Groundwater Monitoring 2023 Annual Report

for Compliance with the Michigan Part 115 CCR Solid Waste Regulations

Erickson Station

Lansing Board of Water & Light

January 30, 2024

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1.0 Introduction

The U.S. Environmental Protection Agency's (EPA) final Coal Combustion Residuals (CCR) Rule 40 CFR §257 and Michigan's Part 115 Solid Waste Management, of the Natural Resources and Environmental Protection Act, 1994 PA 451 (Part 115), 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) 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**). The Erickson Power Station contains a single coal-fired generator that was capable of producing 165 megawatts of electricity. It was permanently shutdown in November 2022. Erickson has three CCR impoundments: the Forebay, Retention Basin, and Clear Water Pond (CWP) (**Figure 2**). The three CCR impoundments are currently inactive.

The BWL CCR surface impoundments, Forebay, Retention Basin, and CWP, are not licensed under Part 115 because Michigan Department of Environment, Great Lakes, and Energy (EGLE) denied BWL's permit application; however, BWL continues to work with EGLE and develop compliance documentation for EGLE as if the impoundments were permitted under an operating permit. BWL implements both the federal and state groundwater monitoring programs concurrently to comply with both the federal CCR Rule and Part 115 solid waste rules. The Part 115 permitting application requirements included approval of a Hydrogeologic Monitoring Plan (HMP) (HDR, 2021a). The current HMP was approved by EGLE and describes the monitoring network, sampling and analysis plan, and data validation and statical procedures for the monitoring program to comply with Part 115 solid waste rules. BWL is currently expanding the monitoring network, therefore the current HMP will be revised and resubmitted to EGLE in the first quarter of 2024.

BWL completed numerous tasks in the first half of 2023 to close the impoundments and further characterize the impact to groundwater to further the assessment of corrective measures. In 2023, BWL completed the following tasks:

- Approval of the Closure Work Plan for the CCR surface impoundments;
- Additional ash sampling and analysis was completed, and a Closure Work Plan Amendment was submitted to EGLE on May 2, 2023 that included the ash analytical data as well as the microscopy verification thresholds.
- Collected Phase II background soil sample and analysis, completed statistics for soil background values, and submitted the revised Soil Background Report to EGLE on April 25, 2023 that will be used during verification of ash removal from the CCR impoundments;
- CCR impoundments dewatering and ash removal, as well as subsequent ash removal verification;
- Installation and slug testing of ten monitoring wells including nature and extent wells, and multi-level wells to evaluate the plume extents horizontally and vertically;

- Sampling of downgradient private wells completed in the bedrock aquifer at the request of private well owners, and completion of an evaluation of this data reported under separate cover;
- Monthly monitoring of groundwater levels for monitoring wells and control points;
- Sampling and analysis associated with semi-annual assessment monitoring as well as higher frequency background monitoring of newly installed wells;
- Developed wetland permitting materials and applied for an EGLE wetland permit for installation of additional downgradient monitoring wells;
- Developed a data collection work plan for site specific data collection for use in remedy selection; and
- Conducted boron isotope analysis of impoundment ash and groundwater.
- Submitted a Federal Emergency Management Agency (FEMA) Flood Insurance Study Data Request as the proposed additional downgradient monitoring wells are located in the floodway.

This Annual Groundwater Monitoring Report presents these activities and the sampling and analysis completed during 2023.

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 impoundments 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.

Figure 1. Vicinity Map for Erickson Power Station

Figure 2. Erickson Power 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 performed through visual, photographic, soil sampling, and laboratory analytical testing. Visual verification was performed in August 2023. Sampling was performed 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 is 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 finalized 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, indicate that groundwater further east of Erickson flows west, back towards the BWL property, indicating the glacial 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 flow north following Carrier Creek. 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**):

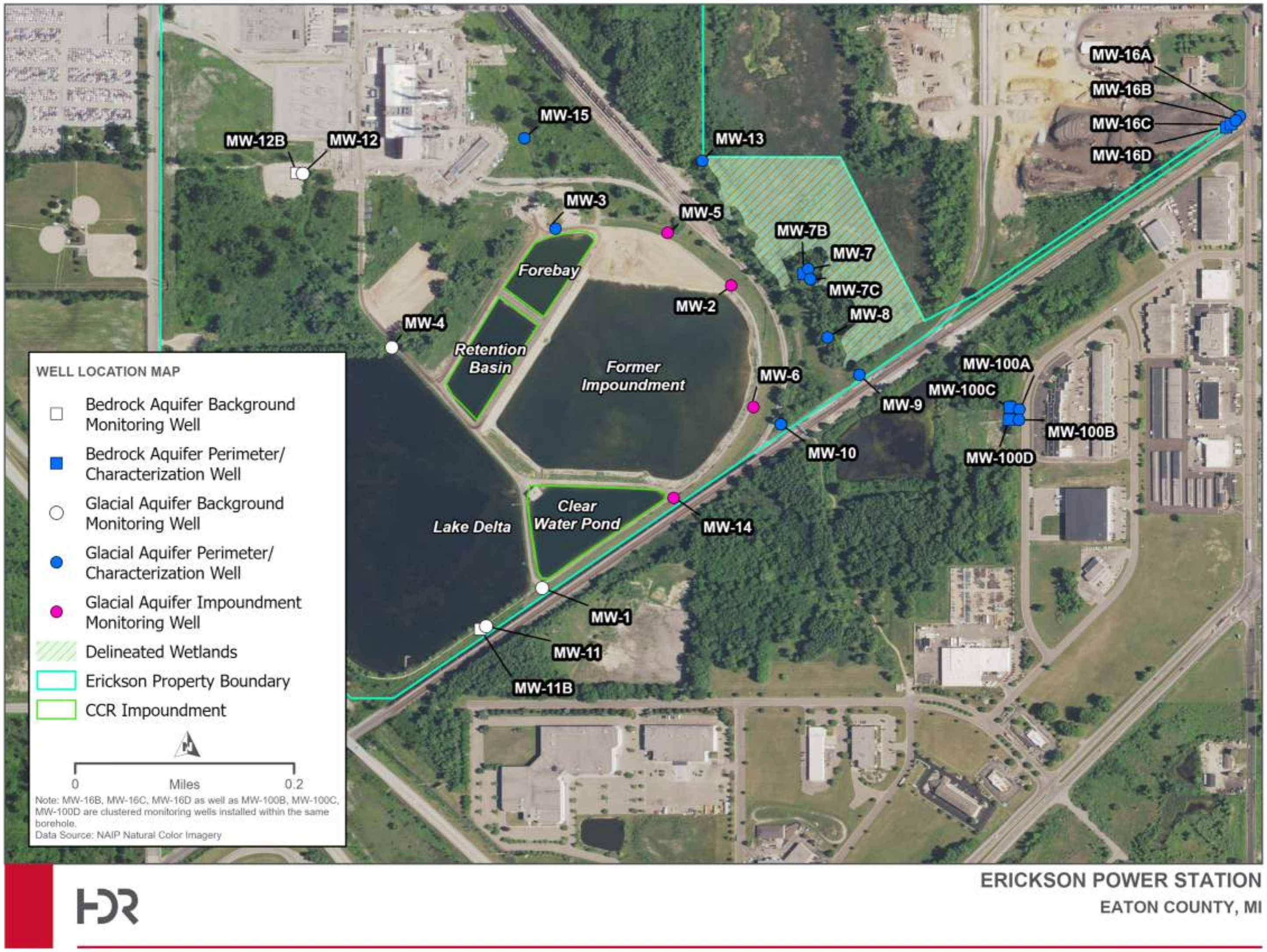
- Glacial downgradient wells to evaluate extent of GPS exceedances: MW-7, MW-7C, MW-8, MW-9, MW-10, MW-13, MW-15, MW-16A, MW-16B, MW-100A, MW-100B
- Bedrock background (upgradient) wells: MW-11B, MW-12B
- Bedrock downgradient wells: MW-7B, MW-16C, MW-16D, MW-100C, and MW-100D

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 between January and June, 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



Note: MW-16B, MW-16C, MW-16D as well as MW-100B, MW-100C, MW-100D are clustered monitoring wells installed within the same borehole.
Data Source: NAIP Natural Color Imagery

ERICKSON POWER STATION
EATON COUNTY, MI

Figure 3. CCR Units and Monitoring Wells

3.0 Monitoring

3.1 Groundwater

3.1.1 Frequency

Table 2 provides the well identification number, well location, and the dates and purpose of the samples collected. Semi-annual assessment monitoring events for Erickson in 2023 were conducted in February and August.

Between January and June 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 after the September (MW-14, MW-15) and November (MW-16A, MW-16B, MW-16C, MW-16D) sampling events. 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 Monitoring Purpose for the Erickson Impoundments

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
			March 22, 2023	Isotope Sampling
			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
			March 21, 2023	Isotope Sampling
			August 2, 2023	Assessment Monitoring
MW-7B	Downgradient	Bedrock	February 8, 2023	Assessment Monitoring
			March 21, 2023	Isotope Sampling
			August 2, 2023	Assessment Monitoring
MW-7C	Downgradient	Glacial	February 8, 2023	Assessment Monitoring
			March 21, 2023	Isotope Sampling
			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
			March 22, 2023	Isotope Sampling
			August 3, 2023	Assessment Monitoring
MW-11B	Background/ Upgradient	Bedrock	February 9, 2023	Assessment Monitoring
			March 22, 2023	Isotope Sampling
			August 3, 2023	Assessment Monitoring

Monitoring Well I.D.	Well Location	Aquifer Monitored	Dates Monitored	Monitoring Purpose
MW-12	Background/ Upgradient	Glacial	February 9, 2023	Assessment Monitoring
			March 22, 2023	Isotope Sampling
			August 3, 2023	Assessment Monitoring
MW-12B	Background/ Upgradient	Bedrock	February 9, 2023	Assessment Monitoring
			March 22, 2023	Isotope Sampling
			August 3, 2023	Assessment Monitoring
MW-13	Downgradient	Glacial	February 8, 2023 August 2, 2023	Assessment Monitoring
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	Background Monitoring / Isotope Sampling
			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

Monitoring Well I.D.	Well Location	Aquifer Monitored	Dates Monitored	Monitoring Purpose
MW-16B (installed January 25, 2023)	Downgradient	Glacial	February 2, 2023	Background Monitoring / Assessment Monitoring
			March 21, 2023	Background Monitoring / Isotope Sampling
			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 21, 2023	Background Monitoring / Isotope Sampling
			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
MW-16D (installed January 25, 2023)	Downgradient	Bedrock	February 2, 2023	Background Monitoring / Assessment Monitoring
			March 21, 2023	Background Monitoring / Isotope Sampling
			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

Monitoring Well I.D.	Well Location	Aquifer Monitored	Dates Monitored	Monitoring Purpose
			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 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

Samples collected for background monitoring and assessment monitoring events were analyzed for the parameters listed in **Table 3**. In addition to the required list in **Table 3**, on occasion, well were analyzed for general water quality parameters including alkalinity, magnesium, potassium, and sodium.

Table 3. Constituents of Interest

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

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.

Samples and quality control (QC) were reviewed and evaluated, and no samples were rejected. Quality Control analyses were within reportable limits; however, when QC was outside limit controls, samples were reported as estimated. Field and laboratory precision and accuracy goals were nearly met for all samples analyzed. Where failures of field and laboratory precision and accuracy were outside of control limits, data was qualified as necessary. Data analyses required minimal qualifications, and data were usable, even when qualified. Laboratory reports and accompanying data validation reports for the sampling completed in 2023 are in **Appendix C.**

3.2 Private Well Sampling

BWL previously performed a limited sampling of downgradient 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 five downgradient private wells at the request of homeowners in March, May, and November 2023. Data from these events were provided to those homeowners.

3.3 Ash and Groundwater Sampling for Isotope Study

BWL performed sampling of select wells on March 21-23, 2023 (MW-16 series sampled concurrently with the background sampling event) to investigate if isotopic data could differentiate boron originating from the ash impoundments compared to naturally occurring boron in the shale bedrock aquifer.

Groundwater

Fourteen samples, including two duplicate samples, were collected from select glacial and bedrock background wells (MW-11, MW-11B, MW-12, and MW-12B) and select glacial and bedrock downgradient wells (MW-2, MW-7, MW-7B, MW-7C, MW-16A, MW-16B, MW-16C, and MW-16D).

Ash Samples

Ash was sampled from the Forebay and Clear Water Pond CCR impoundments. Two samples of leachate were prepared from the ash from each impoundment, one was prepared via Synthetic Precipitate Leaching Procedure (SPLP, SW-846 Method 1312) and one prepared via centrifuge pore water. Ash samples were submitted to Merit Laboratory for leachate preparation before submittal to the isotope laboratory.

Groundwater and ash leachate samples for the Isotope Study were submitted under Chain of Custody to Covalent Metrology of Sunnyvale, California. Samples were analyzed for ^{7}Li, ^{11}B, ^{87}Rb, ^{86}Sr, $\partial(^{11}B/^{10}B)$, and $\partial(^{87}Sr/^{86}Sr)$. Laboratory reports for data obtained from the isotope study are in **Appendix C** and a brief discussion of the data is in **Section 4.2.1**.

4.0 Monitoring Results

4.1 Water Levels and Groundwater Flow Direction

Water levels for Erickson Power Station are provided in **Table 4** and depicted in the hydrographs in **Figures 4 and 5**. 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 2023.

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. Further investigation into the hydraulic disconnection of MW-16D is detailed in **Section 4.2**.

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).

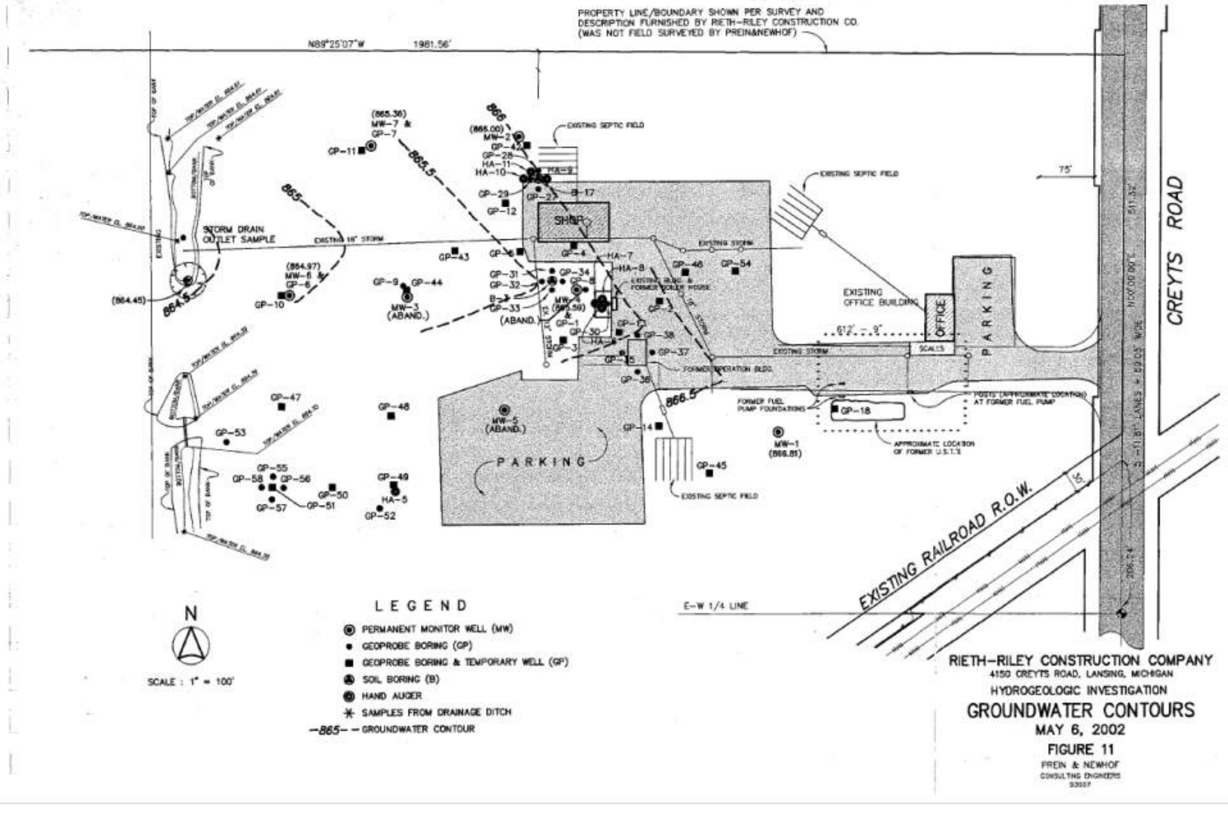


Figure 4. Groundwater Contours for Shallow Groundwater Wells on the Adjacent Reith Riley Property demonstrating groundwater flow under that property to be westward towards the wetland and Erickson (Prien & Newhof, 2003).

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.

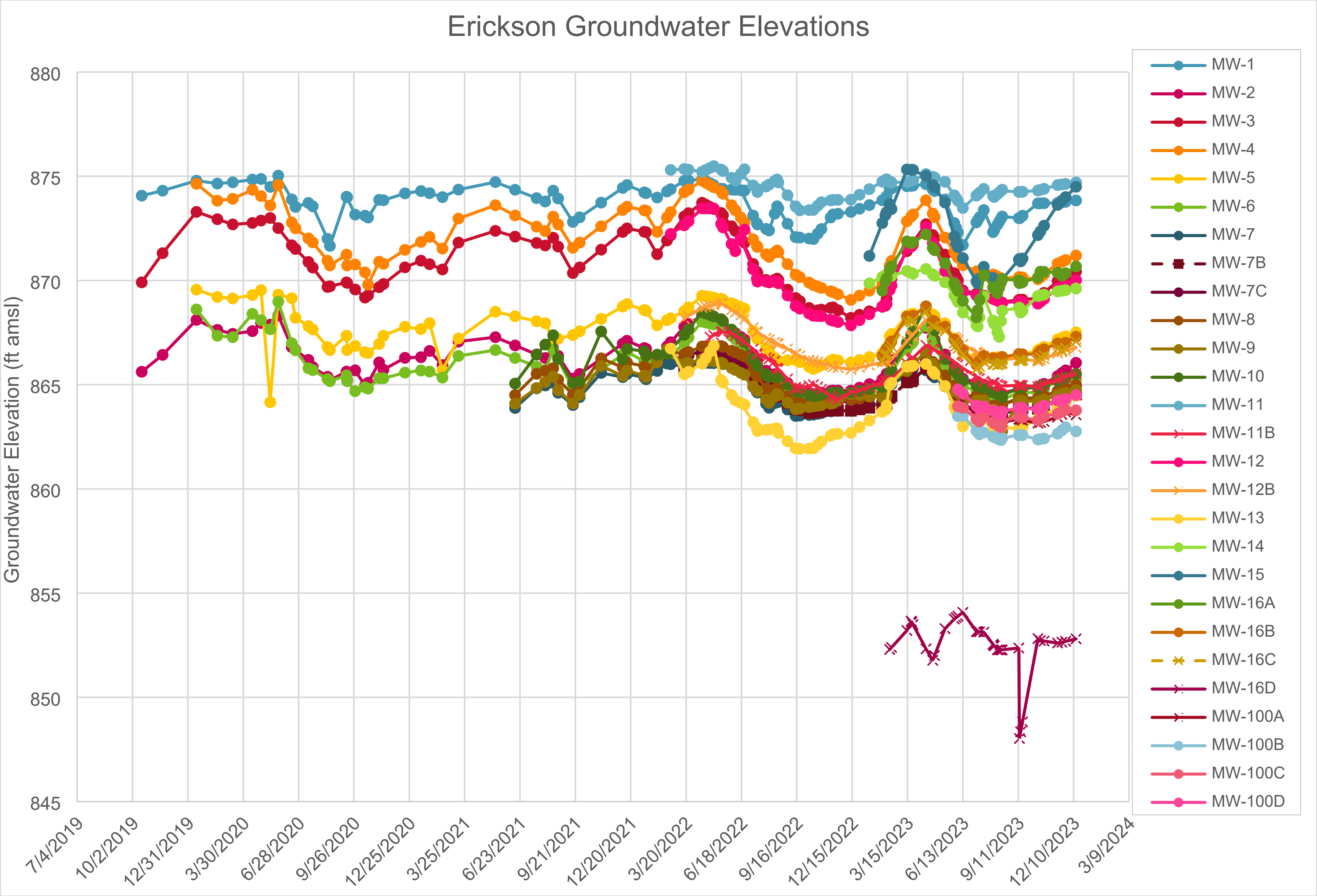


Figure 5. Erickson Power Station Groundwater Elevations

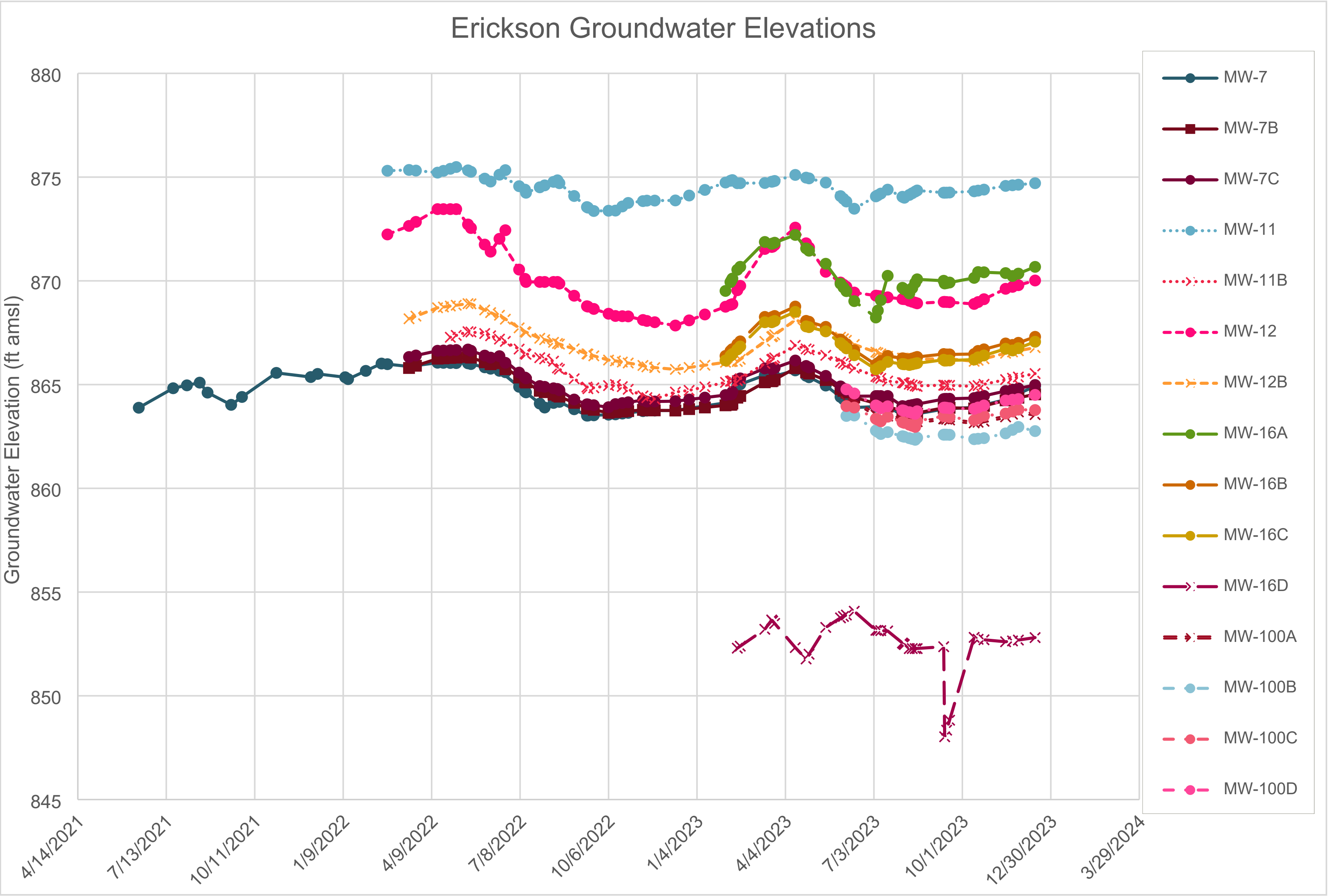


Figure 6. Erickson Power Station Paired Glacial and Bedrock Well Groundwater Elevations

4.2 Water Quality

A table summary of the analytical data is provided in **Appendix B** and laboratory reports are provided in **Appendix C**. In accordance with R 299.4441(9), Groundwater Protection Standards (GPS) were established for each detected COI.

Glacial Aquifer Background Values

Water quality data collected at MW-1 showed a possible impact from the CWP. The possible impact was observed when comparing historical sampling data from MW-1 to background well MW-4. Sample results showed MW-1 is consistently higher in concentrations of iron, lithium, sulfate, radium, boron, TDS, and TSS. Therefore, wells MW-11 and MW-12 were installed in February 2022 west of MW-1 and northwest of MW-3, respectively, to provide water quality data unimpacted by nearby BWL facilities. Wells MW-11 and MW-12 are upgradient and, as of November 2022, eight background samples had been collected. 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 through the previous semi-annual assessment monitoring event, and are provided in **Table 5**. The Background Statistical Certification Report summarizing these background statistics is being finalized and will be submitted to EGLE in first quarter 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)
Sb, total	Antimony	0.005	0.006	0.006	0.006
As, total	Arsenic	0.021	0.01	0.01	0.021
Ba, total	Barium	0.168	2	2	2
Be, total	Beryllium	0.001	0.004	0.004	0.004
B, total	Boron	0.48	NV	0.5	0.5
Cd, total	Cadmium	0.0005	0.005	0.005	0.005
Cr, total	Chromium	0.005	0.1	0.1	0.1
Co, total	Cobalt	0.005	0.006	0.1	0.006
Cu, total	Copper	0.005	1.3	1	1
Fe, total	Iron	23.5	0.3	0.3	23.5
Pb, total	Lead	0.003	0.015	0.004	0.004
Li, total	Lithium	0.0397	0.04	0.35	0.04
Hg, total	Mercury	0.0002	0.002	0.002	0.002
Mo, total	Molybdenum	0.024	0.1	0.21	0.1
Ni, total	Nickel	0.021	NV	0.1	0.1
Se, total	Selenium	0.005	0.05	0.05	0.05
Ag, total	Silver	0.0005	0.1	0.098	0.098
Tl, total	Thallium	0.002	0.002	0.002	0.002
V, total	Vanadium	0.005	NV	0.062	0.062
Zn, total	Zinc	0.036	5	5	5
Ca	Calcium	188	NV	NV	188
F	Fluoride	1	4	2	2
Cl	Chloride	94.377	250	250	250
SO_4	Sulfate	344	250	250	344

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)
TDS	Total Dissolved Solids	1168.639	500	500	1168.639
Ra226/228	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 through the last semi-annual assessment monitoring event. Background values for the bedrock aquifer are provided in **Table 6**. The Background Statistical Certification Report summarizing the background statistics is being finalized and will be submitted to EGLE in first quarter 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)
Sb, total	Antimony	0.005	0.006	0.006	0.006
As, total	Arsenic	0.009	0.01	0.01	0.01
Ba, total	Barium	0.081	2	2	2
Be, total	Beryllium	0.001	0.004	0.004	0.004
B, total	Boron	3.52	NV	0.5	3.52
Cd, total	Cadmium	0.0005	0.005	0.005	0.005
Cr, total	Chromium	0.005	0.1	0.1	0.1
Co, total	Cobalt	0.005	0.006	0.1	0.006
Cu, total	Copper	0.005	1.3	1	1
Fe, total	Iron	3.04	0.3	0.3	3.04
Pb, total	Lead	0.003	0.015	0.004	0.004
Li, total	Lithium	0.051	0.04	0.35	0.051
Hg, total	Mercury	0.0002	0.002	0.002	0.002
Mo, total	Molybdenum	0.011	0.1	0.21	0.1
Ni, total	Nickel	0.011	NV	0.1	0.1
Se, total	Selenium	0.005	0.05	0.05	0.05
Ag, total	Silver	0.0005	0.1	0.098	0.098
Tl, total	Thallium	0.002	0.002	0.002	0.002
V, total	Vanadium	0.005	NV	0.062	0.062
Zn, total	Zinc	0.042	5	5	5
Ca	Calcium	69.6	NV	NV	69.6

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)
F	Fluoride	1	4	2	2
Cl	Chloride	5	250	250	250
SO_4	Sulfate	5	250	250	250
TDS	Total Dissolved Solids	380	500	500	500
Ra226/228	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-5, MW-6, MW-7, and MW-7C. In accordance with Michigan Rule R 299.4441, downgradient well concentrations were statistically evaluated to determine if one or more constituents are detected at SSLs above the GPS. 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. Statistical output files are in **Appendix D**.

Glacial Aquifer

Wells MW-2 and MW-5 had SSLs of boron, calcium, lithium, sulfate, and TDS over the GPS (**Table 7**). Well MW-6 had SSLs of boron and lithium over the GPS, and well MW-7 had SSLs of boron, lithium, and molybdenum, over the GPS (**Table 6**). Well MW-7C had SSLs of boron, calcium, lithium, molybdenum, sulfate, and TDS over the GPS (**Table 6**). Well MW-3 had LCL concentrations greater than GPS for boron, calcium, lithium, molybdenum, sulfate, and TDS; but it was calculated based on only five sample events and is therefore not yet considered an SSL due to having less than 8 sample events. Similarly, MW-14 also had LCL values greater than the GPS for boron and lithium, but this has been calculated on only four sample events and is therefore not yet considered an SSL due to having less than eight sample events. Exceedances above the GPS were observed for MW-16A for chloride, however LCLs were not calculated for MW-16A or MW-16B due to the wells only having one sample event and therefore not yet considered an SSL.

Table 7. SSLs for CCR Impoundments at Erickson Power Station – Calculated through the February 2023 Assessment Monitoring Event

Monitoring Well	Constituent	Boron	Calcium	Lithium	Molybdenum	Sulfate	TDS
	State Glacial GPS*	**0.50 mg/l**	**188 mg/l**	**0.040 mg/l**	**0.10 mg/l**	**344 mg/l**	**1,169 mg/l**
MW-2	**95% LCL**	**4.71**	**241**	**0.056**	**-**	**439**	**1,218**
MW-5	**95% LCL**	**4.29**	**217**	**0.061**	**-**	**617**	**1,277**

MW-6	**95% LCL**	**0.728**	**-**	**0.044**	**-**	**-**	**-**
MW-7	**95% LCL**	**1.70**	**-**	**0.089**	**0.173**	**-**	**-**
MW-7C	**95% LCL**	**6.44**	**234**	**0.126**	**0.388**	**679**	**1,360**

*SSLs for the August 2023 assessment monitoring event were compared to GPS values calculated in October 2023.
"-" Denotes the LCL did not exceed GPS

Bedrock Aquifer

No bedrock aquifer wells had concentrations of COIs that demonstrated SSLs above the GPS during the February 2023 sampling event. Exceedances above the GPS were observed in MW-16D for boron, however LCLs were not calculated for MW-16C or MW-16D due to the wells only having one sample event and therefore not yet considered an SSL.

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-5, MW-6, MW-7, and MW-7C. In accordance with Michigan Rule R 299.4441, downgradient well concentrations were statistically evaluated to determine if one or more constituents are detected at SSLs above the GPS. 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. Statistical output files are in **Appendix D**.

Glacial Aquifer

Wells MW-2 and MW-5 had SSLs of boron, calcium, lithium, sulfate, and TDS over the GPS (**Table 7**). Well MW-6 had SSLs of boron and lithium over the GPS, and well MW-7 had SSLs of boron, lithium, and molybdenum, over the GPS (**Table 7**). Well MW-7C had SSLs of boron, calcium, lithium, molybdenum, sulfate, and TDS over the GPS (**Table 7**). Well MW-3 also had LCL values greater than the GPS for boron, calcium, lithium, molybdenum, sulfate, and TDS; but it was calculated based 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. SSLs for CCR Impoundments at Erickson Power Station – Calculated through the August 2023 Assessment Monitoring Event

Monitoring Well	**Constituent**	**Boron**	**Calcium**	**Lithium**	**Molybdenum**	**Sulfate**	**TDS**
	State GPS*	**0.50 mg/l**	**188 mg/l**	**0.040 mg/l**	**0.10 mg/l**	**344 mg/l**	**1,169 mg/l**
MW-2	**95% LCL**	**4.69**	**237**	**0.055**	**-**	**423**	**1,198**
MW-5	**95% LCL**	**4.29**	**217**	**0.061**	**-**	**587**	**1,233**
MW-6	**95% LCL**	**0.736**	**-**	**0.045**	**-**	**-**	**-**
MW-7	**95% LCL**	**1.61**	**-**	**0.084**	**0.173**	**-**	**-**
MW-7C	**95% LCL**	**6.48**	**235**	**0.126**	**0.391**	**680**	**1,360**

*SSLs for the August 2023 assessment monitoring event were compared to GPS values calculated in October 2023.

"-" Denotes the LCL did not exceed GPS

Bedrock Aquifer

No bedrock aquifer wells had concentrations of COIs that demonstrated SSLs above the GPS during the August 2023 sampling event. Well MW-16C had exceedances of calcium above the GPS and well MW-16D demonstrated exceedances of boron above the GPS during the sampling events, however LCLs were not calculated at the time of the sampling event for MW-16C and MW-16D as statistical significance for these wells was planned to be achieved in the following months. No other bedrock wells had exceedances of bedrock GPS.

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 above, 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 and statistical evaluation was completed and the findings of this evaluation are described below. 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**.

Background Monitoring Events – 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, MW-16A, and MW-16D. In accordance with Michigan Rule R 299.4441, downgradient well concentrations were statistically evaluated to determine if one or more constituents are detected at SSLs above the GPS. 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. Statistical output files are in **Appendix D**.

Glacial Aquifer

Well MW-14 had SSLs of boron and lithium over the GPS (**Table 8**). No concentrations of COIs above the GPS have been detected in MW-15. Therefore, the plume extent north of the impoundments is considered delineated.

Well MW-16A had SSLs of chloride and TDS over the GPS (**Table 8**). At this time, it is anticipated that the chloride and TDS is likely the result of salt applications to the road for deicing. Well MW-16A do not exceed GPS for boron or any other COI (besides the chloride and TDS in MW-16A). Additionally, groundwater flow observed at the site and described in **Section 4.1** indicates SSLs originating from these wells would not be indicative of contamination originating from Erickson Station because the groundwater elevation at MW-16A is higher than MW-7 indicating a westward groundwater flow direction between MW-16A and MW-7. Based on the observed groundwater flow and no GPS exceedances of constituents with GPS exceedances at waste boundary wells, an alternate source demonstration will be prepared and submitted for any SSL observed in well MW-16A. No concentrations of COIs above the GPS have been detected in well MW-16B. Therefore, the plume extent in the eastward direction is delineated and the farthest extent of the plume is east of MW-7 and west of MW-16.

Table 9. SSLs for CCR Impoundments at Erickson Power Station for Glacial Aquifer Wells Achieving Statistical Significance Not Concurrent with Assessment Monitoring Events

Monitoring Well	Constituent	Boron	Chloride	Lithium	TDS
	State GPS*	0.50 mg/l	250 mg/l	0.040 mg/l	1,169 mg/l
MW-14[1]	95% LCL	2.09	-	0.109	-
MW-16A[2]	95% LCL	-	405	-	1,285

*SSLs for the wells achieving statistical significance outside of scheduled assessment monitoring events were compared to GPS values calculated in October 2023.
1) Calculated with data obtained through September 15, 2023.
2) Calculated with data obtained through November 21, 2023.
"-" Denotes the LCL did not exceed GPS

Bedrock Aquifer

Well MW-16C had exceedances above the GPS for calcium during the background sampling events for May, July, August, September, October, and November 2023. This well had eight sample events in November 2023 and LCLs were calculated after this event which demonstrated that no SSLs are present in this well. No known cause of elevated calcium levels in well MW-16C has been identified, however similar to the concentrations at MW-16A and MW-16B for the glacial aquifer wells, bedrock groundwater elevations are higher at MW-16C than MW-7B indicating the groundwater at MW-16C is not flowing from the Erickson but would be coming from the east flowing west.

Well MW-16D had an SSL of boron over the GPS (**Table 9**) after the November 2023 sample event. However, as described in **Section 4.1** and demonstrated in **Figure 5** and **Figure 6**, MW-

16D appears to be hydraulically disconnected to the other wells at Erickson Station. In addition, a review of the impacted wells closer to the impoundment show a consistent set of parameters that exceed GPS, not solely boron. For example, at glacial wells with SSIs and SSLs over GPS, the parameters that exceed include lithium, sulfate, and TDS in addition to the boron. However, at MW-16D bedrock well, only boron exceeds the GPS. This is similar to the findings observed in the private wells completed in bedrock farther east and described in the Private Well Report. This is further data supporting the boron in the bedrock to be naturally occurring.

Table 10. SSLs for CCR Impoundments at Erickson Power Station for Bedrock Aquifer Wells Achieving Statistical Significance Not Concurrent with Assessment Monitoring Events

Monitoring Well	Constituent	Boron
	State GPS*	3.52 mg/l
MW-16D[1]	95% LCL	4.57

*SSLs for the wells achieving statistical significance outside of scheduled assessment monitoring events were compared to GPS values calculated in October 2023.
1) Calculated with data obtained through November 21, 2023.
"-" Denotes the LCL did not exceed GPS

Further, analysis of general water quality parameters from this well on a Piper Diagram suggest the water quality at MW-16D plots similarly to bedrock wells MW-7B, MW-12B, and MW-100D, and plots in a different quadrant as wells MW-16C, MW-11B, and MW-100C, and in a different quadrant than impacted glacial wells MW-3 and MW-7C, indicating they are different classes of waters. The water quality groupings of bedrock wells can be observed in the piper diagram in **Figure 6**. The bedrock wells that plot nearest each other on the piper diagram, MW-7B, MW-12B, MW-16D, and MW-100D, are also the same group of bedrock wells that have the higher concentrations of boron (≥ 3.0 mg/L boron). These same group of four wells have the highest percent of shale in the screened interval (80-100% shale) (**Figure 7**). The other group of bedrock wells that plot near each other on the piper diagram, MW-11B, MW-16C, and MW-100C, all have lower concentrations of boron (≤1.45 mg/L boron) and have the lowest percent of shale (more sandstone) in the screened interval (**Figure 7**). Figure 7 displays a correlation between the amount of shale in the bedrock screened zone and the boron concentration from that well. The shale appears to be the naturally occurring source of boron in groundwater. This same exercise has not been possible to evaluate in the private wells due to the driller well logs grouping the bedrock lithology instead of logging it separately. For example, private well logs state "shale and sandstone" for bedrock intervals instead of separating shale intervals from sandstone intervals.

Based on the observed groundwater flow and no GPS exceedances of constituents with GPS exceedances at waste boundary wells (except for calcium in MW-16C and boron in MW-16D), an alternate source demonstration will be prepared and submitted for the boron SSL observed in well MW-16D.

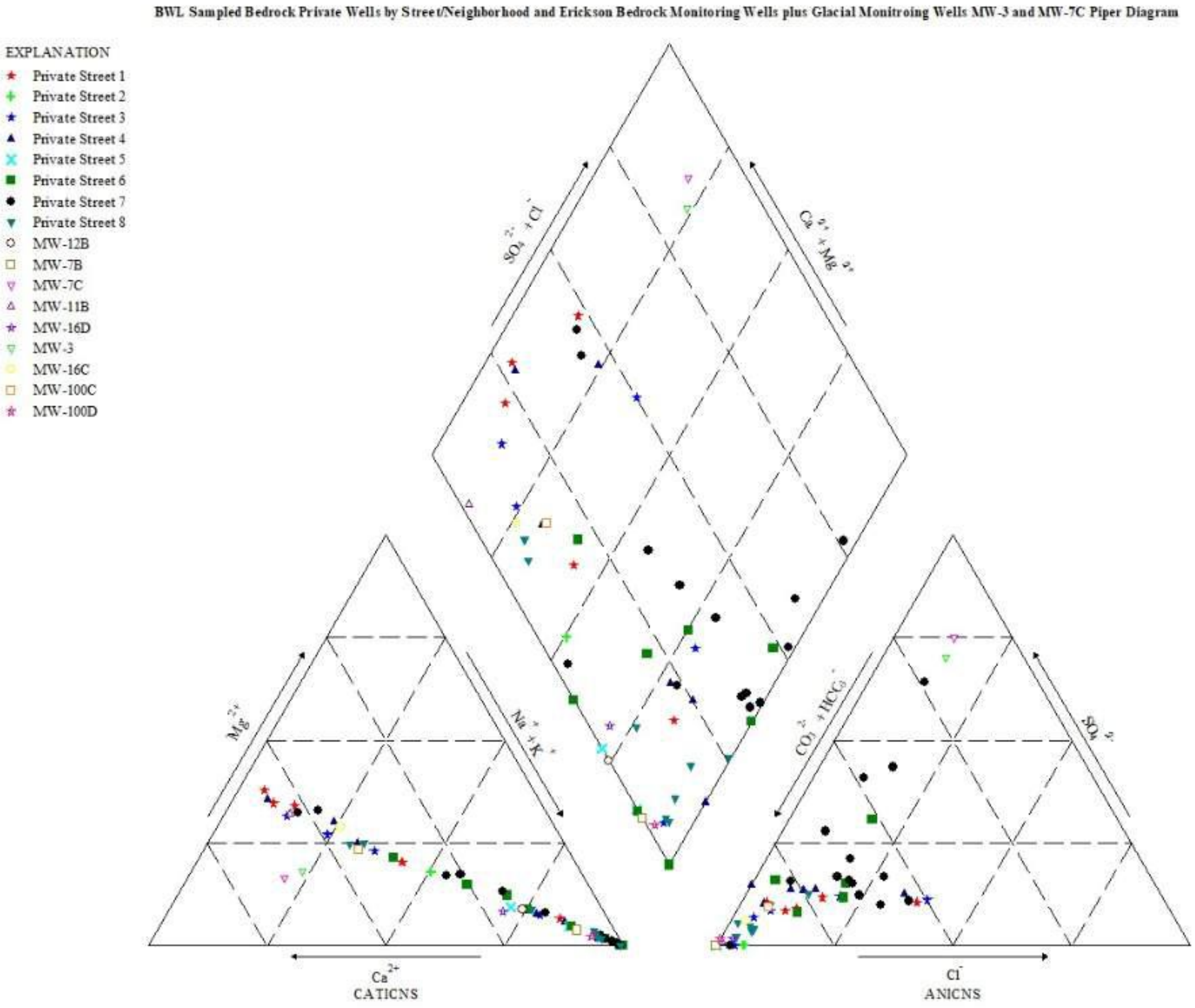
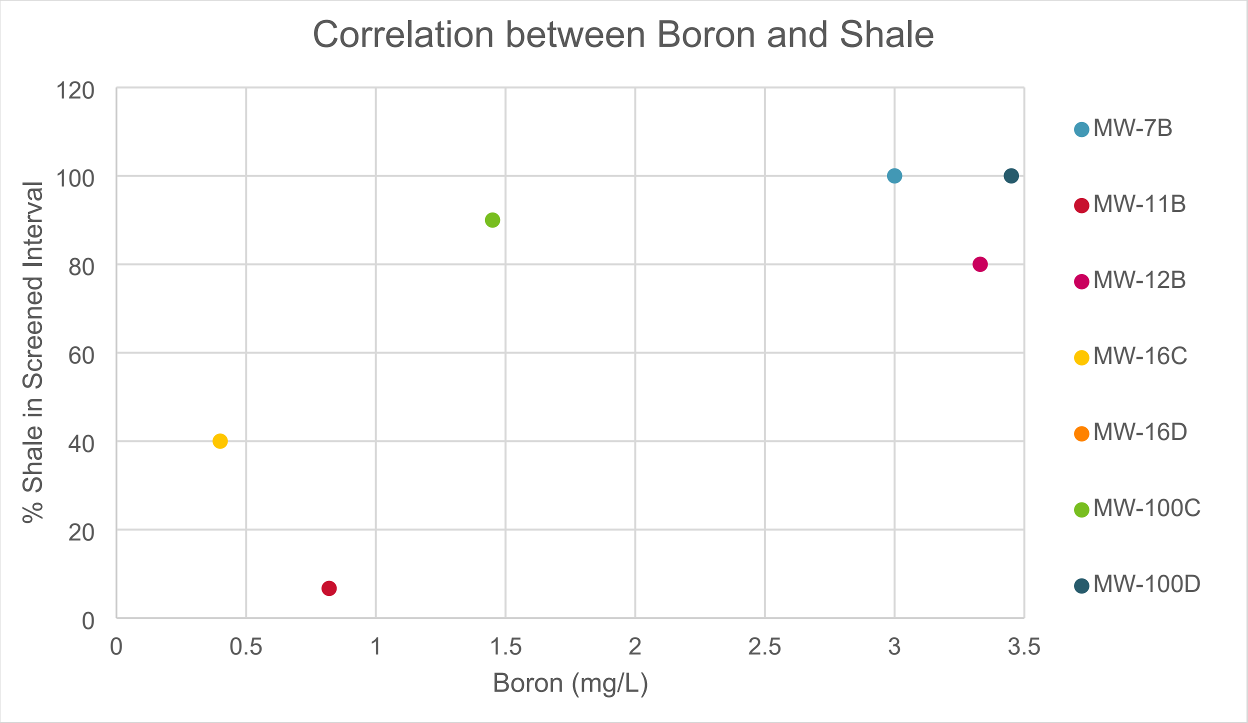


Figure 7. BWL Bedrock Wells, Private Wells, and Glacial Wells MW-3 and MW-7C Piper Diagram



*Concentrations of boron depicted in MW-7B, MW-11B, MW-12B, MW-16C, and MW-16D are representative of the February 2023 Assessment Monitoring Event. Concentrations of boron depicted in MW-100C and MW-100D are representative of their currently unvalidated background sampling event conducted in June 2023.

Figure 8. Erickson Power Station Bedrock Well Screened Shale Percentages and Boron Concentrations

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 current flow and transport model, 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.

Select private wells were re-sampled in 2023 and analyses from these sampling events were similar to their original 2022 results. Re-sampling results were provided to homeowners.

Isotope Study

As described in the July 2023 Semiannual report, BWL collected samples of ash leachate from the Forebay and CWP CCR impoundments and groundwater from locations that are known to be impacted and unimpacted by CCR and analyzed isotopic ratios to evaluate if there was a different isotopic signature of naturally occurring boron in the shale in the Saginaw aquifer versus boron in the groundwater from the Erickson CCR impoundments. Samples were collected in March 2023 and were reported in the July report. The laboratory report for the isotope analysis is provided chronologically in **Appendix C**. The ∂^{11}B versus boron concentration of the sampled wells and ash leachate are shown in **Figure 8**. As shown in **Figure 8**, the CCR leachates had lower ∂^{11}B values (<4.05), which is consistent with the literature study on boron isotopic characterization of CCR that showed CCR leachate were lower (Ruhl et al, 2014). Also shown in **Figure 8**, the ∂^{11}B at glacial wells impacted by the CCR impoundments (MW-2, MW-7, and MW-7C) are also lower (<4.05). Background wells (MW-11, MW-11B, MW-12, and MW-12B) and unimpacted glacial wells (MW-16A and MW-16B) have higher ∂^{11}B (>4.05). Therefore, the data indicate that ∂^{11}B higher than 4.05 appear to indicate naturally occurring boron. All of the bedrock wells sampled had ∂^{11}B greater than 4.05 and had the highest measured ∂^{11}B (4.11-4.16) indicating that the ratio of boron isotopes in the bedrock groundwater are more similar to background groundwater and unimpacted groundwater than to ash leachate and impacted groundwater from the ash leachate.

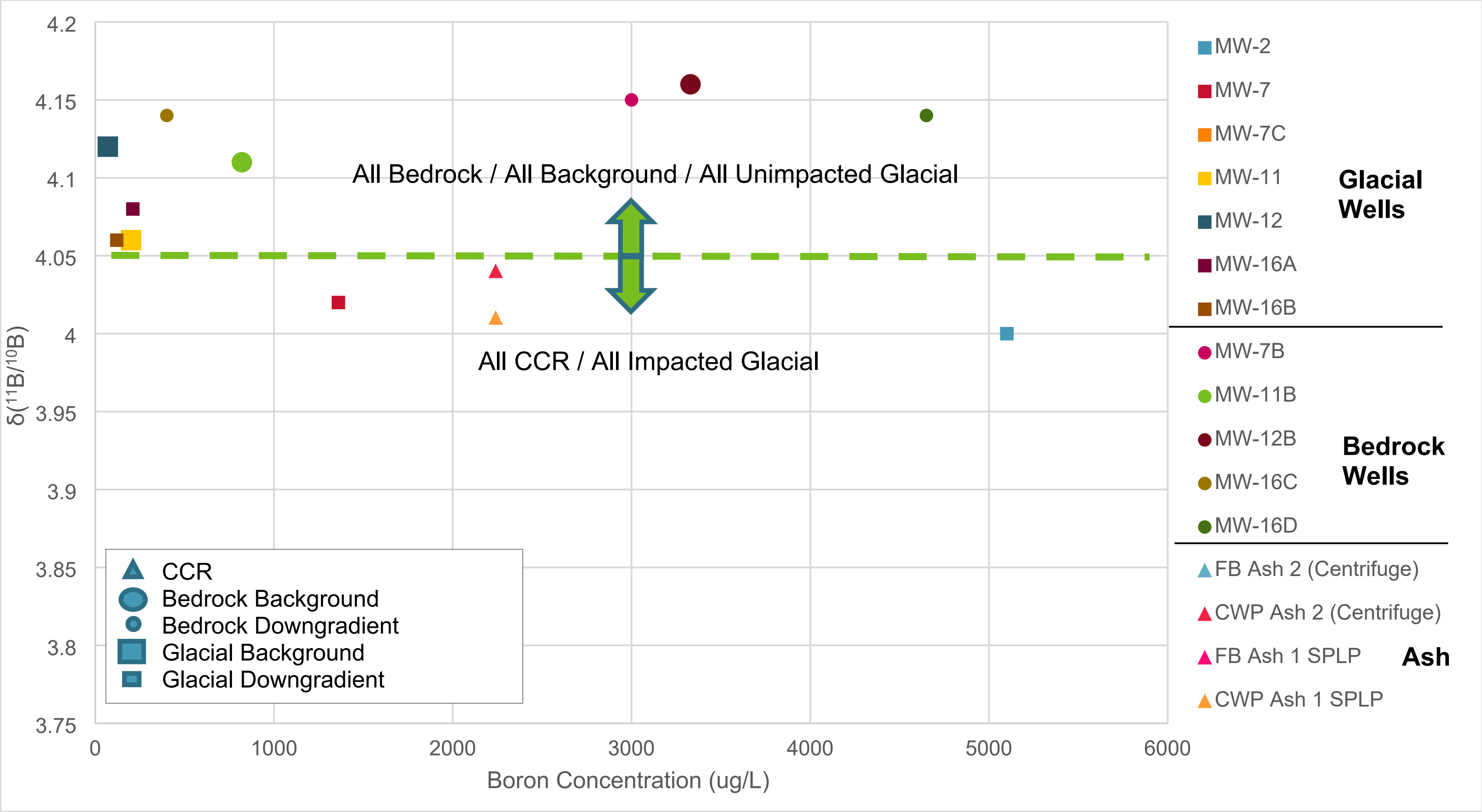


Figure 9. Boron Concentrations and Boron Isotope Ratios of Known Impacted and Unimpacted Wells and Impoundment Ash, Erickson Power Station

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 source removed prior to implementation of groundwater remedy measures.

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; 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.

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. BWL has been working with adjacent and nearby landowners requesting agreements to install monitoring wells. This time-consuming effort necessitated multiple points of contact and several landowners would not grant easements for monitoring well installations. Meanwhile BWL has been developing “work-around” alternatives to landowner's parcels to the extent practical, including wells on narrow BWL-owned strips of land and submitting wetland permit applications for wells in the wetlands in April 2023. Ten new wells were installed for assessment and characterization of the groundwater plume at Erickson to the north, east, and south of the CCR impoundments. Groundwater data from these wells currently suggest that the plume is contained within the boundaries of these newly installed wells. In addition, BWL has proposed two sets of multi-level wells at the wetland on the east side of the property boundary. These wells require permitting to protect the wetland, which has been ongoing throughout all of 2023. Currently, eight new wells have been proposed and are anticipated be installed in 2024, pending EGLE permit approval:

- MW-17A, MW-17B, MW-17C, and MW-17D to be installed to the north of the clustered wells at MW-7 to confirm groundwater flow directions and delineate the northern extents of the plume in the glacial and bedrock aquifers. Access limitations are currently being designed and a permit to access and construct in the protected wetland is in progress.
- MW-18A, MW-18B, MW-18C, and MW-18D to be installed to the east of the clustered wells at MW-7 to confirm groundwater flow directions and delineate the eastern extents of the plume in the glacial and bedrock aquifers. Access limitations are currently being designed and a permit to access and construct in the protected wetland is in progress.

An Assessment of Corrective Measures Data Collection Work Plan is being developed for the site to support the Assessment of Corrective Measures completed for the site in November 2021. The workplan is to be finalized by Q1 2024 and focuses on data collection and the site-specific feasibility and time to achieve compliance for the MNA and Groundwater Extraction and Treatment remedial measures.

Updated background threshold values for the glacial aquifer and newly developed background threshold values for the bedrock aquifer were completed in October 2023. These BTVs will be incorporated into a Background Water Quality Report and submitted to EGLE in Q1 2024.

The Private Well Sampling Report was published in April 2023 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 the 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 not to sample the private wells further at this time, which was met with verbal approval.

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:

- Installation of a pump test well located in the vicinity of MW-7,
- Completion of a 24-hour constant rate pump test for use in assessing corrective measures using site specific data,
- Implementation of the sediment and groundwater MNA sampling and analysis following the Assessment of Corrective Measures Data Collection Work Plan for use in assessing corrective measures using site specific data,
- continued semiannual groundwater assessment monitoring,
- installation of access to proposed monitoring well locations and installation of wetland monitoring wells pending EGLE permit approval 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 in 2023:

- 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-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.
- New data associated with isotopes, bedrock lithology, and review of Piper Diagram plots all support prior indications that the boron in bedrock is naturally occurring:
  - Boron isotope data indicated that the $\partial^{11}B$ ratio in bedrock groundwater is higher and therefore more similar to the ratio in background and unimpacted wells and therefore seems to indicate the boron is naturally occurring.
  - Review of bedrock lithology in screened wells relative to boron shows correlation between the shale and boron concentration. The more shale in the screened zone of the well, the higher the boron concentration of the well.
  - Piper diagram plots show none of the bedrock wells plot similarly to the impacted glacial wells and show bedrock wells plot similarly to each other depending how much shale/boron is in the well.
- Model calibration was updated for calcium, molybdenum, and sulfate transport models.
- Cleanout and closure of the CCR impoundments at Erickson Station has been initiated and is expected to be complete by February 2024.
- Erickson Power Station impoundment monitoring status is assessment monitoring and assessment of corrective measures.

7.0 References

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

HDR, 2020. Determination of Statistically Significant Increases over Background. November 23, 2020.

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

HDR, 2021. Assessment Monitoring Plan (AMP). March 26, 2021.

HDR, 2021a. Hydrogeologic Monitoring Plan (HMP). March 26, 2021.

HDR, 2021b. Response Action Plan (RAP). March 26, 2021.

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

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

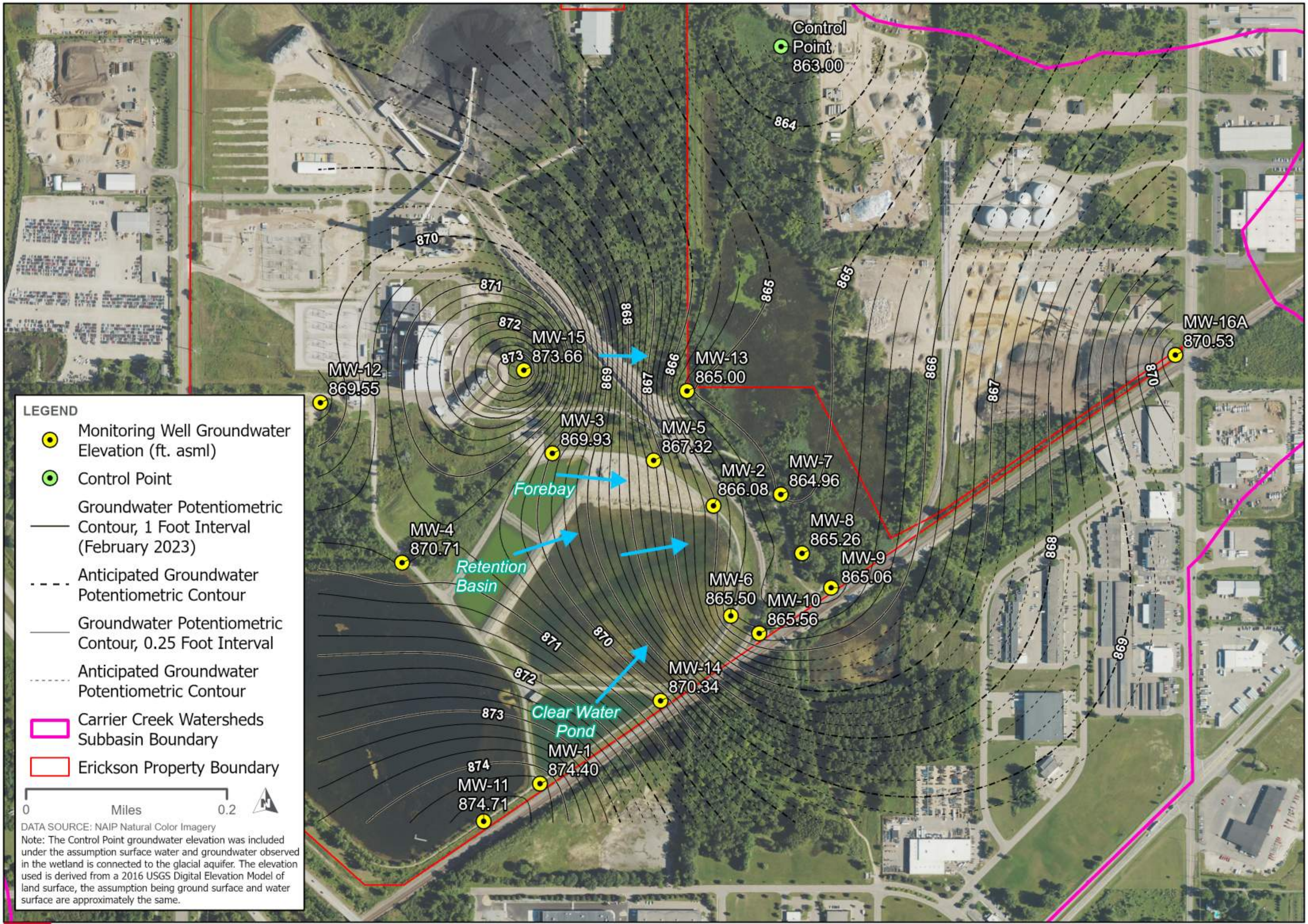
HDR, 2021e. Groundwater Monitoring System Certification, Erickson Station. November 5, 2021.

Ruhl, L. S., Dwyer, G. S., Hsu-Kim, H., Hower, J. C., and Vengosh, A, 2014. Boron and strontium isotopic characterization of coal combustion residuals: Validation of new environmental tracers. *Environmental Science & Technology*, *48*(24), 14790–14798.

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

Appendix A

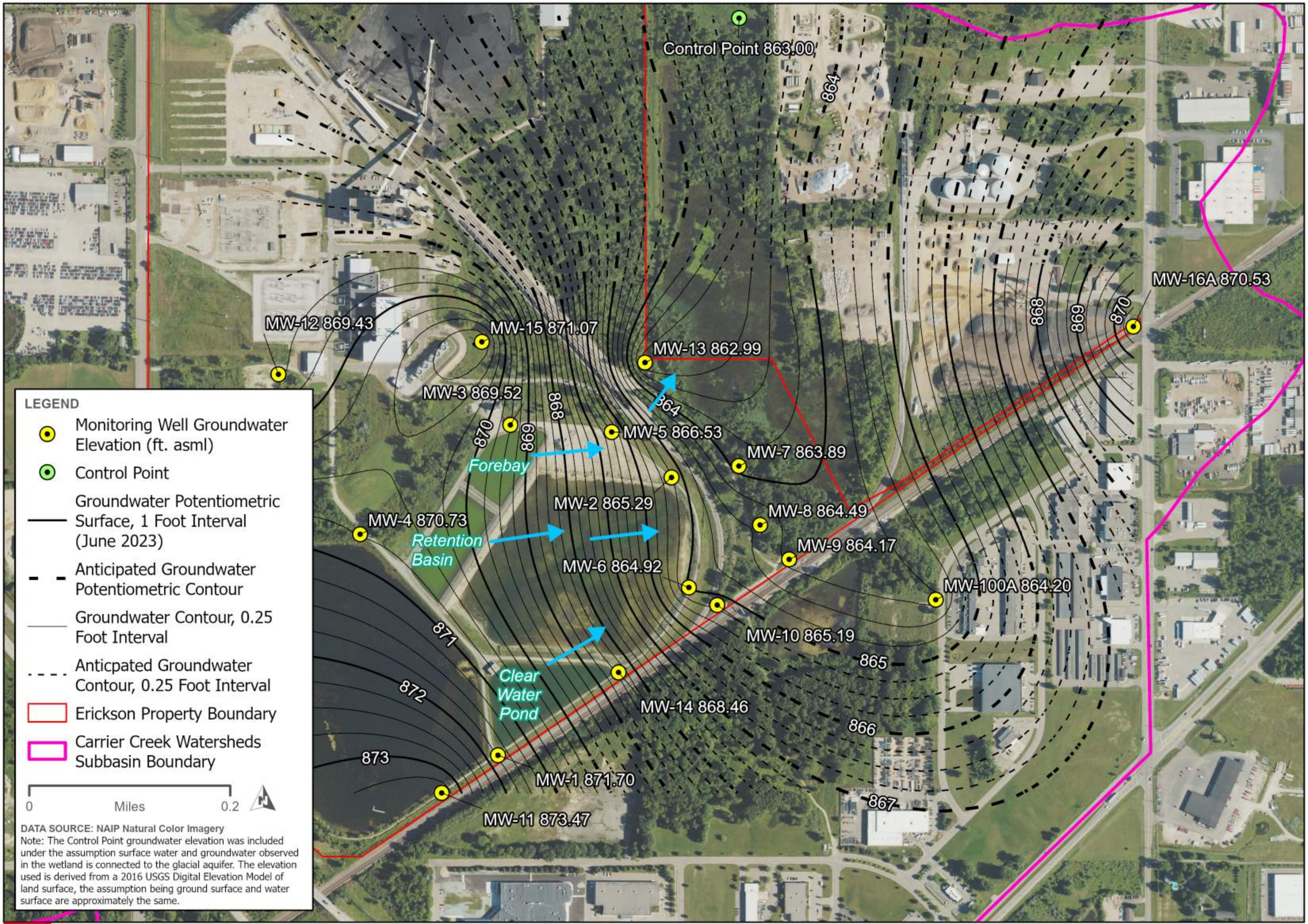
Potentiometric Surface Maps



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.

ERICKSON POWER STATION
EATON COUNTY, MI



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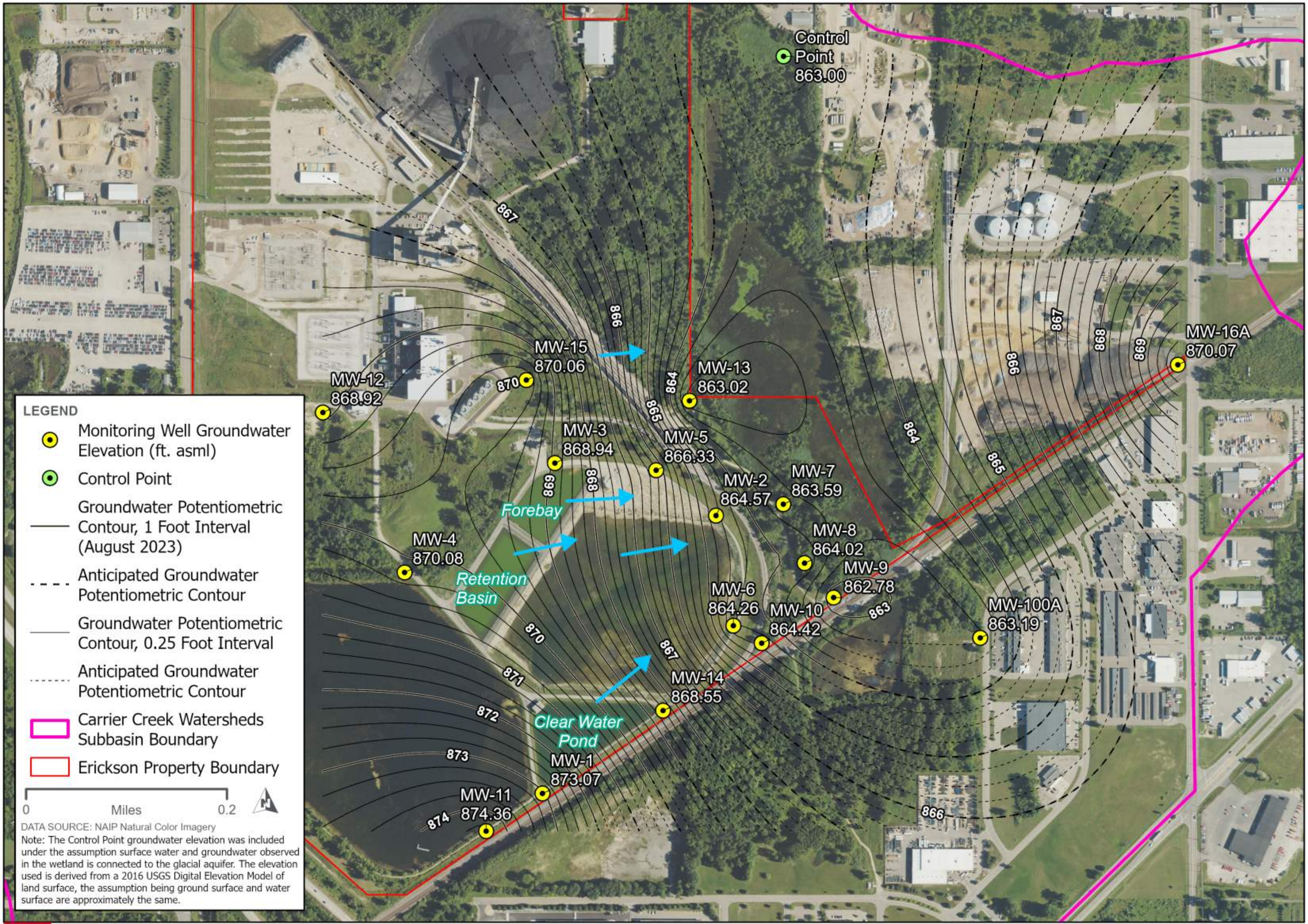
ERICKSON POWER STATION
EATON COUNTY, MI



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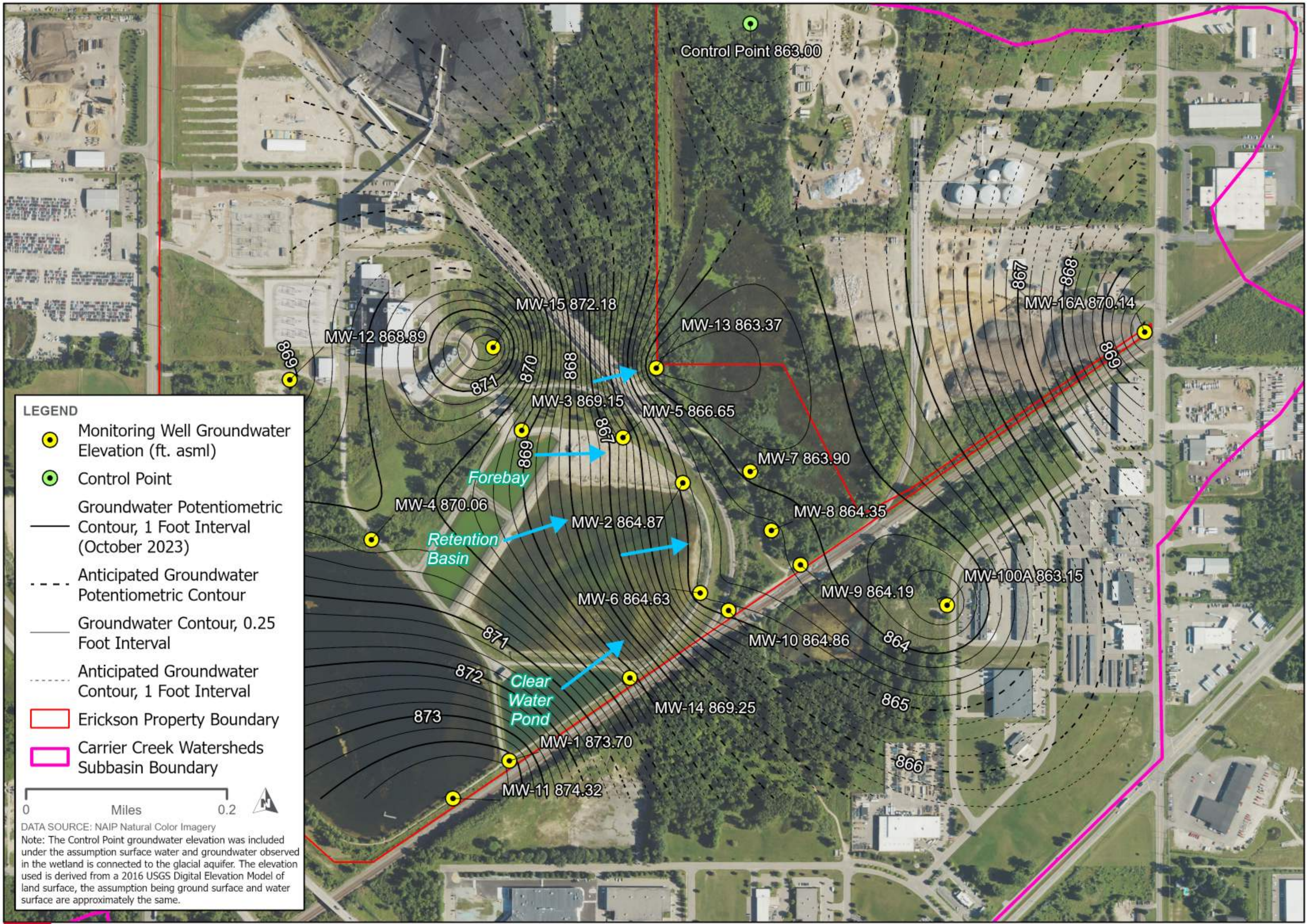

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Note: The Control Point groundwater elevation was included under the assumption surface water and groundwater observed in the wetland is connected to the glacial aquifer. The elevation used is derived from a 2016 USGS Digital Elevation Model of land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

HDR

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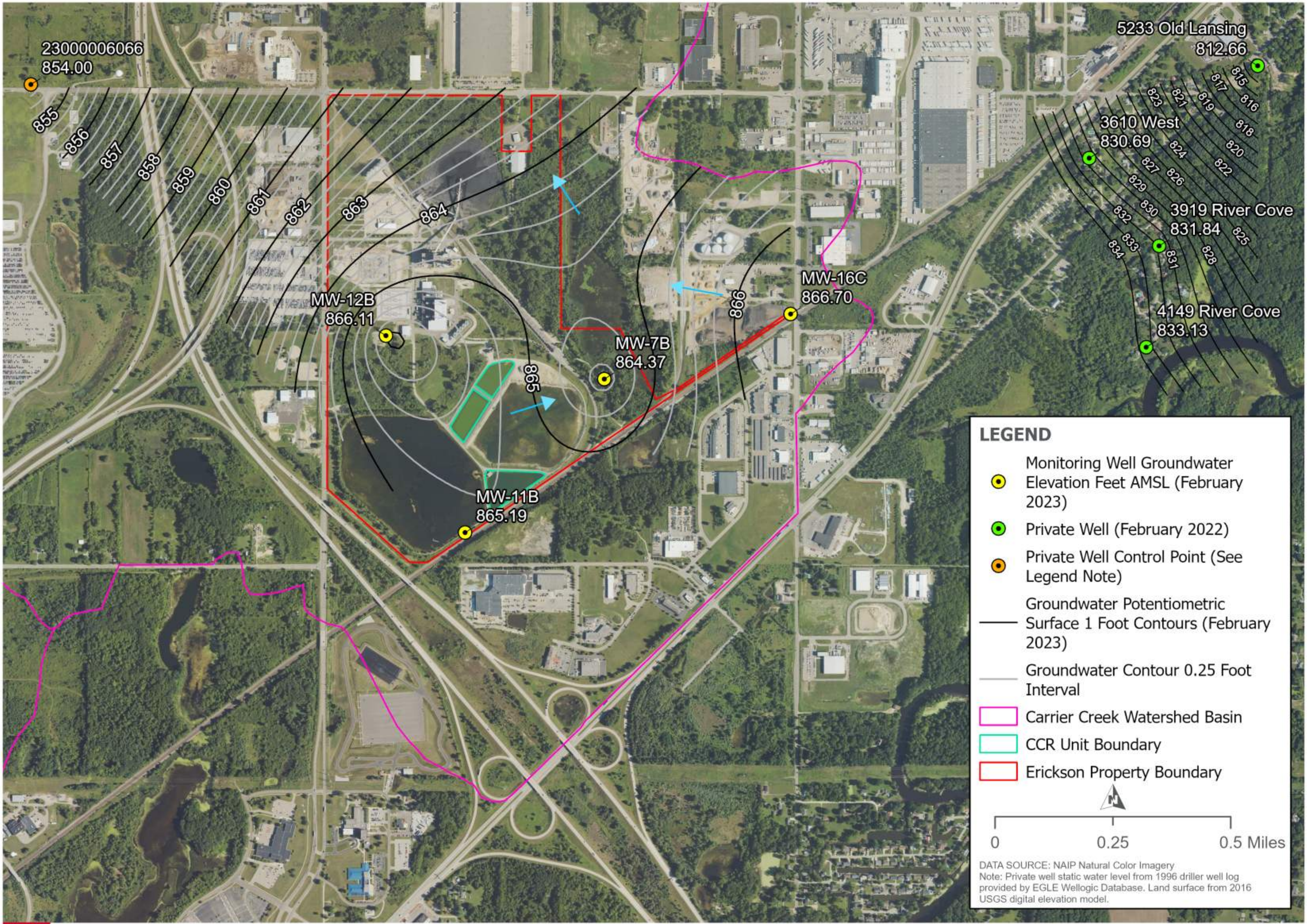

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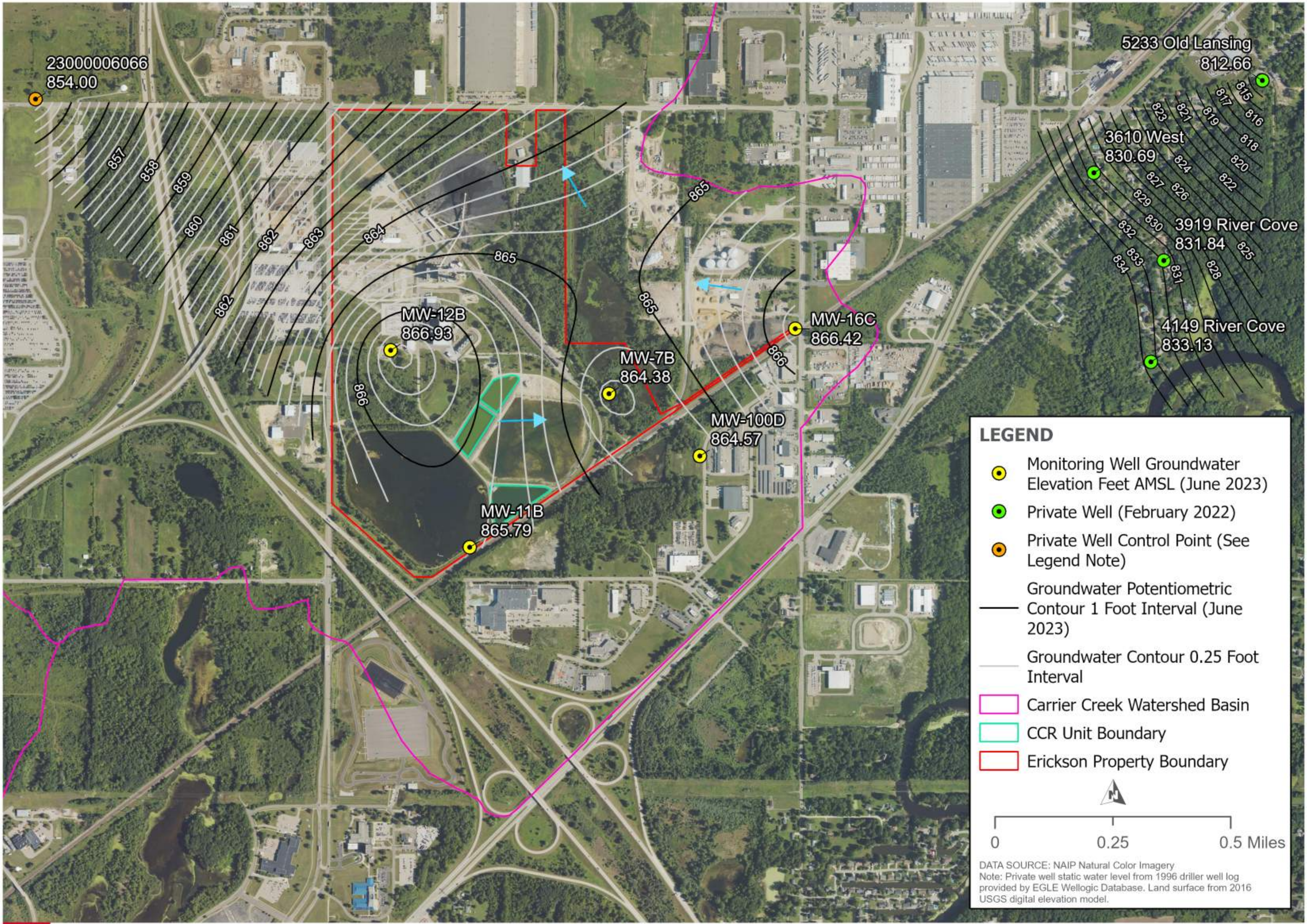

DATA SOURCE: NAIP Natural Color Imagery
Note: Private well static water level from 1996 driller well log provided by EGLE Wellogic Database. Land surface from 2016 USGS digital elevation model.

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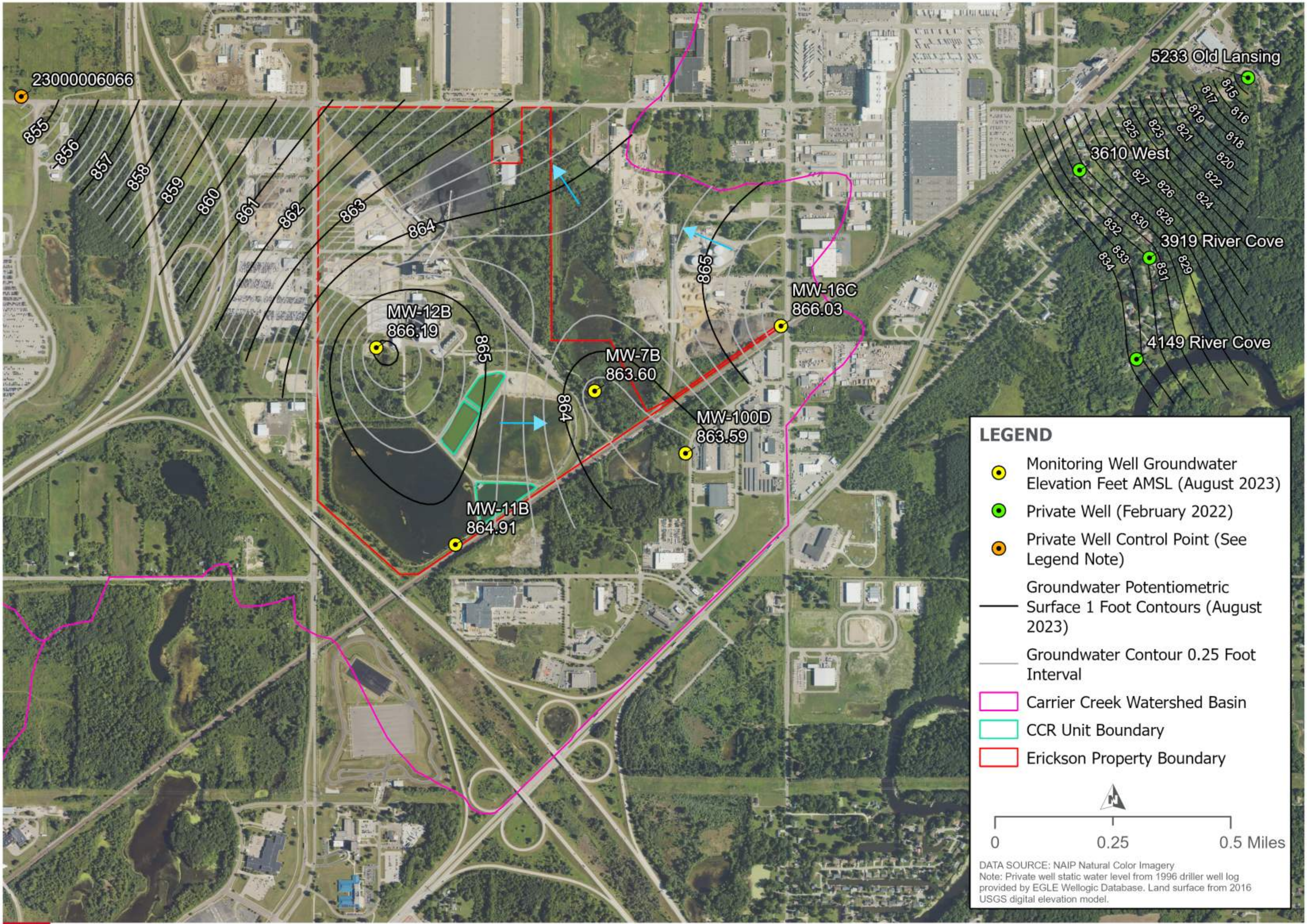
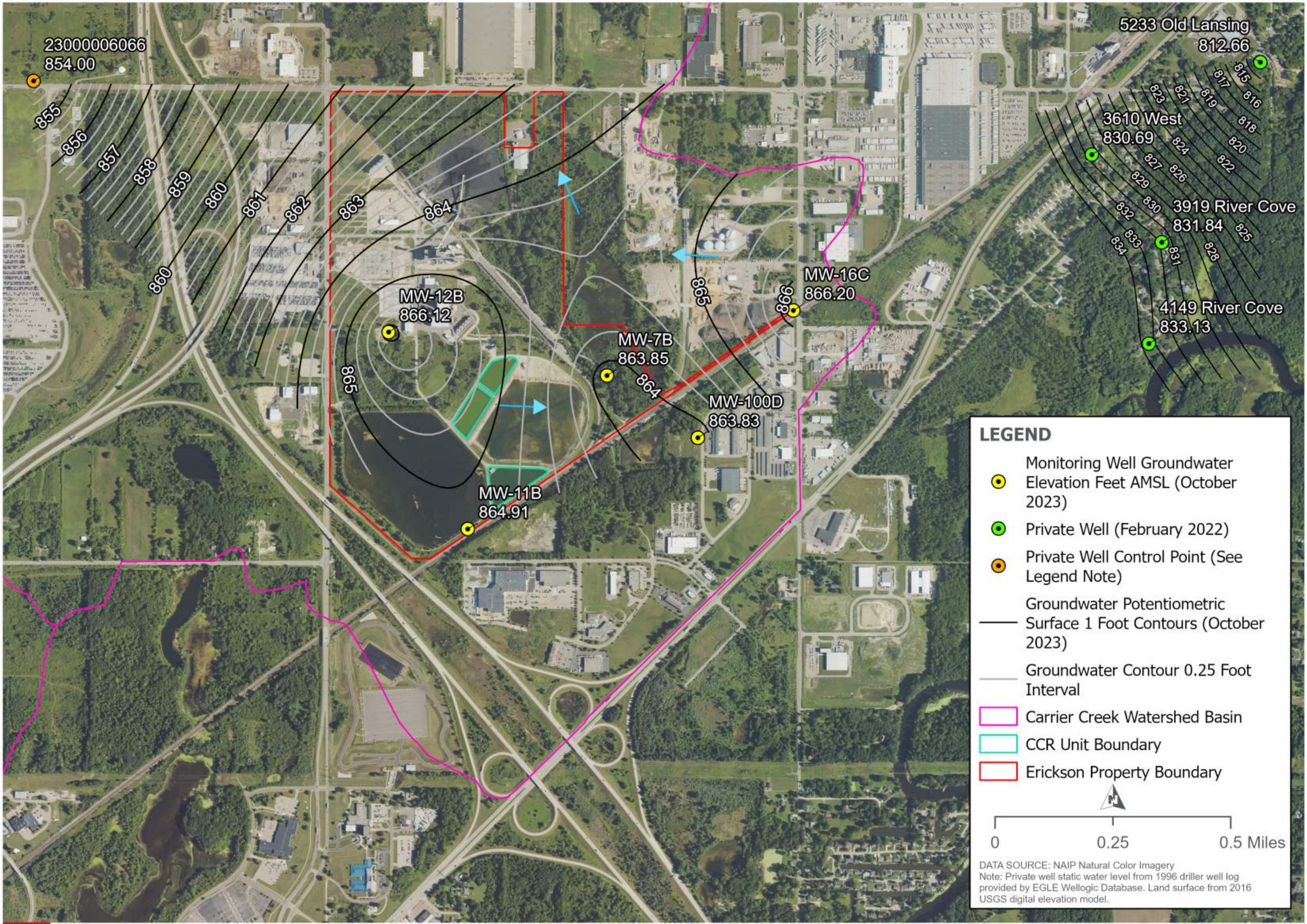
EATON COUNTY, MI



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.

ERICKSON POWER STATION
EATON COUNTY, MI



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EATON COUNTY, MI

Appendix B

Lab Reports Summary Tables

			Sample Location:		MW-1									
			Sample Type:		Upgradient									
			Sample Date:		4/28/2020	5/26/2020	6/23/2020	7/21/2020	8/18/2020	9/15/2020	9/28/2020	10/12/2020	10/19/2020	
Constituent	Unit	BTVs[1]	MCL	State Program GPS	Background Monitoring									
Field Parameters														Field Dup
pH	su	-	-	-	6.81	6.62	6.75	6.85	6.89	6.90	6.77	6.78	7.15	7.15
Conductivity	mS/cm	-	-	-	1.175	1.199	1.218	1.209	1.220	1.215	1.177	1.185	1.210	1.210
Turbidity	NTU	-	-	-	28.20	40.21	17.10	32.30	21.45	15.61	7.32	7.05	8.64	8.64
Dissolved Oxygen	mg/L	-	-	-	0.00	0.01	0.08	0.05	0.52	0.01	0.05	0.30	0.09	0.09
Temperature	°C	-	-	-	11.3	15.2	13.5	16.5	15.6	15.5	13.8	15.1	13.9	13.9
Oxidation Reduction Potential	mV	-	-	-	-43.2	-28.5	-87.2	-53.0	-34.7	-109.8	-62.7	-59.4	-79.2	-79.2
Part 115														
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	23.5	0.3	23.5	5.05	5.26	8.44	6.09	6.32	8.04	5.98	6.02	6.14^{J}	6.15^{J}
Nickel	mg/L	0.021		0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.036	5	5	<0.005	0.036	<0.005	<0.005	<0.005	0.007	<0.005	<0.005	<0.005	<0.005
Appendix III														
Boron	mg/L	0.48	-	0.50	0.48	0.27	0.39	0.38	0.41	0.44	0.45	0.37	0.41	0.39
Calcium	mg/L	188	-	188	162	180	165	156^{J}	161	170	153	167	156^{J}	150^{J}
Chloride	mg/L	94.3	250	250	74	52	70	64	65	59	61	59	52	53
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	-	-	-	6.81	6.62	6.75	6.85	6.89	6.90	6.77	6.78	7.15	7.15
Sulfate	mg/L	344	250	344	38	69	59	75	75	77	80	81	84	85
Total Dissolved Solids	mg/L	1168	500	1168	728	794	774	782	776	768	796	774	806	784
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	0.004	0.005	0.007	0.004	0.006	0.006	0.006	0.006	0.005	0.006
Barium	mg/L	0.168	2.0	2.0	0.149	0.15	0.168	0.128	0.152	0.148	0.145	0.129	0.136	0.135
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	0.036	0.023	0.032	0.033	0.034	0.039	0.041	0.037	0.036	0.036
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	-	-	-	1.1	0.34	0.518	0.299	0.4	0.618	-0.0627	0.717	0.812^{J+}	0.464^{J-}
Radium-228	pCi/L	-	-	-	0.518	0.457	-0.166	0.254	1.47	0.217	-0.778	0.031	0.00457^{J-}	1.14^{J+}
Radium-226/228	pCi/L	5.00	5	5.00	1.61	0.796	0.518	0.553	1.87	0.889	0.00	0.748	0.816^{J-}	1.61^{J+}
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	-	-	-	31	45	43	37	48	55	19	20	31	32
Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Hardness	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-

			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
Part 115												
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	23.5	0.3	23.5	7.12	5.45	4.84	6.61	6.92	12	9.57	7.21
Nickel	mg/L	0.021		0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.036	5	5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
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^{J+}	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^{J+}	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:	4/28/2020	5/26/2020	6/23/2020	7/21/2020	8/18/2020	9/15/2020	9/28/2020	10/12/2020	10/19/2020
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring								
Field Parameters													
pH	su	-	-	-	6.77	6.54	6.69	6.75	6.80	6.83	6.70	6.72	7.08
Conductivity	mS/cm	-	-	-	1.602	1.556	1.699	1.744	1.762	1.794	1.761	1.762	1.798
Turbidity	NTU	-	-	-	72.31	8.27	8.95	9.42	5.95	4.15	7.11	9.56	6.28
Dissolved Oxygen	mg/L	-	-	-	0.02	0.02	0.07	0.19	0.15	0.12	0.03	0.34	0.03
Temperature	°C	-	-	-	11.6	14.2	12.9	15.0	13.9	13.7	12.7	14.5	12.3
Oxidation Reduction Potential	mV	-	-	-	-42.5	36.0	-40.2	32.5	38.2	-75.8	56.1	35.3	22.1
Part 115													
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	23.5	0.3	23.5	0.91	0.67	0.48	0.44	0.62	0.51	0.51	0.67^{J}	0.63^{J}
Nickel	mg/L	0.021		0.1	0.018	0.019	0.022	0.024	0.026	0.027	0.027	0.028	0.027
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.036	5	5	<0.005	0.041	<0.005	<0.005	0.007	<0.005	<0.005	<0.005	<0.005
Appendix III													
Boron	mg/L	0.48	-	0.50	3.56	3.38	4.05	4.61	5.19	5.97	5.94	5.97	5.97
Calcium	mg/L	188	-	188	251	256	268	271^{J}	272	270	265	270	270^{J}
Chloride	mg/L	94.3	250	250	67	68	75	81	85	88	84	88	88
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	-	-	-	6.77	6.54	6.69	6.75	6.80	6.83	6.70	6.72	7.08
Sulfate	mg/L	344	250	344	386	386	484	549	580	560	586	560	560
Total Dissolved Solids	mg/L	1168	500	1168	1170	1180	1300	1390	1430	1390	1420	1390	1390
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	0.039	0.043	0.045	0.036	0.045	0.039	0.041	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
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	0.055	0.047	0.055	0.053	0.057	0.066	0.066	0.065	0.07
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	0.01	0.008	0.01	0.007	0.011	0.011	0.012	0.012	0.012
Radium-226	pCi/L	-	-	-	0.813	0.0551	0.754	0.329	0.171	0.183	0.263	0.151	0.405
Radium-228	pCi/L	-	-	-	1.05	0.0833	-0.139	0.0326	0.573	-0.0154	0.0604	1.3	0.0896
Radium-226/228	pCi/L	5.00	5	5.00	1.86	0.138	0.754	0.362	0.745	0.183	0.323	1.45	0.495
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	1^{U}	<3	<3	14	<3	2^{U}	6	3^{U}
Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Hardness	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-

				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
Part 115												
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	23.5	0.3	23.5	0.54	0.49	0.55	0.66	1.93	0.93	1.30	0.79
Nickel	mg/L	0.021		0.1	0.027	0.026	0.025	0.025	0.026	0.018	0.020	0.017
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.036	5	5	<0.005	<0.005	<0.005	<0.005	0.007	<0.005	<0.005	<0.005
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^{J+}	-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^{J+}	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
Part 115										
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	23.5	0.3	23.5	2.01	2.05	1.94	1.80	2.03	1.70
Nickel	mg/L	0.021		0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.036	5	5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
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^{J+}	1.61	0.236
Radium-226/228	pCi/L	5.00	5	5.00	1.20	1.11	2.45	2.92^{J+}	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:	4/28/2020		5/26/2020		6/23/2020		7/21/2020		8/18/2020		9/15/2020	

Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring											
Field Parameters						Field Dup		Field Dup		Field Dup		Field Dup		Field Dup		Field Dup
pH	su	-	-	-	7.18	7.18	7.13	7.13	7.11	7.11	7.23	7.23	7.24	7.24	7.28	7.28
Conductivity	mS/cm	-	-	-	0.902	0.902	0.894	0.894	0.911	0.911	0.890	0.890	0.880	0.880	0.888	0.888
Turbidity	NTU	-	-	-	2.57	2.57	0.26	0.26	3.01	3.01	1.70	1.70	1.56	1.56	1.64	1.64
Dissolved Oxygen	mg/L	-	-	-	0.31	0.31	0.29	0.29	0.02	0.02	0.03	0.03	0.01	0.01	0.02	0.02
Temperature	°C	-	-	-	10.2	10.2	14.1	14.1	13.5	13.5	14.7	14.7	14.2	14.2	13.7	13.7
Oxidation Reduction Potential	mV	-	-	-	-76.7	-76.7	-45.2	-45.2	-174.8	-174.8	-68.4	-68.4	-75.0	-75.0	-153.2	-153.2
Part 115																
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	23.5	0.3	23.5	1.03	1.03	1.13	1.19	1.24	1.26	1.37	1.38	1.33	1.33	1.33	1.32
Nickel	mg/L	0.021		0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.036	5	5	<0.005	<0.005	0.031	0.035	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	<0.005
Appendix III																
Boron	mg/L	0.48	-	0.50	0.05	0.05	0.06	0.06	0.06	0.05	0.06	0.05	0.06	0.06	0.07	0.07
Calcium	mg/L	188	-	188	113	111	115	114	108	108	105^{J}	102	111	107	108	110
Chloride	mg/L	94.3	250	250	70	70	72	72	72	73	72	72	70	71	68	70
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	<1.0
pH, Field	su	-	-	-	7.18	7.18	7.13	7.13	7.11	7.11	7.23	7.23	7.24	7.24	7.28	7.28
Sulfate	mg/L	344	250	344	59	60	57	56	57	57	56	56	58	59	58	58
Total Dissolved Solids	mg/L	1168	500	1168	548	546	566	562	558	582	540	534	582	552	572	542
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	<0.005
Arsenic	mg/L	0.021	0.01	0.021	0.006	0.006	0.006	0.007	0.007	0.007	0.007	0.007	0.008	0.007	0.009	0.007
Barium	mg/L	0.168	2.0	2.0	0.157	0.155	0.165	0.168	0.165	0.17	0.146	0.147	0.166	0.167	0.163	0.163
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	<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	<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	<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	<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	<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	<0.003
Lithium	mg/L	0.0396	0.040	0.040	<0.010	<0.010	0.009	0.009	0.008	0.008	0.009	0.008	<0.010	<0.010	0.01	0.01
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	<0.0002
Molybdenum	mg/L	0.024	0.1	0.100	<0.005	<0.005	<0.005	0.005	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	0.005	<0.005
Radium-226	pCi/L	-	-	-	0.839	0.953	0.599	0.265	0.368^{J-}	0.568^{J+}	0.339	1.06	0.527^{J+}	0.34^{J-}	0.583^{J-}	1.01^{J+}
Radium-228	pCi/L	-	-	-	1.08	1.38	-0.093	0.357	-0.141^{J-}	0.771^{J+}	0.863	-0.0421	2.46^{J+}	1.22^{J-}	0.113^{J-}	0.641^{J+}
Radium-226/228	pCi/L	5.00	5	5.00	1.92	2.33	0.599	0.622	0.368^{J-}	1.34^{J+}	1.2	1.06	2.99^{J+}	1.56^{J-}	0.696^{J-}	1.65^{J+}
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	<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	<0.002
Other																
Total Suspended Solids	mg/L	-	-	-	<3	<3	1^{U}	1^{U}	<3	<3	<3	<3	<3	<3	<3	<3
Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hardness	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

				Sample Location:	MW-4										
				Sample Type:	Upgradient										
				Sample Date:	9/28/2020		10/12/2020		10/19/2020	11/6/2020		1/27/2021		5/4/2021	
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring					Initial A.M.		Assessment Monitoring			
Field Parameters						Field Dup		Field Dup			Field Dup		Field Dup		Field Dup
pH	su	-	-	-	7.14	7.14	7.13	7.13	7.87	7.22	7.22	7.14	7.14	7.10	7.10
Conductivity	mS/cm	-	-	-	0.859	0.859	0.866	0.866	0.875	0.876	0.876	0.900	0.900	0.910	0.910
Turbidity	NTU	-	-	-	1.08	1.08	1.39	1.39	1.25	1.21	1.21	1.57	1.57	2.00	2.00
Dissolved Oxygen	mg/L	-	-	-	0.02	0.02	0.35	0.35	0.04	0.18	0.18	0.13	0.13	0.19	0.19
Temperature	°C	-	-	-	13.4	13.4	14.0	14.0	12.9	14.4	14.4	9.7	9.7	13.0	13.0
Oxidation Reduction Potential	mV	-	-	-	-77.3	-77.3	-63.8	-63.8	-78.1	-119.1	-119.1	-21.9	-21.9	-22.5	-22.5
Part 115															
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	23.5	0.3	23.5	1.30	1.29	1.33	1.35	1.25^{J}	1.32	1.34	1.15	1.21	1.23	1.27
Nickel	mg/L	0.021		0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.036	5	5	0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Appendix III															
Boron	mg/L	0.48	-	0.50	0.07	0.07	0.06	0.05	0.06	-	-	0.05	0.05	0.05	0.05
Calcium	mg/L	188	-	188	102	105^{J}	111	110	99.7^{J}	-	-	112	109	102	107
Chloride	mg/L	94.3	250	250	69	70	71	71	68	-	-	70	70	72	75
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	-	-	-	7.14	7.14	7.13	7.13	7.87	7.22	7.22	7.14	7.14	7.10	7.10
Sulfate	mg/L	344	250	344	58	58	60	59	57	-	-	57	57	56	58
Total Dissolved Solids	mg/L	1168	500	1168	538	544	538	534	554	-	-	522	514	532	526
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	0.008	0.009	0.009	0.009	0.009	0.009	0.009	0.007	0.007	0.006	0.007
Barium	mg/L	0.168	2.0	2.0	0.163	0.168	0.151	0.155	0.16	0.16	0.159	0.157	0.153	0.156	0.156
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	0.01	0.011	0.01	<0.010	0.01	0.011	0.011	0.012	0.01	<0.010	0.011
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0005	<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	-	-	-	0.797^{J+}	0.175^{J-}	0.35	0.31	0.357	0.742	0.393	0.524^{J+}	0.297^{J-}	2.12	0.626
Radium-228	pCi/L	-	-	-	0.839^{J+}	0.27^{J-}	1.65^{J+}	0.237^{J-}	0.232	0.0791	0.426	-0.957^{J-}	0.956^{J+}	2.89	-0.910
Radium-226/228	pCi/L	5.00	5	5.00	1.64^{J+}	0.445^{J-}	2.00^{J+}	0.547^{J-}	0.589	0.821	0.819	0.524^{J-}	1.25^{J+}	5.00^{J+}	0.626^{J-}
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	-	-	-	2^{U}	2^{U}	<3	1^{U}	3^{U}	1^{U}	1^{U}	1^{U}	<3	1^{U}	<3
Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hardness	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-

			Sample Location:	MW-4										
				Sample Type:	Upgradient									
				Sample Date:	8/3/2021		2/1/2022		8/2/2022		2/7/2023		8/1/2023	
Constituent	Unit	BTVs	MCL	State Program GPS	Assessment Monitoring									
Field Parameters						Field Dup		Field Dup		Field Dup		Field Dup		Field Dup
pH	su	-	-	-	7.03	7.03	7.13	7.13	7.19	7.19	7.19	7.19	7.06	7.06
Conductivity	mS/cm	-	-	-	0.884	0.884	0.911	0.911	0.429	0.429	0.882	0.882	0.893	0.893
Turbidity	NTU	-	-	-	1.84	1.84	2.54	2.54	0.75	0.75	3.28	3.28	1.97	1.97
Dissolved Oxygen	mg/L	-	-	-	0.03	0.03	0.37	0.37	0.12	0.12	0.44	0.44	0.08	0.08
Temperature	°C	-	-	-	14.4	14.4	10.6	10.6	13.8	13.8	11.5	11.5	14.1	14.1
Oxidation Reduction Potential	mV	-	-	-	-66.4	-66.4	-34.0	-34.0	-88.8	-88.8	-44.2	-44.2	-68.3	-68.3
Part 115														
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	23.5	0.3	23.5	1.43	1.46	1.26	1.23	1.53	1.54	1.31	1.30	1.39	1.44
Nickel	mg/L	0.021		0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.036	5	5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Appendix III														
Boron	mg/L	0.48	-	0.50	0.08	0.07	0.07	0.06	0.06	0.07	0.06	0.06	0.08	0.06
Calcium	mg/L	188	-	188	98.4	94.6	110	110	110	109	106	106	112	114
Chloride	mg/L	94.3	250	250	68	68	72	74	75	76	74	75	77	77
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	-	-	-	7.03	7.03	7.13	7.13	7.19	7.19	7.19	7.19	7.06	7.06
Sulfate	mg/L	344	250	344	52	53	54	53	51	52	56	56	52	52
Total Dissolved Solids	mg/L	1168	500	1168	568	570	548	540	554	574	532	530	558	572
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	0.008	0.008	0.008	0.008	0.008	0.008	0.007	0.007	0.007	0.008
Barium	mg/L	0.168	2.0	2.0	0.155	0.159	0.163	0.162	0.167	0.165	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	<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	0.01	0.01	0.010	0.011	0.009	0.009	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	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	mg/L	0.024	0.1	0.100	0.009	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Radium-226	pCi/L	-	-	-	0.232^{J-}	0.532^{J+}	0.606^{J+}	0.322^{J-}	0.393	0.457	0.701	0.898	0.744	0.501
Radium-228	pCi/L	-	-	-	-0.362^{J-}	1.81^{J+}	2.17^{J+}	1.41^{J-}	-0.793^{J}	2.88^{J+}	0.692^{J+}	-0.593^{J-}	0.877^{J+}	0.0402^{J-}
Radium-226/228	pCi/L	5.00	5	5.00	0.232^{J-}	2.34^{J+}	2.78^{J+}	1.74^{J-}	0.393^{J}	3.34^{J+}	1.39^{J+}	0.898^{J-}	0.744^{J+}	0.541^{J-}
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}	1^{U}	2^{U}	1^{U}	3^{J+}	<3^{UJ}	<3	<3	1.8	2.1
Bicarbonate	mg/L	-	-	-	-	-	-	-	400	410	406	407	420	400
Carbonate	mg/L	-	-	-	-	-	-	-	<10	<10	<10	<10	<10	<10
Hardness	mg/L	-	-	-	-	-	-	-	412	426	420	431	450	434
Magnesium	mg/L	-	-	-	-	-	-	-	39.3	38.8	38.3	38.9	39.6	40.5
Potassium	mg/L	-	-	-	-	-	-	-	1.41	1.41	1.39	1.41	1.45	1.49
Sodium	mg/L	-	-	-	-	-	-	-	28.9	28.3	28.5	28.2	31.2	31.7

			Sample Location:		MW-5								
			Sample Type:		Downgradient								
			Sample Date:		4/28/2020	5/26/2020	6/23/2020	7/21/2020	8/18/2020	9/15/2020	9/28/2020	10/12/2020	10/19/2020
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring								
Field Parameters													
pH	su	-	-	-	7.27	7.24	7.31	7.34	7.30	7.17	6.71	7.34	7.45
Conductivity	mS/cm	-	-	-	1.576	1.882	1.970	1.869	1.750	1.893	1.945	2.493	1.425
Turbidity	NTU	-	-	-	179.57	69.71	17.91	15.10	20.25	19.02	15.75	12.35	9.58
Dissolved Oxygen	mg/L	-	-	-	0.55	0.65	2.61	3.85	2.50	0.64	1.27	3.49	4.25
Temperature	°C	-	-	-	11.6	13.9	15.2	17.5	12.7	12.3	12.5	15.5	11.6
Oxidation Reduction Potential	mV	-	-	-	-33.0	28.7	-34.8	58.4	69.5	-24.8	180.1	-31.2	130.2
Part 115													
Copper	mg/L	0.005	1.3	1.00	0.009	<0.005	<0.005	0.026	0.005	<0.005	<0.005	0.011	<0.005
Iron	mg/L	23.5	0.3	23.5	8.00	1.93	0.39	0.27	2.45	0.21	0.18	1.74	0.18^{J}
Nickel	mg/L	0.021		0.1	0.019	0.016	0.013	0.011	0.013	0.011	0.016	0.018	0.014
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	0.012	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.036	5	5	0.023	0.033	0.026	0.007	0.011	<0.005	0.006	0.014	<0.005
Appendix III													
Boron	mg/L	0.48	-	0.50	4.99	5.19	4.59	4.57	4.48	5	5.09	5	5.75
Calcium	mg/L	188	-	188	245	320	289	251^{J}	266	266	283	372	319^{J}
Chloride	mg/L	94.3	250	250	68	82	75	80	76	77	78	81	83
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	-	-	-	7.27	7.24	7.31	7.34	7.30	7.17	6.71	7.34	7.45
Sulfate	mg/L	344	250	344	591	930	931	877	714	791	873	1,080	1,170
Total Dissolved Solids	mg/L	1168	500	1168	1280	1770	1720	1640	1520	1540	1660	1960	2020
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	0.005	0.002	<0.002	<0.002	0.003	<0.002	<0.002	<0.002	<0.002
Barium	mg/L	0.168	2.0	2.0	0.064	0.056	0.049	0.041	0.056	0.043	0.043	0.048	0.042
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	0.01	<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	0.006	<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	<1.0
Lead	mg/L	0.003	0.015	0.004	0.005	<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	0.091	0.051	0.061	0.074	0.085	0.091	0.07	0.054	0.046
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	0.096	0.051	0.05	0.052	0.067	0.053	0.044	0.038	0.035
Radium-226	pCi/L	-	-	-	1.1	1.08	0.223	0.811	0.30	0.773	0.759	0.709	0.600
Radium-228	pCi/L	-	-	-	0.187	0.28	0.302	0.721	0.253	-0.641	1.47	1.38	-0.262
Radium-226/228	pCi/L	5.00	5	5.00	1.29	1.36	0.524	1.53	0.552	0.773	2.23	2.09	0.600
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	-	-	-	161	21	23	37	20	61	6	14	7
Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Hardness	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-

				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												Diss. Metals		Diss. Metals
pH	su	-	-	-	7.16	7.35	6.40	7.22	7.18	7.40	7.13	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
Turbidity	NTU	-	-	-	18.49	15.25	21.00	9.52	14.21	20.19	23.53	23.53	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
Temperature	°C	-	-	-	12.5	8.6	13.0	13.3	10.1	15.3	10.5	10.5	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
Part 115														
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	0.019	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	23.5	0.3	23.5	<0.02	0.63	0.9	1.12	4.69	0.75	0.53	<0.02	1.25	<0.02
Nickel	mg/L	0.021		0.1	0.007	0.01	0.01	0.01	0.008	0.011	0.006	0.005	0.006	<0.005
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	0.009	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.036	5	5	<0.005	0.098	<0.005	0.005	0.048	0.009	0.005	<0.005	0.006	<0.005
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
Calcium	mg/L	188	-	188	-	245	221	229	70.1	223	187	176	173	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
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
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
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
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	0.007	<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	-
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
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
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	0.032	0.054	0.05	0.039	0.010	0.063	0.055	0.055	0.072	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^{J}	0.726	0.271	1.54	0.33^{J+}	1.22	-	1.24	-
Radium-226/228	pCi/L	5.00	5	5.00	4.22	3.99^{J}	1.08	0.644	1.79	0.855^{J+}	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
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	-	-	-	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
Potassium	mg/L	-	-	-	-	-	-	-	-	3.77	4.44	4.06	4.61	4.22
Sodium	mg/L	-	-	-	-	-	-	-	-	69.5	57.4	52.3	47.8	44.1

				Sample Location:	MW-6								
				Sample Type:	Downgradient								
				Sample Date:	4/28/2020	5/26/2020	6/23/2020	7/21/2020	8/18/2020	9/15/2020	9/28/2020	10/12/2020	10/19/2020
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring								
Field Parameters													
pH	su	-	-	-	6.64	6.35	6.68	6.76	6.80	6.85	6.69	6.71	7.11
Conductivity	mS/cm	-	-	-	0.954	0.902	1.044	1.075	1.130	1.251	1.149	1.205	1.275
Turbidity	NTU	-	-	-	16.71	17.80	33.60	6.61	8.99	6.95	5.42	8.45	8.35
Dissolved Oxygen	mg/L	-	-	-	0.05	0.01	0.09	0.09	0.05	0.04	0.02	0.24	0.04
Temperature	°C	-	-	-	10.5	14.2	11.7	13.4	13.0	13.6	12.6	14.3	12.8
Oxidation Reduction Potential	mV	-	-	-	-26.9	102.4	-45.9	139.7	91.1	-66.5	59.5	88.9	91.2
Part 115													
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	23.5	0.3	23.5	0.08	0.20	0.07	0.05	0.03	<0.02	<0.02	<0.02	<0.02^{UJ}
Nickel	mg/L	0.021		0.1	0.005	<0.005	0.007	0.007	0.008	0.007	0.008	0.007	0.007
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.036	5	5	<0.005	0.034	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Appendix III													
Boron	mg/L	0.48	-	0.50	0.56	0.49	0.65	0.75	0.86	1.05	0.97	0.99	1.09
Calcium	mg/L	188	-	188	142	143	154	161^{J}	170	192	175	189	173^{J}
Chloride	mg/L	94.3	250	250	26	24	29	33	37	43	39	41	42
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	-	-	-	6.64	6.35	6.68	6.76	6.80	6.85	6.69	6.71	7.11
Sulfate	mg/L	344	250	344	135	123	154	183	222	264	214	242	263
Total Dissolved Solids	mg/L	1168	500	1168	642	598	706	738	820	880	822	868	898
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	0.042	0.05	0.042	0.044	0.053	0.054	0.055	0.054	0.057
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	0.037	0.038	0.037	0.041	0.044	0.055	0.053	0.052	0.059
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	0.021	0.021	0.026	0.025	0.03	0.031	0.028	0.029	0.034
Radium-226	pCi/L	-	-	-	0.212	-0.0419	0.379	-0.0445	0.415	0.458	0.533	0.461	0.537
Radium-228	pCi/L	-	-	-	0.384	-0.481	-0.299	0.460	1.06	-0.00462	0.225	0.176	-0.866
Radium-226/228	pCi/L	5.00	5	5.00	0.596	0.00	0.379	0.460	1.48	0.458	0.758	0.637	0.537
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	6	<3	<3	<3	<3	<3	<3	1^{U}
Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Hardness	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-

				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
Part 115												
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	23.5	0.3	23.5	<0.02	<0.02	<0.02	0.02	0.04	0.02	<0.02	0.03
Nickel	mg/L	0.021		0.1	0.007	0.006	0.006	0.007	0.007	<0.005	0.006	<0.005
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.036	5	5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
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^{J+}	-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^{J+}	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
Part 115															
Copper	mg/L	0.005	1.3	1.00	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	23.5	0.3	23.5	1.34	1.25	1.31	1.37	1.49	1.50	1.52	2.81	1.19	1.00	1.04
Nickel	mg/L	0.021		0.1	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	0.0005	0.1	0.098	< 0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.036	5	5	< 0.005	0.007	0.014	<0.005	<0.005	<0.005	<0.005	<0.005	0.007	<0.005	<0.005
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^{J+}	3.42	0.535	2.49	0.115	0.179	-0.650	1.51	1.27^{J+}	4.38	1.18
Radium-226/228	pCi/L	5.00	5	5.00	2.11^{J+}	4.82	1.30	3.32	0.781^{J}	2.82	0.676	2.33	1.84^{J+}	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	2/8/2023	8/2/2023
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring										Assessment 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	8.15	7.87
Conductivity	mS/cm	-	-	-	0.73	0.73	0.588	0.588	0.589	0.586	0.588	0.580	0.587	0.577	0.577	0.565
Turbidity	NTU	-	-	-	0.02	0.02	7.01	7.01	6.25	6.01	4.05	4.20	5.25	6.01	3.12	0.98
Dissolved Oxygen	mg/L	-	-	-	0.85	0.85	0.26	0.26	0.1	0.09	0.11	0.67	0.16	0.12	0.07	0.02
Temperature	°C	-	-	-	11.7	11.7	11.0	11.0	13.1	13.3	14.1	14.0	13.3	13.4	11.2	14.9
Oxidation Reduction Potential	mV	-	-	-	19.2	19.2	-95.1	-95.1	-135.8	-38.8	-108.9	-117.5	-98.2	-106.9	-130.1	-138.4
Part 115																
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	3.0	0.3	3.04	0.06	0.06	0.03	0.03	0.03	0.05^{J}	0.04	0.05	0.06	0.07	0.08	0.09
Nickel	mg/L	0.011		0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.042	5	5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
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	3.00	3.06
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	8.77	9.36
Chloride	mg/L	5.0	250	250	<5	<5	<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	<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	8.15	7.87
Sulfate	mg/L	5.0	250	250	<5	<5	<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	362	356
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	<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	<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	0.009	0.010	0.008	0.009	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	<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	<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	<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	<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	<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	<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	0.032	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	<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	<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	0.504	0.434
Radium-228	pCi/L	-	-	-	1.270	0.536	0.872	0.428	-0.123	1.88	0.136^{J+}	0.286	0.103	1.30	-0.879	1.13
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^{J+}	0.726	1.09	1.77	0.504	1.57
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	<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	<0.002
Other																
Total Suspended Solids	mg/L	-	-	-	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Bicarbonate	mg/L	-	-	-	390	390	390	400	400	380	390	390	390	400	418	400
Carbonate	mg/L	-	-	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hardness	mg/L	-	-	-	38	40	37	51	29	31	30	29	30	29	29	38
Magnesium	mg/L	-	-	-	2.93	3.00	2.99	2.93	2.43	2.75	2.79	2.84	2.75	2.78	2.81	2.81
Potassium	mg/L	-	-	-	5.48	5.57	5.64	5.57	4.8	5.57	5.72	5.61	5.53	5.85	5.58	5.78
Sodium	mg/L	-	-	-	132	131	136	133	116	135	138	140	138	137	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	2/8/2023	8/2/2023
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring									Assessment 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	7.41	7.24
Conductivity	mS/cm	-	-	-	2.01	2.01	1.811	1.758	1.651	1.672	1.700	1.330	1.678	1.537	1.619
Turbidity	NTU	-	-	-	0.02	0.02	5.87	3.95	2.59	1.97	2.80	4.20	4.01	7.29	0.65
Dissolved Oxygen	mg/L	-	-	-	1.77	1.77	0.23	0.07	0.08	0.09	0.61	0.12	0.09	0.09	0.06
Temperature	°C	-	-	-	12.3	12.3	11.0	13.7	13.8	14.3	16.0	13.7	13.8	11.3	16.4
Oxidation Reduction Potential	mV	-	-	-	-39	-39	-121.4	-182.8	-110.2	-151.5	-136.4	-128.8	-120.4	-111.5	-130.0
Part 115															
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	23.5	0.3	23.5	4.15	4.11	4.34	4.28	3.77^{J}	3.84	4.11	3.81	4.11	3.67	4.02
Nickel	mg/L	0.021		0.1	0.01	0.011	0.008	0.008	0.007	0.008	0.008	0.007	0.007	0.007	0.007
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.036	5	5	<0.005	0.007	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	<0.005
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	6.46	6.68
Calcium	mg/L	188	-	188	277	272	255	183	245	241	247	234	243	246	235
Chloride	mg/L	94.3	250	250	96	95	101	93	91	90	93	93	92	94	93
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	-	-	-	7.32	7.32	7.51	7.49	7.28	7.24	7.30	7.23	7.35	7.41	7.24
Sulfate	mg/L	344	250	344	751	761	736	723	668	660	703	675	685	687	656
Total Dissolved Solids	mg/L	1168	500	1168	1500	1500	1450	1420	1360	1360	1370	1360	1360	1360	1350
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	0.007	0.007	0.006	0.007	0.006	0.006	0.006	0.006	0.005	0.006	0.007
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	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	<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	<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	0.132	0.129	0.121	0.130	0.127	0.138	0.137	0.128	0.125	0.125	0.126
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	0.41	0.41	0.40	0.42	0.379	0.39	0.405	0.377	0.415	0.386	0.397
Radium-226	pCi/L	-	-	-	0.867	0.916	0.566	0.444	0.958	0.193	0.606	0.595	0.680	1.11	0.795
Radium-228	pCi/L	-	-	-	2.790	2.110	3.090	0.550	2.35	0.58^{J+}	0.204	1.39	1.08	2.17	0.451
Radium-226/228	pCi/L	5.00	5	5.00	3.660	3.030	3.650	0.994	3.31	0.773^{J+}	0.810	1.99	1.76	3.27	1.25
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	-	-	-	27^{J+}	13^{J-}	10	9	8	<3	<3	<3	6	7	7.4
Bicarbonate	mg/L	-	-	-	150	160	160	170	160	160	170	150	150	172	170
Carbonate	mg/L	-	-	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hardness	mg/L	-	-	-	840	860	812	812	777	740	764	750	754	742	779
Magnesium	mg/L	-	-	-	44.1	44.90	43.10	33.70	40	40	42.2	42.1	41.0	42.7	41.5
Potassium	mg/L	-	-	-	5.34	5.04	5.68	4.92	5.89	5.71	5.88	6.14	5.96	6.07	5.79
Sodium	mg/L	-	-	-	97.9	97.1	96.8	79	94.2	95.7	99.1	95.7	98.7	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
Part 115															
Copper	mg/L	0.005	1.3	1.00	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	23.5	0.3	23.5	< 0.02	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nickel	mg/L	0.021		0.1	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	0.0005	0.1	0.098	< 0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.036	5	5	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
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^{UJ}	<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^{J+}	-0.103	0.114	0.469	1.71	0.583	4.44	2.00	3.04^{J+}	-0.133	4.30
Radium-226/228	pCi/L	5.00	5	5.00	0.683^{J+}	0.389	0.551	0.697	1.93^{J}	2.28	6.21	2.84	3.24^{J+}	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:	6/15/2021		7/20/2021		8/24/2021		9/28/2021		11/2/2021		12/7/2021	
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring										
Field Parameters						Field Dup		Field Dup		Field Dup		Field Dup		Field Dup	
pH	su	-	-	-	7.74	7.74	7.20	7.20	7.21	7.21	7.28	7.28	7.14	7.14	7.27	7.27
Conductivity	mS/cm	-	-	-	0.393	0.393	0.42	0.42	0.44	0.44	0.444	0.444	0.471	0.471	0.459	0.459
Turbidity	NTU	-	-	-	1.60	1.60	6.7	6.7	6.15	6.15	5.25	5.25	5.61	5.61	2.21	2.21
Dissolved Oxygen	mg/L	-	-	-	5.48	5.48	5.35	5.35	4.52	4.52	4.5	4.5	4.89	4.89	5.42	5.42
Temperature	°C	-	-	-	12.9	12.9	17	17	19	19	17.1	17.1	13.8	13.8	9.5	9.5
Oxidation Reduction Potential	mV	-	-	-	164.1	164.1	310.7	310.7	329.2	329.2	171.8	171.8	238.1	238.1	135.9	135.9
Part 115																
Copper	mg/L	0.005	1.3	1.00	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	23.5	0.3	23.5	< 0.02	< 0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nickel	mg/L	0.021		0.1	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	0.0005	0.1	0.098	< 0.0005	< 0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.036	5	5	< 0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.009	<0.005
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	<0.04	<0.04	<0.04
Calcium	mg/L	188	-	188	62.1	64.2	66.3	67.5	69.2	68.8	71.0	71.5	78.0	80.7	76.6	75.8
Chloride	mg/L	94.3	250	250	< 5	< 5	<5	<5	<5	<5	<5	<5	<5	<5	1.11	1.07
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	0.033	0.033
pH, Field	su	-	-	-	7.74	7.74	7.20	7.20	7.21	7.21	7.28	7.28	7.14	7.14	7.27	7.27
Sulfate	mg/L	344	250	344	< 5	< 5	<5	<5	<5	<5	<5	<5	<5	<5	3.58	3.52
Total Dissolved Solids	mg/L	1168	500	1168	232	240	242	232	242	256	246	244	252	268	244	246
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	<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	<0.002
Barium	mg/L	0.168	2.0	2.0	0.015	0.015	0.013	0.014	0.015	0.014	0.014	0.015	0.015	0.016	0.014	0.015
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	<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	<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	<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	<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	0.033	0.033
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	<0.003
Lithium	mg/L	0.0396	0.040	0.040	<0.010	<0.010	<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^{UJ}	<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	<0.005
Radium-226	pCi/L	-	-	-	0.625	0.646	0.189	0.166	0.266^{J-}	0.421^{J+}	0.797	0.368	0.177^{J-}	0.534^{J+}	1.67	1.69
Radium-228	pCi/L	-	-	-	0.218^{J+}	0.171^{J+}	0.286^{J+}	-0.125^{J-}	-0.359^{J-}	1.65^{J+}	0.453	0.846	-0.0915^{J}	0.483^{J+}	0.666	0.826
Radium-226/228	pCi/L	5.00	5	5.00	0.844^{J+}	0.817^{J+}	0.475^{J+}	0.166^{J-}	0.266^{J-}	2.07^{J+}	1.25	1.21	0.177^{J}	1.02^{J+}	2.34	2.51
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	<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	<0.002
Other																
Total Suspended Solids	mg/L	-	-	-	< 3	< 3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hardness	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

			Sample Location:	MW-9							
			Sample Type:	Downgradient							
			Sample Date:	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						Field Dup		Field Dup			
pH	su	-	-	-	7.35	7.35	7.16	7.16	7.44	7.45	7.13
Conductivity	mS/cm	-	-	-	0.455	0.455	0.471	0.471	0.420	0.424	0.474
Turbidity	NTU	-	-	-	2.89	2.89	1.6	1.6	3.44	3.01	2.20
Dissolved Oxygen	mg/L	-	-	-	6.13	6.13	6.17	6.17	3.96	6.33	3.35
Temperature	°C	-	-	-	7	7	4.7	4.7	19.2	7.3	16.5
Oxidation Reduction Potential	mV	-	-	-	260.1	260.1	380.9	380.9	99.2	252.1	132.5
Part 115											
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	23.5	0.3	23.5	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nickel	mg/L	0.021		0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.036	5	5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Appendix III											
Boron	mg/L	0.48	-	0.50	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Calcium	mg/L	188	-	188	76.9	75.0	77.6	78	61.8	76.9	75.7
Chloride	mg/L	94.3	250	250	<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
pH, Field	su	-	-	-	7.35	7.35	7.16	7.16	7.44	7.45	7.13
Sulfate	mg/L	344	250	344	<5	<5	<5	<5	5.00	<5	6
Total Dissolved Solids	mg/L	1168	500	1168	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
Arsenic	mg/L	0.021	0.01	0.021	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Barium	mg/L	0.168	2.0	2.0	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
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	<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	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Radium-226	pCi/L	-	-	-	0.838^{J-}	1.22^{J+}	0.533	0.657	0.0527	0.372	0.305
Radium-228	pCi/L	-	-	-	1.53^{J+}	-0.724^{J-}	0.0438^{J}	0.283^{J+}	1.88^{J+}	1.60	-0.426
Radium-226/228	pCi/L	5.00	5	5.00	2.37^{J+}	1.22^{J-}	0.576^{J}	0.940^{J+}	1.94^{J+}	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
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	-	-	-	<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

				Sample Location:	MW-10												
				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															Field Dup		Field Dup
pH	su	-	-	-	7.30	6.60	6.70	6.89	6.57	6.69	6.68	6.49	6.85	6.73	6.73	6.52	6.52
Conductivity	mS/cm	-	-	-	0.725	0.71	0.741	0.664	0.78	0.753	0.807	0.784	0.691	0.679	0.679	0.739	0.739
Turbidity	NTU	-	-	-	1.79	2.3	1.95	5.99	1.29	2.09	2.98	3.76	3.57	1.88	1.88	2.34	2.34
Dissolved Oxygen	mg/L	-	-	-	2.05	3.3	3.2	2.43	2.83	2.89	3.92	3.61	2.82	4.03	4.03	3.15	3.15
Temperature	°C	-	-	-	12.0	14	15.5	15	14.2	11.6	9.7	8.6	15.4	9.5	9.5	14.4	14.4
Oxidation Reduction Potential	mV	-	-	-	121.2	240.0	330.1	164.1	230.9	147.9	283.3	391.8	98.9	238.0	238	163.5	163.5
Part 115																	
Copper	mg/L	0.005	1.3	1.00	< 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
Iron	mg/L	23.5	0.3	23.5	< 0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nickel	mg/L	0.021		0.1	< 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
Silver	mg/L	0.0005	0.1	0.098	< 0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	< 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
Zinc	mg/L	0.036	5	5	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.020	<0.005	0.01	<0.005	<0.005	<0.005	<0.005
Appendix III																	
Boron	mg/L	0.48	-	0.50	0.05	0.05	0.06	0.05	0.07	0.05	0.06	0.05	0.05	0.04	0.05	0.05	0.06
Calcium	mg/L	188	-	188	132	128	129	113	137	128	141	142	117	136	140	131	129
Chloride	mg/L	94.3	250	250	< 5	<5	<5	<5	<5	1.03	<5	<5	<5	<5	<5	6	6
Fluoride	mg/L	1.0	4	2.0	< 1.0	<1.0	<1.0	<1.0	<1.0	0.0660	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
pH, Field	su	-	-	-	7.30	6.60	6.70	6.89	6.57	6.69	6.68	6.49	6.85	6.73	6.73	6.52	6.52
Sulfate	mg/L	344	250	344	12	15	14	9	17	14.5	18	16	10	13	13	18	17
Total Dissolved Solids	mg/L	1168	500	1168	446	410	432	376	436	428	474	482	398	494	482	452	450
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	<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	<0.002	<0.002
Barium	mg/L	0.168	2.0	2.0	0.044	0.041	0.047	0.041	0.044	0.043	0.040	0.038	0.037	0.036	0.036	0.037	0.037
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	<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	<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	<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	<0.005	<0.005
Fluoride	mg/L	1.0	4.0	2.0	< 1.0	<1.0	<1.0	<1.0	<1.0	0.0660	<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	<0.003	<0.003
Lithium	mg/L	0.0396	0.040	0.040	< 0.010	<0.005	<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	$<0.0002^{UJ}$	<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	<0.005	<0.005
Radium-226	pCi/L	-	-	-	0.548	0.262	0.183	0.701	0.381^{J}	1.46	1.59	0.894	0.195	0.407	0.443	0.519^{J-}	0.840^{J+}
Radium-228	pCi/L	-	-	-	0.123^{J+}	-0.994	0.187	-0.076	0.225	0.929	0.142	-0.916	0.402^{J+}	-0.255^{J-}	0.758^{J+}	-0.799^{J-}	0.502^{J+}
Radium-226/228	pCi/L	5.00	5	5.00	0.671^{J+}	0.262	0.371	0.701	0.605^{J}	2.39	1.73	0.894	0.597^{J+}	0.407^{J-}	1.20^{J+}	0.519^{J-}	1.34^{J+}
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	<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	<0.002	<0.002
Other																	
Total Suspended Solids	mg/L	-	-	-	< 3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	440	525	522	450	450
Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	<10	<10	<10	<10	<10
Hardness	mg/L	-	-	-	-	-	-	-	-	-	-	-	382	461	460	433	420
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	23.6	29.5	29.2	25.8	25.6
Potassium	mg/L	-	-	-	-	-	-	-	-	-	-	-	0.73	0.62	0.70	0.68	0.68
Sodium	mg/L	-	-	-	-	-	-	-	-	-	-	-	2.24	2.54	2.73	4.55	4.64

				Sample Location:	MW-11												
				Sample Type:	Upgradient												
				Sample Date:	2/23/2022		3/30/2022		5/4/2022	6/8/2022		7/13/2022		8/17/2022		9/21/2022	
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring												
Field Parameters						Field Dup		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	6.91	6.91
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	1.122	1.122
Turbidity	NTU	-	-	-	9.65	9.65	8.95	8.95	9.22	6.98	6.98	3.02	3.02	4.01	4.01	5.25	5.25
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	0.18	0.18
Temperature	°C	-	-	-	9.50	9.50	9.8	9.8	12	11.3	11.3	12.8	12.8	14.4	14.4	15.7	15.7
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	-122.9	-122.1
Part 115																	
Copper	mg/L	0.005	1.3	1.00	<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
Iron	mg/L	23.5	0.3	23.5	22.2	22.0	23.2	23.0	23.50	21.4	21.9	22	21.8^{J}	21.4	20.9	21.5	20.8
Nickel	mg/L	0.021		0.1	<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
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<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
Zinc	mg/L	0.036	5	5	<0.005	<0.005	<0.005	<0.005	<0.005	0.009	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.006
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	0.22	0.22
Calcium	mg/L	188	-	188	136	130	138	140	144	139	138	134	135	140	138	141	142
Chloride	mg/L	94.3	250	250	67	67	67	67	63	63	63	61	62	63	64	61	62
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	<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	6.91	6.91
Sulfate	mg/L	344	250	344	<5	<5	<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	652	658
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	<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	0.021	0.02
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	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	<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	<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	<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	<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	<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	<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	<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	<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	<0.005^{UJ}	0.005^{J+}
Radium-226	pCi/L	-	-	-	0.273^{J-}	0.472^{J+}	0.358^{J-}	0.603^{J+}	0.545	0.618^{J}	1.520^{J}	0.325^{J+}	0.942^{J+}	0.542^{J-}	0.971^{J+}	0.396	0.443
Radium-228	pCi/L	-	-	-	0.000^{J-}	0.248^{J+}	0.757^{J+}	-0.419^{J}	0.479^{J}	0.573^{J}	0.630^{J}	0.925	0.383	0.0495^{J-}	0.835^{J+}	0.0525^{J-}	0.994^{J+}
Radium-226/228	pCi/L	5.00	5	5.00	0.273^{J-}	0.720^{J+}	1.11^{J+}	0.603^{J-}	1.020	1.190^{J}	2.150^{J}	1.25^{J+}	1.33^{J+}	0.591^{J-}	1.81^{J+}	0.449^{J-}	1.44^{J+}
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	<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	<0.002	<0.002
Other																	
Total Suspended Solids	mg/L	-	-	-	48	41	32	32	23	32	31	29	28	20	23	23	20
Bicarbonate	mg/L	-	-	-	-	-	-	-	610	595	593	600	610	620	630	600	620
Carbonate	mg/L	-	-	-	-	-	-	-	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hardness	mg/L	-	-	-	-	-	-	-	506	495	490	503	512	529	502	512	508
Magnesium	mg/L	-	-	-	-	-	39.0	37.8	40.80	39.4	39.1	38.8	38.3	39.8	39	40.8	39.6
Potassium	mg/L	-	-	-	-	-	1.47	1.45	1.38	1.3	1.32	1.31	1.3	1.38	1.34	1.55	1.52
Sodium	mg/L	-	-	-	-	-	40.4	39.6	39.70	37.5	38.8	38.9	37	38.7	37.8	39.7	38.5

			Sample Location:	MW-11				
			Sample Type:	Upgradient				
			Sample Date:	10/26/2022		2/9/2023		8/3/2023
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring		Assessment Monitoring	
Field Parameters						Field Dup		Diss. Metals	
pH	su	-	-	-	6.77	6.77	7.43	7.43	6.74
Conductivity	mS/cm	-	-	-	1.075	1.075	1.082	1.082	1.095
Turbidity	NTU	-	-	-	5.78	5.78	25.29	25.29	0.98
Dissolved Oxygen	mg/L	-	-	-	0.37	0.37	0.33	0.33	0.06
Temperature	°C	-	-	-	12.2	12.2	10.9	10.9	13.8
Oxidation Reduction Potential	mV	-	-	-	-99.1	-99.1	-191.1	-191.1	-97.1
Part 115									
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	23.5	0.3	23.5	19.8	20.6	15.5	0.44	24.3
Nickel	mg/L	0.021		0.1	0.007^{J+}	<0.005^{UJ}	<0.005	<0.005	<0.005
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.036	5	5	0.018^{J+}	0.006^{J-}	<0.005	<0.005	0.007
Appendix III									
Boron	mg/L	0.48	-	0.50	0.21	0.21	0.21	0.20	0.20
Calcium	mg/L	188	-	188	138	139	140	132	140
Chloride	mg/L	94.3	250	250	62	62	59	-	62
Fluoride	mg/L	1.0	4	2.0	<1.0	<1.0	<1.0	-	<1.0
pH, Field	su	-	-	-	6.77	6.77	7.43	7.43	6.74
Sulfate	mg/L	344	250	344	<5	<5	<5	-	<5
Total Dissolved Solids	mg/L	1168	500	1168	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
Arsenic	mg/L	0.021	0.01	0.021	0.02	0.02	0.017	0.004	0.017
Barium	mg/L	0.168	2.0	2.0	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
Cadmium	mg/L	0.0005	0.005	0.005	<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
Cobalt	mg/L	0.005	0.006	0.006	<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
Lead	mg/L	0.003	0.015	0.004	<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
Mercury	mg/L	0.0002	0.002	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	mg/L	0.024	0.1	0.100	<0.005	<0.005	0.006	0.006	<0.005
Radium-226	pCi/L	-	-	-	0.981	0.59	0.194	-	1.58
Radium-228	pCi/L	-	-	-	1.53	1.18	0.824	-	1.58
Radium-226/228	pCi/L	5.00	5	5.00	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
Thallium	mg/L	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Other									
Total Suspended Solids	mg/L	-	-	-	29	32	35	-	19.8
Bicarbonate	mg/L	-	-	-	601	604	645	-	630
Carbonate	mg/L	-	-	-	<10	<10	<10	-	<10
Hardness	mg/L	-	-	-	512	518	509	-	538
Magnesium	mg/L	-	-	-	39.4	39.3	40.5	37.5	41.2
Potassium	mg/L	-	-	-	1.47	1.45	11.4	10.9	3.01
Sodium	mg/L	-	-	-	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
Part 115														
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	3.0	0.3	3.04	0.10	0.11	0.96	0.98	2.59	2.66	3.04	3	2.48	2.44
Nickel	mg/L	0.011		0.1	<0.005	<0.005	<0.005	<0.005	0.011^{J+}	$<0.005^{UJ}$	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.042	5	5	<0.005	<0.005	<0.005	<0.005	0.042^{J+}	$<0.005^{UJ}$	<0.005	<0.005	<0.005	<0.005
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^{J+}	0.0501^{J-}	0.702	1.06	0.518	0.509
Radium-228	pCi/L	-	-	-	1.680	2.140	0.633	1.68	0.753^{J+}	0.445^{J-}	-1.33^{J-}	1.32^{J+}	0.773^{J+}	0.0951^{J}
Radium-226/228	pCi/L	4.42	5.00	5.00	2.690	3.590	2.35	3.47	1.39^{J+}	0.495^{J-}	0.702^{J-}	2.38^{J+}	1.29^{J+}	0.604^{J}
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^{J+}	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 Parameters						Field Dup		Field Dup		Field Dup		Field Dup	
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
Part 115													
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	3.0	0.3	3.04	1.82	1.83	1.32	1.3	2.3	2.25	1.23	1.24	1.10
Nickel	mg/L	0.011		0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.042	5	5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.012^{J+}	<0.005UJ	<0.005
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^{J+}	2.40^{J+}	0.745^{J-}	2.63J+	0.56J	0.131	0.583	3.26
Radium-226/228	pCi/L	4.42	5.00	5.00	1.96^{J}	3.13^{J+}	3.32^{J+}	1.81^{J-}	3.56J+	1.33J	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^{J+}	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

			Sample Location:		MW-12											
			Sample Type:		Upgradient											
			Sample Date:		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 Parameters						Diss. Metals		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	7.24	7.24
Conductivity	mS/cm	-	-	-	0.75	0.75	1.648	1.648	1.734	1.734	1.797	1.797	1.686	1.686	1.586	1.586
Turbidity	NTU	-	-	-	65.25	65.25	44.12	44.12	16.45	16.45	31.26	31.26	30.26	30.26	45.15	45.15
Dissolved Oxygen	mg/L	-	-	-	5.45	5.45	3.95	3.95	3.34	3.34	5.25	5.25	3.20	3.20	4.64	4.64
Temperature	°C	-	-	-	8.40	8.40	8.5	8.5	12	12	15.4	15.4	16.8	16.8	16.9	16.9
Oxidation Reduction Potential	mV	-	-	-	-113.50	-113.50	188.2	188.2	-35	-35	140.2	140.2	14.2	14.2	-17.9	-17.9
Part 115																
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	23.5	0.3	23.5	3.83	<0.02	2.24	<0.02	2.05	0.03	1	<0.02	1.82	0.05	1.37	0.03
Nickel	mg/L	0.021		0.1	0.02	0.02	0.02	0.02	0.02	0.02	0.018	0.015	0.017	0.017	0.018	0.016
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.036	5	5	<0.005	0.008	0.009	0.006	0.005	<0.005	<0.005	<0.005	0.007	<0.005	0.006	<0.005
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	0.07	0.07
Calcium	mg/L	188	-	188	185	188	157	147	149	143	149	144	147	143	157	148
Chloride	mg/L	94.3	250	250	90	-	94	-	90	-	82	-	83	-	83	-
Fluoride	mg/L	1.0	4	2.0	<1.0	-	<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	7.24	7.24
Sulfate	mg/L	344	250	344	344	-	308	-	283	-	254	-	250	-	256	-
Total Dissolved Solids	mg/L	1168	500	1168	1090	-	1110	-	1140	-	1080	-	1090	-	1050	-
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	<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	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	0.064	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	<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	<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	<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	<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	<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	0.019	0.018
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	<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	0.014	0.014
Radium-226	pCi/L	-	-	-	0.252	-	0.783	-	1.23	-	1.9	-	0.394^{J+}	-	0.398	-
Radium-228	pCi/L	-	-	-	0.948	-	2.33	-	0.237	-	0.721	-	1.23	-	1.8	-
Radium-226/228	pCi/L	5.00	5	5.00	1.200	-	3.110	-	1.46	-	2.62	-	1.63^{J+}	-	2.2	-
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	<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	<0.002
Other																
Total Suspended Solids	mg/L	-	-	-	24	-	39	-	22	-	17	-	50	-	23	-
Bicarbonate	mg/L	-	-	-	-	-	-	-	650	-	695	-	670	-	620	-
Carbonate	mg/L	-	-	-	-	-	-	-	<10	-	<10	-	<10	-	<10	-
Hardness	mg/L	-	-	-	-	-	-	-	572	-	565	-	566	-	609	-
Magnesium	mg/L	-	-	-	-	-	58.80	56.40	56.40	52.80	56.2	54.5	56.2	55.7	58.8	57.6
Potassium	mg/L	-	-	-	-	-	3.93	3.87	3.73	3.55	3.91	3.95	3.3	3.13	3.33	3.1
Sodium	mg/L	-	-	-	-	-	168.00	169.00	193.00	189.00	199	195	171	167	145	138

			Sample Location:		MW-12							
			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 Parameters						Diss. Metals		Diss. Metals		Diss. Metals		Diss. Metals
pH	su	-	-	-	7.38	7.38	7.05	7.05	7.13	7.13	7.10	7.10
Conductivity	mS/cm	-	-	-	1.600	1.600	1.387	1.387	1.391	1.391	1.457	1.457
Turbidity	NTU	-	-	-	46.25	46.25	26.20	26.20	17.01	17.01	10.32	10.32
Dissolved Oxygen	mg/L	-	-	-	1.95	1.96	3.57	3.57	2.95	2.95	3.41	3.41
Temperature	°C	-	-	-	15.9	15.9	11.8	11.8	11.5	11.5	16.0	16.0
Oxidation Reduction Potential	mV	-	-	-	15.2	15.2	155.8	155.8	-27.4	-27.4	122.7	122.7
Part 115												
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	23.5	0.3	23.5	1.25	<0.02	0.96	0.19	0.60	<0.02	0.74	<0.02
Nickel	mg/L	0.021		0.1	0.018	0.017	0.018	0.015	0.017	0.016	0.015	0.015
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.036	5	5	0.008	0.005	<0.005	<0.005	<0.005	<0.005	0.005	<0.005
Appendix III												
Boron	mg/L	0.48	-	0.50	0.08	0.08	0.08	0.08	0.07	0.07	0.06	0.06
Calcium	mg/L	188	-	188	154	148	156	136	143	141	156	151
Chloride	mg/L	94.3	250	250	80	-	78	-	71	-	70	-
Fluoride	mg/L	1.0	4	2.0	<1.0	-	<1.0	-	<1.0	-	<1.0	-
pH, Field	su	-	-	-	7.38	7.38	7.05	7.05	7.13	7.13	7.10	7.10
Sulfate	mg/L	344	250	344	255	-	252	-	207	-	184	-
Total Dissolved Solids	mg/L	1168	500	1168	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
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	0.064	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
Cadmium	mg/L	0.0005	0.005	0.005	<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
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	-
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	0.022	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
Molybdenum	mg/L	0.024	0.1	0.100	0.015	0.014	0.013	0.012	0.011	0.011	0.007	0.007
Radium-226	pCi/L	-	-	-	0.739	-	0.628	-	0.836	-	0.663	-
Radium-228	pCi/L	-	-	-	-0.692	-	2.11	-	2.60	-	0.731^{J+}	-
Radium-226/228	pCi/L	5.00	5	5.00	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
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	-	-	-	43	-	16	-	9	-	8.4	-
Bicarbonate	mg/L	-	-	-	610	-	631	-	689	-	700	-
Carbonate	mg/L	-	-	-	<10	-	<10	-	<10	-	<10	-
Hardness	mg/L	-	-	-	611	-	618	-	575	-	628	-
Magnesium	mg/L	-	-	-	58.6	57.5	59.9	53	56.8	55.6	64.2	60.0
Potassium	mg/L	-	-	-	3.65	3.54	3.71	3.04	3.01	3.02	2.74	2.65
Sodium	mg/L	-	-	-	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		9/1/2022		10/6/2022	
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring												
Field Parameters						Field Dupe			Field Dupe		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	7.60	7.60	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	0.600	0.600	0.593	0.593
Turbidity	NTU	-	-	-	10.2	10.2	9.89	9.72	9.72	6.89	6.89	8.35	8.35	6.70	6.70	7.15	7.15
Dissolved Oxygen	mg/L	-	-	-	3.58	3.58	0.31	0.05	0.05	0.2	0.2	0.22	0.22	0.74	0.74	0.24	0.24
Temperature	°C	-	-	-	10.8	10.8	10.1	12	12	12.8	12.8	14	14	13.0	13.0	12.7	12.7
Oxidation Reduction Potential	mV	-	-	-	100.9	100.9	-80.1	-97.8	-97.8	-73.2	-73.2	-141.0	-141.0	-124.1	-124.1	-117.2	-117.2
Part 115																	
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005^{UJ}	0.007^{J+}	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	3.0	0.3	3.04	0.34	0.36	0.24	0.33	0.33	0.3^{J}	0.28^{J}	0.29	0.3	0.37	0.37	0.41	0.34
Nickel	mg/L	0.011		0.1	<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
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<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
Zinc	mg/L	0.042	5	5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005^{UJ}	0.015^{J+}	<0.005	<0.005	<0.005	<0.005
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	3.52	3.35	3.22	3.3
Calcium	mg/L	69.6	-	69.6	23.7	24	24	21.5	21.7	26.1	25.5	25.7	25.4	26.2	26.2	26.2	25.9
Chloride	mg/L	5.0	250	250	<5	<5	<5	<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	<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	7.60	7.60	7.50	7.50
Sulfate	mg/L	5.0	250	250	<5	<5	<5	<5	<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	360	370	362	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	<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	<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	0.028	0.028	0.027	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	<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	<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	<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	<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	<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	<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	0.041	0.038	0.039	0.042
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	<0.0002	<0.0002
Molybdenum	mg/L	0.011	0.1	0.100	<0.005	<0.005	<0.005	0.011^{J+}	0.005^{J-}	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Radium-226	pCi/L	-	-	-	0.480^{J+}	0.302^{J-}	0.264	0.611	0.657	1.00^{J-}	1.89^{J+}	0.581^{J-}	2.17^{J+}	0.398	0.519	0.370^{J-}	0.615^{J+}
Radium-228	pCi/L	-	-	-	0.275^{J-}	1.03^{J+}	0.116	0.421^{J-}	1.10^{J+}	0.209^{J-}	1.47^{J+}	-0.356^{J+}	-1.12^{J}	-0.204^{J-}	1.34^{J+}	1.26^{J+}	0.165^{J-}
Radium-226/228	pCi/L	4.42	5.00	5.00	0.755^{J-}	1.33^{J+}	0.38	1.03^{J-}	1.76^{J+}	1.21^{J-}	3.37^{J+}	0.581^{J}	2.17^{J+}	0.398^{J-}	1.86^{J+}	1.63^{J+}	0.779^{J-}
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	<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	<0.002	<0.002
Other																	
Total Suspended Solids	mg/L	-	-	-	28	31	3^{U}	7	7	5	<3	<3	<3	<3^{UJ}	3^{J+}	1^{U}	<3
Bicarbonate	mg/L	-	-	-	390	400	410	410	420	400	390	410	420	400	400	400	400
Carbonate	mg/L	-	-	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hardness	mg/L	-	-	-	96	83	99	93	96	94	97	90	90	91	95	100	90
Magnesium	mg/L	-	-	-	7.5	7.36	8.12	6.63	6.68	8.31	8.14	8.22	8.02	8.33	8.65	8.39	8.33
Potassium	mg/L	-	-	-	8.99	8.61	8.26	6.93	7.07	8.27	8.15	8.28	8.07	8.18	8.36	8.32	8.14
Sodium	mg/L	-	-	-	116	117	109	90.9	92.4	111	107	107	107	113	115	112	109

				Sample Location:	MW-12B				
				Sample Type:	Upgradient				
				Sample Date:	11/10/2022		2/9/2023	8/3/2023	
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring		Assessment Monitoring		
Field Parameters						Field Dupe			Field Dup
pH	su	-	-	-	7.61	7.61	7.71	7.52	7.52
Conductivity	mS/cm	-	-	-	0.591	0.591	0.587	0.582	0.582
Turbidity	NTU	-	-	-	6.35	6.35	8.18	2.25	2.25
Dissolved Oxygen	mg/L	-	-	-	0.18	0.18	0.29	0.13	0.13
Temperature	°C	-	-	-	13.1	13.1	10.9	15.1	15.1
Oxidation Reduction Potential	mV	-	-	-	-100.3	-100.3	-107.5	-113.5	-113.5
Part 115									
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	3.0	0.3	3.04	0.31	0.30	0.22	0.26	0.25
Nickel	mg/L	0.011		0.1	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.042	5	5	<0.005	<0.005	<0.005	<0.005	<0.005
Appendix III									
Boron	mg/L	3.52	-	3.52	3.35	3.19	3.33	3.33	3.38
Calcium	mg/L	69.6	-	69.6	25.7	26.2	26.3	25.8	25.9
Chloride	mg/L	5.0	250	250	<5	<5	<5	<5	<5
Fluoride	mg/L	1.0	4	2.0	<1.0	<1.0	<1.0	<1.0	<1.0
pH, Field	su	-	-	-	7.61	7.61	7.71	7.52	7.52
Sulfate	mg/L	5.0	250	250	<5	<5	<5	<5	<5
Total Dissolved Solids	mg/L	380	500	500	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
Arsenic	mg/L	0.009	0.01	0.01	<0.002	<0.002	<0.002	<0.002	<0.002
Barium	mg/L	0.081	2	2.0	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
Cadmium	mg/L	0.0005	0.005	0.005	<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
Cobalt	mg/L	0.005	0.006	0.006	<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
Lead	mg/L	0.003	0.015	0.004	<0.003	<0.003	<0.003	<0.003	<0.003
Lithium	mg/L	0.051	0.04	0.051	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
Molybdenum	mg/L	0.011	0.1	0.100	<0.005	<0.005	<0.005	<0.005	<0.005
Radium-226	pCi/L	-	-	-	0.608	0.619	0.831	1.13^{J-}	0.880^{J+}
Radium-228	pCi/L	-	-	-	0.638	0.282	3.31	0.848^{J-}	2.68^{J+}
Radium-226/228	pCi/L	4.42	5.00	5.00	1.25	0.901	4.14	1.98^{J-}	3.56^{J+}
Selenium	mg/L	0.005	0.05	0.050	<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
Other									
Total Suspended Solids	mg/L	-	-	-	<3	<3	<3	1.1	1.2
Bicarbonate	mg/L	-	-	-	390	390	417	360	390
Carbonate	mg/L	-	-	-	<10	<10	<10	<10	<10
Hardness	mg/L	-	-	-	96	96	98	92	110
Magnesium	mg/L	-	-	-	8.2	8.15	8.61	8.48	8.52
Potassium	mg/L	-	-	-	8.19	8.15	7.88	8.19	8.15
Sodium	mg/L	-	-	-	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	2/8/2023	8/2/2023
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring									Assessment 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	7.04	6.39
Conductivity	mS/cm	-	-	-	0.78	0.73	0.549	0.549	0.585	0.661	0.595	0.635	0.624	0.672	0.777
Turbidity	NTU	-	-	-	7.11	7.90	4.15	4.15	6.50	1.79	3.55	4.24	3.75	6.01	0.30
Dissolved Oxygen	mg/L	-	-	-	1.31	2.61	6.23	6.23	5.42	6.21	4.94	3.83	2.39	0.65	4.69
Temperature	°C	-	-	-	5.8	6.9	8.5	8.5	12.2	14.5	17.5	17.4	13.8	8.4	16.1
Oxidation Reduction Potential	mV	-	-	-	163.0	151.8	96.4	96.4	101.6	66.9	89.1	84.8	216.8	61.2	-48.6
Part 115															
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	23.5	0.3	23.5	0.04	0.02	<0.02	0.02	0.08	0.03	0.02	0.03	0.04	0.06	0.16
Nickel	mg/L	0.021		0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.036	5	5	<0.005	<0.005	<0.005	<0.005	<0.005	0.01	<0.005	<0.005	<0.005	<0.005	<0.005
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	0.18	0.17
Calcium	mg/L	188	-	188	138	128.00	95.80	97.60	96.1	107	94.1	100	101	132	124
Chloride	mg/L	94.3	250	250	<5	<5	9.00	9.00	13	16	16	20	32	43	45
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	-	-	-	6.91	6.75	7.01	7.01	7.07	7.06	7.22	7.25	7.11	7.04	6.39
Sulfate	mg/L	344	250	344	32	45	16	16	17	55	33	30	22	37	87
Total Dissolved Solids	mg/L	1168	500	1168	478	430	336	342	354	396	380	384	386	476	492
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	0.004
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	0.028	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	<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	-	-	-	0.300	0.755	0.322^{J+}	0.149^{J-}	0.657	0.291^{J+}	0.402	0.286	0.392	0.000	0.0699
Radium-228	pCi/L	-	-	-	-0.842	1.320	0.0544^{J}	0.893^{J+}	1.66	1.35	0.00710	-0.0026	0.291	0.188	-0.6698
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	0.188	0.0699
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	<3	<3	<3	<3
Bicarbonate	mg/L	-	-	-	-	-	340	330	349	330	320	340	351	437	330
Carbonate	mg/L	-	-	-	-	-	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hardness	mg/L	-	-	-	-	-	309	308	310	353	312	333	358	444	428
Magnesium	mg/L	-	-	-	-	26.30	19.70	20.10	20.7	23.1	20.6	21.9	23.0	29.0	26.9
Potassium	mg/L	-	-	-	-	0.75	0.69	0.70	0.83	0.779	0.78	0.82	0.81	0.76	0.94
Sodium	mg/L	-	-	-	-	3.05	2.45	2.51	2.59	5.59	4.60	5.70	4.99	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		6/2/2023		7/7/2023	
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring											
Field Parameters						Field Dup		Field Dup		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	7.00	7.00	7.06	7.06
Conductivity	mS/cm	-	-	-	1.27	1.27	1.091	1.091	1.295	1.295	1.323	1.323	1.307	1.307	1.285	1.285
Turbidity	NTU	-	-	-	6.31	6.31	5.34	5.34	3.95	3.95	4.05	4.05	5.42	5.42	3.24	3.24
Dissolved Oxygen	mg/L	-	-	-	0.45	0.45	0.39	0.39	0.07	0.07	0.09	0.09	0.21	0.21	0.06	0.06
Temperature	°C	-	-	-	10.9	10.9	10.1	10.1	10.5	10.5	10.3	10.3	13.3	13.3	13.7	13.7
Oxidation Reduction Potential	mV	-	-	-	-105.6	-105.6	-89.4	-89.4	-104.3	-104.3	-124.8	-124.8	-114.2	-114.2	-96.5	-96.5
Part 115																
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	23.5	0.3	23.5	6.58	6.78	9.46	9.35	10.2	10.4	11.2	11.2^{J}	11.5	11.8	11.4	11.5^{J}
Nickel	mg/L	0.021		0.1	0.006	0.007	0.005^{J+}	<0.005^{UJ}	<0.005UJ	0.005J+	<0.005	<0.005	<0.005	<0.005	<0.005^{UJ}	0.005^{J+}
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005^{UJ}	0.005^{J+}
Zinc	mg/L	0.036	5	5	<0.005^{UJ}	0.007J+	<0.005	<0.005	<0.005UJ	0.013J+	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
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	2.06	2.02	2.16	2.14
Calcium	mg/L	188	-	188	147	149	144	144	144	148	143	140^{J}	141	141	148	148
Chloride	mg/L	94.3	250	250	108	109	111	112	114	114	115	115	114	114	113	114
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	<1.0
pH, Field	su	-	-	-	7.04	7.04	7.11	7.11	6.98	6.98	7.13	7.13	7.00	7.00	7.06	7.06
Sulfate	mg/L	344	250	344	30	30	22	21	748	748	17	16	19	19	20	19
Total Dissolved Solids	mg/L	1168	500	1168	774	768	732	716	<0.005	<0.005	796	782	792	784	784	774
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	<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	0.005	0.006	0.007	0.008
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	0.126	0.128	0.134	0.131
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	<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	<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	<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	<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	<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	<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	0.106	0.106	0.108	0.106
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	<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	0.014	0.015	0.016	0.016
Radium-226	pCi/L	-	-	-	0.907	0.322	0.396	0.363	0.964^{J+}	0.321^{J-}	0.260^{J-}	1.27^{J+}	0.275	0.271	0.388	0.244
Radium-228	pCi/L	-	-	-	3.53	3.07	0.272^{J-}	1.07^{J+}	0.853	1.10	1.20^{J+}	0.807^{J+}	0.601^{J-}	0.983^{J+}	0.0761^{J-}	0.915^{J+}
Radium-226/228	pCi/L	5.00	5	5.00	4.44	3.39	0.668^{J-}	1.43^{J+}	1.82	1.41	1.46^{J}	2.08^{J+}	0.876^{J-}	1.25^{J+}	0.464^{J-}	1.16^{J+}
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	0.009	0.009	0.013	0.012
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	<0.002
Other																
Total Suspended Solids	mg/L	-	-	-	16	16	4^{J-}	7^{J+}	22.2	22.0	23.4	24.3	26.0	26.0	24.8	26.3
Bicarbonate	mg/L	-	-	-	600	610	601	606	650	650	660	670	630	630	640	650
Carbonate	mg/L	-	-	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hardness	mg/L	-	-	-	556	554	498	506	536	548	566	562	540	550	536	548
Magnesium	mg/L	-	-	-	42.3	42.2	41.3	41.2	40.3	42.1	39.7	38.5	40.0	39.5	41.9	41.0
Potassium	mg/L	-	-	-	4.79	4.76	5.82	5.81	4.72	4.82	4.55	4.43	4.65	4.72	5.03	5.08
Sodium	mg/L	-	-	-	79.2	80.4	78.3	77.9	75.8	77.3	72.5	70.9	73.7	73.9	79.0	77.0

MW-14			
Downgradient			
8/11/2023		9/15/2023	
Background Monitoring			
	Field Dup		Field Dup
6.95	6.95	6.92	6.92
1.285	1.285	1.277	1.277
3.10	3.1	6.35	6.35
0.02	0.02	0.00	0
14.1	14.1	13.5	13.5
-116.2	-116.2	-127.9	-127.9
<0.005	<0.005	<0.005	<0.005
12.9	12.7	11.9	11.7
<0.005	<0.005	<0.005	<0.005
<0.0005	<0.0005	<0.0005	<0.0005
<0.005	<0.005	<0.005	<0.005
<0.005	<0.005	<0.005	<0.005
2.14	2.10	2.17	2.13
147	149	154	155
118	118	111	110
<1.0	<1.0	<1.0	<1.0
6.95	6.95	6.92	6.92
16	16	16	16
804	804	808	824
<0.005	<0.005	<0.005	<0.005
0.007	0.007	0.008	0.007
0.122	0.124	0.132	0.138
<0.001	<0.001	<0.001	<0.001
<0.0005	<0.0005	<0.0005	<0.0005
<0.005	<0.005	<0.005	<0.005
<0.005	<0.005	<0.005	<0.005
<1.0	<1.0	<1.0	<1.0
<0.003	<0.003	<0.003	<0.003
0.111	0.109	0.109	0.112
<0.0002	<0.0002	<0.0002	<0.0002
0.013	0.014	0.014	0.014
0.624	0.465	0.442^{J}	1.06^{J+}
0.326^{J+}	0.147^{J-}	0.497^{J}	0.821^{J+}
0.951^{J+}	0.612^{J-}	0.939^{J}	1.88^{J+}
<0.005	<0.005	<0.005	<0.005
<0.002	<0.002	<0.002	<0.002
25.9	26.6	24.8	25.4
690	680	670	660
<10	<10	<10	<10
588	630	574	584
42.2	42.1	42.1	43.8
4.96	5.07	5.43	5.58
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
Part 115												
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	23.5	0.3	23.5	<0.02	0.04	0.02	0.03	0.11	0.11	0.05	0.14
Nickel	mg/L	0.021		0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.036	5	5	<0.005	<0.005	<0.005	0.021	<0.005	<0.005	<0.005	<0.005
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^{J+}	-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^{J+}	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		8/8/2023	
Constituent	Unit	BTVs	MCL	State Program GPS	Background Monitoring											
Field Parameters						Field Dup		Field Dup		Field Dup		Field Dup		Field Dup		Field Dup
pH	su	-	-	-	6.95	6.95	6.91	6.91	7.00	7.00	6.72	6.72	6.79	6.79	6.84	6.84
Conductivity	mS/cm	-	-	-	2.219	2.219	1.871	1.871	1.948	1.948	1.875	1.875	2.163	2.163	2.271	2.271
Turbidity	NTU	-	-	-	3.06	3.06	4.15	4.15	6.54	6.54	4.01	4.01	6.18	6.18	3.81	3.81
Dissolved Oxygen	mg/L	-	-	-	0.22	0.22	0.20	0.20	0.10	0.10	0.05	0.05	0.43	0.43	0.07	0.07
Temperature	°C	-	-	-	7.3	7.3	8.6	8.6	8.3	8.3	12.5	12.5	15.6	15.6	16.5	16.5
Oxidation Reduction Potential	mV	-	-	-	-51.0	-51.0	-48.6	-48.6	-65.2	-65.2	-49.9	-49.9	-102.3	-102.3	-67.3	-67.3
Part 115																
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	23.5	0.3	23.5	3.71	3.70	3.15	3.14	2.96	2.99	2.59	2.52	2.69	2.72	2.63	2.54
Nickel	mg/L	0.021		0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.036	5	5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
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	0.16	0.17
Calcium	mg/L	188	-	188	179	176	147	150	145	148	172	171	173	174	172	167
Chloride	mg/L	94.3	250	250	383	383	405	411	391	397	401	400	436	439	423	442
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	<2.0	<2.0
pH, Field	su	-	-	-	6.95	6.95	6.91	6.91	7.00	7.00	6.72	6.72	6.79	6.79	6.84	6.84
Sulfate	mg/L	344	250	344	145	146	86	85	92	92	132	132	151	154	131	130
Total Dissolved Solids	mg/L	1168	500	1168	1360	1350	1180	1180	1170	1170	1260	1270	1370	1340	1390	1390
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	<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	0.004	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	0.132	0.135
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	<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	<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	<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	<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	<2.0	<2.0
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	<0.003
Lithium	mg/L	0.0396	0.040	0.040	0.005^{J+}	<0.005^{UJ}	<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	<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	<0.005
Radium-226	pCi/L	-	-	-	0.385	0.325	0.510^{J-}	1.22^{J+}	0.781	0.721	0.585^{J+}	0.261^{J-}	6.13^{J+}	1.17^{J-}	0.232^{J-}	1.18^{J+}
Radium-228	pCi/L	-	-	-	0.178^{J+}	-0.723^{J-}	0.698	0.907	1.59^{J+}	-2.75^{J}	-0.313^{J-}	4.94^{J+}	1.33^{J+}	-0.181^{UJ}	0.945	1.01
Radium-226/228	pCi/L	5.00	5	5.00	0.562^{J}	0.325^{J}	1.21^{J-}	2.13^{J+}	2.37^{J+}	0.721^{J}	0.585^{J-}	5.20^{J+}	7.46^{J+}	1.17^{J-}	1.18^{J-}	2.19^{J+}
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	<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	<0.002
Other																
Total Suspended Solids	mg/L	-	-	-	7	7	<3	<3	2.0	1.6	5.7	5.2	2.5^{J}	2.0^{J}	2.1^{J+}	1.2^{J-}
Bicarbonate	mg/L	-	-	-	610	620	460	470	420	420	440	430	460	470	510	500
Carbonate	mg/L	-	-	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hardness	mg/L	-	-	-	608	605	524	522	526	519	570	576	598	600	578	568
Magnesium	mg/L	-	-	-	42.4	42.3	33.9	34.1	33.2	34.4	37.2	36.6	39.9	38.5	38.5	38.7
Potassium	mg/L	-	-	-	2.12	2.06	1.58	1.58	1.34	1.45	1.16	1.04	1.24	1.23	1.25	1.21
Sodium	mg/L	-	-	-	276	281	244	247	229	243	241	240	253	258	279	262

MW-16A					
Downgradient					
9/12/2023		10/17/2023		11/21/2023	
Background Monitoring					
	Field Dup		Field Dup		Field Dup
6.76	6.76	6.78	6.78	6.82	6.82
2.579	2.579	2.599	2.599	2.44	2.44
5.28	5.28	6.41	6.41	4.39	4.39
0.34	0.34	0.01	0.01	0.01	0.01
16.8	16.8	15.8	15.8	13.6	13.6
-59.8	-59.8	-3.1	-3.1	-43.9	-43.9
<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4.13	4.11	3.78	3.81	3.08	3.04
<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
<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
0.23	0.22	0.21	0.21	0.19	0.20
220	219	226	226	210	211
484	493	505	505	459	455
<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
6.76	6.76	6.78	6.78	6.82	6.82
239	250	257	257	264	257
1640	1630	1720	1730	1580	1590
<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
0.003	0.004	0.004	0.004	0.004	0.003
0.178	0.172	0.177	0.181	0.163	0.166
<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
<0.0005	<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
<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
0.421^{J-}	1.06^{J+}	0.892	0.682	2.26	1.78
0.285^{J-}	1.05^{J+}	2.26	2.85	0.548^{J-}	1.23^{J+}
0.705^{J-}	2.10^{J+}	3.15	3.53	2.80	3.01
0.005^{J+}	<0.005^{UJ}	<0.005	<0.005	<0.005	<0.005
<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
3.5	3.9	4.5	4.5	1.2^{J+}	<3^{UJ}
520	520	520	510	510	510
<10	<10	<10	<10	<10	<10
840	860	732	724	754	766
52.2	52.2	51.1	51.7	52.4	52.1
1.40	1.44	1.45	1.40	1.49	1.49
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
Part 115													
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	23.5	0.3	23.5	0.93	0.62	0.51	0.67	0.43	0.42	0.41	0.45	0.39
Nickel	mg/L	0.021		0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.036	5	5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
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^{J+}	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^{J+}	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
Part 115													
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	3.0	0.3	3.04	0.76	1.10	0.64	0.61	0.51	0.48	0.48	0.47	0.45
Nickel	mg/L	0.011		0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.042	5	5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
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^{J+}	-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^{J+}	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
Part 115												
Copper	mg/L	0.005	1.3	1.00	0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	3.0	0.3	3.04	0.16	0.06	0.08	0.38	0.25	0.28	0.34	0.45	0.28
Nickel	mg/L	0.011		0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.042	5	5	0.11	0.271	0.183	0.036	0.025	0.011	0.008	0.023	0.014
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^{J+}	0.461	0.593	0.500
Radium-228	pCi/L	-	-	-	1.84	0.757	1.93^{J+}	-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^{J+}	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
Part 115										
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	23.5	0.3	23.5	0.63	1.25	3.75	3.59	3.04	2.88
Nickel	mg/L	0.021		0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.036	5	5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
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^{J+}	0.320^{J+}	-0.164^{J+}	1.09^{J+}
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		10/23/2023	11/27/2023
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	7.44	7.40
Conductivity	mS/cm	-	-	-	0.799	0.799	0.805	0.805	0.776	0.776	0.745	0.745	0.752	0.713
Turbidity	NTU	-	-	-	4.02	4.02	4.15	4.15	4.15	4.15	0.81	0.81	5.16	5.01
Dissolved Oxygen	mg/L	-	-	-	0.03	0.03	0.08	0.08	0.19	0.19	0	0	0	0
Temperature	°C	-	-	-	13.8	13.8	13.9	13.9	14.2	14.2	12.9	12.9	12.1	10.6
Oxidation Reduction Potential	mV	-	-	-	-129.9	-129.9	-145.9	-145.9	-176.8	-176.8	-149.9	-149.9	-154.8	-141.7
Part 115														
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	23.5	0.3	23.5	1.77	1.79	3.54	3.43	2.89	2.88	2.34	2.36	2.33	2.35
Nickel	mg/L	0.021		0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.036	5	5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
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	0.26	0.29
Calcium	mg/L	188	-	188	108	106	102	101	98.0	99.2	97.8	100	95.9	94.5
Chloride	mg/L	94.3	250	250	22	22	23	23	25	25	25	25	24	24.0
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	0.15
pH, Field	su	-	-	-	7.34	7.34	7.33	7.33	7.40	7.40	7.34	7.34	7.44	7.40
Sulfate	mg/L	344	250	344	136	135	126	126	116	116	110	110	108	105
Total Dissolved Solids	mg/L	1168	500	1168	538	534	534	526	508	510	492	496	490	482
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	0.009	0.008	0.010	0.010	0.011	0.010	0.011	0.012	0.010	0.010
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	0.145	0.147
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	0.15
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	0.017	0.018	0.016	0.016	0.017	0.017	0.019	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	<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	0.009	0.009
Radium-226	pCi/L	-	-	-	0.549^{UJ}	0.295^{UJ}	0.576^{UJ}	0.395^{UJ}	1.31^{J+}	0.200^{J-}	0.983^{J+}	0.188^{J}	0.732^{J+}	0.868^{J+}
Radium-228	pCi/L	-	-	-	1.61^{J+}	1.50^{J-}	1.52^{J+}	1.17^{J-}	0.682	0.960	0.0316	0.832^{J+}	0.613	0.953
Radium-226/228	pCi/L	5.00	5	5.00	2.16^{J}	1.80^{J}	1.62^{J+}	1.23^{J-}	1.99^{J+}	1.16^{J-}	1.01	1.02	1.35	1.82
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	2.3	7.1	6.7	3.0	3.4	3.7	4.7	4.1	2.5
Bicarbonate	mg/L	-	-	-	350	360	440	350	360	360	320	330	330	310
Carbonate	mg/L	-	-	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hardness	mg/L	-	-	-	410	410	397	393	364	364	374	378	364	369
Magnesium	mg/L	-	-	-	35.7	38.0	35.0	34.9	35.8	35.5	32.7	33.5	33.2	32.5
Potassium	mg/L	-	-	-	3.34	3.35	3.50	3.54	3.46	3.54	3.51	3.61	3.69	3.76
Sodium	mg/L	-	-	-	23.2	23.0	26.9	27.1	24.8	24.9	25.9	24.8	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
Part 115												
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	3.0	0.3	3.04	0.31	1.00	0.97	0.76	0.66	0.66	0.64	0.66
Nickel	mg/L	0.011		0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.042	5	5	<0.005	<0.005	<0.005	<0.005	0.010	<0.005	<0.005	<0.005
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^{J+}	$<1.0^{UJ}$
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^{J+}	0.542^{J}	1.07^{J+}	1.69^{J+}	0.450^{J}
Radium-228	pCi/L	-	-	-	-0.307	0.827	-0.958	0.276	0.836	1.02	-0.293^{J-}	0.906^{J+}
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^{J+}	$<3^{UJ}$
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
Part 115										
Copper	mg/L	0.005	1.3	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	3.0	0.3	3.04	0.24	0.64	0.45	0.38	0.15	0.12
Nickel	mg/L	0.011		0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/L	0.0005	0.1	0.098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L	0.005		0.062	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	0.042	5	5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
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^{J+}	0.649^{J+}	0.893^{J+}
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
Lab Report Date: 03/01/2023
Data Validator: Aryka Thomson
Data Validation Completion Date: 03/02/2023

General Overall Assessment:
_____ Data are usable without qualification.
__X__ 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, HCO_3, CO_3, 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.

Merit
Laboratories, Inc.

Analytical Laboratory Report

Final Report

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

Merit Laboratories, Inc.
2680 East Lansing Drive
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:
John Laverty (johnlaverty@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. #:

Table of Contents

Maya Murshak

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

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	

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.

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	

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.

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	

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.

Analytical Laboratory 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	

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.	☐ Yes	☒ No	☐ N/A	Samples are received at 4C +/- 2C Thermometer #	IR 1.8
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? Subcontacted to:	GEL
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: 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			

Merit
Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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.

INVOICE TO

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

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☒ NPDES

Project Locations
☐ Detroit ☐ New York
☐ Other

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Total Metals	F- undisstiled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness					Special Instructions
44308.01	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: SIGNATURE/ORGANIZATION KGleason ☐ Sampler	DATE 01/13/23	TIME 1029	
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE 1/13/23	TIME 1029	
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
NOTES: TEMP. ON ARRIVAL 1.8

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

Rev. 5.18.12

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

GEL Laboratories LLC
a member of The GEL Group INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171
F 843.766.1178

gel.com

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
Heather Millar for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	Client ID
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

Heather Millar for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

607953

Merit Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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. P.O. NO.
E-MAIL ADDRESS results@meritlabs.com QUOTE NO.

INVOICE TO ☒ SAME

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 S44308
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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Radium 226*	Radium 228**
	01/12/23	1612	S44308.01	GW	2			2					✓	✓
	01/12/23	1436	S44308.02	GW	2			2					✓	✓
	01/12/23	1612	S44308.03 Field Dupe	GW	2			2					✓	✓
	01/12/23	1325	S44308.04 Field Blank	GW	2			2					✓	✓

(# Containers & Preservatives: NONE, HCl, HNO_3, H_2SO_4, NaOH, MeOH, OTHER)

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES

Project Locations
☐ Detroit ☐ New York
☐ 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 ☐ Sampler DATE 1/18/23 TIME 1200
RECEIVED BY: SIGNATURE/ORGANIZATION UPS DATE 1/18/23 TIME 1700
RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
RECEIVED BY: SIGNATURE/ORGANIZATION DATE TIME

RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
RECEIVED BY: SIGNATURE/ORGANIZATION DATE 01.20.23 TIME 1100
SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS NOTES: TEMP. ON ARRIVAL
SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS

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

Rev. 5.18.12

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: MERI	**SDG/AR/COC/Work Order:** 607953
Received By: PG	**Date Received:** 1/20/23
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground [✓ UPS] Field Services Courier Other 12 466 477 036335 8537

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?		X	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?		X	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?		X	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?		X	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?		X	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?	X			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	X			Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		X		Preservation Method: Wet Ice Ice Packs Dry ice [✓ None] Other: *all temperatures are recorded in Celsius **TEMP:** 19
4	Daily check performed and passed on IR temperature gun?	X			**Temperature Device Serial #:** IR 5-21 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	X			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	X			Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			X	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?	X			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	X			ID's and containers affected:
10	Date & time on COC match date & time on bottles?	X			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?	X			Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?			X	
13	COC form is properly signed in relinquished/received sections?	X			Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):

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

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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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

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
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

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:	S44308.02	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
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

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:	S44308.03 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

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

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:	S44308.04 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
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: February 16, 2023

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	U	0.569		0.509	pCi/L	11.1		(0% - 100%)	LXP1	02/12/23	10:07
	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

QC Summary

Workorder: **607953**

Parmname **NOM** **Sample** **Qual** **QC** **Units** **RPD%** **REC%** **Range** **Anlst** **Date** **Time**

UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2373642	GFC28RAL	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
WORK 1951-D	Ba-133	.1 mL
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 Subtrate	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

Comments:

Pipet Id: RAD-GFC-1795419
Data Entry Date2: 08-FEB-2023 00:00

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

Geometry: 25mm Filter

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

Sample Characteristics					**Tracer Calculations**					
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

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	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%

Pos.	Calibration Data 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 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	0.7484	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%

2373642.xls

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 Lais Brint

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:	**Product:**	**Description:** Lucas Cell Radium 226
2373612	LUC26RAL	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	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

Batch : 2373612
Analyst : LIN01615
Prep Date : 2/8/2023
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**							
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)
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		

Lyndsey Pace

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

General Overall Assessment:
_____ Data are usable without qualification.
__X__ 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, HCO_3, CO_3, 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.

Merit
Laboratories, Inc.

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

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 Laverty (johnlaverty@meritlabs.com)
Barbara Ball (bball@meritlabs.com)

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. #:

Table of Contents

Maya Murshak

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

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	

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.

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	

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.

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	

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	

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.

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	

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

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	

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

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	

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

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	

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. ☒ Yes ☐ No ☐ N/A	Samples are received at 4C +/- 2C Thermometer #	IR 3.1
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? Subcontacted 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?	.05 Metals
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	.05 Metals
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: 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			

Merit
Laboratories, Inc.

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

CHAIN OF COUSTODY RECORD

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.

INVOICE TO

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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	YEAR TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Total Metals	F- undisstiled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness	dissolved Metals			
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					✓	✓	✓	✓	✓	✓				

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
Dissolved metals are the same as total.

RELINQUISHED BY: SIGNATURE/ORGANIZATION ☐ Sampler DATE 2.8.23 TIME 1545
RECEIVED BY: SIGNATURE/ORGANIZATION M Chilcote DATE 2/8/23 TIME 1545
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
NOTES: TEMP. ON ARRIVAL 3.1

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

Rev. 5.18.12

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

GEL Laboratories LLC
a member of The GEL Group INC

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gel.com

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

Jordan Melton for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	Client ID
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.

Jordan Melton

Jordan Melton for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

Merit
Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

610687

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. P.O. NO.
E-MAIL ADDRESS results@meritlabs.com QUOTE NO.

INVOICE TO ☒ SAME

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 S45134
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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES

Project Locations
☐ Detroit ☐ New York
☐ Other

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Radium 226*	Radium 228**								Special Instructions
	2/7/23	1352	S45134.01	GW	2			2					✓	✓								* E903.1 Mod.
	2/7/23	1700	S45134.02	GW	2			2					✓	✓								** E904.0/SW 9320 Mod.
	2/7/23	1018	S45134.03	GW	2			2					✓	✓								
	2/7/23	1149	S45134.04	GW	2			2					✓	✓								Please use calculation product &
	2/7/23	1735	S45134.05	GW	2			2					✓	✓								provide Radium 226/228 combined
	2/7/23	1529	S45134.06	GW	2			2					✓	✓								results on the report
	2/7/23	1149	S45134.07	GW	2			2					✓	✓								
	2/7/23	0755	S45134.08	GW	2			2					✓	✓								(No Ice needed)
																						** Subcontracted to
																						GEL Laboratories, Inc.
																						2040 Savage Road
																						Charleston, SC 29407

RELINQUISHED BY: SIGNATURE/ORGANIZATION Patr ☐ Sampler DATE 2/9/23 TIME 1700
RECEIVED BY: SIGNATURE/ORGANIZATION UPS DATE 2/9/23 TIME 1700
RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
RECEIVED BY: SIGNATURE/ORGANIZATION DATE TIME

RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
RECEIVED BY: SIGNATURE/ORGANIZATION DATE 2/13/23 TIME 0900
SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS
SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS
NOTES: TEMP. ON ARRIVAL

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

Rev. 5.18.12

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM DS

Client: MERI	**SDG/AR/COC/Work Order:** 610687
Received By: MVH	**Date Received:** 02.13.2023
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground [✓ UPS] Field Services Courier Other 1Z4064770362195189

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): 0 [✓ 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?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		Preservation Method: Wet Ice Ice Packs Dry ice [✓ None] Other: *all temperatures are recorded in Celsius **TEMP:** 21
4	Daily check performed and passed on IR temperature gun?	✓			**Temperature Device Serial #:** IR2-21 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?			✓	Sample ID's and Containers Affected: S45134.04 If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	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?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			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?	✓			Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?			✓	
13	COC form is properly signed in relinquished/received sections?	✓			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

GL-CHL-SR-001 Rev 7

Jordan Melton

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

Follow Up Flag: Follow up
Flag Status: Completed

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 Laverty <johnlaverty@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

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

Jordan,

Would adding more preservative effect results?

Thanks,
Patrick

On Mon, Feb 13, 2023 at 1:56 PM John Laverty <johnlaverty@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 Laverty <johnlaverty@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

Follow us on LinkedIn

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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

This message is intended only for the addressed person(s) and may contain privileged, confidential, and/or disclosure exempt information. Dissemination, distribution, or copying of this communication is strictly prohibited by any other than the intended recipient or an agent or employee thereof. If you have received this communication in error, please notify us immediately and delete this message.

--

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

--

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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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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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

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

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:	S45134.02	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
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

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:	S45134.03	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

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:	S45134.04	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
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

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:	S45134.05	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
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

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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

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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:	S45134.07	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

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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:	S45134.08	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

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

QC Summary

Workorder: **610687**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2387247	GFC28RAL	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
WORK 1951-E	Ba-133	.1 mL
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 Subtrate	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

Comments:

Pipet Id: RAD-GFC-1795419

Data Entry Date2: 03-MAR-2023 00:00

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

Geometry: 25mm Filter

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

Sample Characteristics					**Tracer Calculations**					
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

Pos.	Detector ID	Counting Time (min.)	Gross Counts Alpha	Gross Counts Beta	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 %
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

* - RPD changed to 0% due to sample & dup activity below MDA

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): 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:	**Product:**	**Description:** Lucas Cell Radium 226
2387198	LUC26RAL	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

Batch : 2387198
Analyst : LIN01615
Prep Date : 3/3/2023
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**							
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)
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 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections De-Gas to Ingrowth	Rn-222 Corrections Ingrowth to Count	Rn-222 Corrections During Count	Ra-226 Decay
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

Lyndsey Pace

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
Data Validator: Aryka Thomson

Lab Report Date: 04/03/2023
Data Validation Completion Date: 04/09/2023

General Overall Assessment:
_____ Data are usable without qualification.
__X__ 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, HCO$_3$, CO$_3$, 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.

Merit
Laboratories, Inc.

Analytical Laboratory Report

Final Report

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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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. #:

Table of Contents

Maya Murshak

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 (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

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	

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.

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	

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

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	

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.

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	

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.

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	

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.

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	

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

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	

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.

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	

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.

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	

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. ☒ Yes ☐ No ☐ N/A	Samples are received at 4C +/- 2C Thermometer #	IR 2.0
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? Subcontacted to:	GEL
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: S45182 Submitted: 02/09/2023 13:55
Client: BWL01 (Board of Water & Light)
Project: Erickson AM MI Wells 7-10

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

Initial Preservation Check: 02/09/2023 16:59 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
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			

Merit Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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.

INVOICE TO

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

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION		MATRIX	# OF BOTTLES	# Containers & Preservatives NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Total Metals	F- undisstiled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness
451820,01	02/08/23	1340	MW-7	L302145-01	GW	5	2		3					✓	✓	✓	✓	✓	✓
.02		1223	MW-8	-02	GW	5	2		3					✓	✓	✓	✓	✓	✓
.03		1106	MW-9	-03	GW	5	2		3					✓	✓	✓	✓	✓	✓
.04		0911	MW-10	-04	GW	5	2		3					✓	✓	✓	✓	✓	✓
.05		1453	MW-7B	-05	GW	5	2		3					✓	✓	✓	✓	✓	✓
.06		1604	MW-7C	-06	GW	5	2		3					✓	✓	✓	✓	✓	✓
.07		0911	MWT-10	-07	GW	5	2		3					✓	✓	✓	✓	✓	✓
.08		0815	Field Blank	-08	DI	5	2		3					✓	✓	✓	✓	✓	✓
.09	↓	1722	MW-13	↓ -09	GW	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: SIGNATURE/ORGANIZATION ☐ Sampler DATE 2.9.23 TIME 1355
RECEIVED BY: SIGNATURE/ORGANIZATION DATE 2/9/23 TIME 1355
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

NOTES: TEMP. ON ARRIVAL 2.0

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

Rev. 5.18.12

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

GEL Laboratories LLC
a member of **The GEL Group** INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171
F 843.766.1178

gel.com

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

Jordan Melton for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	Client ID
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.

Jordan Melton

Jordan Melton for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

612576

Merit Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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. P.O. NO.
E-MAIL ADDRESS results@meritlabs.com QUOTE NO.

INVOICE TO

CONTACT NAME Julie Teague ☒ SAME
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 S45182
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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Radium 226*	Radium 228**
	2/8/23	1340	S45182.01	GW	2			2					✓	✓
	2/8/23	1223	S45182.02	GW	2			2					✓	✓
	2/8/23	1106	S45182.03	GW	2			2					✓	✓
	2/8/23	0911	S45182.04	GW	2			2					✓	✓
	2/8/23	1453	S45182.05	GW	2			2					✓	✓
	2/8/23	1604	S45182.06	GW	2			2					✓	✓
	2/8/23	0911	S45182.07	GW	2			2					✓	✓
	2/8/23	0815	S45182.08	GW	2			2					✓	✓
	2/8/23	1722	S45182.09	GW	2			2					✓	✓

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES

Project Locations
☐ Detroit ☐ New York
☐ 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 ☐ Sampler DATE 2/13/23 TIME 1200
RECEIVED BY: SIGNATURE/ORGANIZATION DATE 2/13/23 TIME 1100
RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
RECEIVED BY: SIGNATURE/ORGANIZATION DATE TIME

RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
RECEIVED BY: SIGNATURE/ORGANIZATION DATE 3/1/23 TIME 1000
SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS
SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS
NOTES: TEMP. ON ARRIVAL

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

Rev. 5.18.12

GEL | Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: MERI	SDG/AR/COC/Work Order: 612576
Received By: Stacy Boone	Date Received: MARCH 1, 2023
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground [✓ UPS] Field Services Courier Other 12 466 477 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): 0 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?	✓	▨		Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓	▨		Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		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?	✓	▨		Temperature Device Serial #: IR3-22 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?		▨	✓	Circle Applicable: Seals broken Damaged container Leaking container Other (describe) S45182.08 1 of 2 ALMOST EMPTY
6	Samples requiring chemical preservation at proper pH?	✓			Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?		▨	✓	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?	✓	▨		ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓	▨		ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			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?	✓	▨		Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?		▨	✓	
13	COC form is properly signed in relinquished/received sections?	✓	▨		Circle Applicable: Not relinquished Other (describe)

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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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
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

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:	S45182.02	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
Sample ID: 612576003
Matrix: Ground Water
Collect Date: 08-FEB-23 11:06
Receive Date: 01-MAR-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	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
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

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: S45182.04
Sample ID: 612576004
Matrix: Ground Water
Collect Date: 08-FEB-23 09:11
Receive Date: 01-MAR-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	-0.255	+/-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
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

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:	S45182.05	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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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:	S45182.06	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
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

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
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

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
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

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
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

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**

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

QC Summary

Workorder: **612576**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2397396	GFC28RAL	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
WORK 1951-E	Ba-133	.1 mL
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 Subtrate	5 mL
REGNT 3875878.6	Nitric Acid	5 mL
REGNT 3465466	Barium Carrier Ra228 REG	1 mL

Comments:

Pipet Id: RAD-GFC-1795419
Data Entry Date2: 22-MAR-2023 00:00

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

Geometry: 25mm Filter

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

Sample Characteristics					**Tracer Calculations**					
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	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%

2397396.xls

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 Buist

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:	**Product:**	**Description:** Lucas Cell Radium 226
2397378	LUC26RAL	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

Batch : 2397378
Analyst : LIN01615
Prep Date : 3/22/2023
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**							
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)
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			
						De-Gas to Ingrowth	Ingrowth to Count	During Count	Ra-226 Decay
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

Lyndsey Pace

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.
__X__ 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, HCO_3, CO_3, 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.

