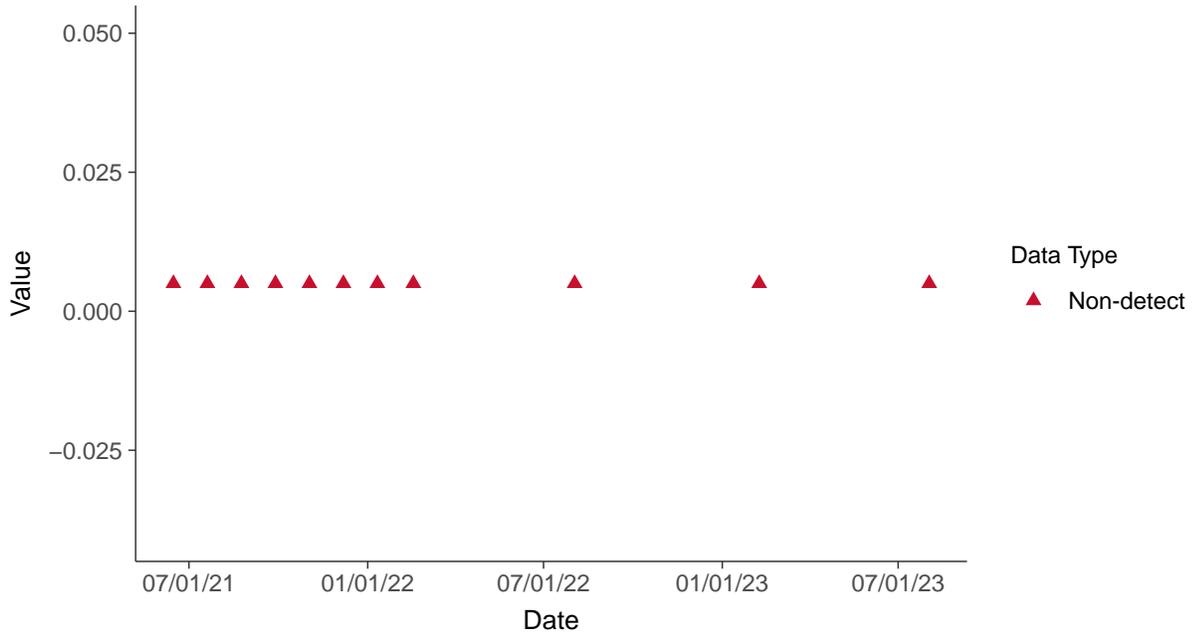


Appendix IV: Chromium, MW-9

ID: 09_2_13

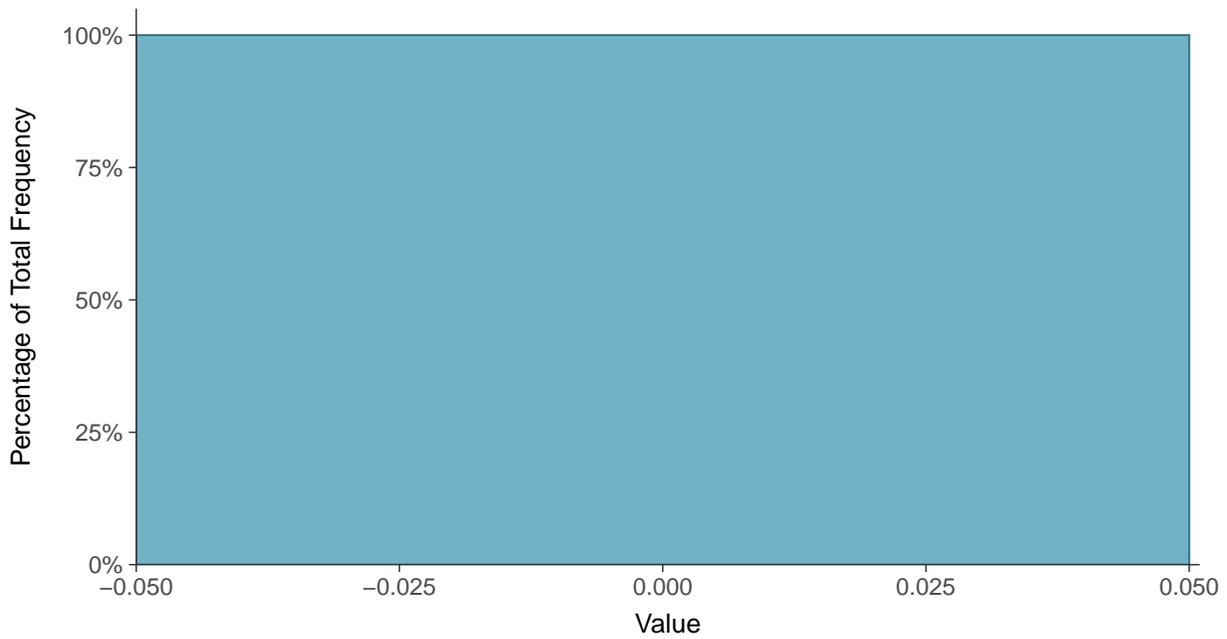
Scatter Plot

Chromium, MW-9 (mg/L)



Histogram

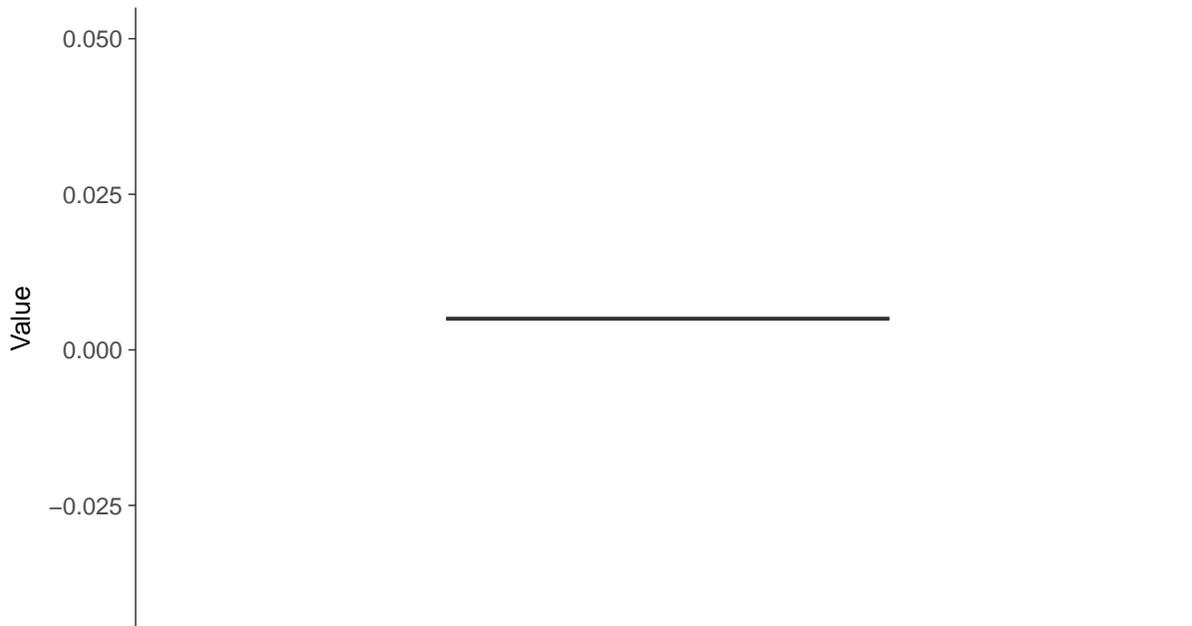
Chromium, MW-9 (mg/L)





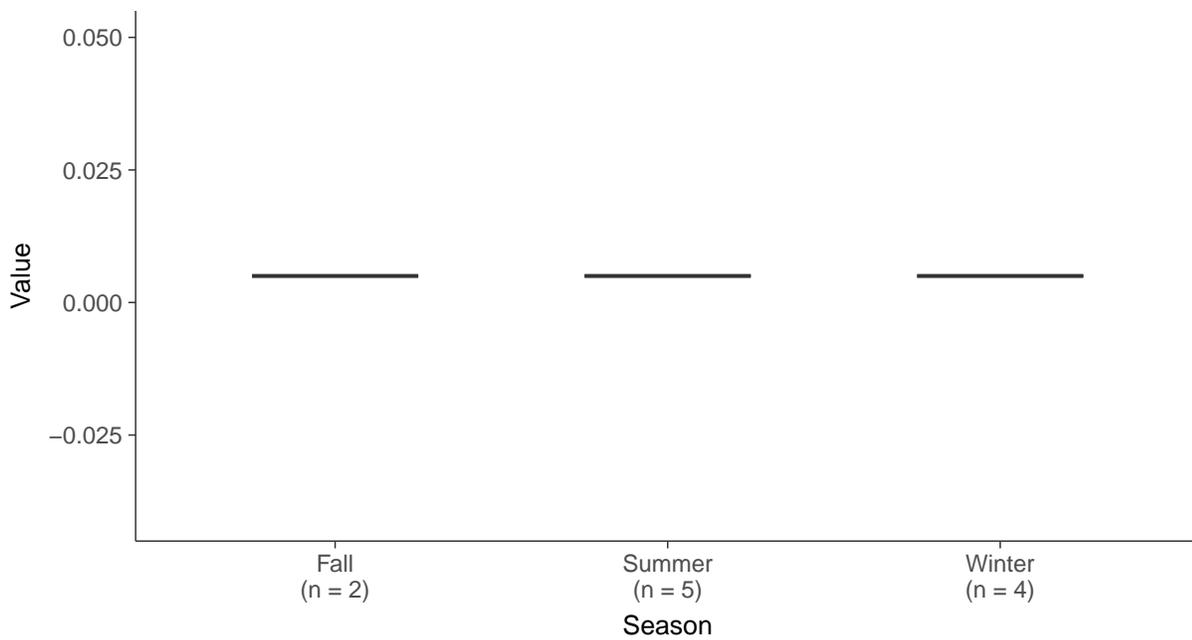
Boxplot

Chromium, MW-9 (mg/L)



Boxplot by Season

Chromium, MW-9 (mg/L)



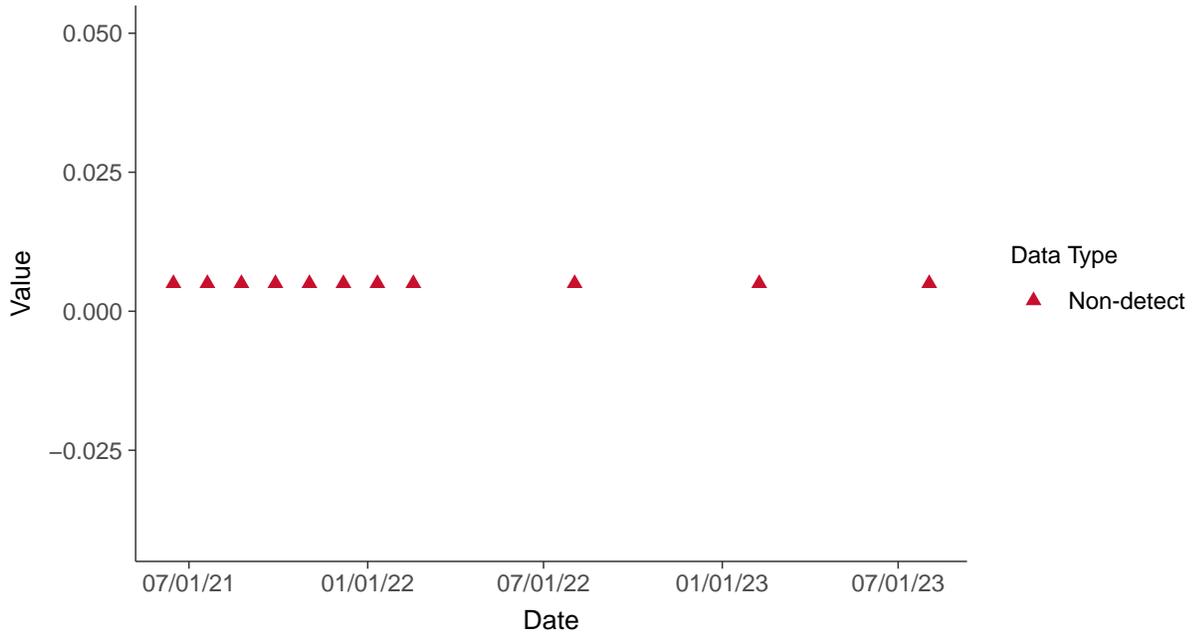


Appendix IV: Cobalt, MW-9

ID: 09_2_14

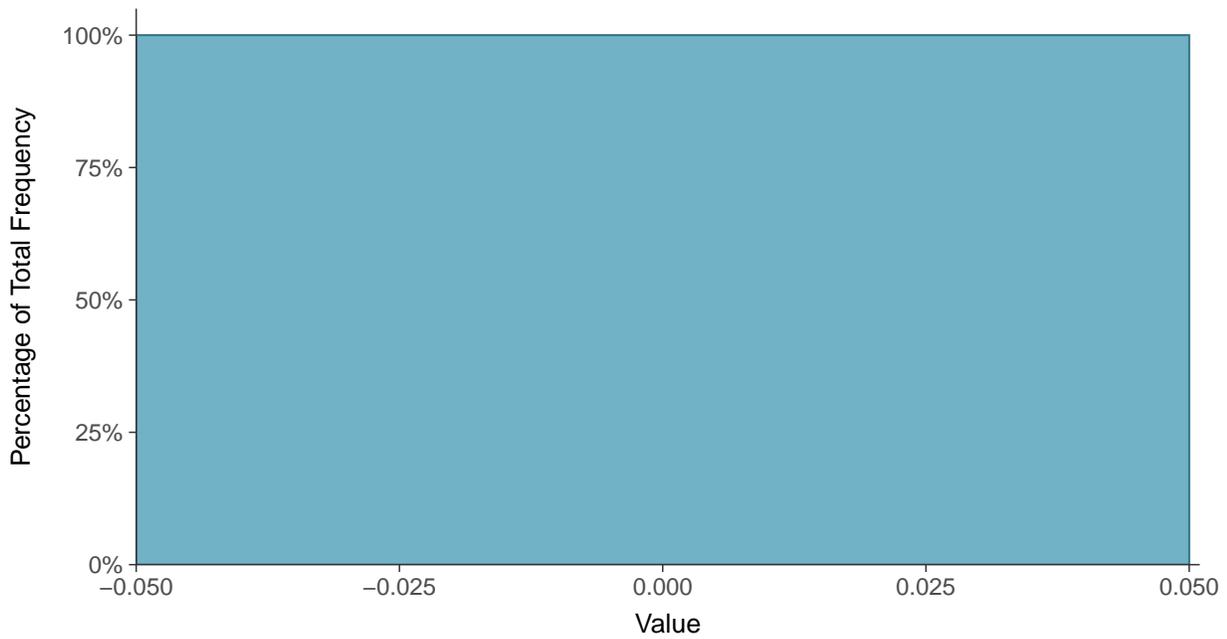
Scatter Plot

Cobalt, MW-9 (mg/L)



Histogram

Cobalt, MW-9 (mg/L)





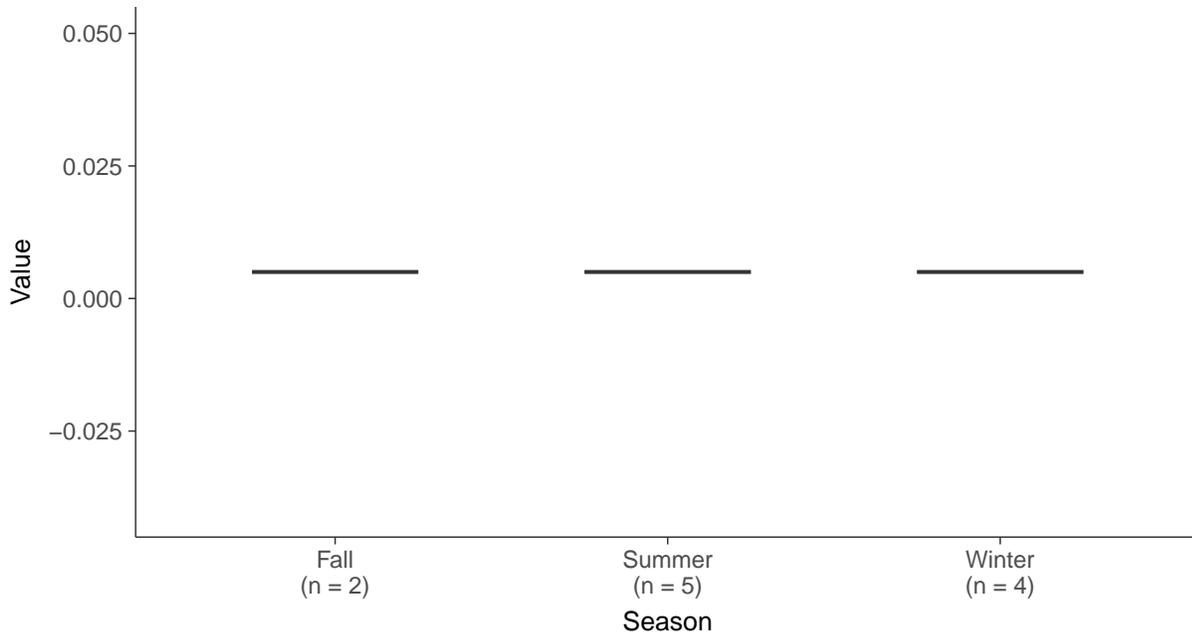
Boxplot

Cobalt, MW-9 (mg/L)



Boxplot by Season

Cobalt, MW-9 (mg/L)



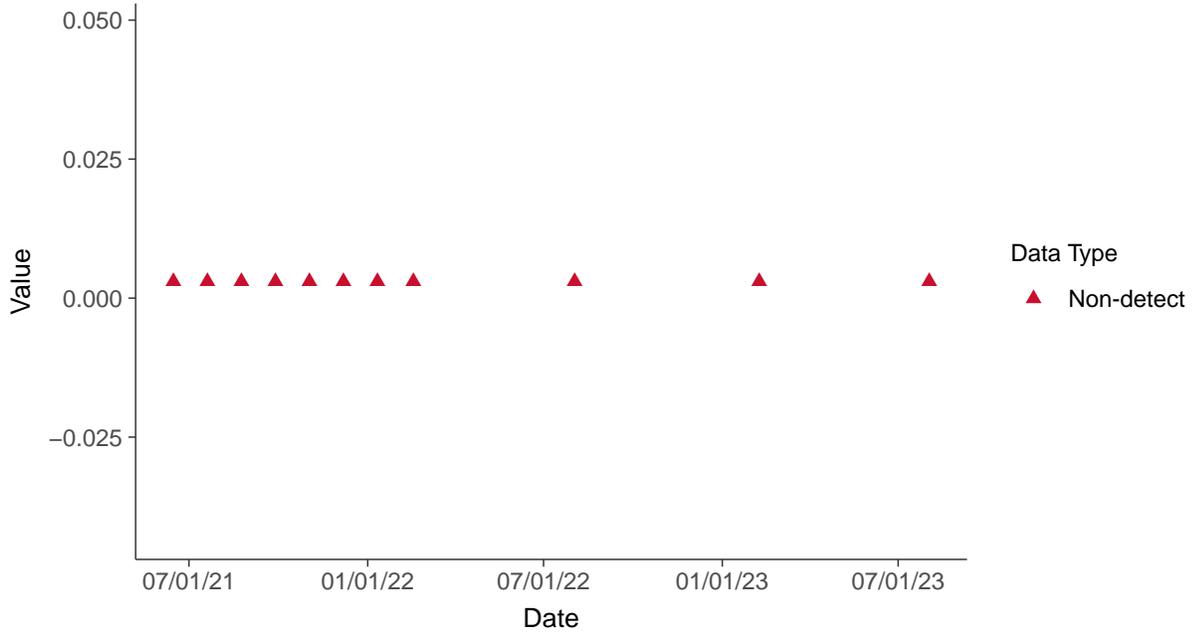


Appendix IV: Lead, MW-9

ID: 09_2_15

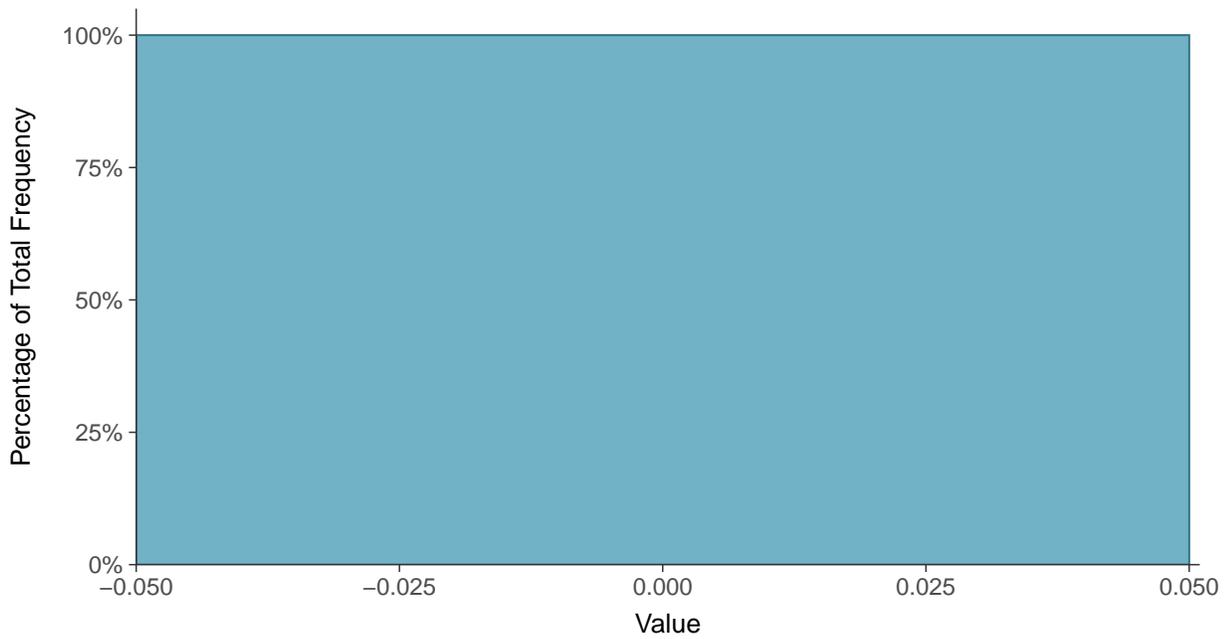
Scatter Plot

Lead, MW-9 (mg/L)



Histogram

Lead, MW-9 (mg/L)





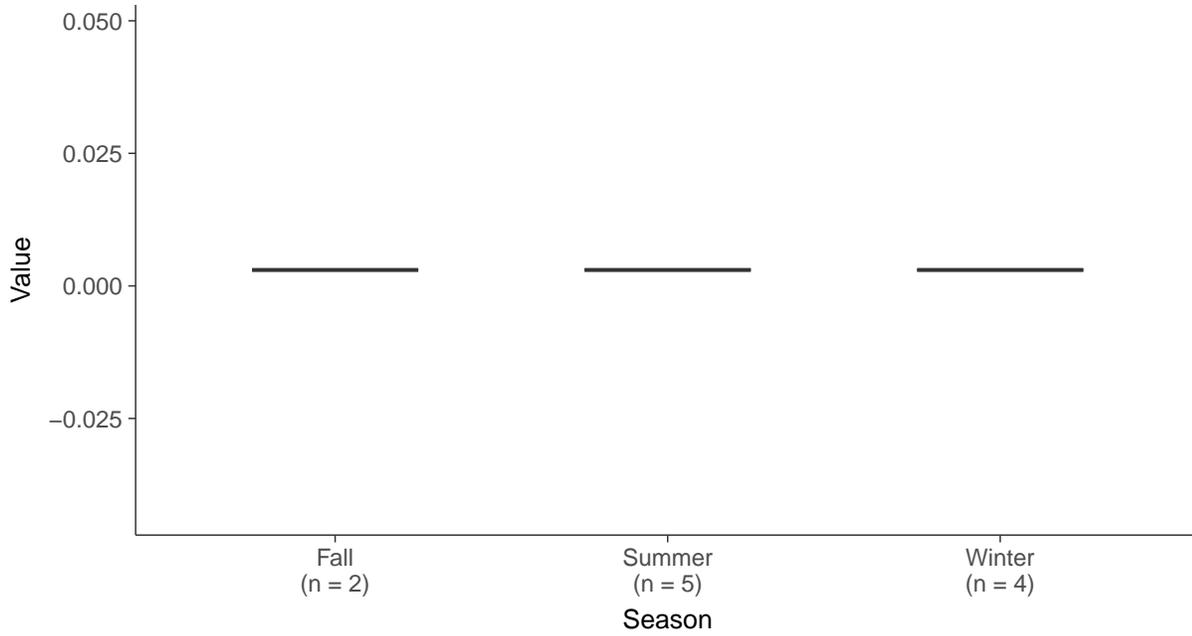
Boxplot

Lead, MW-9 (mg/L)



Boxplot by Season

Lead, MW-9 (mg/L)



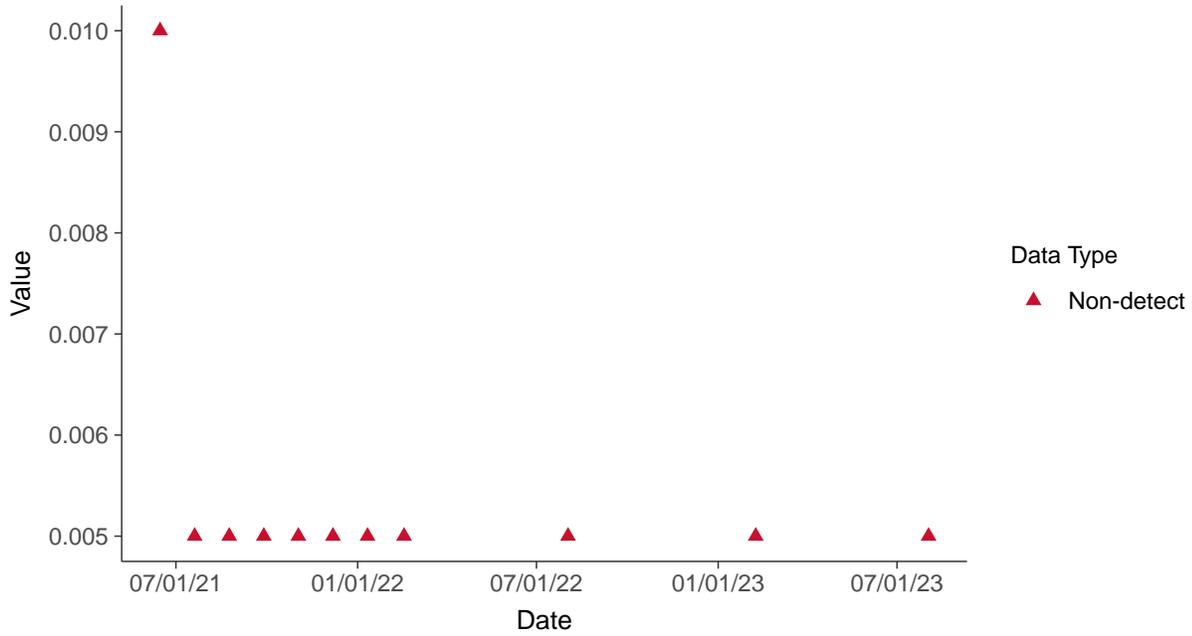


Appendix IV: Lithium, MW-9

ID: 09_2_16

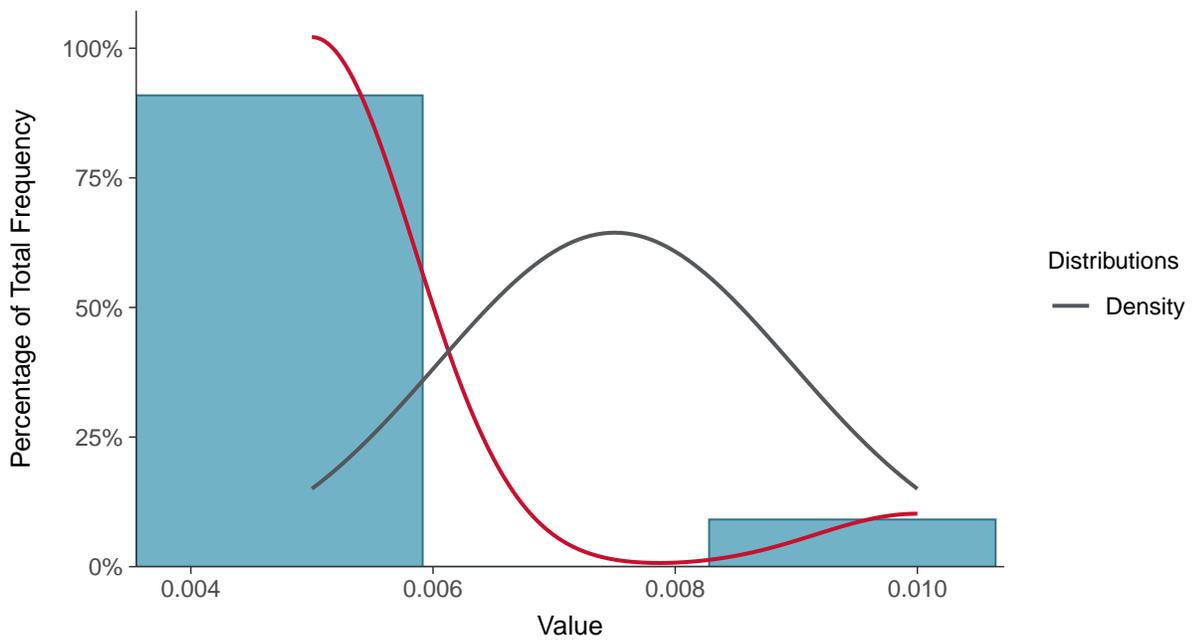
Scatter Plot

Lithium, MW-9 (mg/L)



Histogram

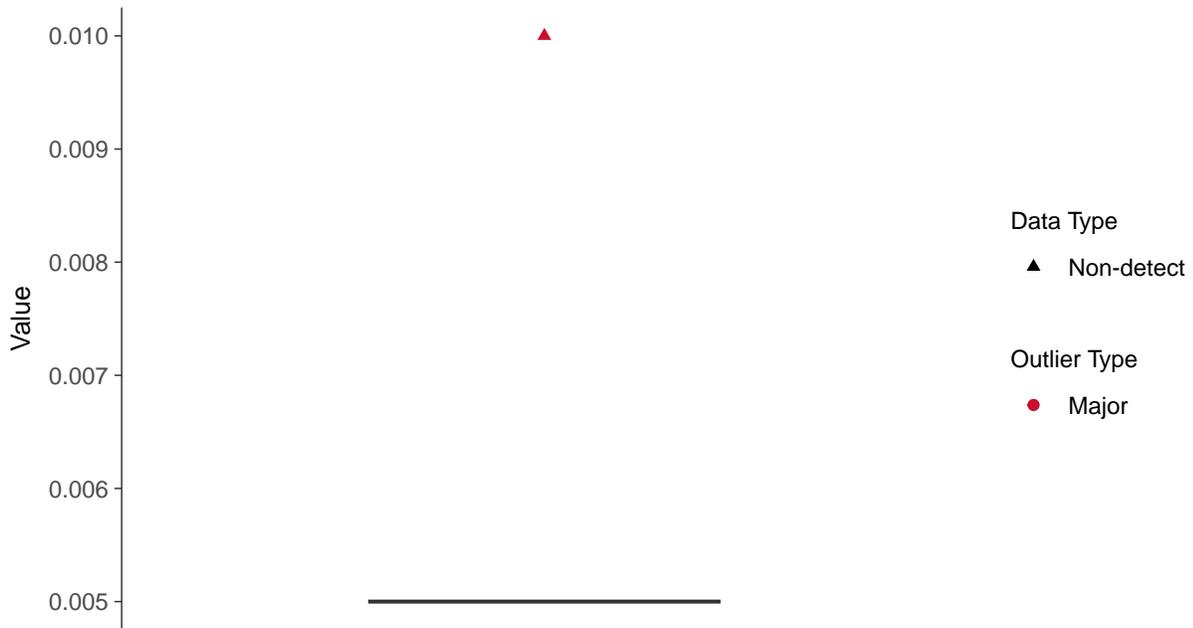
Lithium, MW-9 (mg/L)





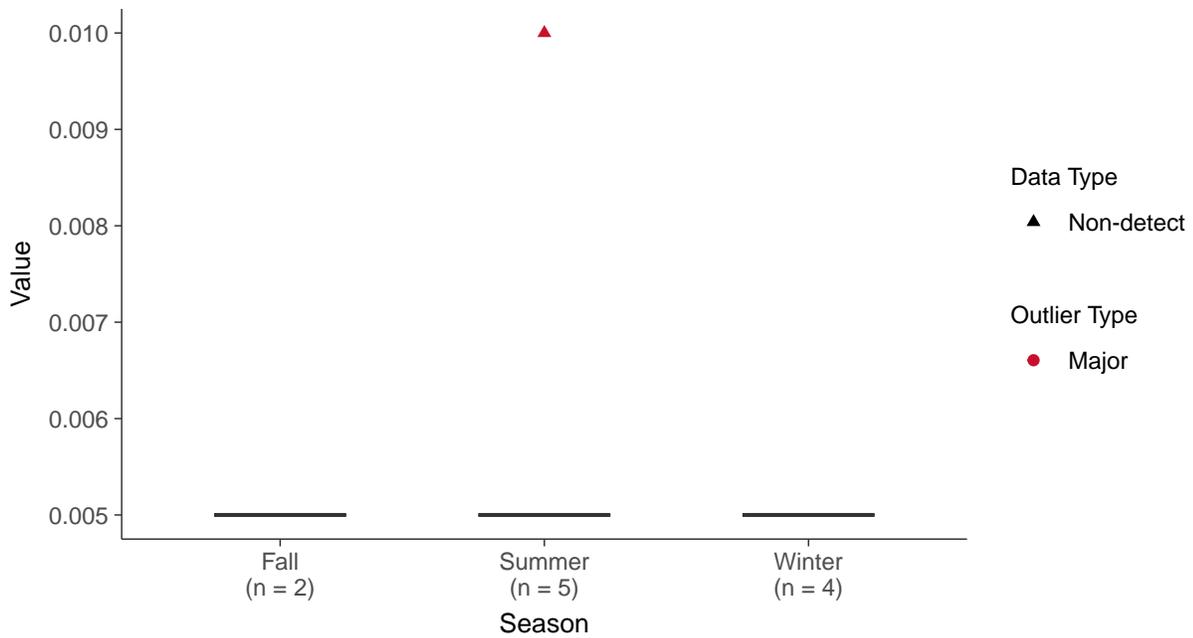
Boxplot

Lithium, MW-9 (mg/L)



Boxplot by Season

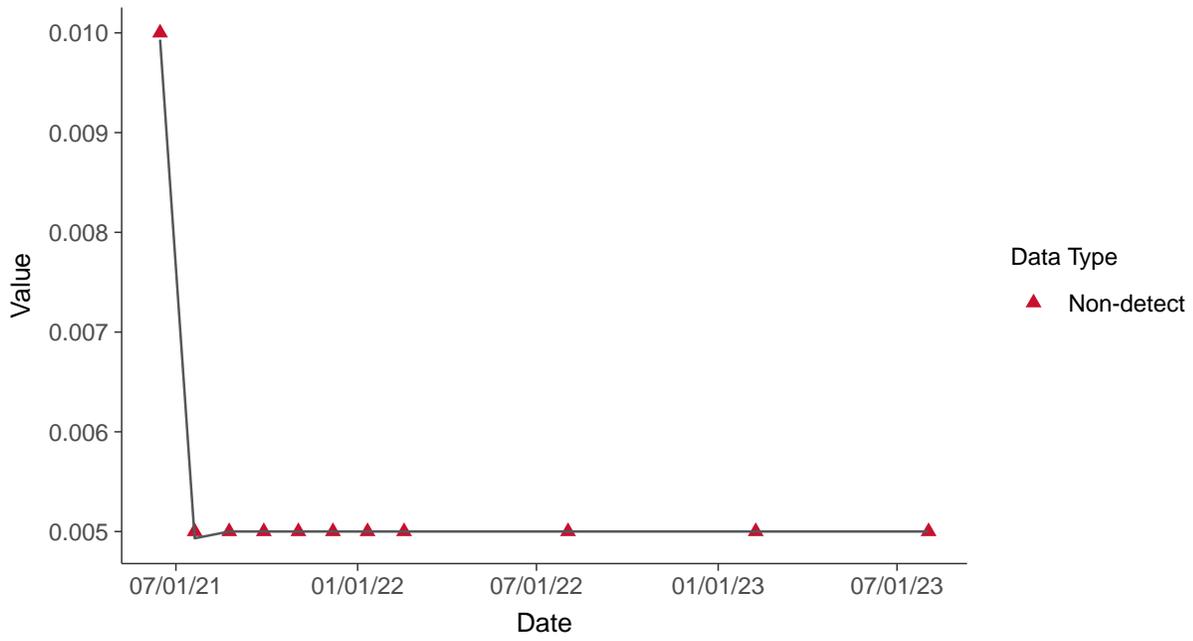
Lithium, MW-9 (mg/L)





Trend Regression: Piecewise Linear-Linear

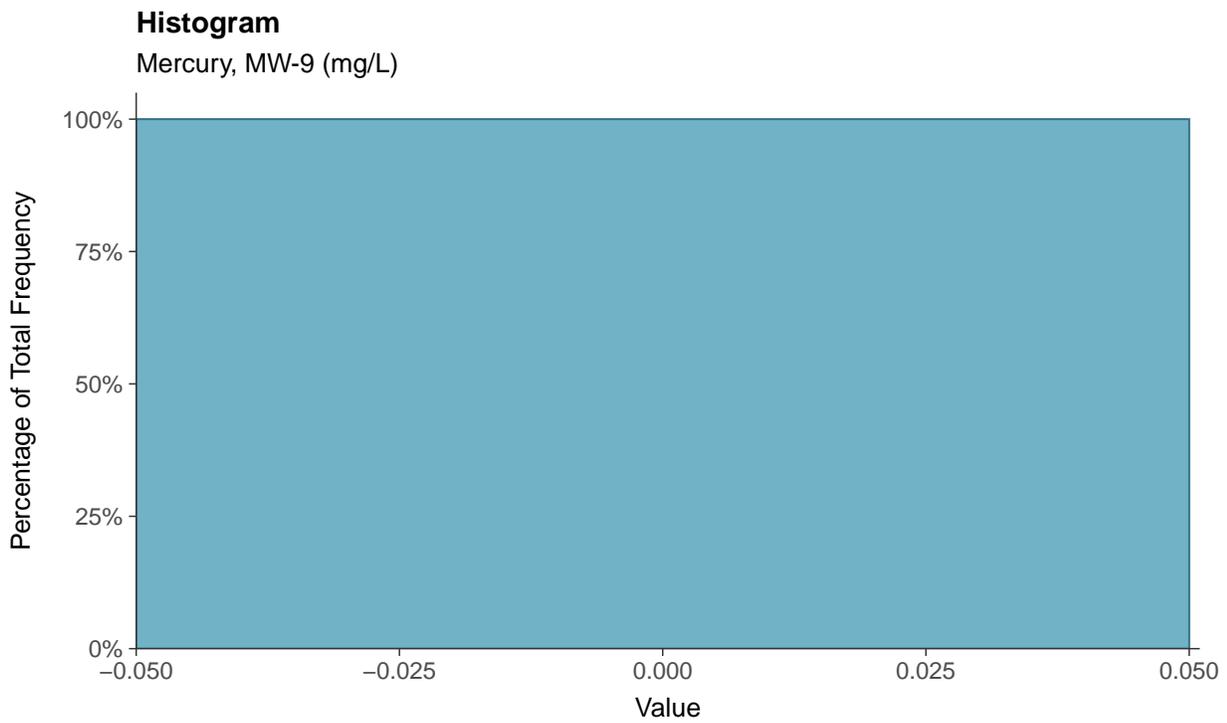
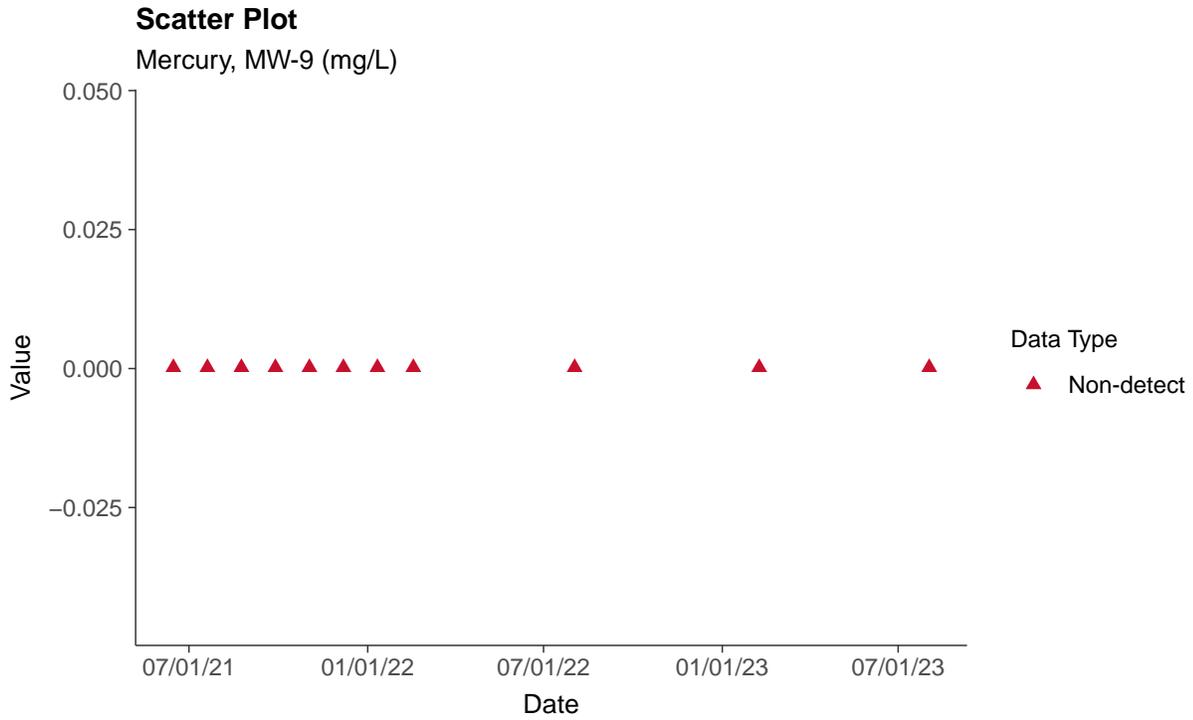
Lithium, MW-9 (mg/L)





Appendix IV: Mercury, MW-9

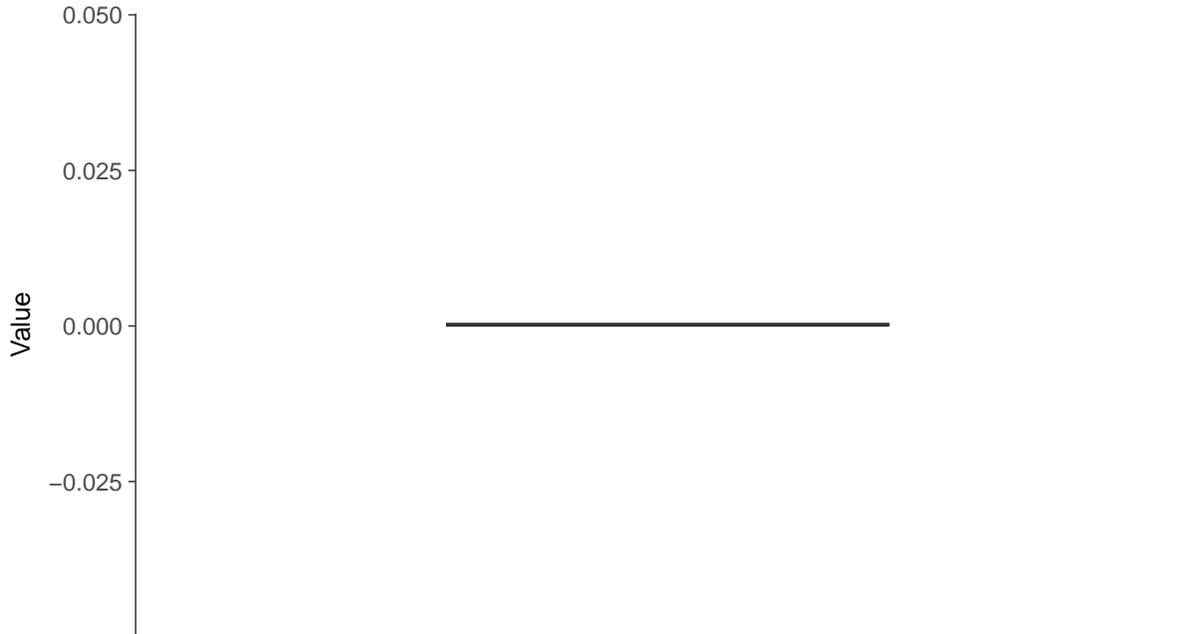
ID: 09_2_17





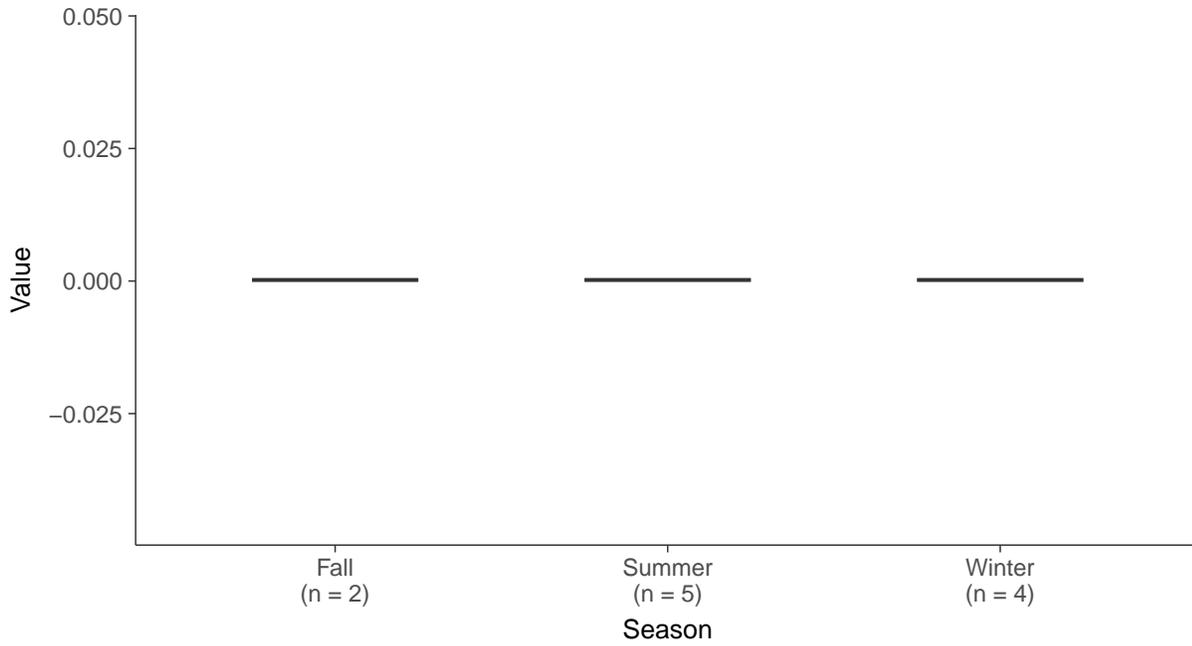
Boxplot

Mercury, MW-9 (mg/L)



Boxplot by Season

Mercury, MW-9 (mg/L)



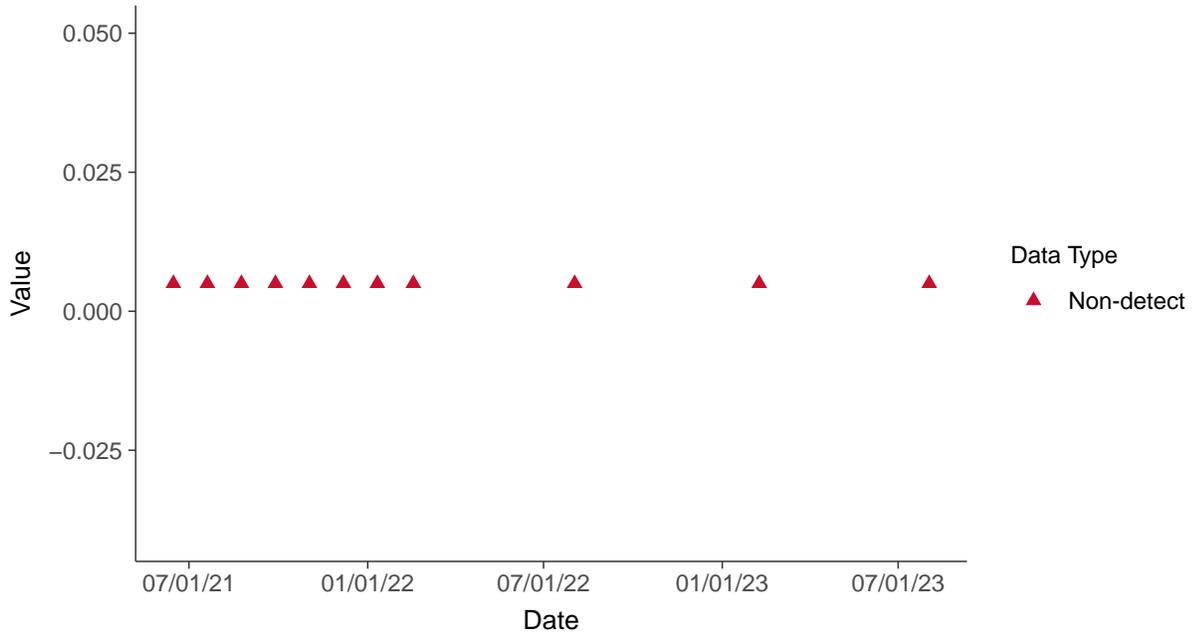


Appendix IV: Molybdenum, MW-9

ID: 09_2_18

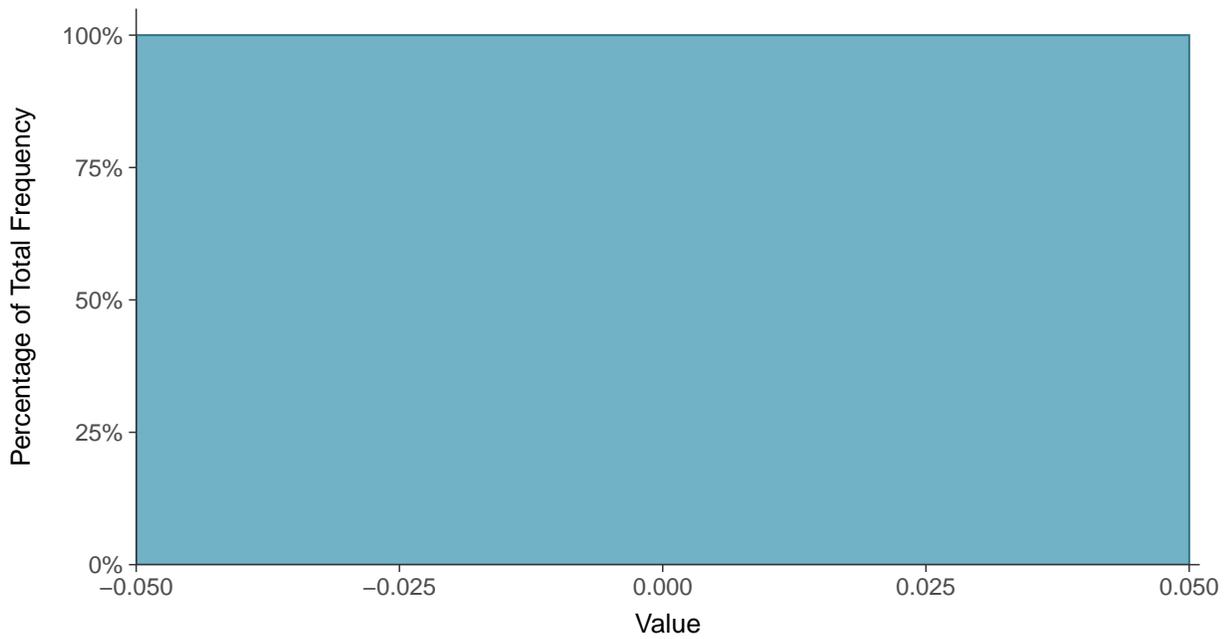
Scatter Plot

Molybdenum, MW-9 (mg/L)



Histogram

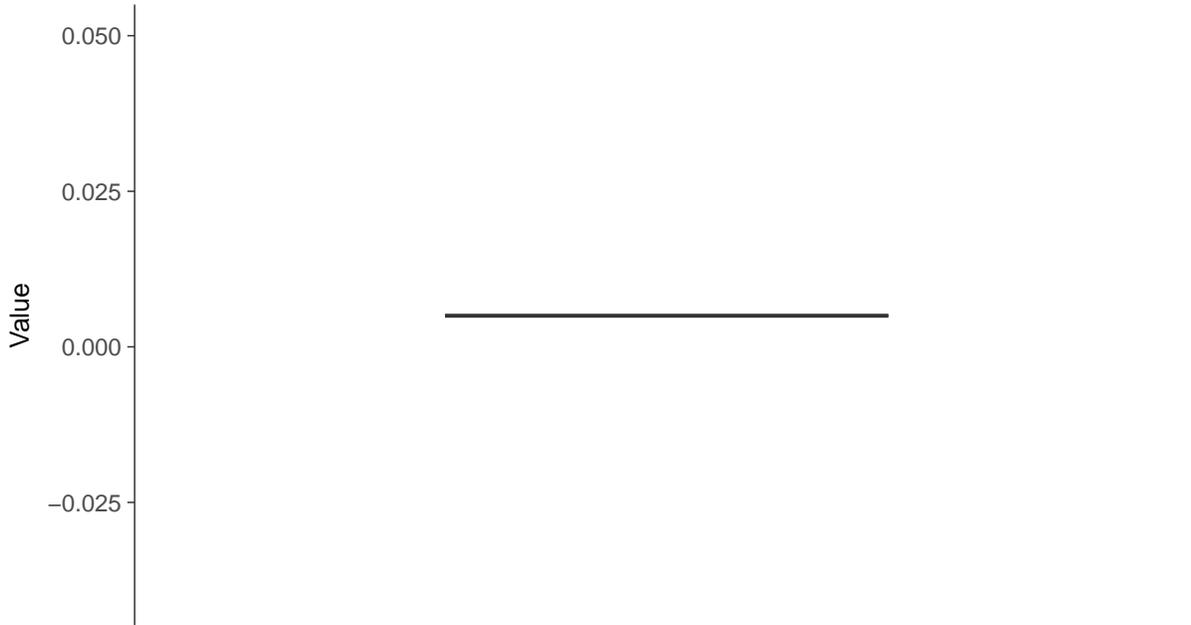
Molybdenum, MW-9 (mg/L)





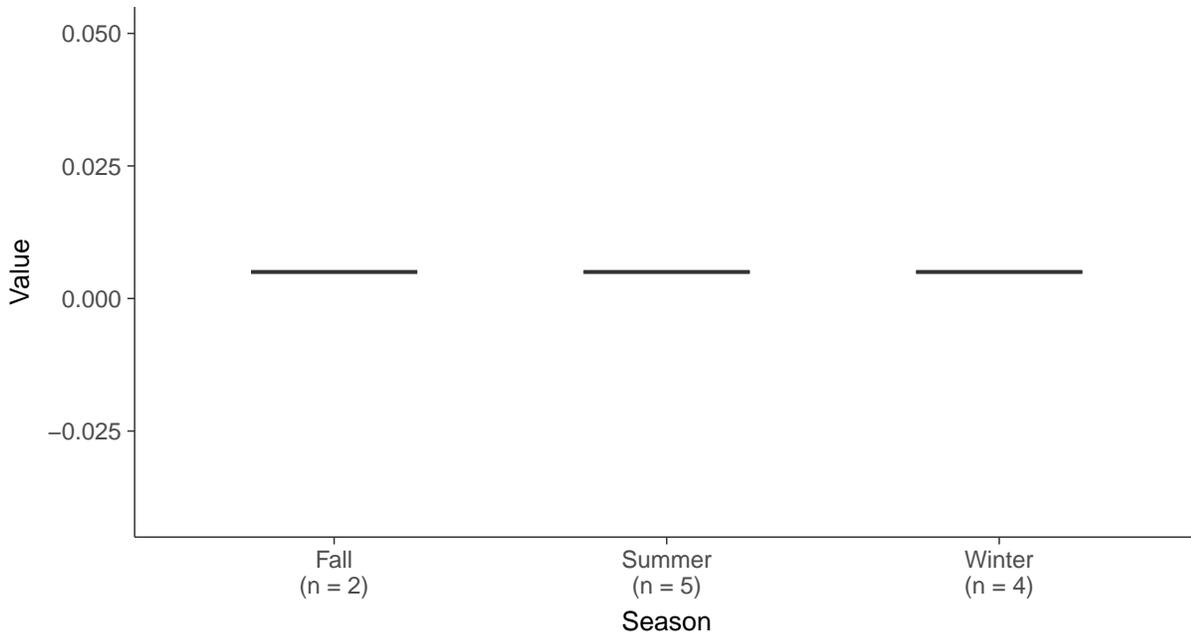
Boxplot

Molybdenum, MW-9 (mg/L)



Boxplot by Season

Molybdenum, MW-9 (mg/L)



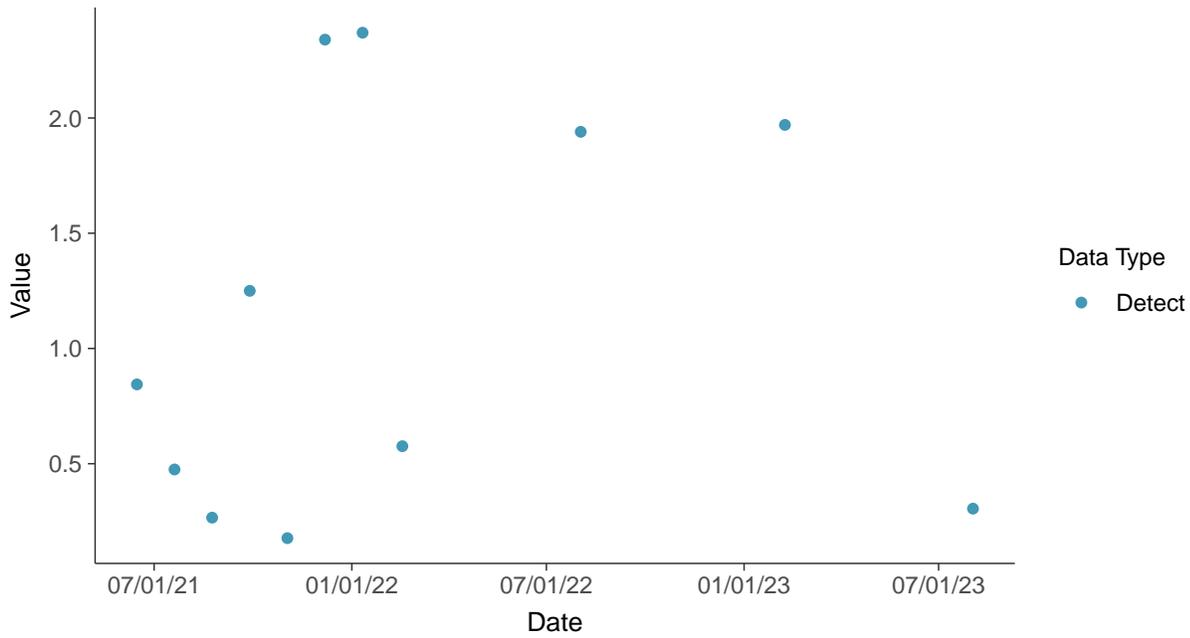


Appendix IV: Radium-226/228, MW-9

ID: 09_2_20

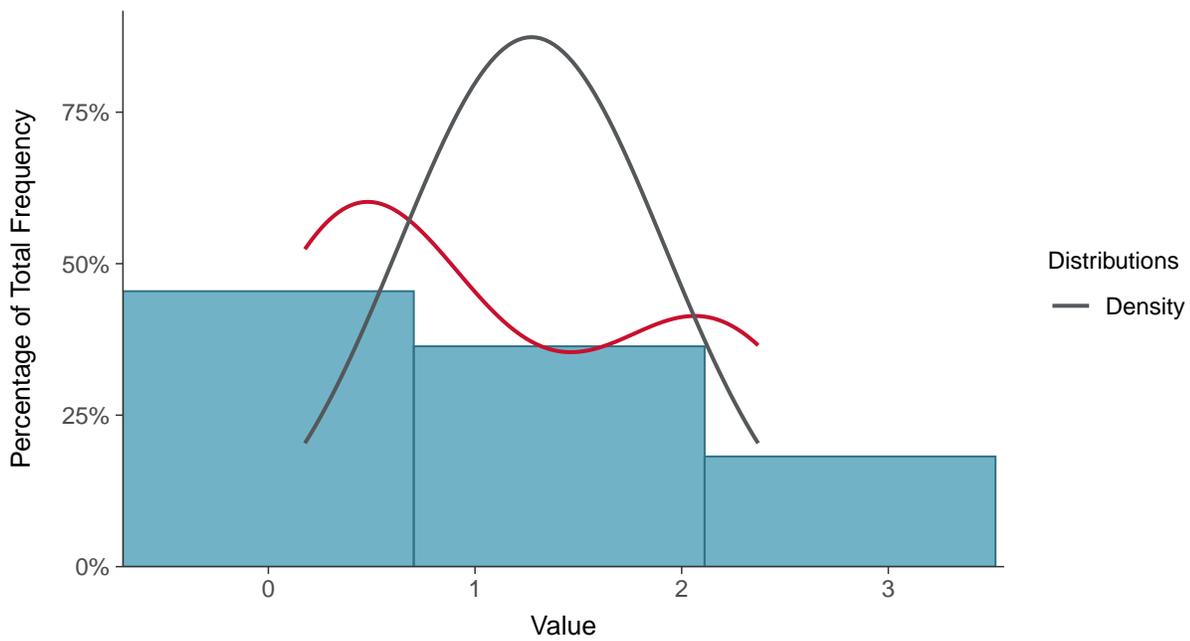
Scatter Plot

Radium-226/228, MW-9 (pCi/L)



Histogram

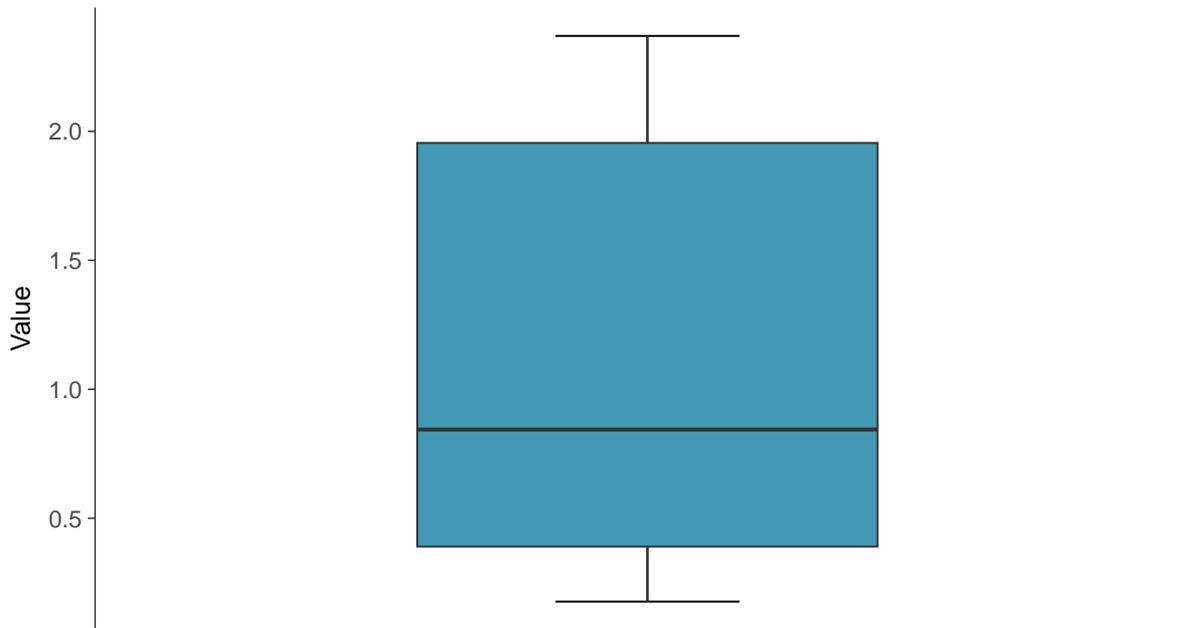
Radium-226/228, MW-9 (pCi/L)





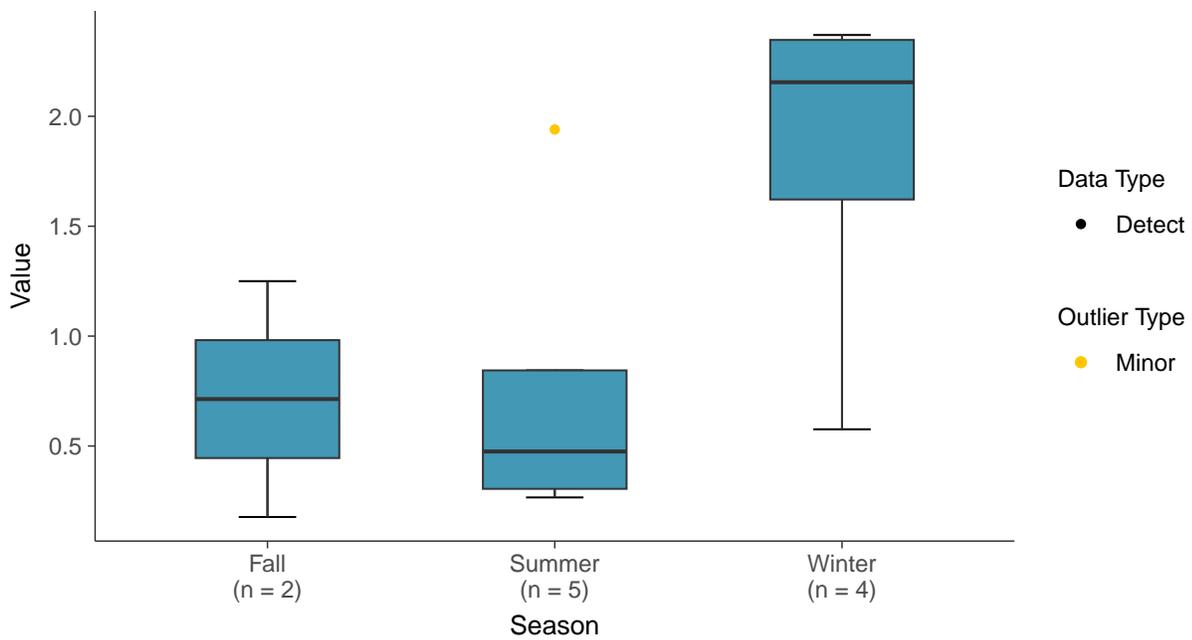
Boxplot

Radium-226/228, MW-9 (pCi/L)



Boxplot by Season

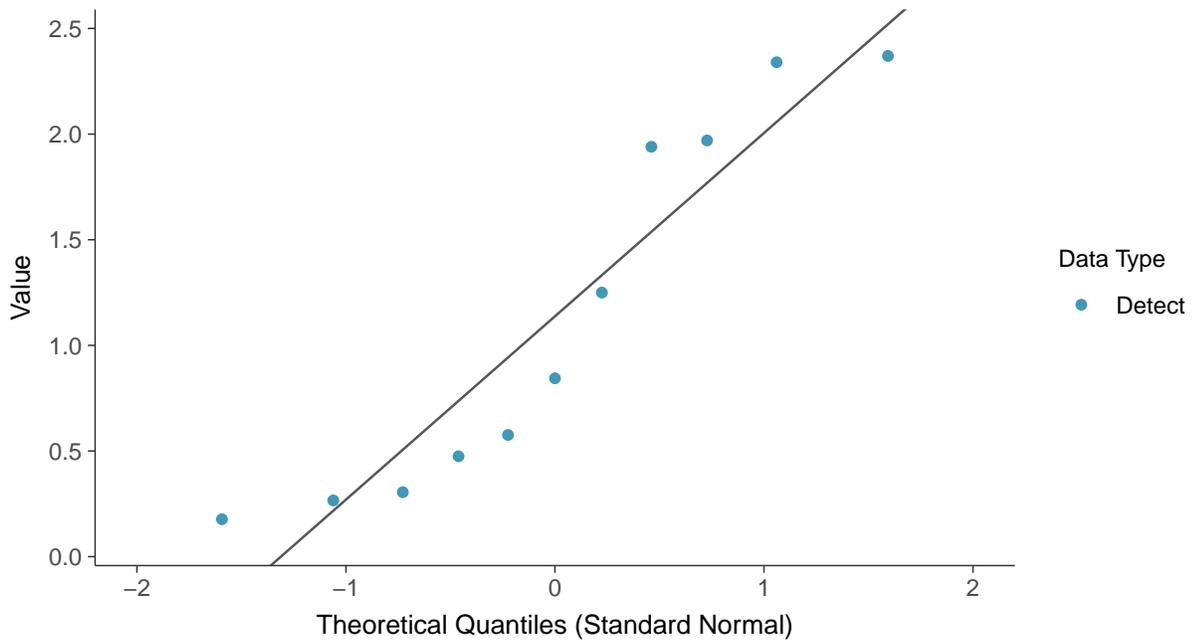
Radium-226/228, MW-9 (pCi/L)





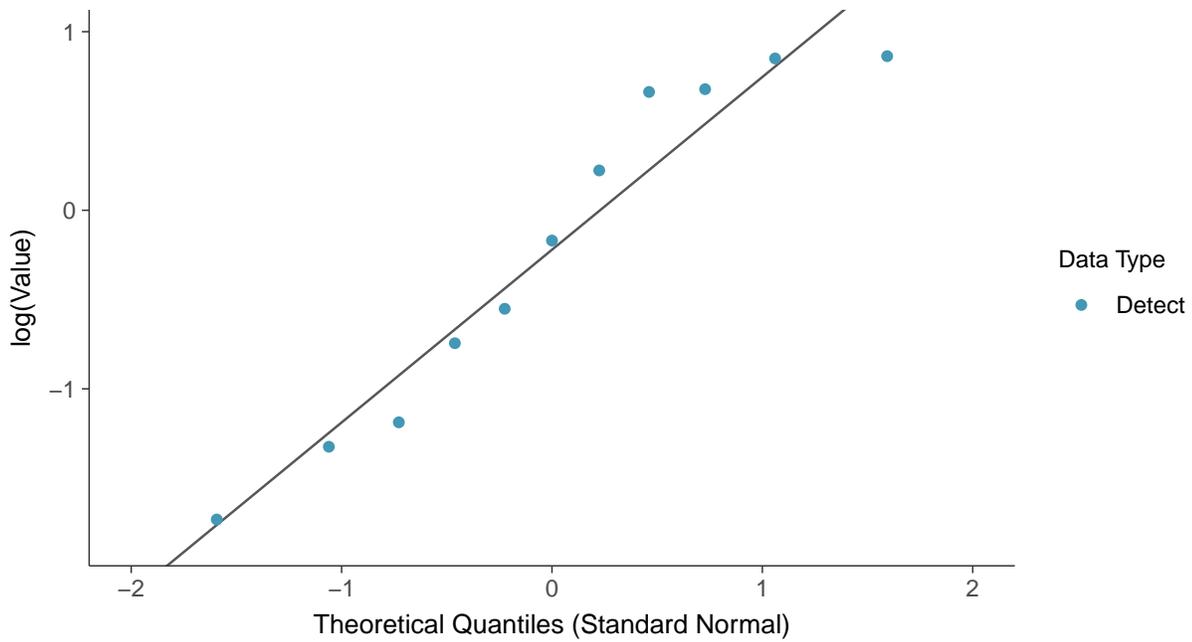
Normal Q-Q plot

Radium-226/228, MW-9 (pCi/L)



Lognormal Q-Q plot

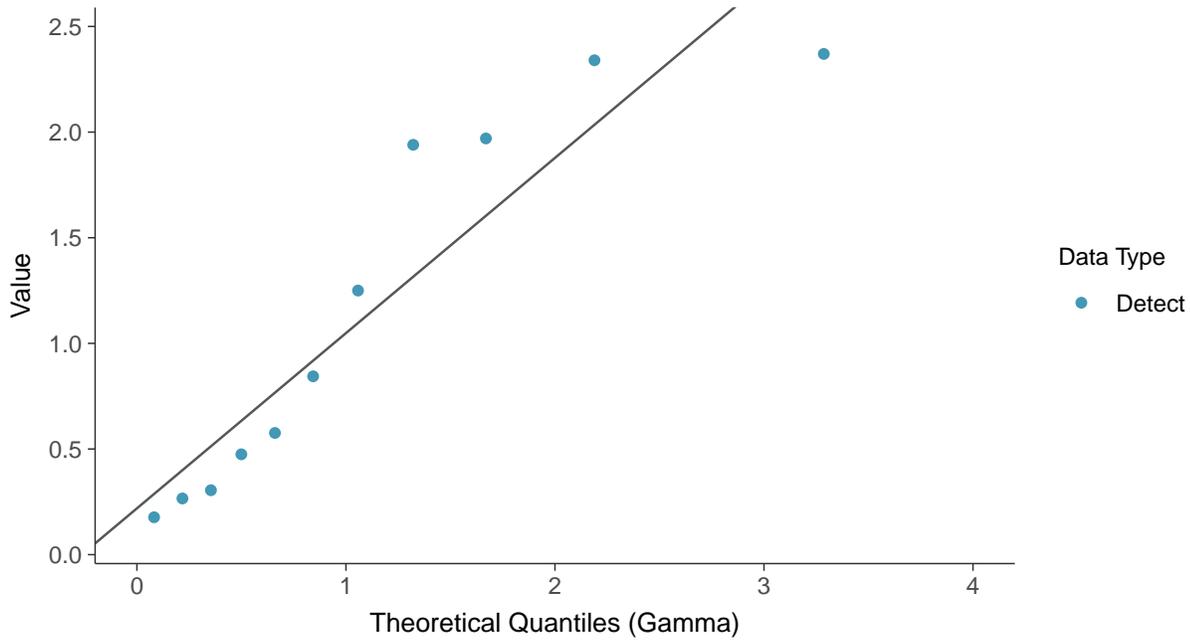
Radium-226/228, MW-9 (pCi/L)





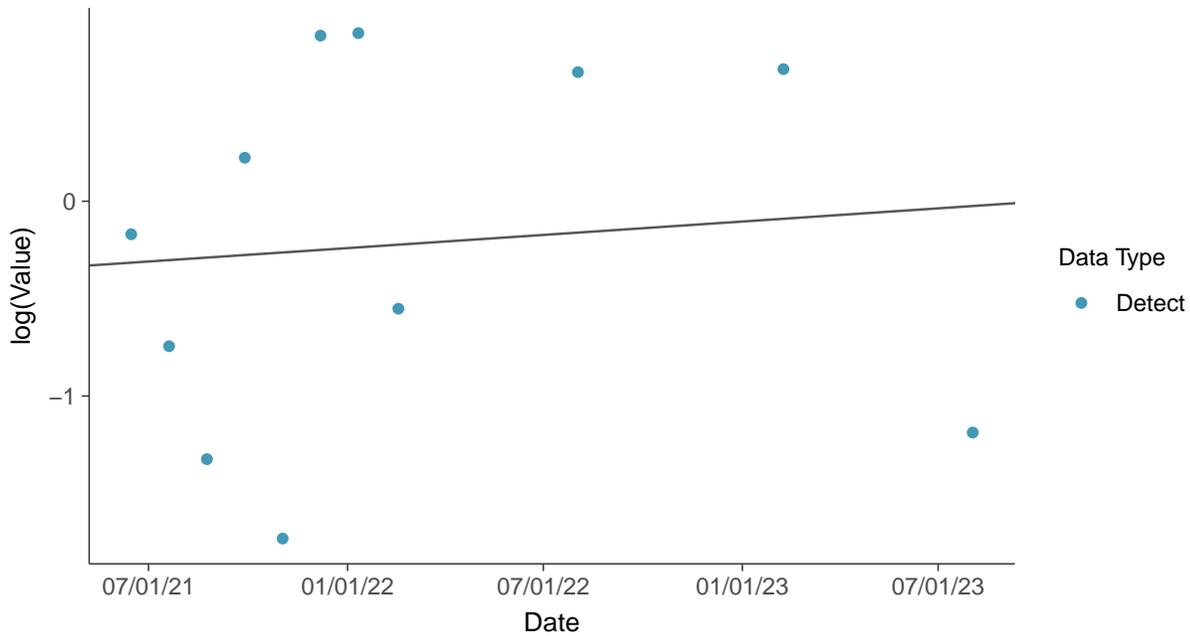
Gamma Q-Q plot

Radium-226/228, MW-9 (pCi/L)



Trend Regression: Lognormal MLE

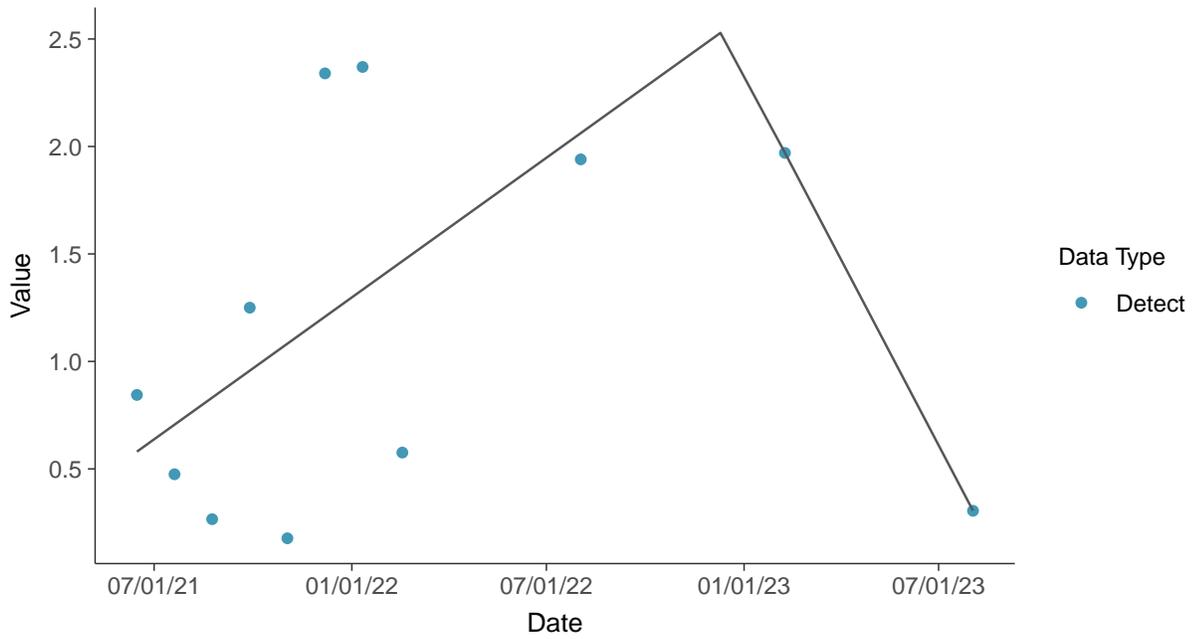
Radium-226/228, MW-9 (pCi/L)





Trend Regression: Piecewise Linear-Linear

Radium-226/228, MW-9 (pCi/L)



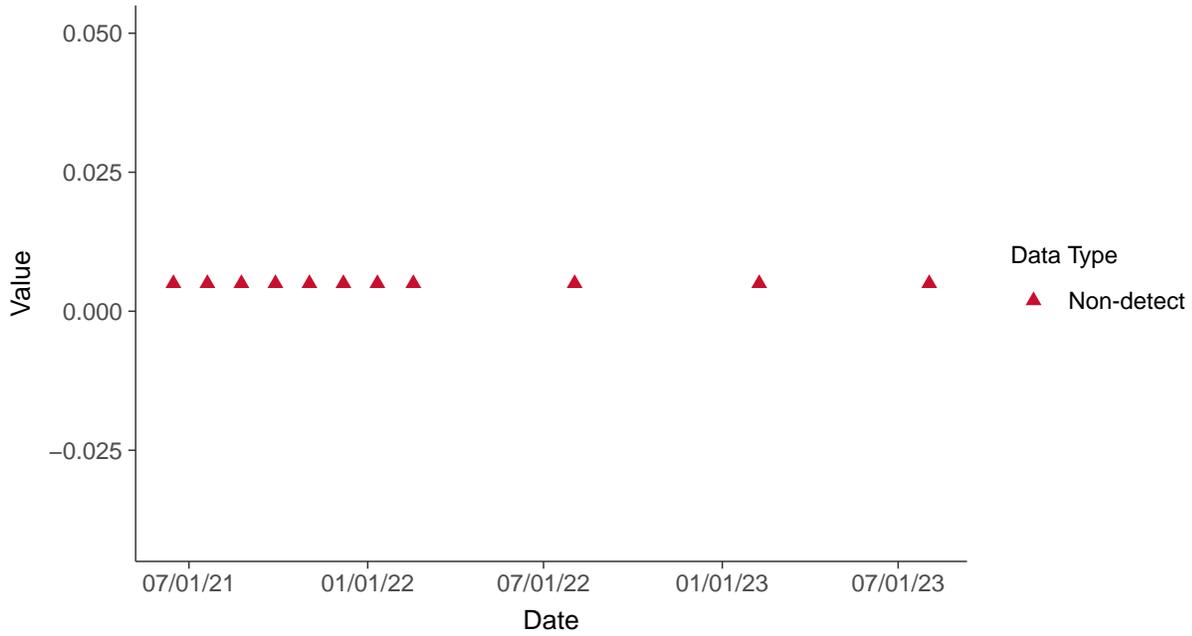


Appendix IV: Selenium, MW-9

ID: 09_2_22

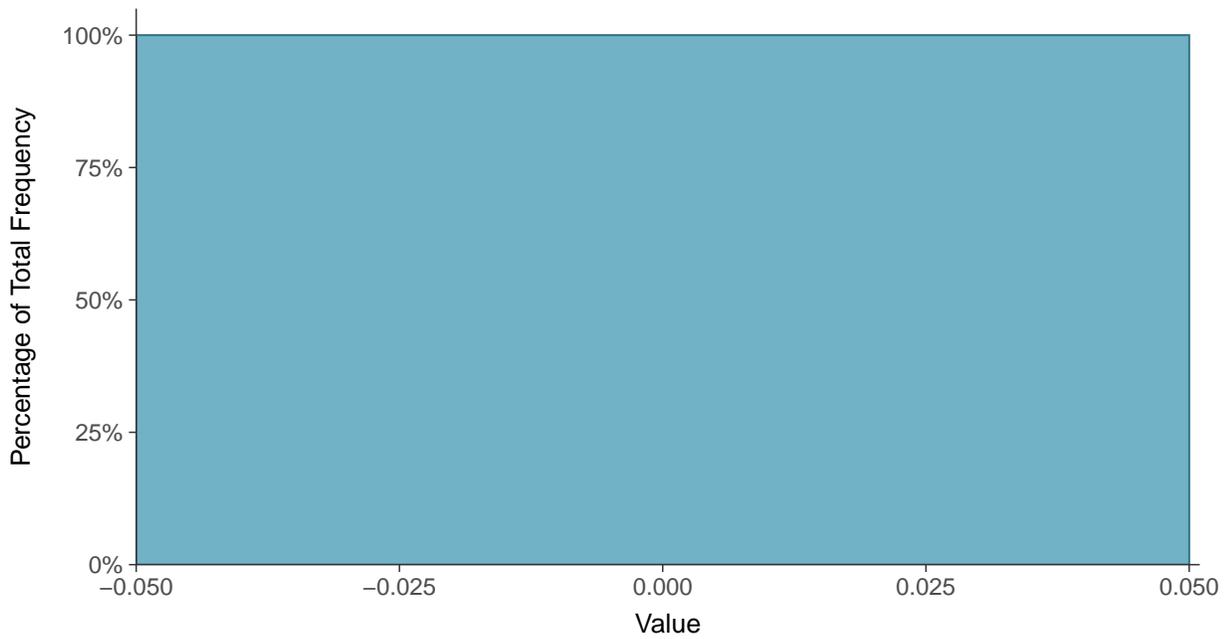
Scatter Plot

Selenium, MW-9 (mg/L)



Histogram

Selenium, MW-9 (mg/L)





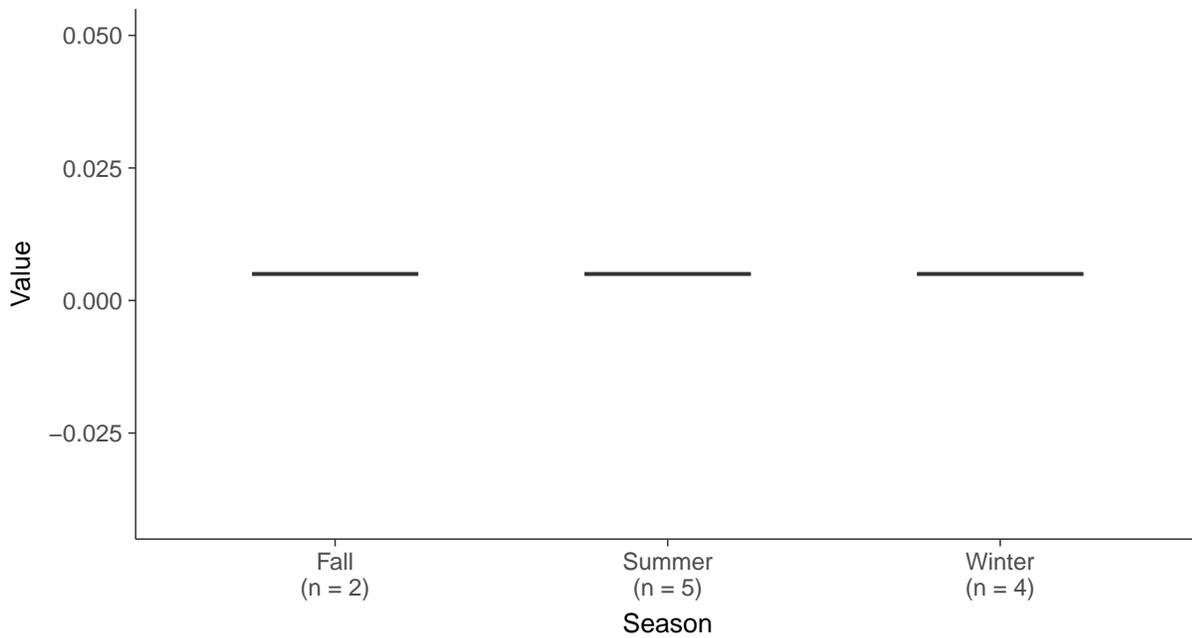
Boxplot

Selenium, MW-9 (mg/L)



Boxplot by Season

Selenium, MW-9 (mg/L)



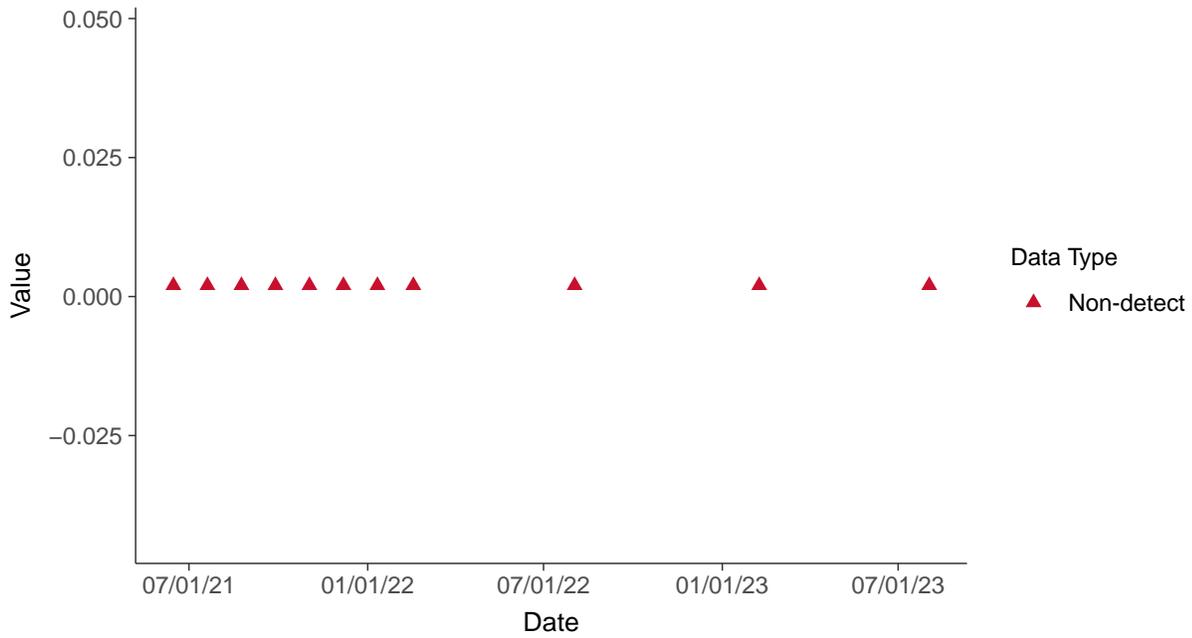


Appendix IV: Thallium, MW-9

ID: 09_2_23

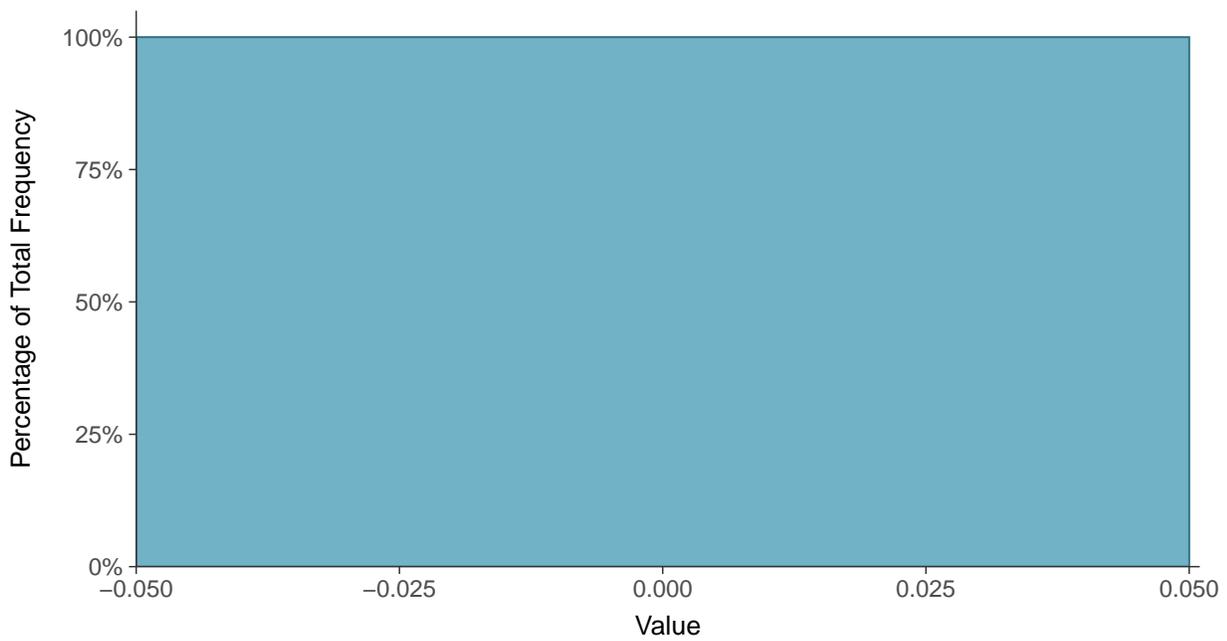
Scatter Plot

Thallium, MW-9 (mg/L)



Histogram

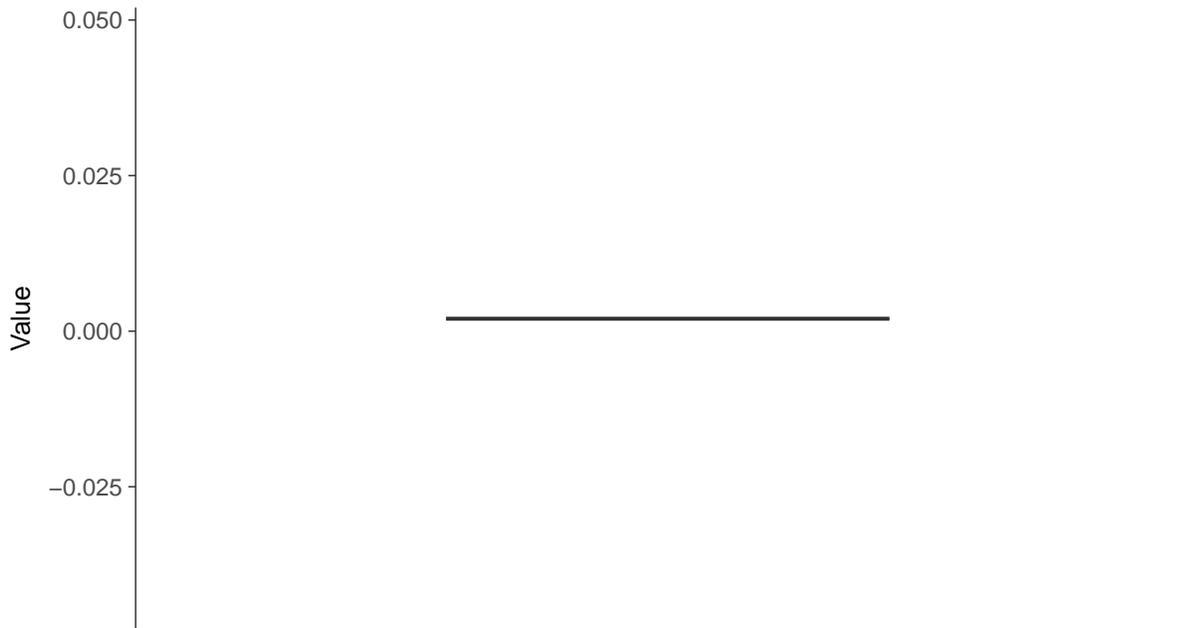
Thallium, MW-9 (mg/L)





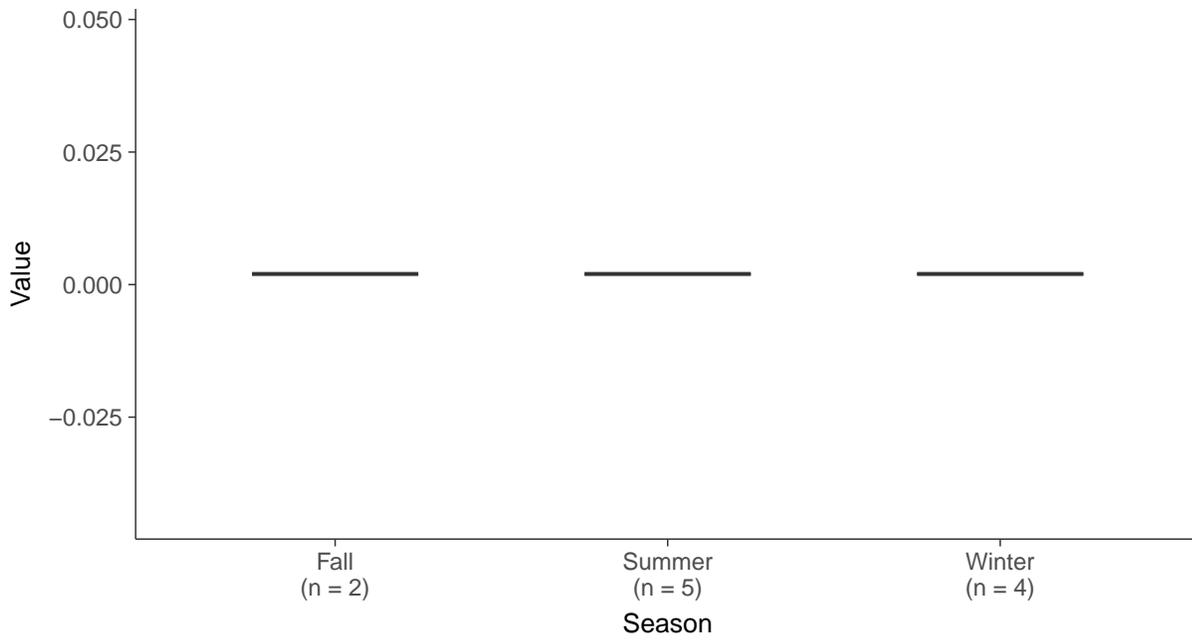
Boxplot

Thallium, MW-9 (mg/L)



Boxplot by Season

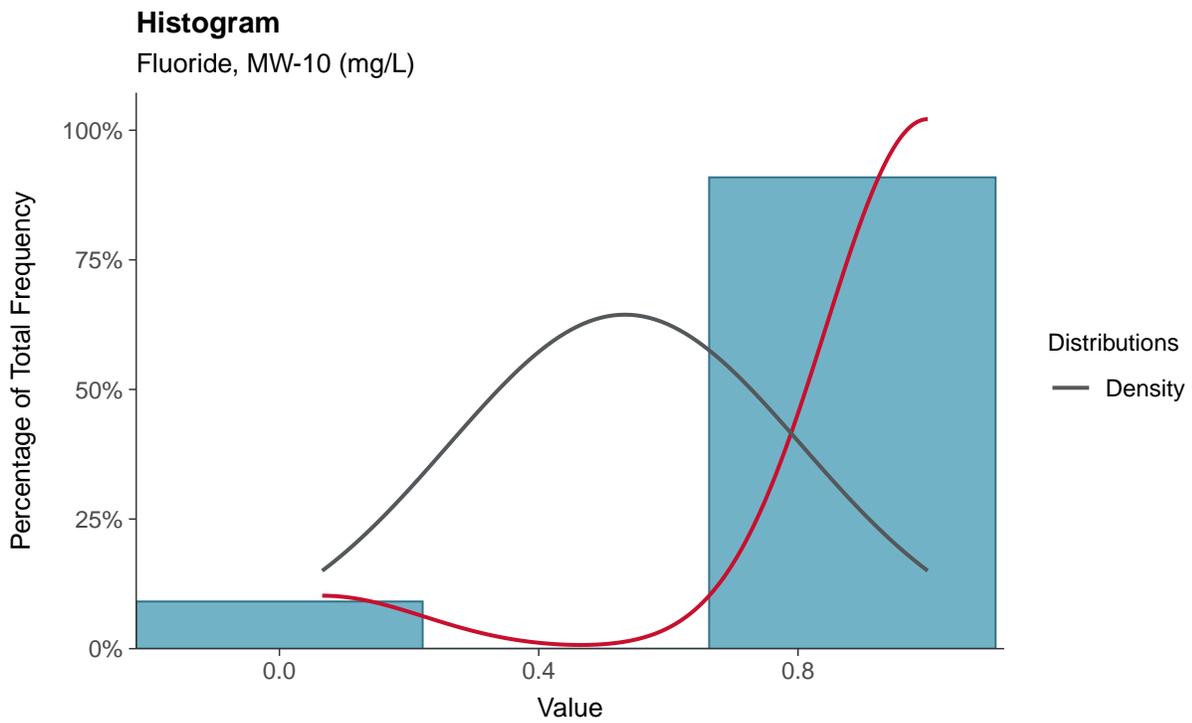
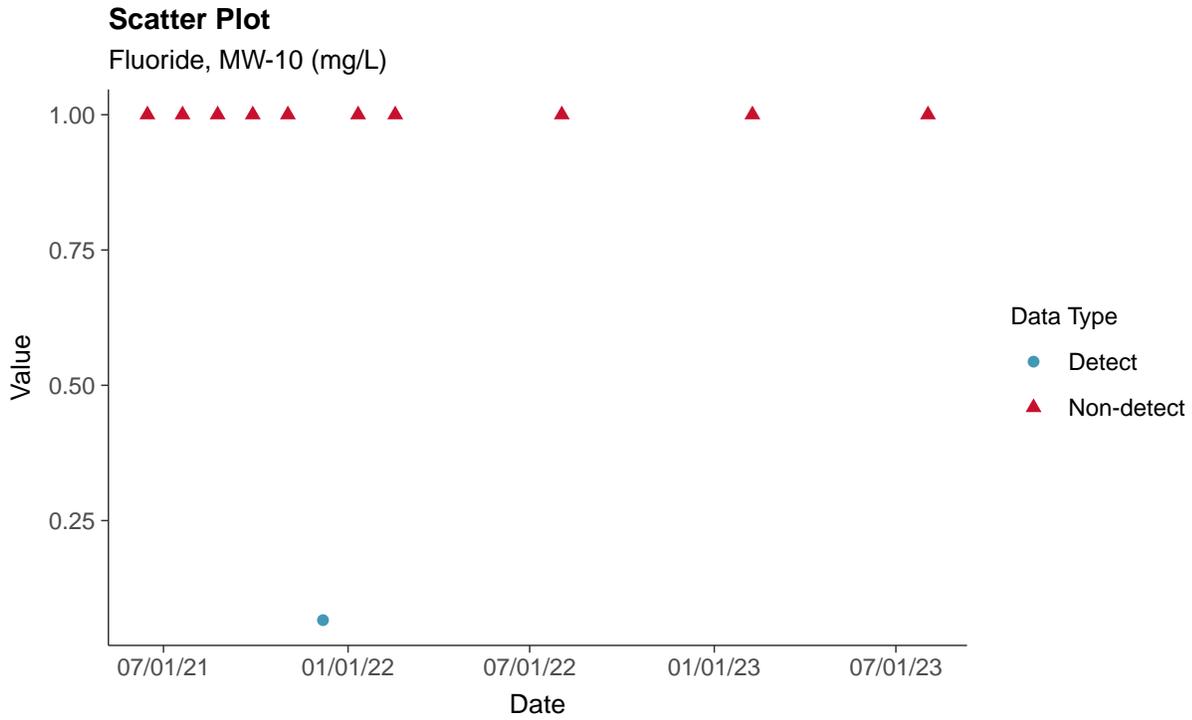
Thallium, MW-9 (mg/L)





Appendix IV: Fluoride, MW-10

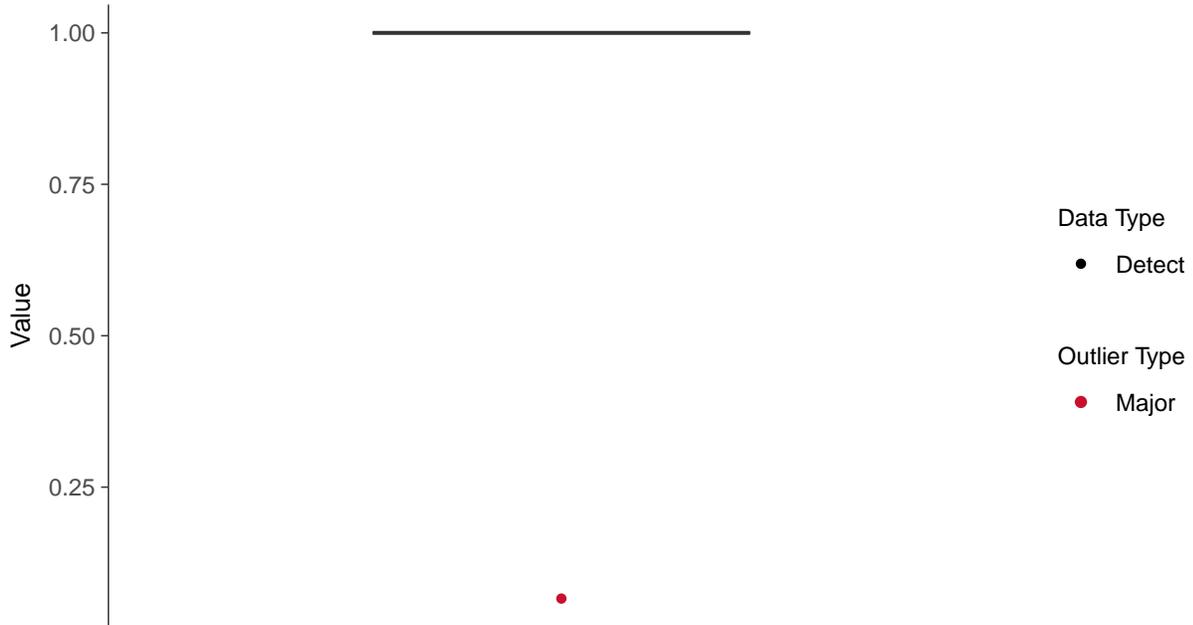
ID: 10_2_04





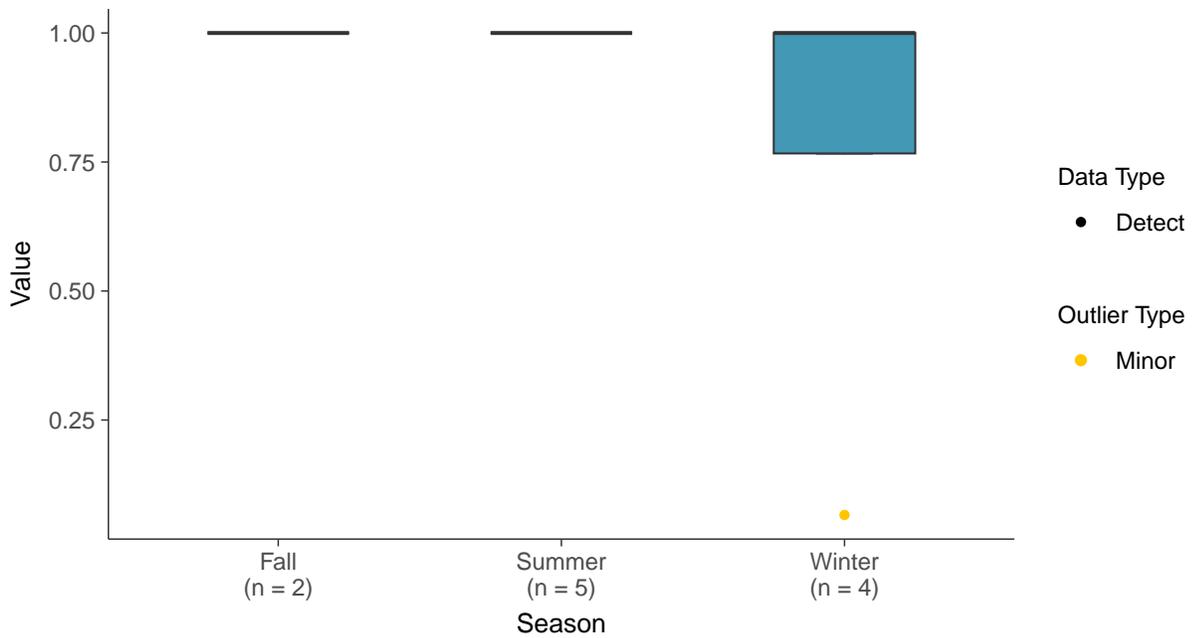
Boxplot

Fluoride, MW-10 (mg/L)



Boxplot by Season

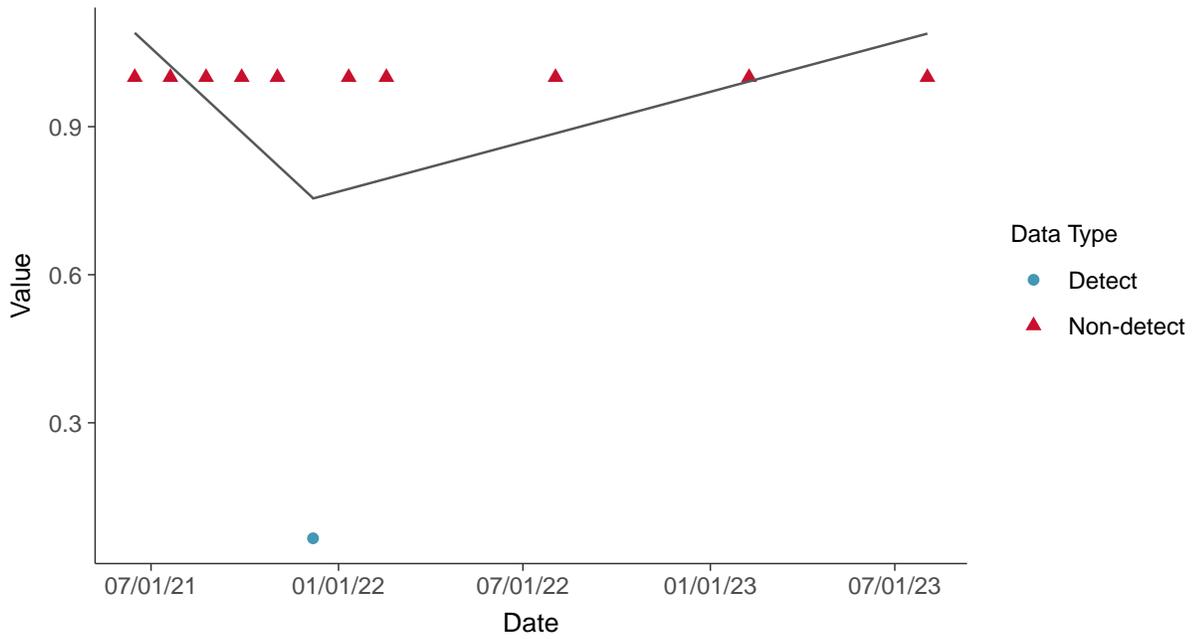
Fluoride, MW-10 (mg/L)





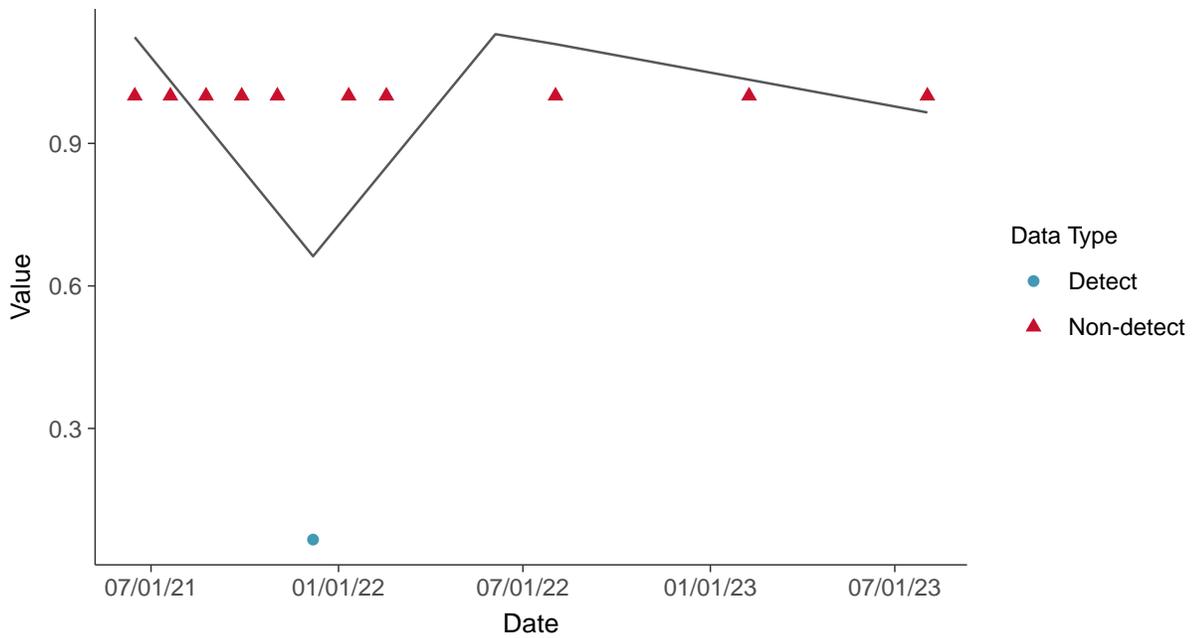
Trend Regression: Piecewise Linear-Linear

Fluoride, MW-10 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Fluoride, MW-10 (mg/L)



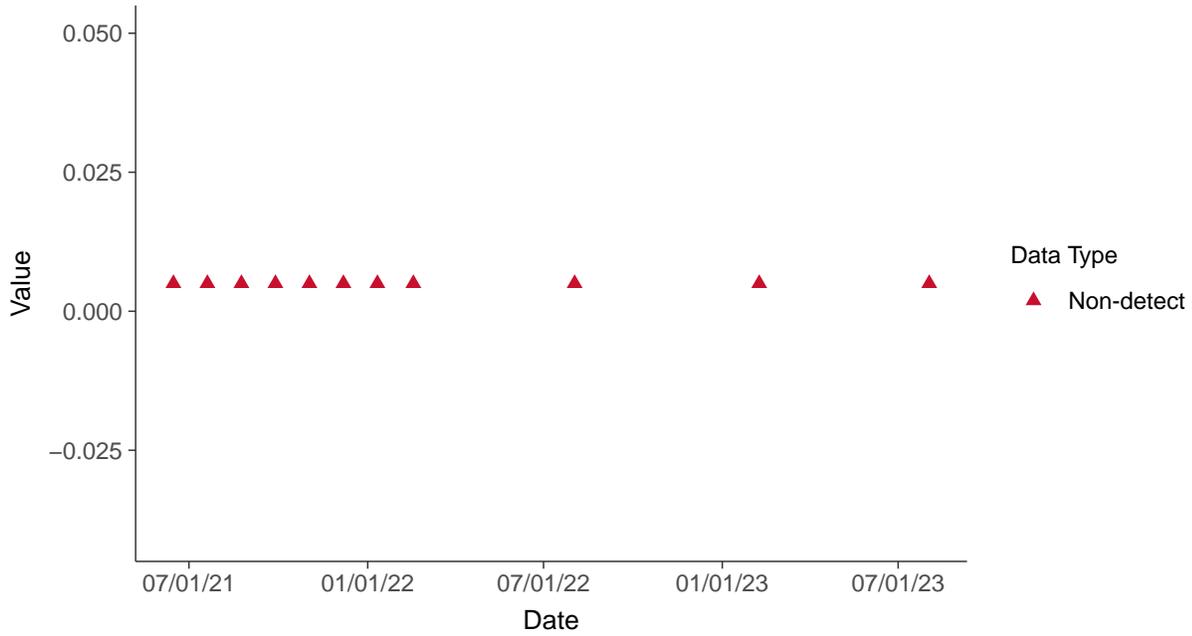


Appendix IV: Antimony, MW-10

ID: 10_2_08

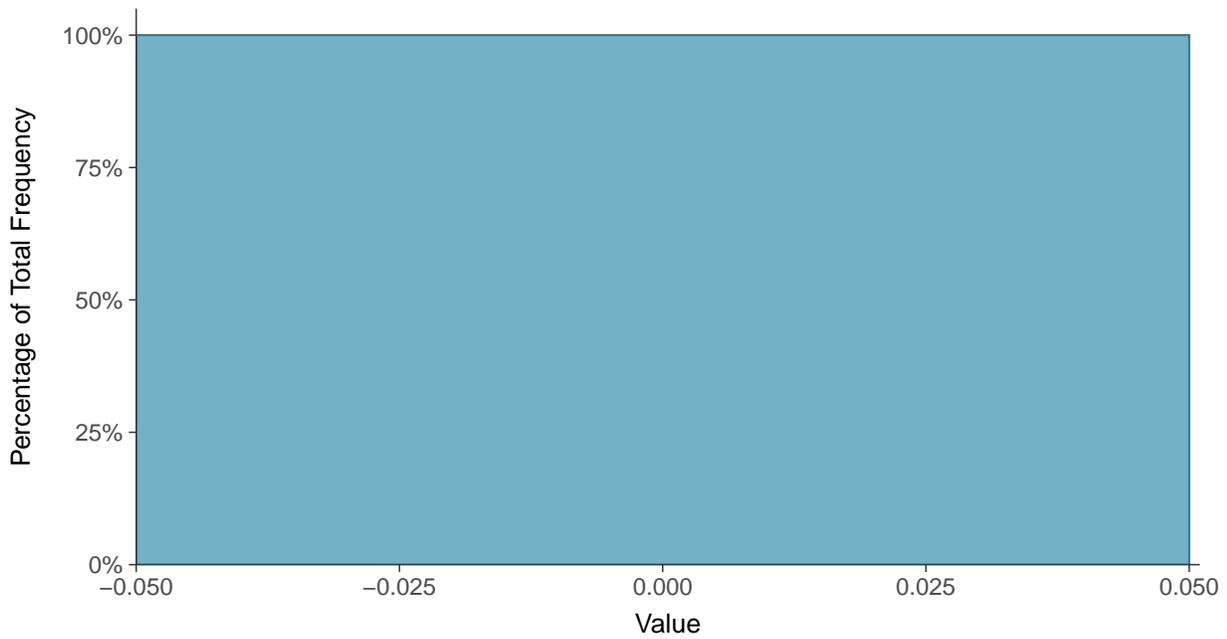
Scatter Plot

Antimony, MW-10 (mg/L)



Histogram

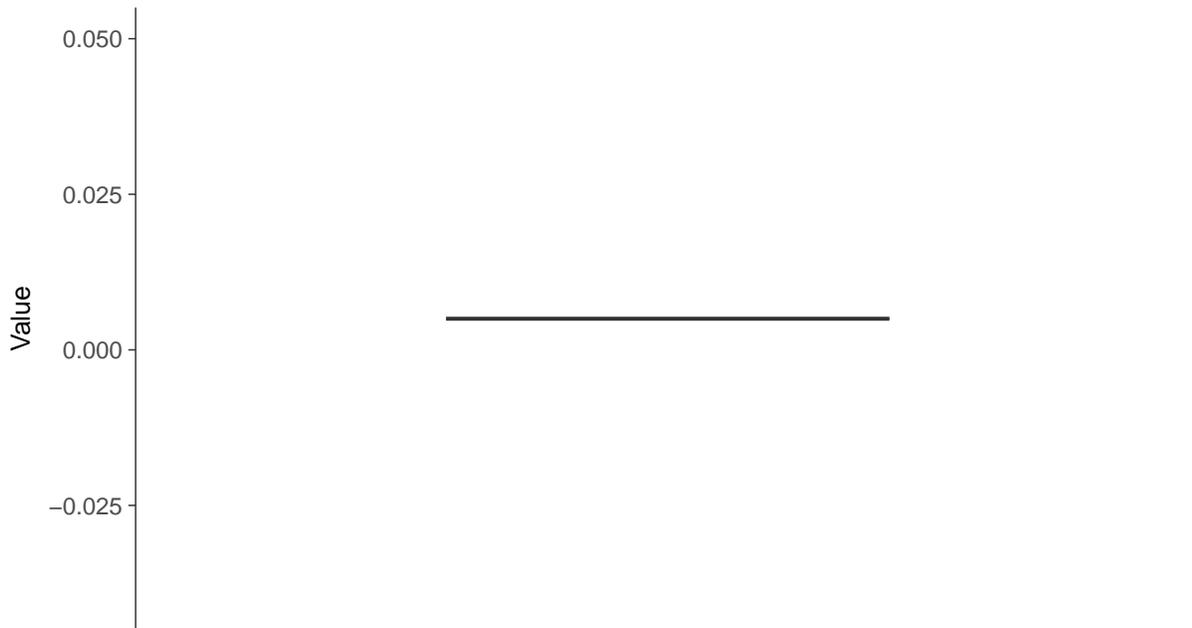
Antimony, MW-10 (mg/L)





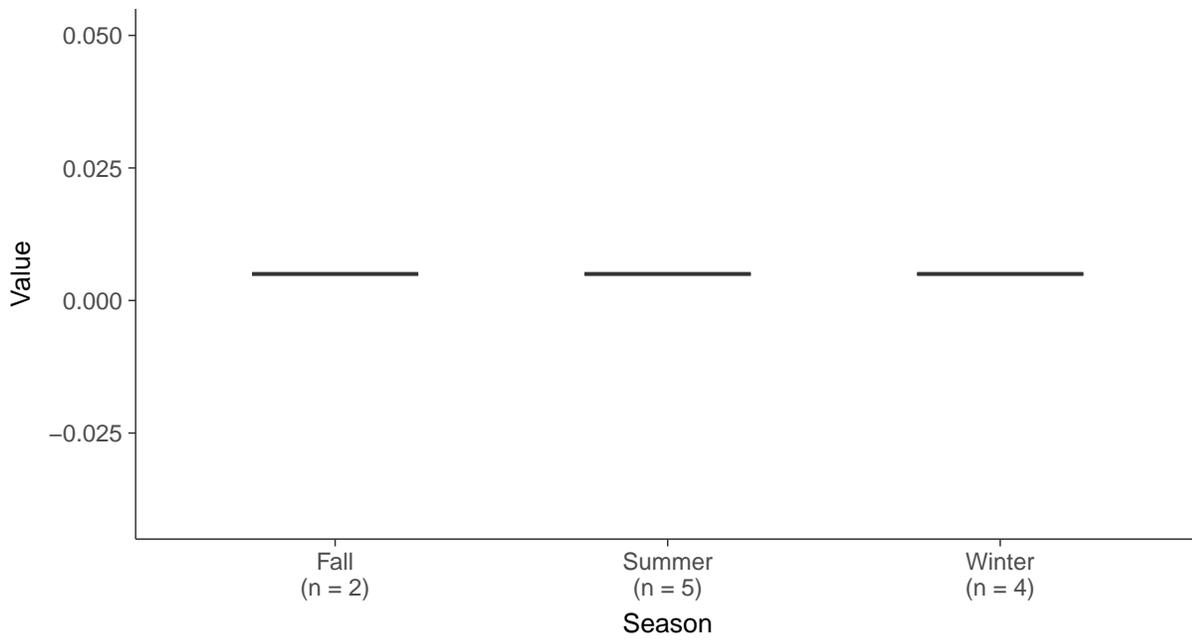
Boxplot

Antimony, MW-10 (mg/L)



Boxplot by Season

Antimony, MW-10 (mg/L)



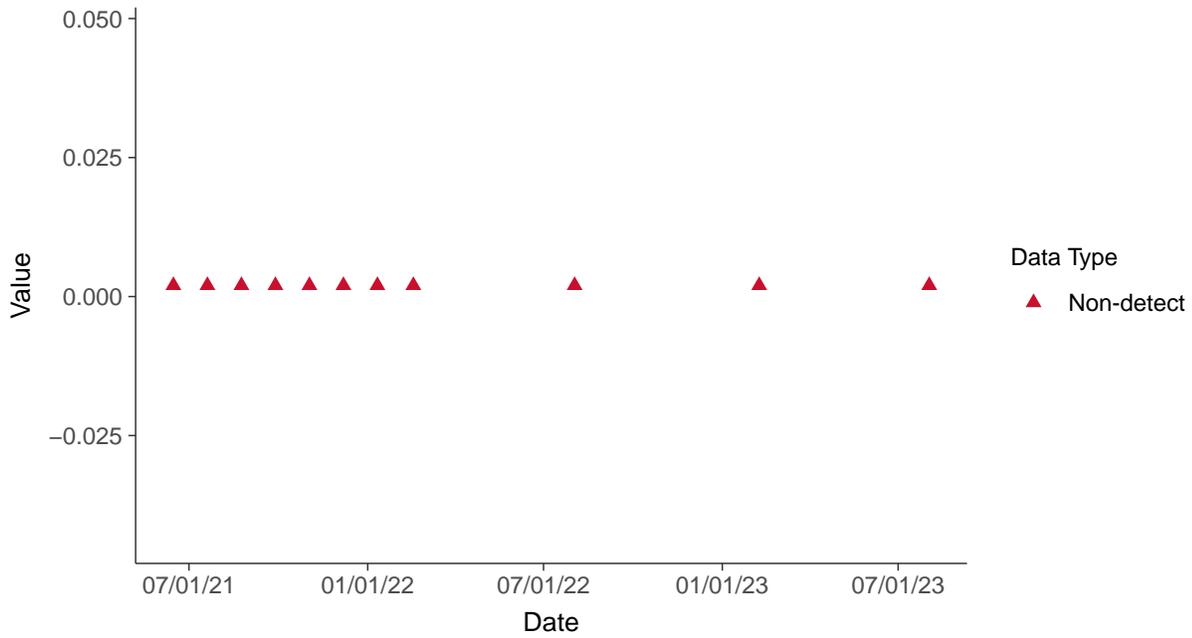


Appendix IV: Arsenic, MW-10

ID: 10_2_09

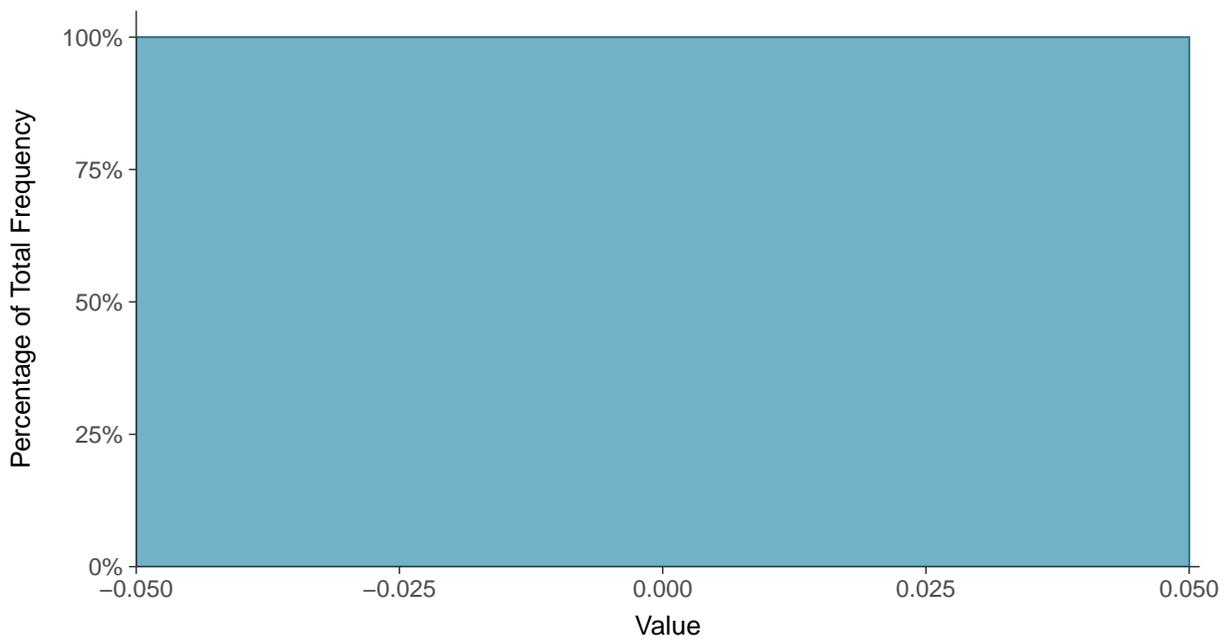
Scatter Plot

Arsenic, MW-10 (mg/L)



Histogram

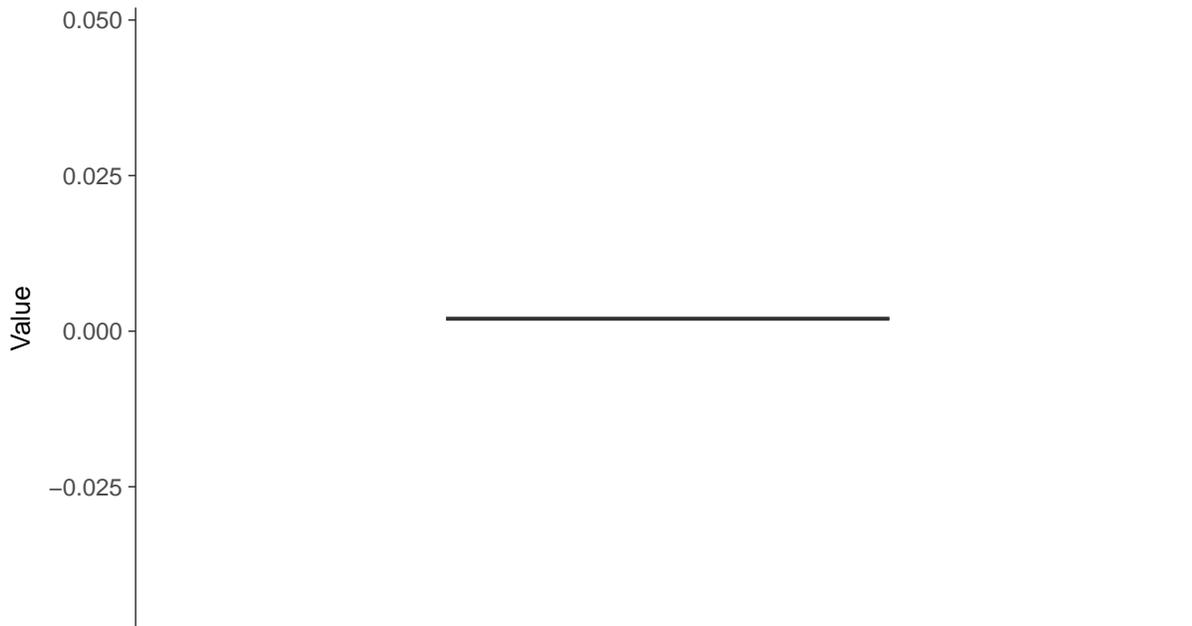
Arsenic, MW-10 (mg/L)





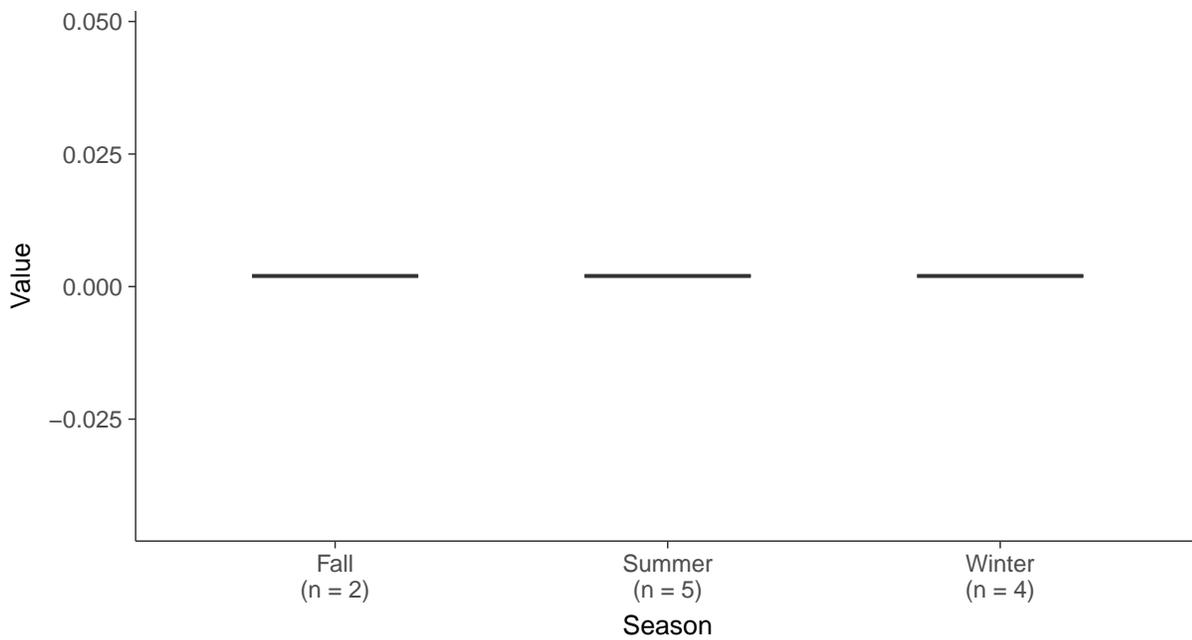
Boxplot

Arsenic, MW-10 (mg/L)



Boxplot by Season

Arsenic, MW-10 (mg/L)



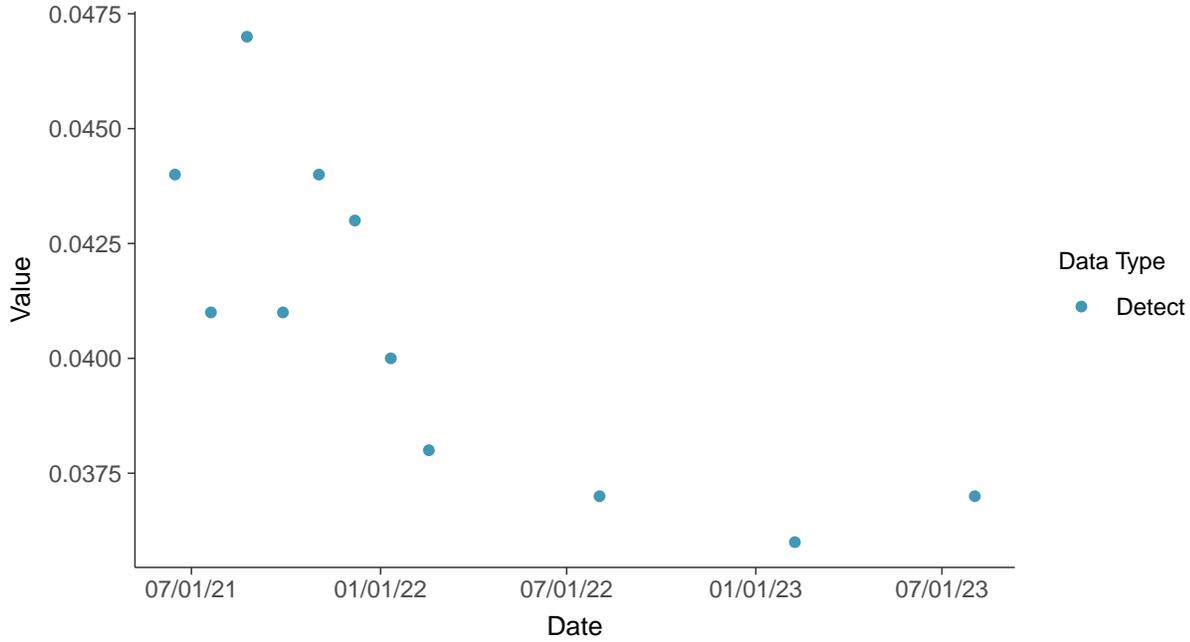


Appendix IV: Barium, MW-10

ID: 10_2_10

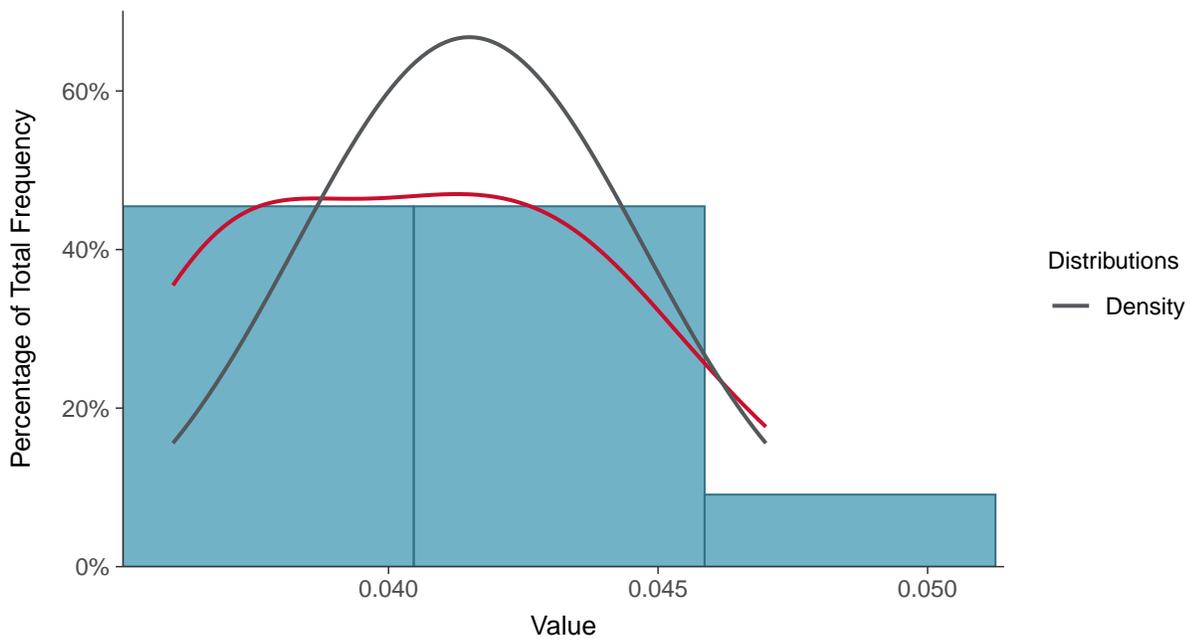
Scatter Plot

Barium, MW-10 (mg/L)



Histogram

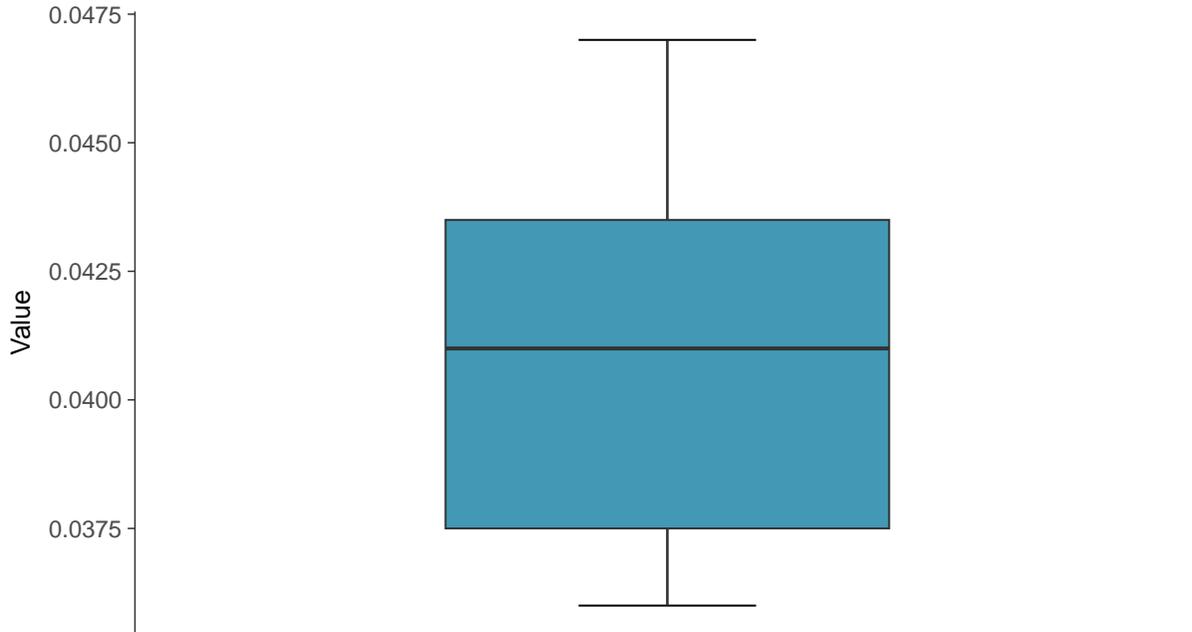
Barium, MW-10 (mg/L)





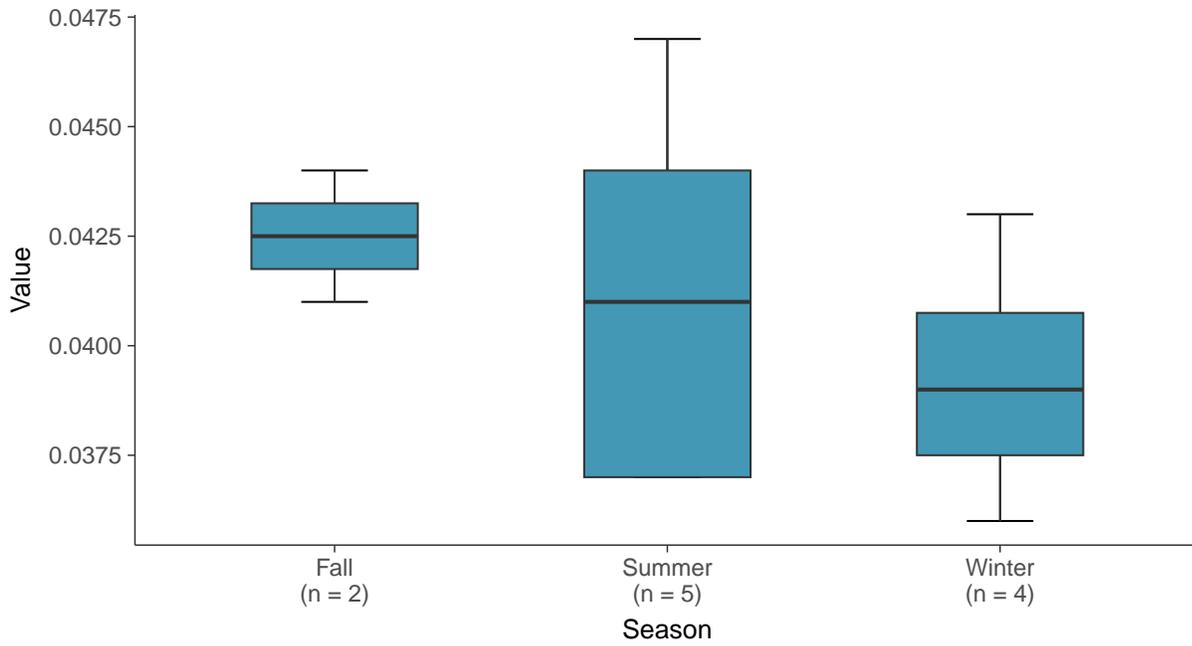
Boxplot

Barium, MW-10 (mg/L)



Boxplot by Season

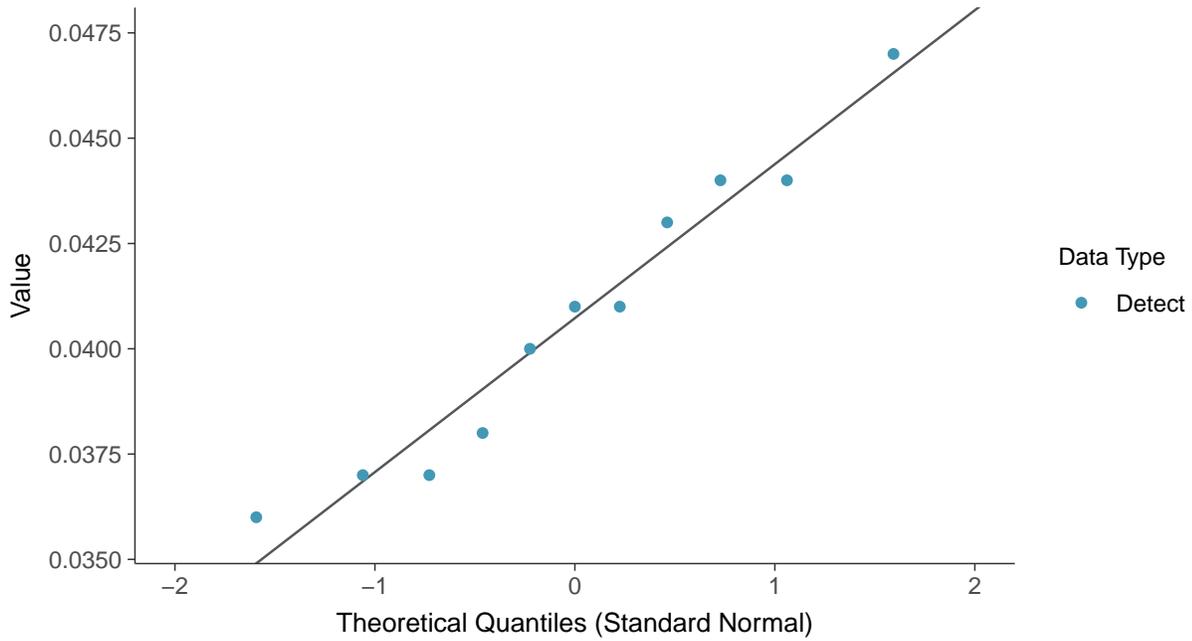
Barium, MW-10 (mg/L)





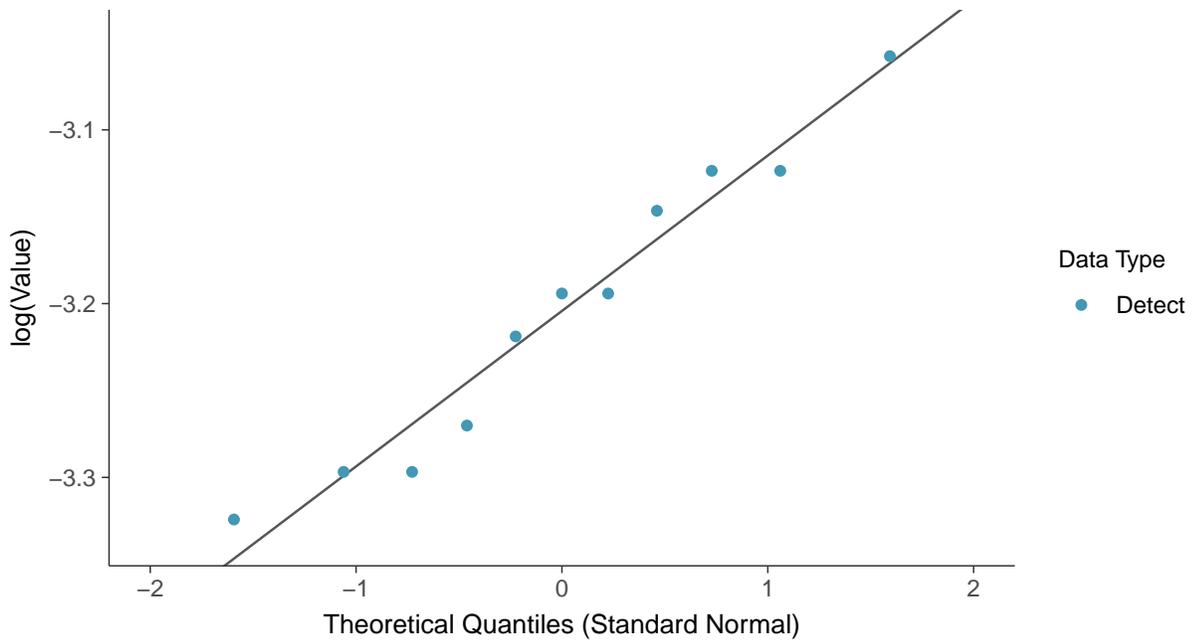
Normal Q-Q plot

Barium, MW-10 (mg/L)



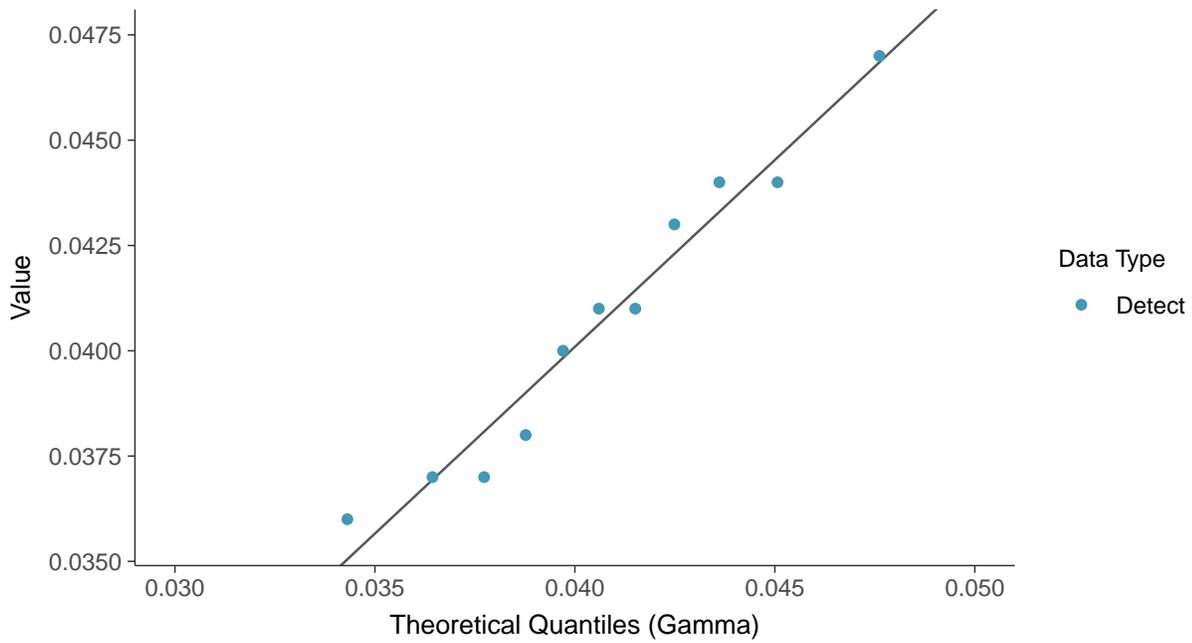
Lognormal Q-Q plot

Barium, MW-10 (mg/L)

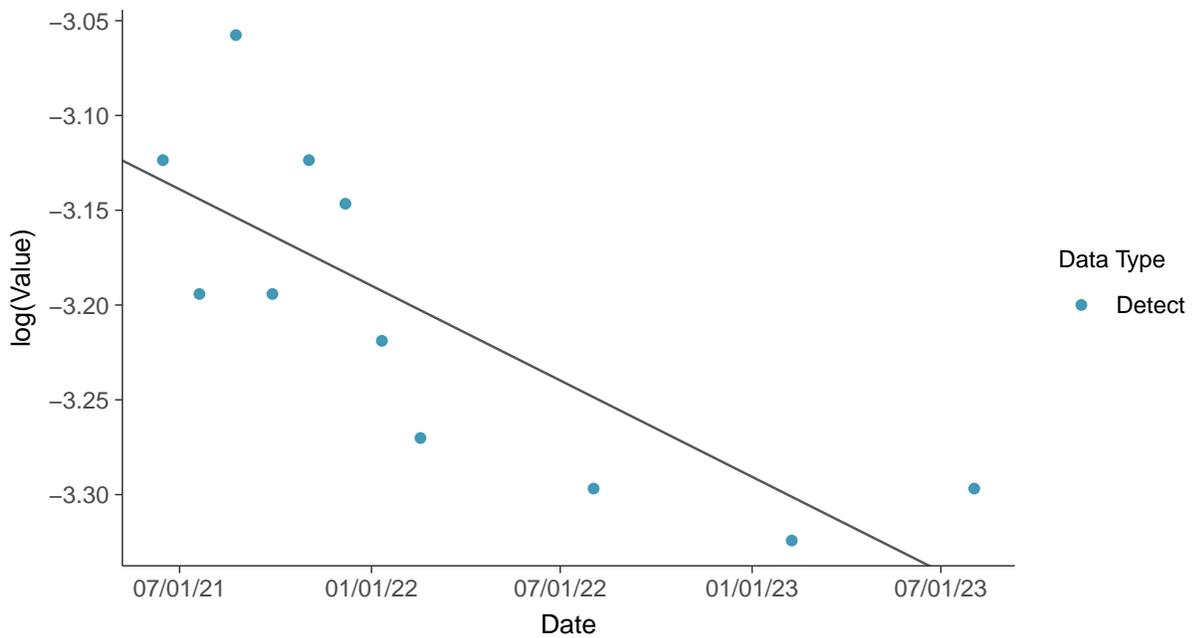




Gamma Q-Q plot
Barium, MW-10 (mg/L)



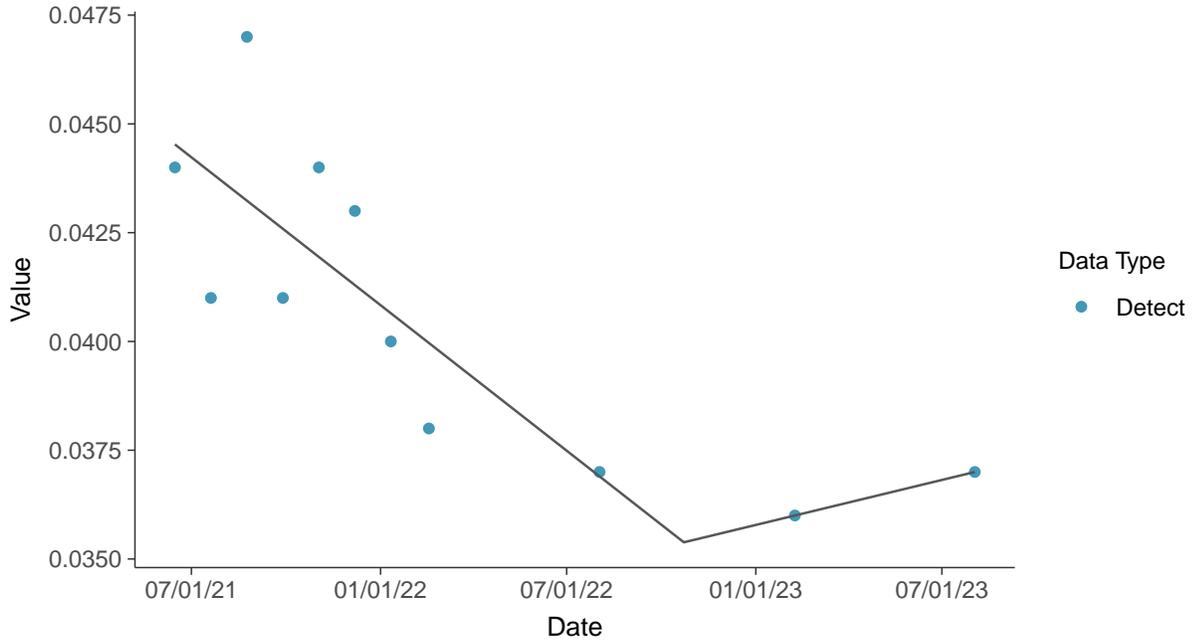
Trend Regression: Lognormal MLE
Barium, MW-10 (mg/L)





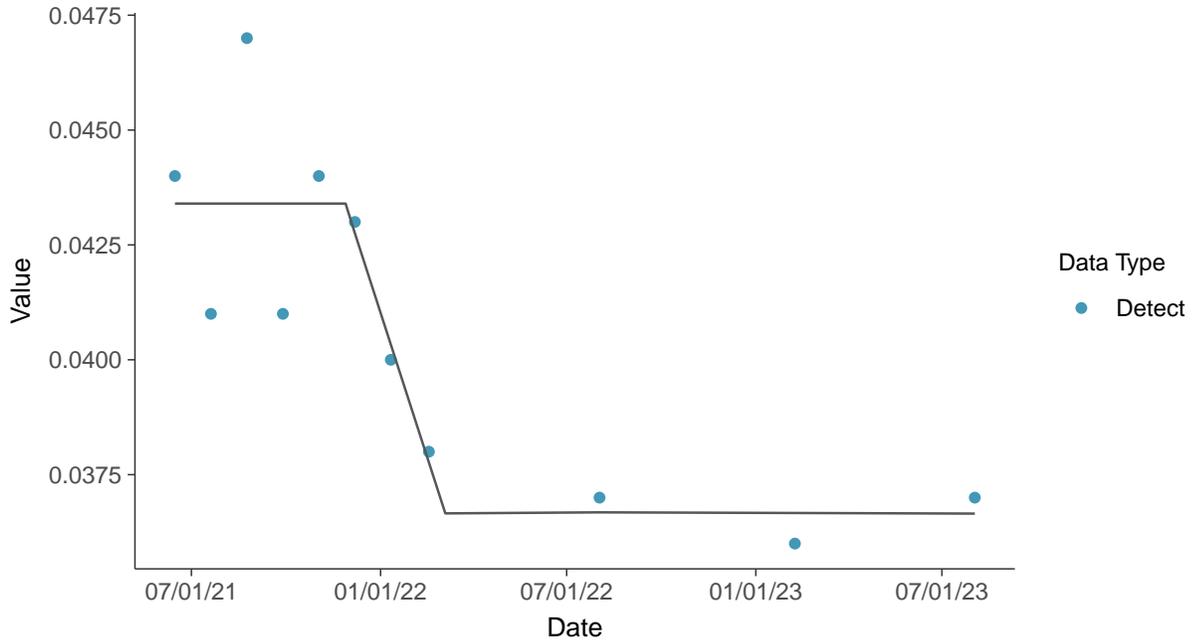
Trend Regression: Piecewise Linear-Linear

Barium, MW-10 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

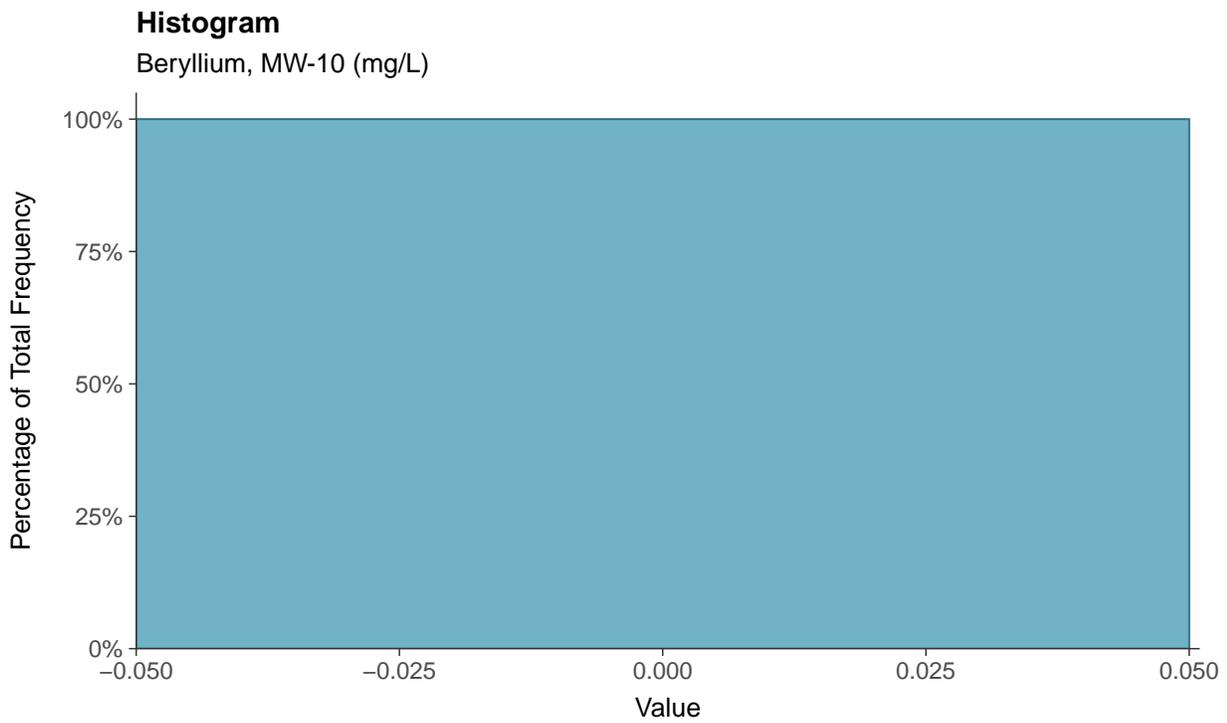
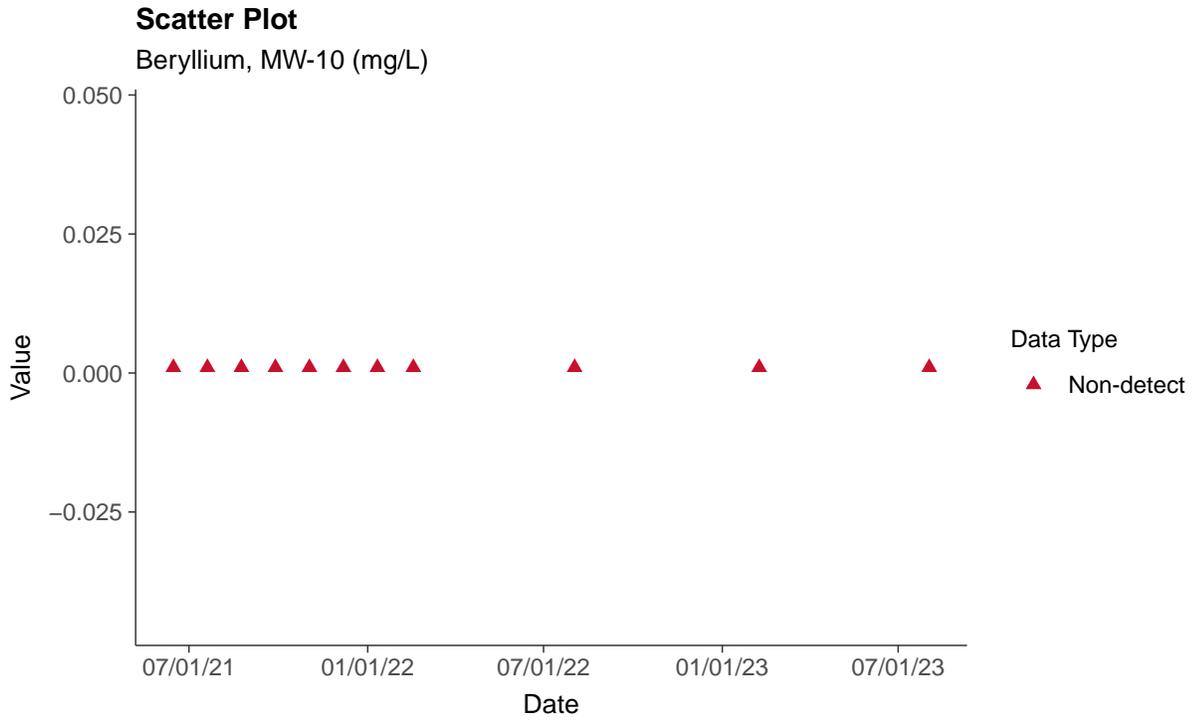
Barium, MW-10 (mg/L)





Appendix IV: Beryllium, MW-10

ID: 10_2_11





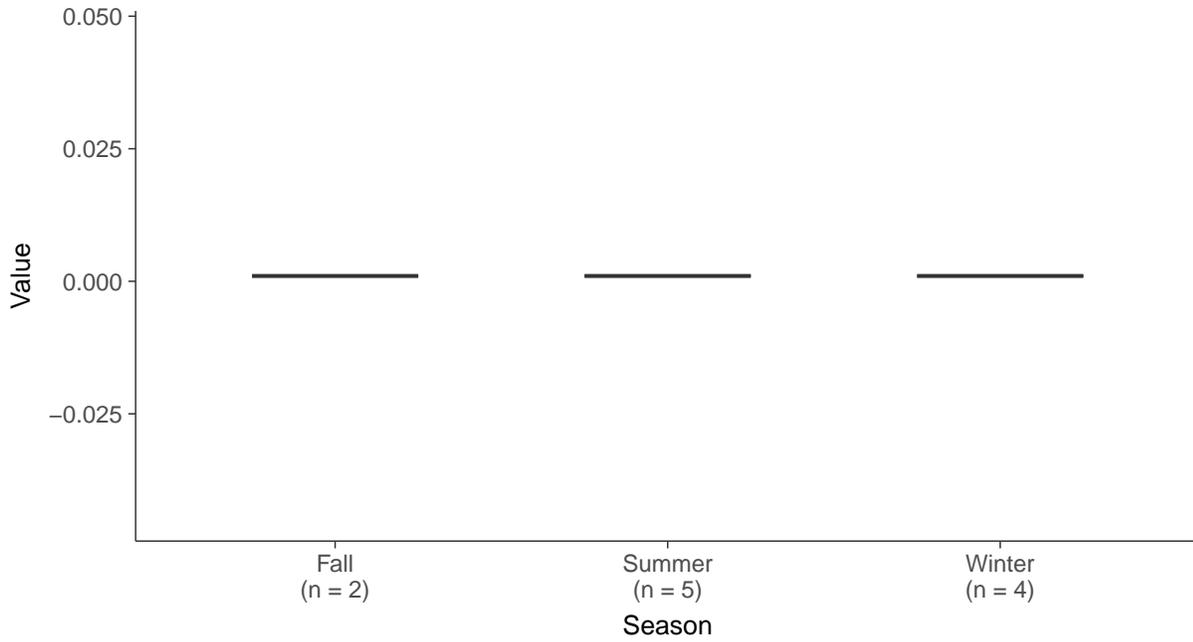
Boxplot

Beryllium, MW-10 (mg/L)



Boxplot by Season

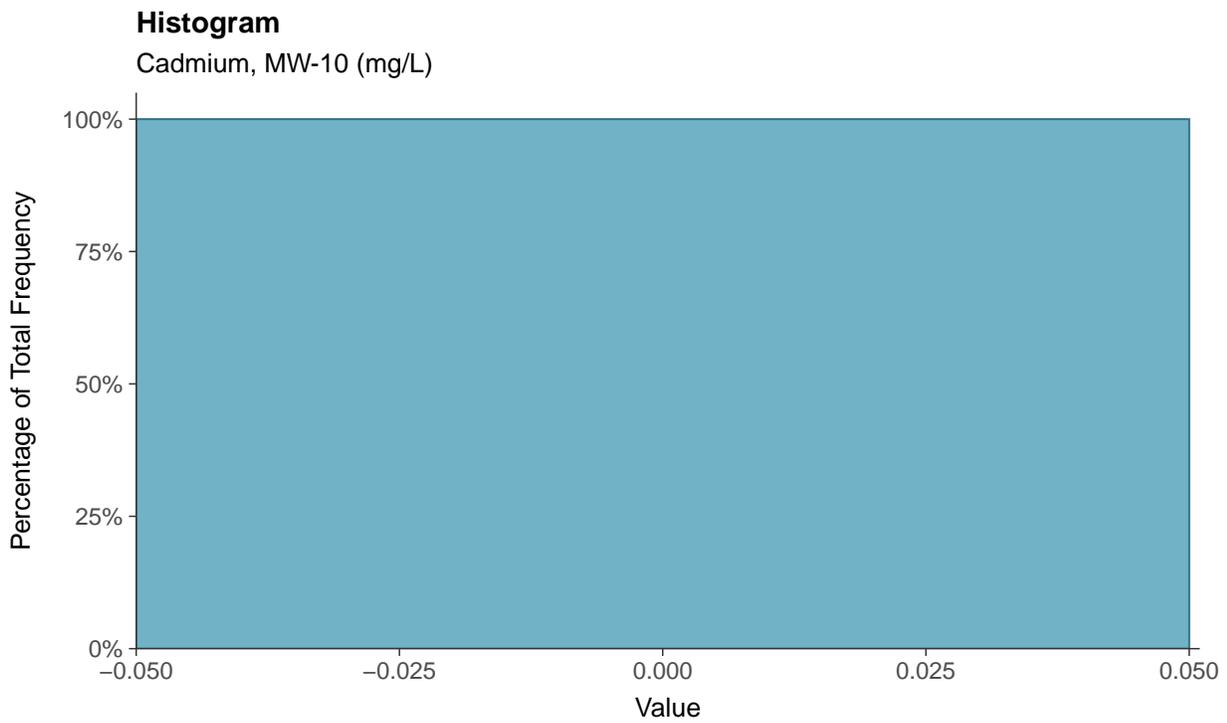
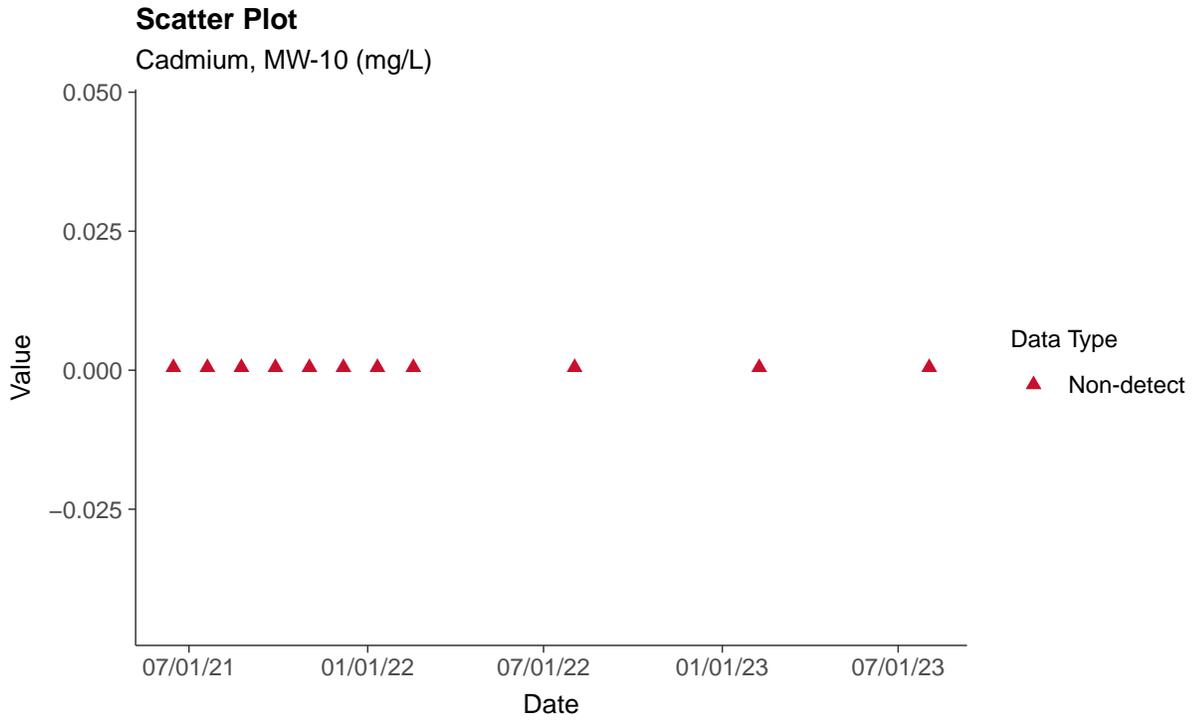
Beryllium, MW-10 (mg/L)





Appendix IV: Cadmium, MW-10

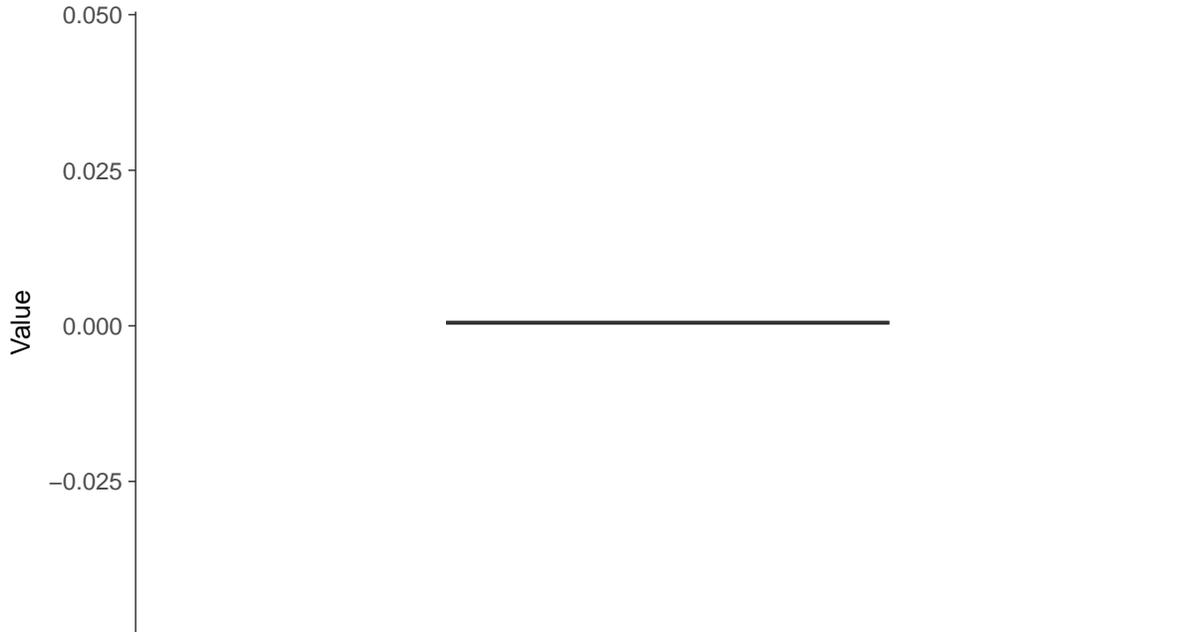
ID: 10_2_12





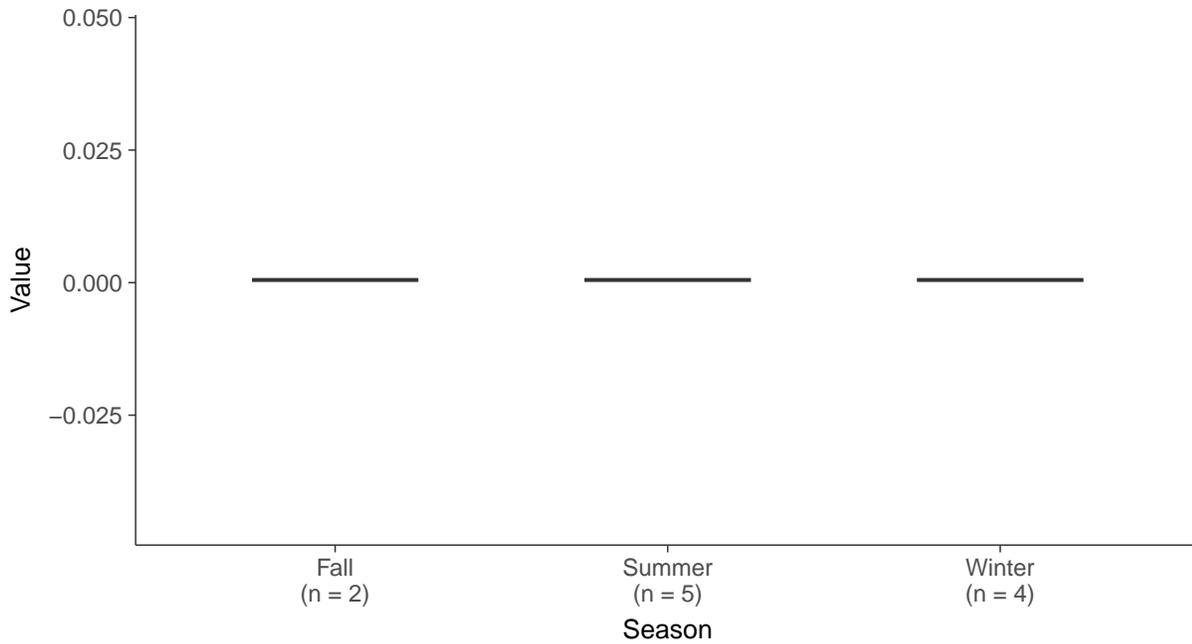
Boxplot

Cadmium, MW-10 (mg/L)



Boxplot by Season

Cadmium, MW-10 (mg/L)



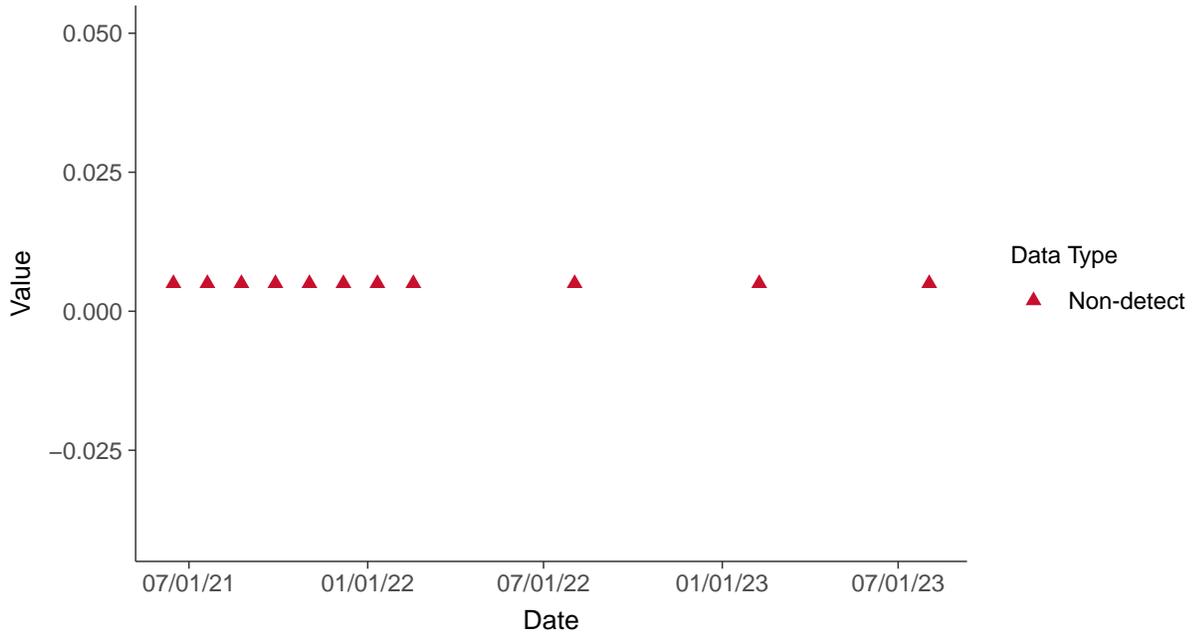


Appendix IV: Chromium, MW-10

ID: 10_2_13

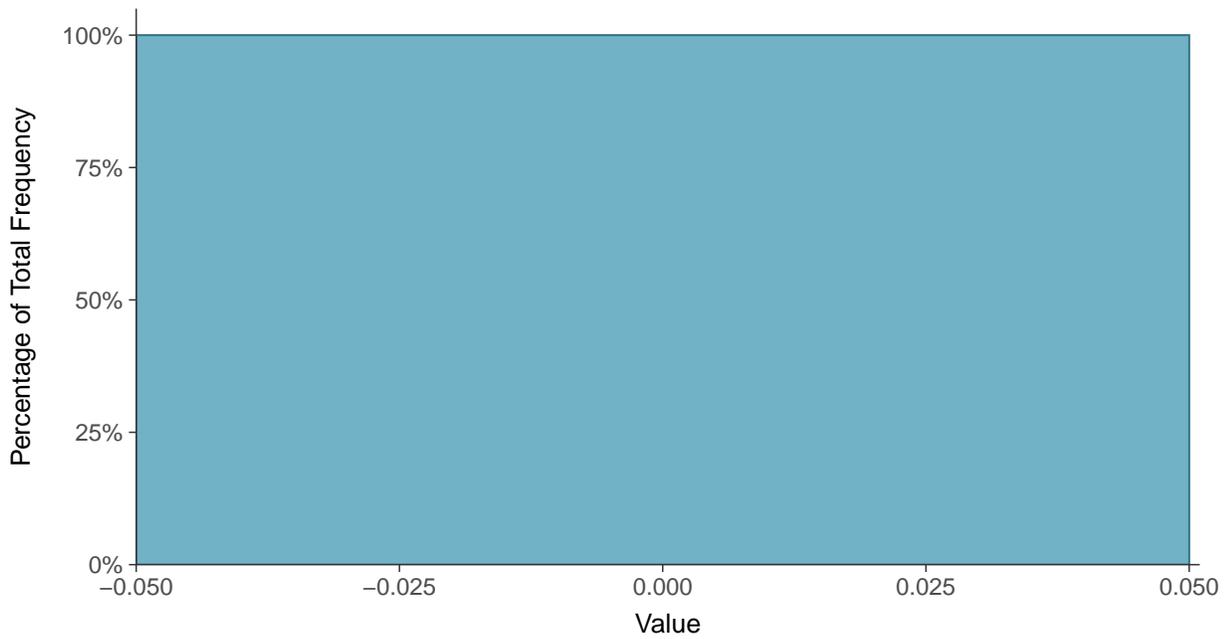
Scatter Plot

Chromium, MW-10 (mg/L)



Histogram

Chromium, MW-10 (mg/L)





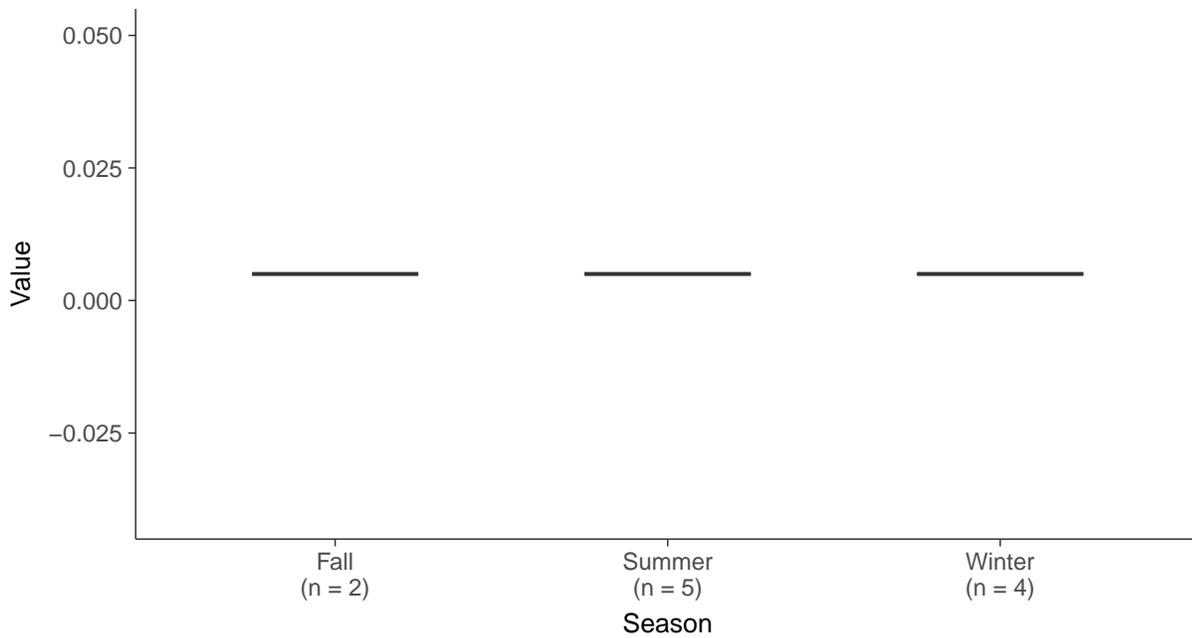
Boxplot

Chromium, MW-10 (mg/L)



Boxplot by Season

Chromium, MW-10 (mg/L)



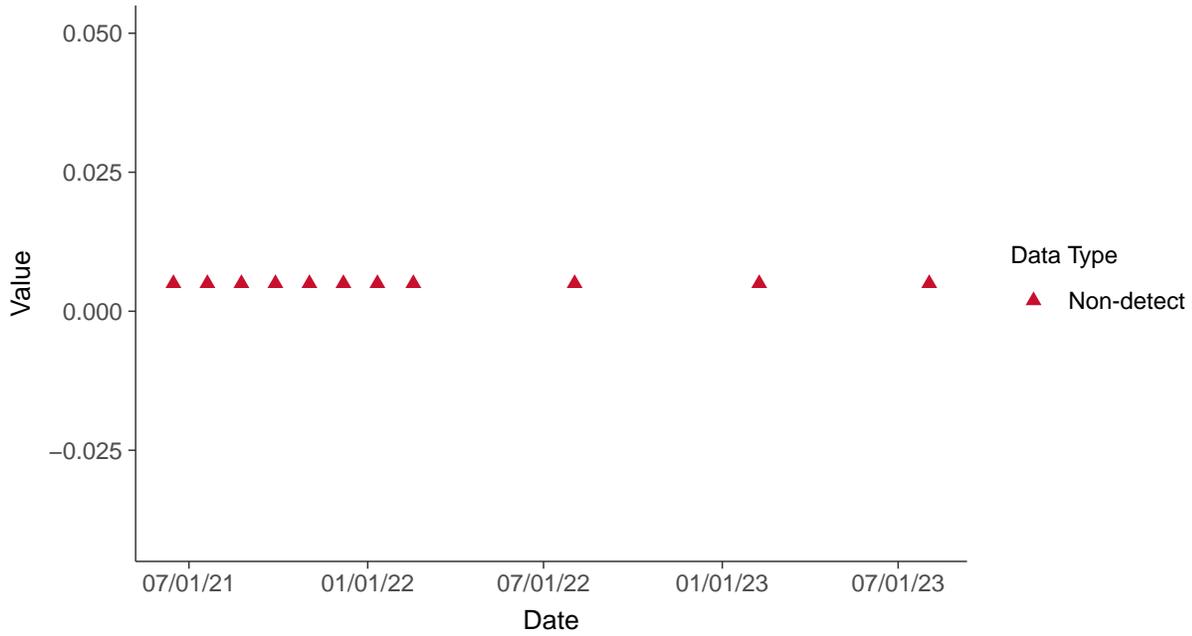


Appendix IV: Cobalt, MW-10

ID: 10_2_14

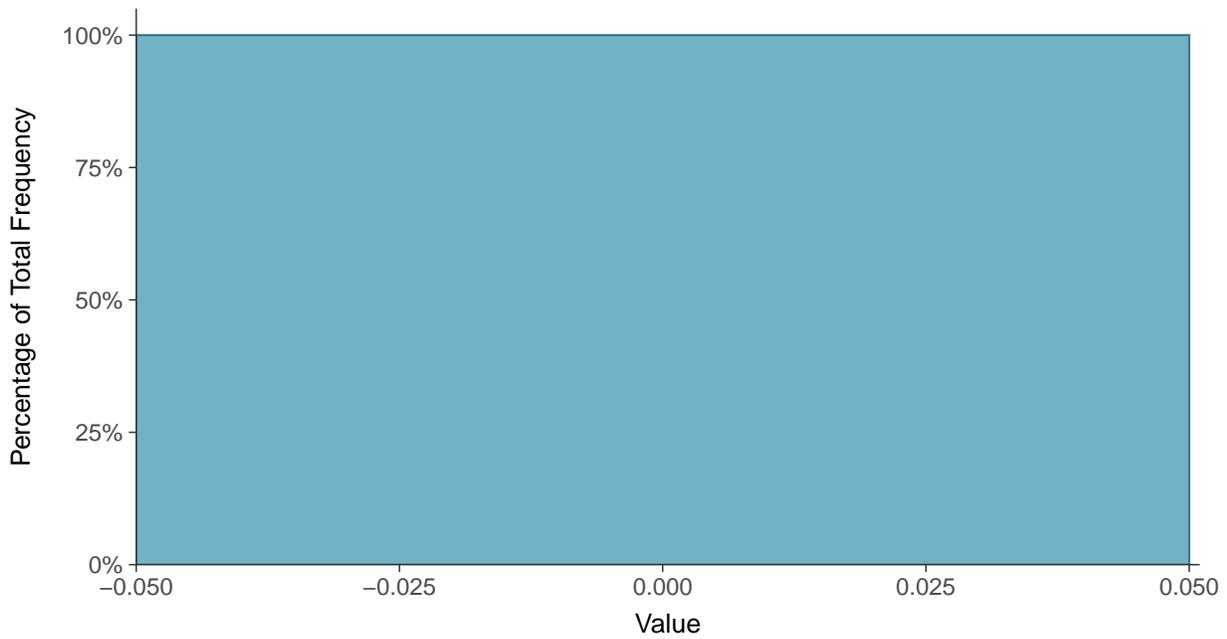
Scatter Plot

Cobalt, MW-10 (mg/L)



Histogram

Cobalt, MW-10 (mg/L)





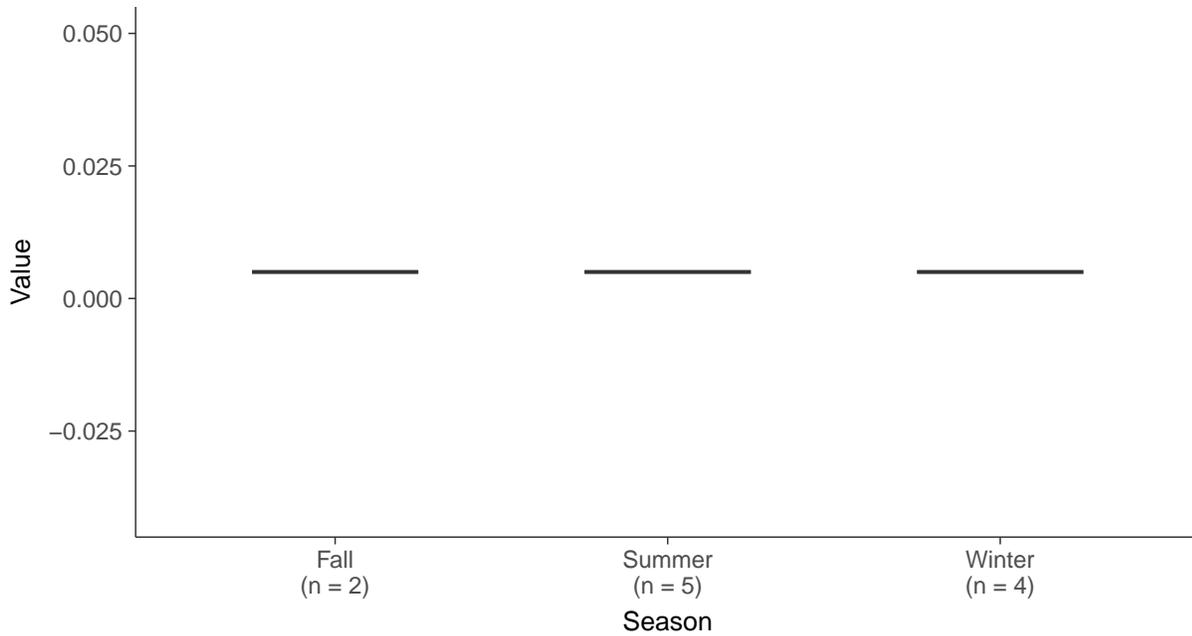
Boxplot

Cobalt, MW-10 (mg/L)



Boxplot by Season

Cobalt, MW-10 (mg/L)



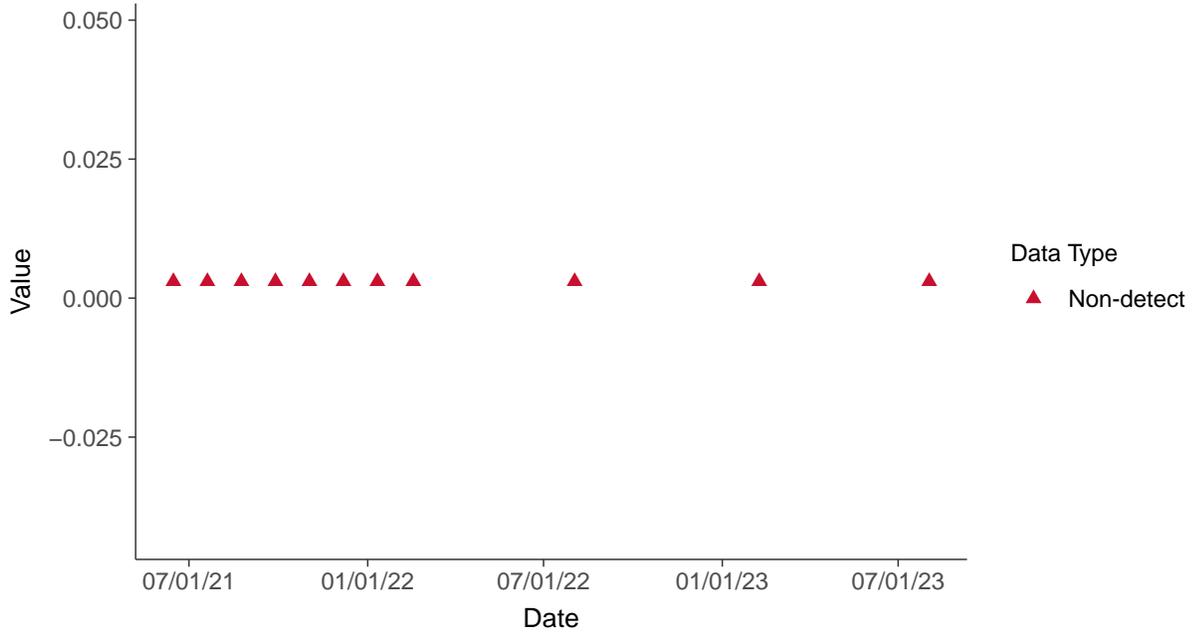


Appendix IV: Lead, MW-10

ID: 10_2_15

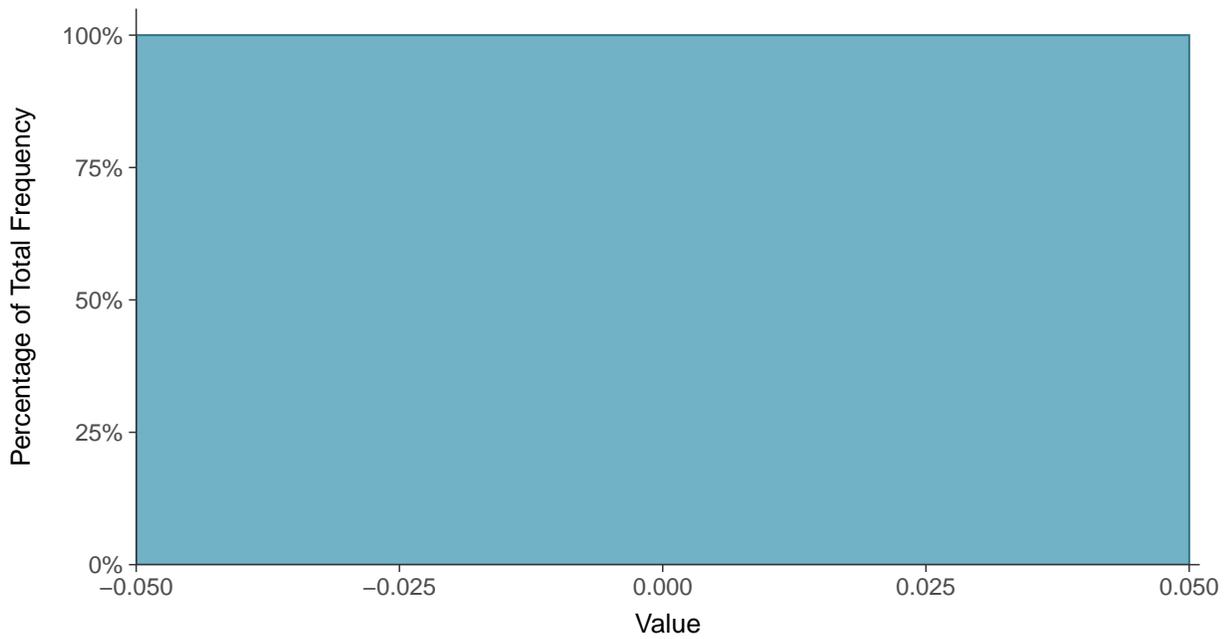
Scatter Plot

Lead, MW-10 (mg/L)



Histogram

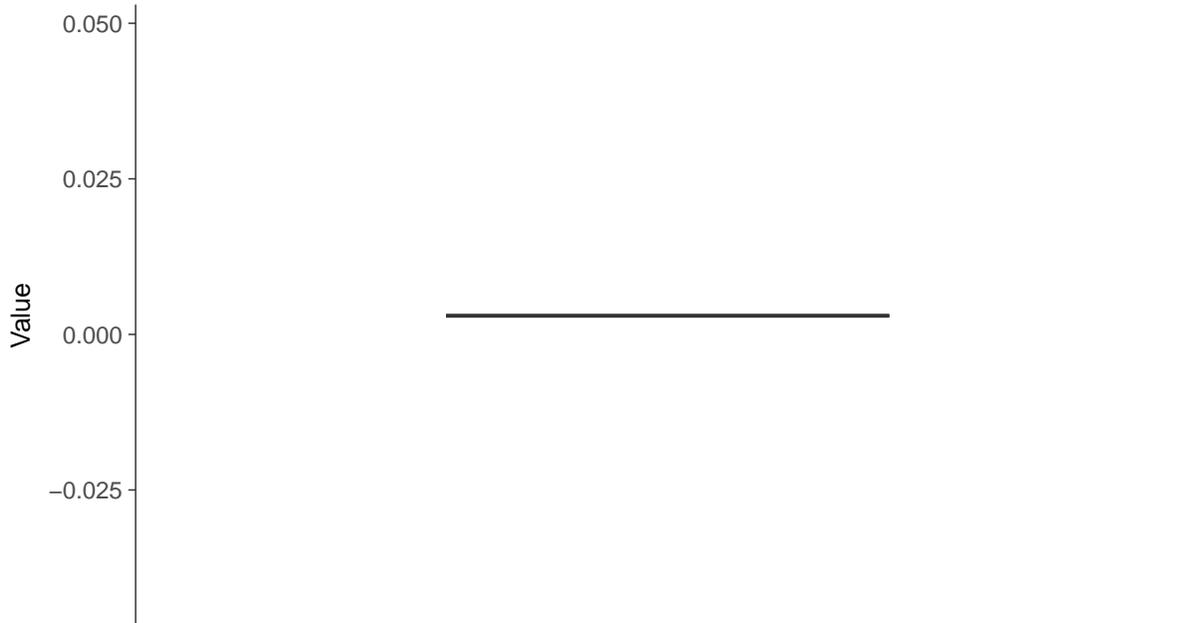
Lead, MW-10 (mg/L)





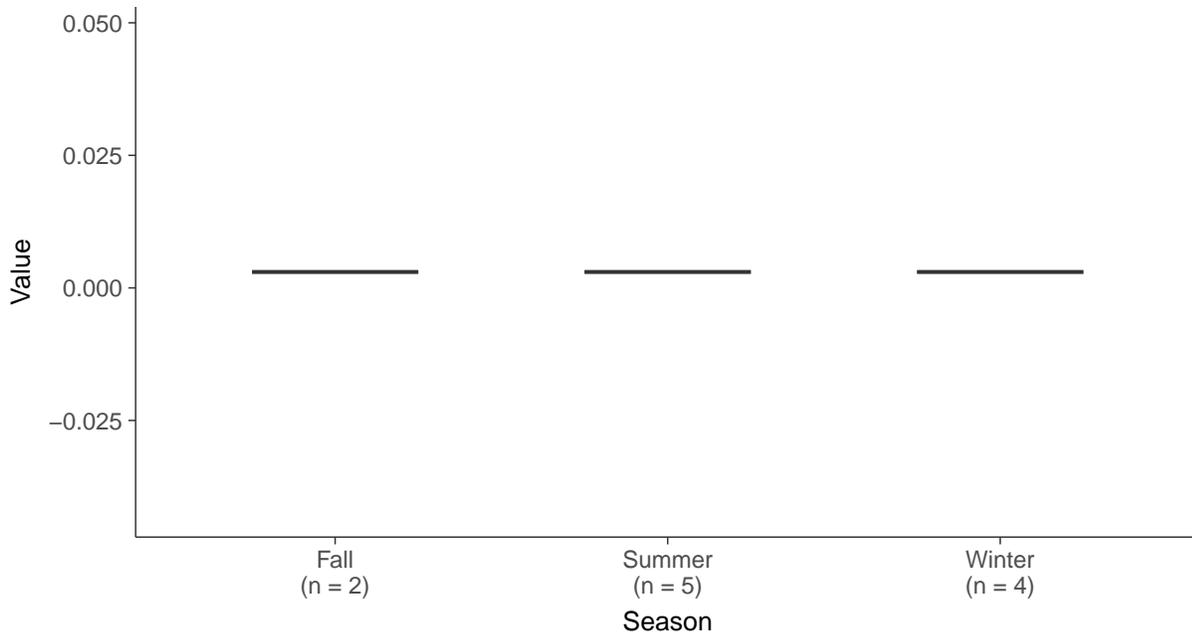
Boxplot

Lead, MW-10 (mg/L)



Boxplot by Season

Lead, MW-10 (mg/L)



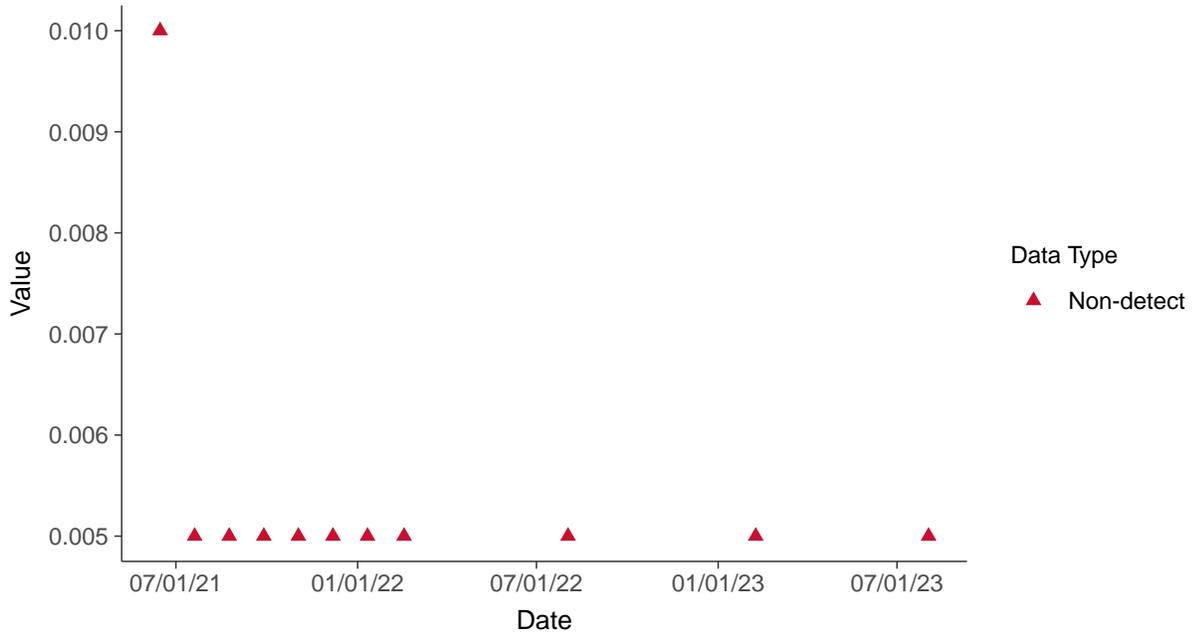


Appendix IV: Lithium, MW-10

ID: 10_2_16

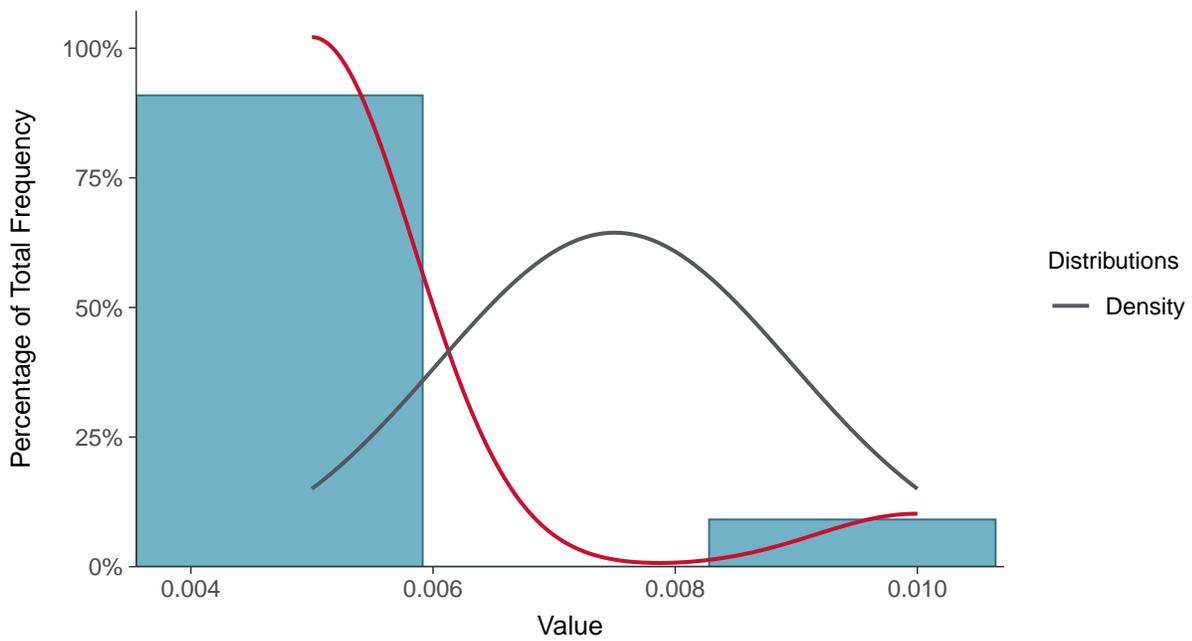
Scatter Plot

Lithium, MW-10 (mg/L)



Histogram

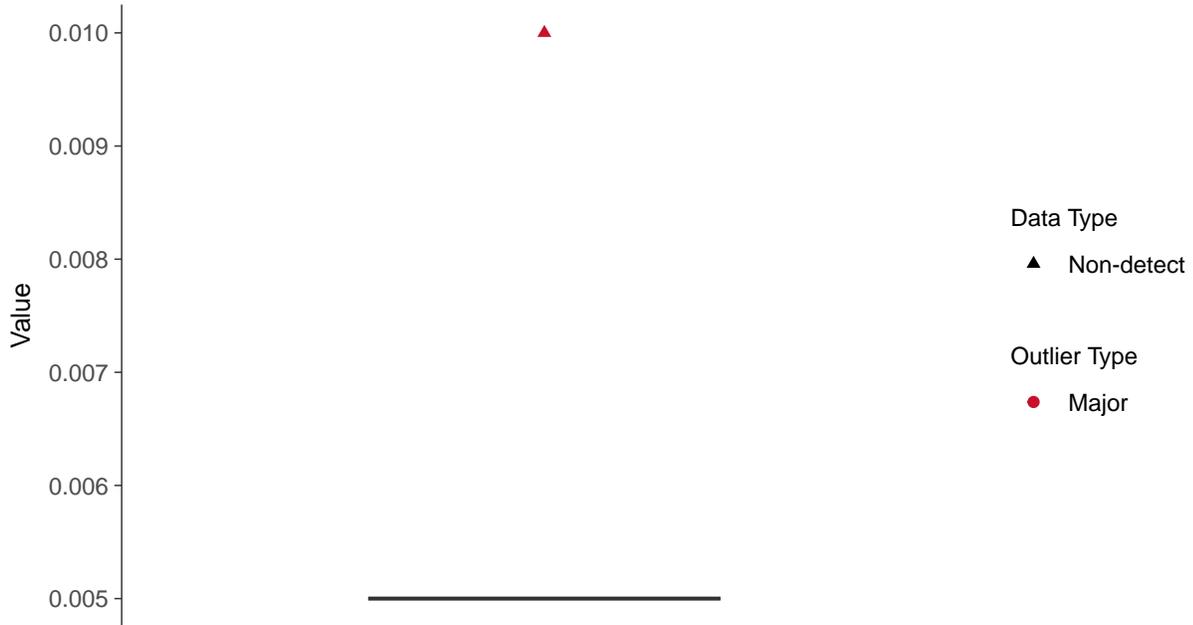
Lithium, MW-10 (mg/L)





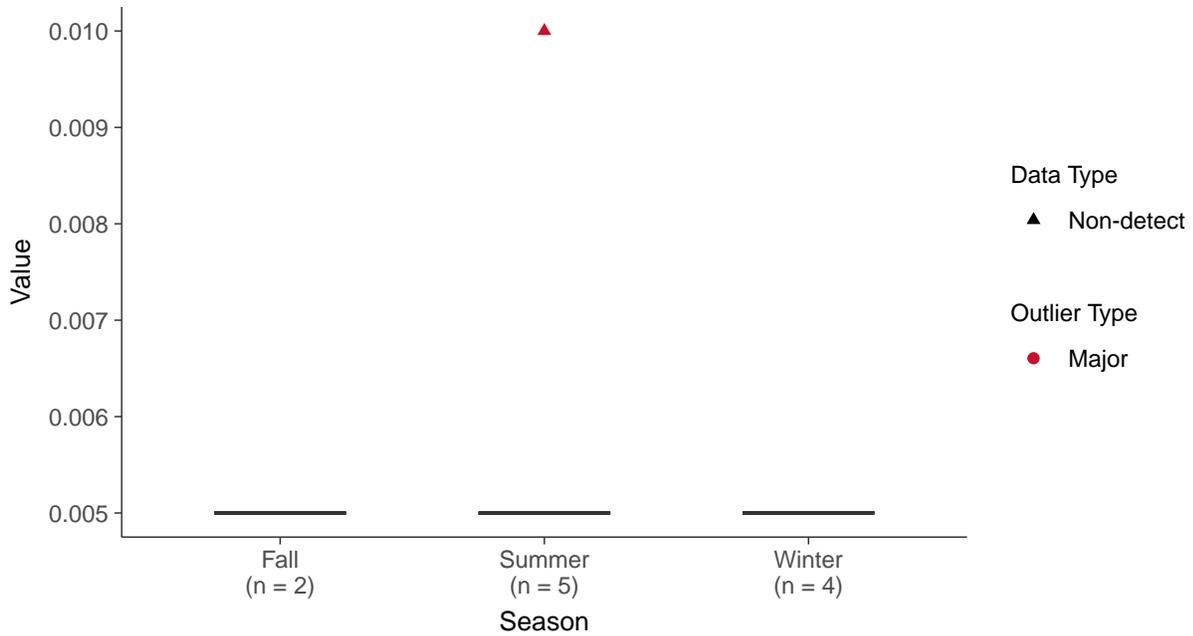
Boxplot

Lithium, MW-10 (mg/L)



Boxplot by Season

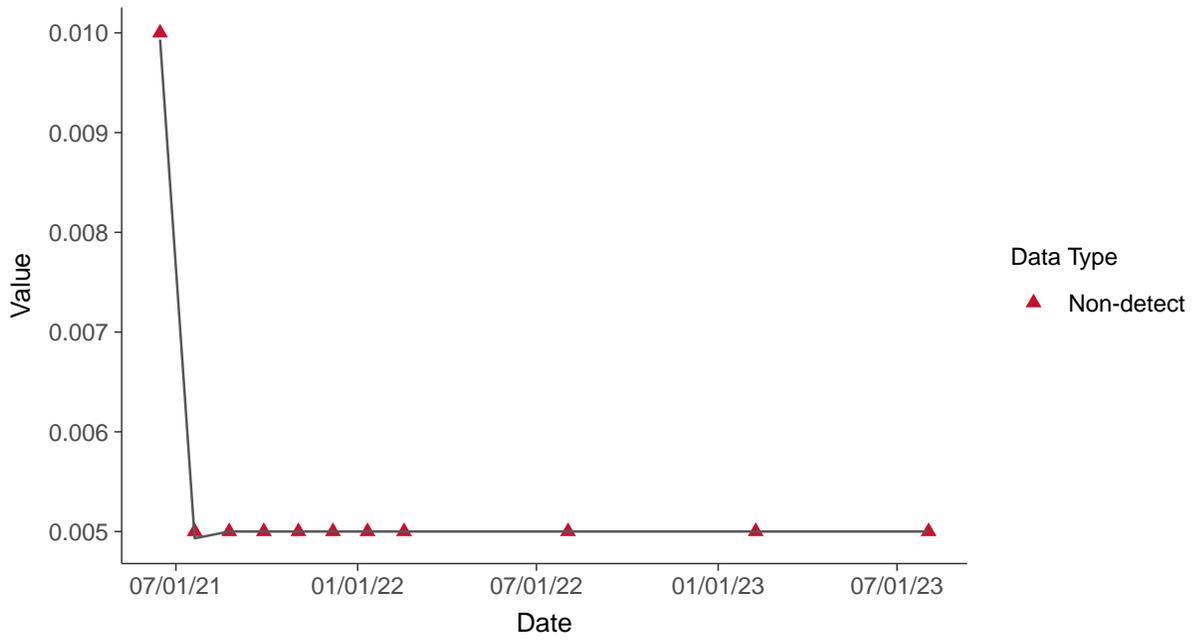
Lithium, MW-10 (mg/L)





Trend Regression: Piecewise Linear-Linear

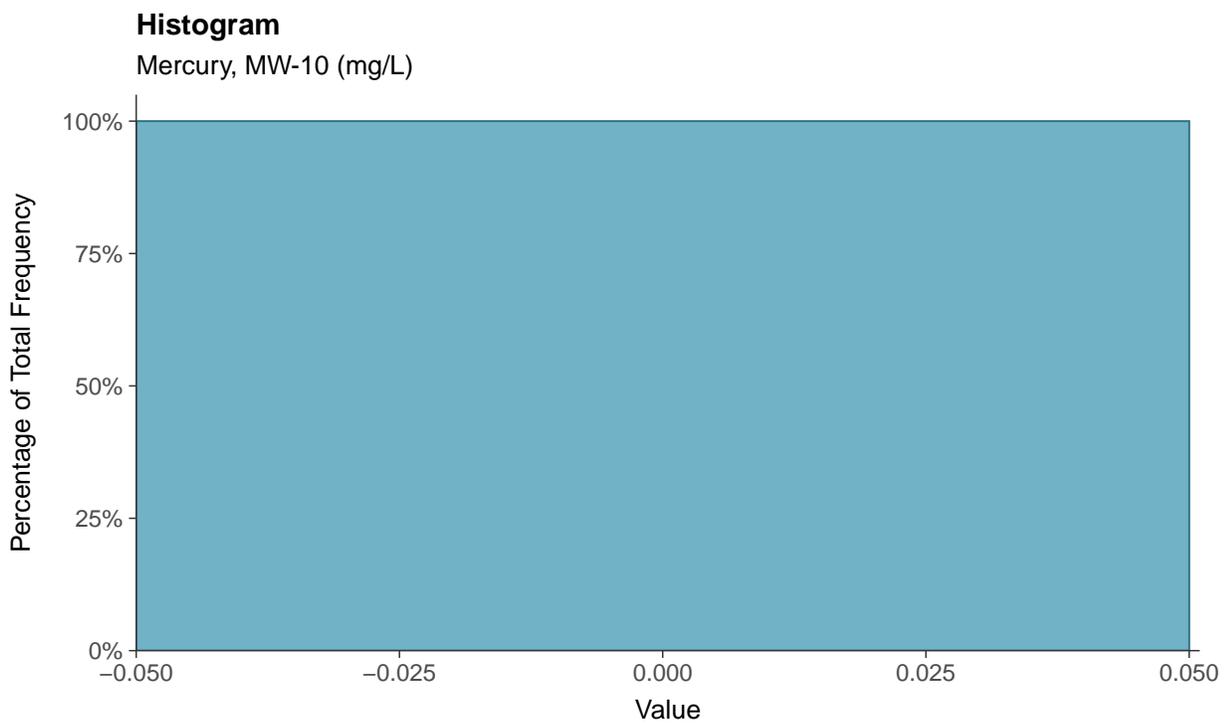
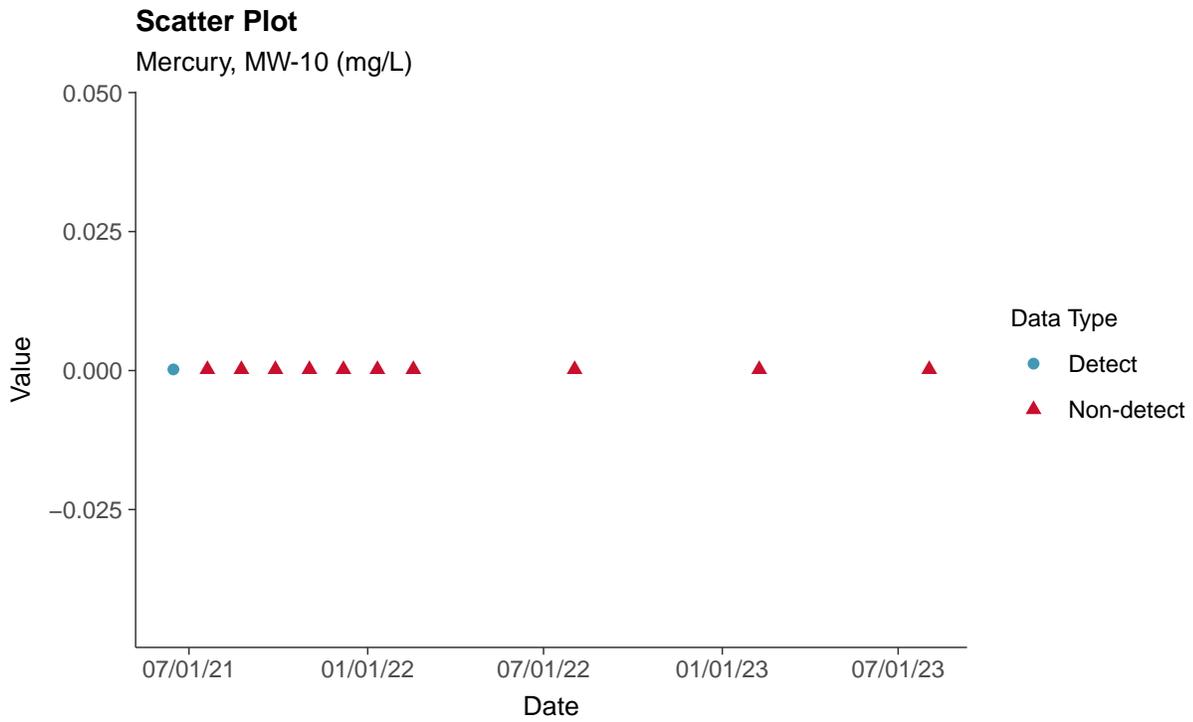
Lithium, MW-10 (mg/L)





Appendix IV: Mercury, MW-10

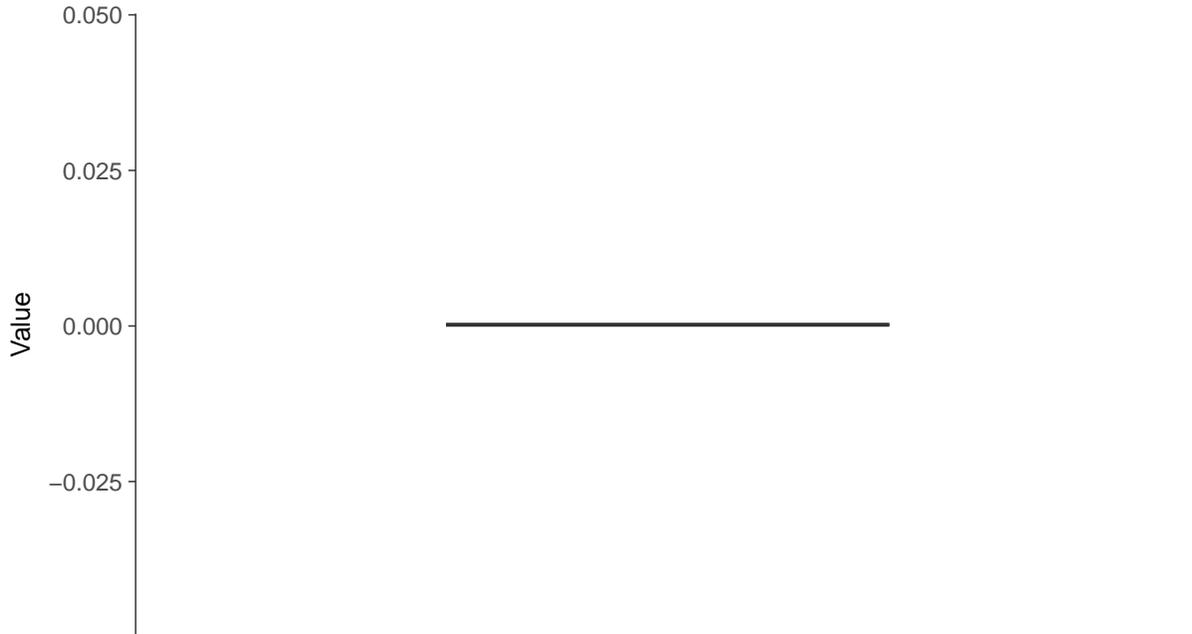
ID: 10_2_17





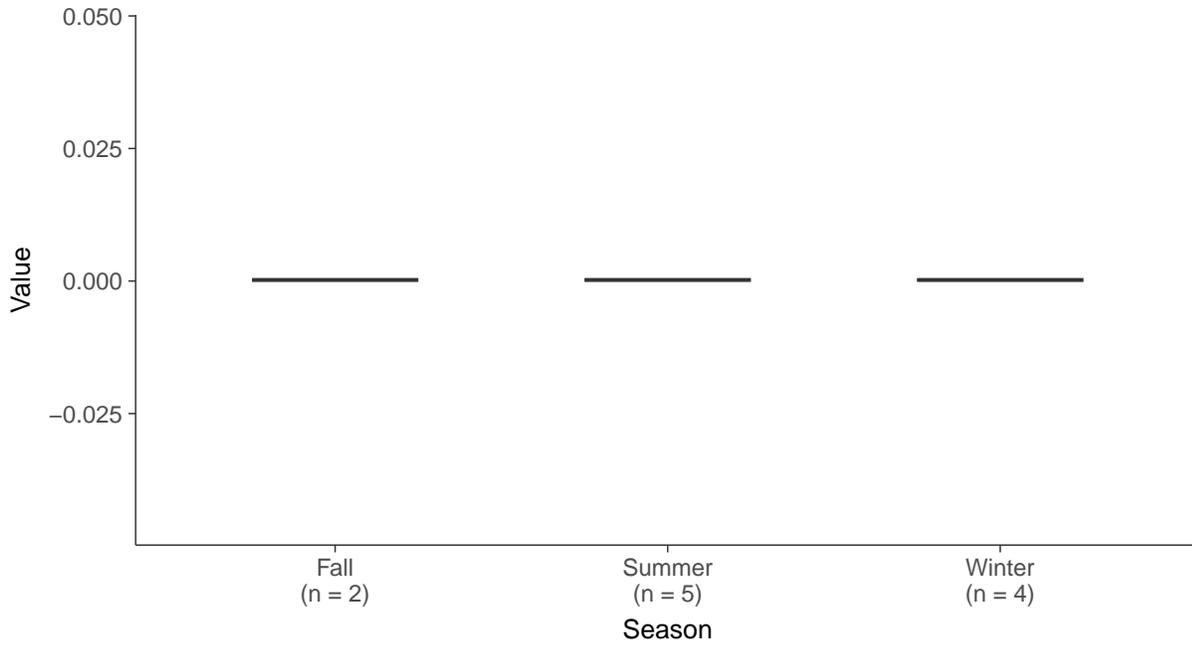
Boxplot

Mercury, MW-10 (mg/L)



Boxplot by Season

Mercury, MW-10 (mg/L)



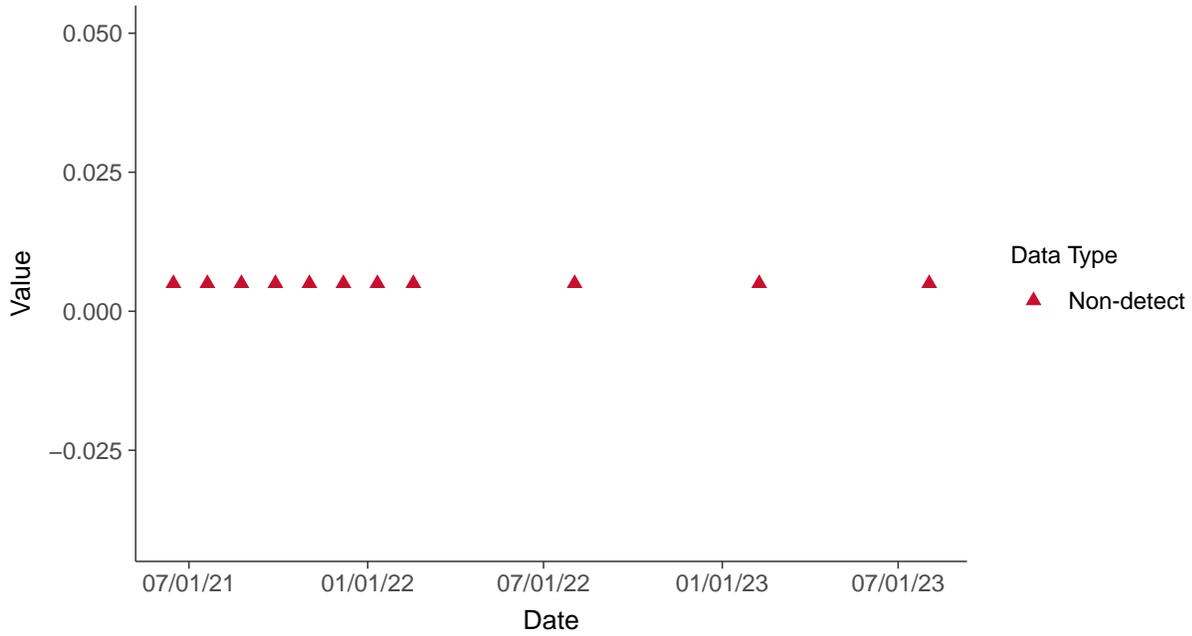


Appendix IV: Molybdenum, MW-10

ID: 10_2_18

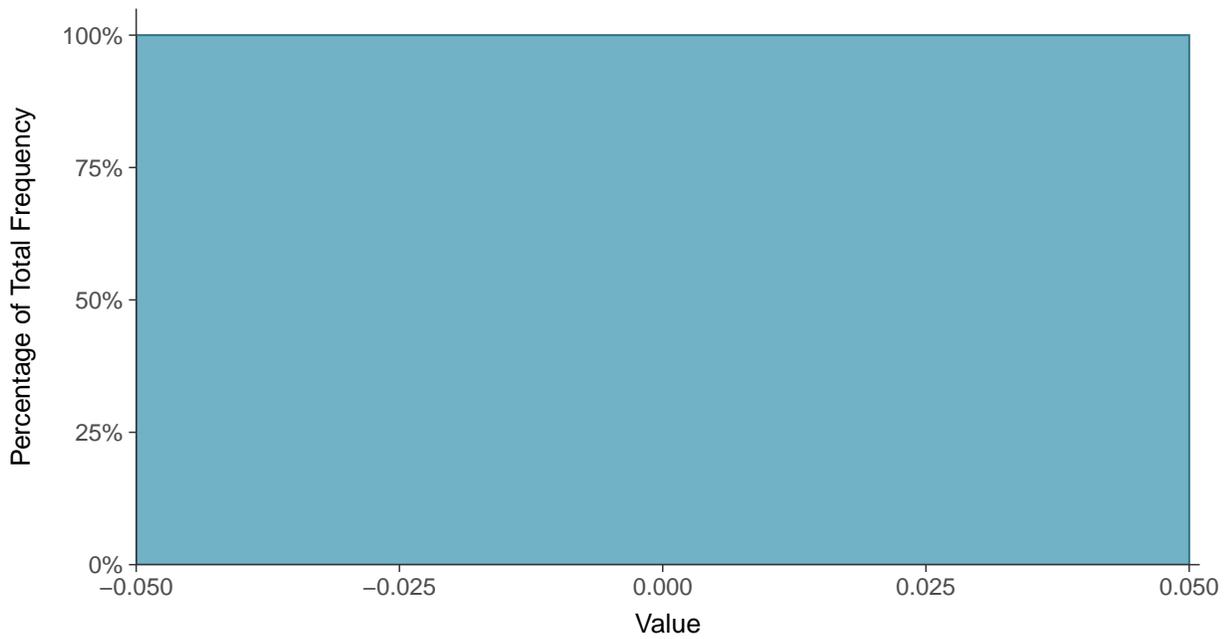
Scatter Plot

Molybdenum, MW-10 (mg/L)



Histogram

Molybdenum, MW-10 (mg/L)





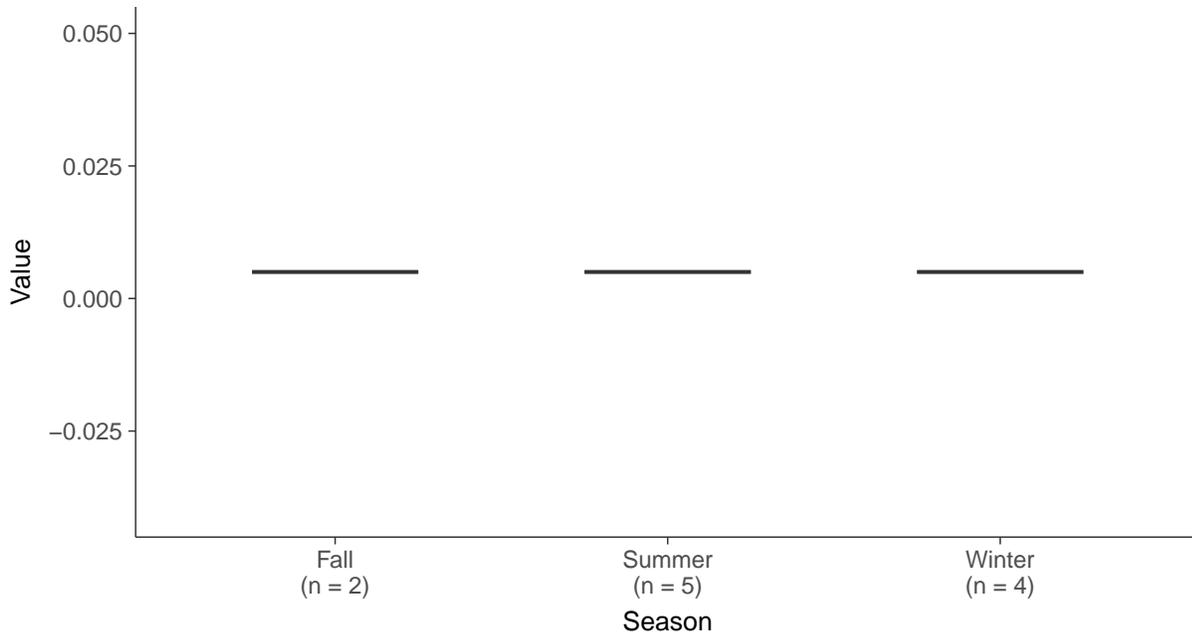
Boxplot

Molybdenum, MW-10 (mg/L)



Boxplot by Season

Molybdenum, MW-10 (mg/L)



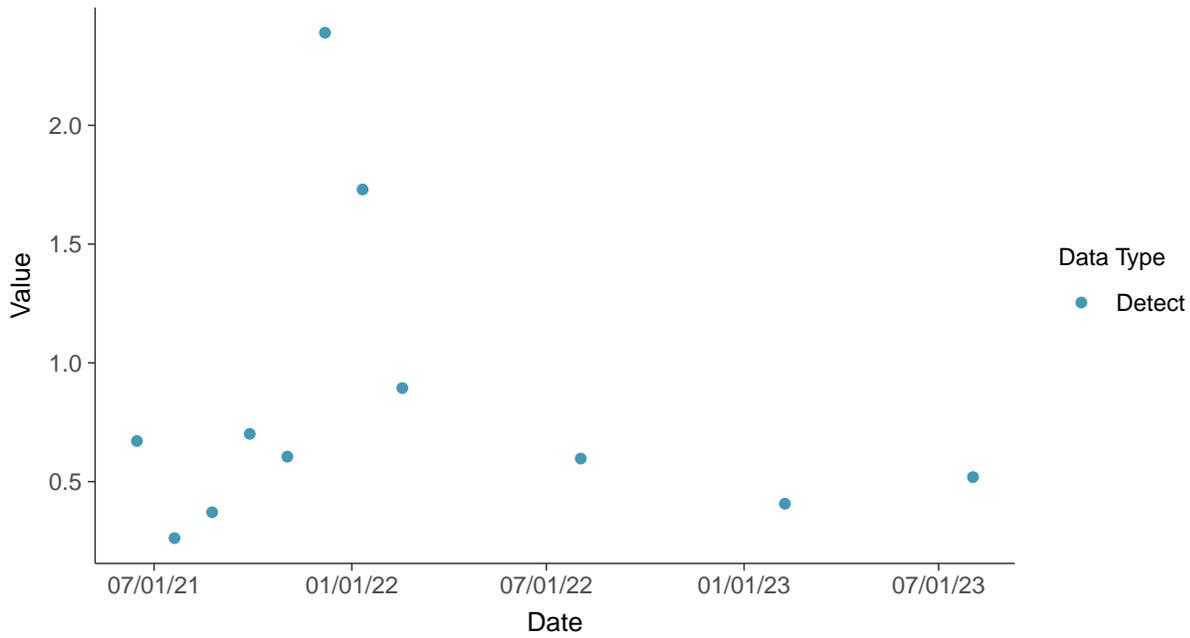


Appendix IV: Radium-226/228, MW-10

ID: 10_2_20

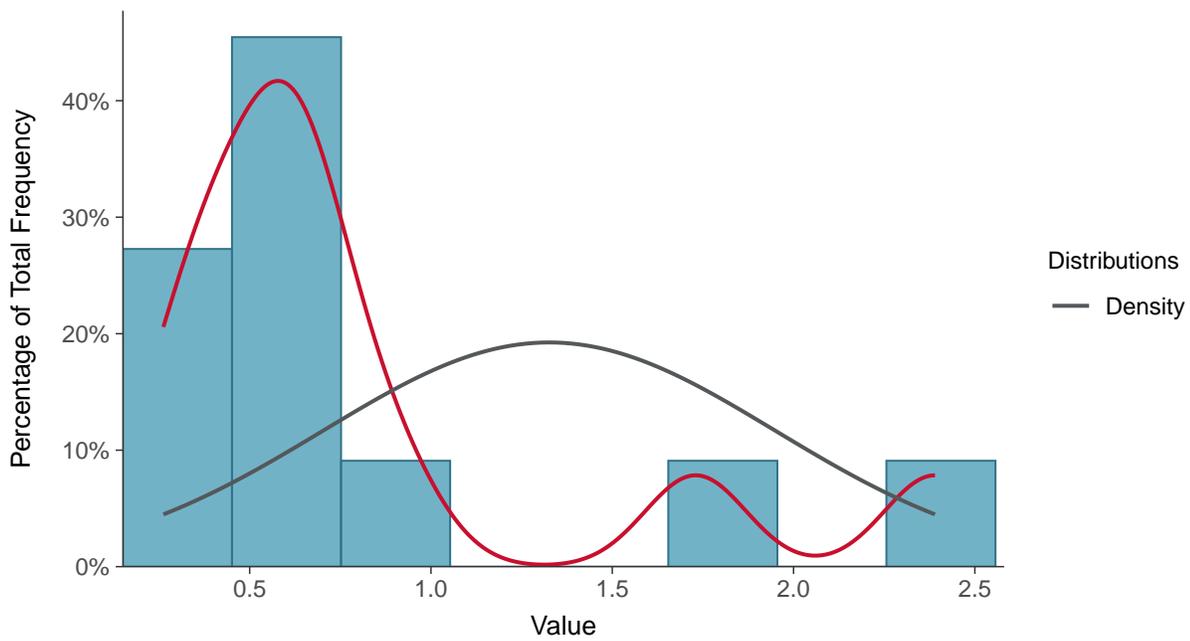
Scatter Plot

Radium-226/228, MW-10 (pCi/L)



Histogram

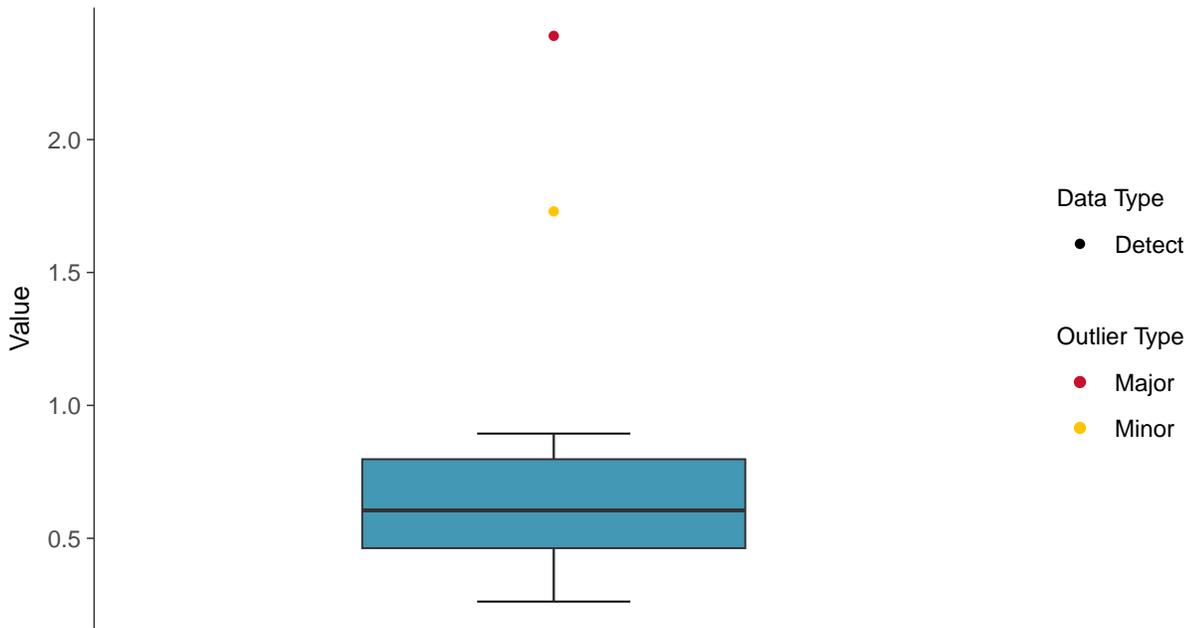
Radium-226/228, MW-10 (pCi/L)





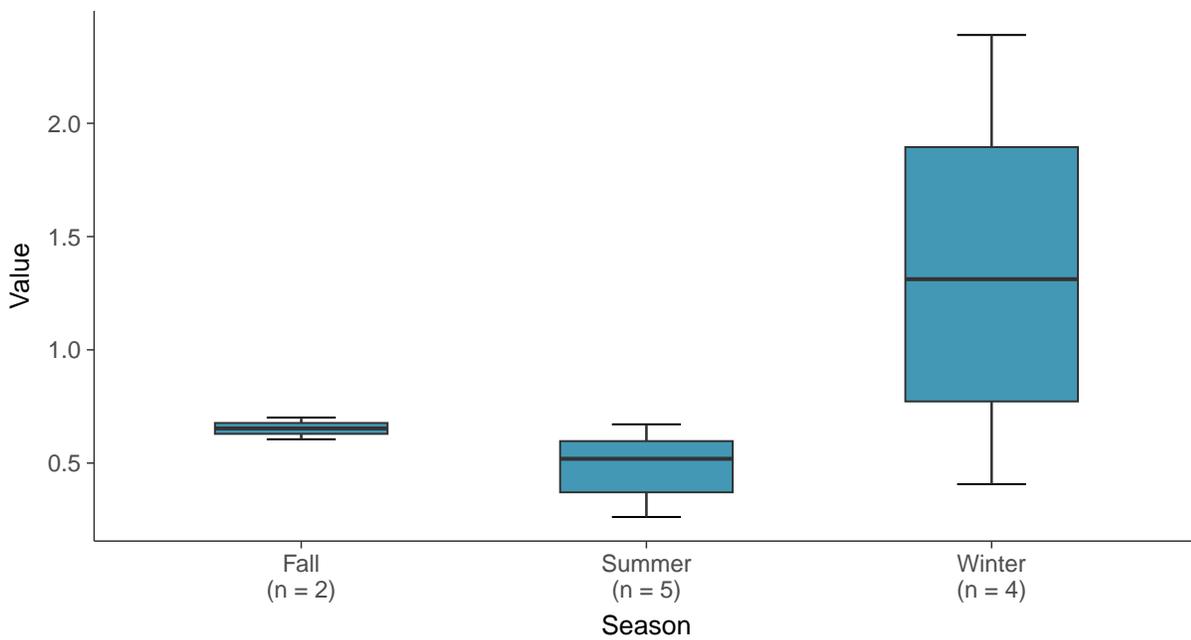
Boxplot

Radium-226/228, MW-10 (pCi/L)



Boxplot by Season

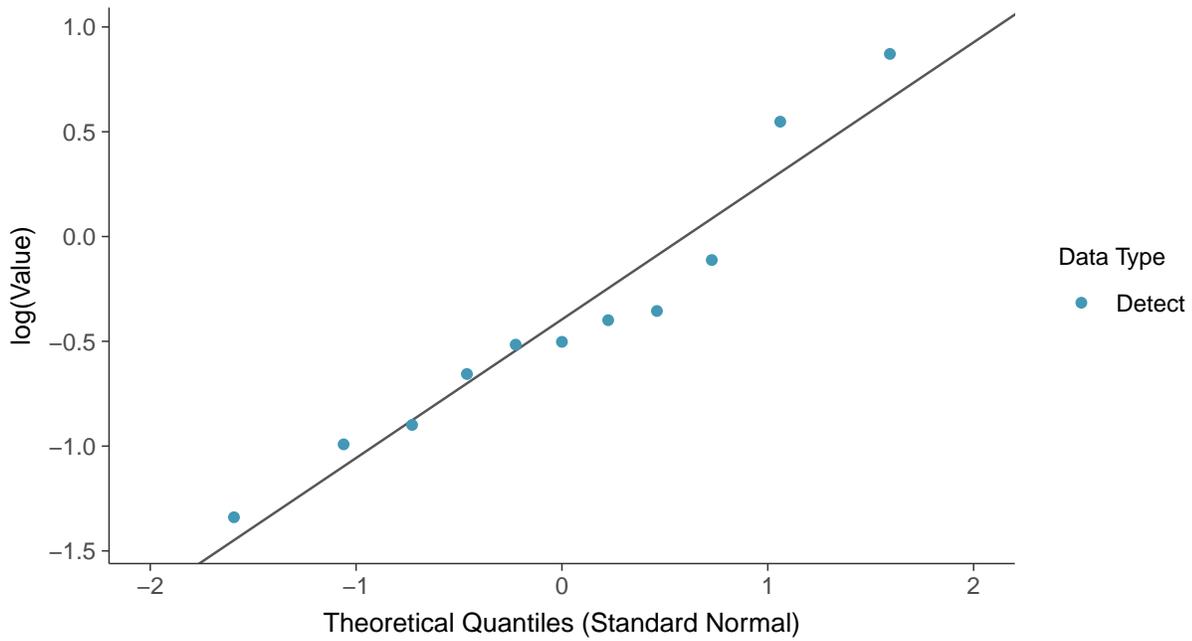
Radium-226/228, MW-10 (pCi/L)





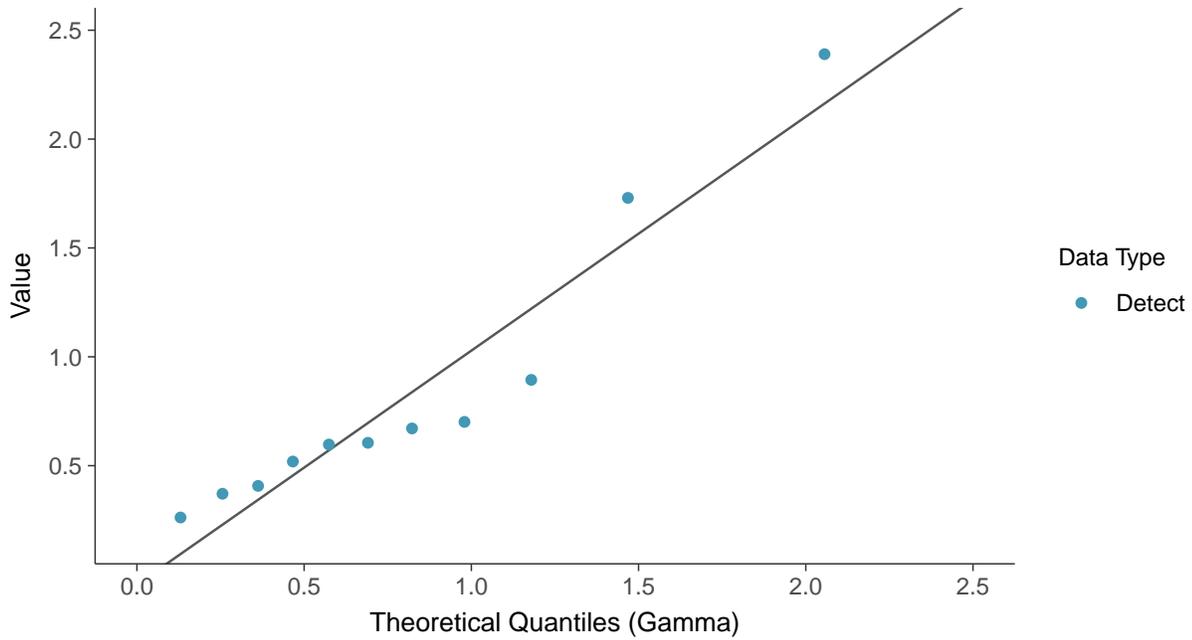
Lognormal Q-Q plot

Radium-226/228, MW-10 (pCi/L)



Gamma Q-Q plot

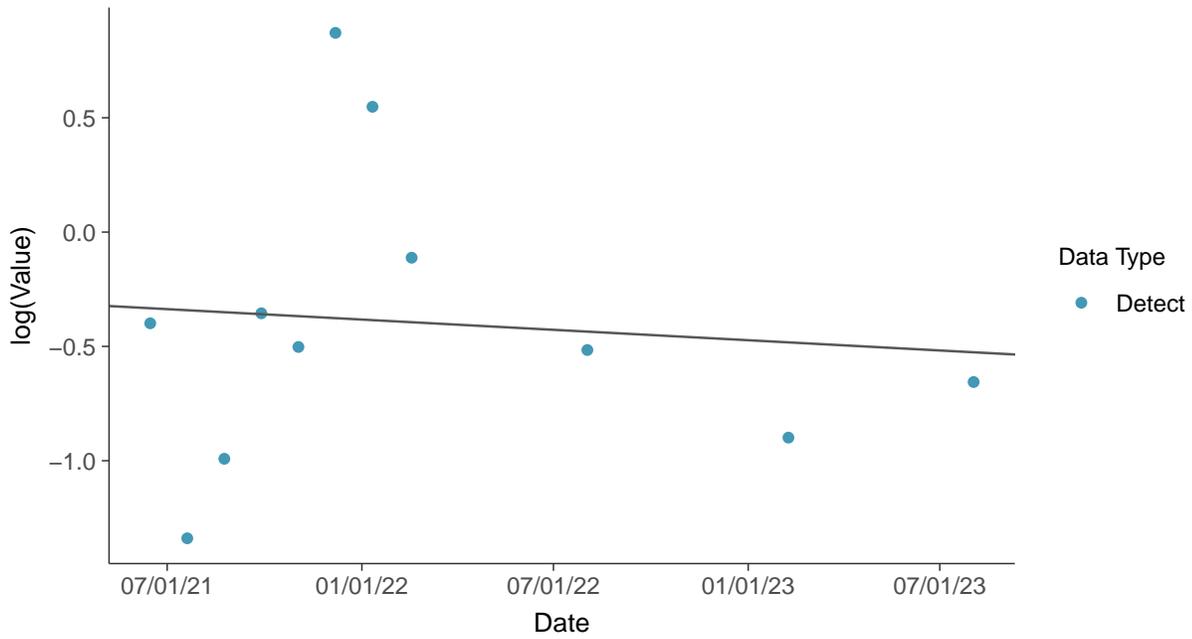
Radium-226/228, MW-10 (pCi/L)