Merit
Laboratories, Inc.

Analytical Laboratory Report

Final Report

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

Merit Laboratories, Inc.
2680 East Lansing Drive
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:
John Laverty (johnlaverty@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. #:

Table of Contents

Maya Murshak

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
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

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	

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

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.

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	

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

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.

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	

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

#	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 09:51, 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 14:16, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Bicarbonate*	417	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 12:36, Analyst: PJH

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	98	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	356	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 12:15, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	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	3.33	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	
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	0.22	0.02	0.00192	mg/L	5	7439-89-6	

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.

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	

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

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	

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. ☒ Yes ☐ No ☐ N/A	Samples are received at 4C +/- 2C Thermometer #	IR 2.2
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? Subcontacted to:	GEL
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?	Sample .01/.02
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	Sample .01/.02
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: S45204 Submitted: 02/10/2023 09:28

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 11-13

Initial Preservation Check: 02/10/2023 11:26 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
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			

Merit
Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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.

INVOICE TO

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 11-13
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 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. FOR LAB USE ONLY	YEAR DATE	YEAR TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Total Metals	F- undisstiled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	Dissolved Metals	HCO3, CO3, Hardness
45204.01	02/09/13	1258	MW-11 L302146-01	GW	5	2		3					✓	✓	✓	✓	✓	✓	✓
.02	↓	1710	MW-12 -02	GW	6	3		3					✓	✓	✓	✓	✓	✓	✓
	JSC 02/09/23		~~MW-13~~ N/A ~~-03~~	GW	5	2		3					✓	✓	✓	✓	✓		✓
.03	02/09/13	1423	MW-11B -04	GW	5	2		3					✓	✓	✓	✓	✓		✓
.04		1540	MW-12B -05	GW	5	2		3					✓	✓	✓	✓	✓		✓
.05		1423	MWT-11B -06	GW	5	2		3					✓	✓	✓	✓	✓		✓
.06	↓	0930	Field Blank ↓ -07	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

The analytes for dissolved metals are same metals that are analysed for total.

RELINQUISHED BY: SIGNATURE/ORGANIZATION ☒ Sampler	DATE 2-10-23	TIME 0928	
RECEIVED BY: SIGNATURE/ORGANIZATION M Chilcote	DATE 2/10/23	TIME 0928	
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
NOTES:
TEMP. ON ARRIVAL 2.2

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

Rev. 5.18.12

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

GEL | Laboratories LLC
a member of The GEL Group INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171
F 843.766.1178

gel.com

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

Jordan Melton for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	Client ID
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.

Jordan Melton

Jordan Melton for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

Merit Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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. P.O. NO.
E-MAIL ADDRESS results@meritlabs.com QUOTE NO.

INVOICE TO

CONTACT NAME Julie Teague ☒ SAME
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

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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Radium 226*	Radium 228**	Special Instructions
	2/9/23	1258	S45204.01	GW	2			2					✓	✓	* E903.1 Mod.
	2/9/23	1710	S45204.02	GW	2			2					✓	✓	** E904.0/SW 9320 Mod.
	2/9/23	1423	S45204.03	GW	2			2					✓	✓	
	2/9/23	1540	S45204.04	GW	2			2					✓	✓	Please use calculation product &
	2/9/23	1423	S45204.05	GW	2			2					✓	✓	provide Radium 226/228 combined
	2/9/23	0930	S45204.06	GW	2			2					✓	✓	results on the report
															(No Ice needed)
															** Subcontracted to
															GEL Laboratories, Inc.
															2040 Savage Road
															Charleston, SC 29407

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES

Project Locations
☐ Detroit ☐ New York
☐ Other

RELINQUISHED BY: SIGNATURE/ORGANIZATION ☐ Sampler DATE 2/13/23 TIME 1700
RECEIVED BY: SIGNATURE/ORGANIZATION UPS DATE 2/13/23 TIME 1700
RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
RECEIVED BY: SIGNATURE/ORGANIZATION DATE TIME

RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
RECEIVED BY: SIGNATURE/ORGANIZATION 3/1/23 DATE TIME 1000
SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS
SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS
NOTES: TEMP. ON ARRIVAL

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

Rev. 5.18.12

GEL 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 12 466 477 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): 0 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?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		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?	✓			Temperature Device Serial #: IR3-22 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?			✓	Circle Applicable: Seals broken Damaged container Leaking container Other (describe) S45182.08 1 of 2 ALMOST EMPTY
6	Samples requiring chemical preservation at proper pH?	✓			Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	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?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			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?	✓			Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?			✓	
13	COC form is properly signed in relinquished/received sections?	✓			Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials JM Date 3-1-23 Page 1 of 1

GL-CHL-SR-001 Rev 7

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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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

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:	S45204.01	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
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

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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:	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

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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:	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
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

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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:	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

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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: S45204.05
Sample ID: 612583005
Matrix: Ground Water
Collect Date: 09-FEB-23 14:23
Receive Date: 01-MAR-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	0.583	+/-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
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

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:	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

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

QC Summary

Workorder: **612583**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2397396	GFC28RAL	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
WORK 1951-E	Ba-133	.1 mL
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 Subtrate	5 mL
REGNT 3875878.6	Nitric Acid	5 mL
REGNT 3465466	Barium Carrier Ra228 REG	1 mL

Comments:

Pipet Id: RAD-GFC-1795419
Data Entry Date2: 22-MAR-2023 00:00

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

Geometry: 25mm Filter

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

Sample Characteristics					**Tracer Calculations**					
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	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 Buisto

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:	**Product:**	**Description:** Lucas Cell Radium 226
2397378	LUC26RAL	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

Batch : 2397378
Analyst : LIN01615
Prep Date : 3/22/2023
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**							
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)
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

						Rn-222 Corrections			
Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	De-Gas to Ingrowth	Ingrowth to Count	During Count	Ra-226 Decay
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

Lyndsey Pace

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
Lab Report Date: 3/21/2023
Data Validator: Andrew Byks
Data Validation Completion Date: 4/9/2023

General Overall Assessment:
______ Data are usable without qualification.
__X__ 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, HCO_3, CO_3, 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

Report produced by
Merit Laboratories, Inc.
2680 East Lansing Drive
East Lansing, MI 48823

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Contacts for report questions:
John Laverty (johnlaverty@meritlabs.com)
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. #:

Table of Contents

Maya Murshak

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

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	

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.

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	

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

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	

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.

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	

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.	☒ Yes	☐ No	☐ N/A	Samples are received at 4C +/- 2C Thermometer #	IR 5.7
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? Subcontacted to:	GEL
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: S45490 Submitted: 02/17/2023 15:02

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 14-15

Initial Preservation Check: 02/17/2023 15:20 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
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			

Merit
Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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.

INVOICE TO

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. FOR LAB USE ONLY	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives							ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)									
	DATE	TIME				NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Total Metals	F- undisstiled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness				
45490.01	02/17/23	1115	MW-14 L302181-01	GW	5	2		3					✓	✓	✓	✓	✓	✓				
.02	02/17/23	1310	MW-15 L302181-02	GW	5	2		3					✓	✓	✓	✓	✓	✓				
.03	02/17/23	1115	MWT-14 L302181-03	GW	5	2		3					✓	✓	✓	✓	✓	✓				
.04	02/17/23	1020	Field Blank L302181-04	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: SIGNATURE/ORGANIZATION ☒ Sampler DATE 2-17-23 TIME 1502
RECEIVED BY: SIGNATURE/ORGANIZATION M Chilcote DATE 2/17/23 TIME 1502
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

NOTES: TEMP. ON ARRIVAL 5.7

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

Rev. 5.18.12

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

GEL | Laboratories LLC
a member of The GEL Group INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171
F 843.766.1178

gel.com

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

Jordan Melton for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	Client ID
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

Jordan Melton for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

Merit Laboratories, Inc.

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

CHAIN OF COUSTODY RECORD

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. P.O. NO.
E-MAIL ADDRESS results@meritlabs.com QUOTE NO.

INVOICE TO ☒ SAME

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 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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Radium 226*	Radium 228**
	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					✓	✓

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES

Project Locations
☐ Detroit ☐ New York
☐ 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 M Wilcott ☐ Sampler DATE TIME
RECEIVED BY: SIGNATURE/ORGANIZATION UPS DATE TIME
RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
RECEIVED BY: SIGNATURE/ORGANIZATION Stacy L Boone DATE 2/22/23 TIME 1000

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

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

Rev. 5.18.12

GEL 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	Circle Applicable: FedEx Express FedEx Ground [✓ UPS] Field Services Courier Other 1Z 466 477 03 6322 6250

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?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		Preservation Method: Wet Ice Ice Packs Dry ice [✓ None] Other: TEMP: 19°c *all temperatures are recorded in Celsius
4	Daily check performed and passed on IR temperature gun?	✓			Temperature Device Serial #: IR3-22 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	✓			Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	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?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			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?	✓			Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?			✓	
13	COC form is properly signed in relinquished/received sections?	X SB		✓	Circle Applicable: [✓ Not relinquished] Other (describe)

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials JM Date 2/28/23 Page 1 of 1

GL-CHL-SR-001 Rev 7

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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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

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: S45490.01
Sample ID: 611797001
Matrix: Ground Water
Collect Date: 17-FEB-23 11:15
Receive Date: 22-FEB-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	0.272	+/-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 Laverty
Project: Routine Analysis

Client Sample ID: S45490.02
Sample ID: 611797002
Matrix: Ground Water
Collect Date: 17-FEB-23 13:10
Receive Date: 22-FEB-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	-0.367	+/-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
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

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

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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

QC Summary

Workorder: **611797**

Parmname **NOM** **Sample** **Qual** **QC** **Units** **RPD%** **REC%** **Range** **Anlst** **Date** **Time**

UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2393679	GFC28RAL	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	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
WORK 1951-D	Ba-133	.1 mL
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 Subtrate	5 mL
REGNT 3454413.21	Nitric Acid	5 mL
REGNT 3465466	Barium Carrier Ra228 REG	1 mL

Comments:
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

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

Geometry: 25mm Filter

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

Sample Characteristics					**Tracer Calculations**					
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

Pos.	Detector ID	Counting Time (min.)	Gross Counts Alpha	Gross Counts Beta	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 %
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

* - RPD changed to 0% due to sample & dup activity below MDA

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): 425.05
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	1.1857	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%

2393679.xls

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:	**Product:**	**Description:** Lucas Cell Radium 226
2393661	LUC26RAL	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

Batch : 2393661
Analyst : LIN01615
Prep Date : 3/9/2023
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**							
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)
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			
						De-Gas to Ingrowth	Ingrowth to Count	During Count	Ra-226 Decay
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	Lab Report Date: 03/21/2023
Data Validator: Aryka Thomson	Data Validation Completion Date: 04/03/2023

General Overall Assessment:
_____ Data are usable without qualification.
__X__ 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, HCO_3, CO_3, 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.

Merit
Laboratories, Inc.

Analytical Laboratory Report

Final Report

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

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 Laverty (johnlaverty@meritlabs.com)
Barbara Ball (bball@meritlabs.com)

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. #:

Table of Contents

Maya Murshak

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

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	

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	

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

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	

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	

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

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	

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.

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	

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.

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	

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.

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	

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.	☒ Yes	☐ No	☐ N/A	Samples are received at 4C +/- 2C Thermometer #	IR 2.1
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? Subcontacted to:	GEL
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?	Sample .03
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	Sample .03
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: S44989 Submitted: 02/03/2023 10:50

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 16A-16D

Initial Preservation Check: 02/03/2023 12:52 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
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			

Merit Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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.

INVOICE TO

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

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☒ NPDES

Project Locations
☐ Detroit ☐ New York
☐ Other

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Total Metals	F- undisstiled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness	Dissolved Metals				Special Instructions
	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 t. metals

RELINQUISHED BY: SIGNATURE/ORGANIZATION ☒ Sampler	DATE 2-3-23	TIME 1050	RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE 2/3/23	TIME 1050	RECEIVED BY: SIGNATURE/ORGANIZATION DATE TIME
RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME	SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME	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

Rev. 5.18.12

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

GEL | Laboratories LLC
a member of **The GEL Group** INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171
F 843.766.1178

gel.com

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

Jordan Melton for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	Client ID
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.

Jordan Melton

Jordan Melton for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

Merit Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD 610325

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. P.O. NO.
E-MAIL ADDRESS results@meritlabs.com QUOTE NO.

INVOICE TO

CONTACT NAME Julie Teague ☒ SAME
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 S44989 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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES

Project Locations
☐ Detroit ☐ New York
☐ Other

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Radium 226*	Radium 228**	Special Instructions
	2/2/23	0935	S44989.01	GW	2			2					✓	✓	* E903.1 Mod.
	2/2/23	1110	S44989.02	GW	2			2					✓	✓	** E904.0/SW 9320 Mod.
	2/2/23	1408	S44989.03	GW	2			2					✓	✓	
	2/2/23	1608	S44989.04	GW	2			2					✓	✓	Please use calculation product &
	2/2/23	0935	S44989.05	GW	2			2					✓	✓	provide Radium 226/228 combined
	2/2/23	0815	S44989.06	GW	2			2					✓	✓	results on the report
	2/2/23	0830	S44989.07	GW	2			2					✓	✓	
															(No Ice needed)
															** Subcontracted to
															GEL Laboratories, Inc.
															2040 Savage Road
															Charleston, SC 29407

RELINQUISHED BY: SIGNATURE/ORGANIZATION	☐ Sampler	DATE 2/7/23	TIME 1700
RECEIVED BY: SIGNATURE/ORGANIZATION UPS		DATE 2/7/23	TIME 1700
RELINQUISHED BY: SIGNATURE/ORGANIZATION		DATE	TIME
RECEIVED BY: SIGNATURE/ORGANIZATION		DATE	TIME

RELINQUISHED BY: SIGNATURE/ORGANIZATION		DATE	TIME
RECEIVED BY: SIGNATURE/ORGANIZATION		DATE 02.09.2023	TIME 1000
SEAL NO.	SEAL INTACT YES ☐ NO ☐	INITIALS	NOTES: TEMP. ON ARRIVAL
SEAL NO.	SEAL INTACT YES ☐ NO ☐	INITIALS	

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

Rev. 5.18.12

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM DS

Client: MERI	**SDG/AR/COC/Work Order:** 610325
Received By: MVH	**Date Received:** 02·09·2023
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground [✓ UPS] Field Services Courier Other 1Z4664770362566448

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): 0 [✓ 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?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		Preservation Method: Wet Ice Ice Packs Dry ice [✓ None] Other: *all temperatures are recorded in Celsius TEMP: 21
4	Daily check performed and passed on IR temperature gun?	✓			**Temperature Device Serial #:** IR2-21 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	✓			Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	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?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			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?	✓			Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?			✓	
13	COC form is properly signed in relinquished/received sections?	~~✓~~		✓	Circle Applicable: [✓ Not relinquished] Other (describe)

Comments (Use Continuation Form if needed) MV2·10·23

PM (or PMA) review: Initials______ Date 2/11/23 Page 1 of 1

GL-CHL-SR-001 Rev 7

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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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

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:	S44989.01	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
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

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

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:	S44989.03	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
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

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:	S44989.04	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
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

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: S44989.05
Sample ID: 610325005
Matrix: Ground Water
Collect Date: 02-FEB-23 09:35
Receive Date: 09-FEB-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	-0.723	+/-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
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

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:	S44989.06	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
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

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: S44989.07
Sample ID: 610325007
Matrix: Ground Water
Collect Date: 02-FEB-23 08:30
Receive Date: 09-FEB-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	0.438	+/-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
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: March 8, 2023

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

Contact: **John Laverty**

Workorder: **610325**

Parmname	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

QC Summary

Workorder: **610325**

Parmname	**NOM**	**Sample**	**Qual**	**QC**	**Units**	**RPD%**	**REC%**	**Range**	**Anlst**	**Date**	**Time**

UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2387212	GFC28RAL	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
WORK 1951-E	Ba-133	.1 mL
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

Comments:

Pipet Id: RAD-GFC-1795419
Data Entry Date2: 01-MAR-2023 00:00

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

Geometry: 25mm Filter

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

Sample Characteristics					**Tracer Calculations**					
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

Pos.	Detector ID	Counting Time (min.)	Gross Counts Alpha	Gross Counts Beta	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 %
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%

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.)
Calibration Data								
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

* - RPD changed to 0% due to sample & dup activity below MDA

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): 426.17
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	1.2269	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:	**Product:**	**Description:** Lucas Cell Radium 226
2387191	LUC26RAL	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	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

Batch : 2387191
Analyst : LXP1
Prep Date : 3/1/2023
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**							
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)
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 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	3/2/2023 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
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.
__X__ 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, HCO_3, CO_3, 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.

Analytical Laboratory Report

Final Report

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 Laverty (johnlaverty@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. #:

Table of Contents

Maya Murshak

Maya Murshak
Technical Director

Hometown People. Hometown Power.

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	Received	Account Number
L303201	3/24/2023 3:33:00PM	

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

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	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	

Client: BWL - Erickson Station
Address: 3725 S. Canal
Lansing MI, 48917

Client Project Manager: Cheryl Louden

Report Date: 04/24/2023

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.
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
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

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	

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.

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	

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.

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	

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.

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	

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. ☒ Yes ☐ No ☐ N/A	Samples are received at 4C +/- 2C Thermometer #	IR 5.9
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? Subcontacted to:	GEL
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: 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			

Merit
Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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.

INVOICE TO

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

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	YEAR TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Total Metals	F- undisstiled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness				
46674.01	03/24/23	1242	MW-14	GW	5	2		3					✓	✓	✓	✓	✓	✓				
.02		1435	MW-15	GW	5	2		3					✓	✓	✓	✓	✓	✓				
.03		1242	MWT-14	GW	5	2		3					✓	✓	✓	✓	✓	✓				
.04		1145	Field Blank	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: SIGNATURE/ORGANIZATION ☒ Sampler	DATE 3-24-23	TIME 1550	RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME
RECEIVED BY: SIGNATURE/ORGANIZATION M Chilcot	DATE 3/24/23	TIME 1550	RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME
RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME	SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS	NOTES:	TEMP. ON ARRIVAL 5.9
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME	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	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

GEL | Laboratories LLC
a member of The GEL Group INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171
F 843.766.1178

gel.com

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

Jordan Melton for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	Client ID
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

Jordan Melton for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

616069

Merit Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

REPORT TO		INVOICE TO	
CONTACT NAME	Project Management Team	CONTACT NAME	Julie Teague ☒ SAME
COMPANY	Merit Laboratories	COMPANY	Merit Laboratories
ADDRESS	2680 East Lansing Drive	ADDRESS	2680 East Lansing Drive
CITY	East Lansing STATE MI ZIP CODE 48823	CITY	East Lansing STATE MI ZIP CODE 48823
PHONE NO.	517-332-0167 FAX NO. P.O. NO.	PHONE NO.	517-332-0167
E-MAIL ADDRESS	results@meritlabs.com QUOTE NO.	E-MAIL ADDRESS	juliet@meritlabs.com

PROJECT NO./NAME S46674

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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Radium 226*	Radium 228**
	3/24/23	1242	S46674.01	GW	2			2					✓	✓
	3/24/23	1435	S46674.02	GW	2			2					✓	✓
	3/24/23	1242	S46674.03	GW	2			2					✓	✓
	3/24/23	1145	S46674.04	GW	2			2					✓	✓

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES

Project Locations
☐ Detroit ☐ New York
☐ 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 ☐ Sampler	DATE 3/27/23	TIME 17:00	RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE 3.29.2023 TIME 1600
RECEIVED BY: SIGNATURE/ORGANIZATION UPS	DATE 3/27/23	TIME 17:00	RECEIVED BY: SIGNATURE/ORGANIZATION Stacy Boon DATE 3/29/23 TIME 1000
RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME	SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS NOTES: TEMP. ON ARRIVAL
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME	SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS

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

Rev. 5.18.12

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: MERI	**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 [✓ UPS] Field Services Courier Other 1Z 466 477 03 6331 3478

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): 0 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?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		Preservation Method: Wet Ice Ice Packs Dry ice [✓ None] Other: *all temperatures are recorded in Celsius **TEMP:** 18°c
4	Daily check performed and passed on IR temperature gun?	✓			**Temperature Device Serial #:** IR3-22 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	✓			Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	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?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			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?	✓			Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?			✓	
13	COC form is properly signed in relinquished/received sections?	✓			Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials JM Date 3-29-23 Page 1 of 1

GL-CHL-SR-001 Rev 7

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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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

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
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

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:	S46674.02	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 Laverty
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
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

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
Sample ID: 616069004
Matrix: Ground Water
Collect Date: 24-MAR-23 11:45
Receive Date: 29-MAR-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	0.535	+/-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

Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan
Contact: **John Laverty**

Workorder: **616069**

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

QC Summary

Workorder: **616069**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2406255	GFC28RAL	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
WORK 1951-E	Ba-133	.1 mL
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 Subtrate	5 mL
REGNT 3465466	Barium Carrier Ra228 REG	1 mL
REGNT 3879639.10	Nitric Acid	5 mL

Comments:
Pipet Id: RAD-GFC-1795419
Data Entry Date2: 05-APR-2023 00:00

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

Geometry: 25mm Filter

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

Sample Characteristics					**Tracer Calculations**					
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

Pos.	Detector ID	Counting Time (min.)	Gross Counts Alpha	Gross Counts Beta	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 %
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%

Pos.	**Calibration Data** 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

* - RPD changed to 0% due to sample & dup activity below MDA

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): 559.43
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	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%

2406255.xls

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

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 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:	**Product:**	**Description:** Lucas Cell Radium 226
2406215	LUC26RAL	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

Batch : 2406215
Analyst : LIN01615
Prep Date : 4/5/2023
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**							
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)
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

						Rn-222 Corrections			
Cell Efficiency Error (%)	Cell Calibration Date	Cell Calibration Due Date	De-Gas Date/Time	Rn-222 Ingrow End Date/Time	Count Start Date/Time	De-Gas to Ingrowth	Ingrowth to Count	During Count	Ra-226 Decay
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

Lyndsey Pace

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

LANSING BWL
Hometown People. Hometown Power.

Environmental Laboratory
1232 Haco Drive
Lansing
Michigan, 48910

CHAIN OF CUSTODY

Phone: (517)702-6372

Page 1 of 1

Lab Work Order Number L303201

Client Name BWL - Erickson Station	Project Name Erickson AM MI Wells 14-15
Client Contact Cheryl Louden	Project Number [none]
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	

Requested Turn Around

Rush requests subject to additional charge

Rush requests subject to lab approval.

						Requested Analyses										
						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							
						Preservation Code										
Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	b	a	a	b							Sample Comments
MW-14	03/24/23	1242	G	GW	5	1	1	1	2							
MW-15	↓	1435	G	GW	5	1	1	1	2							
MWT-14		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 J Caporale	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.
__X__ 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, HCO_3, CO_3, 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.

Hometown People. Hometown Power.

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	Received	Account Number
L303200	3/22/2023 8:30:00AM	

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jennifer Caporale

Jennifer Caporale, Supervisor

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	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	

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	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	

Client: BWL - Erickson Station
Address: 3725 S. Canal
Lansing MI, 48917

Client Project Manager: Cheryl Louden

Report Date: 04/24/2023

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.

Merit
Laboratories, Inc.

Analytical Laboratory Report

Final Report

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 Laverty (johnlaverty@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. #:

Table of Contents

Maya Murshak

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

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	

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

#	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 09:37, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	11	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: 03/23/23 14:10, 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: 03/23/23 13:44, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	329	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	366	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 11:36, 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	0.085	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	0.13	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	
Iron	0.62	0.02	0.00192	mg/L	5	7439-89-6	

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.

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	

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.

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	

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.

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	

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

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	

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
Client: BWL01 (Board of Water & Light)
Project: Erickson AM MI Wells 16A-16D
Submitted: 03/22/2023 16:04 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. ☐ Yes ☒ No ☐ N/A	Samples are received at 4C +/- 2C Thermometer #	IR 1.6
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? Subcontacted to:	GEL
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: 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			

Merit Laboratories, Inc.

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Phone (517) 332-0167 Fax (517) 332-4034
www.meritlabs.com

C.O.C. PAGE # 1 OF 1

CHAIN OF CUSTODY RECORD

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.

INVOICE TO

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)

Certifications
☐OHIO VAP ☐Drinking Water
☐DoD ☒NPDES

Project Locations
☐Detroit ☐New York
☐Other

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Total Metals	F- undisstiled, Cl, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness					Special Instructions
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~~ JSC 03/22/23	~~DI~~	~~5~~	~~2~~		~~3~~					~~✓~~	~~✓~~	~~✓~~	~~✓~~	~~✓~~	~~✓~~					

		DATE	TIME		DATE	TIME
RELINQUISHED BY: SIGNATURE/ORGANIZATION	☒Sampler	3-22-23	1604	RELINQUISHED BY: SIGNATURE/ORGANIZATION		
RECEIVED BY: SIGNATURE/ORGANIZATION	M Wilcox	3/22/23	1604	RECEIVED BY: SIGNATURE/ORGANIZATION		
RELINQUISHED BY: SIGNATURE/ORGANIZATION				SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS	NOTES:	TEMP. ON ARRIVAL 1.6
RECEIVED BY: SIGNATURE/ORGANIZATION				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	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

GEL Laboratories LLC
a member of The GEL Group INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171
F 843.766.1178

gel.com

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

Jordan Melton for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	Client ID
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.

Jordan Melton

Jordan Melton for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

615636

Merit Laboratories, Inc

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

CHAIN OF CUSTODY RECORD

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. P.O. NO.
E-MAIL ADDRESS results@meritlabs.com QUOTE NO.

INVOICE TO ☒ SAME

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 S46568
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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Radium 226*	Radium 228**
	3/21/23	1108	S46568.01	GW	2			2					✓	✓
	3/21/23	1444	S46568.02	GW	2			2					✓	✓
	3/21/23	1317	S46568.03	GW	2			2					✓	✓
	3/21/23	1406	S46568.04	GW	2			2					✓	✓
	3/21/23	1108	S46568.05	GW	2			2					✓	✓
	3/21/23	0805	S46568.06	DI	2			2					✓	✓

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES

Project Locations
☐ Detroit ☐ New York
☐ 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 ☐ Sampler DATE 3/22/23 TIME 1700
RECEIVED BY: SIGNATURE/ORGANIZATION UPS DATE 3/22/23 TIME 1700
RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
RECEIVED BY: SIGNATURE/ORGANIZATION DATE 3-24-23 TIME 1000

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

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

Rev. 5.18.12

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: MERI	SDG/AR/COC/Work Order: 615-636
Received By: SNS	Date Received: 3/24/23
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground [✓ UPS] Field Services Courier Other 1Z4664770363754377

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?		X	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?		X	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?		X	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?		X	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?		X	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?	X			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	X			Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		X		Preservation Method: Wet Ice Ice Packs Dry ice [✓ None] Other: TEMP: 20C *all temperatures are recorded in Celsius
4	Daily check performed and passed on IR temperature gun?	X			Temperature Device Serial #: IR1-23 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	X			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	X			Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			X	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?	X			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	X			ID's and containers affected:
10	Date & time on COC match date & time on bottles?	X			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?	X			Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?			X	
13	COC form is properly signed in relinquished/received sections?	X			Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials ______ 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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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)

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: 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

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:	S46568.02	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 Laverty
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
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

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:	S46568.04	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
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

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
Sample ID: 615636005
Matrix: Ground Water
Collect Date: 21-MAR-23 11:08
Receive Date: 24-MAR-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	0.907	+/-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
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

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:	S46568.06	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

Page 1 of 2

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

QC Summary

Workorder: **615636**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2406255	GFC28RAL	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
WORK 1951-E	Ba-133	.1 mL
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 Subtrate	5 mL
REGNT 3465466	Barium Carrier Ra228 REG	1 mL
REGNT 3879639.10	Nitric Acid	5 mL

Comments:

Pipet Id: RAD-GFC-1795419
Data Entry Date2: 05-APR-2023 00:00

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

Geometry: 25mm Filter

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

Sample Characteristics					**Tracer Calculations**					
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

Pos.	Detector ID	Counting Time (min.)	Gross Counts Alpha	Gross Counts Beta	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 %
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%

Pos.	**Calibration Data** 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

* - RPD changed to 0% due to sample & dup activity below MDA

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): 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%

2406255.xls

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

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 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:	**Product:**	**Description:** Lucas Cell Radium 226
2406215	LUC26RAL	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

Batch : 2406215
Analyst : LIN01615
Prep Date : 4/5/2023
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**							
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)
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 De-Gas to Ingrowth	Rn-222 Corrections Ingrowth to Count	Rn-222 Corrections During Count	Ra-226 Decay
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
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

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Environmental Laboratory
1232 Haco Drive
Lansing
Michigan, 48910

CHAIN OF CUSTODY

Phone: (517)702-6372

Page 1 of 1

Lab Work Order Number L303200

Client Name BWL - Erickson Station	**Project Name** Erickson AM MI Wells 16A-D
Client Contact Cheryl Louden	**Project Number** (none)
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	

Requested Turn Around

Rush requests subject to additional charge.

Rush requests subject to lab approval.

						Requested Analyses										
						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							
						Preservation Code										
Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	b	a	a	b							Sample Comments
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		0805	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	Received By	Date/Time
	3-21-23 1945	J. Caporale	03/22/23 0830

Comments

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

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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 Louden
3725 S. Canal
Lansing, MI 48917

Project: General Lab

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	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

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

Sample Description and Objective

- 20 sample of groundwater were received for analysis by ICPMS:

  Goal: Quantify ^{7}Li, ^{11}B, ^{86}Sr, ^{87}Sr, and ^{87}Sr/^{86}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}Sr/^{86}Sr ratio was 0.52, with a low of 0.51 and a high of 0.55

Analytical Results

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

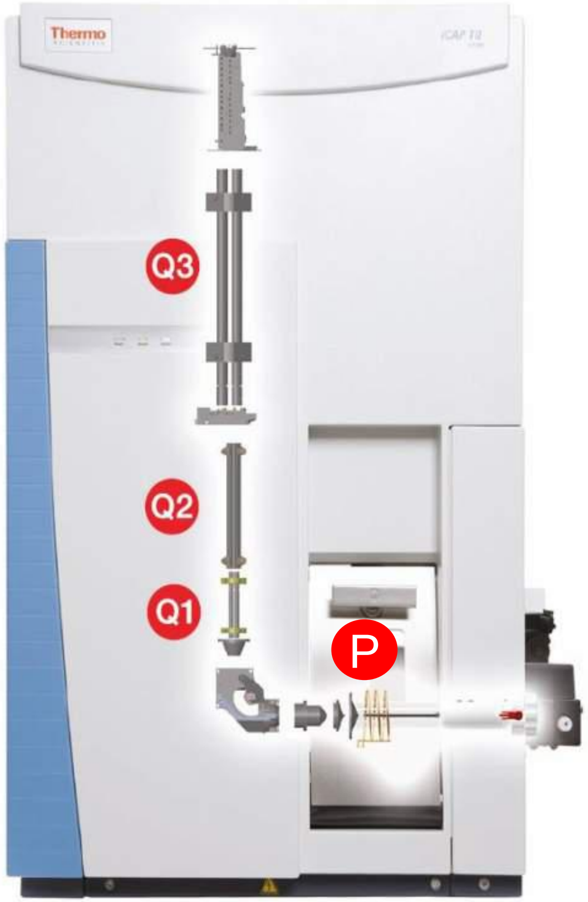
Element / Isotope	Instrument Mode	MW-11B 3-22-23 1404	MWF-12B 3-22-23 1019	MW-7 3-21-23 1732	MW-16C 3-21-23 1317	MW-7B 3-21-23 1830	MW-16A 3-21-23 1108	L303223-02A
^{7}Li	SQ-KED	19.58	31.92	52.57	18.30	13.62	*N.D.*	*N.D.*
^{11}B	SQ-KED	996.08	3153.90	1448.23	386.16	2842.92	108.79	1026.18
^{86}Sr	SQ-KED	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

TQ-ICP-MS Instrument Description

- 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

TQ-ICP-MS Instrument Description – Instrument Modes

- 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.

TQ-ICP-MS Instrument Description – Instrument Modes

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

Analytical Terminology

Table B: Analytical Terminology

SD	Standard deviation for n replicate measurements	$SD = \sqrt{\frac{1}{n-1} \cdot \sum_{i=1}^{n} (x_i - \bar{x})^{2}}$
MQL	Method quantitation limit where SD_{Blank} is the standard deviation for the calibration blank measured 10 times	$MQL = \left(\frac{10 \times SD_{Blank}}{a_1}\right) \times TDF$
a_1 , a_0	Slope and intercept of the calibration function	$f(x) = a_1 x + a_0$
TDF	Total dilution factor	$TDF = \frac{V_S + V_D}{V_S} = \frac{\textit{Total volume of sample + diluent}}{\textit{Volume of sample}}$
$C_{m,i}$	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*.	$U_{m,i} = \frac{t \cdot SD_i}{\sqrt{n}}$

Analytical Terminology - Units

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

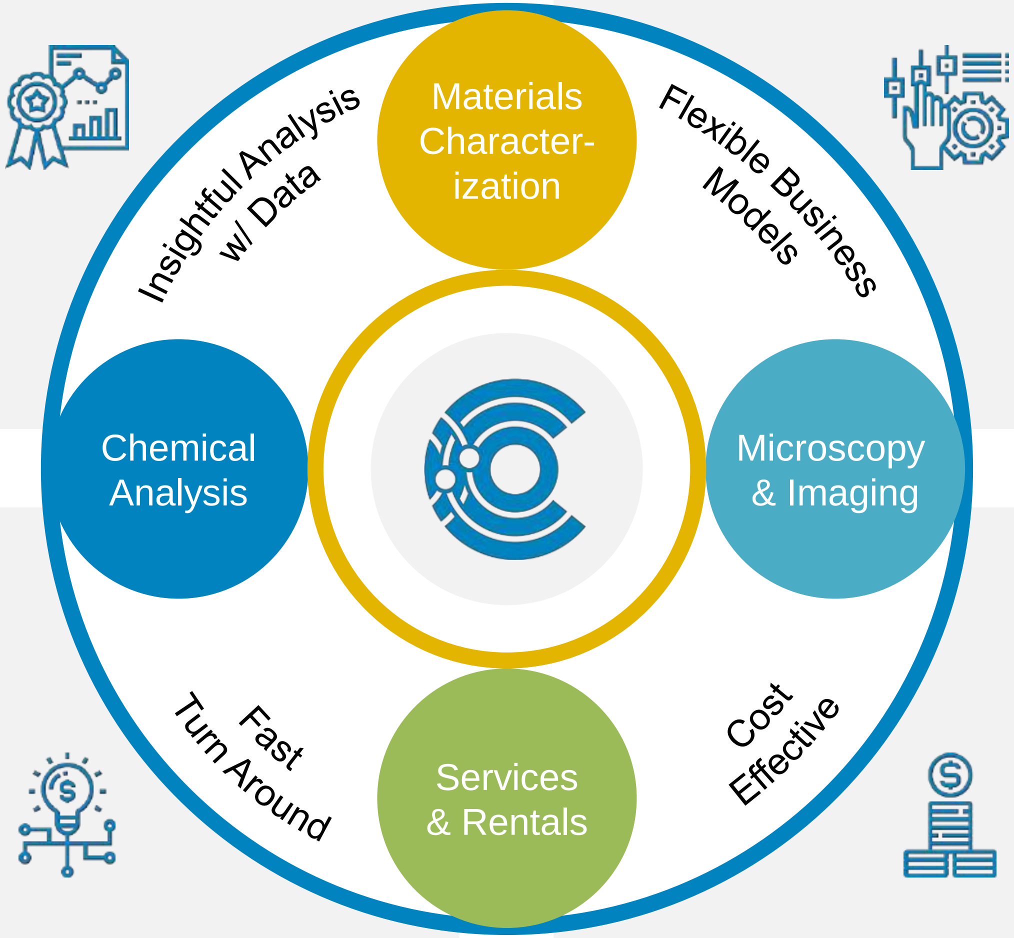
Metrology Summary

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/NCLS-Z540.3 accredited calibration weights.
5. Analytical standards are all NIST-traceable.

The Covalent Way

- Domain Experts in Every Technique
- Advanced Analysis and Interpretation
- Expert Advisory Services

- Transparent Pricing
- Frictionless Experience
- Solution for Every Budget



Materials Characterization

Chemical Analysis

Microscopy & Imaging

Services & Rentals

Insightful Analysis w/ Data

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Cost Effective

- Fast & Easy Quotation Process
- Sample Pick-Up in Bay Area
- Full Service Analytical Lab for All Your Characterization Needs

- 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

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1232 Haco Drive
Lansing
Michigan, 48910

CHAIN OF CUSTODY

Phone: (517)702-6372

Page 1 of 1

Lab Work Order Number L303217

Client Name BWL - Erickson Station	Project Name General Lab
Client Contact Cheryl Louden	Project Number [none]
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	

Requested Analyses

δ(11)B, (7)Li, (87)Sr,(86)Sr,(87)Sr/(86)Sr ratio

Requested Turn Around

Rush requests subject to additional charge

Rush requests subject to lab approval.

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code a											Sample Comments
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	Date/Time	Received By	Date/Time
MAW	3/21/23 1945	Jennifer Caporale	3/22/2023 8:30

Comments

Cooler Numbers and Temperatures
E0776 at 1 ºC

Matrix Codes: GW=Ground Water

Preserv. Codes: a=None

LANSING BWL
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Environmental Laboratory
1232 Haco Drive
Lansing
Michigan, 48910

CHAIN OF CUSTODY

Phone: (517)702-6372

Page 1 of 1

Lab Work Order Number L303220

Client Name BWL - Erickson Station		**Project Name** General Lab
Client Contact Cheryl Louden		**Project Number** [none]
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		

Requested Analyses

δ(11)B, (7)Li, (87)Sr,(86)Sr,(87)Sr/(86)Sr ratio

Requested Turn Around

Rush requests subject to additional charge.

Rush requests subject to lab approval.

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code a	Sample Comments
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	Received By	Date/Time
	3/22/2023 15:23	Jennifer Caporale	3/22/2023 15:23

Comments

Cooler Numbers and Temperatures
E0776 at 1.3 ºC

Matrix Codes: GW=Ground Water

Preserv. Codes a=None

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Environmental Laboratory
1232 Haco Drive
Lansing
Michigan, 48910

CHAIN OF CUSTODY

Phone: (517)702-6372

Page 1 of 1

Lab Work Order Number L303222

Client Name BWL - Erickson Station		**Project Name** General Lab
Client Contact Cheryl Louden		**Project Number** [none]
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		

Requested Analyses: To Merit for SPLP; Isotope Analysis sent to Covalent Metrology

Requested Turn Around

Rush requests subject to additional charge

Rush requests subject to lab approval.

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	To Merit for SPLP Preservation Code: a	Isotope Analysis sent to Covalent Metrology Preservation Code: a	Sample Comments
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	Received By	Date/Time
	3/23/23 15:00	EJA	3-23-23 1500
			Date/Time
			Date/Time

Comments

LANSING BWL
Hometown People. Hometown Power.

Environmental Laboratory
1232 Haco Drive
Lansing
Michigan, 48910

CHAIN OF CUSTODY

Phone: (517)702-6372

Page 1 of 1

Lab Work Order Number L303223

Client Name BWL - Erickson Station	**Project Name** General Lab
Client Contact Cheryl Louden	**Project Number** [none]
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	

Requested Analyses
- Centrifuge before going to Covalent Metrology
- Isotope Analysis sent to Covalent Metrology

Requested Turn Around

Rush requests subject to additional charge.

Rush requests subject to lab approval.

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Centrifuge before going to Covalent Metrology Preservation Code: a	Isotope Analysis sent to Covalent Metrology Preservation Code: a	Sample Comments
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	Received By	Date/Time
	3/23/23 15:00		3-23-23 1500
	Date/Time	Received By	Date/Time

E0776 8.6°C

Preserv. Codes:

Merit
Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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.

INVOICE TO

CONTACT NAME Beth Zimpfer
COMPANY
ADDRESS
CITY STATE ZIP CODE
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

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

Certifications
☐ OHIO VAP ☒ Drinking Water
☐ DoD ☒ NPDES
Project Location
☐ Detroit ☐ New York
☐ Other
Special Instructions

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO₃	H₂SO₄	NaOH	MeOH	OTHER	SPLP, Send back to LBWL
46672.01	3-23-23	1345	FB Ash 1 L303222-01	S	1	1							✓
.02	3-23-23	1405	CWP Ash 1 L303222-02	S	1	1							✓

Return COC

SPLP ASTM Leach Performed

RELINQUISHED BY: SIGNATURE/ORGANIZATION ☐ Sampler		DATE 3.24.23	TIME 1543
RECEIVED BY: SIGNATURE/ORGANIZATION	M Ostrosh	DATE 3/24/23	TIME 1543
RELINQUISHED BY: SIGNATURE/ORGANIZATION		DATE 3.28.23	TIME 1505
RECEIVED BY: SIGNATURE/ORGANIZATION	J Caporale Temp 2.1 [illegible] 03/28/23	DATE	TIME 1505
RELINQUISHED BY: SIGNATURE/ORGANIZATION	M Ostrosh	DATE 3/28/23	TIME 1430
RECEIVED BY: SIGNATURE/ORGANIZATION		DATE	TIME

SEAL NO. SEAL INTACT YES☐ NO☐ INITIALS
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

Rev. 6.18.12

Sending to Covalent Metrology 03/29/23 JSC 03/28/23 pg 1 of 2

Covalent Internal Chain of Custody

Analysis by ICPMS	Qty	Description of Sample	Date/Time Sampled
δ(11)B,b(7)Li, (87)Sr,(86)Sr (87)Sr/(86)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

Pg 2 of 2

Covalent Internal Chain of Custody

Analysis by ICPMS	Qty	Description of Sample	Date/Time Sampled
δ(11)B,b(7)Li, (87)Sr,(86)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

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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Results Summary

Sample Description and Objective

- 20 sample of groundwater were received for analysis by ICPMS:

  Goal: Quantify ^{7}Li, ^{11}B, ^{86}Sr, ^{87}Sr, ^{87}Sr/^{86}Sr ratio, and ^{11}B/^{10}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

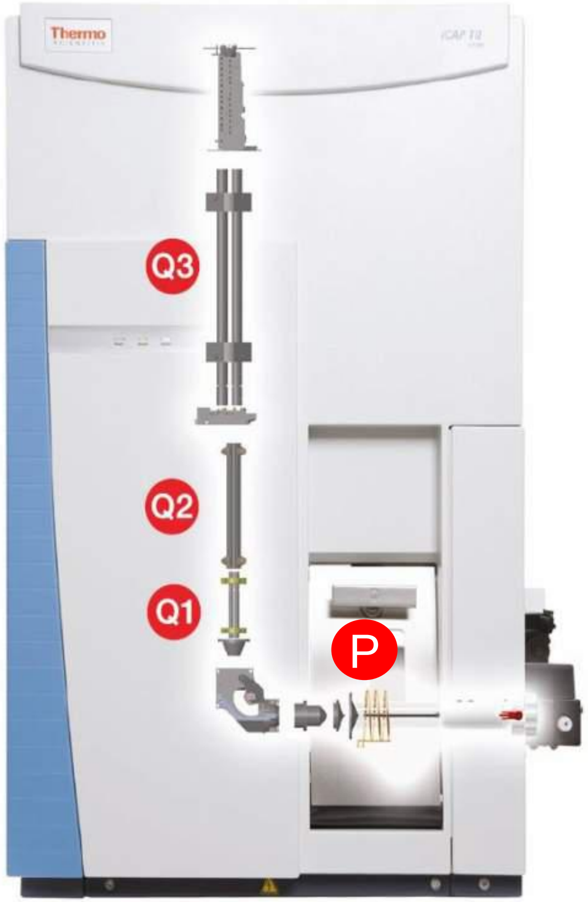
		FieldBlank 3-22-23 0815			MW-11 3-22-23 1304			MW-16D 3-21-23 1406			MW-12B 3-22-23 1019			MW-16B 3-21-23 1444			MW-12 3-22-23			L303223-01A		
Element /	Instrument	C_m	U_m	U_m	C_m	U_m	U_m	C_m	U_m	U_m	C_m	U_m	U_m	C_m	U_m	U_m	C_m	U_m	U_m	C_m	U_m	U_m
Isotope	Mode	(ng/mL)	(ng/mL)	(%)	(ng/mL)	(ng/mL)	(%)	(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

TQ-ICP-MS Instrument Description

- 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

TQ-ICP-MS Instrument Description – Instrument Modes

- 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.

TQ-ICP-MS Instrument Description – Instrument Modes

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

Analytical Terminology

Table B: Analytical Terminology

SD	Standard deviation for *n* replicate measurements	$SD = \sqrt{\frac{1}{n-1} \cdot \sum_{i=1}^{n} (x_i - \bar{x})^2}$
MQL	Method quantitation limit where SD_{Blank} is the standard deviation for the calibration blank measured 10 times	$MQL = \left(\frac{10 \times SD_{Blank}}{a_1}\right) \times TDF$
a_1 , a_0	Slope and intercept of the calibration function	$f(x) = a_1 x + a_0$
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* .	$U_{m,i} = \frac{t \cdot SD_i}{\sqrt{n}}$

Analytical Terminology - Units

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

Metrology Summary

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/NCLS-Z540.3 accredited calibration weights.
5. Analytical standards are all NIST-traceable.

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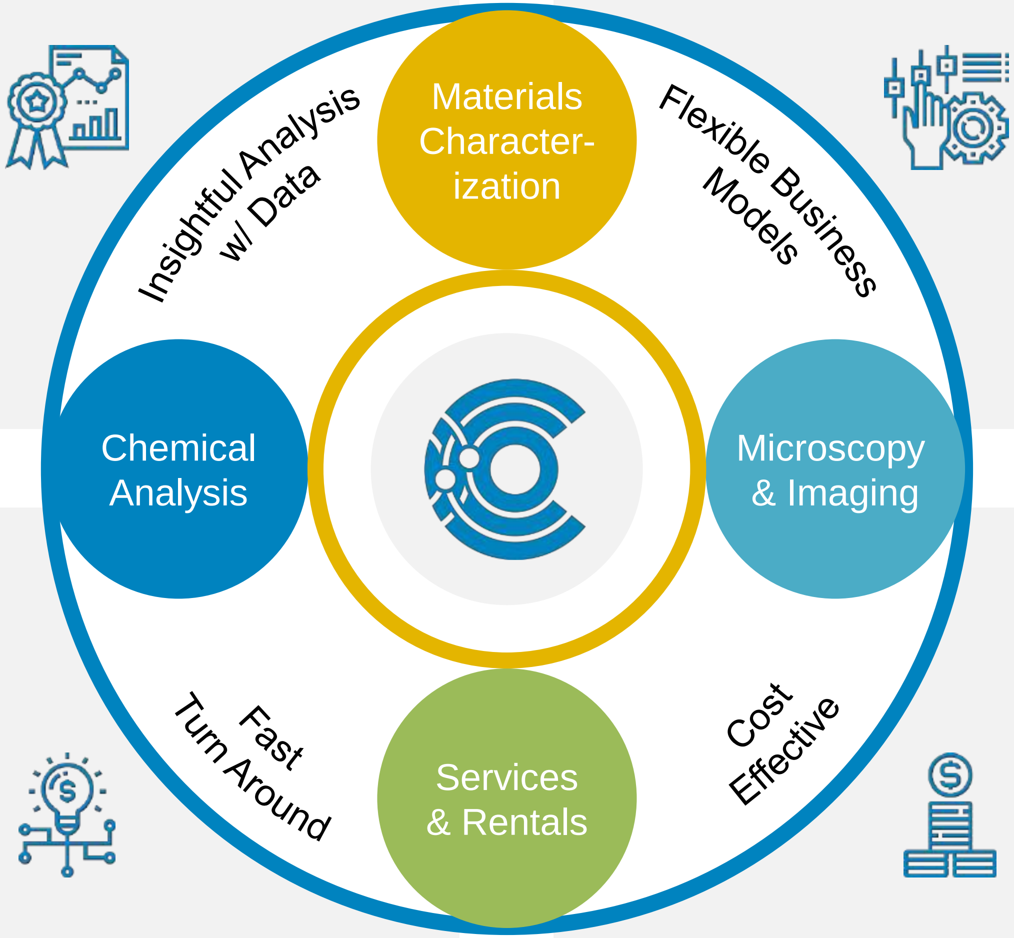

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Data Verification & Validation Report

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
Data Validator: Aryka Thomson

Lab Report Date: 06/13/2023
Data Validation Completion Date: 06/28/2023

General Overall Assessment:
_____ Data are usable without qualification.
__X__ 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, HCO_3, CO_3, 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).

Analytical Laboratory Report

Supplemental Report

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

Merit Laboratories, Inc.
2680 East Lansing Drive
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:
John Laverty (johnlaverty@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

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

Analytical Laboratory Report

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

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	

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	

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	

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

#	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 09:36, 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: 05/01/23 10:52, 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: 05/01/23 11:28, Analyst: JKB

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

Method: SM2540C, Run Date: 04/28/23 18:45, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	Not detected	50	12	mg/L	2		

Method: SM2540D, Run Date: 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 11:32, 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	

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.	☒ Yes	☐ No	☐ N/A	Samples are received at 4C +/- 2C Thermometer #	IR 3.7
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? Subcontacted to:	GEL
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: 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			

Merit
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Phone (517) 332-0167 Fax (517) 332-4034
www.meritlabs.com

C.O.C. PAGE # 1 OF 1

CHAIN OF CUSTODY RECORD

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.

INVOICE TO

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

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO3	H2SO4	NaOH	MeOH	OTHER	Total Metals	F- undisstiled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness
48012.01	04/28/23	1142	MW-14 L304235-01	GW	5	2		3					✓	✓	✓	✓	✓	✓
.02	04/28/23	1354	MW-15 L304235-02	GW	5	2		3					✓	✓	✓	✓	✓	✓
.03	04/28/23	1142	MWT- L304235-03	GW	5	2		3					✓	✓	✓	✓	✓	✓
.04	04/28/23	1030	Field Blank L304235-04	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: SIGNATURE/ORGANIZATION ☒ Sampler	DATE 4-28-23	TIME 1520
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE 4/28/23	TIME 1520
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
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	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

GEL Laboratories LLC
a member of The GEL Group INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171
F 843.766.1178

gel.com

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

Jordan Melton for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	Client ID
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

Jordan Melton for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

620562

Merit Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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
P.O. NO.
QUOTE NO.

INVOICE TO ☒ SAME

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 S48012
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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO$_3$	H$_2$SO$_4$	NaOH	MeOH	OTHER	Radium 226*	Radium 228**
	4/28/23	1142	S48012.01	GW	2			2					✓	✓
	4/28/23	1354	S48012.02	GW	2			2					✓	✓
	4/28/23	1142	S48012.03	GW	2			2					✓	✓
	4/28/23	1030	S48012.04	DI	2			2					✓	✓

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES

Project Locations
☐ Detroit ☐ New York
☐ 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	☐ Sampler	DATE 5/1/23 ~~4/28/23~~	TIME 1700
RECEIVED BY: SIGNATURE/ORGANIZATION UPS		DATE 5/1/23 ~~4/28/23~~ pl	TIME 1700
RELINQUISHED BY: SIGNATURE/ORGANIZATION		DATE	TIME
RECEIVED BY: SIGNATURE/ORGANIZATION		DATE	TIME
RELINQUISHED BY: SIGNATURE/ORGANIZATION		DATE 5/3/23	TIME 1010
RECEIVED BY: SIGNATURE/ORGANIZATION		DATE	TIME

SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS
SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS
NOTES:
TEMP. ON ARRIVAL

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

Rev. 5.18.12

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: MERI		**SDG/AR/COC/Work Order:** 620562	DS
Received By: MVH		**Date Received:** ~~05-04-2023~~ JM 5/5 5-3-23	
Carrier and Tracking Number		Circle Applicable: FedEx Express FedEx Ground [✓ UPS] Field Services Courier Other	
		1Z4664770361126746	

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): 0 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?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		Preservation Method: Wet Ice Ice Packs Dry ice [✓ None] Other: *all temperatures are recorded in Celsius **TEMP:** 21
4	Daily check performed and passed on IR temperature gun?	✓			**Temperature Device Serial #:** IR2-21 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	✓			Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	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?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			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?	✓			Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?			✓	
13	COC form is properly signed in relinquished/received sections?	✓			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

GL-CHL-SR-001 Rev 7

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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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: Kenshalla Oston **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 Laverty
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
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

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
Sample ID: 620562004
Matrix: Water
Collect Date: 28-APR-23 10:30
Receive Date: 03-MAY-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		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

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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

QC Summary

Workorder: **620562**

Parmname **NOM** **Sample** **Qual** **QC** **Units** **RPD%** **REC%** **Range** **Anlst** **Date** **Time**

UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2423921	GFC28RAL	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
WORK 1951-E	Ba-133	.1 mL
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

Comments:

Pipet Id: RAD-GFC-1795419
Data Entry Date2: 16-MAY-2023 00:00

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

Geometry: 25mm Filter

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

Sample Characteristics					**Tracer Calculations**					
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

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	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 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	1.3766	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:	**Product:**	**Description:** Lucas Cell Radium 226
2423881	LUC26RAL	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

Batch : 2423881
Analyst : LIN01615
Prep Date : 5/16/2023
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**							
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)
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 De-Gas to Ingrowth	Rn-222 Corrections Ingrowth to Count	Rn-222 Corrections During Count	Ra-226 Decay
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

Lyndsey Pace

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.
__X__ 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, HCO_3, CO_3, 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.

Merit
Laboratories, Inc.

Analytical Laboratory Report

Supplemental Report

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

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 Laverty (johnlaverty@meritlabs.com)
Barbara Ball (bball@meritlabs.com)

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. #:

Table of Contents

Maya Murshak

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

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

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.

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.

Analytical Laboratory 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

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

#	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 12:08, 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: 04/27/23 12:30, 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: 04/26/23 15:24, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	103	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	380	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 11:42, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.004	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.038	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	

b-Value detected less than reporting limit, but greater than MDL

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.

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

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.

Analytical Laboratory 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	

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.	☒ Yes	☐ No	☐ N/A	Samples are received at 4C +/- 2C Thermometer #	IR 2.3
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? Subcontacted to:	GEL
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: 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			

Merit
Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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.

INVOICE TO

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)

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☒ NPDES

Project Locations
☐ Detroit ☐ New York
☐ Other

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Total Metals	F- undisstiled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness					Special Instructions
47857.01	04/25/23	1236	MW-16A L304234-01	GW	5	2		3					✓	✓	✓	✓	✓	✓					Metals to analyse:Na, Mg, K
.02	04/25/23	1432	MW-16B L304234-02	GW	5	2		3					✓	✓	✓	✓	✓	✓					B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03	04/25/23	1554	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	0925	Field Blank L304234-06	DI	5	2		3					✓	✓	✓	✓	✓	✓					

RELINQUISHED BY: SIGNATURE/ORGANIZATION ☒ Sampler DATE 4-26-23 TIME 0934
RECEIVED BY: SIGNATURE/ORGANIZATION M Chilcote DATE 4/26/23 TIME 0934
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
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

GEL Laboratories LLC
a member of The GEL Group INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171
F 843.766.1178

gel.com

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

Jordan Melton for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	Client ID
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.

Jordan Melton

Jordan Melton for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

620147

Merit Laboratories, Inc.

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

CHAIN OF COSTODY RECORD

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
P.O. NO.
QUOTE NO.

INVOICE TO

☒ SAME
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 S47857
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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Radium 226*	Radium 228**
	4/25/23	1236	S47857.01	GW	2			2					✓	✓
	4/25/23	1432	S47857.02	GW	2			2					✓	✓
	4/25/23	1554	S47857.03	GW	2			2					✓	✓
	4/25/23	1139	S47857.04	GW	2			2					✓	✓
	4/25/23	1236	S47857.05	GW	2			2					✓	✓
	4/25/23	0925	S47857.06	DI	2			2					✓	✓

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES

Project Locations
☐ Detroit ☐ New York
☐ 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 M Chilcote ☐ Sampler	DATE 4/26/23	TIME 1700	
RECEIVED BY: SIGNATURE/ORGANIZATION UPS	DATE 4/26/23	TIME 1700	
RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME	
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME	
RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME	
RECEIVED BY: SIGNATURE/ORGANIZATION GEL	DATE 4/28/23	TIME 1000	

SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS
SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS
NOTES:
TEMP. ON ARRIVAL

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

Rev. 5.18.12

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: MERI	**SDG/AR/COC/Work Order:** 620147
Received By: QG	**Date Received:** 4/28/23
Carrier and Tracking Number	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): 0 [✓ 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?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		Preservation Method: Wet Ice Ice Packs Dry ice None Other: *all temperatures are recorded in Celsius **TEMP:**______
4	Daily check performed and passed on IR temperature gun?	✓			**Temperature Device Serial #:** IR2-23 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	✓			Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	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?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			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?	✓			Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?			✓	
13	COC form is properly signed in relinquished/received sections?	✓			Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials AM Date 5/1/23 Page 1 of 1

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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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
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

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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

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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

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
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

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
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

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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**

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

QC Summary

Workorder: **620147**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2423921	GFC28RAL	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
WORK 1951-E	Ba-133	.1 mL
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

Comments:
Pipet Id: RAD-GFC-1795419
Data Entry Date2: 16-MAY-2023 00:00

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

Geometry: 25mm Filter

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

Sample Characteristics					**Tracer Calculations**					
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

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	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%

Pos.	**Calibration Data** 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 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	1.3766	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:	**Product:**	**Description:** Lucas Cell Radium 226
2423881	LUC26RAL	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

Batch : 2423881
Analyst : LIN01615
Prep Date : 5/16/2023
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**							
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)
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			
						De-Gas to Ingrowth	Ingrowth to Count	During Count	Ra-226 Decay
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
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
Data Validator: Aryka Thomson

Lab Report Date: 07/14/2023 Revised 07/26/2023
Data Validation Completion Date: 07/26/2023

General Overall Assessment:
_____ Data are usable without qualification.
__X__ 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, HCO_3, CO_3, 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.

Merit
Laboratories, Inc.

Analytical Laboratory Report

Revised Report

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

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 Laverty (johnlaverty@meritlabs.com)
Barbara Ball (bball@meritlabs.com)

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. #:

Table of Contents

Maya Murshak

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

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

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	

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

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

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.

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	

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.

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	

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

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	

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.

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	

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.	☐ Yes	☒ No	☐ N/A	Samples are received at 4C +/- 2C Thermometer #	IR 1.6
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? Subcontacted to:	GEL
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: 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			

Merit
Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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.

INVOICE TO

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)

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☒ NPDES

Project Locations
☐ Detroit ☐ New York
☐ Other

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	YEAR TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Total Metals	F- undisstiled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness					Special Instructions
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 ☒ Sampler DATE 5-31-23 TIME 0924
RECEIVED BY: SIGNATURE/ORGANIZATION M Wilcox 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 YES ☐ NO ☐ INITIALS
SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS
NOTES: TEMP. ON ARRIVAL 1.6

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

Rev. 5.18.12

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

GEL Laboratories LLC
a member of The GEL Group INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171
F 843.766.1178

gel.com

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

Jordan Melton for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	Client ID
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.

Jordan Melton

Jordan Melton for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

G 244177

Merit Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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. P.O. NO.
E-MAIL ADDRESS results@meritlabs.com QUOTE NO.

INVOICE TO

CONTACT NAME Julie Teague ☒ SAME
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 S49138
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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO₃	H₂SO₄	NaOH	MeOH	OTHER	Radium 226*	Radium 228**
	5/31/23	1108	S49138.01	GW	2			2					✓	✓
	5/31/23	1310	S49138.02	GW	2			2					✓	✓
	5/31/23	1511	S49138.03	GW	2			2					✓	✓
	5/31/23	1216	S49138.04	GW	2			2					✓	✓
	5/31/23	1108	S49138.05	GW	2			2					✓	✓
	5/31/23	0930	S49138.06 Field Blank	DI	2			2					✓	✓

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES

Project Locations
☐ Detroit ☐ New York
☐ 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	Pat ☐ Sampler	DATE 5/31/23	TIME 1700	
RECEIVED BY: SIGNATURE/ORGANIZATION	UPS	DATE 5/31/23	TIME 1700	
RELINQUISHED BY: SIGNATURE/ORGANIZATION		DATE	TIME	
RECEIVED BY: SIGNATURE/ORGANIZATION		DATE 6-2-23	TIME 1000	

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

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

Rev. 5.18.12

GEL | Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: MERI	**SDG/AR/COC/Work Order:** 624477
Received By: QG	**Date Received:** 6/2/23
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground [✓ UPS] Field Services Courier Other 12 466 477 03 6161 4825

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): 0 [✓ 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?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		Preservation Method: Wet Ice Ice Packs Dry ice [✓ None] Other: *all temperatures are recorded in Celsius TEMP: 22°C
4	Daily check performed and passed on IR temperature gun?	✓			Temperature Device Serial #: IR2-20 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	✓			Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	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?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			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?	✓			Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?			✓	
13	COC form is properly signed in relinquished/received sections?	✓			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

GL-CHL-SR-001 Rev 7

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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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

Certificate of Analysis

Report Date: June 30, 2023

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

East Lansing, Michigan 48823
Contact: John Laverty
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
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

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 Laverty
Project: Routine Analysis

Client Sample ID: S49138.02
Sample ID: 624477002
Matrix: Ground Water
Collect Date: 31-MAY-23 13:10
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		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

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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 Laverty
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
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

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 Laverty
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

Certificate of Analysis

Report Date: June 30, 2023

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

East Lansing, Michigan 48823
Contact: John Laverty
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

Certificate of Analysis

Report Date: June 30, 2023

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

East Lansing, Michigan 48823
Contact: John Laverty
Project: Routine Analysis

Client Sample ID:	S49138.06 Field Blank	Project:	MERI00120
Sample ID:	624477006	Client ID:	MERI001
Matrix:	Ground Water		
Collect Date:	31-MAY-23 09:30		
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	0.593	+/-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	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

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**

Parmname	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

QC Summary

Workorder: **624477**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2438552	GFC28RAL	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	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
WORK 1951-E	Ba-133	.1 mL
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 Subtrate	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

Comments:
Pipet Id: RAD-GFC-1795419
Data Entry Date2: 08-JUN-2023 00:00

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

Geometry: 25mm Filter

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

Sample Characteristics					**Tracer Calculations**					
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

Pos.	Detector ID	Counting Time (min.)	Gross Counts Alpha	Gross Counts Beta	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 %
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

* - RPD changed to 0% due to sample & dup activity below MDA

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):	547.73
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	1.0595	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

2438552.xls

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:	**Product:**	**Description:** Lucas Cell Radium 226
2438537	LUC26RAL	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	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
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**							
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)
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 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections De-Gas to Ingrowth	Rn-222 Corrections Ingrowth to Count	Rn-222 Corrections During Count	Ra-226 Decay
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

Lyndsey Pace

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
Data Validator: Aryka Thomson

Lab Report Date: 07/14/2023
Data Validation Completion Date: 07/24/2023

General Overall Assessment:
_____ Data are usable without qualification.
__X__ 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, HCO_3, CO_3, 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.

Merit
Laboratories, Inc.

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

Merit Laboratories, Inc.
2680 East Lansing Drive
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:
John Laverty (johnlaverty@meritlabs.com)
Barbara Ball (bball@meritlabs.com)

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. #:

Table of Contents

Maya Murshak

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

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	

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

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

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

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	

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

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

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.	☒ Yes	☐ No	☐ N/A	Samples are received at 4C +/- 2C Thermometer #	IR 5.3
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? Subcontacted to:	GEL
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: 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			

Merit
Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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.

INVOICE TO

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

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☒ NPDES

Project Locations
☐ Detroit ☐ New York
☐ Other

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Total Metals	F- undisstiled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness					Special Instructions
49283.01	06/02/23	1106	MW-14 L306194-01	GW	5	2		3					✓	✓	✓	✓	✓	✓					Metals to analyse:Na, Mg, K
.02	↓	1331	MW-15 L306194-02	GW	5	2		3					✓	✓	✓	✓	✓	✓					B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03		1106	MWT-14 L306194-03	GW	5	2		3					✓	✓	✓	✓	✓	✓					Co, Li, Hg, Mo,Pb,Se, Tl,
.04		1029	Field Blank L306194-04	di	5	2		3					✓	✓	✓	✓	✓	✓					Fe, Cu, Ni, Ag, V, Zn
																							Please send a preliminary report

RELINQUISHED BY: SIGNATURE/ORGANIZATION ☒ Sampler DATE 6-2-23 TIME 1513
RECEIVED BY: SIGNATURE/ORGANIZATION M Chilcott DATE 6/2/23 TIME 1513
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
NOTES: TEMP. ON ARRIVAL 5.3

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

Rev. 5.18.12

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

GEL | Laboratories LLC
a member of The GEL Group INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171
F 843.766.1178

gel.com

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

Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	Client ID
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

Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

625000

Merit Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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. P.O. NO.
E-MAIL ADDRESS results@meritlabs.com QUOTE NO.

INVOICE TO

☒ SAME
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 S49283
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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Radium 226*	Radium 228**
	6/2/23	1106	S49283.01	GW	2			2					✓	✓
	6/2/23	1331	S49283.02	GW	2			2					✓	✓
	6/2/23	1106	S49283.03	GW	2			2					✓	✓
	6/2/23	1029	S49283.04 Field Blank	DI	2			2					✓	✓

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES

Project Locations
☐ Detroit ☐ New York
☐ 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	Pat ☐ Sampler	DATE 6/5/23	TIME 1700
RECEIVED BY: SIGNATURE/ORGANIZATION	UPS	DATE 6/5/23	TIME 1700
RELINQUISHED BY: SIGNATURE/ORGANIZATION	GEL	DATE 6.7.23	TIME 1030
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
NOTES: TEMP. ON ARRIVAL

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

Rev. 5.18.12

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

PS

Client: MERI	**SDG/AR/COC/Work Order:** 625000
Received By: QG	**Date Received:** 6/7/23
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground [✓ UPS] Field Services Courier Other 12 466 477 03 6137 5567

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): 0 [✓ 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?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		Preservation Method: Wet Ice Ice Packs Dry ice [✓ None] Other: *all temperatures are recorded in Celsius **TEMP:** 23 °C
4	Daily check performed and passed on IR temperature gun?	✓			**Temperature Device Serial #:** IR2-20 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	✓			Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	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?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			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?	✓			Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?			✓	
13	COC form is properly signed in relinquished/received sections?	✓			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

GL-CHL-SR-001 Rev 7

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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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

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

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
Sample ID: 625000002
Matrix: Ground Water
Collect Date: 02-JUN-23 13:31
Receive Date: 07-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	-0.108	+/-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

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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
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

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
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

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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

QC Summary

Workorder: **625000**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2442121	GFC28RAL	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**
WORK 1951-E	Ba-133	.1 mL
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 Subtrate	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

Comments:
Pipet Id: RAD-GFC-1795419
Data Entry Date2: 14-JUN-2023 00:00

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

Geometry: 25mm Filter

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

Sample Characteristics					**Tracer Calculations**					
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

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	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

* - RPD changed to 0% due to sample & dup activity below MDA

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): 546.65
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	1.6138	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%

2442121.xls

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:	**Product:**	**Description:** Lucas Cell Radium 226
2442108	LUC26RAL	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

Batch : 2442108
Analyst : LIN01615
Prep Date : 6/29/2023
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**							
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)
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

* - RPD changed to 0% due to sample & dup activity below MDA

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	0.2133	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

Lyndsey Pace

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.
__X__ 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, HCO_3, CO_3, 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.

Merit
Laboratories, Inc.

Analytical Laboratory Report

Final Report

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

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 Laverty (johnlaverty@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. #:

Table of Contents

Maya Murshak

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

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	

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.

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	

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

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

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

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.

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

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.

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	

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.	☒ Yes	☐ No	☐ N/A	Samples are received at 4C +/- 2C Thermometer #	IR 2.3
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? Subcontacted to:	GEL
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: S49324 Submitted: 06/06/2023 08:38

Client: BWL01 (Board of Water & Light)

Project: Erickson Well Project 100A-100D

Initial Preservation Check: 06/06/2023 08:47 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
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			

Merit Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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.

INVOICE TO

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. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION		MATRIX	# OF BOTTLES	# Containers & Preservatives NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Total Metals	F- undisstiled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness					Special Instructions
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					✓	✓	✓	✓	✓	✓					

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☒ NPDES

Project Locations
☐ Detroit ☐ New York
☐ Other

RELINQUISHED BY: SIGNATURE/ORGANIZATION Julie Schell ☐ Sampler DATE 6/6/23 TIME 0838
RECEIVED BY: SIGNATURE/ORGANIZATION Johanna Murray DATE 6/6/23 TIME 0838
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
NOTES: TEMP. ON ARRIVAL 2.3

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

Rev. 5.18.12

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

GEL Laboratories LLC
a member of The GEL Group INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171
F 843.766.1178

gel.com

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

Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	**Client ID**
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.

Delaney Stone

Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

Merit
Laboratories, Inc.

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Phone (517) 332-0167 Fax (517) 332-4034
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C.O.C. PAGE # 1 OF 1

CHAIN OF CUSTODY RECORD

625165

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. P.O. NO.
E-MAIL ADDRESS results@meritlabs.com QUOTE NO.

INVOICE TO

☒ SAME
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 S49324
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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Radium 226*	Radium 228**
	6/5/23	1515	S49324.01	GW	2			2					✓	✓
	6/5/23	1129	S49324.02	GW	2			2					✓	✓
	6/5/23	1344	S49324.03	GW	2			2					✓	✓
	6/5/23	1506	S49324.04	GW	2			2					✓	✓
	6/5/23	1129	S49324.05	GW	2			2					✓	✓
	6/5/23	0945	S49324.06 Field Blank	DI	2			2					✓	✓

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES

Project Locations
☐ Detroit ☐ New York
☐ 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	M Chilcote ☐ Sampler	DATE 6/6/23	TIME 1700	
RECEIVED BY: SIGNATURE/ORGANIZATION	UPS	DATE 6/6/23	TIME 1700	
RELINQUISHED BY: SIGNATURE/ORGANIZATION		DATE	TIME	
RECEIVED BY: SIGNATURE/ORGANIZATION		DATE	TIME	
RELINQUISHED BY: SIGNATURE/ORGANIZATION		DATE 6/8/23	TIME 0900	
RECEIVED BY: SIGNATURE/ORGANIZATION		DATE	TIME	
SEAL NO.	SEAL INTACT YES ☐ NO ☐	INITIALS	NOTES:	TEMP. ON ARRIVAL
SEAL NO.	SEAL INTACT YES ☐ NO ☐	INITIALS		

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

Rev 5.18.17

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: MERI	**SDG/AR/COC/Work Order:** 625 - 165
Received By: QG	**Date Received:** 6/8/23
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground [✓ UPS] Field Services Courier Other 1Z 466 477 03 6334 6484

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): 0 [✓ 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?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		Preservation Method: Wet Ice Ice Packs Dry ice [✓ None] Other: *all temperatures are recorded in Celsius **TEMP:** 21°C
4	Daily check performed and passed on IR temperature gun?	✓			**Temperature Device Serial #:** IR2-20 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	✓			Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	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?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			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?	✓			Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?			✓	
13	COC form is properly signed in relinquished/received sections?	✓			Circle Applicable: Not relinquished Other (describe)

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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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.

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: 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

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
Sample ID: 625165001
Matrix: Ground Water
Collect Date: 05-JUN-23 15:15
Receive Date: 08-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	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

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
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

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
Sample ID: 625165005
Matrix: Ground Water
Collect Date: 05-JUN-23 11:29
Receive Date: 08-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	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
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

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

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

QC Summary

Report Date: July 5, 2023

Page 1 of 2

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

QC Summary

Workorder: **625165**

Parmname	**NOM**	**Sample**	**Qual**	**QC**	**Units**	**RPD%**	**REC%**	**Range**	**Anlst**	**Date**	**Time**

UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2442121	GFC28RAL	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
WORK 1951-E	Ba-133	.1 mL
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 Subtrate	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

Comments:

Pipet Id: RAD-GFC-1795419
Data Entry Date2: 14-JUN-2023 00:00

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

Geometry: 25mm Filter

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

Sample Characteristics Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	**Tracer Calculations** 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

Pos.	Detector ID	Counting Time (min.)	Gross Counts Alpha	Gross Counts Beta	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 %
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%

Pos.	**Calibration Data** 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

* - RPD changed to 0% due to sample & dup activity below MDA

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): 546.65
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	1.6138	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%

2442121.xls

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:	**Product:**	**Description:** Lucas Cell Radium 226
2442108	LUC26RAL	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

Batch : 2442108
Analyst : LIN01615
Prep Date : 6/29/2023
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**							
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)
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

* - RPD changed to 0% due to sample & dup activity below MDA

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	0.2133	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

Lyndsey Pace

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
Data Validator: Aryka Thomson

Lab Report Date: 08/21/2023
Data Validation Completion Date: 08/29/2023

General Overall Assessment:
_____ Data are usable without qualification.
__X__ 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, HCO_3, CO_3, 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	X		RLs as requested		X		RLs for hardness, 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		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.

Merit
Laboratories, Inc.

Analytical Laboratory Report

Final Report

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
Merit Laboratories, Inc.
2680 East Lansing Drive
East Lansing, MI 48823

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Contacts for report questions:
John Laverty (johnlaverty@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. #:

Table of Contents

Maya Murshak

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

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	

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

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.

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	

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.

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	

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.	☒ Yes	☐ No	☐ N/A	Samples are received at 4C +/- 2C Thermometer #	IR 4.1
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? Subcontacted to:	GEL
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: 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			

Merit
Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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.

INVOICE TO

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

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Total Metals	F- undisstiled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness
50700.01	7.7.23	1138	MW-14 L307209-01	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: SIGNATURE/ORGANIZATION ☒ Sampler	DATE 7-7-23	TIME 1550	
RECEIVED BY: SIGNATURE/ORGANIZATION M Chilcote	DATE 7/7/23	TIME 1550	
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
NOTES: TEMP. ON ARRIVAL 4.1

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

Rev. 5.18.12

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

GEL | Laboratories LLC
a member of The GEL Group INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171
F 843.766.1178

gel.com

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

Jordan Melton for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	Client ID
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

Jordan Melton for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

628839

Merit Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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. P.O. NO.
E-MAIL ADDRESS results@meritlabs.com QUOTE NO.

INVOICE TO ☒ SAME

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 S50700 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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Radium 226*	Radium 228**
	7/7/23	1138	S50700.01	GW	2			2					✓	✓
	7/7/23	1410	S50700.02	GW	2			2					✓	✓
	7/7/23	1138	S50700.03	GW	2			2					✓	✓
	7/7/23	1040	S50700.04 Field Blank	DI	2			2					✓	✓

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES

Project Locations
☐ Detroit ☐ New York
☐ 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	☐ Sampler	DATE 7/10/23	TIME 1700	
RECEIVED BY: SIGNATURE/ORGANIZATION	UPS	DATE 7/10/23	TIME 1700	
RELINQUISHED BY: SIGNATURE/ORGANIZATION		DATE	TIME	
RECEIVED BY: SIGNATURE/ORGANIZATION		DATE	TIME	
RELINQUISHED BY: SIGNATURE/ORGANIZATION		DATE	TIME	
RECEIVED BY: SIGNATURE/ORGANIZATION	GEL	DATE 7/12/23	TIME	

SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS NOTES: TEMP. ON ARRIVAL
SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS

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

Rev. 5.18.12

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

PS

Client: MERI		SDG/AR/COC/Work Order: 628839	
Received By: QG		Date Received: 7/12/23	
Carrier and Tracking Number		Circle Applicable: FedEx Express FedEx Ground [✓ UPS] Field Services Courier Other 12 468 477 03 6204 6410	

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): 0 [✓ 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?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		Preservation Method: Wet Ice Ice Packs Dry ice [✓ None] Other: *all temperatures are recorded in Celsius TEMP: 22°c
4	Daily check performed and passed on IR temperature gun?	✓			**Temperature Device Serial #:** IR4-23 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	✓			Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	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?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			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?	✓			Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?				
13	COC form is properly signed in relinquished/received sections?	✓			Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials JM Date 7-13-23 Page 1 of 1

GL-CHL-SR-001 Rev 7

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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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: John Petrovic **Name:** **John Petrovic**

Date: **07 AUG 2023** **Title:** **Data Validator**

Sample Data Summary

GEL LABORATORIES LLC

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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:	S50700.01	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

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
Sample ID: 628839002
Matrix: Ground Water
Collect Date: 07-JUL-23 14:10
Receive Date: 12-JUL-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	-0.119	+/-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
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

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
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

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:	S50700.04 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
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

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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**

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

QC Summary

Workorder: **628839**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2458012	GFC28RAL	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
WORK 1951-E	Ba-133	.1 mL
REGNT 3943473	RGF-1.5M Ammonium Sulfate	10 mL
REGNT 3942486	RGF-1M Citric Acid	5 mL
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 Subtrate	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

Comments:
Pipet Id: RAD-GFC-1795419
Data Entry Date2: 24-JUL-2023 14:25 SP-C018367602 Jacqueline Winston
Data Entry Date3: 21-JUL-2023 00:00

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

Geometry: 25mm Filter

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

Sample Characteristics					**Tracer Calculations**					
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

Pos.	Detector ID	Counting Time (min.)	Gross Counts Alpha	Gross Counts Beta	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 %
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

* - RPD changed to 0% due to sample & dup activity below MDA

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): 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%

2458012.xls

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:	**Product:**	**Description:** Lucas Cell Radium 226
2457992	LUC26RAL	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	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

Batch : 2457992
Analyst : LIN01615
Prep Date : 7/21/2023
Ra-226 Method Uncertainty : 0.073648

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

Sample Characteristics					**Count Raw Data**							
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)
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 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections De-Gas to Ingrowth	Rn-222 Corrections Ingrowth to Count	Rn-222 Corrections During Count	Ra-226 Decay
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

* - RPD changed to 0% due to sample & dup activity below MDA

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	0.1093	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

Lyndsey Pace

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

GEL Laboratories LLC
a member of The GEL Group INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171
F 843.766.1178

gel.com

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

Jordan Melton for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	Client ID
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

Jordan Melton for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

628839

Merit Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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. P.O. NO.
E-MAIL ADDRESS results@meritlabs.com QUOTE NO.

INVOICE TO ☒ SAME

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 S50700 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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Radium 226*	Radium 228**
	7/7/23	1138	S50700.01	GW	2			2					✓	✓
	7/7/23	1410	S50700.02	GW	2			2					✓	✓
	7/7/23	1138	S50700.03	GW	2			2					✓	✓
	7/7/23	1040	S50700.04 Field Blank	DI	2			2					✓	✓

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES

Project Locations
☐ Detroit ☐ New York
☐ 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 ☐ Sampler	DATE 7/10/23	TIME 1700	
RECEIVED BY: SIGNATURE/ORGANIZATION UPS	DATE 7/10/23	TIME 1700	
RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME	
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME	

RELINQUISHED BY: SIGNATURE/ORGANIZATION		DATE	TIME
RECEIVED BY: SIGNATURE/ORGANIZATION GEL		DATE 7/12/23	TIME
SEAL NO.	SEAL INTACT YES ☐ NO ☐	INITIALS	NOTES: TEMP. ON ARRIVAL
SEAL NO.	SEAL INTACT YES ☐ NO ☐	INITIALS	

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

Rev. 5.18.12

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

PS

Client: MERI	SDG/AR/COC/Work Order: 628839
Received By: QG	Date Received: 7/12/23
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground [✓ UPS] Field Services Courier Other 12 468 477 03 6204 6410

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): 0 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?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		Preservation Method: Wet Ice Ice Packs Dry ice [✓ None] Other: *all temperatures are recorded in Celsius TEMP: 22°C
4	Daily check performed and passed on IR temperature gun?	✓			Temperature Device Serial #: IR4-23 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	✓			Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	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?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			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?	✓			Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?		✓		
13	COC form is properly signed in relinquished/received sections?	✓			Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials JM Date 7-13-23 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 #: 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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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: John Petrovic   **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 Laverty
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
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

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
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

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

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:	S50700.04 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

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

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2458012	GFC28RAL	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
WORK 1951-E	Ba-133	.1 mL
REGNT 3943473	RGF-1.5M Ammonium Sulfate	10 mL
REGNT 3942486	RGF-1M Citric Acid	5 mL
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 Subtrate	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

Comments:

Pipet Id: RAD-GFC-1795419
Data Entry Date2: 24-JUL-2023 14:25 SP-C018367602 Jacqueline Winston
Data Entry Date3: 21-JUL-2023 00:00

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

Geometry: 25mm Filter

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

Sample Characteristics					**Tracer Calculations**					
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

Pos.	Detector ID	Counting Time (min.)	Gross Counts Alpha	Gross Counts Beta	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 %
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

* - RPD changed to 0% due to sample & dup activity below MDA

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): 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%

2458012.xls

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:	**Product:**	**Description:** Lucas Cell Radium 226
2457992	LUC26RAL	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	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

Batch : 2457992
Analyst : LIN01615
Prep Date : 7/21/2023
Ra-226 Method Uncertainty : 0.073648

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

Sample Characteristics					**Count Raw Data**							
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)
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 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections De-Gas to Ingrowth	Rn-222 Corrections Ingrowth to Count	Rn-222 Corrections During Count	Ra-226 Decay
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

* - RPD changed to 0% due to sample & dup activity below MDA

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	0.1093	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

Lyndsey Pace

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
Data Validator: Aryka Thomson

Lab Report Date: 08/09/2023
Data Validation Completion Date: 08/20/2023

General Overall Assessment:
_____ Data are usable without qualification.
__X__ 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, HCO_3, CO_3, 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			

<u>Other instances of nonconformance to QC control limits noted on case narrative:</u>

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.

Merit
Laboratories, Inc.

Analytical Laboratory Report

Final Report

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

Report produced by

Merit Laboratories, Inc.
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East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:
John Laverty (johnlaverty@meritlabs.com)
Barbara Ball (bball@meritlabs.com)

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. #:

Table of Contents

Maya Murshak

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

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

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

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

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

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

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	

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

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

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

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	

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.	☒ Yes	☐ No	☐ N/A	Samples are received at 4C +/- 2C Thermometer #	IR 3.4
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? Subcontacted to:	GEL
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: 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			

Merit
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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

CHAIN OF CUSTODY RECORD

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.

INVOICE TO

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)

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☒ NPDES

Project Locations
☐ Detroit ☐ New York
☐ Other

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Total Metals	F- undisstiled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness					Special Instructions
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: SIGNATURE/ORGANIZATION ☒ Sampler	DATE 7-6-23	TIME 0921	
RECEIVED BY: SIGNATURE/ORGANIZATION M Chilcote	DATE 7/6/23	TIME 0921	
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
NOTES: TEMP. ON ARRIVAL 3.4

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

GEL Laboratories LLC
a member of **The GEL Group** INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171
F 843.766.1178

gel.com

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

Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	Client ID
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.

Delaney Stone

Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

Merit
Laboratories, Inc.

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

628531

CHAIN OF CUSTODY RECORD

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. P.O. NO.
E-MAIL ADDRESS results@meritlabs.com QUOTE NO.

INVOICE TO

☒ SAME
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 S50581
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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Radium 226*	Radium 228**
	7/5/23	1035	S50581.01	GW	2			2					✓	✓
	7/5/23	1237	S50581.02	GW	2			2					✓	✓
	7/5/23	1408	S50581.03	GW	2			2					✓	✓
	7/5/23	1117	S50581.04	GW	2			2					✓	✓
	7/5/23	1035	S50581.05	GW	2			2					✓	✓
	7/5/23	0830	S50581.06 Field Blank	DI	2			2					✓	✓

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES
Project Locations
☐ Detroit ☐ New York
☐ 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	☐ Sampler	DATE 7/6/23	TIME 1700
RECEIVED BY: SIGNATURE/ORGANIZATION		DATE 7/6/23	TIME 1700
RELINQUISHED BY: SIGNATURE/ORGANIZATION		DATE	TIME
RECEIVED BY: SIGNATURE/ORGANIZATION	7.10.2023	DATE	TIME 855

RELINQUISHED BY: SIGNATURE/ORGANIZATION		DATE	TIME
RECEIVED BY: SIGNATURE/ORGANIZATION		DATE	TIME
SEAL NO.	SEAL INTACT YES ☐ NO ☐	INITIALS	NOTES: TEMP. ON ARRIVAL 23
SEAL NO.	SEAL INTACT YES ☐ NO ☐	INITIALS	

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

Rev. 5.18.12

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: MER 1	**SDG/AR/COC/Work Order:** 628531 DS
Received By: MVH	**Date Received:** 07.10.2023
Carrier and Tracking Number	Circle Applicable: 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?		✓	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): 0 [✓ 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?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		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?	✓			**Temperature Device Serial #:** IR2-21 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	✓			Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	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?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			ID's and containers affected:
10	Date & time on COC match date & time on bottles?			✓	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?	✓			Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?			✓	
13	COC form is properly signed in relinquished/received sections?	✓			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

GL-CHL-SR-001 Rev 7

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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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
Sample ID: 628531001
Matrix: Ground Water
Collect Date: 05-JUL-23 10:35
Receive Date: 10-JUL-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		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
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

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
Sample ID: 628531002
Matrix: Ground Water
Collect Date: 05-JUL-23 12:37
Receive Date: 10-JUL-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	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
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

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
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

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:	S50581.05	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
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

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:	S50581.06 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
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: August 3, 2023

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	6.13		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

QC Summary

Workorder: **628531**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2456015	GFC28RAL	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
WORK 1951-E	Ba-133	.1 mL
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 Subtrate	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

Comments:
Pipet Id: RAD-GFC-1795419
Data Entry Date2: 11-JUL-2023 00:00

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

Geometry: 25mm Filter

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

Sample Characteristics					**Tracer Calculations**					
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

Pos.	Detector ID	Counting Time (min.)	Gross Counts Alpha	Gross Counts Beta	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 %
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%

Pos.	**Calibration Data** 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 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	0.6800	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:	**Product:**	**Description:** Lucas Cell Radium 226
2456017	LUC26RAL	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	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

Batch : 2456017
Analyst : LIN01615
Prep Date : 7/12/2023
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**							
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)
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 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections De-Gas to Ingrowth	Rn-222 Corrections Ingrowth to Count	Rn-222 Corrections During Count	Ra-226 Decay
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.
__X__ 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, HCO_3, CO_3, 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-).

Merit
Laboratories, Inc.

Analytical Laboratory Report

Final Report

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

Report produced by

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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. #:

Table of Contents

Maya Murshak

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
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

Analytical Laboratory Report

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	

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.

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	

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.

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

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.

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

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.

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	

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

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	

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.	☒ 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? Subcontacted to:	GEL
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: S50741 Submitted: 07/11/2023 09:31

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: 07/11/2023 10:00 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
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			

Merit
Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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.

INVOICE TO

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)

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☒ NPDES

Project Locations
☐ Detroit ☐ New York
☐ Other

MERIT LAB NO. FOR LAB USE ONLY	DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Total Metals	F- undisstiled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness					Special Instructions
50741.01	07/10/23	1455	MW-100A L307211-01	GW	5	2		3					✓	✓	✓	✓	✓	✓					Metals to analyse:Na, Mg, K
.02		1111	MW-100B -02	GW	5	2		3					✓	✓	✓	✓	✓	✓					B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03		1300	MW-100C -03	GW	5	2		3					✓	✓	✓	✓	✓	✓					Co, Li, Hg, Mo,Pb,Se, Tl,
.04		1431	MW100D -04	GW	5	2		3					✓	✓	✓	✓	✓	✓					Fe, Cu, Ni, Ag, V, Zn
.05		1111	MWT-100B -05	GW	5	2		3					✓	✓	✓	✓	✓	✓					Please send a preliminary report
.06		0925	Field Blank -06	DI	5	2		3					✓	✓	✓	✓	✓	✓					

RELINQUISHED BY: SIGNATURE/ORGANIZATION ☒ Sampler	DATE 7-11-23	TIME 0931	RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE 7/11/23	TIME 0931	RECEIVED BY: SIGNATURE/ORGANIZATION DATE TIME
RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME	SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME	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

GEL Laboratories LLC
a member of The GEL Group INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171
F 843.766.1178

gel.com

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

Jordan Melton for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	Client ID
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.

Jordan Melton

Jordan Melton for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

629302

Merit Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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
P.O. NO.
QUOTE NO.

INVOICE TO ☒ SAME

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 S50741
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 SL=SLUDGE WW=WASTEWATER DW=DRINKING WATER S=SOIL O=OIL L=LIQUID WP=WIPE A=AIR SD=SOLID W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Radium 226*	Radium 228**
	7/10/23	1455	S50741.01	GW	2			2					✓	✓
	7/10/23	1111	S50741.02	GW	2			2					✓	✓
	7/10/23	1300	S50741.03	GW	2			2					✓	✓
	7/10/23	1431	S50741.04	GW	2			2					✓	✓
	7/10/23	1111	S50741.05	GW	2			2					✓	✓
	7/10/23	0925	S50741.06 Field Blank	DI	2			2					✓	✓

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES

Project Locations
☐ Detroit ☐ New York
☐ 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 UPS ☐ Sampler DATE 7/12/23 TIME 1700
RECEIVED BY SIGNATURE/ORGANIZATION GEL DATE 7/14/23 TIME 1000
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
NOTES: TEMP. ON ARRIVAL

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

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: MERI	**SDG/AR/COC/Work Order:** 629302
Received By: QG	**Date Received:** 7/14/23
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground [✓ UPS] Field Services Courier Other 12 466 477 03 6219 7696

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): 0 [✓ 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?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		Preservation Method: Wet Ice Ice Packs Dry ice [✓ None] Other: *all temperatures are recorded in Celsius TEMP: 18°C
4	Daily check performed and passed on IR temperature gun?	✓			Temperature Device Serial #: IR4-23 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	✓			Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	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?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			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?	✓			Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?			✓	
13	COC form is properly signed in relinquished/received sections?				Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials AM Date 7/17/23 Page 1 of 1

GL-CHL-SR-001 Rev 7

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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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 reprepped 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).

GEL Sample ID#	Client Sample Identification
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 Laverty
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

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

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:	S50741.02	Project:	MERI00120
Sample ID:	629302002	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	0.994	+/-1.52	2.61	3.00	pCi/L			JE1	08/10/23	1012	2472079	1
Radium-226+Radium-228 Calculation "See Parent Products"													
Radium-226+228 Sum		2.17	+/-1.62			pCi/L			NXL1	08/10/23	1234	2460566	2
Rad Radium-226													
Lucas Cell, Ra226, Liquid "As Received"													
Radium-226		1.18	+/-0.576	0.685	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"			67	(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

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
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

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
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

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

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

QC Summary

Workorder: **629302**

Parmname	**NOM**	**Sample**	**Qual**	**QC**	**Units**	**RPD%**	**REC%**	**Range**	**Anlst**	**Date**	**Time**

UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2472079	GFC28RAL	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
WORK 1951-E	Ba-133	.1 mL
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 Subtrate	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

Comments:
Pipet Id: RAD-GFC-1795419
Data Entry Date2: 07-AUG-2023 00:00

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

Geometry: 25mm Filter

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

Sample Characteristics					**Tracer Calculations**					
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

Pos.	Detector ID	Counting Time (min.)	Gross Counts Alpha	Gross Counts Beta	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 %
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

* - RPD changed to 0% due to sample & dup activity below MDA

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): 536.99
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	1.0192	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%

2472079.xls

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:	**Product:**	**Description:** Lucas Cell Radium 226
2460565	LUC26RAL	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

Batch : 2460565
Analyst : LIN01615
Prep Date : 8/1/2023
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 Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	**Count Raw Data** Cell Number	Counting Time (min.)	Gross Counts	Gross CPM	Background Counts	Background CPM	Background 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 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections De-Gas to Ingrowth	Ingrowth to Count	During Count	Ra-226 Decay
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.
__X__ 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, HCO_3, CO_3, 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.

Merit
Laboratories, Inc.

Analytical Laboratory Report

Supplemental Report

Report ID: S51686.01(02)
Generated on 09/06/2023
Replaces report S51686.01(01) generated on 08/04/2023

Report to	Report produced by
Attention: Jennifer Caporale	Merit Laboratories, Inc.
Board of Water & Light	2680 East Lansing Drive
P.O. Box 13007	East Lansing, MI 48823
Lansing, MI 48901	
	Phone: (517) 332-0167 FAX: (517) 332-6333
Phone: 517-702-6372 FAX:	
Email: Environmental_Laboratory@LBWL.com	Contacts for report questions:
	John Laverty (johnlaverty@meritlabs.com)
	Barbara Ball (bball@meritlabs.com)

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. #:

Table of Contents

Maya Murshak

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	

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.

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	

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	

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.

Analytical Laboratory 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

#	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 12:22, 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 11:48, 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: 08/03/23 11:18, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	450	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	558	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	1.8	3	1	mg/L	1		b

Metals

Method: E200.8, Run Date: 08/03/23 12:29, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	0.007	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.169	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	

b-Value detected less than reporting limit, but greater than MDL

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	

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

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.

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

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.

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	

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. ☒ 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? Subcontacted to:	GEL
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?	.05 Diss Metals
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	.05 Diss Metals
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: S51686 Submitted: 08/02/2023 09:07

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: 08/02/2023 09:48 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
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			

Merit Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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.

INVOICE TO

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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

Certifications
☐OHIO VAP ☐Drinking Water
☐DoD ☒NPDES

Project Locations
☐Detroit ☐New York
☐Other

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Total Metals	F- undisstiled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness	dissolved Metals				Special Instructions
51686.01	08/01/23	1443	MW-1 L308172-01	GW	5	2		3					✓	✓	✓	✓	✓	✓					Metals to analyse:Na, Mg, K
.02	↓	1759	MW-2 -02	GW	5	2		3					✓	✓	✓	✓	✓	✓					B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03		1051	MW-3 -03	GW	5	2		3					✓	✓	✓	✓	✓	✓					Co, Li, Hg, Mo,Pb,Se, Tl,
.04		1224	MW-4 -04	GW	5	2		3					✓	✓	✓	✓	✓	✓					Fe, Cu, Ni, Ag, V, Zn
.05		1840	MW-5 -05	GW	5	2		3					✓	✓	✓	✓	✓	✓	✓				Please send a preliminary report
.06		1637	MW-6 -06	GW	5	2		3					✓	✓	✓	✓	✓	✓					
.07		1224	MWT-4 -07	GW	5	2		3					✓	✓	✓	✓	✓	✓					Dissolved metals are the same as total.
.08	↓	0815	Field Blank -08	DI	5	2		3					✓	✓	✓	✓	✓	✓					

RELINQUISHED BY: SIGNATURE/ORGANIZATION Julie Schell ☐ Sampler DATE 8/2/23 TIME 0907
RECEIVED BY: SIGNATURE/ORGANIZATION Johanna Murray DATE 8/2/23 TIME 0907
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
NOTES: TEMP. ON ARRIVAL 2.4

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

Rev. 5.18.12

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

GEL Laboratories LLC
a member of The GEL Group INC

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

Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	Client ID
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.

Delaney Stone

Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

632334

Merit Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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. P.O. NO.
E-MAIL ADDRESS results@meritlabs.com QUOTE NO.

INVOICE TO

☒ SAME
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 S51686
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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES

Project Locations
☐ Detroit ☐ New York
☐ Other

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Radium 226*	Radium 228**	Special Instructions
	8/1/23	1443	S51686.01	GW	2			2					✓	✓	* E903.1 Mod.
	8/1/23	1759	S51686.02	GW	2			2					✓	✓	** E904.0/SW 9320 Mod.
	8/1/23	1051	S51686.03	GW	2			2					✓	✓	
	8/1/23	1224	S51686.04	GW	2			2					✓	✓	Please use calculation product &
	8/1/23	1840	S51686.05	GW	2			2					✓	✓	provide Radium 226/228 combined
	8/1/23	1637	S51686.06	GW	2			2					✓	✓	results on the report
	8/1/23	1224	S51686.07	GW	2			2					✓	✓	
	8/1/23	0815	S51686.08 Field Blank	DI	2			2					✓	✓	(No Ice needed)
															** Subcontracted to
															GEL Laboratories, Inc.
															2040 Savage Road
															Charleston, SC 29407

RELINQUISHED BY: SIGNATURE/ORGANIZATION ☐ Sampler	DATE 8/3/23	TIME 1700	
RECEIVED BY: SIGNATURE/ORGANIZATION UPS	DATE 8/3/23	TIME 1700	
RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME	
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE 8.7.23	TIME 855	

RELINQUISHED BY: SIGNATURE/ORGANIZATION		DATE	TIME
RECEIVED BY: SIGNATURE/ORGANIZATION		DATE	TIME
SEAL NO.	SEAL INTACT YES ☐ NO ☐	INITIALS	NOTES: TEMP. ON ARRIVAL
SEAL NO.	SEAL INTACT YES ☐ NO ☐	INITIALS	

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

Rev. 5.18.12

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: MERI	SDG/AR/COC/Work Order: 632332 | 632334 | 633237 MB
Received By: MVH	Date Received: 08-07-2023
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground [✓ UPS] Field Services Courier Other 1246647703613329232 1246647703633378227

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): 0 [✓ 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?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		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?	✓			**Temperature Device Serial #:** IR2-21 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?			✓	Sample ID's and Containers Affected: S51686.01(X2), S51686.05(X1), If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	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?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			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?	✓			Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?			✓	
13	COC form is properly signed in relinquished/received sections?	✓			Circle Applicable: Not relinquished Other (describe)

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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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)

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
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).

GEL Sample ID#	Client Sample Identification
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.

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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: John Petrovic **Name:** **John Petrovic**

Date: **05 SEP 2023** **Title:** **Data Validator**

Sample Data Summary

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
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

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: S51686.02
Sample ID: 632334002
Matrix: Ground Water
Collect Date: 01-AUG-23 17:59
Receive Date: 07-AUG-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	0.623	+/-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
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

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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:	S51686.03	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

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:	S51686.04	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
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

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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:	S51686.05	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

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:	S51686.06	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 Laverty
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

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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:	S51686.08 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
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: September 5, 2023

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

QC Summary

Workorder: **632334**

Parmname **NOM** **Sample** **Qual** **QC** **Units** **RPD%** **REC%** **Range** **Anlst** **Date** **Time**

UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2473355	GFC28RAL	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
WORK 2097-B	Ba-133 Tracer	.1 mL
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 Subtrate	5 mL
REGNT 3946607.6	Nitric Acid	5 mL
REGNT 3950136	RGF-7M Nitric Acid	25 mL

Comments:
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

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

Geometry: 25mm Filter

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

Sample Characteristics					**Tracer Calculations**					
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

Pos.	Detector ID	Counting Time (min.)	Gross Counts Alpha	Gross Counts Beta	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 %
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

* - RPD changed to 0% due to sample & dup activity below MDA

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): 535.58
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:	**Product:**	**Description:** Lucas Cell Radium 226
2473320	LUC26RAL	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	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**							
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)
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

* - RPD changed to 0% due to sample & dup activity below MDA

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: 0.20

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

Merit
Laboratories, Inc.

Analytical Laboratory Report

Supplemental Report

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:
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 Laverty (johnlaverty@meritlabs.com)
Barbara Ball (bball@meritlabs.com)

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. #:

Table of Contents

Maya Murshak

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

Analytical Laboratory Report

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	

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	

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

#	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 14:15, 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: 08/03/23 14:16, 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: 08/03/23 11:36, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	270	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	282	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 13:15, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.016	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	

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

#	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 14:28, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	6	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: 08/03/23 14:18, 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: 08/03/23 11:38, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	433	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	452	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 13:19, 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	0.037	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	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	

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.

Analytical Laboratory 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

#	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 14:41, 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	Not detected	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/03/23 14:20, 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 11:40, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	38	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	356	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 13:22, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.008	0.005	0.000162	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000215	mg/L	5	7440-41-7	
Boron	3.06	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	0.09	0.02	0.00192	mg/L	5	7439-89-6	

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.

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	

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.

Analytical Laboratory 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

#	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 09:01, Analyst: JDP

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	6	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: 08/03/23 14:24, 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: 08/03/23 11:44, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	420	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	450	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 13:33, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	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	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	Not detected	0.02	0.00192	mg/L	5	7439-89-6	

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

#	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 09:14, 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: 08/03/23 14:26, 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 11:46, 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: 08/03/23 12:06, 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: 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	

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. ☒ Yes ☐ No ☐ N/A	Samples are received at 4C +/- 2C Thermometer #	IR 3.1
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? Subcontacted to:	GEL
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: S51747 Submitted: 08/03/2023 08:43

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI New Wells 7-10

Attention: Jennifer Caporale

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

Initial Preservation Check: 08/03/2023 09:31 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
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			

Merit
Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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.

INVOICE TO

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

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☒ NPDES

Project Locations
☐ Detroit ☐ New York
☐ Other

MERIT LAB NO. FOR LAB USE ONLY	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives							Total Metals	F- undisstiled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness					Special Instructions
	DATE	TIME				NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER											
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: SIGNATURE/ORGANIZATION Julie Maltby ☐ Sampler DATE 8/3/23 TIME 0843
RECEIVED BY: SIGNATURE/ORGANIZATION Johanna Murray DATE 8/3/23 TIME 0843
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
NOTES: TEMP. ON ARRIVAL
3.1

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

Rev. 5.18.12

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

GEL Laboratories LLC
a member of The GEL Group INC

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

Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	Client ID
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.

Delaney Stone

Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

632337

Merit Laboratories, Inc.

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Phone (517) 332-0167 Fax (517) 332-4034
www.meritlabs.com

C.O.C. PAGE # 1 OF 1

CHAIN OF CUSTODY RECORD

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. P.O. NO.
E-MAIL ADDRESS results@meritlabs.com QUOTE NO.

INVOICE TO

☒ SAME
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 S51747
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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Radium 226*	Radium 228**
	8/2/23	1453	S51747.01	GW	2			2					✓	✓
	8/2/23	1330	S51747.02	GW	2			2					✓	✓
	8/2/23	1209	S51747.03	GW	2			2					✓	✓
	8/2/23	1031	S51747.04	GW	2			2					✓	✓
	8/2/23	1606	S51747.05	GW	2			2					✓	✓
	8/2/23	1722	S51747.06	GW	2			2					✓	✓
	8/2/23	1031	S51747.07	GW	2			2					✓	✓
	8/2/23	0930	S51747.08	GW	2			2					✓	✓
	8/2/23	1846	S51747.09 Field Blank	DI	2			2					✓	✓

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES

Project Locations
☐ Detroit ☐ New York
☐ 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 Pat W ☐ Sampler DATE 8/3/23 TIME 1700
RECEIVED BY: SIGNATURE/ORGANIZATION UPS DATE 8/3/23 TIME 1700
RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
RECEIVED BY: SIGNATURE/ORGANIZATION DATE 8-7-23 TIME 855

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

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

Rev. 5.18.12

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: MERI	**SDG/AR/COC/Work Order:** 632332 | 632334 | 633237 MB
Received By: MVH	**Date Received:** 08-07-2023
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground [✓ UPS] Field Services Courier Other 1246647703613329232 1246647703633837827

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): 0 [✓ 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?	✓	■		Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓	■		Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		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?	✓	■		**Temperature Device Serial #:** IR2-21 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓	■		Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?			✓	Sample ID's and Containers Affected: S516860.01(X2), S516860.05(X1), If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?		■	✓	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?	✓	■		ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓	■		ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			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?	✓	■		Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?			✓	
13	COC form is properly signed in relinquished/received sections?	✓	■		Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):
S516860.02(X2), S516860.04(X2), S516860.06(X2), S516860.07(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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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: John Petrovic **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:	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
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

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:	S51747.02	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
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

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:	S51747.03	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 Laverty
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
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

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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: S51747.05
Sample ID: 632337005
Matrix: Ground Water
Collect Date: 02-AUG-23 16:06
Receive Date: 07-AUG-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	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
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

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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
Sample ID: 632337006
Matrix: Ground Water
Collect Date: 02-AUG-23 17:22
Receive Date: 07-AUG-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	0.451	+/-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
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

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:	S51747.07	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
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

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:	S51747.08	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
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

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

QC Summary

Workorder: **632337**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2473355	GFC28RAL	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
WORK 2097-B	Ba-133 Tracer	.1 mL
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 Subtrate	5 mL
REGNT 3946607.6	Nitric Acid	5 mL
REGNT 3950136	RGF-7M Nitric Acid	25 mL

Comments:
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

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

Geometry: 25mm Filter

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

Sample Characteristics					**Tracer Calculations**					
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

Pos.	Detector ID	Counting Time (min.)	Gross Counts Alpha	Gross Counts Beta	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 %
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

* - RPD changed to 0% due to sample & dup activity below MDA

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): 535.58
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:	**Product:**	**Description:** Lucas Cell Radium 226
2473320	LUC26RAL	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	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**							
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)
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

* - RPD changed to 0% due to sample & dup activity below MDA

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: 0.20

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

Lyndsey Pace

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

Analytical Laboratory Report

Supplemental Report

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

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 Laverty (johnlaverty@meritlabs.com)
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. #:

Table of Contents

Maya Murshak

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

Analytical Laboratory Report

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	

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

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

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

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

#	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 11:25, 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 11:18, 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: 08/09/23 13:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	92	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	364	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	1.1	3	1	mg/L	1		b

Metals

Method: E200.8, Run Date: 08/10/23 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	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	3.33	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	
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: S51803.04 (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.

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.

Analytical Laboratory 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. ☐ Yes ☒ No ☐ N/A	Samples are received at 4C +/- 2C Thermometer #	IR 1.9
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? Subcontacted to:	GEL
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?	.02 Diss Metals
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	.02 Diss Metals
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: S51803　Submitted: 08/04/2023 09:27

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 11-12

Attention: Jennifer Caporale

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

Initial Preservation Check: 08/04/2023 09:55 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
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			

Merit
Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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.

INVOICE TO

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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Total Metals	F- undisstiled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	JSC 08/03/23 Dissolved Metals	HCO3, CO3, Hardness			
51803.01	08/03/23	1107	MW-11 L307307-01	GW	6	2		3					✓	✓	✓	✓	✓	~~✓~~	✓			
.02		1516	MW-12 L307307-02	GW	6	3		3					✓	✓	✓	✓	✓	✓	✓			
.03		1228	MW-11B L307307-03	GW	5	2		3					✓	✓	✓	✓	✓		✓			
.04		1421	MW-12B L307307-04	GW	5	2		3					✓	✓	✓	✓	✓		✓			
.05		1421	MWT-12B L307307-05	GW	5	2		3					✓	✓	✓	✓	✓		✓			
.06	↓	0900	Field Blank L307307-06	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

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/ORGANIZATION ☒ Sampler DATE 8-4-23 TIME 0927
RECEIVED BY: SIGNATURE/ORGANIZATION M Chilcot DATE 8/4/23 TIME 0927
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
NOTES: TEMP. ON ARRIVAL 1.9

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

Rev. 5.18.12

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

GEL Laboratories LLC
a member of The GEL Group INC

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

Jordan Melton for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	Client ID
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.

Jordan Melton

Jordan Melton for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

G 32661

Merit Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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. P.O. NO.
E-MAIL ADDRESS results@meritlabs.com QUOTE NO.

INVOICE TO

☒ SAME
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 S51803
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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Radium 226*	Radium 228**
	8/3/23	1107	S51803.01	GW	2			2					✓	✓
	8/3/23	1516	S51803.02	GW	2			2					✓	✓
	8/3/23	1228	S51803.03	GW	2			2					✓	✓
	8/3/23	1421	S51803.04	GW	2			2					✓	✓
	8/3/23	1421	S51803.05	GW	2			2					✓	✓
	8/3/23	0900	S51803.06 Field Blank	DI	2			2					✓	✓

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES

Project Locations
☐ Detroit ☐ New York
☐ 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 ☐ Sampler	DATE 8/7/23	TIME 1700	
RECEIVED BY: SIGNATURE/ORGANIZATION UPS	DATE 8/7/23	TIME 1700	
RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME	
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME	
RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME	
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE 8/9/23	TIME 1030	
SEAL NO.	SEAL INTACT YES ☐ NO ☐	INITIALS	NOTES: TEMP. ON ARRIVAL
SEAL NO.	SEAL INTACT YES ☐ NO ☐	INITIALS	

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

Rev. 5.18.12

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: MERI	**SDG/AR/COC/Work Order:** 632661 DS
Received By: MVH	**Date Received:** 08.09.2023
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground [✓ UPS] Field Services Courier Other 124664770363488692

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): 0 [✓ 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?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		Preservation Method: Wet Ice Ice Packs Dry ice [✓ None] Other: *all temperatures are recorded in Celsius TEMP: 20
4	Daily check performed and passed on IR temperature gun?	✓			**Temperature Device Serial #:** IR2-21 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	✓			Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	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?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			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?	✓			Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?			✓	
13	COC form is properly signed in relinquished/received sections?	✓			Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials JM Date 8-11-23 Page 1 of 1

GL-CHL-SR-001 Rev 7

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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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.

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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:	John Petrovic	**Name:**	**John Petrovic**
Date:	**05 SEP 2023**	**Title:**	**Data Validator**

Sample Data Summary

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

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
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

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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:	S51803.03	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
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

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:	S51803.04	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

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
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

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
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

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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	+/-0.923		+/-1.28						
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	+/-0.545		+/-0.532						
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	1.58		140	pCi/L		110	(75%-125%)		08/24/23 10:53
	Uncertainty	+/-0.545		+/-11.3						

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

QC Summary

Workorder: 632661

Parmname	**NOM**	**Sample**	**Qual**	**QC**	**Units**	**RPD%**	**REC%**	**Range**	**Anlst**	**Date**	**Time**

UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2475719	GFC28RAL	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
WORK 2097-B	Ba-133 Tracer	.1 mL
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 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 Subtrate	5 mL
REGNT 3946607.6	Nitric Acid	5 mL

Comments:
Pipet Id: RAD-GFC-1795419
Data Entry Date2: 16-AUG-2023 12:05 BAL-C236761727 Jacqueline Winston
Data Entry Date3: 16-AUG-2023 00:00

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

Geometry: 25mm Filter

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

Sample Characteristics					**Tracer Calculations**					
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

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	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%

Pos.	**Calibration Data** 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 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	0.8771	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%

2475719r1.xls

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:	**Product:**	**Description:** Lucas Cell Radium 226
2475704	LUC26RAL	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

Batch : 2475704
Analyst : LIN01615
Prep Date : 8/17/2023
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**							
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)
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 Ingrow End Date/Time	Count Start Date/Time	Rn-222 Corrections De-Gas to Ingrowth	Rn-222 Corrections Ingrowth to Count	Rn-222 Corrections During Count	Ra-226 Decay
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 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	Received	Account Number
L308169	8/11/2023 3:32:00PM	

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

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: 09/13/2023

Sample Name: MW-14

Lab #: L308169-01 Ground Water Collected: 11-Aug-23 09:53 By: Marc Wahrer

Analyte	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	

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.

Merit
Laboratories, Inc.

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 Laverty (johnlaverty@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. #:

Table of Contents

Maya Murshak

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

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	

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

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	

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

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	

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.

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	

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.	☒ Yes	☐ No	☐ N/A	Samples are received at 4C +/- 2C Thermometer #	IR 3.6
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? Subcontacted to:	GEL
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: 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			

Merit
Laboratories, Inc.
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

CHAIN OF COSTODY RECORD

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.

INVOICE TO

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

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO$_3$	H$_2$SO$_4$	NaOH	MeOH	OTHER	Total Metals	F- undisstiled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness				
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: SIGNATURE/ORGANIZATION ☒ Sampler DATE 8-11-23 TIME 1557
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 Barbra Bell DATE 8/11/2023 TIME 1557
SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS
SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS
NOTES: TEMP. ON ARRIVAL 3.6

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

Rev. 5.18.12

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

GEL | Laboratories LLC
a member of The GEL Group INC

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

Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	Client ID
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

Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

633542

Merit Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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. P.O. NO.
E-MAIL ADDRESS results@meritlabs.com QUOTE NO.

INVOICE TO

CONTACT NAME Julie Teague ☒SAME
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 S52163
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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Radium 226*	Radium 228**
	8/11/23	1138	S52163.01	GW	2			2					✓	✓
	8/11/23	1410	S52163.02	GW	2			2					✓	✓
	8/11/23	1138	S52163.03	GW	2			2					✓	✓
	8/11/23	1040	S52163.04 Field Blank	GW	2			2					✓	✓

(# Containers & Preservatives)

Certifications
☐OHIO VAP ☐Drinking Water
☐DoD ☐NPDES

Project Locations
☐Detroit ☐New York
☐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 ☐Sampler	DATE 8/14/23	TIME 1700	
RECEIVED BY: SIGNATURE/ORGANIZATION UPS	DATE 8/14/23	TIME 1700	
RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME	
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME	
RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE 8/16/23 [illegible] 9/12/23	TIME	
RECEIVED BY: SIGNATURE/ORGANIZATION GEL	DATE ~~8/15/23~~	TIME 1000	

SEAL NO. SEAL INTACT YES☐ NO☐ INITIALS
SEAL NO. SEAL INTACT YES☐ NO☐ INITIALS
NOTES: TEMP. ON ARRIVAL

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

Rev. 5.18.12

GEL | Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: MERI	**SDG/AR/COC/Work Order:** 633542
Received By: EG	**Date Received:** 8/17/23
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground [✓ UPS] Field Services Courier Other 1Z 466 477 03 6390 2359

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):** 0 [✓ 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 B 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?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		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?	✓			**Temperature Device Serial #:** IR8-23 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?			✓	Sample ID's and Containers Affected: S52163.02 1 of 2 pH 72 If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	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?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			ID's and containers affected:
10	Date & time on COC match date & time on bottles?			✓	Circle Applicable: No dates on containers No times on containers COC missing info Other (describe) times don't match COC on containers
11	Number of containers received match number indicated on COC?	✓			Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?			✓	
13	COC form is properly signed in relinquished/received sections?	✓			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.

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: MERI	**SDG/AR/COC/Work Order:** 635542
Received By: EG	**Date Received:** ~~8/17/23~~ 8/16/23 [illegible] 9/12/23.
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 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): 0 [✓ 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?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		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?	✓			**Temperature Device Serial #:** IR6-23 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?			✓	Sample ID's and Containers Affected: S52163.02 1 of 2 pH 72 If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	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?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			ID's and containers affected:
10	Date & time on COC match date & time on bottles?			✓	Circle Applicable: No dates on containers No times on containers COC missing info Other (describe) times don't match COC on containers
11	Number of containers received match number indicated on COC?	✓			Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?			✓	
13	COC form is properly signed in relinquished/received sections?	✓			Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):

Rev01: Receive dates were updated on final review of the data package. Scan history of UPS tracking confirms receipt on 8/16/23. [illegible]

PM (or PMA) review: Initials AM Date 8/17/23 Page 1 of 1

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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	**Client Sample Identification**
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

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
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

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 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
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: 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

QC Summary

Workorder: **633542**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2479427	GFC28RAL	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
WORK 2097-B	Ba-133 Tracer	.1 mL
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 Subtrate	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

Comments:

Pipet Id: RAD-GFC-1795419
Data Entry Date2: 29-AUG-2023 00:00

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

Geometry: 25mm Filter

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

Sample Characteristics					**Tracer Calculations**					
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

Pos.	Detector ID	Counting Time (min.)	Gross Counts Alpha	Gross Counts Beta	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 %
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 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	0.8492	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%

2479427.xls

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:	**Product:**	**Description:** Lucas Cell Radium 226
2479421	LUC26RAL	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	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
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**							
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)
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

Lyndsey Pace

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

GEL Laboratories LLC
a member of The GEL Group INC

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

Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	Client ID
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

Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

633542

Merit Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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. P.O. NO.
E-MAIL ADDRESS results@meritlabs.com QUOTE NO.

INVOICE TO ☒ SAME

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 S52163
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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	YEAR TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Radium 226*	Radium 228**
	8/11/23	1138	S52163.01	GW	2			2					✓	✓
	8/11/23	1410	S52163.02	GW	2			2					✓	✓
	8/11/23	1138	S52163.03	GW	2			2					✓	✓
	8/11/23	1040	S52163.04 Field Blank	GW	2			2					✓	✓

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES

Project Locations
☐ Detroit ☐ New York
☐ 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 ☐ Sampler DATE 8/14/23 TIME 1700
RECEIVED BY: SIGNATURE/ORGANIZATION UPS DATE 8/14/23 TIME 1700
RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
RECEIVED BY: SIGNATURE/ORGANIZATION DATE TIME

RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
RECEIVED BY: SIGNATURE/ORGANIZATION Sz: DATE 8/16/23 gmH 9/12/23 ~~8/15/23~~ TIME 1000
SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS
SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS
NOTES: TEMP. ON ARRIVAL ______

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

Rev. 5.18.12

GEL | Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: MERI	SDG/AR/COC/Work Order: 633542
Received By: EG	Date Received: 8/17/23
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 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): 0 [✓ 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?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		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?	✓			Temperature Device Serial #: IR6-23 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?			✓	Sample ID's and Containers Affected: S52163.02 1of 2 pH >2 If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	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?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			ID's and containers affected:
10	Date & time on COC match date & time on bottles?			✓	Circle Applicable: No dates on containers No times on containers COC missing info Other (describe) times don't match COC on containers
11	Number of containers received match number indicated on COC?	✓			Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?			✓	
13	COC form is properly signed in relinquished/received sections?	✓			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.

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: MERI	SDG/AR/COC/Work Order: 633542
Received By: EG	Date Received: ~~8/17/23~~ 8/16/23 9/12/23.
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 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): 0 [✓ 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?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		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?	✓			Temperature Device Serial #: IR6-23 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?			✓	Sample ID's and Containers Affected: S52163.02 1 of 2 pH >2 If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	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?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			ID's and containers affected:
10	Date & time on COC match date & time on bottles?			✓	Circle Applicable: No dates on containers No times on containers COC missing info Other (describe) times don't match COC on containers
11	Number of containers received match number indicated on COC?	✓			Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?			✓	
13	COC form is properly signed in relinquished/received sections?	✓			Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):

Rev01: Receive dates were updated on final review of the data package. Scan history of UPS tracking confirms receipt on 8/16/23.

PM (or PMA) review: Initials AM Date 8/17/23 Page 1 of 1

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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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
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

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
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: 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

QC Summary

Workorder: **633542**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2479427	GFC28RAL	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
WORK 2097-B	Ba-133 Tracer	.1 mL
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 Subtrate	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

Comments:

Pipet Id: RAD-GFC-1795419
Data Entry Date2: 29-AUG-2023 00:00

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

Geometry: 25mm Filter

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

Sample Characteristics					**Tracer Calculations**					
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

Pos.	Detector ID	Counting Time (min.)	Gross Counts Alpha	Gross Counts Beta	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 %
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 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	0.8492	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:	**Product:**	**Description:** Lucas Cell Radium 226
2479421	LUC26RAL	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	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
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**							
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)
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
Lyndsey Pace

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

Hometown People. Hometown Power.

Environmental Laboratory
1232 Haco Drive
Lansing
Michigan, 48910

CHAIN OF CUSTODY

Phone: (517)702-6372

Page 1 of 1

Lab Work Order Number L308169

Client Name BWL - Erickson Station	Project Name Erickson AM MI Wells 14-15
Client Contact Cheryl Louden	Project Number [none]
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	

Requested Analyses

- 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

Requested Turn Around

Rush requests subject to additional charge.

Rush requests subject to lab approval

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code b	a	a	b							Sample Comments
MW-14	08/11/23	~~1138~~ 0953	G	GW	5	1	1	1	2							
MW-15		* ~~1410~~ 1153	G	GW	5	1	1	1	2							
MWT-14		* ~~1138~~ 0953	G	GW	5	1	1	1	2							
Field Blank		* ~~1040~~ 0855	G	DI	5	1	1	1	2							
		* JSC 08/24/23														

Relinquished By	Date/Time	Received By	Date/Time
	8-11-23 1532	J Caporale	08/11/23 1532
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

Comments

Cooler Numbers and Temperatures E0716 0.6°C

Matrix Codes. DI=Deionized Water,GW=Ground Water

Preserv. Codes a=None,b=0.5% HNO3

Merit
Laboratories, Inc.

Analytical Laboratory Report

Supplemental Report

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 Laverty (johnlaverty@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. #:

Table of Contents

Maya Murshak

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

Analytical Laboratory Report

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

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

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

#	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 13:01, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	2.5	5	0.08	mg/L	5	16887-00-6	b
Fluoride (Undistilled)	Not detected	0.5	0.13	mg/L	5	16984-48-8	
Sulfate	7.2	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/09/23 11:28, 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: 08/09/23 13:30, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	298	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	322	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 12:51, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00255	mg/L	5	7440-36-0	
Arsenic	Not detected	0.002	0.000255	mg/L	5	7440-38-2	
Barium	0.032	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	
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: S51950.03 (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

#	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 13:14, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	6.8	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	Not detected	0.5	0.13	mg/L	5	16984-48-8	
Sulfate	6.2	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 08/09/23 11:30, 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: 08/09/23 13:32, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	96	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	376	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	12.4	3	1	mg/L	1.3		

Metals

Method: E200.8, Run Date: 08/10/23 12:54, 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	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	0.28	0.02	0.00192	mg/L	5	7439-89-6	

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

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.

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	

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? Subcontacted 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

Initial Preservation Check: 08/09/2023 08:50 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
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			

Merit
Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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.

INVOICE TO

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)

Certifications
☐OHIO VAP ☐Drinking Water
☐DoD ☒NPDES

Project Locations
☐Detroit ☐New York
☐Other

MERIT LAB NO. FOR LAB USE ONLY	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives							Total Metals	F- undisstiled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness					Special Instructions
	DATE	TIME				NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER											
51950.01	08/08/23	1108	MW-16A L308170-01	GW	5	2		3					✓	✓	✓	✓	✓	✓					Metals to analyse:Na, Mg, K
.02		1255	MW-16B -02	GW	5	2		3					✓	✓	✓	✓	✓	✓					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: SIGNATURE/ORGANIZATION ☒Sampler DATE 8-9-23 TIME 0815
RECEIVED BY: SIGNATURE/ORGANIZATION DATE 8/9/23 TIME 0815
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

NOTES: TEMP. ON ARRIVAL 2.4

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

Rev. 5.18.12

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

GEL Laboratories LLC
a member of The GEL Group INC

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

Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	Client ID
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.

Delaney Stone

Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

G33177

Merit Laboratories, Inc

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

CHAIN OF COUNTDY RECORD

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. P.O. NO.
E-MAIL ADDRESS results@meritlabs.com QUOTE NO.

INVOICE TO ☒ SAME

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 S51950
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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Radium 226*	Radium 228**
	8/8/23	1108	S51950.01	GW	2			2					✓	✓
	8/8/23	1255	S51950.02	GW	2			2					✓	✓
	8/8/23	1421	S51950.03	GW	2			2					✓	✓
	8/8/23	1234	S51950.04	GW	2			2					✓	✓
	8/8/23	1108	S51950.05	GW	2			2					✓	✓
	8/8/23	0930	S51950.06 Field Blank	DI	2			2					✓	✓

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES

Project Locations
☐ Detroit ☐ New York
☐ 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 ☐ Sampler		DATE 8/10/23	TIME 17:00
RECEIVED BY: SIGNATURE/ORGANIZATION	UPS	DATE 8/10/23	TIME 17:00
RELINQUISHED BY: SIGNATURE/ORGANIZATION		DATE	TIME
RECEIVED BY: SIGNATURE/ORGANIZATION		DATE 8-14-23	TIME 900
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

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

Rev. 5.18.12

GEL | Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

D.S.

Client: MERI	**SDG/AR/COC/Work Order:** 633177
Received By: Thyasia Tatum	**Date Received:** 8/14/23
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground [✓ UPS] Field Services Courier Other 12466 477 03 6383 5619

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): 0 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?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		Preservation Method: Wet Ice Ice Packs Dry ice [✓ None] Other: *all temperatures are recorded in Celsius TEMP: 16°C
4	Daily check performed and passed on IR temperature gun?	✓			**Temperature Device Serial #:** IR2-23 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	✓			Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	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?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			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?	✓			Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?			✓	
13	COC form is properly signed in relinquished/received sections?	✓			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

GL-CHL-SR-001 Rev 7

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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	**Client Sample Identification**
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

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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

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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:	S51950.01	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

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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
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

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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

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

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
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

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QC Summary

Report Date: September 11, 2023

Merit Laboratories Inc.
2680 East Lansing Drive
East Lansing, Michigan
Contact: **John Laverty**

Workorder: **633177**

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

QC Summary

Workorder: **633177**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2479427	GFC28RAL	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
WORK 2097-B	Ba-133 Tracer	.1 mL
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 Subtrate	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

Comments:

Pipet Id: RAD-GFC-1795419
Data Entry Date2: 29-AUG-2023 00:00

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

Geometry: 25mm Filter

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

Sample Characteristics Pos.	Sample ID	Sample Aliquot L	Sample Aliquot StDev. L	Sample Date/Time	**Tracer Calculations** 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

Pos.	Detector ID	Counting Time (min.)	Gross Counts Alpha	Gross Counts Beta	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 %
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 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	0.8492	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	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
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**							
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)
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

Lyndsey Pace

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

Analytical Laboratory Report

Final Report

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

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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

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

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	

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

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	

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	

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.

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

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.

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	

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	

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. ☒ Yes ☐ No ☐ N/A	Samples are received at 4C +/- 2C Thermometer #	IR 2.2
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? Subcontacted to:	GEL
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: S52209 Submitted: 08/15/2023 08:16

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 100A-100D

Initial Preservation Check: 08/15/2023 08:35 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
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			

Merit
Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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.

INVOICE TO

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)

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☒ NPDES

Project Locations
☐ Detroit ☐ New York
☐ Other

MERIT LAB NO. FOR LAB USE ONLY	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives							Total Metals	F- undisstiled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness					Special Instructions
	DATE	TIME				NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER											
52209.01	8/14/23	1512	MW-100A L308171-01	GW	5	2		3					✓	✓	✓	✓	✓	✓					Metals to analyse:Na, Mg, K
.02		1103	MW-100B -02	GW	5	2		3					✓	✓	✓	✓	✓	✓					B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03		1253	MW-100C -03	GW	5	2		3					✓	✓	✓	✓	✓	✓					Co, Li, Hg, Mo,Pb,Se, Tl,
.04		1431	MW-100D -04	GW	5	2		3					✓	✓	✓	✓	✓	✓					Fe, Cu, Ni, Ag, V, Zn
.05		1103	MWT-100B -05	GW	5	2		3					✓	✓	✓	✓	✓	✓					Please send a preliminary report
.06		0910	Field Blank -06	DI	5	2		3					✓	✓	✓	✓	✓	✓					

RELINQUISHED BY: SIGNATURE/ORGANIZATION ☒ Sampler	DATE 4-15-23	TIME 0816	RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME	RECEIVED BY: SIGNATURE/ORGANIZATION Kartra Ball	DATE 8/15/2023	TIME 0816
RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME	SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS	NOTES:	TEMP. ON ARRIVAL 2.2
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME	SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS		

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

Rev. 5.18.12

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

GEL Laboratories LLC
a member of The GEL Group INC

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

Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	Client ID
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.

Delaney Stone

Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

633715

Merit Laboratories, Inc.

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Phone (517) 332-0167 Fax (517) 332-4034
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C.O.C. PAGE # 1 OF 1

CHAIN OF CUSTODY RECORD

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. P.O. NO.
E-MAIL ADDRESS results@meritlabs.com QUOTE NO.

INVOICE TO ☒ SAME

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 S52209
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 SL=SLUDGE WW=WASTEWATER DW=DRINKING WATER S=SOIL O=OIL L=LIQUID WP=WIPE SD=SOLID A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Radium 226*	Radium 228**
	8/14/23	1512	S52209.01	GW	2			2					✓	✓
	8/14/23	1103	S52209.02	GW	2			2					✓	✓
	8/14/23	1253	S52209.03	GW	2			2					✓	✓
	8/14/23	1431	S52209.04	GW	2			2					✓	✓
	8/14/23	1103	S52209.05	GW	2			2					✓	✓
	8/14/23	0910	S52209.06 Field Blank	DI	2			2					✓	✓

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES

Project Locations
☐ Detroit ☐ New York
☐ 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	☐ Sampler	DATE 8/15/23	TIME 1700
RECEIVED BY: SIGNATURE/ORGANIZATION		DATE 8/15/23	TIME 1700
RELINQUISHED BY: SIGNATURE/ORGANIZATION		DATE	TIME
RECEIVED BY: SIGNATURE/ORGANIZATION		DATE	TIME

RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE 8/17/23	TIME 1015

SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS
SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS
NOTES: TEMP. ON ARRIVAL

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

Rev. 5.18.12

D5

GEL | Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: MERI	**SDG/AR/COC/Work Order:** 633715
Received By: mg	**Date Received:** 8/17/23
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground [✓ UPS] Field Services Courier Other 12 466 477 03 0342 5991

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?		X	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?		X	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?		X	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?		X	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?		X	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?	X			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	X			Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		X		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?	✓			**Temperature Device Serial #:** IR2-28 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	X			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	X			Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			X	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?	X			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	X			ID's and containers affected:
10	Date & time on COC match date & time on bottles?	X			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?	X			Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?			X	
13	COC form is properly signed in relinquished/received sections?	X			Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials AH Date 8/17/23 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 #: 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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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

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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

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:	S52209.01	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

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
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

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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
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

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: S52209.04
Sample ID: 633715004
Matrix: Ground Water
Collect Date: 14-AUG-23 14:31
Receive Date: 17-AUG-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	0.135	+/-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

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
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

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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
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

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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

QC Summary

Workorder: **633715**

Parmname	**NOM**	**Sample**	**Qual**	**QC**	**Units**	**RPD%**	**REC%**	**Range**	**Anlst**	**Date**	**Time**

UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2479427	GFC28RAL	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
WORK 2097-B	Ba-133 Tracer	.1 mL
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 Subtrate	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

Comments:

Pipet Id: RAD-GFC-1795419
Data Entry Date2: 29-AUG-2023 00:00

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

Geometry: 25mm Filter

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

Sample Characteristics					**Tracer Calculations**					
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

Pos.	Detector ID	Counting Time (min.)	Gross Counts Alpha	Gross Counts Beta	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 %
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 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	0.8492	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:	**Product:**	**Description:** Lucas Cell Radium 226
2479421	LUC26RAL	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	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
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**							
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)
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 De-Gas to Ingrowth	Rn-222 Corrections Ingrowth to Count	Rn-222 Corrections During Count	Ra-226 Decay
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

Lyndsey Pace

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

GEL Laboratories LLC
a member of The GEL Group INC

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

Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	Client ID
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.

Delaney Stone

Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

633715

Merit Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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.: P.O. NO.:
E-MAIL ADDRESS: results@meritlabs.com QUOTE NO.:

INVOICE TO

☒ SAME
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: S52209 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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Radium 226*	Radium 228**
	8/14/23	1512	S52209.01	GW	2			2					✓	✓
	8/14/23	1103	S52209.02	GW	2			2					✓	✓
	8/14/23	1253	S52209.03	GW	2			2					✓	✓
	8/14/23	1431	S52209.04	GW	2			2					✓	✓
	8/14/23	1103	S52209.05	GW	2			2					✓	✓
	8/14/23	0910	S52209.06 Field Blank	DI	2			2					✓	✓

Containers & Preservatives

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES

Project Locations
☐ Detroit ☐ New York
☐ 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	☐ Sampler	DATE 8/15/23	TIME 1700
RECEIVED BY: SIGNATURE/ORGANIZATION		DATE 8/15/23	TIME 1700
RELINQUISHED BY: SIGNATURE/ORGANIZATION		DATE	TIME
RECEIVED BY: SIGNATURE/ORGANIZATION		DATE	TIME

RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE 8/17/23	TIME 1015

SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS
SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS
NOTES: TEMP. ON ARRIVAL

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

Rev. 5.18.12

DS

GEL | Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: MERI	SDG/AR/COC/Work Order: 683715
Received By: MG	**Date Received:** 8/17/23
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground [✓ UPS] Field Services Courier Other 12 466 477 03 0342 5991

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?		X	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?		X	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?		X	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?		X	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?		X	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?	X			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	X			Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		X		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?	✓			Temperature Device Serial #: IR2-28 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	X			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	X			Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			X	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?	X			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	X			ID's and containers affected:
10	Date & time on COC match date & time on bottles?	X			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?	X			Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?			X	
13	COC form is properly signed in relinquished/received sections?	X			Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials AR Date 8/17/23 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 #: 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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	**Client Sample Identification**
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

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:	S52209.01	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

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:	S52209.03	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
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

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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:	S52209.04	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
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

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
Sample ID: 633715005
Matrix: Ground Water
Collect Date: 14-AUG-23 11:03
Receive Date: 17-AUG-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	0.960	+/-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
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

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:	S52209.06 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

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

QC Summary

Workorder: **633715**

Parmname	**NOM**	**Sample**	**Qual**	**QC**	**Units**	**RPD%**	**REC%**	**Range**	**Anlst**	**Date**	**Time**

UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2479427	GFC28RAL	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
WORK 2097-B	Ba-133 Tracer	.1 mL
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 Subtrate	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

Comments:

Pipet Id: RAD-GFC-1795419
Data Entry Date2: 29-AUG-2023 00:00

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

Geometry: 25mm Filter

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

Sample Characteristics					**Tracer Calculations**					
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

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	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 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	0.8492	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%

2479427.xls

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:	**Product:**	**Description:** Lucas Cell Radium 226
2479421	LUC26RAL	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	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
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**							
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)
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: **Date:** 11-SEP-23

Lyndsey Pace

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.
__X__ 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, HCO_3, CO_3, 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			

<u>Other instances of nonconformance to QC control limits noted on case narrative:</u>

None.

<u>Comments:</u>

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 Louden

3725 S. Canal

Lansing, MI 48917

Project: Erickson Well Project

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	Received	Account Number
L309174	9/19/2023 8:40:00AM	

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jennifer Caporale

Jennifer Caporale, Supervisor

Sample Name: MW-100 A

Lab #: L309174-01 Ground Water **Collected:** 18-Sep-23 15:15 **By:** Marc Wahrer

Analyte	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	

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.

Merit
Laboratories, Inc.

Analytical Laboratory Report

Final Report

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 Laverty (johnlaverty@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. #:

Table of Contents

Maya Murshak

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

Analytical Laboratory Report

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

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	

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	

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.

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

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

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.

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	

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.

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	

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.	☐ Yes	☒ No	☐ N/A	Samples are received at 4C +/- 2C Thermometer #	IR 1.2
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? Subcontacted to:	GEL
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: S53510 Submitted: 09/19/2023 09:16

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 100A-100D

Initial Preservation Check: 09/19/2023 09:45 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
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			

Merit Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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.

INVOICE TO

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)

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☒ NPDES

Project Locations
☐ Detroit ☐ New York
☐ Other

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	YEAR TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Total Metals	F- undisstilled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness					Special Instructions
53510.01	9.18.23	1515	MW-100A L309174-01	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: SIGNATURE/ORGANIZATION Julie Maltby ☐ Sampler DATE 9/19/23 TIME 0916
RECEIVED BY: SIGNATURE/ORGANIZATION M Chilcote DATE 9/19/23 TIME 0916
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
NOTES: TEMP. ON ARRIVAL 1.2

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

Rev. 5.18.12

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

LANSING BWL
Hometown People. Hometown Power.

Environmental Laboratory
1232 Haco Drive
Lansing
Michigan, 48910

CHAIN OF CUSTODY

Phone: (517)702-6372

Page 1 of 1

Lab Work Order Number 1309174

Client Name BWL - Erickson Station	**Project Name** Erickson Well Project
Client Contact Cheryl Louden	**Project Number** [none]
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	

Requested Analyses

- 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

Requested Turn Around

Rush requests subject to additional charge.

Rush requests subject to lab approval.

						Preservation Code										
Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	b	a	a	b							Sample Comments
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** Dave Weller	**Date/Time** 9.19.23 0840
Relinquished By	**Date/Time**	**Received By**	**Date/Time**
Relinquished By	**Date/Time**	**Received By**	**Date/Time**

Cooler Numbers and Temperatures EOM6 3.4°C

Comments

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:	Lab Report Date:
S53272.01	10/16/2023
S53439.01	10/16/2023

Data Validator: Andrew Byks

Data Validation Completion Date: 11/7/2023

General Overall Assessment:
_____ Data are usable without qualification.
__X__ 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, HCO_3, CO_3, 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
			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 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.

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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 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	Received	Account Number
L309173	9/15/2023 10:40:00AM	

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jennifer Caporale

Jennifer Caporale, Supervisor

Merit Laboratories, Inc.

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 Laverty (johnlaverty@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. #:

Table of Contents

Maya Murshak

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

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	

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.

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	

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.

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	

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

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	

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.	☒ Yes	☐ No	☐ N/A	Samples are received at 4C +/- 2C Thermometer #	IR 2.2
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? Subcontacted to:	GEL
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: 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			

Merit
Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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.

INVOICE TO

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

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☒ NPDES

Project Locations
☐ Detroit ☐ New York
☐ Other

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	YEAR TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Total Metals	F- undisstiled, Cl, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness					Special Instructions
53439.01	9.15.23	0738	MW-14 L309173-01	GW	5	2		3					✓	✓	✓	✓	✓	✓					Metals to analyse:Na, Mg, K
.02		0943	MW-15 -02	GW	5	2		3					✓	✓	✓	✓	✓	✓					B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03		0738	MWT-14 -03	GW	5	2		3					✓	✓	✓	✓	✓	✓					Co, Li, Hg, Mo,Pb,Se, Tl,
.04		0645	Field Blank -04	di	5	2		3					✓	✓	✓	✓	✓	✓					Fe, Cu, Ni, Ag, V, Zn
																							Please send a preliminary report

RELINQUISHED BY: SIGNATURE/ORGANIZATION Julie Maltby ☐ Sampler	DATE 9/15/23	TIME 1238	RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
RECEIVED BY: SIGNATURE/ORGANIZATION M Chilcote	DATE 9/15/23	TIME 1238	RECEIVED BY: SIGNATURE/ORGANIZATION DATE TIME
RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME	SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME	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

Rev. 5.18.12

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

GEL Laboratories LLC
a member of The GEL Group INC

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

Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	Client ID
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

Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

Merit
Laboratories, Inc.

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

037728

CHAIN OF CUSTODY RECORD

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. P.O. NO.
E-MAIL ADDRESS results@meritlabs.com QUOTE NO.
PROJECT NO./NAME S53439 SAMPLER(S) - PLEASE PRINT/SIGN NAME

INVOICE TO

☒ SAME
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

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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives: NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Radium 226*	Radium 228**
	9/15/23	0738	S53439.01	GW	2			2					✓	✓
	9/15/23	0943	S53439.02	GW	2			2					✓	✓
	9/15/23	0738	S53439.03	GW	2			2					✓	✓
	9/15/23	0645	S53439.04 Field blank	DI	2			2					✓	✓

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES

Project Locations
☐ Detroit ☐ New York
☐ 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 ☐ Sampler	DATE 9/15/23	TIME 1700	
RECEIVED BY: SIGNATURE/ORGANIZATION WPS	DATE 9/15/23	TIME 1700	
RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME	
RECEIVED BY: SIGNATURE/ORGANIZATION GEL	DATE 9192023	TIME 915	
RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME	
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME	
SEAL NO.	SEAL INTACT YES ☐ NO ☐	INITIALS	NOTES: TEMP. ON ARRIVAL
SEAL NO.	SEAL INTACT YES ☐ NO ☐	INITIALS	

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

Rev. 5.18.12

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: MEPI	**SDG/AR/COC/Work Order:** ~~637728~~ 637729 / 637728 QG 9/20
Received By: QG	**Date Received:** 9/19/23
Carrier and Tracking Number	Circle Applicable: ~~FedEx Express~~ [✓ FedEx Express] FedEx Ground [✓ UPS] Field Services Courier Other QG 9/19

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): 0 [✓ 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?		■		Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?		■		Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*				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?		■		**Temperature Device Serial #:** IR1-23 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?		■		Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?			✓	Sample ID's and Containers Affected: comments below If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?		■		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?		■		ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?		■		ID's and containers affected:
10	Date & time on COC match date & time on bottles?				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?		■		Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?		■		
13	COC form is properly signed in relinquished/received sections?		■		Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):

S53439.01, S53439.02, S53439.03(+), S53272.01, S53272.02,
S53273.03, S53274.04, S53292.05

PM (or PMA) review: Initials OO Date 9/20/23 Page 1 of 1

GL-CHL-SR-001 Rev 7

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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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 Laverty
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
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

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
Sample ID: 637728002
Matrix: Ground Water
Collect Date: 15-SEP-23 09:43
Receive Date: 19-SEP-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	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
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

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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:	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

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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:	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
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: 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

QC Summary

Workorder: **637728**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2499132	GFC28RAL	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
WORK 2097-B	Ba-133 Tracer	.1 mL
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

Comments:

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

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

Geometry: 25mm Filter

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

Sample Characteristics					**Tracer Calculations**					
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

Pos.	Detector ID	Counting Time (min.)	Gross Counts Alpha	Gross Counts Beta	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 %
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	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%

2499132.xls

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:	**Product:**	**Description:** Lucas Cell Radium 226
2496135	LUC26RAL	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

Batch : 2496135
Analyst : LIN01615
Prep Date : 10/10/2023
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**							
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)
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

Lyndsey Pace

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

LANSING BWL
Hometown People. Hometown Power.

Environmental Laboratory
1232 Haco Drive
Lansing
Michigan, 48910

CHAIN OF CUSTODY

Phone: (517)702-6372

Page 1 of 1

Lab Work Order Number L309173~~0~~ JSC 09/01/23

Client Name BWL - Erickson Station		Project Name Erickson AM MI Wells 14-15
Client Contact Cheryl Louden		Project Number [none]
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		

Requested Analyses:
- 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

Requested Turn Around

Rush requests subject to additional charge.

Rush requests subject to lab approval.

						Preservation Code				
Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	b	a	a	b	Sample Comments
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	Received By	Date/Time
	9-15-23 1040	Dave Wulh	9.15.23 1040

Comments

Cooler Numbers and Temperatures tomb 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 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	Received	Account Number
L309172	9/12/2023 7:45:00AM	

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

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	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	

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: 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

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Contacts for report questions:
John Laverty (johnlaverty@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. #:

Table of Contents

Maya Murshak

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

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	

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.

Analytical Laboratory 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	

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.

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

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.

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	

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

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	

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.

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	

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.	☐ Yes	☒ No	☐ N/A	Samples are received at 4C +/- 2C Thermometer #	IR 1.9
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? Subcontacted to:	GEL
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: S53272 Submitted: 09/13/2023 08:40

Client: BWL01 (Board of Water & Light)

Project: Erickson AM MI Wells 16A-16D

Initial Preservation Check: 09/13/2023 09:37 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
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			

Merit
Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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.

INVOICE TO

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. FOR LAB USE ONLY	YEAR DATE	YEAR TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Total Metals	F- undisstiled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness				
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					✓	✓	✓	✓	✓	✓				

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/ORGANIZATION ☒ Sampler	DATE 9-13-23	TIME 0840
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE 9/13/23	TIME 0840
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

NOTES: TEMP. ON ARRIVAL 1.9

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

Rev. 5.18.12

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

GEL Laboratories LLC
a member of The GEL Group INC

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

Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	Client ID
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.

Delaney Stone

Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

Merit Laboratories, Inc.

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

637729

CHAIN OF CUSTODY RECORD

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. P.O. NO.
E-MAIL ADDRESS results@meritlabs.com QUOTE NO.
PROJECT NO./NAME S53272 SAMPLER(S) - PLEASE PRINT/SIGN NAME

INVOICE TO ☒ SAME

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

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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Radium 226*	Radium 228**
	9/12/23	1058	S53272.01	GW	2			2					✓	✓
	9/12/23	1255	S53272.02	GW	2			2					✓	✓
	9/12/23	1417	S53272.03	GW	2			2					✓	✓
	9/12/23	1156	S53272.04	GW	2			2					✓	✓
	9/12/23	1058	S53272.05	GW	2			2					✓	✓
	9/12/23	0855	S53272.06 Field Blank	DI	2			2					✓	✓

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES

Project Locations
☐ Detroit ☐ New York
☐ 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 ☐ Sampler DATE 9/15/23 TIME 1700
RECEIVED BY: SIGNATURE/ORGANIZATION UPS DATE 9/15/23 TIME 1700
RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
RECEIVED BY: SIGNATURE/ORGANIZATION GEL DATE 9/19/23 TIME 9:15

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

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

Rev. 5.18.12

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: MEPI	SDG/AR/COC/Work Order: ~~[illegible]~~ 637729 / 637728 OO 9/20
Received By: QG	Date Received: 9/19/23
Carrier and Tracking Number	Circle Applicable: ~~FedEx Express~~ FedEx Ground [✓ UPS] Field Services Courier Other QG 9/19

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): 0 [✓ 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?		■		Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?		■		Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*				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?		■		**Temperature Device Serial #:** IR1-23 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?		■		Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?			✓	Sample ID's and Containers Affected: comments If Preservation added, Lot#: below
7	Do any samples require Volatile Analysis?		■		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?		■		ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?		■		ID's and containers affected:
10	Date & time on COC match date & time on bottles?				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?		■		Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?		■		
13	COC form is properly signed in relinquished/received sections?		■		Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):

S53439.01, S53439.02, S53439.03(7), S53272.01, S53272.02, S53273.03, S53274.04, S53292.05

PM (or PMA) review: Initials OO Date 9/20/23 Page 1 of 1

GL-CHL-SR-001 Rev 7

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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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

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
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

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
Sample ID: 637729002
Matrix: Ground Water
Collect Date: 12-SEP-23 12:55
Receive Date: 19-SEP-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	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
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

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
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

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: S53272.04
Sample ID: 637729004
Matrix: Ground Water
Collect Date: 12-SEP-23 11:56
Receive Date: 19-SEP-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	0.773	+/-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
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

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:	S53272.05	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
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

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: S53272.06 Field Blank
Sample ID: 637729006
Matrix: Water
Collect Date: 12-SEP-23 08:55
Receive Date: 19-SEP-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	0.184	+/-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
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

QC Summary

Report Date: October 16, 2023

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

QC Summary

Workorder: **637729**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2499132	GFC28RAL	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
WORK 2097-B	Ba-133 Tracer	.1 mL
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

Comments:

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

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

Geometry: 25mm Filter

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

Sample Characteristics					**Tracer Calculations**					
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

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	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	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%

2499132.xls

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:	**Product:**	**Description:** Lucas Cell Radium 226
2496135	LUC26RAL	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

Batch : 2496135
Analyst : LIN01615
Prep Date : 10/10/2023
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**							
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)
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
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

Hometown People. Hometown Power.

Environmental Laboratory
1232 Haco Drive
Lansing
Michigan, 48910

CHAIN OF CUSTODY

Phone: (517)702-6372

Page 1 of 1

Lab Work Order Number

Client Name: BWL - Erickson Station
Client Contact: Cheryl Louden
Address: 3725 S. Canal
City: Lansing
State/Zip: MI, 48917
Phone: (517) 702-6396
Fax: (517) 702-6373
Sampler: Marc Wahrer

Project Name: Erickson AM MI Wells 16A-D
Project Number: [none]
Project Description:
PO Number: 30926 10021
Shipped By:
Tracking Number:

Requested Turn Around

Rush requests subject to additional charge.

Rush requests subject to lab approval.

						Requested Analyses										
						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							
						Preservation Code										
Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	b	a	a	b							Sample Comments
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	Received By	Date/Time
	9-12-23 1615	Dawn Williams	9.13.23 0745

Comments

Coo: b

Matrix Codes:

Data Verification & Validation Report

Lansing Board of Water & Light – Erickson Power Station

Sampling Event (dates and purpose): Background Sampling

Data Package Number:	Lab Report Date:
S54642.01	11/17/2023
S54888.01	11/21/2023

Data Validator: Andrew Byks

Data Validation Completion Date: 12/30/2023

General Overall Assessment:
_____ Data are usable without qualification.
__X__ 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, HCO_3, CO_3, 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			

<u>Other instances of nonconformance to QC control limits noted on case narrative:</u>

None.

<u>Comments:</u>

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.

Hometown People. Hometown Power.

Lansing Board of Water and Light
Environmental Services Laboratory
1232 Haco Dr.
Lansing, Michigan 48901

20 November 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	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,

Jennifer Caporale

Jennifer Caporale, Supervisor

Sample Name: **MW-16A**

Lab #: **L310247-01 Ground Water** **Collected:** **17-Oct-23 10:46** **By:** **Marc Wahrer**

Analyte	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	

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.

Merit
Laboratories, Inc.

Analytical Laboratory Report

Final Report

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

Merit Laboratories, Inc.
2680 East Lansing Drive
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:
John Laverty (johnlaverty@meritlabs.com)
Barbara Ball (bball@meritlabs.com)

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. #:

Table of Contents

Maya Murshak

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

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	

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

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	

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

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

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	

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.

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	

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.

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	

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.	☐ Yes	☒ No	☐ N/A	Samples are received at 4C +/- 2C Thermometer #	IR 1.8
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? Subcontacted to:	GEL
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: 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			

Merit Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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.

INVOICE TO

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)

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☒ NPDES

Project Locations
☐ Detroit ☐ New York
☐ Other

MERIT LAB NO. FOR LAB USE ONLY	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives							Total Metals	F- undisstiled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness					Special Instructions
	DATE	TIME				NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER											
54642.01	10/17/23	1046	MW-16A L310247-01	GW	5	2		3					✓	✓	✓	✓	✓	✓					Metals to analyse:Na, Mg, K
.02	10/17/23	1236	MW-16B L310247-02	GW	5	2		3					✓	✓	✓	✓	✓	✓					B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03	10/17/23	1357	MW-16C L310247-03	GW	5	2		3					✓	✓	✓	✓	✓	✓					Co, Li, Hg, Mo,Pb,Se, Tl,
.04	10/17/23	1147	MW16-D L310247-04	GW	5	2		3					✓	✓	✓	✓	✓	✓					Fe, Cu, Ni, Ag, V, Zn
.05	10/17/23	1046	MWT-16A L310247-05	GW	5	2		3					✓	✓	✓	✓	✓	✓					Please send a preliminary report
.06	10/17/23	0845	Field Blank L310247-06	DI	5	2		3					✓	✓	✓	✓	✓	✓					

RELINQUISHED BY: SIGNATURE/ORGANIZATION Julie Malby ☐ Sampler DATE 10/18/23 TIME 0834
RECEIVED BY: SIGNATURE/ORGANIZATION M Chilcott DATE 10/18/23 TIME 0834
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
NOTES: TEMP. ON ARRIVAL 1.8

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

Rev. 5.18.12

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

GEL Laboratories LLC
a member of The GEL Group INC

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

Olivia Olsen for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	Client ID
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

Olivia Olsen for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

642209

Merit Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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. P.O. NO.
E-MAIL ADDRESS results@meritlabs.com QUOTE NO.
PROJECT NO./NAME S54642 SAMPLER(S) - PLEASE PRINT/SIGN NAME

INVOICE TO ☒ SAME

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

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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Radium 226*	Radium 228**
	10/17/23	1046	S54642.01	GW	2			2					✓	✓
	10/17/23	1236	S54642.02	GW	2			2					✓	✓
	10/17/23	1357	S54642.03	GW	2			2					✓	✓
	10/17/23	1147	S54642.04	GW	2			2					✓	✓
	10/17/23	1046	S54642.05	GW	2			2					✓	✓
	10/17/23	0845	S54642.06 Field Blank	DI	2			2					✓	✓

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES

Project Locations
☐ Detroit ☐ New York
☐ 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 M ☐ Sampler	DATE 10/18/23	TIME 1700	
RECEIVED BY: SIGNATURE/ORGANIZATION UPS	DATE 10/18/23	TIME 1700	
RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME	
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME	

RELINQUISHED BY: SIGNATURE/ORGANIZATION		DATE	TIME
RECEIVED BY: SIGNATURE/ORGANIZATION		DATE 10/20/23	TIME 1015
SEAL NO.	SEAL INTACT YES ☐ NO ☐	INITIALS	NOTES: TEMP. ON ARRIVAL
SEAL NO.	SEAL INTACT YES ☐ NO ☐	INITIALS	

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

Rev. 5.18.12

GEL | Laboratories LLC

DS

SAMPLE RECEIPT & REVIEW FORM

Client: MERI	SDG/AR/COC/Work Order: 642209
Received By: JW	Date Received: 10-20-23
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground [✓ UPS] Field Services Courier Other 1246647703 63864034

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?		X	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?		X	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?		X	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?		X	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?		X	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?	X	■	~~X~~	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	X	■		Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		X		Preservation Method: Wet Ice Ice Packs Dry ice [✓ None] Other: *all temperatures are recorded in Celsius TEMP: 19
4	Daily check performed and passed on IR temperature gun?	X	■		Temperature Device Serial #: IR2-23 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	X	■		Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?			X	Sample ID's and Containers Affected: S54642.01 (2 containers) S54642.06 (1 container) If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?		■	X	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?	X	■		ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	X	■		ID's and containers affected:
10	Date & time on COC match date & time on bottles?	X			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?	X	■		Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?		■	X	
13	COC form is properly signed in relinquished/received sections?	X	■		Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials OO Date 10/23/23 Page 1 of 1

GL-CHL-SR-001 Rev 7

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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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

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:	S54642.02	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

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:	S54642.03	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

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
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

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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

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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
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

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

QC Summary

Workorder: **642209**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2515277	GFC28RAL	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
WORK 2097-B	Ba-133 Tracer	.1 mL
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 Subtrate	5 mL
REGNT 4049676	Nitric Acid	5 mL
REGNT DGA092223	2503404	2 g

Comments:
Pipet Id: RAD-GFC-1795419
Data Entry Date2: 02-NOV-2023 00:00

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

Geometry: 25mm Filter

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

Sample Characteristics					**Tracer Calculations**					
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

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	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 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	0.9753	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%

2515277.xls

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:	**Product:**	**Description:** Lucas Cell Radium 226
2515281	LUC26RAL	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

Batch : 2515281
Analyst : LIN01615
Prep Date : 11/2/2023
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**							
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)
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 De-Gas to Ingrowth	Rn-222 Corrections Ingrowth to Count	Rn-222 Corrections During Count	Ra-226 Decay
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

LANSING BWL
Hometown People. Hometown Power.

Environmental Laboratory
1232 Haco Drive
Lansing
Michigan, 48910

CHAIN OF CUSTODY

Phone: (517)702-6372

Page 1 of 1

Lab Work Order Number 47

Client Name BWL - Erickson Station	Project Name Erickson AM MI Wells 16A-D
Client Contact Cheryl Louden	Project Number [none]
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	

Requested Analyses

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
b	a	a	b

Requested Turn Around

Rush requests subject to additional charge.

Rush requests subject to lab approval.

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	b	a	a	b	Sample Comments
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	Received By	Date/Time
	10-17-23 1540		540

Cooler Numbers and Temperatures

Comments

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 Louden
3725 S. Canal
Lansing, MI 48917

Project: Erickson Well Project

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	Received	Account Number
L310270	10/24/2023 8:25:00AM	

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jennifer Caporale

Jennifer Caporale, Supervisor

Sample Name: MW-100 A

Lab #: L310270-01 Ground Water Collected: 23-Oct-23 15:20 By: Marc Wahrer

Analyte	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	

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.

Merit
Laboratories, Inc.

Analytical Laboratory Report

Final Report

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

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 Laverty (johnlaverty@meritlabs.com)
Barbara Ball (bball@meritlabs.com)

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. #:

Table of Contents

Maya Murshak

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

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	

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	

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

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	

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.

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	

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.

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	

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	

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
Client: BWL01 (Board of Water & Light)
Project: Erickson Well Project 100A-100D
Submitted: 10/24/2023 09:00   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. ☒ Yes ☐ No ☐ N/A	Samples are received at 4C +/- 2C Thermometer #	IR 2.0
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? Subcontacted to:	GEL
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: S54888 Submitted: 10/24/2023 09:00

Client: BWL01 (Board of Water & Light)

Project: Erickson Well Project 100A-100D

Initial Preservation Check: 10/24/2023 09:45 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
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			

Merit
Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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.

INVOICE TO

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. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Total Metals	F- undisstiled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness
54888.01	10/23/23	1520	MW-100A L310270-01	GW	5	2		3					✓	✓	✓	✓	✓	✓
.02	10/23/23	1157	MW-100B L310270-02	GW	5	2		3					✓	✓	✓	✓	✓	✓
.03	10/23/23	1314	MW-100C L310270-03	GW	5	2		3					✓	✓	✓	✓	✓	✓
.04	10/23/23	1446	MW-100D L310270-04	GW	5	2		3					✓	✓	✓	✓	✓	✓
.05	10/23/23	1314	MWT- 100C L310270-05	GW	5	2		3					✓	✓	✓	✓	✓	✓
.06	10/23/23	1015	Field Blank L310270-06	DI	5	2		3					✓	✓	✓	✓	✓	✓

Containers & Preservatives

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/ORGANIZATION	☒ Sampler	DATE 10-24-23	TIME 0900	
RECEIVED BY: SIGNATURE/ORGANIZATION	M Ailcoto	DATE 10/24/23	TIME 0900	
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
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		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

GEL Laboratories LLC
a member of The GEL Group INC

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

Olivia Olsen for
Delaney Stone
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	Client ID
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.

Olivia Olsen

Olivia Olsen for
Delaney Stone
Project Manager

Chain of Custody and Supporting Documentation

642811

Merit Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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
P.O. NO.
QUOTE NO.

INVOICE TO

☒ SAME
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 S54888
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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Radium 226*	Radium 228**
	10/23/23	1520	S54888.01	GW	2			2					✓	✓
	10/23/23	1157	S54888.02	GW	2			2					✓	✓
	10/23/23	1314	S54888.03	GW	2			2					✓	✓
	10/23/23	1446	S54888.04	GW	2			2					✓	✓
	10/23/23	1314	S54888.05	GW	2			2					✓	✓
	10/23/23	1015	S54888.06 Field Blank	DI	2			2					✓	✓

(# Containers & Preservatives: NONE, HCl, HNO_3, H_2SO_4, NaOH, MeOH, OTHER)

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES

Project Locations
☐ Detroit ☐ New York
☐ 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 M Chilcote ☐ Sampler DATE 10/24/23 TIME 1700
RECEIVED BY: SIGNATURE/ORGANIZATION UPS DATE 10/24/23 TIME 1700
RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
RECEIVED BY: SIGNATURE/ORGANIZATION DATE TIME

RELINQUISHED BY: SIGNATURE/ORGANIZATION DATE TIME
RECEIVED BY: SIGNATURE/ORGANIZATION Thyasia Tatum DATE 10/26/23 TIME 1000
SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS
NOTES:
TEMP. ON ARRIVAL
SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS

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

Rev. 5.18.12

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: MERI	**SDG/AR/COC/Work Order:** 642811 D.S.
Received By: Thyasia Tatum	**Date Received:** 10/26/23
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground [✓ UPS] Field Services Courier Other 1Z 466 477 03 6159 2840

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): 0 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?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		Preservation Method: Wet Ice Ice Packs Dry ice [✓ None] Other: *all temperatures are recorded in Celsius TEMP: 16°C
4	Daily check performed and passed on IR temperature gun?	✓			**Temperature Device Serial #:** IR2-23 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	✓			Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?				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?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			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?	✓			Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?			✓	
13	COC form is properly signed in relinquished/received sections?	✓			Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials OO 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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	**Client Sample Identification**
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 Laverty
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

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

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:	S54888.05	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

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

QC Summary

Report Date: November 20, 2023

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

QC Summary

Workorder: **642811**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

H	Analytical holding time was exceeded
<	Result is less than value reported
>	Result is greater than value reported
UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2516028	GFC28RAL	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
WORK 2097-B	Ba-133 Tracer	.1 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 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 Subtrate	5 mL
REGNT 4049676	Nitric Acid	5 mL
REGNT 4051445	RGF-1.5M Ammonium Sulfate	10 mL
REGNT DGA092223	2503404	2 g

Comments:
Pipet Id: RAD-GFC-1795419
Data Entry Date2: 31-OCT-2023 00:00

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

Geometry: 25mm Filter

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

Sample Characteristics					**Tracer Calculations**					
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

Pos.	Detector ID	Counting Time (min.)	Gross Counts Alpha	Gross Counts Beta	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 %
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 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	0.6449	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:	**Product:**	**Description:** Lucas Cell Radium 226
2516021	LUC26RAL	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

Batch : 2516021
Analyst : LIN01615
Prep Date : 11/8/2023
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**							
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)
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

Hometown People. Hometown Power.

Environmental Laboratory
1232 Haco Drive
Lansing
Michigan, 48910

CHAIN OF CUSTODY

Phone: (517)702-6372

Page 1 of 1

Lab Work Order Number L310270

Client Name BWL - Erickson Station	**Project Name** Erickson Well Project 100A-100D
Client Contact Cheryl Louden	**Project Number** [none]
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	

Requested Analyses

Ag:: As:: B:: Ba:: Be:: Ca:: Cd:: Cr::
Cu:: Fe:: K:: Li:: Mg:: Mo:: Na:: Ni::
Cl-IC:: F-ISE:: Hard,T:: p-Alk:: SO4:: T-
Alk:: TDS:: TSS

Requested Turn Around

Rush requests subject to additional charge.

Rush requests subject to lab approval.

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	Preservation Code b	Preservation Code a	Sample Comments
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	Received By	Date/Time
	10-23-23 1630	aum	

Comments

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:	Lab Report Date:
S56029.01	12/27/2023
S56117.01	12/29/2023

Data Validator: Andrew Byks

Data Validation Completion Date: 1/3/2024

General Overall Assessment:
_____ Data are usable without qualification.
__X__ 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, HCO_3, CO_3, 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 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	Received	Account Number
L311201	11/22/2023 7:40:00AM	

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jennifer Caporale

Jennifer Caporale, Supervisor

Analytical Report

Client:	BWL - Erickson Station	**Client Project Manager:**	Cheryl Louden	**Report Date:**	12/27/2023
Address:	3725 S. Canal				
	Lansing MI, 48917				

Sample Name: MW-16A

Lab #: L311201-01 Ground Water Collected: 21-Nov-23 11:26 By: Marc Wahrer

Analyte	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	

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.

Analytical Laboratory Report

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

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:
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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. #:

Table of Contents

Maya Murshak

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

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	

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.

Analytical Laboratory 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

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

#	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 13:19, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	7.25	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	0.36	1.0	0.13	mg/L	5	16984-48-8	b
Sulfate	4.47	5	0.30	mg/L	5	14808-79-8	b

Method: SM2320B, Run Date: 11/22/23 14:48, 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 13:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	118	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	372	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	2.0	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 11/22/23 12:02, 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	0.035	0.005	0.000900	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000200	mg/L	5	7440-41-7	
Boron	4.85	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: S56029.04 (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.

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	

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. ☐ Yes ☒ No ☐ N/A	Samples are received at 4C +/- 2C Thermometer #	IR 1.8
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? Subcontacted to:	GEL
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: S56029 Submitted: 11/22/2023 08:08

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: 11/22/2023 08:52 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
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			

Merit Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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.

INVOICE TO

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)

Certifications
☐OHIO VAP ☐Drinking Water
☐DoD ☒NPDES

Project Locations
☐Detroit ☐New York
☐Other

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives NONE	HCl	HNO$_3$	H$_2$SO$_4$	NaOH	MeOH	OTHER	Total Metals	F- undisstiled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness					Special Instructions
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/ORGANIZATION ☒Sampler DATE 11-22-23 TIME 0808
RECEIVED BY: SIGNATURE/ORGANIZATION M Chilcote DATE 11/22/23 TIME 0808
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
NOTES: TEMP. ON ARRIVAL 1.8

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

Rev. 5.18.12

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

GEL Laboratories LLC
a member of The GEL Group INC

2040 Savage Road | Charleston, SC 29407
843.556.8171

gel.com

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

Delaney Stonesmith
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	Client ID
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.

Delaney Stonesmith

Delaney Stonesmith
Project Manager

Chain of Custody and Supporting Documentation

644851

Merit Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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. P.O. NO.
E-MAIL ADDRESS results@meritlabs.com QUOTE NO.

INVOICE TO

CONTACT NAME Julie Teague ☒ SAME
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 S56029
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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES

Project Locations
☐ Detroit ☐ New York
☐ Other

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Radium 226*	Radium 228**	Special Instructions
	11/21/23	1126	S56029.01	GW	2			2					✓	✓	* E903.1 Mod.
	11/21/23	1341	S56029.02	GW	2			2					✓	✓	** E904.0/SW 9320 Mod.
	11/21/23	1456	S56029.03	GW	2			2					✓	✓	
	11/21/23	1234	S56029.04	GW	2			2					✓	✓	Please use calculation product &
	11/21/23	1126	S56029.05	GW	2			2					✓	✓	provide Radium 226/228 combined
	11/21/23	0925	S56029.06 Field Blank	DI	2			2					✓	✓	results on the report
															(No Ice needed)
															** Subcontracted to
															GEL Laboratories, Inc.
															2040 Savage Road
															Charleston, SC 29407

RELINQUISHED BY: SIGNATURE/ORGANIZATION	M Chilcott ☐ Sampler	DATE 11/27/23	TIME 1700
RECEIVED BY: SIGNATURE/ORGANIZATION	WPS	DATE 11/27/23	TIME 1700
RELINQUISHED BY: SIGNATURE/ORGANIZATION		DATE 11/27/23	TIME 1030
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
NOTES: TEMP. ON ARRIVAL

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

Rev. 5.18.12

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: MERI	**SDG/AR/COC/Work Order:** 646851 D.S.
Received By: Thyasia Tatum	**Date Received:** 11·29·23
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground [✓ UPS] Field Services Courier Other 1246647703 6185 9866

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): 0 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?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		Preservation Method: Wet Ice Ice Packs Dry ice [✓ None] Other: *all temperatures are recorded in Celsius **TEMP:** 16°C
4	Daily check performed and passed on IR temperature gun?	✓			**Temperature Device Serial #:** IR2-23 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	✓			Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	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?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			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?	✓			Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?			✓	
13	COC form is properly signed in relinquished/received sections?	✓			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 OO

11/30/23

GL-CHL-SR-001 Rev 7

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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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

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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

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:	S56029.02	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
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

GEL LABORATORIES LLC

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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
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

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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

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
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

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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:	S56029.06 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

Page 1 of 2

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		0.980	pCi/L	29.5		(0% - 100%)	LXP1	12/10/23	09:50
	Uncertainty	+/-0.366		+/-0.462							
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

QC Summary

Workorder: **646851**

Parmname	**NOM**	**Sample**	**Qual**	**QC**	**Units**	**RPD%**	**REC%**	**Range**	**Anlst**	**Date**	**Time**

UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2533748	GFC28RAL	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
WORK 2097-B	Ba-133 Tracer	.1 mL
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

Comments:

Pipet Id: RAD-GFC-1795419
Data Entry Date2: 04-DEC-2023 00:00

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

Geometry: 25mm Filter

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

Sample Characteristics					**Tracer Calculations**					
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

Pos.	Detector ID	Counting Time (min.)	Gross Counts Alpha	Gross Counts Beta	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 %
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

* - RPD changed to 0% due to sample & dup activity below MDA

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): 517.50
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	0.9543	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

Gas Flow Proportional Counter Checks for 13-Dec-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 XTalk	13-Dec 05:44	5	8.16E-4	1.44E-4	6.84E-4	+4.47
LB4100H1	Above	Alpha bkg	13-Dec 05:56	60	0.633	-8.08E-2	0.225	+11.00
LB4100H1	Above	Alpha eff	13-Dec 05:36	5	12754	7523	11160	+5.63
LB4100H1	Above	Beta bkg	13-Dec 05:56	60	3.883	-5.15E-1	3.743	+3.20
LB4100H2	Above	Alpha bkg	13-Dec 05:57	60	0.700	-1.57E-1	0.356	+7.03
LB4100H2	Above	Alpha eff	13-Dec 05:36	5	10746	3998	10030	+3.71
LB4100H2	Above	Beta bkg	13-Dec 05:57	60	2.400	0.704	2.217	+3.73
LB4100H3	need 2nd	Alpha bkg	13-Dec 08:45	60	0.133	-9.64E-2	0.246	+1.03
LB4100H4	Above	Alpha bkg	13-Dec 05:57	60	0.583	-5.21E-2	0.241	+9.99
LB4100H4	Above	Alpha eff	13-Dec 05:36	5	18421	15460	17860	+4.40
LB4100H4	Above	Beta bkg	13-Dec 05:57	60	2.217	0.813	1.717	+6.32
LB4100H4	Above	Beta eff	13-Dec 05:44	5	29025	26480	28120	+6.31
LB4200GB2	Below	Alpha eff	13-Dec 05:20	5	9435	9443	9898	-3.10
LB4200GB2	Above	Beta bkg	13-Dec 12:33	60	27.800	0.129	1.304	+138.24
LB4200GD3	Above	Alpha bkg	13-Dec 12:33	60	1.033	-4.84E-2	0.228	+20.45
LB4200GD3	Below	Alpha eff	13-Dec 05:29	5	21643	21680	22220	-3.41
PIC14B	Above	Beta bkg	13-Dec 06:35	60	2.600	-1.06E-1	1.026	+11.34

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

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

PIC1B	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 Jc Poparad

Date 12/13/23

GEL Laboratories LLC

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:	**Product:**	**Description:** Lucas Cell Radium 226
2532924	LUC26RAL	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

Batch : 2532924
Analyst : LIN01615
Prep Date : 12/6/2023
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**							
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)
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 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

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

LANSING BWL
Hometown People. Hometown Power.

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	
Client Contact Cheryl Louden		Project Number [none]	
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			

Requested Turn Around

Rush requests subject to additional charge.

Rush requests subject to lab approval

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	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							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
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

Comments

Cooler Numbers and Temperatures EN776 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 Louden
3725 S. Canal
Lansing, MI 48917

Project: Erickson Well Project

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	Received	Account Number
L311202	11/28/2023 7:40:00AM	

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jennifer Caporale

Jennifer Caporale, Supervisor

Sample Name: MW-100 A

Lab #: L311202-01 Ground Water

Collected: 27-Nov-23 15:33 **By: Marc Wahrer**

Analyte	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	Result	Reporting Limit	Units	Dilution	Regulatory Limit	Analysis Date/Time	By	Method	Notes
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	

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.

Merit
Laboratories, Inc.

Analytical Laboratory Report

Supplemental Report

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.
2680 East Lansing Drive
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:
John Laverty (johnlaverty@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. #:

Table of Contents

Maya Murshak

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

Analytical Laboratory Report

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

Analytical Laboratory Report

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

#	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 11:08, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	10.0	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	0.66	1.0	0.13	mg/L	5	16984-48-8	b
Sulfate	16.2	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 11/29/23 14:06, 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: 11/29/23 12:08, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Hardness	398	20	4.76	mg/L	20		

Method: SM2540C, Run Date: 11/28/23 20:21, Analyst: MDG

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Dissolved Solids	402	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	8.6	3	1	mg/L	1		

Metals

Method: E200.8, Run Date: 11/28/23 11:42, Analyst: CCM

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Antimony*	Not detected	0.005	0.00225	mg/L	5	7440-36-0	
Arsenic	0.014	0.002	0.00145	mg/L	5	7440-38-2	
Barium	0.199	0.005	0.000900	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000200	mg/L	5	7440-41-7	
Boron	0.04	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: S56117.01 (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.

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.

Analytical Laboratory 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

#	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 11:33, Analyst: ASB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Chloride	5.01	5	0.08	mg/L	5	16887-00-6	
Fluoride (Undistilled)	0.13	1.0	0.13	mg/L	5	16984-48-8	b
Sulfate	5.59	5	0.30	mg/L	5	14808-79-8	

Method: SM2320B, Run Date: 11/29/23 14:16, 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: 11/29/23 12:18, 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	306	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	1.2	3	1	mg/L	1		b

Metals

Method: E200.8, Run Date: 11/28/23 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	0.081	0.005	0.000900	mg/L	5	7440-39-3	
Beryllium	Not detected	0.001	0.000200	mg/L	5	7440-41-7	
Boron	1.82	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

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.

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	

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.	☒ Yes	☐ No	☐ N/A	Samples are received at 4C +/- 2C Thermometer #	IR 2.1
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? Subcontacted to:	GEL
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: 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			

Merit Laboratories, Inc.

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

CHAIN OF CUSTODY RECORD

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.

INVOICE TO

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)

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☒ NPDES

Project Locations
☐ Detroit ☐ New York
☐ Other

MERIT LAB NO. FOR LAB USE ONLY	YEAR DATE	YEAR TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Total Metals	F- undisstiled, Cl-, SO4, TDS	Radium 226	Radium 228	TSS	HCO3, CO3, Hardness					Special Instructions
56117.01	11.27.23	1533	MW-100A L311202-01	GW	5	2		3					✓	✓	✓	✓	✓	✓					Metals to analyse:Na, Mg, K
.02		1154	MW-100B -02	GW	5	2		3					✓	✓	✓	✓	✓	✓					B, Ca, Sb, As, Ba, Be, Cd, Cr,
.03		1316	MW-100C -03	GW	5	2		3					✓	✓	✓	✓	✓	✓					Co, Li, Hg, Mo,Pb,Se, Tl,
.04		1458	MW-100D -04	GW	5	2		3					✓	✓	✓	✓	✓	✓					Fe, Cu, Ni, Ag, V, Zn
.05		1316	MWT-100C -05	GW	5	2		3					✓	✓	✓	✓	✓	✓					Please send a preliminary report
.06		1005	Field Blank -06	DI	5	2		3					✓	✓	✓	✓	✓	✓					

RELINQUISHED BY: SIGNATURE/ORGANIZATION ☒ Sampler DATE 11-28-23 TIME 0805
RECEIVED BY: SIGNATURE/ORGANIZATION M Chilcote DATE 11/28/23 TIME 0805
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
NOTES: TEMP. ON ARRIVAL 2.1

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

Rev. 5.18.12

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

GEL Laboratories LLC
a member of The GEL Group INC

2040 Savage Road | Charleston, SC 29407
843.556.8171

gel.com

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

Olivia Olsen for
Delaney Stonesmith
Project Manager

Purchase Order: GELP20-0018
Enclosures

Table of Contents

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:

Laboratory ID	Client ID
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.

Olivia Olsen

Olivia Olsen for
Delaney Stonesmith
Project Manager

Chain of Custody and Supporting Documentation

646993

Merit Laboratories Inc

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

CHAIN OF CUSTODY RECORD

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. P.O. NO.
E-MAIL ADDRESS results@meritlabs.com QUOTE NO.

INVOICE TO

CONTACT NAME Julie Teague ☒ SAME
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 S56117
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=WIPE A=AIR W=WASTE

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO. FOR LAB USE ONLY	DATE	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO_3	H_2SO_4	NaOH	MeOH	OTHER	Radium 226*	Radium 228**
	11/27/23	1533	S56117.01	GW	2			2					✓	✓
	11/27/23	1154	S56117.02	GW	2			2					✓	✓
	11/27/23	1316	S56117.03	GW	2			2					✓	✓
	11/27/23	1458	S56117.04	GW	2			2					✓	✓
	11/27/23	1316	S56117.05	GW	2			2					✓	✓
	11/27/23	1005	S56117.06 Field Blank	DI	2			2					✓	✓

Certifications
☐ OHIO VAP ☐ Drinking Water
☐ DoD ☐ NPDES
Project Locations
☐ Detroit ☐ New York
☐ 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 M Chilcote ☐ Sampler DATE TIME
RECEIVED BY: SIGNATURE/ORGANIZATION UPS 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 11/30/23 TIME 1105
SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS NOTES: TEMP. ON ARRIVAL
SEAL NO. SEAL INTACT YES ☐ NO ☐ INITIALS

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

Rev. 5.18.12

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: MERI	SDG/AR/COC/Work Order: 646993 | 996
Received By: Me'Shalia Mckelvey	Date Received: 11/30/23
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground [✓ UPS] Field Services Courier Other 1Z 466 477 03 6390 8960

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): 0 [✓ 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?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		Preservation Method: Wet Ice Ice Packs Dry ice [✓ None] Other: *all temperatures are recorded in Celsius TEMP: 8°
4	Daily check performed and passed on IR temperature gun?	✓			Temperature Device Serial #: IR6-23 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	✓			Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	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?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			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?	✓			Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?			✓	
13	COC form is properly signed in relinquished/received sections?	✓			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

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).

GEL Sample ID#	Client Sample Identification
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).

GEL Sample ID#	Client Sample Identification
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)

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: 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: John Petrovic **Name:** **John Petrovic**

Date: **28 DEC 2023** **Title:** **Data Validator**

Sample Data Summary

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
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

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
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

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
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

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
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

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: S56117.05
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
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

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
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: 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		0.980	pCi/L	29.5		(0% - 100%)	LXP1	12/10/23 09:50
	Uncertainty	+/-0.366		+/-0.462						
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

QC Summary

Workorder: **646993**

Parmname	**NOM**	**Sample**	**Qual**	**QC**	**Units**	**RPD%**	**REC%**	**Range**	**Anlst**	**Date**	**Time**

UI	Gamma Spectroscopy--Uncertain identification
BD	Results are either below the MDC or tracer recovery is low
h	Preparation or preservation holding time was exceeded
R	Sample results are rejected
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
N/A	RPD or %Recovery limits do not apply.
ND	Analyte concentration is not detected above the detection limit
M	M if above MDC and less than LLD
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
FA	Failed analysis.
UJ	Gamma Spectroscopy--Uncertain identification
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
N1	See case narrative
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
**	Analyte is a Tracer compound
M	REMP Result > MDC/CL and < RDL
J	See case narrative for an explanation

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:	**Product:**	**Description:** Gas Flow Radium 228
2533748	GFC28RAL	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
WORK 2097-B	Ba-133 Tracer	.1 mL
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

Comments:
Pipet Id: RAD-GFC-1795419
Data Entry Date2: 04-DEC-2023 00:00

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

Geometry: 25mm Filter

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

Sample Characteristics					**Tracer Calculations**					
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

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	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

* - RPD changed to 0% due to sample & dup activity below MDA

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): 517.50
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	0.9543	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%

2533748.xls

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

Gas Flow Proportional Counter Checks for 13-Dec-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 XTalk	13-Dec 05:44	5	8.16E-4	1.44E-4	6.84E-4	+4.47
LB4100H1	Above	Alpha bkg	13-Dec 05:56	60	0.633	-8.08E-2	0.225	+11.00
LB4100H1	Above	Alpha eff	13-Dec 05:36	5	12754	7523	11160	+5.63
LB4100H1	Above	Beta bkg	13-Dec 05:56	60	3.883	-5.15E-1	3.743	+3.20
LB4100H2	Above	Alpha bkg	13-Dec 05:57	60	0.700	-1.57E-1	0.356	+7.03
LB4100H2	Above	Alpha eff	13-Dec 05:36	5	10746	3998	10030	+3.71
LB4100H2	Above	Beta bkg	13-Dec 05:57	60	2.400	0.704	2.217	+3.73
LB4100H3	need 2nd	Alpha bkg	13-Dec 08:45	60	0.133	-9.64E-2	0.246	+1.03
LB4100H4	Above	Alpha bkg	13-Dec 05:57	60	0.583	-5.21E-2	0.241	+9.99
LB4100H4	Above	Alpha eff	13-Dec 05:36	5	18421	15460	17860	+4.40
LB4100H4	Above	Beta bkg	13-Dec 05:57	60	2.217	0.813	1.717	+6.32
LB4100H4	Above	Beta eff	13-Dec 05:44	5	29025	26480	28120	+6.31
LB4200GB2	Below	Alpha eff	13-Dec 05:20	5	9435	9443	9898	-3.10
LB4200GB2	Above	Beta bkg	13-Dec 12:33	60	27.800	0.129	1.304	+138.24
LB4200GD3	Above	Alpha bkg	13-Dec 12:33	60	1.033	-4.84E-2	0.228	+20.45
LB4200GD3	Below	Alpha eff	13-Dec 05:29	5	21643	21680	22220	-3.41
PIC14B	Above	Beta bkg	13-Dec 06:35	60	2.600	-1.06E-1	1.026	+11.34

INSTRUMENTS NOT LISTED HAVE PASSED ALL QUALITY ASSURANCE PARAMETERS

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

PIC1B	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 Jc Poparad

Date 12/13/23

GEL Laboratories LLC

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:	**Product:**	**Description:** Lucas Cell Radium 226
2532924	LUC26RAL	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

Batch : 2532924
Analyst : LIN01615
Prep Date : 12/6/2023
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**							
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)
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 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

Lyndsey Pace

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

LANSING BWL
Hometown People. Hometown Power.

Environmental Laboratory
1232 Haco Drive
Lansing
Michigan, 48910

CHAIN OF CUSTODY

Phone: (517)702-6372

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Lab Work Order Number L311202

Client Name BWL - Erickson Station	Project Name Erickson Well Project
Client Contact Cheryl Louden	Project Number [none]
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
Sampler Marc Wahrer	Tracking Number

Requested Analyses

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						

Requested Turn Around

Rush requests subject to additional charge.

Rush requests subject to lab approval.