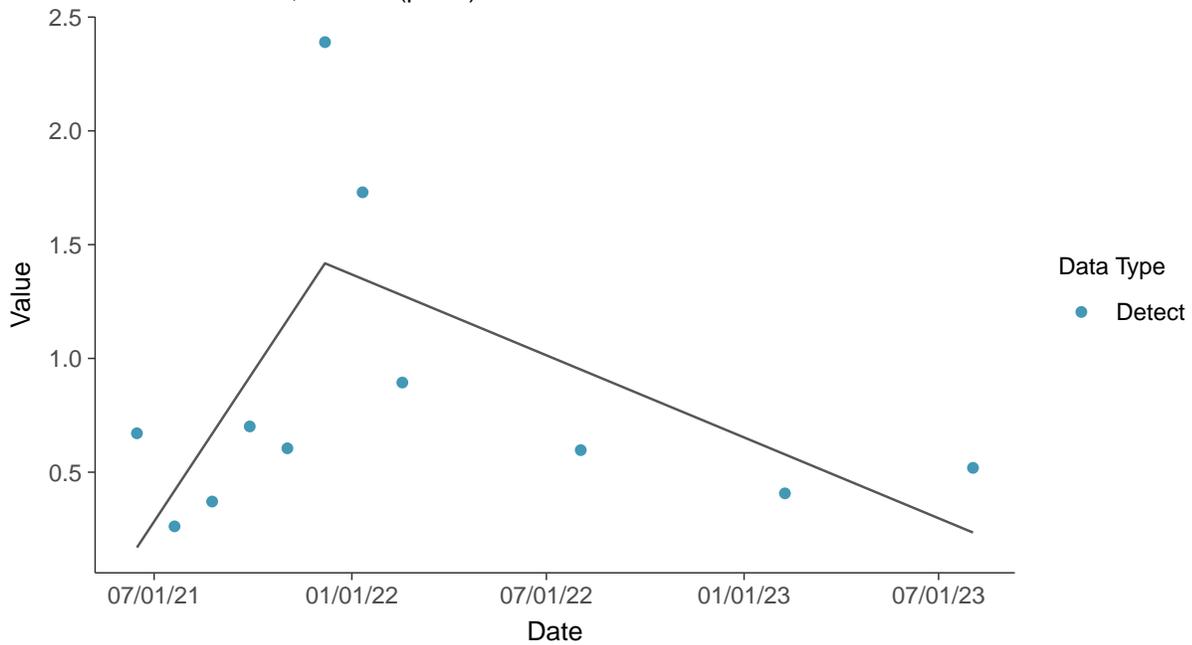
Trend Regression: Lognormal MLE

Radium-226/228, MW-10 (pCi/L)



Trend Regression: Piecewise Linear-Linear

Radium-226/228, MW-10 (pCi/L)



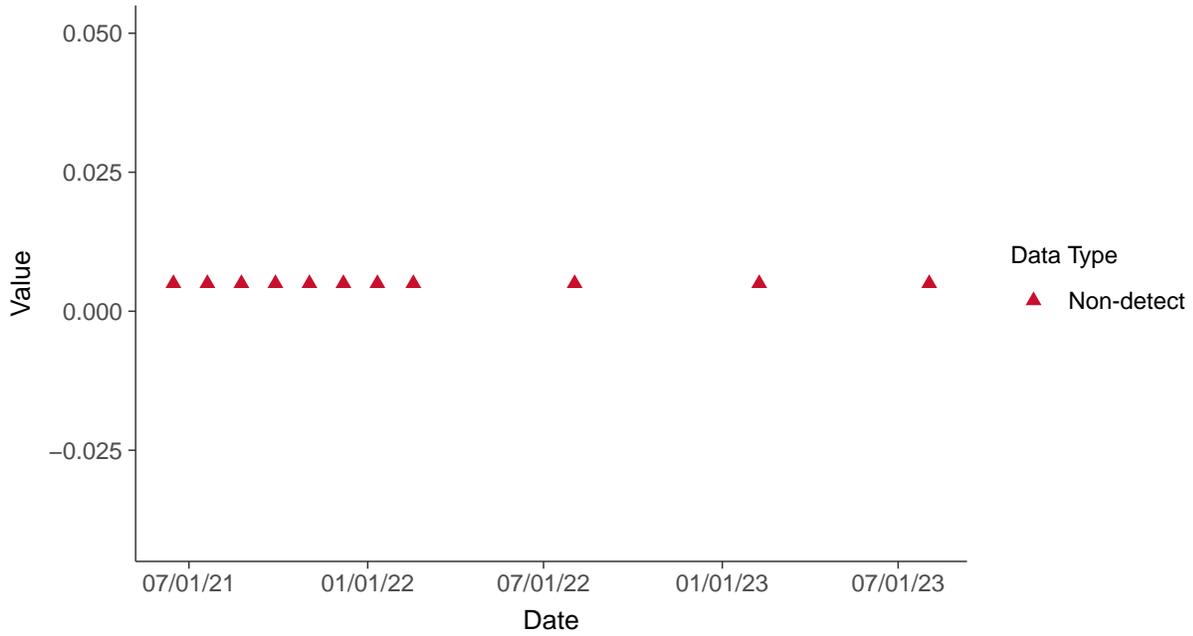


Appendix IV: Selenium, MW-10

ID: 10_2_22

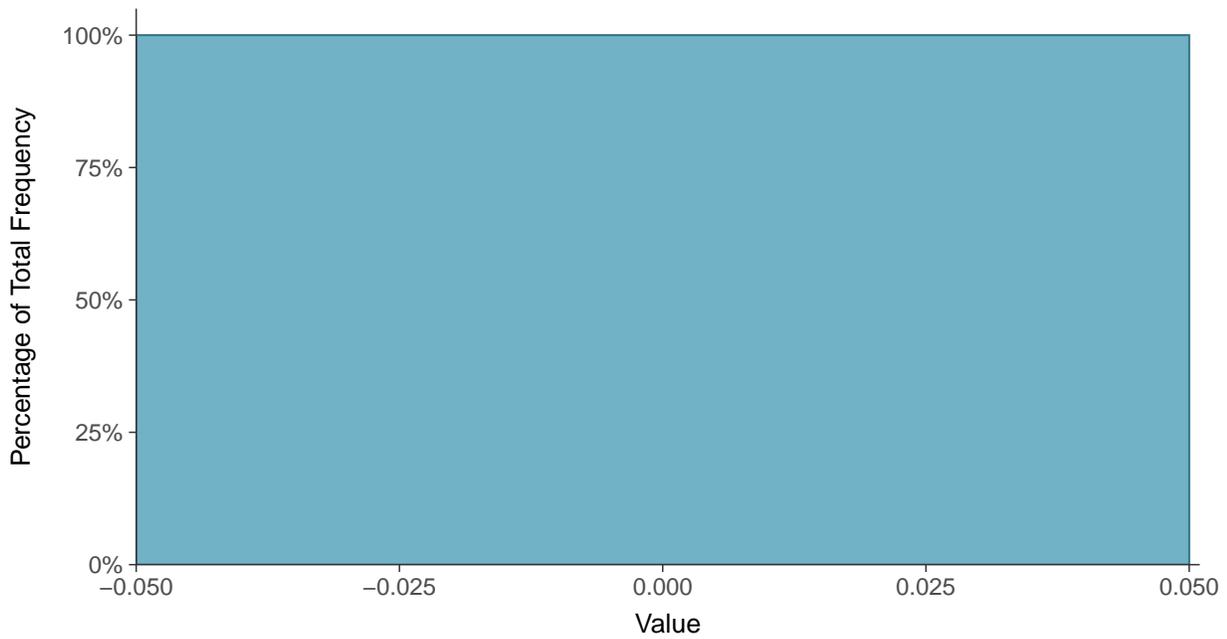
Scatter Plot

Selenium, MW-10 (mg/L)



Histogram

Selenium, MW-10 (mg/L)





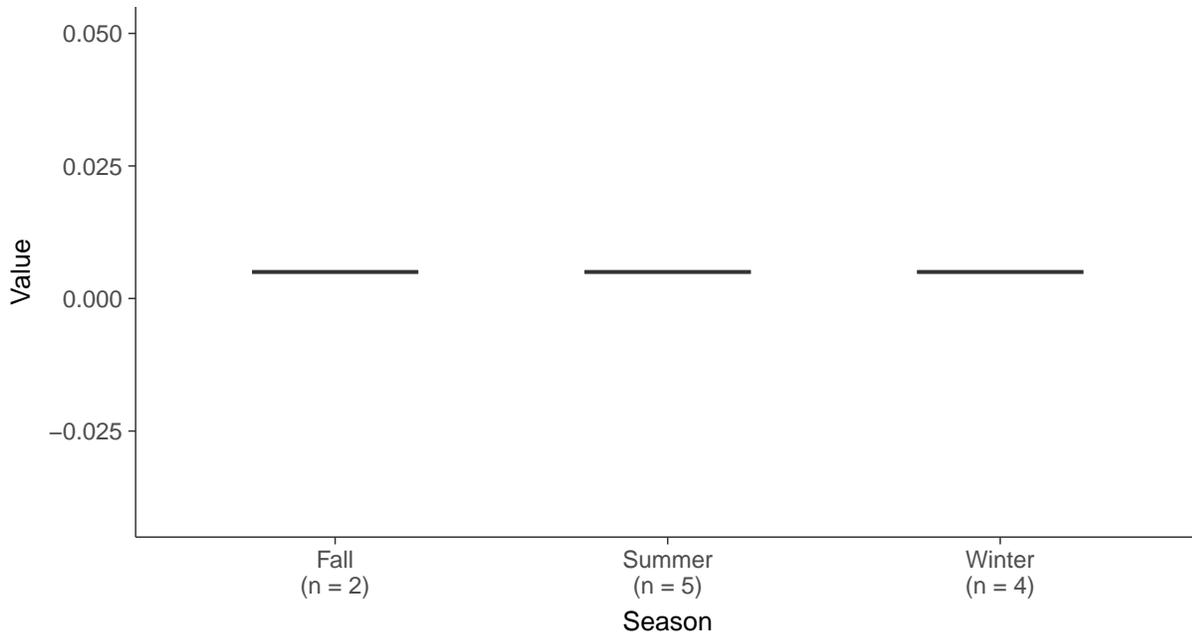
Boxplot

Selenium, MW-10 (mg/L)



Boxplot by Season

Selenium, MW-10 (mg/L)



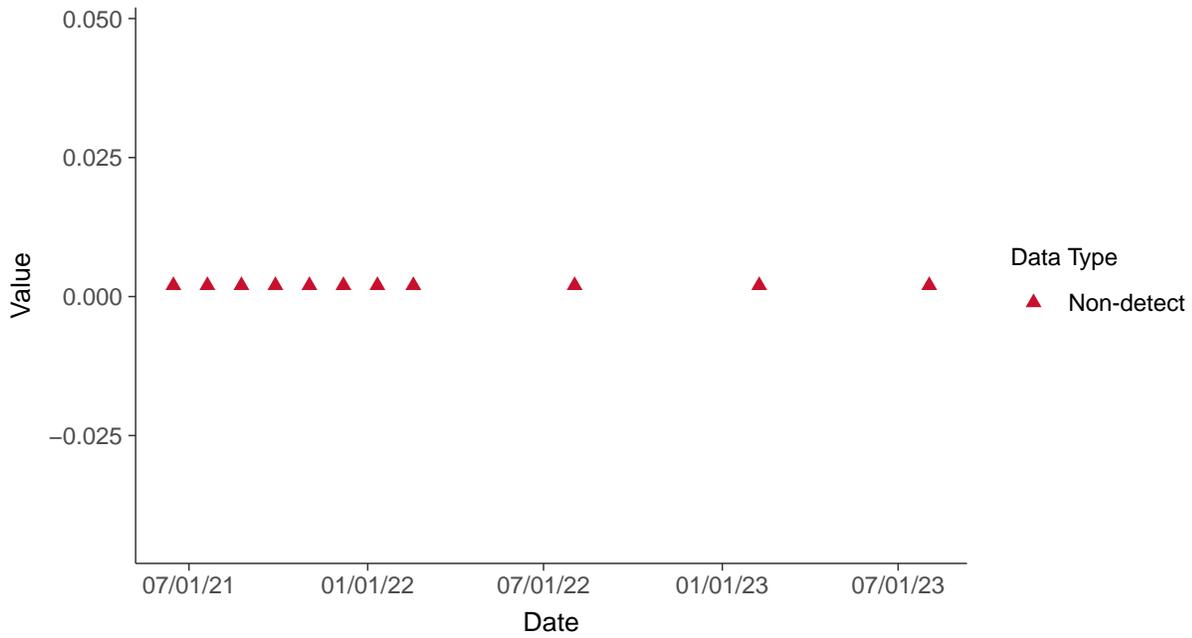


Appendix IV: Thallium, MW-10

ID: 10_2_23

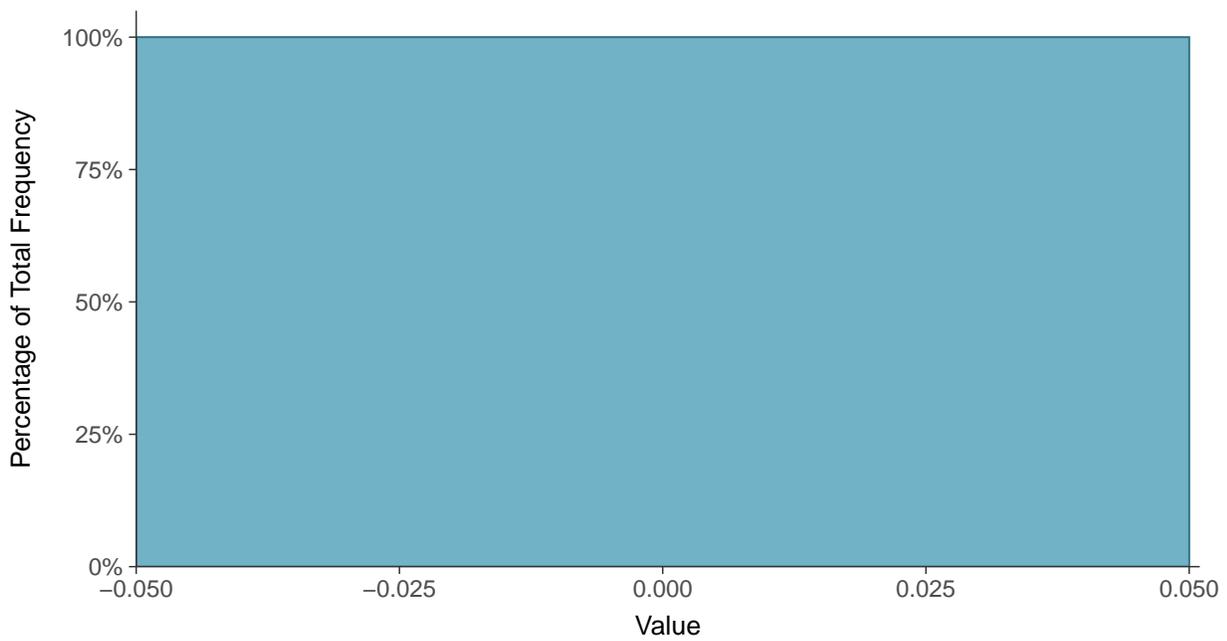
Scatter Plot

Thallium, MW-10 (mg/L)



Histogram

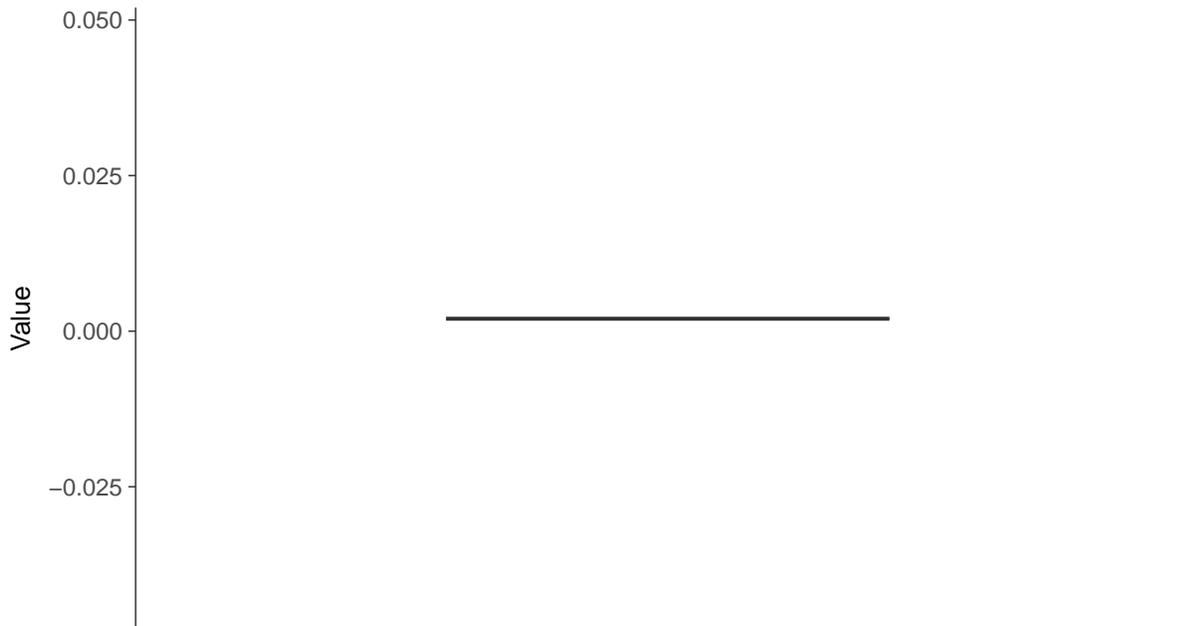
Thallium, MW-10 (mg/L)





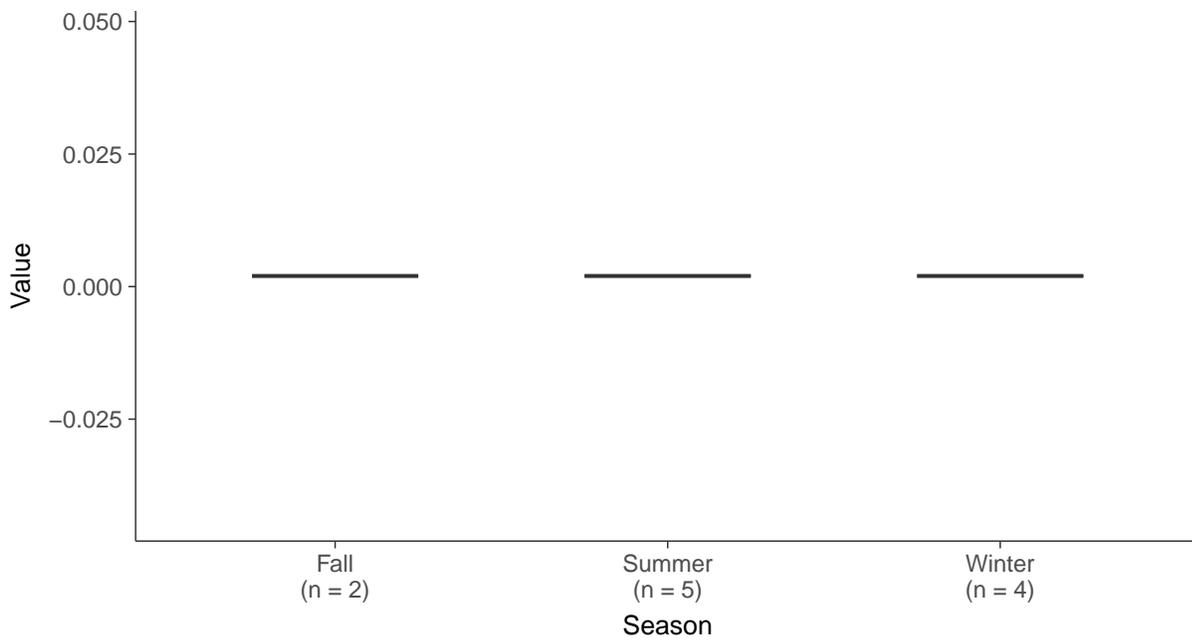
Boxplot

Thallium, MW-10 (mg/L)



Boxplot by Season

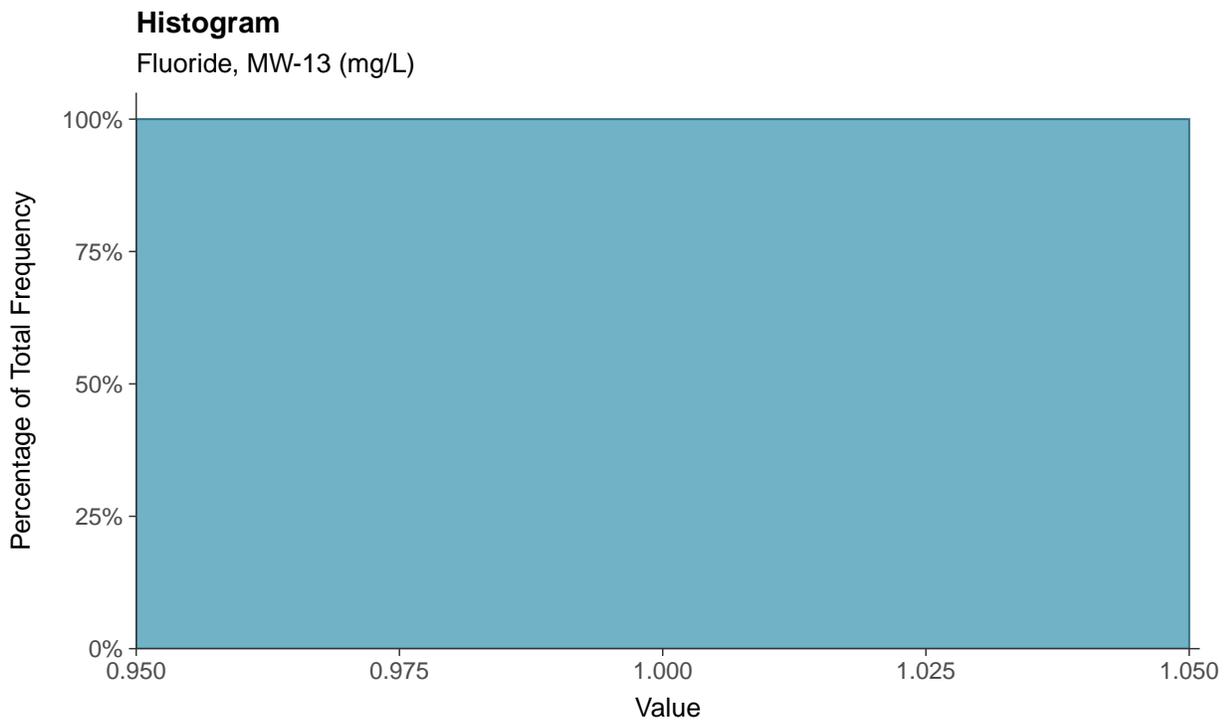
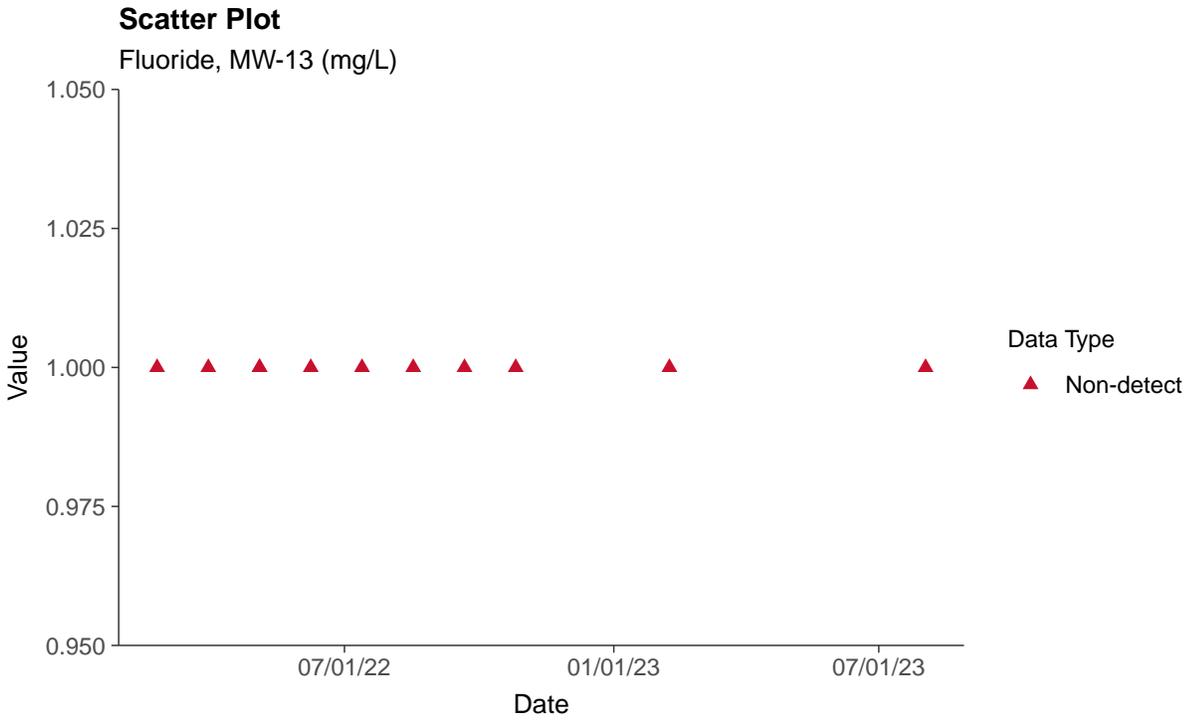
Thallium, MW-10 (mg/L)





Appendix IV: Fluoride, MW-13

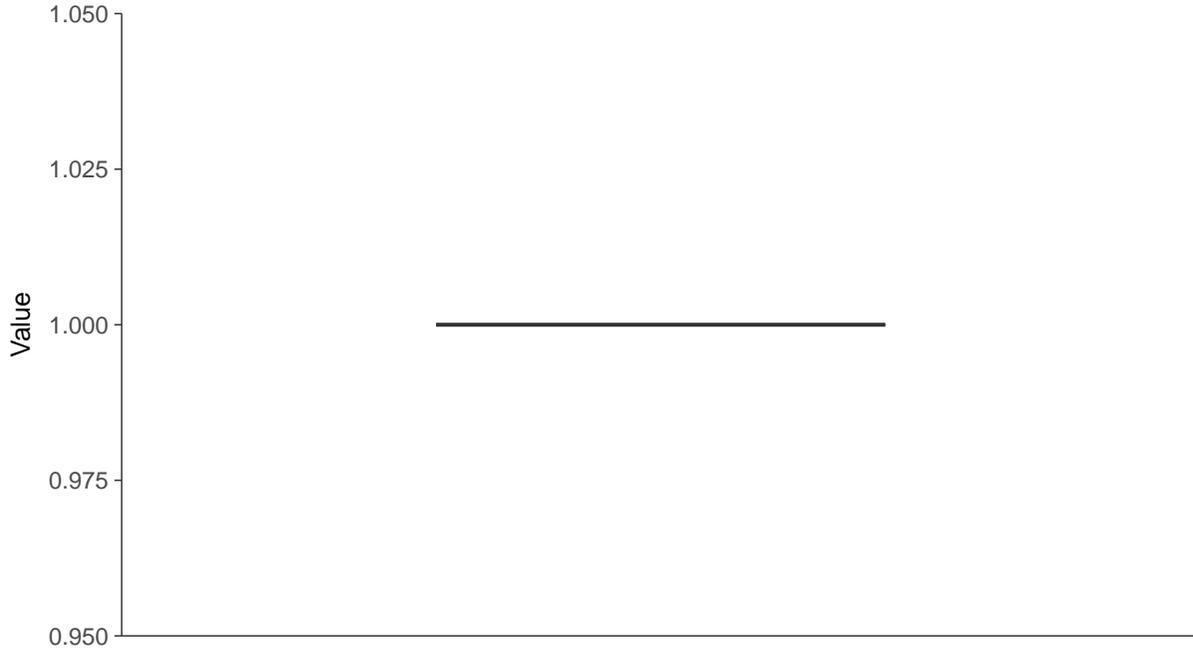
ID: 13_2_04





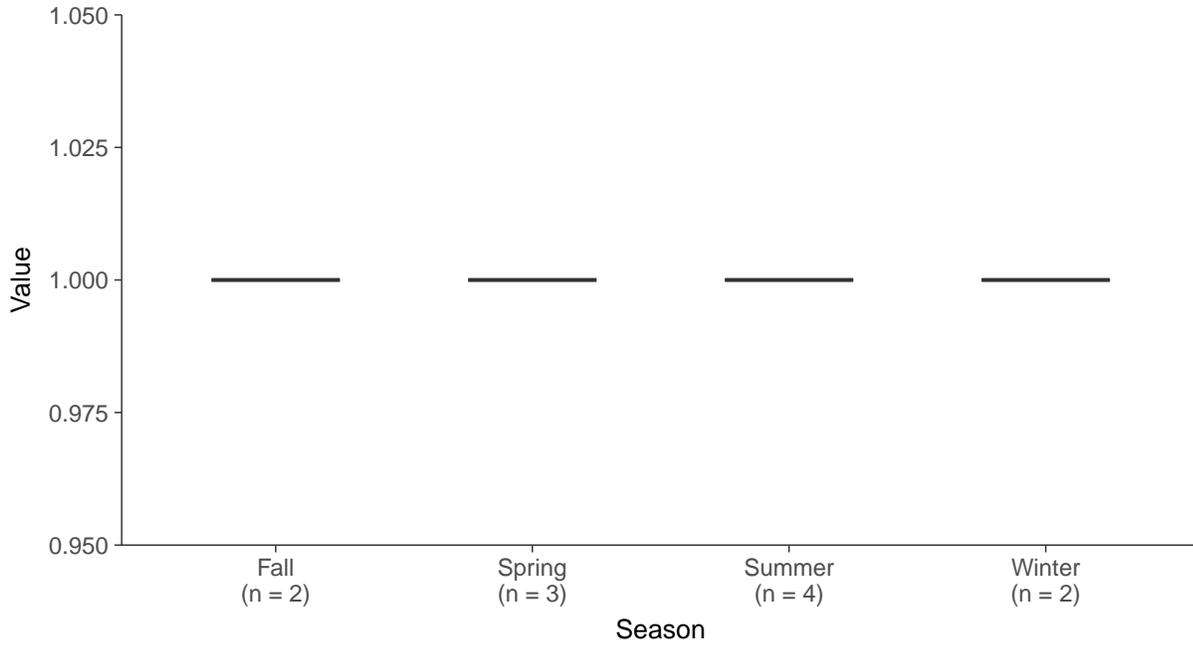
Boxplot

Fluoride, MW-13 (mg/L)



Boxplot by Season

Fluoride, MW-13 (mg/L)



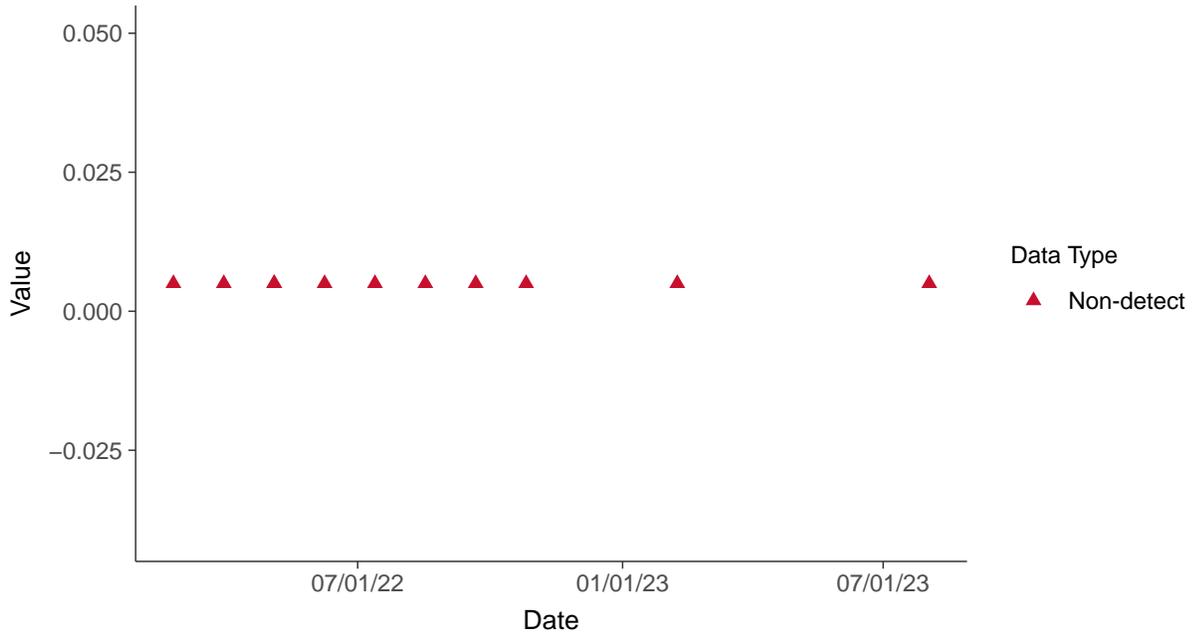


Appendix IV: Antimony, MW-13

ID: 13_2_08

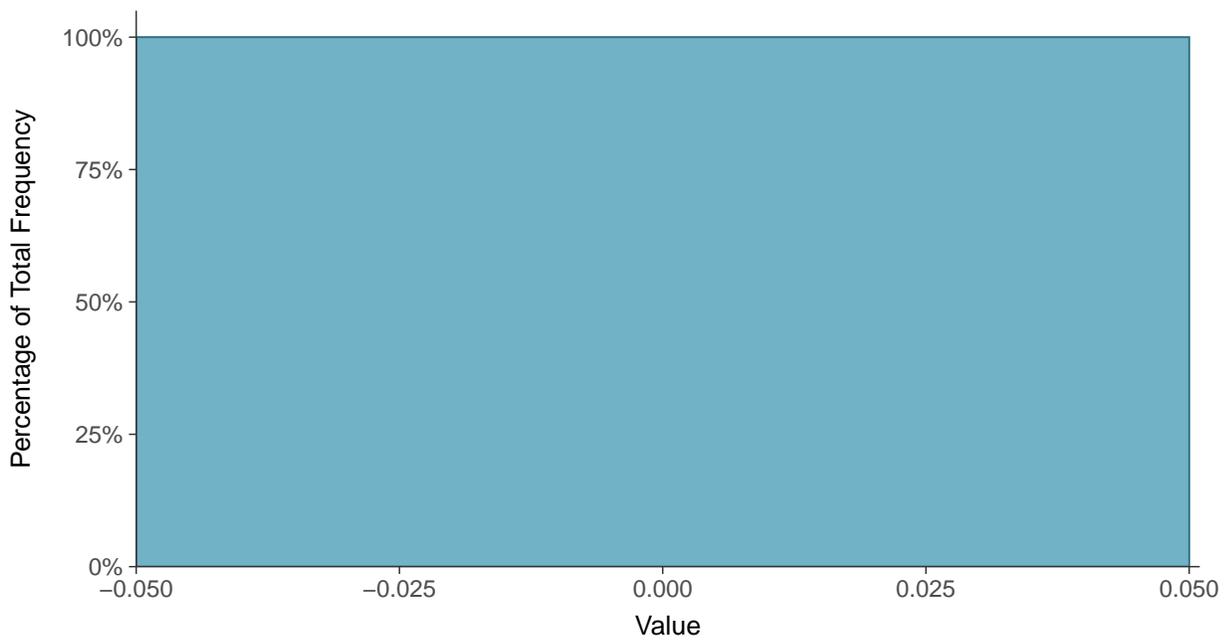
Scatter Plot

Antimony, MW-13 (mg/L)



Histogram

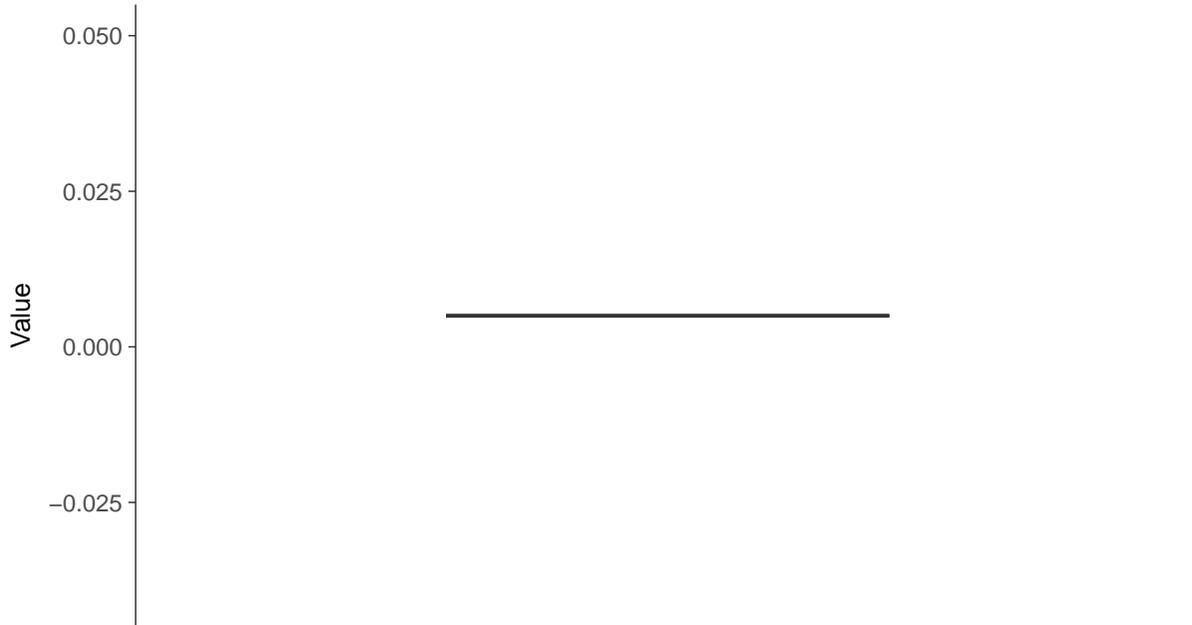
Antimony, MW-13 (mg/L)





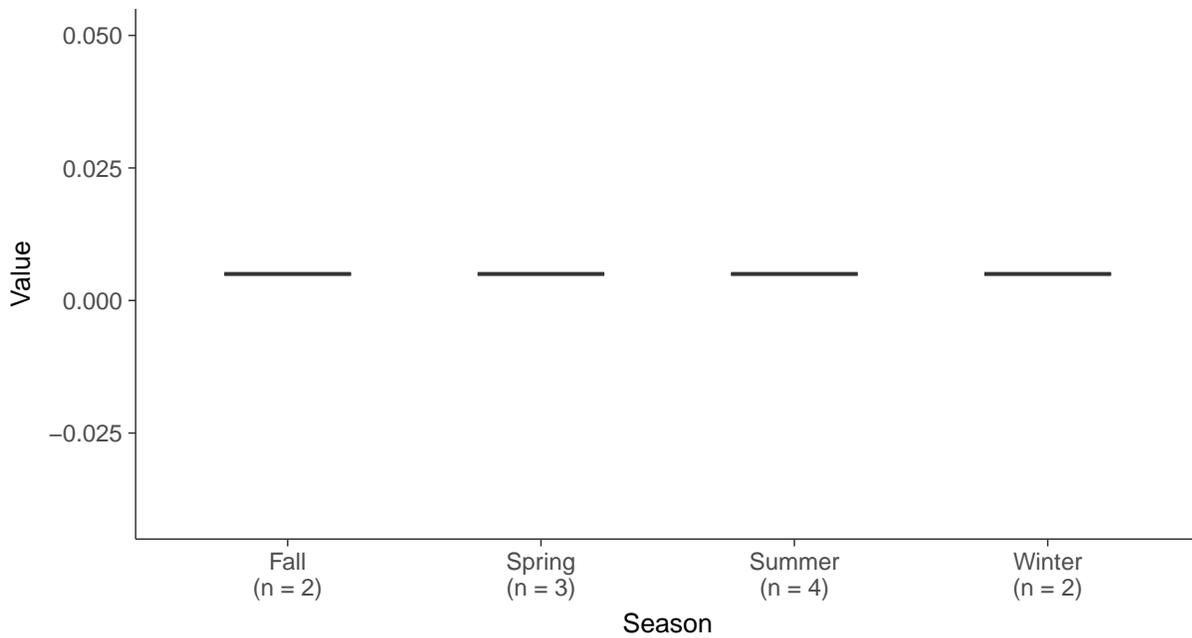
Boxplot

Antimony, MW-13 (mg/L)



Boxplot by Season

Antimony, MW-13 (mg/L)



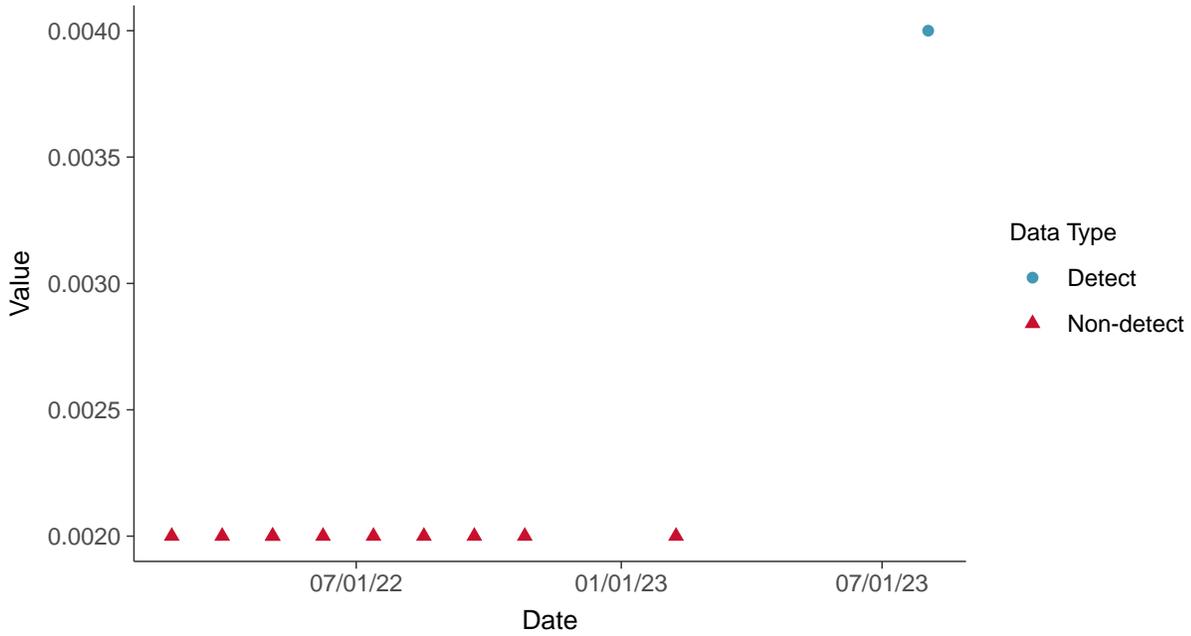


Appendix IV: Arsenic, MW-13

ID: 13_2_09

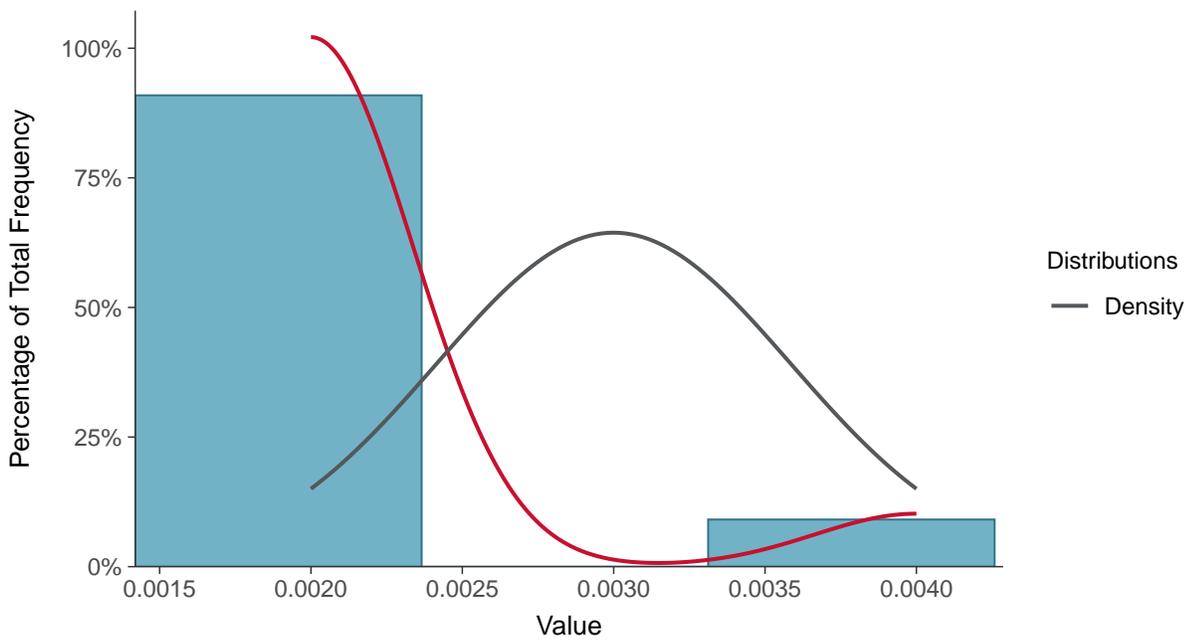
Scatter Plot

Arsenic, MW-13 (mg/L)



Histogram

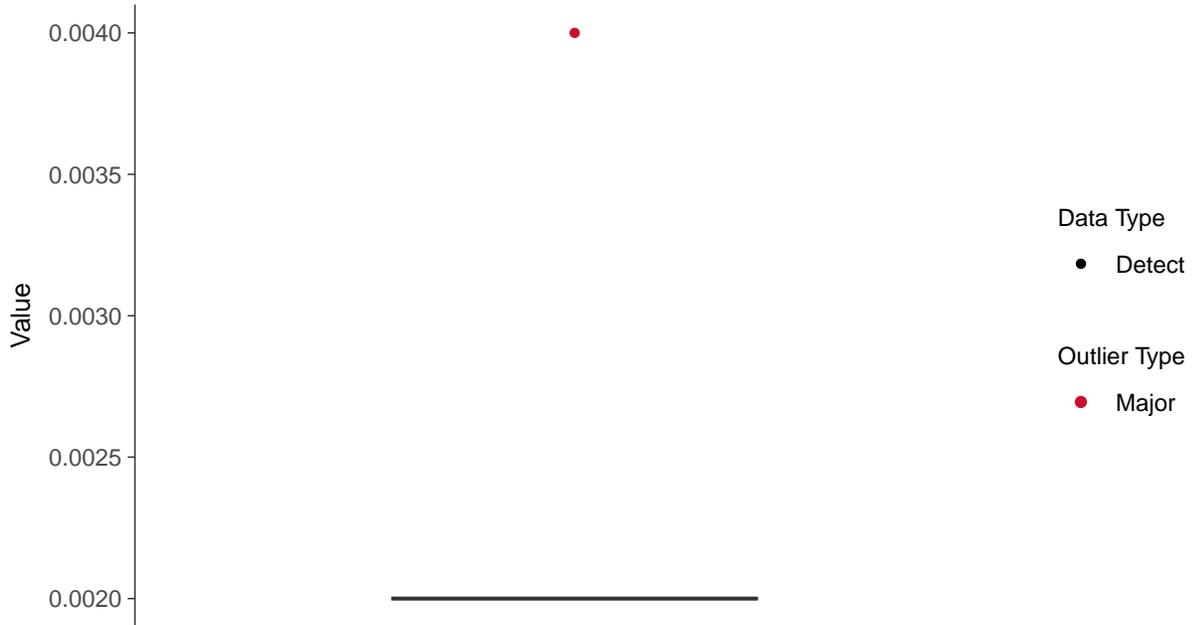
Arsenic, MW-13 (mg/L)





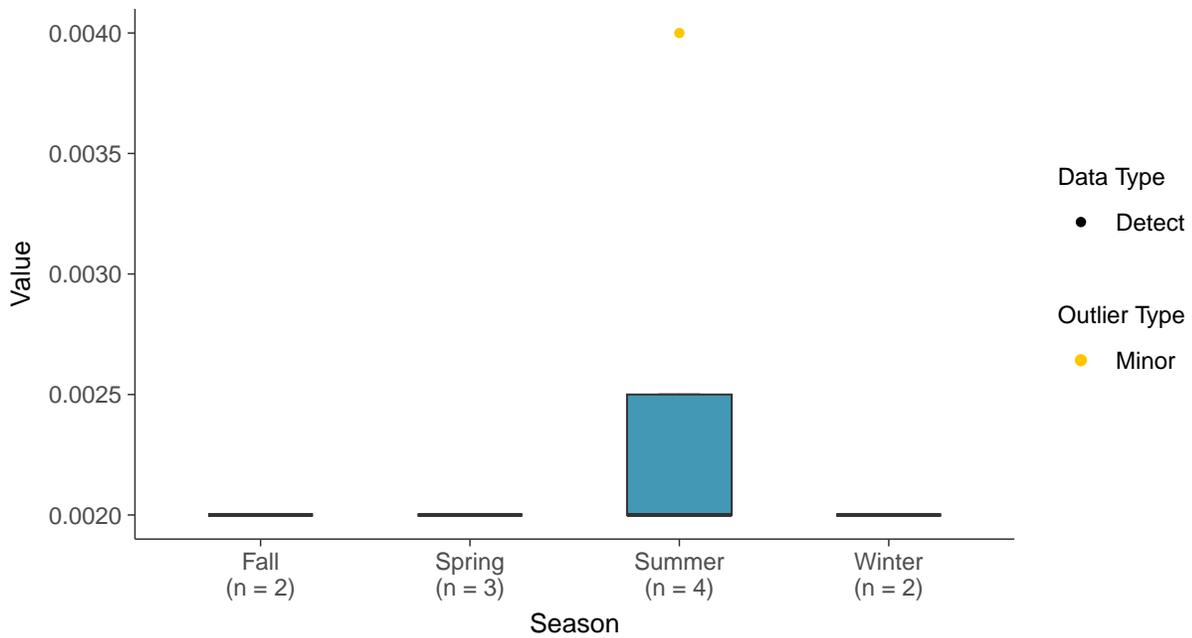
Boxplot

Arsenic, MW-13 (mg/L)



Boxplot by Season

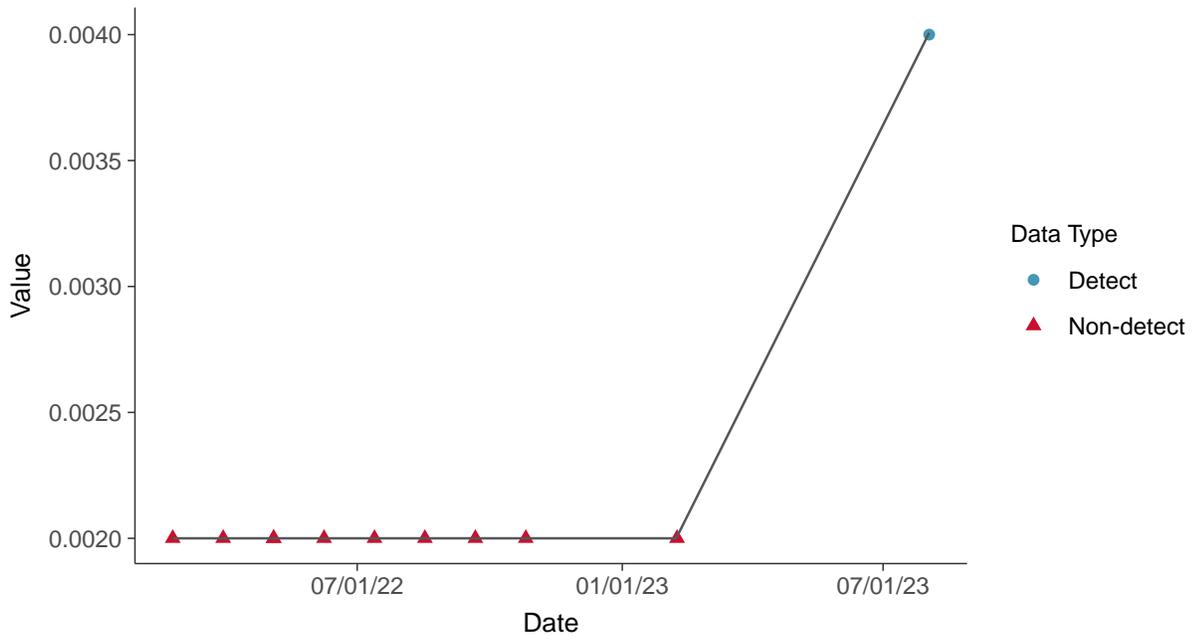
Arsenic, MW-13 (mg/L)





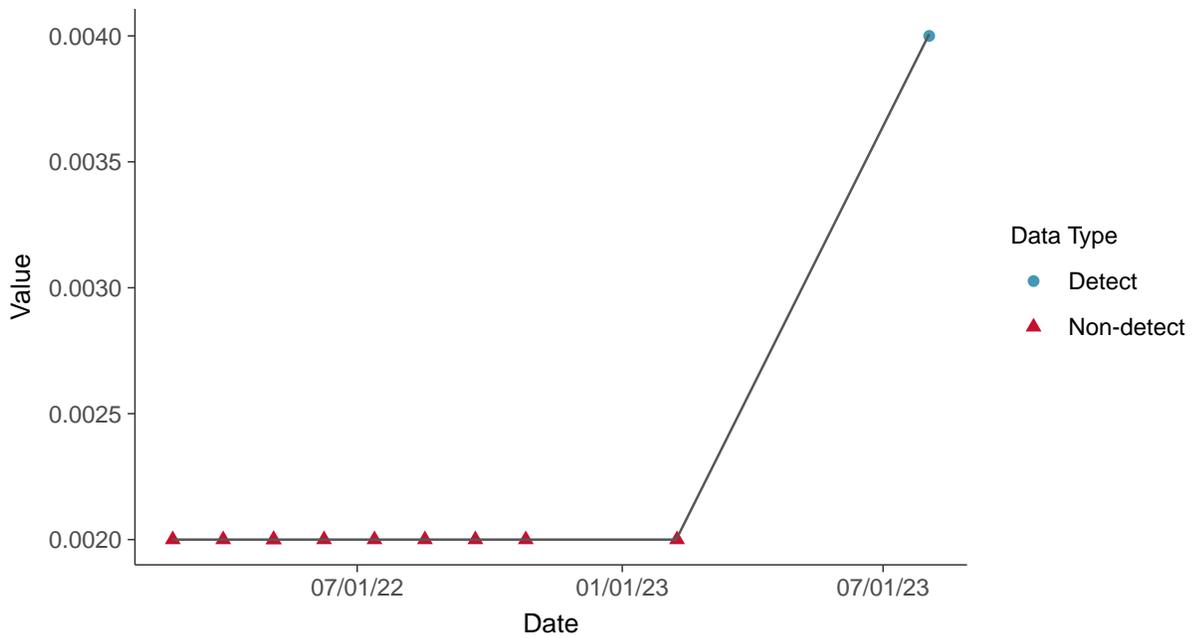
Trend Regression: Piecewise Linear-Linear

Arsenic, MW-13 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Arsenic, MW-13 (mg/L)



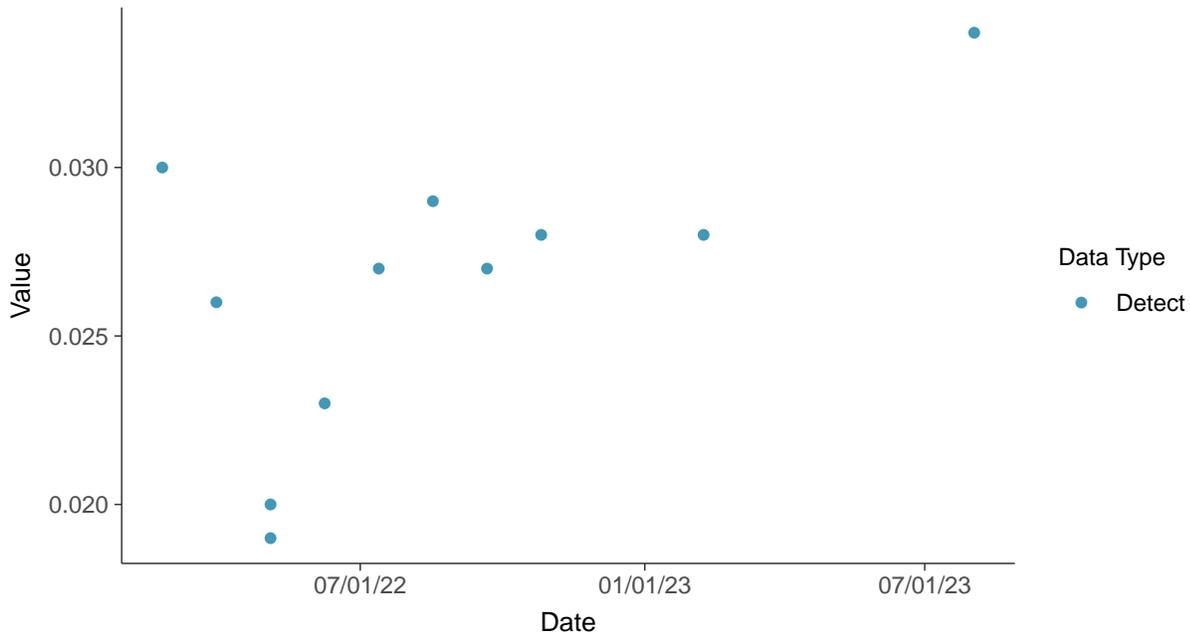


Appendix IV: Barium, MW-13

ID: 13_2_10

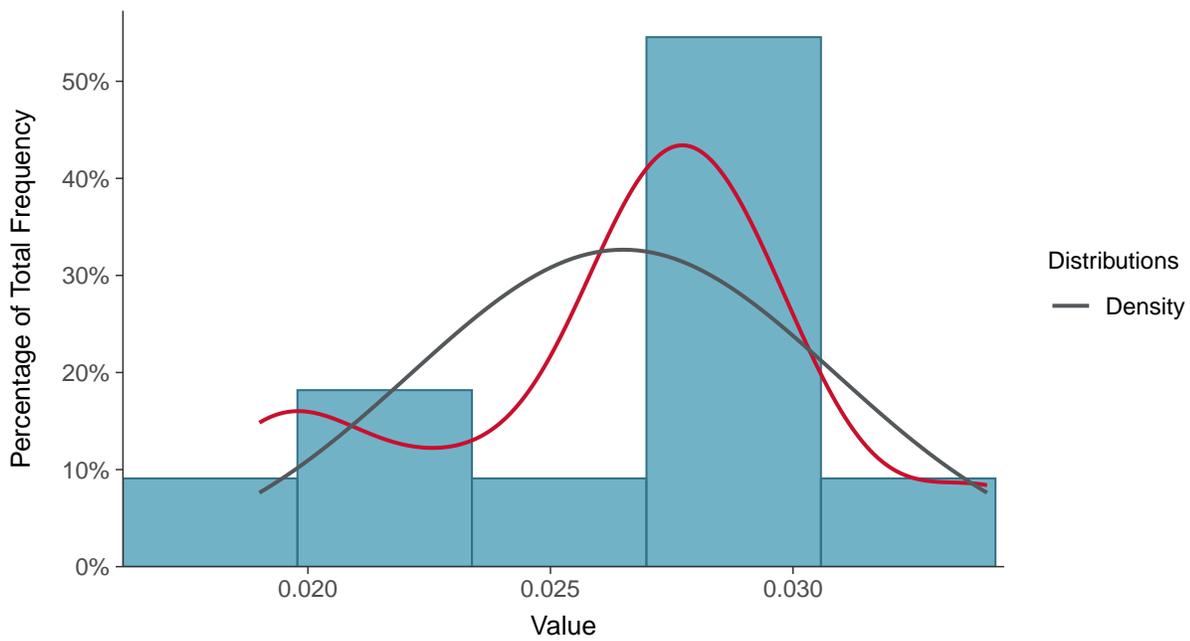
Scatter Plot

Barium, MW-13 (mg/L)



Histogram

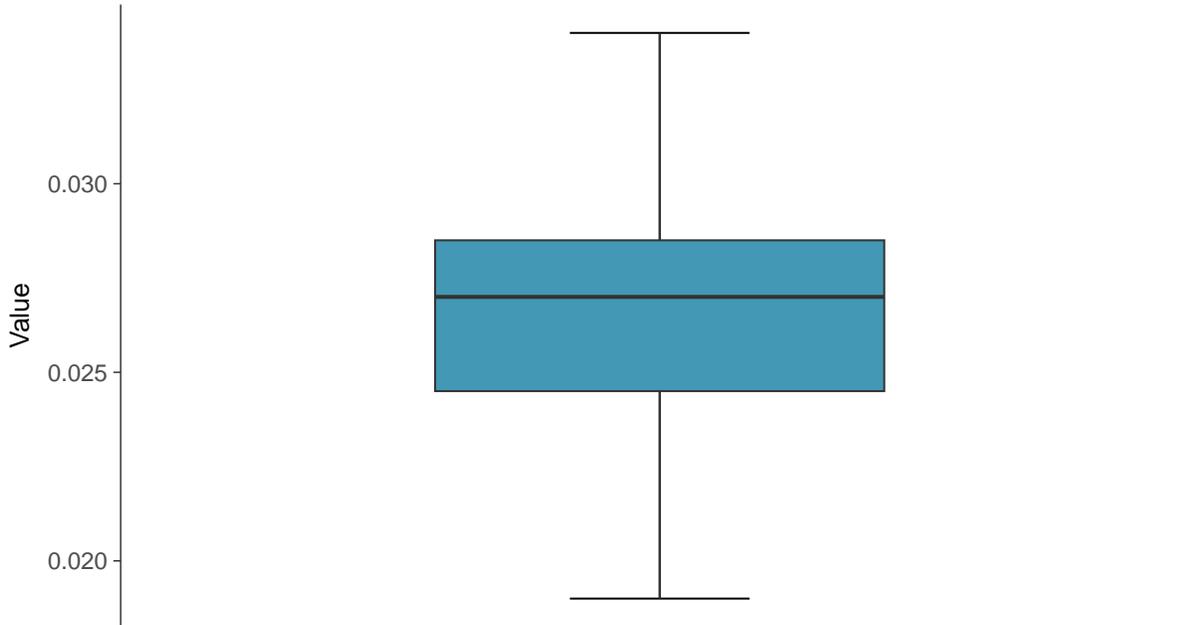
Barium, MW-13 (mg/L)





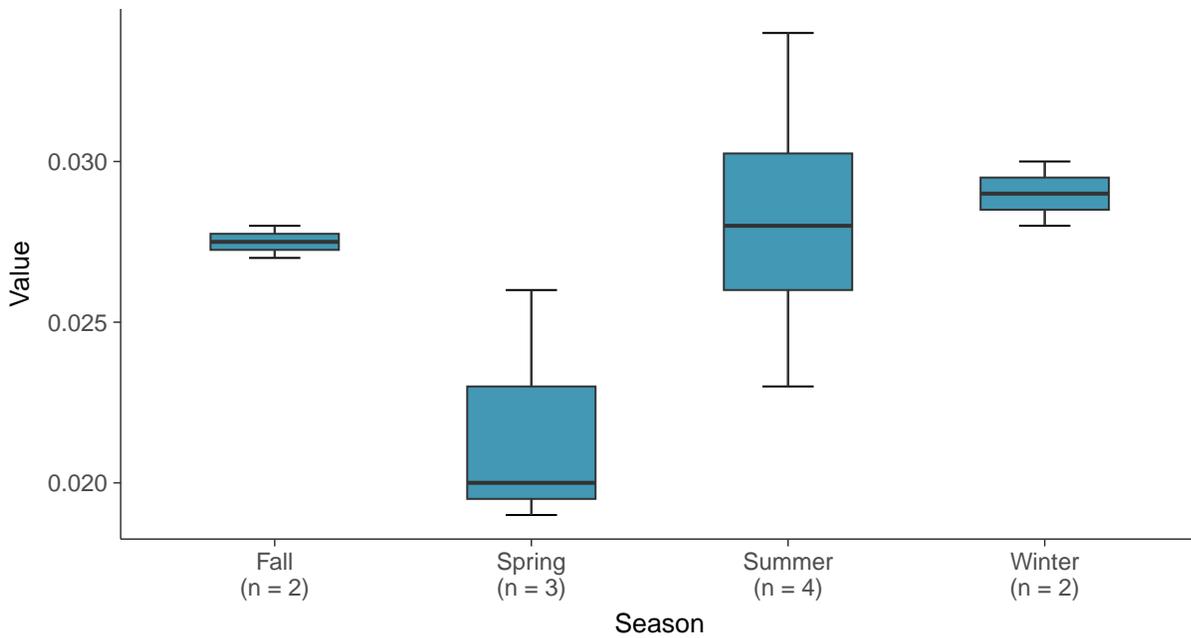
Boxplot

Barium, MW-13 (mg/L)



Boxplot by Season

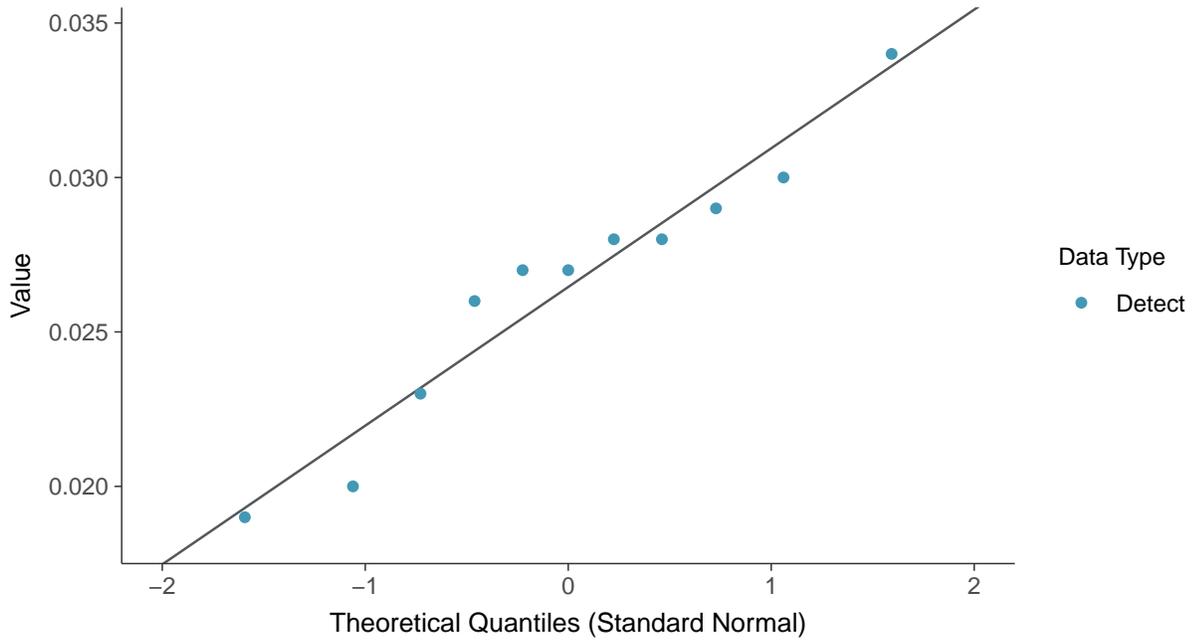
Barium, MW-13 (mg/L)





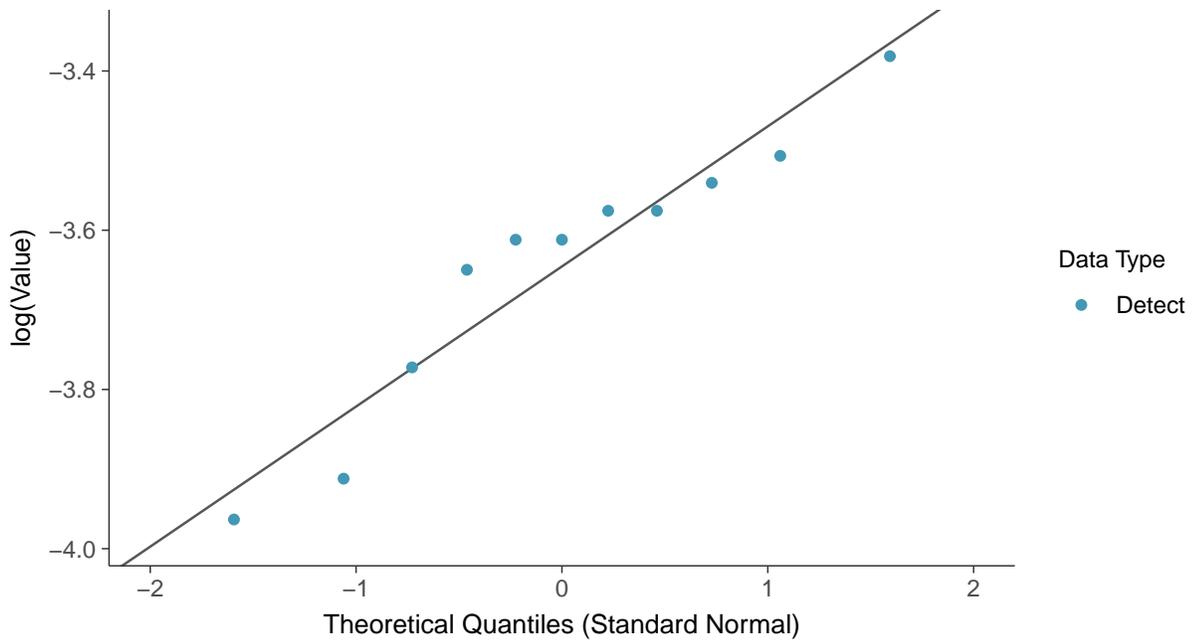
Normal Q-Q plot

Barium, MW-13 (mg/L)



Lognormal Q-Q plot

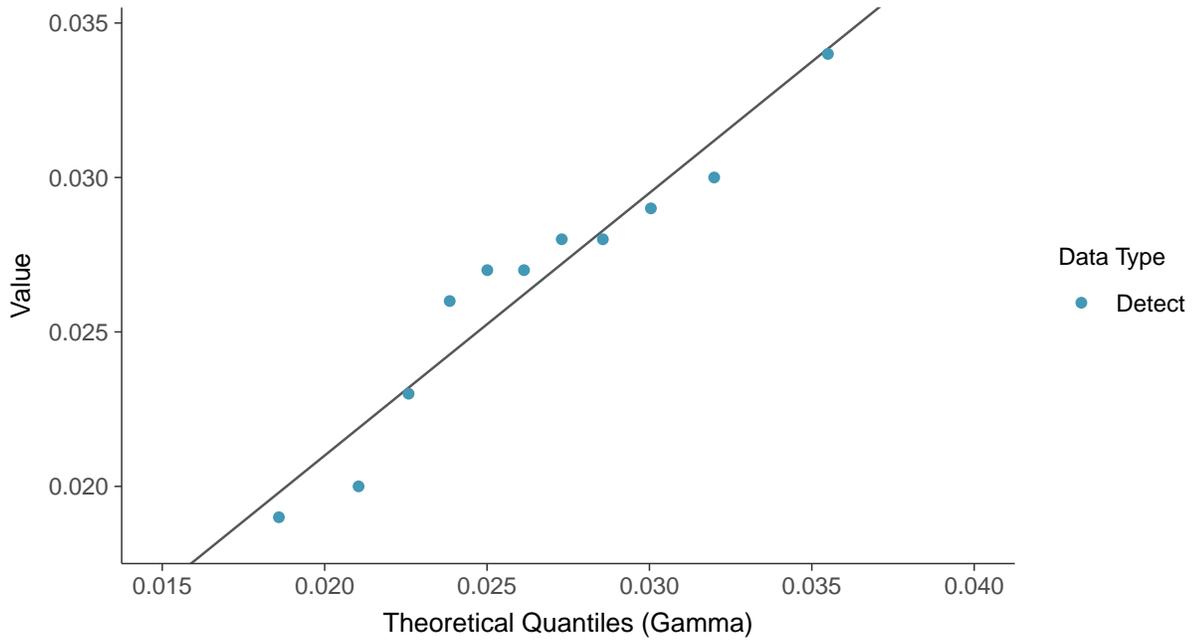
Barium, MW-13 (mg/L)





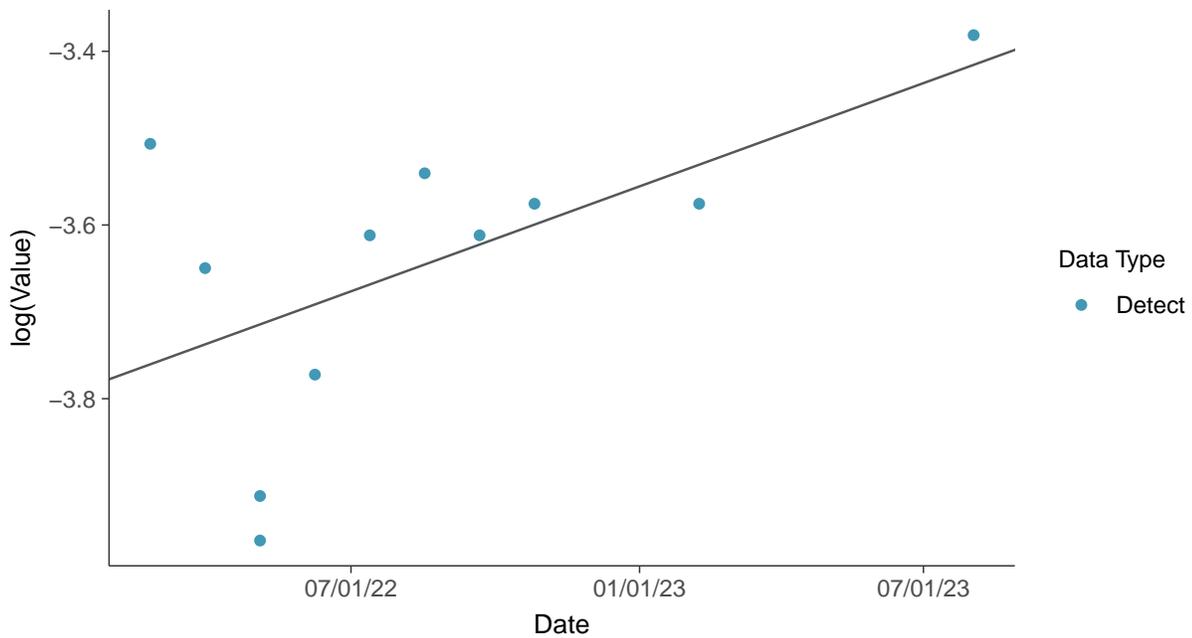
Gamma Q-Q plot

Barium, MW-13 (mg/L)



Trend Regression: Lognormal MLE

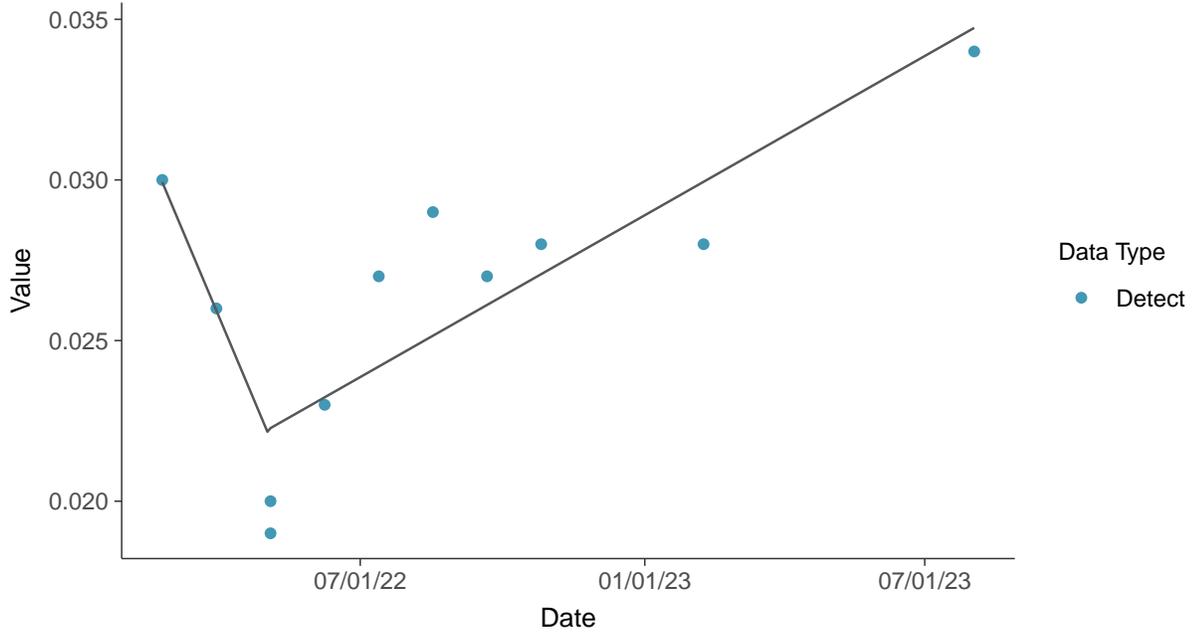
Barium, MW-13 (mg/L)





Trend Regression: Piecewise Linear-Linear

Barium, MW-13 (mg/L)



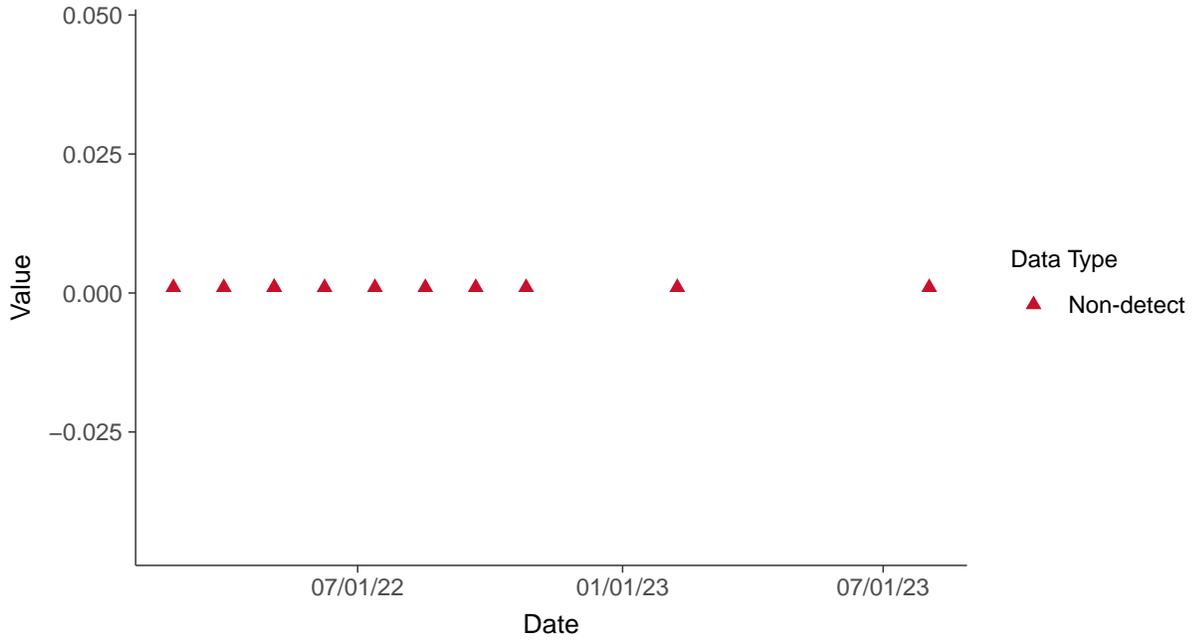


Appendix IV: Beryllium, MW-13

ID: 13_2_11

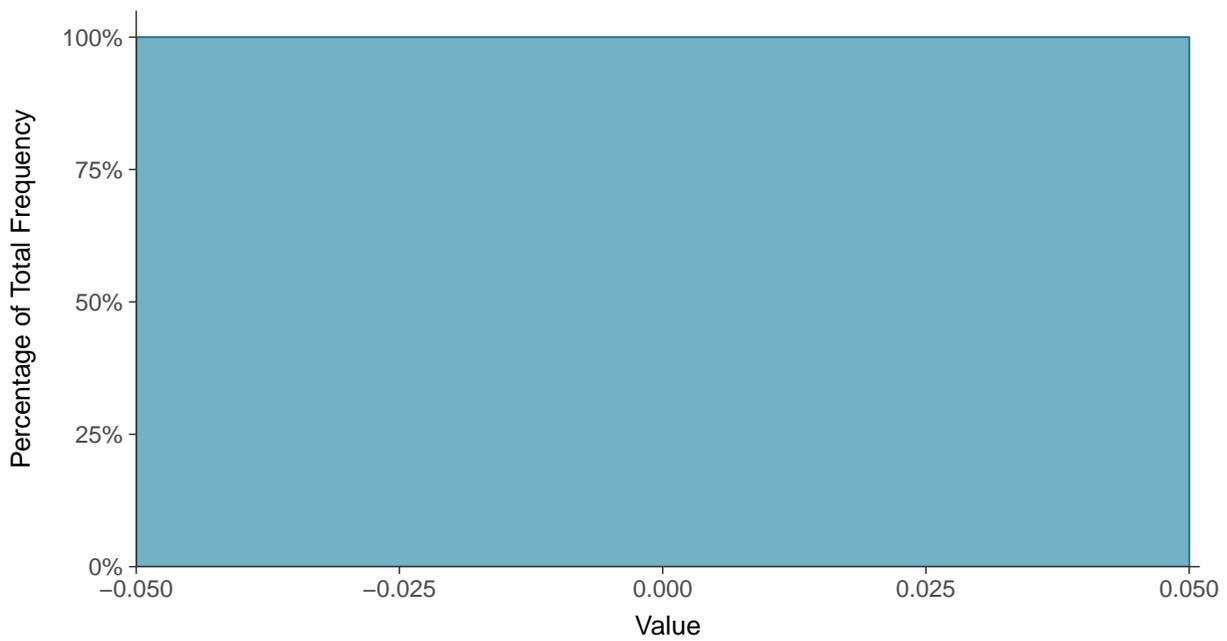
Scatter Plot

Beryllium, MW-13 (mg/L)



Histogram

Beryllium, MW-13 (mg/L)





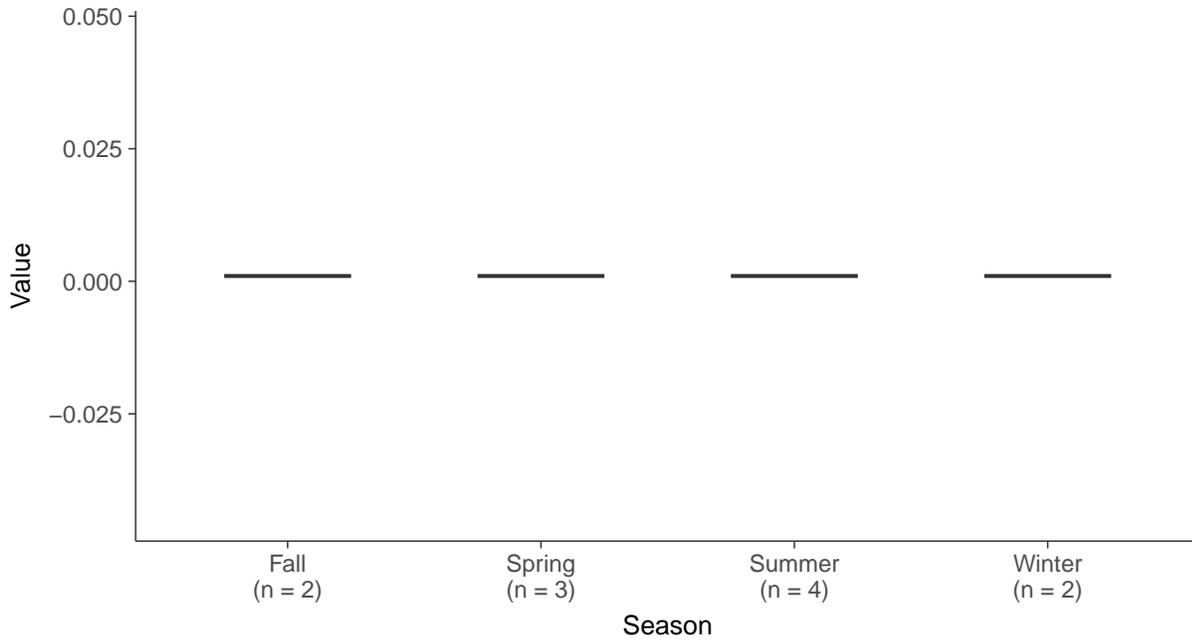
Boxplot

Beryllium, MW-13 (mg/L)



Boxplot by Season

Beryllium, MW-13 (mg/L)



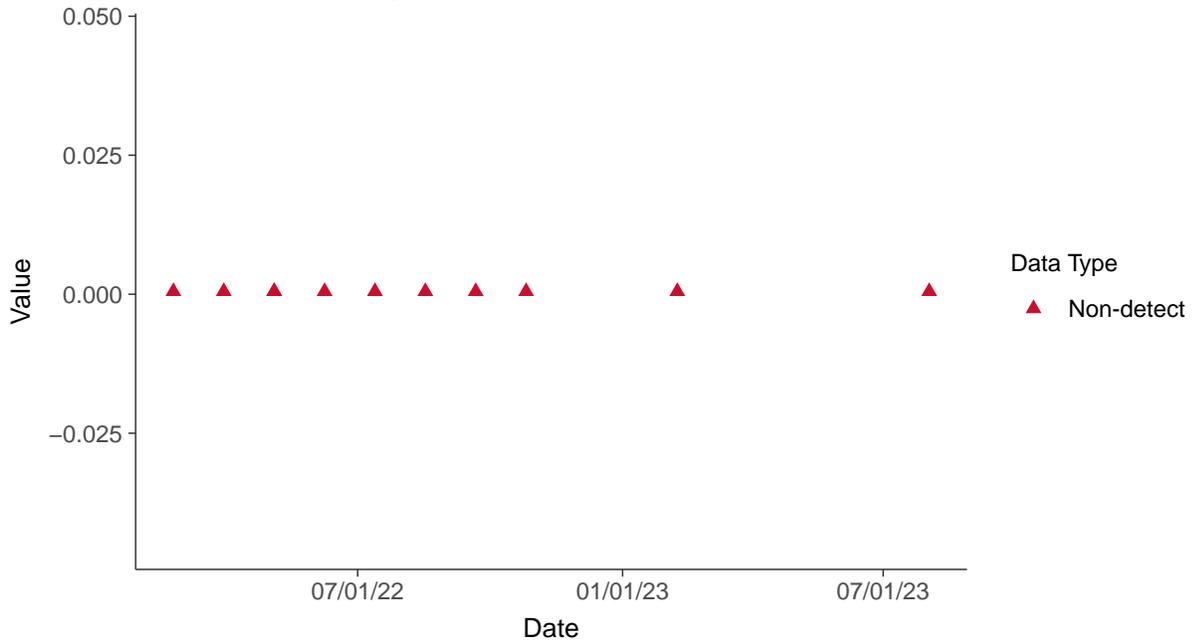


Appendix IV: Cadmium, MW-13

ID: 13_2_12

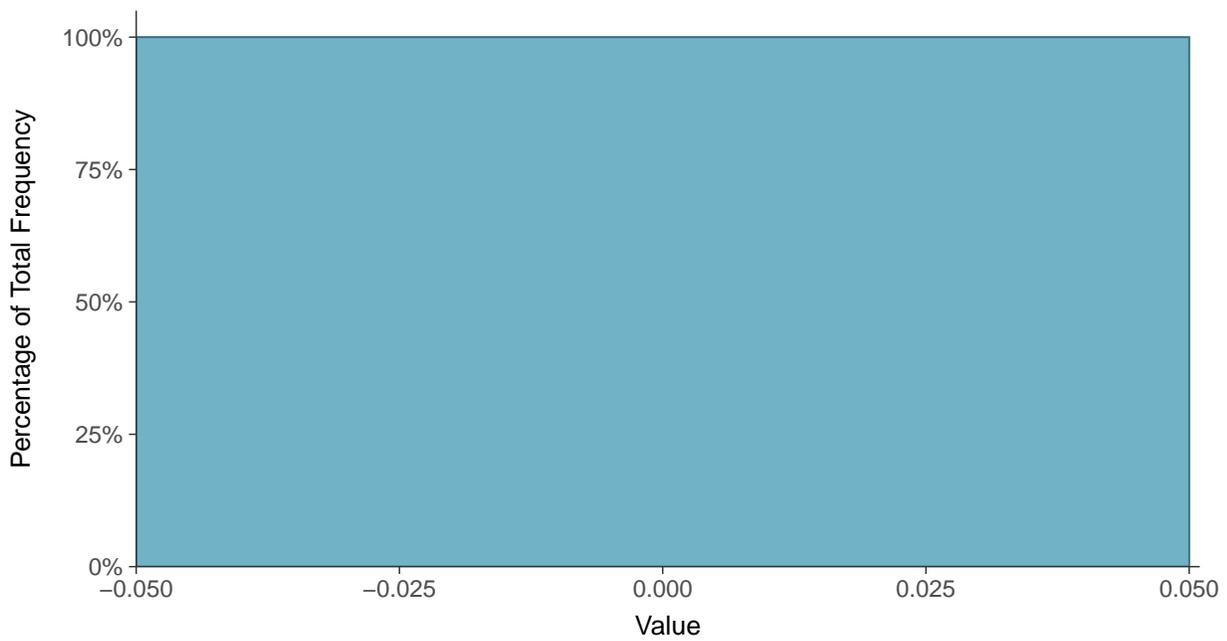
Scatter Plot

Cadmium, MW-13 (mg/L)



Histogram

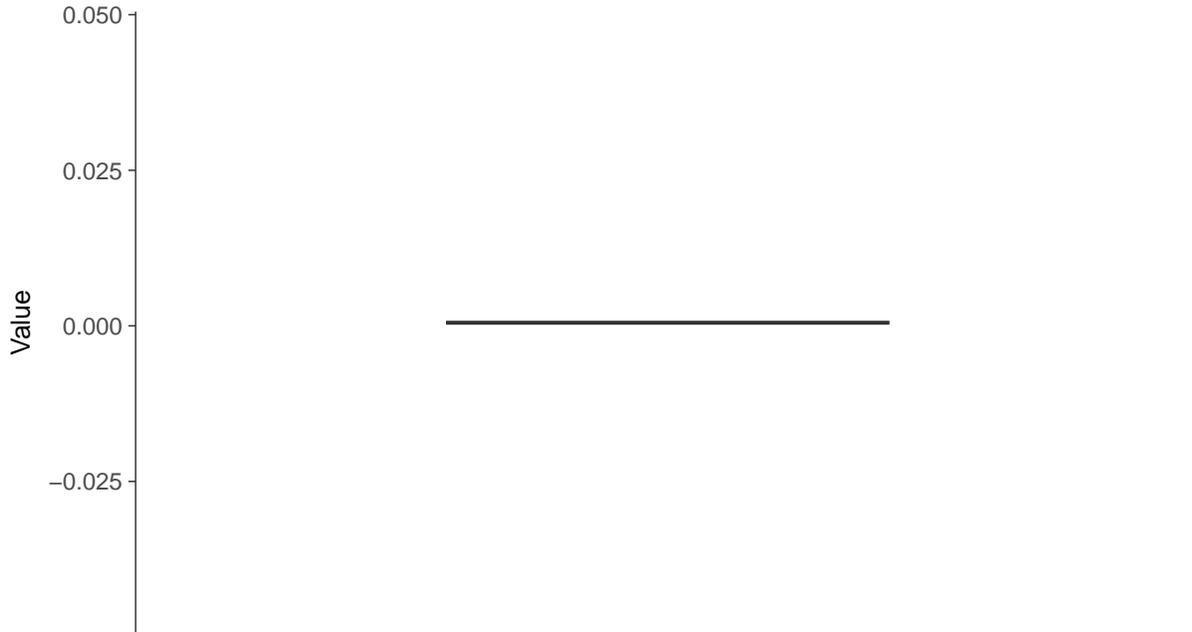
Cadmium, MW-13 (mg/L)





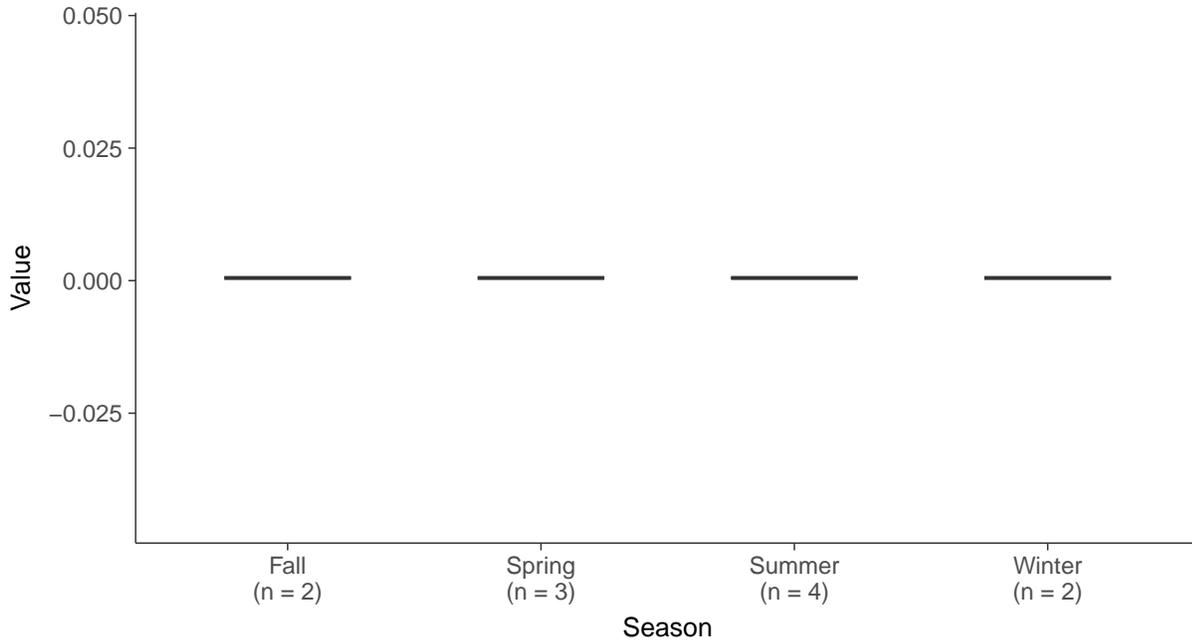
Boxplot

Cadmium, MW-13 (mg/L)



Boxplot by Season

Cadmium, MW-13 (mg/L)



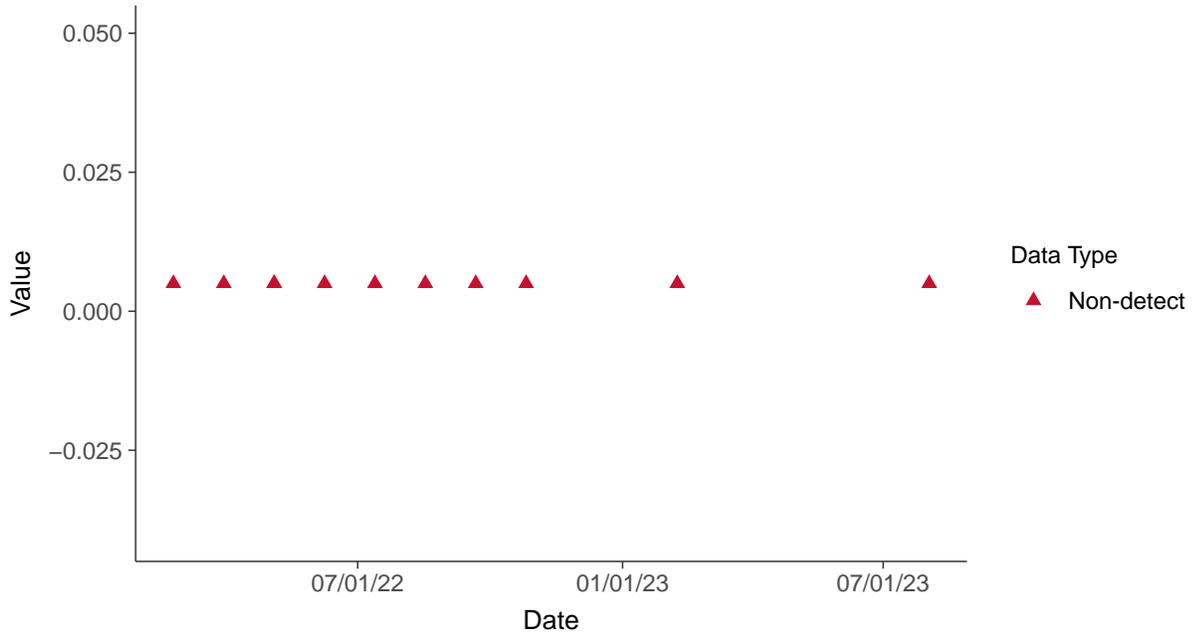


Appendix IV: Chromium, MW-13

ID: 13_2_13

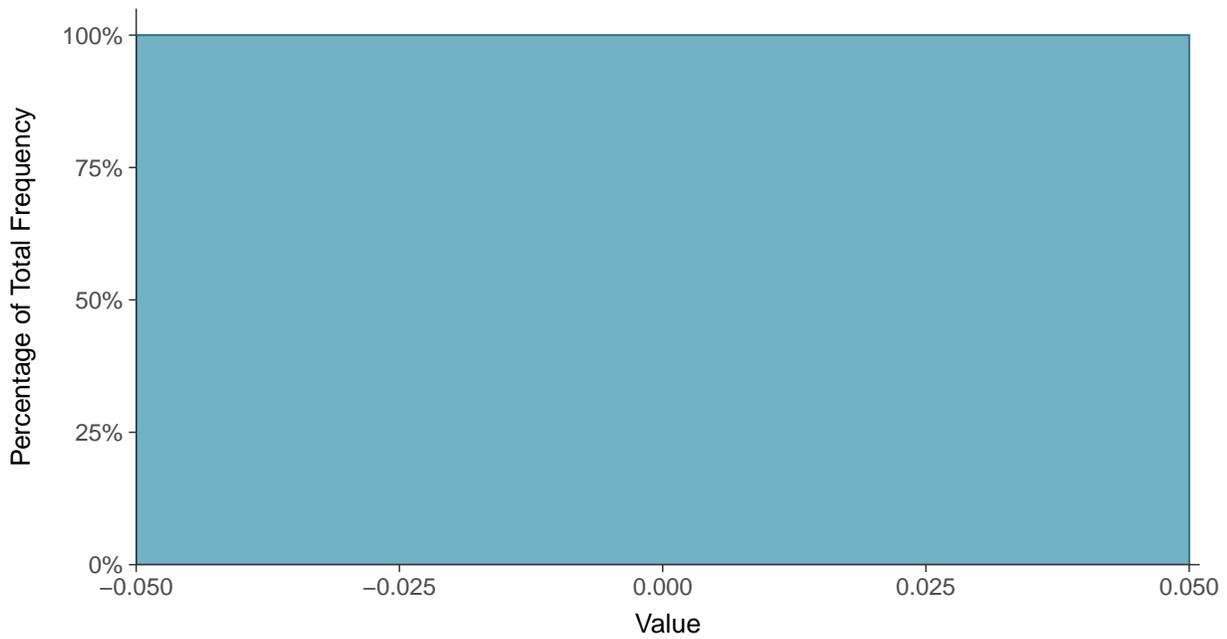
Scatter Plot

Chromium, MW-13 (mg/L)



Histogram

Chromium, MW-13 (mg/L)





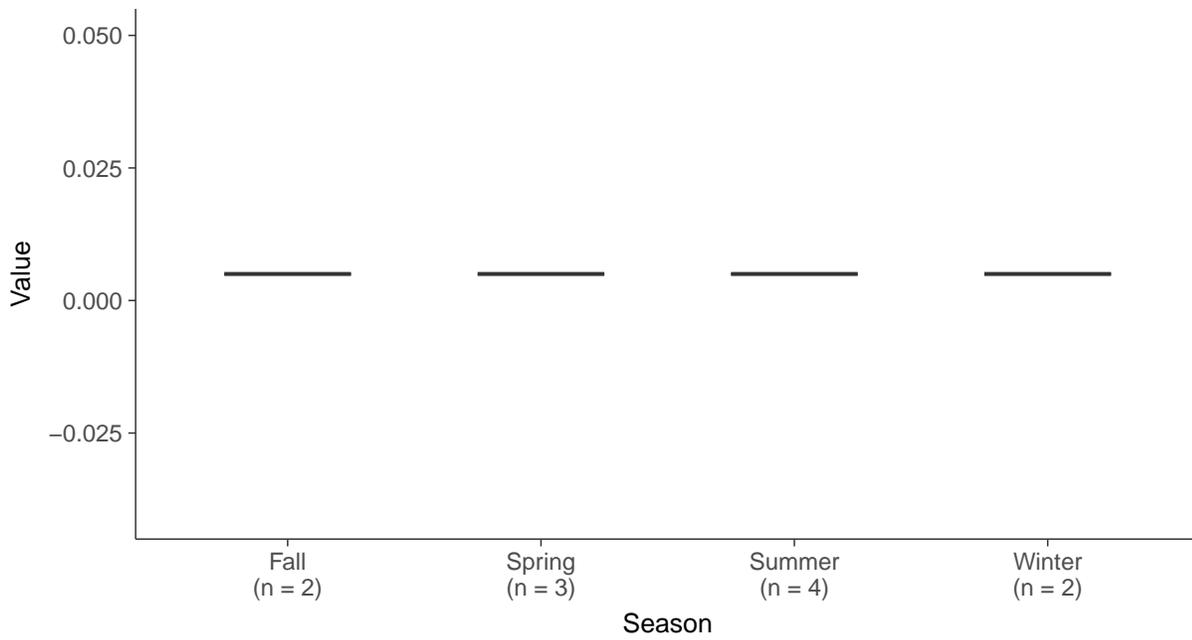
Boxplot

Chromium, MW-13 (mg/L)



Boxplot by Season

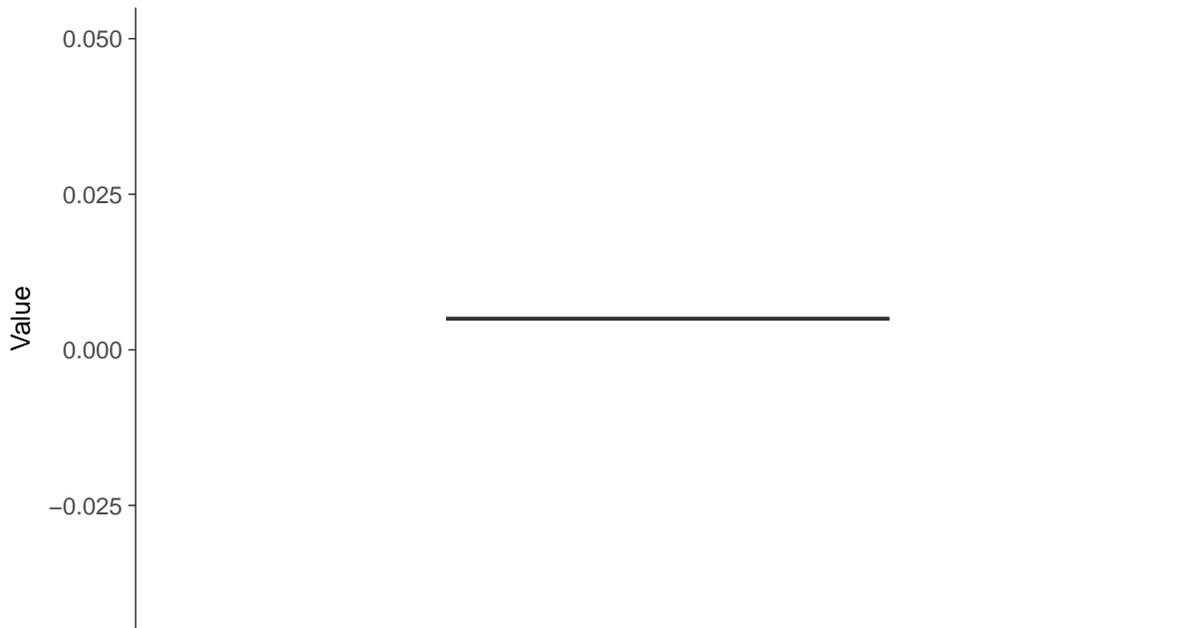
Chromium, MW-13 (mg/L)





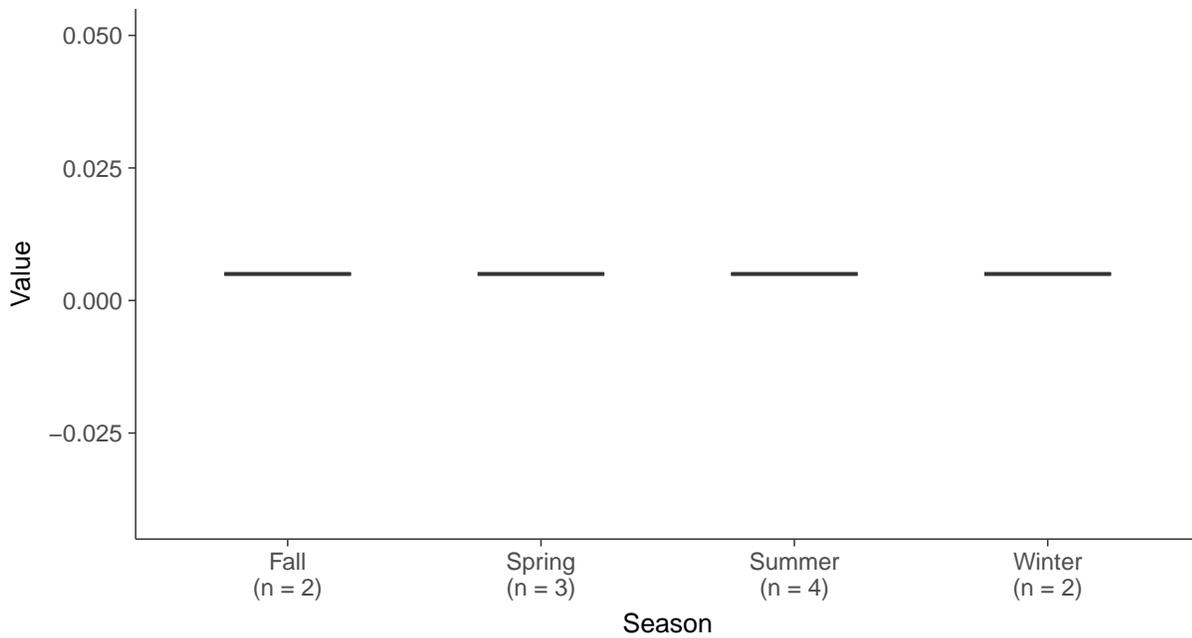
Boxplot

Cobalt, MW-13 (mg/L)



Boxplot by Season

Cobalt, MW-13 (mg/L)



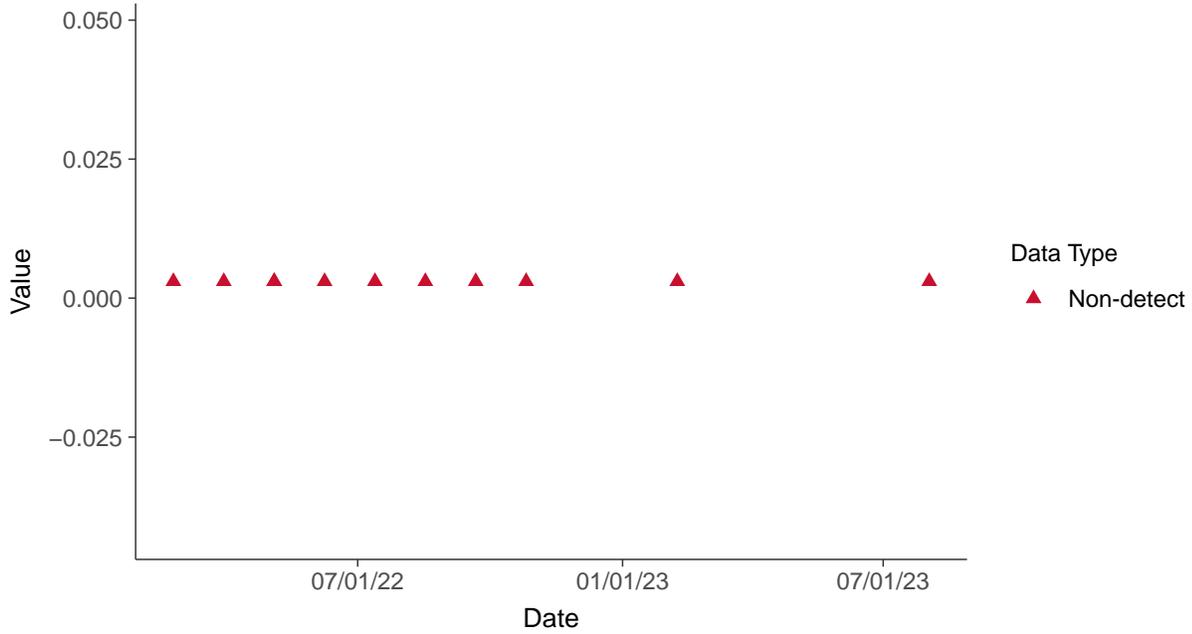


Appendix IV: Lead, MW-13

ID: 13_2_15

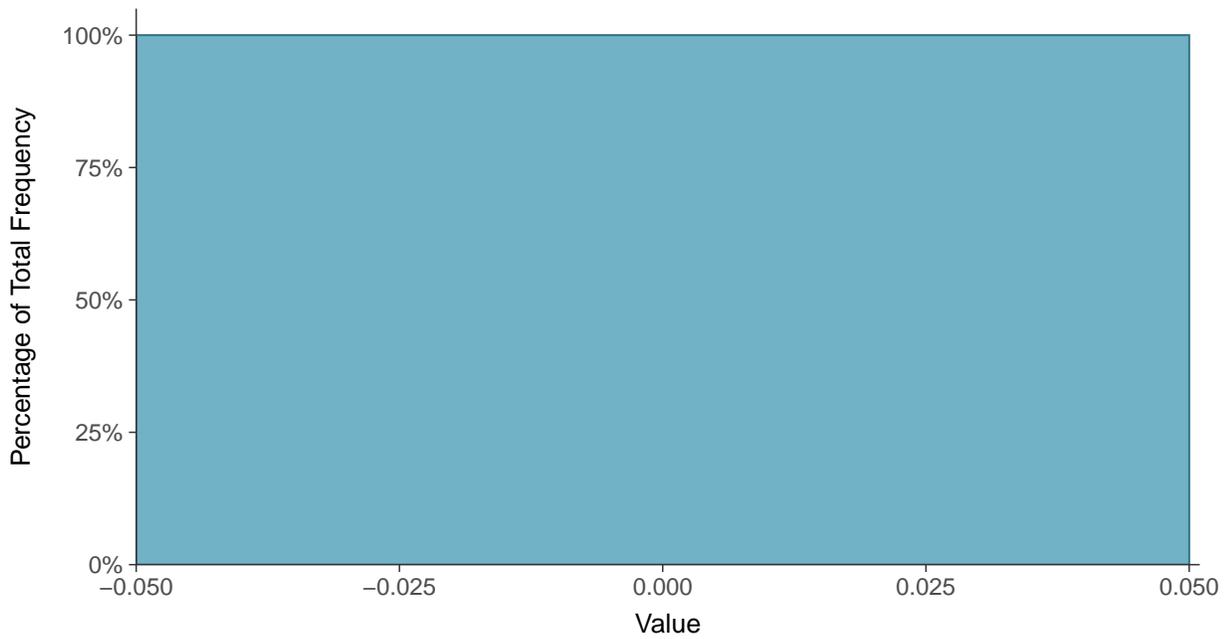
Scatter Plot

Lead, MW-13 (mg/L)



Histogram

Lead, MW-13 (mg/L)





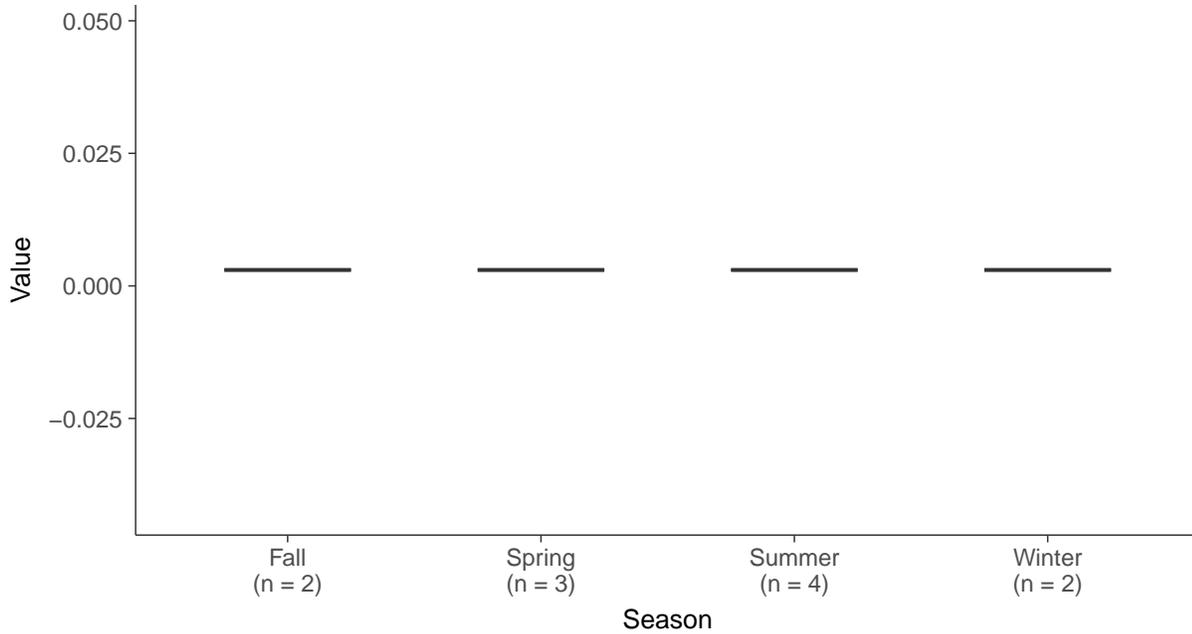
Boxplot

Lead, MW-13 (mg/L)



Boxplot by Season

Lead, MW-13 (mg/L)





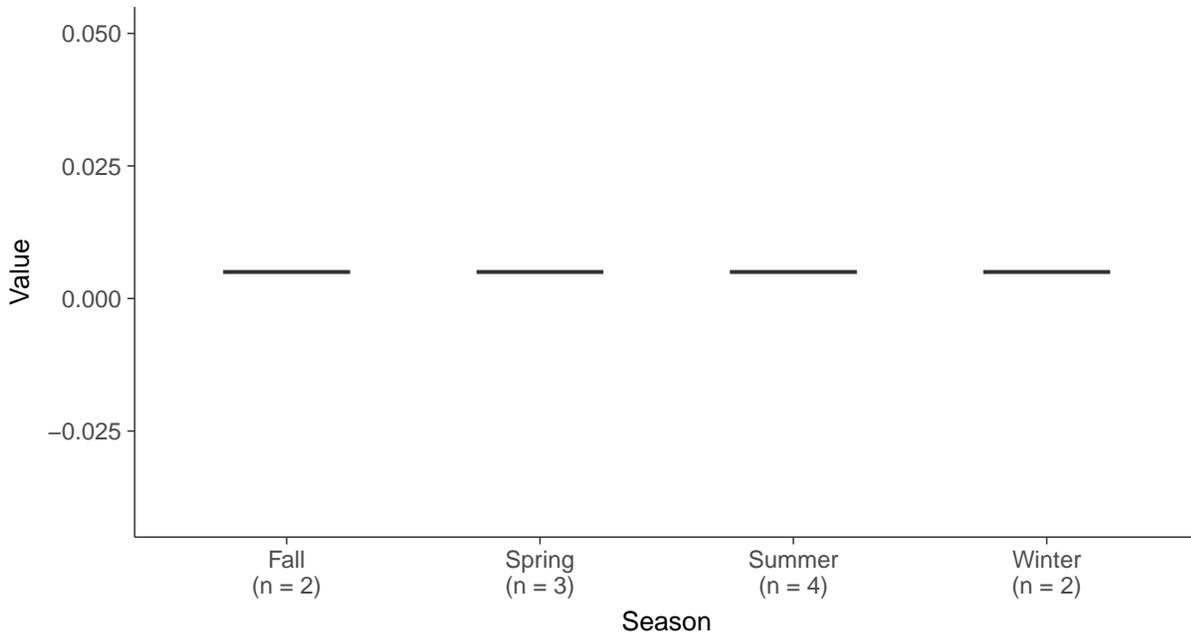
Boxplot

Lithium, MW-13 (mg/L)



Boxplot by Season

Lithium, MW-13 (mg/L)



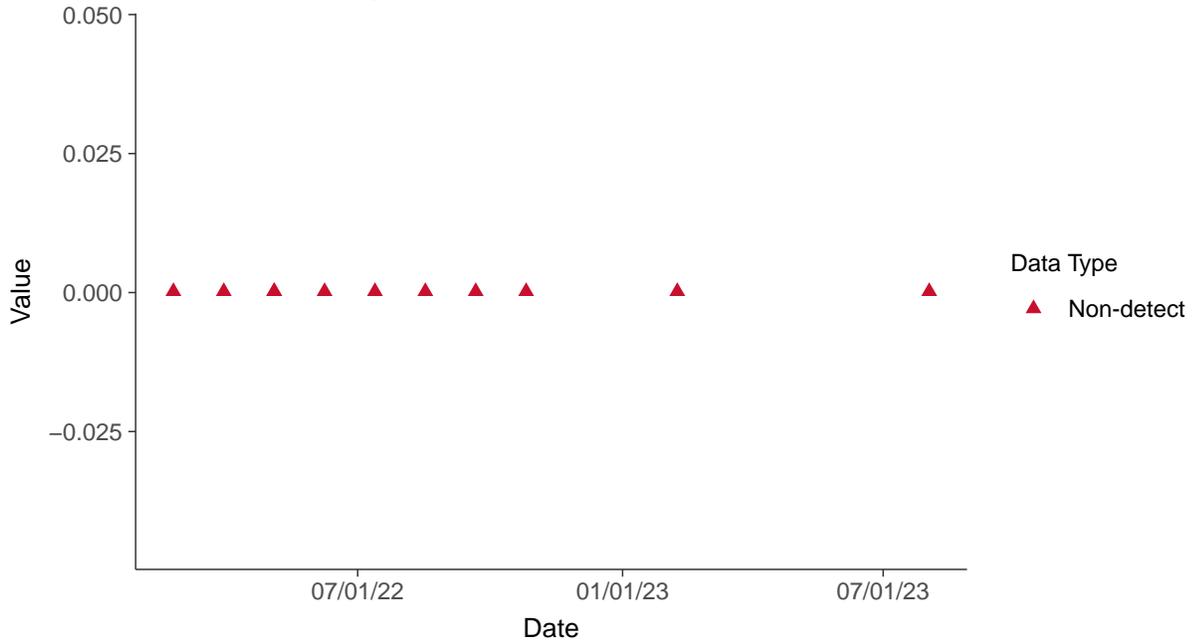


Appendix IV: Mercury, MW-13

ID: 13_2_17

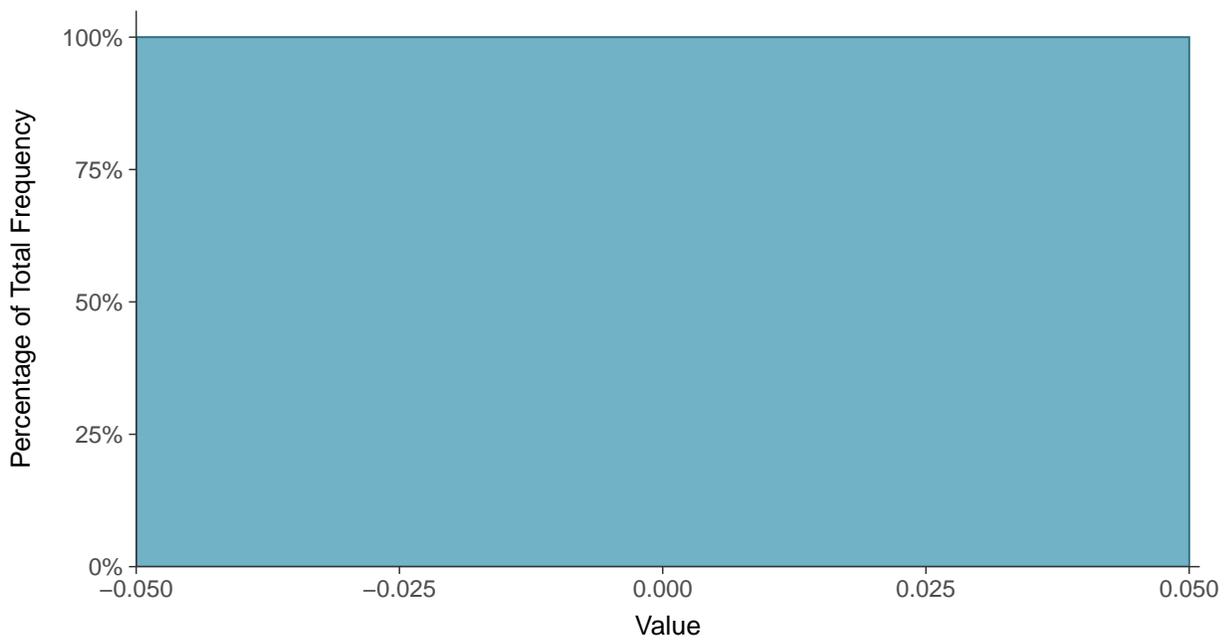
Scatter Plot

Mercury, MW-13 (mg/L)



Histogram

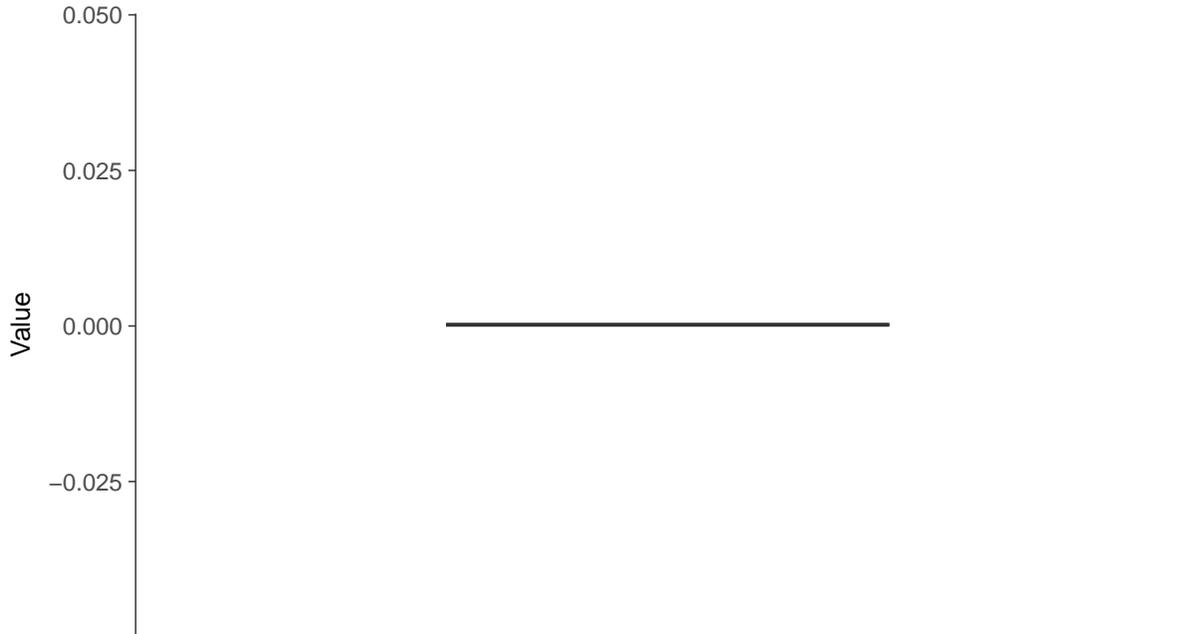
Mercury, MW-13 (mg/L)





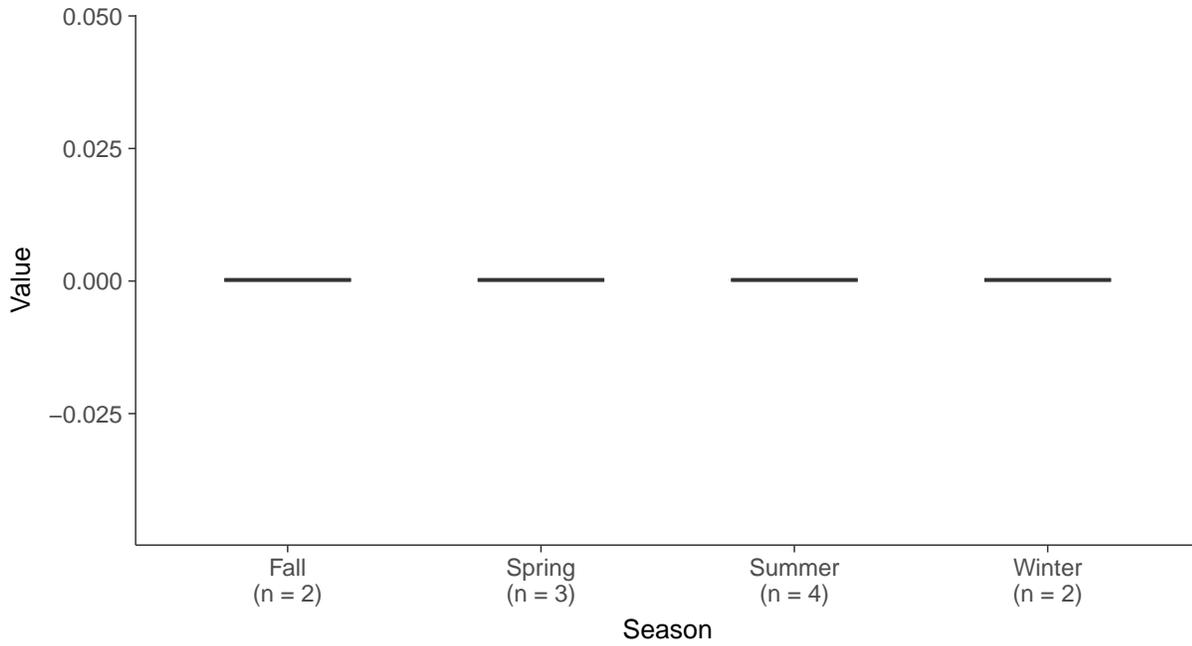
Boxplot

Mercury, MW-13 (mg/L)



Boxplot by Season

Mercury, MW-13 (mg/L)



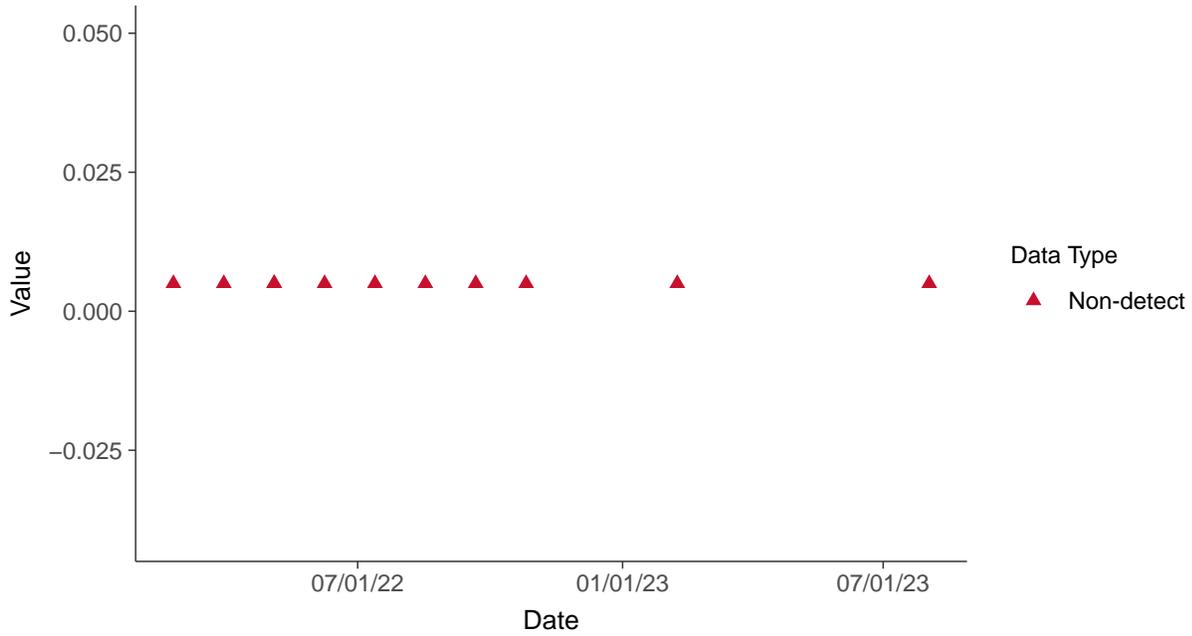


Appendix IV: Molybdenum, MW-13

ID: 13_2_18

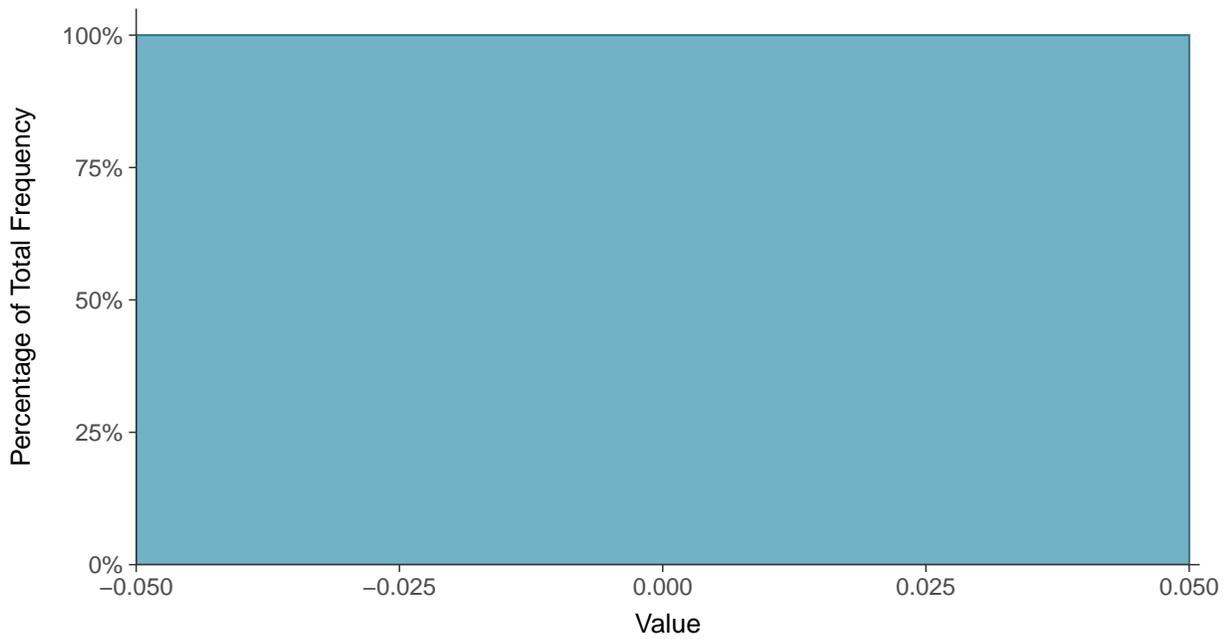
Scatter Plot

Molybdenum, MW-13 (mg/L)



Histogram

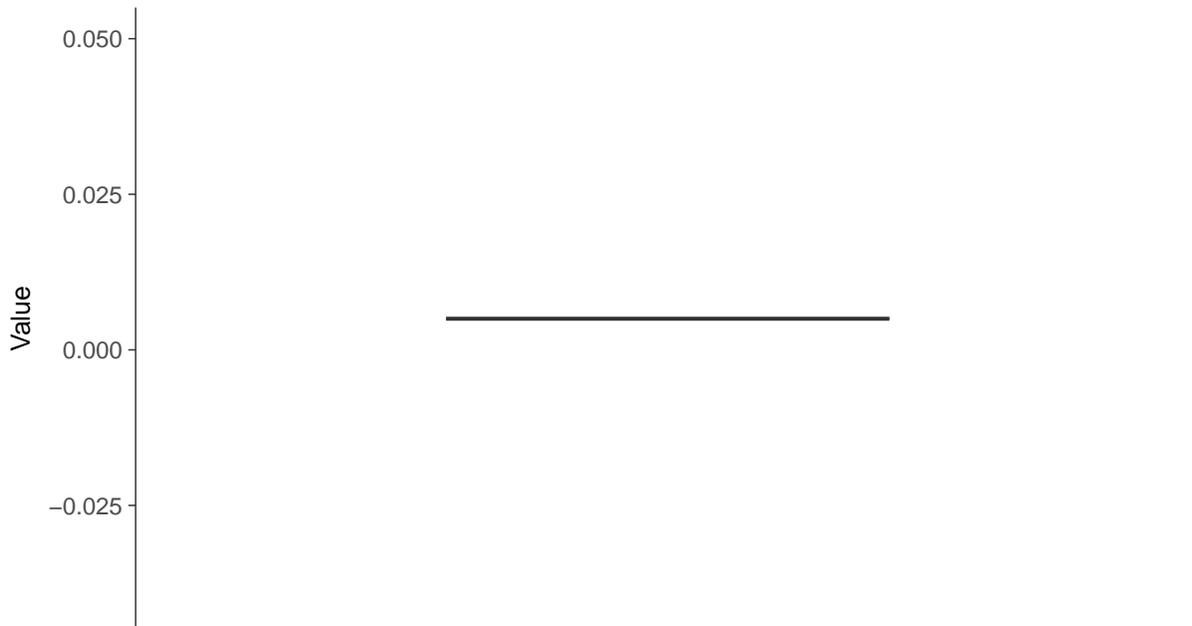
Molybdenum, MW-13 (mg/L)





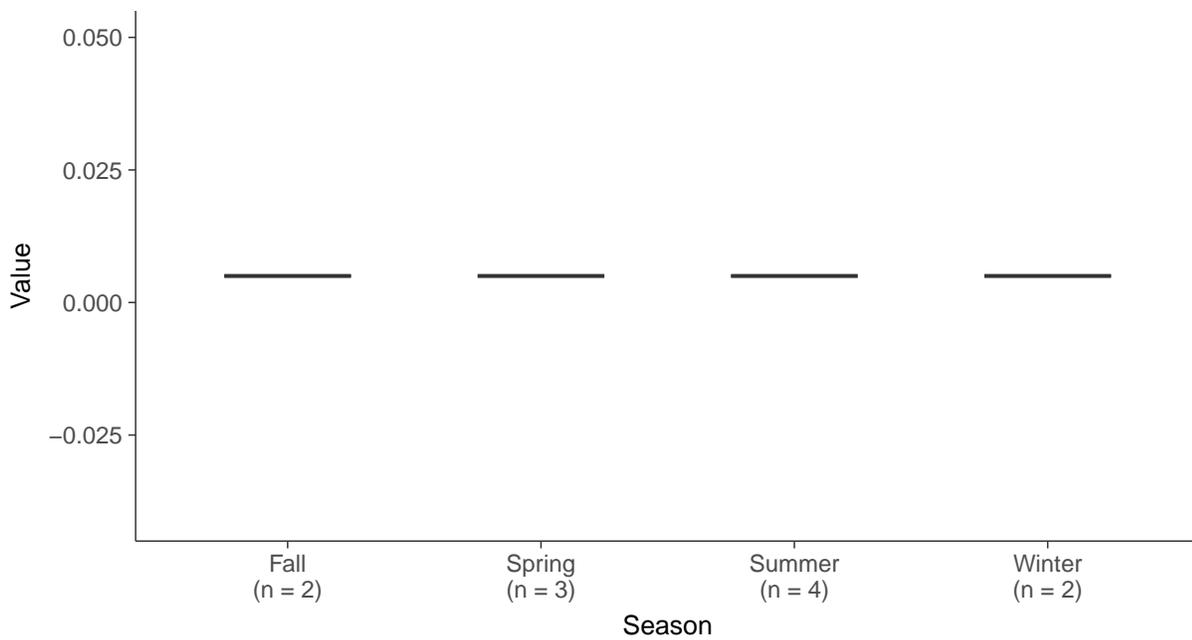
Boxplot

Molybdenum, MW-13 (mg/L)



Boxplot by Season

Molybdenum, MW-13 (mg/L)



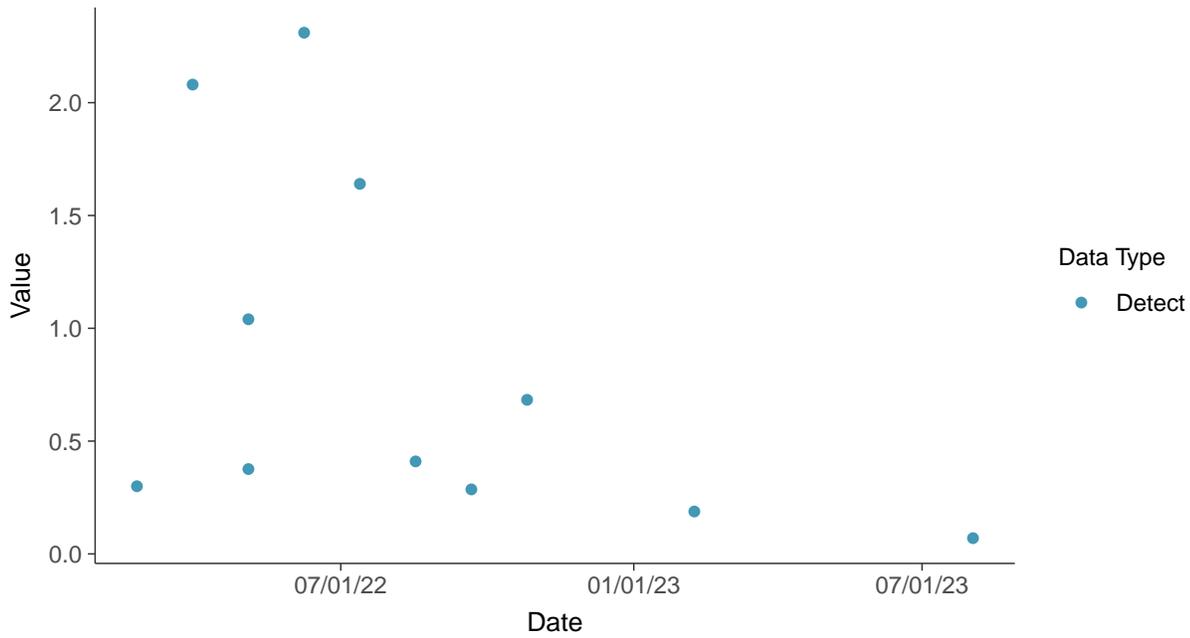


Appendix IV: Radium-226/228, MW-13

ID: 13_2_20

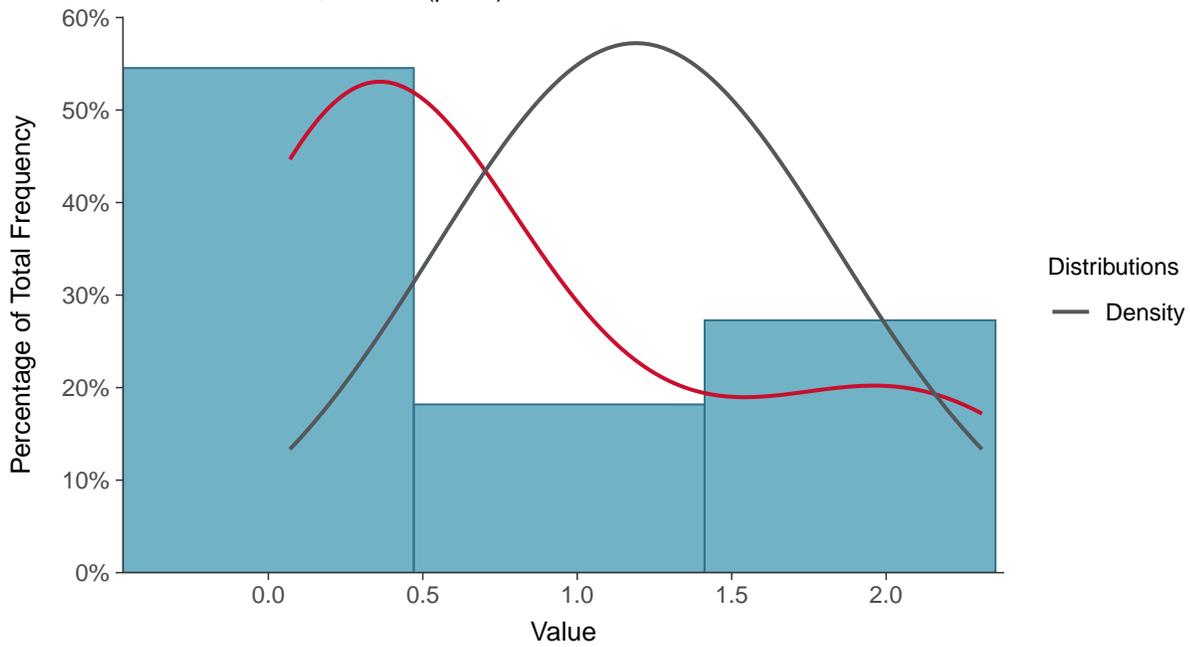
Scatter Plot

Radium-226/228, MW-13 (pCi/L)



Histogram

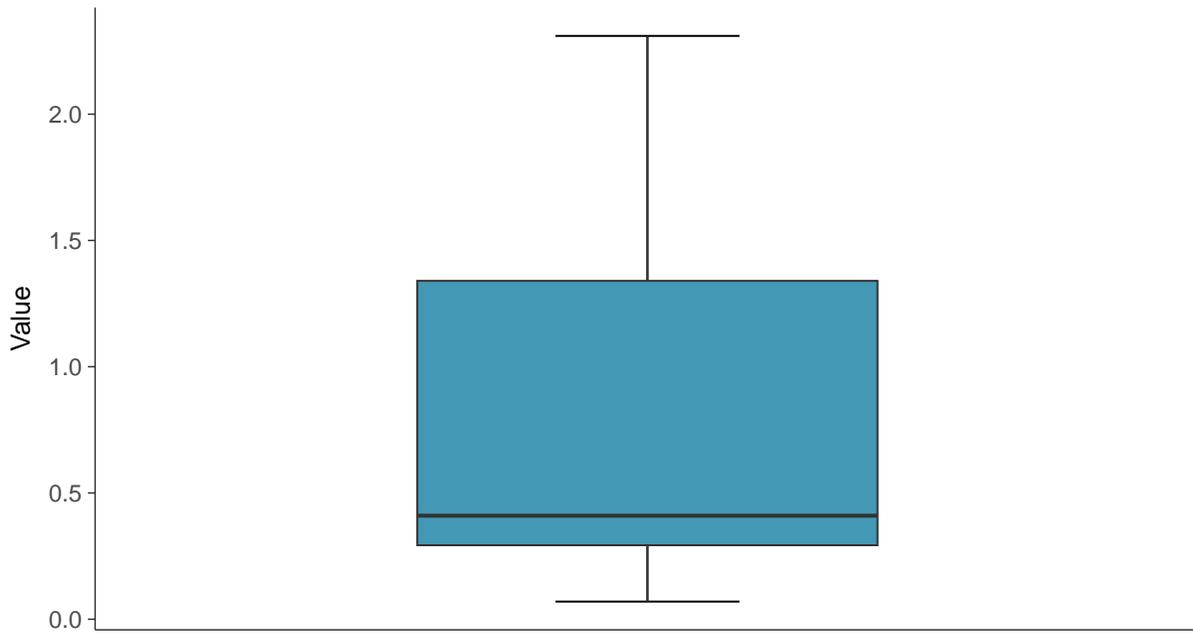
Radium-226/228, MW-13 (pCi/L)





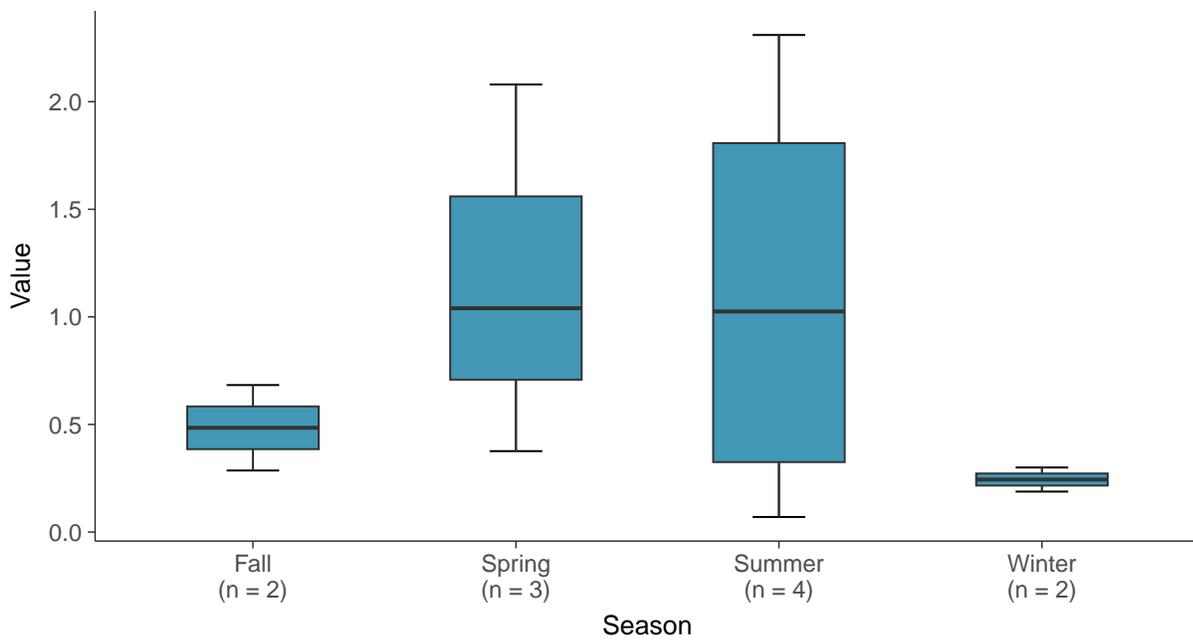
Boxplot

Radium-226/228, MW-13 (pCi/L)



Boxplot by Season

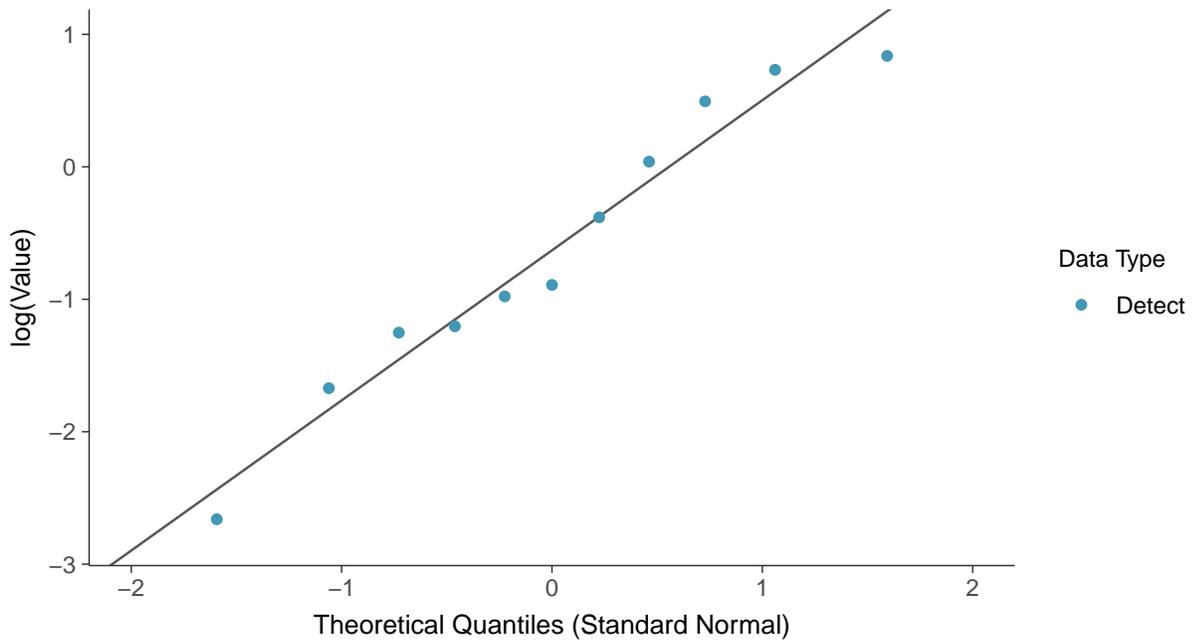
Radium-226/228, MW-13 (pCi/L)





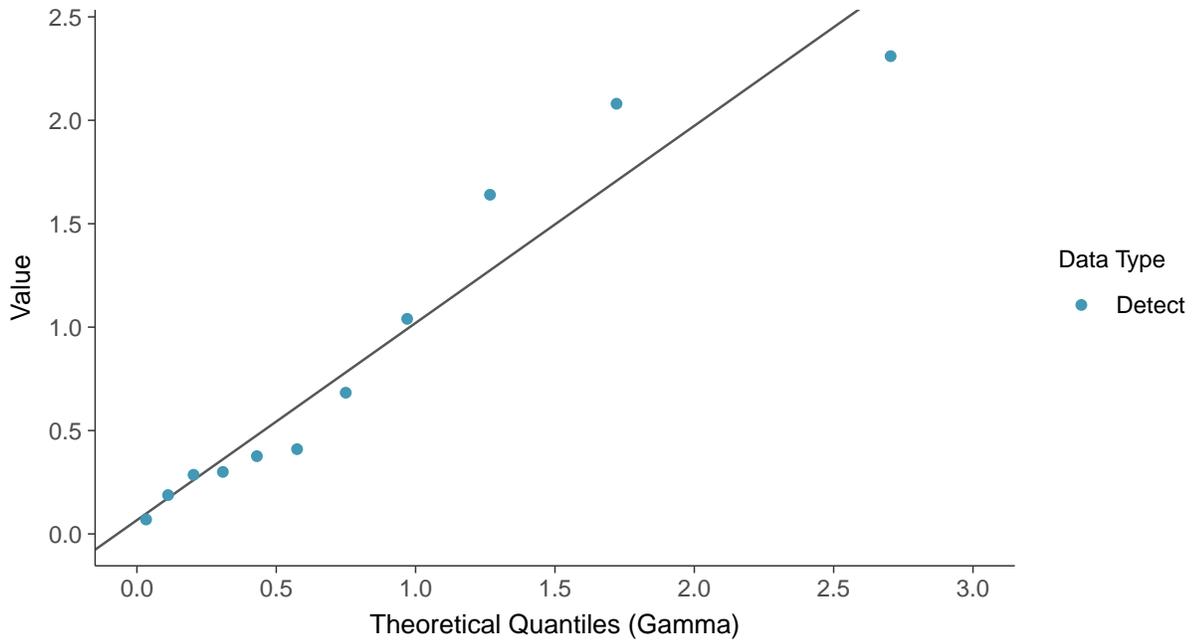
Lognormal Q-Q plot

Radium-226/228, MW-13 (pCi/L)



Gamma Q-Q plot

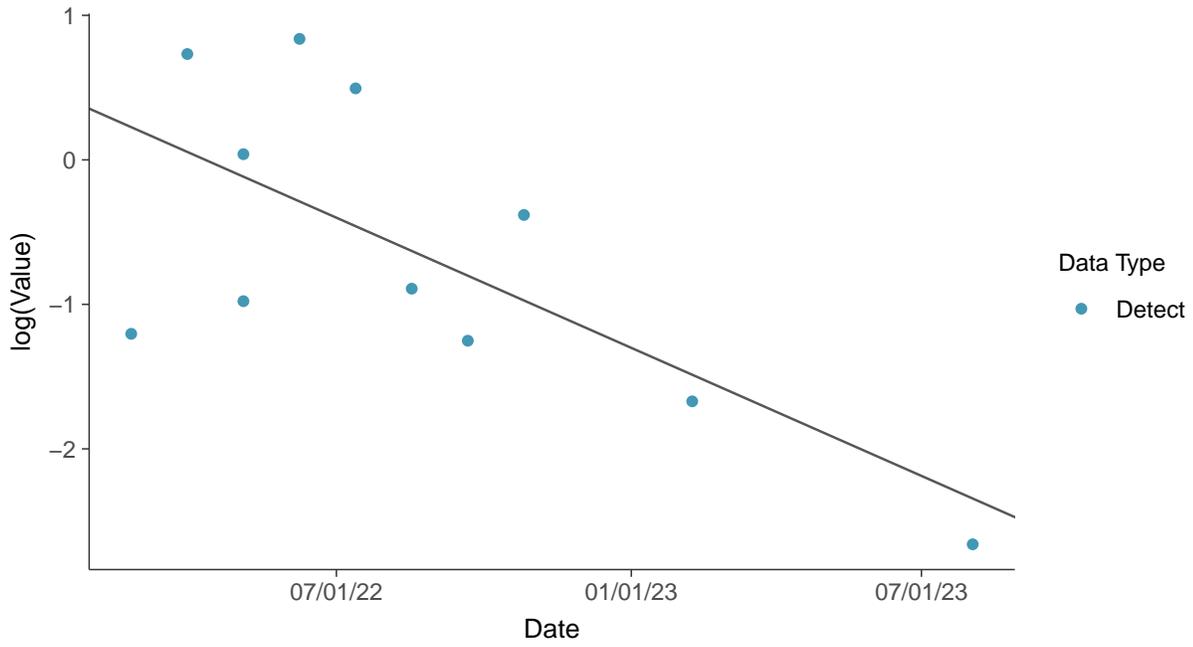
Radium-226/228, MW-13 (pCi/L)





Trend Regression: Lognormal MLE

Radium-226/228, MW-13 (pCi/L)



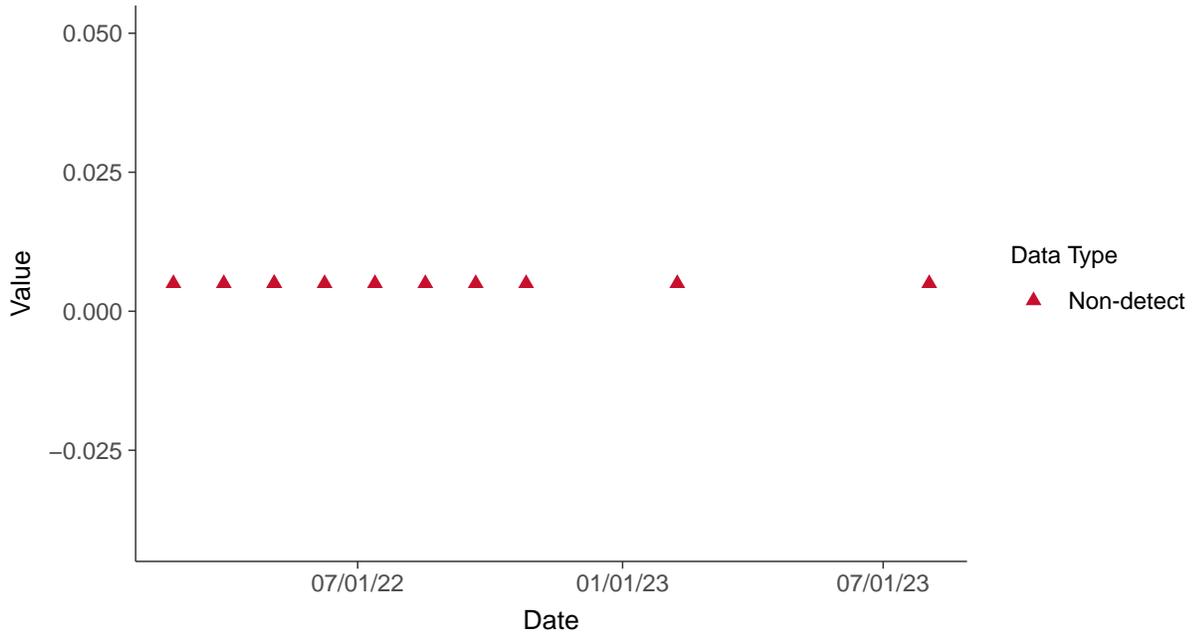


Appendix IV: Selenium, MW-13

ID: 13_2_22

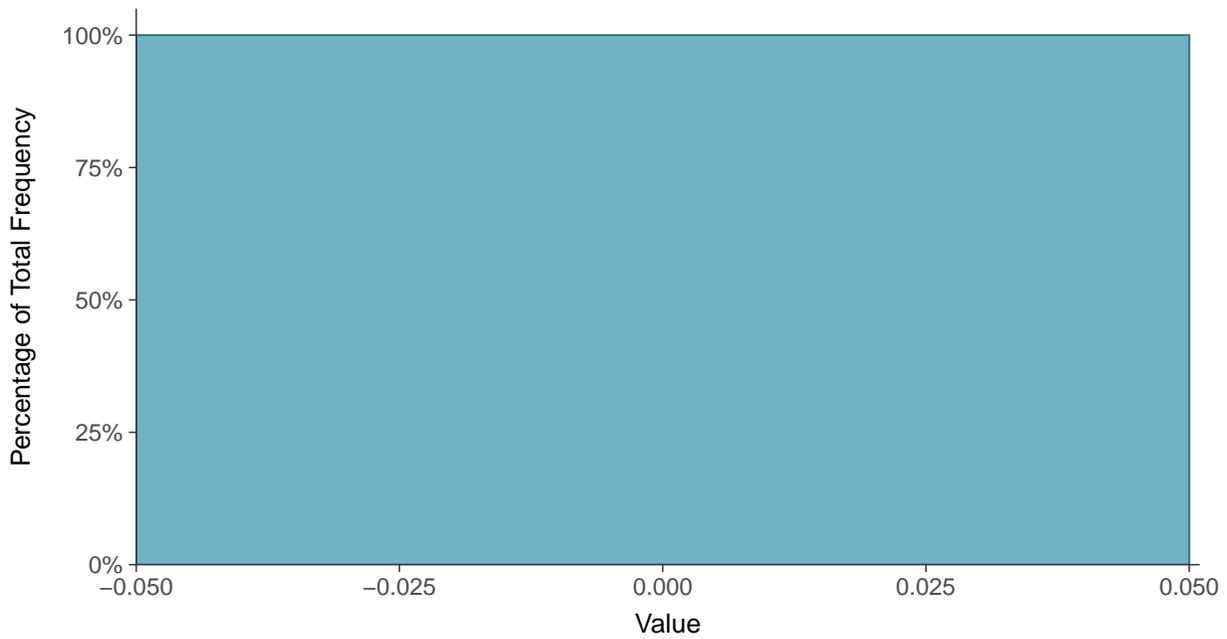
Scatter Plot

Selenium, MW-13 (mg/L)



Histogram

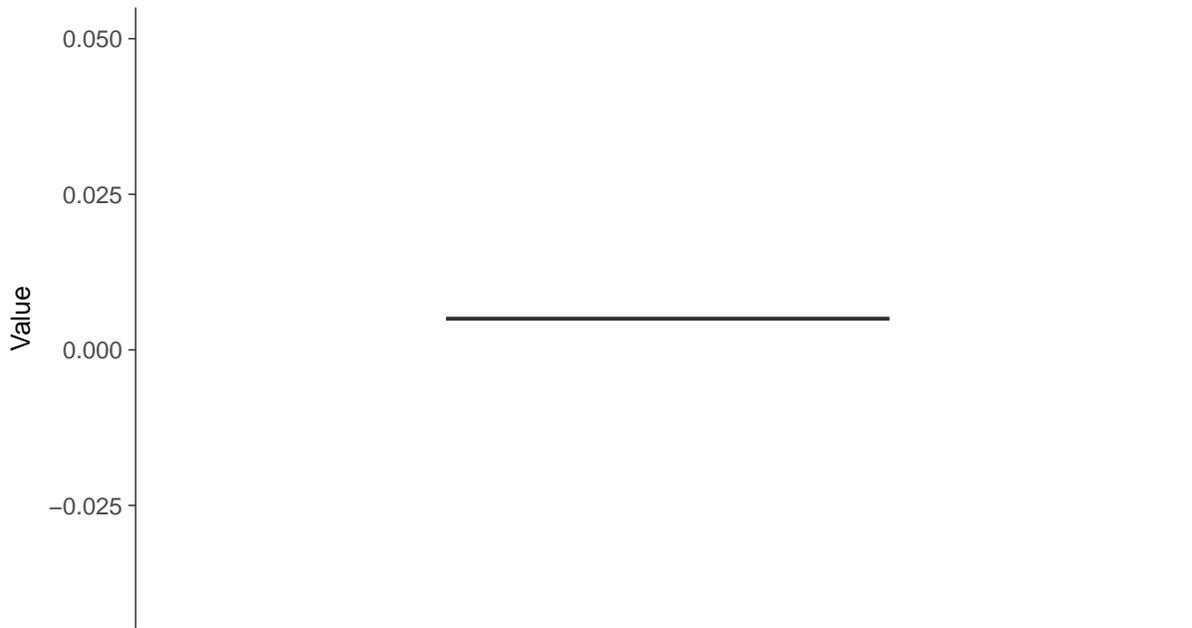
Selenium, MW-13 (mg/L)





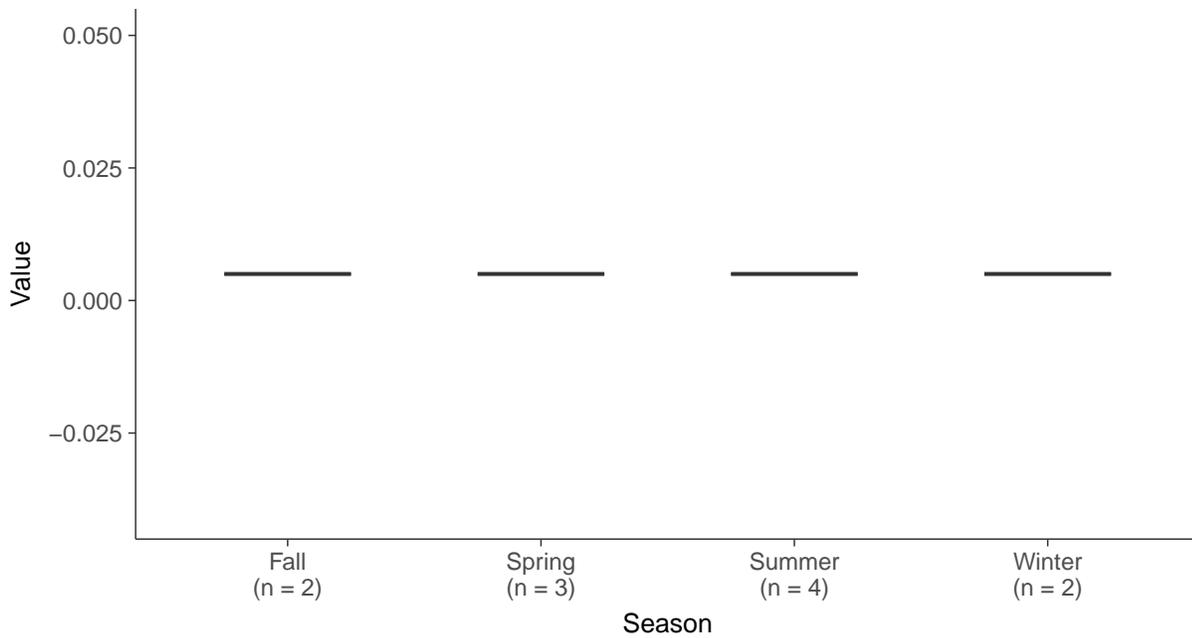
Boxplot

Selenium, MW-13 (mg/L)



Boxplot by Season

Selenium, MW-13 (mg/L)



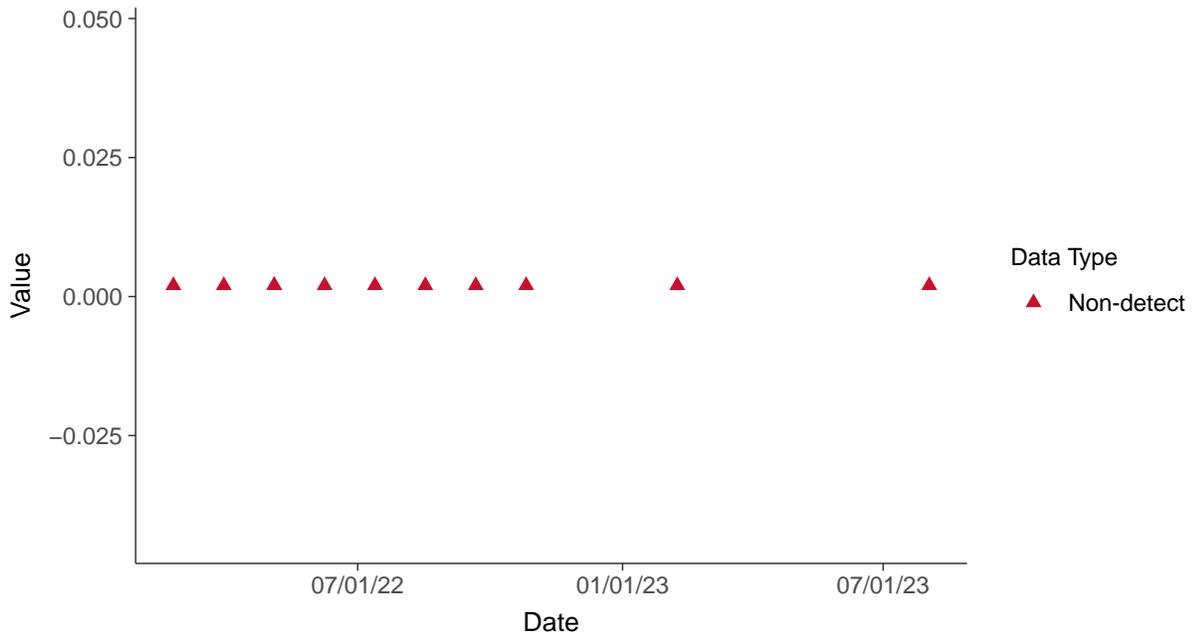


Appendix IV: Thallium, MW-13

ID: 13_2_23

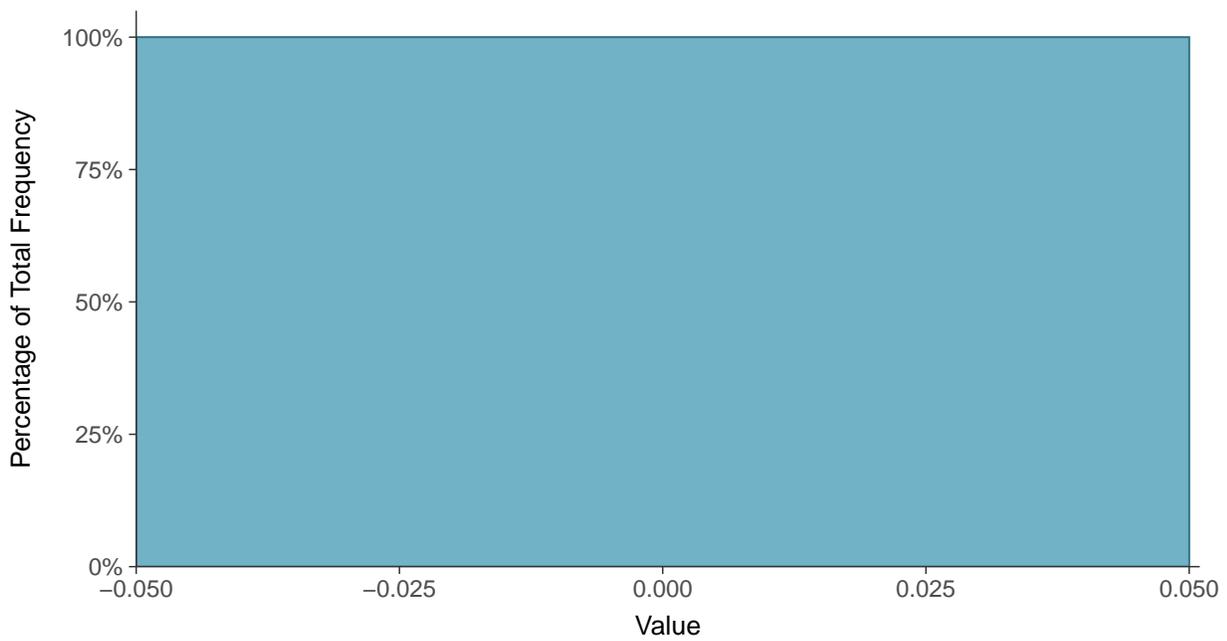
Scatter Plot

Thallium, MW-13 (mg/L)



Histogram

Thallium, MW-13 (mg/L)





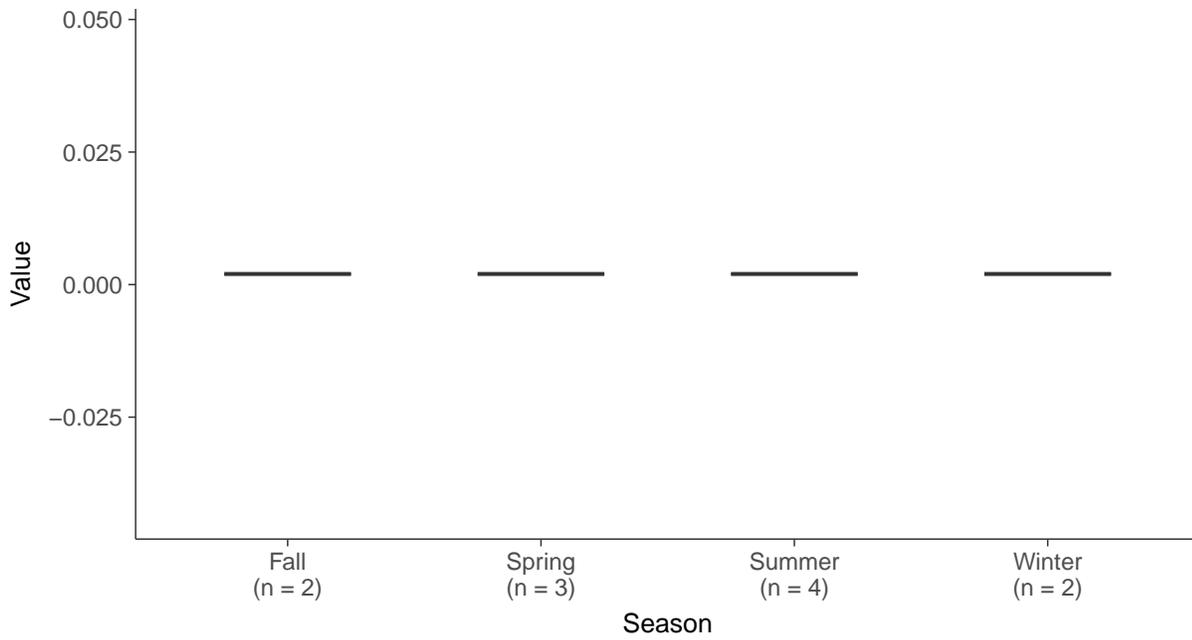
Boxplot

Thallium, MW-13 (mg/L)



Boxplot by Season

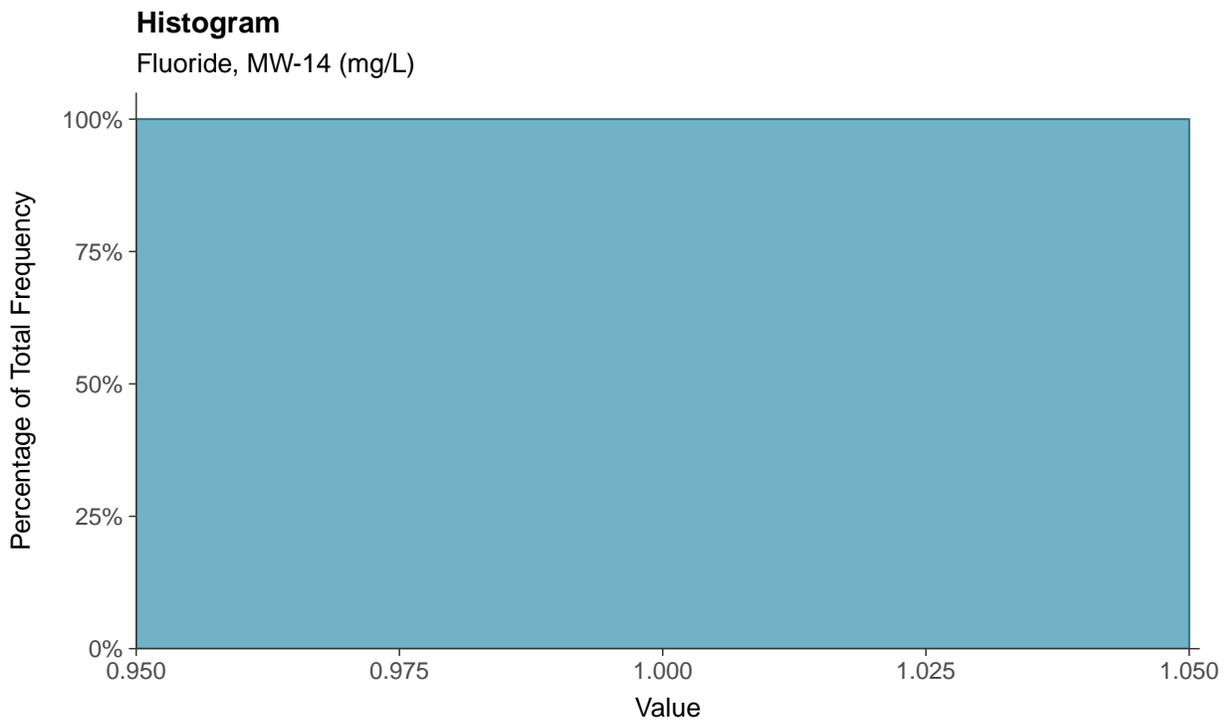
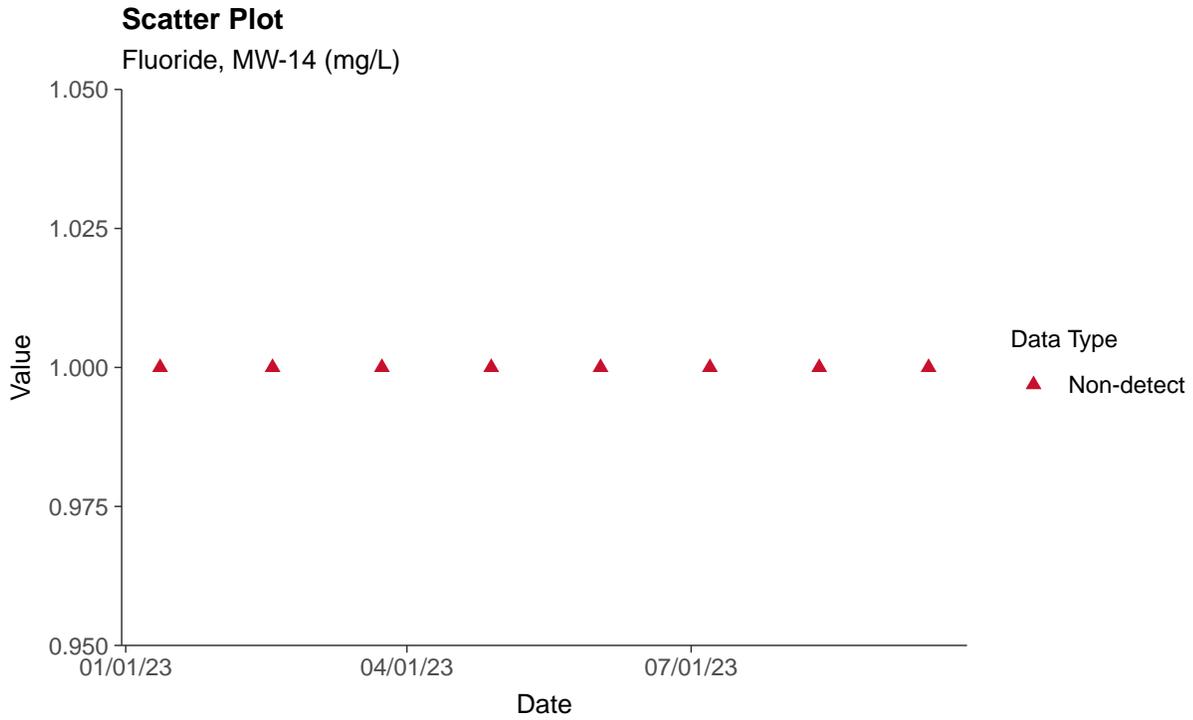
Thallium, MW-13 (mg/L)





Appendix IV: Fluoride, MW-14

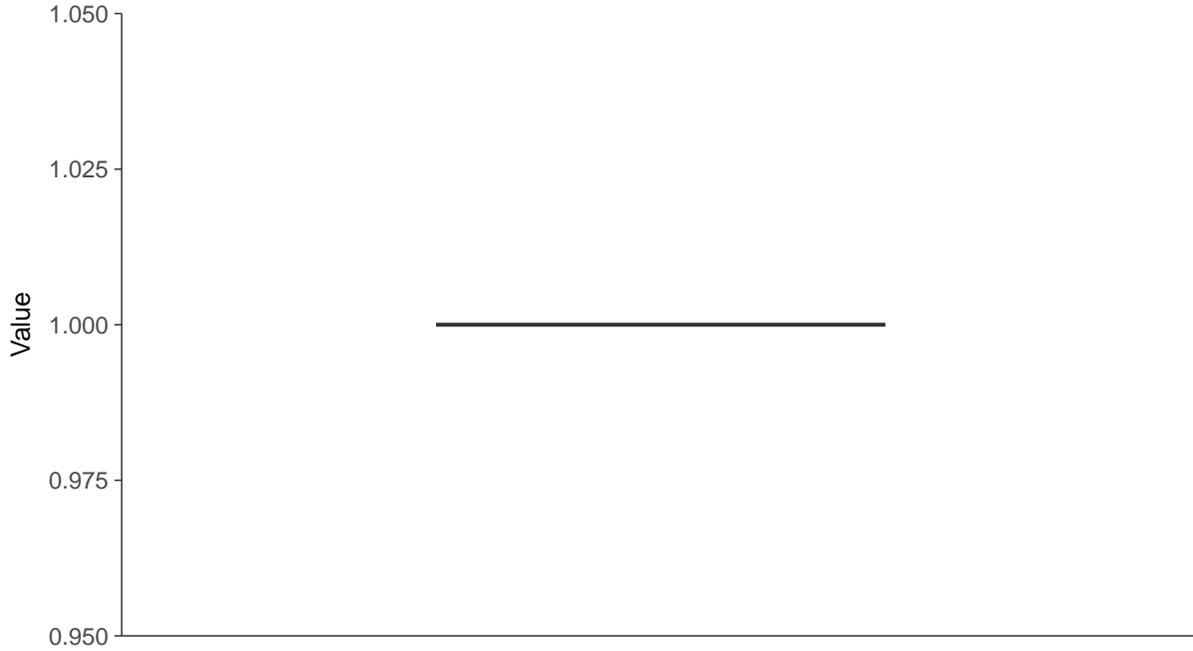
ID: 14_2_04





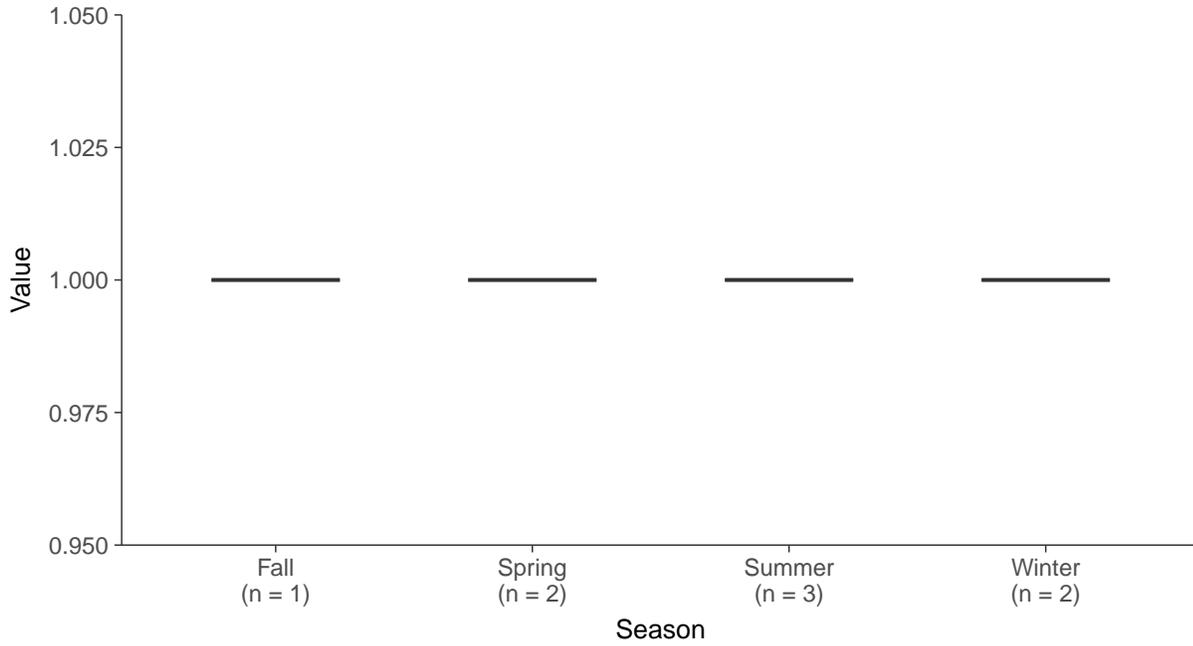
Boxplot

Fluoride, MW-14 (mg/L)



Boxplot by Season

Fluoride, MW-14 (mg/L)



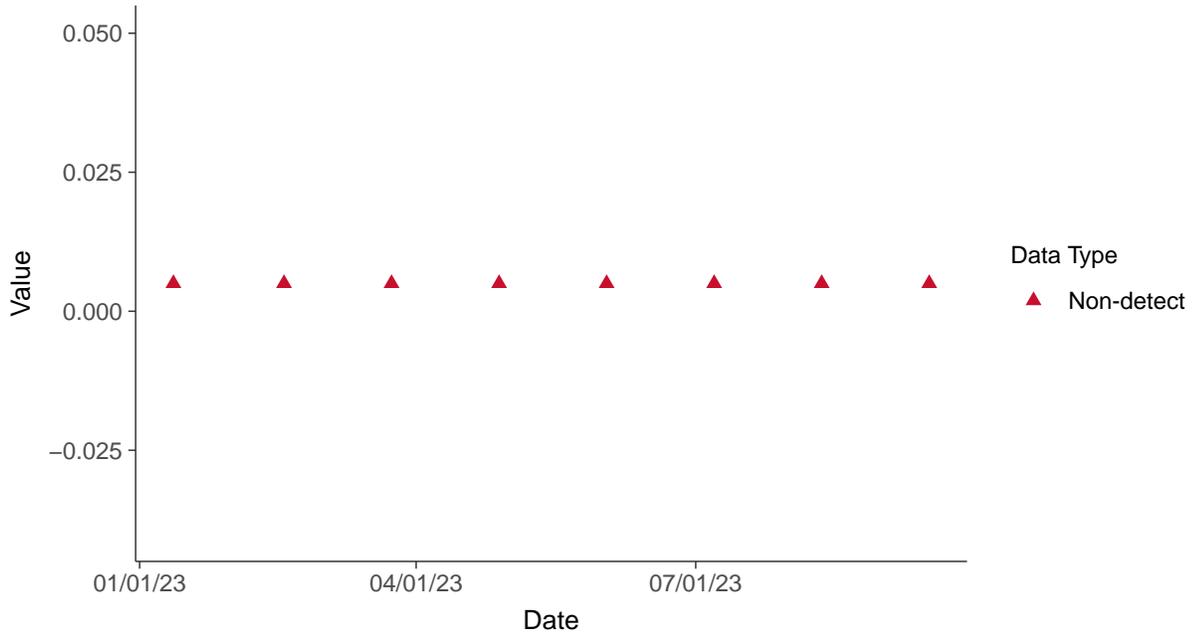


Appendix IV: Antimony, MW-14

ID: 14_2_08

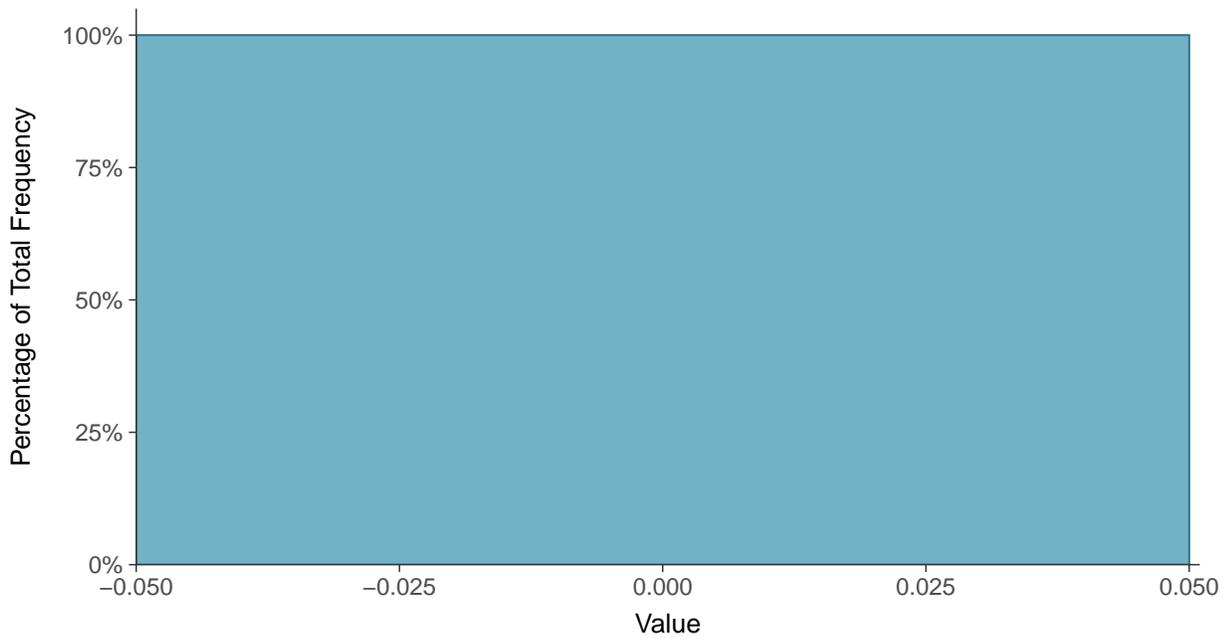
Scatter Plot

Antimony, MW-14 (mg/L)



Histogram

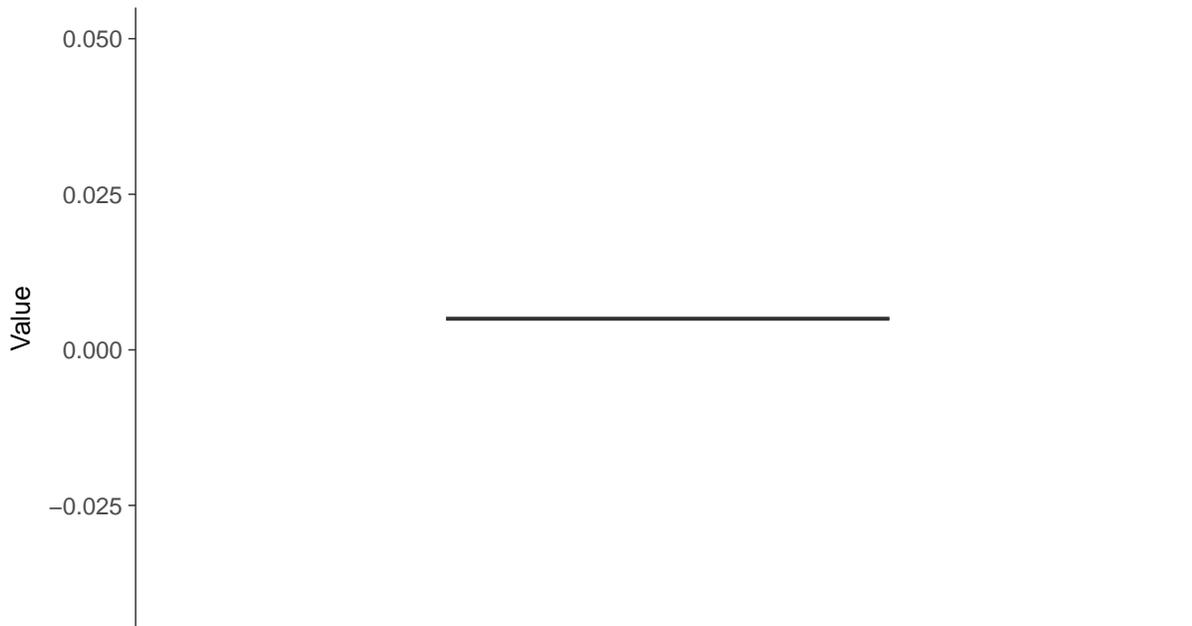
Antimony, MW-14 (mg/L)





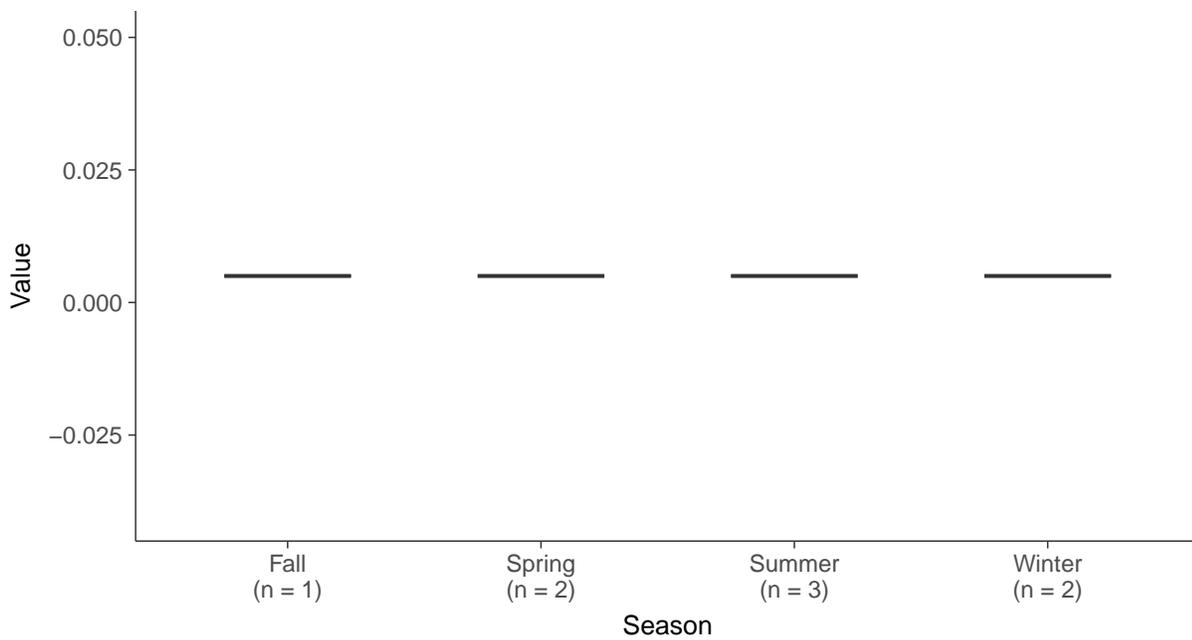
Boxplot

Antimony, MW-14 (mg/L)



Boxplot by Season

Antimony, MW-14 (mg/L)



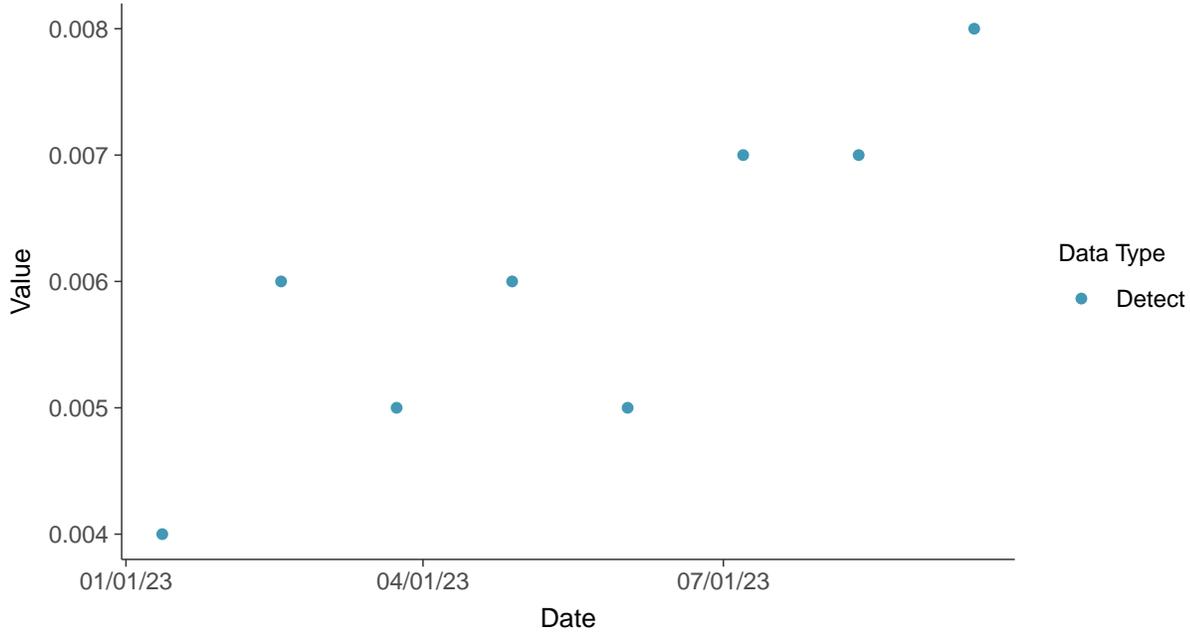


Appendix IV: Arsenic, MW-14

ID: 14_2_09

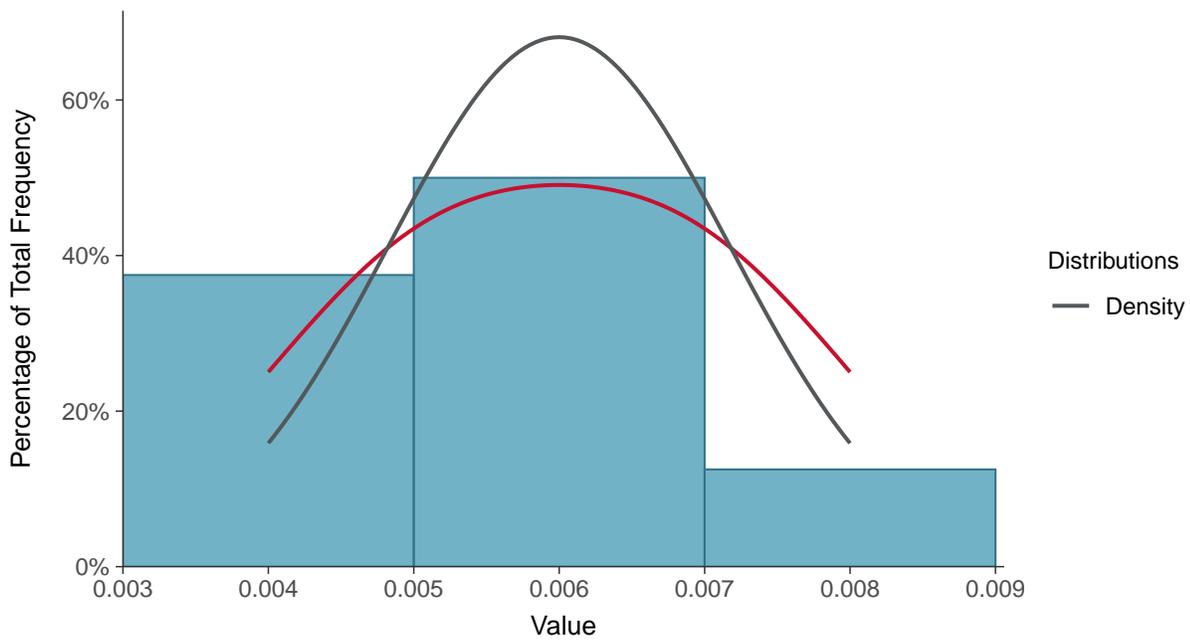
Scatter Plot

Arsenic, MW-14 (mg/L)



Histogram

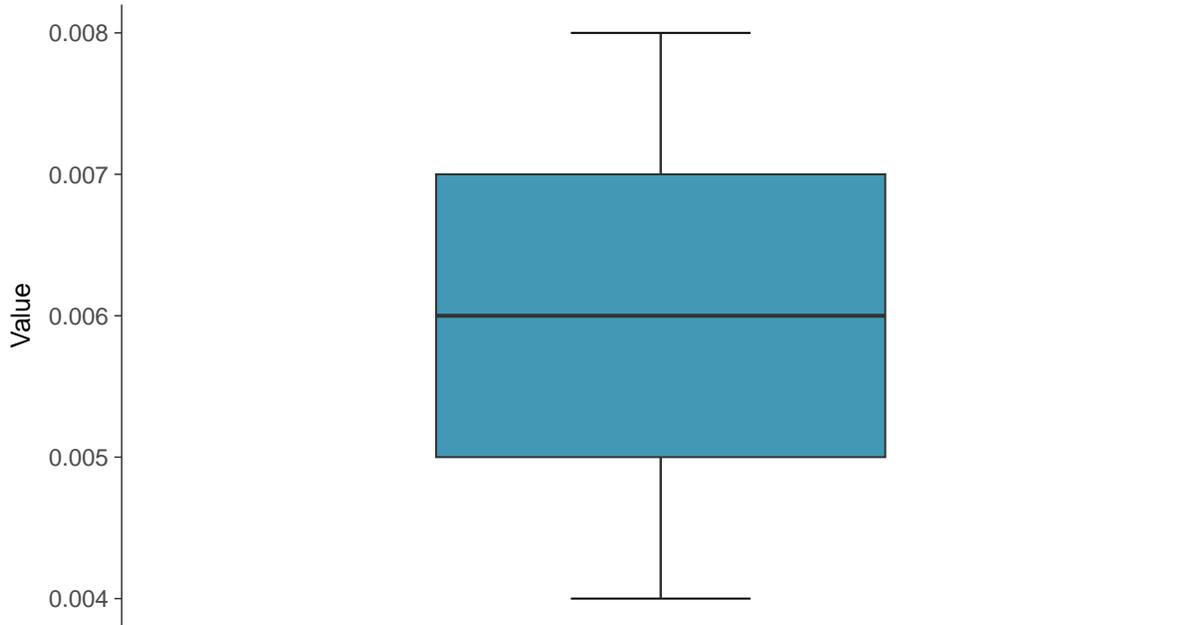
Arsenic, MW-14 (mg/L)





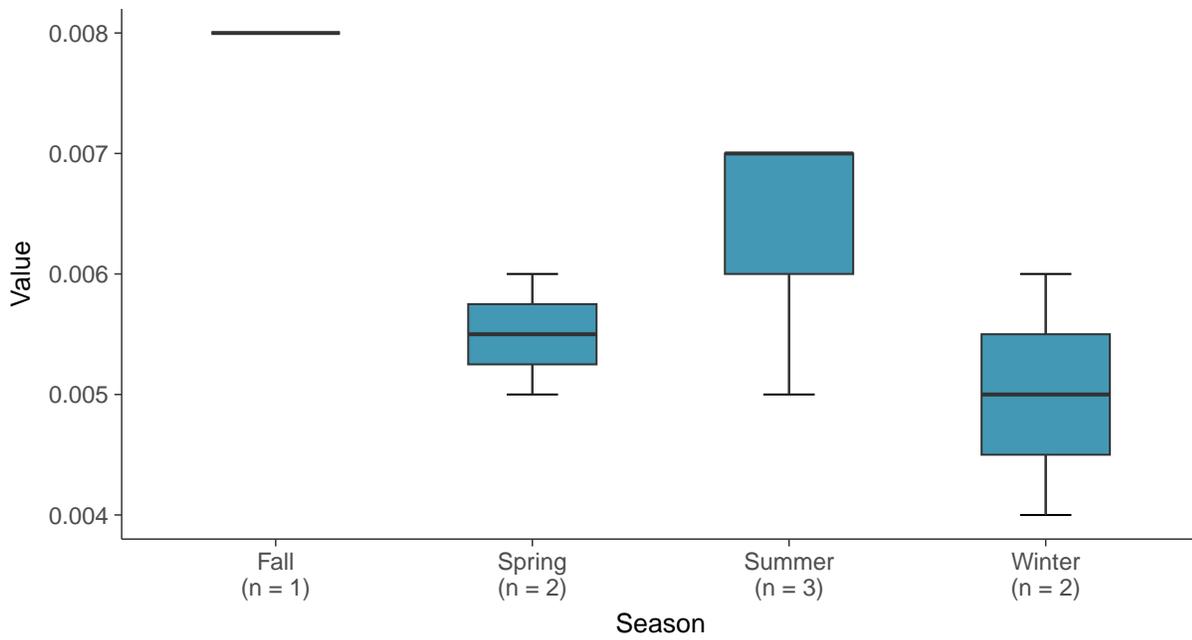
Boxplot

Arsenic, MW-14 (mg/L)



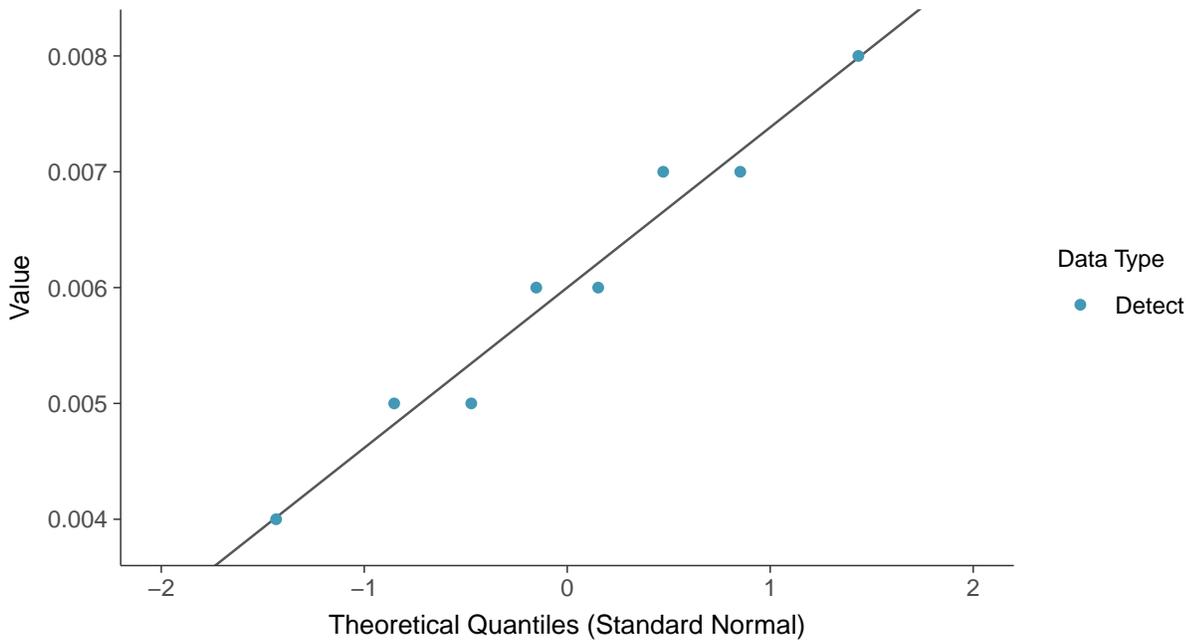
Boxplot by Season

Arsenic, MW-14 (mg/L)

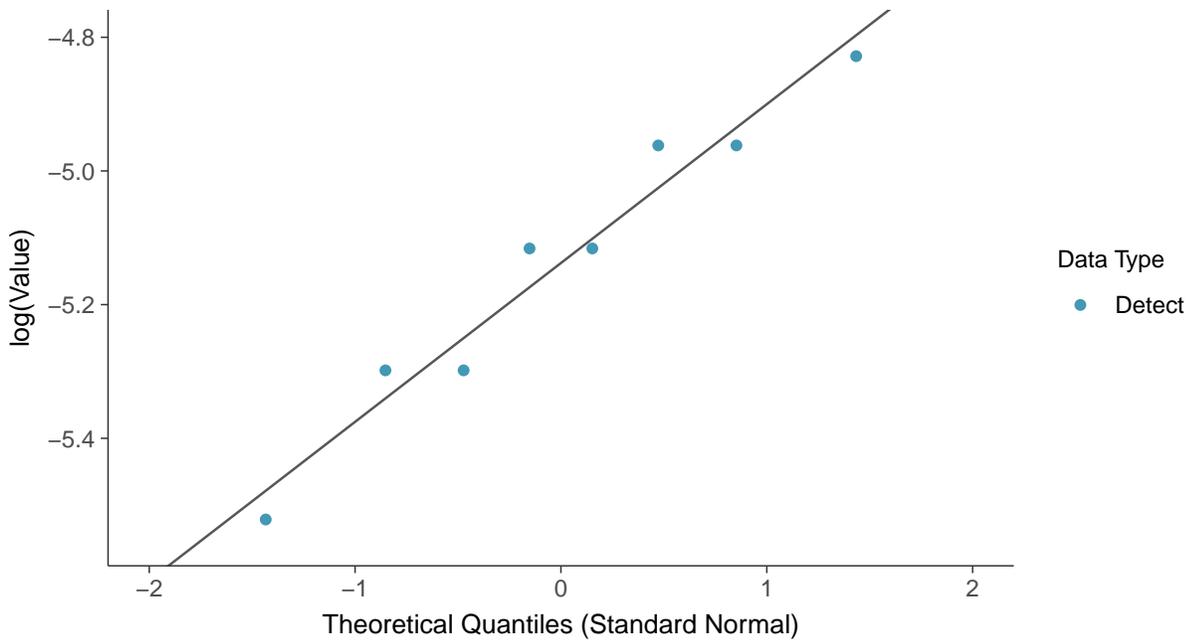




Normal Q-Q plot
Arsenic, MW-14 (mg/L)



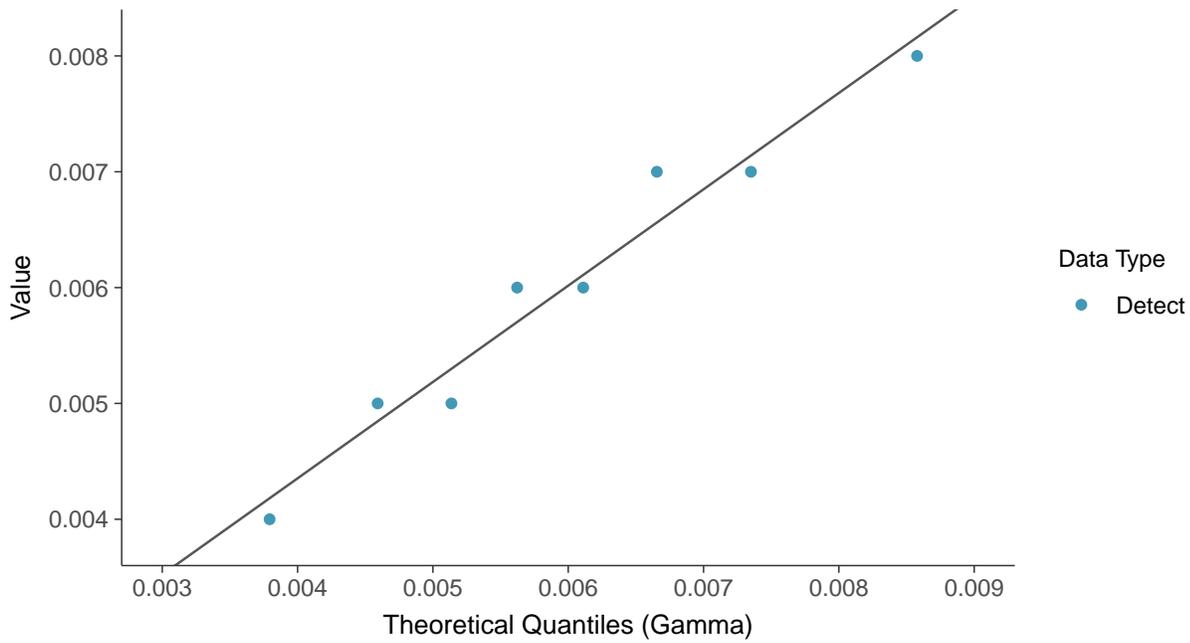
Lognormal Q-Q plot
Arsenic, MW-14 (mg/L)





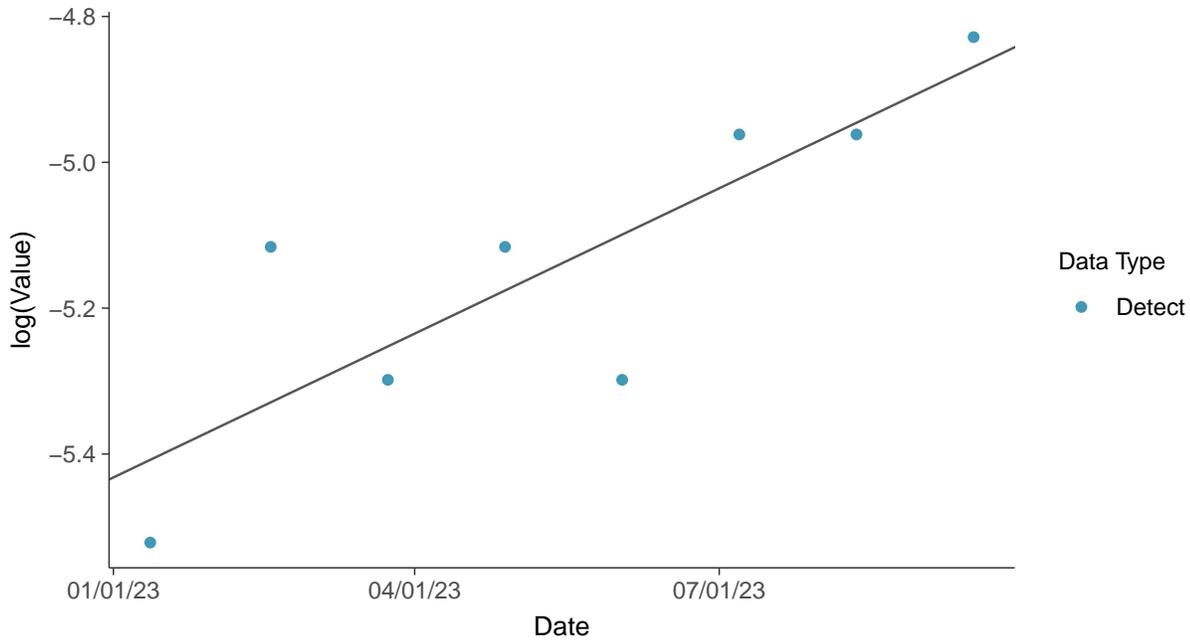
Gamma Q-Q plot

Arsenic, MW-14 (mg/L)



Trend Regression: Lognormal MLE

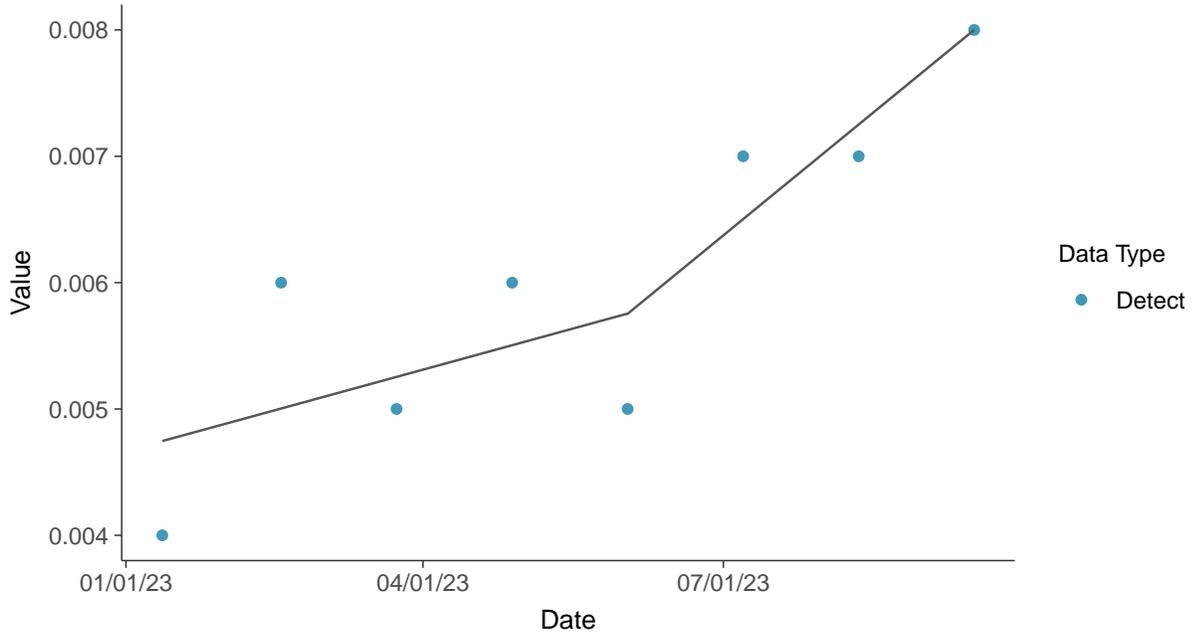
Arsenic, MW-14 (mg/L)





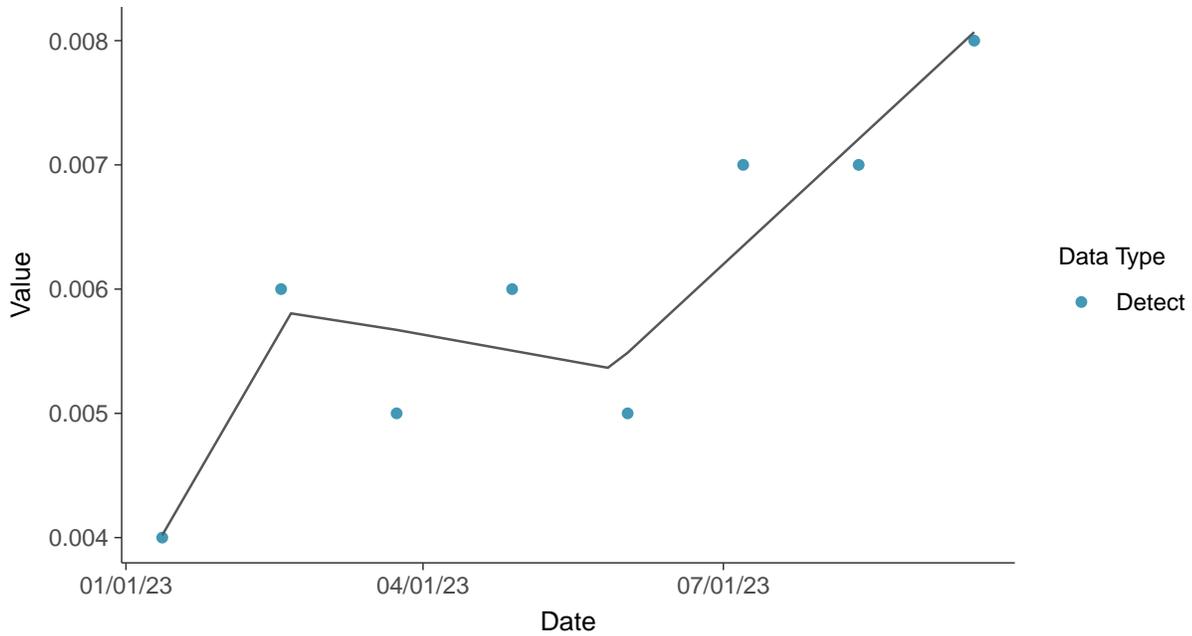
Trend Regression: Piecewise Linear-Linear

Arsenic, MW-14 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

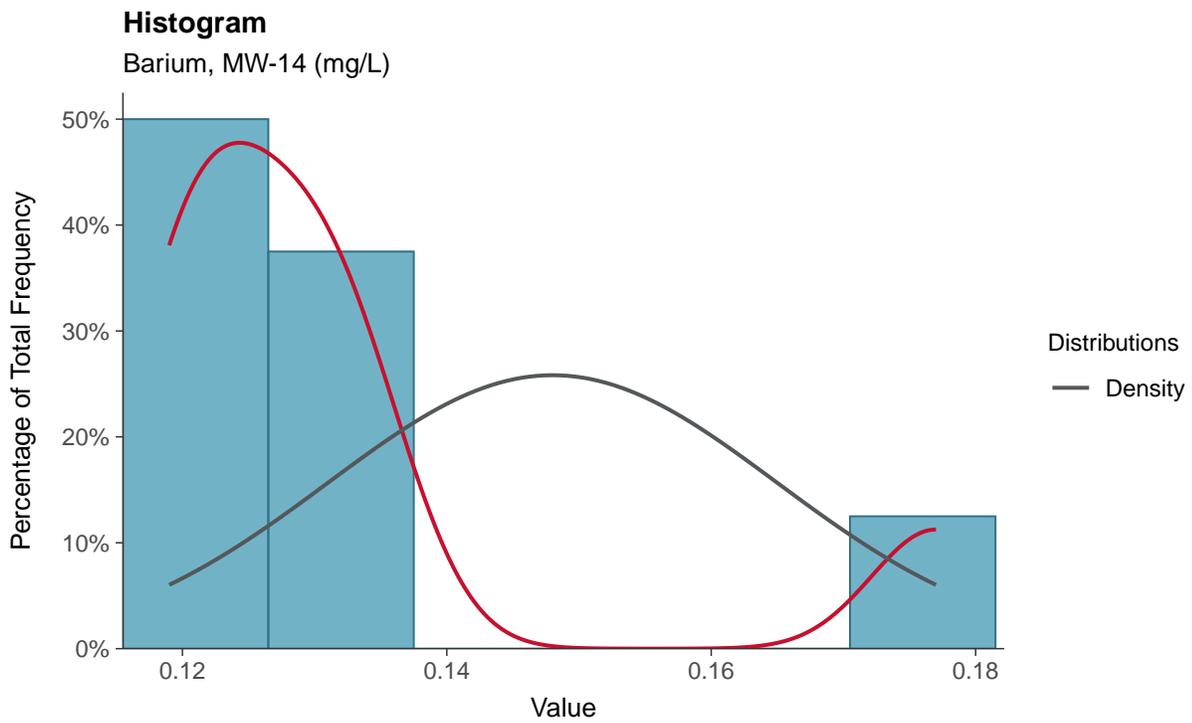
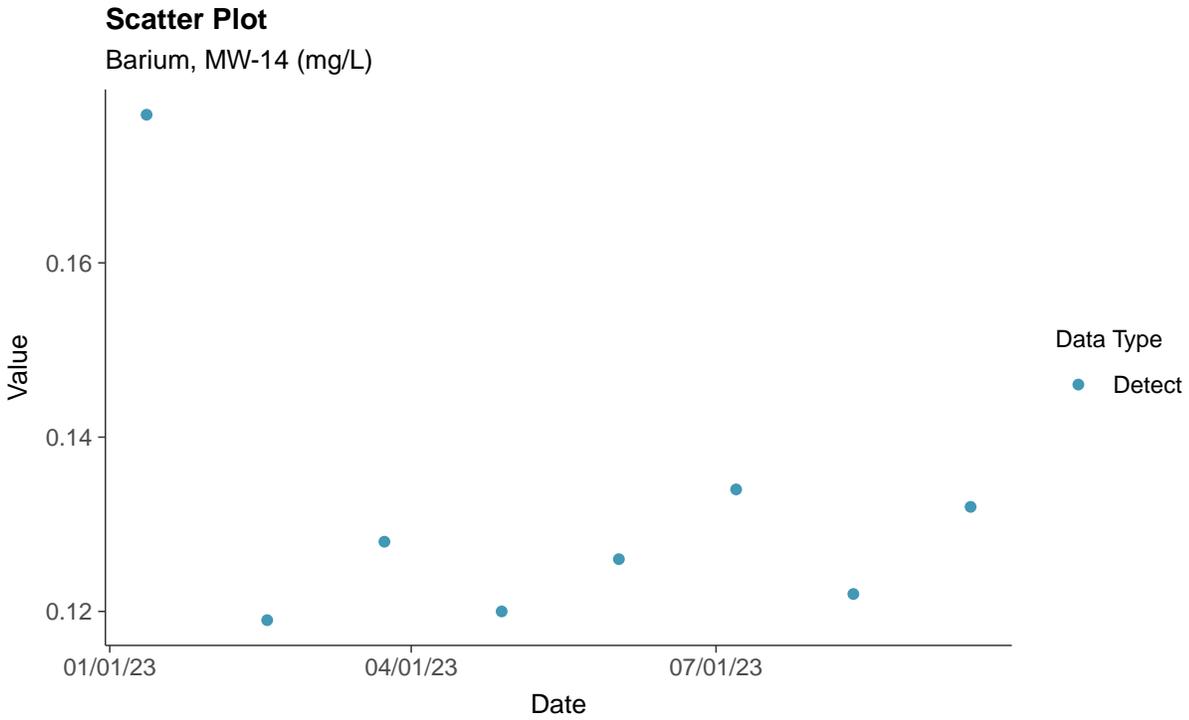
Arsenic, MW-14 (mg/L)





Appendix IV: Barium, MW-14

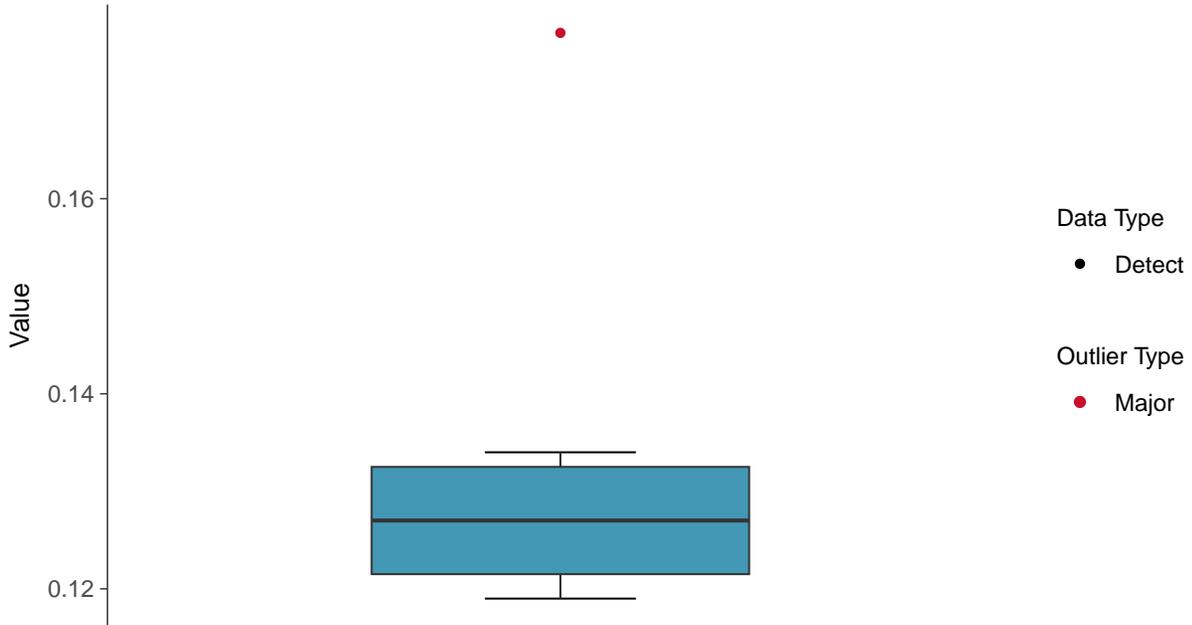
ID: 14_2_10





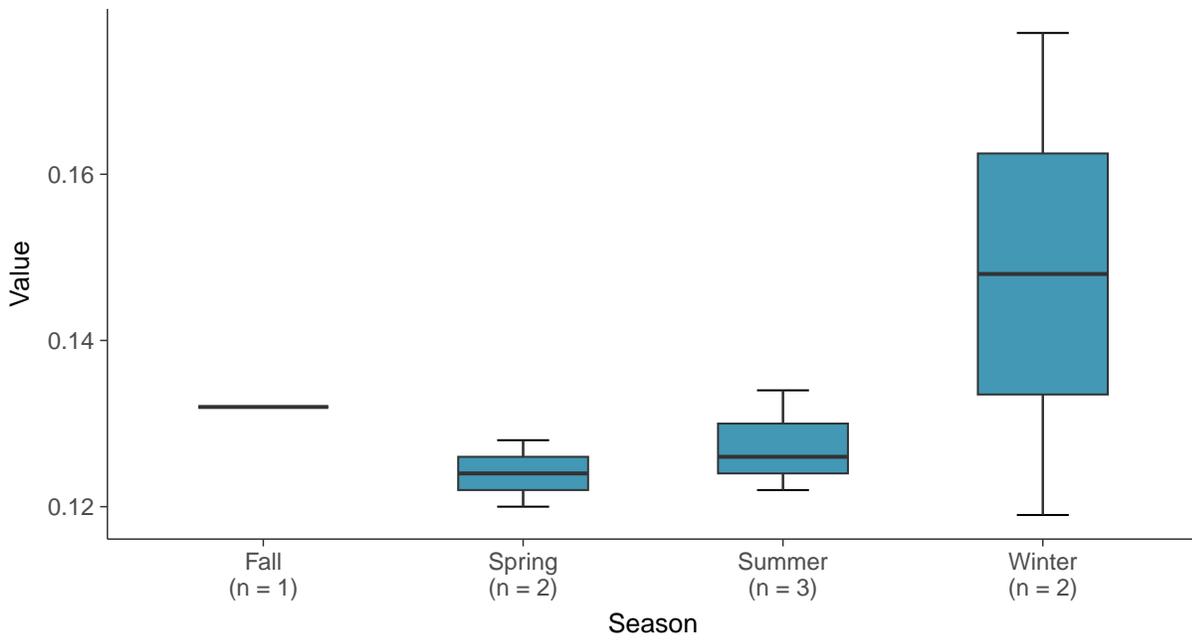
Boxplot

Barium, MW-14 (mg/L)



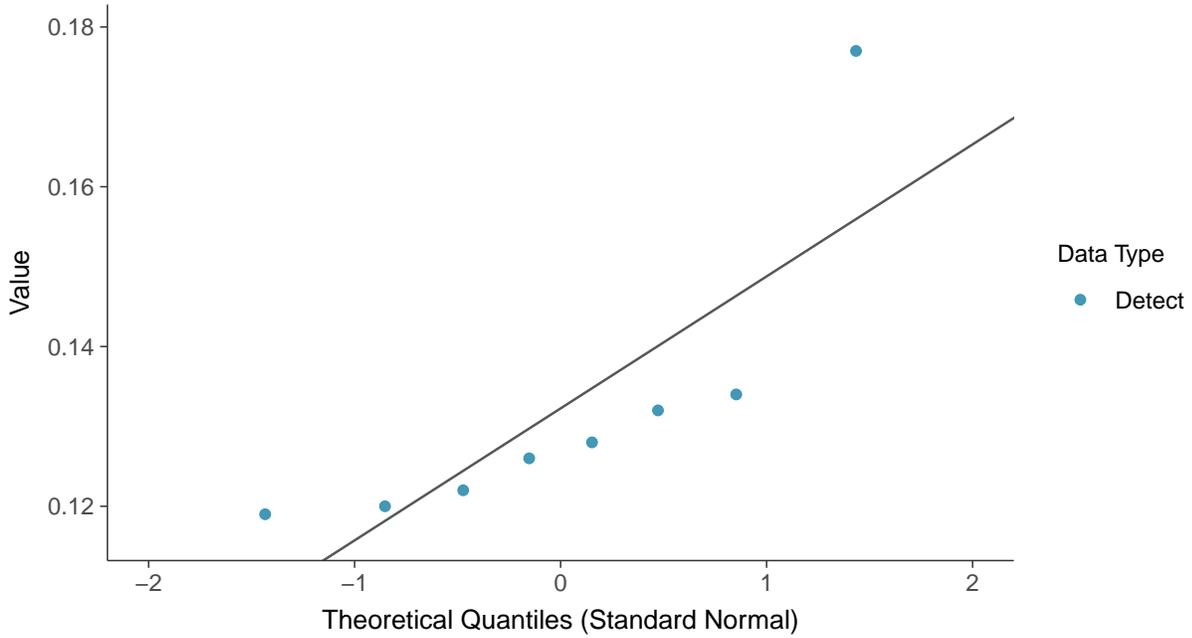
Boxplot by Season

Barium, MW-14 (mg/L)

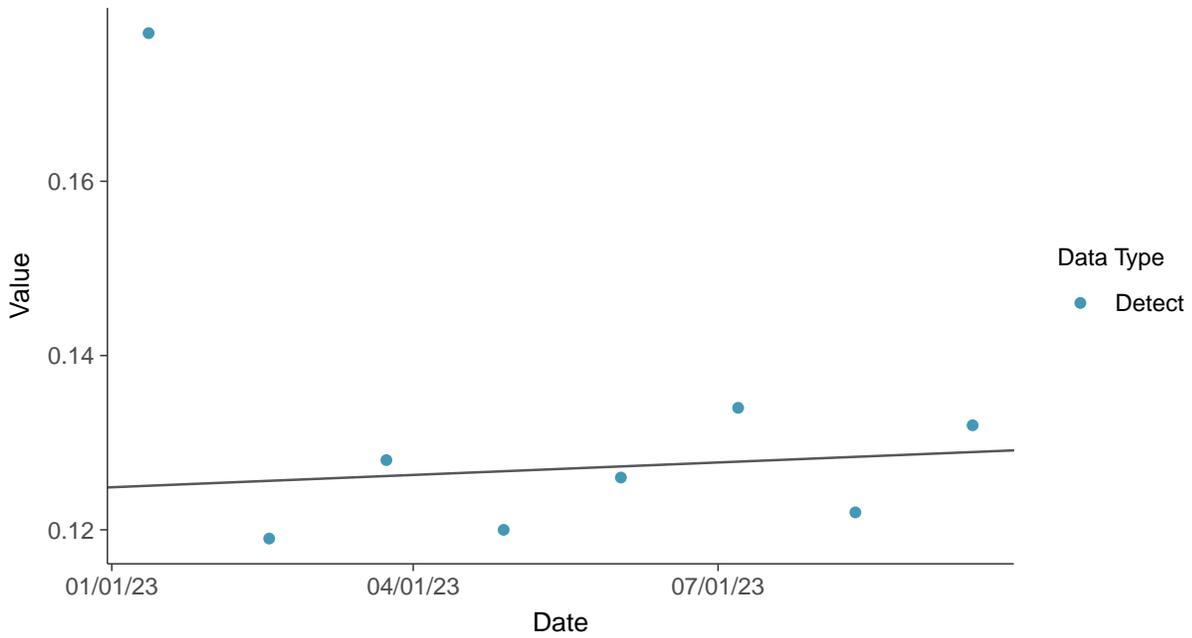




Normal Q-Q plot
Barium, MW-14 (mg/L)



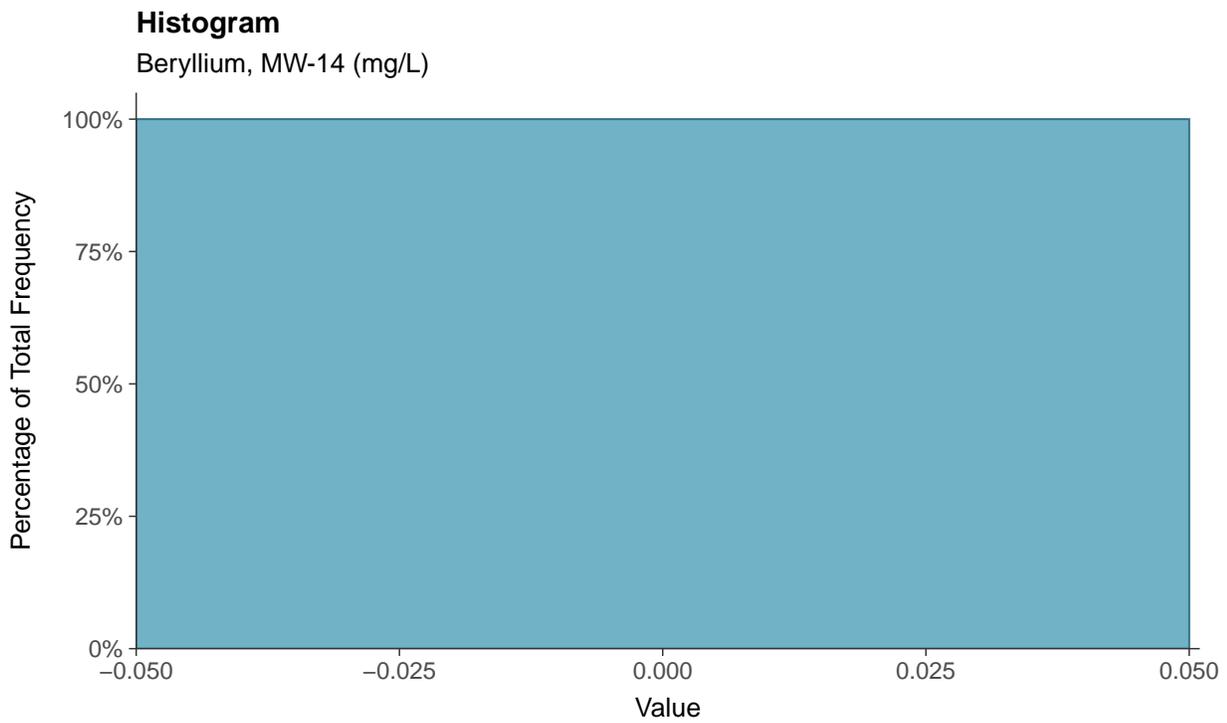
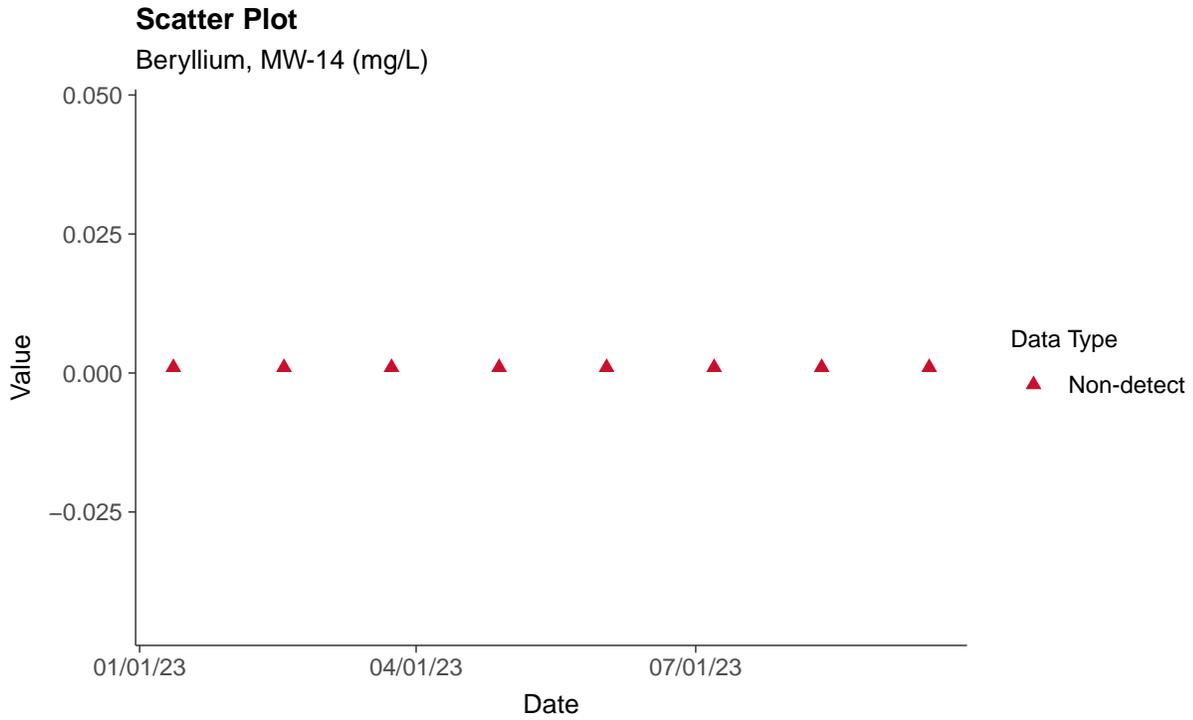
Trend Regression: Mann-Kendall/Theil-Sen Estimate
Barium, MW-14 (mg/L)





Appendix IV: Beryllium, MW-14

ID: 14_2_11





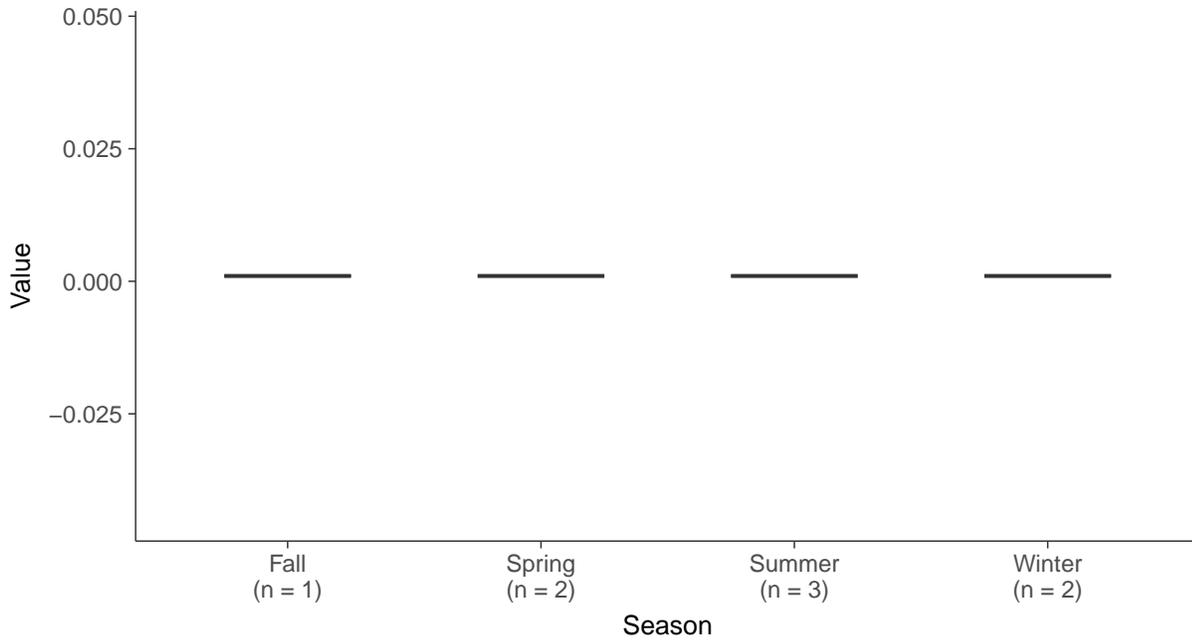
Boxplot

Beryllium, MW-14 (mg/L)



Boxplot by Season

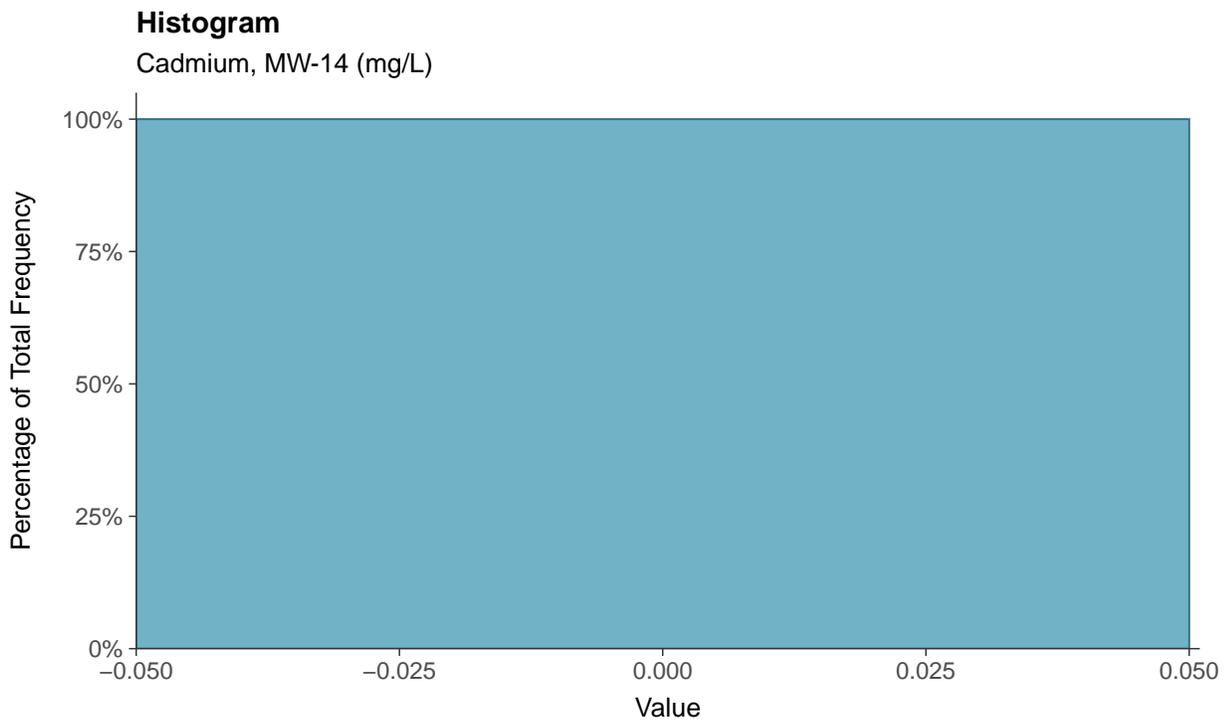
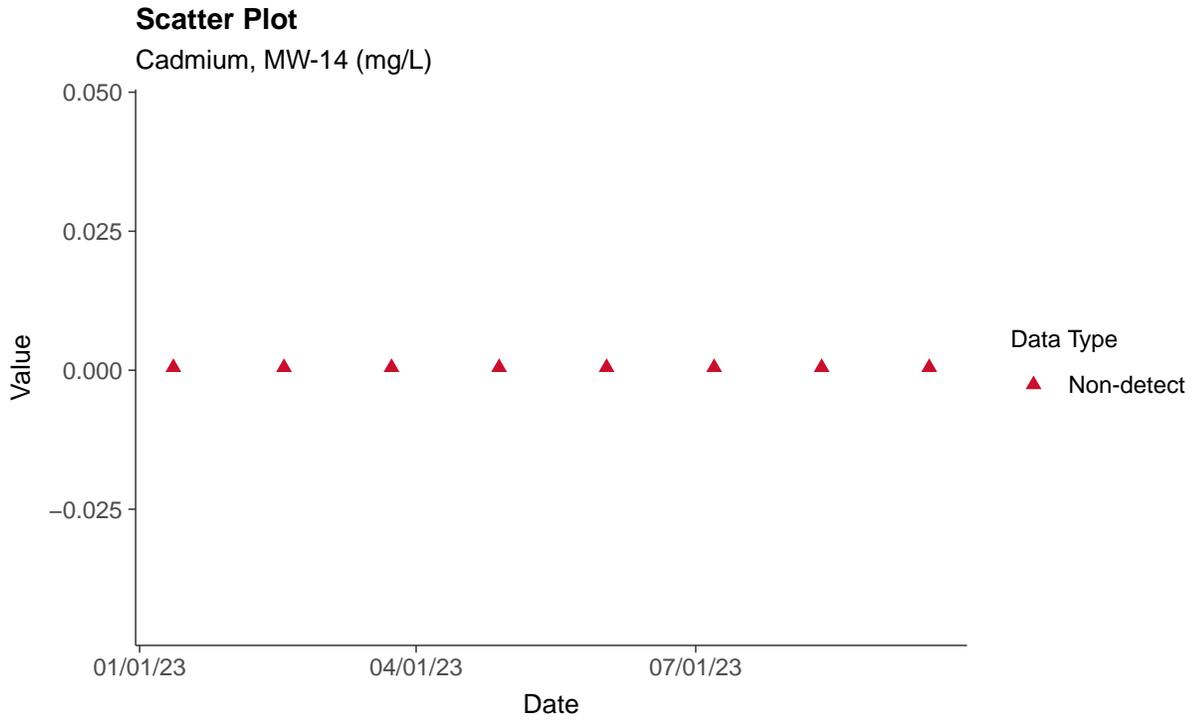
Beryllium, MW-14 (mg/L)