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type Grab/Composite	Matrix Code	Container Count	b	a	a	b							Sample Comments
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							

(Preservation Code row: b, a, a, b)

Relinquished By	Date/Time	Received By	Date/Time
	11-27-23 1645	Dawn Wells	11.28 23 0740

Comments

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 Reports

BWL Glacial (State Program) - 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 III	Boron	mg/L	16	0%	2020-04-28 to 2023-08-01	Normal LCL	4.69
MW-2	Appendix III	Calcium	mg/L	16	0%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	237
MW-2	Appendix III	Chloride	mg/L	16	0%	2020-04-28 to 2023-08-01	Normal LCL	79.1
MW-2	Appendix III	Fluoride	mg/L	16	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	1.00
MW-2	Appendix III	pH, Field	su	17	0%	2020-04-28 to 2023-08-01	Normal LCL	6.72
MW-2	Appendix III	Sulfate	mg/L	16	0%	2020-04-28 to 2023-08-01	Normal LCL	423
MW-2	Appendix III	Total Dissolved Solids	mg/L	16	0%	2020-04-28 to 2023-08-01	Normal LCL	1,198
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	Fluoride	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	1.00
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-2	Part 115	Copper	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00500
MW-2	Part 115	Iron	mg/L	17	0%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.510
MW-2	Part 115	Nickel	mg/L	17	0%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.0200
MW-2	Part 115	Silver	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.000500
MW-2	Part 115	Vanadium	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00500
MW-2	Part 115	Zinc	mg/L	17	82%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00500
MW-3	Appendix III	Boron	mg/L	6	0%	2021-05-04 to 2023-08-01	Nonparametric LCL around the Median	5.41
MW-3	Appendix III	Calcium	mg/L	6	0%	2021-05-04 to 2023-08-01	Nonparametric LCL around the Median	223
MW-3	Appendix III	Chloride	mg/L	6	0%	2021-05-04 to 2023-08-01	Nonparametric LCL around the Median	89.0
MW-3	Appendix III	Fluoride	mg/L	6	100%	2021-05-04 to 2023-08-01	Nonparametric LCL around the Median	1.00
MW-3	Appendix III	pH, Field	su	6	0%	2021-05-04 to 2023-08-01	Nonparametric LCL around the Median	7.15
MW-3	Appendix III	Sulfate	mg/L	6	0%	2021-05-04 to 2023-08-01	Nonparametric LCL around the Median	675
MW-3	Appendix III	Total Dissolved Solids	mg/L	6	0%	2021-05-04 to 2023-08-01	Nonparametric LCL around the Median	1,440
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	Fluoride	mg/L	6	100%	2021-05-04 to 2023-08-01	Nonparametric LCL around the Median	1.00
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-3	Part 115	Copper	mg/L	6	100%	2021-05-04 to 2023-08-01	Nonparametric LCL around the Median	0.00500
MW-3	Part 115	Iron	mg/L	6	0%	2021-05-04 to 2023-08-01	Nonparametric LCL around the Median	1.70
MW-3	Part 115	Nickel	mg/L	6	100%	2021-05-04 to 2023-08-01	Nonparametric LCL around the Median	0.00500
MW-3	Part 115	Silver	mg/L	6	100%	2021-05-04 to 2023-08-01	Nonparametric LCL around the Median	0.000500
MW-3	Part 115	Vanadium	mg/L	6	100%	2021-05-04 to 2023-08-01	Nonparametric LCL around the Median	0.00500
MW-3	Part 115	Zinc	mg/L	6	100%	2021-05-04 to 2023-08-01	Nonparametric LCL around the Median	0.00500
MW-5	Appendix III	Boron	mg/L	16	0%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	4.29
MW-5	Appendix III	Calcium	mg/L	16	0%	2020-04-28 to 2023-08-01	Normal LCL	217
MW-5	Appendix III	Chloride	mg/L	16	0%	2020-04-28 to 2023-08-01	Normal LCL	64.9
MW-5	Appendix III	Fluoride	mg/L	16	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	1.00
MW-5	Appendix III	pH, Field	su	17	0%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	7.17
MW-5	Appendix III	Sulfate	mg/L	16	0%	2020-04-28 to 2023-08-01	Normal LCL	587
MW-5	Appendix III	Total Dissolved Solids	mg/L	16	0%	2020-04-28 to 2023-08-01	Normal LCL	1,233
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	Fluoride	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	1.00
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-5	Part 115	Copper	mg/L	17	71%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00500
MW-5	Part 115	Iron	mg/L	17	6%	2020-04-28 to 2023-08-01	Gamma MLE Normal Approx. LCL	0.775
MW-5	Part 115	Nickel	mg/L	17	0%	2020-04-28 to 2023-08-01	Normal LCL	0.0100
MW-5	Part 115	Silver	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.000500
MW-5	Part 115	Vanadium	mg/L	17	88%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00500
MW-5	Part 115	Zinc	mg/L	17	24%	2020-04-28 to 2023-08-01	Gamma MLE Normal Approx. LCL	0.00955
MW-6	Appendix III	Boron	mg/L	16	0%	2020-04-28 to 2023-08-01	Normal LCL	0.736
MW-6	Appendix III	Calcium	mg/L	16	0%	2020-04-28 to 2023-08-01	Normal LCL	160
MW-6	Appendix III	Chloride	mg/L	16	0%	2020-04-28 to 2023-08-01	Normal LCL	31.4
MW-6	Appendix III	Fluoride	mg/L	16	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	1.00
MW-6	Appendix III	pH, Field	su	17	0%	2020-04-28 to 2023-08-01	Normal LCL	6.66
MW-6	Appendix III	Sulfate	mg/L	16	0%	2020-04-28 to 2023-08-01	Normal LCL	166
MW-6	Appendix III	Total Dissolved Solids	mg/L	16	0%	2020-04-28 to 2023-08-01	Normal LCL	723
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	Fluoride	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	1.00
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-6	Appendix IV	Mercury	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.000200
MW-6	Appendix IV	Molybdenum	mg/L	17	0%	2020-04-28 to 2023-08-01	Normal LCL	0.0243
MW-6	Appendix IV	Radium-226/228	pCi/L	17	0%	2020-04-28 to 2023-08-01	Normal LCL	0.677
MW-6	Appendix IV	Selenium	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00500
MW-6	Appendix IV	Thallium	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00200
MW-6	Part 115	Copper	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00500
MW-6	Part 115	Iron	mg/L	17	47%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median*	0.0200
MW-6	Part 115	Nickel	mg/L	17	18%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00600
MW-6	Part 115	Silver	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.000500
MW-6	Part 115	Vanadium	mg/L	17	100%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00500
MW-6	Part 115	Zinc	mg/L	17	94%	2020-04-28 to 2023-08-01	Nonparametric LCL around the Median	0.00500
MW-7	Appendix III	Boron	mg/L	11	0%	2021-06-15 to 2023-08-02	Normal LCL	1.61
MW-7	Appendix III	Calcium	mg/L	11	0%	2021-06-15 to 2023-08-02	Normal LCL	106
MW-7	Appendix III	Chloride	mg/L	11	0%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	73.0
MW-7	Appendix III	Fluoride	mg/L	11	91%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	1.00
MW-7	Appendix III	pH, Field	su	11	0%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	7.40
MW-7	Appendix III	Sulfate	mg/L	11	0%	2021-06-15 to 2023-08-02	Normal LCL	185
MW-7	Appendix III	Total Dissolved Solids	mg/L	11	0%	2021-06-15 to 2023-08-02	Normal LCL	576
MW-7	Appendix IV	Antimony	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-7	Appendix IV	Arsenic	mg/L	11	0%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-7	Appendix IV	Barium	mg/L	11	0%	2021-06-15 to 2023-08-02	Normal LCL	0.0513
MW-7	Appendix IV	Beryllium	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00100
MW-7	Appendix IV	Cadmium	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.000500
MW-7	Appendix IV	Chromium	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-7	Appendix IV	Cobalt	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-7	Appendix IV	Fluoride	mg/L	11	91%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	1.00
MW-7	Appendix IV	Lead	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00300
MW-7	Appendix IV	Lithium	mg/L	11	0%	2021-06-15 to 2023-08-02	Normal LCL	0.0842
MW-7	Appendix IV	Mercury	mg/L	11	91%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.000200
MW-7	Appendix IV	Molybdenum	mg/L	11	0%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.173
MW-7	Appendix IV	Radium-226/228	pCi/L	11	0%	2021-06-15 to 2023-08-02	Normal LCL	1.64
MW-7	Appendix IV	Selenium	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-7	Appendix IV	Thallium	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00200
MW-7	Part 115	Copper	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-7	Part 115	Iron	mg/L	11	0%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	1.19
MW-7	Part 115	Nickel	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-7	Part 115	Silver	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.000500
MW-7	Part 115	Vanadium	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-7	Part 115	Zinc	mg/L	11	73%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-7C	Appendix III	Boron	mg/L	11	0%	2022-03-10 to 2023-08-02	Normal LCL	6.48

MW-7C	Appendix III	Calcium	mg/L	11	0%	2022-03-10 to 2023-08-02	Nonparametric LCL around the Median	235
MW-7C	Appendix III	Chloride	mg/L	11	0%	2022-03-10 to 2023-08-02	Normal LCL	92.1
MW-7C	Appendix III	Fluoride	mg/L	11	100%	2022-03-10 to 2023-08-02	Nonparametric LCL around the Median	1.00
MW-7C	Appendix III	pH, Field	su	11	0%	2022-03-10 to 2023-08-02	Normal LCL	7.28
MW-7C	Appendix III	Sulfate	mg/L	11	0%	2022-03-10 to 2023-08-02	Normal LCL	680
MW-7C	Appendix III	Total Dissolved Solids	mg/L	11	0%	2022-03-10 to 2023-08-02	Nonparametric LCL around the Median	1,360
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	Fluoride	mg/L	11	100%	2022-03-10 to 2023-08-02	Nonparametric LCL around the Median	1.00
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
MW-7C	Part 115	Copper	mg/L	11	100%	2022-03-10 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-7C	Part 115	Iron	mg/L	11	0%	2022-03-10 to 2023-08-02	Normal LCL	3.90
MW-7C	Part 115	Nickel	mg/L	11	0%	2022-03-10 to 2023-08-02	Nonparametric LCL around the Median	0.00700
MW-7C	Part 115	Silver	mg/L	11	100%	2022-03-10 to 2023-08-02	Nonparametric LCL around the Median	0.000500
MW-7C	Part 115	Vanadium	mg/L	11	100%	2022-03-10 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-7C	Part 115	Zinc	mg/L	11	82%	2022-03-10 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-8	Appendix III	Boron	mg/L	11	9%	2021-06-15 to 2023-08-02	Normal MLE LCL	0.0615
MW-8	Appendix III	Calcium	mg/L	11	0%	2021-06-15 to 2023-08-02	Normal LCL	91.4
MW-8	Appendix III	Chloride	mg/L	11	18%	2021-06-15 to 2023-08-02	Gamma MLE Normal Approx. LCL	9.84
MW-8	Appendix III	Fluoride	mg/L	11	91%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	1.00
MW-8	Appendix III	pH, Field	su	11	0%	2021-06-15 to 2023-08-02	Normal LCL	7.04
MW-8	Appendix III	Sulfate	mg/L	11	0%	2021-06-15 to 2023-08-02	Normal LCL	17.0
MW-8	Appendix III	Total Dissolved Solids	mg/L	11	0%	2021-06-15 to 2023-08-02	Normal LCL	376
MW-8	Appendix IV	Antimony	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-8	Appendix IV	Arsenic	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00200
MW-8	Appendix IV	Barium	mg/L	11	0%	2021-06-15 to 2023-08-02	Normal LCL	0.0200
MW-8	Appendix IV	Beryllium	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00100
MW-8	Appendix IV	Cadmium	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.000500
MW-8	Appendix IV	Chromium	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-8	Appendix IV	Cobalt	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-8	Appendix IV	Fluoride	mg/L	11	91%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	1.00
MW-8	Appendix IV	Lead	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00300
MW-8	Appendix IV	Lithium	mg/L	11	45%	2021-06-15 to 2023-08-02	Normal MLE LCL	0.00275
MW-8	Appendix IV	Mercury	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.000200
MW-8	Appendix IV	Molybdenum	mg/L	11	82%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-8	Appendix IV	Radium-226/228	pCi/L	11	0%	2021-06-15 to 2023-08-02	Adjusted Gamma LCL	1.25
MW-8	Appendix IV	Selenium	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-8	Appendix IV	Thallium	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00200
MW-8	Part 115	Copper	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-8	Part 115	Iron	mg/L	11	91%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.0200
MW-8	Part 115	Nickel	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-8	Part 115	Silver	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.000500
MW-8	Part 115	Vanadium	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-8	Part 115	Zinc	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-9	Appendix III	Boron	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.0400
MW-9	Appendix III	Calcium	mg/L	11	0%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	66.3
MW-9	Appendix III	Chloride	mg/L	11	91%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	5.00
MW-9	Appendix III	Fluoride	mg/L	11	91%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	1.00
MW-9	Appendix III	pH, Field	su	11	0%	2021-06-15 to 2023-08-02	Normal LCL	7.21
MW-9	Appendix III	Sulfate	mg/L	11	73%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	5.00
MW-9	Appendix III	Total Dissolved Solids	mg/L	11	0%	2021-06-15 to 2023-08-02	Normal LCL	245
MW-9	Appendix IV	Antimony	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-9	Appendix IV	Arsenic	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00200
MW-9	Appendix IV	Barium	mg/L	11	0%	2021-06-15 to 2023-08-02	Normal LCL	0.0135
MW-9	Appendix IV	Beryllium	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00100
MW-9	Appendix IV	Cadmium	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.000500
MW-9	Appendix IV	Chromium	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-9	Appendix IV	Cobalt	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-9	Appendix IV	Fluoride	mg/L	11	91%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	1.00
MW-9	Appendix IV	Lead	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00300
MW-9	Appendix IV	Lithium	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-9	Appendix IV	Mercury	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.000200

MW-9	Appendix IV	Molybdenum	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-9	Appendix IV	Radium-226/228	pCi/L	11	0%	2021-06-15 to 2023-08-02	Normal LCL	0.663
MW-9	Appendix IV	Selenium	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-9	Appendix IV	Thallium	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00200
MW-9	Part 115	Copper	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-9	Part 115	Iron	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.0200
MW-9	Part 115	Nickel	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-9	Part 115	Silver	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.000500
MW-9	Part 115	Vanadium	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-9	Part 115	Zinc	mg/L	11	91%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-10	Appendix III	Boron	mg/L	11	0%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.0500
MW-10	Appendix III	Calcium	mg/L	11	0%	2021-06-15 to 2023-08-02	Normal LCL	125
MW-10	Appendix III	Chloride	mg/L	11	82%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	5.00
MW-10	Appendix III	Fluoride	mg/L	11	91%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	1.00
MW-10	Appendix III	pH, Field	su	11	0%	2021-06-15 to 2023-08-02	Normal LCL	6.61
MW-10	Appendix III	Sulfate	mg/L	11	0%	2021-06-15 to 2023-08-02	Normal LCL	12.6
MW-10	Appendix III	Total Dissolved Solids	mg/L	11	0%	2021-06-15 to 2023-08-02	Normal LCL	419
MW-10	Appendix IV	Antimony	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-10	Appendix IV	Arsenic	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00200
MW-10	Appendix IV	Barium	mg/L	11	0%	2021-06-15 to 2023-08-02	Normal LCL	0.0388
MW-10	Appendix IV	Beryllium	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00100
MW-10	Appendix IV	Cadmium	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.000500
MW-10	Appendix IV	Chromium	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-10	Appendix IV	Cobalt	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-10	Appendix IV	Fluoride	mg/L	11	91%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	1.00
MW-10	Appendix IV	Lead	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00300
MW-10	Appendix IV	Lithium	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
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-10	Part 115	Copper	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-10	Part 115	Iron	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.0200
MW-10	Part 115	Nickel	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-10	Part 115	Silver	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.000500
MW-10	Part 115	Vanadium	mg/L	11	100%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-10	Part 115	Zinc	mg/L	11	82%	2021-06-15 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-13	Appendix III	Boron	mg/L	11	0%	2022-02-23 to 2023-08-02	Normal LCL	0.157
MW-13	Appendix III	Calcium	mg/L	11	0%	2022-02-23 to 2023-08-02	Adjusted Gamma LCL	100
MW-13	Appendix III	Chloride	mg/L	11	18%	2022-02-23 to 2023-08-02	Normal MLE LCL	8.34
MW-13	Appendix III	Fluoride	mg/L	11	100%	2022-02-23 to 2023-08-02	Nonparametric LCL around the Median	1.00
MW-13	Appendix III	pH, Field	su	11	0%	2022-02-23 to 2023-08-02	Nonparametric LCL around the Median	6.91
MW-13	Appendix III	Sulfate	mg/L	11	0%	2022-02-23 to 2023-08-02	Normal LCL	23.9
MW-13	Appendix III	Total Dissolved Solids	mg/L	11	0%	2022-02-23 to 2023-08-02	Normal LCL	374
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	Fluoride	mg/L	11	100%	2022-02-23 to 2023-08-02	Nonparametric LCL around the Median	1.00
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-13	Part 115	Copper	mg/L	11	100%	2022-02-23 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-13	Part 115	Iron	mg/L	11	9%	2022-02-23 to 2023-08-02	Gamma MLE Normal Approx. LCL	0.0297
MW-13	Part 115	Nickel	mg/L	11	100%	2022-02-23 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-13	Part 115	Silver	mg/L	11	100%	2022-02-23 to 2023-08-02	Nonparametric LCL around the Median	0.000500
MW-13	Part 115	Vanadium	mg/L	11	100%	2022-02-23 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-13	Part 115	Zinc	mg/L	11	91%	2022-02-23 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-14	Appendix III	Boron	mg/L	8	0%	2023-01-12 to 2023-09-15	Normal LCL	2.09
MW-14	Appendix III	Calcium	mg/L	8	0%	2023-01-12 to 2023-09-15	Normal LCL	143
MW-14	Appendix III	Chloride	mg/L	8	0%	2023-01-12 to 2023-09-15	Normal LCL	111
MW-14	Appendix III	Fluoride	mg/L	8	100%	2023-01-12 to 2023-09-15	Nonparametric LCL around the Median	1.00
MW-14	Appendix III	pH, Field	su	8	0%	2023-01-12 to 2023-09-15	Normal LCL	6.97
MW-14	Appendix III	Sulfate	mg/L	8	0%	2023-01-12 to 2023-09-15	Nonparametric LCL around the Median	16.0
MW-14	Appendix III	Total Dissolved Solids	mg/L	7	0%	2023-01-12 to 2023-09-15	Nonparametric LCL around the Median	732

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	Fluoride	mg/L	8	100%	2023-01-12 to 2023-09-15	Nonparametric LCL around the Median	1.00
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-14	Part 115	Copper	mg/L	8	100%	2023-01-12 to 2023-09-15	Nonparametric LCL around the Median	0.00500
MW-14	Part 115	Iron	mg/L	8	0%	2023-01-12 to 2023-09-15	Normal LCL	9.34
MW-14	Part 115	Nickel	mg/L	8	75%	2023-01-12 to 2023-09-15	Nonparametric LCL around the Median	0.00500
MW-14	Part 115	Silver	mg/L	8	100%	2023-01-12 to 2023-09-15	Nonparametric LCL around the Median	0.000500
MW-14	Part 115	Vanadium	mg/L	8	100%	2023-01-12 to 2023-09-15	Nonparametric LCL around the Median	0.00500
MW-14	Part 115	Zinc	mg/L	8	100%	2023-01-12 to 2023-09-15	Nonparametric LCL around the Median	0.00500
MW-15	Appendix III	Boron	mg/L	8	0%	0023-02-17 to 2023-09-15	Normal LCL	0.346
MW-15	Appendix III	Calcium	mg/L	8	0%	0023-02-17 to 2023-09-15	Normal LCL	119
MW-15	Appendix III	Chloride	mg/L	8	0%	0023-02-17 to 2023-09-15	Normal LCL	64.8
MW-15	Appendix III	Fluoride	mg/L	8	100%	0023-02-17 to 2023-09-15	Nonparametric LCL around the Median	1.00
MW-15	Appendix III	pH, Field	su	8	0%	0023-02-17 to 2023-09-15	Normal LCL	6.77
MW-15	Appendix III	Sulfate	mg/L	8	0%	0023-02-17 to 2023-09-15	Nonparametric LCL around the Median	109
MW-15	Appendix III	Total Dissolved Solids	mg/L	8	0%	0023-02-17 to 2023-09-15	Normal LCL	588
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	Fluoride	mg/L	8	100%	0023-02-17 to 2023-09-15	Nonparametric LCL around the Median	1.00
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-15	Part 115	Copper	mg/L	8	100%	0023-02-17 to 2023-09-15	Nonparametric LCL around the Median	0.00500
MW-15	Part 115	Iron	mg/L	8	12%	0023-02-17 to 2023-09-15	Normal MLE LCL	0.0280
MW-15	Part 115	Nickel	mg/L	8	100%	0023-02-17 to 2023-09-15	Nonparametric LCL around the Median	0.00500
MW-15	Part 115	Silver	mg/L	8	100%	0023-02-17 to 2023-09-15	Nonparametric LCL around the Median	0.000500
MW-15	Part 115	Vanadium	mg/L	8	100%	0023-02-17 to 2023-09-15	Nonparametric LCL around the Median	0.00500
MW-15	Part 115	Zinc	mg/L	8	88%	0023-02-17 to 2023-09-15	Nonparametric LCL around the Median	0.00500
MW-16A	Appendix III	Boron	mg/L	9	0%	2023-02-02 to 2023-11-21	Normal LCL	0.125
MW-16A	Appendix III	Calcium	mg/L	9	0%	2023-02-02 to 2023-11-21	Normal LCL	164
MW-16A	Appendix III	Chloride	mg/L	9	0%	2023-02-02 to 2023-11-21	Normal LCL	405
MW-16A	Appendix III	Fluoride	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	1.00
MW-16A	Appendix III	pH, Field	su	9	0%	2023-02-02 to 2023-11-21	Normal LCL	6.78
MW-16A	Appendix III	Sulfate	mg/L	9	0%	2023-02-02 to 2023-11-21	Normal LCL	124
MW-16A	Appendix III	Total Dissolved Solids	mg/L	9	0%	2023-02-02 to 2023-11-21	Normal LCL	1,285
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	Fluoride	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	1.00
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-16A	Part 115	Copper	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16A	Part 115	Iron	mg/L	9	0%	2023-02-02 to 2023-11-21	Normal LCL	2.85

MW-16A	Part 115	Nickel	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16A	Part 115	Silver	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.000500
MW-16A	Part 115	Vanadium	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16A	Part 115	Zinc	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16B	Appendix III	Boron	mg/L	9	0%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.110
MW-16B	Appendix III	Calcium	mg/L	9	0%	2023-02-02 to 2023-11-21	Normal LCL	78.1
MW-16B	Appendix III	Chloride	mg/L	9	56%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	3.70
MW-16B	Appendix III	Fluoride	mg/L	9	78%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.580
MW-16B	Appendix III	pH, Field	su	9	0%	2023-02-02 to 2023-11-21	Normal LCL	7.36
MW-16B	Appendix III	Sulfate	mg/L	9	0%	2023-02-02 to 2023-11-21	Normal LCL	16.3
MW-16B	Appendix III	Total Dissolved Solids	mg/L	9	0%	2023-02-02 to 2023-11-21	Normal LCL	360
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	Fluoride	mg/L	9	89%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	1.00
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-16B	Part 115	Copper	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16B	Part 115	Iron	mg/L	9	0%	2023-02-02 to 2023-11-21	Normal LCL	0.427
MW-16B	Part 115	Nickel	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16B	Part 115	Silver	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.000500
MW-16B	Part 115	Vanadium	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16B	Part 115	Zinc	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500

* While one or more parametric distributions fit the data, nonparametric methods were used to computed confidence limits due to non-convergence or negative LCLs.

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_1_01	MW-2	Appendix III	Boron	mg/L	16	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	5.08	5.14	3.38	6.17	0.890	0.175	1.11	-0.591	-0.673
02_1_02	MW-2	Appendix III	Calcium	mg/L	16	0	0%	2020-04-28 to 2023-08-01	Nonparametric	Nonparametric	248	258	198	272	26.4	0.106	17.8	-1.03	-0.425
02_1_03	MW-2	Appendix III	Chloride	mg/L	16	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	82.4	84.5	67.0	94.0	7.54	0.0916	5.19	-0.834	0.159
02_1_04	MW-2	Appendix III	Fluoride	mg/L	16	16	100%	2020-04-28 to 2023-08-01		Nonparametric	1.00	1.00	1.00	1.00	0	0	0	NA	NA
02_1_05	MW-2	Appendix III	Sulfate	mg/L	16	0	0%	2020-04-28 to 2023-08-01	Normal	Normal	468	504	278	586	102	0.219	97.0	-0.577	-1.13
02_1_06	MW-2	Appendix III	Total Dissolved Solids	mg/L	16	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	1262	1300	1010	1430	145	0.115	156	-0.606	-0.949
02_1_07	MW-2	Appendix III	pH, Field	su	17	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	6.77	6.75	6.54	7.08	0.114	0.0168	0.0741	0.921	3.32
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
02_5_37	MW-2	Part 115	Copper	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_5_38	MW-2	Part 115	Iron	mg/L	17	0	0%	2020-04-28 to 2023-08-01	Nonparametric	Nonparametric	0.743	0.630	0.440	1.93	0.374	0.504	0.178	2.36	6.13
02_5_39	MW-2	Part 115	Nickel	mg/L	17	0	0%	2020-04-28 to 2023-08-01	Nonparametric	Nonparametric	0.0236	0.0250	0.0170	0.0280	0.00379	0.160	0.00296	-0.689	-1.19
02_5_40	MW-2	Part 115	Silver	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_5_41	MW-2	Part 115	Vanadium	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_5_42	MW-2	Part 115	Zinc	mg/L	17	14	82%	2020-04-28 to 2023-08-01		Nonparametric	0.00735	0.00500	0.00500	0.0410	0.00870	1.18	0	4.08	16.8
03_1_01	MW-3	Appendix III	Boron	mg/L	6	0	0%	2021-05-04 to 2023-08-01	Gamma; Lognormal; Normal	Nonparametric	5.73	5.65	5.41	6.16	0.260	0.0454	0.200	0.822	0.709
03_1_02	MW-3	Appendix III	Calcium	mg/L	6	0	0%	2021-05-04 to 2023-08-01	Gamma; Lognormal; Normal	Nonparametric	244	246	223	255	11.6	0.0474	8.89	-1.32	2.02
03_1_03	MW-3	Appendix III	Chloride	mg/L	6	0	0%	2021-05-04 to 2023-08-01	Gamma; Lognormal; Normal	Nonparametric	96.2	96.5	89.0	102	5.27	0.0548	6.67	-0.239	-1.96
03_1_04	MW-3	Appendix III	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_1_05	MW-3	Appendix III	Sulfate	mg/L	6	0	0%	2021-05-04 to 2023-08-01	Gamma; Lognormal; Normal	Nonparametric	702	701	675	727	21.9	0.0312	33.3	0.0660	-1.78
03_1_06	MW-3	Appendix III	Total Dissolved Solids	mg/L	6	0	0%	2021-05-04 to 2023-08-01	Gamma; Lognormal; Normal	Nonparametric	1467	1465	1440	1500	26.6	0.0181	37.0	0.153	-2.53
03_1_07	MW-3	Appendix III	pH, Field	su	6	0	0%	2021-05-04 to 2023-08-01	Gamma; Lognormal; Normal	Nonparametric	7.22	7.21	7.15	7.28	0.0512	0.00709	0.0667	-0.0169	-1.58
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

(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
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
03_5_37	MW-3	Part 115	Copper	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_5_38	MW-3	Part 115	Iron	mg/L	6	0	0%	2021-05-04 to 2023-08-01	Gamma; Lognormal; Normal	Nonparametric	1.92	1.98	1.70	2.05	0.142	0.0737	0.0963	-0.910	-0.850
03_5_39	MW-3	Part 115	Nickel	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_5_40	MW-3	Part 115	Silver	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_5_41	MW-3	Part 115	Vanadium	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_5_42	MW-3	Part 115	Zinc	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
05_1_01	MW-5	Appendix III	Boron	mg/L	16	0	0%	2020-04-28 to 2023-08-01	Nonparametric	Nonparametric	4.29	4.60	0.370	5.75	1.27	0.296	0.593	-2.18	5.75
05_1_02	MW-5	Appendix III	Calcium	mg/L	16	0	0%	2020-04-28 to 2023-08-01	Normal	Normal	247	248	70.1	372	69.2	0.280	45.9	-0.790	2.08
05_1_03	MW-5	Appendix III	Chloride	mg/L	16	0	0%	2020-04-28 to 2023-08-01	Gamma; Normal	Normal	70.1	74.0	43.0	83.0	11.7	0.167	11.1	-1.06	0.480
05_1_04	MW-5	Appendix III	Fluoride	mg/L	16	16	100%	2020-04-28 to 2023-08-01		Nonparametric	1.00	1.00	1.00	1.00	0	0	0	NA	NA
05_1_05	MW-5	Appendix III	Sulfate	mg/L	16	0	0%	2020-04-28 to 2023-08-01	Gamma; Normal	Normal	706	707	186	1170	272	0.385	249	-0.234	-0.344
05_1_06	MW-5	Appendix III	Total Dissolved Solids	mg/L	16	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	1408	1455	592	2020	400	0.284	356	-0.437	-0.250
05_1_07	MW-5	Appendix III	pH, Field	su	17	0	0%	2020-04-28 to 2023-08-01	Nonparametric	Nonparametric	7.19	7.24	6.40	7.45	0.260	0.0362	0.119	-2.25	5.30
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
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
05_5_37	MW-5	Part 115	Copper	mg/L	17	12	71%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Nonparametric	0.00765	0.00500	0.00500	0.0260	0.00597	0.780	0	2.48	5.74
05_5_38	MW-5	Part 115	Iron	mg/L	17	1	6%	2020-04-28 to 2023-08-01	Gamma; Lognormal	Gamma	1.48	0.750	0.0200	8.00	2.04	1.37	0.800	2.47	6.51
05_5_39	MW-5	Part 115	Nickel	mg/L	17	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	0.0117	0.0110	0.00600	0.0190	0.00395	0.337	0.00444	0.310	-0.685
05_5_40	MW-5	Part 115	Silver	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_5_41	MW-5	Part 115	Vanadium	mg/L	17	15	88%	2020-04-28 to 2023-08-01		Nonparametric	0.00565	0.00500	0.00500	0.0120	0.00190	0.337	0	2.99	8.58
05_5_42	MW-5	Part 115	Zinc	mg/L	17	4	24%	2020-04-28 to 2023-08-01	Gamma; Lognormal	Gamma	0.0183	0.00700	0.00500	0.0980	0.0240	1.31	0.00296	2.66	7.81

(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
06_1_01	MW-6	Appendix III	Boron	mg/L	16	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	0.815	0.825	0.490	1.09	0.179	0.220	0.230	-0.191	-0.943
06_1_02	MW-6	Appendix III	Calcium	mg/L	16	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	168	170	142	193	18.5	0.110	28.9	-0.0169	-1.46
06_1_03	MW-6	Appendix III	Chloride	mg/L	16	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	34.3	36.0	24.0	43.0	6.68	0.195	8.89	-0.219	-1.64
06_1_04	MW-6	Appendix III	Fluoride	mg/L	16	16	100%	2020-04-28 to 2023-08-01		Nonparametric	1.00	1.00	1.00	1.00	0	0	0	NA	NA
06_1_05	MW-6	Appendix III	Sulfate	mg/L	16	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	187	184	123	264	48.6	0.260	69.6	0.228	-1.33
06_1_06	MW-6	Appendix III	Total Dissolved Solids	mg/L	16	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	764	768	598	898	94.4	0.124	116	-0.172	-1.27
06_1_07	MW-6	Appendix III	pH, Field	su	17	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	6.74	6.72	6.35	7.11	0.168	0.0249	0.0593	0.0369	2.07
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
06_5_37	MW-6	Part 115	Copper	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_5_38	MW-6	Part 115	Iron	mg/L	17	8	47%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Nonparametric	0.0412	0.0200	0.0200	0.200	0.0450	1.09	0	3.11	10.6
06_5_39	MW-6	Part 115	Nickel	mg/L	17	3	18%	2020-04-28 to 2023-08-01	Nonparametric	Nonparametric	0.00647	0.00700	0.00500	0.00800	0.00101	0.156	0.00148	-0.325	-0.966
06_5_40	MW-6	Part 115	Silver	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_5_41	MW-6	Part 115	Vanadium	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_5_42	MW-6	Part 115	Zinc	mg/L	17	16	94%	2020-04-28 to 2023-08-01		Nonparametric	0.00671	0.00500	0.00500	0.0340	0.00703	1.05	0	4.12	17.0
07_1_01	MW-7	Appendix III	Boron	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	1.86	1.88	1.08	2.75	0.458	0.247	0.385	0.150	0.480
07_1_02	MW-7	Appendix III	Calcium	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	114	111	97.2	149	14.7	0.128	14.8	1.27	2.17
07_1_03	MW-7	Appendix III	Chloride	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Nonparametric	Nonparametric	77.7	75.0	72.2	98.0	7.47	0.0961	2.96	2.31	5.92
07_1_04	MW-7	Appendix III	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_1_05	MW-7	Appendix III	Sulfate	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	198	191	172	260	24.8	0.125	17.8	1.65	3.45
07_1_06	MW-7	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	607	590	548	758	56.4	0.0928	38.5	2.11	5.53
07_1_07	MW-7	Appendix III	pH, Field	su	11	0	0%	2021-06-15 to 2023-08-02	Nonparametric	Nonparametric	7.52	7.47	7.24	8.18	0.242	0.0322	0.133	2.27	6.52
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

(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
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
07_5_37	MW-7	Part 115	Copper	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_5_38	MW-7	Part 115	Iron	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Nonparametric	Nonparametric	1.44	1.34	1.00	2.81	0.487	0.339	0.222	2.55	7.58
07_5_39	MW-7	Part 115	Nickel	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_5_40	MW-7	Part 115	Silver	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_5_41	MW-7	Part 115	Vanadium	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_5_42	MW-7	Part 115	Zinc	mg/L	11	8	73%	2021-06-15 to 2023-08-02		Nonparametric	0.00618	0.00500	0.00500	0.0140	0.00271	0.439	0	2.85	8.52
08_1_01	MW-8	Appendix III	Boron	mg/L	11	1	9%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	0.0918	0.0800	0.0400	0.210	0.0494	0.538	0.0444	1.43	2.57
08_1_02	MW-8	Appendix III	Calcium	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	94.4	94.6	86.5	104	5.58	0.0591	5.93	0.110	-0.811
08_1_03	MW-8	Appendix III	Chloride	mg/L	11	2	18%	2021-06-15 to 2023-08-02	Gamma; Lognormal	Gamma	20.4	11.0	4.45	66.0	21.7	1.06	8.89	1.64	1.44
08_1_04	MW-8	Appendix III	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_1_05	MW-8	Appendix III	Sulfate	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	25.1	17.0	11.0	52.0	14.7	0.587	8.89	0.902	-0.544
08_1_06	MW-8	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	392	382	362	460	30.3	0.0772	17.8	1.35	1.24
08_1_07	MW-8	Appendix III	pH, Field	su	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	7.17	7.12	6.99	7.78	0.227	0.0316	0.178	2.24	5.94
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
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
08_5_37	MW-8	Part 115	Copper	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_5_38	MW-8	Part 115	Iron	mg/L	11	10	91%	2021-06-15 to 2023-08-02		Nonparametric	0.0200	0.0200	0.0200	0.0200	0	0	0	NA	NA
08_5_39	MW-8	Part 115	Nickel	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_5_40	MW-8	Part 115	Silver	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_5_41	MW-8	Part 115	Vanadium	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_5_42	MW-8	Part 115	Zinc	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

(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
09_1_01	MW-9	Appendix III	Boron	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.0400	0.0400	0.0400	0.0400	0	0	0	NA	NA
09_1_02	MW-9	Appendix III	Calcium	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Nonparametric	Nonparametric	72.0	75.7	61.8	78.0	6.27	0.0871	3.41	-0.730	-1.13
09_1_03	MW-9	Appendix III	Chloride	mg/L	11	10	91%	2021-06-15 to 2023-08-02		Nonparametric	4.65	5.00	1.11	5.00	1.17	0.252	0	-3.32	11.0
09_1_04	MW-9	Appendix III	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_1_05	MW-9	Appendix III	Sulfate	mg/L	11	8	73%	2021-06-15 to 2023-08-02		Nonparametric	4.96	5.00	3.58	6.00	0.548	0.110	0	-1.13	5.62
09_1_06	MW-9	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	255	246	232	282	17.4	0.0685	8.89	0.604	-1.21
09_1_07	MW-9	Appendix III	pH, Field	su	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	7.31	7.27	7.13	7.74	0.182	0.0249	0.163	1.45	2.27
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
09_5_37	MW-9	Part 115	Copper	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_5_38	MW-9	Part 115	Iron	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.0200	0.0200	0.0200	0.0200	0	0	0	NA	NA
09_5_39	MW-9	Part 115	Nickel	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_5_40	MW-9	Part 115	Silver	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_5_41	MW-9	Part 115	Vanadium	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_5_42	MW-9	Part 115	Zinc	mg/L	11	10	91%	2021-06-15 to 2023-08-02		Nonparametric	0.00536	0.00500	0.00500	0.00900	0.00121	0.225	0	3.32	11.0
10_1_01	MW-10	Appendix III	Boron	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Nonparametric	Nonparametric	0.0527	0.0500	0.0400	0.0700	0.00786	0.149	0	0.935	1.65
10_1_02	MW-10	Appendix III	Calcium	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	130	131	113	142	9.06	0.0695	7.41	-0.723	0.107
10_1_03	MW-10	Appendix III	Chloride	mg/L	11	9	82%	2021-06-15 to 2023-08-02		Nonparametric	4.73	5.00	1.03	6.00	1.26	0.267	0	-2.94	9.51
10_1_04	MW-10	Appendix III	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_1_05	MW-10	Appendix III	Sulfate	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	14.2	14.5	9.00	18.0	3.03	0.213	3.70	-0.425	-0.748
10_1_06	MW-10	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	439	436	376	494	36.0	0.0821	38.5	-0.131	-0.538
10_1_07	MW-10	Appendix III	pH, Field	su	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	6.73	6.69	6.49	7.30	0.227	0.0337	0.178	1.71	3.69
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

(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
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
10_5_37	MW-10	Part 115	Copper	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_5_38	MW-10	Part 115	Iron	mg/L	11	11	100%	2021-06-15 to 2023-08-02		Nonparametric	0.0200	0.0200	0.0200	0.0200	0	0	0	NA	NA
10_5_39	MW-10	Part 115	Nickel	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_5_40	MW-10	Part 115	Silver	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_5_41	MW-10	Part 115	Vanadium	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_5_42	MW-10	Part 115	Zinc	mg/L	11	9	82%	2021-06-15 to 2023-08-02		Nonparametric	0.00673	0.00500	0.00500	0.0200	0.00456	0.678	0	2.96	9.01
13_1_01	MW-13	Appendix III	Boron	mg/L	11	0	0%	2022-02-23 to 2023-08-02	Gamma; Lognormal; Normal	Normal	0.171	0.170	0.140	0.220	0.0255	0.149	0.0148	0.409	-0.121
13_1_02	MW-13	Appendix III	Calcium	mg/L	11	0	0%	2022-02-23 to 2023-08-02	Gamma; Lognormal	Gamma	110	101	94.1	138	16.7	0.151	8.89	0.666	-1.46
13_1_03	MW-13	Appendix III	Chloride	mg/L	11	2	18%	2022-02-23 to 2023-08-02	Gamma; Lognormal; Normal	Normal	19.4	16.0	5.00	45.0	14.4	0.742	10.4	0.970	-0.390
13_1_04	MW-13	Appendix III	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_1_05	MW-13	Appendix III	Sulfate	mg/L	11	0	0%	2022-02-23 to 2023-08-02	Gamma; Lognormal; Normal	Normal	35.5	32.0	16.0	87.0	21.1	0.596	19.3	1.58	2.89
13_1_06	MW-13	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	2022-02-23 to 2023-08-02	Gamma; Lognormal; Normal	Normal	405	386	336	492	56.0	0.138	65.2	0.476	-1.24
13_1_07	MW-13	Appendix III	pH, Field	su	11	0	0%	2022-02-23 to 2023-08-02	Nonparametric	Nonparametric	6.98	7.04	6.39	7.25	0.239	0.0343	0.104	-1.67	3.41
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
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
13_5_37	MW-13	Part 115	Copper	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_5_38	MW-13	Part 115	Iron	mg/L	11	1	9%	2022-02-23 to 2023-08-02	Gamma; Lognormal	Gamma	0.0473	0.0300	0.0200	0.160	0.0420	0.888	0.0148	2.28	5.58
13_5_39	MW-13	Part 115	Nickel	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_5_40	MW-13	Part 115	Silver	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
13_5_41	MW-13	Part 115	Vanadium	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_5_42	MW-13	Part 115	Zinc	mg/L	11	10	91%	2022-02-23 to 2023-08-02		Nonparametric	0.00545	0.00500	0.00500	0.0100	0.00151	0.276	0	3.32	11.0

(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
14_1_01	MW-14	Appendix III	Boron	mg/L	8	0	0%	2023-01-12 to 2023-09-15	Gamma; Lognormal; Normal	Normal	2.15	2.15	2.03	2.29	0.0851	0.0396	0.0889	0.288	-0.290
14_1_02	MW-14	Appendix III	Calcium	mg/L	8	0	0%	2023-01-12 to 2023-09-15	Gamma; Lognormal; Normal	Normal	146	146	141	154	4.00	0.0274	2.96	1.05	1.60
14_1_03	MW-14	Appendix III	Chloride	mg/L	8	0	0%	2023-01-12 to 2023-09-15	Gamma; Lognormal; Normal	Normal	113	114	108	118	3.02	0.0268	2.96	-0.0413	0.432
14_1_04	MW-14	Appendix III	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_1_05	MW-14	Appendix III	Sulfate	mg/L	8	0	0%	2023-01-12 to 2023-09-15	Nonparametric	Nonparametric	111	19.5	16.0	748	257	2.32	4.44	2.83	7.99
14_1_06	MW-14	Appendix III	Total Dissolved Solids	mg/L	7	0	0%	2023-01-12 to 2023-09-15	Gamma; Lognormal; Normal	Nonparametric	784	792	732	808	25.8	0.0329	17.8	-1.65	3.03
14_1_07	MW-14	Appendix III	pH, Field	su	8	0	0%	2023-01-12 to 2023-09-15	Gamma; Lognormal; Normal	Normal	7.02	7.02	6.92	7.13	0.0746	0.0106	0.0815	0.127	-1.21
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
14_5_37	MW-14	Part 115	Copper	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_5_38	MW-14	Part 115	Iron	mg/L	8	0	0%	2023-01-12 to 2023-09-15	Gamma; Lognormal; Normal	Normal	10.6	11.3	6.58	12.9	1.94	0.182	1.26	-1.41	2.43
14_5_39	MW-14	Part 115	Nickel	mg/L	8	6	75%	2023-01-12 to 2023-09-15		Nonparametric	0.00513	0.00500	0.00500	0.00600	0.000354	0.0690	0	2.83	8.0
14_5_40	MW-14	Part 115	Silver	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_5_41	MW-14	Part 115	Vanadium	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_5_42	MW-14	Part 115	Zinc	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
15_1_01	MW-15	Appendix III	Boron	mg/L	8	0	0%	0023-02-17 to 2023-09-15	Gamma; Lognormal; Normal	Normal	0.372	0.360	0.330	0.440	0.0399	0.107	0.0370	0.672	-0.973
15_1_02	MW-15	Appendix III	Calcium	mg/L	8	0	0%	0023-02-17 to 2023-09-15	Gamma; Lognormal; Normal	Normal	135	136	104	183	24.1	0.179	19.3	0.969	1.68
15_1_03	MW-15	Appendix III	Chloride	mg/L	8	0	0%	0023-02-17 to 2023-09-15	Gamma; Lognormal; Normal	Normal	73.9	72.5	59.0	100	13.6	0.184	14.1	0.925	0.765
15_1_04	MW-15	Appendix III	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_1_05	MW-15	Appendix III	Sulfate	mg/L	8	0	0%	0023-02-17 to 2023-09-15	Nonparametric	Nonparametric	132	117	109	238	43.7	0.330	11.9	2.60	6.99
15_1_06	MW-15	Appendix III	Total Dissolved Solids	mg/L	8	0	0%	0023-02-17 to 2023-09-15	Gamma; Lognormal; Normal	Normal	658	654	528	878	105	0.159	62.2	1.29	2.75
15_1_07	MW-15	Appendix III	pH, Field	su	8	0	0%	0023-02-17 to 2023-09-15	Gamma; Lognormal; Normal	Normal	6.85	6.85	6.69	6.99	0.112	0.0163	0.133	-0.283	-0.909
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

(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
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
15_5_37	MW-15	Part 115	Copper	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_5_38	MW-15	Part 115	Iron	mg/L	8	1	12%	0023-02-17 to 2023-09-15	Gamma; Lognormal; Normal	Normal	0.0650	0.0450	0.0200	0.140	0.0475	0.731	0.0370	0.639	-1.54
15_5_39	MW-15	Part 115	Nickel	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_5_40	MW-15	Part 115	Silver	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_5_41	MW-15	Part 115	Vanadium	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_5_42	MW-15	Part 115	Zinc	mg/L	8	7	88%	0023-02-17 to 2023-09-15		Nonparametric	0.00700	0.00500	0.00500	0.0210	0.00566	0.808	0	2.83	8.00
16A_1_01	MW-16A	Appendix III	Boron	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	0.158	0.160	0.100	0.230	0.0536	0.340	0.0741	0.0953	-2.10
16A_1_02	MW-16A	Appendix III	Calcium	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	183	173	145	226	29.7	0.162	38.5	0.318	-1.22
16A_1_03	MW-16A	Appendix III	Chloride	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	432	423	383	505	42.8	0.0990	47.4	0.652	-0.853
16A_1_04	MW-16A	Appendix III	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_1_05	MW-16A	Appendix III	Sulfate	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	166	145	86.0	264	69.0	0.415	78.5	0.505	-1.49
16A_1_06	MW-16A	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	1408	1370	1170	1720	199	0.141	281	0.399	-1.18
16A_1_07	MW-16A	Appendix III	pH, Field	su	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	6.84	6.82	6.72	7.00	0.0935	0.0137	0.0889	0.580	-0.782
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
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
16A_5_37	MW-16A	Part 115	Copper	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_5_38	MW-16A	Part 115	Iron	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	3.19	3.08	2.59	4.13	0.558	0.175	0.667	0.590	-1.08
16A_5_39	MW-16A	Part 115	Nickel	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_5_40	MW-16A	Part 115	Silver	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_5_41	MW-16A	Part 115	Vanadium	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_5_42	MW-16A	Part 115	Zinc	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

(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
16B_1_01	MW-16B	Appendix III	Boron	mg/L	9	0	0%	2023-02-02 to 2023-11-21		Nonparametric	0.119	0.120	0.110	0.130	0.00782	0.0658	0.0148	0.216	-1.04
16B_1_02	MW-16B	Appendix III	Calcium	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	80.1	80.2	74.5	85.4	3.36	0.0419	2.67	-0.0735	-0.162
16B_1_03	MW-16B	Appendix III	Chloride	mg/L	9	5	56%	2023-02-02 to 2023-11-21		Nonparametric	5.31	5.00	3.10	11.0	2.25	0.423	0	2.39	6.74
16B_1_04	MW-16B	Appendix III	Fluoride	mg/L	9	7	78%	2023-02-02 to 2023-11-21		Nonparametric	0.877	1.00	0.310	1.00	0.254	0.290	0	-1.91	2.68
16B_1_05	MW-16B	Appendix III	Sulfate	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	17	17.0	15.0	18.0	1.10	0.0646	1.48	-0.711	-0.720
16B_1_06	MW-16B	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Lognormal; Normal	Normal	365	366	350	378	7.69	0.0211	0	-0.548	1.78
16B_1_07	MW-16B	Appendix III	pH, Field	su	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	7.41	7.45	7.25	7.50	0.0865	0.0117	0.0593	-0.898	-0.417
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
16B_5_37	MW-16B	Part 115	Copper	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_5_38	MW-16B	Part 115	Iron	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	0.537	0.450	0.390	0.930	0.177	0.330	0.0889	1.60	2.38
16B_5_39	MW-16B	Part 115	Nickel	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_5_40	MW-16B	Part 115	Silver	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_5_41	MW-16B	Part 115	Vanadium	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_5_42	MW-16B	Part 115	Zinc	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
7C_1_01	MW-7C	Appendix III	Boron	mg/L	11	0	0%	2022-03-10 to 2023-08-02	Gamma; Lognormal; Normal	Normal	6.61	6.55	6.29	7.24	0.247	0.0374	0.163	1.67	4.14
7C_1_02	MW-7C	Appendix III	Calcium	mg/L	11	0	0%	2022-03-10 to 2023-08-02	Nonparametric	Nonparametric	243	245	183	277	24.3	0.0999	14.8	-1.36	3.86
7C_1_03	MW-7C	Appendix III	Chloride	mg/L	11	0	0%	2022-03-10 to 2023-08-02	Gamma; Lognormal; Normal	Normal	93.7	93.0	90.0	101	2.94	0.0313	1.48	1.54	3.45
7C_1_04	MW-7C	Appendix III	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_1_05	MW-7C	Appendix III	Sulfate	mg/L	11	0	0%	2022-03-10 to 2023-08-02	Gamma; Lognormal; Normal	Normal	700	687	656	761	37.1	0.0529	40.0	0.472	-1.25
7C_1_06	MW-7C	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	2022-03-10 to 2023-08-02	Nonparametric	Nonparametric	1399	1360	1350	1500	58.6	0.0419	14.8	1.07	-0.542
7C_1_07	MW-7C	Appendix III	pH, Field	su	11	0	0%	2022-03-10 to 2023-08-02	Gamma; Lognormal; Normal	Normal	7.34	7.32	7.23	7.51	0.0971	0.0132	0.119	0.840	-0.391
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

(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
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
7C_5_37	MW-7C	Part 115	Copper	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_5_38	MW-7C	Part 115	Iron	mg/L	11	0	0%	2022-03-10 to 2023-08-02	Gamma; Lognormal; Normal	Normal	4.02	4.11	3.67	4.34	0.217	0.0541	0.252	-0.209	-1.10
7C_5_39	MW-7C	Part 115	Nickel	mg/L	11	0	0%	2022-03-10 to 2023-08-02	Nonparametric	Nonparametric	0.00800	0.00800	0.00700	0.0110	0.00134	0.168	0.00148	1.52	1.60
7C_5_40	MW-7C	Part 115	Silver	mg/L	11	11	100%	2022-03-10 to 2023-08-02		Nonparametric	0.000500	0.000500	0.000500	0.000500	0	0	0	NA	NA
7C_5_41	MW-7C	Part 115	Vanadium	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_5_42	MW-7C	Part 115	Zinc	mg/L	11	9	82%	2022-03-10 to 2023-08-02		Nonparametric	0.00527	0.00500	0.00500	0.00700	0.000647	0.123	0	2.42	5.51

[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_1_01	MW-2	Appendix III	Boron	mg/L	16	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	5.08	5.14	3.38	6.17	0.890	0.175	1.11	-0.591	-0.673
02_1_02	MW-2	Appendix III	Calcium	mg/L	16	0	0%	2020-04-28 to 2023-08-01	Nonparametric	Nonparametric	248	258	198	272	26.4	0.106	17.8	-1.03	-0.425
02_1_03	MW-2	Appendix III	Chloride	mg/L	16	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	82.4	84.5	67.0	94.0	7.54	0.0916	5.19	-0.834	0.159
02_1_05	MW-2	Appendix III	Sulfate	mg/L	16	0	0%	2020-04-28 to 2023-08-01	Normal	Normal	468	504	278	586	102	0.219	97.0	-0.577	-1.13
02_1_06	MW-2	Appendix III	Total Dissolved Solids	mg/L	16	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	1262	1300	1010	1430	145	0.115	156	-0.606	-0.949
02_1_07	MW-2	Appendix III	pH, Field	su	17	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	6.77	6.75	6.54	7.08	0.114	0.0168	0.0741	0.921	3.32
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
02_5_38	MW-2	Part 115	Iron	mg/L	17	0	0%	2020-04-28 to 2023-08-01	Nonparametric	Nonparametric	0.743	0.630	0.440	1.93	0.374	0.504	0.178	2.36	6.13
02_5_39	MW-2	Part 115	Nickel	mg/L	17	0	0%	2020-04-28 to 2023-08-01	Nonparametric	Nonparametric	0.0236	0.0250	0.0170	0.0280	0.00379	0.160	0.00296	-0.689	-1.19
02_5_42	MW-2	Part 115	Zinc	mg/L	17	14	82%	2020-04-28 to 2023-08-01		Nonparametric	0.0183	0.00700	0.00700	0.0410	0.0196	1.07	0	1.73	NA
03_1_01	MW-3	Appendix III	Boron	mg/L	6	0	0%	2021-05-04 to 2023-08-01	Gamma; Lognormal; Normal	Nonparametric	5.73	5.65	5.41	6.16	0.260	0.0454	0.200	0.822	0.709
03_1_02	MW-3	Appendix III	Calcium	mg/L	6	0	0%	2021-05-04 to 2023-08-01	Gamma; Lognormal; Normal	Nonparametric	244	246	223	255	11.6	0.0474	8.89	-1.32	2.02
03_1_03	MW-3	Appendix III	Chloride	mg/L	6	0	0%	2021-05-04 to 2023-08-01	Gamma; Lognormal; Normal	Nonparametric	96.2	96.5	89.0	102	5.27	0.0548	6.67	-0.239	-1.96
03_1_05	MW-3	Appendix III	Sulfate	mg/L	6	0	0%	2021-05-04 to 2023-08-01	Gamma; Lognormal; Normal	Nonparametric	702	701	675	727	21.9	0.0312	33.3	0.0660	-1.78
03_1_06	MW-3	Appendix III	Total Dissolved Solids	mg/L	6	0	0%	2021-05-04 to 2023-08-01	Gamma; Lognormal; Normal	Nonparametric	1467	1465	1440	1500	26.6	0.0181	37.0	0.153	-2.53
03_1_07	MW-3	Appendix III	pH, Field	su	6	0	0%	2021-05-04 to 2023-08-01	Gamma; Lognormal; Normal	Nonparametric	7.22	7.21	7.15	7.28	0.0512	0.00709	0.0667	-0.0169	-1.58
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
03_5_38	MW-3	Part 115	Iron	mg/L	6	0	0%	2021-05-04 to 2023-08-01	Gamma; Lognormal; Normal	Nonparametric	1.92	1.98	1.70	2.05	0.142	0.0737	0.0963	-0.910	-0.850
05_1_01	MW-5	Appendix III	Boron	mg/L	16	0	0%	2020-04-28 to 2023-08-01	Nonparametric	Nonparametric	4.29	4.60	0.370	5.75	1.27	0.296	0.593	-2.18	5.75
05_1_02	MW-5	Appendix III	Calcium	mg/L	16	0	0%	2020-04-28 to 2023-08-01	Normal	Normal	247	248	70.1	372	69.2	0.280	45.9	-0.790	2.08
05_1_03	MW-5	Appendix III	Chloride	mg/L	16	0	0%	2020-04-28 to 2023-08-01	Gamma; Normal	Normal	70.1	74.0	43.0	83.0	11.7	0.167	11.1	-1.06	0.480
05_1_05	MW-5	Appendix III	Sulfate	mg/L	16	0	0%	2020-04-28 to 2023-08-01	Gamma; Normal	Normal	706	707	186	1170	272	0.385	249	-0.234	-0.344
05_1_06	MW-5	Appendix III	Total Dissolved Solids	mg/L	16	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	1408	1455	592	2020	400	0.284	356	-0.437	-0.250
05_1_07	MW-5	Appendix III	pH, Field	su	17	0	0%	2020-04-28 to 2023-08-01	Nonparametric	Nonparametric	7.19	7.24	6.40	7.45	0.260	0.0362	0.119	-2.25	5.30
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
05_5_37	MW-5	Part 115	Copper	mg/L	17	12	71%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Nonparametric	0.0140	0.0110	0.00500	0.0260	0.00843	0.602	0.00889	0.677	-0.901
05_5_38	MW-5	Part 115	Iron	mg/L	17	1	6%	2020-04-28 to 2023-08-01	Gamma; Lognormal	Gamma	1.58	0.825	0.180	8.00	2.07	1.31	0.867	2.42	6.17
05_5_39	MW-5	Part 115	Nickel	mg/L	17	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	0.0117	0.0110	0.00600	0.0190	0.00395	0.337	0.00444	0.310	-0.685

(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
05_5_41	MW-5	Part 115	Vanadium	mg/L	17	15	88%	2020-04-28 to 2023-08-01		Nonparametric	0.0105	0.0105	0.00900	0.0120	0.00212	0.202	0.00222	NA	NA
05_5_42	MW-5	Part 115	Zinc	mg/L	17	4	24%	2020-04-28 to 2023-08-01	Gamma; Lognormal	Gamma	0.0224	0.0110	0.00500	0.0980	0.0262	1.17	0.00889	2.31	5.85
06_1_01	MW-6	Appendix III	Boron	mg/L	16	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	0.815	0.825	0.490	1.09	0.179	0.220	0.230	-0.191	-0.943
06_1_02	MW-6	Appendix III	Calcium	mg/L	16	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	168	170	142	193	18.5	0.110	28.9	-0.0169	-1.46
06_1_03	MW-6	Appendix III	Chloride	mg/L	16	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	34.3	36.0	24.0	43.0	6.68	0.195	8.89	-0.219	-1.64
06_1_05	MW-6	Appendix III	Sulfate	mg/L	16	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	187	184	123	264	48.6	0.260	69.6	0.228	-1.33
06_1_06	MW-6	Appendix III	Total Dissolved Solids	mg/L	16	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	764	768	598	898	94.4	0.124	116	-0.172	-1.27
06_1_07	MW-6	Appendix III	pH, Field	su	17	0	0%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Normal	6.74	6.72	6.35	7.11	0.168	0.0249	0.0593	0.0369	2.07
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
06_5_38	MW-6	Part 115	Iron	mg/L	17	8	47%	2020-04-28 to 2023-08-01	Gamma; Lognormal; Normal	Nonparametric	0.0600	0.0400	0.0200	0.200	0.0566	0.943	0.0296	2.27	5.66
06_5_39	MW-6	Part 115	Nickel	mg/L	17	3	18%	2020-04-28 to 2023-08-01	Nonparametric	Nonparametric	0.00679	0.00700	0.00500	0.00800	0.000802	0.118	0	-0.608	0.801
06_5_42	MW-6	Part 115	Zinc	mg/L	17	16	94%	2020-04-28 to 2023-08-01		Nonparametric	0.0340	0.0340	0.0340	0.0340	NA	NA	0	NA	NA
07_1_01	MW-7	Appendix III	Boron	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	1.86	1.88	1.08	2.75	0.458	0.247	0.385	0.150	0.480
07_1_02	MW-7	Appendix III	Calcium	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	114	111	97.2	149	14.7	0.128	14.8	1.27	2.17
07_1_03	MW-7	Appendix III	Chloride	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Nonparametric	Nonparametric	77.7	75.0	72.2	98.0	7.47	0.0961	2.96	2.31	5.92
07_1_04	MW-7	Appendix III	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_1_05	MW-7	Appendix III	Sulfate	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	198	191	172	260	24.8	0.125	17.8	1.65	3.45
07_1_06	MW-7	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	607	590	548	758	56.4	0.0928	38.5	2.11	5.53
07_1_07	MW-7	Appendix III	pH, Field	su	11	0	0%	2021-06-15 to 2023-08-02	Nonparametric	Nonparametric	7.52	7.47	7.24	8.18	0.242	0.0322	0.133	2.27	6.52
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
07_5_38	MW-7	Part 115	Iron	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Nonparametric	Nonparametric	1.44	1.34	1.00	2.81	0.487	0.339	0.222	2.55	7.58
07_5_42	MW-7	Part 115	Zinc	mg/L	11	8	73%	2021-06-15 to 2023-08-02		Nonparametric	0.00933	0.00700	0.00700	0.0140	0.00404	0.433	0	1.73	NA
08_1_01	MW-8	Appendix III	Boron	mg/L	11	1	9%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	0.0970	0.0800	0.0400	0.210	0.0488	0.503	0.0370	1.46	2.69
08_1_02	MW-8	Appendix III	Calcium	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	94.4	94.6	86.5	104	5.58	0.0591	5.93	0.110	-0.811
08_1_03	MW-8	Appendix III	Chloride	mg/L	11	2	18%	2021-06-15 to 2023-08-02	Gamma; Lognormal	Gamma	23.8	15.0	4.45	66.0	22.7	0.953	10.4	1.39	0.442
08_1_04	MW-8	Appendix III	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_1_05	MW-8	Appendix III	Sulfate	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	25.1	17.0	11.0	52.0	14.7	0.587	8.89	0.902	-0.544
08_1_06	MW-8	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	392	382	362	460	30.3	0.0772	17.8	1.35	1.24
08_1_07	MW-8	Appendix III	pH, Field	su	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	7.17	7.12	6.99	7.78	0.227	0.0316	0.178	2.24	5.94
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

(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
08_5_38	MW-8	Part 115	Iron	mg/L	11	10	91%	2021-06-15 to 2023-08-02		Nonparametric	0.0200	0.0200	0.0200	0.0200	NA	NA	0	NA	NA
09_1_02	MW-9	Appendix III	Calcium	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Nonparametric	Nonparametric	72.0	75.7	61.8	78.0	6.27	0.0871	3.41	-0.730	-1.13
09_1_03	MW-9	Appendix III	Chloride	mg/L	11	10	91%	2021-06-15 to 2023-08-02		Nonparametric	1.11	1.11	1.11	1.11	NA	NA	0	NA	NA
09_1_04	MW-9	Appendix III	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_1_05	MW-9	Appendix III	Sulfate	mg/L	11	8	73%	2021-06-15 to 2023-08-02		Nonparametric	4.86	5.00	3.58	6.00	1.22	0.250	1.48	-0.511	NA
09_1_06	MW-9	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	255	246	232	282	17.4	0.0685	8.89	0.604	-1.21
09_1_07	MW-9	Appendix III	pH, Field	su	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	7.31	7.27	7.13	7.74	0.182	0.0249	0.163	1.45	2.27
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
09_5_42	MW-9	Part 115	Zinc	mg/L	11	10	91%	2021-06-15 to 2023-08-02		Nonparametric	0.00900	0.00900	0.00900	0.00900	NA	NA	0	NA	NA
10_1_01	MW-10	Appendix III	Boron	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Nonparametric	Nonparametric	0.0527	0.0500	0.0400	0.0700	0.00786	0.149	0	0.935	1.65
10_1_02	MW-10	Appendix III	Calcium	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	130	131	113	142	9.06	0.0695	7.41	-0.723	0.107
10_1_03	MW-10	Appendix III	Chloride	mg/L	11	9	82%	2021-06-15 to 2023-08-02		Nonparametric	3.52	3.52	1.03	6.00	3.51	1.00	3.68	NA	NA
10_1_04	MW-10	Appendix III	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_1_05	MW-10	Appendix III	Sulfate	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	14.2	14.5	9.00	18.0	3.03	0.213	3.70	-0.425	-0.748
10_1_06	MW-10	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	439	436	376	494	36.0	0.0821	38.5	-0.131	-0.538
10_1_07	MW-10	Appendix III	pH, Field	su	11	0	0%	2021-06-15 to 2023-08-02	Gamma; Lognormal; Normal	Normal	6.73	6.69	6.49	7.30	0.227	0.0337	0.178	1.71	3.69
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
10_5_42	MW-10	Part 115	Zinc	mg/L	11	9	82%	2021-06-15 to 2023-08-02		Nonparametric	0.0145	0.0145	0.00900	0.0200	0.00778	0.536	0.00815	NA	NA
13_1_01	MW-13	Appendix III	Boron	mg/L	11	0	0%	2022-02-23 to 2023-08-02	Gamma; Lognormal; Normal	Normal	0.171	0.170	0.140	0.220	0.0255	0.149	0.0148	0.409	-0.121
13_1_02	MW-13	Appendix III	Calcium	mg/L	11	0	0%	2022-02-23 to 2023-08-02	Gamma; Lognormal	Gamma	110	101	94.1	138	16.7	0.151	8.89	0.666	-1.46
13_1_03	MW-13	Appendix III	Chloride	mg/L	11	2	18%	2022-02-23 to 2023-08-02	Gamma; Lognormal; Normal	Normal	22.6	16.0	9.00	45.0	14	0.620	10.4	0.840	-0.947
13_1_05	MW-13	Appendix III	Sulfate	mg/L	11	0	0%	2022-02-23 to 2023-08-02	Gamma; Lognormal; Normal	Normal	35.5	32.0	16.0	87.0	21.1	0.596	19.3	1.58	2.89
13_1_06	MW-13	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	2022-02-23 to 2023-08-02	Gamma; Lognormal; Normal	Normal	405	386	336	492	56.0	0.138	65.2	0.476	-1.24
13_1_07	MW-13	Appendix III	pH, Field	su	11	0	0%	2022-02-23 to 2023-08-02	Nonparametric	Nonparametric	6.98	7.04	6.39	7.25	0.239	0.0343	0.104	-1.67	3.41
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
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_5_38	MW-13	Part 115	Iron	mg/L	11	1	9%	2022-02-23 to 2023-08-02	Gamma; Lognormal	Gamma	0.0500	0.0350	0.0200	0.160	0.0432	0.864	0.0222	2.17	5.06
13_5_42	MW-13	Part 115	Zinc	mg/L	11	10	91%	2022-02-23 to 2023-08-02		Nonparametric	0.0100	0.0100	0.0100	0.0100	NA	NA	0	NA	NA
14_1_01	MW-14	Appendix III	Boron	mg/L	8	0	0%	2023-01-12 to 2023-09-15	Gamma; Lognormal; Normal	Normal	2.15	2.15	2.03	2.29	0.0851	0.0396	0.0889	0.288	-0.290
14_1_02	MW-14	Appendix III	Calcium	mg/L	8	0	0%	2023-01-12 to 2023-09-15	Gamma; Lognormal; Normal	Normal	146	146	141	154	4.00	0.0274	2.96	1.05	1.60
14_1_03	MW-14	Appendix III	Chloride	mg/L	8	0	0%	2023-01-12 to 2023-09-15	Gamma; Lognormal; Normal	Normal	113	114	108	118	3.02	0.0268	2.96	-0.0413	0.432
14_1_05	MW-14	Appendix III	Sulfate	mg/L	8	0	0%	2023-01-12 to 2023-09-15	Nonparametric	Nonparametric	111	19.5	16.0	748	257	2.32	4.44	2.83	7.99
14_1_06	MW-14	Appendix III	Total Dissolved Solids	mg/L	7	0	0%	2023-01-12 to 2023-09-15	Gamma; Lognormal; Normal	Nonparametric	784	792	732	808	25.8	0.0329	17.8	-1.65	3.03
14_1_07	MW-14	Appendix III	pH, Field	su	8	0	0%	2023-01-12 to 2023-09-15	Gamma; Lognormal; Normal	Normal	7.02	7.02	6.92	7.13	0.0746	0.0106	0.0815	0.127	-1.21
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

(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
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
14_5_38	MW-14	Part 115	Iron	mg/L	8	0	0%	2023-01-12 to 2023-09-15	Gamma; Lognormal; Normal	Normal	10.6	11.3	6.58	12.9	1.94	0.182	1.26	-1.41	2.43
14_5_39	MW-14	Part 115	Nickel	mg/L	8	6	75%	2023-01-12 to 2023-09-15		Nonparametric	0.00550	0.00550	0.00500	0.00600	0.000707	0.129	0.000741	NA	NA
15_1_01	MW-15	Appendix III	Boron	mg/L	8	0	0%	0023-02-17 to 2023-09-15	Gamma; Lognormal; Normal	Normal	0.372	0.360	0.330	0.440	0.0399	0.107	0.0370	0.672	-0.973
15_1_02	MW-15	Appendix III	Calcium	mg/L	8	0	0%	0023-02-17 to 2023-09-15	Gamma; Lognormal; Normal	Normal	135	136	104	183	24.1	0.179	19.3	0.969	1.68
15_1_03	MW-15	Appendix III	Chloride	mg/L	8	0	0%	0023-02-17 to 2023-09-15	Gamma; Lognormal; Normal	Normal	73.9	72.5	59.0	100	13.6	0.184	14.1	0.925	0.765
15_1_05	MW-15	Appendix III	Sulfate	mg/L	8	0	0%	0023-02-17 to 2023-09-15	Nonparametric	Nonparametric	132	117	109	238	43.7	0.330	11.9	2.60	6.99
15_1_06	MW-15	Appendix III	Total Dissolved Solids	mg/L	8	0	0%	0023-02-17 to 2023-09-15	Gamma; Lognormal; Normal	Normal	658	654	528	878	105	0.159	62.2	1.29	2.75
15_1_07	MW-15	Appendix III	pH, Field	su	8	0	0%	0023-02-17 to 2023-09-15	Gamma; Lognormal; Normal	Normal	6.85	6.85	6.69	6.99	0.112	0.0163	0.133	-0.283	-0.909
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
15_5_38	MW-15	Part 115	Iron	mg/L	8	1	12%	0023-02-17 to 2023-09-15	Gamma; Lognormal; Normal	Normal	0.0714	0.0500	0.0200	0.140	0.0474	0.664	0.0444	0.414	-1.92
15_5_42	MW-15	Part 115	Zinc	mg/L	8	7	88%	0023-02-17 to 2023-09-15		Nonparametric	0.0210	0.0210	0.0210	0.0210	NA	NA	0	NA	NA
16A_1_01	MW-16A	Appendix III	Boron	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	0.158	0.160	0.100	0.230	0.0536	0.340	0.0741	0.0953	-2.10
16A_1_02	MW-16A	Appendix III	Calcium	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	183	173	145	226	29.7	0.162	38.5	0.318	-1.22
16A_1_03	MW-16A	Appendix III	Chloride	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	432	423	383	505	42.8	0.0990	47.4	0.652	-0.853
16A_1_05	MW-16A	Appendix III	Sulfate	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	166	145	86.0	264	69.0	0.415	78.5	0.505	-1.49
16A_1_06	MW-16A	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	1408	1370	1170	1720	199	0.141	281	0.399	-1.18
16A_1_07	MW-16A	Appendix III	pH, Field	su	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	6.84	6.82	6.72	7.00	0.0935	0.0137	0.0889	0.580	-0.782
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
16A_5_38	MW-16A	Part 115	Iron	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	3.19	3.08	2.59	4.13	0.558	0.175	0.667	0.590	-1.08
16B_1_01	MW-16B	Appendix III	Boron	mg/L	9	0	0%	2023-02-02 to 2023-11-21		Nonparametric	0.119	0.120	0.110	0.130	0.00782	0.0658	0.0148	0.216	-1.04
16B_1_02	MW-16B	Appendix III	Calcium	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	80.1	80.2	74.5	85.4	3.36	0.0419	2.67	-0.0735	-0.162
16B_1_03	MW-16B	Appendix III	Chloride	mg/L	9	5	56%	2023-02-02 to 2023-11-21		Nonparametric	5.70	4.35	3.10	11.0	3.62	0.635	1.41	1.73	3.0
16B_1_04	MW-16B	Appendix III	Fluoride	mg/L	9	7	78%	2023-02-02 to 2023-11-21		Nonparametric	0.445	0.445	0.310	0.580	0.191	0.429	0.200	NA	NA
16B_1_05	MW-16B	Appendix III	Sulfate	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	17	17.0	15.0	18.0	1.10	0.0646	1.48	-0.711	-0.720
16B_1_06	MW-16B	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Lognormal; Normal	Normal	365	366	350	378	7.69	0.0211	0	-0.548	1.78
16B_1_07	MW-16B	Appendix III	pH, Field	su	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	7.41	7.45	7.25	7.50	0.0865	0.0117	0.0593	-0.898	-0.417
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
16B_5_38	MW-16B	Part 115	Iron	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	0.537	0.450	0.390	0.930	0.177	0.330	0.0889	1.60	2.38

(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
7C_1_01	MW-7C	Appendix III	Boron	mg/L	11	0	0%	2022-03-10 to 2023-08-02	Gamma; Lognormal; Normal	Normal	6.61	6.55	6.29	7.24	0.247	0.0374	0.163	1.67	4.14
7C_1_02	MW-7C	Appendix III	Calcium	mg/L	11	0	0%	2022-03-10 to 2023-08-02	Nonparametric	Nonparametric	243	245	183	277	24.3	0.0999	14.8	-1.36	3.86
7C_1_03	MW-7C	Appendix III	Chloride	mg/L	11	0	0%	2022-03-10 to 2023-08-02	Gamma; Lognormal; Normal	Normal	93.7	93.0	90.0	101	2.94	0.0313	1.48	1.54	3.45
7C_1_05	MW-7C	Appendix III	Sulfate	mg/L	11	0	0%	2022-03-10 to 2023-08-02	Gamma; Lognormal; Normal	Normal	700	687	656	761	37.1	0.0529	40.0	0.472	-1.25
7C_1_06	MW-7C	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	2022-03-10 to 2023-08-02	Nonparametric	Nonparametric	1399	1360	1350	1500	58.6	0.0419	14.8	1.07	-0.542
7C_1_07	MW-7C	Appendix III	pH, Field	su	11	0	0%	2022-03-10 to 2023-08-02	Gamma; Lognormal; Normal	Normal	7.34	7.32	7.23	7.51	0.0971	0.0132	0.119	0.840	-0.391
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	-0.0000000000000485	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
7C_5_38	MW-7C	Part 115	Iron	mg/L	11	0	0%	2022-03-10 to 2023-08-02	Gamma; Lognormal; Normal	Normal	4.02	4.11	3.67	4.34	0.217	0.0541	0.252	-0.209	-1.10
7C_5_39	MW-7C	Part 115	Nickel	mg/L	11	0	0%	2022-03-10 to 2023-08-02	Nonparametric	Nonparametric	0.00800	0.00800	0.00700	0.0110	0.00134	0.168	0.00148	1.52	1.60
7C_5_42	MW-7C	Part 115	Zinc	mg/L	11	9	82%	2022-03-10 to 2023-08-02		Nonparametric	0.00650	0.00650	0.00600	0.00700	0.000707	0.109	0.000741	NA	NA

Table 3: Goodness-of-Fit Tests, Non-Detects Excluded

								Normal				Lognormal				Gamma						
								S-W		Lilliefors		S-W		Lilliefors		K-S		A-D				
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution
02_1_01	MW-2	Appendix III	Boron	mg/L	16	0	0%	0.916	0.144	0.166	0.284	0.894	0.064	0.160	0.339	0.170	>= 0.10	0.573	>= 0.10	0.188	Gamma; Lognormal; Normal	Normal
02_1_02	MW-2	Appendix III	Calcium	mg/L	16	0	0%	0.805	0.003	0.225	0.029	0.790	0.002	0.243	0.012	0.240	0.01 <= p < 0.05	1.452	< 0.01	0.113	Nonparametric	Nonparametric
02_1_03	MW-2	Appendix III	Chloride	mg/L	16	0	0%	0.910	0.114	0.168	0.268	0.889	0.054	0.169	0.259	0.180	>= 0.10	0.743	0.01 <= p < 0.05	0.095	Gamma; Lognormal; Normal	Normal
02_1_04	MW-2	Appendix III	Fluoride	mg/L	16	16	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
02_1_05	MW-2	Appendix III	Sulfate	mg/L	16	0	0%	0.888	0.051	0.198	0.092	0.869	0.026	0.222	0.034	0.220	0.01 <= p < 0.05	0.864	0.01 <= p < 0.05	0.240	Normal	Normal
02_1_06	MW-2	Appendix III	Total Dissolved Solids	mg/L	16	0	0%	0.888	0.051	0.187	0.141	0.875	0.032	0.182	0.168	0.197	>= 0.10	0.794	0.01 <= p < 0.05	0.119	Gamma; Lognormal; Normal	Normal
02_1_07	MW-2	Appendix III	pH, Field	su	17	0	0%	0.917	0.130	0.144	0.463	0.922	0.159	0.142	0.486	0.136	>= 0.10	0.507	>= 0.10	0.017	Gamma; Lognormal; Normal	Normal
02_2_04	MW-2	Appendix IV	Fluoride	mg/L	17	17	100%	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		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		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		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		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		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		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		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		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		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		Nonparametric
02_5_37	MW-2	Part 115	Copper	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
02_5_38	MW-2	Part 115	Iron	mg/L	17	0	0%	0.716	0.000	0.283	0.001	0.867	0.020	0.226	0.021	0.252	< 0.01	1.076	< 0.01	0.388	Nonparametric	Nonparametric
02_5_39	MW-2	Part 115	Nickel	mg/L	17	0	0%	0.850	0.011	0.228	0.019	0.834	0.006	0.245	0.008	0.248	< 0.01	1.326	< 0.01	0.171	Nonparametric	Nonparametric
02_5_40	MW-2	Part 115	Silver	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
02_5_41	MW-2	Part 115	Vanadium	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
02_5_42	MW-2	Part 115	Zinc	mg/L	17	14	82%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		1.021		Nonparametric
03_1_01	MW-3	Appendix III	Boron	mg/L	6	0	0%	0.931	0.590	0.258	0.241	0.938	0.642	0.252	0.272	0.261	>= 0.10	0.338	>= 0.10	0.045	Gamma; Lognormal; Normal	Nonparametric
03_1_02	MW-3	Appendix III	Calcium	mg/L	6	0	0%	0.889	0.313	0.237	0.365	0.878	0.259	0.246	0.307	0.233	>= 0.10	0.410	>= 0.10	0.049	Gamma; Lognormal; Normal	Nonparametric
03_1_03	MW-3	Appendix III	Chloride	mg/L	6	0	0%	0.924	0.535	0.205	0.600	0.924	0.532	0.209	0.568	0.226	>= 0.10	0.329	>= 0.10	0.055	Gamma; Lognormal; Normal	Nonparametric
03_1_04	MW-3	Appendix III	Fluoride	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
03_1_05	MW-3	Appendix III	Sulfate	mg/L	6	0	0%	0.905	0.405	0.205	0.598	0.907	0.416	0.204	0.608	0.225	>= 0.10	0.345	>= 0.10	0.031	Gamma; Lognormal; Normal	Nonparametric
03_1_06	MW-3	Appendix III	Total Dissolved Solids	mg/L	6	0	0%	0.864	0.204	0.235	0.378	0.864	0.202	0.234	0.385	0.253	>= 0.10	0.487	>= 0.10	0.018	Gamma; Lognormal; Normal	Nonparametric
03_1_07	MW-3	Appendix III	pH, Field	su	6	0	0%	0.950	0.742	0.177	0.804	0.950	0.744	0.177	0.805	0.199	>= 0.10	0.245	>= 0.10	0.007	Gamma; Lognormal; Normal	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		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		Nonparametric
03_2_09	MW-3	Appendix IV	Arsenic	mg/L	6	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.117		Nonparametric
03_2_10	MW-3	Appendix IV	Barium	mg/L	6	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.049		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)*

								Normal				Lognormal				Gamma						
								S-W		Lilliefors		S-W		Lilliefors		K-S		A-D				
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution
03_2_11	MW-3	Appendix IV	Beryllium	mg/L	6	6	100%	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		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		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		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		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		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		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		Nonparametric
03_5_37	MW-3	Part 115	Copper	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
03_5_38	MW-3	Part 115	Iron	mg/L	6	0	0%	0.872	0.236	0.234	0.385	0.866	0.210	0.234	0.381	0.257	>= 0.10	0.490	>= 0.10	0.076	Gamma; Lognormal; Normal	Nonparametric
03_5_39	MW-3	Part 115	Nickel	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
03_5_40	MW-3	Part 115	Silver	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
03_5_41	MW-3	Part 115	Vanadium	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
03_5_42	MW-3	Part 115	Zinc	mg/L	6	6	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
05_1_01	MW-5	Appendix III	Boron	mg/L	16	0	0%	0.774	0.001	0.249	0.009	0.503	0.000	0.323	0.000	0.311	< 0.01	2.488	< 0.01	0.649	Nonparametric	Nonparametric
05_1_02	MW-5	Appendix III	Calcium	mg/L	16	0	0%	0.949	0.478	0.164	0.301	0.778	0.001	0.249	0.009	0.219	0.01 <= p < 0.05	0.784	0.01 <= p < 0.05	0.377	Normal	Normal
05_1_03	MW-5	Appendix III	Chloride	mg/L	16	0	0%	0.891	0.058	0.177	0.200	0.848	0.013	0.218	0.041	0.201	0.05 <= p < 0.10	0.817	0.01 <= p < 0.05	0.187	Gamma; Normal	Normal
05_1_04	MW-5	Appendix III	Fluoride	mg/L	16	16	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
05_1_05	MW-5	Appendix III	Sulfate	mg/L	16	0	0%	0.976	0.920	0.131	0.652	0.887	0.049	0.225	0.029	0.190	>= 0.10	0.456	>= 0.10	0.488	Gamma; Normal	Normal
05_1_06	MW-5	Appendix III	Total Dissolved Solids	mg/L	16	0	0%	0.969	0.830	0.123	0.747	0.907	0.105	0.187	0.140	0.161	>= 0.10	0.399	>= 0.10	0.331	Gamma; Lognormal; Normal	Normal
05_1_07	MW-5	Appendix III	pH, Field	su	17	0	0%	0.727	0.000	0.293	0.000	0.711	0.000	0.303	0.000	0.294	< 0.01	1.846	< 0.01	0.038	Nonparametric	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		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		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		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		Nonparametric
05_2_13	MW-5	Appendix IV	Chromium	mg/L	17	15	88%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.252		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		Nonparametric
05_2_15	MW-5	Appendix IV	Lead	mg/L	17	14	82%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.785		Nonparametric
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		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		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		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)*

								Normal				Lognormal				Gamma						
								S-W		Lilliefors		S-W		Lilliefors		K-S		A-D				
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution
05_5_37	MW-5	Part 115	Copper	mg/L	17	12	71%	0.944	0.692	0.239	0.455	0.978	0.922	0.163	0.931	0.193	>= 0.10	0.212	>= 0.10	0.645	Gamma; Lognormal; Normal	Nonparametric
05_5_38	MW-5	Part 115	Iron	mg/L	17	1	6%	0.684	0.000	0.250	0.009	0.962	0.705	0.092	0.974	0.133	>= 0.10	0.464	>= 0.10	1.140	Gamma; Lognormal	Gamma
05_5_39	MW-5	Part 115	Nickel	mg/L	17	0	0%	0.953	0.507	0.159	0.302	0.950	0.452	0.152	0.367	0.129	>= 0.10	0.280	>= 0.10	0.354	Gamma; Lognormal; Normal	Normal
05_5_40	MW-5	Part 115	Silver	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
05_5_41	MW-5	Part 115	Vanadium	mg/L	17	15	88%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.203		Nonparametric
05_5_42	MW-5	Part 115	Zinc	mg/L	17	4	24%	0.701	0.001	0.254	0.022	0.913	0.200	0.151	0.576	0.186	>= 0.10	0.665	0.05 <= p < 0.10	0.956	Gamma; Lognormal	Gamma
06_1_01	MW-6	Appendix III	Boron	mg/L	16	0	0%	0.969	0.817	0.119	0.791	0.953	0.543	0.115	0.825	0.125	>= 0.10	0.254	>= 0.10	0.233	Gamma; Lognormal; Normal	Normal
06_1_02	MW-6	Appendix III	Calcium	mg/L	16	0	0%	0.907	0.106	0.178	0.189	0.909	0.113	0.174	0.217	0.184	>= 0.10	0.522	>= 0.10	0.111	Gamma; Lognormal; Normal	Normal
06_1_03	MW-6	Appendix III	Chloride	mg/L	16	0	0%	0.893	0.061	0.176	0.207	0.884	0.046	0.179	0.186	0.183	>= 0.10	0.788	0.01 <= p < 0.05	0.202	Gamma; Lognormal; Normal	Normal
06_1_04	MW-6	Appendix III	Fluoride	mg/L	16	16	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
06_1_05	MW-6	Appendix III	Sulfate	mg/L	16	0	0%	0.923	0.191	0.151	0.430	0.925	0.203	0.154	0.391	0.161	>= 0.10	0.437	>= 0.10	0.264	Gamma; Lognormal; Normal	Normal
06_1_06	MW-6	Appendix III	Total Dissolved Solids	mg/L	16	0	0%	0.941	0.358	0.161	0.325	0.938	0.330	0.170	0.250	0.174	>= 0.10	0.432	>= 0.10	0.126	Gamma; Lognormal; Normal	Normal
06_1_07	MW-6	Appendix III	pH, Field	su	17	0	0%	0.921	0.151	0.193	0.093	0.920	0.149	0.197	0.079	0.192	>= 0.10	0.726	0.05 <= p < 0.10	0.025	Gamma; Lognormal; Normal	Normal
06_2_04	MW-6	Appendix IV	Fluoride	mg/L	17	17	100%	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		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		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		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		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		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		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		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		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	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		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		Nonparametric
06_5_37	MW-6	Part 115	Copper	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
06_5_38	MW-6	Part 115	Iron	mg/L	17	8	47%	0.715	0.002	0.251	0.105	0.925	0.431	0.155	0.771	0.174	>= 0.10	0.491	>= 0.10	0.743	Gamma; Lognormal; Normal	Nonparametric
06_5_39	MW-6	Part 115	Nickel	mg/L	17	3	18%	0.850	0.022	0.320	0.000	0.832	0.013	0.335	0.000	0.334	< 0.01	1.221	< 0.01	0.124	Nonparametric	Nonparametric
06_5_40	MW-6	Part 115	Silver	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
06_5_41	MW-6	Part 115	Vanadium	mg/L	17	17	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
06_5_42	MW-6	Part 115	Zinc	mg/L	17	16	94%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
07_1_01	MW-7	Appendix III	Boron	mg/L	11	0	0%	0.967	0.855	0.160	0.597	0.954	0.697	0.207	0.208	0.190	>= 0.10	0.302	>= 0.10	0.259	Gamma; Lognormal; Normal	Normal
07_1_02	MW-7	Appendix III	Calcium	mg/L	11	0	0%	0.901	0.190	0.203	0.234	0.934	0.455	0.184	0.372	0.190	>= 0.10	0.340	>= 0.10	0.122	Gamma; Lognormal; Normal	Normal
07_1_03	MW-7	Appendix III	Chloride	mg/L	11	0	0%	0.709	0.001	0.280	0.016	0.740	0.002	0.278	0.018	0.277	0.01 <= p < 0.05	1.140	< 0.01	0.089	Nonparametric	Nonparametric
07_1_04	MW-7	Appendix III	Fluoride	mg/L	11	10	91%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
07_1_05	MW-7	Appendix III	Sulfate	mg/L	11	0	0%	0.858	0.053	0.170	0.506	0.899	0.182	0.146	0.733	0.156	>= 0.10	0.444	>= 0.10	0.117	Gamma; Lognormal; Normal	Normal

(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)*

								Normal				Lognormal				Gamma						
								S-W		Lilliefors		S-W		Lilliefors		K-S		A-D				
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution
07_1_06	MW-7	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	0.781	0.005	0.243	0.068	0.821	0.018	0.236	0.088	0.238	0.05 <= p < 0.10	0.820	0.01 <= p < 0.05	0.087	Gamma; Lognormal; Normal	Normal
07_1_07	MW-7	Appendix III	pH, Field	su	11	0	0%	0.748	0.002	0.307	0.005	0.763	0.003	0.299	0.007	0.298	< 0.01	1.058	< 0.01	0.031	Nonparametric	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		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		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		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		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		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		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		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		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		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		Nonparametric
07_5_37	MW-7	Part 115	Copper	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
07_5_38	MW-7	Part 115	Iron	mg/L	11	0	0%	0.692	0.000	0.342	0.001	0.825	0.020	0.274	0.020	0.294	0.01 <= p < 0.05	0.906	0.01 <= p < 0.05	0.273	Nonparametric	Nonparametric
07_5_39	MW-7	Part 115	Nickel	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
07_5_40	MW-7	Part 115	Silver	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
07_5_41	MW-7	Part 115	Vanadium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
07_5_42	MW-7	Part 115	Zinc	mg/L	11	8	73%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.400		Nonparametric
08_1_01	MW-8	Appendix III	Boron	mg/L	11	1	9%	0.864	0.086	0.236	0.117	0.953	0.701	0.224	0.164	0.206	>= 0.10	0.392	>= 0.10	0.473	Gamma; Lognormal; Normal	Normal
08_1_02	MW-8	Appendix III	Calcium	mg/L	11	0	0%	0.967	0.856	0.133	0.851	0.967	0.851	0.136	0.824	0.146	>= 0.10	0.196	>= 0.10	0.059	Gamma; Lognormal; Normal	Normal
08_1_03	MW-8	Appendix III	Chloride	mg/L	11	2	18%	0.764	0.008	0.285	0.034	0.945	0.638	0.155	0.773	0.212	>= 0.10	0.499	>= 0.10	0.891	Gamma; Lognormal	Gamma
08_1_04	MW-8	Appendix III	Fluoride	mg/L	11	10	91%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
08_1_05	MW-8	Appendix III	Sulfate	mg/L	11	0	0%	0.856	0.050	0.254	0.046	0.909	0.238	0.209	0.197	0.237	>= 0.10	0.511	>= 0.10	0.567	Gamma; Lognormal; Normal	Normal
08_1_06	MW-8	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	0.851	0.045	0.245	0.064	0.868	0.073	0.237	0.085	0.242	0.05 <= p < 0.10	0.666	0.05 <= p < 0.10	0.074	Gamma; Lognormal; Normal	Normal
08_1_07	MW-8	Appendix III	pH, Field	su	11	0	0%	0.740	0.002	0.249	0.056	0.752	0.002	0.240	0.075	0.238	0.05 <= p < 0.10	0.969	0.01 <= p < 0.05	0.031	Gamma; Lognormal; Normal	Normal
08_2_04	MW-8	Appendix IV	Fluoride	mg/L	11	10	91%	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		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		Nonparametric
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		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		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		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		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		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)*

								Normal				Lognormal				Gamma						
								S-W		Lilliefors		S-W		Lilliefors		K-S		A-D				
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution
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		Nonparametric
08_2_18	MW-8	Appendix IV	Molybdenum	mg/L	11	9	82%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.547		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		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		Nonparametric
08_5_37	MW-8	Part 115	Copper	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
08_5_38	MW-8	Part 115	Iron	mg/L	11	10	91%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
08_5_39	MW-8	Part 115	Nickel	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
08_5_40	MW-8	Part 115	Silver	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
08_5_41	MW-8	Part 115	Vanadium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
08_5_42	MW-8	Part 115	Zinc	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
09_1_01	MW-9	Appendix III	Boron	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
09_1_02	MW-9	Appendix III	Calcium	mg/L	11	0	0%	0.832	0.025	0.267	0.027	0.826	0.021	0.270	0.024	0.283	0.01 <= p < 0.05	0.884	0.01 <= p < 0.05	0.090	Nonparametric	Nonparametric
09_1_03	MW-9	Appendix III	Chloride	mg/L	11	10	91%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
09_1_04	MW-9	Appendix III	Fluoride	mg/L	11	10	91%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
09_1_05	MW-9	Appendix III	Sulfate	mg/L	11	8	73%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.262		Nonparametric
09_1_06	MW-9	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	0.874	0.086	0.233	0.096	0.881	0.107	0.228	0.113	0.236	>= 0.10	0.680	0.05 <= p < 0.10	0.068	Gamma; Lognormal; Normal	Normal
09_1_07	MW-9	Appendix III	pH, Field	su	11	0	0%	0.861	0.059	0.194	0.294	0.868	0.073	0.190	0.321	0.194	>= 0.10	0.545	>= 0.10	0.025	Gamma; Lognormal; Normal	Normal
09_2_04	MW-9	Appendix IV	Fluoride	mg/L	11	10	91%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		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		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		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		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		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		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		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		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		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		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		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		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		Nonparametric
09_5_37	MW-9	Part 115	Copper	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
09_5_38	MW-9	Part 115	Iron	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
09_5_39	MW-9	Part 115	Nickel	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
09_5_40	MW-9	Part 115	Silver	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
09_5_41	MW-9	Part 115	Vanadium	mg/L	11	11	100%	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)*

								Normal				Lognormal				Gamma						
								S-W		Lilliefors		S-W		Lilliefors		K-S		A-D				
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution
09_5_42	MW-9	Part 115	Zinc	mg/L	11	10	91%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
10_1_01	MW-10	Appendix III	Boron	mg/L	11	0	0%	0.810	0.013	0.363	0.000	0.825	0.020	0.345	0.001	0.358	< 0.01	1.210	< 0.01	0.144	Nonparametric	Nonparametric
10_1_02	MW-10	Appendix III	Calcium	mg/L	11	0	0%	0.927	0.386	0.215	0.165	0.914	0.275	0.229	0.109	0.218	>= 0.10	0.419	>= 0.10	0.071	Gamma; Lognormal; Normal	Normal
10_1_03	MW-10	Appendix III	Chloride	mg/L	11	9	82%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		1.246		Nonparametric
10_1_04	MW-10	Appendix III	Fluoride	mg/L	11	10	91%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
10_1_05	MW-10	Appendix III	Sulfate	mg/L	11	0	0%	0.948	0.616	0.106	0.979	0.923	0.348	0.148	0.720	0.134	>= 0.10	0.299	>= 0.10	0.229	Gamma; Lognormal; Normal	Normal
10_1_06	MW-10	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	0.980	0.966	0.108	0.974	0.977	0.946	0.122	0.917	0.119	>= 0.10	0.163	>= 0.10	0.083	Gamma; Lognormal; Normal	Normal
10_1_07	MW-10	Appendix III	pH, Field	su	11	0	0%	0.846	0.038	0.226	0.121	0.859	0.056	0.220	0.145	0.221	>= 0.10	0.590	>= 0.10	0.033	Gamma; Lognormal; Normal	Normal
10_2_04	MW-10	Appendix IV	Fluoride	mg/L	11	10	91%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		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		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		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		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		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		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		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		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		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		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		Nonparametric
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		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		Nonparametric
10_5_37	MW-10	Part 115	Copper	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
10_5_38	MW-10	Part 115	Iron	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
10_5_39	MW-10	Part 115	Nickel	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
10_5_40	MW-10	Part 115	Silver	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
10_5_41	MW-10	Part 115	Vanadium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
10_5_42	MW-10	Part 115	Zinc	mg/L	11	9	82%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.565		Nonparametric
13_1_01	MW-13	Appendix III	Boron	mg/L	11	0	0%	0.920	0.323	0.179	0.419	0.920	0.317	0.172	0.478	0.179	>= 0.10	0.414	>= 0.10	0.148	Gamma; Lognormal; Normal	Normal
13_1_02	MW-13	Appendix III	Calcium	mg/L	11	0	0%	0.832	0.024	0.258	0.040	0.840	0.031	0.249	0.055	0.256	0.05 <= p < 0.10	0.833	0.01 <= p < 0.05	0.146	Gamma; Lognormal	Gamma
13_1_03	MW-13	Appendix III	Chloride	mg/L	11	2	18%	0.846	0.068	0.239	0.145	0.911	0.322	0.168	0.653	0.204	>= 0.10	0.444	>= 0.10	0.613	Gamma; Lognormal; Normal	Normal
13_1_04	MW-13	Appendix III	Fluoride	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
13_1_05	MW-13	Appendix III	Sulfate	mg/L	11	0	0%	0.845	0.037	0.198	0.265	0.941	0.536	0.138	0.811	0.135	>= 0.10	0.329	>= 0.10	0.541	Gamma; Lognormal; Normal	Normal
13_1_06	MW-13	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	0.899	0.180	0.200	0.255	0.912	0.260	0.177	0.440	0.187	>= 0.10	0.470	>= 0.10	0.136	Gamma; Lognormal; Normal	Normal
13_1_07	MW-13	Appendix III	pH, Field	su	11	0	0%	0.842	0.034	0.271	0.023	0.829	0.023	0.276	0.019	0.278	0.01 <= p < 0.05	0.764	0.01 <= p < 0.05	0.035	Nonparametric	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		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		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		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)*

								Normal				Lognormal				Gamma						
								S-W		Lilliefors		S-W		Lilliefors		K-S		A-D				
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution
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		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		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		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		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		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		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		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		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		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		Nonparametric
13_5_37	MW-13	Part 115	Copper	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
13_5_38	MW-13	Part 115	Iron	mg/L	11	1	9%	0.724	0.002	0.292	0.016	0.894	0.190	0.190	0.387	0.237	>= 0.10	0.612	>= 0.10	0.681	Gamma; Lognormal	Gamma
13_5_39	MW-13	Part 115	Nickel	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
13_5_40	MW-13	Part 115	Silver	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
13_5_41	MW-13	Part 115	Vanadium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
13_5_42	MW-13	Part 115	Zinc	mg/L	11	10	91%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
14_1_01	MW-14	Appendix III	Boron	mg/L	8	0	0%	0.979	0.956	0.151	0.851	0.981	0.966	0.145	0.890	0.140	>= 0.10	0.164	>= 0.10	0.039	Gamma; Lognormal; Normal	Normal
14_1_02	MW-14	Appendix III	Calcium	mg/L	8	0	0%	0.918	0.417	0.191	0.525	0.925	0.470	0.190	0.535	0.201	>= 0.10	0.359	>= 0.10	0.027	Gamma; Lognormal; Normal	Normal
14_1_03	MW-14	Appendix III	Chloride	mg/L	8	0	0%	0.975	0.931	0.130	0.958	0.974	0.928	0.133	0.945	0.141	>= 0.10	0.229	>= 0.10	0.027	Gamma; Lognormal; Normal	Normal
14_1_04	MW-14	Appendix III	Fluoride	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
14_1_05	MW-14	Appendix III	Sulfate	mg/L	8	0	0%	0.433	0.000	0.498	0.000	0.555	0.000	0.383	0.001	0.476	< 0.01	2.120	< 0.01	1.305	Nonparametric	Nonparametric
14_1_06	MW-14	Appendix III	Total Dissolved Solids	mg/L	7	0	0%	0.848	0.117	0.210	0.462	0.838	0.095	0.216	0.418	0.214	>= 0.10	0.539	>= 0.10	0.034	Gamma; Lognormal; Normal	Nonparametric
14_1_07	MW-14	Appendix III	pH, Field	su	8	0	0%	0.965	0.854	0.126	0.968	0.965	0.857	0.126	0.969	0.141	>= 0.10	0.195	>= 0.10	0.011	Gamma; Lognormal; Normal	Normal
14_2_04	MW-14	Appendix IV	Fluoride	mg/L	8	8	100%	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		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		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		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		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		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		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		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		0.260		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)*

								Normal				Lognormal				Gamma						
								S-W		Lilliefors		S-W		Lilliefors		K-S		A-D				
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution
14_2_23	MW-14	Appendix IV	Thallium	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
14_5_37	MW-14	Part 115	Copper	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
14_5_38	MW-14	Part 115	Iron	mg/L	8	0	0%	0.886	0.213	0.238	0.201	0.820	0.047	0.253	0.137	0.257	>= 0.10	0.610	0.05 <= p < 0.10	0.210	Gamma; Lognormal; Normal	Normal
14_5_39	MW-14	Part 115	Nickel	mg/L	8	6	75%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.129		Nonparametric
14_5_40	MW-14	Part 115	Silver	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
14_5_41	MW-14	Part 115	Vanadium	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
14_5_42	MW-14	Part 115	Zinc	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
15_1_01	MW-15	Appendix III	Boron	mg/L	8	0	0%	0.903	0.307	0.214	0.349	0.910	0.355	0.208	0.391	0.220	>= 0.10	0.405	>= 0.10	0.105	Gamma; Lognormal; Normal	Normal
15_1_02	MW-15	Appendix III	Calcium	mg/L	8	0	0%	0.924	0.463	0.212	0.358	0.956	0.773	0.185	0.582	0.186	>= 0.10	0.282	>= 0.10	0.173	Gamma; Lognormal; Normal	Normal
15_1_03	MW-15	Appendix III	Chloride	mg/L	8	0	0%	0.929	0.504	0.151	0.856	0.953	0.738	0.120	0.982	0.131	>= 0.10	0.239	>= 0.10	0.178	Gamma; Lognormal; Normal	Normal
15_1_04	MW-15	Appendix III	Fluoride	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
15_1_05	MW-15	Appendix III	Sulfate	mg/L	8	0	0%	0.592	0.000	0.350	0.005	0.657	0.001	0.294	0.040	0.311	0.01 <= p < 0.05	1.339	< 0.01	0.262	Nonparametric	Nonparametric
15_1_06	MW-15	Appendix III	Total Dissolved Solids	mg/L	8	0	0%	0.898	0.275	0.257	0.125	0.940	0.607	0.228	0.256	0.232	>= 0.10	0.334	>= 0.10	0.151	Gamma; Lognormal; Normal	Normal
15_1_07	MW-15	Appendix III	pH, Field	su	8	0	0%	0.916	0.401	0.183	0.594	0.915	0.392	0.186	0.569	0.181	>= 0.10	0.351	>= 0.10	0.016	Gamma; Lognormal; Normal	Normal
15_2_04	MW-15	Appendix IV	Fluoride	mg/L	8	8	100%	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		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		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		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		Nonparametric
15_2_13	MW-15	Appendix IV	Chromium	mg/L	8	8	100%	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		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		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		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		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		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		Nonparametric
15_5_37	MW-15	Part 115	Copper	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
15_5_38	MW-15	Part 115	Iron	mg/L	8	1	12%	0.879	0.223	0.246	0.226	0.920	0.473	0.238	0.269	0.253	>= 0.10	0.405	>= 0.10	0.744	Gamma; Lognormal; Normal	Normal
15_5_39	MW-15	Part 115	Nickel	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
15_5_40	MW-15	Part 115	Silver	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
15_5_41	MW-15	Part 115	Vanadium	mg/L	8	8	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
15_5_42	MW-15	Part 115	Zinc	mg/L	8	7	88%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
16A_1_01	MW-16A	Appendix III	Boron	mg/L	9	0	0%	0.849	0.073	0.258	0.085	0.838	0.055	0.253	0.099	0.269	0.05 <= p < 0.10	0.707	0.05 <= p < 0.10	0.352	Gamma; Lognormal; Normal	Normal
16A_1_02	MW-16A	Appendix III	Calcium	mg/L	9	0	0%	0.898	0.243	0.216	0.263	0.906	0.287	0.188	0.476	0.199	>= 0.10	0.456	>= 0.10	0.162	Gamma; Lognormal; Normal	Normal
16A_1_03	MW-16A	Appendix III	Chloride	mg/L	9	0	0%	0.926	0.447	0.180	0.550	0.936	0.540	0.176	0.581	0.187	>= 0.10	0.305	>= 0.10	0.097	Gamma; Lognormal; Normal	Normal
16A_1_04	MW-16A	Appendix III	Fluoride	mg/L	9	9	100%	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)*

								Normal				Lognormal				Gamma						
								S-W		Lilliefors		S-W		Lilliefors		K-S		A-D				
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution
16A_1_05	MW-16A	Appendix III	Sulfate	mg/L	9	0	0%	0.864	0.105	0.255	0.096	0.901	0.261	0.186	0.490	0.212	>= 0.10	0.494	>= 0.10	0.419	Gamma; Lognormal; Normal	Normal
16A_1_06	MW-16A	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.922	0.408	0.202	0.358	0.929	0.472	0.178	0.564	0.187	>= 0.10	0.336	>= 0.10	0.140	Gamma; Lognormal; Normal	Normal
16A_1_07	MW-16A	Appendix III	pH, Field	su	9	0	0%	0.945	0.633	0.171	0.625	0.946	0.650	0.169	0.647	0.170	>= 0.10	0.303	>= 0.10	0.014	Gamma; Lognormal; Normal	Normal
16A_2_04	MW-16A	Appendix IV	Fluoride	mg/L	9	9	100%	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		Nonparametric
16A_2_09	MW-16A	Appendix IV	Arsenic	mg/L	9	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.221		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		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		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		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		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		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		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		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		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		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		Nonparametric
16A_5_37	MW-16A	Part 115	Copper	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
16A_5_38	MW-16A	Part 115	Iron	mg/L	9	0	0%	0.902	0.266	0.196	0.408	0.914	0.342	0.166	0.673	0.176	>= 0.10	0.390	>= 0.10	0.171	Gamma; Lognormal; Normal	Normal
16A_5_39	MW-16A	Part 115	Nickel	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
16A_5_40	MW-16A	Part 115	Silver	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
16A_5_41	MW-16A	Part 115	Vanadium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
16A_5_42	MW-16A	Part 115	Zinc	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
16B_1_01	MW-16B	Appendix III	Boron	mg/L	9	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.066		Nonparametric
16B_1_02	MW-16B	Appendix III	Calcium	mg/L	9	0	0%	0.991	0.997	0.100	0.998	0.990	0.995	0.098	0.999	0.103	>= 0.10	0.129	>= 0.10	0.042	Gamma; Lognormal; Normal	Normal
16B_1_03	MW-16B	Appendix III	Chloride	mg/L	9	5	56%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.560		Nonparametric
16B_1_04	MW-16B	Appendix III	Fluoride	mg/L	9	7	78%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.443		Nonparametric
16B_1_05	MW-16B	Appendix III	Sulfate	mg/L	9	0	0%	0.865	0.109	0.218	0.253	0.861	0.099	0.216	0.259	0.233	>= 0.10	0.603	>= 0.10	0.066	Gamma; Lognormal; Normal	Normal
16B_1_06	MW-16B	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.878	0.149	0.324	0.007	0.875	0.139	0.327	0.006	0.329	< 0.01	0.745	0.01 <= p < 0.05	0.021	Lognormal; Normal	Normal
16B_1_07	MW-16B	Appendix III	pH, Field	su	9	0	0%	0.884	0.172	0.234	0.167	0.882	0.166	0.234	0.164	0.245	>= 0.10	0.556	>= 0.10	0.012	Gamma; Lognormal; Normal	Normal
16B_2_04	MW-16B	Appendix IV	Fluoride	mg/L	9	8	89%	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		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		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		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		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		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		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)*

								Normal				Lognormal				Gamma						
								S-W		Lilliefors		S-W		Lilliefors		K-S		A-D				
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution
16B_2_15	MW-16B	Appendix IV	Lead	mg/L	9	9	100%	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		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		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		Nonparametric
16B_5_37	MW-16B	Part 115	Copper	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
16B_5_38	MW-16B	Part 115	Iron	mg/L	9	0	0%	0.807	0.025	0.244	0.129	0.866	0.111	0.235	0.161	0.250	>= 0.10	0.631	0.05 <= p < 0.10	0.290	Gamma; Lognormal; Normal	Normal
16B_5_39	MW-16B	Part 115	Nickel	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
16B_5_40	MW-16B	Part 115	Silver	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
16B_5_41	MW-16B	Part 115	Vanadium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
16B_5_42	MW-16B	Part 115	Zinc	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
7C_1_01	MW-7C	Appendix III	Boron	mg/L	11	0	0%	0.854	0.048	0.210	0.192	0.870	0.077	0.202	0.241	0.198	>= 0.10	0.586	>= 0.10	0.037	Gamma; Lognormal; Normal	Normal
7C_1_02	MW-7C	Appendix III	Calcium	mg/L	11	0	0%	0.848	0.040	0.258	0.039	0.804	0.011	0.283	0.014	0.268	0.01 <= p < 0.05	0.834	0.01 <= p < 0.05	0.108	Nonparametric	Nonparametric
7C_1_03	MW-7C	Appendix III	Chloride	mg/L	11	0	0%	0.866	0.069	0.234	0.093	0.878	0.097	0.231	0.104	0.235	>= 0.10	0.604	>= 0.10	0.031	Gamma; Lognormal; Normal	Normal
7C_1_04	MW-7C	Appendix III	Fluoride	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
7C_1_05	MW-7C	Appendix III	Sulfate	mg/L	11	0	0%	0.921	0.328	0.187	0.347	0.925	0.363	0.181	0.402	0.188	>= 0.10	0.374	>= 0.10	0.052	Gamma; Lognormal; Normal	Normal
7C_1_06	MW-7C	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	0.747	0.002	0.327	0.002	0.750	0.002	0.325	0.002	0.332	< 0.01	1.325	< 0.01	0.041	Nonparametric	Nonparametric
7C_1_07	MW-7C	Appendix III	pH, Field	su	11	0	0%	0.889	0.136	0.200	0.255	0.891	0.144	0.198	0.268	0.201	>= 0.10	0.509	>= 0.10	0.013	Gamma; Lognormal; Normal	Normal
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		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		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		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		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		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		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		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		Nonparametric
7C_5_37	MW-7C	Part 115	Copper	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
7C_5_38	MW-7C	Part 115	Iron	mg/L	11	0	0%	0.939	0.504	0.208	0.205	0.936	0.473	0.214	0.172	0.220	>= 0.10	0.418	>= 0.10	0.054	Gamma; Lognormal; Normal	Normal
7C_5_39	MW-7C	Part 115	Nickel	mg/L	11	0	0%	0.750	0.002	0.318	0.003	0.774	0.004	0.289	0.011	0.298	< 0.01	1.146	< 0.01	0.155	Nonparametric	Nonparametric
7C_5_40	MW-7C	Part 115	Silver	mg/L	11	11	100%	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)*

								Normal				Lognormal				Gamma						
								S-W		Lilliefors		S-W		Lilliefors		K-S		A-D				
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution
7C_5_41	MW-7C	Part 115	Vanadium	mg/L	11	11	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
7C_5_42	MW-7C	Part 115	Zinc	mg/L	11	9	82%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.109		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_1_01	MW-2	Appendix III	Boron	mg/L	16	0	0%	0.667	0.003	**
02_1_02	MW-2	Appendix III	Calcium	mg/L	16	0	0%	0.763	0.001	***
02_1_03	MW-2	Appendix III	Chloride	mg/L	16	0	0%	0.526	0.021	*
02_1_05	MW-2	Appendix III	Sulfate	mg/L	16	0	0%	0.745	0.001	**
02_1_06	MW-2	Appendix III	Total Dissolved Solids	mg/L	16	0	0%	0.754	0.001	***
02_1_07	MW-2	Appendix III	pH, Field	su	17	0	0%	0.187	0.402	
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	
02_5_38	MW-2	Part 115	Iron	mg/L	17	0	0%	0.279	0.210	
02_5_39	MW-2	Part 115	Nickel	mg/L	17	0	0%	0.615	0.006	**
02_5_42	MW-2	Part 115	Zinc	mg/L	17	14	82%	-0.167	0.648	
03_1_01	MW-3	Appendix III	Boron	mg/L	6	0	0%	-0.628	0.052	
03_1_02	MW-3	Appendix III	Calcium	mg/L	6	0	0%	-0.330	0.307	
03_1_03	MW-3	Appendix III	Chloride	mg/L	6	0	0%	0.527	0.103	
03_1_05	MW-3	Appendix III	Sulfate	mg/L	6	0	0%	-0.530	0.101	
03_1_06	MW-3	Appendix III	Total Dissolved Solids	mg/L	6	0	0%	0.497	0.124	
03_1_07	MW-3	Appendix III	pH, Field	su	6	0	0%	0.144	0.656	
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	
03_5_38	MW-3	Part 115	Iron	mg/L	6	0	0%	-0.257	0.427	
05_1_01	MW-5	Appendix III	Boron	mg/L	16	0	0%	0.097	0.672	
05_1_02	MW-5	Appendix III	Calcium	mg/L	16	0	0%	0.436	0.056	
05_1_03	MW-5	Appendix III	Chloride	mg/L	16	0	0%	0.455	0.046	*
05_1_05	MW-5	Appendix III	Sulfate	mg/L	16	0	0%	0.439	0.054	
05_1_06	MW-5	Appendix III	Total Dissolved Solids	mg/L	16	0	0%	0.471	0.039	*
05_1_07	MW-5	Appendix III	pH, Field	su	17	0	0%	-0.150	0.501	
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	
05_5_37	MW-5	Part 115	Copper	mg/L	17	12	71%	-0.549	0.104	
05_5_38	MW-5	Part 115	Iron	mg/L	17	1	6%	0.031	0.891	

(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.
05_5_39	MW-5	Part 115	Nickel	mg/L	17	0	0%	0.486	0.029	*
05_5_41	MW-5	Part 115	Vanadium	mg/L	17	15	88%	-0.500	0.157	
05_5_42	MW-5	Part 115	Zinc	mg/L	17	4	24%	-0.210	0.398	
06_1_01	MW-6	Appendix III	Boron	mg/L	16	0	0%	0.619	0.007	**
06_1_02	MW-6	Appendix III	Calcium	mg/L	16	0	0%	0.459	0.044	*
06_1_03	MW-6	Appendix III	Chloride	mg/L	16	0	0%	0.650	0.004	**
06_1_05	MW-6	Appendix III	Sulfate	mg/L	16	0	0%	0.606	0.008	**
06_1_06	MW-6	Appendix III	Total Dissolved Solids	mg/L	16	0	0%	0.615	0.007	**
06_1_07	MW-6	Appendix III	pH, Field	su	17	0	0%	0.011	0.959	
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	
06_5_38	MW-6	Part 115	Iron	mg/L	17	8	47%	0.328	0.248	
06_5_39	MW-6	Part 115	Nickel	mg/L	17	3	18%	0.114	0.636	
06_5_42	MW-6	Part 115	Zinc	mg/L	17	16	94%	NA	NA	
07_1_01	MW-7	Appendix III	Boron	mg/L	11	0	0%	0.301	0.254	
07_1_02	MW-7	Appendix III	Calcium	mg/L	11	0	0%	0.210	0.428	
07_1_03	MW-7	Appendix III	Chloride	mg/L	11	0	0%	0.222	0.402	
07_1_04	MW-7	Appendix III	Fluoride	mg/L	11	10	91%	NA	NA	
07_1_05	MW-7	Appendix III	Sulfate	mg/L	11	0	0%	0.017	0.949	
07_1_06	MW-7	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	0.167	0.528	
07_1_07	MW-7	Appendix III	pH, Field	su	11	0	0%	-0.131	0.620	
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	
07_5_38	MW-7	Part 115	Iron	mg/L	11	0	0%	0.047	0.860	
07_5_42	MW-7	Part 115	Zinc	mg/L	11	8	73%	-0.667	0.068	
08_1_01	MW-8	Appendix III	Boron	mg/L	11	1	9%	0.007	0.979	
08_1_02	MW-8	Appendix III	Calcium	mg/L	11	0	0%	0.072	0.784	
08_1_03	MW-8	Appendix III	Chloride	mg/L	11	2	18%	-0.092	0.747	
08_1_04	MW-8	Appendix III	Fluoride	mg/L	11	10	91%	NA	NA	
08_1_05	MW-8	Appendix III	Sulfate	mg/L	11	0	0%	0.112	0.671	
08_1_06	MW-8	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	0.278	0.294	
08_1_07	MW-8	Appendix III	pH, Field	su	11	0	0%	-0.222	0.401	
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	

(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.
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	
08_5_38	MW-8	Part 115	Iron	mg/L	11	10	91%	NA	NA	
09_1_02	MW-9	Appendix III	Calcium	mg/L	11	0	0%	0.147	0.579	
09_1_03	MW-9	Appendix III	Chloride	mg/L	11	10	91%	NA	NA	
09_1_04	MW-9	Appendix III	Fluoride	mg/L	11	10	91%	NA	NA	
09_1_05	MW-9	Appendix III	Sulfate	mg/L	11	8	73%	-0.007	0.986	
09_1_06	MW-9	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	0.233	0.379	
09_1_07	MW-9	Appendix III	pH, Field	su	11	0	0%	-0.171	0.518	
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	
09_5_42	MW-9	Part 115	Zinc	mg/L	11	10	91%	NA	NA	
10_1_01	MW-10	Appendix III	Boron	mg/L	11	0	0%	-0.144	0.585	
10_1_02	MW-10	Appendix III	Calcium	mg/L	11	0	0%	-0.288	0.276	
10_1_03	MW-10	Appendix III	Chloride	mg/L	11	9	82%	-0.500	0.157	
10_1_04	MW-10	Appendix III	Fluoride	mg/L	11	10	91%	NA	NA	
10_1_05	MW-10	Appendix III	Sulfate	mg/L	11	0	0%	-0.149	0.573	
10_1_06	MW-10	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	-0.117	0.658	
10_1_07	MW-10	Appendix III	pH, Field	su	11	0	0%	-0.213	0.421	
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	
10_5_42	MW-10	Part 115	Zinc	mg/L	11	9	82%	-0.500	0.157	
13_1_01	MW-13	Appendix III	Boron	mg/L	11	0	0%	0.598	0.024	*
13_1_02	MW-13	Appendix III	Calcium	mg/L	11	0	0%	0.381	0.150	
13_1_03	MW-13	Appendix III	Chloride	mg/L	11	2	18%	0.681	0.017	*
13_1_05	MW-13	Appendix III	Sulfate	mg/L	11	0	0%	0.057	0.828	
13_1_06	MW-13	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	0.448	0.090	
13_1_07	MW-13	Appendix III	pH, Field	su	11	0	0%	0.190	0.472	
13_2_09	MW-13	Appendix IV	Arsenic	mg/L	11	10	91%	NA	NA	
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	
13_5_38	MW-13	Part 115	Iron	mg/L	11	1	9%	0.125	0.648	
13_5_42	MW-13	Part 115	Zinc	mg/L	11	10	91%	NA	NA	
14_1_01	MW-14	Appendix III	Boron	mg/L	8	0	0%	0.438	0.139	
14_1_02	MW-14	Appendix III	Calcium	mg/L	8	0	0%	0.205	0.488	
14_1_03	MW-14	Appendix III	Chloride	mg/L	8	0	0%	0.031	0.916	
14_1_05	MW-14	Appendix III	Sulfate	mg/L	8	0	0%	-0.161	0.586	
14_1_06	MW-14	Appendix III	Total Dissolved Solids	mg/L	7	0	0%	0.119	0.699	
14_1_07	MW-14	Appendix III	pH, Field	su	8	0	0%	-0.139	0.638	

(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.
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	
14_5_38	MW-14	Part 115	Iron	mg/L	8	0	0%	0.408	0.168	
14_5_39	MW-14	Part 115	Nickel	mg/L	8	6	75%	-0.500	0.157	
15_1_01	MW-15	Appendix III	Boron	mg/L	8	0	0%	0.470	0.112	
15_1_02	MW-15	Appendix III	Calcium	mg/L	8	0	0%	-0.402	0.174	
15_1_03	MW-15	Appendix III	Chloride	mg/L	8	0	0%	-0.068	0.819	
15_1_05	MW-15	Appendix III	Sulfate	mg/L	8	0	0%	-0.140	0.635	
15_1_06	MW-15	Appendix III	Total Dissolved Solids	mg/L	8	0	0%	-0.147	0.620	
15_1_07	MW-15	Appendix III	pH, Field	su	8	0	0%	0.390	0.187	
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	
15_5_38	MW-15	Part 115	Iron	mg/L	8	1	12%	0.099	0.747	
15_5_42	MW-15	Part 115	Zinc	mg/L	8	7	88%	NA	NA	
16A_1_01	MW-16A	Appendix III	Boron	mg/L	9	0	0%	0.517	0.069	
16A_1_02	MW-16A	Appendix III	Calcium	mg/L	9	0	0%	0.637	0.025	*
16A_1_03	MW-16A	Appendix III	Chloride	mg/L	9	0	0%	0.604	0.034	*
16A_1_05	MW-16A	Appendix III	Sulfate	mg/L	9	0	0%	0.634	0.026	*
16A_1_06	MW-16A	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.725	0.011	*
16A_1_07	MW-16A	Appendix III	pH, Field	su	9	0	0%	0.169	0.553	
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	
16A_5_38	MW-16A	Part 115	Iron	mg/L	9	0	0%	0.269	0.344	
16B_1_01	MW-16B	Appendix III	Boron	mg/L	9	0	0%	-0.025	0.929	
16B_1_02	MW-16B	Appendix III	Calcium	mg/L	9	0	0%	0.507	0.075	
16B_1_03	MW-16B	Appendix III	Chloride	mg/L	9	5	56%	0.073	0.835	
16B_1_04	MW-16B	Appendix III	Fluoride	mg/L	9	7	78%	-0.500	0.157	
16B_1_05	MW-16B	Appendix III	Sulfate	mg/L	9	0	0%	0.390	0.170	
16B_1_06	MW-16B	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.348	0.221	
16B_1_07	MW-16B	Appendix III	pH, Field	su	9	0	0%	0.000	1.000	
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	

(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.
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	
16B_5_38	MW-16B	Part 115	Iron	mg/L	9	0	0%	0.255	0.371	
7C_1_01	MW-7C	Appendix III	Boron	mg/L	11	0	0%	-0.328	0.214	
7C_1_02	MW-7C	Appendix III	Calcium	mg/L	11	0	0%	0.073	0.783	
7C_1_03	MW-7C	Appendix III	Chloride	mg/L	11	0	0%	0.265	0.316	
7C_1_05	MW-7C	Appendix III	Sulfate	mg/L	11	0	0%	0.555	0.036	*
7C_1_06	MW-7C	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	0.710	0.007	**
7C_1_07	MW-7C	Appendix III	pH, Field	su	11	0	0%	0.221	0.404	
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	
7C_5_38	MW-7C	Part 115	Iron	mg/L	11	0	0%	0.038	0.885	
7C_5_39	MW-7C	Part 115	Nickel	mg/L	11	0	0%	0.500	0.059	
7C_5_42	MW-7C	Part 115	Zinc	mg/L	11	9	82%	-0.500	0.157	

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 5: Outlier Counts by Date

Date	Count
2020-04-28	1
2020-05-26	3
2020-10-19	1
2021-01-27	1
2021-05-04	1
2021-06-15	2
2021-08-24	1
2021-12-07	1
2022-02-01	2
2022-02-17	2
2022-03-10	1
2022-08-02	1
2023-01-12	3
2023-03-24	1
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
02_1_07	MW-2	Appendix III	pH, Field	su	17	0	0%	17	2020-10-19	7.08
02_5_38	MW-2	Part 115	Iron	mg/L	17	0	0%	17	2022-02-01	1.93
02_5_42	MW-2	Part 115	Zinc	mg/L	17	14	82%	3	2020-05-26	0.0410
03_2_09	MW-3	Appendix IV	Arsenic	mg/L	6	0	0%	6	2023-08-01	0.00400
05_1_01	MW-5	Appendix III	Boron	mg/L	16	0	0%	16	2022-02-01	0.370
05_1_07	MW-5	Appendix III	pH, Field	su	17	0	0%	17	2021-05-04	6.40
05_5_38	MW-5	Part 115	Iron	mg/L	17	1	6%	16	2020-04-28	8.00
05_5_42	MW-5	Part 115	Zinc	mg/L	17	4	24%	13	2021-01-27	0.0980
06_1_07	MW-6	Appendix III	pH, Field	su	17	0	0%	17	2020-05-26	6.35
06_5_38	MW-6	Part 115	Iron	mg/L	17	8	47%	9	2020-05-26	0.200
07_1_03	MW-7	Appendix III	Chloride	mg/L	11	0	0%	11	2022-08-02	98.0
07_1_06	MW-7	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	11	2022-02-17	758
07_1_07	MW-7	Appendix III	pH, Field	su	11	0	0%	11	2021-06-15	8.18
07_5_38	MW-7	Part 115	Iron	mg/L	11	0	0%	11	2022-02-17	2.81
07_5_42	MW-7	Part 115	Zinc	mg/L	11	8	73%	3	2021-08-24	0.0140
08_1_07	MW-8	Appendix III	pH, Field	su	11	0	0%	11	2021-06-15	7.78
10_2_20	MW-10	Appendix IV	Radium-226/228	pCi/L	11	0	0%	11	2021-12-07	2.39
14_1_05	MW-14	Appendix III	Sulfate	mg/L	8	0	0%	8	2023-03-24	748
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
15_1_05	MW-15	Appendix III	Sulfate	mg/L	8	0	0%	8	2023-01-12	238
7C_5_39	MW-7C	Part 115	Nickel	mg/L	11	0	0%	11	2022-03-10	0.0110

Table 7: Seasonality Tests

						Full											Without Non-Detects										
						Sample Size					p-Value						Sample Size					p-Value					
ID	Well	Constituent Type	Constituent	Unit	% NDs	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis		ANOVA		Log ANOVA		Winter	Spring	Summer	Fall	Total	Kruskal-Wallis		ANOVA		Log ANOVA	
02_1_01	MW-2	Appendix III	Boron	mg/L	0%	3	3	6	4	16	0.034	*	0.008	**	0.009	**	3	3	6	4	16	0.034	*	0.008	**	0.009	**
02_1_02	MW-2	Appendix III	Calcium	mg/L	0%	3	3	6	4	16	0.260		0.269		0.279		3	3	6	4	16	0.260		0.269		0.279	
02_1_03	MW-2	Appendix III	Chloride	mg/L	0%	3	3	6	4	16	0.010	**	0.000	***	0.000	***	3	3	6	4	16	0.010	**	0.000	***	0.000	***
02_1_04	MW-2	Appendix III	Fluoride	mg/L	100%	3	3	6	4	16	NA		NA		NA		NA	NA	NA	NA	NA	NA		NA		NA	
02_1_05	MW-2	Appendix III	Sulfate	mg/L	0%	3	3	6	4	16	0.077		0.141		0.209		3	3	6	4	16	0.077		0.141		0.209	
02_1_06	MW-2	Appendix III	Total Dissolved Solids	mg/L	0%	3	3	6	4	16	0.120		0.162		0.197		3	3	6	4	16	0.120		0.162		0.197	
02_1_07	MW-2	Appendix III	pH, Field	su	0%	3	3	6	5	17	0.459		0.277		0.273		3	3	6	5	17	0.459		0.277		0.273	
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	
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	
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	
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	
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	
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	
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	
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	
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	
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	
02_5_37	MW-2	Part 115	Copper	mg/L	100%	3	3	6	5	17	NA		NA		0.200		NA	NA	NA	NA	NA	NA		NA		NA	
02_5_38	MW-2	Part 115	Iron	mg/L	0%	3	3	6	5	17	0.507		0.063		0.136		3	3	6	5	17	0.507		0.063		0.136	
02_5_39	MW-2	Part 115	Nickel	mg/L	0%	3	3	6	5	17	0.010	*	0.039	*	0.055		3	3	6	5	17	0.010	*	0.039	*	0.055	
02_5_40	MW-2	Part 115	Silver	mg/L	100%	3	3	6	5	17	NA		NA		NA		NA	NA	NA	NA	NA	NA		NA		NA	
02_5_41	MW-2	Part 115	Vanadium	mg/L	100%	3	3	6	5	17	NA		NA		0.200		NA	NA	NA	NA	NA	NA		NA		NA	
02_5_42	MW-2	Part 115	Zinc	mg/L	82%	3	3	6	5	17	0.548		0.217		0.262		1	1	1	0	3	0.368		NA		NA	
03_1_01	MW-3	Appendix III	Boron	mg/L	0%	2	1	3	0	6	0.117		0.212		0.199		2	1	3	0	6	0.117		0.212		0.199	
03_1_02	MW-3	Appendix III	Calcium	mg/L	0%	2	1	3	0	6	0.377		0.609		0.613		2	1	3	0	6	0.377		0.609		0.613	
03_1_03	MW-3	Appendix III	Chloride	mg/L	0%	2	1	3	0	6	0.304		0.410		0.394		2	1	3	0	6	0.304		0.410		0.394	
03_1_04	MW-3	Appendix III	Fluoride	mg/L	100%	2	1	3	0	6	NA		0.000	***	NA		NA	NA	NA	NA	NA	NA		NA		NA	
03_1_05	MW-3	Appendix III	Sulfate	mg/L	0%	2	1	3	0	6	0.946		0.982		0.984		2	1	3	0	6	0.946		0.982		0.984	
03_1_06	MW-3	Appendix III	Total Dissolved Solids	mg/L	0%	2	1	3	0	6	0.643		0.724		0.723		2	1	3	0	6	0.643		0.724		0.723	
03_1_07	MW-3	Appendix III	pH, Field	su	0%	2	1	3	0	6	0.377		0.575		0.575		2	1	3	0	6	0.377		0.575		0.575	
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	
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	
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	

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 7: Seasonality Tests *(continued)*

						Full											Without Non-Detects										
						Sample Size					p-Value						Sample Size					p-Value					
ID	Well	Constituent Type	Constituent	Unit	% NDs	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis		ANOVA		Log ANOVA		Winter	Spring	Summer	Fall	Total	Kruskal-Wallis		ANOVA		Log ANOVA	
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	
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	
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	
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	
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	
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	
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	
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	
03_5_37	MW-3	Part 115	Copper	mg/L	100%	2	1	3	0	6	NA		NA		NA		NA	NA	NA	NA	NA	NA		NA		NA	
03_5_38	MW-3	Part 115	Iron	mg/L	0%	2	1	3	0	6	0.807		0.571		0.561		2	1	3	0	6	0.807		0.571		0.561	
03_5_39	MW-3	Part 115	Nickel	mg/L	100%	2	1	3	0	6	NA		NA		NA		NA	NA	NA	NA	NA	NA		NA		NA	
03_5_40	MW-3	Part 115	Silver	mg/L	100%	2	1	3	0	6	NA		NA		0.000	***	NA	NA	NA	NA	NA	NA		NA		NA	
03_5_41	MW-3	Part 115	Vanadium	mg/L	100%	2	1	3	0	6	NA		NA		NA		NA	NA	NA	NA	NA	NA		NA		NA	
03_5_42	MW-3	Part 115	Zinc	mg/L	100%	2	1	3	0	6	NA		NA		NA		NA	NA	NA	NA	NA	NA		NA		NA	
05_1_01	MW-5	Appendix III	Boron	mg/L	0%	3	3	6	4	16	0.033	*	0.084		0.153		3	3	6	4	16	0.033	*	0.084		0.153	
05_1_02	MW-5	Appendix III	Calcium	mg/L	0%	3	3	6	4	16	0.075		0.034	*	0.057		3	3	6	4	16	0.075		0.034	*	0.057	
05_1_03	MW-5	Appendix III	Chloride	mg/L	0%	3	3	6	4	16	0.034	*	0.021	*	0.026	*	3	3	6	4	16	0.034	*	0.021	*	0.026	*
05_1_04	MW-5	Appendix III	Fluoride	mg/L	100%	3	3	6	4	16	NA		NA		NA		NA	NA	NA	NA	NA	NA		NA		NA	
05_1_05	MW-5	Appendix III	Sulfate	mg/L	0%	3	3	6	4	16	0.044	*	0.022	*	0.039	*	3	3	6	4	16	0.044	*	0.022	*	0.039	*
05_1_06	MW-5	Appendix III	Total Dissolved Solids	mg/L	0%	3	3	6	4	16	0.043	*	0.023	*	0.033	*	3	3	6	4	16	0.043	*	0.023	*	0.033	*
05_1_07	MW-5	Appendix III	pH, Field	su	0%	3	3	6	5	17	0.525		0.368		0.363		3	3	6	5	17	0.525		0.368		0.363	
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	
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	
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	
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	
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	
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	
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	
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	

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 7: Seasonality Tests *(continued)*

						Full											Without Non-Detects										
						Sample Size					p-Value						Sample Size					p-Value					
ID	Well	Constituent Type	Constituent	Unit	% NDs	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis		ANOVA		Log ANOVA		Winter	Spring	Summer	Fall	Total	Kruskal-Wallis		ANOVA		Log ANOVA	
05_5_37	MW-5	Part 115	Copper	mg/L	71%	3	3	6	5	17	0.952		0.853		0.912		1	1	2	1	5	0.849		0.952		0.964	
05_5_38	MW-5	Part 115	Iron	mg/L	6%	3	3	6	5	17	0.083		0.172		0.056		3	3	6	4	16	0.156		0.235		0.128	
05_5_39	MW-5	Part 115	Nickel	mg/L	0%	3	3	6	5	17	0.126		0.105		0.132		3	3	6	5	17	0.126		0.105		0.132	
05_5_40	MW-5	Part 115	Silver	mg/L	100%	3	3	6	5	17	NA		NA		NA		NA	NA	NA	NA	NA	NA		NA		NA	
05_5_41	MW-5	Part 115	Vanadium	mg/L	88%	3	3	6	5	17	0.271		0.272		0.279		1	1	0	0	2	0.317		NA		NA	
05_5_42	MW-5	Part 115	Zinc	mg/L	24%	3	3	6	5	17	0.339		0.048	*	0.132		3	2	6	2	13	0.397		0.152		0.235	
06_1_01	MW-6	Appendix III	Boron	mg/L	0%	3	3	6	4	16	0.008	**	0.000	***	0.000	***	3	3	6	4	16	0.008	**	0.000	***	0.000	***
06_1_02	MW-6	Appendix III	Calcium	mg/L	0%	3	3	6	4	16	0.026	*	0.011	*	0.009	**	3	3	6	4	16	0.026	*	0.011	*	0.009	**
06_1_03	MW-6	Appendix III	Chloride	mg/L	0%	3	3	6	4	16	0.016	*	0.005	**	0.005	**	3	3	6	4	16	0.016	*	0.005	**	0.005	**
06_1_04	MW-6	Appendix III	Fluoride	mg/L	100%	3	3	6	4	16	NA		NA		NA		NA	NA	NA	NA	NA	NA		NA		NA	
06_1_05	MW-6	Appendix III	Sulfate	mg/L	0%	3	3	6	4	16	0.019	*	0.003	**	0.003	**	3	3	6	4	16	0.019	*	0.003	**	0.003	**
06_1_06	MW-6	Appendix III	Total Dissolved Solids	mg/L	0%	3	3	6	4	16	0.010	*	0.001	**	0.001	***	3	3	6	4	16	0.010	*	0.001	**	0.001	***
06_1_07	MW-6	Appendix III	pH, Field	su	0%	3	3	6	5	17	0.617		0.584		0.579		3	3	6	5	17	0.617		0.584		0.579	
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	
06_5_37	MW-6	Part 115	Copper	mg/L	100%	3	3	6	5	17	NA		NA		0.200		NA	NA	NA	NA	NA	NA		NA		NA	
06_5_38	MW-6	Part 115	Iron	mg/L	47%	3	3	6	5	17	0.112		0.067		0.067		1	2	6	0	9	0.109		0.045	*	0.055	
06_5_39	MW-6	Part 115	Nickel	mg/L	18%	3	3	6	5	17	0.080		0.071		0.069		3	2	4	5	14	0.034	*	0.008	**	0.006	**
06_5_40	MW-6	Part 115	Silver	mg/L	100%	3	3	6	5	17	NA		NA		NA		NA	NA	NA	NA	NA	NA		NA		NA	
06_5_41	MW-6	Part 115	Vanadium	mg/L	100%	3	3	6	5	17	NA		NA		0.200		NA	NA	NA	NA	NA	NA		NA		NA	
06_5_42	MW-6	Part 115	Zinc	mg/L	94%	3	3	6	5	17	0.198		0.200		0.200		0	1	0	0	1	NA		NA		NA	
07_1_01	MW-7	Appendix III	Boron	mg/L	0%	4	0	5	2	11	0.226		0.275		0.319		4	0	5	2	11	0.226		0.275		0.319	
07_1_02	MW-7	Appendix III	Calcium	mg/L	0%	4	0	5	2	11	0.313		0.250		0.265		4	0	5	2	11	0.313		0.250		0.265	
07_1_03	MW-7	Appendix III	Chloride	mg/L	0%	4	0	5	2	11	0.776		0.650		0.655		4	0	5	2	11	0.776		0.650		0.655	
07_1_04	MW-7	Appendix III	Fluoride	mg/L	91%	4	0	5	2	11	0.417		0.463		0.463		1	0	0	0	1	NA		NA		NA	
07_1_05	MW-7	Appendix III	Sulfate	mg/L	0%	4	0	5	2	11	0.021	*	0.044	*	0.030	*	4	0	5	2	11	0.021	*	0.044	*	0.030	*

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 7: Seasonality Tests *(continued)*

						Full								Without Non-Detects							
						Sample Size					p-Value			Sample Size					p-Value		
ID	Well	Constituent Type	Constituent	Unit	% NDs	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA
07_1_06	MW-7	Appendix III	Total Dissolved Solids	mg/L	0%	4	0	5	2	11	0.226	0.221	0.212	4	0	5	2	11	0.226	0.221	0.212
07_1_07	MW-7	Appendix III	pH, Field	su	0%	4	0	5	2	11	0.704	0.624	0.626	4	0	5	2	11	0.704	0.624	0.626
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
07_5_37	MW-7	Part 115	Copper	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
07_5_38	MW-7	Part 115	Iron	mg/L	0%	4	0	5	2	11	0.188	0.376	0.386	4	0	5	2	11	0.188	0.376	0.386
07_5_39	MW-7	Part 115	Nickel	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
07_5_40	MW-7	Part 115	Silver	mg/L	100%	4	0	5	2	11	NA	0.600	0.600	NA	NA	NA	NA	NA	NA	NA	NA
07_5_41	MW-7	Part 115	Vanadium	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
07_5_42	MW-7	Part 115	Zinc	mg/L	73%	4	0	5	2	11	0.111	0.316	0.228	0	0	3	0	3	NA	NA	NA
08_1_01	MW-8	Appendix III	Boron	mg/L	9%	4	0	5	2	11	0.052	0.059	0.024 *	3	0	5	2	10	0.103	0.124	0.069
08_1_02	MW-8	Appendix III	Calcium	mg/L	0%	4	0	5	2	11	0.027 *	0.007 **	0.008 **	4	0	5	2	11	0.027 *	0.007 **	0.008 **
08_1_03	MW-8	Appendix III	Chloride	mg/L	18%	4	0	5	2	11	0.231	0.443	0.268	2	0	5	2	9	0.830	0.753	0.733
08_1_04	MW-8	Appendix III	Fluoride	mg/L	91%	4	0	5	2	11	0.417	0.463	0.463	1	0	0	0	1	NA	NA	NA
08_1_05	MW-8	Appendix III	Sulfate	mg/L	0%	4	0	5	2	11	0.166	0.414	0.328	4	0	5	2	11	0.166	0.414	0.328
08_1_06	MW-8	Appendix III	Total Dissolved Solids	mg/L	0%	4	0	5	2	11	0.900	0.945	0.950	4	0	5	2	11	0.900	0.945	0.950
08_1_07	MW-8	Appendix III	pH, Field	su	0%	4	0	5	2	11	0.931	0.912	0.921	4	0	5	2	11	0.931	0.912	0.921
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
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

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 7: Seasonality Tests *(continued)*

						Full								Without Non-Detects							
						Sample Size					p-Value			Sample Size					p-Value		
ID	Well	Constituent Type	Constituent	Unit	% NDs	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA
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
08_5_37	MW-8	Part 115	Copper	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
08_5_38	MW-8	Part 115	Iron	mg/L	91%	4	0	5	2	11	NA	NA	0.600	1	0	0	0	1	NA	NA	NA
08_5_39	MW-8	Part 115	Nickel	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
08_5_40	MW-8	Part 115	Silver	mg/L	100%	4	0	5	2	11	NA	0.600	0.600	NA	NA	NA	NA	NA	NA	NA	NA
08_5_41	MW-8	Part 115	Vanadium	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
08_5_42	MW-8	Part 115	Zinc	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
09_1_01	MW-9	Appendix III	Boron	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
09_1_02	MW-9	Appendix III	Calcium	mg/L	0%	4	0	5	2	11	0.037 *	0.025 *	0.027 *	4	0	5	2	11	0.037 *	0.025 *	0.027 *
09_1_03	MW-9	Appendix III	Chloride	mg/L	91%	4	0	5	2	11	0.417	0.463	0.463	1	0	0	0	1	NA	NA	NA
09_1_04	MW-9	Appendix III	Fluoride	mg/L	91%	4	0	5	2	11	0.417	0.463	0.463	1	0	0	0	1	NA	NA	NA
09_1_05	MW-9	Appendix III	Sulfate	mg/L	73%	4	0	5	2	11	0.325	0.353	0.356	1	0	2	0	3	0.221	0.270	0.226
09_1_06	MW-9	Appendix III	Total Dissolved Solids	mg/L	0%	4	0	5	2	11	0.220	0.319	0.309	4	0	5	2	11	0.220	0.319	0.309
09_1_07	MW-9	Appendix III	pH, Field	su	0%	4	0	5	2	11	0.736	0.724	0.726	4	0	5	2	11	0.736	0.724	0.726
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
09_5_37	MW-9	Part 115	Copper	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
09_5_38	MW-9	Part 115	Iron	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
09_5_39	MW-9	Part 115	Nickel	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
09_5_40	MW-9	Part 115	Silver	mg/L	100%	4	0	5	2	11	NA	0.600	0.600	NA	NA	NA	NA	NA	NA	NA	NA
09_5_41	MW-9	Part 115	Vanadium	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)*

						Full								Without Non-Detects							
						Sample Size					p-Value			Sample Size					p-Value		
ID	Well	Constituent Type	Constituent	Unit	% NDs	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA
09_5_42	MW-9	Part 115	Zinc	mg/L	91%	4	0	5	2	11	0.417	0.463	0.463	1	0	0	0	1	NA	NA	NA
10_1_01	MW-10	Appendix III	Boron	mg/L	0%	4	0	5	2	11	0.506	0.363	0.398	4	0	5	2	11	0.506	0.363	0.398
10_1_02	MW-10	Appendix III	Calcium	mg/L	0%	4	0	5	2	11	0.272	0.211	0.220	4	0	5	2	11	0.272	0.211	0.220
10_1_03	MW-10	Appendix III	Chloride	mg/L	82%	4	0	5	2	11	0.325	0.391	0.425	1	0	1	0	2	0.317	NA	NA
10_1_04	MW-10	Appendix III	Fluoride	mg/L	91%	4	0	5	2	11	0.417	0.463	0.463	1	0	0	0	1	NA	NA	NA
10_1_05	MW-10	Appendix III	Sulfate	mg/L	0%	4	0	5	2	11	0.684	0.655	0.585	4	0	5	2	11	0.684	0.655	0.585
10_1_06	MW-10	Appendix III	Total Dissolved Solids	mg/L	0%	4	0	5	2	11	0.145	0.060	0.065	4	0	5	2	11	0.145	0.060	0.065
10_1_07	MW-10	Appendix III	pH, Field	su	0%	4	0	5	2	11	0.751	0.677	0.683	4	0	5	2	11	0.751	0.677	0.683
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
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
10_5_37	MW-10	Part 115	Copper	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
10_5_38	MW-10	Part 115	Iron	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
10_5_39	MW-10	Part 115	Nickel	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
10_5_40	MW-10	Part 115	Silver	mg/L	100%	4	0	5	2	11	NA	0.600	0.600	NA	NA	NA	NA	NA	NA	NA	NA
10_5_41	MW-10	Part 115	Vanadium	mg/L	100%	4	0	5	2	11	NA	NA	0.600	NA	NA	NA	NA	NA	NA	NA	NA
10_5_42	MW-10	Part 115	Zinc	mg/L	82%	4	0	5	2	11	0.741	0.578	0.650	1	0	1	0	2	0.317	NA	NA
13_1_01	MW-13	Appendix III	Boron	mg/L	0%	2	3	4	2	11	0.035 *	0.000 ***	0.000 ***	2	3	4	2	11	0.035 *	0.000 ***	0.000 ***
13_1_02	MW-13	Appendix III	Calcium	mg/L	0%	2	3	4	2	11	0.206	0.110	0.134	2	3	4	2	11	0.206	0.110	0.134
13_1_03	MW-13	Appendix III	Chloride	mg/L	18%	2	3	4	2	11	0.211	0.482	0.292	1	2	4	2	9	0.159	0.265	0.128
13_1_04	MW-13	Appendix III	Fluoride	mg/L	100%	2	3	4	2	11	NA	0.217	NA	NA	NA	NA	NA	NA	NA	NA	NA
13_1_05	MW-13	Appendix III	Sulfate	mg/L	0%	2	3	4	2	11	0.422	0.550	0.579	2	3	4	2	11	0.422	0.550	0.579
13_1_06	MW-13	Appendix III	Total Dissolved Solids	mg/L	0%	2	3	4	2	11	0.286	0.185	0.193	2	3	4	2	11	0.286	0.185	0.193
13_1_07	MW-13	Appendix III	pH, Field	su	0%	2	3	4	2	11	0.178	0.707	0.720	2	3	4	2	11	0.178	0.707	0.720
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

(Table continues on next page)

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Table 7: Seasonality Tests *(continued)*

						Full								Without Non-Detects							
						Sample Size					p-Value			Sample Size					p-Value		
ID	Well	Constituent Type	Constituent	Unit	% NDs	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA
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
13_5_37	MW-13	Part 115	Copper	mg/L	100%	2	3	4	2	11	NA	NA	0.217	NA	NA	NA	NA	NA	NA	NA	NA
13_5_38	MW-13	Part 115	Iron	mg/L	9%	2	3	4	2	11	0.161	0.467	0.294	2	2	4	2	10	0.282	0.594	0.458
13_5_39	MW-13	Part 115	Nickel	mg/L	100%	2	3	4	2	11	NA	NA	0.217	NA	NA	NA	NA	NA	NA	NA	NA
13_5_40	MW-13	Part 115	Silver	mg/L	100%	2	3	4	2	11	NA	0.217	0.217	NA	NA	NA	NA	NA	NA	NA	NA
13_5_41	MW-13	Part 115	Vanadium	mg/L	100%	2	3	4	2	11	NA	NA	0.217	NA	NA	NA	NA	NA	NA	NA	NA
13_5_42	MW-13	Part 115	Zinc	mg/L	91%	2	3	4	2	11	0.626	0.697	0.697	0	0	1	0	1	NA	NA	NA
14_1_01	MW-14	Appendix III	Boron	mg/L	0%	2	2	3	1	8	0.121	0.076	0.081	2	2	3	1	8	0.121	0.076	0.081
14_1_02	MW-14	Appendix III	Calcium	mg/L	0%	2	2	3	1	8	0.371	0.151	0.164	2	2	3	1	8	0.371	0.151	0.164
14_1_03	MW-14	Appendix III	Chloride	mg/L	0%	2	2	3	1	8	0.156	0.148	0.142	2	2	3	1	8	0.156	0.148	0.142
14_1_04	MW-14	Appendix III	Fluoride	mg/L	100%	2	2	3	1	8	NA	0.479	NA	NA	NA	NA	NA	NA	NA	NA	NA
14_1_05	MW-14	Appendix III	Sulfate	mg/L	0%	2	2	3	1	8	0.294	0.485	0.529	2	2	3	1	8	0.294	0.485	0.529
14_1_06	MW-14	Appendix III	Total Dissolved Solids	mg/L	0%	2	1	3	1	7	0.180	0.220	0.227	2	1	3	1	7	0.180	0.220	0.227
14_1_07	MW-14	Appendix III	pH, Field	su	0%	2	2	3	1	8	0.355	0.391	0.388	2	2	3	1	8	0.355	0.391	0.388
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
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

(Table continues on next page)

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Table 7: Seasonality Tests *(continued)*

						Full								Without Non-Detects							
						Sample Size					p-Value			Sample Size					p-Value		
ID	Well	Constituent Type	Constituent	Unit	% NDs	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA
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
14_5_37	MW-14	Part 115	Copper	mg/L	100%	2	2	3	1	8	NA	NA	0.479	NA	NA	NA	NA	NA	NA	NA	NA
14_5_38	MW-14	Part 115	Iron	mg/L	0%	2	2	3	1	8	0.109	0.091	0.115	2	2	3	1	8	0.109	0.091	0.115
14_5_39	MW-14	Part 115	Nickel	mg/L	75%	2	2	3	1	8	0.392	0.479	0.479	2	0	0	0	2	NA	NA	NA
14_5_40	MW-14	Part 115	Silver	mg/L	100%	2	2	3	1	8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
14_5_41	MW-14	Part 115	Vanadium	mg/L	100%	2	2	3	1	8	NA	NA	0.479	NA	NA	NA	NA	NA	NA	NA	NA
14_5_42	MW-14	Part 115	Zinc	mg/L	100%	2	2	3	1	8	NA	NA	0.479	NA	NA	NA	NA	NA	NA	NA	NA
15_1_01	MW-15	Appendix III	Boron	mg/L	0%	2	2	3	1	8	0.139	0.091	0.099	2	2	3	1	8	0.139	0.091	0.099
15_1_02	MW-15	Appendix III	Calcium	mg/L	0%	2	2	3	1	8	0.165	0.186	0.165	2	2	3	1	8	0.165	0.186	0.165
15_1_03	MW-15	Appendix III	Chloride	mg/L	0%	2	2	3	1	8	0.154	0.091	0.105	2	2	3	1	8	0.154	0.091	0.105
15_1_04	MW-15	Appendix III	Fluoride	mg/L	100%	2	2	3	1	8	NA	0.479	NA	NA	NA	NA	NA	NA	NA	NA	NA
15_1_05	MW-15	Appendix III	Sulfate	mg/L	0%	2	2	3	1	8	0.191	0.267	0.209	2	2	3	1	8	0.191	0.267	0.209
15_1_06	MW-15	Appendix III	Total Dissolved Solids	mg/L	0%	2	2	3	1	8	0.768	0.681	0.703	2	2	3	1	8	0.768	0.681	0.703
15_1_07	MW-15	Appendix III	pH, Field	su	0%	2	2	3	1	8	0.112	0.121	0.121	2	2	3	1	8	0.112	0.121	0.121
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
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
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
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
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
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
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
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
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
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
15_5_37	MW-15	Part 115	Copper	mg/L	100%	2	2	3	1	8	NA	NA	0.479	NA	NA	NA	NA	NA	NA	NA	NA
15_5_38	MW-15	Part 115	Iron	mg/L	12%	2	2	3	1	8	0.111	0.050 *	0.052	1	2	3	1	7	0.135	0.124	0.094
15_5_39	MW-15	Part 115	Nickel	mg/L	100%	2	2	3	1	8	NA	NA	0.479	NA	NA	NA	NA	NA	NA	NA	NA
15_5_40	MW-15	Part 115	Silver	mg/L	100%	2	2	3	1	8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
15_5_41	MW-15	Part 115	Vanadium	mg/L	100%	2	2	3	1	8	NA	NA	0.479	NA	NA	NA	NA	NA	NA	NA	NA
15_5_42	MW-15	Part 115	Zinc	mg/L	88%	2	2	3	1	8	0.392	0.479	0.479	0	1	0	0	1	NA	NA	NA
16A_1_01	MW-16A	Appendix III	Boron	mg/L	0%	1	3	2	3	9	0.076	0.005 **	0.006 **	1	3	2	3	9	0.076	0.005 **	0.006 **
16A_1_02	MW-16A	Appendix III	Calcium	mg/L	0%	1	3	2	3	9	0.067	0.004 **	0.006 **	1	3	2	3	9	0.067	0.004 **	0.006 **
16A_1_03	MW-16A	Appendix III	Chloride	mg/L	0%	1	3	2	3	9	0.060	0.004 **	0.003 **	1	3	2	3	9	0.060	0.004 **	0.003 **
16A_1_04	MW-16A	Appendix III	Fluoride	mg/L	100%	1	3	2	3	9	0.321	0.372	0.372	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)*

						Full										Without Non-Detects									
						Sample Size					p-Value					Sample Size					p-Value				
ID	Well	Constituent Type	Constituent	Unit	% NDs	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA		Log ANOVA		Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA		Log ANOVA	
16A_1_05	MW-16A	Appendix III	Sulfate	mg/L	0%	1	3	2	3	9	0.089	0.001	***	0.004	**	1	3	2	3	9	0.089	0.001	***	0.004	**
16A_1_06	MW-16A	Appendix III	Total Dissolved Solids	mg/L	0%	1	3	2	3	9	0.060	0.001	***	0.001	***	1	3	2	3	9	0.060	0.001	***	0.001	***
16A_1_07	MW-16A	Appendix III	pH, Field	su	0%	1	3	2	3	9	0.477	0.472		0.475		1	3	2	3	9	0.477	0.472		0.475	
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	
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	
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	
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	
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	
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	
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	
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	
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	
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	
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	
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	
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	
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	
16A_5_37	MW-16A	Part 115	Copper	mg/L	100%	1	3	2	3	9	NA	NA		0.000	***	NA	NA	NA	NA	NA	NA	NA		NA	
16A_5_38	MW-16A	Part 115	Iron	mg/L	0%	1	3	2	3	9	0.165	0.086		0.076		1	3	2	3	9	0.165	0.086		0.076	
16A_5_39	MW-16A	Part 115	Nickel	mg/L	100%	1	3	2	3	9	NA	NA		0.000	***	NA	NA	NA	NA	NA	NA	NA		NA	
16A_5_40	MW-16A	Part 115	Silver	mg/L	100%	1	3	2	3	9	NA	0.000	***	0.000	***	NA	NA	NA	NA	NA	NA	NA		NA	
16A_5_41	MW-16A	Part 115	Vanadium	mg/L	100%	1	3	2	3	9	NA	NA		0.000	***	NA	NA	NA	NA	NA	NA	NA		NA	
16A_5_42	MW-16A	Part 115	Zinc	mg/L	100%	1	3	2	3	9	NA	NA		0.000	***	NA	NA	NA	NA	NA	NA	NA		NA	
16B_1_01	MW-16B	Appendix III	Boron	mg/L	0%	1	3	2	3	9	0.179	0.150		0.155		1	3	2	3	9	0.179	0.150		0.155	
16B_1_02	MW-16B	Appendix III	Calcium	mg/L	0%	1	3	2	3	9	0.089	0.034	*	0.031	*	1	3	2	3	9	0.089	0.034	*	0.031	*
16B_1_03	MW-16B	Appendix III	Chloride	mg/L	56%	1	3	2	3	9	0.429	0.542		0.505		0	2	1	1	4	0.259	0.676		0.575	
16B_1_04	MW-16B	Appendix III	Fluoride	mg/L	78%	1	3	2	3	9	0.530	0.568		0.518		0	0	1	1	2	0.317	NA		NA	
16B_1_05	MW-16B	Appendix III	Sulfate	mg/L	0%	1	3	2	3	9	0.060	0.003	**	0.004	**	1	3	2	3	9	0.060	0.003	**	0.004	**
16B_1_06	MW-16B	Appendix III	Total Dissolved Solids	mg/L	0%	1	3	2	3	9	0.156	0.204		0.204		1	3	2	3	9	0.156	0.204		0.204	
16B_1_07	MW-16B	Appendix III	pH, Field	su	0%	1	3	2	3	9	0.612	0.840		0.842		1	3	2	3	9	0.612	0.840		0.842	
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	
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	
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	
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	
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	
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	
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	
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	

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 7: Seasonality Tests *(continued)*

						Full											Without Non-Detects										
						Sample Size					p-Value						Sample Size					p-Value					
ID	Well	Constituent Type	Constituent	Unit	% NDs	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis		ANOVA		Log ANOVA		Winter	Spring	Summer	Fall	Total	Kruskal-Wallis		ANOVA		Log ANOVA	
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	
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	
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	
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	
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	
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	
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	
16B_5_37	MW-16B	Part 115	Copper	mg/L	100%	1	3	2	3	9	NA		NA		0.000	***	NA	NA	NA	NA	NA	NA		NA		NA	
16B_5_38	MW-16B	Part 115	Iron	mg/L	0%	1	3	2	3	9	0.089		0.002	**	0.003	**	1	3	2	3	9	0.089		0.002	**	0.003	**
16B_5_39	MW-16B	Part 115	Nickel	mg/L	100%	1	3	2	3	9	NA		NA		0.000	***	NA	NA	NA	NA	NA	NA		NA		NA	
16B_5_40	MW-16B	Part 115	Silver	mg/L	100%	1	3	2	3	9	NA		0.000	***	0.000	***	NA	NA	NA	NA	NA	NA		NA		NA	
16B_5_41	MW-16B	Part 115	Vanadium	mg/L	100%	1	3	2	3	9	NA		NA		0.000	***	NA	NA	NA	NA	NA	NA		NA		NA	
16B_5_42	MW-16B	Part 115	Zinc	mg/L	100%	1	3	2	3	9	NA		NA		0.000	***	NA	NA	NA	NA	NA	NA		NA		NA	
7C_1_01	MW-7C	Appendix III	Boron	mg/L	0%	1	4	3	3	11	0.846		0.844		0.856		1	4	3	3	11	0.846		0.844		0.856	
7C_1_02	MW-7C	Appendix III	Calcium	mg/L	0%	1	4	3	3	11	0.525		0.990		0.998		1	4	3	3	11	0.525		0.990		0.998	
7C_1_03	MW-7C	Appendix III	Chloride	mg/L	0%	1	4	3	3	11	0.075		0.127		0.120		1	4	3	3	11	0.075		0.127		0.120	
7C_1_04	MW-7C	Appendix III	Fluoride	mg/L	100%	1	4	3	3	11	NA		0.697		NA		NA	NA	NA	NA	NA	NA		NA		NA	
7C_1_05	MW-7C	Appendix III	Sulfate	mg/L	0%	1	4	3	3	11	0.030	*	0.001	***	0.001	***	1	4	3	3	11	0.030	*	0.001	***	0.001	***
7C_1_06	MW-7C	Appendix III	Total Dissolved Solids	mg/L	0%	1	4	3	3	11	0.039	*	0.002	**	0.002	**	1	4	3	3	11	0.039	*	0.002	**	0.002	**
7C_1_07	MW-7C	Appendix III	pH, Field	su	0%	1	4	3	3	11	0.108		0.102		0.101		1	4	3	3	11	0.108		0.102		0.101	
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	
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	
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	
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	
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	
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	
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	
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	
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	
7C_5_37	MW-7C	Part 115	Copper	mg/L	100%	1	4	3	3	11	NA		NA		0.697		NA	NA	NA	NA	NA	NA		NA		NA	
7C_5_38	MW-7C	Part 115	Iron	mg/L	0%	1	4	3	3	11	0.051		0.022	*	0.021	*	1	4	3	3	11	0.051		0.022	*	0.021	*
7C_5_39	MW-7C	Part 115	Nickel	mg/L	0%	1	4	3	3	11	0.104		0.114		0.096		1	4	3	3	11	0.104		0.114		0.096	
7C_5_40	MW-7C	Part 115	Silver	mg/L	100%	1	4	3	3	11	NA		0.697		0.697		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)*

						Full								Without Non-Detects							
						Sample Size					p-Value			Sample Size					p-Value		
ID	Well	Constituent Type	Constituent	Unit	% NDs	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA
7C_5_41	MW-7C	Part 115	Vanadium	mg/L	100%	1	4	3	3	11	NA	NA	0.697	NA	NA	NA	NA	NA	NA	NA	NA
7C_5_42	MW-7C	Part 115	Zinc	mg/L	82%	1	4	3	3	11	0.737	0.806	0.808	0	1	1	0	2	0.317	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_1_01	MW-2	Appendix III	Boron	mg/L	16	0	0%	Parametric	Lognormal MLE	0.0000513	0.684	↔
02_1_02	MW-2	Appendix III	Calcium	mg/L	16	0	0%	Nonparametric	MK	-0.0612	0.006	↓
02_1_03	MW-2	Appendix III	Chloride	mg/L	16	0	0%	Parametric	Lognormal MLE	0.0000889	0.141	↔
02_1_05	MW-2	Appendix III	Sulfate	mg/L	16	0	0%	Parametric	Lognormal MLE	-0.000491	0.000	↓
02_1_06	MW-2	Appendix III	Total Dissolved Solids	mg/L	16	0	0%	Parametric	Lognormal MLE	-0.000254	0.000	↓
02_1_07	MW-2	Appendix III	pH, Field	su	17	0	0%	Parametric	Lognormal MLE	0.00000686	0.536	↔
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	↔
02_5_38	MW-2	Part 115	Iron	mg/L	17	0	0%	Nonparametric	MK	0.000313	0.076	↔
02_5_39	MW-2	Part 115	Nickel	mg/L	17	0	0%	Nonparametric	MK	0	0.739	↔
05_1_01	MW-5	Appendix III	Boron	mg/L	16	0	0%	Nonparametric	MK	-0.00146	0.024	↔
05_1_02	MW-5	Appendix III	Calcium	mg/L	16	0	0%	Parametric	Lognormal MLE	-0.000590	0.004	↓
05_1_03	MW-5	Appendix III	Chloride	mg/L	16	0	0%	Parametric	Lognormal MLE	-0.000387	0.000	↓
05_1_05	MW-5	Appendix III	Sulfate	mg/L	16	0	0%	Parametric	Lognormal MLE	-0.000951	0.000	↓
05_1_06	MW-5	Appendix III	Total Dissolved Solids	mg/L	16	0	0%	Parametric	Lognormal MLE	-0.000663	0.000	↓
05_1_07	MW-5	Appendix III	pH, Field	su	17	0	0%	Nonparametric	MK	-0.0000587	0.650	↔
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	↔
05_5_38	MW-5	Part 115	Iron	mg/L	17	1	6%	Parametric	Lognormal MLE	0.000543	0.589	↔
05_5_39	MW-5	Part 115	Nickel	mg/L	17	0	0%	Parametric	Lognormal MLE	-0.000739	0.000	↓
05_5_42	MW-5	Part 115	Zinc	mg/L	17	4	24%	Parametric	Lognormal MLE	-0.000415	0.589	↔
06_1_01	MW-6	Appendix III	Boron	mg/L	16	0	0%	Parametric	Lognormal MLE	0.000136	0.376	↔
06_1_02	MW-6	Appendix III	Calcium	mg/L	16	0	0%	Parametric	Lognormal MLE	0.000113	0.101	↔
06_1_03	MW-6	Appendix III	Chloride	mg/L	16	0	0%	Parametric	Lognormal MLE	0.000124	0.350	↔
06_1_05	MW-6	Appendix III	Sulfate	mg/L	16	0	0%	Parametric	Lognormal MLE	0.00000771	0.965	↔
06_1_06	MW-6	Appendix III	Total Dissolved Solids	mg/L	16	0	0%	Parametric	Lognormal MLE	0.0000647	0.437	↔
06_1_07	MW-6	Appendix III	pH, Field	su	17	0	0%	Parametric	Lognormal MLE	0.00000374	0.822	↔
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	↔
06_5_38	MW-6	Part 115	Iron	mg/L	17	8	47%	Nonparametric	MK	-0.0000159	0.023	↔
06_5_39	MW-6	Part 115	Nickel	mg/L	17	3	18%	Nonparametric	MK	0	0.269	↔
07_1_01	MW-7	Appendix III	Boron	mg/L	11	0	0%	Parametric	Lognormal MLE	-0.000761	0.000	↓
07_1_02	MW-7	Appendix III	Calcium	mg/L	11	0	0%	Parametric	Lognormal MLE	-0.000232	0.077	↔
07_1_03	MW-7	Appendix III	Chloride	mg/L	11	0	0%	Nonparametric	MK	0.0141	0.034	↔
07_1_05	MW-7	Appendix III	Sulfate	mg/L	11	0	0%	Parametric	Lognormal MLE	-0.0000953	0.496	↔
07_1_06	MW-7	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	Parametric	Lognormal MLE	-0.000102	0.314	↔
07_1_07	MW-7	Appendix III	pH, Field	su	11	0	0%	Nonparametric	MK	0.0000509	0.814	↔
07_2_09	MW-7	Appendix IV	Arsenic	mg/L	11	0	0%	Nonparametric	MK	-0.00000281	0.070	↔

(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
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	↔
07_5_38	MW-7	Part 115	Iron	mg/L	11	0	0%	Nonparametric	MK	-0.000159	1.000	↔
08_1_01	MW-8	Appendix III	Boron	mg/L	11	1	9%	Parametric	Lognormal MLE	0.000153	0.818	↔
08_1_02	MW-8	Appendix III	Calcium	mg/L	11	0	0%	Parametric	Lognormal MLE	0.0000302	0.673	↔
08_1_03	MW-8	Appendix III	Chloride	mg/L	11	2	18%	Parametric	Lognormal MLE	0.00181	0.126	↔
08_1_05	MW-8	Appendix III	Sulfate	mg/L	11	0	0%	Parametric	Lognormal MLE	0.000696	0.290	↔
08_1_06	MW-8	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	Parametric	Lognormal MLE	0.000224	0.000	↑
08_1_07	MW-8	Appendix III	pH, Field	su	11	0	0%	Parametric	Lognormal MLE	-0.0000282	0.440	↔
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_1_02	MW-9	Appendix III	Calcium	mg/L	11	0	0%	Nonparametric	MK	0.0175	0.184	↔
09_1_06	MW-9	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	Parametric	Lognormal MLE	0.000200	0.000	↑
09_1_07	MW-9	Appendix III	pH, Field	su	11	0	0%	Parametric	Lognormal MLE	-0.0000142	0.632	↔
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_1_01	MW-10	Appendix III	Boron	mg/L	11	0	0%	Nonparametric	MK	0	0.361	↔
10_1_02	MW-10	Appendix III	Calcium	mg/L	11	0	0%	Parametric	Lognormal MLE	0.0000260	0.764	↔
10_1_05	MW-10	Appendix III	Sulfate	mg/L	11	0	0%	Parametric	Lognormal MLE	0.000172	0.531	↔
10_1_06	MW-10	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	Parametric	Lognormal MLE	0.000125	0.182	↔
10_1_07	MW-10	Appendix III	pH, Field	su	11	0	0%	Parametric	Lognormal MLE	-0.0000476	0.205	↔
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_1_01	MW-13	Appendix III	Boron	mg/L	11	0	0%	Parametric	Lognormal MLE	0.000447	0.081	↔
13_1_02	MW-13	Appendix III	Calcium	mg/L	11	0	0%	Parametric	Lognormal MLE	0.000173	0.539	↔
13_1_03	MW-13	Appendix III	Chloride	mg/L	11	2	18%	Parametric	Lognormal MLE	0.00485	0.000	↑
13_1_05	MW-13	Appendix III	Sulfate	mg/L	11	0	0%	Parametric	Lognormal MLE	0.00198	0.023	↔
13_1_06	MW-13	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	Parametric	Lognormal MLE	0.000426	0.068	↔
13_1_07	MW-13	Appendix III	pH, Field	su	11	0	0%	Nonparametric	MK	0.000714	0.240	↔
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	↓
13_5_38	MW-13	Part 115	Iron	mg/L	11	1	9%	Parametric	Lognormal MLE	0.00329	0.001	↑
14_1_01	MW-14	Appendix III	Boron	mg/L	8	0	0%	Parametric	Lognormal MLE	-0.000170	0.261	↔
14_1_02	MW-14	Appendix III	Calcium	mg/L	8	0	0%	Parametric	Lognormal MLE	0.000168	0.075	↔
14_1_03	MW-14	Appendix III	Chloride	mg/L	8	0	0%	Parametric	Lognormal MLE	0.000157	0.098	↔
14_1_05	MW-14	Appendix III	Sulfate	mg/L	8	0	0%	Nonparametric	MK	-0.0498	0.046	↔
14_1_07	MW-14	Appendix III	pH, Field	su	8	0	0%	Parametric	Lognormal MLE	-0.0000740	0.035	↔
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	↓

(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
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	↔
14_5_38	MW-14	Part 115	Iron	mg/L	8	0	0%	Parametric	Lognormal MLE	0.00206	0.000	↑
15_1_01	MW-15	Appendix III	Boron	mg/L	8	0	0%	Parametric	Lognormal MLE	0.000000185	0.036	↔
15_1_02	MW-15	Appendix III	Calcium	mg/L	8	0	0%	Parametric	Lognormal MLE	0.0000000559	0.755	↔
15_1_03	MW-15	Appendix III	Chloride	mg/L	8	0	0%	Parametric	Lognormal MLE	-0.000000120	0.508	↔
15_1_05	MW-15	Appendix III	Sulfate	mg/L	8	0	0%	Nonparametric	MK	-0.0000205	0.158	↔
15_1_06	MW-15	Appendix III	Total Dissolved Solids	mg/L	8	0	0%	Parametric	Lognormal MLE	0.0000000144	0.927	↔
15_1_07	MW-15	Appendix III	pH, Field	su	8	0	0%	Parametric	Lognormal MLE	-0.0000000243	0.100	↔
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	↓
15_5_38	MW-15	Part 115	Iron	mg/L	8	1	12%	Parametric	Lognormal MLE	0.000000974	0.237	↔
16A_1_01	MW-16A	Appendix III	Boron	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00161	0.131	↔
16A_1_02	MW-16A	Appendix III	Calcium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00126	0.000	↑
16A_1_03	MW-16A	Appendix III	Chloride	mg/L	9	0	0%	Parametric	Lognormal MLE	0.000867	0.000	↑
16A_1_05	MW-16A	Appendix III	Sulfate	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00346	0.000	↑
16A_1_06	MW-16A	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00114	0.000	↑
16A_1_07	MW-16A	Appendix III	pH, Field	su	9	0	0%	Parametric	Lognormal MLE	-0.0000865	0.017	↔
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	↔
16A_5_38	MW-16A	Part 115	Iron	mg/L	9	0	0%	Parametric	Lognormal MLE	0.000192	0.739	↔
16B_1_01	MW-16B	Appendix III	Boron	mg/L	9	0	0%	Nonparametric	MK	-0.0000399	0.215	↔
16B_1_02	MW-16B	Appendix III	Calcium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.000403	0.000	↑
16B_1_05	MW-16B	Appendix III	Sulfate	mg/L	9	0	0%	Parametric	Lognormal MLE	0.000295	0.143	↔
16B_1_06	MW-16B	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	Parametric	Lognormal MLE	0.000114	0.062	↔
16B_1_07	MW-16B	Appendix III	pH, Field	su	9	0	0%	Parametric	Lognormal MLE	-0.0000188	0.632	↔
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	↔
16B_5_38	MW-16B	Part 115	Iron	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00252	0.000	↓
7C_1_01	MW-7C	Appendix III	Boron	mg/L	11	0	0%	Parametric	Lognormal MLE	0.0000181	0.798	↔
7C_1_02	MW-7C	Appendix III	Calcium	mg/L	11	0	0%	Nonparametric	MK	-0.0600	0.101	↔
7C_1_03	MW-7C	Appendix III	Chloride	mg/L	11	0	0%	Parametric	Lognormal MLE	-0.0000683	0.223	↔
7C_1_05	MW-7C	Appendix III	Sulfate	mg/L	11	0	0%	Parametric	Lognormal MLE	-0.000247	0.000	↓
7C_1_06	MW-7C	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	Nonparametric	MK	-0.321	0.001	↓
7C_1_07	MW-7C	Appendix III	pH, Field	su	11	0	0%	Parametric	Lognormal MLE	-0.0000286	0.235	↔
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	↔
7C_2_18	MW-7C	Appendix IV	Molybdenum	mg/L	11	0	0%	Parametric	Lognormal MLE	-0.0000723	0.291	↔

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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_20	MW-7C	Appendix IV	Radium-226/228	pCi/L	11	0	0%	Parametric	Lognormal MLE	-0.00118	0.304	↔
7C_5_38	MW-7C	Part 115	Iron	mg/L	11	0	0%	Parametric	Lognormal MLE	-0.000148	0.122	↔
7C_5_39	MW-7C	Part 115	Nickel	mg/L	11	0	0%	Nonparametric	MK	-0.00000571	0.005	↓

Table 9: Trend Tests: Piecewise Linear-Linear

								Line 1			Line 2					
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	R-Squared	Overall Trend
02_1_01	MW-2	Appendix III	Boron	mg/L	16	0	0%	0.0184	0.000	↑	-0.00133	0.001	↓	2020-09-26	0.890	↔
02_1_02	MW-2	Appendix III	Calcium	mg/L	16	0	0%	0.304	0.135	↔	-0.0747	0.000	↓	2020-07-12	0.936	↔
02_1_03	MW-2	Appendix III	Chloride	mg/L	16	0	0%	0.175	0.004	↑	-0.00215	0.574	↔	2020-08-26	0.727	↔
02_1_05	MW-2	Appendix III	Sulfate	mg/L	16	0	0%	2.10	0.000	↑	-0.294	0.000	↓	2020-08-09	0.961	↔
02_1_06	MW-2	Appendix III	Total Dissolved Solids	mg/L	16	0	0%	2.79	0.001	↑	-0.415	0.000	↓	2020-08-03	0.938	↔
02_1_07	MW-2	Appendix III	pH, Field	su	17	0	0%	0.000815	0.280	↔	-0.0000320	0.778	↔	2020-10-18	0.148	↔
02_2_09	MW-2	Appendix IV	Arsenic	mg/L	17	13	76%	0.00000147	0.188	↔	-0.000000588	0.630	↔	2022-01-31	0.311	↔
02_2_10	MW-2	Appendix IV	Barium	mg/L	17	0	0%	0.00000566	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	↔
02_5_38	MW-2	Part 115	Iron	mg/L	17	0	0%	0.00127	0.020	↔	-0.000600	0.628	↔	2022-02-01	0.438	↔
02_5_39	MW-2	Part 115	Nickel	mg/L	17	0	0%	0.0000750	0.000	↑	-0.00000966	0.000	↓	2020-09-08	0.901	↔
02_5_42	MW-2	Part 115	Zinc	mg/L	17	14	82%	-0.000114	0.249	↔	0.000000238	0.973	↔	2020-08-27	0.246	↔
03_1_03	MW-3	Appendix III	Chloride	mg/L	6	0	0%	0.0246	0.027	↔	-0.0171	0.280	↔	2022-12-01	0.970	↔
03_1_06	MW-3	Appendix III	Total Dissolved Solids	mg/L	6	0	0%	-0.113	0.264	↔	-0.0206	0.749	↔	2022-08-01	0.881	↔
03_1_07	MW-3	Appendix III	pH, Field	su	6	0	0%	0.000207	0.175	↔	-0.000571	0.181	↔	2023-01-08	0.812	↔
03_2_09	MW-3	Appendix IV	Arsenic	mg/L	6	0	0%	-0.00000000000000405	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	↔	-0.000000000000213	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_1_01	MW-5	Appendix III	Boron	mg/L	16	0	0%	-0.00425	0.076	↔	0.00140	0.580	↔	2022-01-31	0.501	↔
05_1_02	MW-5	Appendix III	Calcium	mg/L	16	0	0%	-0.242	0.010	↓	0.0693	0.732	↔	2022-02-01	0.567	↔
05_1_03	MW-5	Appendix III	Chloride	mg/L	16	0	0%	-0.0373	0.008	↓	-0.00442	0.882	↔	2022-02-01	0.669	↔
05_1_05	MW-5	Appendix III	Sulfate	mg/L	16	0	0%	6.87	0.492	↔	-0.600	0.001	↓	2020-06-09	0.602	↔
05_1_06	MW-5	Appendix III	Total Dissolved Solids	mg/L	16	0	0%	5.83	0.685	↔	-0.899	0.001	↓	2020-06-22	0.614	↔
05_1_07	MW-5	Appendix III	pH, Field	su	17	0	0%	-0.00101	0.350	↔	0.000436	0.257	↔	2021-05-03	0.173	↔
05_2_09	MW-5	Appendix IV	Arsenic	mg/L	17	12	71%	-0.0000605	0.396	↔	0.000000660	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	↓	0.00000000000763	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	↔

(Table continues on next page)

Table 9: Trend Tests: Piecewise Linear-Linear *(continued)*

								Line 1			Line 2					
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	R-Squared	Overall Trend
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	↔
05_5_37	MW-5	Part 115	Copper	mg/L	17	12	71%	-0.0000151	0.655	↔	-0.000000171	0.983	↔	2020-11-06	0.028	↔
05_5_38	MW-5	Part 115	Iron	mg/L	17	1	6%	-0.217	0.004	↓	0.000766	0.412	↔	2020-05-31	0.706	↔
05_5_39	MW-5	Part 115	Nickel	mg/L	17	0	0%	-0.0000238	0.124	↔	-0.00000446	0.215	↔	2020-12-25	0.572	↔
05_5_41	MW-5	Part 115	Vanadium	mg/L	17	15	88%	-0.000105	0.151	↔	0.000000804	0.435	↔	2020-06-22	0.587	↔
05_5_42	MW-5	Part 115	Zinc	mg/L	17	4	24%	0.0000702	0.500	↔	-0.0000276	0.455	↔	2021-01-27	0.079	↔
06_1_01	MW-6	Appendix III	Boron	mg/L	16	0	0%	0.00317	0.057	↔	-0.000131	0.267	↔	2020-09-14	0.558	↔
06_1_02	MW-6	Appendix III	Calcium	mg/L	16	0	0%	0.264	0.167	↔	0.00394	0.774	↔	2020-09-05	0.408	↔
06_1_03	MW-6	Appendix III	Chloride	mg/L	16	0	0%	0.111	0.124	↔	-0.00183	0.721	↔	2020-08-27	0.372	↔
06_1_05	MW-6	Appendix III	Sulfate	mg/L	16	0	0%	0.836	0.117	↔	-0.0453	0.244	↔	2020-08-23	0.350	↔
06_1_06	MW-6	Appendix III	Total Dissolved Solids	mg/L	16	0	0%	1.77	0.075	↔	-0.0422	0.546	↔	2020-08-22	0.420	↔
06_1_07	MW-6	Appendix III	pH, Field	su	17	0	0%	0.00261	0.166	↔	-0.000106	0.425	↔	2020-08-25	0.283	↔
06_2_10	MW-6	Appendix IV	Barium	mg/L	17	0	0%	0.0000671	0.142	↔	-0.00000922	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	↔	-0.00000699	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	↔
06_5_38	MW-6	Part 115	Iron	mg/L	17	8	47%	-0.000893	0.021	↔	0.00000724	0.774	↔	2020-09-04	0.635	↔
06_5_39	MW-6	Part 115	Nickel	mg/L	17	3	18%	0.0000357	0.046	↔	-0.00000195	0.002	↓	2020-07-10	0.671	↔
06_5_42	MW-6	Part 115	Zinc	mg/L	17	16	94%	-0.000104	0.353	↔	-0.000000000000107	1.000	↔	2020-08-17	0.256	↔
07_1_01	MW-7	Appendix III	Boron	mg/L	11	0	0%	0.00233	0.083	↔	-0.00263	0.036	↔	2022-02-17	0.771	↔
07_1_02	MW-7	Appendix III	Calcium	mg/L	11	0	0%	0.102	0.109	↔	-0.0780	0.019	↔	2022-02-16	0.657	↔
07_1_03	MW-7	Appendix III	Chloride	mg/L	11	0	0%	0.0496	0.066	↔	-0.0270	0.223	↔	2022-08-01	0.661	↔
07_1_04	MW-7	Appendix III	Fluoride	mg/L	11	10	91%	-0.00136	0.507	↔	0.000393	0.355	↔	2021-12-06	0.189	↔
07_1_05	MW-7	Appendix III	Sulfate	mg/L	11	0	0%	0.204	0.052	↔	-0.111	0.193	↔	2022-02-17	0.550	↔
07_1_06	MW-7	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	0.473	0.065	↔	-0.282	0.026	↔	2022-02-16	0.645	↔
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	↔
07_5_38	MW-7	Part 115	Iron	mg/L	11	0	0%	0.00340	0.172	↔	-0.00218	0.073	↔	2022-02-16	0.495	↔
07_5_42	MW-7	Part 115	Zinc	mg/L	11	8	73%	-0.0000122	0.574	↔	-0.000000322	0.961	↔	2021-12-29	0.120	↔
08_1_01	MW-8	Appendix III	Boron	mg/L	11	1	9%	-0.000342	0.150	↔	0.000162	0.414	↔	2022-02-23	0.333	↔
08_1_03	MW-8	Appendix III	Chloride	mg/L	11	2	18%	-0.0234	0.657	↔	0.240	0.143	↔	2022-11-25	0.517	↔
08_1_04	MW-8	Appendix III	Fluoride	mg/L	11	10	91%	-0.00193	0.507	↔	0.000558	0.355	↔	2021-12-06	0.189	↔
08_1_05	MW-8	Appendix III	Sulfate	mg/L	11	0	0%	-0.0879	0.108	↔	0.101	0.047	↔	2022-04-30	0.619	↔
08_1_06	MW-8	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	-0.0512	0.497	↔	0.214	0.011	↔	2022-05-23	0.798	↔
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	↔

(Table continues on next page)

Table 9: Trend Tests: Piecewise Linear-Linear *(continued)*

								Line 1			Line 2					
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	R-Squared	Overall Trend
08_2_18	MW-8	Appendix IV	Molybdenum	mg/L	11	9	82%	-0.0000204	0.218	↔	0.000000000000968	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_1_02	MW-9	Appendix III	Calcium	mg/L	11	0	0%	0.0940	0.207	↔	-0.00373	0.687	↔	2021-11-01	0.502	↔
09_1_03	MW-9	Appendix III	Chloride	mg/L	11	10	91%	-0.00797	0.507	↔	0.00231	0.355	↔	2021-12-06	0.189	↔
09_1_04	MW-9	Appendix III	Fluoride	mg/L	11	10	91%	-0.00198	0.507	↔	0.000574	0.355	↔	2021-12-06	0.189	↔
09_1_05	MW-9	Appendix III	Sulfate	mg/L	11	8	73%	-0.000224	0.879	↔	0.00571	0.204	↔	2022-12-26	0.405	↔
09_1_06	MW-9	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	0.117	0.132	↔	0.0248	0.459	↔	2022-02-16	0.632	↔
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	↔
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	↔
09_5_42	MW-9	Part 115	Zinc	mg/L	11	10	91%	0.00000819	0.507	↔	-0.00000237	0.355	↔	2021-12-06	0.189	↔
10_1_01	MW-10	Appendix III	Boron	mg/L	11	0	0%	0.0000547	0.596	↔	-0.0000227	0.123	↔	2021-11-01	0.326	↔
10_1_02	MW-10	Appendix III	Calcium	mg/L	11	0	0%	0.0357	0.546	↔	-0.00673	0.804	↔	2022-01-12	0.072	↔
10_1_03	MW-10	Appendix III	Chloride	mg/L	11	9	82%	-0.00887	0.464	↔	0.00356	0.172	↔	2021-12-06	0.296	↔
10_1_04	MW-10	Appendix III	Fluoride	mg/L	11	10	91%	-0.00191	0.507	↔	0.000554	0.355	↔	2021-12-06	0.189	↔
10_1_06	MW-10	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	0.149	0.500	↔	0.0167	0.868	↔	2022-02-16	0.190	↔
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	↔	0.00000571	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	↔
10_5_42	MW-10	Part 115	Zinc	mg/L	11	9	82%	0.0000334	0.227	↔	-0.0000102	0.415	↔	2022-01-11	0.265	↔
13_1_01	MW-13	Appendix III	Boron	mg/L	11	0	0%	0.000277	0.006	↑	-0.000138	0.338	↔	2022-10-26	0.702	↔
13_1_02	MW-13	Appendix III	Calcium	mg/L	11	0	0%	-0.618	0.005	↓	0.0796	0.016	↔	2022-05-11	0.796	↔
13_1_05	MW-13	Appendix III	Sulfate	mg/L	11	0	0%	-0.00498	0.939	↔	0.286	0.046	↔	2023-01-09	0.667	↔
13_1_06	MW-13	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	-1.98	0.044	↔	0.346	0.000	↑	2022-05-03	0.910	↔
13_1_07	MW-13	Appendix III	pH, Field	su	11	0	0%	0.00201	0.005	↑	-0.00269	0.001	↓	2022-09-27	0.890	↔
13_2_09	MW-13	Appendix IV	Arsenic	mg/L	11	10	91%	-0.00000000000000000172	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	↔
13_5_38	MW-13	Part 115	Iron	mg/L	11	1	9%	0.0000130	0.888	↔	0.000571	0.011	↔	2022-12-27	0.830	↔
13_5_42	MW-13	Part 115	Zinc	mg/L	11	10	91%	0.0000137	0.377	↔	-0.00000523	0.389	↔	2022-07-13	0.200	↔
14_1_01	MW-14	Appendix III	Boron	mg/L	8	0	0%	-0.00253	0.013	↔	0.00103	0.019	↔	2023-04-25	0.930	↔
14_1_02	MW-14	Appendix III	Calcium	mg/L	8	0	0%	-0.0341	0.231	↔	0.109	0.011	↔	2023-05-30	0.870	↔
14_1_03	MW-14	Appendix III	Chloride	mg/L	8	0	0%	0.0845	0.166	↔	-0.0114	0.641	↔	2023-04-07	0.606	↔
14_1_05	MW-14	Appendix III	Sulfate	mg/L	8	0	0%	5.68	0.614	↔	-2.69	0.211	↔	2023-03-23	0.394	↔
14_1_07	MW-14	Appendix III	pH, Field	su	8	0	0%	-0.000114	0.817	↔	-0.00191	0.523	↔	2023-07-07	0.531	↔
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	↔
14_5_38	MW-14	Part 115	Iron	mg/L	8	0	0%	0.0800	0.023	↔	0.0110	0.048	↔	2023-02-27	0.951	↔
14_5_39	MW-14	Part 115	Nickel	mg/L	8	6	75%	-0.0000168	0.062	↔	0.000000797	0.522	↔	2023-03-12	0.873	↔
15_1_01	MW-15	Appendix III	Boron	mg/L	8	0	0%	0.0000000274	0.225	↔	0.000800	0.011	↔	2023-05-29	0.930	↔

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Table 9: Trend Tests: Piecewise Linear-Linear *(continued)*