Appendix IV: Cadmium, MW-14

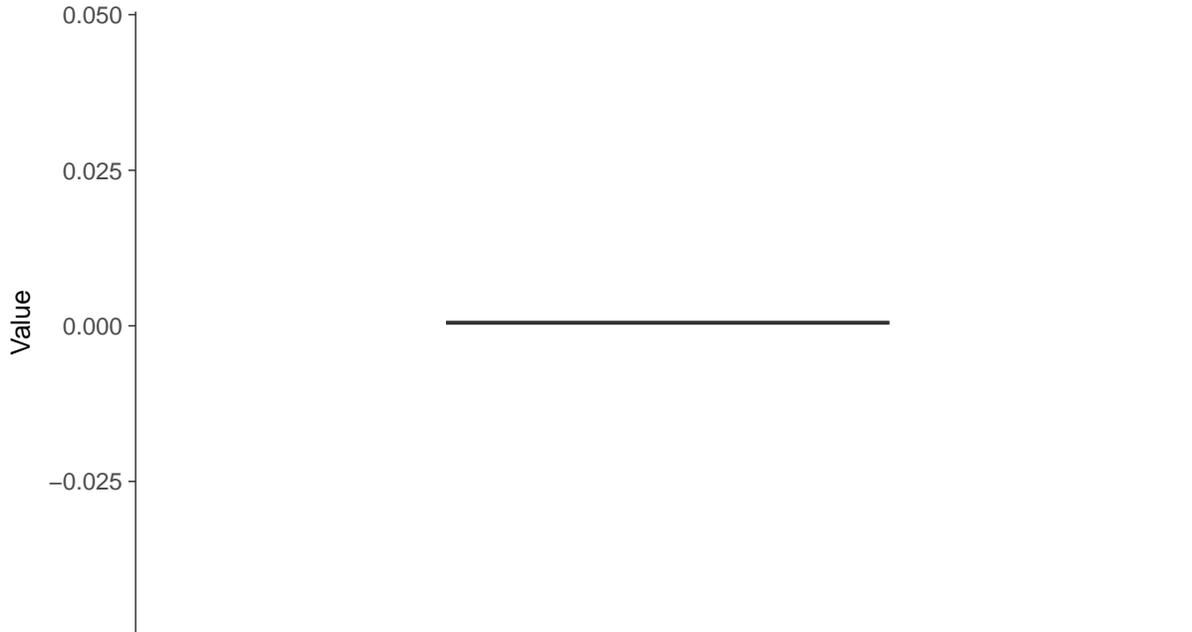
ID: 14_2_12





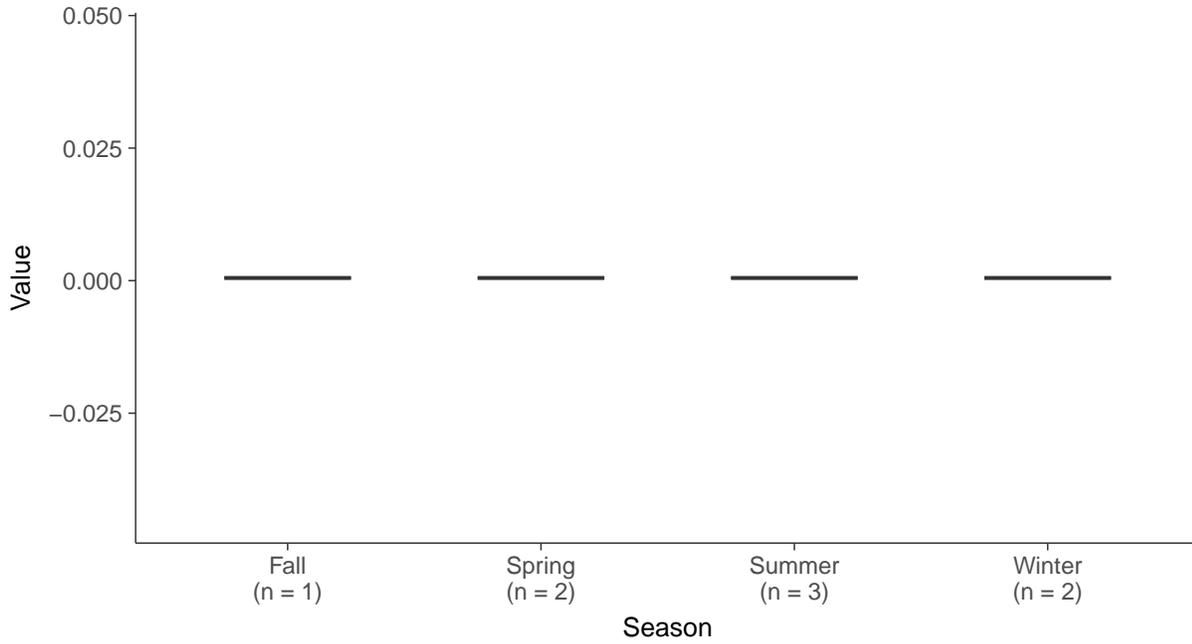
Boxplot

Cadmium, MW-14 (mg/L)



Boxplot by Season

Cadmium, MW-14 (mg/L)



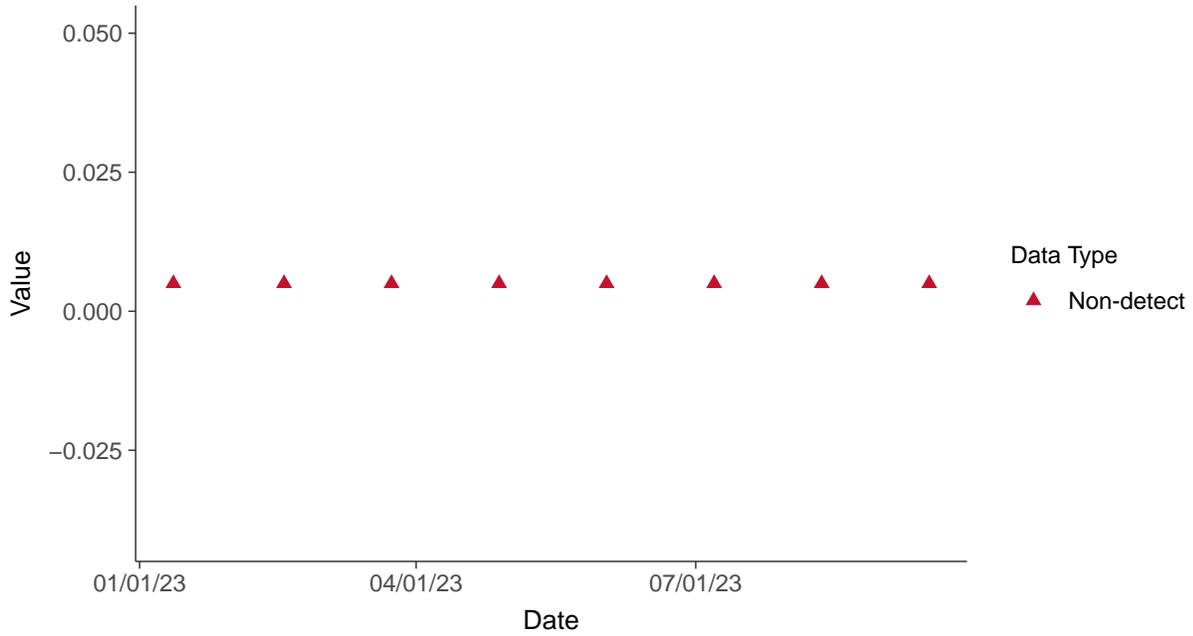


Appendix IV: Chromium, MW-14

ID: 14_2_13

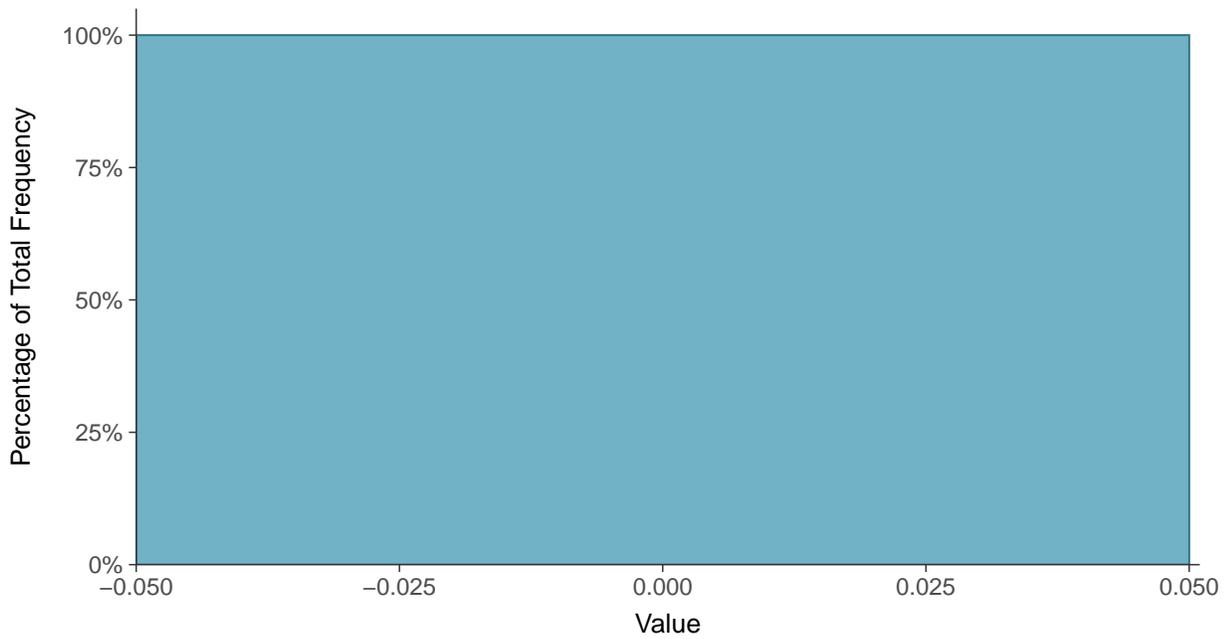
Scatter Plot

Chromium, MW-14 (mg/L)



Histogram

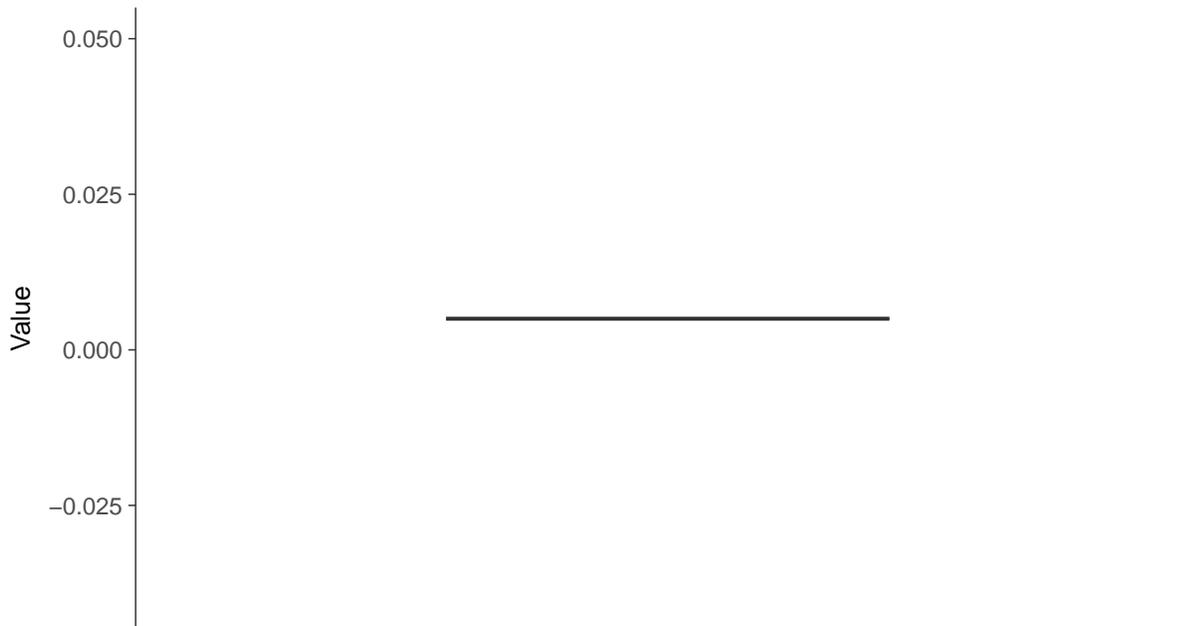
Chromium, MW-14 (mg/L)





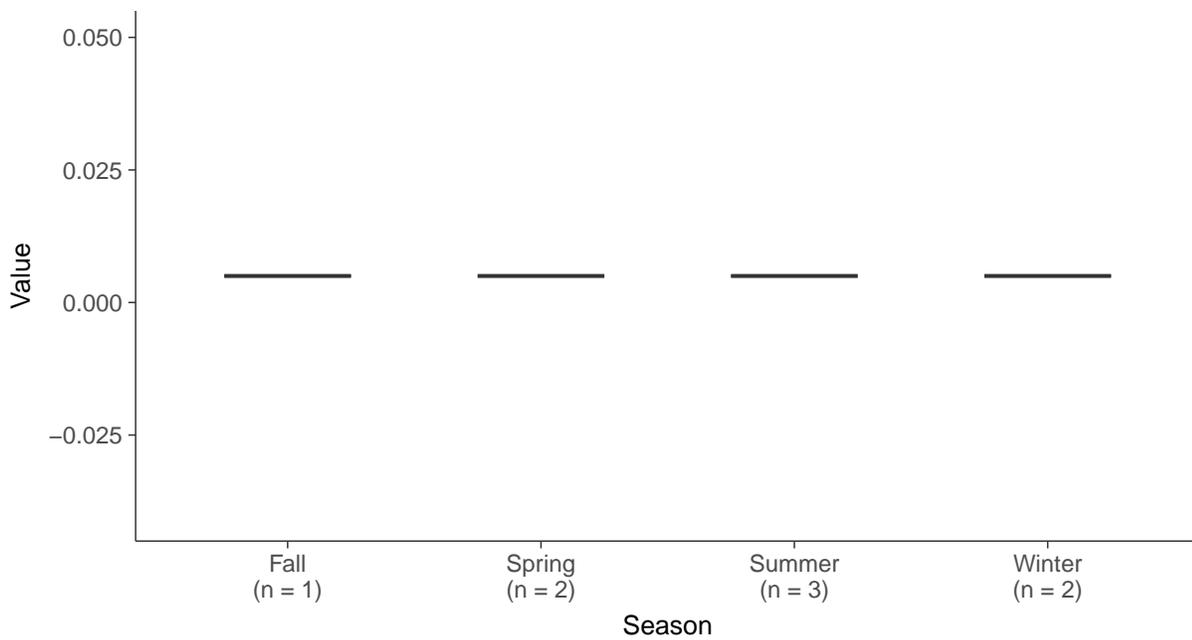
Boxplot

Chromium, MW-14 (mg/L)



Boxplot by Season

Chromium, MW-14 (mg/L)



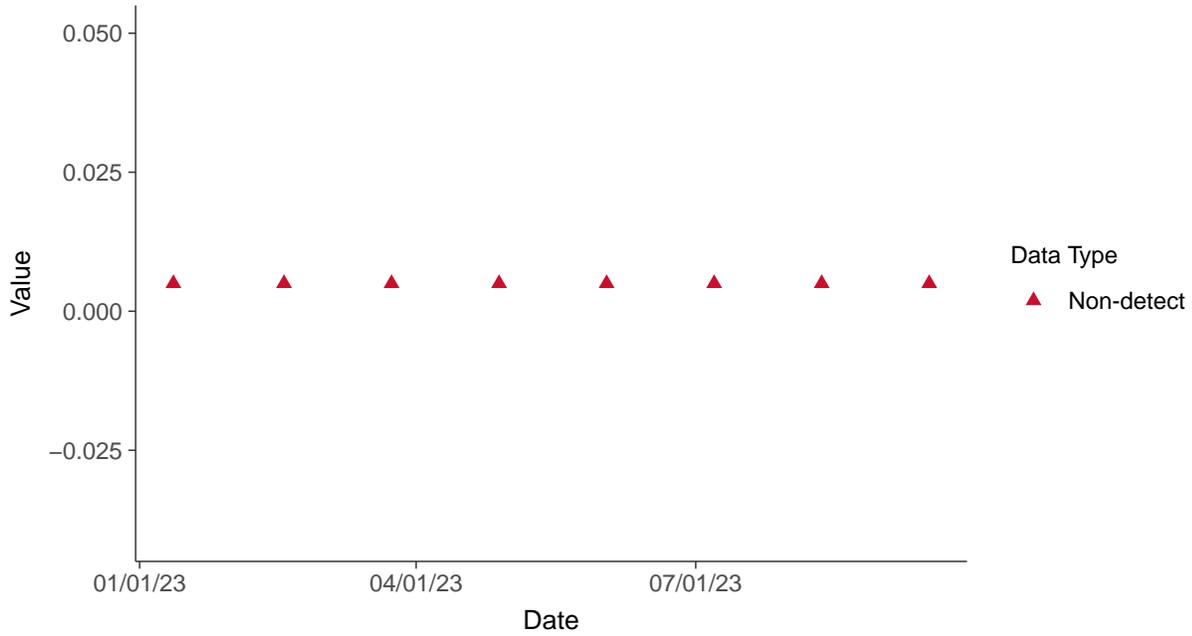


Appendix IV: Cobalt, MW-14

ID: 14_2_14

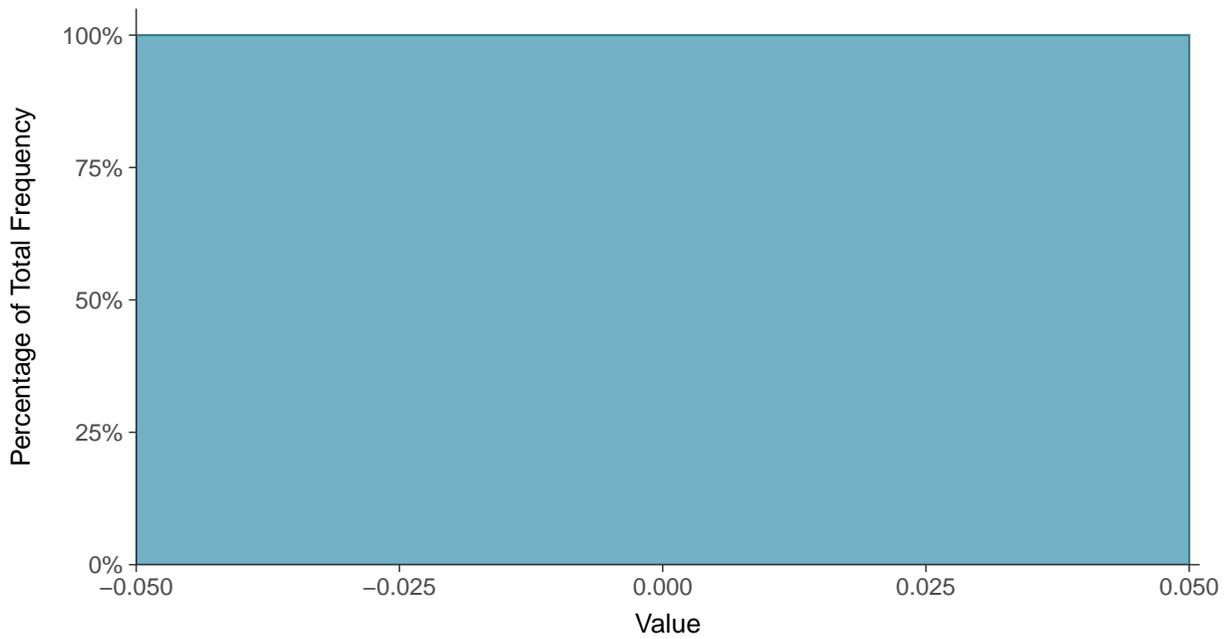
Scatter Plot

Cobalt, MW-14 (mg/L)



Histogram

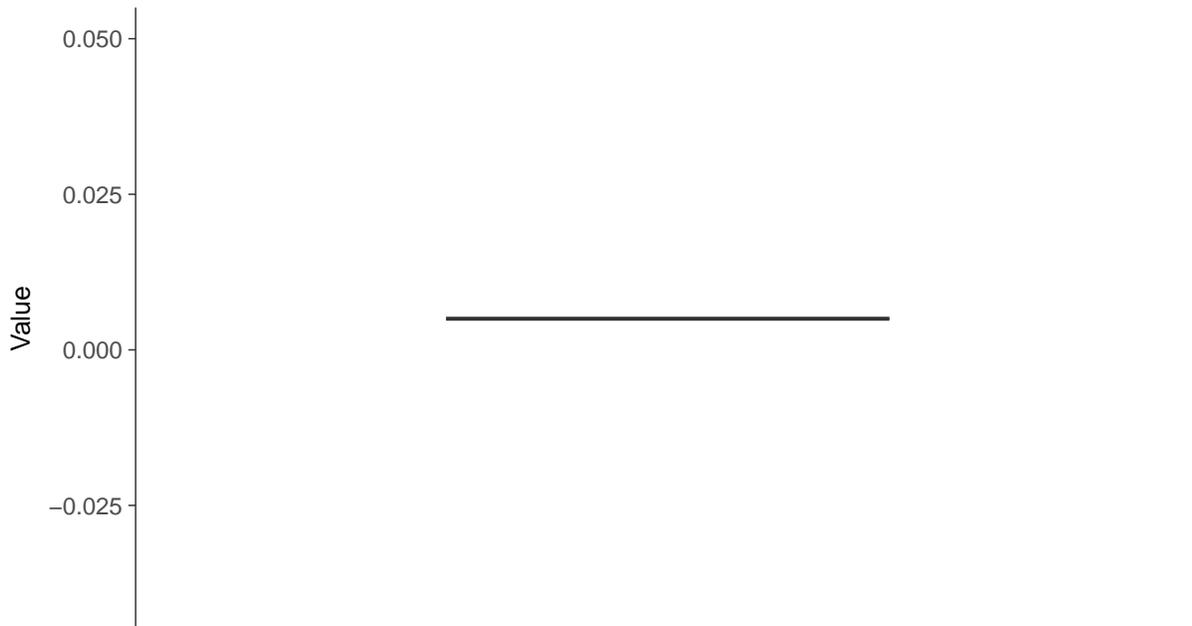
Cobalt, MW-14 (mg/L)





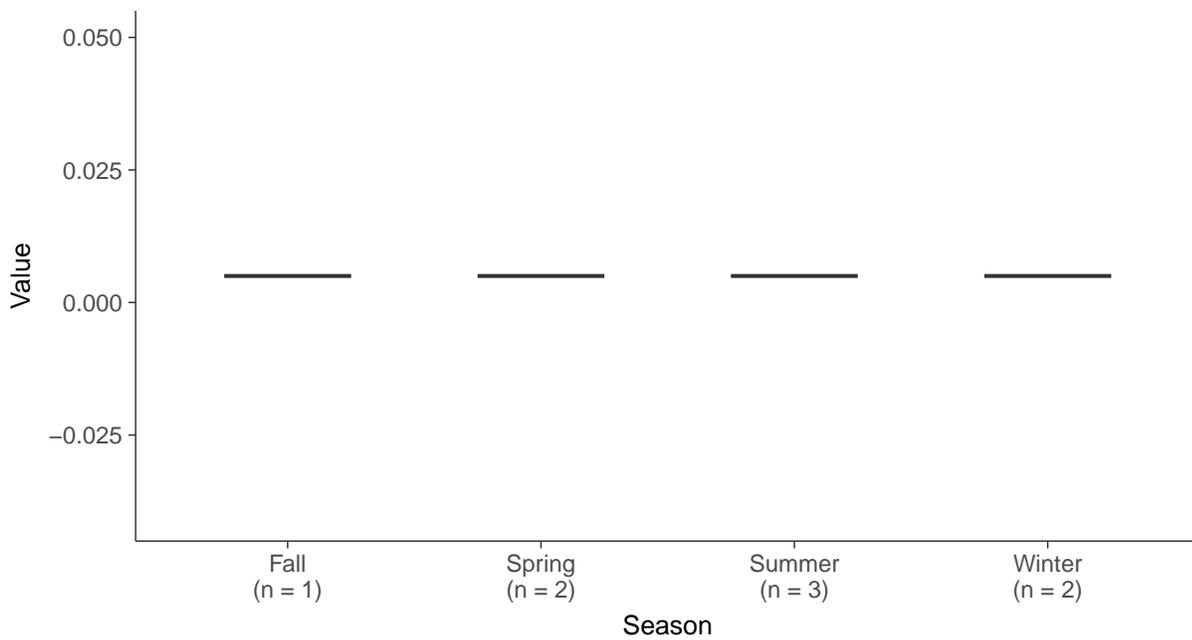
Boxplot

Cobalt, MW-14 (mg/L)



Boxplot by Season

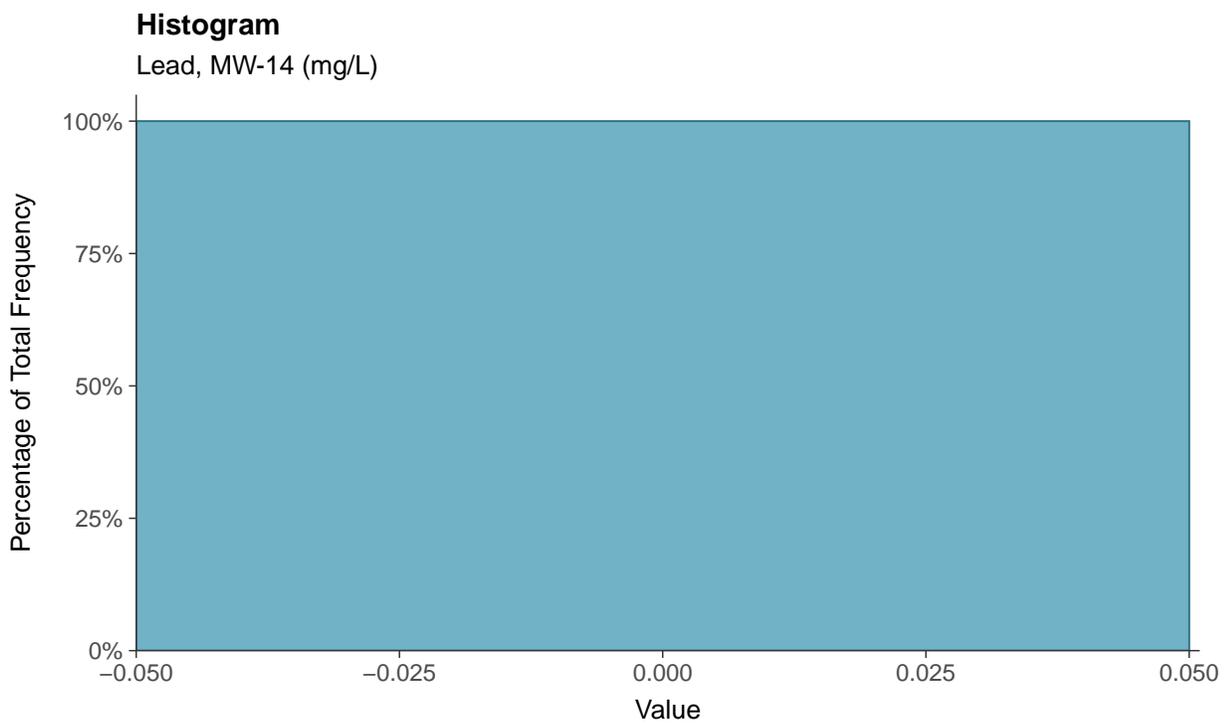
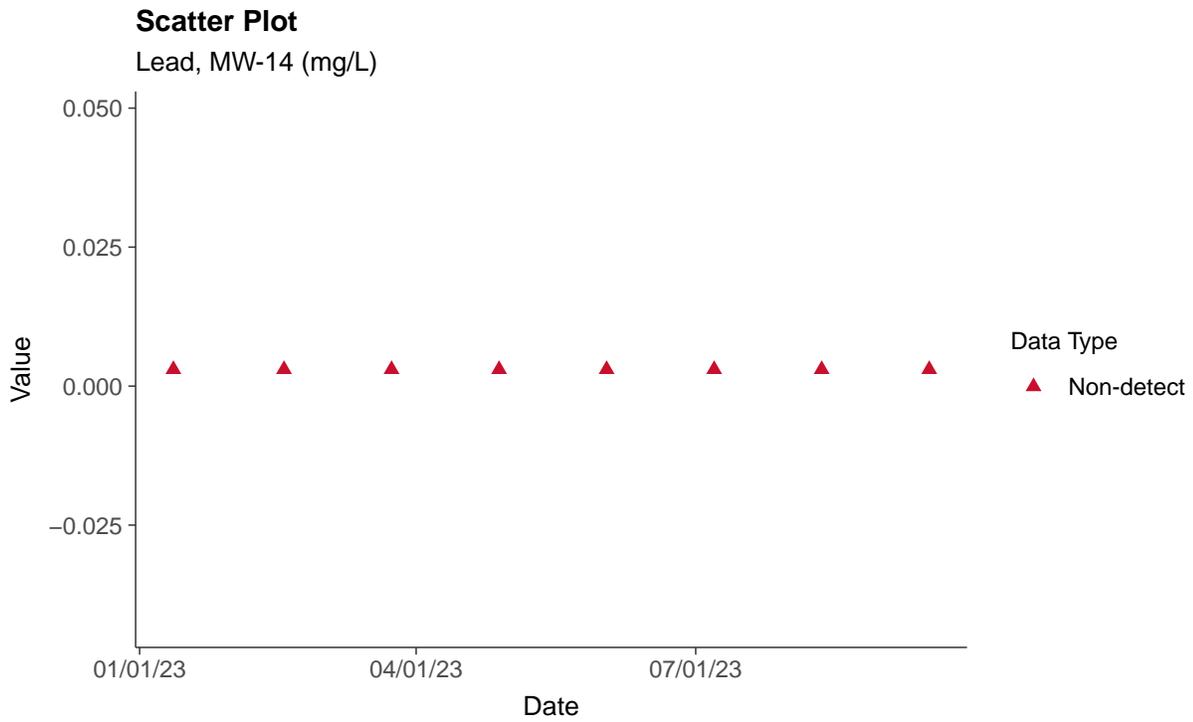
Cobalt, MW-14 (mg/L)





Appendix IV: Lead, MW-14

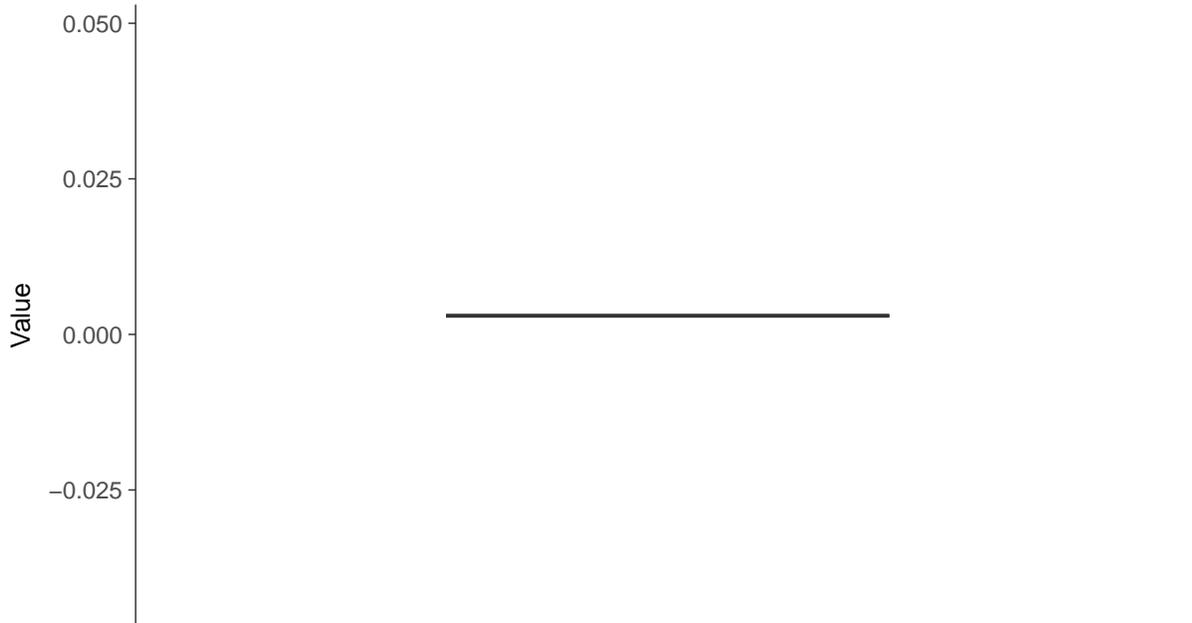
ID: 14_2_15





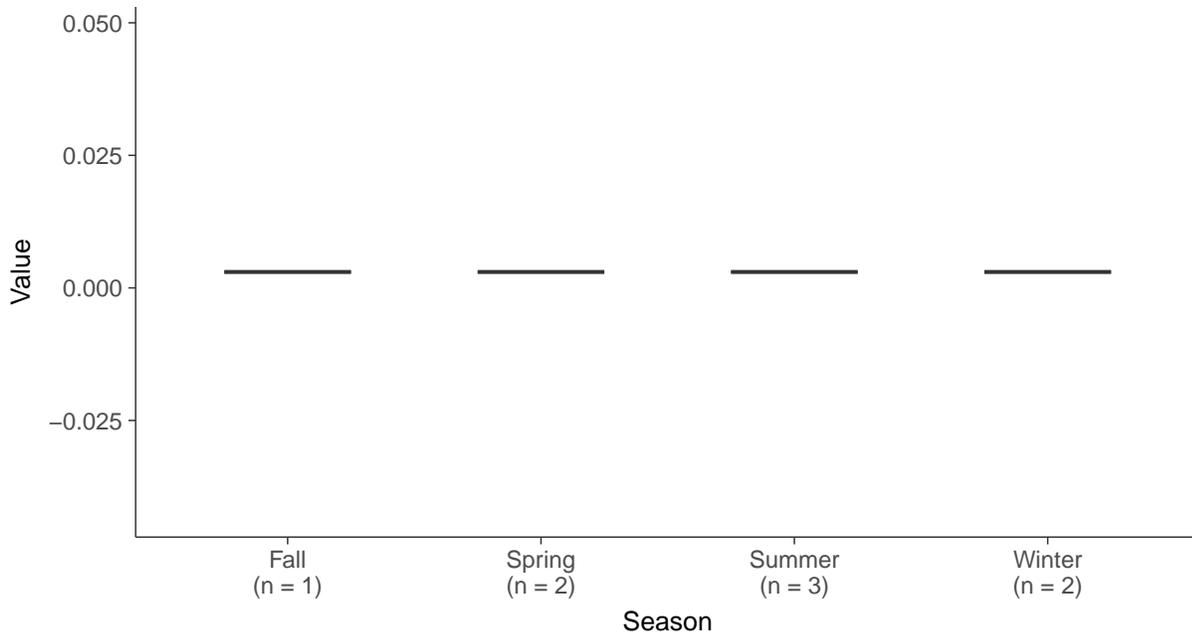
Boxplot

Lead, MW-14 (mg/L)



Boxplot by Season

Lead, MW-14 (mg/L)



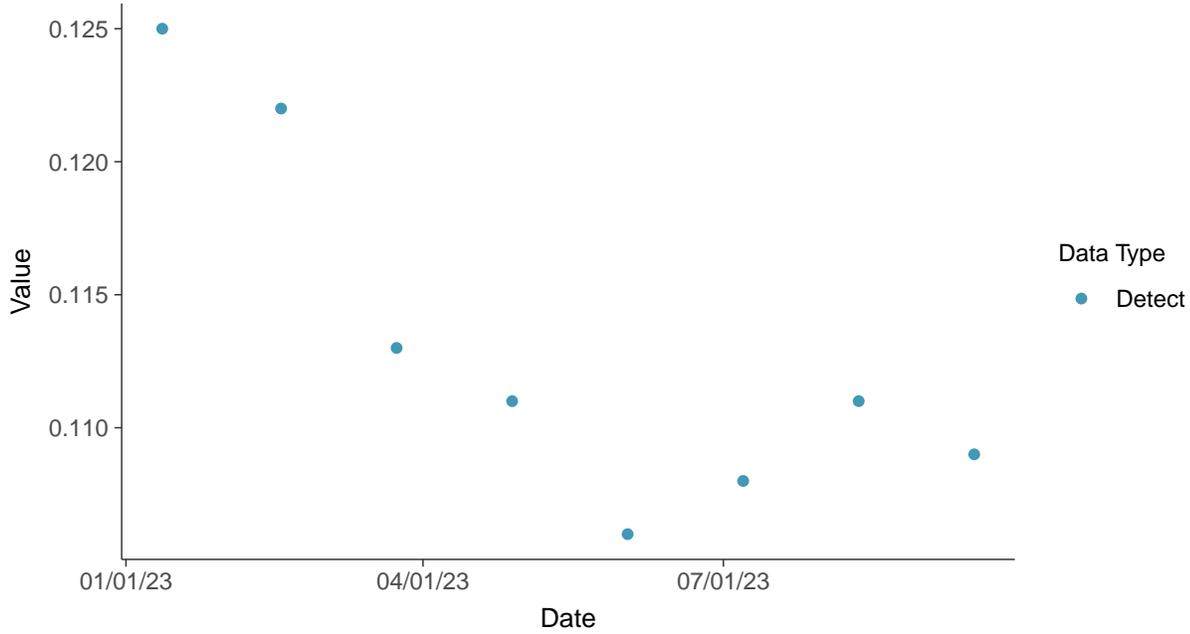


Appendix IV: Lithium, MW-14

ID: 14_2_16

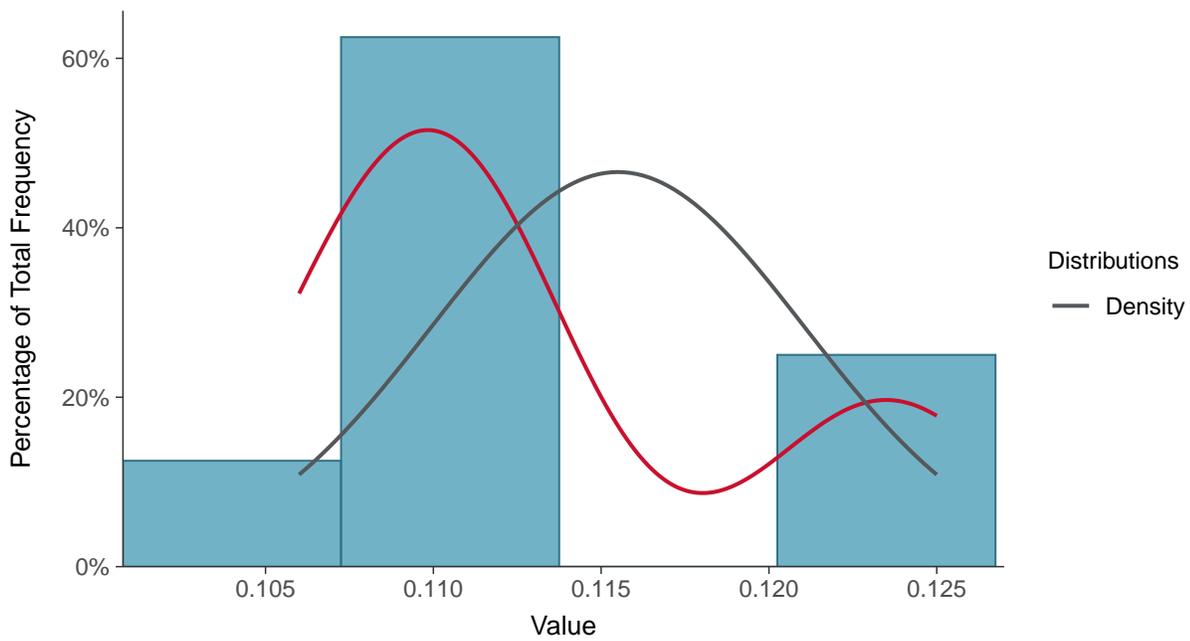
Scatter Plot

Lithium, MW-14 (mg/L)



Histogram

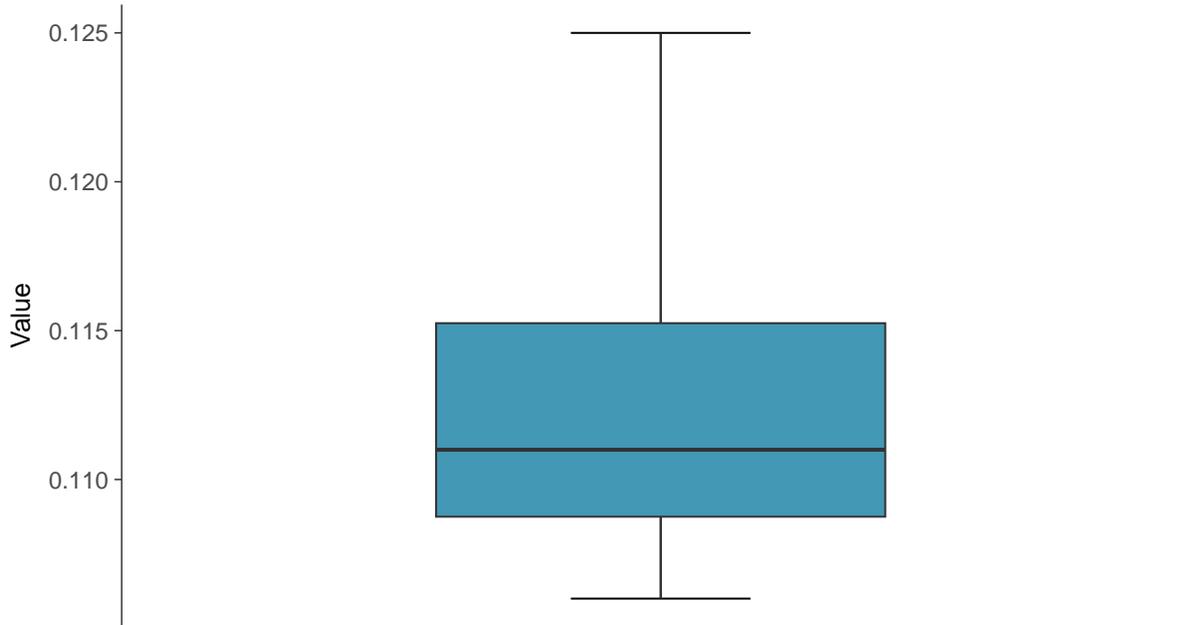
Lithium, MW-14 (mg/L)





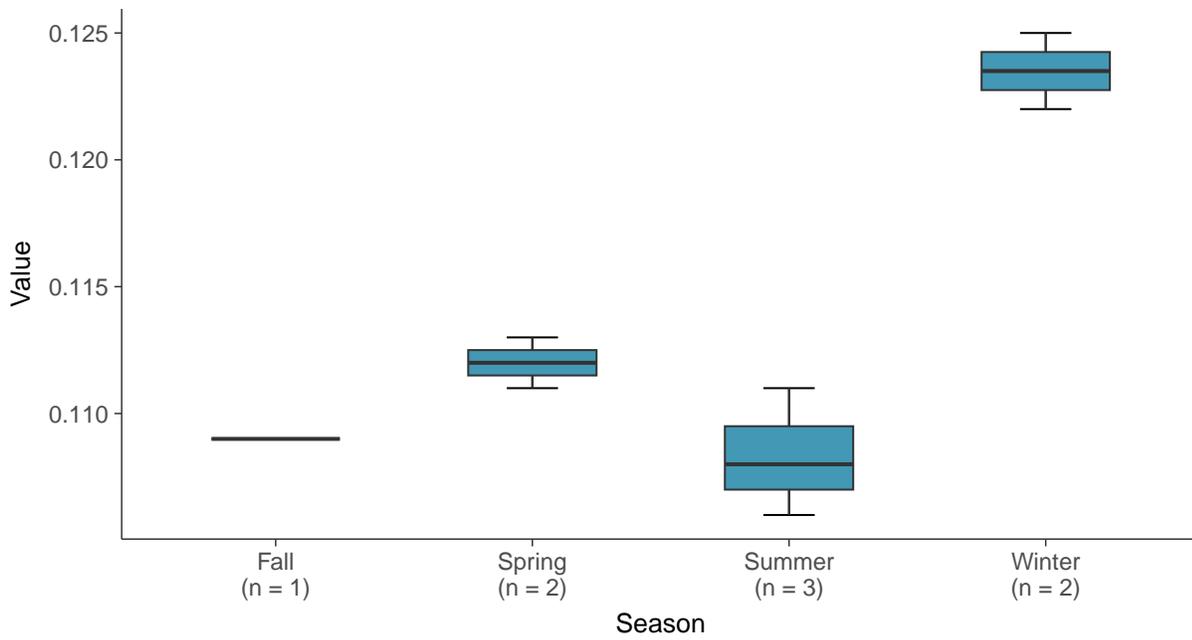
Boxplot

Lithium, MW-14 (mg/L)



Boxplot by Season

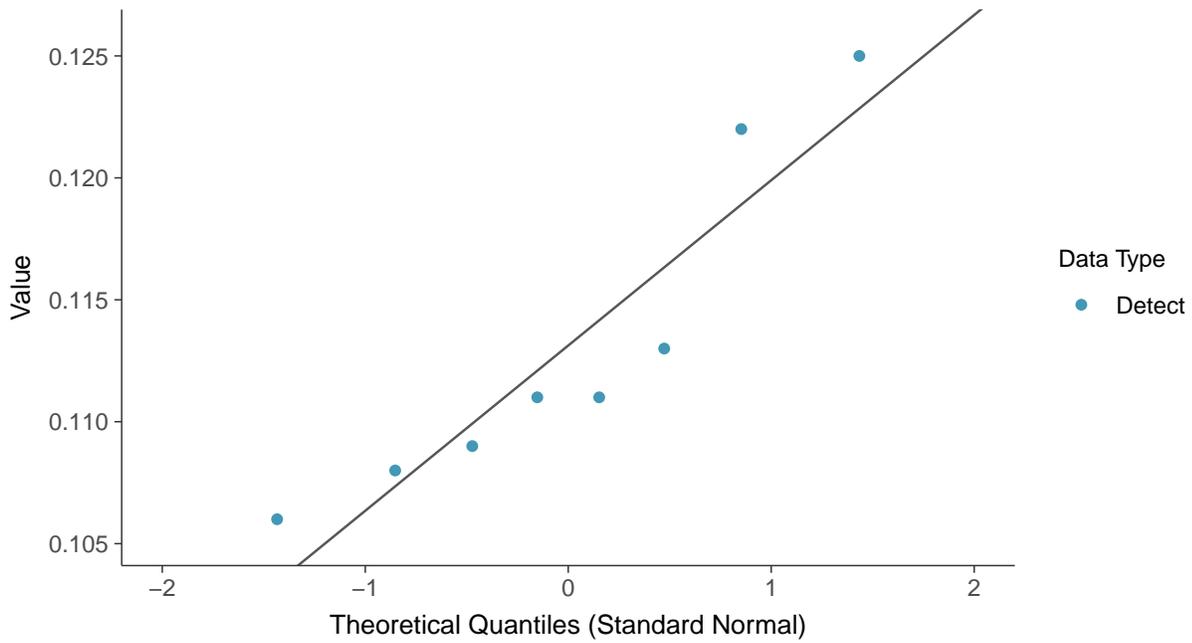
Lithium, MW-14 (mg/L)





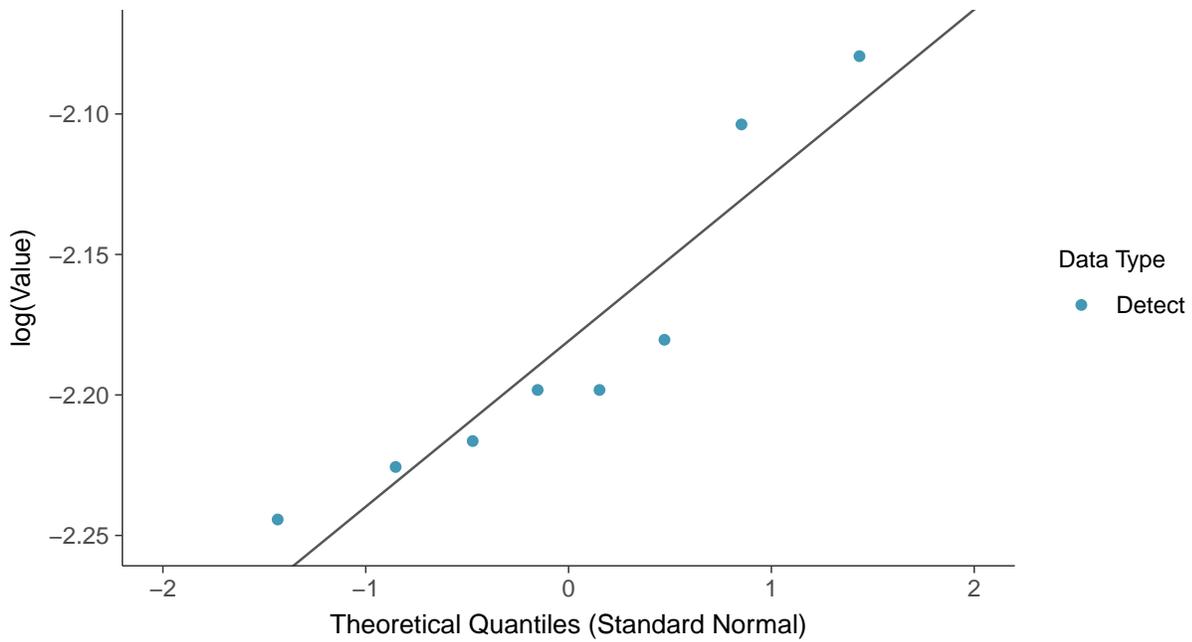
Normal Q-Q plot

Lithium, MW-14 (mg/L)



Lognormal Q-Q plot

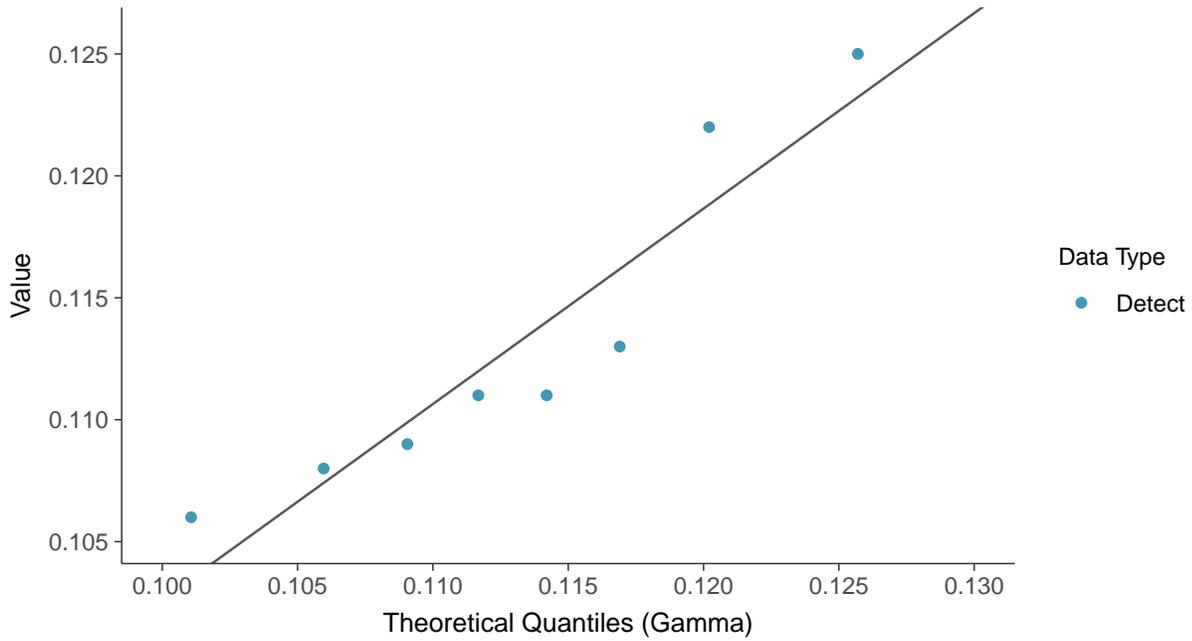
Lithium, MW-14 (mg/L)





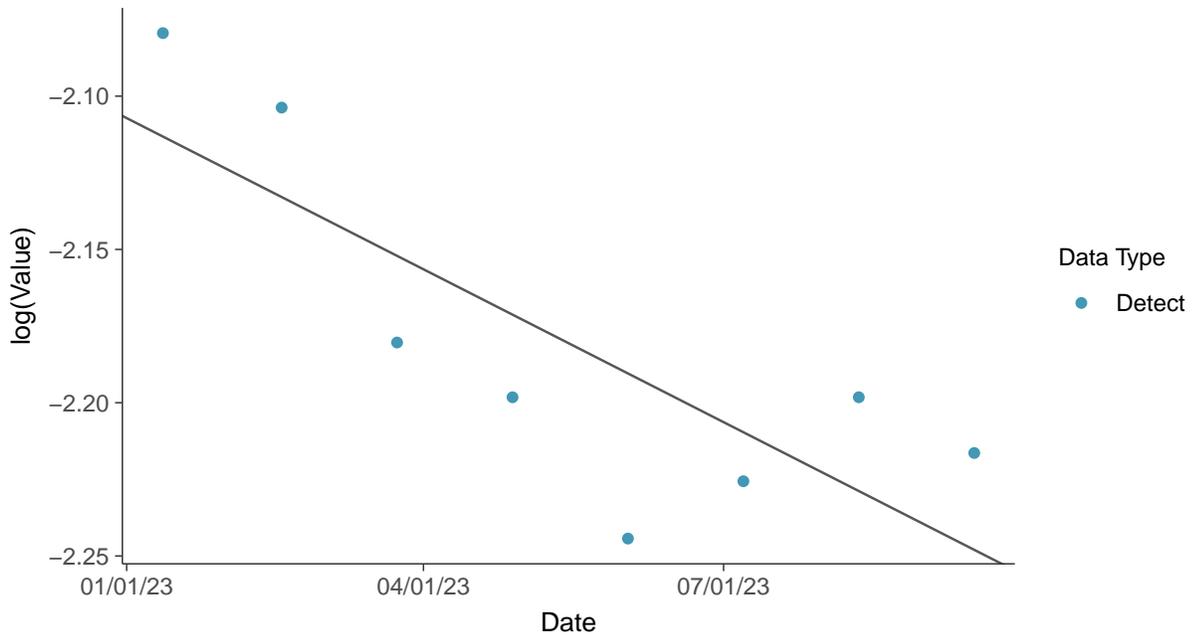
Gamma Q-Q plot

Lithium, MW-14 (mg/L)



Trend Regression: Lognormal MLE

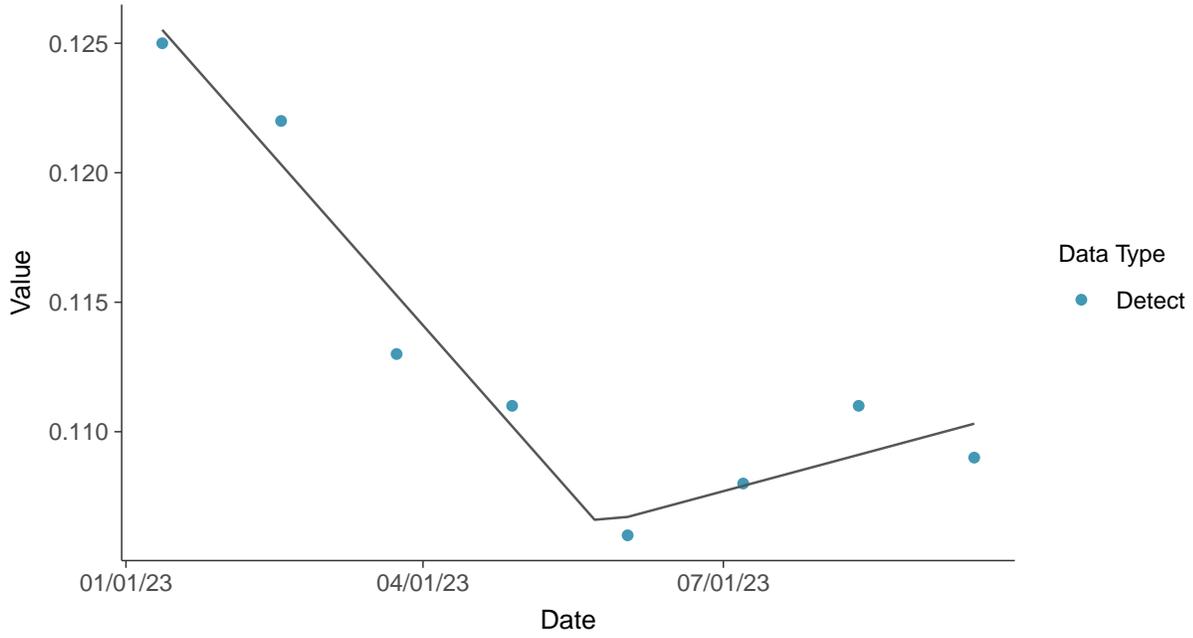
Lithium, MW-14 (mg/L)





Trend Regression: Piecewise Linear-Linear

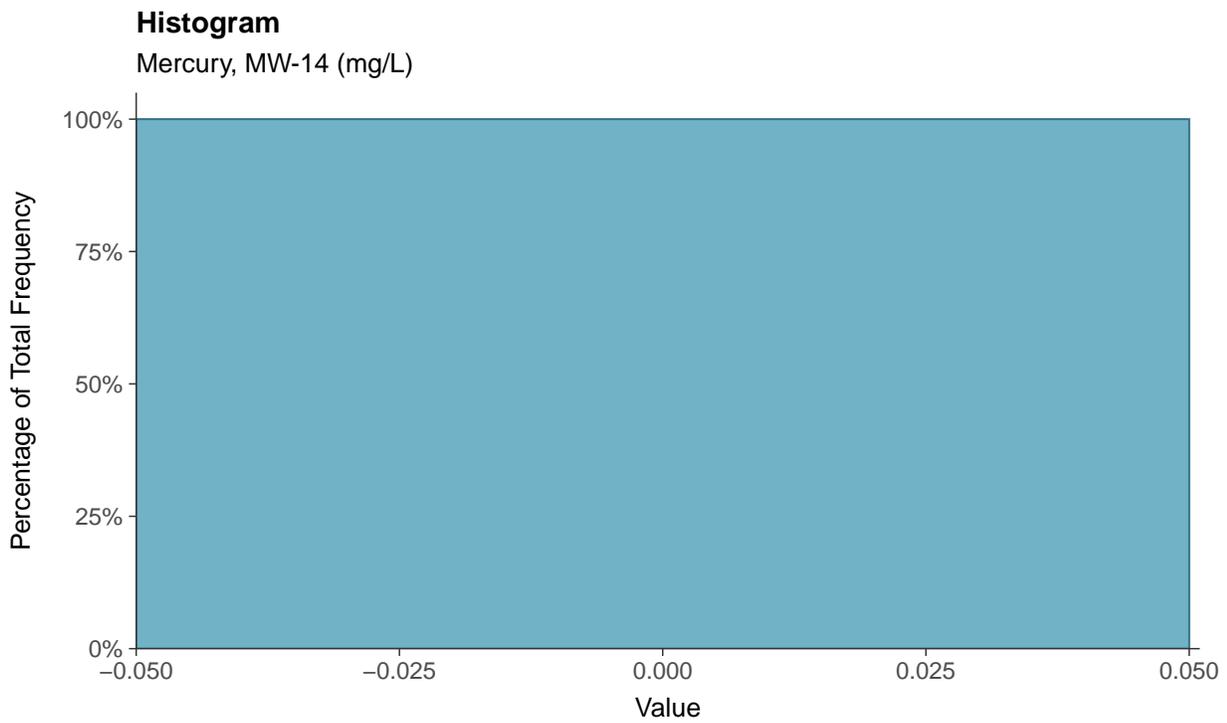
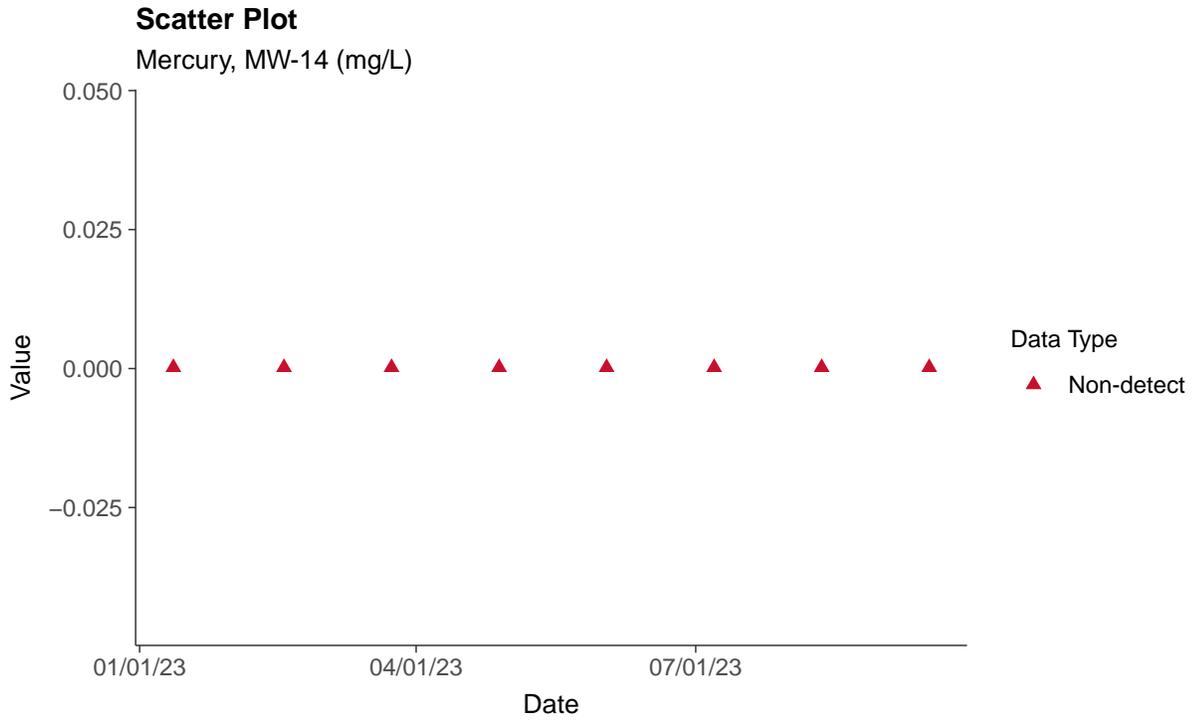
Lithium, MW-14 (mg/L)





Appendix IV: Mercury, MW-14

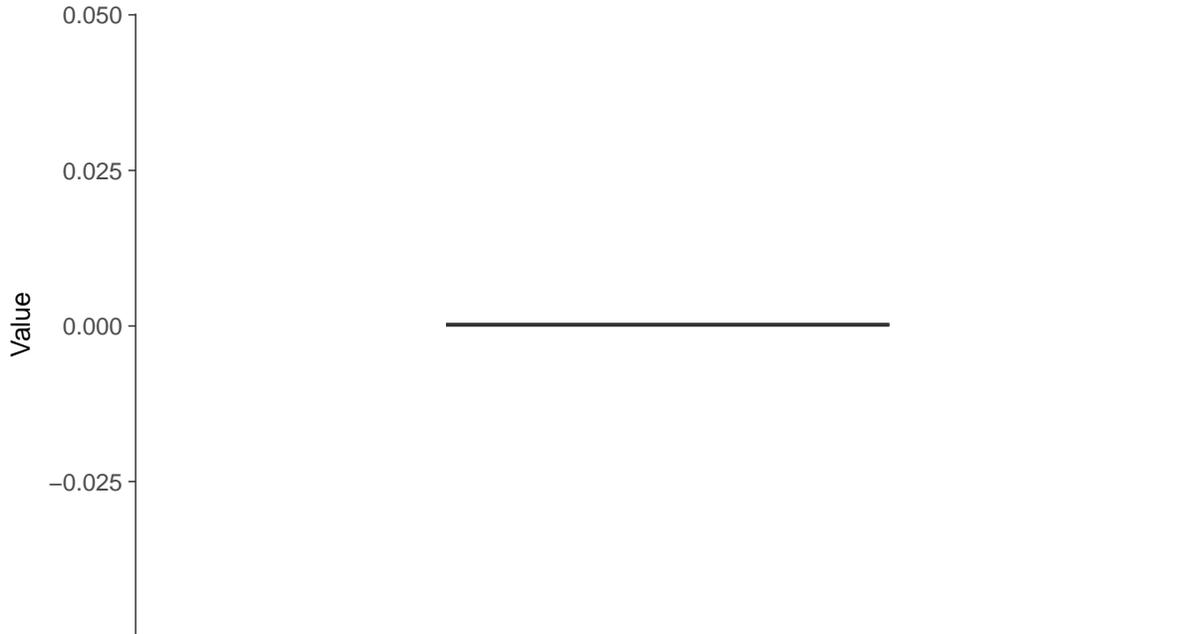
ID: 14_2_17





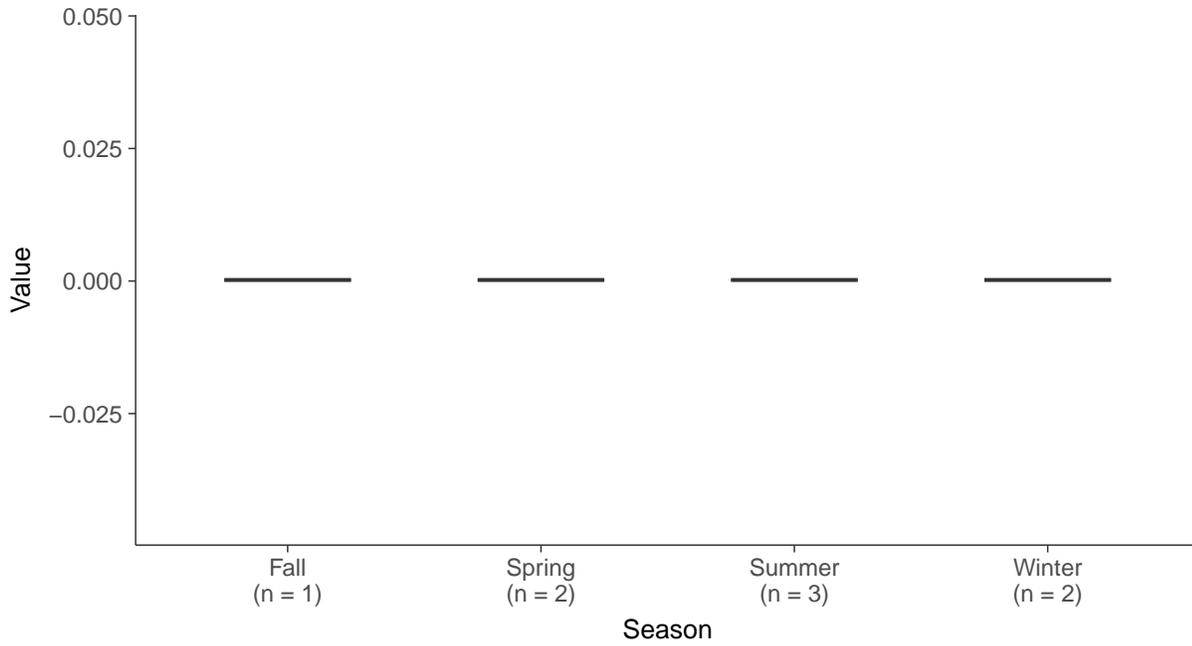
Boxplot

Mercury, MW-14 (mg/L)



Boxplot by Season

Mercury, MW-14 (mg/L)



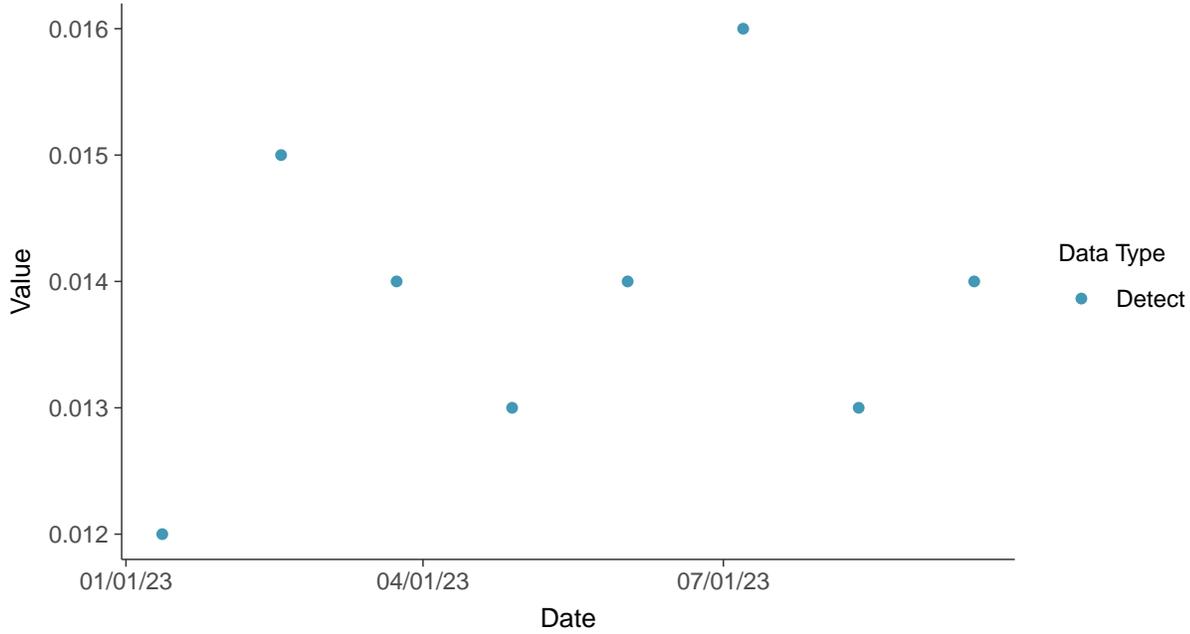


Appendix IV: Molybdenum, MW-14

ID: 14_2_18

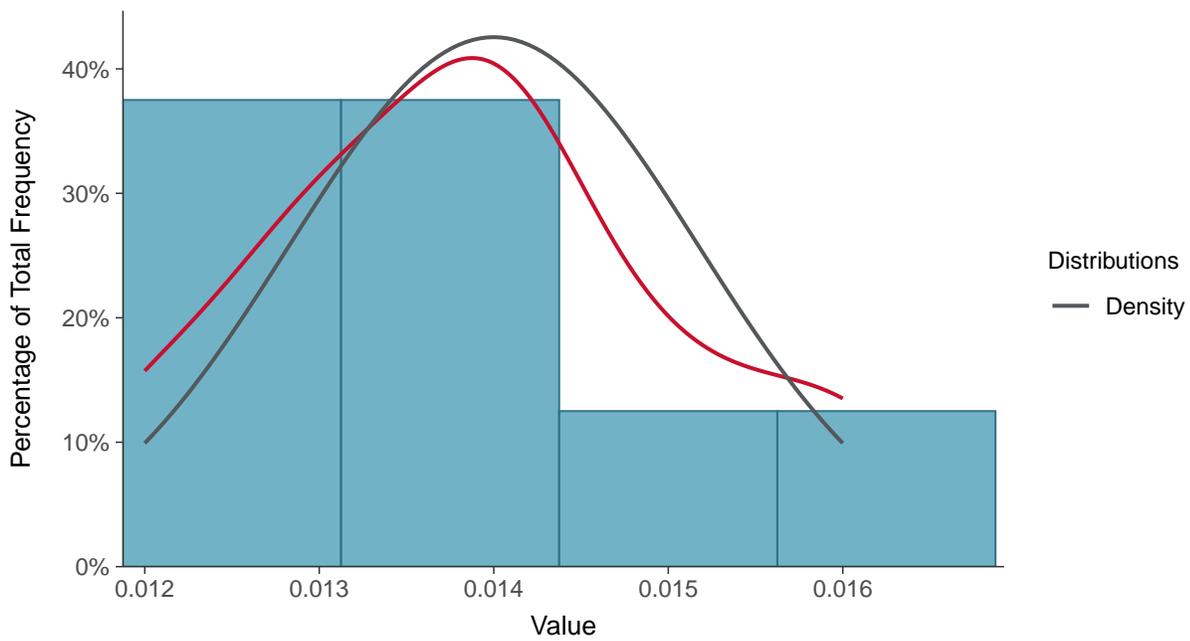
Scatter Plot

Molybdenum, MW-14 (mg/L)



Histogram

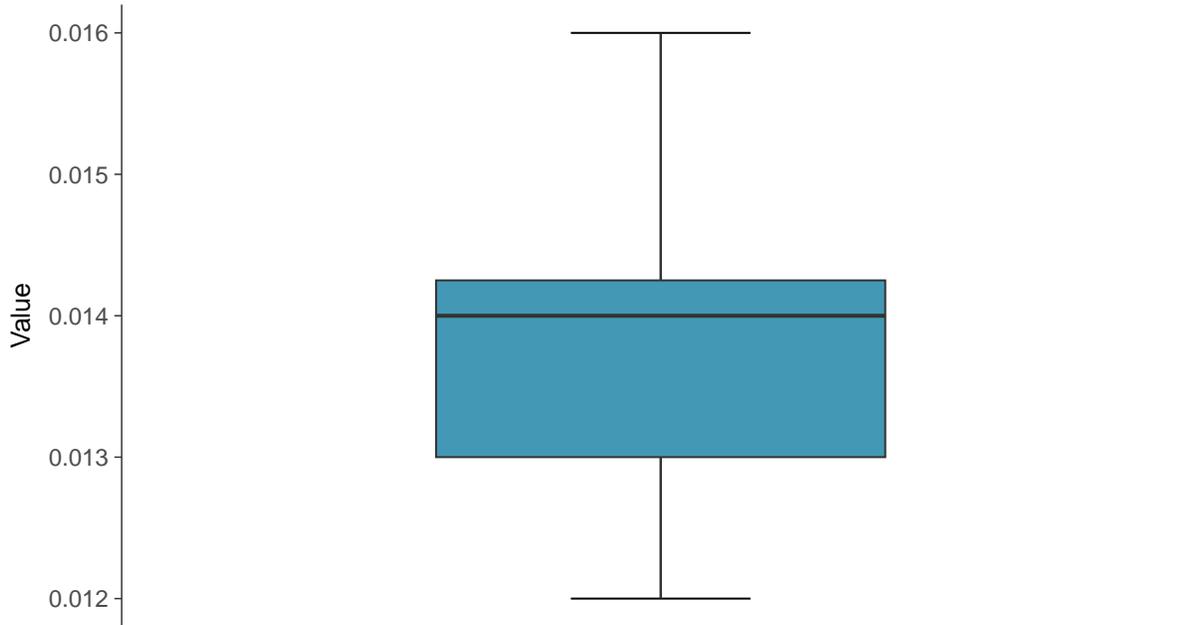
Molybdenum, MW-14 (mg/L)





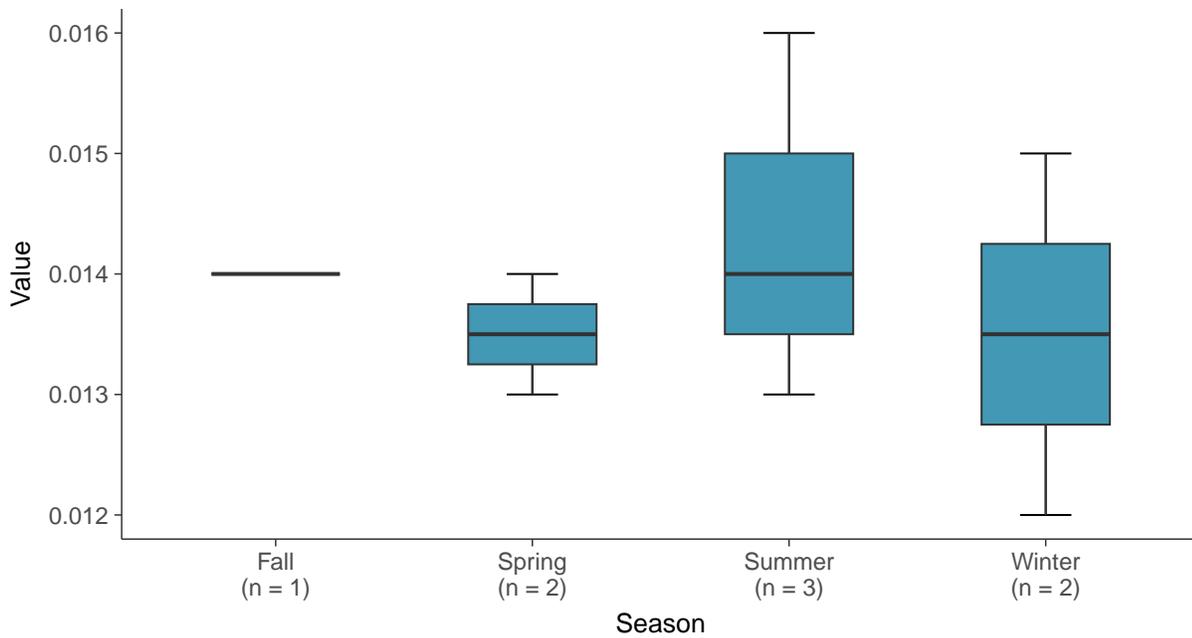
Boxplot

Molybdenum, MW-14 (mg/L)



Boxplot by Season

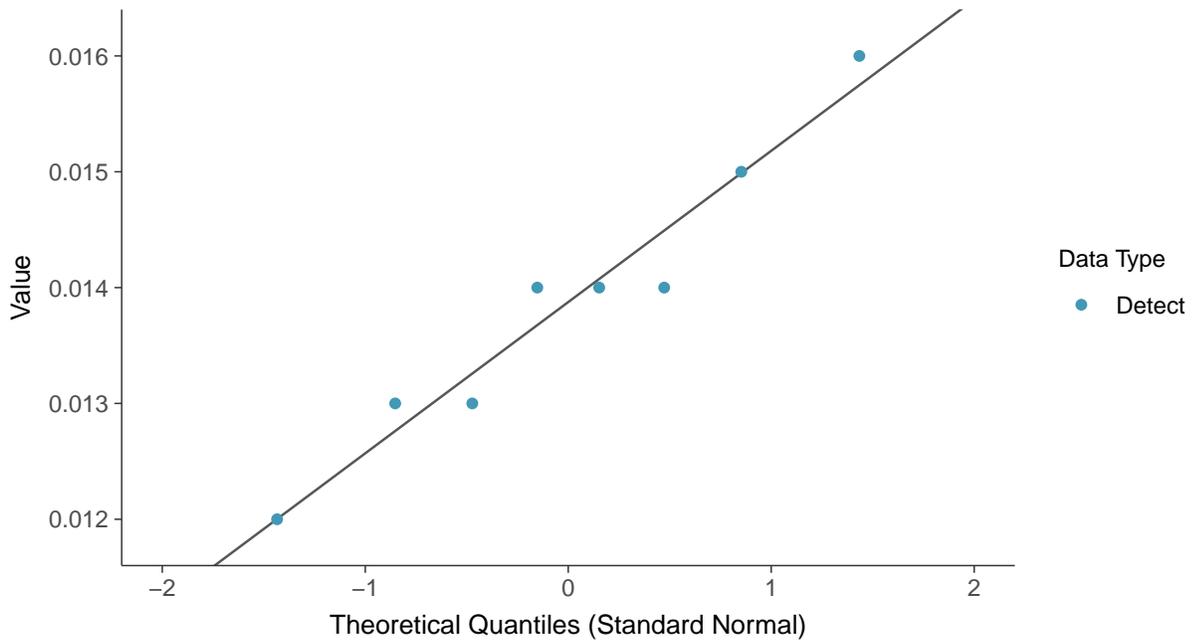
Molybdenum, MW-14 (mg/L)





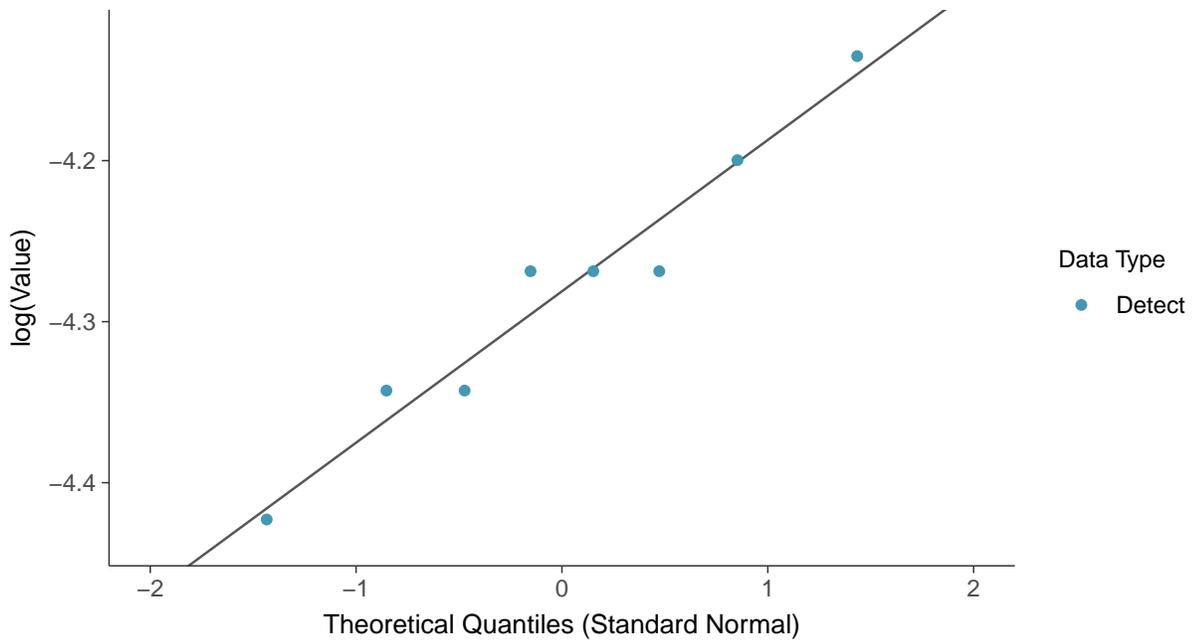
Normal Q-Q plot

Molybdenum, MW-14 (mg/L)



Lognormal Q-Q plot

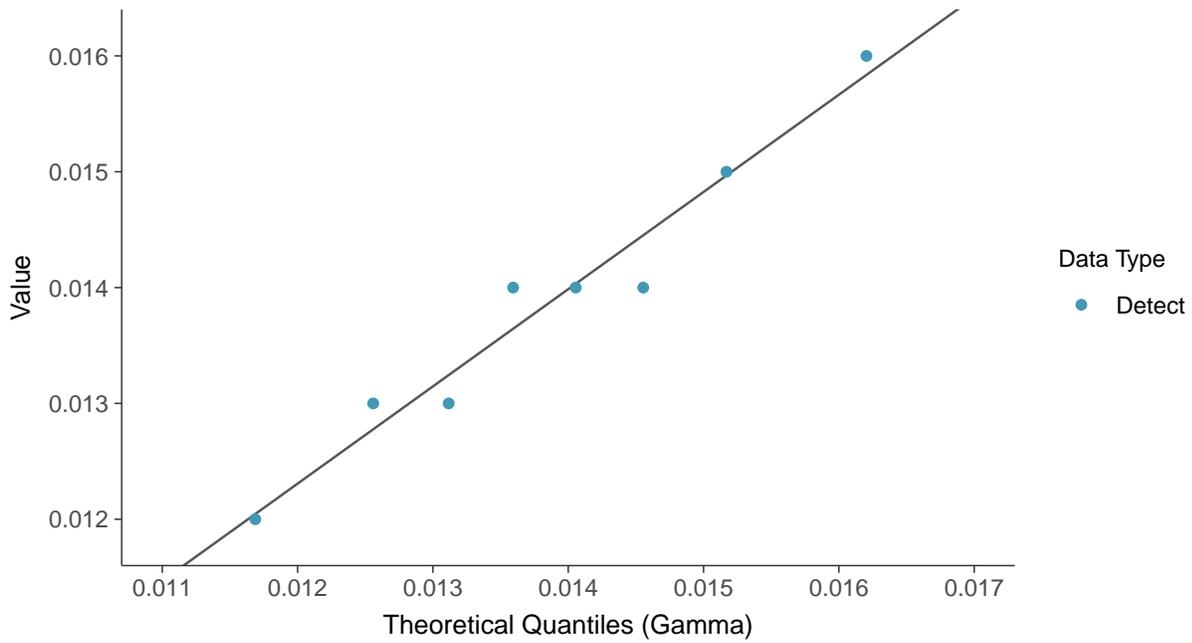
Molybdenum, MW-14 (mg/L)





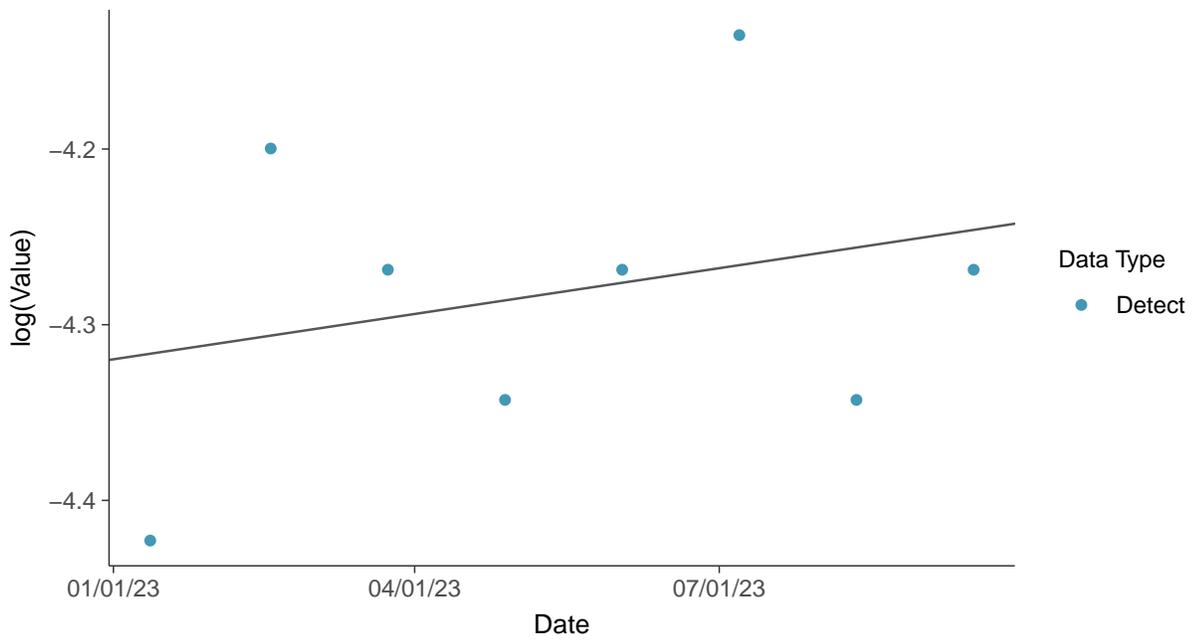
Gamma Q-Q plot

Molybdenum, MW-14 (mg/L)



Trend Regression: Lognormal MLE

Molybdenum, MW-14 (mg/L)



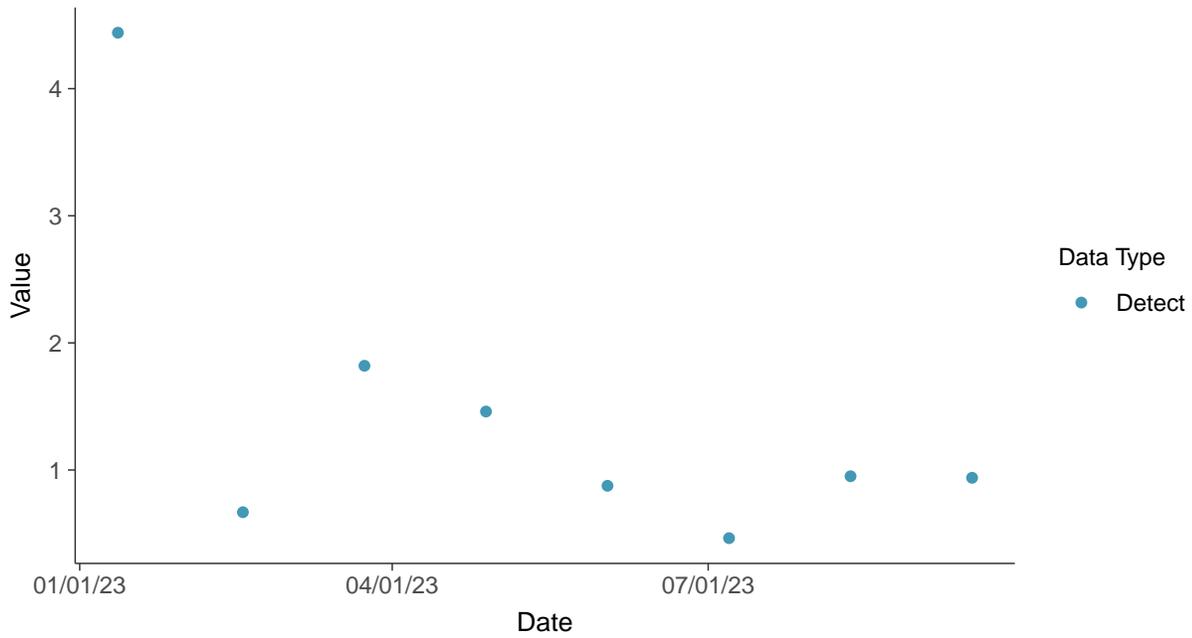


Appendix IV: Radium-226/228, MW-14

ID: 14_2_20

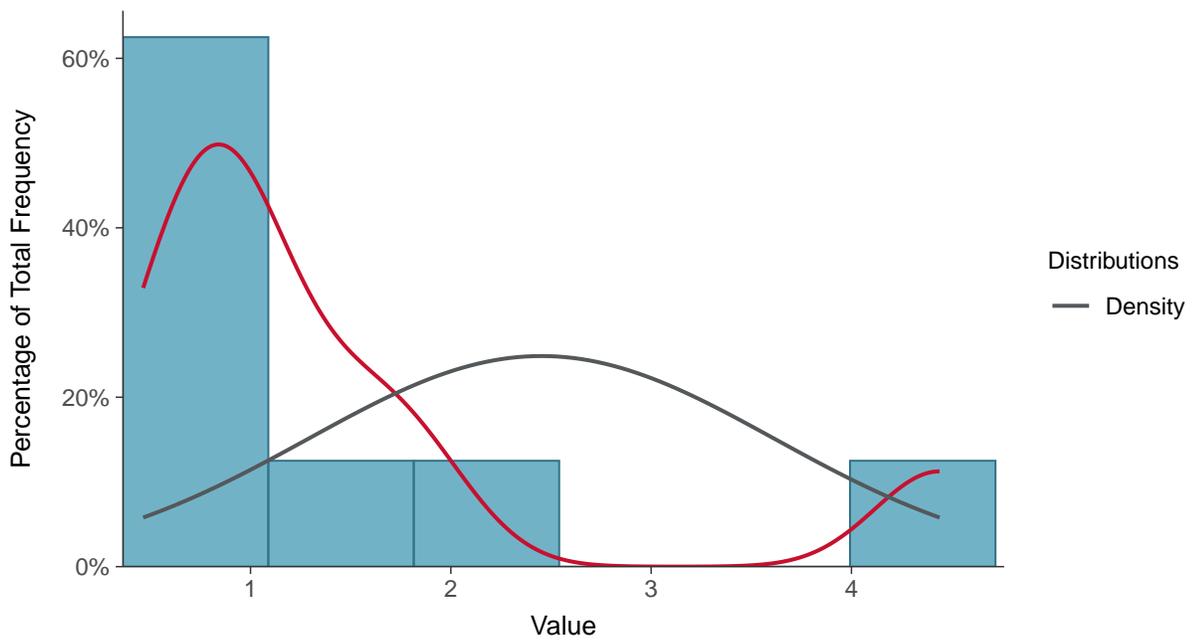
Scatter Plot

Radium-226/228, MW-14 (pCi/L)



Histogram

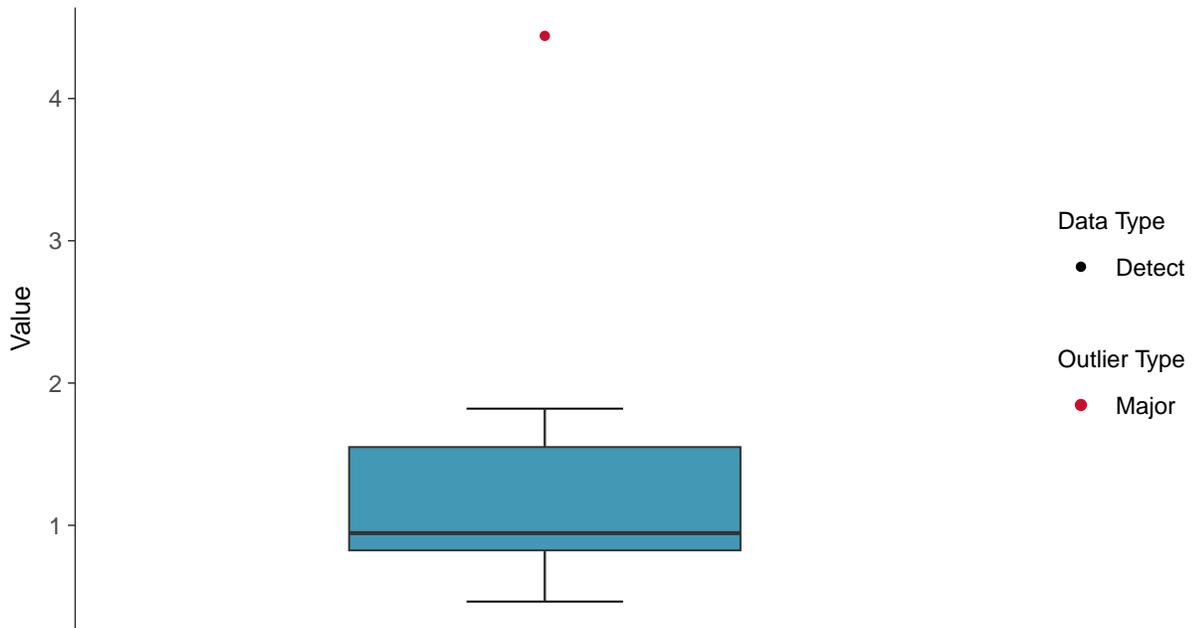
Radium-226/228, MW-14 (pCi/L)





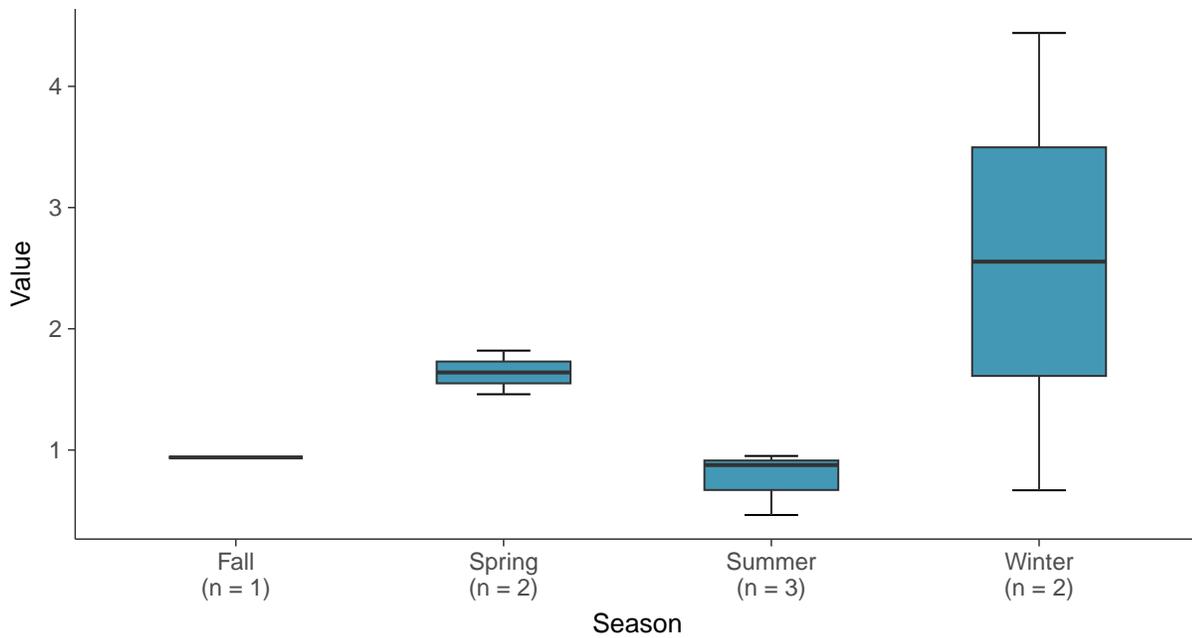
Boxplot

Radium-226/228, MW-14 (pCi/L)



Boxplot by Season

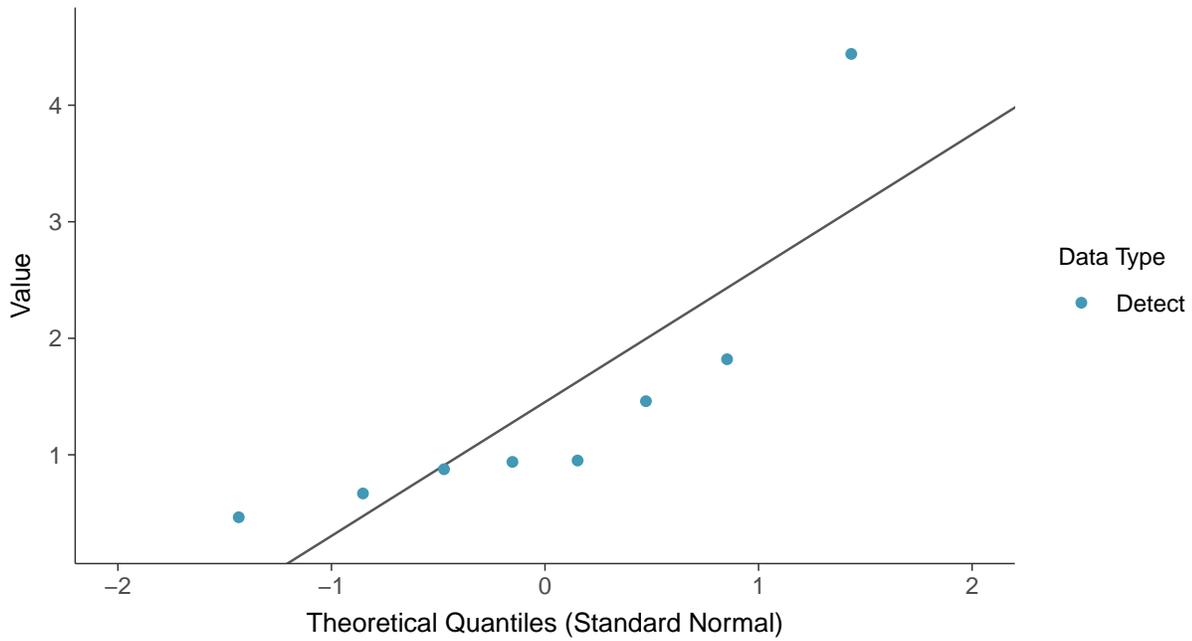
Radium-226/228, MW-14 (pCi/L)





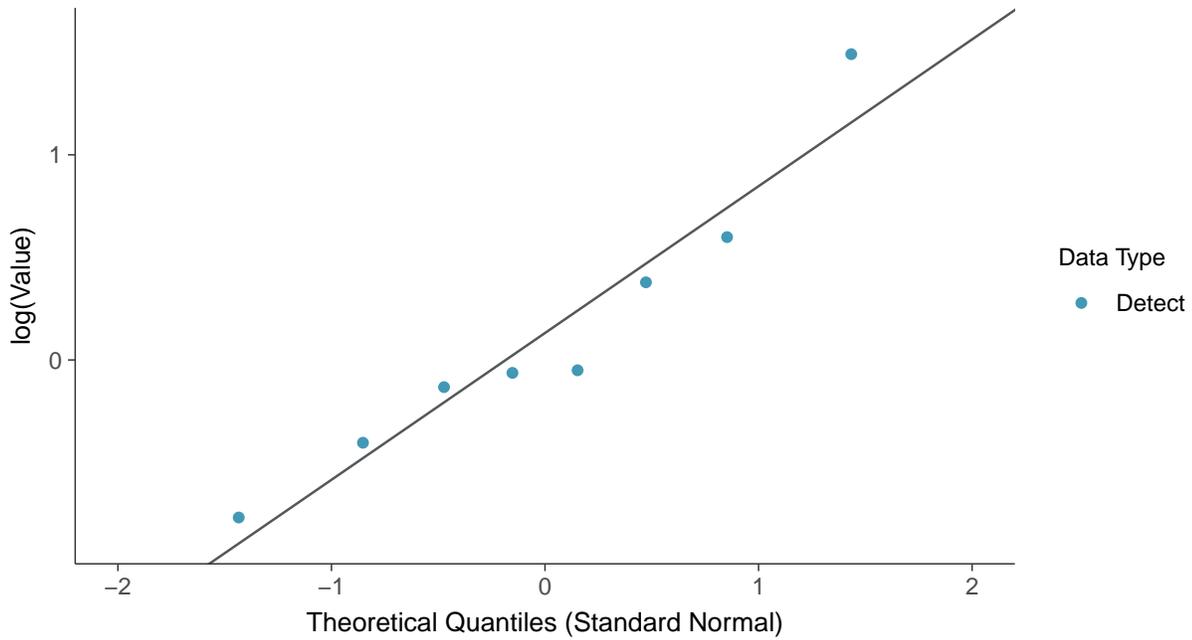
Normal Q-Q plot

Radium-226/228, MW-14 (pCi/L)



Lognormal Q-Q plot

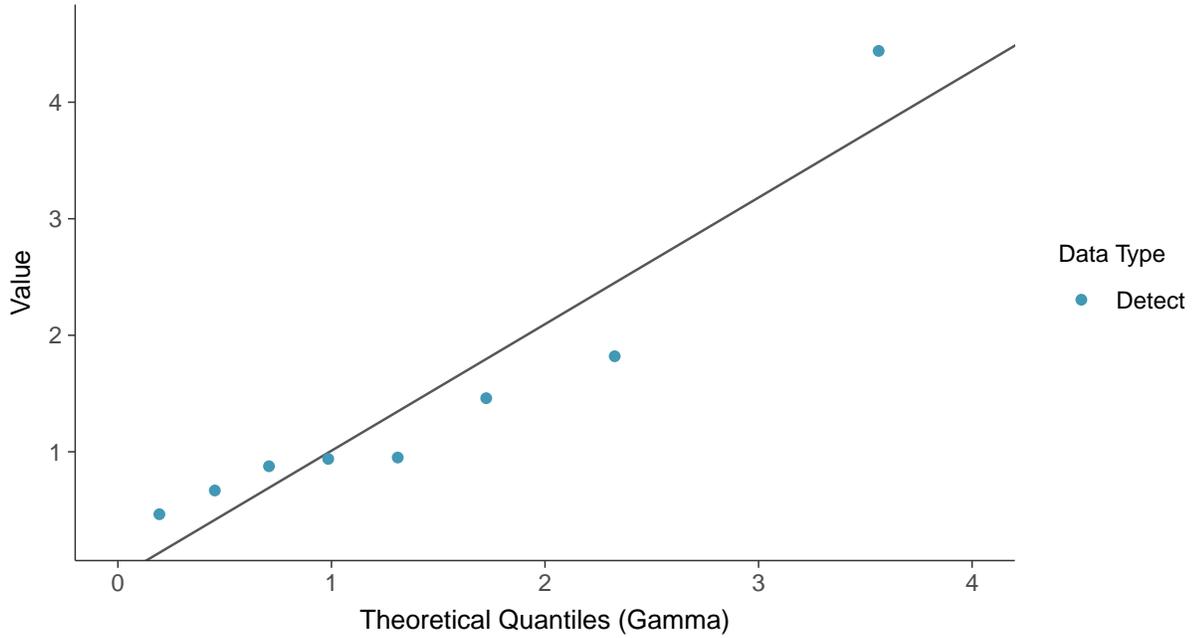
Radium-226/228, MW-14 (pCi/L)





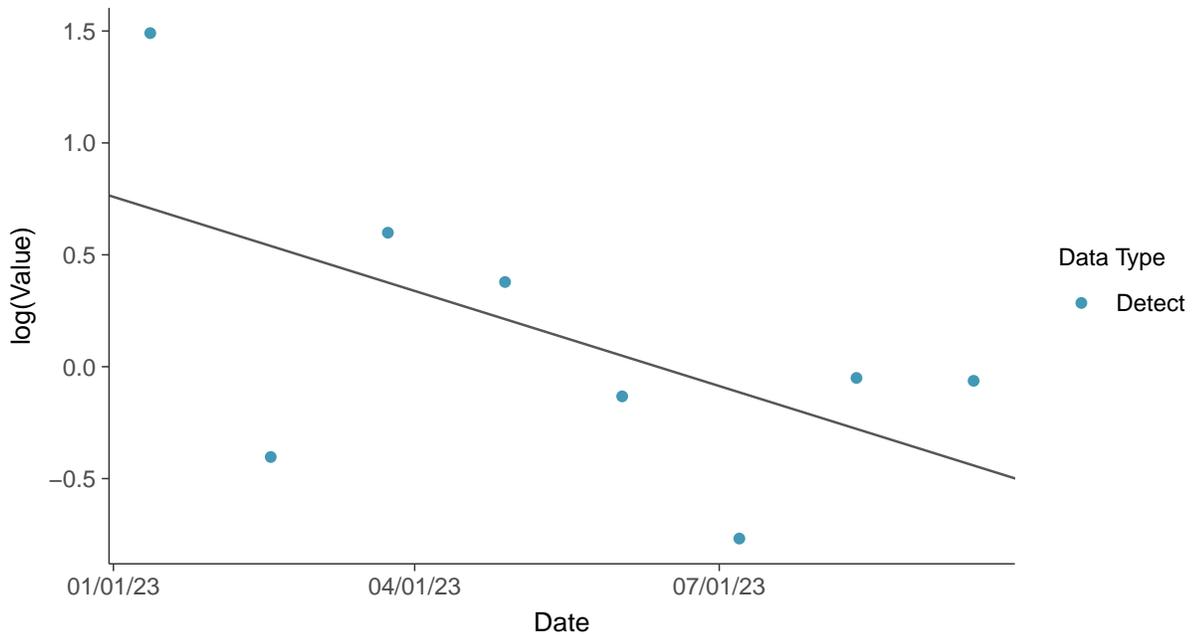
Gamma Q-Q plot

Radium-226/228, MW-14 (pCi/L)



Trend Regression: Lognormal MLE

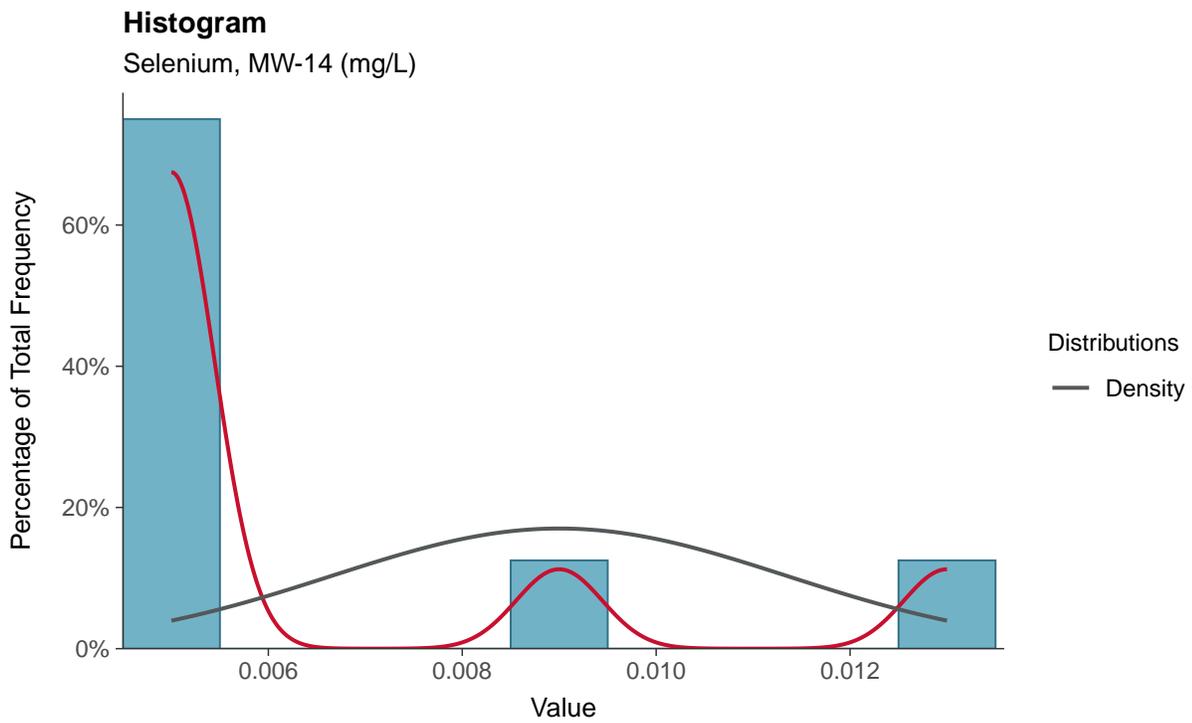
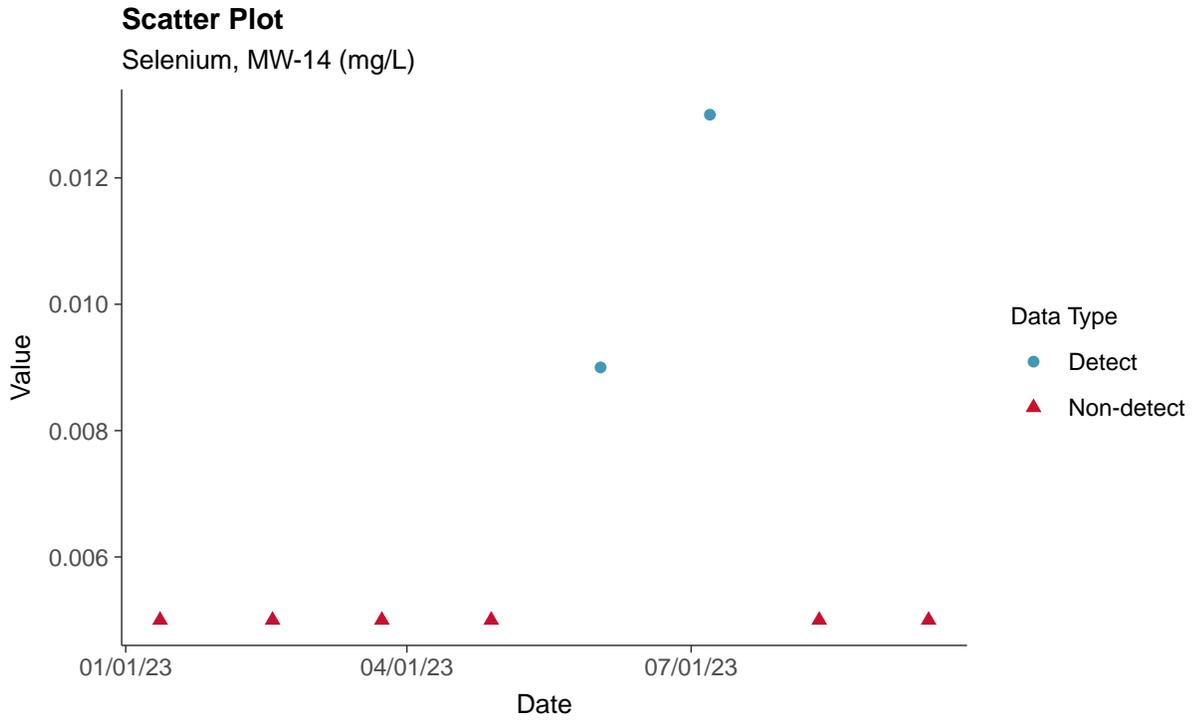
Radium-226/228, MW-14 (pCi/L)





Appendix IV: Selenium, MW-14

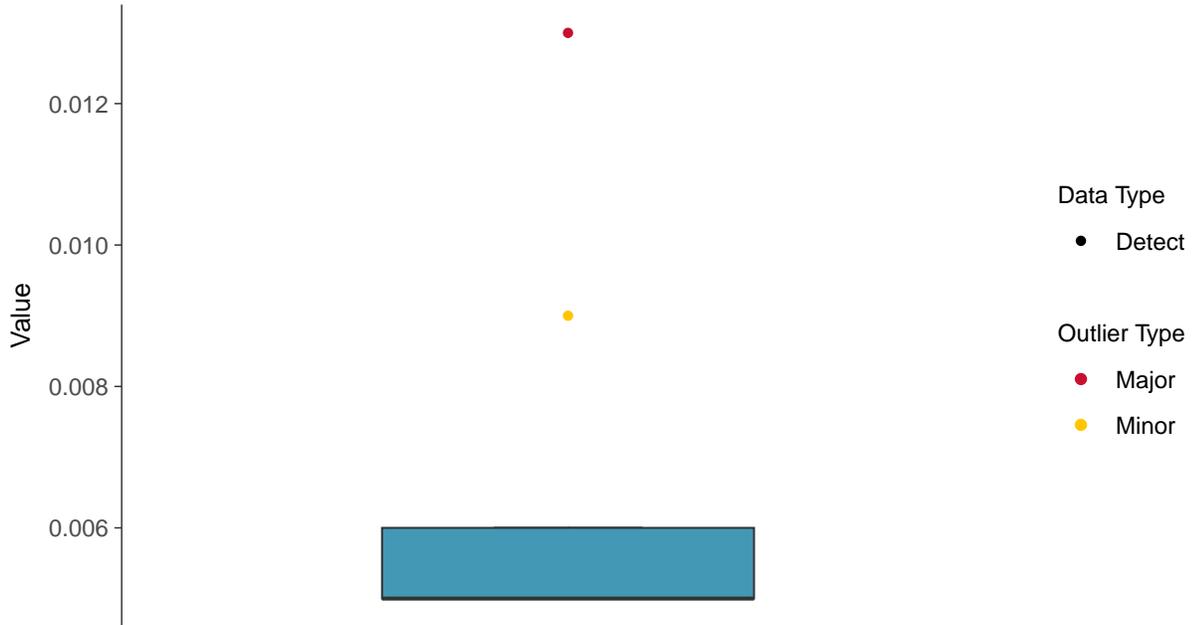
ID: 14_2_22





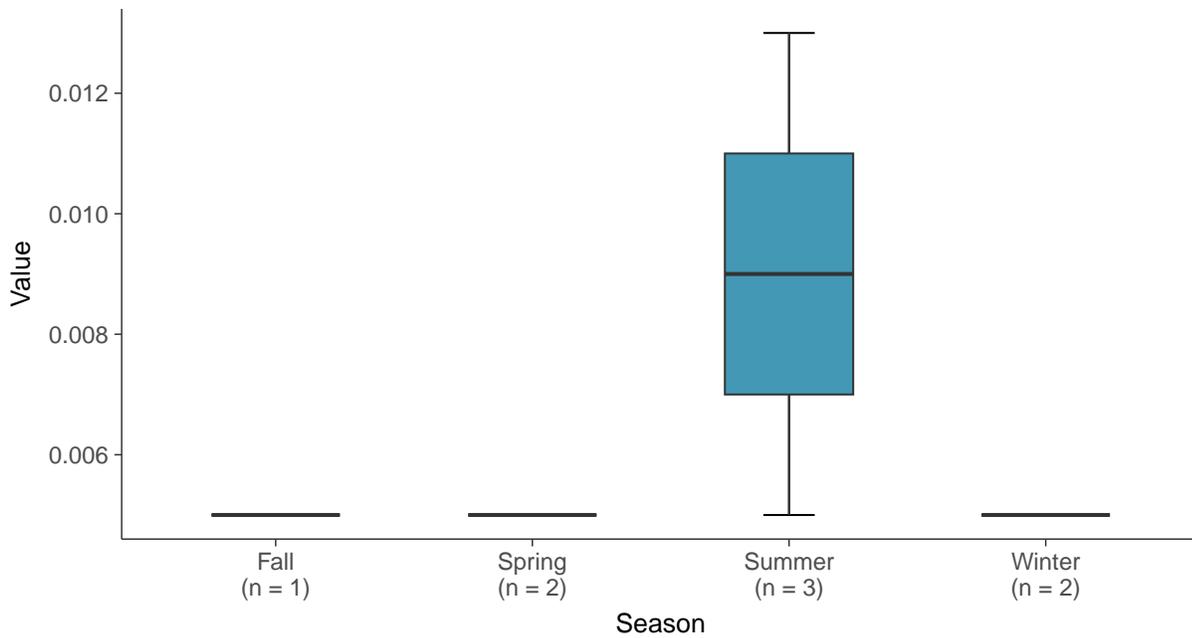
Boxplot

Selenium, MW-14 (mg/L)



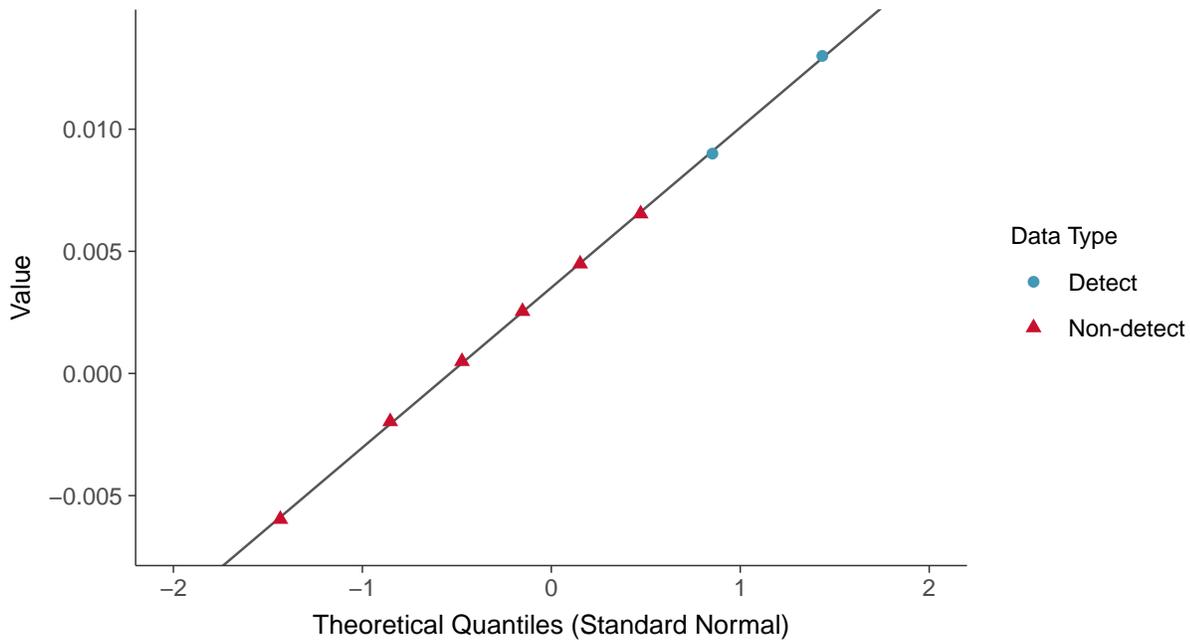
Boxplot by Season

Selenium, MW-14 (mg/L)

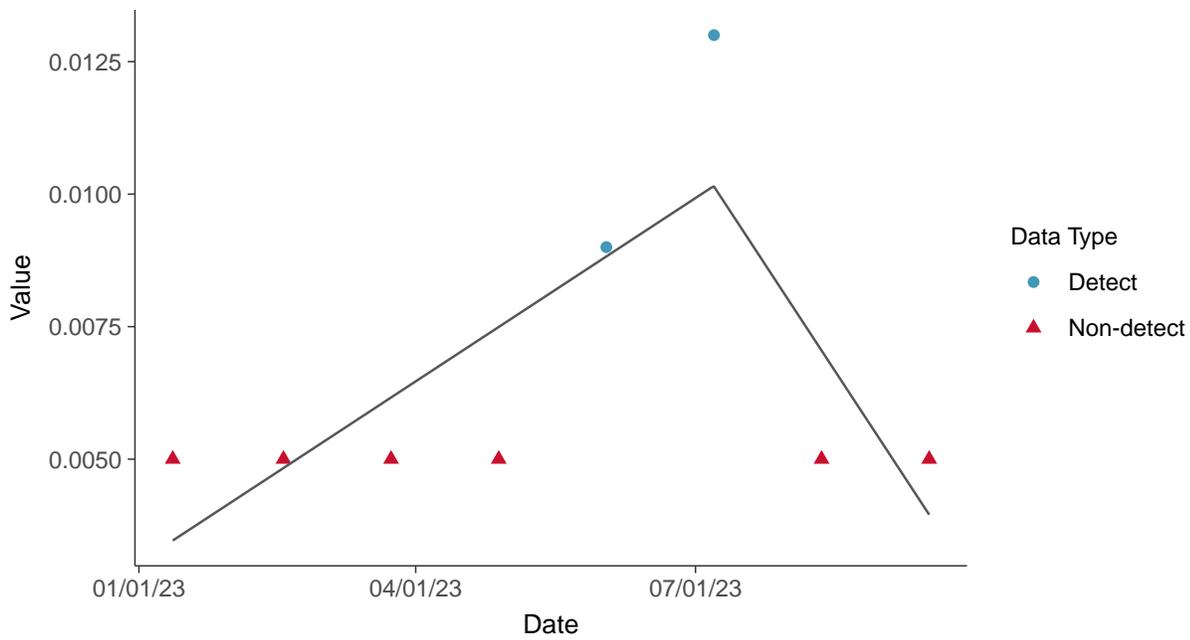




Normal Q-Q plot using ROS Imputed Estimates
Selenium, MW-14 (mg/L)



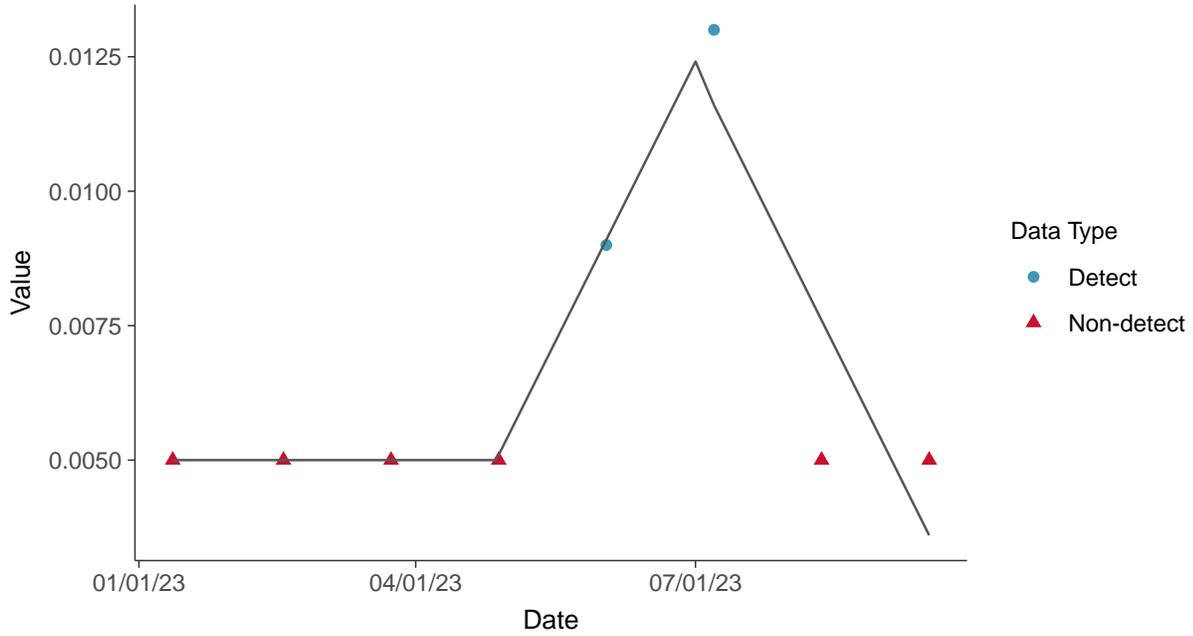
Trend Regression: Piecewise Linear-Linear
Selenium, MW-14 (mg/L)





Trend Regression: Piecewise Linear-Linear-Linear

Selenium, MW-14 (mg/L)



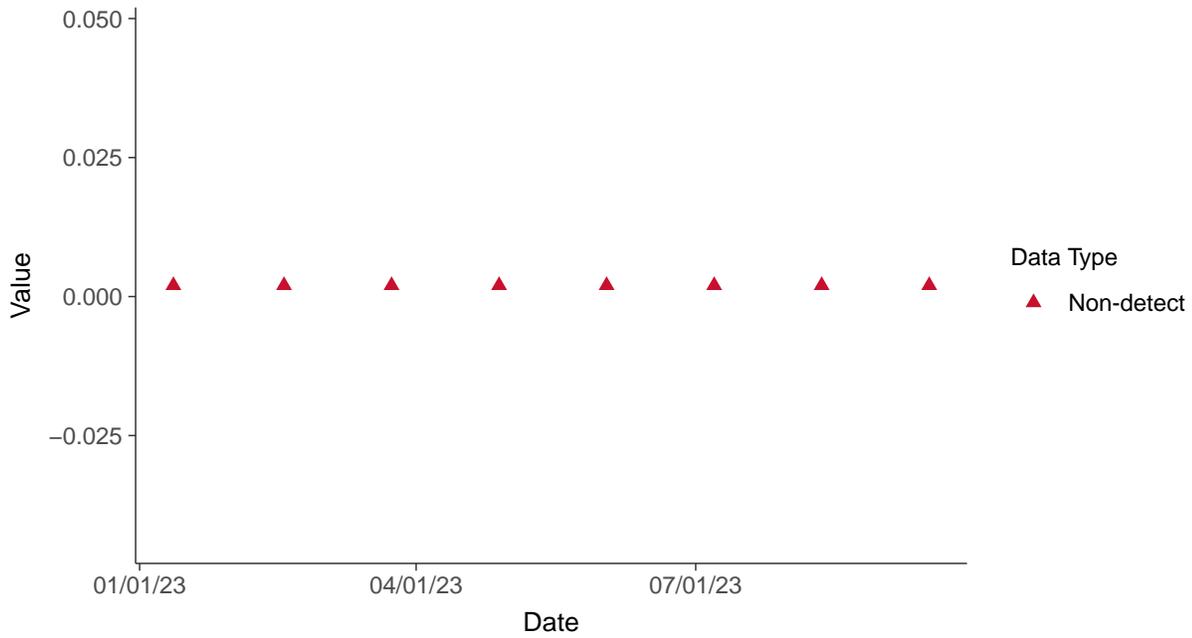


Appendix IV: Thallium, MW-14

ID: 14_2_23

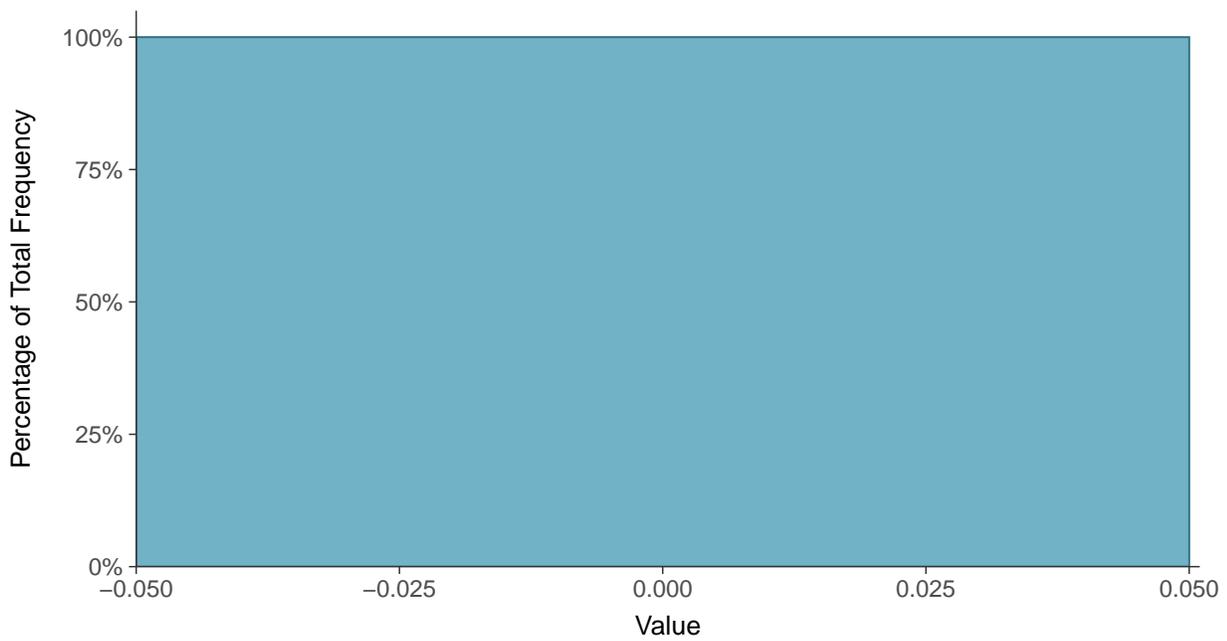
Scatter Plot

Thallium, MW-14 (mg/L)



Histogram

Thallium, MW-14 (mg/L)





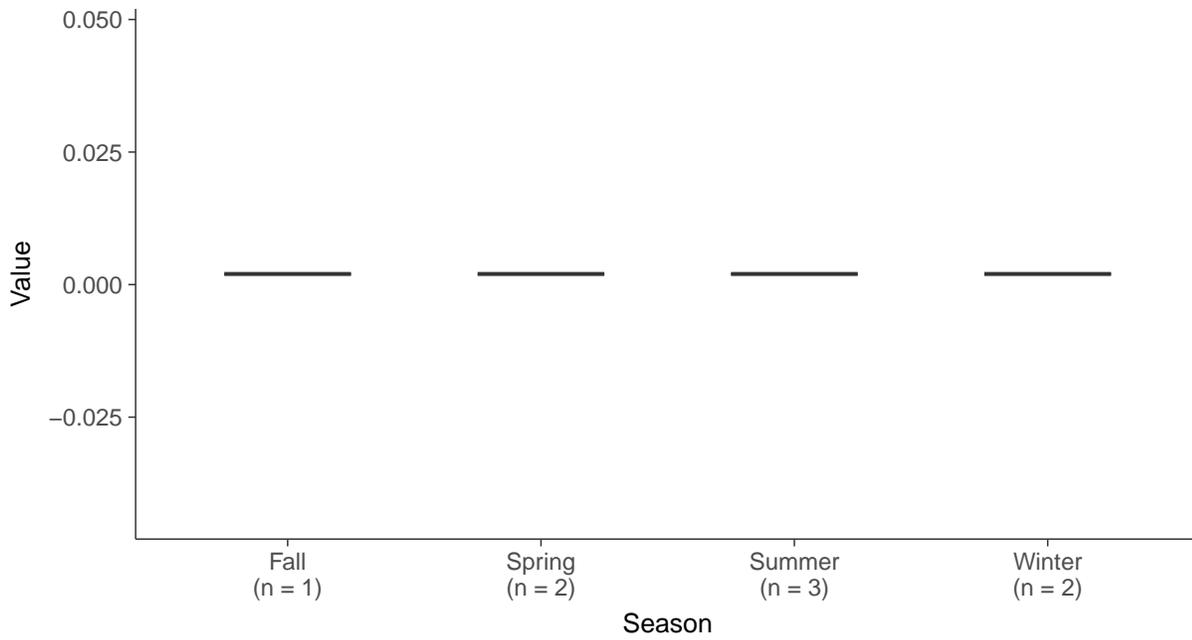
Boxplot

Thallium, MW-14 (mg/L)



Boxplot by Season

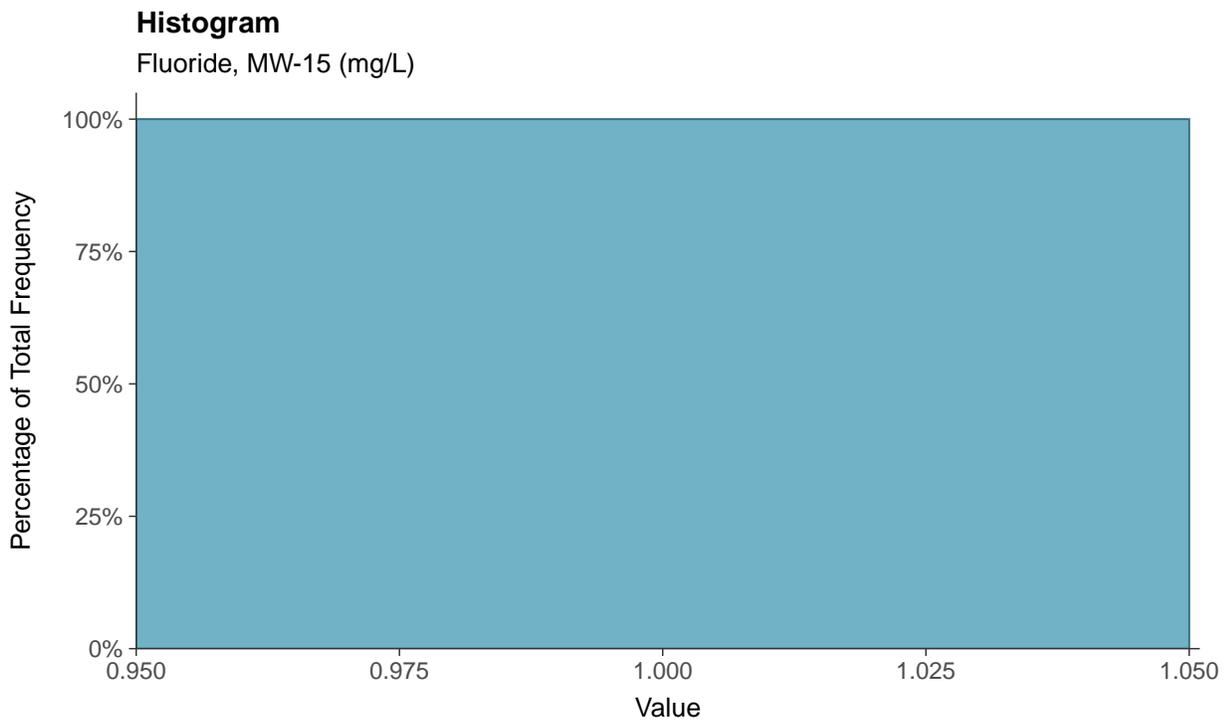
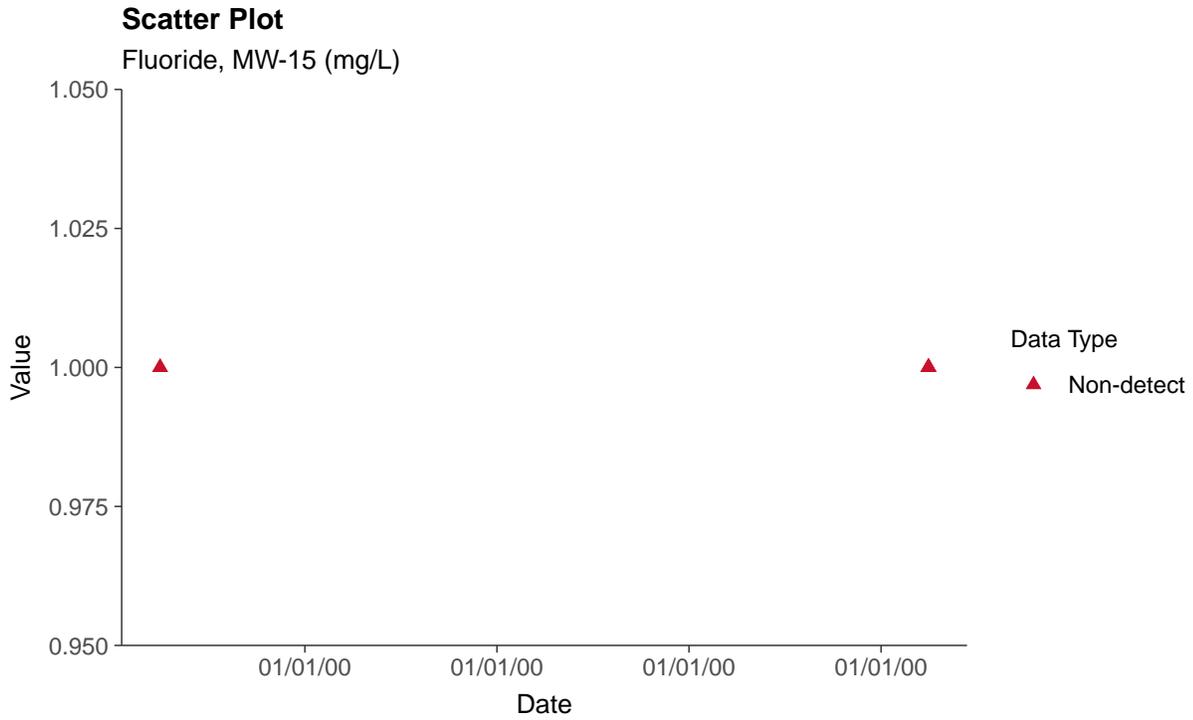
Thallium, MW-14 (mg/L)





Appendix IV: Fluoride, MW-15

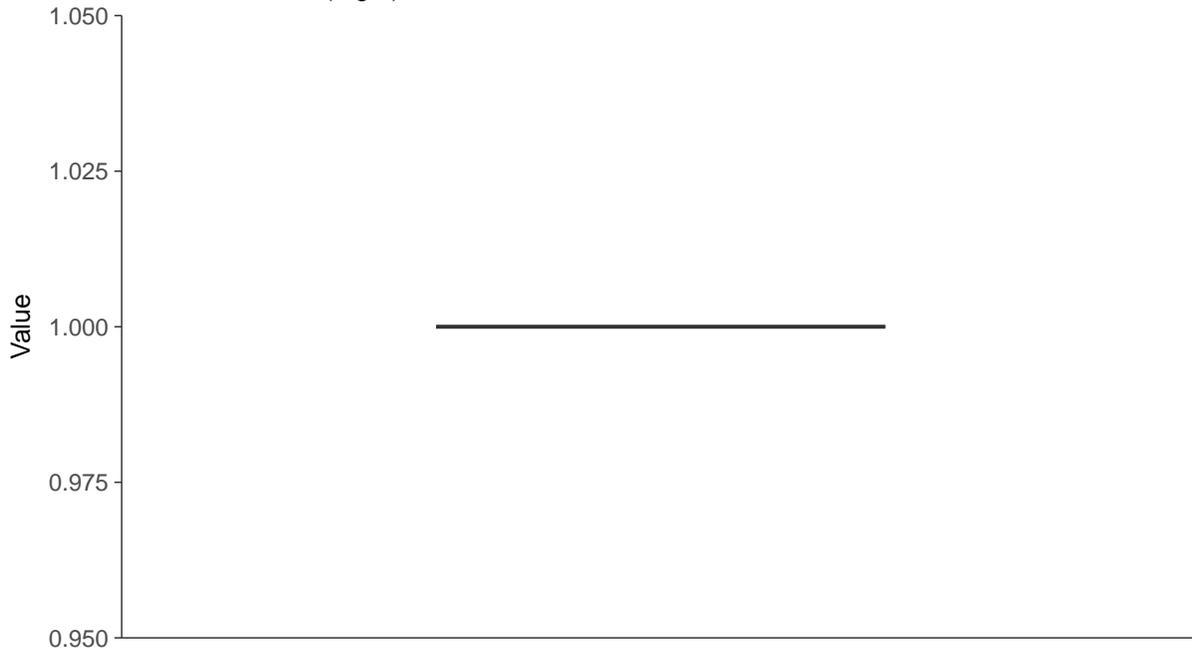
ID: 15_2_04





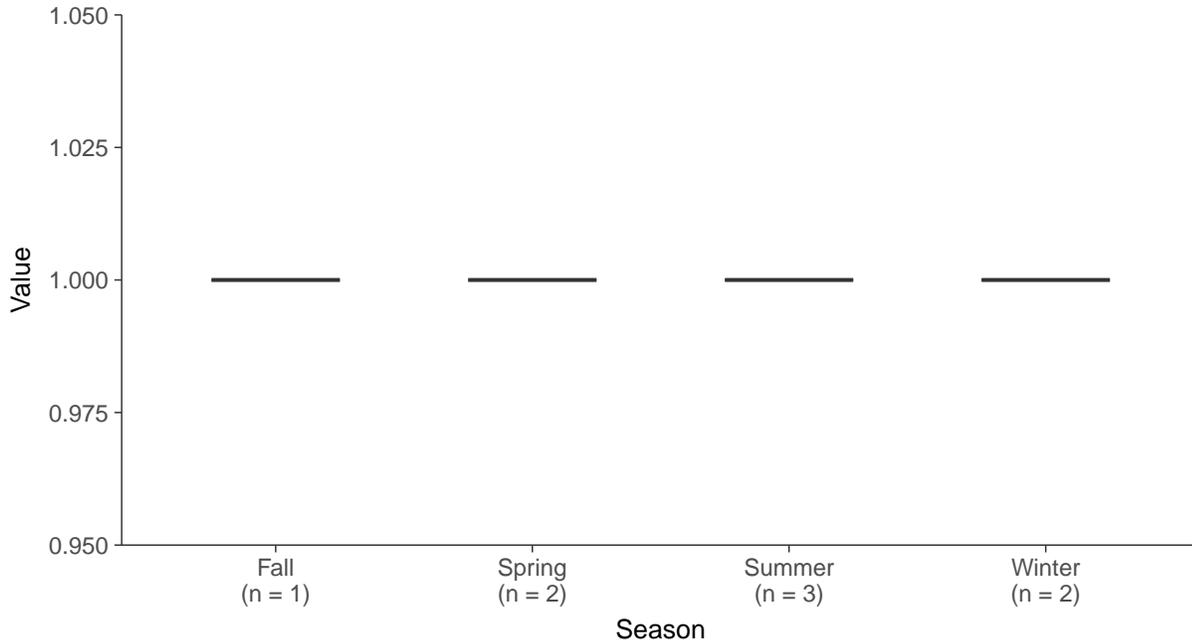
Boxplot

Fluoride, MW-15 (mg/L)



Boxplot by Season

Fluoride, MW-15 (mg/L)



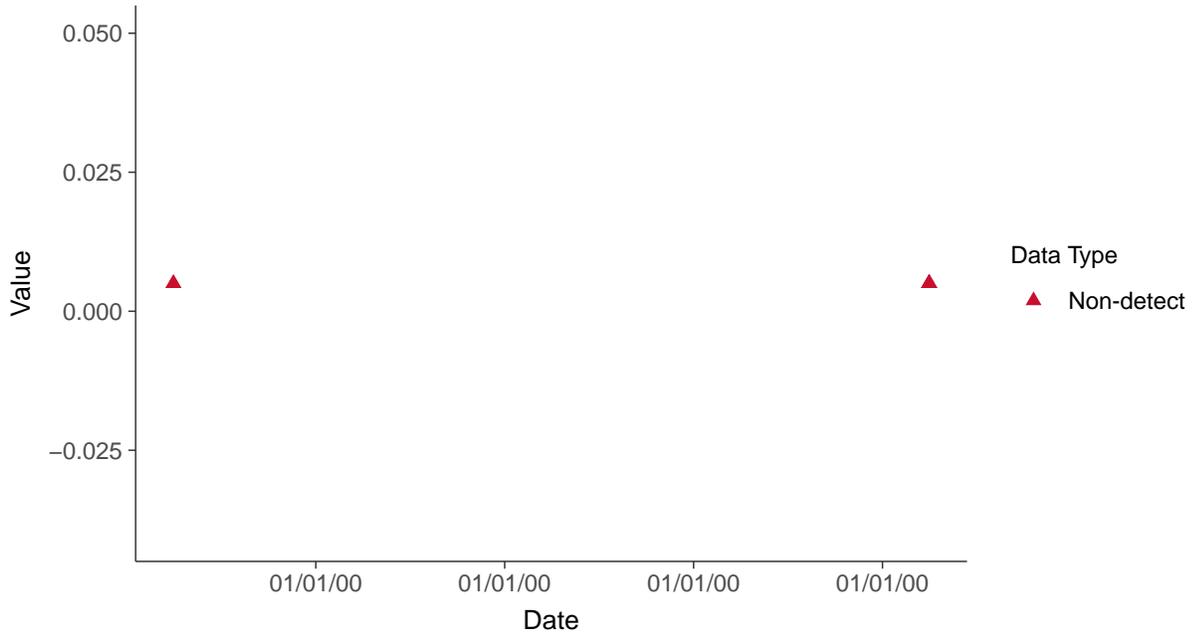


Appendix IV: Antimony, MW-15

ID: 15_2_08

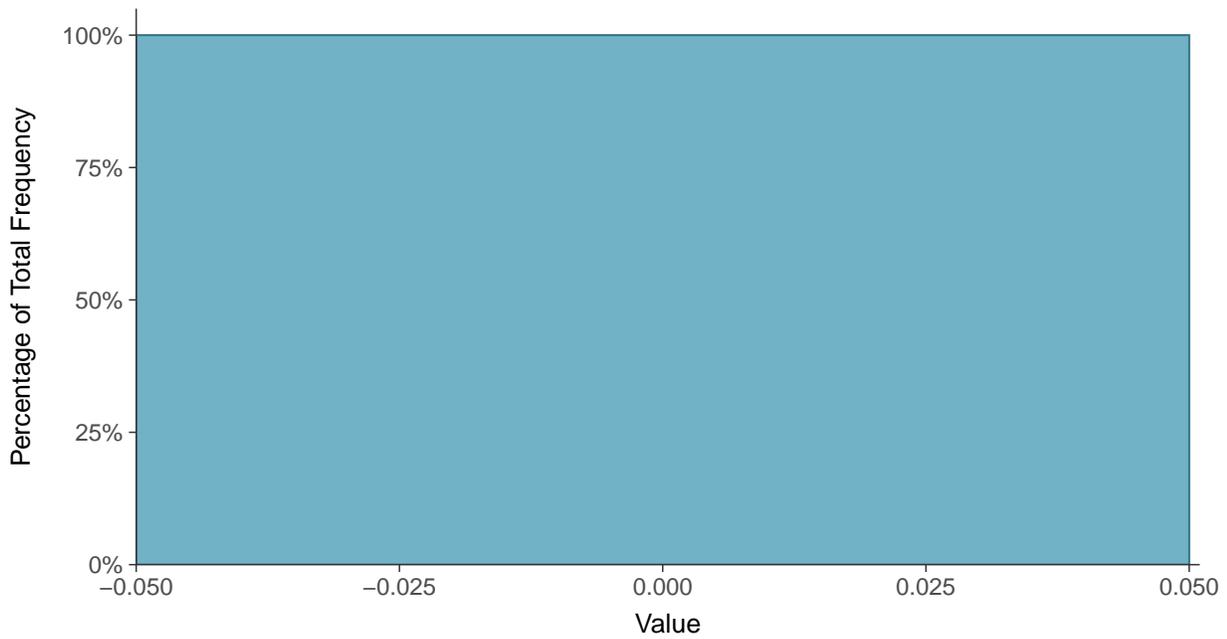
Scatter Plot

Antimony, MW-15 (mg/L)



Histogram

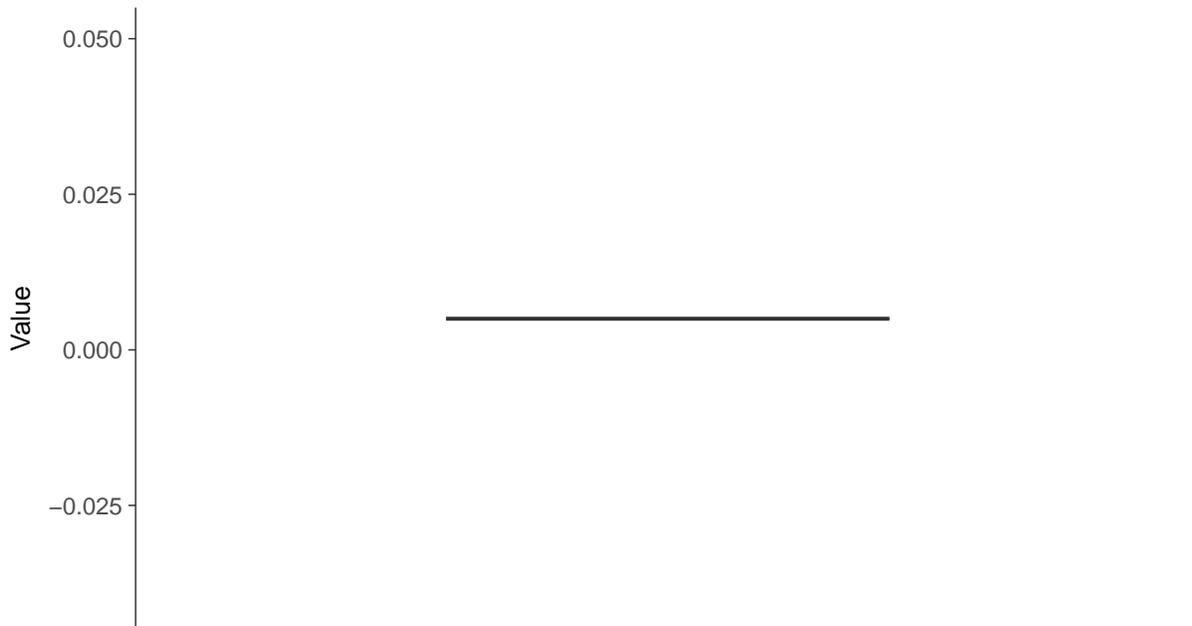
Antimony, MW-15 (mg/L)





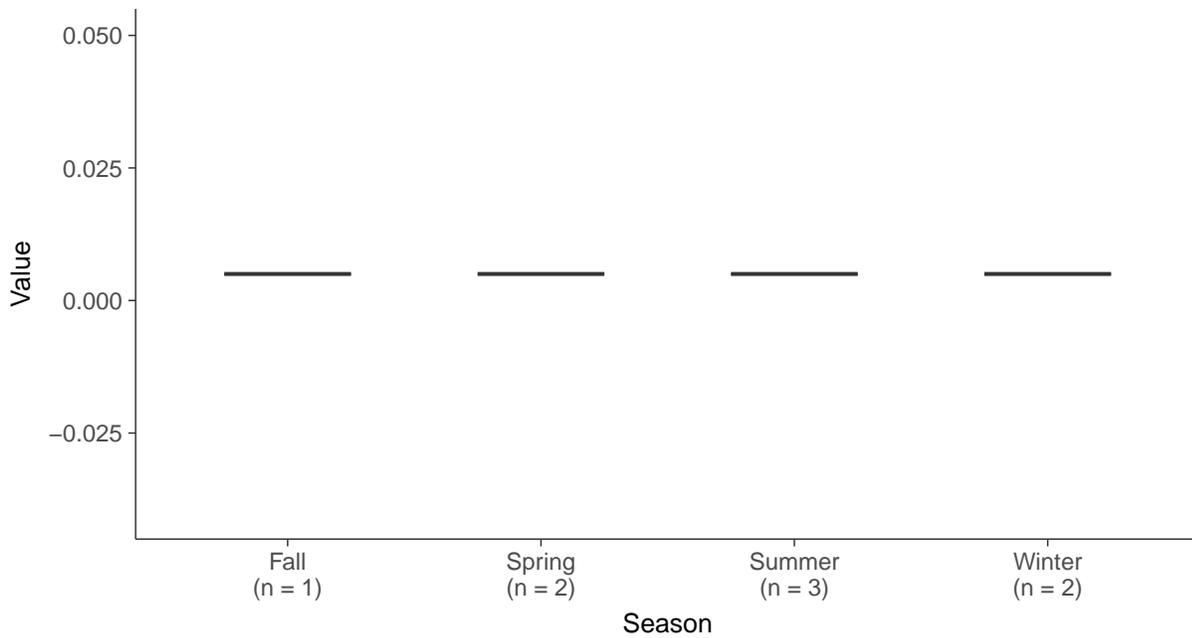
Boxplot

Antimony, MW-15 (mg/L)



Boxplot by Season

Antimony, MW-15 (mg/L)



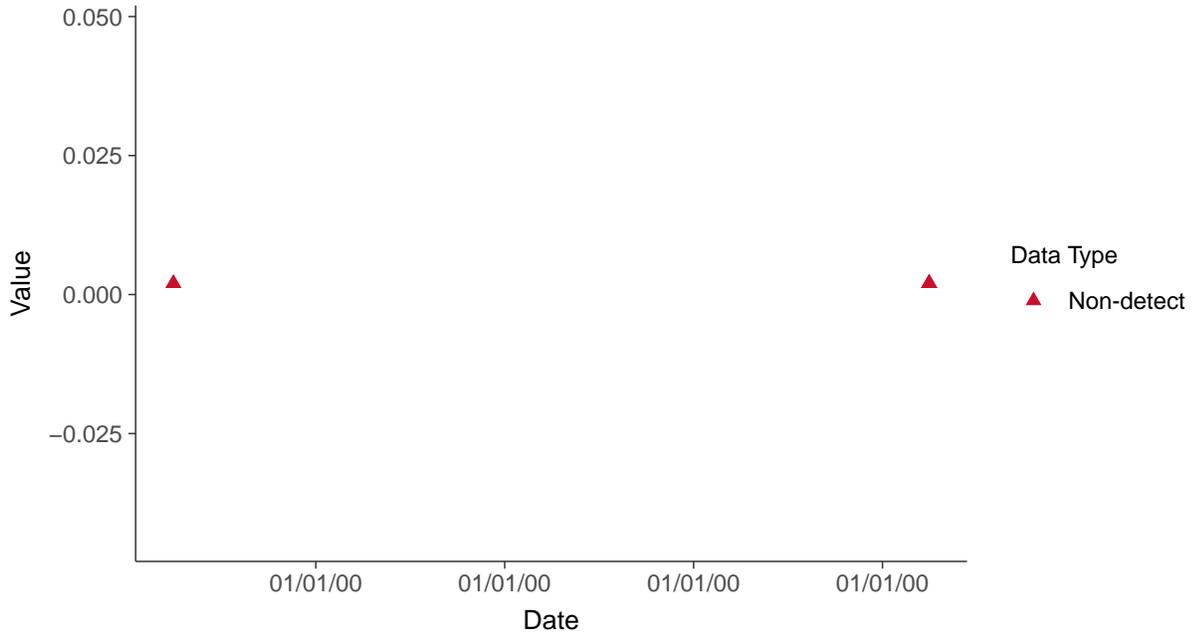


Appendix IV: Arsenic, MW-15

ID: 15_2_09

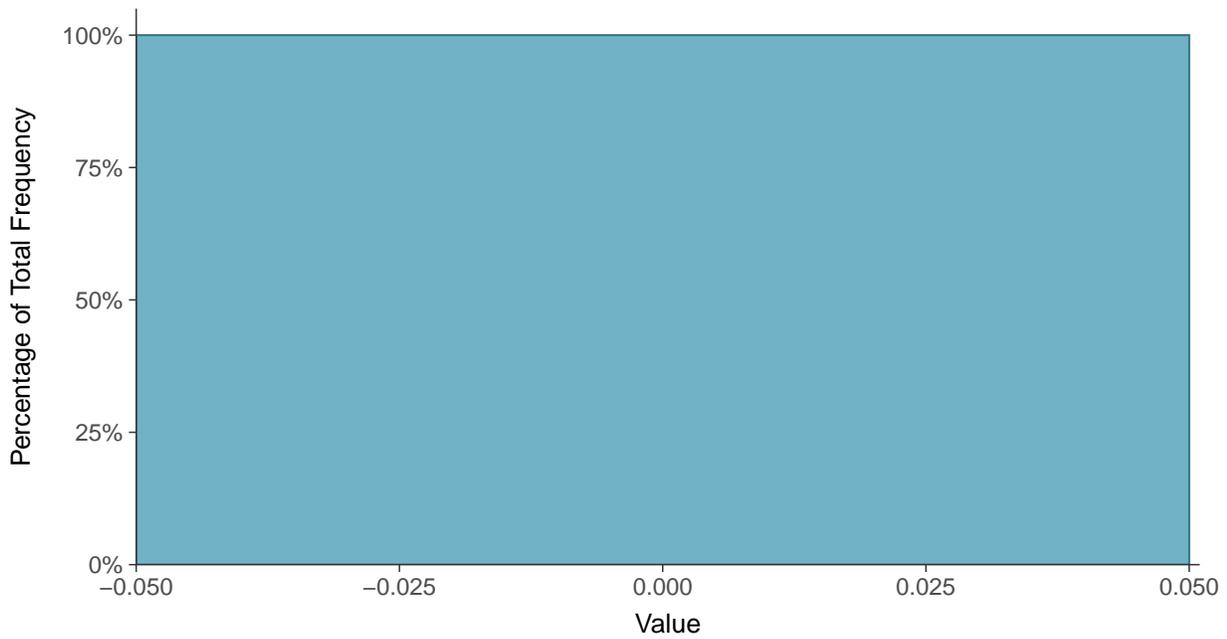
Scatter Plot

Arsenic, MW-15 (mg/L)



Histogram

Arsenic, MW-15 (mg/L)





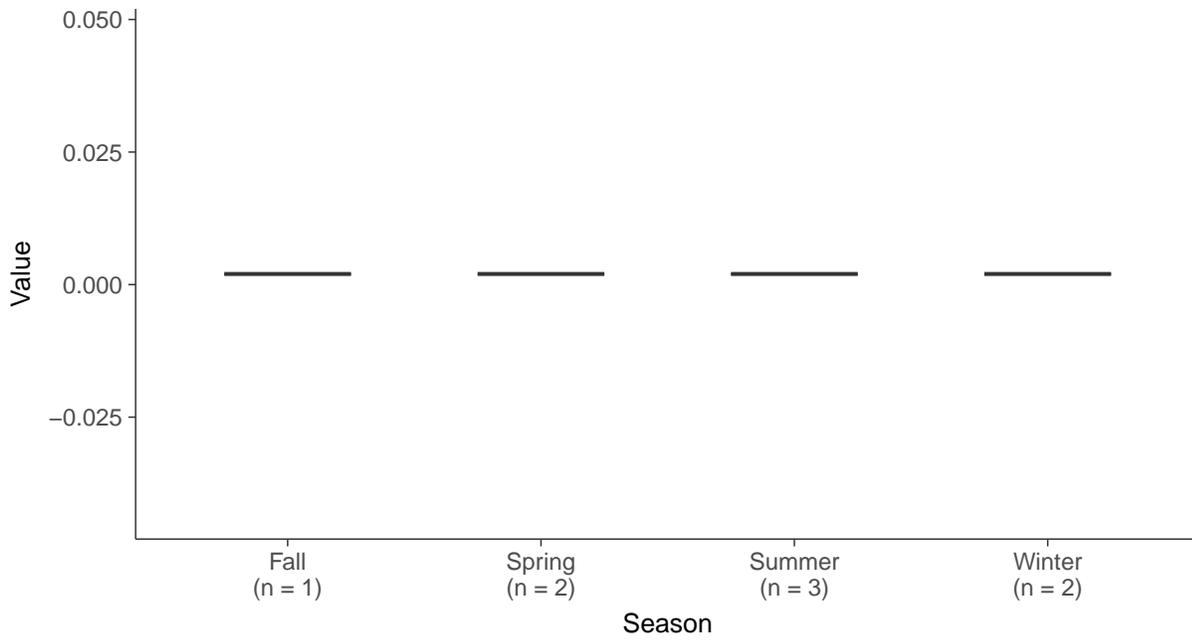
Boxplot

Arsenic, MW-15 (mg/L)



Boxplot by Season

Arsenic, MW-15 (mg/L)



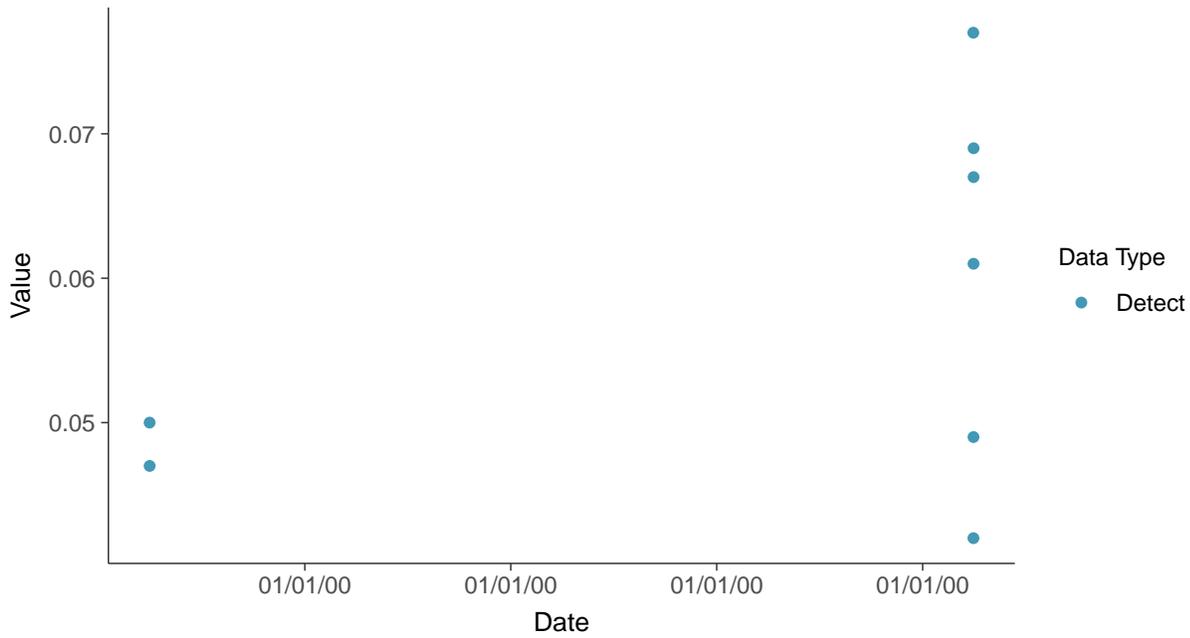


Appendix IV: Barium, MW-15

ID: 15_2_10

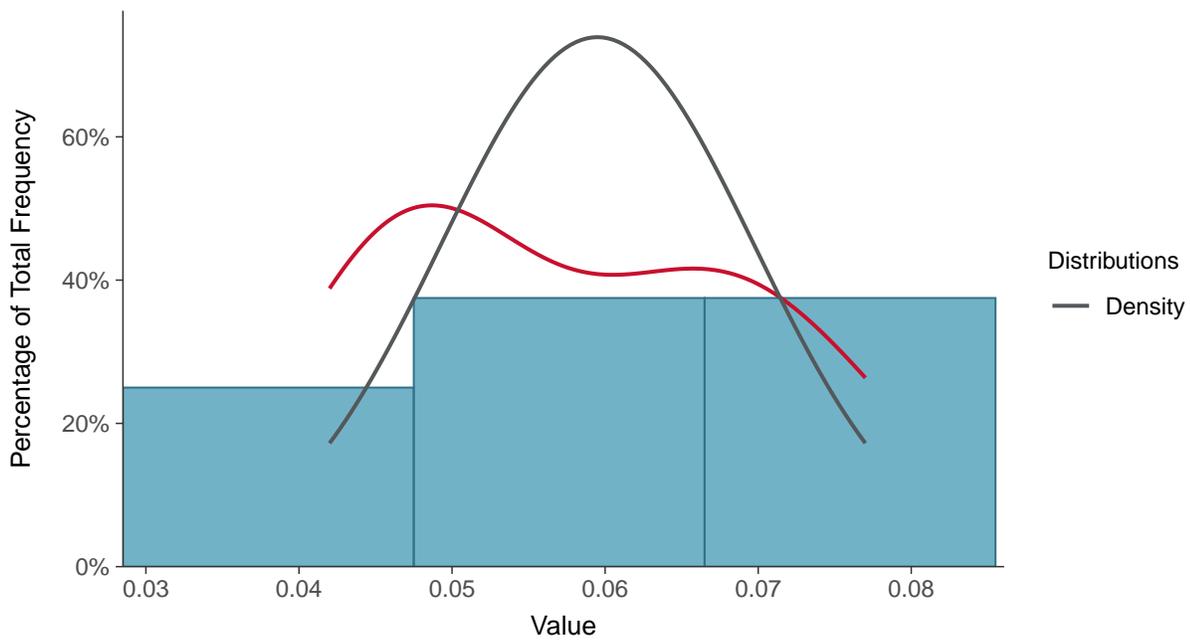
Scatter Plot

Barium, MW-15 (mg/L)



Histogram

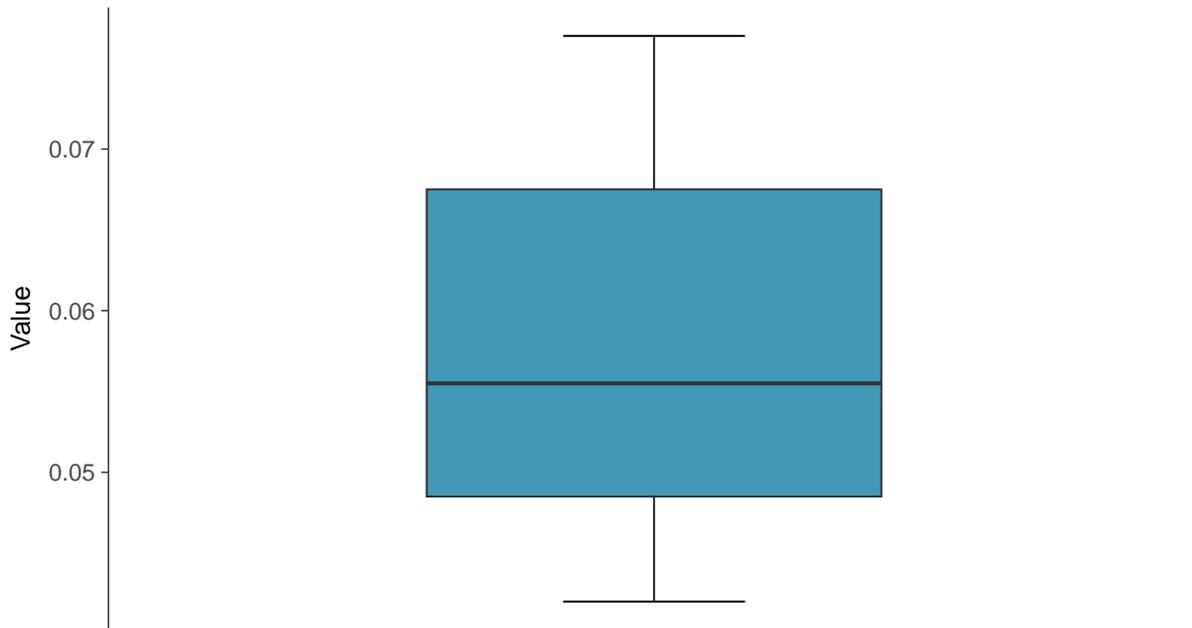
Barium, MW-15 (mg/L)





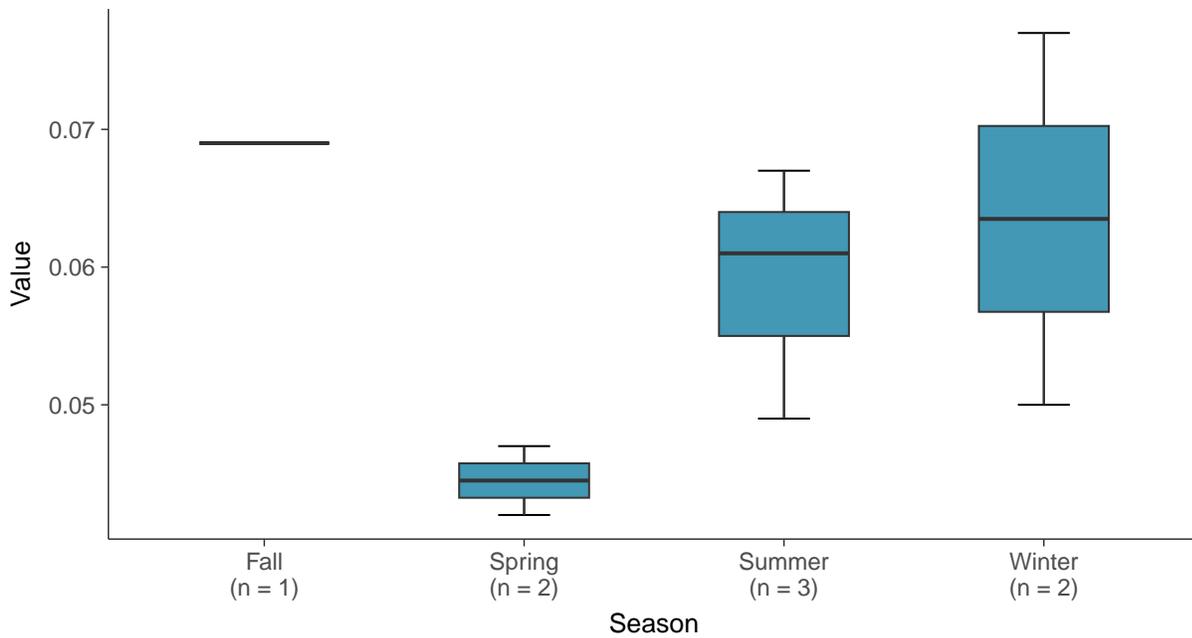
Boxplot

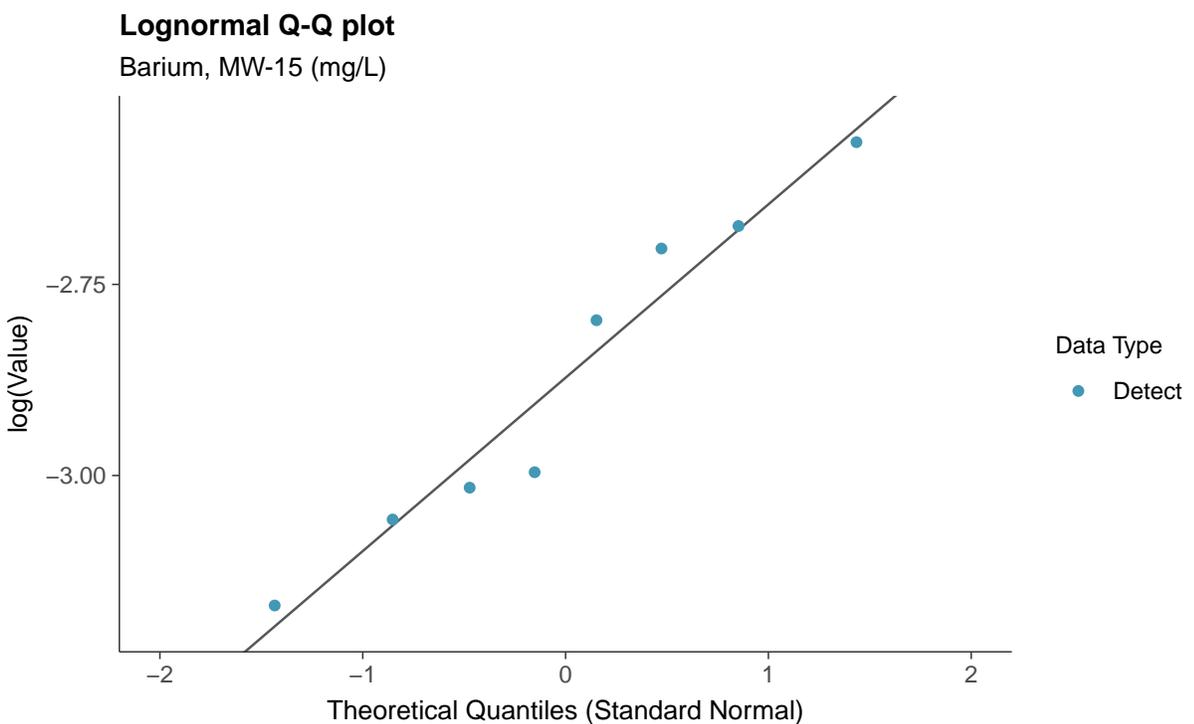
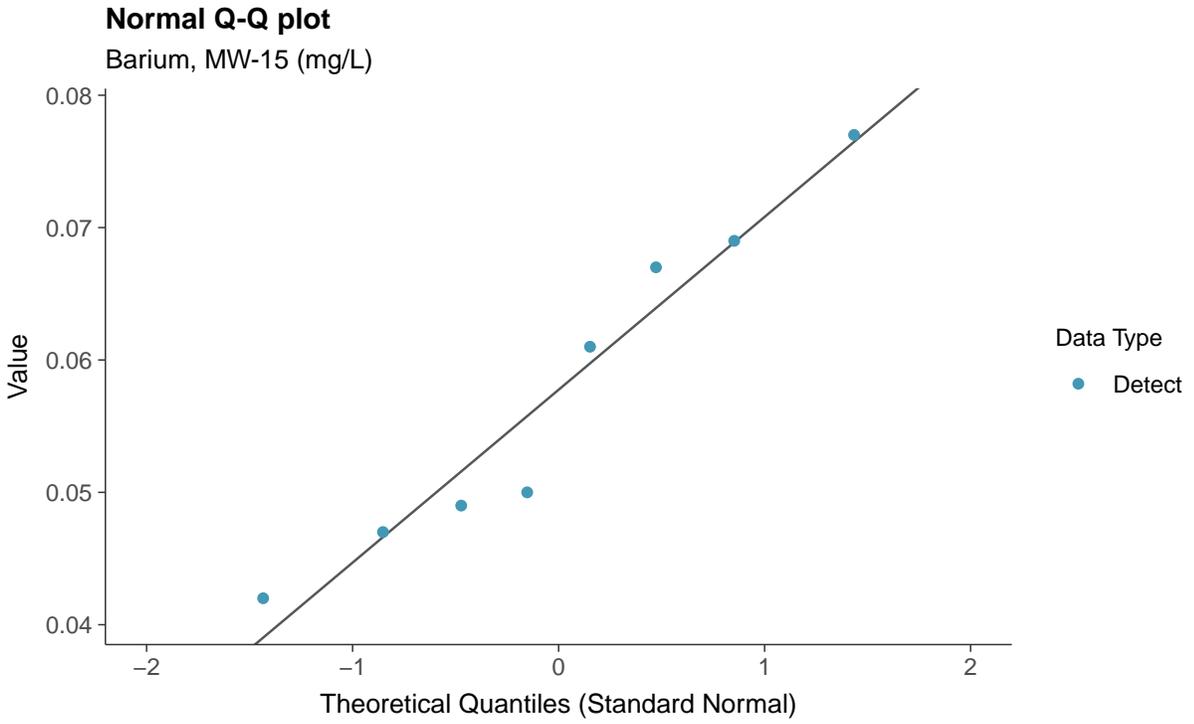
Barium, MW-15 (mg/L)

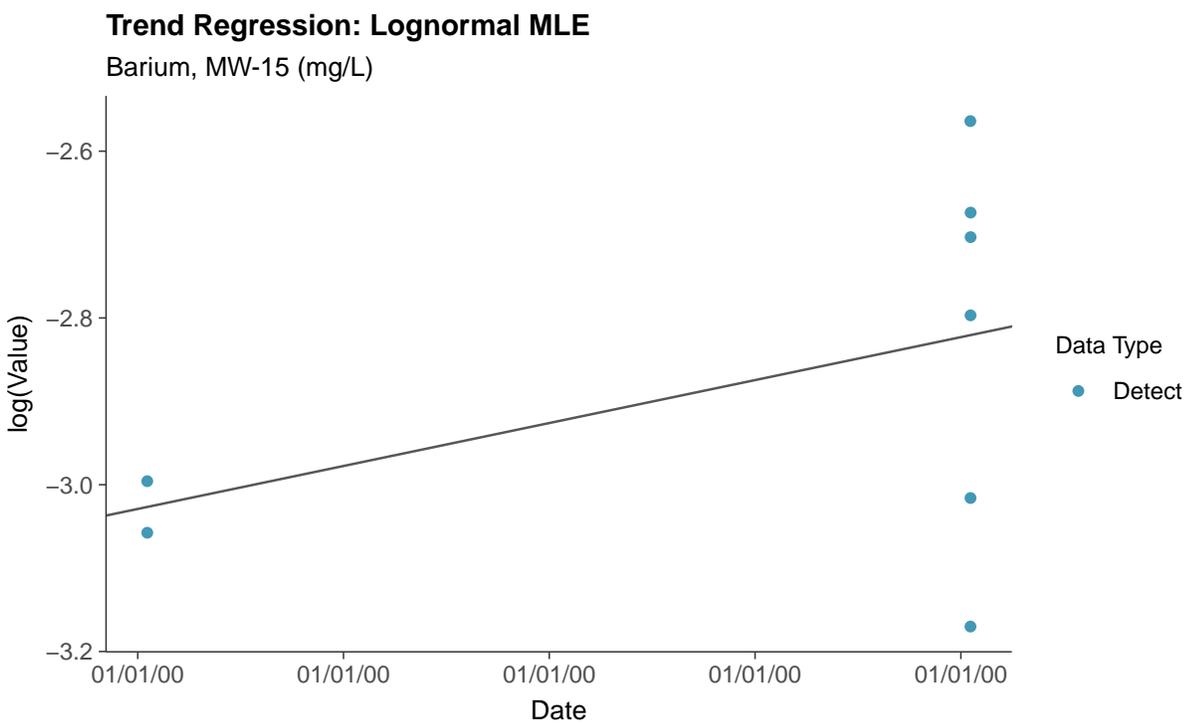
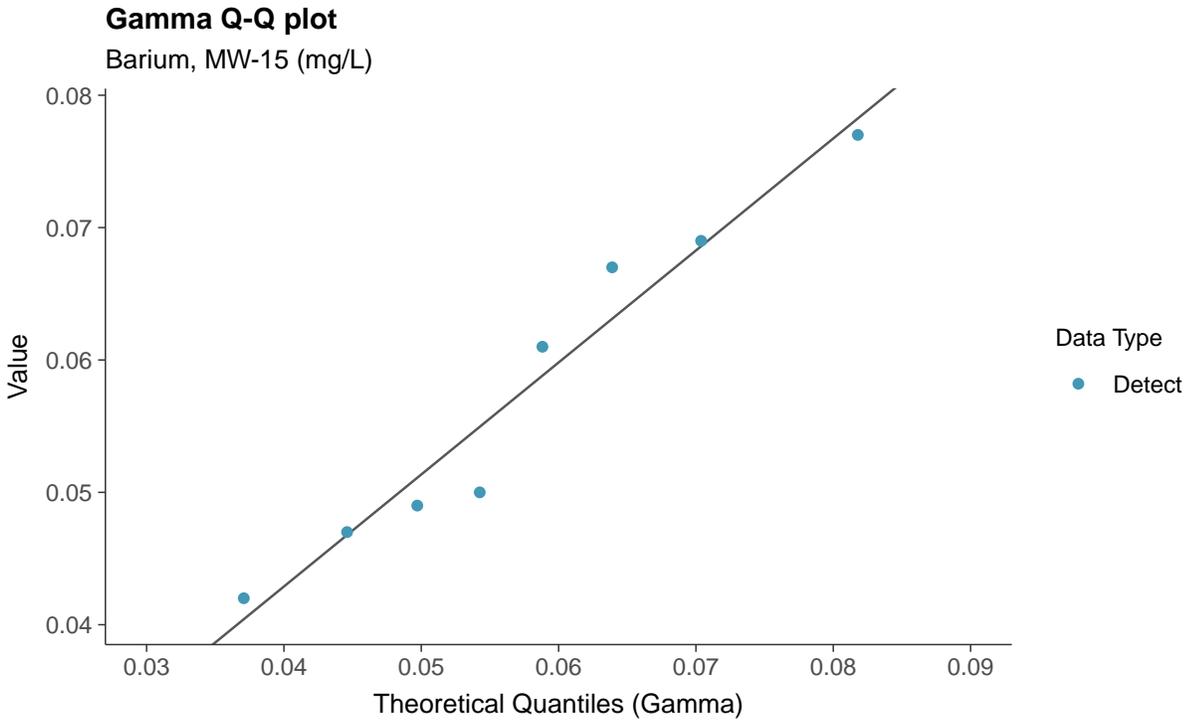


Boxplot by Season

Barium, MW-15 (mg/L)



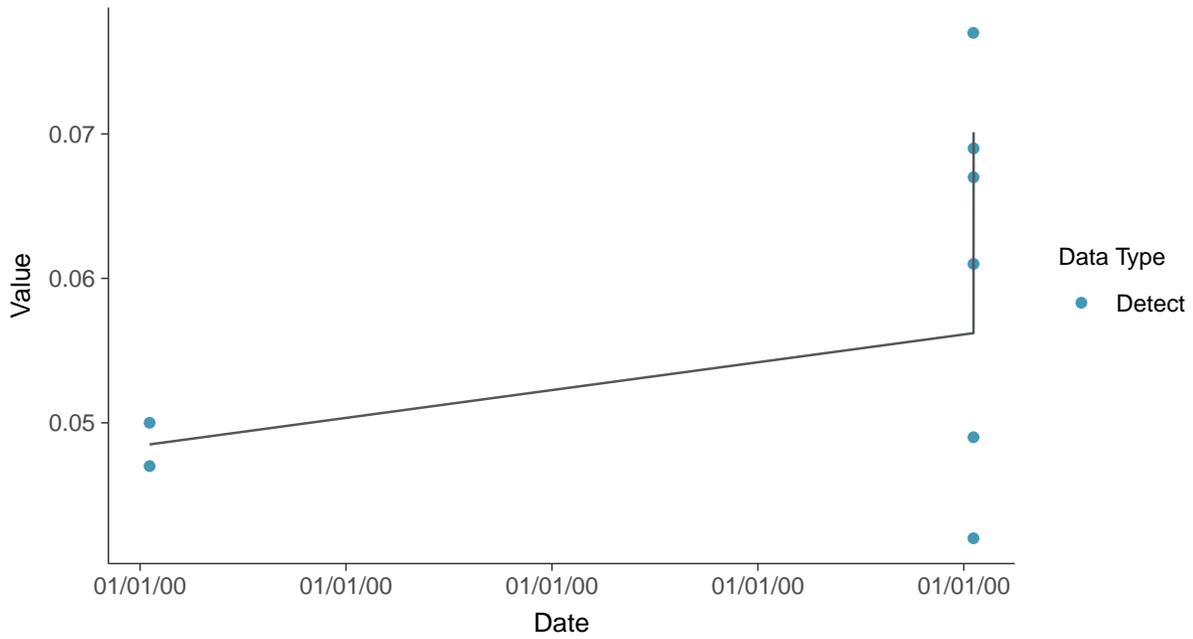






Trend Regression: Piecewise Linear-Linear

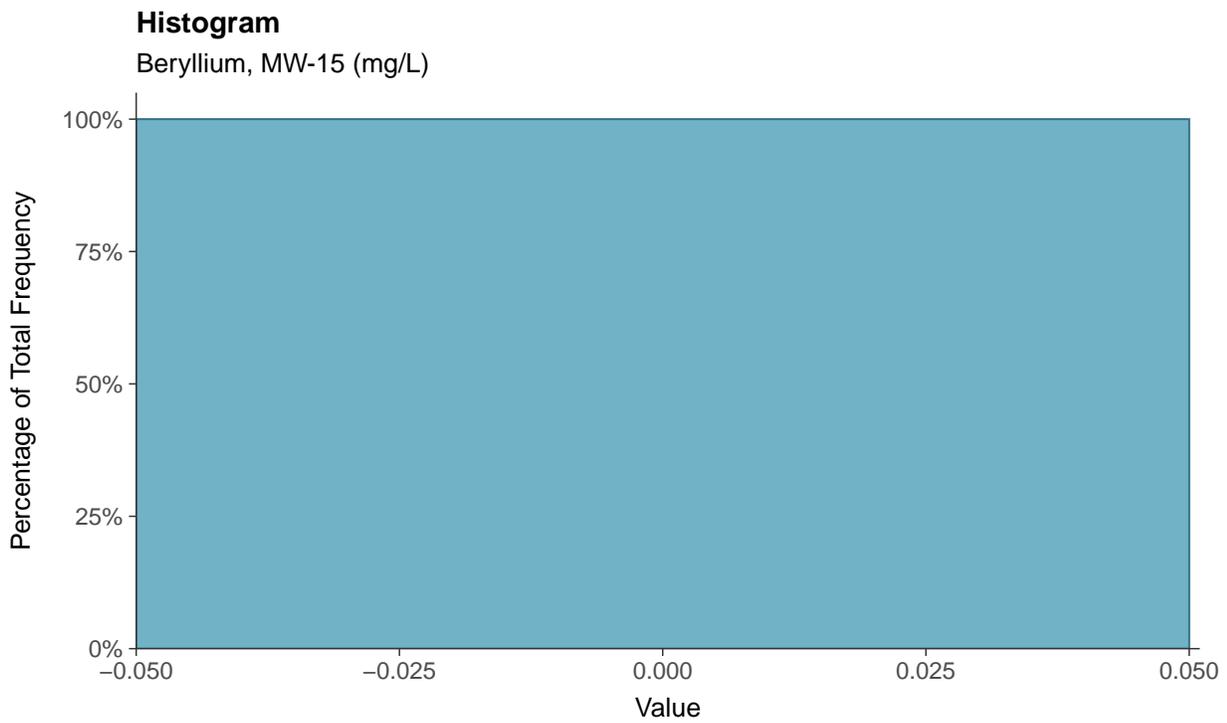
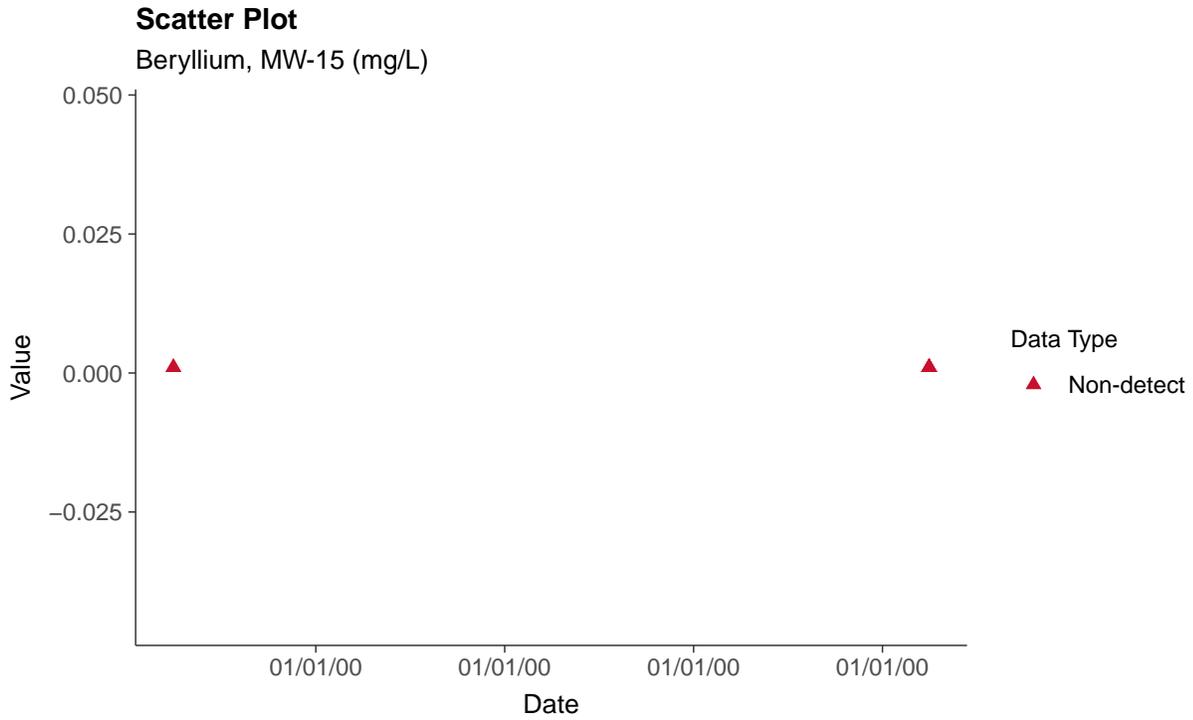
Barium, MW-15 (mg/L)





Appendix IV: Beryllium, MW-15

ID: 15_2_11





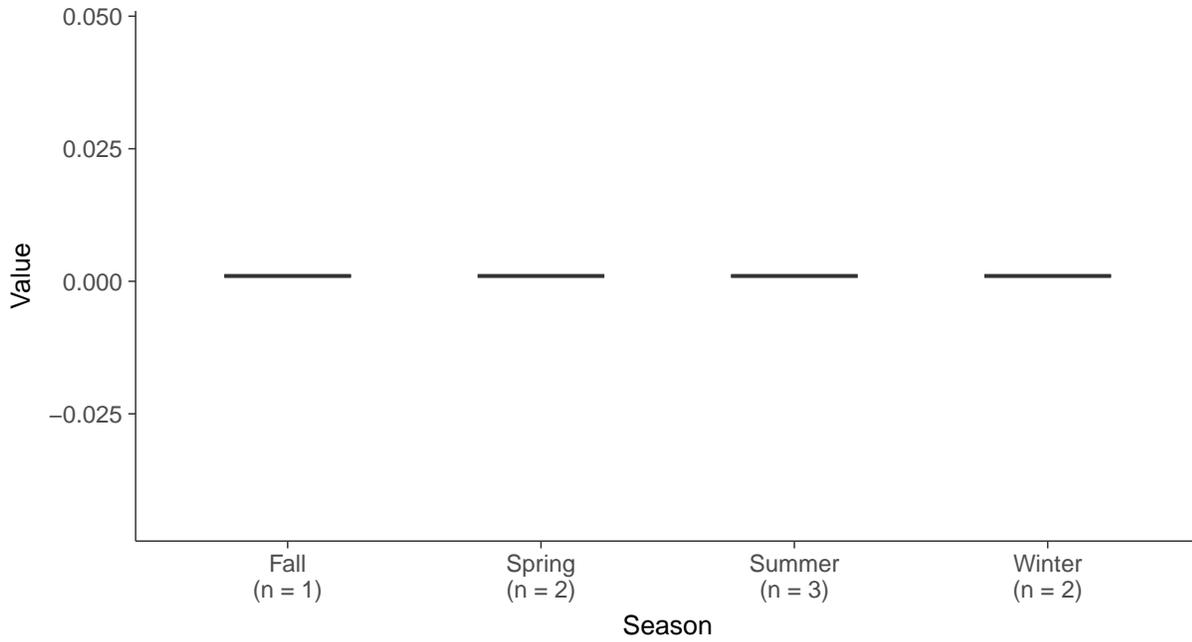
Boxplot

Beryllium, MW-15 (mg/L)



Boxplot by Season

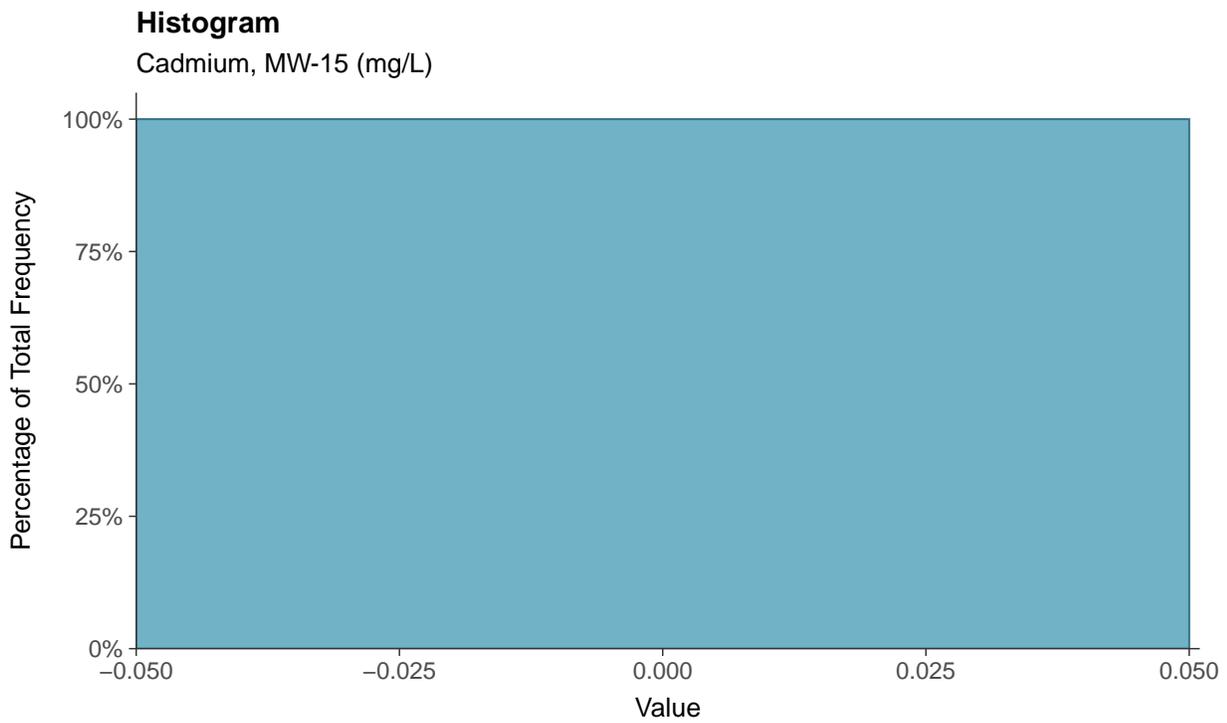
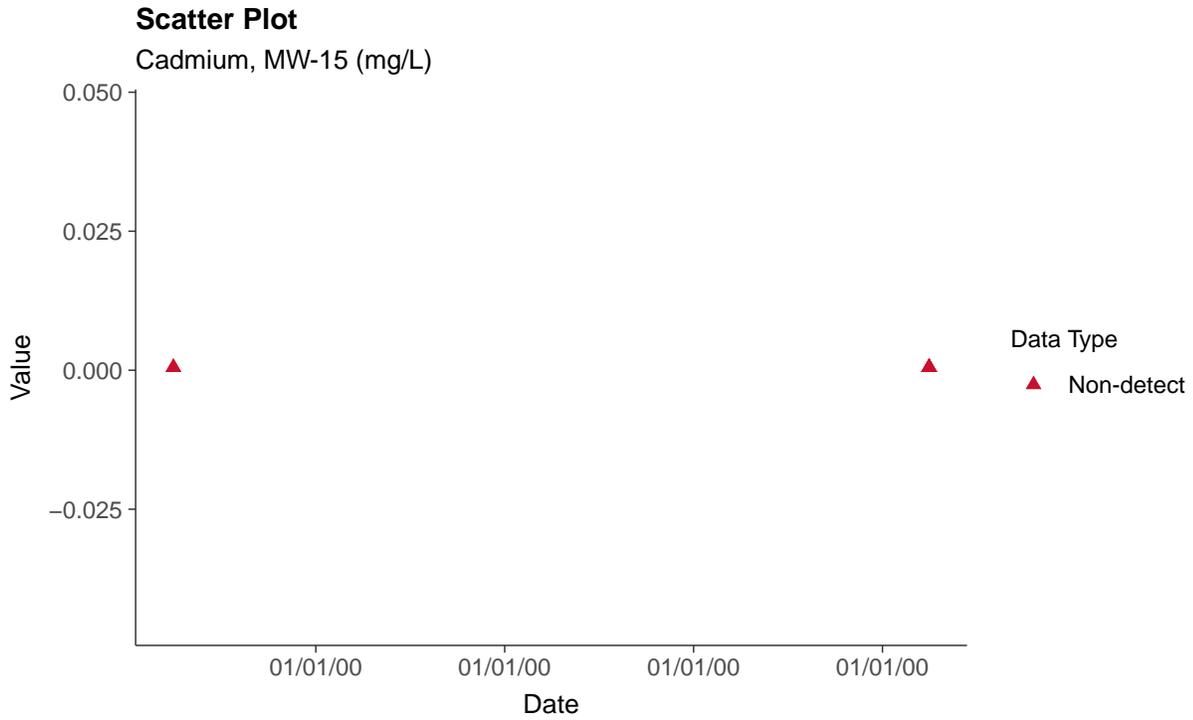
Beryllium, MW-15 (mg/L)





Appendix IV: Cadmium, MW-15

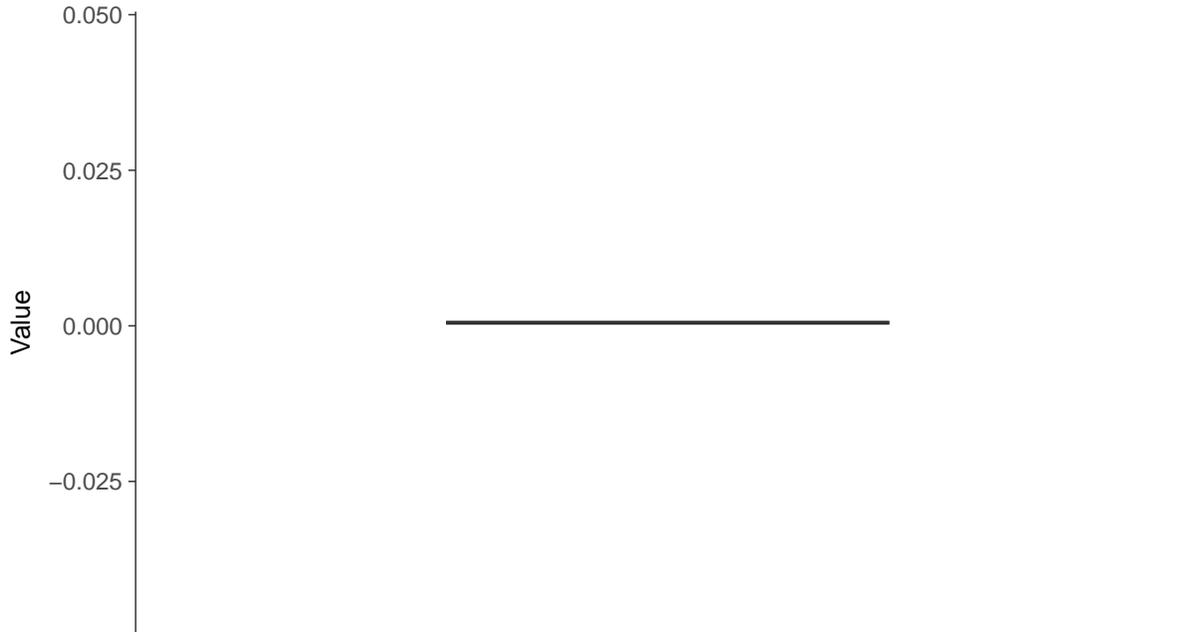
ID: 15_2_12





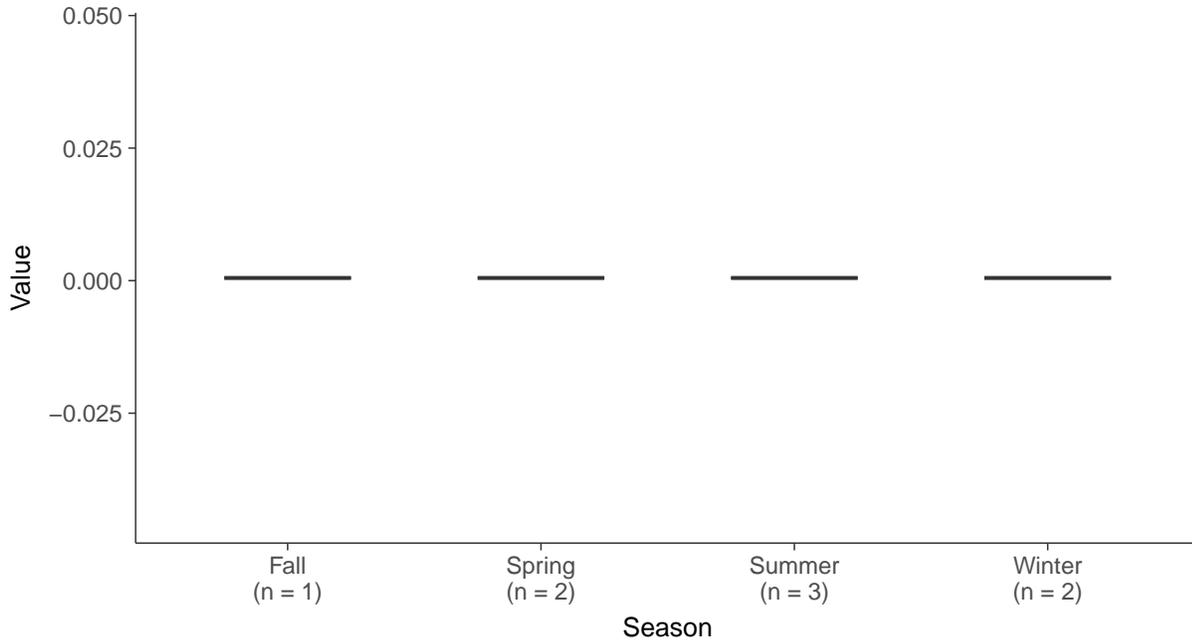
Boxplot

Cadmium, MW-15 (mg/L)



Boxplot by Season

Cadmium, MW-15 (mg/L)



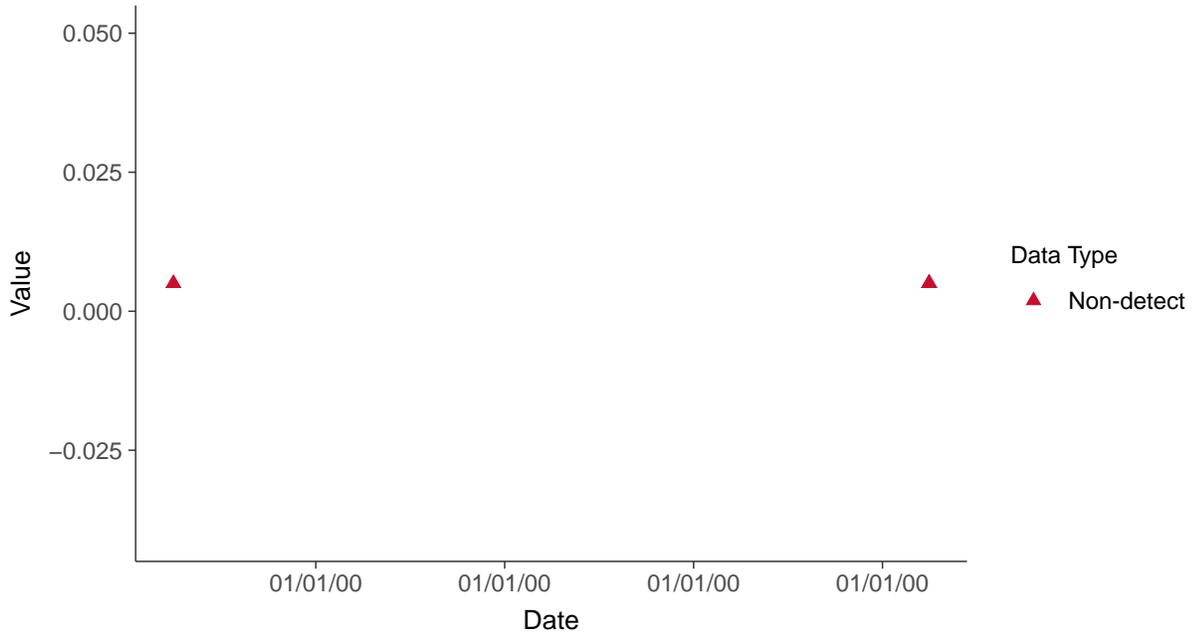


Appendix IV: Chromium, MW-15

ID: 15_2_13

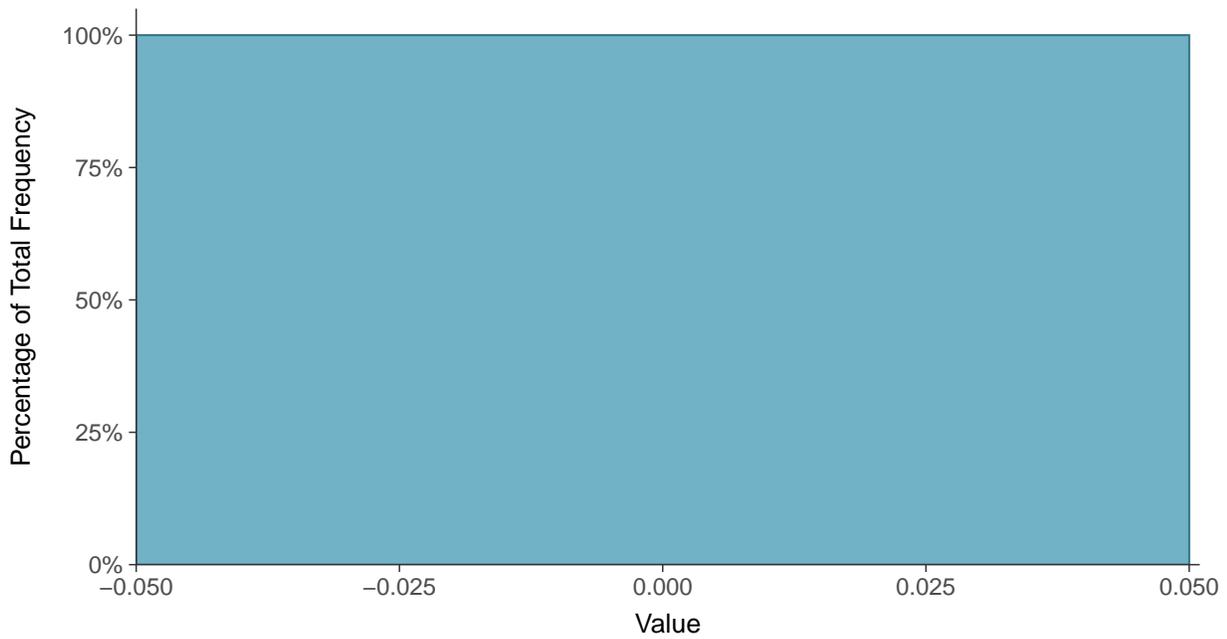
Scatter Plot

Chromium, MW-15 (mg/L)



Histogram

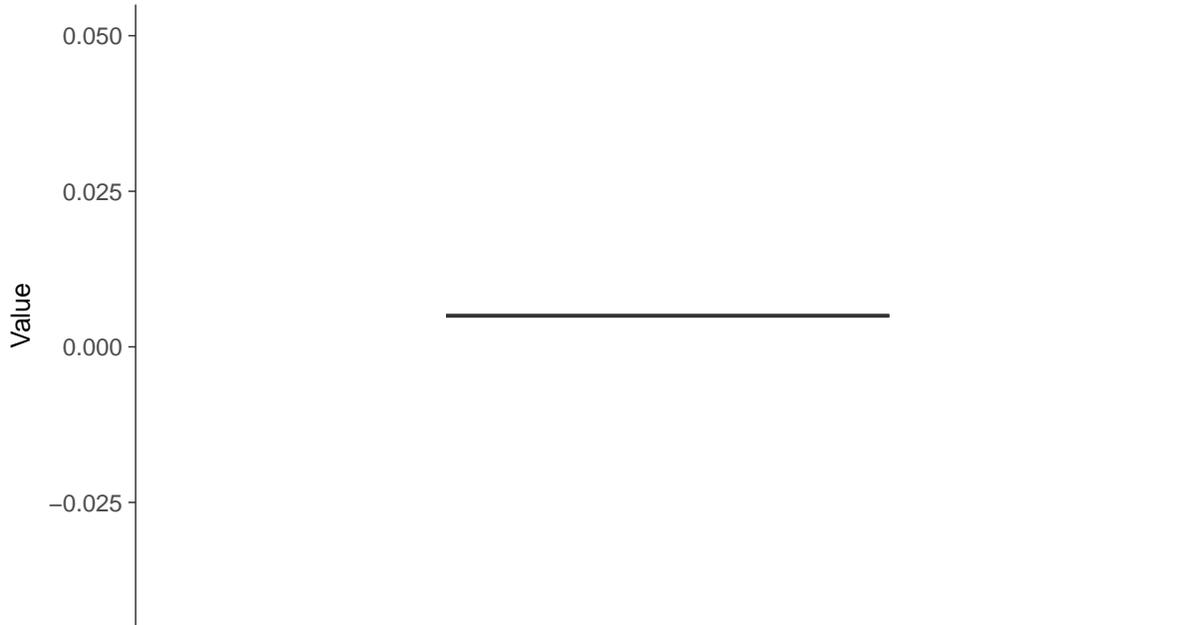
Chromium, MW-15 (mg/L)





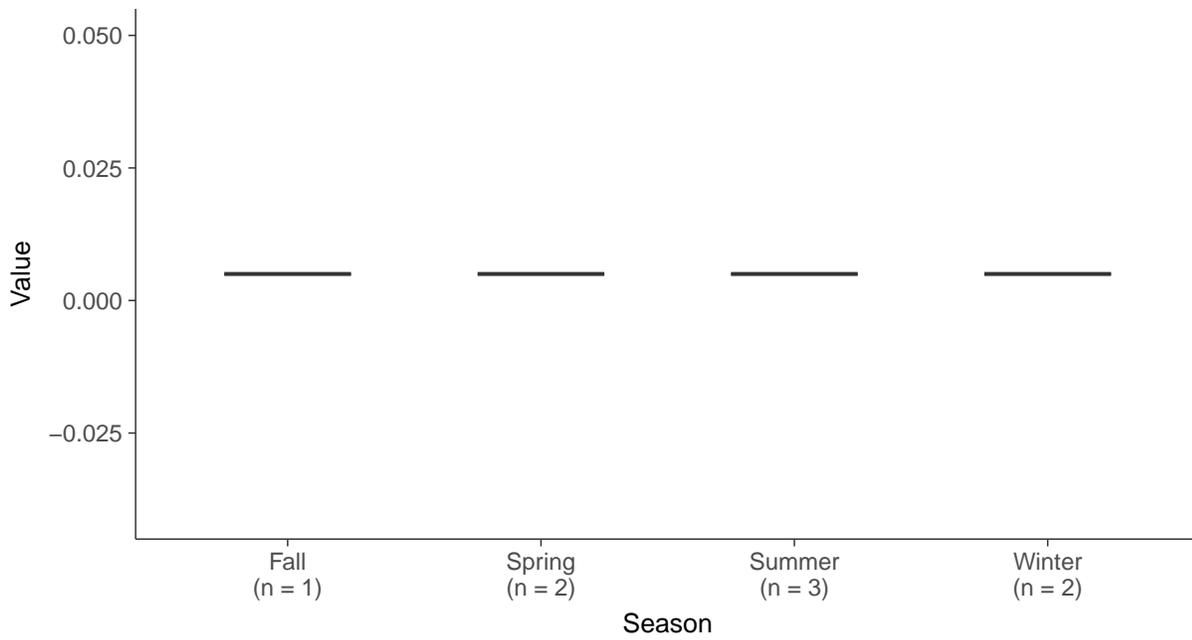
Boxplot

Chromium, MW-15 (mg/L)



Boxplot by Season

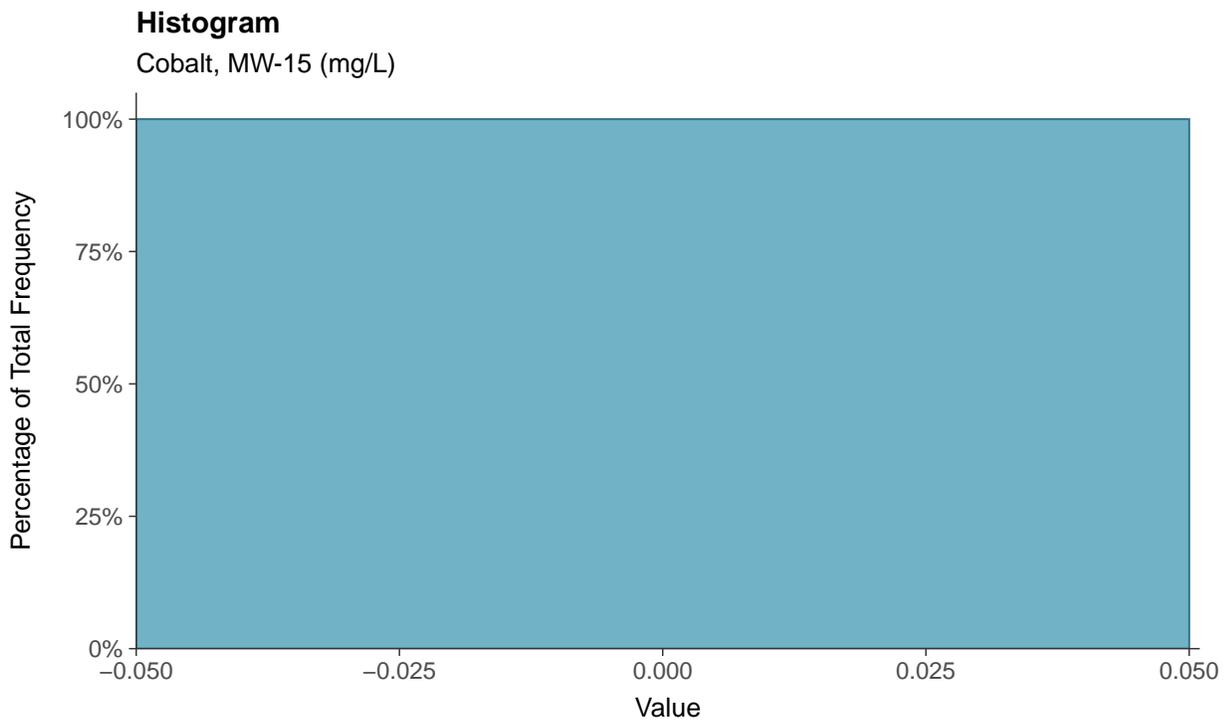
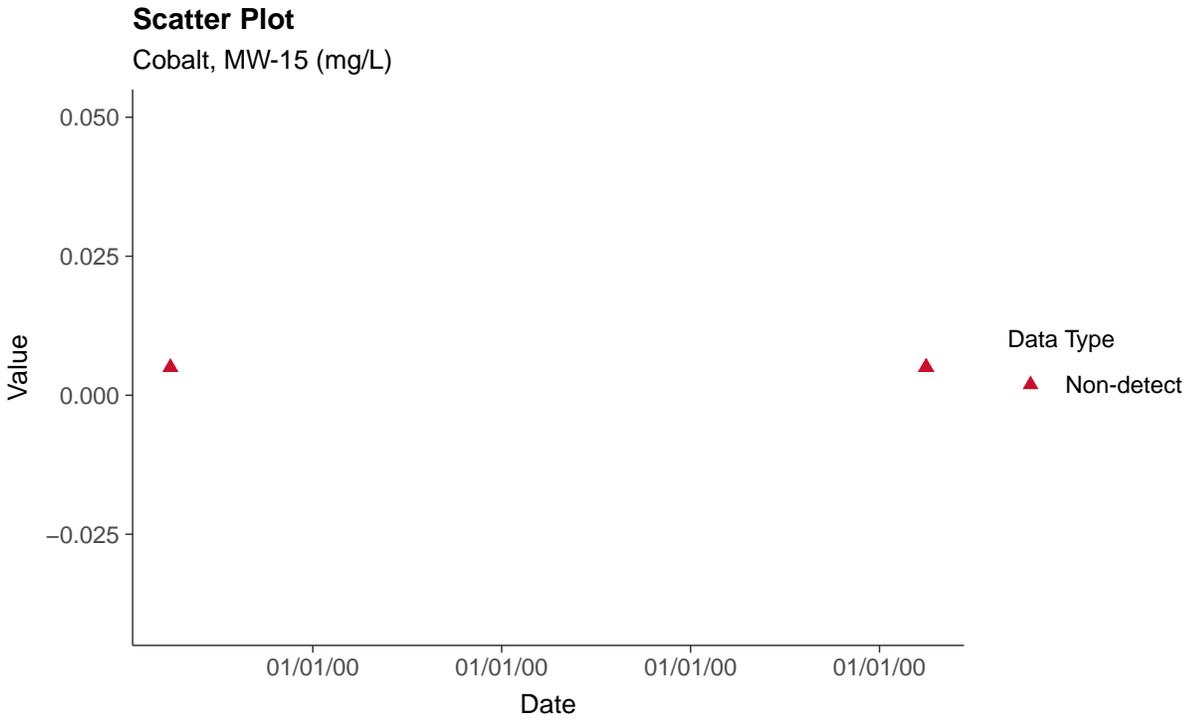
Chromium, MW-15 (mg/L)





Appendix IV: Cobalt, MW-15

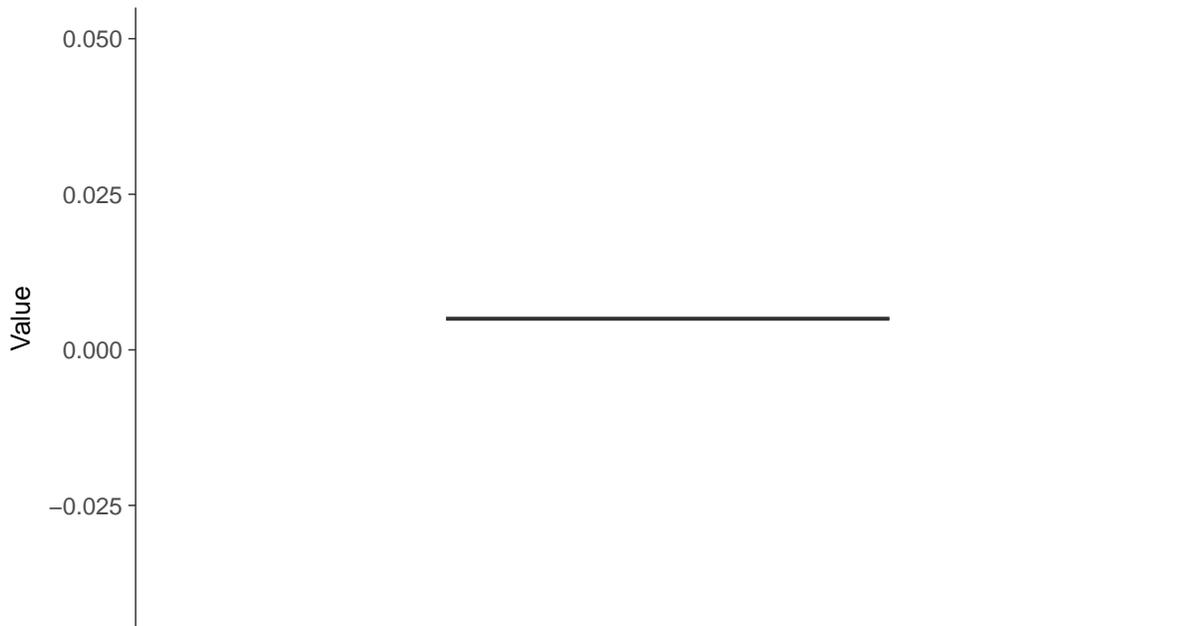
ID: 15_2_14





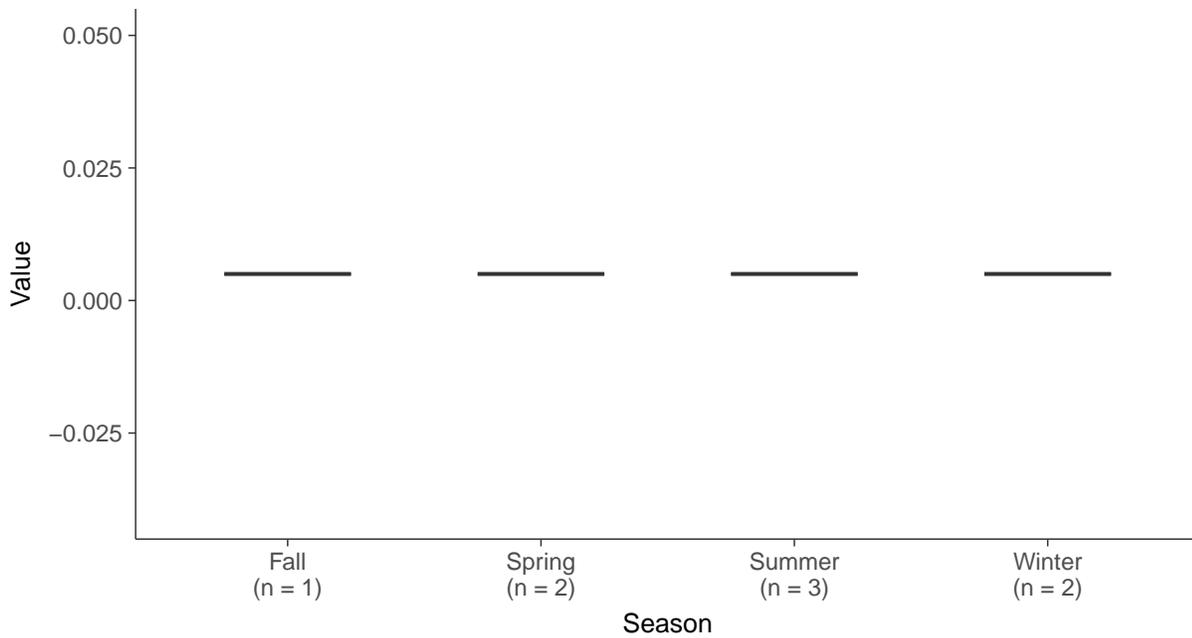
Boxplot

Cobalt, MW-15 (mg/L)



Boxplot by Season

Cobalt, MW-15 (mg/L)



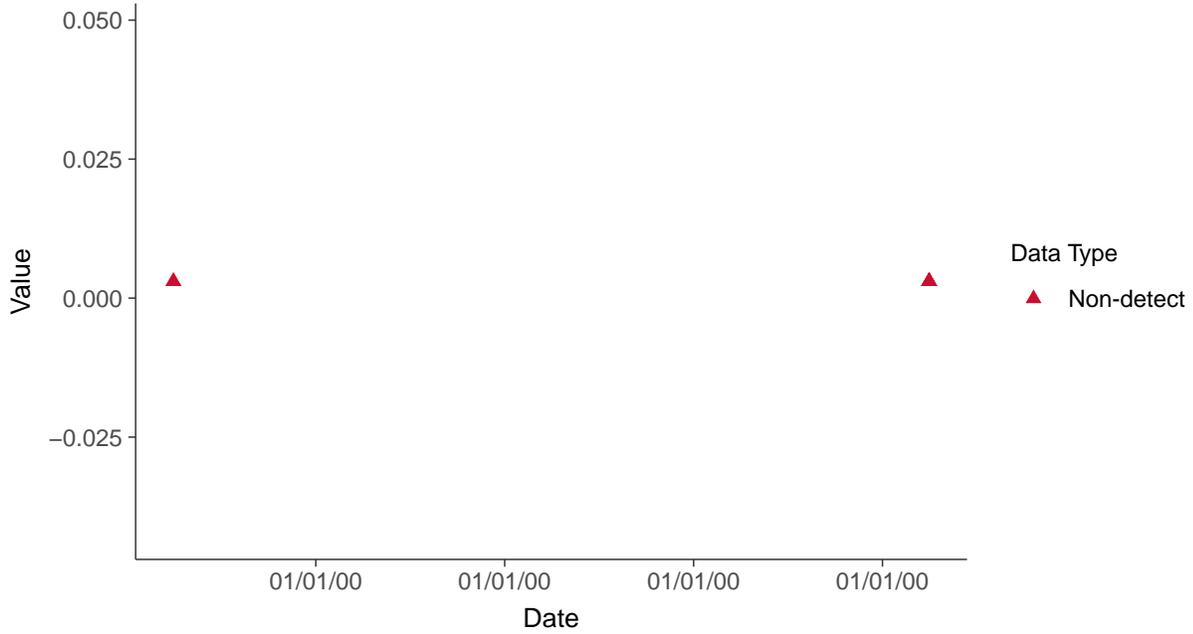


Appendix IV: Lead, MW-15

ID: 15_2_15

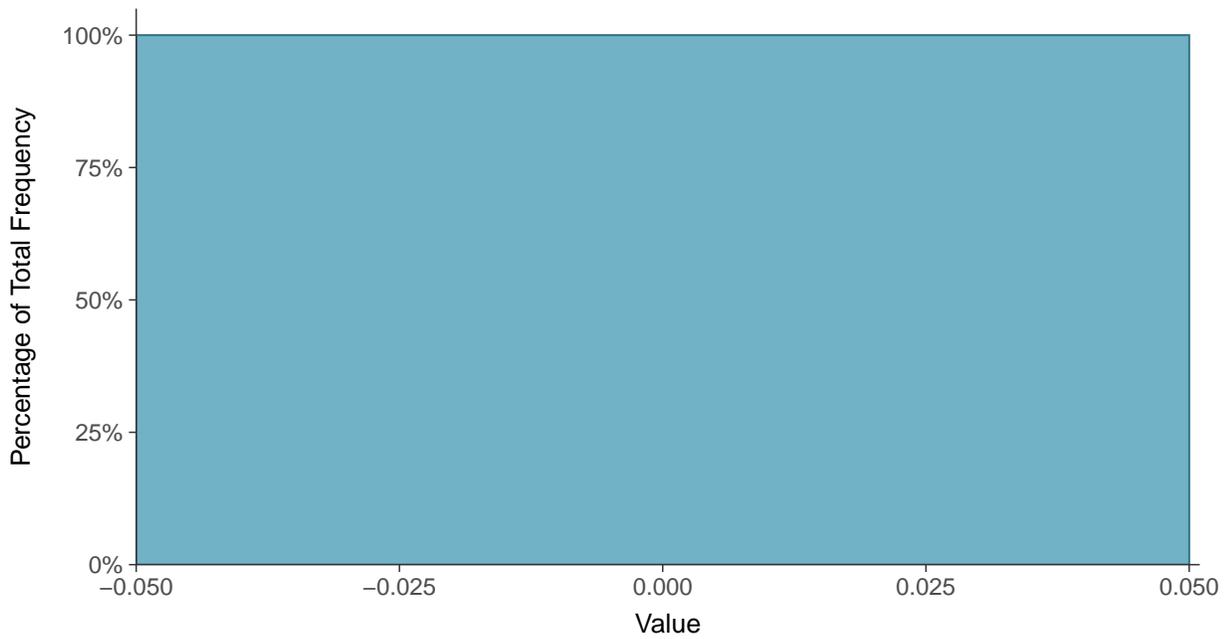
Scatter Plot

Lead, MW-15 (mg/L)



Histogram

Lead, MW-15 (mg/L)





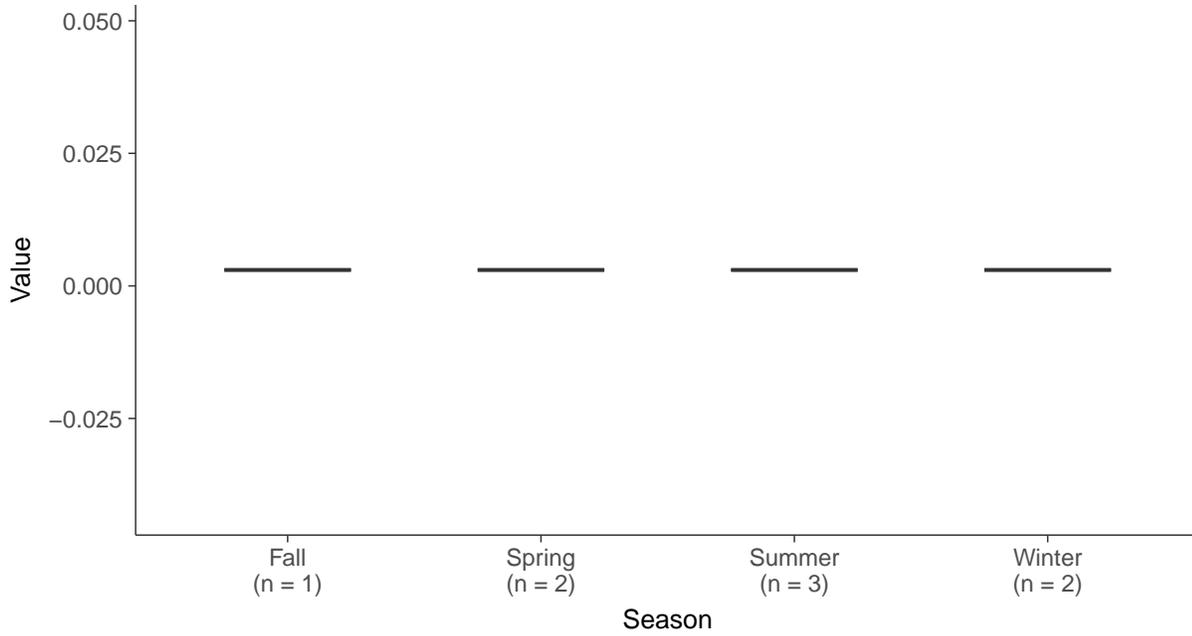
Boxplot

Lead, MW-15 (mg/L)



Boxplot by Season

Lead, MW-15 (mg/L)



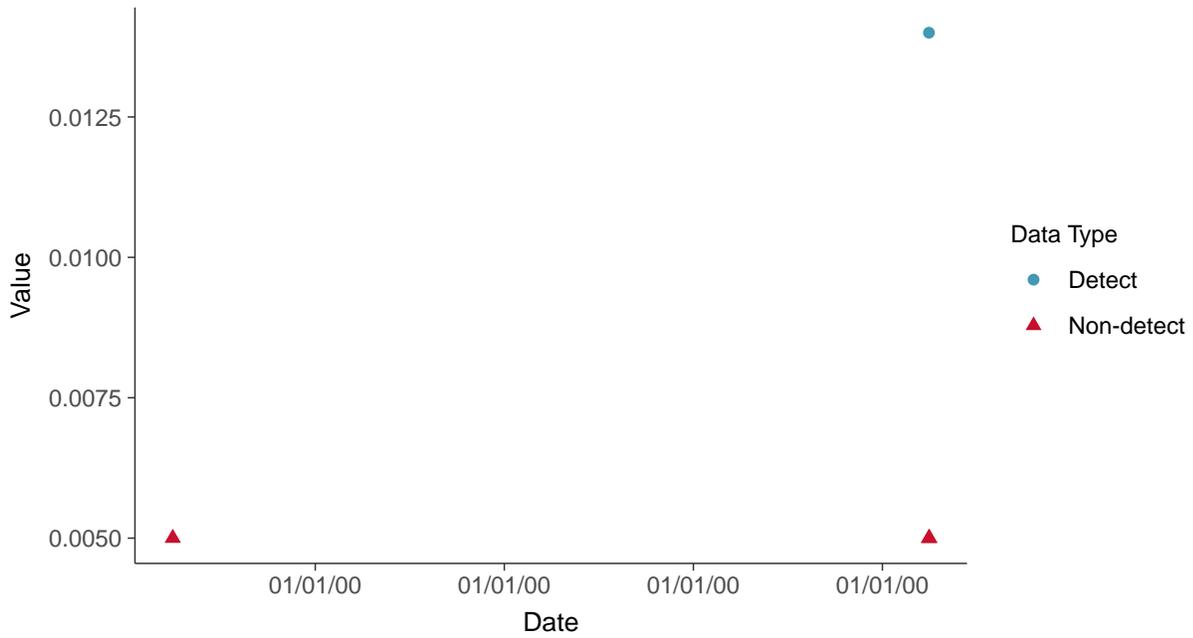


Appendix IV: Lithium, MW-15

ID: 15_2_16

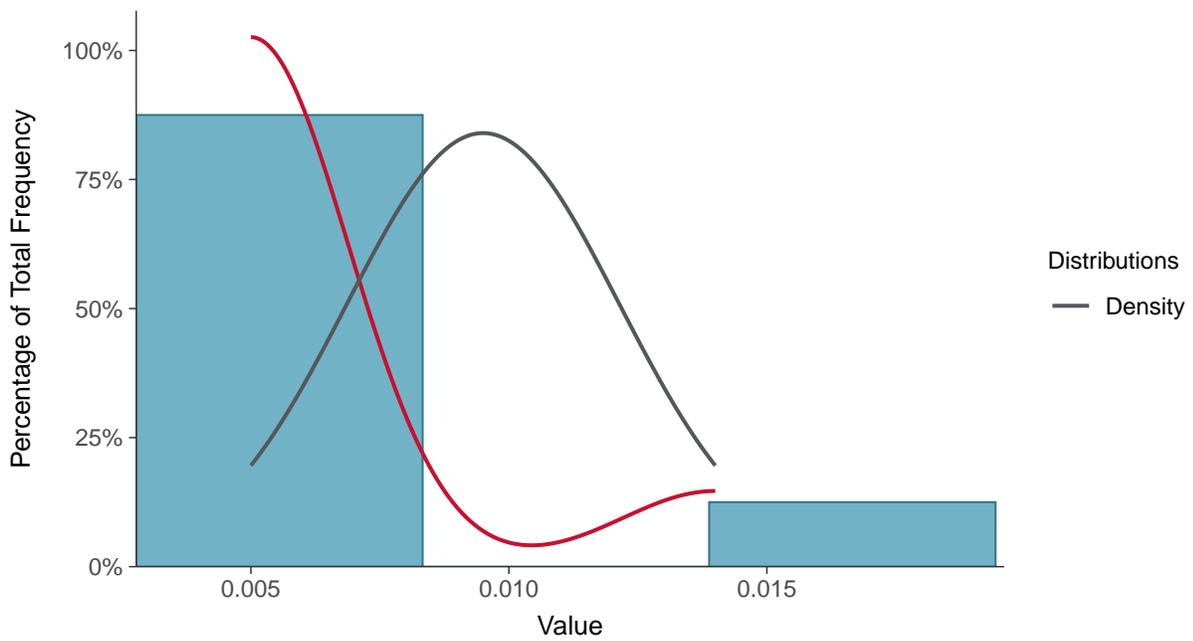
Scatter Plot

Lithium, MW-15 (mg/L)



Histogram

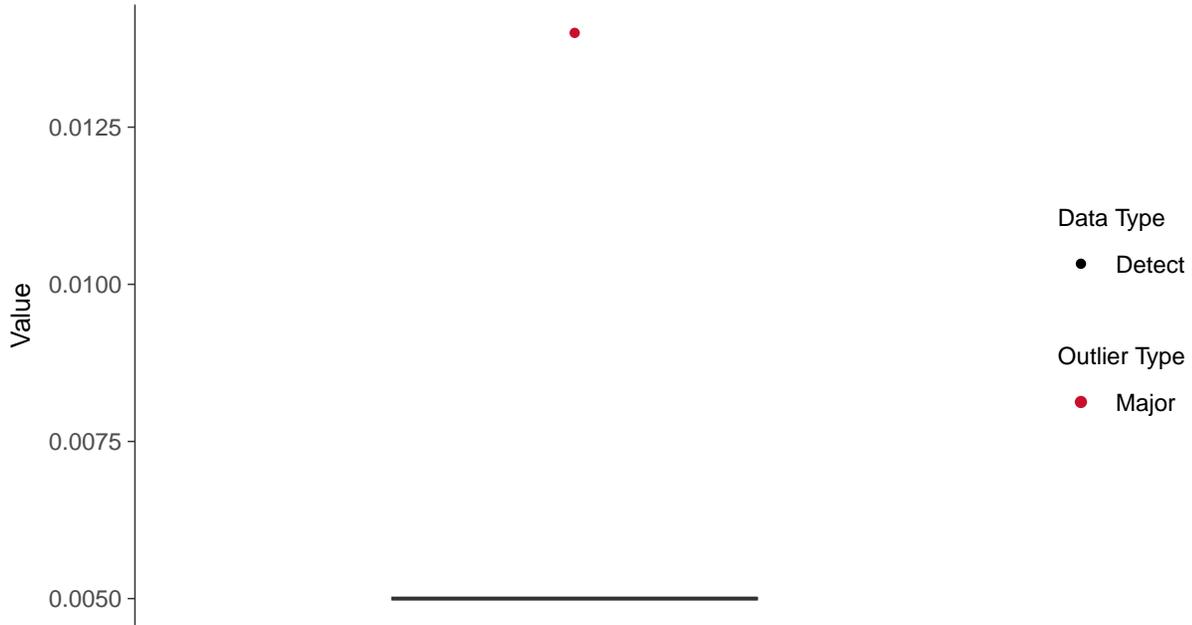
Lithium, MW-15 (mg/L)





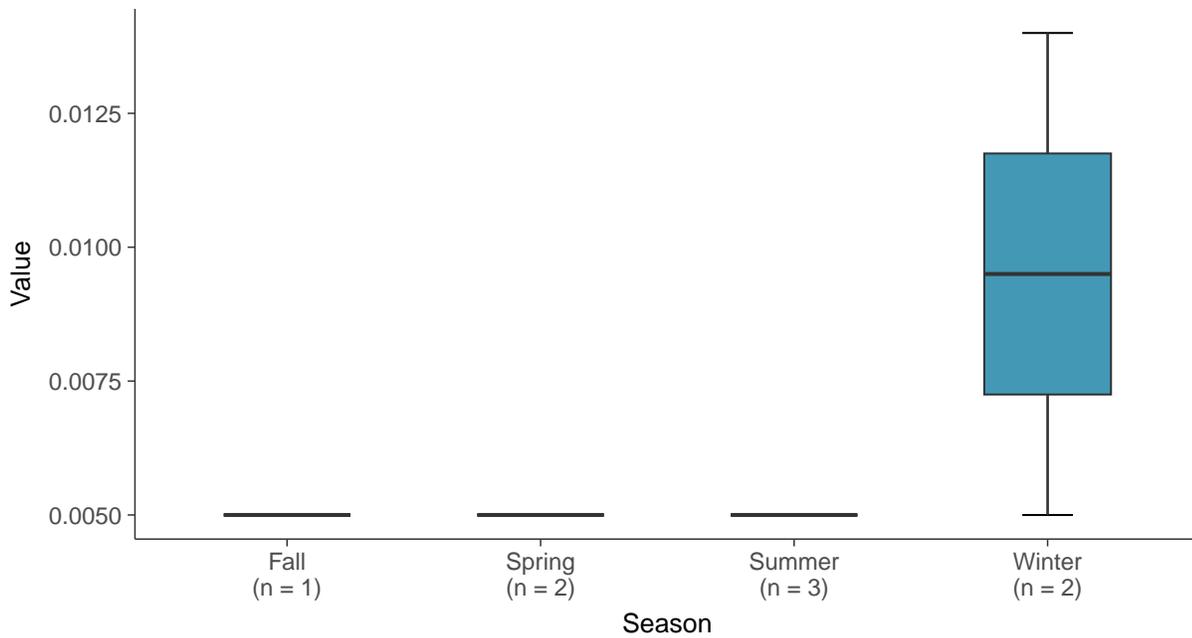
Boxplot

Lithium, MW-15 (mg/L)



Boxplot by Season

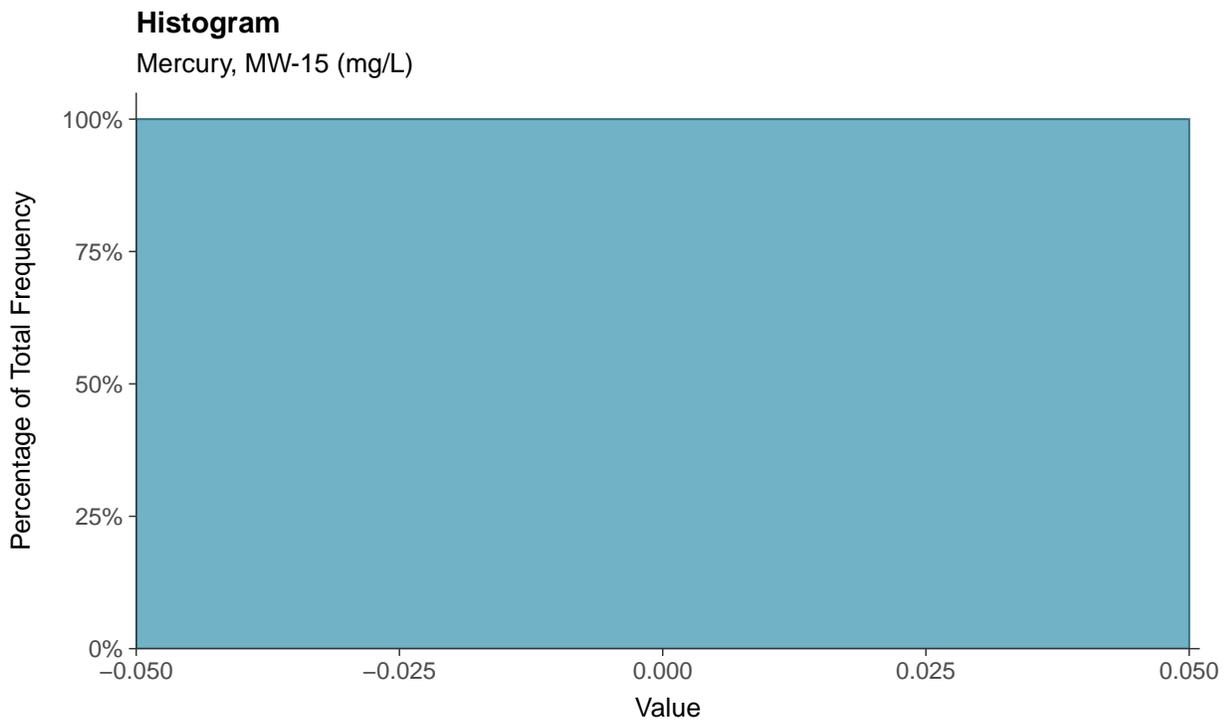
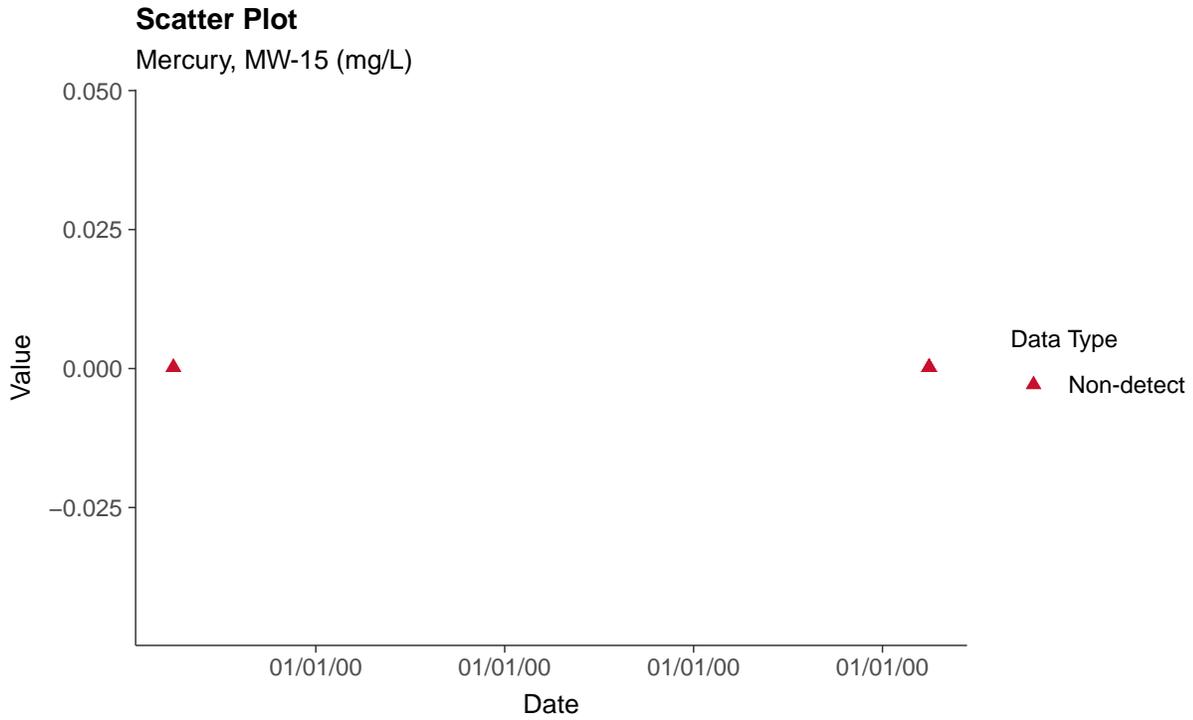
Lithium, MW-15 (mg/L)





Appendix IV: Mercury, MW-15

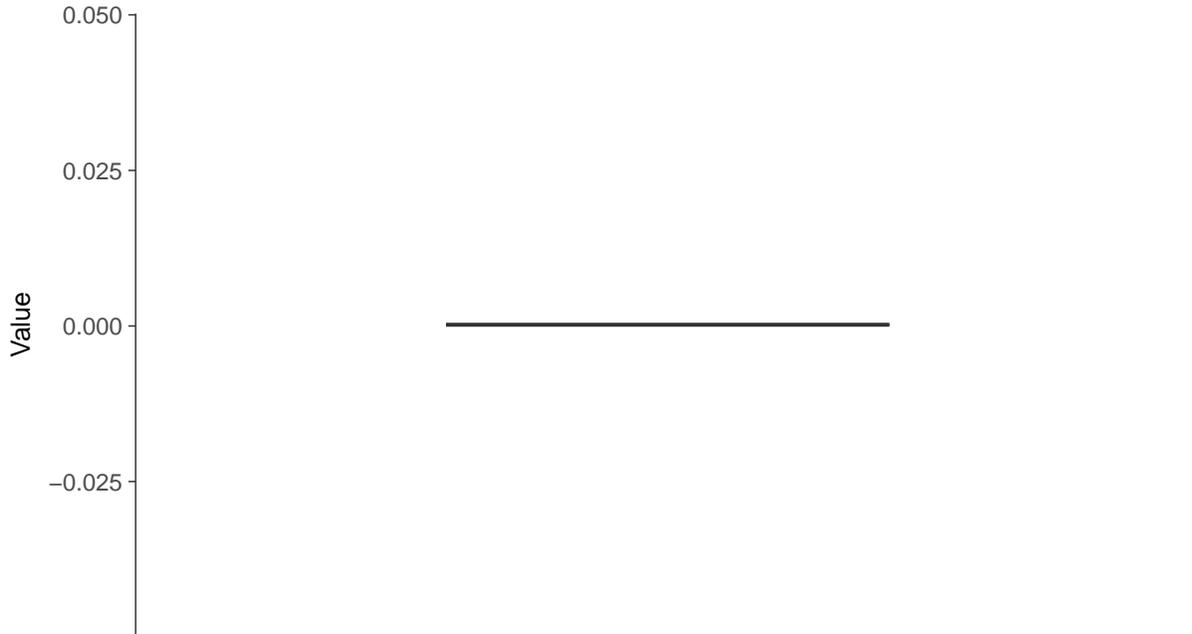
ID: 15_2_17





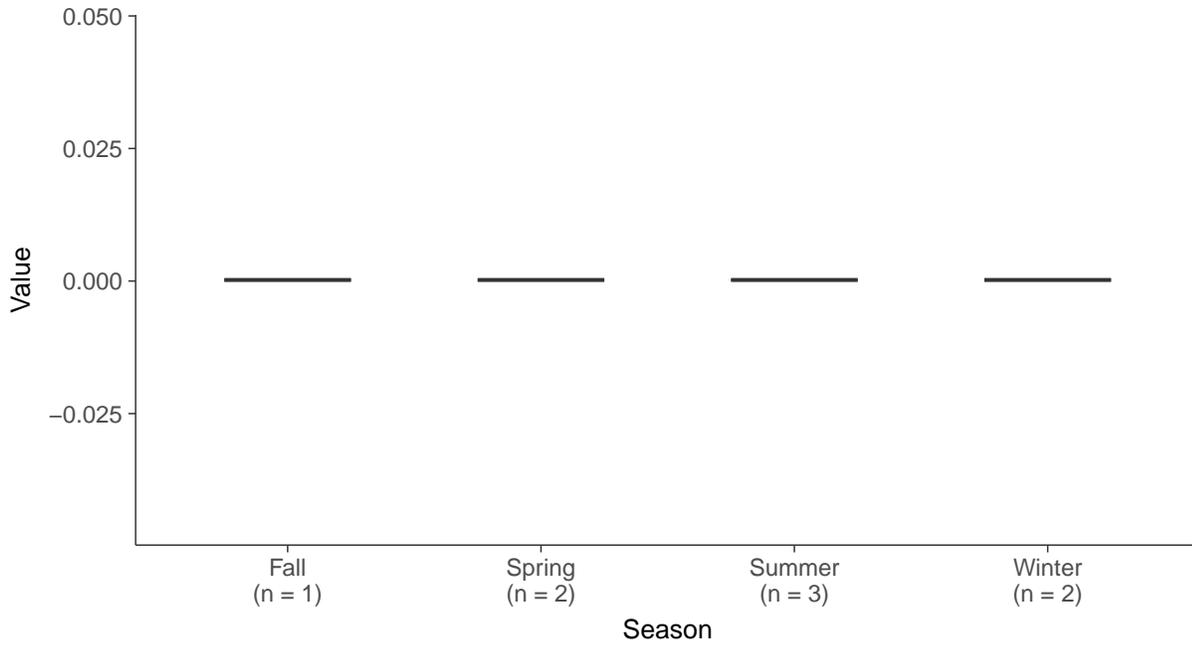
Boxplot

Mercury, MW-15 (mg/L)



Boxplot by Season

Mercury, MW-15 (mg/L)



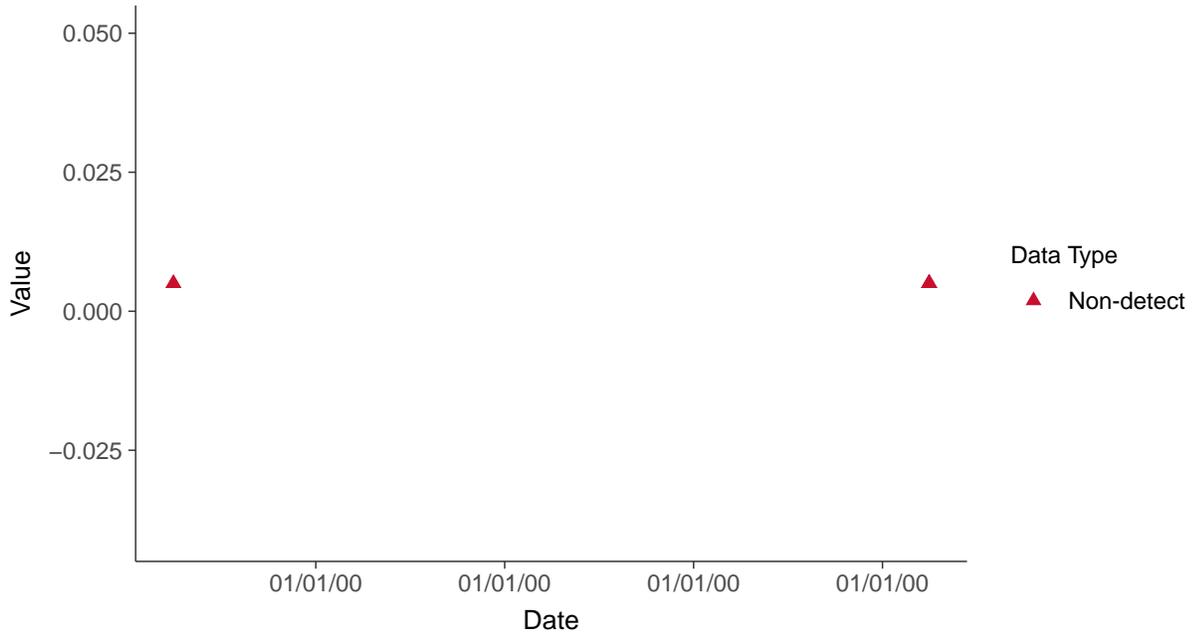


Appendix IV: Molybdenum, MW-15

ID: 15_2_18

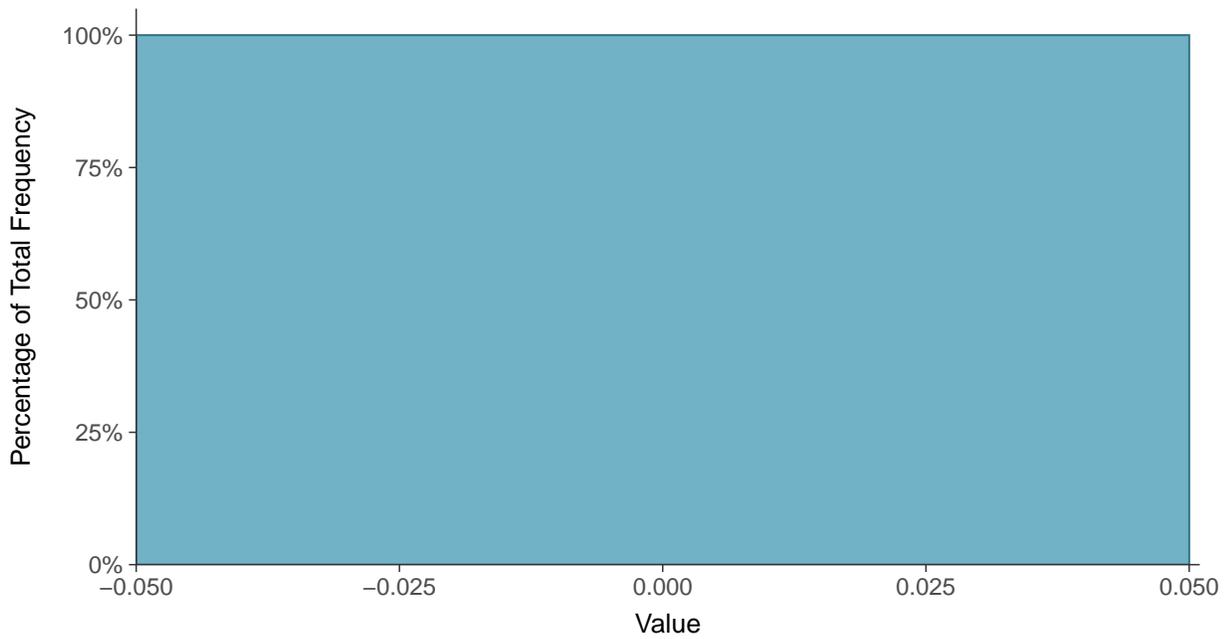
Scatter Plot

Molybdenum, MW-15 (mg/L)



Histogram

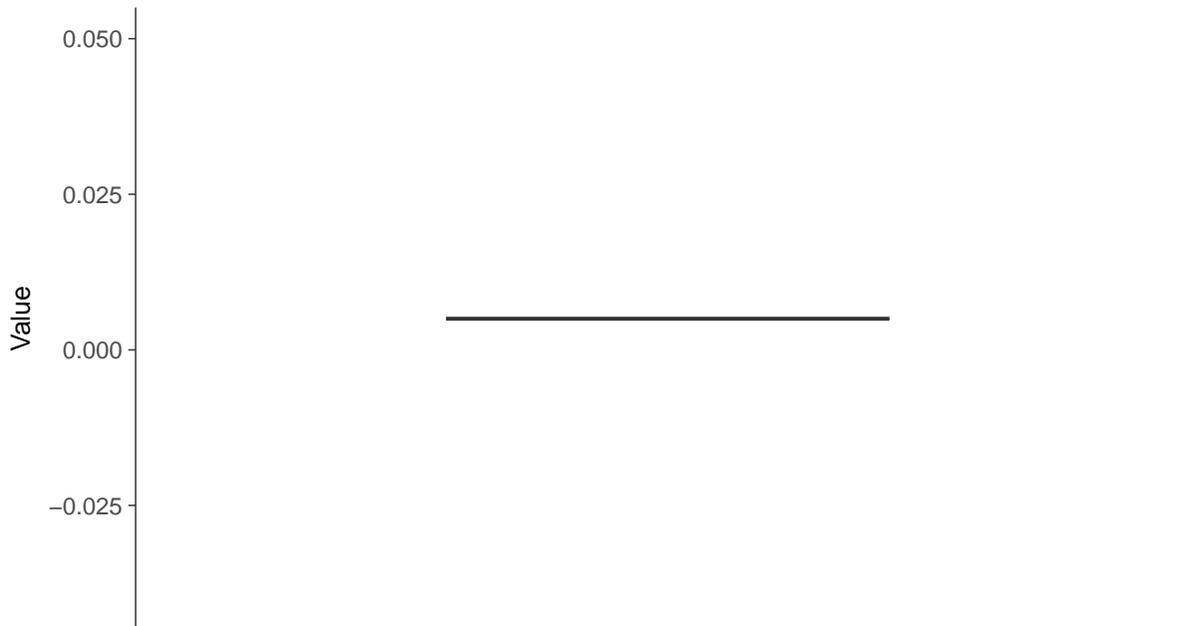
Molybdenum, MW-15 (mg/L)





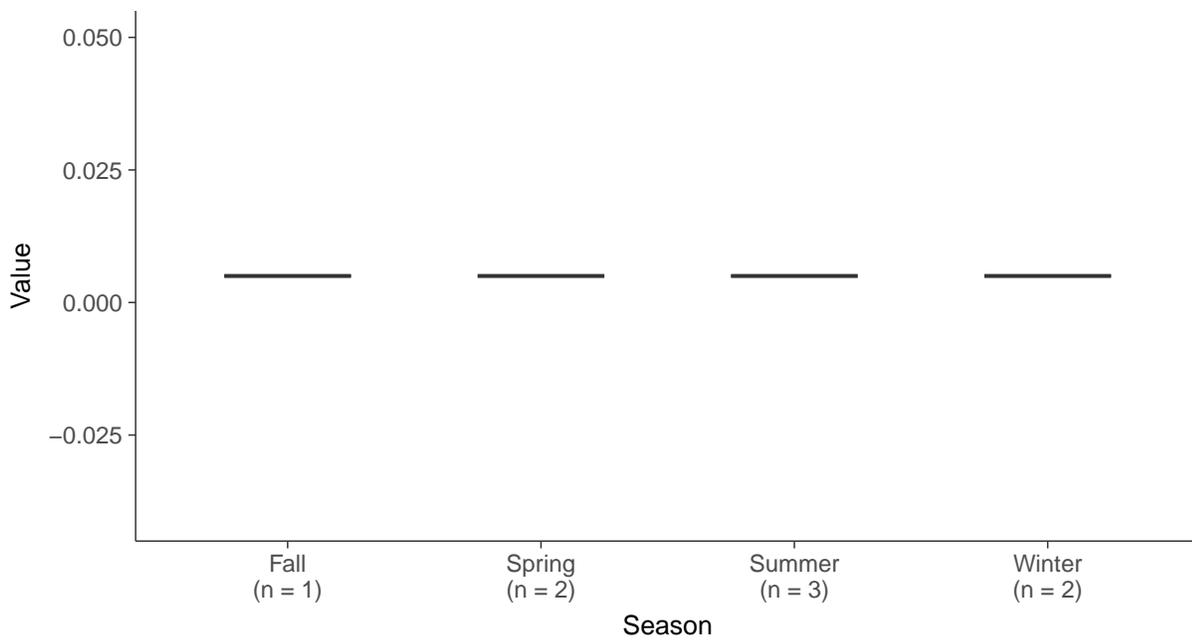
Boxplot

Molybdenum, MW-15 (mg/L)



Boxplot by Season

Molybdenum, MW-15 (mg/L)



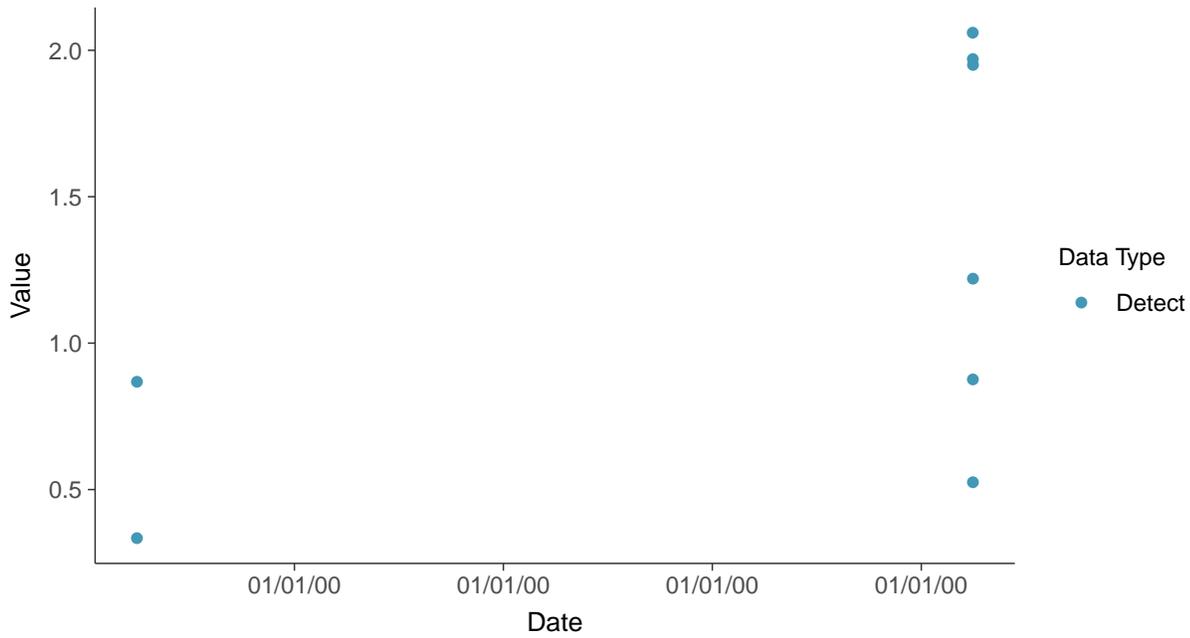


Appendix IV: Radium-226/228, MW-15

ID: 15_2_20

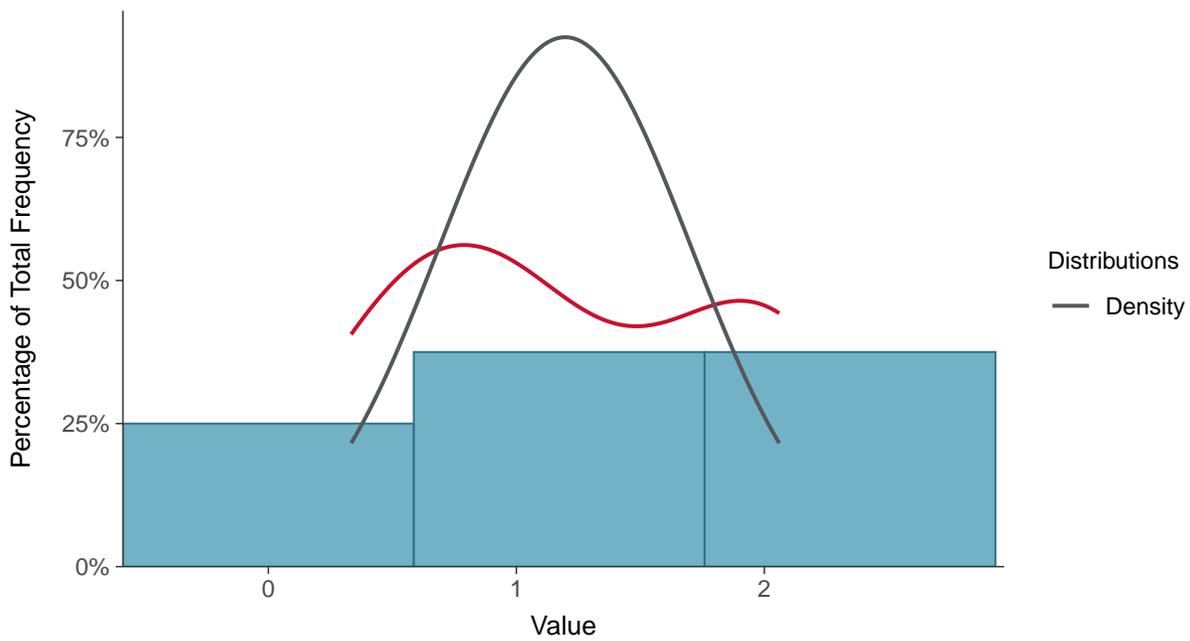
Scatter Plot

Radium-226/228, MW-15 (pCi/L)



Histogram

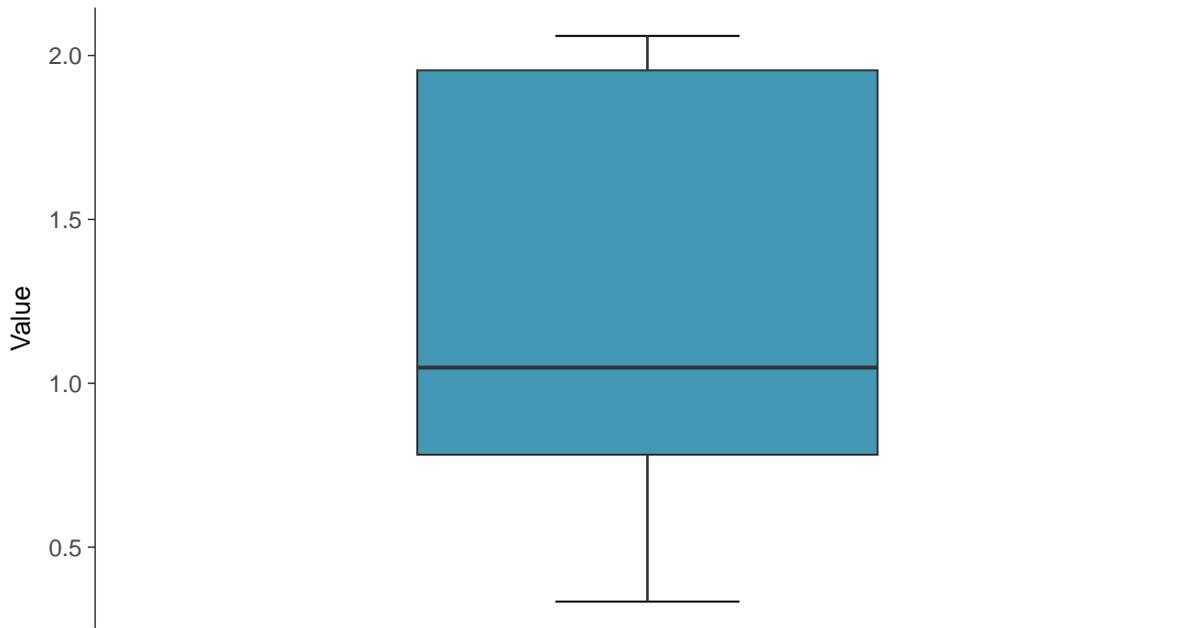
Radium-226/228, MW-15 (pCi/L)





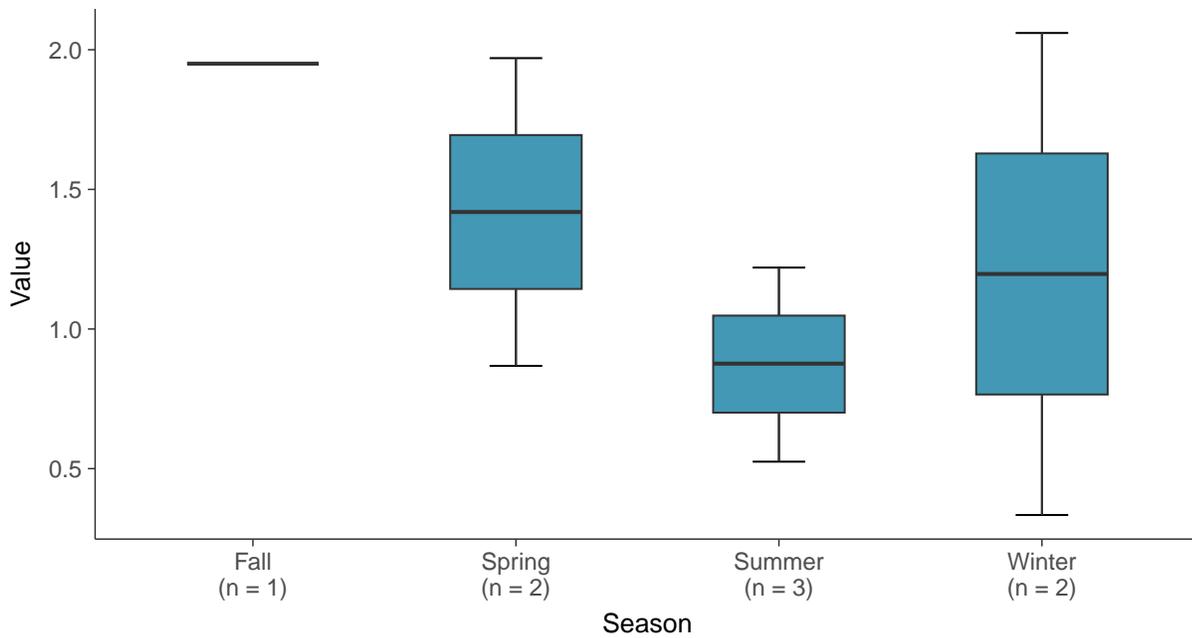
Boxplot

Radium-226/228, MW-15 (pCi/L)



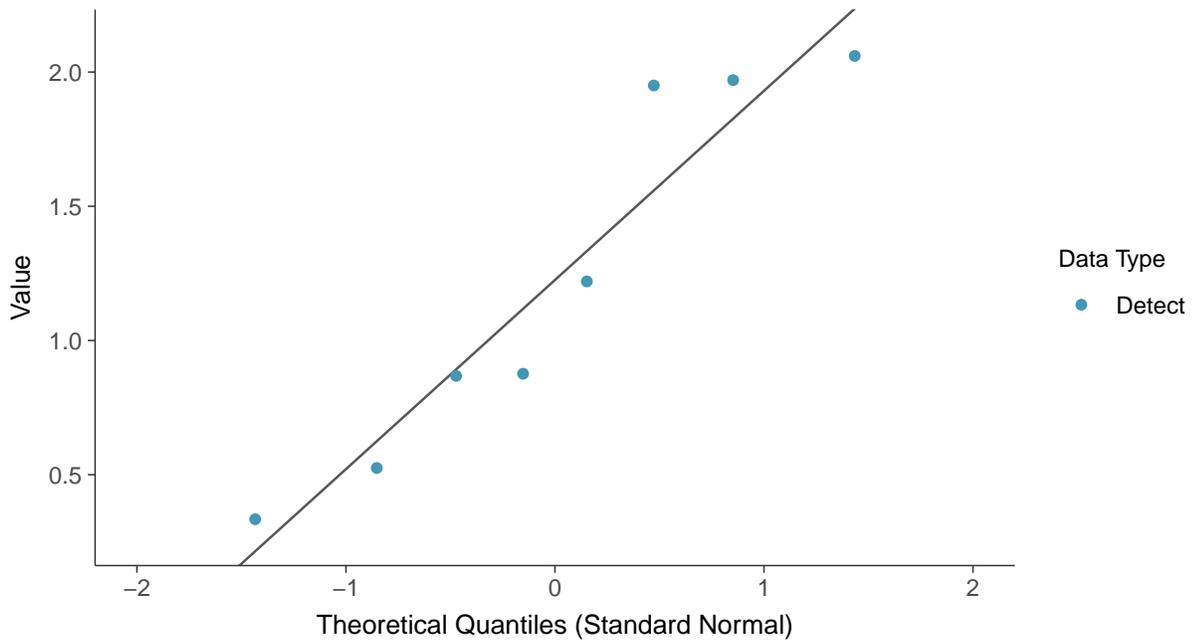
Boxplot by Season

Radium-226/228, MW-15 (pCi/L)

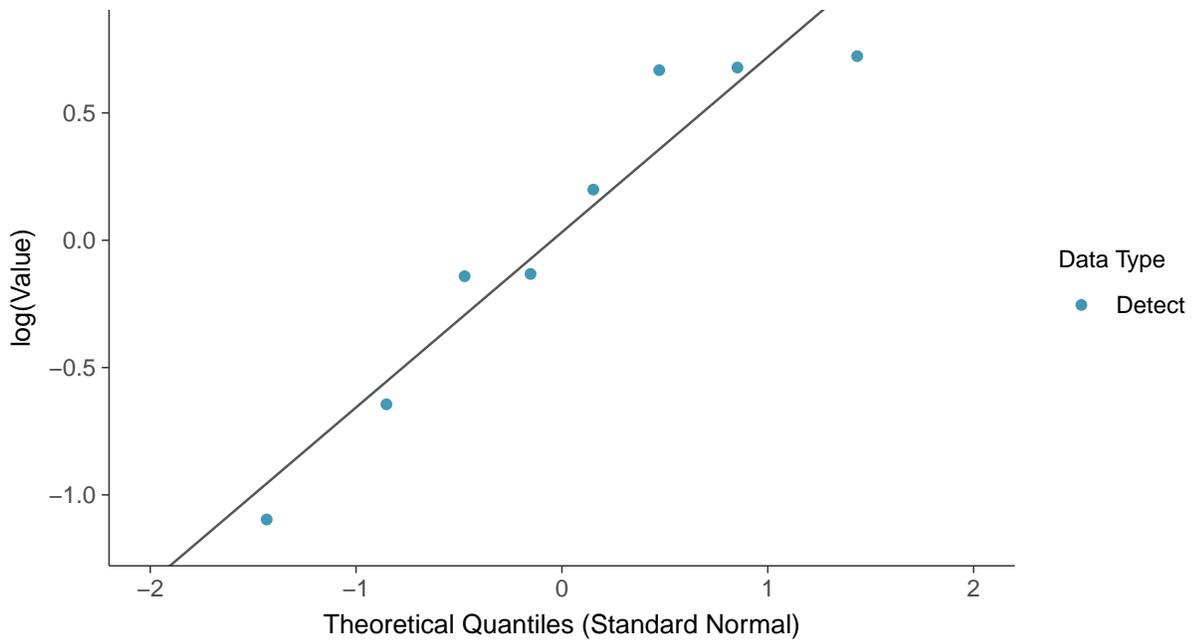




Normal Q-Q plot
Radium-226/228, MW-15 (pCi/L)



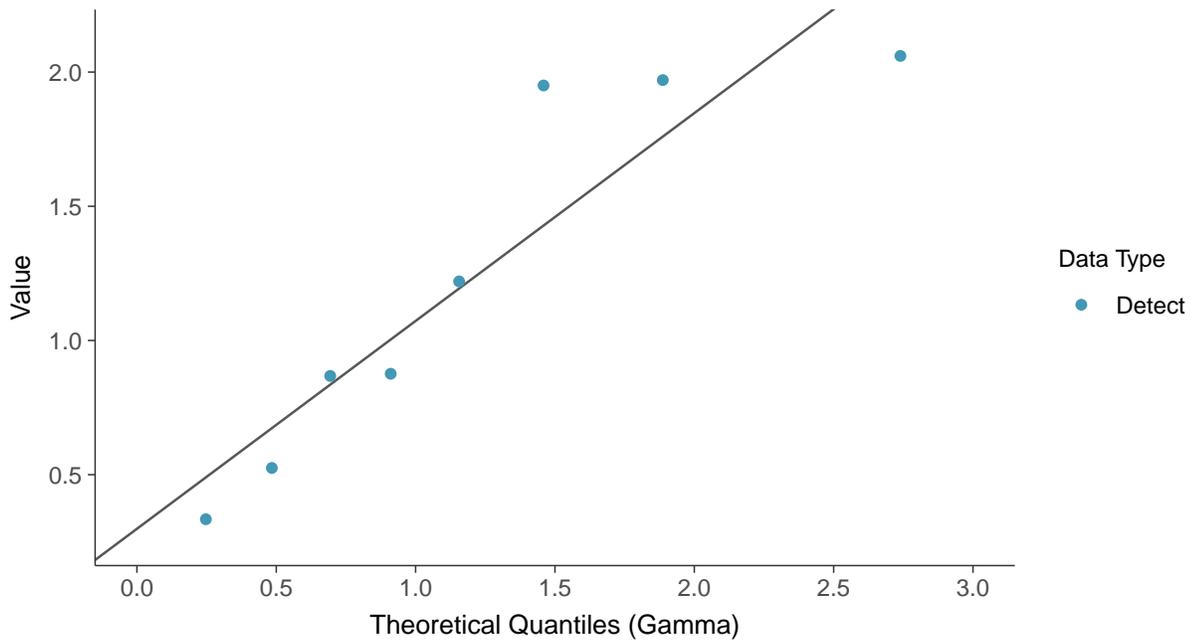
Lognormal Q-Q plot
Radium-226/228, MW-15 (pCi/L)





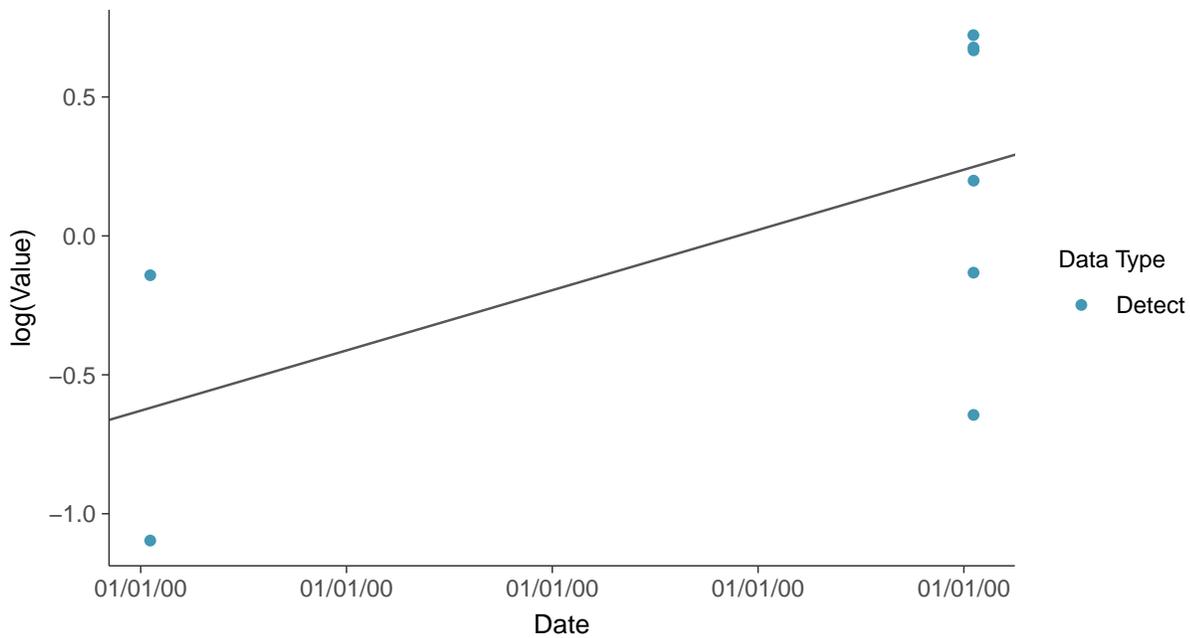
Gamma Q-Q plot

Radium-226/228, MW-15 (pCi/L)



Trend Regression: Lognormal MLE

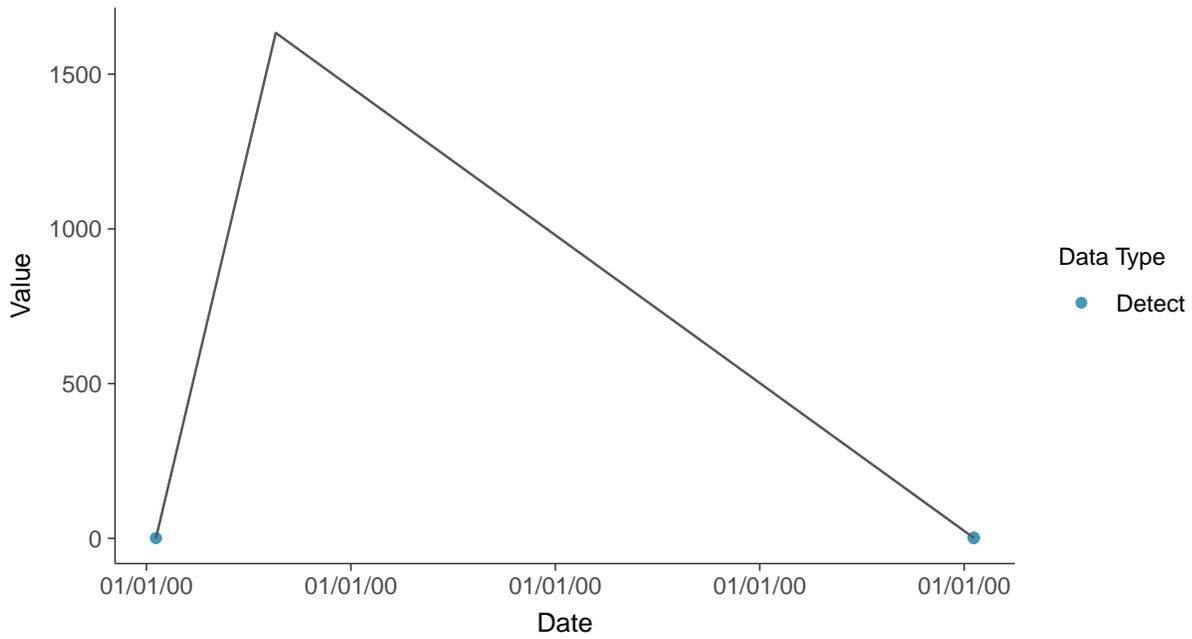
Radium-226/228, MW-15 (pCi/L)





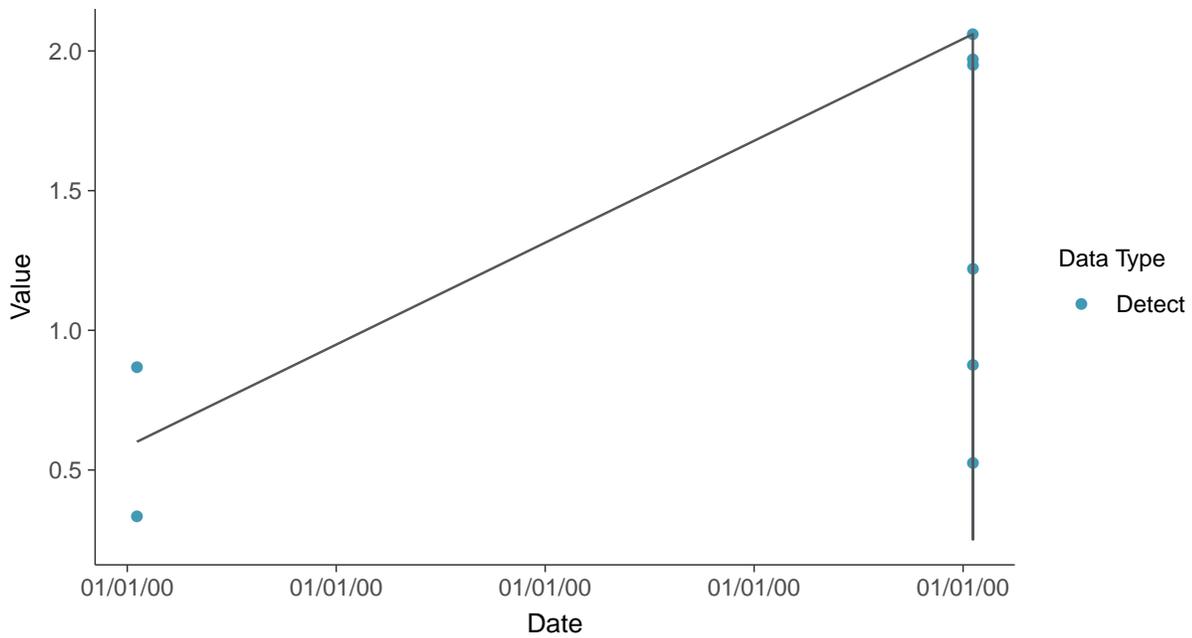
Trend Regression: Piecewise Linear-Linear

Radium-226/228, MW-15 (pCi/L)



Trend Regression: Piecewise Linear-Linear-Linear

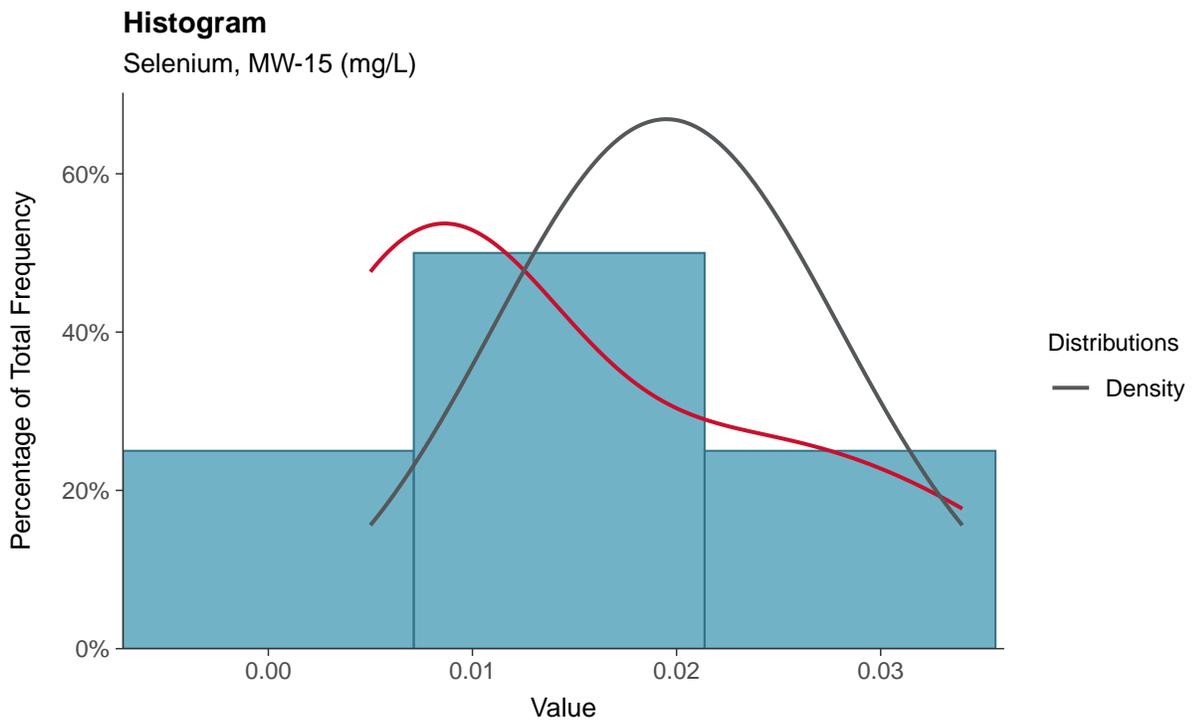
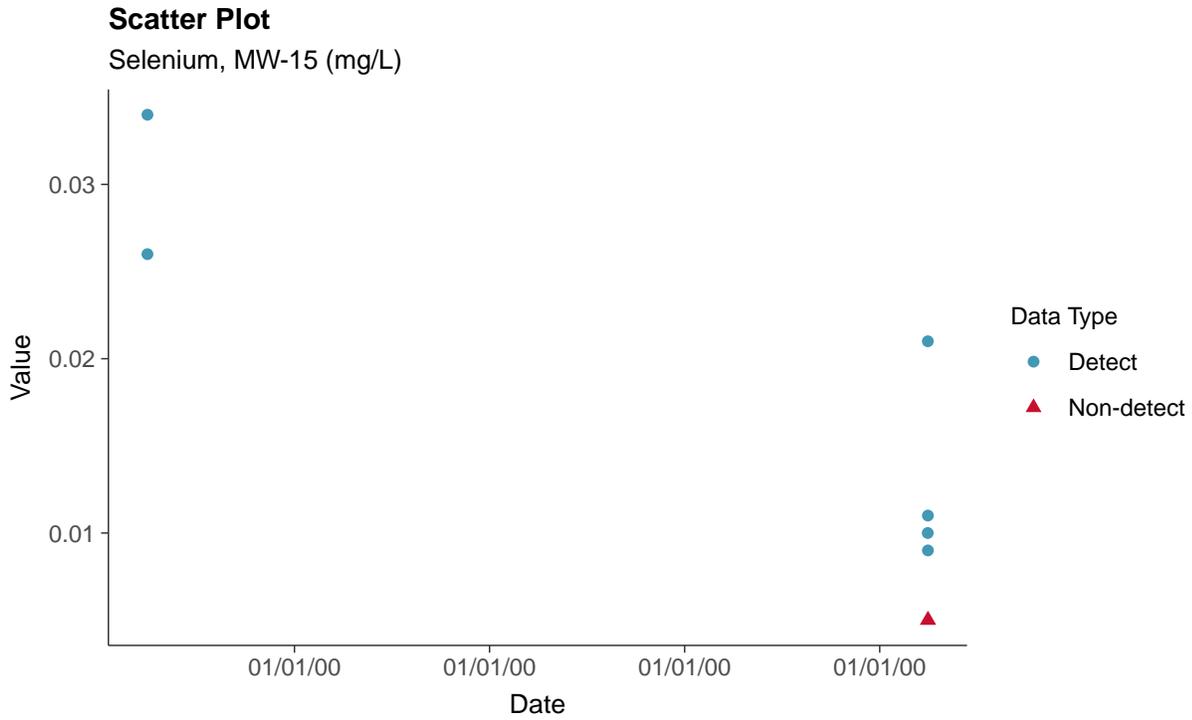
Radium-226/228, MW-15 (pCi/L)





Appendix IV: Selenium, MW-15

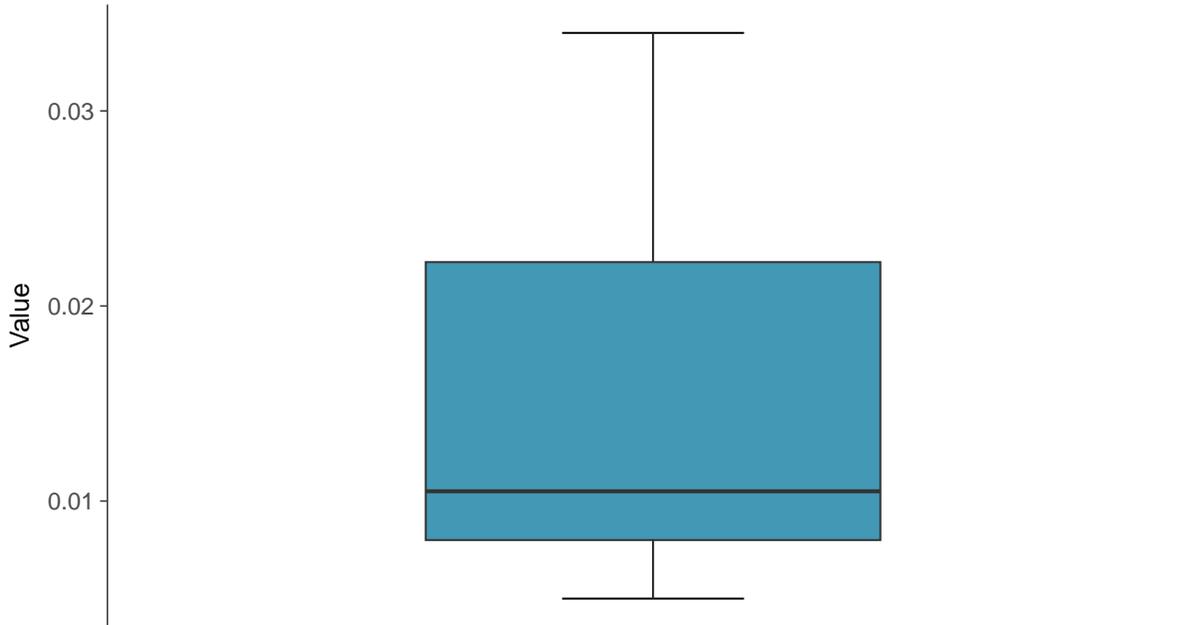
ID: 15_2_22





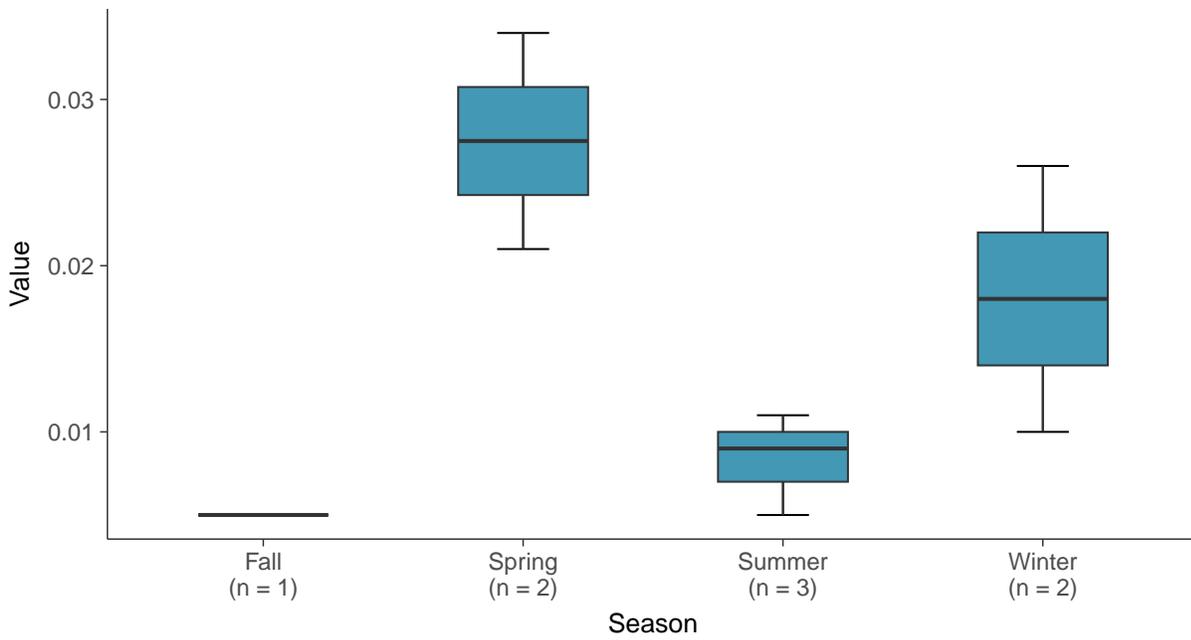
Boxplot

Selenium, MW-15 (mg/L)



Boxplot by Season

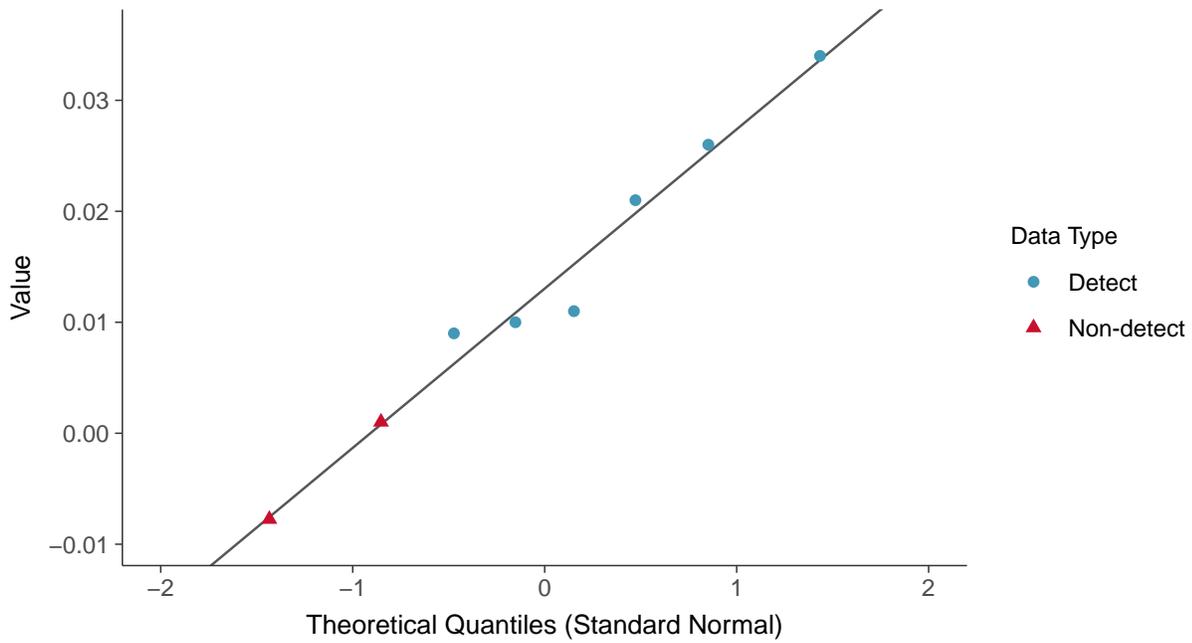
Selenium, MW-15 (mg/L)





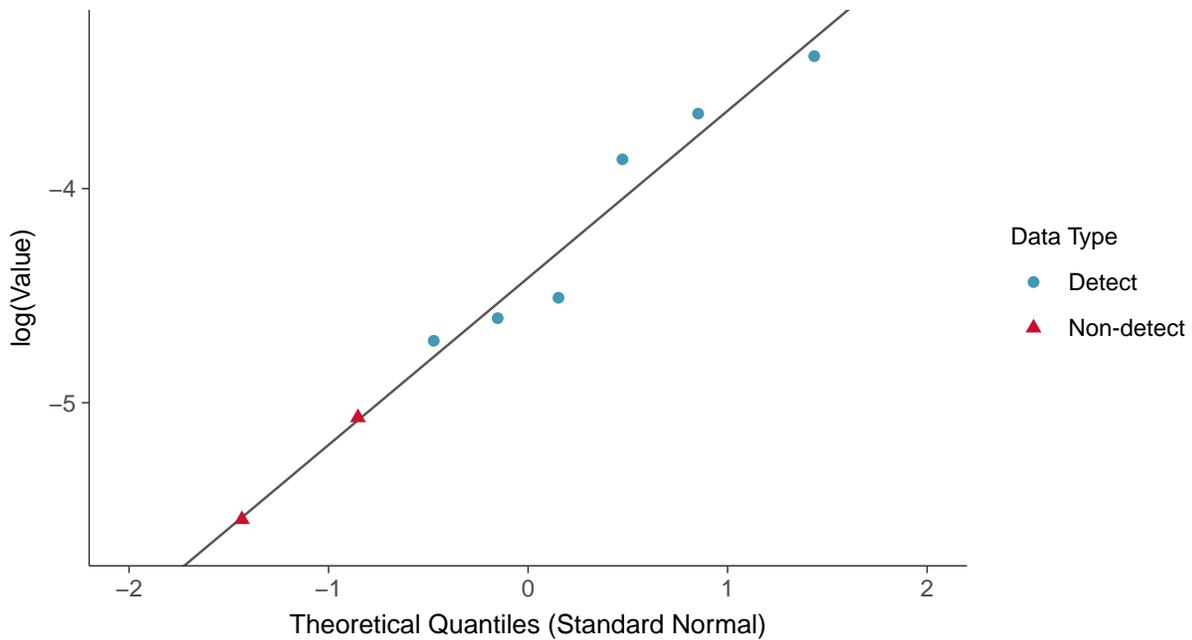
Normal Q-Q plot using ROS Imputed Estimates

Selenium, MW-15 (mg/L)



Lognormal Q-Q plot using ROS Imputed Estimates

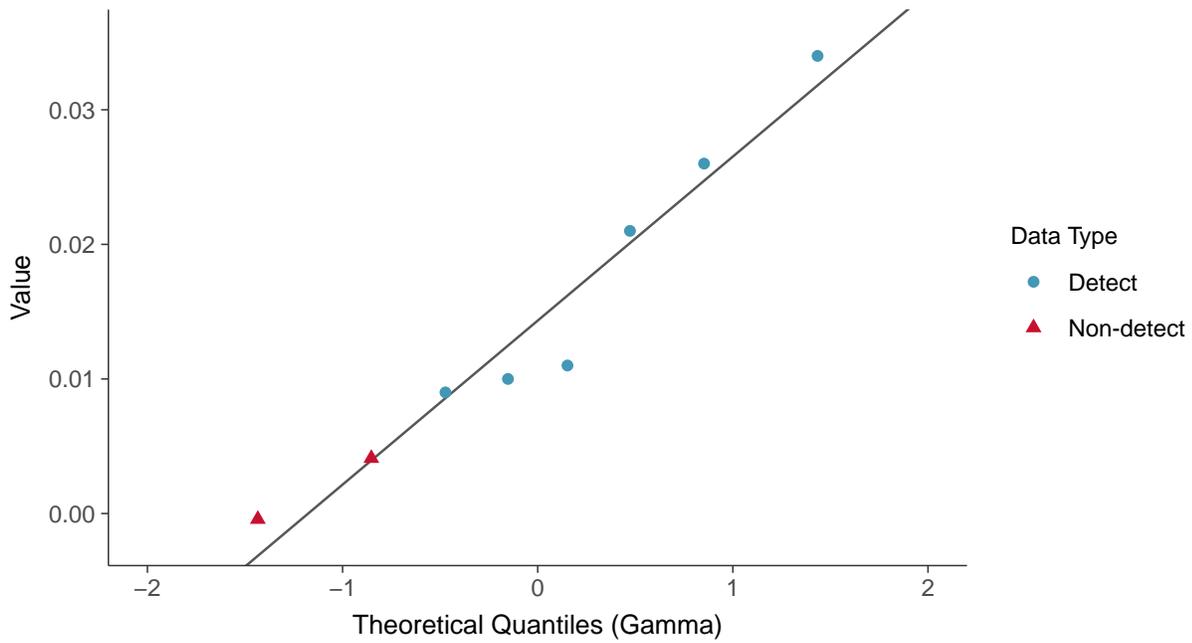
Selenium, MW-15 (mg/L)





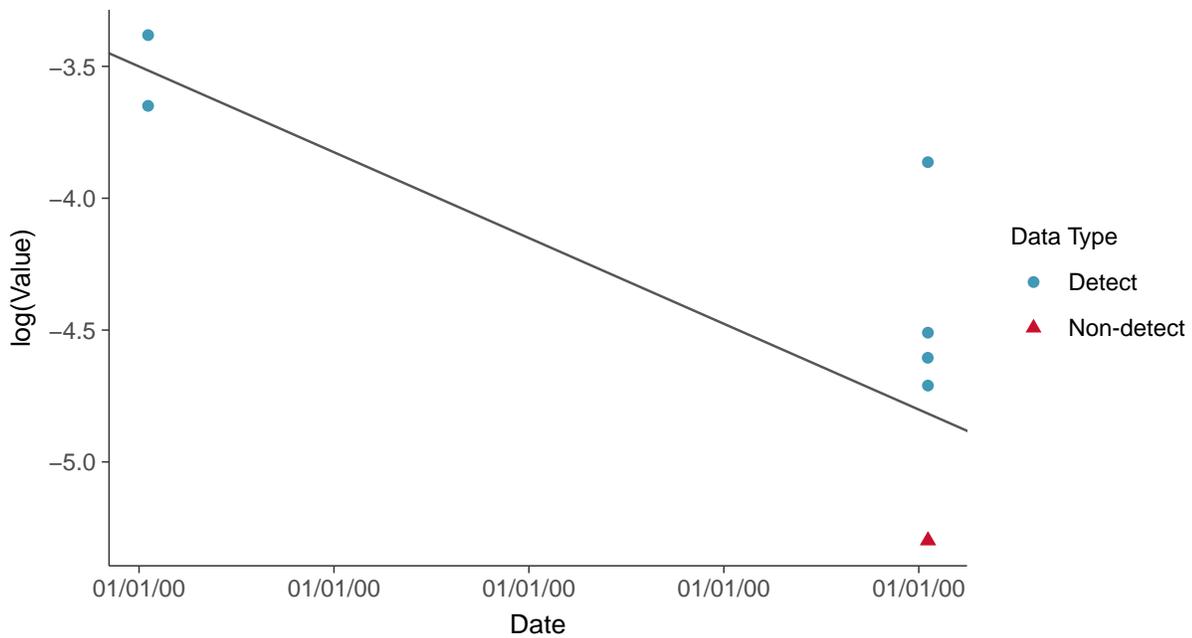
Gamma Q-Q plot using ROS Imputed Estimates

Selenium, MW-15 (mg/L)



Trend Regression: Lognormal MLE

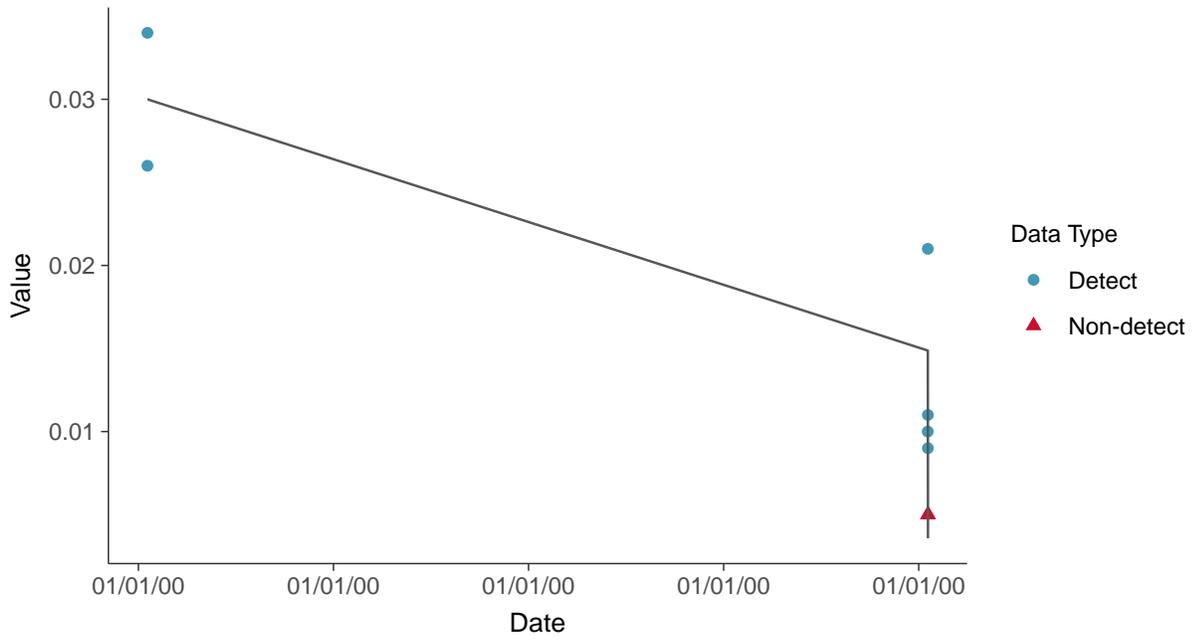
Selenium, MW-15 (mg/L)





Trend Regression: Piecewise Linear-Linear

Selenium, MW-15 (mg/L)



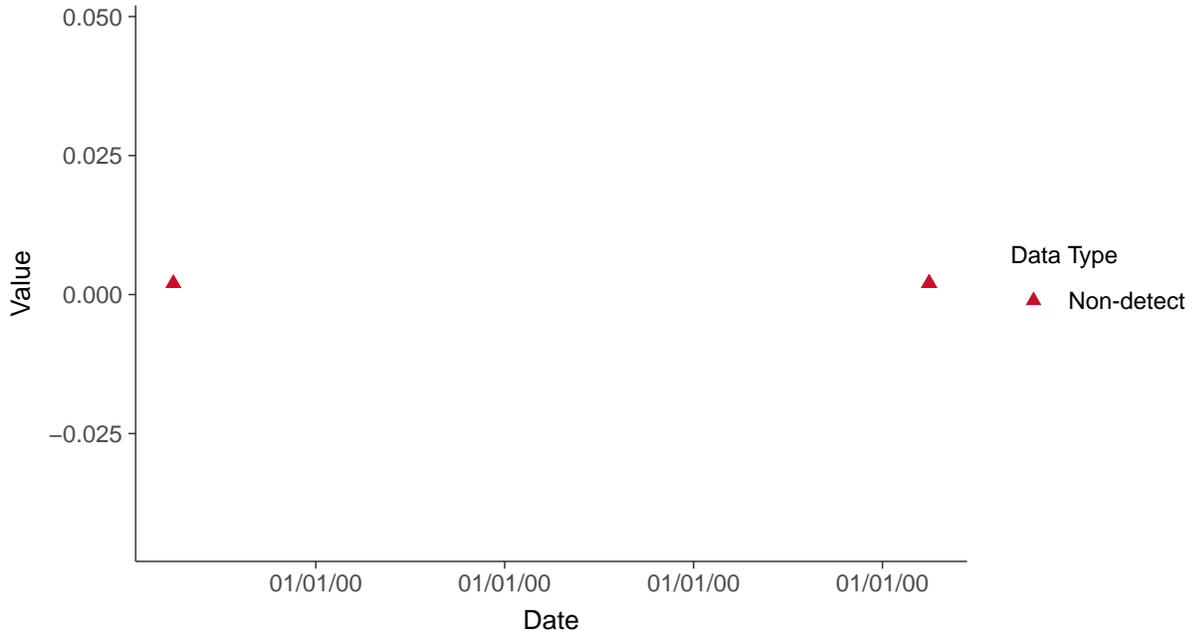


Appendix IV: Thallium, MW-15

ID: 15_2_23

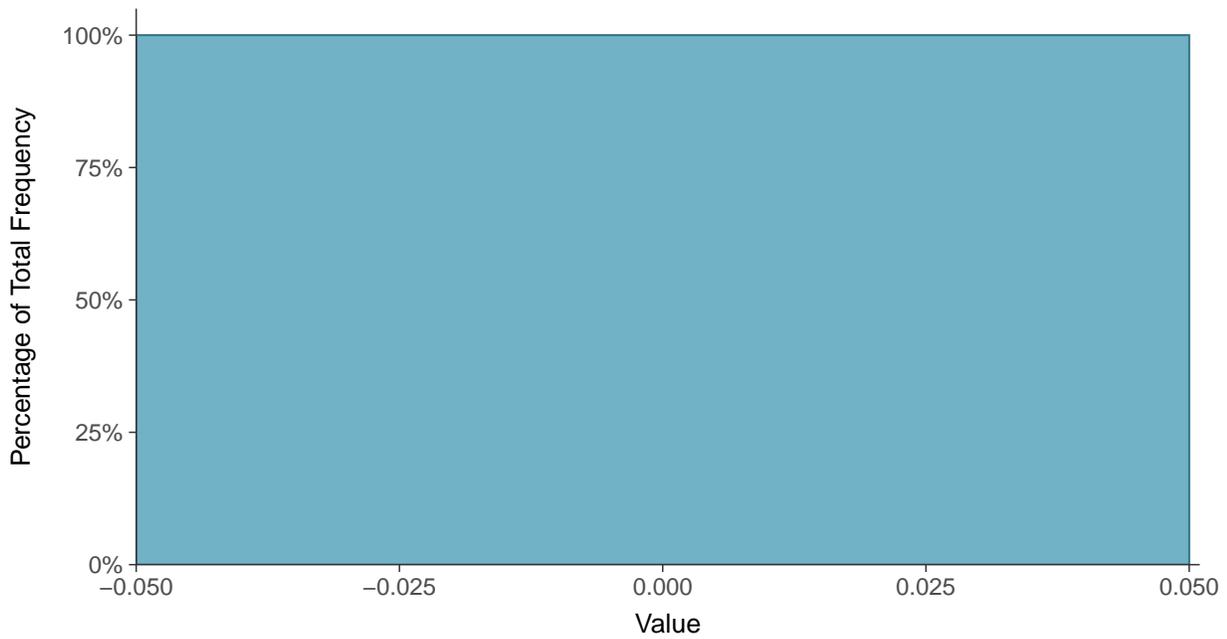
Scatter Plot

Thallium, MW-15 (mg/L)



Histogram

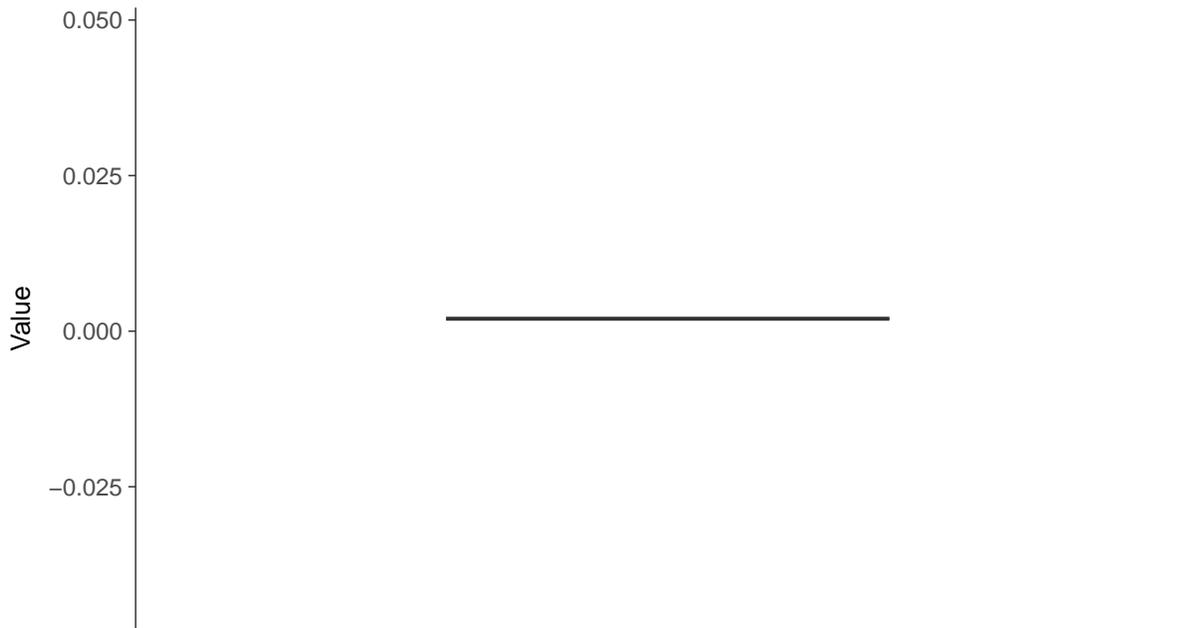
Thallium, MW-15 (mg/L)





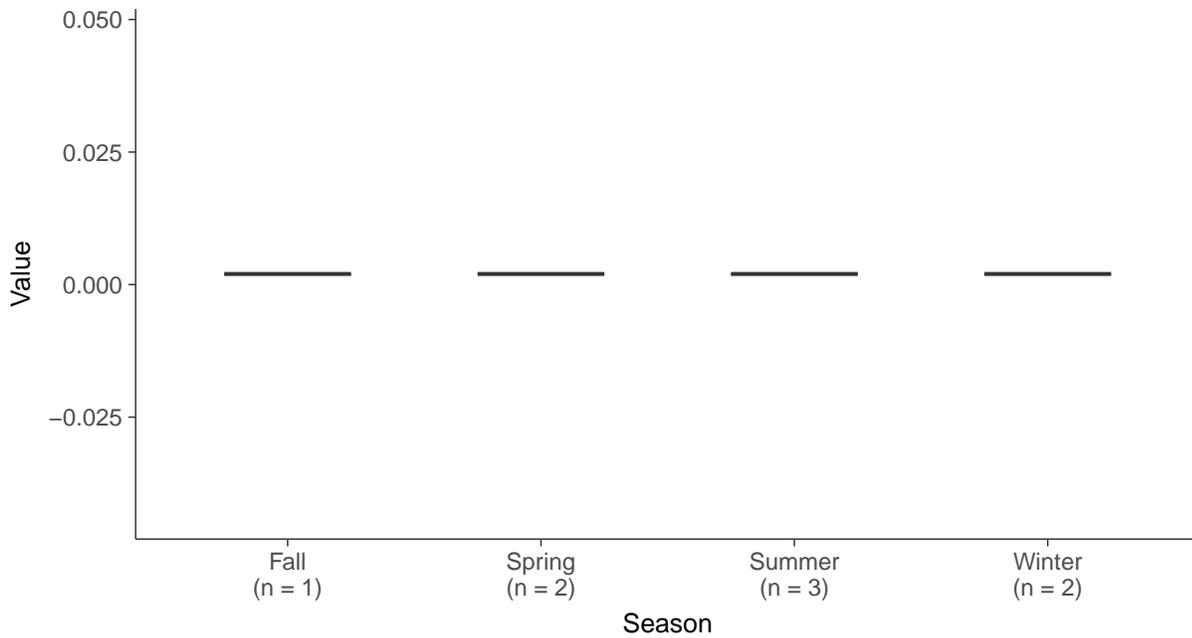
Boxplot

Thallium, MW-15 (mg/L)



Boxplot by Season

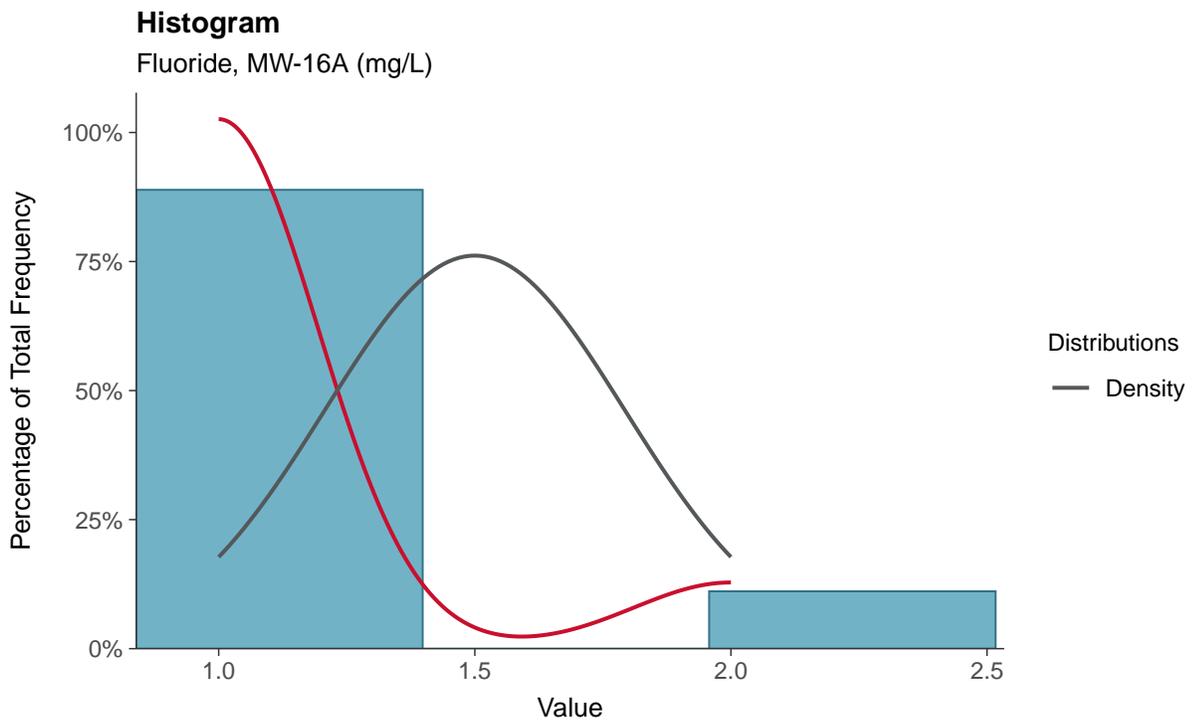
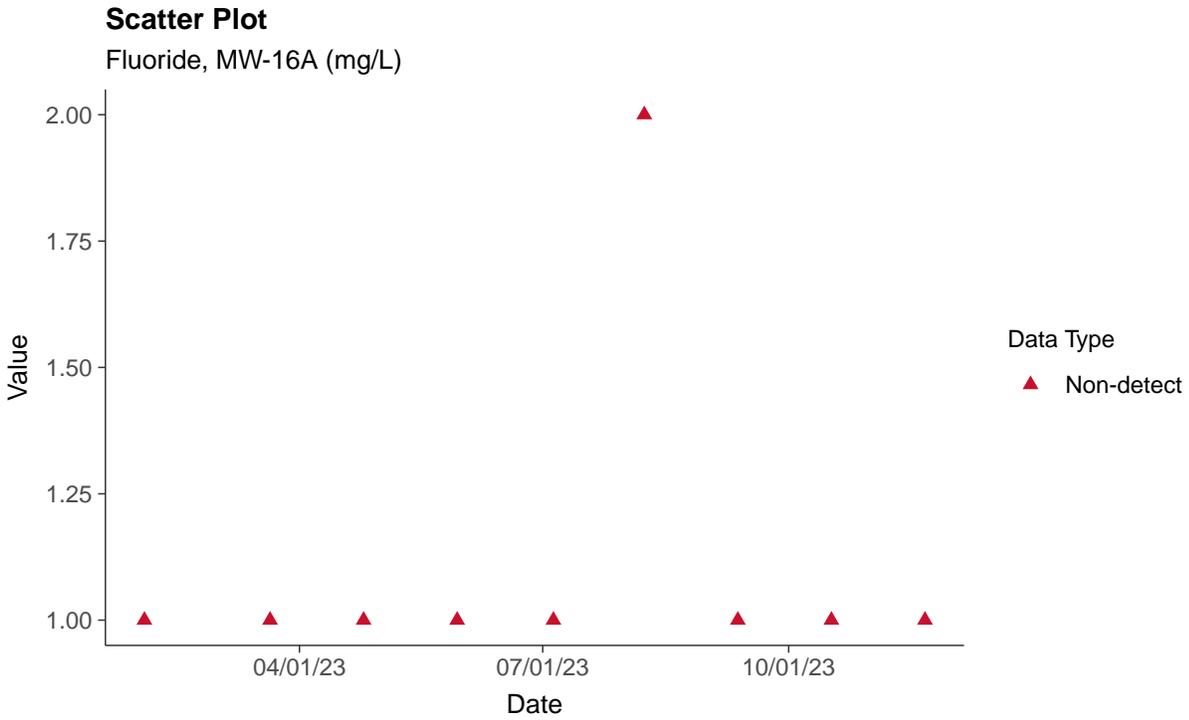
Thallium, MW-15 (mg/L)





Appendix IV: Fluoride, MW-16A

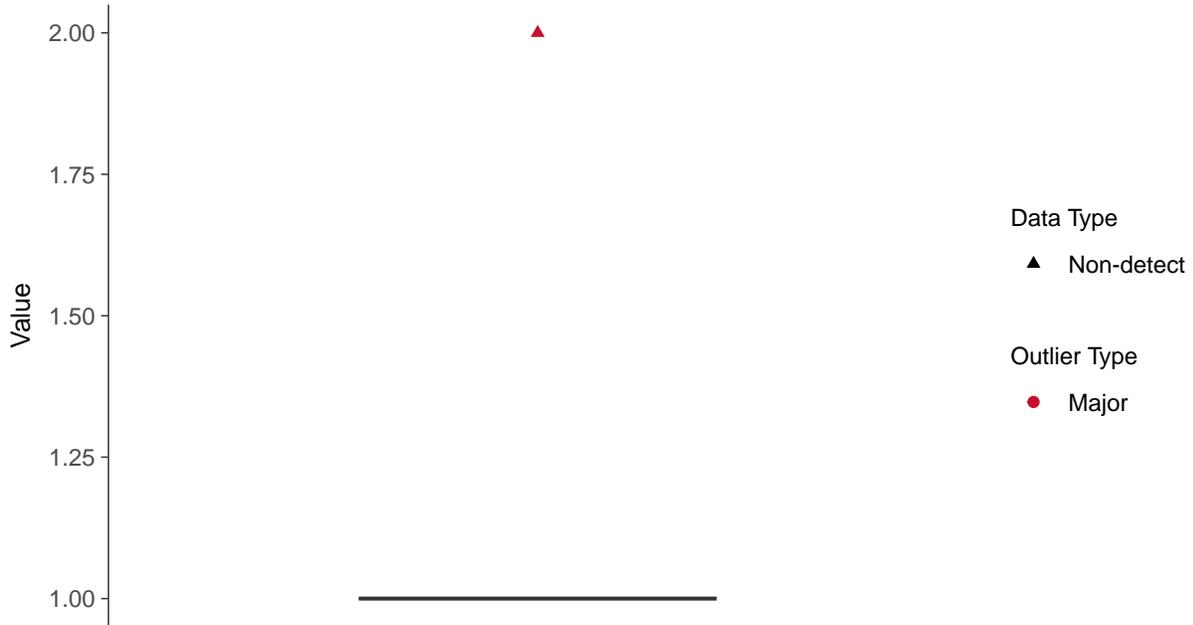
ID: 16A_2_04





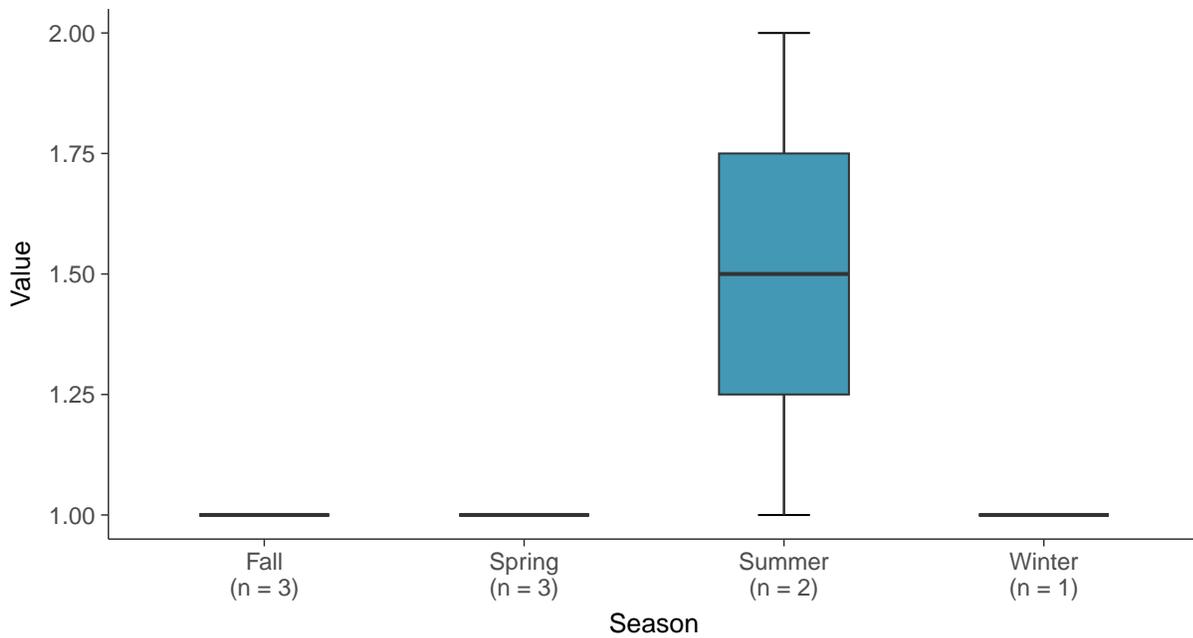
Boxplot

Fluoride, MW-16A (mg/L)



Boxplot by Season

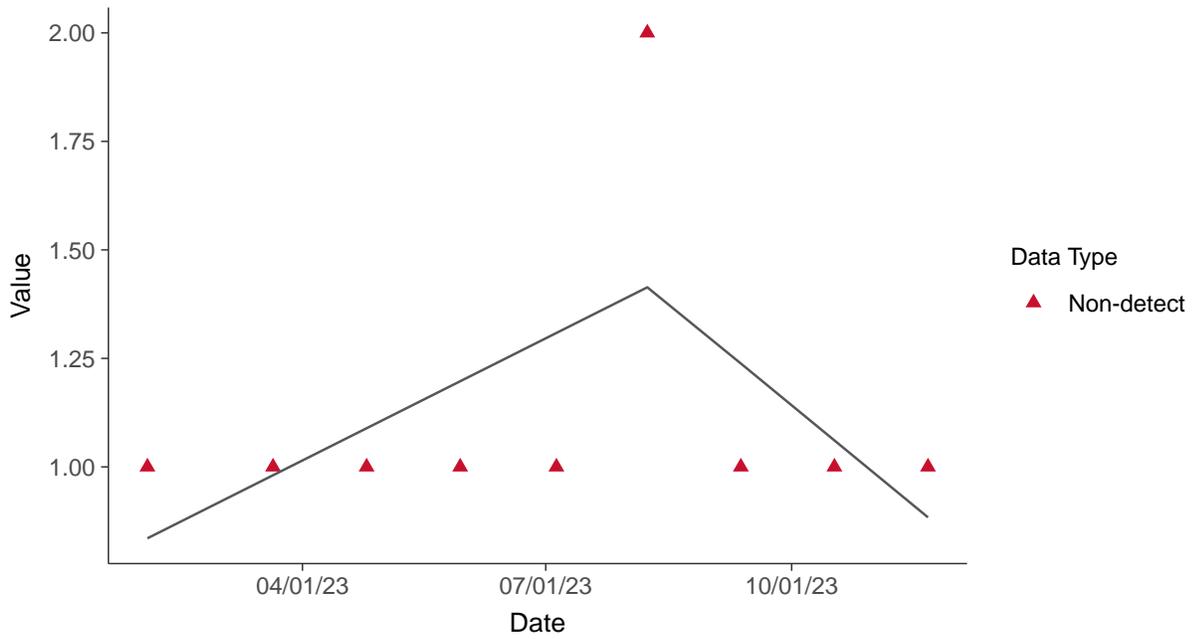
Fluoride, MW-16A (mg/L)





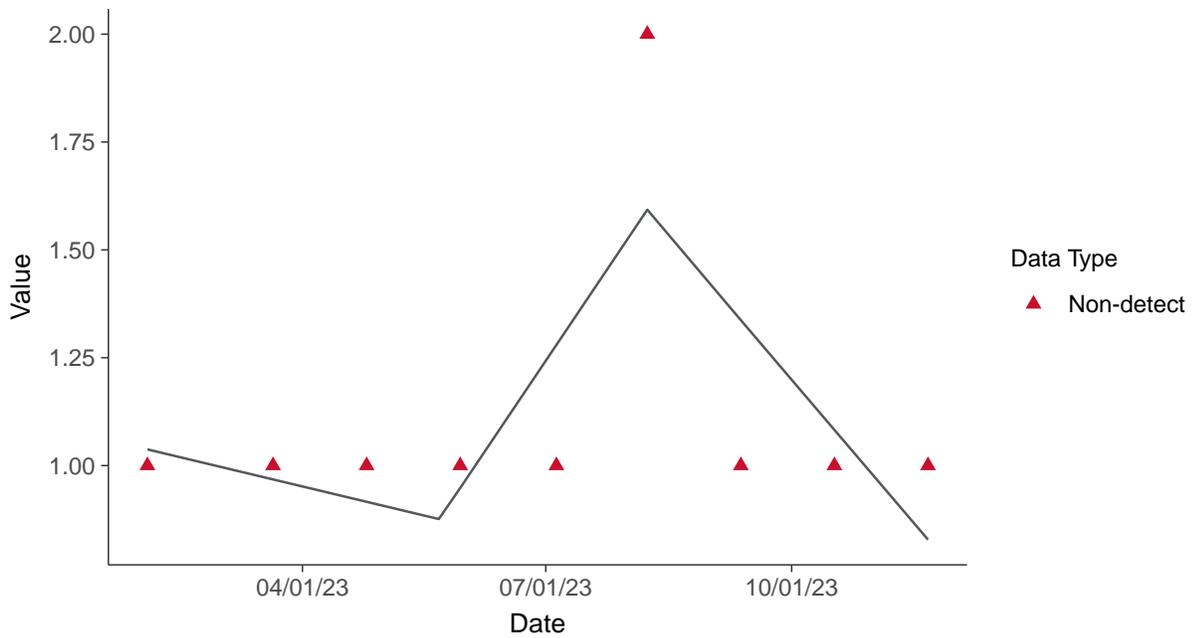
Trend Regression: Piecewise Linear-Linear

Fluoride, MW-16A (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Fluoride, MW-16A (mg/L)



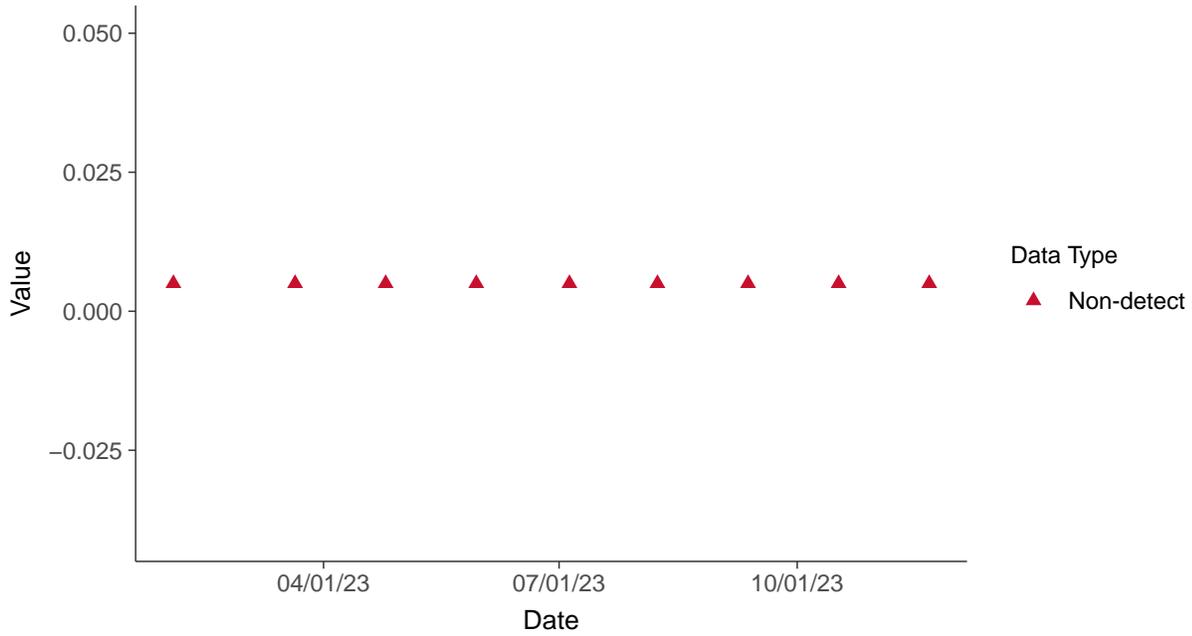


Appendix IV: Antimony, MW-16A

ID: 16A_2_08

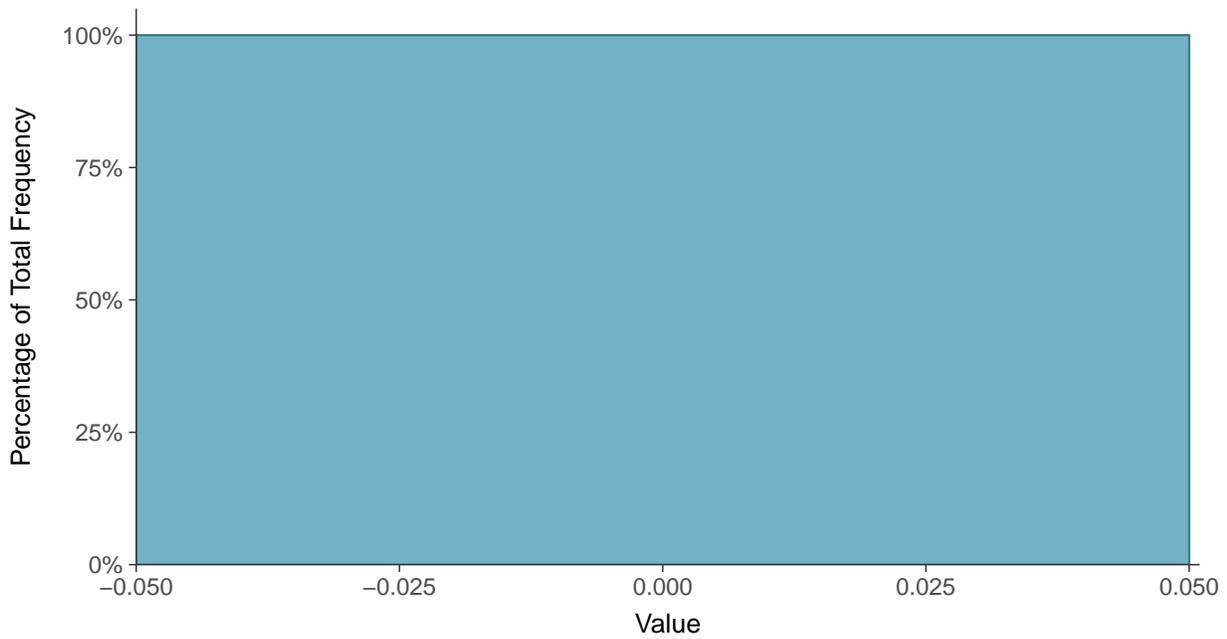
Scatter Plot

Antimony, MW-16A (mg/L)



Histogram

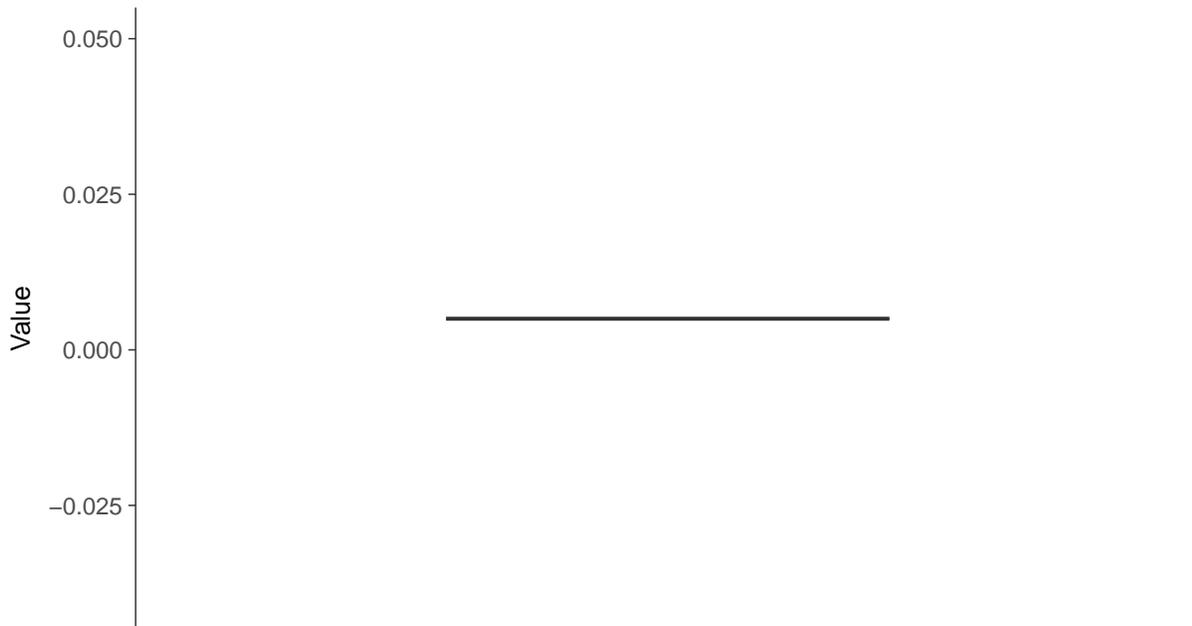
Antimony, MW-16A (mg/L)





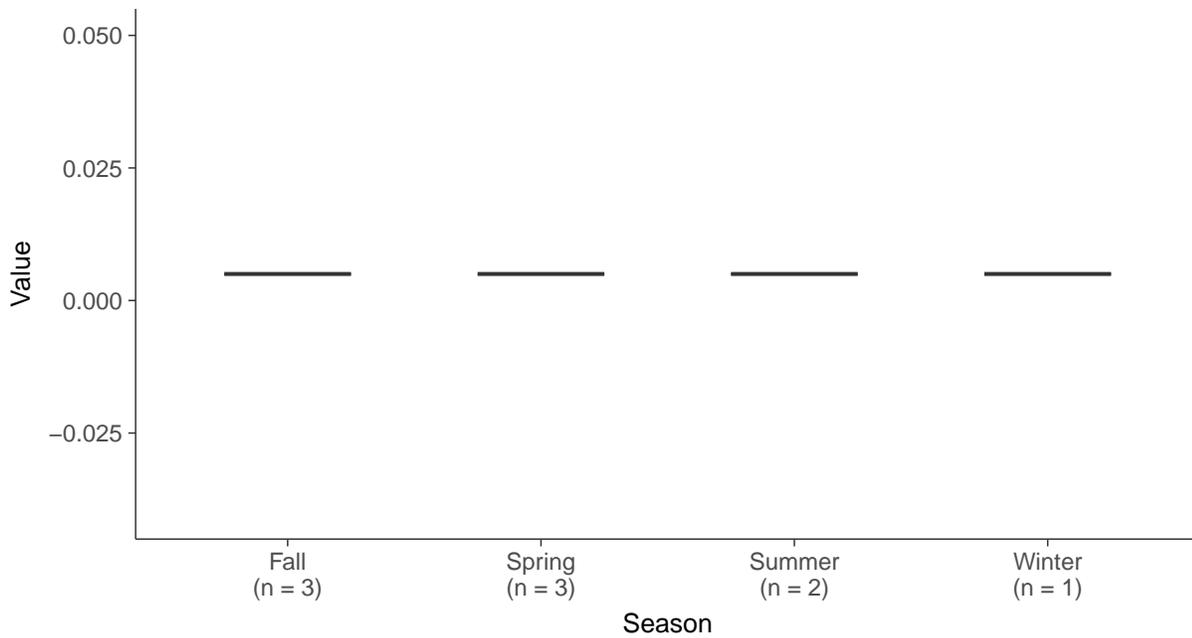
Boxplot

Antimony, MW-16A (mg/L)



Boxplot by Season

Antimony, MW-16A (mg/L)



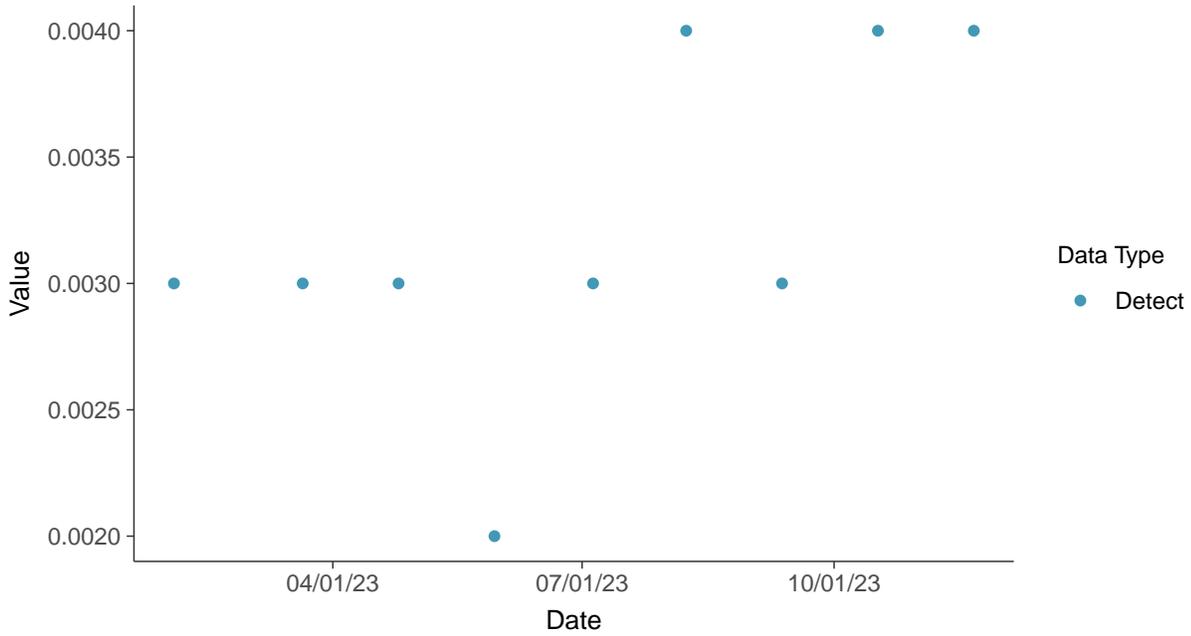


Appendix IV: Arsenic, MW-16A

ID: 16A_2_09

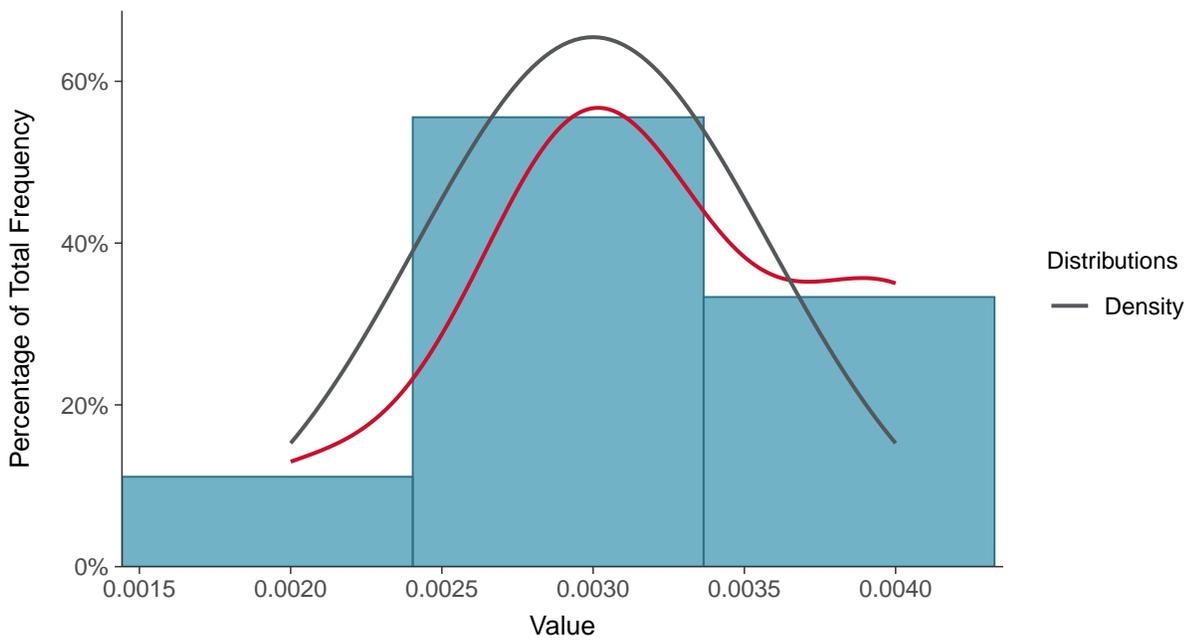
Scatter Plot

Arsenic, MW-16A (mg/L)



Histogram

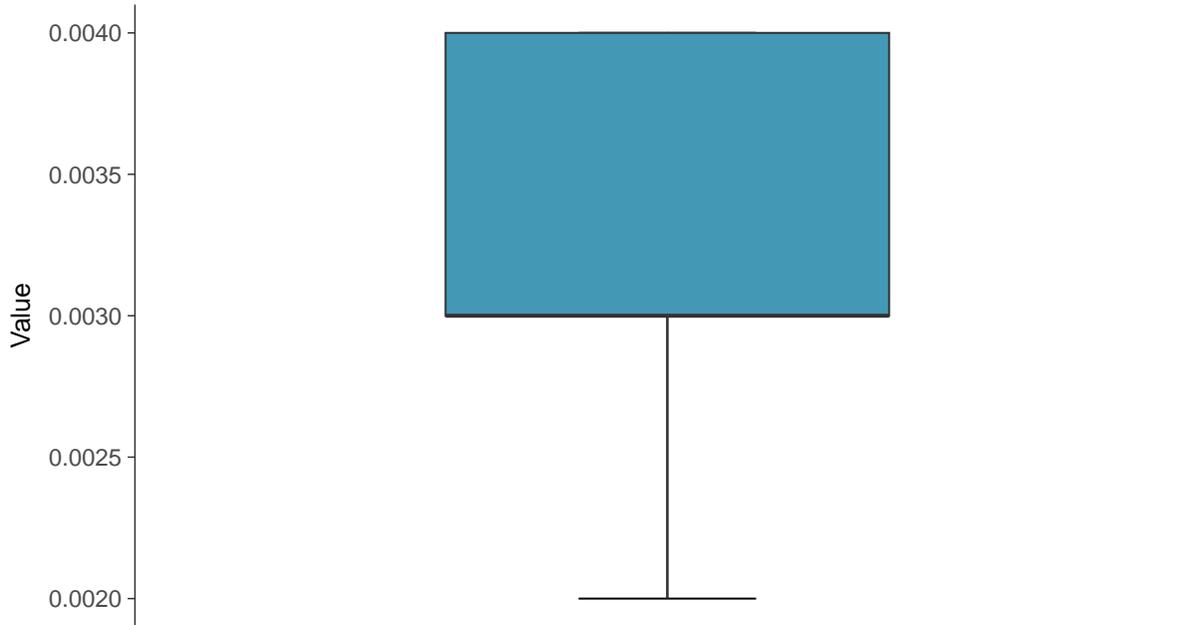
Arsenic, MW-16A (mg/L)





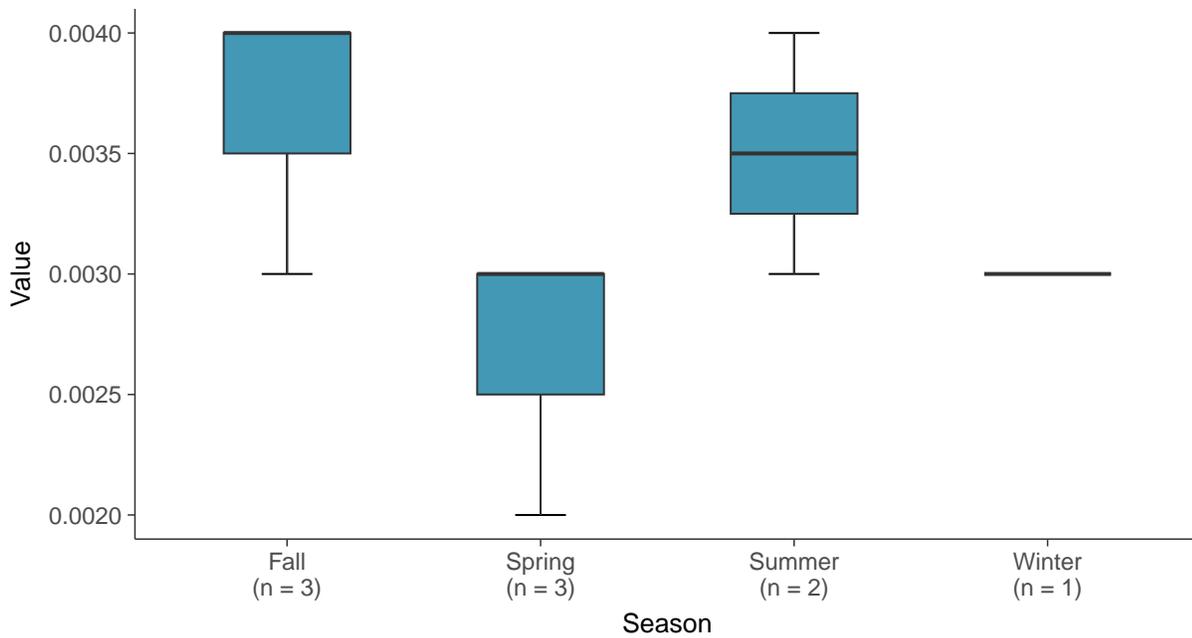
Boxplot

Arsenic, MW-16A (mg/L)



Boxplot by Season

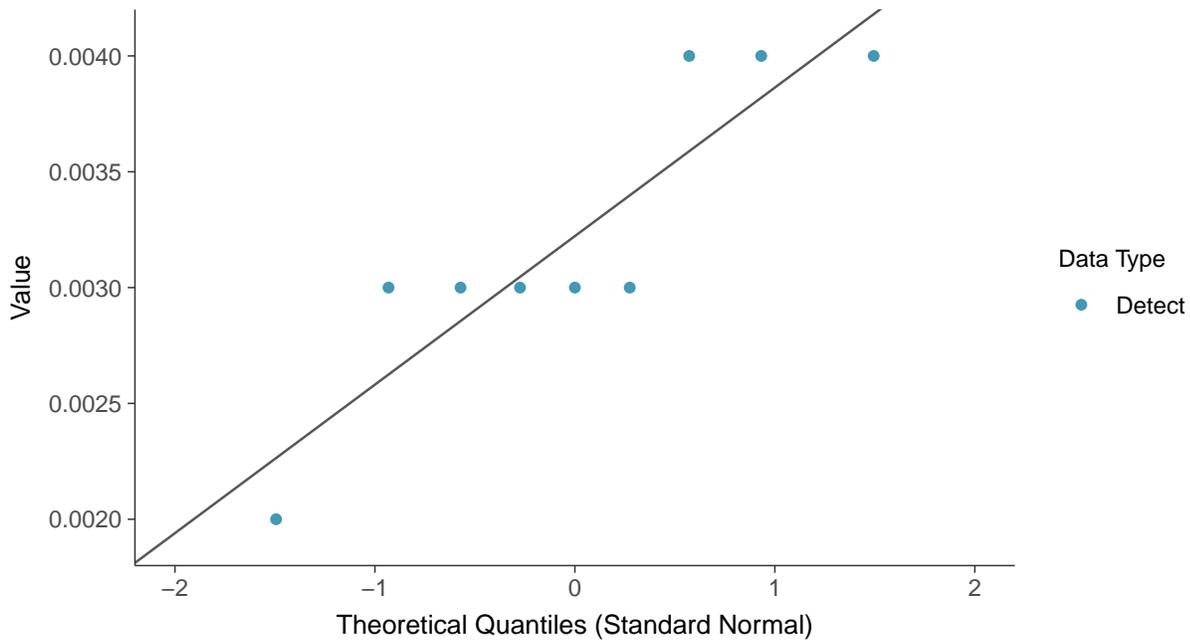
Arsenic, MW-16A (mg/L)





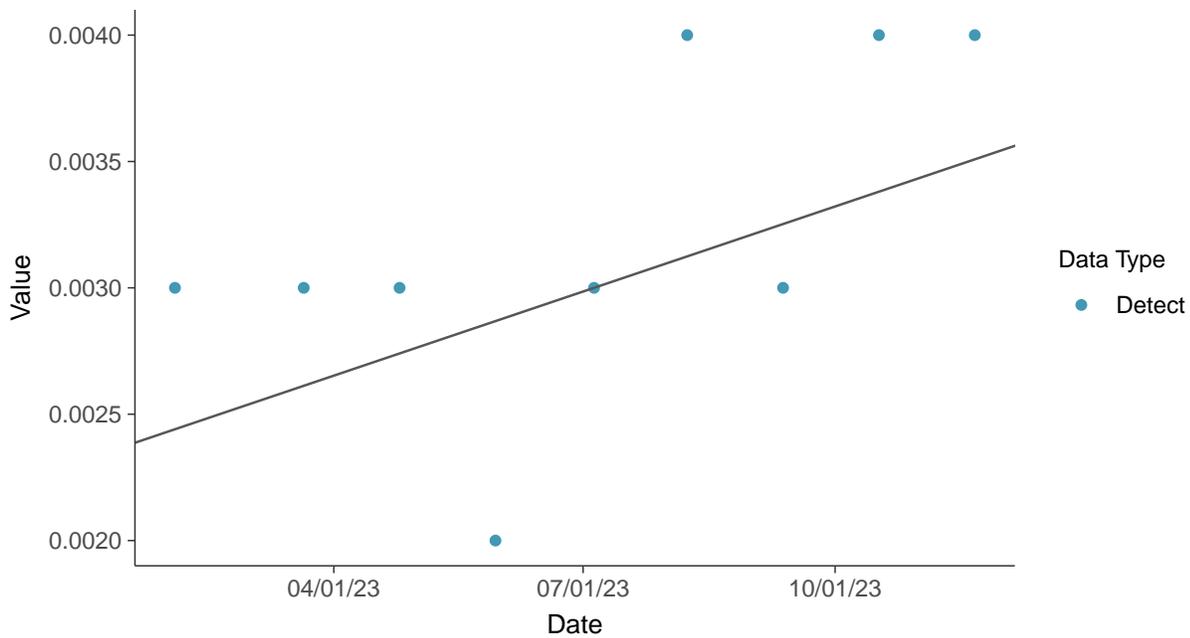
Normal Q-Q plot

Arsenic, MW-16A (mg/L)



Trend Regression: Mann-Kendall/Theil-Sen Estimate

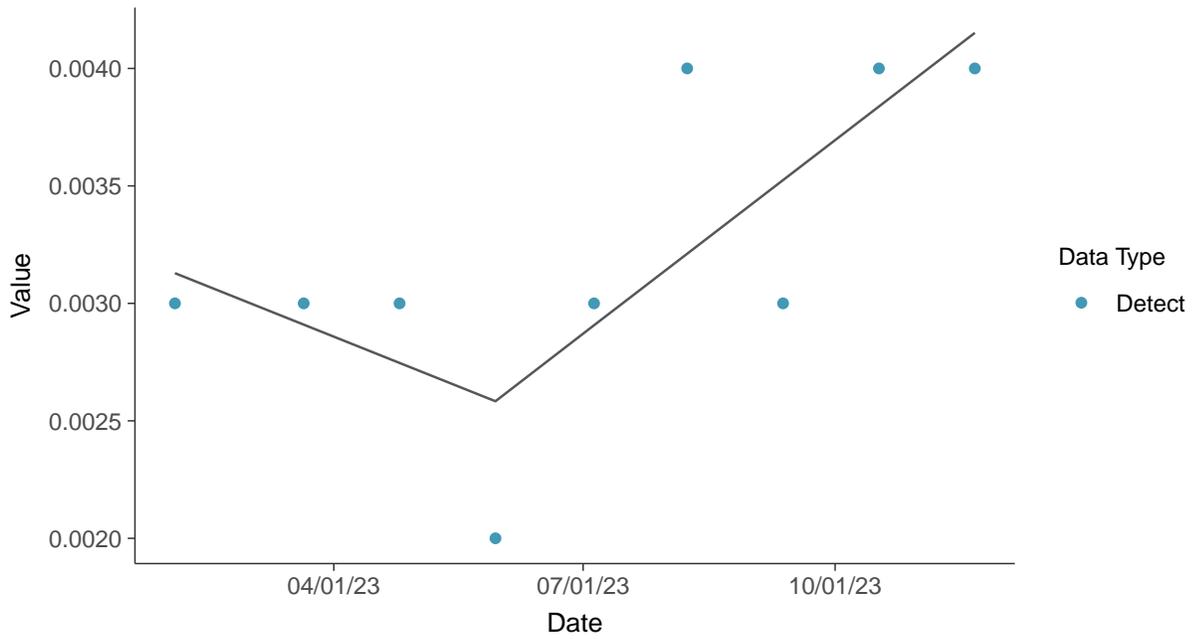
Arsenic, MW-16A (mg/L)





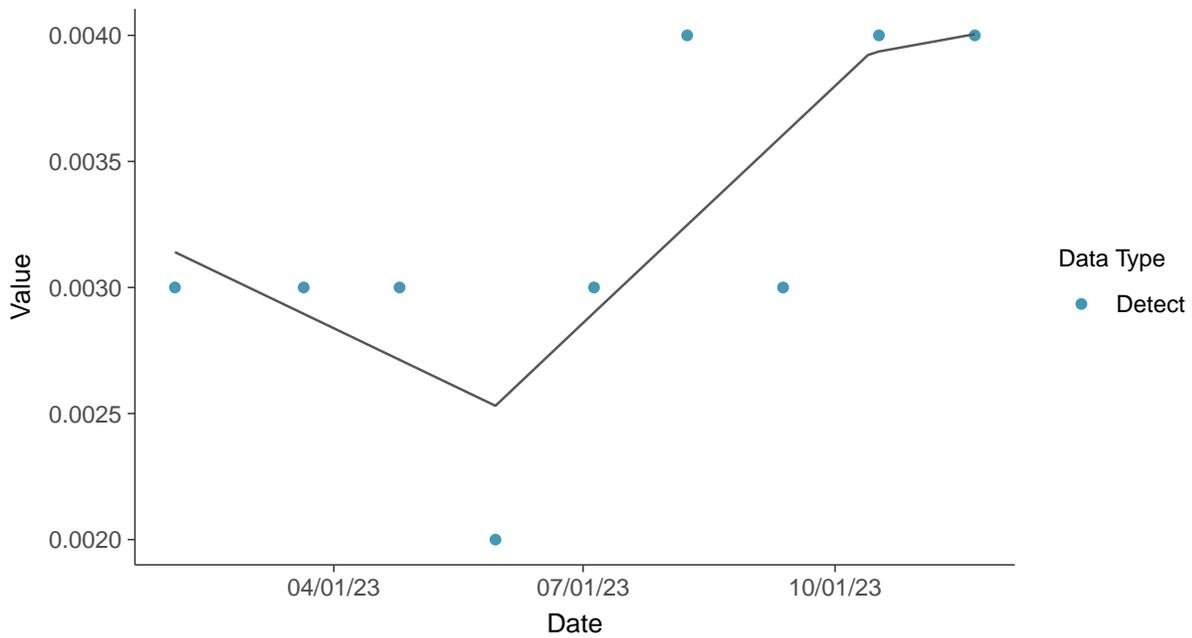
Trend Regression: Piecewise Linear-Linear

Arsenic, MW-16A (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

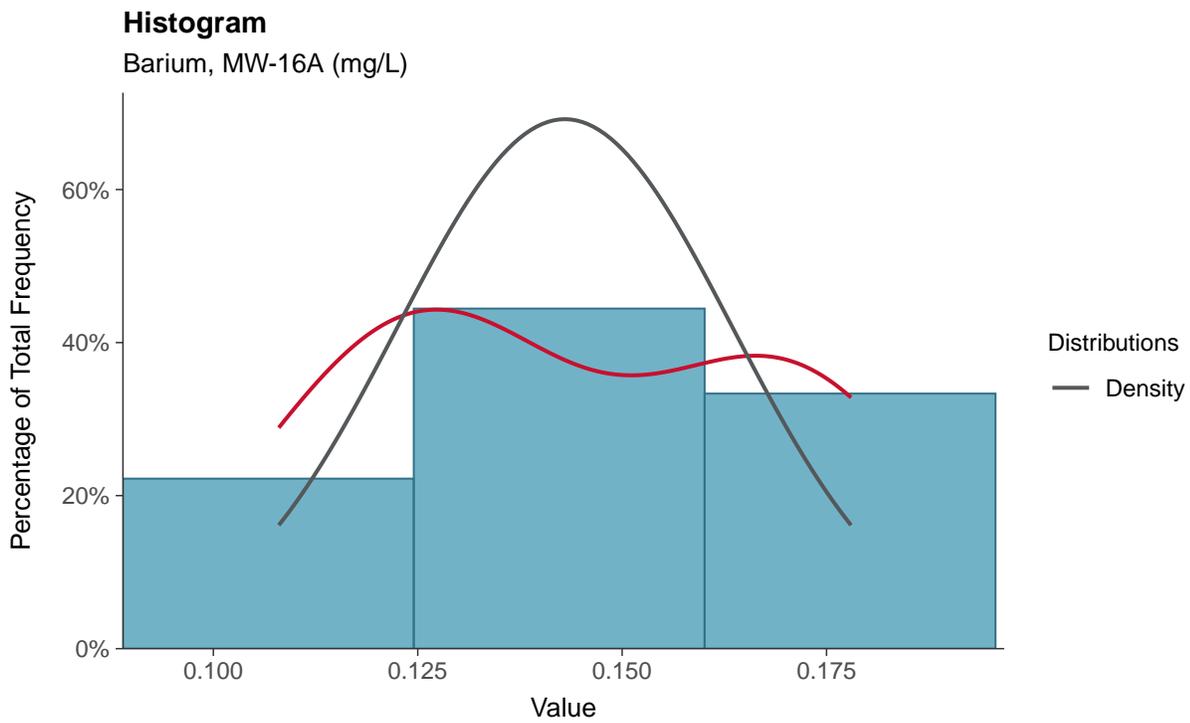
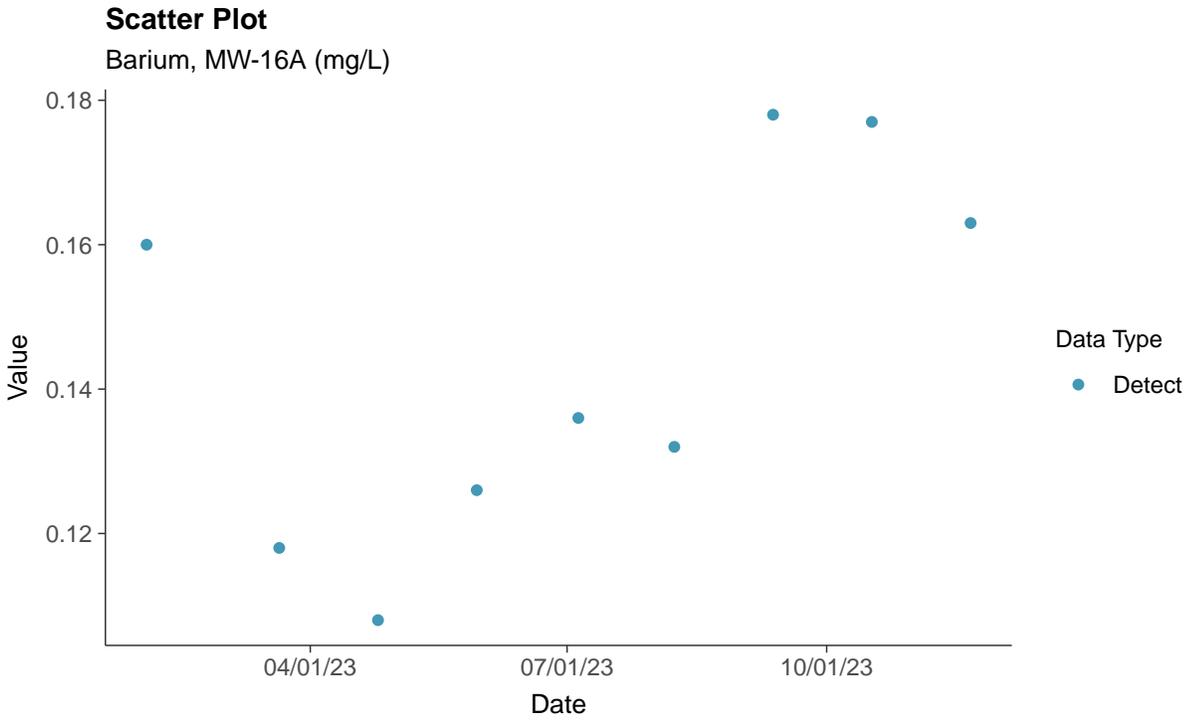
Arsenic, MW-16A (mg/L)





Appendix IV: Barium, MW-16A

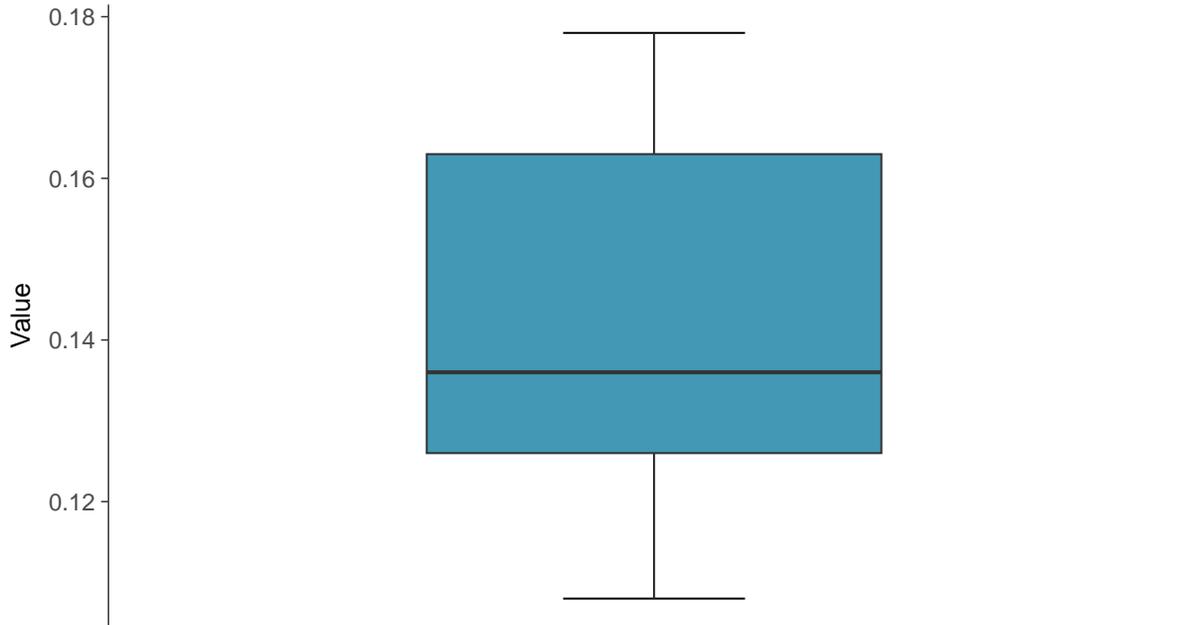
ID: 16A_2_10





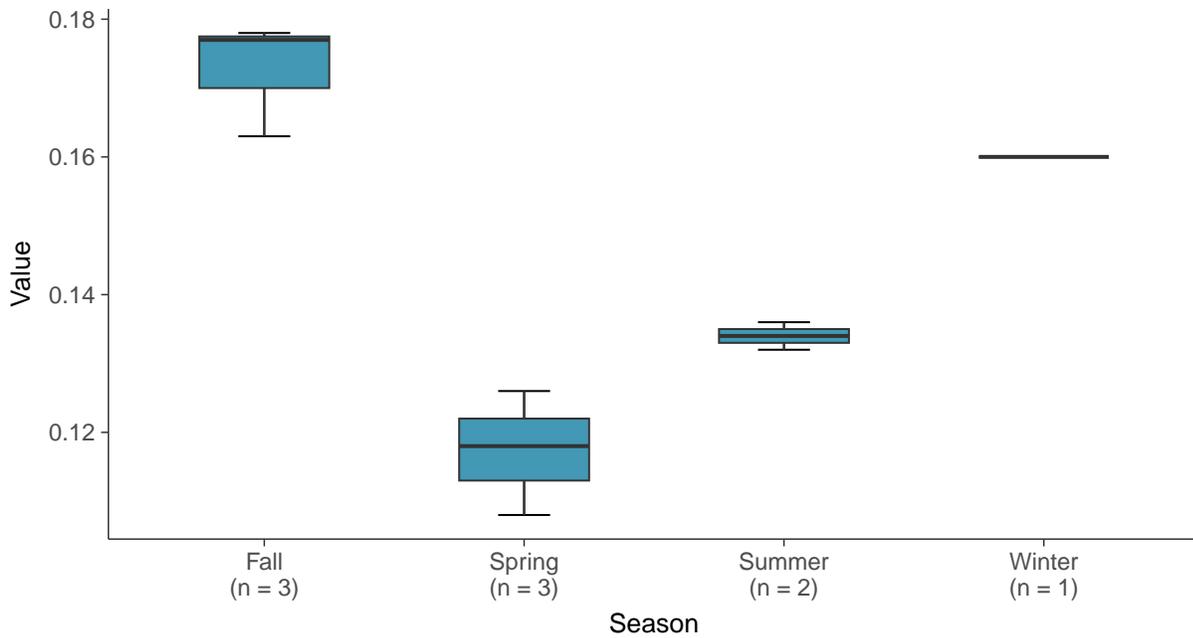
Boxplot

Barium, MW-16A (mg/L)



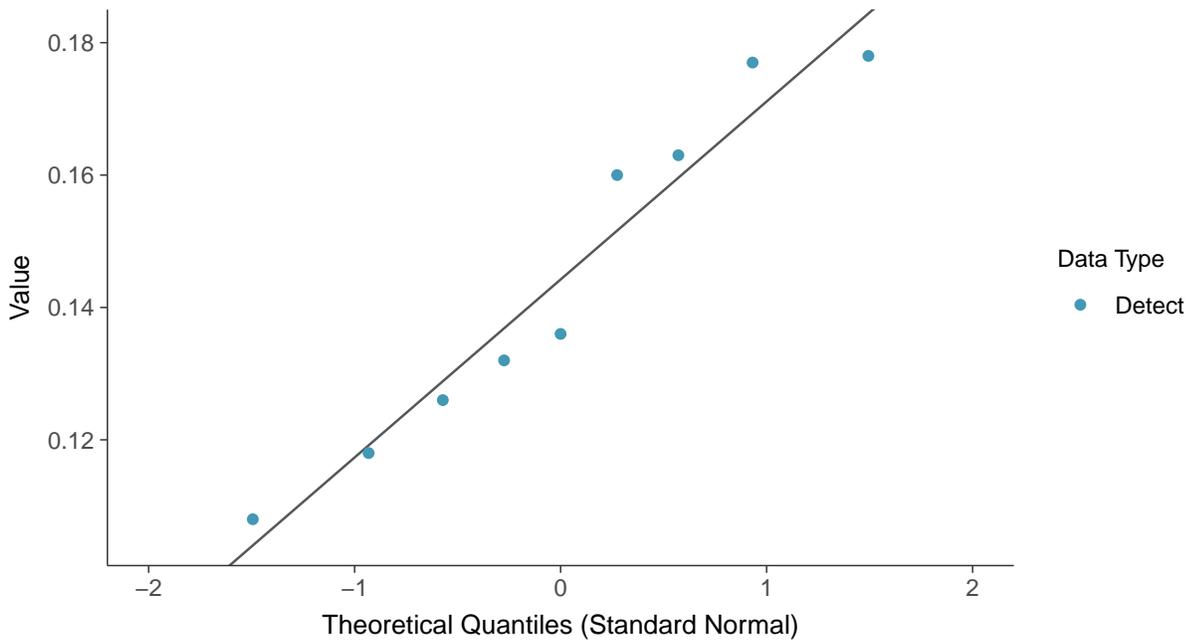
Boxplot by Season

Barium, MW-16A (mg/L)

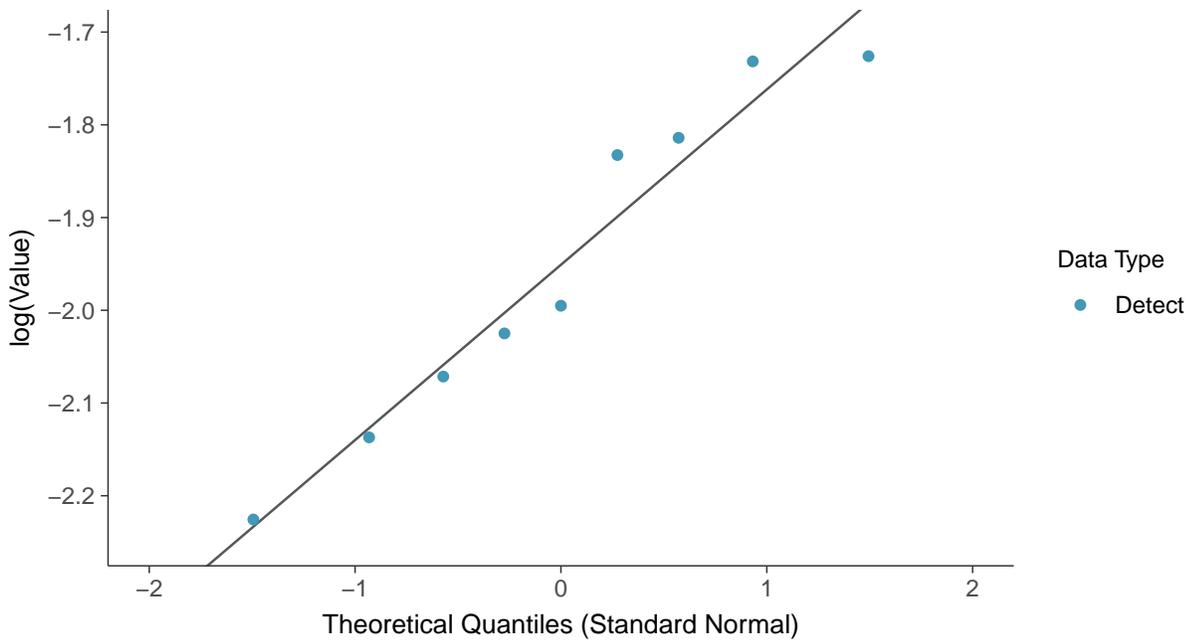




Normal Q-Q plot
Barium, MW-16A (mg/L)

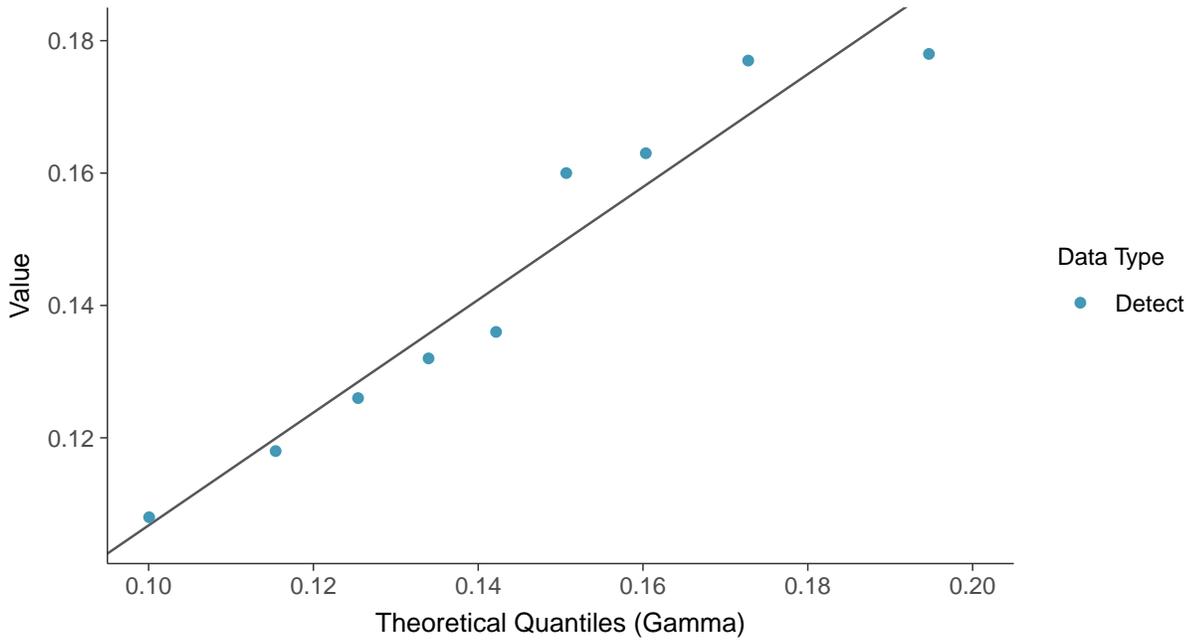


Lognormal Q-Q plot
Barium, MW-16A (mg/L)

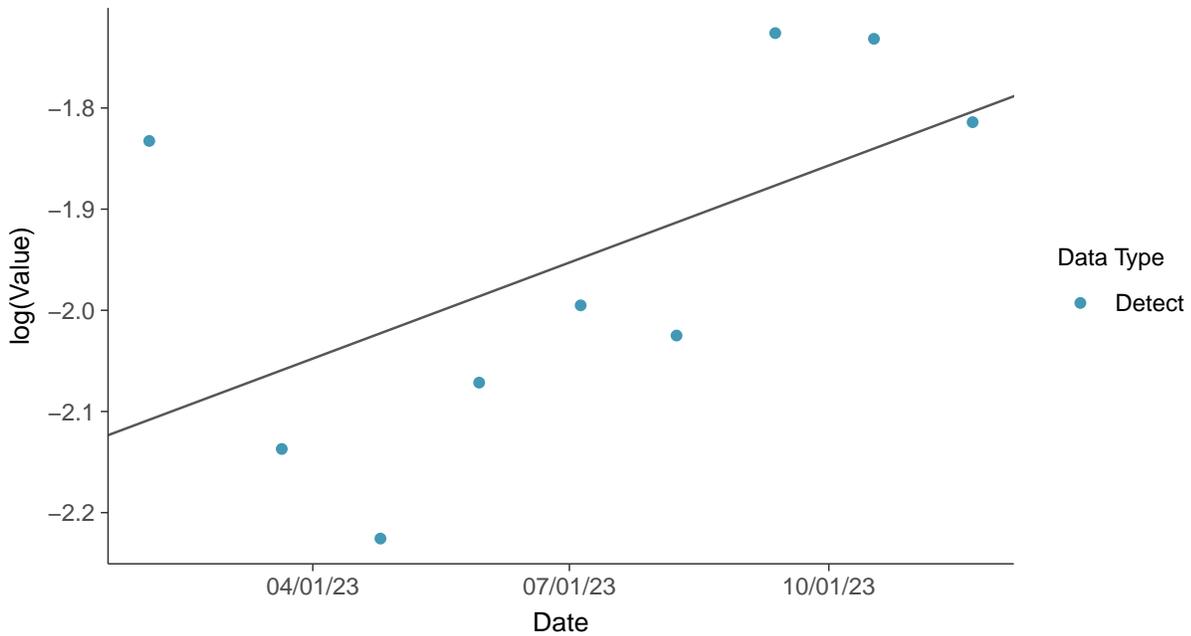




Gamma Q-Q plot
Barium, MW-16A (mg/L)



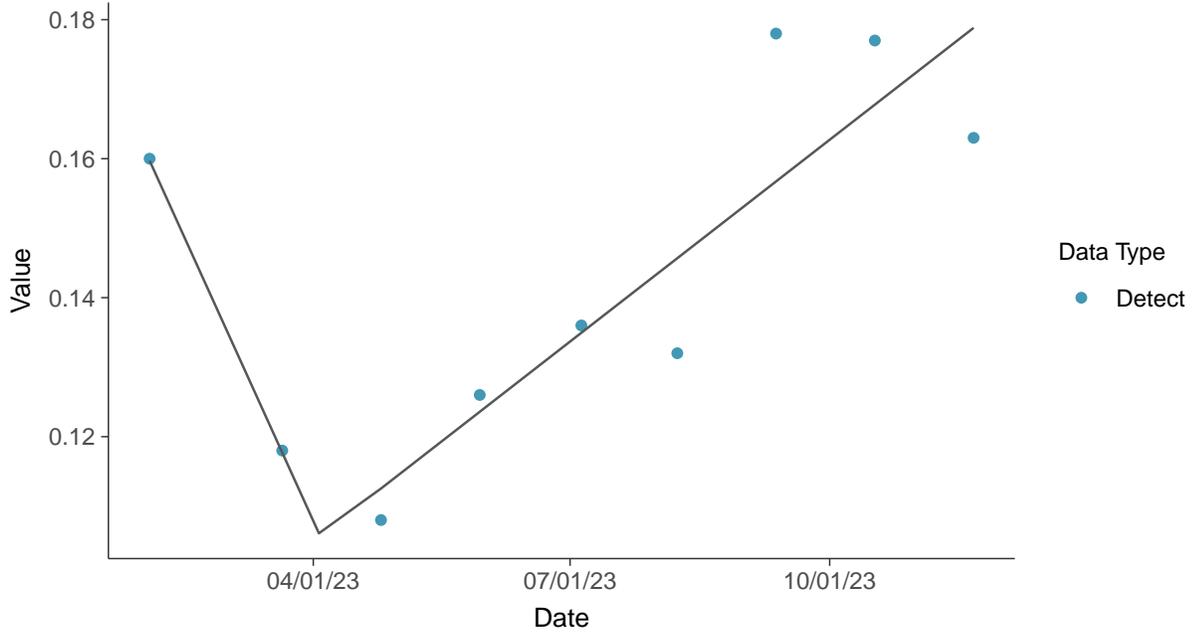
Trend Regression: Lognormal MLE
Barium, MW-16A (mg/L)





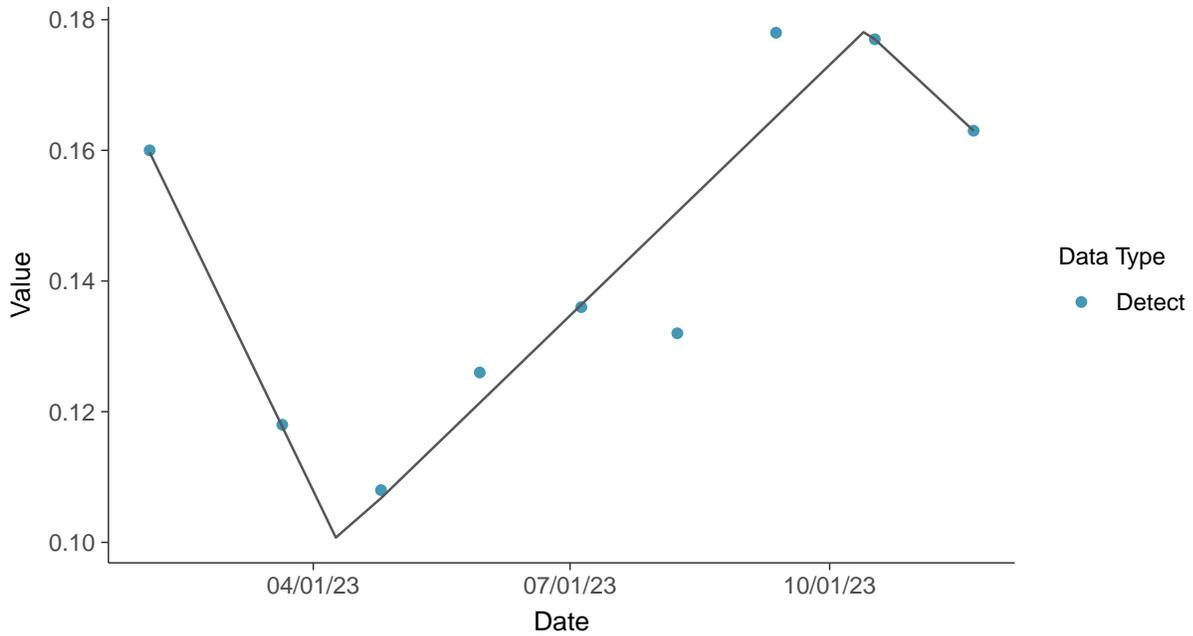
Trend Regression: Piecewise Linear-Linear

Barium, MW-16A (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Barium, MW-16A (mg/L)



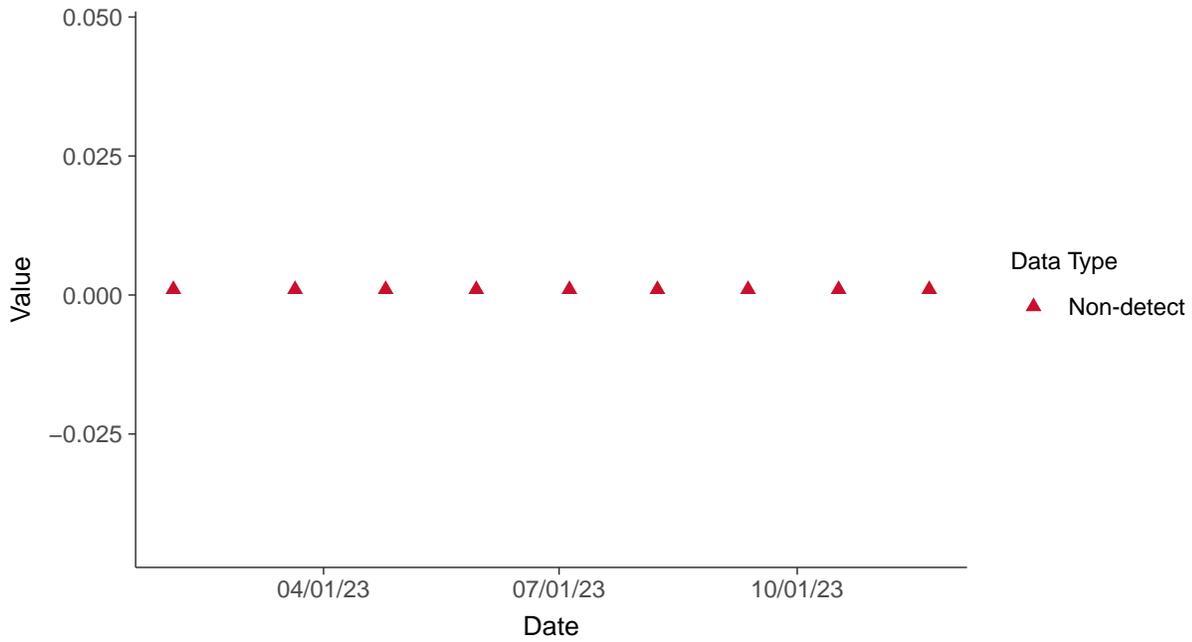


Appendix IV: Beryllium, MW-16A

ID: 16A_2_11

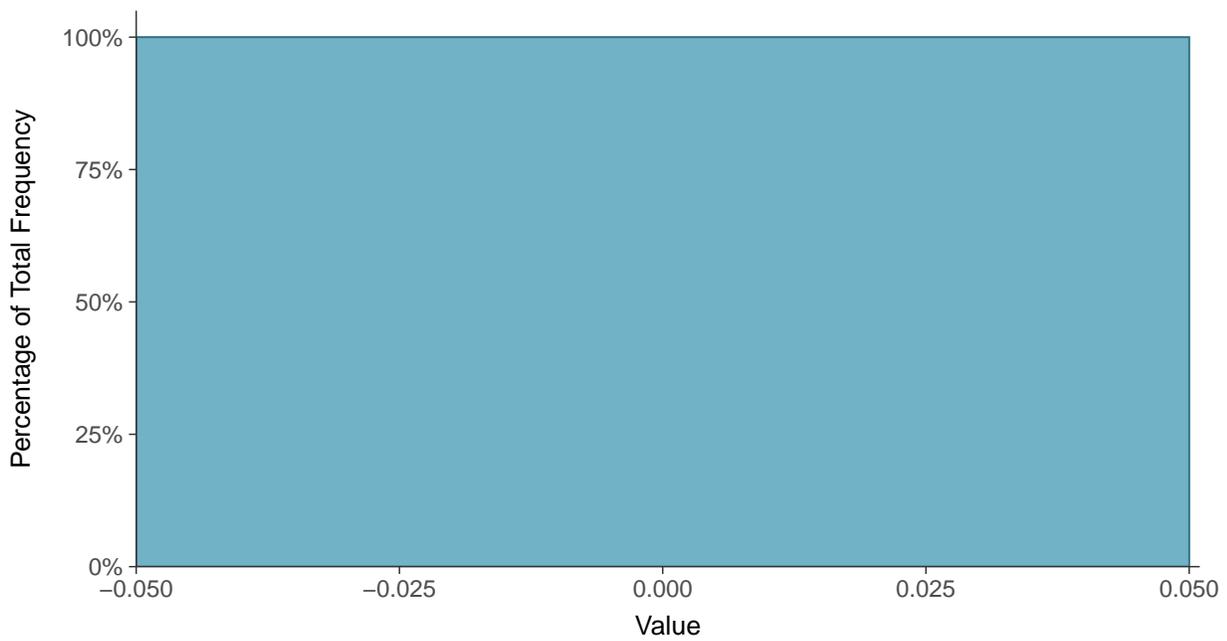
Scatter Plot

Beryllium, MW-16A (mg/L)



Histogram

Beryllium, MW-16A (mg/L)





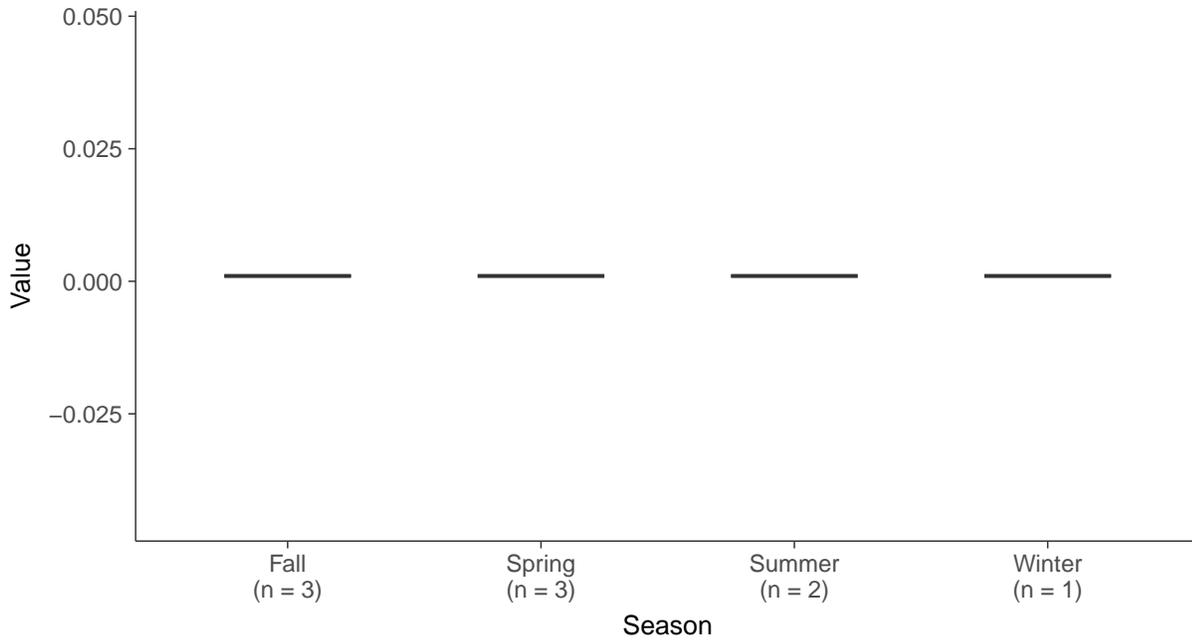
Boxplot

Beryllium, MW-16A (mg/L)



Boxplot by Season

Beryllium, MW-16A (mg/L)



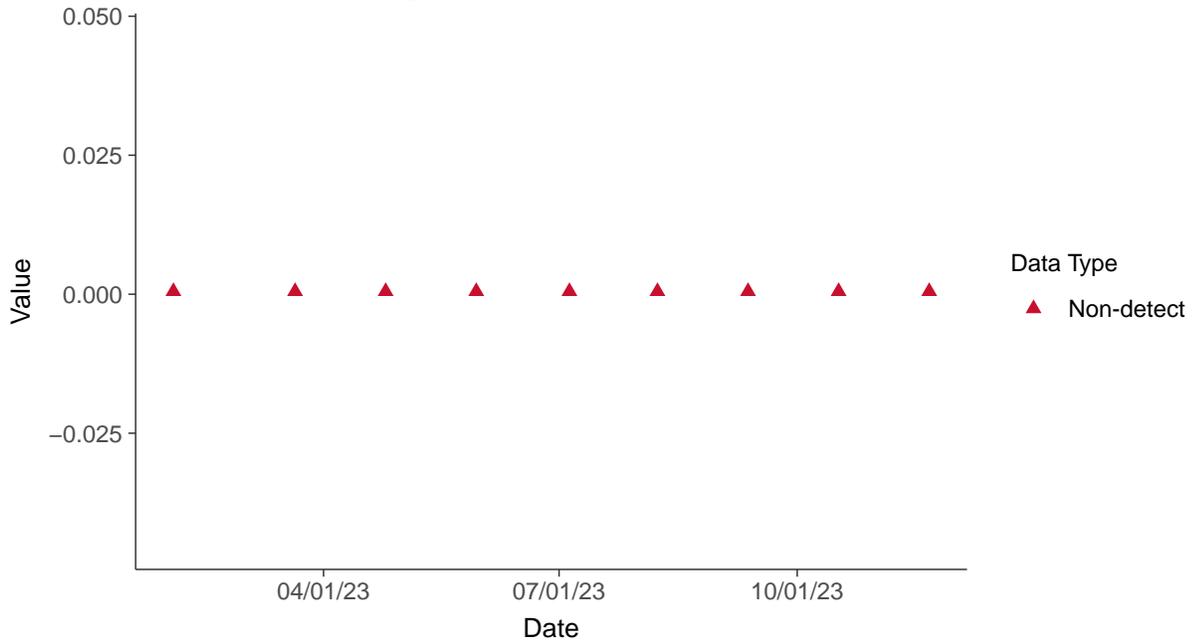


Appendix IV: Cadmium, MW-16A

ID: 16A_2_12

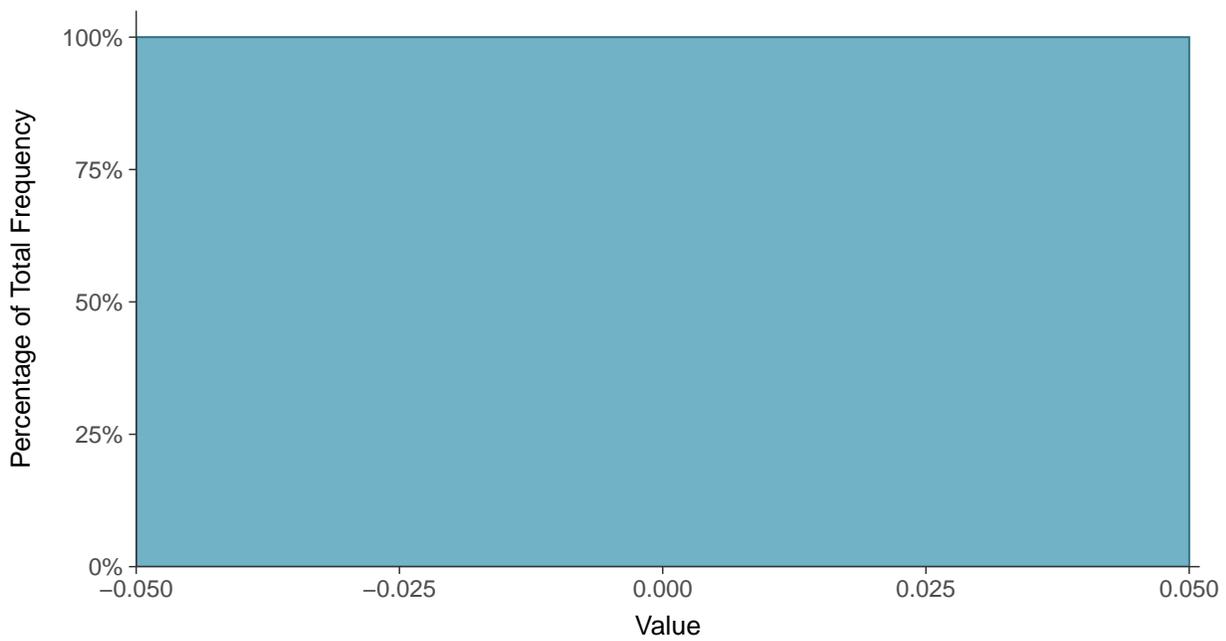
Scatter Plot

Cadmium, MW-16A (mg/L)



Histogram

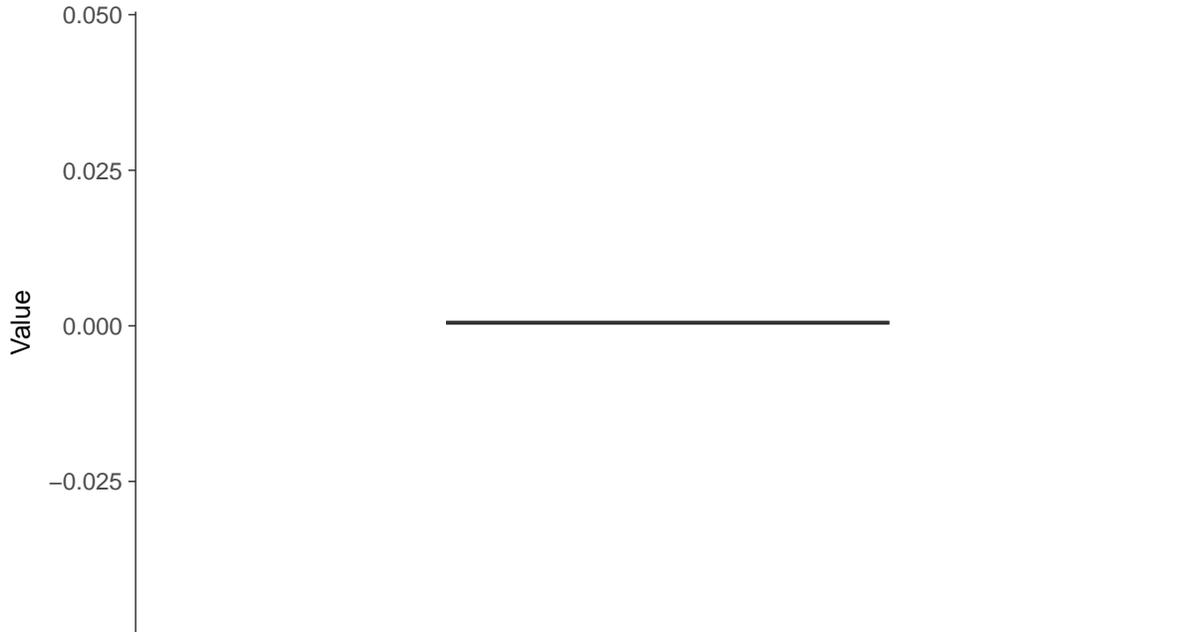
Cadmium, MW-16A (mg/L)





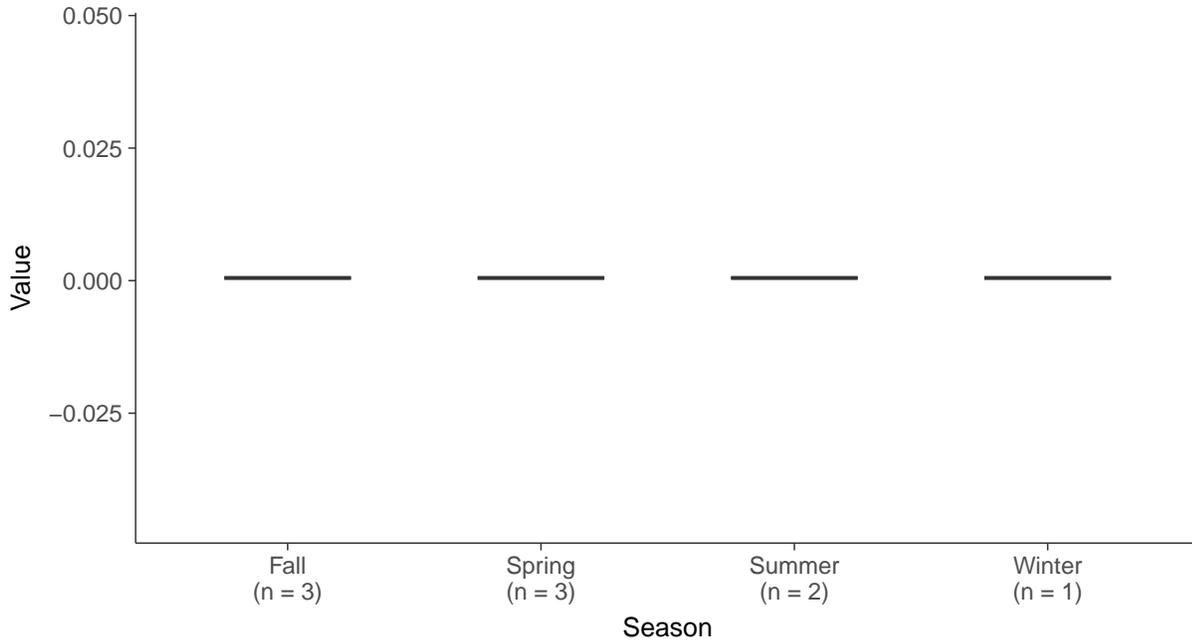
Boxplot

Cadmium, MW-16A (mg/L)



Boxplot by Season

Cadmium, MW-16A (mg/L)



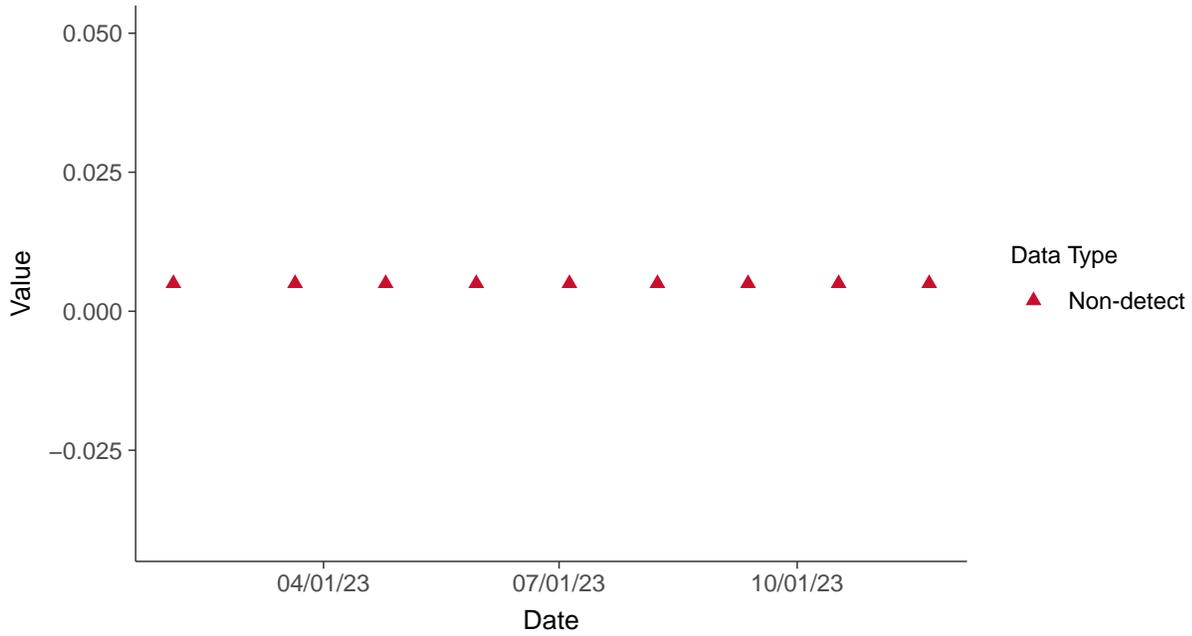


Appendix IV: Chromium, MW-16A

ID: 16A_2_13

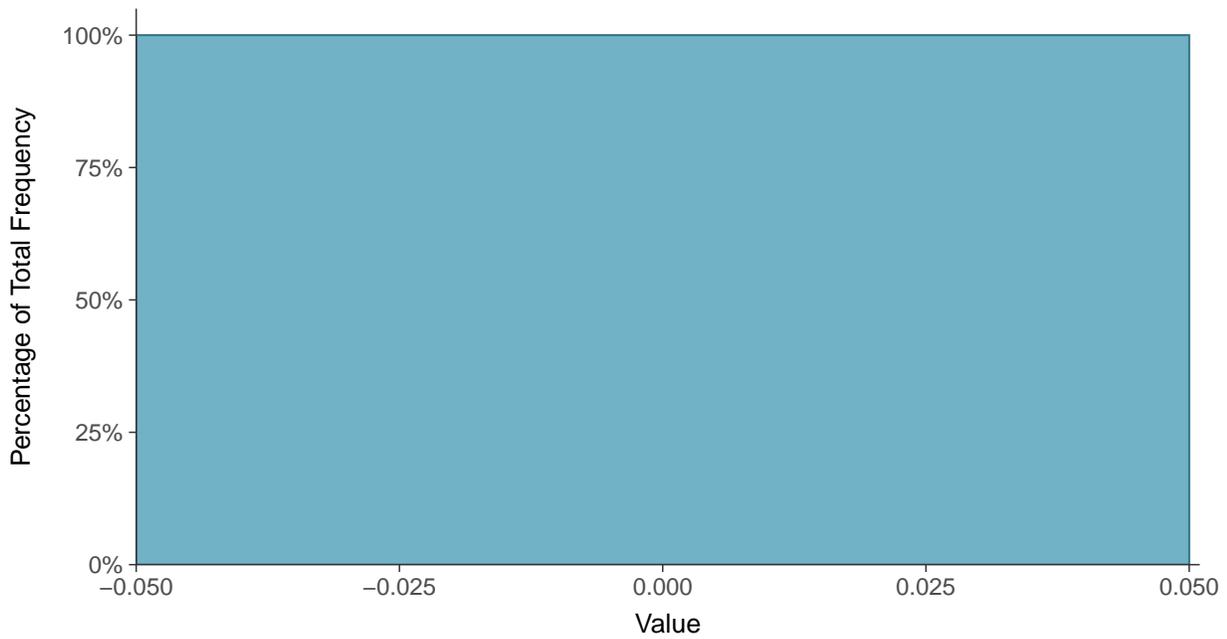
Scatter Plot

Chromium, MW-16A (mg/L)



Histogram

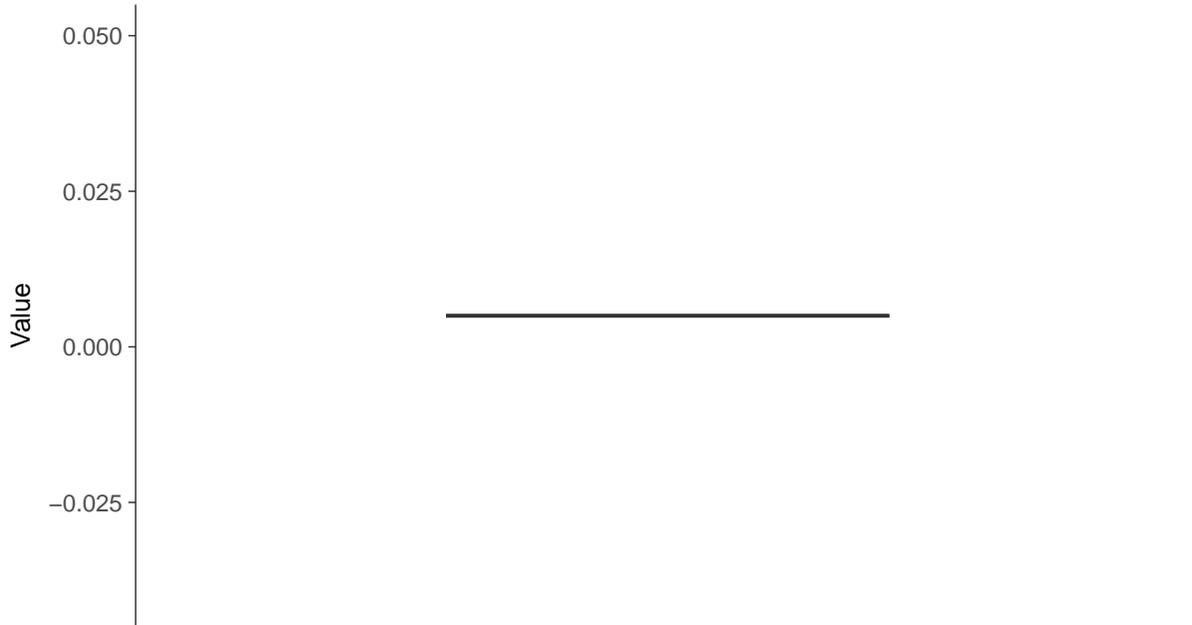
Chromium, MW-16A (mg/L)





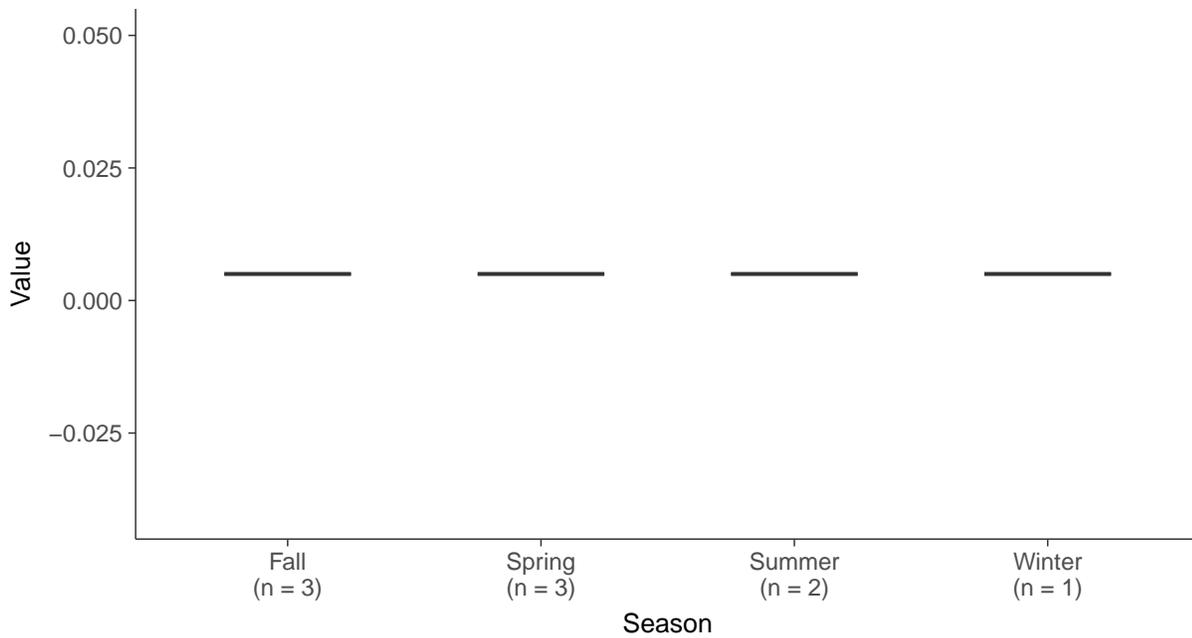
Boxplot

Chromium, MW-16A (mg/L)



Boxplot by Season

Chromium, MW-16A (mg/L)



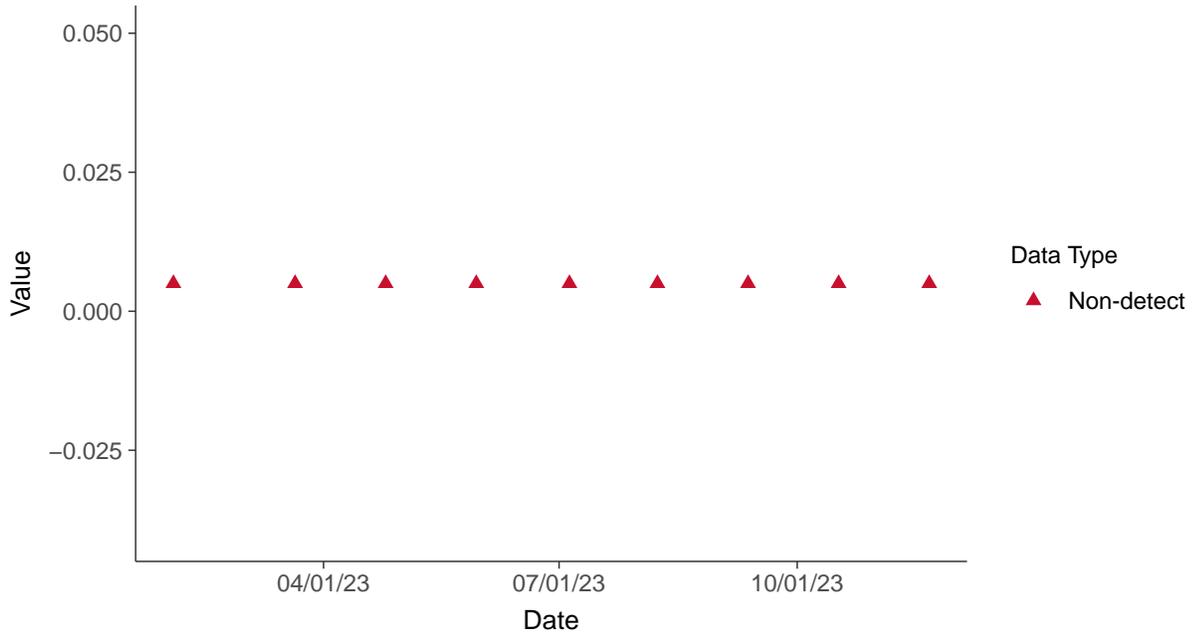


Appendix IV: Cobalt, MW-16A

ID: 16A_2_14

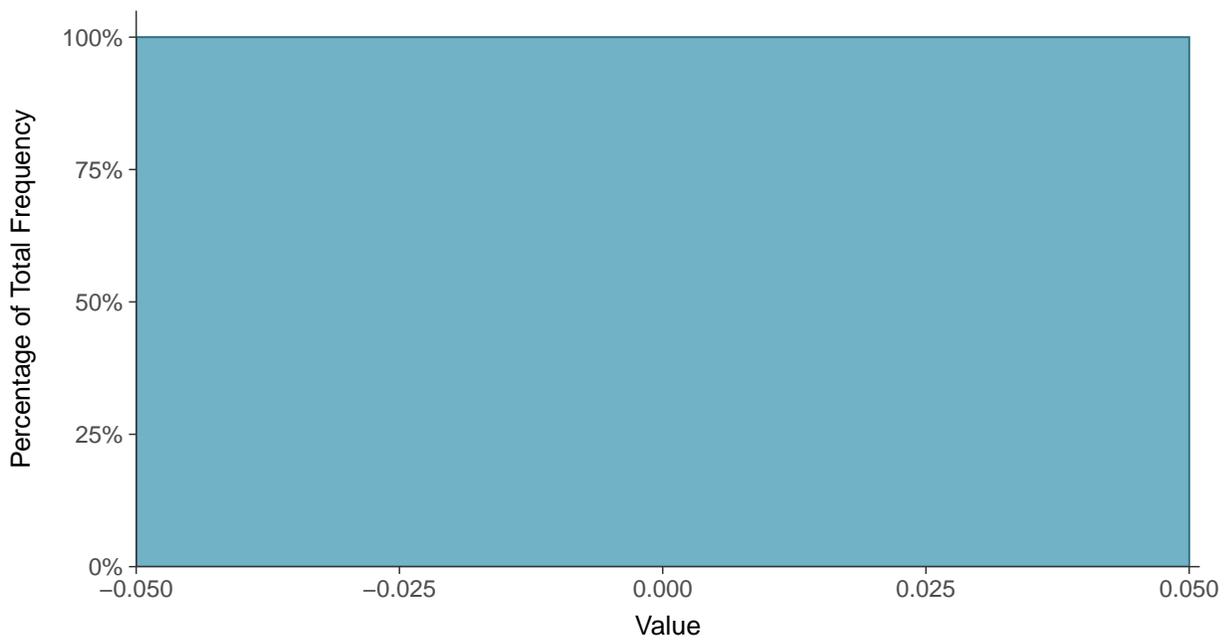
Scatter Plot

Cobalt, MW-16A (mg/L)



Histogram

Cobalt, MW-16A (mg/L)





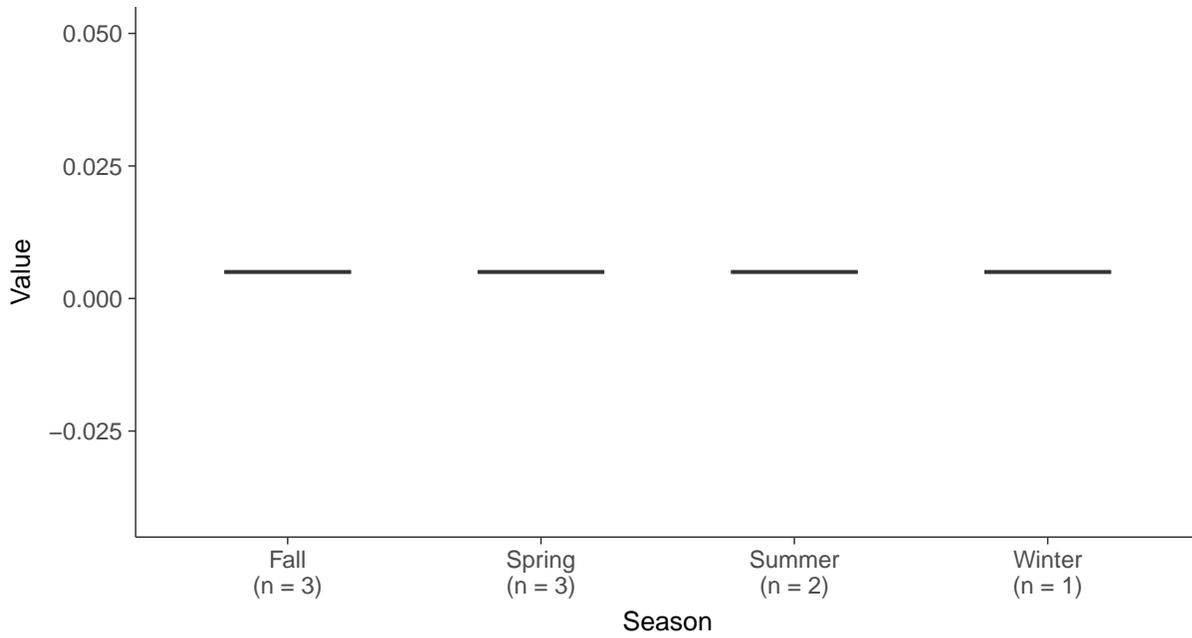
Boxplot

Cobalt, MW-16A (mg/L)



Boxplot by Season

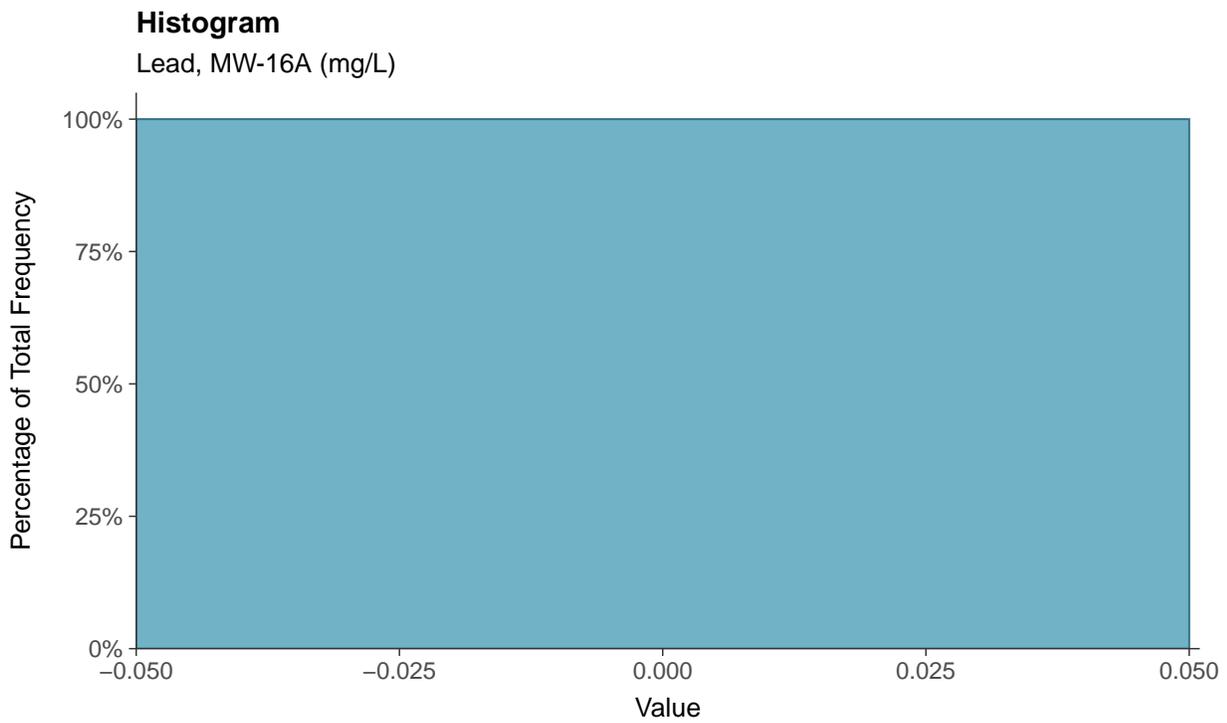
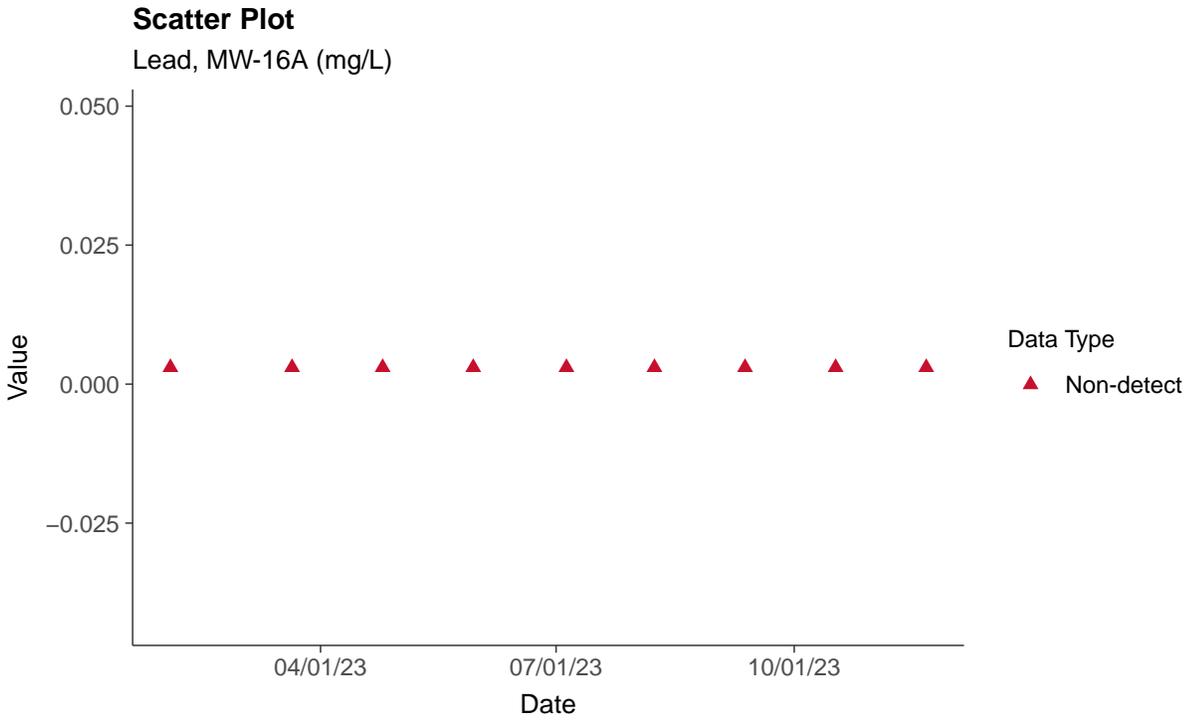
Cobalt, MW-16A (mg/L)





Appendix IV: Lead, MW-16A

ID: 16A_2_15





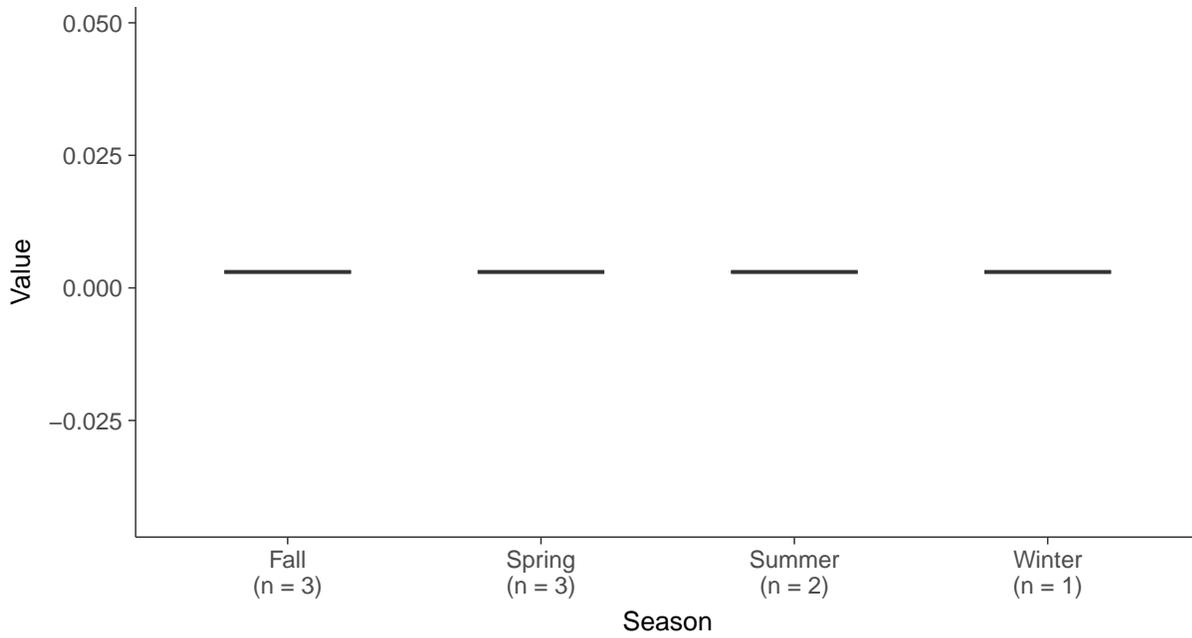
Boxplot

Lead, MW-16A (mg/L)



Boxplot by Season

Lead, MW-16A (mg/L)



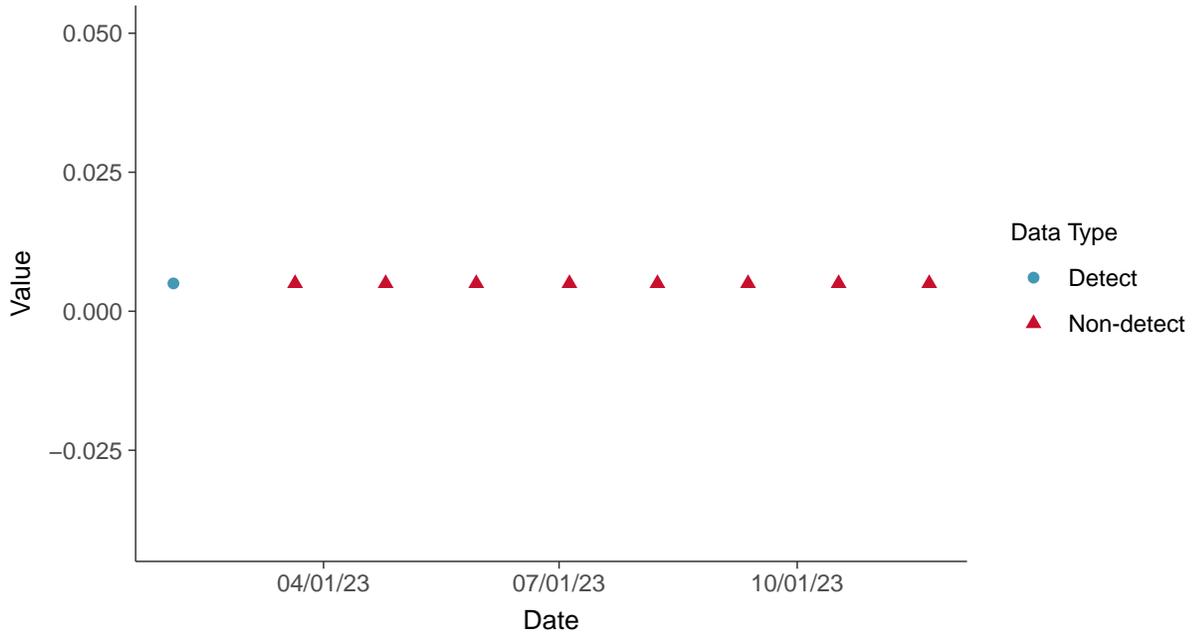


Appendix IV: Lithium, MW-16A

ID: 16A_2_16

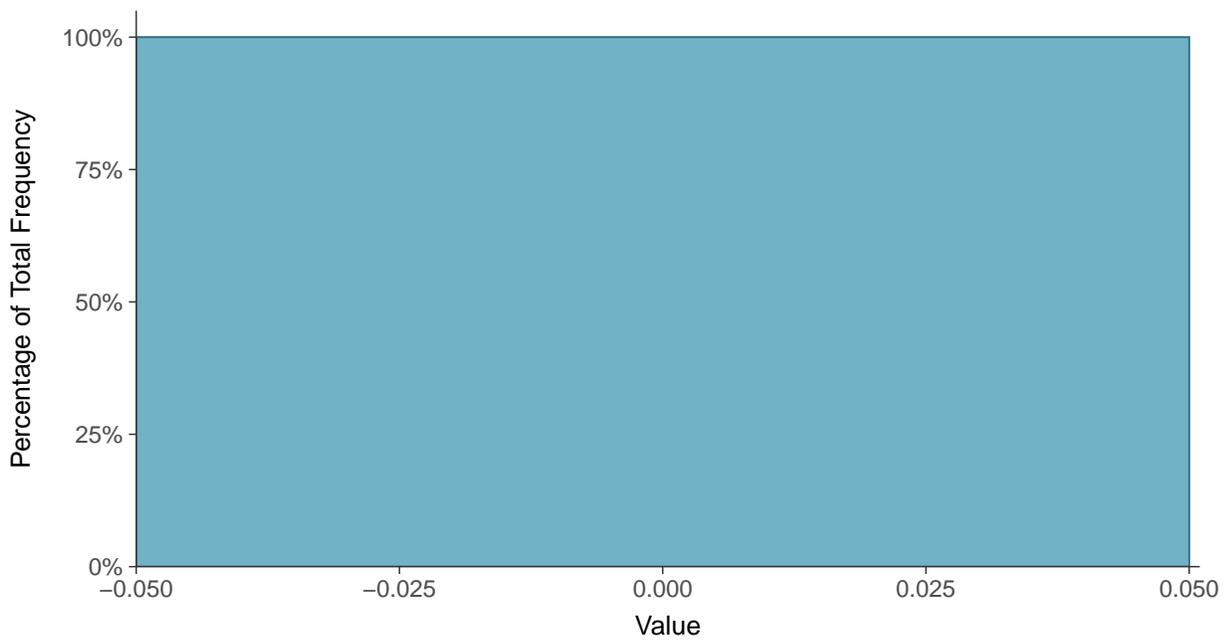
Scatter Plot

Lithium, MW-16A (mg/L)



Histogram

Lithium, MW-16A (mg/L)





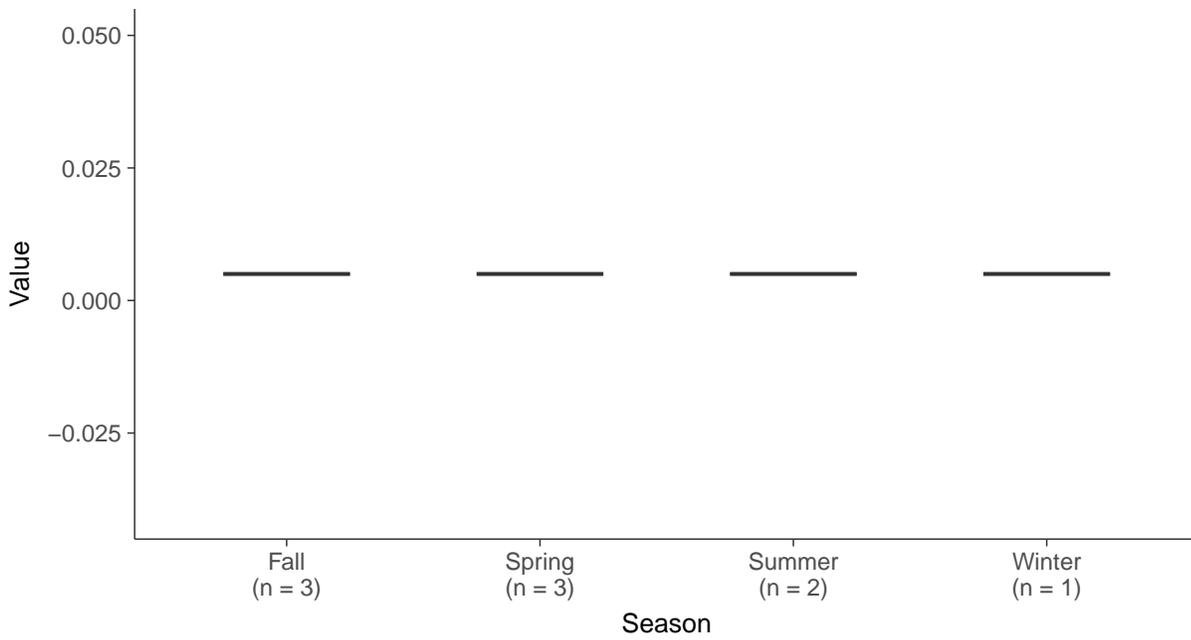
Boxplot

Lithium, MW-16A (mg/L)



Boxplot by Season

Lithium, MW-16A (mg/L)



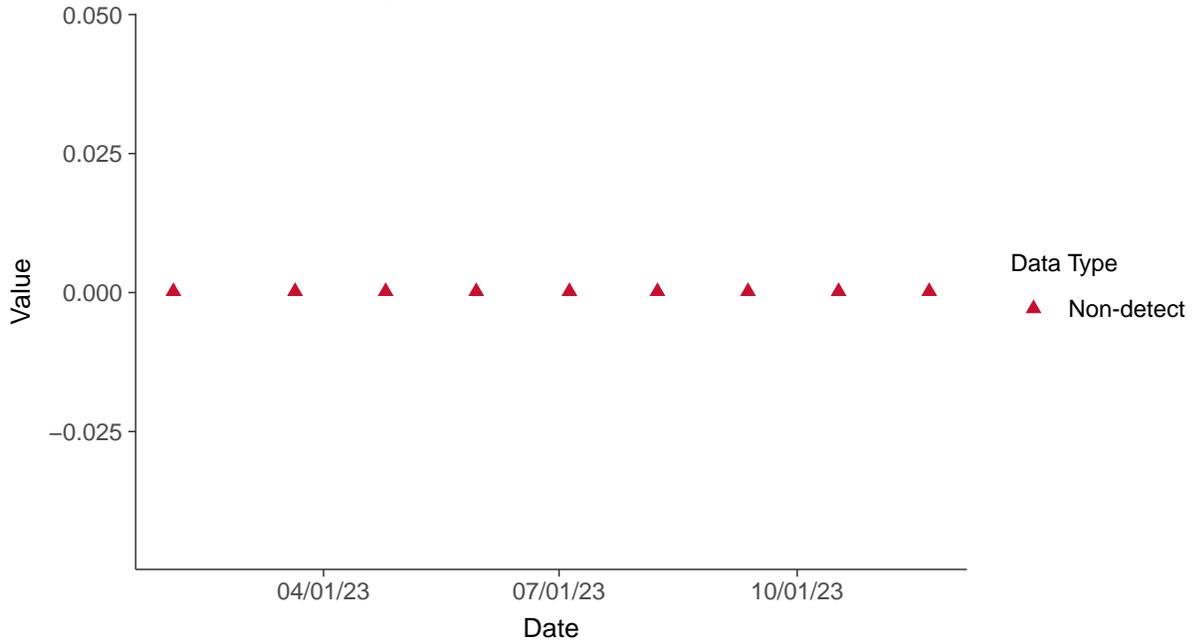


Appendix IV: Mercury, MW-16A

ID: 16A_2_17

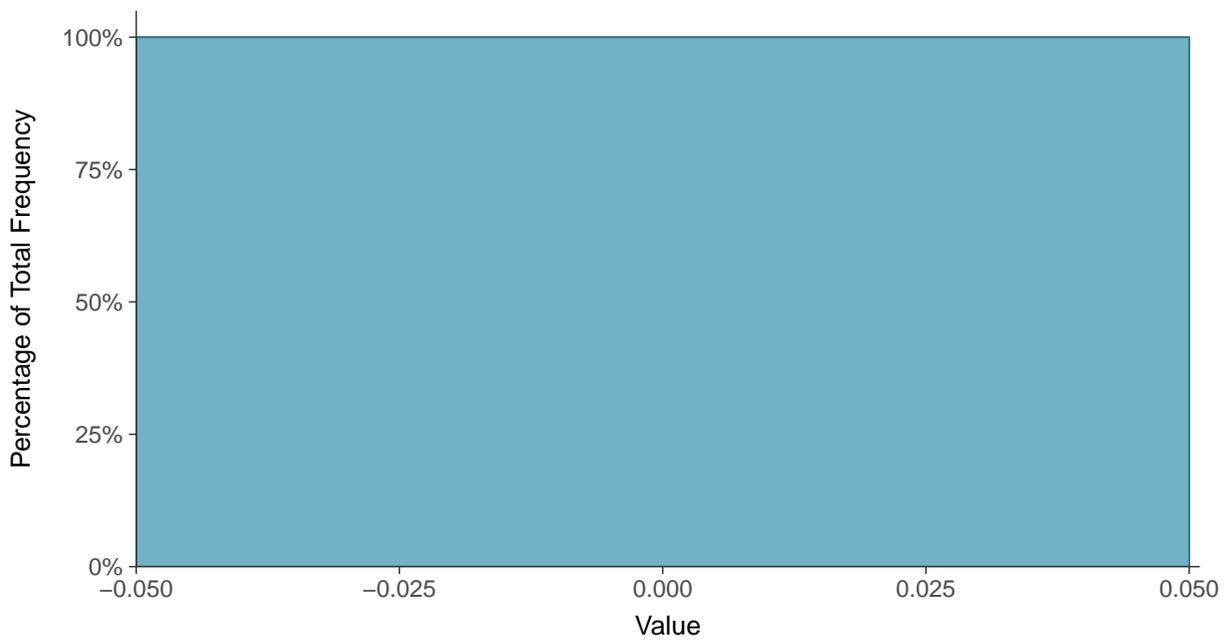
Scatter Plot

Mercury, MW-16A (mg/L)



Histogram

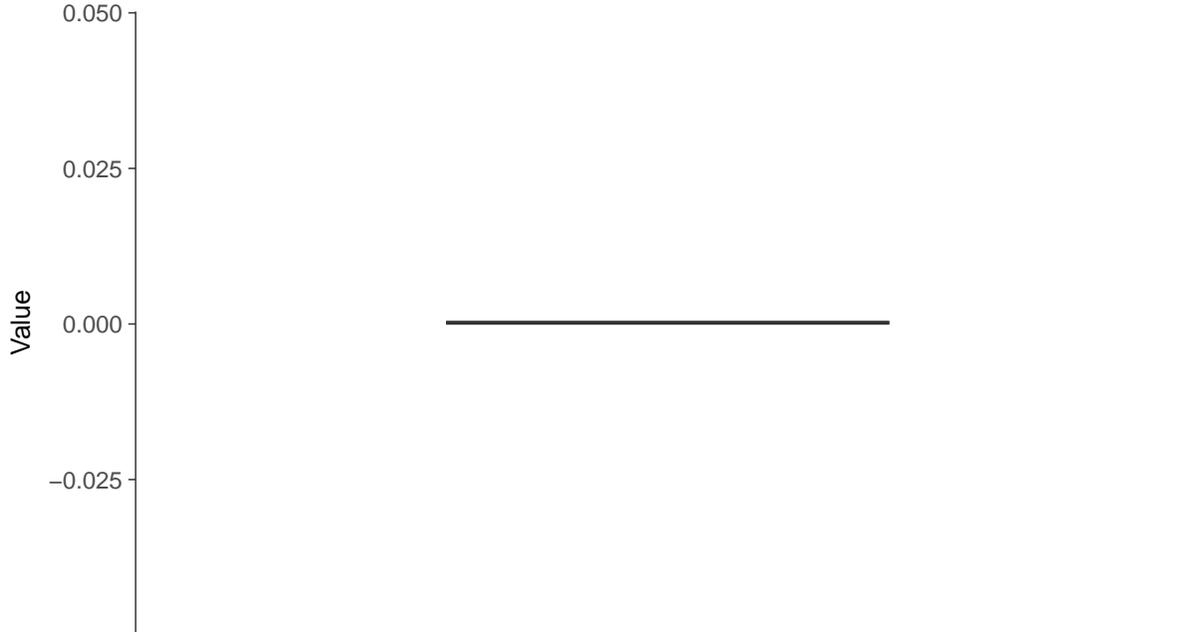
Mercury, MW-16A (mg/L)





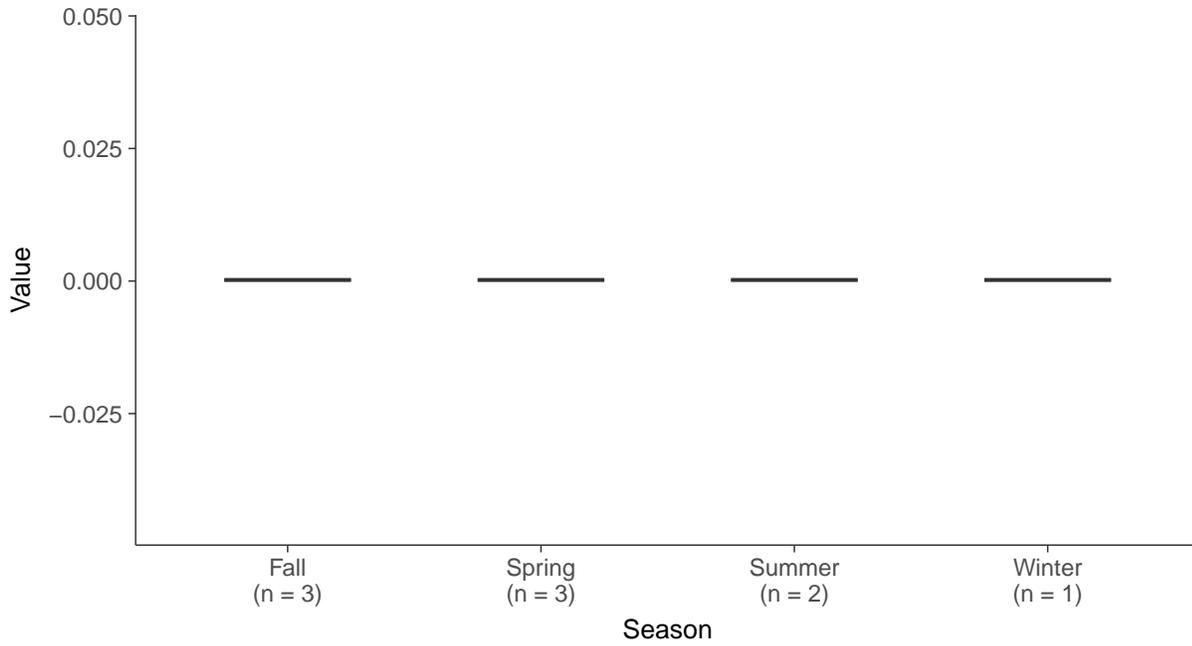
Boxplot

Mercury, MW-16A (mg/L)



Boxplot by Season

Mercury, MW-16A (mg/L)



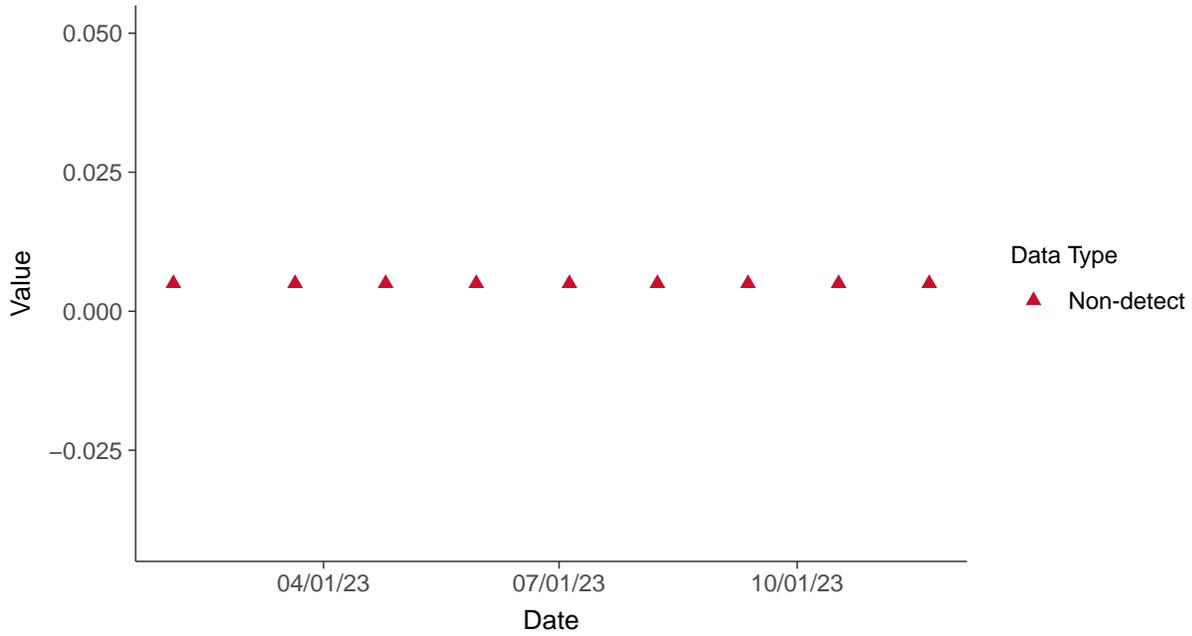


Appendix IV: Molybdenum, MW-16A

ID: 16A_2_18

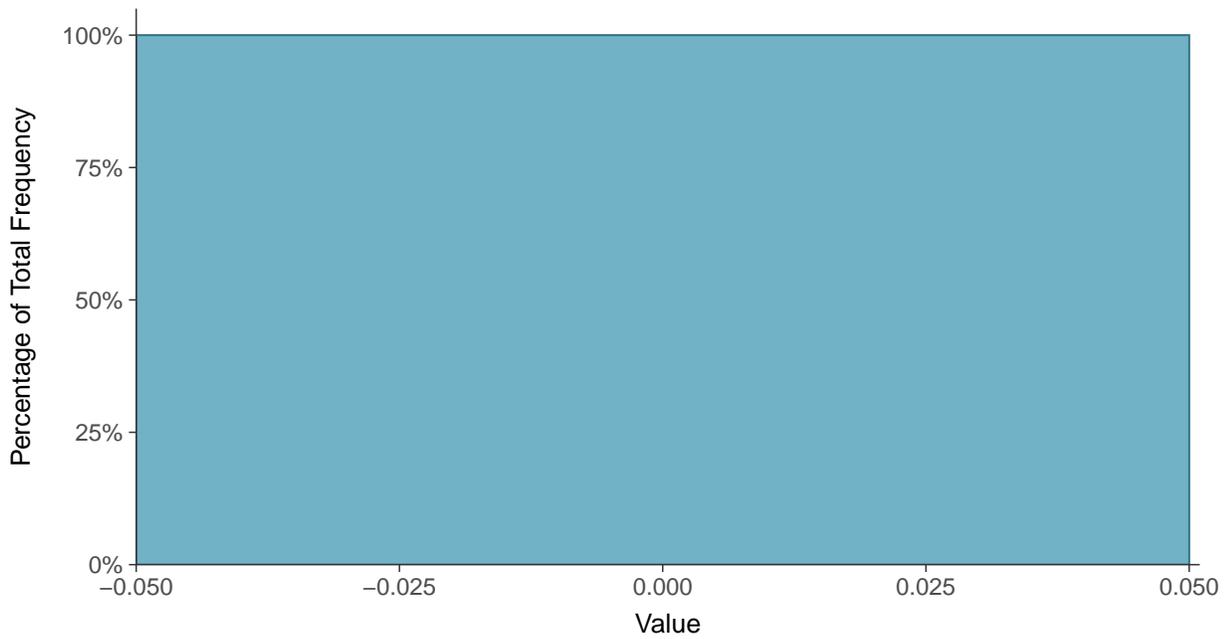
Scatter Plot

Molybdenum, MW-16A (mg/L)



Histogram

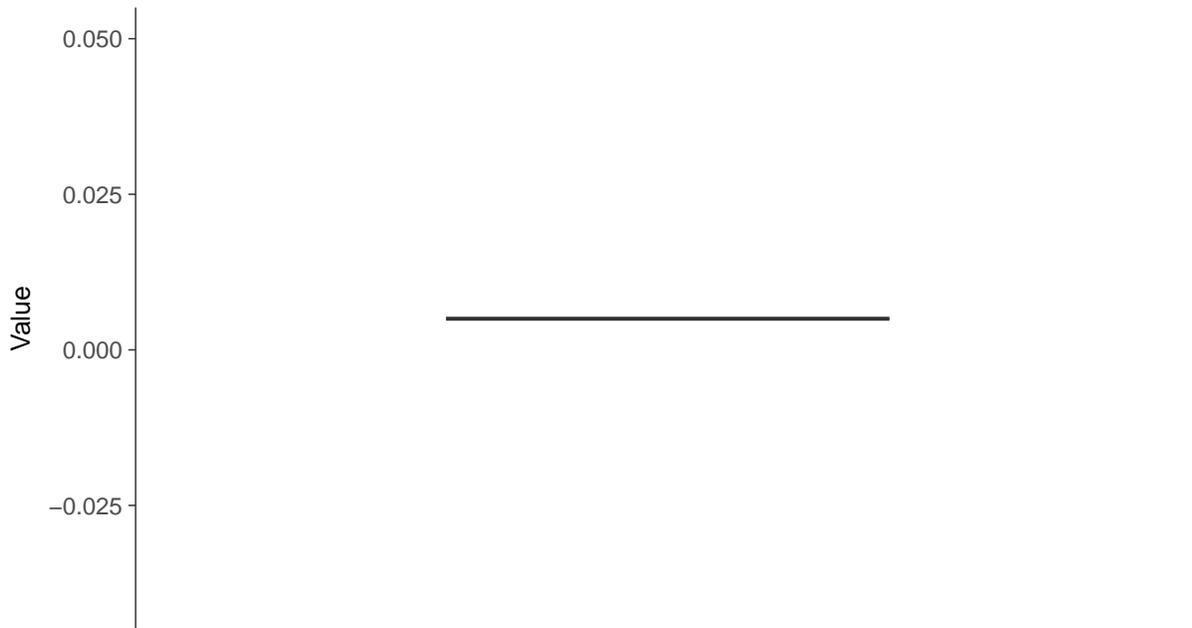
Molybdenum, MW-16A (mg/L)





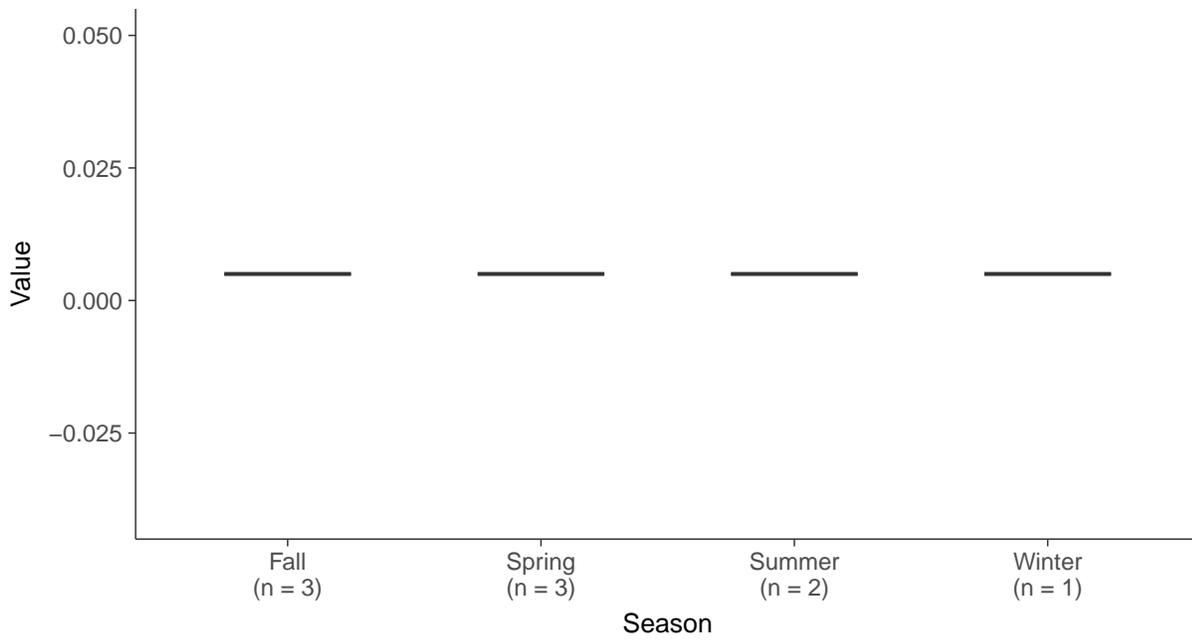
Boxplot

Molybdenum, MW-16A (mg/L)



Boxplot by Season

Molybdenum, MW-16A (mg/L)



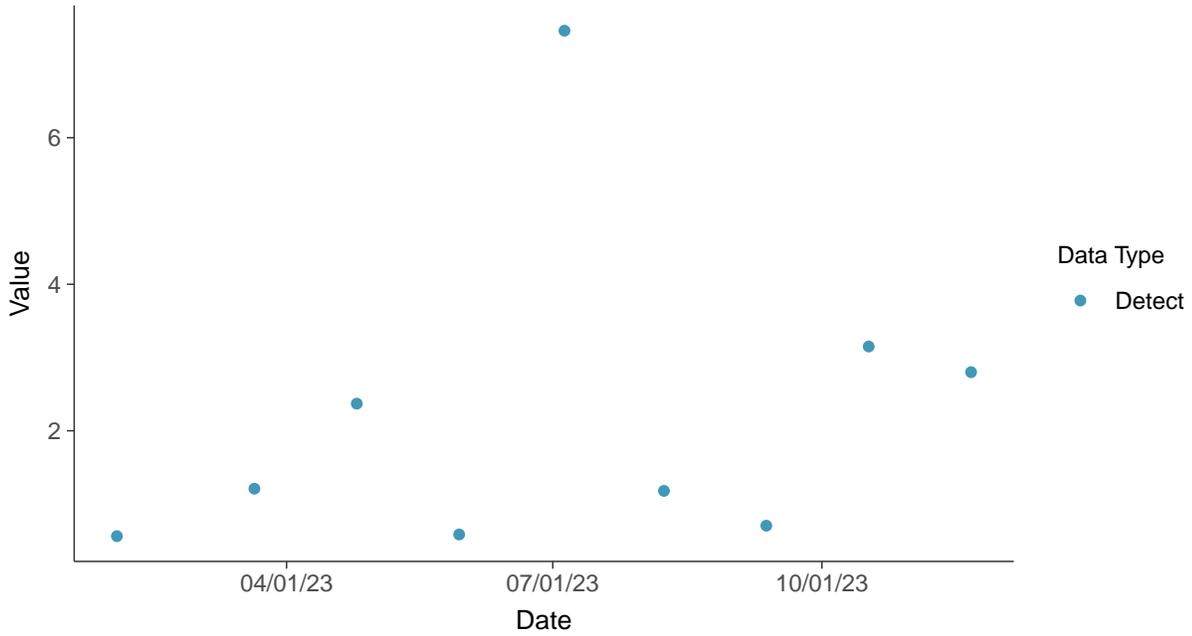


Appendix IV: Radium-226/228, MW-16A

ID: 16A_2_20

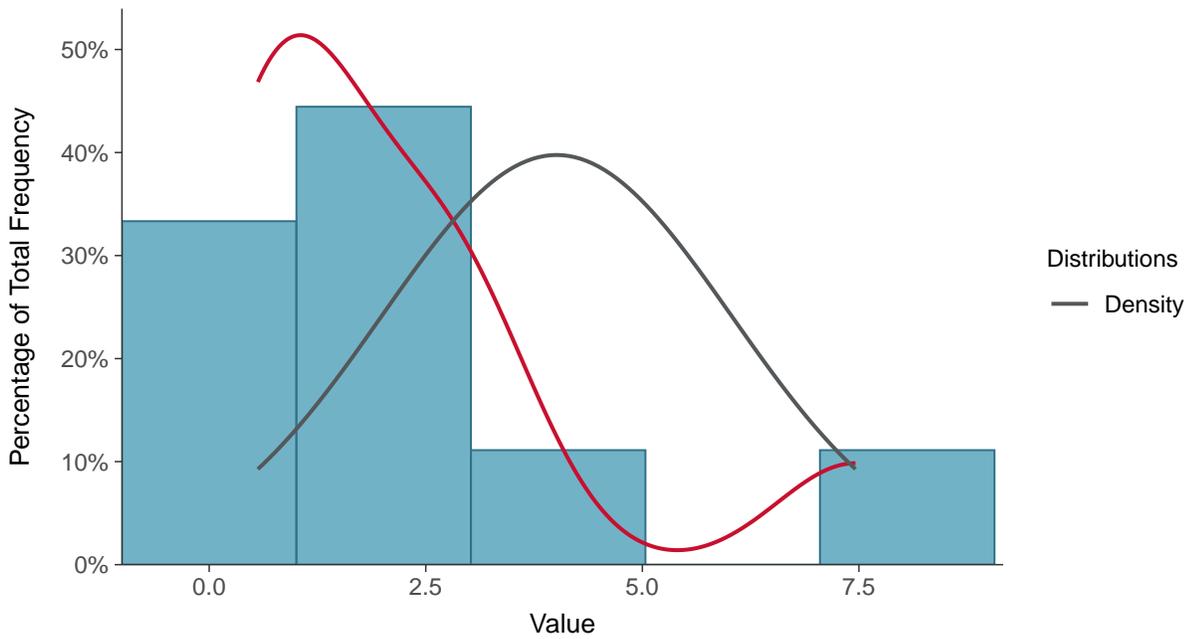
Scatter Plot

Radium-226/228, MW-16A (pCi/L)



Histogram

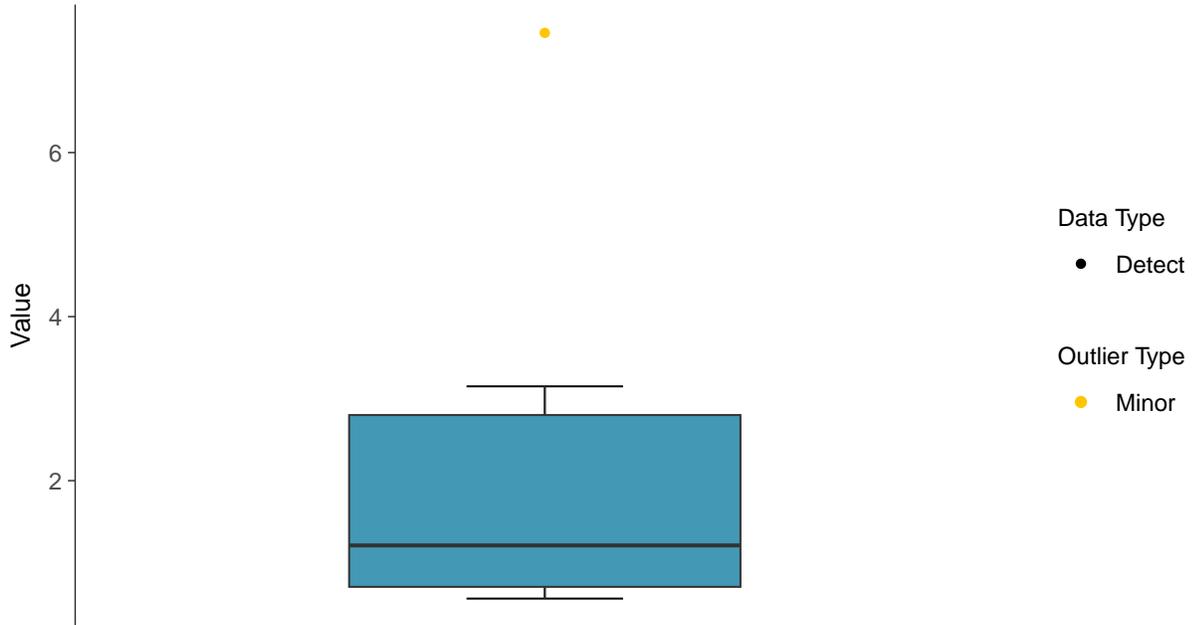
Radium-226/228, MW-16A (pCi/L)





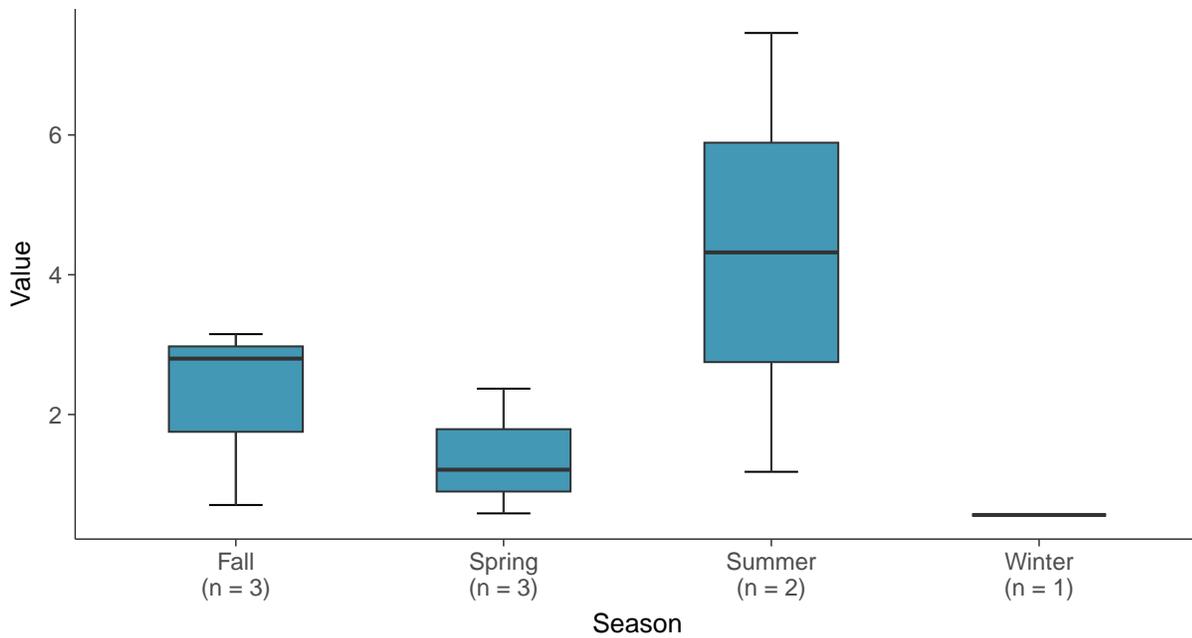
Boxplot

Radium-226/228, MW-16A (pCi/L)



Boxplot by Season

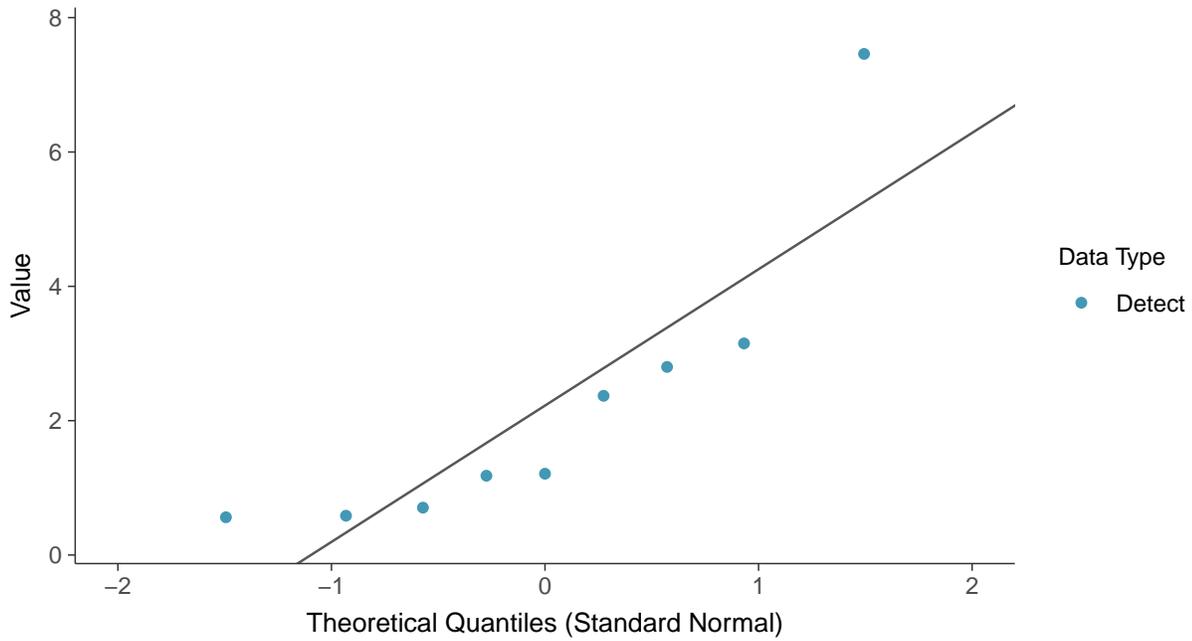
Radium-226/228, MW-16A (pCi/L)





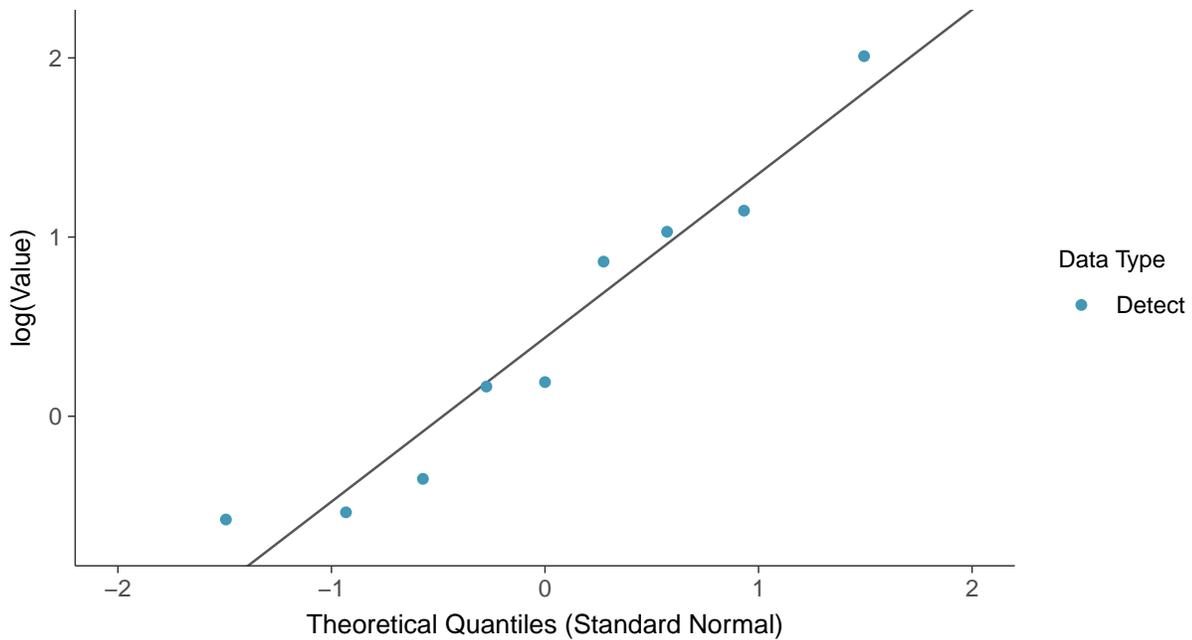
Normal Q-Q plot

Radium-226/228, MW-16A (pCi/L)



Lognormal Q-Q plot

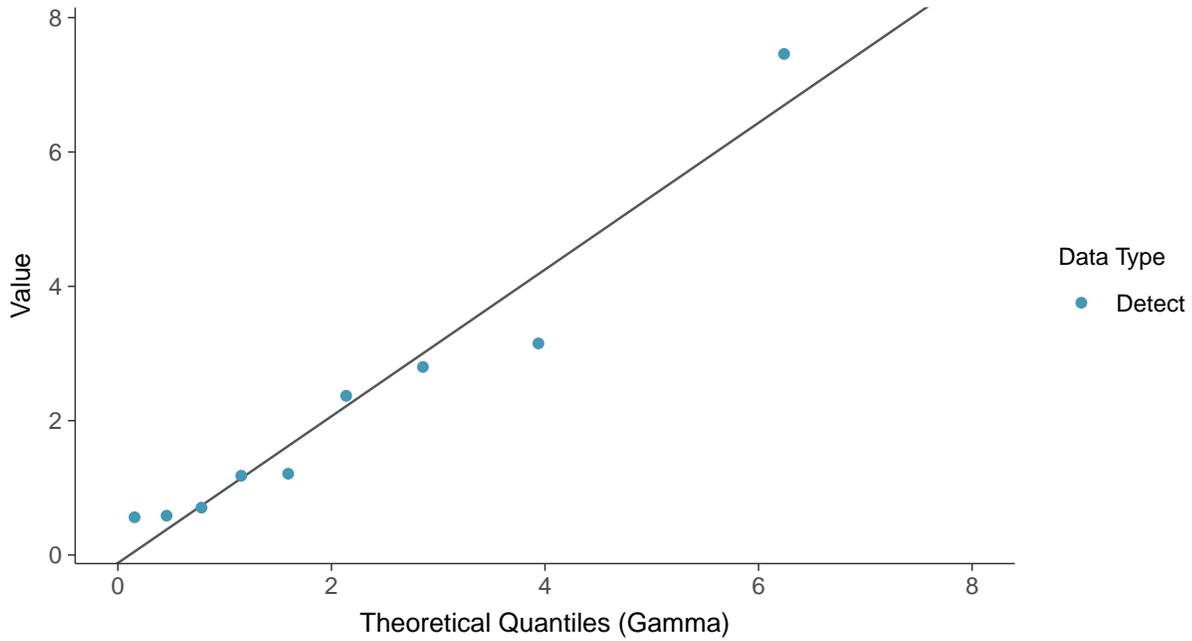
Radium-226/228, MW-16A (pCi/L)





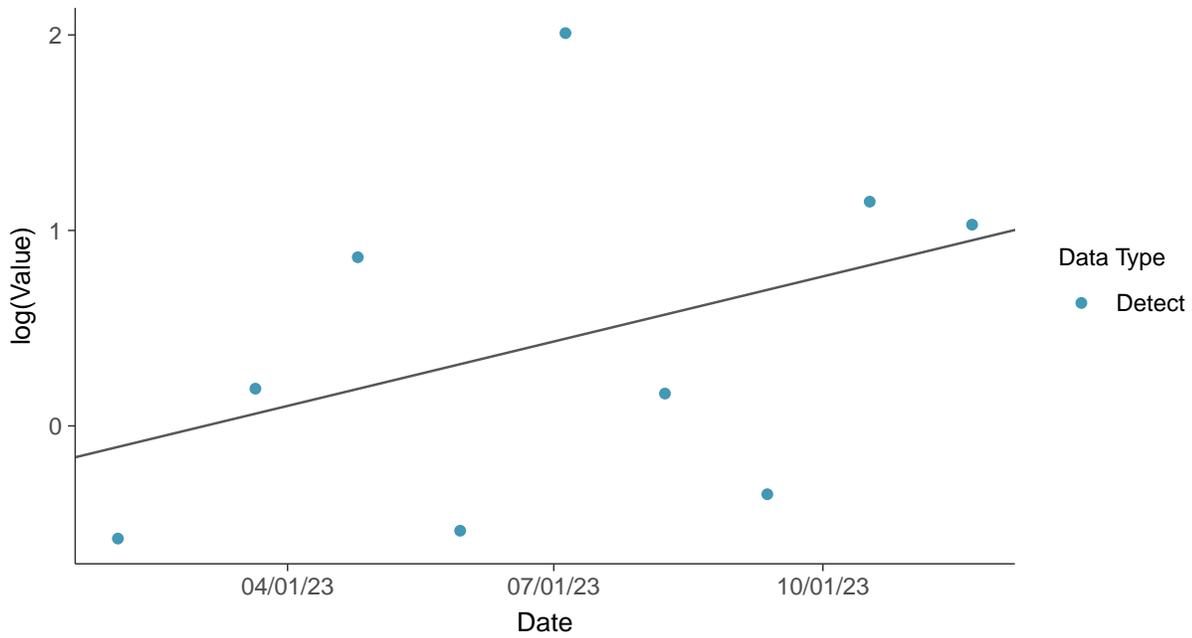
Gamma Q-Q plot

Radium-226/228, MW-16A (pCi/L)



Trend Regression: Lognormal MLE

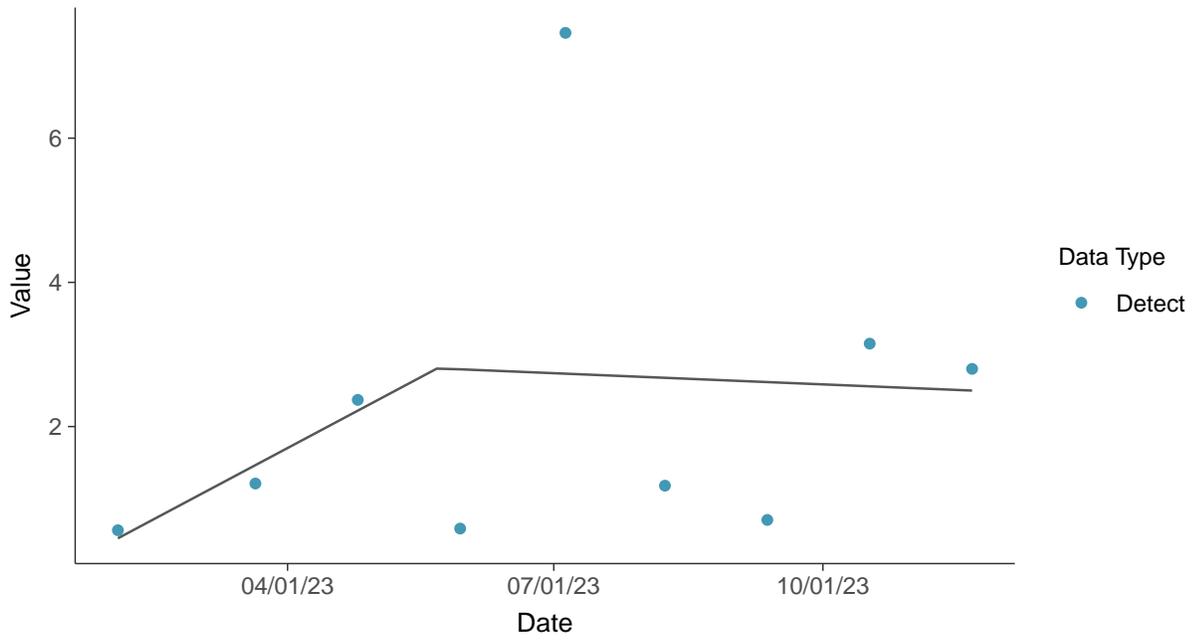
Radium-226/228, MW-16A (pCi/L)





Trend Regression: Piecewise Linear-Linear

Radium-226/228, MW-16A (pCi/L)



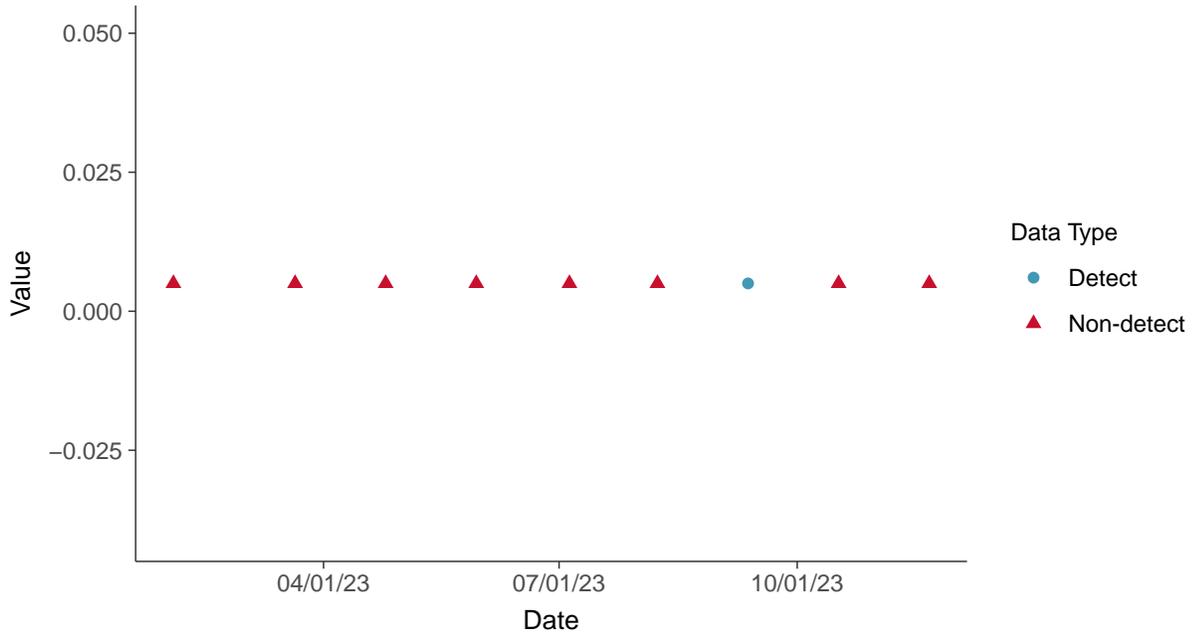


Appendix IV: Selenium, MW-16A

ID: 16A_2_22

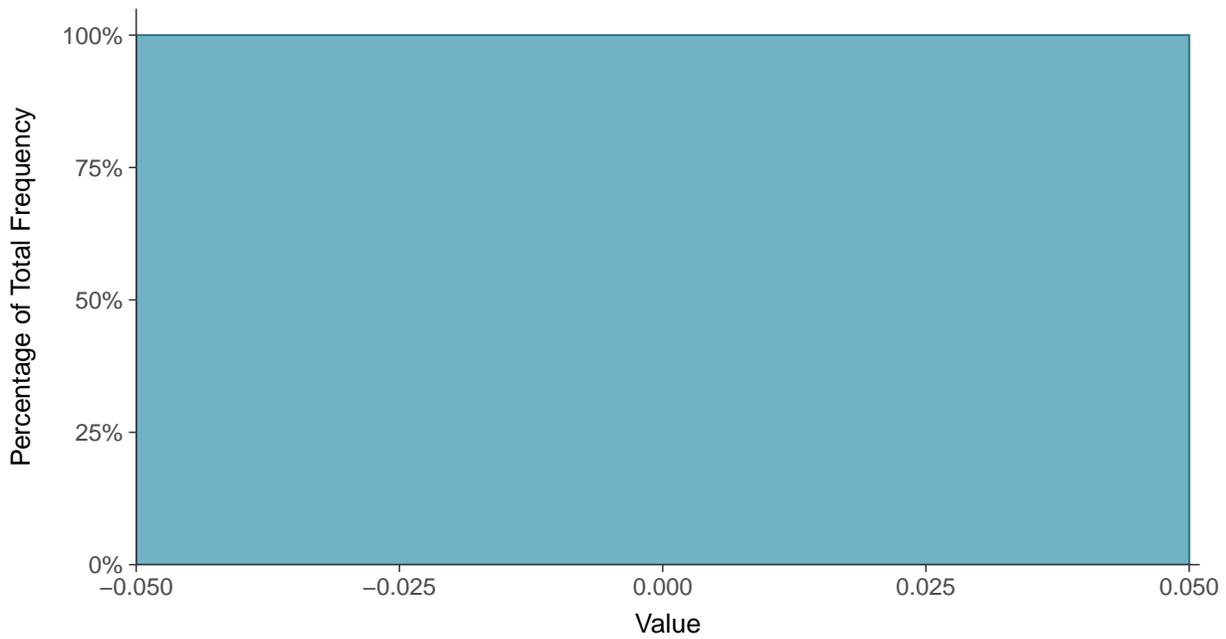
Scatter Plot

Selenium, MW-16A (mg/L)



Histogram

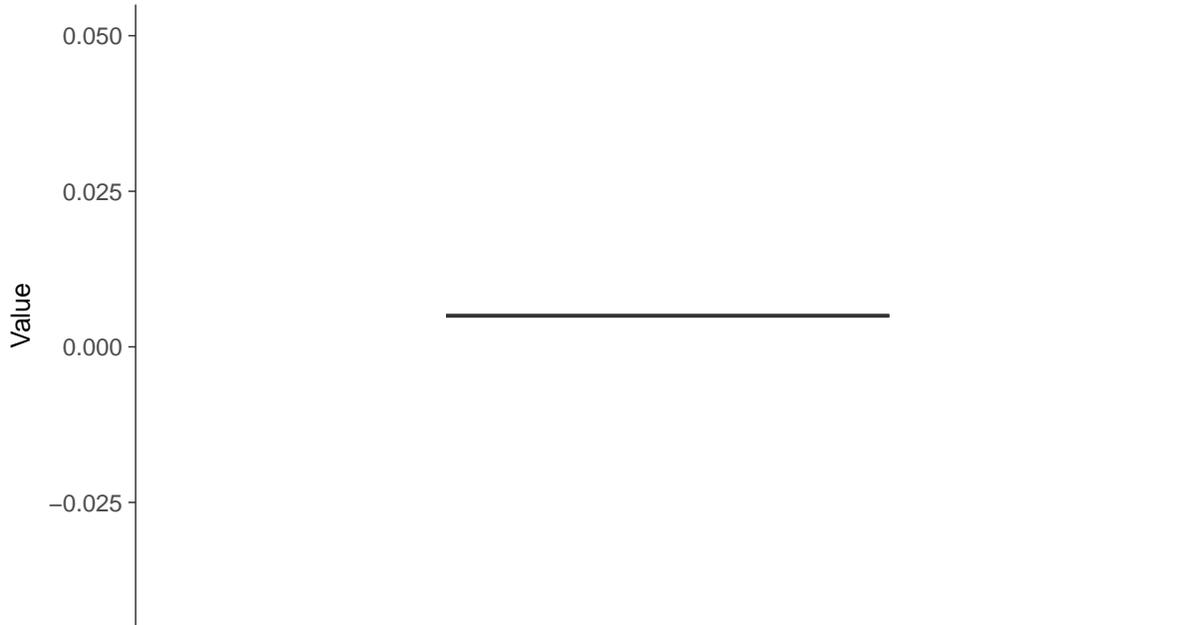
Selenium, MW-16A (mg/L)





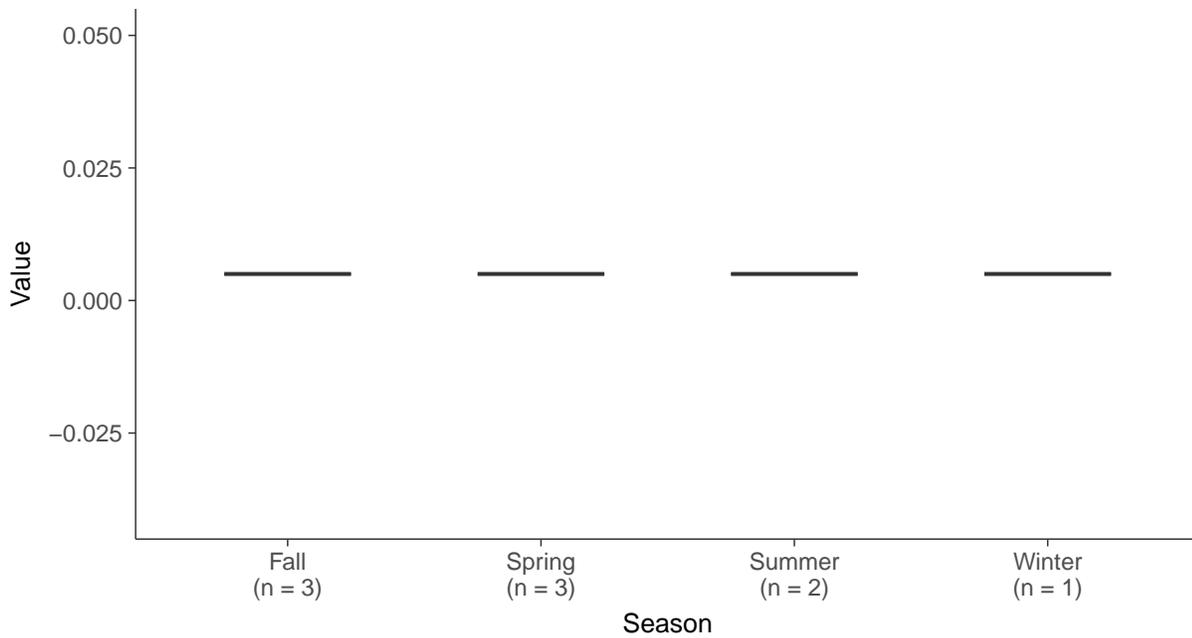
Boxplot

Selenium, MW-16A (mg/L)



Boxplot by Season

Selenium, MW-16A (mg/L)



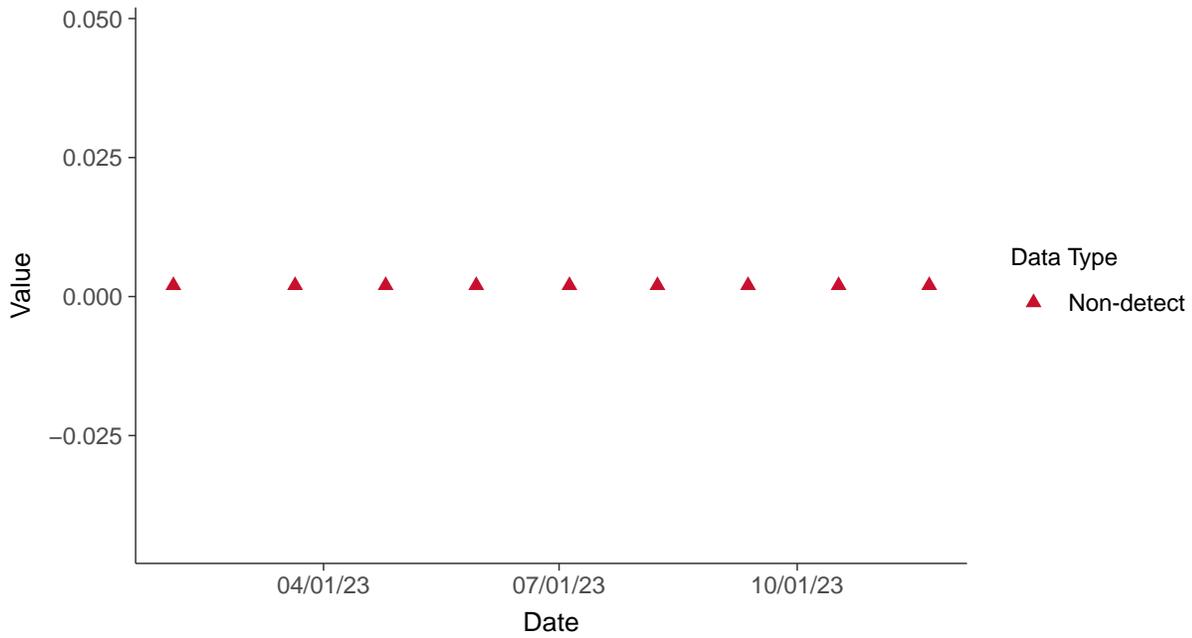


Appendix IV: Thallium, MW-16A

ID: 16A_2_23

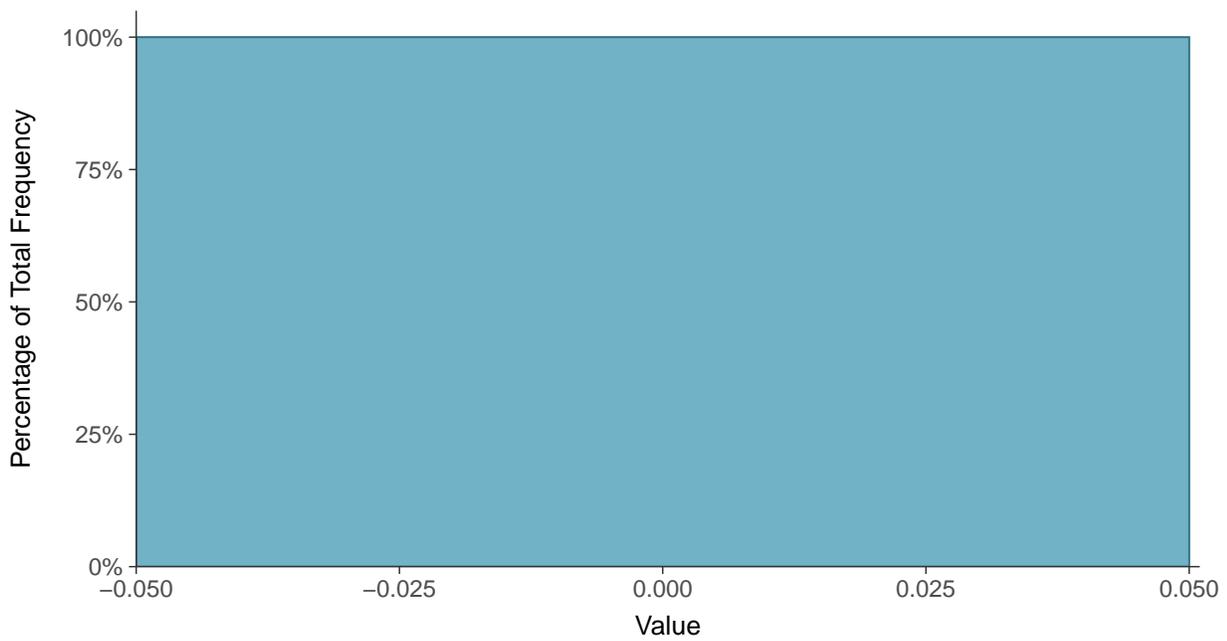
Scatter Plot

Thallium, MW-16A (mg/L)