								Line 1			Line 2					
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	R-Squared	Overall Trend
15_1_02	MW-15	Appendix III	Calcium	mg/L	8	0	0%	0.130	0.920	↔	-0.101	0.549	↔	0894-05-24	0.116	↔
15_1_03	MW-15	Appendix III	Chloride	mg/L	8	0	0%	0.0295	0.966	↔	-0.0789	0.389	↔	1478-11-08	0.218	↔
15_1_05	MW-15	Appendix III	Sulfate	mg/L	8	0	0%	0.000101	1.000	↔	-0.477	0.052	↔	2023-01-11	0.651	↔
15_1_06	MW-15	Appendix III	Total Dissolved Solids	mg/L	8	0	0%	2.40	0.646	↔	-0.635	0.359	↔	0441-07-02	0.251	↔
15_1_07	MW-15	Appendix III	pH, Field	su	8	0	0%	-0.0000000257	0.772	↔	-0.00176	0.085	↔	2023-04-28	0.833	↔
15_2_10	MW-15	Appendix IV	Barium	mg/L	8	0	0%	0.0000000105	0.557	↔	0.000132	0.646	↔	2023-06-02	0.365	↔
15_2_16	MW-15	Appendix IV	Lithium	mg/L	8	7	88%	0.00000000902	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%	-0.0000000207	0.068	↔	-0.0000807	0.146	↔	2023-04-27	0.876	↔
15_5_38	MW-15	Part 115	Iron	mg/L	8	1	12%	-0.000571	0.733	↔	0.000409	0.108	↔	0857-08-26	0.623	↔
15_5_42	MW-15	Part 115	Zinc	mg/L	8	7	88%	0.00000000821	0.482	↔	-0.0000571	0.374	↔	2023-04-27	0.286	↔
16A_1_01	MW-16A	Appendix III	Boron	mg/L	9	0	0%	-0.00213	0.069	↔	0.000622	0.013	↔	2023-04-04	0.796	↔
16A_1_02	MW-16A	Appendix III	Calcium	mg/L	9	0	0%	-0.681	0.198	↔	0.357	0.007	↑	2023-03-29	0.835	↔
16A_1_03	MW-16A	Appendix III	Chloride	mg/L	9	0	0%	0.118	0.800	↔	0.457	0.049	↔	2023-05-01	0.773	↔
16A_1_04	MW-16A	Appendix III	Fluoride	mg/L	9	9	100%	0.00309	0.223	↔	-0.00506	0.497	↔	2023-08-08	0.340	↔
16A_1_05	MW-16A	Appendix III	Sulfate	mg/L	9	0	0%	-1.26	0.186	↔	0.872	0.002	↑	2023-04-02	0.903	↔
16A_1_06	MW-16A	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	-3.83	0.220	↔	2.47	0.004	↑	2023-04-02	0.870	↔
16A_1_07	MW-16A	Appendix III	pH, Field	su	9	0	0%	-0.00149	0.170	↔	-0.000000661	0.999	↔	2023-06-08	0.537	↔
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%	-0.00000466	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	↔
16A_5_38	MW-16A	Part 115	Iron	mg/L	9	0	0%	-0.00930	0.357	↔	0.00590	0.167	↔	2023-05-26	0.428	↔
16B_1_02	MW-16B	Appendix III	Calcium	mg/L	9	0	0%	0.0511	0.269	↔	0.0283	0.012	↔	2023-04-14	0.897	↔
16B_1_05	MW-16B	Appendix III	Sulfate	mg/L	9	0	0%	-0.0254	0.085	↔	0.0148	0.026	↔	2023-05-03	0.754	↔
16B_1_06	MW-16B	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	-0.155	0.158	↔	0.0933	0.054	↔	2023-04-25	0.688	↔
16B_1_07	MW-16B	Appendix III	pH, Field	su	9	0	0%	-0.00167	0.120	↔	0.000804	0.304	↔	2023-06-04	0.500	↔
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	↔
16B_5_38	MW-16B	Part 115	Iron	mg/L	9	0	0%	-0.00660	0.041	↔	-0.000840	0.110	↔	2023-03-26	0.872	↔
7C_1_01	MW-7C	Appendix III	Boron	mg/L	11	0	0%	0.00111	0.631	↔	-0.000486	0.659	↔	2022-08-31	0.084	↔
7C_1_02	MW-7C	Appendix III	Calcium	mg/L	11	0	0%	-0.691	0.360	↔	0.0481	0.397	↔	2022-05-18	0.520	↔
7C_1_03	MW-7C	Appendix III	Chloride	mg/L	11	0	0%	-0.0471	0.135	↔	0.00519	0.556	↔	2022-07-04	0.474	↔
7C_1_05	MW-7C	Appendix III	Sulfate	mg/L	11	0	0%	-0.719	0.038	↔	-0.0417	0.414	↔	2022-06-22	0.864	↔
7C_1_06	MW-7C	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	-1.28	0.000	↓	-0.0349	0.107	↔	2022-06-23	0.993	↔
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%	0.000000856	0.182	↔	-0.000000940	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	↔

(Table continues on next page)

Table 9: Trend Tests: Piecewise Linear-Linear *(continued)*

								Line 1			Line 2					
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	R-Squared	Overall Trend
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	↔
7C_5_38	MW-7C	Part 115	Iron	mg/L	11	0	0%	-0.00239	0.335	↔	0.0000216	0.976	↔	2022-07-16	0.340	↔
7C_5_39	MW-7C	Part 115	Nickel	mg/L	11	0	0%	-0.0000714	0.005	↓	-0.00000201	0.178	↔	2022-04-17	0.900	↔

Table 10: Trend Tests: Piecewise Linear-Linear-Linear

								Line 1			Line 2			Line 3						
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	Break 2	R-Squared	Overall Trend
02_1_02	MW-2	Appendix III	Calcium	mg/L	16	0	0%	0.241	0.052	↔	-0.0905	0.000	↓	-0.0270	0.637	↔	2020-08-02	2022-08-02	0.955	↔
02_1_03	MW-2	Appendix III	Chloride	mg/L	16	0	0%	0.175	0.005	↑	-0.0258	0.261	↔	0.00444	0.573	↔	2020-09-07	2021-05-04	0.773	↔
02_1_05	MW-2	Appendix III	Sulfate	mg/L	16	0	0%	2.09	0.000	↑	-0.333	0.000	↓	-0.171	0.073	↔	2020-08-11	2022-08-01	0.969	↔
02_1_06	MW-2	Appendix III	Total Dissolved Solids	mg/L	16	0	0%	2.86	0.000	↑	-0.509	0.000	↓	-0.113	0.403	↔	2020-08-06	2022-08-01	0.965	↔
02_1_07	MW-2	Appendix III	pH, Field	su	17	0	0%	0.00122	0.079	↔	-0.000999	0.618	↔	0.000164	0.323	↔	2020-10-19	2021-03-31	0.323	↔
02_2_09	MW-2	Appendix IV	Arsenic	mg/L	17	13	76%	-0.000000989	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	↔
02_5_38	MW-2	Part 115	Iron	mg/L	17	0	0%	-0.00306	0.357	↔	0.00191	0.058	↔	-0.000958	0.192	↔	2020-09-01	2022-01-31	0.610	↔
02_5_39	MW-2	Part 115	Nickel	mg/L	17	0	0%	0.0000763	0.006	↑	0.0000287	0.560	↔	-0.00000998	0.000	↓	2020-08-15	2020-10-11	0.904	↔
02_5_42	MW-2	Part 115	Zinc	mg/L	17	14	82%	-0.000117	0.281	↔	0.00000217	0.909	↔	-0.00000230	0.949	↔	2020-08-28	2022-02-01	0.247	↔
05_1_01	MW-5	Appendix III	Boron	mg/L	16	0	0%	0.00403	0.817	↔	-0.00508	0.143	↔	0.00185	0.493	↔	2020-08-06	2022-01-31	0.533	↔
05_1_02	MW-5	Appendix III	Calcium	mg/L	16	0	0%	0.262	0.385	↔	-0.375	0.016	↔	0.133	0.478	↔	2020-10-14	2022-02-01	0.699	↔
05_1_03	MW-5	Appendix III	Chloride	mg/L	16	0	0%	0.0359	0.422	↔	-0.0567	0.014	↔	0.00487	0.860	↔	2020-10-15	2022-02-01	0.767	↔
05_1_06	MW-5	Appendix III	Total Dissolved Solids	mg/L	16	0	0%	1.54	0.359	↔	-2.00	0.126	↔	0.208	0.749	↔	2020-10-17	2022-01-22	0.723	↔
05_1_07	MW-5	Appendix III	pH, Field	su	17	0	0%	-0.00132	0.243	↔	0.00122	0.394	↔	-0.000535	0.620	↔	2021-05-03	2022-06-19	0.260	↔
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	↔
05_2_14	MW-5	Appendix IV	Cobalt	mg/L	17	16	94%	-0.0000171	0.020	↔	0.00000135	0.511	↔	-0.0000000123	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	↔
05_5_37	MW-5	Part 115	Copper	mg/L	17	12	71%	-0.0000223	0.400	↔	0.0000335	0.744	↔	-0.0000210	0.208	↔	2021-03-17	2022-01-31	0.201	↔
05_5_38	MW-5	Part 115	Iron	mg/L	17	1	6%	-0.217	0.008	↓	0.0137	0.841	↔	0.000603	0.574	↔	2020-06-04	2020-08-11	0.712	↔
05_5_39	MW-5	Part 115	Nickel	mg/L	17	0	0%	-0.000105	0.491	↔	-0.0000115	0.489	↔	-0.00000514	0.235	↔	2020-06-17	2021-02-15	0.626	↔
05_5_41	MW-5	Part 115	Vanadium	mg/L	17	15	88%	-0.000248	0.000	↓	0.00000394	0.108	↔	-0.00000439	0.067	↔	2020-05-28	2022-01-31	0.852	↔
05_5_42	MW-5	Part 115	Zinc	mg/L	17	4	24%	-0.000191	0.359	↔	0.000364	0.670	↔	-0.0000528	0.084	↔	2020-09-26	2021-01-26	0.348	↔
06_1_02	MW-6	Appendix III	Calcium	mg/L	16	0	0%	0.346	0.002	↑	-0.115	0.009	↓	0.0640	0.026	↔	2020-09-16	2021-08-03	0.804	↔
06_1_03	MW-6	Appendix III	Chloride	mg/L	16	0	0%	0.131	0.000	↑	-0.0588	0.003	↓	0.0214	0.001	↑	2020-09-22	2021-07-02	0.878	↔
06_1_05	MW-6	Appendix III	Sulfate	mg/L	16	0	0%	0.991	0.001	↑	-0.479	0.005	↓	0.107	0.031	↔	2020-09-16	2021-06-04	0.828	↔
06_1_06	MW-6	Appendix III	Total Dissolved Solids	mg/L	16	0	0%	1.93	0.000	↑	-0.904	0.003	↓	0.241	0.008	↑	2020-09-22	2021-05-30	0.865	↔
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	↔

(Table continues on next page)

Table 10: Trend Tests: Piecewise Linear-Linear-Linear *(continued)*

								Line 1			Line 2			Line 3						
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	Break 2	R-Squared	Overall Trend
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	↔
06_5_39	MW-6	Part 115	Nickel	mg/L	17	3	18%	0.0000297	0.013	↔	-0.0000115	0.275	↔	-0.00000131	0.110	↔	2020-08-11	2020-12-01	0.730	↔
07_1_03	MW-7	Appendix III	Chloride	mg/L	11	0	0%	-0.00718	0.777	↔	0.0980	0.499	↔	-0.0449	0.022	↔	2021-12-15	2022-07-31	0.889	↔
07_1_04	MW-7	Appendix III	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_1_07	MW-7	Appendix III	pH, Field	su	11	0	0%	-0.0223	0.006	↓	0.000354	0.450	↔	-0.000800	0.449	↔	2021-07-20	2023-02-02	0.876	↔
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_1_01	MW-8	Appendix III	Boron	mg/L	11	1	9%	0.000561	0.540	↔	-0.00109	0.099	↔	0.000196	0.124	↔	2021-09-27	2022-01-19	0.634	↔
08_1_03	MW-8	Appendix III	Chloride	mg/L	11	2	18%	0.262	0.294	↔	-0.303	0.431	↔	0.119	0.042	↔	2021-09-28	2022-02-09	0.675	↔
08_1_05	MW-8	Appendix III	Sulfate	mg/L	11	0	0%	0.0747	0.624	↔	-0.223	0.369	↔	0.0846	0.030	↔	2021-09-28	2022-02-07	0.712	↔
08_1_06	MW-8	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	-0.0863	0.532	↔	0.0462	0.951	↔	0.212	0.034	↔	2021-12-07	2022-08-01	0.806	↔
08_1_07	MW-8	Appendix III	pH, Field	su	11	0	0%	-0.00539	0.319	↔	0.000449	0.668	↔	-0.000827	0.689	↔	2021-09-14	2022-12-18	0.433	↔
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_1_02	MW-9	Appendix III	Calcium	mg/L	11	0	0%	0.0878	0.014	↔	-0.0690	0.622	↔	0.0379	0.036	↔	2021-12-24	2022-08-01	0.849	↔
09_1_05	MW-9	Appendix III	Sulfate	mg/L	11	8	73%	-0.00318	0.549	↔	0.00115	0.718	↔	0.00389	0.420	↔	2021-12-06	2022-12-08	0.499	↔
09_1_06	MW-9	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	0.166	0.244	↔	-0.0296	0.918	↔	0.0884	0.162	↔	2021-11-27	2022-08-01	0.682	↔
09_1_07	MW-9	Appendix III	pH, Field	su	11	0	0%	-0.0154	0.008	↓	0.000596	0.123	↔	-0.00183	0.053	↔	2021-07-21	2023-01-15	0.879	↔
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	↔
09_5_42	MW-9	Part 115	Zinc	mg/L	11	10	91%	0.0000113	0.422	↔	-0.0000112	0.707	↔	0.00000169	0.773	↔	2021-12-06	2022-06-04	0.298	↔
10_1_01	MW-10	Appendix III	Boron	mg/L	11	0	0%	0.0000728	0.345	↔	-0.0000445	0.342	↔	0.0000553	0.417	↔	2021-11-02	2023-01-26	0.516	↔
10_1_04	MW-10	Appendix III	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_1_05	MW-10	Appendix III	Sulfate	mg/L	11	0	0%	0.0804	0.615	↔	-0.00783	0.582	↔	0.0227	0.483	↔	2021-07-24	2022-11-04	0.249	↔
10_1_06	MW-10	Appendix III	Total Dissolved Solids	mg/L	11	0	0%	-0.457	0.393	↔	0.641	0.445	↔	-0.0129	0.898	↔	2021-09-28	2022-01-13	0.436	↔
10_1_07	MW-10	Appendix III	pH, Field	su	11	0	0%	-0.00334	0.169	↔	0.000832	0.539	↔	-0.00120	0.549	↔	2021-11-02	2022-10-16	0.484	↔
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	↔
10_5_42	MW-10	Part 115	Zinc	mg/L	11	9	82%	-0.0000149	0.823	↔	0.000101	0.356	↔	-0.0000143	0.301	↔	2021-10-21	2022-01-11	0.413	↔
13_1_01	MW-13	Appendix III	Boron	mg/L	11	0	0%	-0.000366	0.575	↔	0.000385	0.022	↔	-0.000160	0.087	↔	2022-04-16	2022-10-20	0.824	↔
13_1_02	MW-13	Appendix III	Calcium	mg/L	11	0	0%	-0.606	0.020	↔	0.0280	0.950	↔	0.0880	0.063	↔	2022-05-07	2022-08-15	0.803	↔
13_1_03	MW-13	Appendix III	Chloride	mg/L	11	2	18%	0.0753	0.000	↑	0.343	0.001	↑	0.0114	0.328	↔	2022-09-20	2022-11-24	0.996	↔
13_1_05	MW-13	Appendix III	Sulfate	mg/L	11	0	0%	-0.196	0.778	↔	0.0387	0.707	↔	0.279	0.087	↔	2022-05-03	2023-01-29	0.703	↔
13_2_09	MW-13	Appendix IV	Arsenic	mg/L	11	10	91%	0.000000000000636	0.769	↔	-0.000000000000488	0.168	↔	0.0000114	0.000	↑	2022-04-22	2023-02-07	1.000	↔
13_5_38	MW-13	Part 115	Iron	mg/L	11	1	9%	0.000260	0.418	↔	-0.000377	0.708	↔	0.000418	0.007	↑	2022-06-08	2022-09-05	0.843	↔
14_1_05	MW-14	Appendix III	Sulfate	mg/L	8	0	0%	8.19	0.552	↔	-7.39	0.340	↔	1.74	0.797	↔	2023-03-23	2023-06-15	0.626	↔
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%	-0.000000000000300	1.000	↔	0.000114	0.345	↔	-0.000114	0.134	↔	2023-04-27	2023-07-01	0.828	↔
14_5_39	MW-14	Part 115	Nickel	mg/L	8	6	75%	-0.0000278	0.000	↓	0.0000000000956	0.481	↔	-0.0000000000973	0.808	↔	2023-02-17	2023-07-24	1.000	↔
15_1_02	MW-15	Appendix III	Calcium	mg/L	8	0	0%	0.0000530	0.412	↔	-0.474	0.740	↔	0.546	0.472	↔	2023-02-17	2023-06-25	0.535	↔
15_1_03	MW-15	Appendix III	Chloride	mg/L	8	0	0%	0.0000300	1.000	↔	-0.368	0.046	↔	0.194	0.131	↔	2023-01-11	2023-05-14	0.942	↔

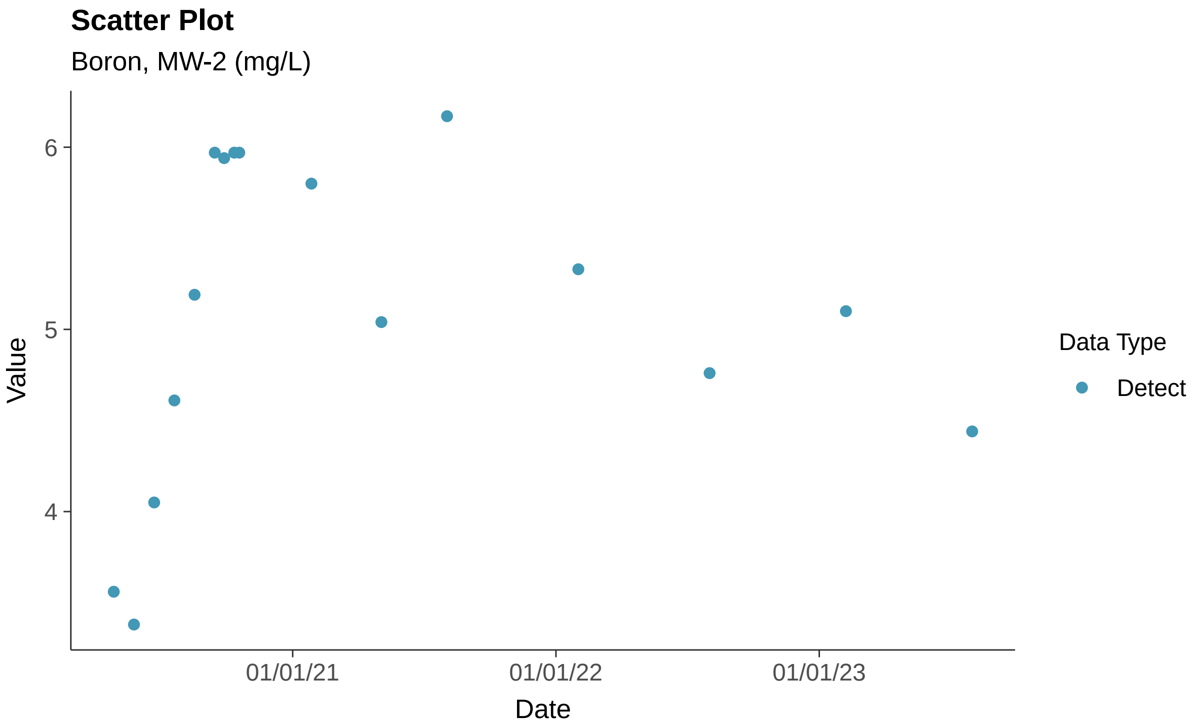
(Table continues on next page)

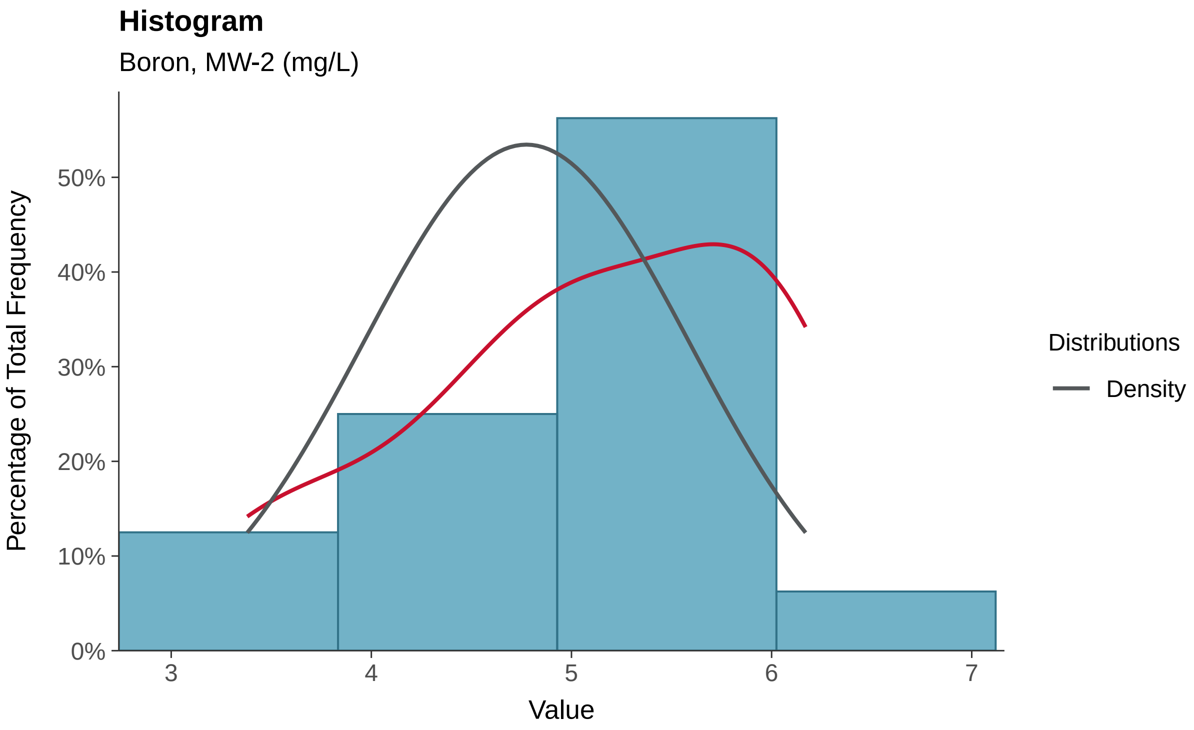
Table 10: Trend Tests: Piecewise Linear-Linear-Linear *(continued)*

								Line 1			Line 2			Line 3						
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	Break 2	R-Squared	Overall Trend
15_1_05	MW-15	Appendix III	Sulfate	mg/L	8	0	0%	0.000138	0.083	↔	-0.887	0.477	↔	0.247	0.676	↔	2023-01-12	2023-06-13	0.904	↔
15_1_06	MW-15	Appendix III	Total Dissolved Solids	mg/L	8	0	0%	0.000229	0.405	↔	-2.17	0.720	↔	2.14	0.501	↔	2023-02-17	2023-06-25	0.557	↔
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_1_01	MW-16A	Appendix III	Boron	mg/L	9	0	0%	-0.00139	0.048	↔	0.00126	0.029	↔	-0.000571	0.611	↔	2023-05-12	2023-09-19	0.919	↔
16A_1_04	MW-16A	Appendix III	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_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	↔
16A_5_38	MW-16A	Part 115	Iron	mg/L	9	0	0%	-0.00702	0.017	↔	0.0429	0.009	↑	-0.0200	0.066	↔	2023-07-31	2023-09-17	0.963	↔
16B_1_05	MW-16B	Appendix III	Sulfate	mg/L	9	0	0%	-0.0254	0.094	↔	0.0288	0.101	↔	-0.00286	0.832	↔	2023-05-20	2023-09-02	0.884	↔
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_1_02	MW-7C	Appendix III	Calcium	mg/L	11	0	0%	-1.08	0.116	↔	0.565	0.144	↔	-0.0358	0.579	↔	2022-05-18	2022-08-06	0.779	↔
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	↔
7C_5_39	MW-7C	Part 115	Nickel	mg/L	11	0	0%	-0.0000714	0.016	↔	-0.00000408	0.345	↔	-0.0000000000615	1.000	↔	2022-04-14	2022-12-14	0.909	↔

Appendix III: Boron, MW-2

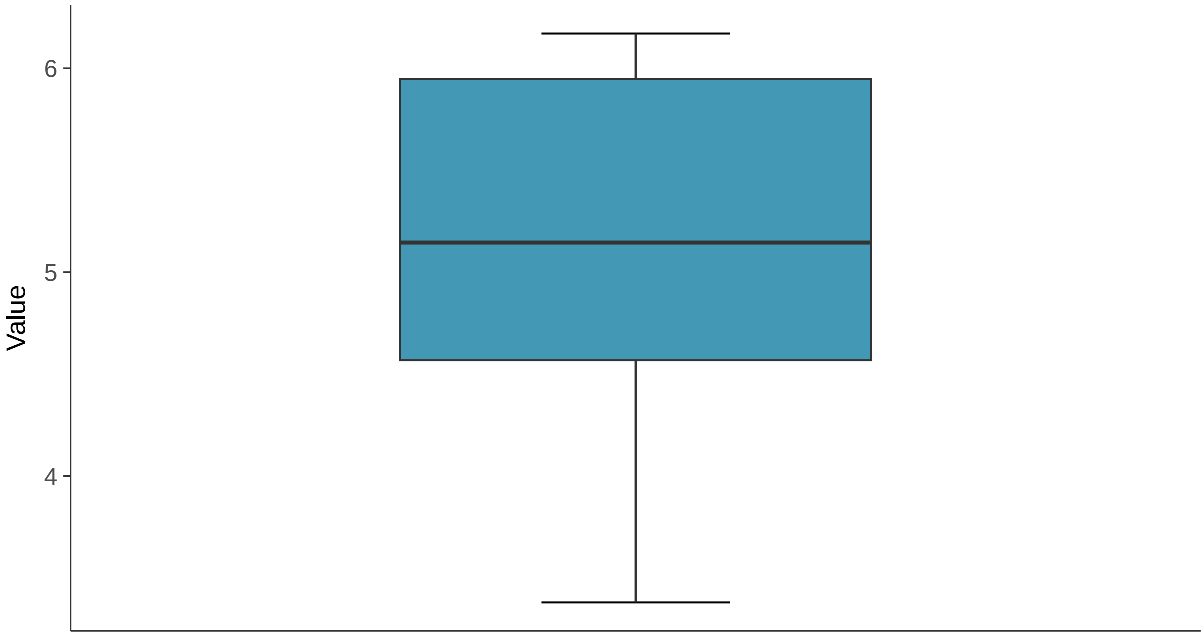
ID: 02_1_01





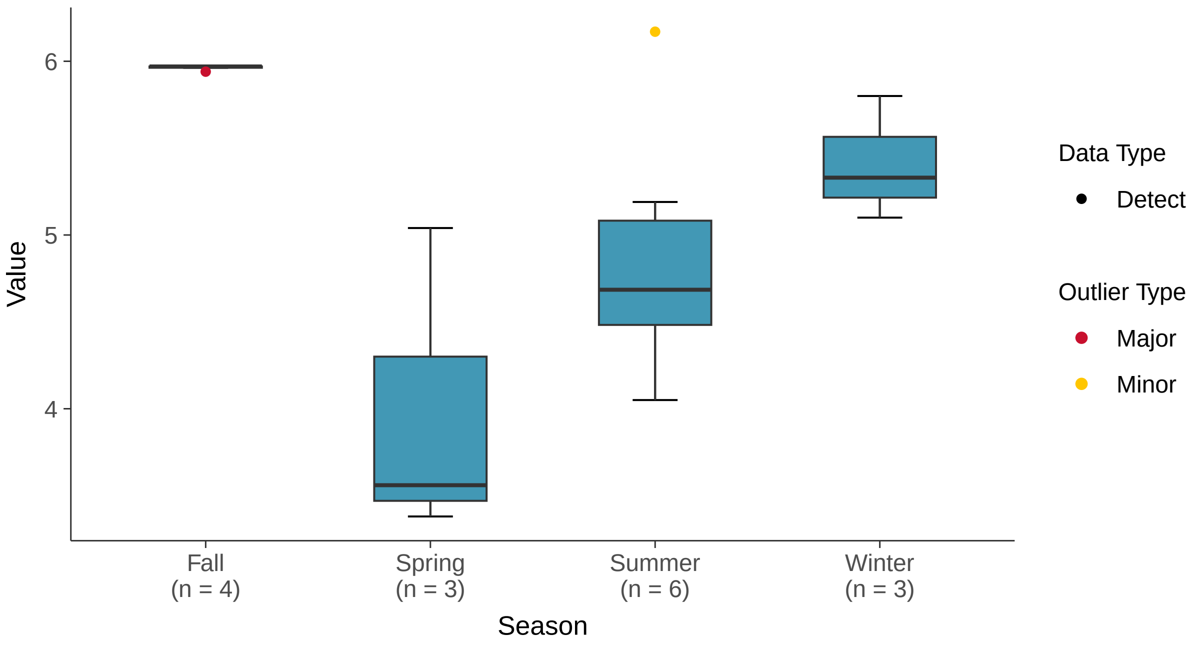
Boxplot

Boron, MW-2 (mg/L)



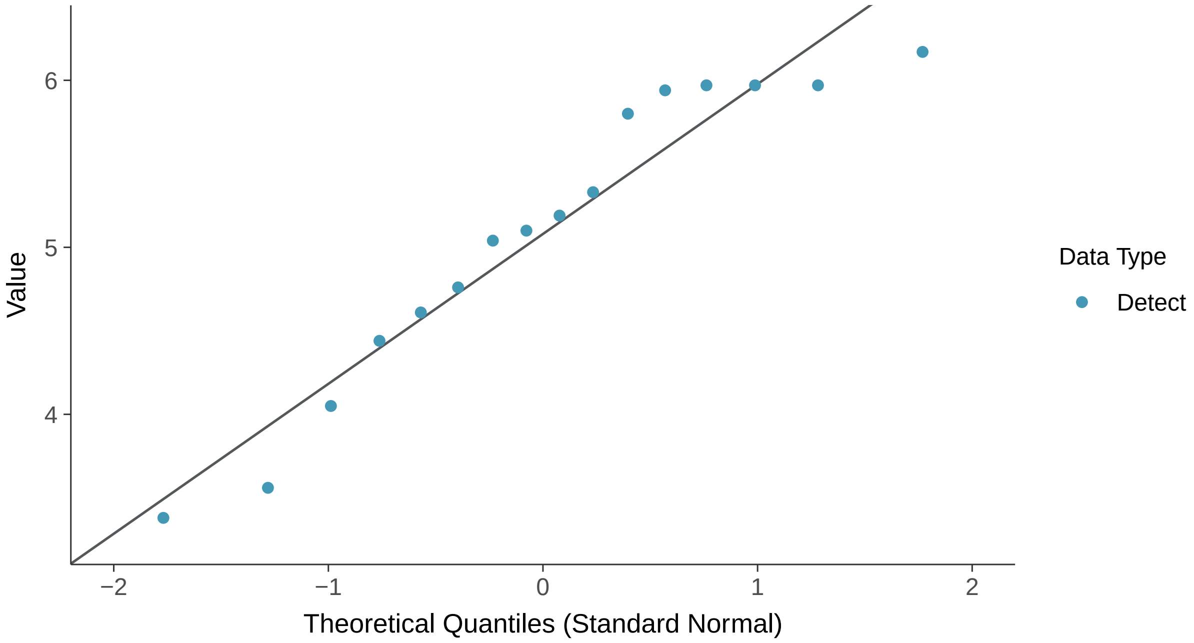
Boxplot by Season

Boron, MW-2 (mg/L)



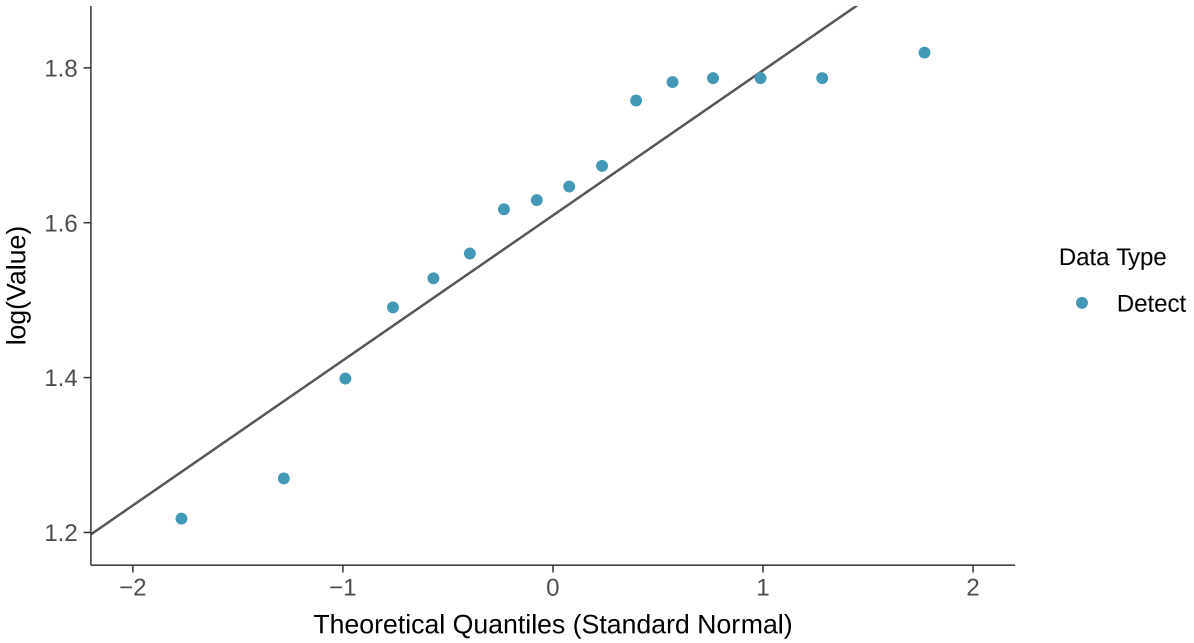
Normal Q-Q plot

Boron, MW-2 (mg/L)



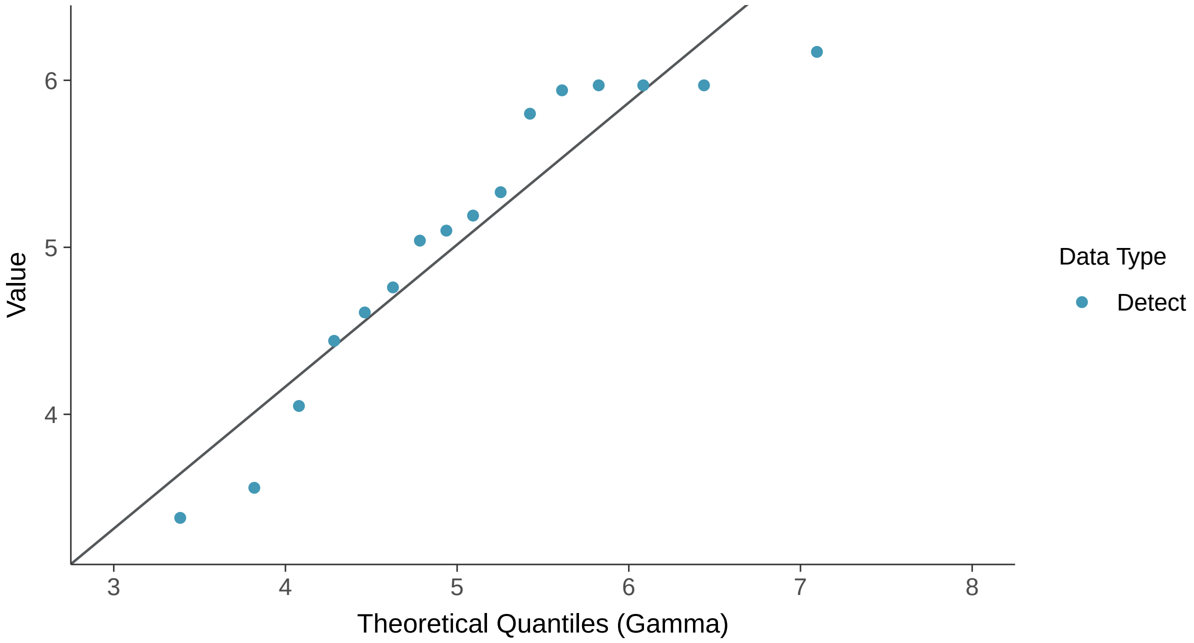
Lognormal Q-Q plot

Boron, MW-2 (mg/L)



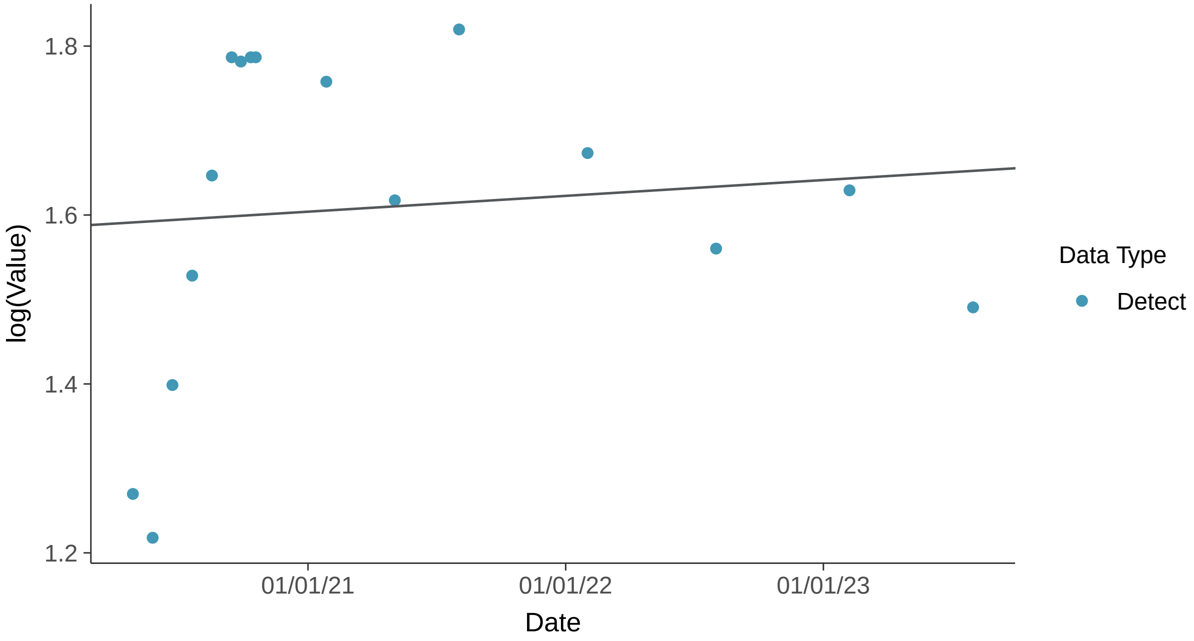
Gamma Q-Q plot

Boron, MW-2 (mg/L)



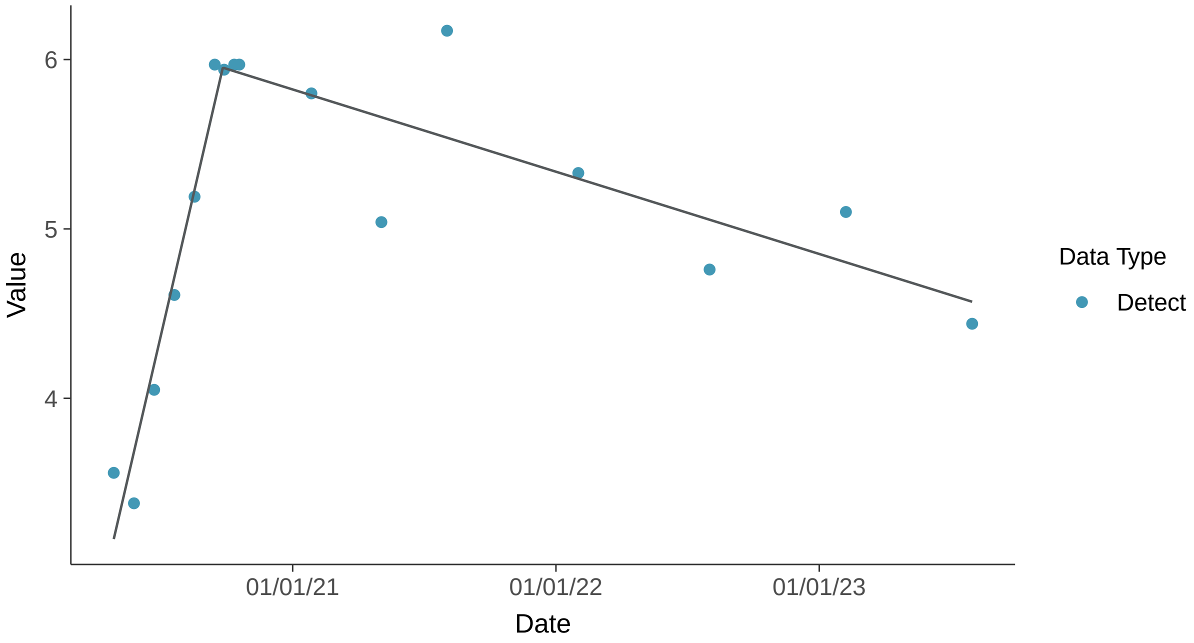
Trend Regression: Lognormal MLE

Boron, MW-2 (mg/L)



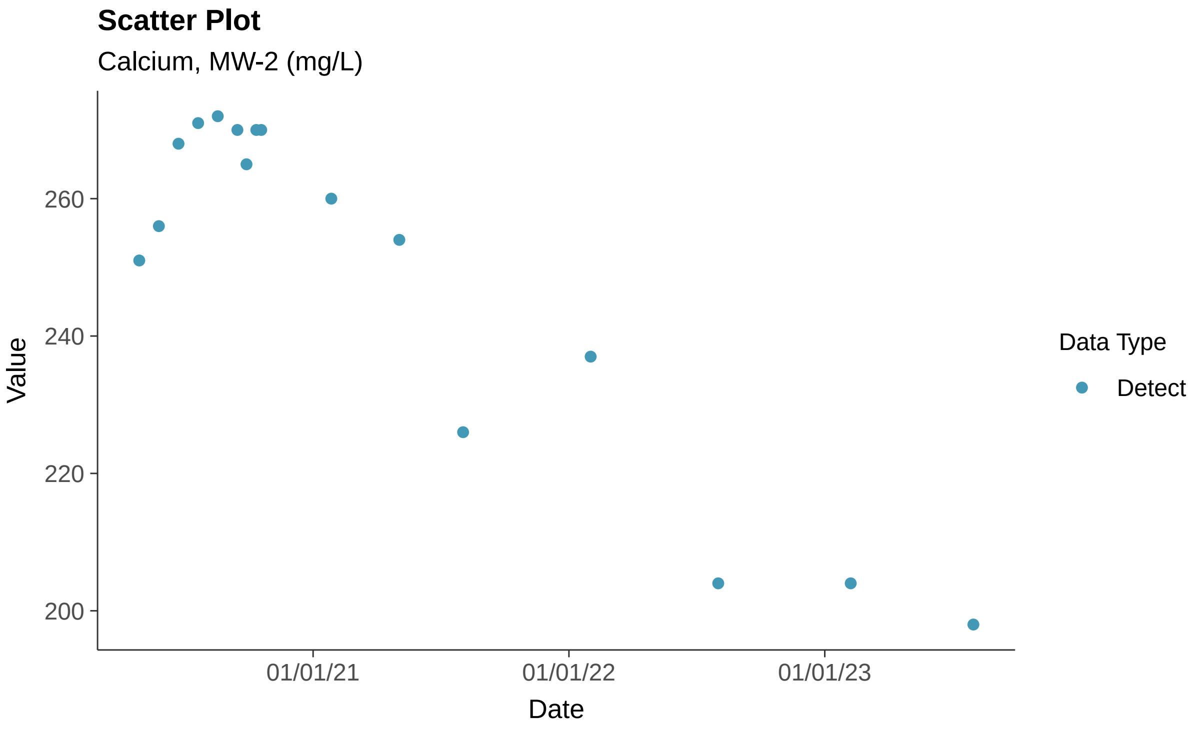
Trend Regression: Piecewise Linear-Linear

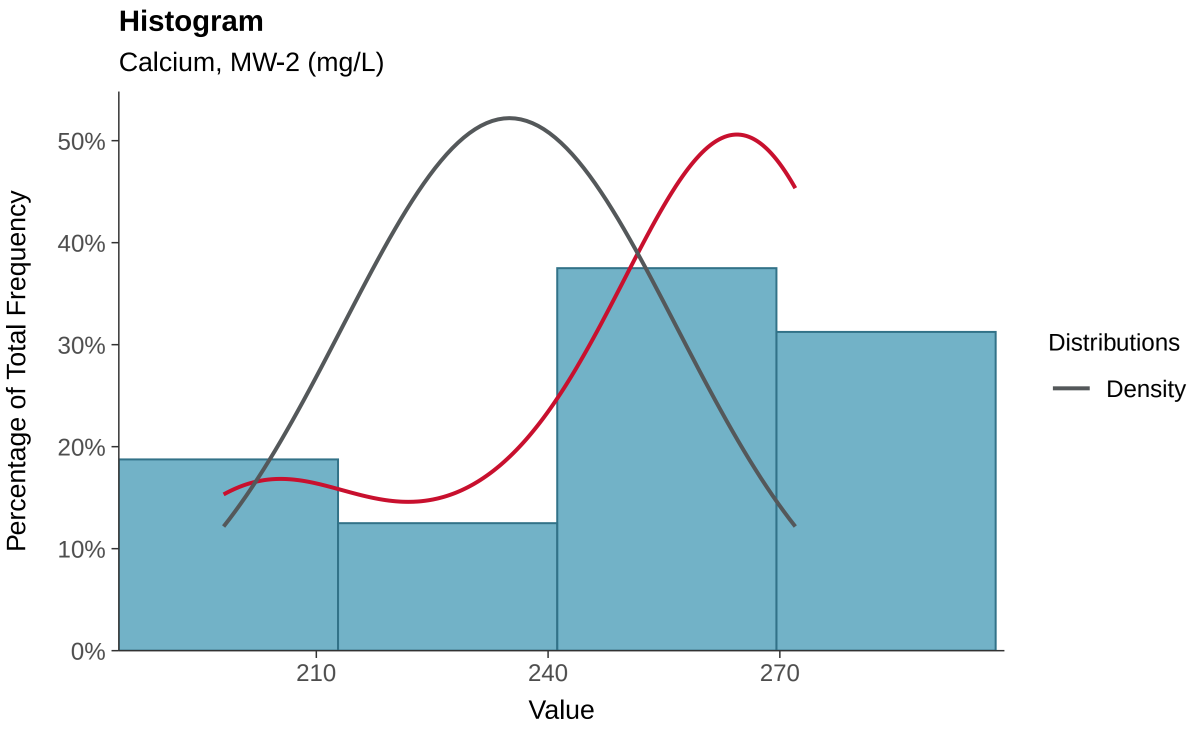
Boron, MW-2 (mg/L)



Appendix III: Calcium, MW-2

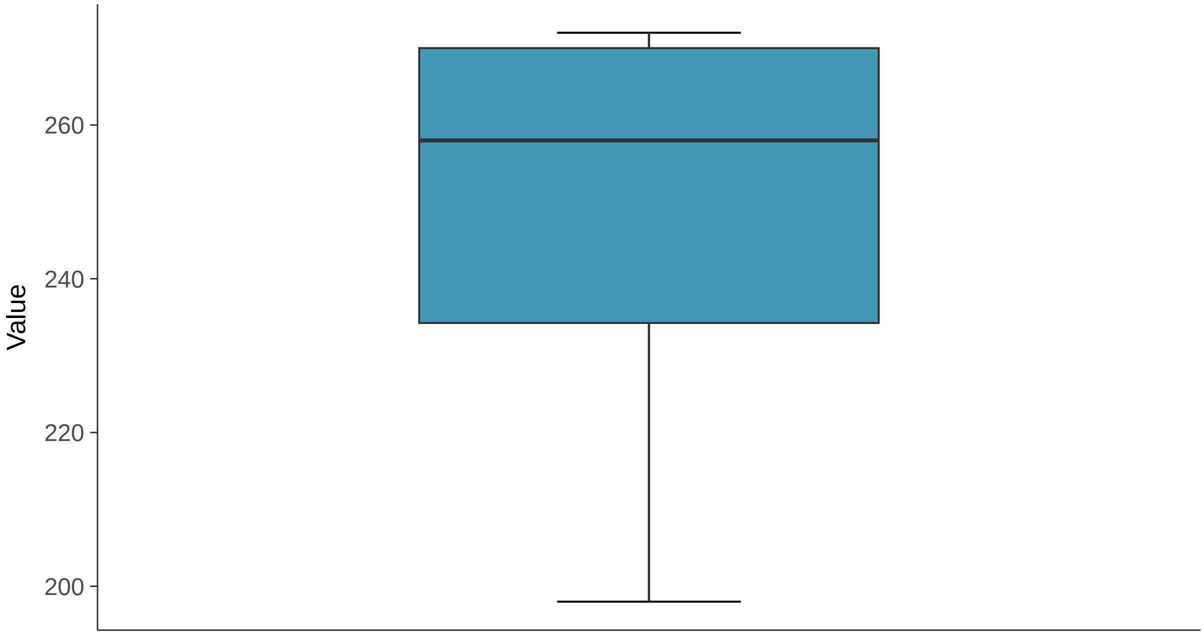
ID: 02_1_02





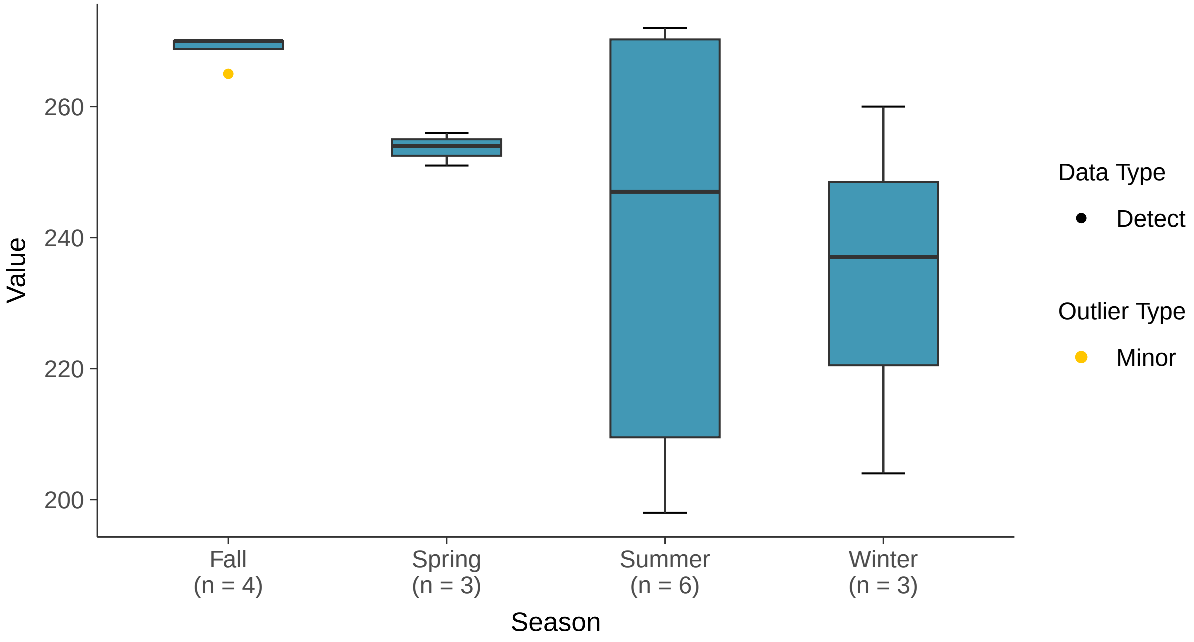
Boxplot

Calcium, MW-2 (mg/L)



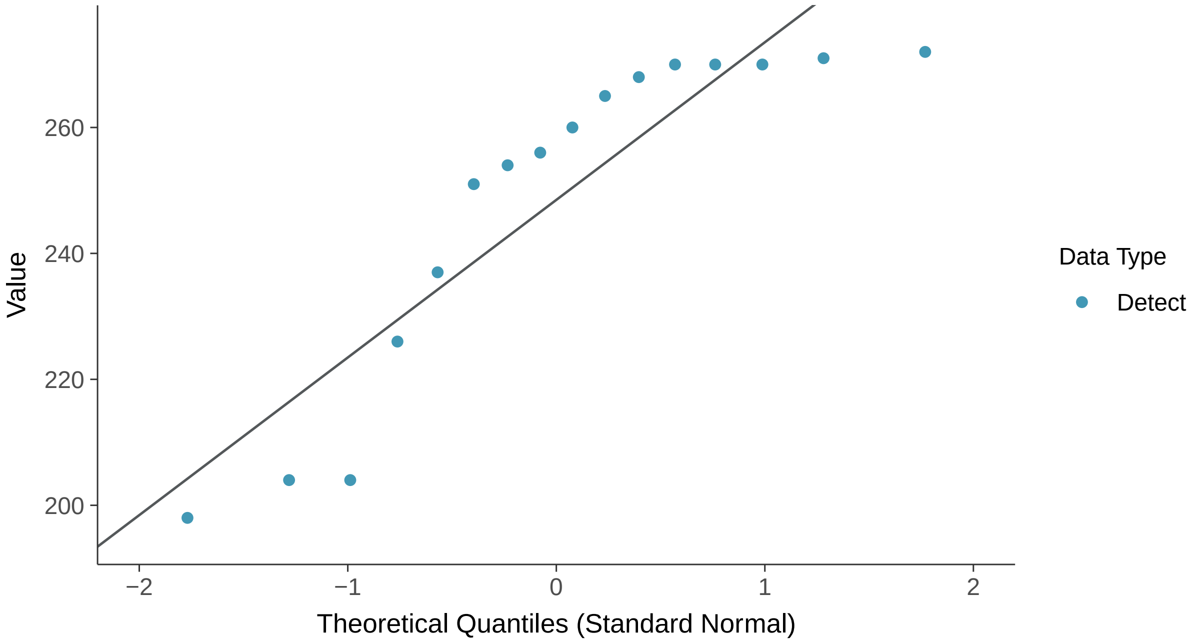
Boxplot by Season

Calcium, MW-2 (mg/L)



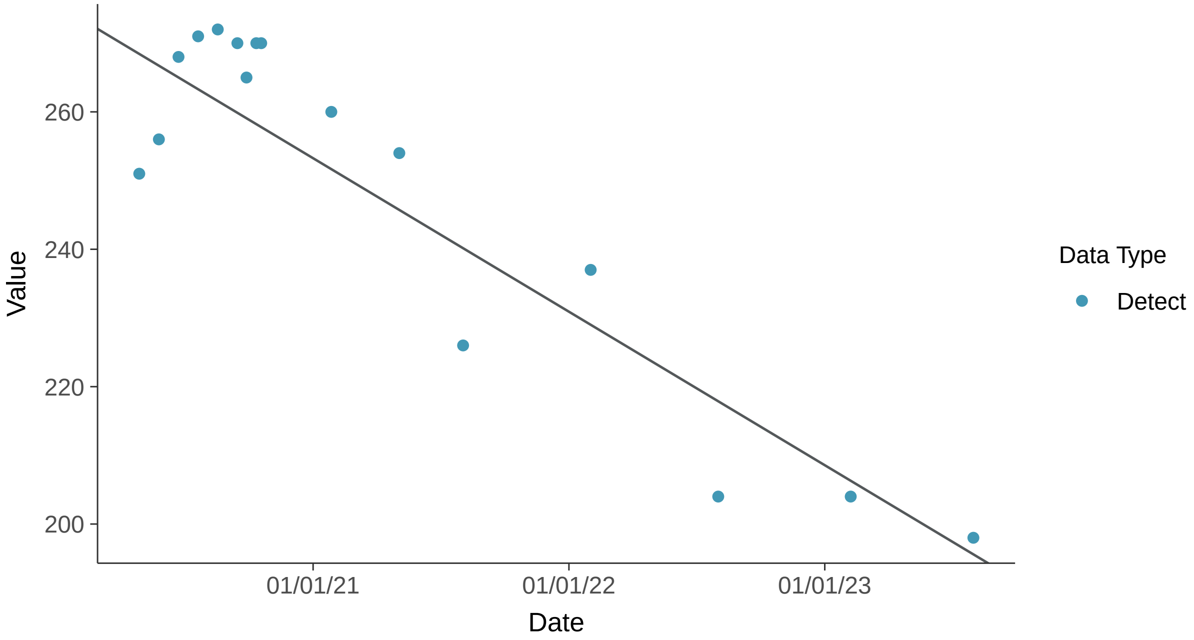
Normal Q-Q plot

Calcium, MW-2 (mg/L)



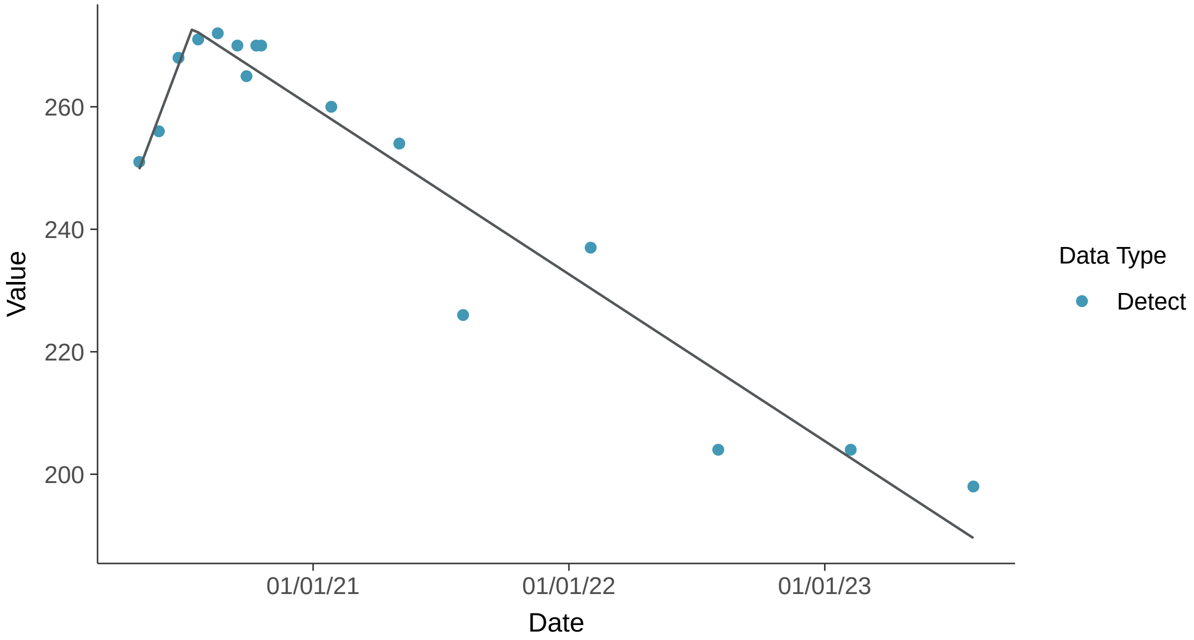
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Calcium, MW-2 (mg/L)



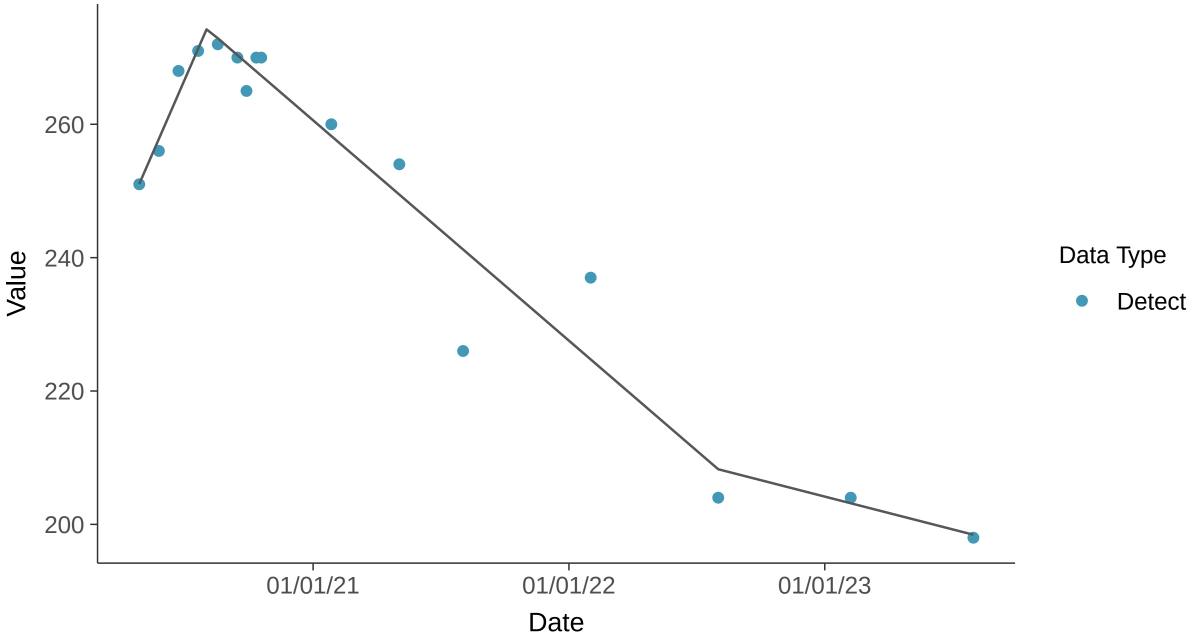
Trend Regression: Piecewise Linear-Linear

Calcium, MW-2 (mg/L)



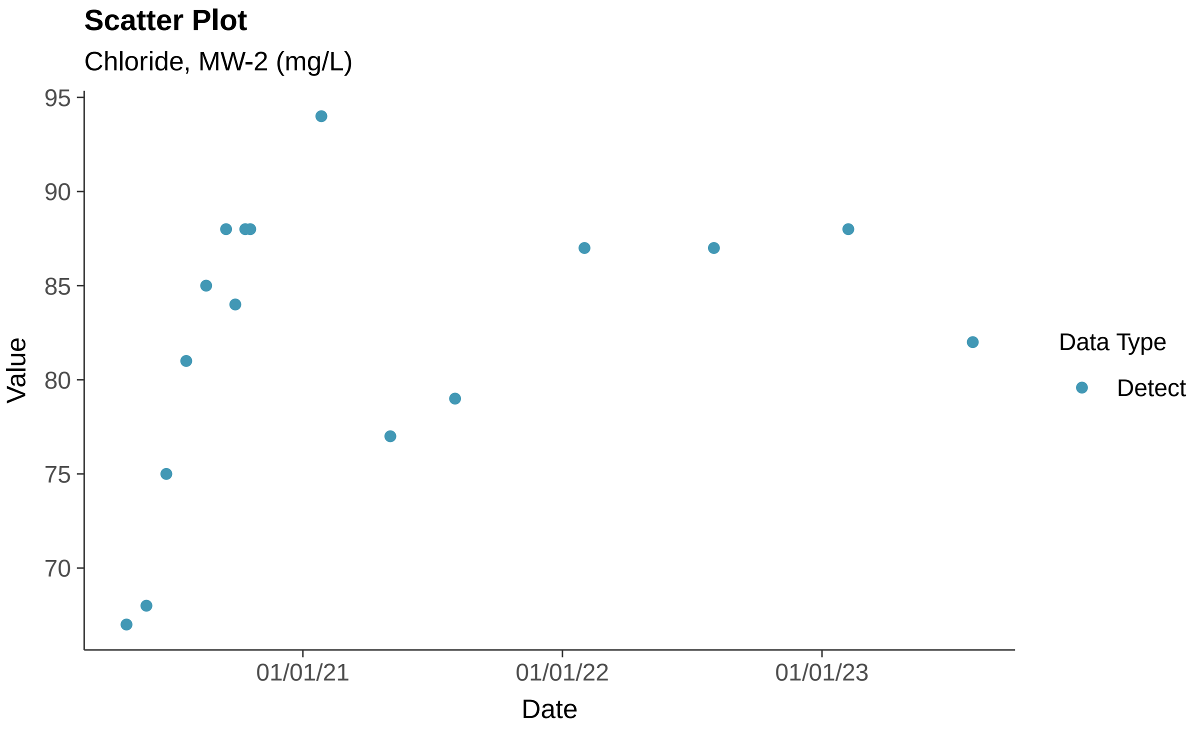
Trend Regression: Piecewise Linear-Linear-Linear

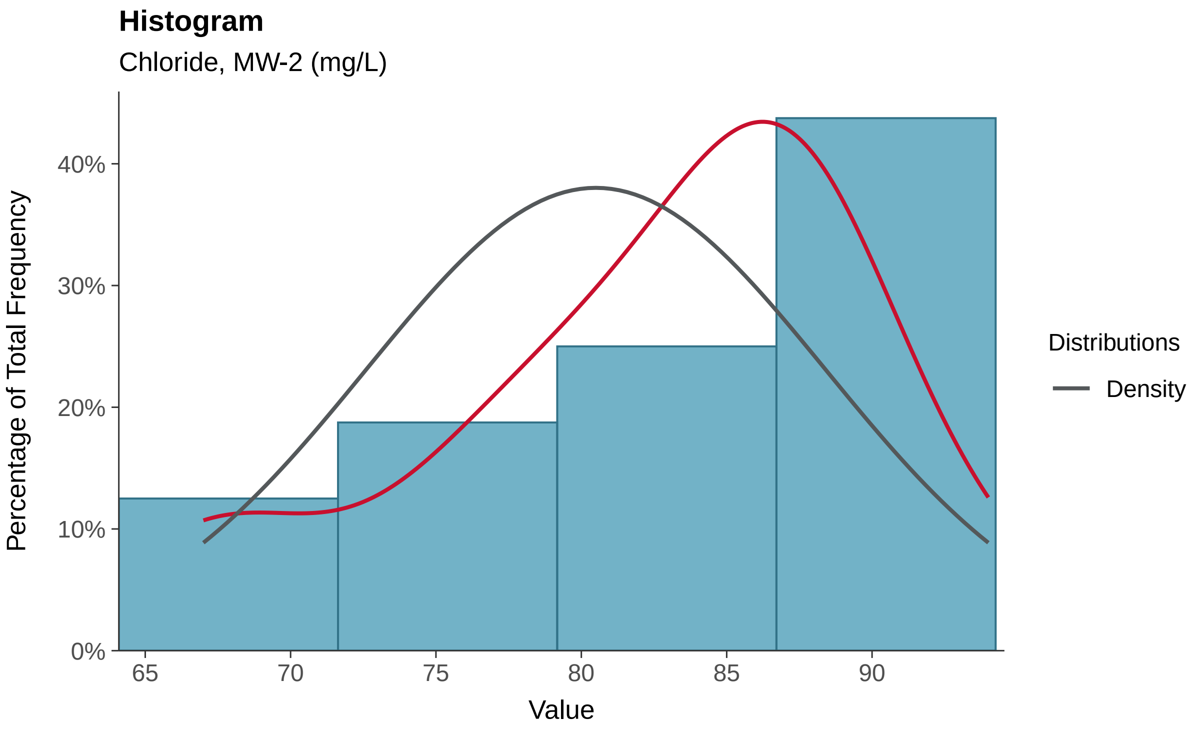
Calcium, MW-2 (mg/L)



Appendix III: Chloride, MW-2

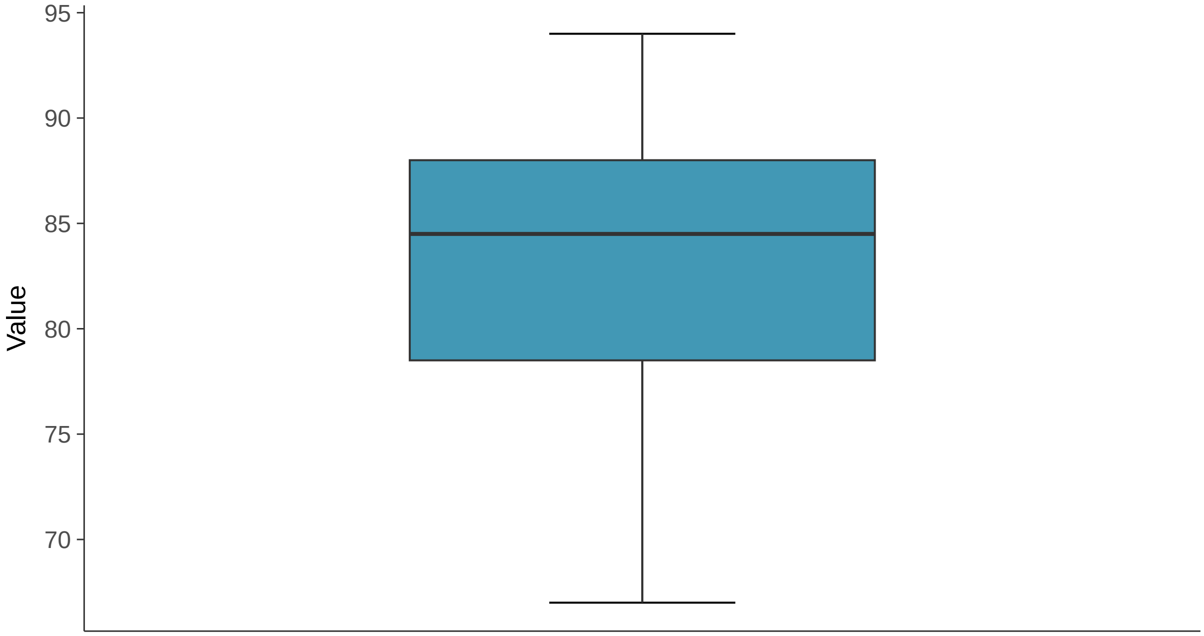
ID: 02_1_03





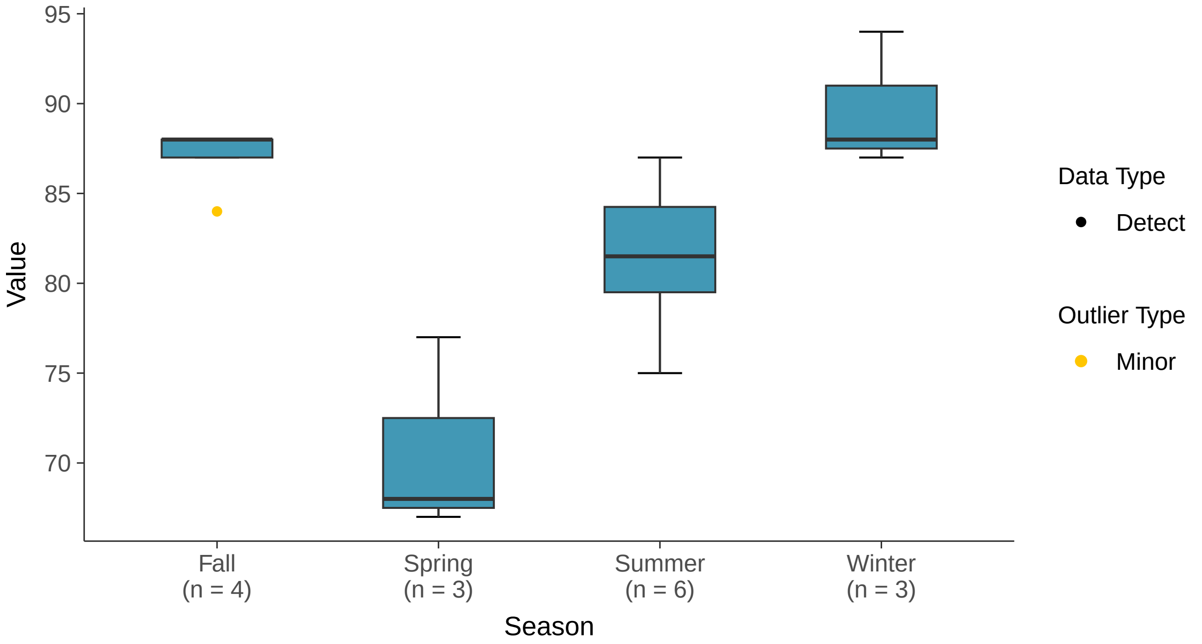
Boxplot

Chloride, MW-2 (mg/L)



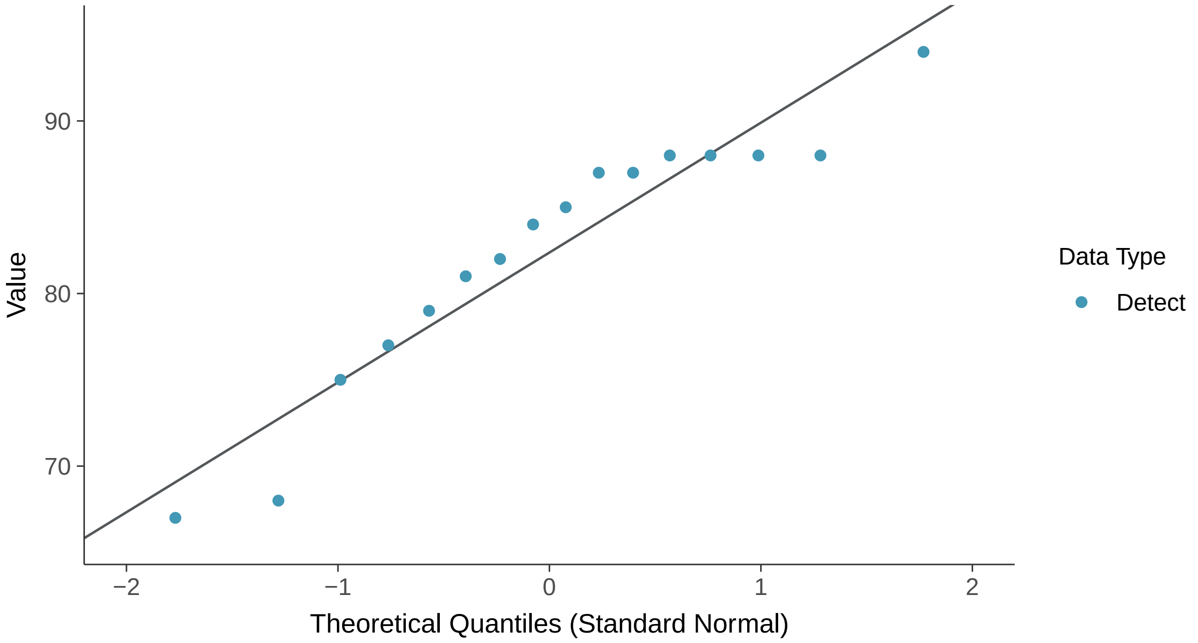
Boxplot by Season

Chloride, MW-2 (mg/L)



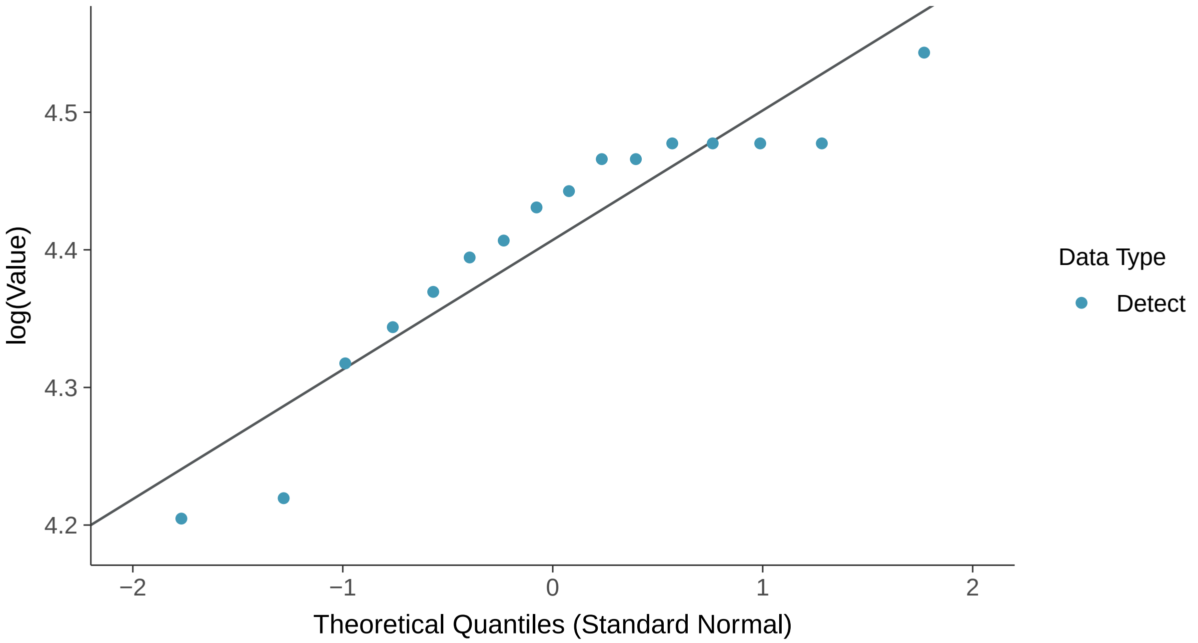
Normal Q-Q plot

Chloride, MW-2 (mg/L)



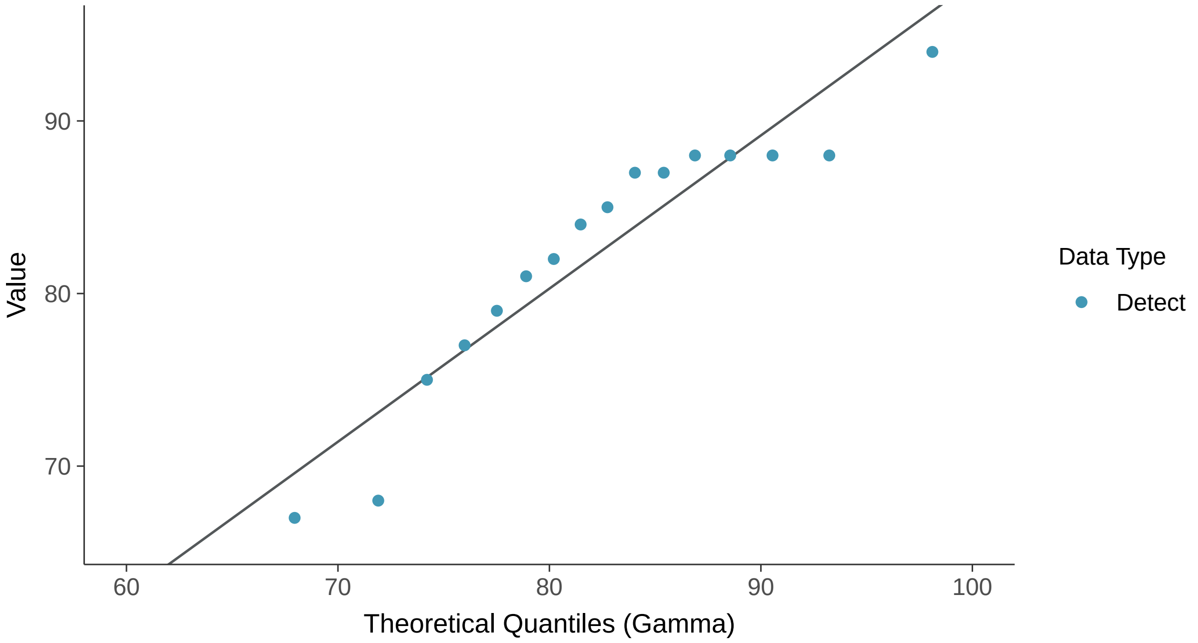
Lognormal Q-Q plot

Chloride, MW-2 (mg/L)



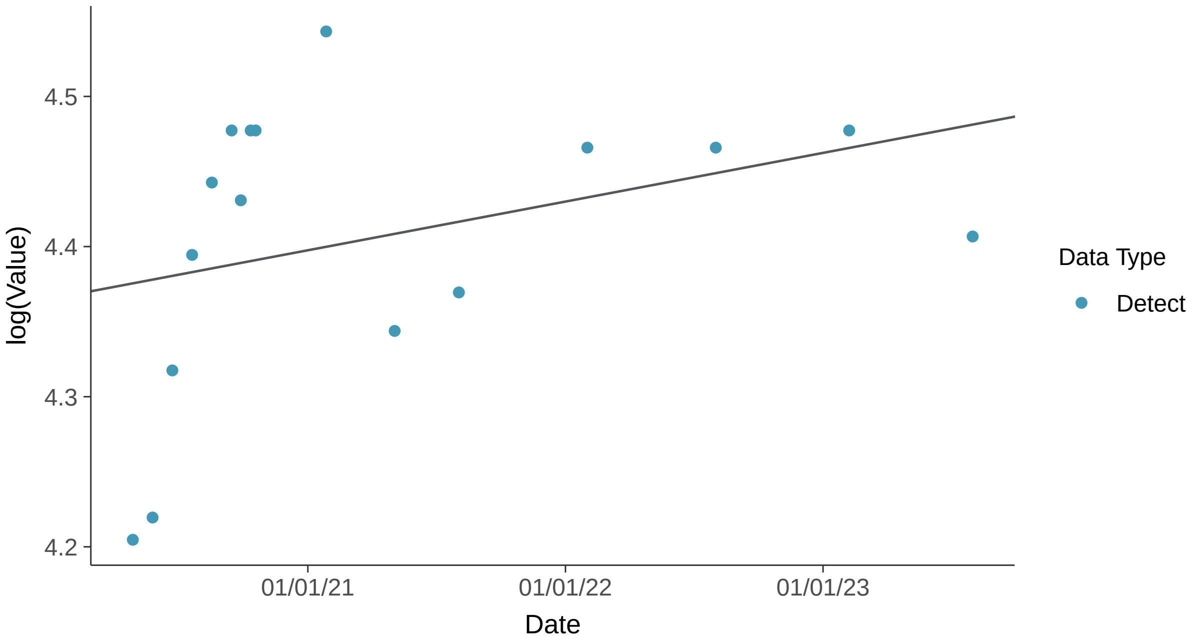
Gamma Q-Q plot

Chloride, MW-2 (mg/L)



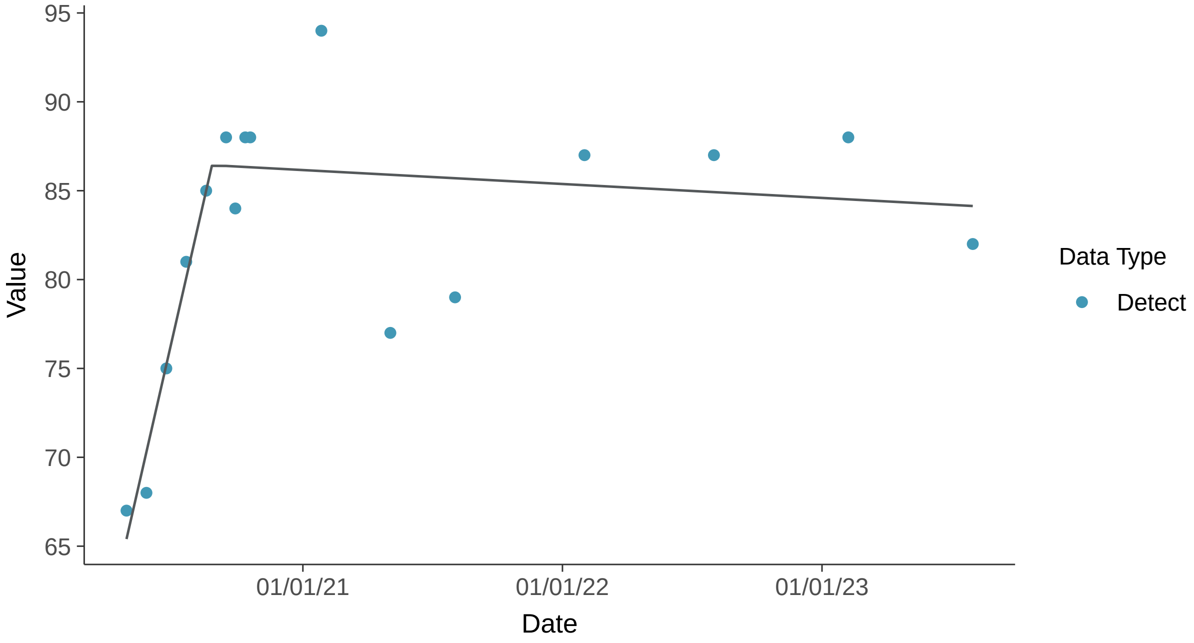
Trend Regression: Lognormal MLE

Chloride, MW-2 (mg/L)



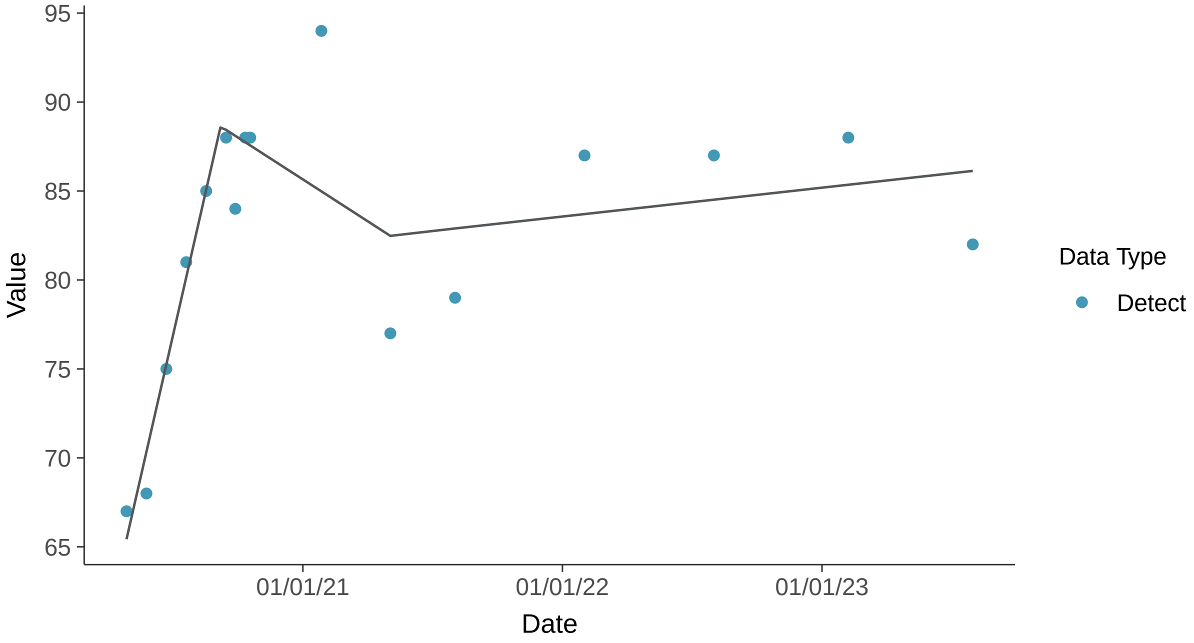
Trend Regression: Piecewise Linear-Linear

Chloride, MW-2 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Chloride, MW-2 (mg/L)

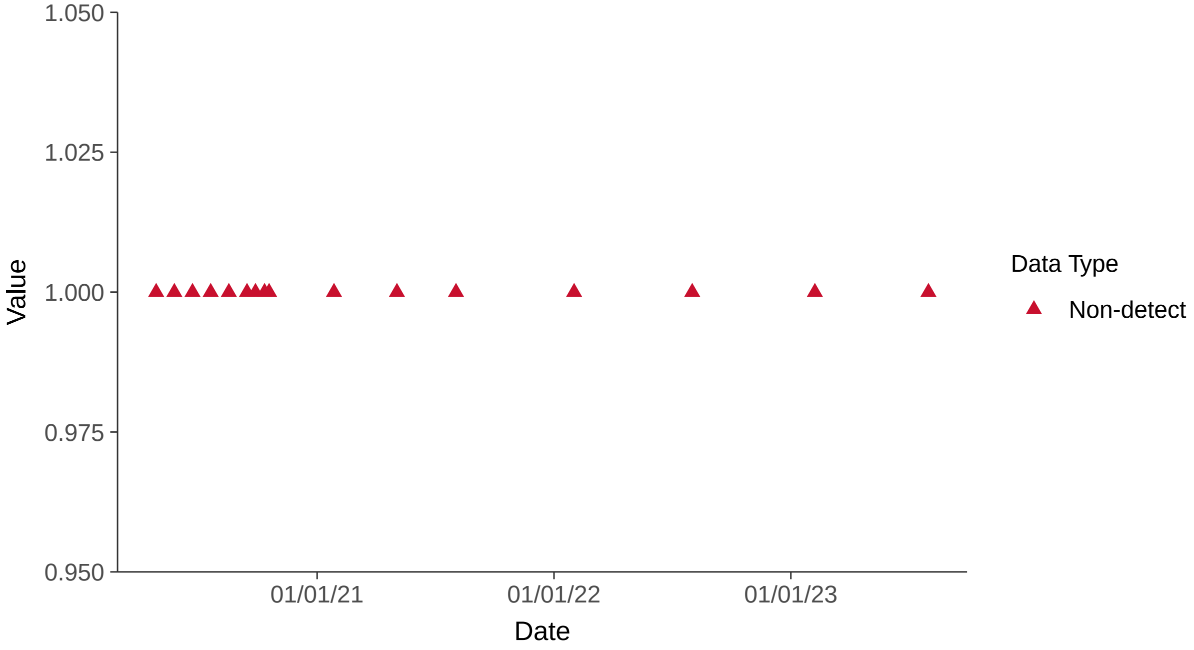


Appendix III: Fluoride, MW-2

ID: 02_1_04

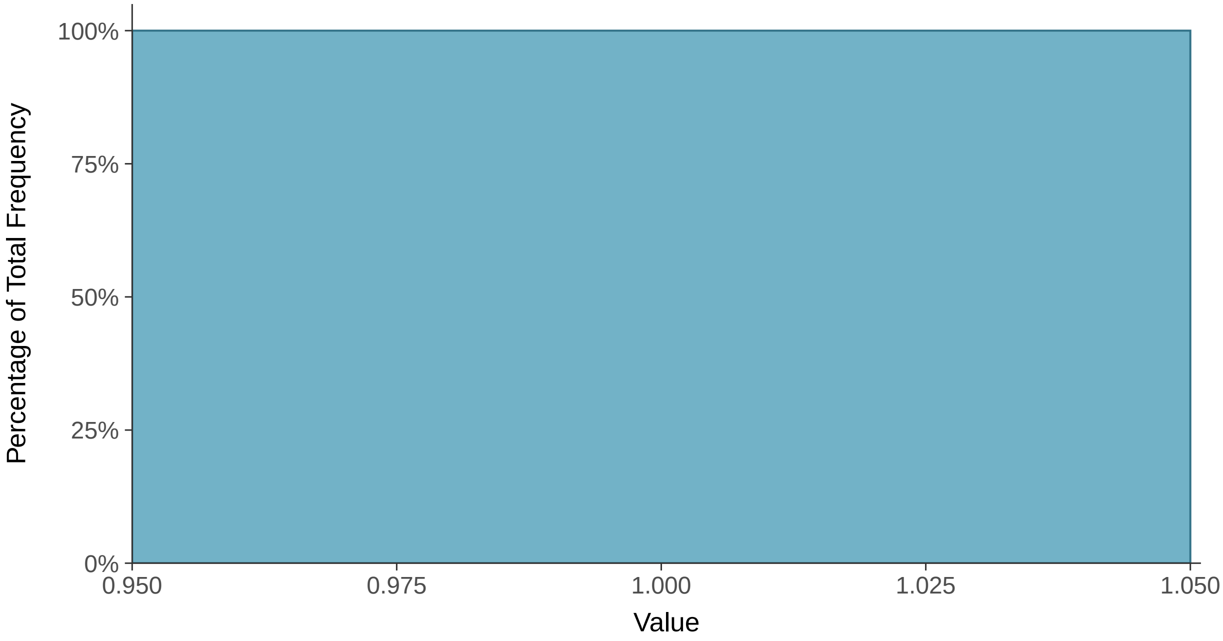
Scatter Plot

Fluoride, MW-2 (mg/L)



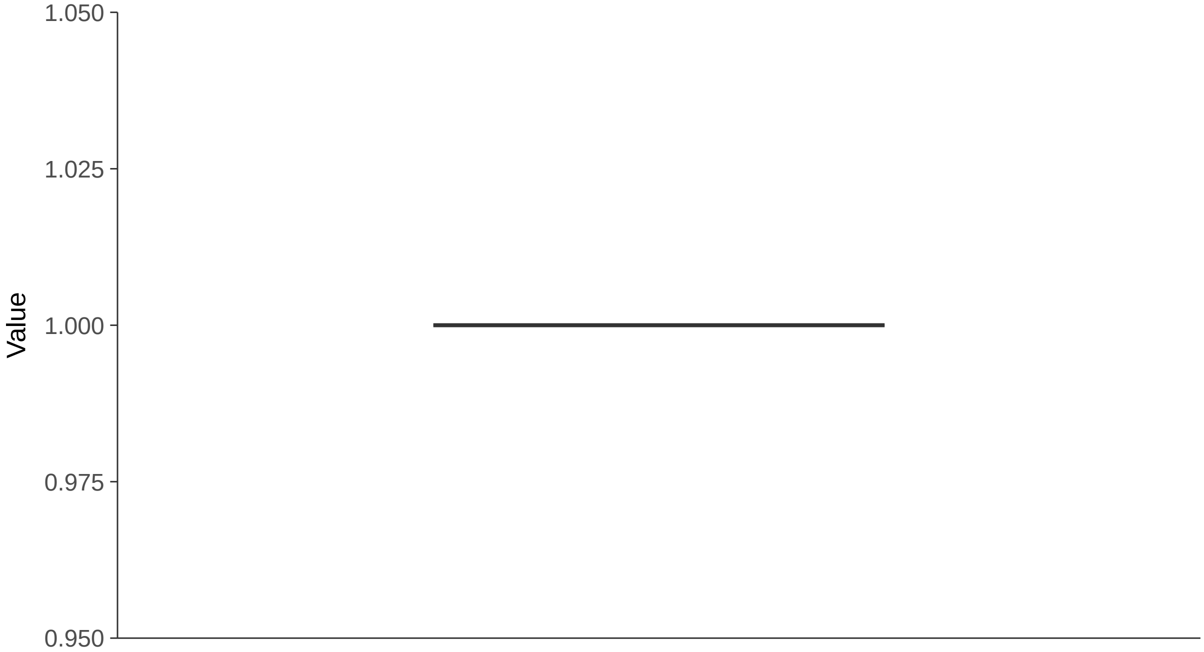
Histogram

Fluoride, MW-2 (mg/L)



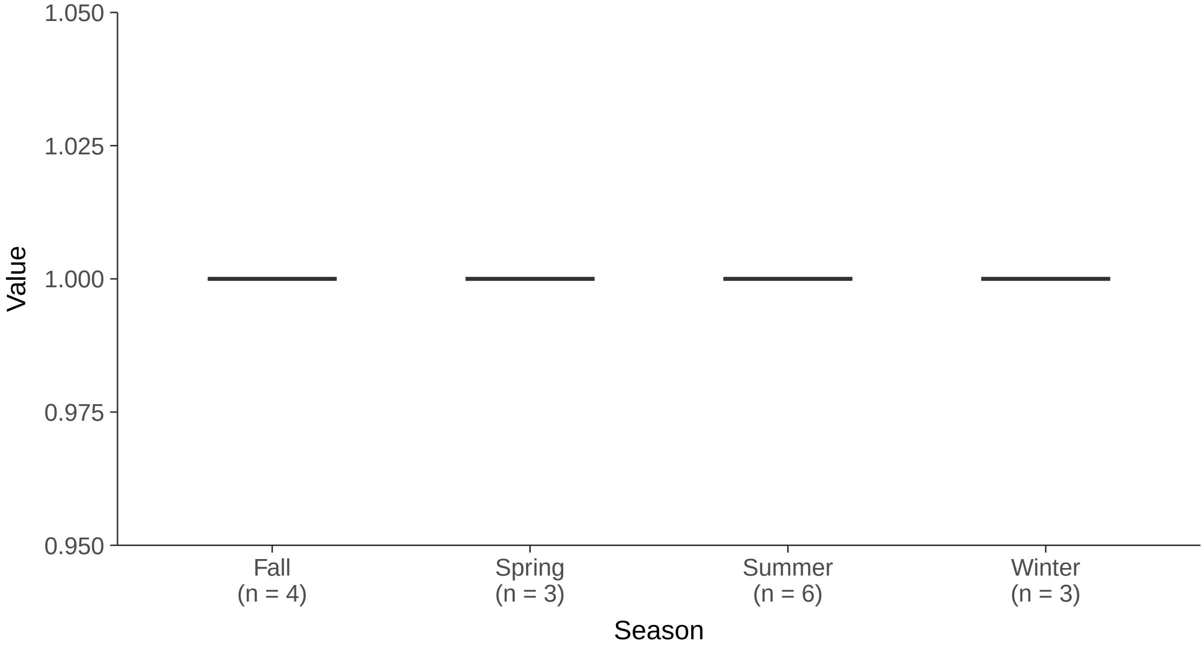
Boxplot

Fluoride, MW-2 (mg/L)



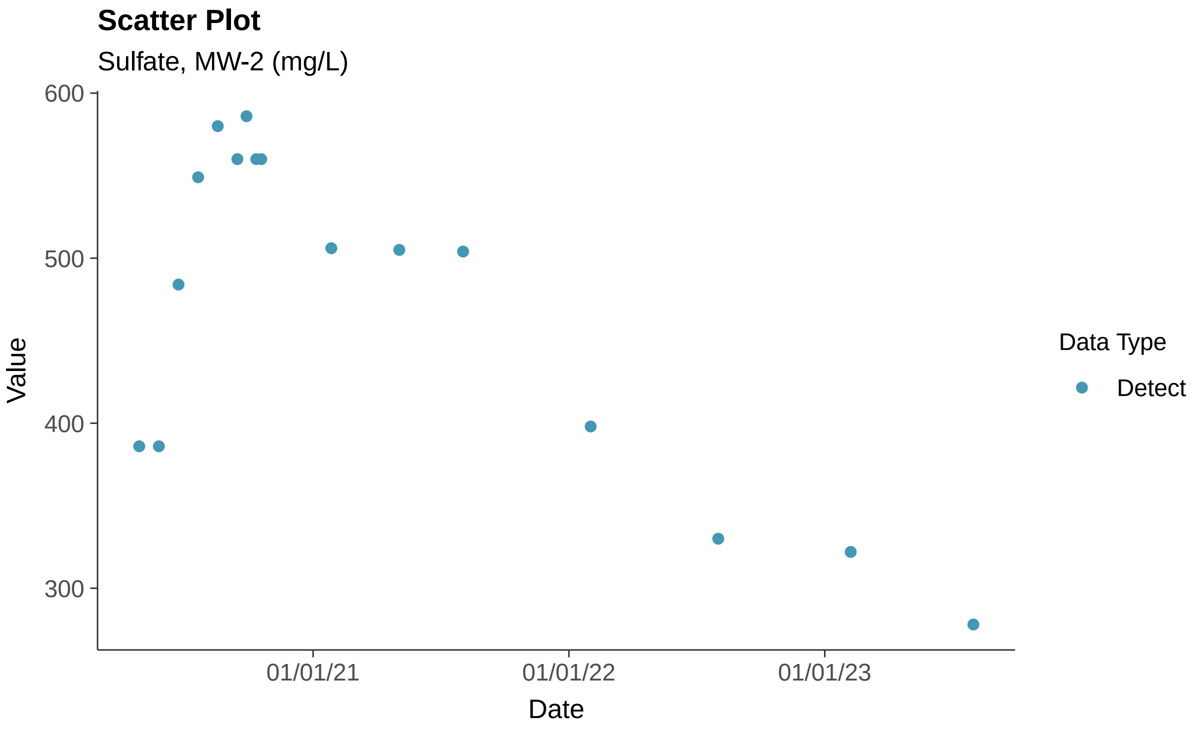
Boxplot by Season

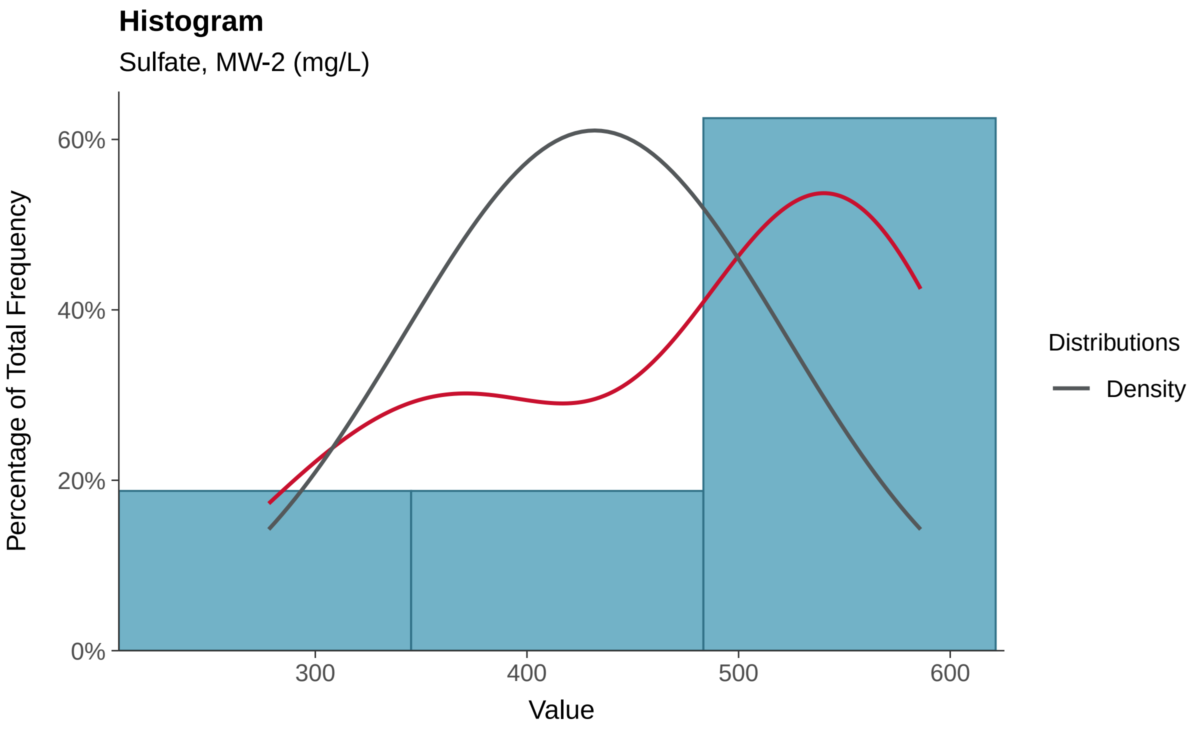
Fluoride, MW-2 (mg/L)



Appendix III: Sulfate, MW-2

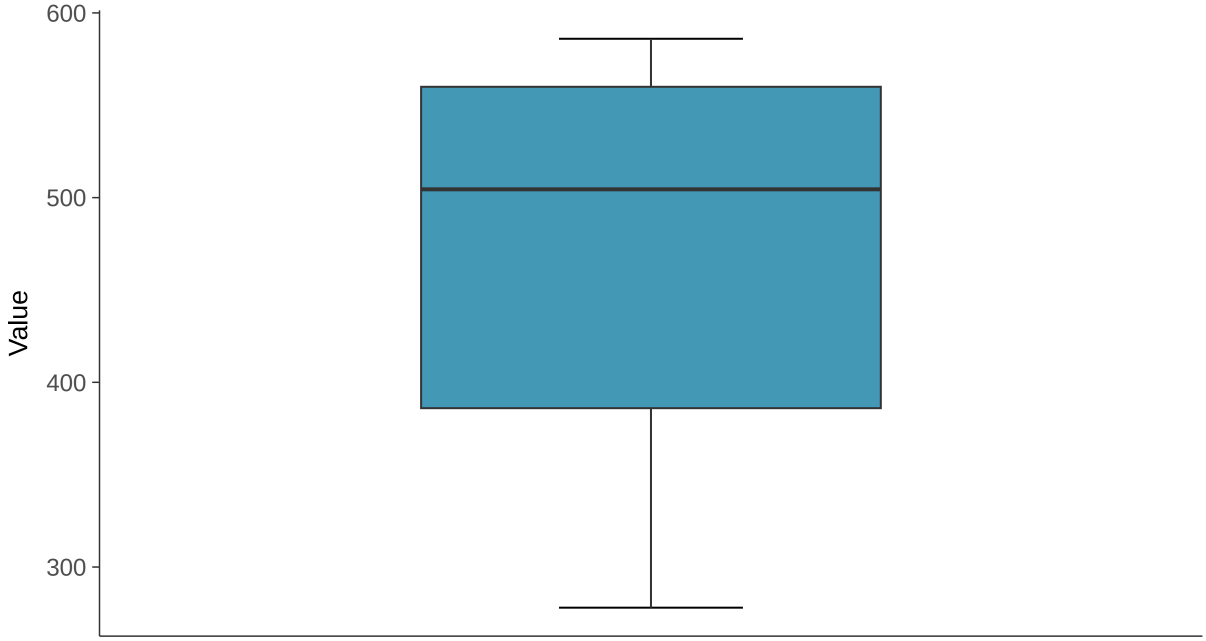
ID: 02_1_05





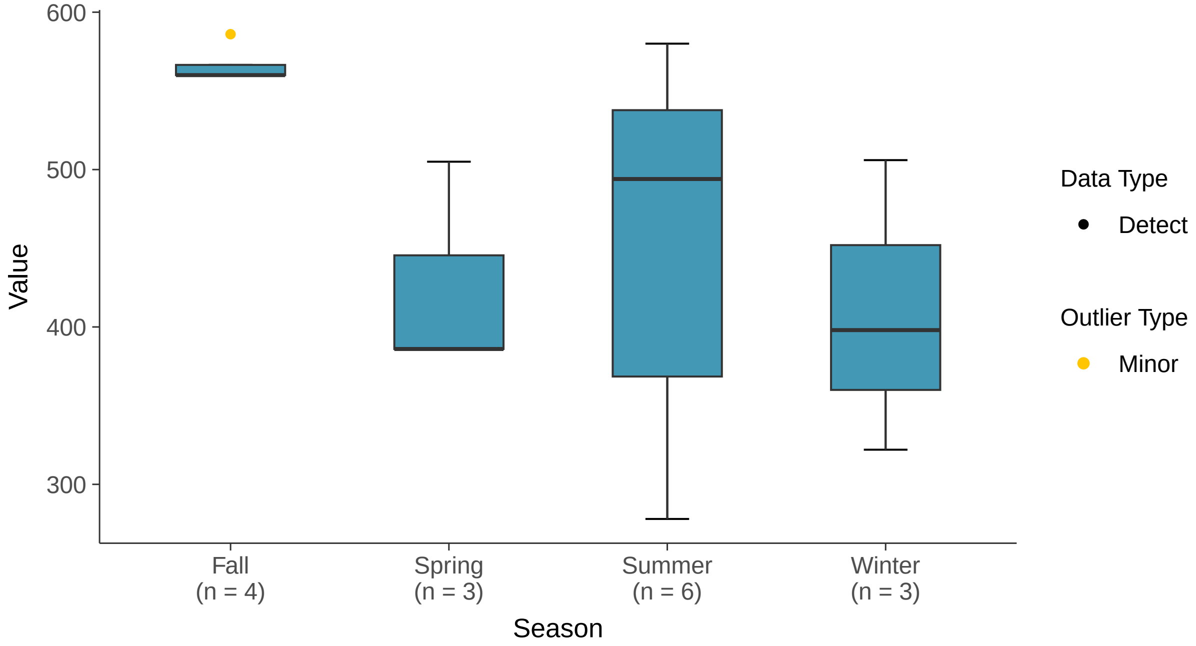
Boxplot

Sulfate, MW-2 (mg/L)



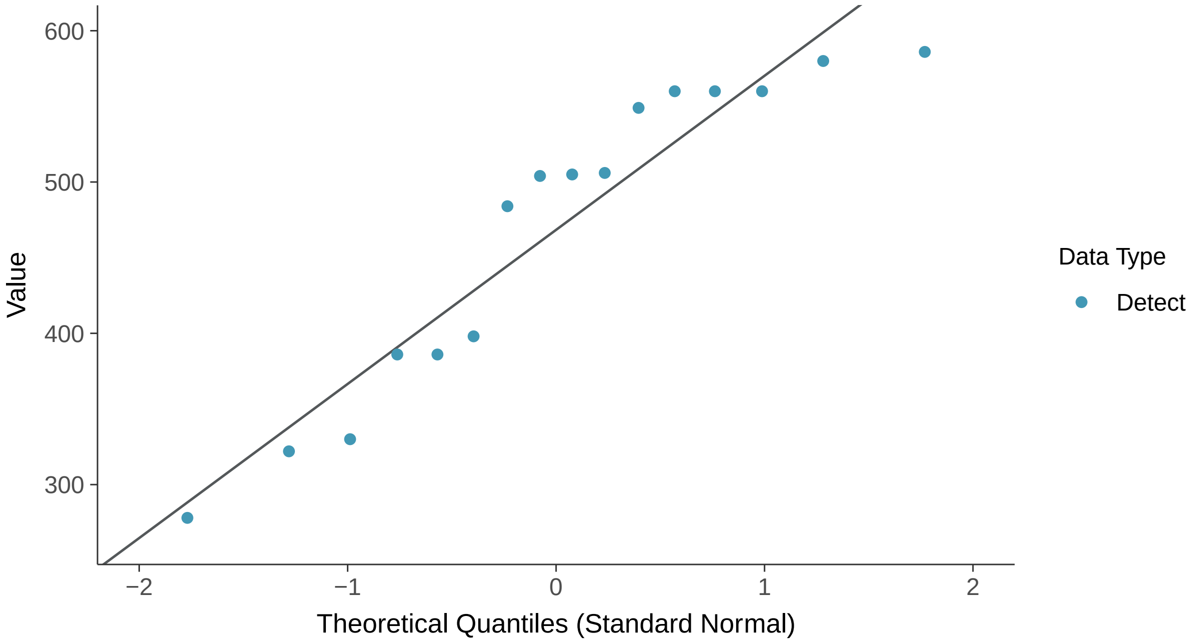
Boxplot by Season

Sulfate, MW-2 (mg/L)



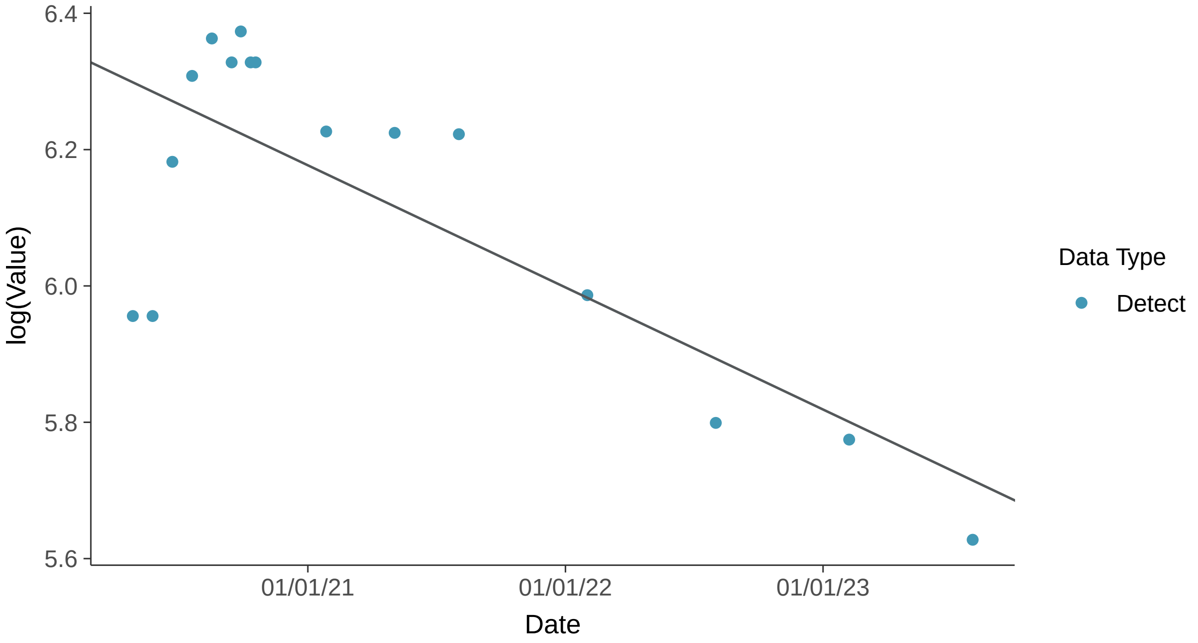
Normal Q-Q plot

Sulfate, MW-2 (mg/L)



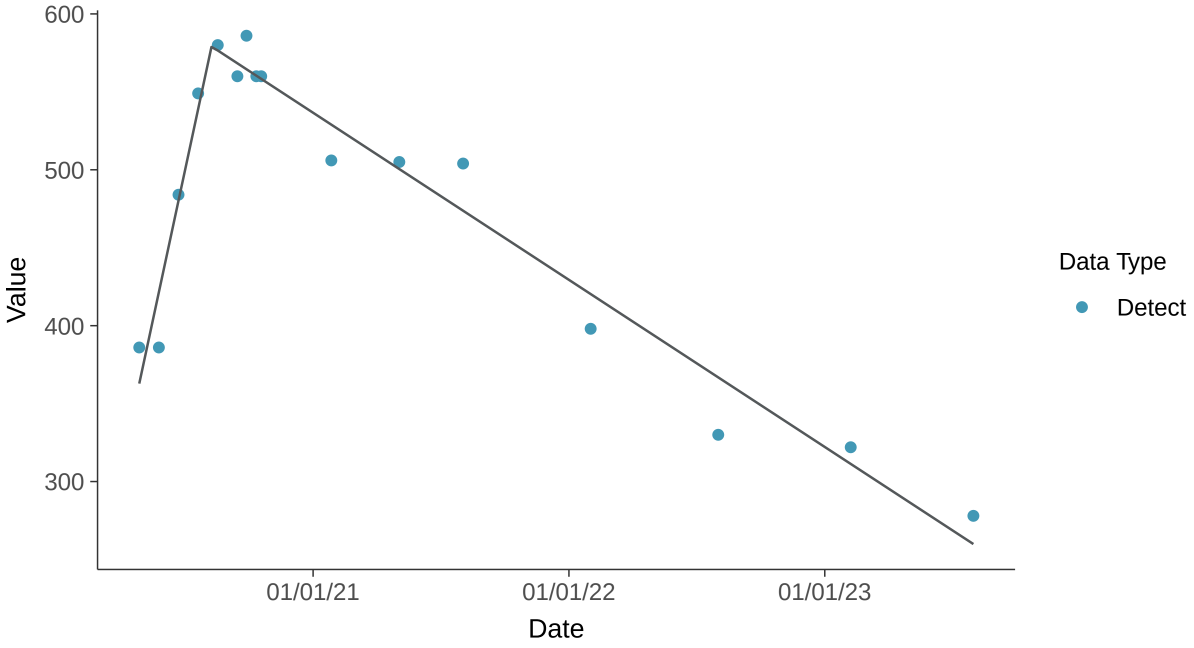
Trend Regression: Lognormal MLE

Sulfate, MW-2 (mg/L)



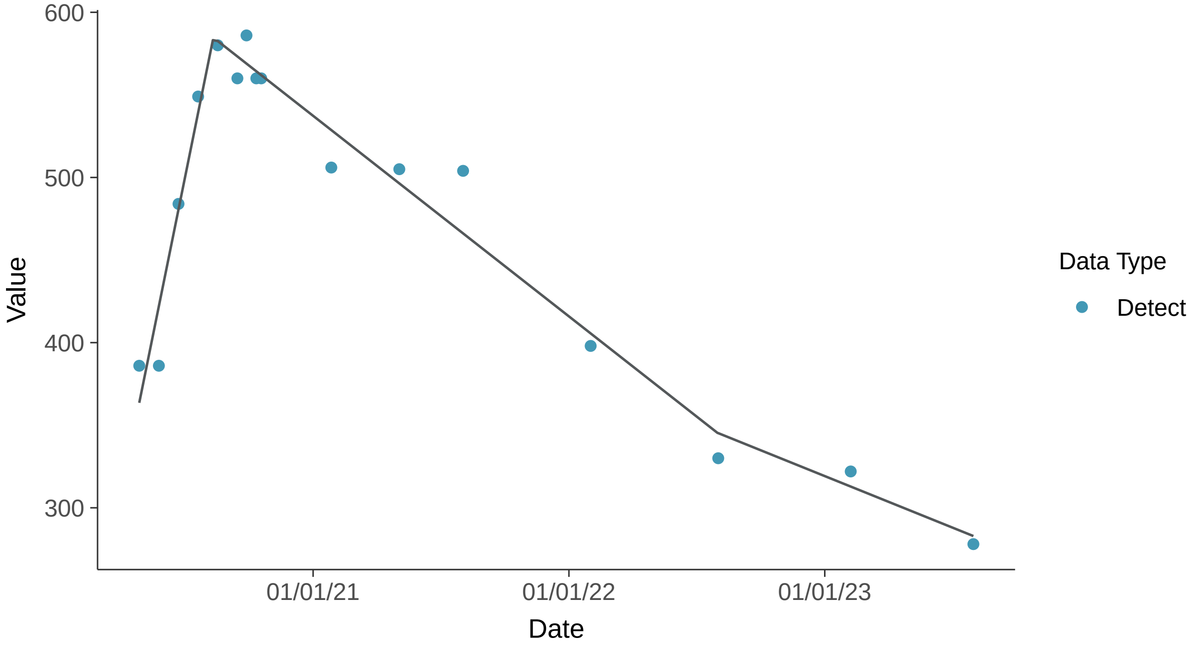
Trend Regression: Piecewise Linear-Linear

Sulfate, MW-2 (mg/L)



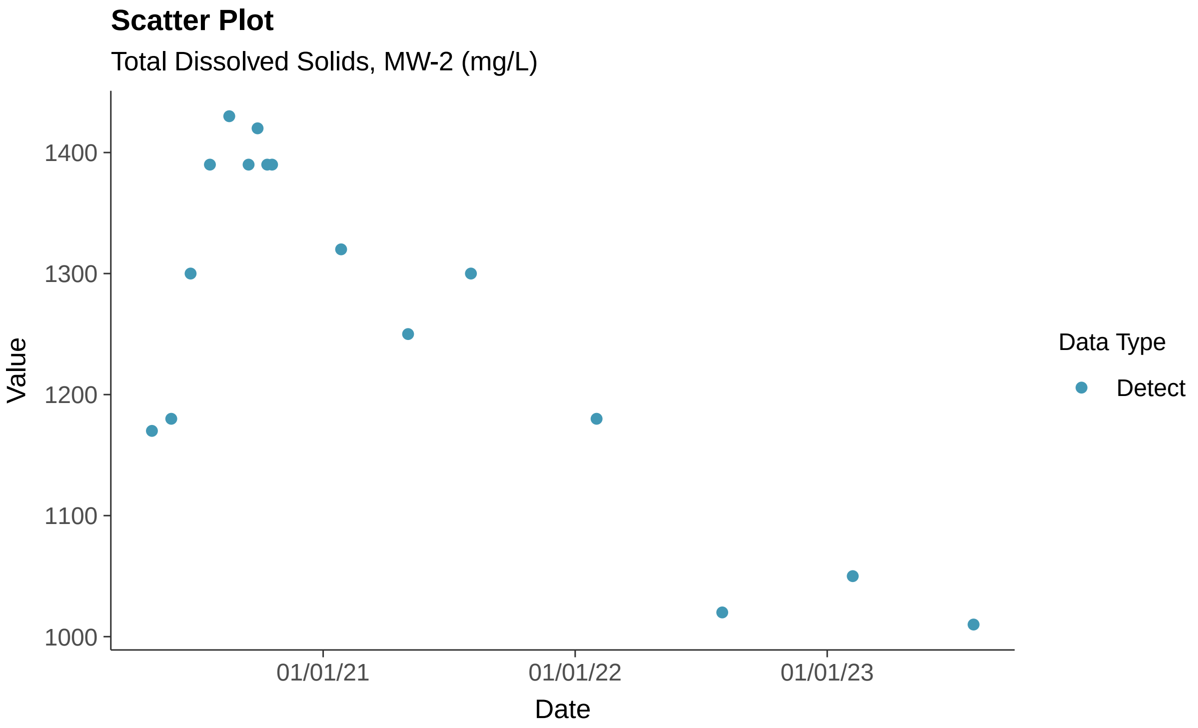
Trend Regression: Piecewise Linear-Linear-Linear

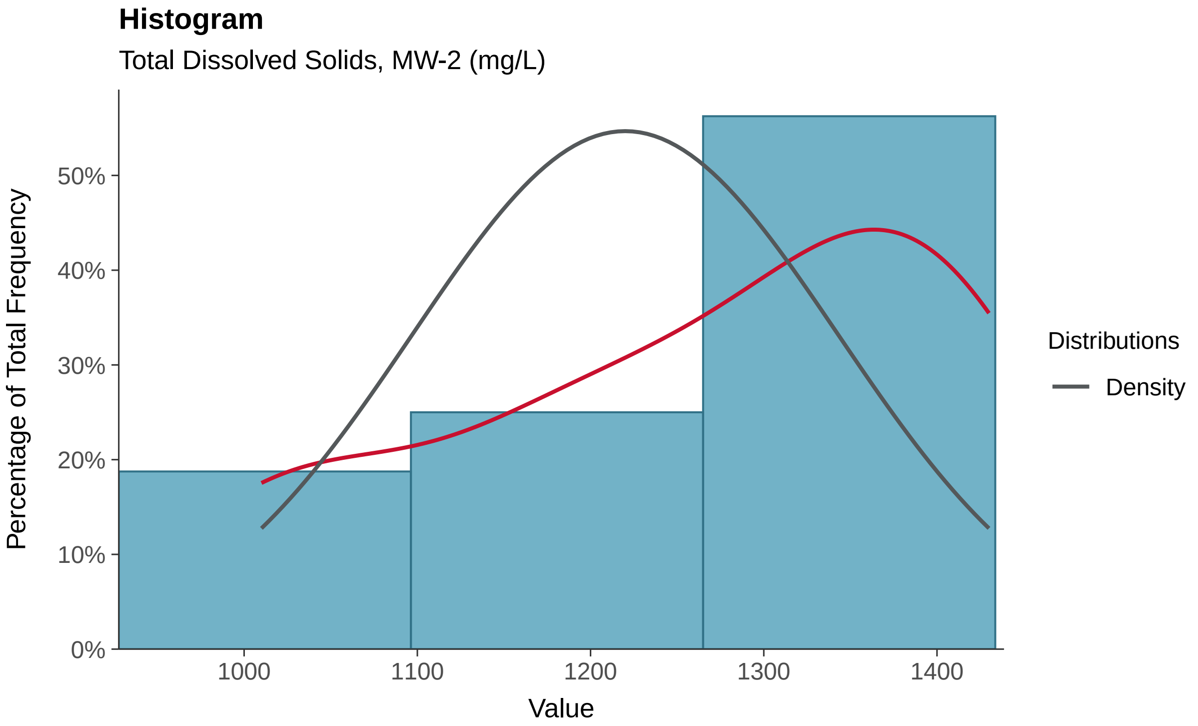
Sulfate, MW-2 (mg/L)



Appendix III: Total Dissolved Solids, MW-2

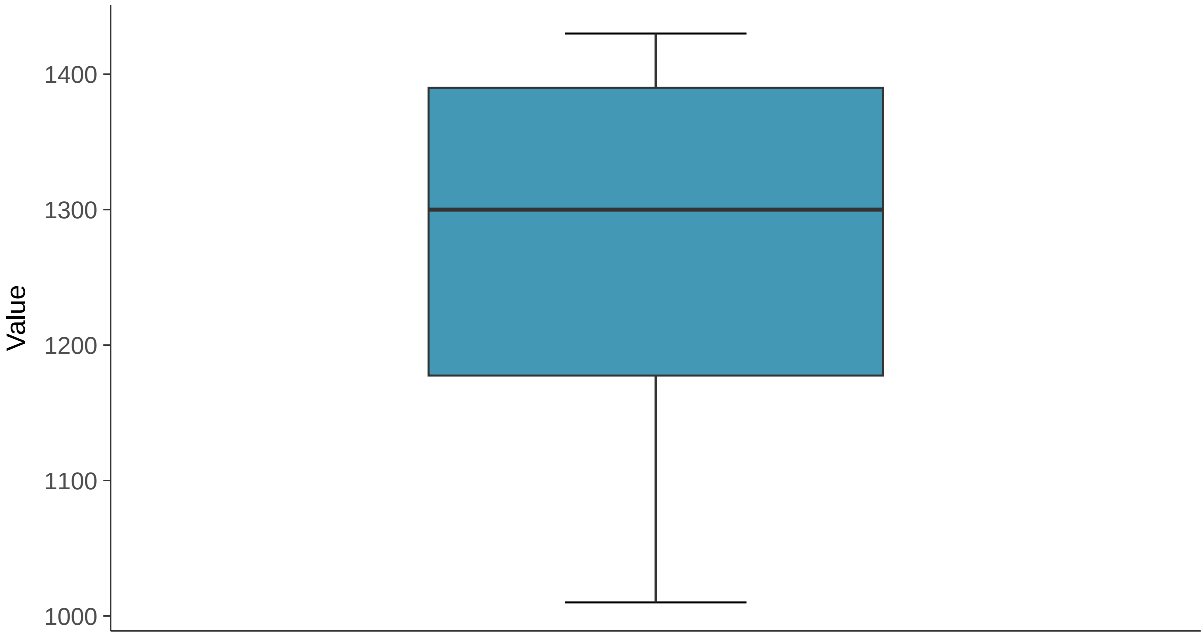
ID: 02_1_06





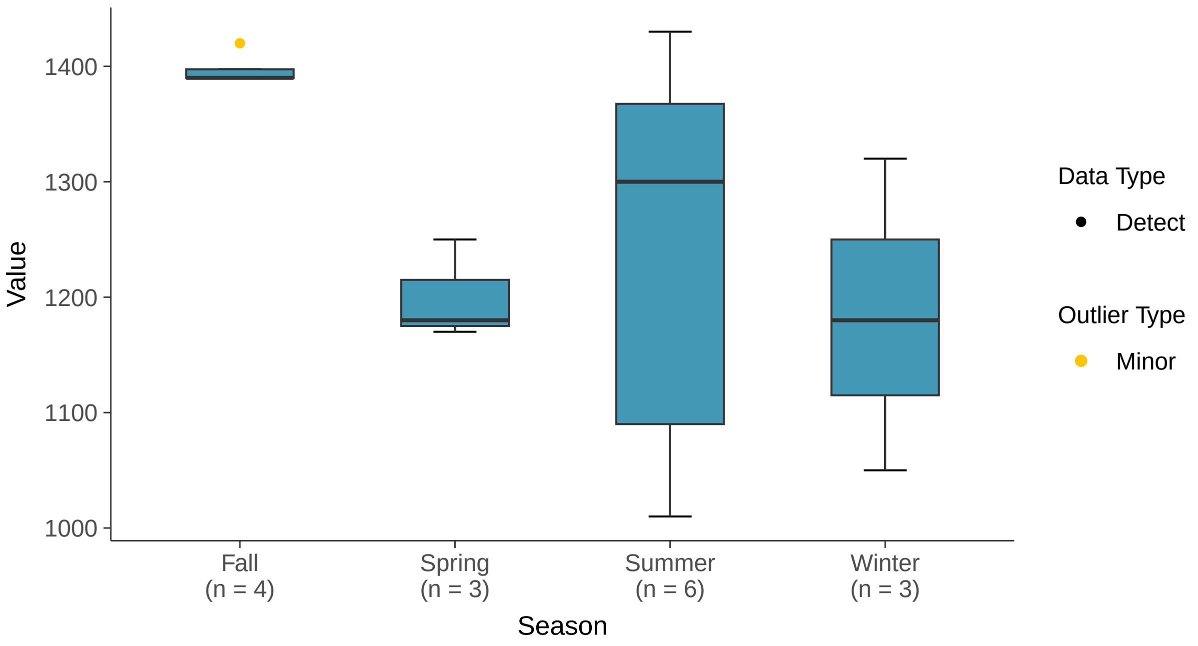
Boxplot

Total Dissolved Solids, MW-2 (mg/L)



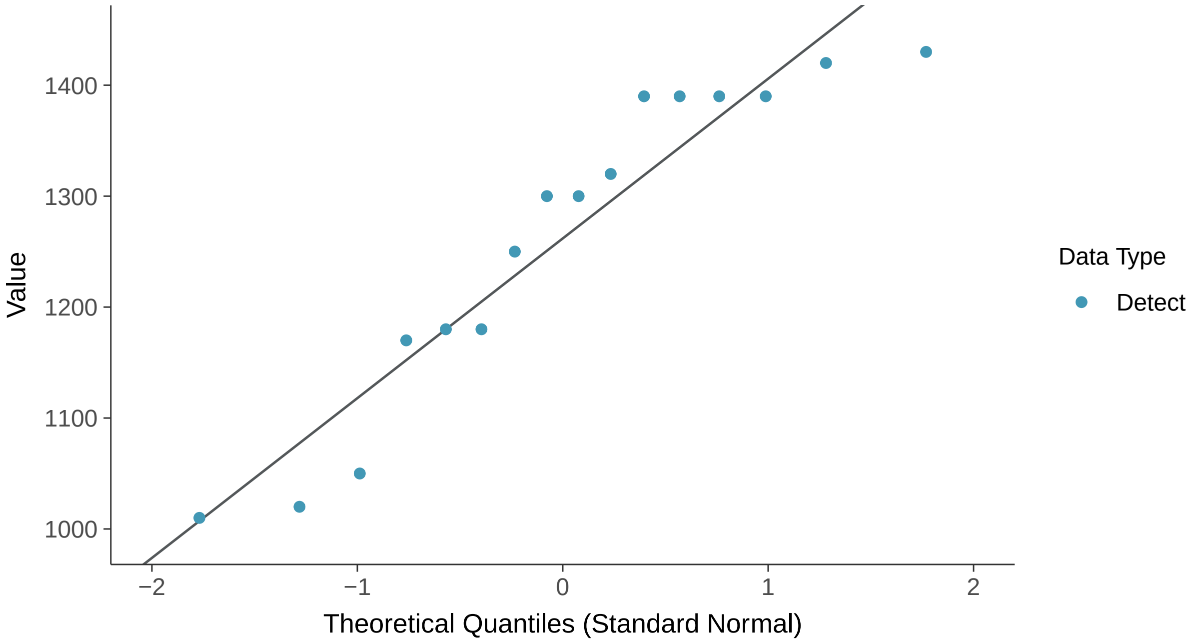
Boxplot by Season

Total Dissolved Solids, MW-2 (mg/L)



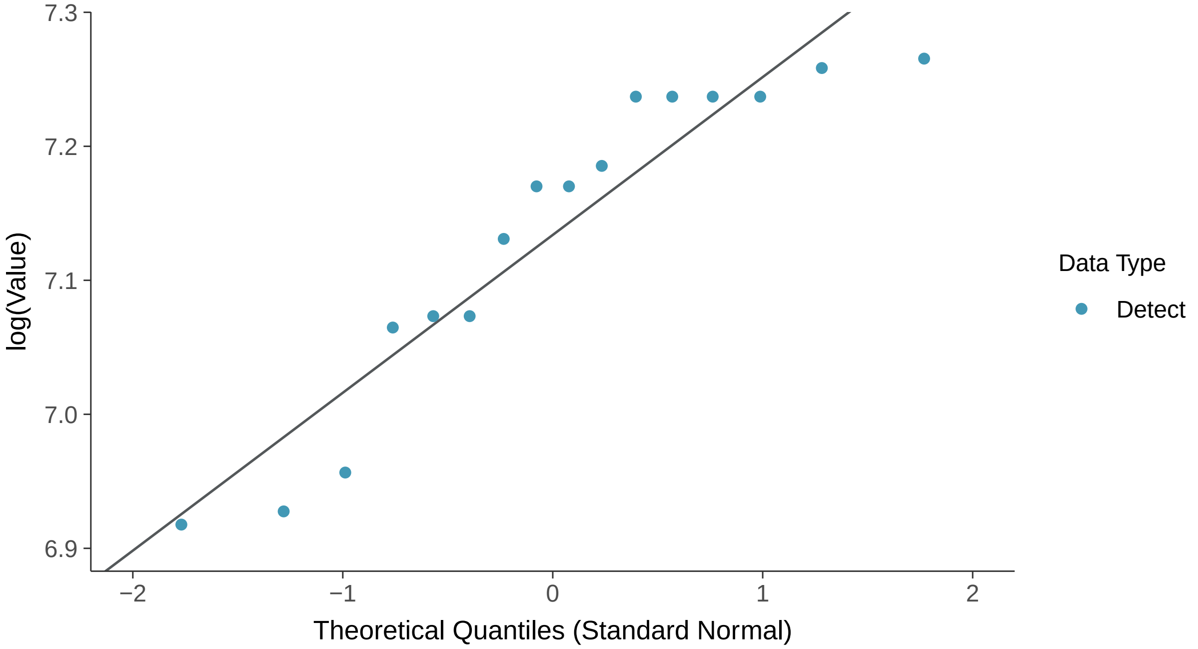
Normal Q-Q plot

Total Dissolved Solids, MW-2 (mg/L)



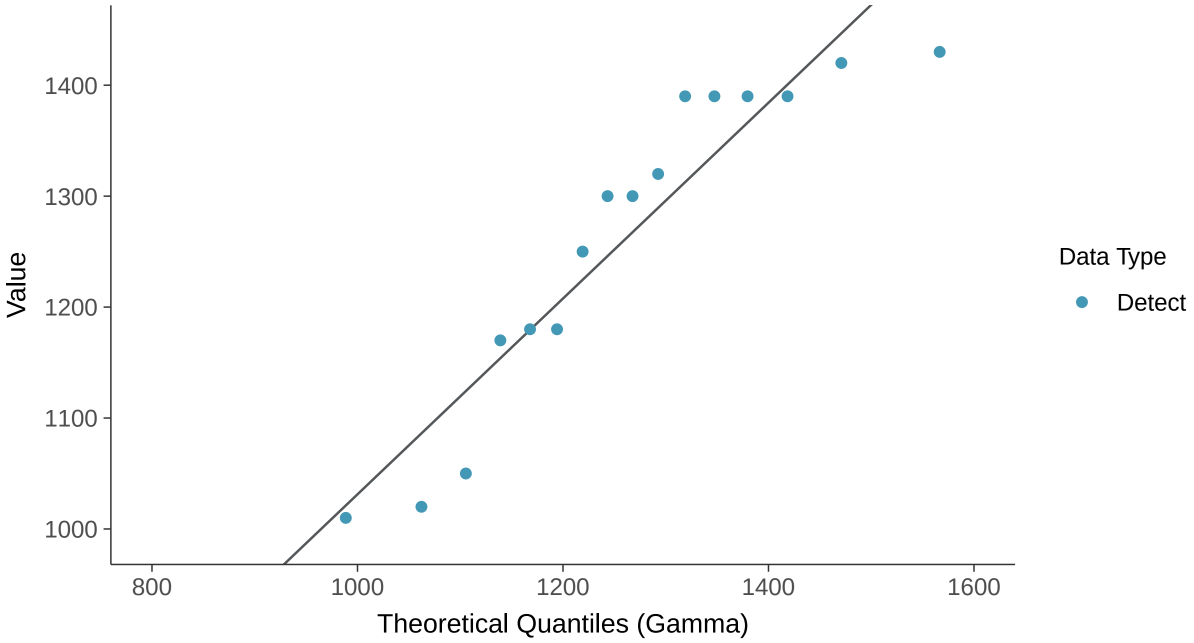
Lognormal Q-Q plot

Total Dissolved Solids, MW-2 (mg/L)



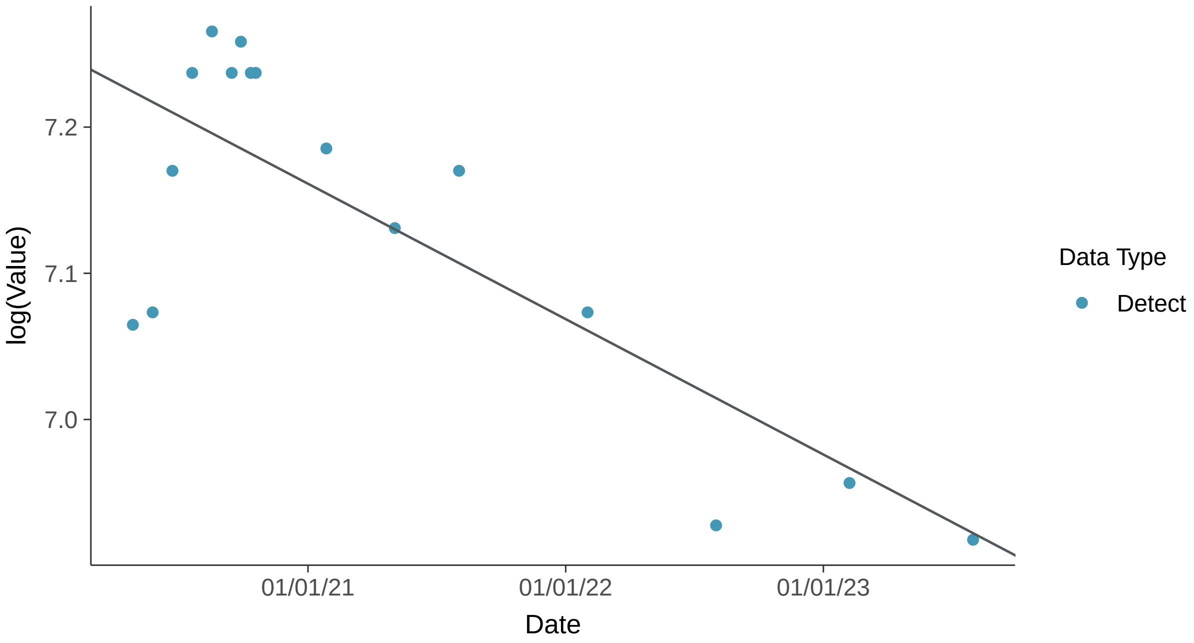
Gamma Q-Q plot

Total Dissolved Solids, MW-2 (mg/L)



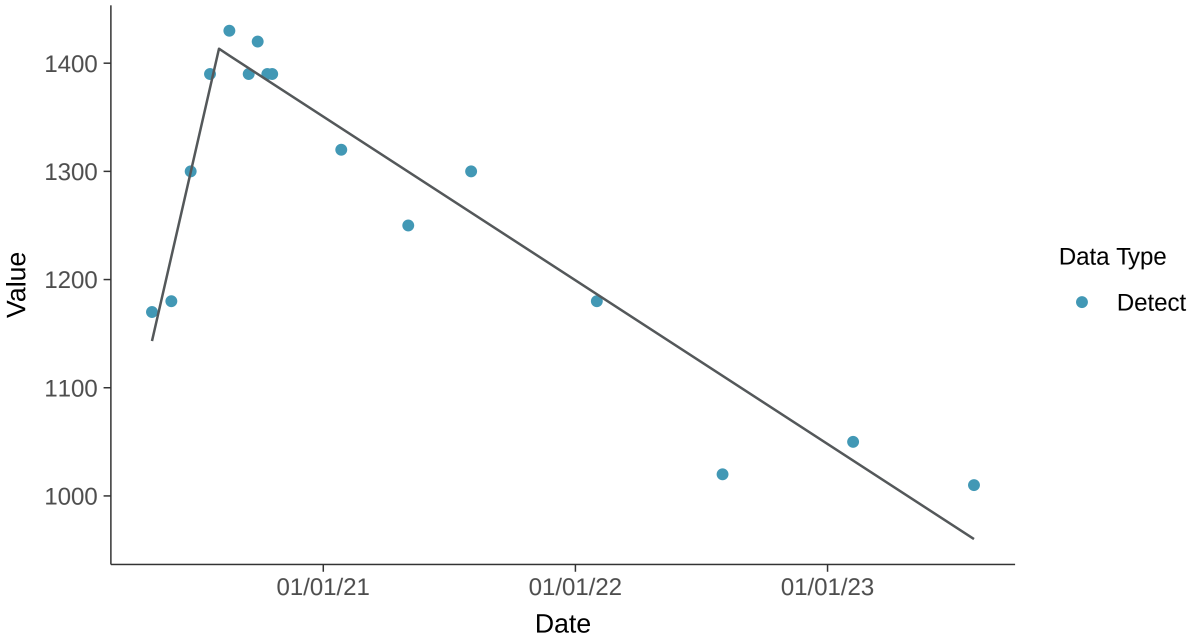
Trend Regression: Lognormal MLE

Total Dissolved Solids, MW-2 (mg/L)



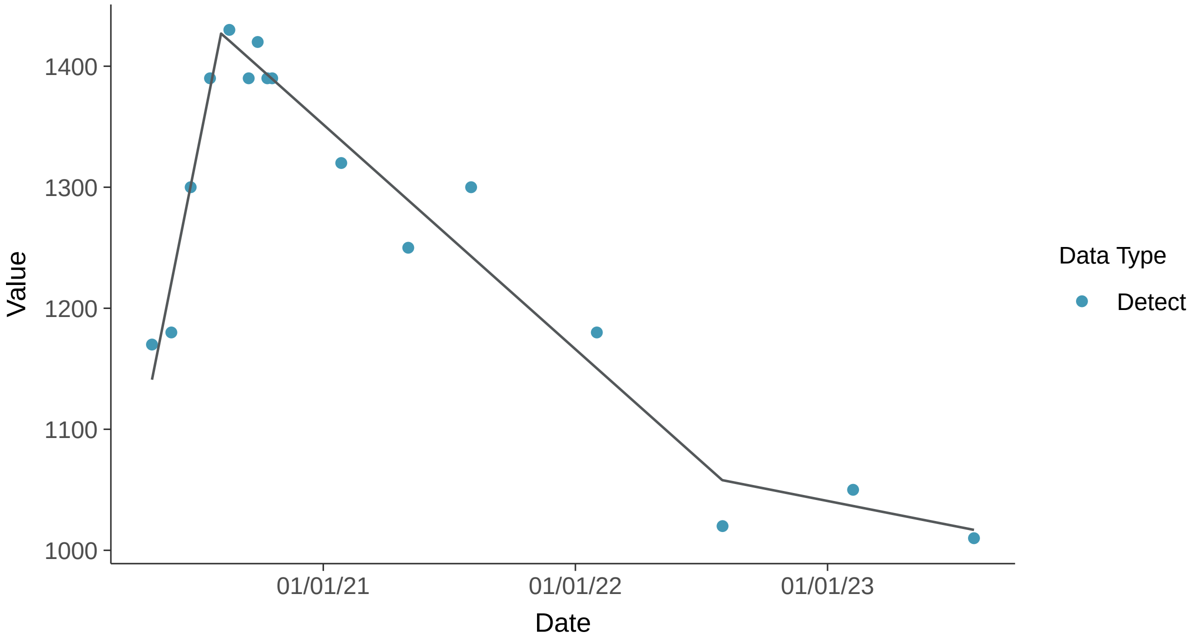
Trend Regression: Piecewise Linear-Linear

Total Dissolved Solids, MW-2 (mg/L)



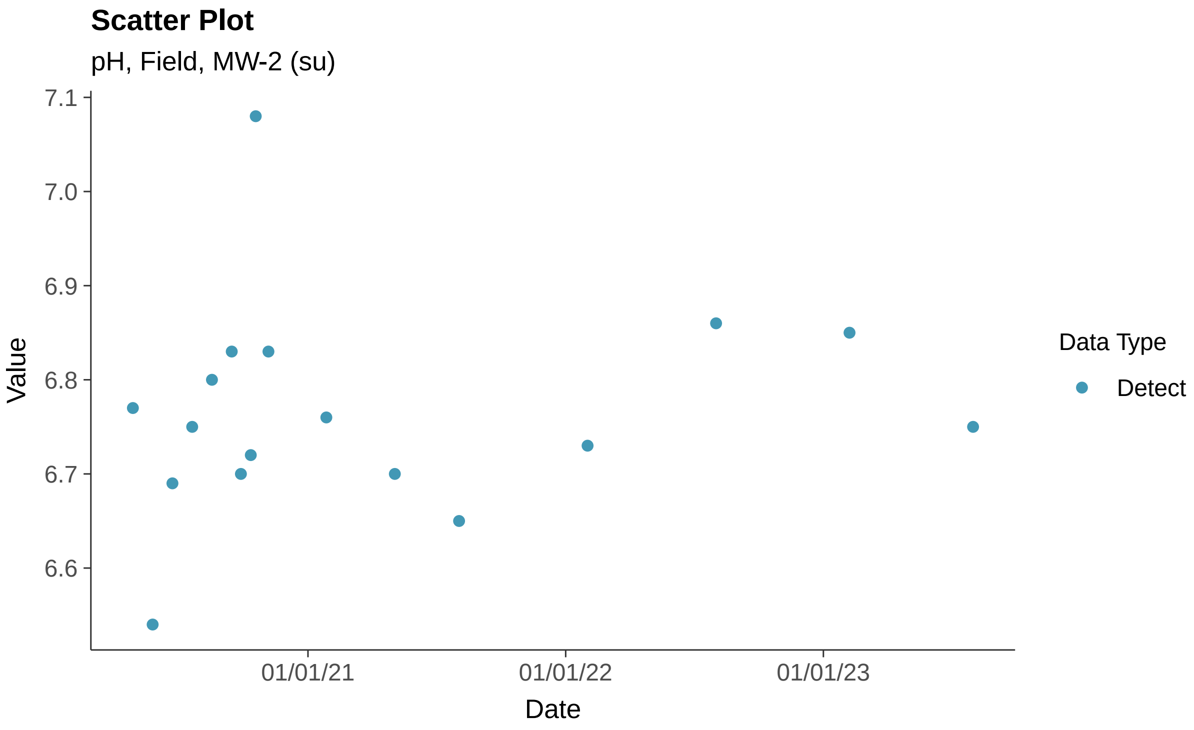
Trend Regression: Piecewise Linear-Linear-Linear

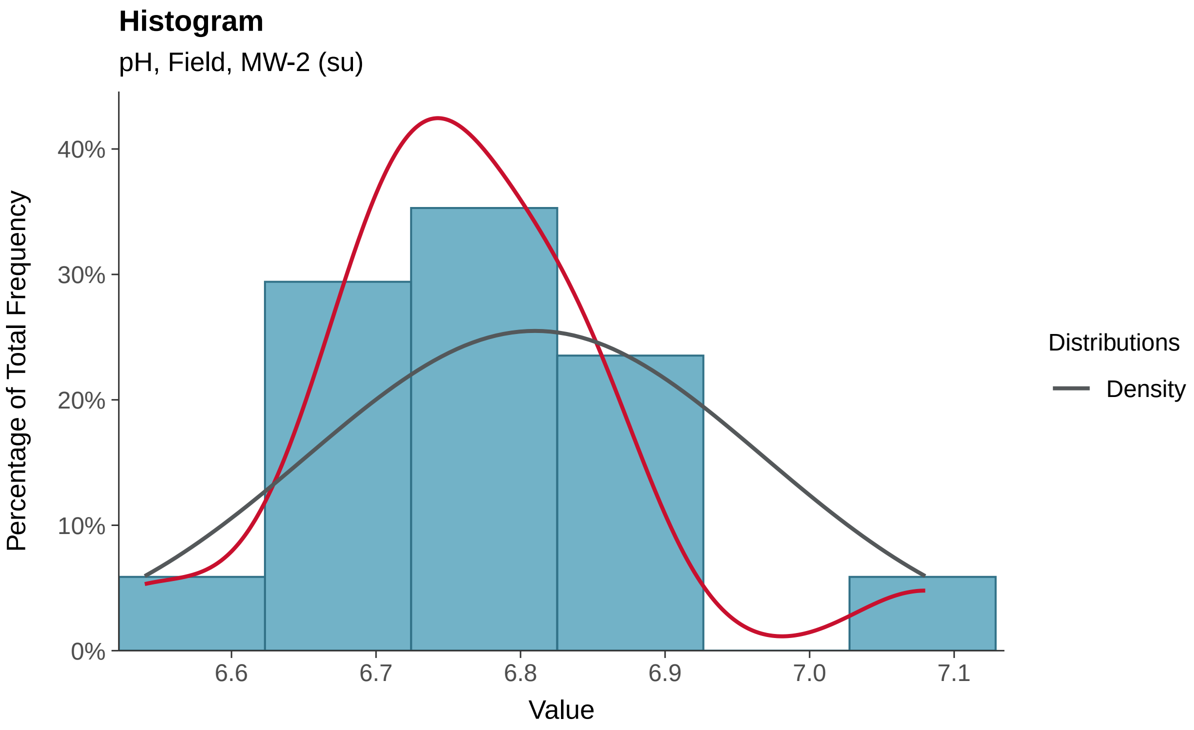
Total Dissolved Solids, MW-2 (mg/L)



Appendix III: pH, Field, MW-2

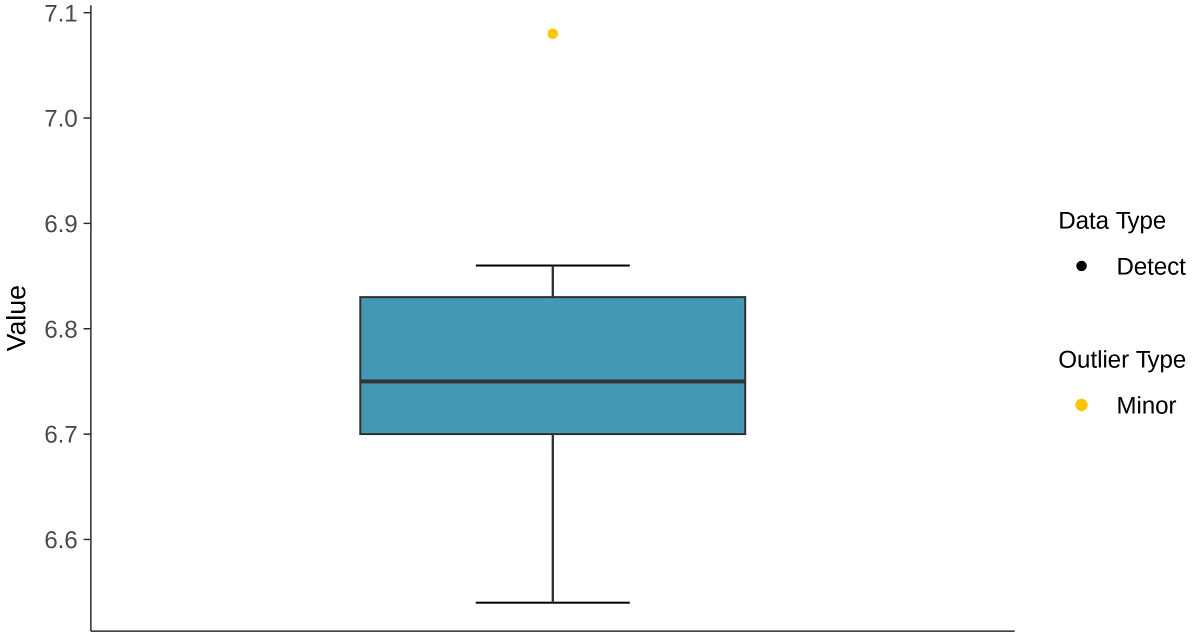
ID: 02_1_07





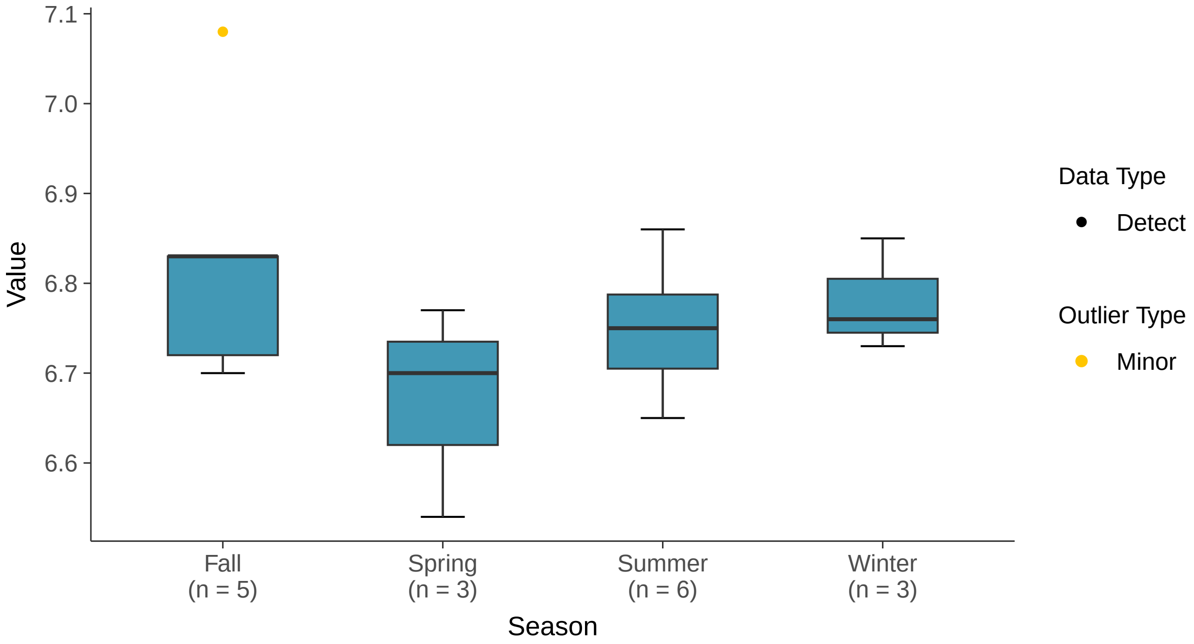
Boxplot

pH, Field, MW-2 (su)



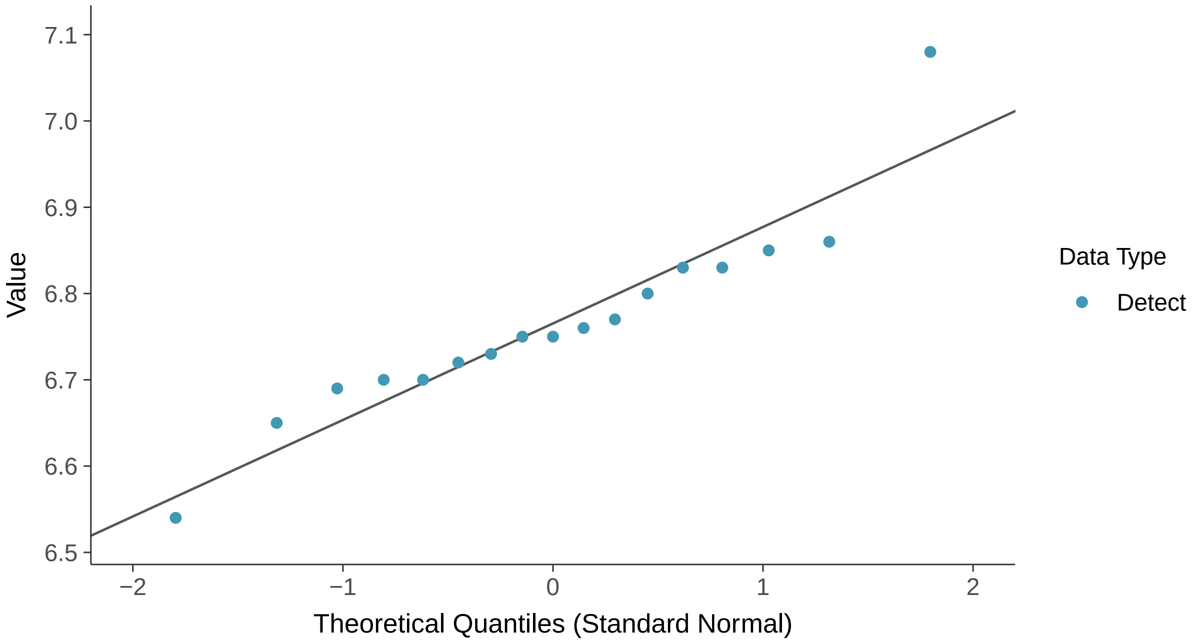
Boxplot by Season

pH, Field, MW-2 (su)



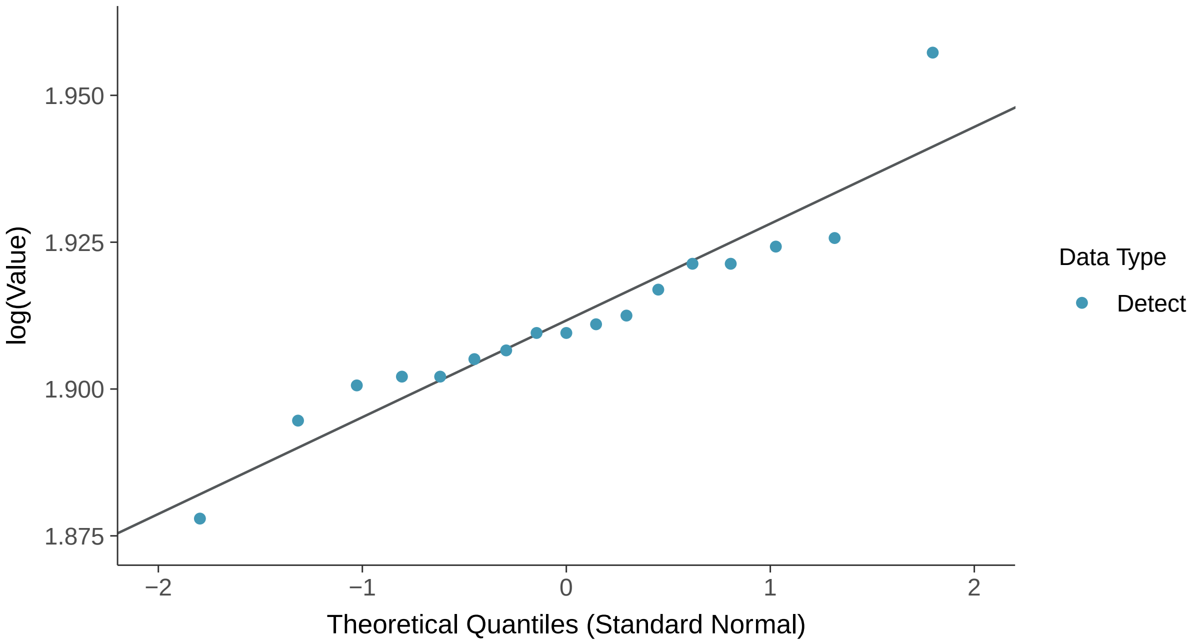
Normal Q-Q plot

pH, Field, MW-2 (su)



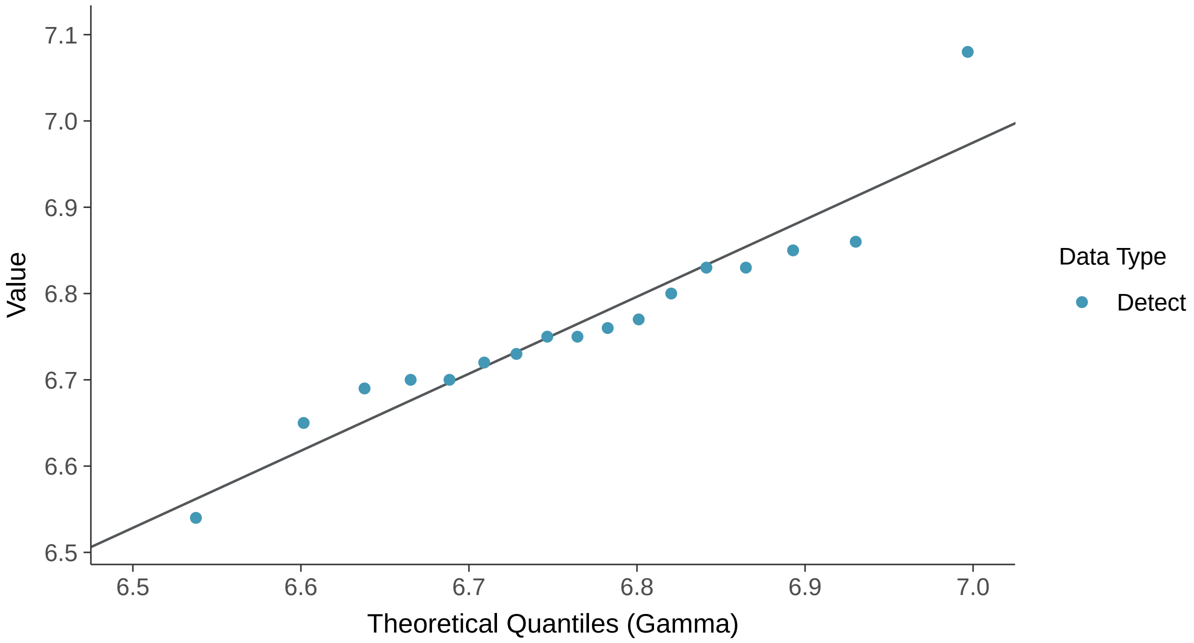
Lognormal Q-Q plot

pH, Field, MW-2 (su)



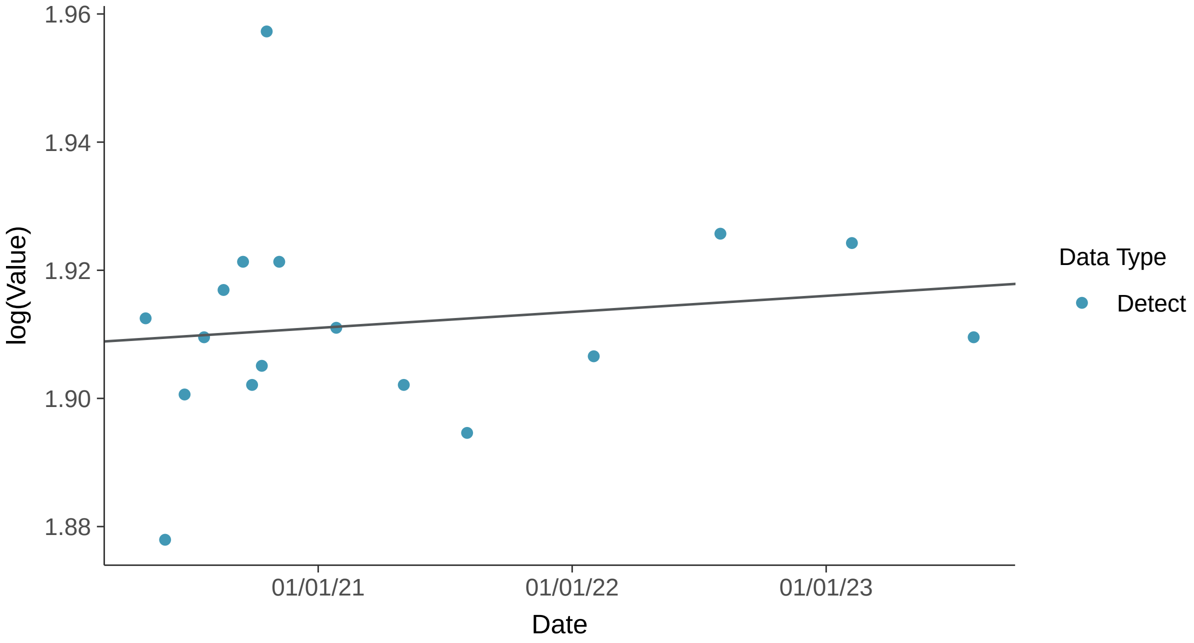
Gamma Q-Q plot

pH, Field, MW-2 (su)



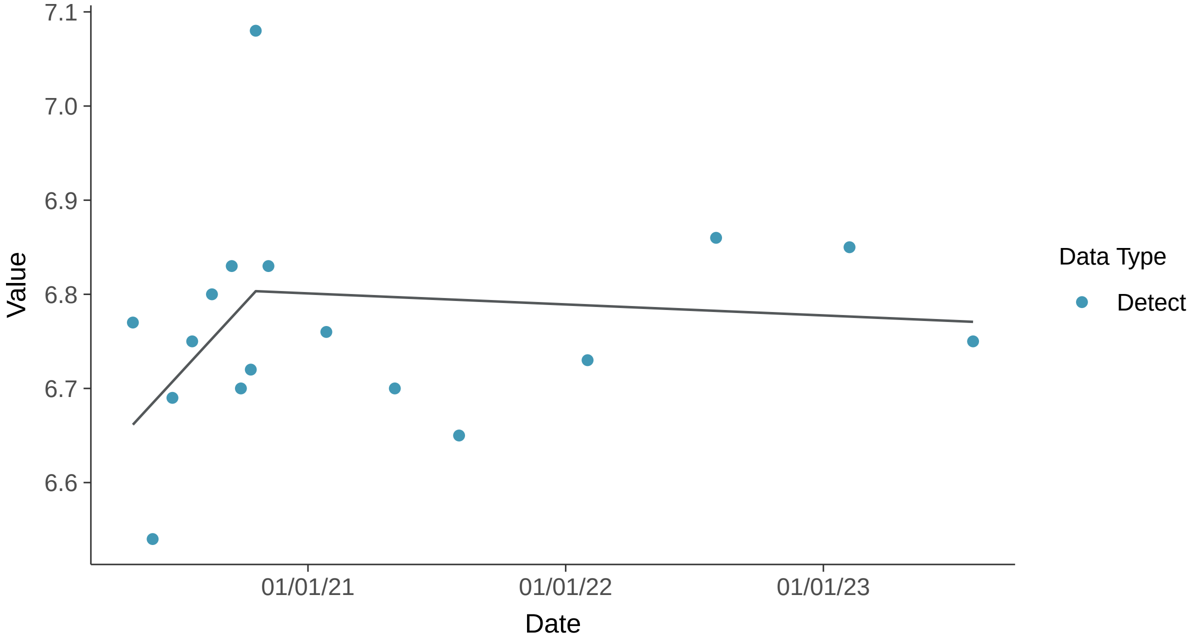
Trend Regression: Lognormal MLE

pH, Field, MW-2 (su)



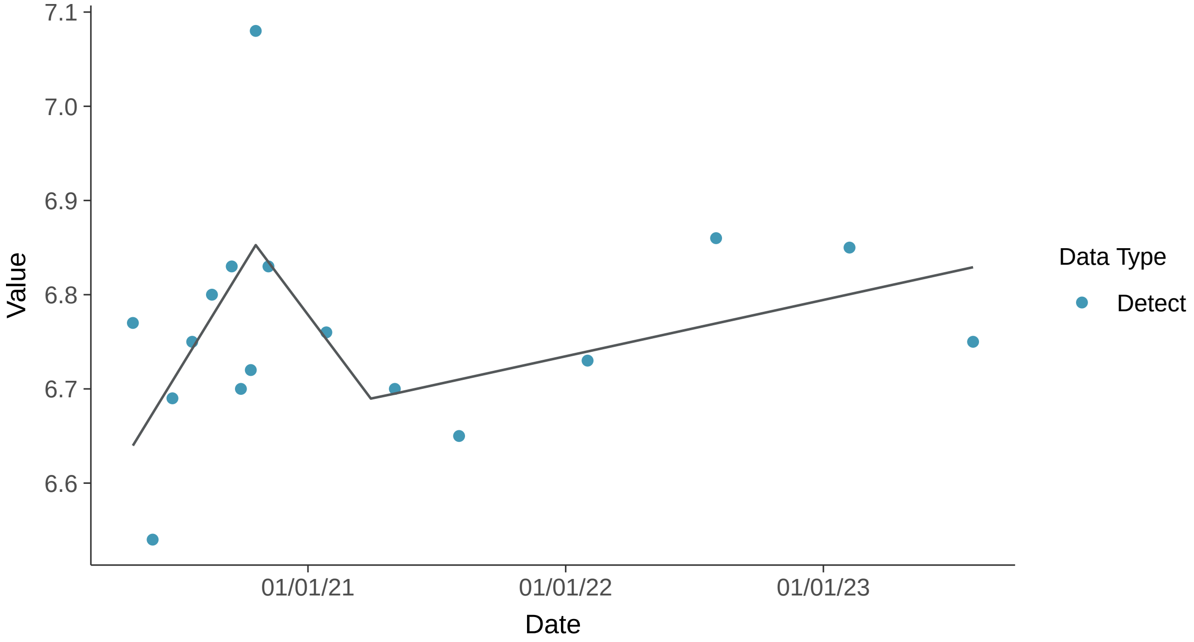
Trend Regression: Piecewise Linear-Linear

pH, Field, MW-2 (su)



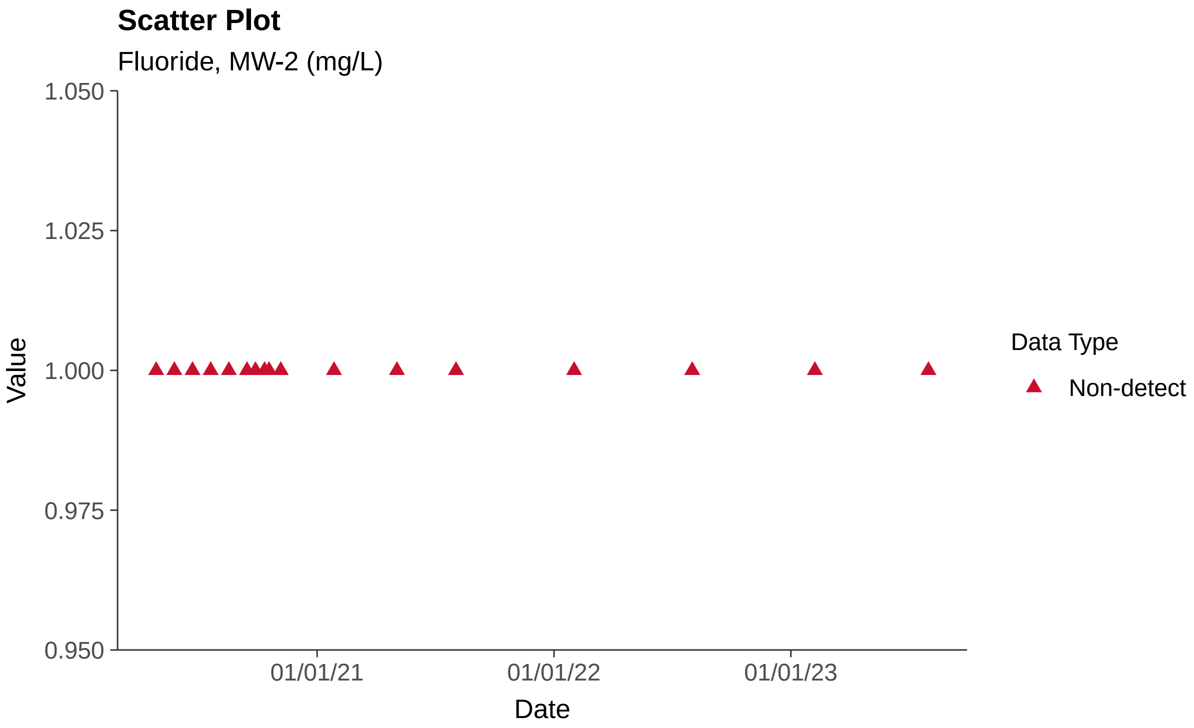
Trend Regression: Piecewise Linear-Linear-Linear

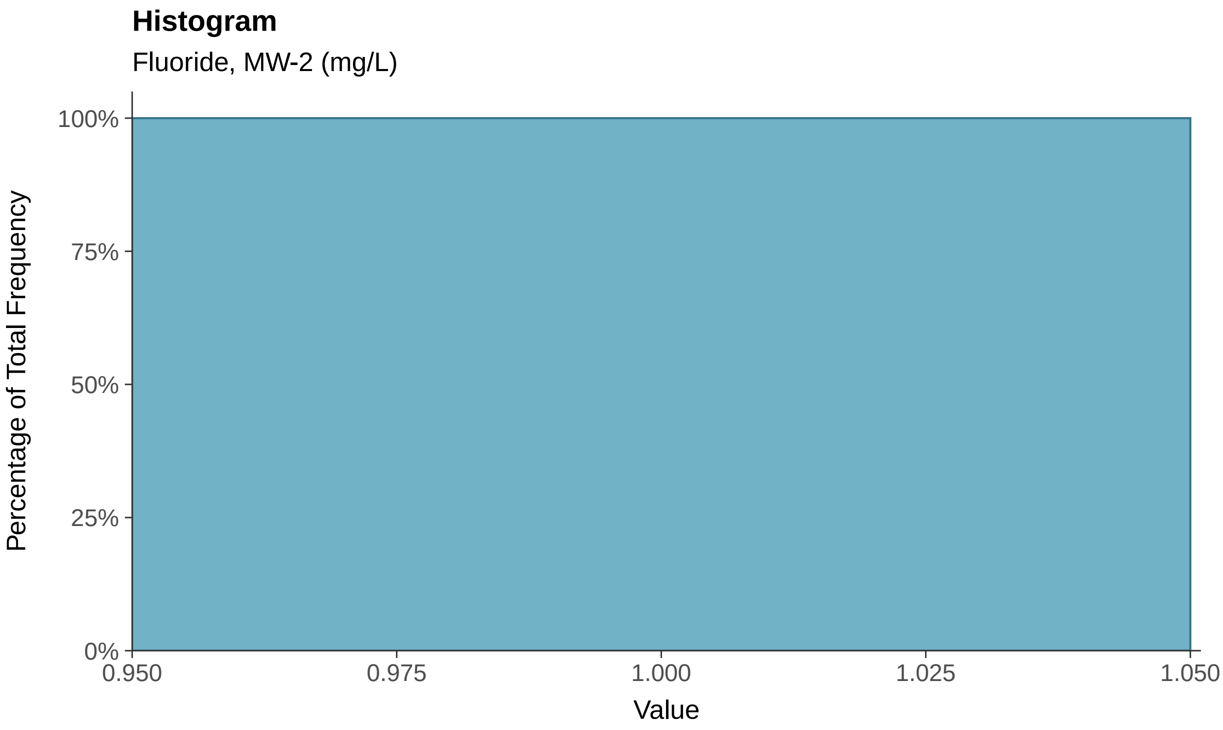
pH, Field, MW-2 (su)



Appendix IV: Fluoride, MW-2

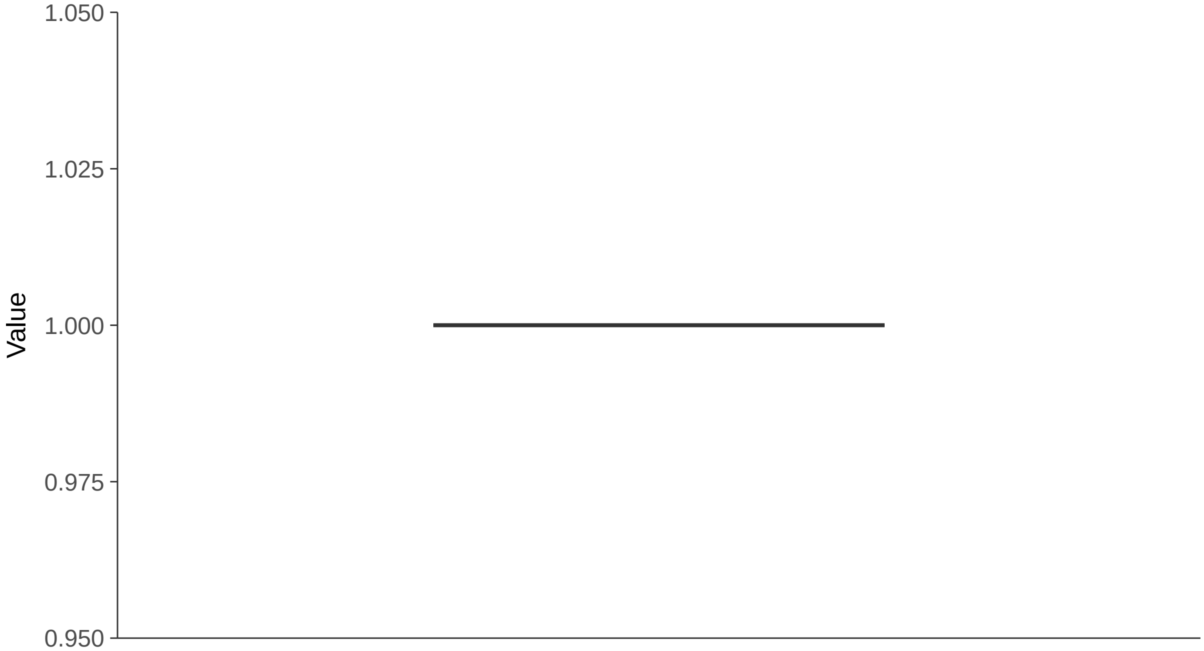
ID: 02_2_04





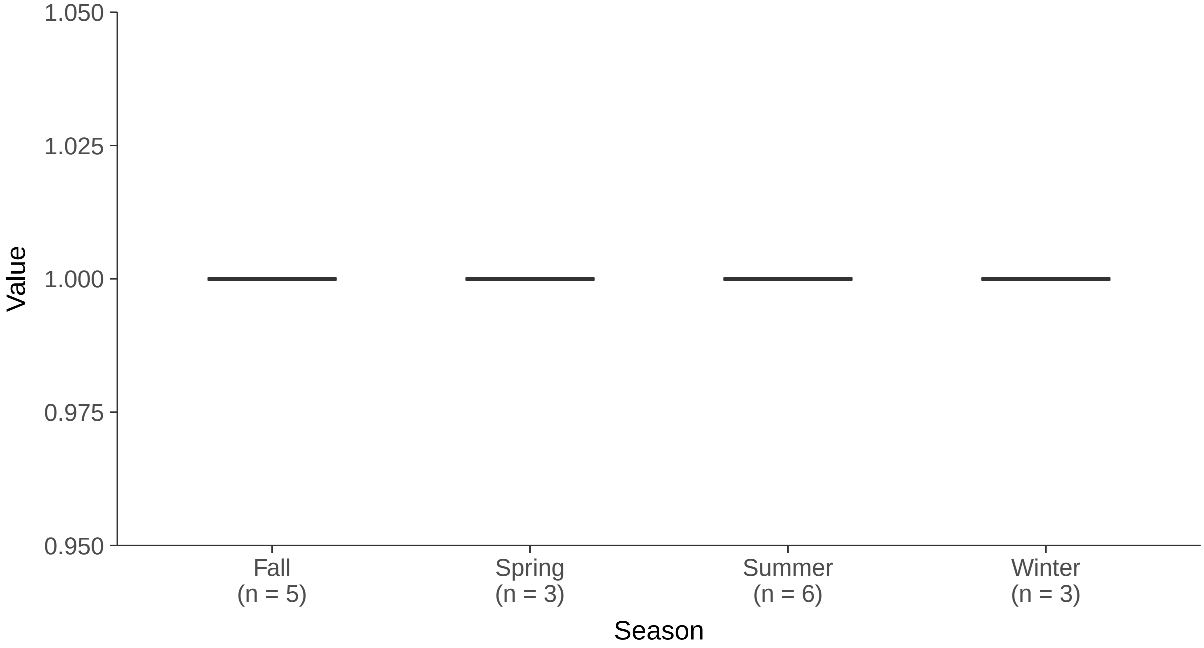
Boxplot

Fluoride, MW-2 (mg/L)



Boxplot by Season

Fluoride, MW-2 (mg/L)

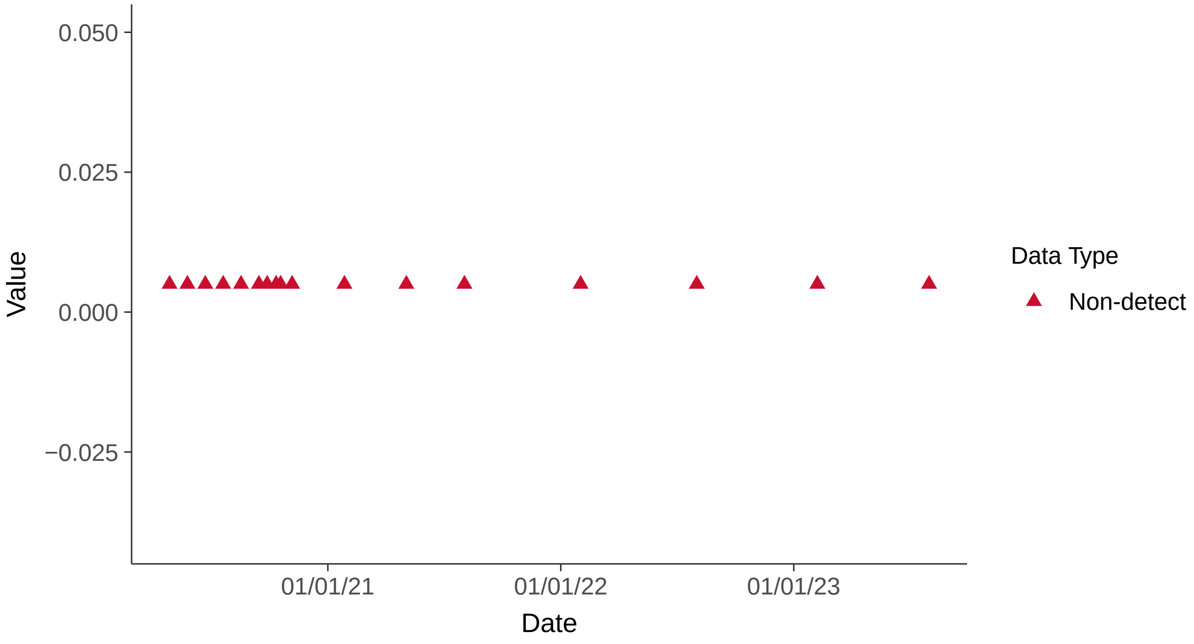


Appendix IV: Antimony, MW-2

ID: 02_2_08

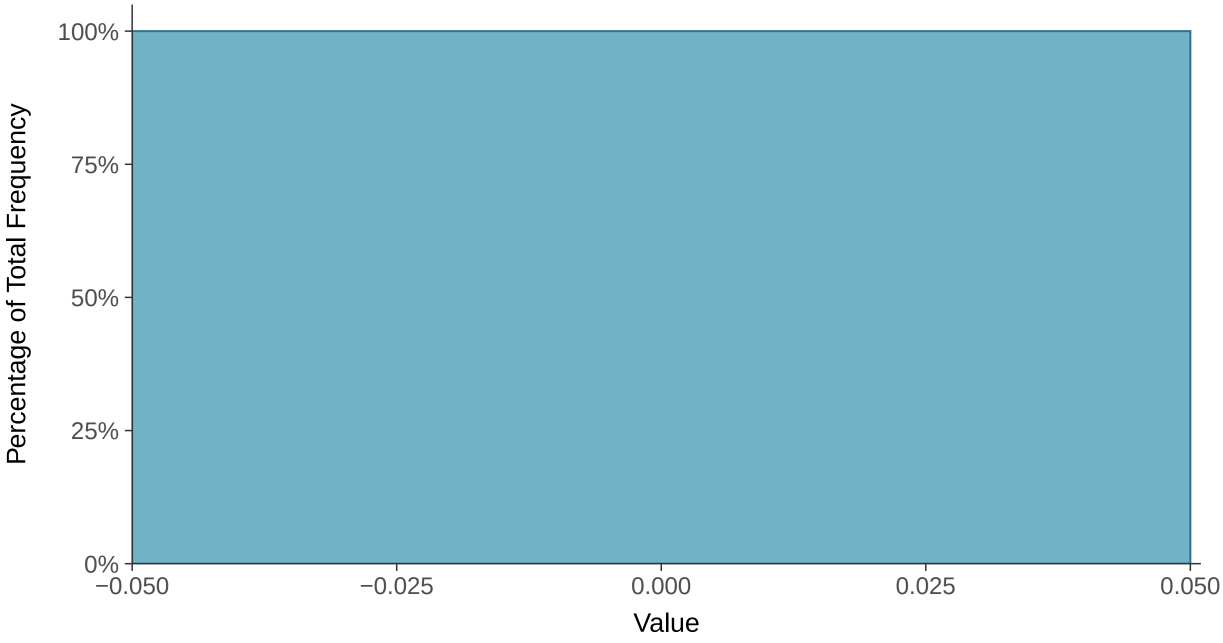
Scatter Plot

Antimony, MW-2 (mg/L)



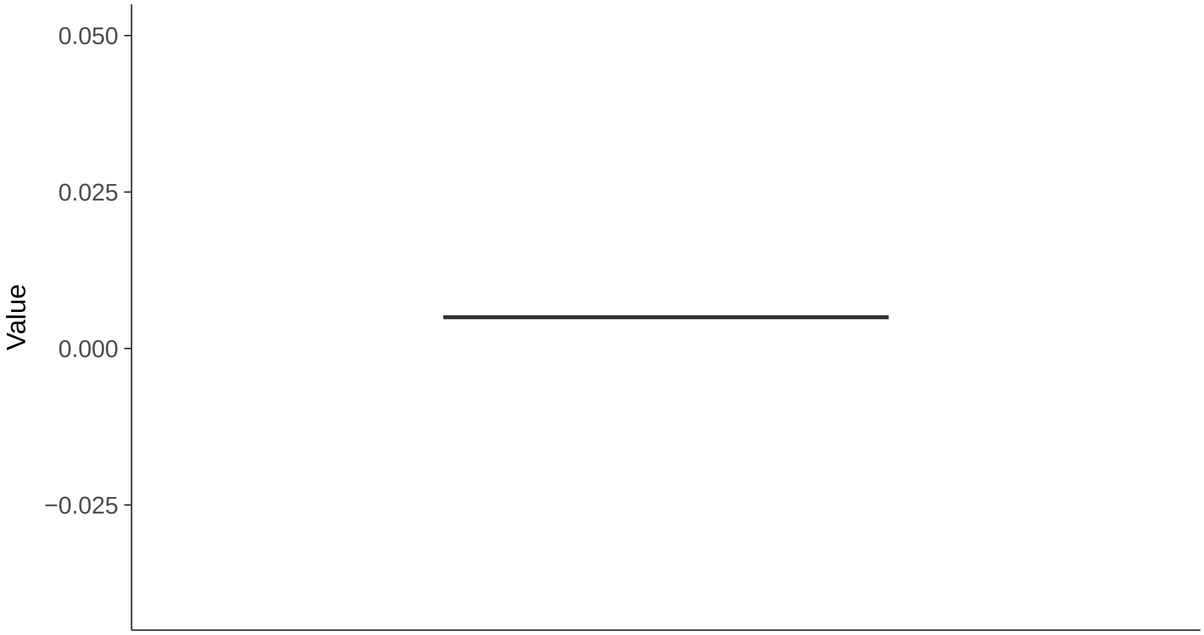
Histogram

Antimony, MW-2 (mg/L)



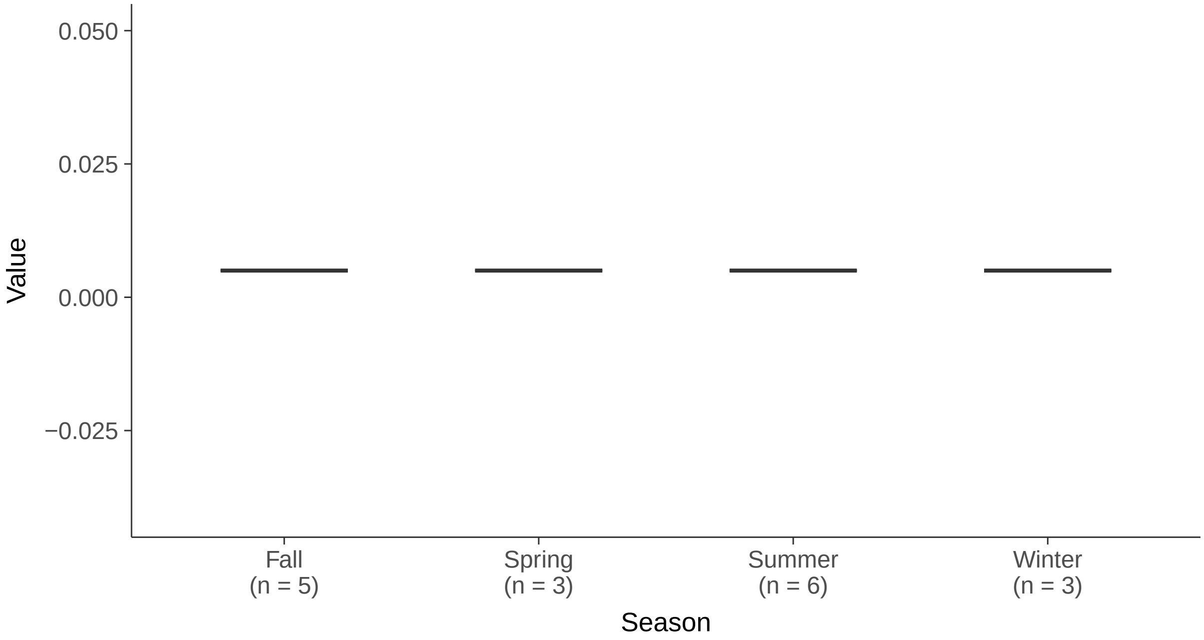
Boxplot

Antimony, MW-2 (mg/L)



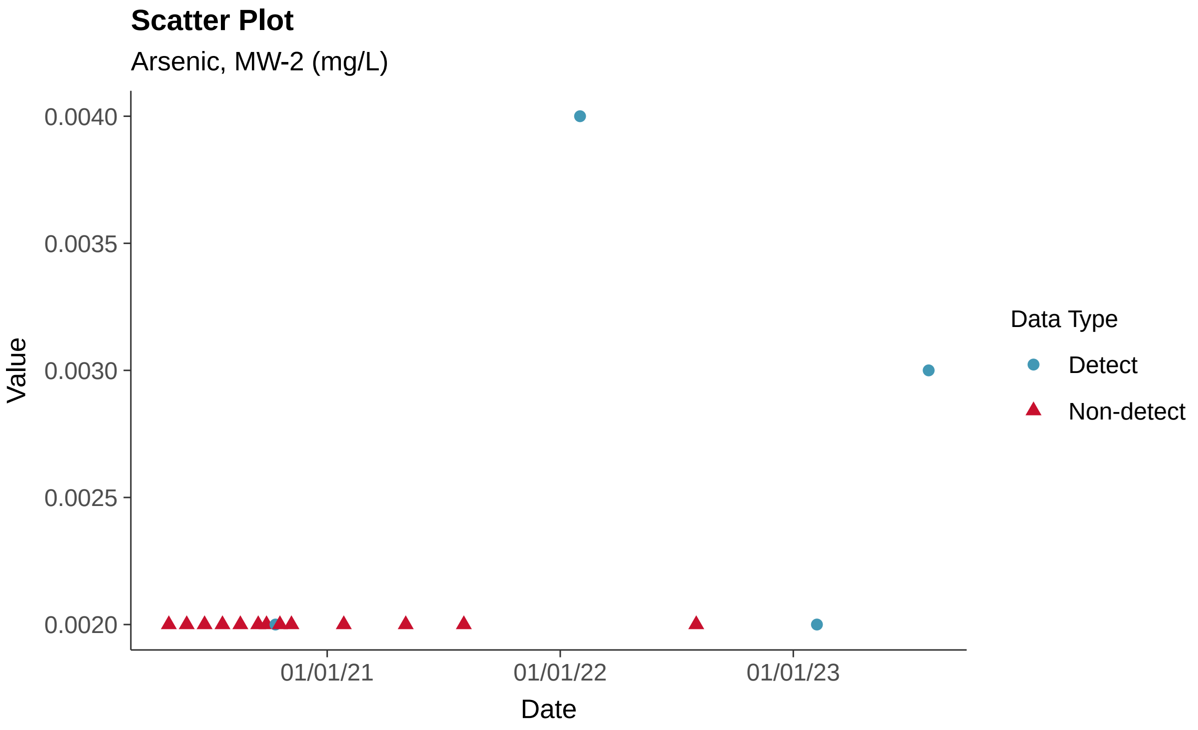
Boxplot by Season

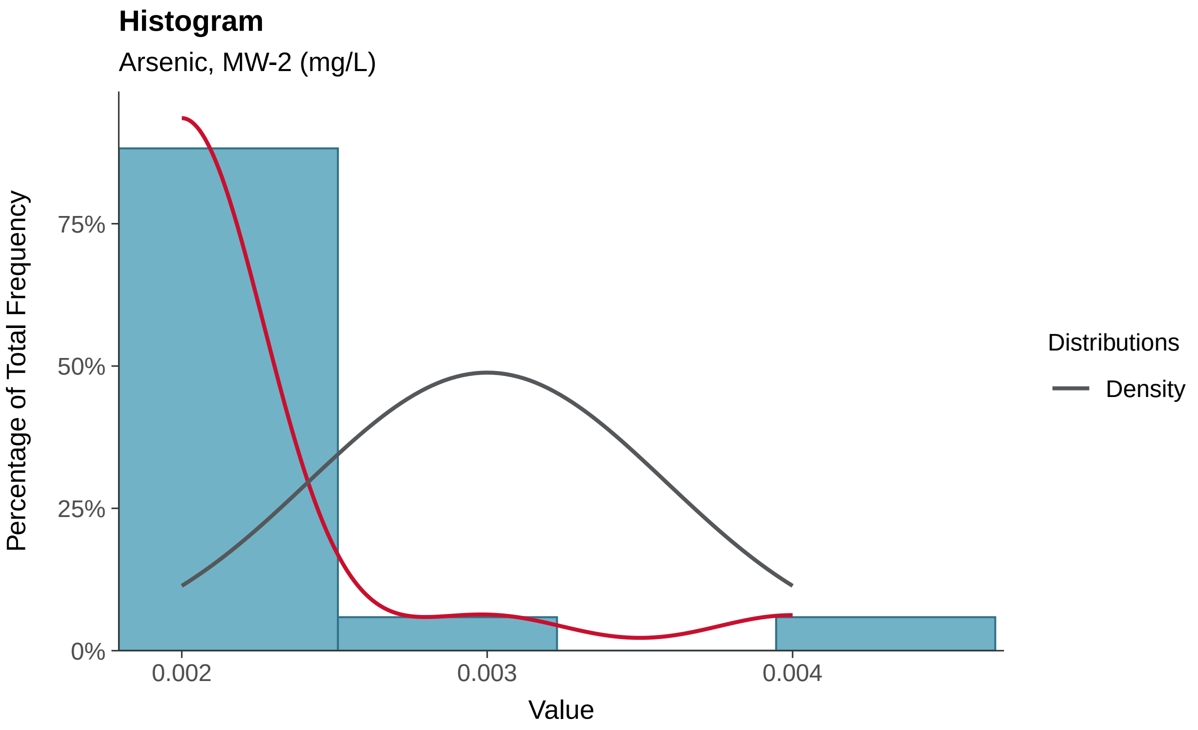
Antimony, MW-2 (mg/L)



Appendix IV: Arsenic, MW-2

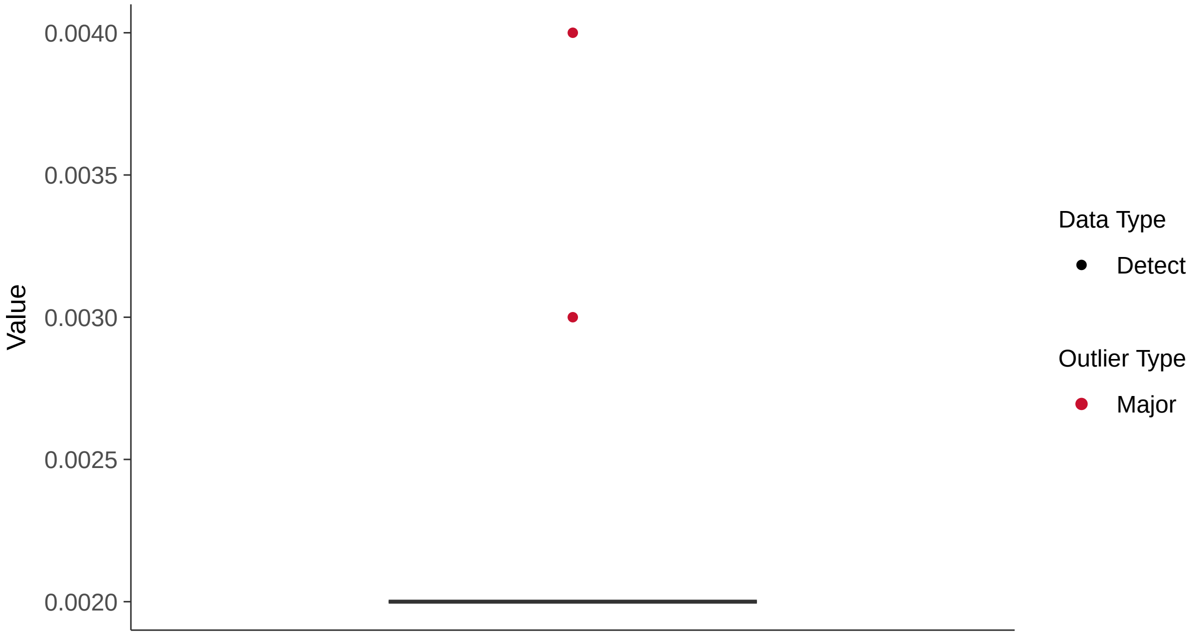
ID: 02_2_09





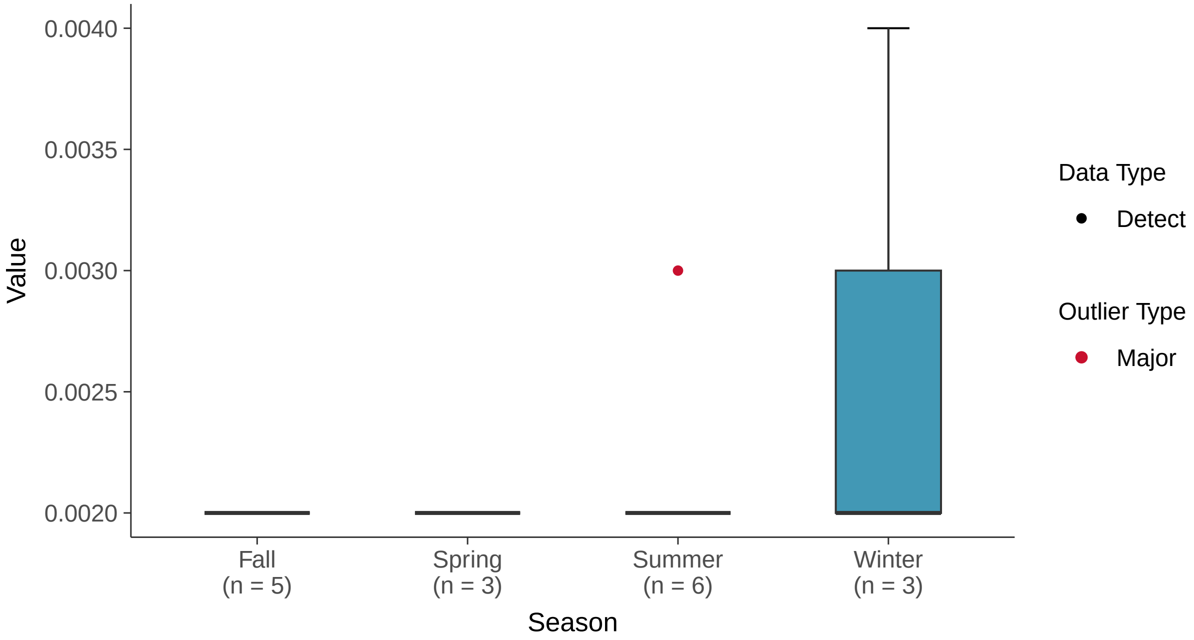
Boxplot

Arsenic, MW-2 (mg/L)



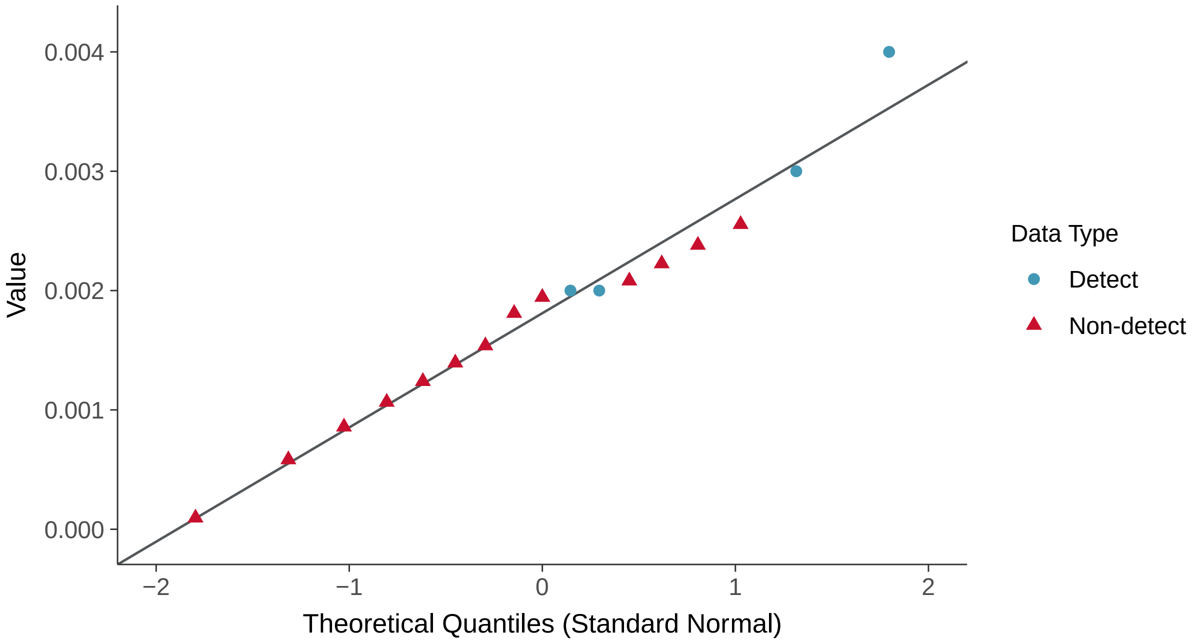
Boxplot by Season

Arsenic, MW-2 (mg/L)



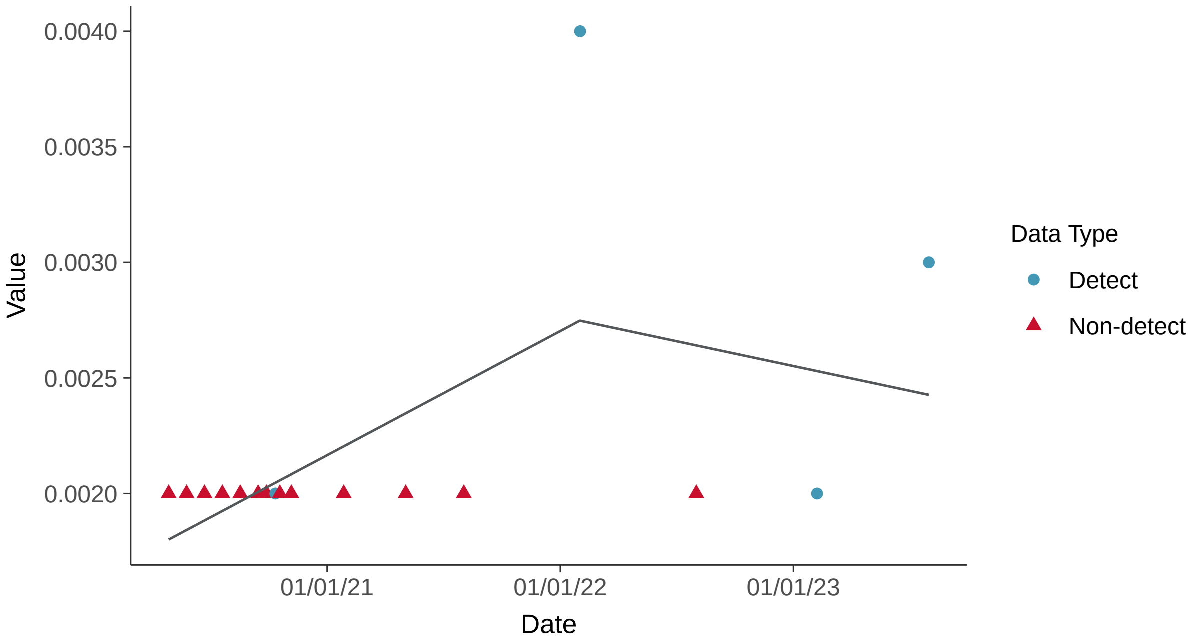
Normal Q-Q plot using ROS Imputed Estimates

Arsenic, MW-2 (mg/L)



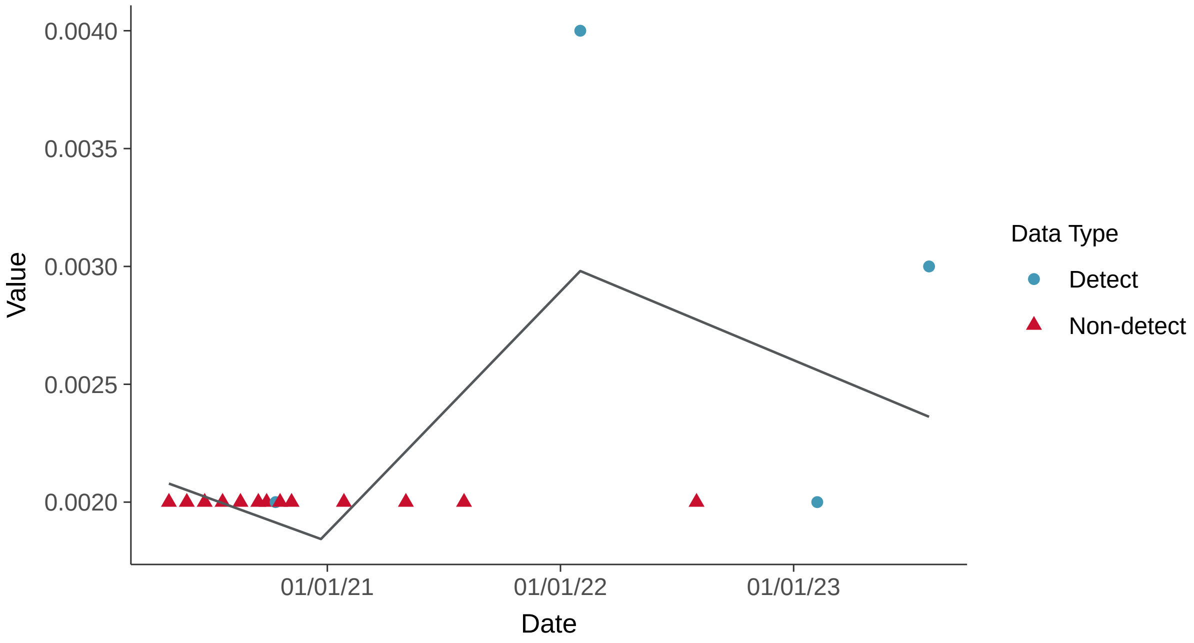
Trend Regression: Piecewise Linear-Linear

Arsenic, MW-2 (mg/L)



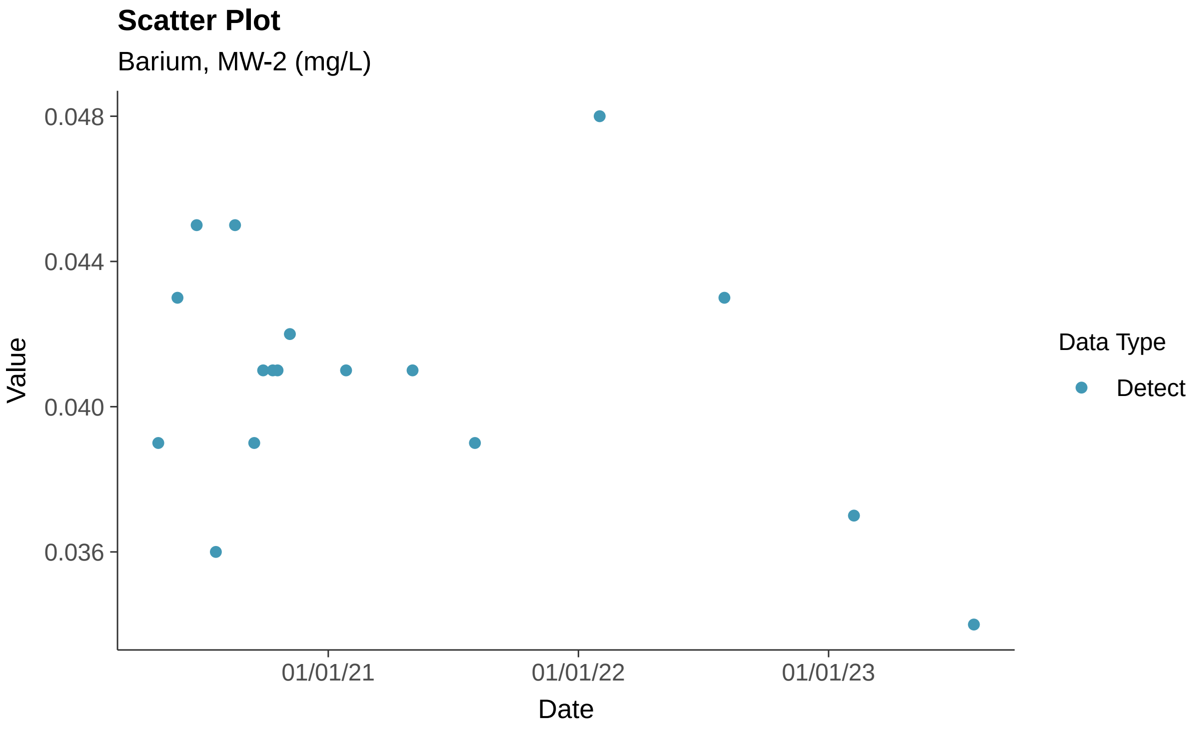
Trend Regression: Piecewise Linear-Linear-Linear

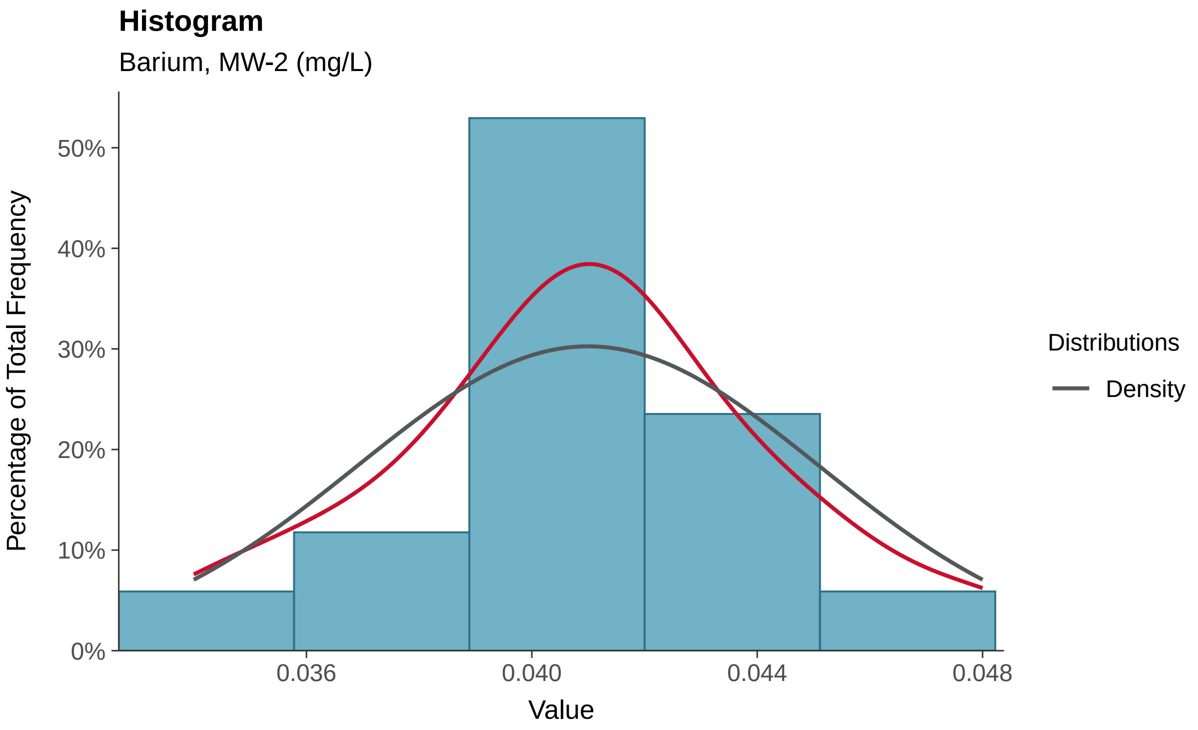
Arsenic, MW-2 (mg/L)



Appendix IV: Barium, MW-2

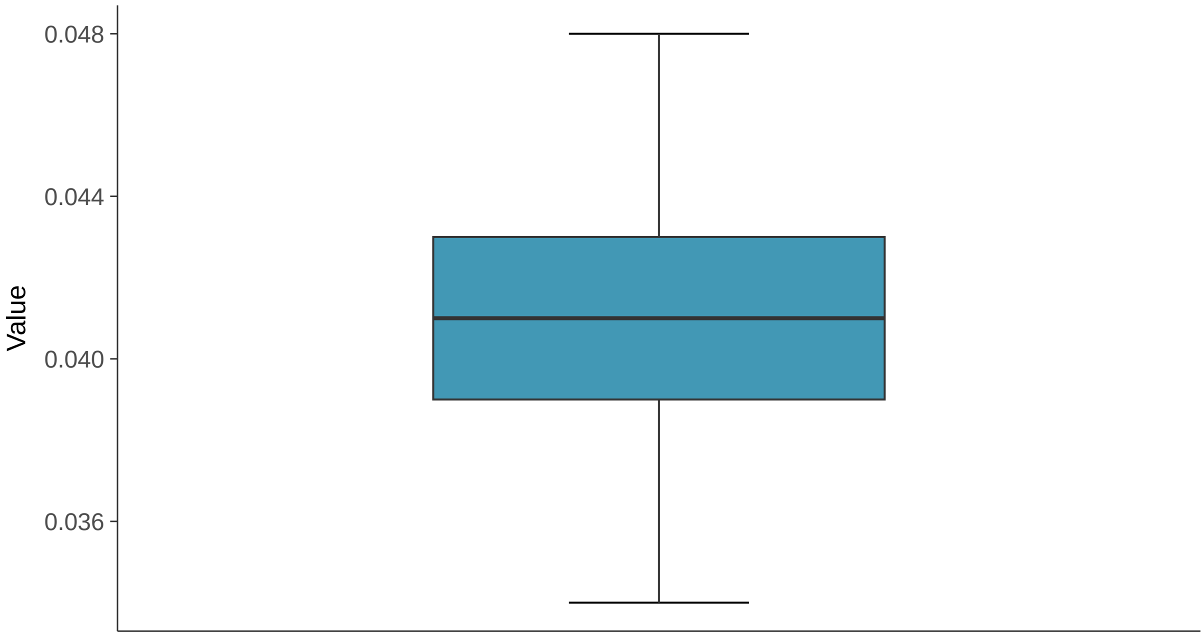
ID: 02_2_10





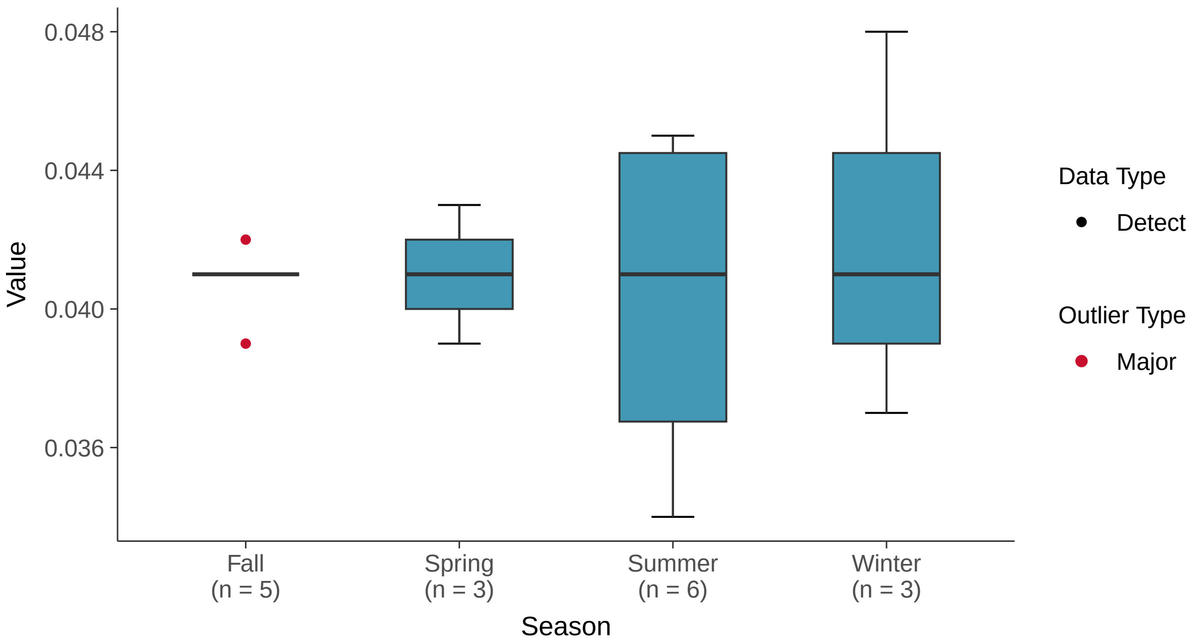
Boxplot

Barium, MW-2 (mg/L)



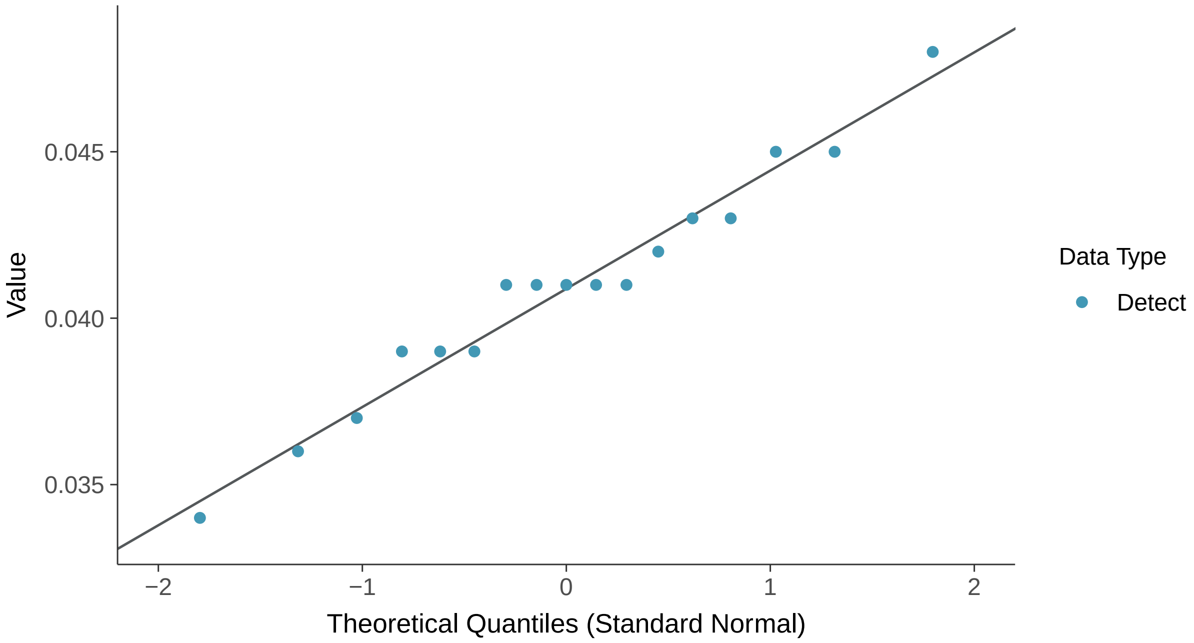
Boxplot by Season

Barium, MW-2 (mg/L)



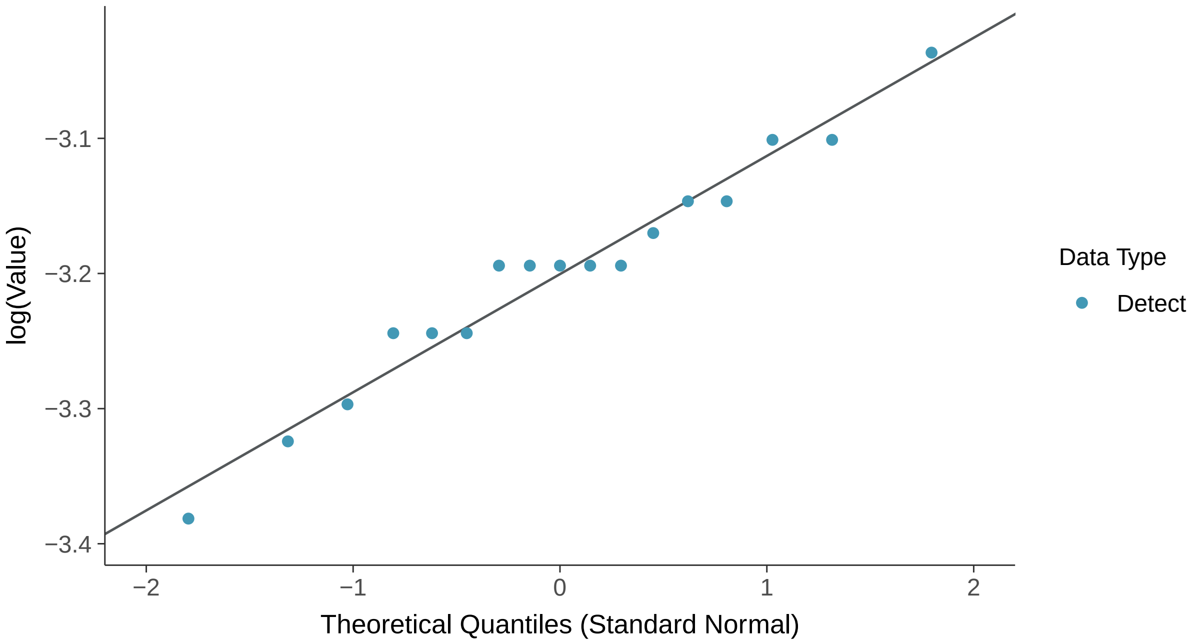
Normal Q-Q plot

Barium, MW-2 (mg/L)



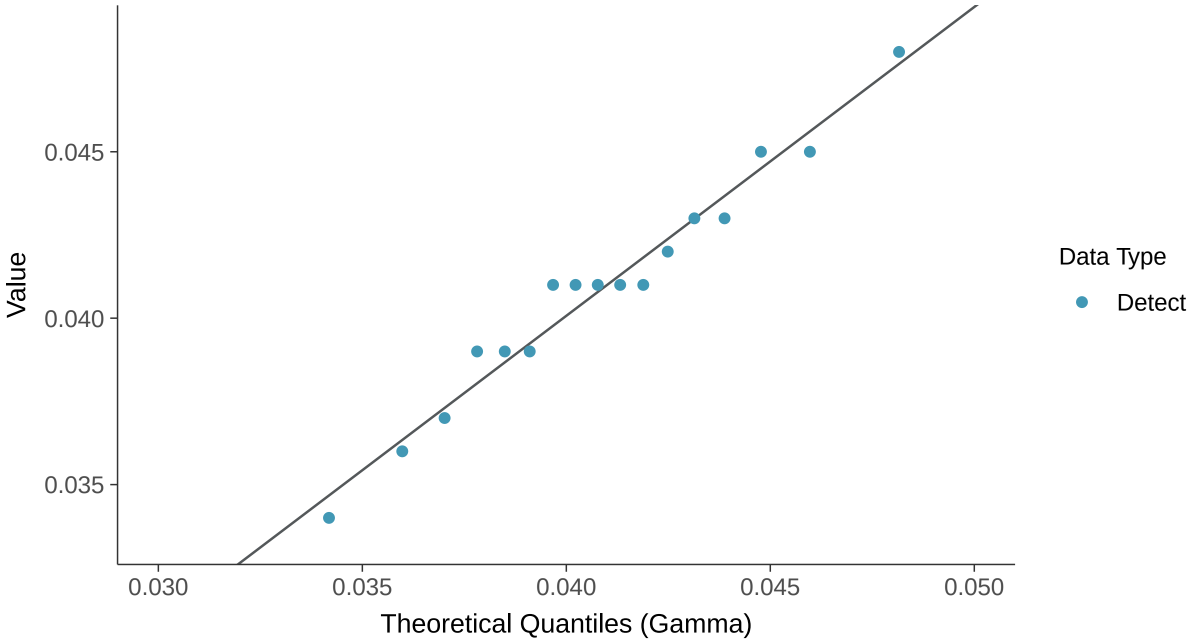
Lognormal Q-Q plot

Barium, MW-2 (mg/L)



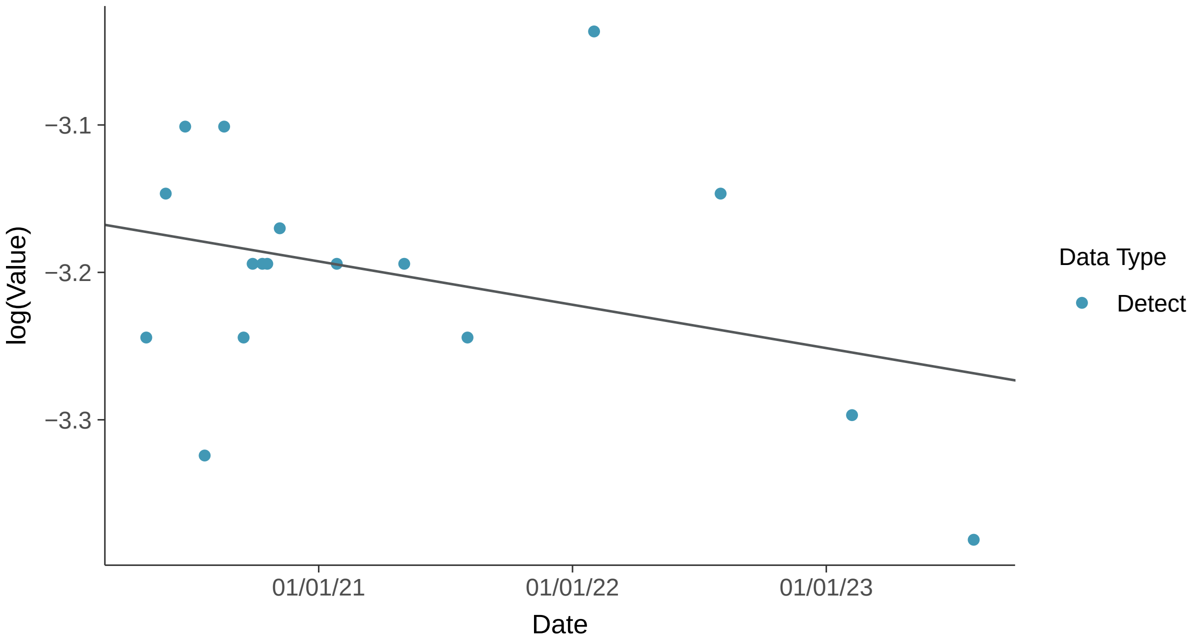
Gamma Q-Q plot

Barium, MW-2 (mg/L)



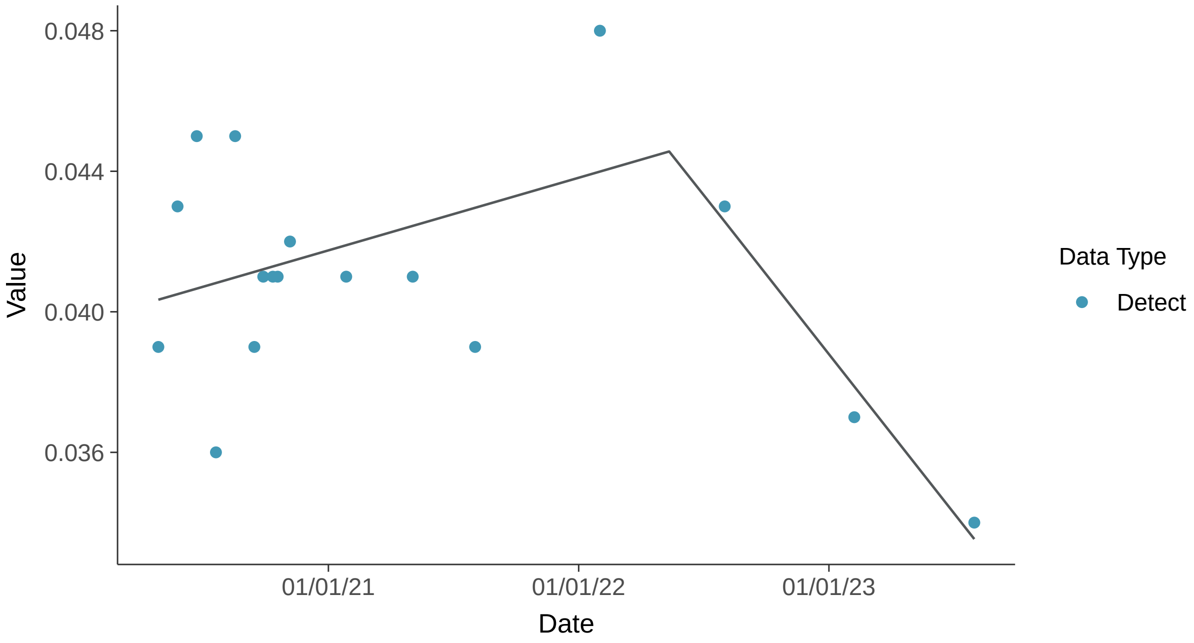
Trend Regression: Lognormal MLE

Barium, MW-2 (mg/L)



Trend Regression: Piecewise Linear-Linear

Barium, MW-2 (mg/L)

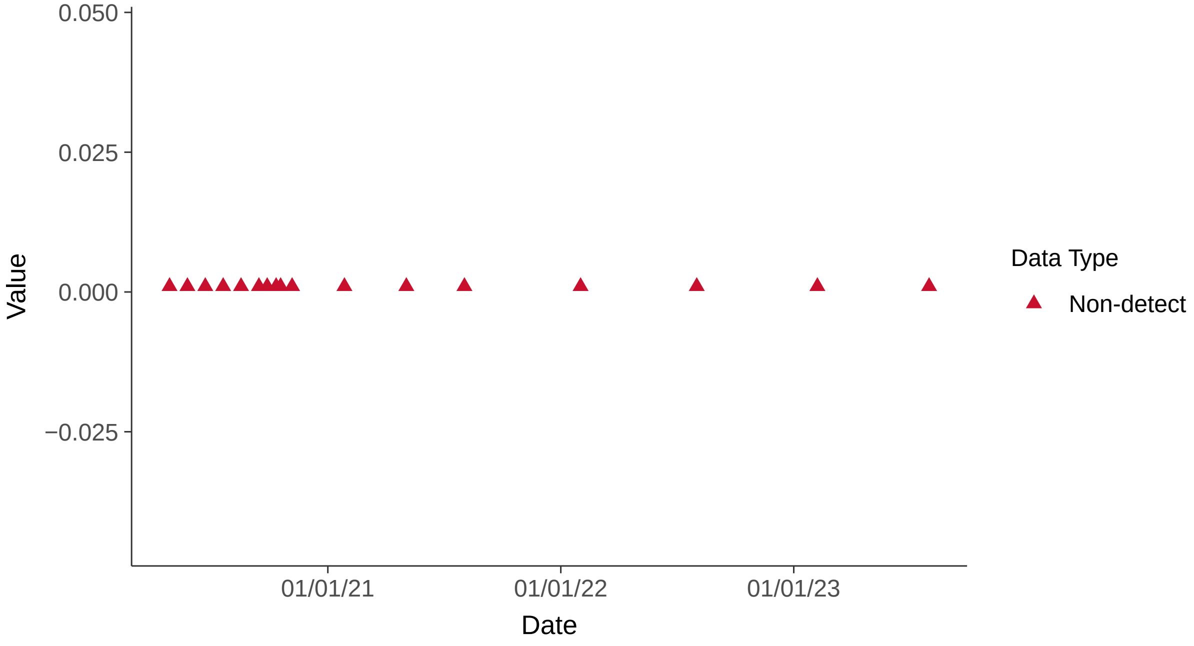


Appendix IV: Beryllium, MW-2

ID: 02_2_11

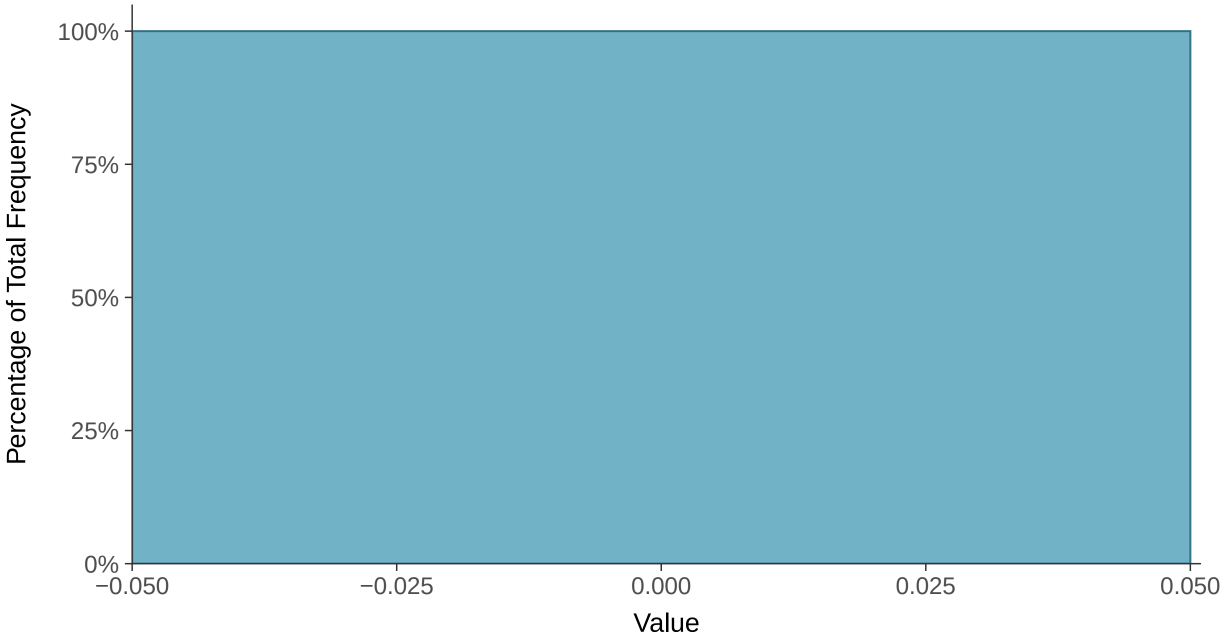
Scatter Plot

Beryllium, MW-2 (mg/L)



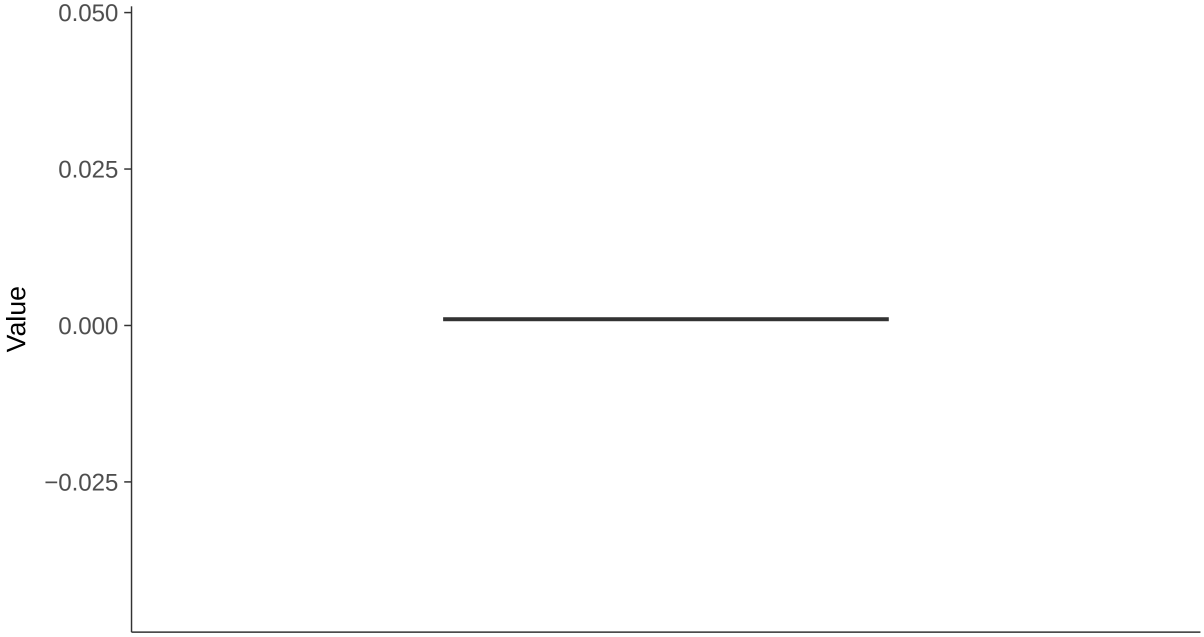
Histogram

Beryllium, MW-2 (mg/L)



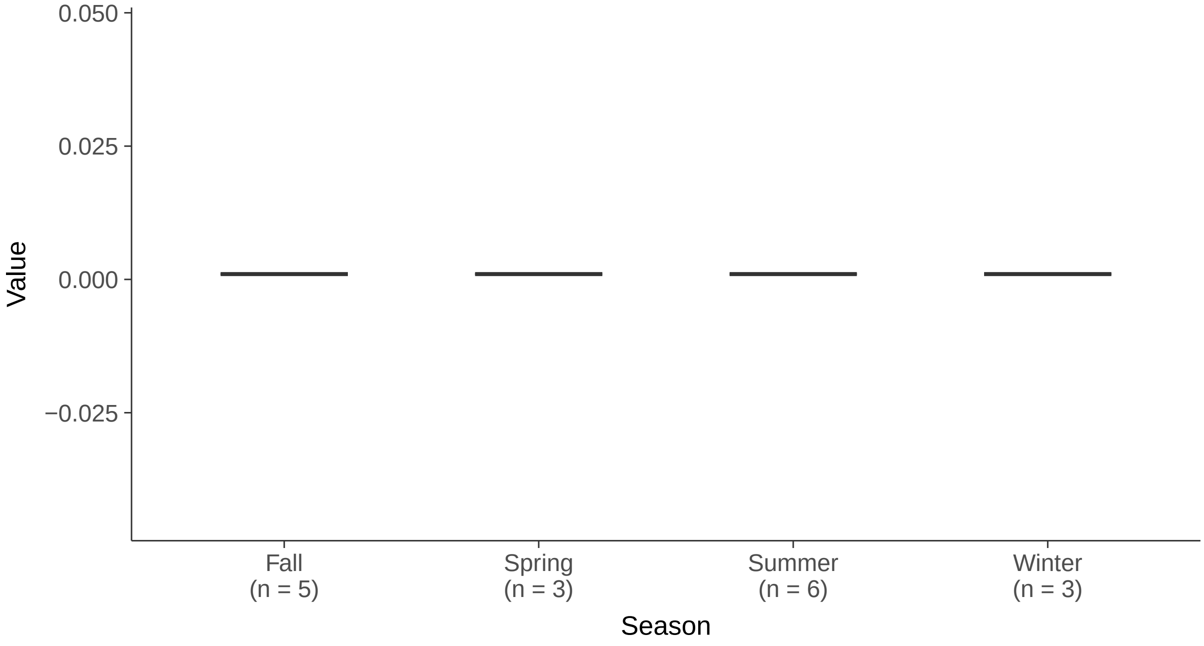
Boxplot

Beryllium, MW-2 (mg/L)



Boxplot by Season

Beryllium, MW-2 (mg/L)

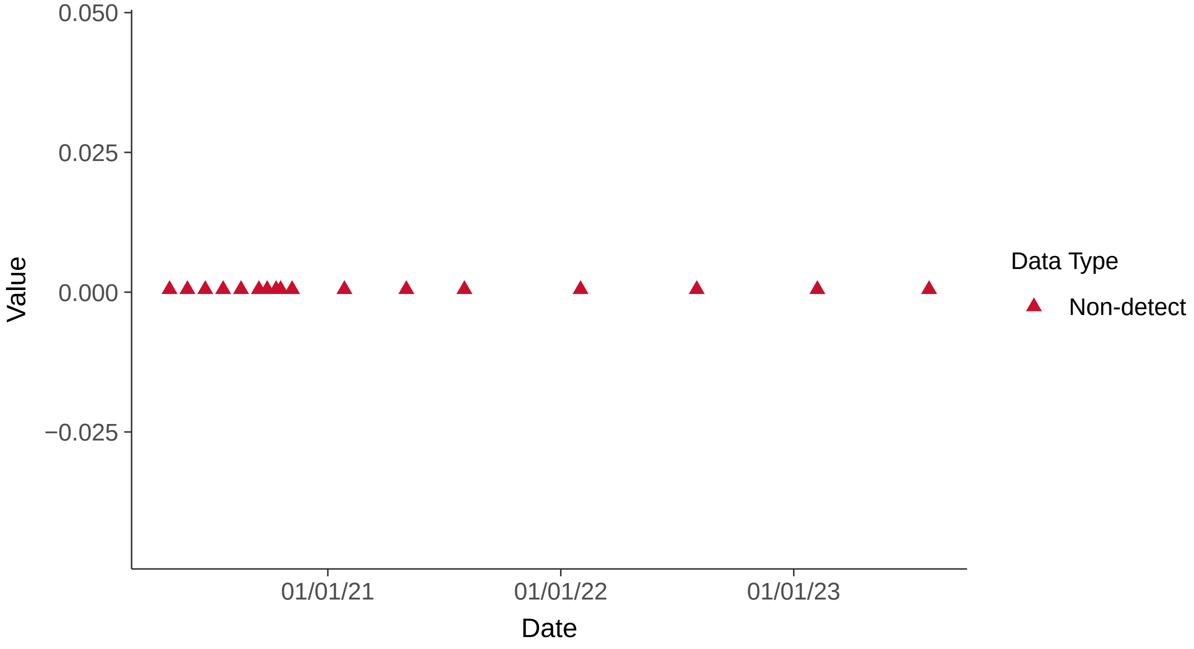


Appendix IV: Cadmium, MW-2

ID: 02_2_12

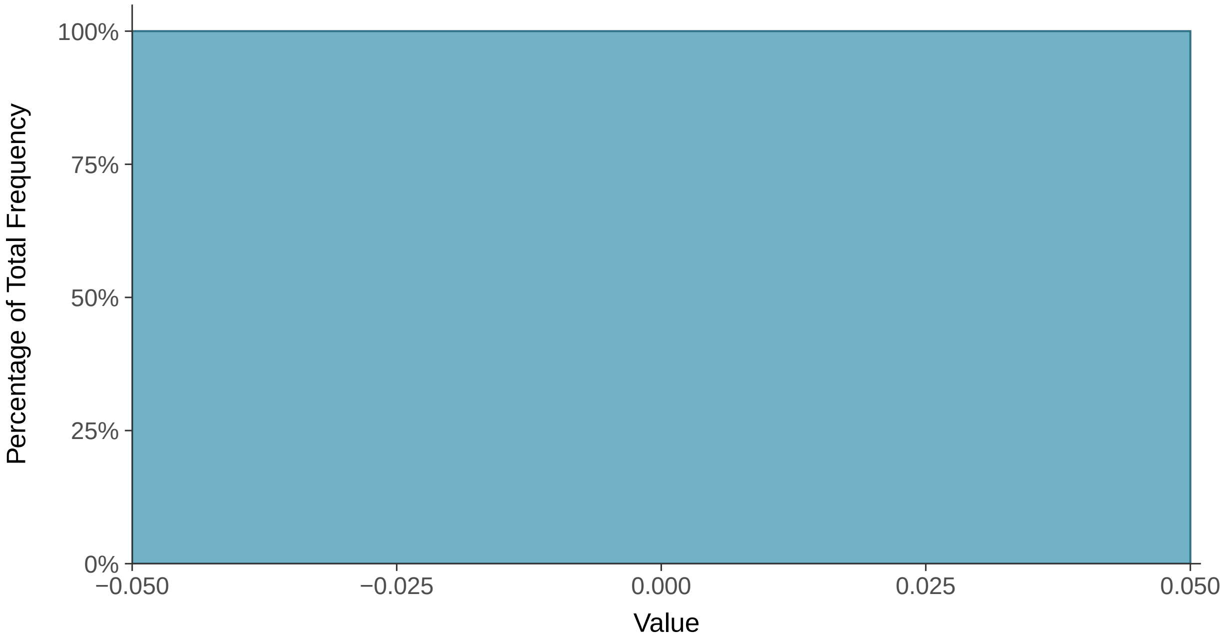
Scatter Plot

Cadmium, MW-2 (mg/L)



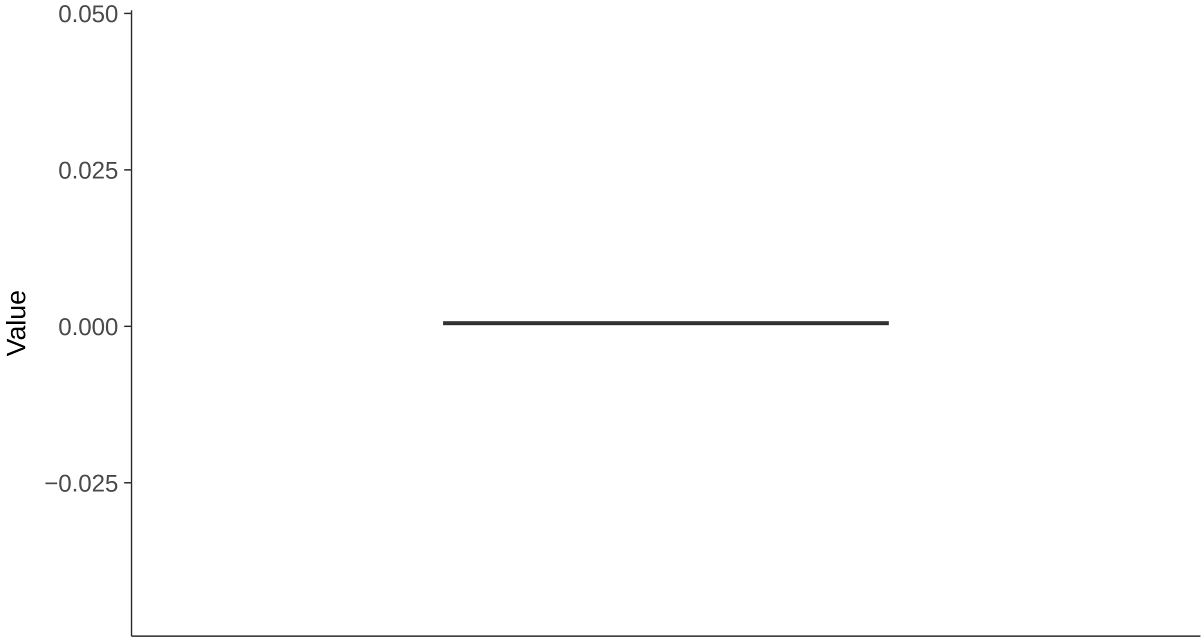
Histogram

Cadmium, MW-2 (mg/L)



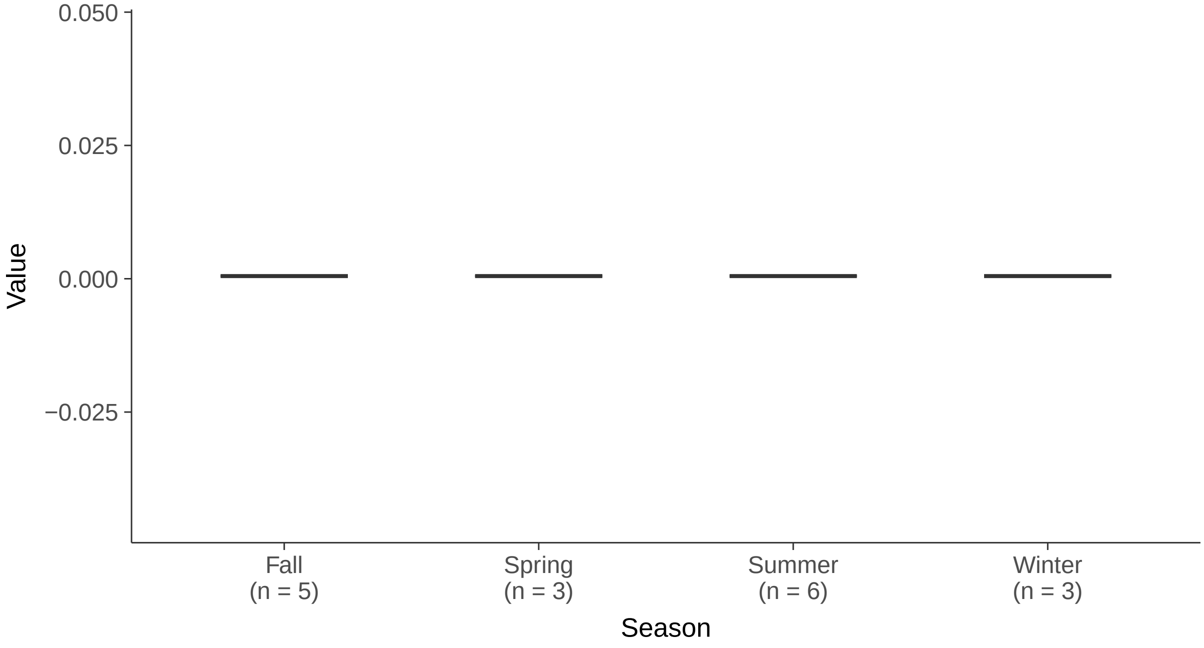
Boxplot

Cadmium, MW-2 (mg/L)



Boxplot by Season

Cadmium, MW-2 (mg/L)

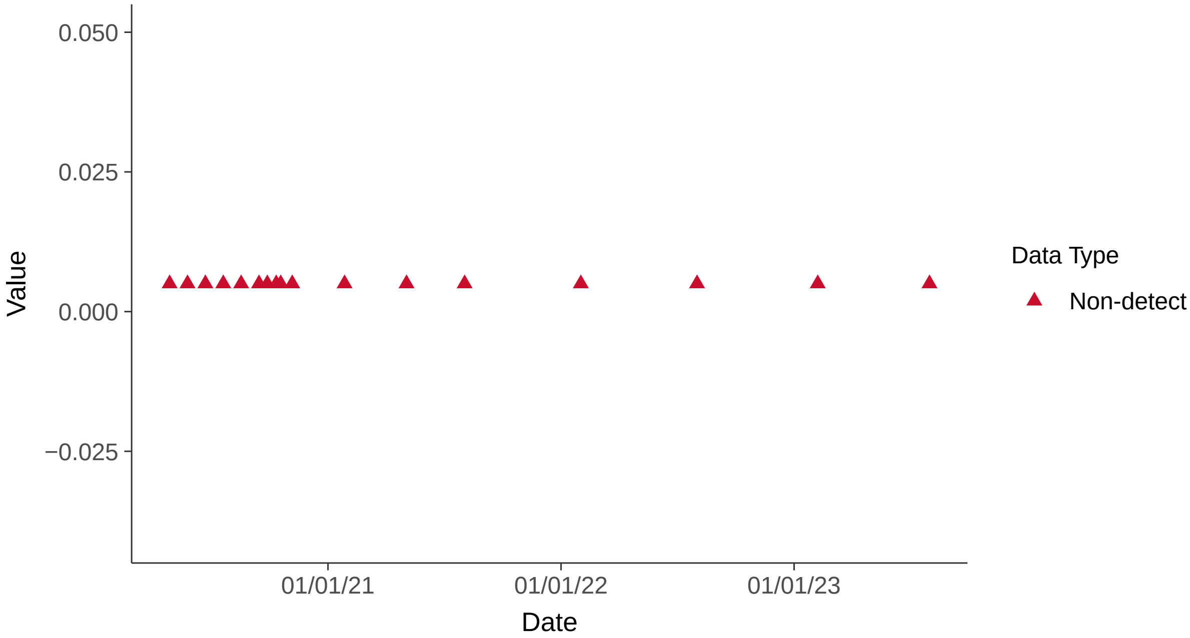


Appendix IV: Chromium, MW-2

ID: 02_2_13

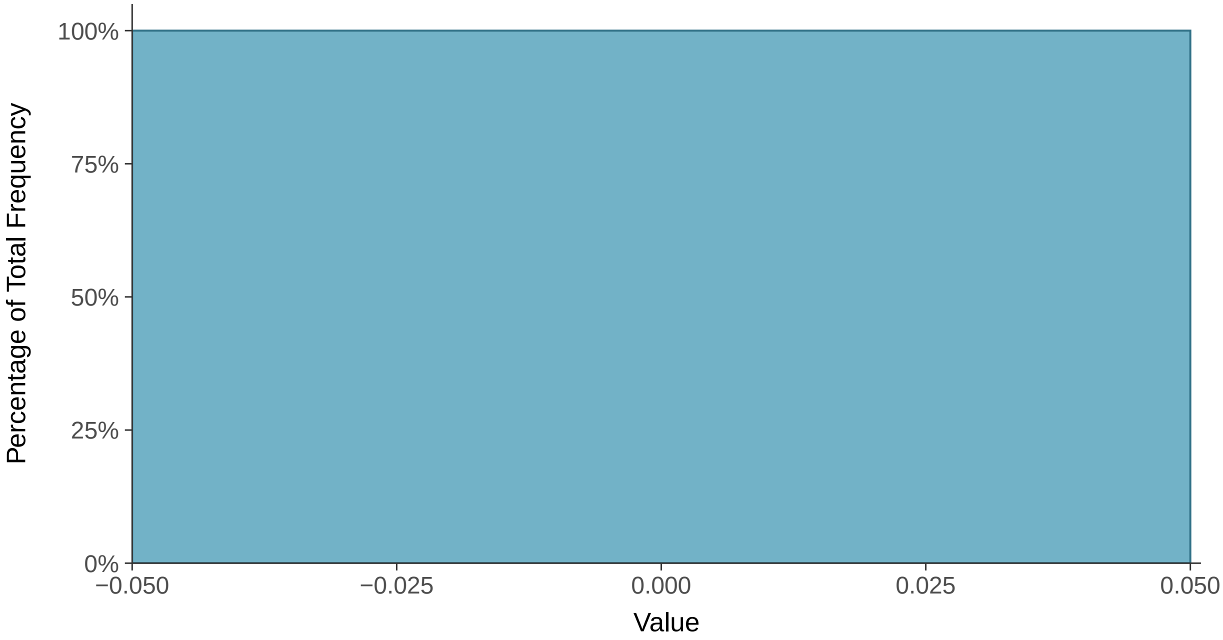
Scatter Plot

Chromium, MW-2 (mg/L)



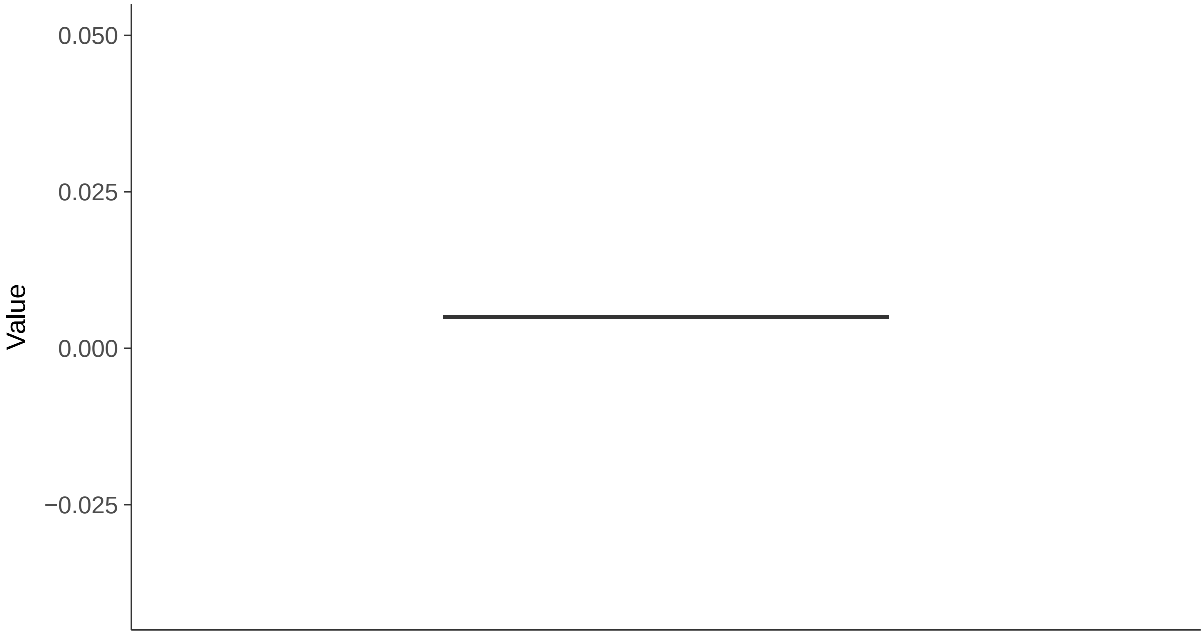
Histogram

Chromium, MW-2 (mg/L)



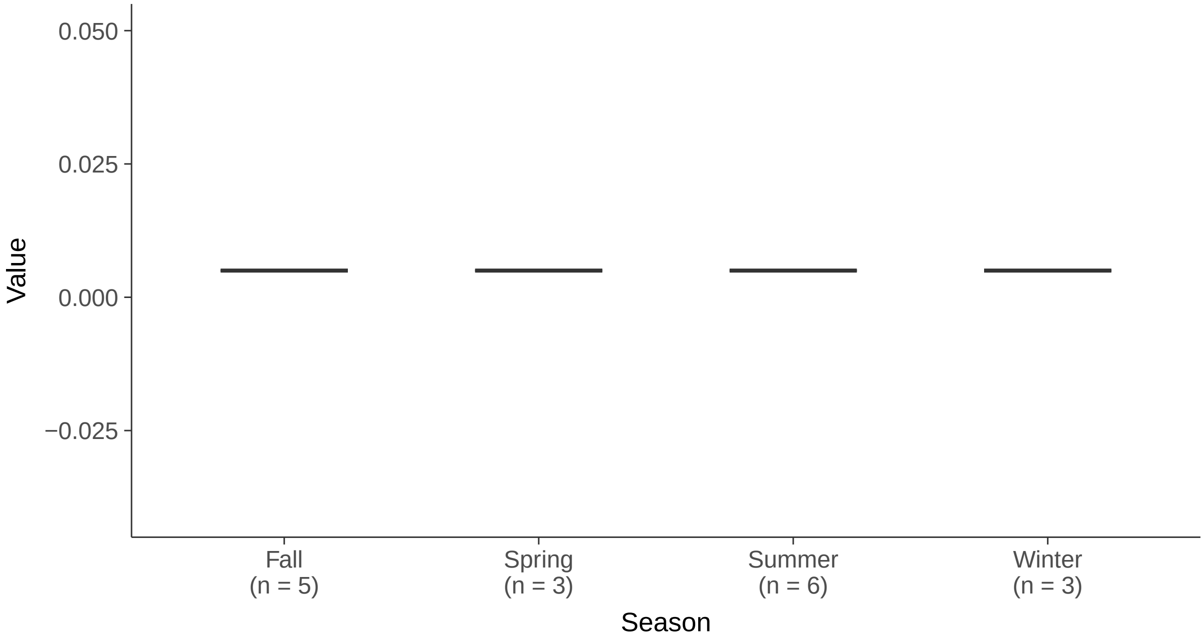
Boxplot

Chromium, MW-2 (mg/L)



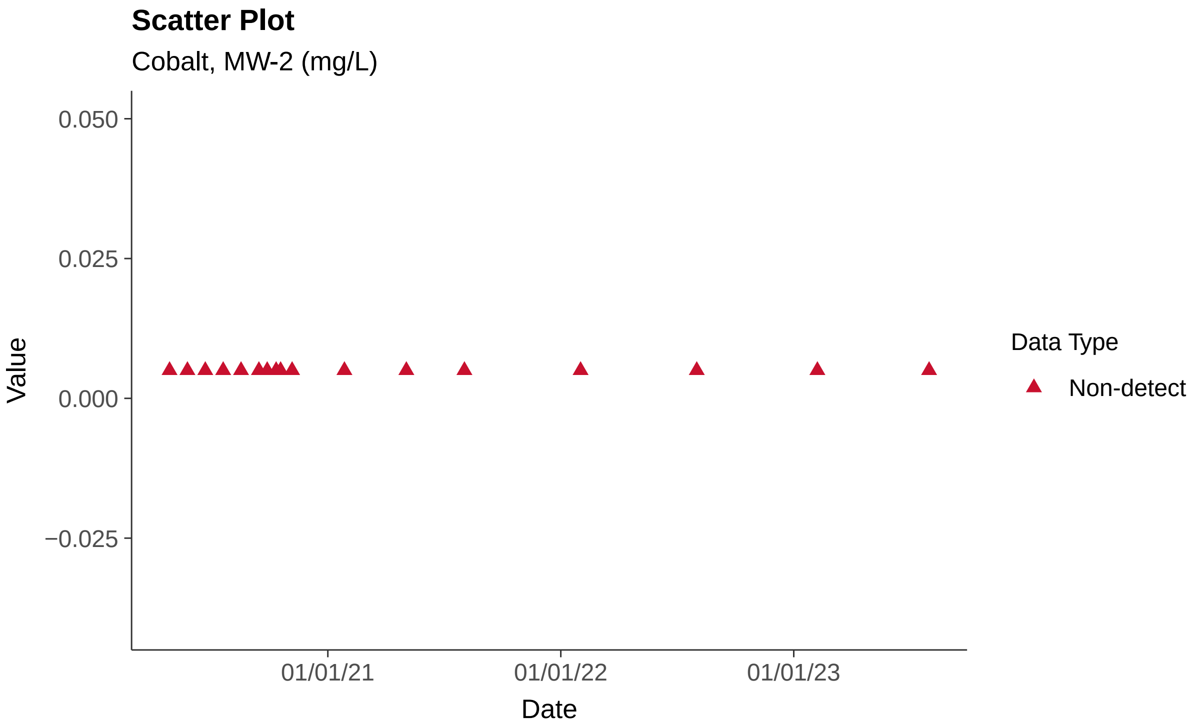
Boxplot by Season

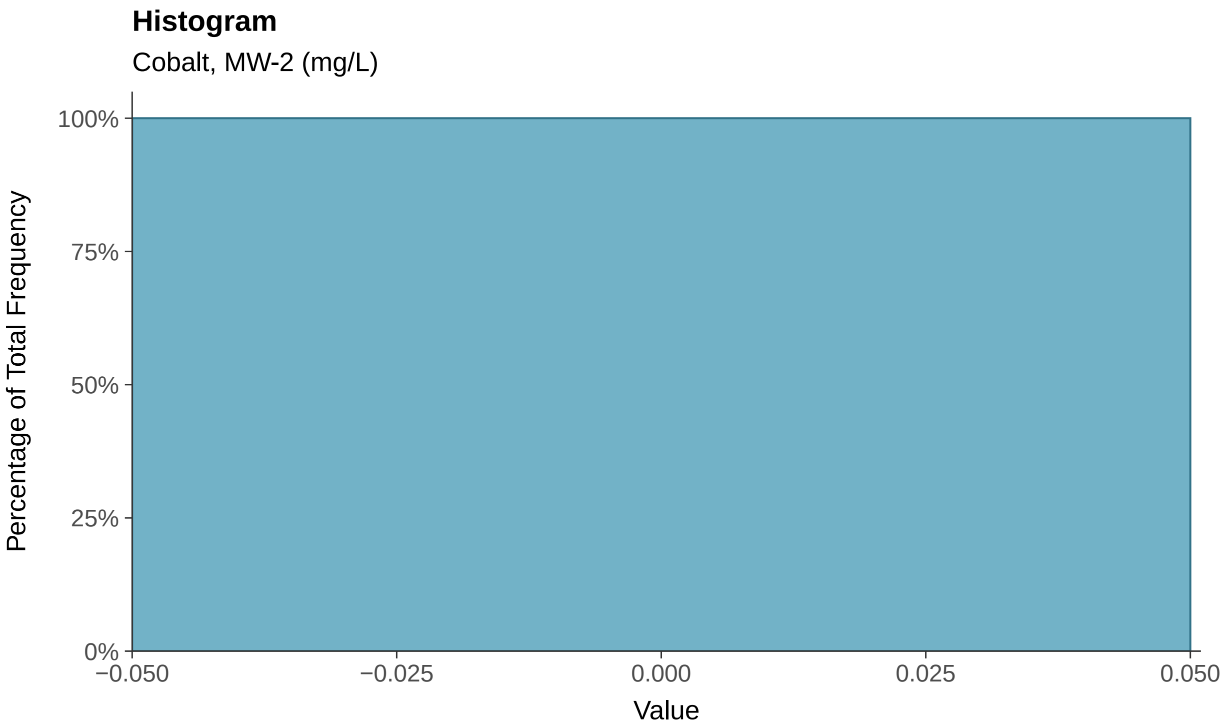
Chromium, MW-2 (mg/L)



Appendix IV: Cobalt, MW-2

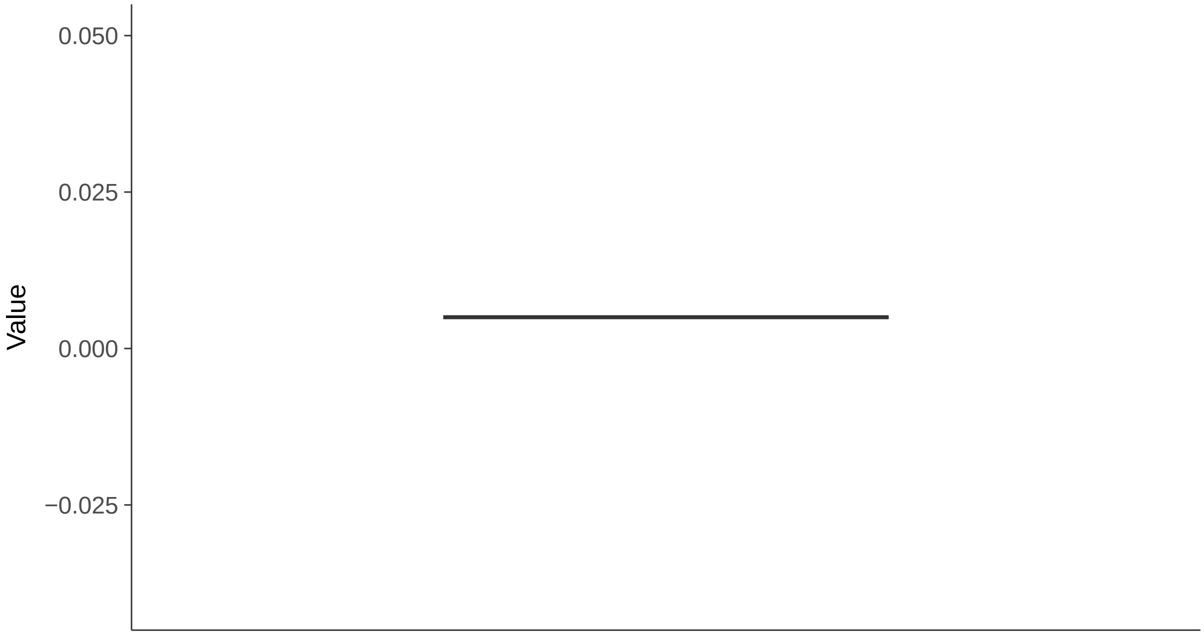
ID: 02_2_14





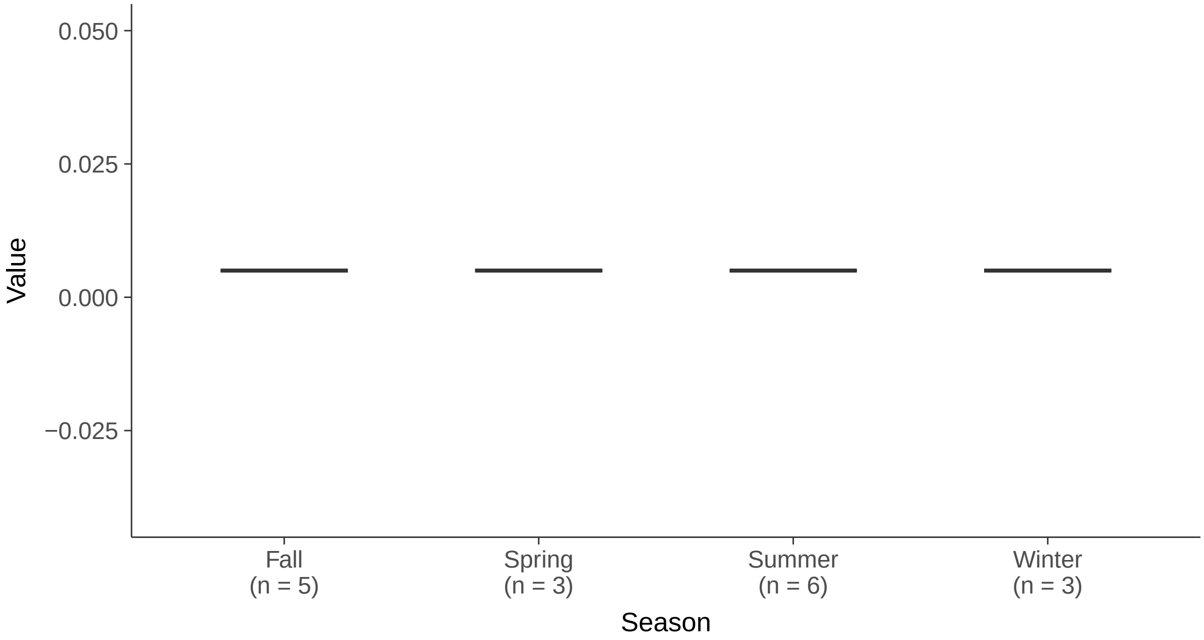
Boxplot

Cobalt, MW-2 (mg/L)



Boxplot by Season

Cobalt, MW-2 (mg/L)

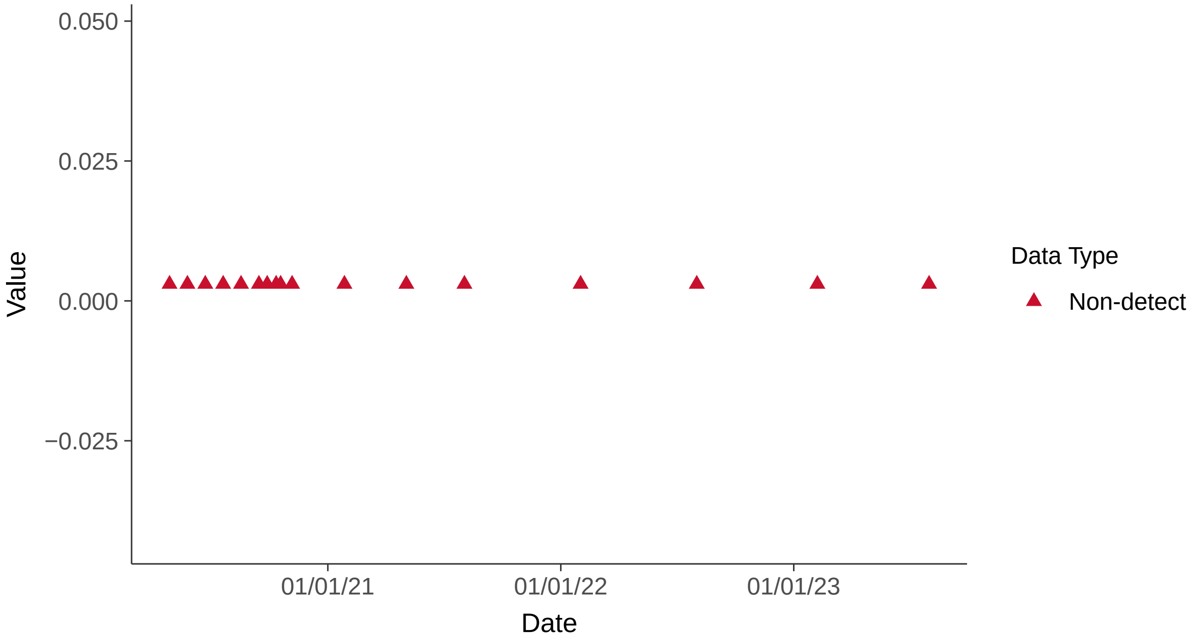


Appendix IV: Lead, MW-2

ID: 02_2_15

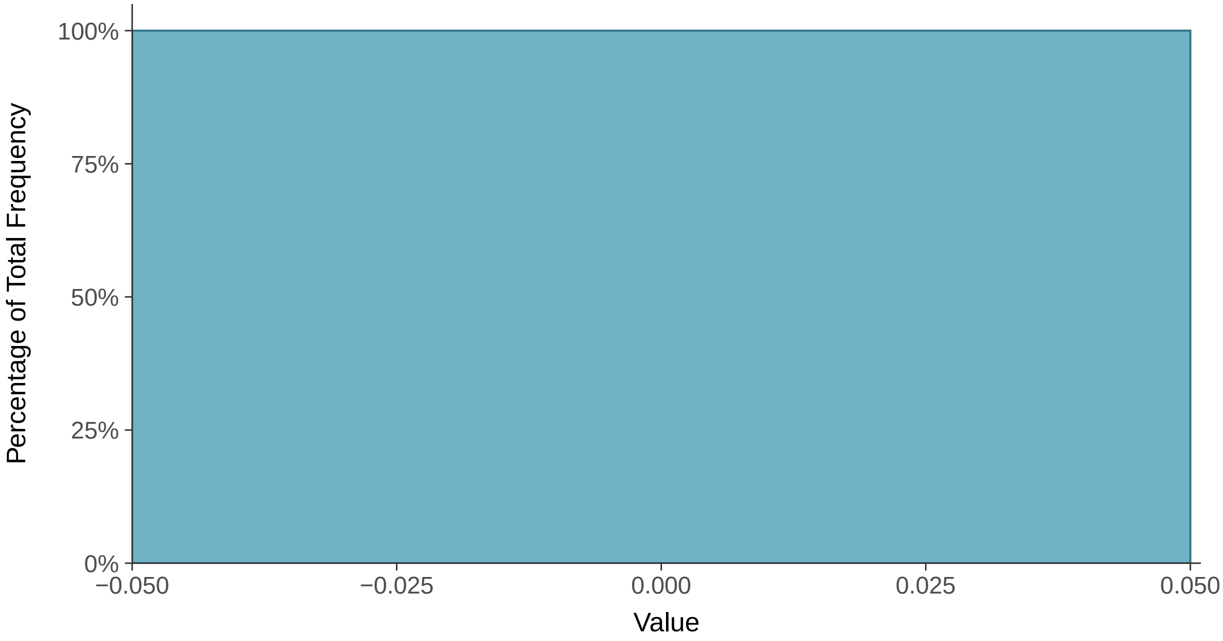
Scatter Plot

Lead, MW-2 (mg/L)



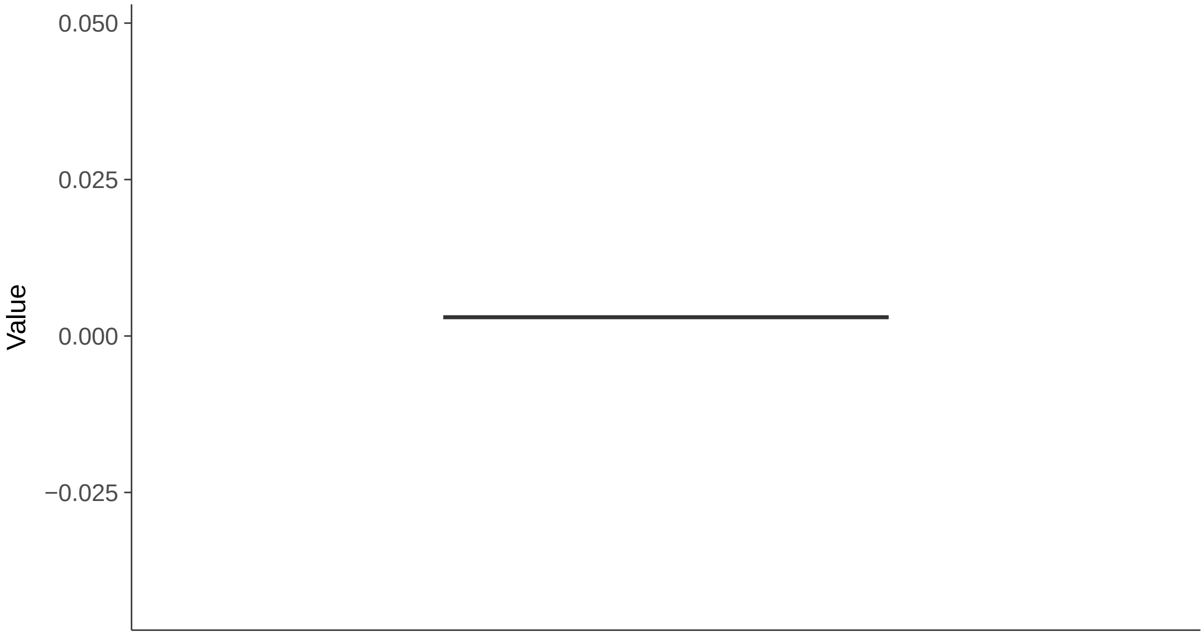
Histogram

Lead, MW-2 (mg/L)



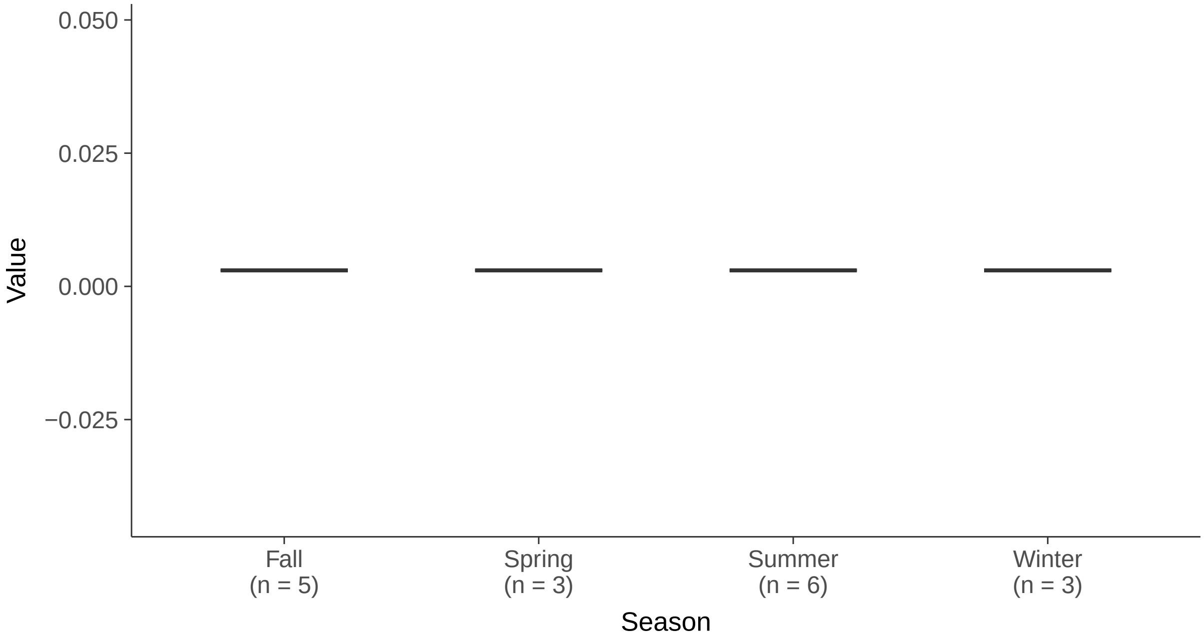
Boxplot

Lead, MW-2 (mg/L)



Boxplot by Season

Lead, MW-2 (mg/L)

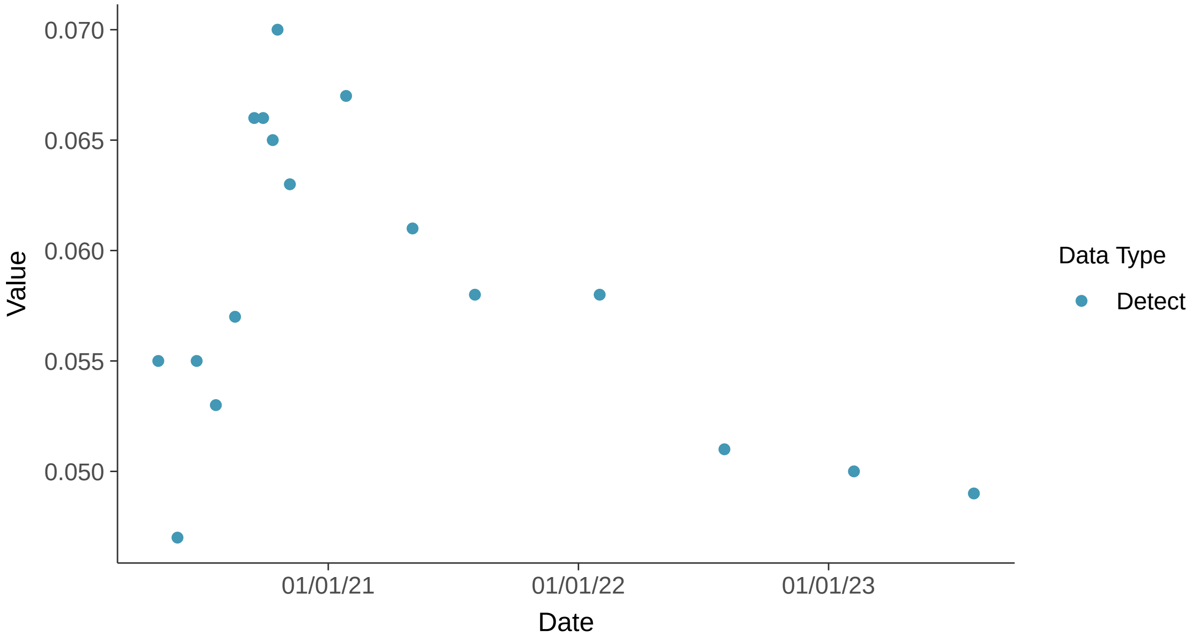


Appendix IV: Lithium, MW-2

ID: 02_2_16

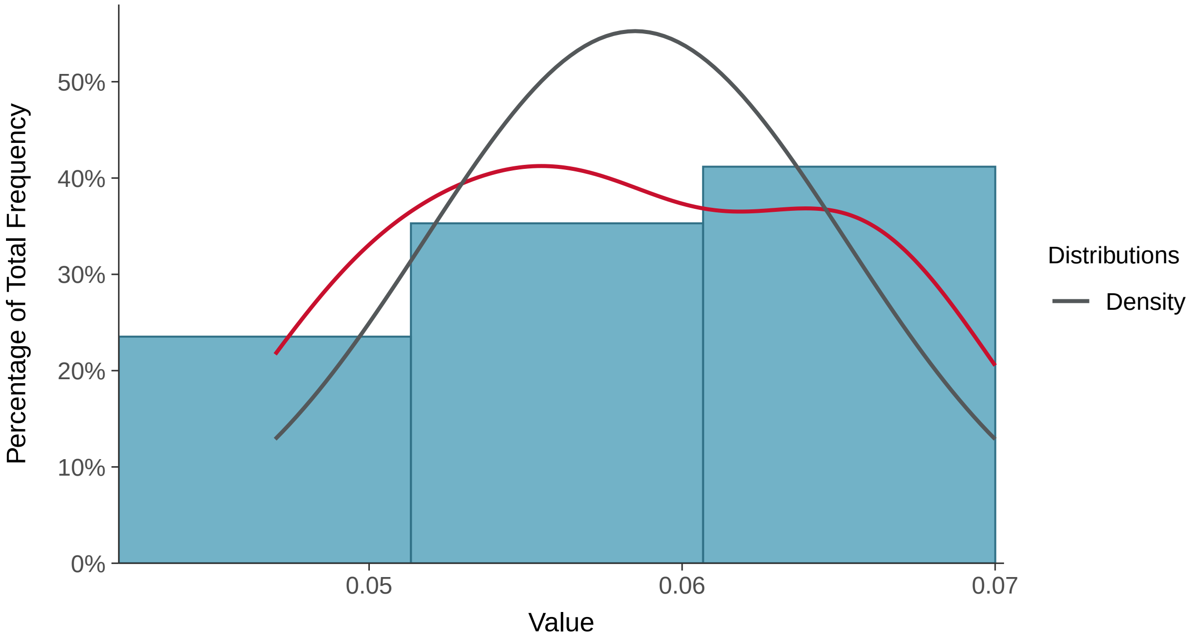
Scatter Plot

Lithium, MW-2 (mg/L)



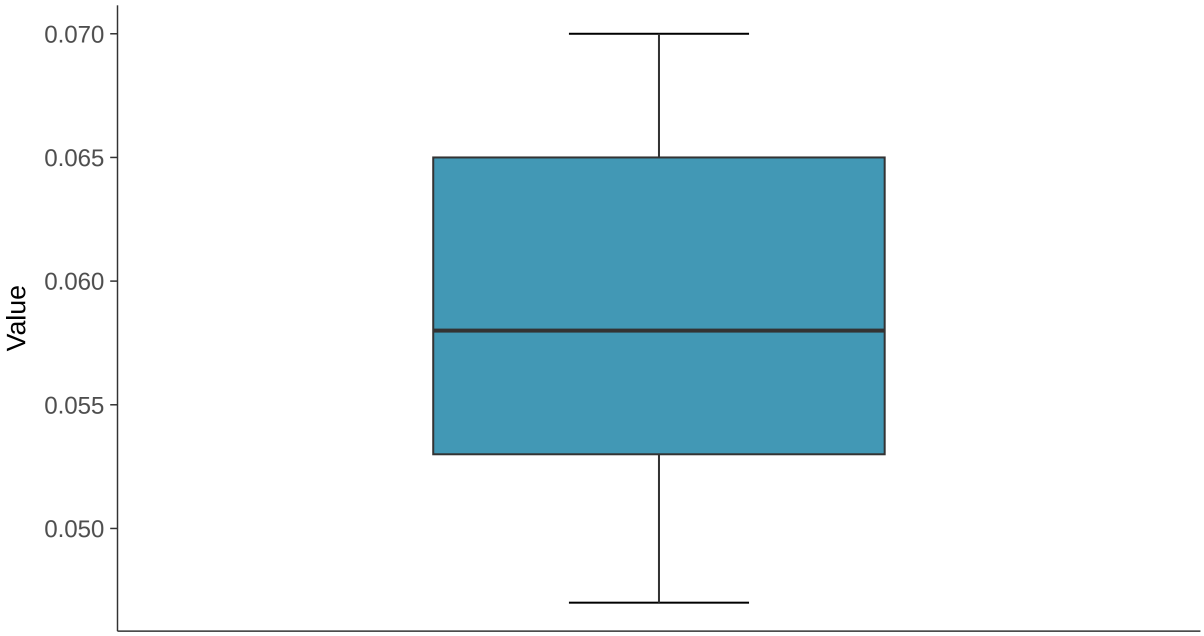
Histogram

Lithium, MW-2 (mg/L)



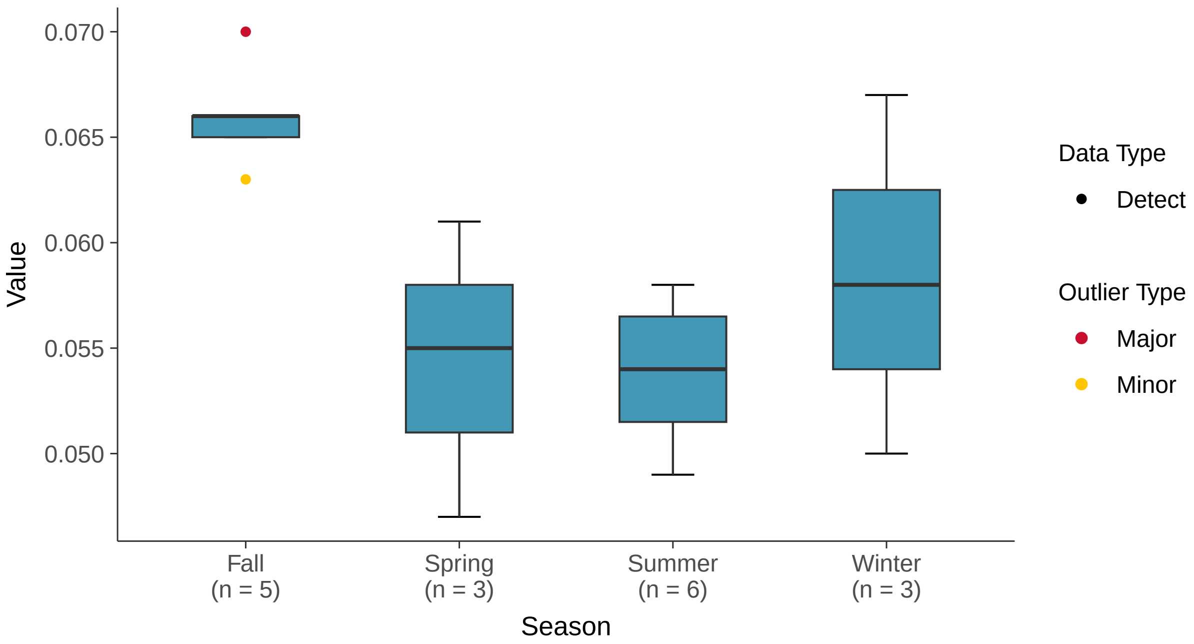
Boxplot

Lithium, MW-2 (mg/L)



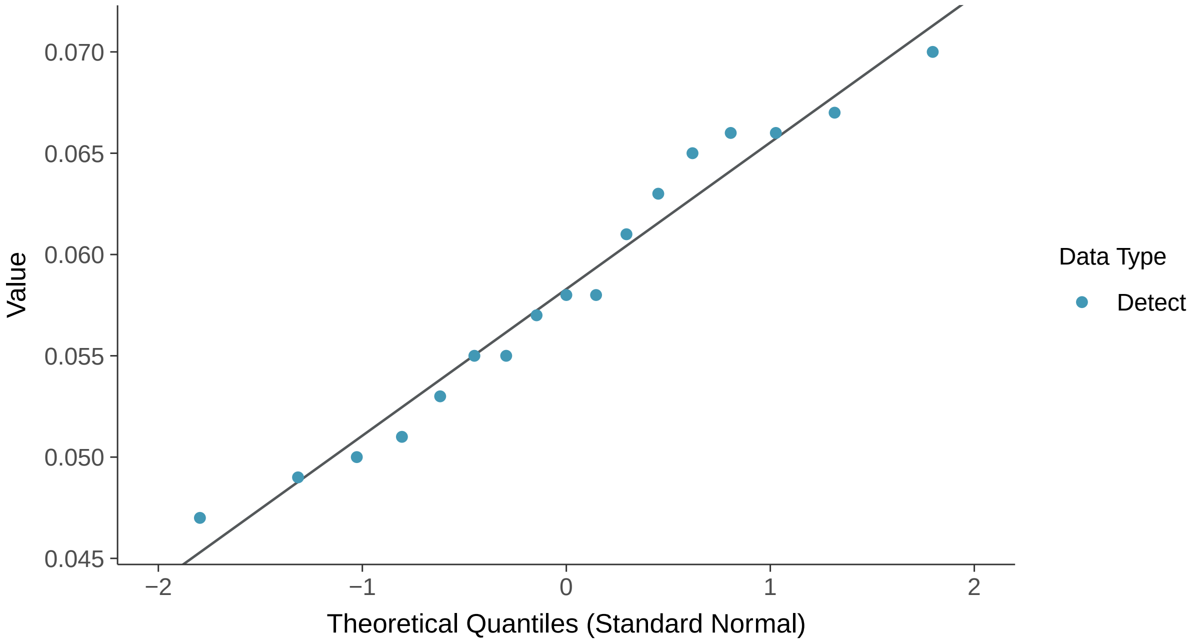
Boxplot by Season

Lithium, MW-2 (mg/L)



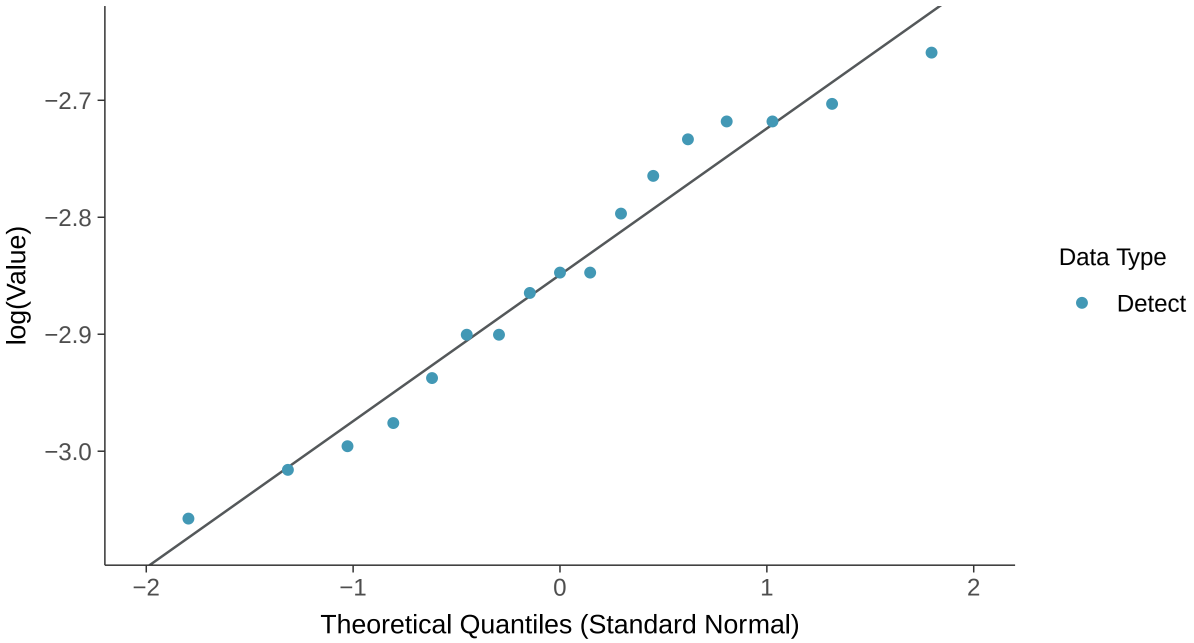
Normal Q-Q plot

Lithium, MW-2 (mg/L)



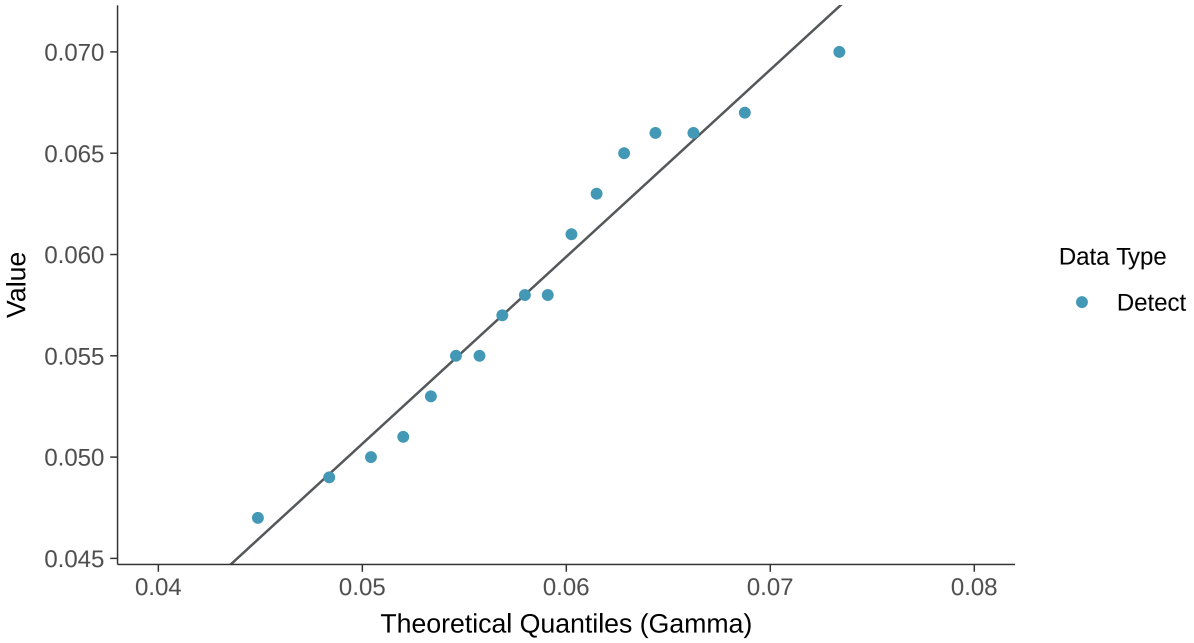
Lognormal Q-Q plot

Lithium, MW-2 (mg/L)



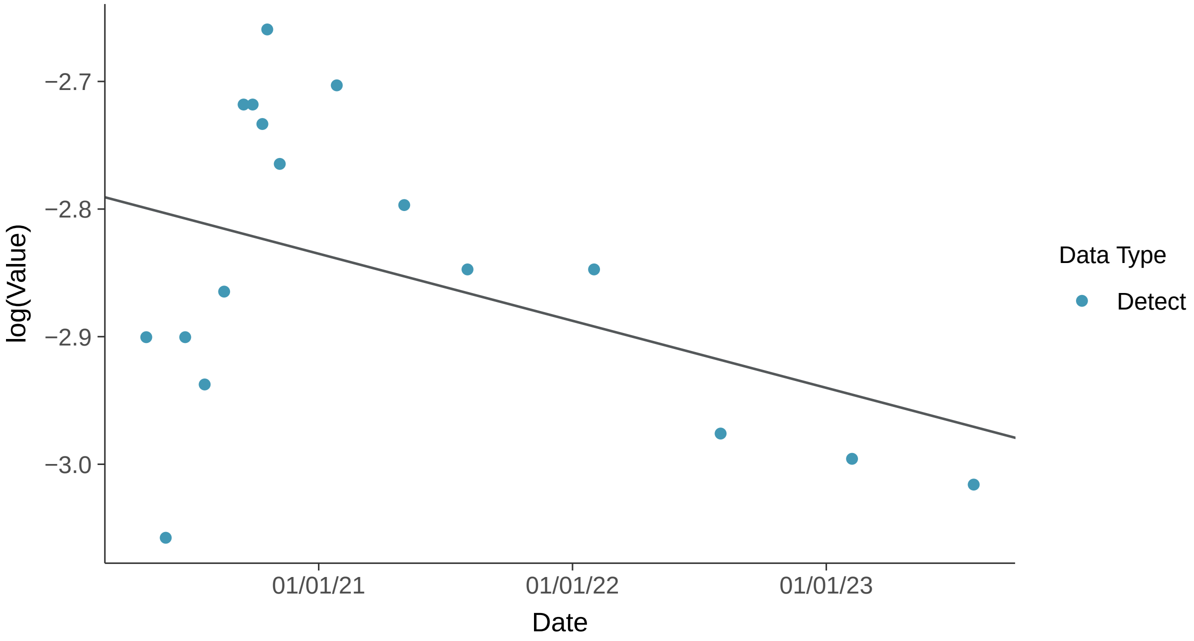
Gamma Q-Q plot

Lithium, MW-2 (mg/L)



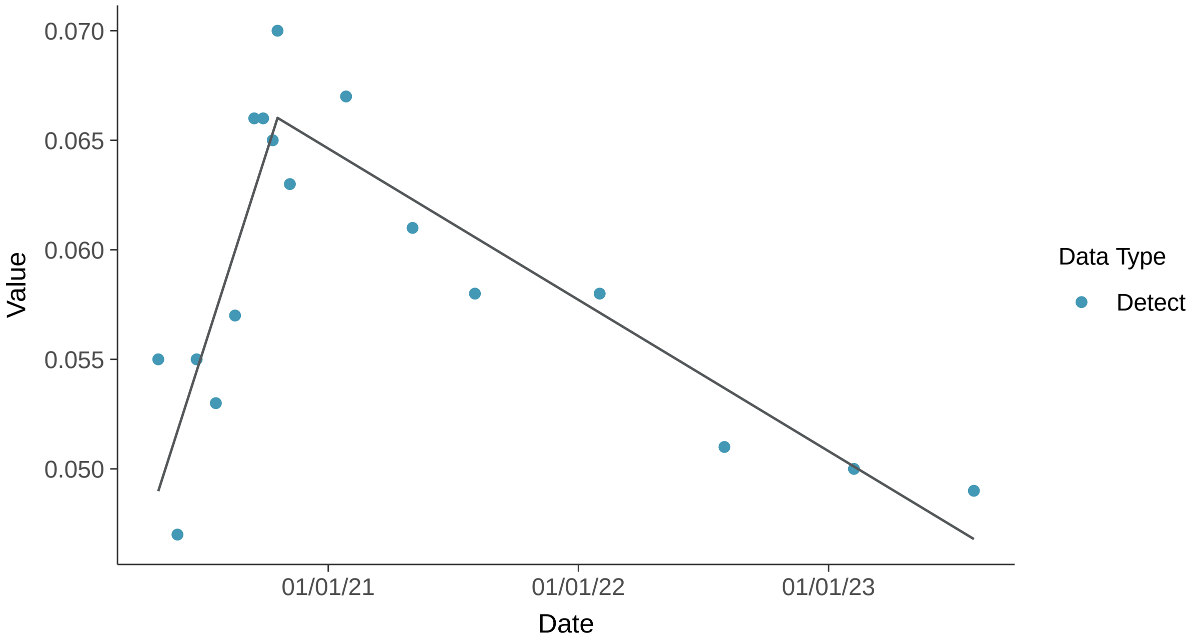
Trend Regression: Lognormal MLE

Lithium, MW-2 (mg/L)



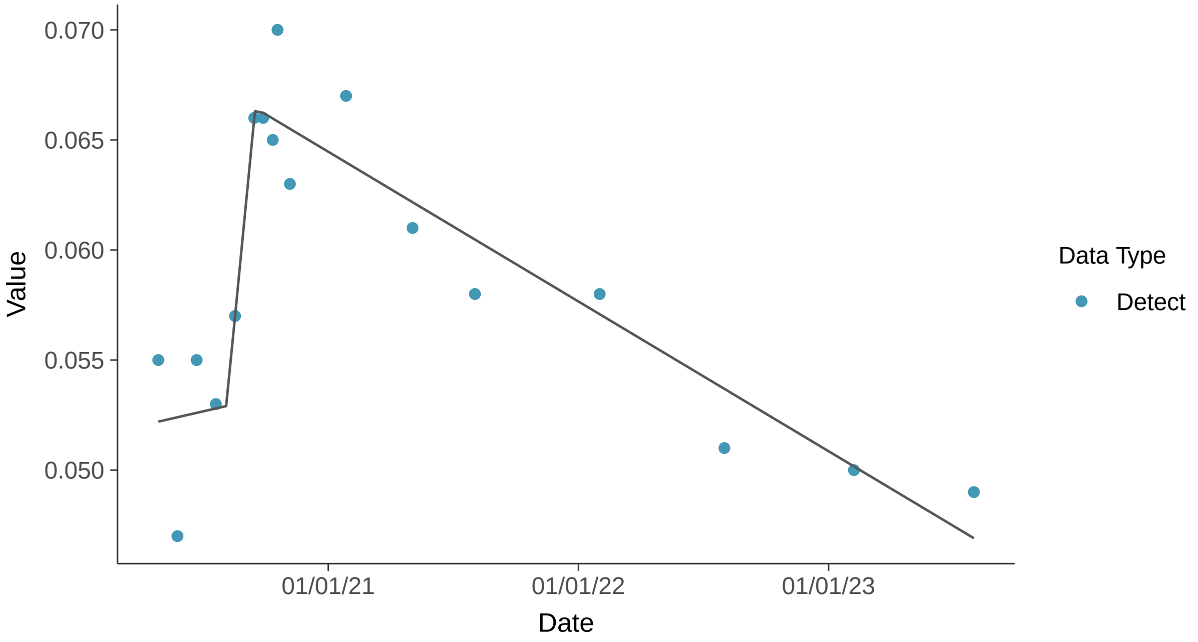
Trend Regression: Piecewise Linear-Linear

Lithium, MW-2 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Lithium, MW-2 (mg/L)

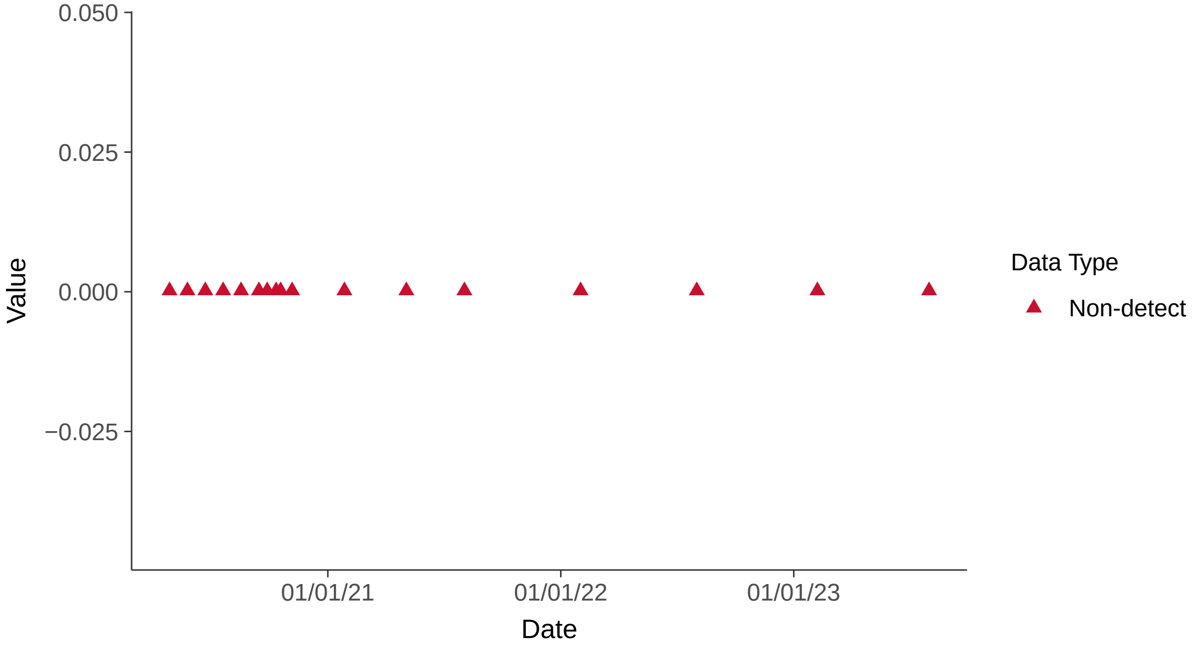


Appendix IV: Mercury, MW-2

ID: 02_2_17

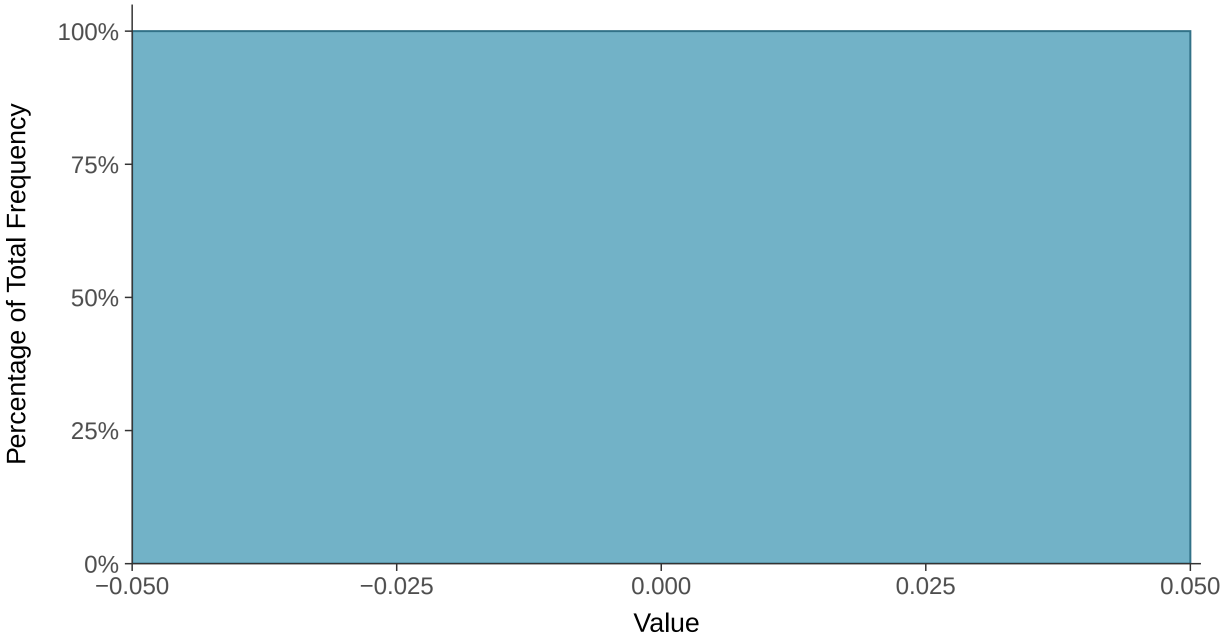
Scatter Plot

Mercury, MW-2 (mg/L)



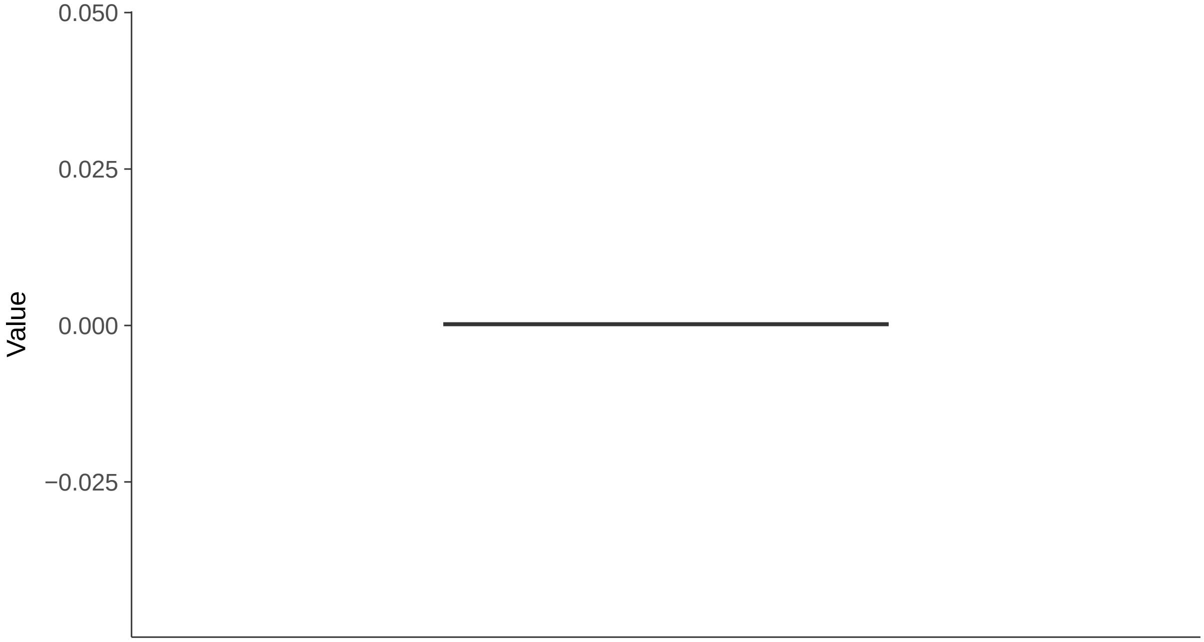
Histogram

Mercury, MW-2 (mg/L)



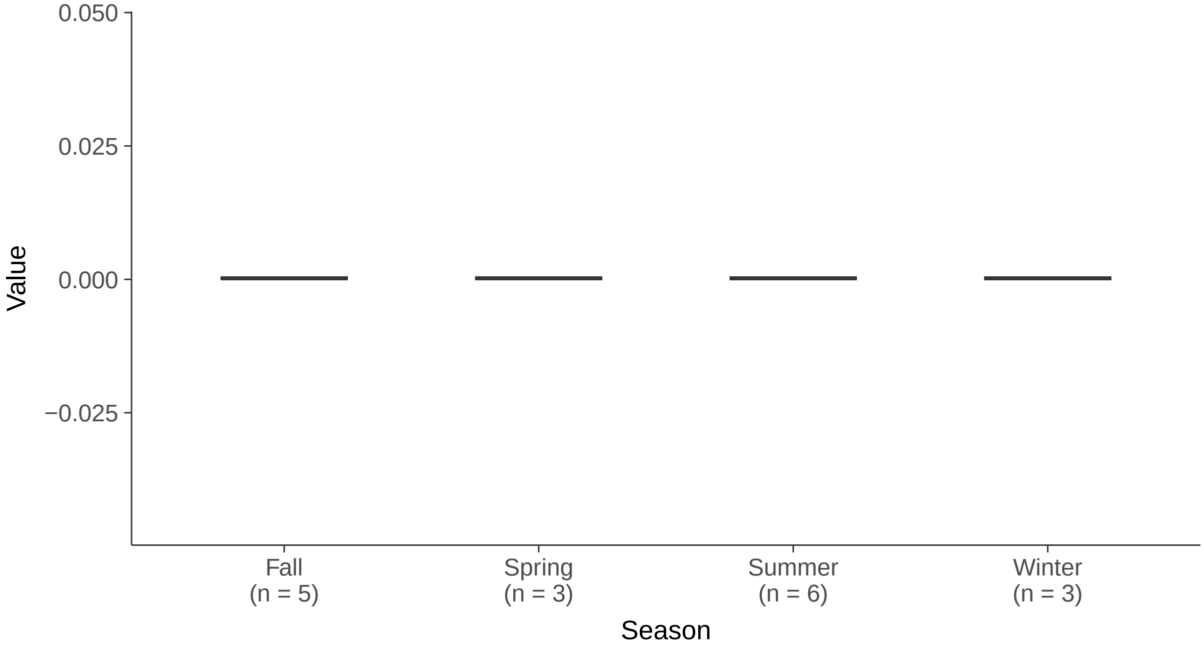
Boxplot

Mercury, MW-2 (mg/L)



Boxplot by Season

Mercury, MW-2 (mg/L)

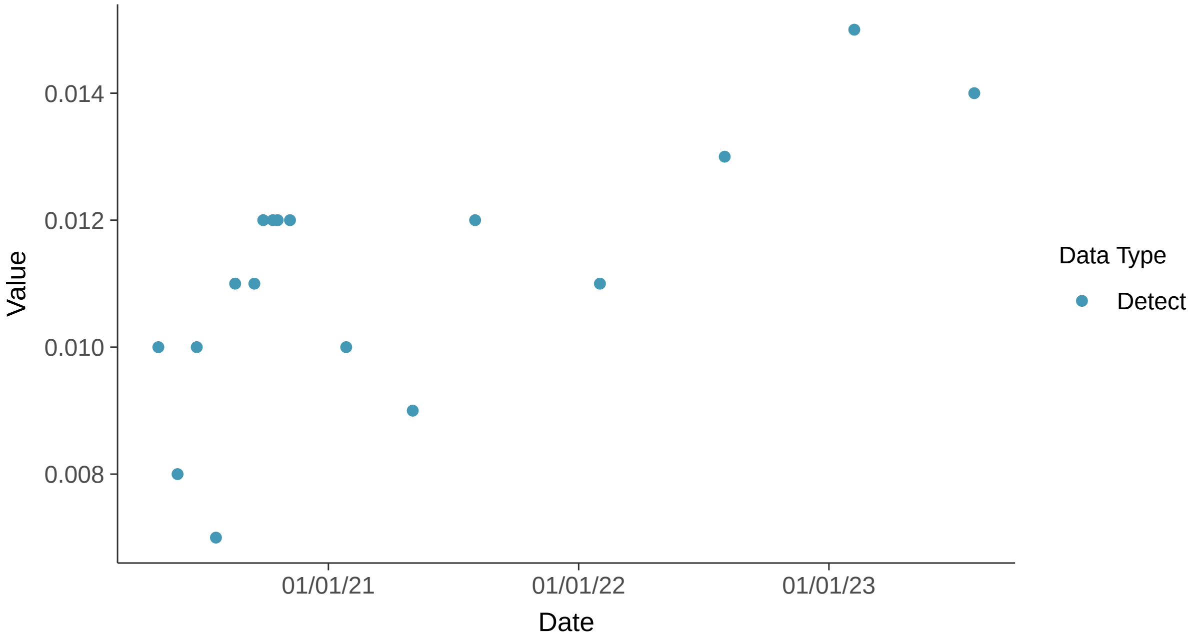


Appendix IV: Molybdenum, MW-2

ID: 02_2_18

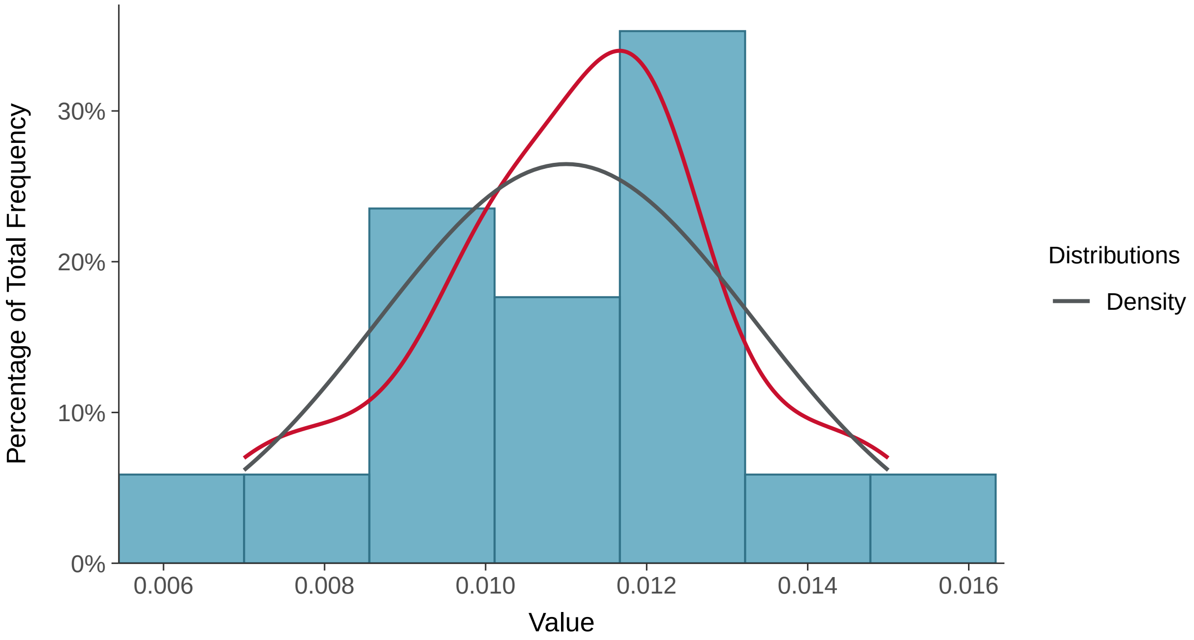
Scatter Plot

Molybdenum, MW-2 (mg/L)



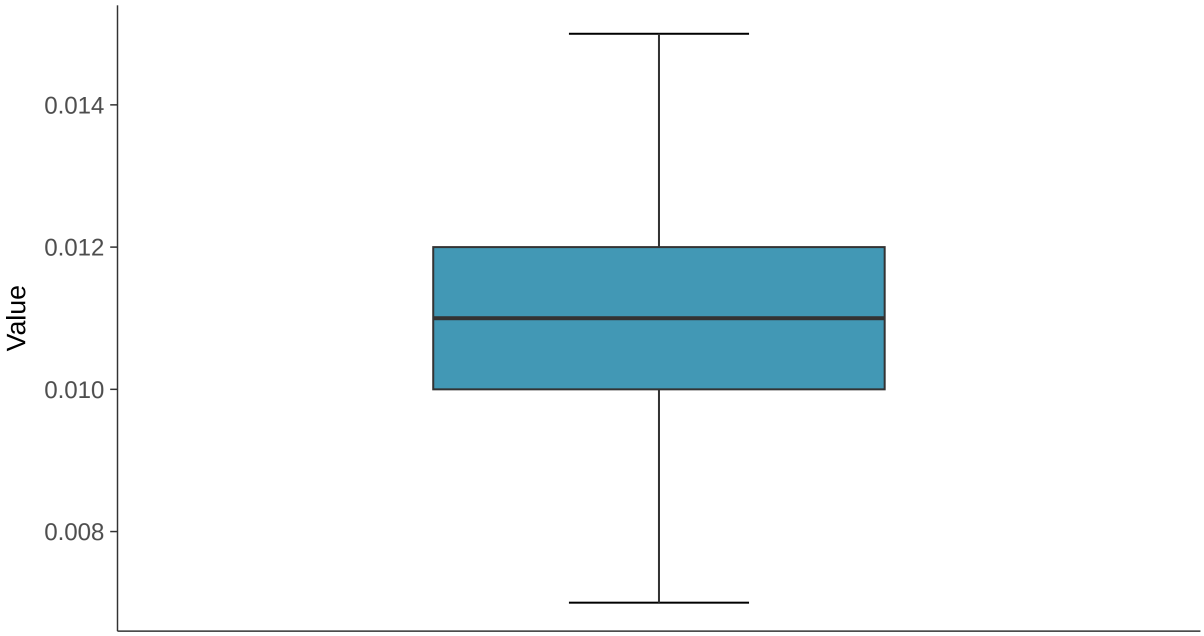
Histogram

Molybdenum, MW-2 (mg/L)



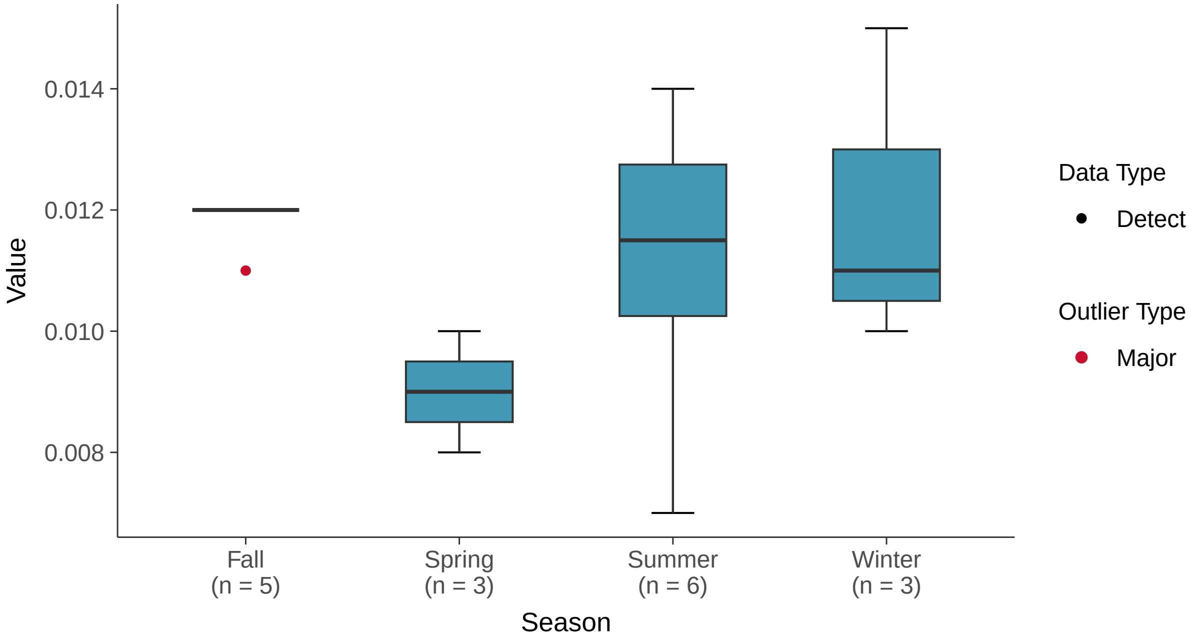
Boxplot

Molybdenum, MW-2 (mg/L)



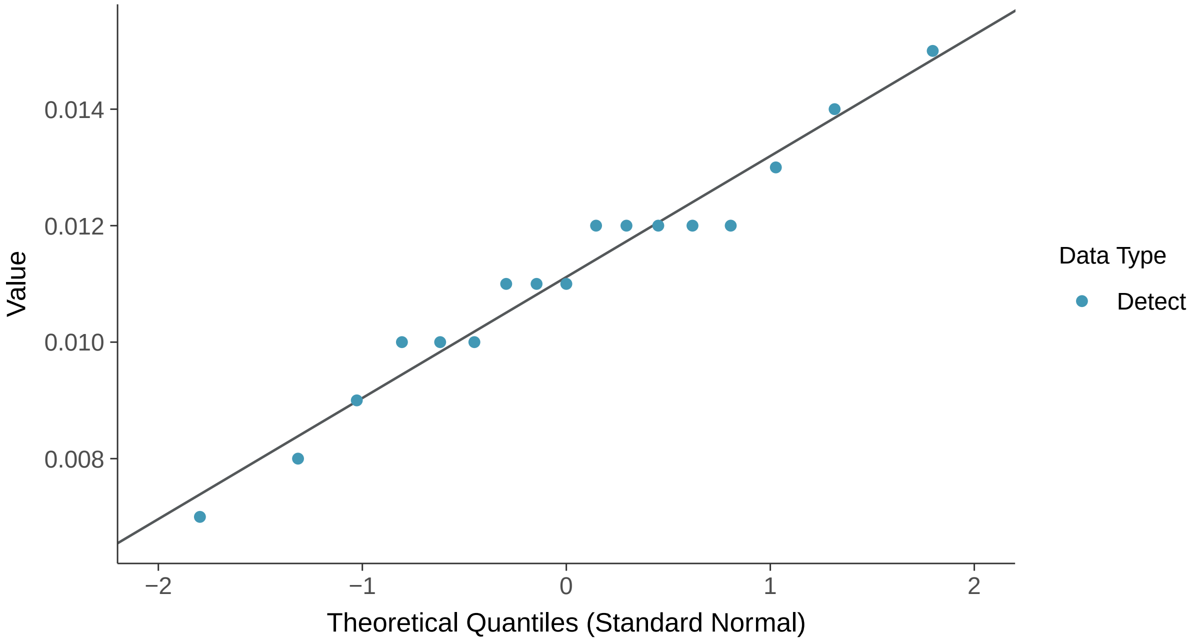
Boxplot by Season

Molybdenum, MW-2 (mg/L)



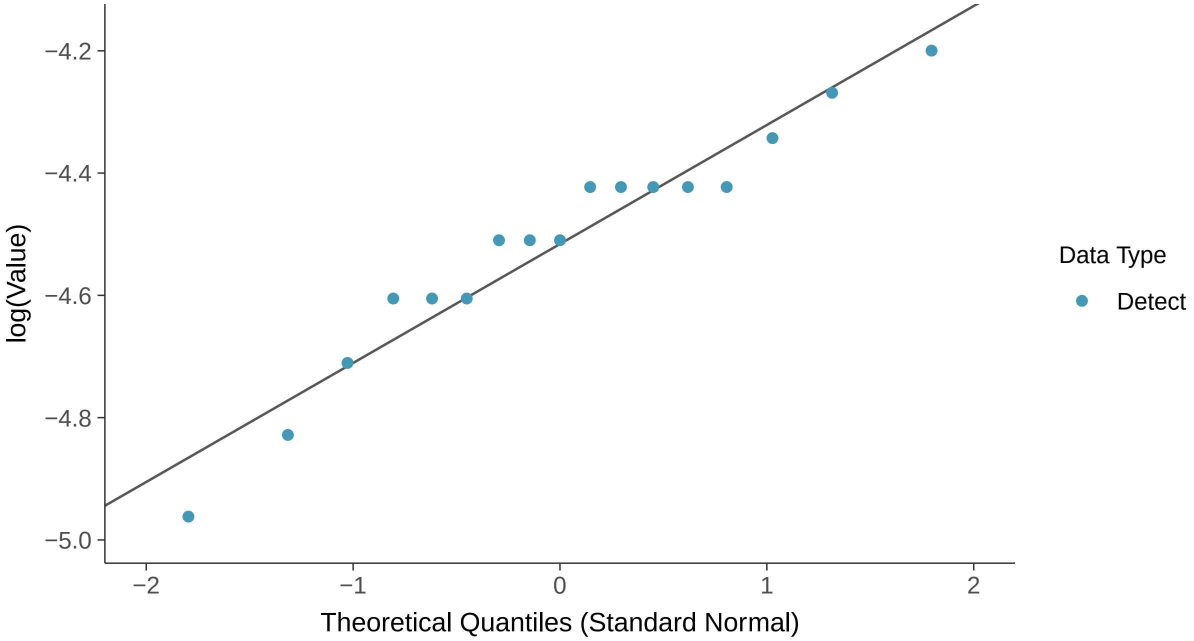
Normal Q-Q plot

Molybdenum, MW-2 (mg/L)



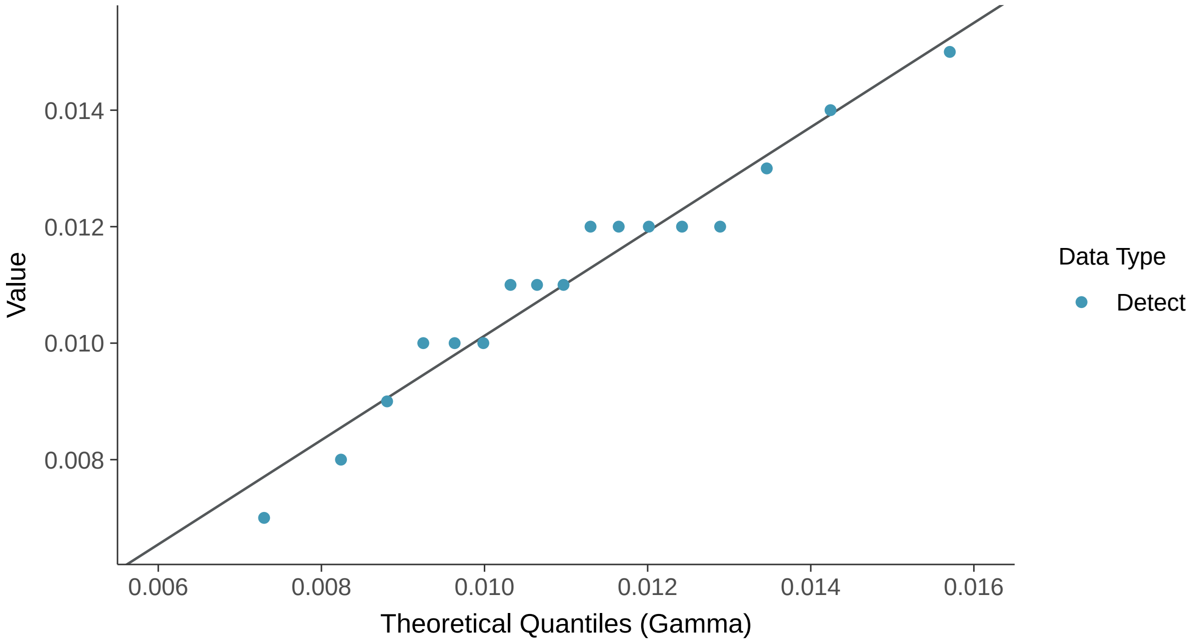
Lognormal Q-Q plot

Molybdenum, MW-2 (mg/L)



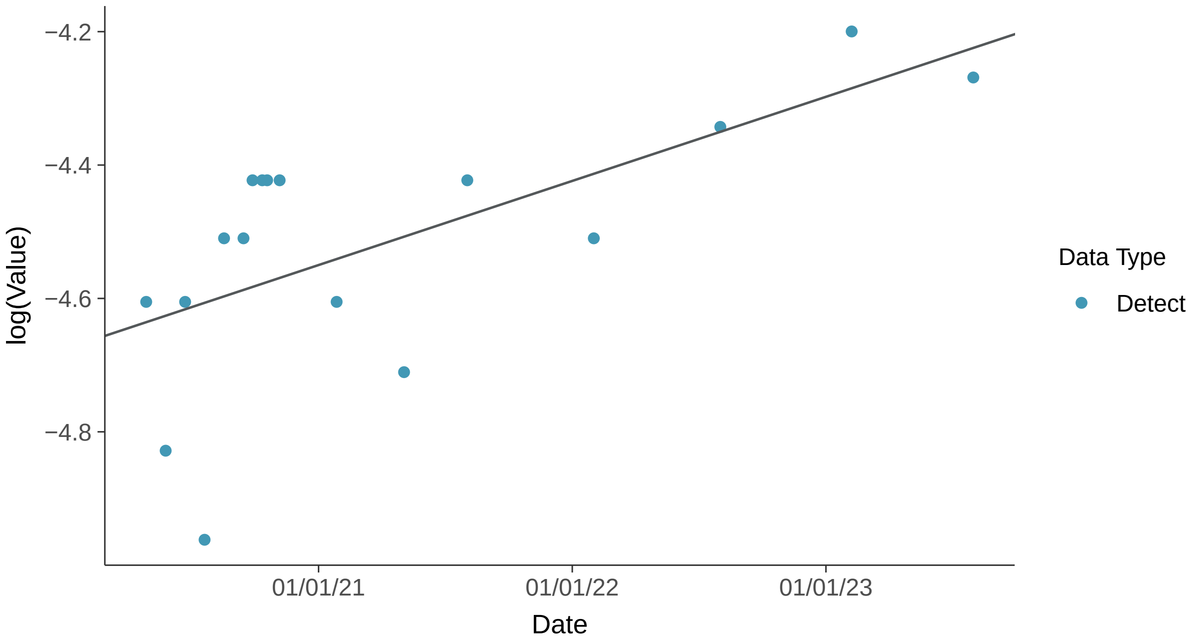
Gamma Q-Q plot

Molybdenum, MW-2 (mg/L)



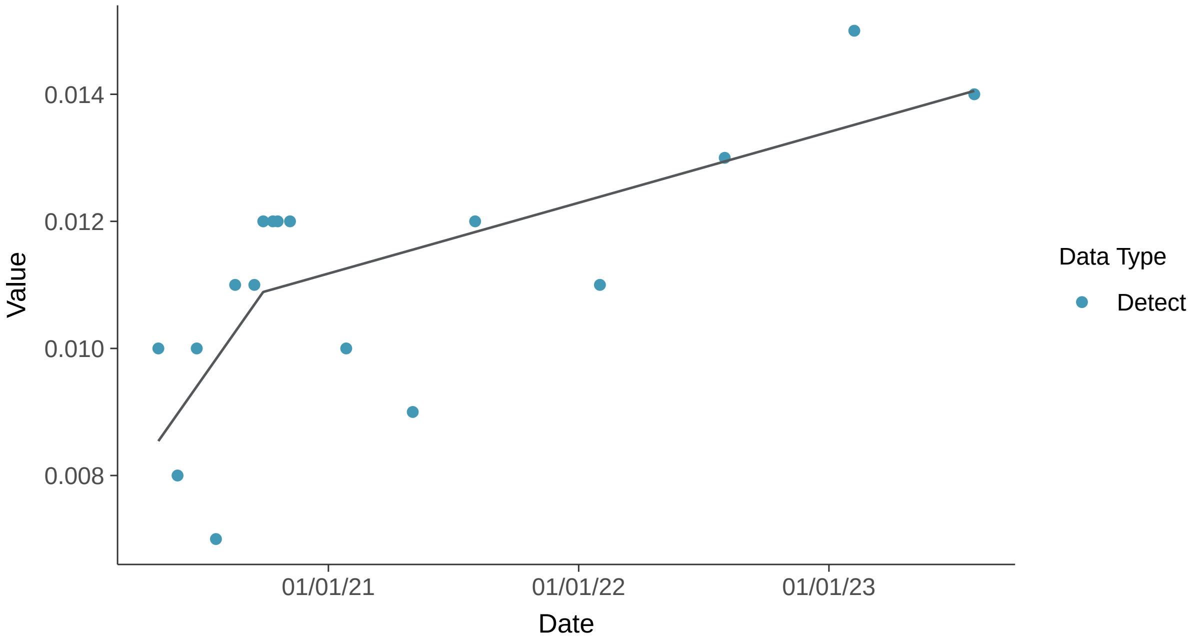
Trend Regression: Lognormal MLE

Molybdenum, MW-2 (mg/L)



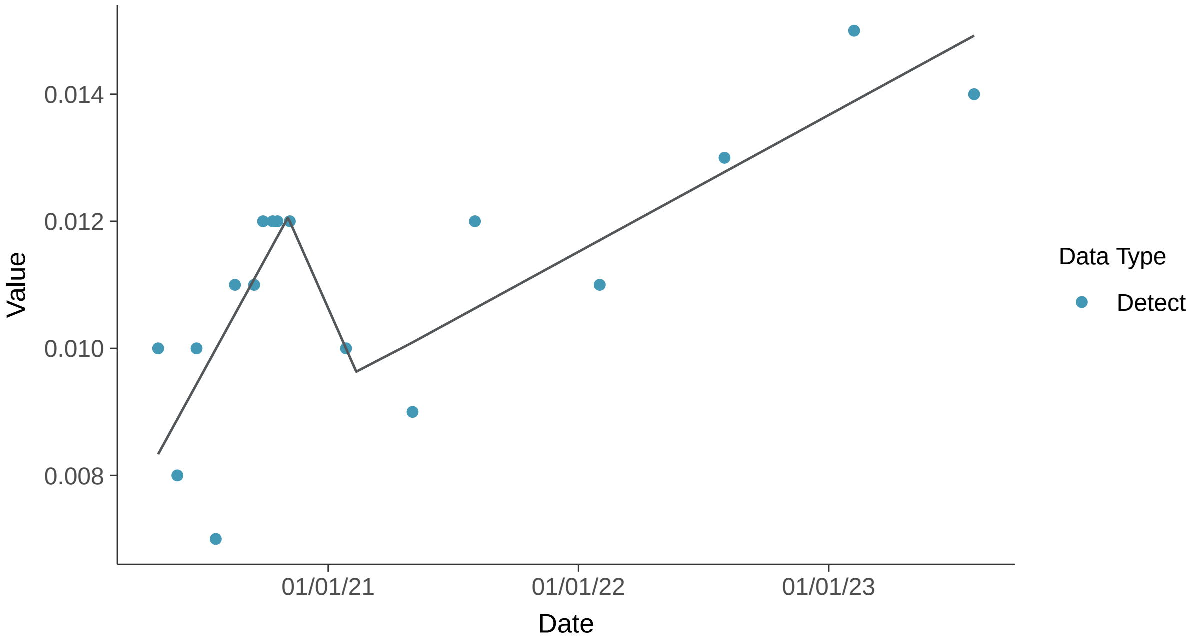
Trend Regression: Piecewise Linear-Linear

Molybdenum, MW-2 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Molybdenum, MW-2 (mg/L)

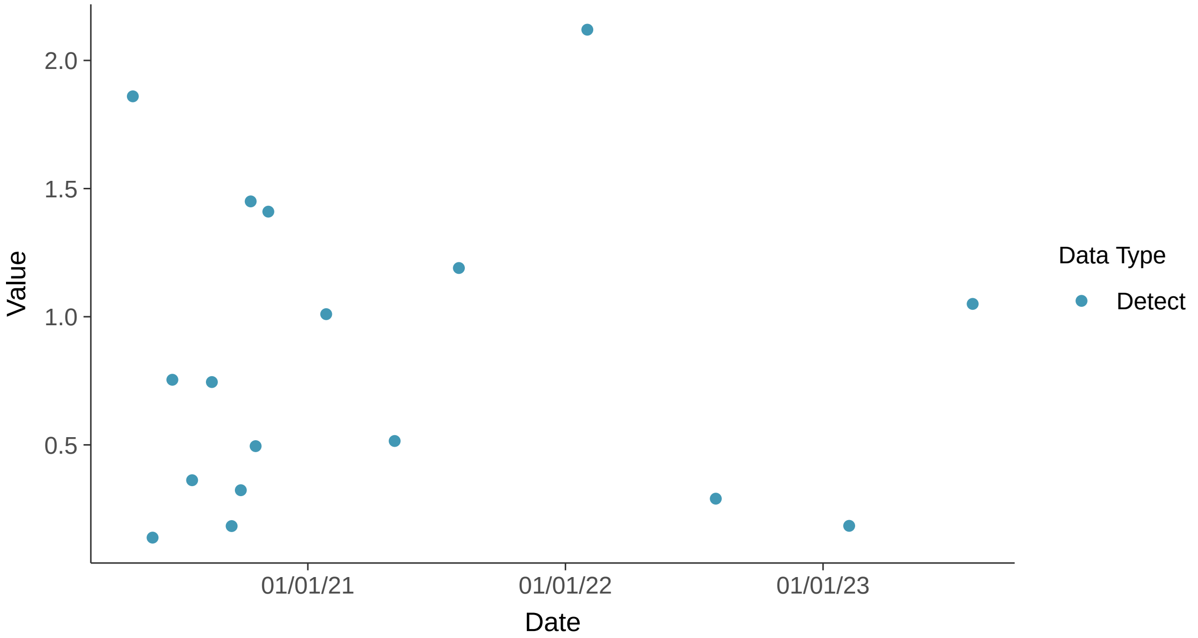


Appendix IV: Radium-226/228, MW-2

ID: 02_2_20

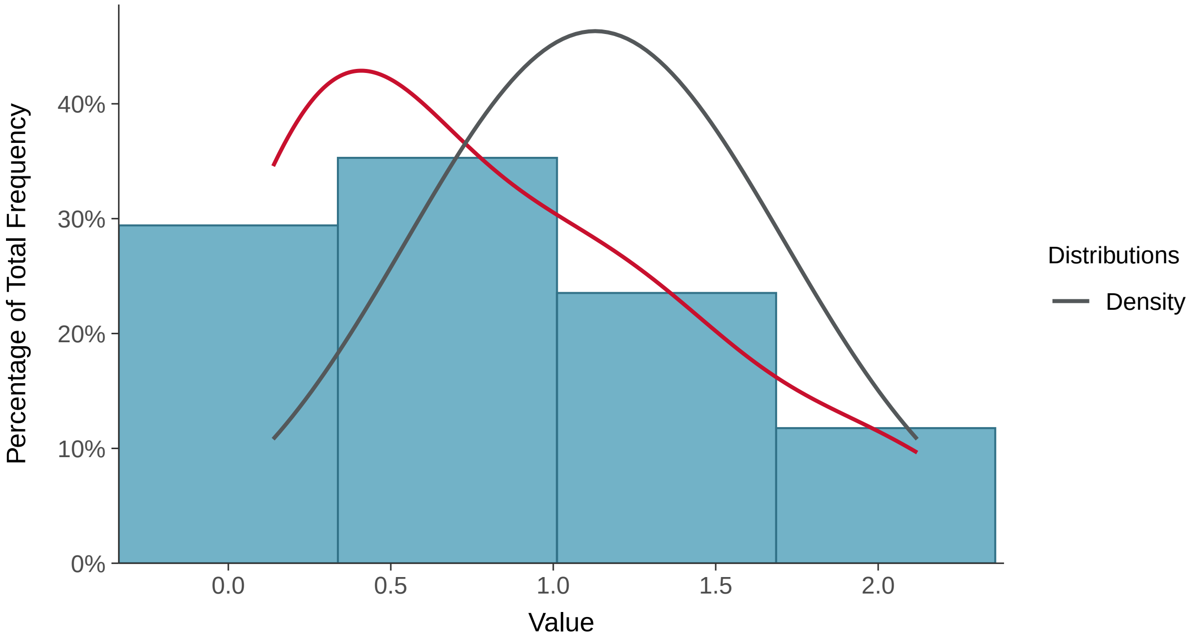
Scatter Plot

Radium-226/228, MW-2 (pCi/L)



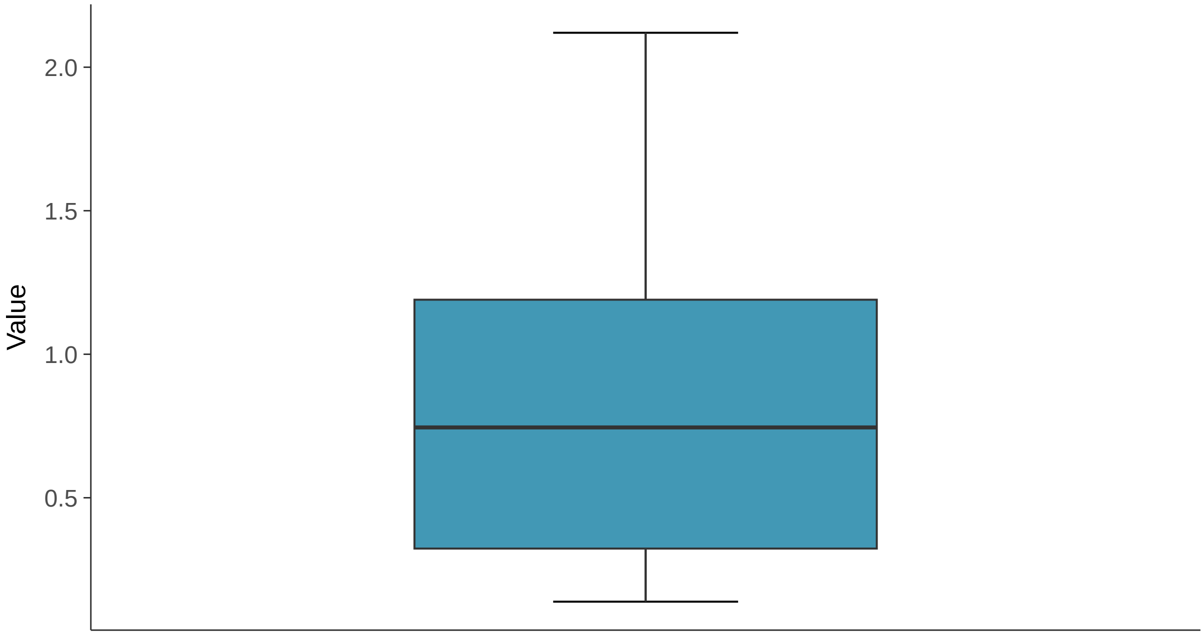
Histogram

Radium-226/228, MW-2 (pCi/L)



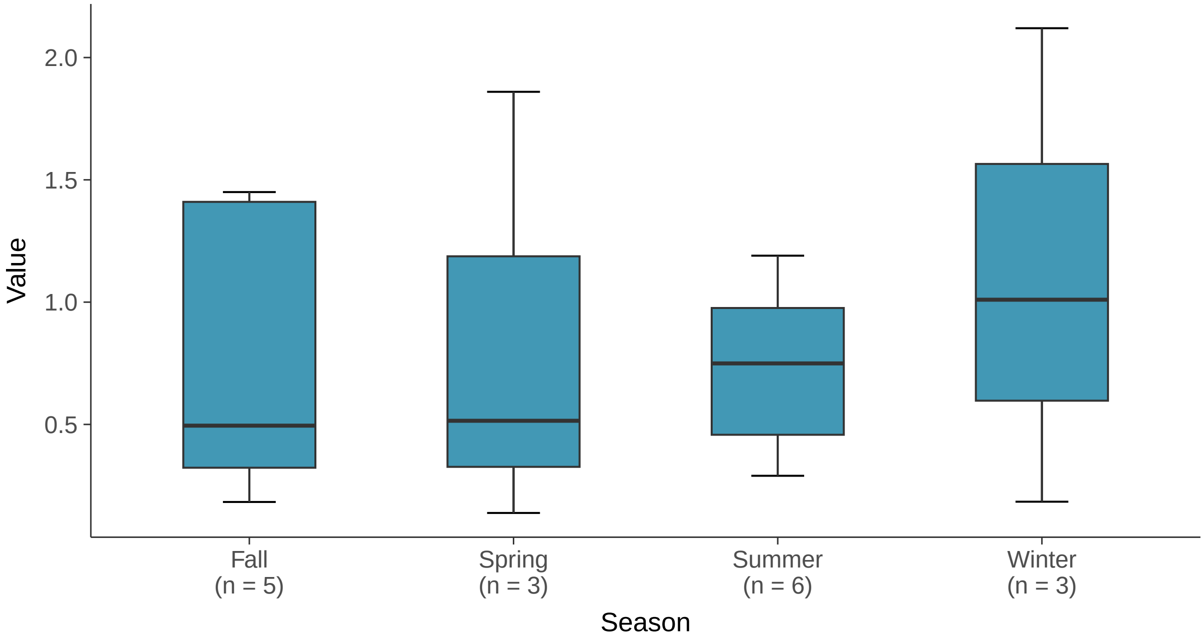
Boxplot

Radium-226/228, MW-2 (pCi/L)



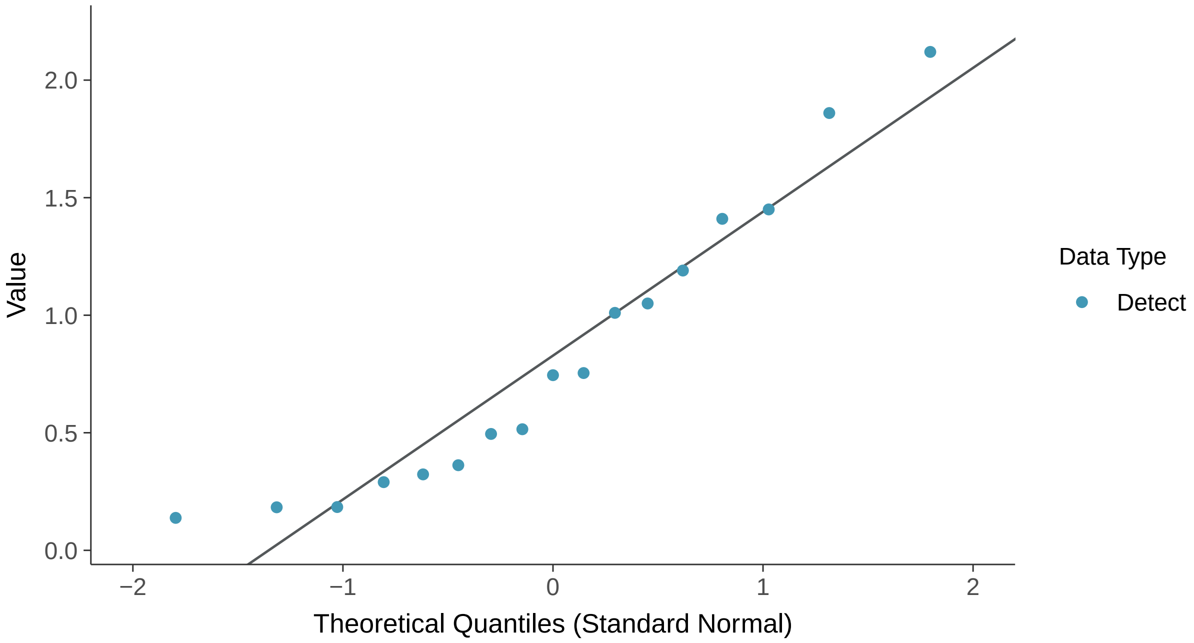
Boxplot by Season

Radium-226/228, MW-2 (pCi/L)



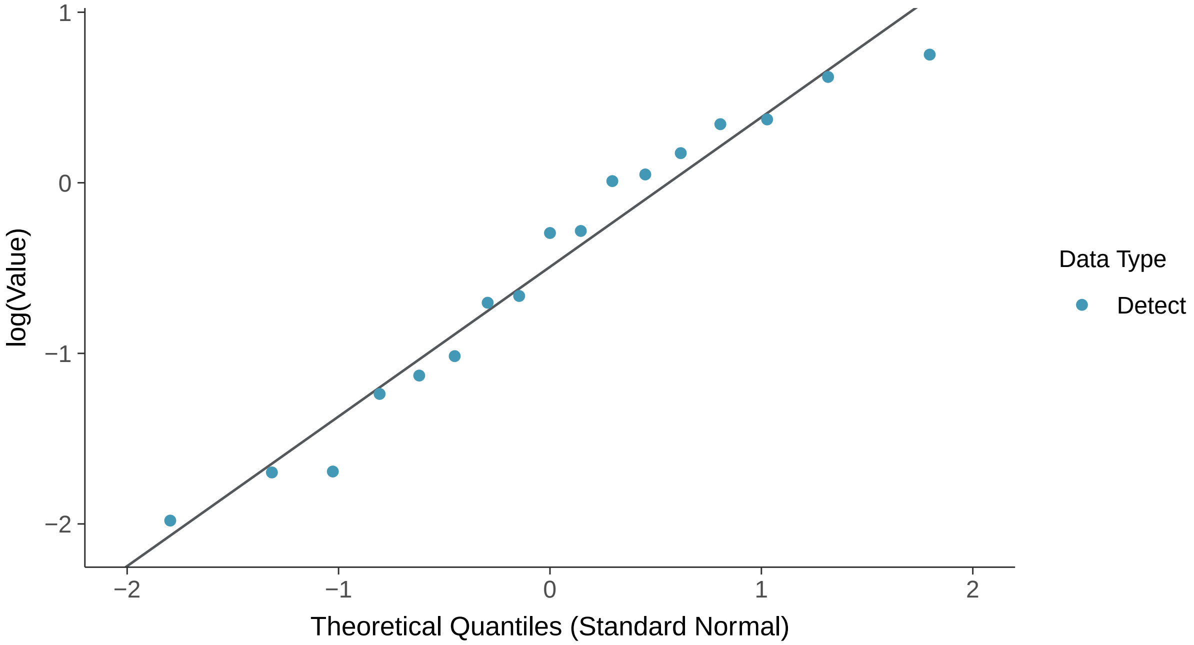
Normal Q-Q plot

Radium-226/228, MW-2 (pCi/L)



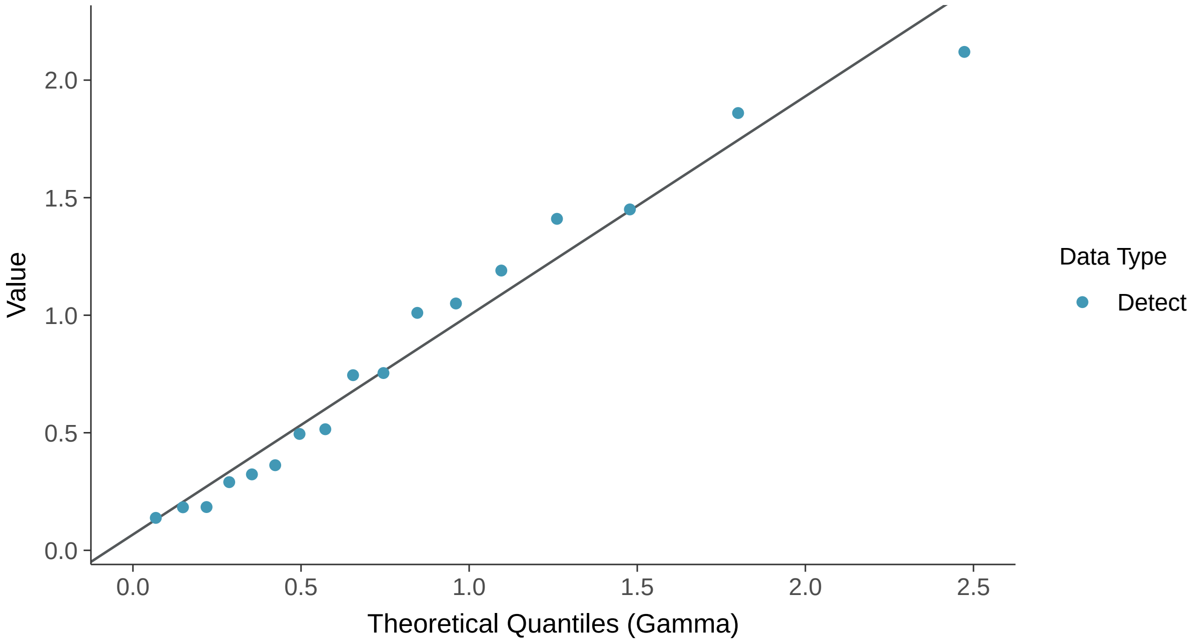
Lognormal Q-Q plot

Radium-226/228, MW-2 (pCi/L)



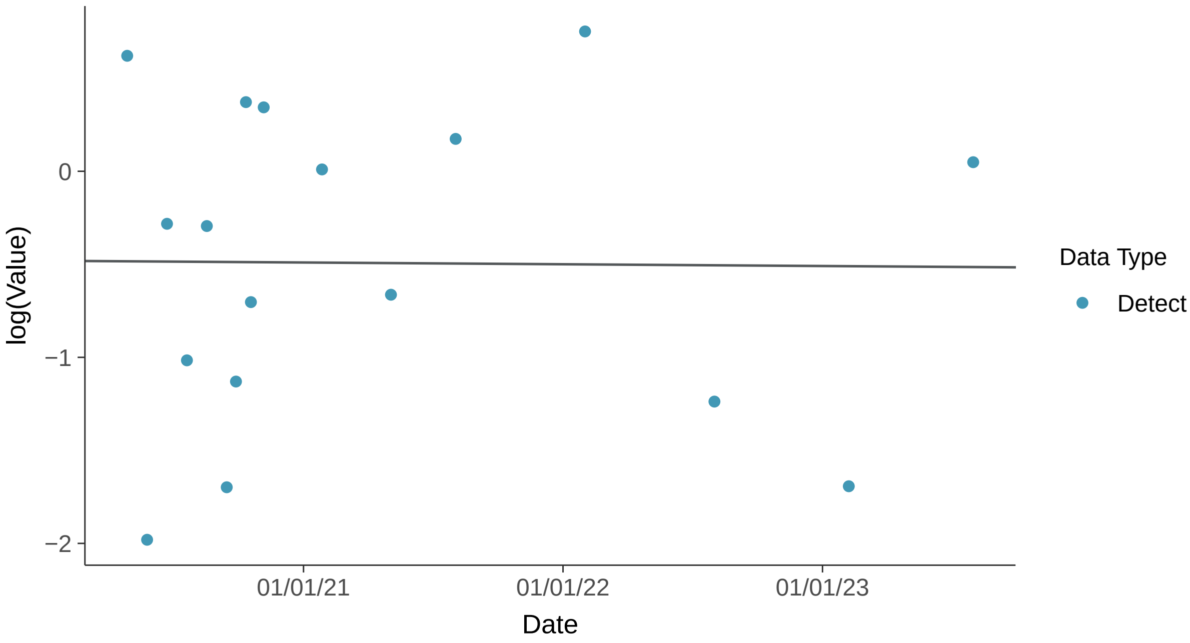
Gamma Q-Q plot

Radium-226/228, MW-2 (pCi/L)



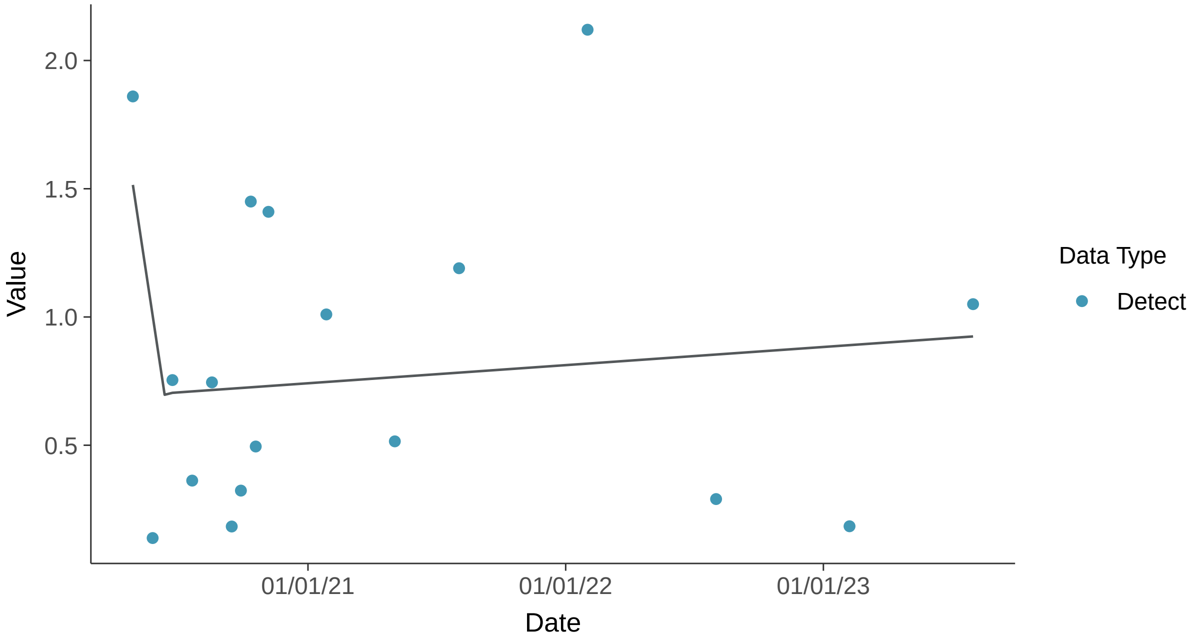
Trend Regression: Lognormal MLE

Radium-226/228, MW-2 (pCi/L)



Trend Regression: Piecewise Linear-Linear

Radium-226/228, MW-2 (pCi/L)

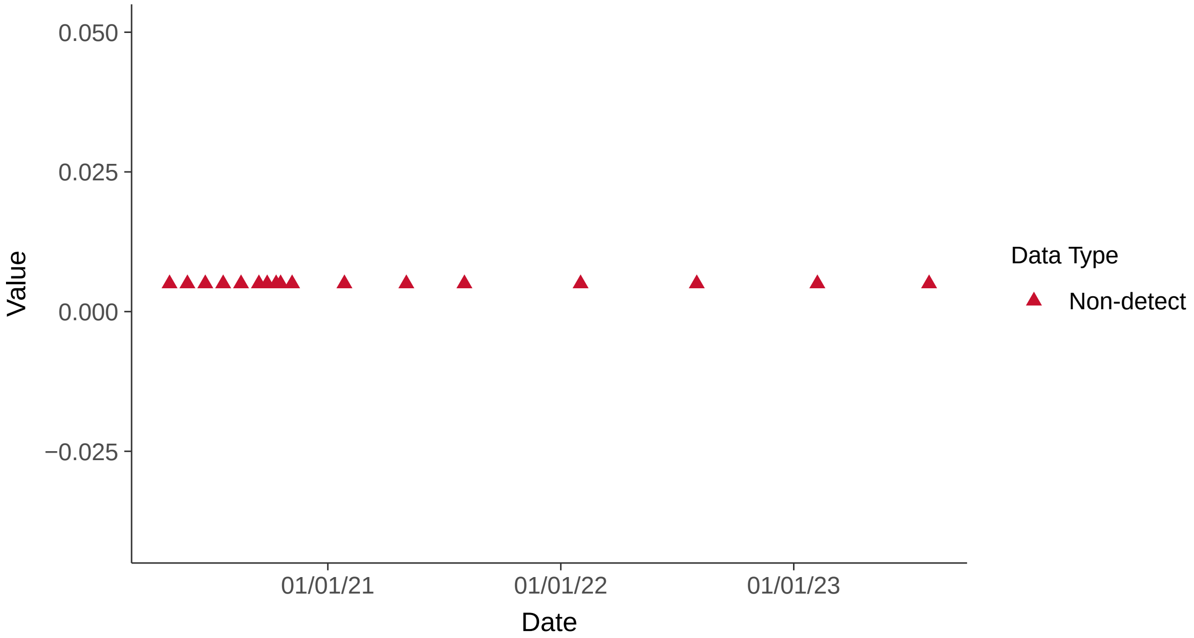


Appendix IV: Selenium, MW-2

ID: 02_2_22

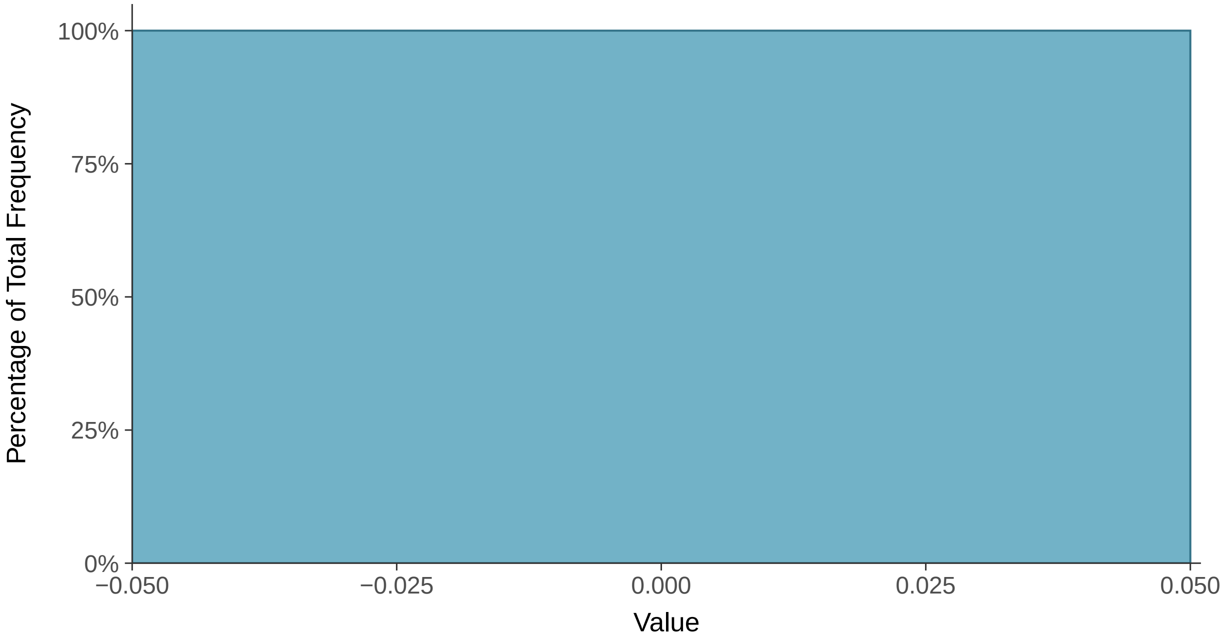
Scatter Plot

Selenium, MW-2 (mg/L)



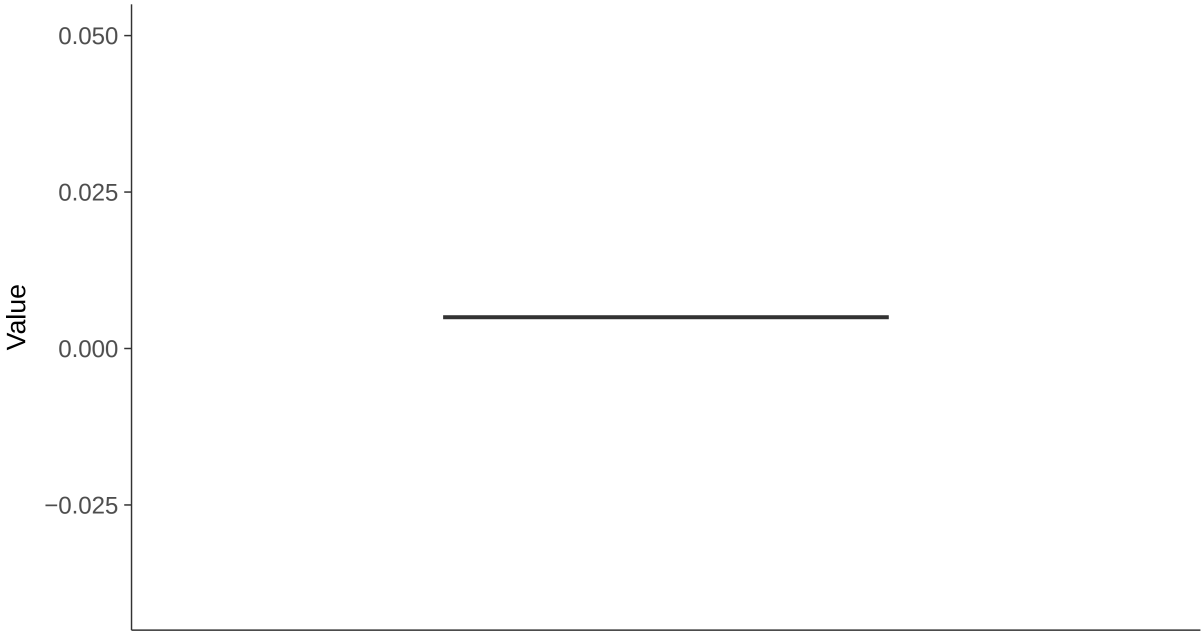
Histogram

Selenium, MW-2 (mg/L)



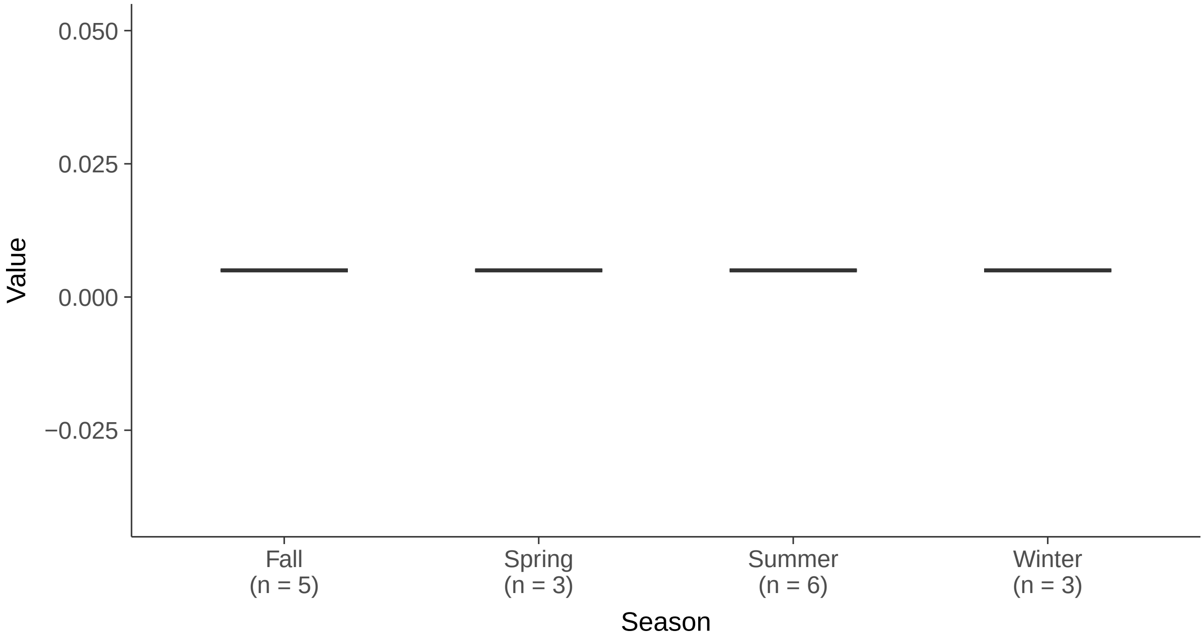
Boxplot

Selenium, MW-2 (mg/L)