Histogram

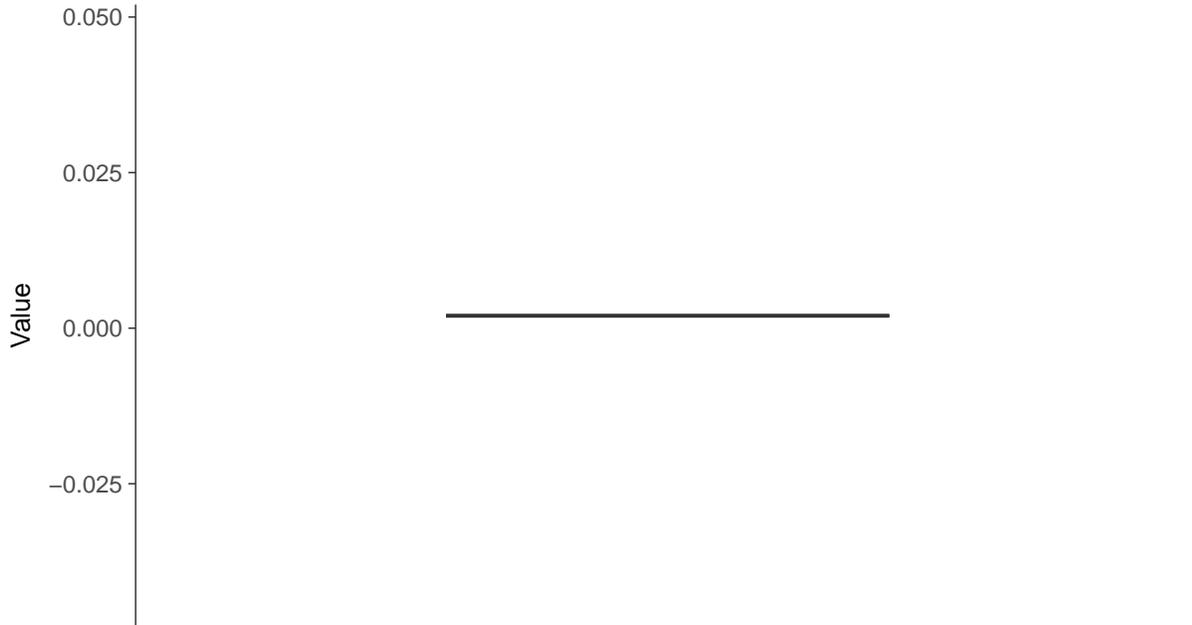
Thallium, MW-16A (mg/L)





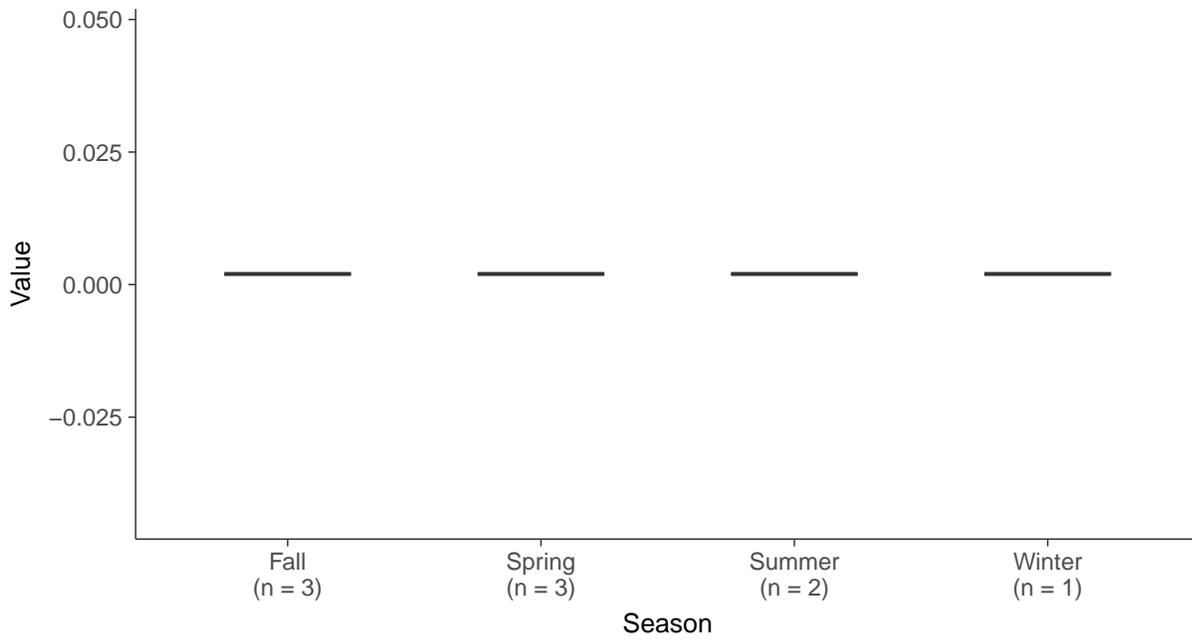
Boxplot

Thallium, MW-16A (mg/L)



Boxplot by Season

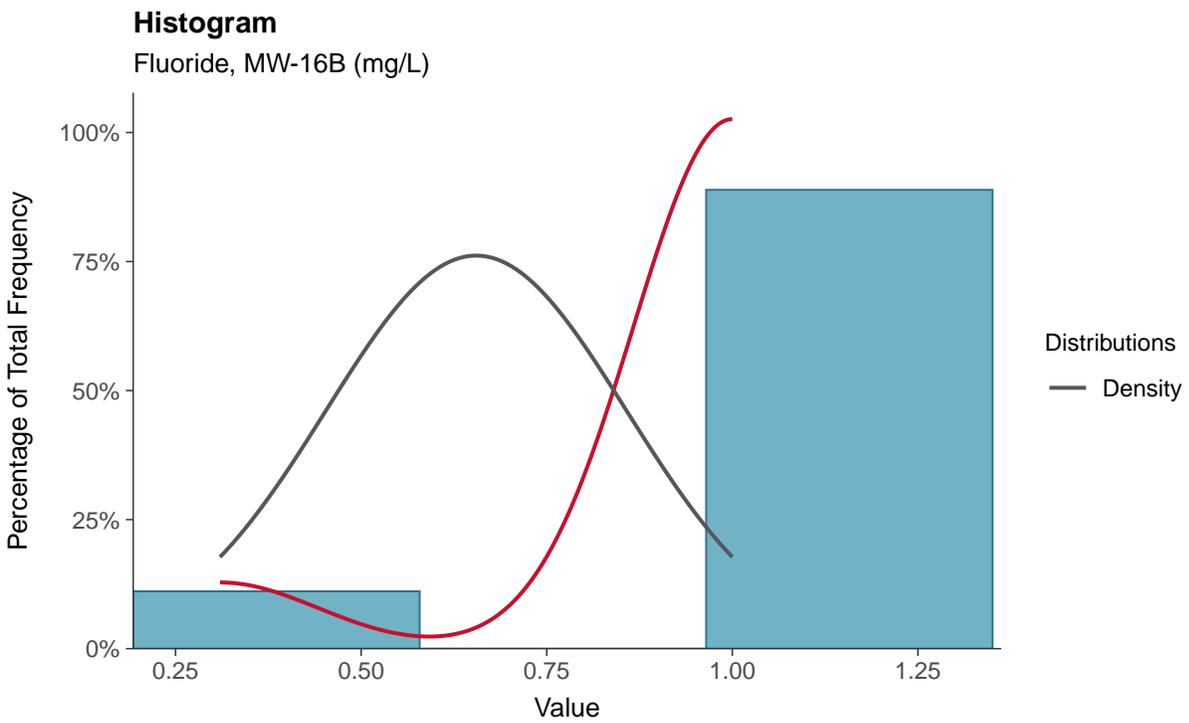
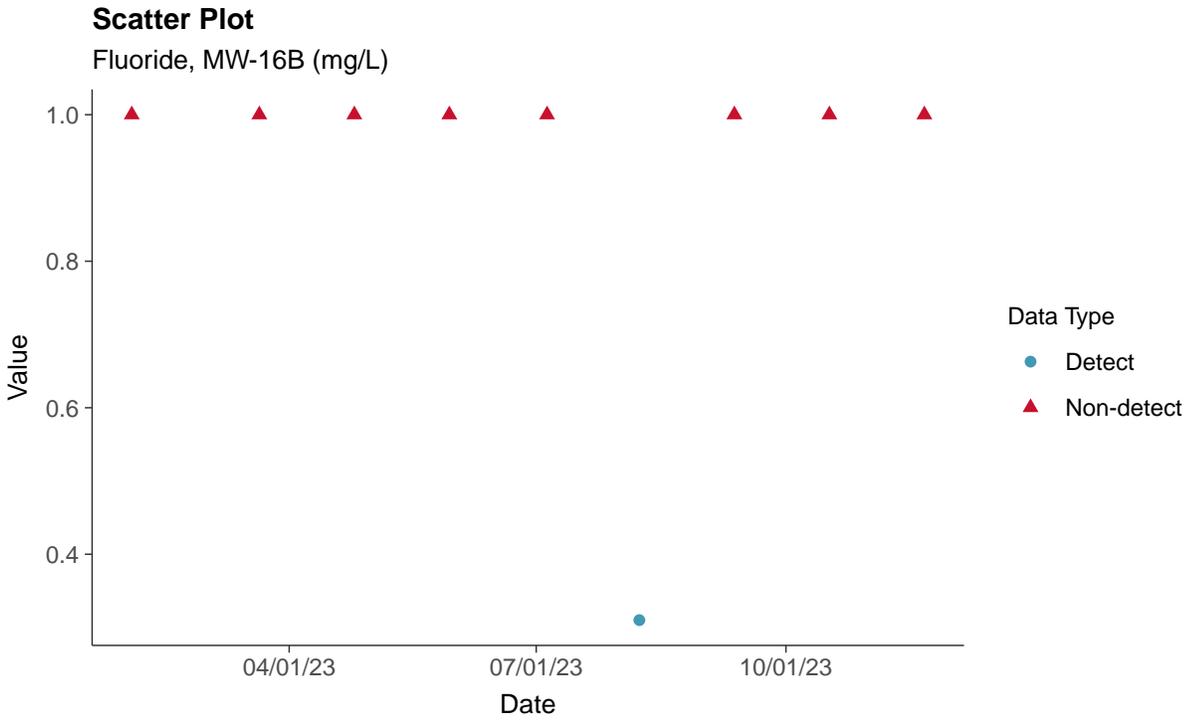
Thallium, MW-16A (mg/L)





Appendix IV: Fluoride, MW-16B

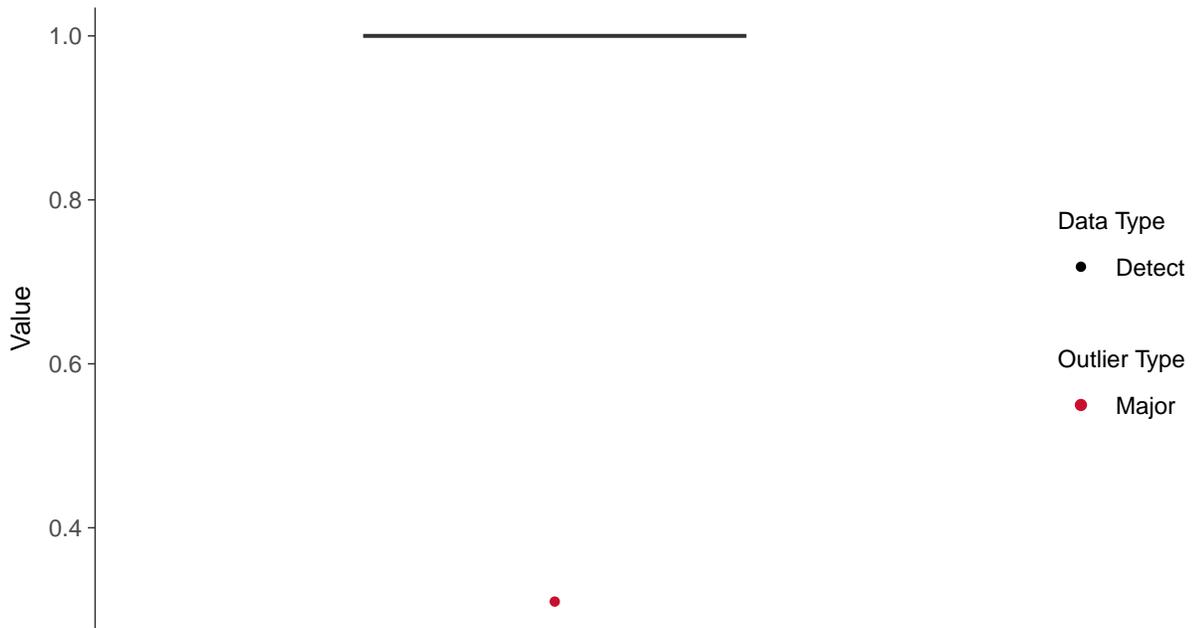
ID: 16B_2_04





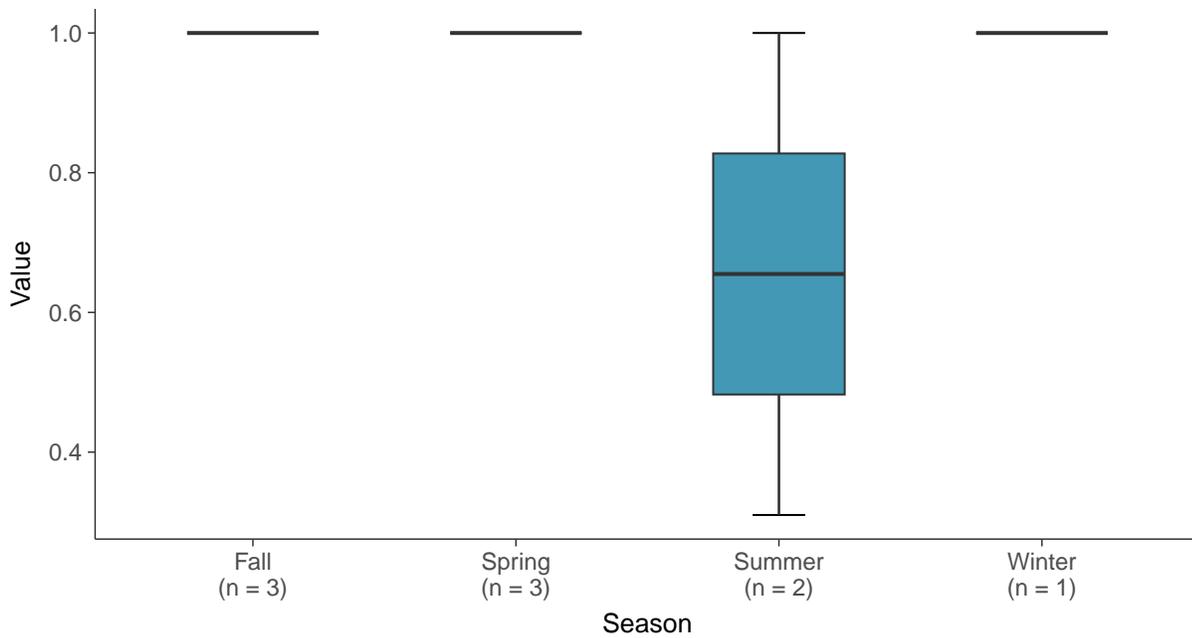
Boxplot

Fluoride, MW-16B (mg/L)



Boxplot by Season

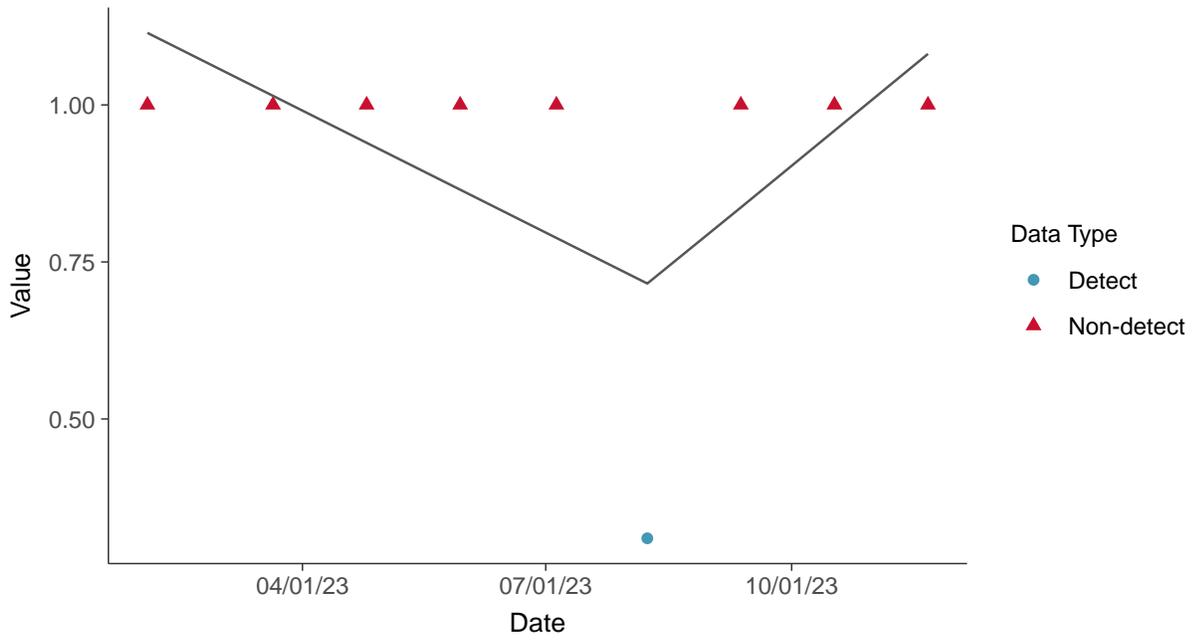
Fluoride, MW-16B (mg/L)





Trend Regression: Piecewise Linear-Linear

Fluoride, MW-16B (mg/L)



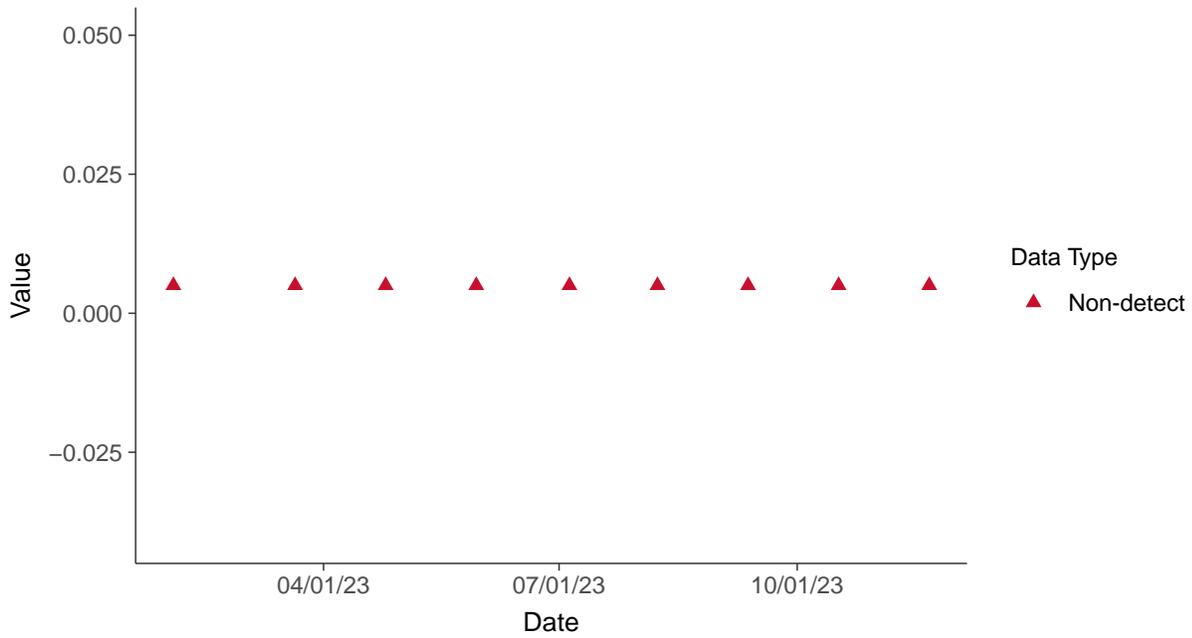


Appendix IV: Antimony, MW-16B

ID: 16B_2_08

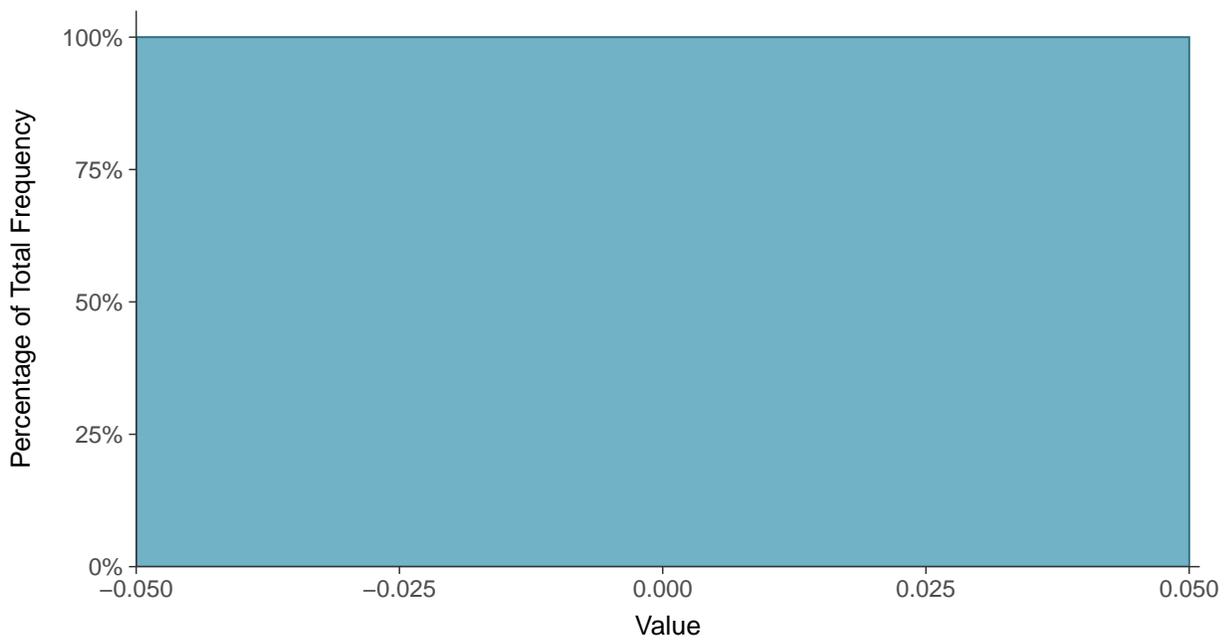
Scatter Plot

Antimony, MW-16B (mg/L)



Histogram

Antimony, MW-16B (mg/L)





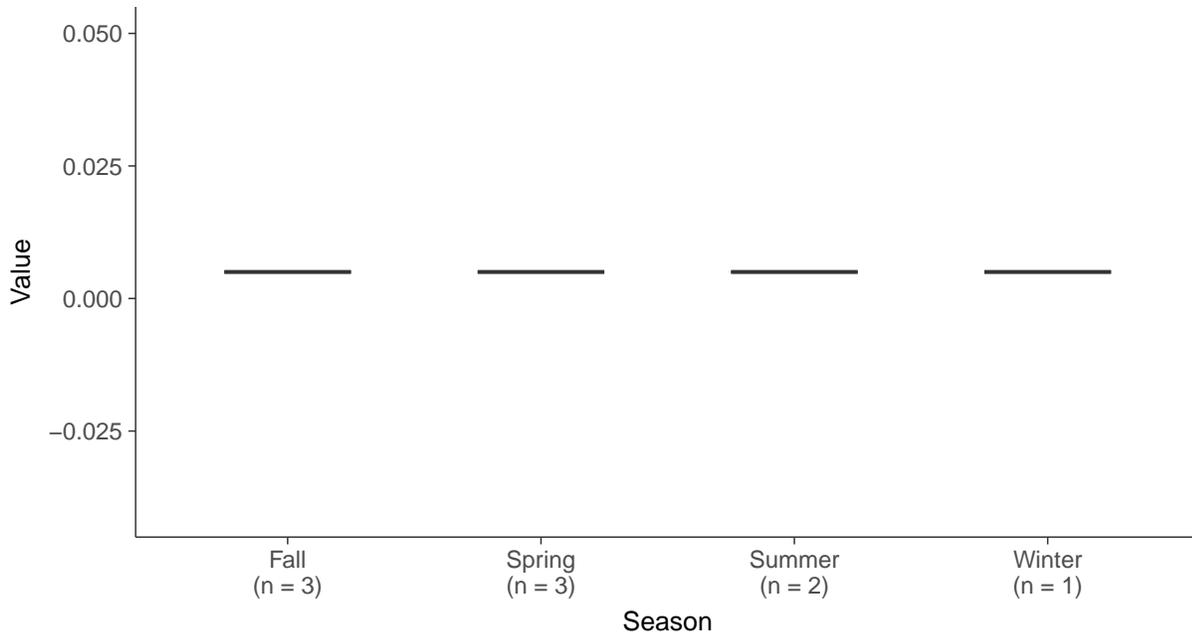
Boxplot

Antimony, MW-16B (mg/L)



Boxplot by Season

Antimony, MW-16B (mg/L)



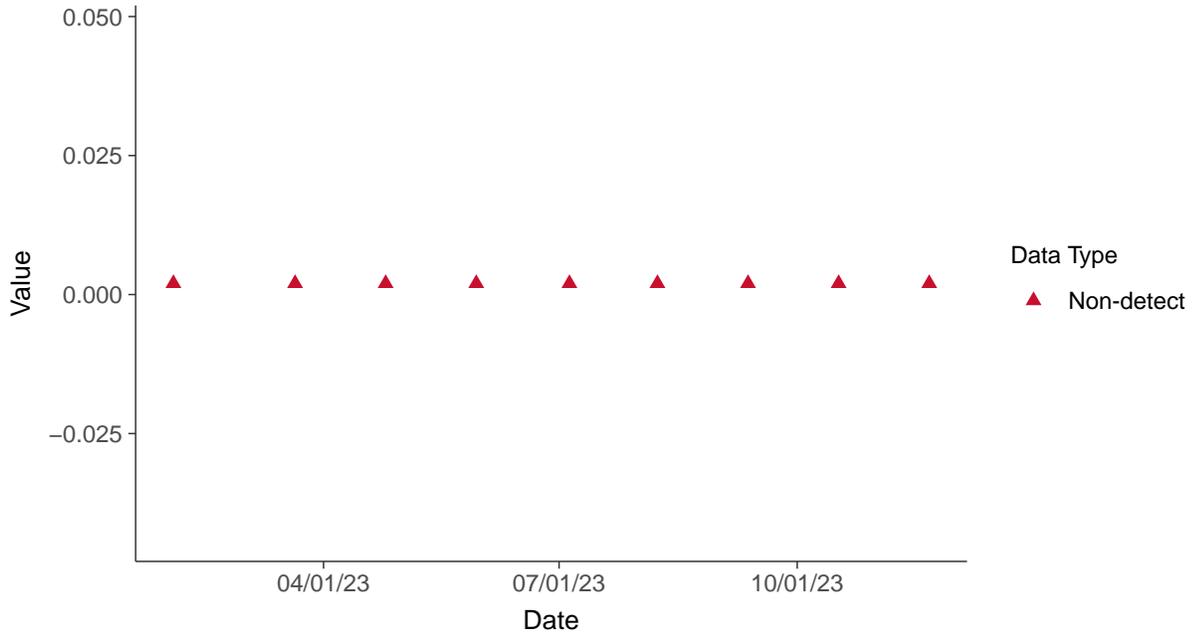


Appendix IV: Arsenic, MW-16B

ID: 16B_2_09

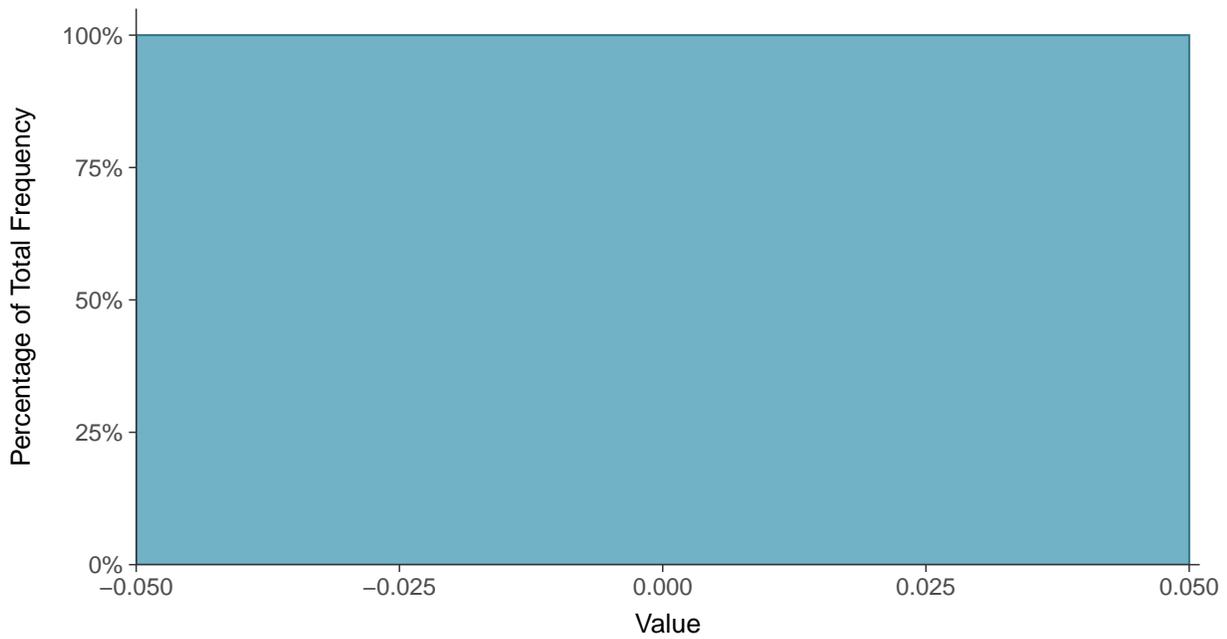
Scatter Plot

Arsenic, MW-16B (mg/L)



Histogram

Arsenic, MW-16B (mg/L)





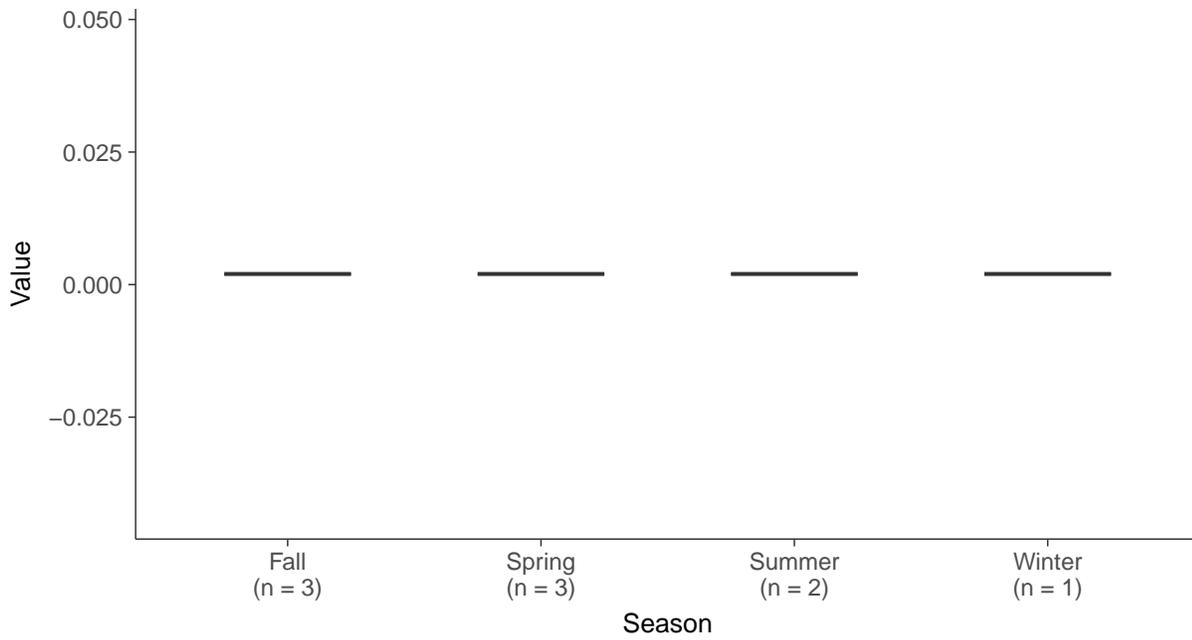
Boxplot

Arsenic, MW-16B (mg/L)



Boxplot by Season

Arsenic, MW-16B (mg/L)



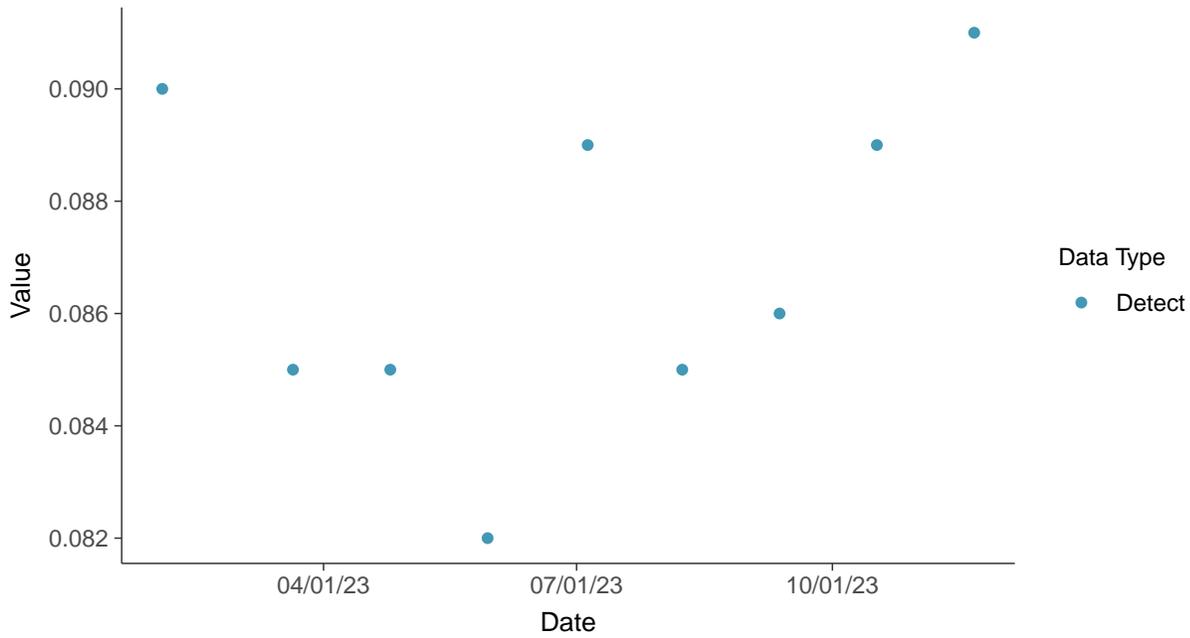


Appendix IV: Barium, MW-16B

ID: 16B_2_10

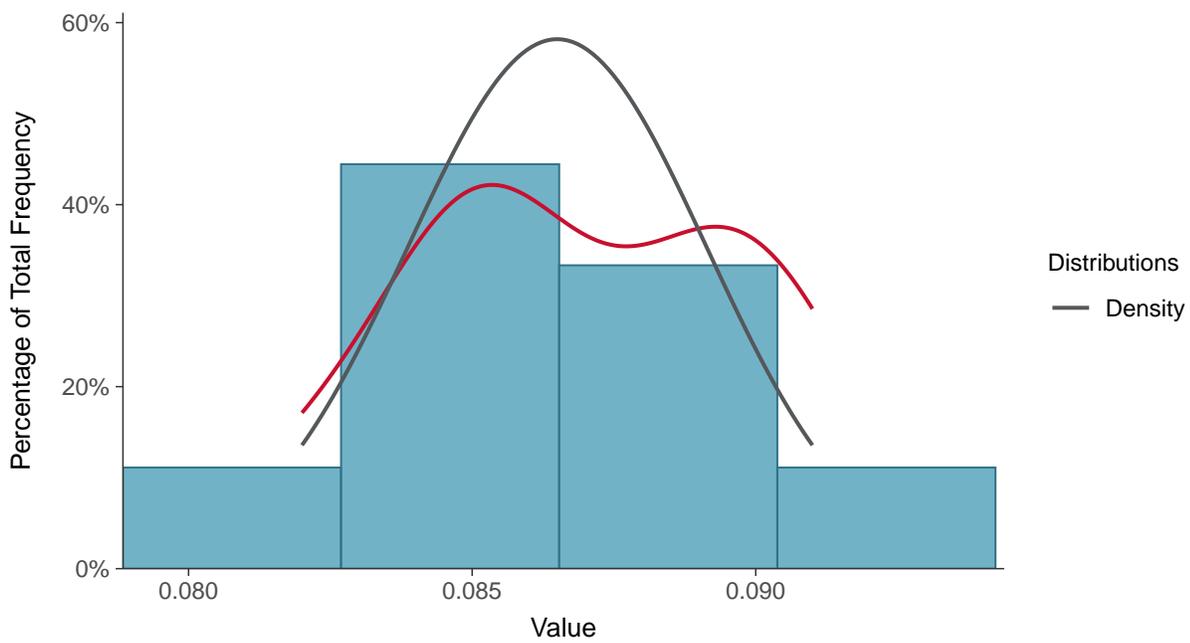
Scatter Plot

Barium, MW-16B (mg/L)



Histogram

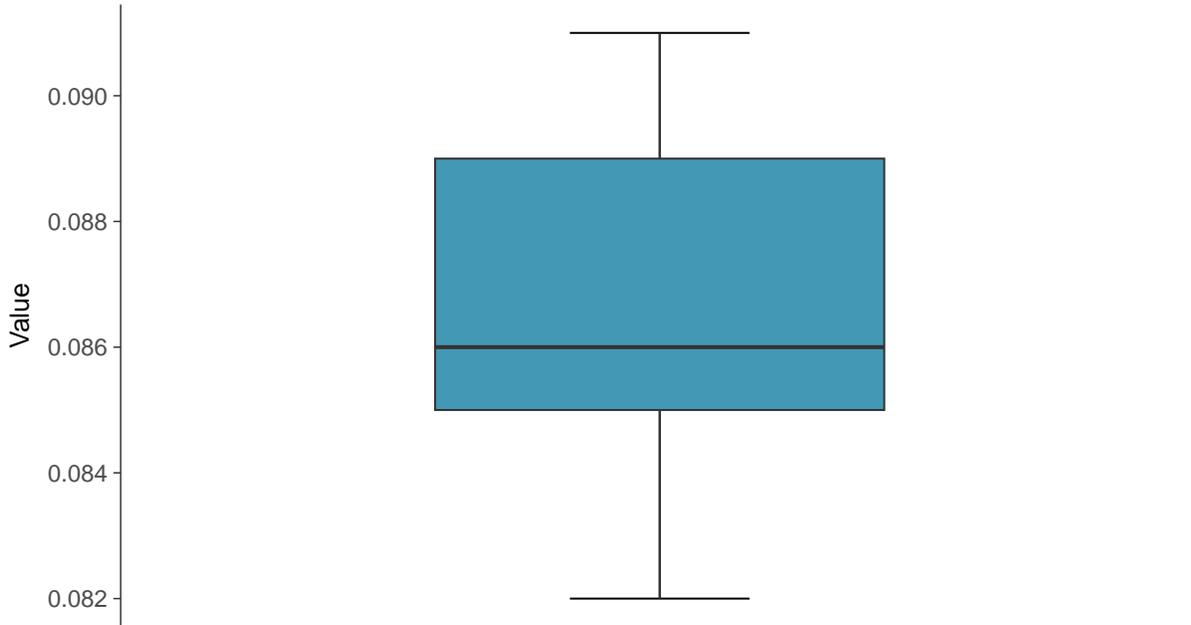
Barium, MW-16B (mg/L)





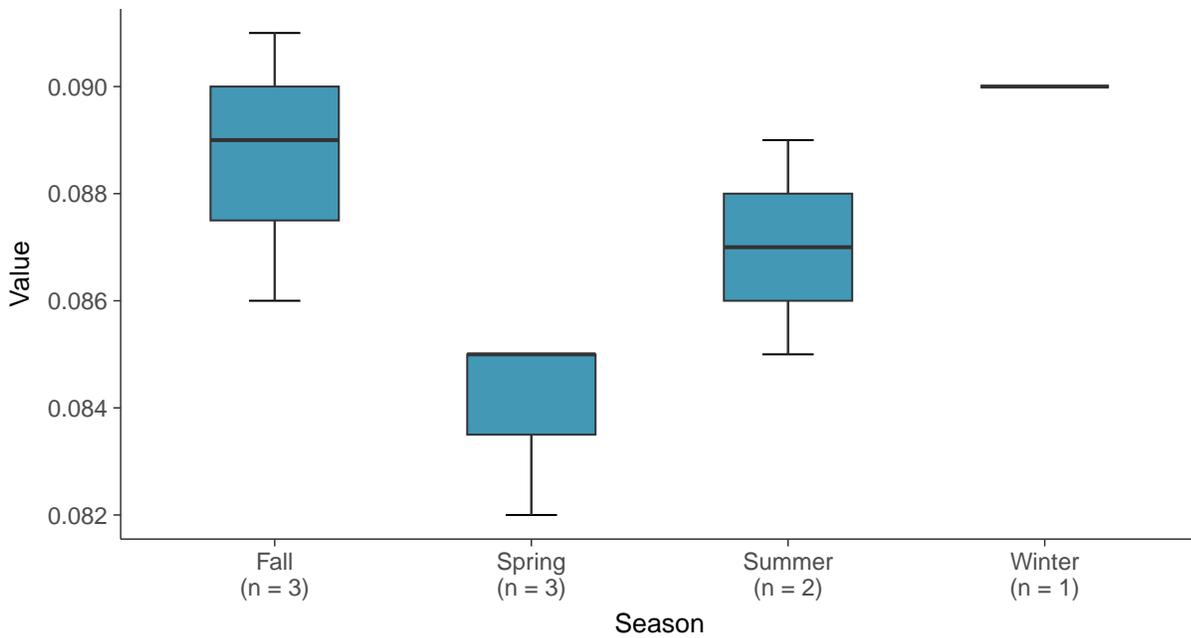
Boxplot

Barium, MW-16B (mg/L)



Boxplot by Season

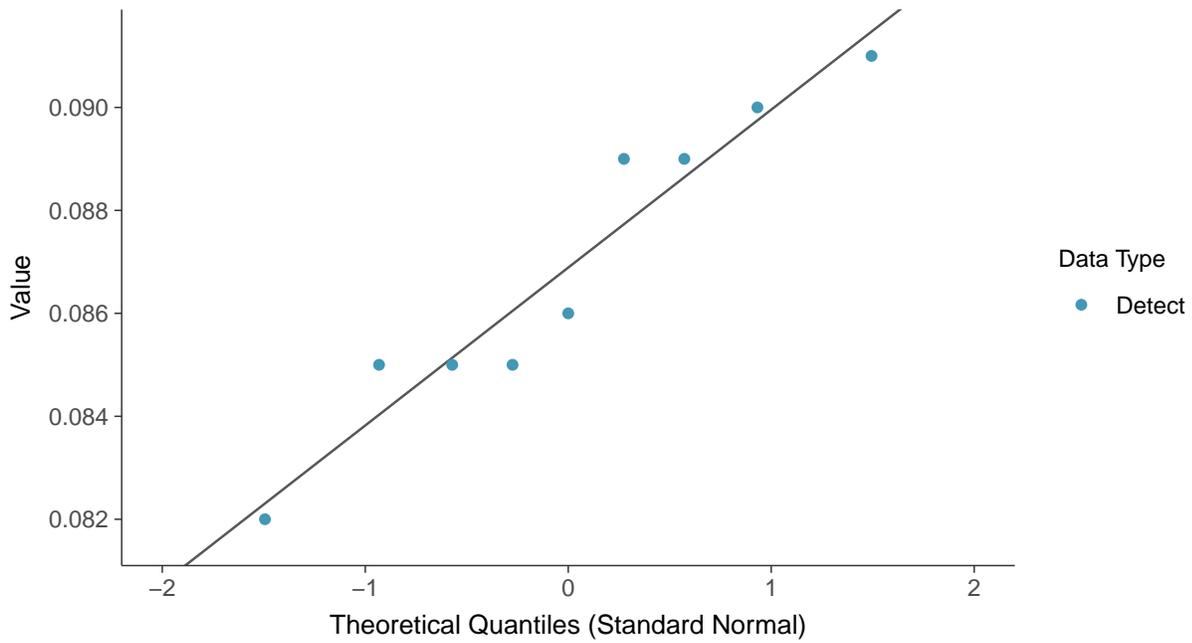
Barium, MW-16B (mg/L)





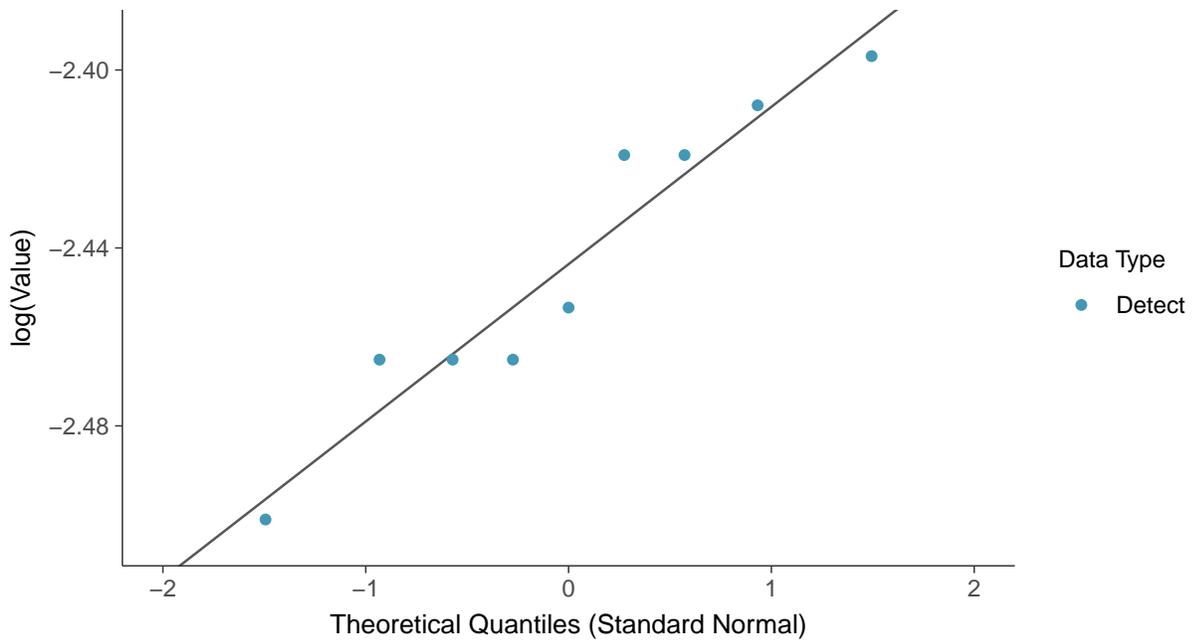
Normal Q-Q plot

Barium, MW-16B (mg/L)



Lognormal Q-Q plot

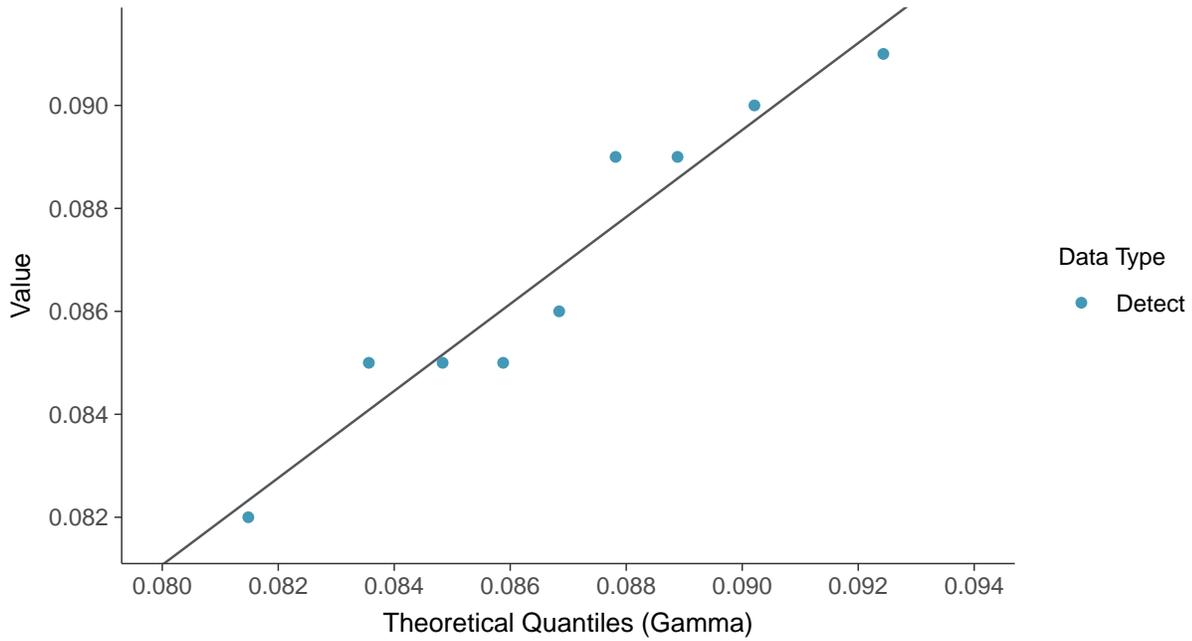
Barium, MW-16B (mg/L)





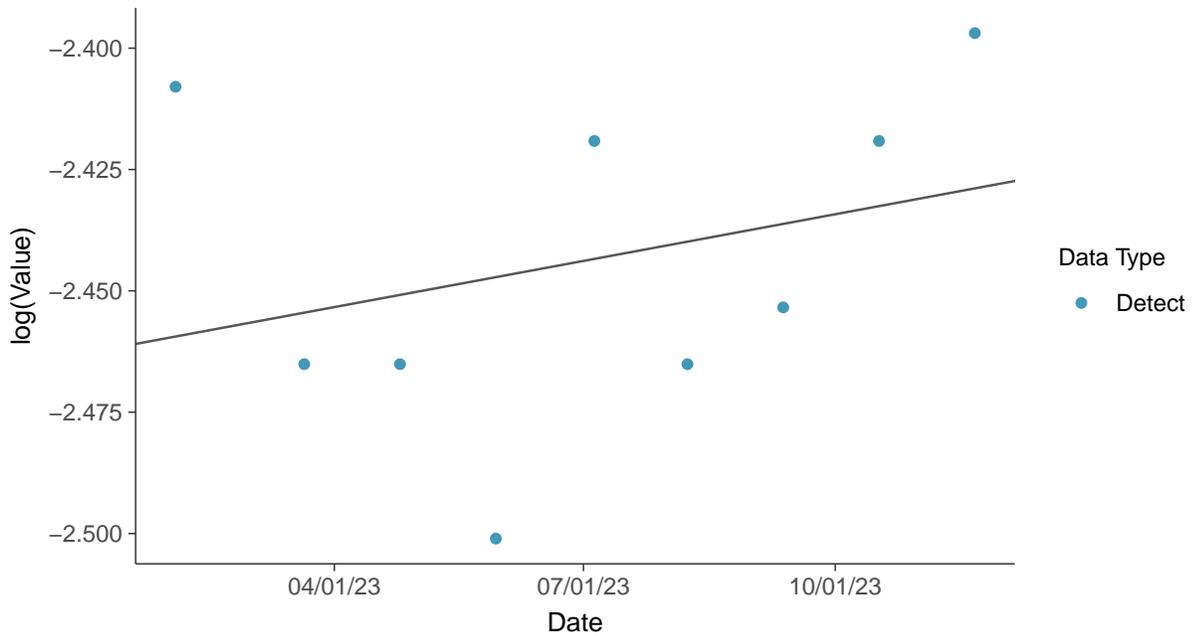
Gamma Q-Q plot

Barium, MW-16B (mg/L)



Trend Regression: Lognormal MLE

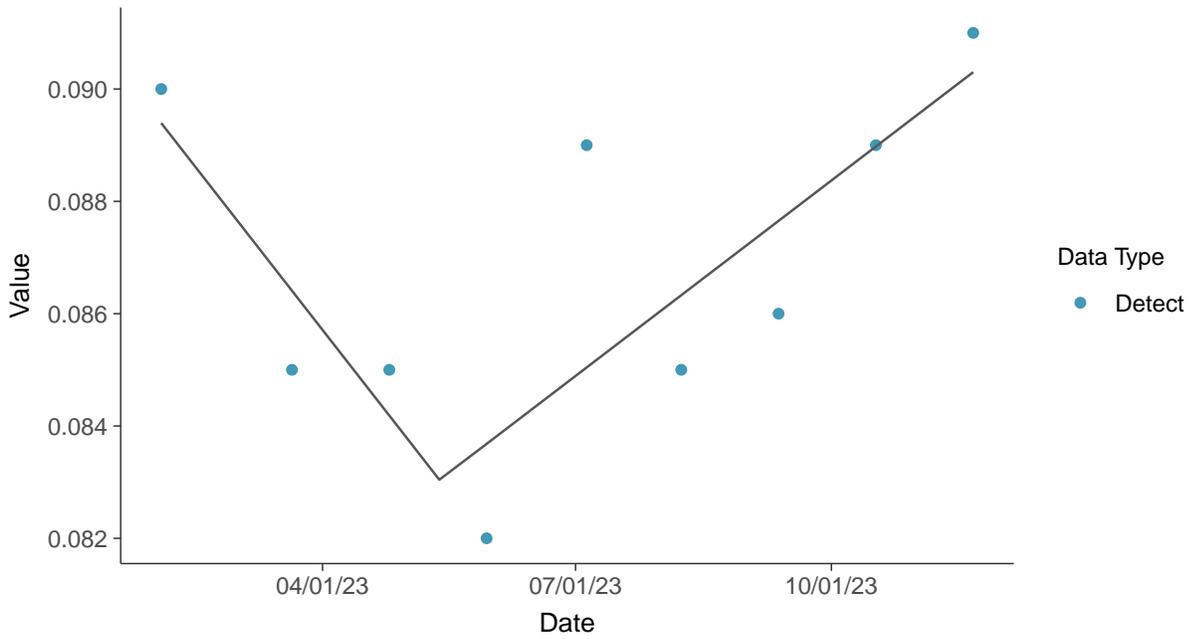
Barium, MW-16B (mg/L)





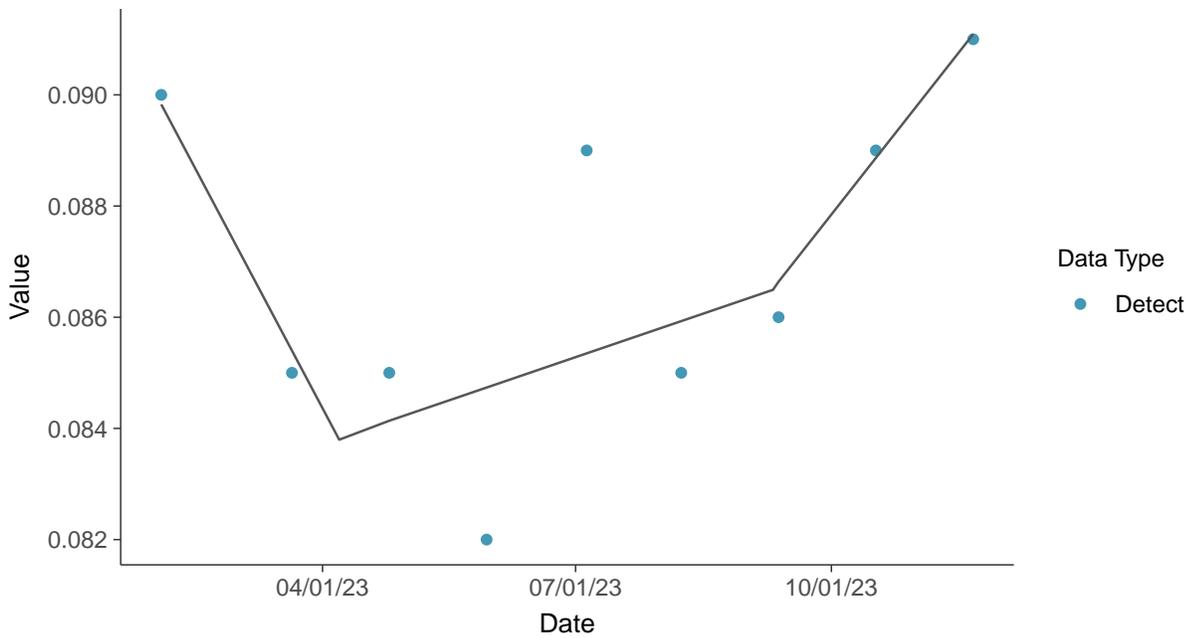
Trend Regression: Piecewise Linear-Linear

Barium, MW-16B (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Barium, MW-16B (mg/L)



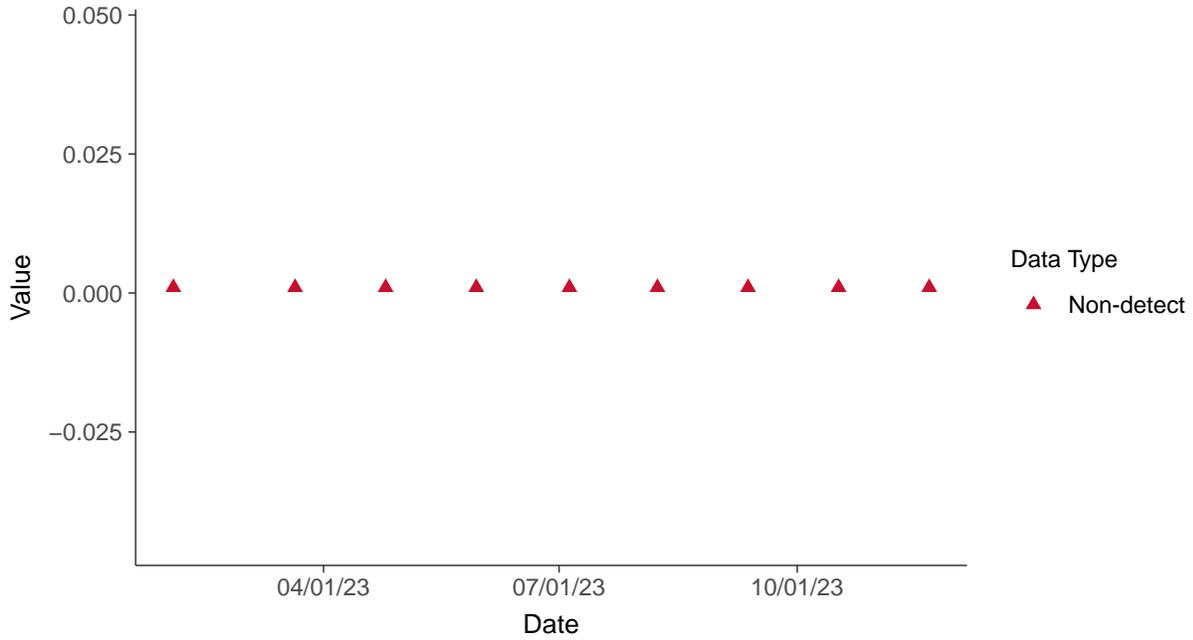


Appendix IV: Beryllium, MW-16B

ID: 16B_2_11

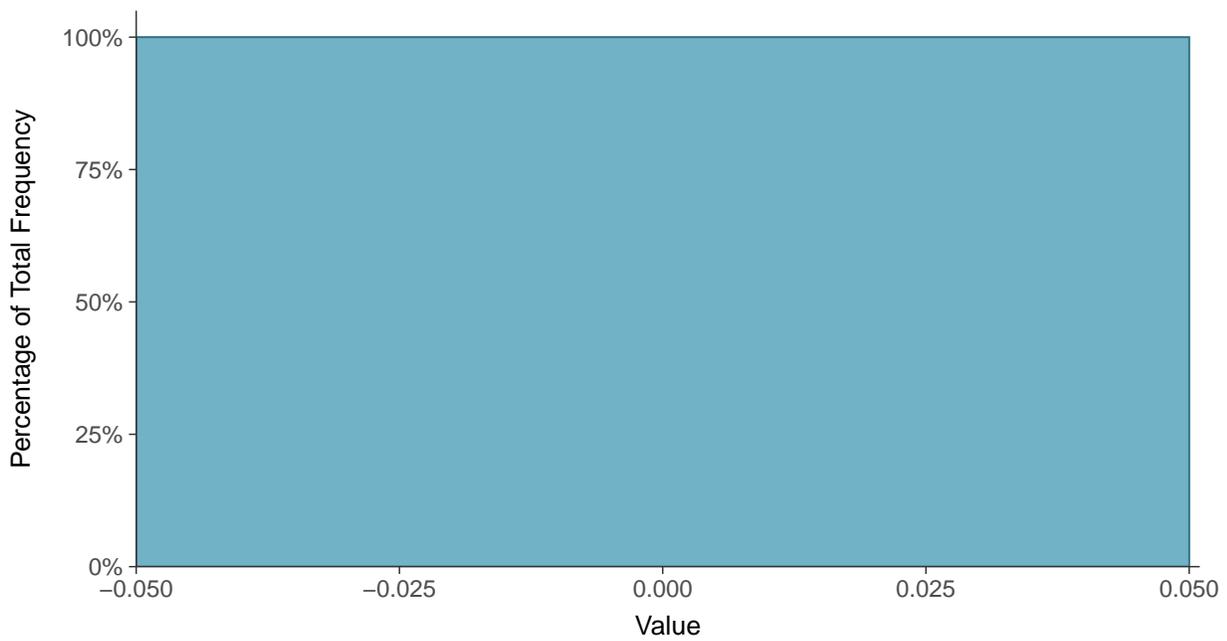
Scatter Plot

Beryllium, MW-16B (mg/L)



Histogram

Beryllium, MW-16B (mg/L)





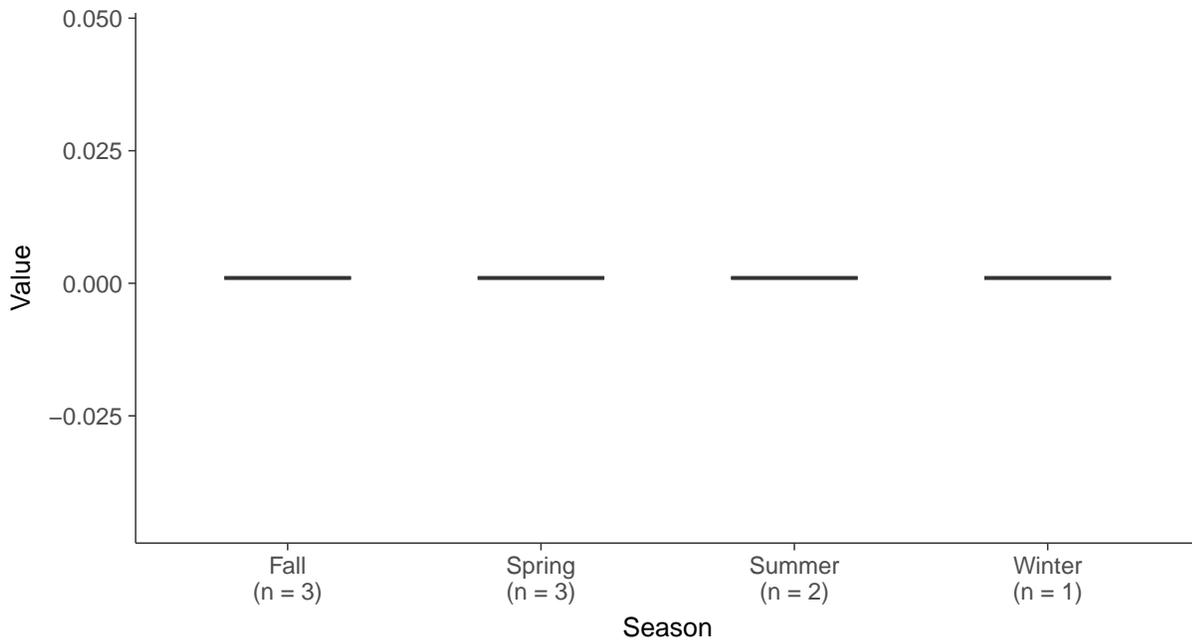
Boxplot

Beryllium, MW-16B (mg/L)



Boxplot by Season

Beryllium, MW-16B (mg/L)



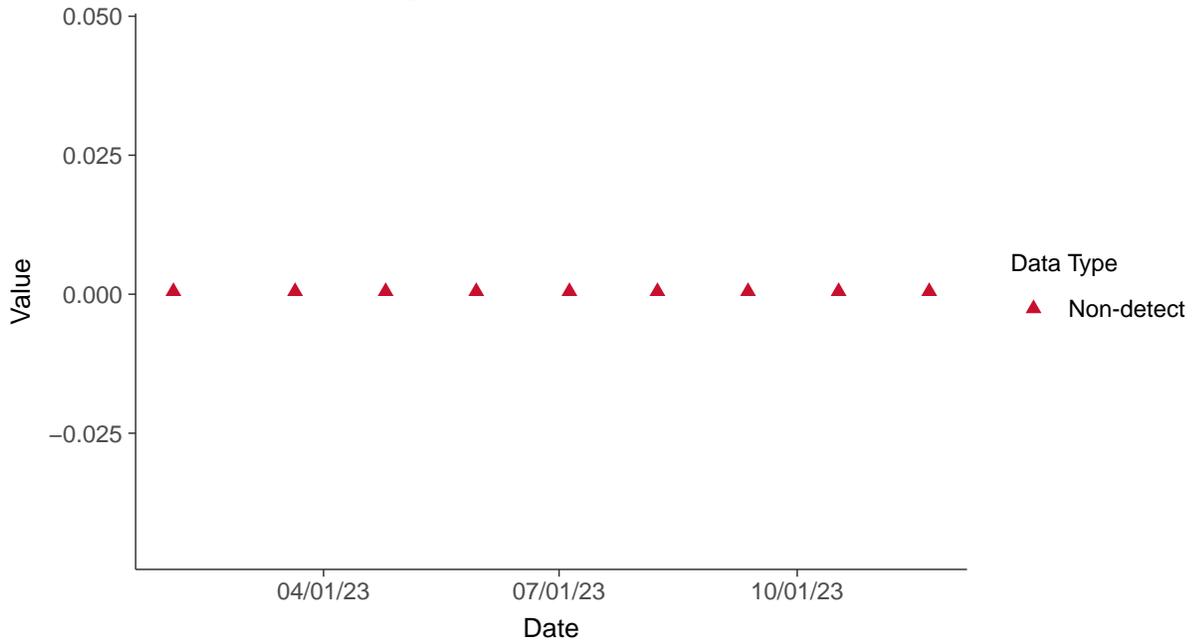


Appendix IV: Cadmium, MW-16B

ID: 16B_2_12

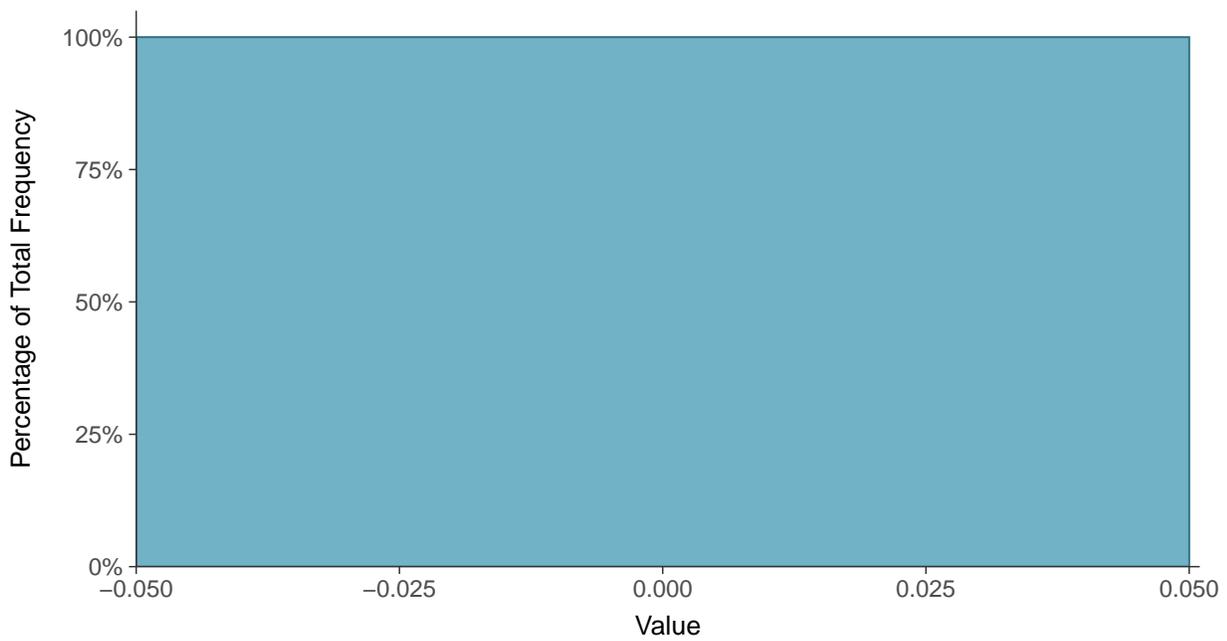
Scatter Plot

Cadmium, MW-16B (mg/L)



Histogram

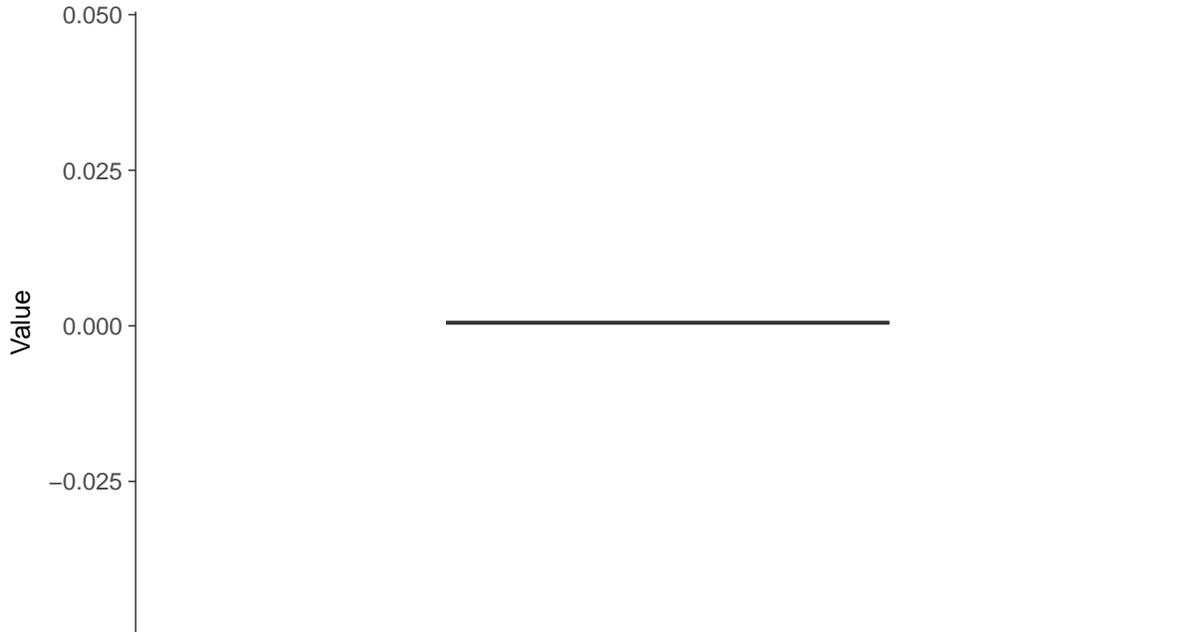
Cadmium, MW-16B (mg/L)





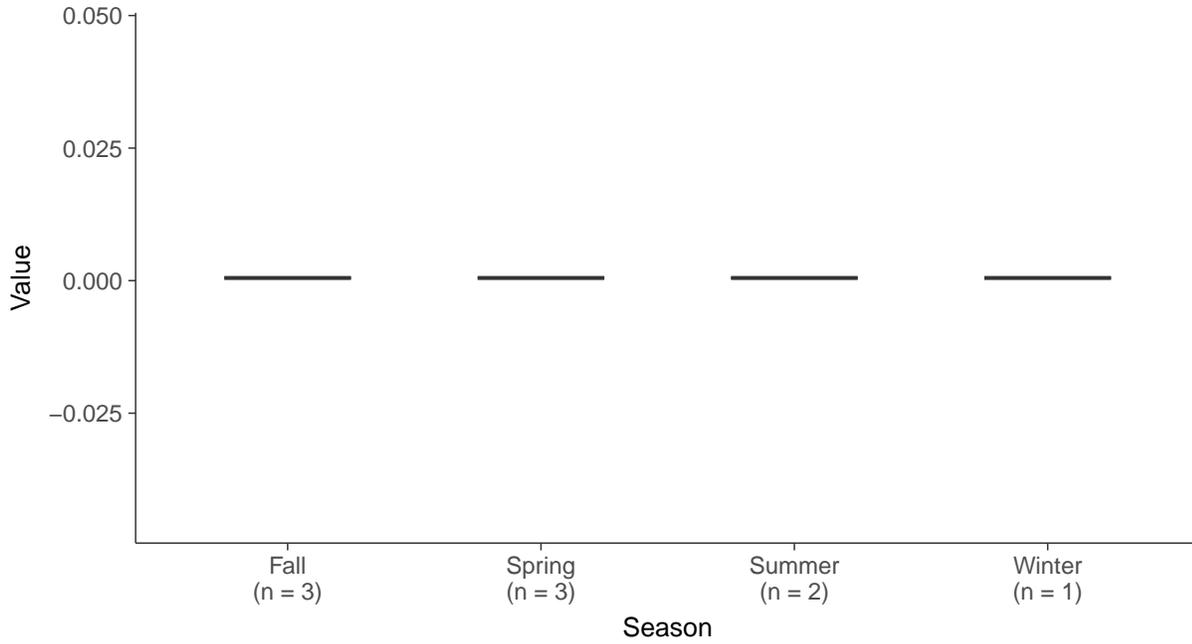
Boxplot

Cadmium, MW-16B (mg/L)



Boxplot by Season

Cadmium, MW-16B (mg/L)



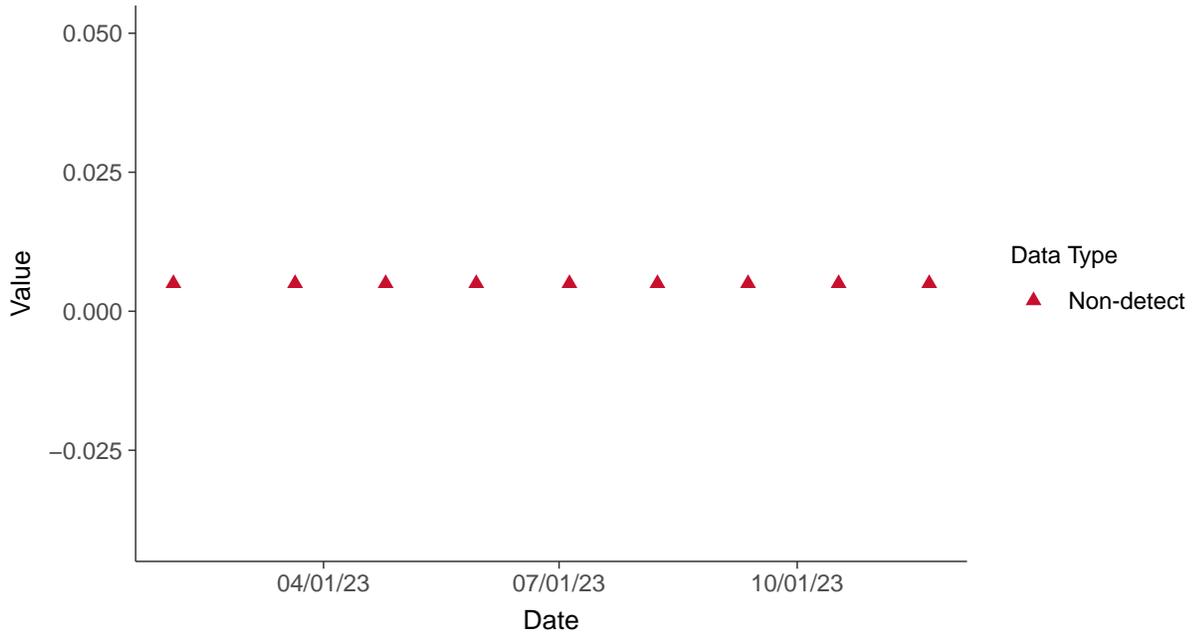


Appendix IV: Chromium, MW-16B

ID: 16B_2_13

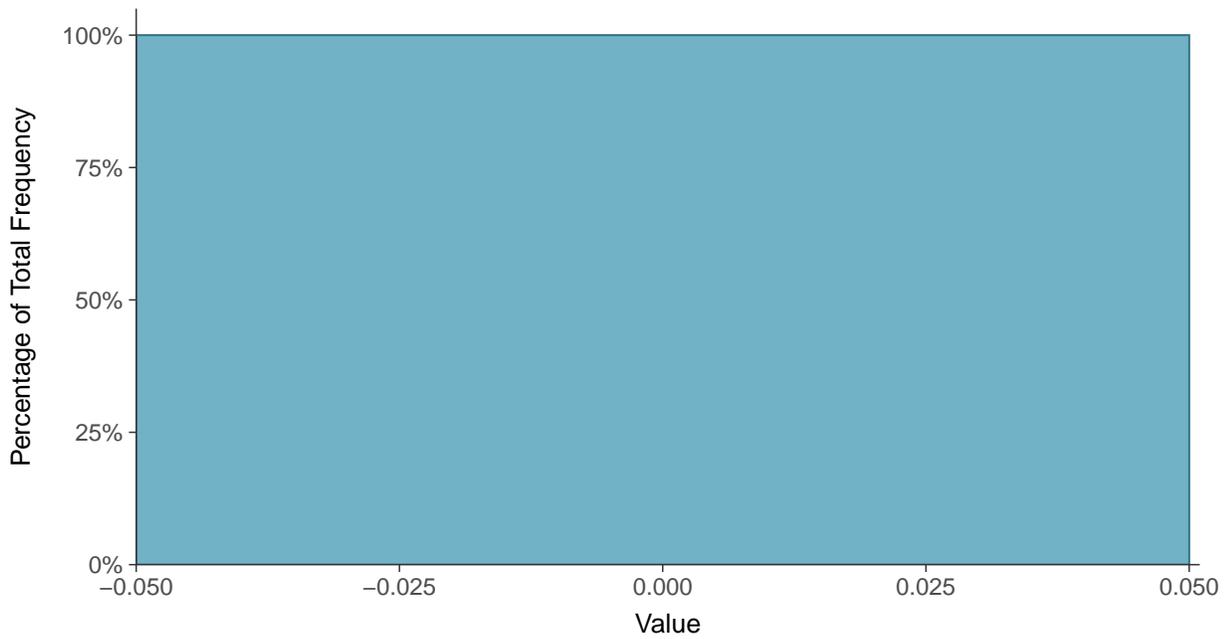
Scatter Plot

Chromium, MW-16B (mg/L)



Histogram

Chromium, MW-16B (mg/L)





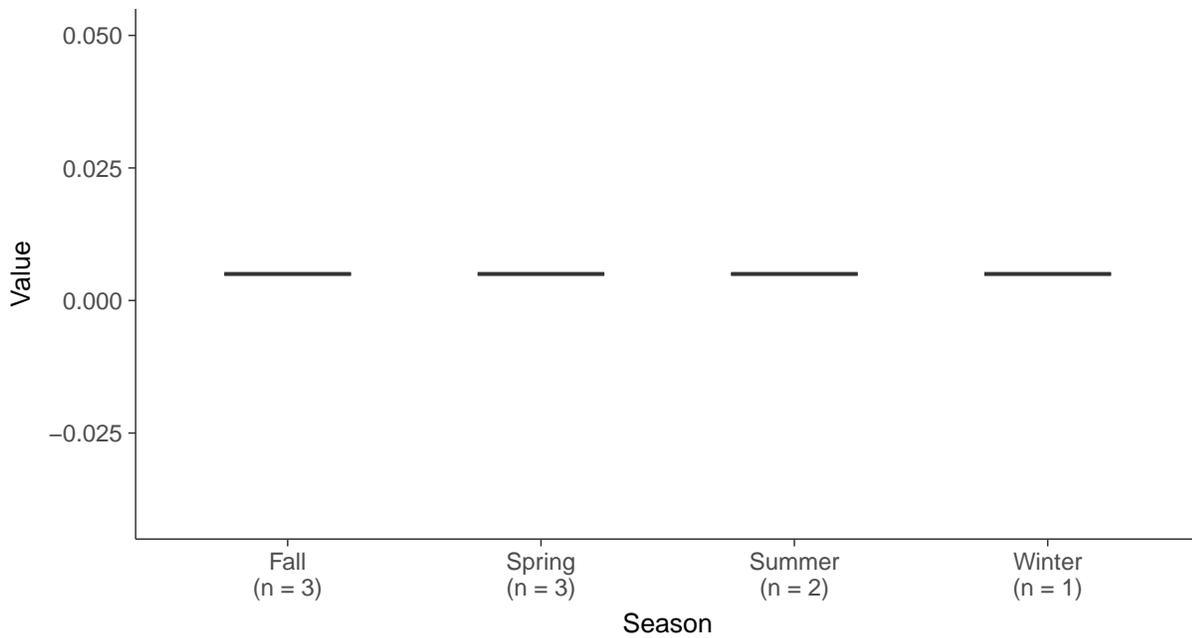
Boxplot

Chromium, MW-16B (mg/L)



Boxplot by Season

Chromium, MW-16B (mg/L)



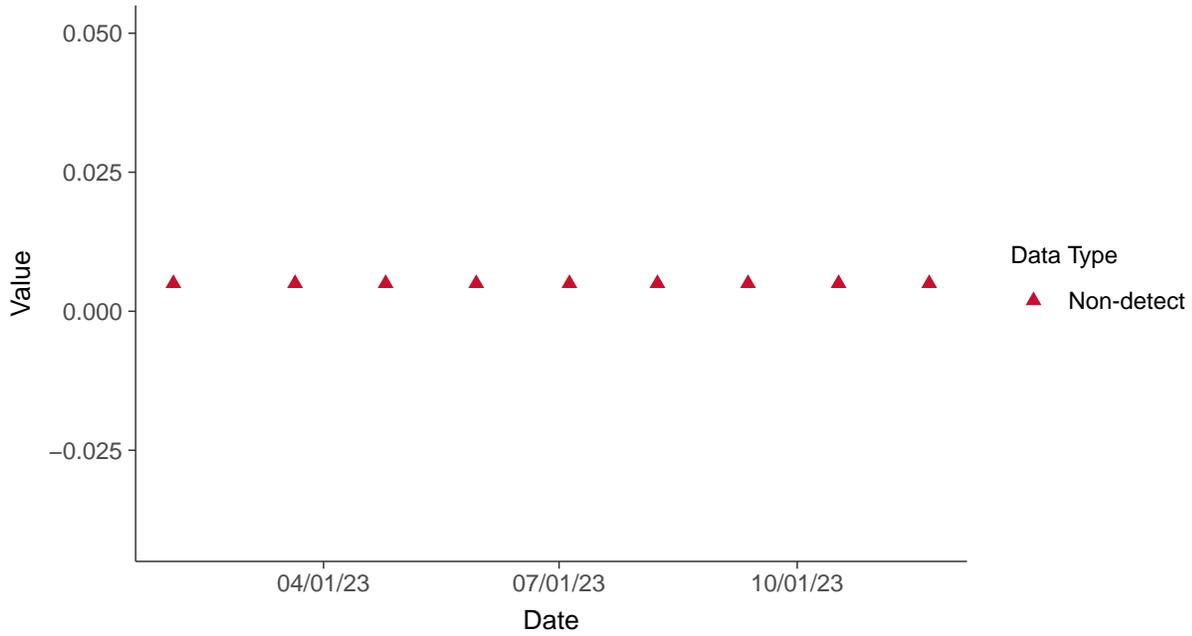


Appendix IV: Cobalt, MW-16B

ID: 16B_2_14

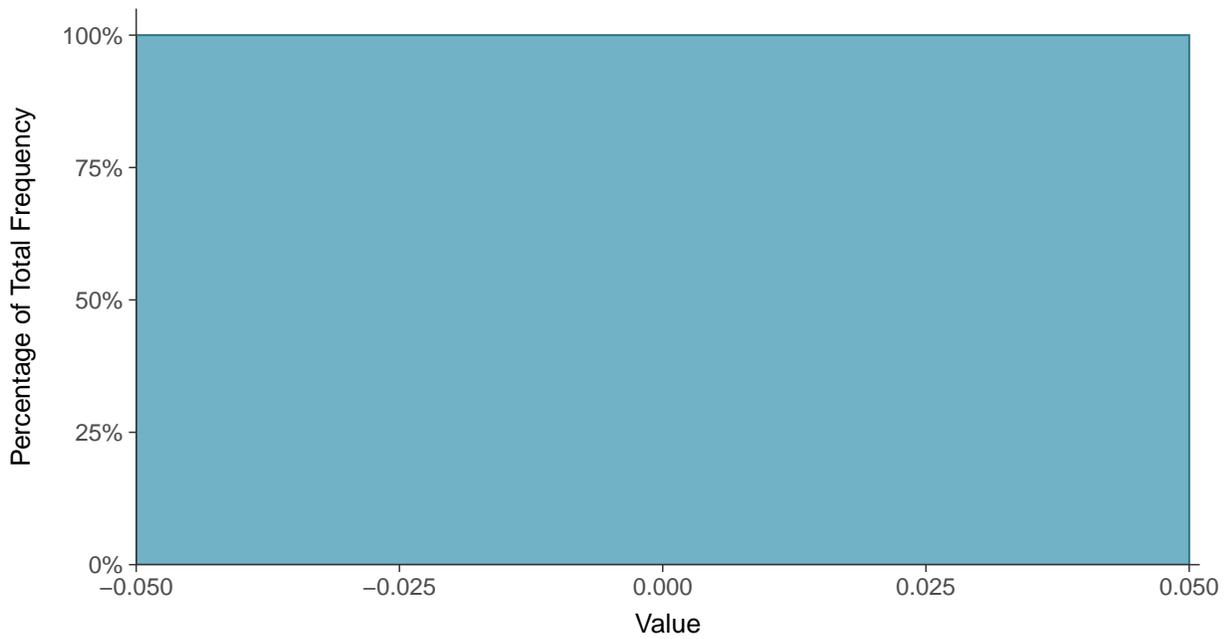
Scatter Plot

Cobalt, MW-16B (mg/L)



Histogram

Cobalt, MW-16B (mg/L)





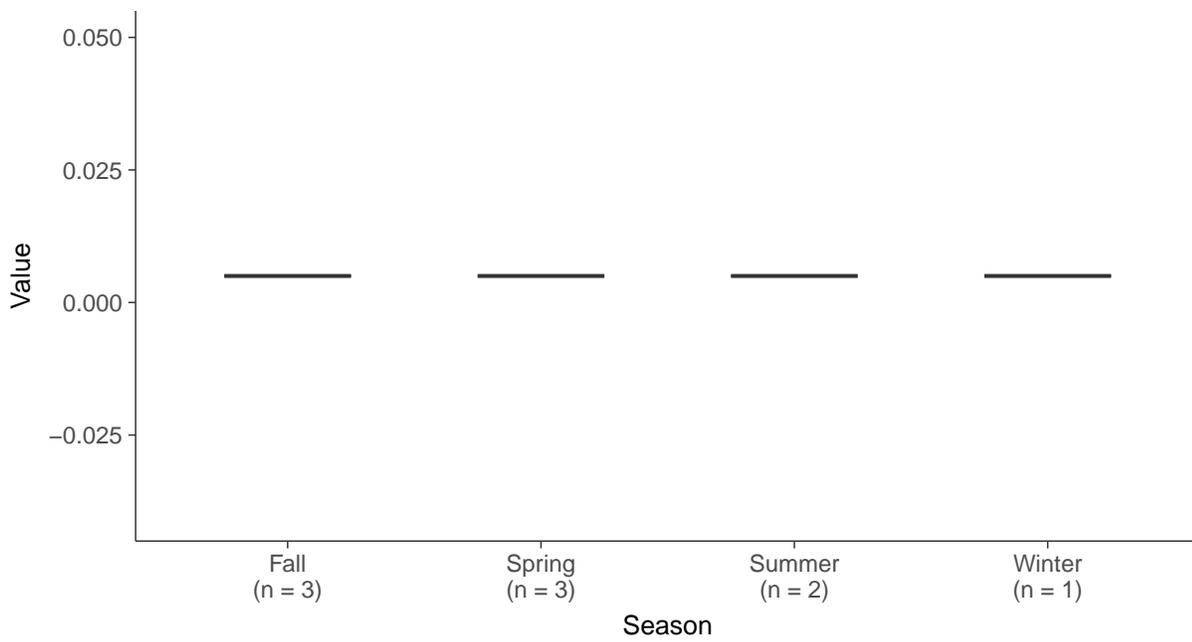
Boxplot

Cobalt, MW-16B (mg/L)



Boxplot by Season

Cobalt, MW-16B (mg/L)



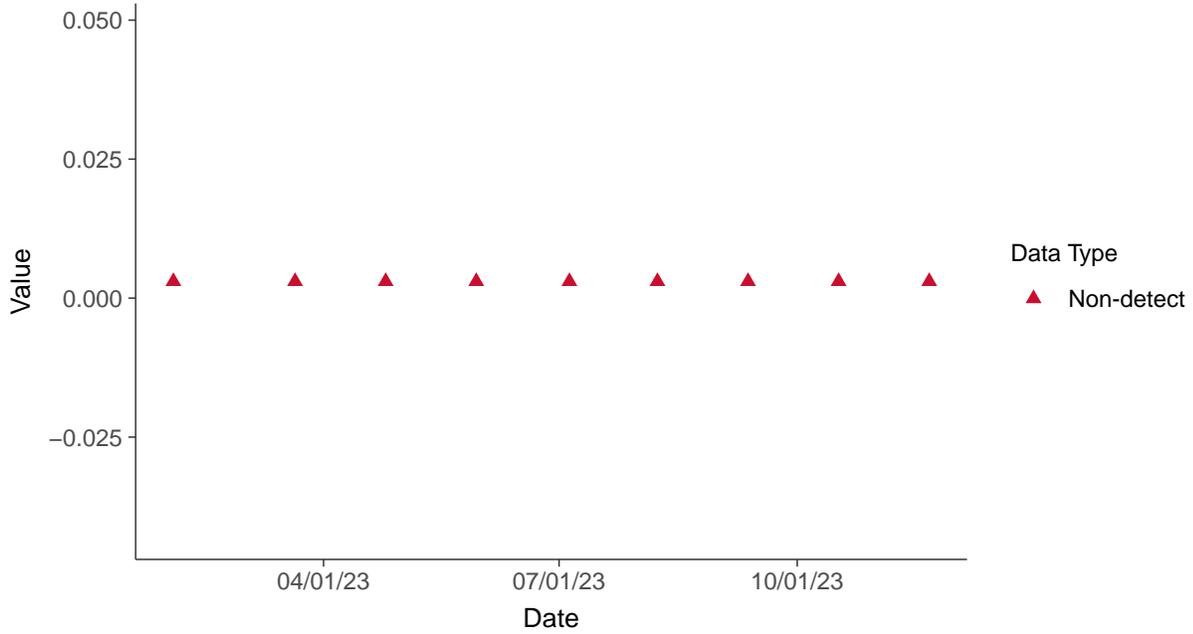


Appendix IV: Lead, MW-16B

ID: 16B_2_15

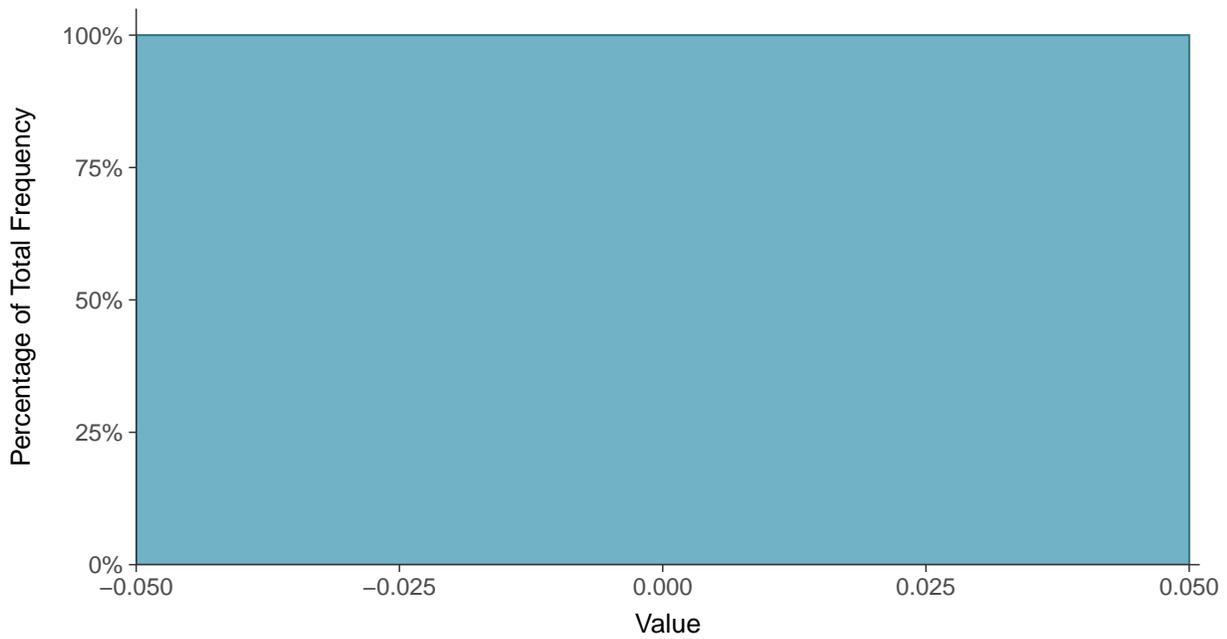
Scatter Plot

Lead, MW-16B (mg/L)



Histogram

Lead, MW-16B (mg/L)





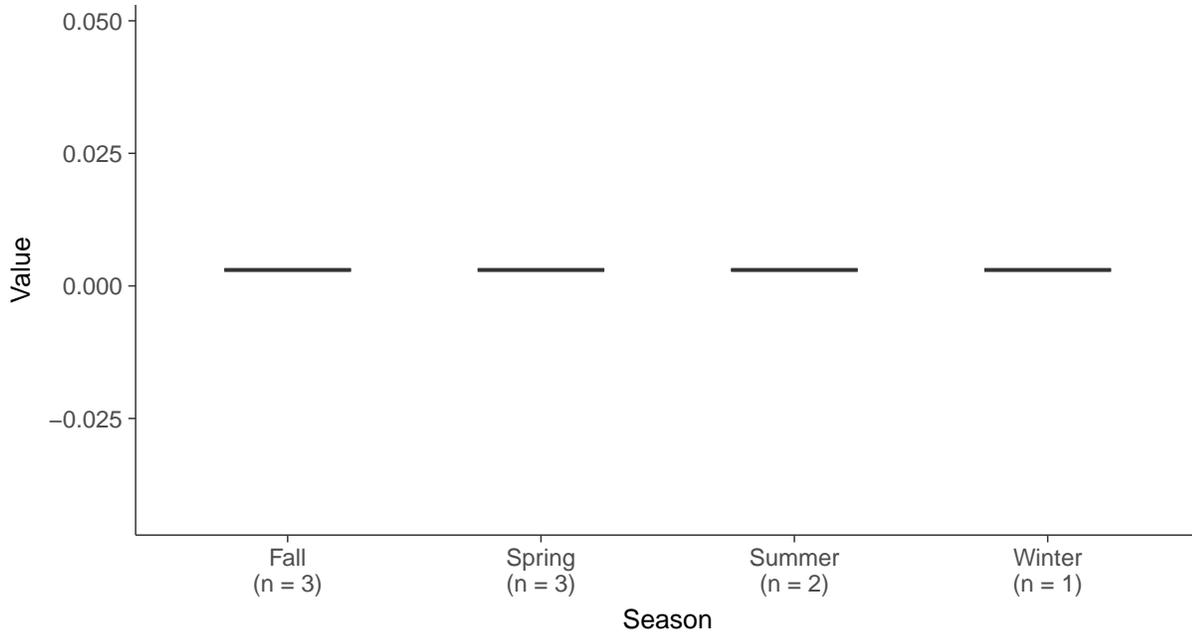
Boxplot

Lead, MW-16B (mg/L)



Boxplot by Season

Lead, MW-16B (mg/L)



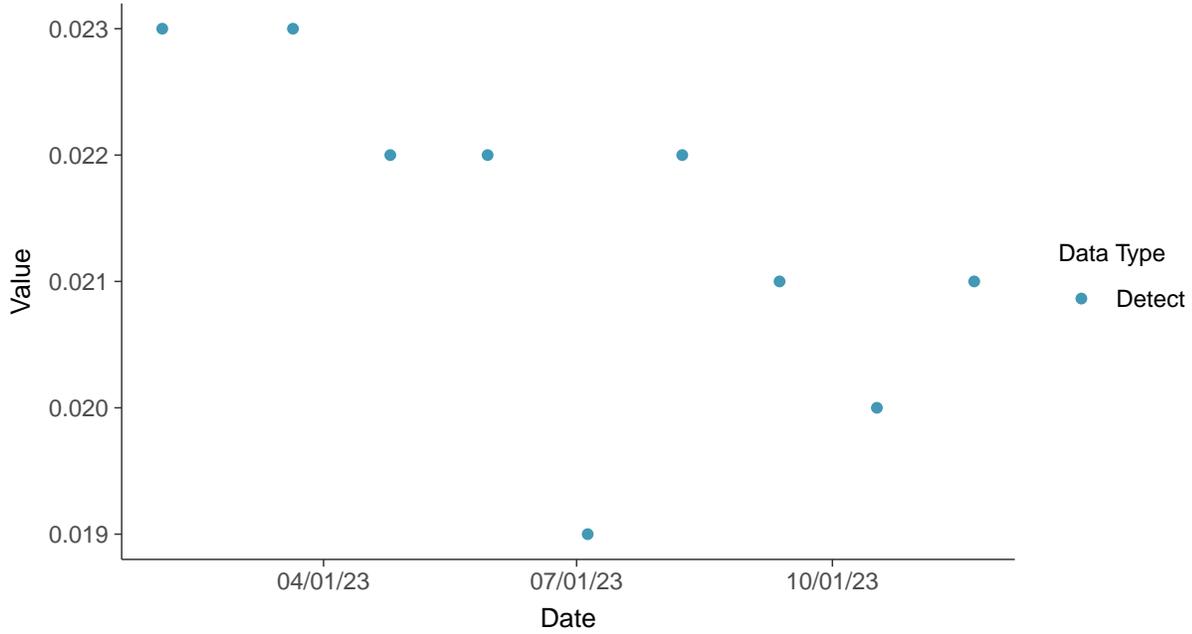


Appendix IV: Lithium, MW-16B

ID: 16B_2_16

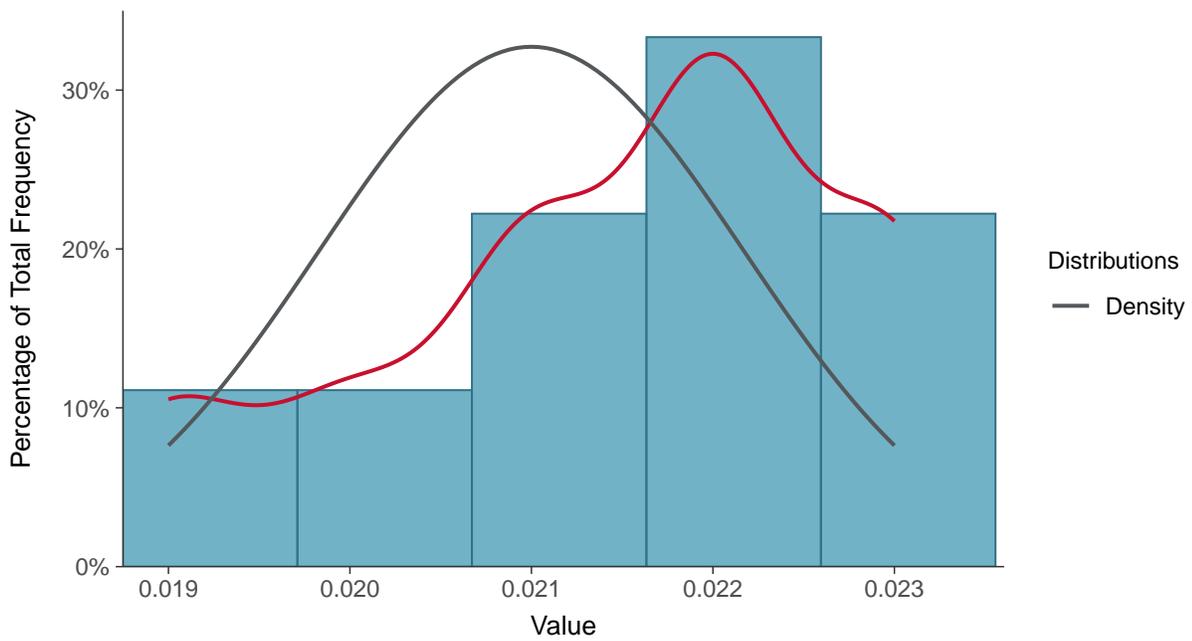
Scatter Plot

Lithium, MW-16B (mg/L)



Histogram

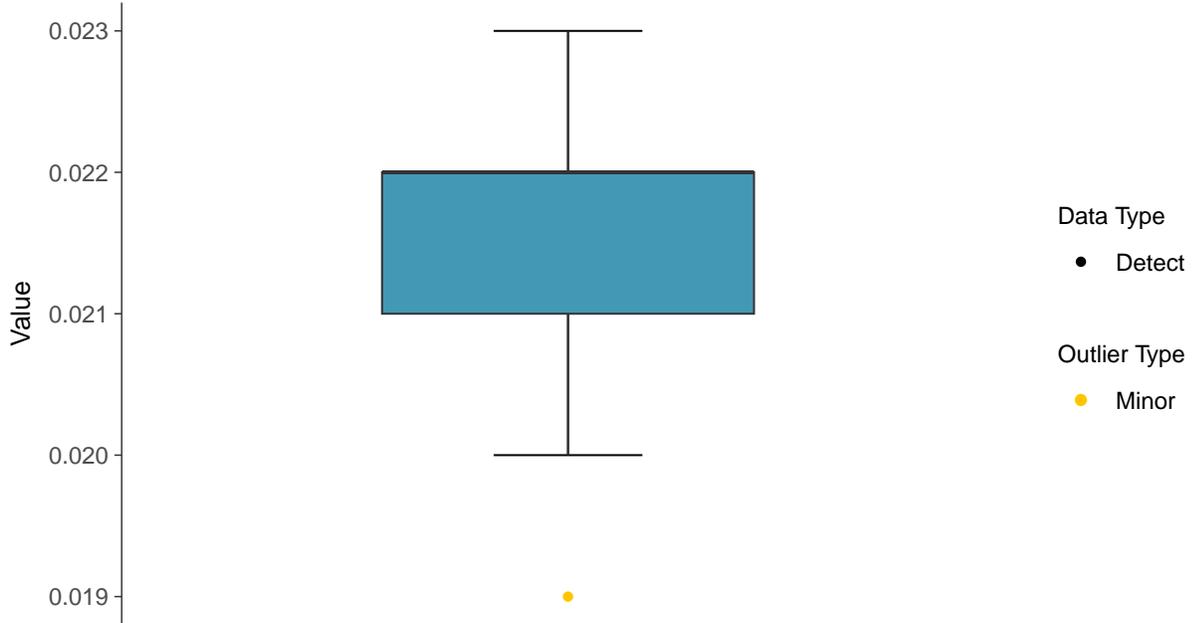
Lithium, MW-16B (mg/L)





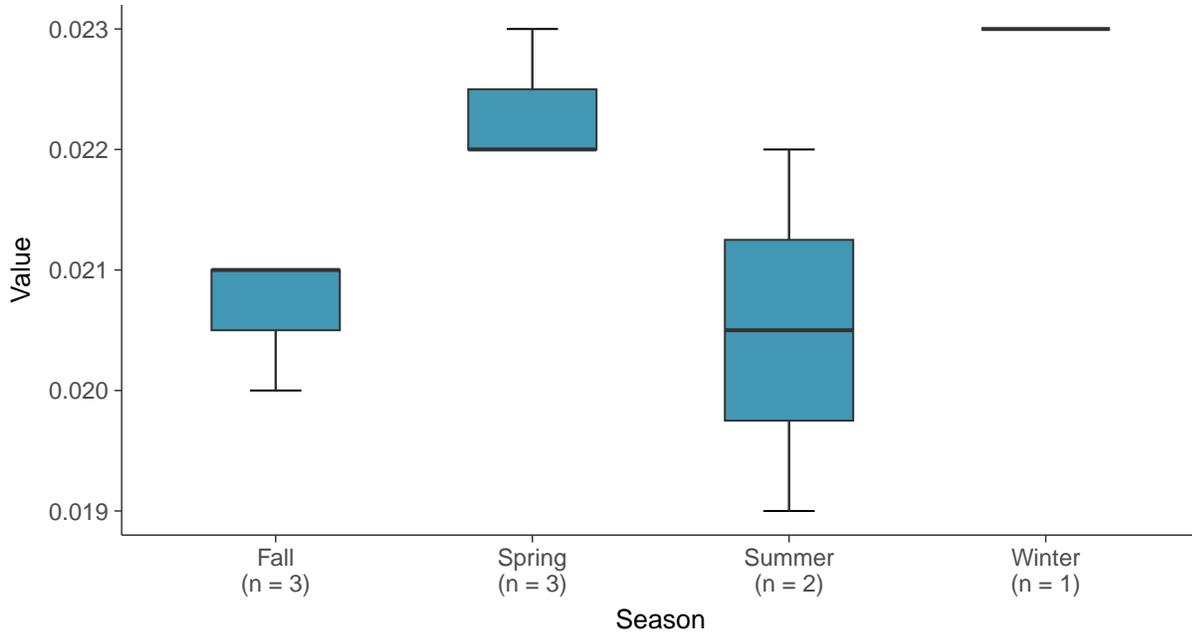
Boxplot

Lithium, MW-16B (mg/L)



Boxplot by Season

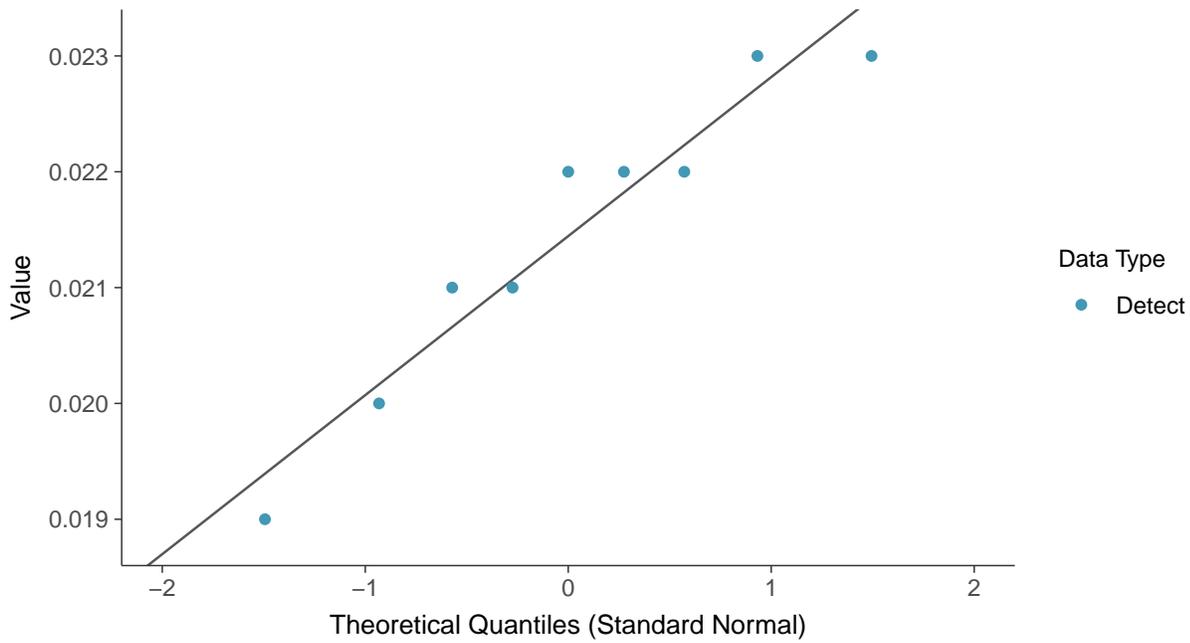
Lithium, MW-16B (mg/L)





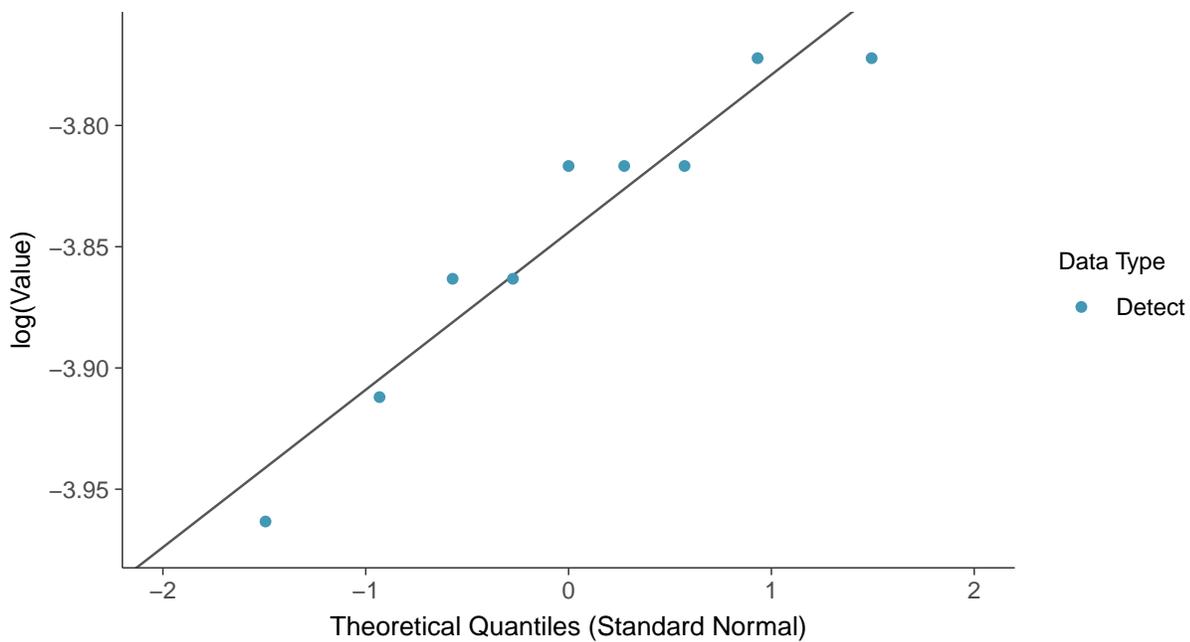
Normal Q-Q plot

Lithium, MW-16B (mg/L)



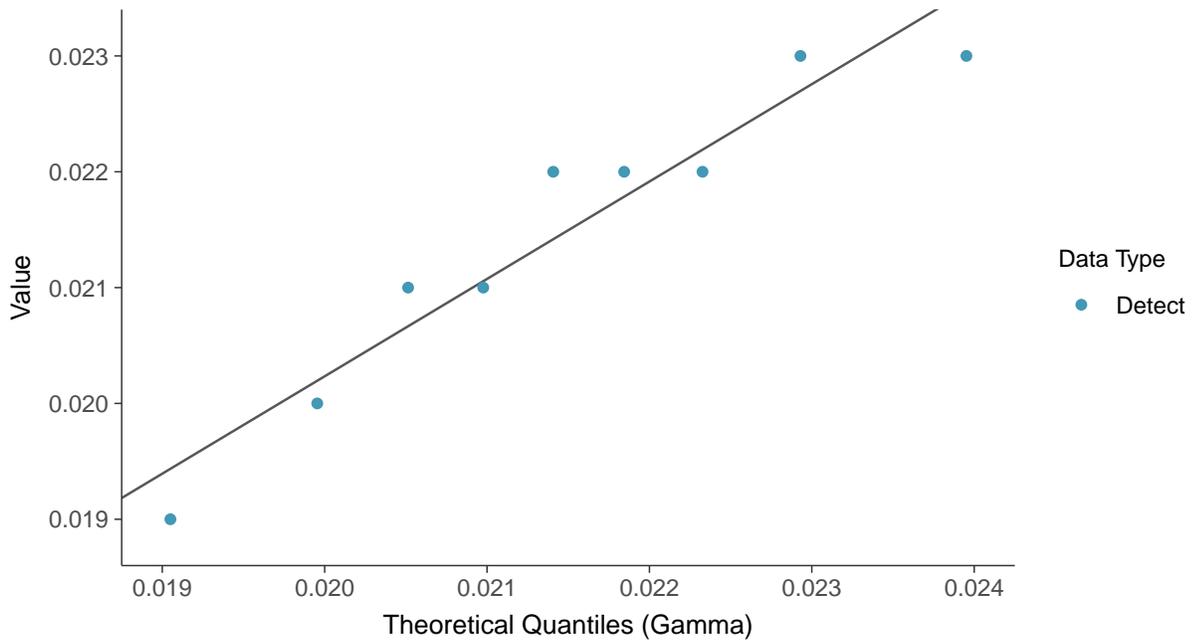
Lognormal Q-Q plot

Lithium, MW-16B (mg/L)

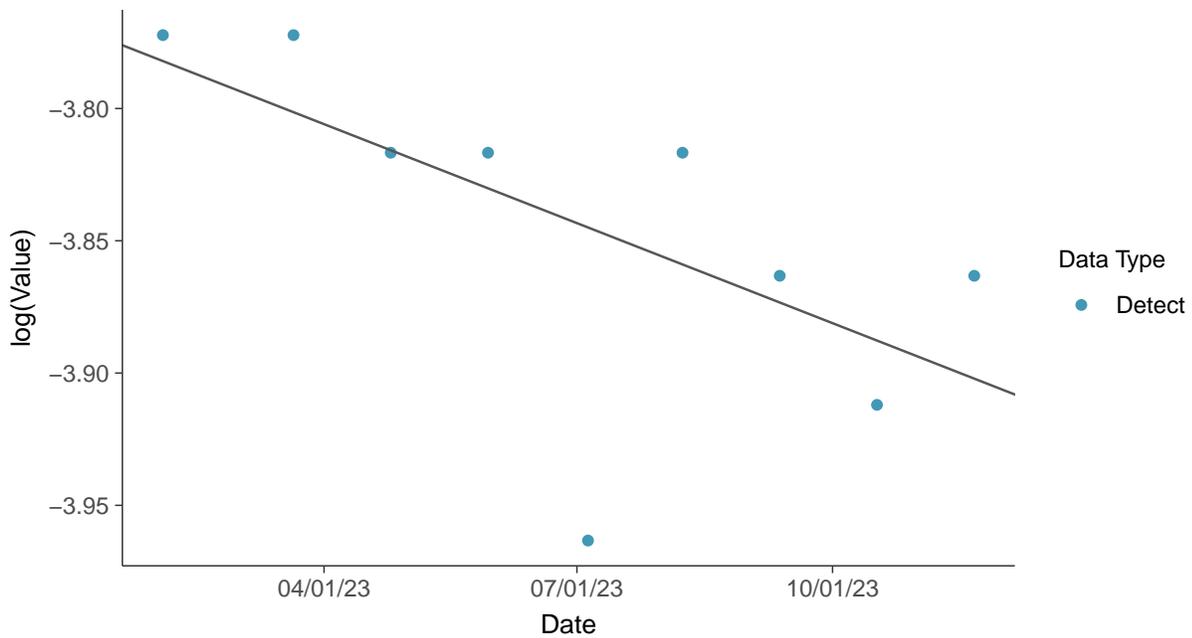




Gamma Q-Q plot
Lithium, MW-16B (mg/L)



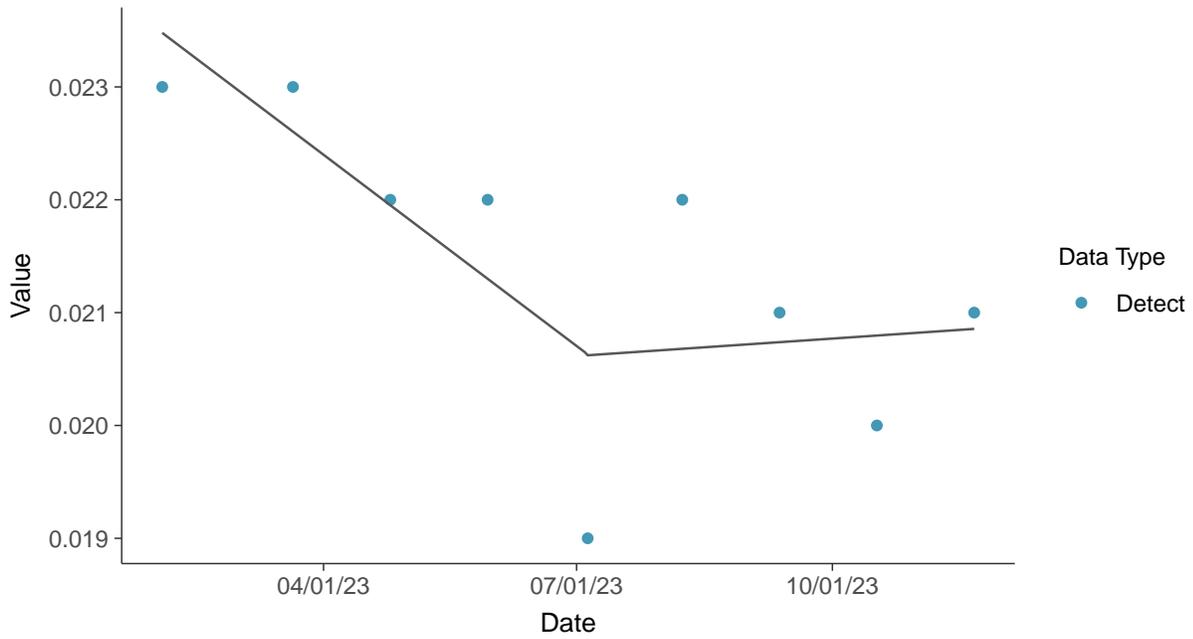
Trend Regression: Lognormal MLE
Lithium, MW-16B (mg/L)





Trend Regression: Piecewise Linear-Linear

Lithium, MW-16B (mg/L)



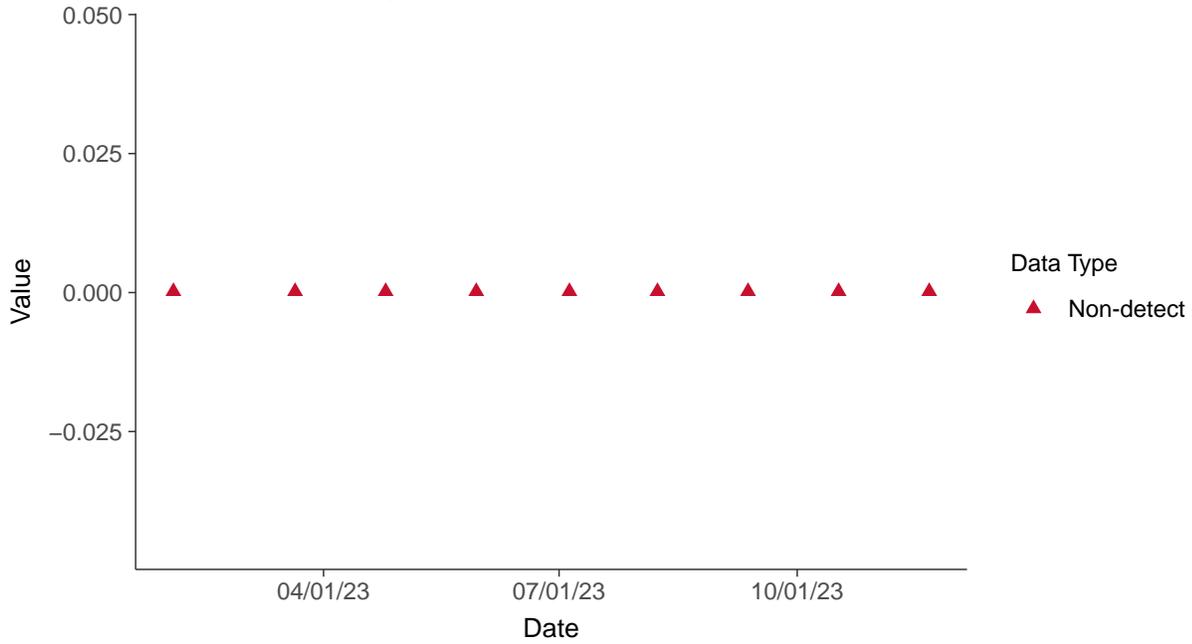


Appendix IV: Mercury, MW-16B

ID: 16B_2_17

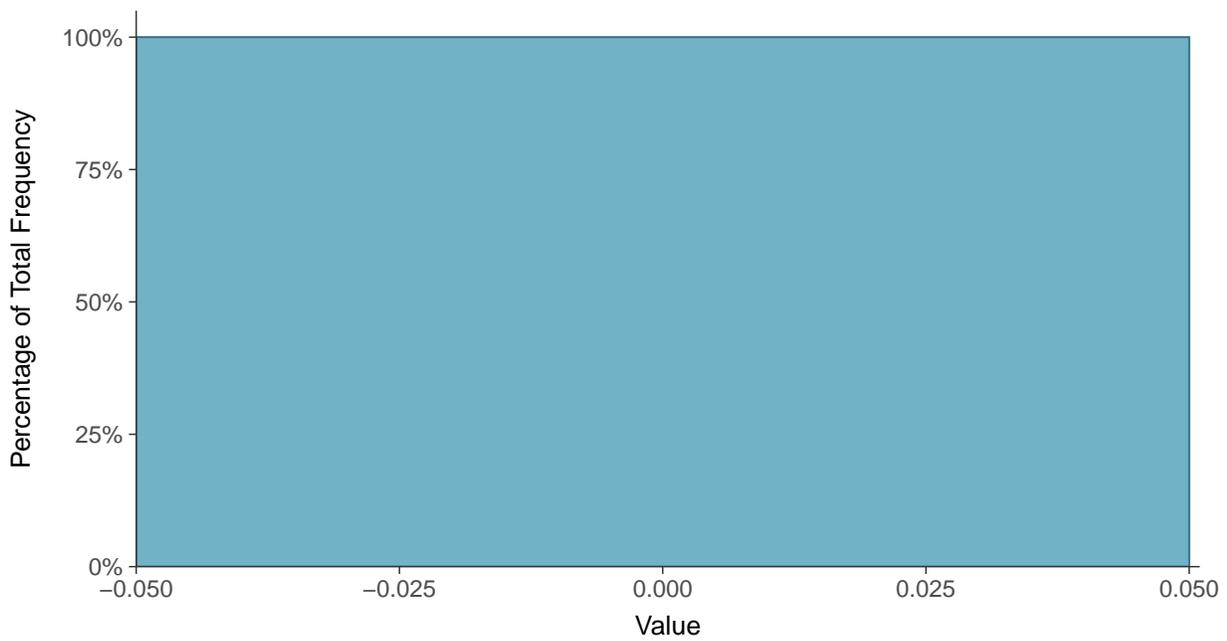
Scatter Plot

Mercury, MW-16B (mg/L)



Histogram

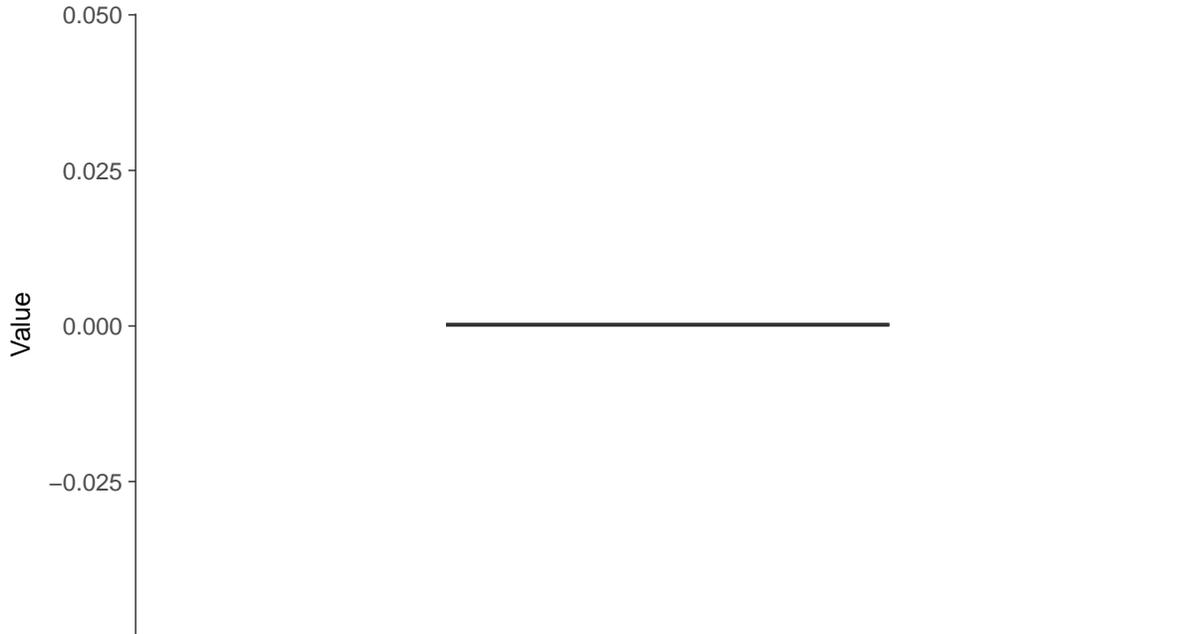
Mercury, MW-16B (mg/L)





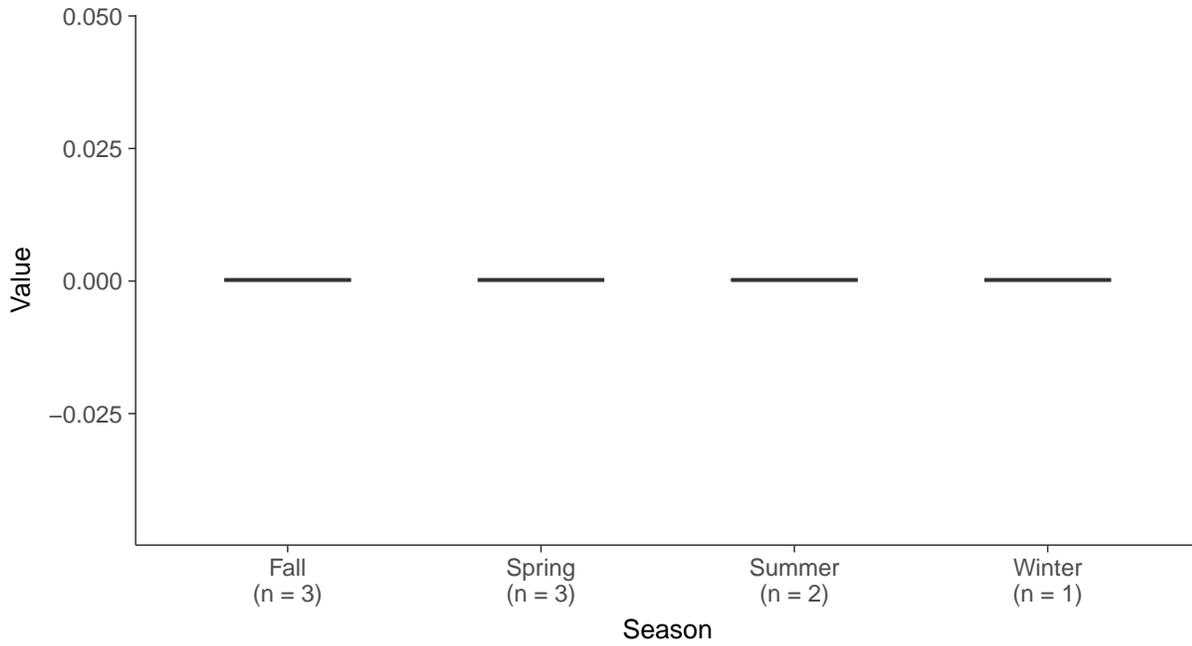
Boxplot

Mercury, MW-16B (mg/L)



Boxplot by Season

Mercury, MW-16B (mg/L)



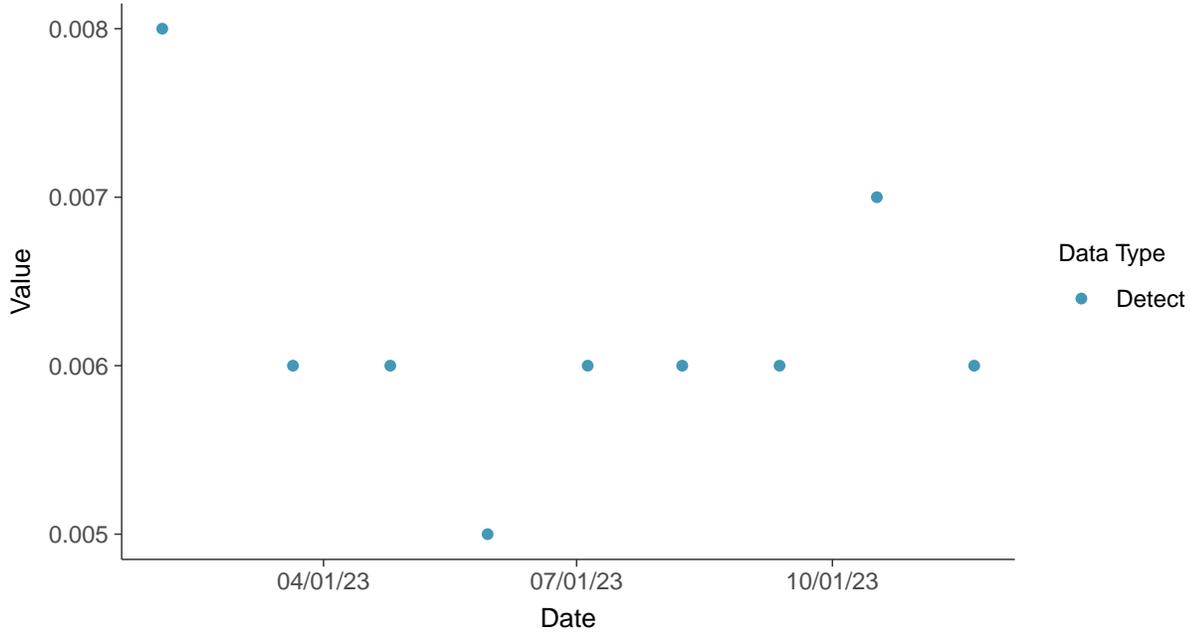


Appendix IV: Molybdenum, MW-16B

ID: 16B_2_18

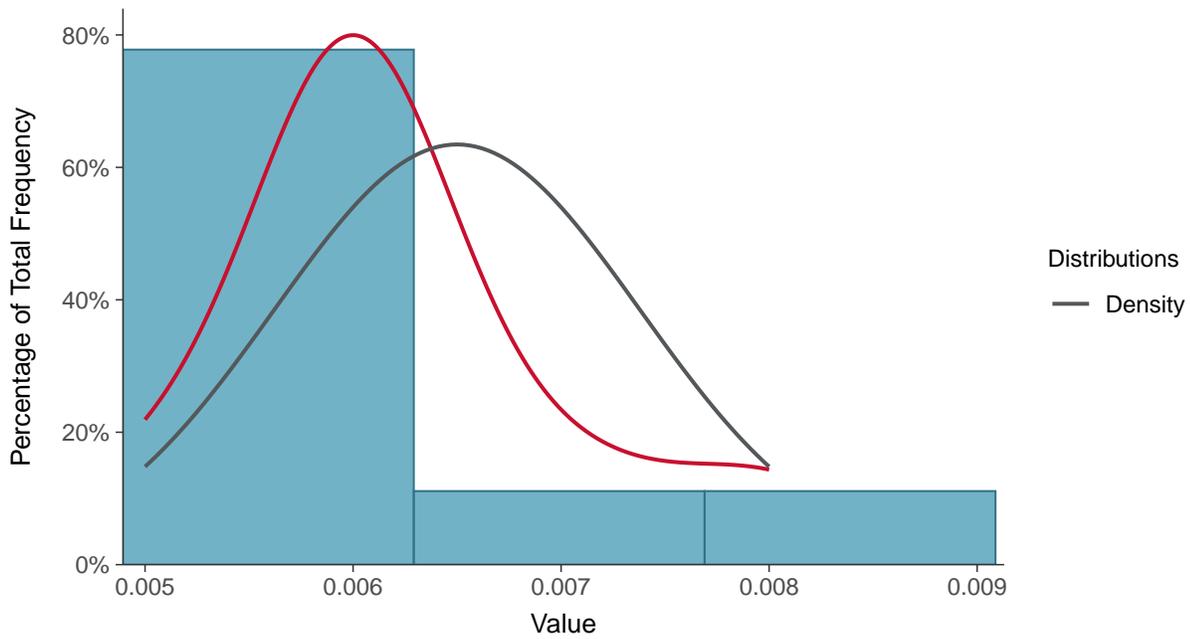
Scatter Plot

Molybdenum, MW-16B (mg/L)



Histogram

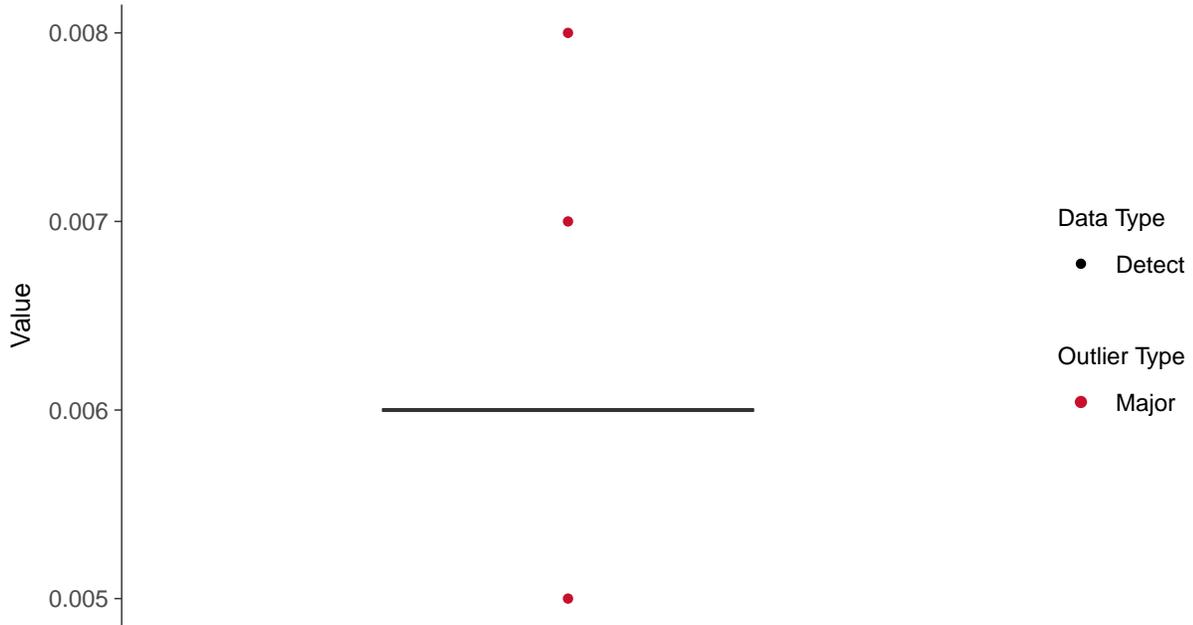
Molybdenum, MW-16B (mg/L)





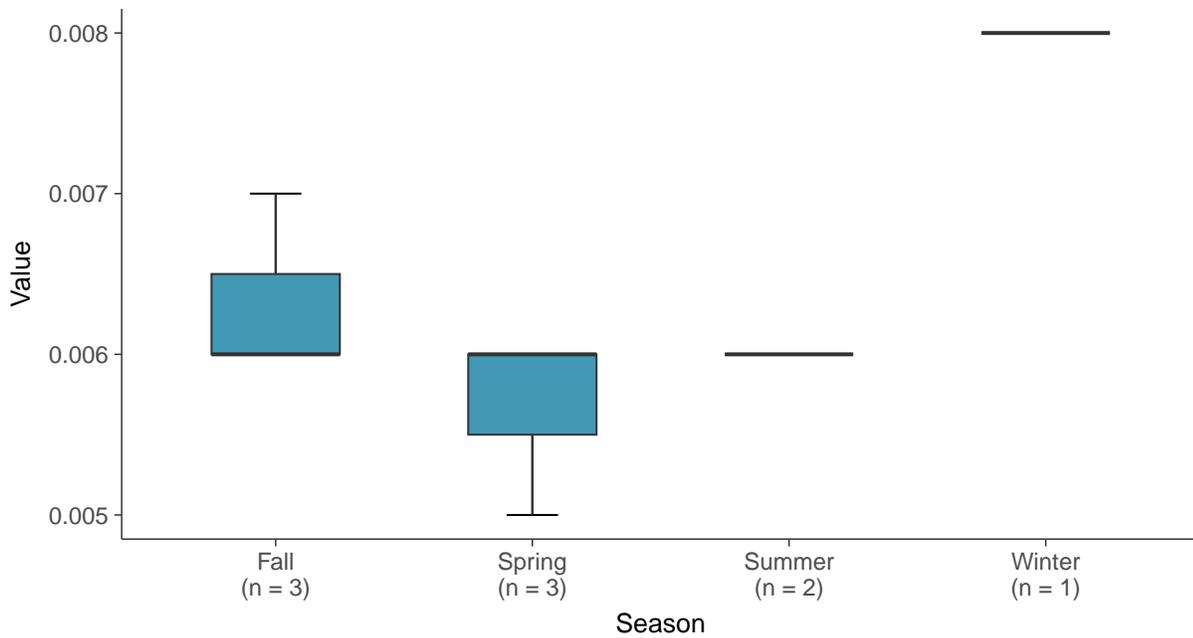
Boxplot

Molybdenum, MW-16B (mg/L)



Boxplot by Season

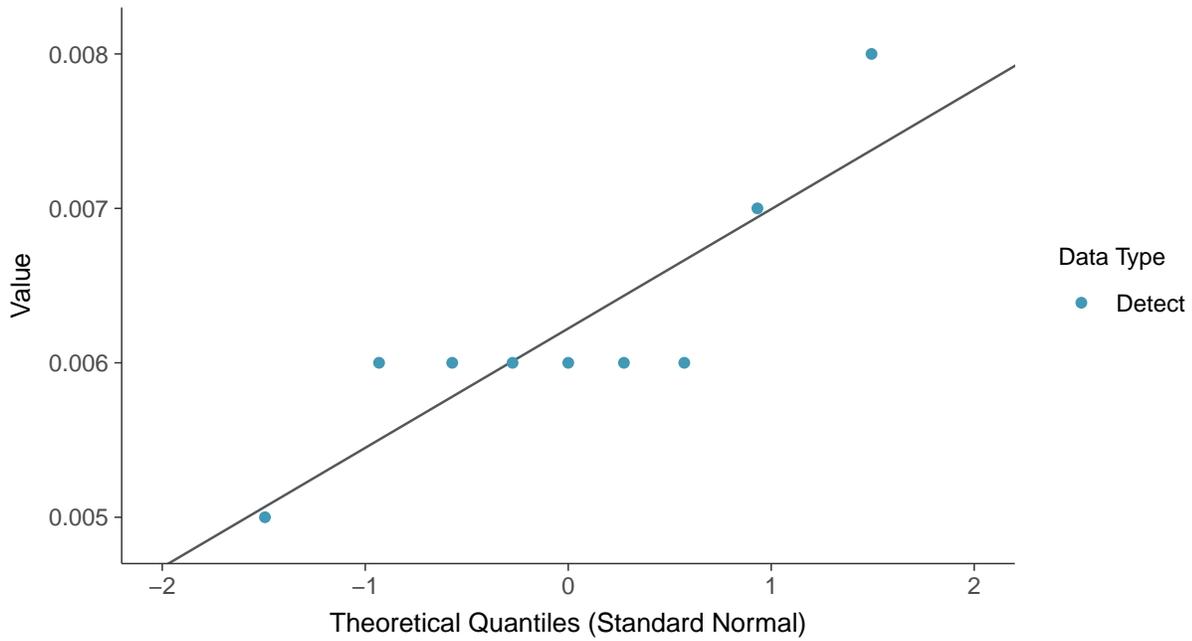
Molybdenum, MW-16B (mg/L)





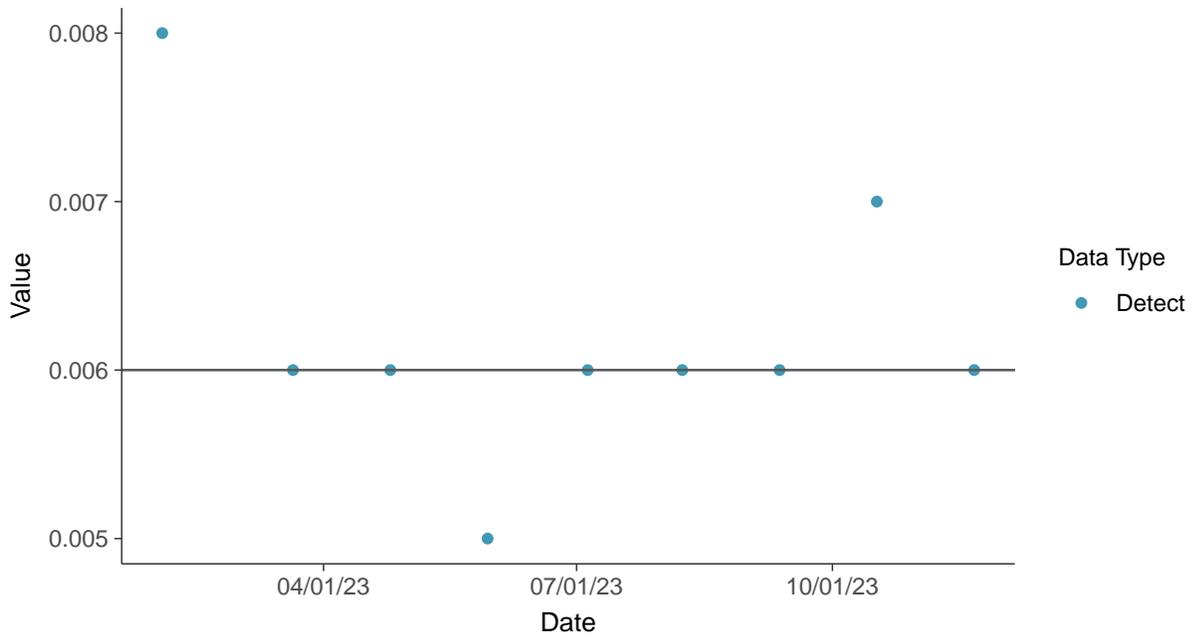
Normal Q-Q plot

Molybdenum, MW-16B (mg/L)



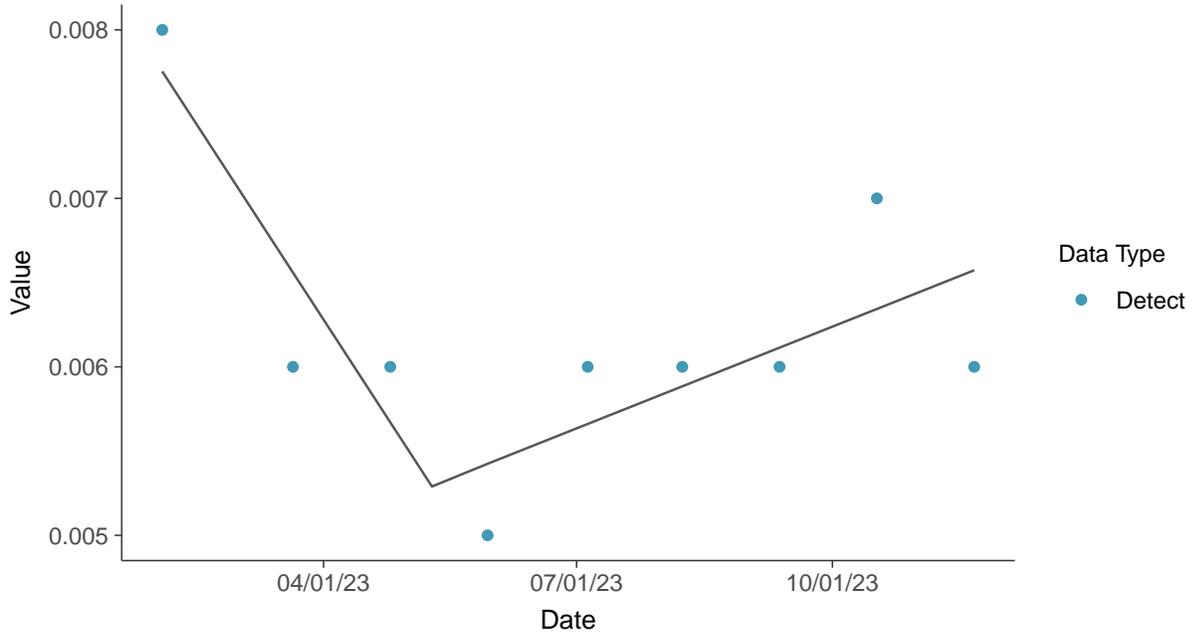
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Molybdenum, MW-16B (mg/L)





Trend Regression: Piecewise Linear-Linear
Molybdenum, MW-16B (mg/L)



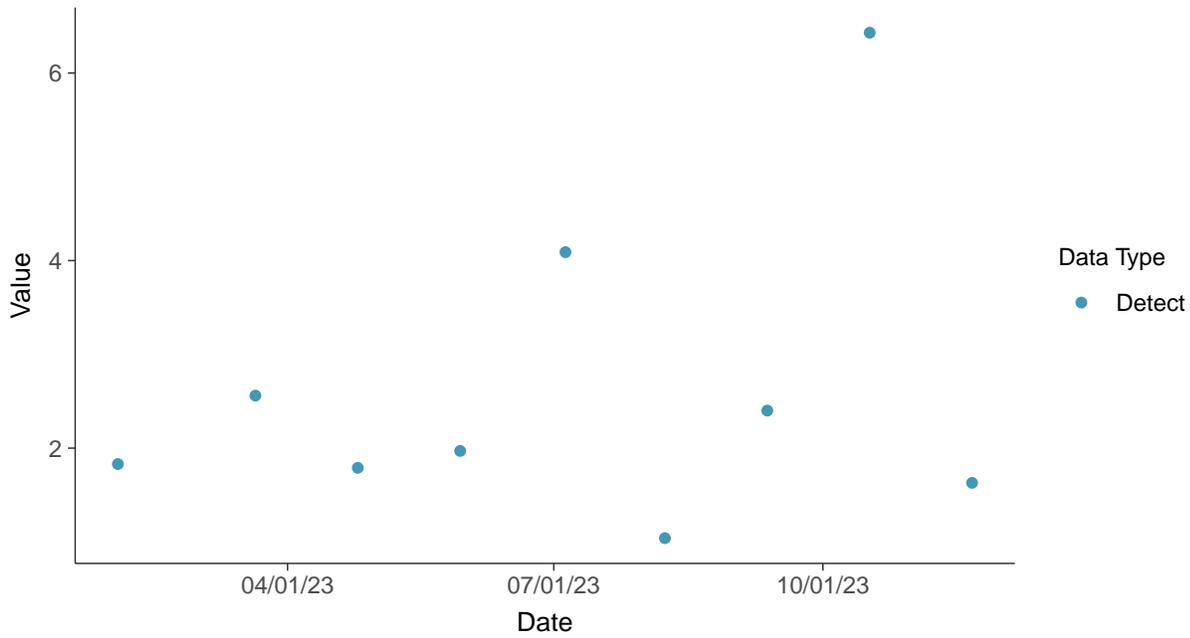


Appendix IV: Radium-226/228, MW-16B

ID: 16B_2_20

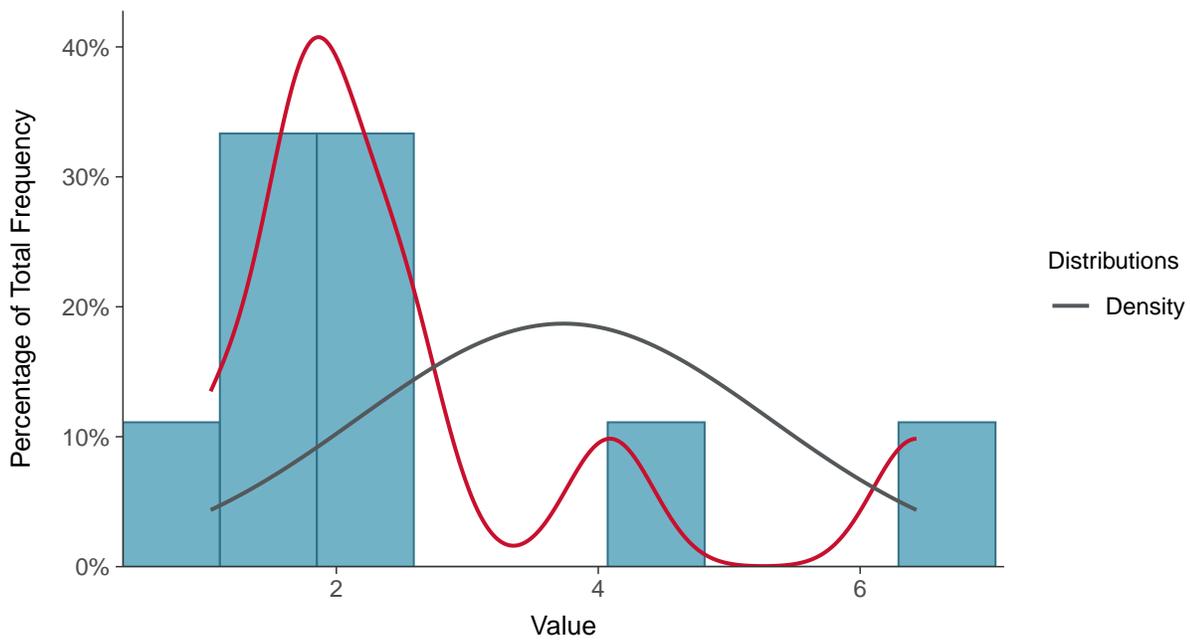
Scatter Plot

Radium-226/228, MW-16B (pCi/L)



Histogram

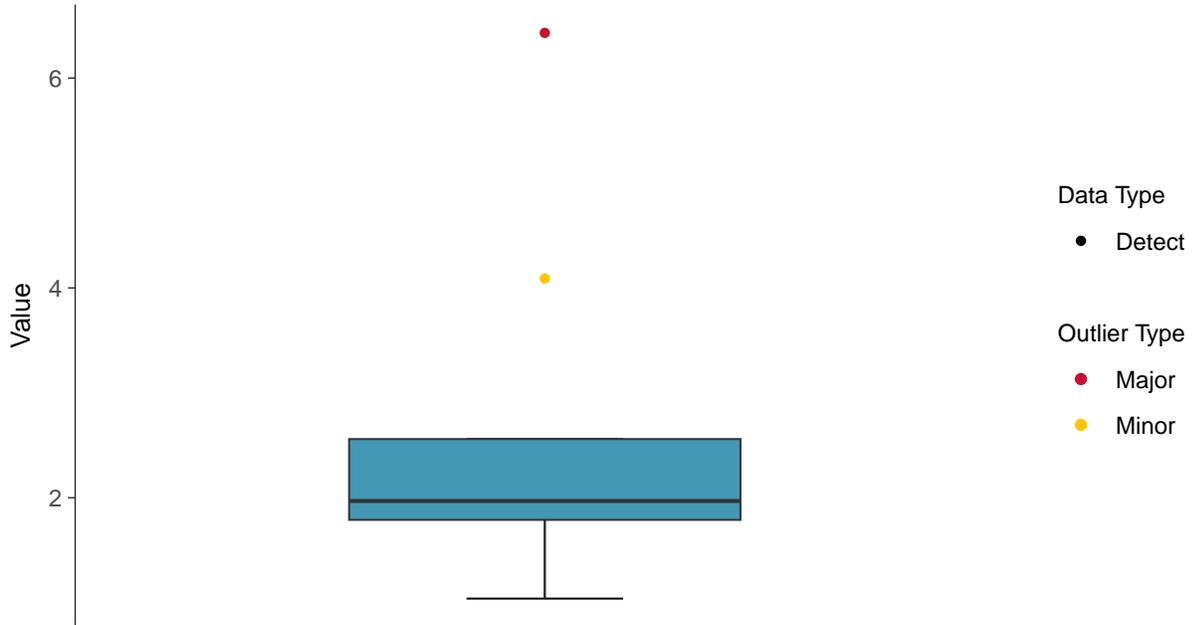
Radium-226/228, MW-16B (pCi/L)





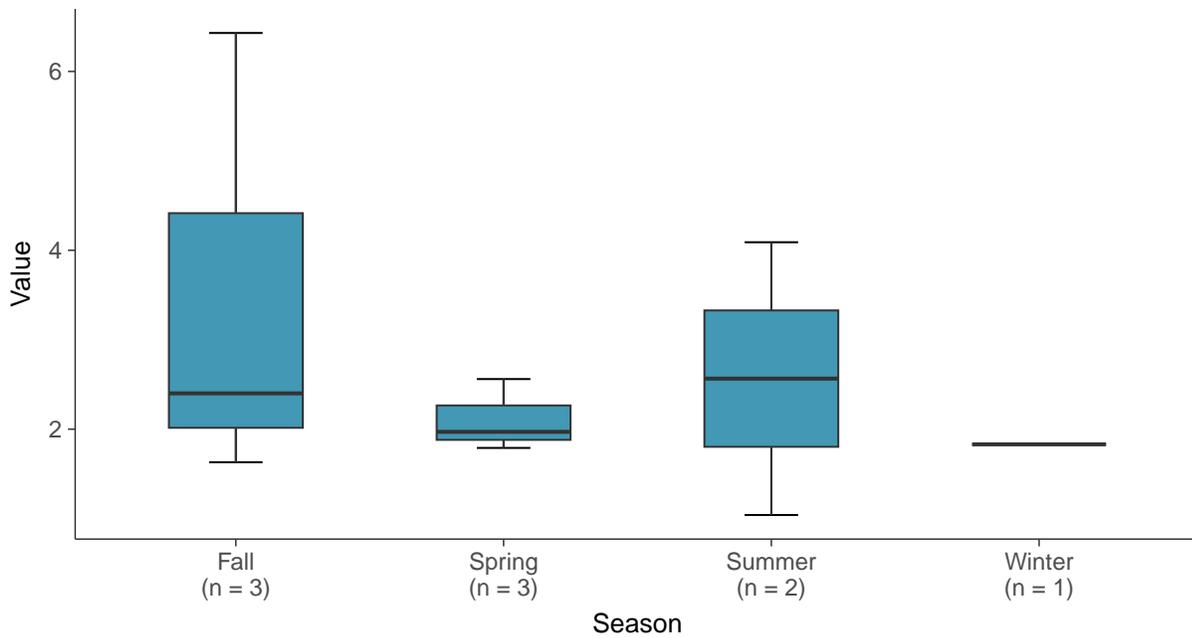
Boxplot

Radium-226/228, MW-16B (pCi/L)



Boxplot by Season

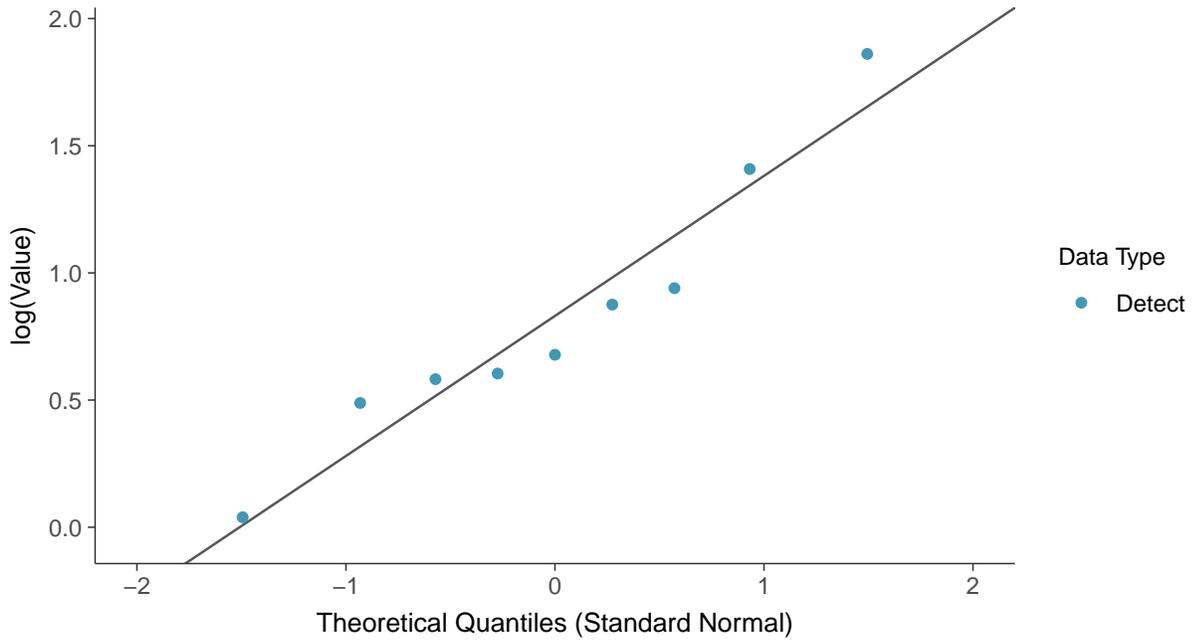
Radium-226/228, MW-16B (pCi/L)





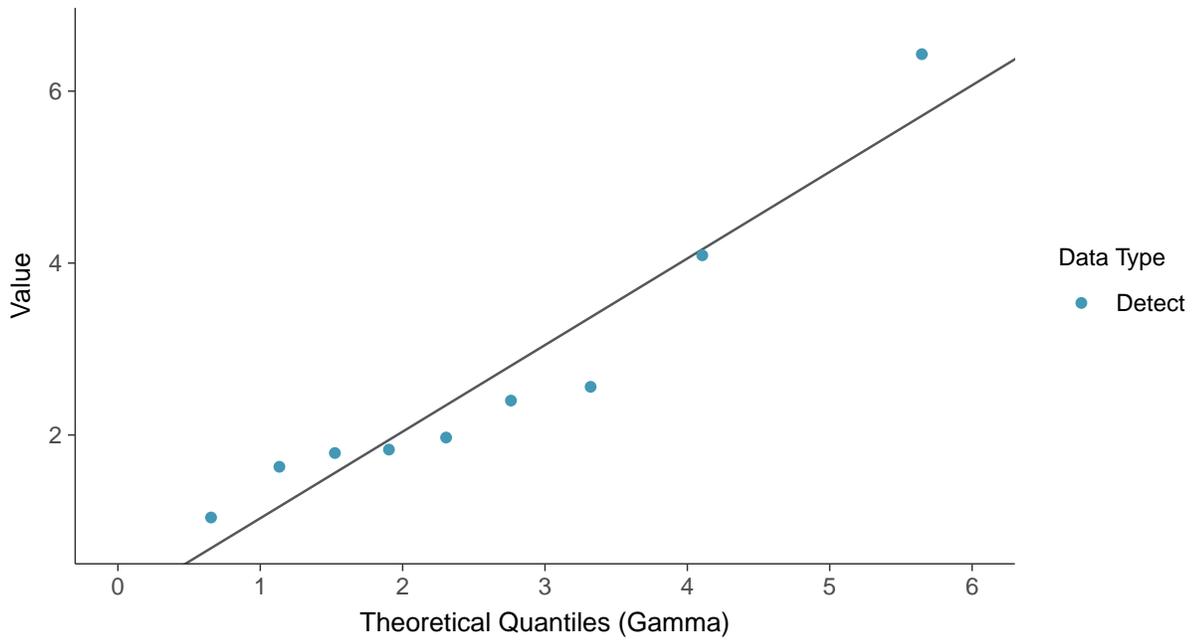
Lognormal Q-Q plot

Radium-226/228, MW-16B (pCi/L)



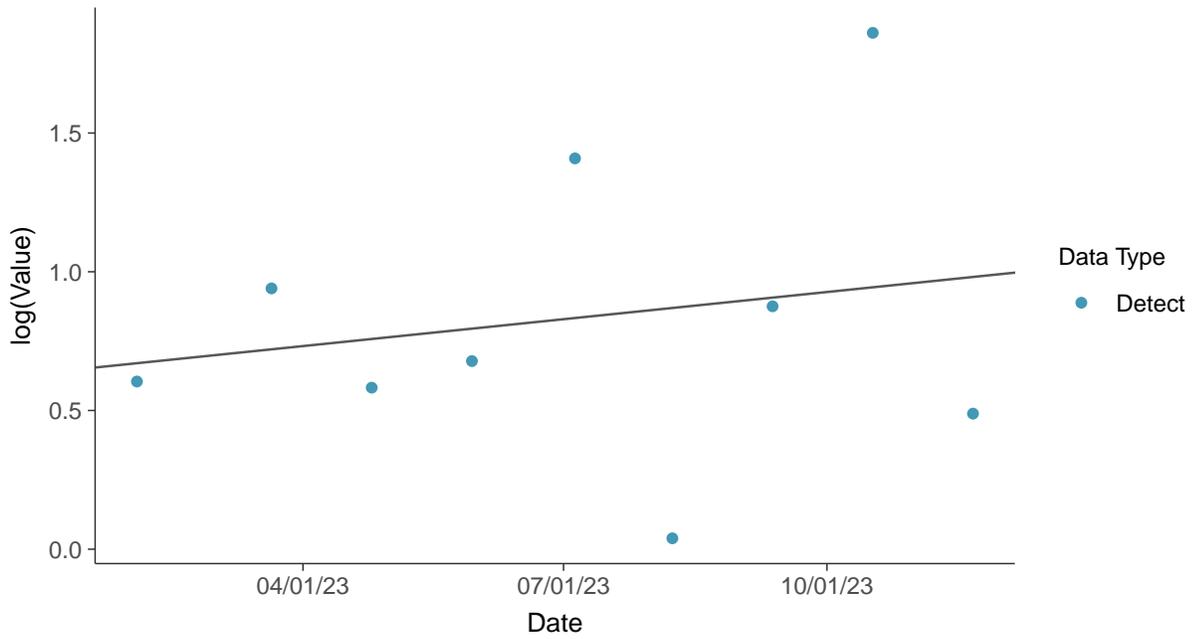
Gamma Q-Q plot

Radium-226/228, MW-16B (pCi/L)





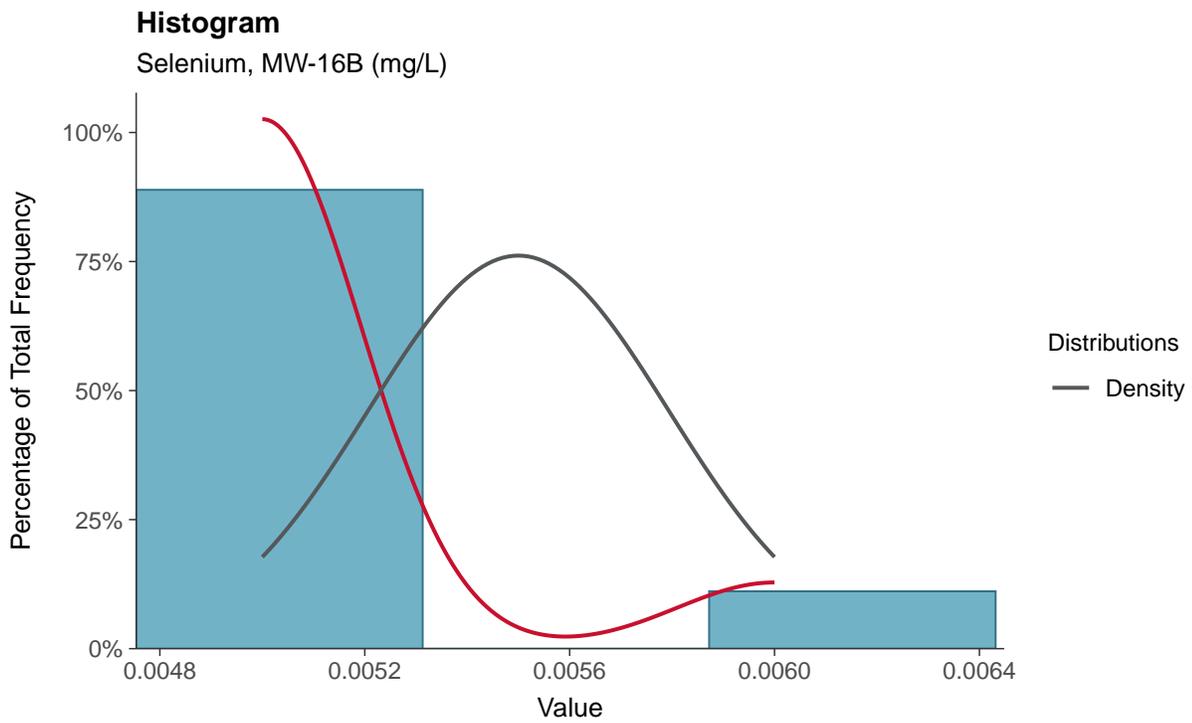
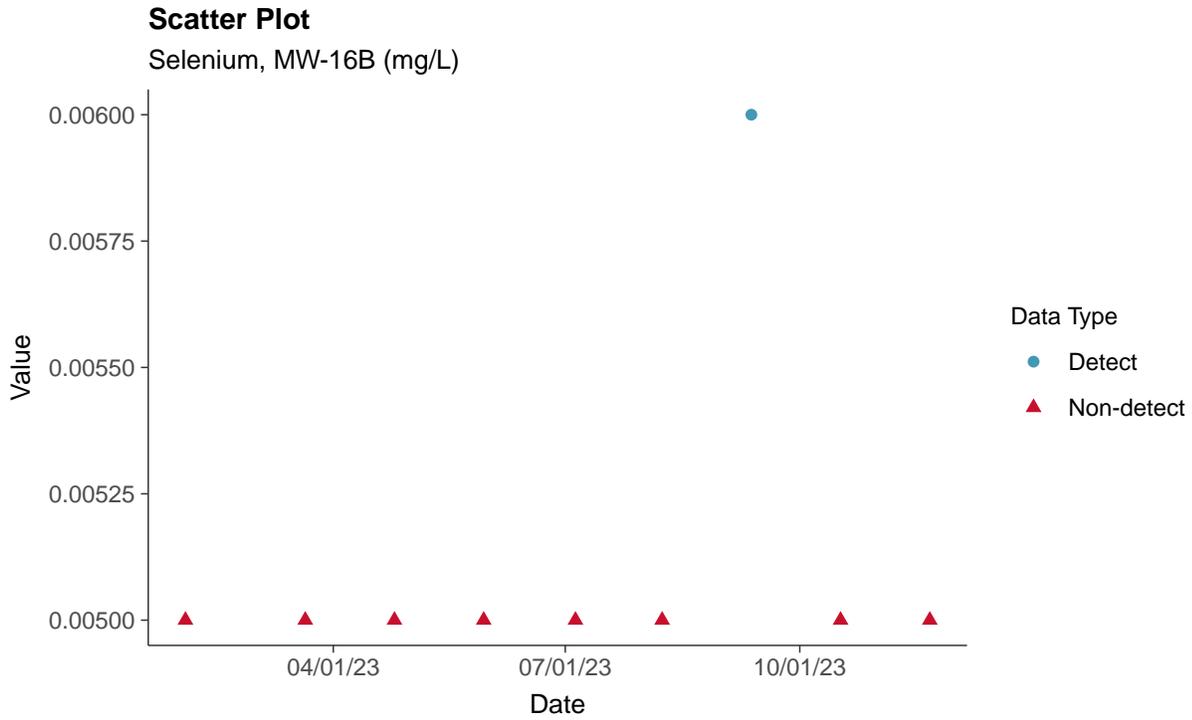
Trend Regression: Lognormal MLE
Radium-226/228, MW-16B (pCi/L)





Appendix IV: Selenium, MW-16B

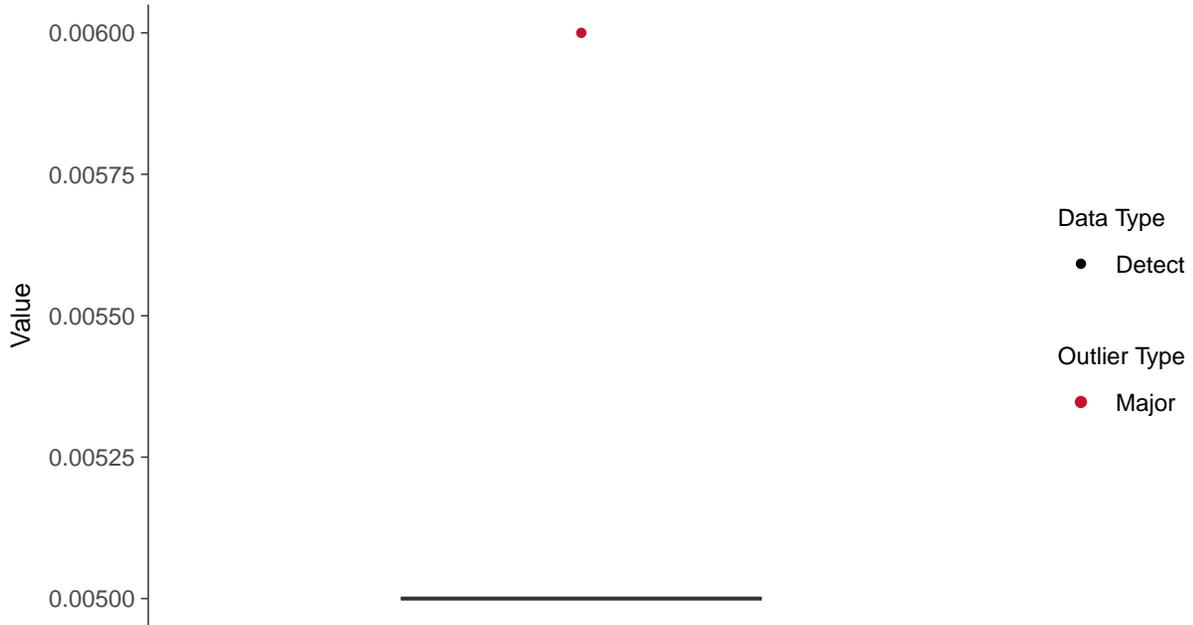
ID: 16B_2_22





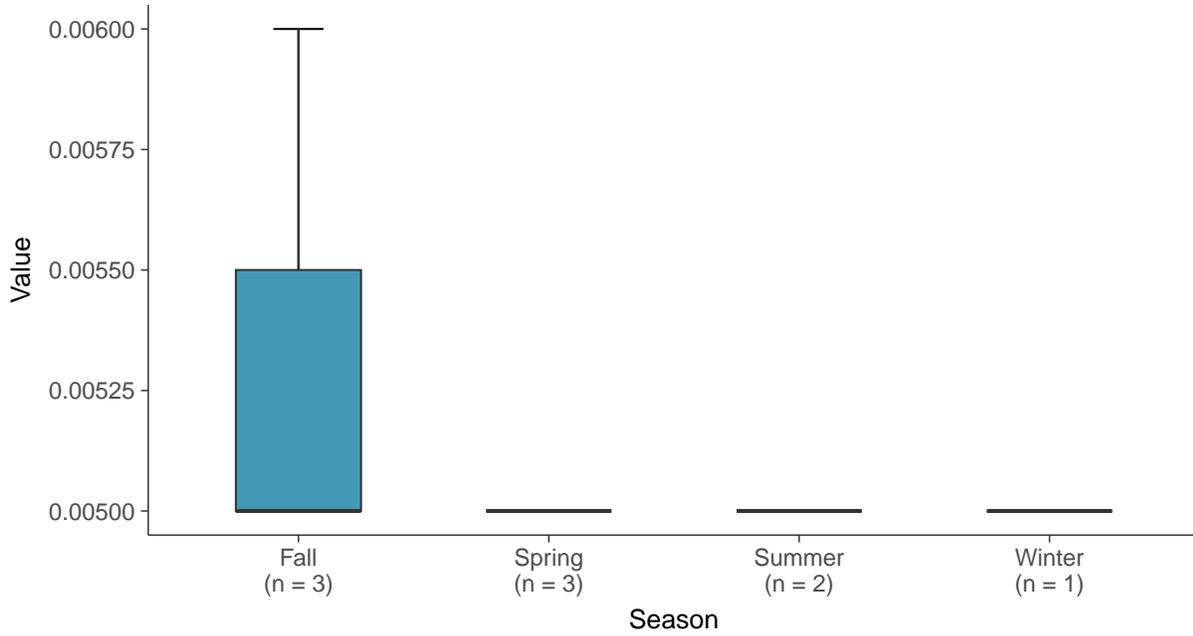
Boxplot

Selenium, MW-16B (mg/L)



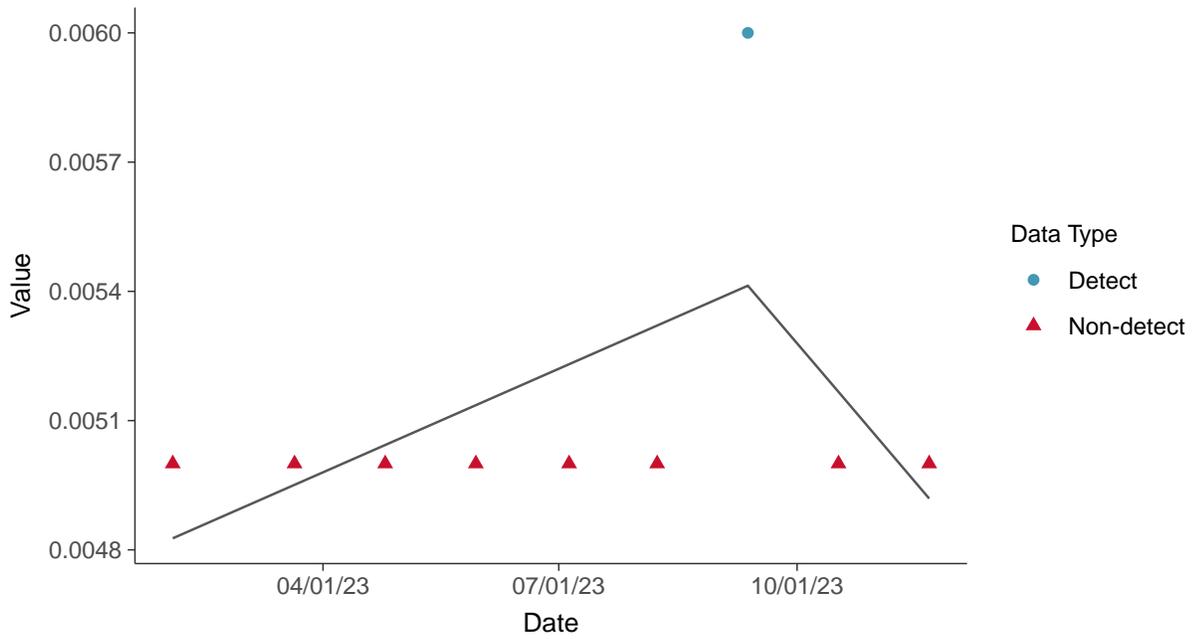
Boxplot by Season

Selenium, MW-16B (mg/L)

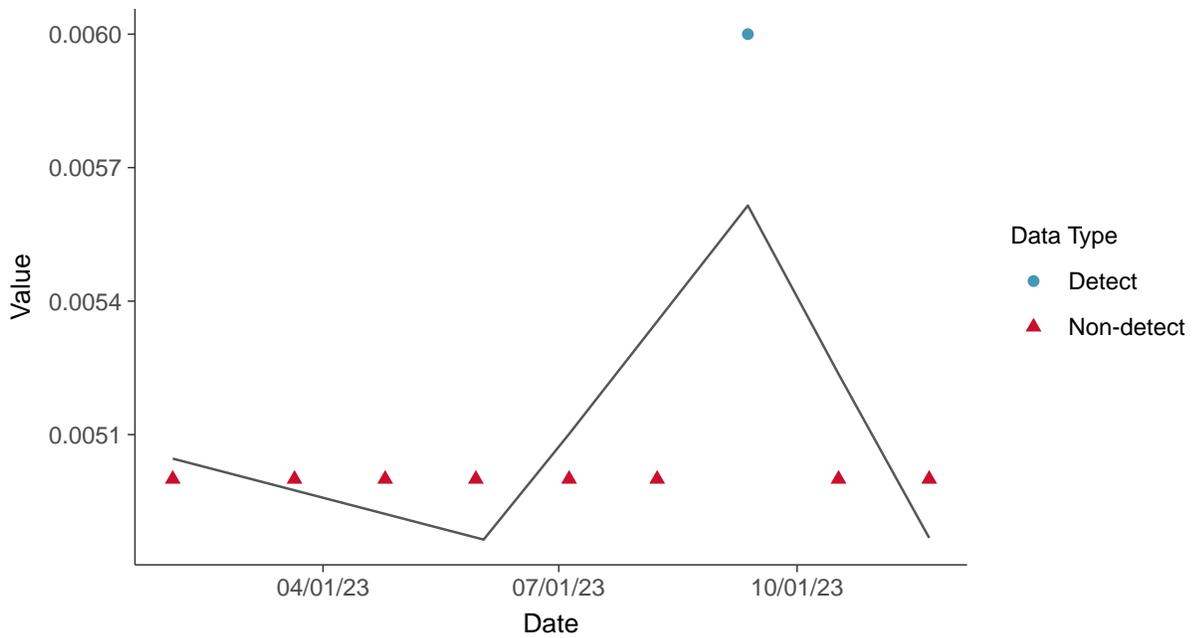




Trend Regression: Piecewise Linear-Linear
Selenium, MW-16B (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear
Selenium, MW-16B (mg/L)



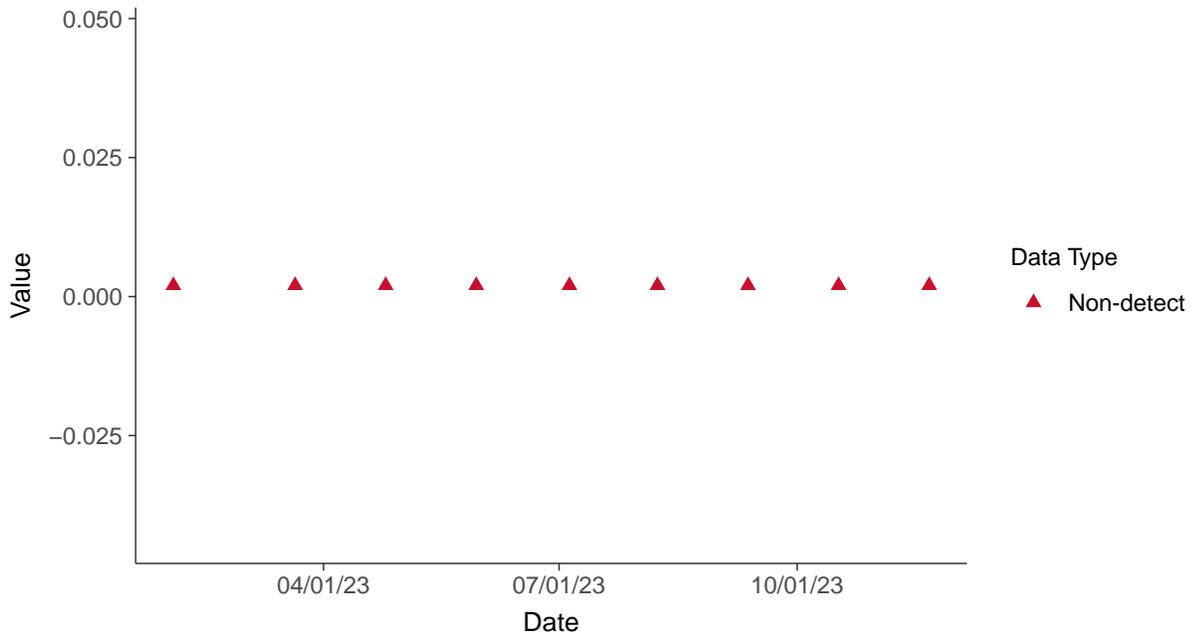


Appendix IV: Thallium, MW-16B

ID: 16B_2_23

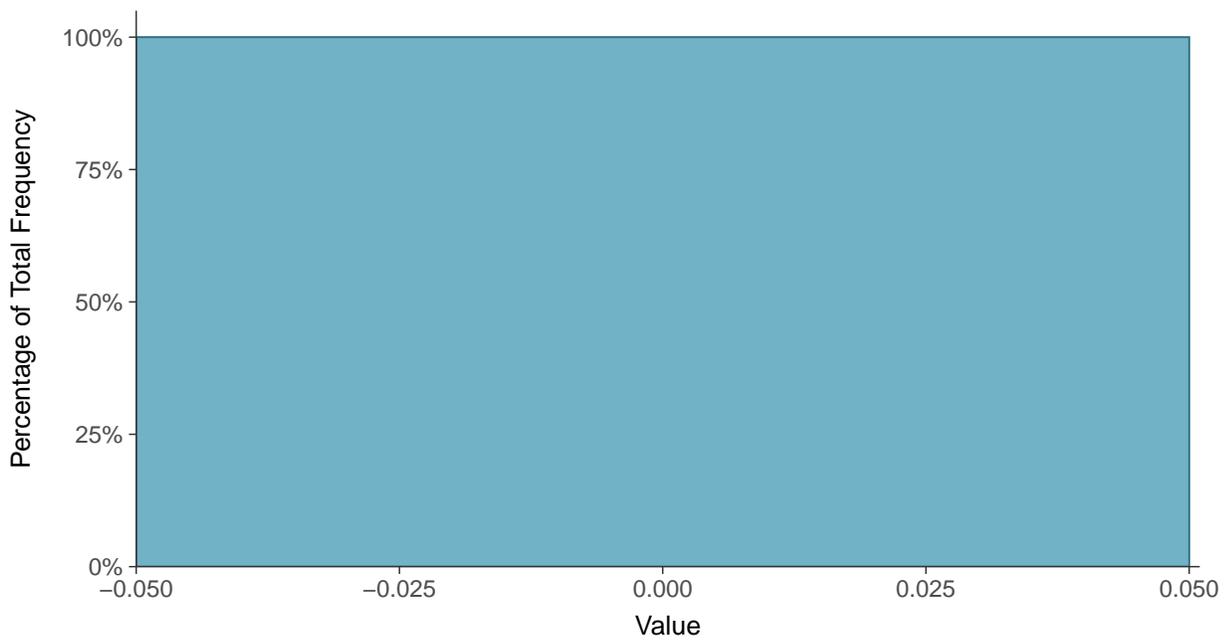
Scatter Plot

Thallium, MW-16B (mg/L)



Histogram

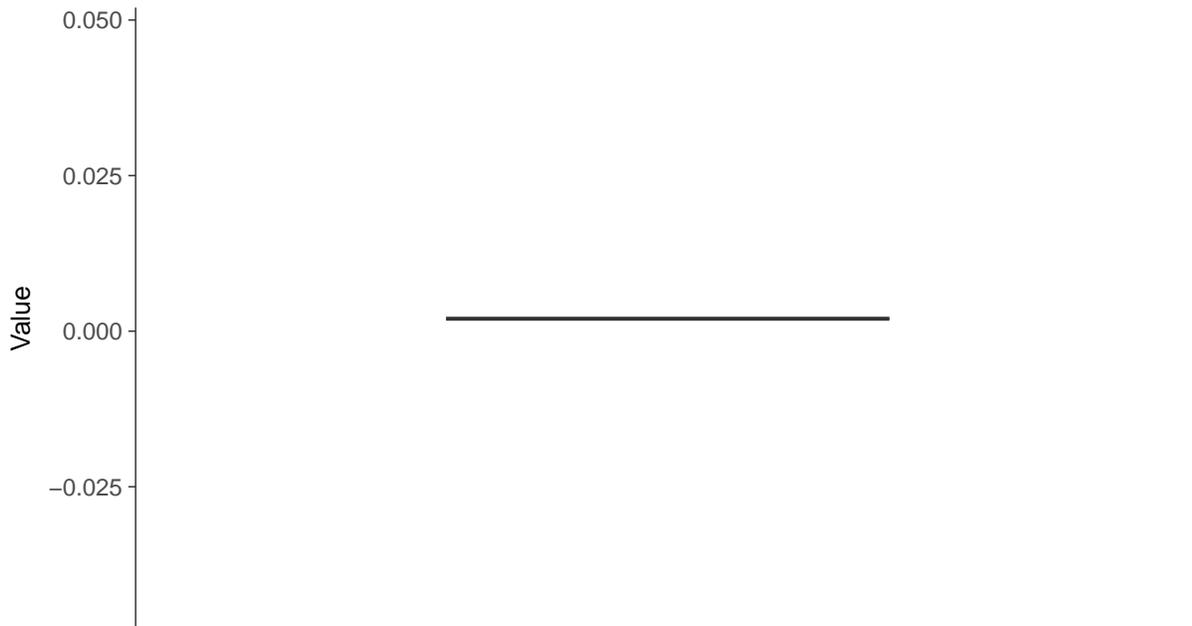
Thallium, MW-16B (mg/L)





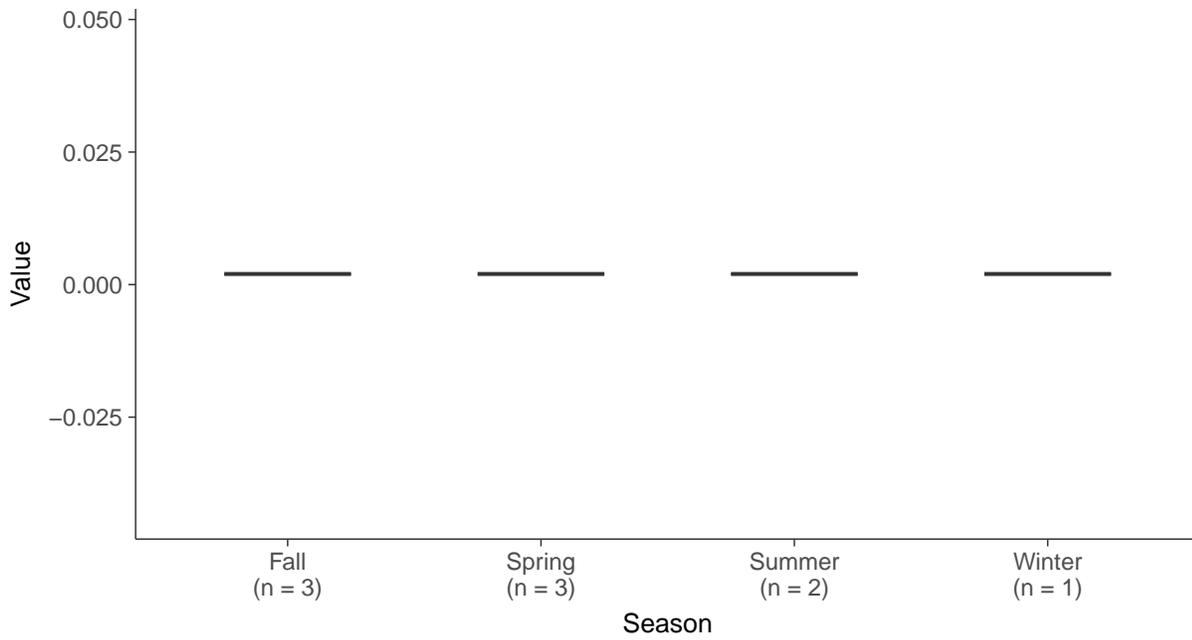
Boxplot

Thallium, MW-16B (mg/L)



Boxplot by Season

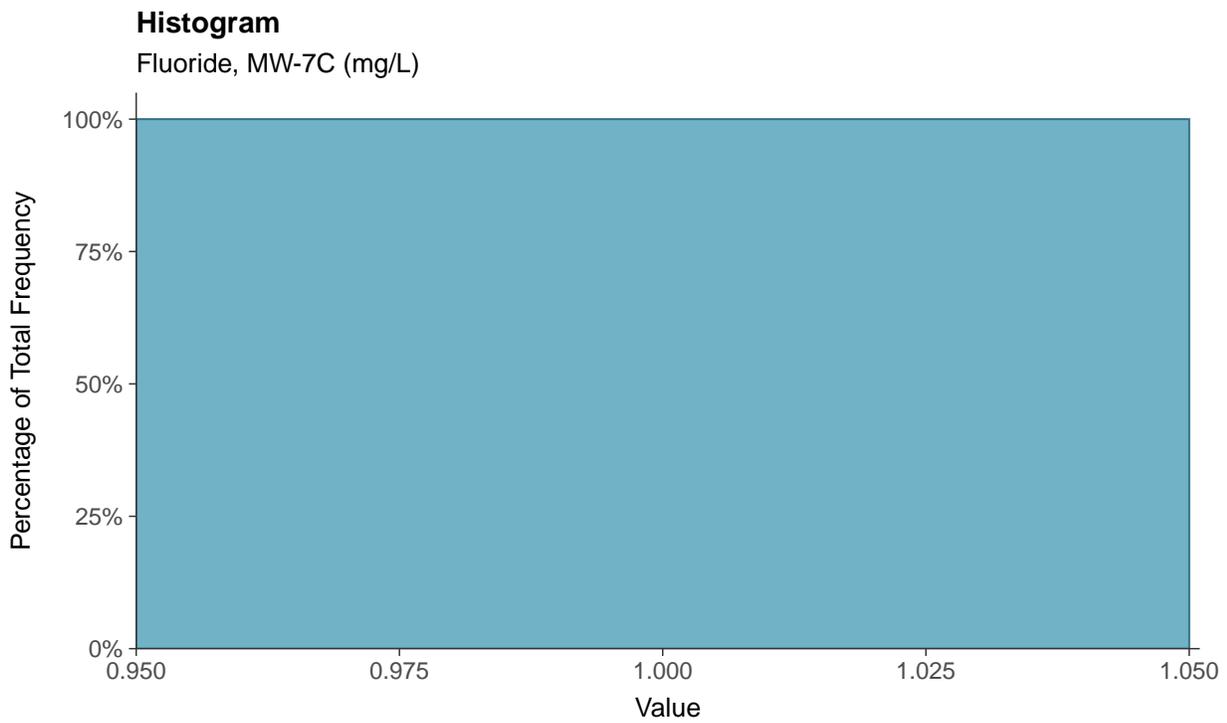
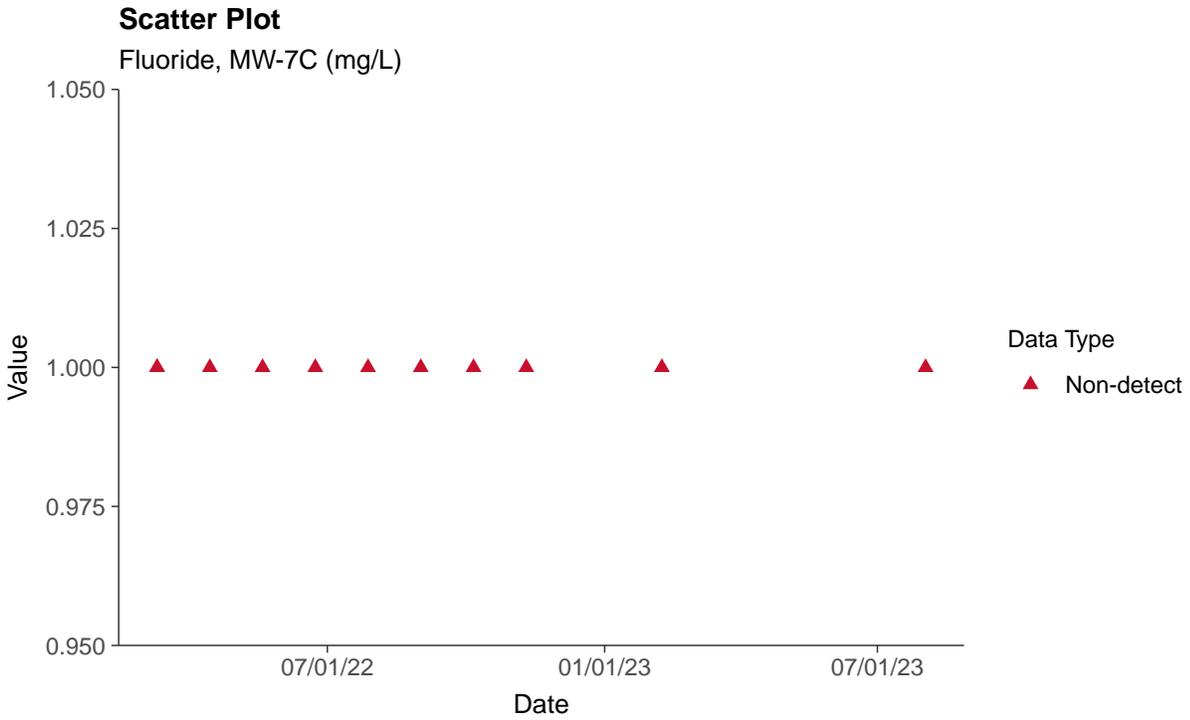
Thallium, MW-16B (mg/L)





Appendix IV: Fluoride, MW-7C

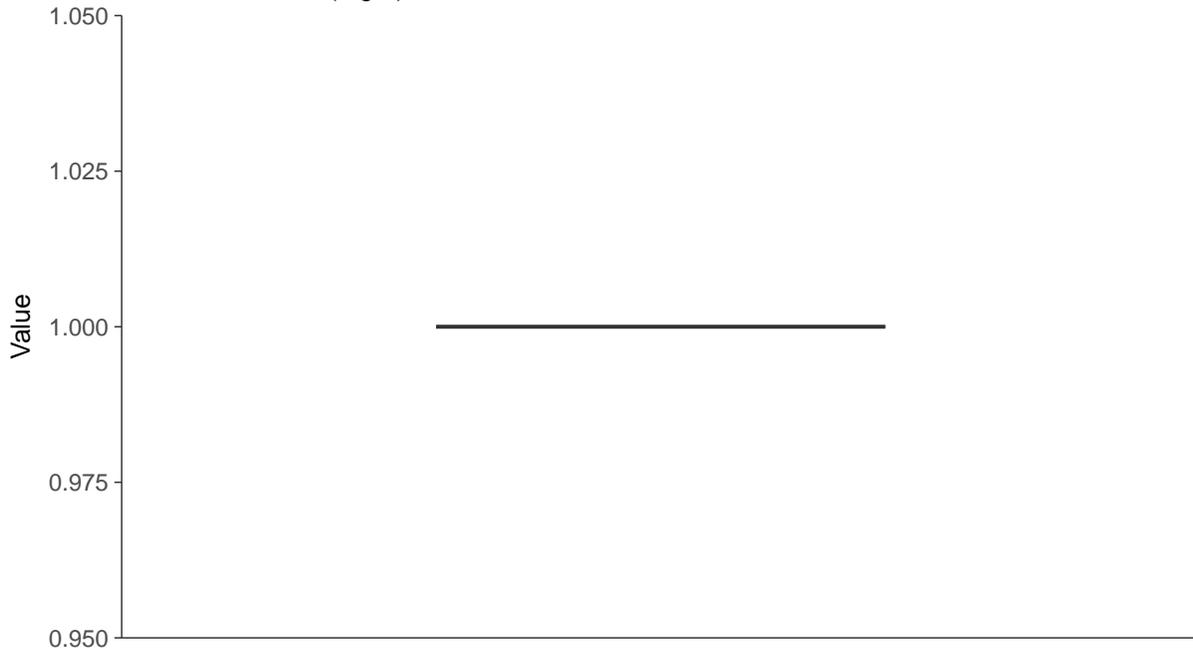
ID: 7C_2_04





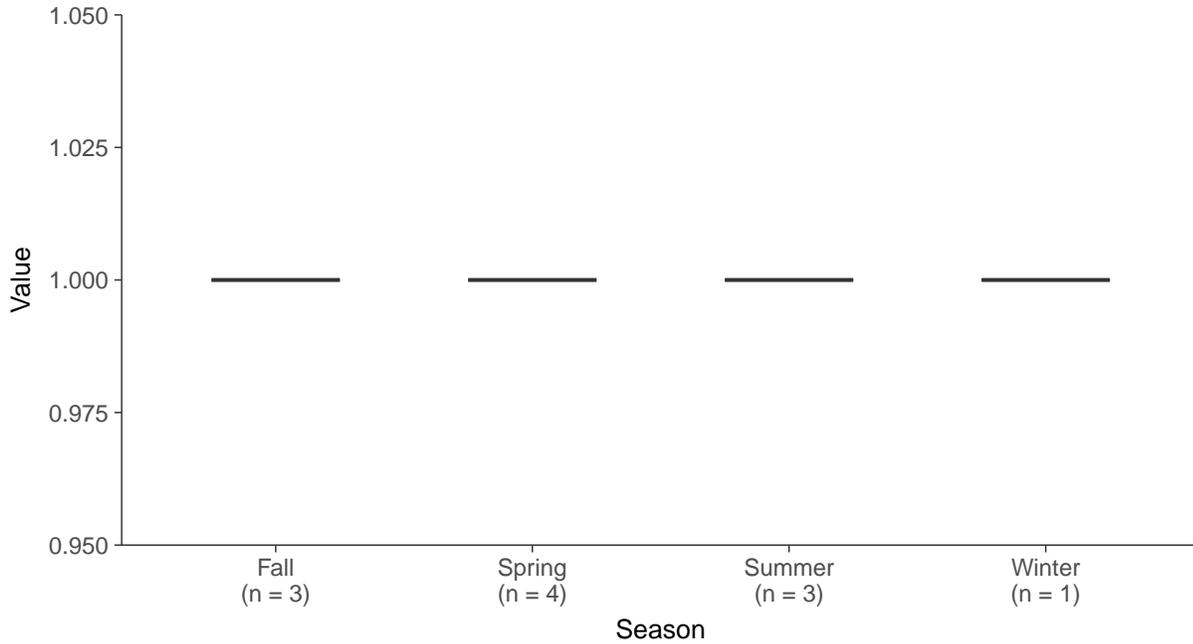
Boxplot

Fluoride, MW-7C (mg/L)



Boxplot by Season

Fluoride, MW-7C (mg/L)



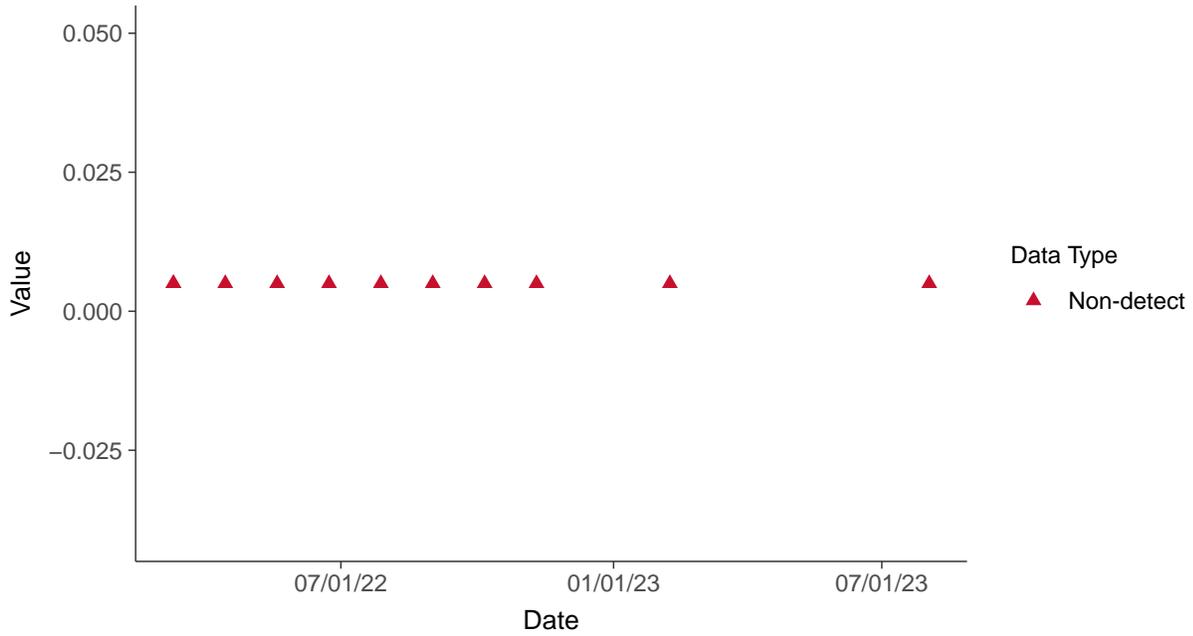


Appendix IV: Antimony, MW-7C

ID: 7C_2_08

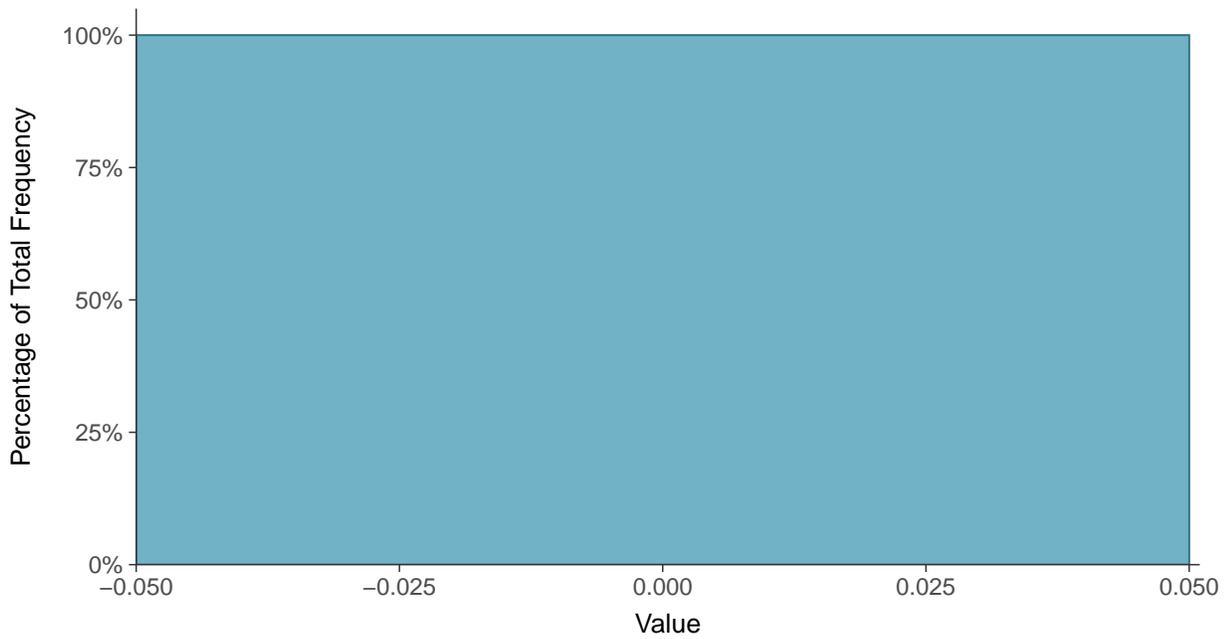
Scatter Plot

Antimony, MW-7C (mg/L)



Histogram

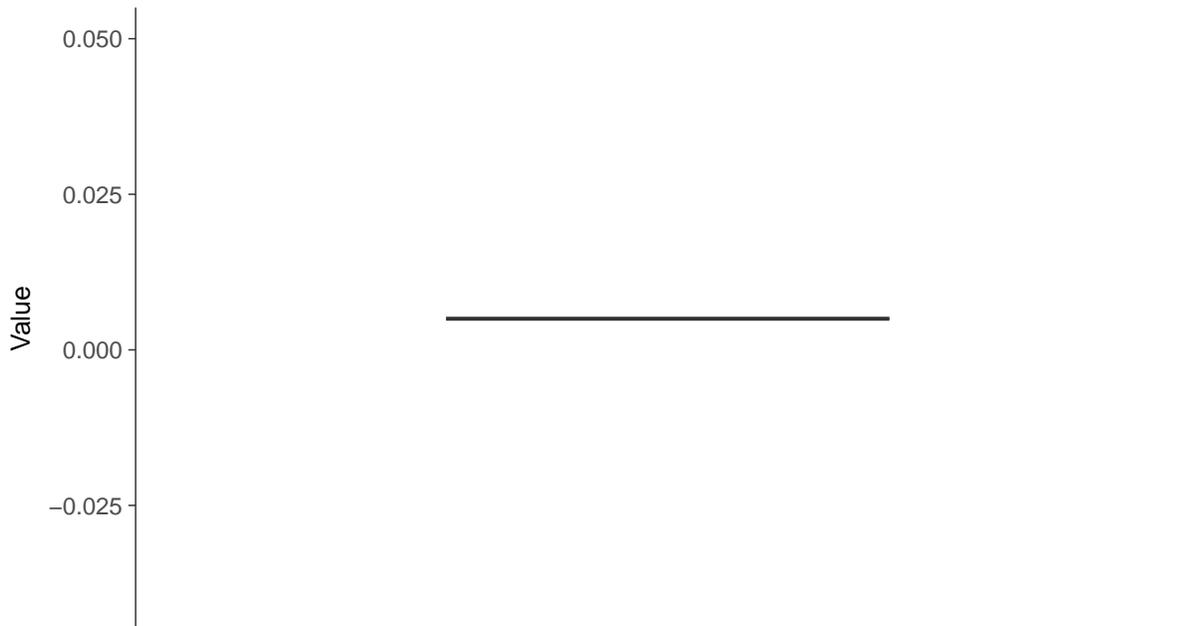
Antimony, MW-7C (mg/L)





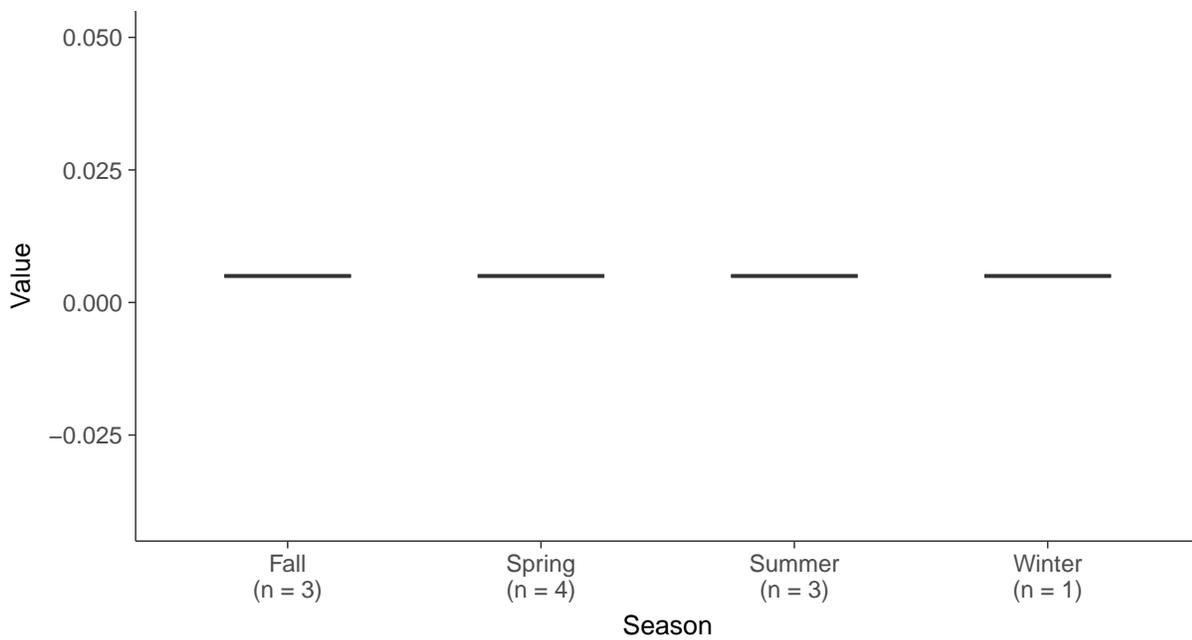
Boxplot

Antimony, MW-7C (mg/L)



Boxplot by Season

Antimony, MW-7C (mg/L)



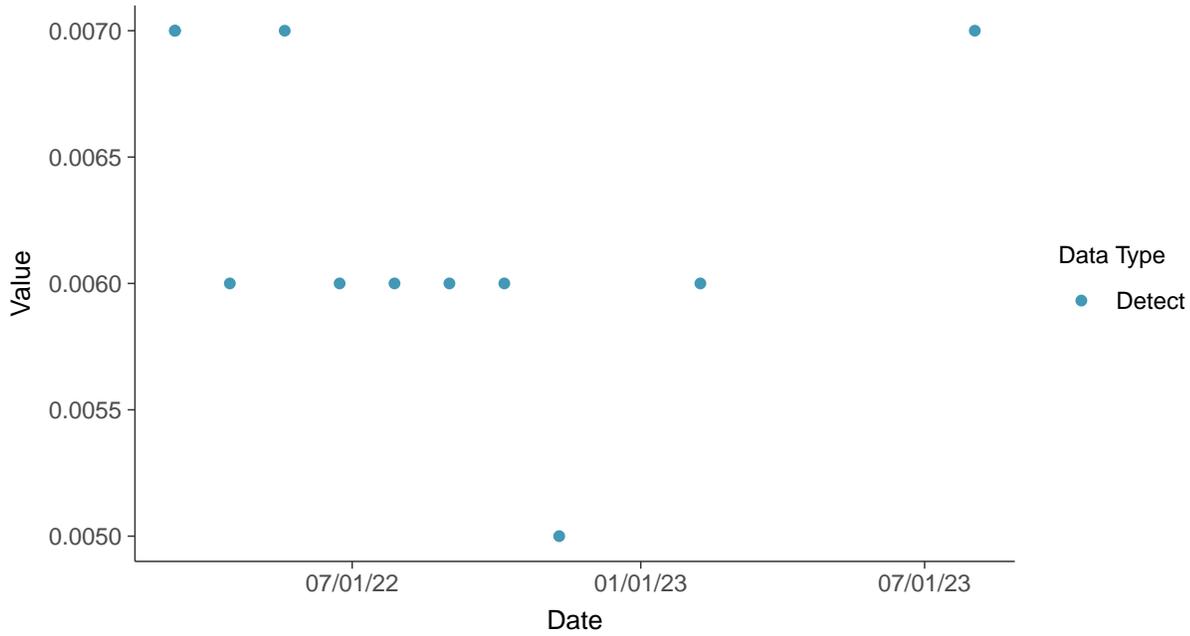


Appendix IV: Arsenic, MW-7C

ID: 7C_2_09

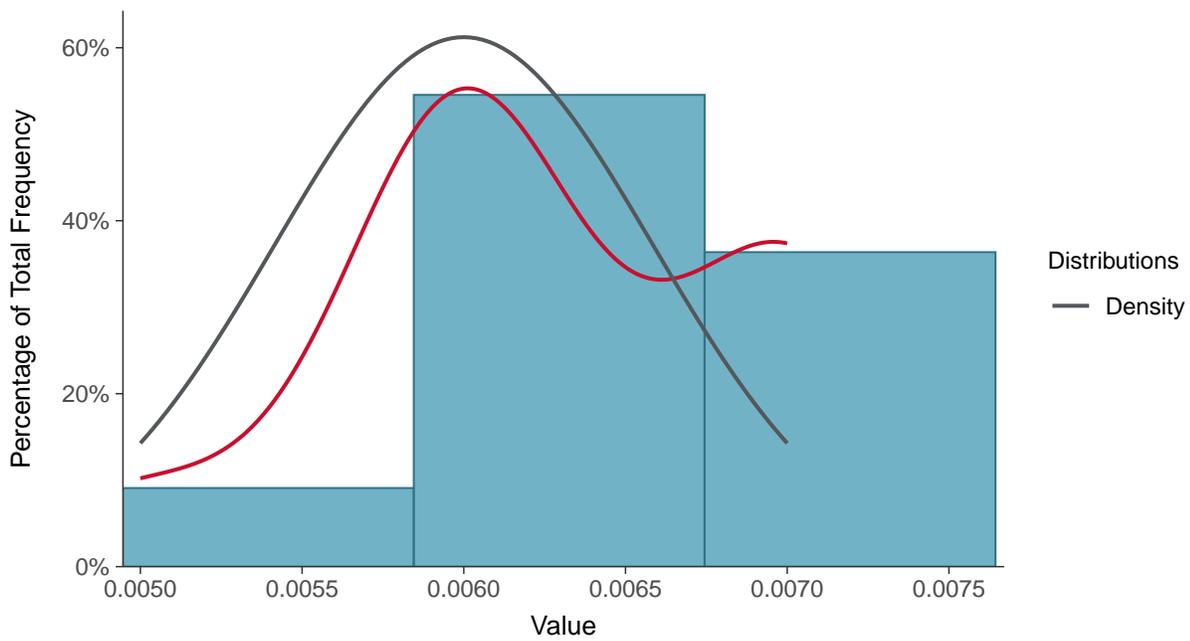
Scatter Plot

Arsenic, MW-7C (mg/L)



Histogram

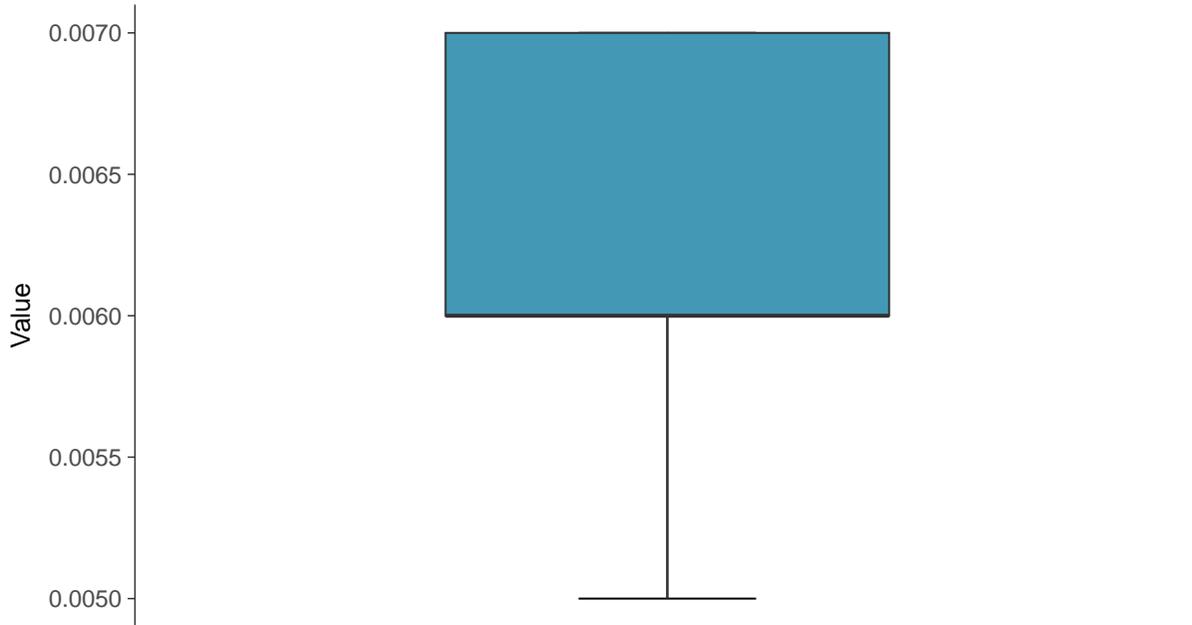
Arsenic, MW-7C (mg/L)





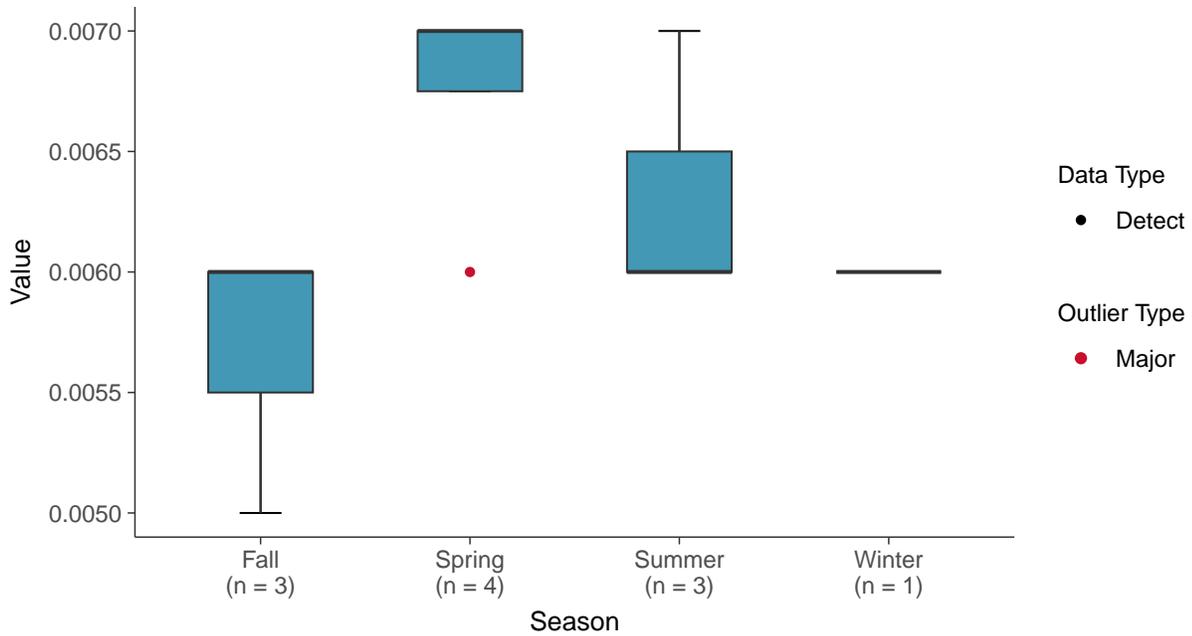
Boxplot

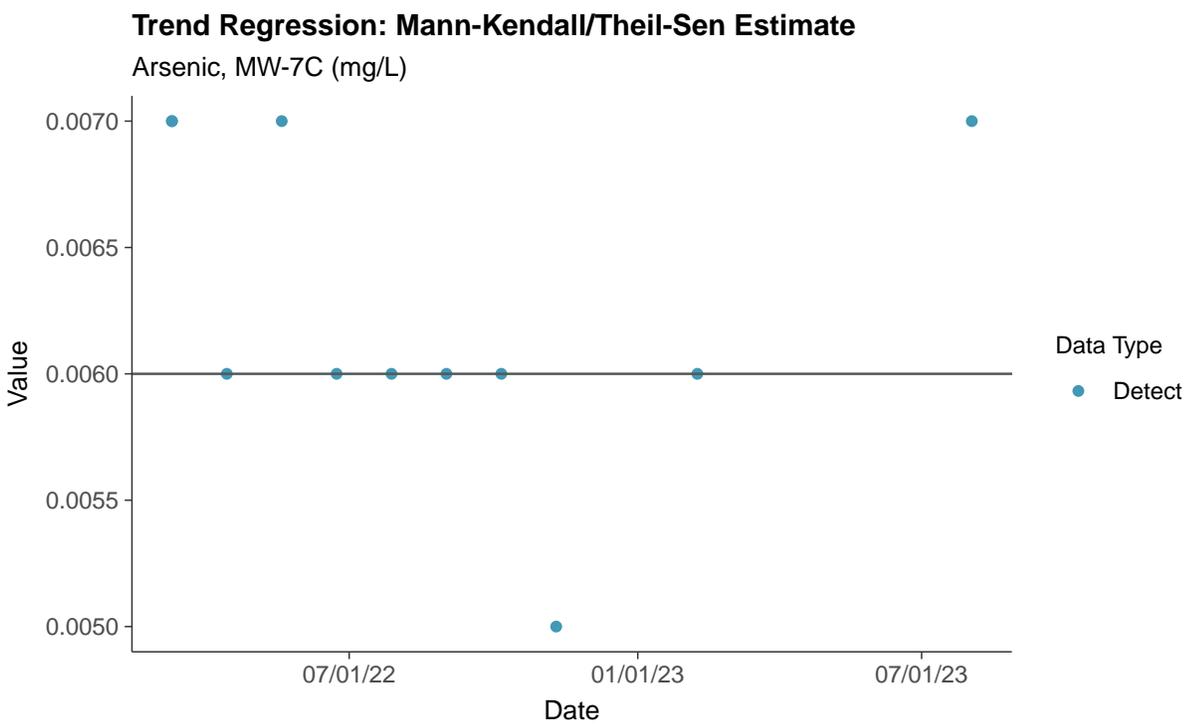
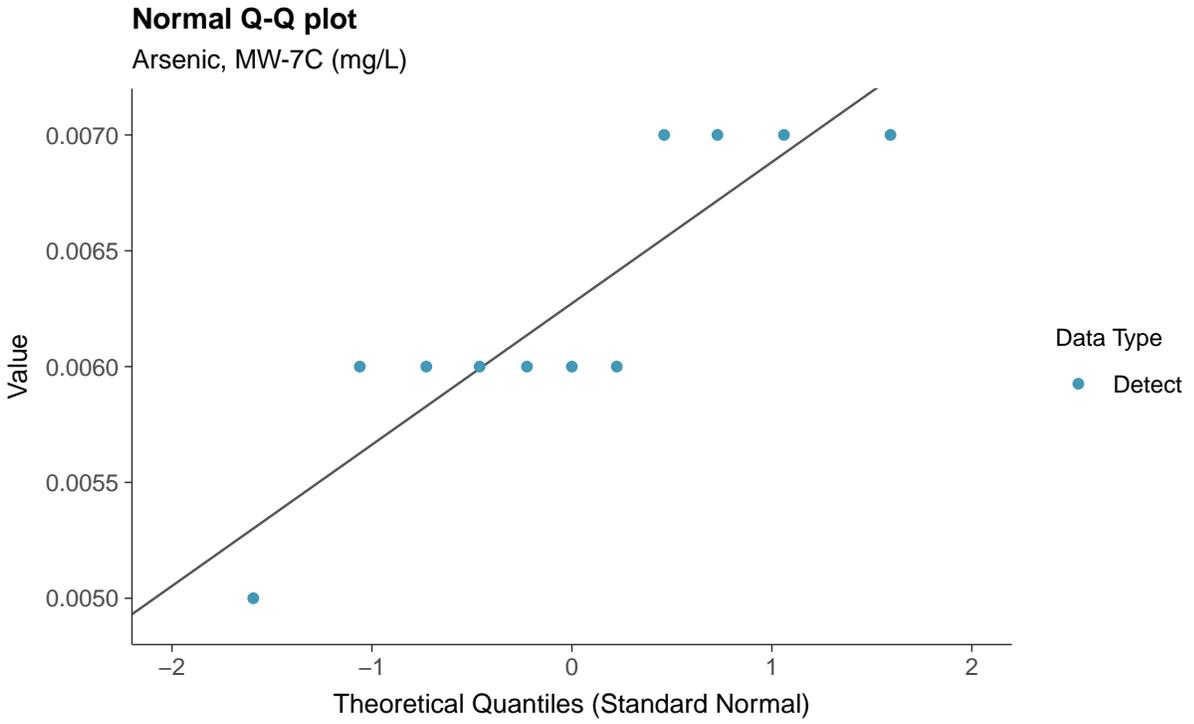
Arsenic, MW-7C (mg/L)



Boxplot by Season

Arsenic, MW-7C (mg/L)

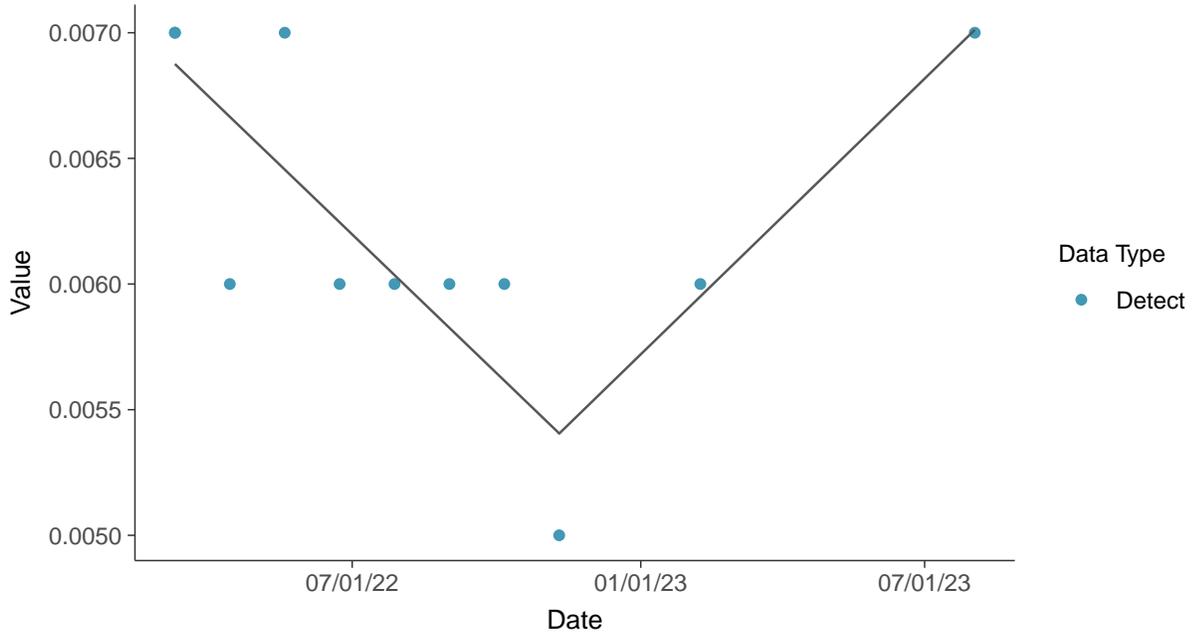






Trend Regression: Piecewise Linear-Linear

Arsenic, MW-7C (mg/L)



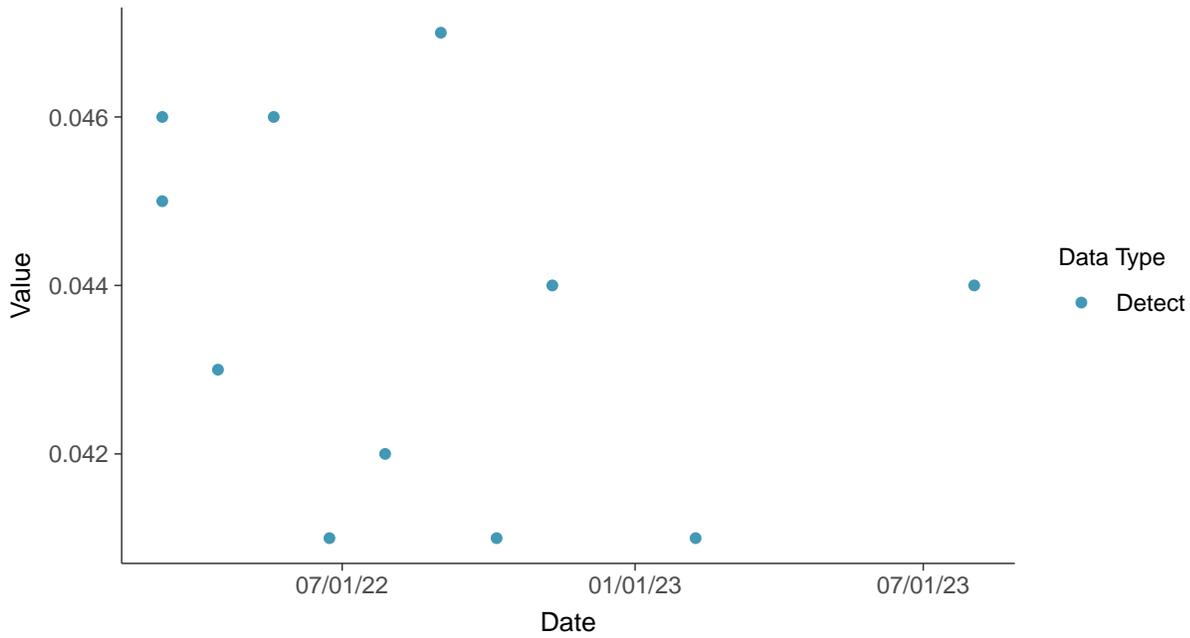


Appendix IV: Barium, MW-7C

ID: 7C_2_10

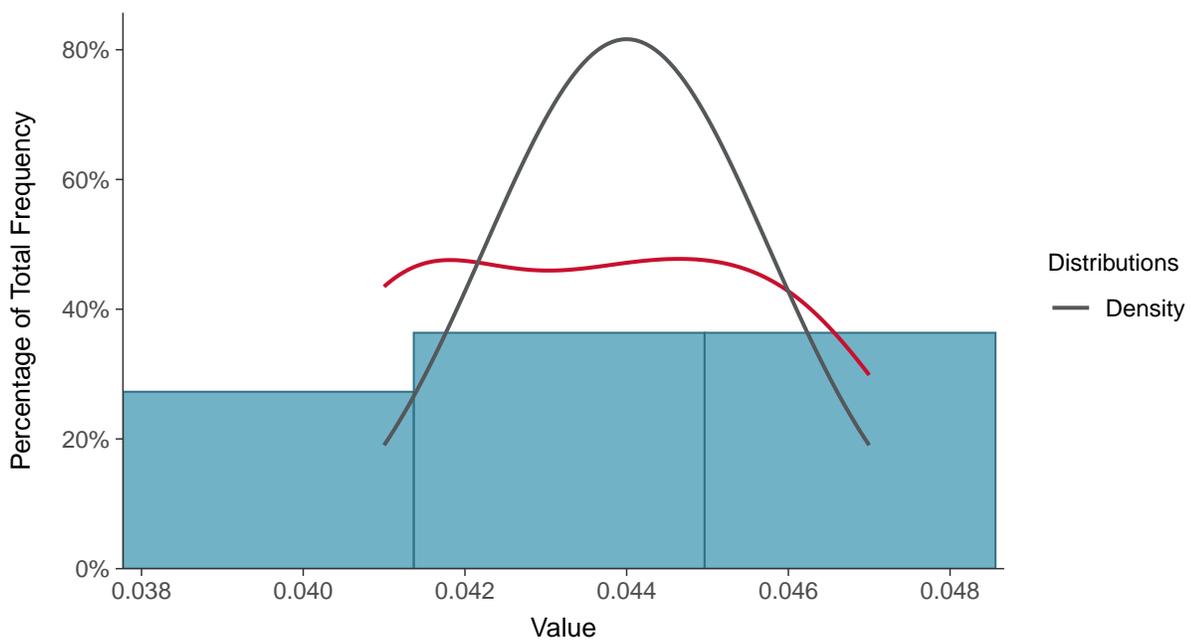
Scatter Plot

Barium, MW-7C (mg/L)



Histogram

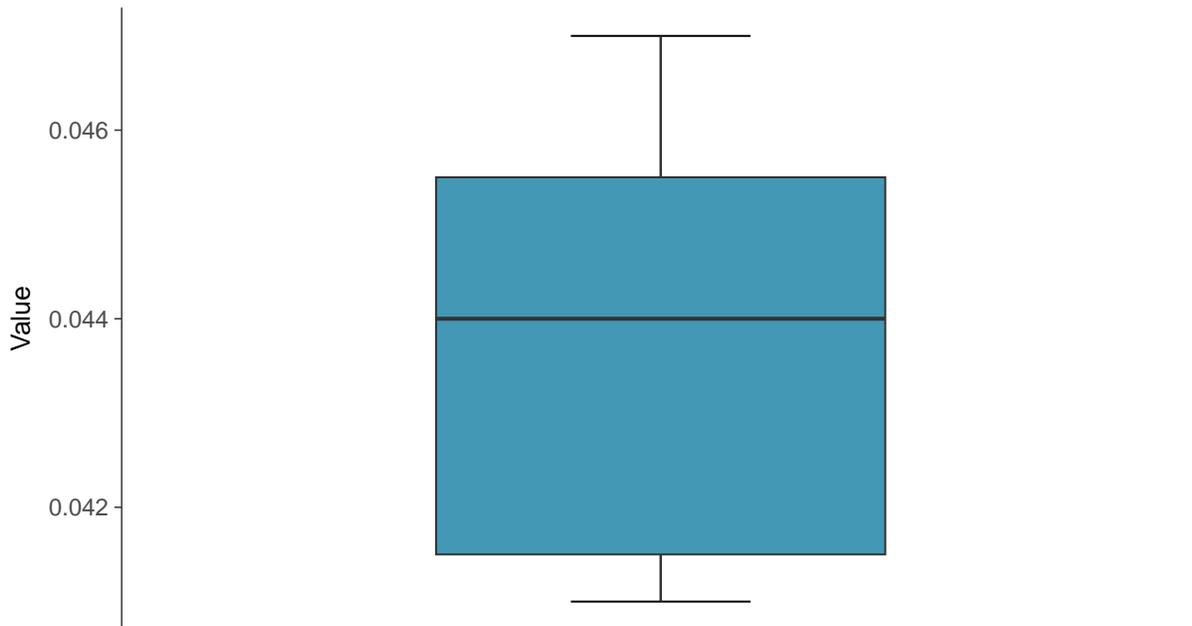
Barium, MW-7C (mg/L)





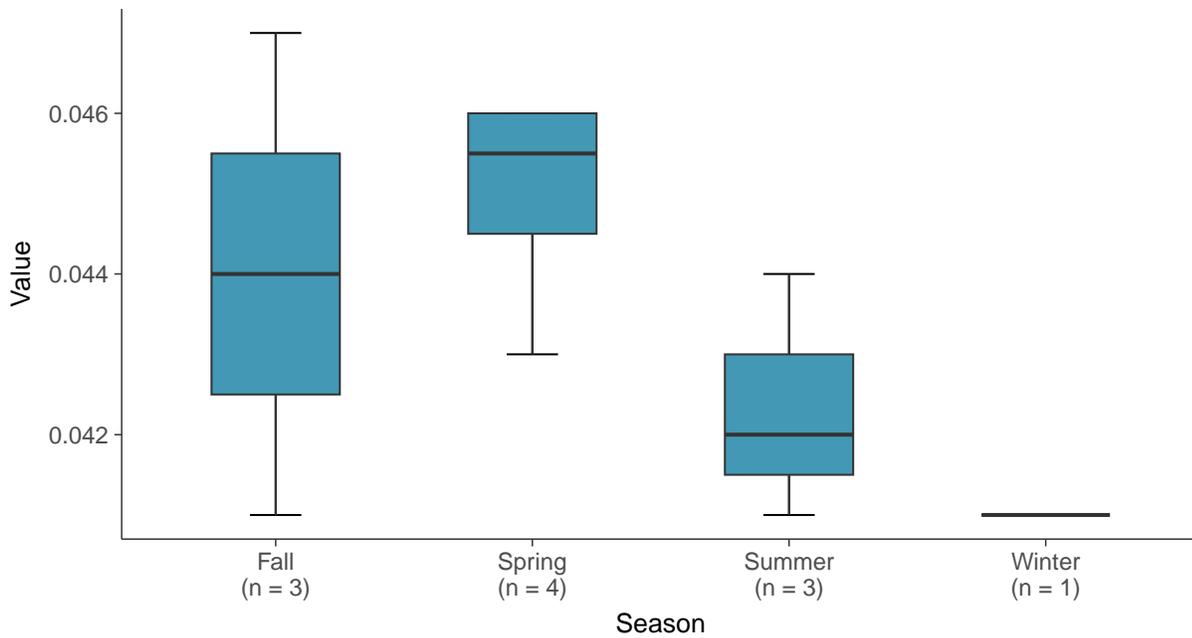
Boxplot

Barium, MW-7C (mg/L)



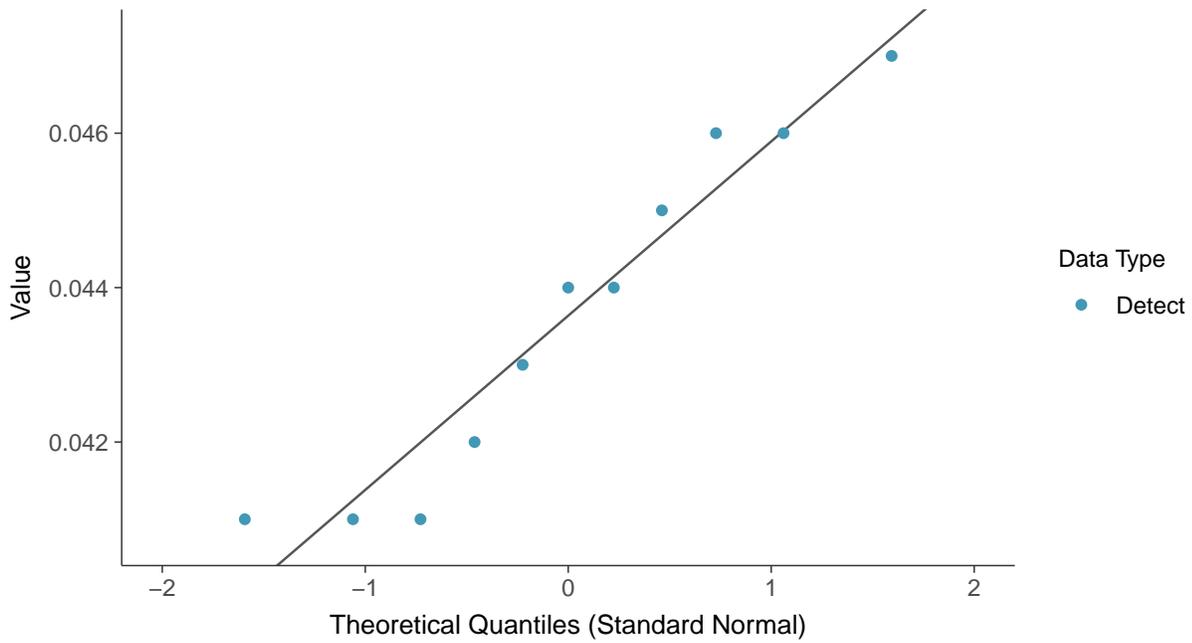
Boxplot by Season

Barium, MW-7C (mg/L)

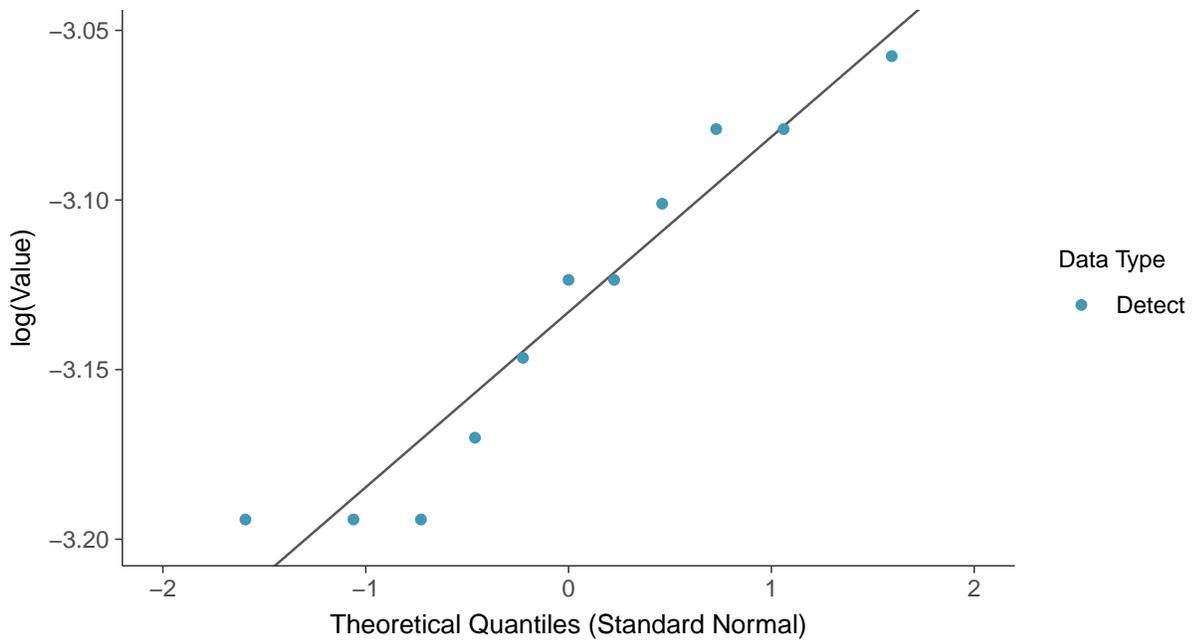




Normal Q-Q plot
Barium, MW-7C (mg/L)

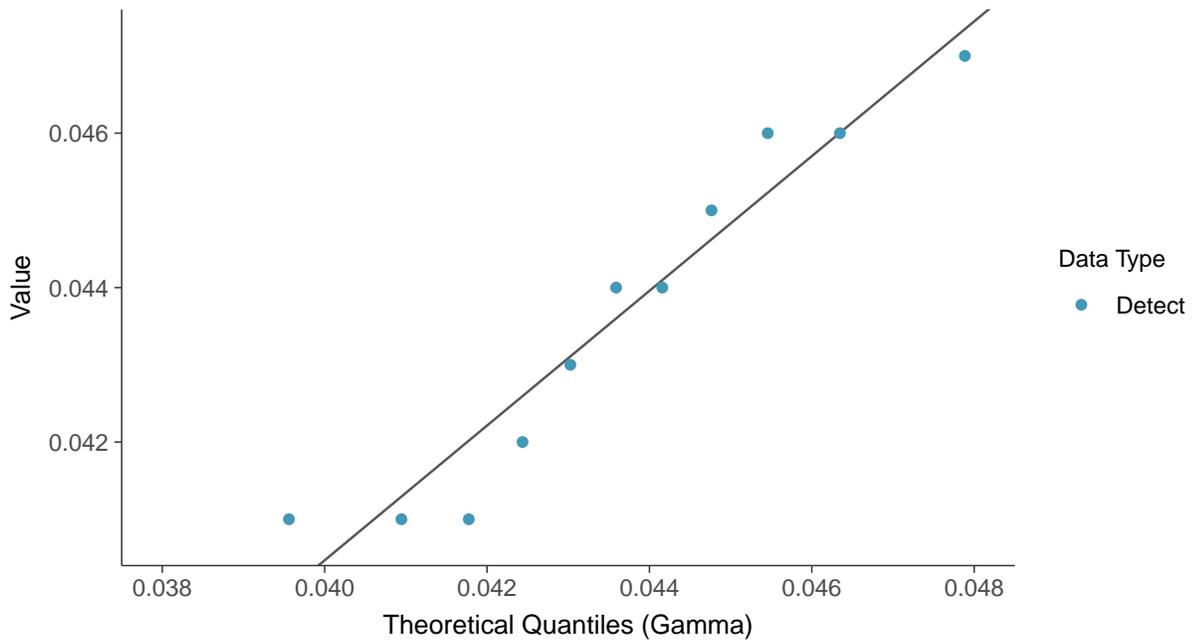


Lognormal Q-Q plot
Barium, MW-7C (mg/L)

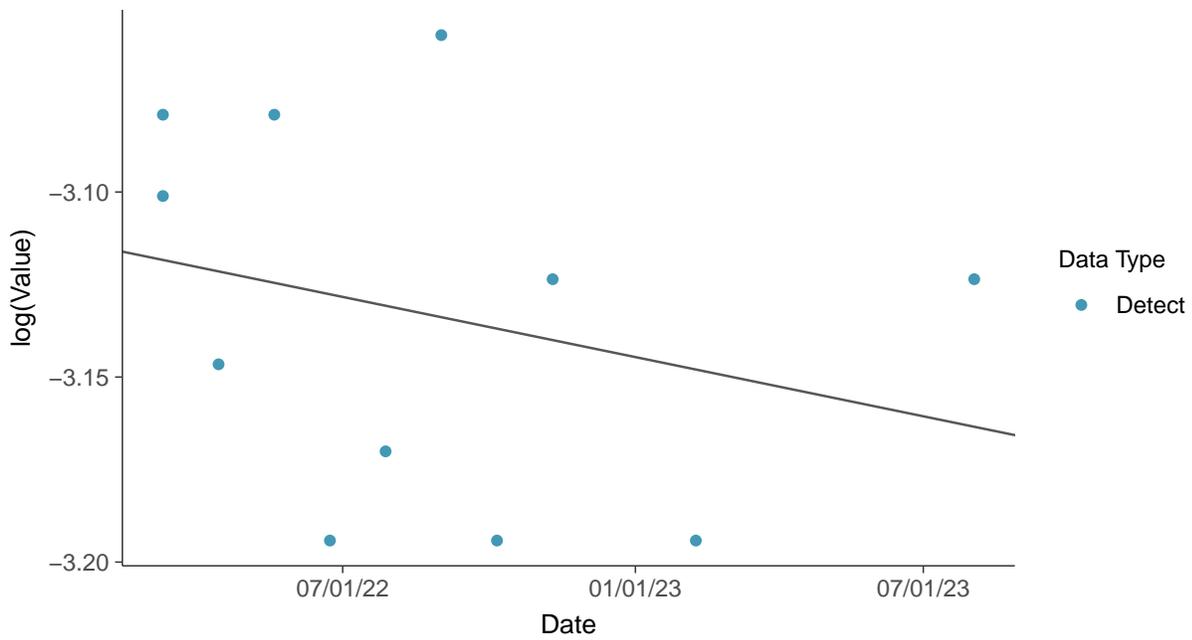




Gamma Q-Q plot
Barium, MW-7C (mg/L)