Boxplot by Season

Selenium, MW-2 (mg/L)

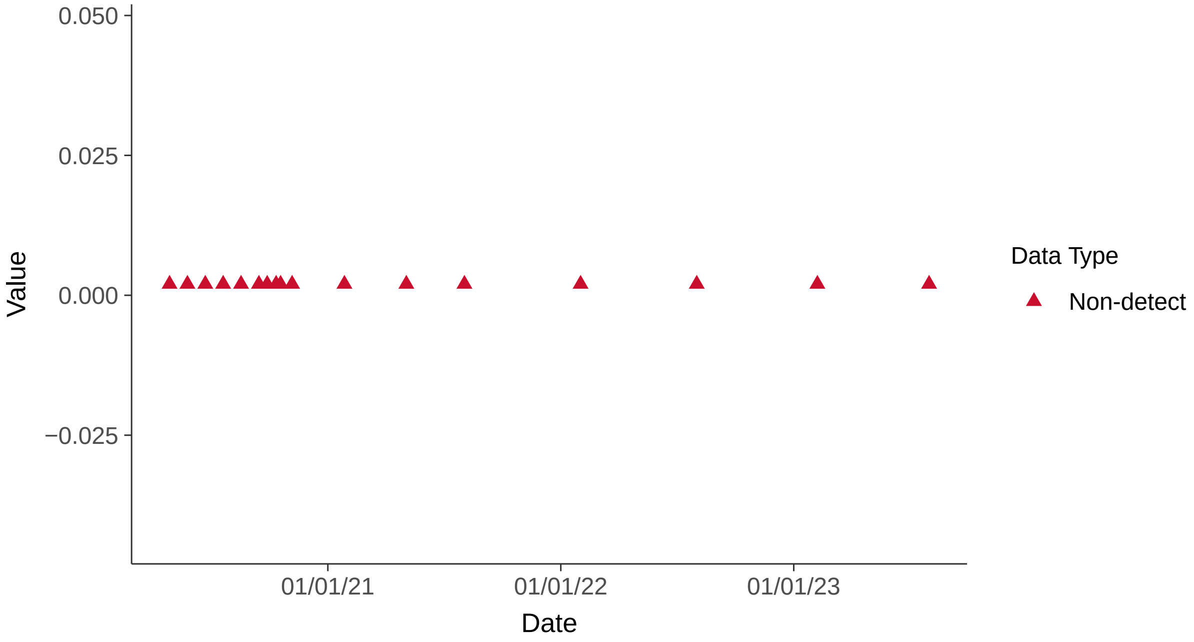


Appendix IV: Thallium, MW-2

ID: 02_2_23

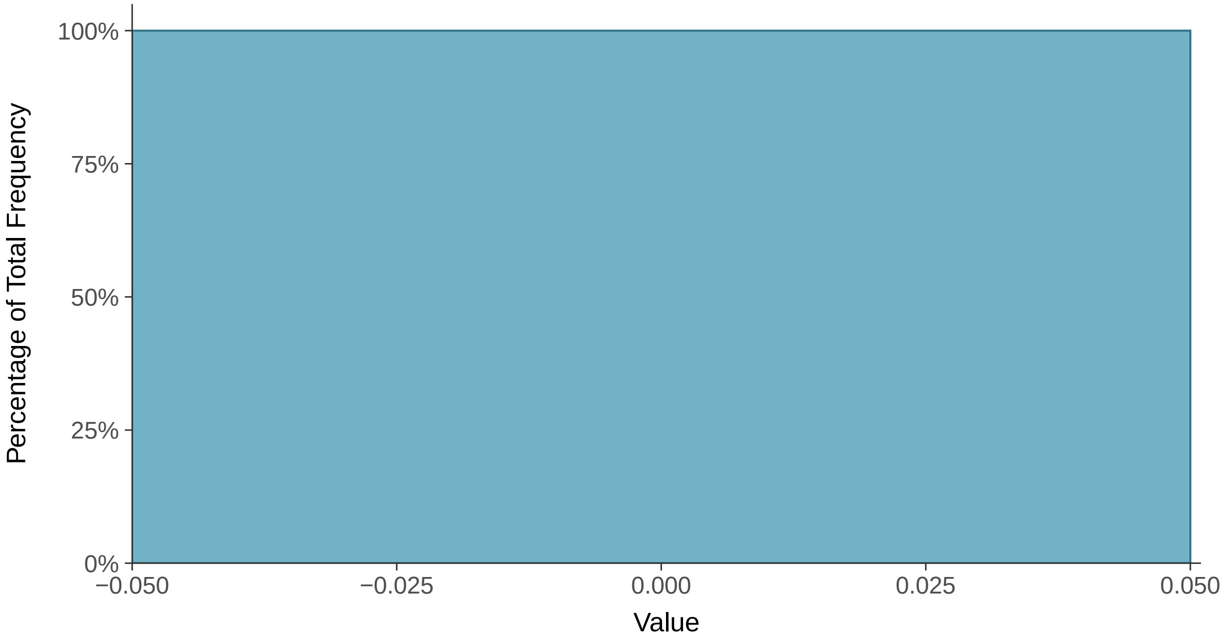
Scatter Plot

Thallium, MW-2 (mg/L)



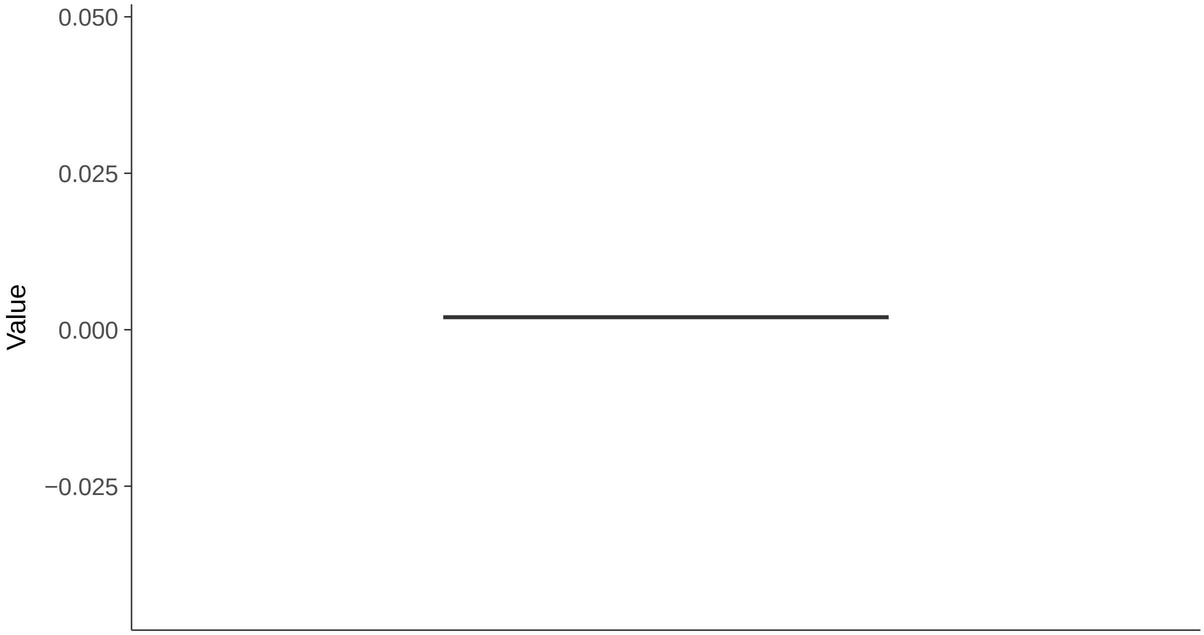
Histogram

Thallium, MW-2 (mg/L)



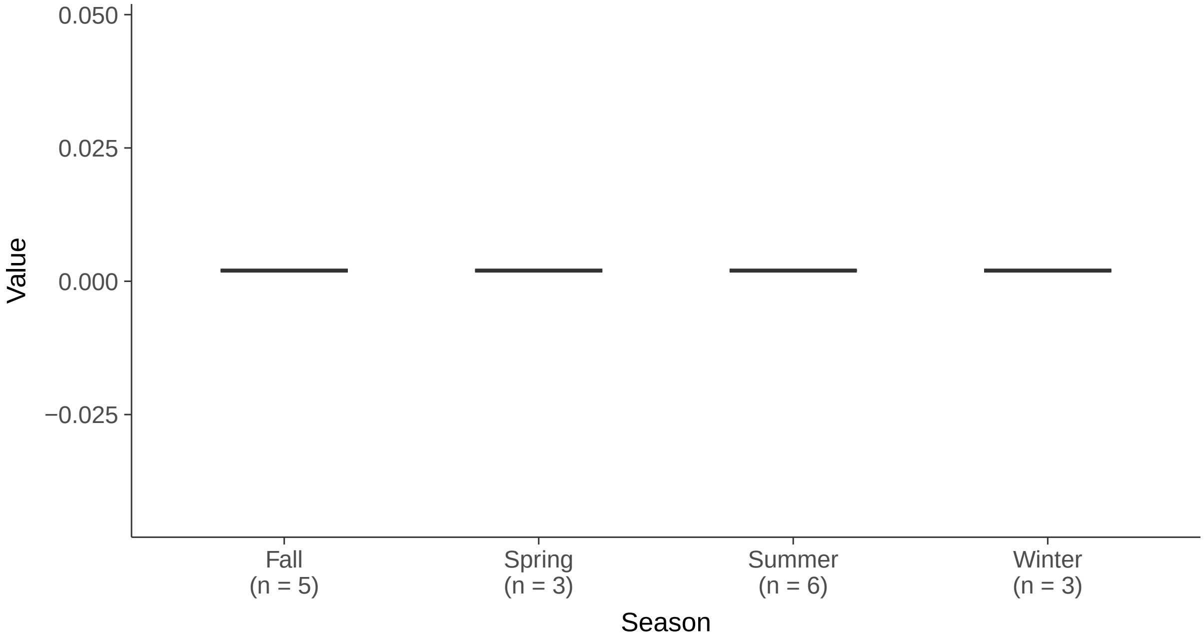
Boxplot

Thallium, MW-2 (mg/L)



Boxplot by Season

Thallium, MW-2 (mg/L)

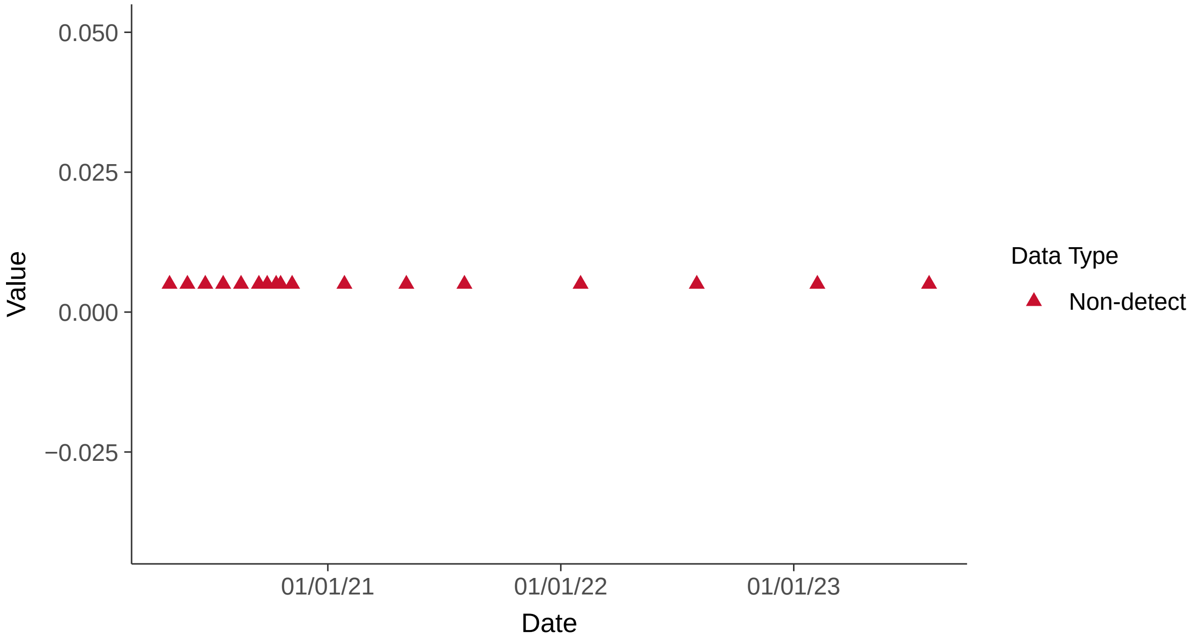


Part 115: Copper, MW-2

ID: 02_5_37

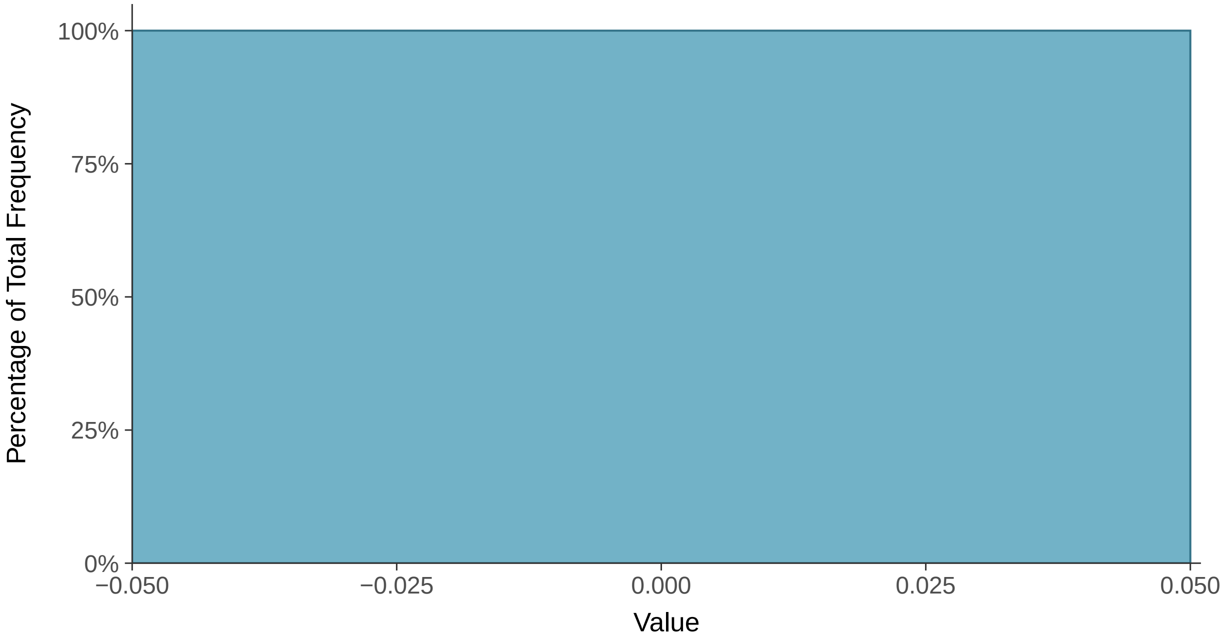
Scatter Plot

Copper, MW-2 (mg/L)



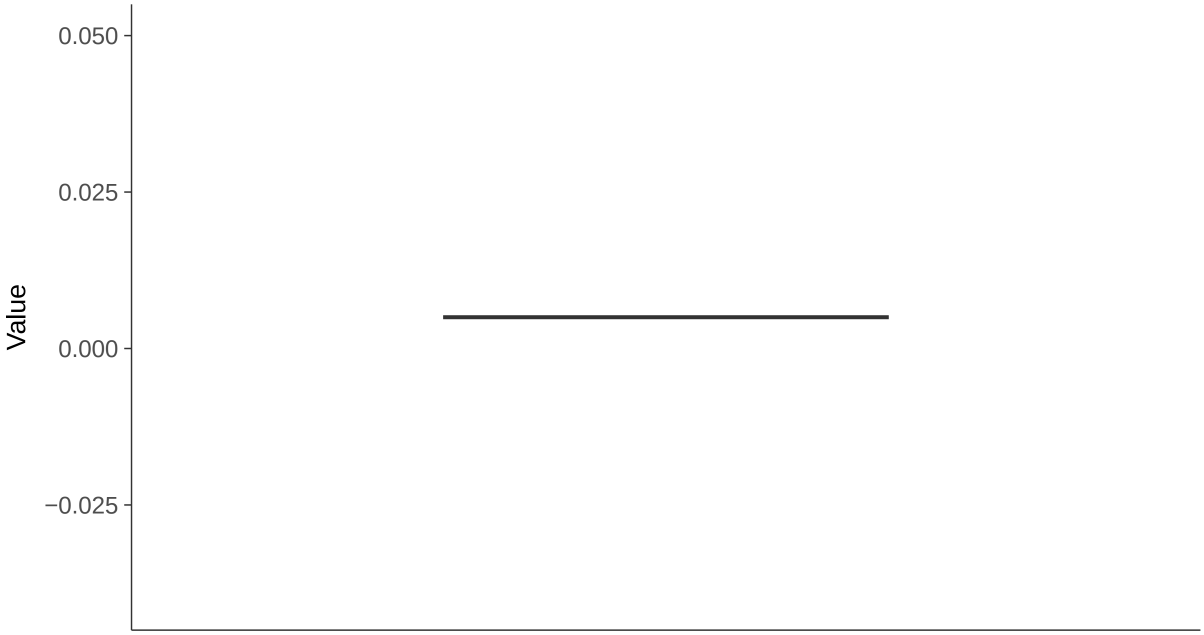
Histogram

Copper, MW-2 (mg/L)



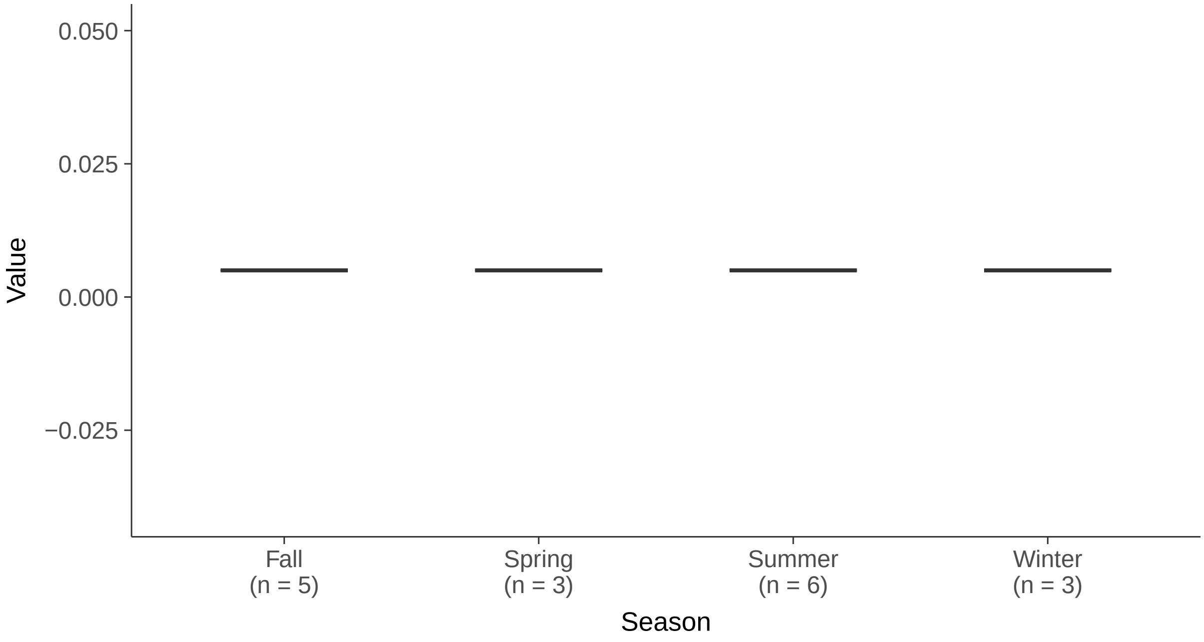
Boxplot

Copper, MW-2 (mg/L)



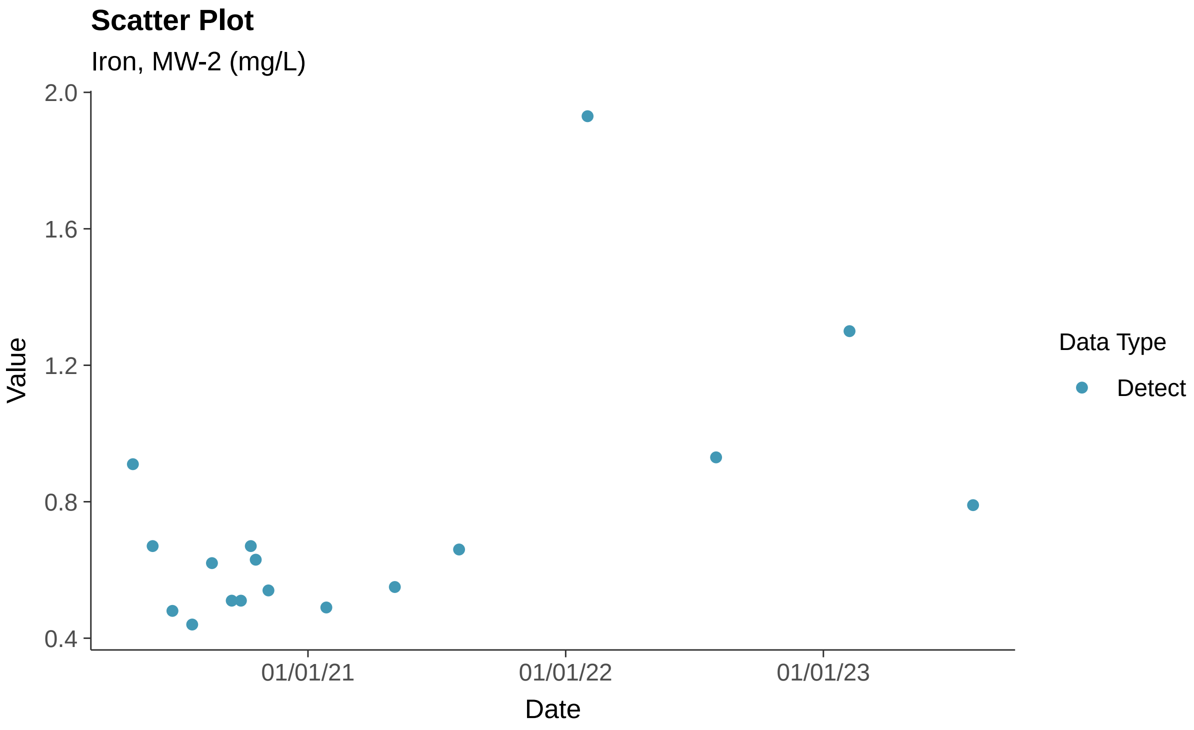
Boxplot by Season

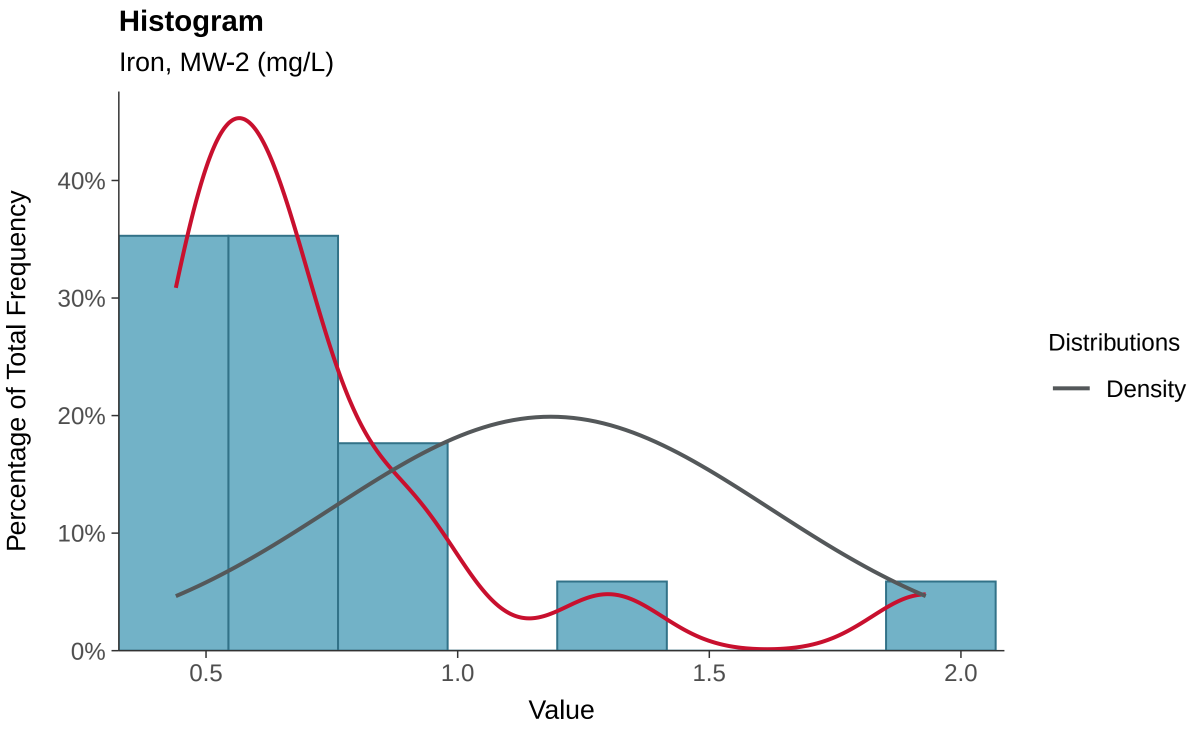
Copper, MW-2 (mg/L)



Part 115: Iron, MW-2

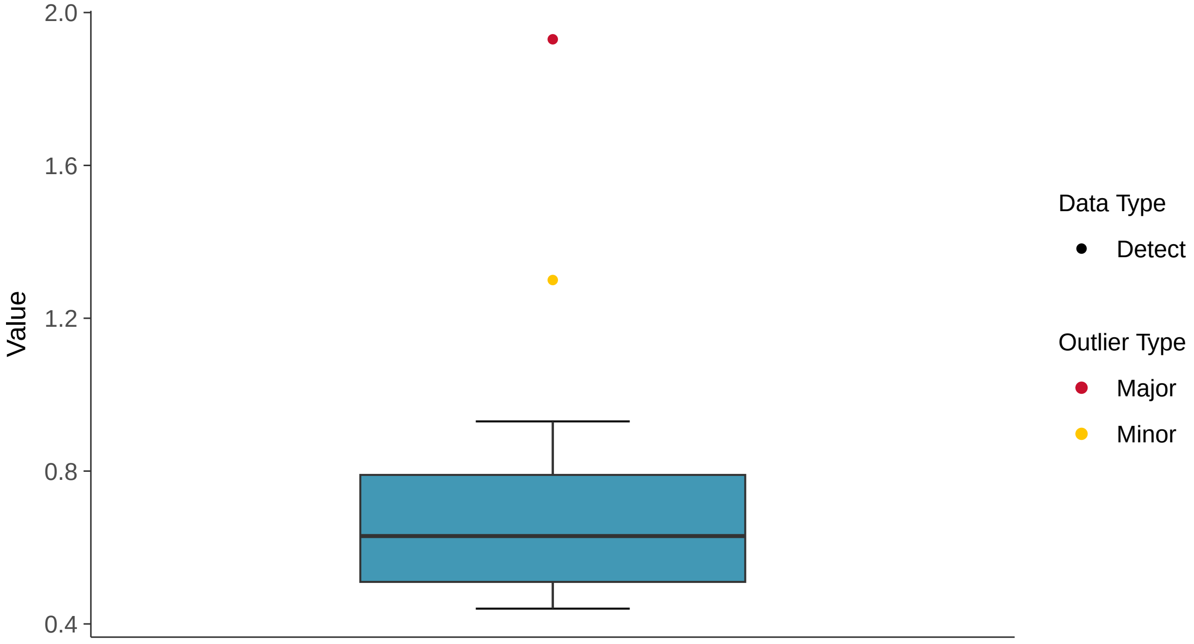
ID: 02_5_38





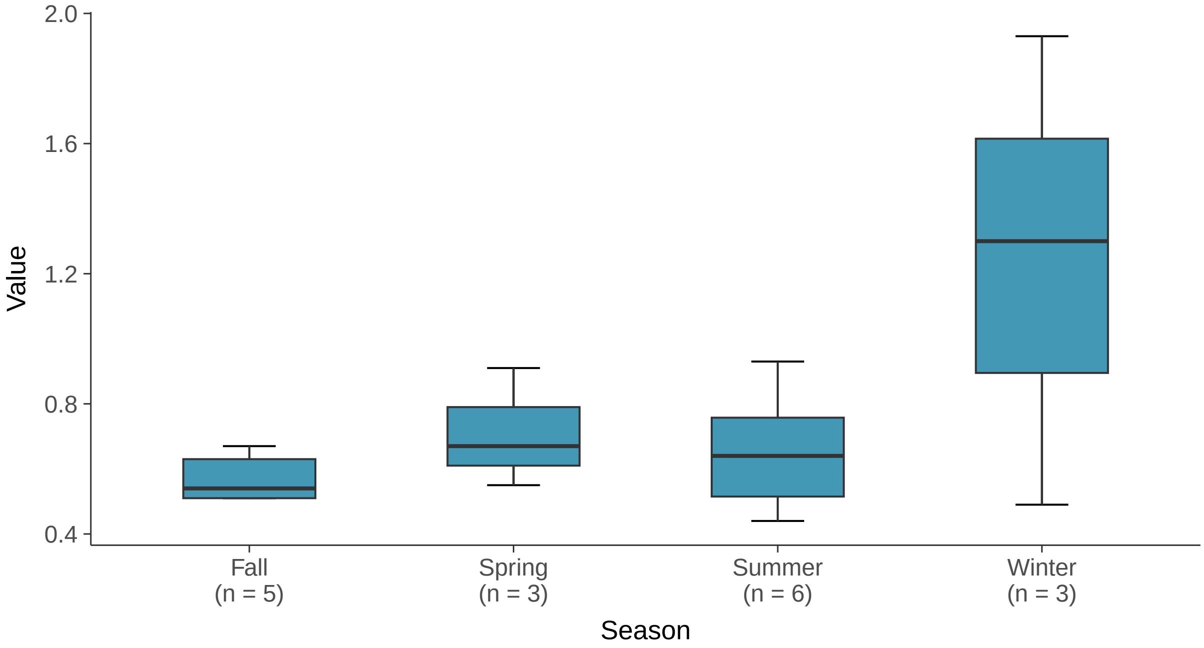
Boxplot

Iron, MW-2 (mg/L)



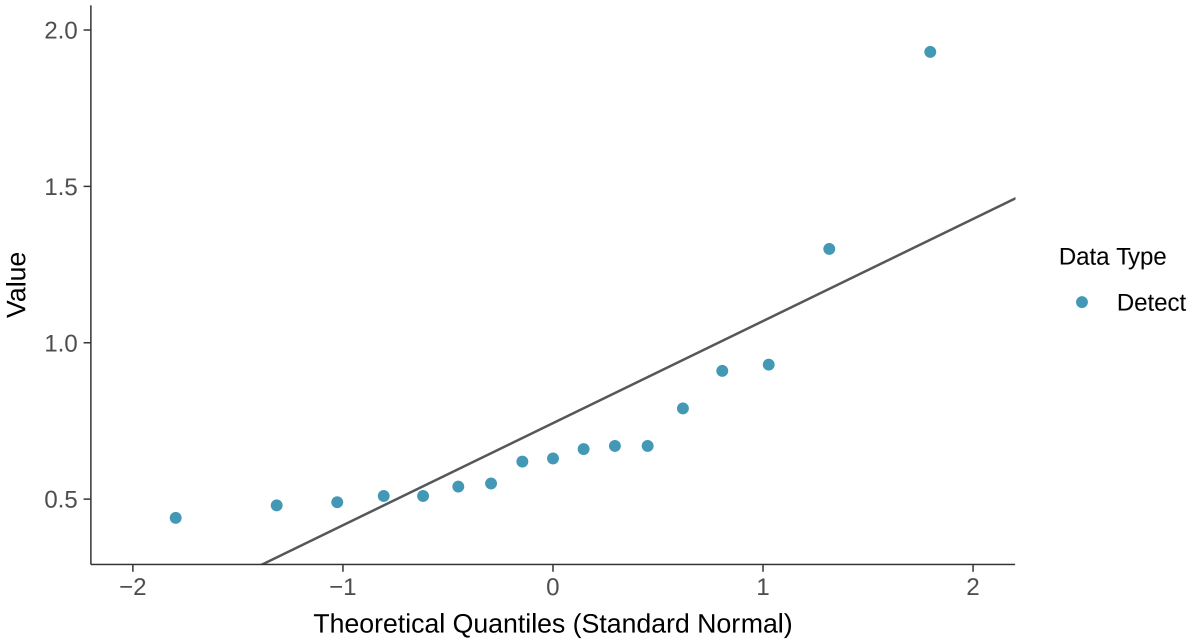
Boxplot by Season

Iron, MW-2 (mg/L)



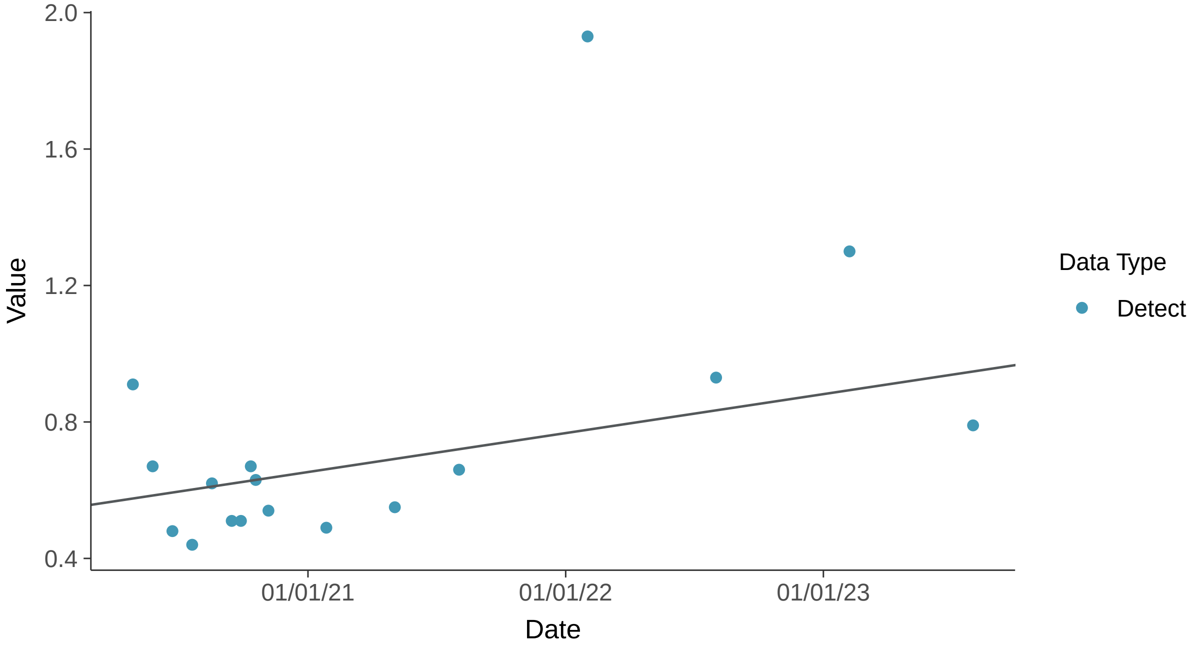
Normal Q-Q plot

Iron, MW-2 (mg/L)



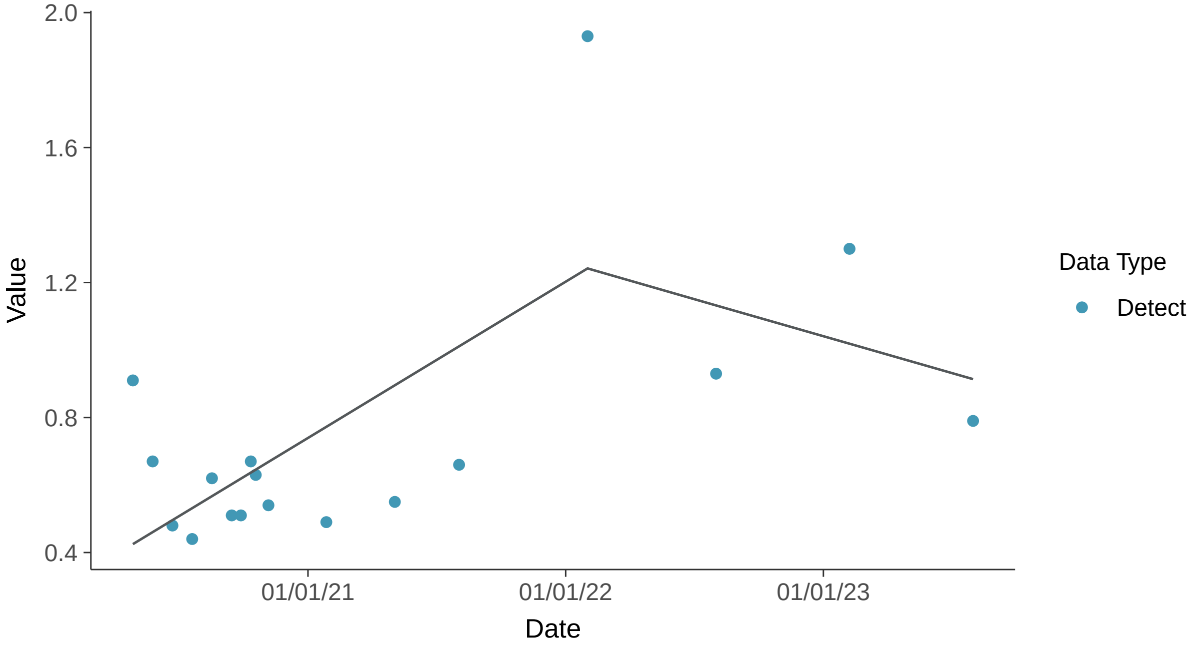
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Iron, MW-2 (mg/L)



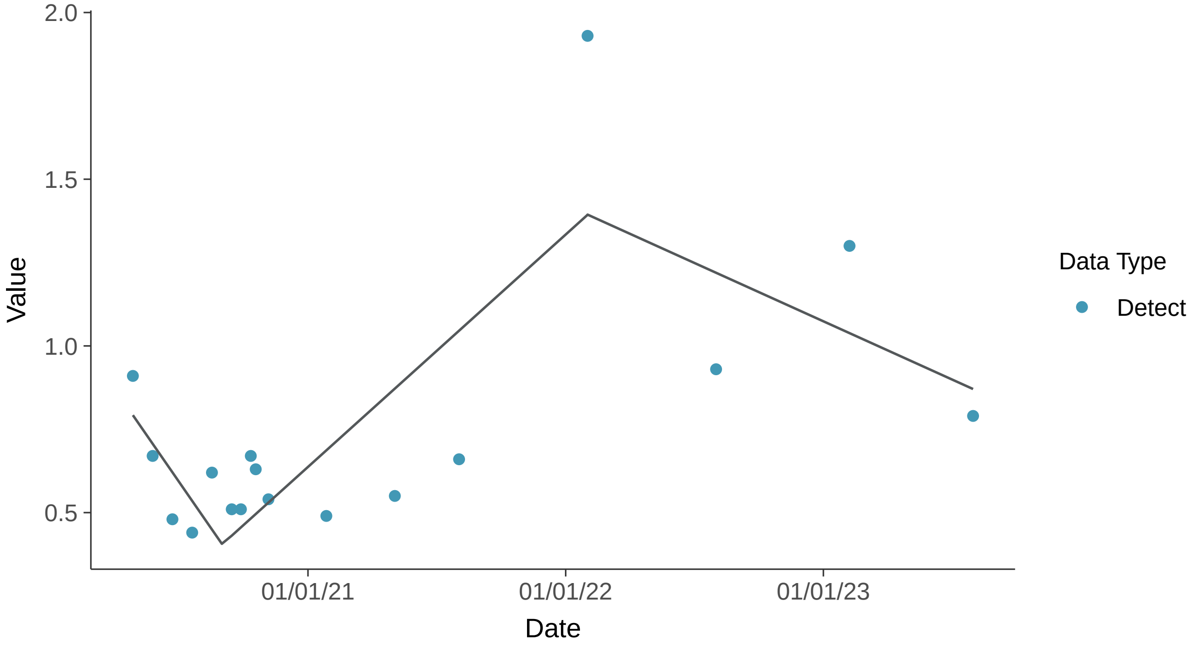
Trend Regression: Piecewise Linear-Linear

Iron, MW-2 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Iron, MW-2 (mg/L)

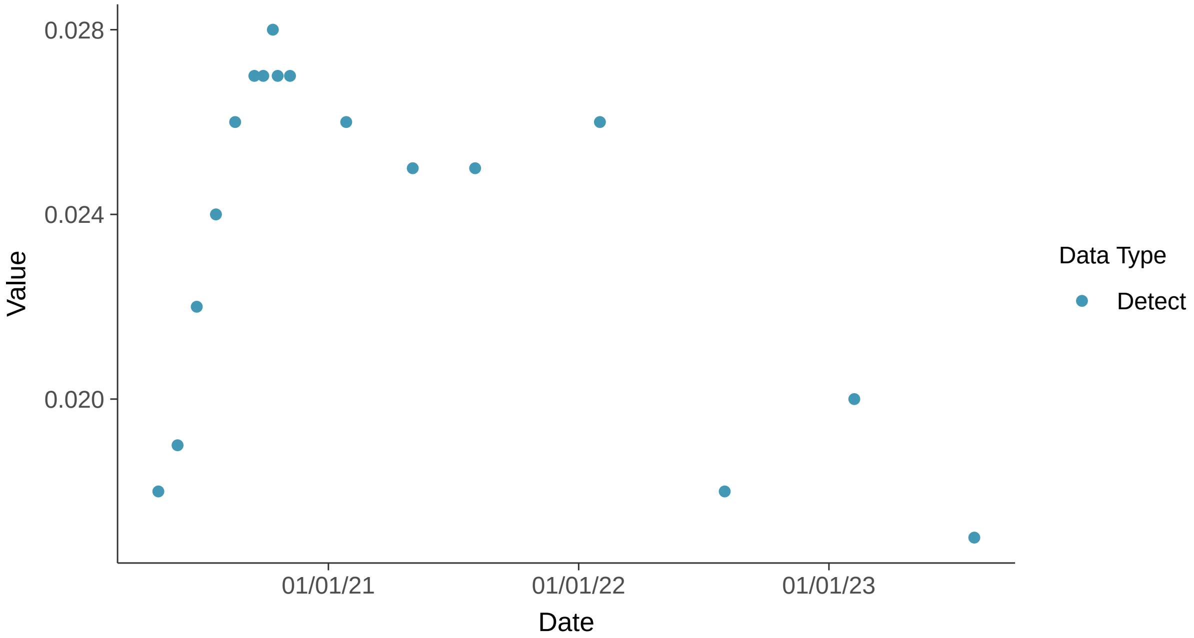


Part 115: Nickel, MW-2

ID: 02_5_39

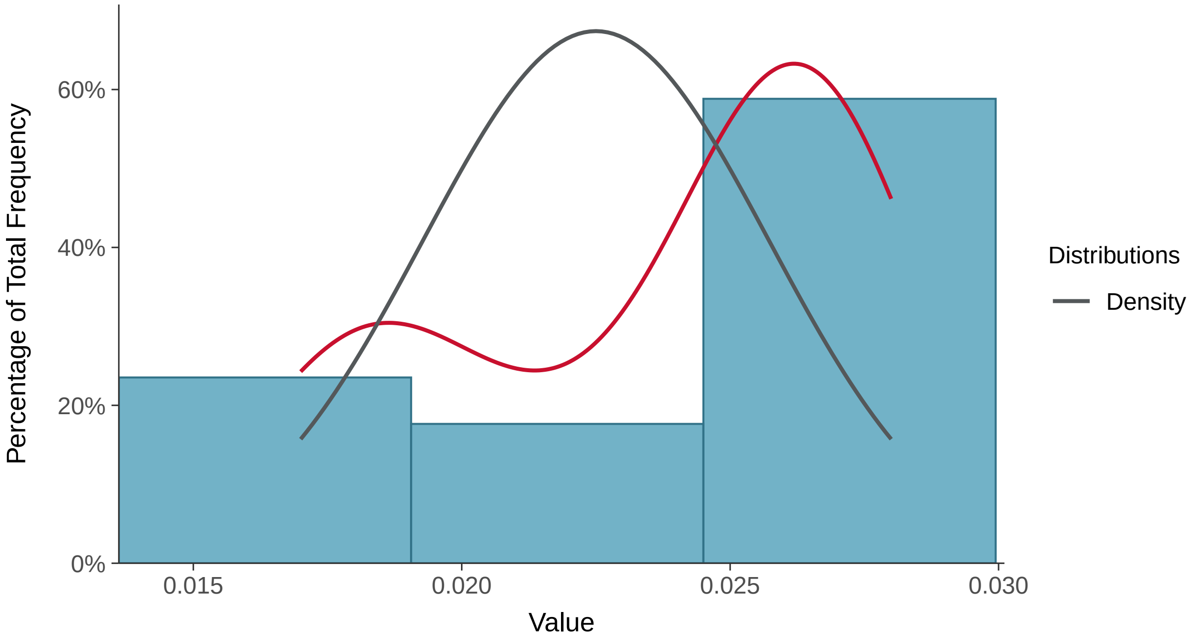
Scatter Plot

Nickel, MW-2 (mg/L)



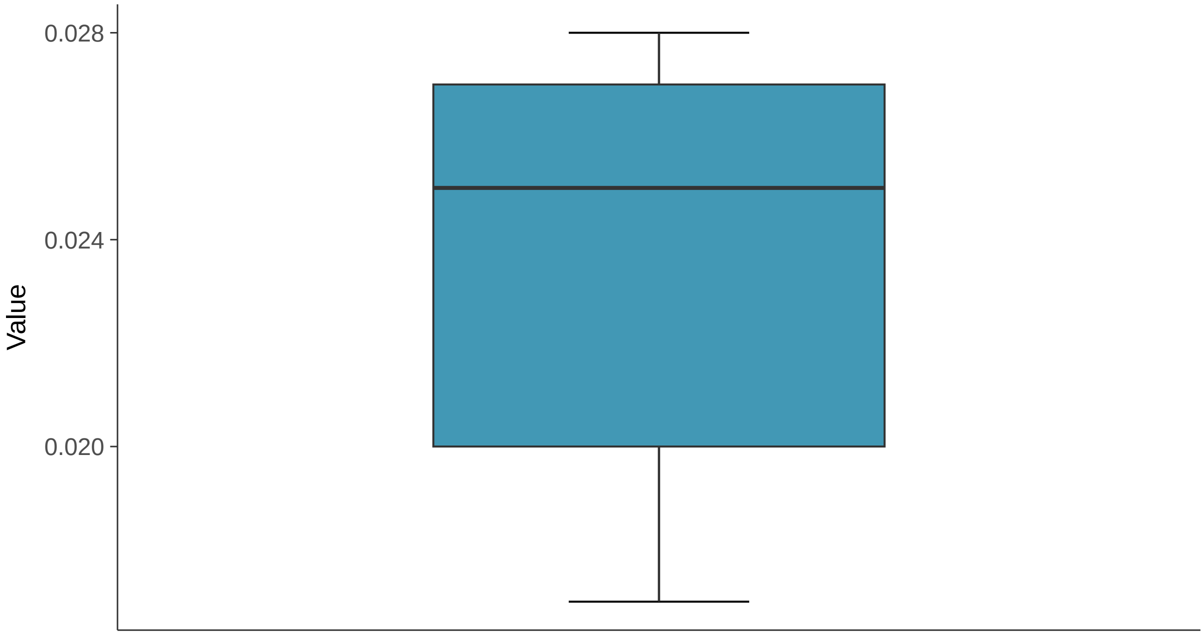
Histogram

Nickel, MW-2 (mg/L)



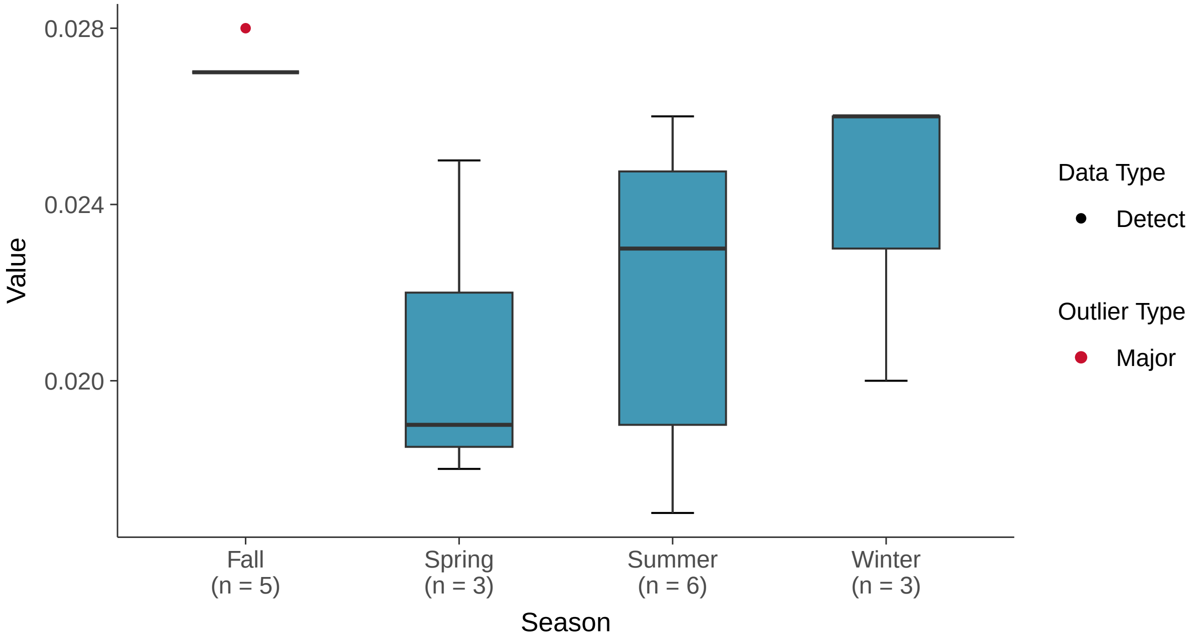
Boxplot

Nickel, MW-2 (mg/L)



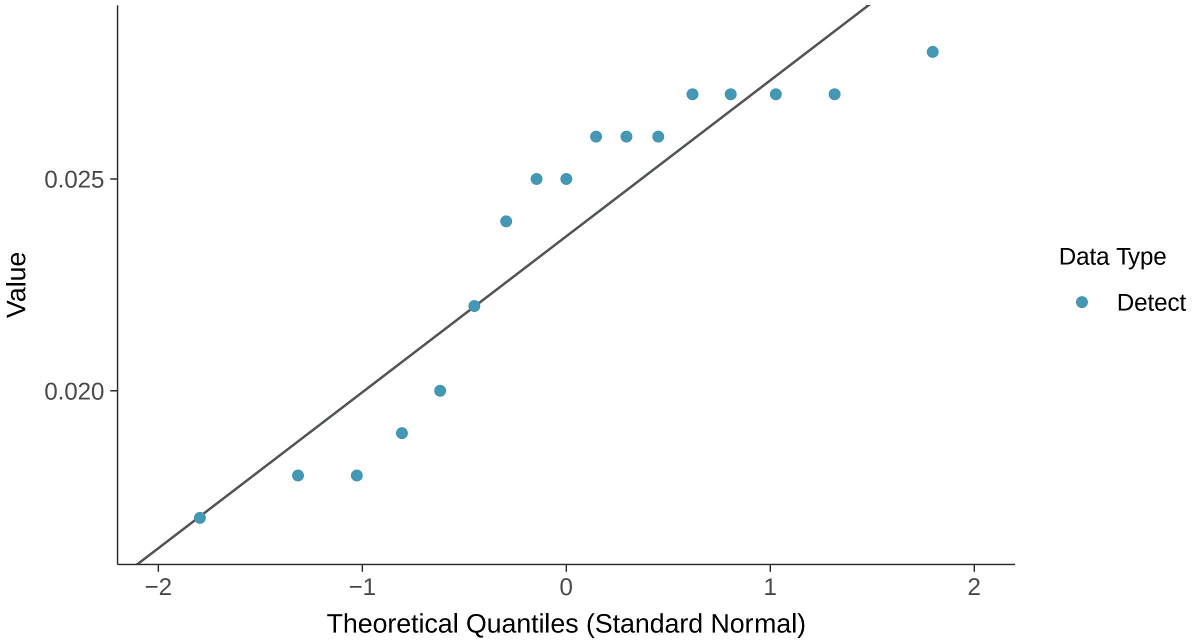
Boxplot by Season

Nickel, MW-2 (mg/L)



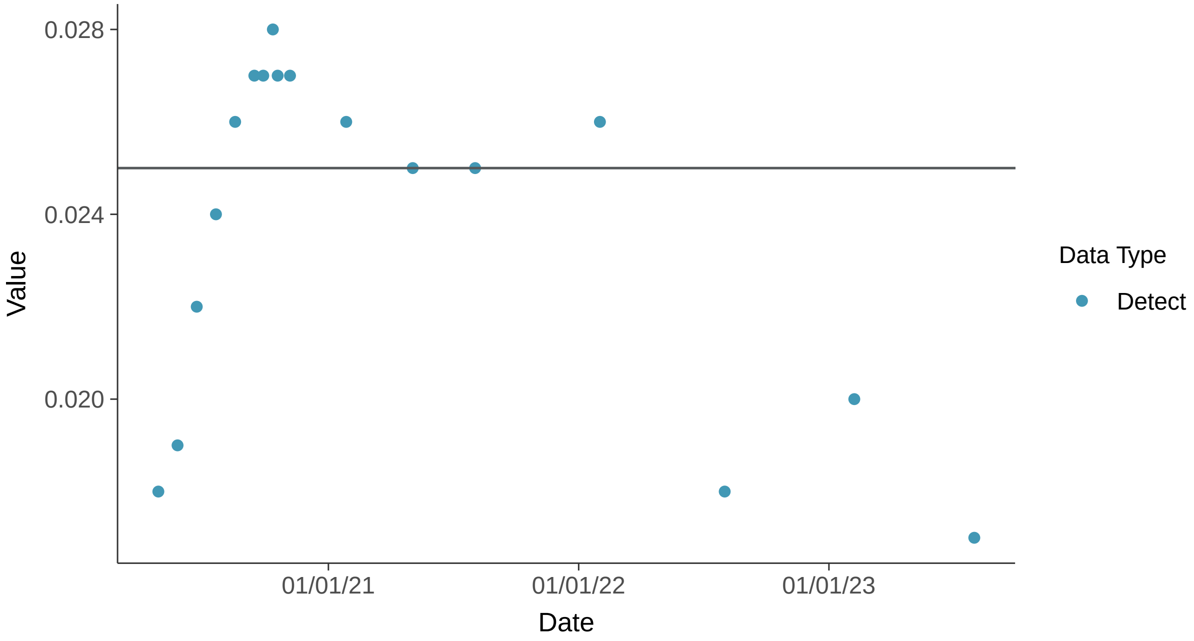
Normal Q-Q plot

Nickel, MW-2 (mg/L)



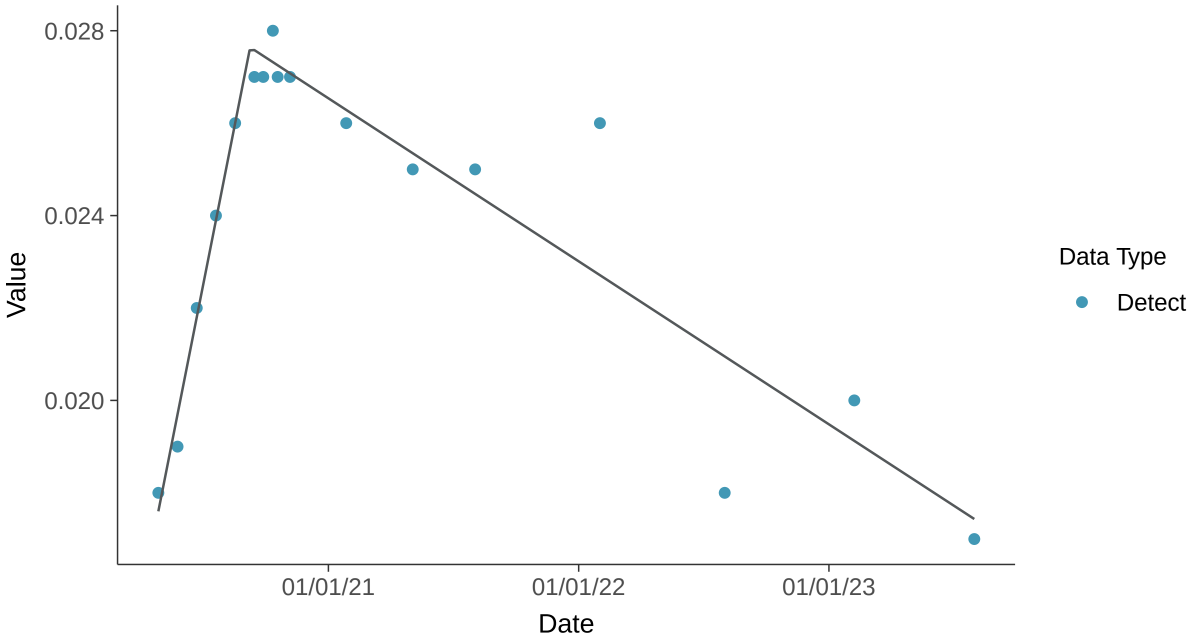
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Nickel, MW-2 (mg/L)



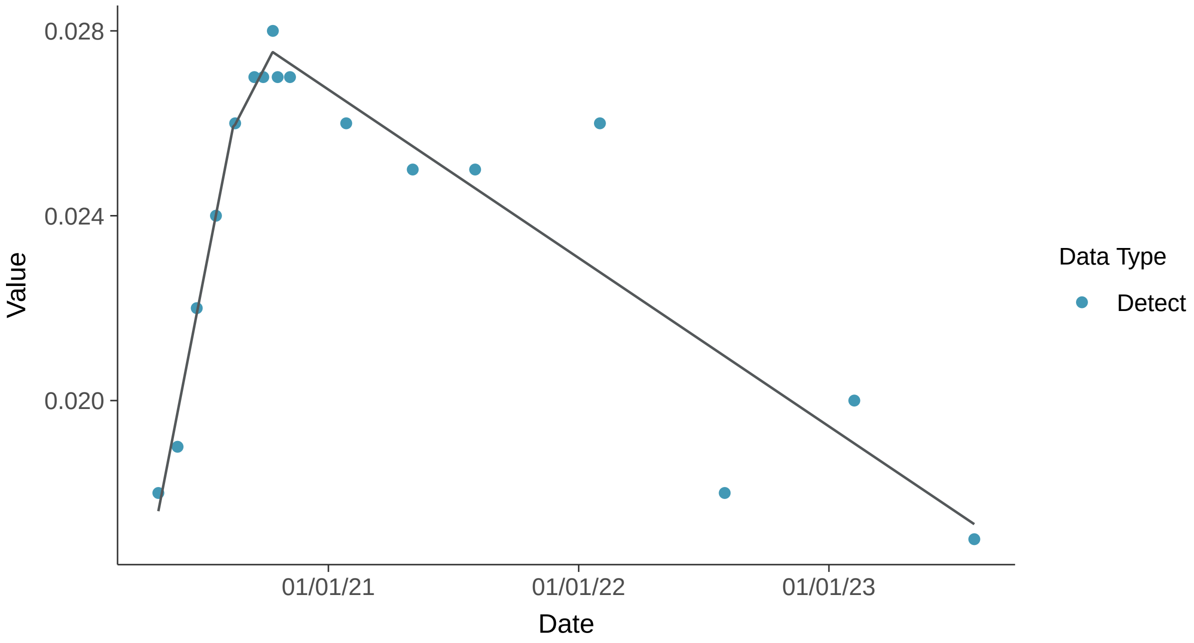
Trend Regression: Piecewise Linear-Linear

Nickel, MW-2 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Nickel, MW-2 (mg/L)

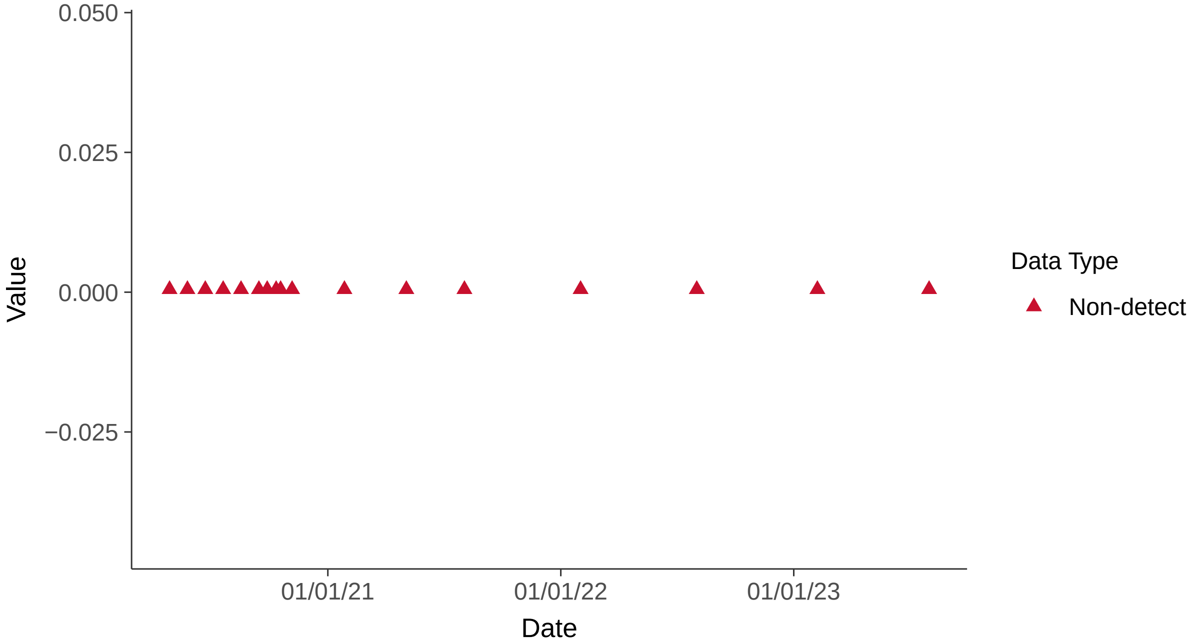


Part 115: Silver, MW-2

ID: 02_5_40

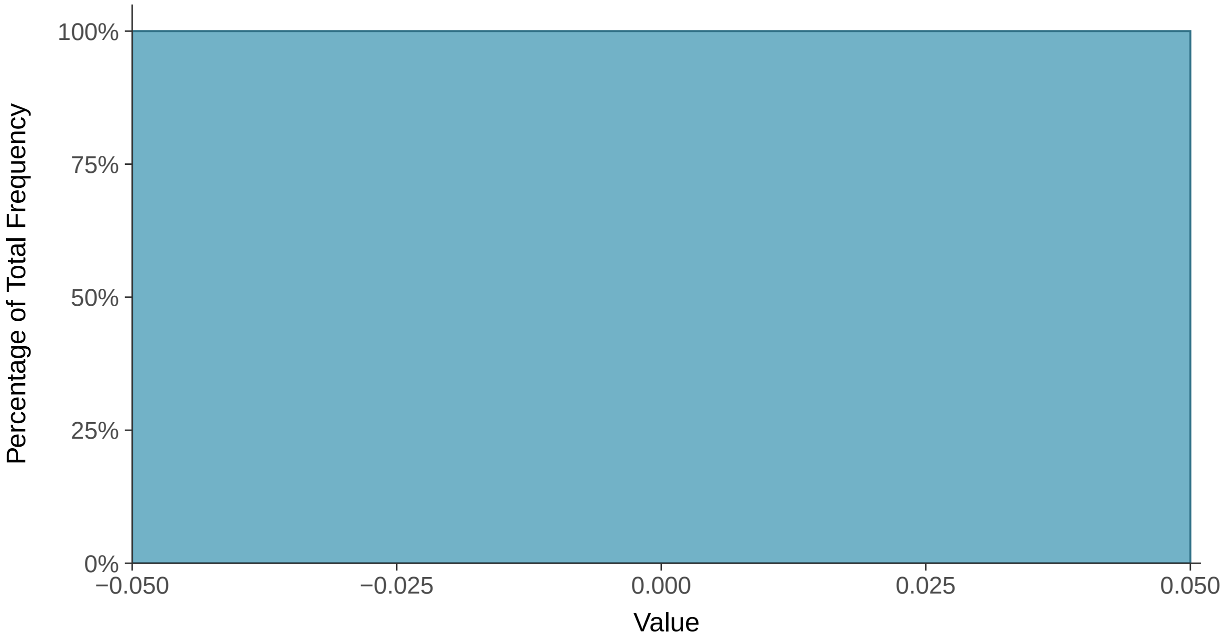
Scatter Plot

Silver, MW-2 (mg/L)



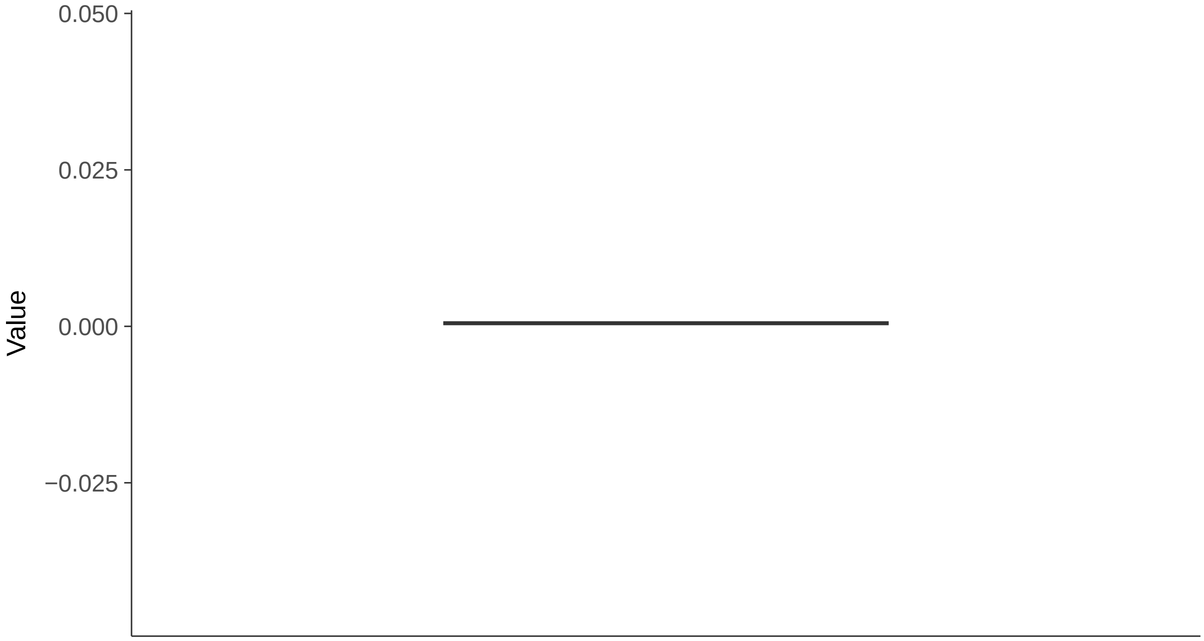
Histogram

Silver, MW-2 (mg/L)



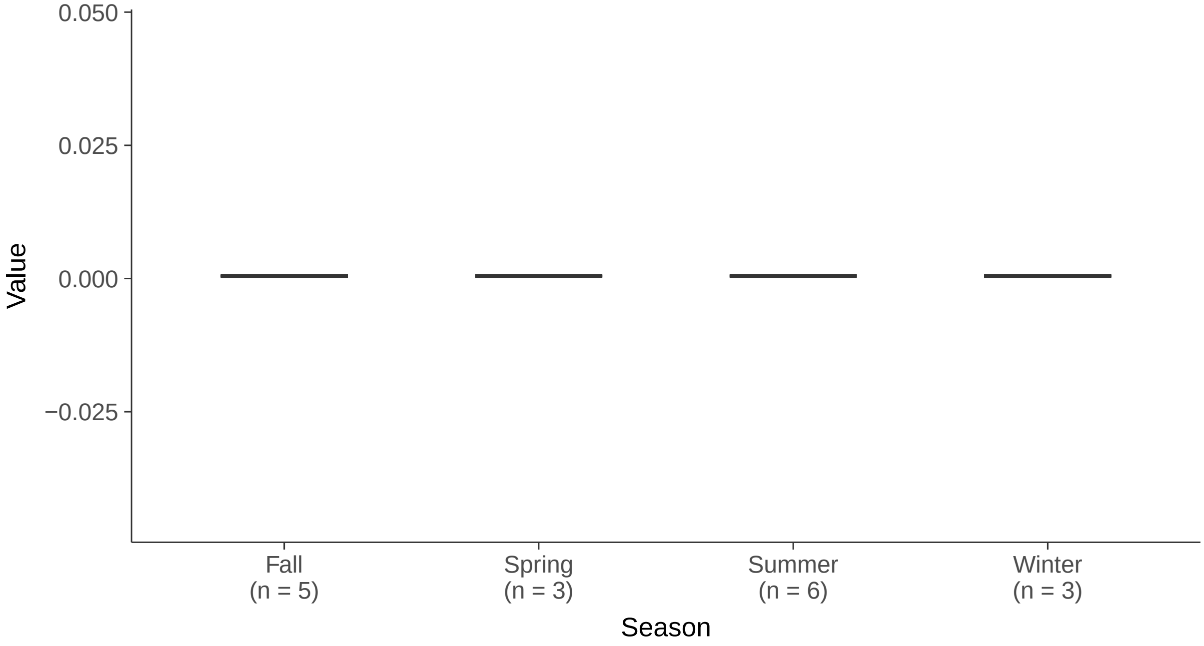
Boxplot

Silver, MW-2 (mg/L)



Boxplot by Season

Silver, MW-2 (mg/L)

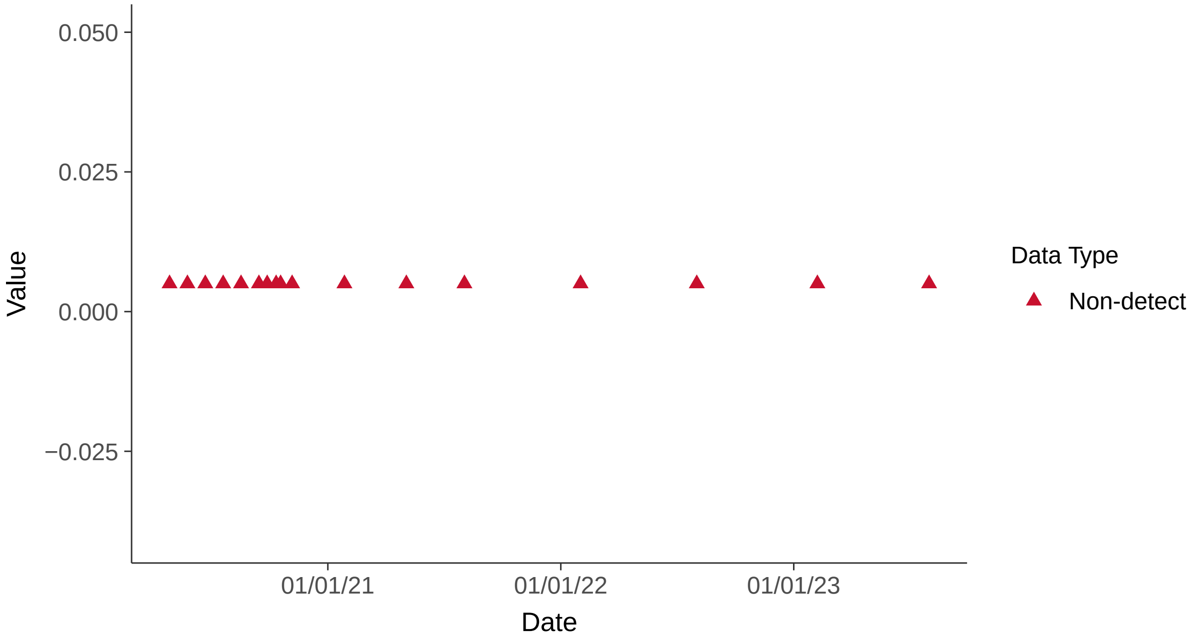


Part 115: Vanadium, MW-2

ID: 02_5_41

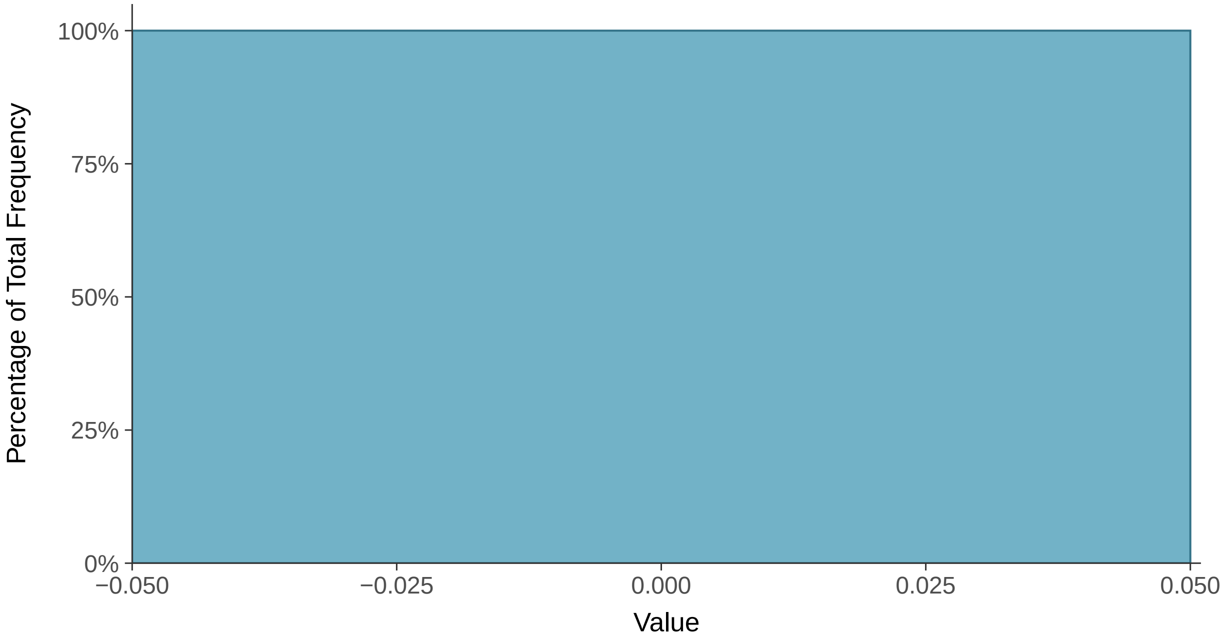
Scatter Plot

Vanadium, MW-2 (mg/L)



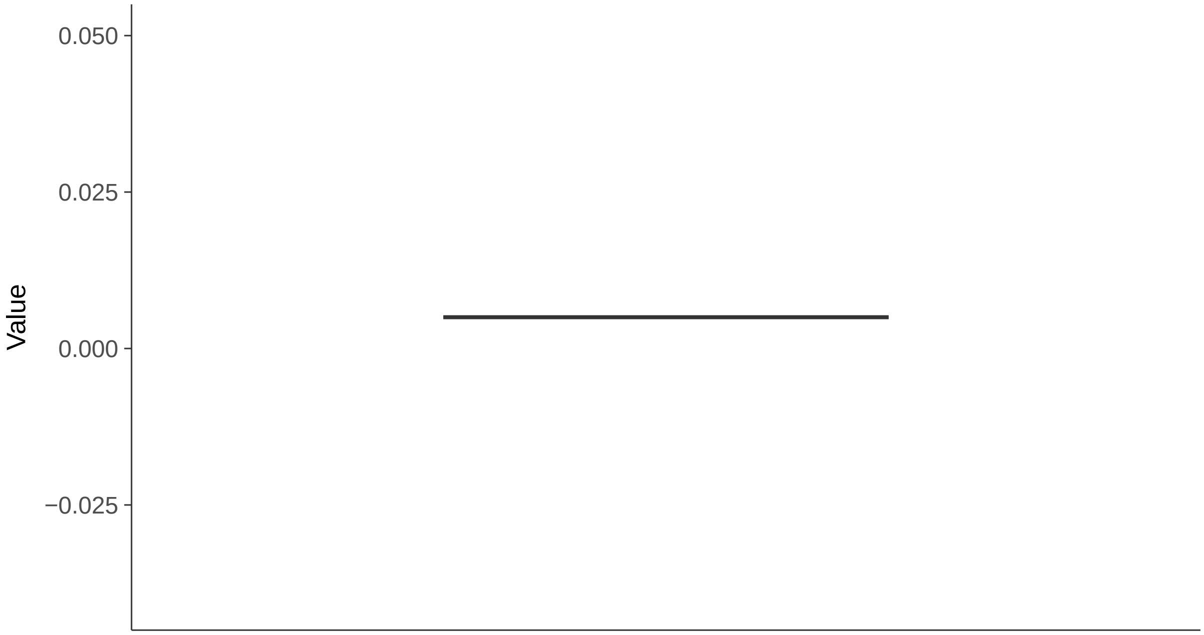
Histogram

Vanadium, MW-2 (mg/L)



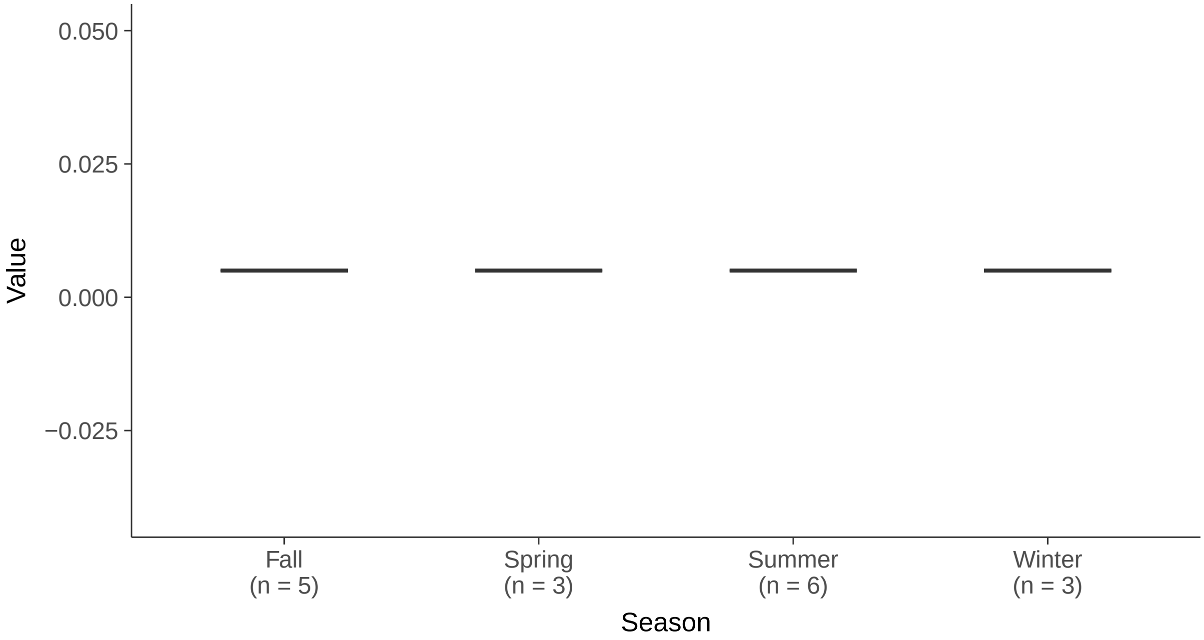
Boxplot

Vanadium, MW-2 (mg/L)



Boxplot by Season

Vanadium, MW-2 (mg/L)

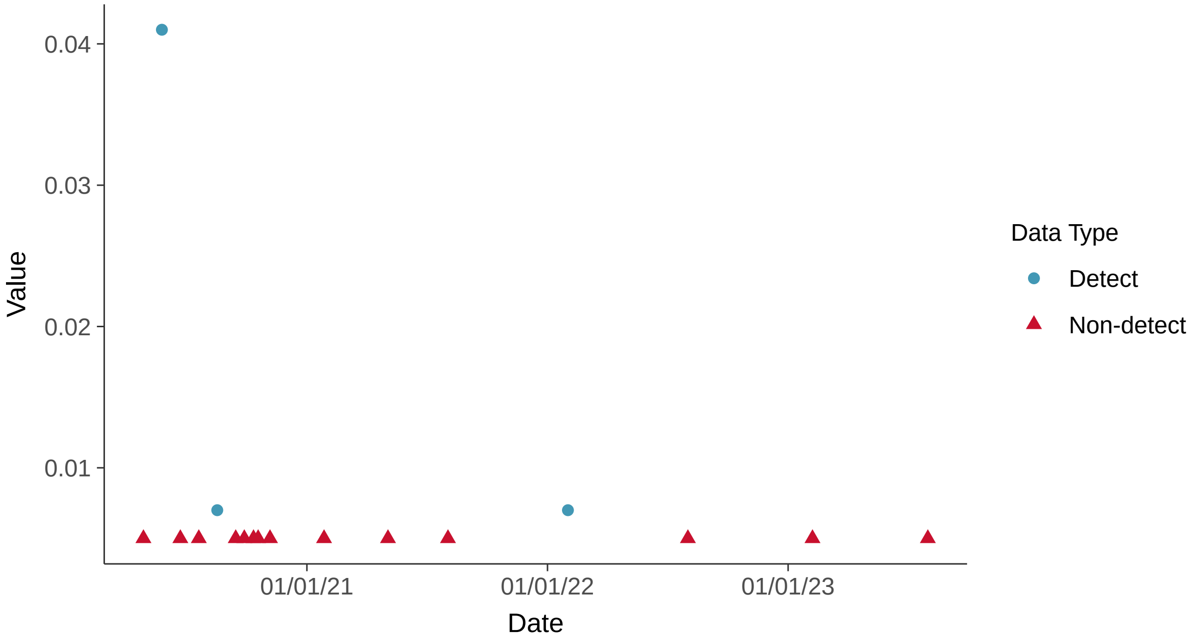


Part 115: Zinc, MW-2

ID: 02_5_42

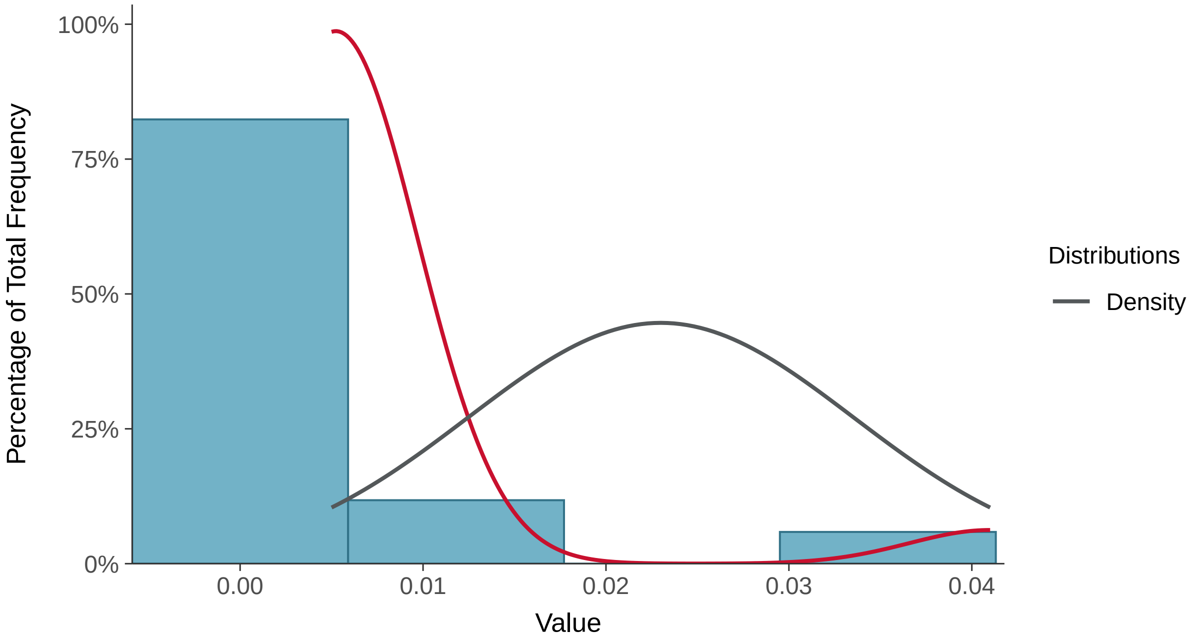
Scatter Plot

Zinc, MW-2 (mg/L)



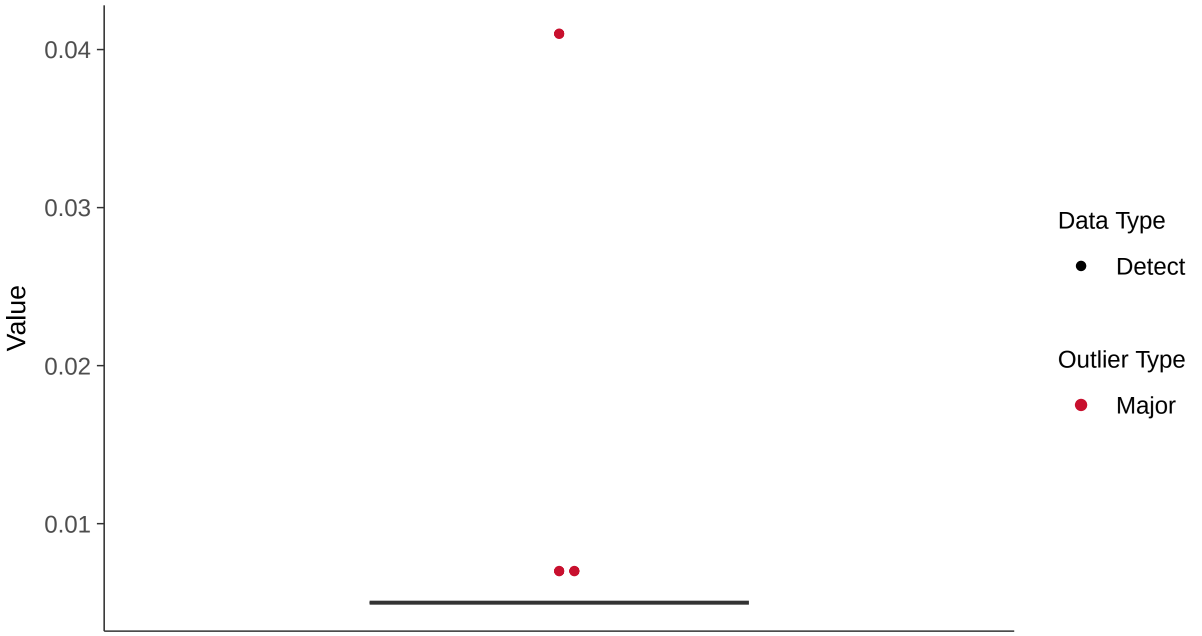
Histogram

Zinc, MW-2 (mg/L)



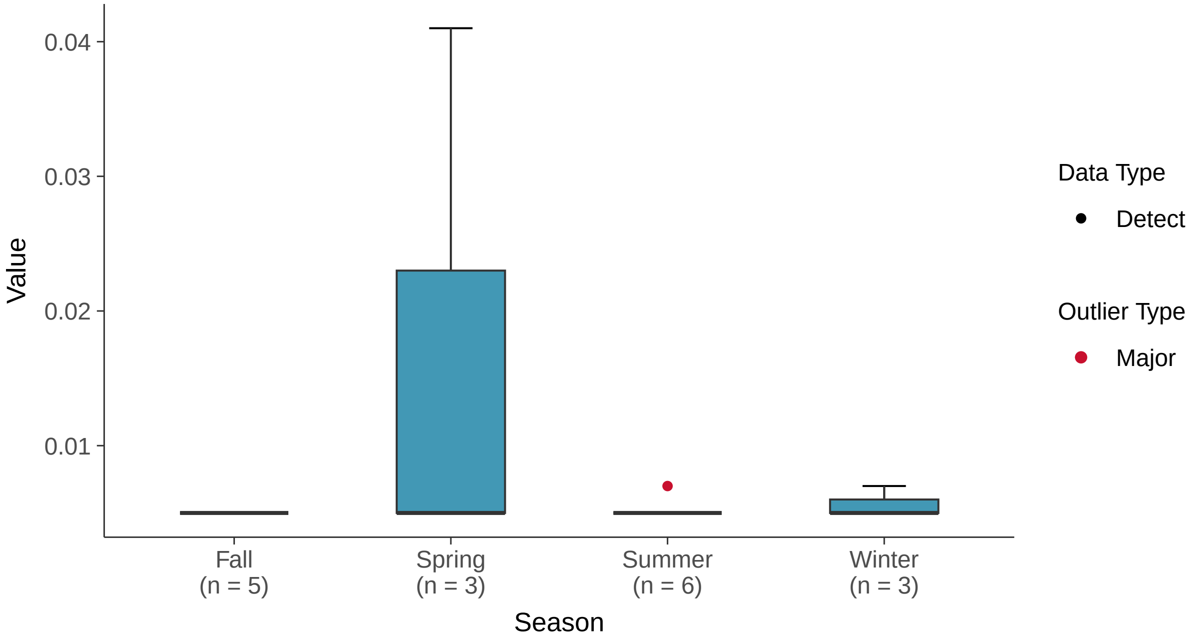
Boxplot

Zinc, MW-2 (mg/L)



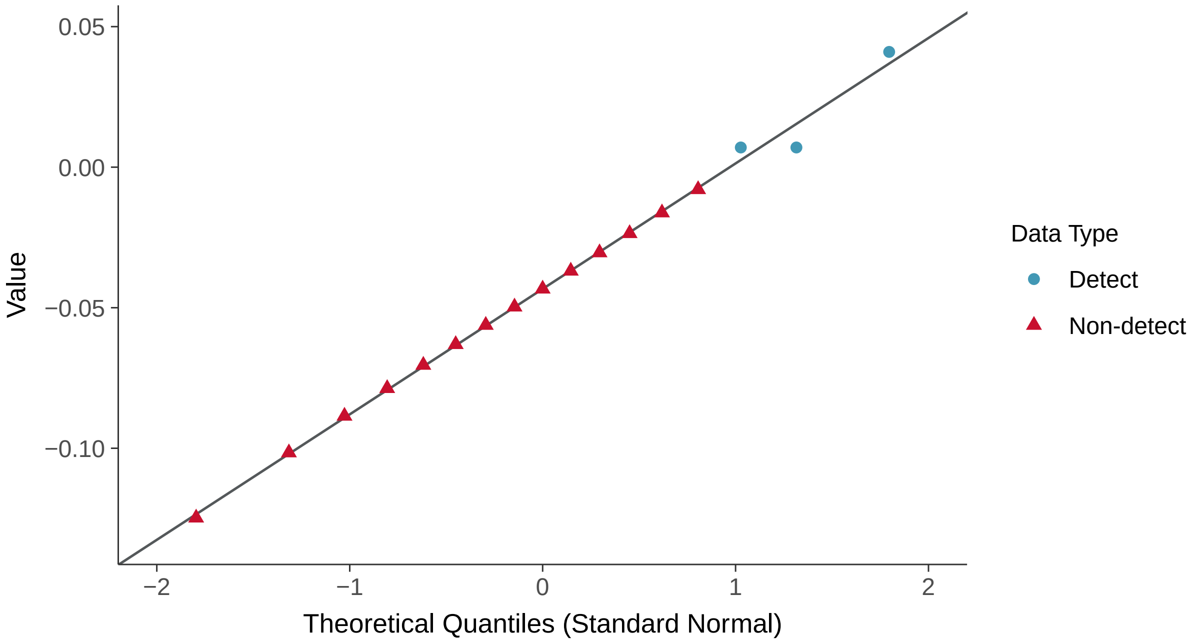
Boxplot by Season

Zinc, MW-2 (mg/L)



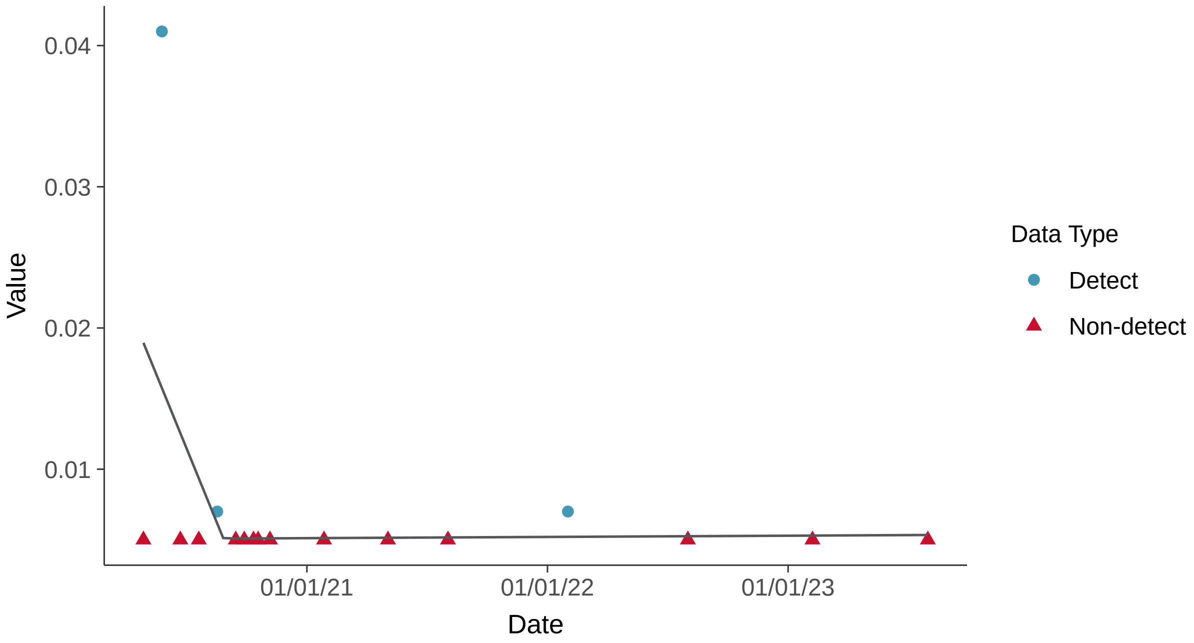
Normal Q-Q plot using ROS Imputed Estimates

Zinc, MW-2 (mg/L)



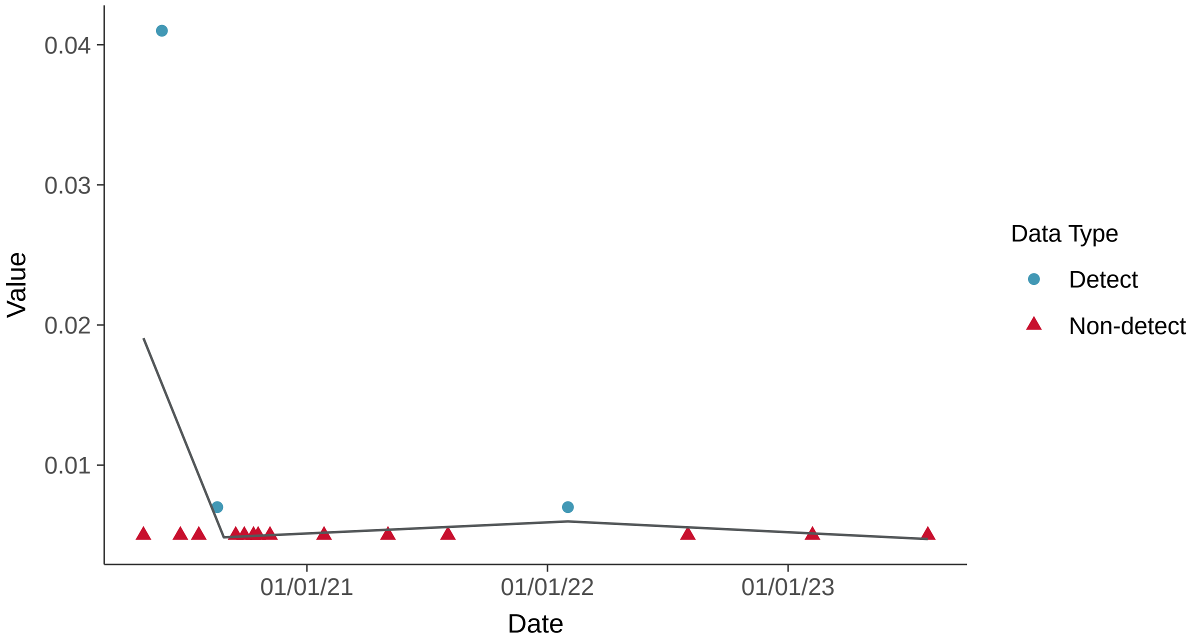
Trend Regression: Piecewise Linear-Linear

Zinc, MW-2 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Zinc, MW-2 (mg/L)

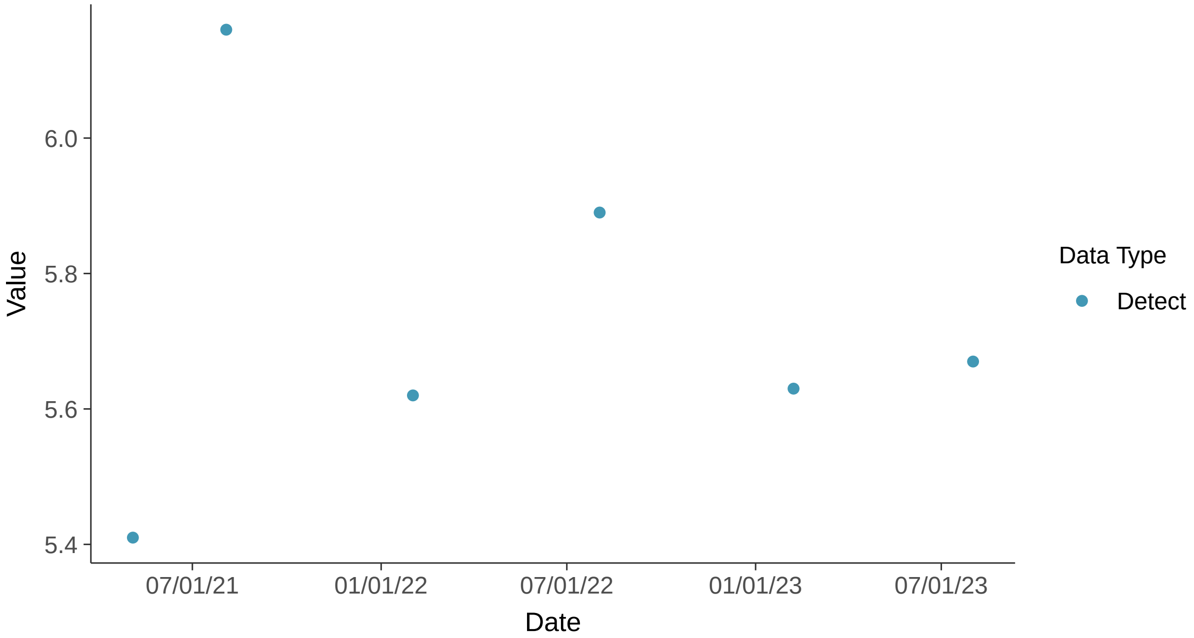


Appendix III: Boron, MW-3

ID: 03_1_01

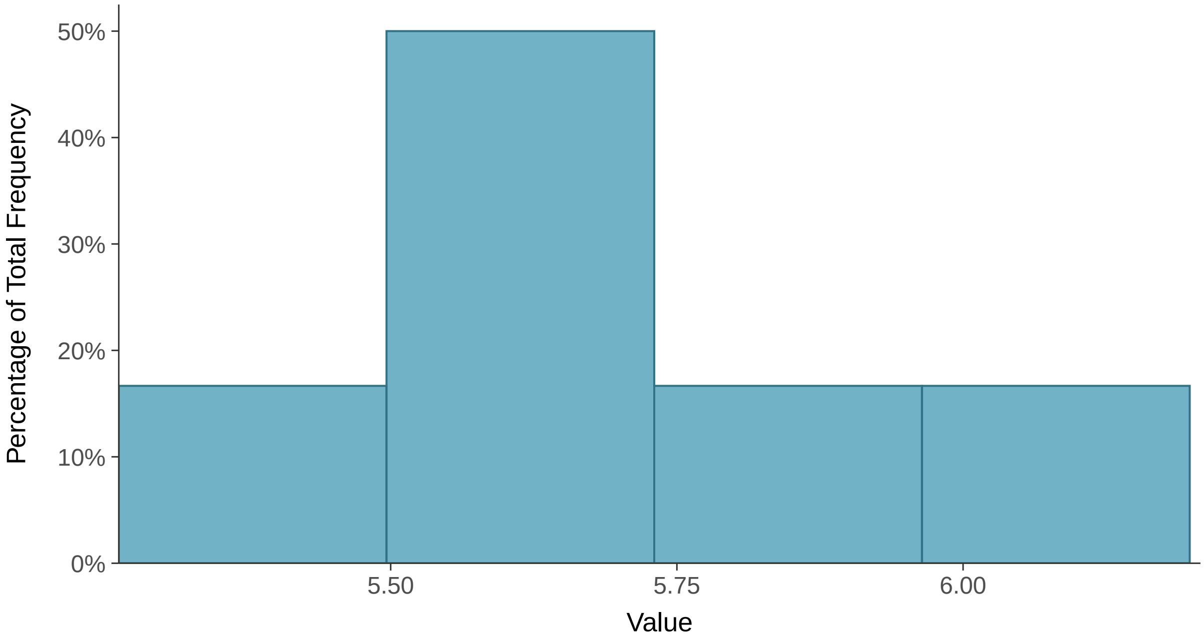
Scatter Plot

Boron, MW-3 (mg/L)



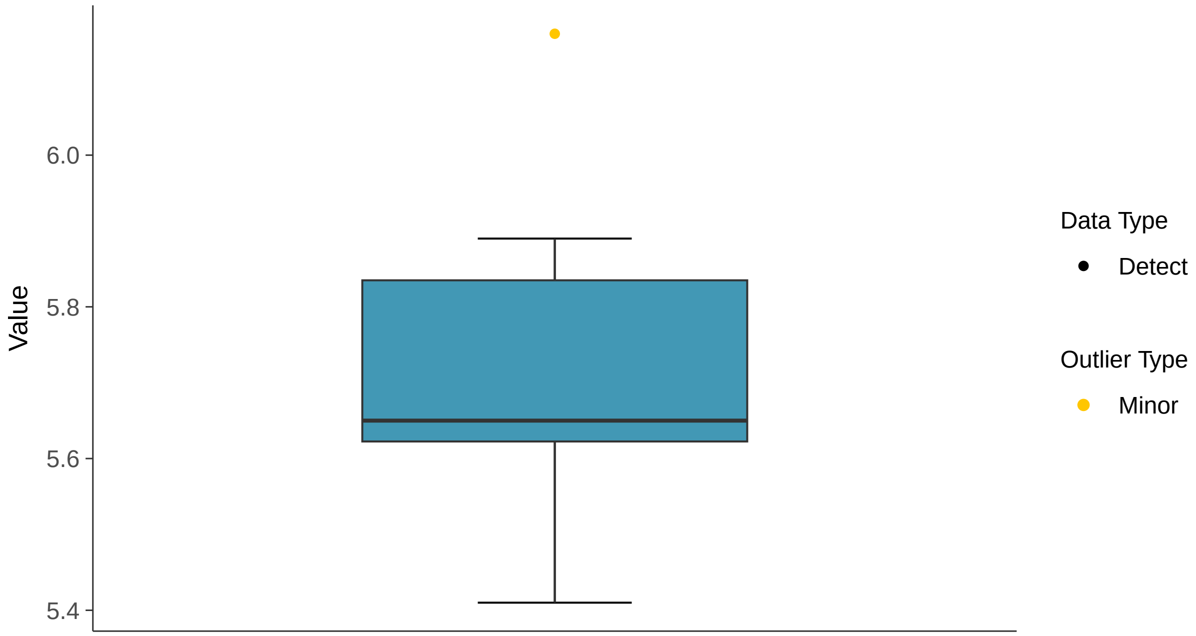
Histogram

Boron, MW-3 (mg/L)



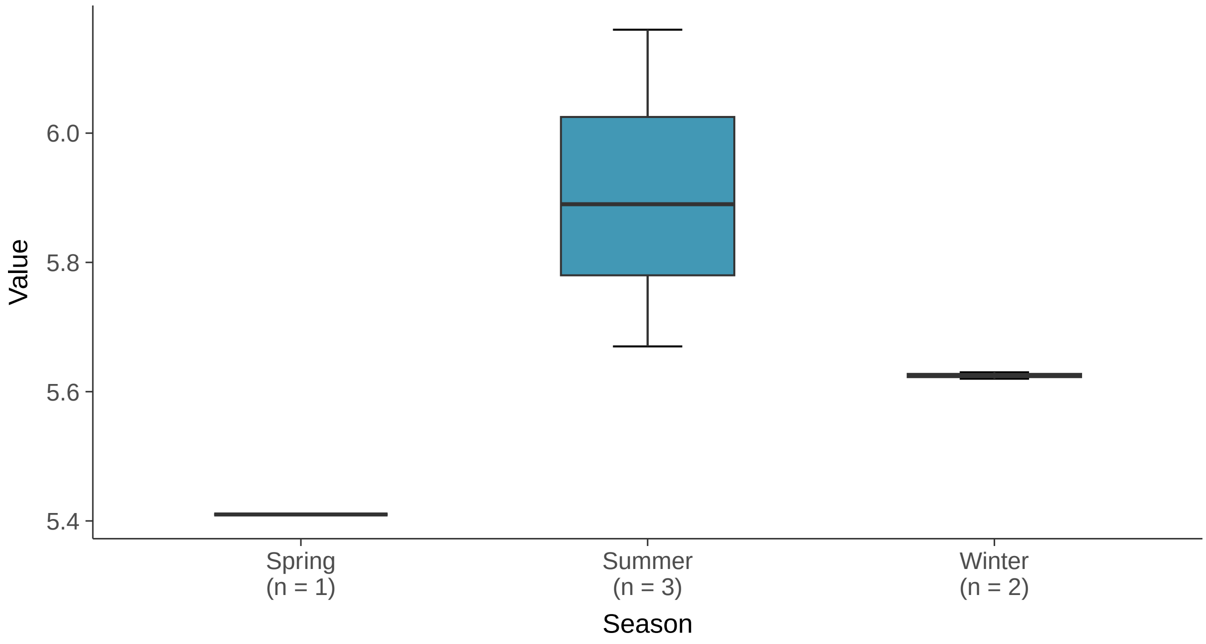
Boxplot

Boron, MW-3 (mg/L)



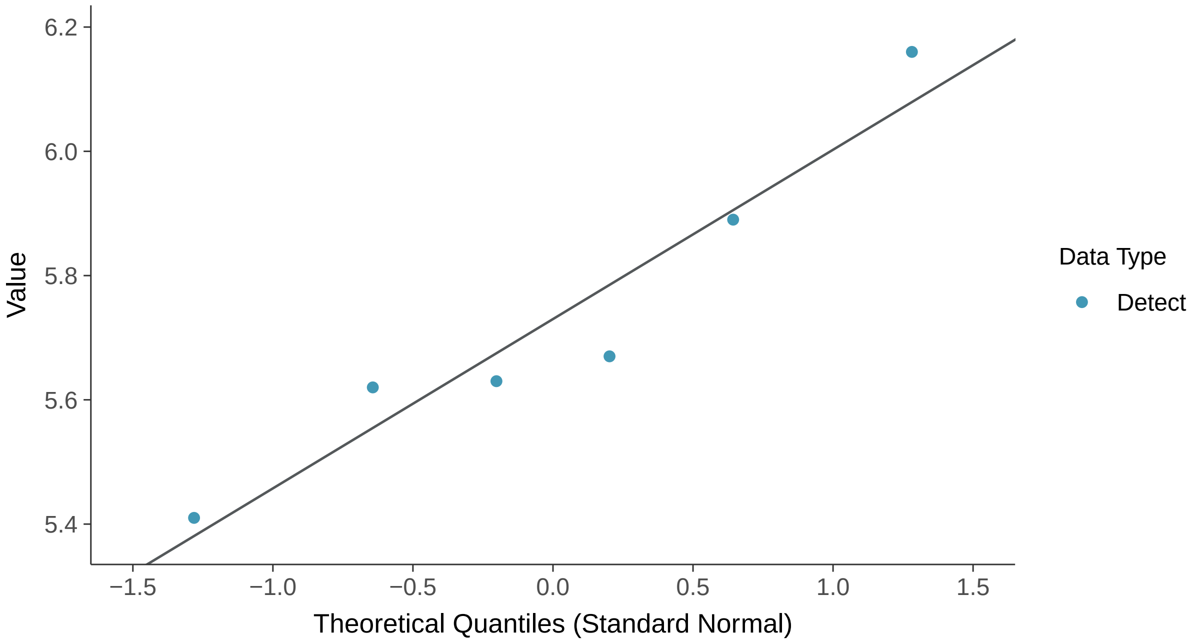
Boxplot by Season

Boron, MW-3 (mg/L)



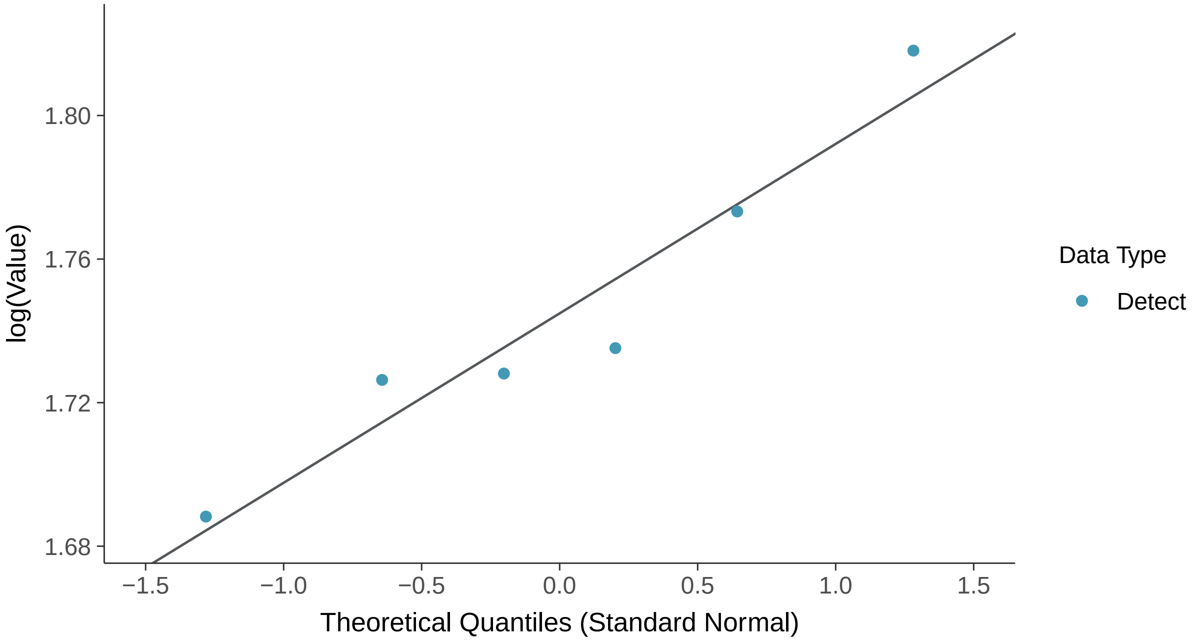
Normal Q-Q plot

Boron, MW-3 (mg/L)



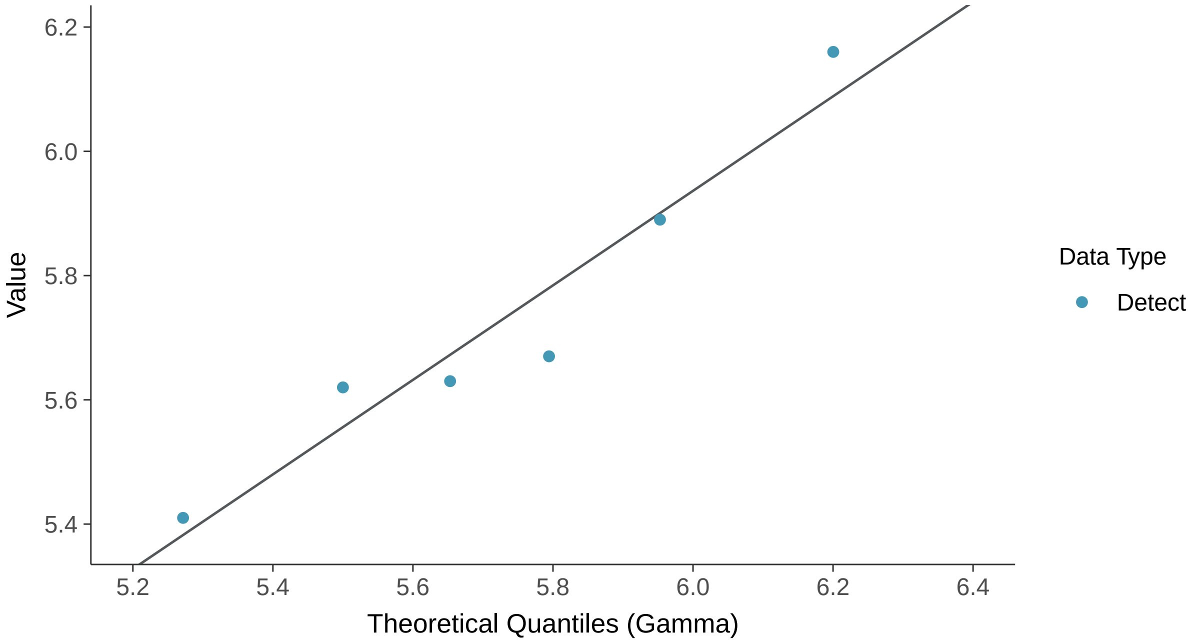
Lognormal Q-Q plot

Boron, MW-3 (mg/L)



Gamma Q-Q plot

Boron, MW-3 (mg/L)

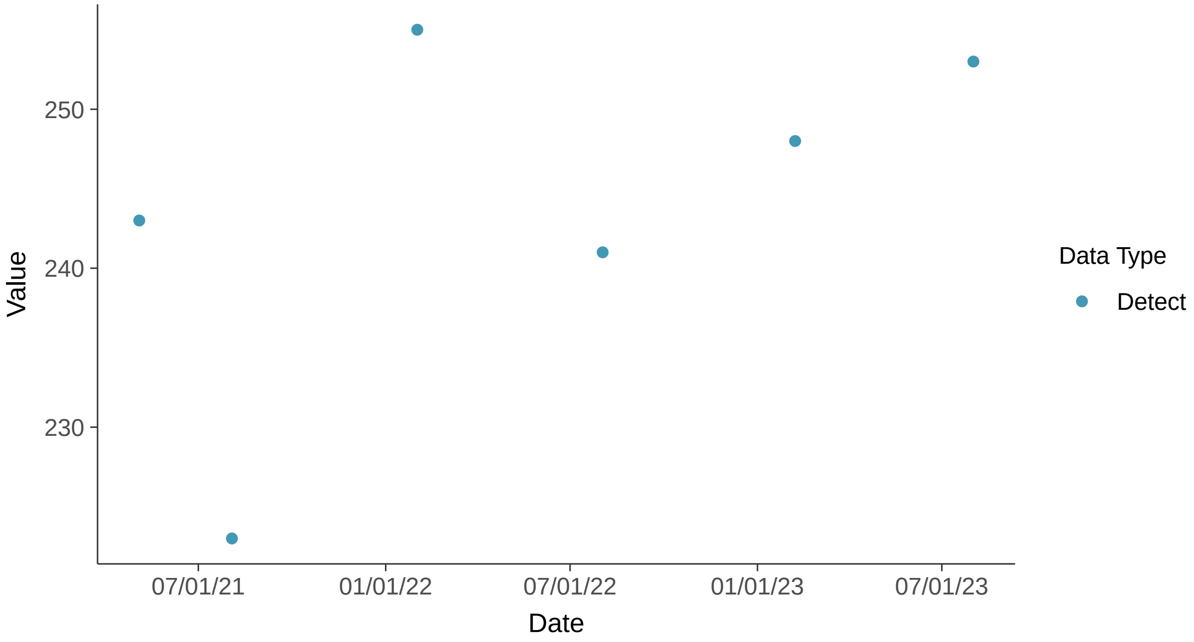


Appendix III: Calcium, MW-3

ID: 03_1_02

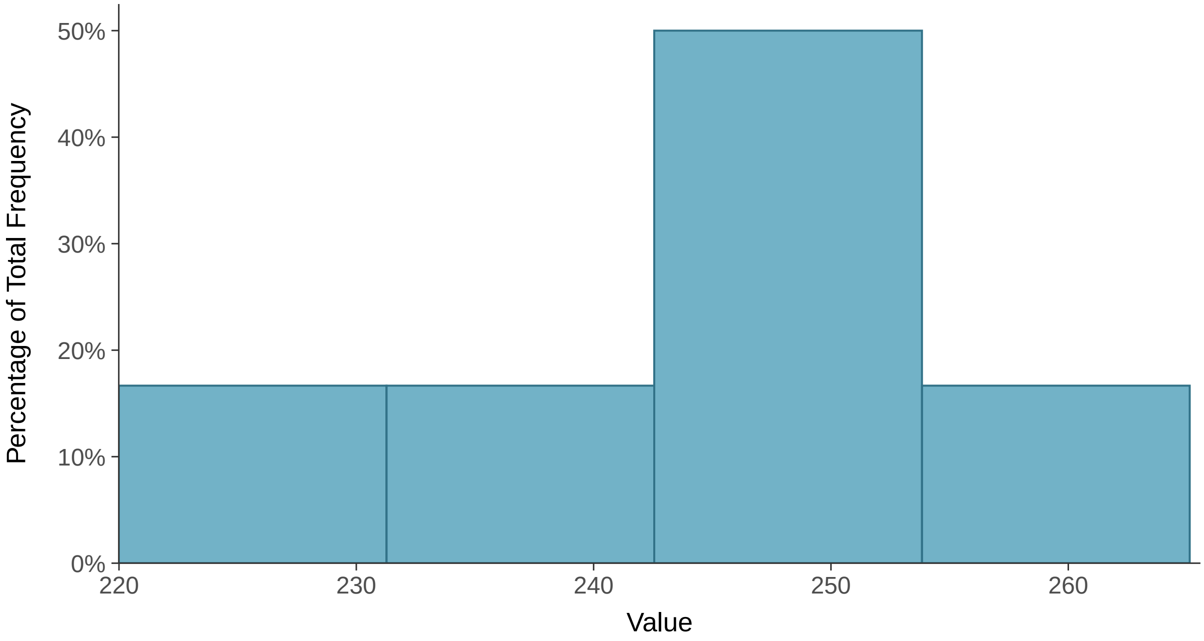
Scatter Plot

Calcium, MW-3 (mg/L)



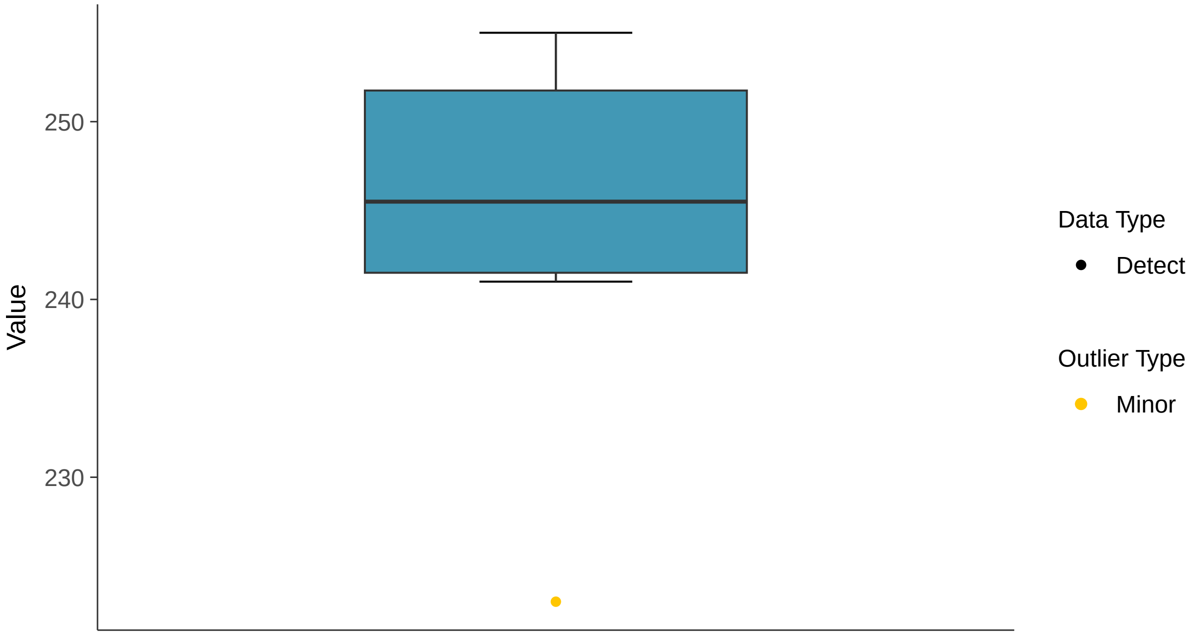
Histogram

Calcium, MW-3 (mg/L)



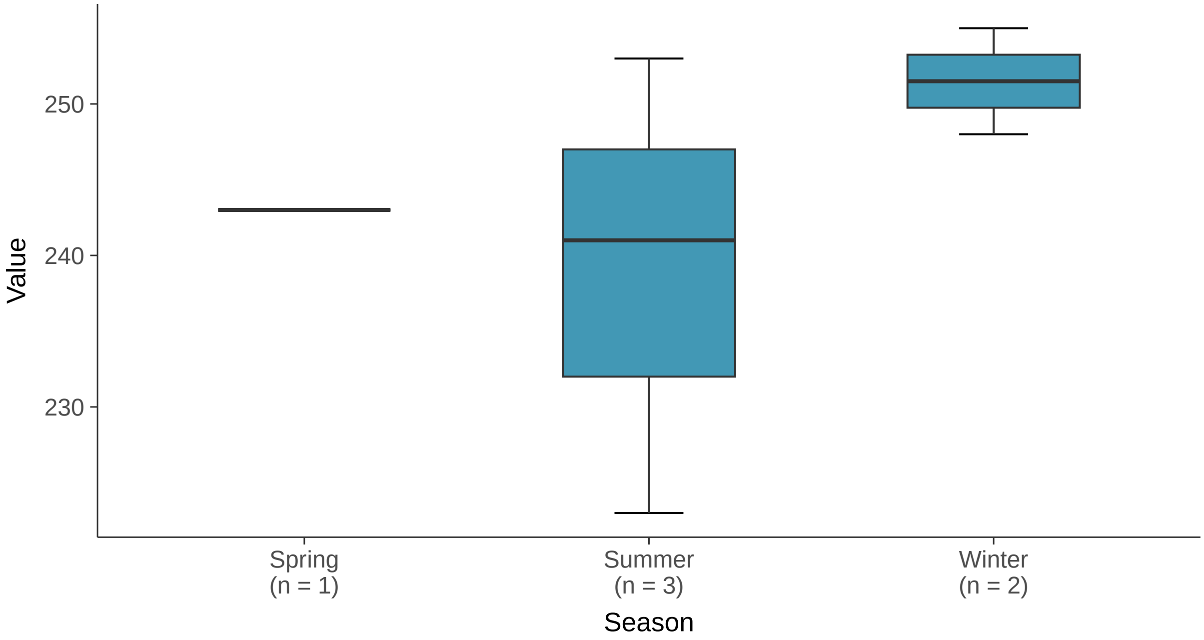
Boxplot

Calcium, MW-3 (mg/L)



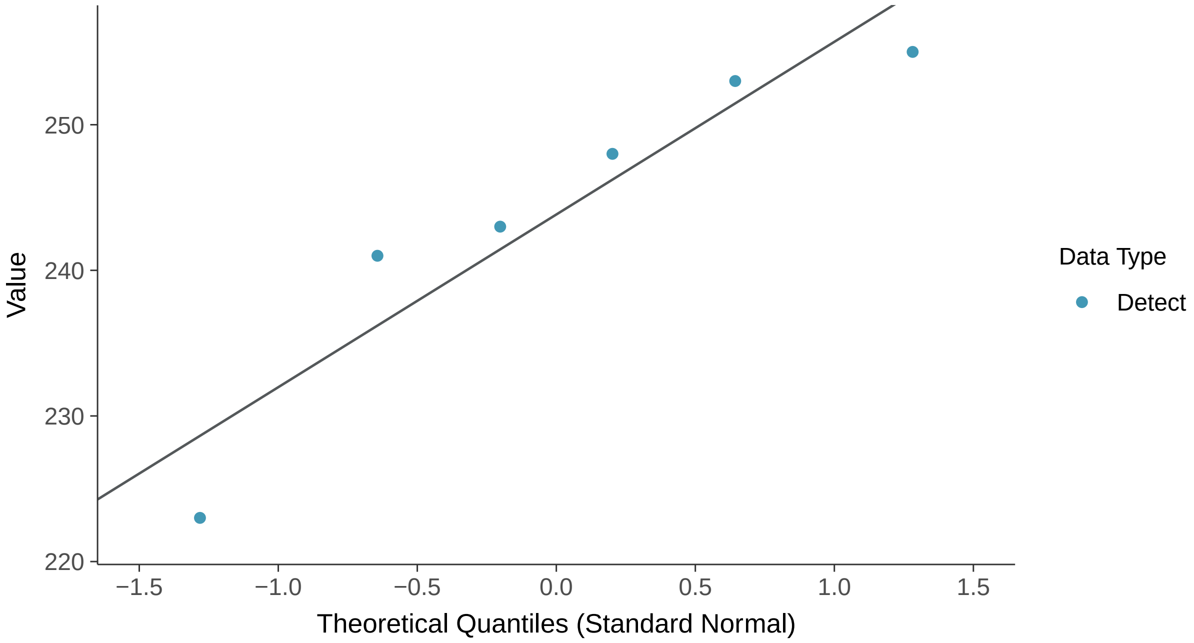
Boxplot by Season

Calcium, MW-3 (mg/L)



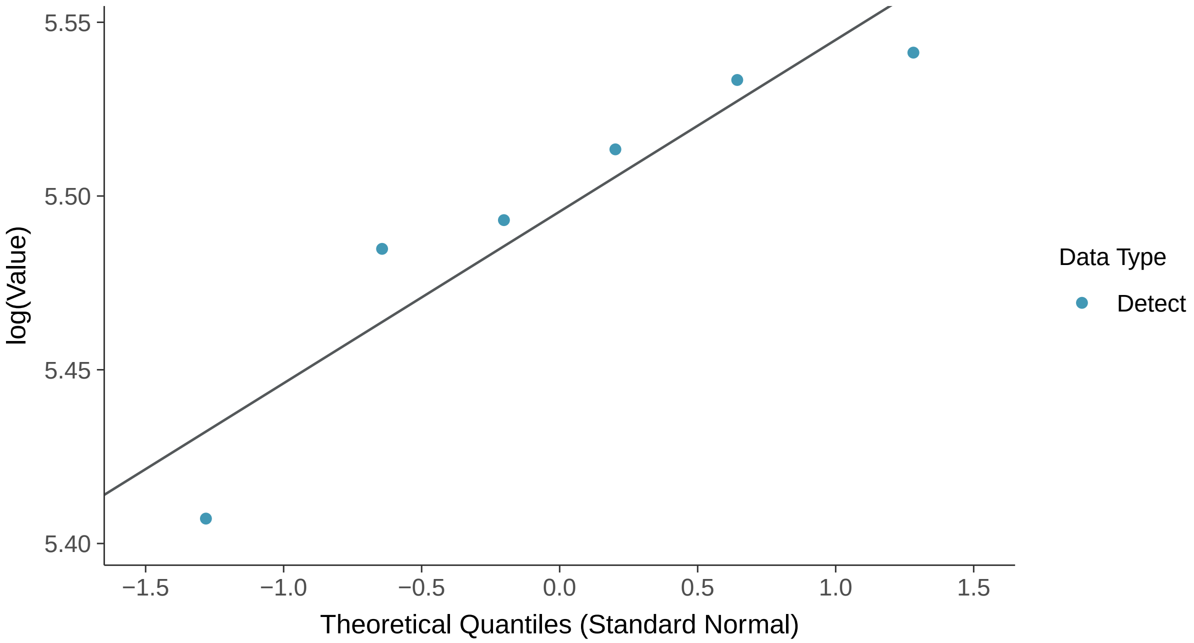
Normal Q-Q plot

Calcium, MW-3 (mg/L)



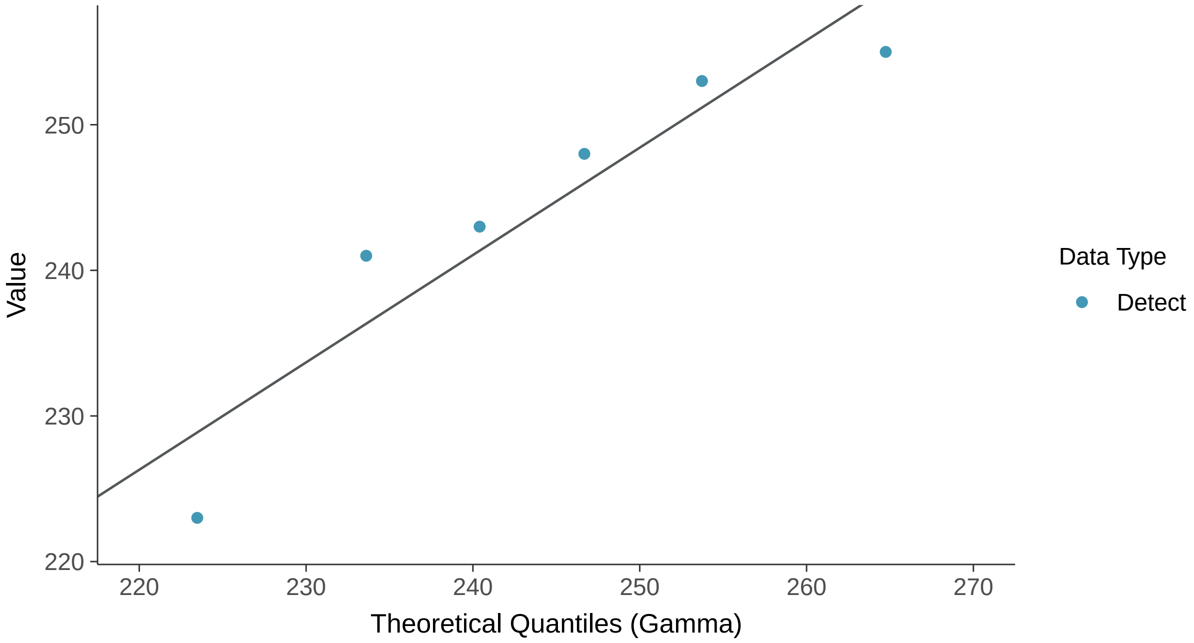
Lognormal Q-Q plot

Calcium, MW-3 (mg/L)



Gamma Q-Q plot

Calcium, MW-3 (mg/L)

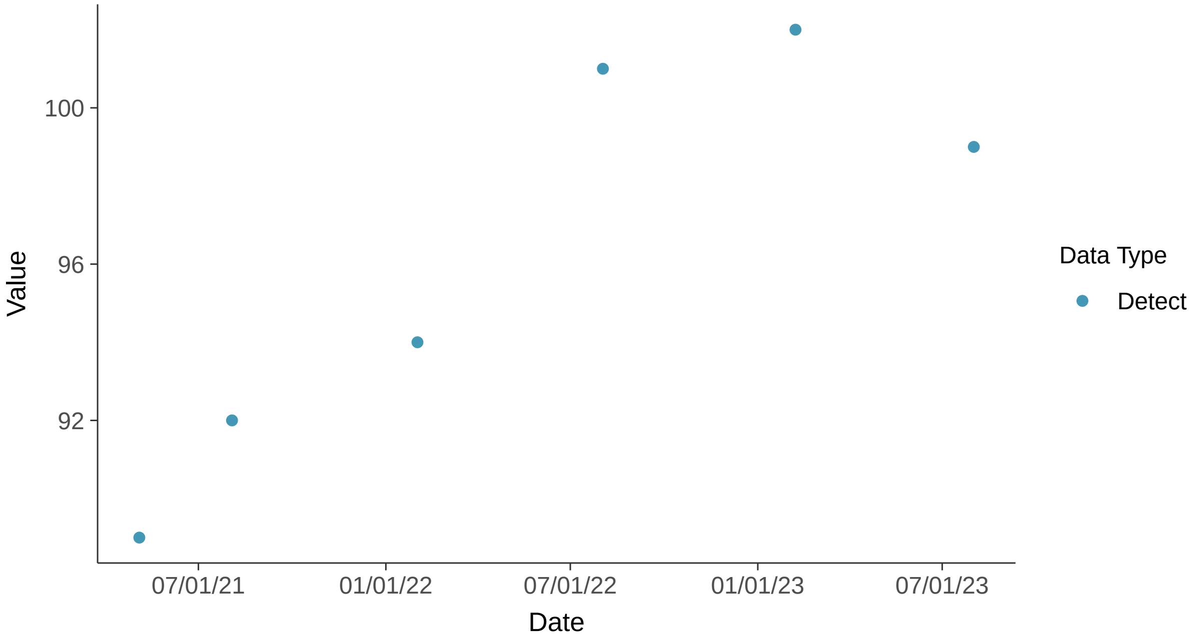


Appendix III: Chloride, MW-3

ID: 03_1_03

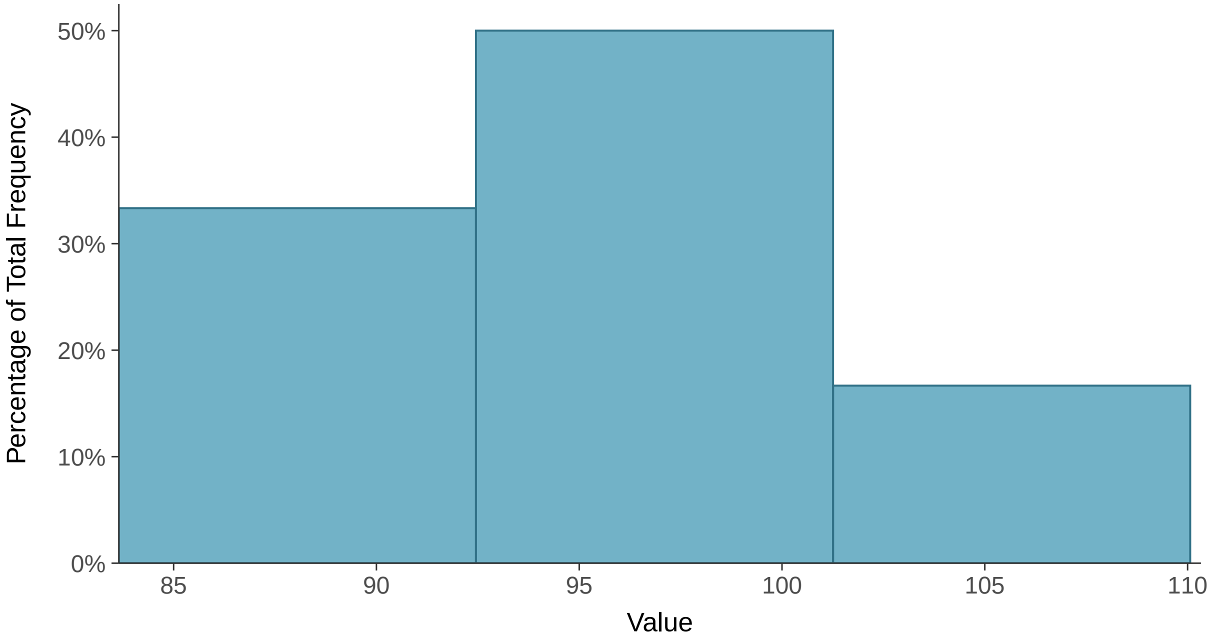
Scatter Plot

Chloride, MW-3 (mg/L)



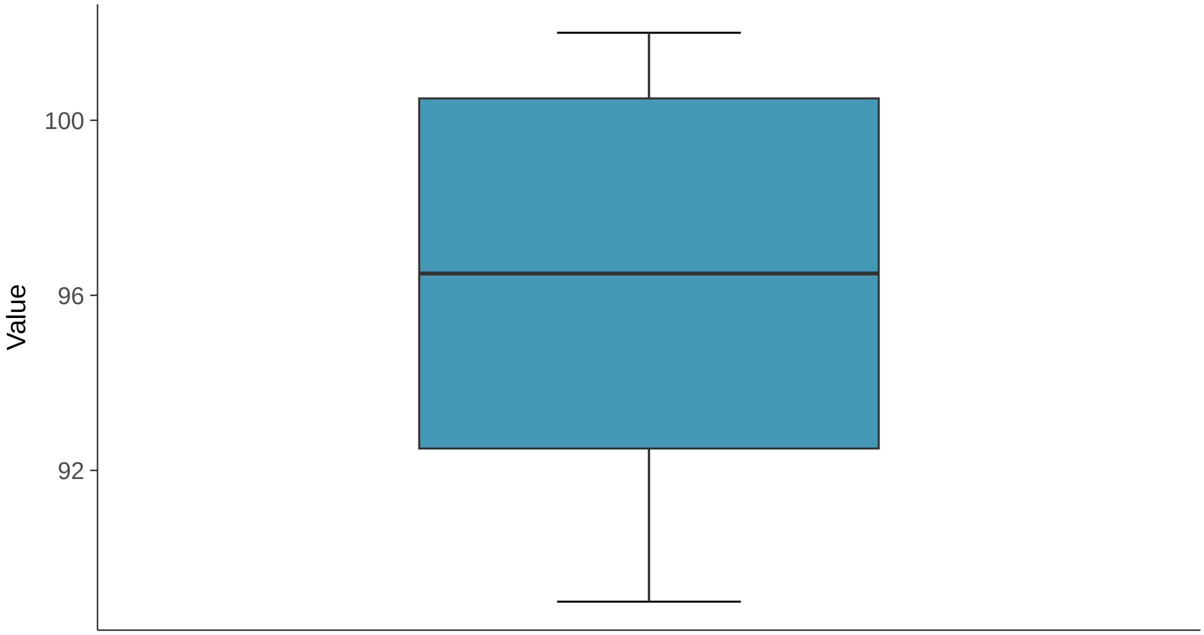
Histogram

Chloride, MW-3 (mg/L)



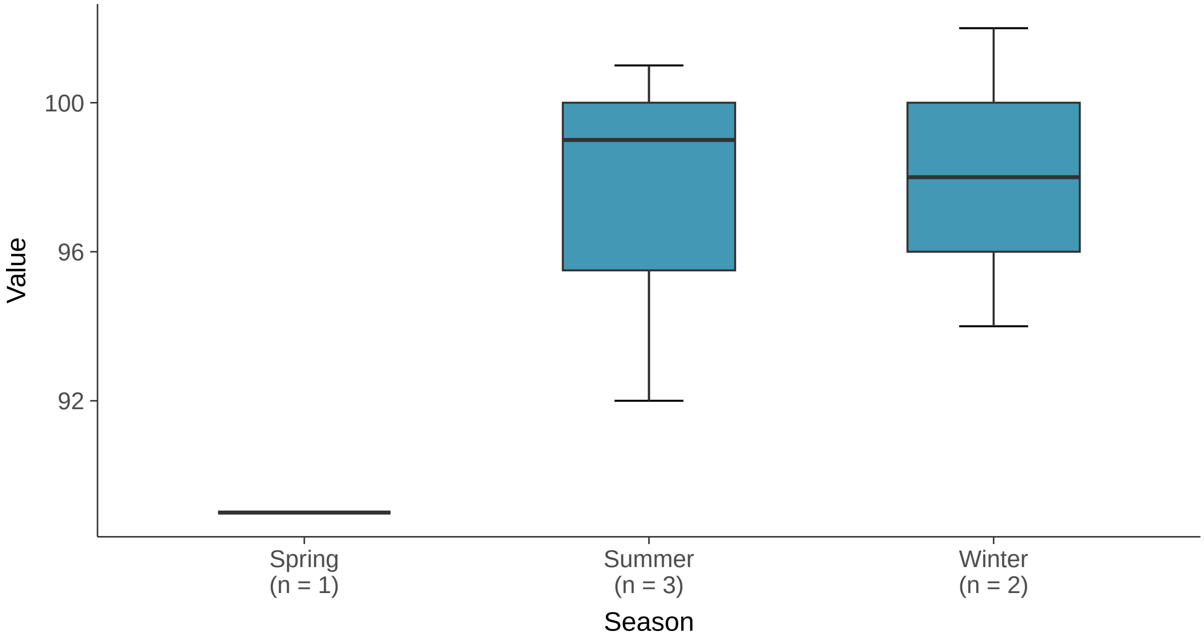
Boxplot

Chloride, MW-3 (mg/L)



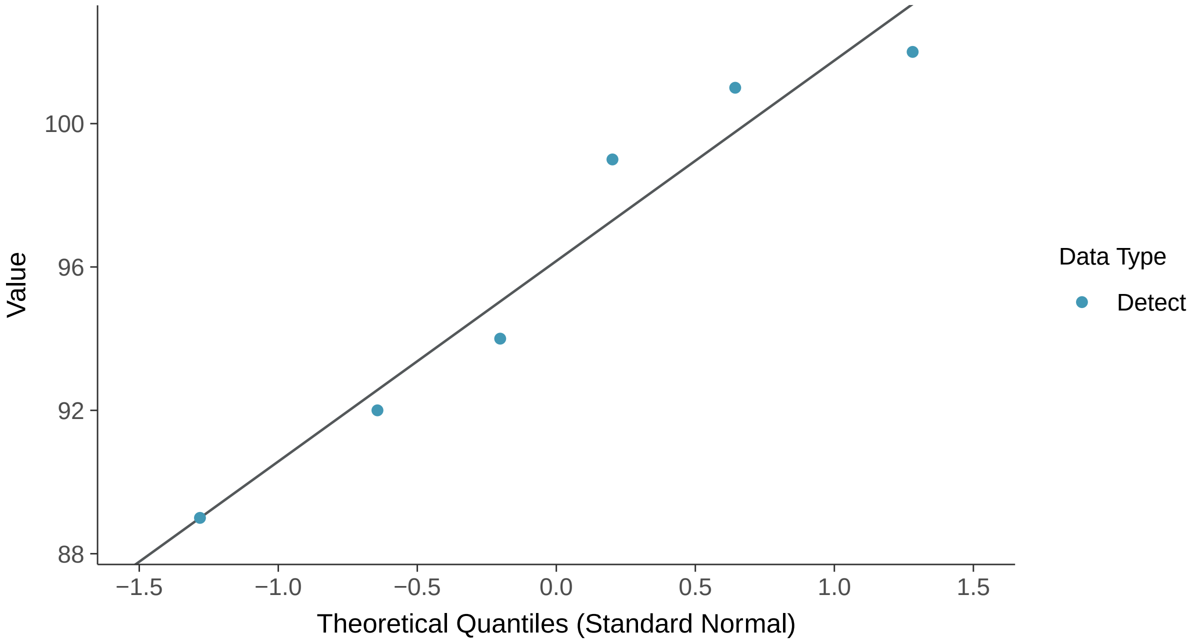
Boxplot by Season

Chloride, MW-3 (mg/L)



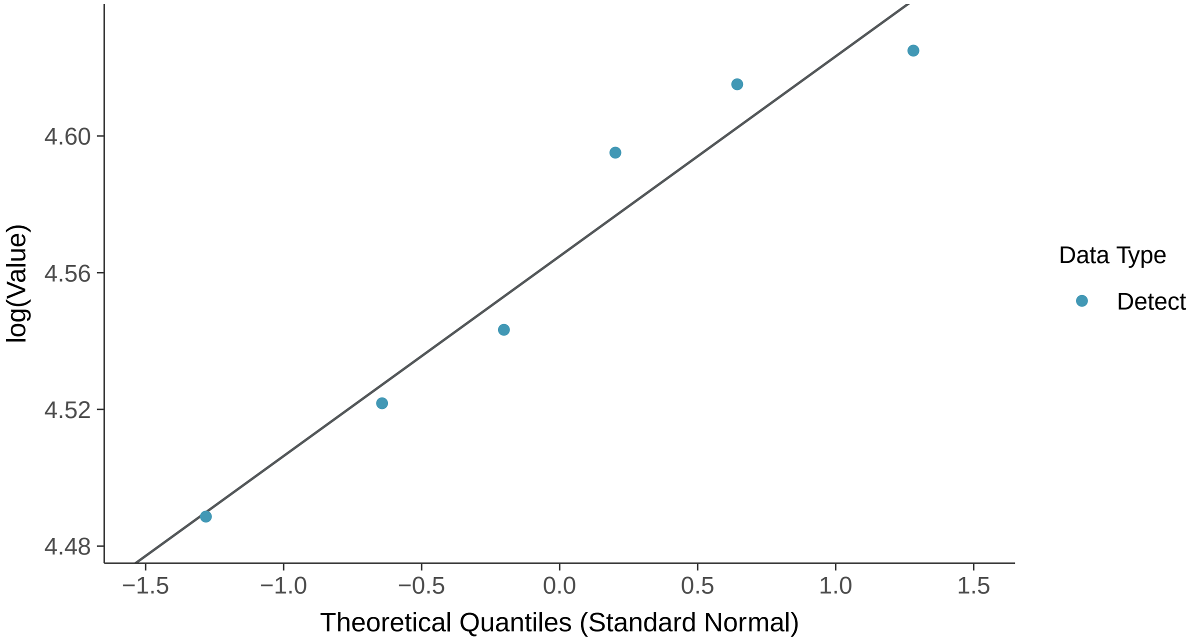
Normal Q-Q plot

Chloride, MW-3 (mg/L)



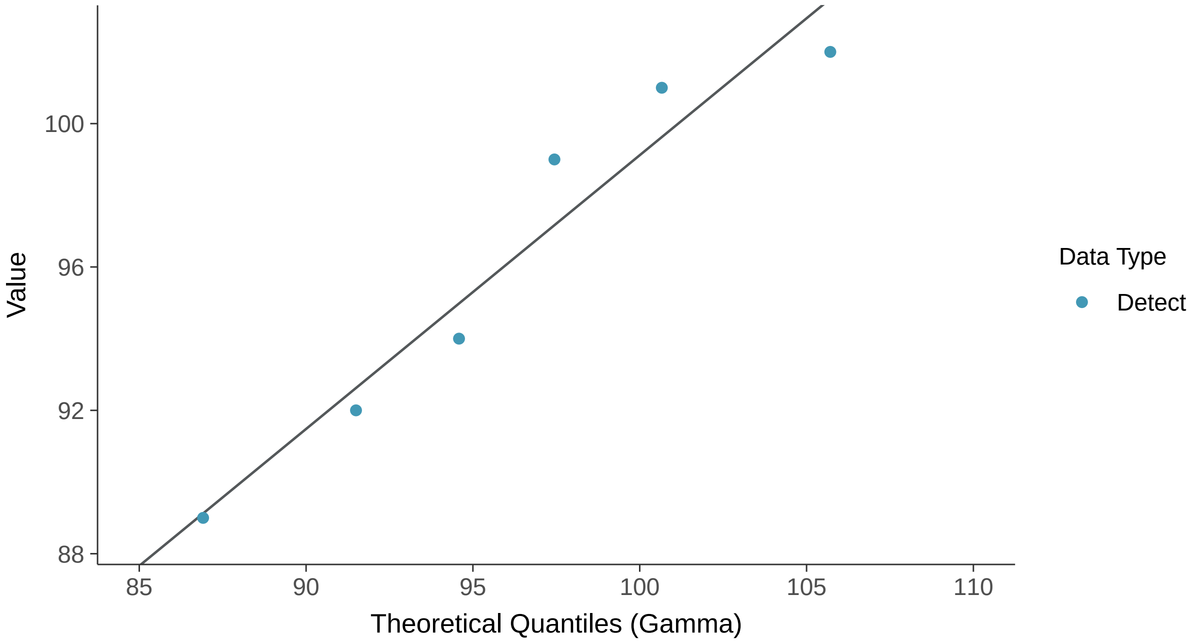
Lognormal Q-Q plot

Chloride, MW-3 (mg/L)



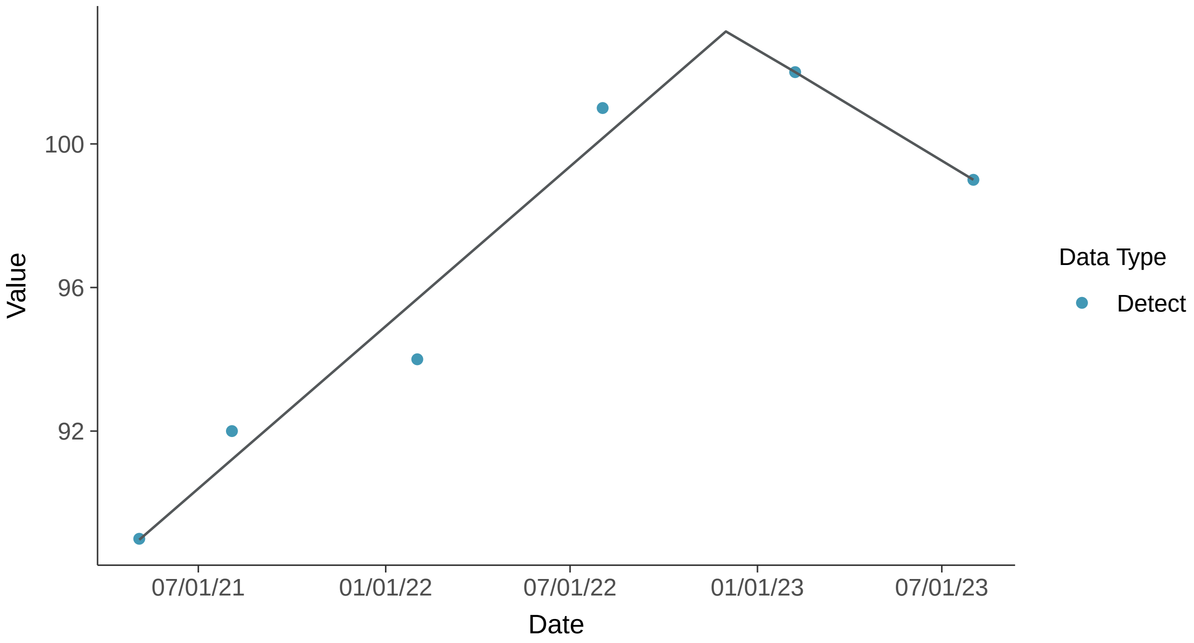
Gamma Q-Q plot

Chloride, MW-3 (mg/L)



Trend Regression: Piecewise Linear-Linear

Chloride, MW-3 (mg/L)

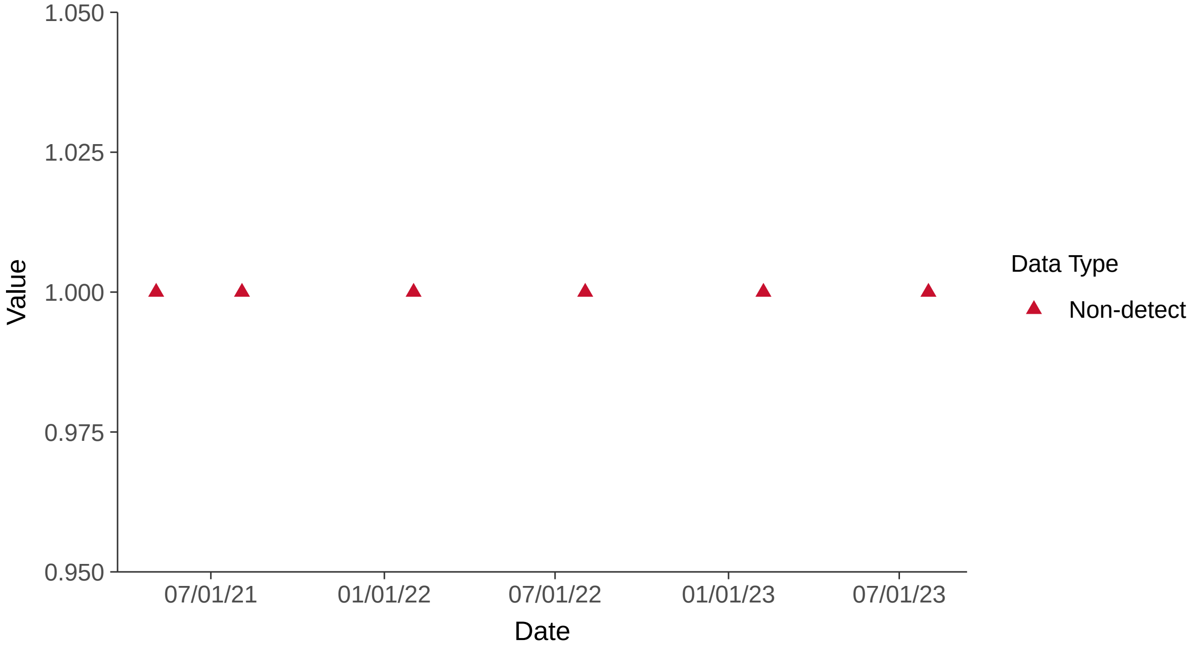


Appendix III: Fluoride, MW-3

ID: 03_1_04

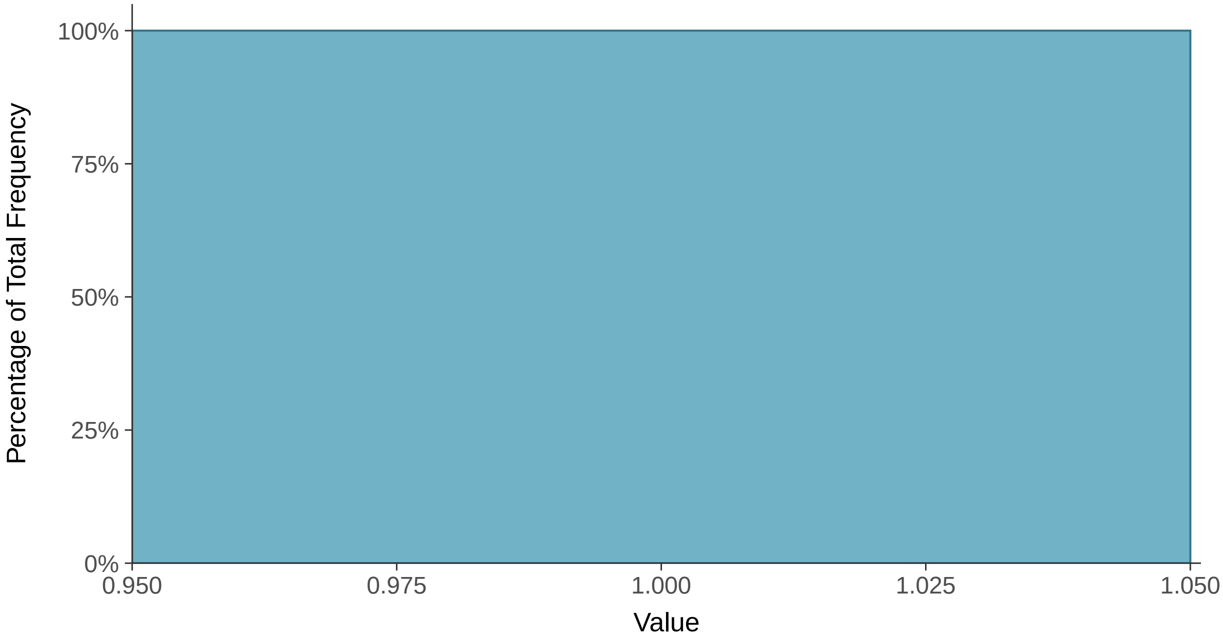
Scatter Plot

Fluoride, MW-3 (mg/L)



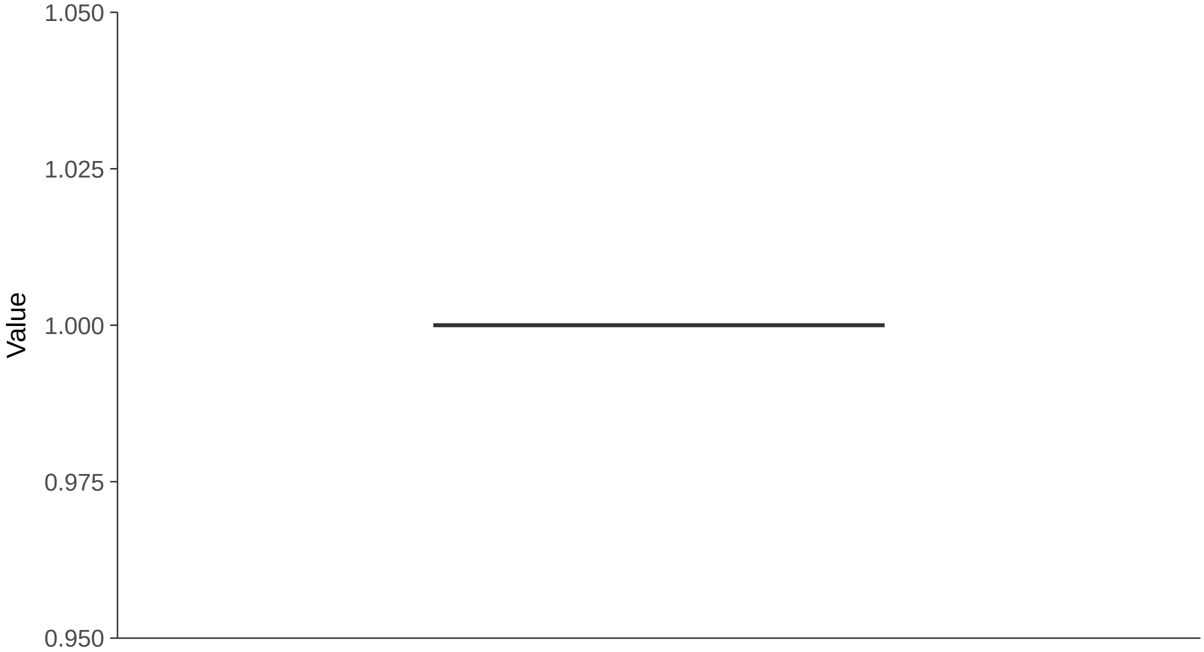
Histogram

Fluoride, MW-3 (mg/L)



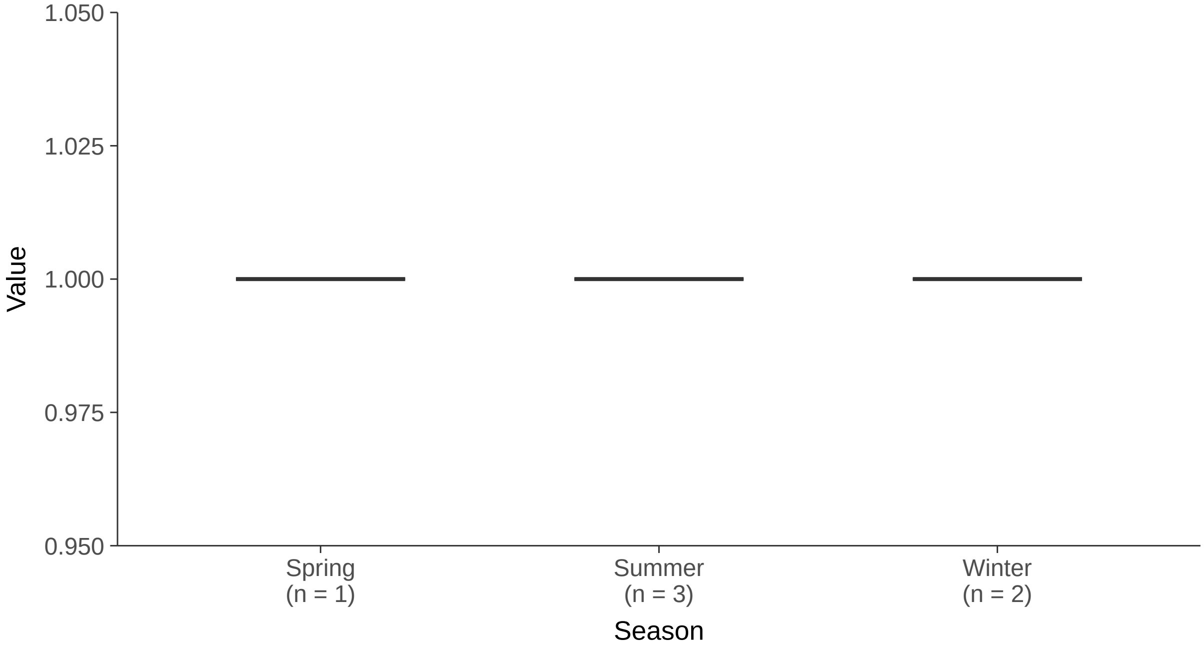
Boxplot

Fluoride, MW-3 (mg/L)



Boxplot by Season

Fluoride, MW-3 (mg/L)

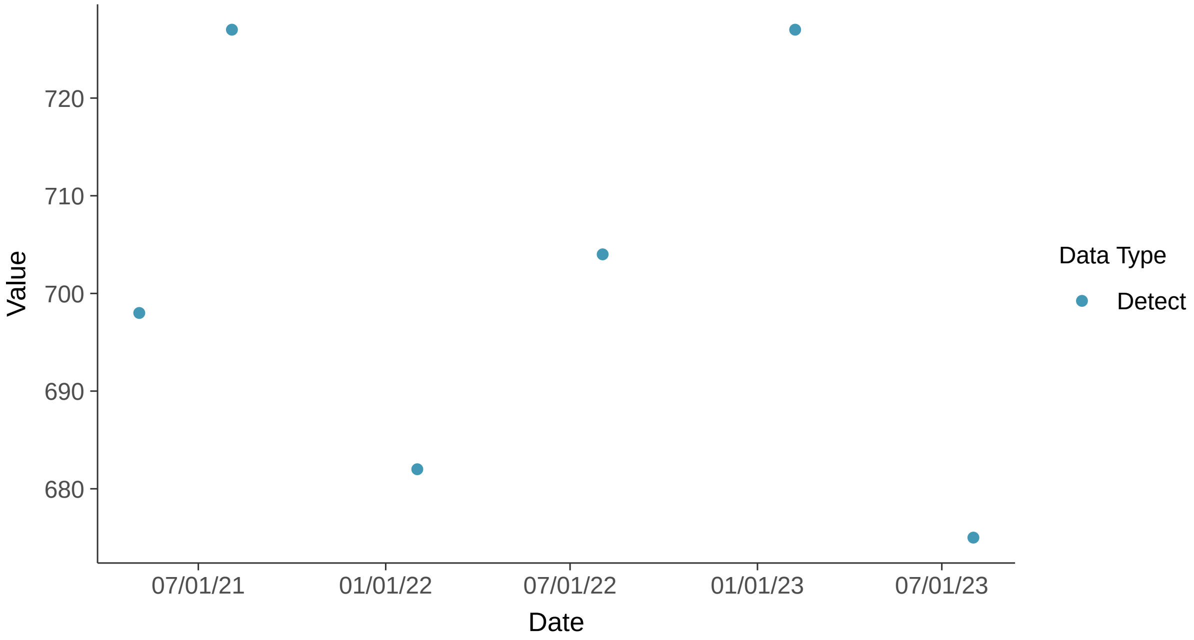


Appendix III: Sulfate, MW-3

ID: 03_1_05

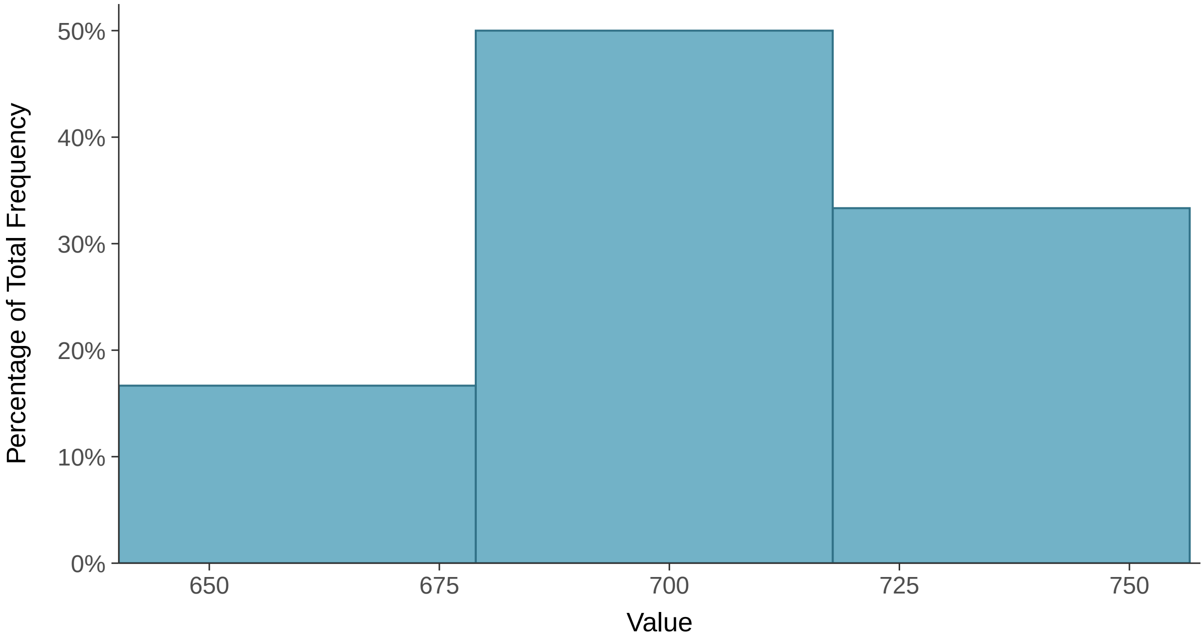
Scatter Plot

Sulfate, MW-3 (mg/L)



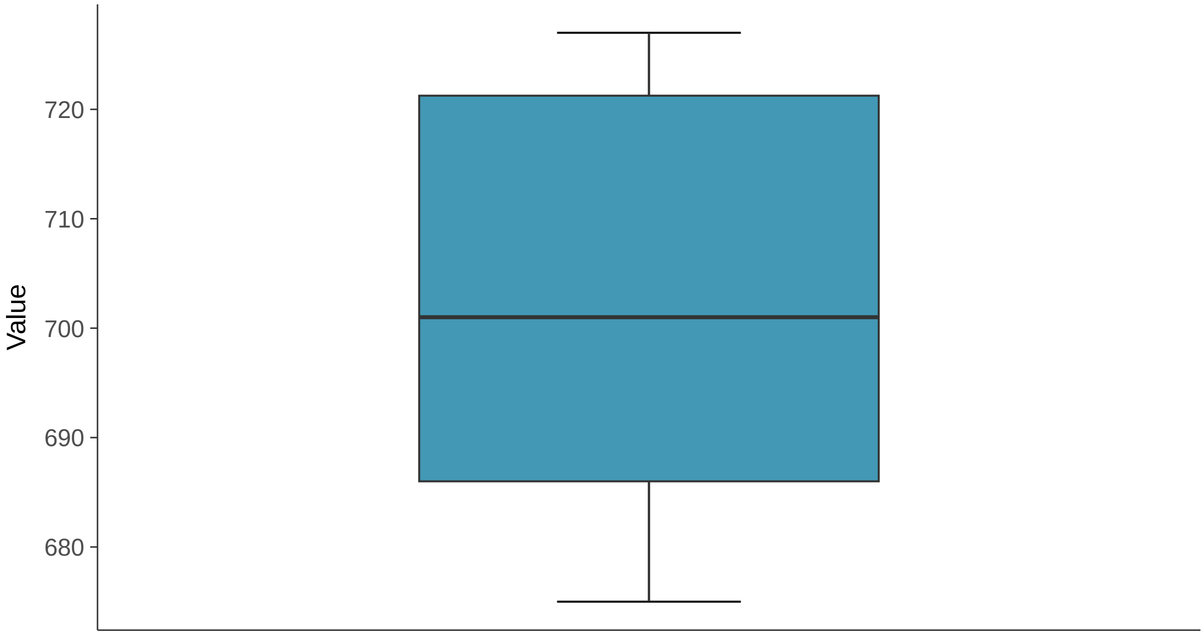
Histogram

Sulfate, MW-3 (mg/L)



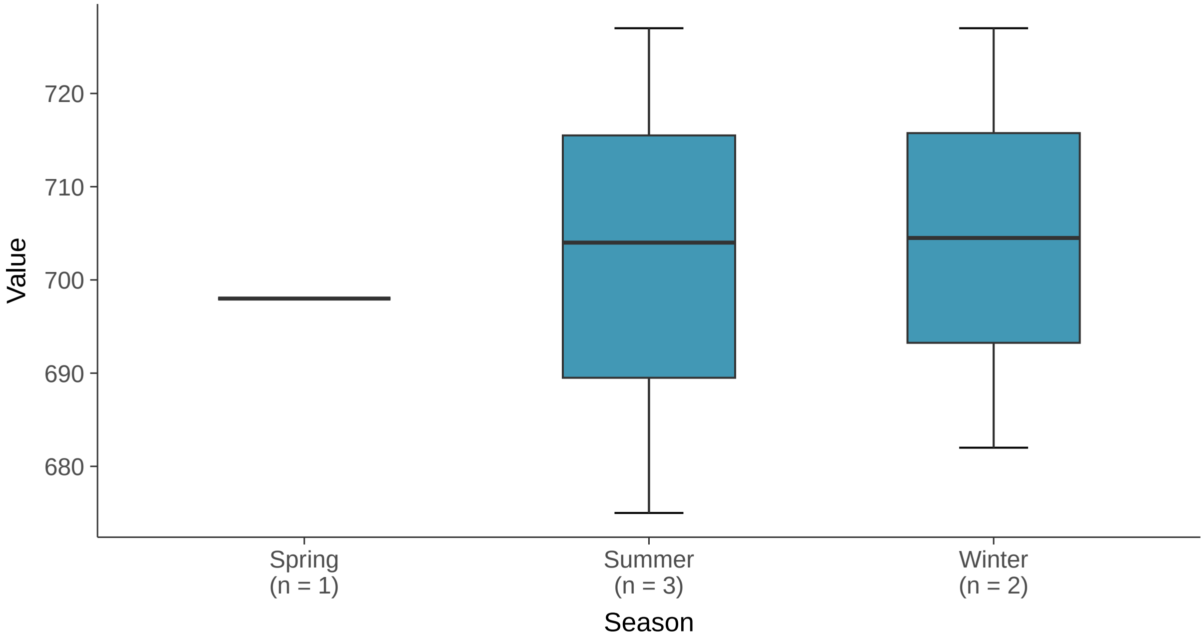
Boxplot

Sulfate, MW-3 (mg/L)



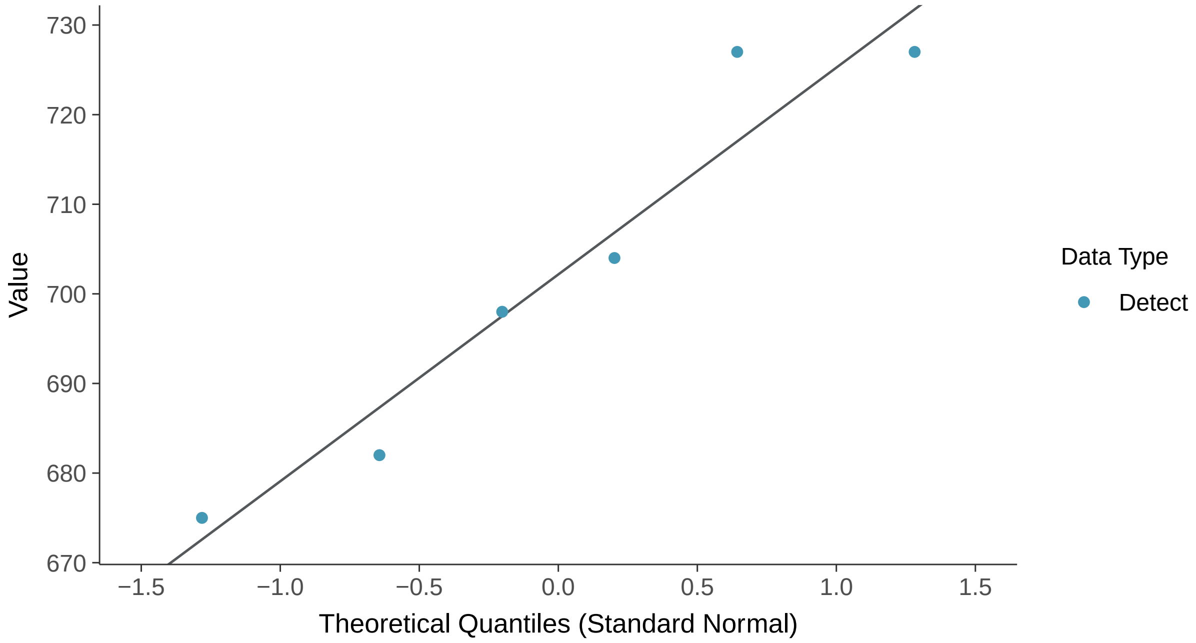
Boxplot by Season

Sulfate, MW-3 (mg/L)



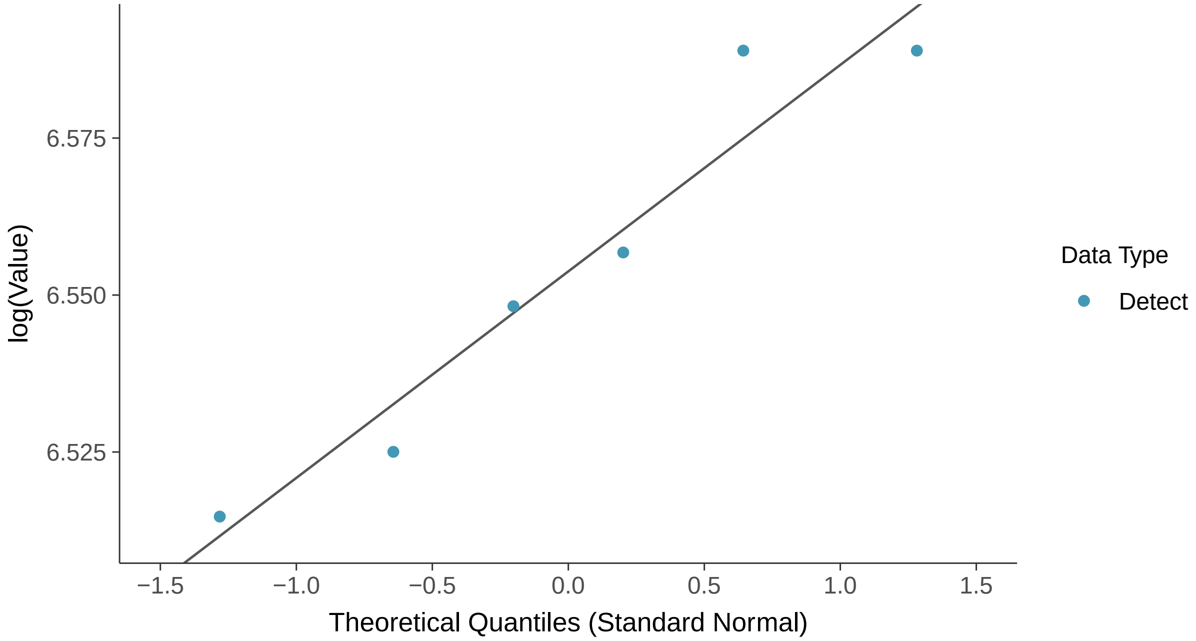
Normal Q-Q plot

Sulfate, MW-3 (mg/L)



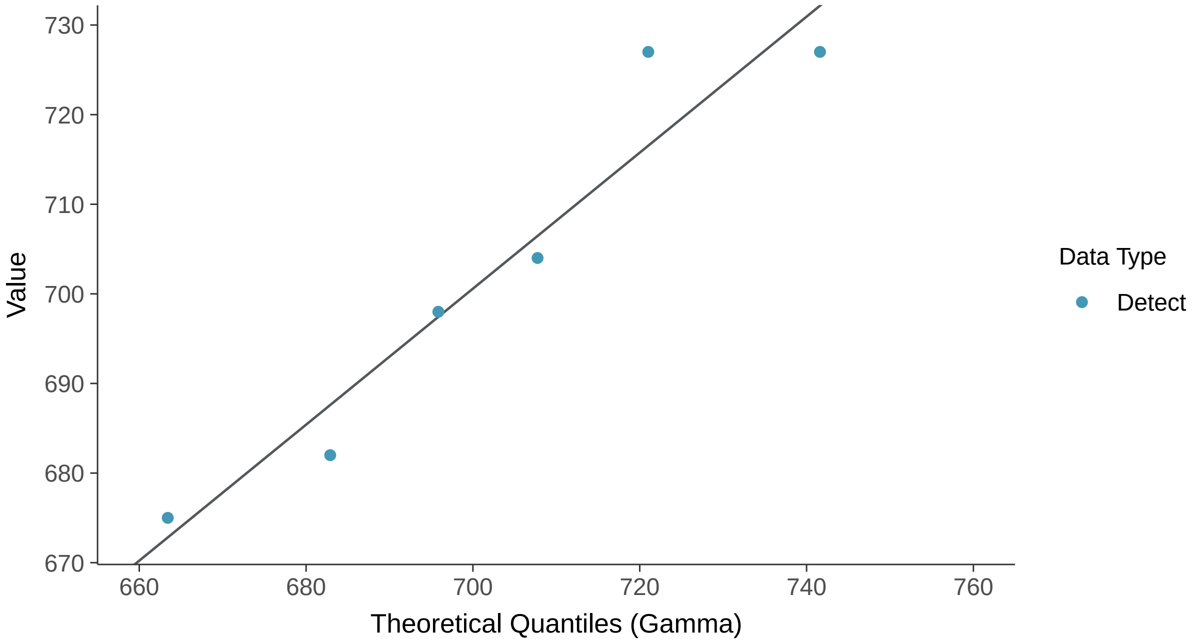
Lognormal Q-Q plot

Sulfate, MW-3 (mg/L)



Gamma Q-Q plot

Sulfate, MW-3 (mg/L)

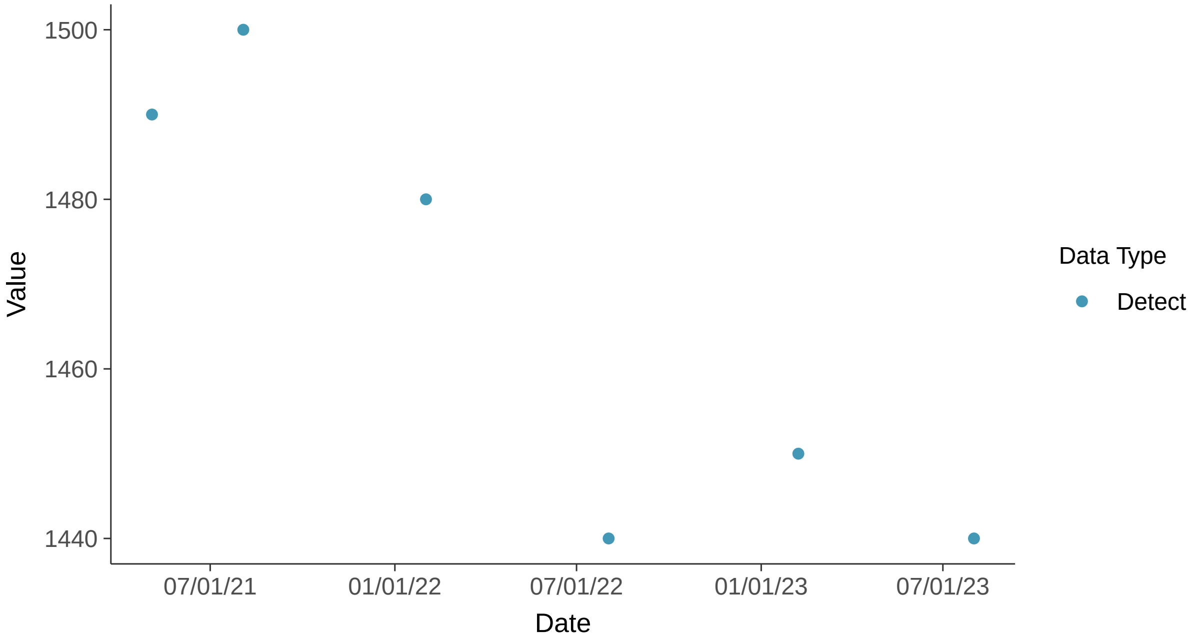


Appendix III: Total Dissolved Solids, MW-3

ID: 03_1_06

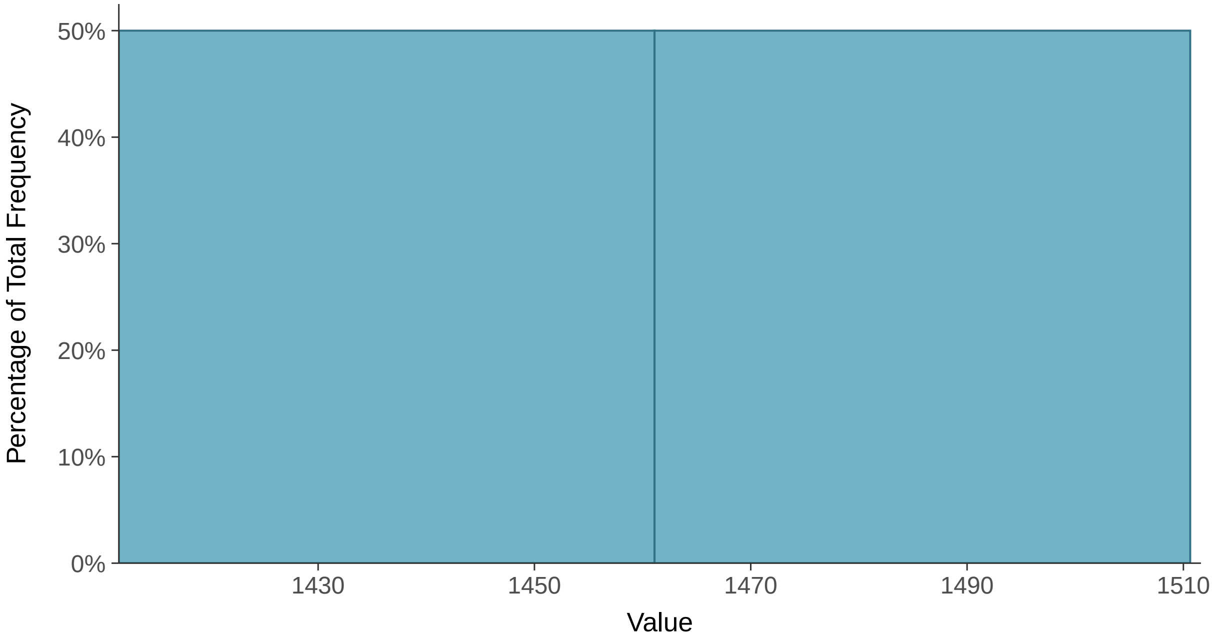
Scatter Plot

Total Dissolved Solids, MW-3 (mg/L)