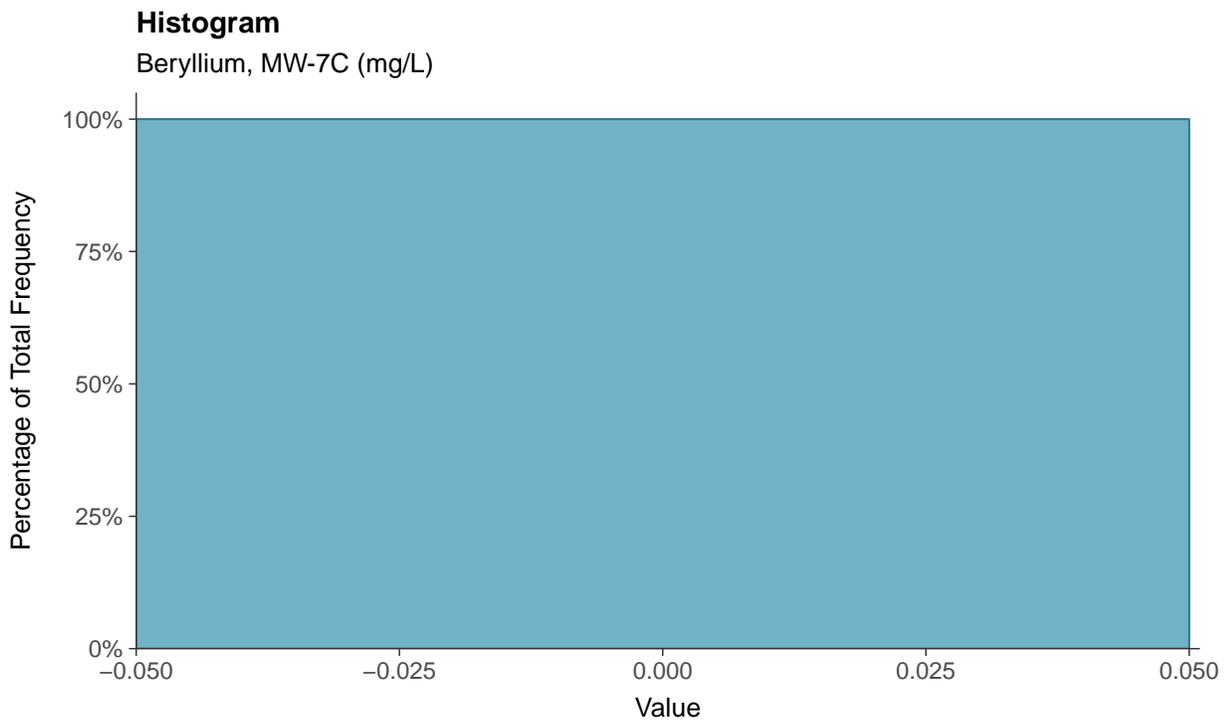
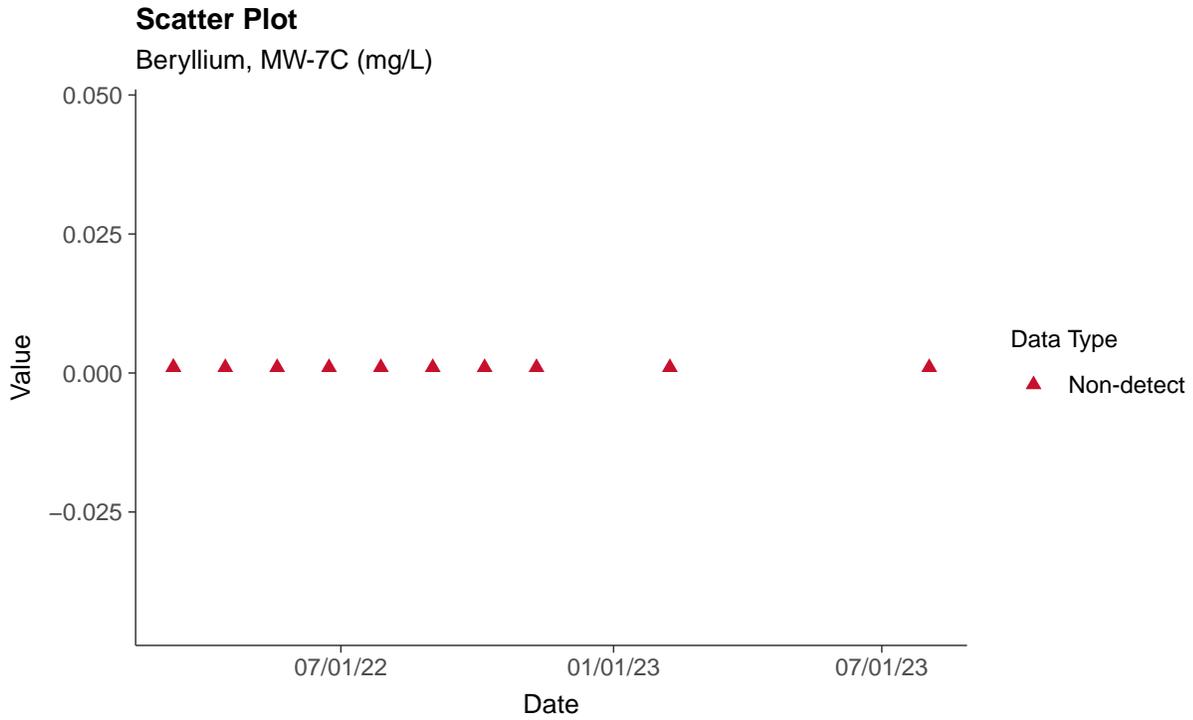
Trend Regression: Lognormal MLE
Barium, MW-7C (mg/L)





Appendix IV: Beryllium, MW-7C

ID: 7C_2_11





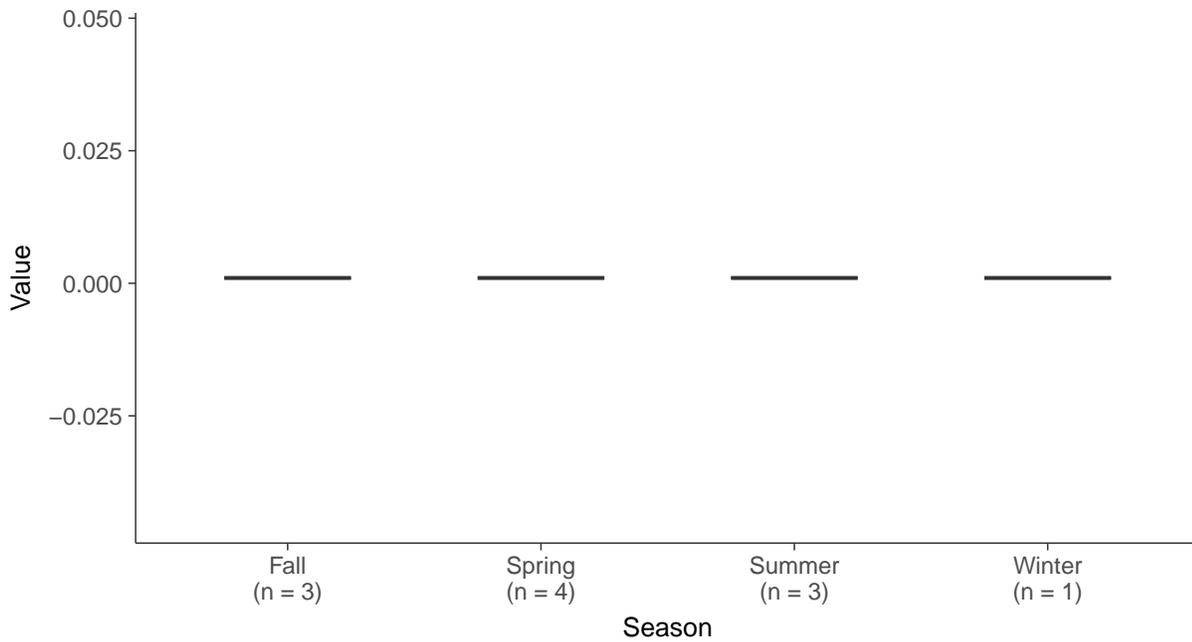
Boxplot

Beryllium, MW-7C (mg/L)



Boxplot by Season

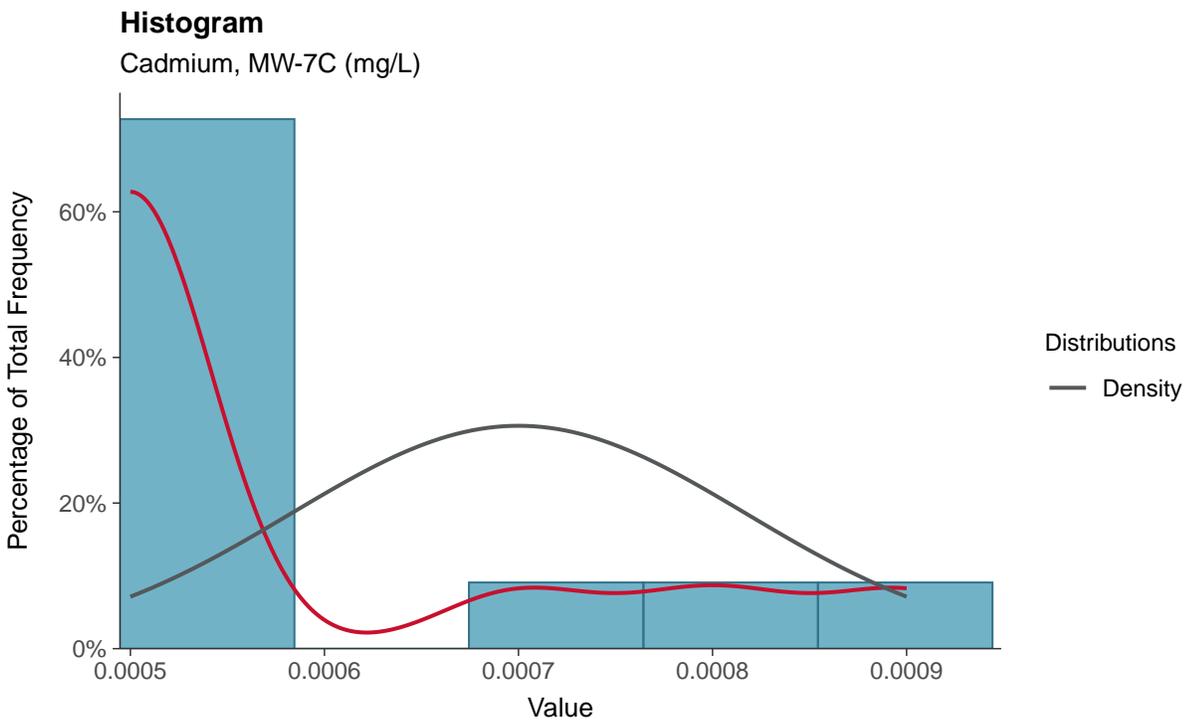
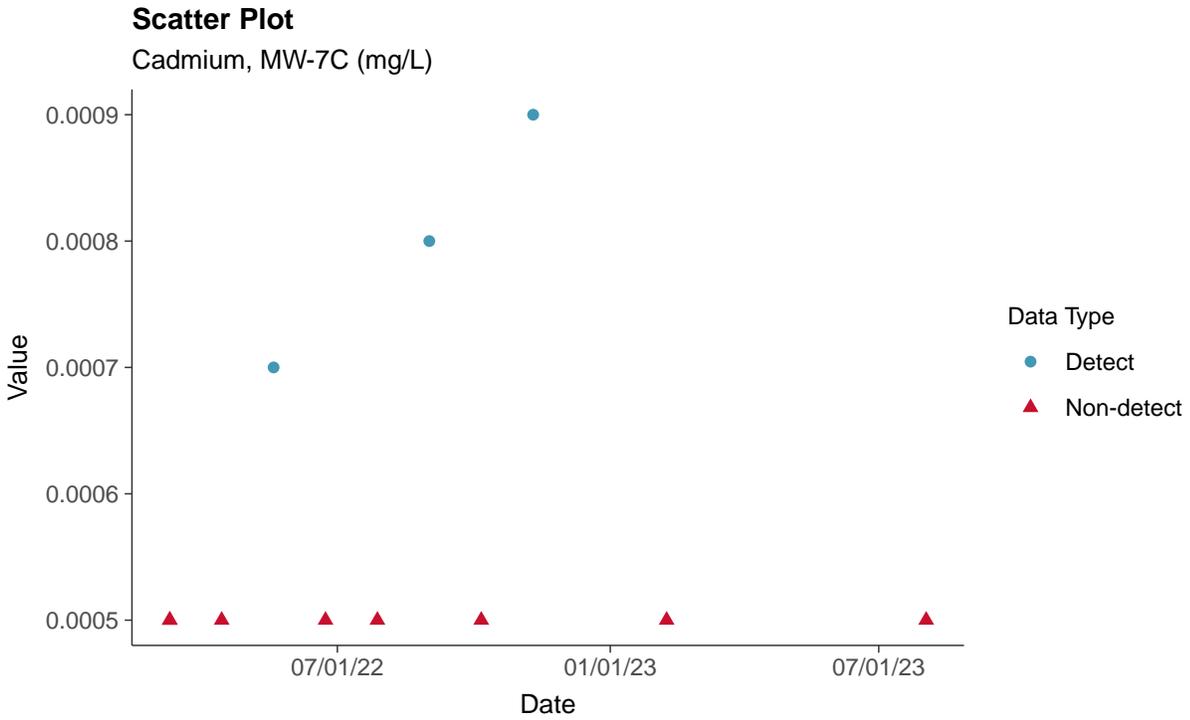
Beryllium, MW-7C (mg/L)





Appendix IV: Cadmium, MW-7C

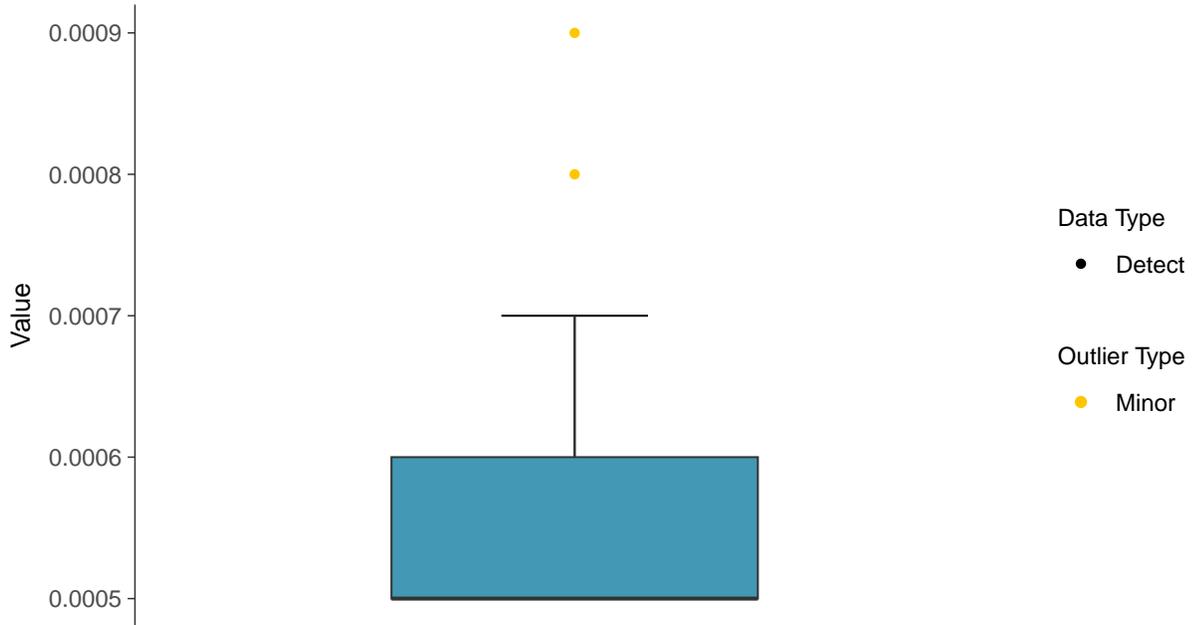
ID: 7C_2_12





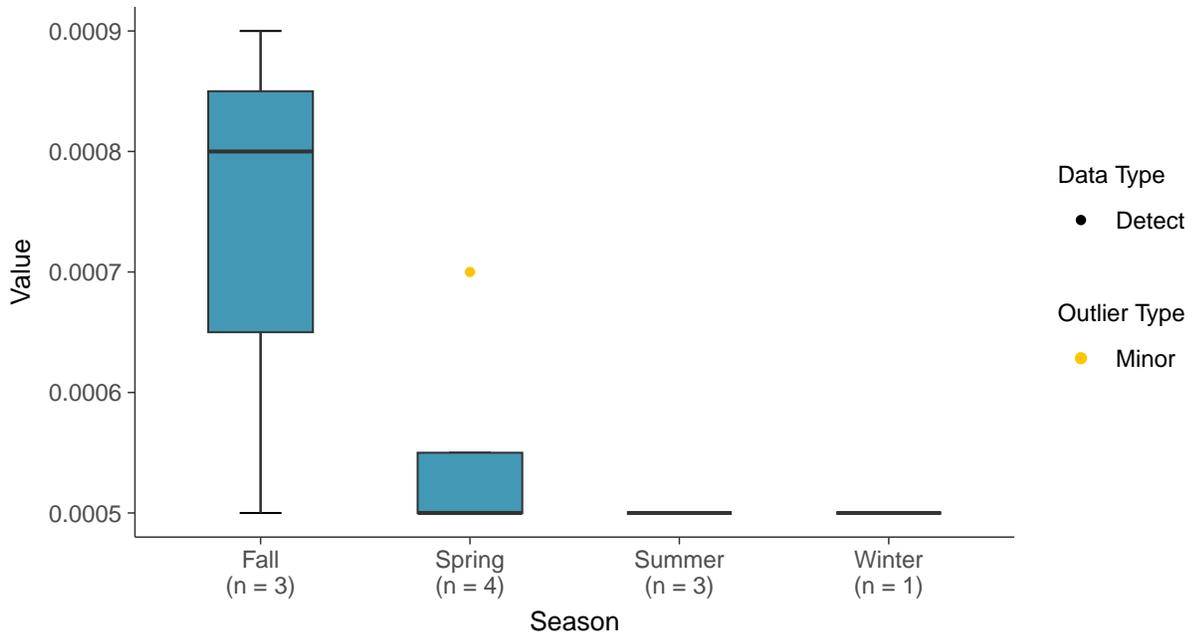
Boxplot

Cadmium, MW-7C (mg/L)



Boxplot by Season

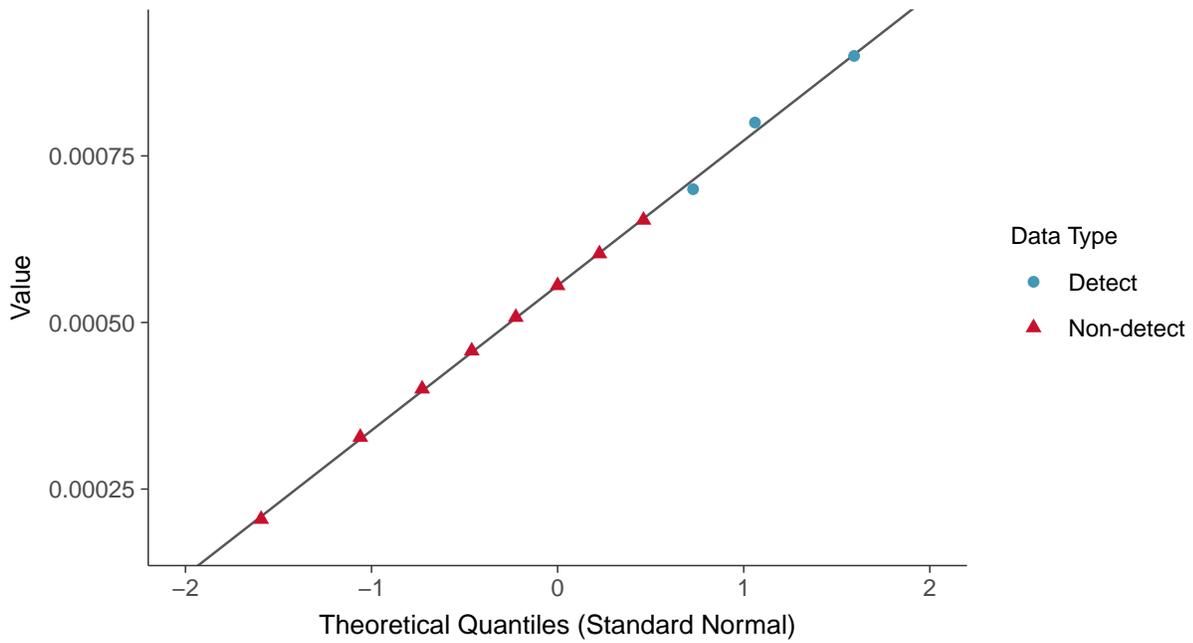
Cadmium, MW-7C (mg/L)





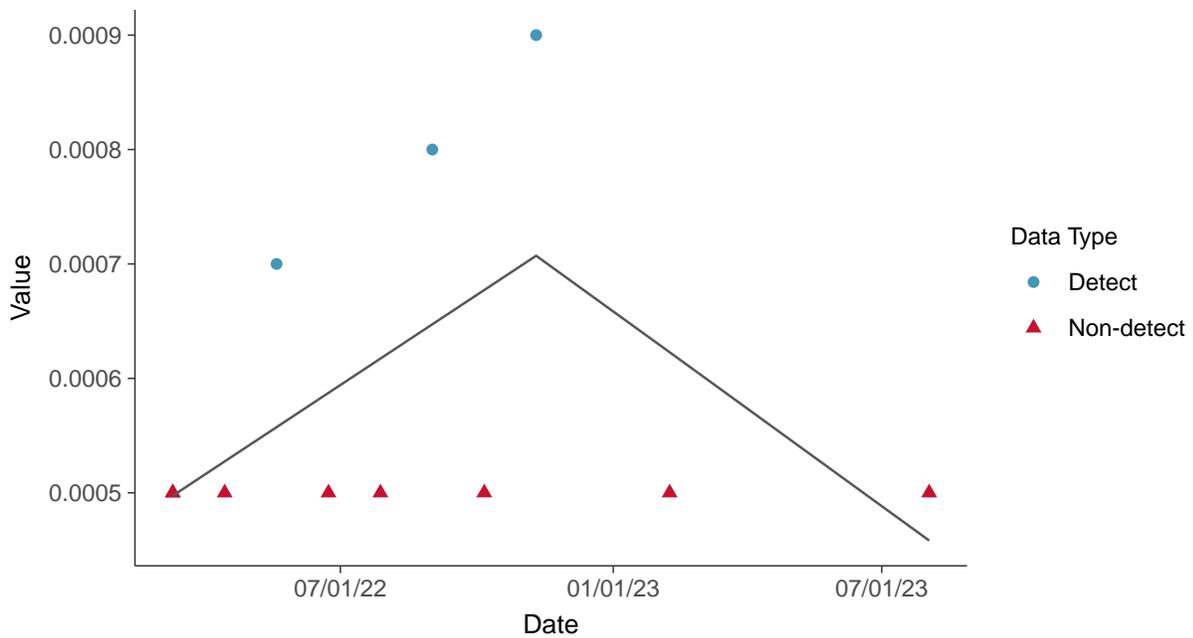
Normal Q-Q plot using ROS Imputed Estimates

Cadmium, MW-7C (mg/L)



Trend Regression: Piecewise Linear-Linear

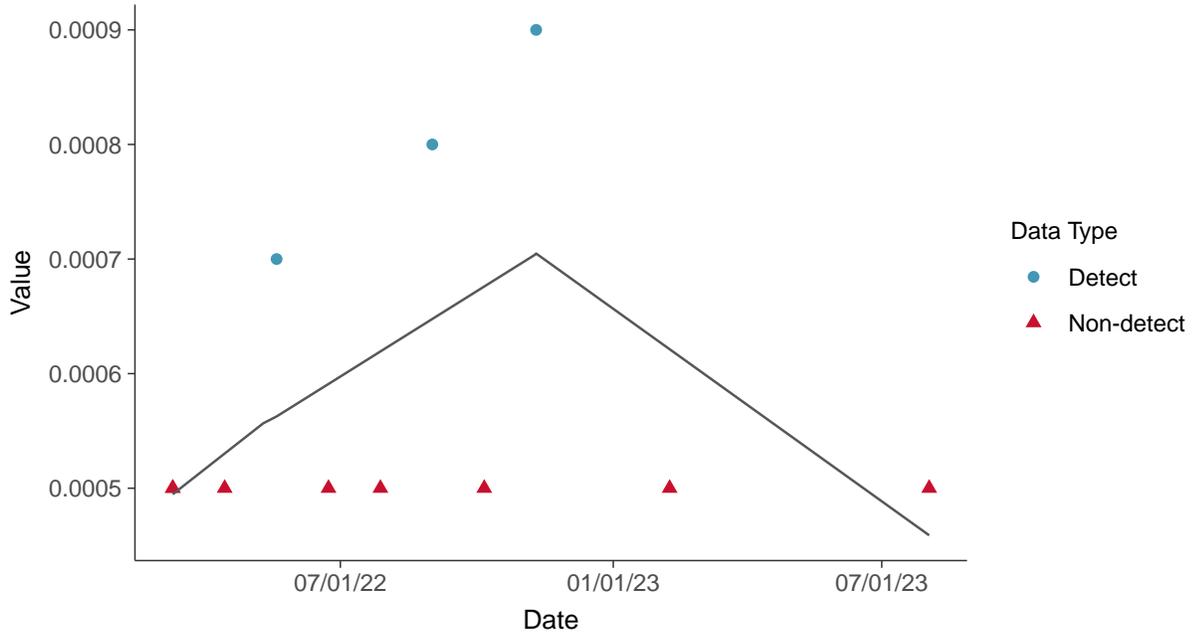
Cadmium, MW-7C (mg/L)





Trend Regression: Piecewise Linear-Linear-Linear

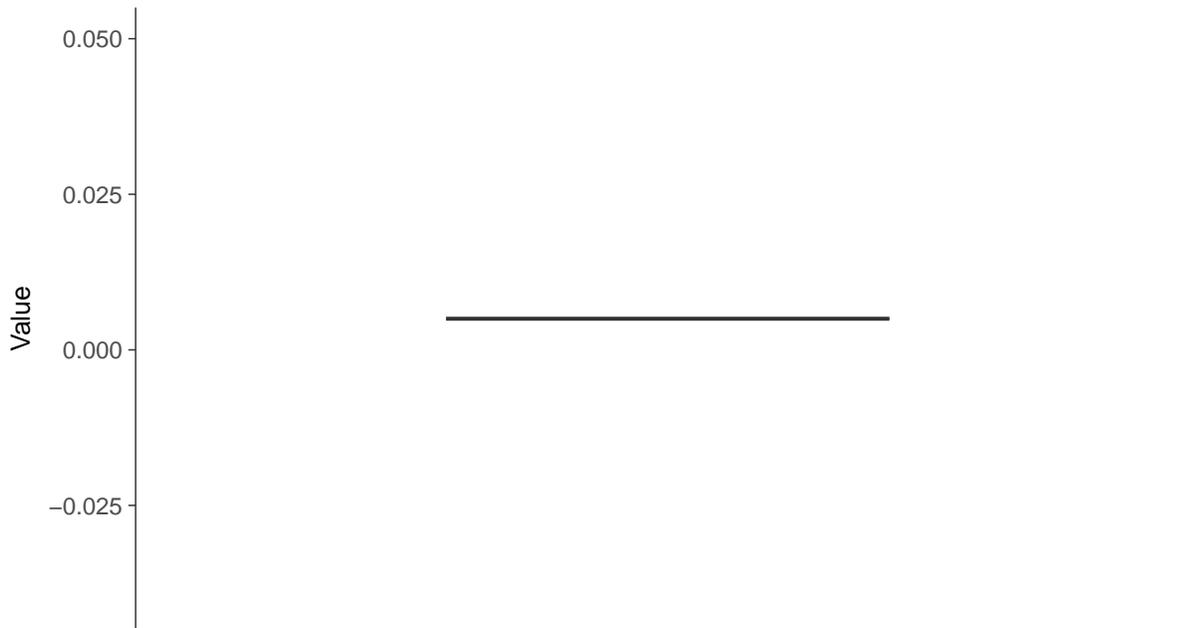
Cadmium, MW-7C (mg/L)





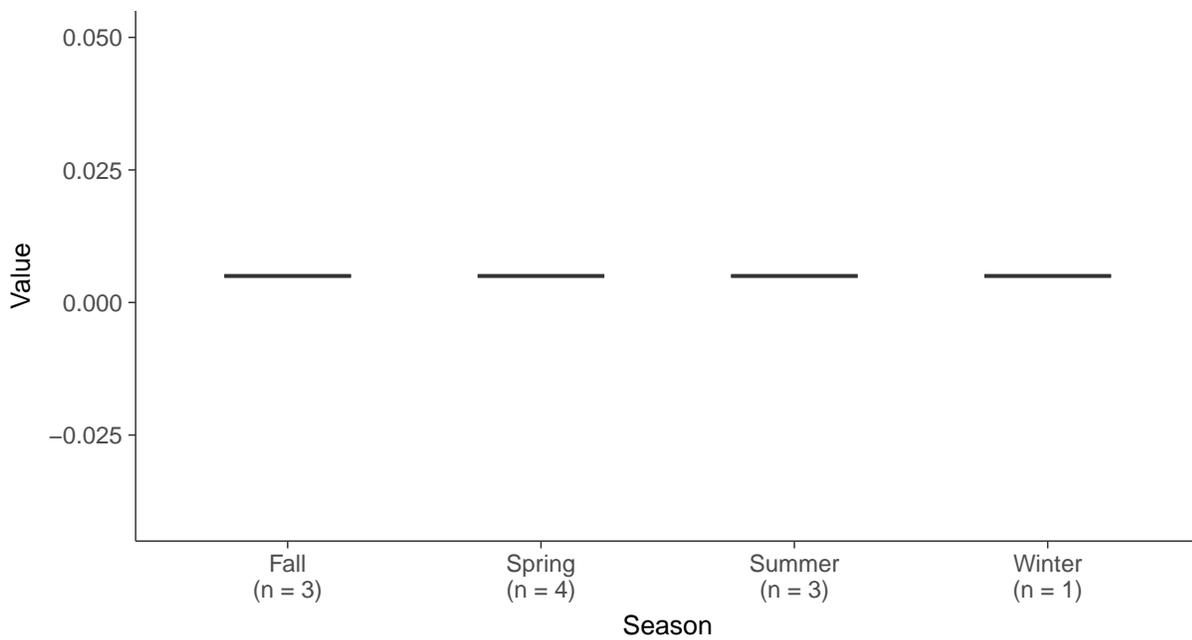
Boxplot

Chromium, MW-7C (mg/L)



Boxplot by Season

Chromium, MW-7C (mg/L)



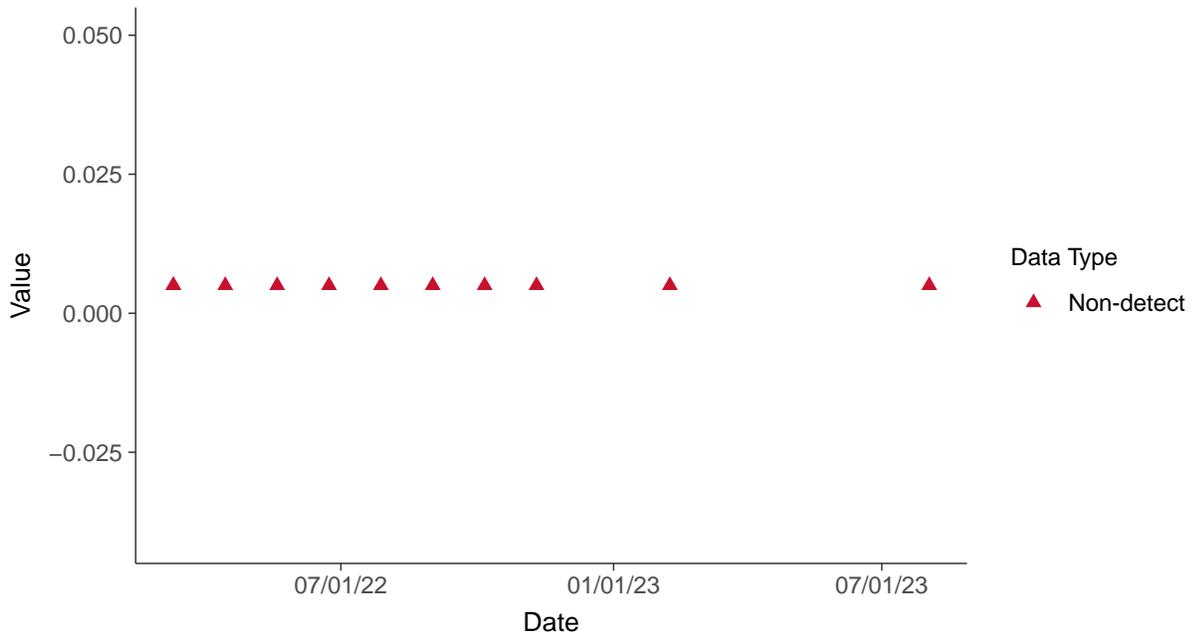


Appendix IV: Cobalt, MW-7C

ID: 7C_2_14

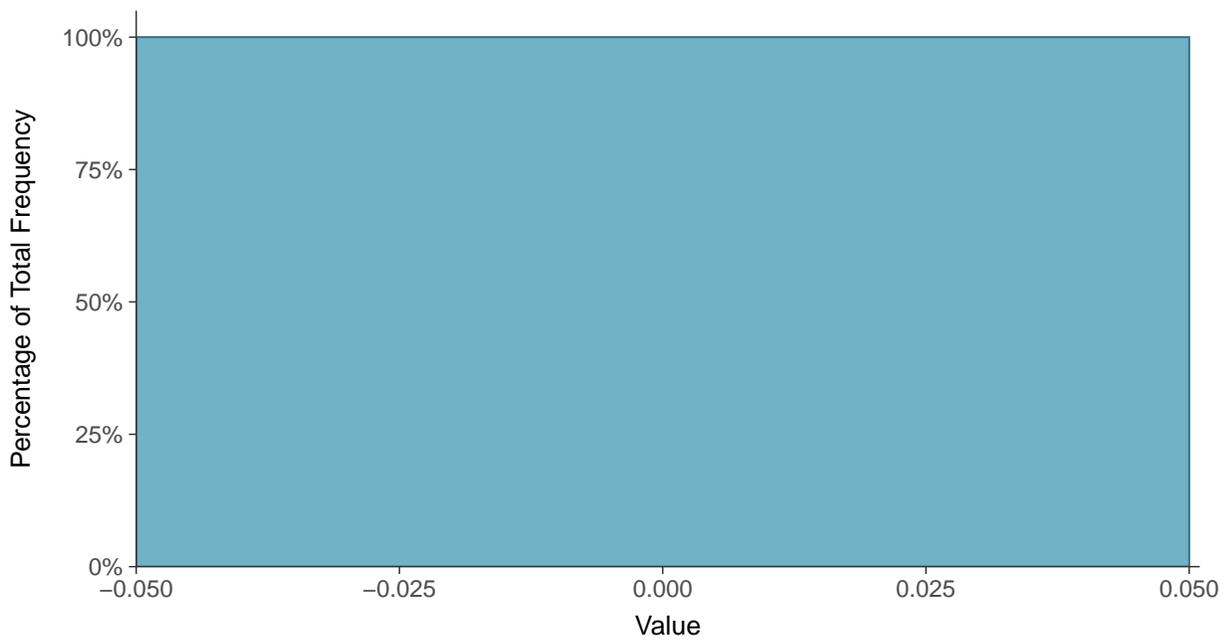
Scatter Plot

Cobalt, MW-7C (mg/L)



Histogram

Cobalt, MW-7C (mg/L)





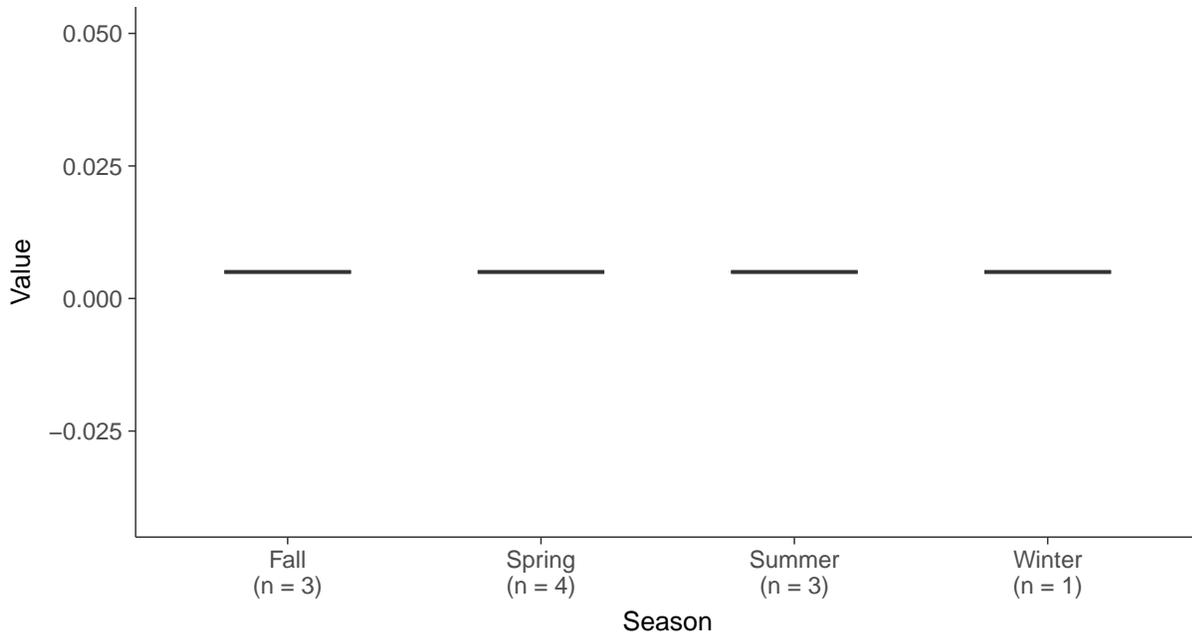
Boxplot

Cobalt, MW-7C (mg/L)



Boxplot by Season

Cobalt, MW-7C (mg/L)



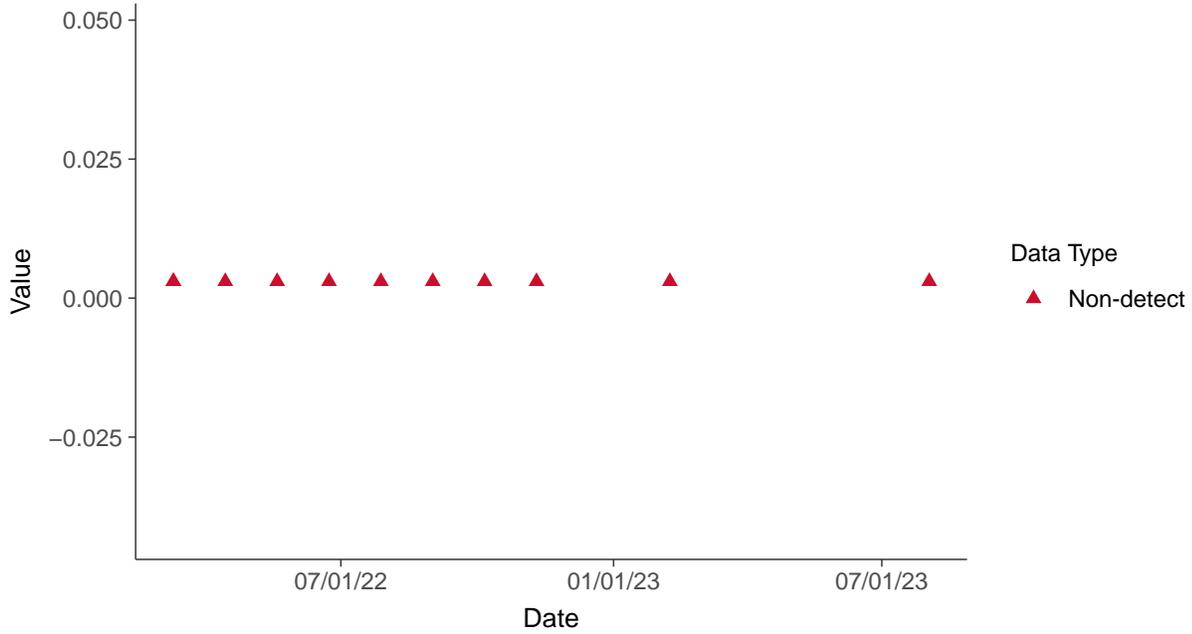


Appendix IV: Lead, MW-7C

ID: 7C_2_15

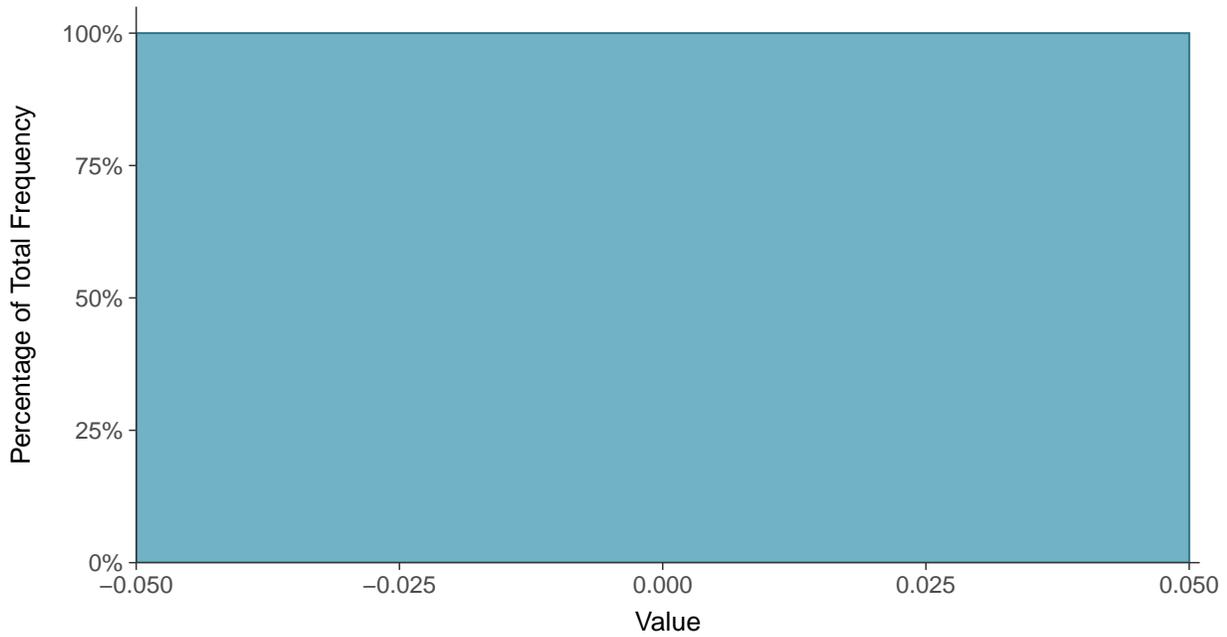
Scatter Plot

Lead, MW-7C (mg/L)



Histogram

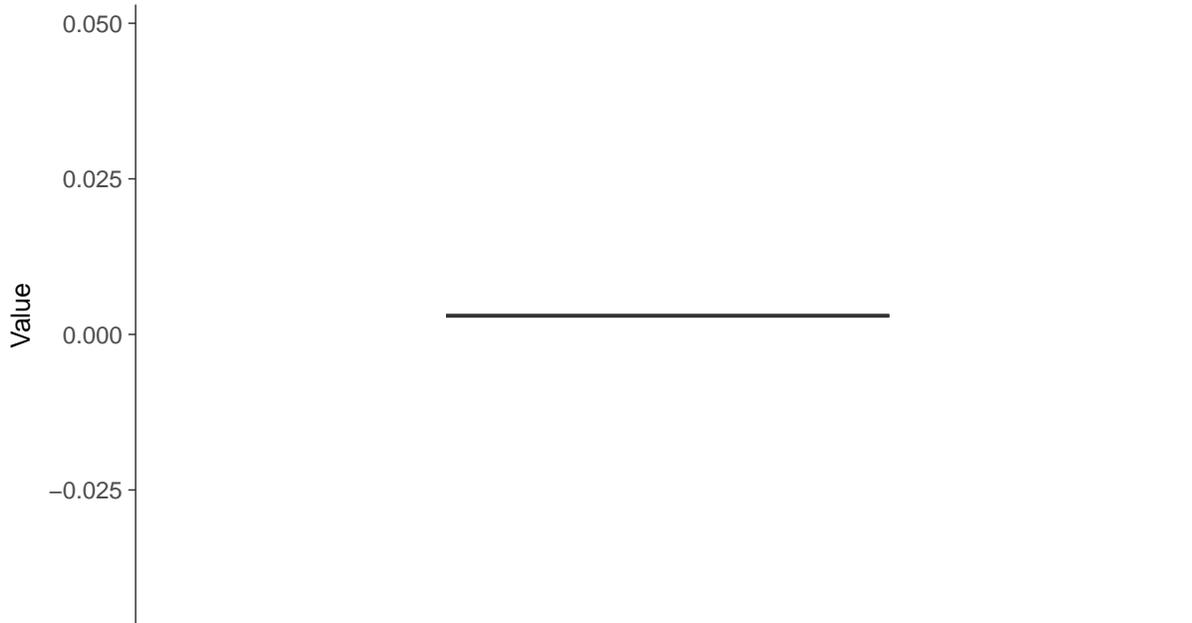
Lead, MW-7C (mg/L)





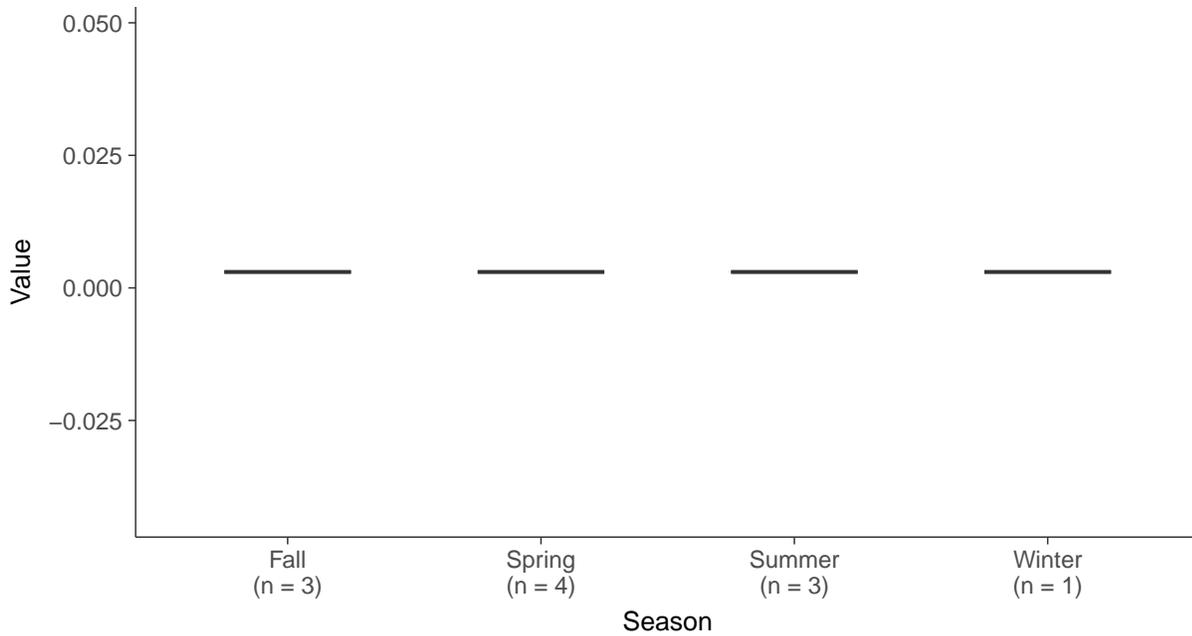
Boxplot

Lead, MW-7C (mg/L)



Boxplot by Season

Lead, MW-7C (mg/L)



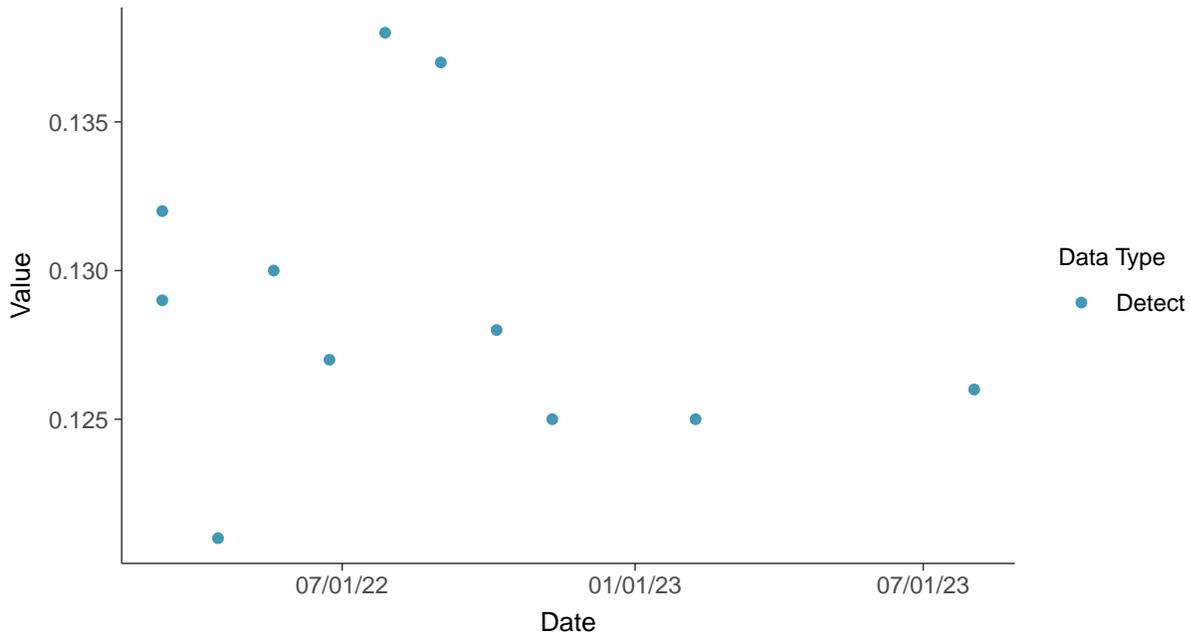


Appendix IV: Lithium, MW-7C

ID: 7C_2_16

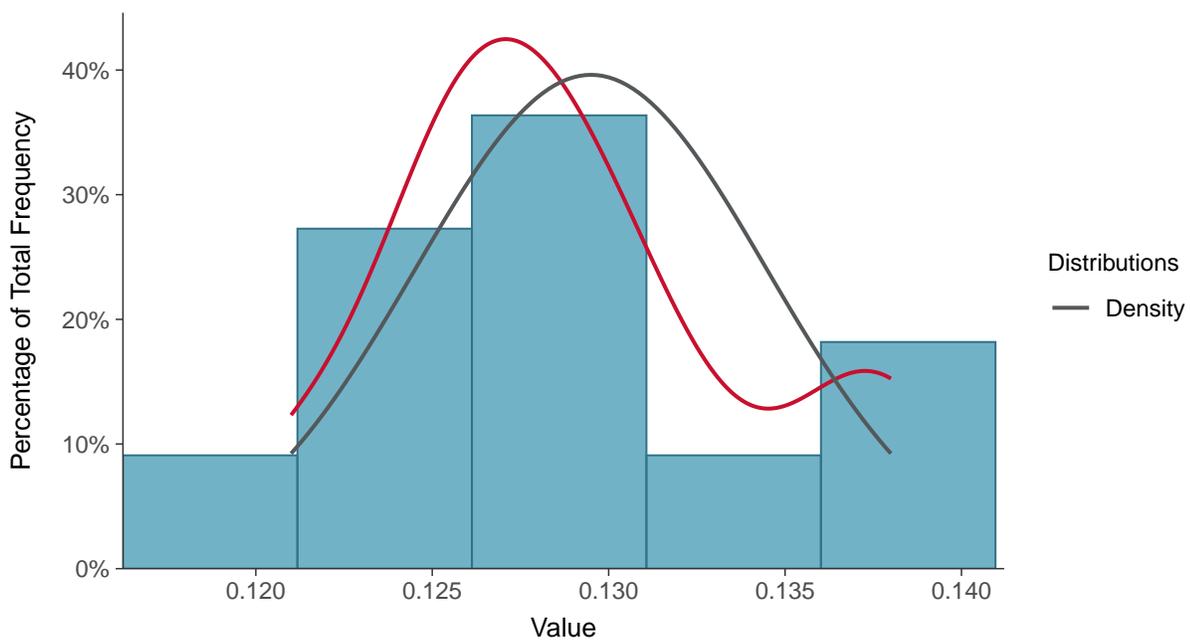
Scatter Plot

Lithium, MW-7C (mg/L)



Histogram

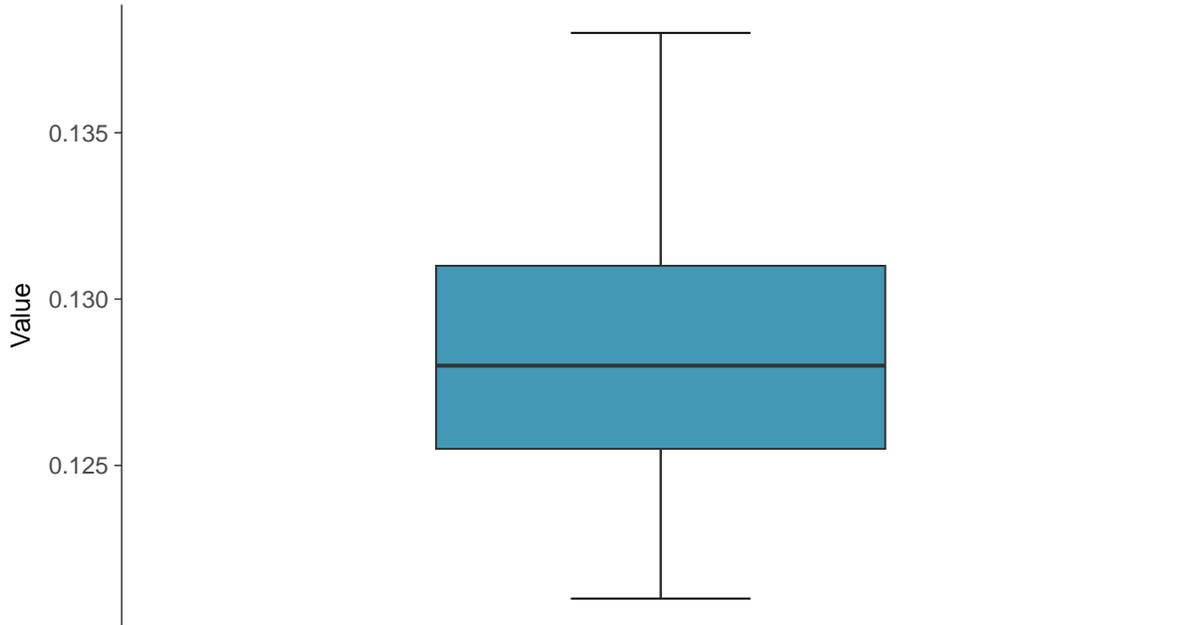
Lithium, MW-7C (mg/L)





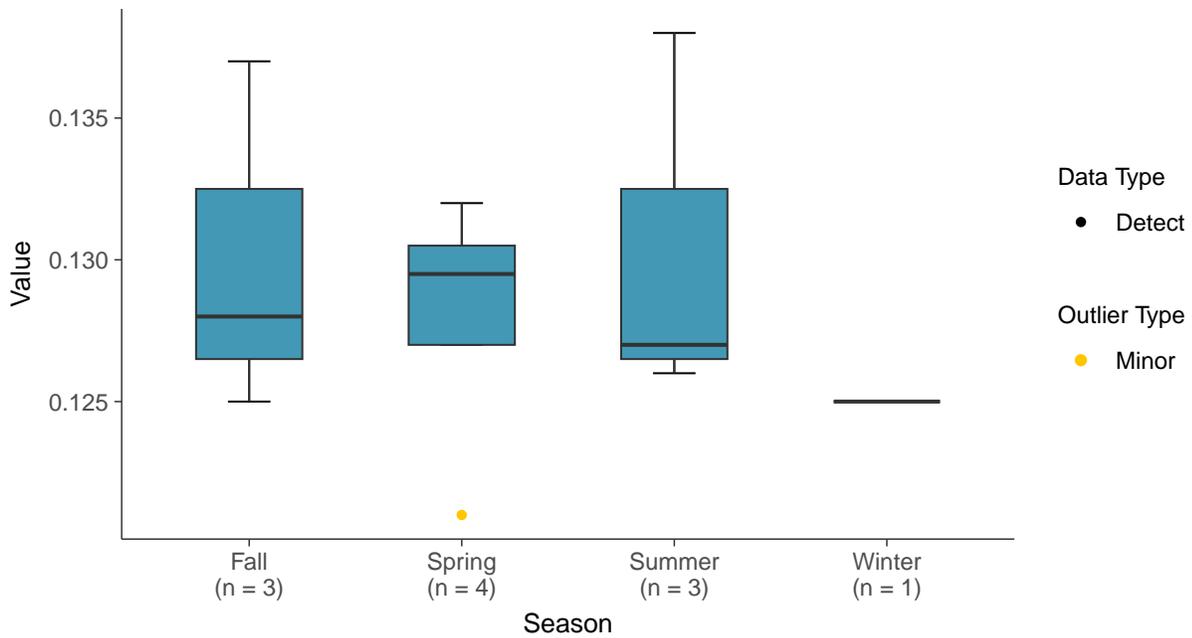
Boxplot

Lithium, MW-7C (mg/L)



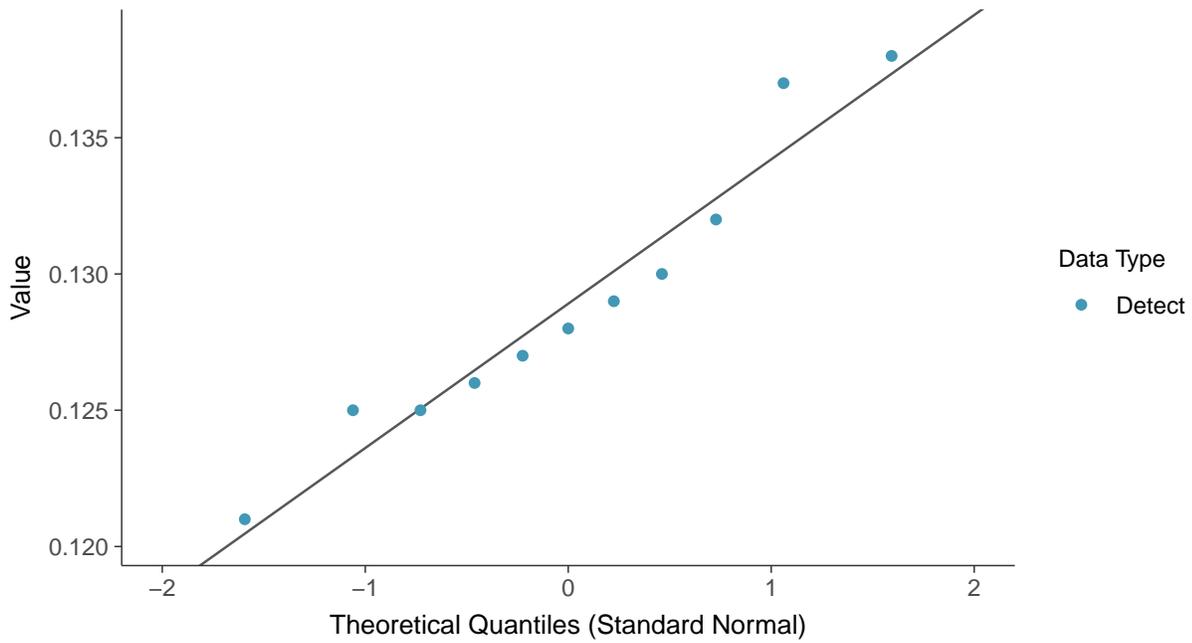
Boxplot by Season

Lithium, MW-7C (mg/L)

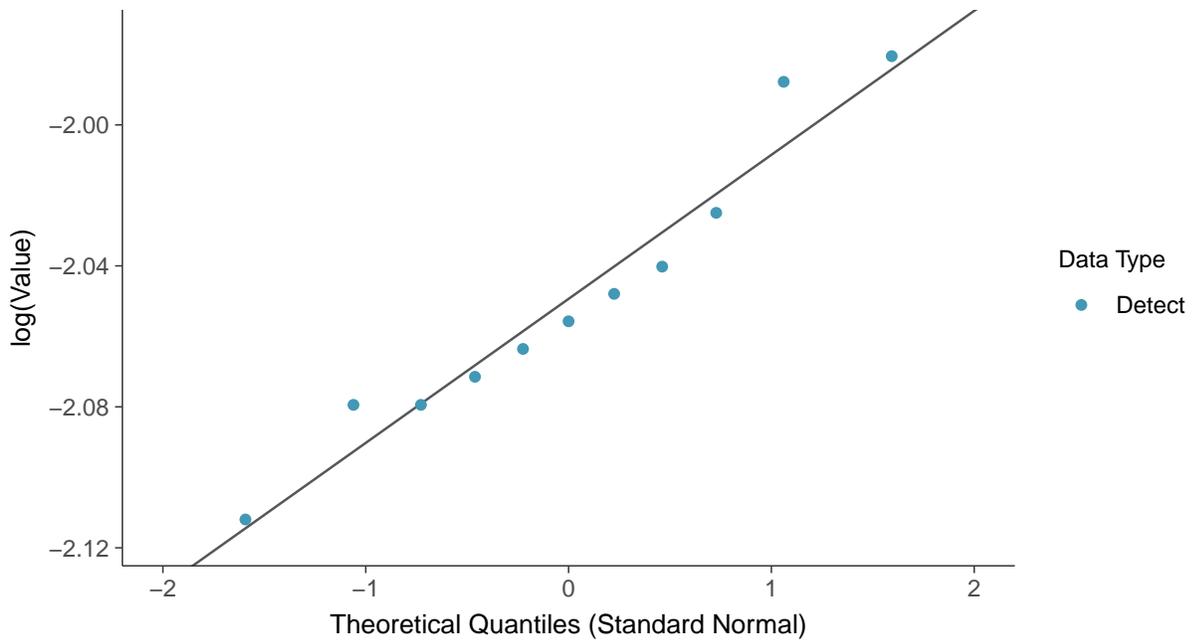




Normal Q-Q plot
Lithium, MW-7C (mg/L)

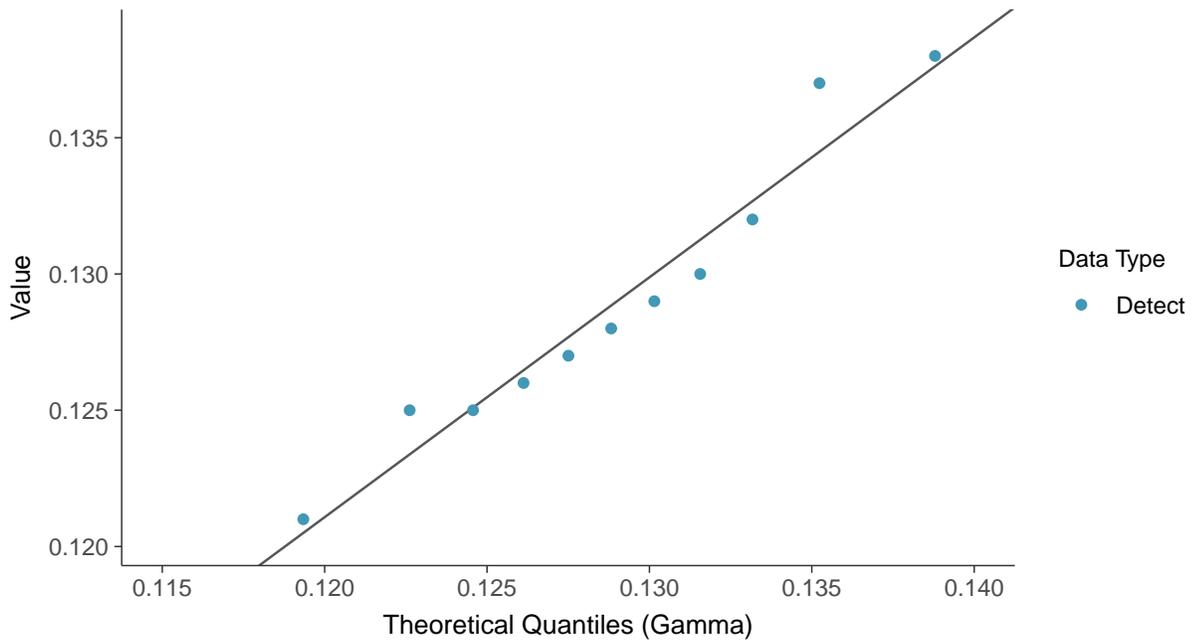


Lognormal Q-Q plot
Lithium, MW-7C (mg/L)

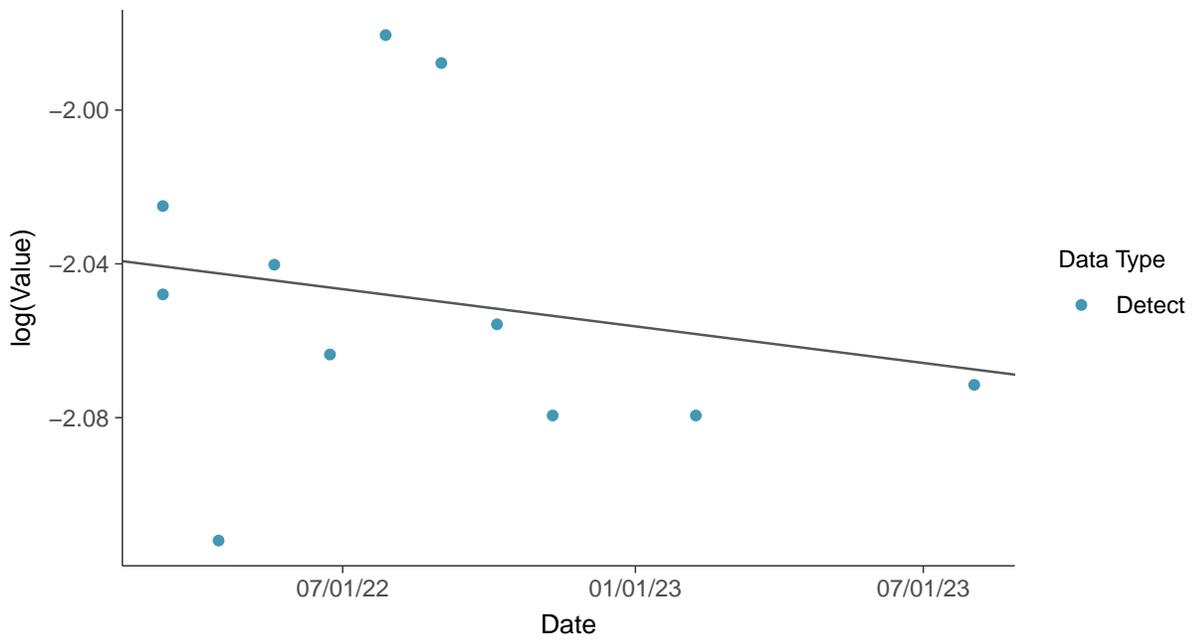




Gamma Q-Q plot
Lithium, MW-7C (mg/L)



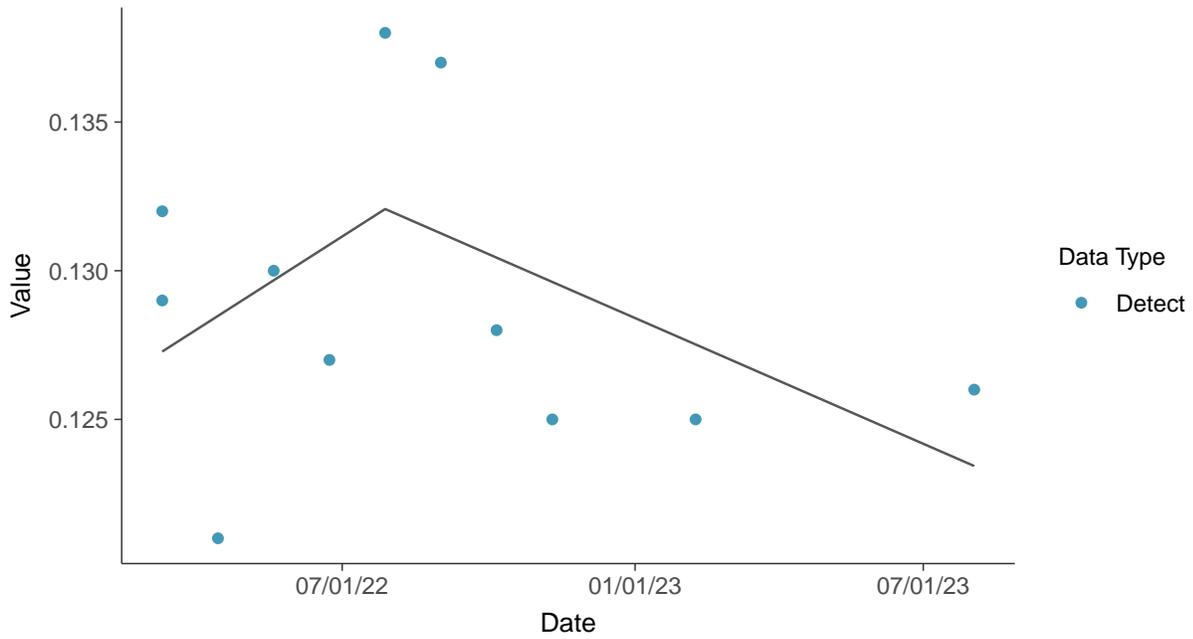
Trend Regression: Lognormal MLE
Lithium, MW-7C (mg/L)





Trend Regression: Piecewise Linear-Linear

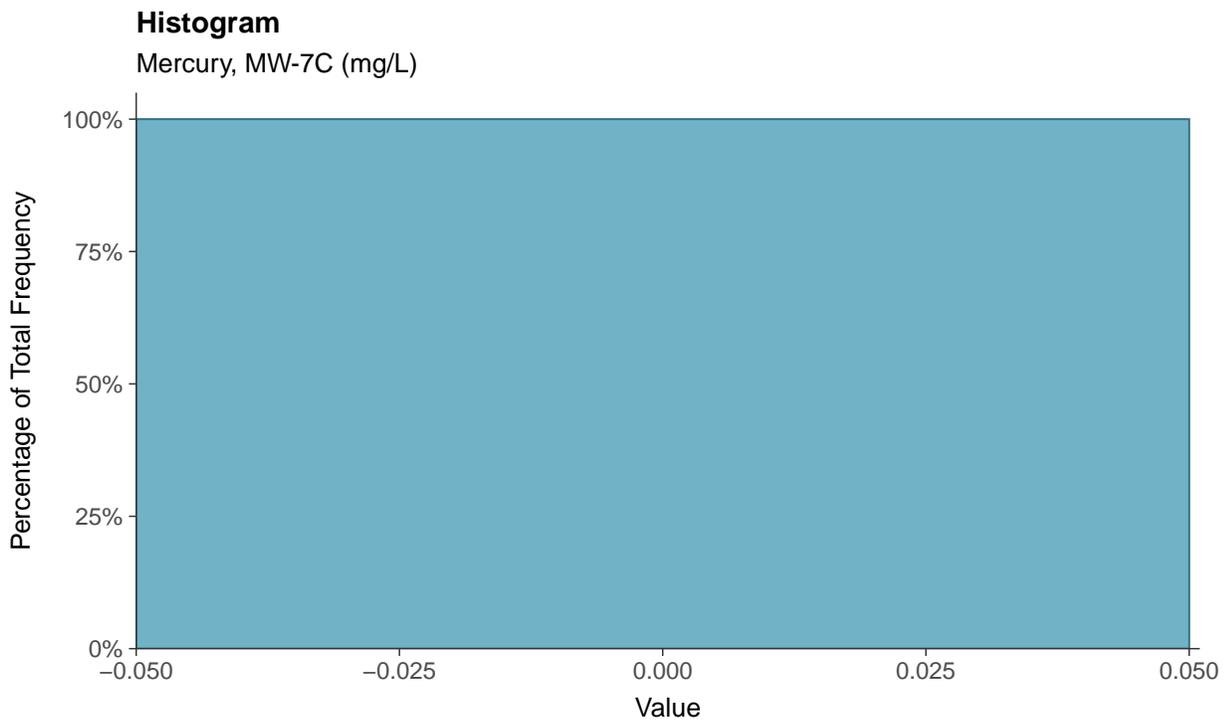
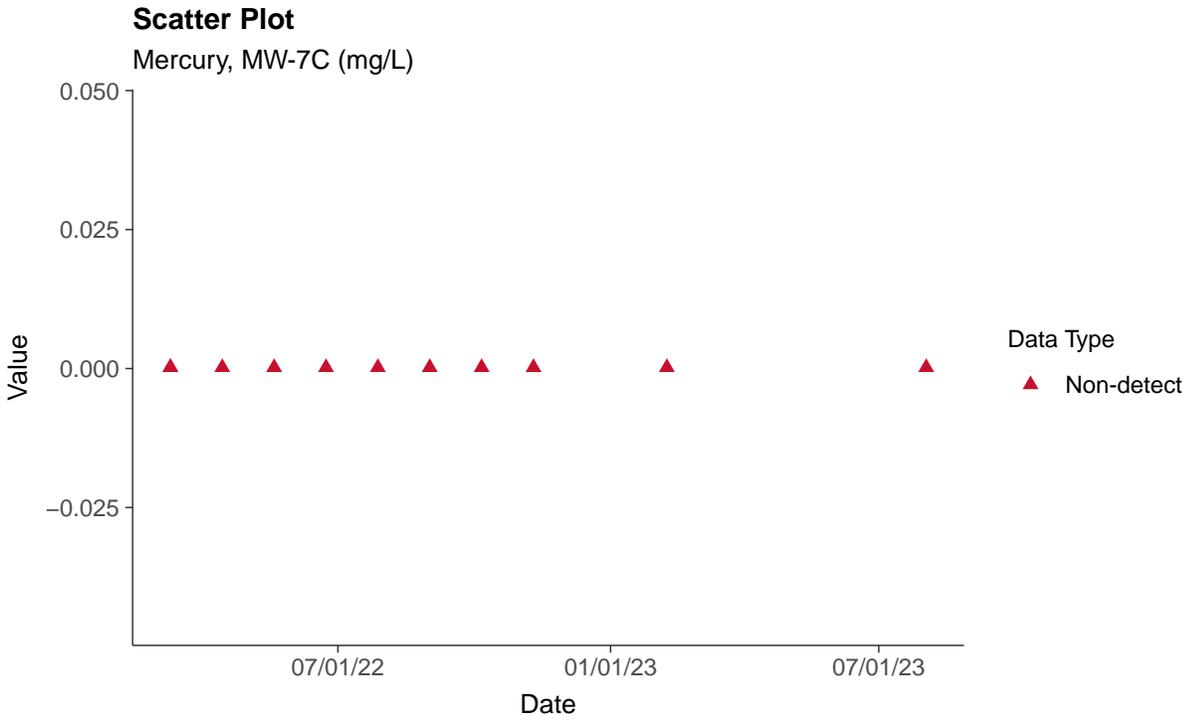
Lithium, MW-7C (mg/L)





Appendix IV: Mercury, MW-7C

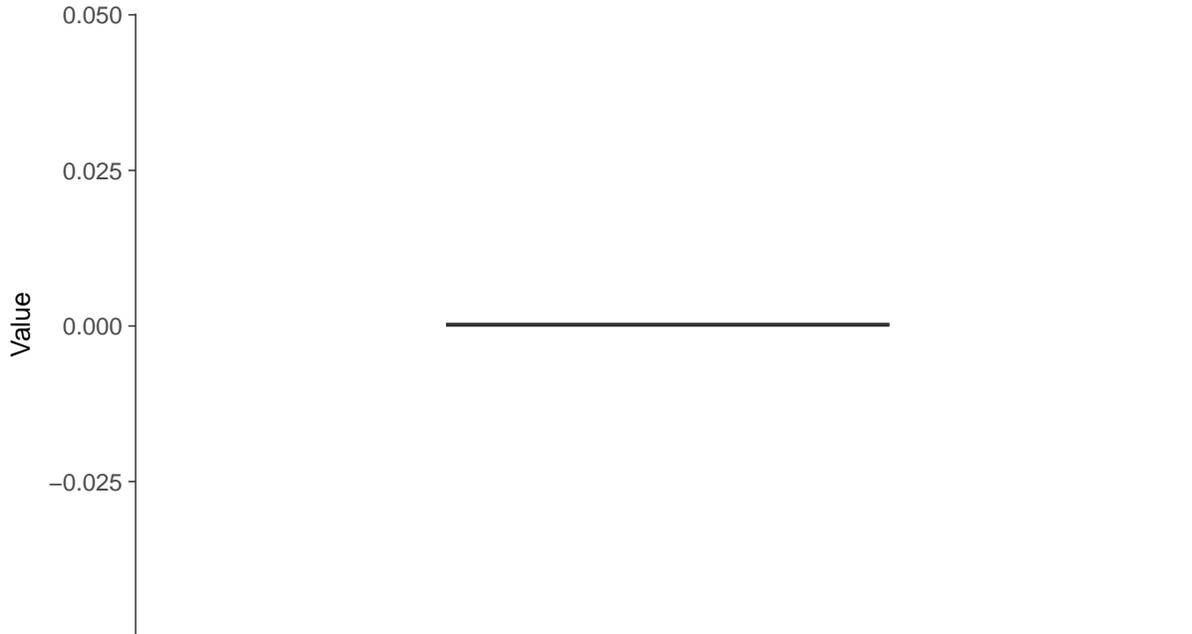
ID: 7C_2_17





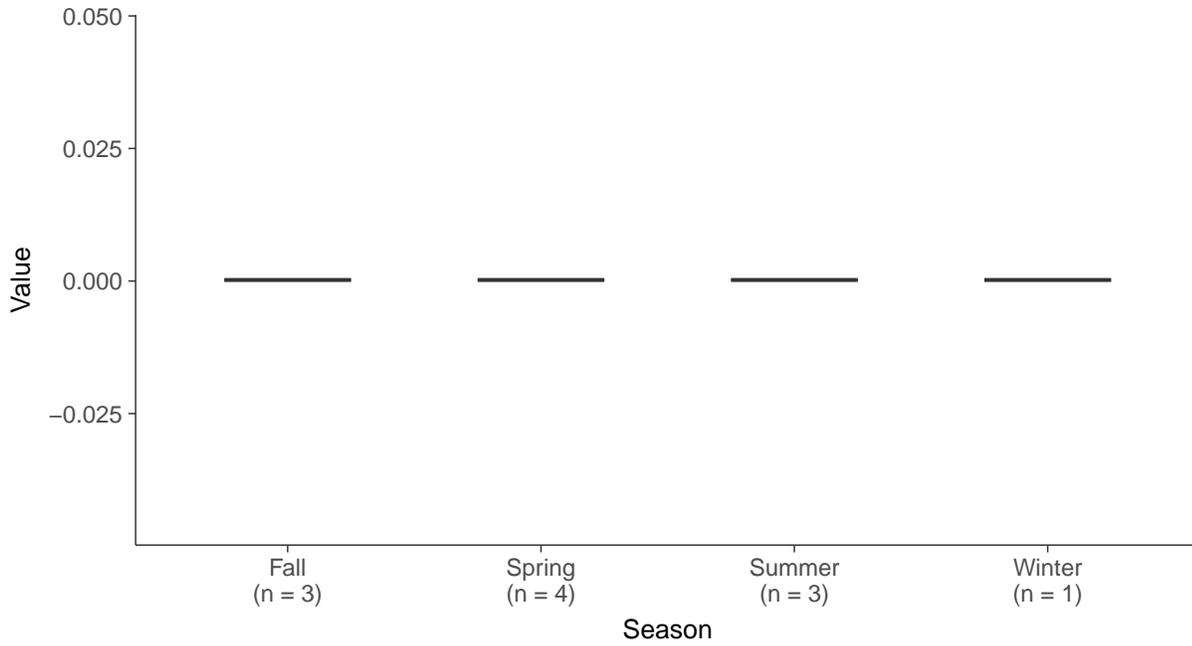
Boxplot

Mercury, MW-7C (mg/L)



Boxplot by Season

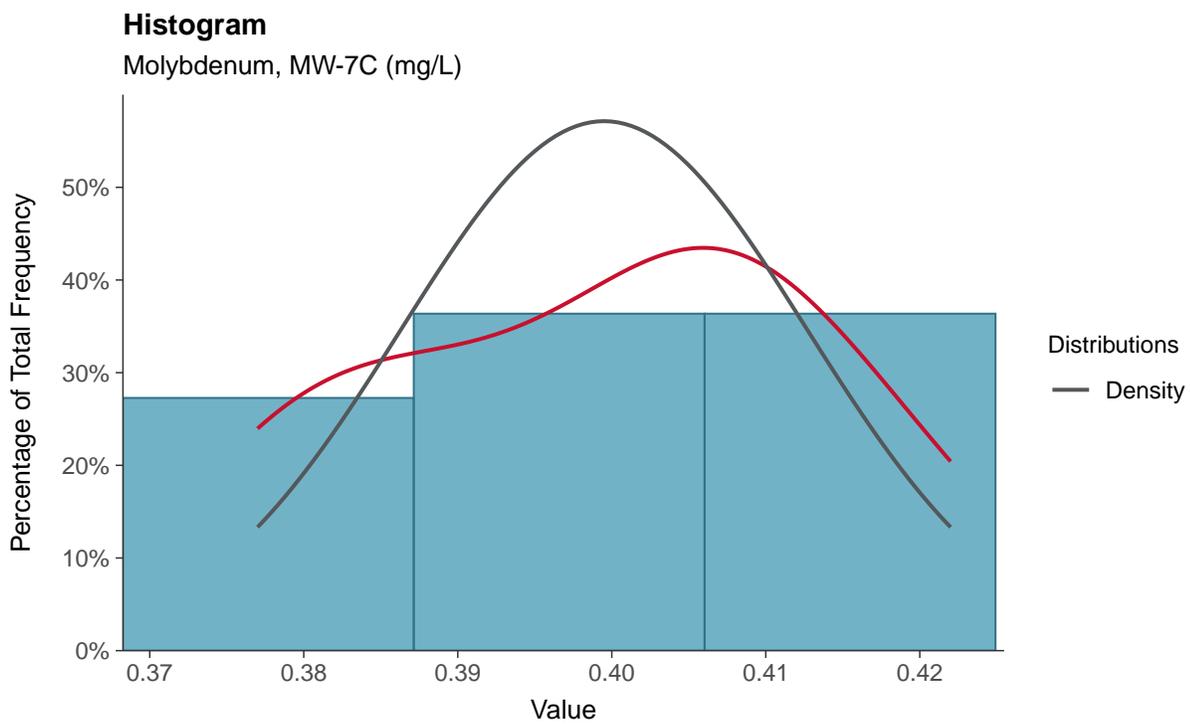
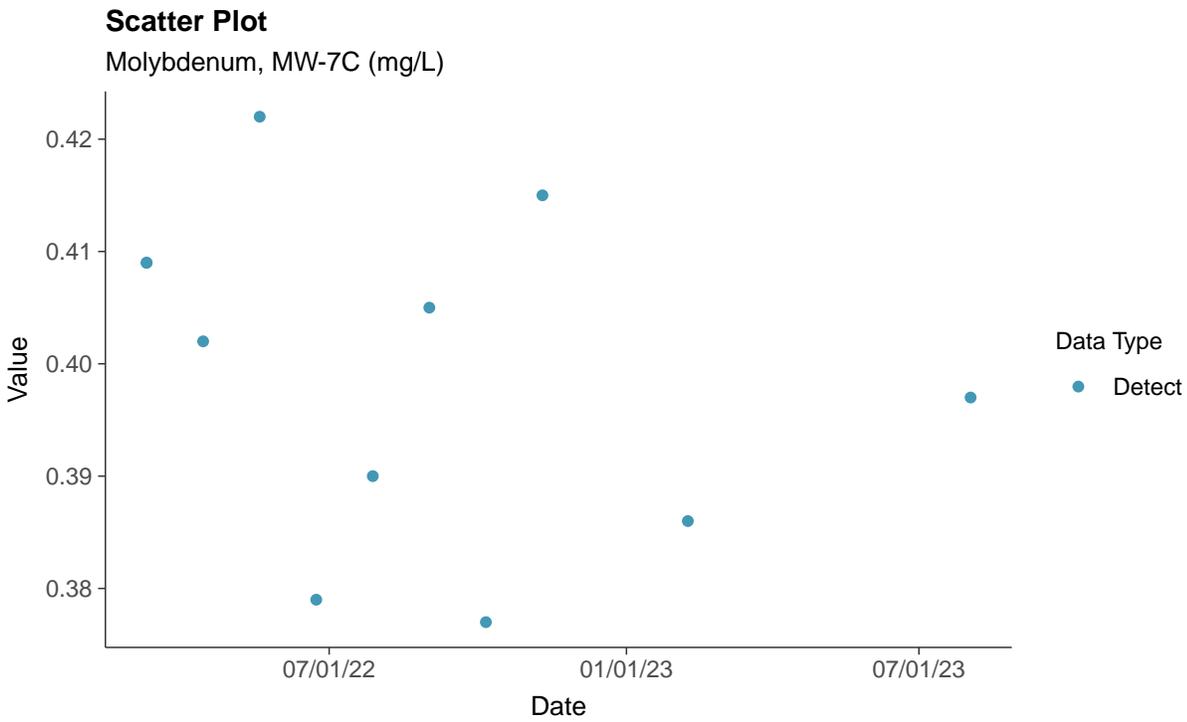
Mercury, MW-7C (mg/L)





Appendix IV: Molybdenum, MW-7C

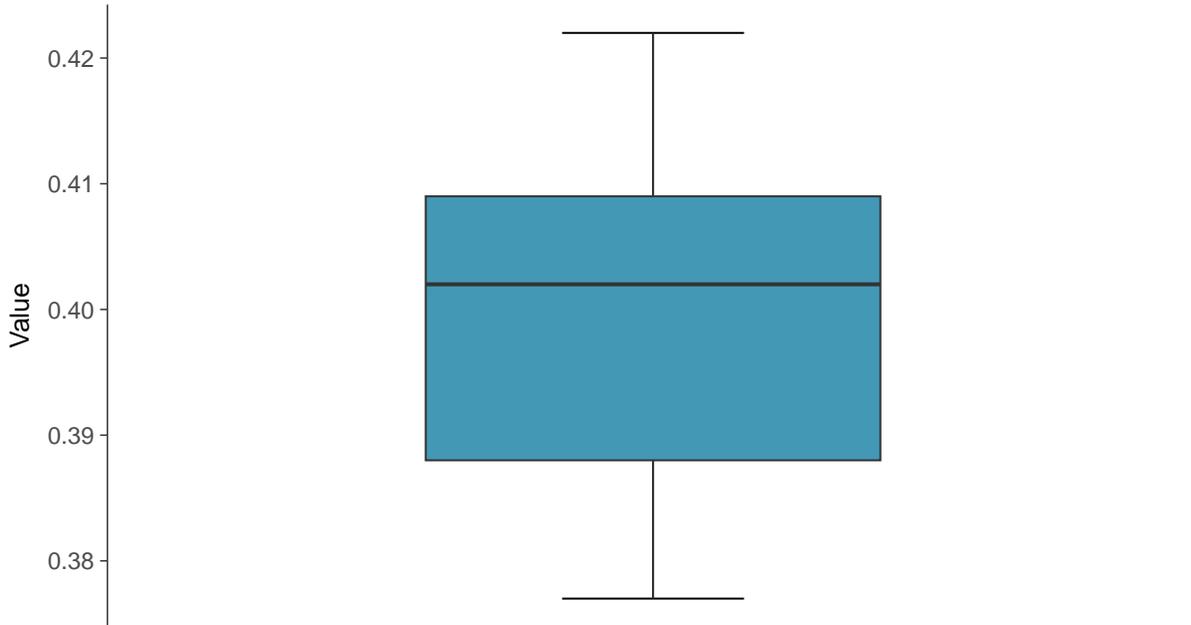
ID: 7C_2_18





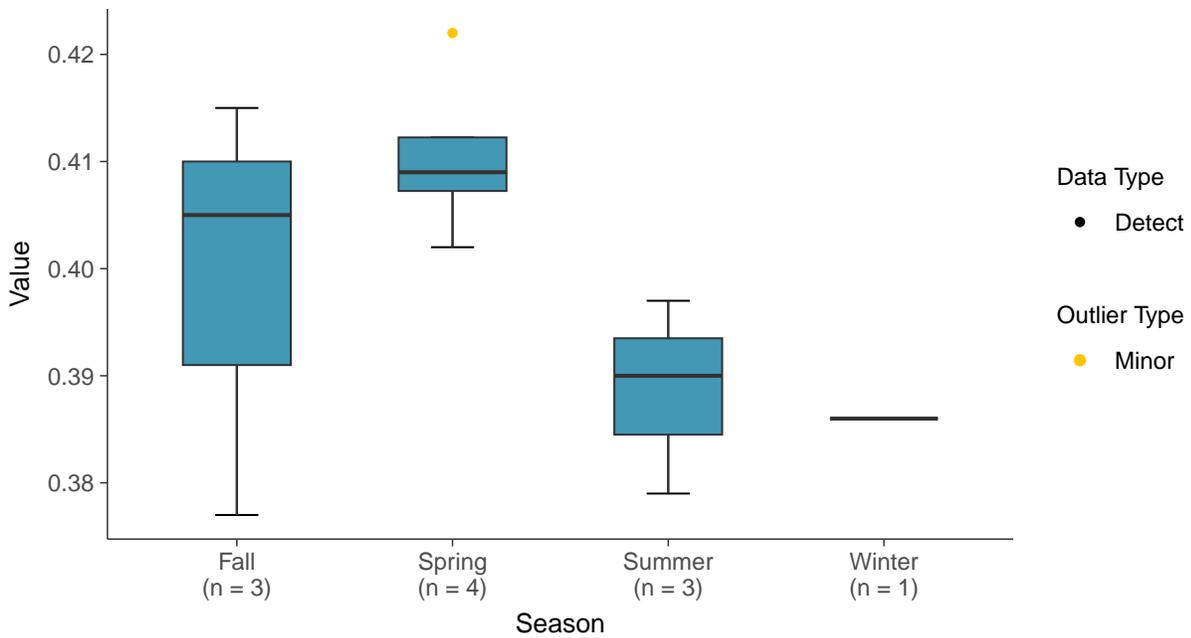
Boxplot

Molybdenum, MW-7C (mg/L)



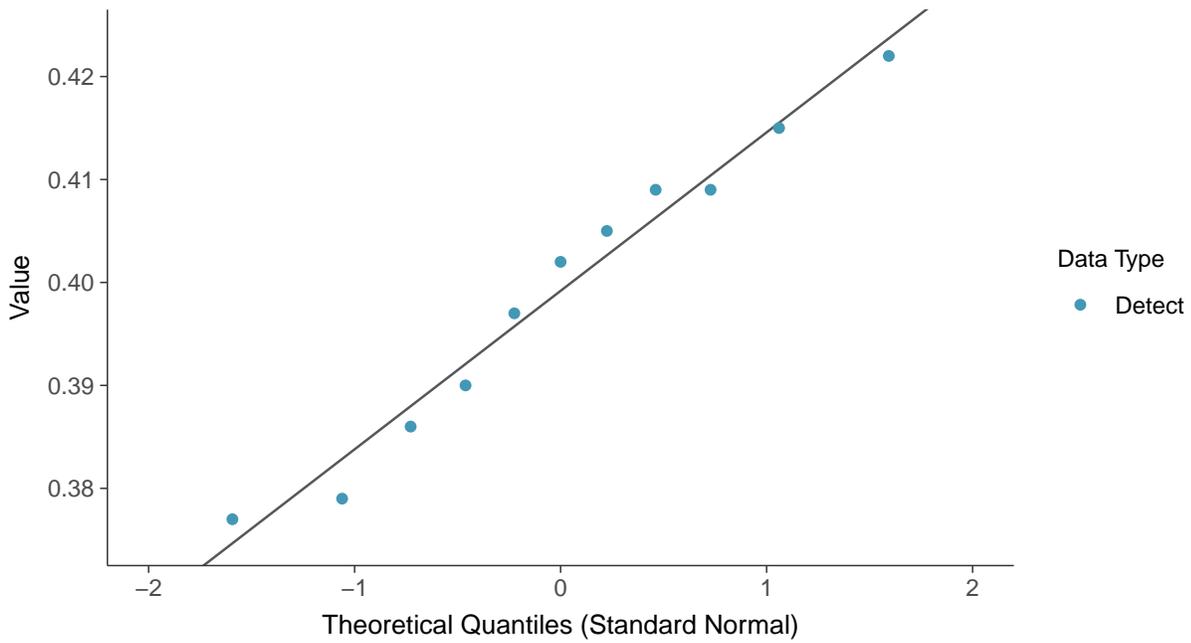
Boxplot by Season

Molybdenum, MW-7C (mg/L)

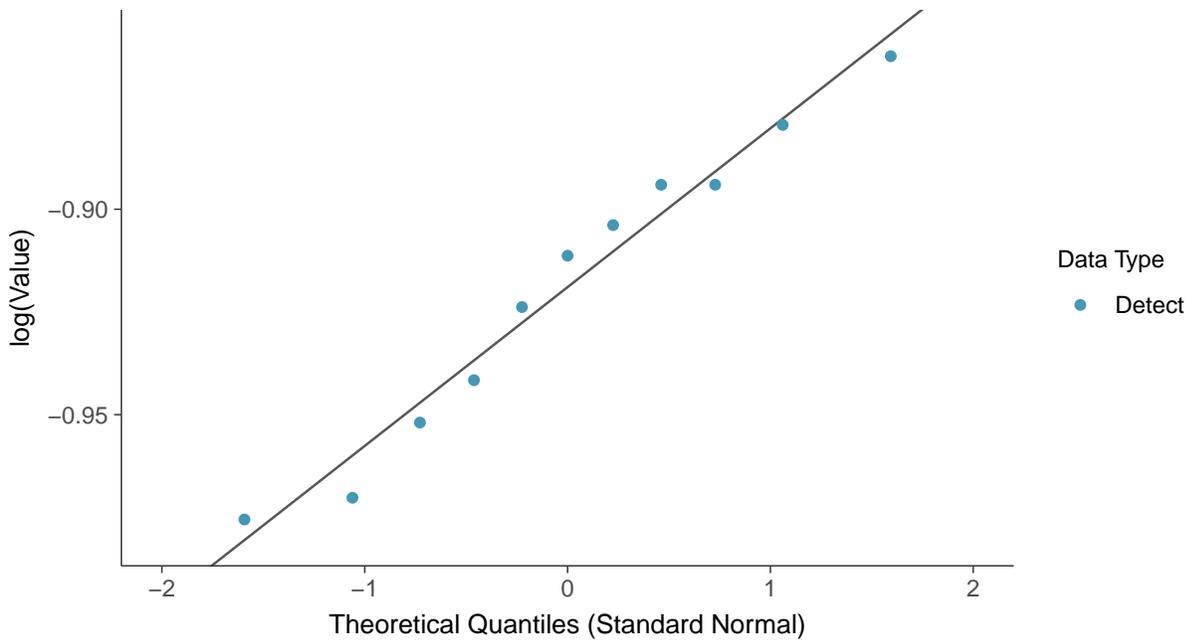




Normal Q-Q plot
Molybdenum, MW-7C (mg/L)

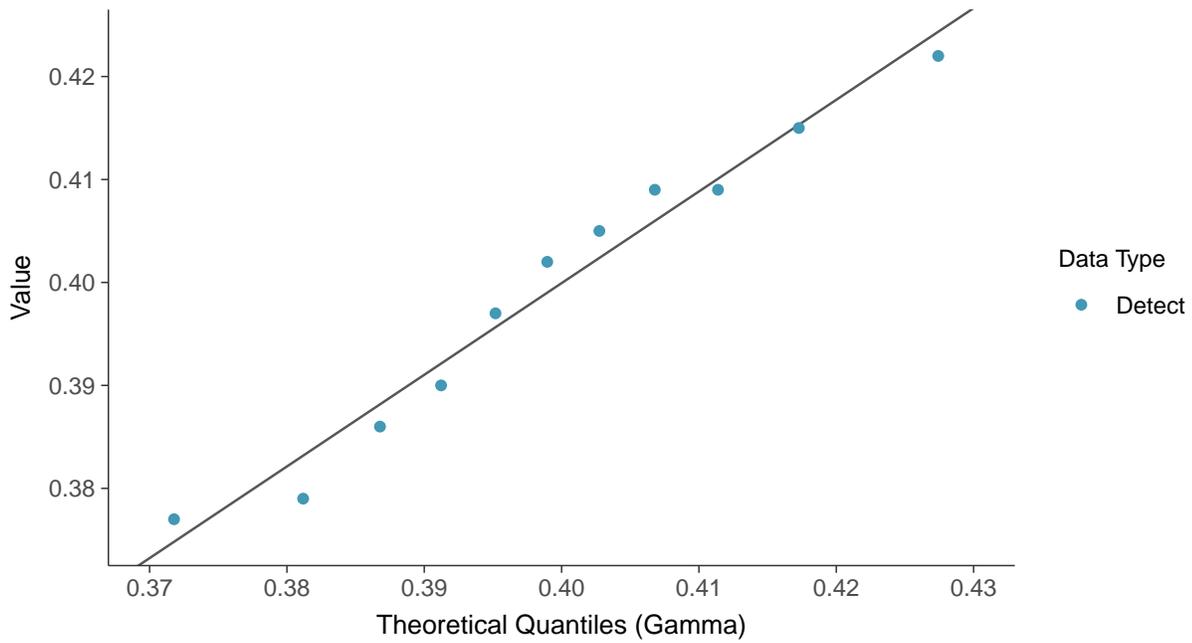


Lognormal Q-Q plot
Molybdenum, MW-7C (mg/L)

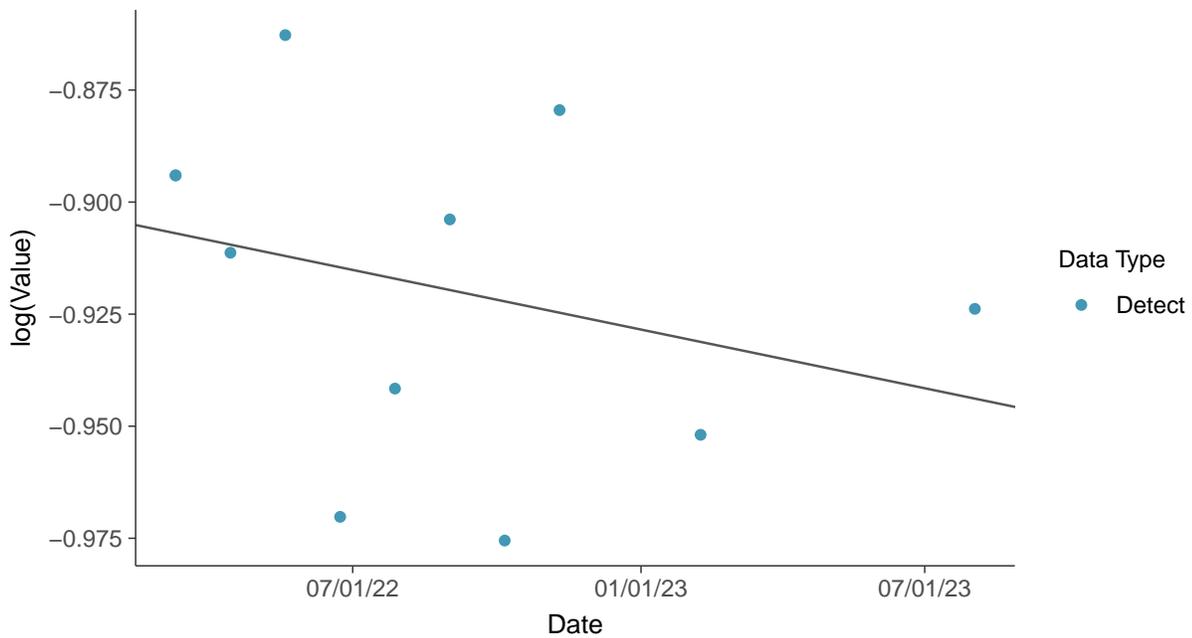




Gamma Q-Q plot
Molybdenum, MW-7C (mg/L)

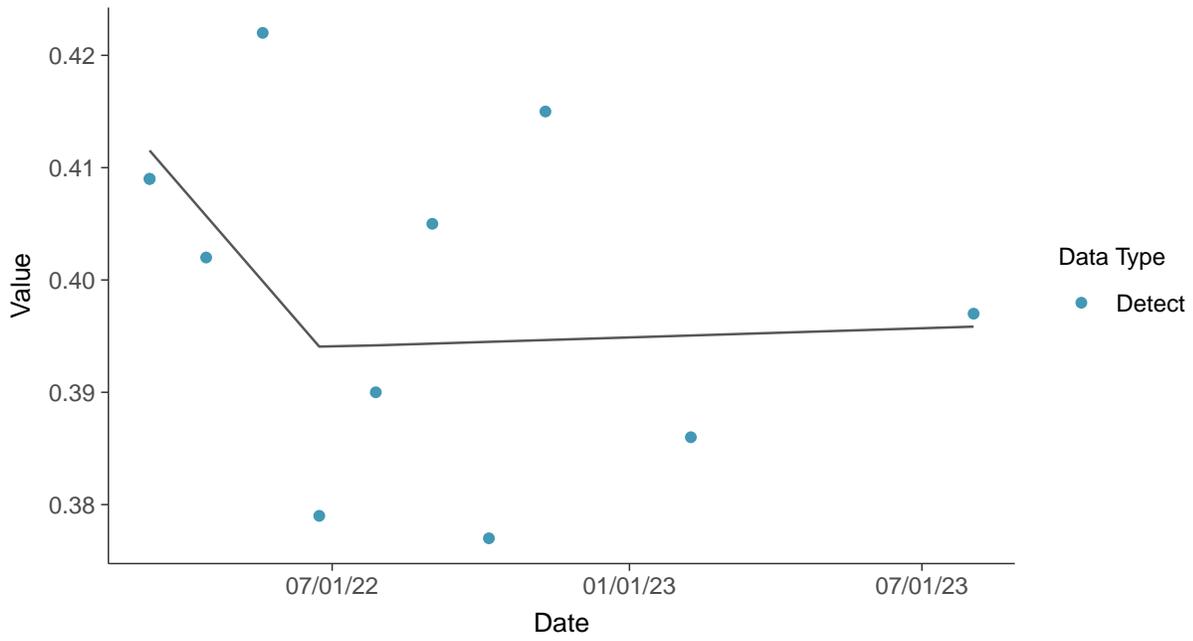


Trend Regression: Lognormal MLE
Molybdenum, MW-7C (mg/L)





Trend Regression: Piecewise Linear-Linear
Molybdenum, MW-7C (mg/L)



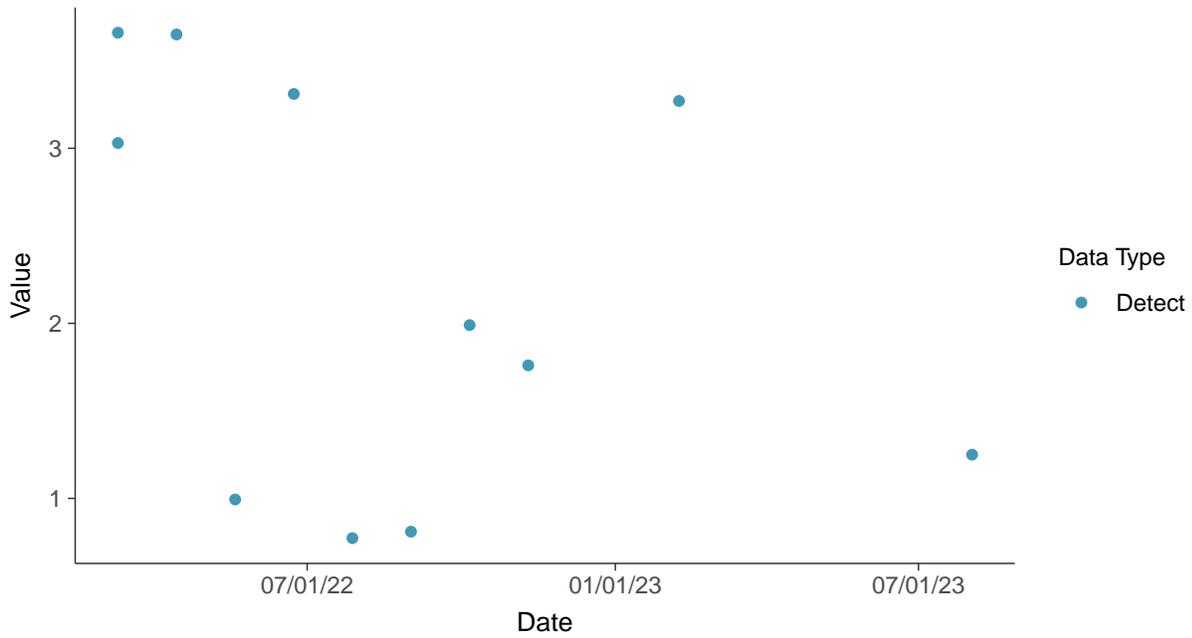


Appendix IV: Radium-226/228, MW-7C

ID: 7C_2_20

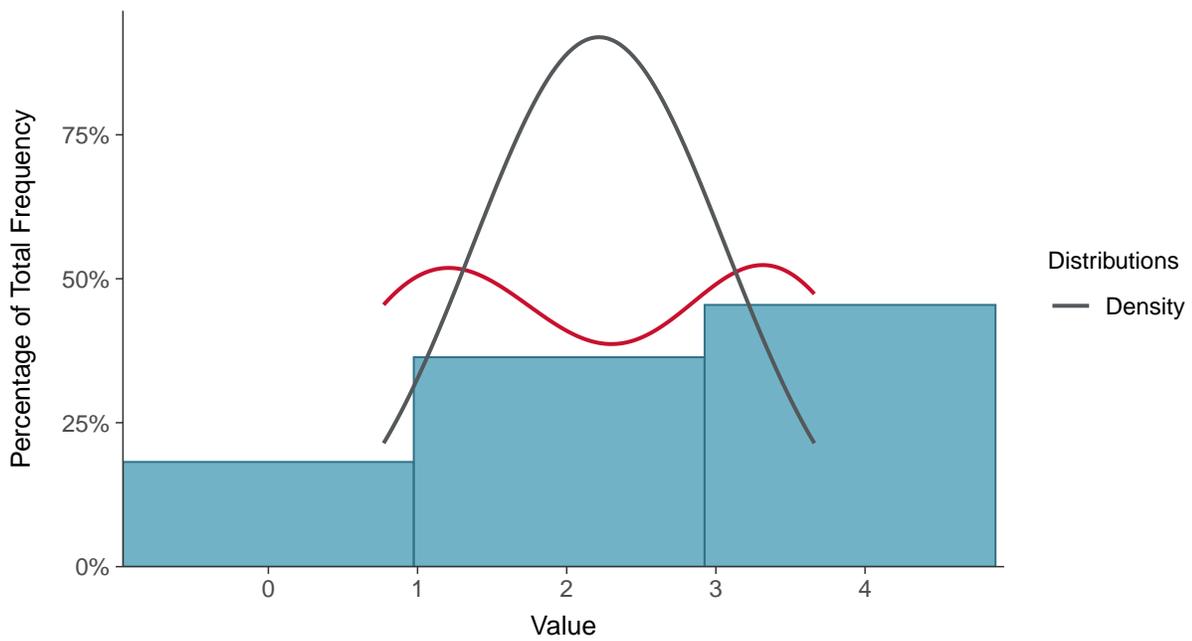
Scatter Plot

Radium-226/228, MW-7C (pCi/L)



Histogram

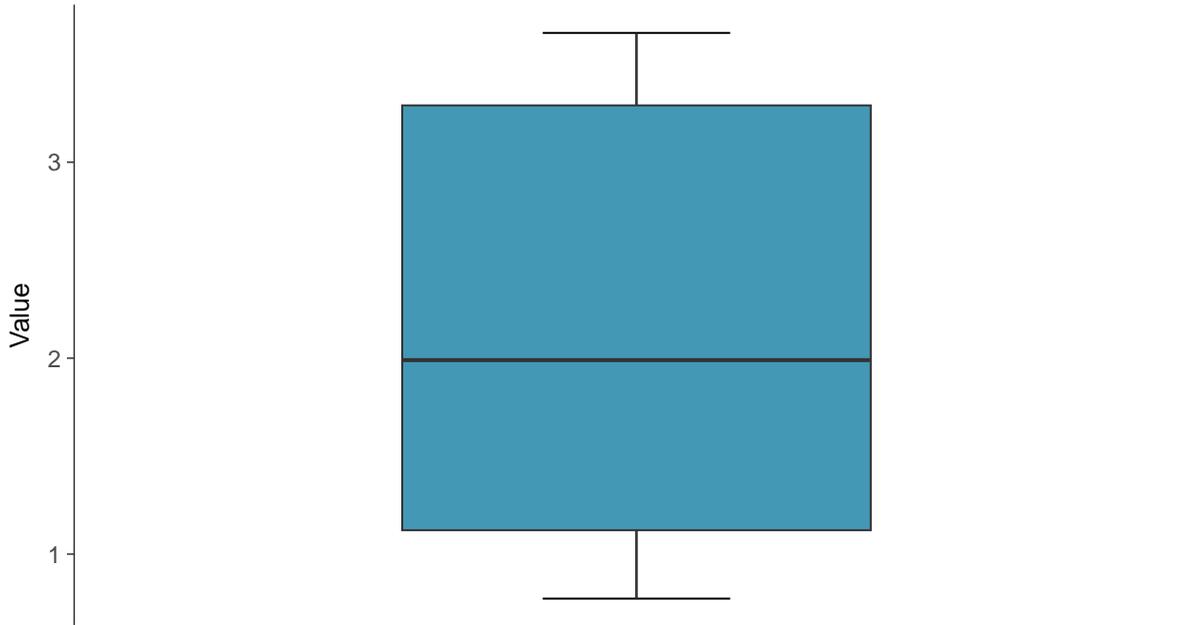
Radium-226/228, MW-7C (pCi/L)





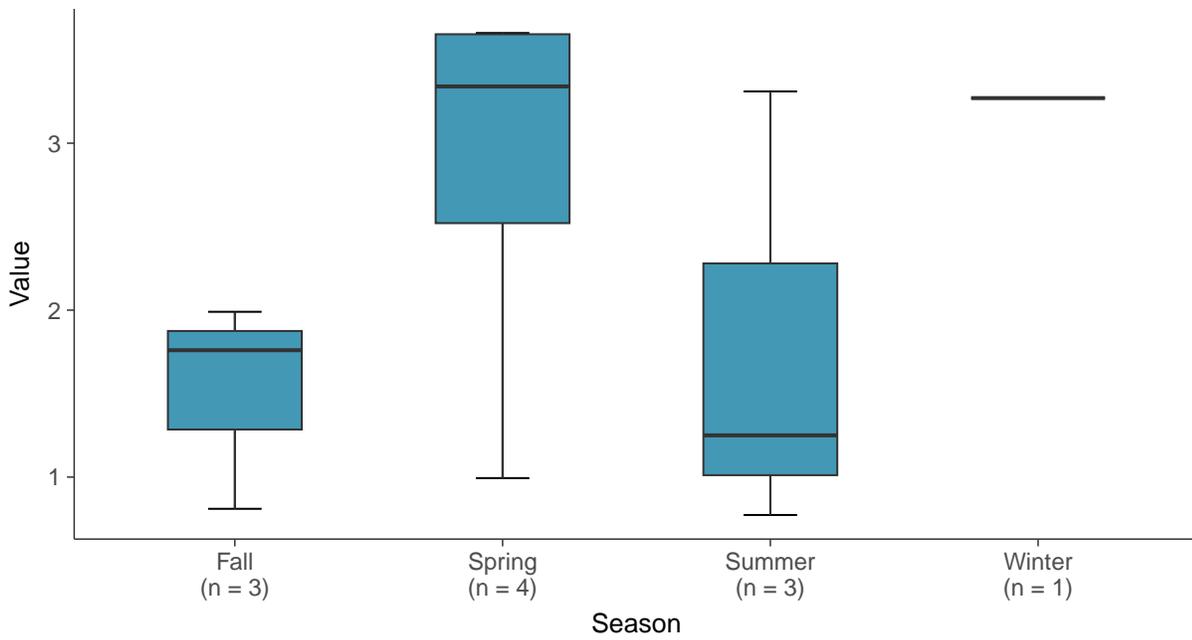
Boxplot

Radium-226/228, MW-7C (pCi/L)



Boxplot by Season

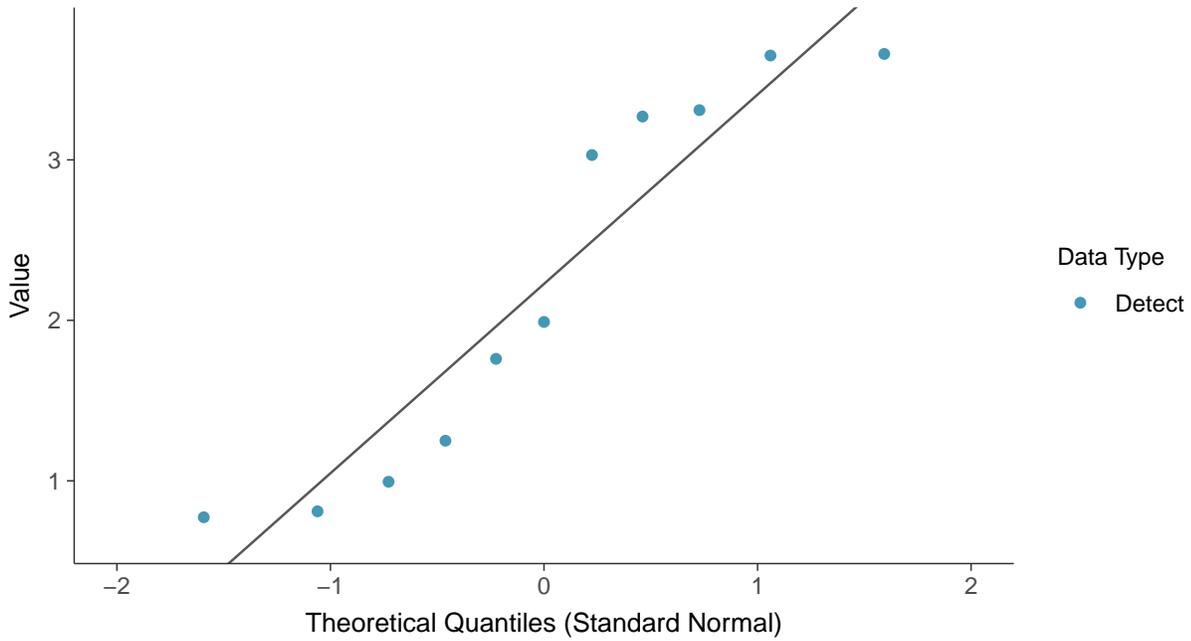
Radium-226/228, MW-7C (pCi/L)





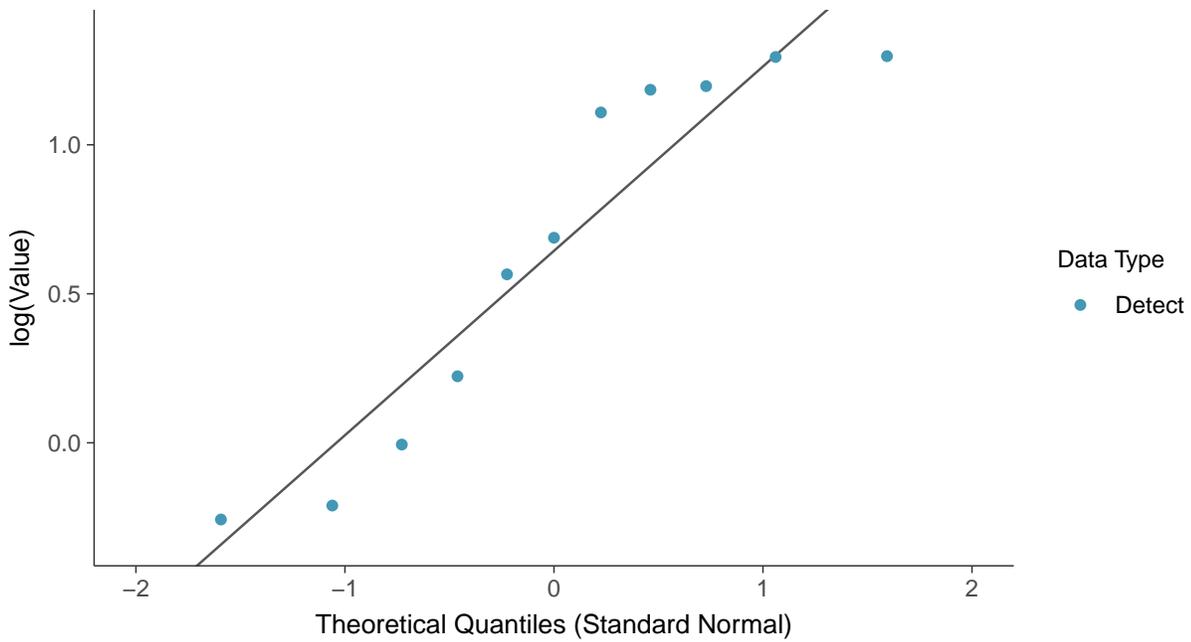
Normal Q-Q plot

Radium-226/228, MW-7C (pCi/L)



Lognormal Q-Q plot

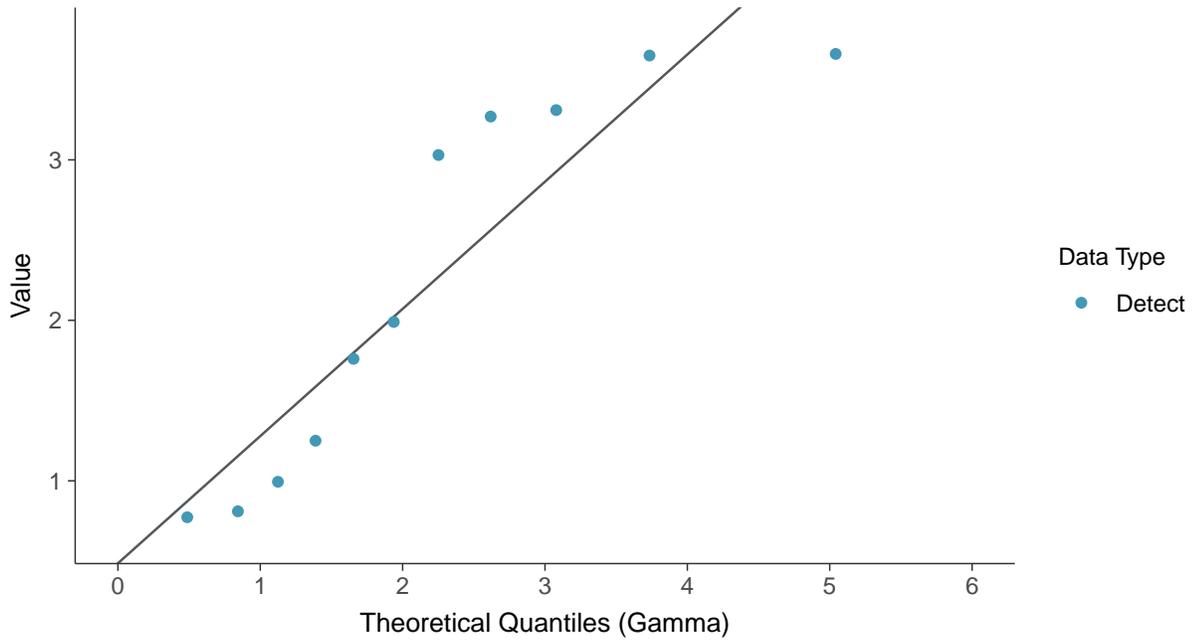
Radium-226/228, MW-7C (pCi/L)





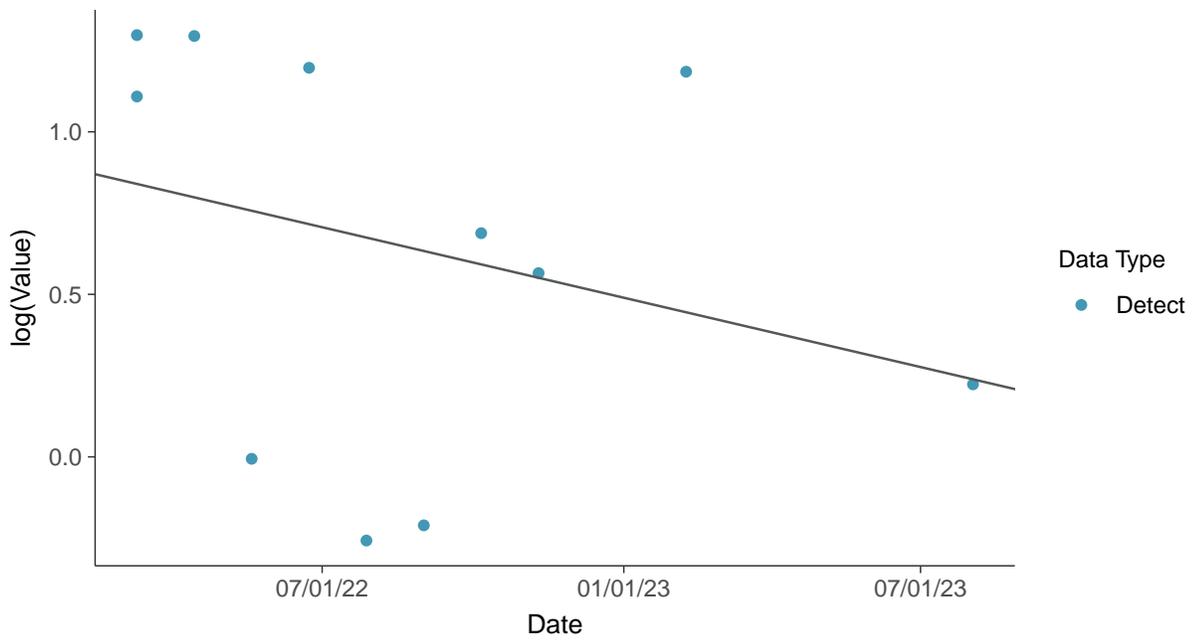
Gamma Q-Q plot

Radium-226/228, MW-7C (pCi/L)



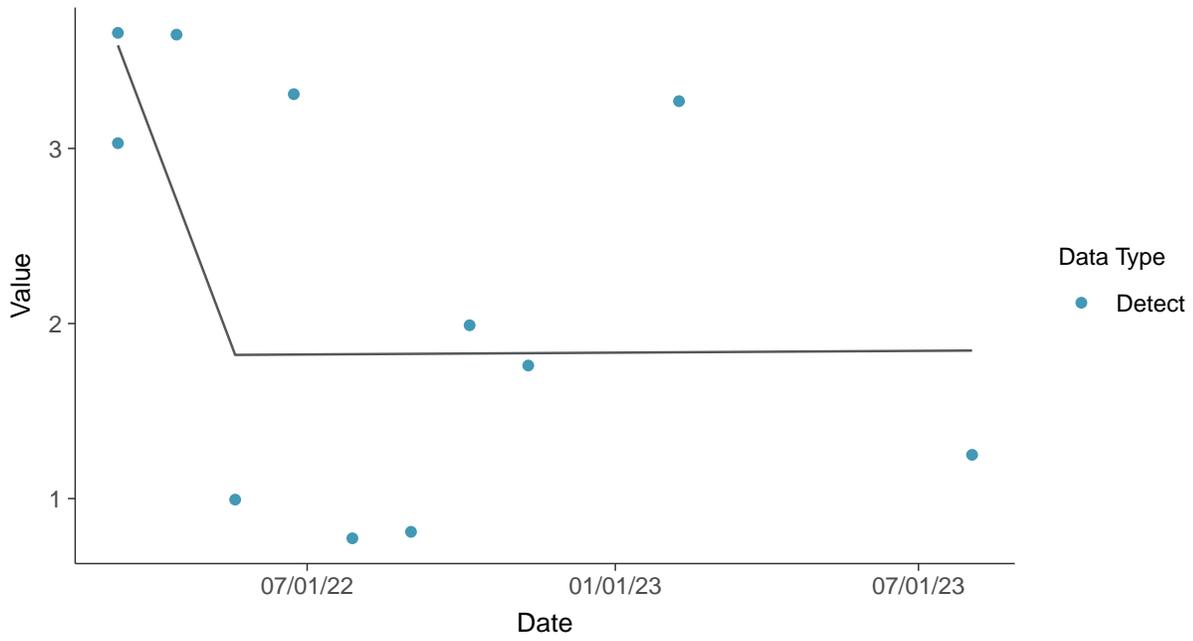
Trend Regression: Lognormal MLE

Radium-226/228, MW-7C (pCi/L)





Trend Regression: Piecewise Linear-Linear
Radium-226/228, MW-7C (pCi/L)





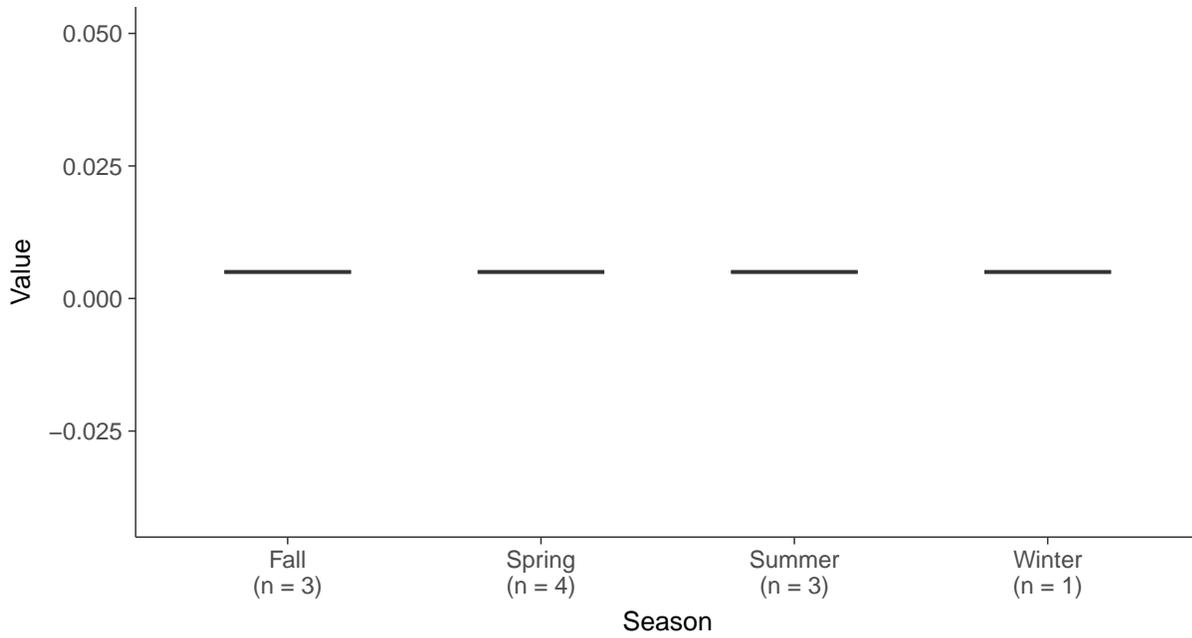
Boxplot

Selenium, MW-7C (mg/L)



Boxplot by Season

Selenium, MW-7C (mg/L)



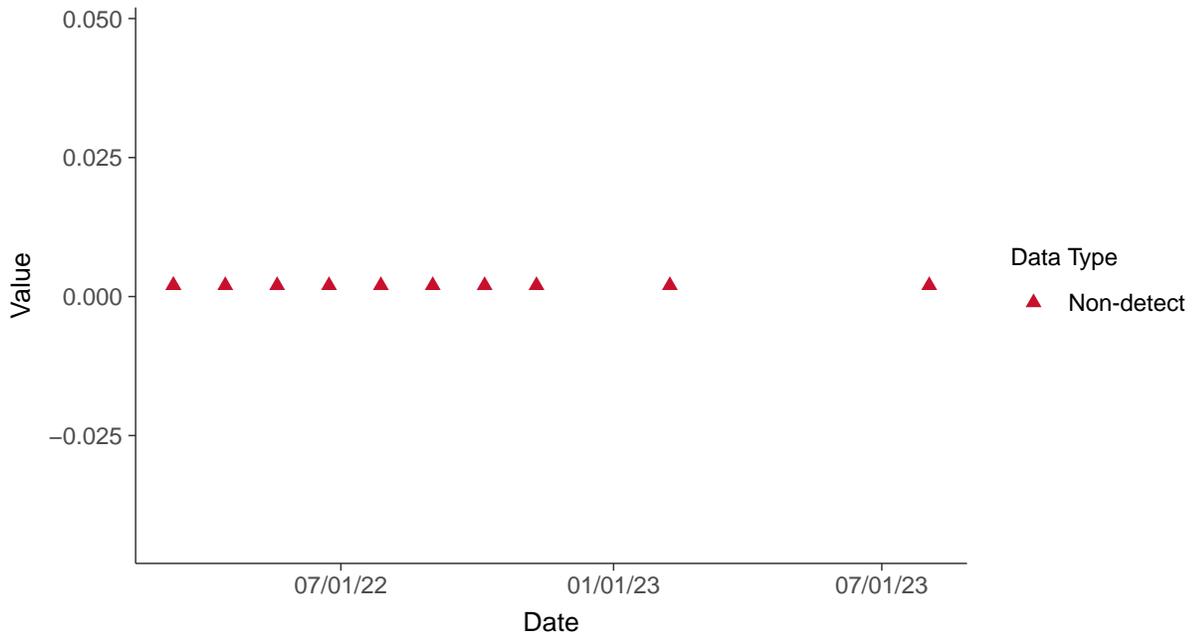


Appendix IV: Thallium, MW-7C

ID: 7C_2_23

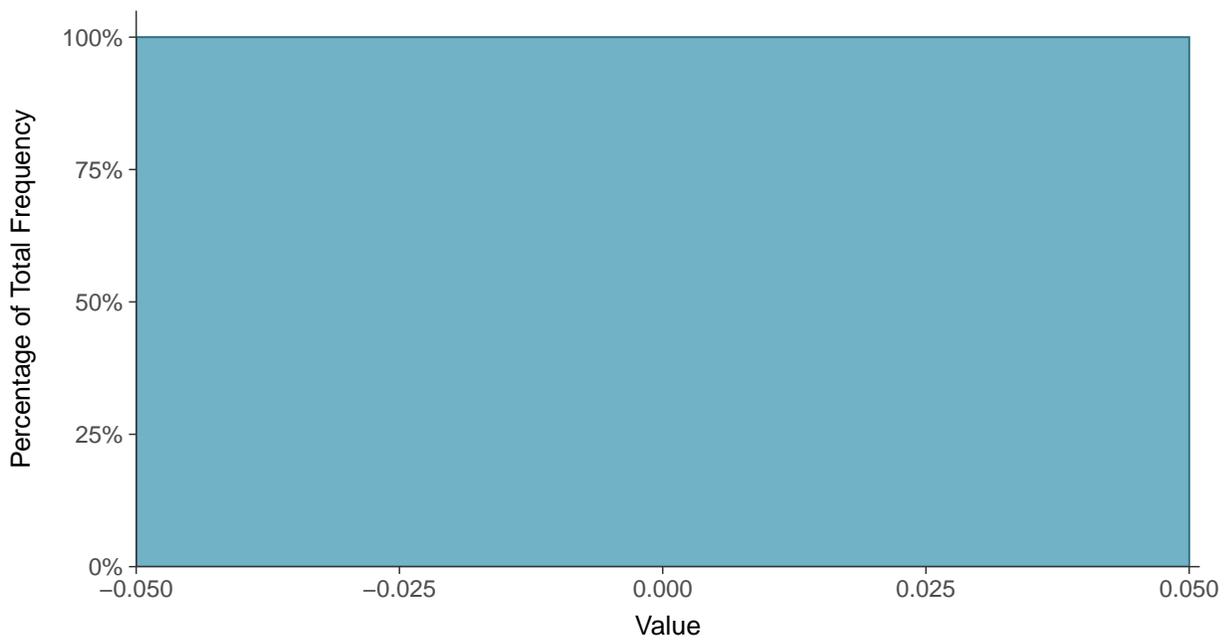
Scatter Plot

Thallium, MW-7C (mg/L)



Histogram

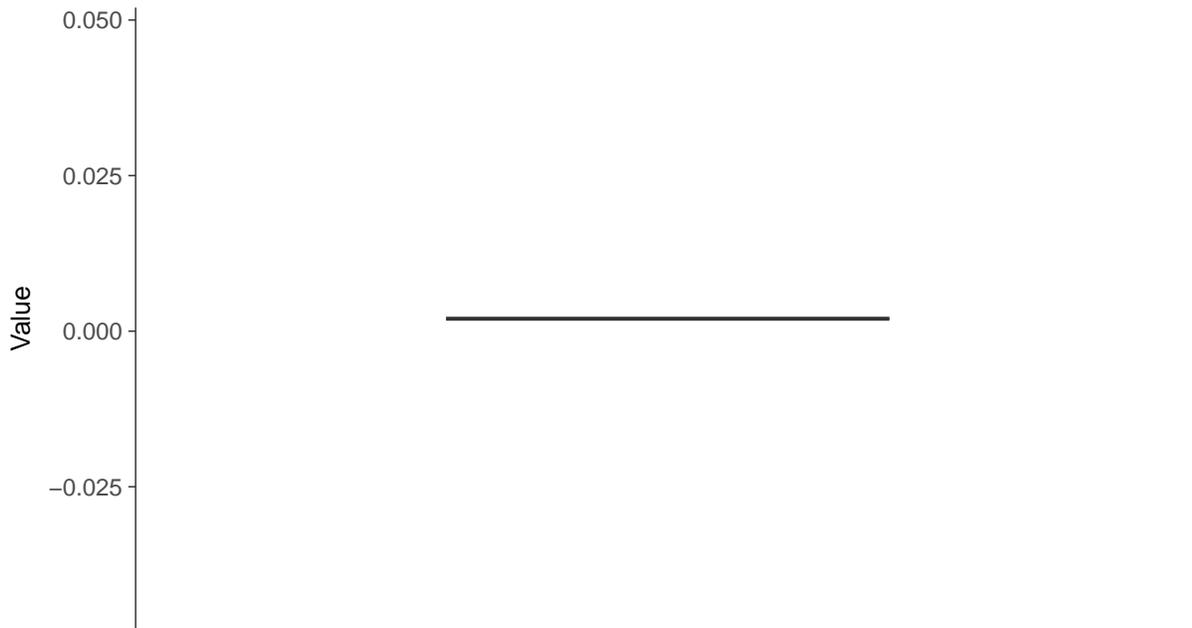
Thallium, MW-7C (mg/L)





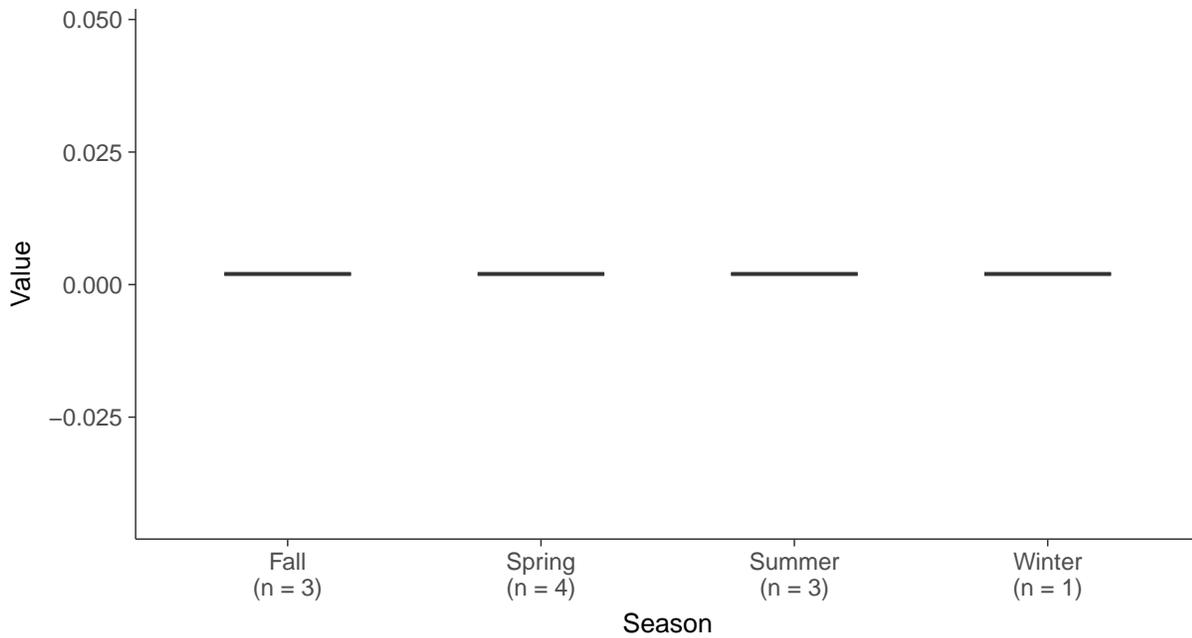
Boxplot

Thallium, MW-7C (mg/L)



Boxplot by Season

Thallium, MW-7C (mg/L)



**BWL Bedrock - 95% Lower Confidence Limits for Assessment Monitoring
Downgradient wells as of November, 2023**

Well	Type	Constituent	Unit	n	% NDs	Range of Sampling Period	Method	LCL
MW-16C	Appendix IV	Fluoride	mg/L	9	89%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.500
MW-16C	Appendix IV	Antimony	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16C	Appendix IV	Arsenic	mg/L	9	78%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00200
MW-16C	Appendix IV	Barium	mg/L	9	0%	2023-02-02 to 2023-11-21	Normal LCL	0.0336
MW-16C	Appendix IV	Beryllium	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00100
MW-16C	Appendix IV	Cadmium	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.000500
MW-16C	Appendix IV	Chromium	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16C	Appendix IV	Cobalt	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16C	Appendix IV	Lead	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00300
MW-16C	Appendix IV	Lithium	mg/L	9	0%	2023-02-02 to 2023-11-21	Normal LCL	0.0264
MW-16C	Appendix IV	Mercury	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.000200
MW-16C	Appendix IV	Molybdenum	mg/L	9	78%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16C	Appendix IV	Radium-226/228	pCi/L	9	0%	2023-02-02 to 2023-11-21	Adjusted Gamma LCL	0.826
MW-16C	Appendix IV	Selenium	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16C	Appendix IV	Thallium	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00200
MW-16D	Appendix IV	Fluoride	mg/L	9	89%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.500
MW-16D	Appendix IV	Antimony	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16D	Appendix IV	Arsenic	mg/L	9	33%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00200
MW-16D	Appendix IV	Barium	mg/L	9	0%	2023-02-02 to 2023-11-21	Normal LCL	0.0352
MW-16D	Appendix IV	Beryllium	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00100
MW-16D	Appendix IV	Cadmium	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.000500
MW-16D	Appendix IV	Chromium	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16D	Appendix IV	Cobalt	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16D	Appendix IV	Lead	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00300
MW-16D	Appendix IV	Lithium	mg/L	9	0%	2023-02-02 to 2023-11-21	Normal LCL	0.0269
MW-16D	Appendix IV	Mercury	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.000200
MW-16D	Appendix IV	Molybdenum	mg/L	9	0%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.0100
MW-16D	Appendix IV	Radium-226/228	pCi/L	9	0%	2023-02-02 to 2023-11-21	Normal LCL	1.15
MW-16D	Appendix IV	Selenium	mg/L	9	89%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16D	Appendix IV	Thallium	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00200
MW-7B	Appendix IV	Fluoride	mg/L	10	100%	2022-03-09 to 2023-08-02	Nonparametric LCL around the Median	1.00
MW-7B	Appendix IV	Antimony	mg/L	10	100%	2022-03-09 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-7B	Appendix IV	Arsenic	mg/L	10	90%	2022-03-09 to 2023-08-02	Nonparametric LCL around the Median	0.00200
MW-7B	Appendix IV	Barium	mg/L	10	0%	2022-03-09 to 2023-08-02	Normal LCL	0.00875
MW-7B	Appendix IV	Beryllium	mg/L	10	100%	2022-03-09 to 2023-08-02	Nonparametric LCL around the Median	0.00100
MW-7B	Appendix IV	Cadmium	mg/L	10	100%	2022-03-09 to 2023-08-02	Nonparametric LCL around the Median	0.000500
MW-7B	Appendix IV	Chromium	mg/L	10	100%	2022-03-09 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-7B	Appendix IV	Cobalt	mg/L	10	100%	2022-03-09 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-7B	Appendix IV	Lead	mg/L	10	90%	2022-03-09 to 2023-08-02	Nonparametric LCL around the Median	0.00300
MW-7B	Appendix IV	Lithium	mg/L	10	0%	2022-03-09 to 2023-08-02	Nonparametric LCL around the Median	0.0310
MW-7B	Appendix IV	Mercury	mg/L	10	100%	2022-03-09 to 2023-08-02	Nonparametric LCL around the Median	0.000200
MW-7B	Appendix IV	Molybdenum	mg/L	10	100%	2022-03-09 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-7B	Appendix IV	Radium-226/228	pCi/L	10	0%	2022-03-09 to 2023-08-02	Normal LCL	0.792
MW-7B	Appendix IV	Selenium	mg/L	10	100%	2022-03-09 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-7B	Appendix IV	Thallium	mg/L	10	100%	2022-03-09 to 2023-08-02	Nonparametric LCL around the Median	0.00200



Table 1: Summary Statistics, Non-Detects Included

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit ^a	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
16C_2_04	MW-16C	Appendix IV	Fluoride	mg/L	9	8	89%	2023-02-02 to 2023-11-21		Nonparametric	0.856	1.00	0.200	1.00	0.296	0.346	0	-1.89	2.51
16C_2_08	MW-16C	Appendix IV	Antimony	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
16C_2_09	MW-16C	Appendix IV	Arsenic	mg/L	9	7	78%	2023-02-02 to 2023-11-21		Nonparametric	0.00211	0.00200	0.00200	0.00300	0.000333	0.158	0	3.00	9.0
16C_2_10	MW-16C	Appendix IV	Barium	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	0.0404	0.0350	0.0300	0.0610	0.0111	0.274	0.00741	0.898	-0.500
16C_2_11	MW-16C	Appendix IV	Beryllium	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.00100	0.00100	0.00100	0.00100	0	0	0	NA	NA
16C_2_12	MW-16C	Appendix IV	Cadmium	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
16C_2_13	MW-16C	Appendix IV	Chromium	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
16C_2_14	MW-16C	Appendix IV	Cobalt	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
16C_2_15	MW-16C	Appendix IV	Lead	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.00300	0.00300	0.00300	0.00300	0	0	0	NA	NA
16C_2_16	MW-16C	Appendix IV	Lithium	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	0.0273	0.0270	0.0260	0.0300	0.00158	0.0578	0.00148	0.759	-1.20
16C_2_17	MW-16C	Appendix IV	Mercury	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.000200	0.000200	0.000200	0.000200	0	0	0	NA	NA
16C_2_18	MW-16C	Appendix IV	Molybdenum	mg/L	9	7	78%	2023-02-02 to 2023-11-21		Nonparametric	0.00567	0.00500	0.00500	0.00900	0.00141	0.250	0	2.12	4.0
16C_2_20	MW-16C	Appendix IV	Radium-226/228	pCi/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Gamma	1.45	1.30	0.225	3.60	1.16	0.803	1.42	0.722	-0.353
16C_2_22	MW-16C	Appendix IV	Selenium	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
16C_2_23	MW-16C	Appendix IV	Thallium	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
16D_2_04	MW-16D	Appendix IV	Fluoride	mg/L	9	8	89%	2023-02-02 to 2023-11-21		Nonparametric	0.873	1.00	0.360	1.00	0.254	0.291	0	-1.70	1.28
16D_2_08	MW-16D	Appendix IV	Antimony	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
16D_2_09	MW-16D	Appendix IV	Arsenic	mg/L	9	3	33%	2023-02-02 to 2023-11-21		Nonparametric	0.00300	0.00300	0.00200	0.00400	0.000866	0.289	0.00148	0	-1.71
16D_2_10	MW-16D	Appendix IV	Barium	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	0.0360	0.0360	0.0340	0.0380	0.00122	0.0340	0.00148	0.0000000000000110	-0.286
16D_2_11	MW-16D	Appendix IV	Beryllium	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.00100	0.00100	0.00100	0.00100	0	0	0	NA	NA
16D_2_12	MW-16D	Appendix IV	Cadmium	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
16D_2_13	MW-16D	Appendix IV	Chromium	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
16D_2_14	MW-16D	Appendix IV	Cobalt	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
16D_2_15	MW-16D	Appendix IV	Lead	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.00300	0.00300	0.00300	0.00300	0	0	0	NA	NA
16D_2_16	MW-16D	Appendix IV	Lithium	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	0.0298	0.0300	0.0220	0.0390	0.00460	0.155	0.00296	0.440	2.07
16D_2_17	MW-16D	Appendix IV	Mercury	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.000200	0.000200	0.000200	0.000200	0	0	0	NA	NA
16D_2_18	MW-16D	Appendix IV	Molybdenum	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Nonparametric	Nonparametric	0.0101	0.0110	0.00500	0.0120	0.00203	0.201	0.00148	-2.39	6.49
16D_2_20	MW-16D	Appendix IV	Radium-226/228	pCi/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	1.85	1.52	0.515	4.14	1.13	0.609	1.04	1.03	0.885
16D_2_22	MW-16D	Appendix IV	Selenium	mg/L	9	8	89%	2023-02-02 to 2023-11-21		Nonparametric	0.00511	0.00500	0.00500	0.00600	0.000333	0.0652	0	3.00	9.0
16D_2_23	MW-16D	Appendix IV	Thallium	mg/L	9	9	100%	2023-02-02 to 2023-11-21		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA
7B_2_04	MW-7B	Appendix IV	Fluoride	mg/L	10	10	100%	2022-03-09 to 2023-08-02		Nonparametric	1.00	1.00	1.00	1.00	0	0	0	NA	NA
7B_2_08	MW-7B	Appendix IV	Antimony	mg/L	10	10	100%	2022-03-09 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
7B_2_09	MW-7B	Appendix IV	Arsenic	mg/L	10	9	90%	2022-03-09 to 2023-08-02		Nonparametric	0.00210	0.00200	0.00200	0.00300	0.000316	0.151	0	3.16	10.0
7B_2_10	MW-7B	Appendix IV	Barium	mg/L	10	0	0%	2022-03-09 to 2023-08-02	Gamma; Lognormal; Normal	Normal	0.00930	0.00900	0.00800	0.0110	0.000949	0.102	0.00148	0.234	-0.347
7B_2_11	MW-7B	Appendix IV	Beryllium	mg/L	10	10	100%	2022-03-09 to 2023-08-02		Nonparametric	0.00100	0.00100	0.00100	0.00100	0	0	0	NA	NA
7B_2_12	MW-7B	Appendix IV	Cadmium	mg/L	10	10	100%	2022-03-09 to 2023-08-02		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
7B_2_13	MW-7B	Appendix IV	Chromium	mg/L	10	10	100%	2022-03-09 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
7B_2_14	MW-7B	Appendix IV	Cobalt	mg/L	10	10	100%	2022-03-09 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
7B_2_15	MW-7B	Appendix IV	Lead	mg/L	10	9	90%	2022-03-09 to 2023-08-02		Nonparametric	0.00390	0.00300	0.00300	0.0120	0.00285	0.730	0	3.16	10.0
7B_2_16	MW-7B	Appendix IV	Lithium	mg/L	10	0	0%	2022-03-09 to 2023-08-02	Nonparametric	Nonparametric	0.0315	0.0320	0.0280	0.0340	0.00151	0.0479	0.000741	-1.09	3.64
7B_2_17	MW-7B	Appendix IV	Mercury	mg/L	10	10	100%	2022-03-09 to 2023-08-02		Nonparametric	0.000200	0.000200	0.000200	0.000200	0	0	0	NA	NA
7B_2_18	MW-7B	Appendix IV	Molybdenum	mg/L	10	10	100%	2022-03-09 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA

(Table continues on next page)

^a Non-detects are excluded from goodness-of-fit tests.



Table 1: Summary Statistics, Non-Detects Included (continued)

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit ^a	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
7B_2_20	MW-7B	Appendix IV	Radium-226/228	pCi/L	10	0	0%	2022-03-09 to 2023-08-02	Gamma; Lognormal; Normal	Normal	1.19	1.20	0.378	2.43	0.689	0.578	0.807	0.368	-0.813
7B_2_22	MW-7B	Appendix IV	Selenium	mg/L	10	10	100%	2022-03-09 to 2023-08-02		Nonparametric	0.00500	0.00500	0.00500	0.00500	0	0	0	NA	NA
7B_2_23	MW-7B	Appendix IV	Thallium	mg/L	10	10	100%	2022-03-09 to 2023-08-02		Nonparametric	0.00200	0.00200	0.00200	0.00200	0	0	0	NA	NA

^a Non-detects are excluded from goodness-of-fit tests.



Table 2: Summary Statistics, Non-Detects Excluded

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
16C_2_04	MW-16C	Appendix IV	Fluoride	mg/L	9	8	89%	2023-02-02 to 2023-11-21		Nonparametric	0.200	0.200	0.200	0.200	NA	NA	0	NA	NA
16C_2_09	MW-16C	Appendix IV	Arsenic	mg/L	9	7	78%	2023-02-02 to 2023-11-21		Nonparametric	0.00250	0.00250	0.00200	0.00300	0.000707	0.283	0.000741	NA	NA
16C_2_10	MW-16C	Appendix IV	Barium	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	0.0404	0.0350	0.0300	0.0610	0.0111	0.274	0.00741	0.898	-0.500
16C_2_16	MW-16C	Appendix IV	Lithium	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	0.0273	0.0270	0.0260	0.0300	0.00158	0.0578	0.00148	0.759	-1.20
16C_2_18	MW-16C	Appendix IV	Molybdenum	mg/L	9	7	78%	2023-02-02 to 2023-11-21		Nonparametric	0.00800	0.00800	0.00700	0.00900	0.00141	0.177	0.00148	NA	NA
16C_2_20	MW-16C	Appendix IV	Radium-226/228	pCi/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Gamma	1.45	1.30	0.225	3.60	1.16	0.803	1.42	0.722	-0.353
16D_2_04	MW-16D	Appendix IV	Fluoride	mg/L	9	8	89%	2023-02-02 to 2023-11-21		Nonparametric	0.360	0.360	0.360	0.360	NA	NA	0	NA	NA
16D_2_09	MW-16D	Appendix IV	Arsenic	mg/L	9	3	33%	2023-02-02 to 2023-11-21		Nonparametric	0.00350	0.00350	0.00300	0.00400	0.000548	0.156	0.000741	0	-3.33
16D_2_10	MW-16D	Appendix IV	Barium	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	0.0360	0.0360	0.0340	0.0380	0.00122	0.0340	0.00148	0.0000000000000110	-0.286
16D_2_16	MW-16D	Appendix IV	Lithium	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	0.0298	0.0300	0.0220	0.0390	0.00460	0.155	0.00296	0.440	2.07
16D_2_18	MW-16D	Appendix IV	Molybdenum	mg/L	9	0	0%	2023-02-02 to 2023-11-21		Nonparametric	0.0101	0.0110	0.00500	0.0120	0.00203	0.201	0.00148	-2.39	6.49
16D_2_20	MW-16D	Appendix IV	Radium-226/228	pCi/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	1.85	1.52	0.515	4.14	1.13	0.609	1.04	1.03	0.885
16D_2_22	MW-16D	Appendix IV	Selenium	mg/L	9	8	89%	2023-02-02 to 2023-11-21		Nonparametric	0.00600	0.00600	0.00600	0.00600	NA	NA	0	NA	NA
7B_2_09	MW-7B	Appendix IV	Arsenic	mg/L	10	9	90%	2022-03-09 to 2023-08-02		Nonparametric	0.00300	0.00300	0.00300	0.00300	NA	NA	0	NA	NA
7B_2_10	MW-7B	Appendix IV	Barium	mg/L	10	0	0%	2022-03-09 to 2023-08-02	Gamma; Lognormal; Normal	Normal	0.00930	0.00900	0.00800	0.0110	0.000949	0.102	0.00148	0.234	-0.347
7B_2_15	MW-7B	Appendix IV	Lead	mg/L	10	9	90%	2022-03-09 to 2023-08-02		Nonparametric	0.0120	0.0120	0.0120	0.0120	NA	NA	0	NA	NA
7B_2_16	MW-7B	Appendix IV	Lithium	mg/L	10	0	0%	2022-03-09 to 2023-08-02		Nonparametric	0.0315	0.0320	0.0280	0.0340	0.00151	0.0479	0.000741	-1.09	3.64
7B_2_20	MW-7B	Appendix IV	Radium-226/228	pCi/L	10	0	0%	2022-03-09 to 2023-08-02	Gamma; Lognormal; Normal	Normal	1.19	1.20	0.378	2.43	0.689	0.578	0.807	0.368	-0.813



Table 3: Goodness-of-Fit Tests, Non-Detects Excluded

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Normal		Lognormal		Gamma				Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution				
								S-W		Lilliefors		S-W		Lilliefors					K-S		A-D	
								Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value				Stat.	p-Value	Stat.	p-Value
16C_2_04	MW-16C	Appendix IV	Fluoride	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric		
16C_2_08	MW-16C	Appendix IV	Antimony	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric		
16C_2_09	MW-16C	Appendix IV	Arsenic	mg/L	9	7	78%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.287	NA	Nonparametric		
16C_2_10	MW-16C	Appendix IV	Barium	mg/L	9	0	0%	0.862	0.100	0.244	0.126	0.883	0.170	0.225	0.209	0.242	>= 0.10	0.565	>= 0.10	0.259	Gamma; Lognormal; Normal	Normal
16C_2_11	MW-16C	Appendix IV	Beryllium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16C_2_12	MW-16C	Appendix IV	Cadmium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16C_2_13	MW-16C	Appendix IV	Chromium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16C_2_14	MW-16C	Appendix IV	Cobalt	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16C_2_15	MW-16C	Appendix IV	Lead	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16C_2_16	MW-16C	Appendix IV	Lithium	mg/L	9	0	0%	0.807	0.024	0.250	0.107	0.809	0.026	0.247	0.116	0.258	0.05 <= p < 0.10	0.843	0.01 <= p < 0.05	0.057	Gamma; Lognormal; Normal	Normal
16C_2_17	MW-16C	Appendix IV	Mercury	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16C_2_18	MW-16C	Appendix IV	Molybdenum	mg/L	9	7	78%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.178	NA	NA	Nonparametric	
16C_2_20	MW-16C	Appendix IV	Radium-226/228	pCi/L	9	0	0%	0.921	0.404	0.157	0.758	0.925	0.434	0.163	0.705	0.136	>= 0.10	0.252	>= 0.10	1.016	Gamma; Lognormal; Normal	Gamma
16C_2_22	MW-16C	Appendix IV	Selenium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16C_2_23	MW-16C	Appendix IV	Thallium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16D_2_04	MW-16D	Appendix IV	Fluoride	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16D_2_08	MW-16D	Appendix IV	Antimony	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16D_2_09	MW-16D	Appendix IV	Arsenic	mg/L	9	3	33%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.158	NA	NA	Nonparametric	
16D_2_10	MW-16D	Appendix IV	Barium	mg/L	9	0	0%	0.963	0.830	0.167	0.668	0.963	0.827	0.173	0.613	0.171	>= 0.10	0.285	>= 0.10	0.034	Gamma; Lognormal; Normal	Normal
16D_2_11	MW-16D	Appendix IV	Beryllium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16D_2_12	MW-16D	Appendix IV	Cadmium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16D_2_13	MW-16D	Appendix IV	Chromium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16D_2_14	MW-16D	Appendix IV	Cobalt	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16D_2_15	MW-16D	Appendix IV	Lead	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16D_2_16	MW-16D	Appendix IV	Lithium	mg/L	9	0	0%	0.929	0.468	0.204	0.349	0.936	0.539	0.213	0.282	0.206	>= 0.10	0.415	>= 0.10	0.155	Gamma; Lognormal; Normal	Normal
16D_2_17	MW-16D	Appendix IV	Mercury	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16D_2_18	MW-16D	Appendix IV	Molybdenum	mg/L	9	0	0%	0.683	0.001	0.367	0.001	0.602	0.000	0.411	0.000	0.399	< 0.01	1.545	< 0.01	0.262	Nonparametric	Nonparametric
16D_2_20	MW-16D	Appendix IV	Radium-226/228	pCi/L	9	0	0%	0.930	0.484	0.171	0.625	0.989	0.995	0.132	0.922	0.112	>= 0.10	0.134	>= 0.10	0.639	Gamma; Lognormal; Normal	Normal
16D_2_22	MW-16D	Appendix IV	Selenium	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
16D_2_23	MW-16D	Appendix IV	Thallium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
7B_2_04	MW-7B	Appendix IV	Fluoride	mg/L	10	10	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
7B_2_08	MW-7B	Appendix IV	Antimony	mg/L	10	10	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
7B_2_09	MW-7B	Appendix IV	Arsenic	mg/L	10	9	90%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
7B_2_10	MW-7B	Appendix IV	Barium	mg/L	10	0	0%	0.911	0.287	0.224	0.165	0.910	0.284	0.209	0.249	0.220	>= 0.10	0.517	>= 0.10	0.102	Gamma; Lognormal; Normal	Normal
7B_2_11	MW-7B	Appendix IV	Beryllium	mg/L	10	10	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
7B_2_12	MW-7B	Appendix IV	Cadmium	mg/L	10	10	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
7B_2_13	MW-7B	Appendix IV	Chromium	mg/L	10	10	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
7B_2_14	MW-7B	Appendix IV	Cobalt	mg/L	10	10	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	
7B_2_15	MW-7B	Appendix IV	Lead	mg/L	10	9	90%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	

(Table continues on next page)

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.



Table 3: Goodness-of-Fit Tests, Non-Detects Excluded (*continued*)

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Normal		Lognormal		Gamma				Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution				
								S-W		Lilliefors		S-W		Lilliefors					K-S		A-D	
								Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value				Stat.	p-Value	Stat.	p-Value
7B_2_16	MW-7B	Appendix IV	Lithium	mg/L	10	0	0%	0.823	0.028	0.270	0.037	0.809	0.019	0.281	0.025	0.268	0.01 <= p < 0.05	0.967	0.01 <= p < 0.05	0.049	Nonparametric	Nonparametric
7B_2_17	MW-7B	Appendix IV	Mercury	mg/L	10	10	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	Nonparametric
7B_2_18	MW-7B	Appendix IV	Molybdenum	mg/L	10	10	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	Nonparametric
7B_2_20	MW-7B	Appendix IV	Radium-226/228	pCi/L	10	0	0%	0.933	0.480	0.150	0.753	0.915	0.320	0.160	0.660	0.160	>= 0.10	0.363	>= 0.10	0.666	Gamma; Lognormal; Normal	Normal
7B_2_22	MW-7B	Appendix IV	Selenium	mg/L	10	10	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	Nonparametric
7B_2_23	MW-7B	Appendix IV	Thallium	mg/L	10	10	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Nonparametric	Nonparametric

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.

Table 4: Autocorrelation Tests, Non-Detects Excluded

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Autocorrelation	Box-Ljung p-value	Sig.
16C_2_04	MW-16C	Appendix IV	Fluoride	mg/L	9	8	89%	NA	NA	
16C_2_09	MW-16C	Appendix IV	Arsenic	mg/L	9	7	78%	-0.500	0.157	
16C_2_10	MW-16C	Appendix IV	Barium	mg/L	9	0	0%	0.707	0.013	*
16C_2_16	MW-16C	Appendix IV	Lithium	mg/L	9	0	0%	-0.272	0.338	
16C_2_18	MW-16C	Appendix IV	Molybdenum	mg/L	9	7	78%	-0.500	0.157	
16C_2_20	MW-16C	Appendix IV	Radium-226/228	pCi/L	9	0	0%	-0.499	0.079	
16D_2_04	MW-16D	Appendix IV	Fluoride	mg/L	9	8	89%	NA	NA	
16D_2_09	MW-16D	Appendix IV	Arsenic	mg/L	9	3	33%	-0.167	0.606	
16D_2_10	MW-16D	Appendix IV	Barium	mg/L	9	0	0%	0.250	0.379	
16D_2_16	MW-16D	Appendix IV	Lithium	mg/L	9	0	0%	0.232	0.415	
16D_2_18	MW-16D	Appendix IV	Molybdenum	mg/L	9	0	0%	-0.081	0.774	
16D_2_20	MW-16D	Appendix IV	Radium-226/228	pCi/L	9	0	0%	-0.271	0.340	
16D_2_22	MW-16D	Appendix IV	Selenium	mg/L	9	8	89%	NA	NA	
7B_2_09	MW-7B	Appendix IV	Arsenic	mg/L	10	9	90%	NA	NA	
7B_2_10	MW-7B	Appendix IV	Barium	mg/L	10	0	0%	0.248	0.365	
7B_2_15	MW-7B	Appendix IV	Lead	mg/L	10	9	90%	NA	NA	
7B_2_16	MW-7B	Appendix IV	Lithium	mg/L	10	0	0%	-0.305	0.266	
7B_2_20	MW-7B	Appendix IV	Radium-226/228	pCi/L	10	0	0%	-0.541	0.048	*

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 5: Outlier Counts by Date

Date	Count
2022-04-13	1
2023-02-02	1

Table 6: Outliers Identified at the 1% Significance Level, Non-Detects Excluded

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	No. Detects	Date	Value
16D_2_18	MW-16D	Appendix IV	Molybdenum	mg/L	9	0	0%	9	2023-02-02	0.00500
7B_2_16	MW-7B	Appendix IV	Lithium	mg/L	10	0	0%	10	2022-04-13	0.0280



Table 7: Seasonality Tests

ID	Well	Constituent Type	Constituent	Unit	% NDs	Full							Without Non-Detects														
						Sample Size					p-Value		Sample Size					p-Value									
						Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA						
16C_2_04	MW-16C	Appendix IV	Fluoride	mg/L	89%	1	3	2	3	9	0.608	NA	0.725	0.737	0	0	0	1	1	NA	NA	NA	NA				
16C_2_08	MW-16C	Appendix IV	Antimony	mg/L	100%	1	3	2	3	9	NA	NA	NA	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA				
16C_2_09	MW-16C	Appendix IV	Arsenic	mg/L	78%	1	3	2	3	9	0.572	NA	0.667	0.667	1	1	0	0	2	0.317	NA	NA	NA				
16C_2_10	MW-16C	Appendix IV	Barium	mg/L	0%	1	3	2	3	9	0.090	NA	0.040	*	0.021	*	1	3	2	3	9	0.090	NA	0.040	*	0.021	*
16C_2_11	MW-16C	Appendix IV	Beryllium	mg/L	100%	1	3	2	3	9	NA	NA	0.000	***	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16C_2_12	MW-16C	Appendix IV	Cadmium	mg/L	100%	1	3	2	3	9	NA	NA	0.000	***	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16C_2_13	MW-16C	Appendix IV	Chromium	mg/L	100%	1	3	2	3	9	NA	NA	NA	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16C_2_14	MW-16C	Appendix IV	Cobalt	mg/L	100%	1	3	2	3	9	NA	NA	NA	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16C_2_15	MW-16C	Appendix IV	Lead	mg/L	100%	1	3	2	3	9	NA	NA	0.000	***	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16C_2_16	MW-16C	Appendix IV	Lithium	mg/L	0%	1	3	2	3	9	0.336	NA	0.277	0.292	1	3	2	3	9	0.336	NA	0.277	0.292				
16C_2_17	MW-16C	Appendix IV	Mercury	mg/L	100%	1	3	2	3	9	NA	NA	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16C_2_18	MW-16C	Appendix IV	Molybdenum	mg/L	78%	1	3	2	3	9	0.280	NA	0.530	0.477	1	1	0	0	2	0.317	NA	NA	NA				
16C_2_20	MW-16C	Appendix IV	Radium-226/228	pCi/L	0%	1	3	2	3	9	0.477	NA	0.745	0.393	1	3	2	3	9	0.477	NA	0.745	0.393				
16C_2_22	MW-16C	Appendix IV	Selenium	mg/L	100%	1	3	2	3	9	NA	NA	NA	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
16C_2_23	MW-16C	Appendix IV	Thallium	mg/L	100%	1	3	2	3	9	NA	NA	0.000	***	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16D_2_04	MW-16D	Appendix IV	Fluoride	mg/L	89%	1	3	2	3	9	0.608	NA	0.704	0.719	0	0	0	1	1	NA	NA	NA	NA	NA	NA	NA	NA
16D_2_08	MW-16D	Appendix IV	Antimony	mg/L	100%	1	3	2	3	9	NA	NA	NA	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16D_2_09	MW-16D	Appendix IV	Arsenic	mg/L	33%	1	3	2	3	9	0.572	NA	0.667	0.623	0	2	2	2	6	1.000	NA	1.000	1.000				
16D_2_10	MW-16D	Appendix IV	Barium	mg/L	0%	1	3	2	3	9	0.161	NA	0.163	0.165	1	3	2	3	9	0.161	NA	0.163	0.165				
16D_2_11	MW-16D	Appendix IV	Beryllium	mg/L	100%	1	3	2	3	9	NA	NA	0.000	***	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16D_2_12	MW-16D	Appendix IV	Cadmium	mg/L	100%	1	3	2	3	9	NA	NA	0.000	***	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16D_2_13	MW-16D	Appendix IV	Chromium	mg/L	100%	1	3	2	3	9	NA	NA	NA	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16D_2_14	MW-16D	Appendix IV	Cobalt	mg/L	100%	1	3	2	3	9	NA	NA	NA	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16D_2_15	MW-16D	Appendix IV	Lead	mg/L	100%	1	3	2	3	9	NA	NA	0.000	***	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16D_2_16	MW-16D	Appendix IV	Lithium	mg/L	0%	1	3	2	3	9	0.334	NA	0.099	0.156	1	3	2	3	9	0.334	NA	0.099	0.156				
16D_2_17	MW-16D	Appendix IV	Mercury	mg/L	100%	1	3	2	3	9	NA	NA	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16D_2_18	MW-16D	Appendix IV	Molybdenum	mg/L	0%	1	3	2	3	9	0.259	NA	0.004	**	0.001	***	1	3	2	3	9	0.259	NA	0.004	**	0.001	***
16D_2_20	MW-16D	Appendix IV	Radium-226/228	pCi/L	0%	1	3	2	3	9	0.620	NA	0.800	0.764	1	3	2	3	9	0.620	NA	0.800	0.764				
16D_2_22	MW-16D	Appendix IV	Selenium	mg/L	89%	1	3	2	3	9	0.572	NA	0.667	0.667	0	0	0	1	1	NA	NA	NA	NA	NA	NA	NA	NA
16D_2_23	MW-16D	Appendix IV	Thallium	mg/L	100%	1	3	2	3	9	NA	NA	0.000	***	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7B_2_04	MW-7B	Appendix IV	Fluoride	mg/L	100%	1	3	3	3	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7B_2_08	MW-7B	Appendix IV	Antimony	mg/L	100%	1	3	3	3	10	NA	NA	0.586	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7B_2_09	MW-7B	Appendix IV	Arsenic	mg/L	90%	1	3	3	3	10	0.506	NA	0.586	0.586	0	1	0	0	1	NA	NA	NA	NA	NA	NA	NA	NA
7B_2_10	MW-7B	Appendix IV	Barium	mg/L	0%	1	3	3	3	10	0.144	NA	0.127	0.143	1	3	3	3	10	0.144	NA	0.127	0.143				
7B_2_11	MW-7B	Appendix IV	Beryllium	mg/L	100%	1	3	3	3	10	NA	NA	0.586	0.586	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7B_2_12	MW-7B	Appendix IV	Cadmium	mg/L	100%	1	3	3	3	10	NA	NA	0.586	0.586	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7B_2_13	MW-7B	Appendix IV	Chromium	mg/L	100%	1	3	3	3	10	NA	NA	0.586	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7B_2_14	MW-7B	Appendix IV	Cobalt	mg/L	100%	1	3	3	3	10	NA	NA	0.586	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7B_2_15	MW-7B	Appendix IV	Lead	mg/L	90%	1	3	3	3	10	0.506	NA	0.586	0.586	0	0	1	0	1	NA	NA	NA	NA	NA	NA	NA	NA

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05



Table 7: Seasonality Tests (continued)

ID	Well	Constituent Type	Constituent	Unit	% NDs	Full					Without Non-Detects												
						Sample Size					p-Value			Sample Size					p-Value				
						Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA		
7B_2_16	MW-7B	Appendix IV	Lithium	mg/L	0%	1	3	3	3	10	0.586	NA	0.895	0.878	1	3	3	3	10	0.586	NA	0.895	0.878
7B_2_17	MW-7B	Appendix IV	Mercury	mg/L	100%	1	3	3	3	10	NA	NA	0.586	0.586	NA	NA	NA	NA	NA	NA	NA	NA	NA
7B_2_18	MW-7B	Appendix IV	Molybdenum	mg/L	100%	1	3	3	3	10	NA	NA	0.586	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7B_2_20	MW-7B	Appendix IV	Radium-226/228	pCi/L	0%	1	3	3	3	10	0.784	NA	0.756	0.795	1	3	3	3	10	0.784	NA	0.756	0.795
7B_2_22	MW-7B	Appendix IV	Selenium	mg/L	100%	1	3	3	3	10	NA	NA	0.586	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7B_2_23	MW-7B	Appendix IV	Thallium	mg/L	100%	1	3	3	3	10	NA	NA	0.586	0.586	NA	NA	NA	NA	NA	NA	NA	NA	NA

*** p < 0.001, ** p < 0.01, * p < 0.05



Table 8: Trend Tests: Lognormal MLE and MK

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Type	Method	Slope	p-value	Trend
16C_2_10	MW-16C	Appendix IV	Barium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00242	0.000	↓
16C_2_16	MW-16C	Appendix IV	Lithium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0000274	0.887	↔
16C_2_20	MW-16C	Appendix IV	Radium-226/228	pCi/L	9	0	0%	Parametric	Lognormal MLE	0.00399	0.210	↔
16D_2_09	MW-16D	Appendix IV	Arsenic	mg/L	9	3	33%	Nonparametric	MK	0.00000171	0.374	↔
16D_2_10	MW-16D	Appendix IV	Barium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.000231	0.007	↓
16D_2_16	MW-16D	Appendix IV	Lithium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.000203	0.698	↔
16D_2_18	MW-16D	Appendix IV	Molybdenum	mg/L	9	0	0%	Nonparametric	MK	0	1.000	↔
16D_2_20	MW-16D	Appendix IV	Radium-226/228	pCi/L	9	0	0%	Parametric	Lognormal MLE	-0.000613	0.777	↔
7B_2_10	MW-7B	Appendix IV	Barium	mg/L	10	0	0%	Parametric	Lognormal MLE	-0.000492	0.001	↓
7B_2_16	MW-7B	Appendix IV	Lithium	mg/L	10	0	0%	Nonparametric	MK	0	0.769	↔
7B_2_20	MW-7B	Appendix IV	Radium-226/228	pCi/L	10	0	0%	Parametric	Lognormal MLE	0.000105	0.939	↔

Table 9: Trend Tests: Piecewise Linear-Linear

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Line 1			Line 2			Break 1	R-Squared	Overall Trend
								Slope	p-Value	Trend	Slope	p-Value	Trend			
16C_2_04	MW-16C	Appendix IV	Fluoride	mg/L	9	8	89%	0.0000000000323	1.000	↔	-0.00316	0.290	↔	2023-06-21	0.386	↔
16C_2_09	MW-16C	Appendix IV	Arsenic	mg/L	9	7	78%	-0.00000231	0.502	↔	0.0000000000400	1.000	↔	2023-07-18	0.185	↔
16C_2_10	MW-16C	Appendix IV	Barium	mg/L	9	0	0%	-0.000135	0.013	↔	-0.0000266	0.822	↔	2023-08-08	0.843	↔
16C_2_18	MW-16C	Appendix IV	Molybdenum	mg/L	9	7	78%	-0.0000242	0.129	↔	-0.00000000000349	1.000	↔	2023-06-05	0.586	↔
16D_2_04	MW-16D	Appendix IV	Fluoride	mg/L	9	8	89%	-0.00000000000423	1.000	↔	-0.00224	0.388	↔	2023-06-02	0.342	↔
16D_2_09	MW-16D	Appendix IV	Arsenic	mg/L	9	3	33%	0.0000196	0.491	↔	-0.000000918	0.854	↔	2023-04-24	0.360	↔
16D_2_10	MW-16D	Appendix IV	Barium	mg/L	9	0	0%	0.00000511	0.881	↔	-0.0000116	0.105	↔	2023-04-20	0.511	↔
16D_2_16	MW-16D	Appendix IV	Lithium	mg/L	9	0	0%	-0.000183	0.001	↓	0.0000358	0.025	↔	2023-04-25	0.920	↔
16D_2_18	MW-16D	Appendix IV	Molybdenum	mg/L	9	0	0%	0.000128	0.002	↑	-0.00000510	0.242	↔	2023-03-24	0.923	↔
16D_2_20	MW-16D	Appendix IV	Radium-226/228	pCi/L	9	0	0%	-0.00882	0.441	↔	0.0128	0.461	↔	2023-08-07	0.223	↔
16D_2_22	MW-16D	Appendix IV	Selenium	mg/L	9	8	89%	0.00000264	0.198	↔	-0.00000707	0.631	↔	2023-09-12	0.339	↔
7B_2_09	MW-7B	Appendix IV	Arsenic	mg/L	10	9	90%	-0.00000287	0.530	↔	-0.00000000000163	1.000	↔	2022-07-27	0.224	↔
7B_2_10	MW-7B	Appendix IV	Barium	mg/L	10	0	0%	-0.0000113	0.265	↔	-0.00000300	0.260	↔	2022-07-01	0.605	↔
7B_2_15	MW-7B	Appendix IV	Lead	mg/L	10	9	90%	0.0000302	0.644	↔	-0.00000969	0.333	↔	2022-06-22	0.197	↔

Table 10: Trend Tests: Piecewise Linear-Linear-Linear

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Line 1			Line 2			Line 3			Break 1	Break 2	R-Squared	Overall Trend
								Slope	p-Value	Trend	Slope	p-Value	Trend	Slope	p-Value	Trend				
16C_2_18	MW-16C	Appendix IV	Molybdenum	mg/L	9	7	78%	-0.0000242	0.254	↔	0.00000000000164	1.000	↔	-0.00000000000152	1.000	↔	2023-06-05	2023-10-09	0.586	↔
16D_2_10	MW-16D	Appendix IV	Barium	mg/L	9	0	0%	0.0000104	0.612	↔	-0.0000330	0.226	↔	0.00000513	0.828	↔	2023-05-13	2023-08-08	0.712	↔
16D_2_16	MW-16D	Appendix IV	Lithium	mg/L	9	0	0%	-0.000202	0.003	↓	0.0000699	0.279	↔	0.00000834	0.662	↔	2023-04-25	2023-07-27	0.968	↔
16D_2_22	MW-16D	Appendix IV	Selenium	mg/L	9	8	89%	-0.00000152	0.739	↔	0.00000744	0.386	↔	-0.0000105	0.520	↔	2023-06-02	2023-09-12	0.566	↔

(Table continues on next page)



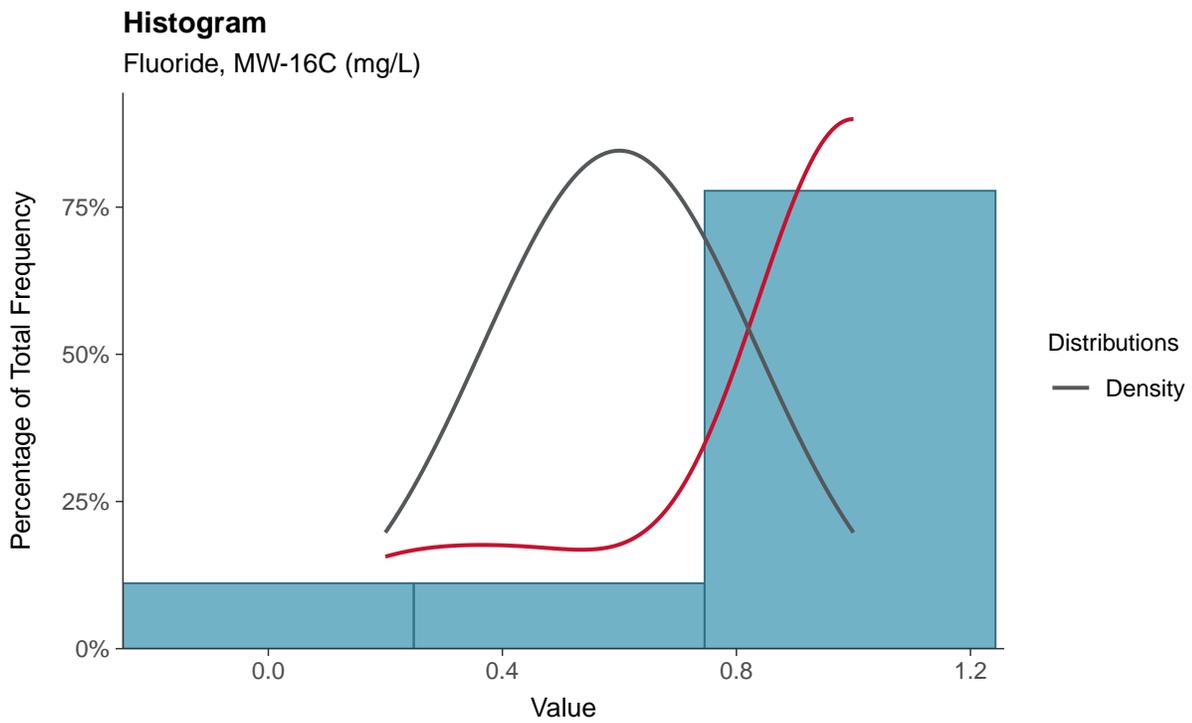
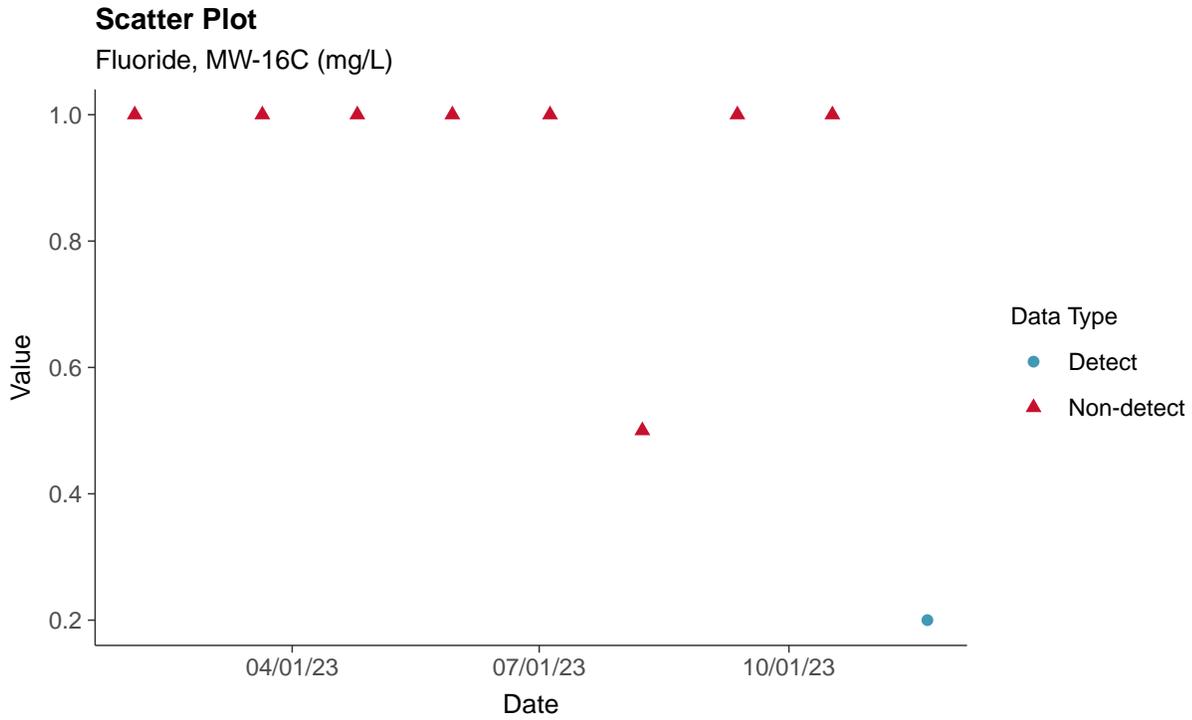
Table 10: Trend Tests: Piecewise Linear-Linear-Linear (*continued*)

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Line 1			Line 2			Line 3			Break 1	Break 2	R-Squared	Overall Trend
								Slope	p-Value	Trend	Slope	p-Value	Trend	Slope	p-Value	Trend				
7B_2_10	MW-7B	Appendix IV	Barium	mg/L	10	0	0%	-0.0000118	0.345	↔	0.00000294	0.876	↔	-0.00000398	0.435	↔	2022-07-25	2022-10-06	0.622	↔
7B_2_15	MW-7B	Appendix IV	Lead	mg/L	10	9	90%	0.0000571	0.409	↔	-0.0000526	0.449	↔	0.00000350	0.807	↔	2022-06-22	2022-10-05	0.470	↔



Appendix IV: Fluoride, MW-16C

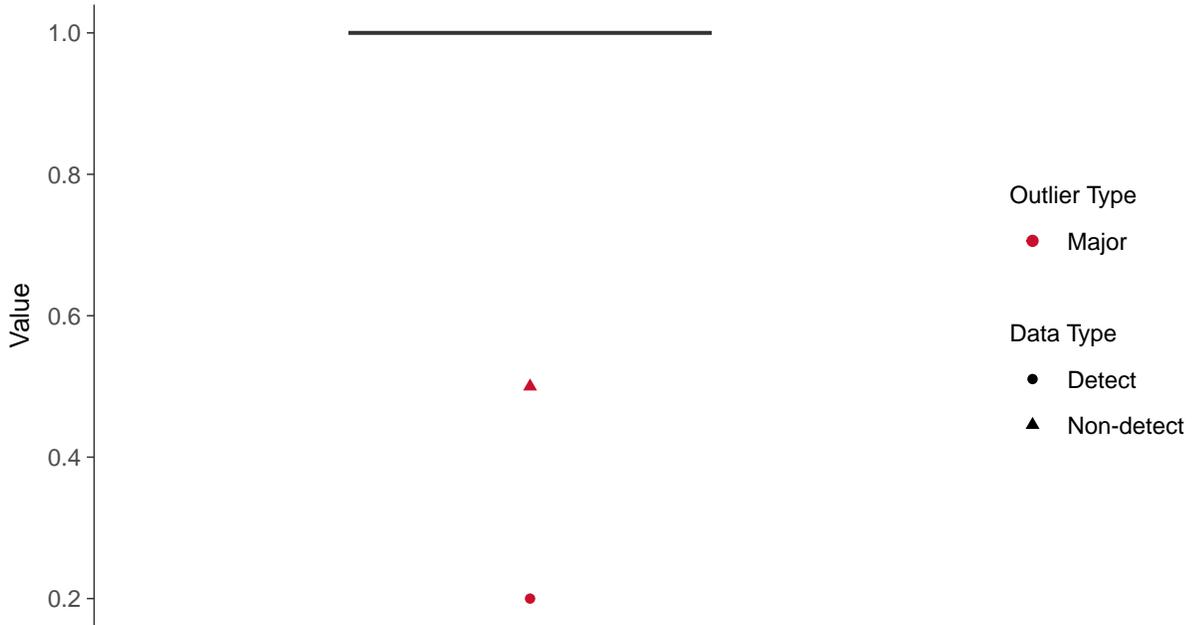
ID: 16C_2_04





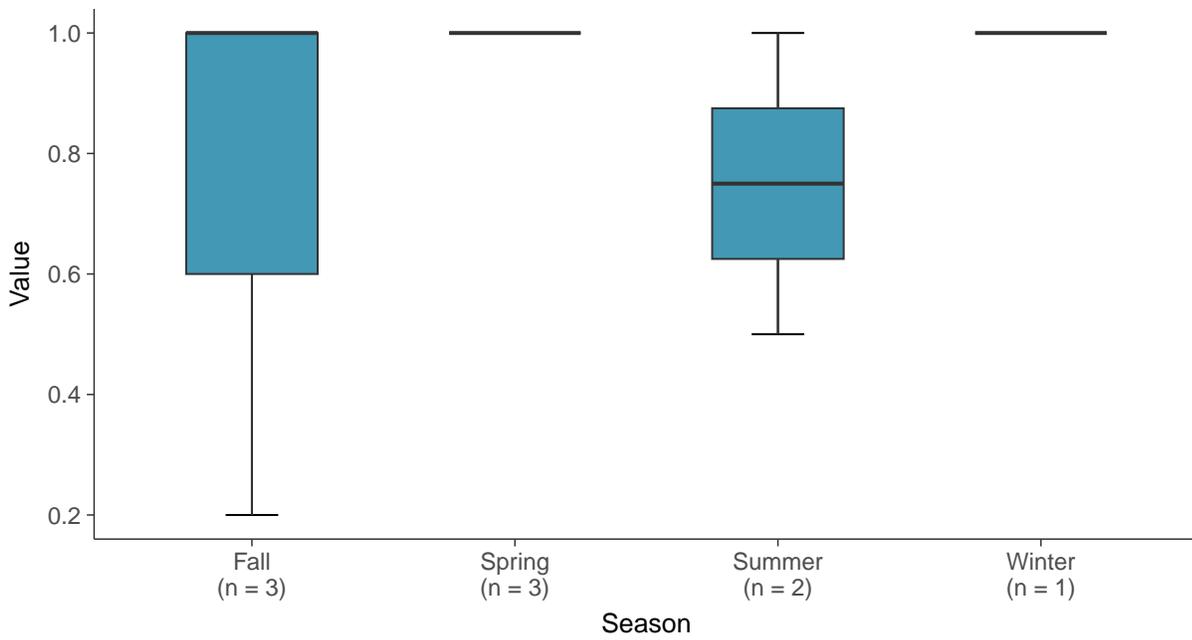
Boxplot

Fluoride, MW-16C (mg/L)



Boxplot by Season

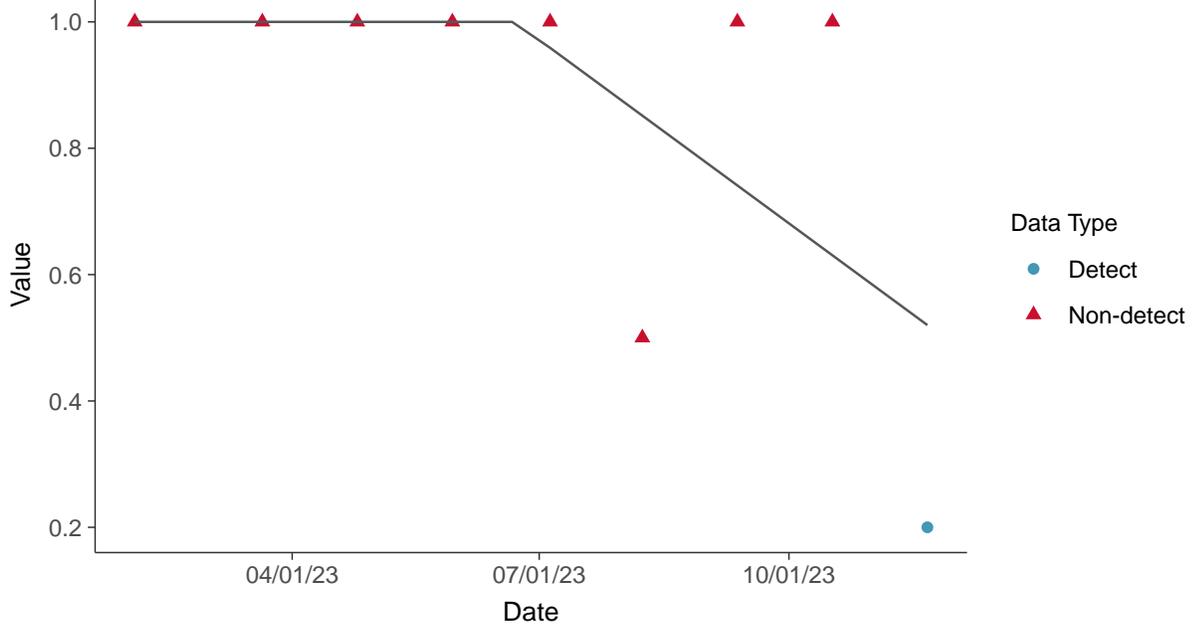
Fluoride, MW-16C (mg/L)





Trend Regression: Piecewise Linear-Linear

Fluoride, MW-16C (mg/L)



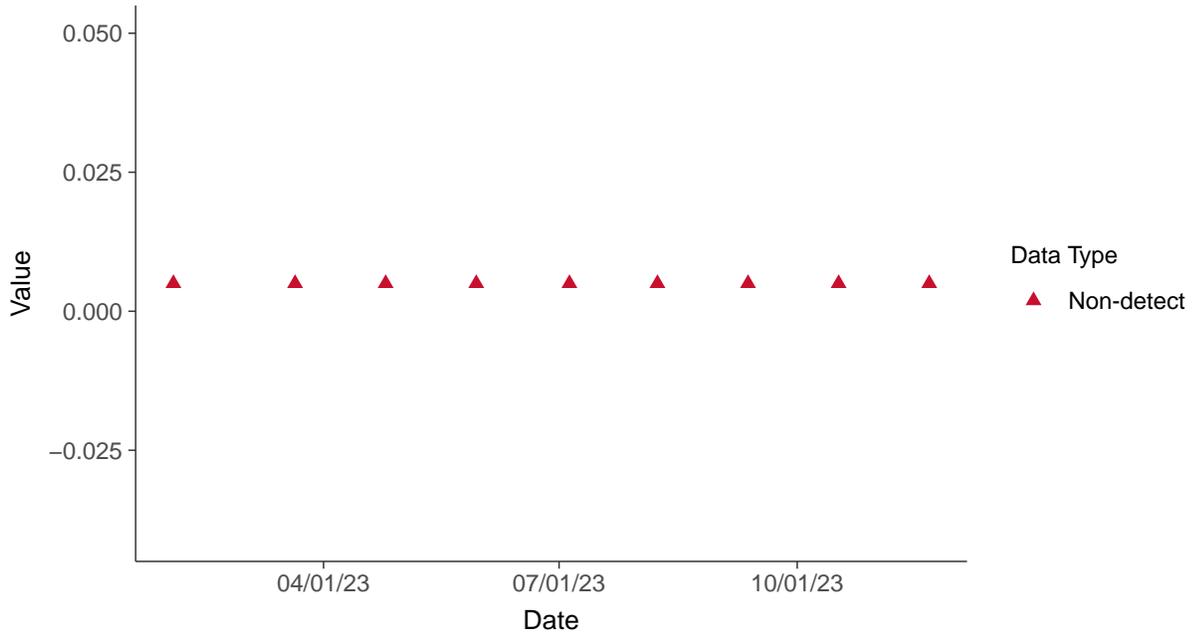


Appendix IV: Antimony, MW-16C

ID: 16C_2_08

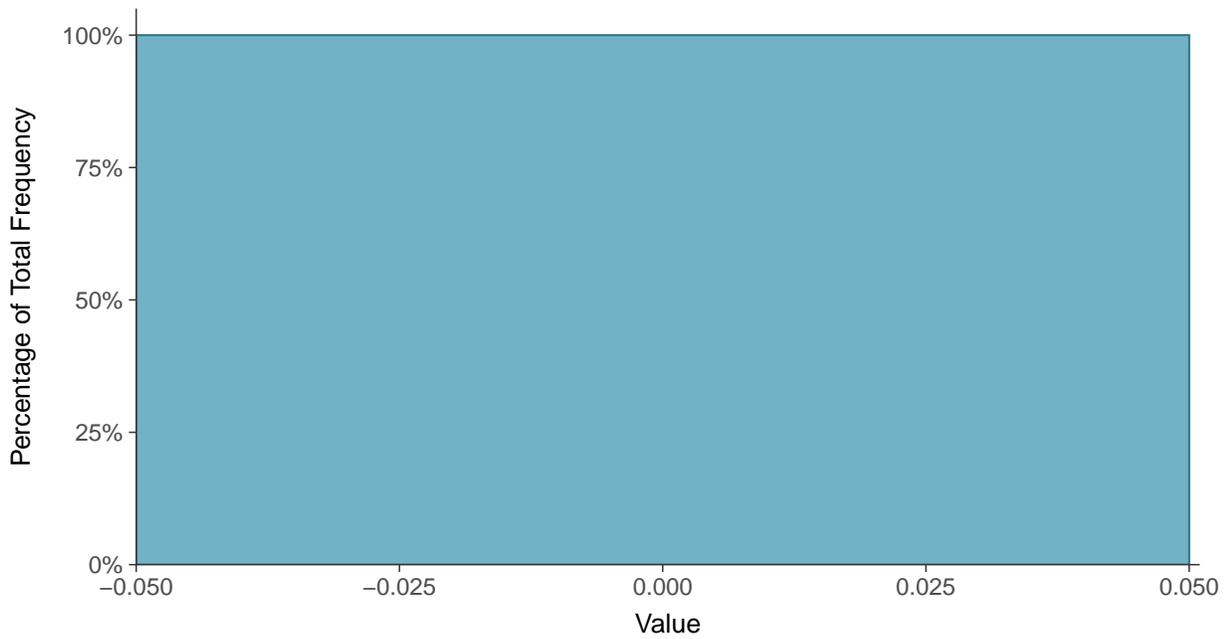
Scatter Plot

Antimony, MW-16C (mg/L)



Histogram

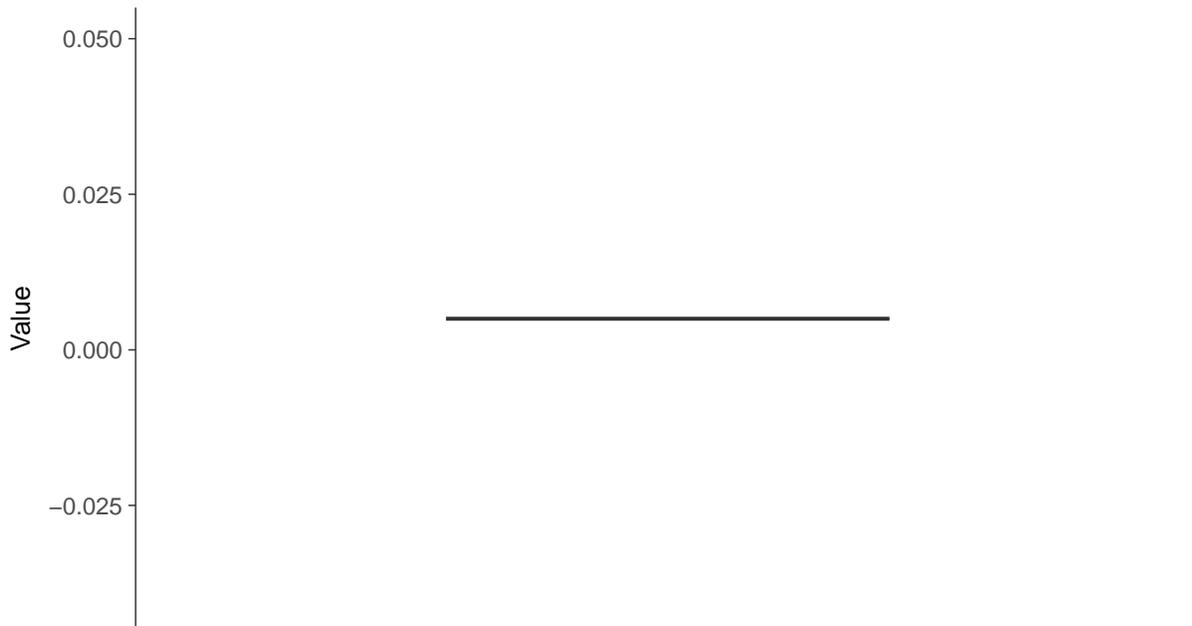
Antimony, MW-16C (mg/L)





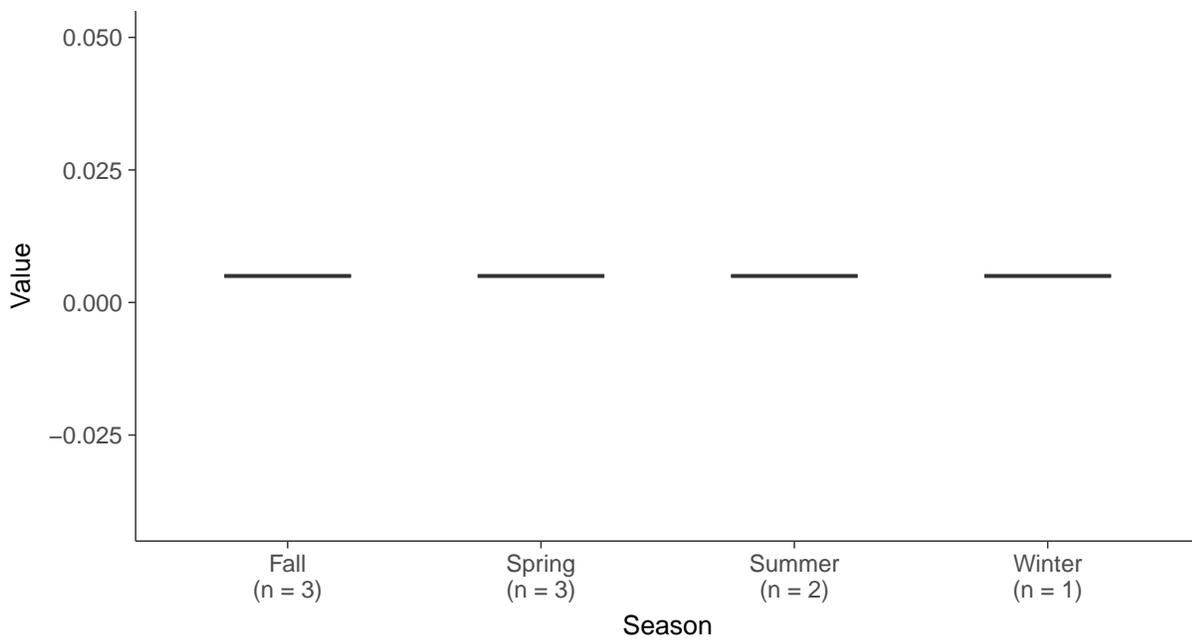
Boxplot

Antimony, MW-16C (mg/L)



Boxplot by Season

Antimony, MW-16C (mg/L)



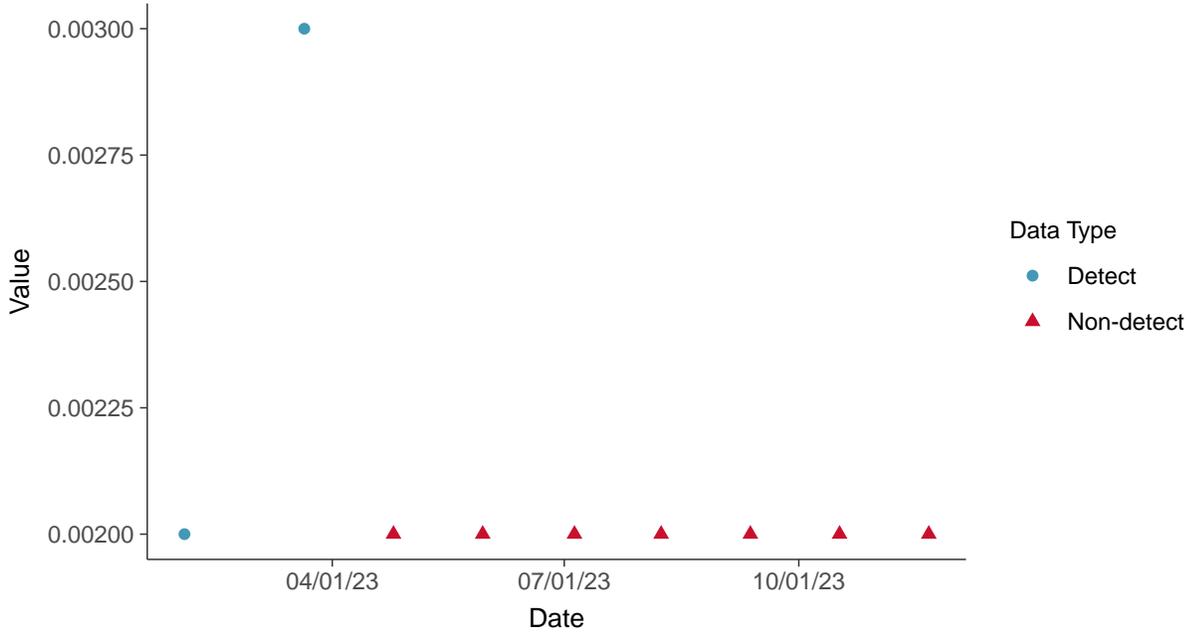


Appendix IV: Arsenic, MW-16C

ID: 16C_2_09

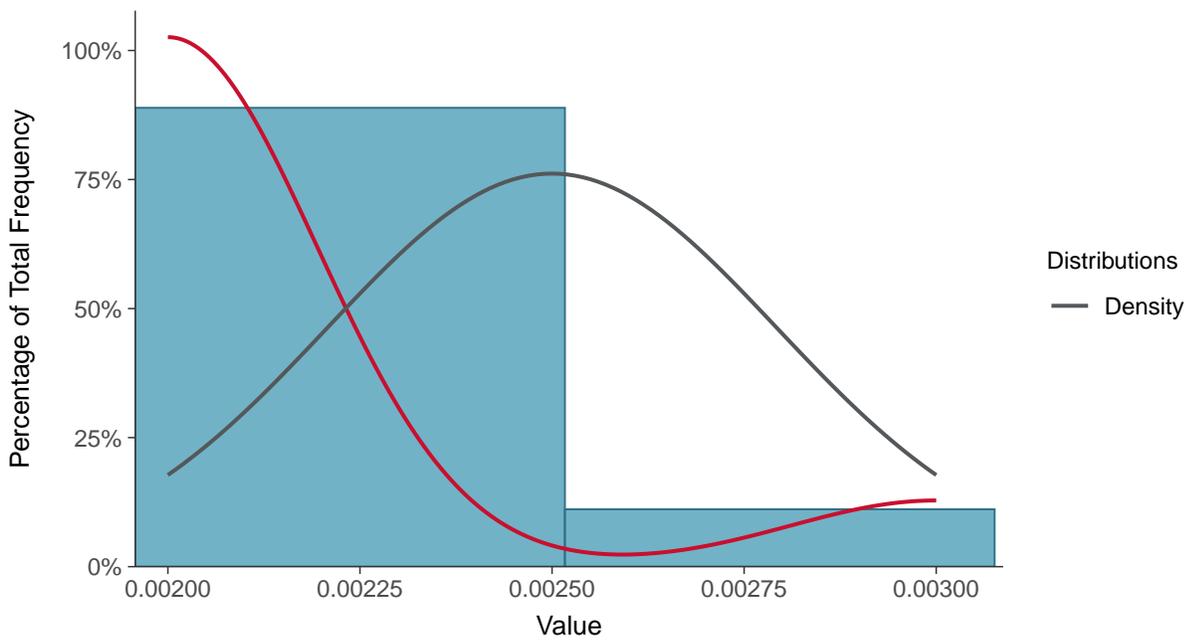
Scatter Plot

Arsenic, MW-16C (mg/L)



Histogram

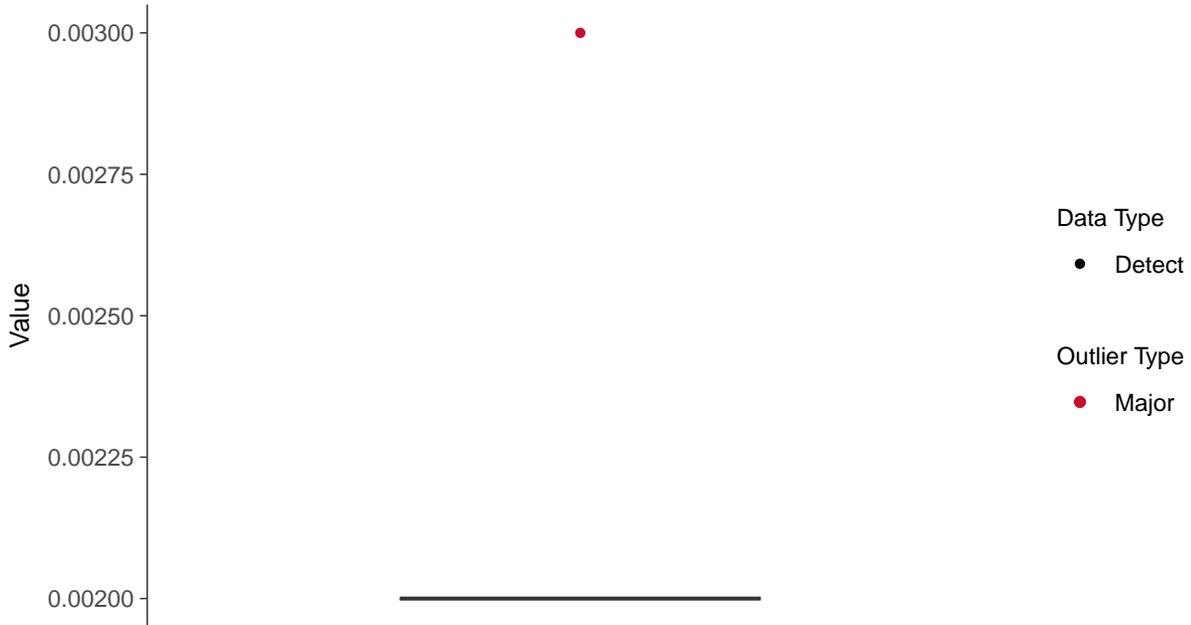
Arsenic, MW-16C (mg/L)





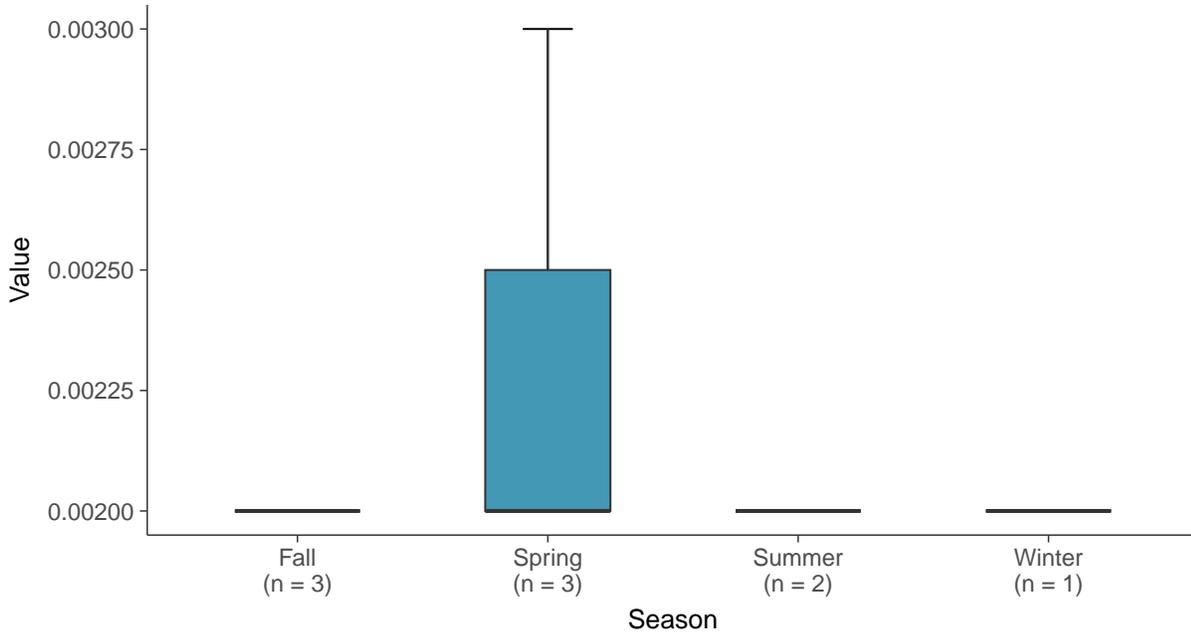
Boxplot

Arsenic, MW-16C (mg/L)



Boxplot by Season

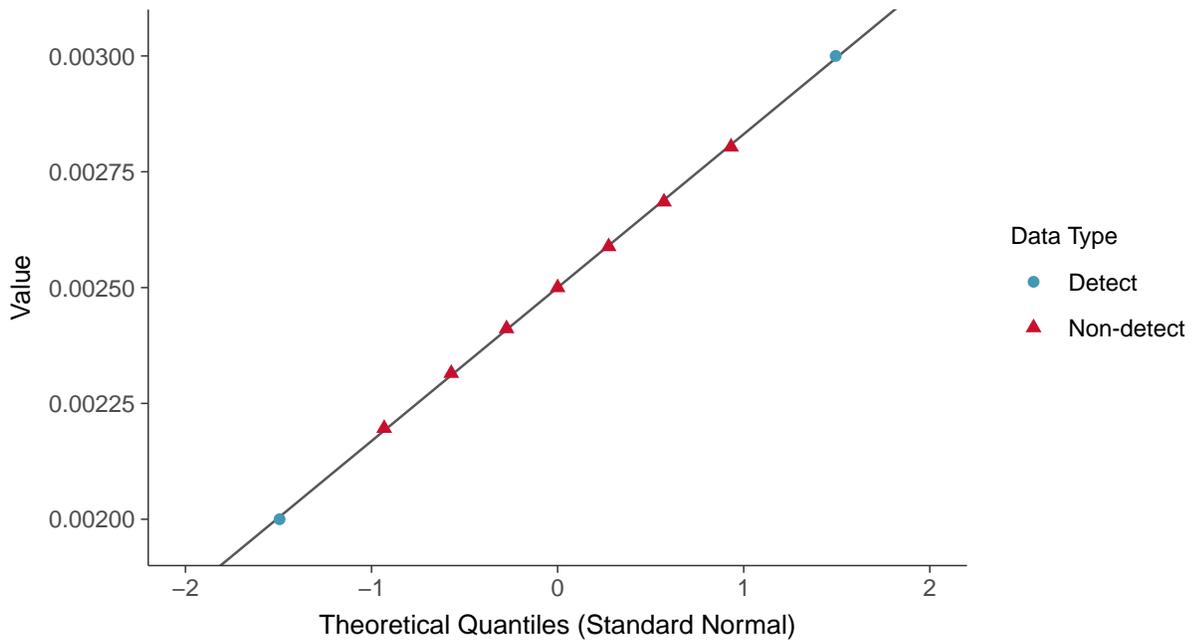
Arsenic, MW-16C (mg/L)





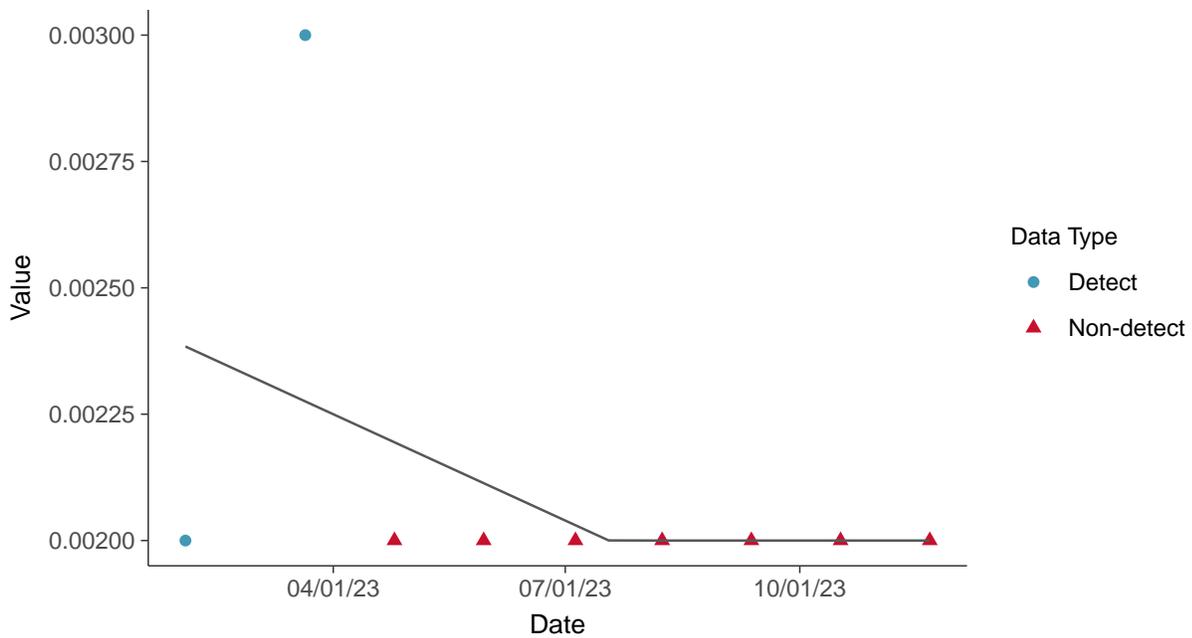
Normal Q-Q plot using ROS Imputed Estimates

Arsenic, MW-16C (mg/L)



Trend Regression: Piecewise Linear-Linear

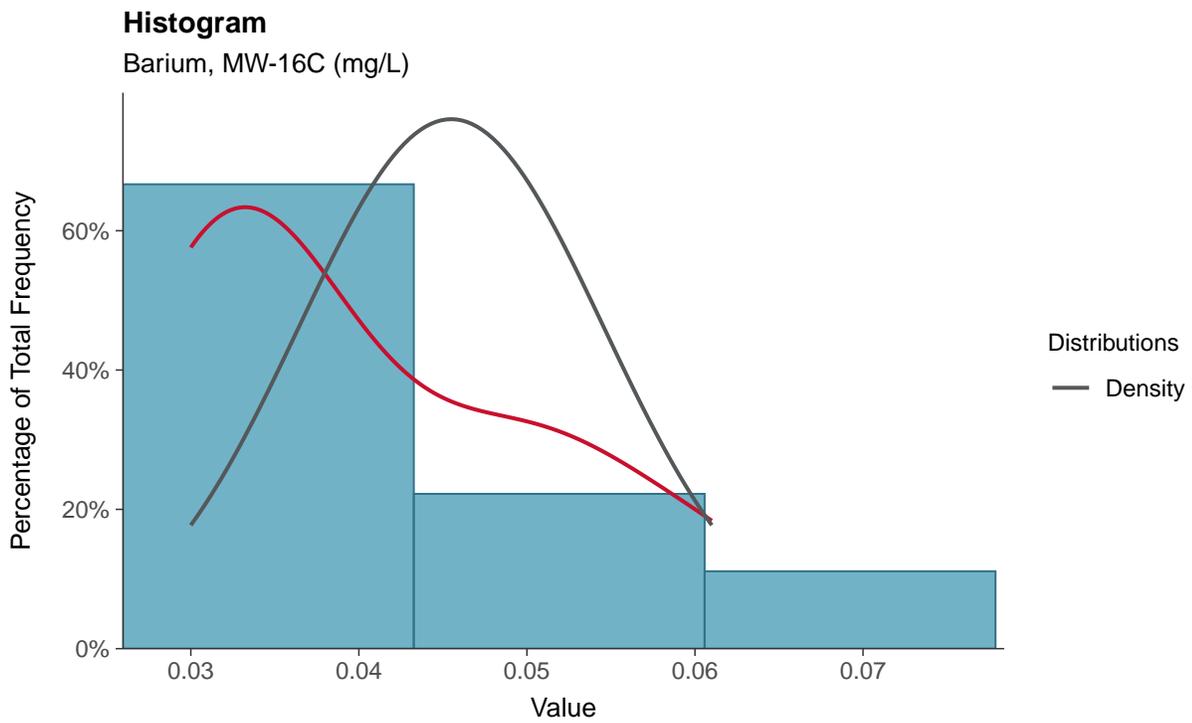
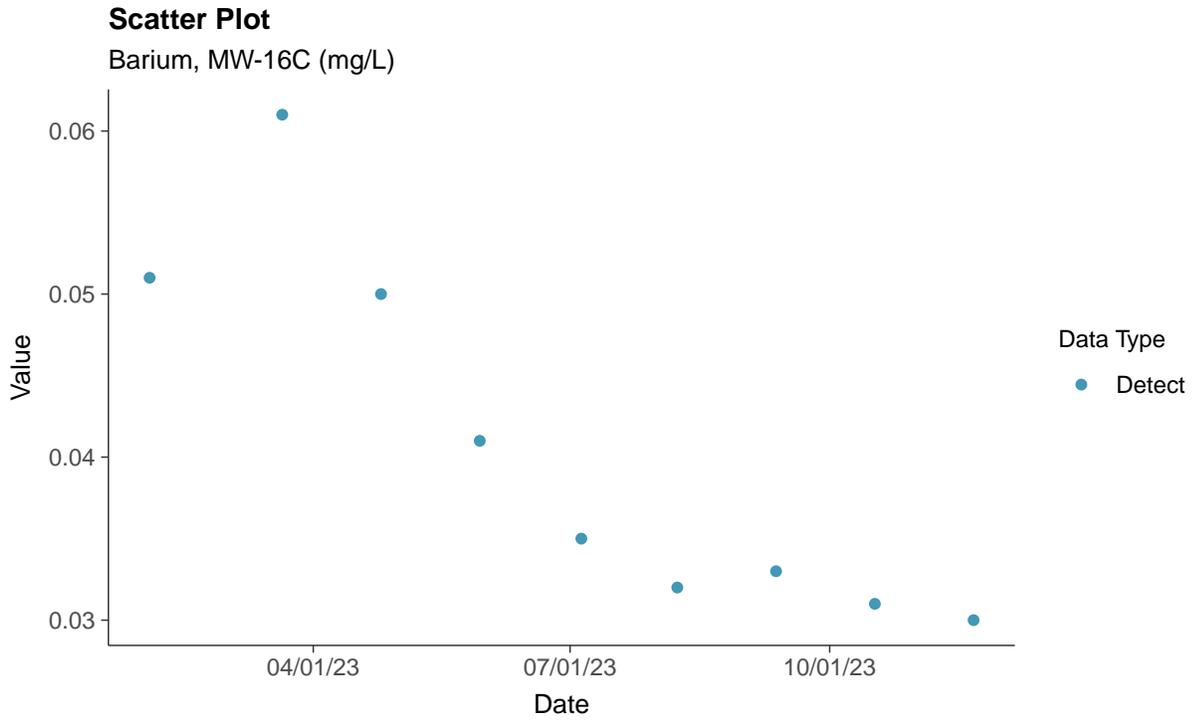
Arsenic, MW-16C (mg/L)





Appendix IV: Barium, MW-16C

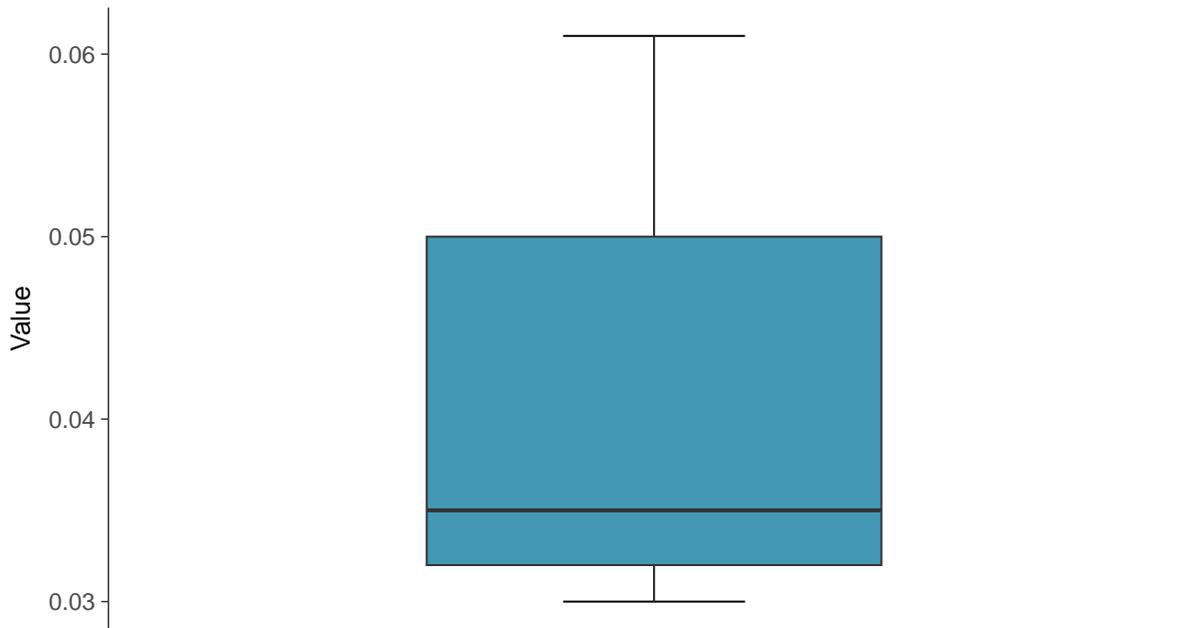
ID: 16C_2_10





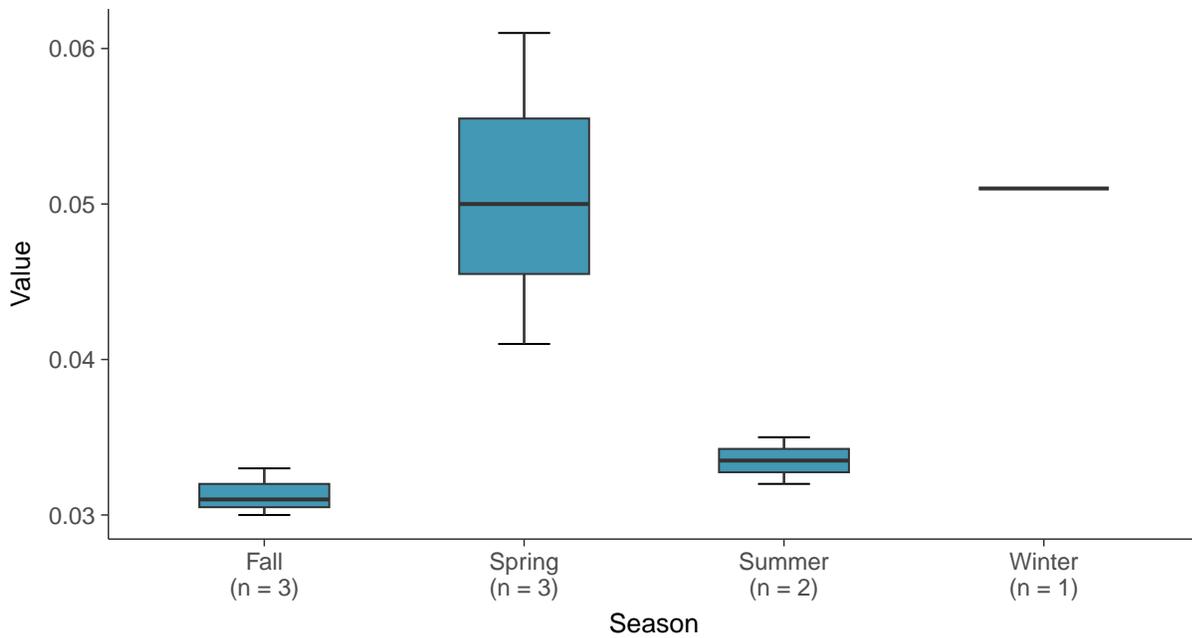
Boxplot

Barium, MW-16C (mg/L)



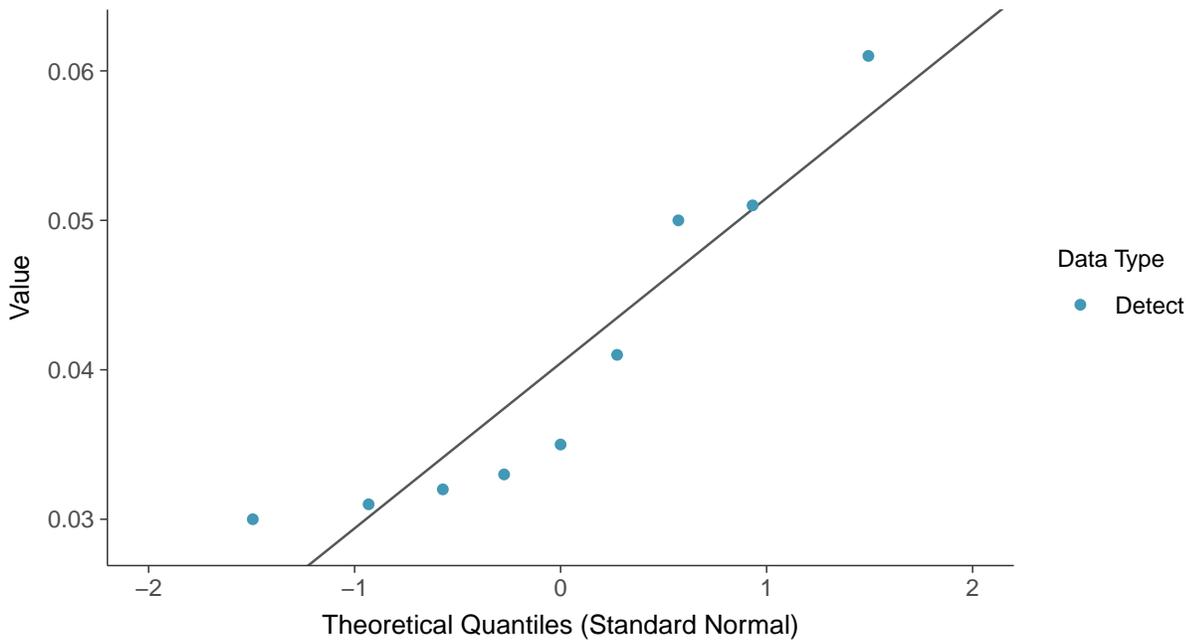
Boxplot by Season

Barium, MW-16C (mg/L)

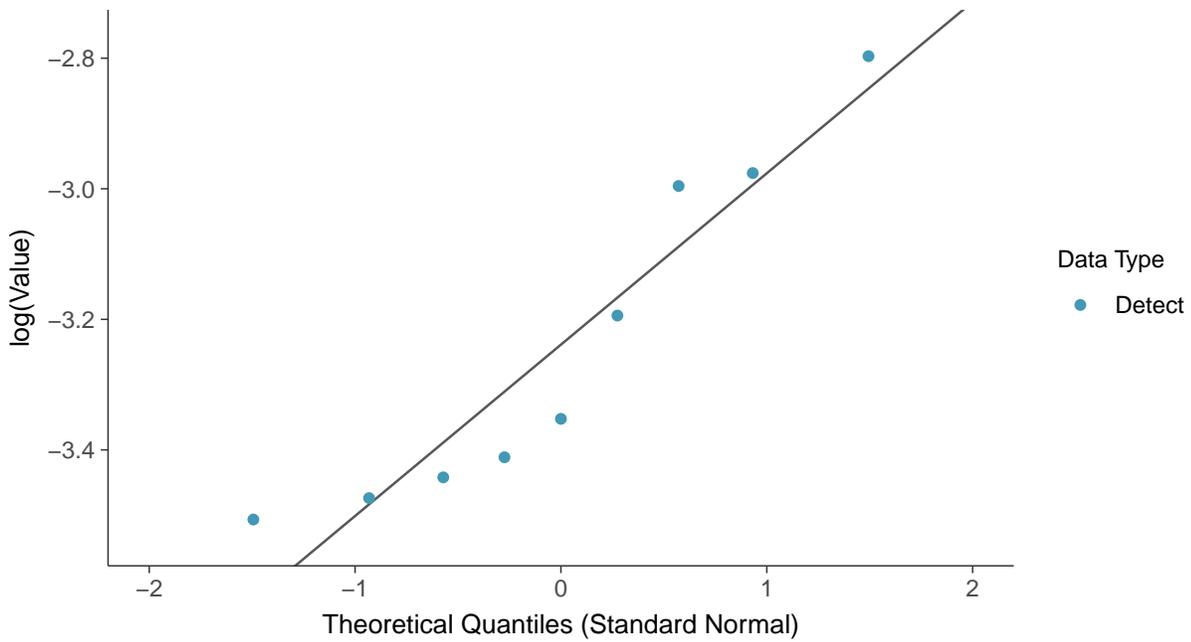




Normal Q-Q plot
Barium, MW-16C (mg/L)

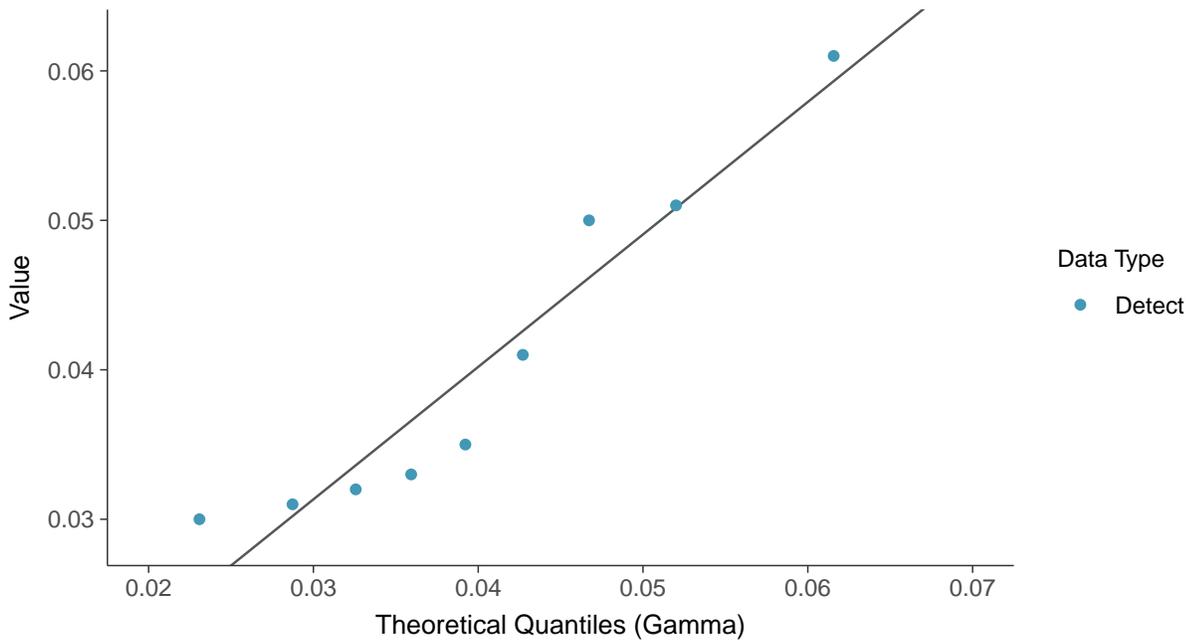


Lognormal Q-Q plot
Barium, MW-16C (mg/L)

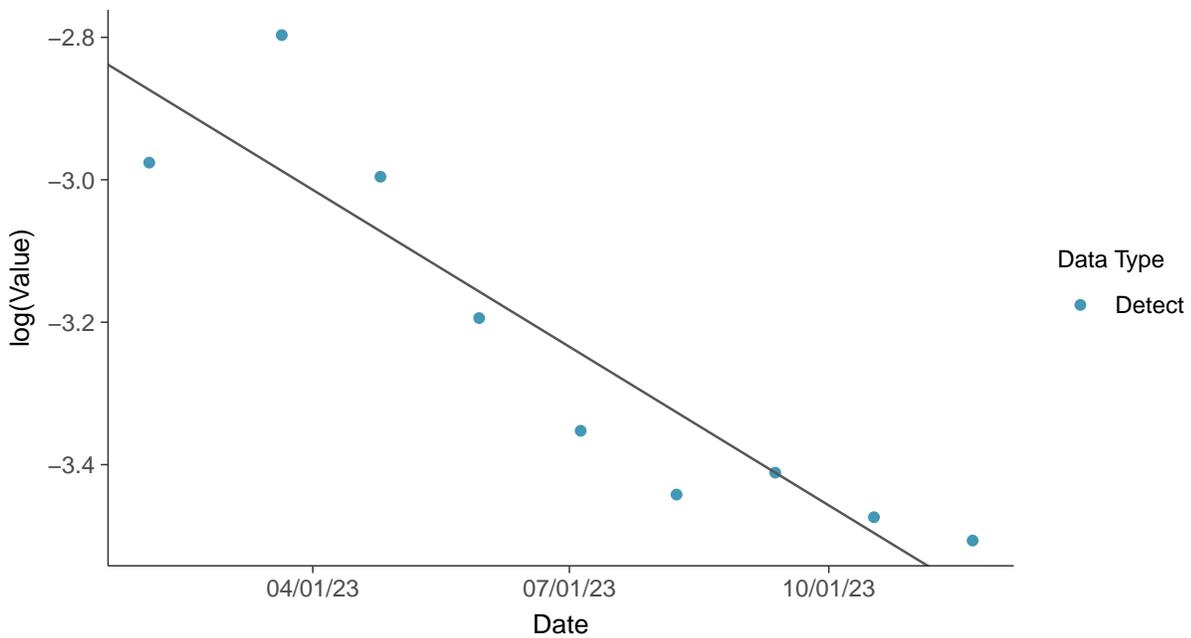




Gamma Q-Q plot
Barium, MW-16C (mg/L)



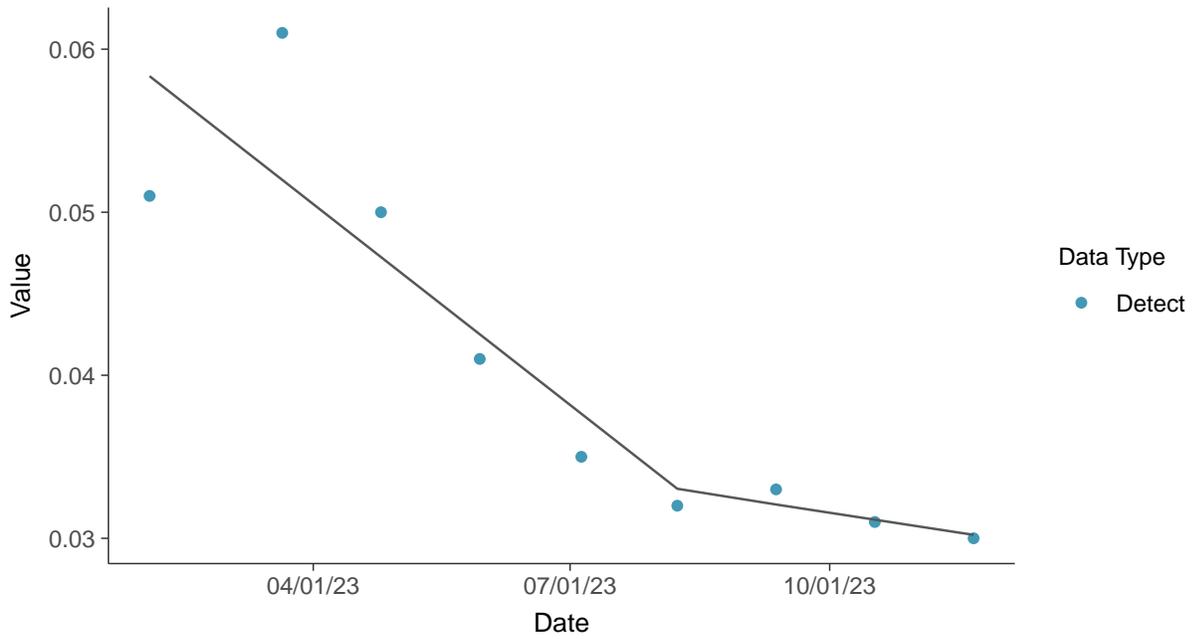
Trend Regression: Lognormal MLE
Barium, MW-16C (mg/L)





Trend Regression: Piecewise Linear-Linear

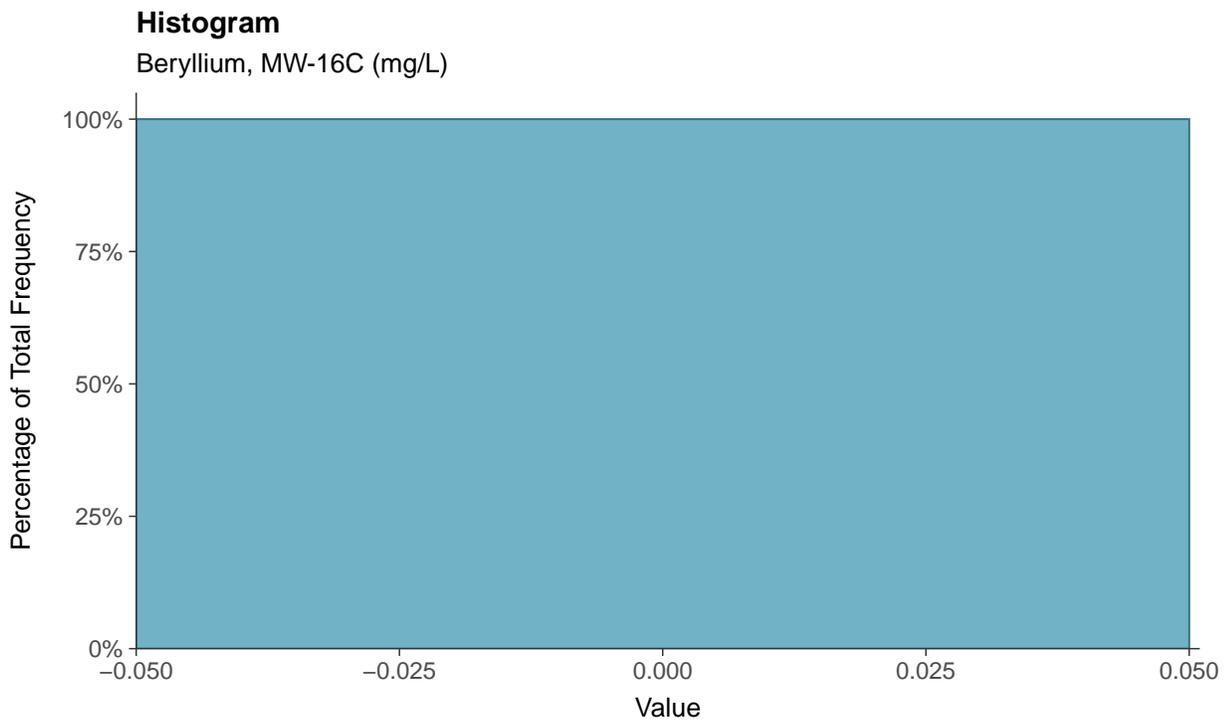
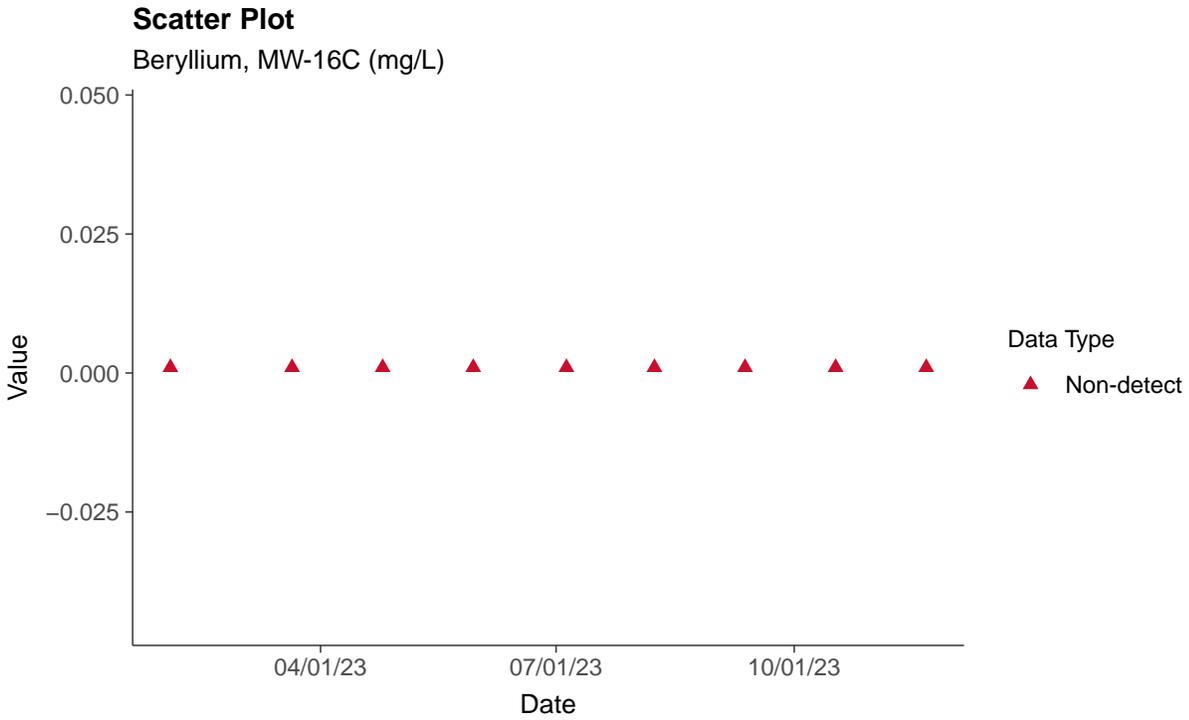
Barium, MW-16C (mg/L)





Appendix IV: Beryllium, MW-16C

ID: 16C_2_11





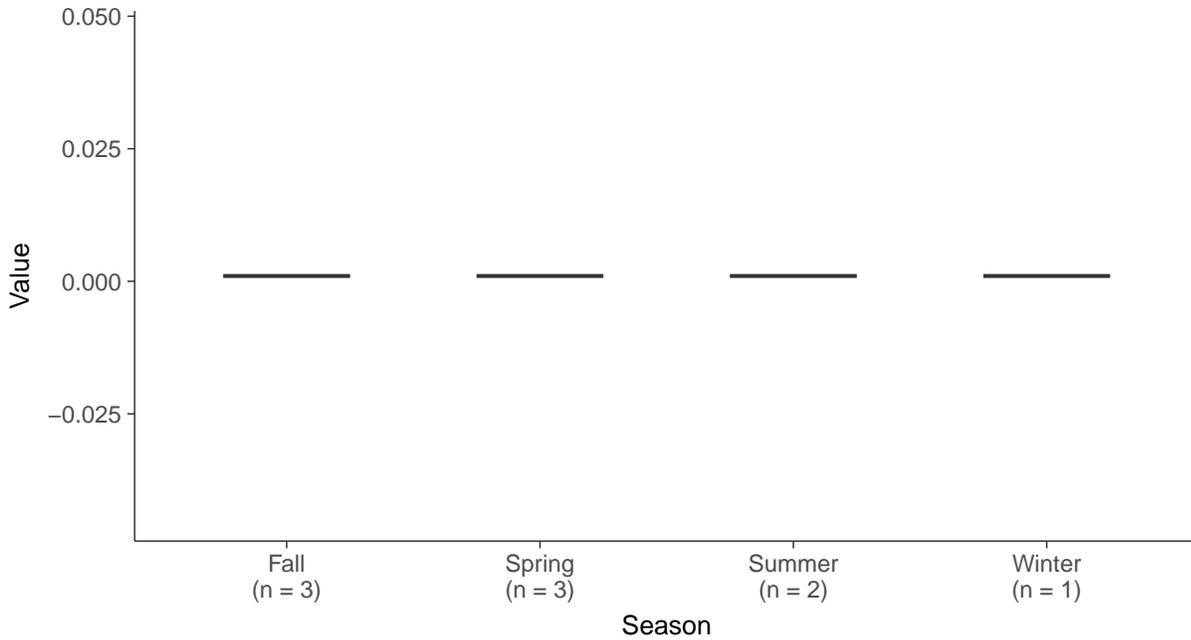
Boxplot

Beryllium, MW-16C (mg/L)