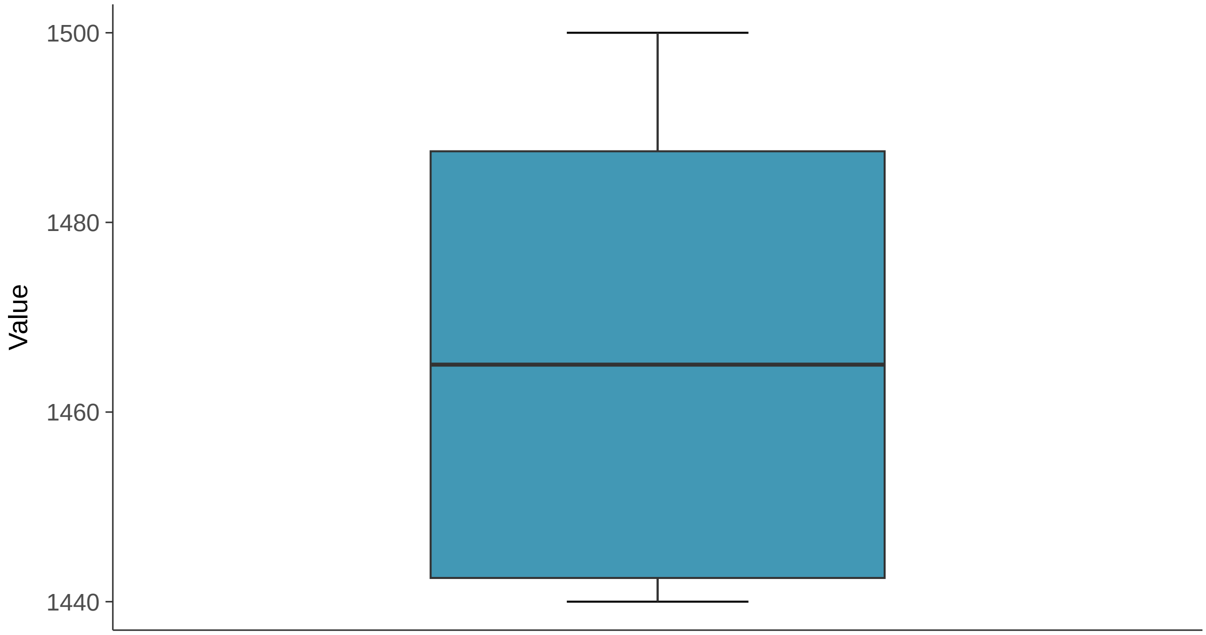
Histogram

Total Dissolved Solids, MW-3 (mg/L)



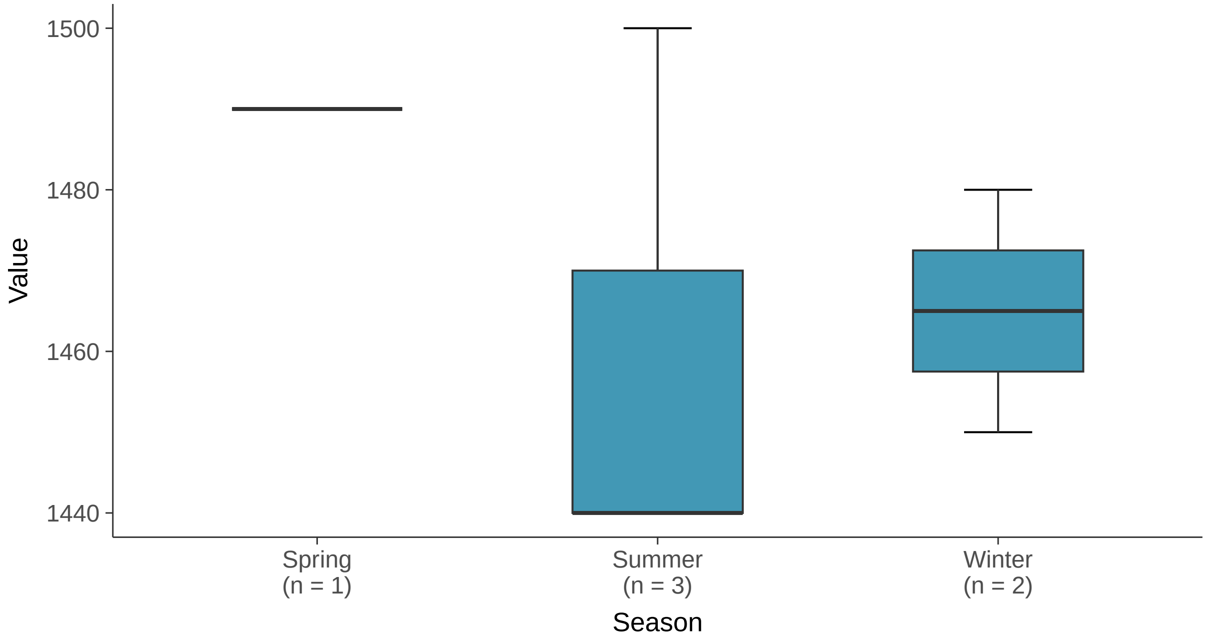
Boxplot

Total Dissolved Solids, MW-3 (mg/L)



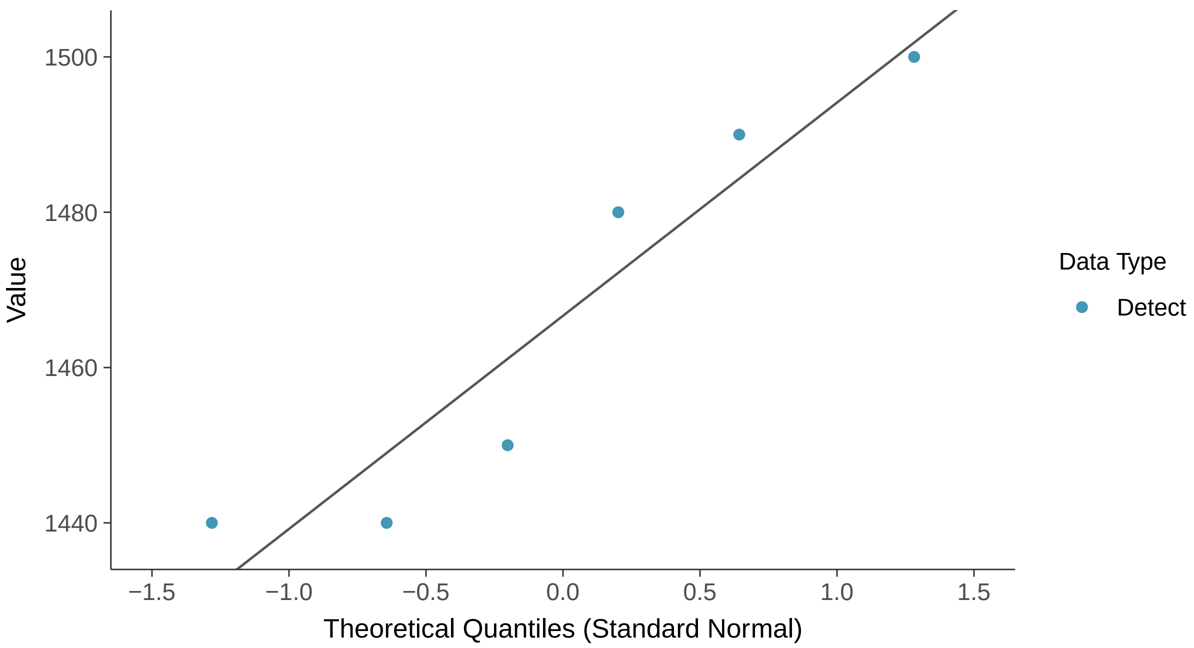
Boxplot by Season

Total Dissolved Solids, MW-3 (mg/L)



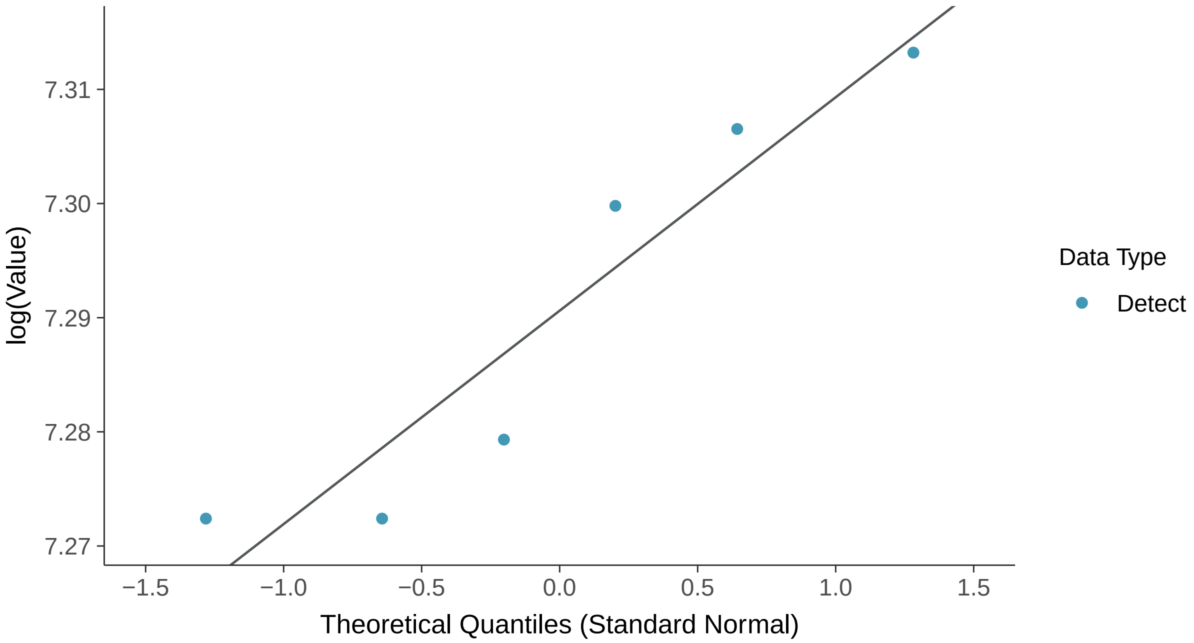
Normal Q-Q plot

Total Dissolved Solids, MW-3 (mg/L)



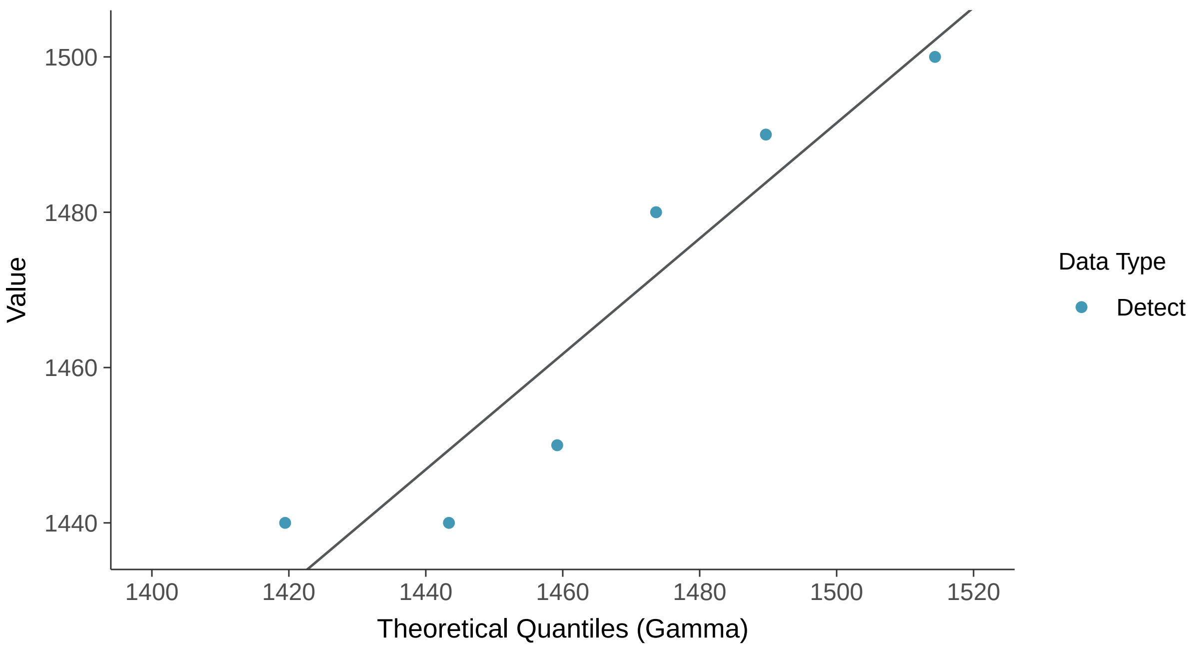
Lognormal Q-Q plot

Total Dissolved Solids, MW-3 (mg/L)



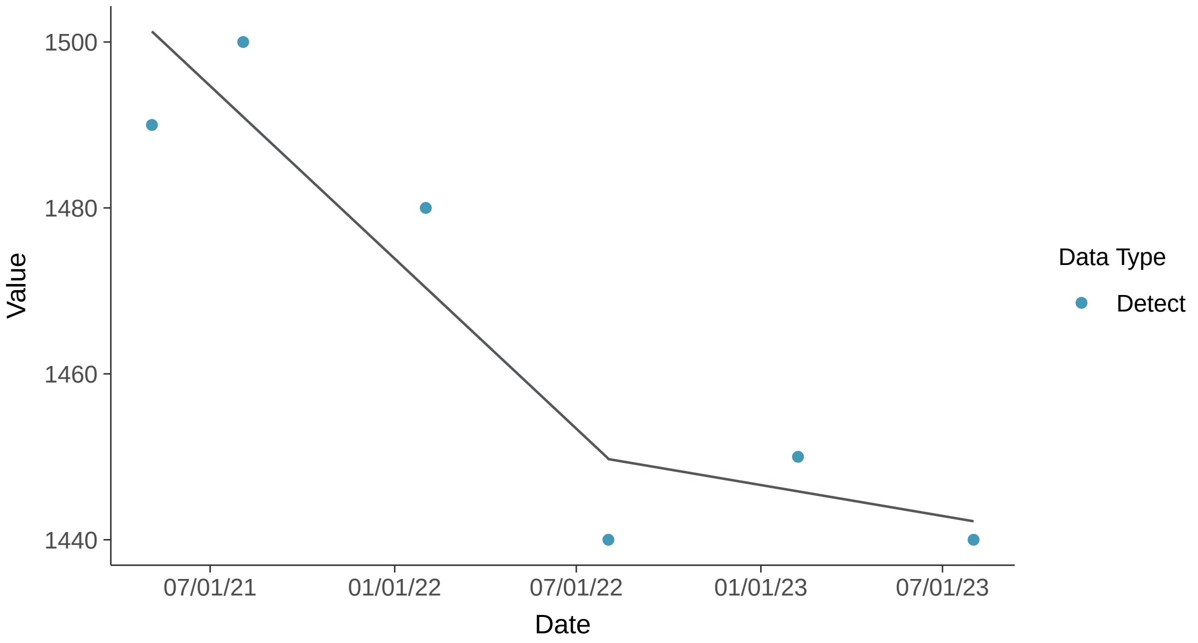
Gamma Q-Q plot

Total Dissolved Solids, MW-3 (mg/L)



Trend Regression: Piecewise Linear-Linear

Total Dissolved Solids, MW-3 (mg/L)

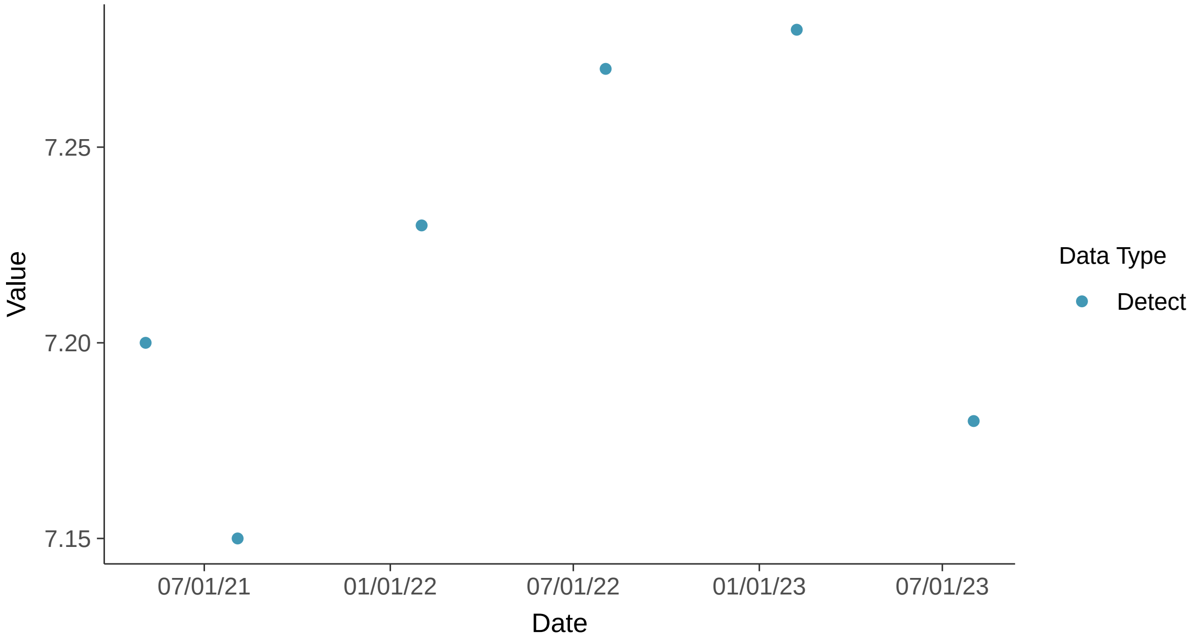


Appendix III: pH, Field, MW-3

ID: 03_1_07

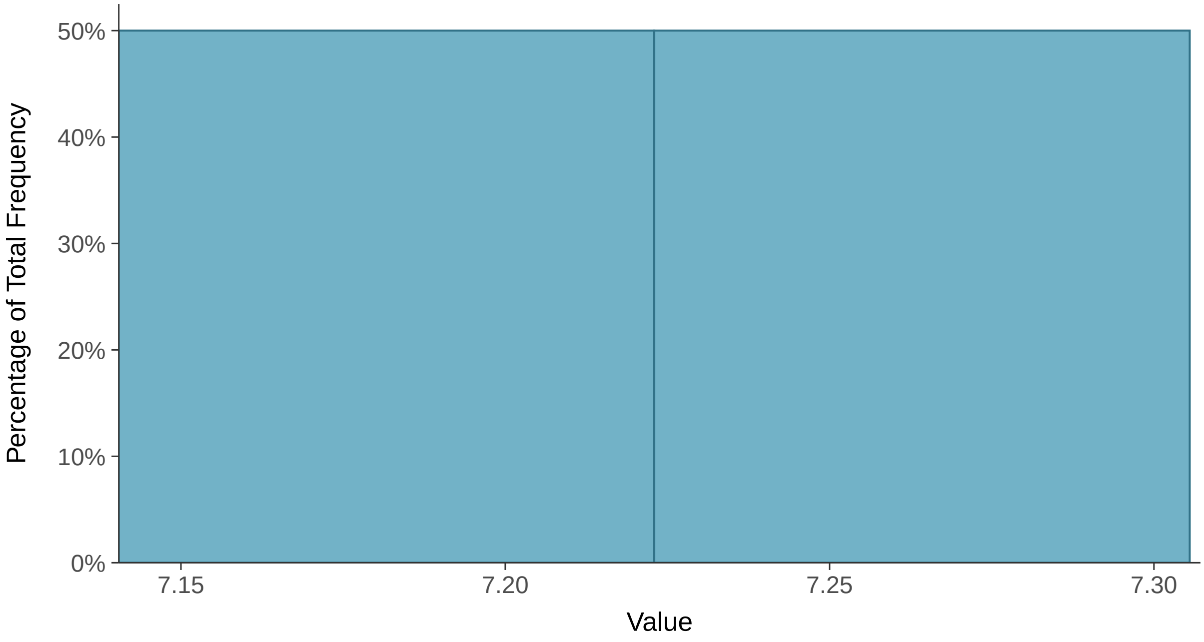
Scatter Plot

pH, Field, MW-3 (su)



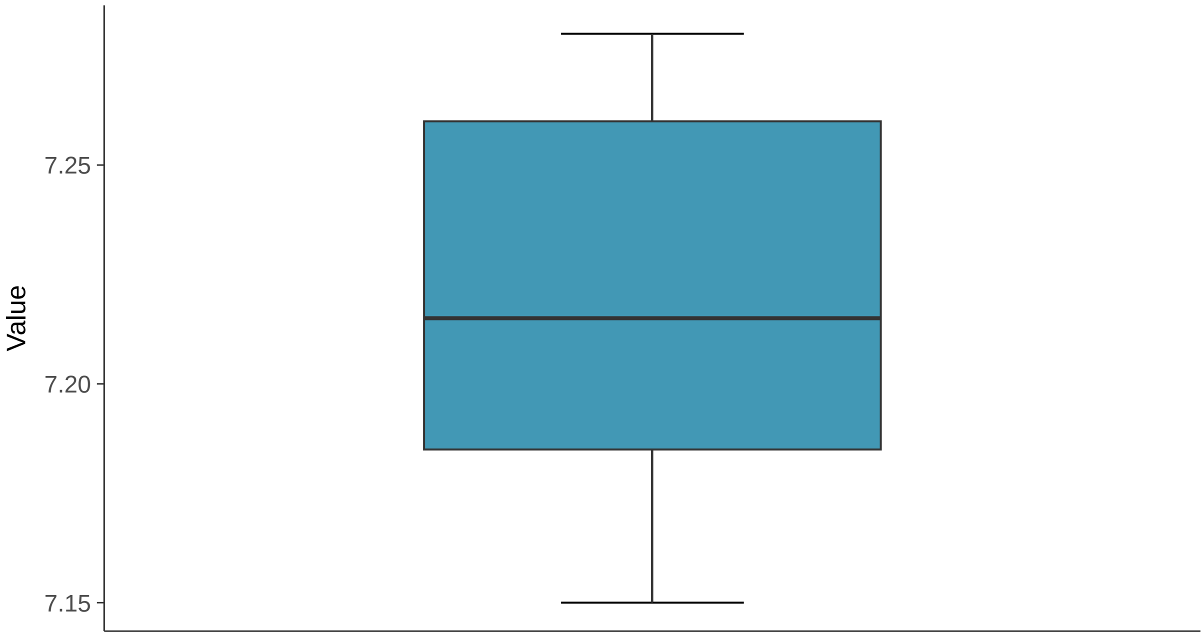
Histogram

pH, Field, MW-3 (su)



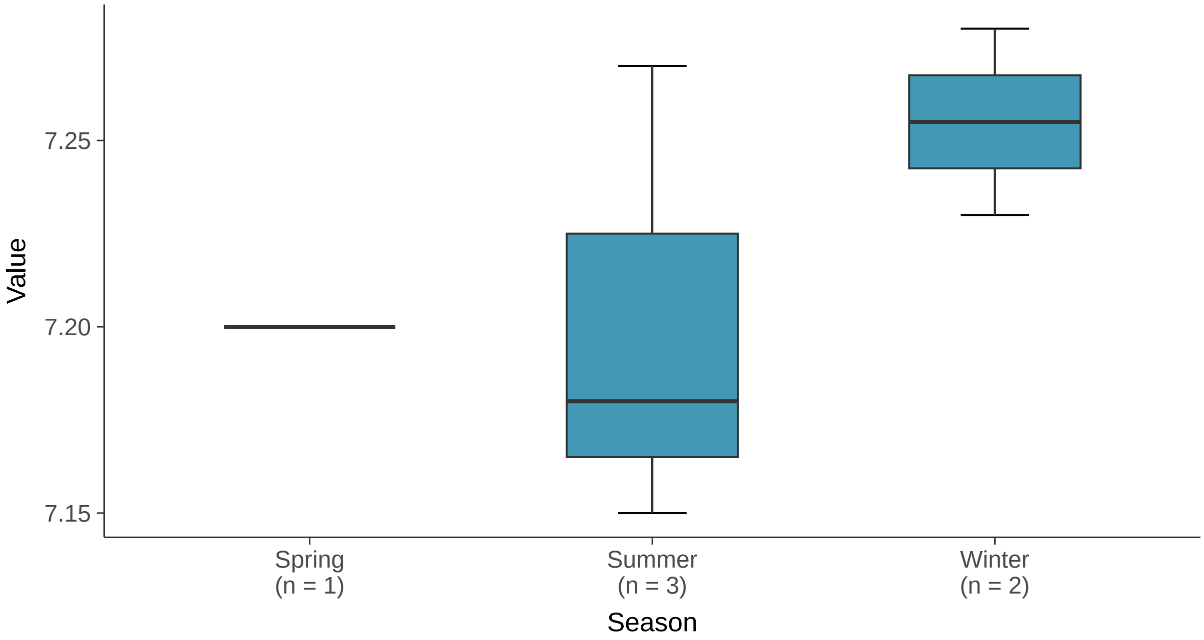
Boxplot

pH, Field, MW-3 (su)



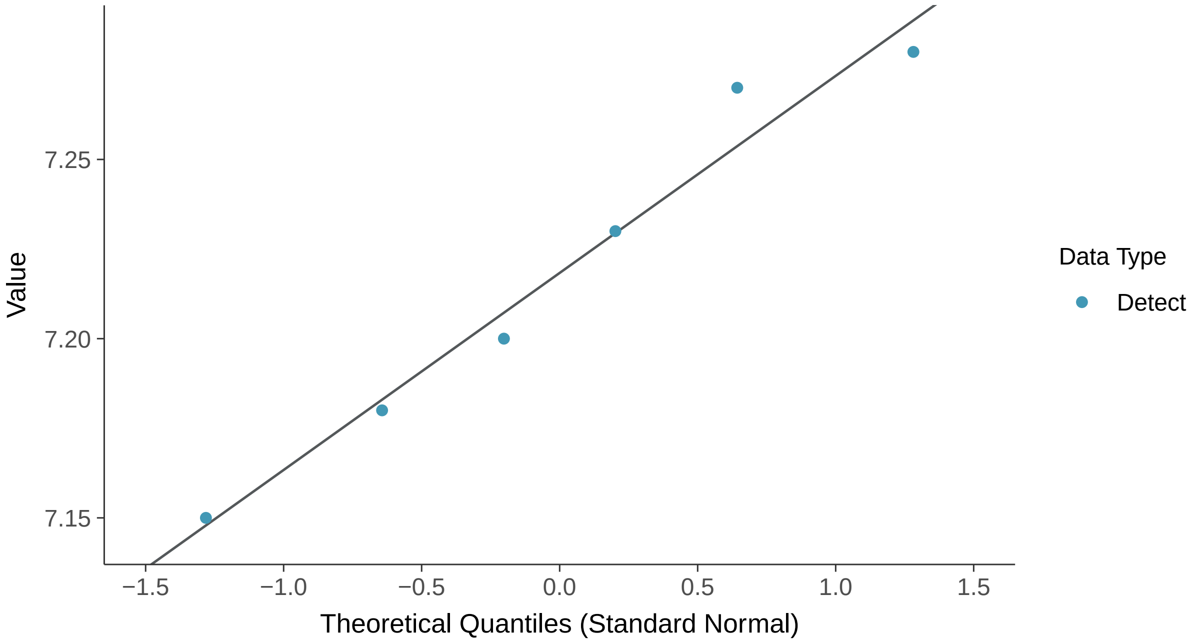
Boxplot by Season

pH, Field, MW-3 (su)



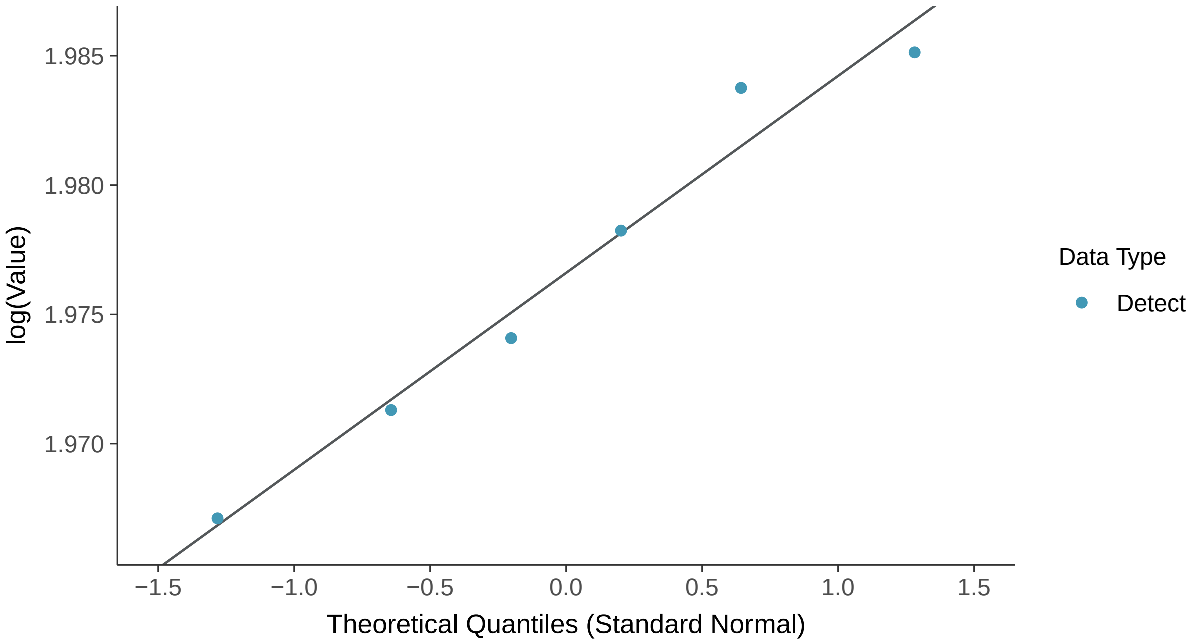
Normal Q-Q plot

pH, Field, MW-3 (su)



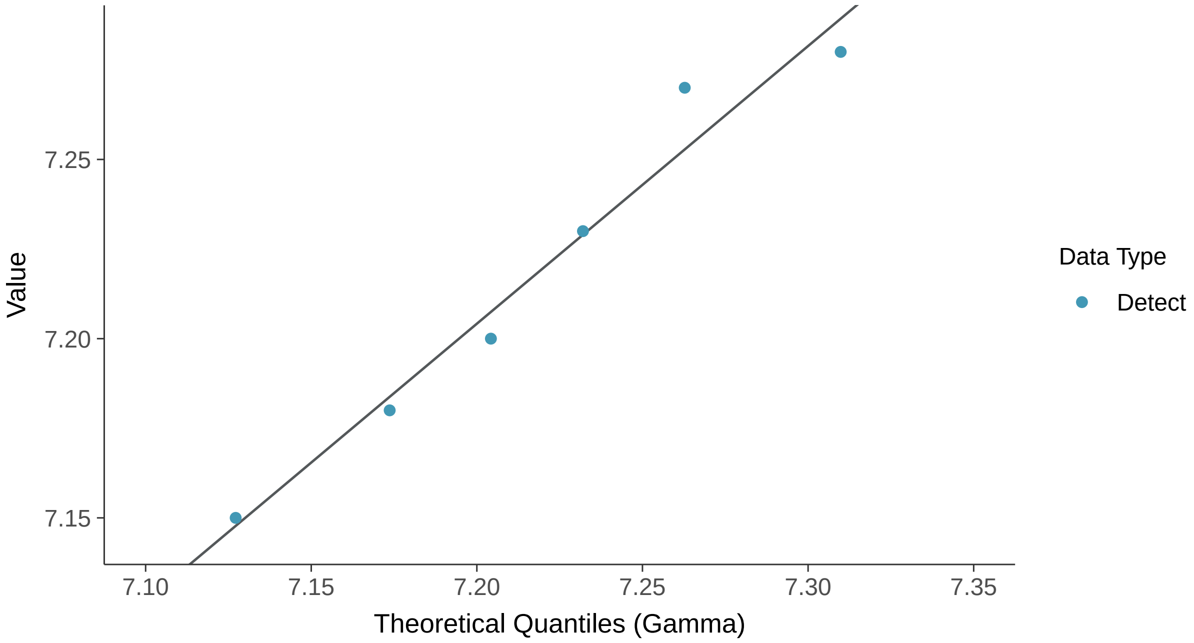
Lognormal Q-Q plot

pH, Field, MW-3 (su)



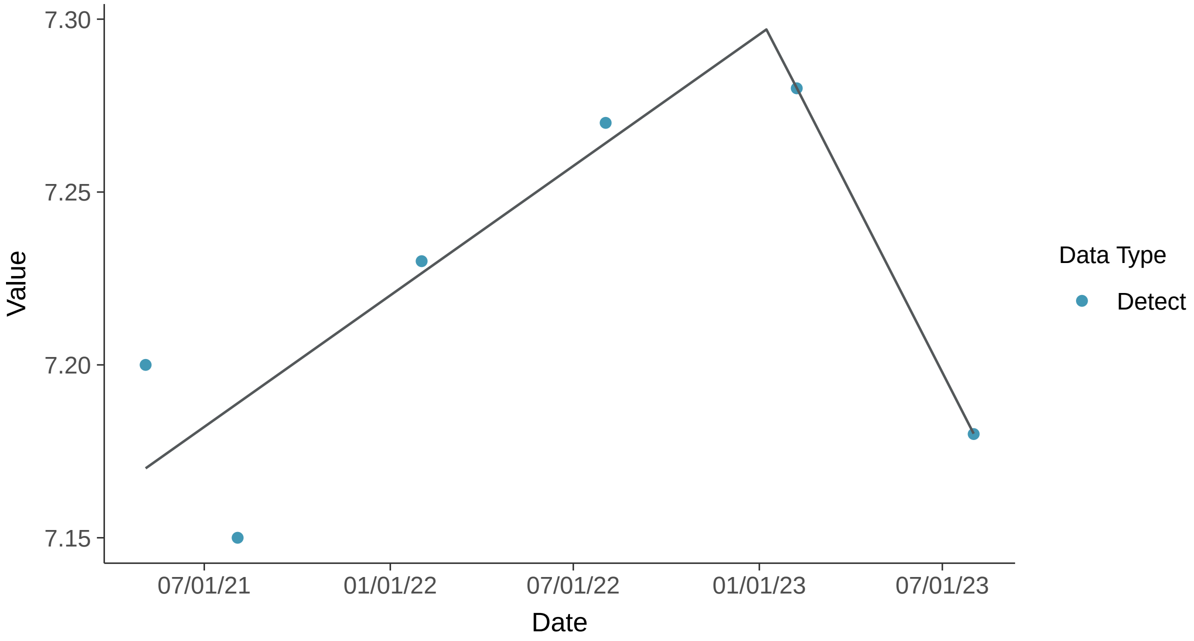
Gamma Q-Q plot

pH, Field, MW-3 (su)



Trend Regression: Piecewise Linear-Linear

pH, Field, MW-3 (su)

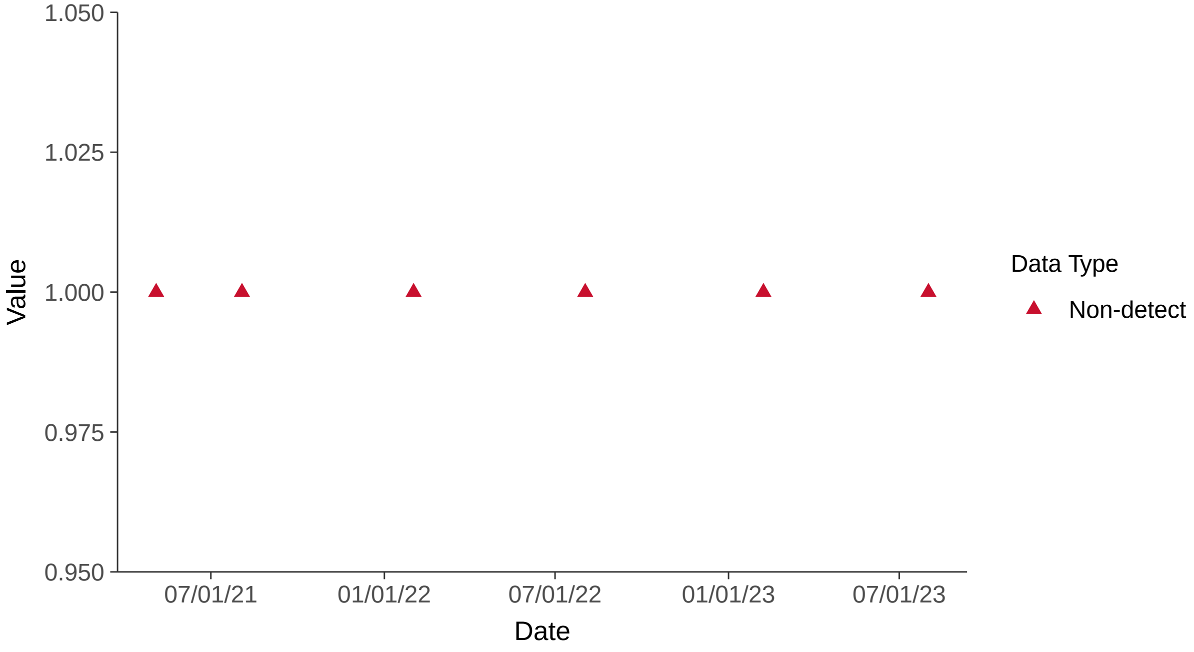


Appendix IV: Fluoride, MW-3

ID: 03_2_04

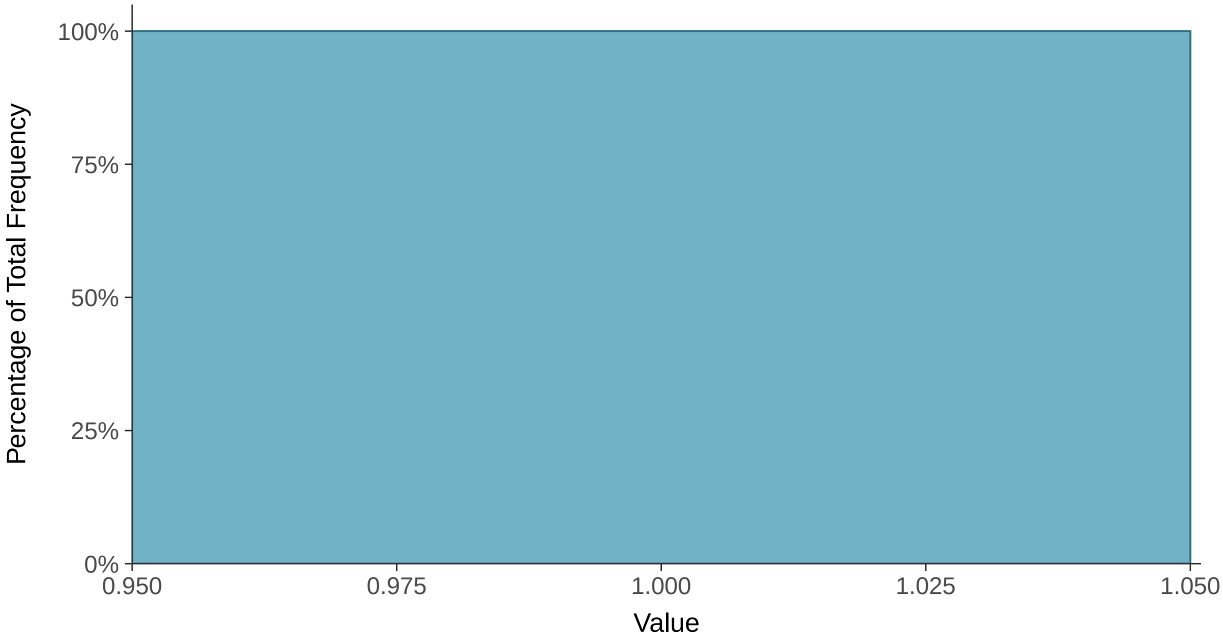
Scatter Plot

Fluoride, MW-3 (mg/L)



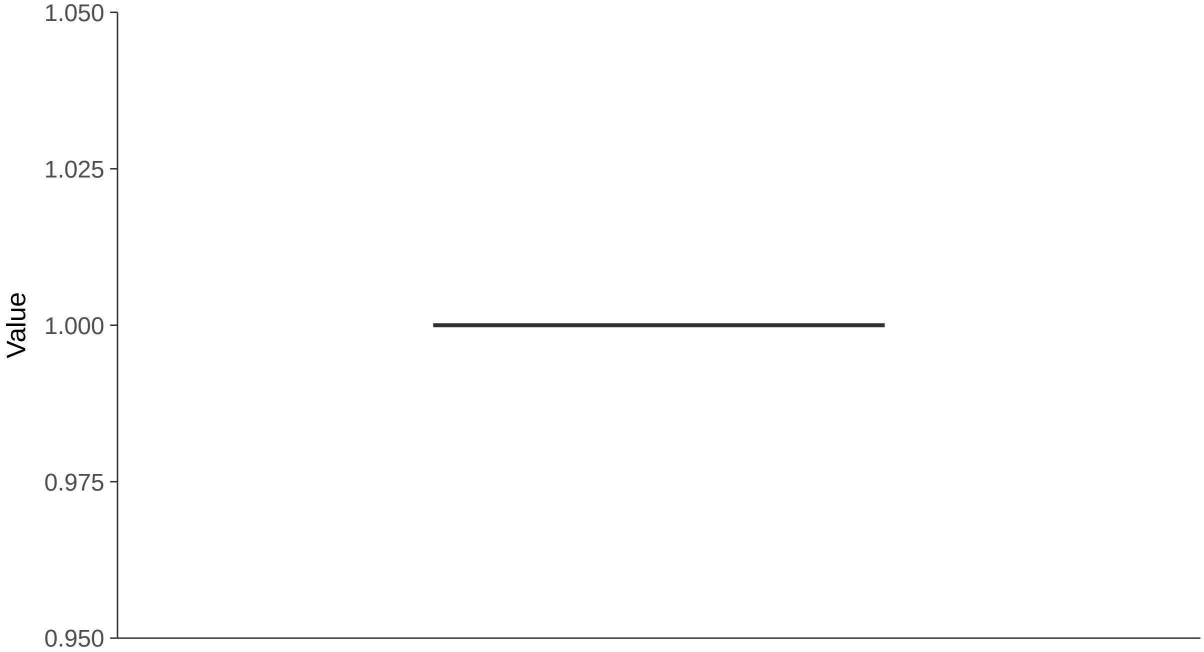
Histogram

Fluoride, MW-3 (mg/L)



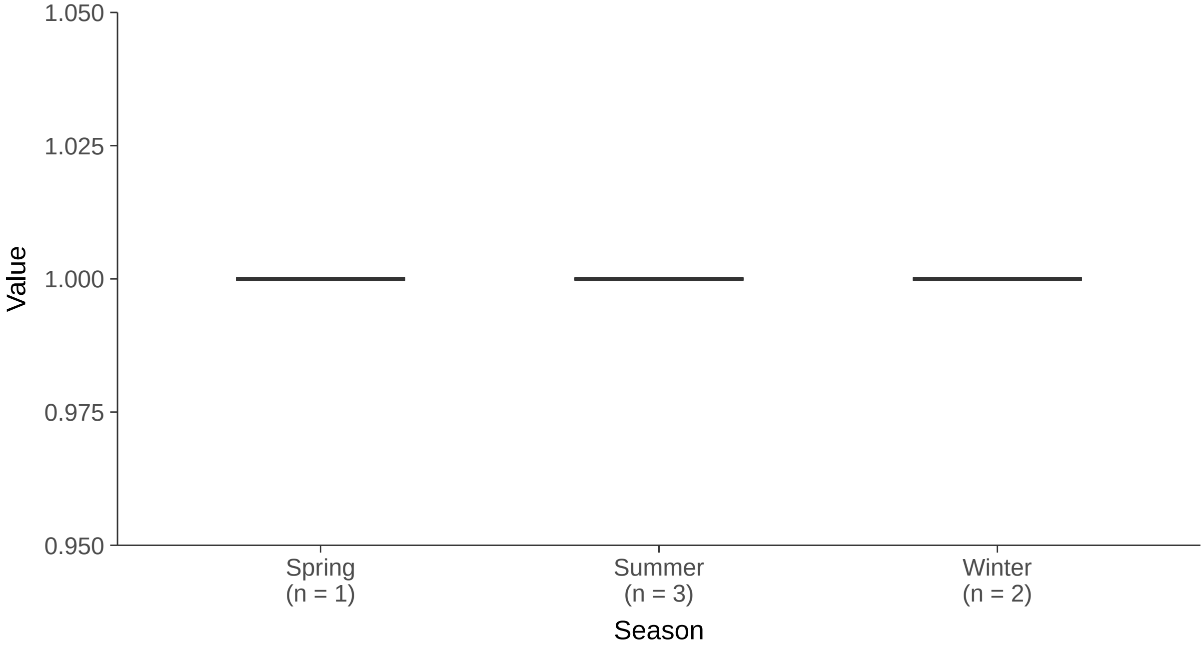
Boxplot

Fluoride, MW-3 (mg/L)



Boxplot by Season

Fluoride, MW-3 (mg/L)

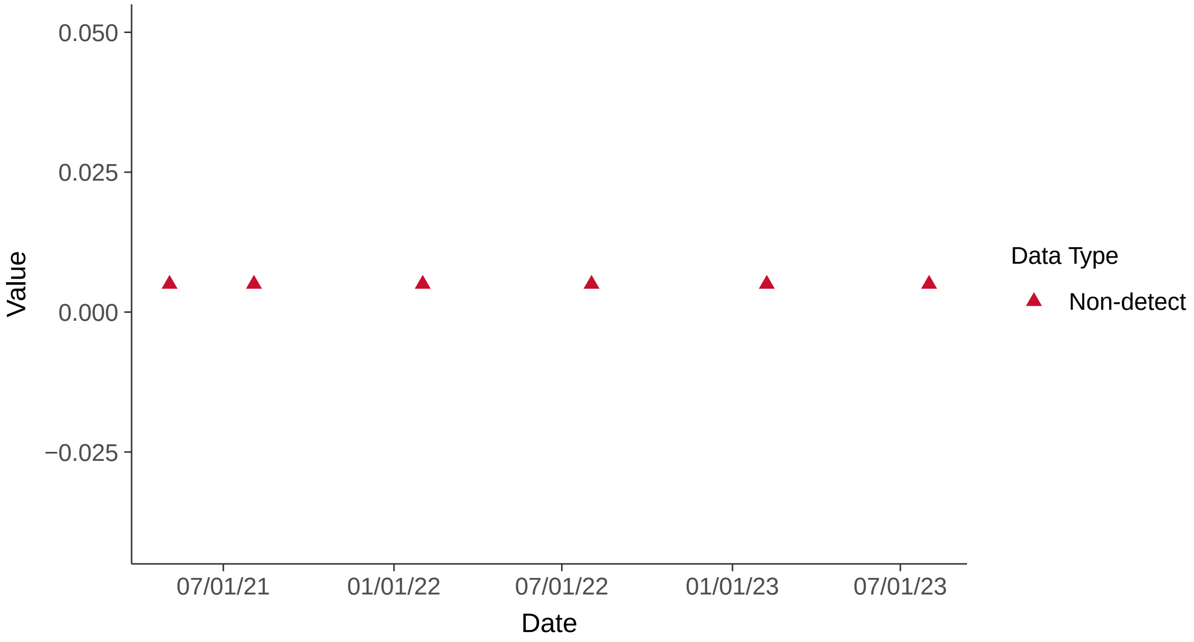


Appendix IV: Antimony, MW-3

ID: 03_2_08

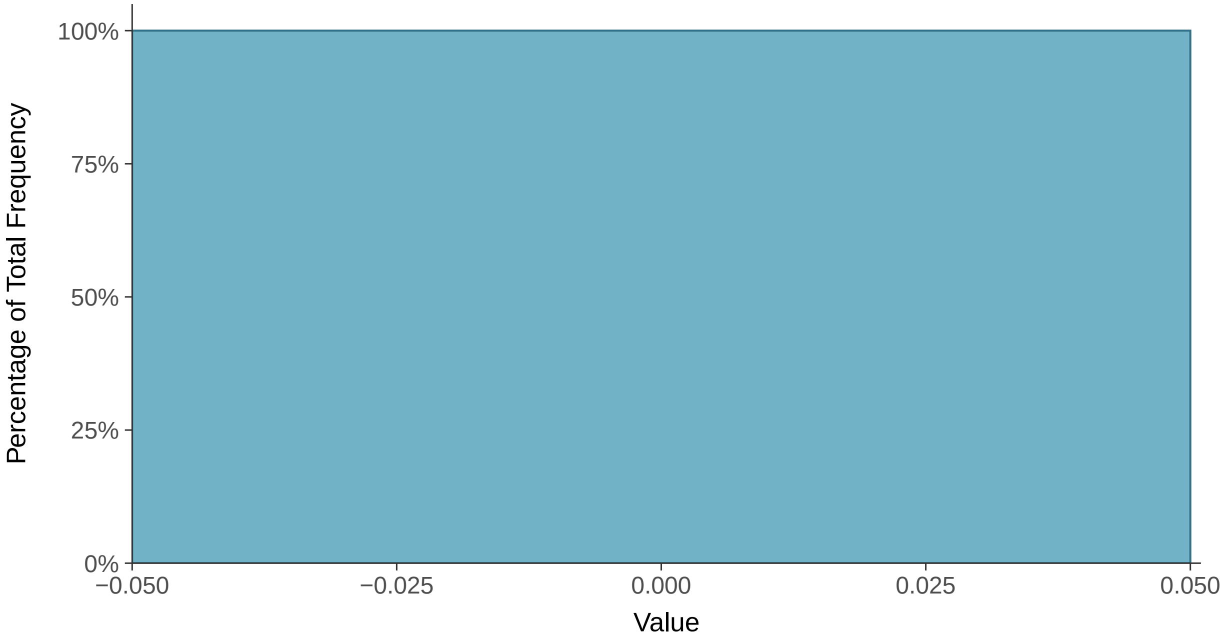
Scatter Plot

Antimony, MW-3 (mg/L)



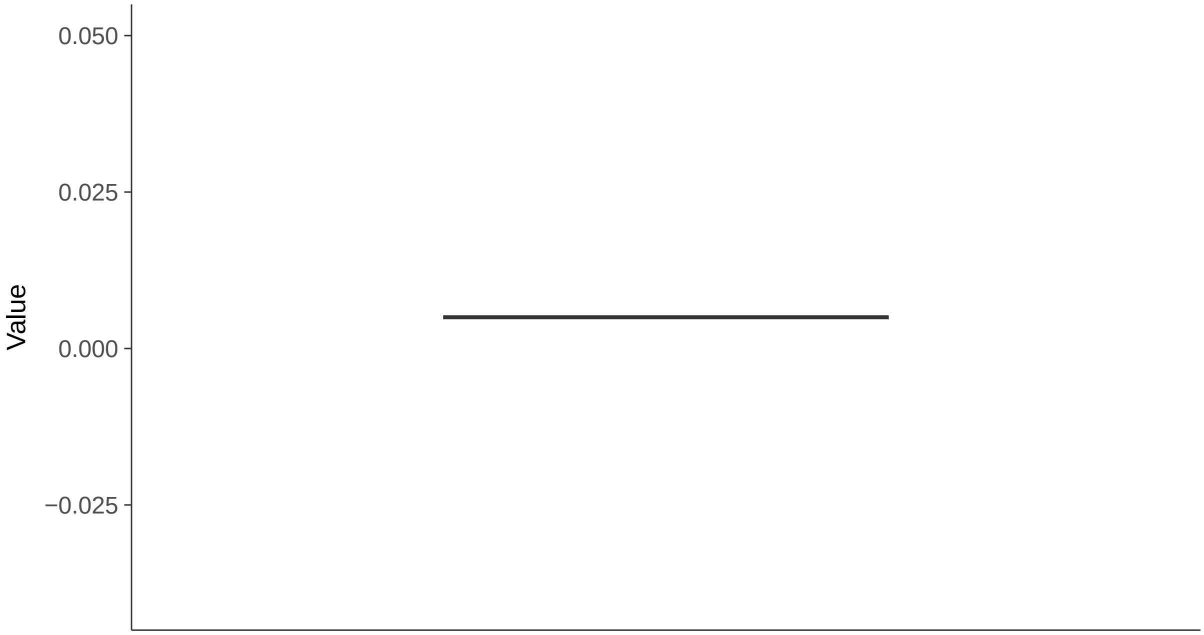
Histogram

Antimony, MW-3 (mg/L)



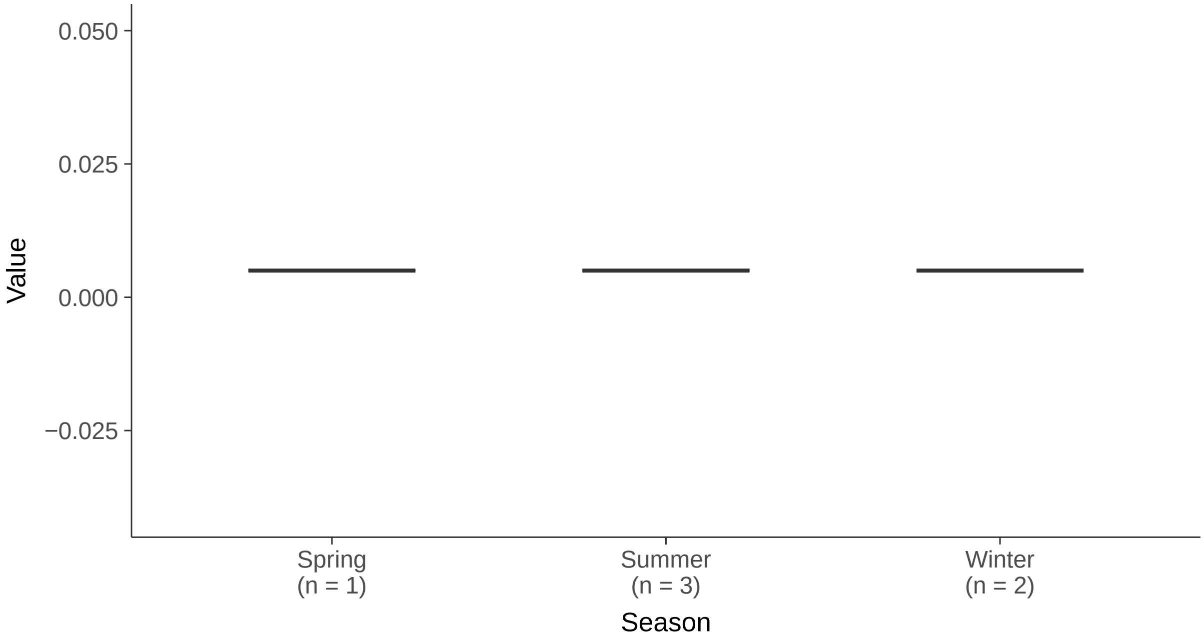
Boxplot

Antimony, MW-3 (mg/L)



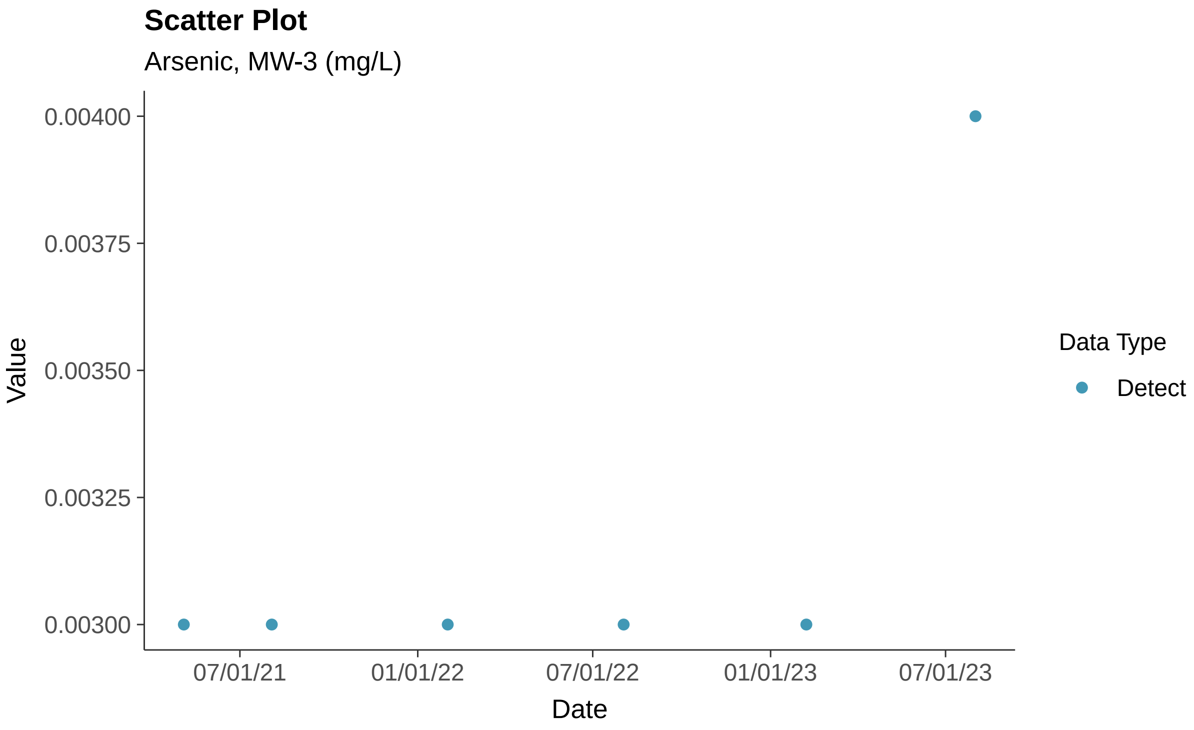
Boxplot by Season

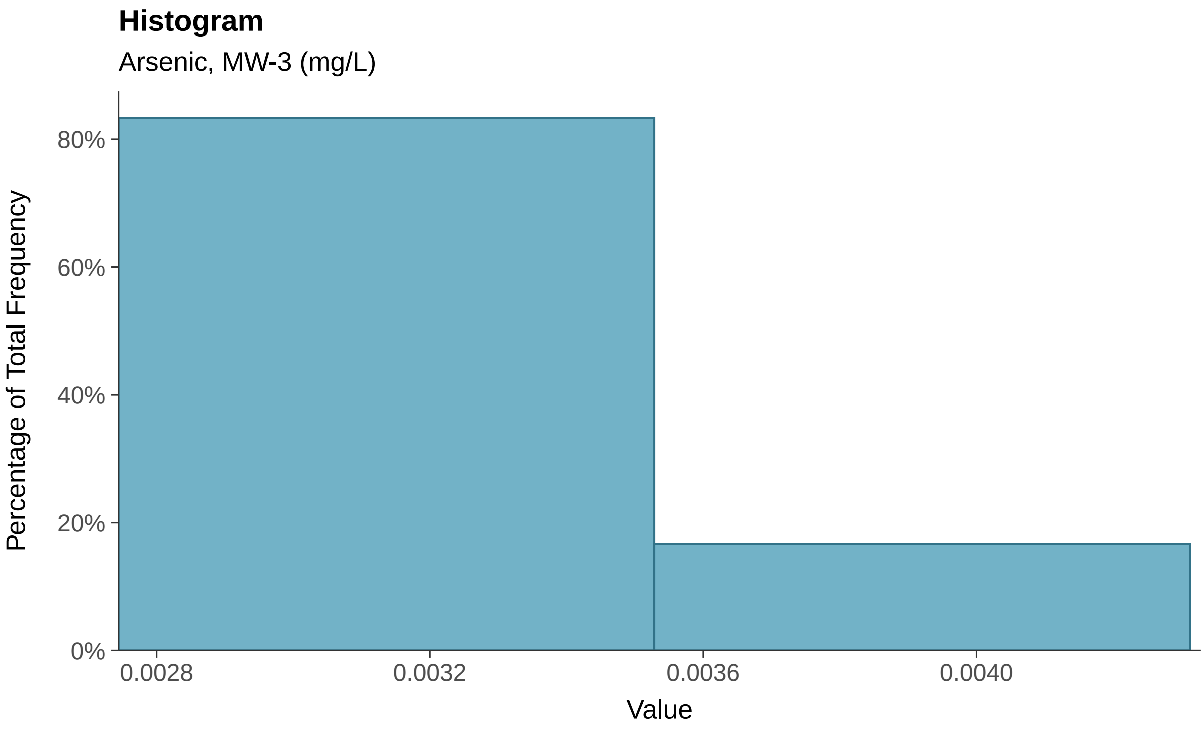
Antimony, MW-3 (mg/L)



Appendix IV: Arsenic, MW-3

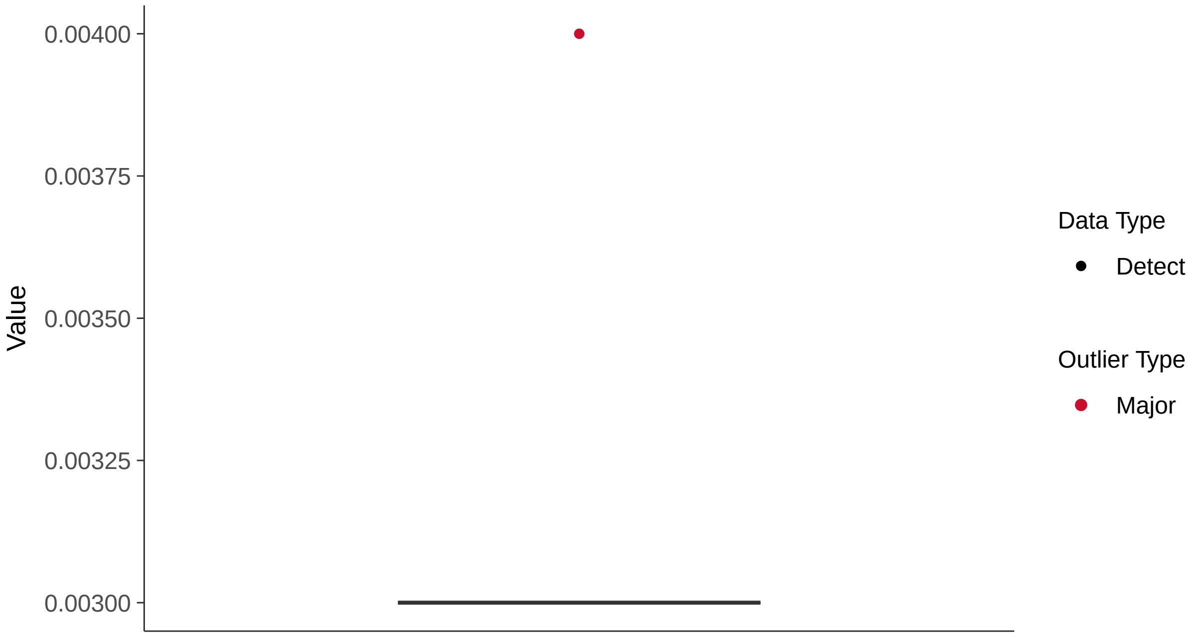
ID: 03_2_09





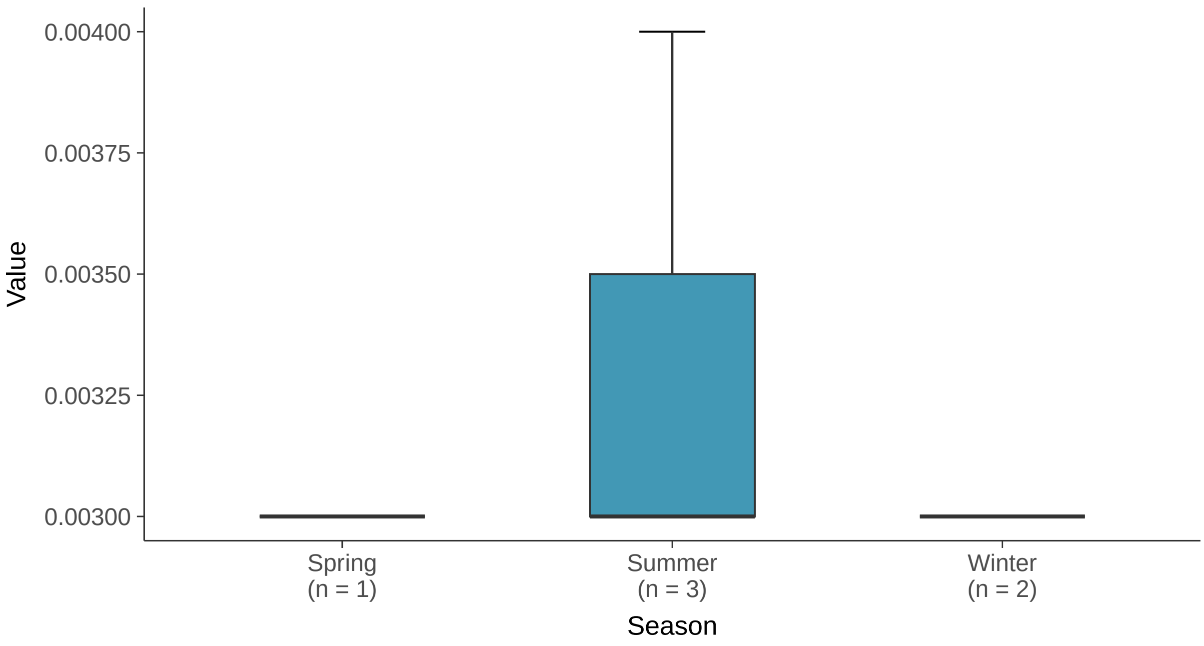
Boxplot

Arsenic, MW-3 (mg/L)



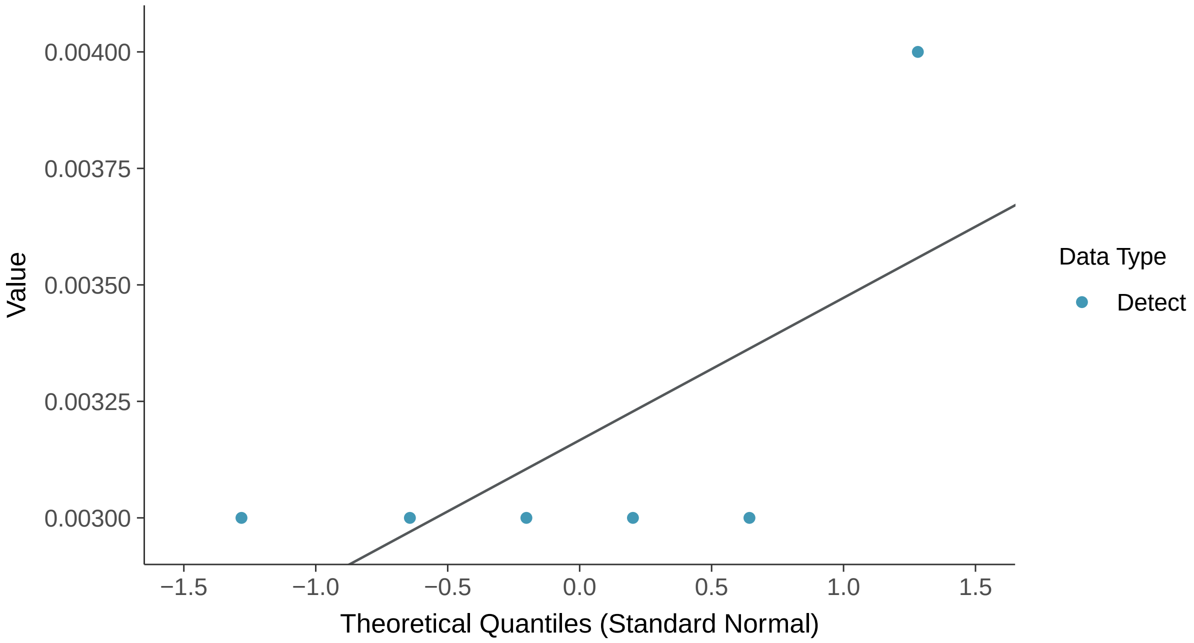
Boxplot by Season

Arsenic, MW-3 (mg/L)



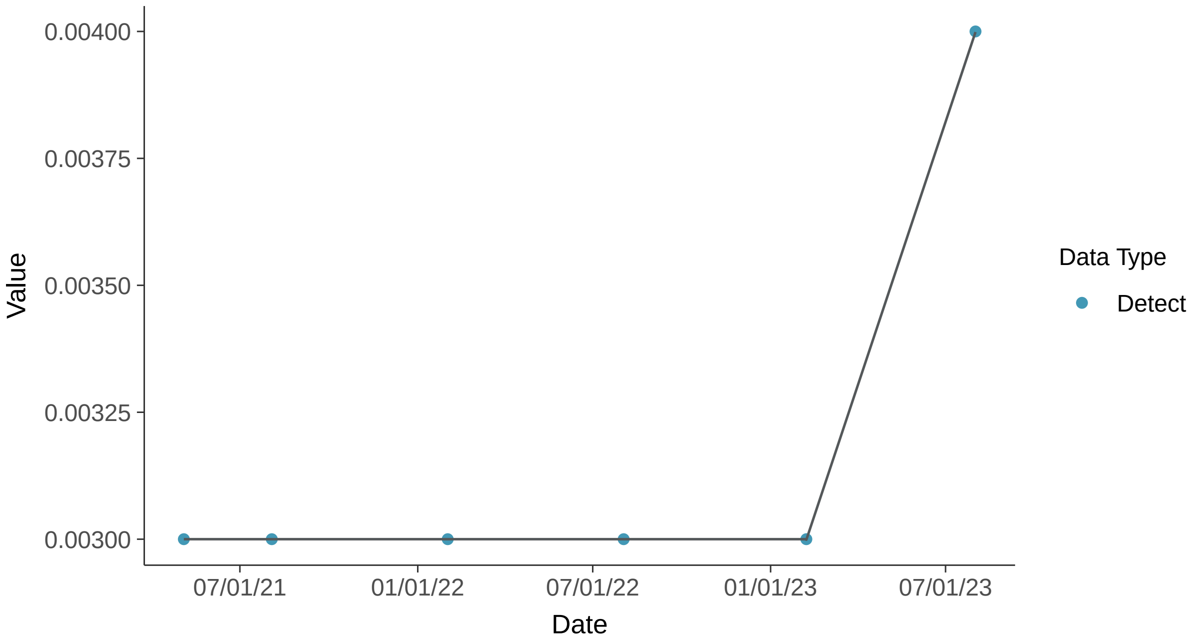
Normal Q-Q plot

Arsenic, MW-3 (mg/L)



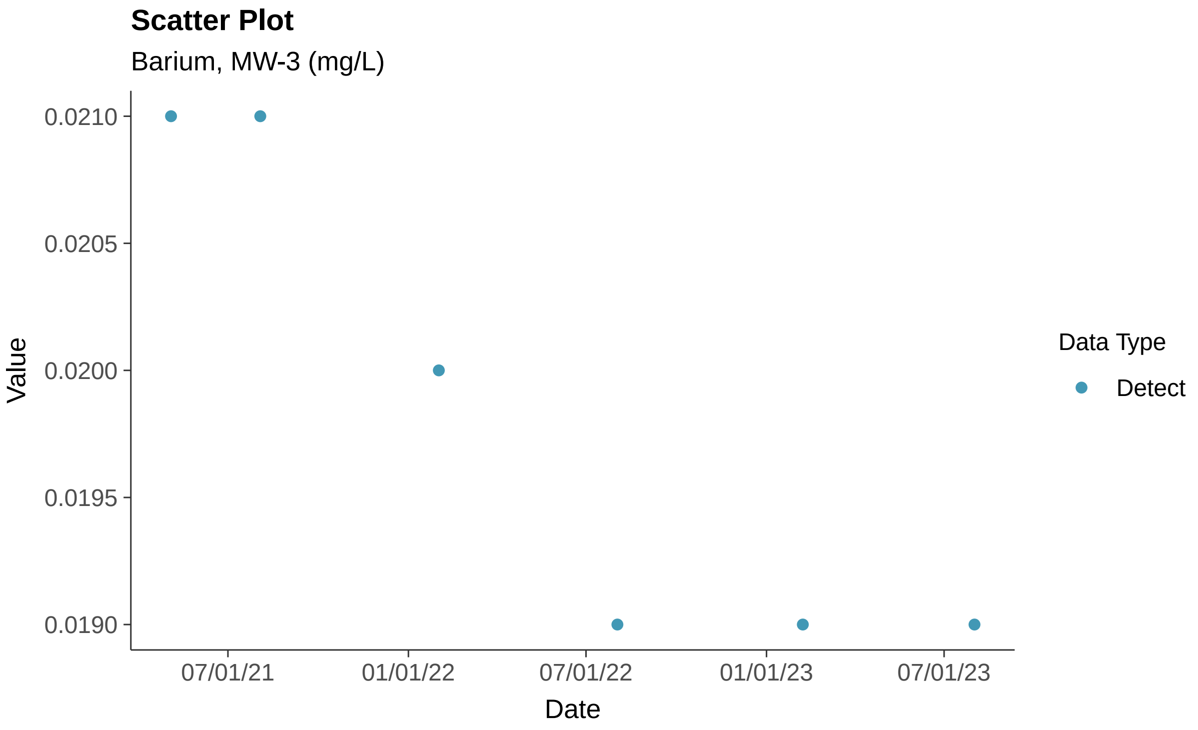
Trend Regression: Piecewise Linear-Linear

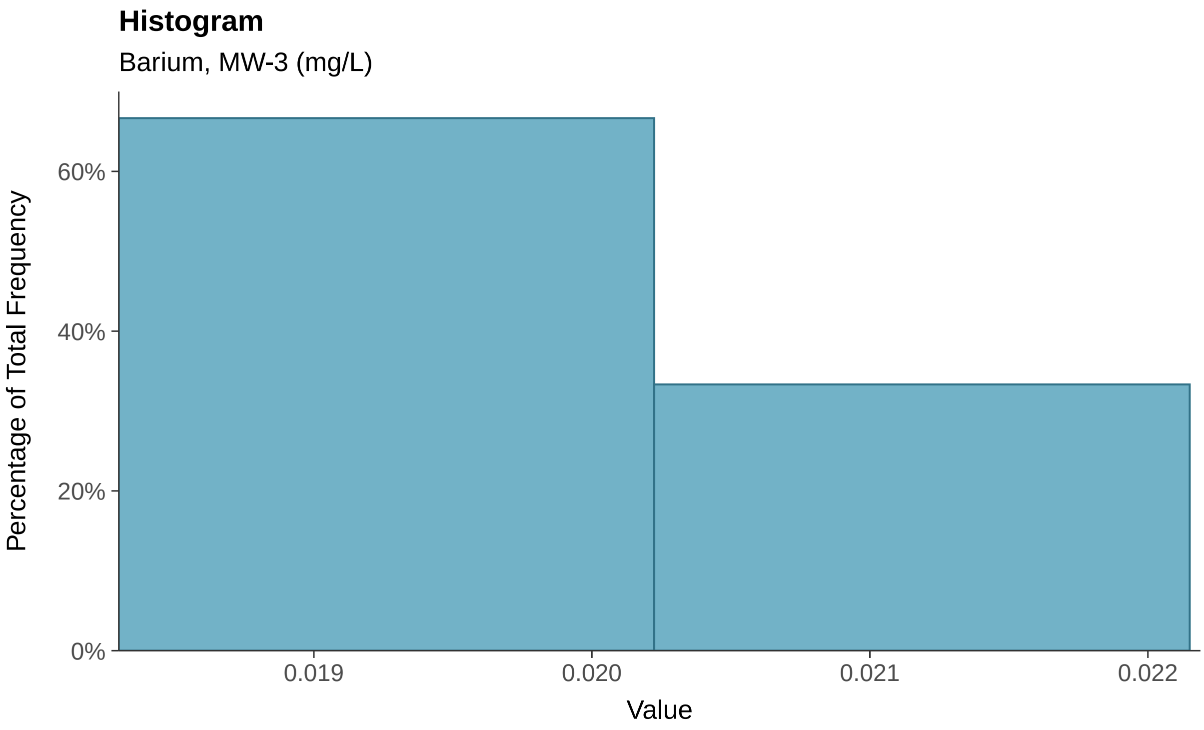
Arsenic, MW-3 (mg/L)



Appendix IV: Barium, MW-3

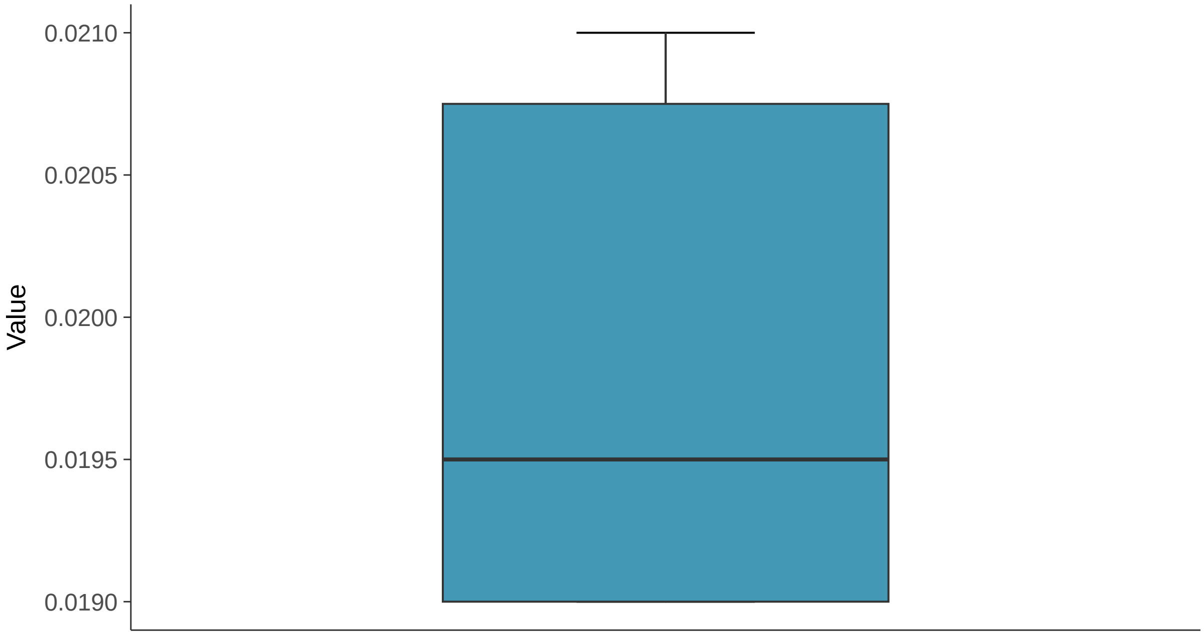
ID: 03_2_10





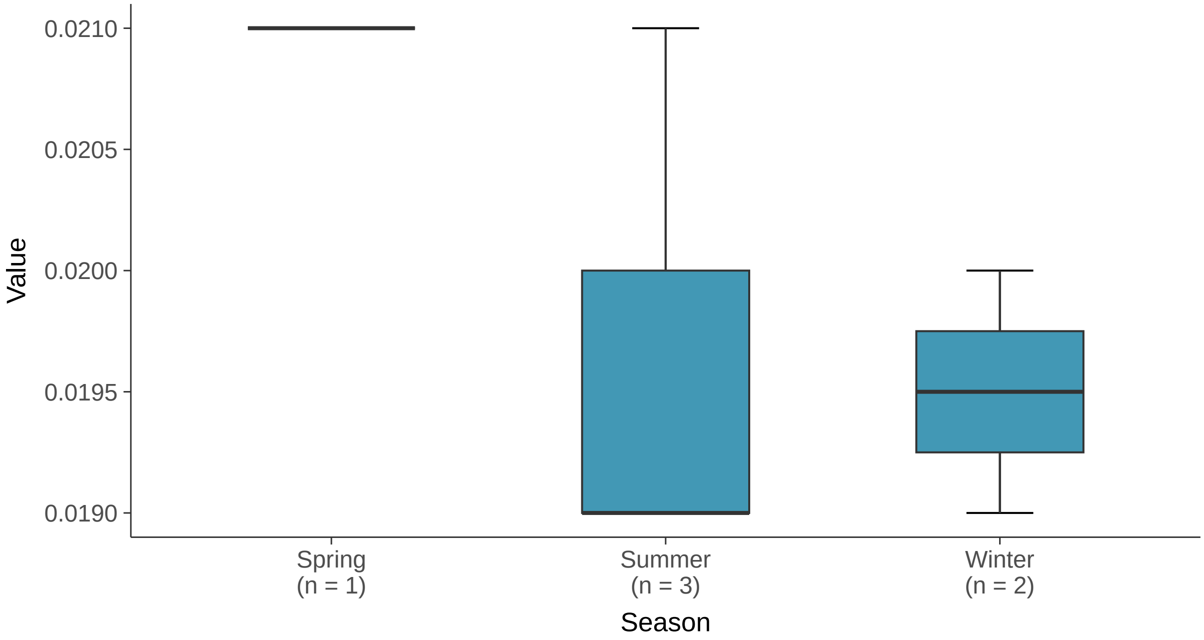
Boxplot

Barium, MW-3 (mg/L)



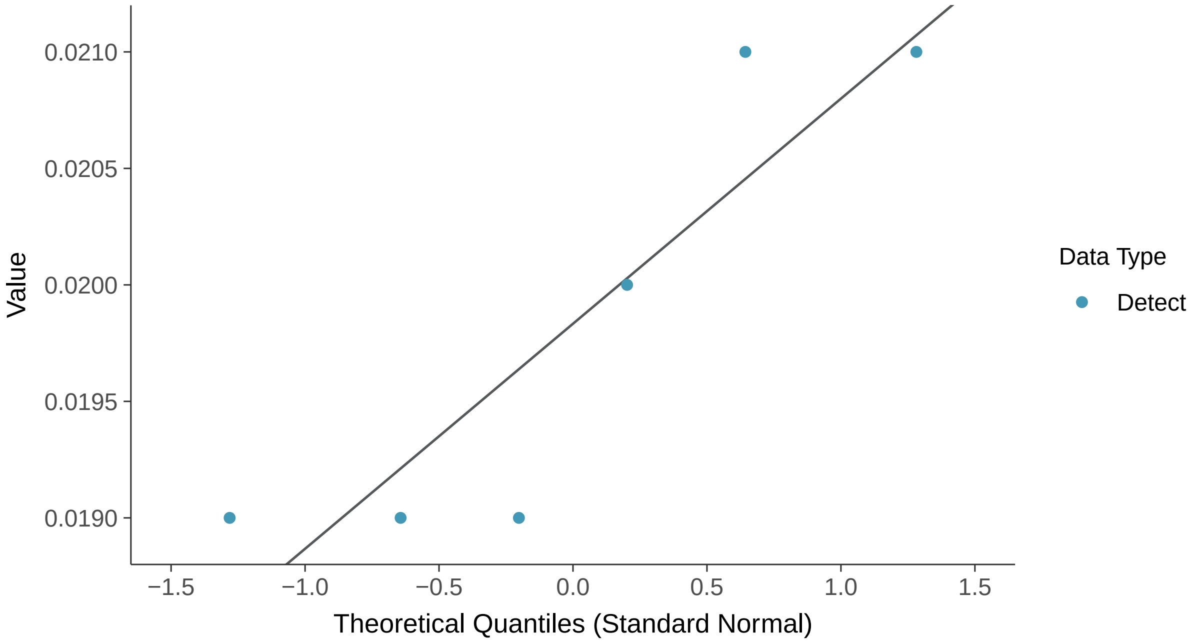
Boxplot by Season

Barium, MW-3 (mg/L)



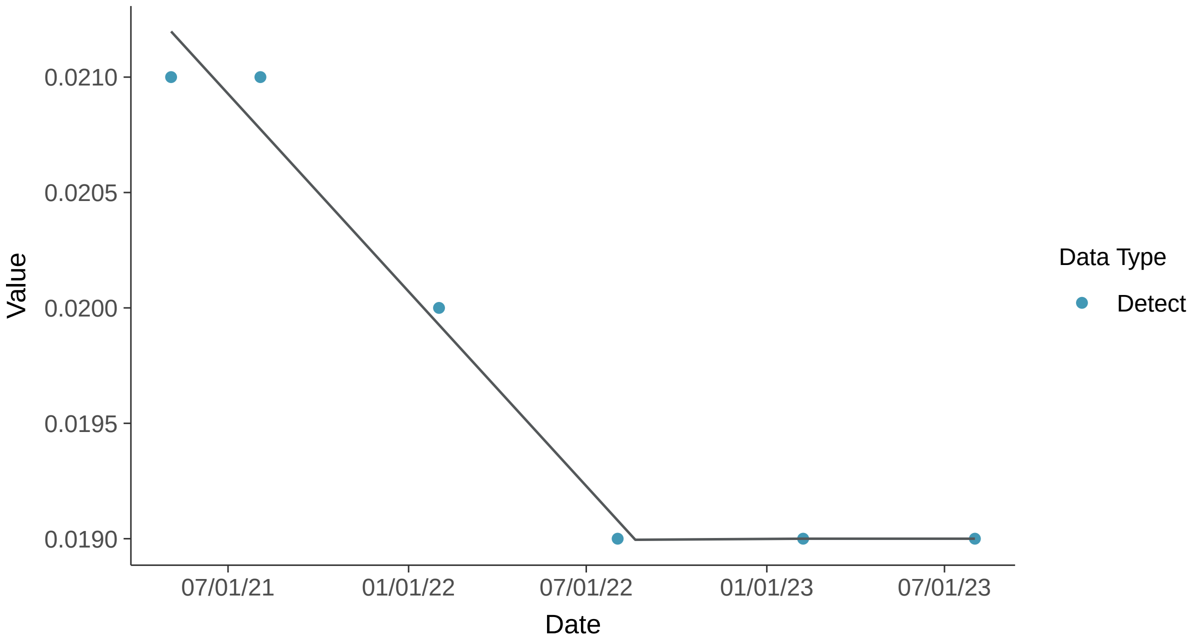
Normal Q-Q plot

Barium, MW-3 (mg/L)



Trend Regression: Piecewise Linear-Linear

Barium, MW-3 (mg/L)

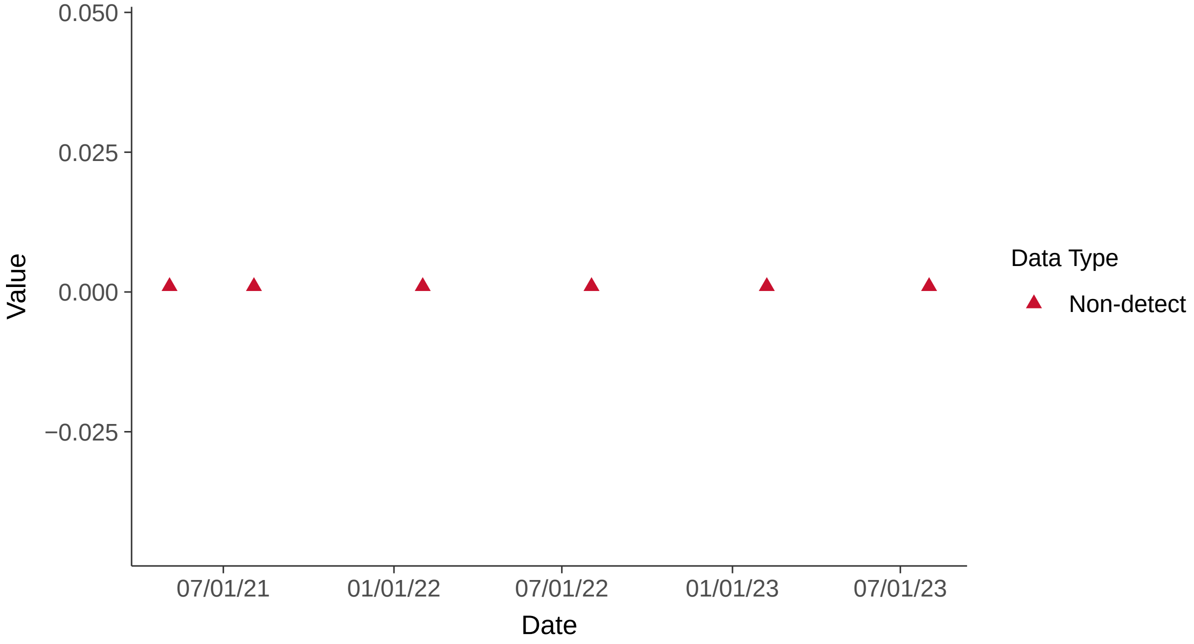


Appendix IV: Beryllium, MW-3

ID: 03_2_11

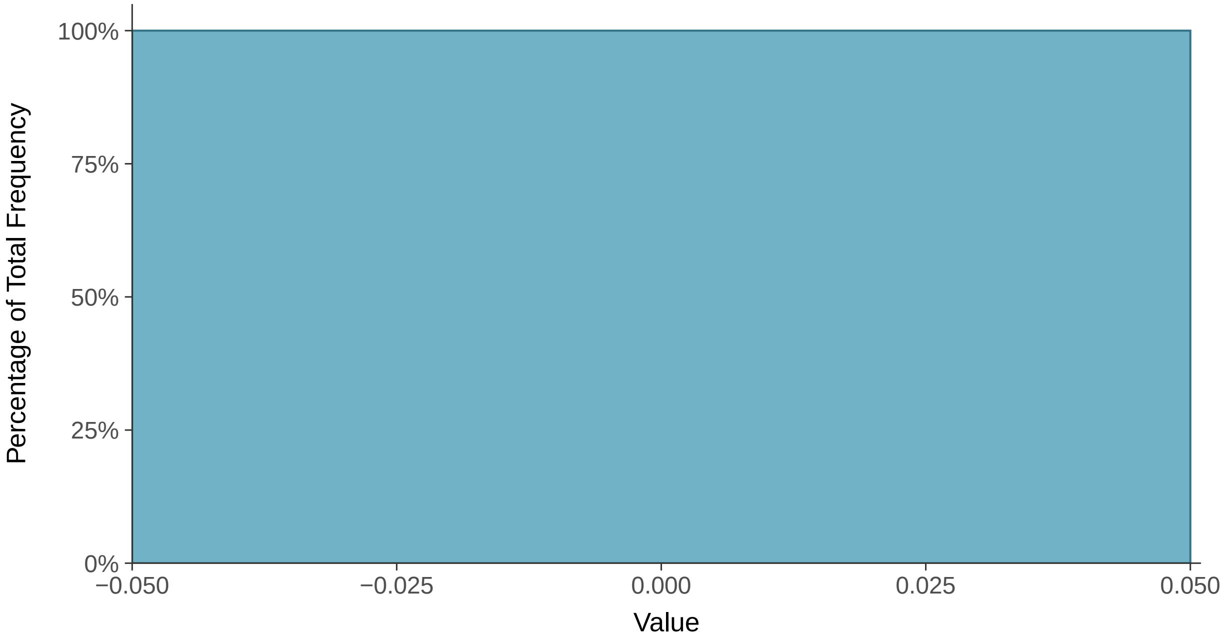
Scatter Plot

Beryllium, MW-3 (mg/L)



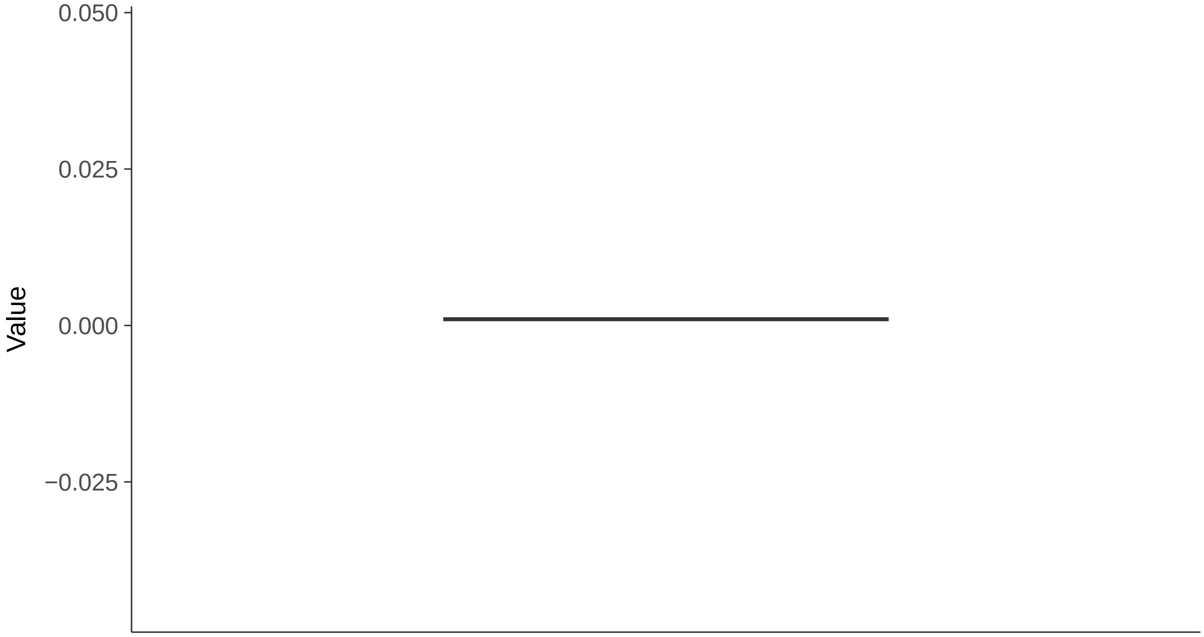
Histogram

Beryllium, MW-3 (mg/L)



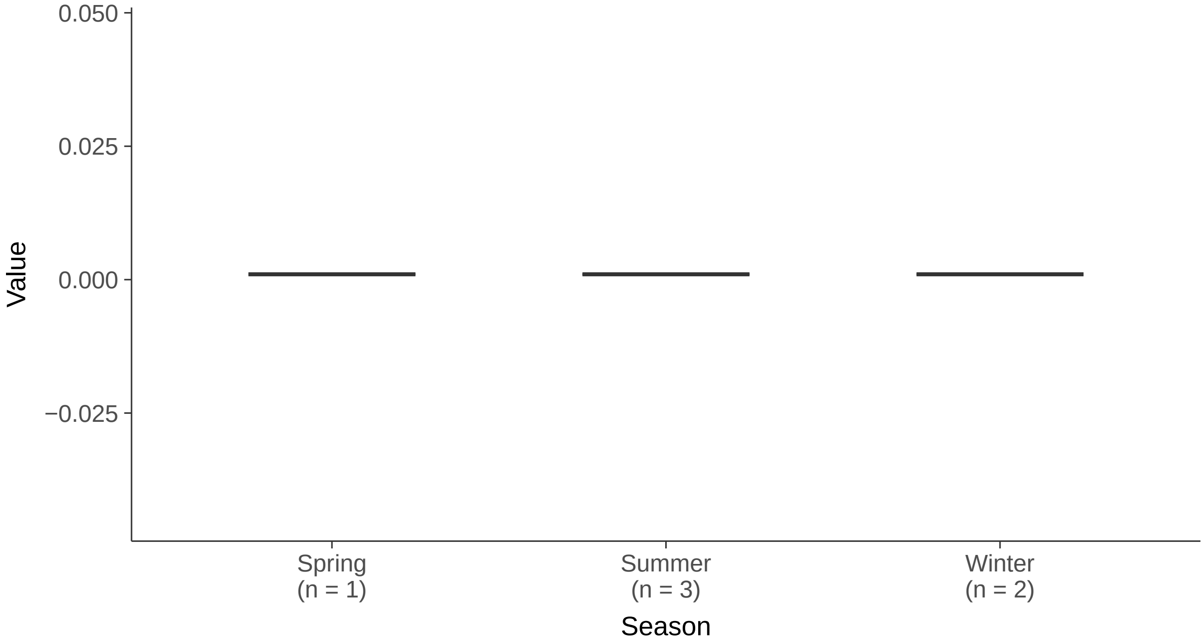
Boxplot

Beryllium, MW-3 (mg/L)



Boxplot by Season

Beryllium, MW-3 (mg/L)

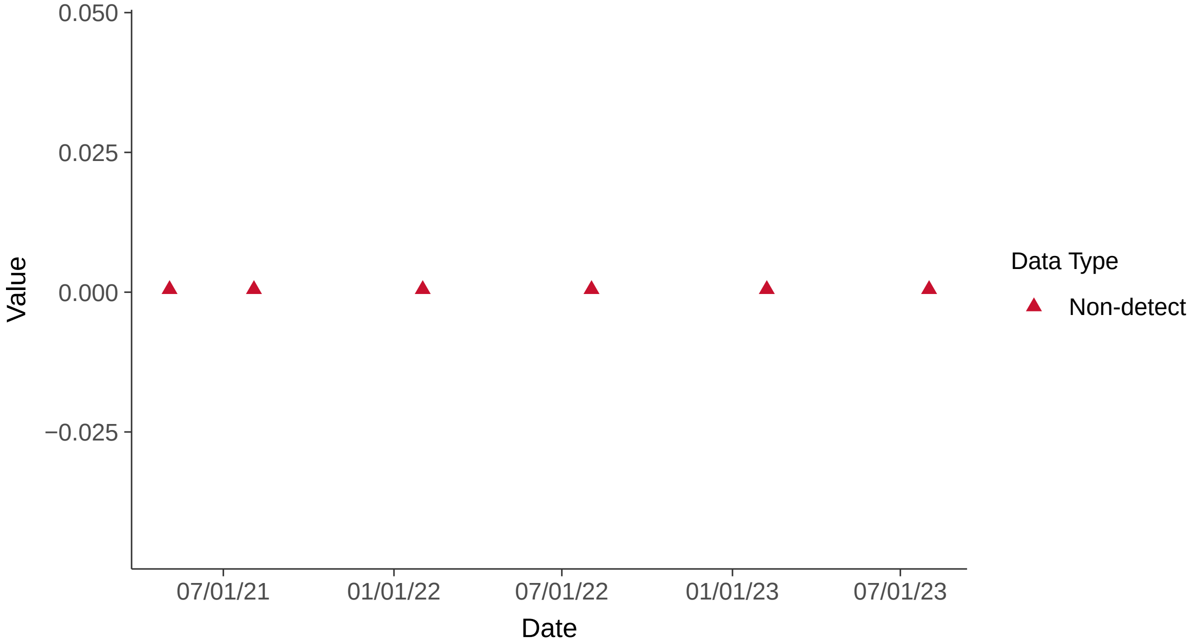


Appendix IV: Cadmium, MW-3

ID: 03_2_12

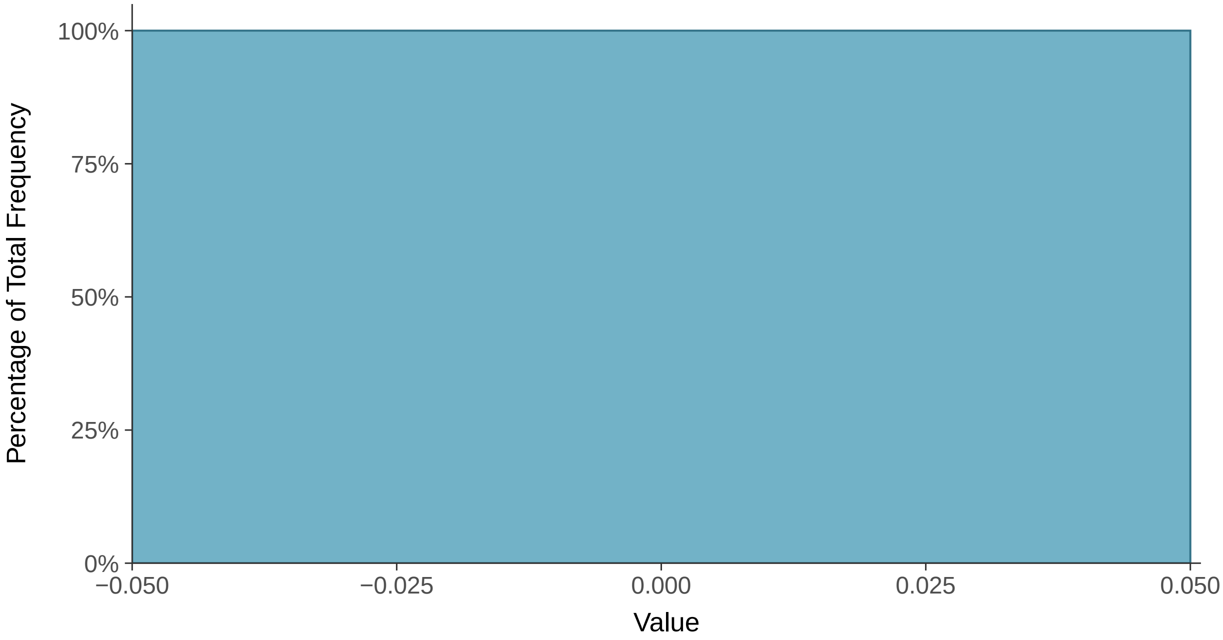
Scatter Plot

Cadmium, MW-3 (mg/L)



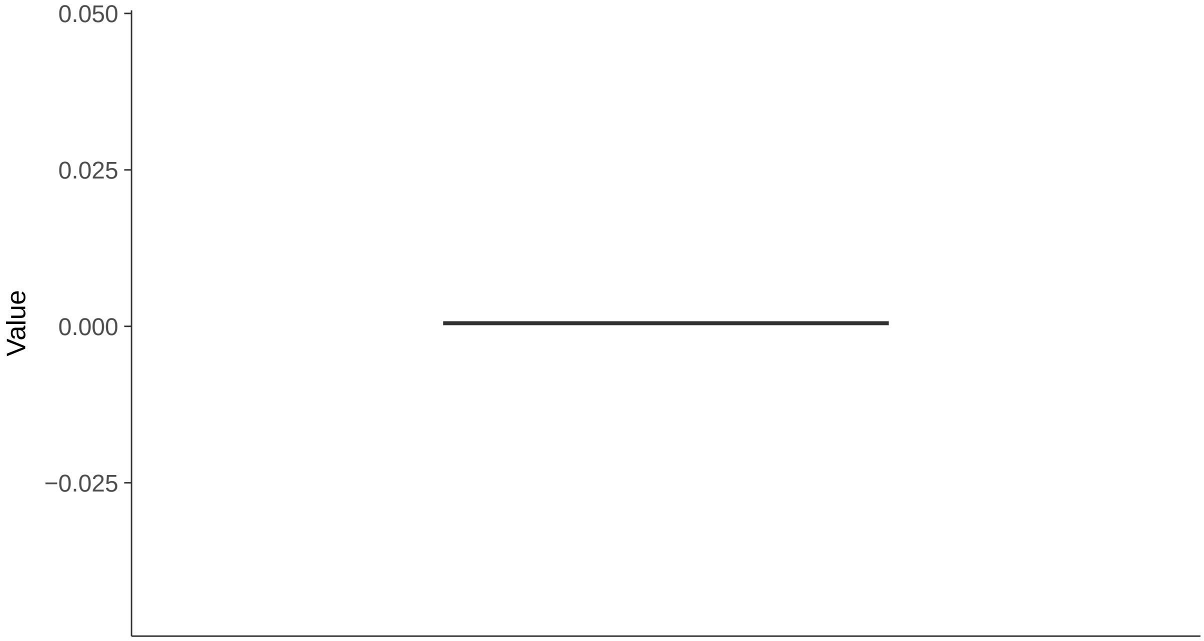
Histogram

Cadmium, MW-3 (mg/L)



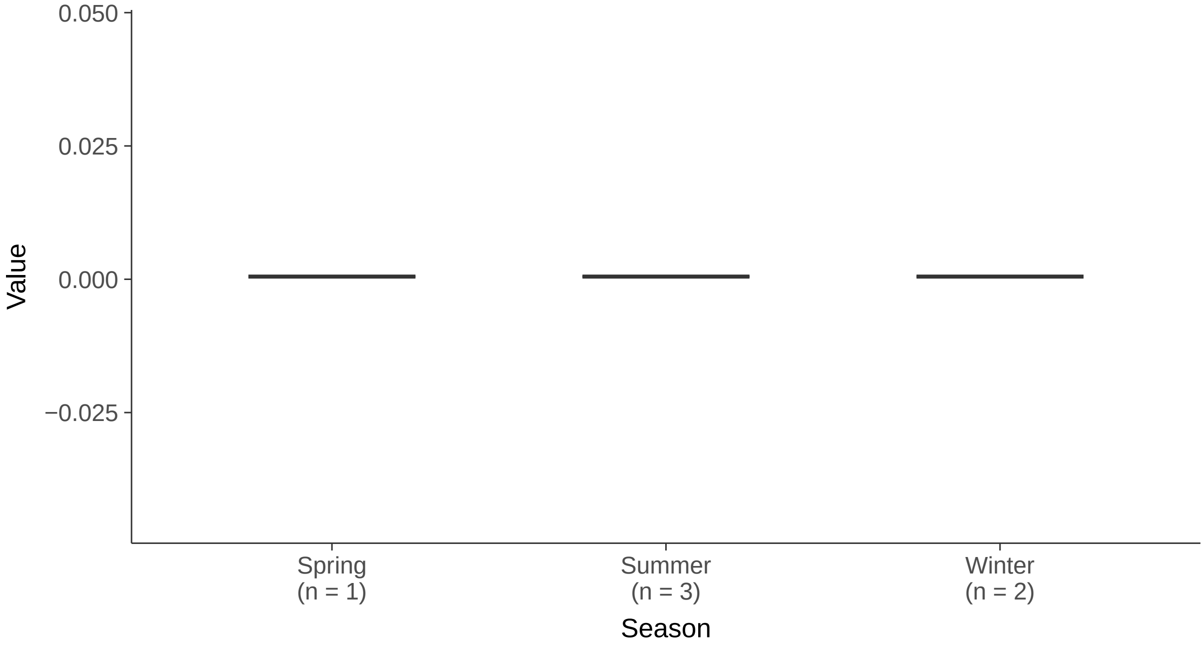
Boxplot

Cadmium, MW-3 (mg/L)



Boxplot by Season

Cadmium, MW-3 (mg/L)

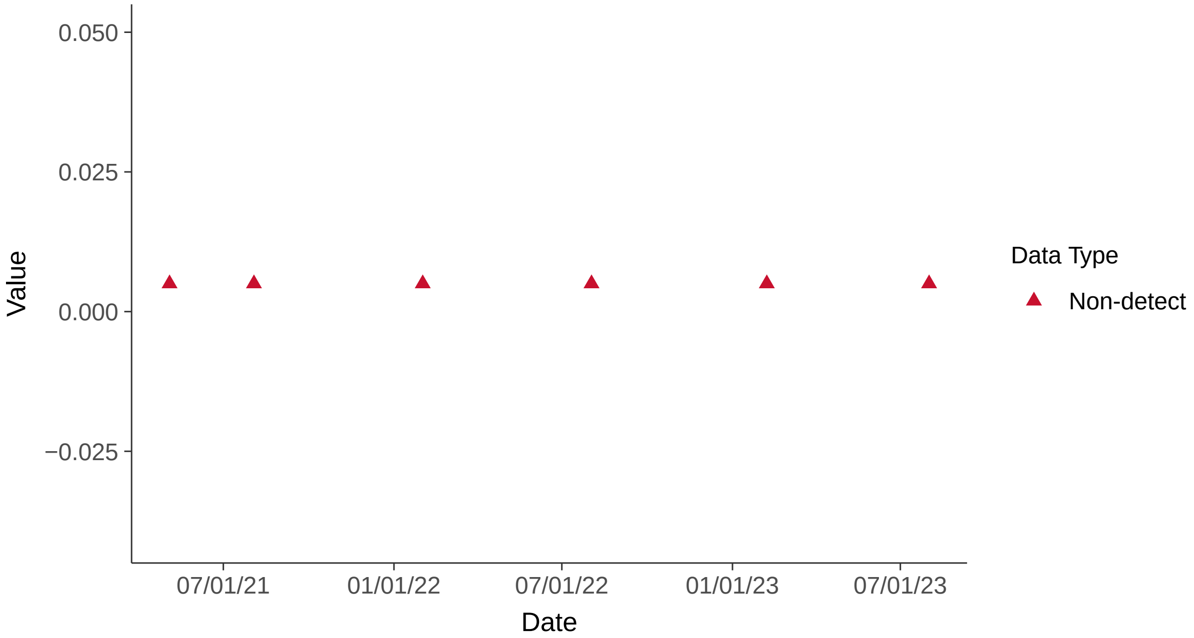


Appendix IV: Chromium, MW-3

ID: 03_2_13

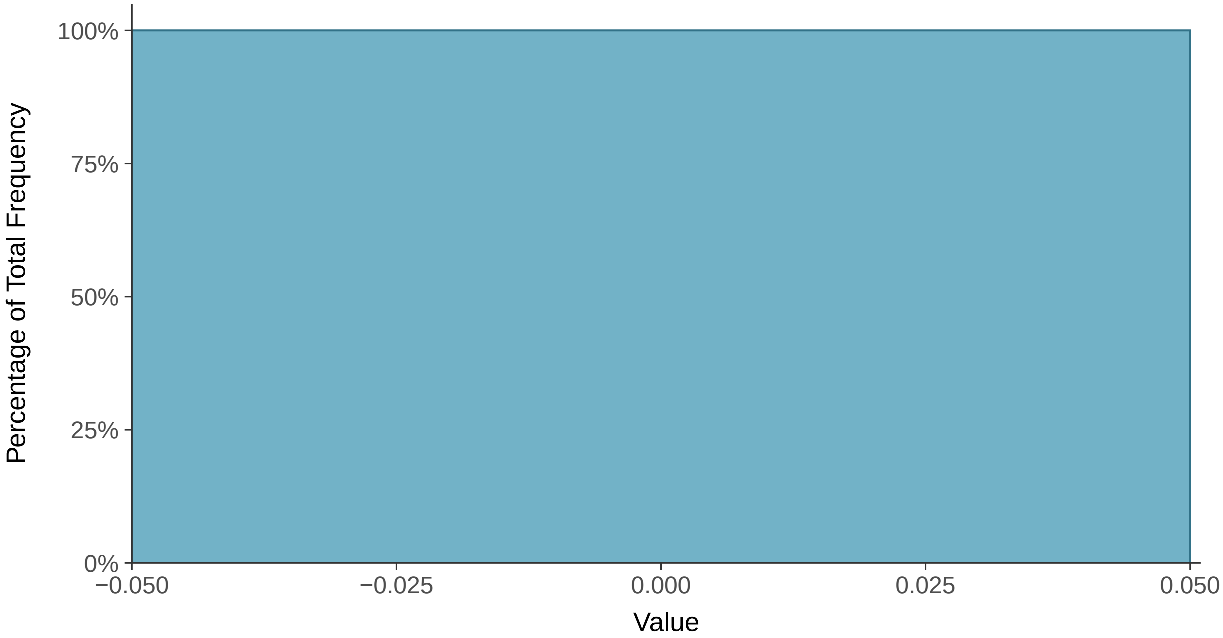
Scatter Plot

Chromium, MW-3 (mg/L)



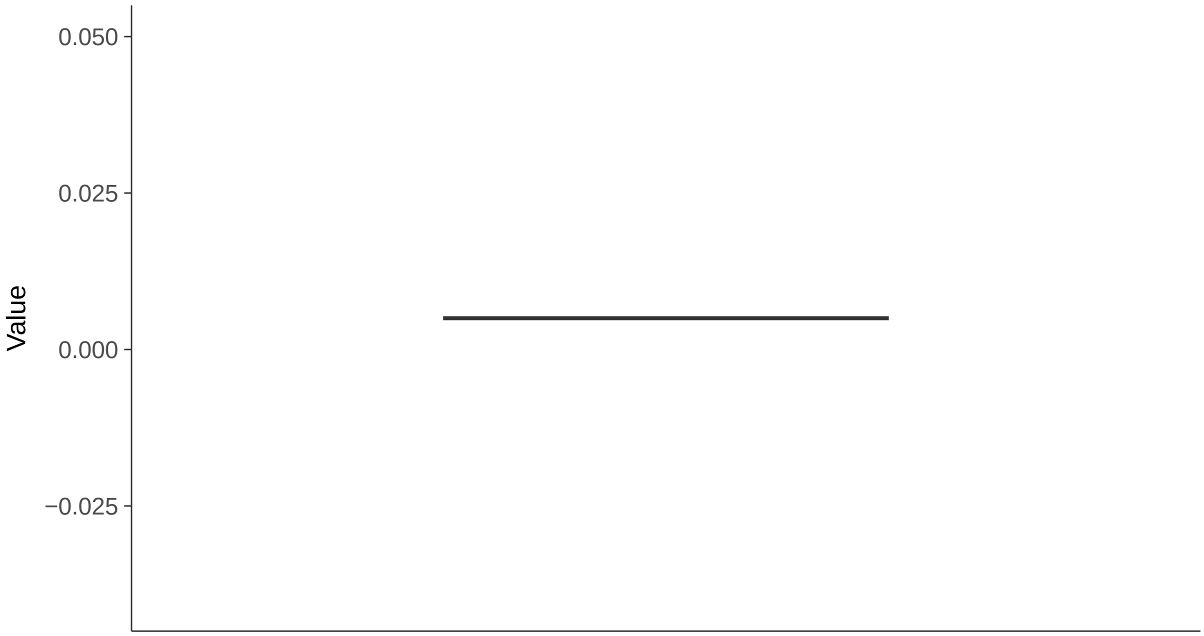
Histogram

Chromium, MW-3 (mg/L)



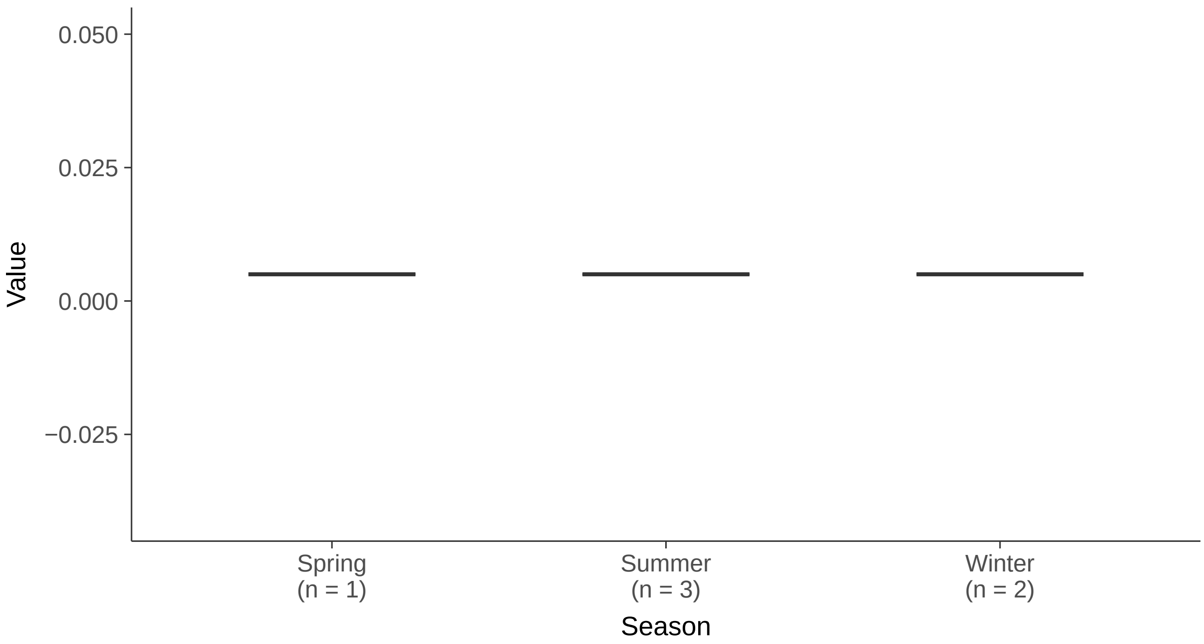
Boxplot

Chromium, MW-3 (mg/L)



Boxplot by Season

Chromium, MW-3 (mg/L)

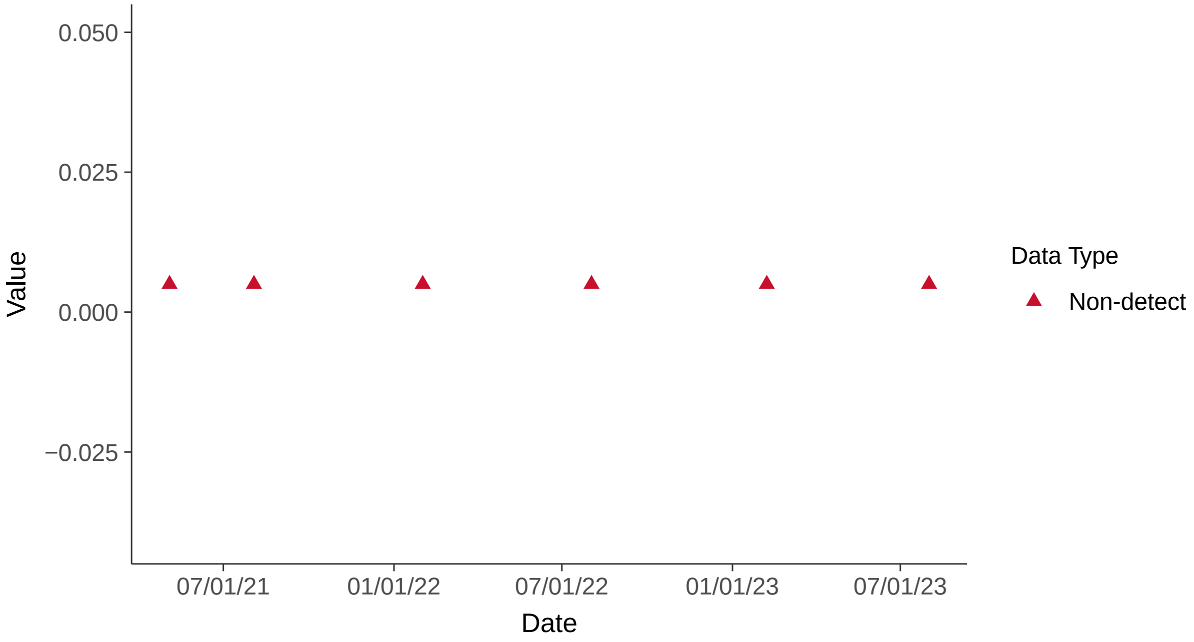


Appendix IV: Cobalt, MW-3

ID: 03_2_14

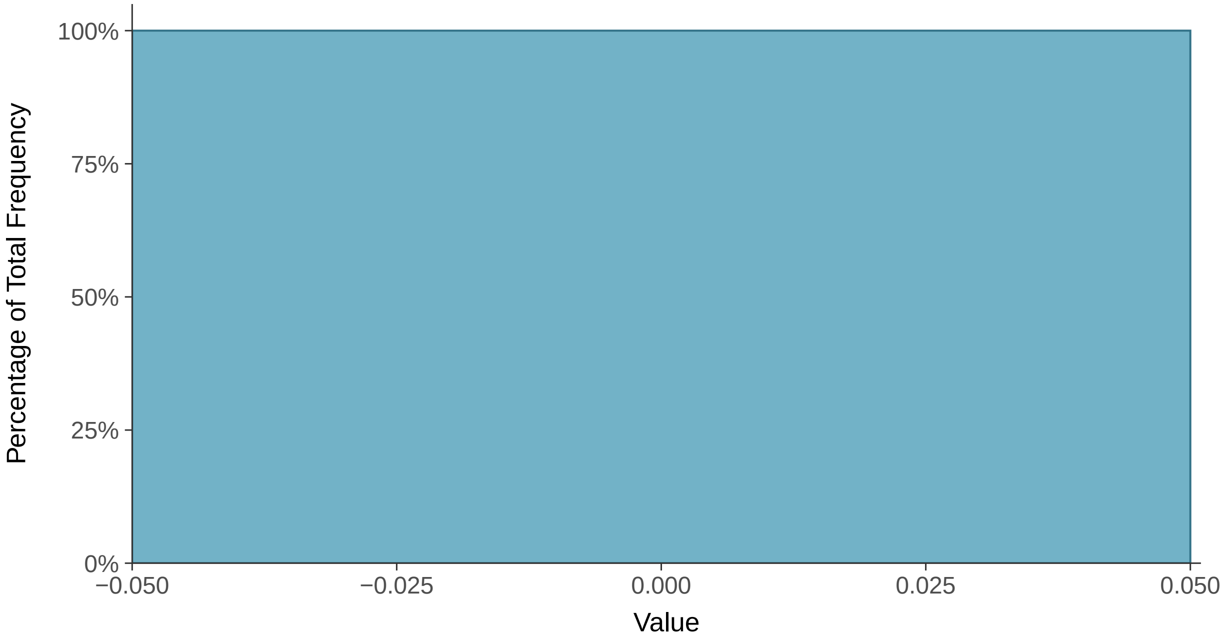
Scatter Plot

Cobalt, MW-3 (mg/L)



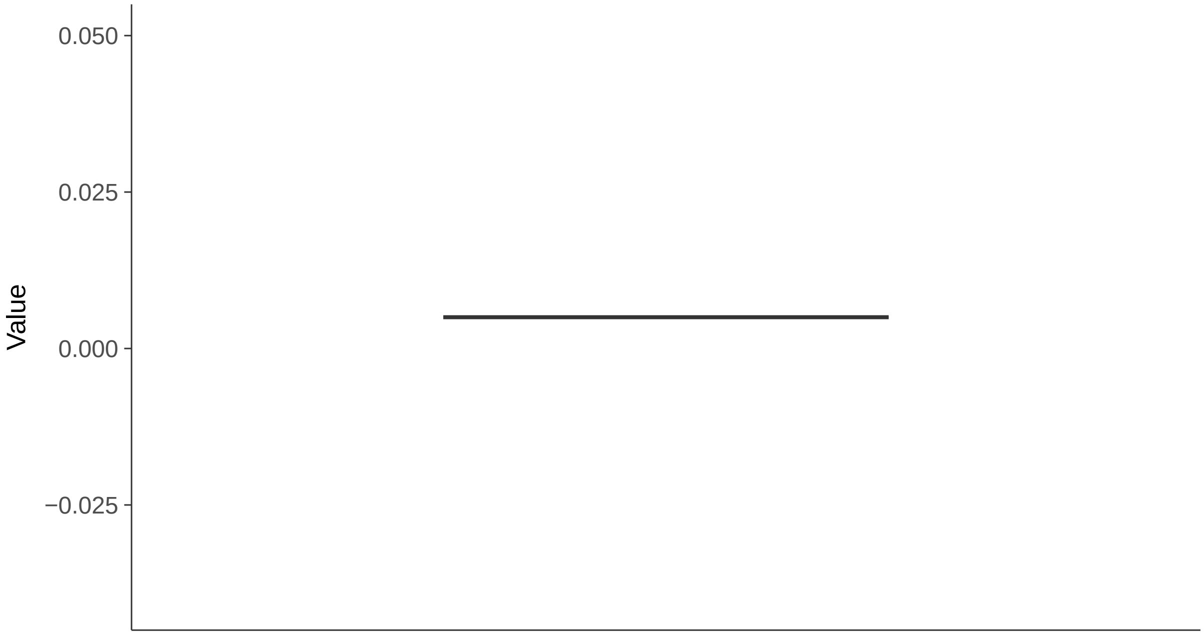
Histogram

Cobalt, MW-3 (mg/L)



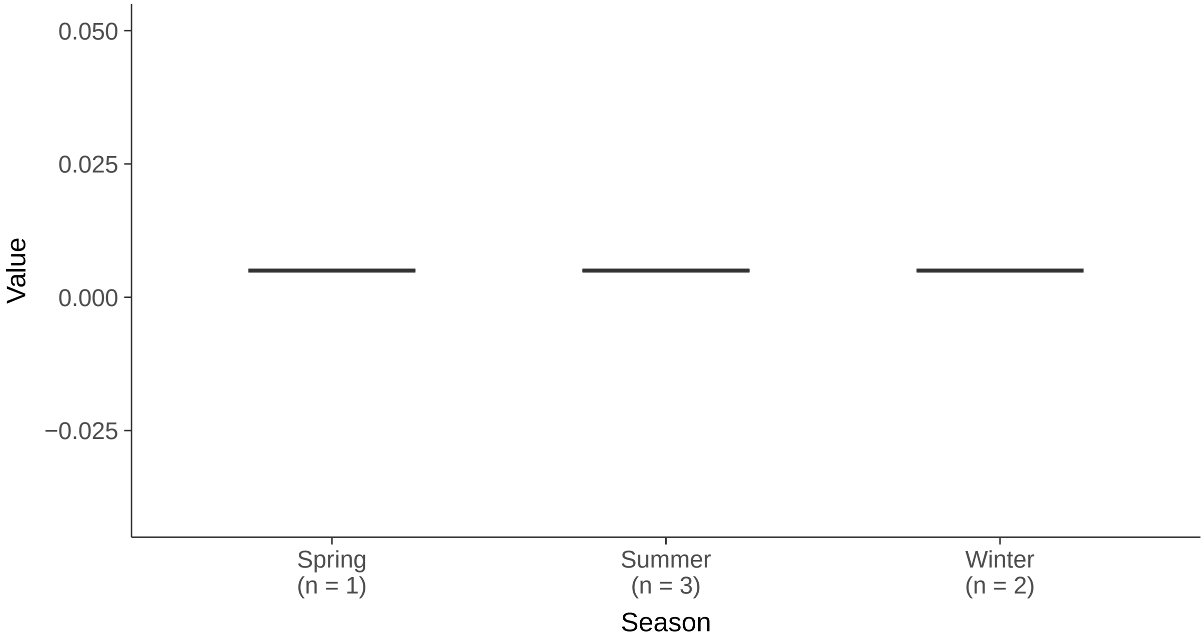
Boxplot

Cobalt, MW-3 (mg/L)



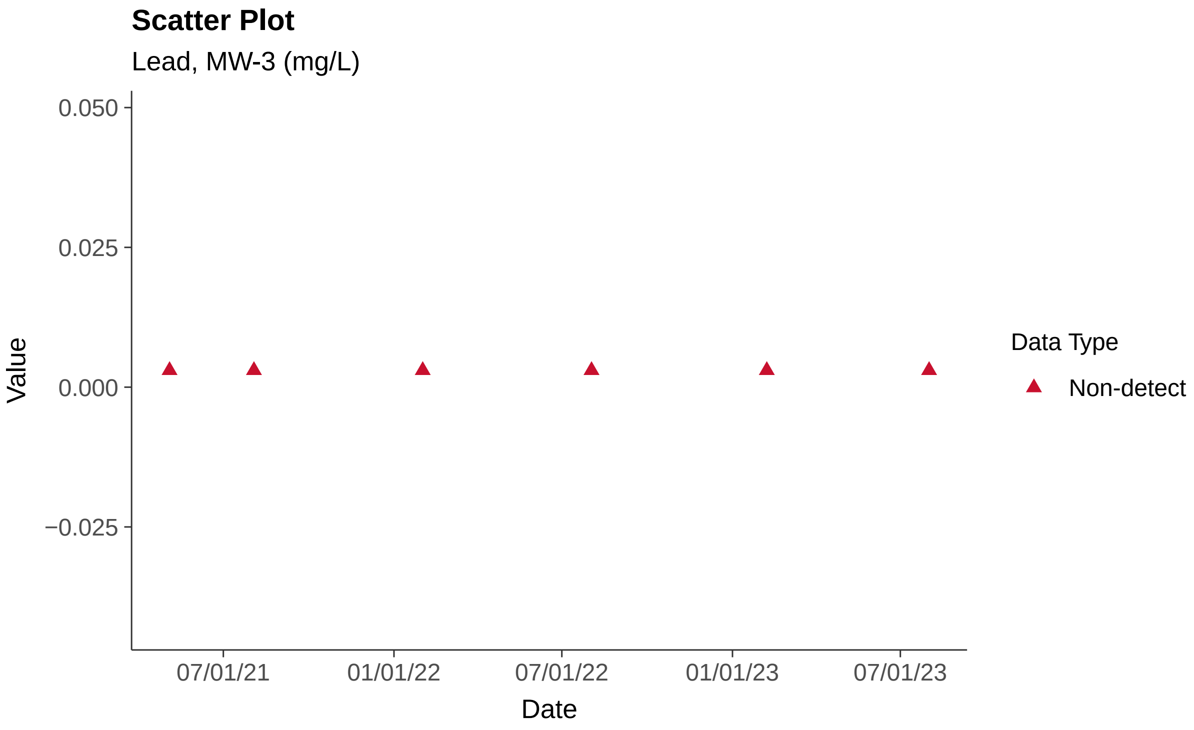
Boxplot by Season

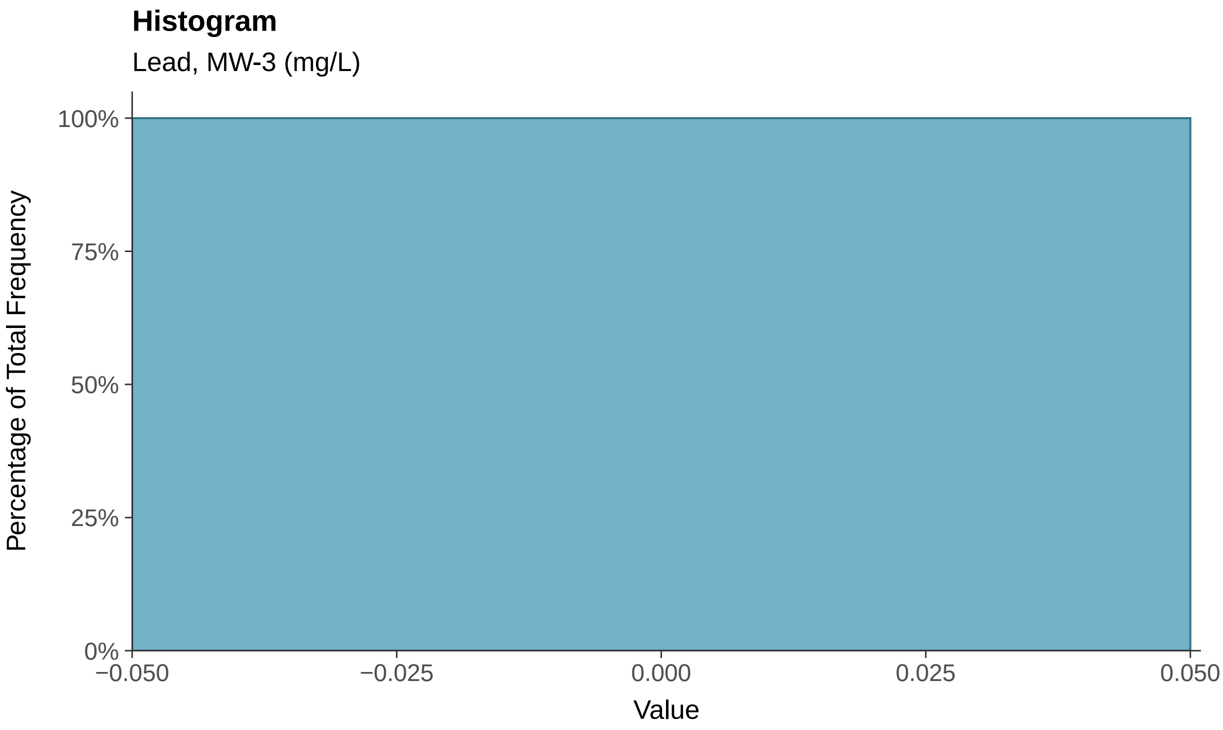
Cobalt, MW-3 (mg/L)



Appendix IV: Lead, MW-3

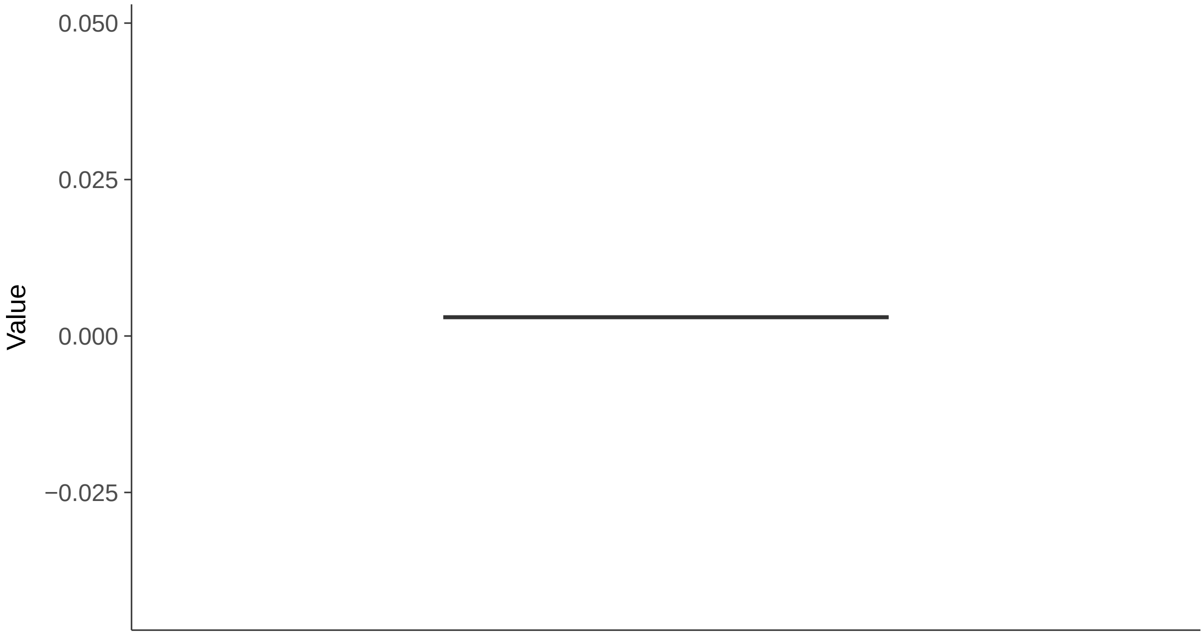
ID: 03_2_15





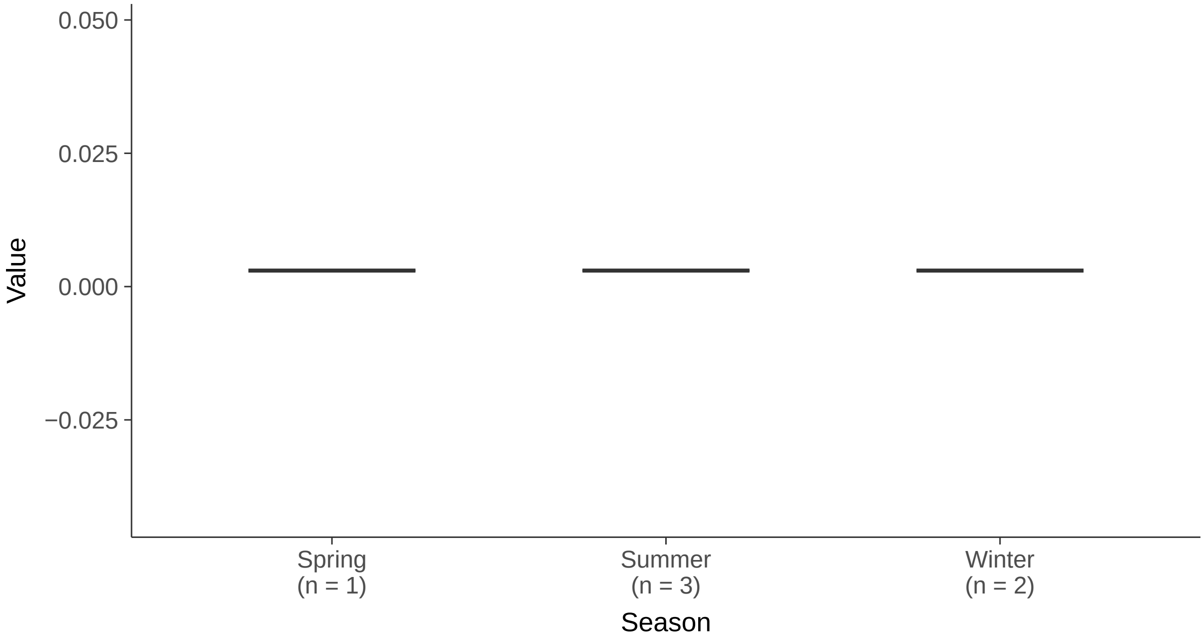
Boxplot

Lead, MW-3 (mg/L)



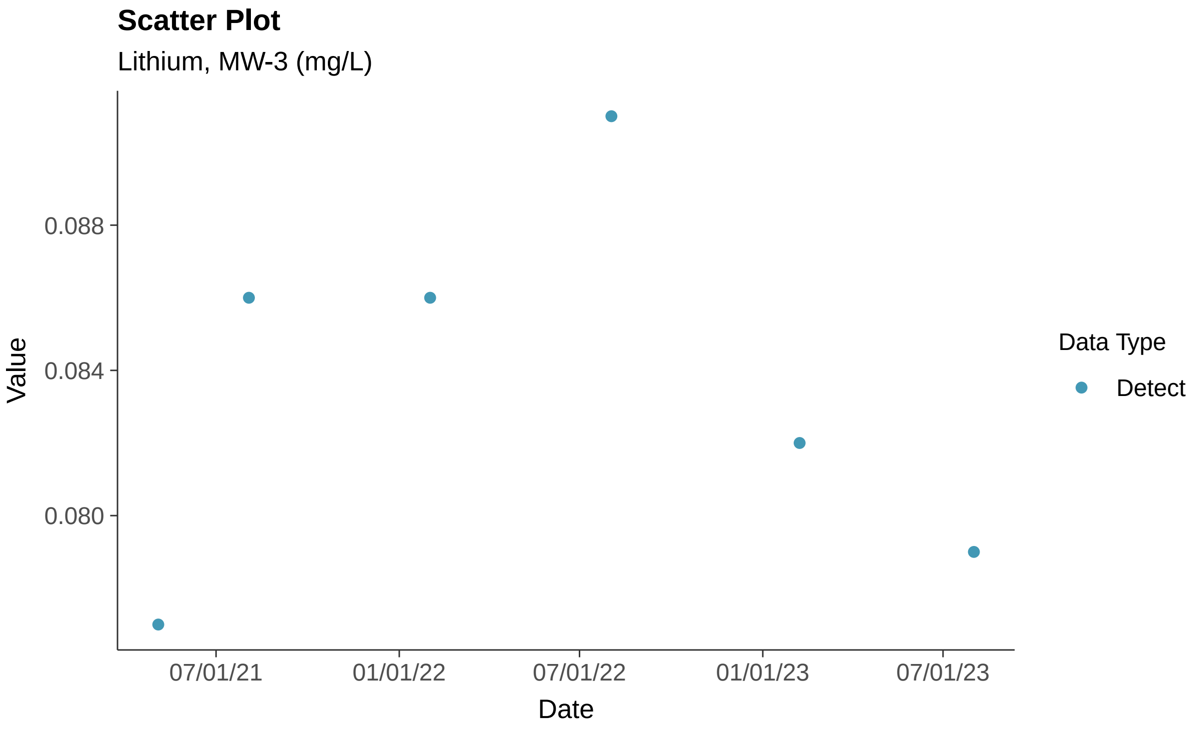
Boxplot by Season

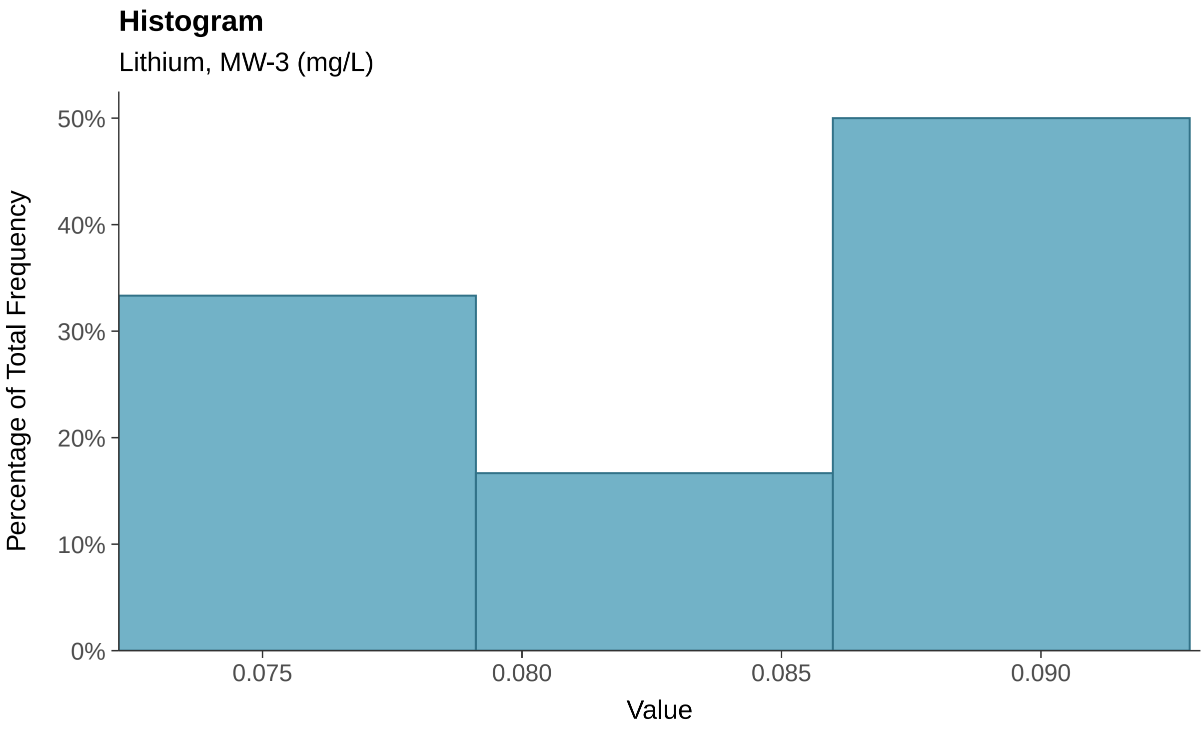
Lead, MW-3 (mg/L)



Appendix IV: Lithium, MW-3

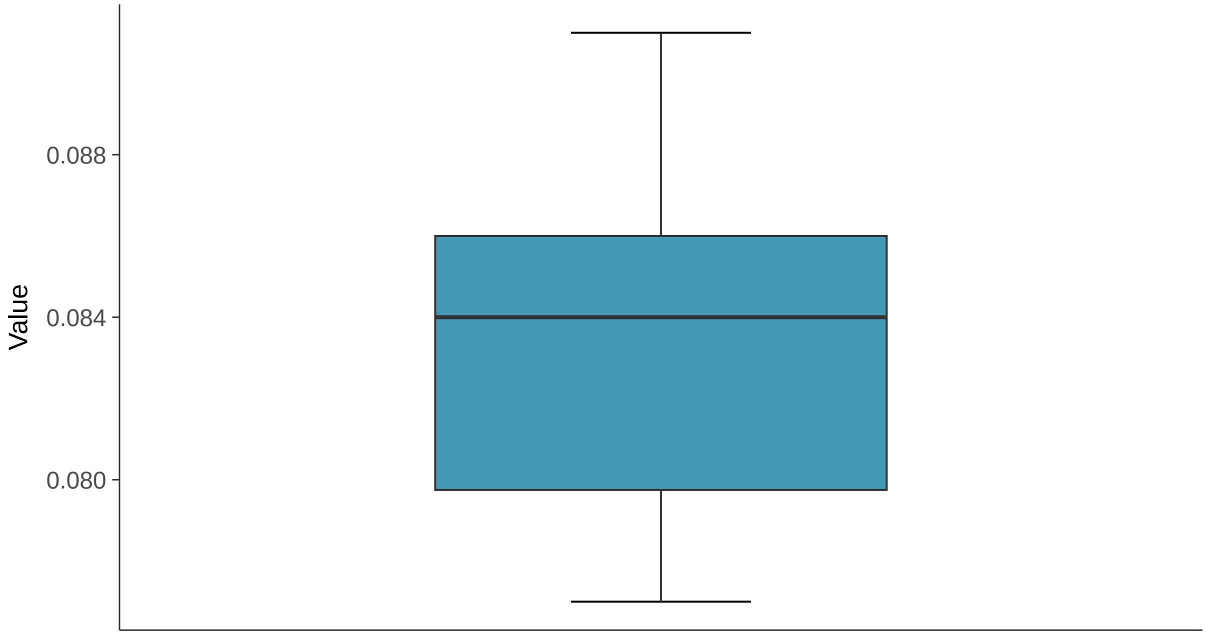
ID: 03_2_16





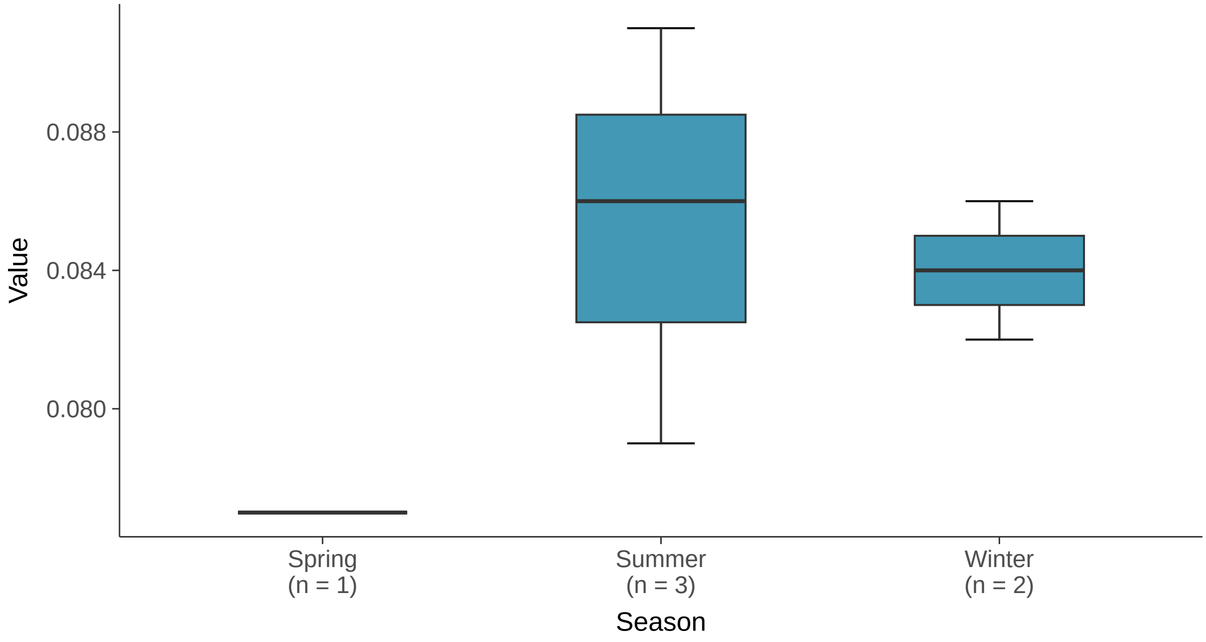
Boxplot

Lithium, MW-3 (mg/L)



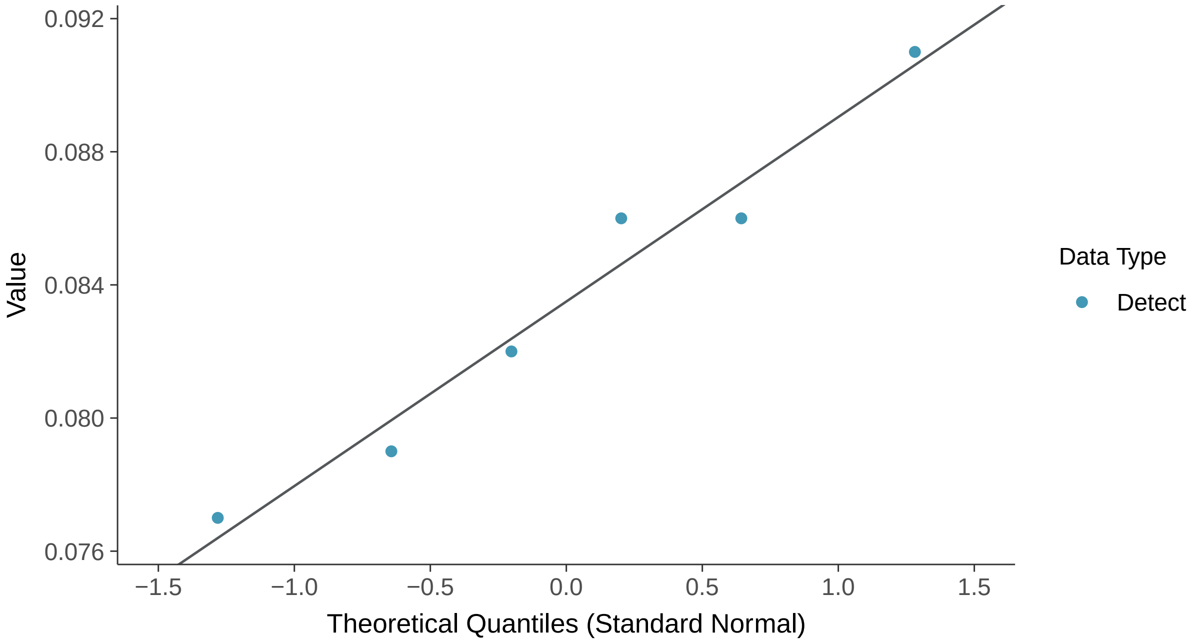
Boxplot by Season

Lithium, MW-3 (mg/L)



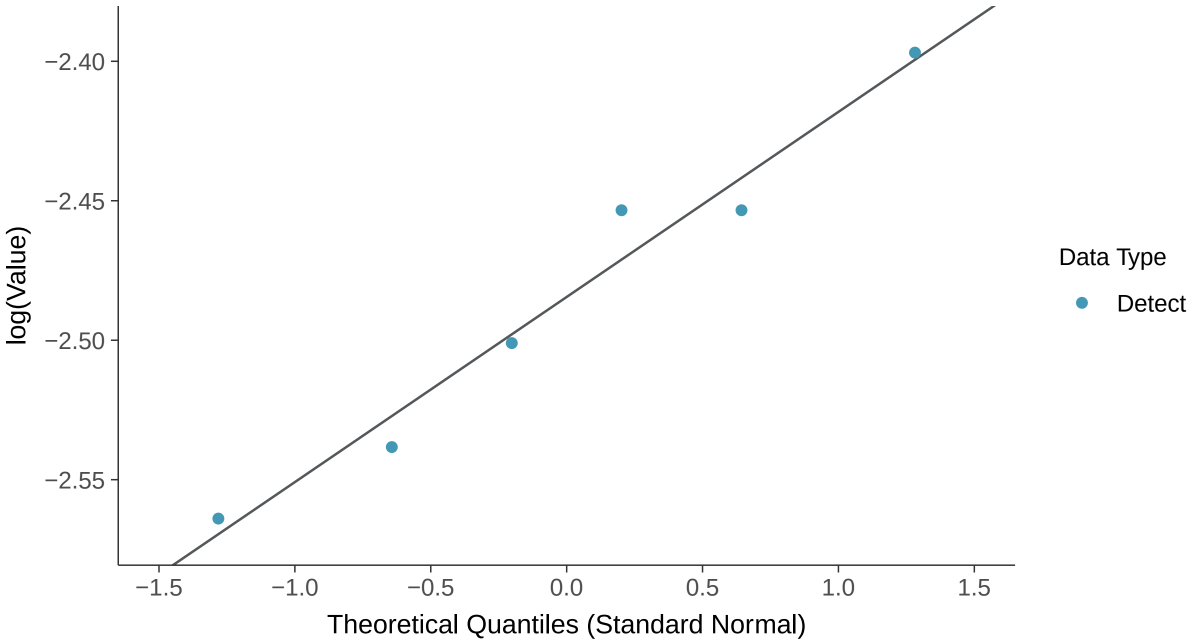
Normal Q-Q plot

Lithium, MW-3 (mg/L)



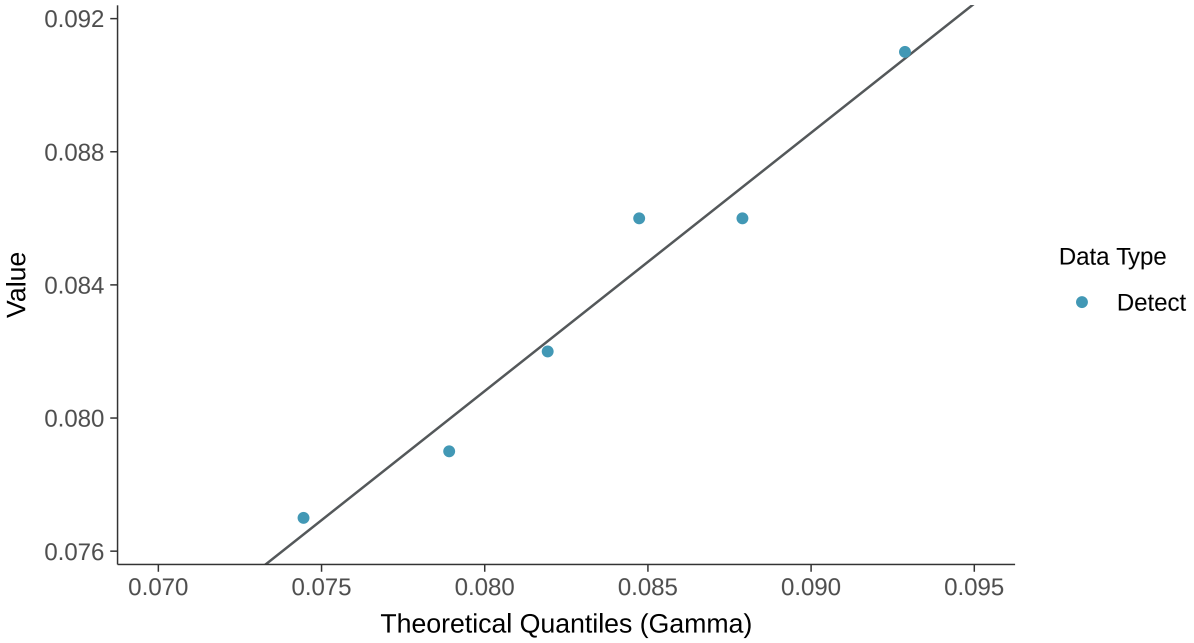
Lognormal Q-Q plot

Lithium, MW-3 (mg/L)



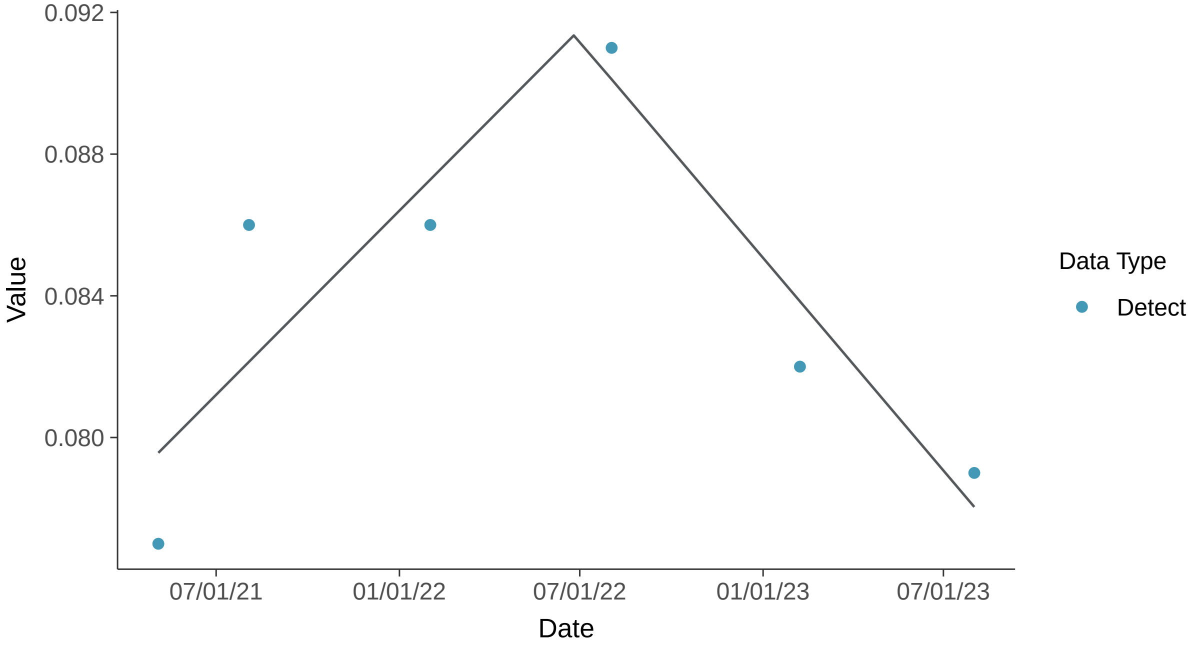
Gamma Q-Q plot

Lithium, MW-3 (mg/L)



Trend Regression: Piecewise Linear-Linear

Lithium, MW-3 (mg/L)

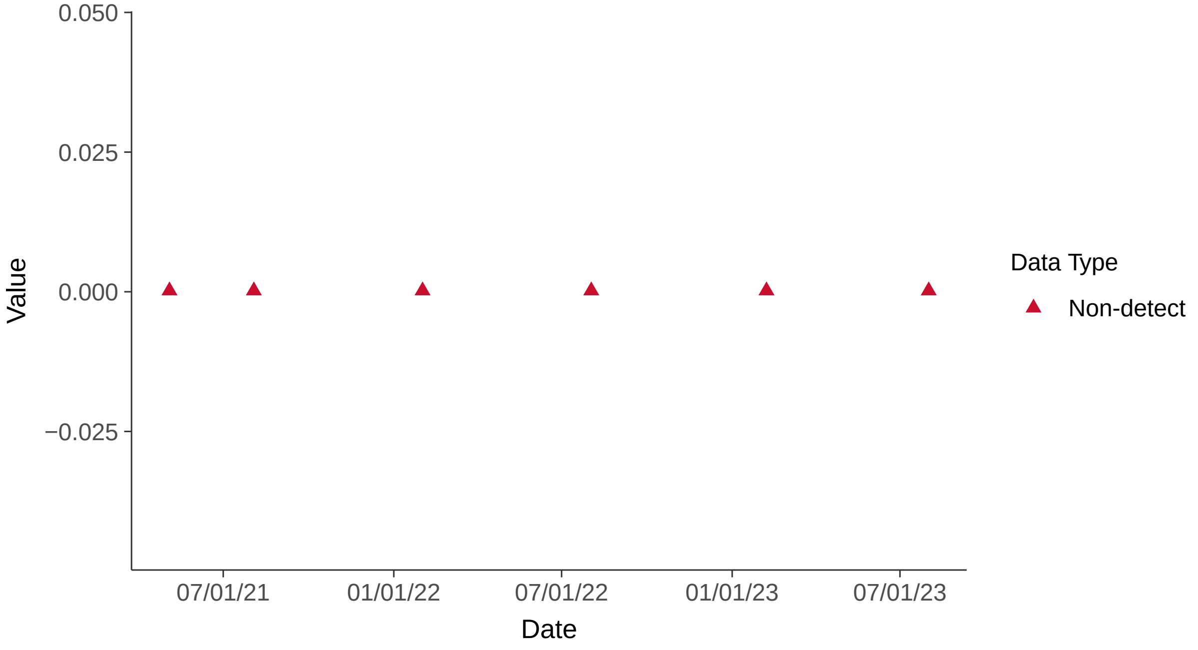


Appendix IV: Mercury, MW-3

ID: 03_2_17

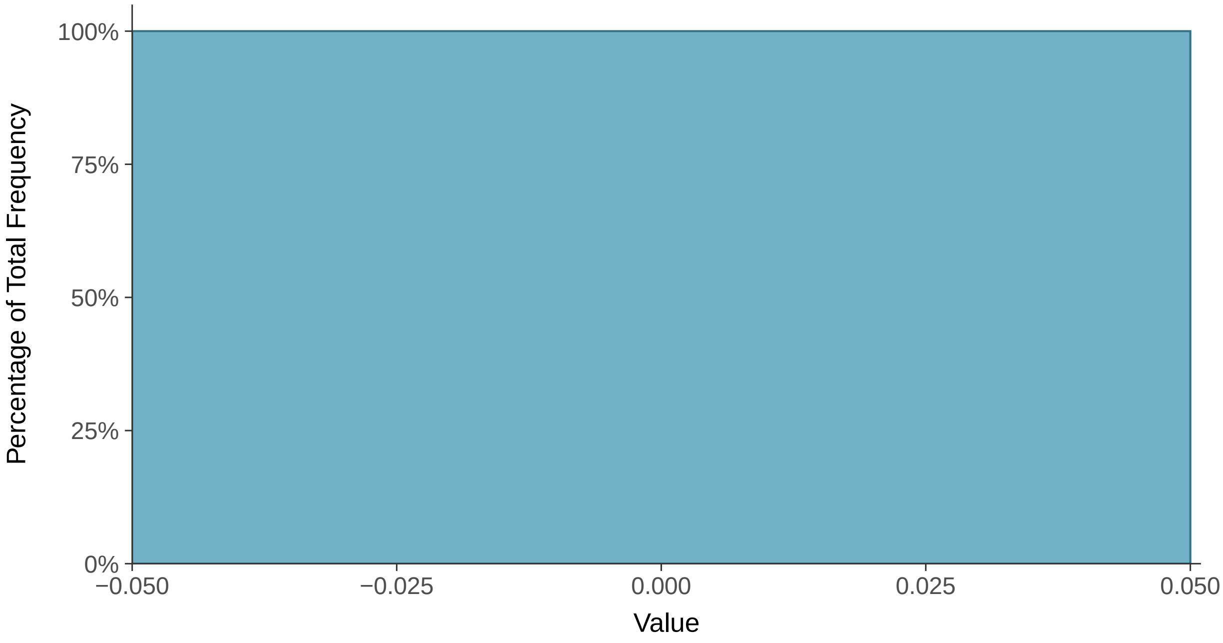
Scatter Plot

Mercury, MW-3 (mg/L)



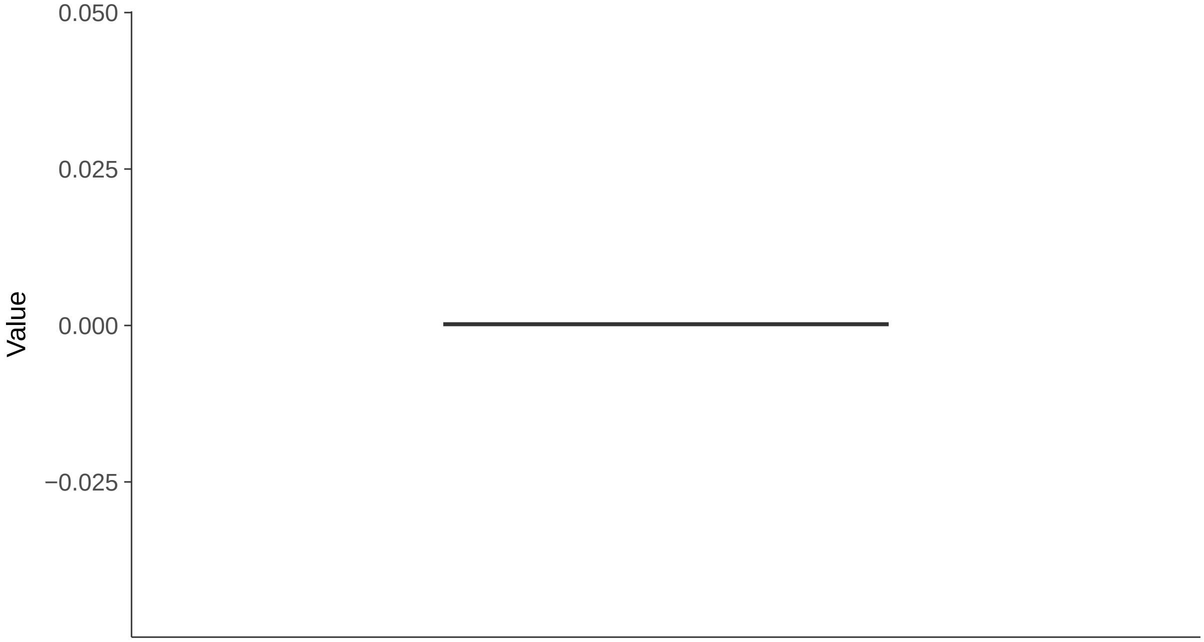
Histogram

Mercury, MW-3 (mg/L)



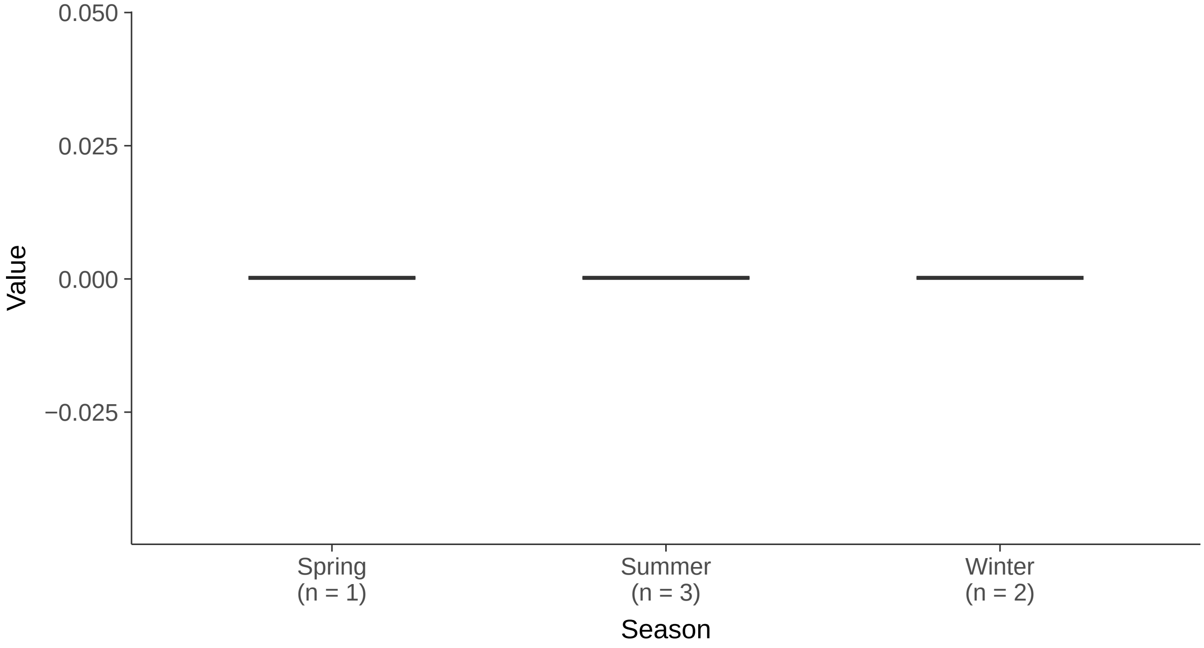
Boxplot

Mercury, MW-3 (mg/L)



Boxplot by Season

Mercury, MW-3 (mg/L)

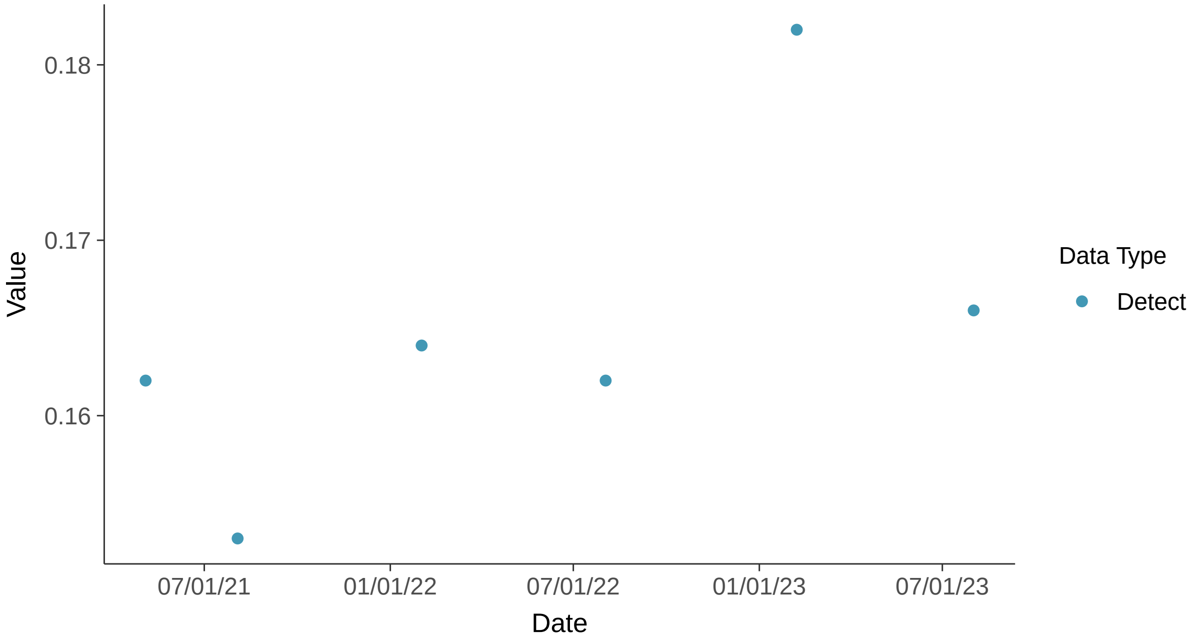


Appendix IV: Molybdenum, MW-3

ID: 03_2_18

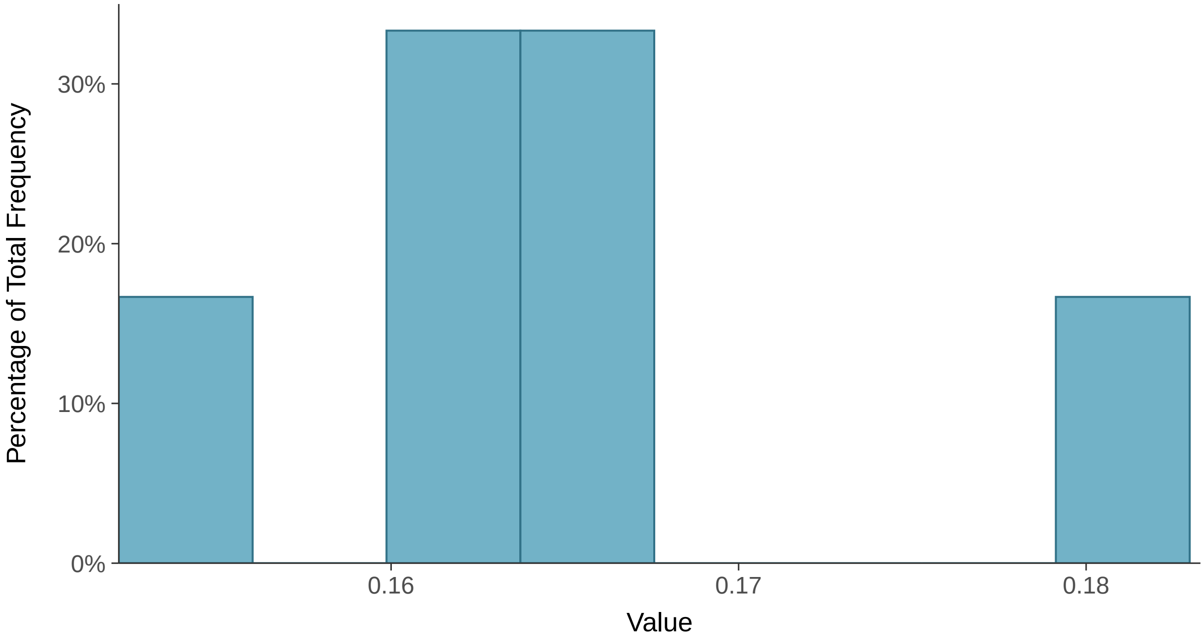
Scatter Plot

Molybdenum, MW-3 (mg/L)



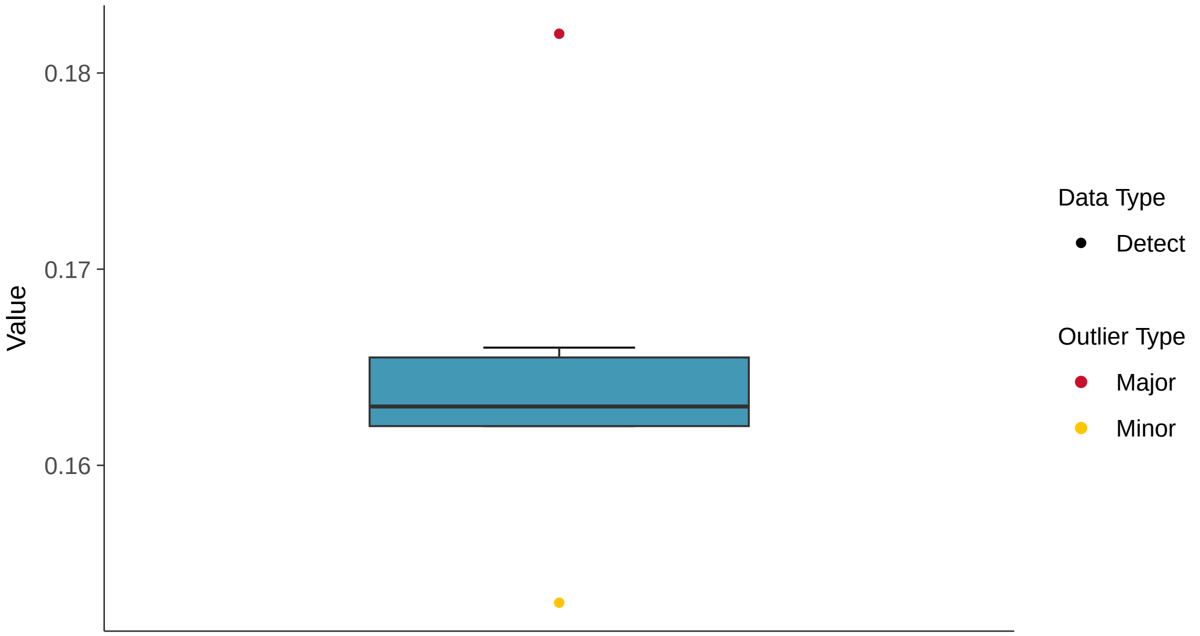
Histogram

Molybdenum, MW-3 (mg/L)



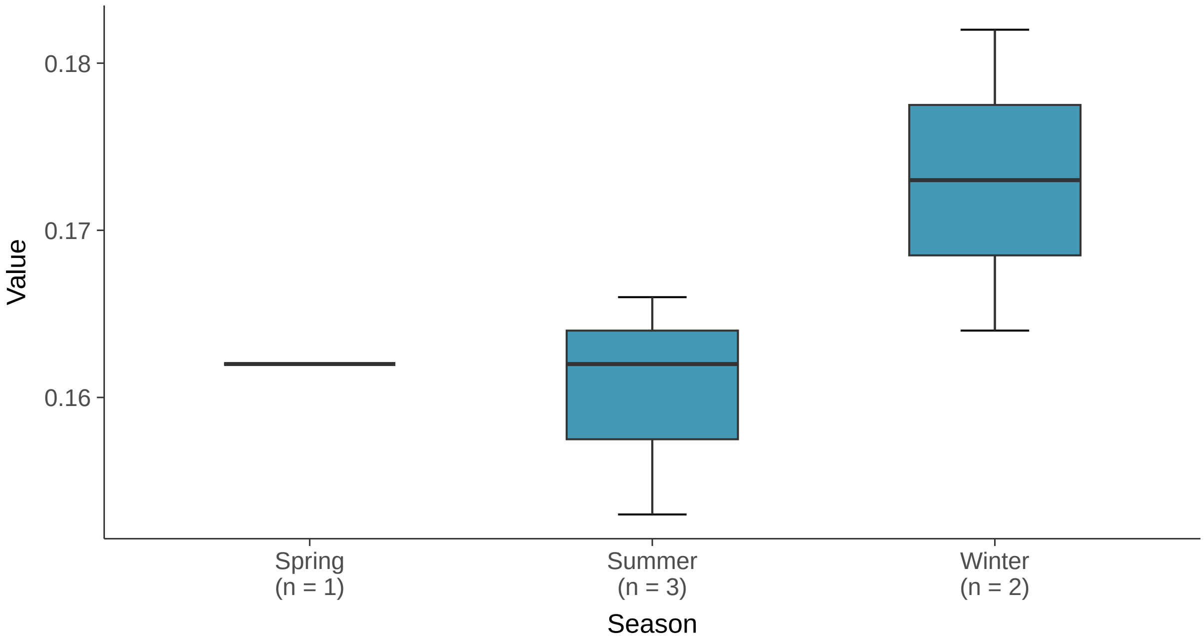
Boxplot

Molybdenum, MW-3 (mg/L)



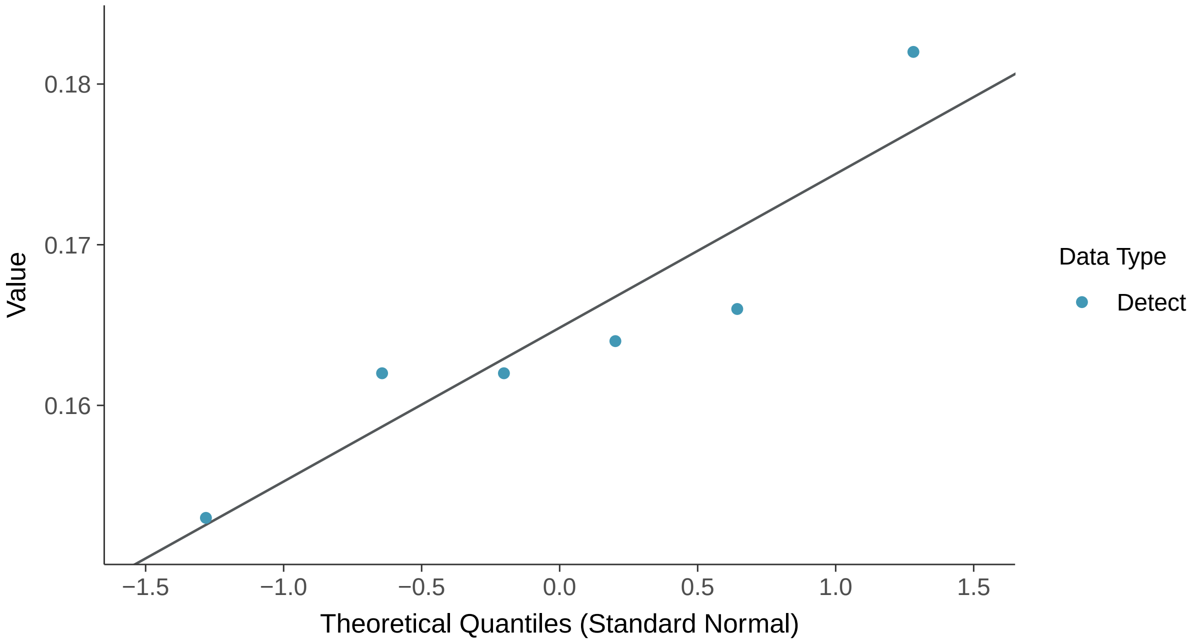
Boxplot by Season

Molybdenum, MW-3 (mg/L)



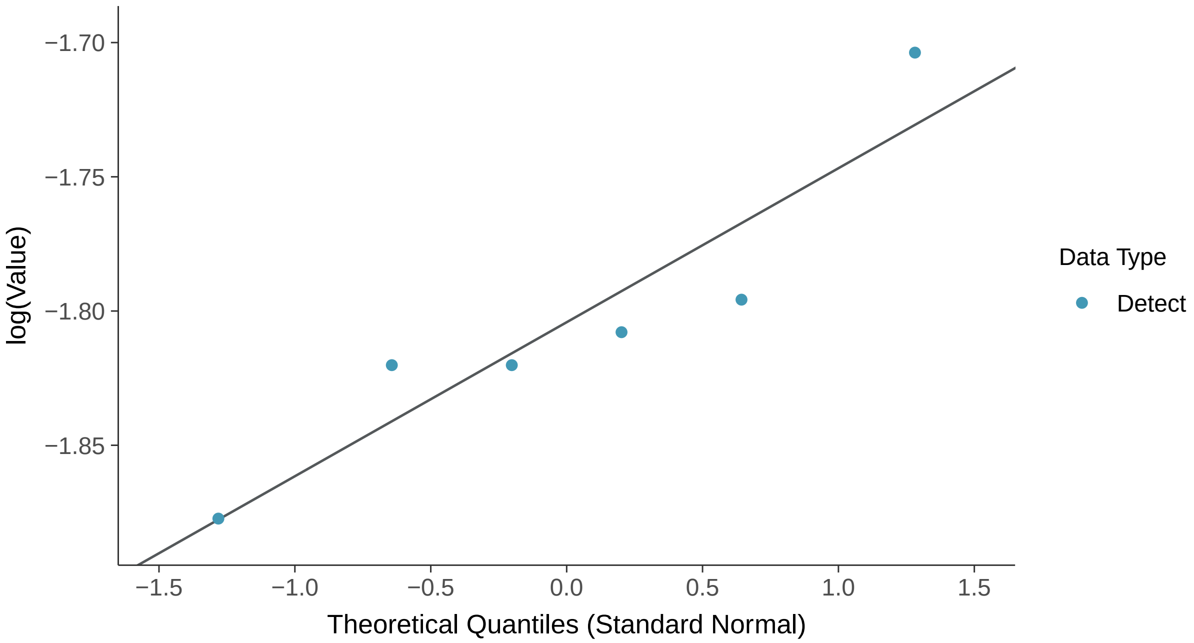
Normal Q-Q plot

Molybdenum, MW-3 (mg/L)



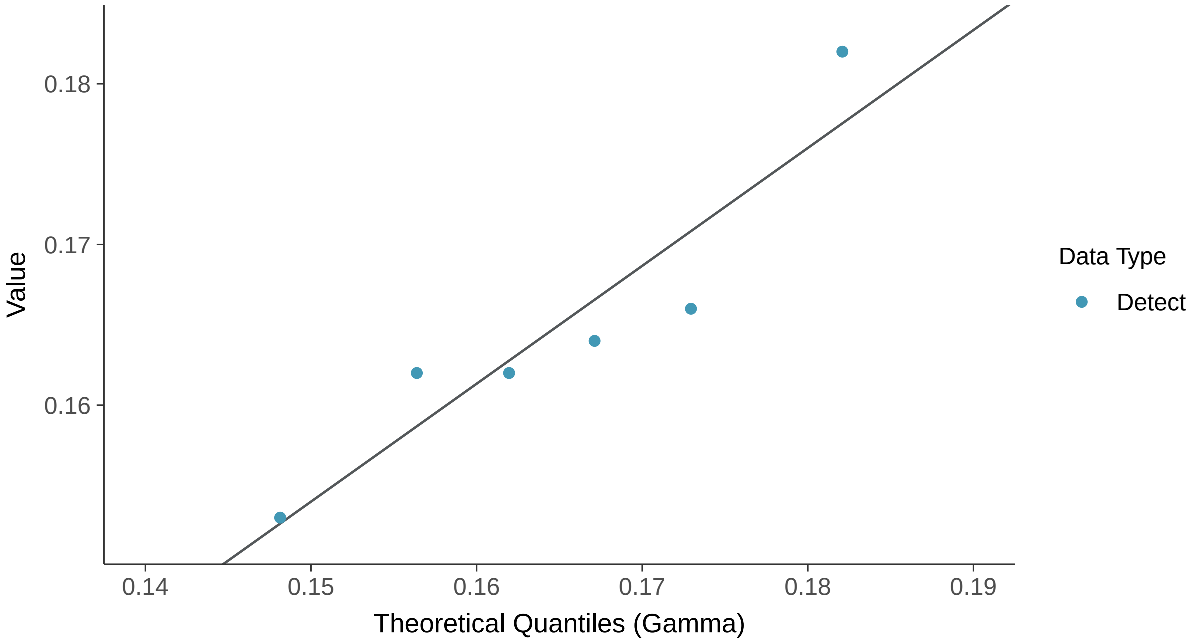
Lognormal Q-Q plot

Molybdenum, MW-3 (mg/L)



Gamma Q-Q plot

Molybdenum, MW-3 (mg/L)