Boxplot by Season

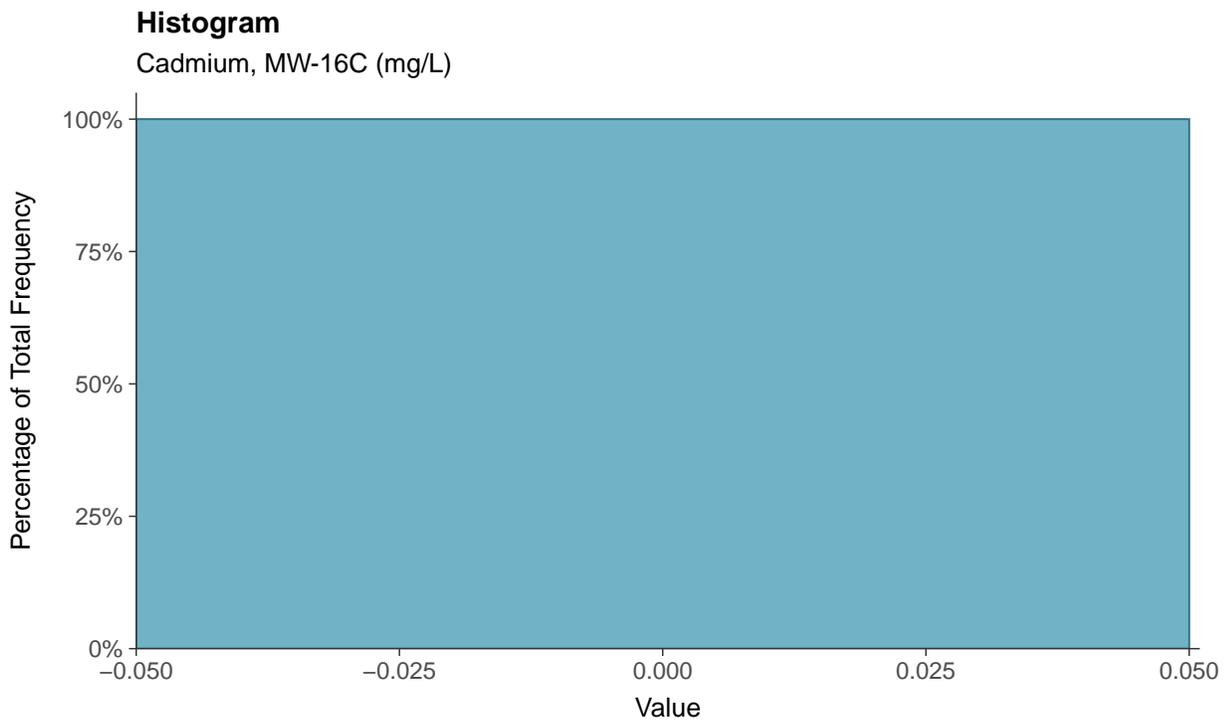
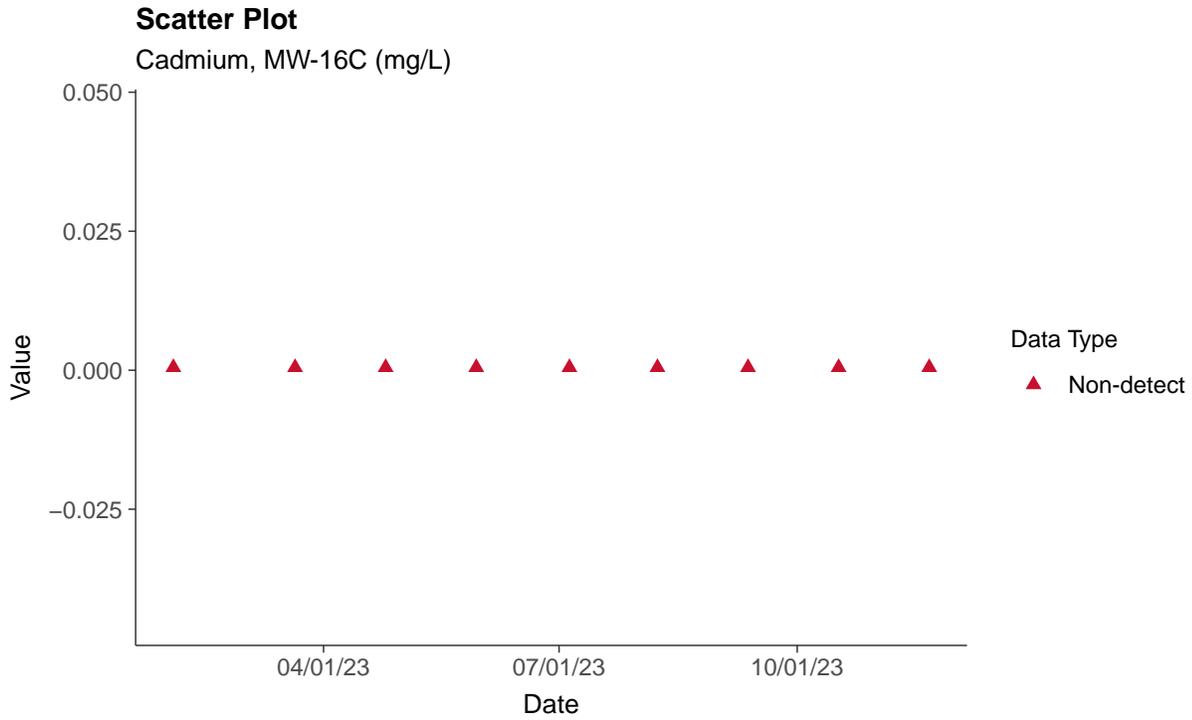
Beryllium, MW-16C (mg/L)





Appendix IV: Cadmium, MW-16C

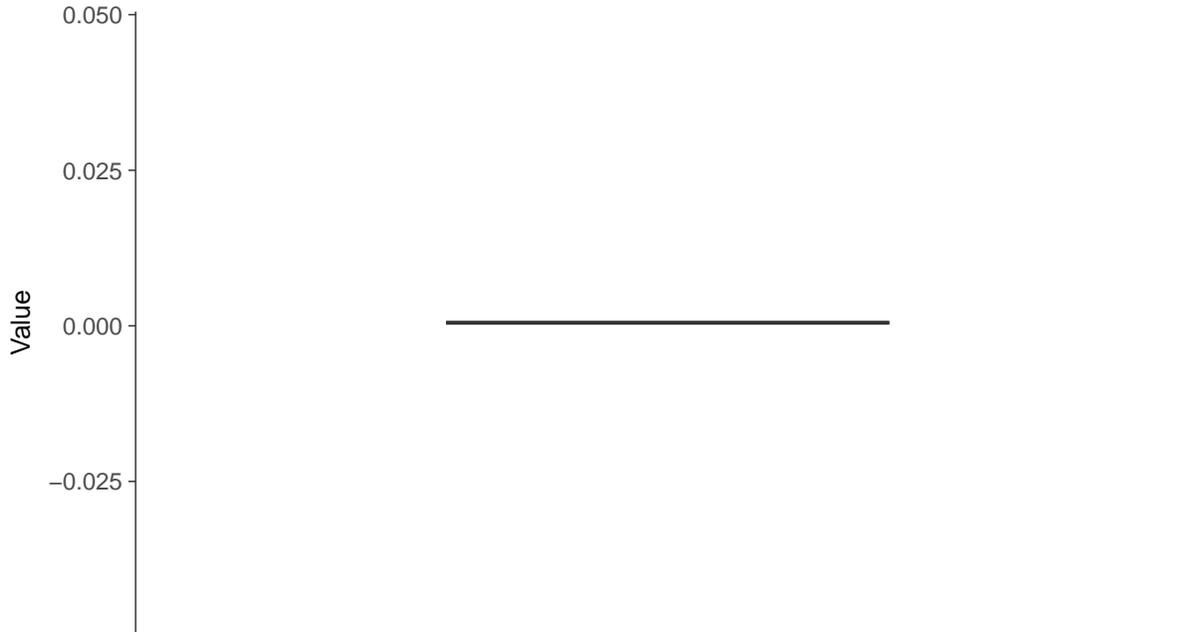
ID: 16C_2_12





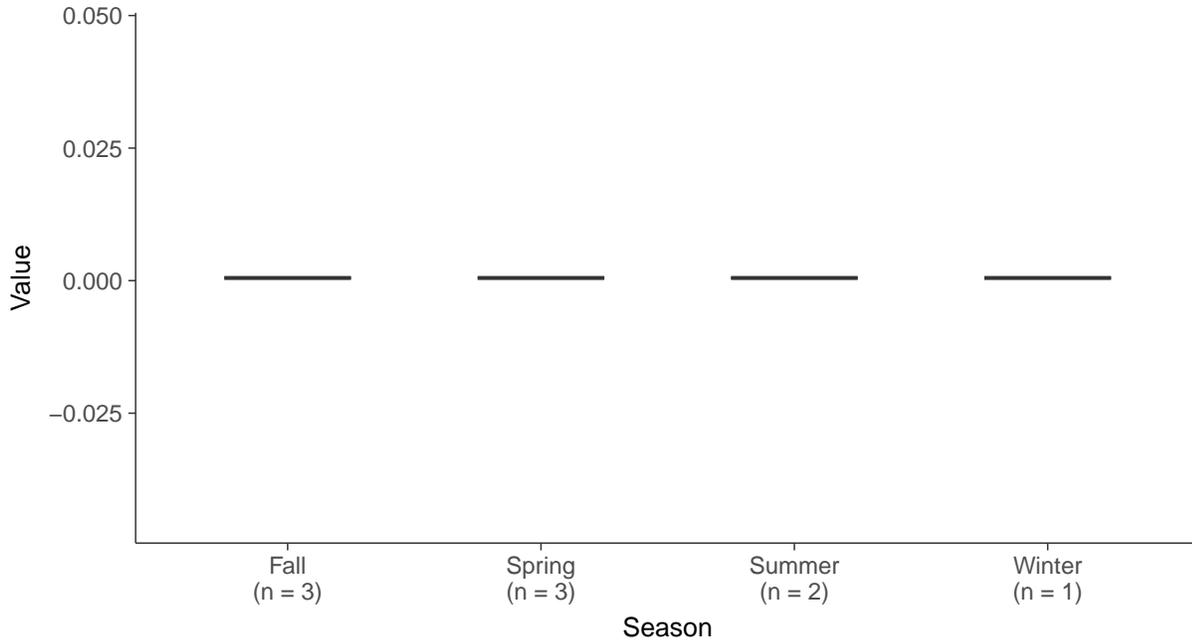
Boxplot

Cadmium, MW-16C (mg/L)



Boxplot by Season

Cadmium, MW-16C (mg/L)



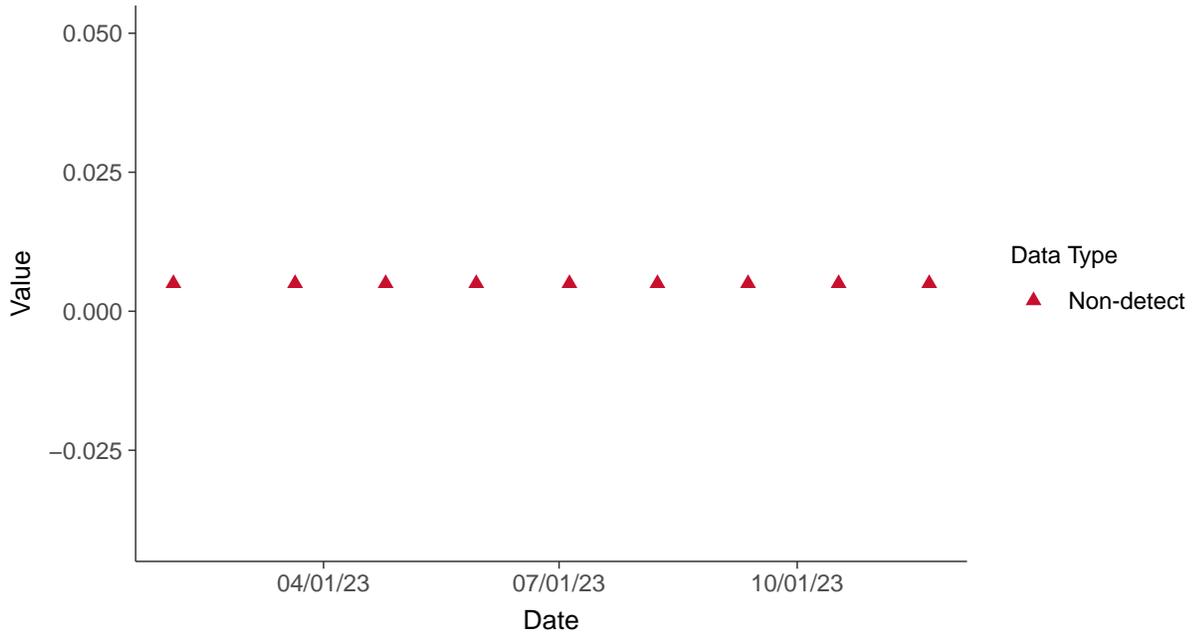


Appendix IV: Chromium, MW-16C

ID: 16C_2_13

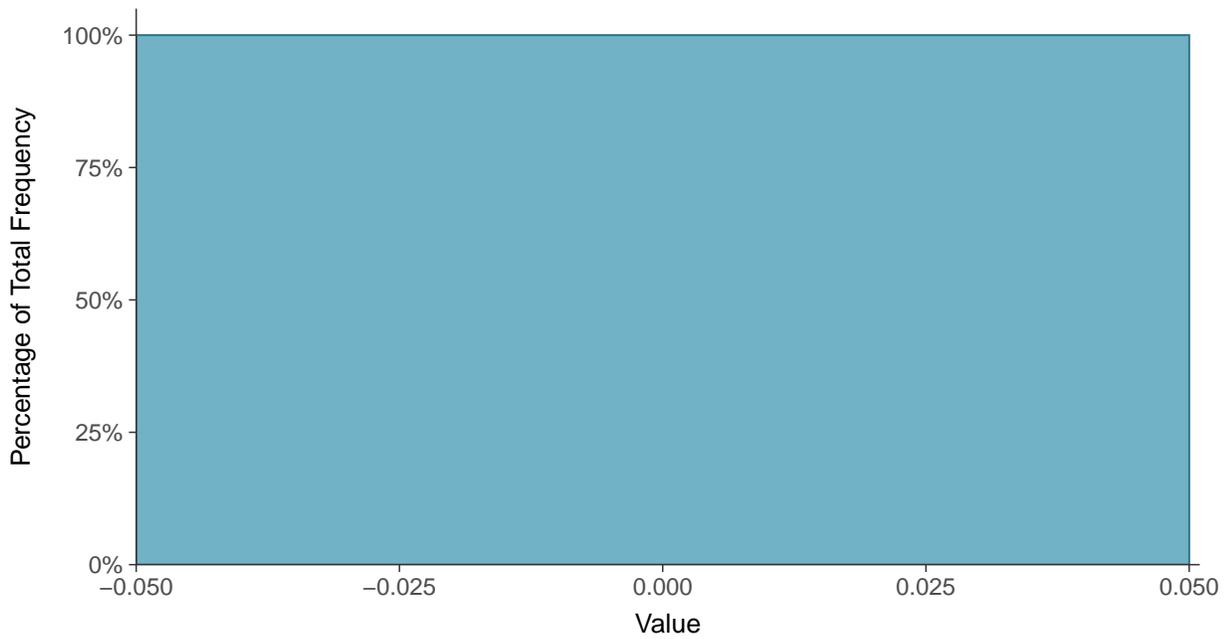
Scatter Plot

Chromium, MW-16C (mg/L)



Histogram

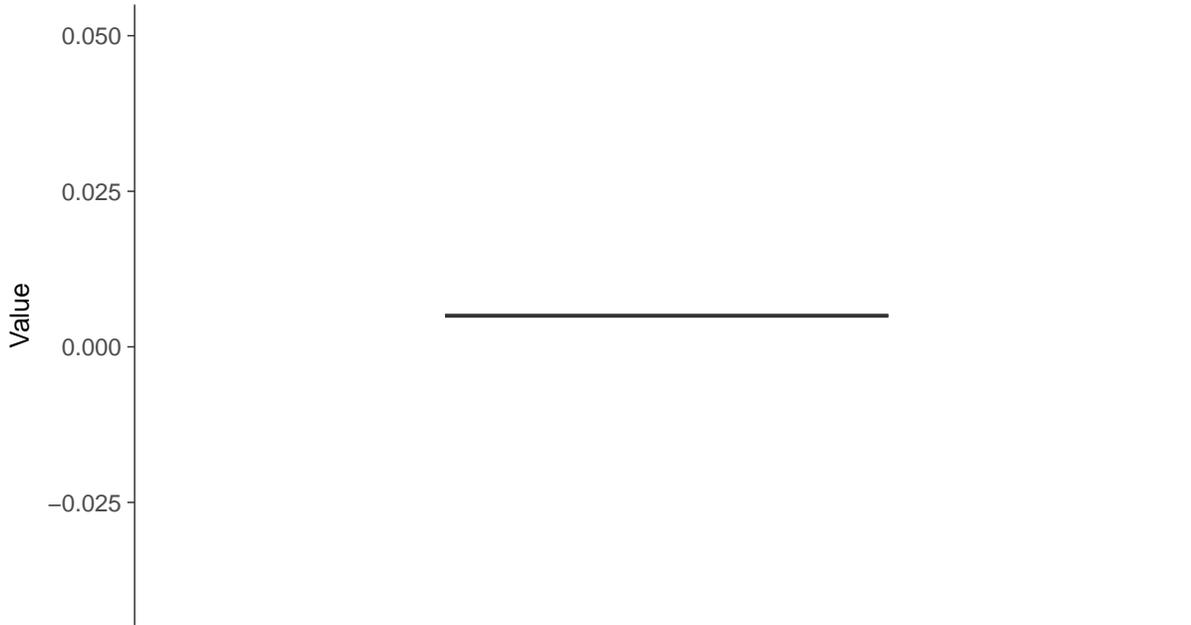
Chromium, MW-16C (mg/L)





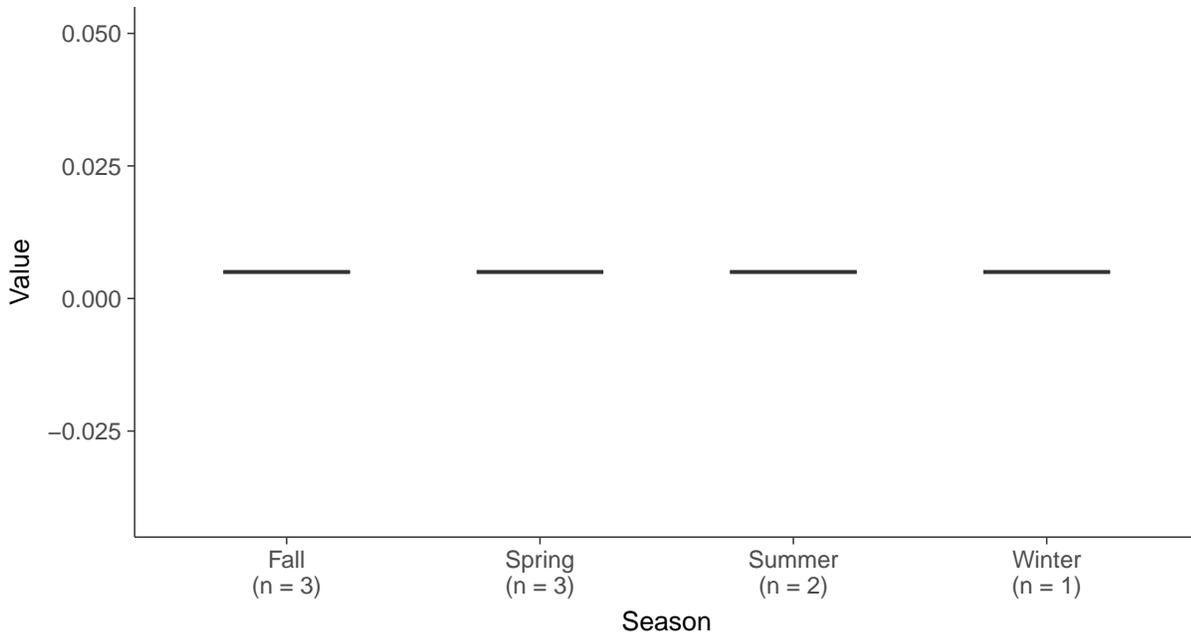
Boxplot

Chromium, MW-16C (mg/L)



Boxplot by Season

Chromium, MW-16C (mg/L)



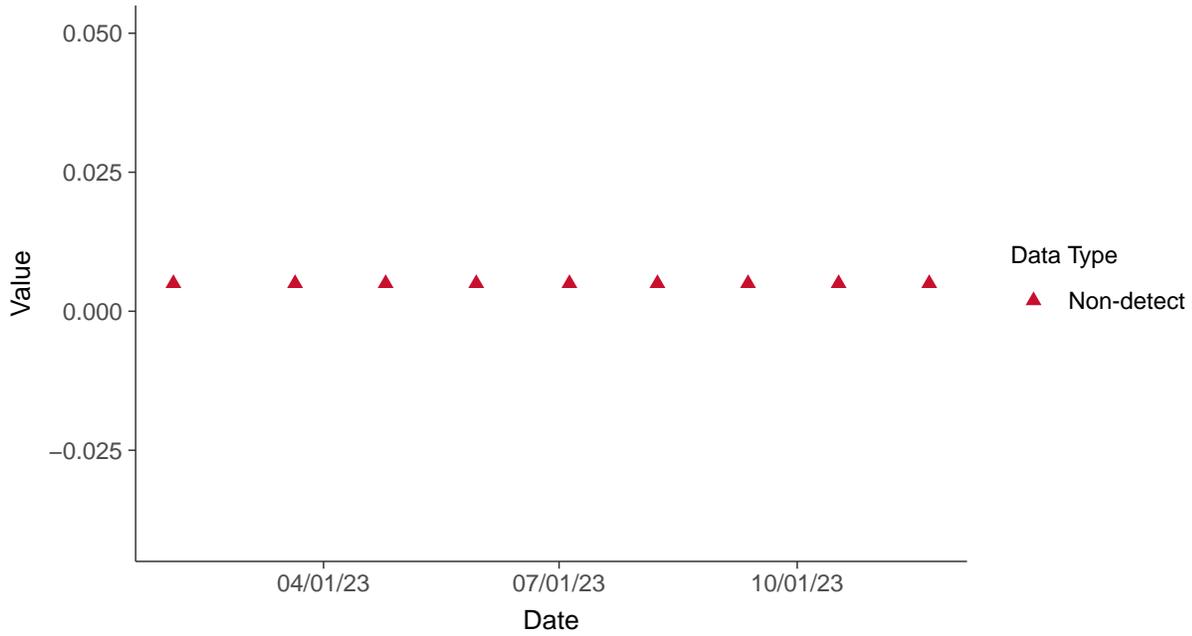


Appendix IV: Cobalt, MW-16C

ID: 16C_2_14

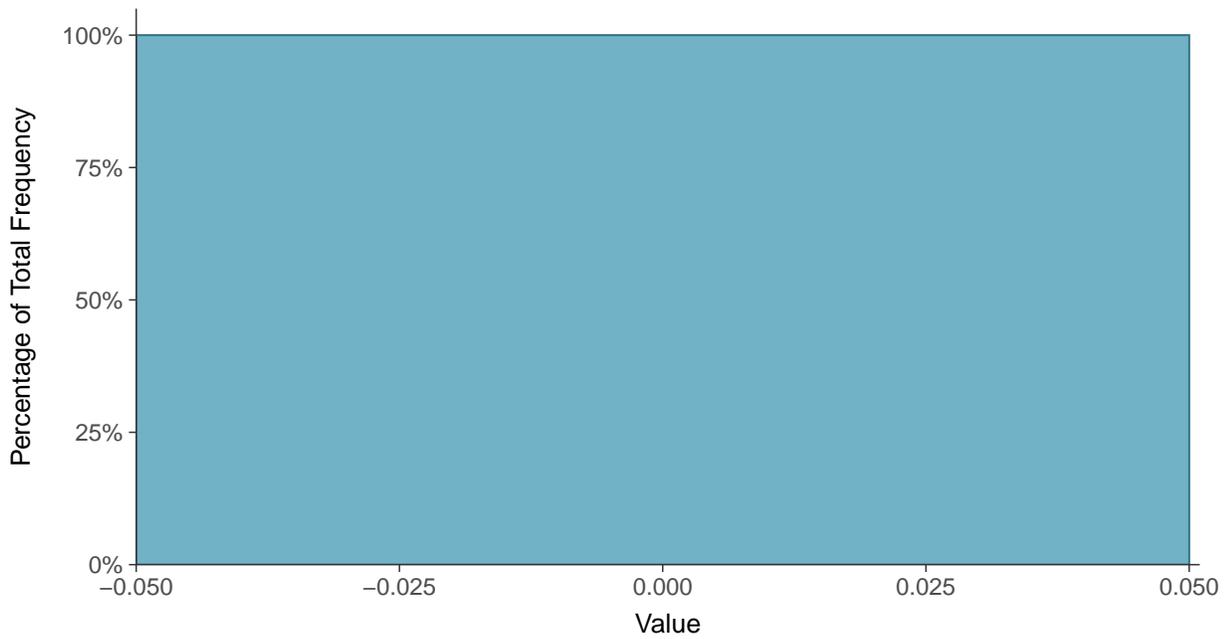
Scatter Plot

Cobalt, MW-16C (mg/L)



Histogram

Cobalt, MW-16C (mg/L)





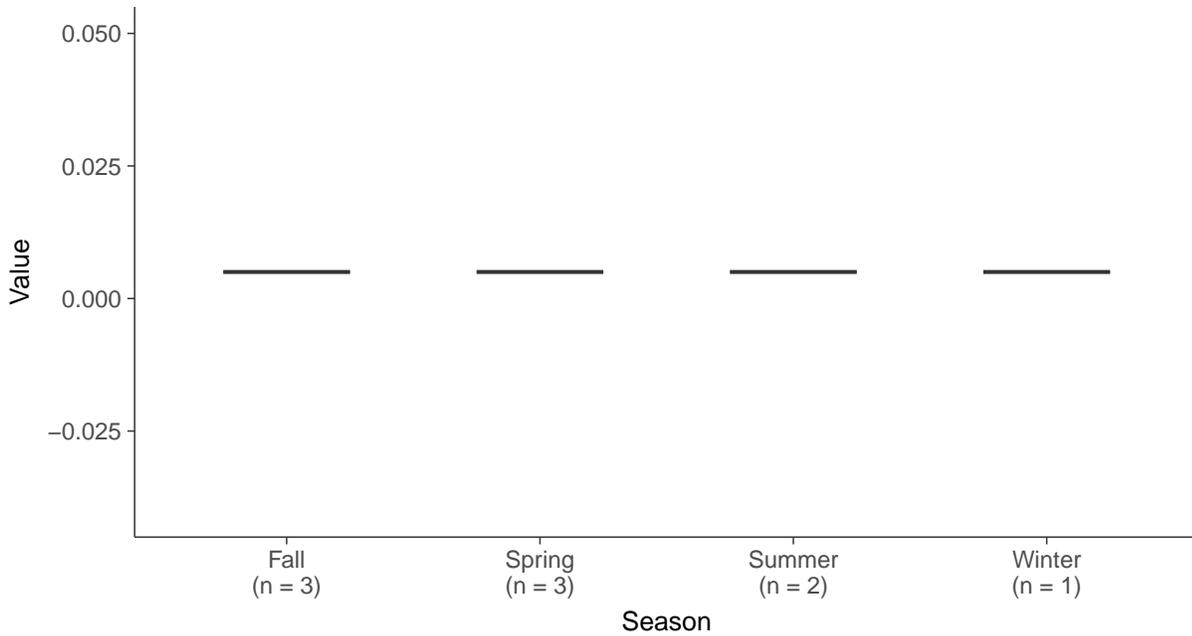
Boxplot

Cobalt, MW-16C (mg/L)



Boxplot by Season

Cobalt, MW-16C (mg/L)



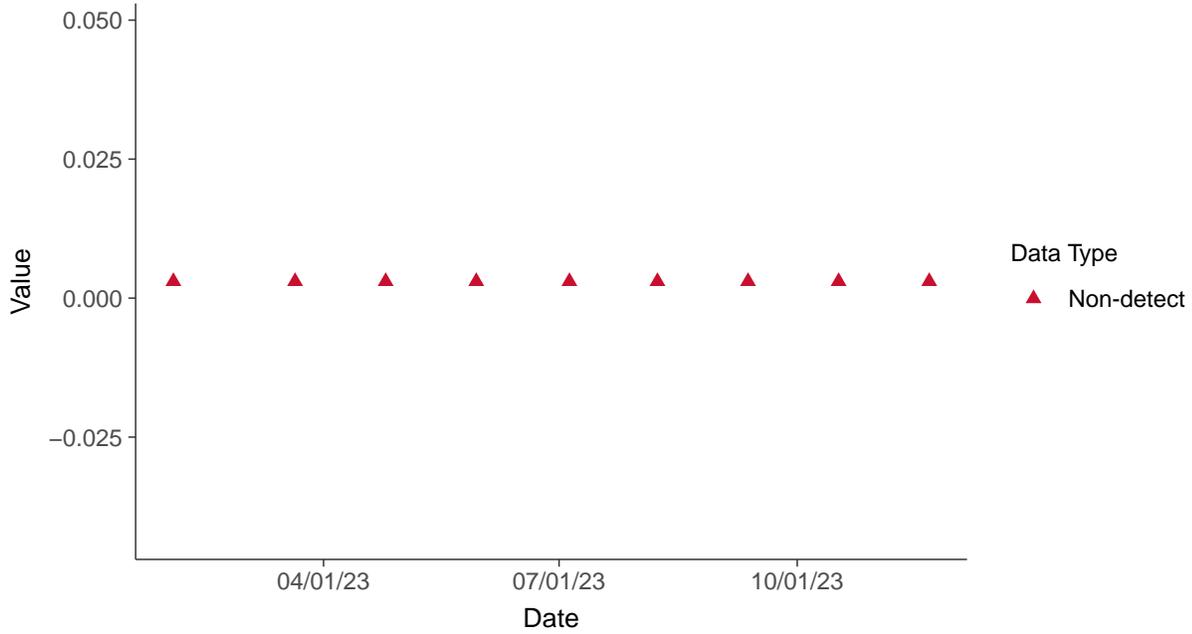


Appendix IV: Lead, MW-16C

ID: 16C_2_15

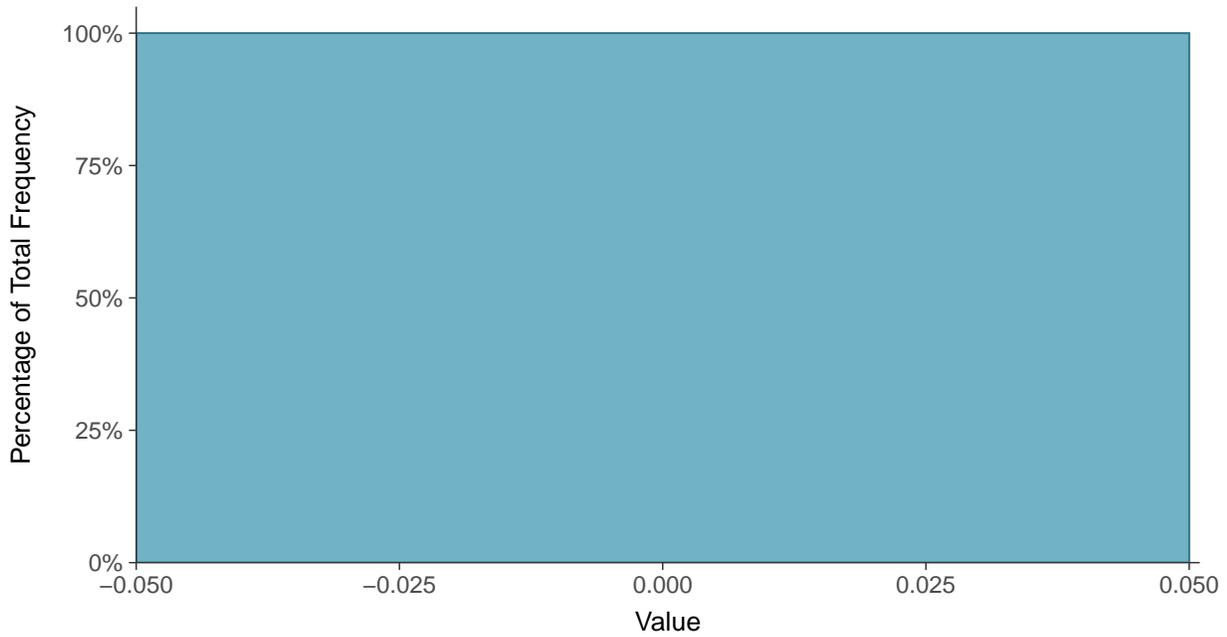
Scatter Plot

Lead, MW-16C (mg/L)



Histogram

Lead, MW-16C (mg/L)





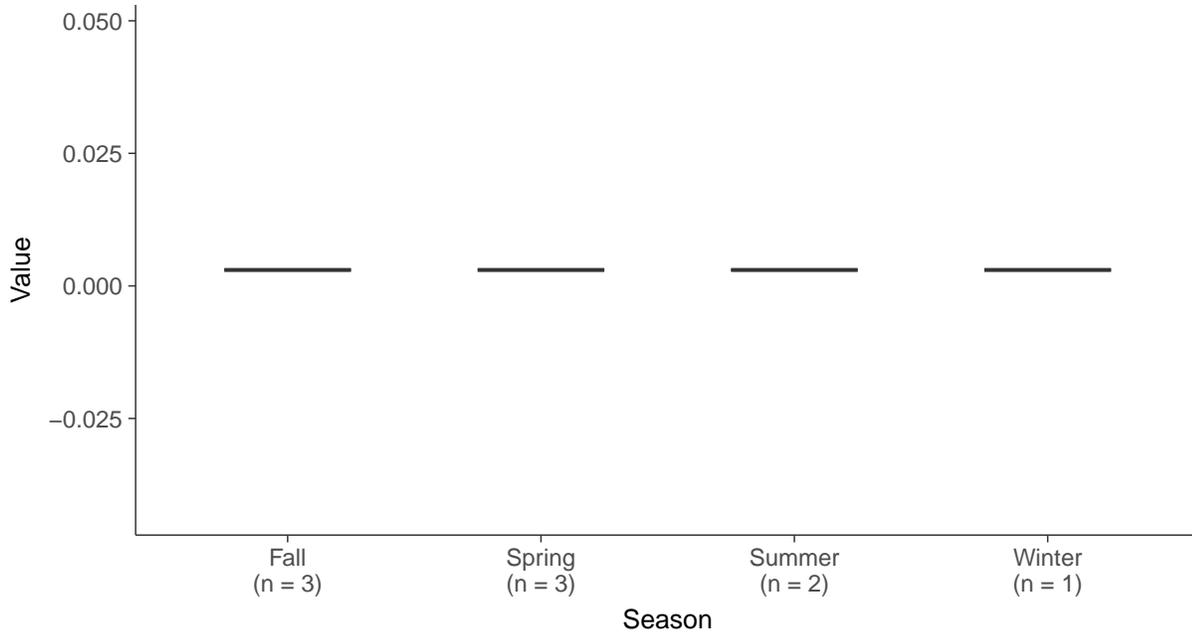
Boxplot

Lead, MW-16C (mg/L)



Boxplot by Season

Lead, MW-16C (mg/L)



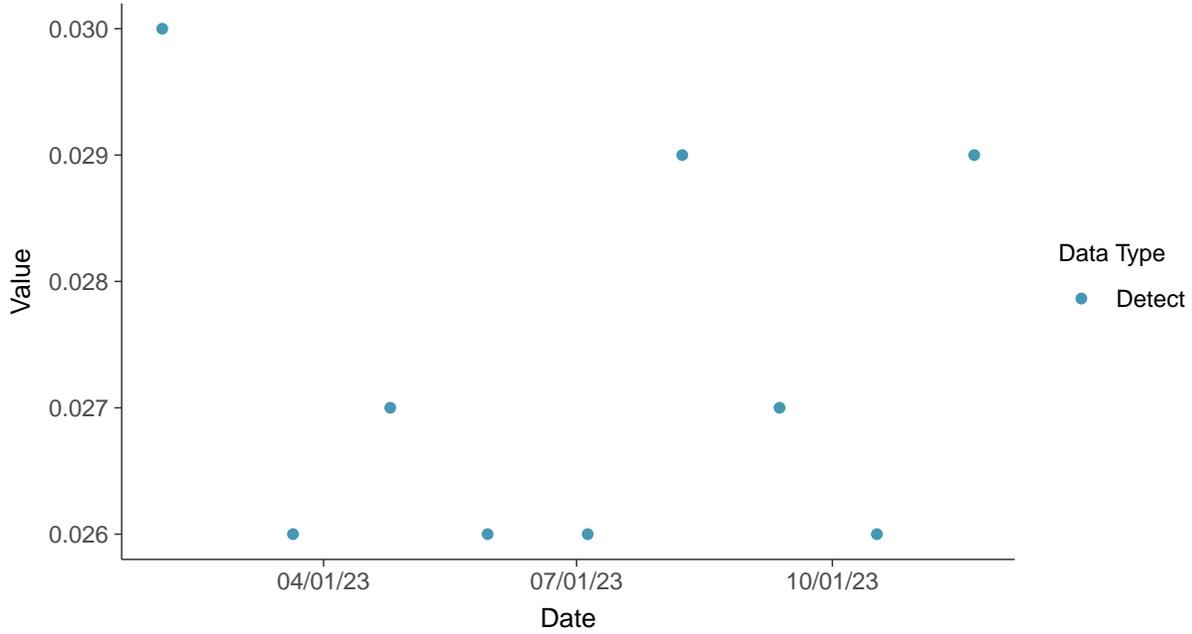


Appendix IV: Lithium, MW-16C

ID: 16C_2_16

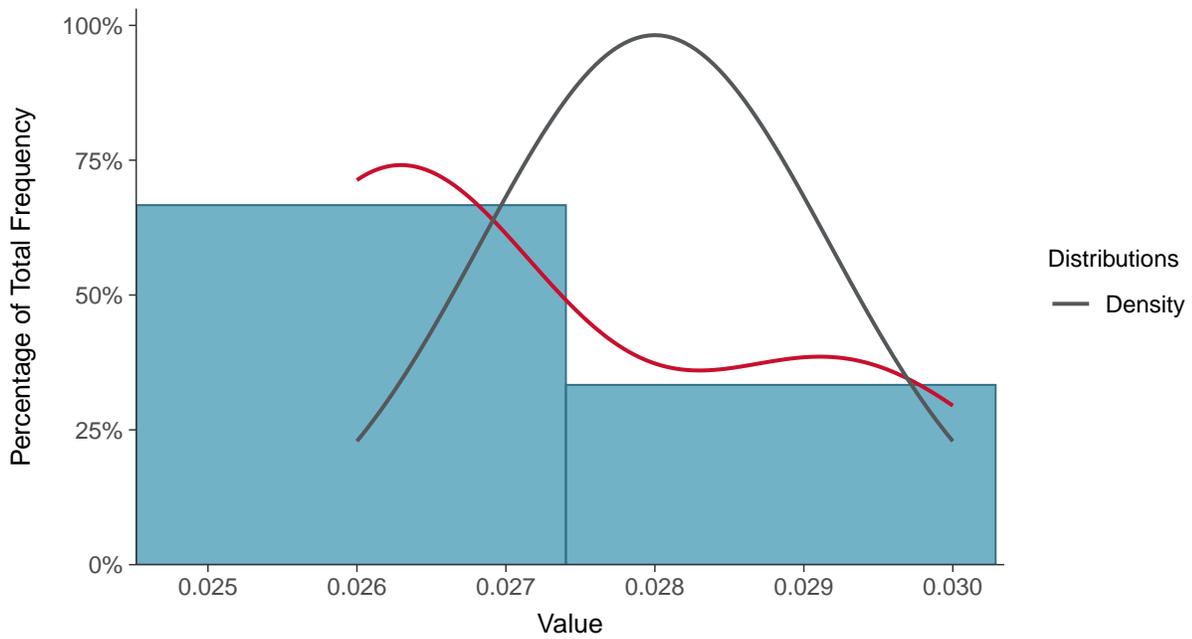
Scatter Plot

Lithium, MW-16C (mg/L)



Histogram

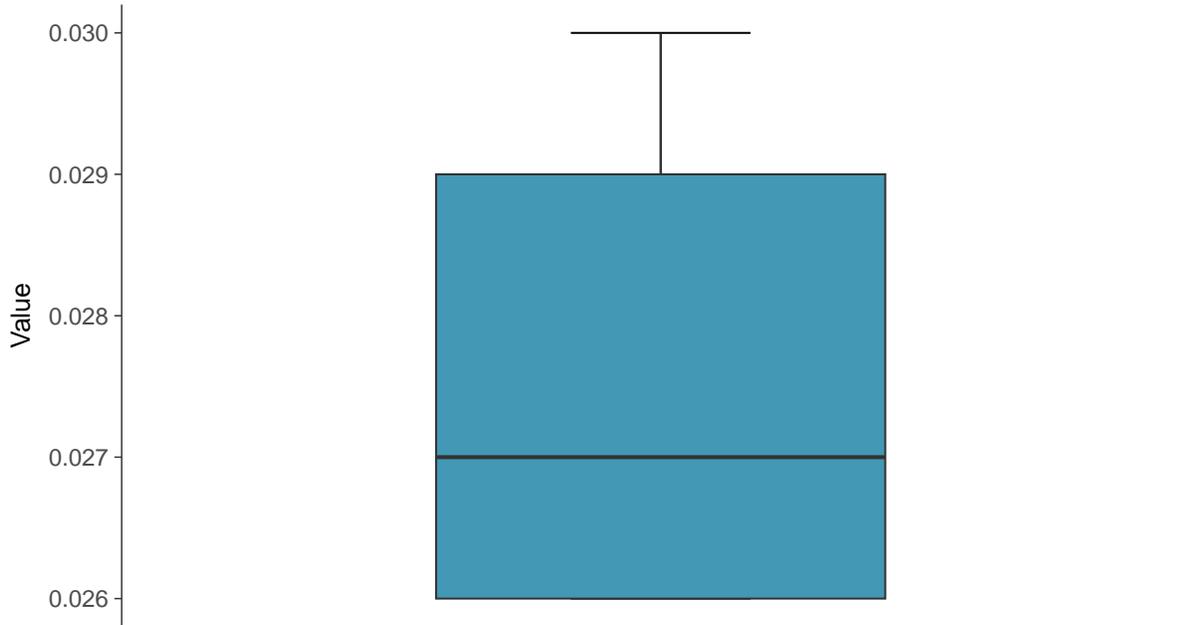
Lithium, MW-16C (mg/L)





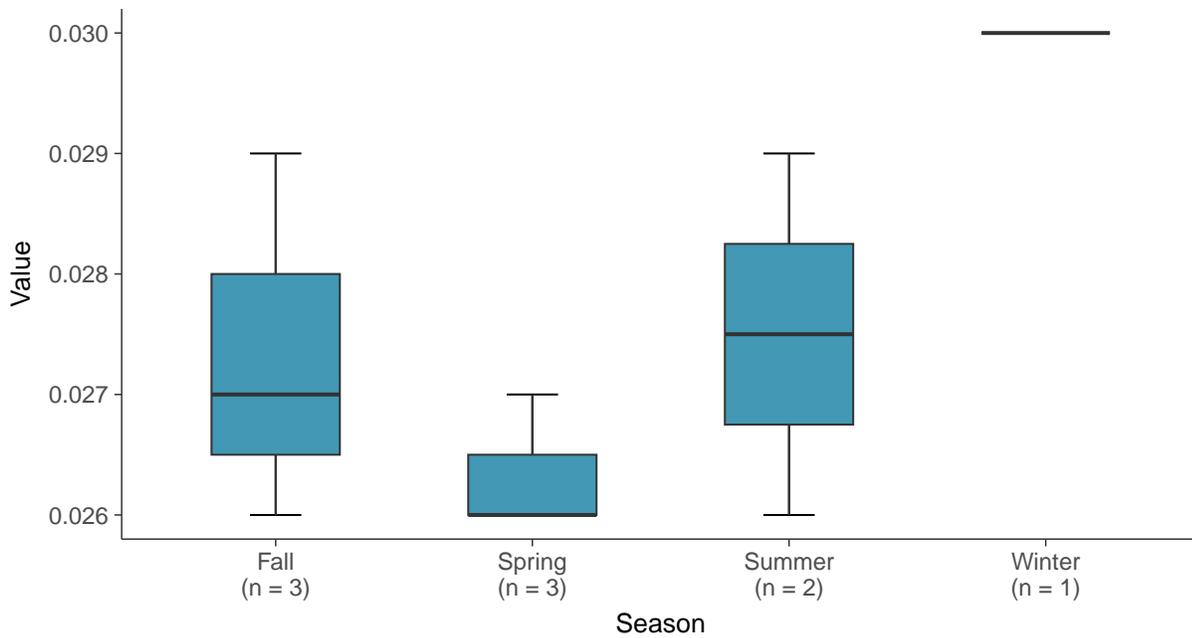
Boxplot

Lithium, MW-16C (mg/L)



Boxplot by Season

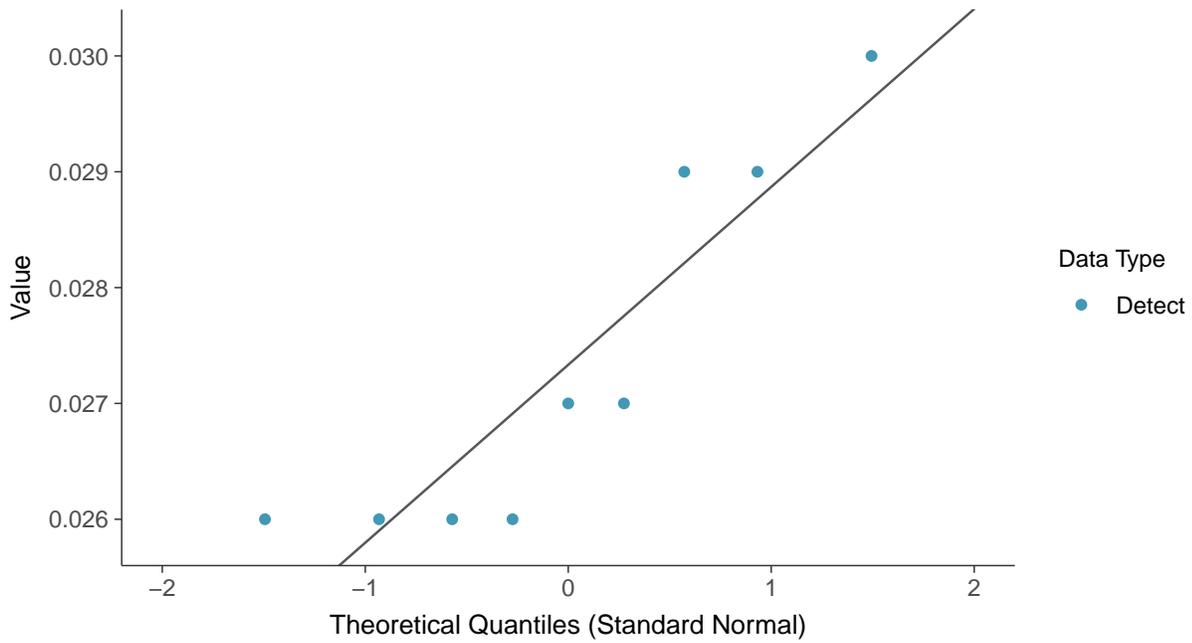
Lithium, MW-16C (mg/L)





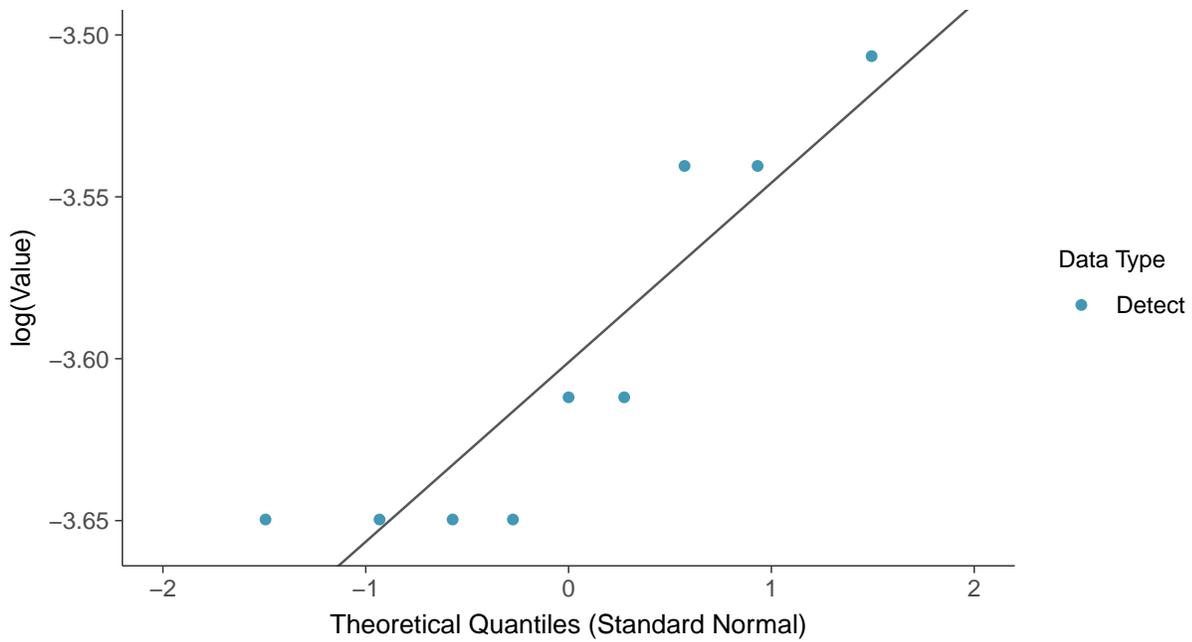
Normal Q-Q plot

Lithium, MW-16C (mg/L)



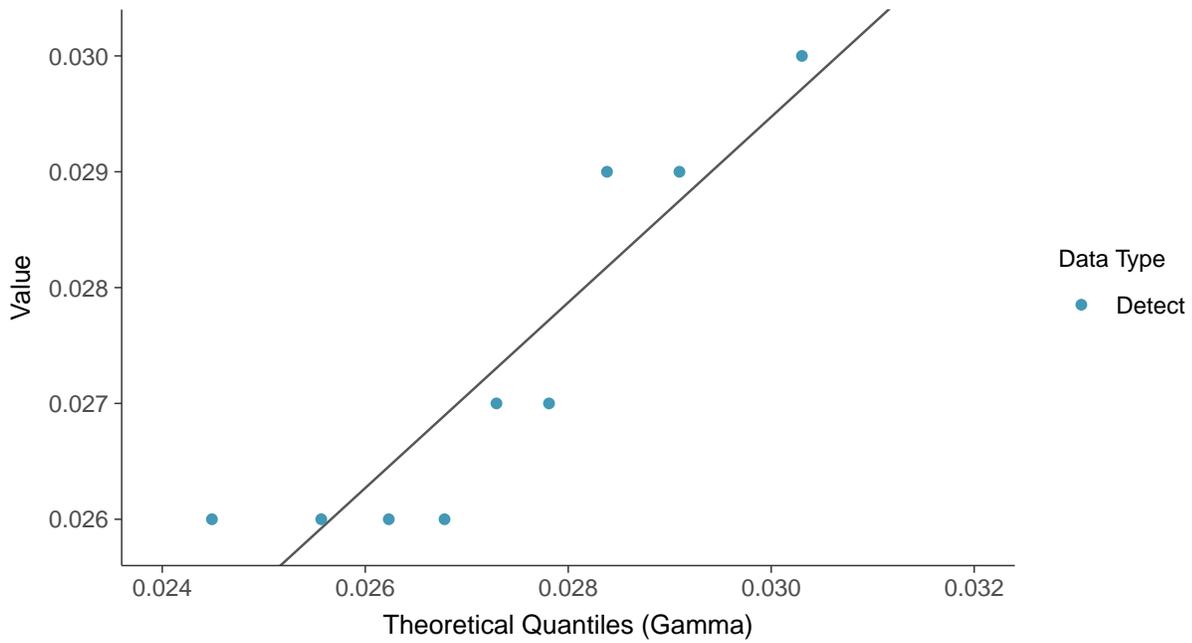
Lognormal Q-Q plot

Lithium, MW-16C (mg/L)

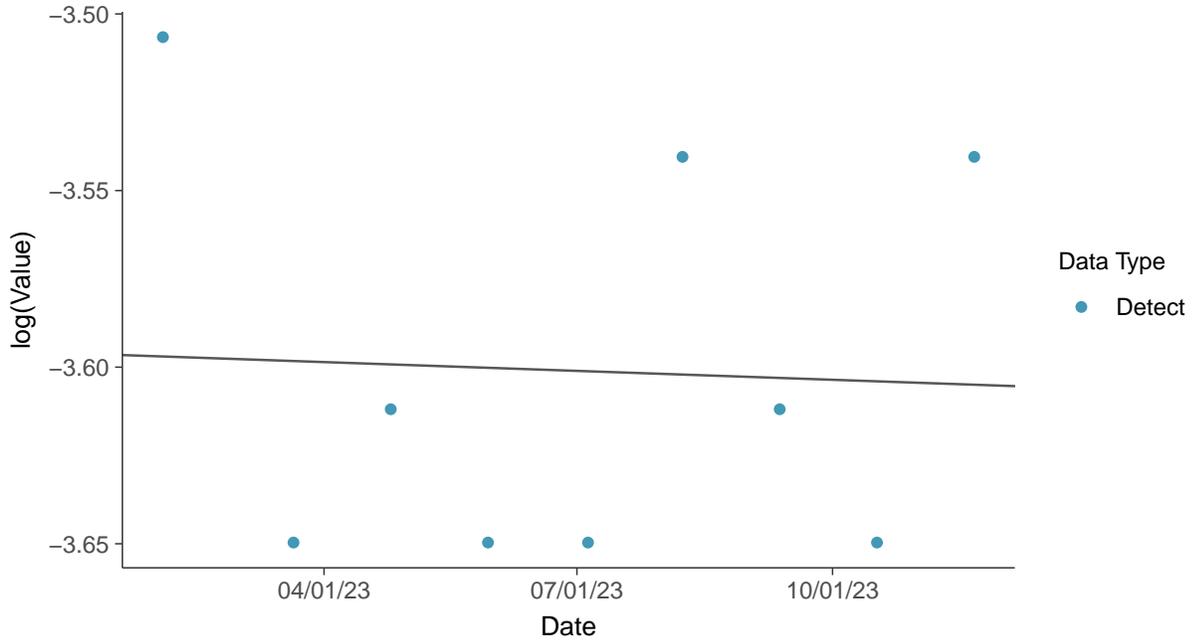




Gamma Q-Q plot
Lithium, MW-16C (mg/L)



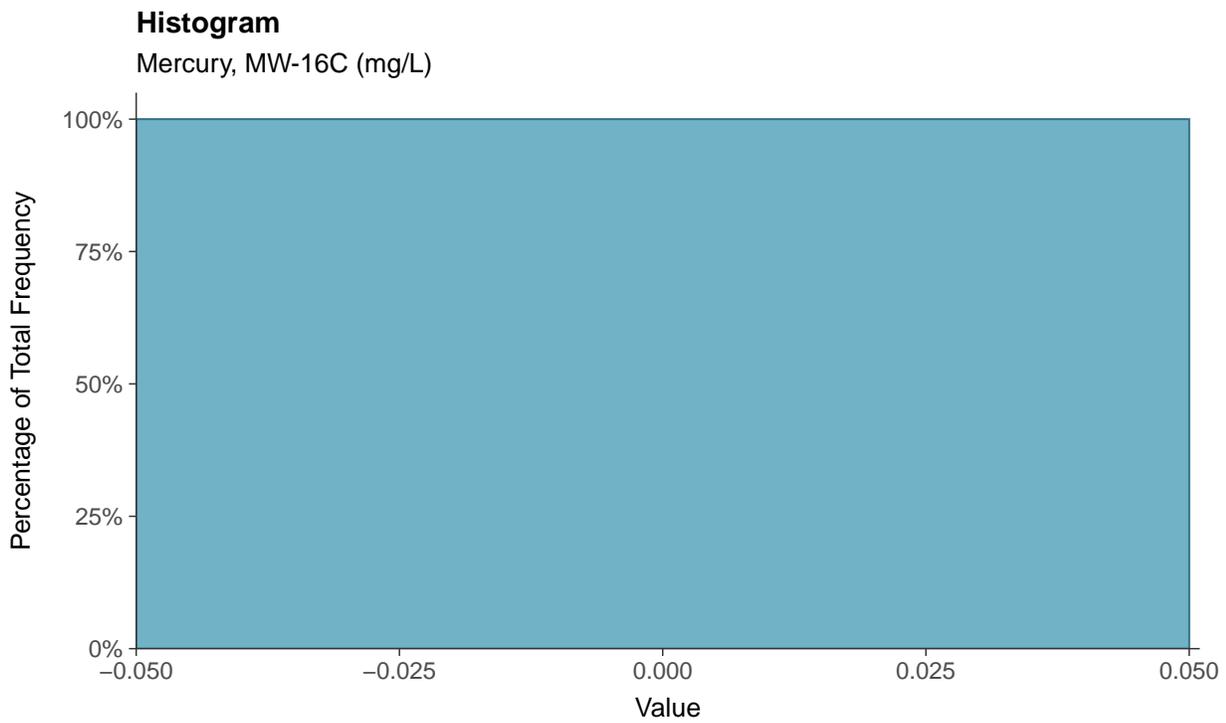
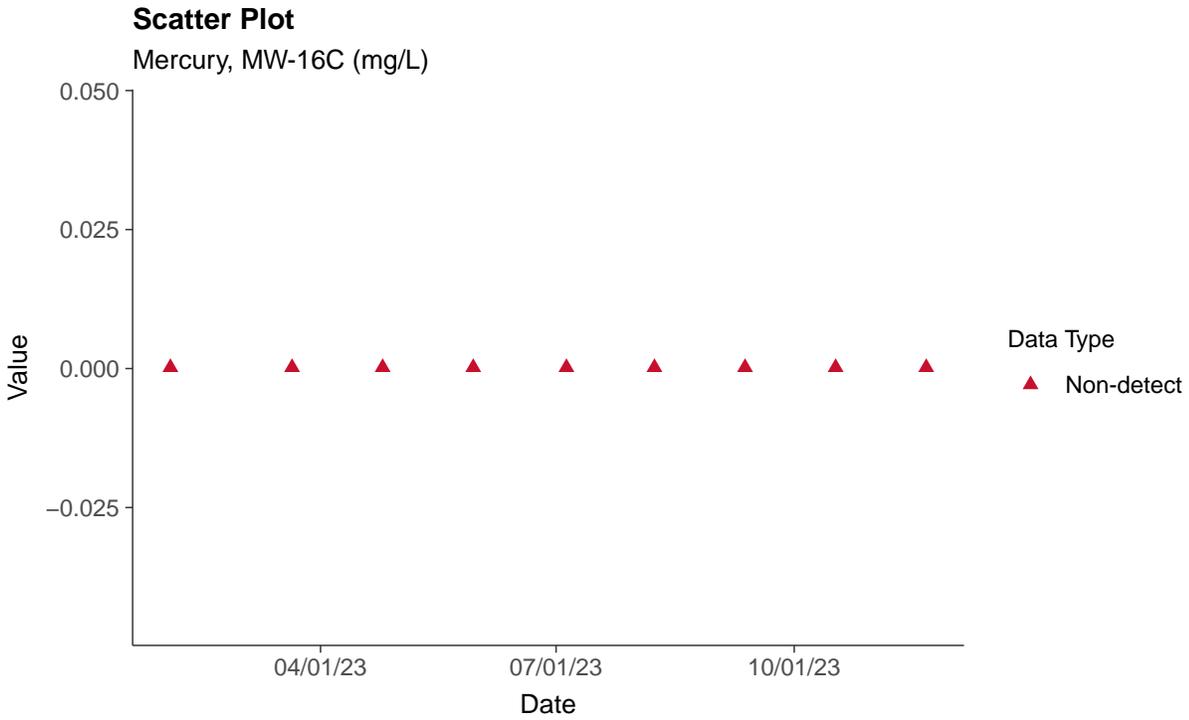
Trend Regression: Lognormal MLE
Lithium, MW-16C (mg/L)





Appendix IV: Mercury, MW-16C

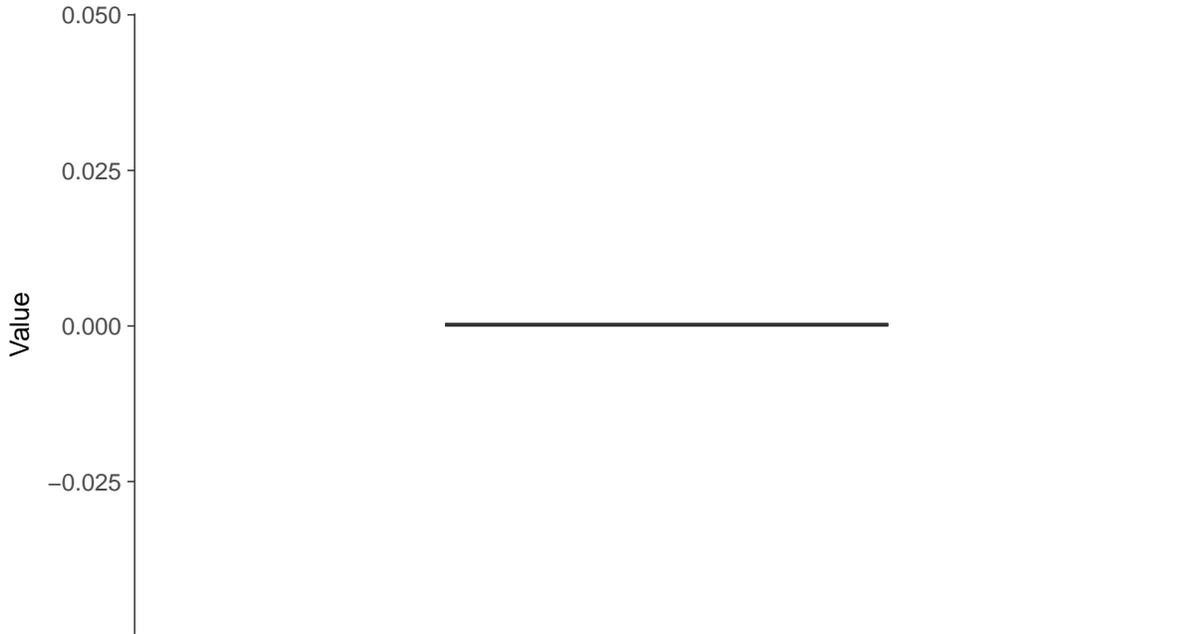
ID: 16C_2_17





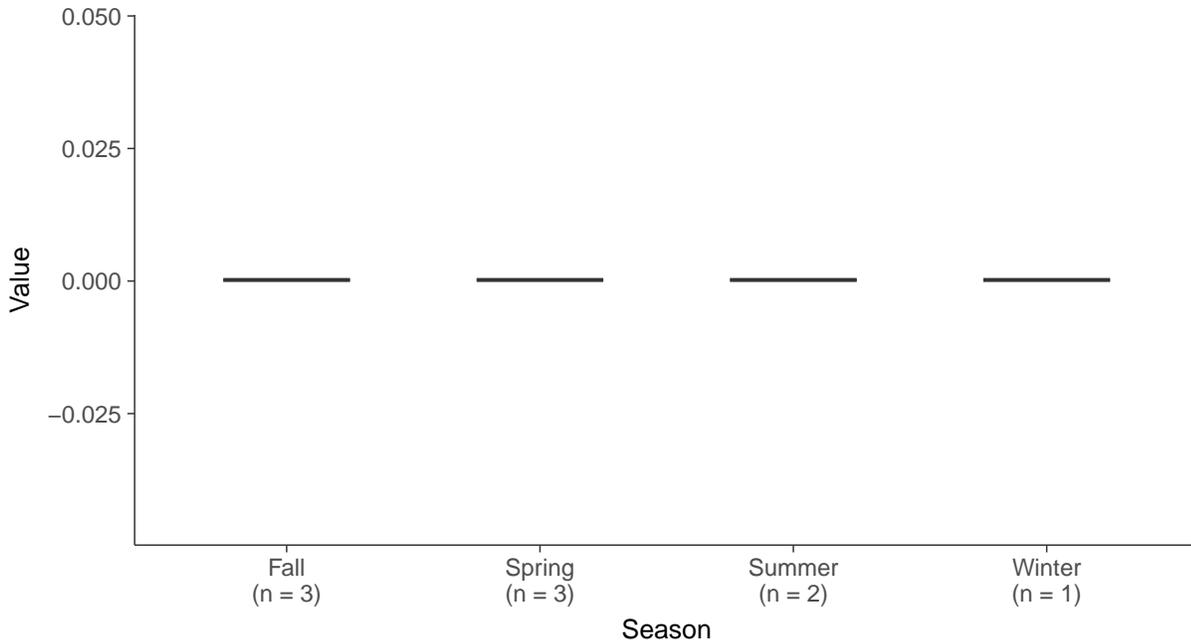
Boxplot

Mercury, MW-16C (mg/L)



Boxplot by Season

Mercury, MW-16C (mg/L)



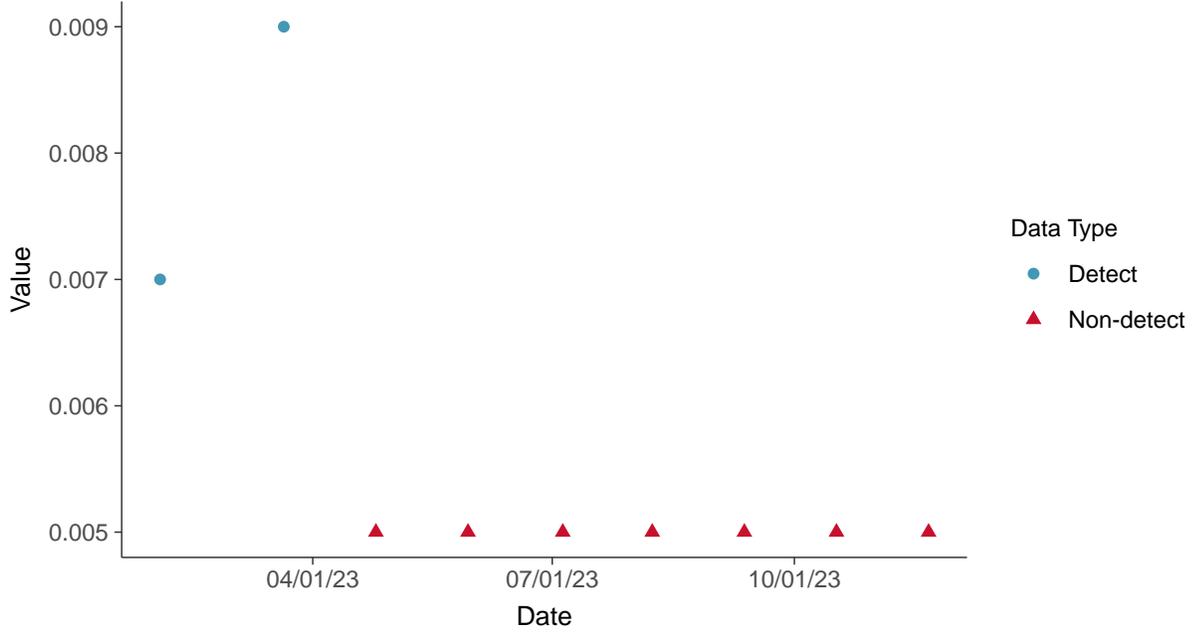


Appendix IV: Molybdenum, MW-16C

ID: 16C_2_18

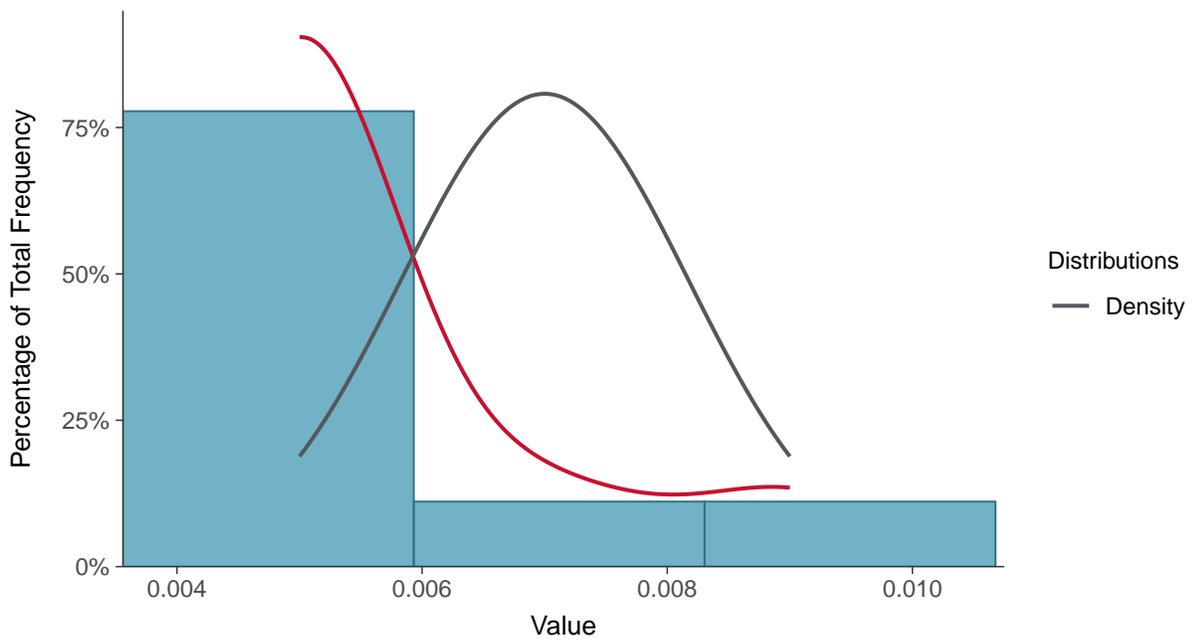
Scatter Plot

Molybdenum, MW-16C (mg/L)



Histogram

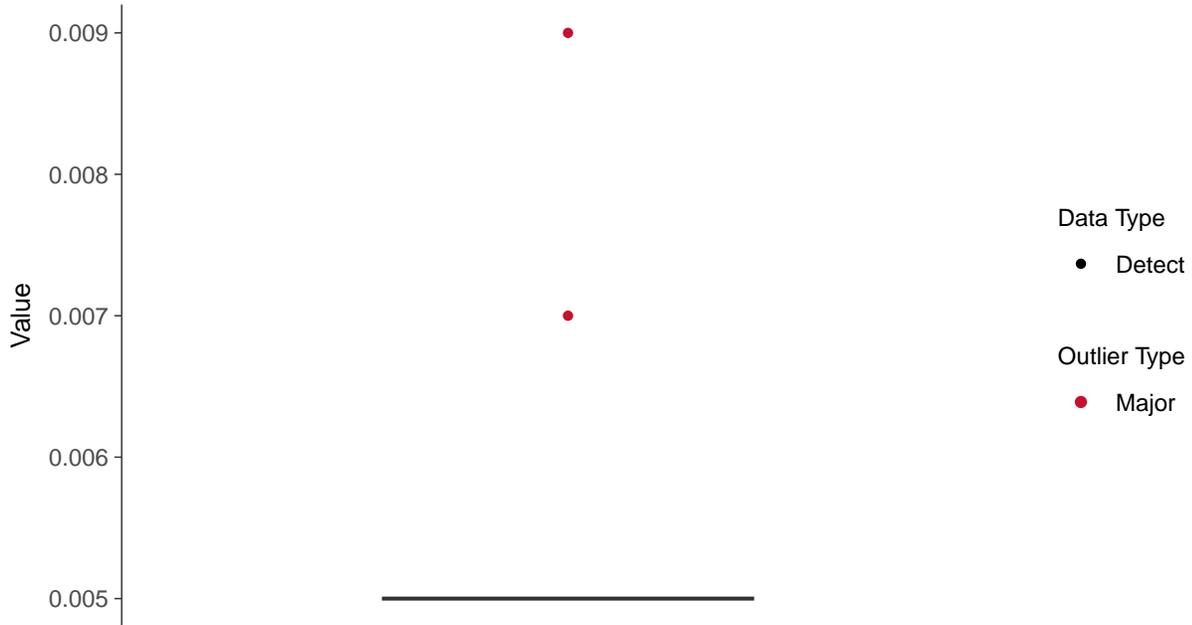
Molybdenum, MW-16C (mg/L)





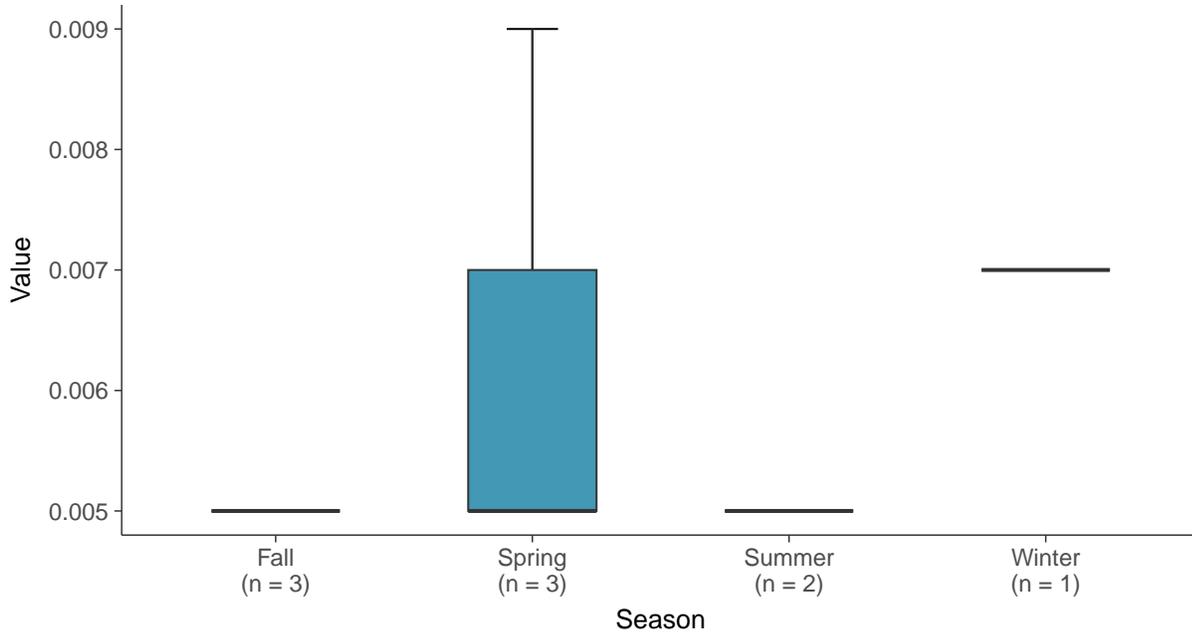
Boxplot

Molybdenum, MW-16C (mg/L)



Boxplot by Season

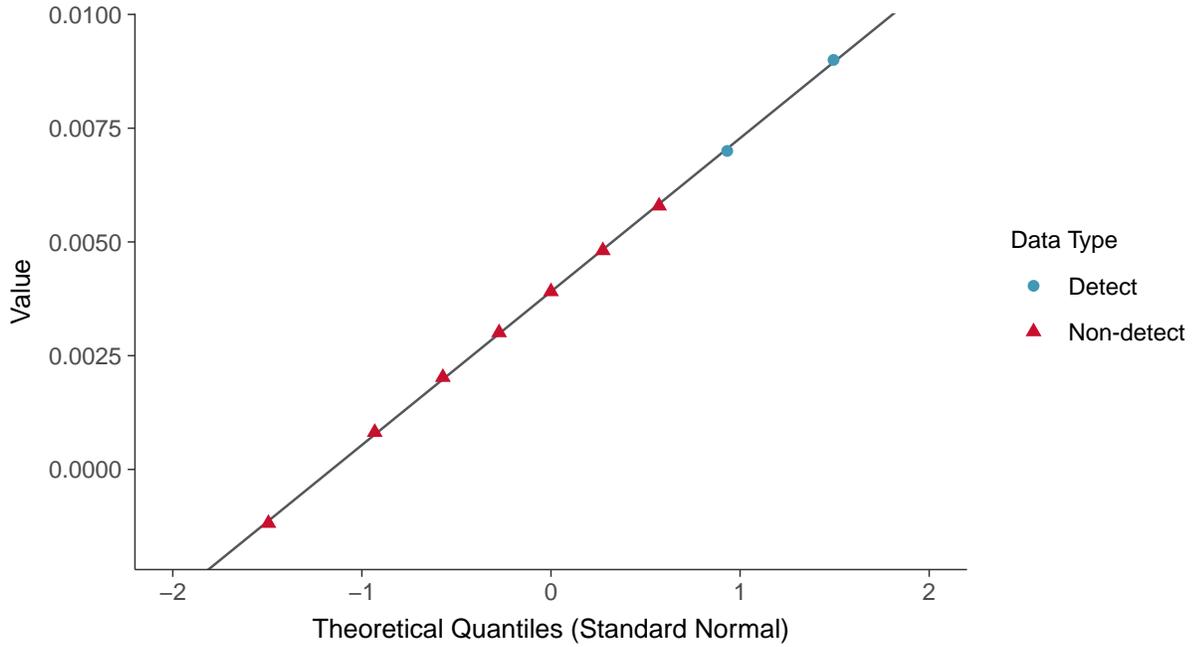
Molybdenum, MW-16C (mg/L)





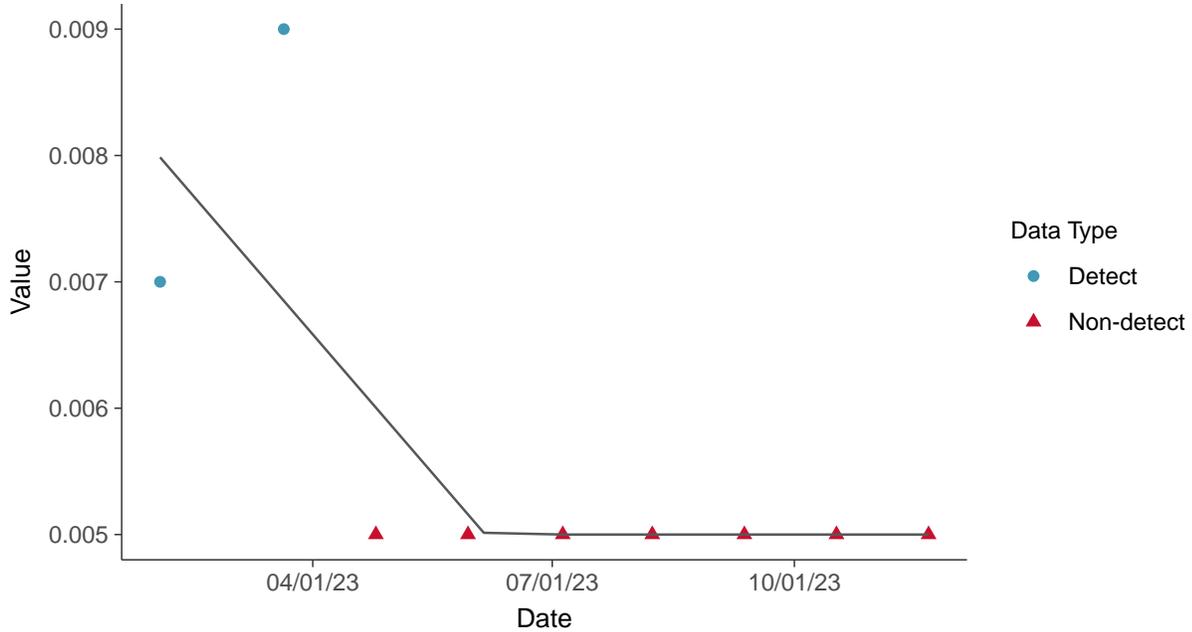
Normal Q-Q plot using ROS Imputed Estimates

Molybdenum, MW-16C (mg/L)



Trend Regression: Piecewise Linear-Linear

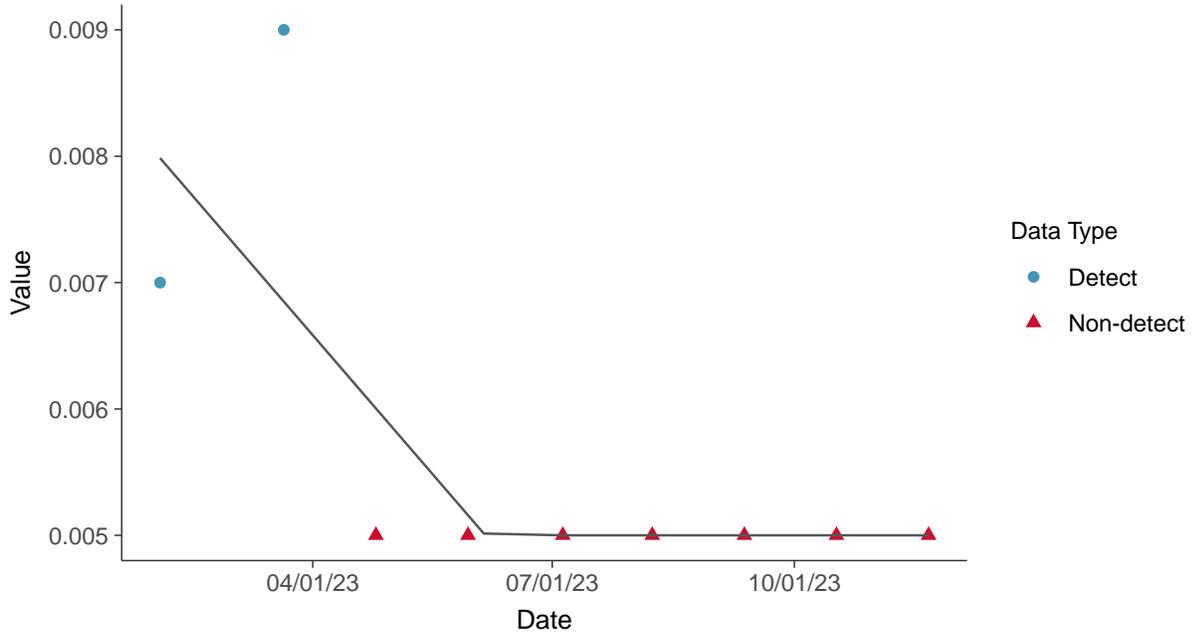
Molybdenum, MW-16C (mg/L)





Trend Regression: Piecewise Linear-Linear-Linear

Molybdenum, MW-16C (mg/L)

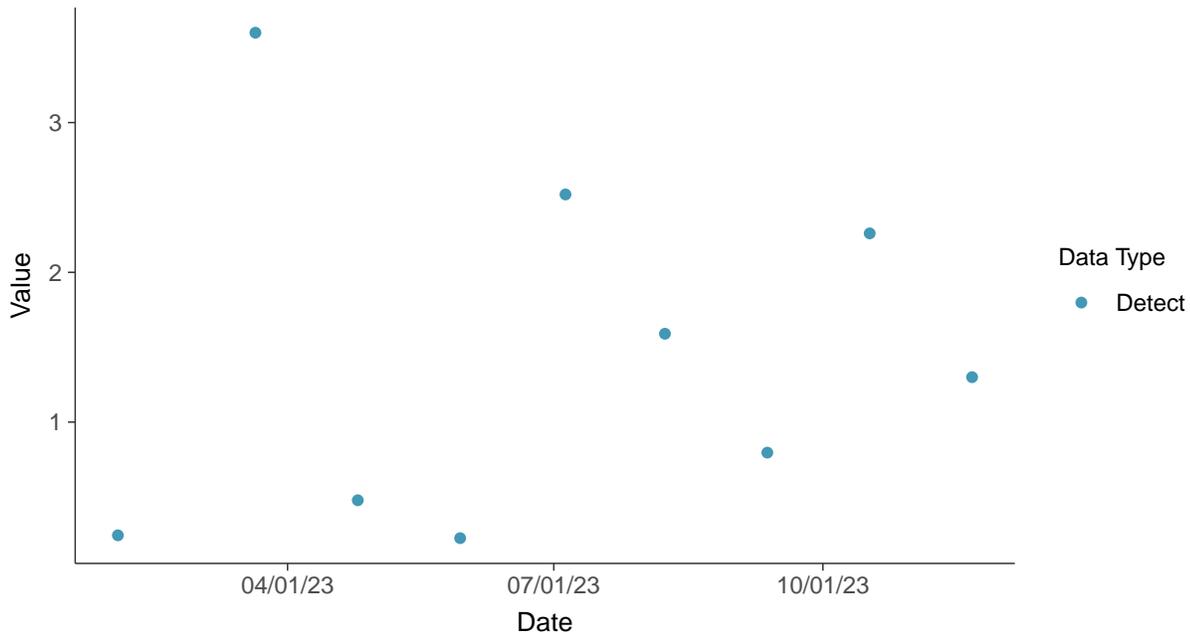


Appendix IV: Radium-226/228, MW-16C

ID: 16C_2_20

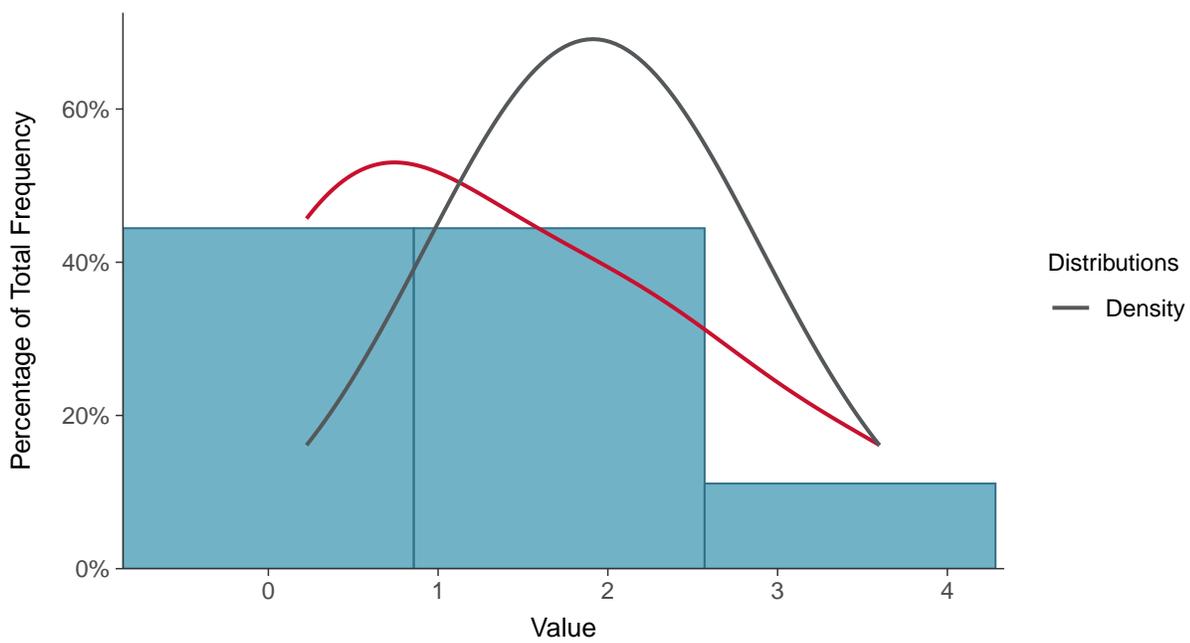
Scatter Plot

Radium-226/228, MW-16C (pCi/L)



Histogram

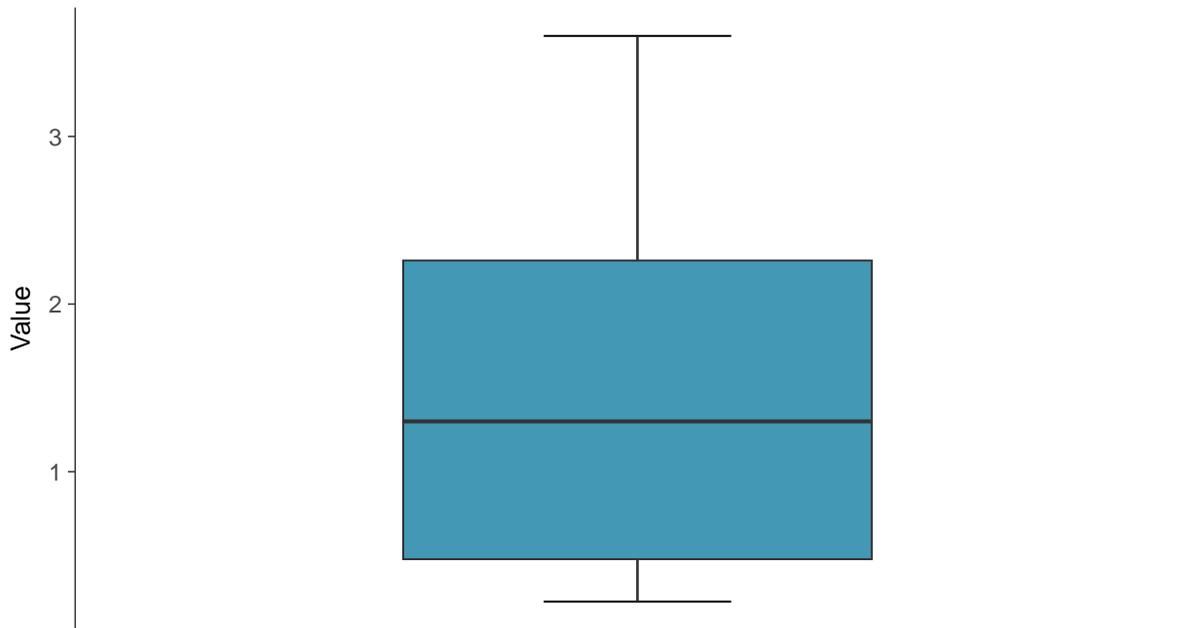
Radium-226/228, MW-16C (pCi/L)





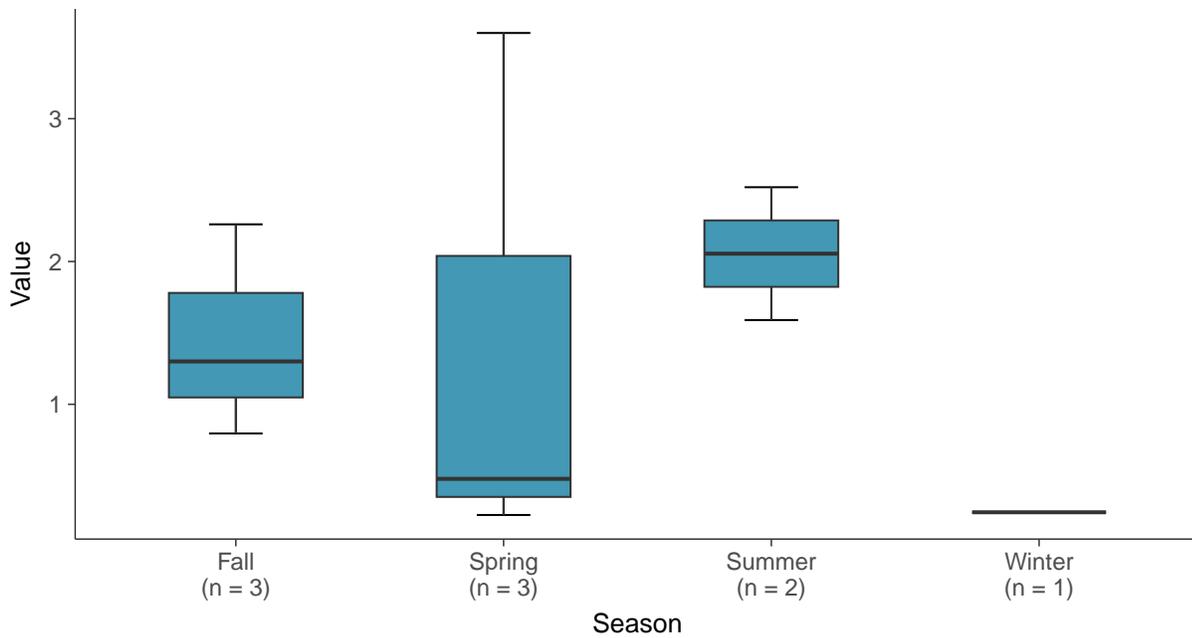
Boxplot

Radium-226/228, MW-16C (pCi/L)



Boxplot by Season

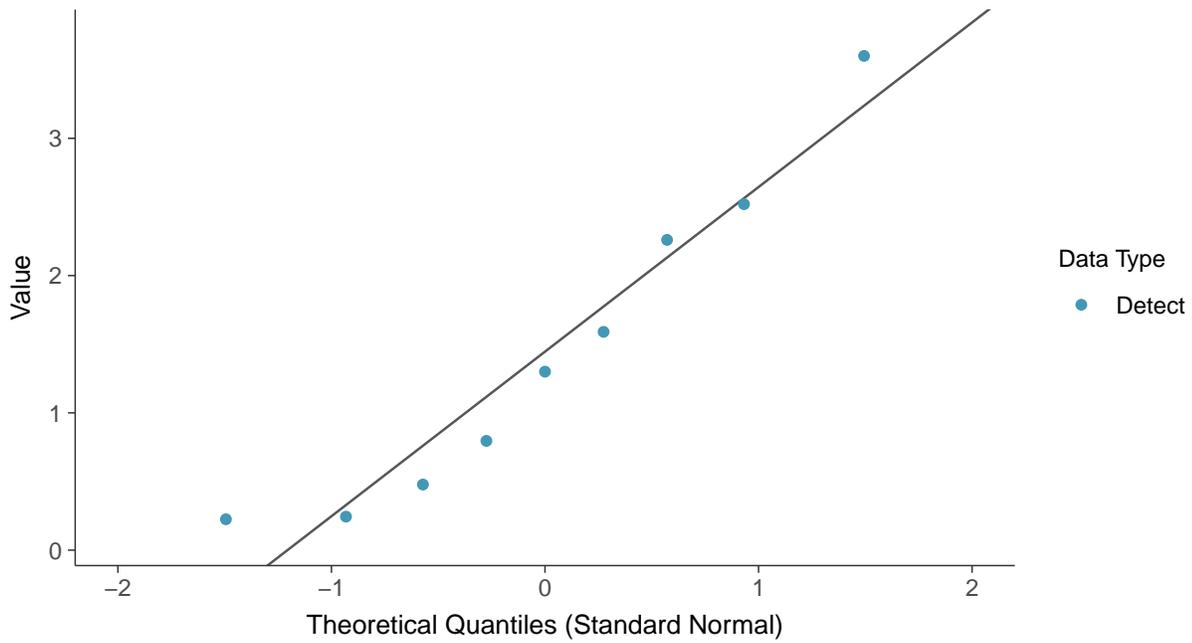
Radium-226/228, MW-16C (pCi/L)





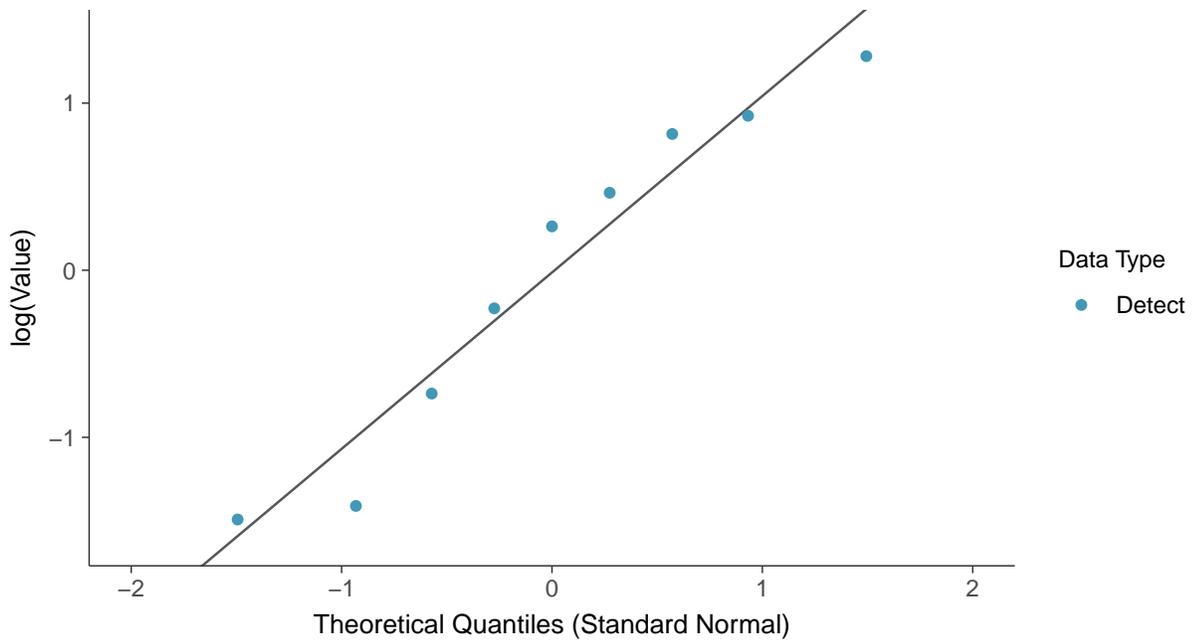
Normal Q-Q plot

Radium-226/228, MW-16C (pCi/L)



Lognormal Q-Q plot

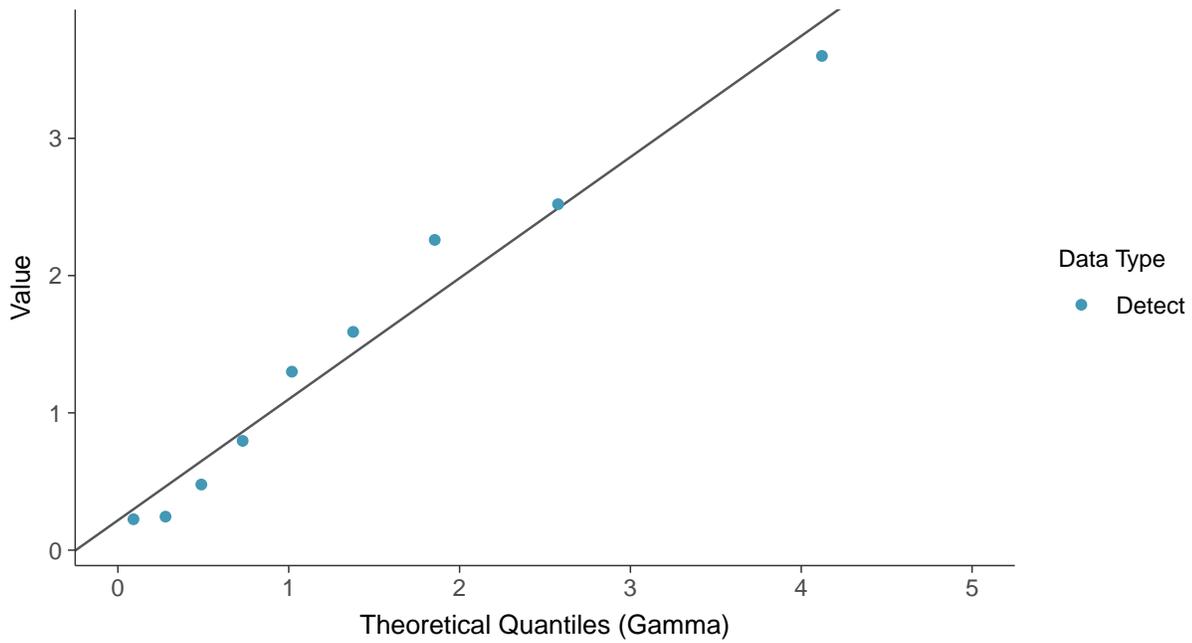
Radium-226/228, MW-16C (pCi/L)





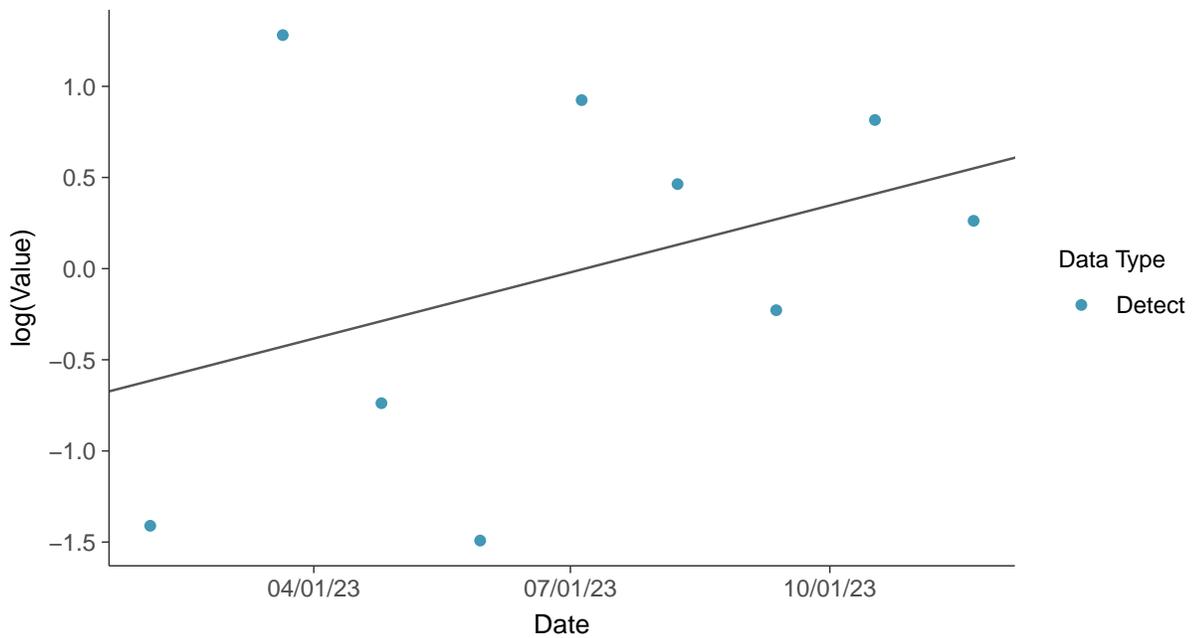
Gamma Q-Q plot

Radium-226/228, MW-16C (pCi/L)



Trend Regression: Lognormal MLE

Radium-226/228, MW-16C (pCi/L)



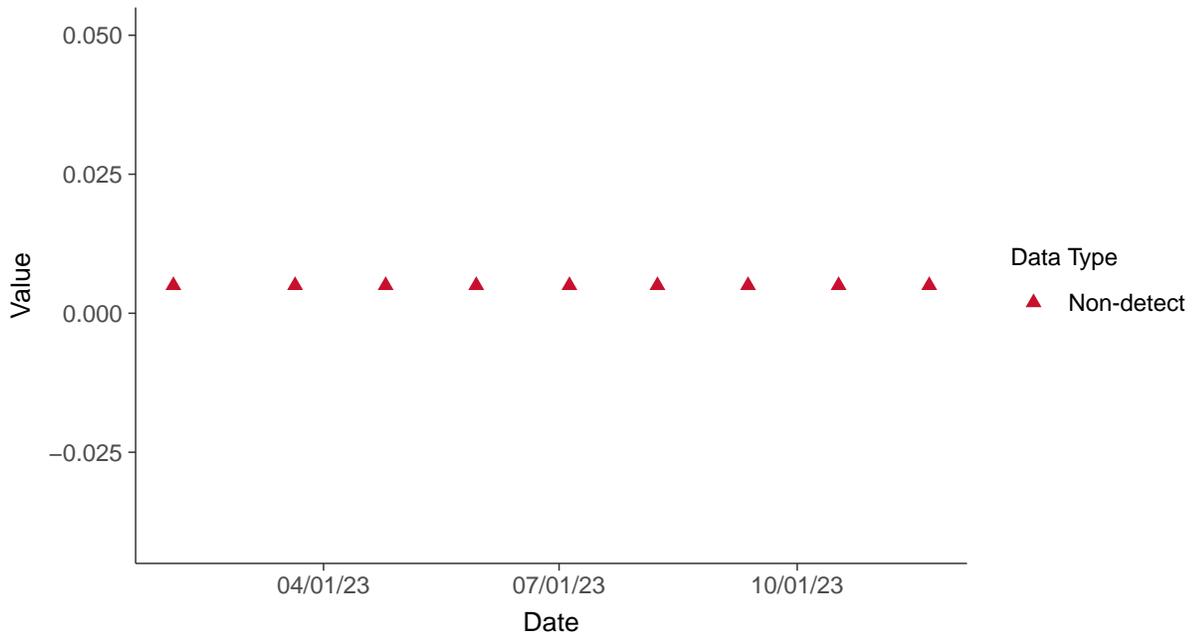


Appendix IV: Selenium, MW-16C

ID: 16C_2_22

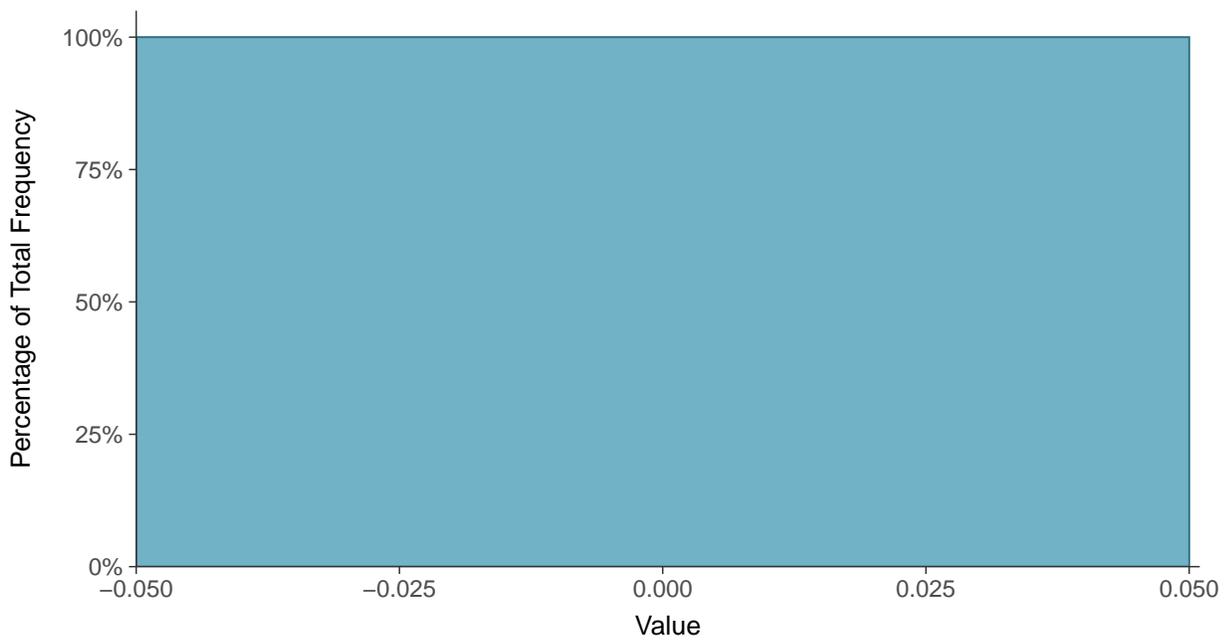
Scatter Plot

Selenium, MW-16C (mg/L)



Histogram

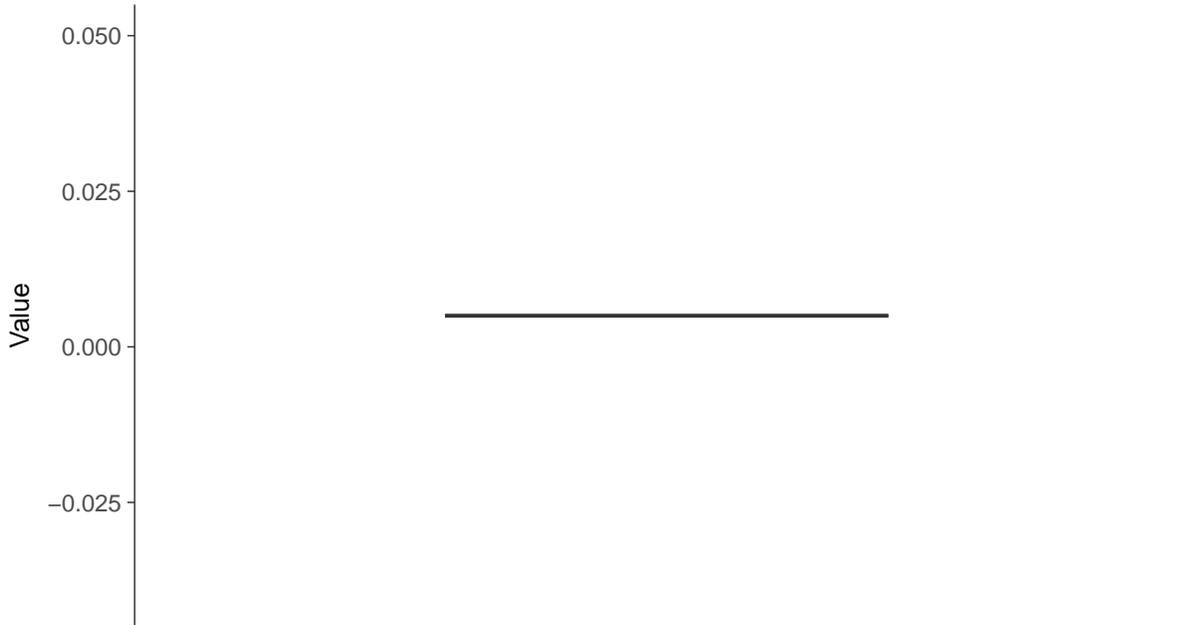
Selenium, MW-16C (mg/L)





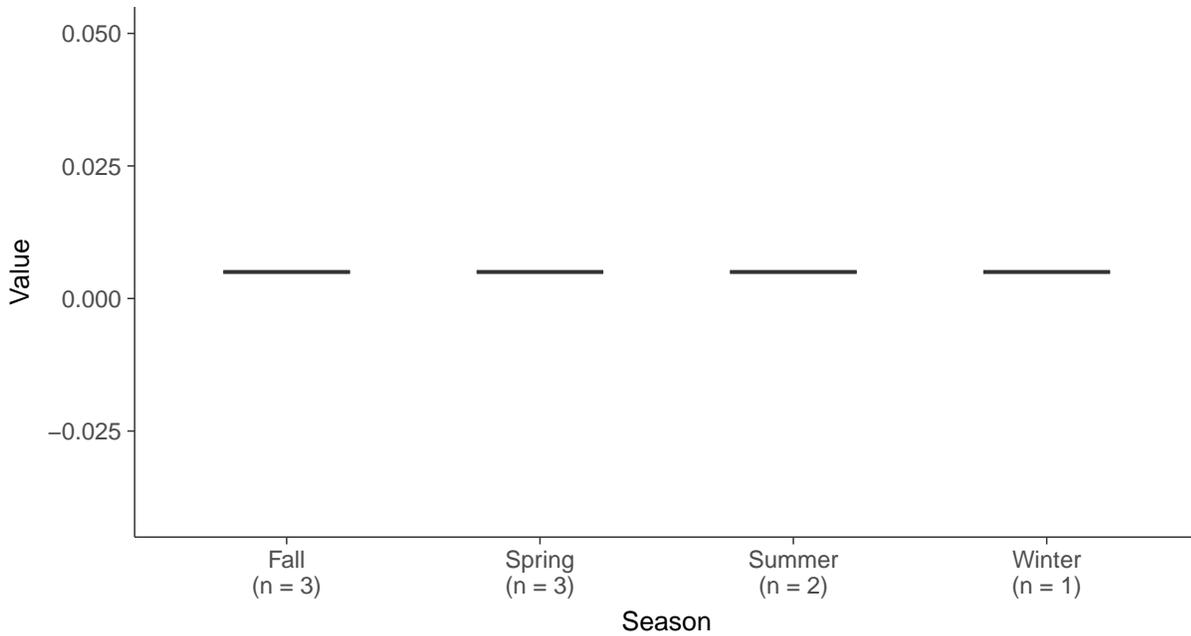
Boxplot

Selenium, MW-16C (mg/L)



Boxplot by Season

Selenium, MW-16C (mg/L)



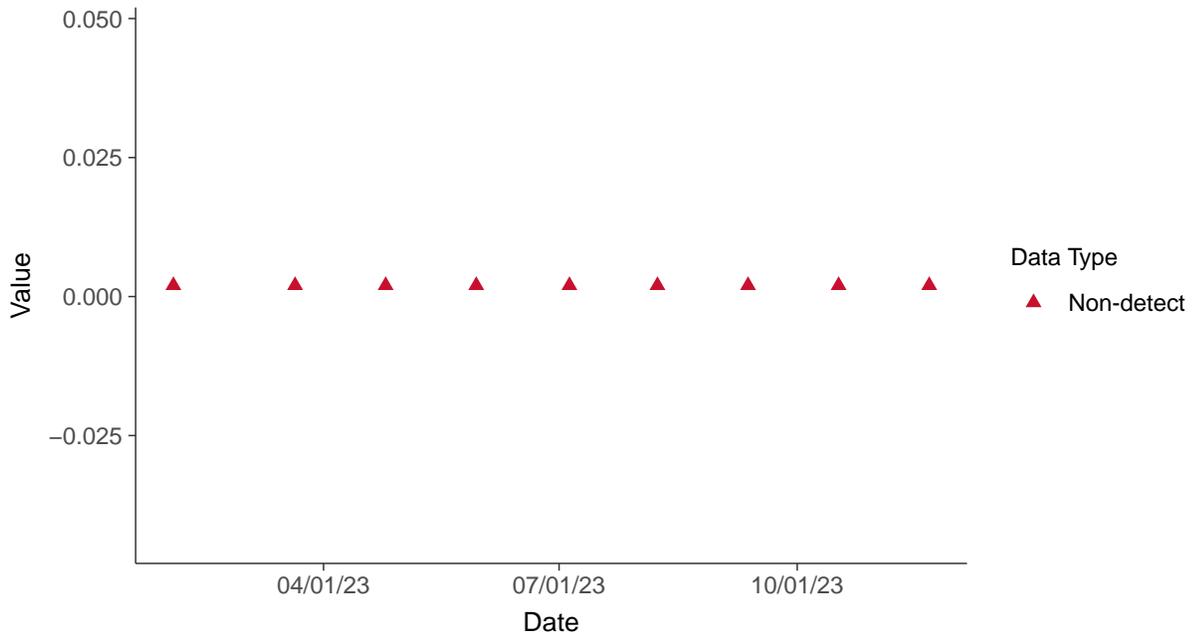


Appendix IV: Thallium, MW-16C

ID: 16C_2_23

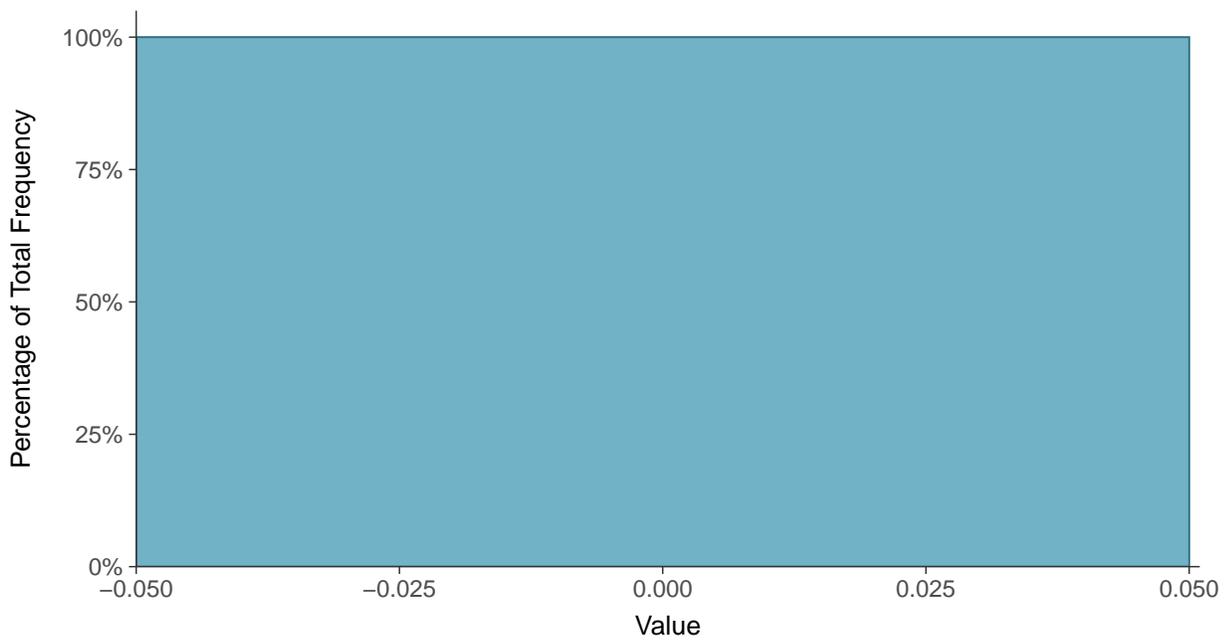
Scatter Plot

Thallium, MW-16C (mg/L)



Histogram

Thallium, MW-16C (mg/L)





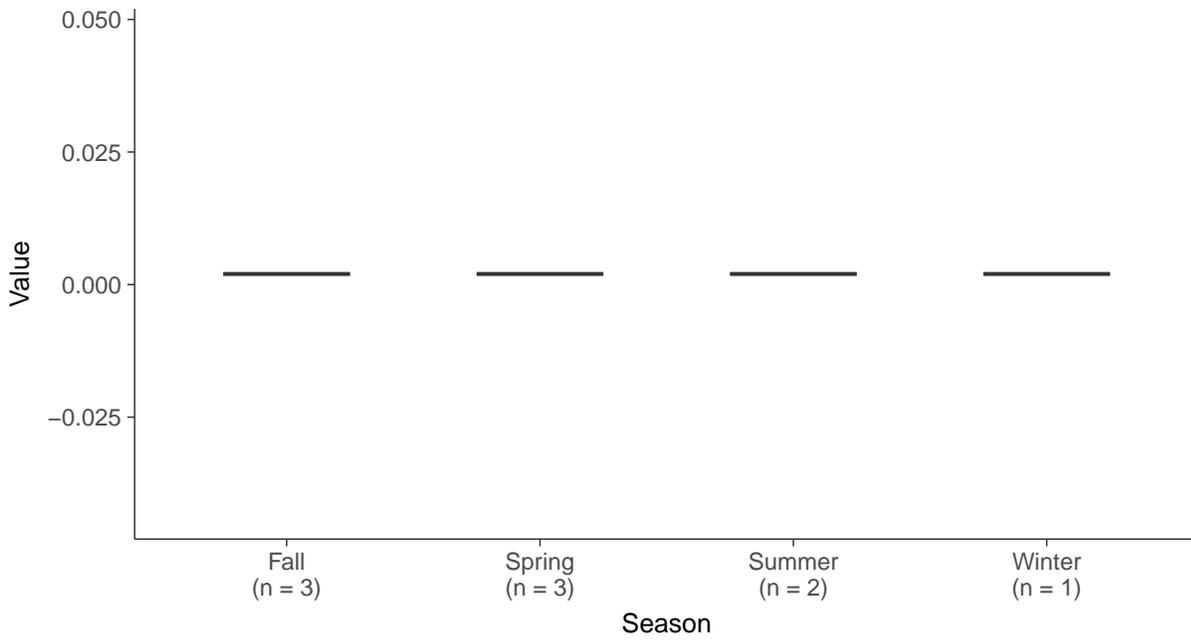
Boxplot

Thallium, MW-16C (mg/L)



Boxplot by Season

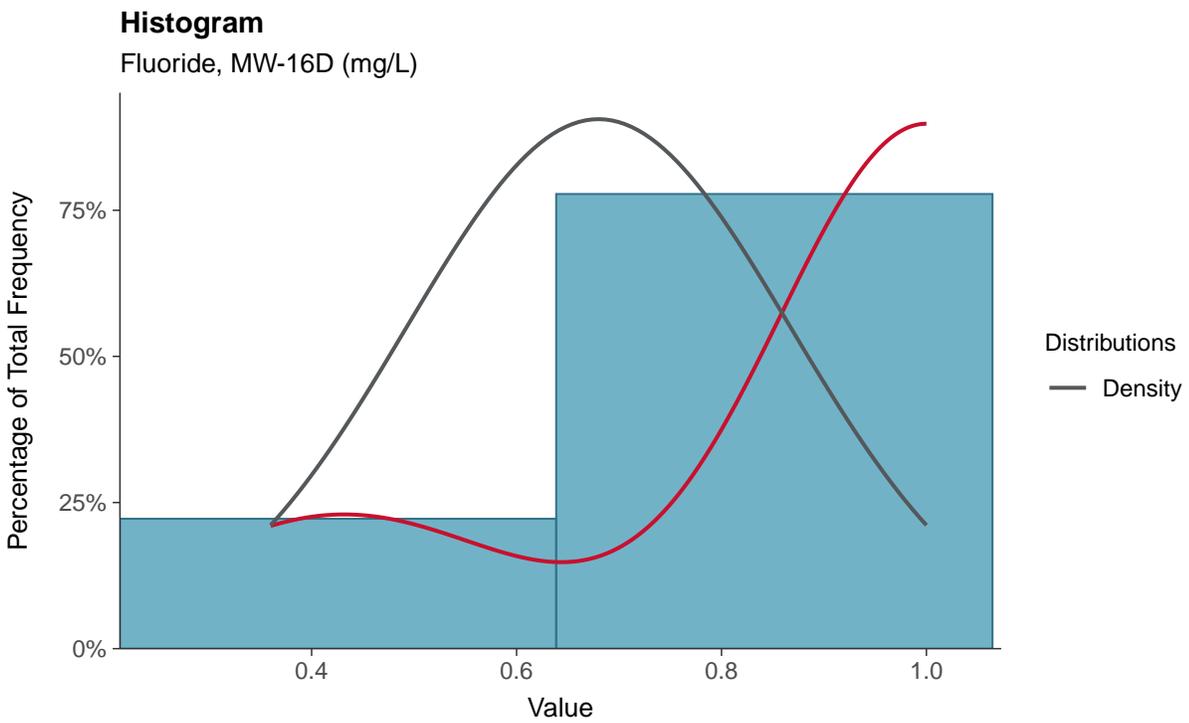
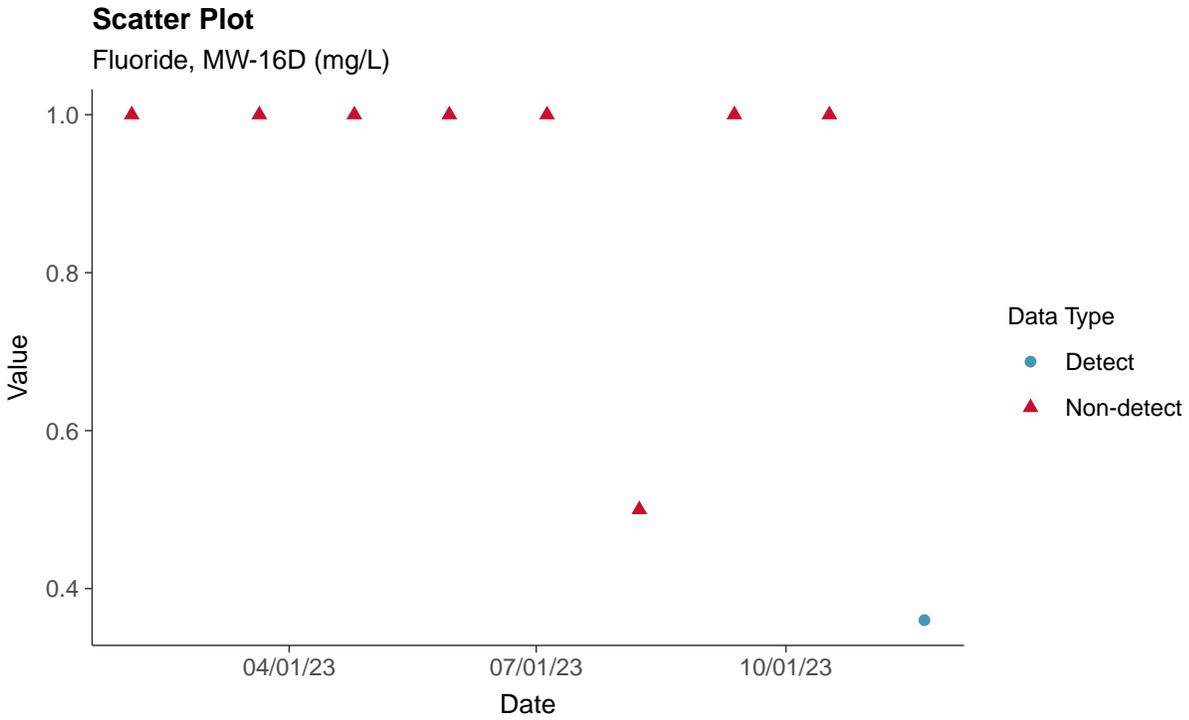
Thallium, MW-16C (mg/L)





Appendix IV: Fluoride, MW-16D

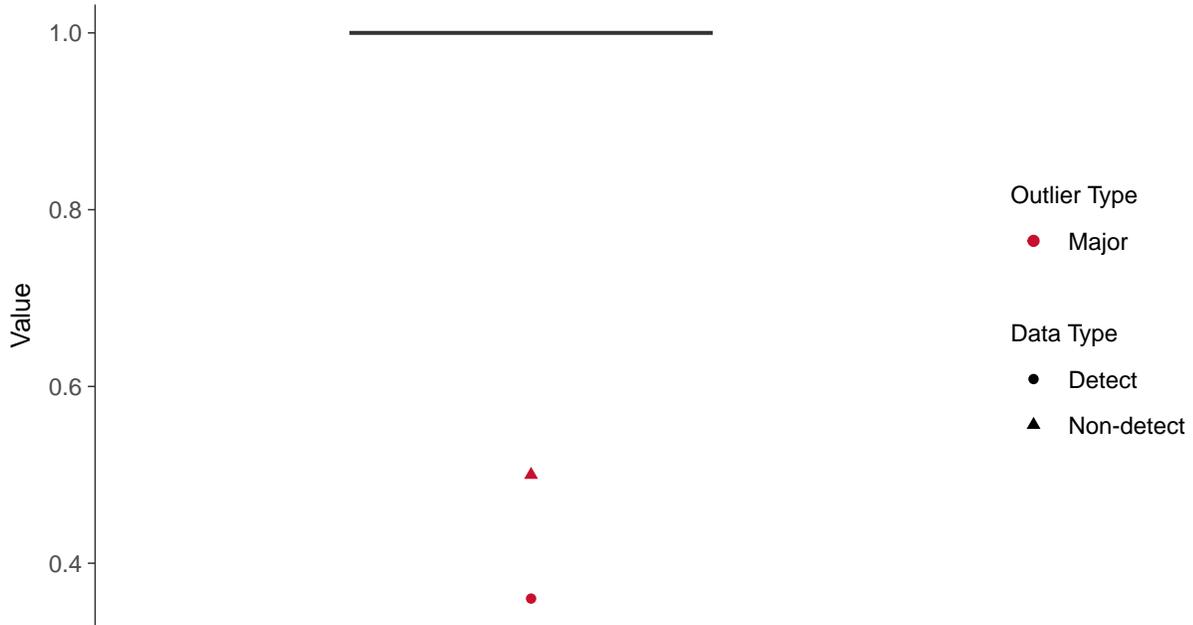
ID: 16D_2_04





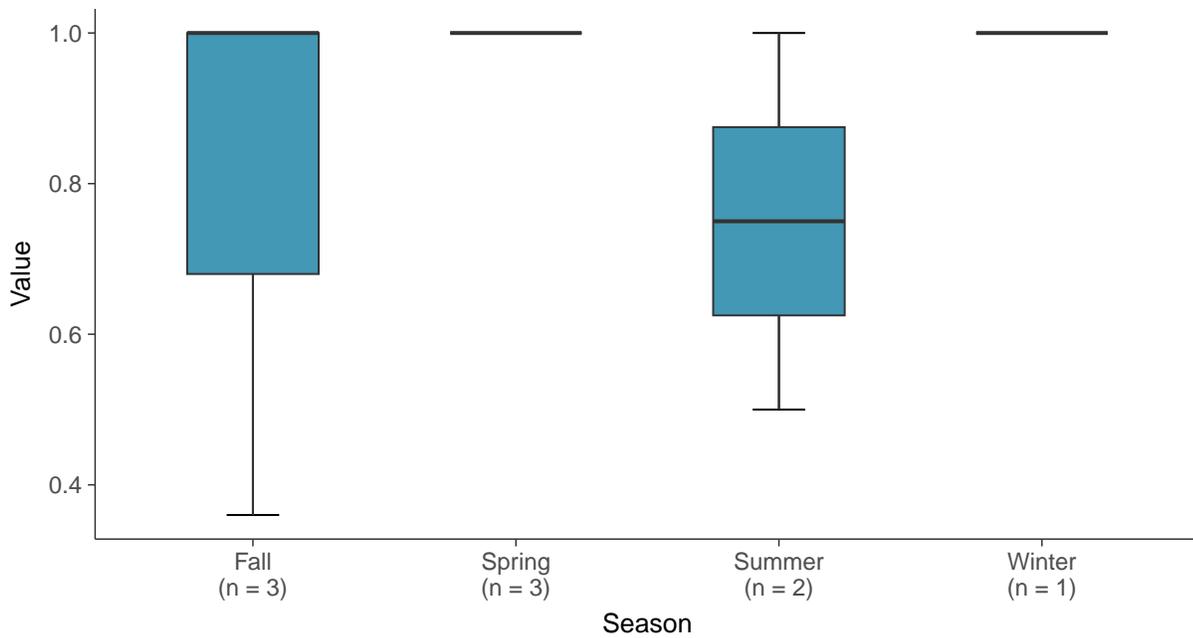
Boxplot

Fluoride, MW-16D (mg/L)



Boxplot by Season

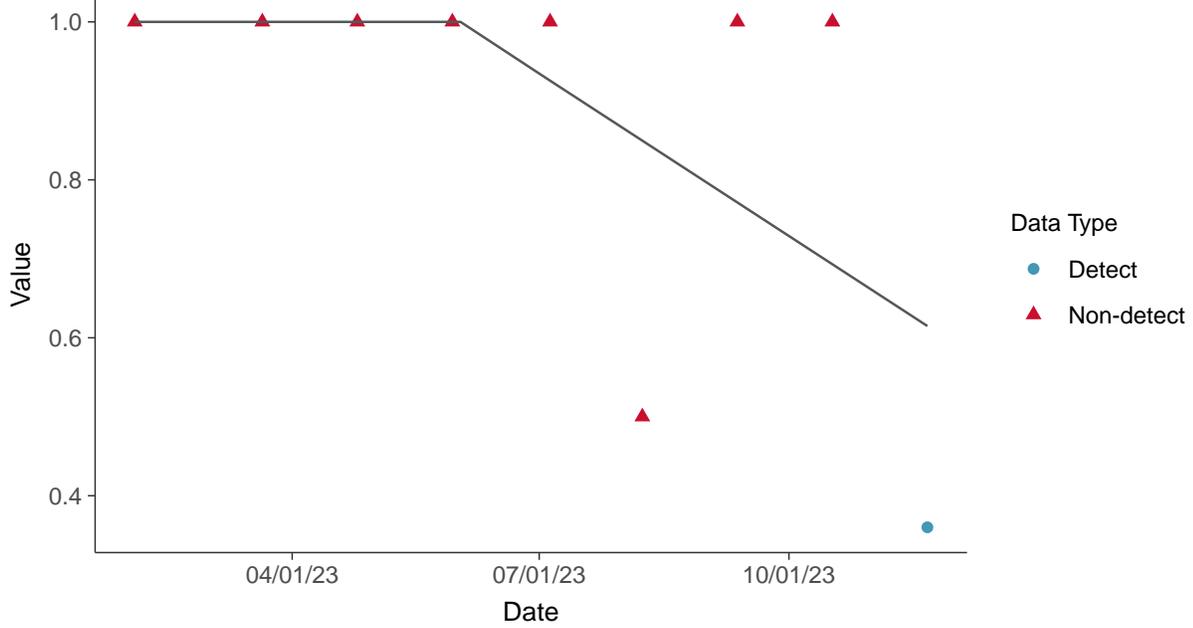
Fluoride, MW-16D (mg/L)





Trend Regression: Piecewise Linear-Linear

Fluoride, MW-16D (mg/L)



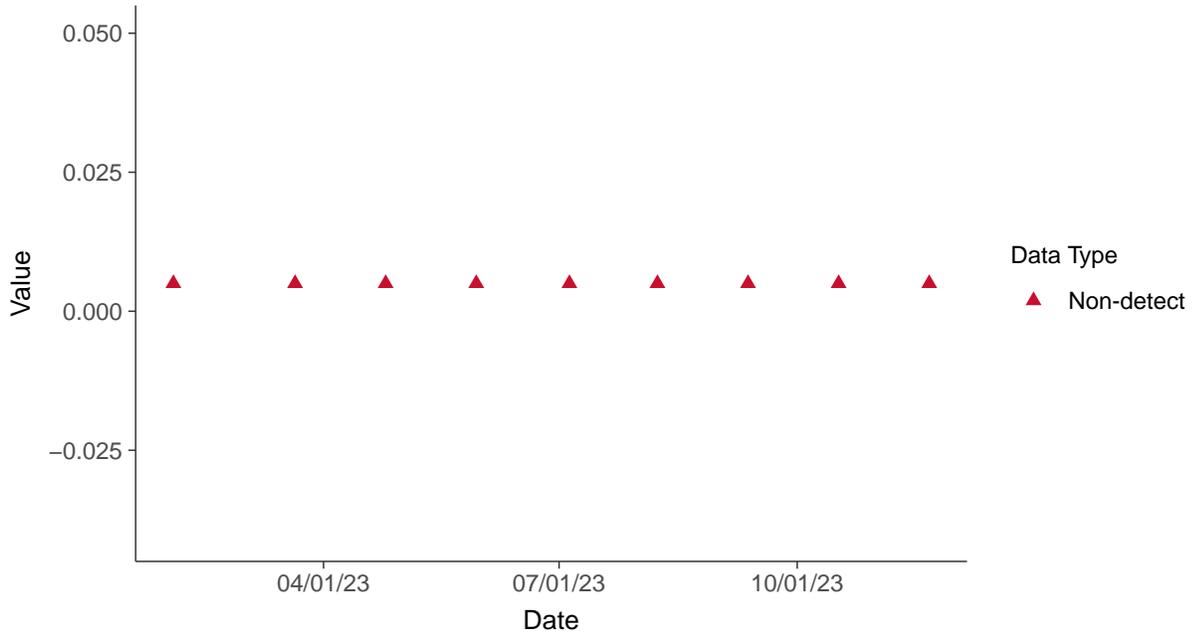


Appendix IV: Antimony, MW-16D

ID: 16D_2_08

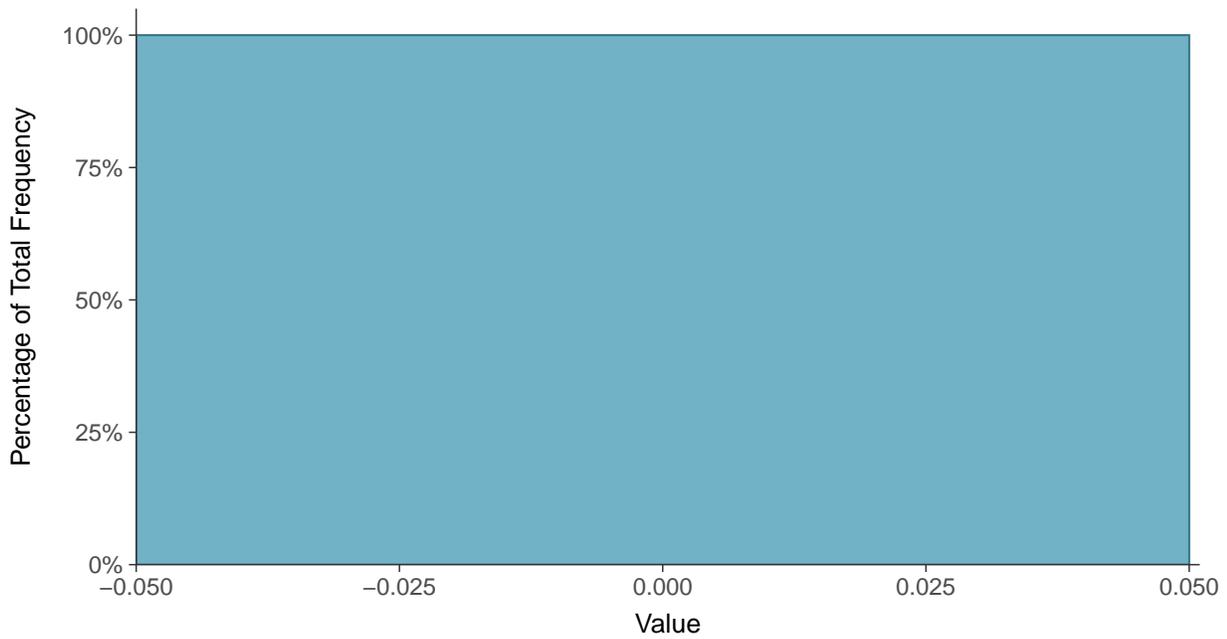
Scatter Plot

Antimony, MW-16D (mg/L)



Histogram

Antimony, MW-16D (mg/L)





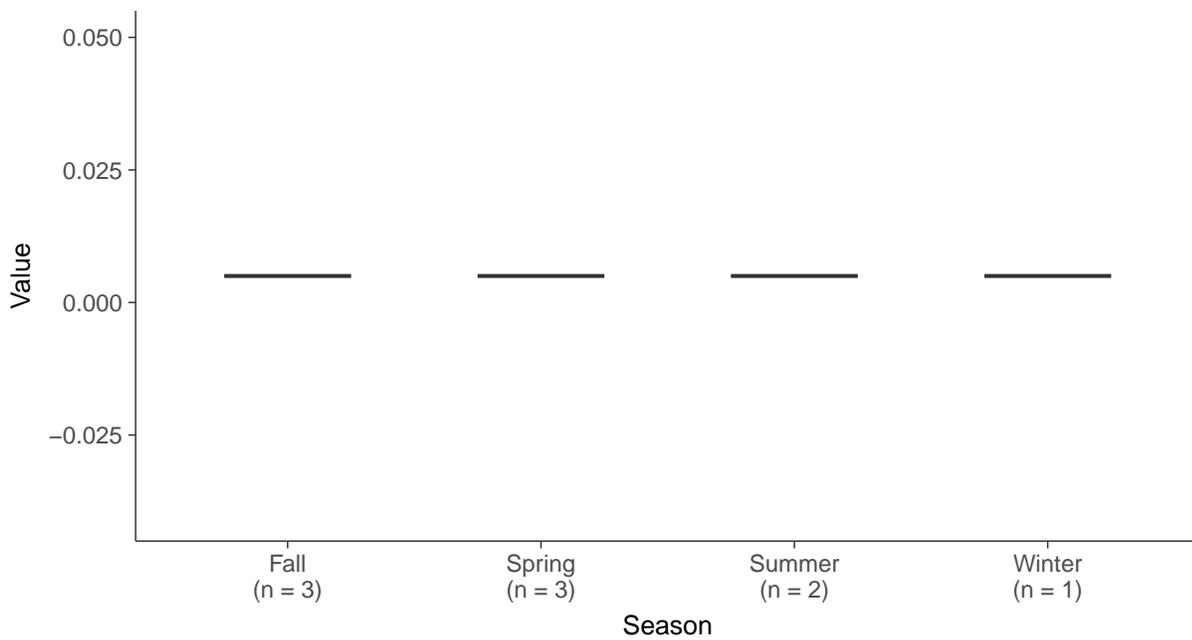
Boxplot

Antimony, MW-16D (mg/L)



Boxplot by Season

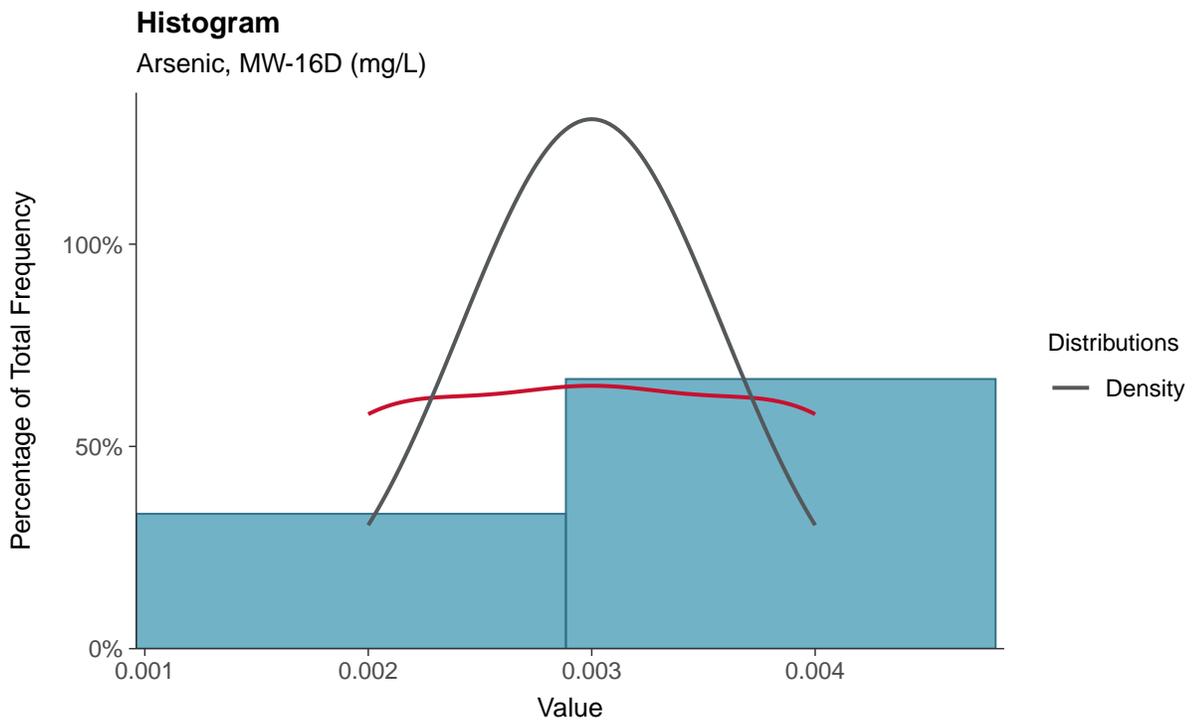
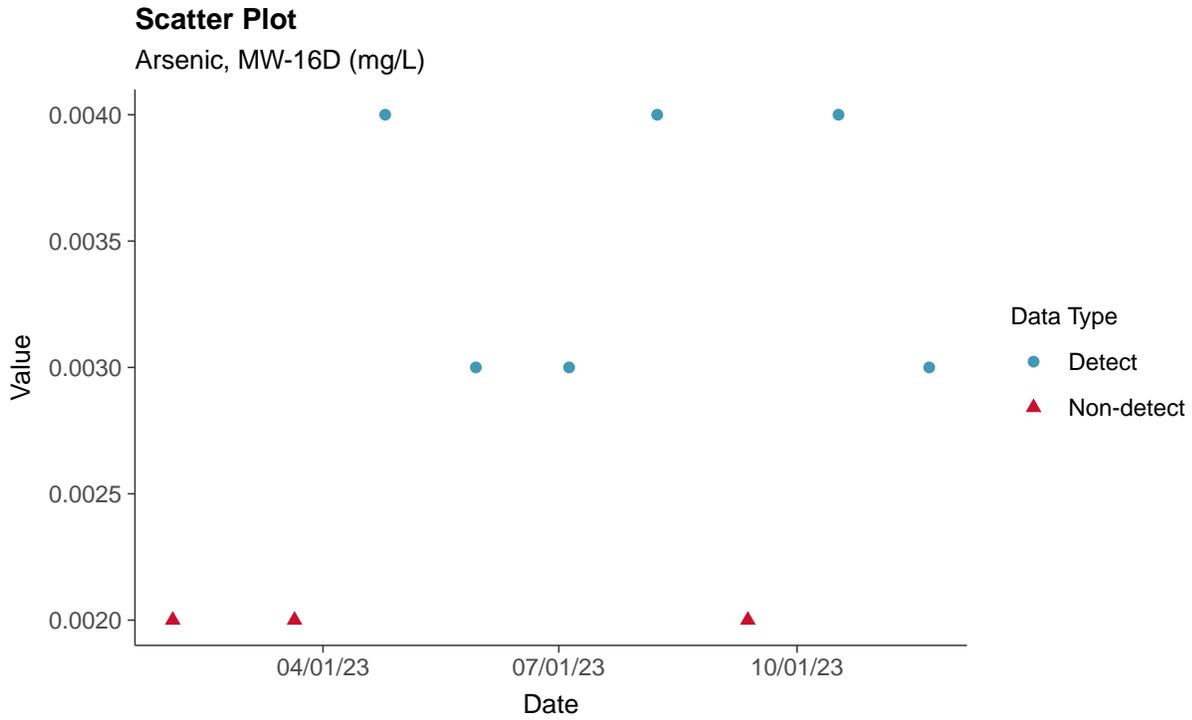
Antimony, MW-16D (mg/L)





Appendix IV: Arsenic, MW-16D

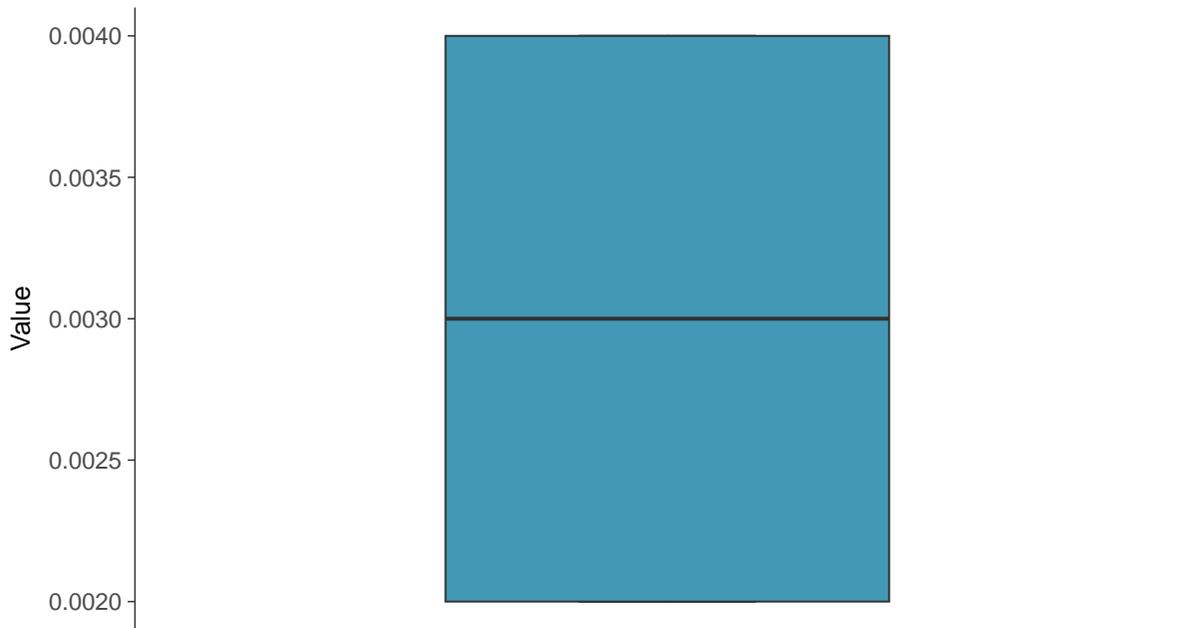
ID: 16D_2_09





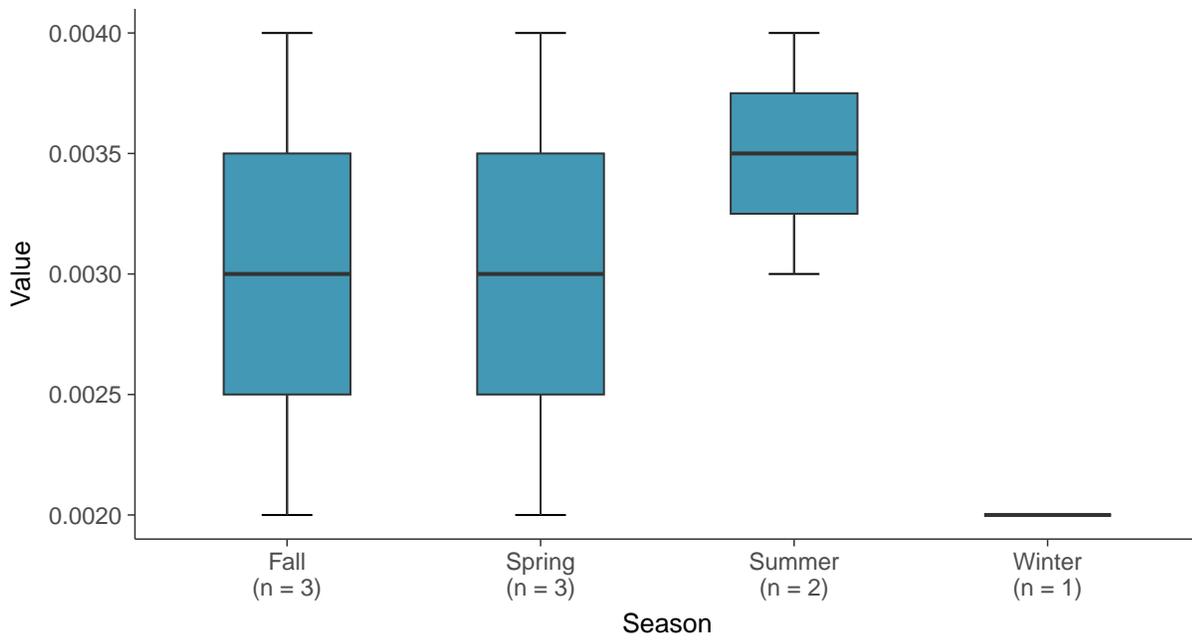
Boxplot

Arsenic, MW-16D (mg/L)



Boxplot by Season

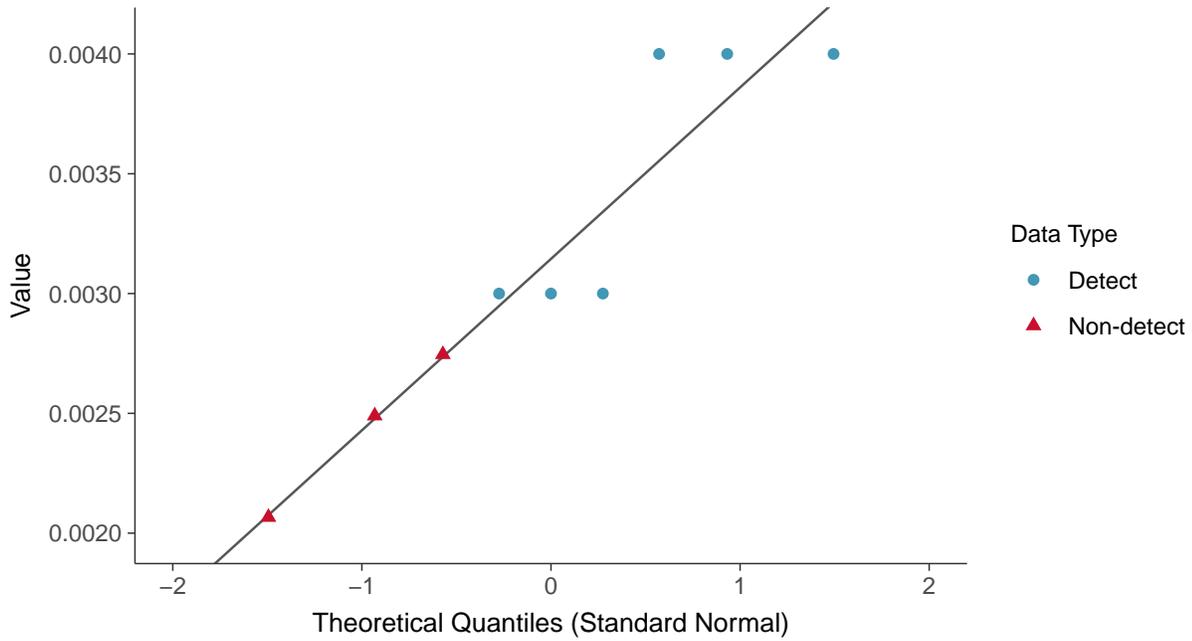
Arsenic, MW-16D (mg/L)





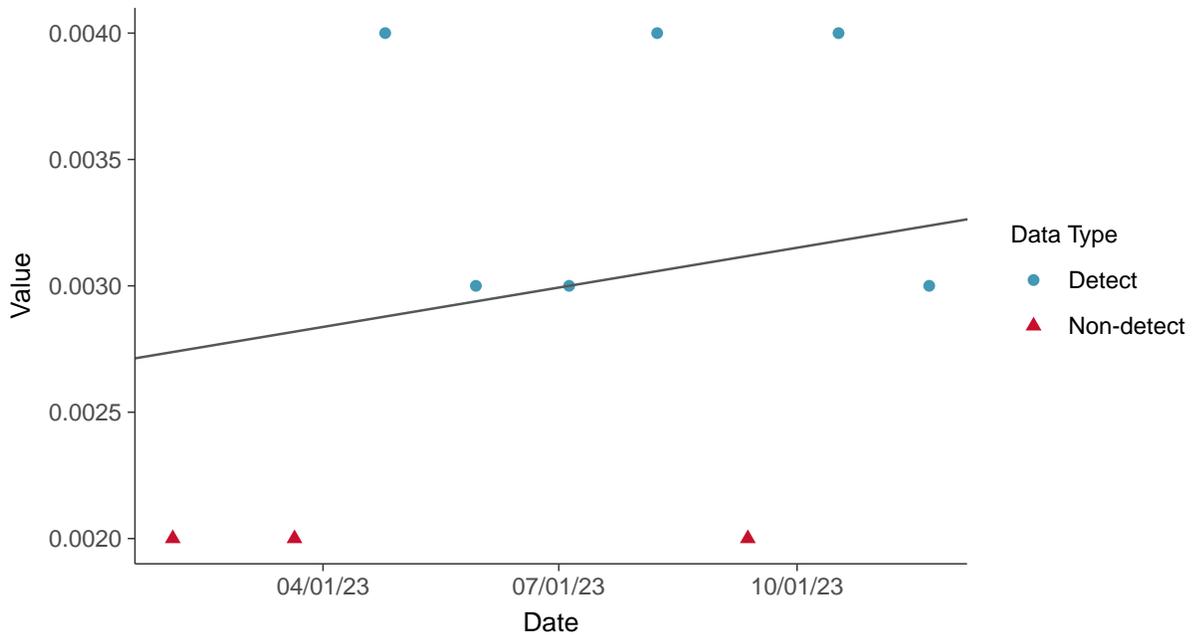
Normal Q-Q plot using ROS Imputed Estimates

Arsenic, MW-16D (mg/L)



Trend Regression: Mann-Kendall/Theil-Sen Estimate

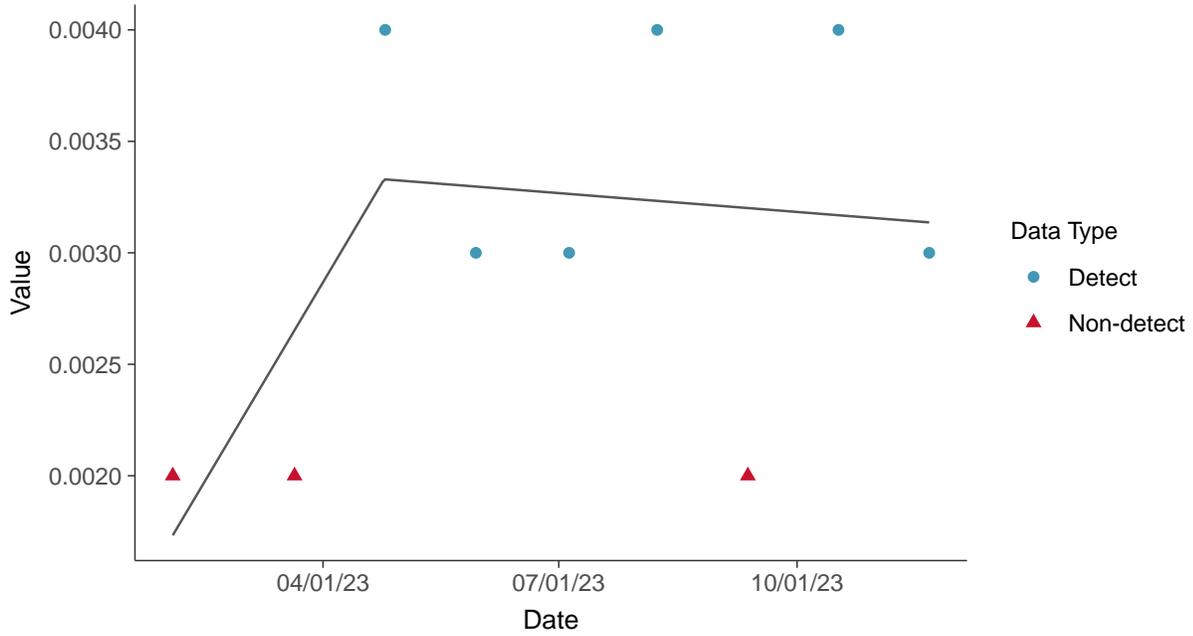
Arsenic, MW-16D (mg/L)





Trend Regression: Piecewise Linear-Linear

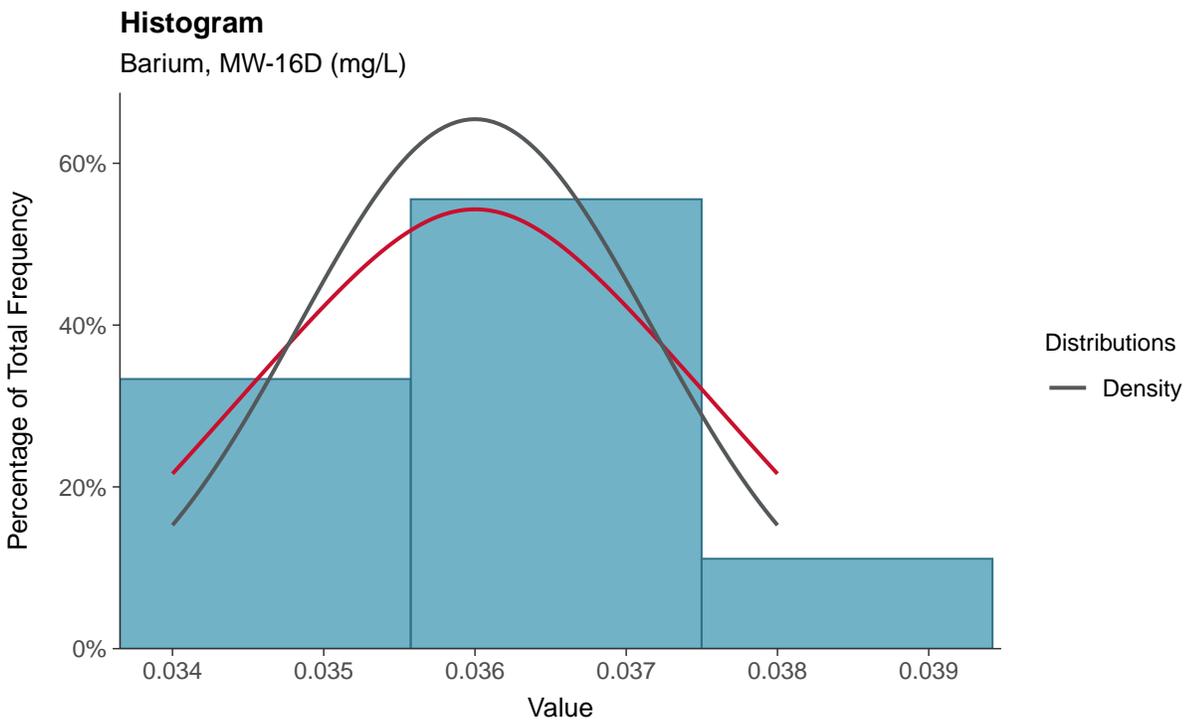
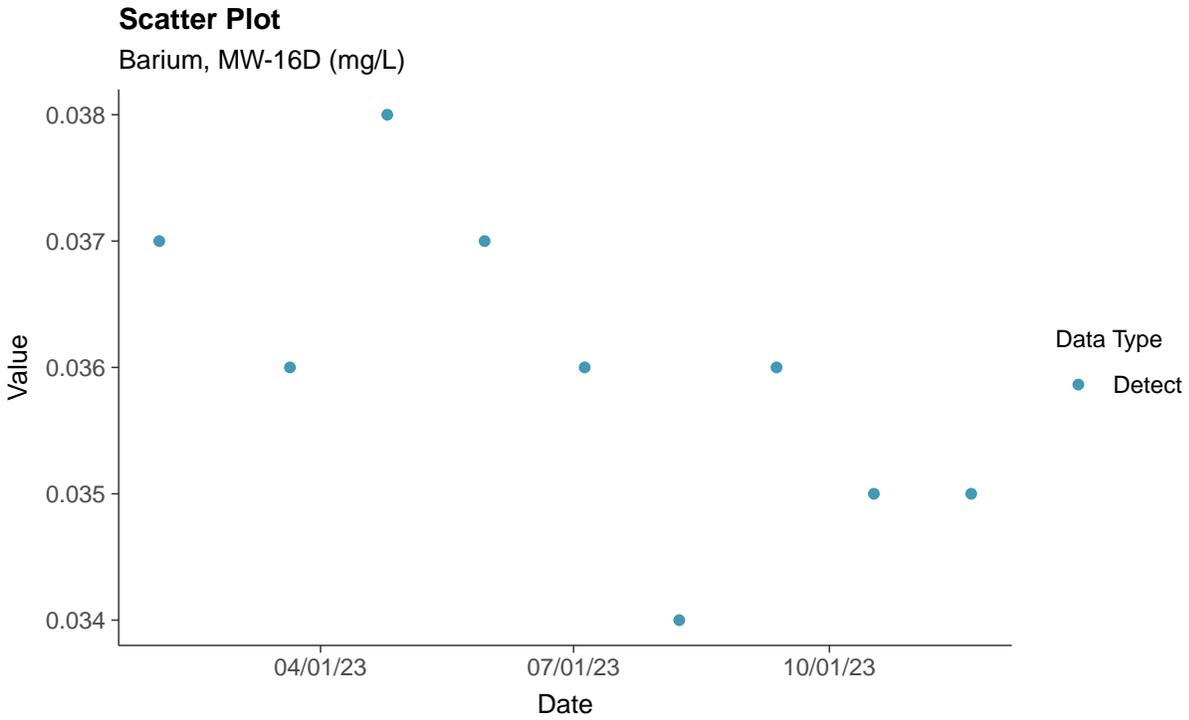
Arsenic, MW-16D (mg/L)





Appendix IV: Barium, MW-16D

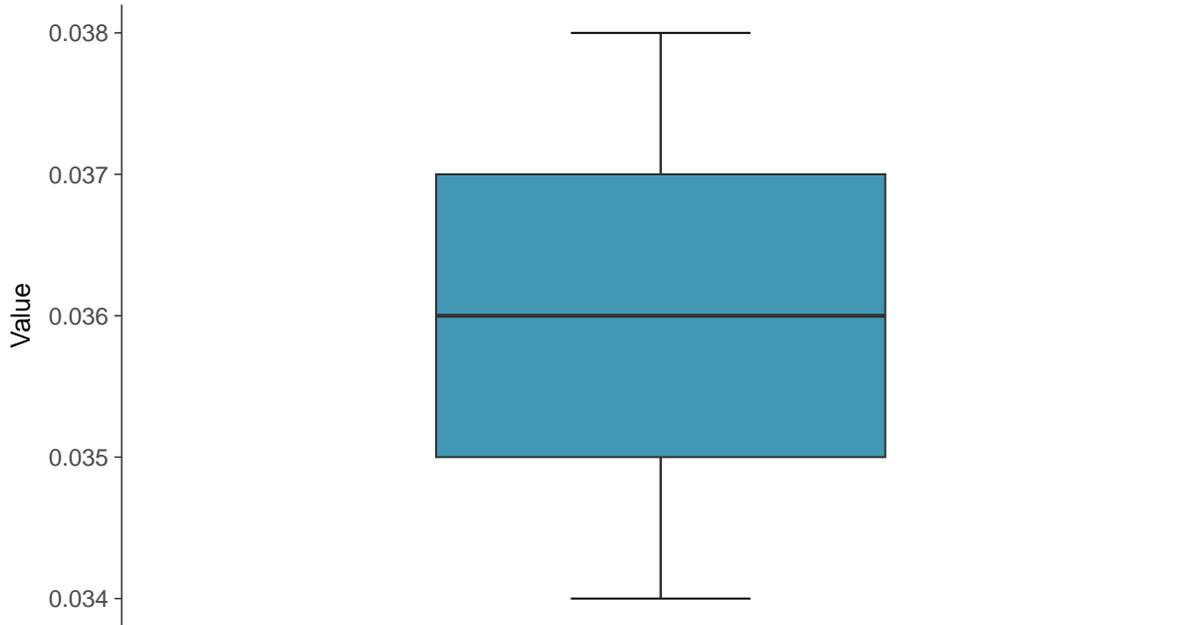
ID: 16D_2_10





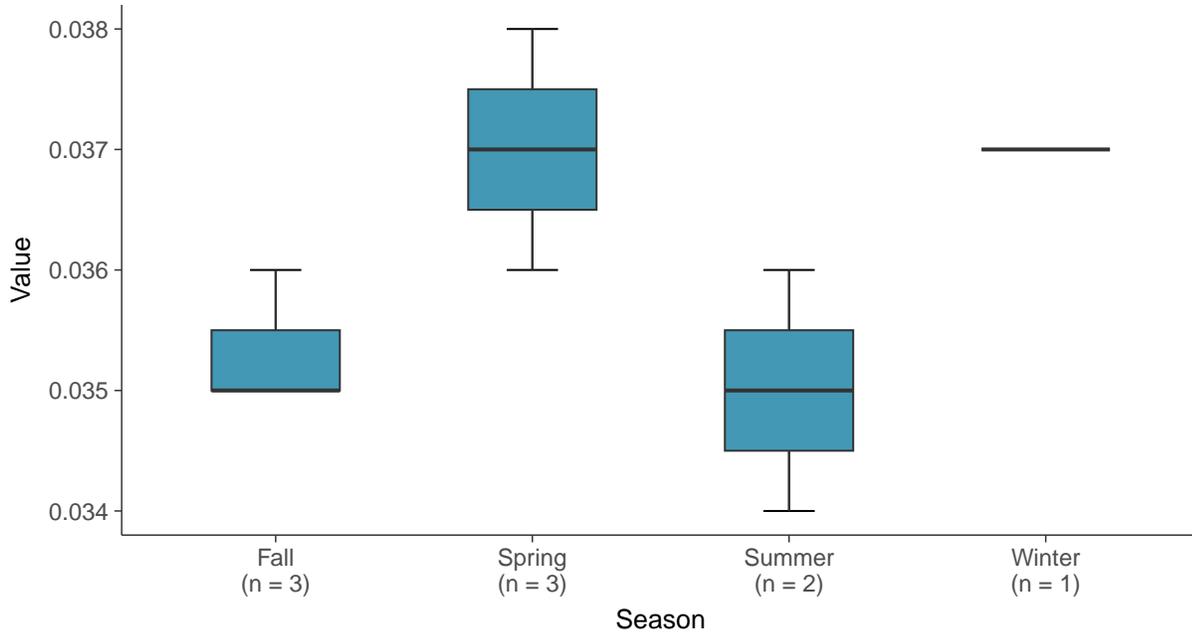
Boxplot

Barium, MW-16D (mg/L)



Boxplot by Season

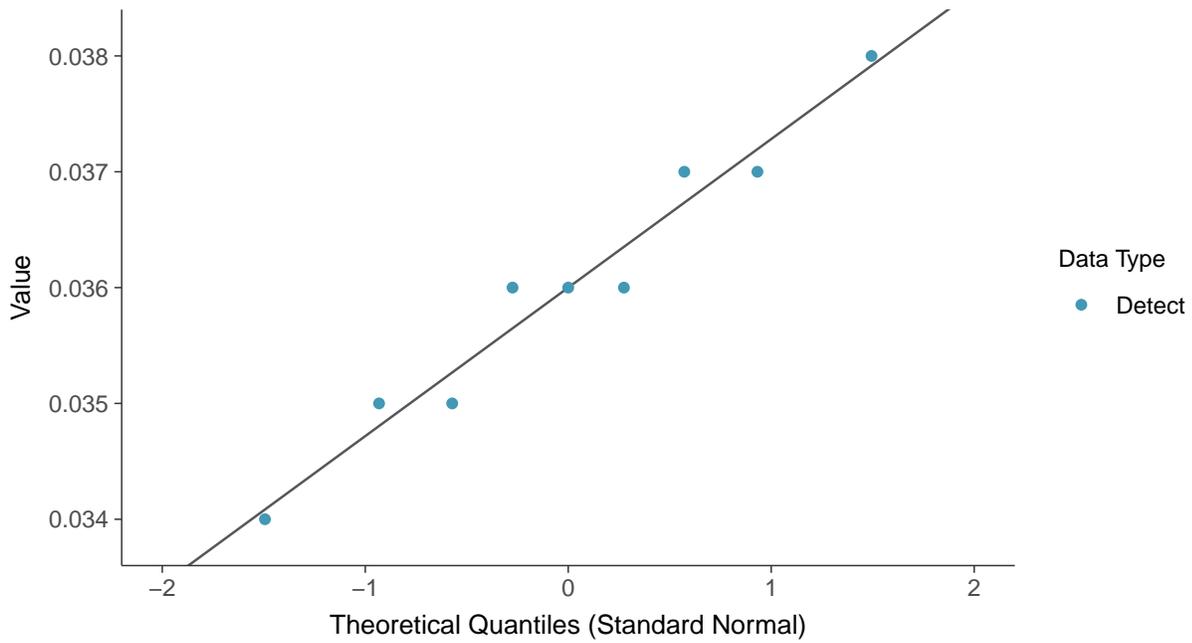
Barium, MW-16D (mg/L)





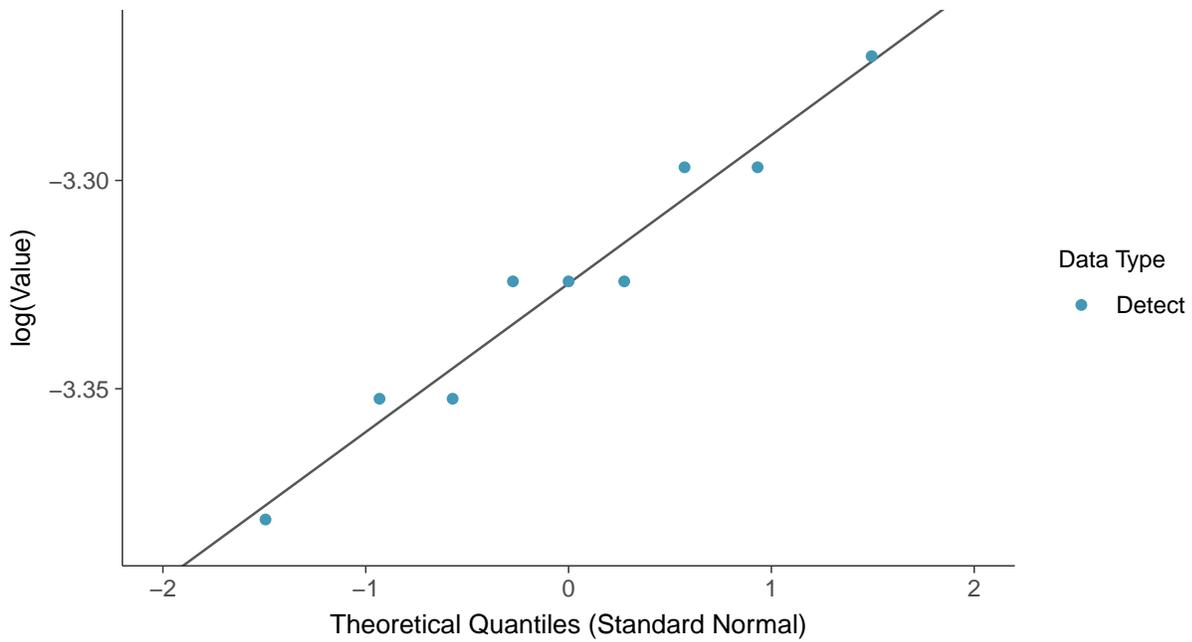
Normal Q-Q plot

Barium, MW-16D (mg/L)



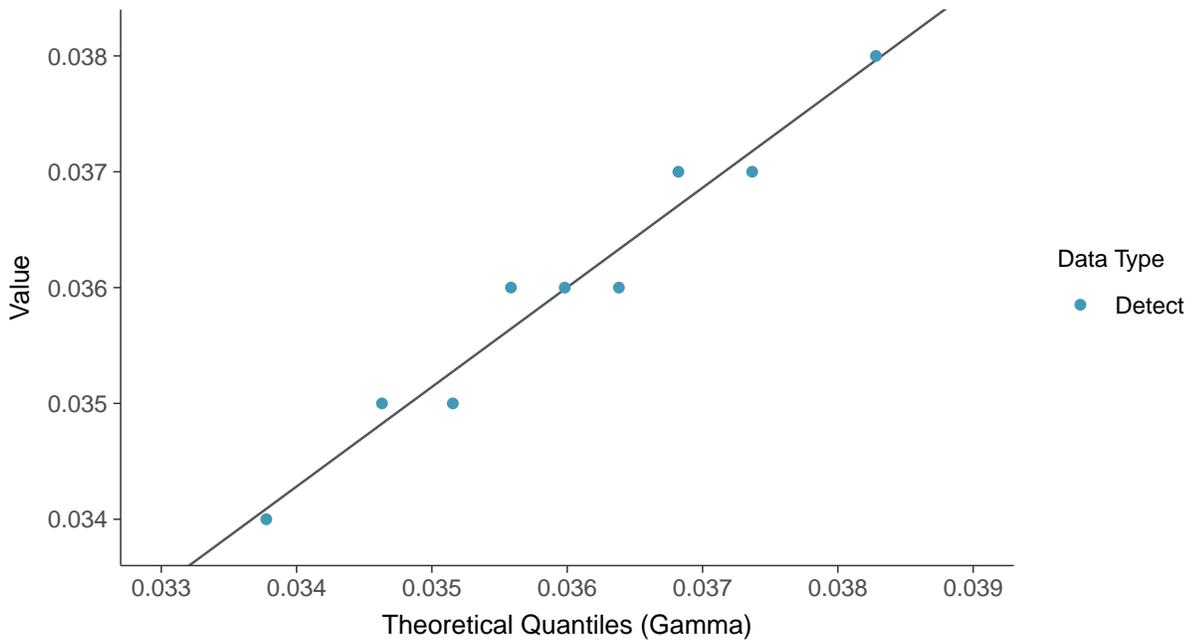
Lognormal Q-Q plot

Barium, MW-16D (mg/L)

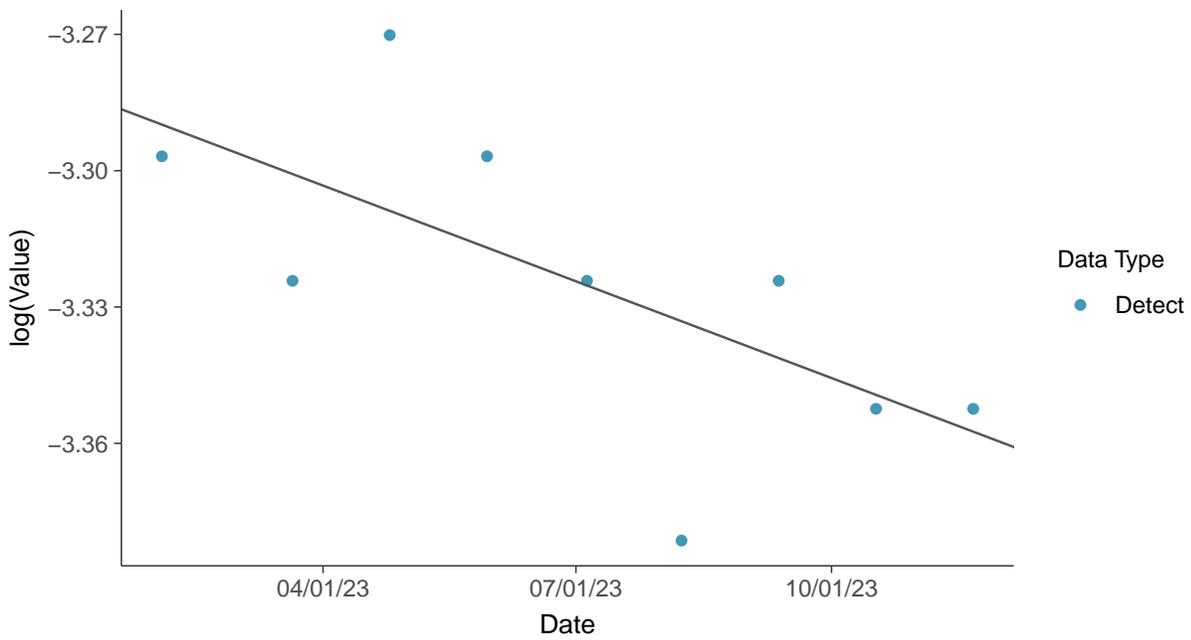




Gamma Q-Q plot
Barium, MW-16D (mg/L)



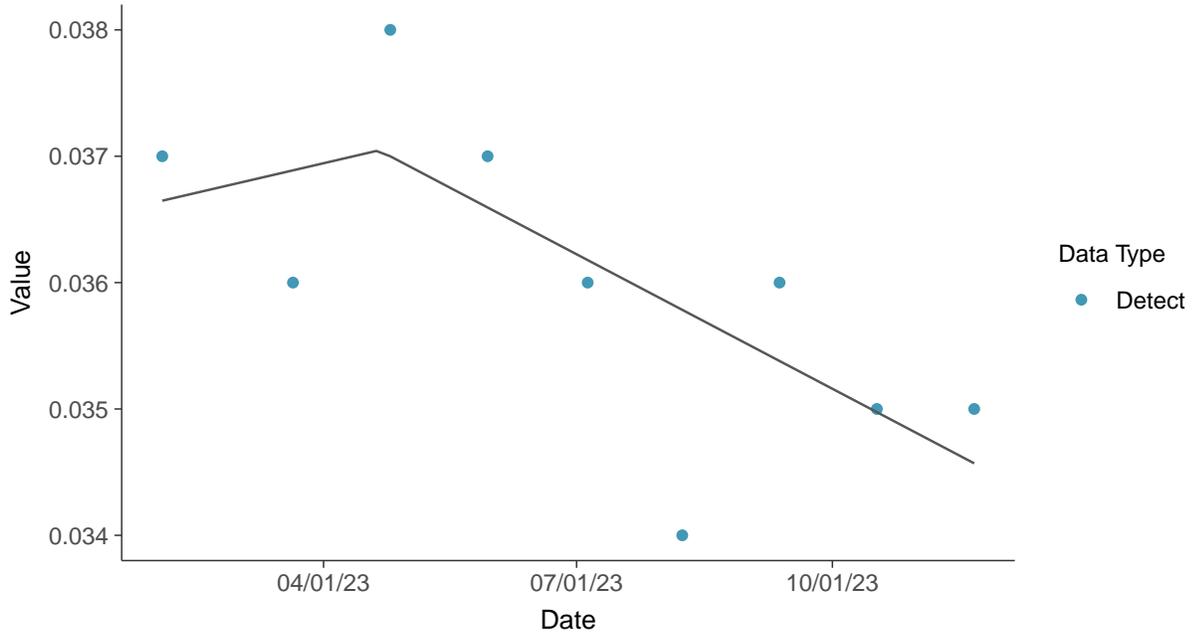
Trend Regression: Lognormal MLE
Barium, MW-16D (mg/L)





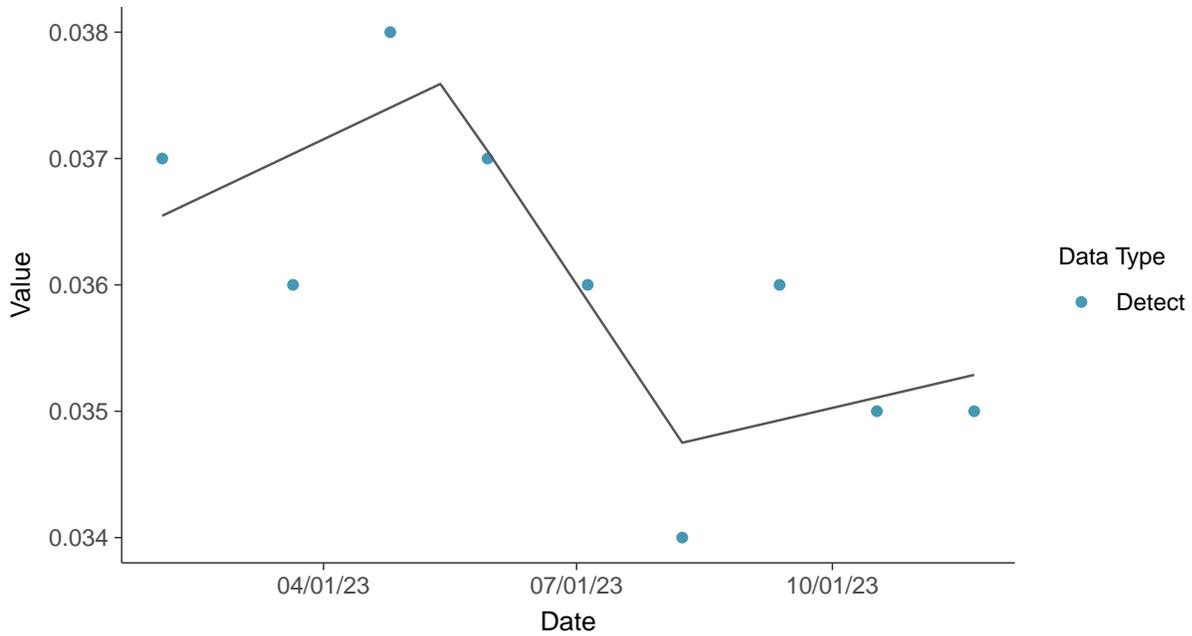
Trend Regression: Piecewise Linear-Linear

Barium, MW-16D (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

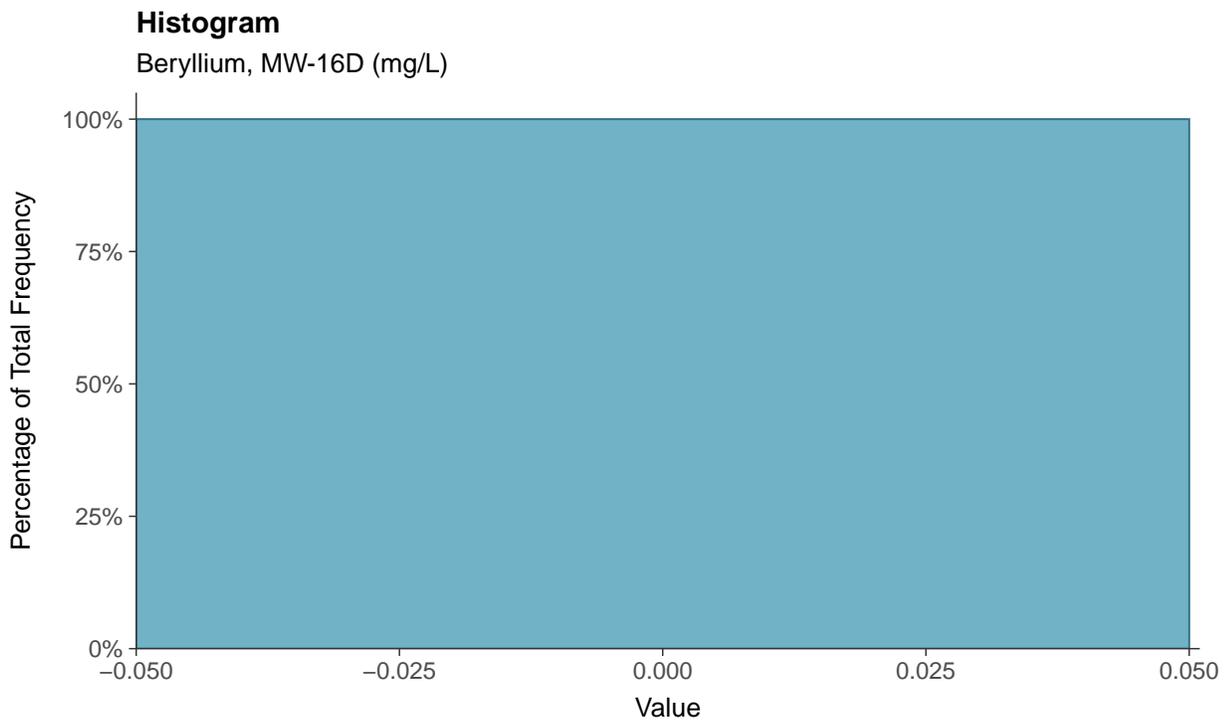
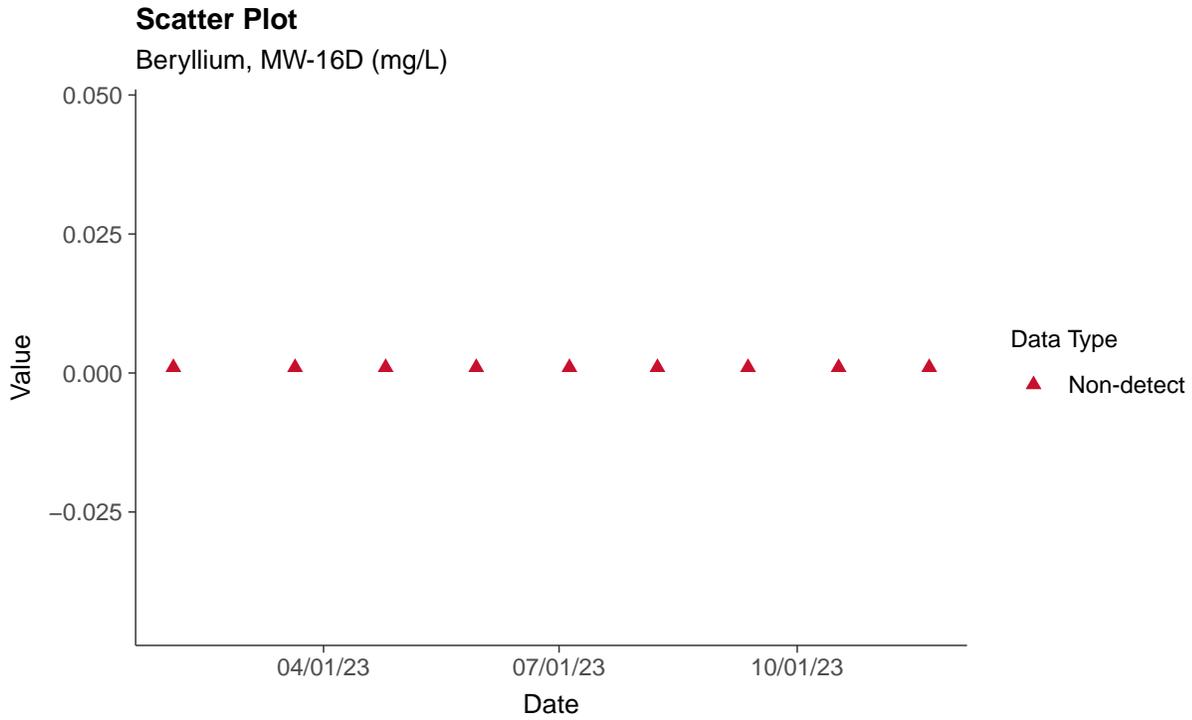
Barium, MW-16D (mg/L)





Appendix IV: Beryllium, MW-16D

ID: 16D_2_11





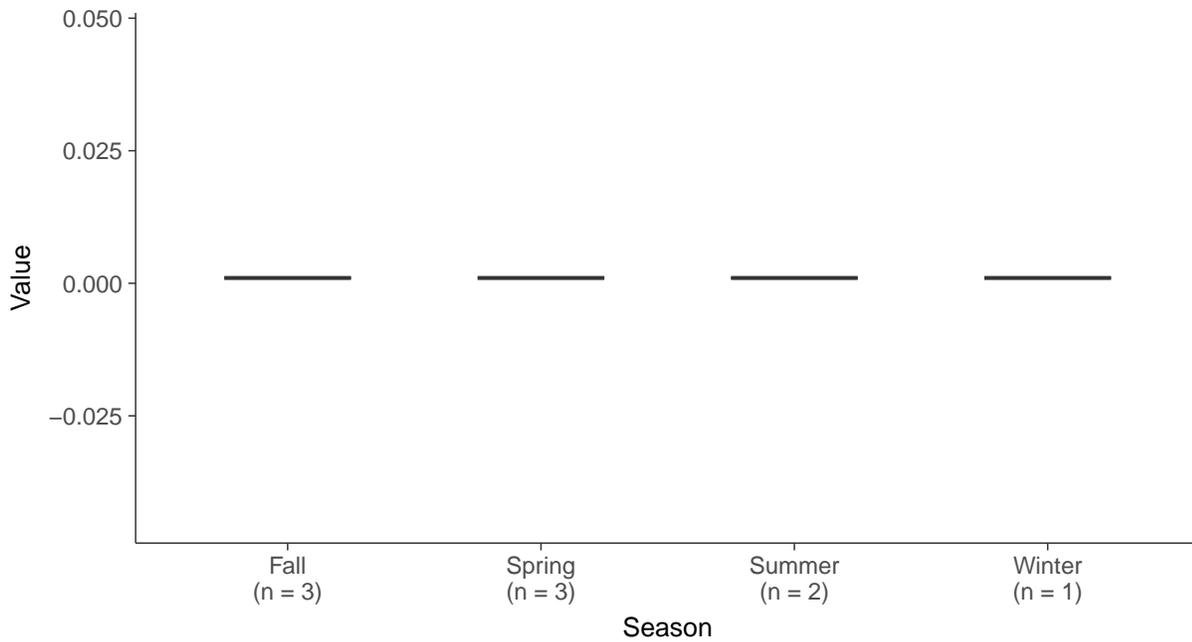
Boxplot

Beryllium, MW-16D (mg/L)



Boxplot by Season

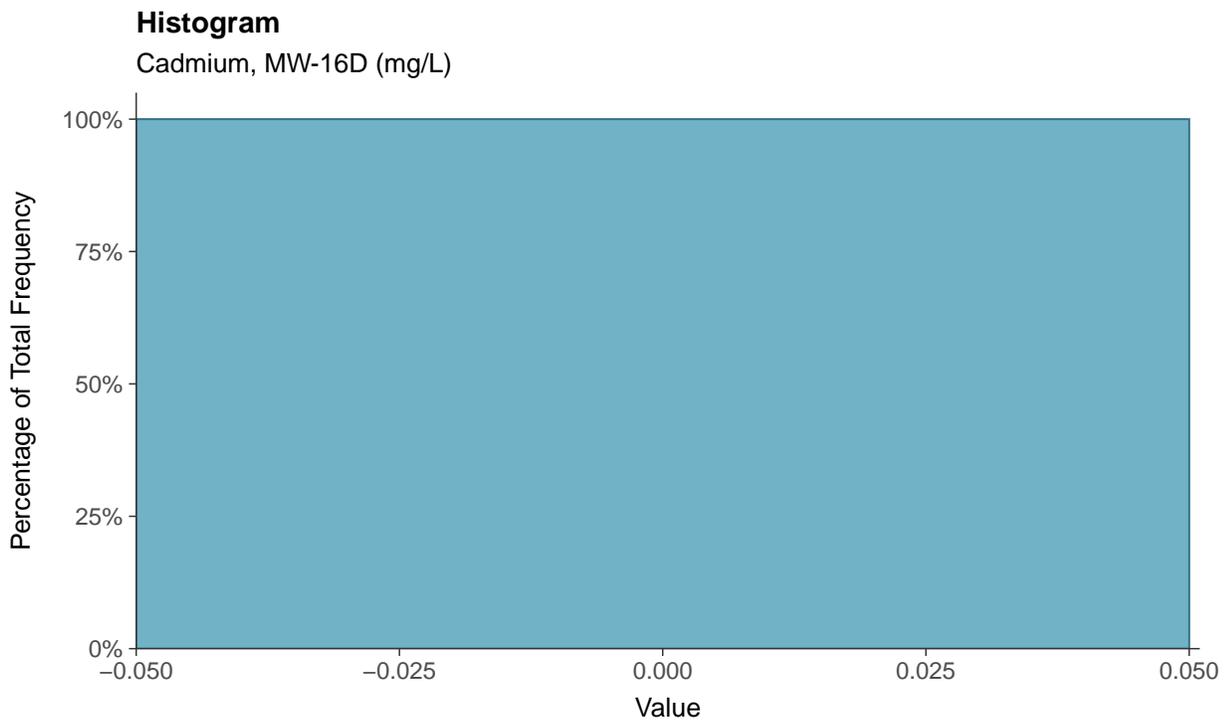
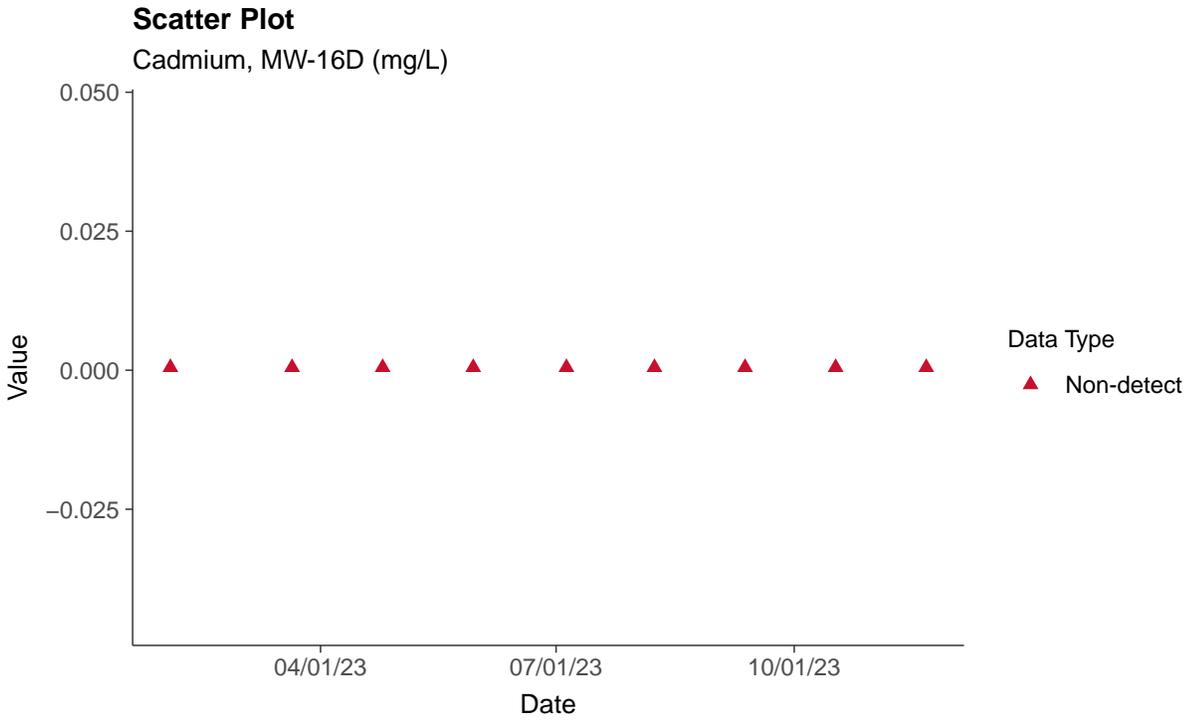
Beryllium, MW-16D (mg/L)





Appendix IV: Cadmium, MW-16D

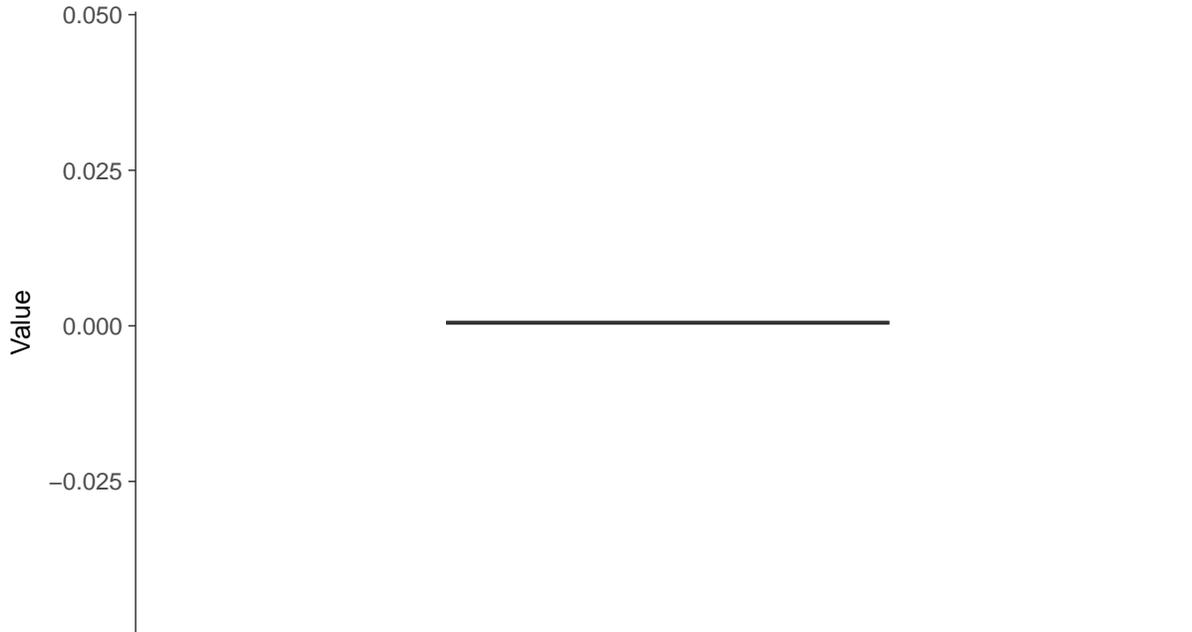
ID: 16D_2_12





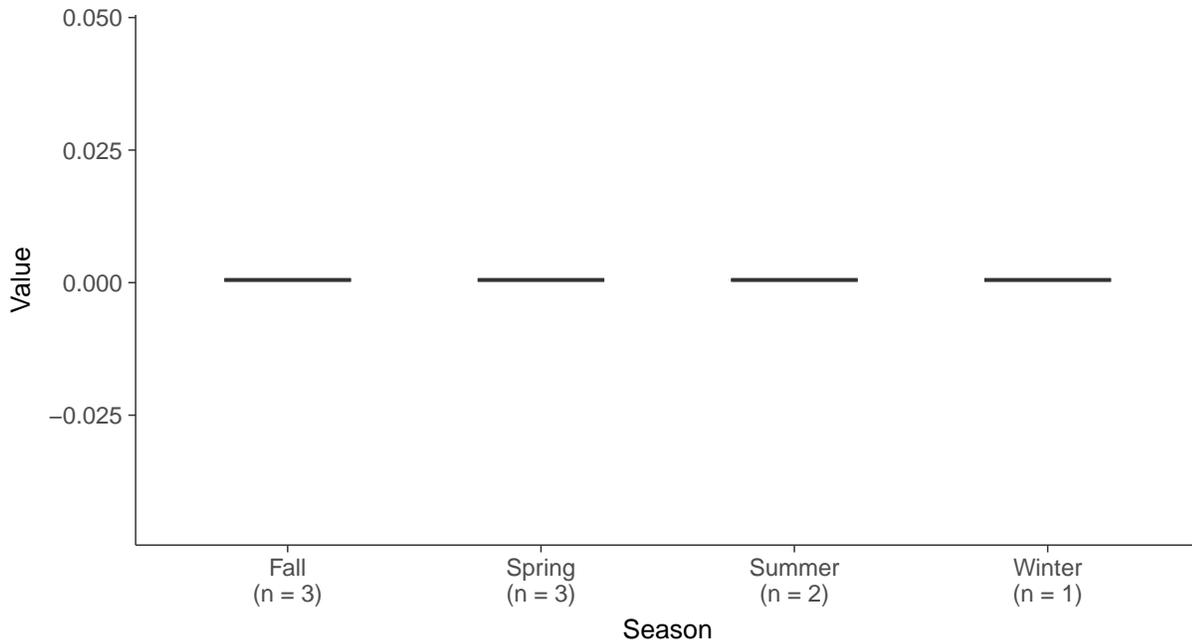
Boxplot

Cadmium, MW-16D (mg/L)



Boxplot by Season

Cadmium, MW-16D (mg/L)



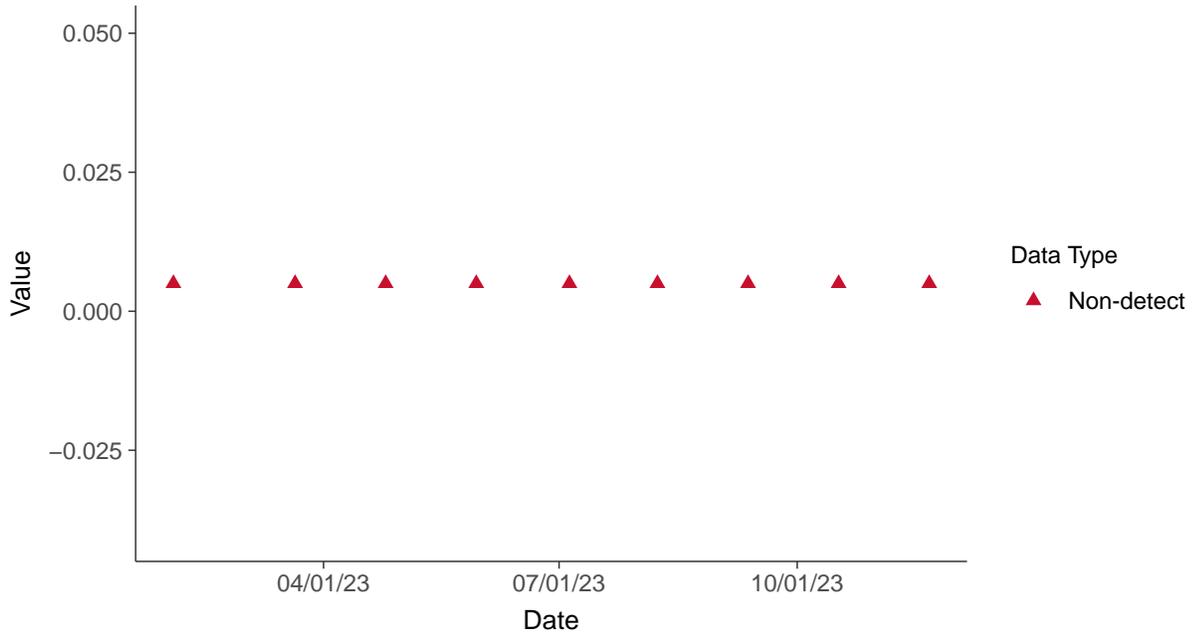


Appendix IV: Chromium, MW-16D

ID: 16D_2_13

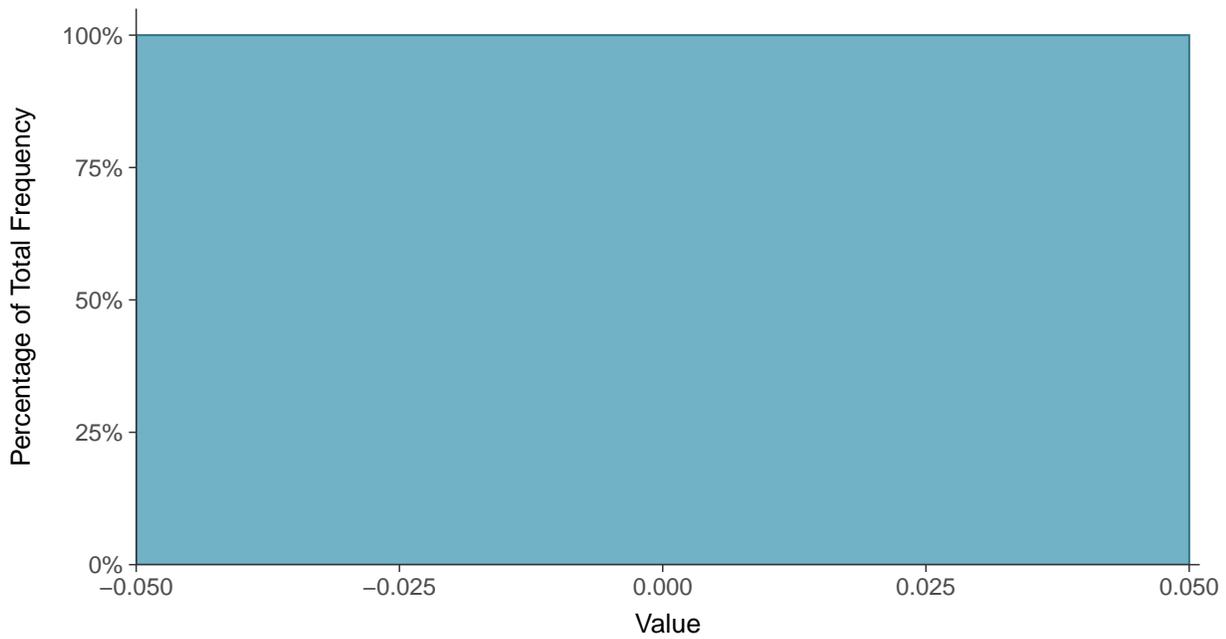
Scatter Plot

Chromium, MW-16D (mg/L)



Histogram

Chromium, MW-16D (mg/L)





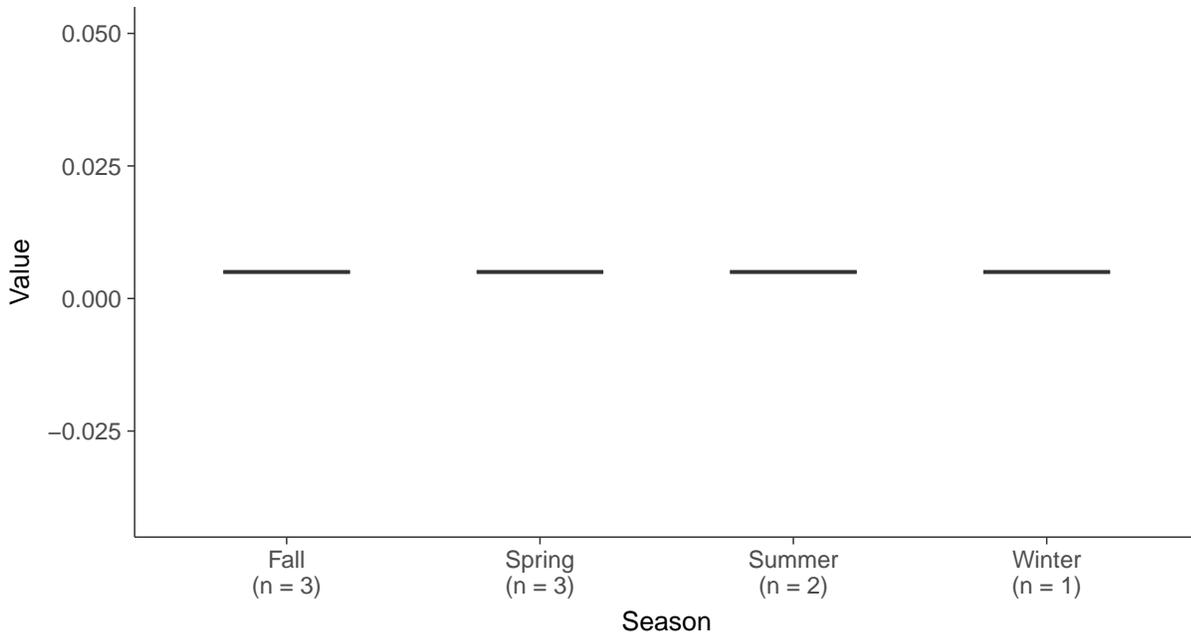
Boxplot

Chromium, MW-16D (mg/L)



Boxplot by Season

Chromium, MW-16D (mg/L)



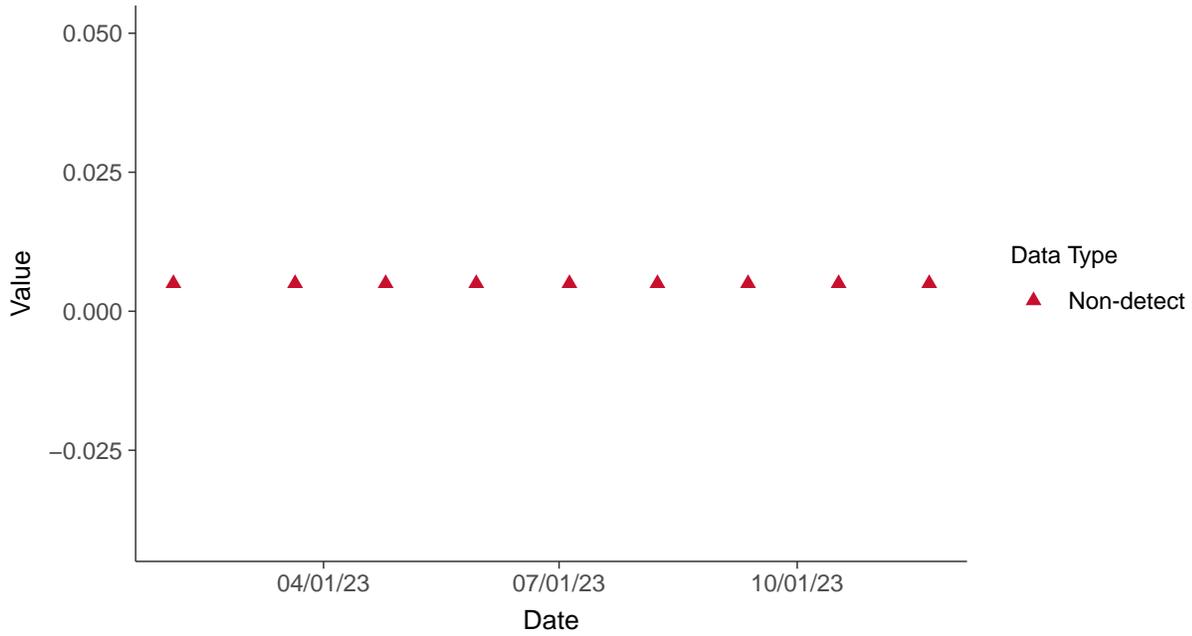


Appendix IV: Cobalt, MW-16D

ID: 16D_2_14

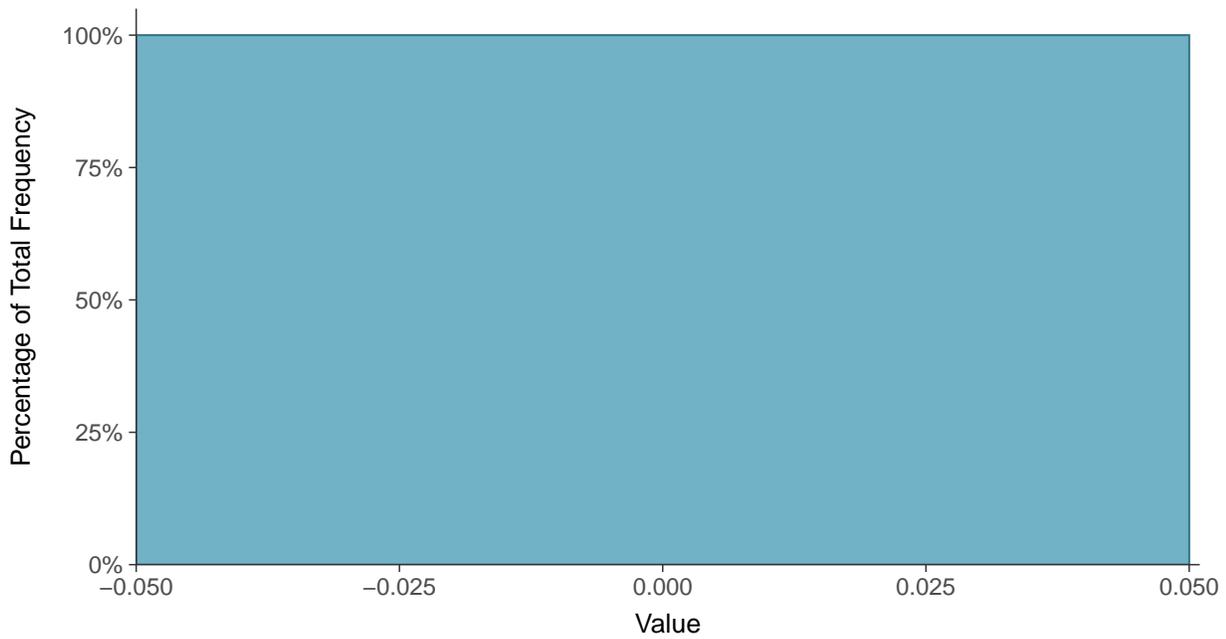
Scatter Plot

Cobalt, MW-16D (mg/L)



Histogram

Cobalt, MW-16D (mg/L)





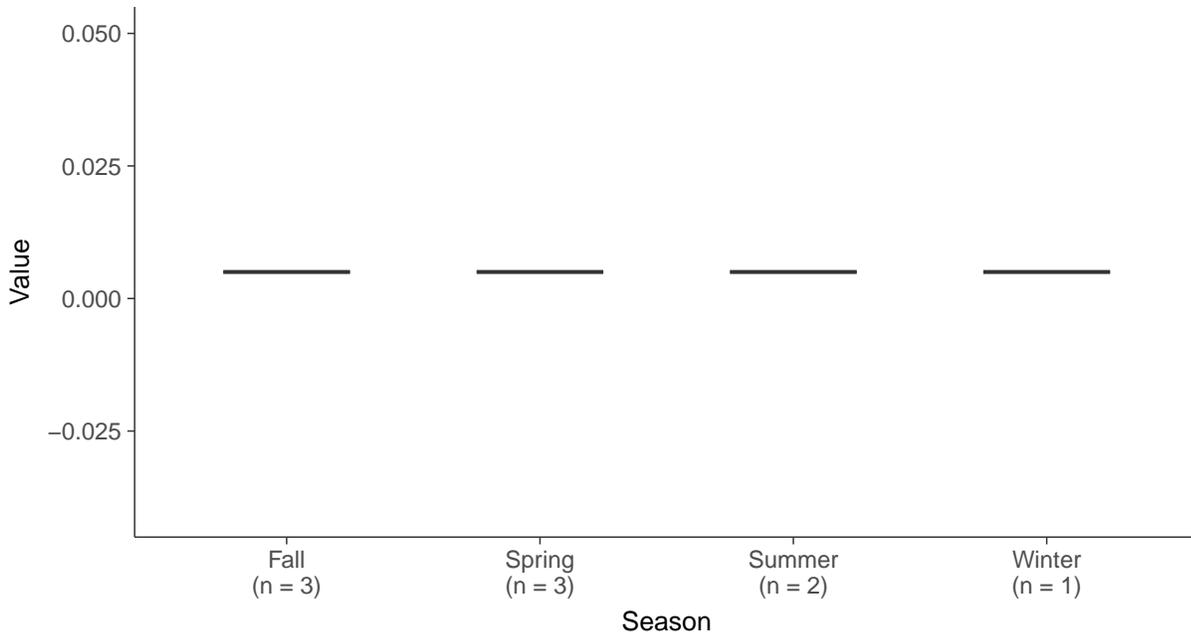
Boxplot

Cobalt, MW-16D (mg/L)



Boxplot by Season

Cobalt, MW-16D (mg/L)



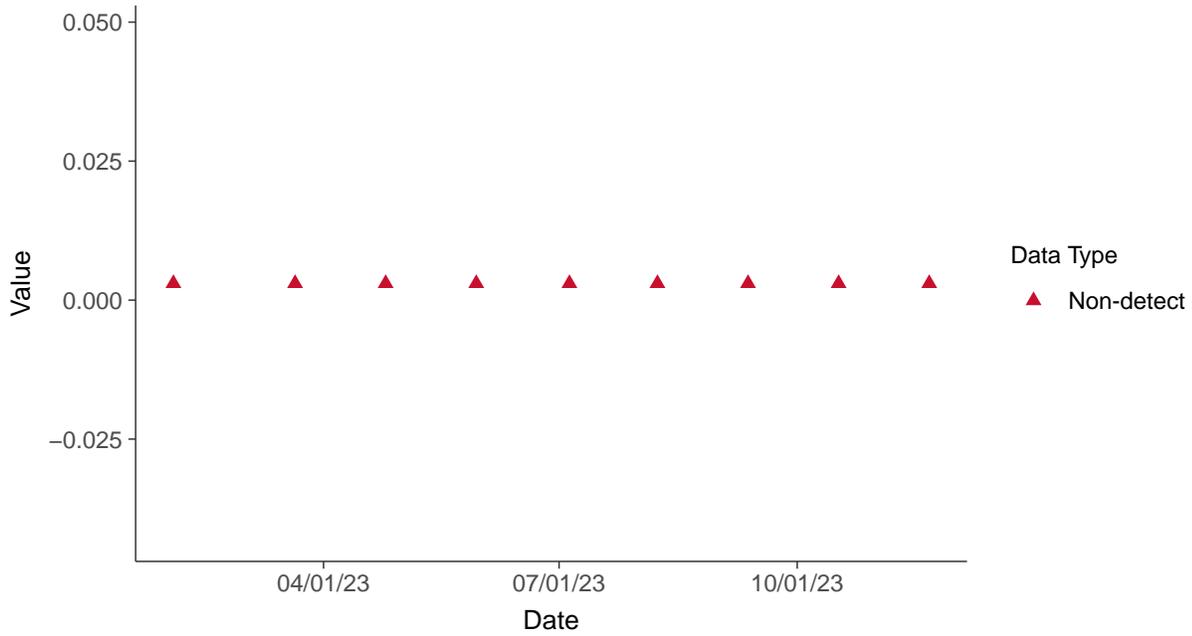


Appendix IV: Lead, MW-16D

ID: 16D_2_15

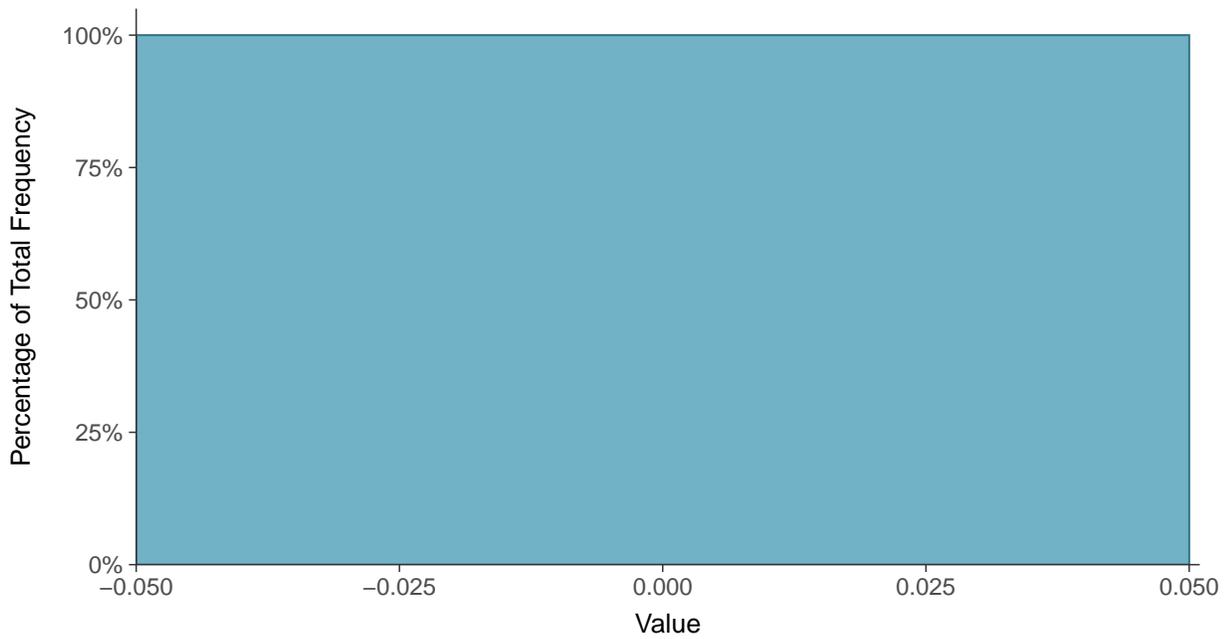
Scatter Plot

Lead, MW-16D (mg/L)



Histogram

Lead, MW-16D (mg/L)





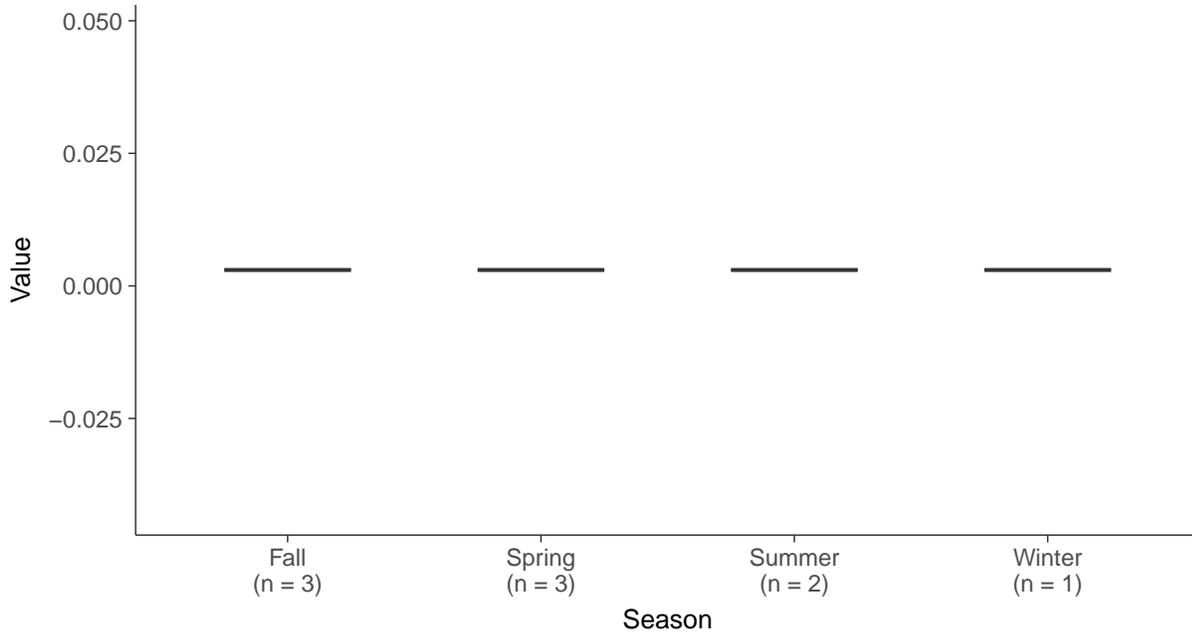
Boxplot

Lead, MW-16D (mg/L)



Boxplot by Season

Lead, MW-16D (mg/L)



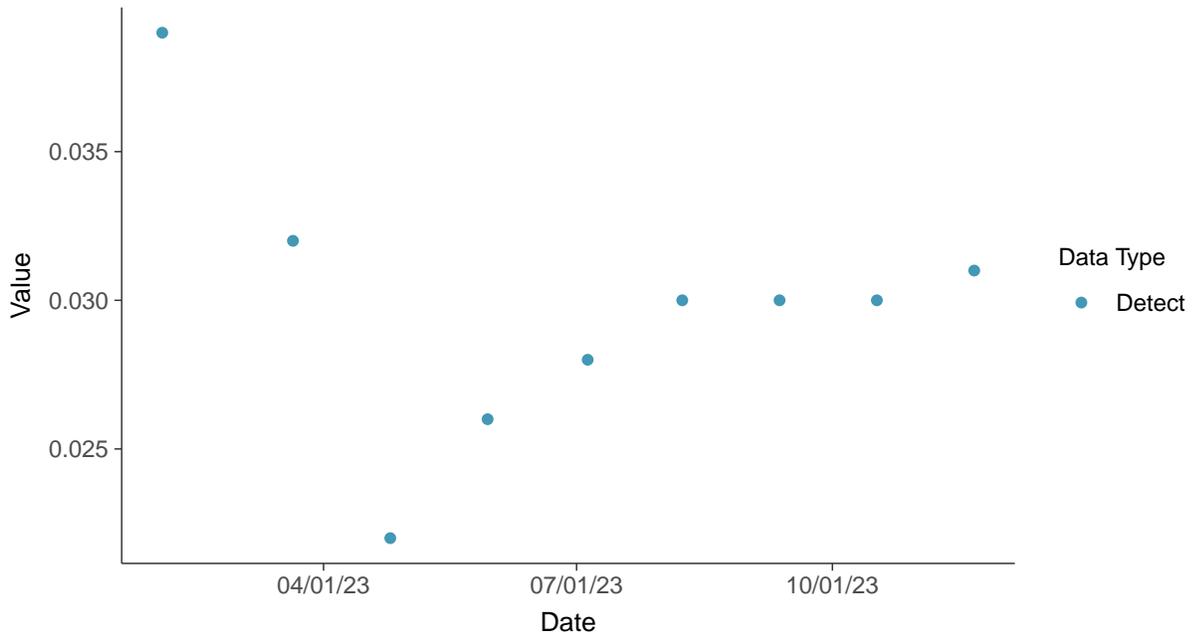


Appendix IV: Lithium, MW-16D

ID: 16D_2_16

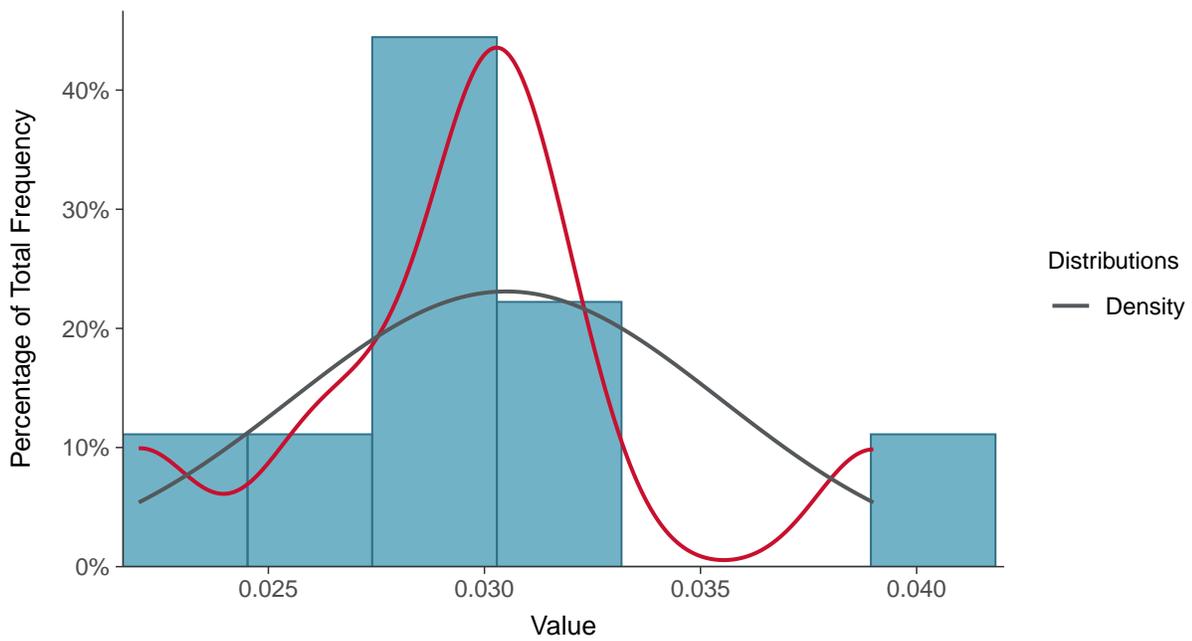
Scatter Plot

Lithium, MW-16D (mg/L)



Histogram

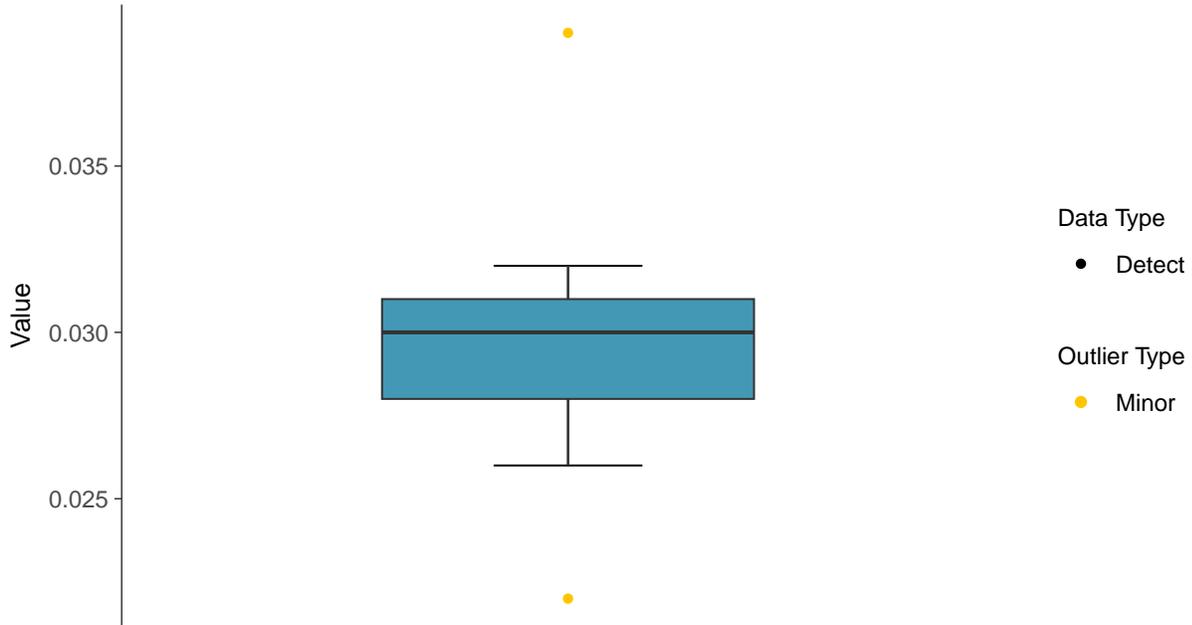
Lithium, MW-16D (mg/L)





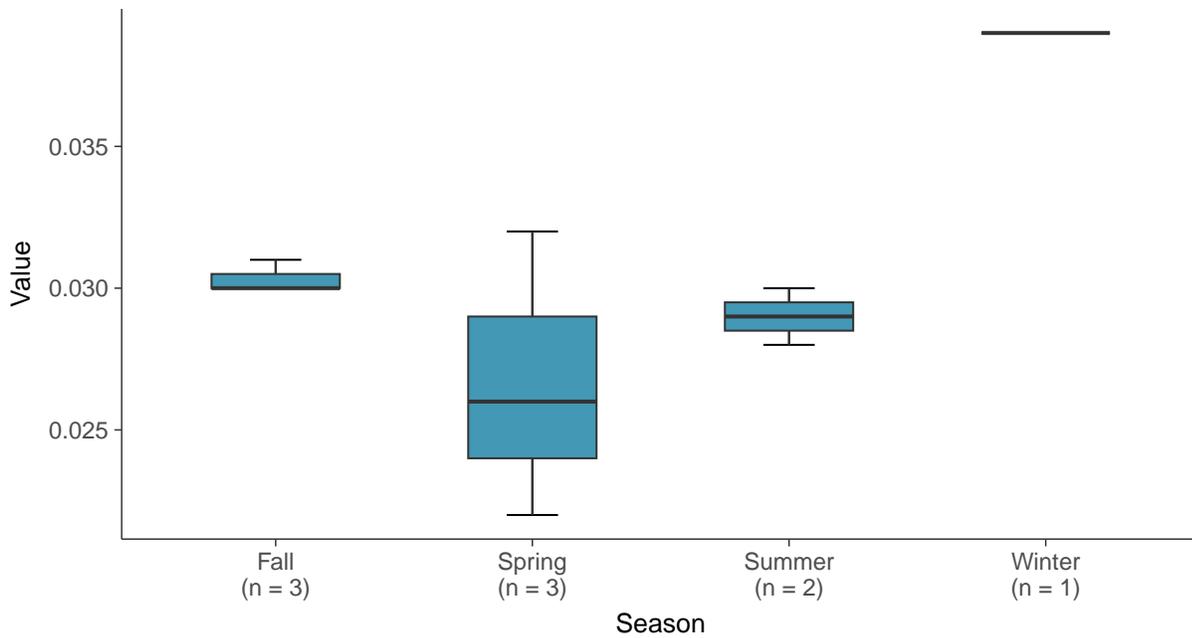
Boxplot

Lithium, MW-16D (mg/L)



Boxplot by Season

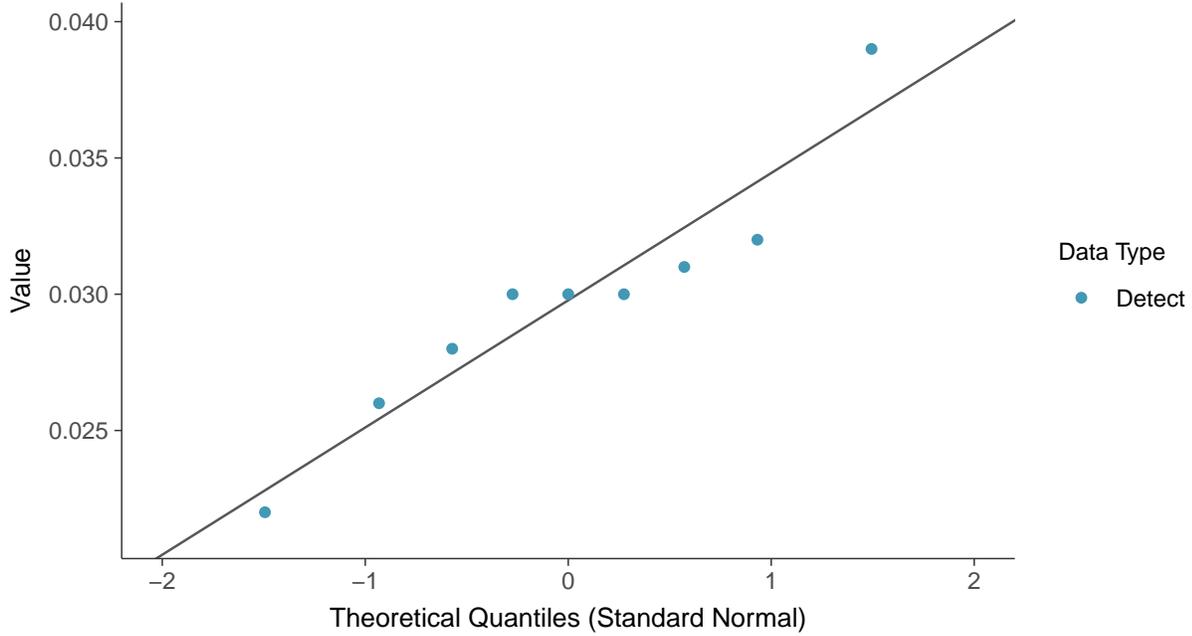
Lithium, MW-16D (mg/L)





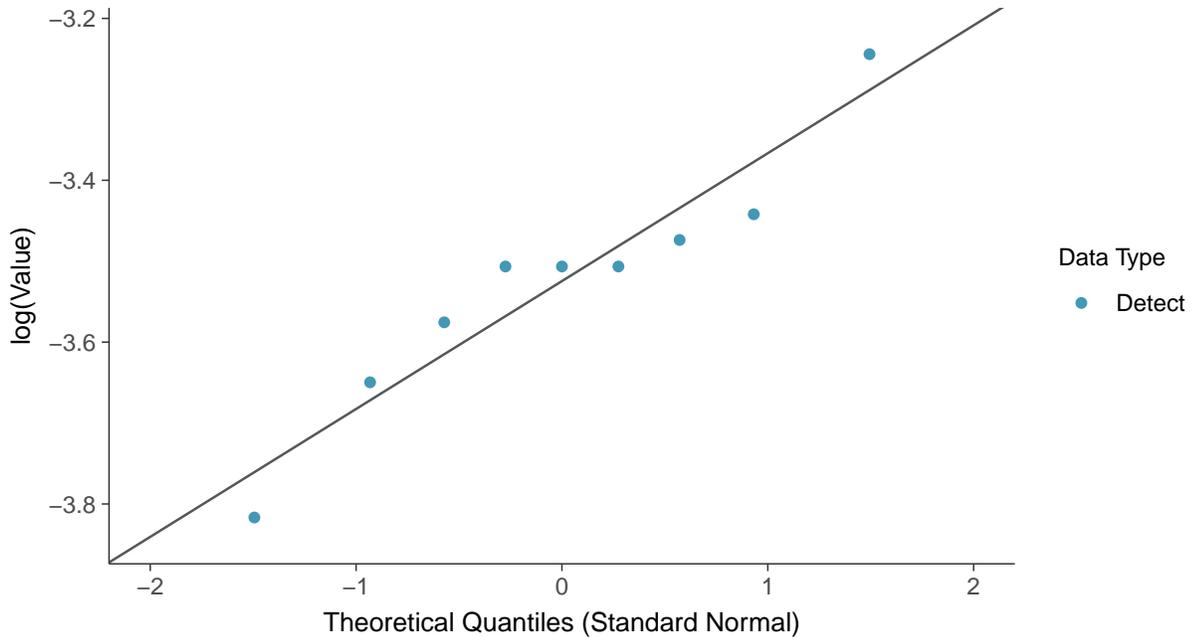
Normal Q-Q plot

Lithium, MW-16D (mg/L)



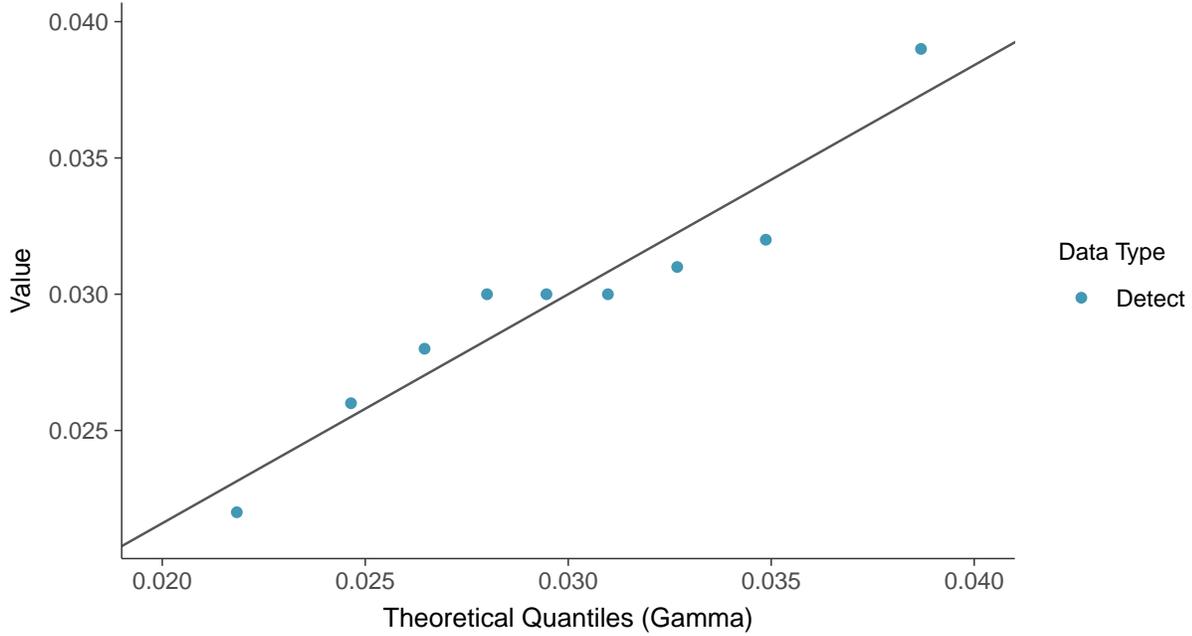
Lognormal Q-Q plot

Lithium, MW-16D (mg/L)

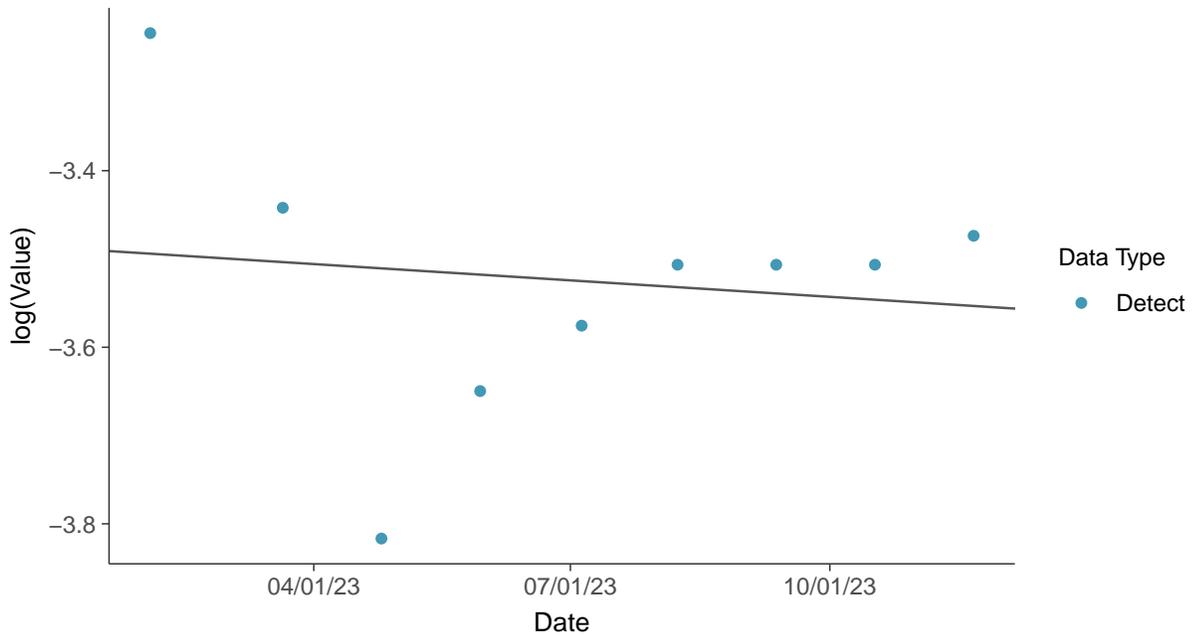




Gamma Q-Q plot
Lithium, MW-16D (mg/L)



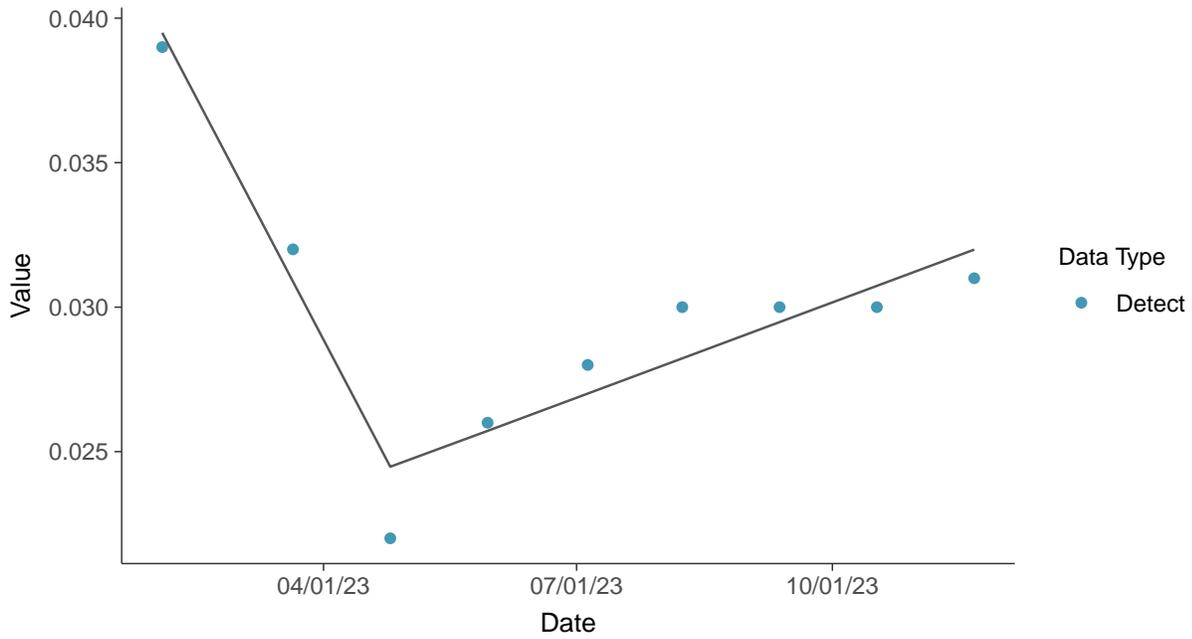
Trend Regression: Lognormal MLE
Lithium, MW-16D (mg/L)





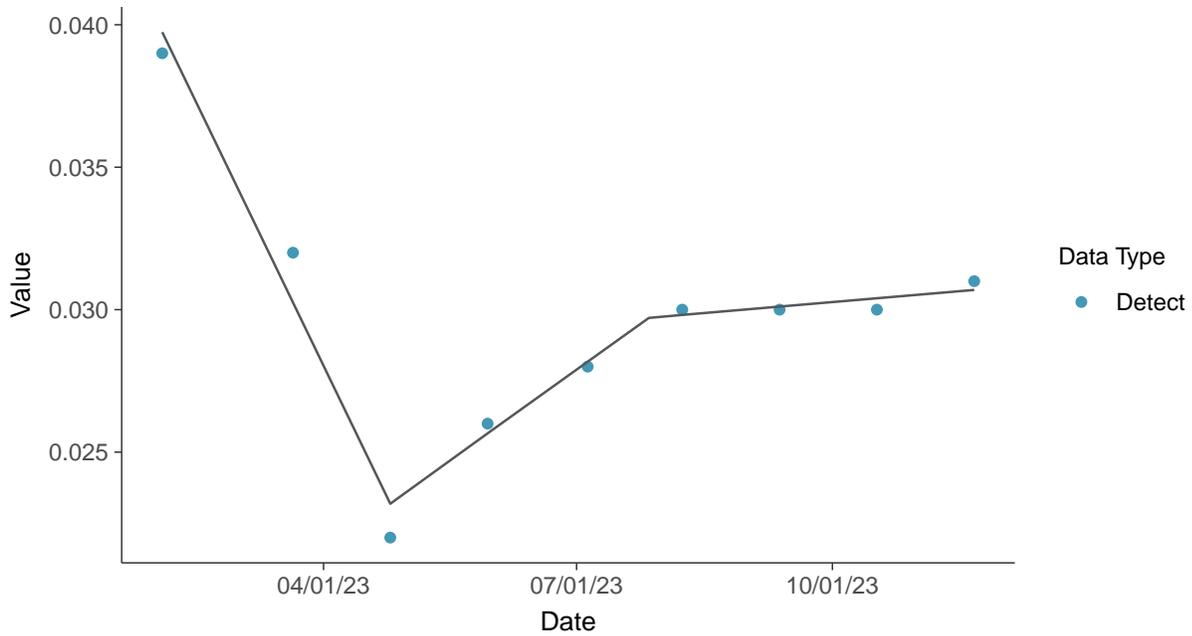
Trend Regression: Piecewise Linear-Linear

Lithium, MW-16D (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

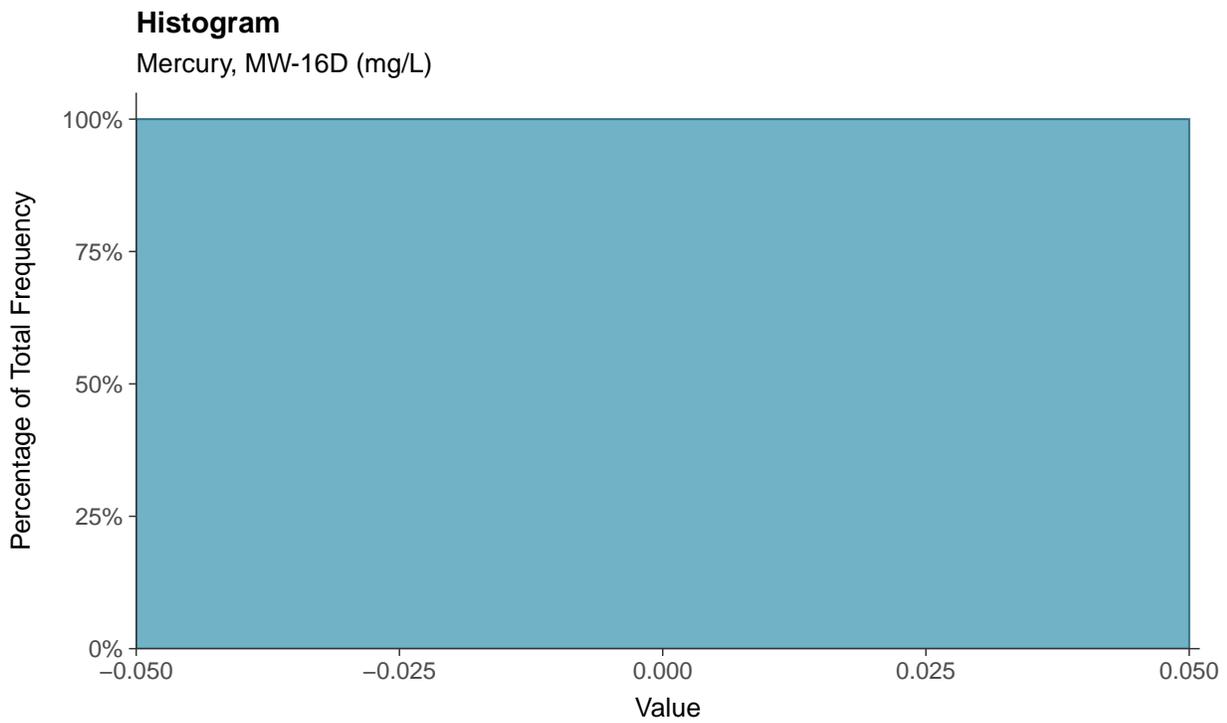
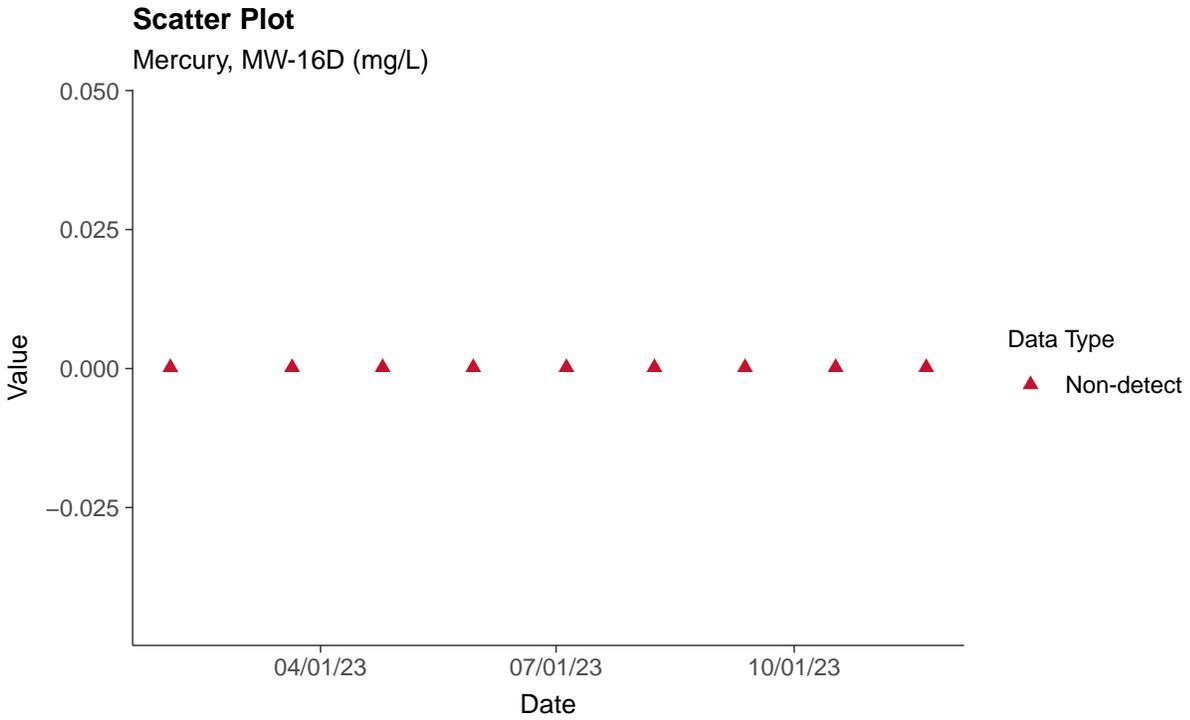
Lithium, MW-16D (mg/L)





Appendix IV: Mercury, MW-16D

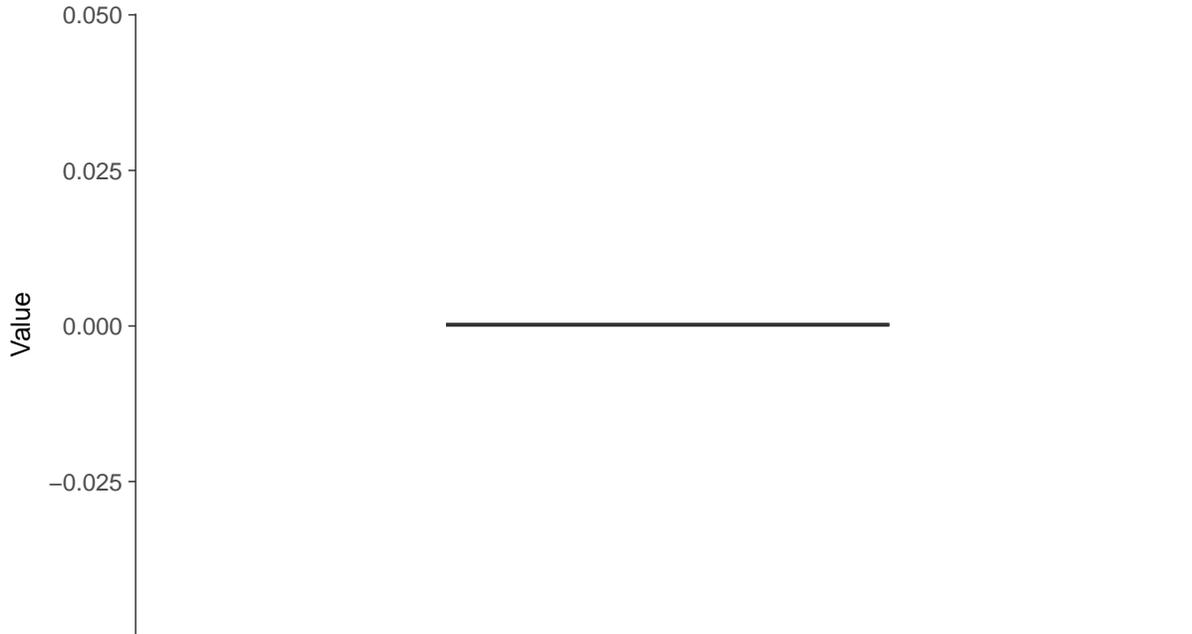
ID: 16D_2_17





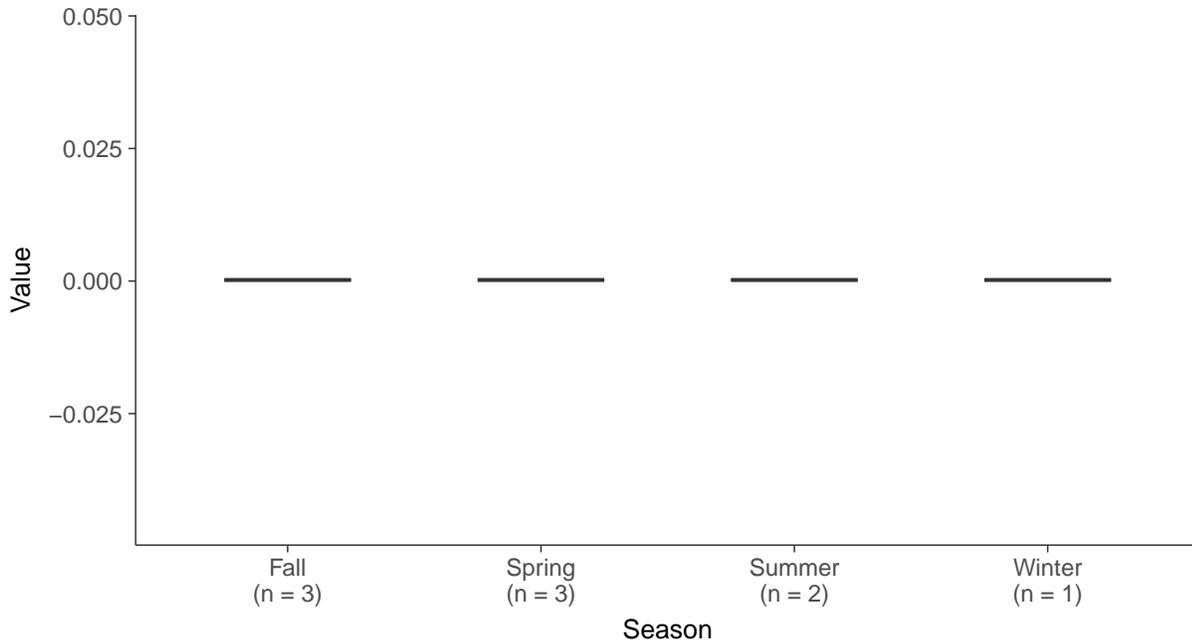
Boxplot

Mercury, MW-16D (mg/L)



Boxplot by Season

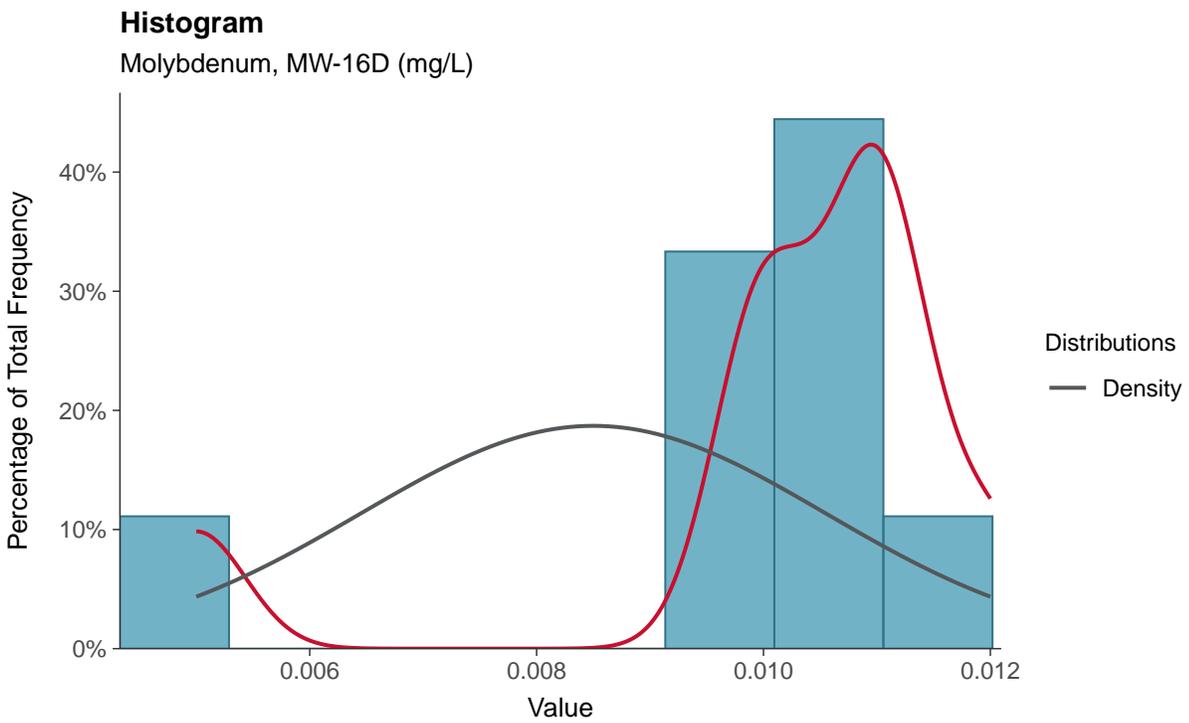
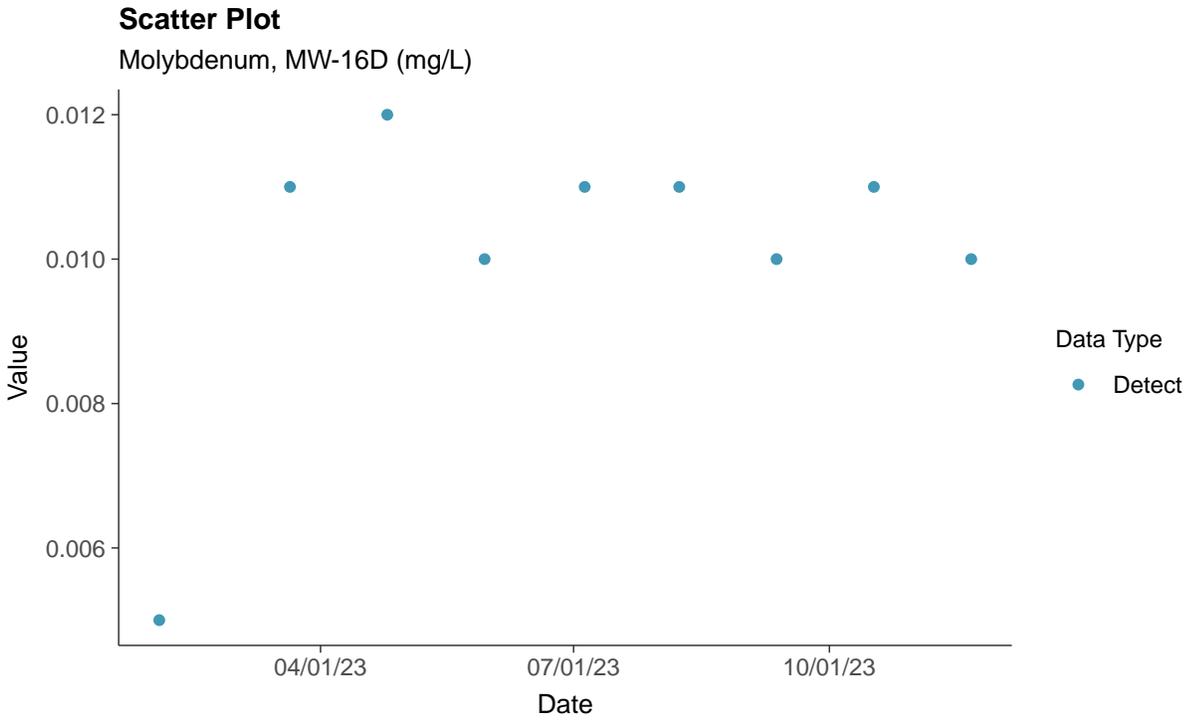
Mercury, MW-16D (mg/L)





Appendix IV: Molybdenum, MW-16D

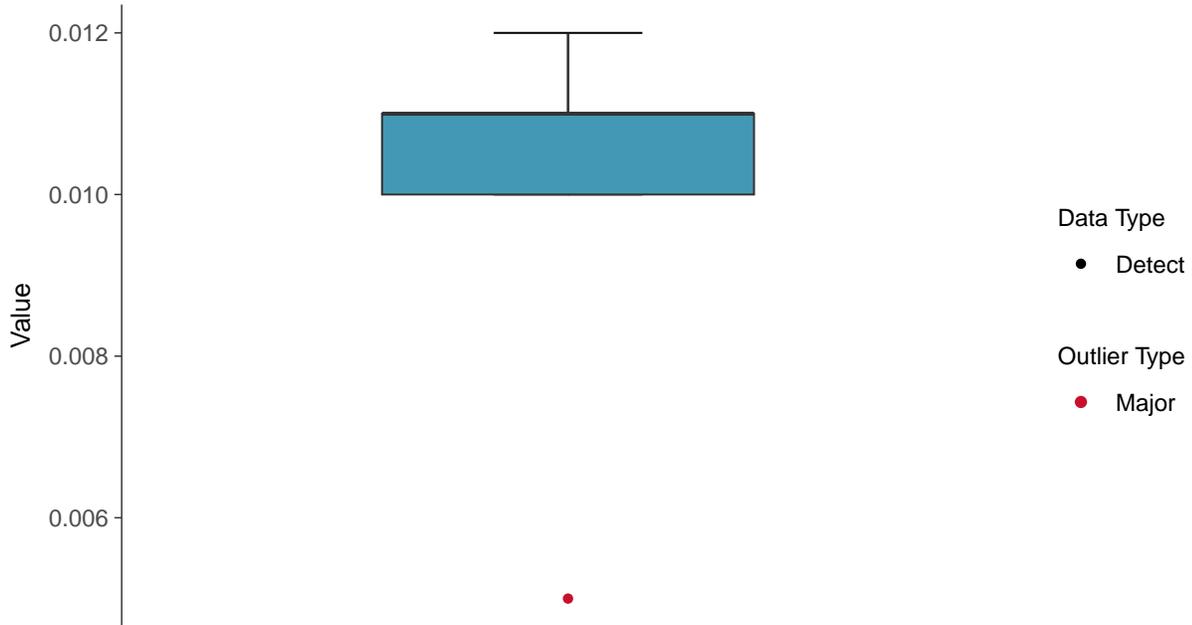
ID: 16D_2_18





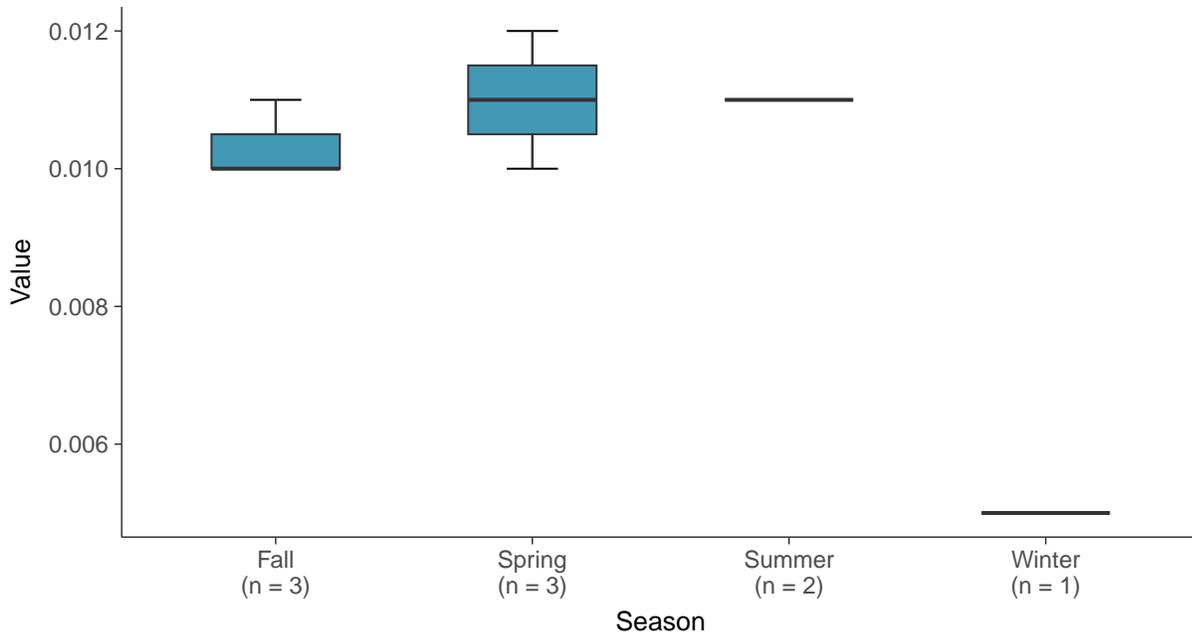
Boxplot

Molybdenum, MW-16D (mg/L)



Boxplot by Season

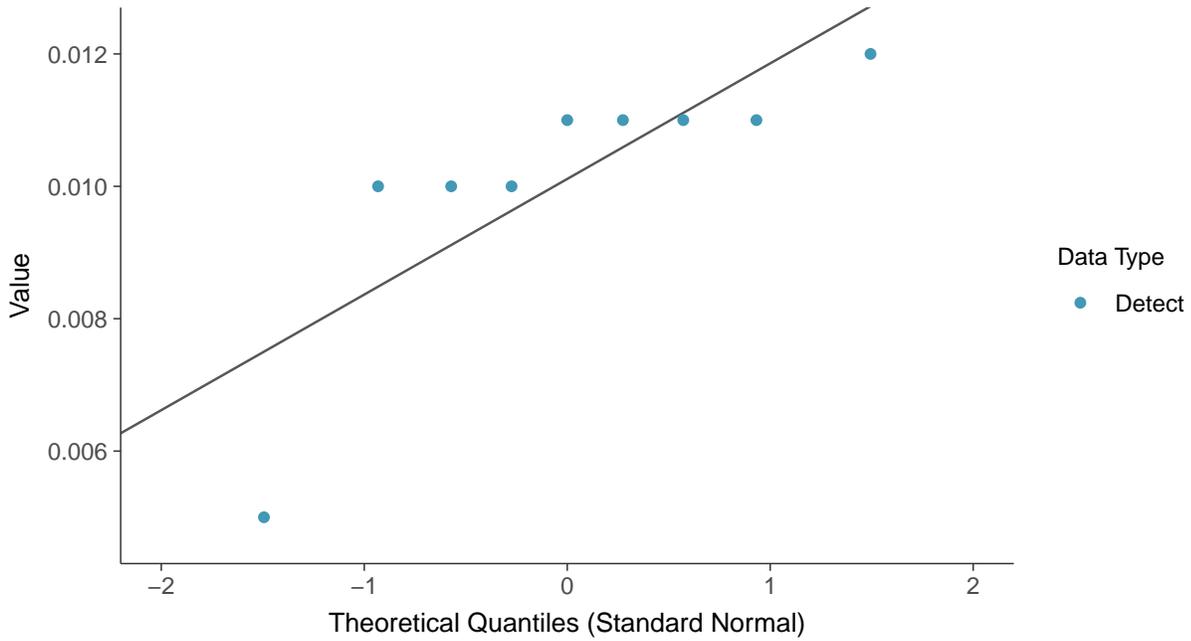
Molybdenum, MW-16D (mg/L)





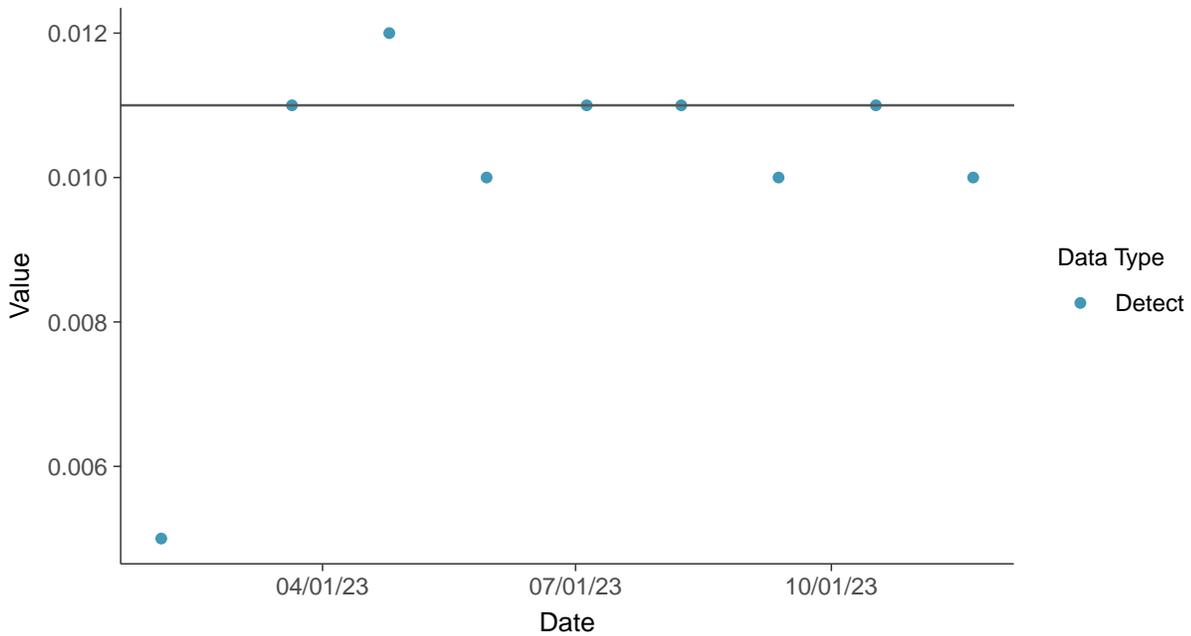
Normal Q-Q plot

Molybdenum, MW-16D (mg/L)



Trend Regression: Mann-Kendall/Theil-Sen Estimate

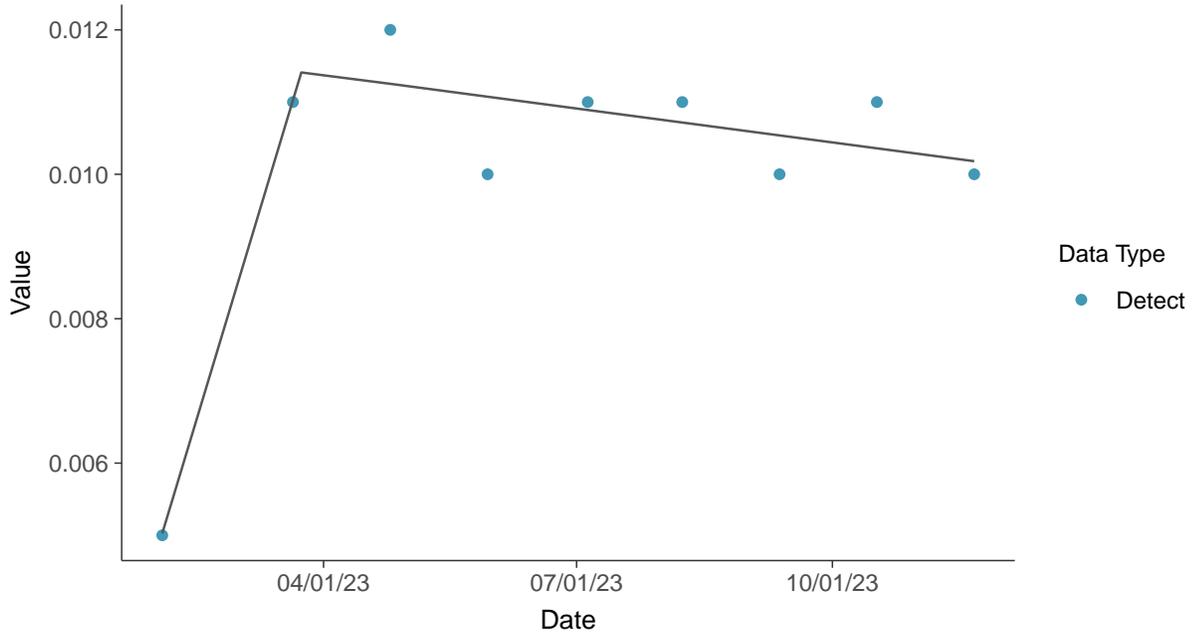
Molybdenum, MW-16D (mg/L)





Trend Regression: Piecewise Linear-Linear

Molybdenum, MW-16D (mg/L)



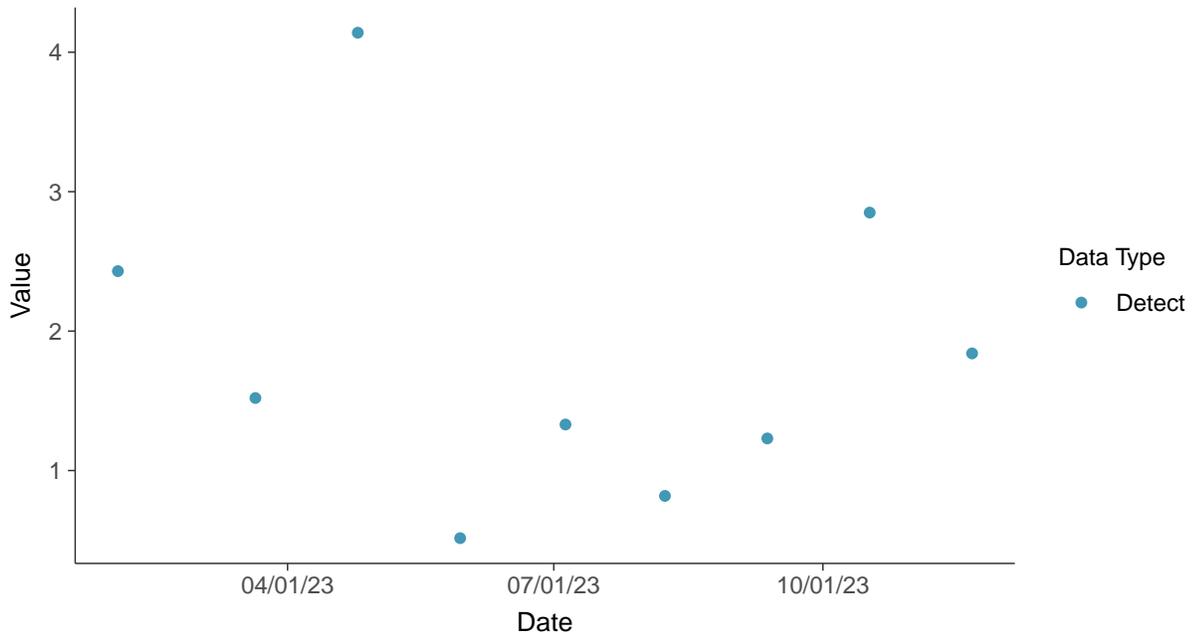


Appendix IV: Radium-226/228, MW-16D

ID: 16D_2_20

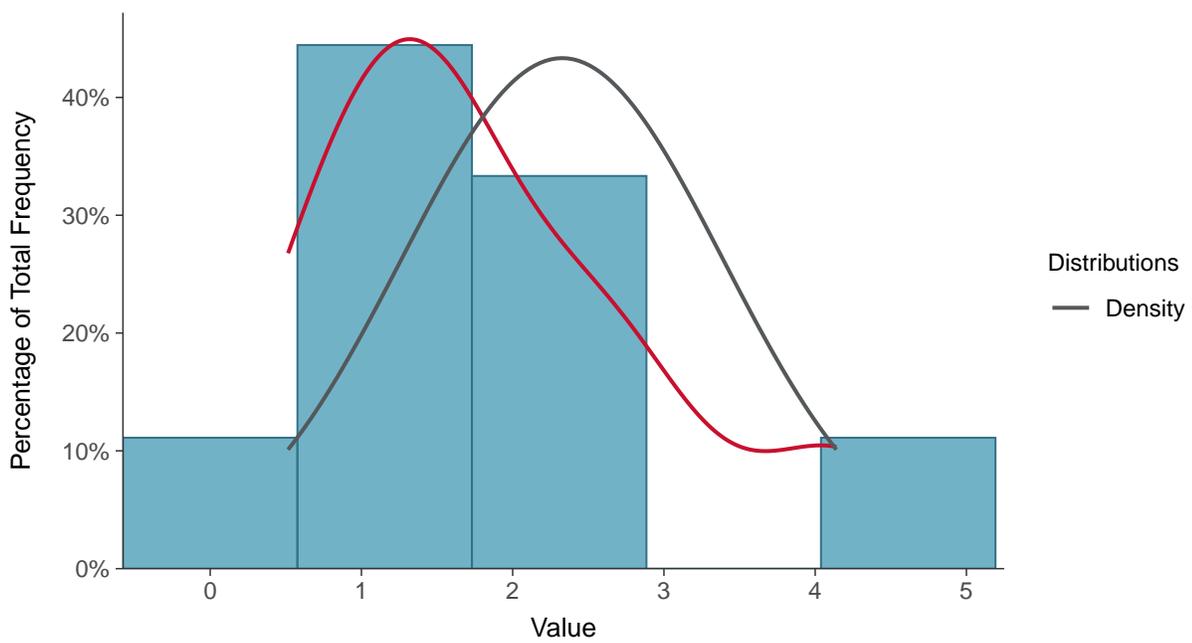
Scatter Plot

Radium-226/228, MW-16D (pCi/L)



Histogram

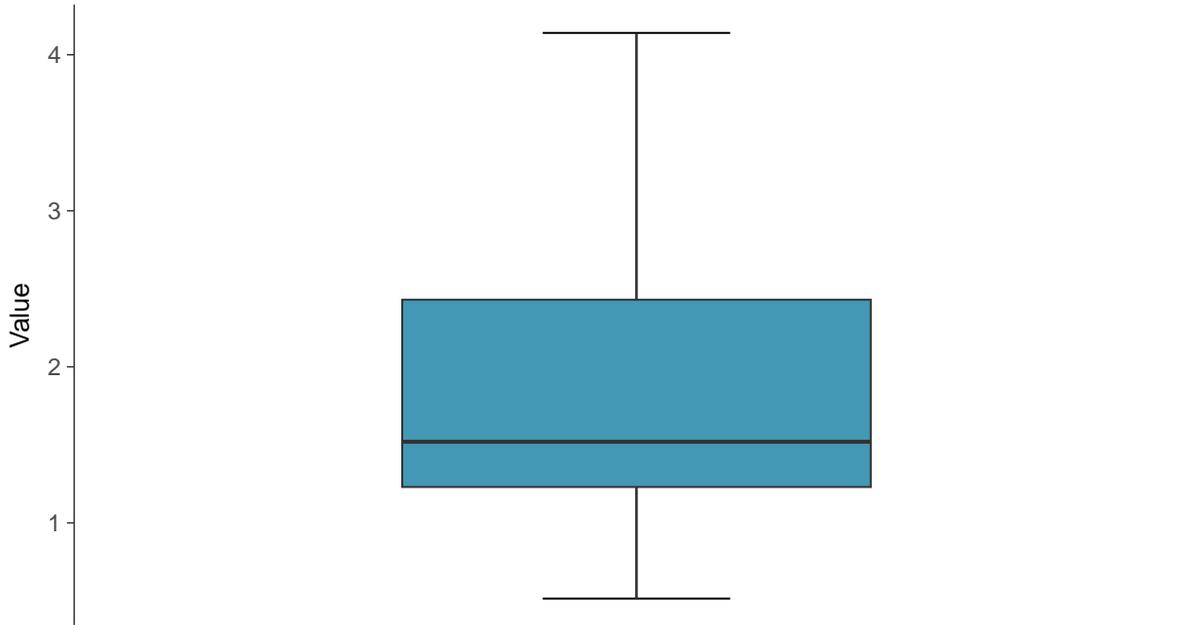
Radium-226/228, MW-16D (pCi/L)





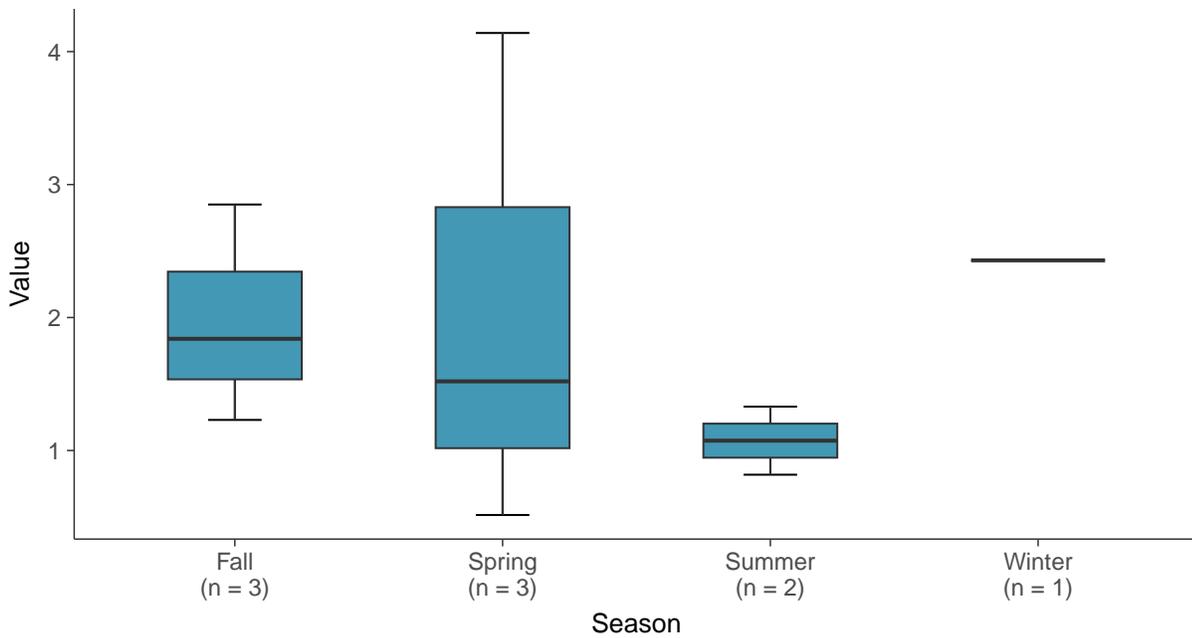
Boxplot

Radium-226/228, MW-16D (pCi/L)



Boxplot by Season

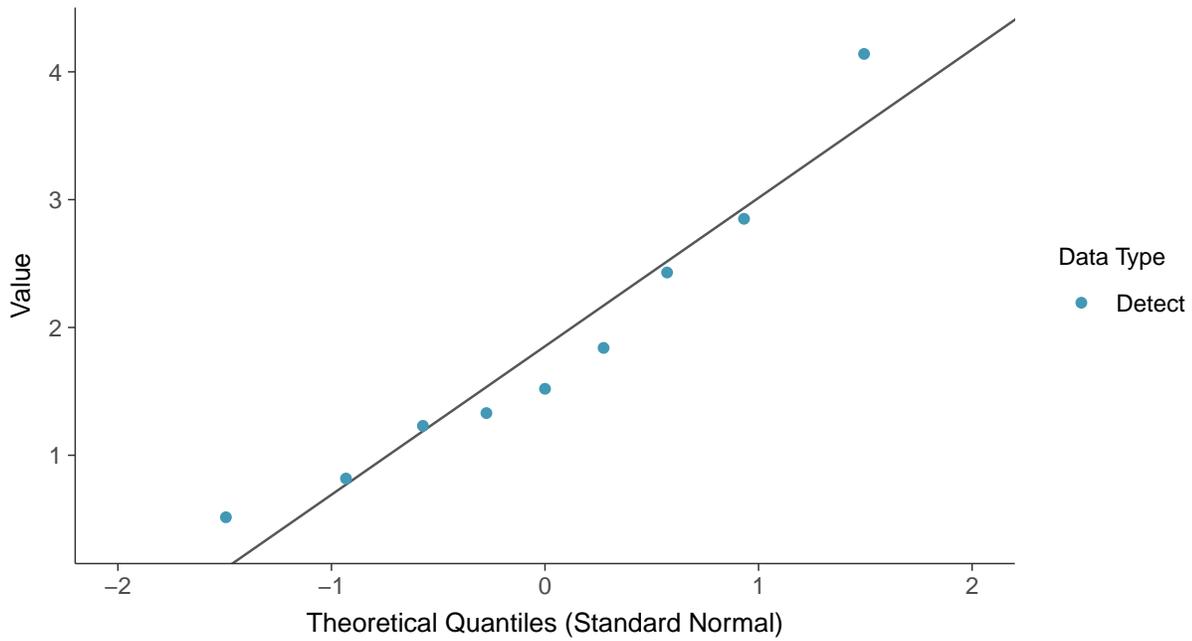
Radium-226/228, MW-16D (pCi/L)





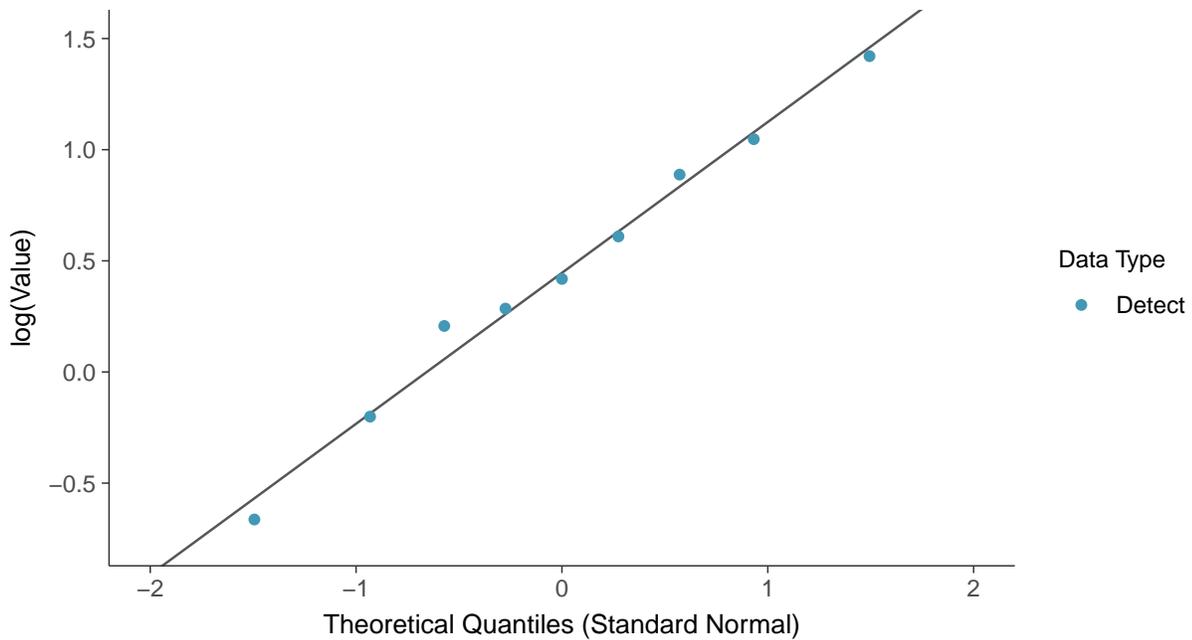
Normal Q-Q plot

Radium-226/228, MW-16D (pCi/L)



Lognormal Q-Q plot

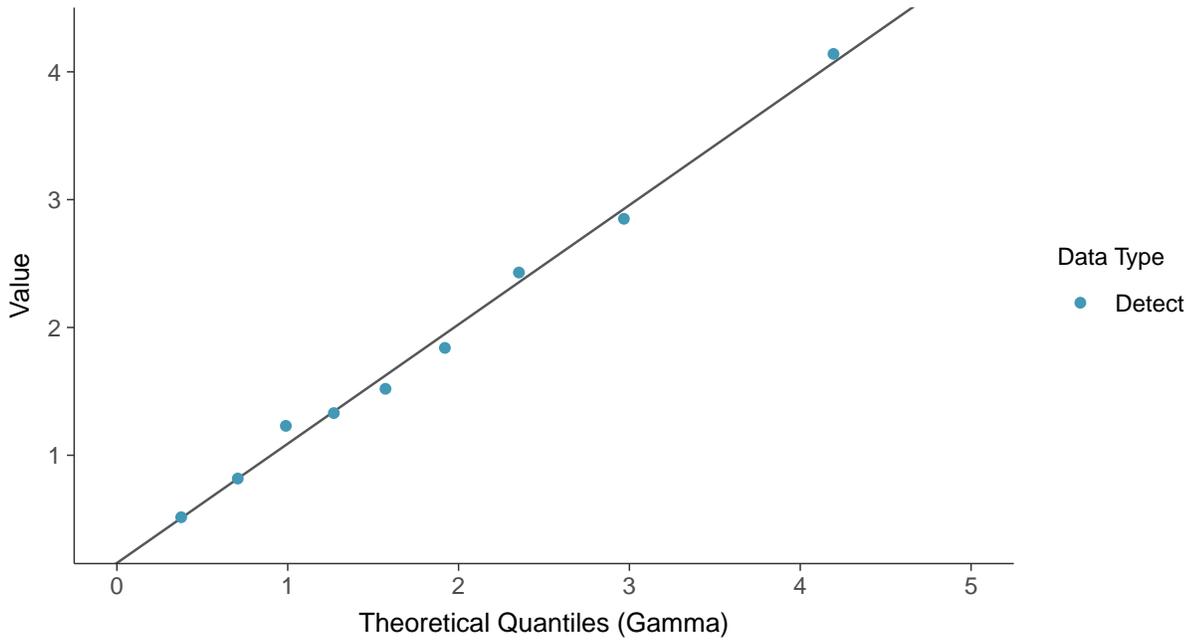
Radium-226/228, MW-16D (pCi/L)





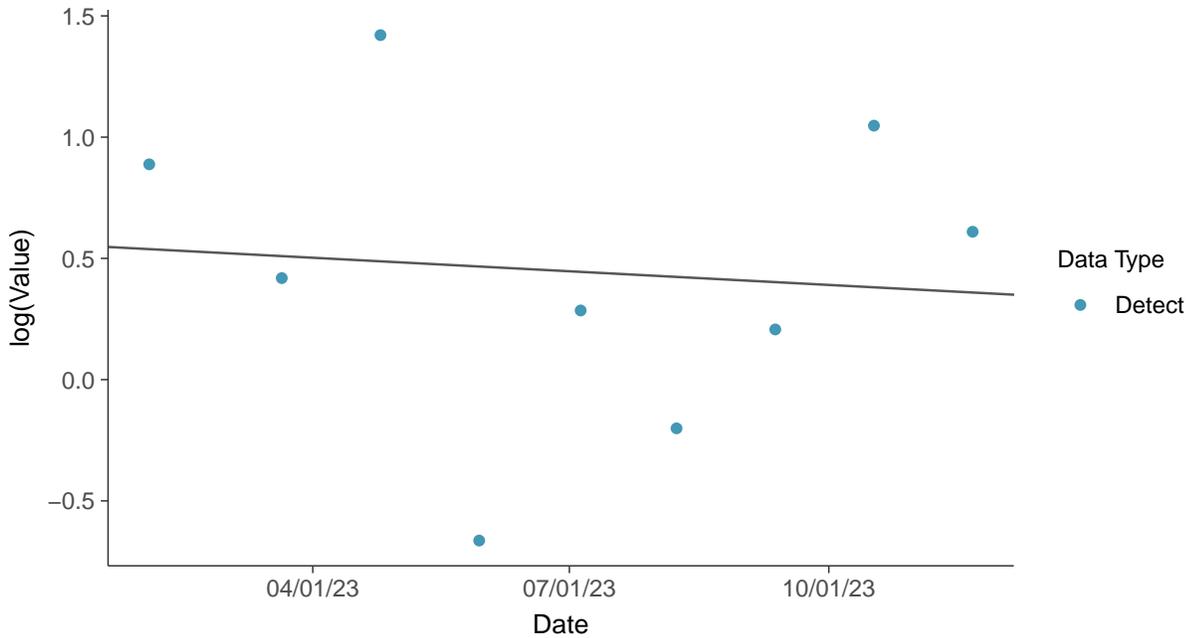
Gamma Q-Q plot

Radium-226/228, MW-16D (pCi/L)



Trend Regression: Lognormal MLE

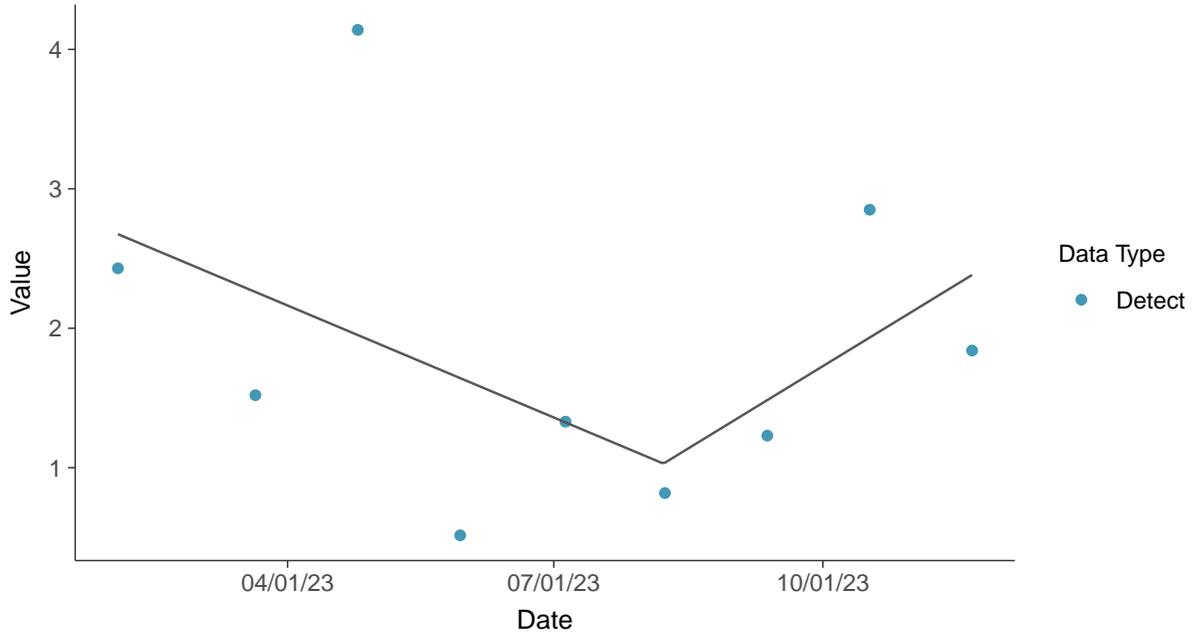
Radium-226/228, MW-16D (pCi/L)





Trend Regression: Piecewise Linear-Linear

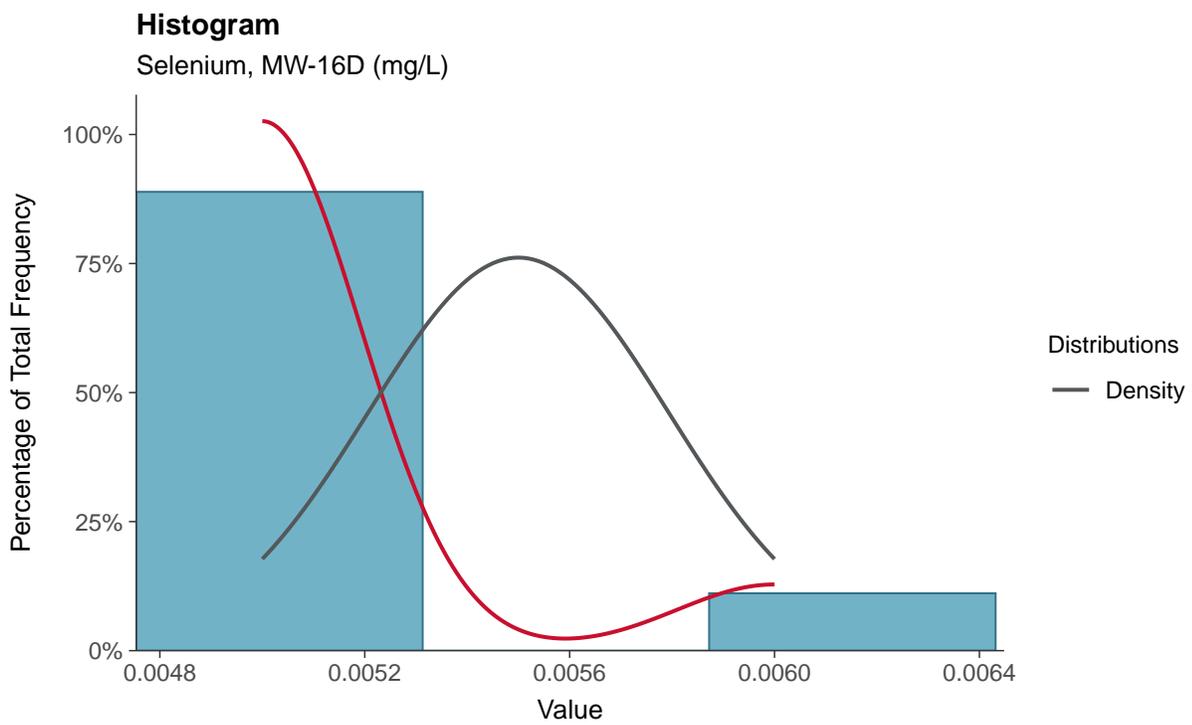
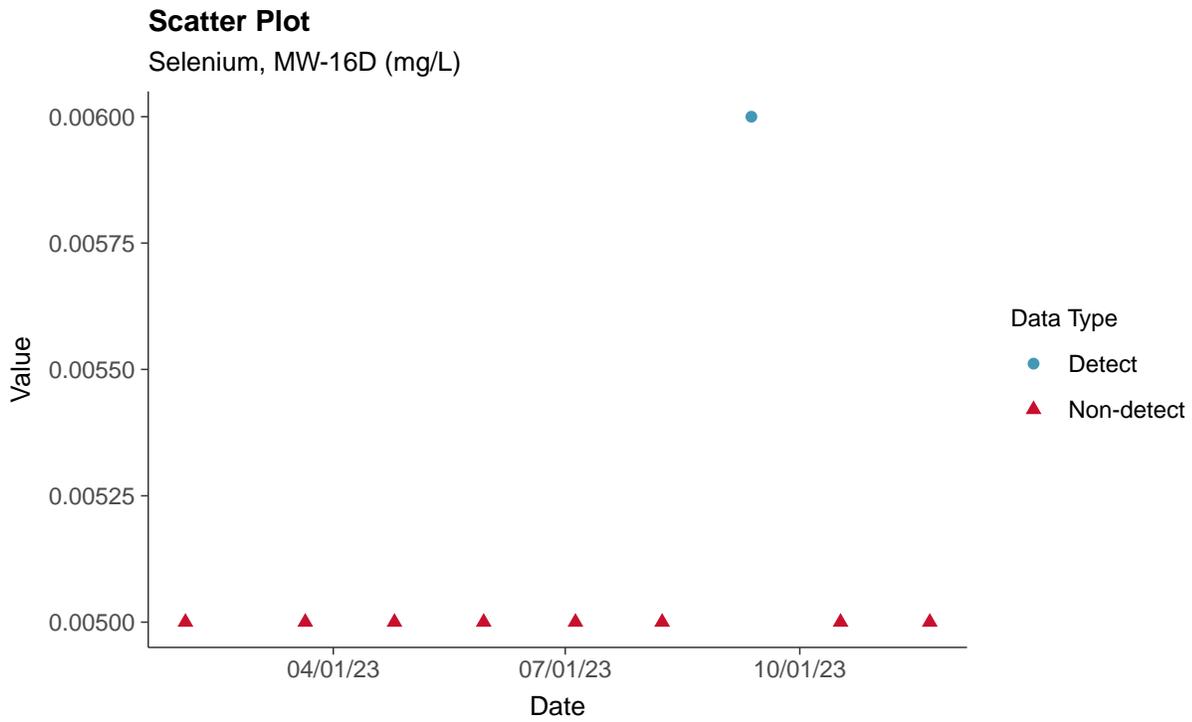
Radium-226/228, MW-16D (pCi/L)





Appendix IV: Selenium, MW-16D

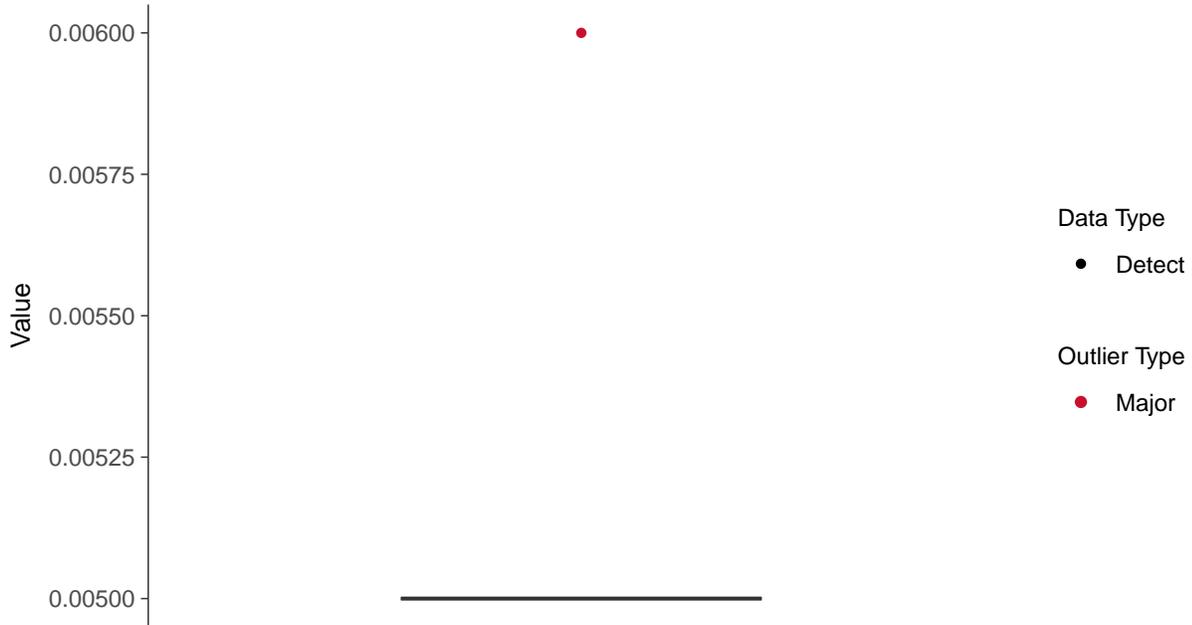
ID: 16D_2_22





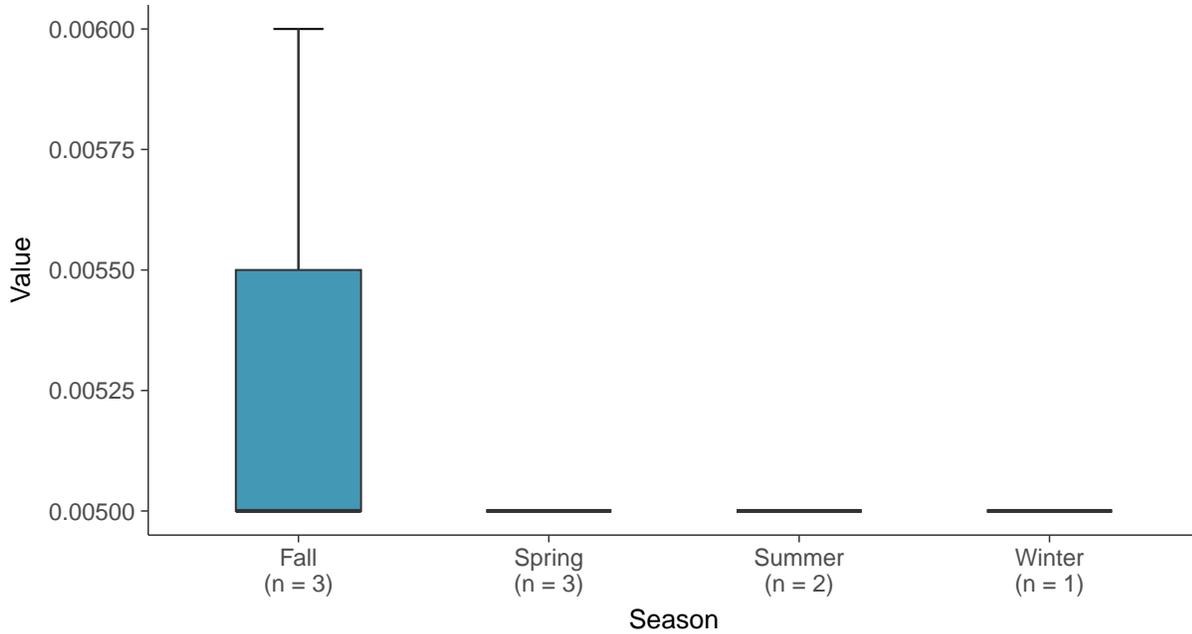
Boxplot

Selenium, MW-16D (mg/L)



Boxplot by Season

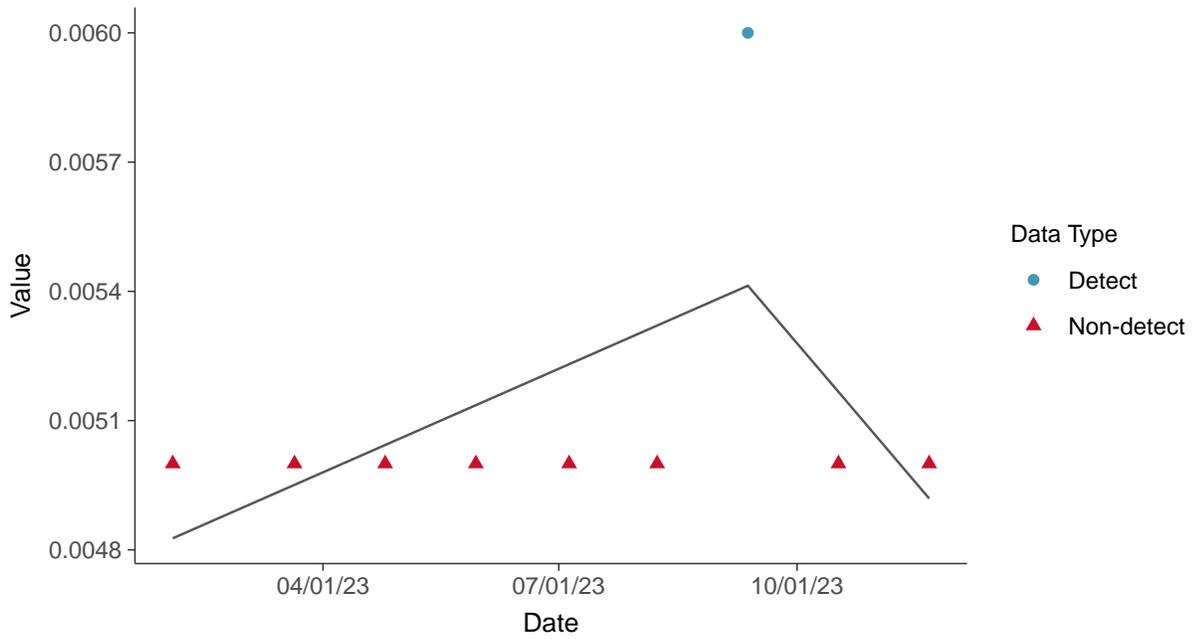
Selenium, MW-16D (mg/L)





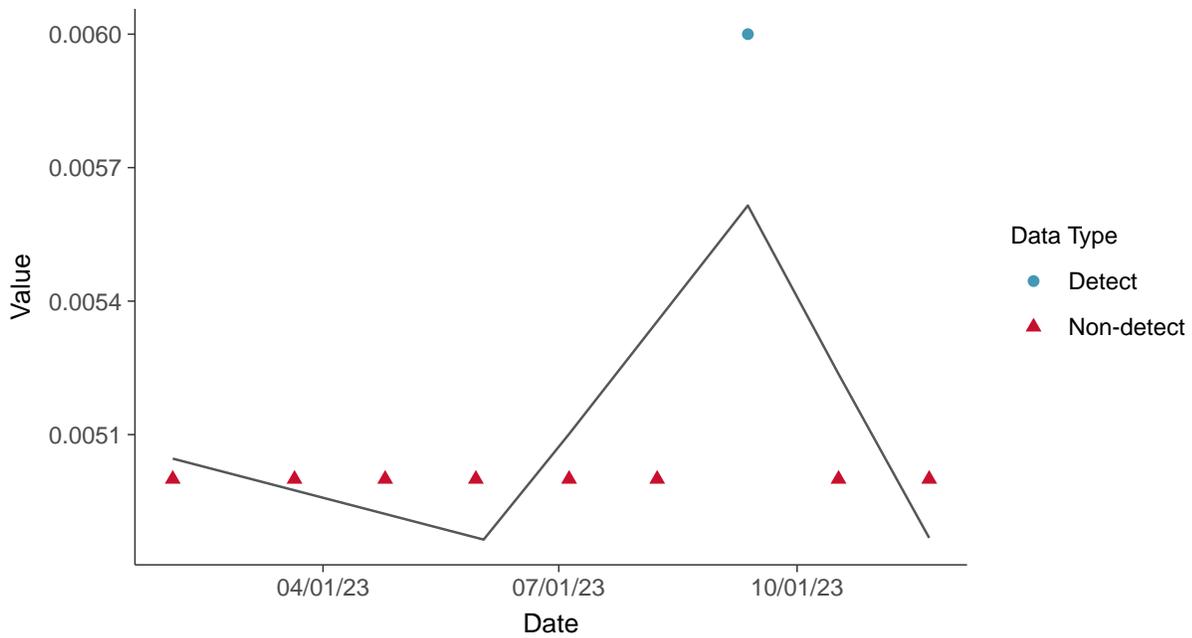
Trend Regression: Piecewise Linear-Linear

Selenium, MW-16D (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Selenium, MW-16D (mg/L)



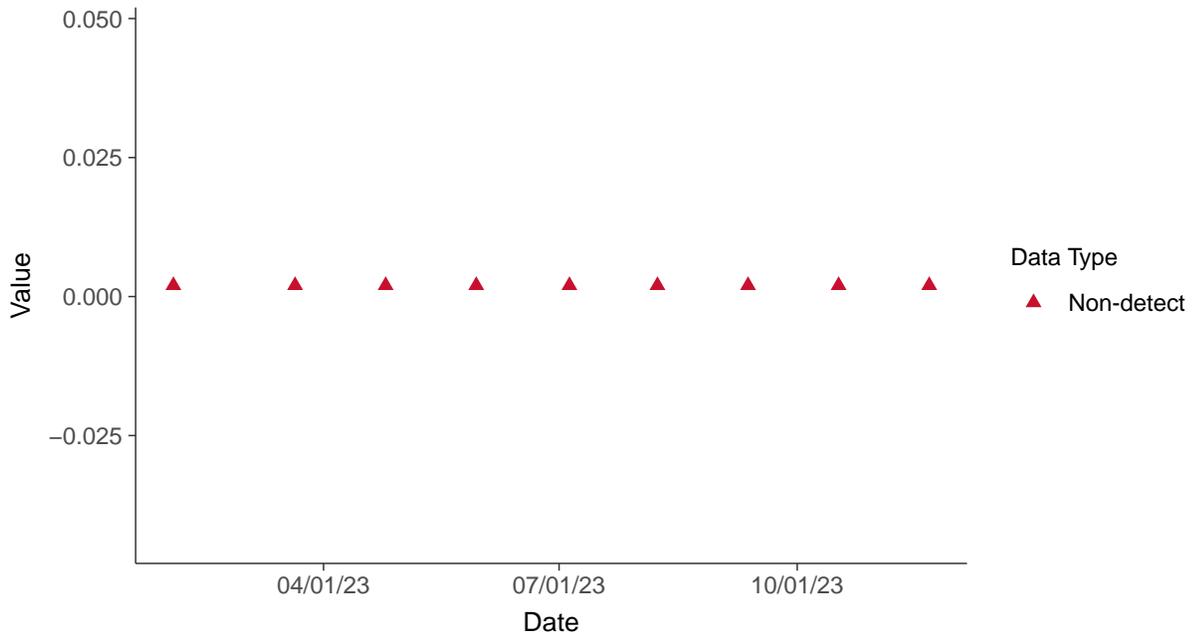


Appendix IV: Thallium, MW-16D

ID: 16D_2_23

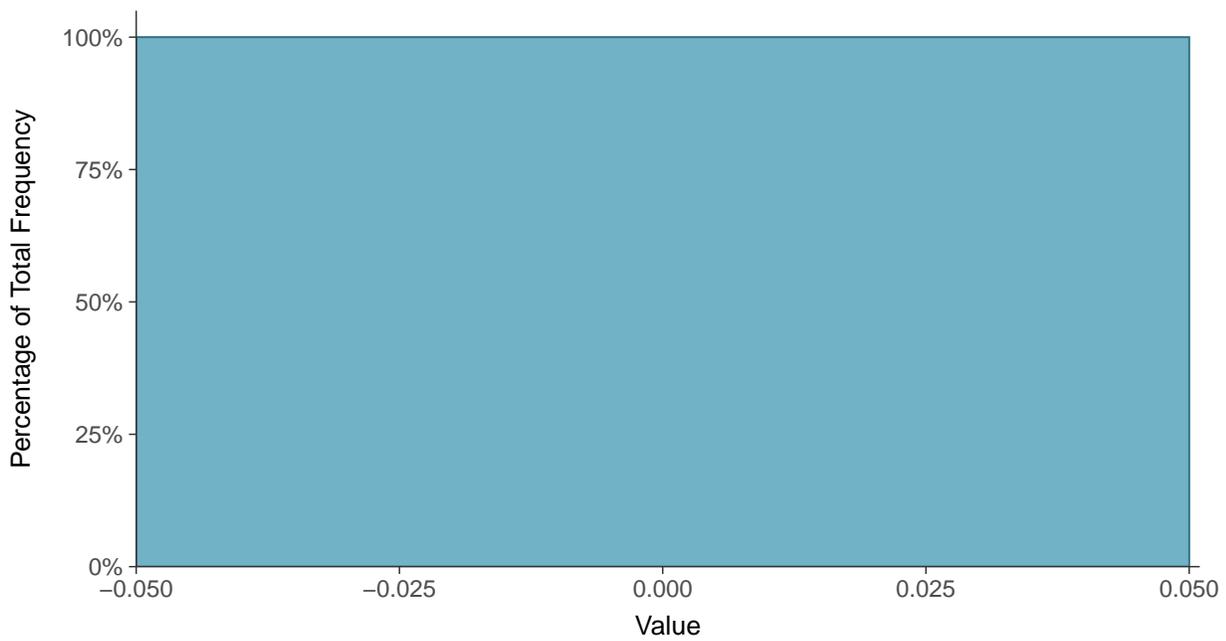
Scatter Plot

Thallium, MW-16D (mg/L)



Histogram

Thallium, MW-16D (mg/L)





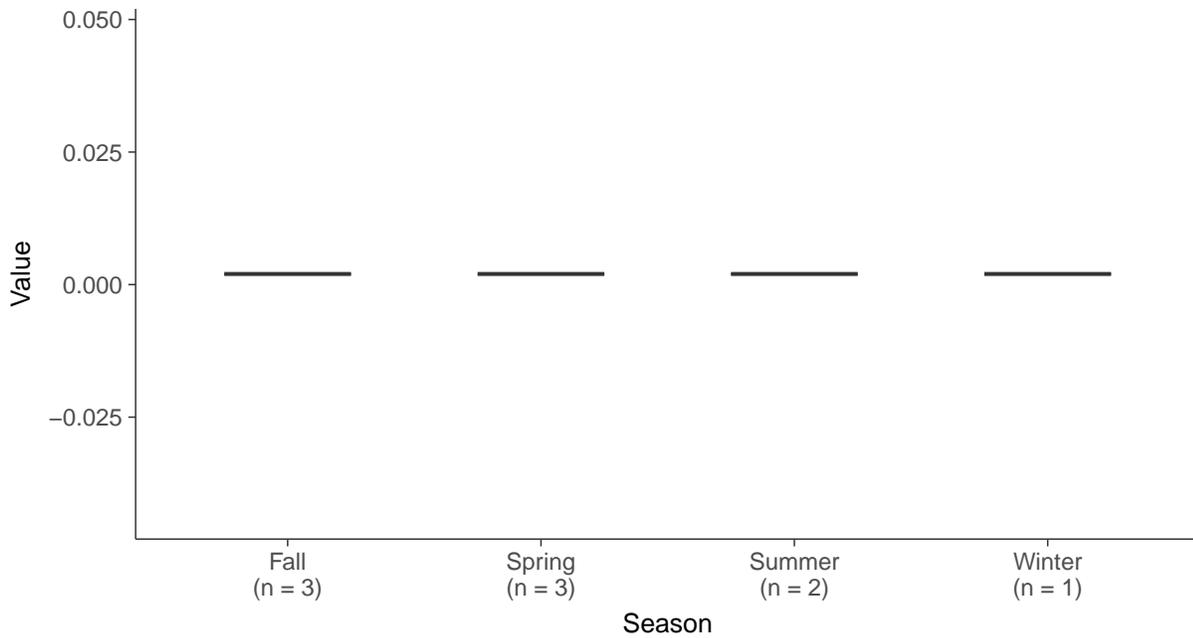
Boxplot

Thallium, MW-16D (mg/L)



Boxplot by Season

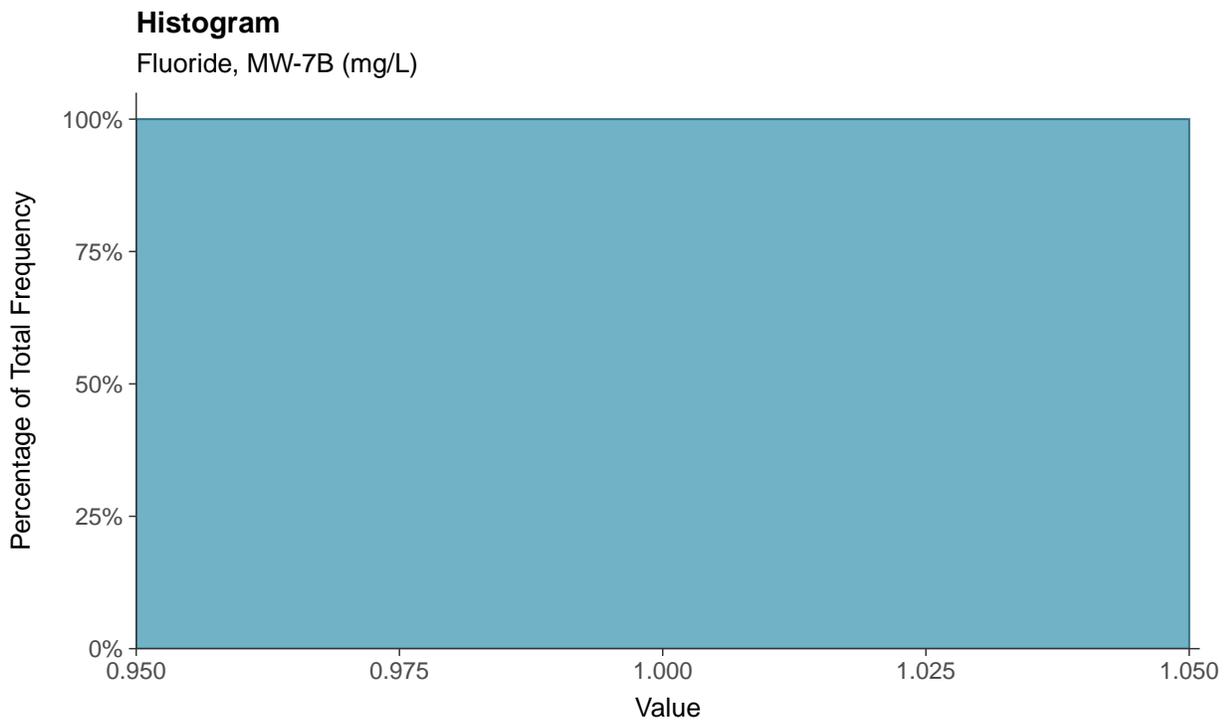
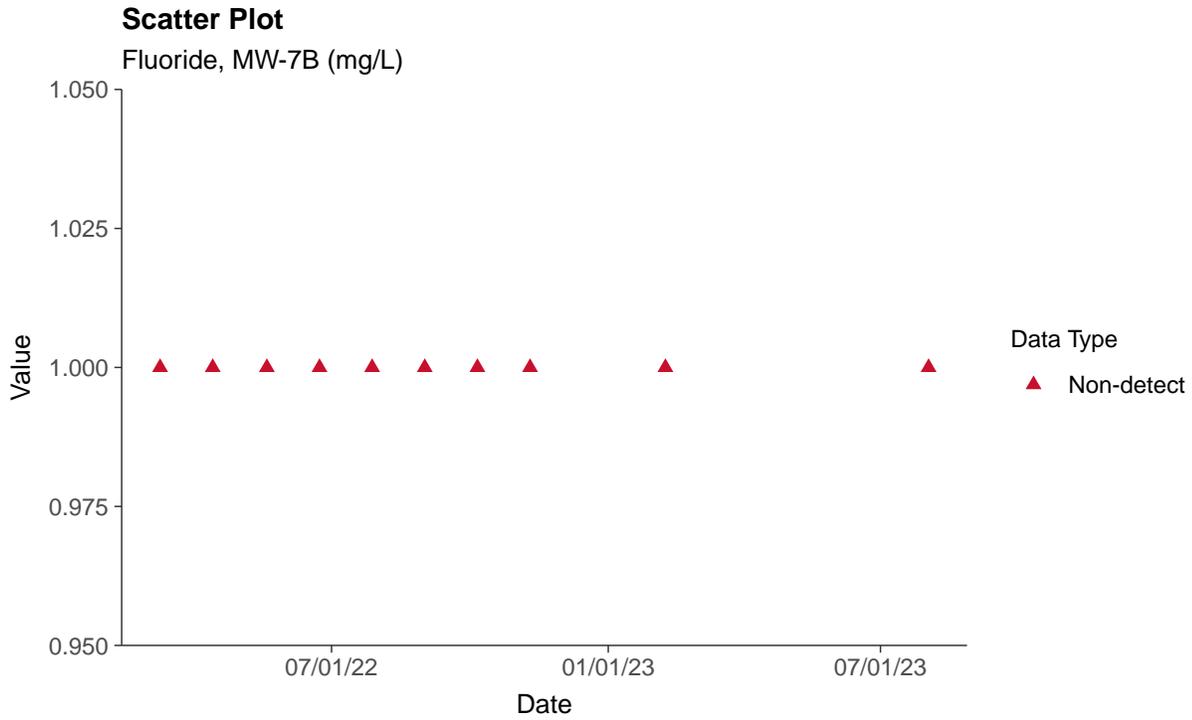
Thallium, MW-16D (mg/L)





Appendix IV: Fluoride, MW-7B

ID: 7B_2_04





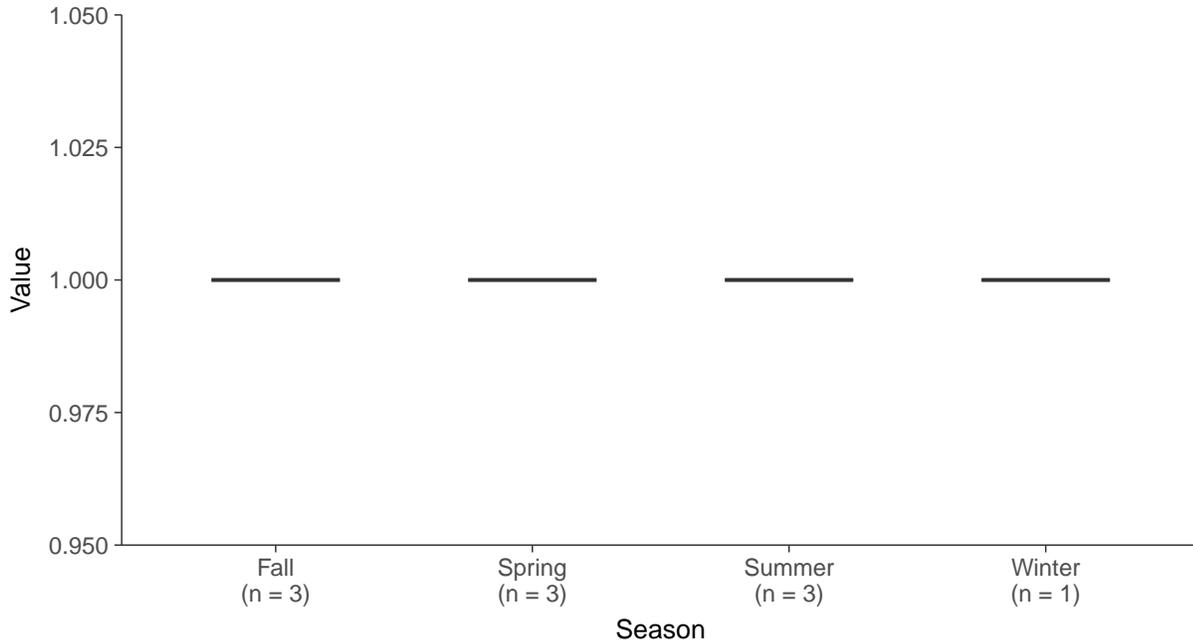
Boxplot

Fluoride, MW-7B (mg/L)



Boxplot by Season

Fluoride, MW-7B (mg/L)



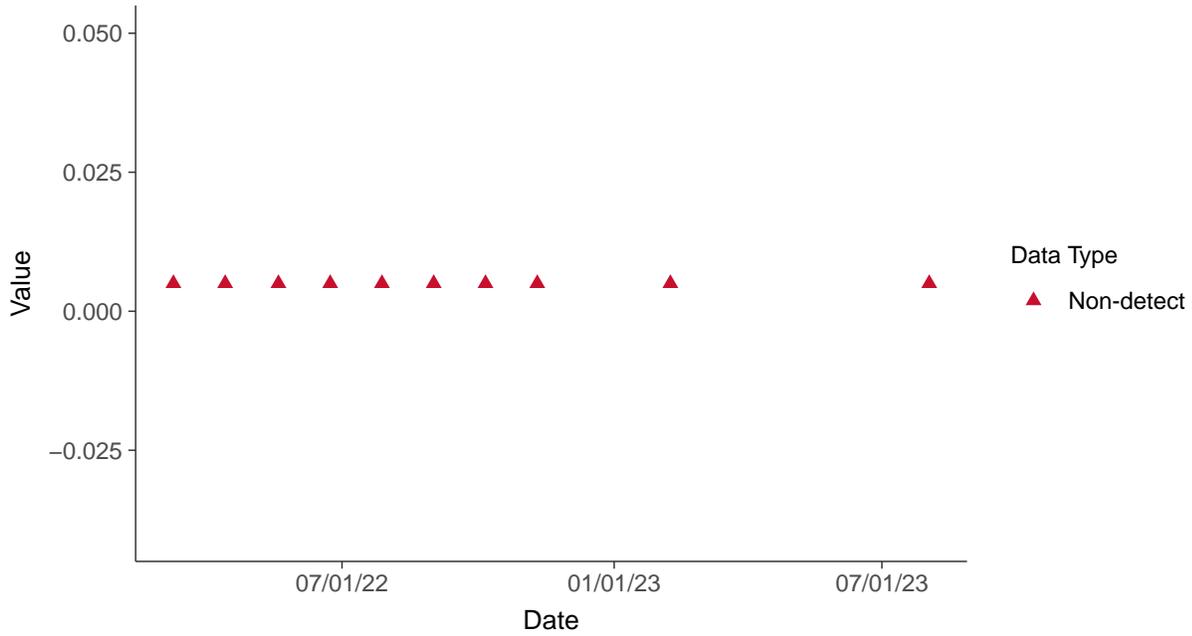


Appendix IV: Antimony, MW-7B

ID: 7B_2_08

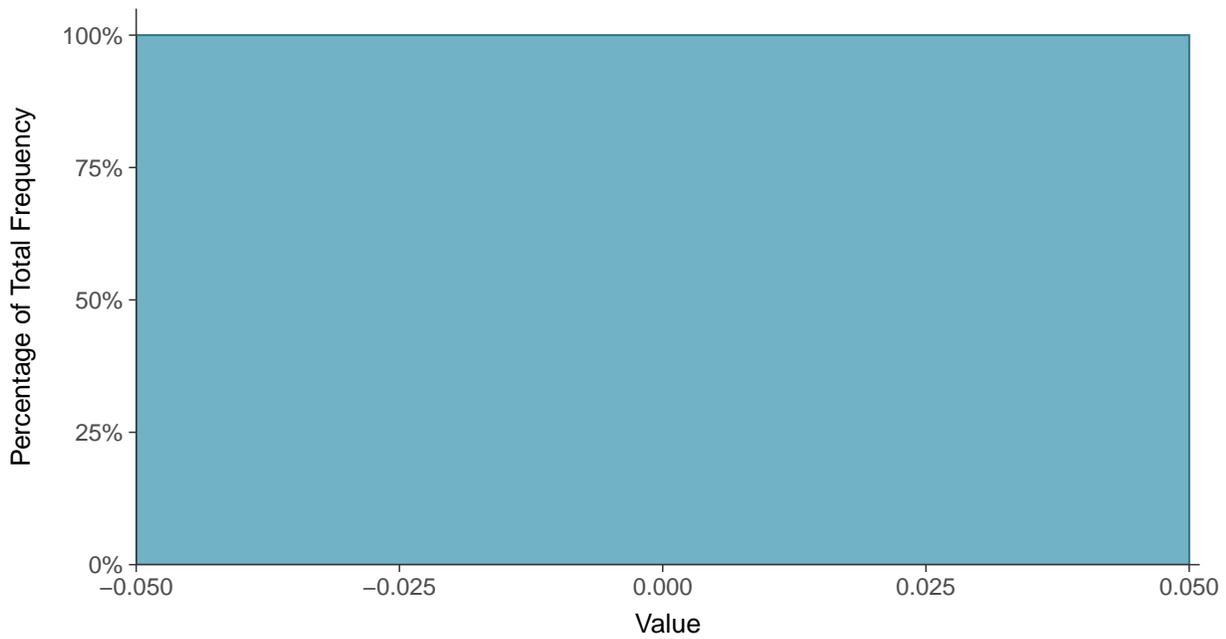
Scatter Plot

Antimony, MW-7B (mg/L)



Histogram

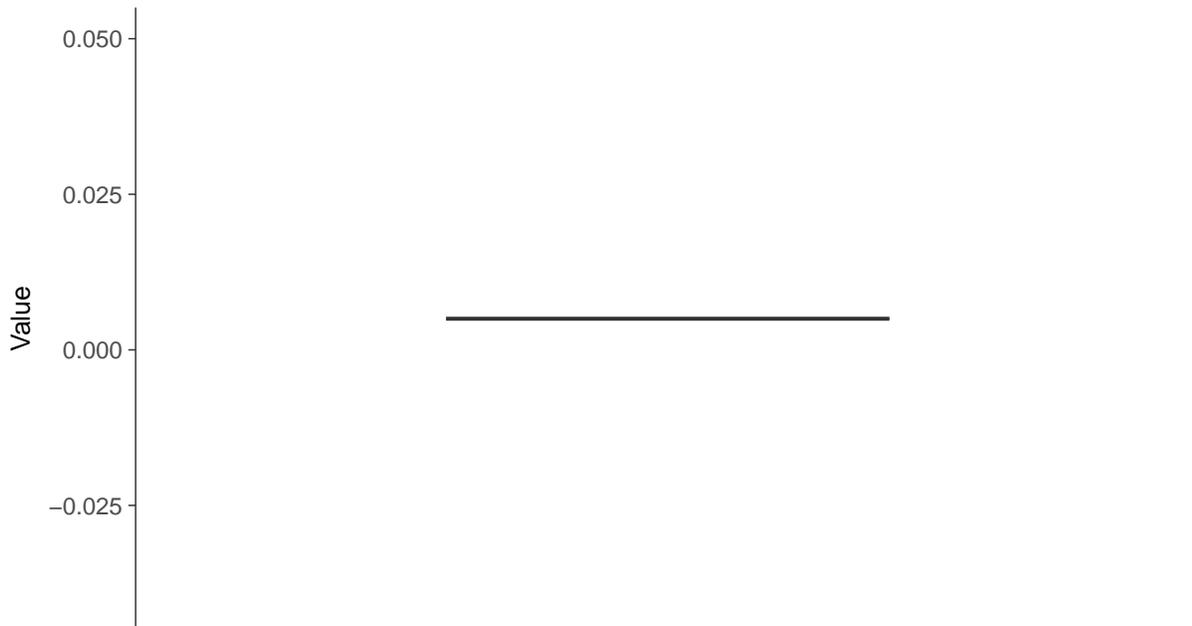
Antimony, MW-7B (mg/L)





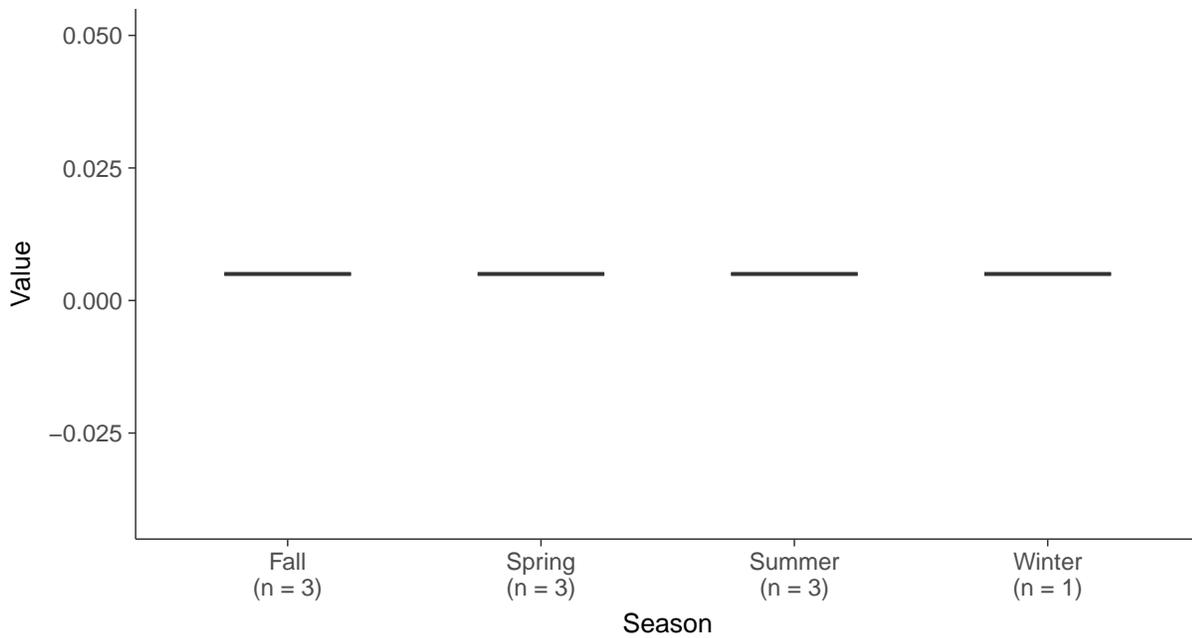
Boxplot

Antimony, MW-7B (mg/L)



Boxplot by Season

Antimony, MW-7B (mg/L)



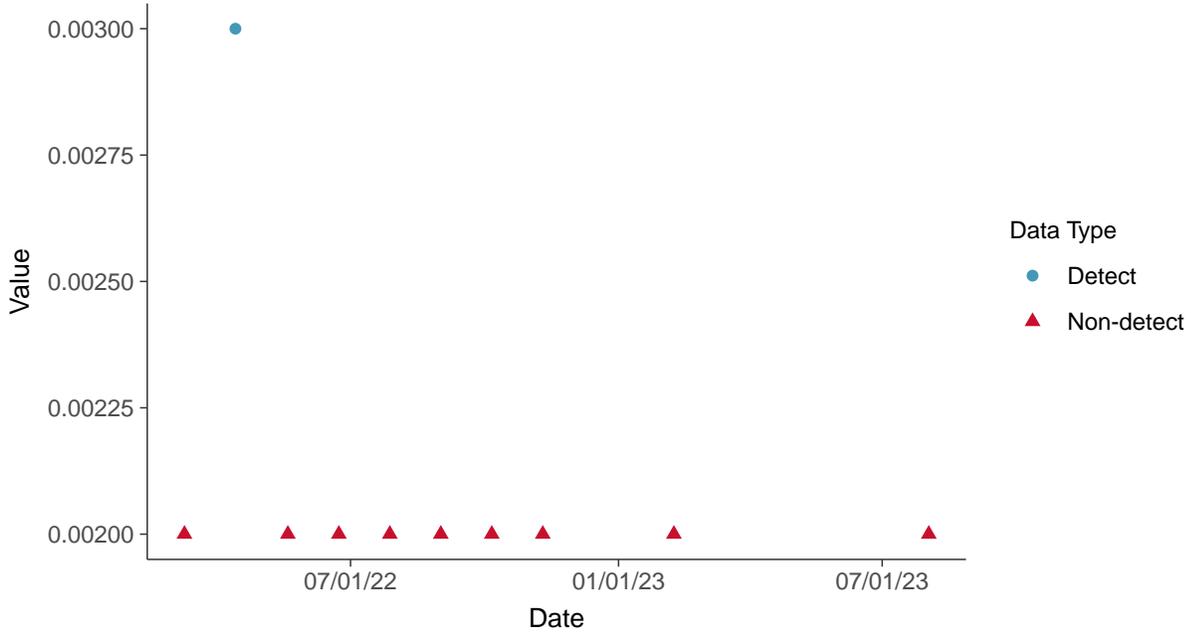


Appendix IV: Arsenic, MW-7B

ID: 7B_2_09

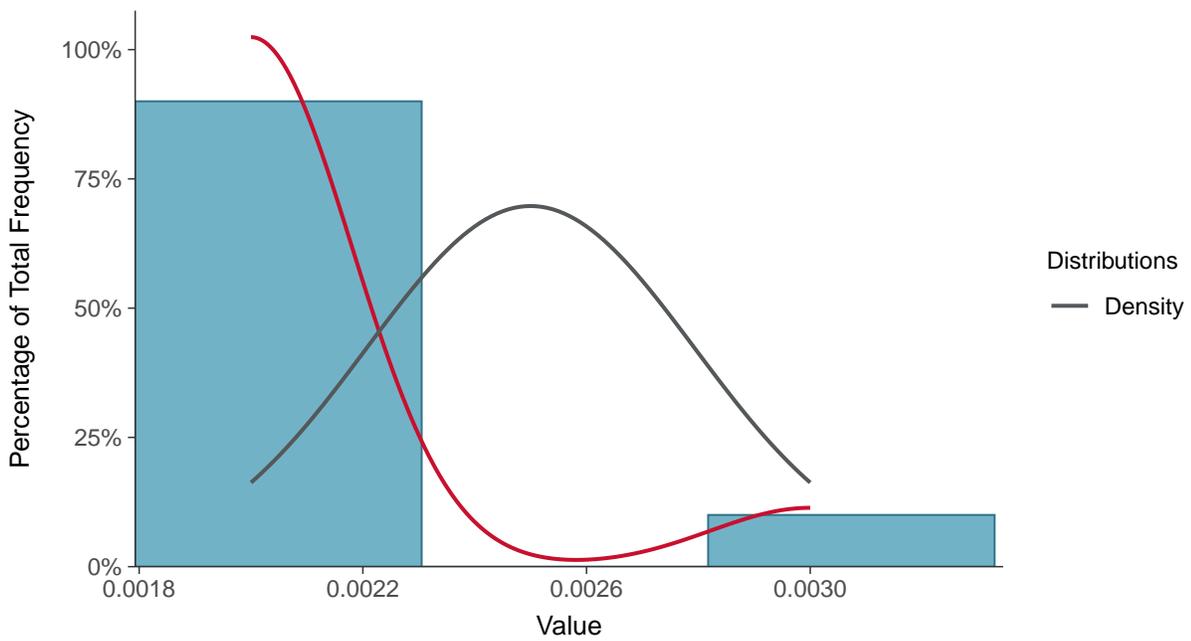
Scatter Plot

Arsenic, MW-7B (mg/L)



Histogram

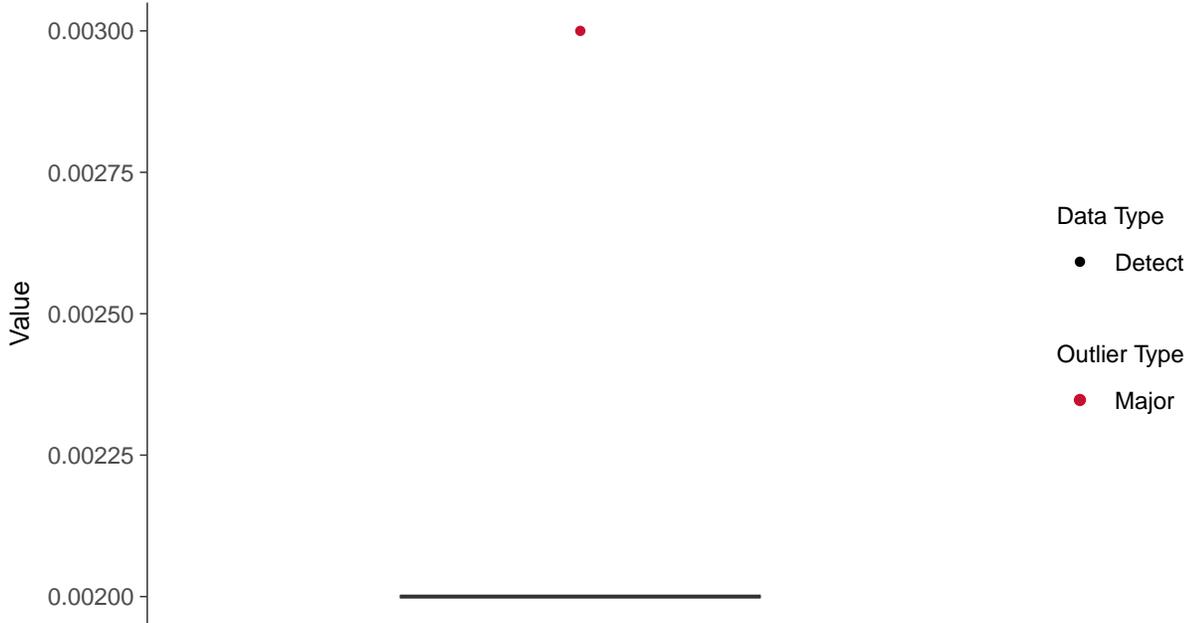
Arsenic, MW-7B (mg/L)





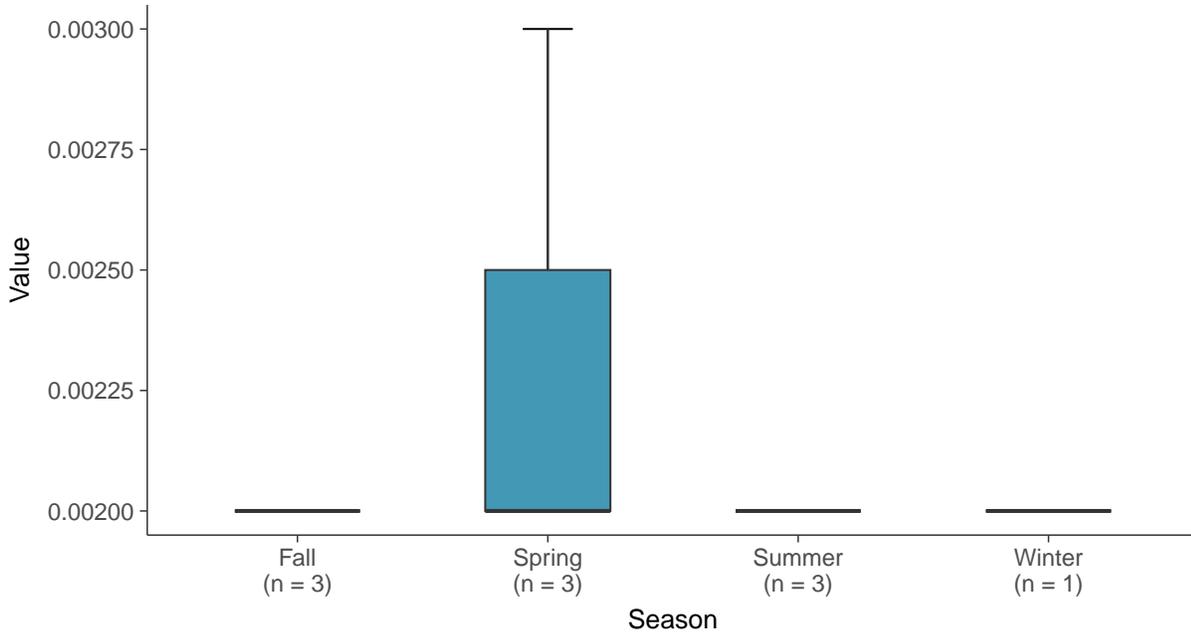
Boxplot

Arsenic, MW-7B (mg/L)



Boxplot by Season

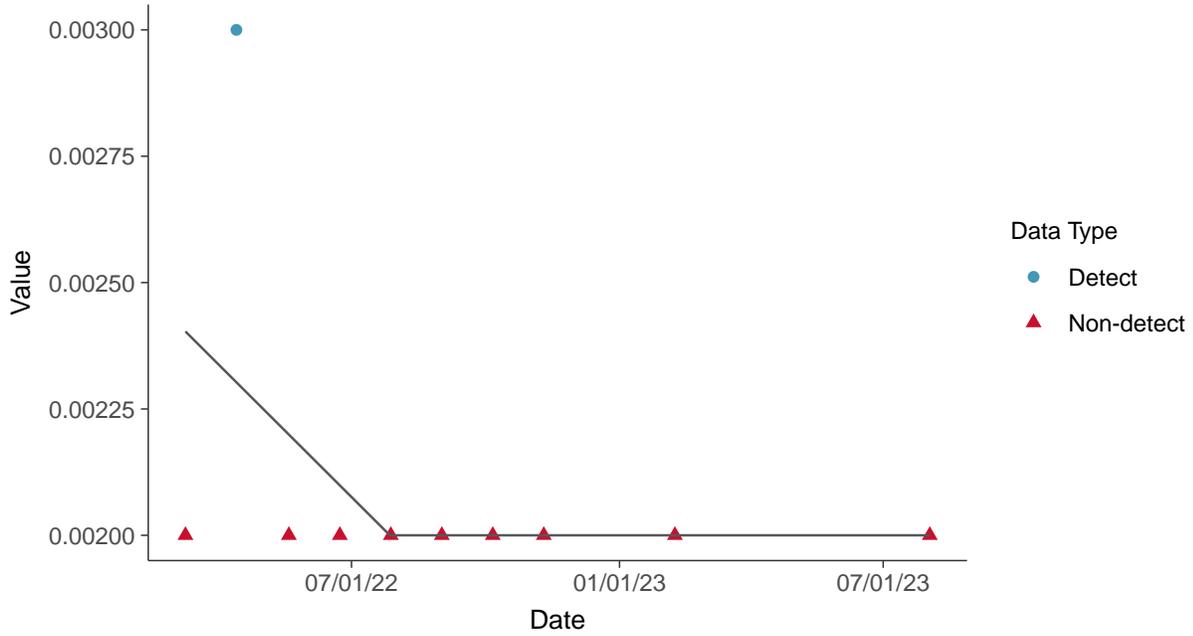
Arsenic, MW-7B (mg/L)





Trend Regression: Piecewise Linear-Linear

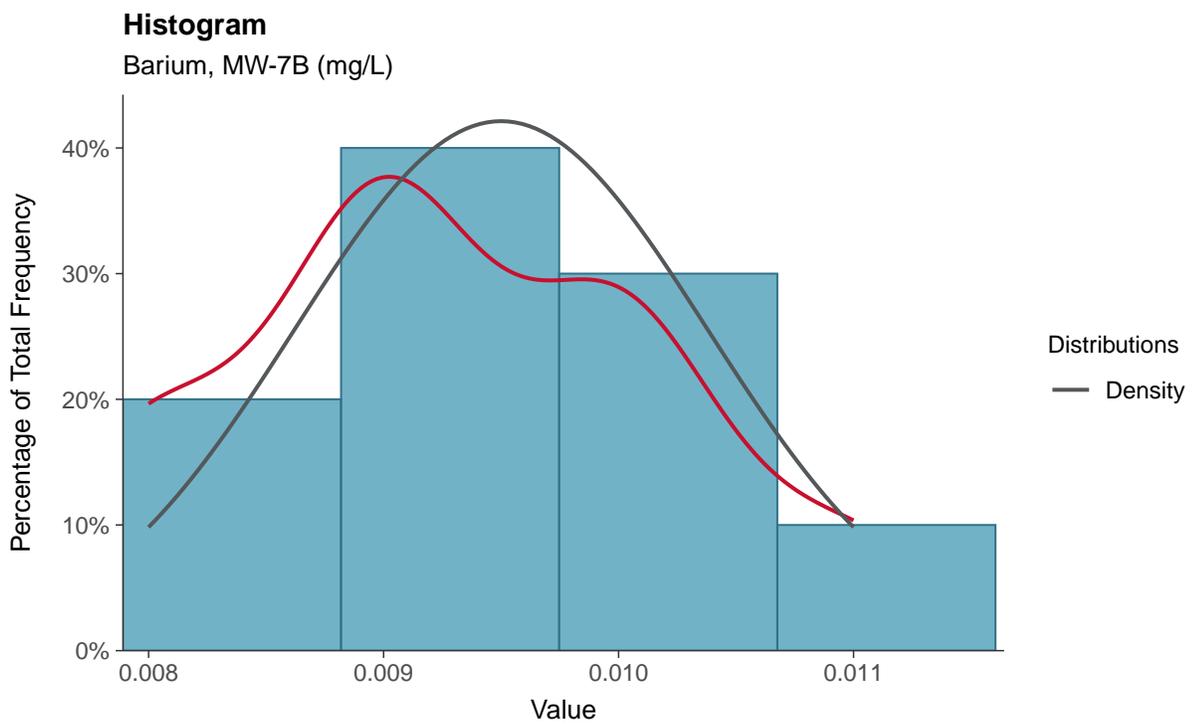
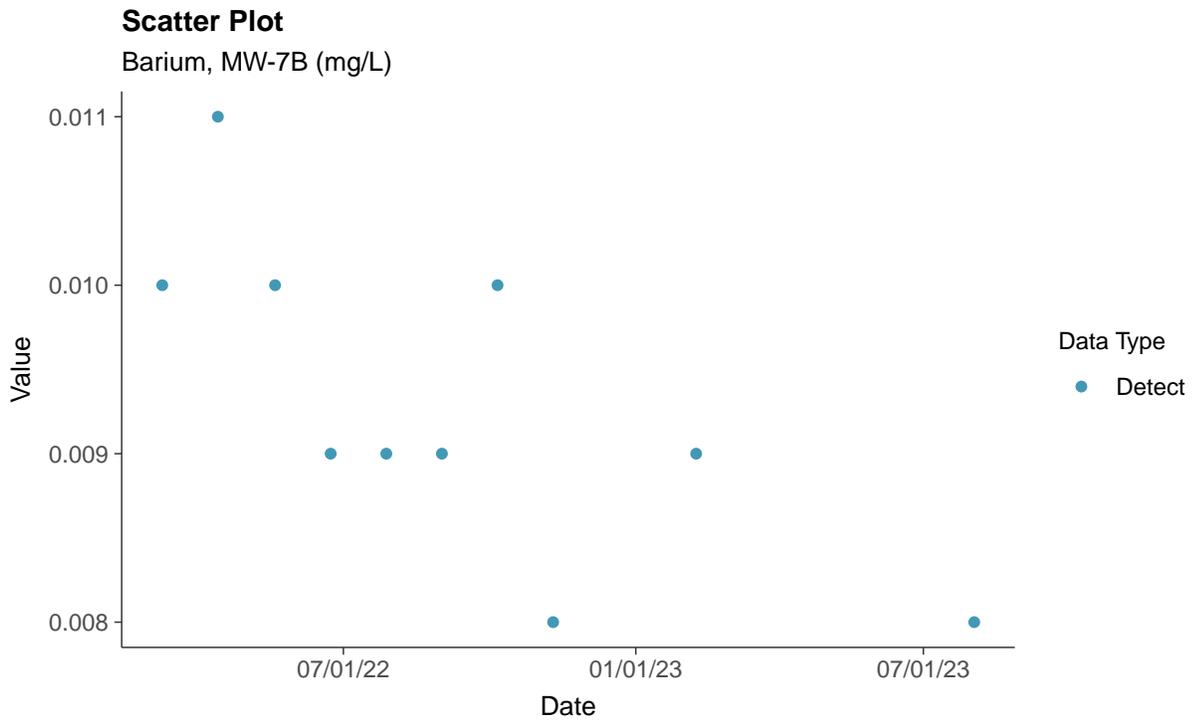
Arsenic, MW-7B (mg/L)





Appendix IV: Barium, MW-7B

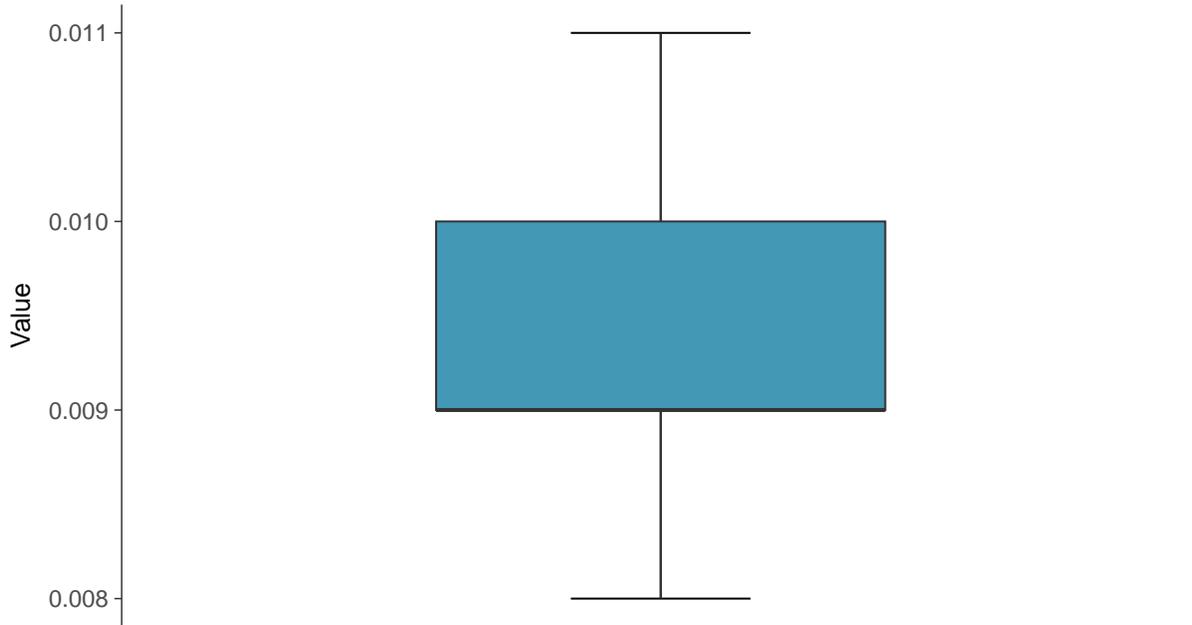
ID: 7B_2_10





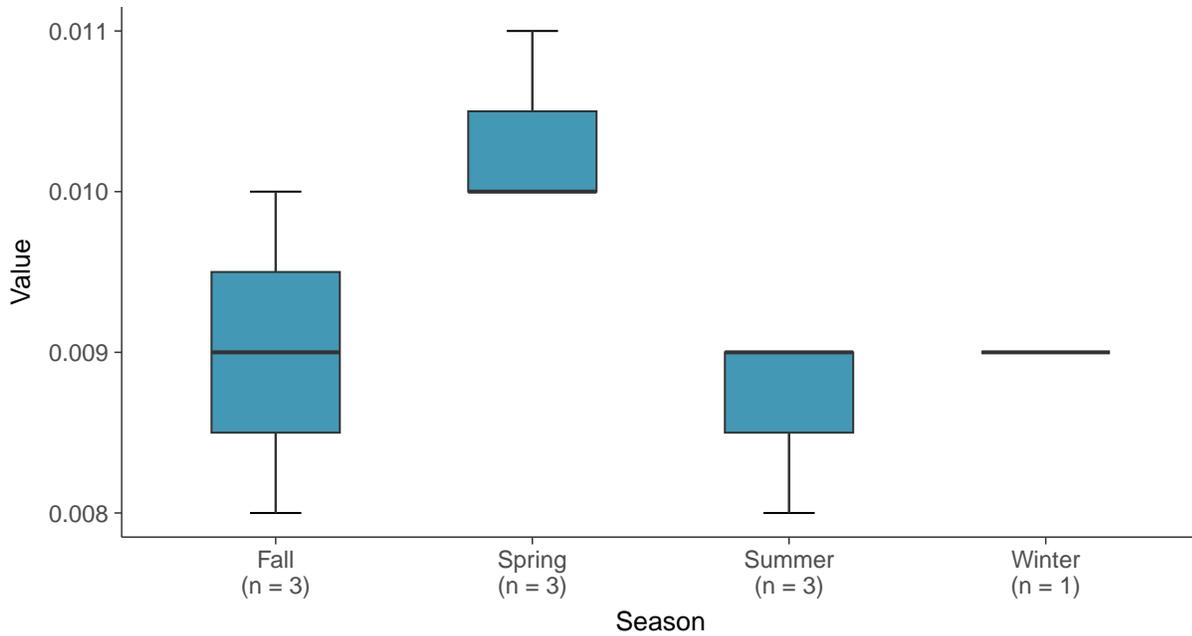
Boxplot

Barium, MW-7B (mg/L)



Boxplot by Season

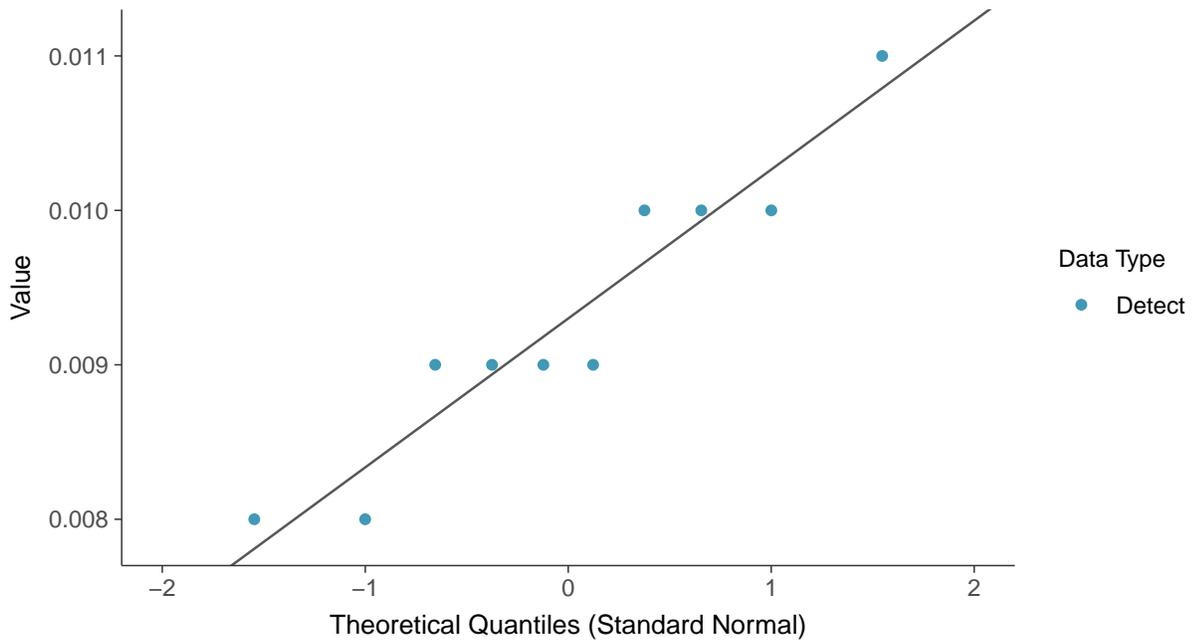
Barium, MW-7B (mg/L)





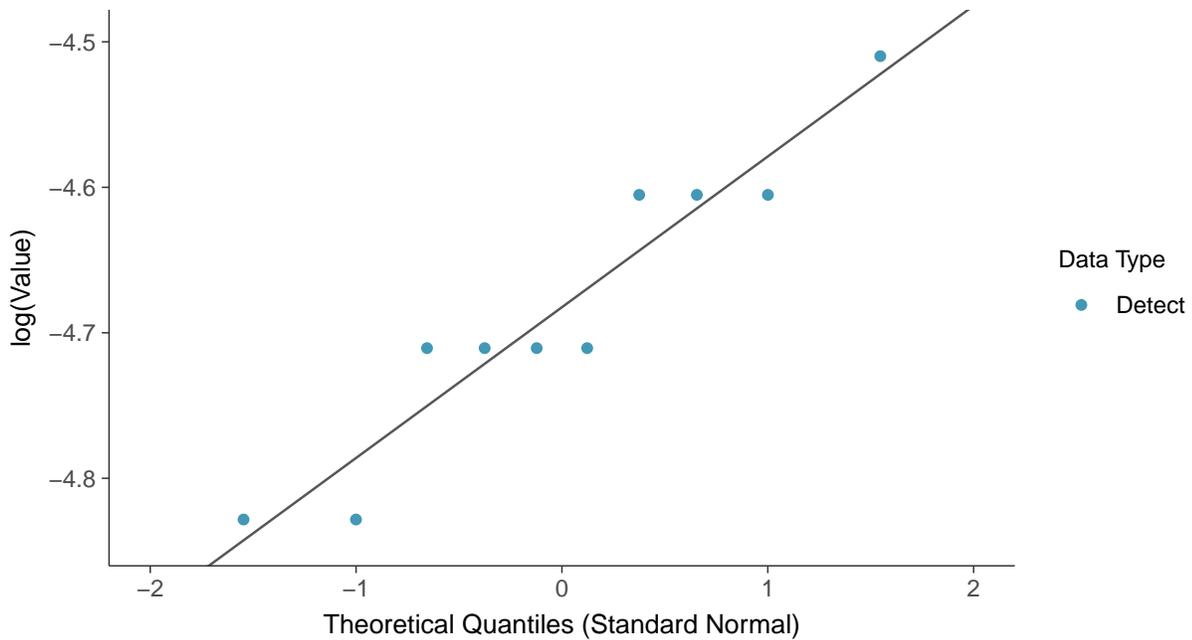
Normal Q-Q plot

Barium, MW-7B (mg/L)



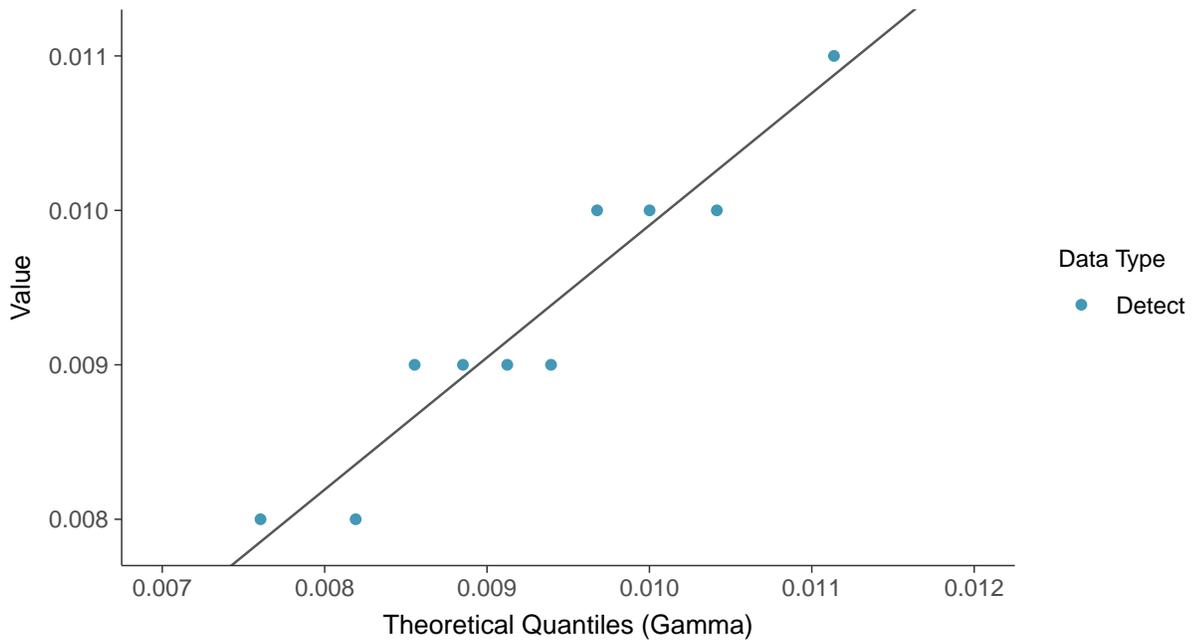
Lognormal Q-Q plot

Barium, MW-7B (mg/L)

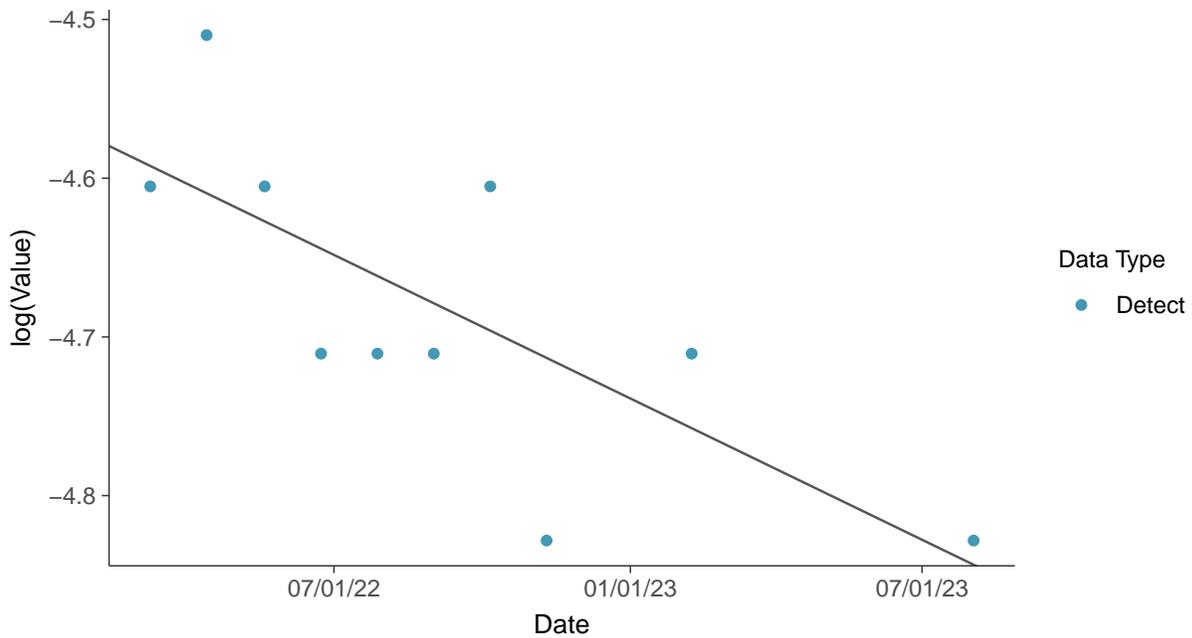




Gamma Q-Q plot
Barium, MW-7B (mg/L)



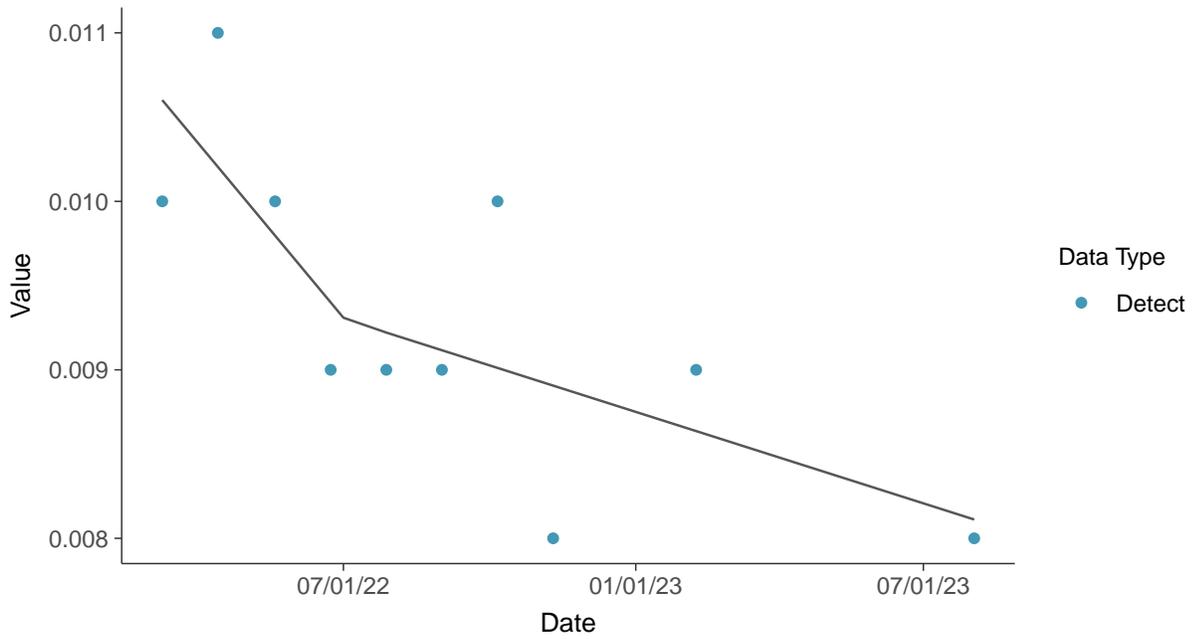
Trend Regression: Lognormal MLE
Barium, MW-7B (mg/L)





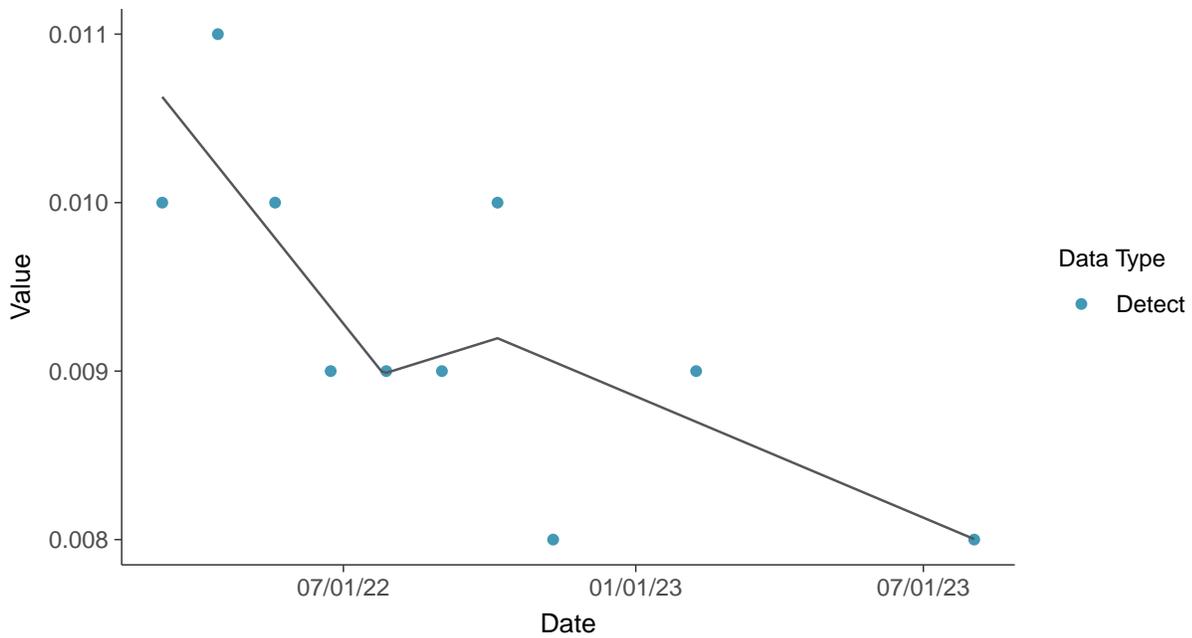
Trend Regression: Piecewise Linear-Linear

Barium, MW-7B (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

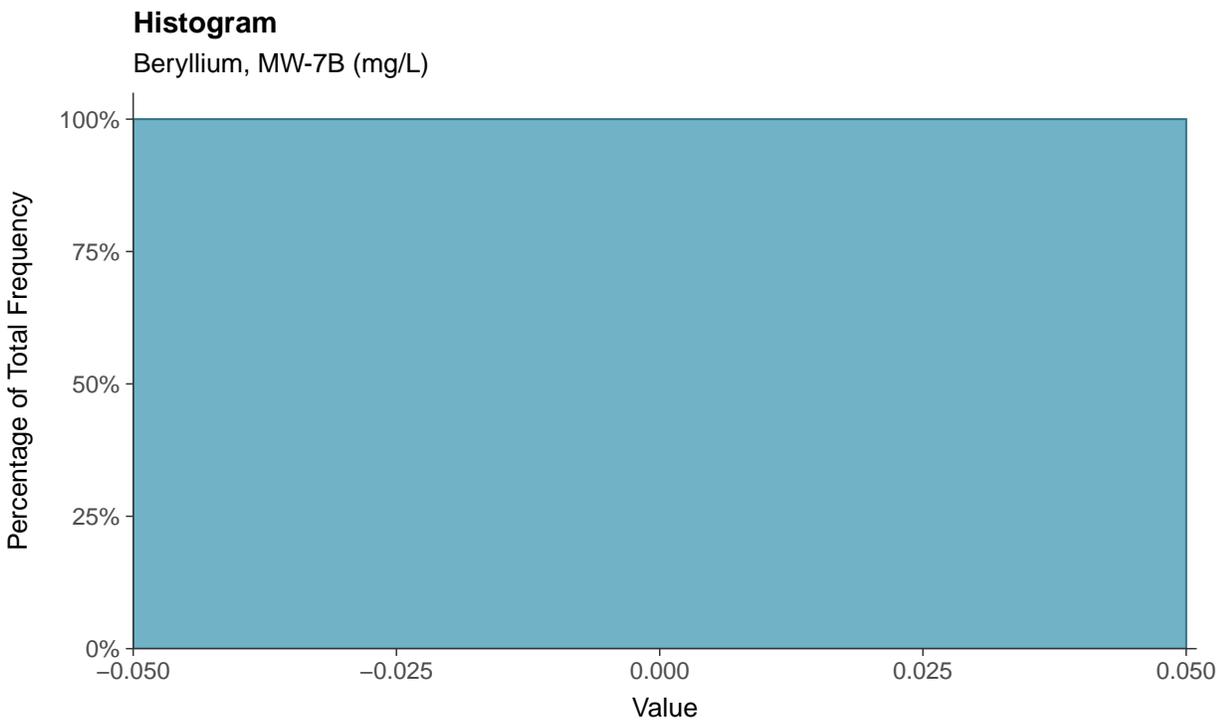
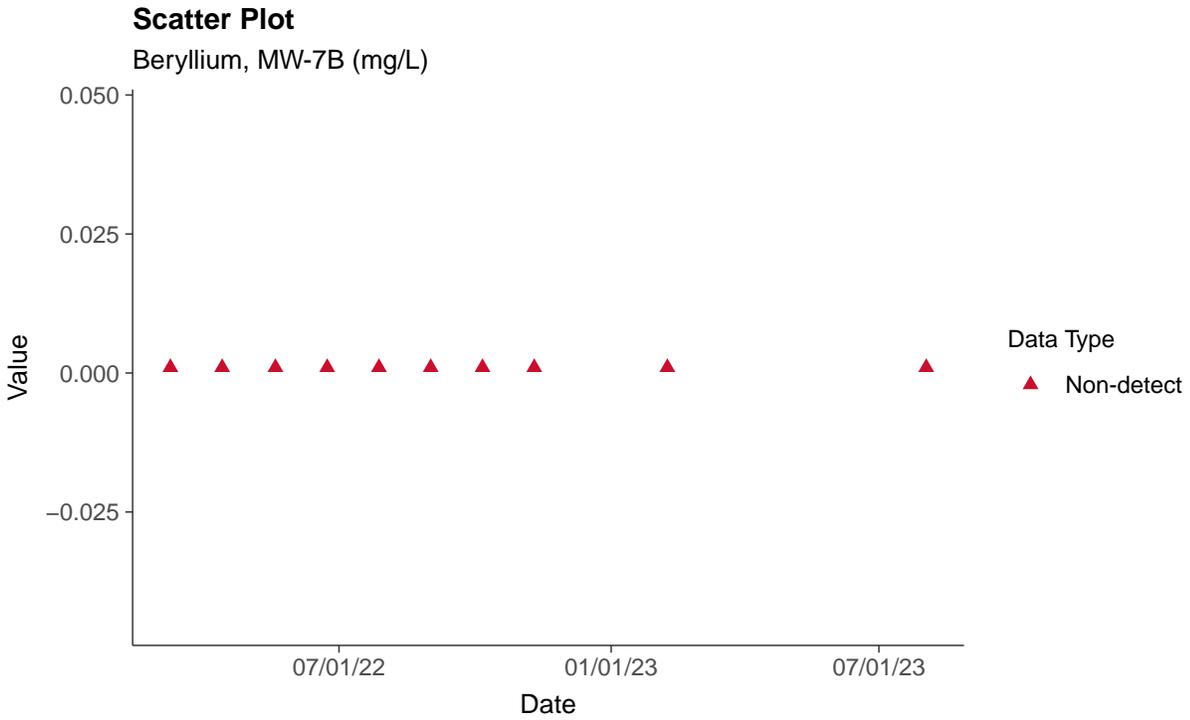
Barium, MW-7B (mg/L)





Appendix IV: Beryllium, MW-7B

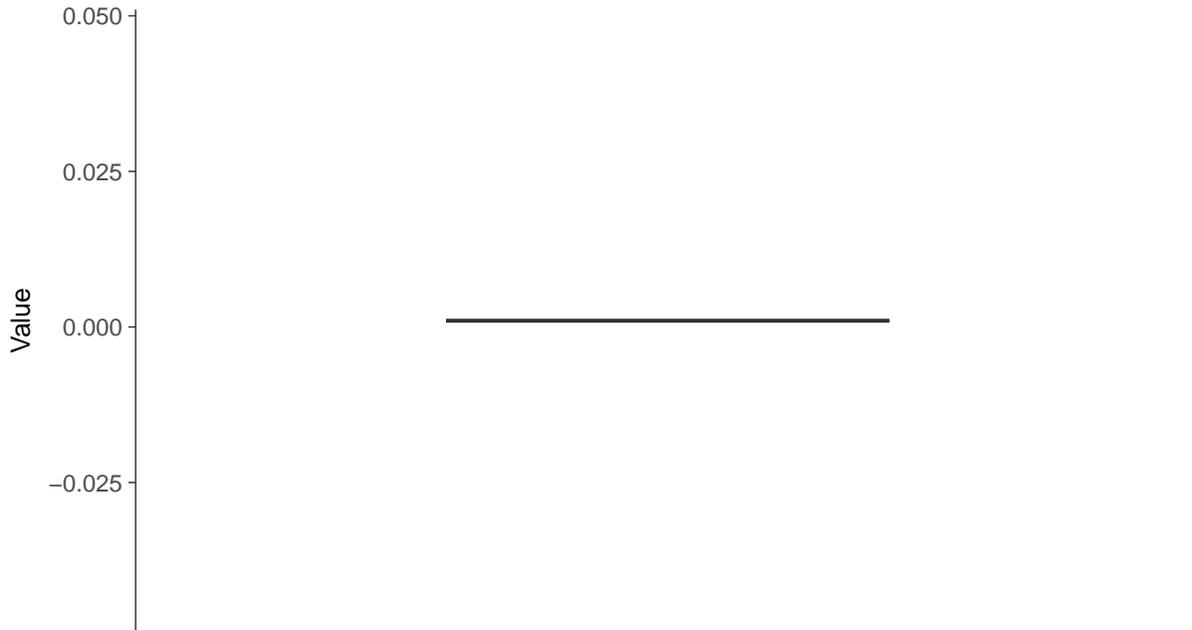
ID: 7B_2_11





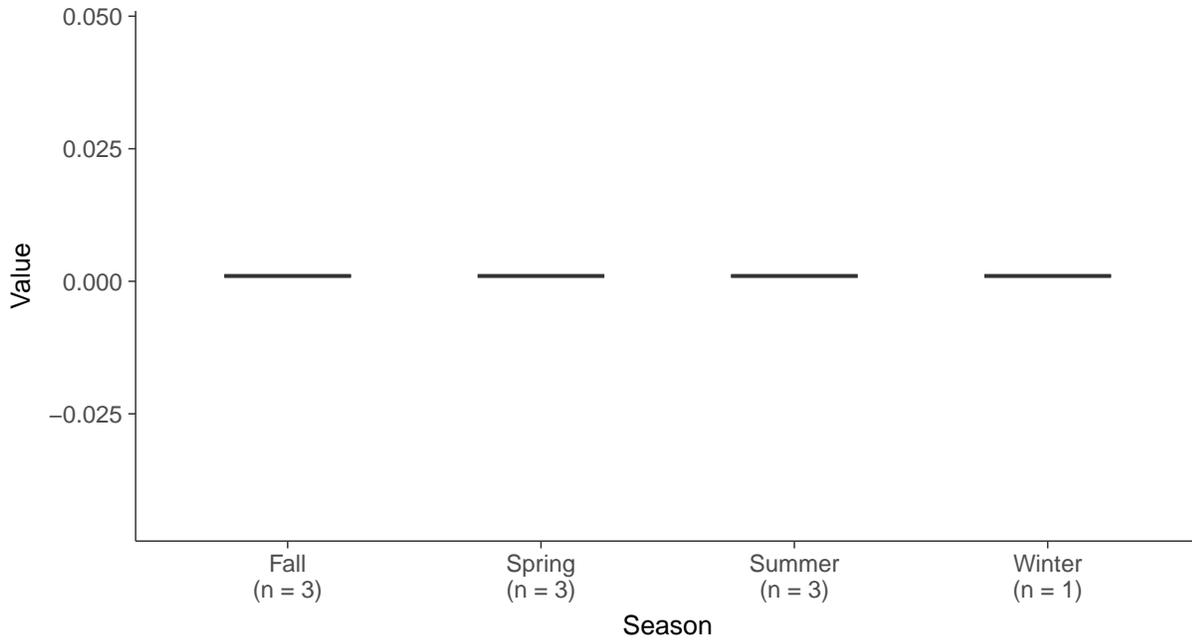
Boxplot

Beryllium, MW-7B (mg/L)



Boxplot by Season

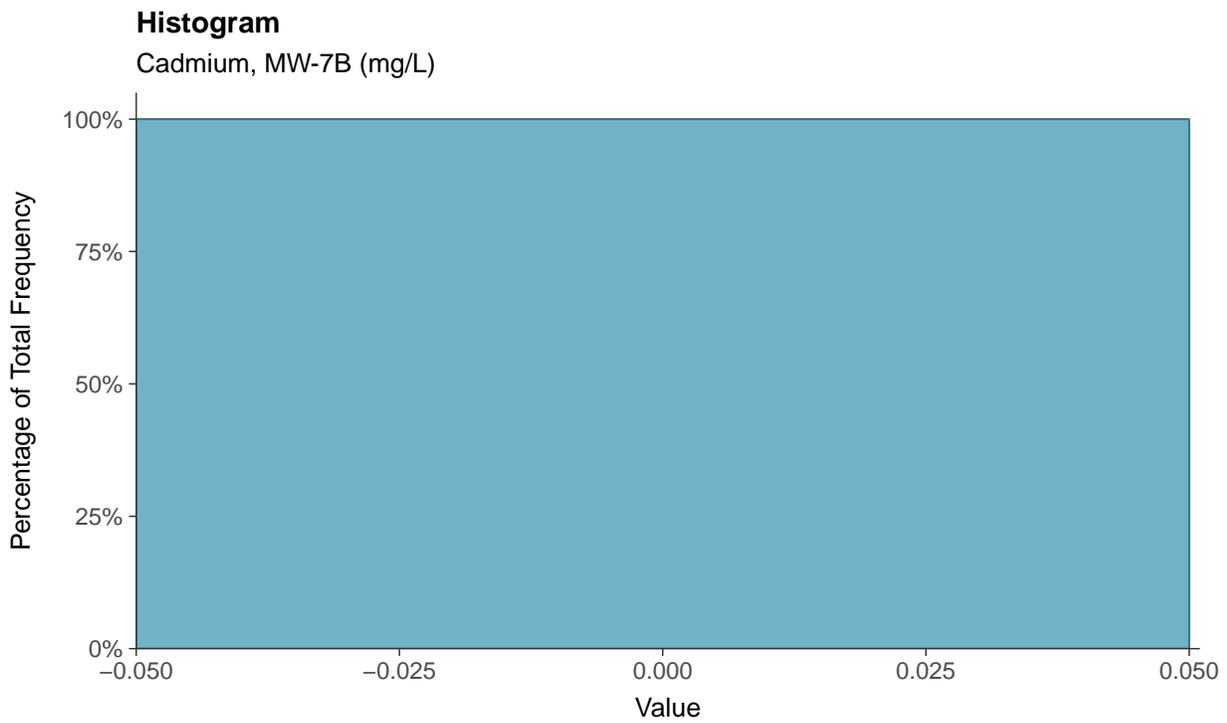
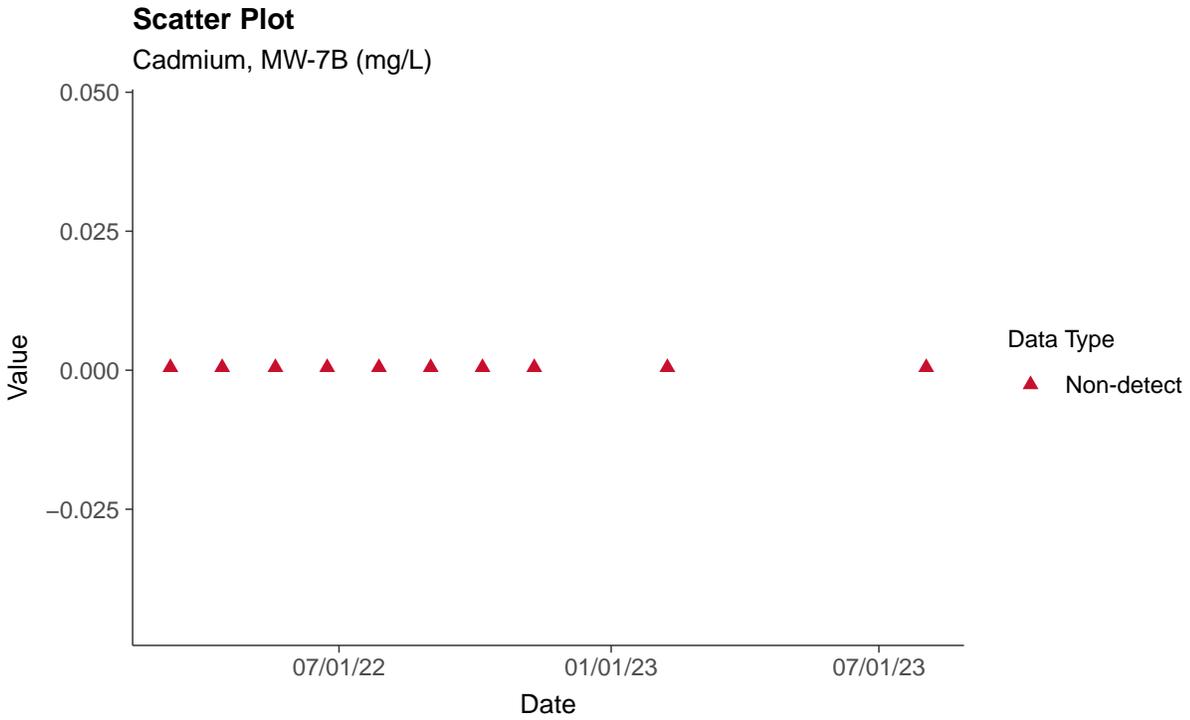
Beryllium, MW-7B (mg/L)





Appendix IV: Cadmium, MW-7B

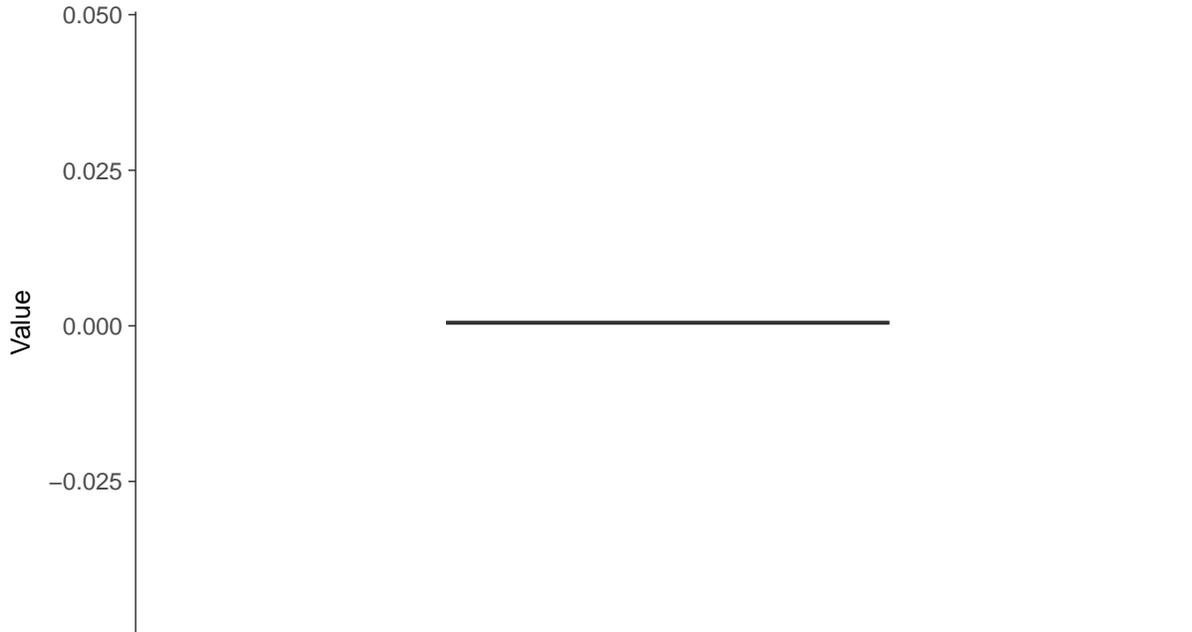
ID: 7B_2_12





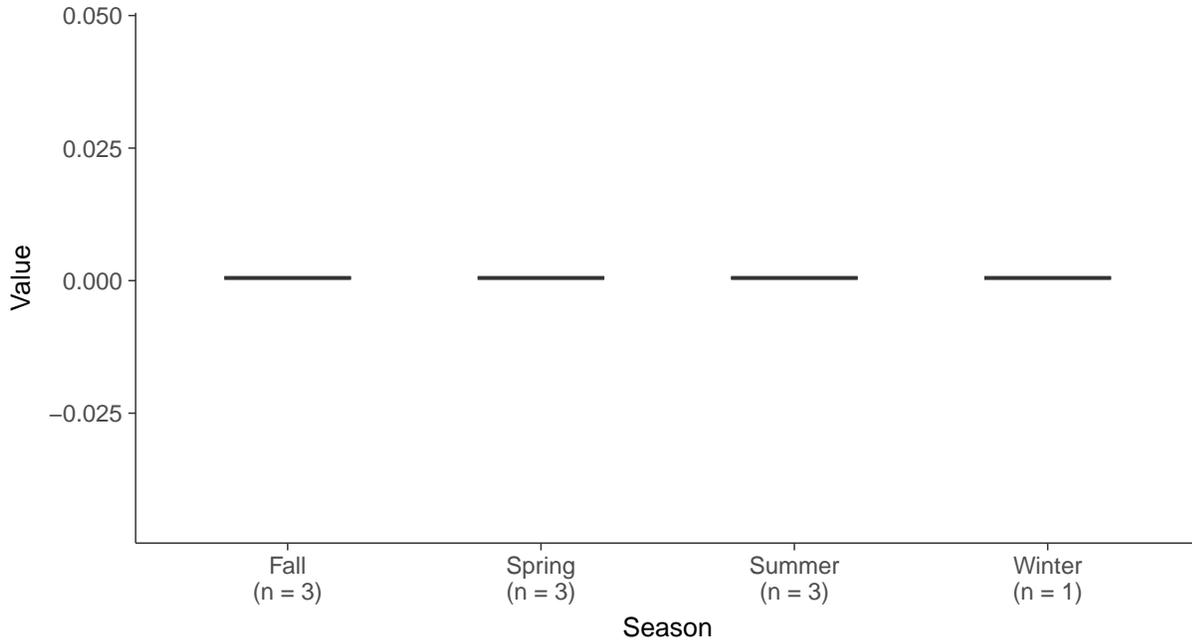
Boxplot

Cadmium, MW-7B (mg/L)



Boxplot by Season

Cadmium, MW-7B (mg/L)



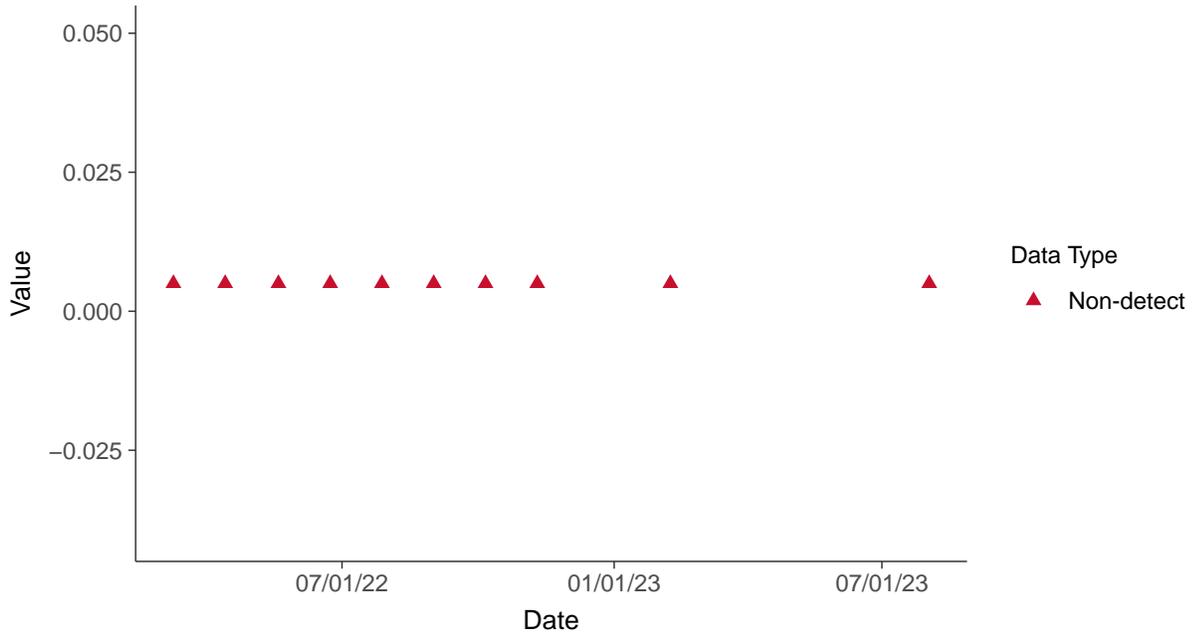


Appendix IV: Chromium, MW-7B

ID: 7B_2_13

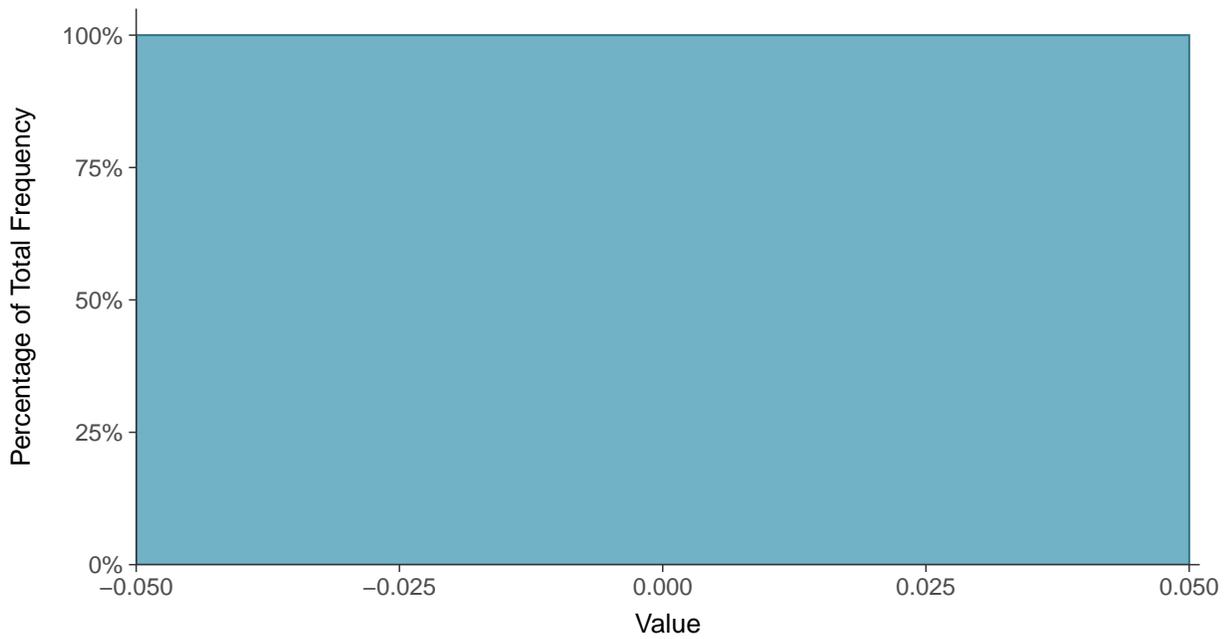
Scatter Plot

Chromium, MW-7B (mg/L)



Histogram

Chromium, MW-7B (mg/L)





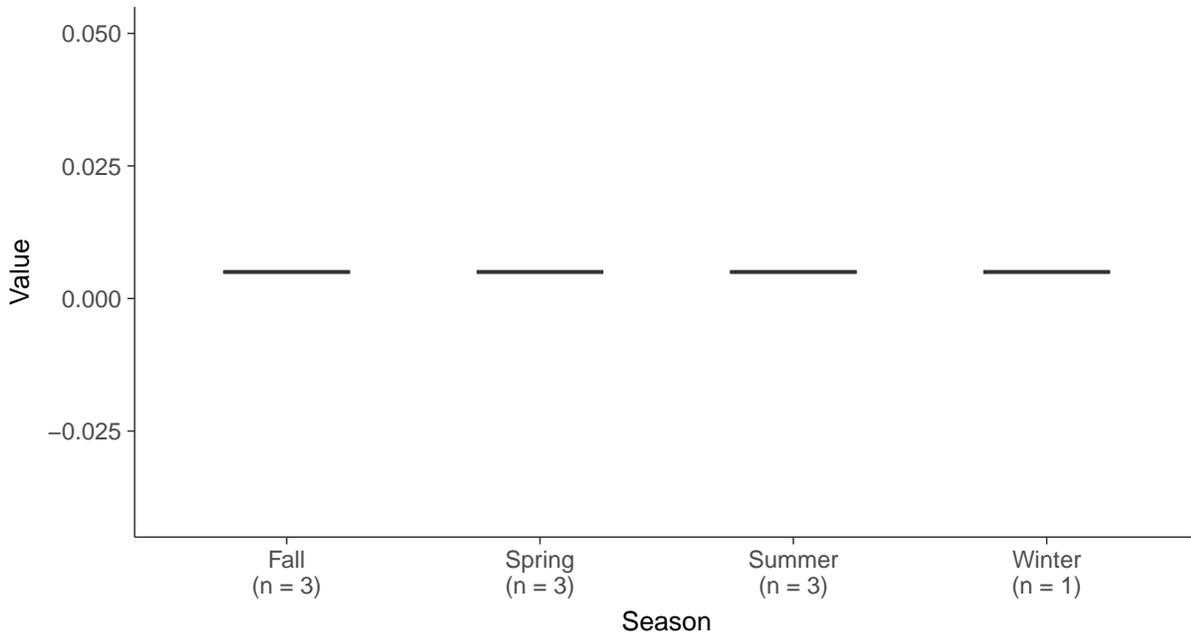
Boxplot

Chromium, MW-7B (mg/L)



Boxplot by Season

Chromium, MW-7B (mg/L)



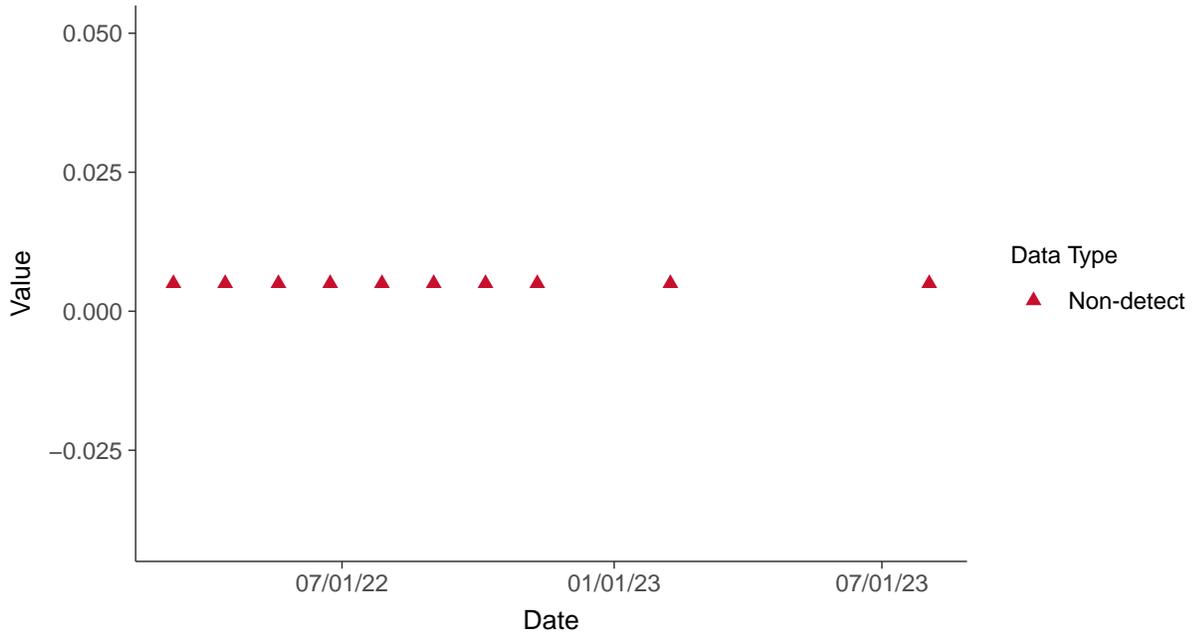


Appendix IV: Cobalt, MW-7B

ID: 7B_2_14

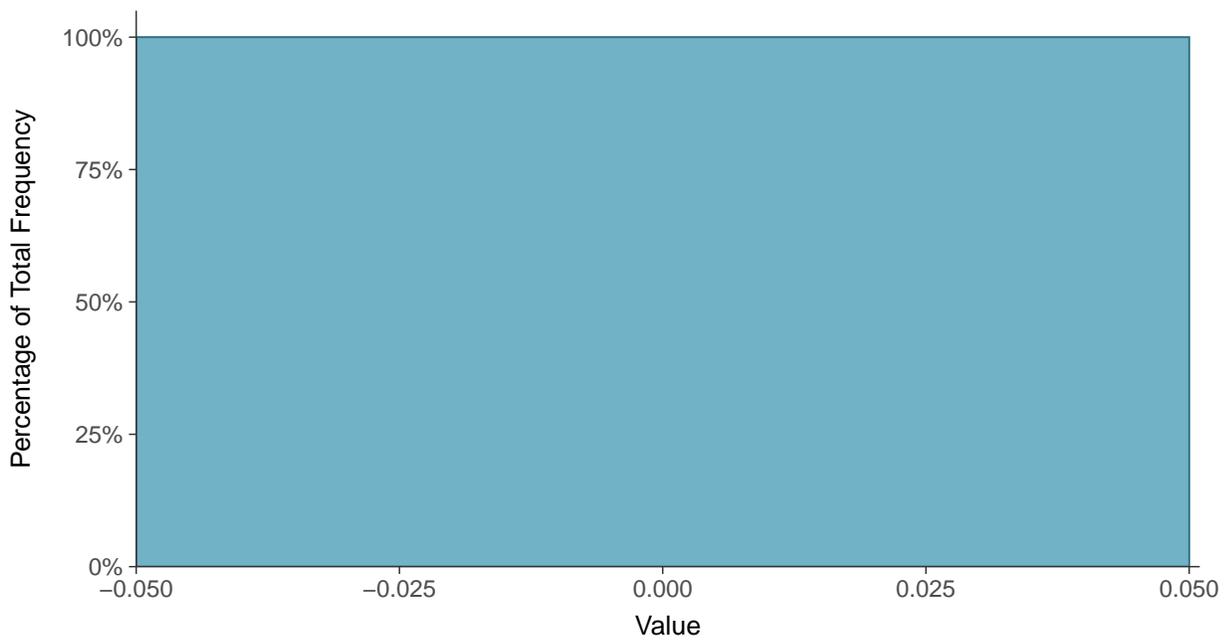
Scatter Plot

Cobalt, MW-7B (mg/L)



Histogram

Cobalt, MW-7B (mg/L)





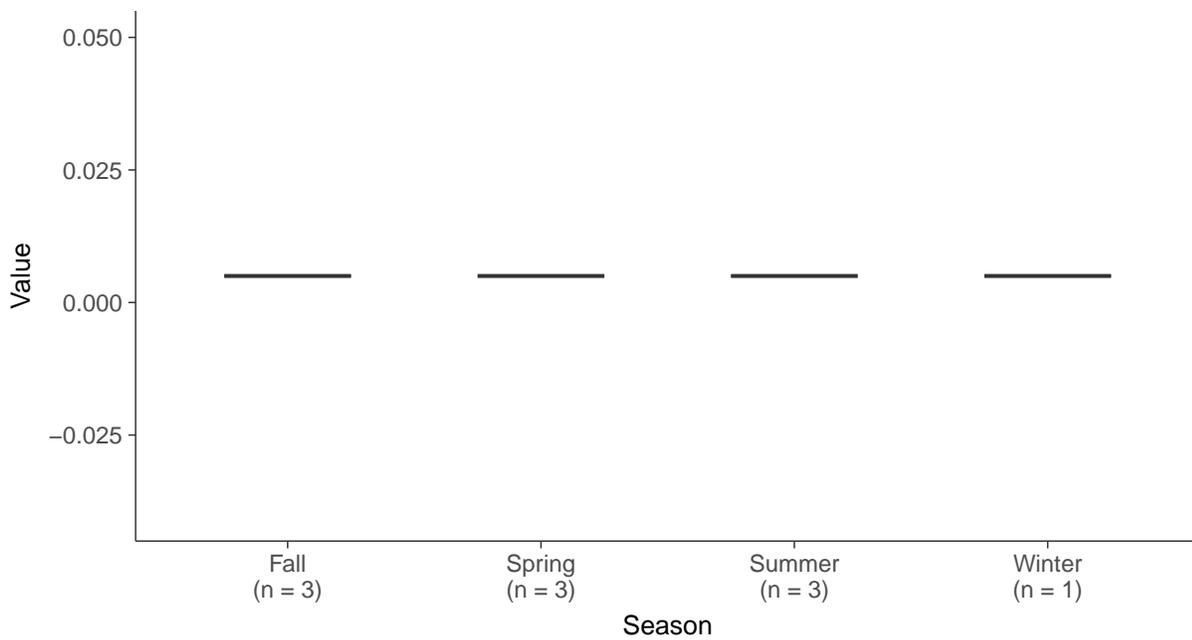
Boxplot

Cobalt, MW-7B (mg/L)



Boxplot by Season

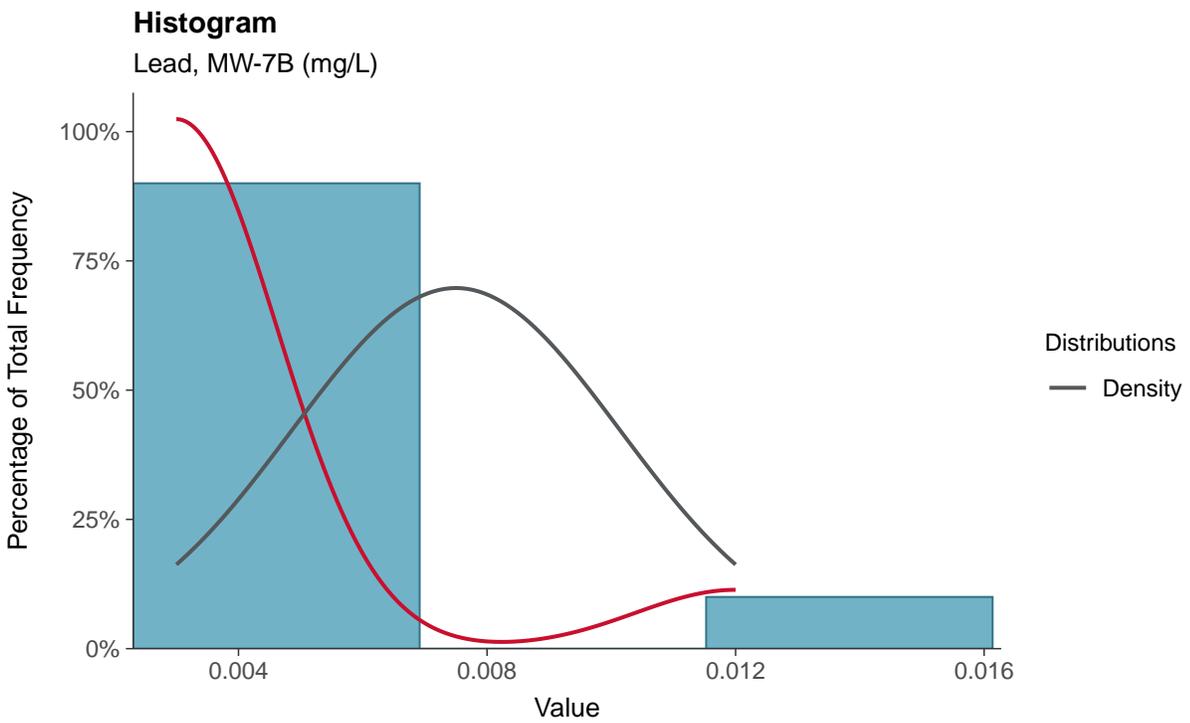
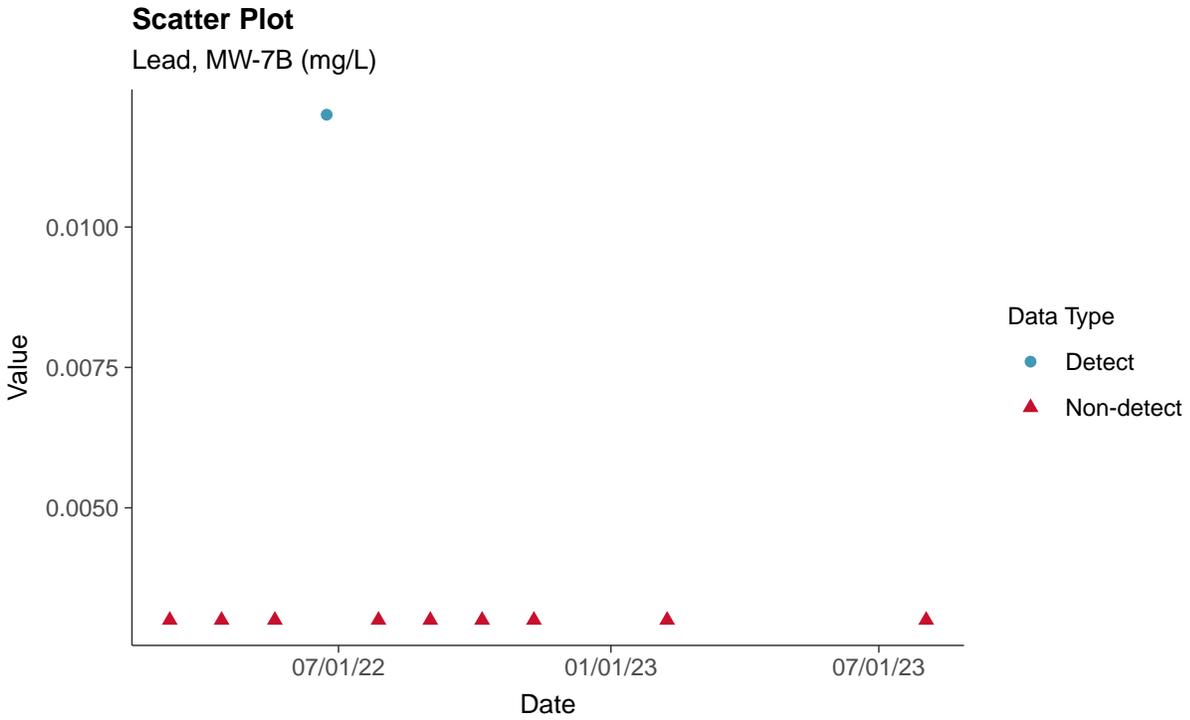
Cobalt, MW-7B (mg/L)





Appendix IV: Lead, MW-7B

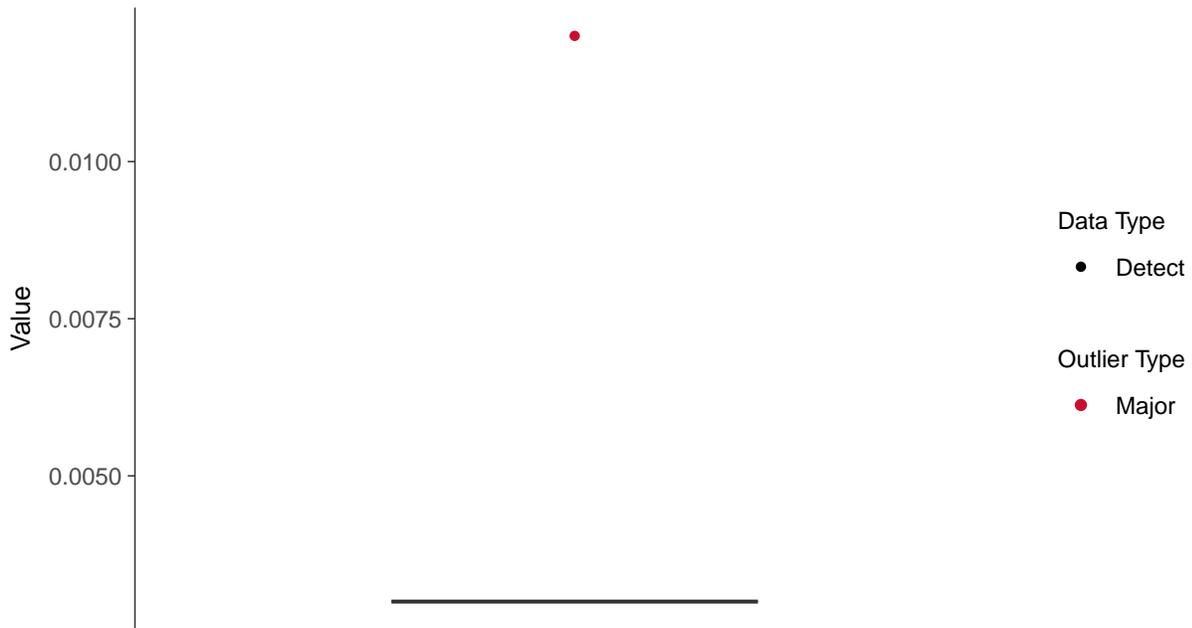
ID: 7B_2_15





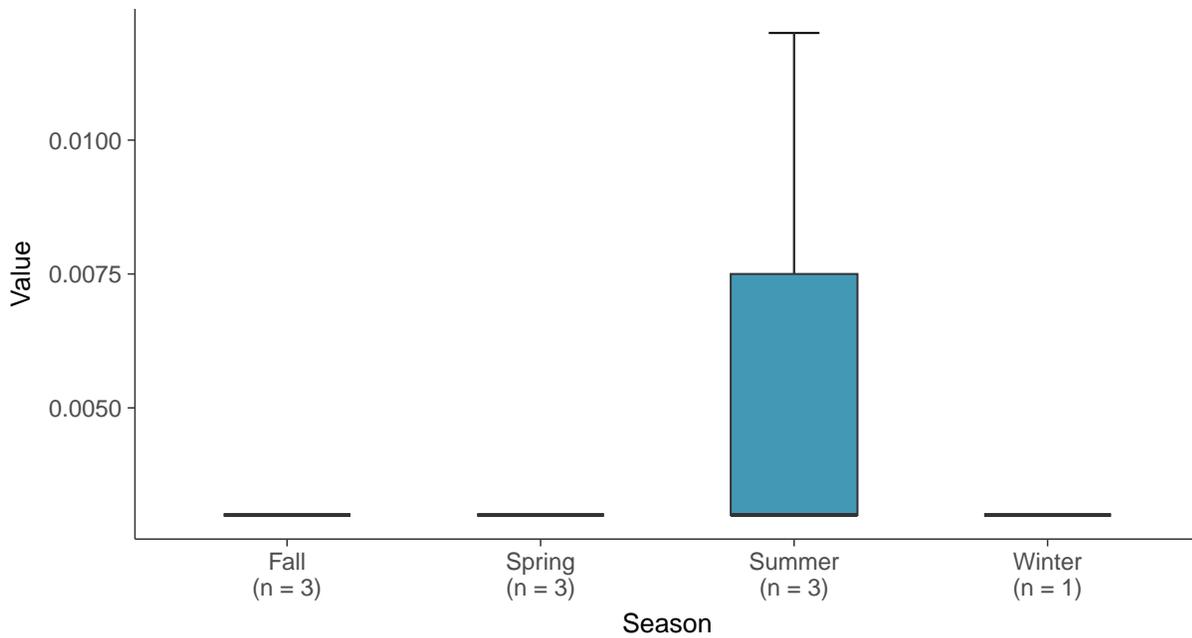
Boxplot

Lead, MW-7B (mg/L)



Boxplot by Season

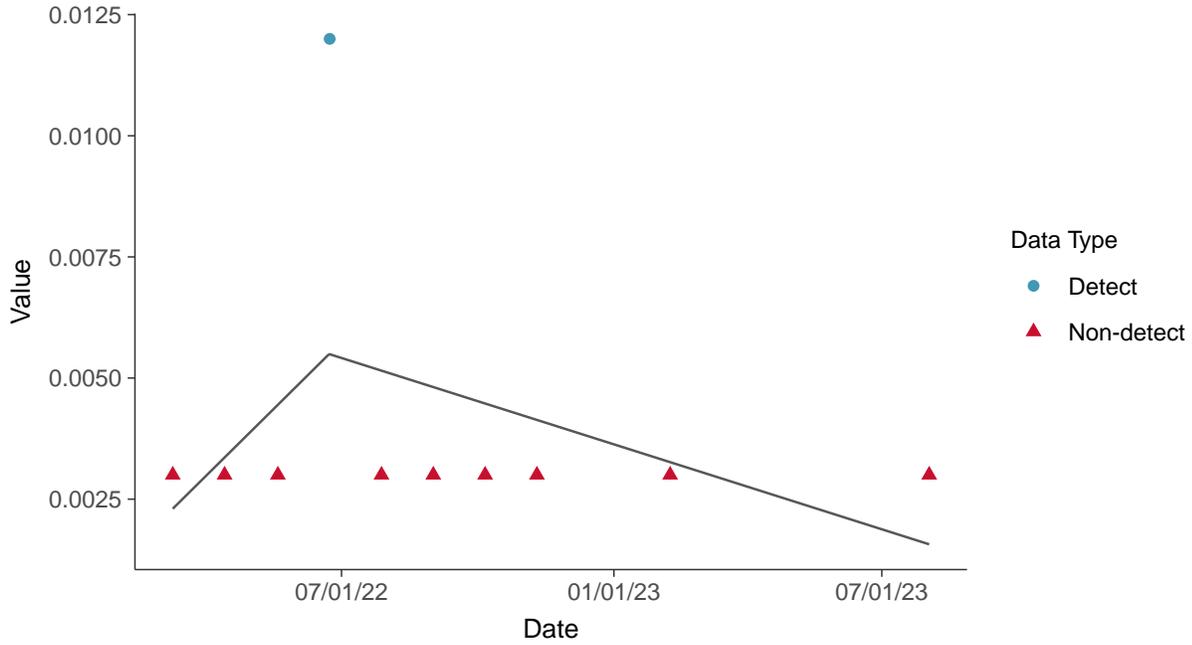
Lead, MW-7B (mg/L)





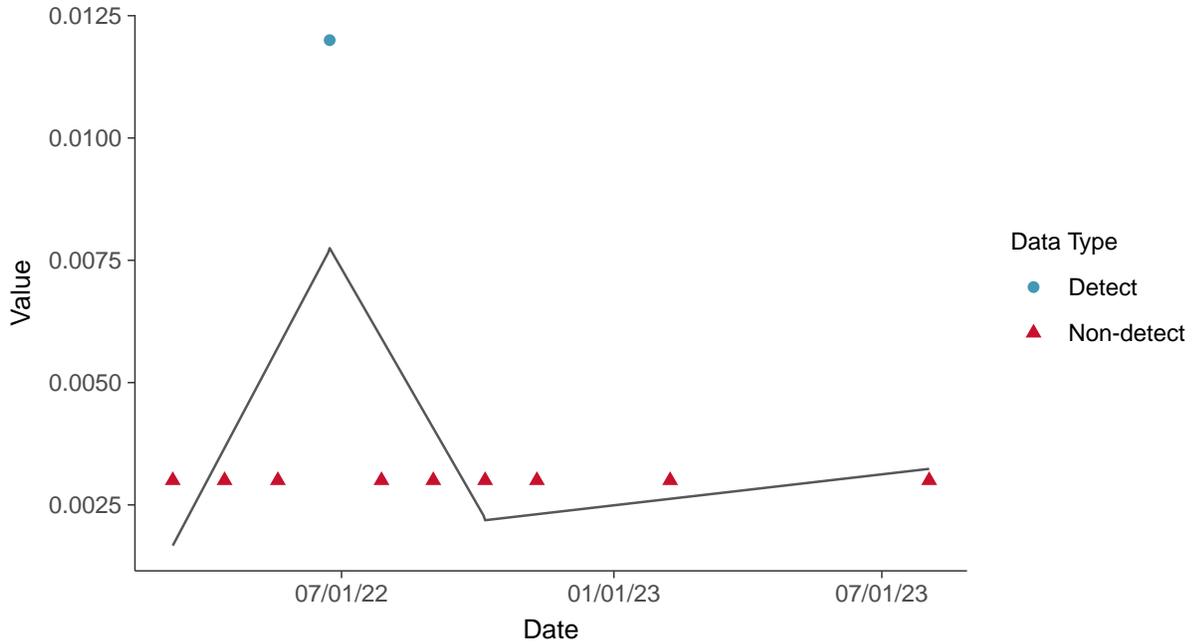
Trend Regression: Piecewise Linear-Linear

Lead, MW-7B (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

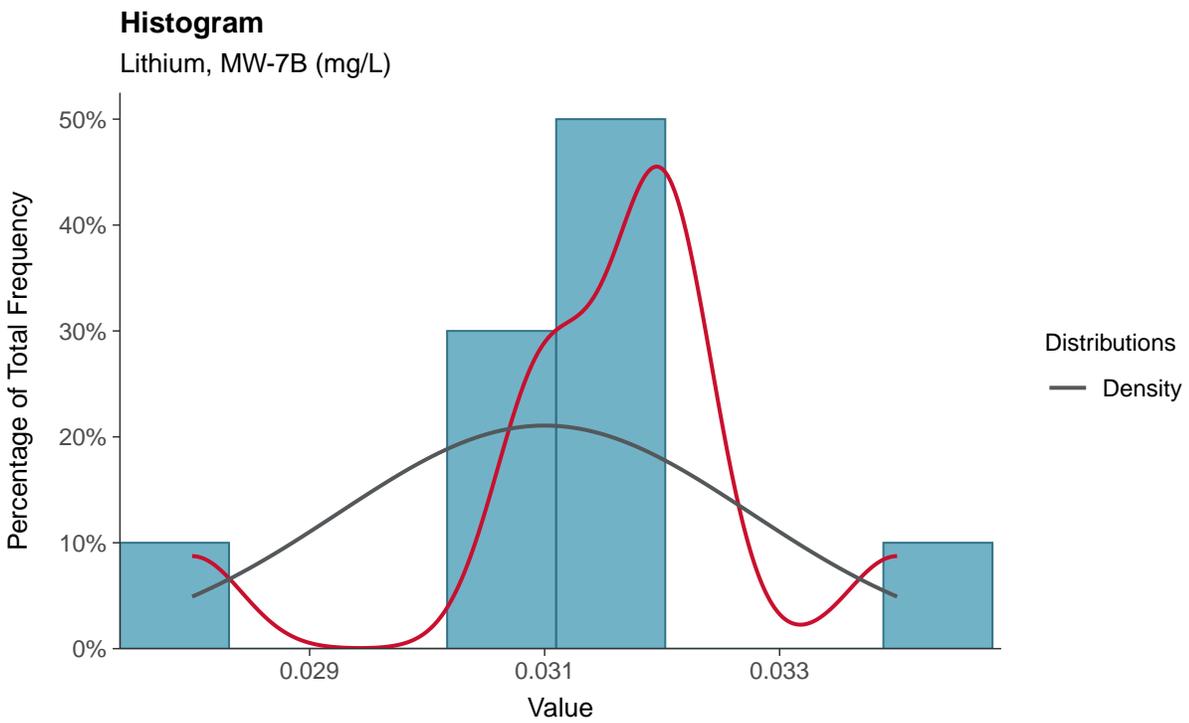
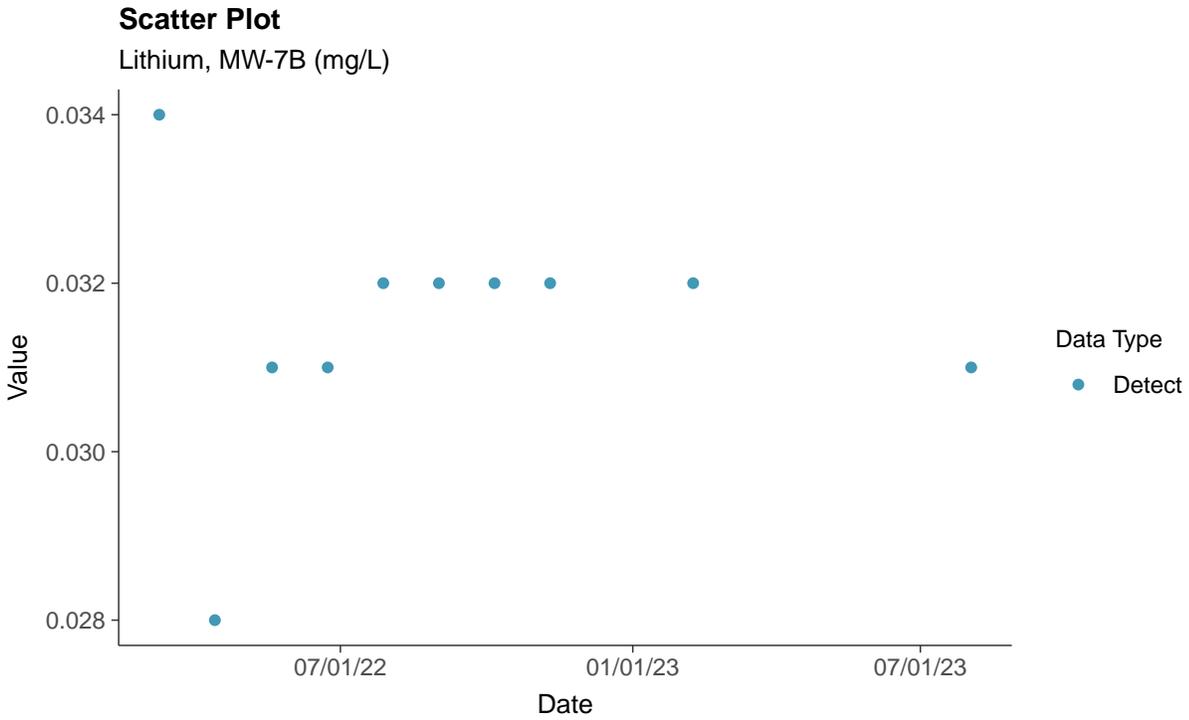
Lead, MW-7B (mg/L)





Appendix IV: Lithium, MW-7B

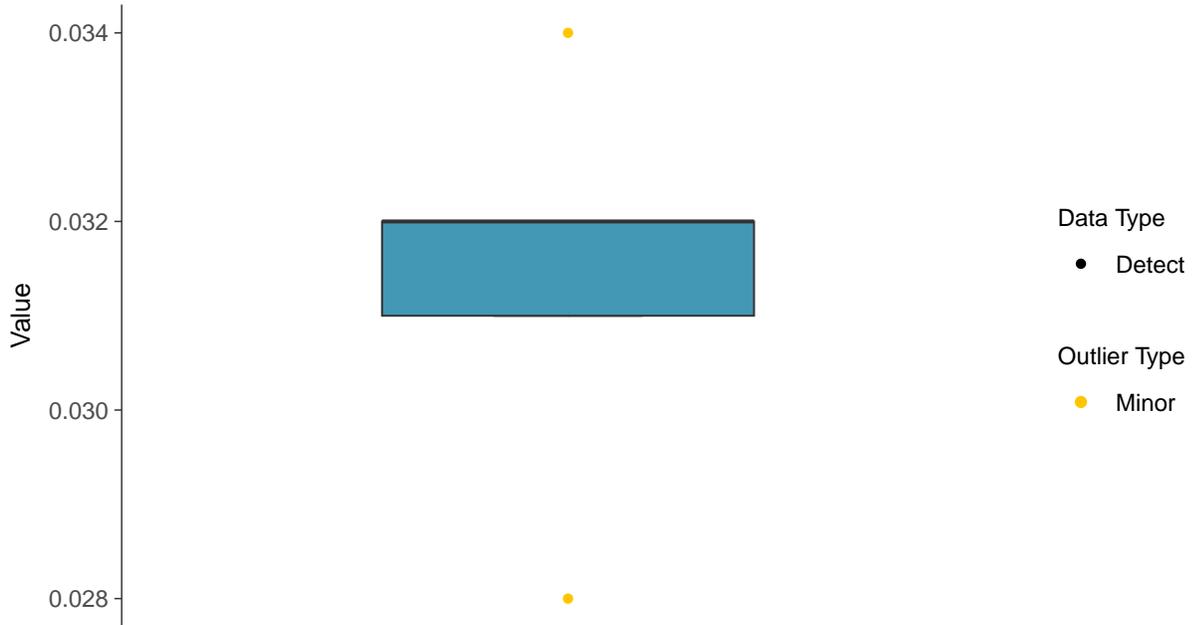
ID: 7B_2_16





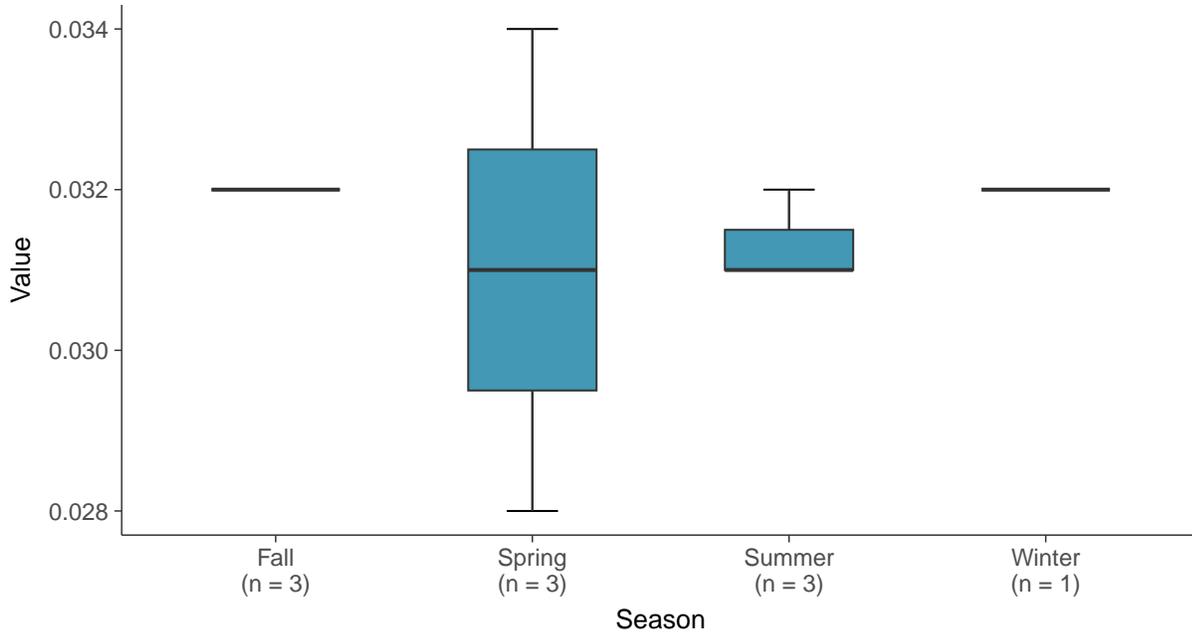
Boxplot

Lithium, MW-7B (mg/L)



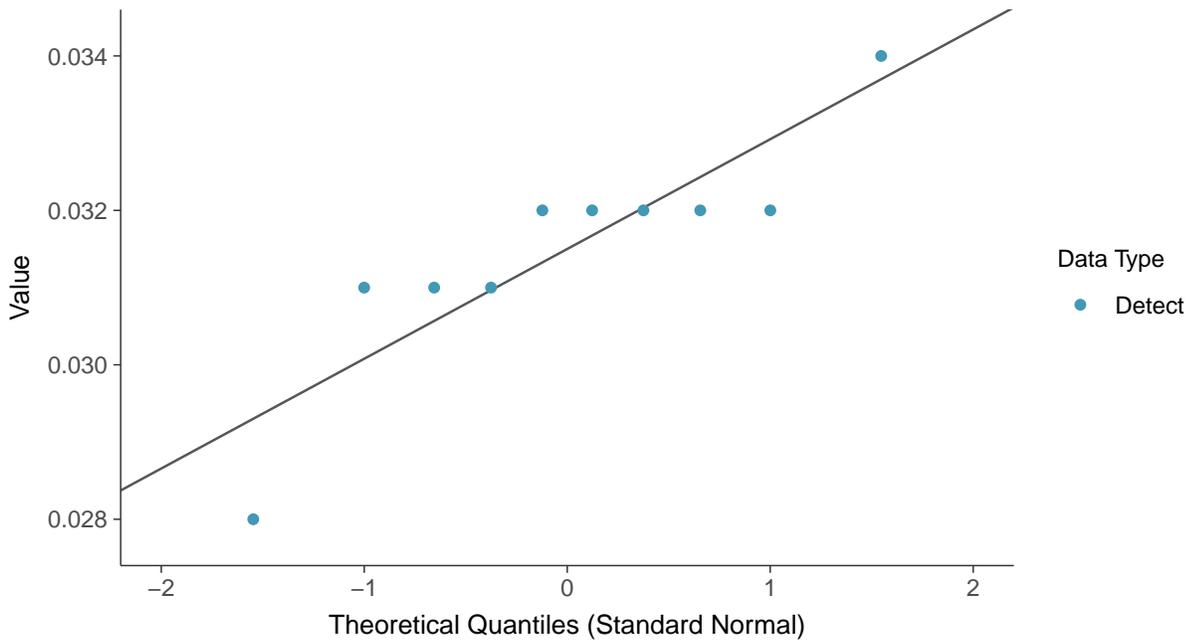
Boxplot by Season

Lithium, MW-7B (mg/L)

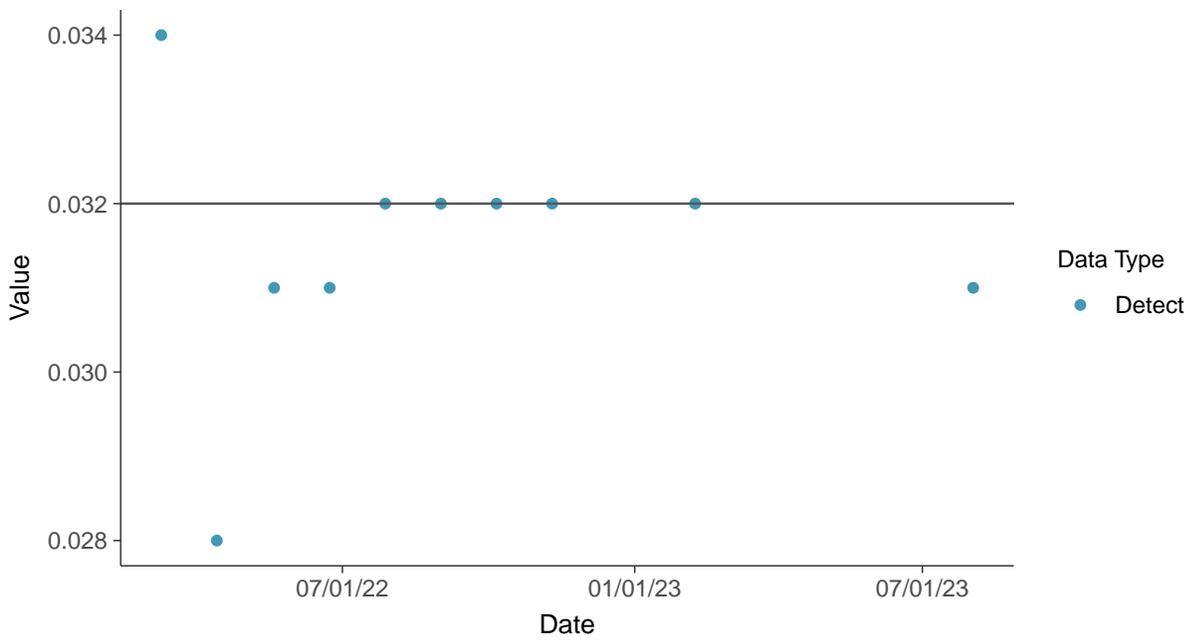




Normal Q-Q plot
Lithium, MW-7B (mg/L)



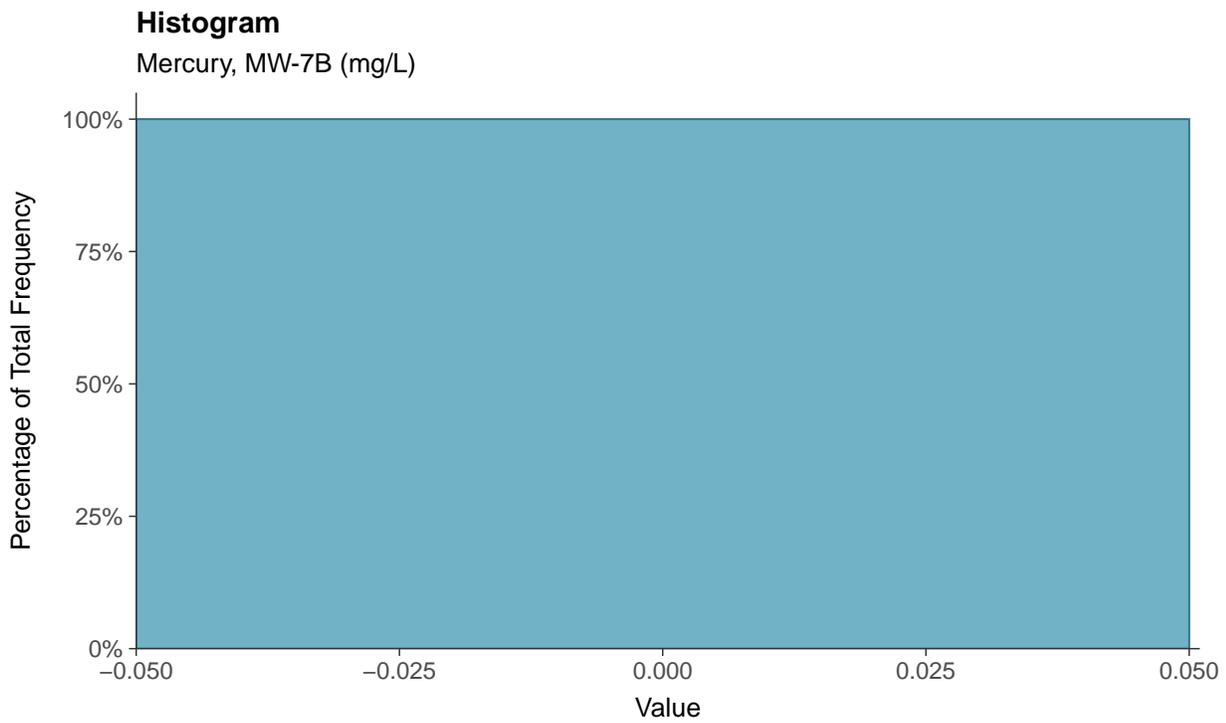
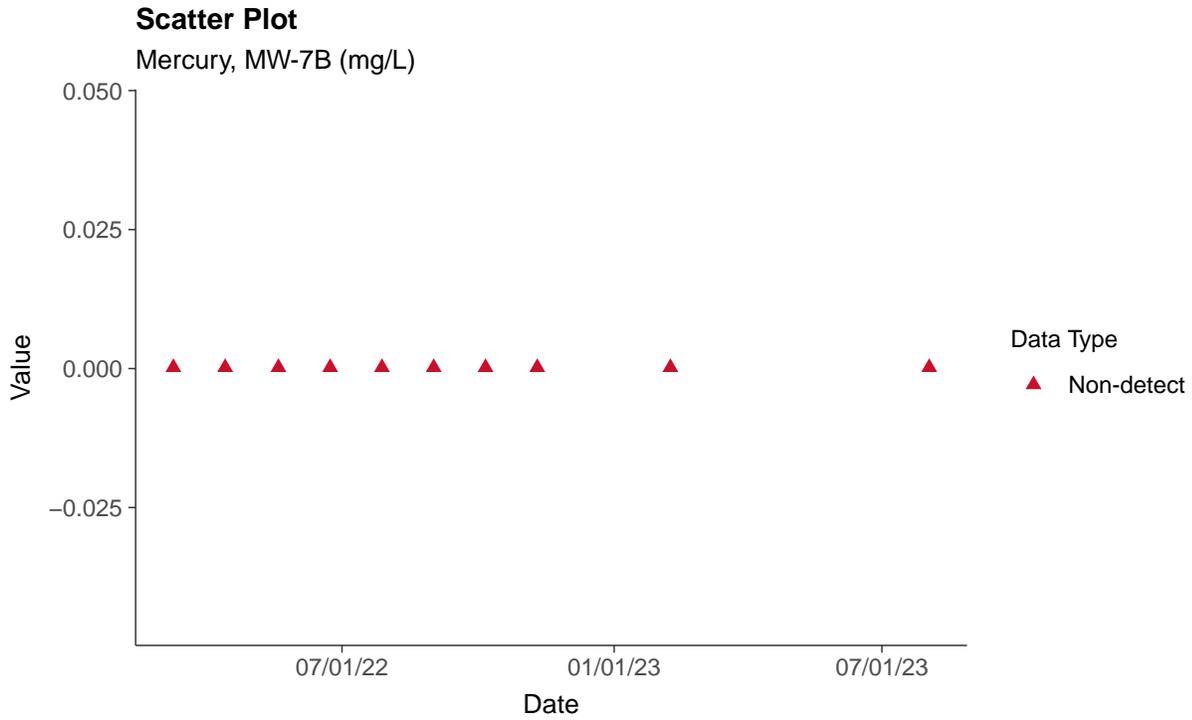
Trend Regression: Mann-Kendall/Theil-Sen Estimate
Lithium, MW-7B (mg/L)





Appendix IV: Mercury, MW-7B

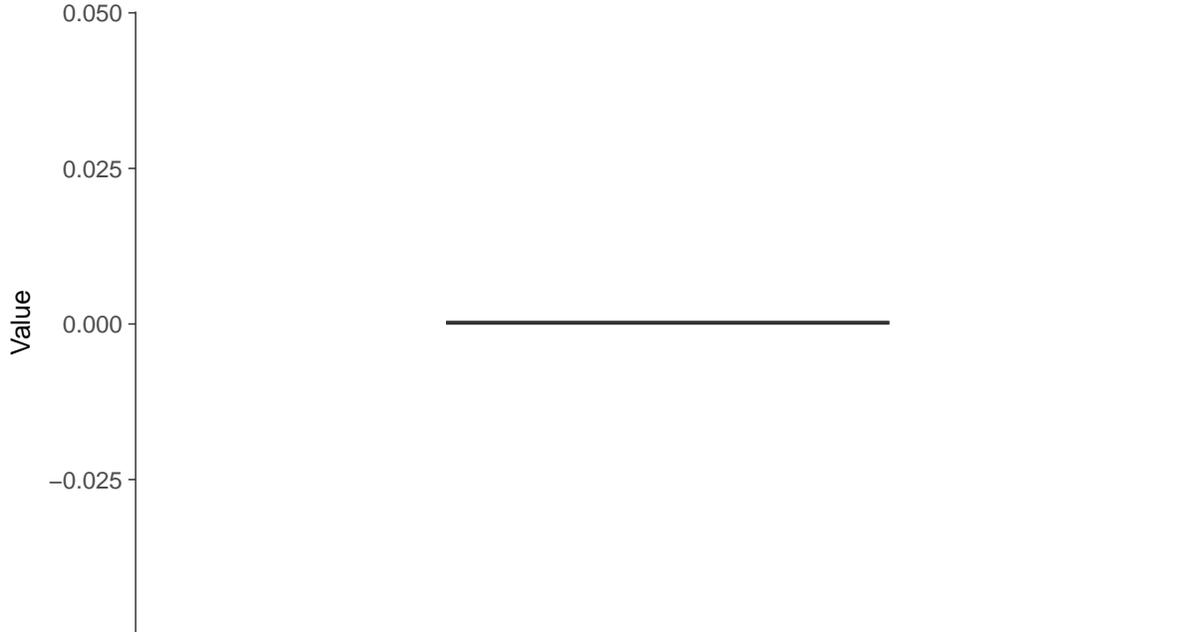
ID: 7B_2_17





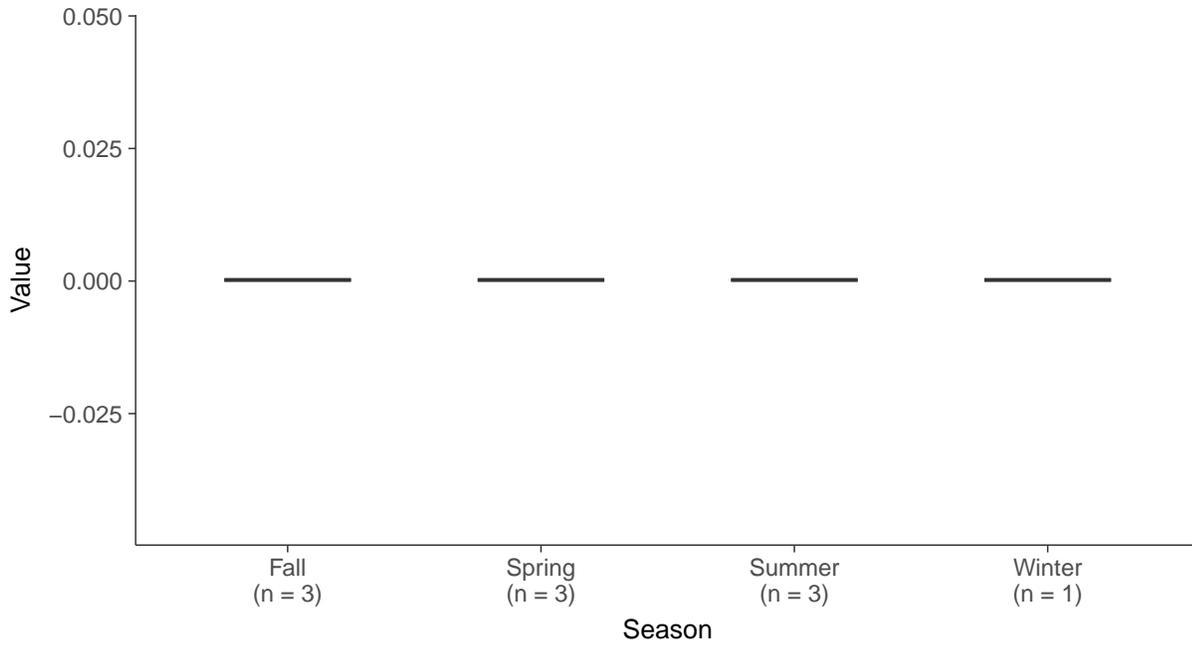
Boxplot

Mercury, MW-7B (mg/L)



Boxplot by Season

Mercury, MW-7B (mg/L)



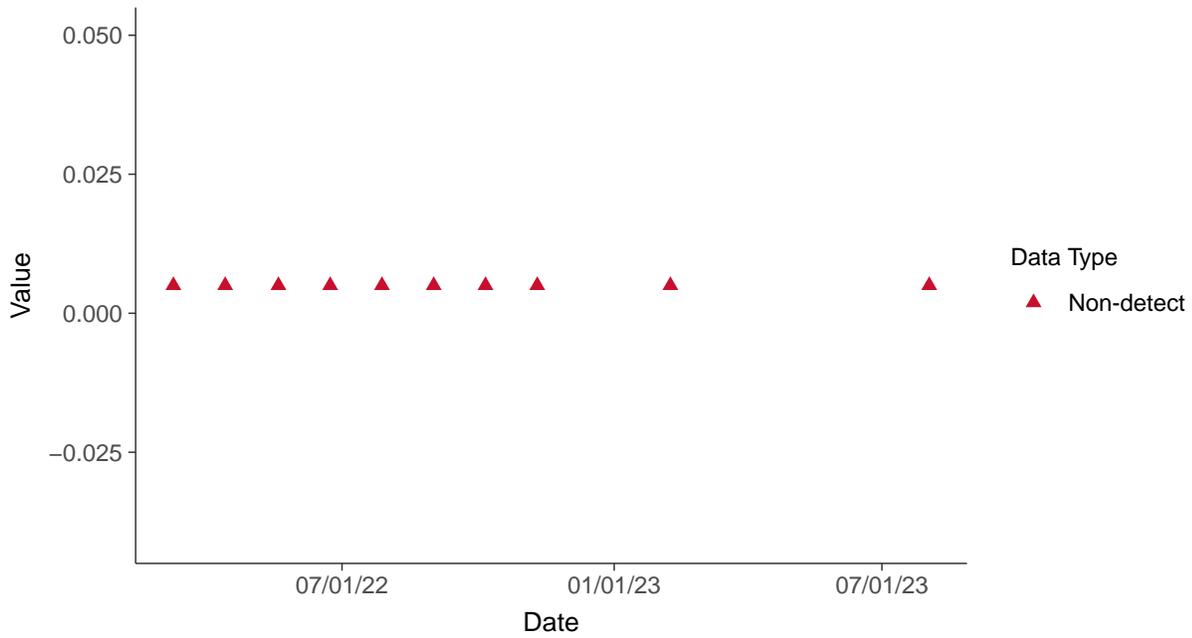


Appendix IV: Molybdenum, MW-7B

ID: 7B_2_18

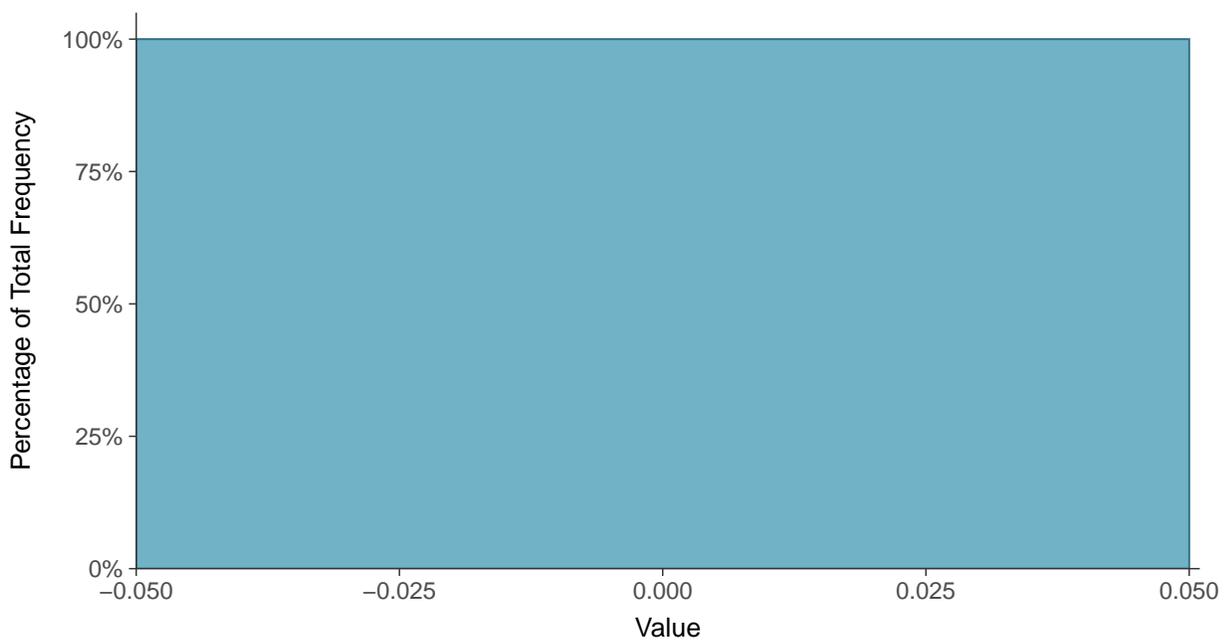
Scatter Plot

Molybdenum, MW-7B (mg/L)



Histogram

Molybdenum, MW-7B (mg/L)





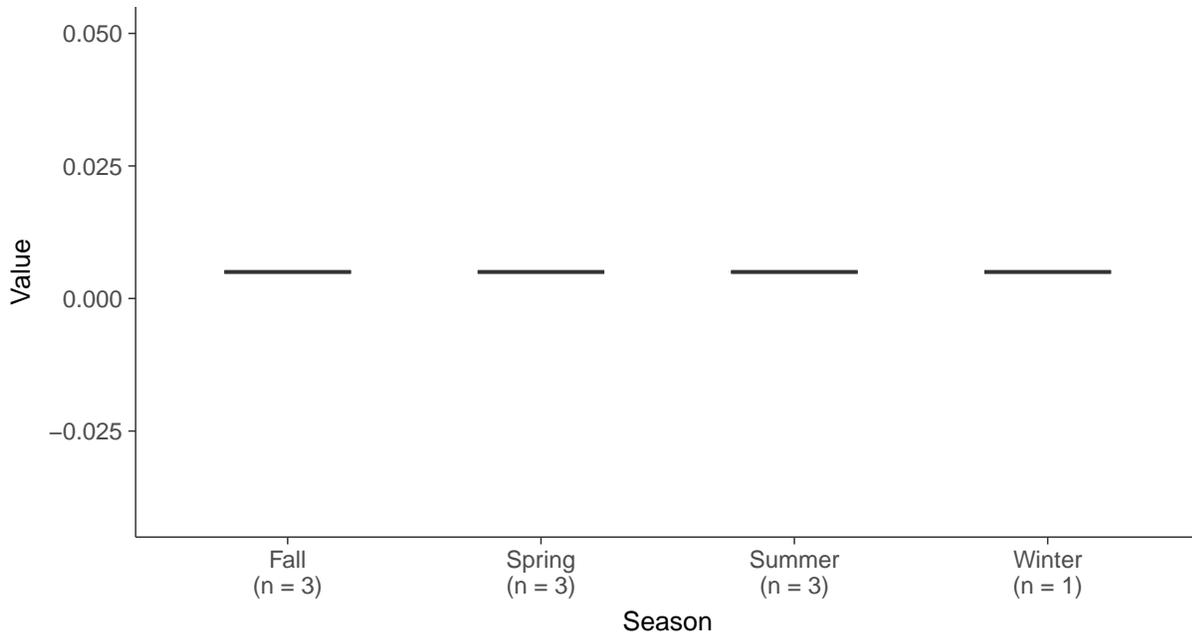
Boxplot

Molybdenum, MW-7B (mg/L)



Boxplot by Season

Molybdenum, MW-7B (mg/L)



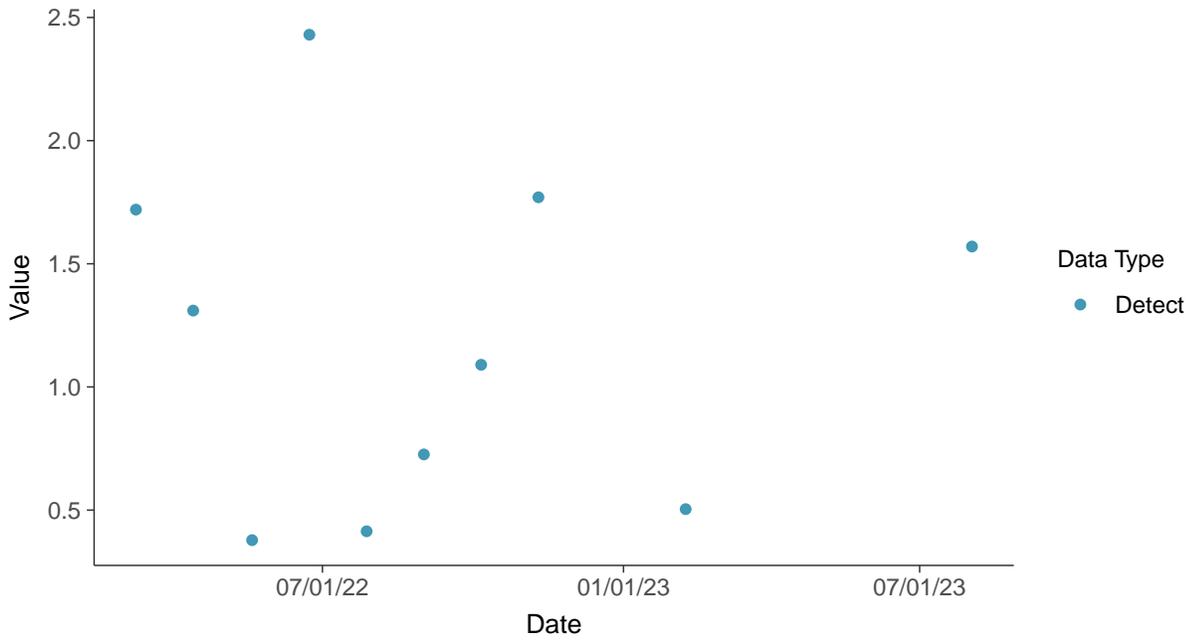


Appendix IV: Radium-226/228, MW-7B

ID: 7B_2_20

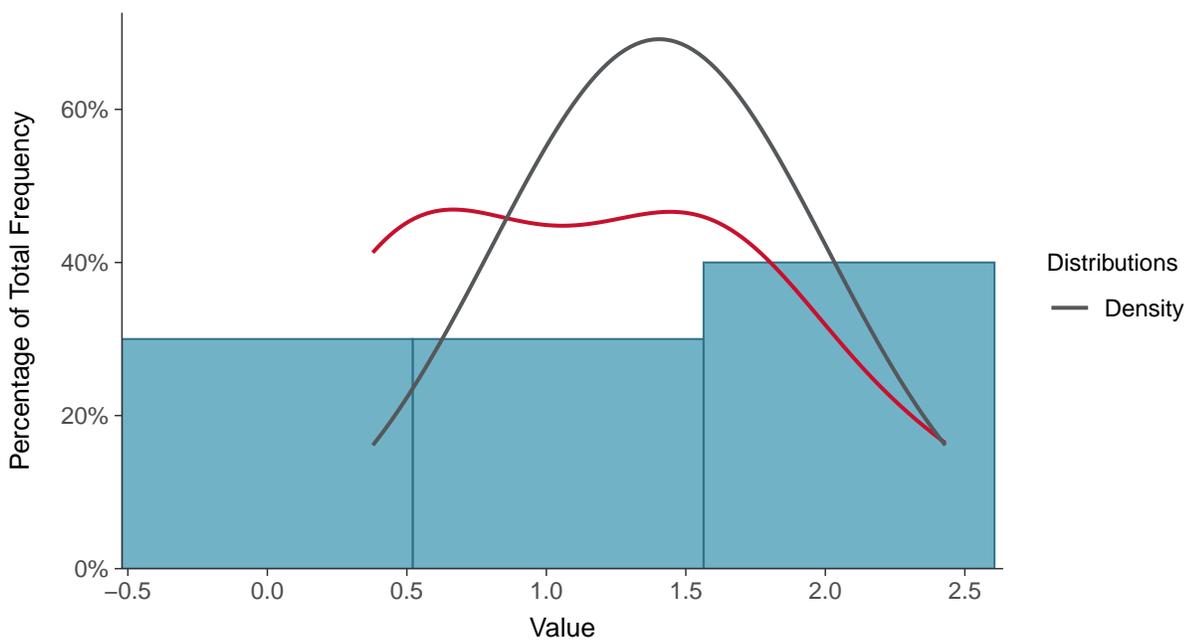
Scatter Plot

Radium-226/228, MW-7B (pCi/L)



Histogram

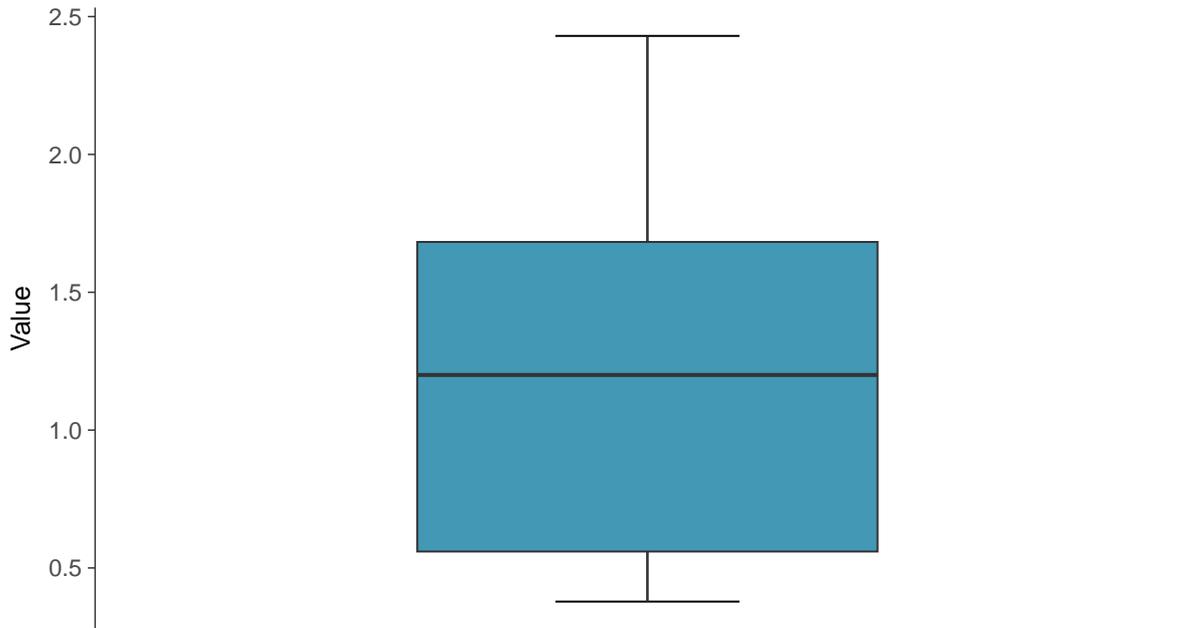
Radium-226/228, MW-7B (pCi/L)





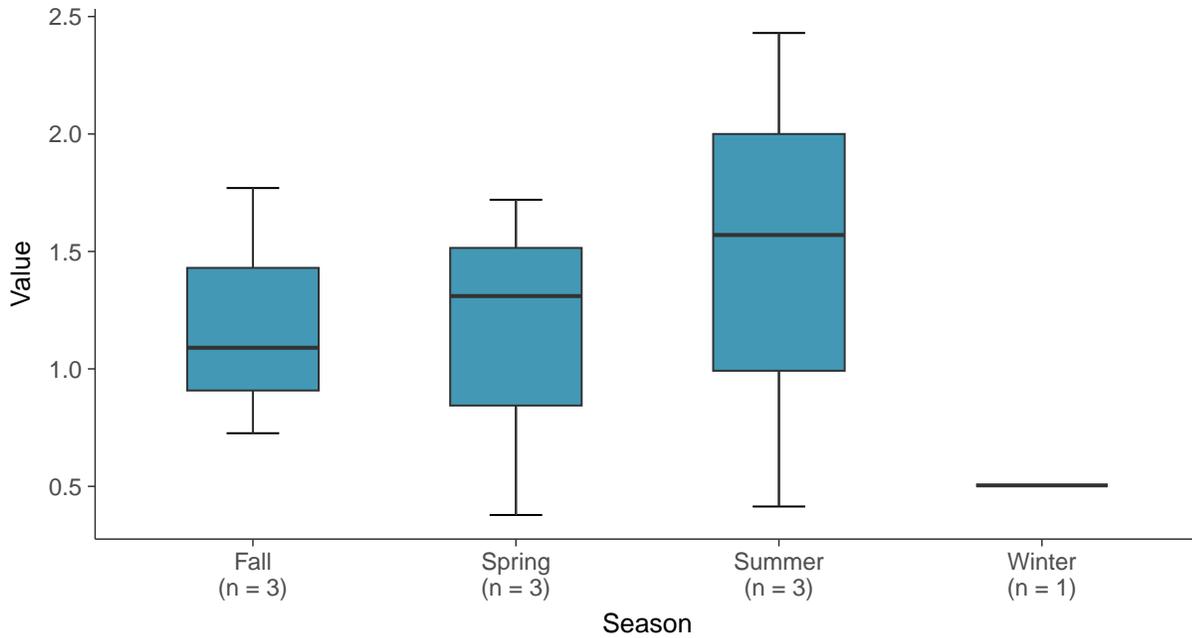
Boxplot

Radium-226/228, MW-7B (pCi/L)



Boxplot by Season

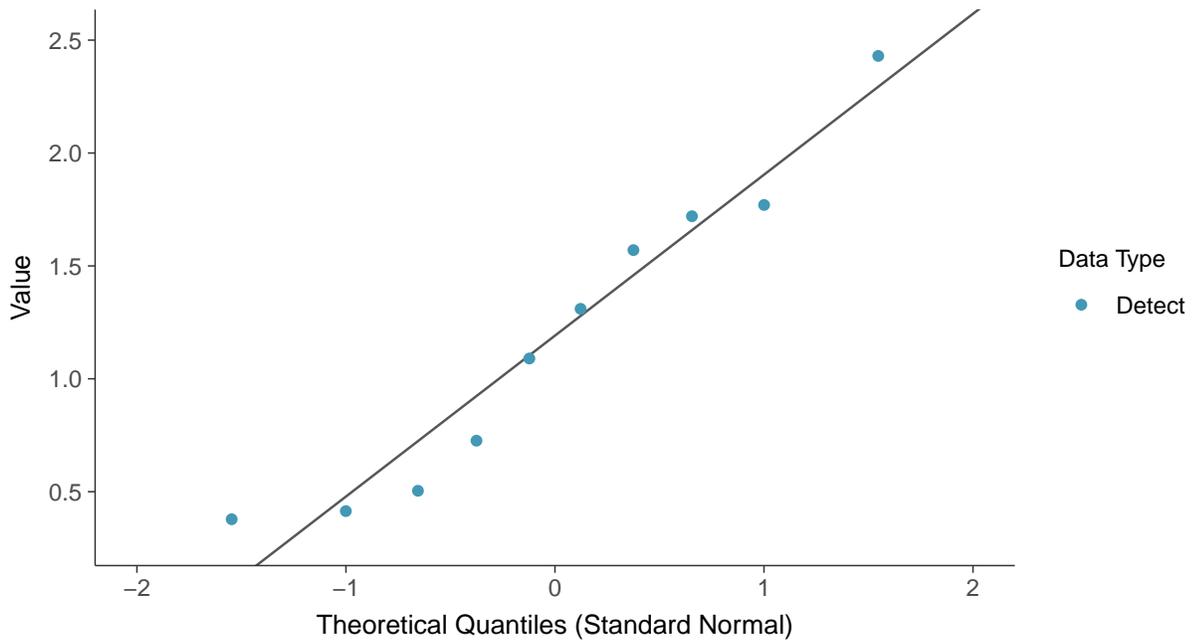
Radium-226/228, MW-7B (pCi/L)





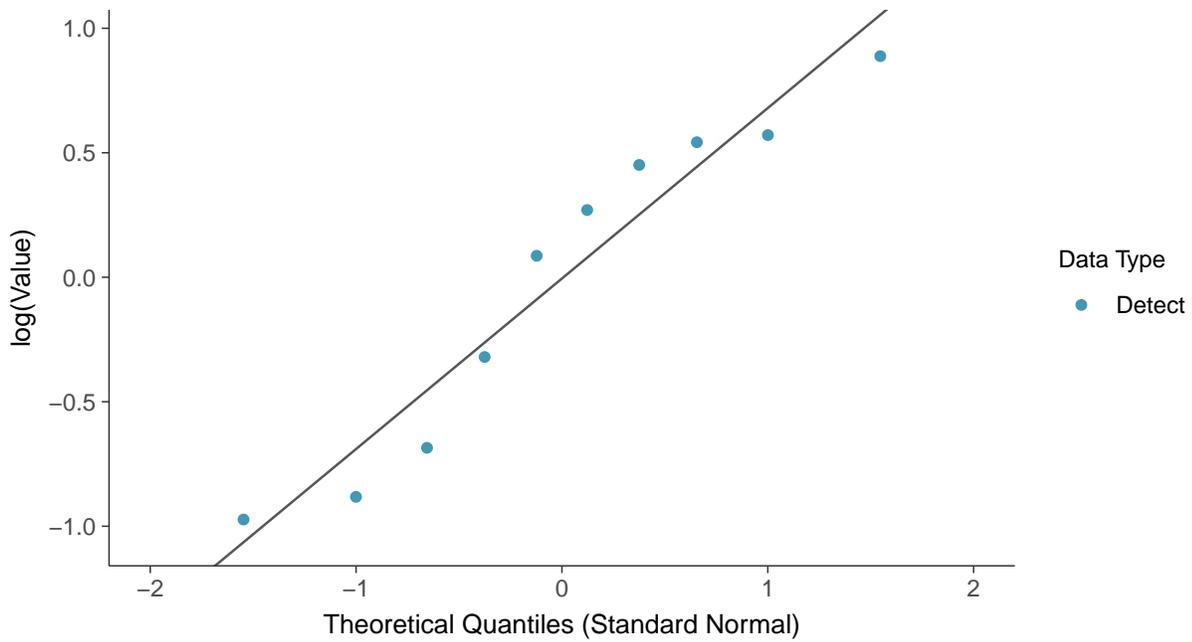
Normal Q-Q plot

Radium-226/228, MW-7B (pCi/L)



Lognormal Q-Q plot

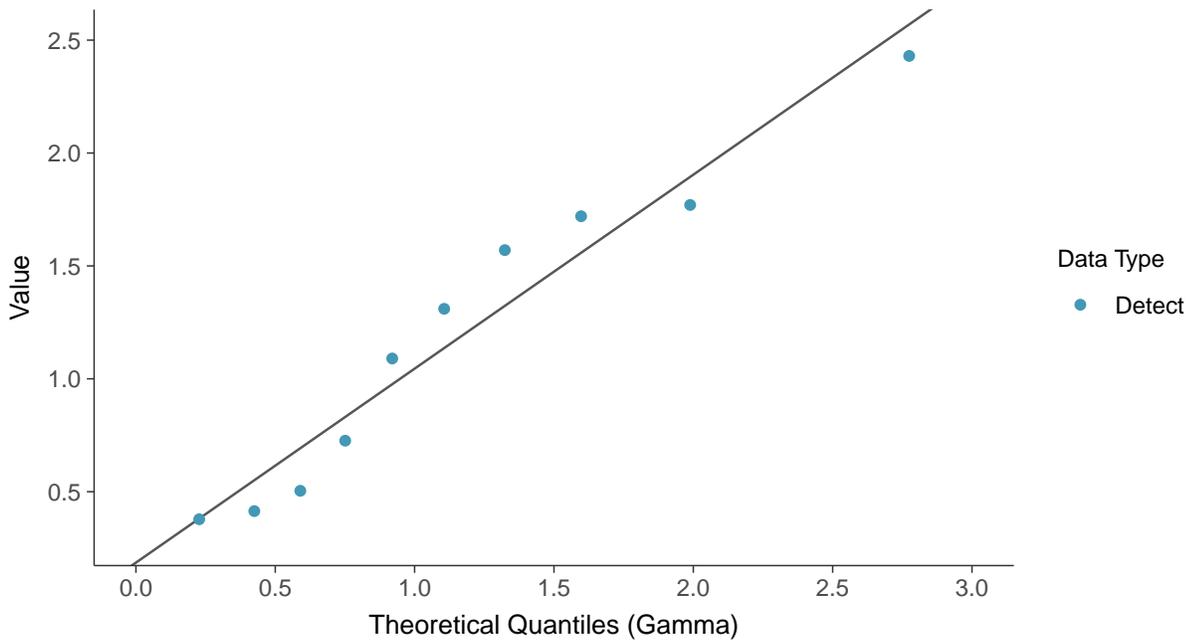
Radium-226/228, MW-7B (pCi/L)





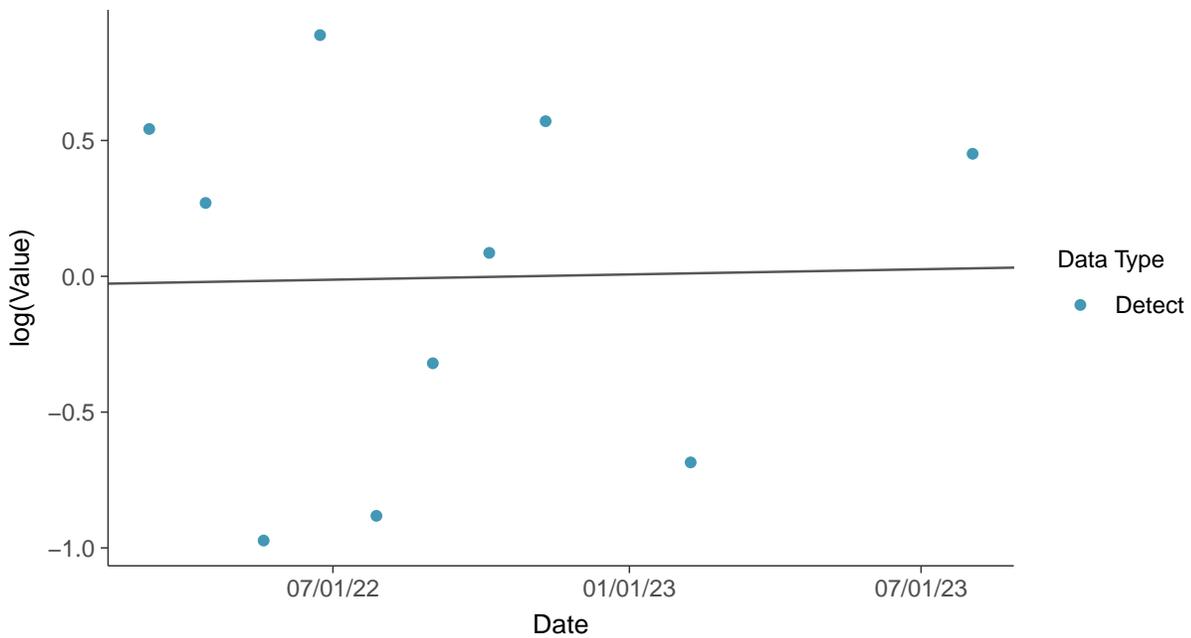
Gamma Q-Q plot

Radium-226/228, MW-7B (pCi/L)



Trend Regression: Lognormal MLE

Radium-226/228, MW-7B (pCi/L)



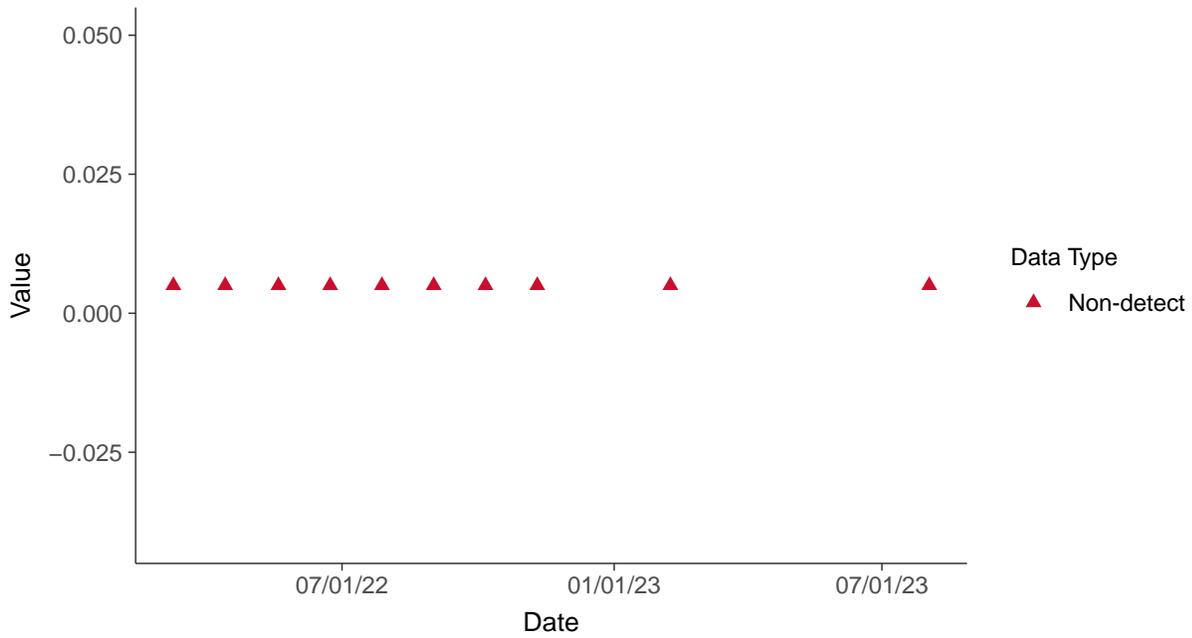


Appendix IV: Selenium, MW-7B

ID: 7B_2_22

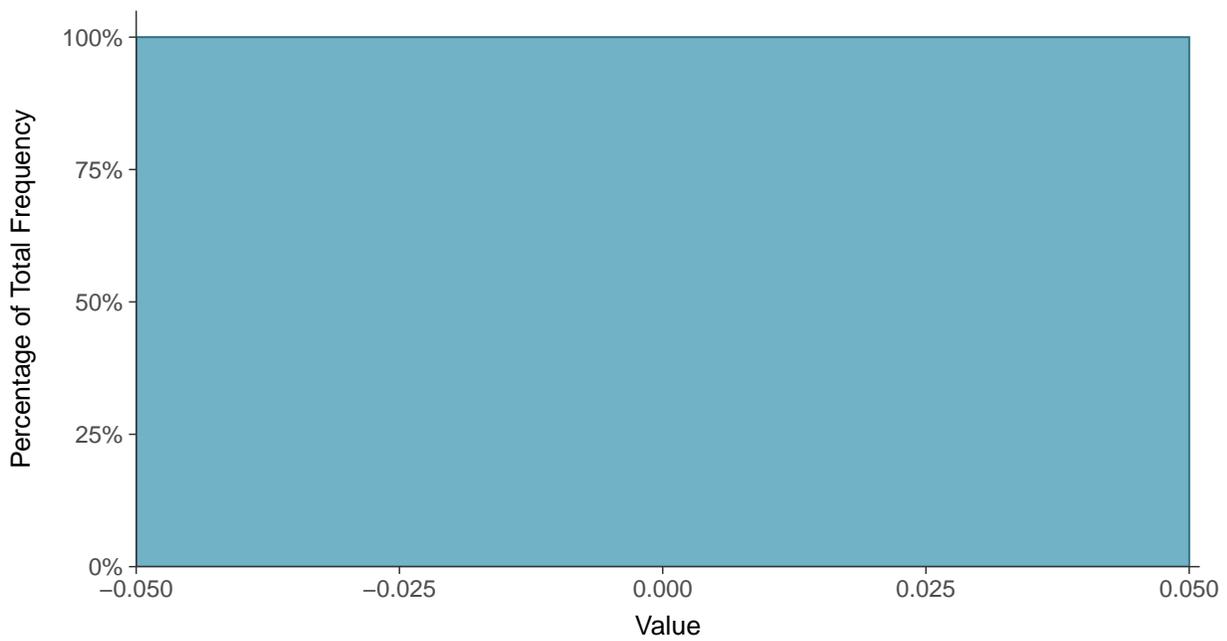
Scatter Plot

Selenium, MW-7B (mg/L)



Histogram

Selenium, MW-7B (mg/L)





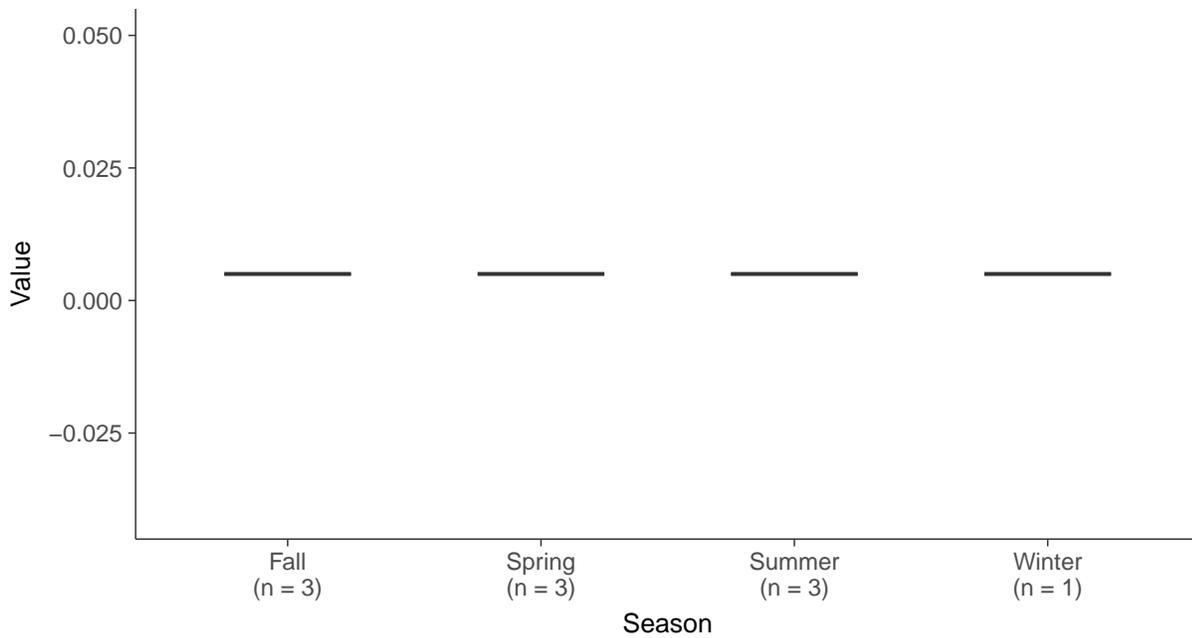
Boxplot

Selenium, MW-7B (mg/L)



Boxplot by Season

Selenium, MW-7B (mg/L)



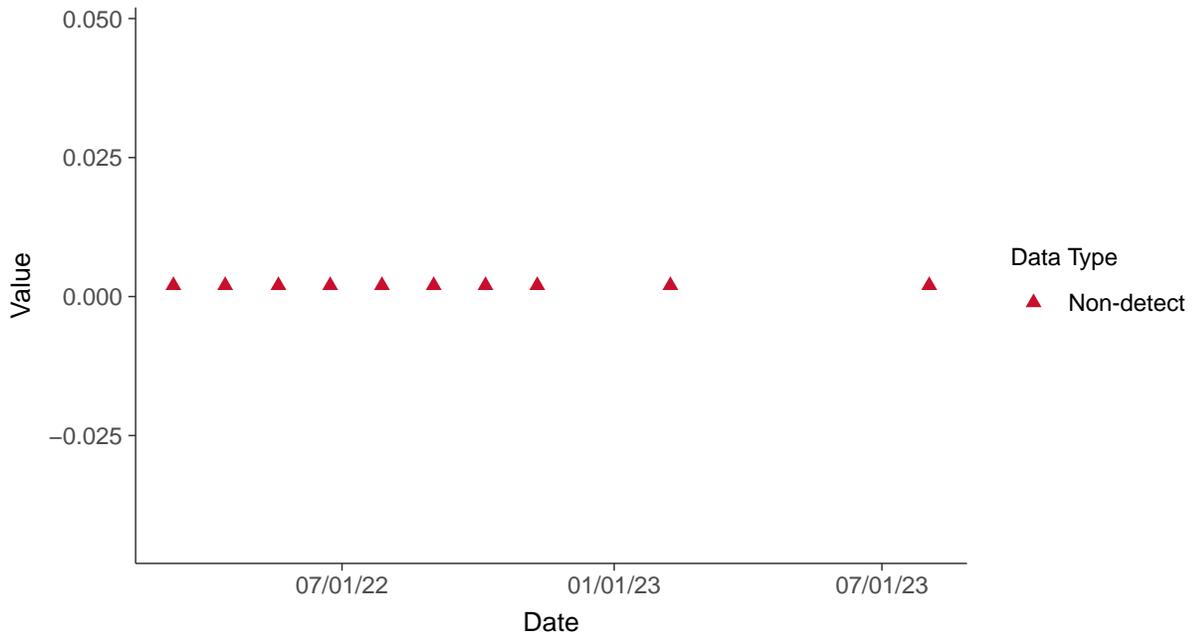


Appendix IV: Thallium, MW-7B

ID: 7B_2_23

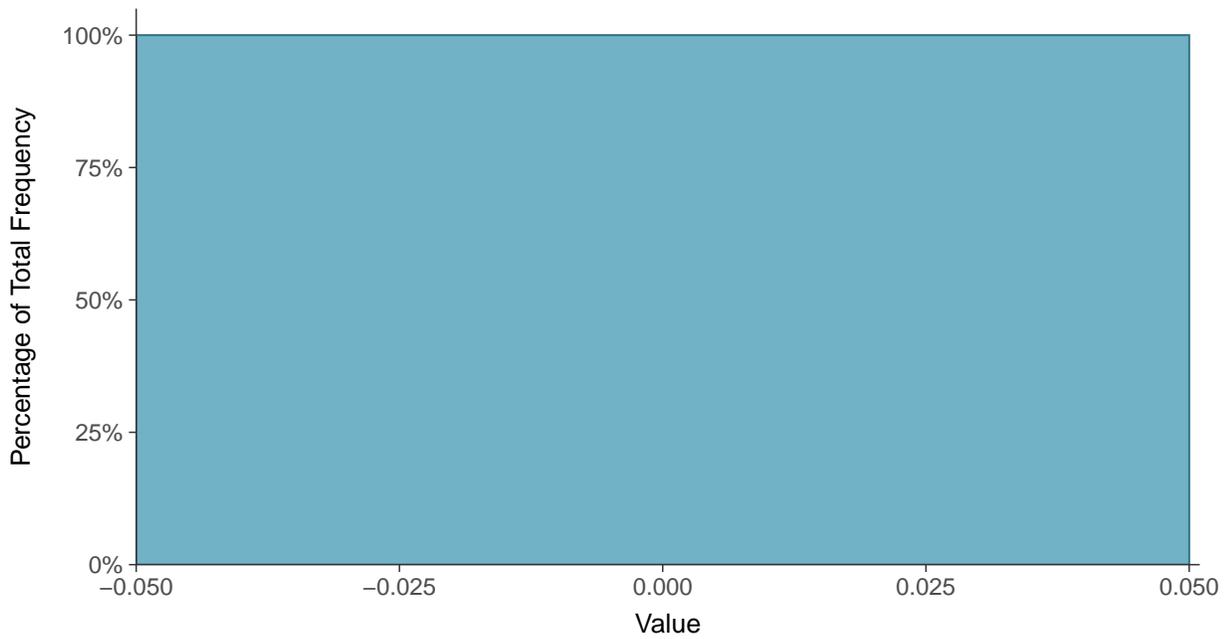
Scatter Plot

Thallium, MW-7B (mg/L)



Histogram

Thallium, MW-7B (mg/L)





Boxplot

Thallium, MW-7B (mg/L)



Boxplot by Season

Thallium, MW-7B (mg/L)