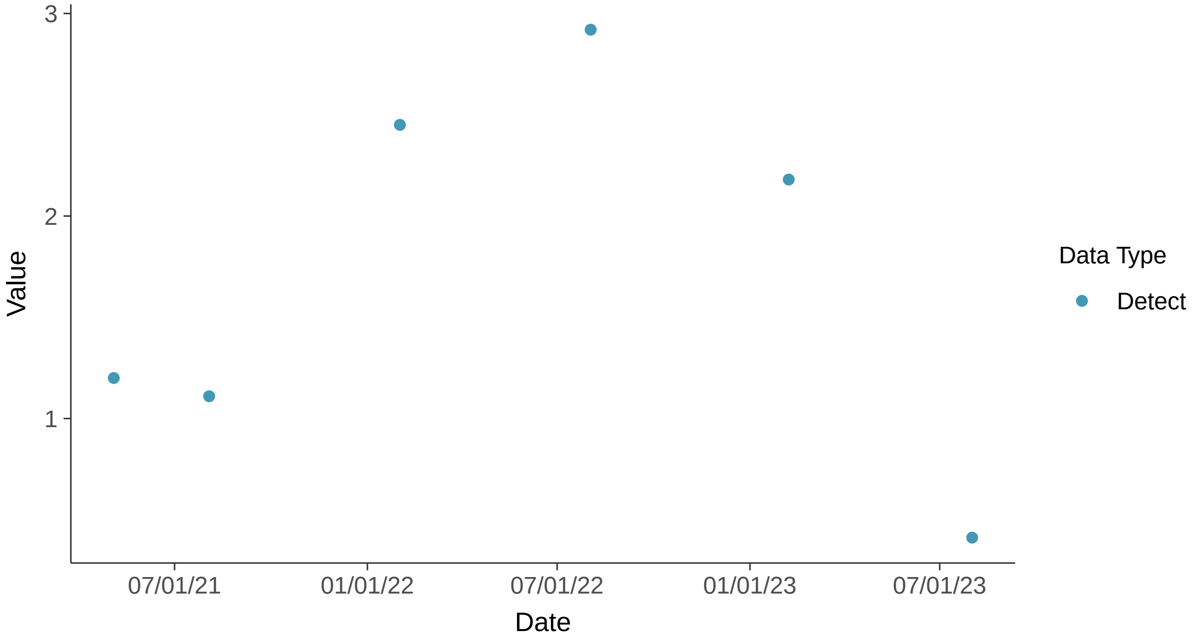


Appendix IV: Radium-226/228, MW-3

ID: 03_2_20

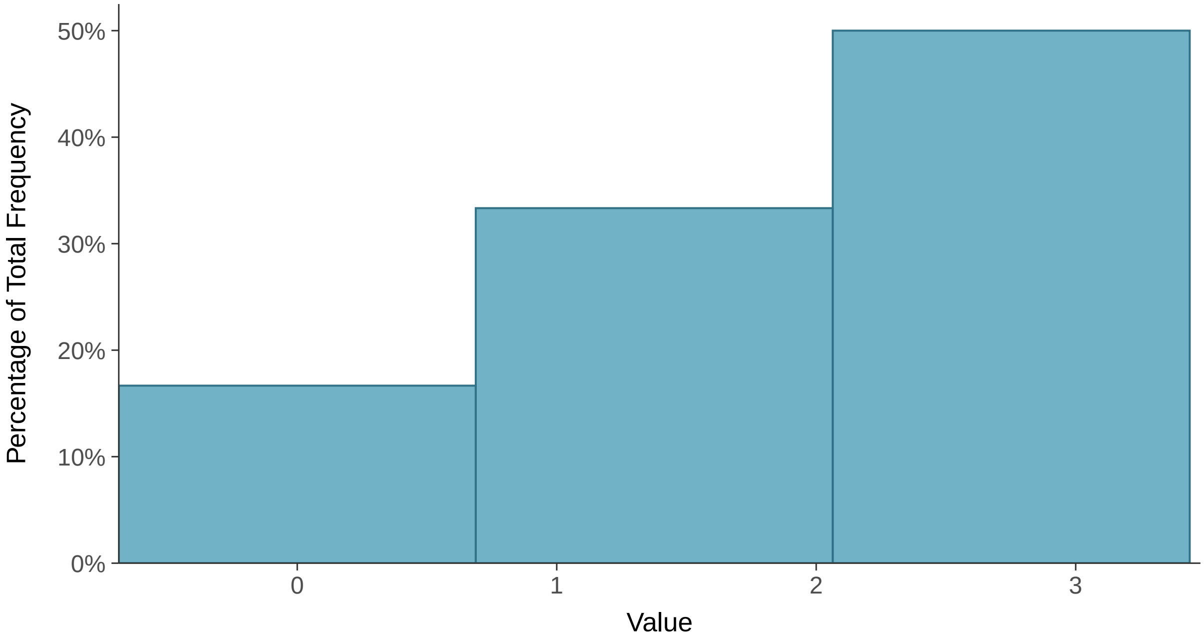
Scatter Plot

Radium-226/228, MW-3 (pCi/L)



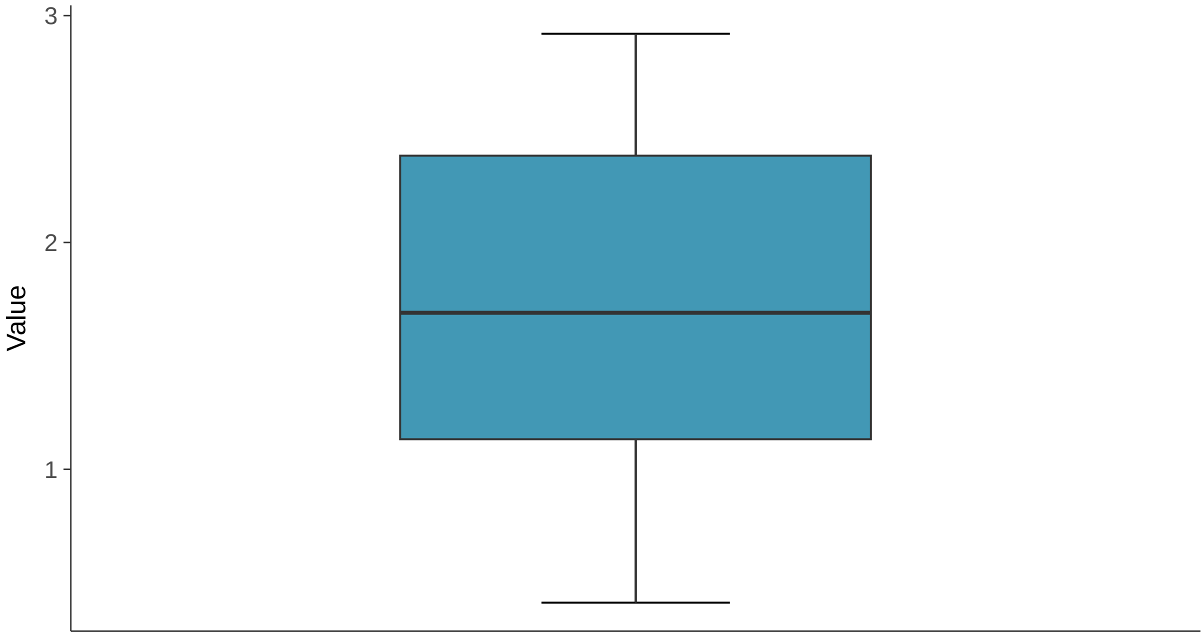
Histogram

Radium-226/228, MW-3 (pCi/L)



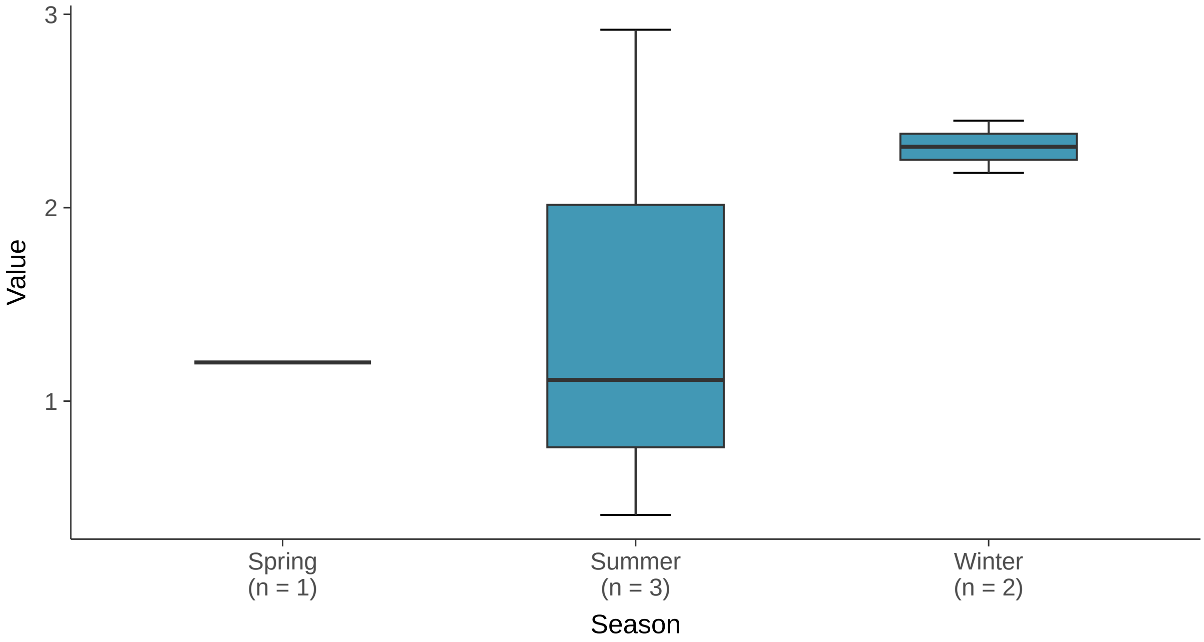
Boxplot

Radium-226/228, MW-3 (pCi/L)



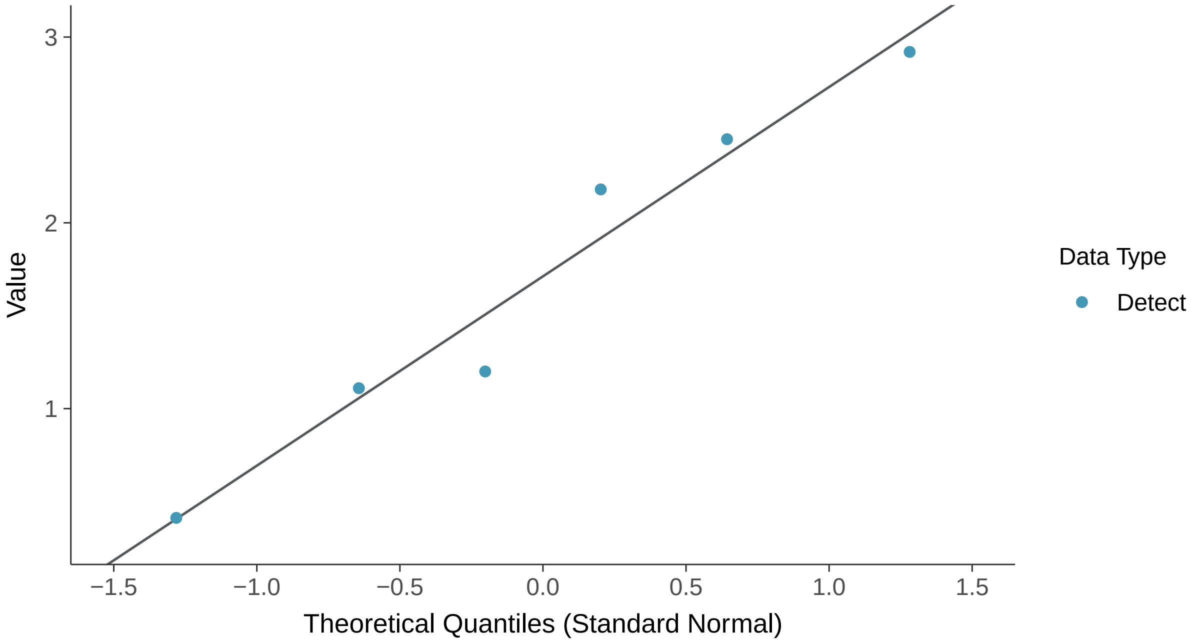
Boxplot by Season

Radium-226/228, MW-3 (pCi/L)



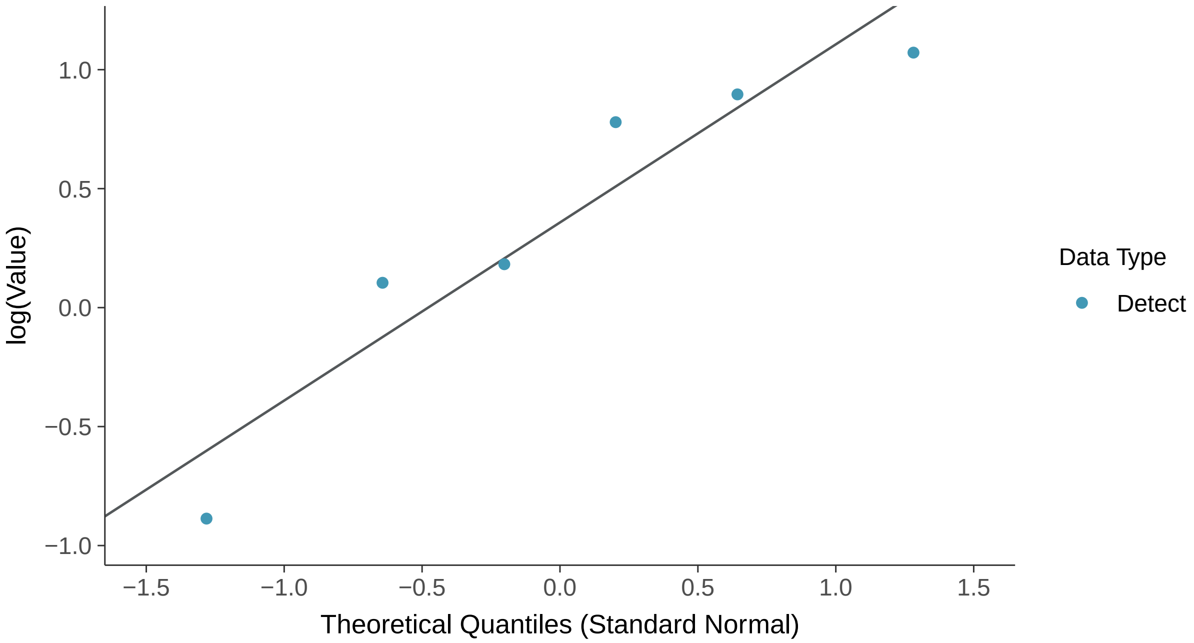
Normal Q-Q plot

Radium-226/228, MW-3 (pCi/L)



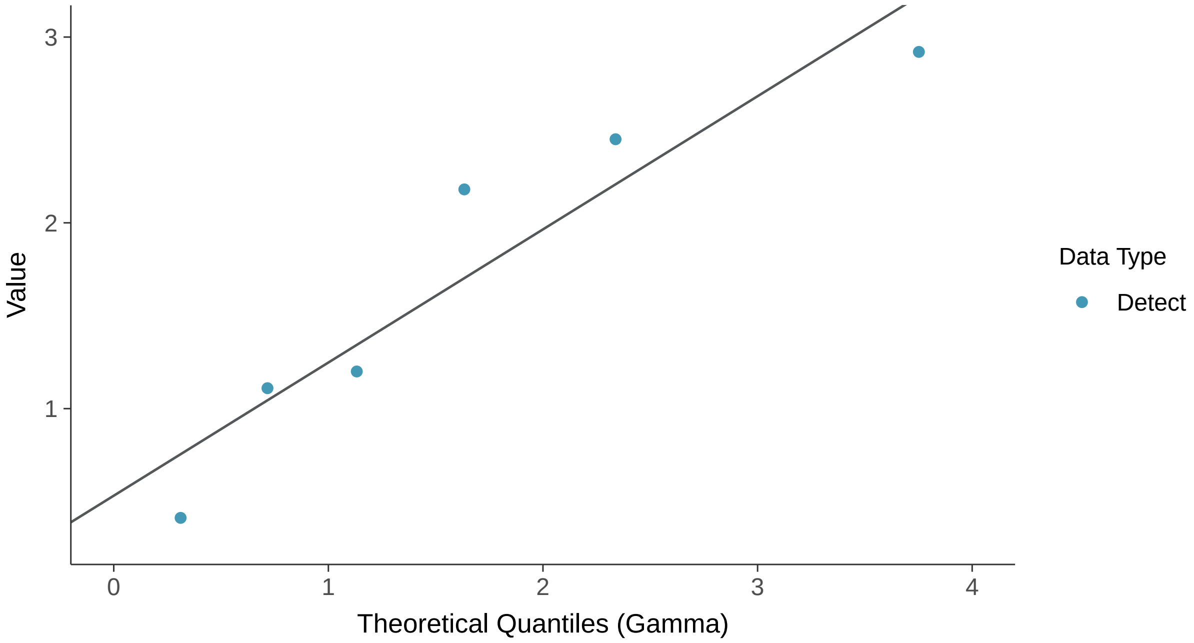
Lognormal Q-Q plot

Radium-226/228, MW-3 (pCi/L)



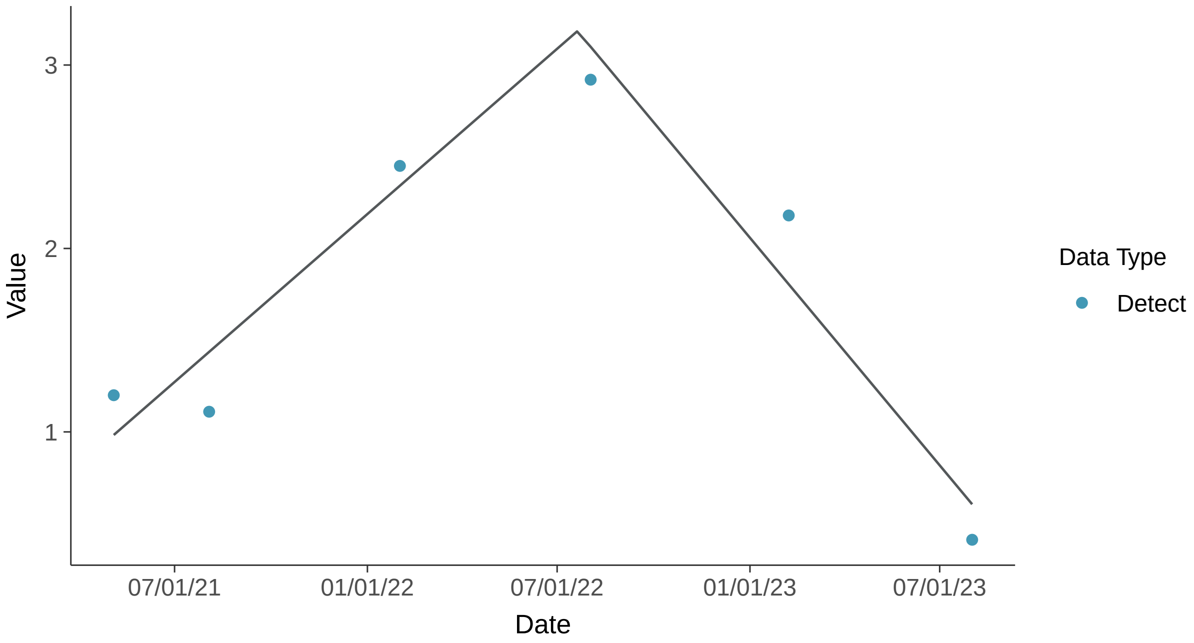
Gamma Q-Q plot

Radium-226/228, MW-3 (pCi/L)



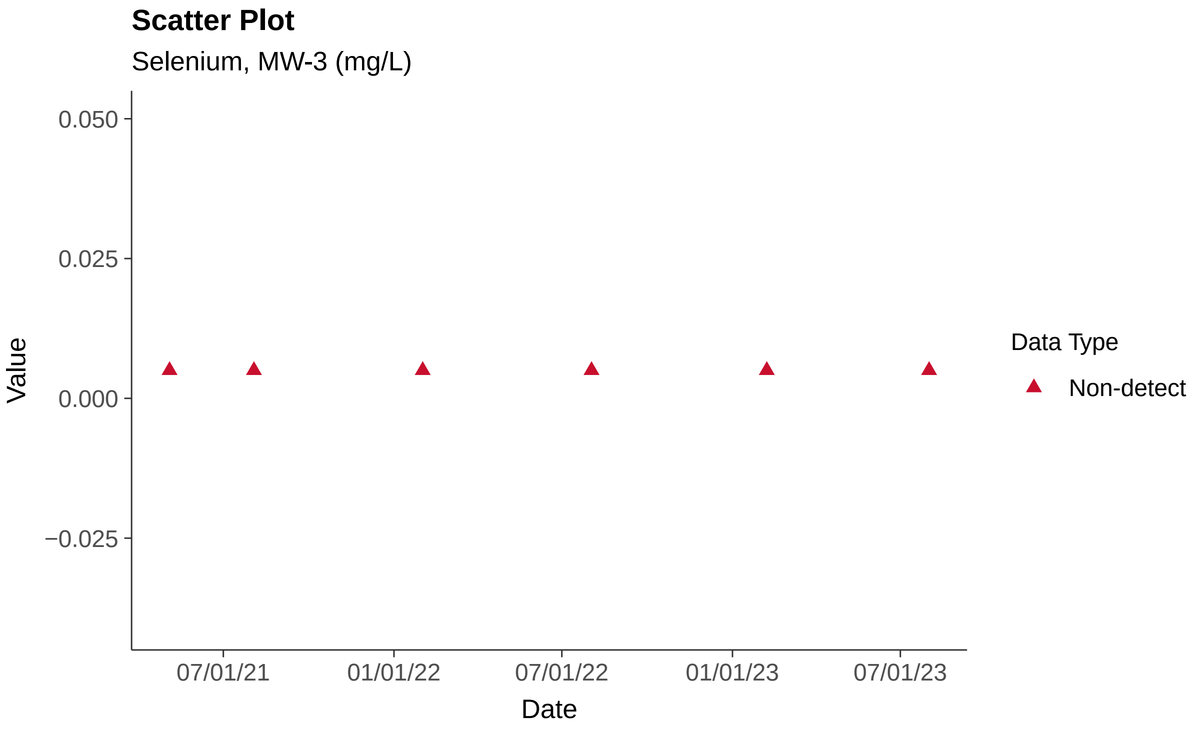
Trend Regression: Piecewise Linear-Linear

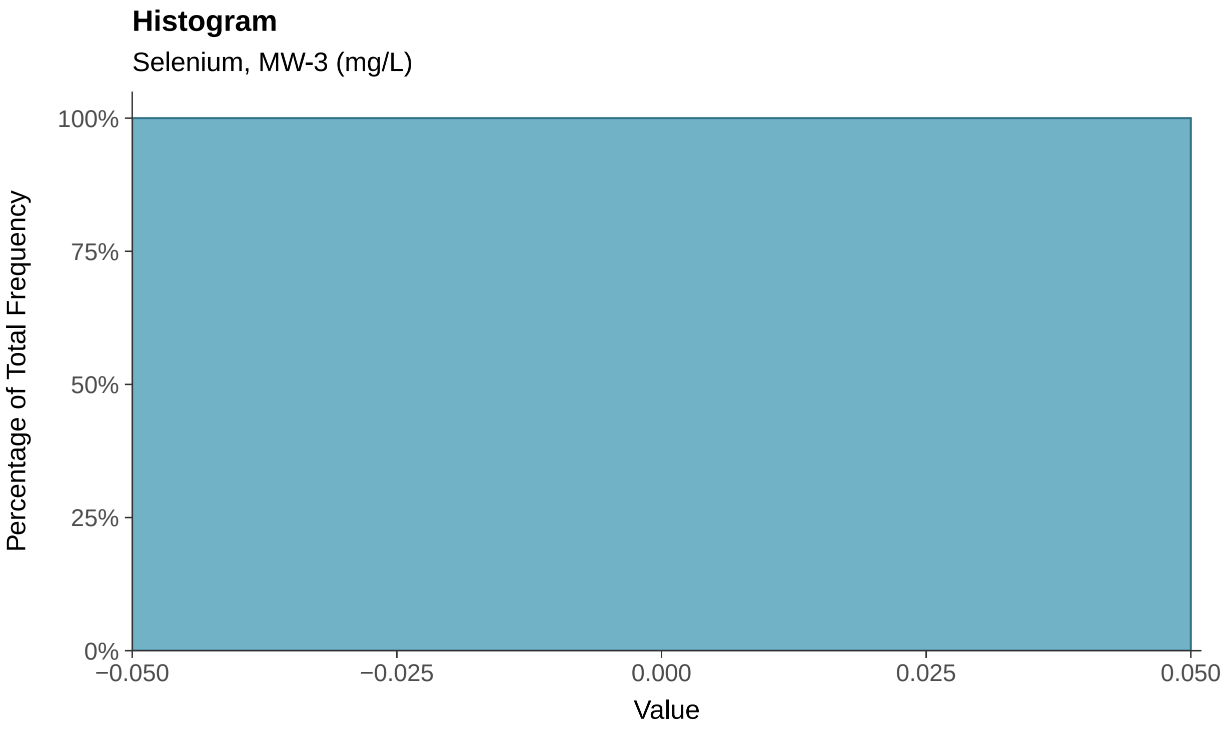
Radium-226/228, MW-3 (pCi/L)



Appendix IV: Selenium, MW-3

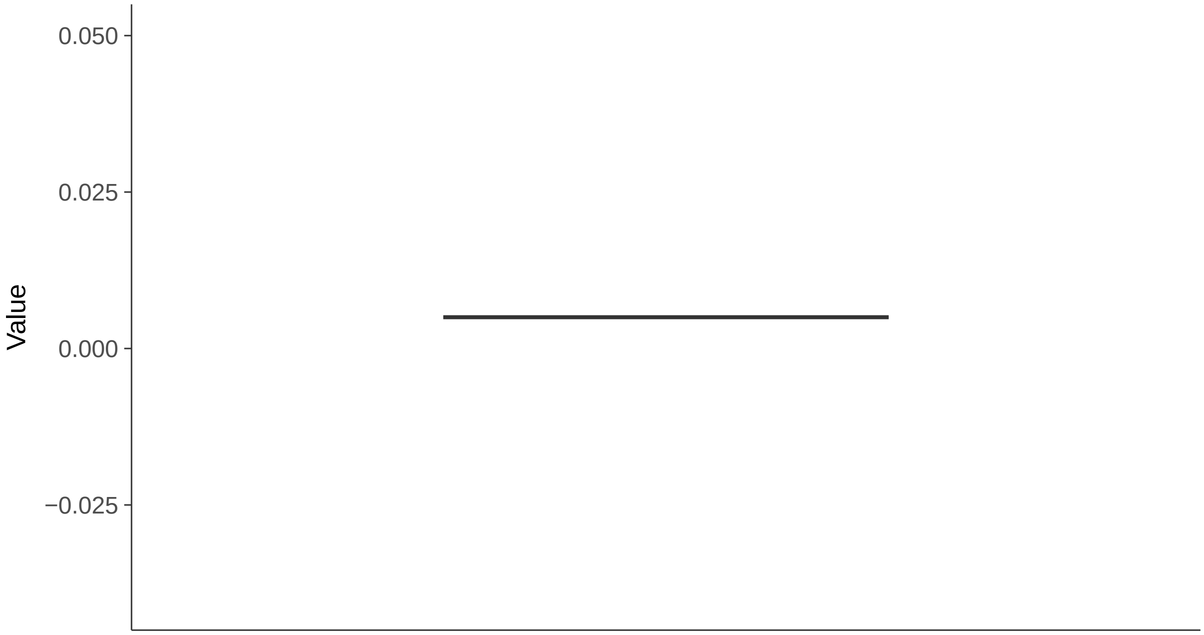
ID: 03_2_22





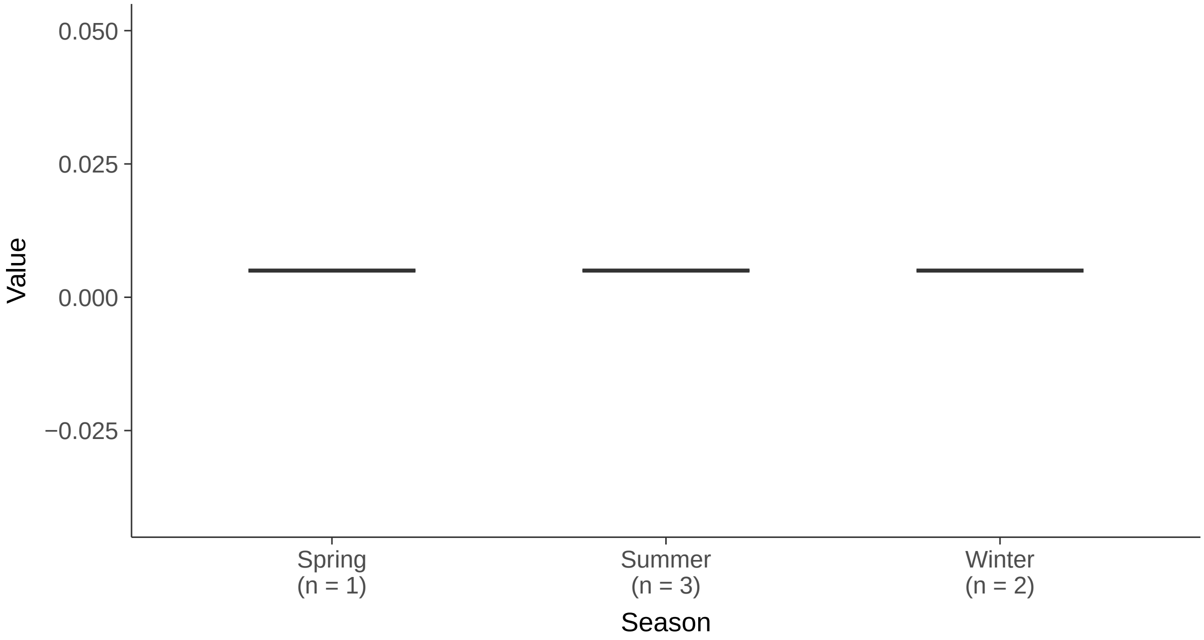
Boxplot

Selenium, MW-3 (mg/L)



Boxplot by Season

Selenium, MW-3 (mg/L)

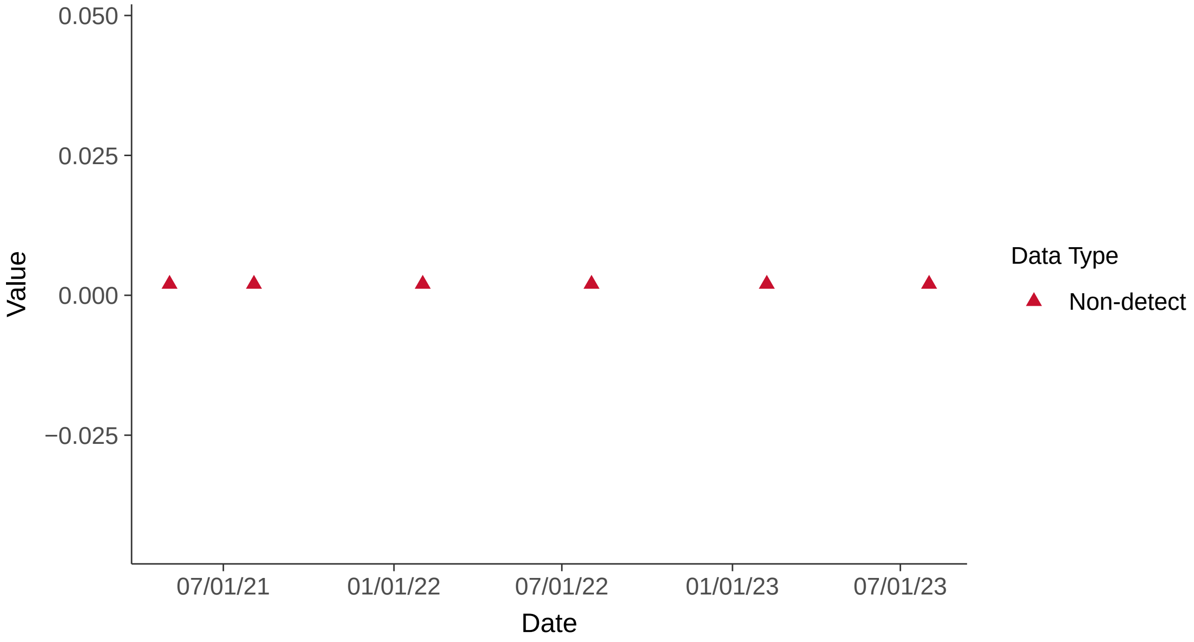


Appendix IV: Thallium, MW-3

ID: 03_2_23

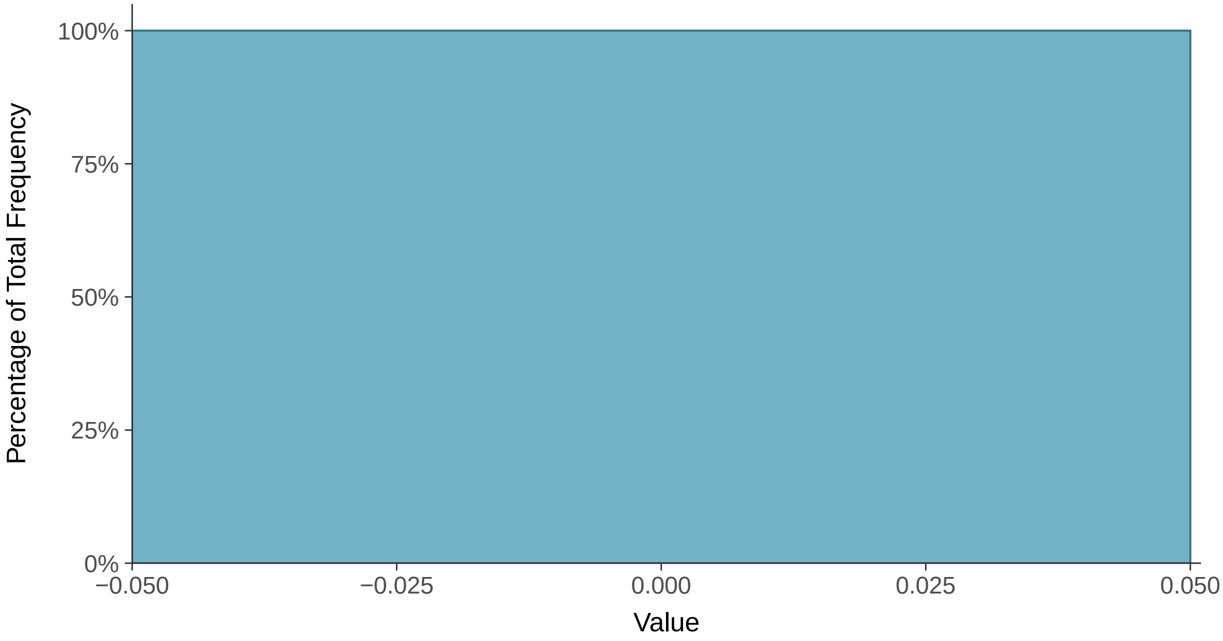
Scatter Plot

Thallium, MW-3 (mg/L)



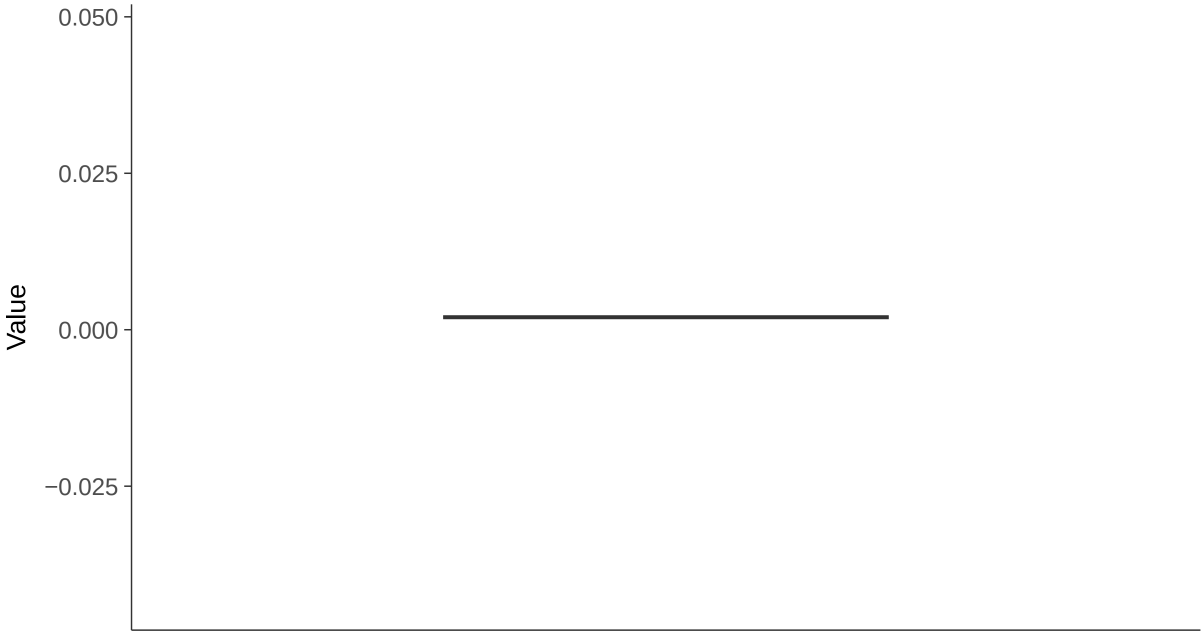
Histogram

Thallium, MW-3 (mg/L)



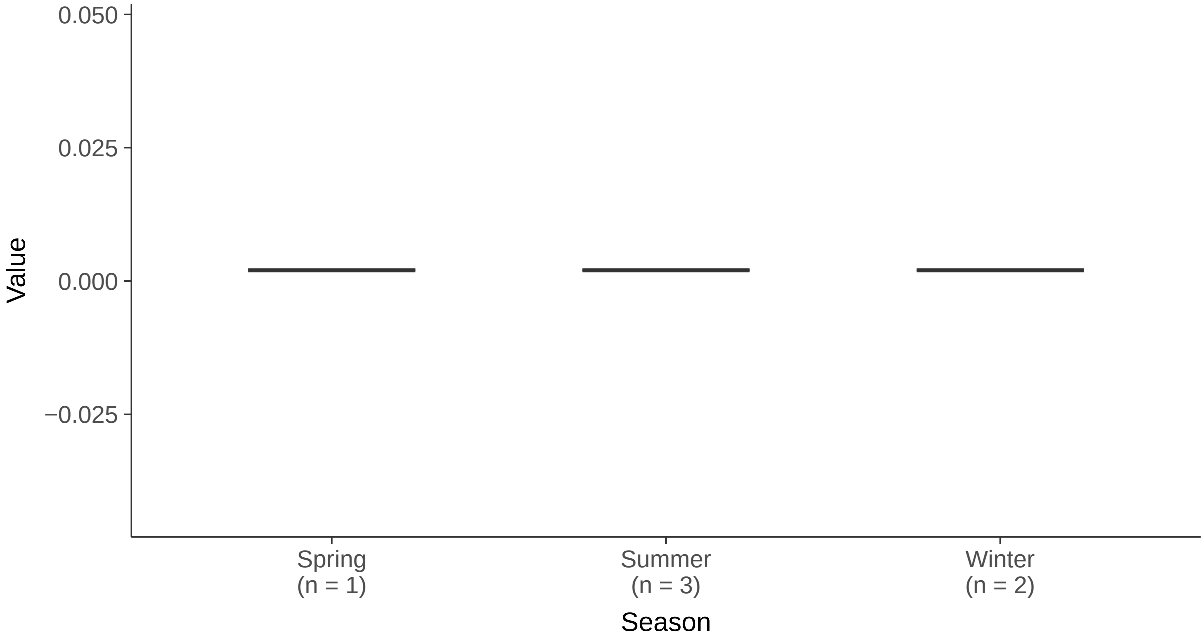
Boxplot

Thallium, MW-3 (mg/L)



Boxplot by Season

Thallium, MW-3 (mg/L)

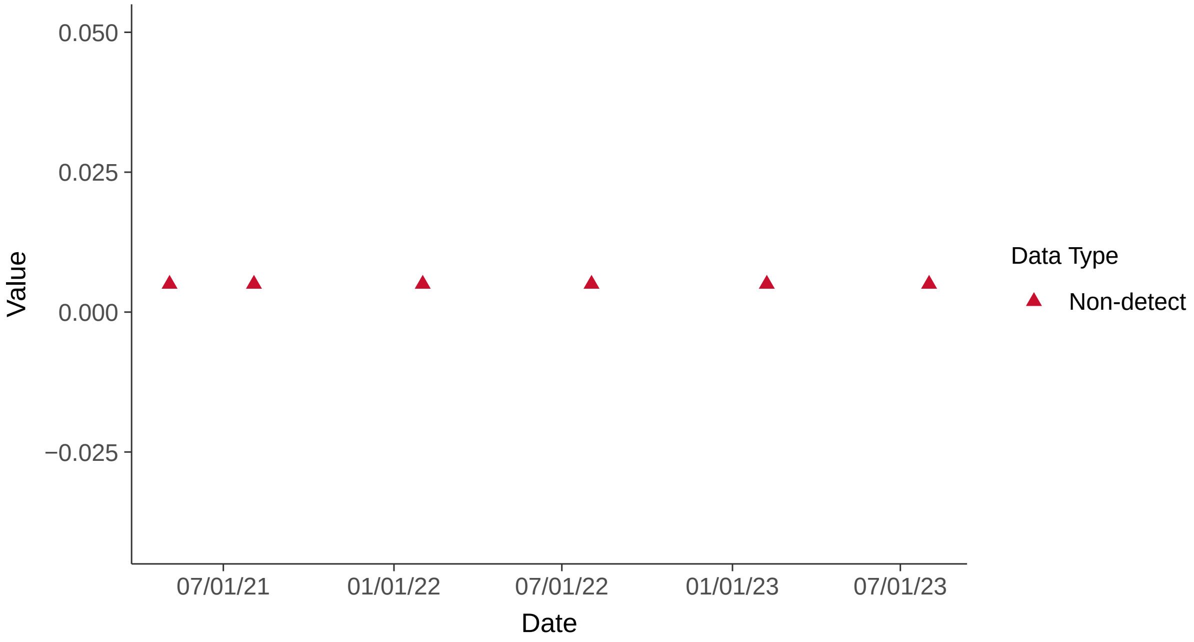


Part 115: Copper, MW-3

ID: 03_5_37

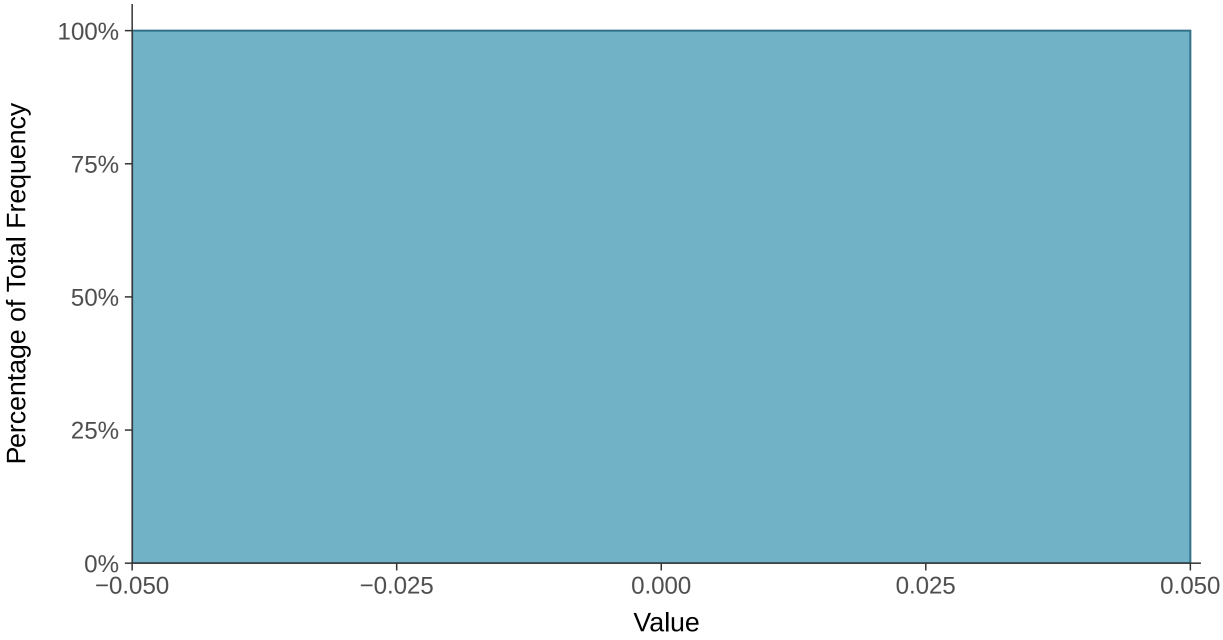
Scatter Plot

Copper, MW-3 (mg/L)



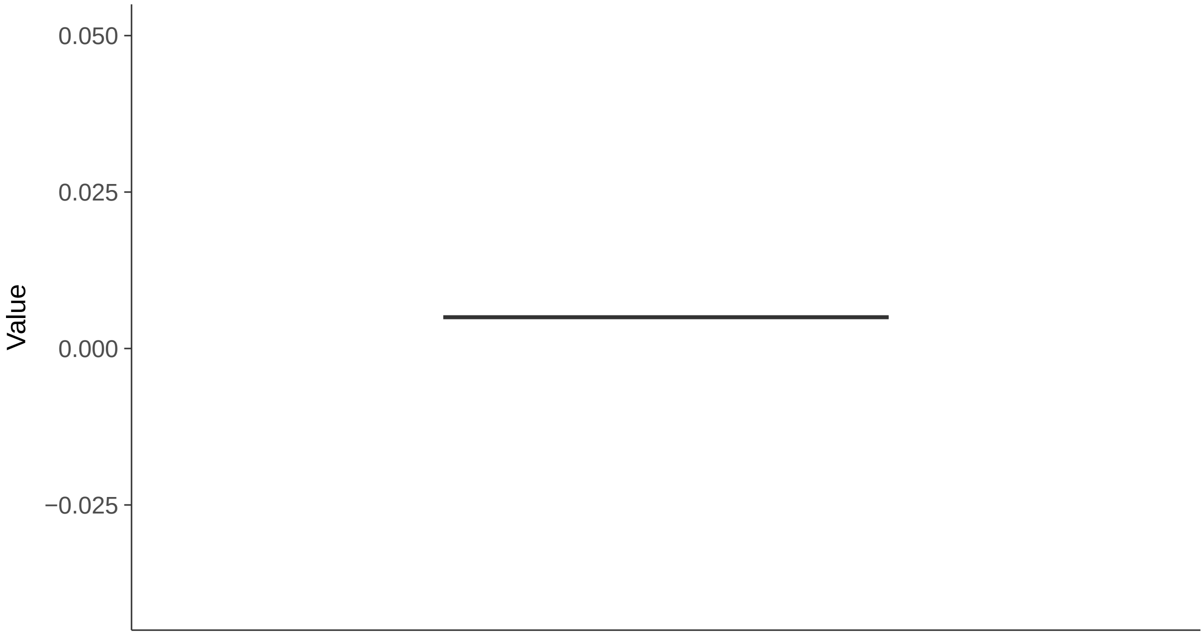
Histogram

Copper, MW-3 (mg/L)



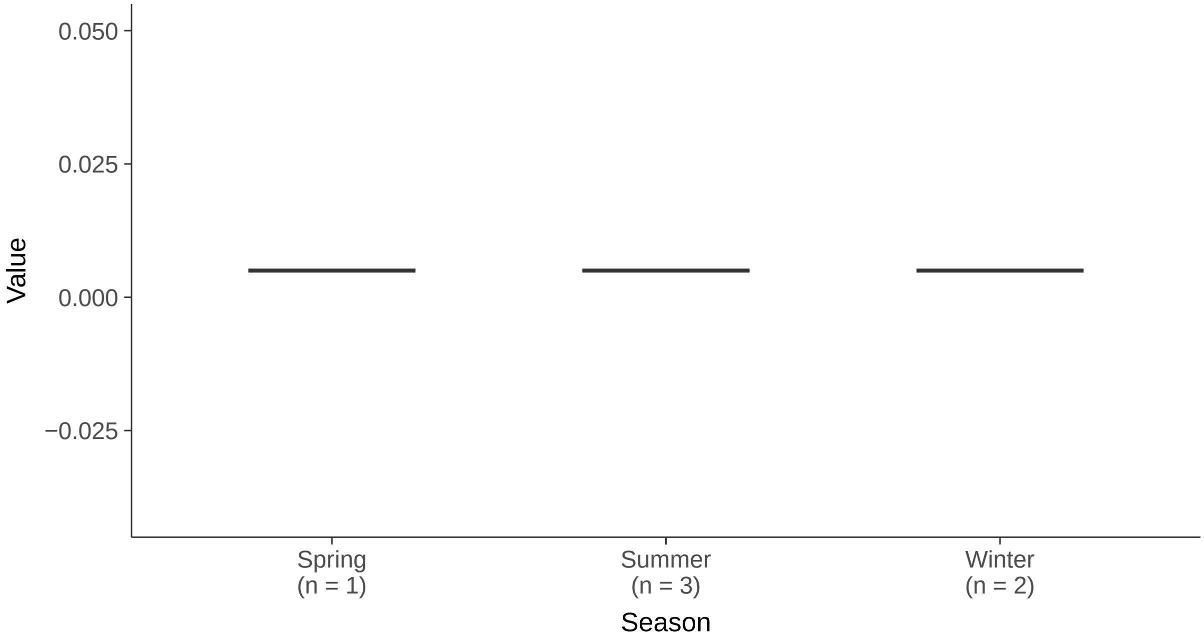
Boxplot

Copper, MW-3 (mg/L)



Boxplot by Season

Copper, MW-3 (mg/L)

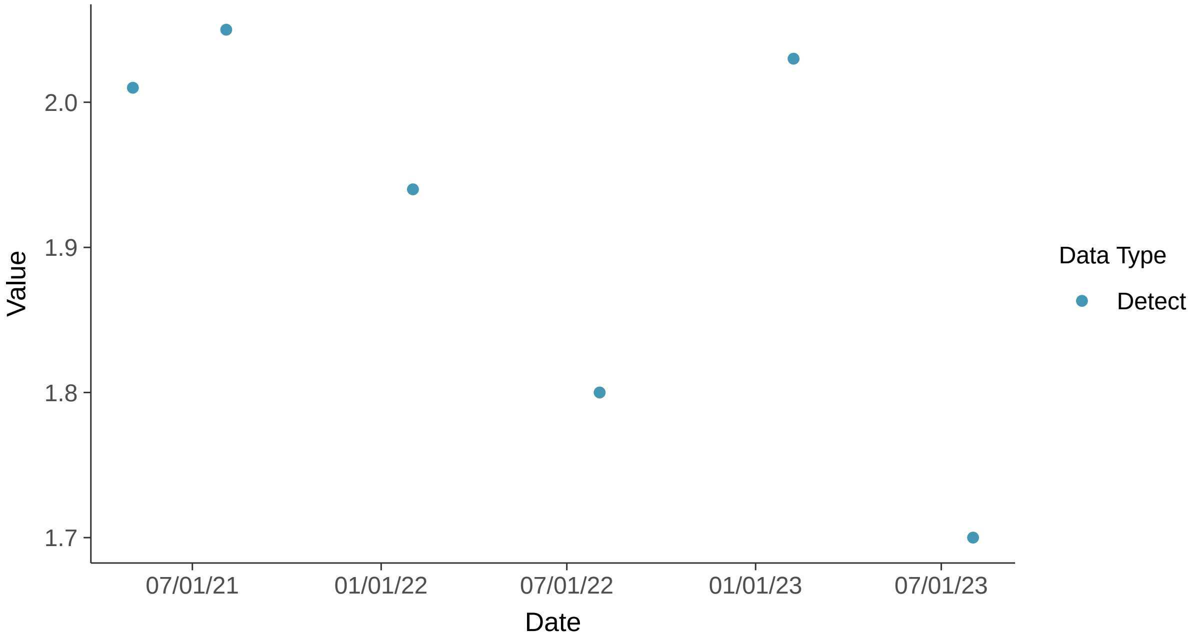


Part 115: Iron, MW-3

ID: 03_5_38

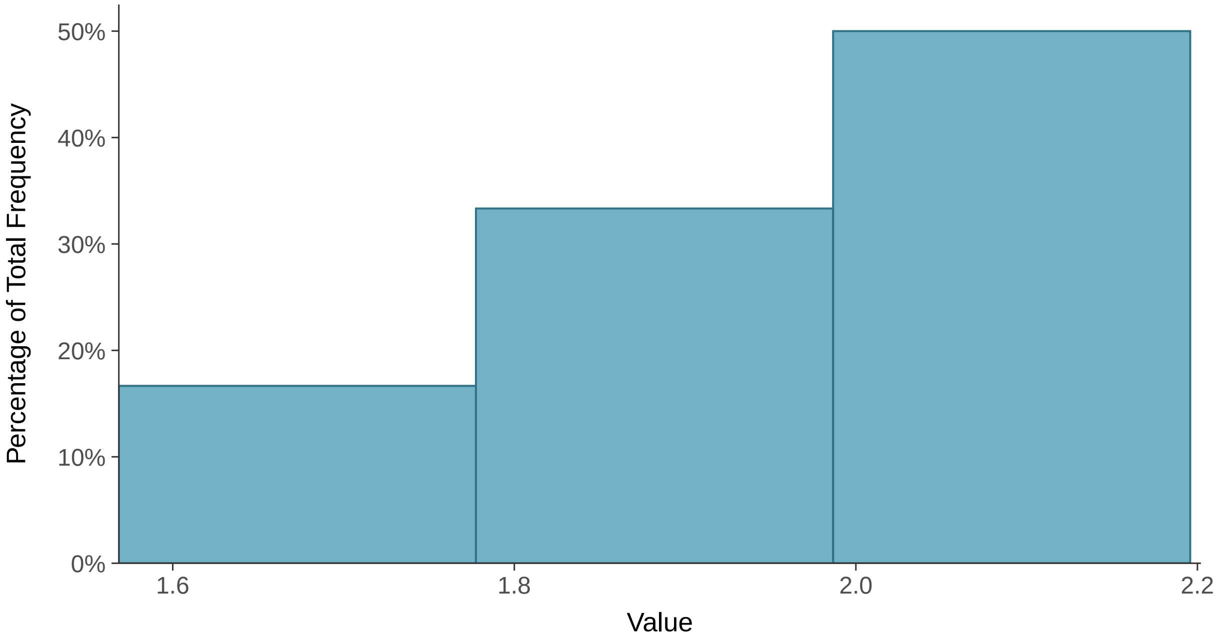
Scatter Plot

Iron, MW-3 (mg/L)



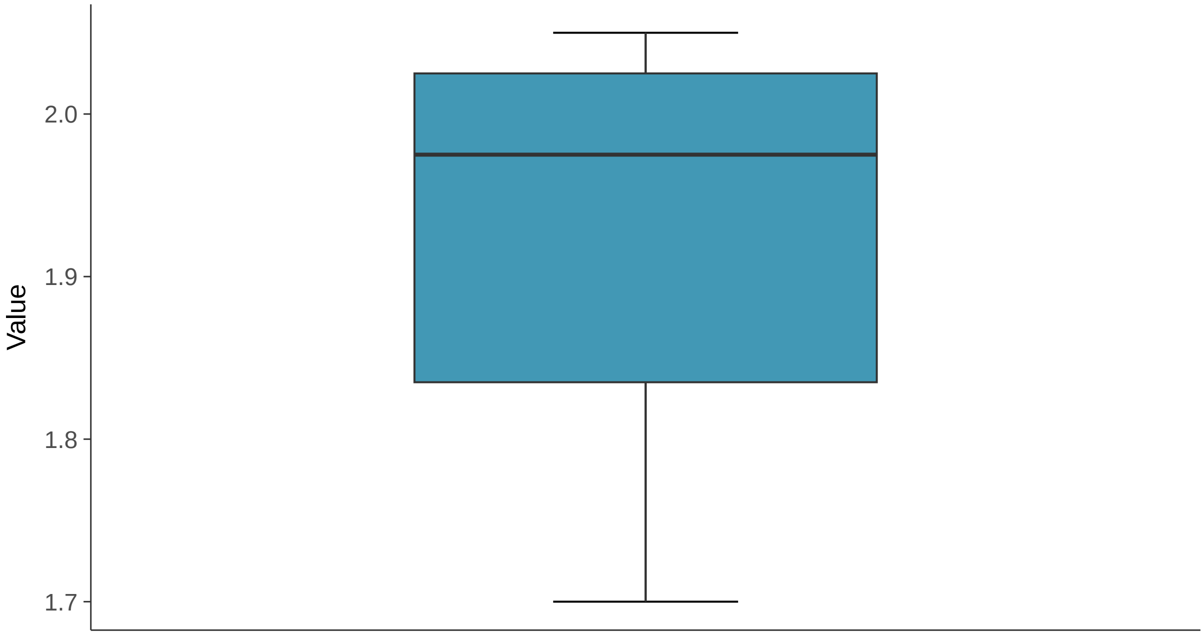
Histogram

Iron, MW-3 (mg/L)



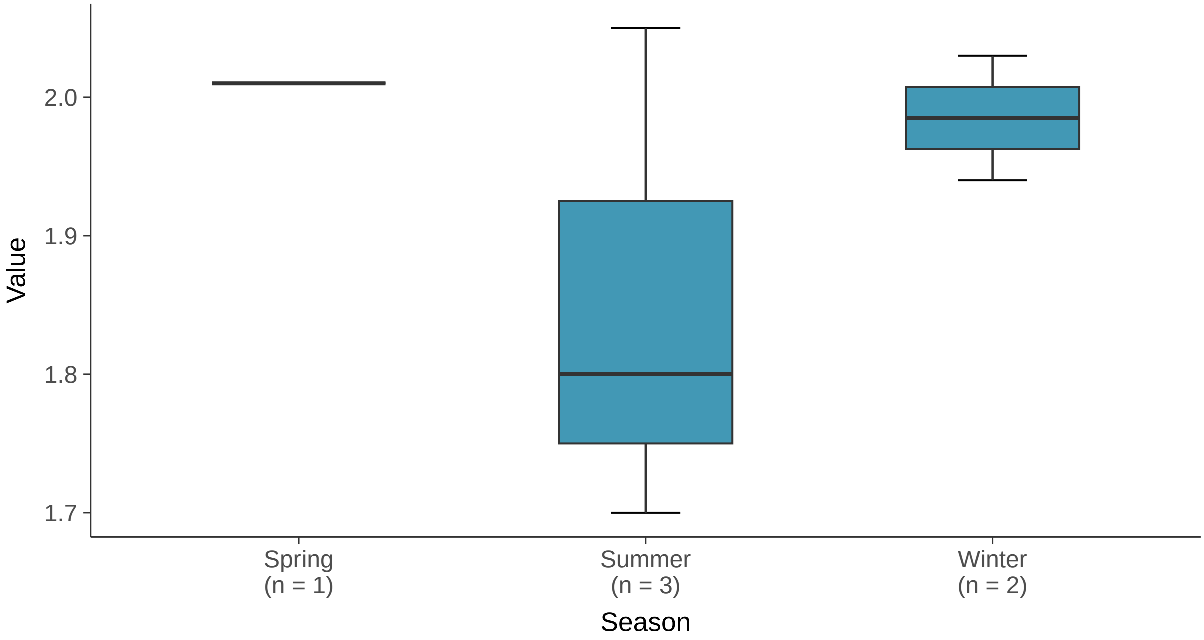
Boxplot

Iron, MW-3 (mg/L)



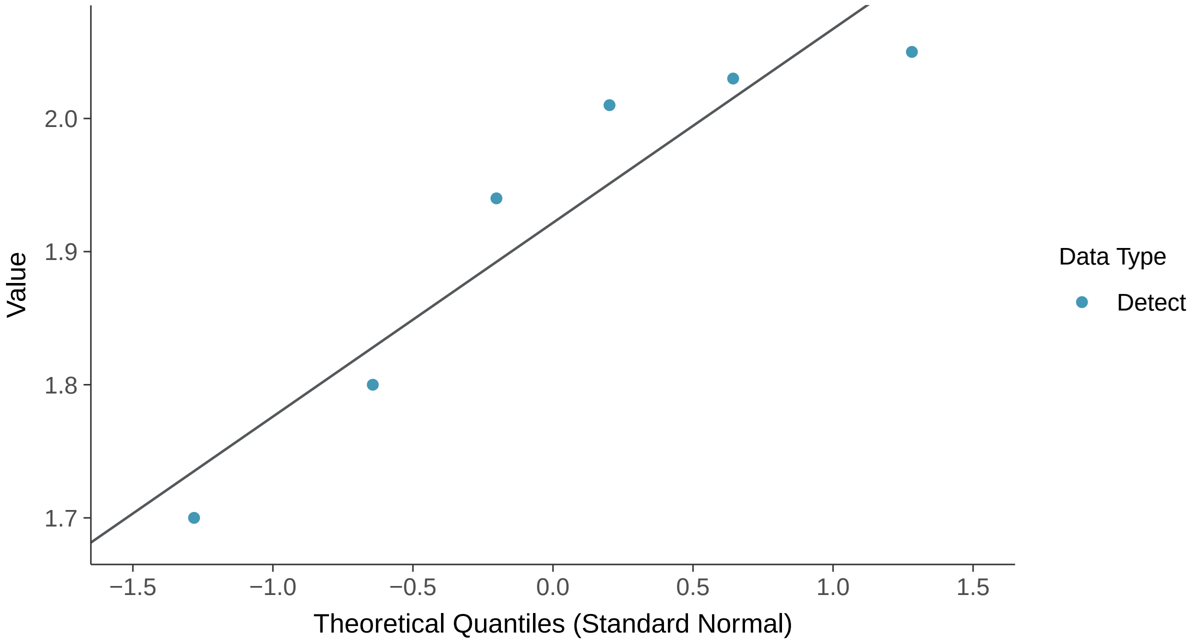
Boxplot by Season

Iron, MW-3 (mg/L)



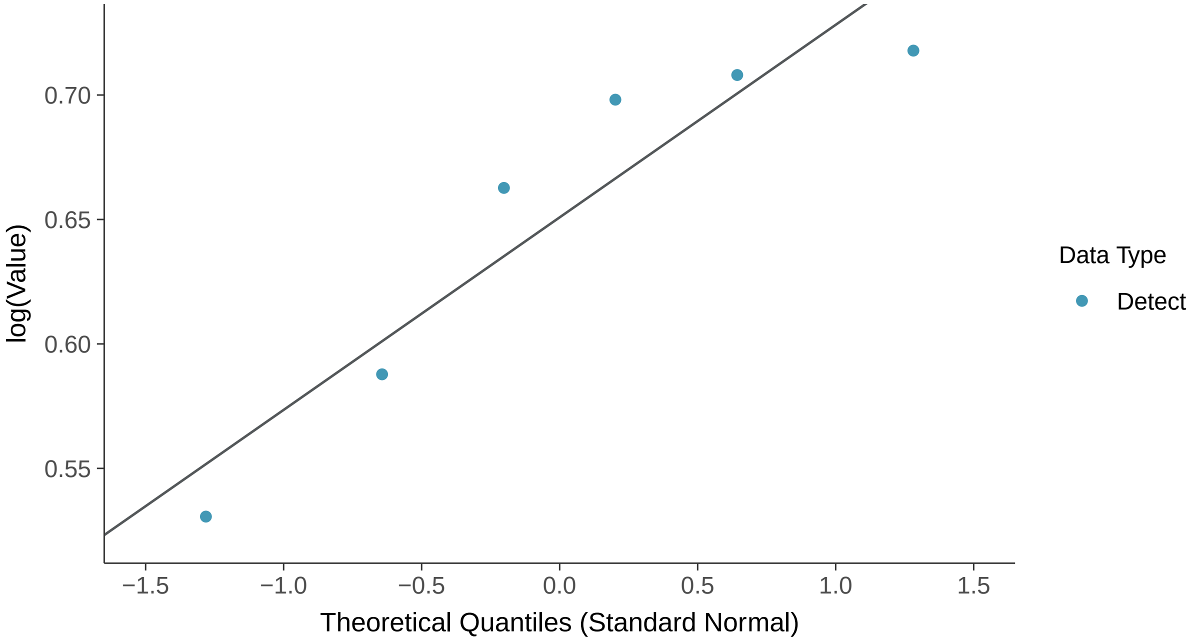
Normal Q-Q plot

Iron, MW-3 (mg/L)



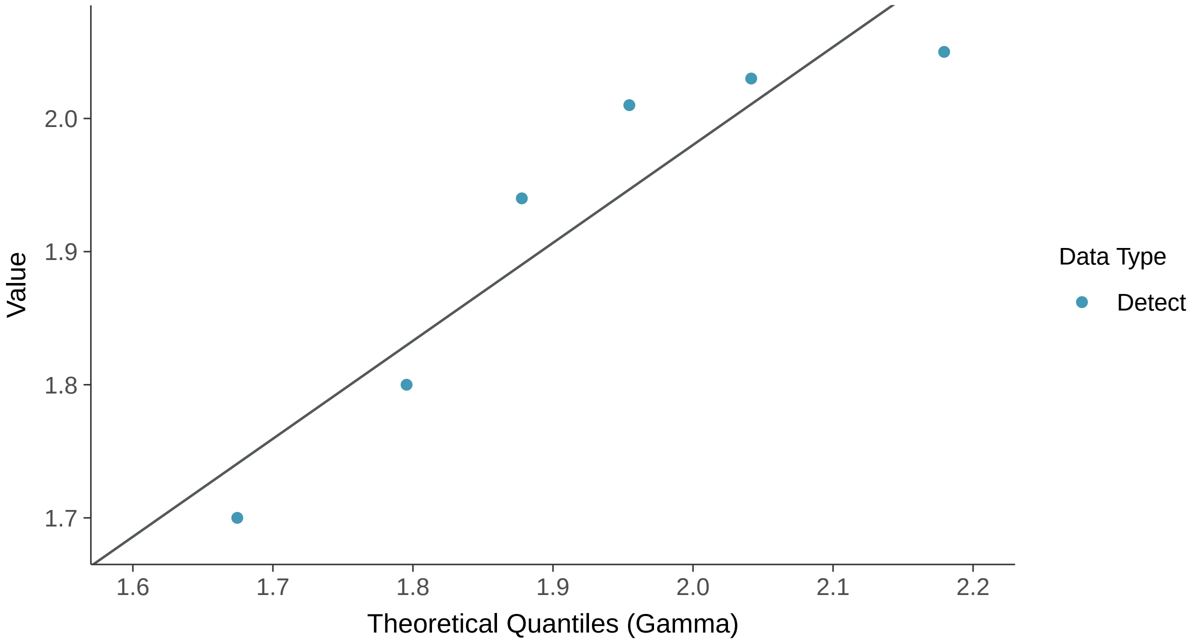
Lognormal Q-Q plot

Iron, MW-3 (mg/L)



Gamma Q-Q plot

Iron, MW-3 (mg/L)

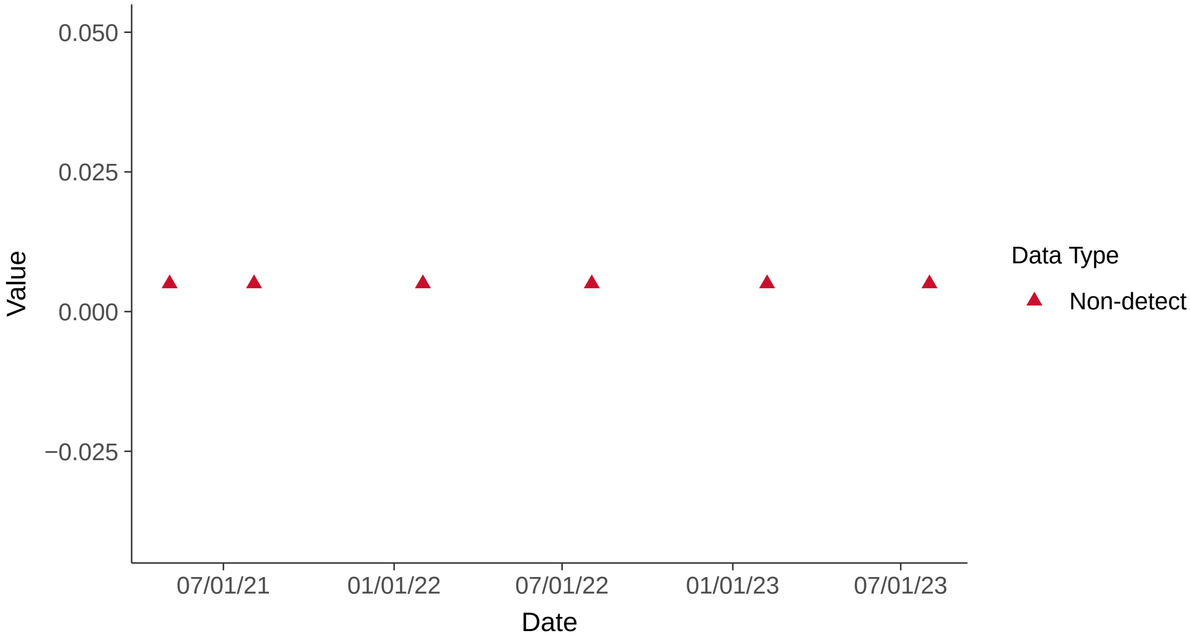


Part 115: Nickel, MW-3

ID: 03_5_39

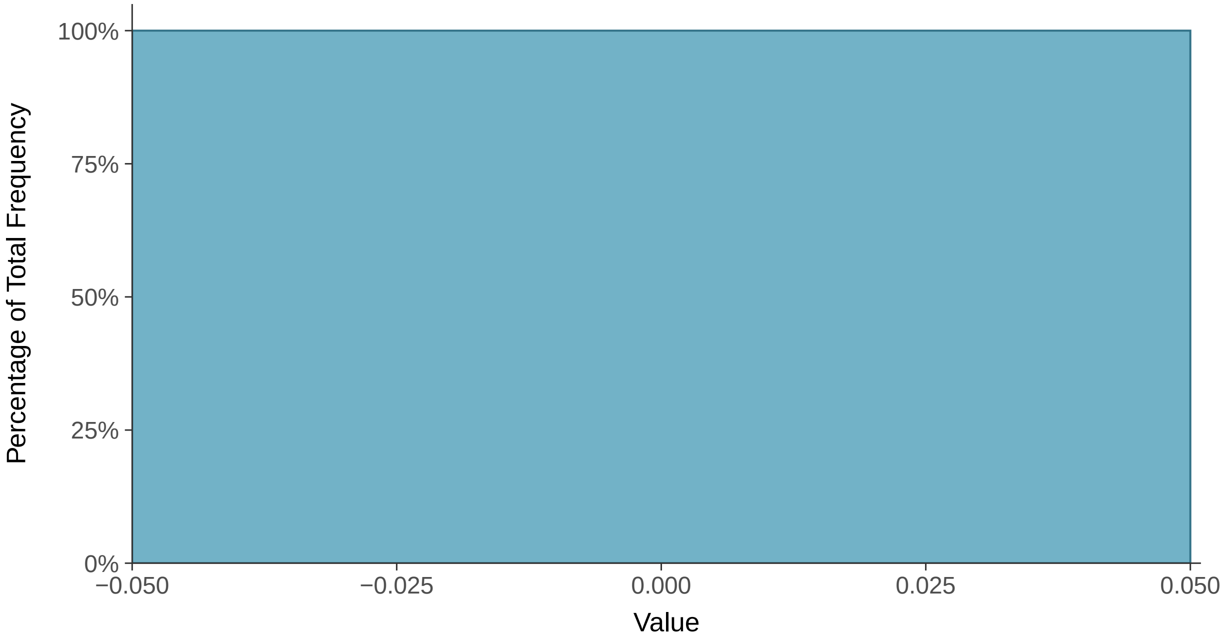
Scatter Plot

Nickel, MW-3 (mg/L)



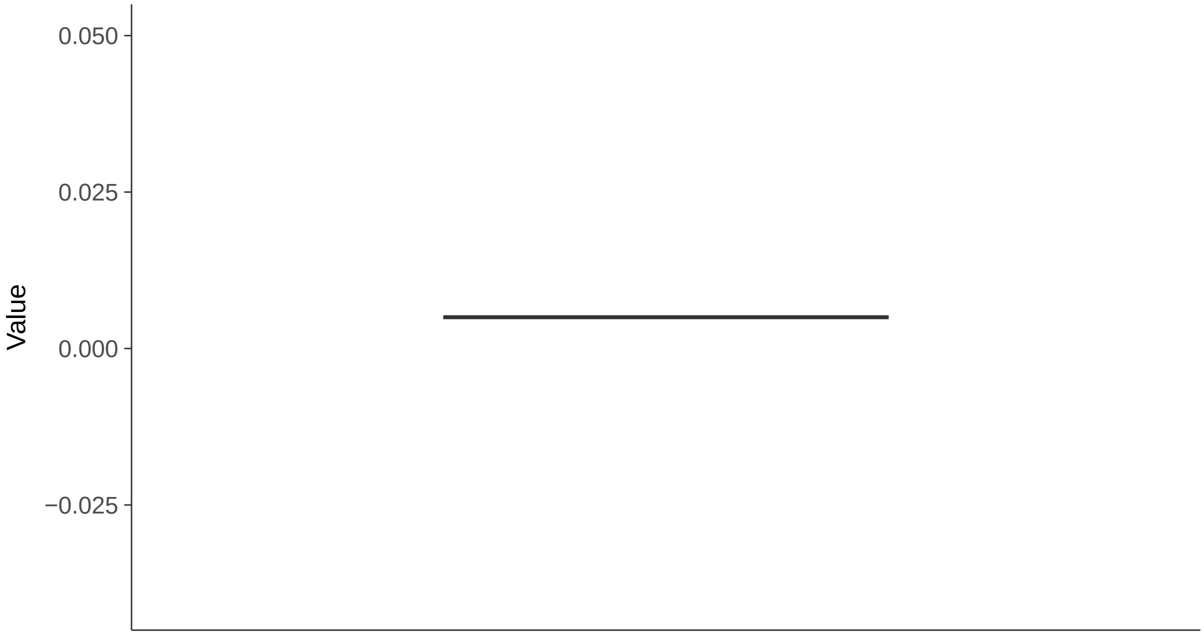
Histogram

Nickel, MW-3 (mg/L)



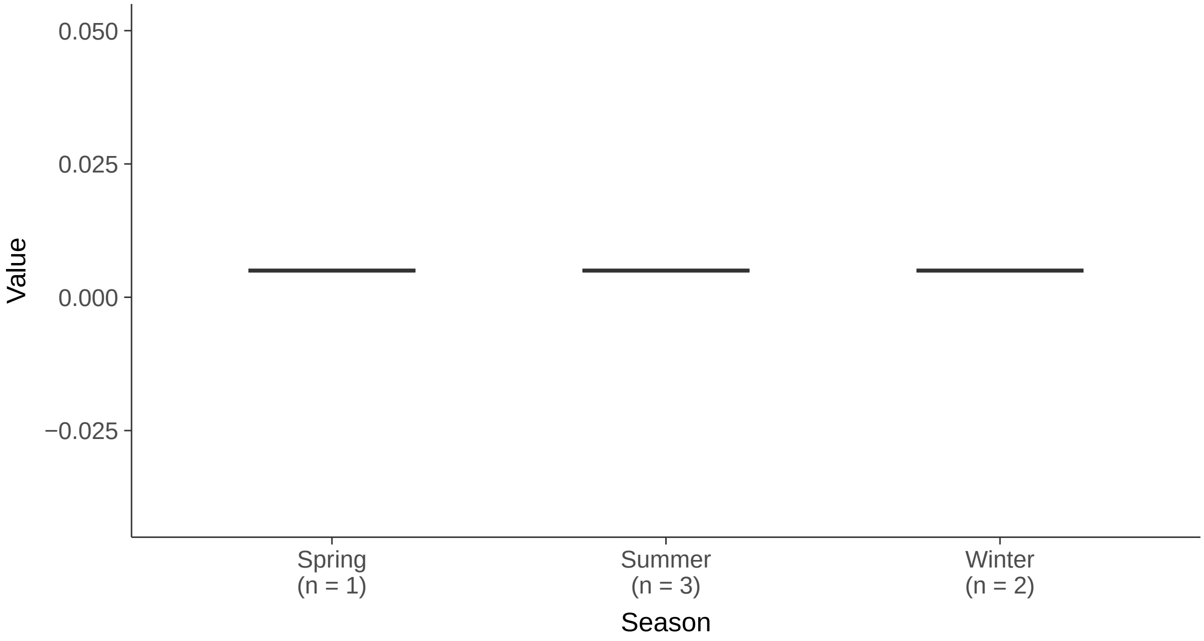
Boxplot

Nickel, MW-3 (mg/L)



Boxplot by Season

Nickel, MW-3 (mg/L)

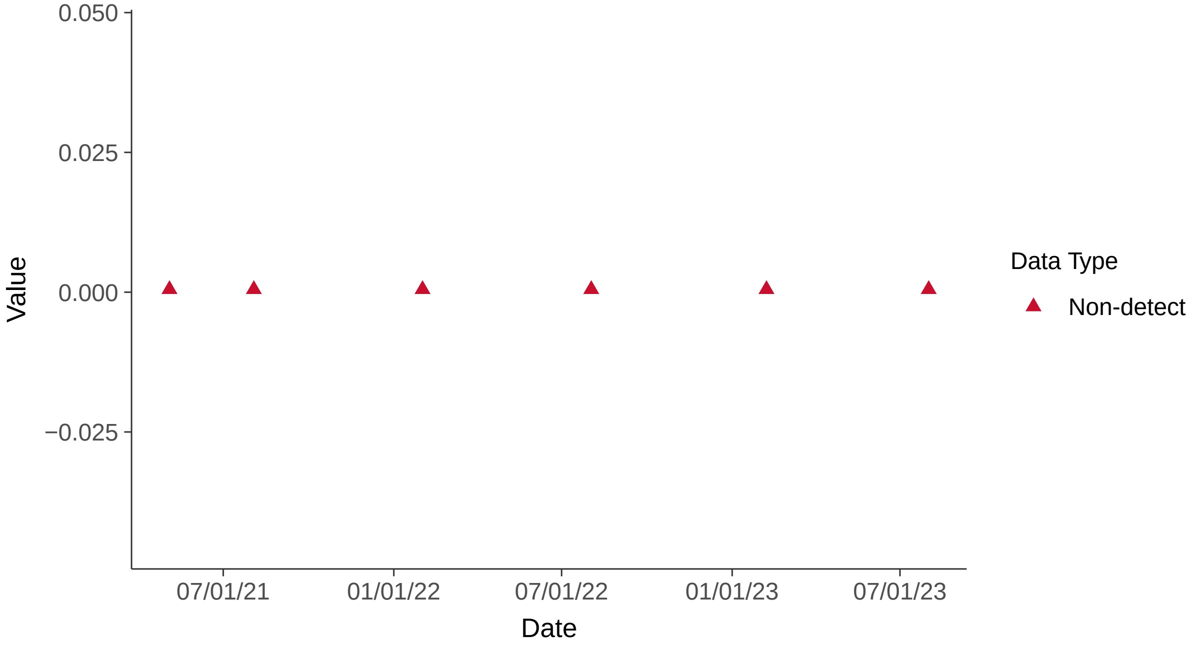


Part 115: Silver, MW-3

ID: 03_5_40

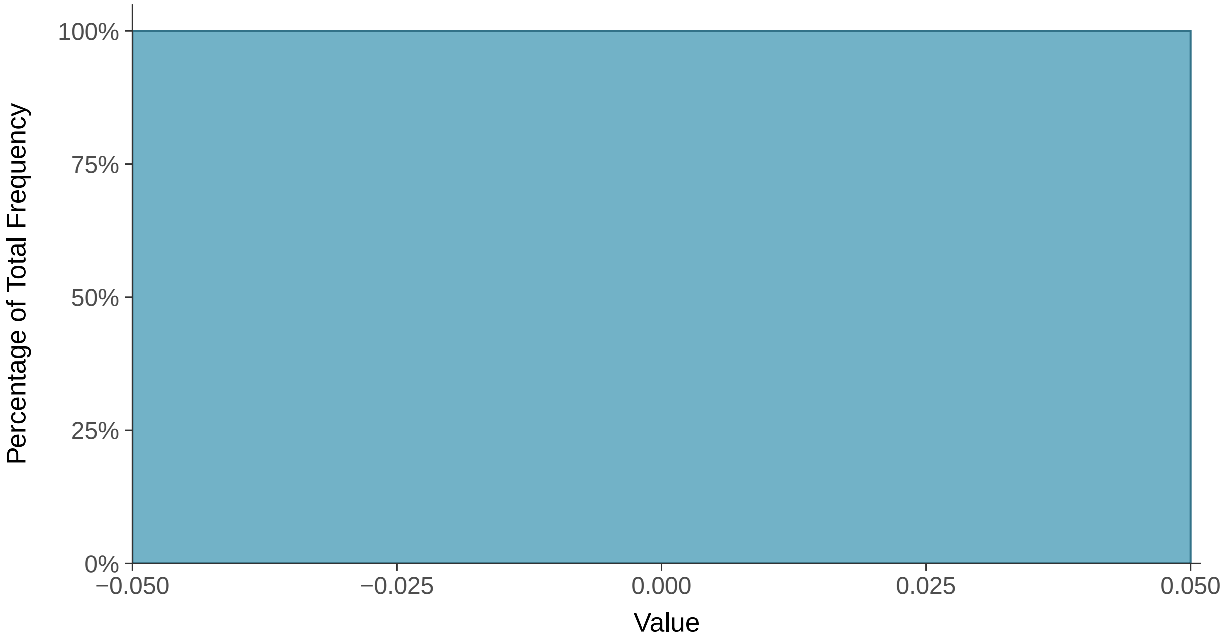
Scatter Plot

Silver, MW-3 (mg/L)



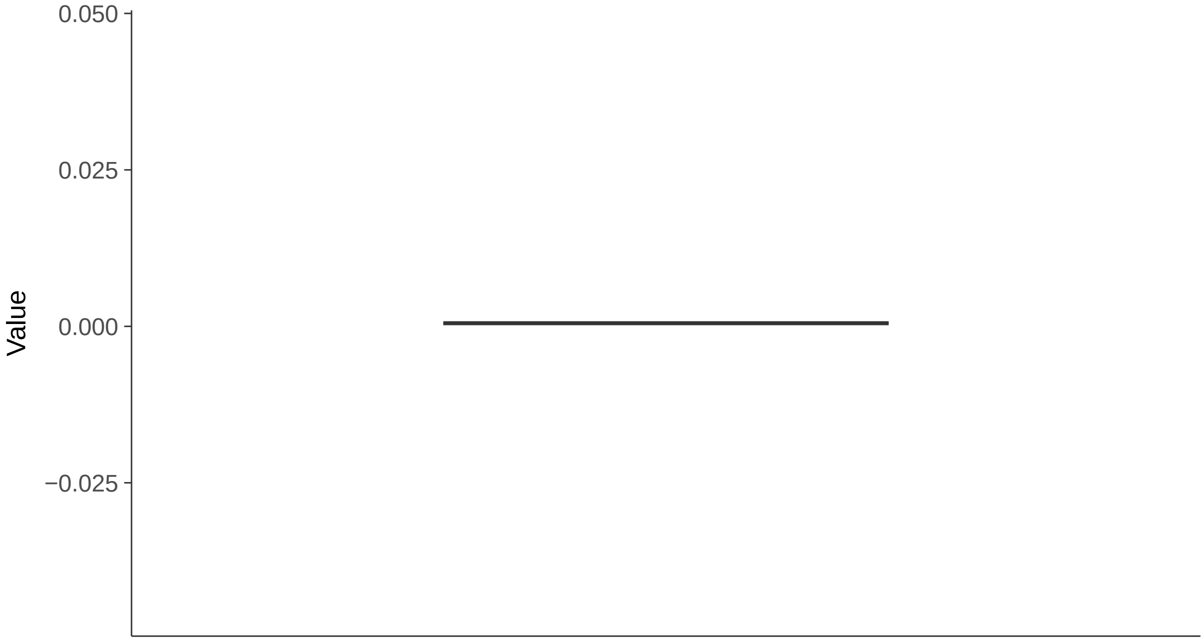
Histogram

Silver, MW-3 (mg/L)



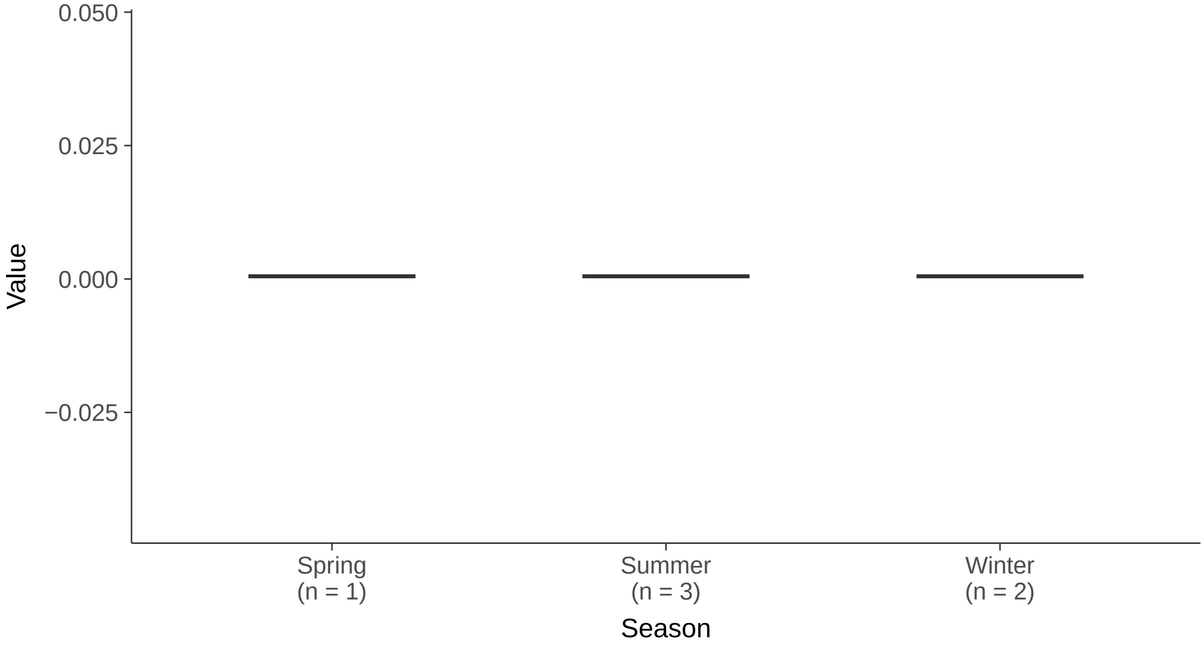
Boxplot

Silver, MW-3 (mg/L)



Boxplot by Season

Silver, MW-3 (mg/L)

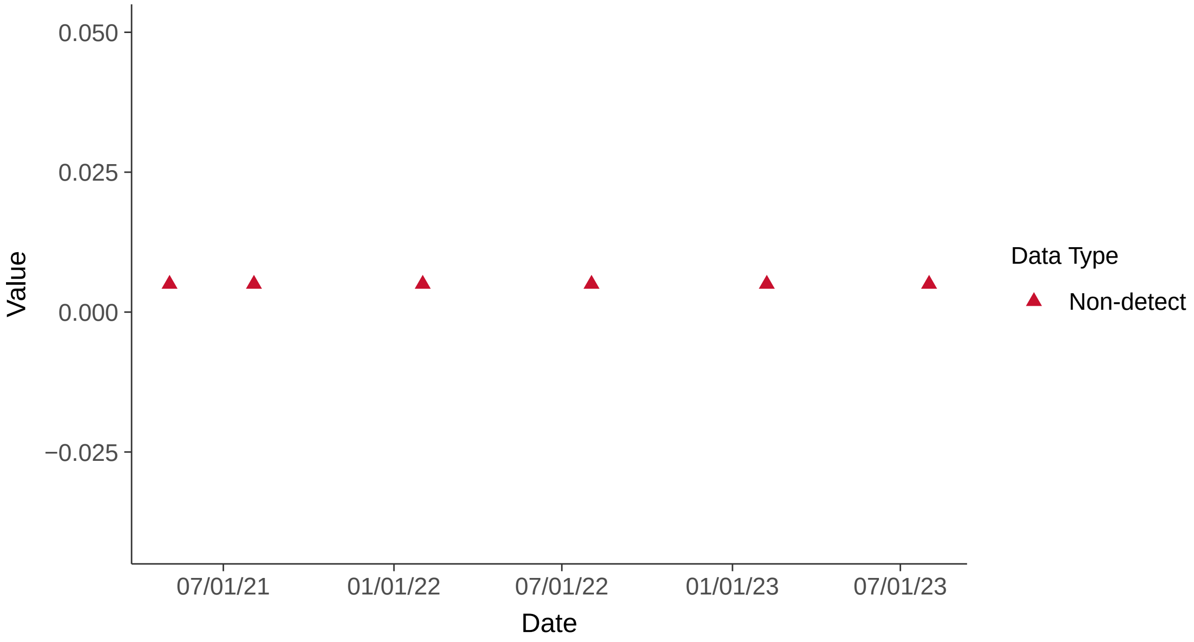


Part 115: Vanadium, MW-3

ID: 03_5_41

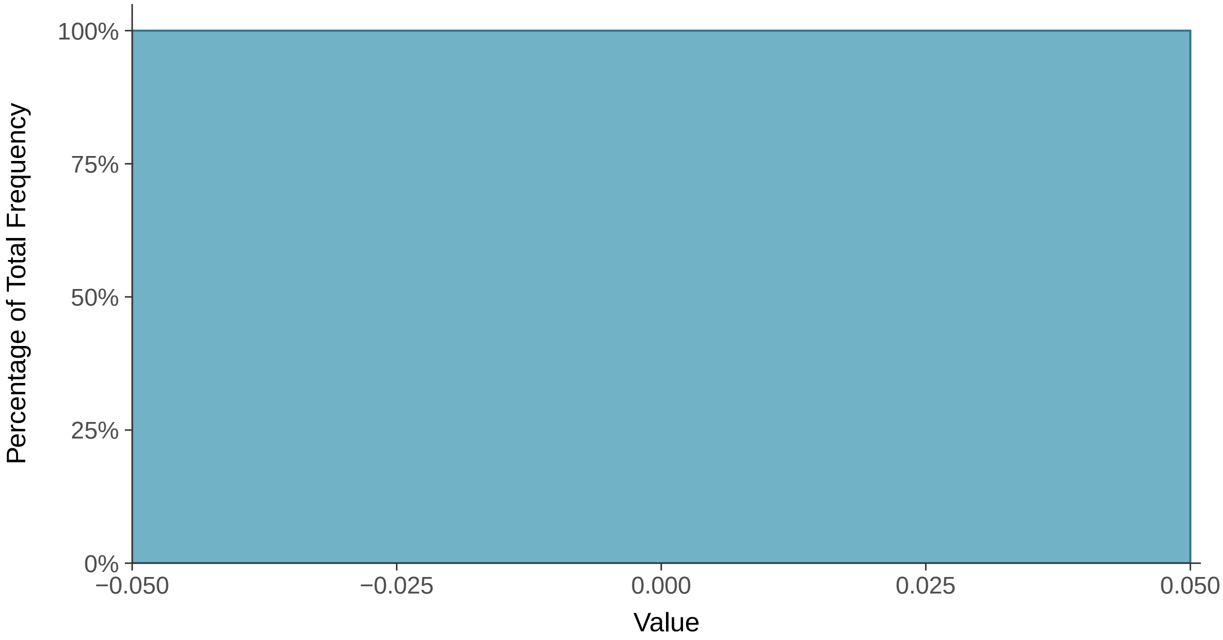
Scatter Plot

Vanadium, MW-3 (mg/L)



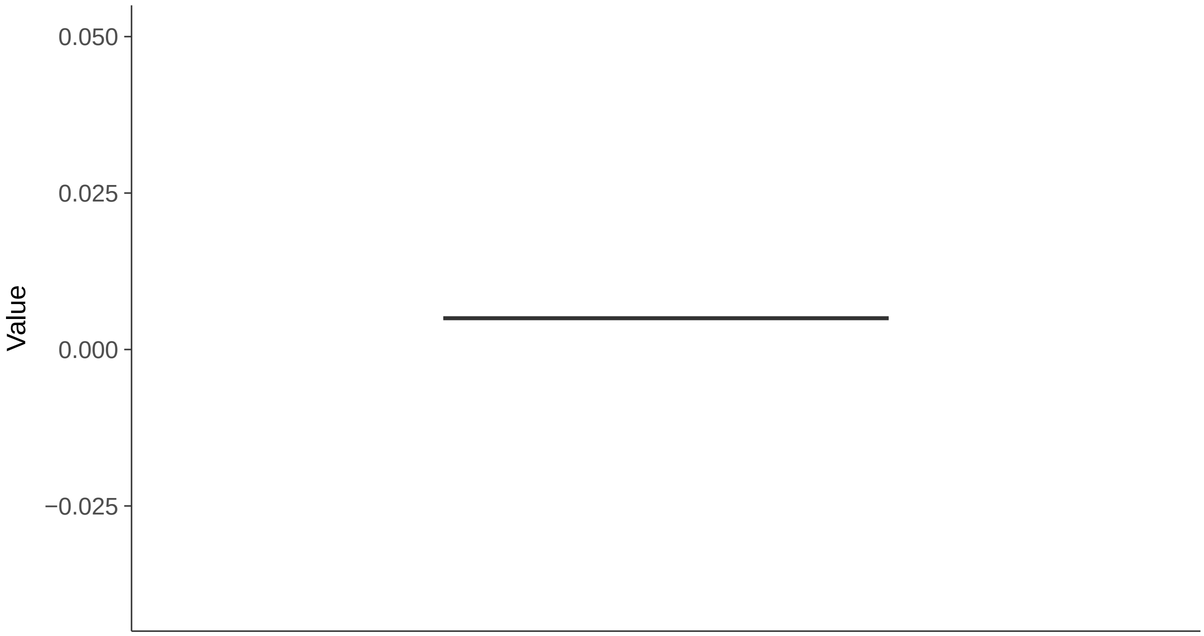
Histogram

Vanadium, MW-3 (mg/L)



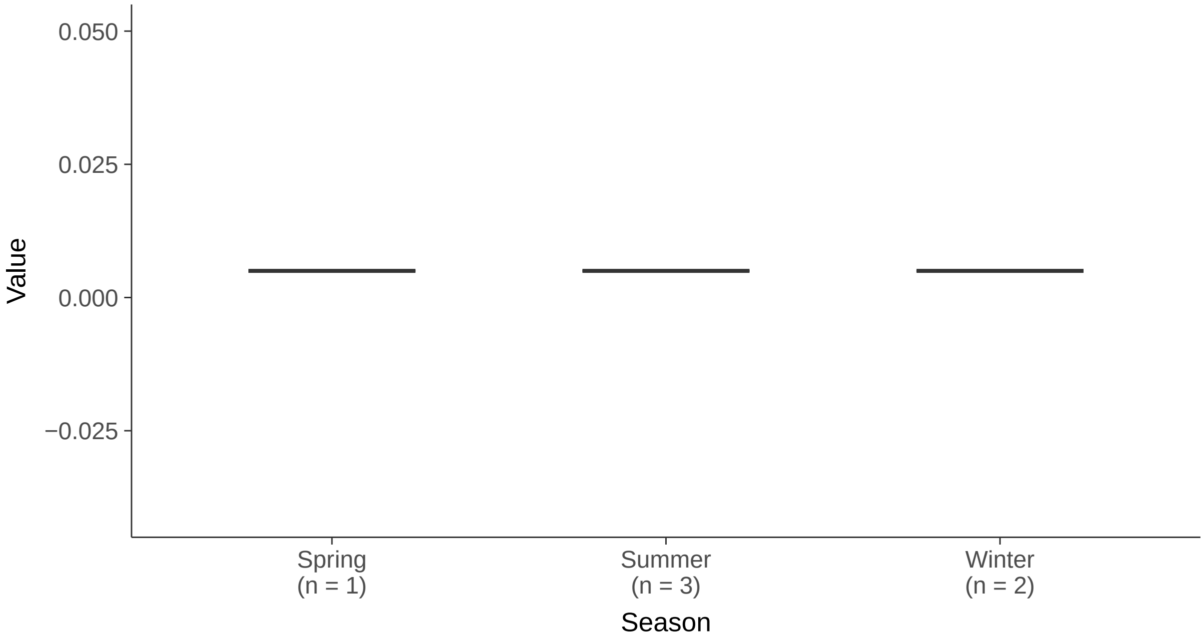
Boxplot

Vanadium, MW-3 (mg/L)



Boxplot by Season

Vanadium, MW-3 (mg/L)

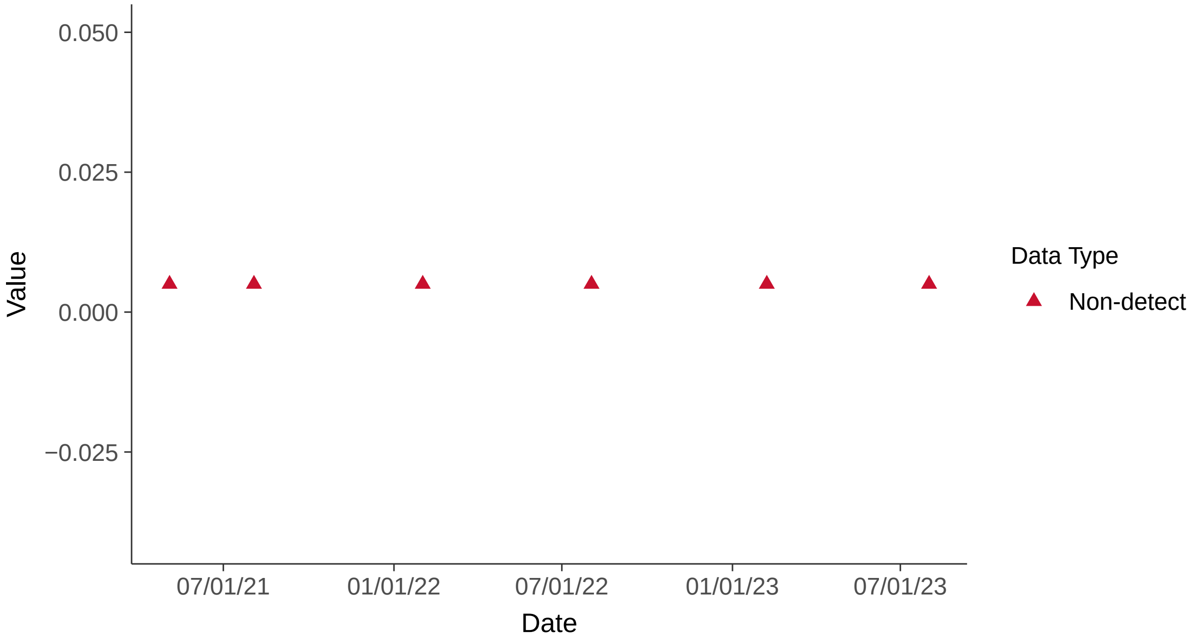


Part 115: Zinc, MW-3

ID: 03_5_42

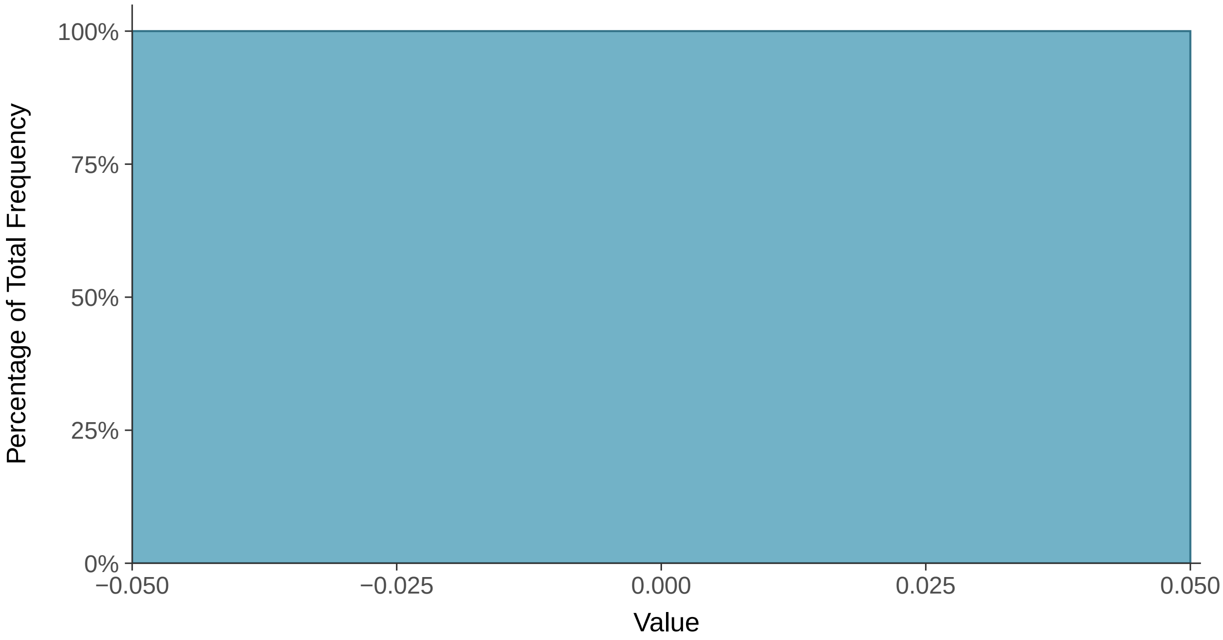
Scatter Plot

Zinc, MW-3 (mg/L)



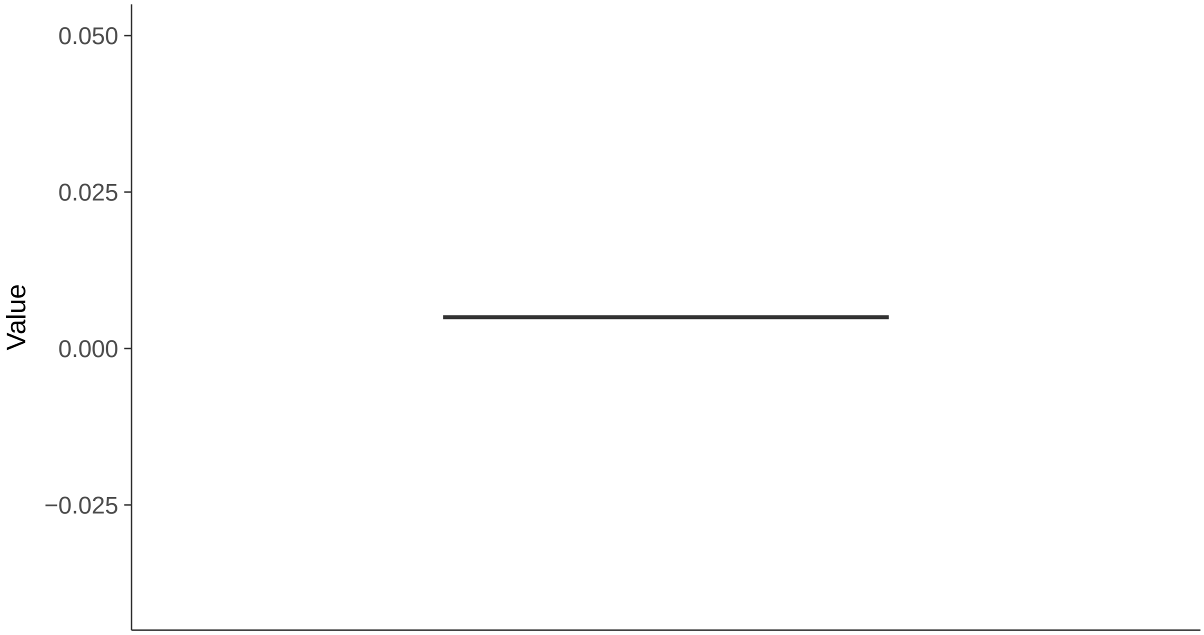
Histogram

Zinc, MW-3 (mg/L)



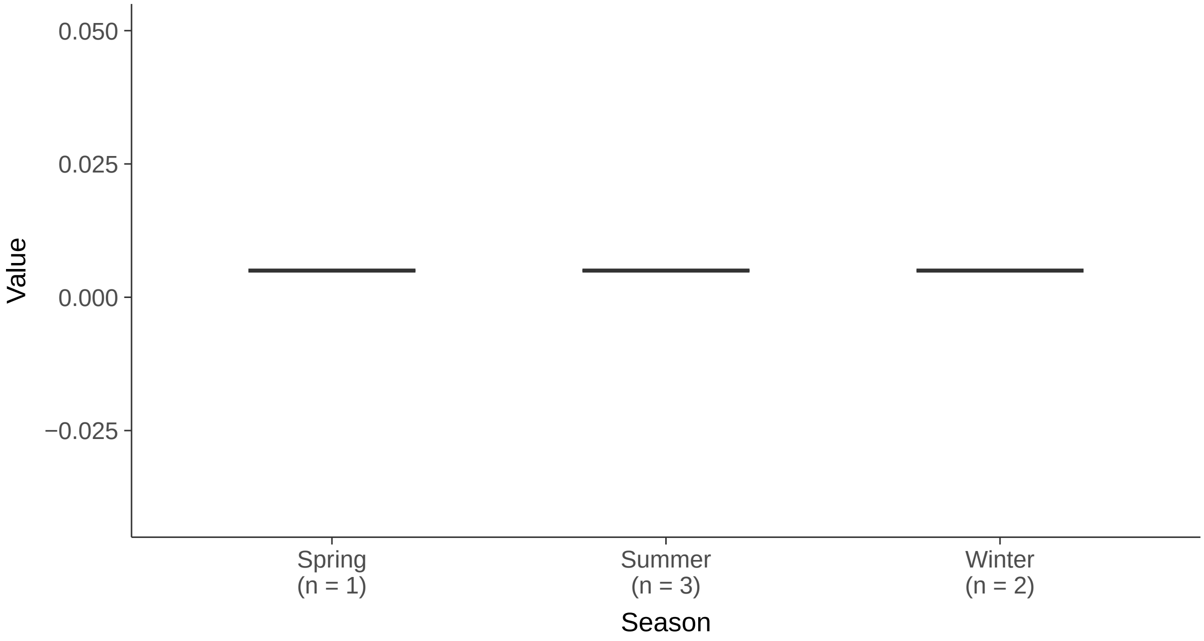
Boxplot

Zinc, MW-3 (mg/L)



Boxplot by Season

Zinc, MW-3 (mg/L)

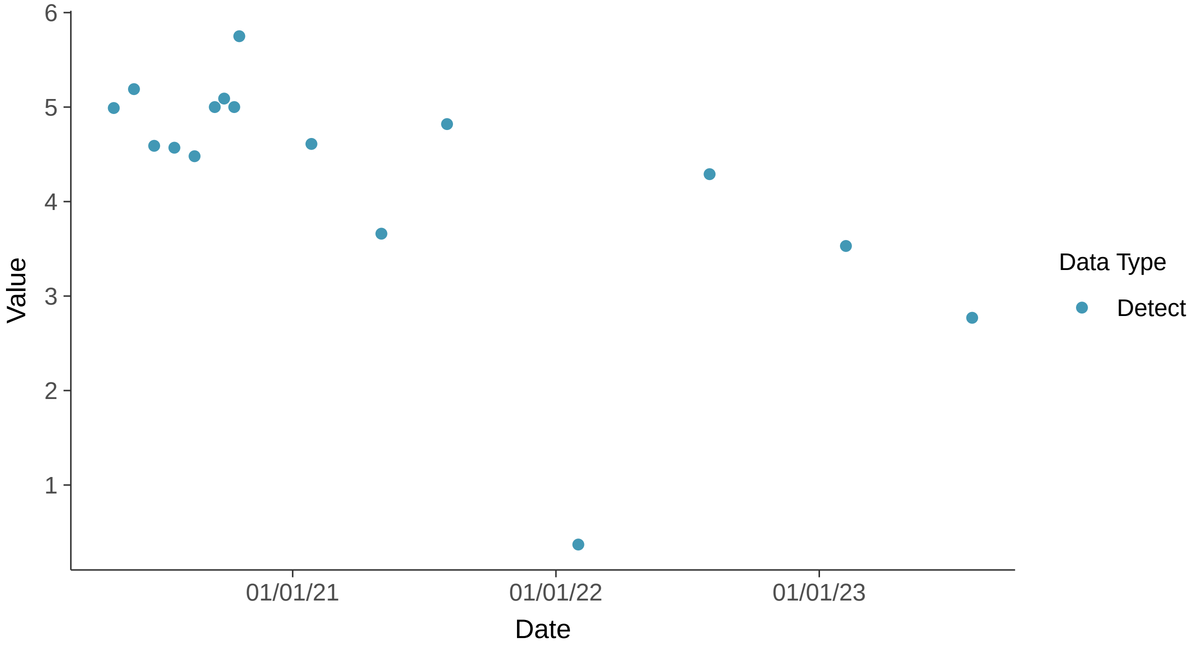


Appendix III: Boron, MW-5

ID: 05_1_01

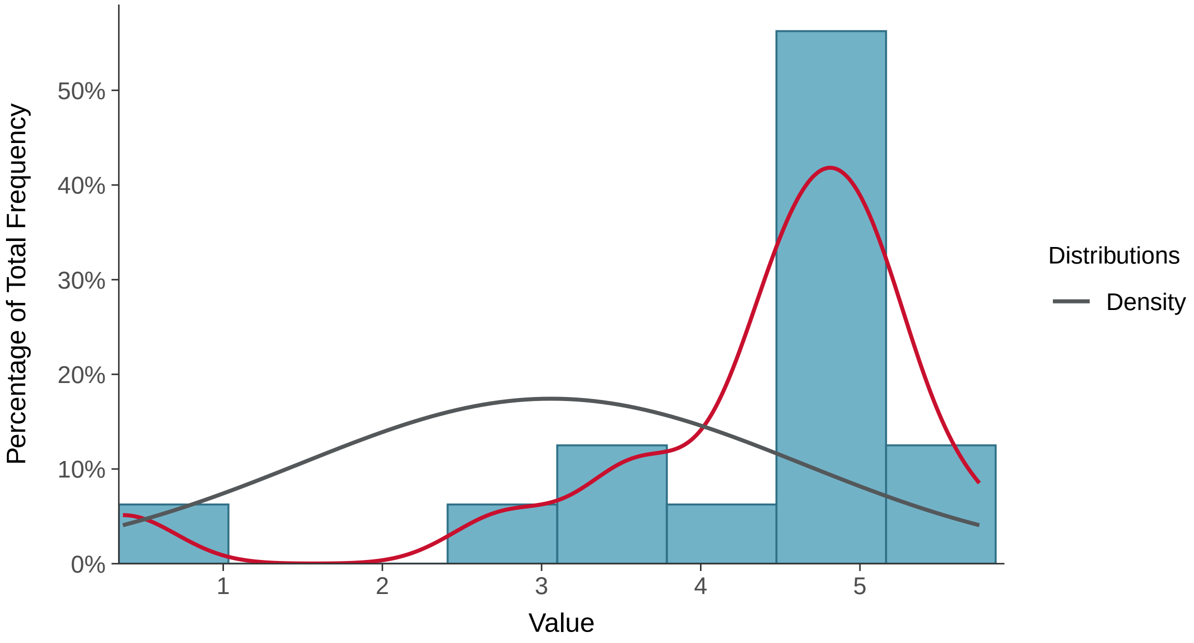
Scatter Plot

Boron, MW-5 (mg/L)



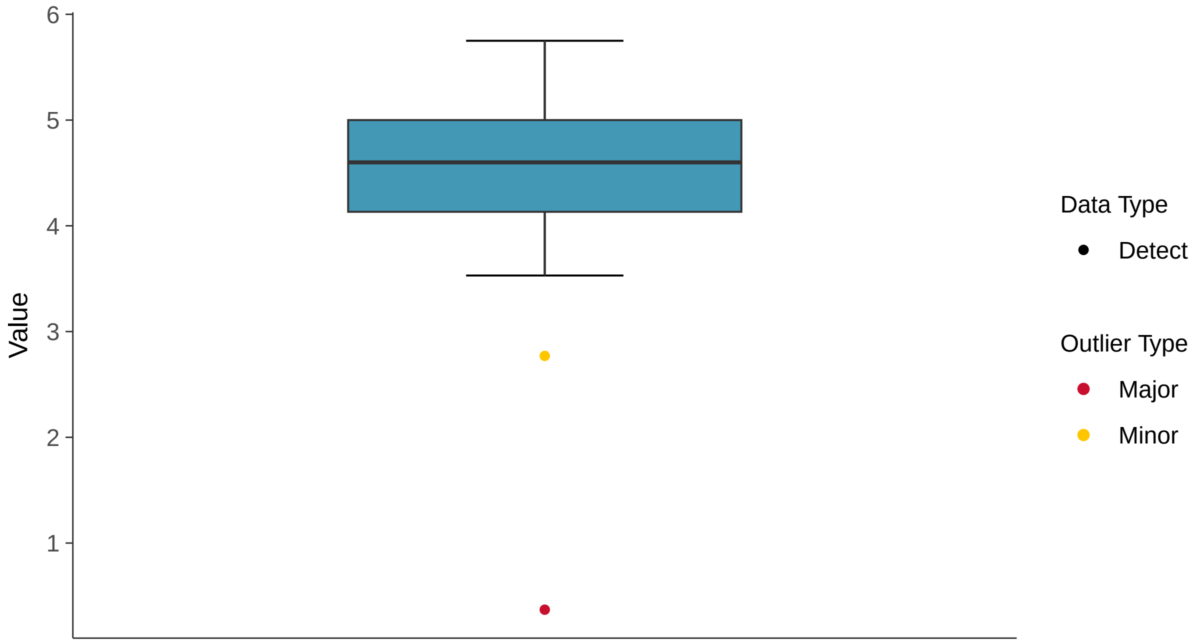
Histogram

Boron, MW-5 (mg/L)



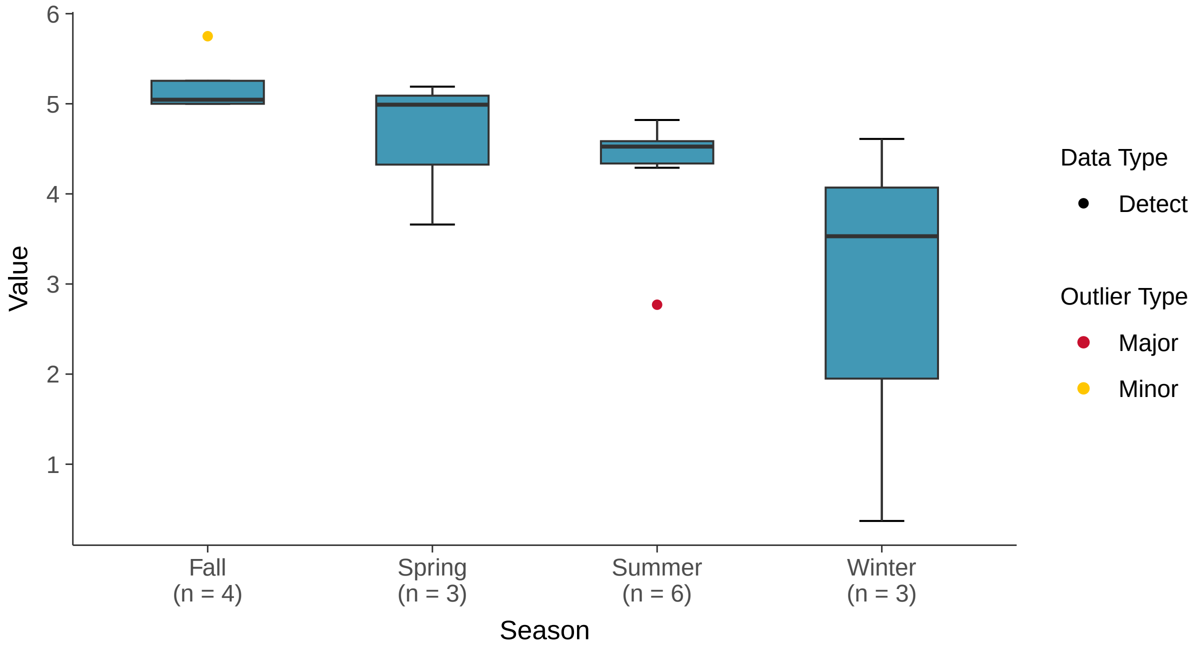
Boxplot

Boron, MW-5 (mg/L)



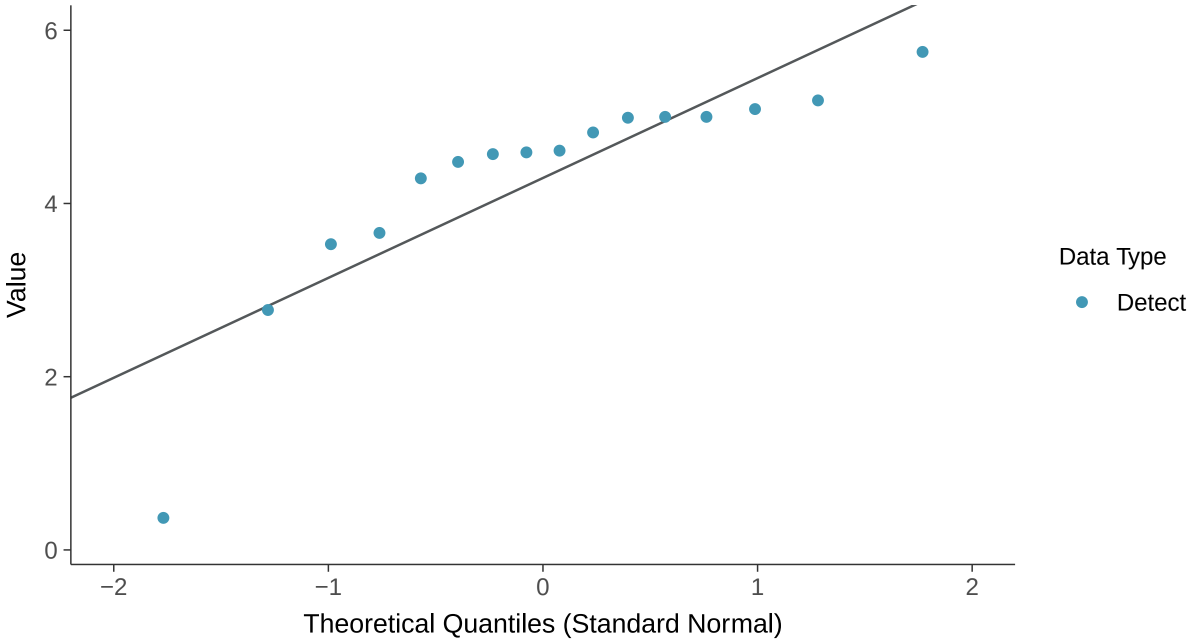
Boxplot by Season

Boron, MW-5 (mg/L)



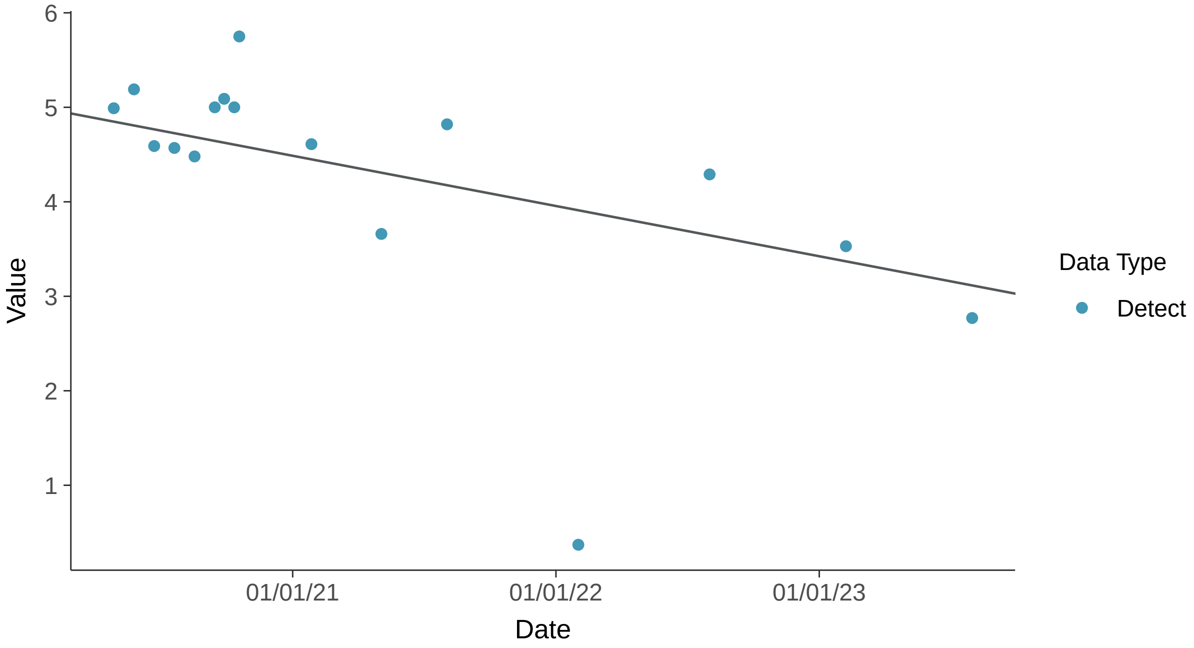
Normal Q-Q plot

Boron, MW-5 (mg/L)



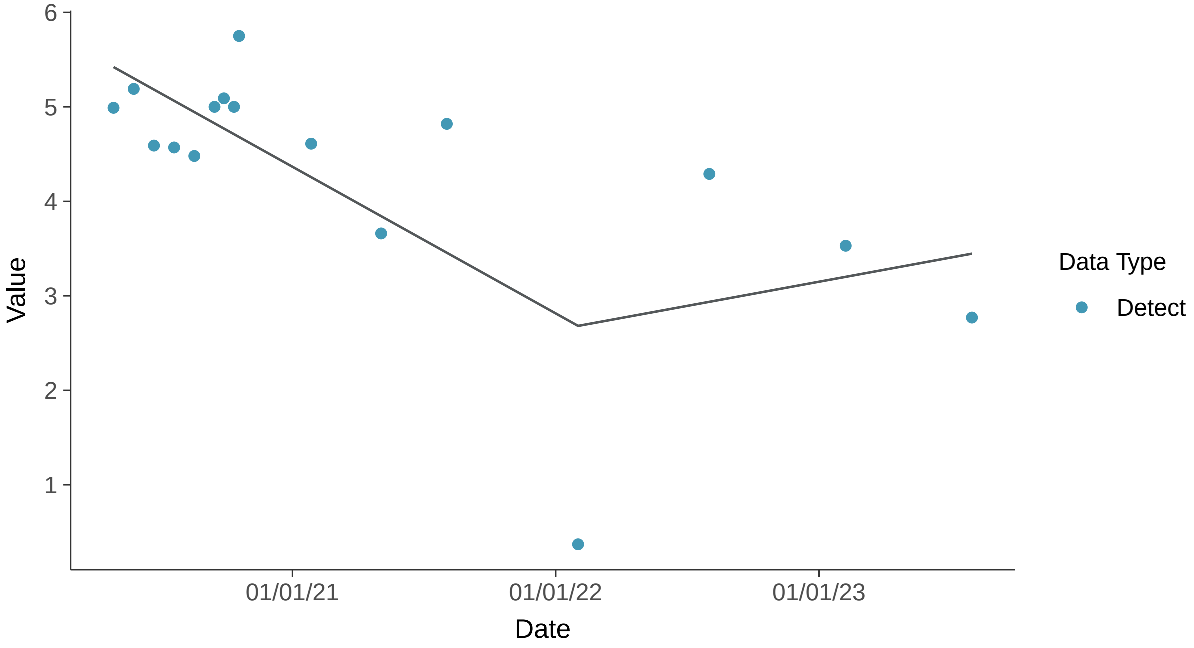
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Boron, MW-5 (mg/L)



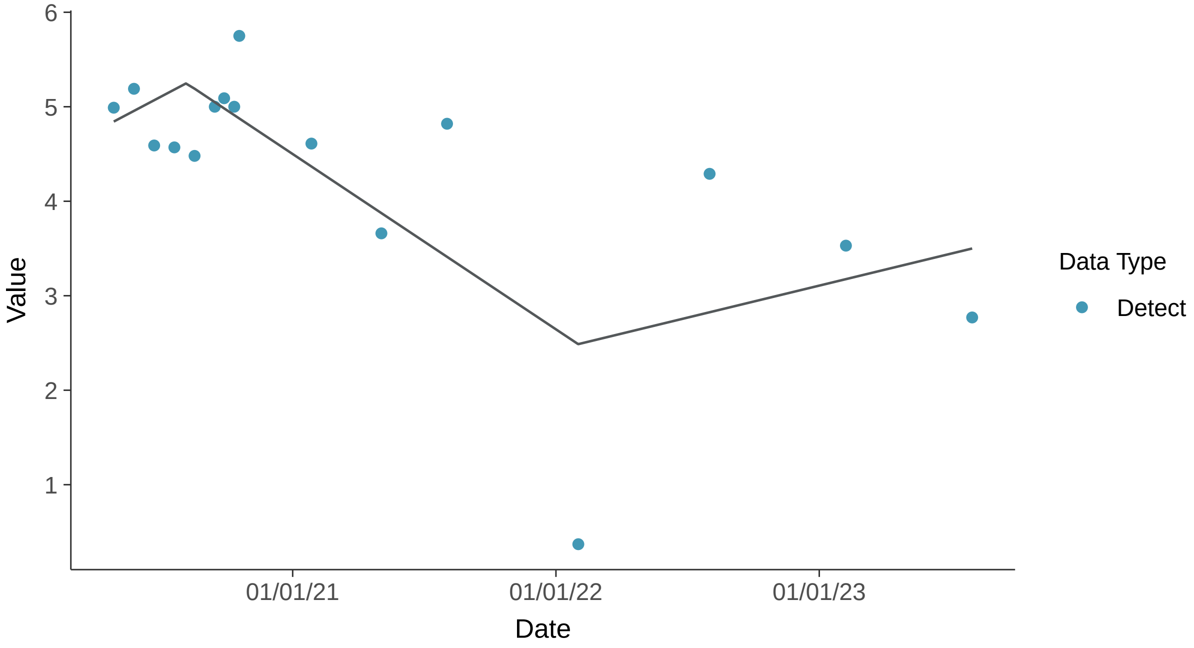
Trend Regression: Piecewise Linear-Linear

Boron, MW-5 (mg/L)



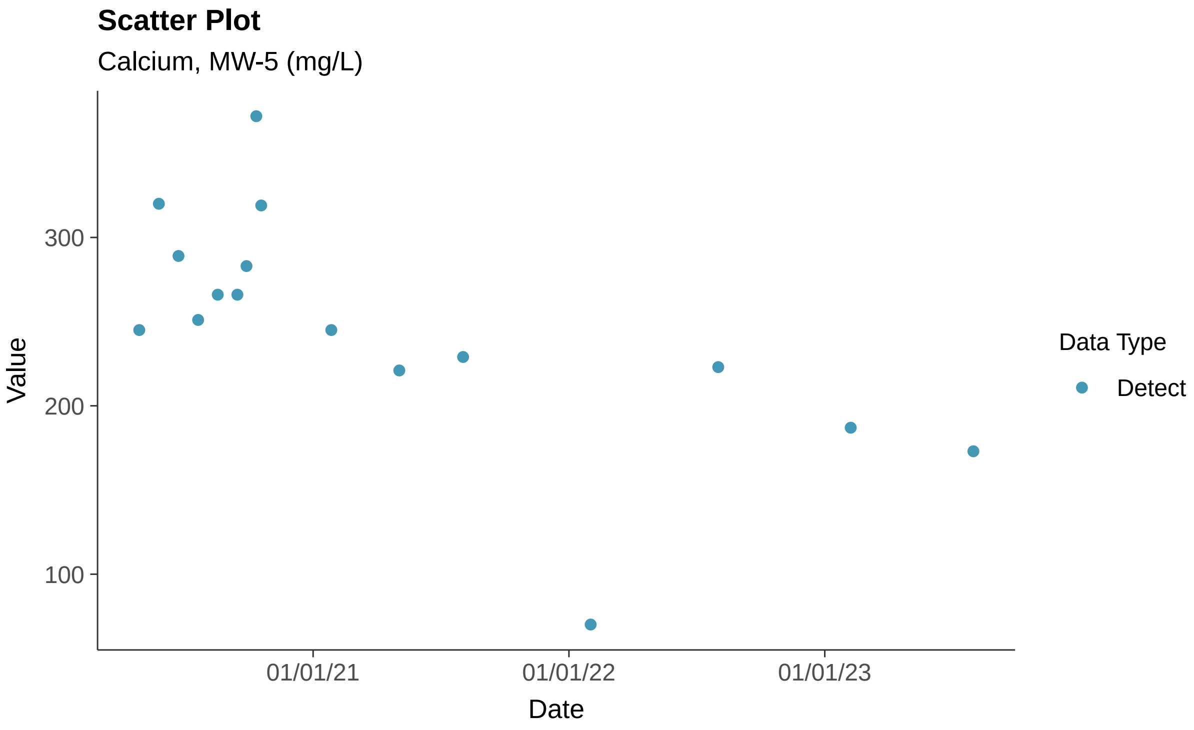
Trend Regression: Piecewise Linear-Linear-Linear

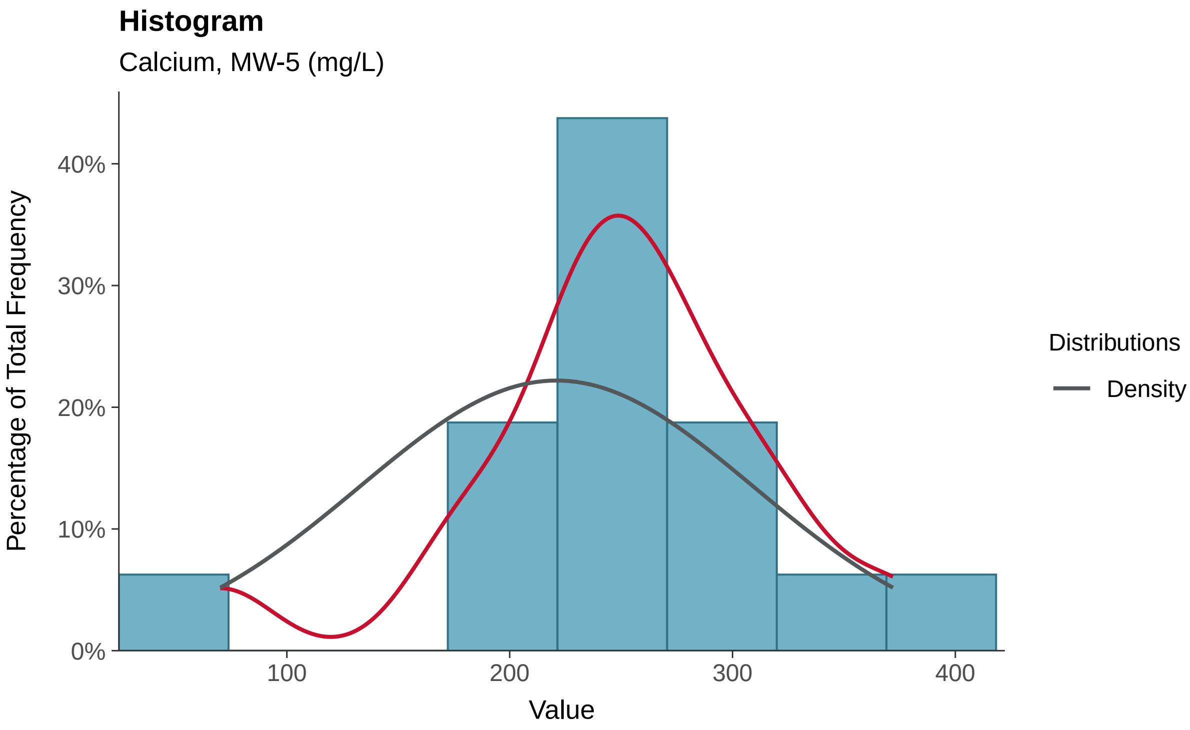
Boron, MW-5 (mg/L)



Appendix III: Calcium, MW-5

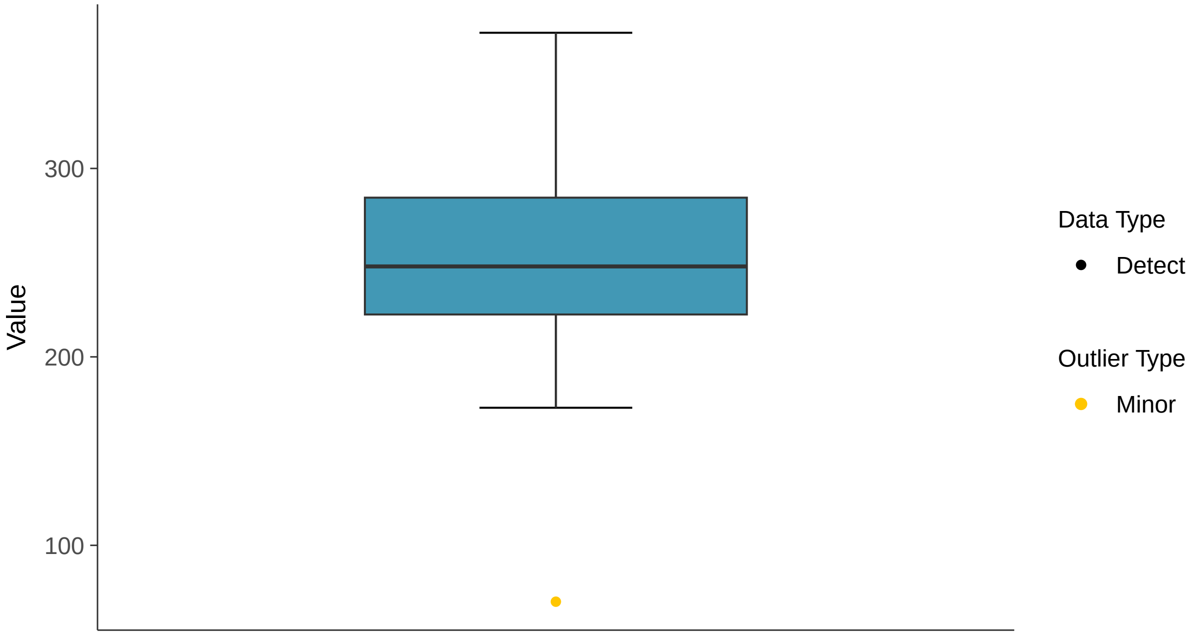
ID: 05_1_02





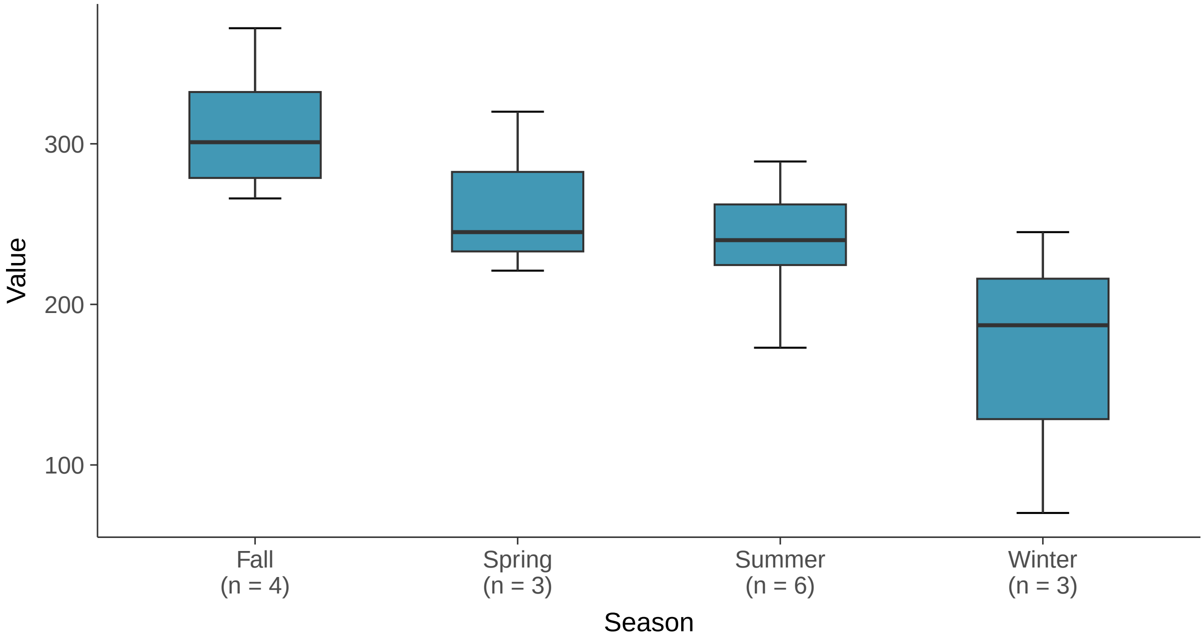
Boxplot

Calcium, MW-5 (mg/L)



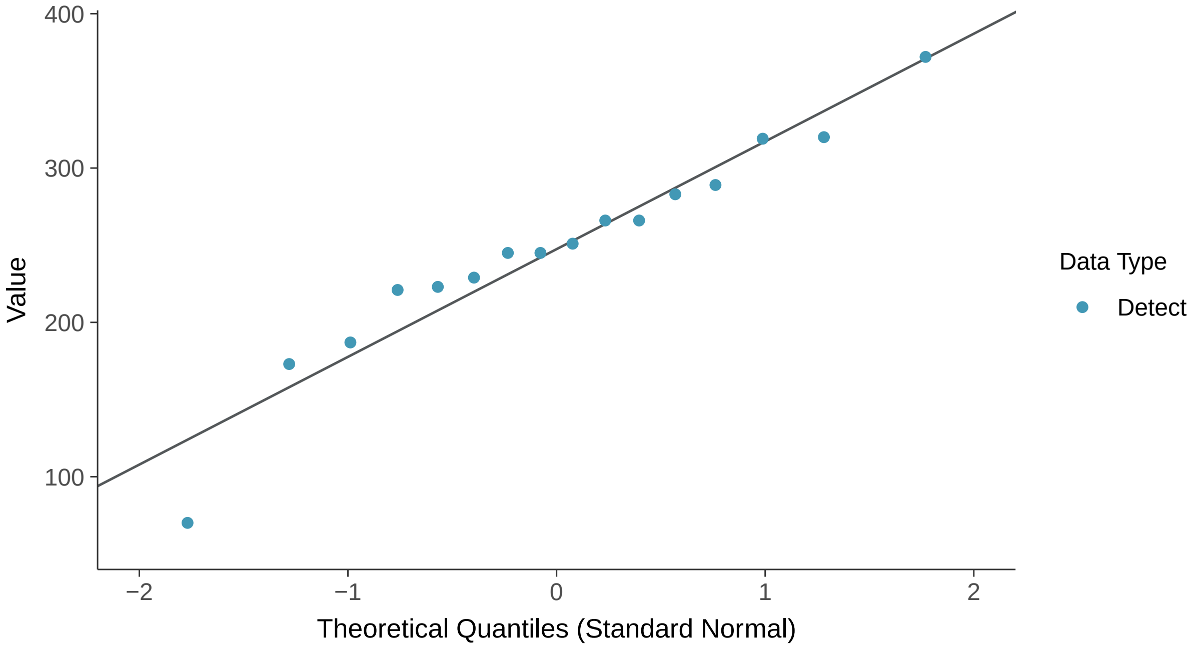
Boxplot by Season

Calcium, MW-5 (mg/L)



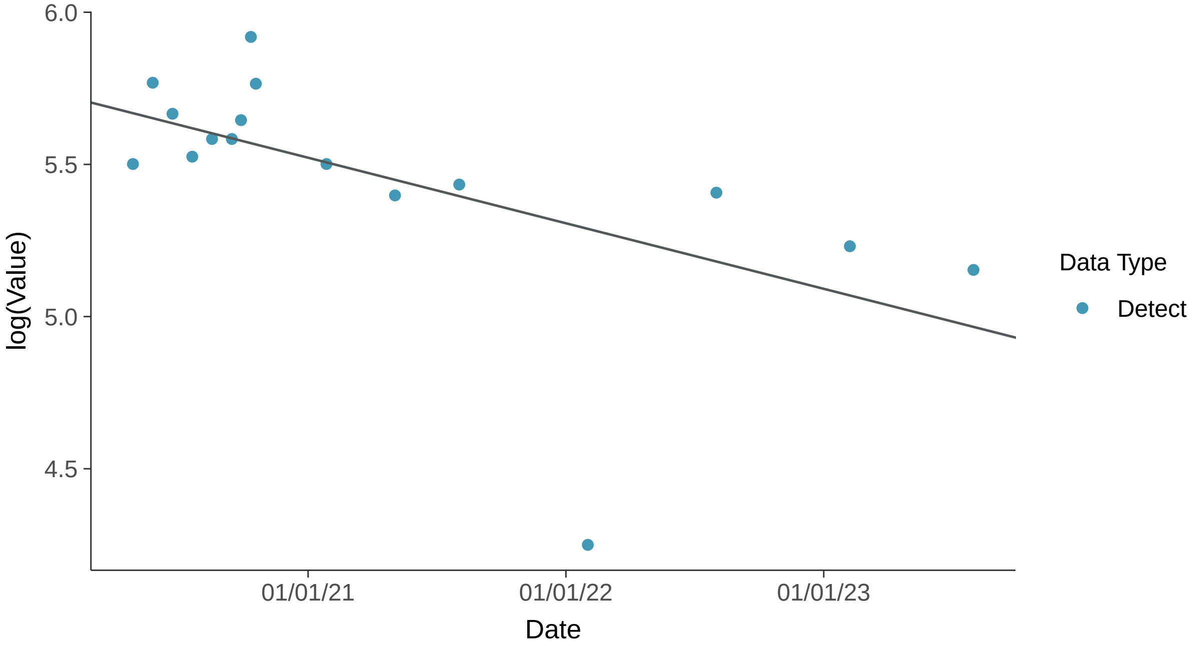
Normal Q-Q plot

Calcium, MW-5 (mg/L)



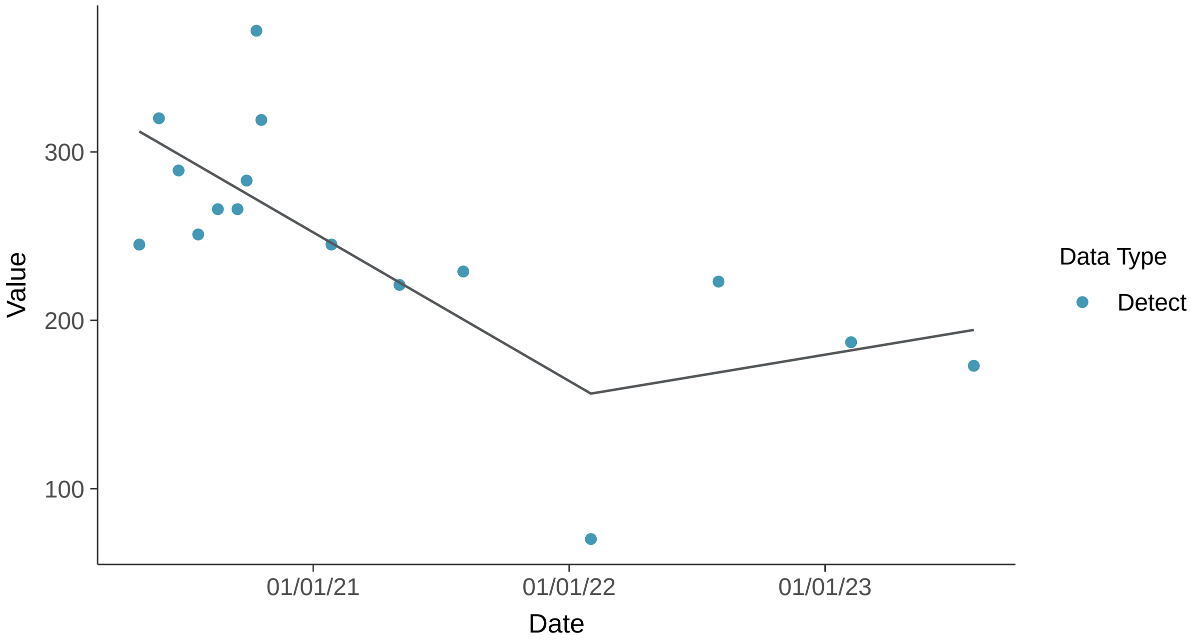
Trend Regression: Lognormal MLE

Calcium, MW-5 (mg/L)



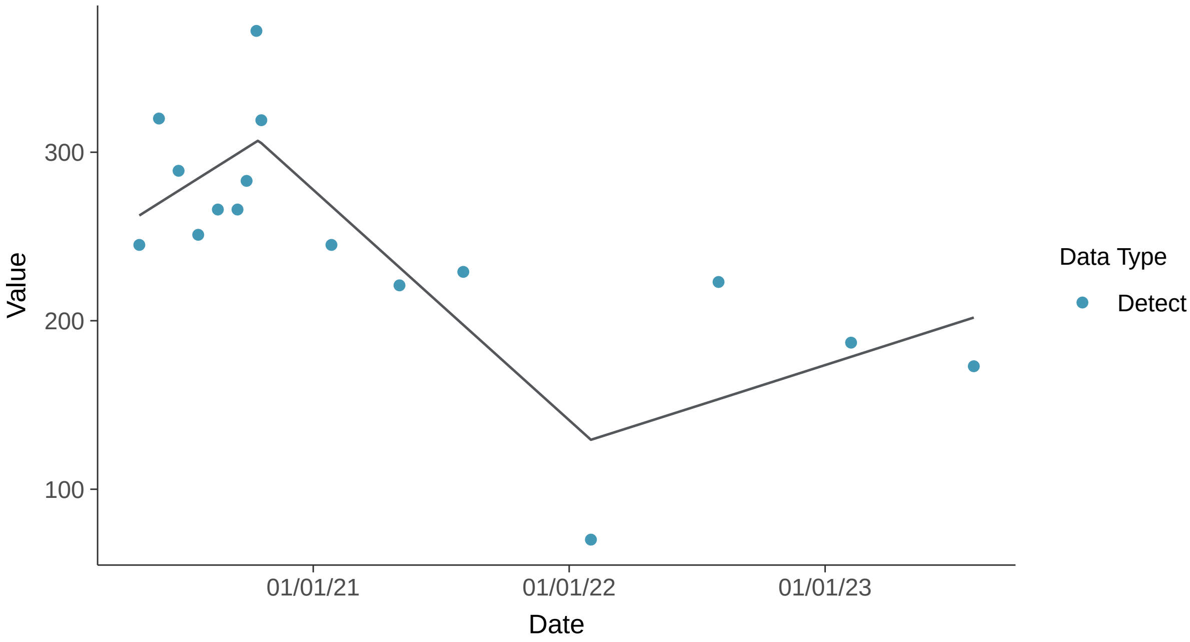
Trend Regression: Piecewise Linear-Linear

Calcium, MW-5 (mg/L)



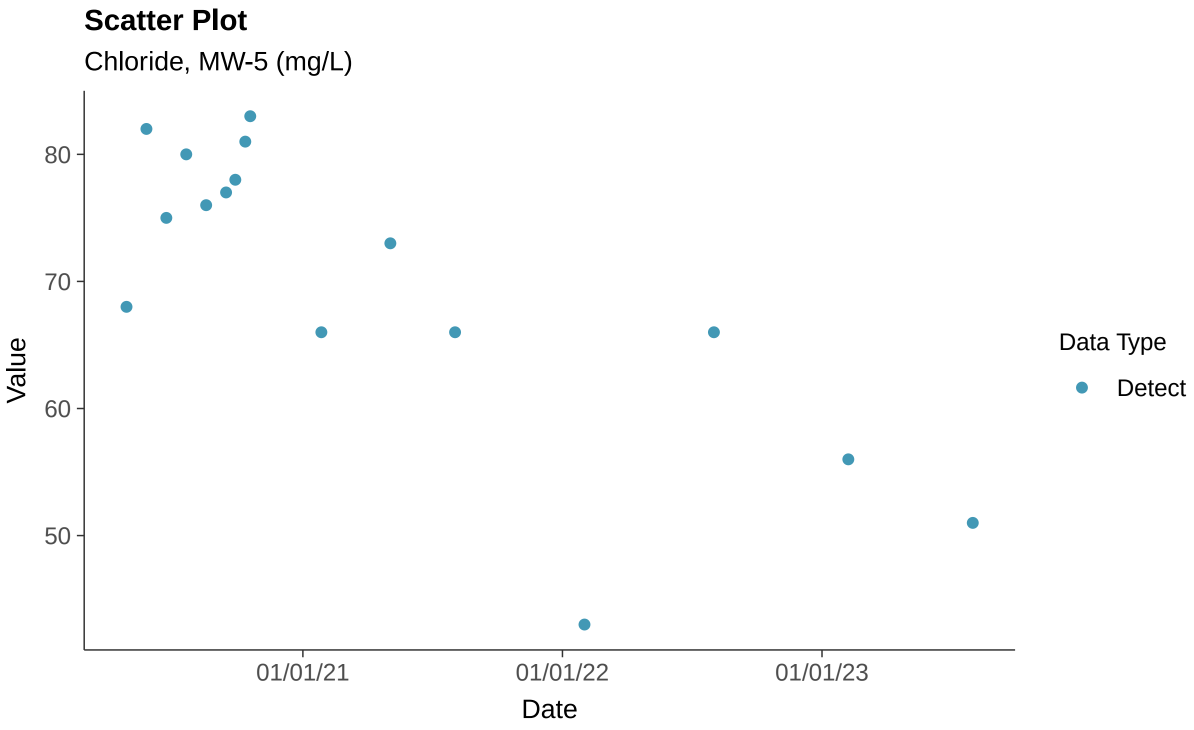
Trend Regression: Piecewise Linear-Linear-Linear

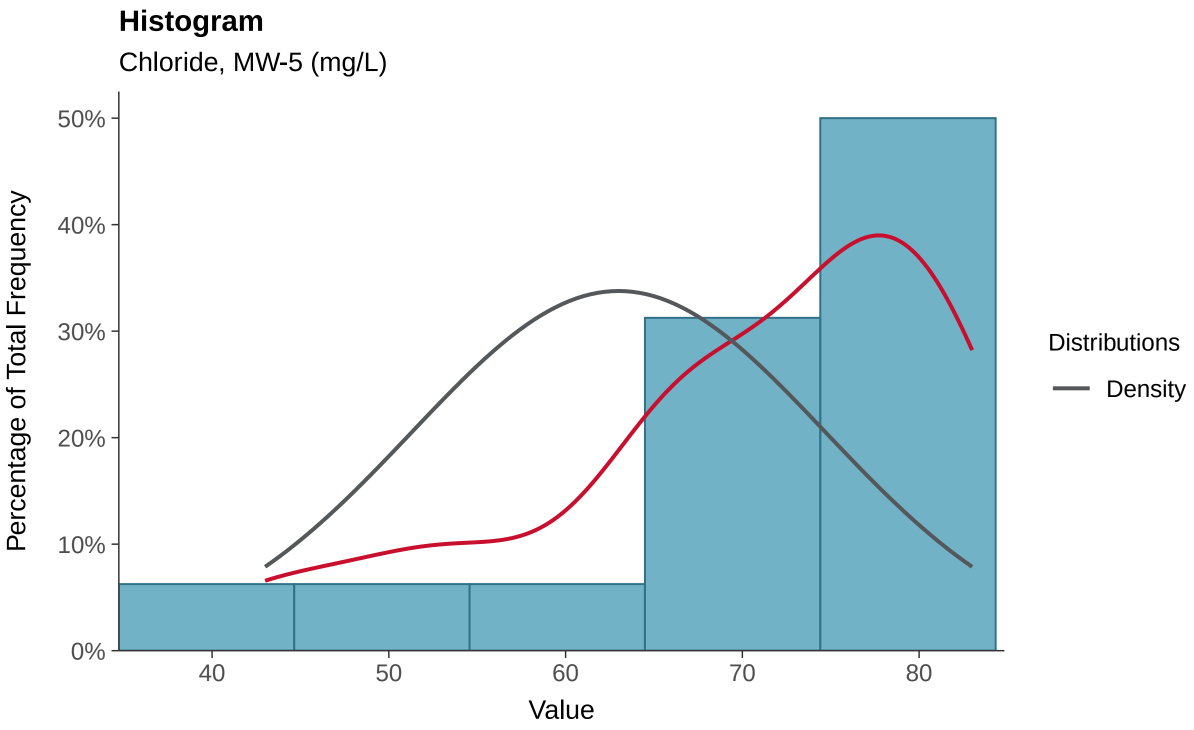
Calcium, MW-5 (mg/L)



Appendix III: Chloride, MW-5

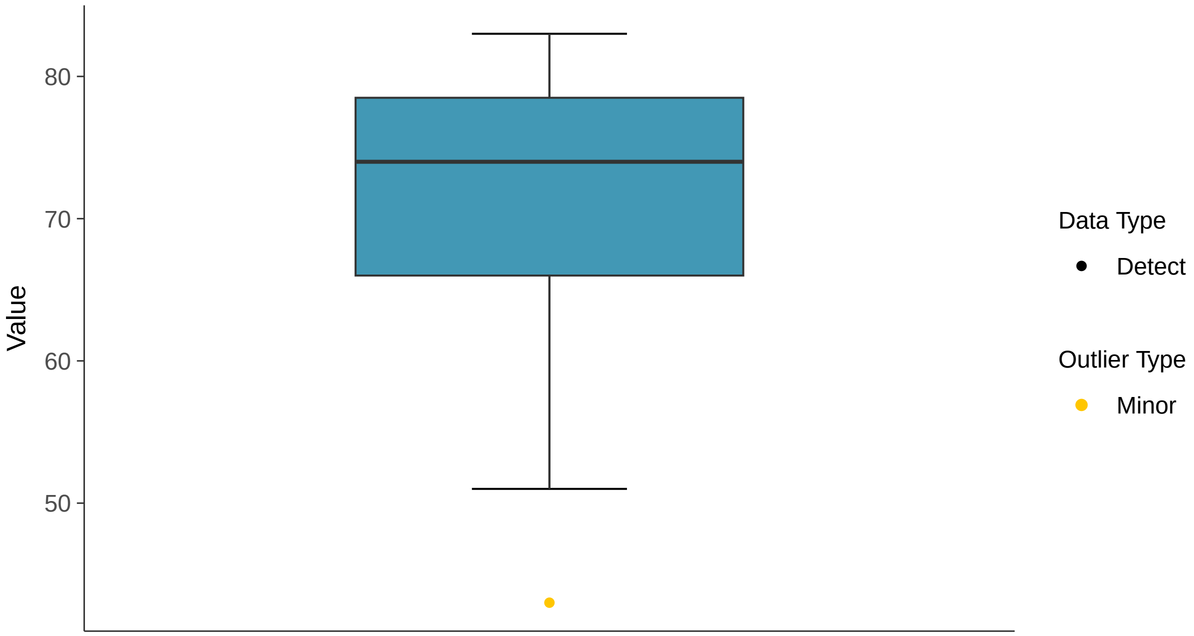
ID: 05_1_03





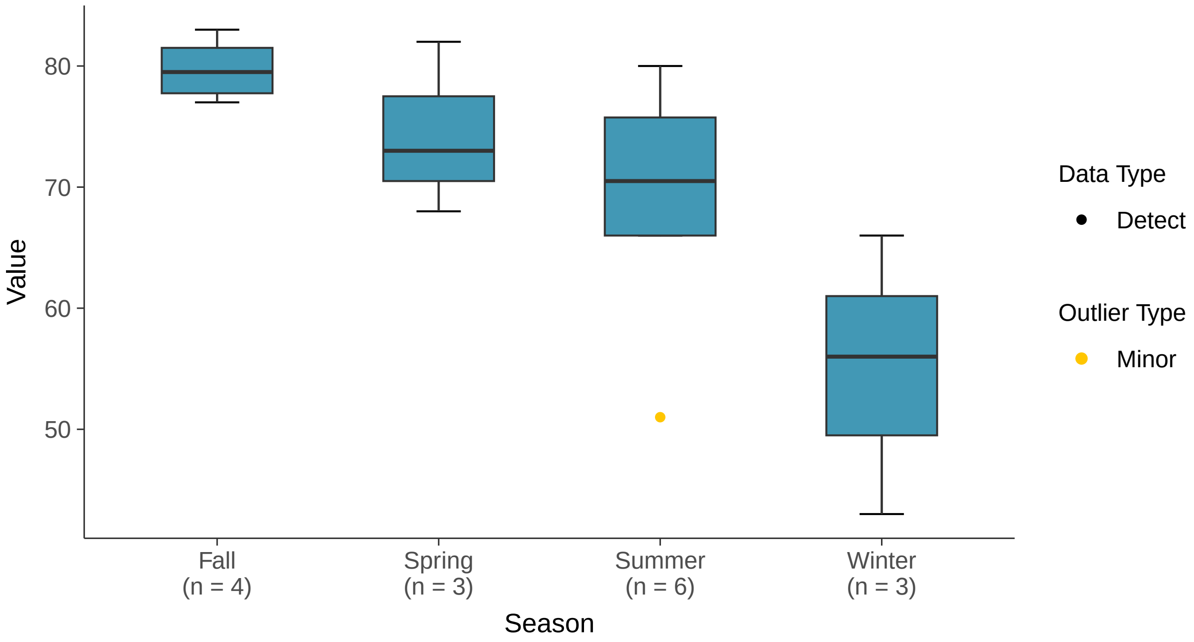
Boxplot

Chloride, MW-5 (mg/L)



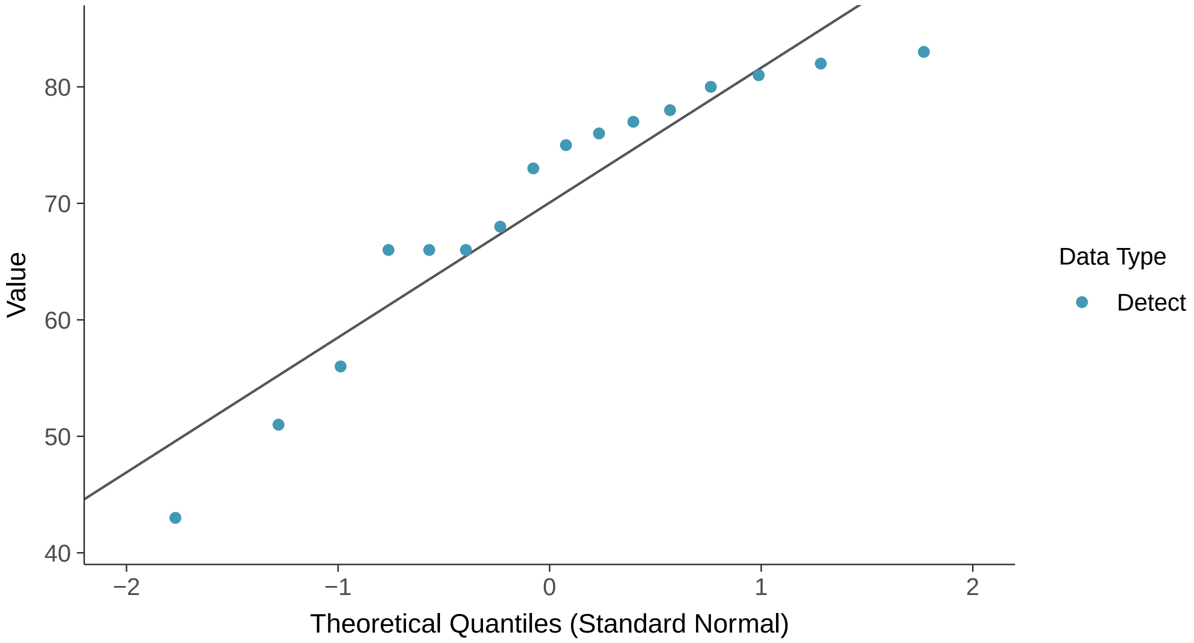
Boxplot by Season

Chloride, MW-5 (mg/L)



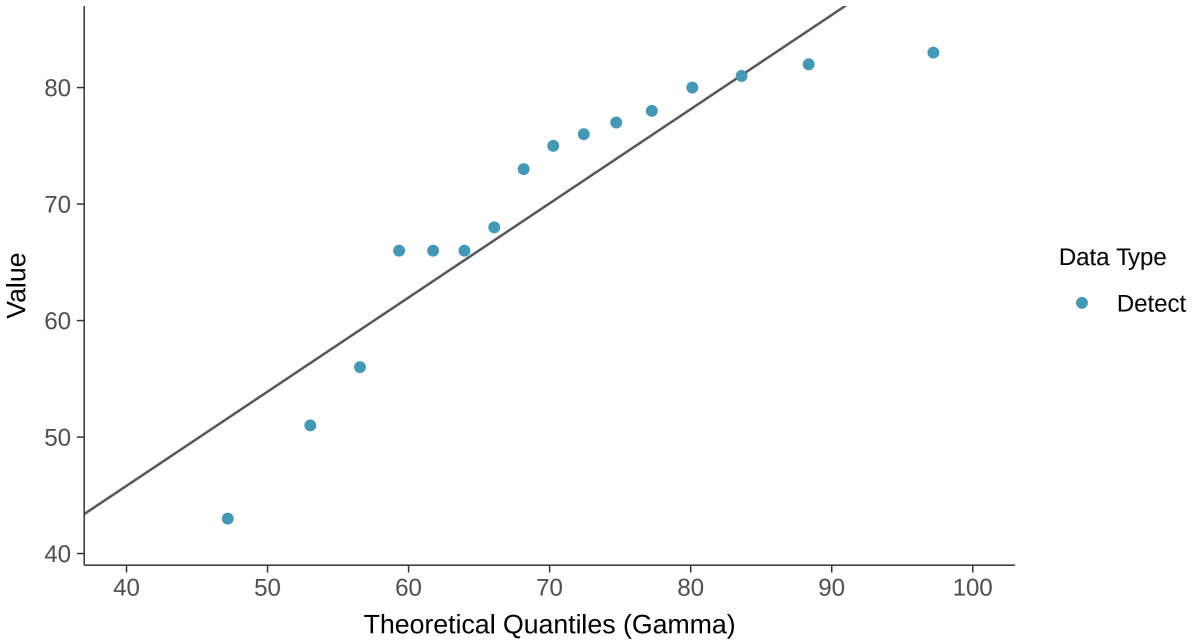
Normal Q-Q plot

Chloride, MW-5 (mg/L)



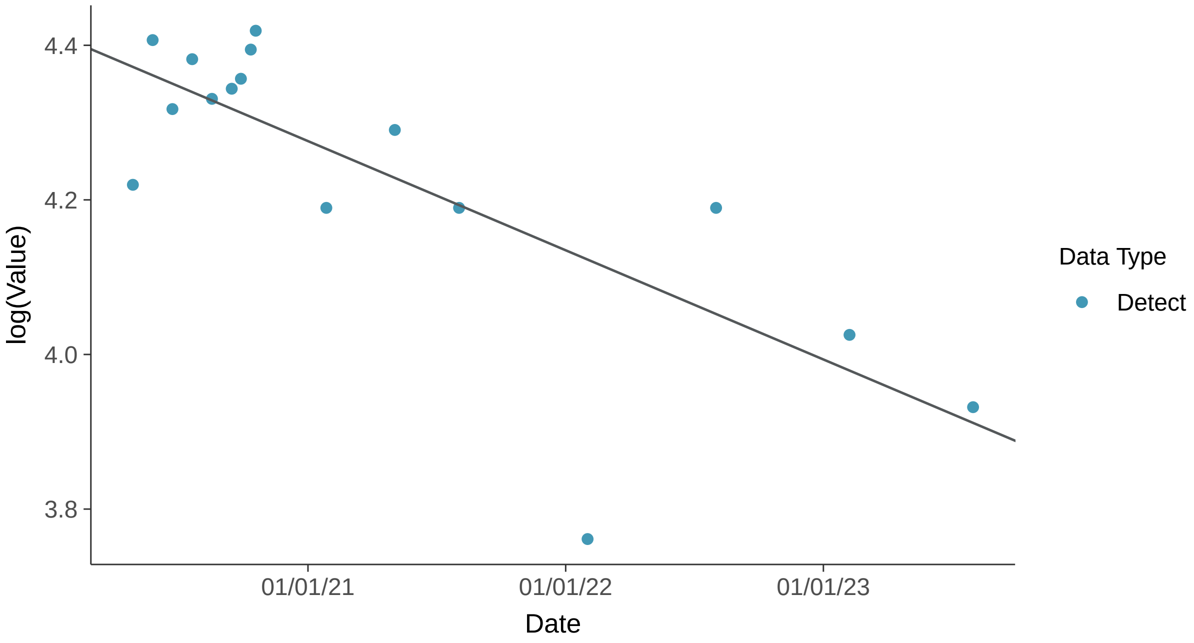
Gamma Q-Q plot

Chloride, MW-5 (mg/L)



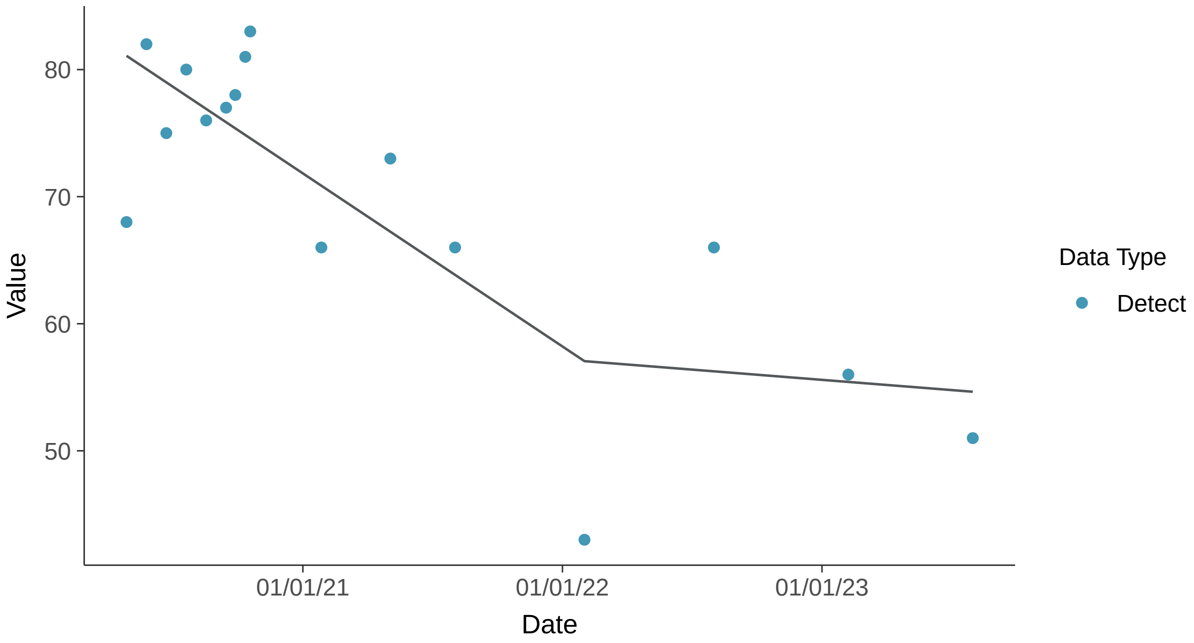
Trend Regression: Lognormal MLE

Chloride, MW-5 (mg/L)



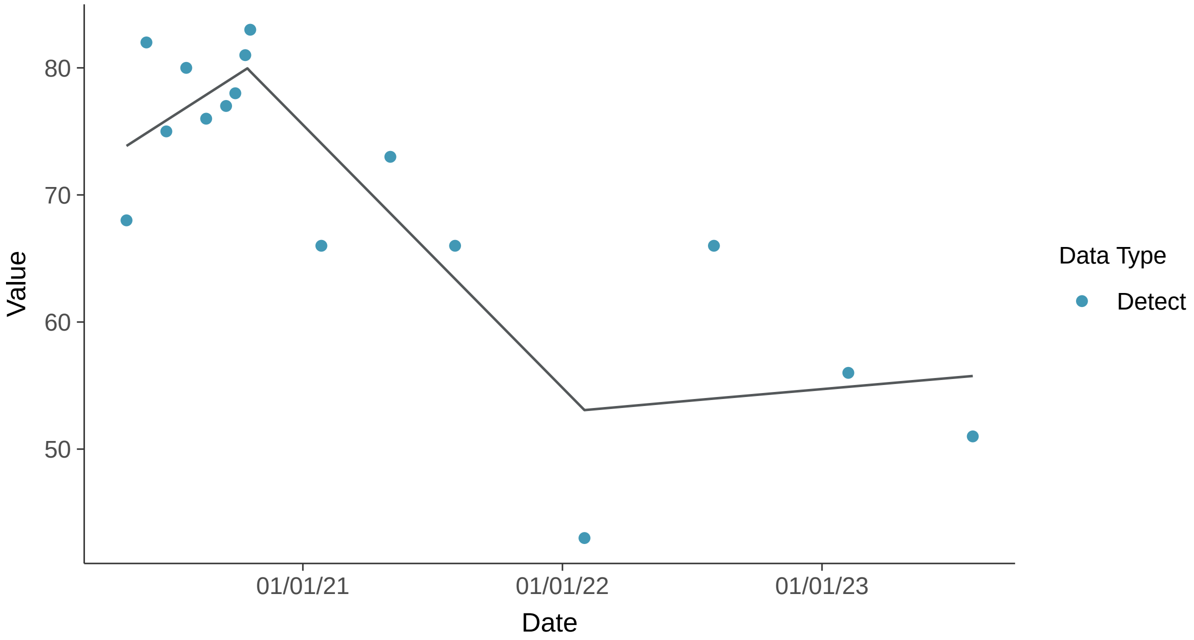
Trend Regression: Piecewise Linear-Linear

Chloride, MW-5 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Chloride, MW-5 (mg/L)

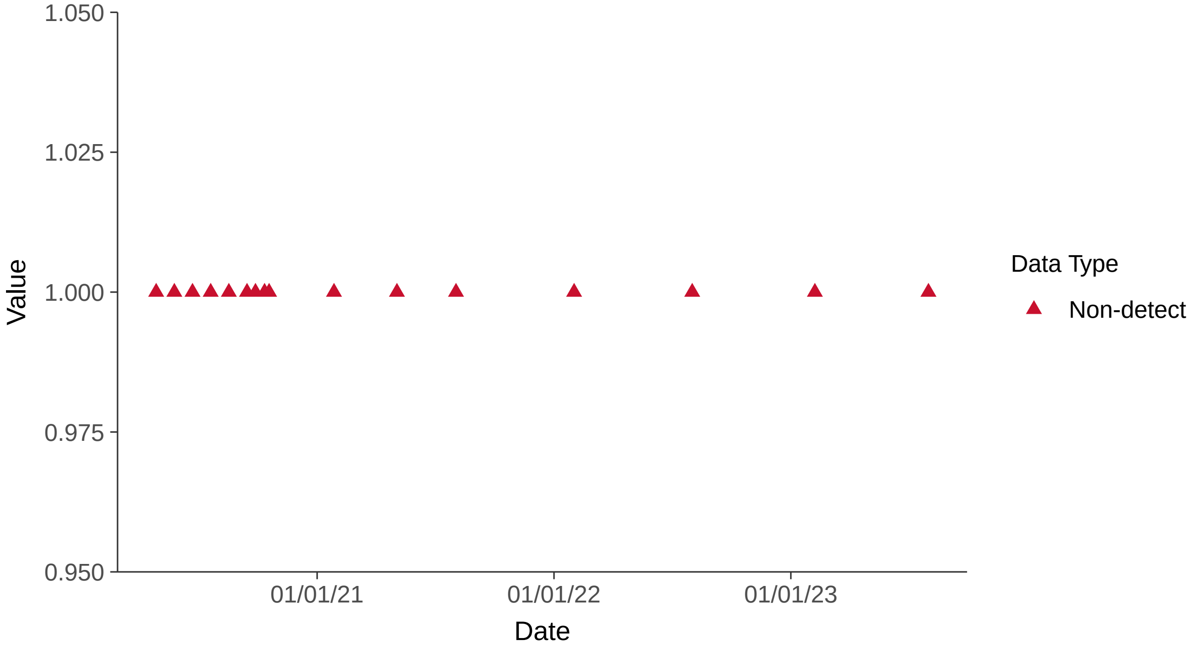


Appendix III: Fluoride, MW-5

ID: 05_1_04

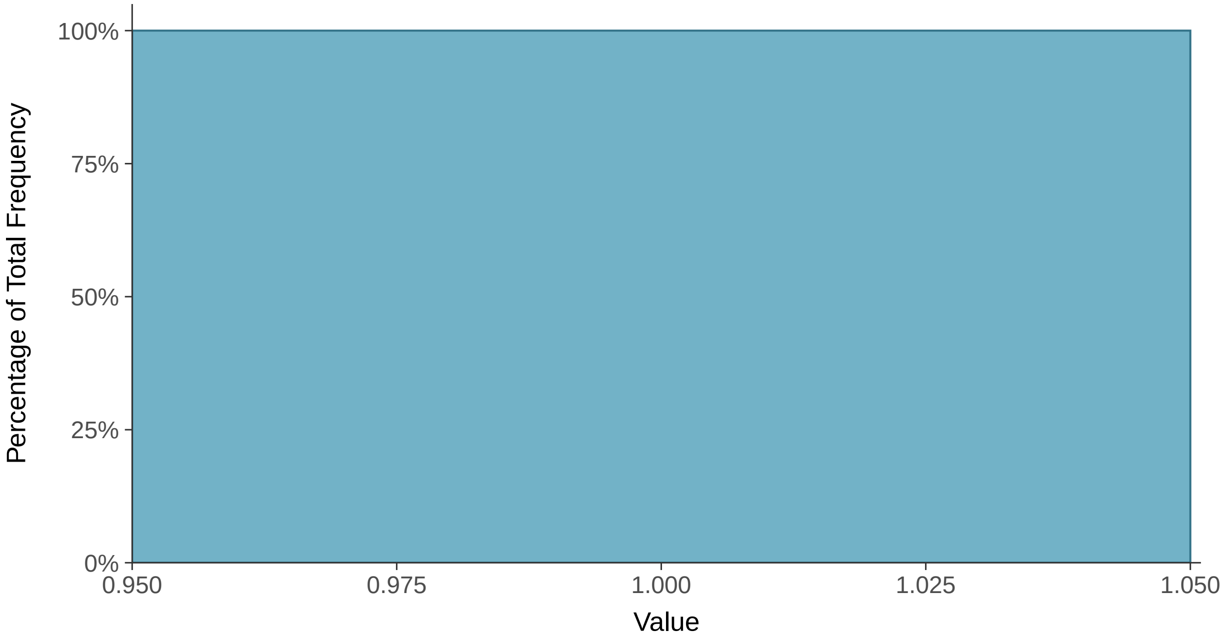
Scatter Plot

Fluoride, MW-5 (mg/L)



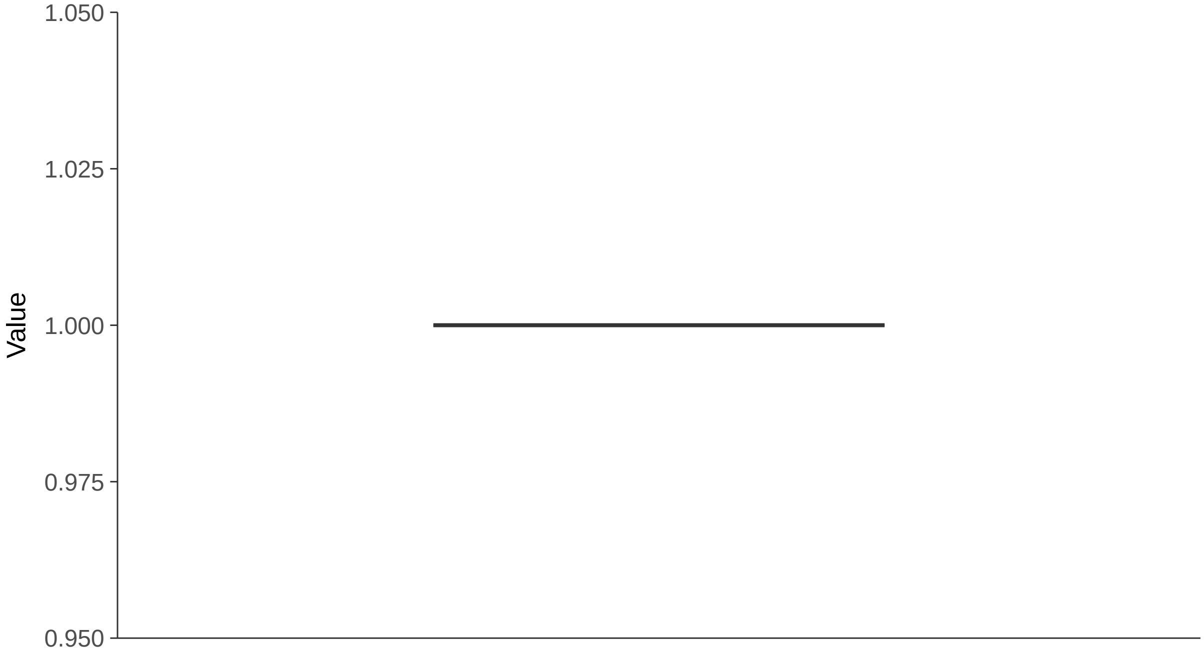
Histogram

Fluoride, MW-5 (mg/L)



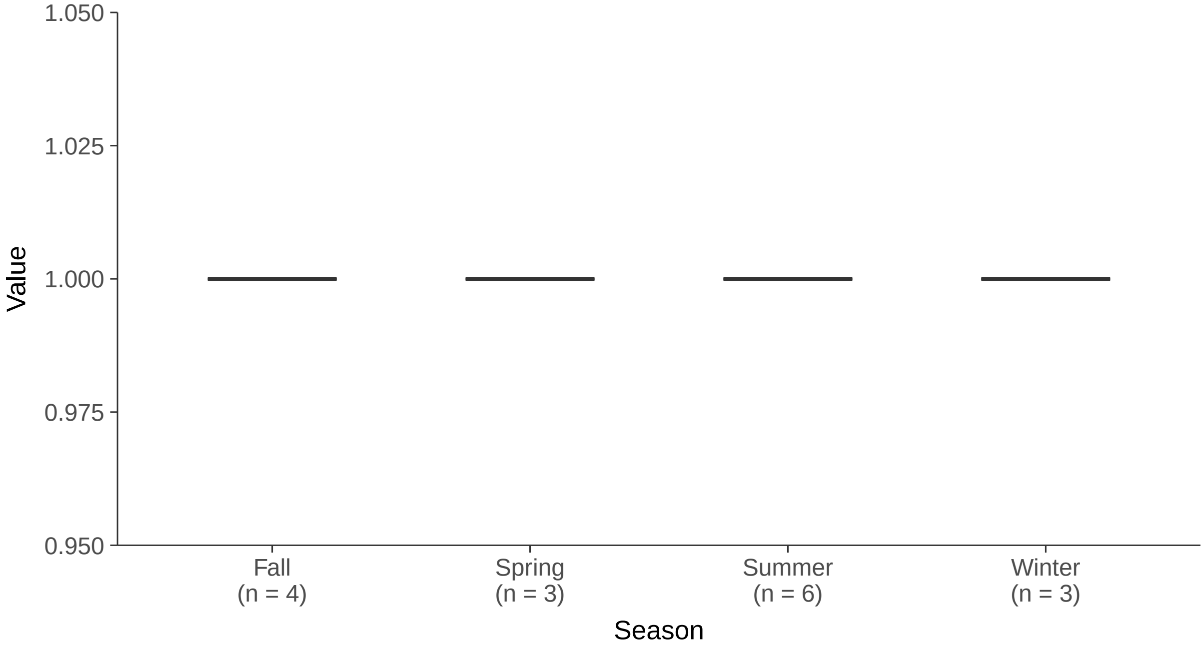
Boxplot

Fluoride, MW-5 (mg/L)



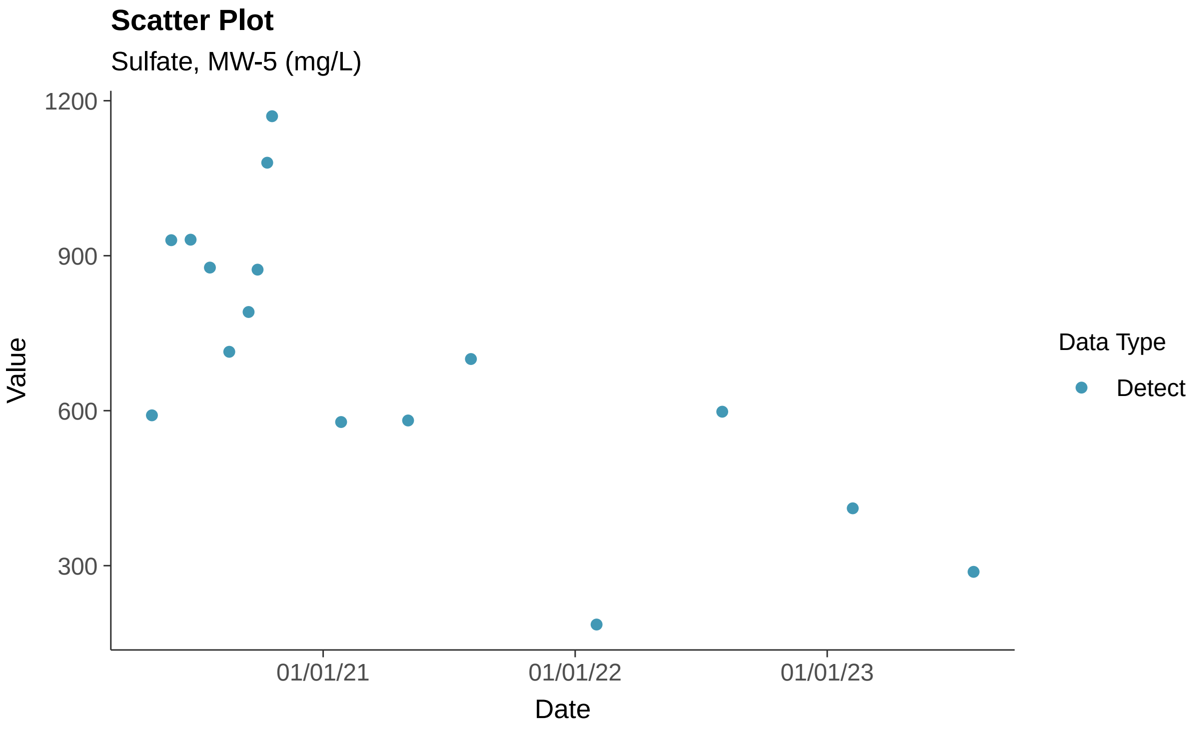
Boxplot by Season

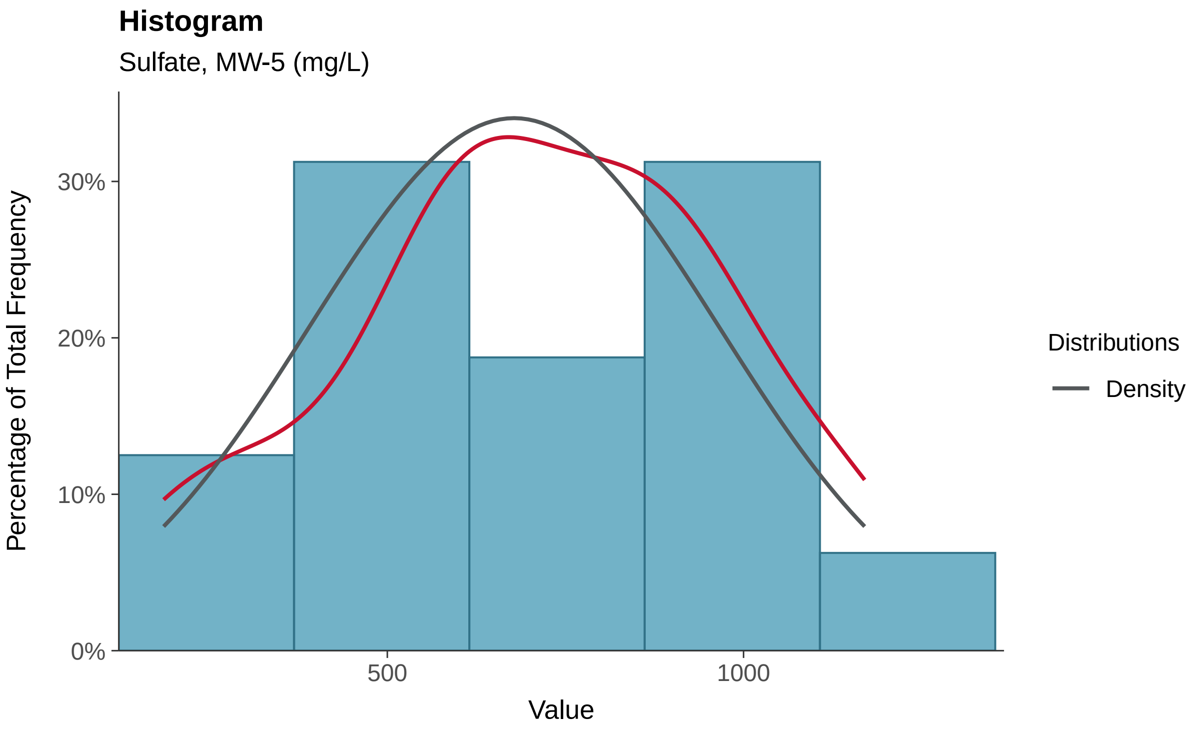
Fluoride, MW-5 (mg/L)



Appendix III: Sulfate, MW-5

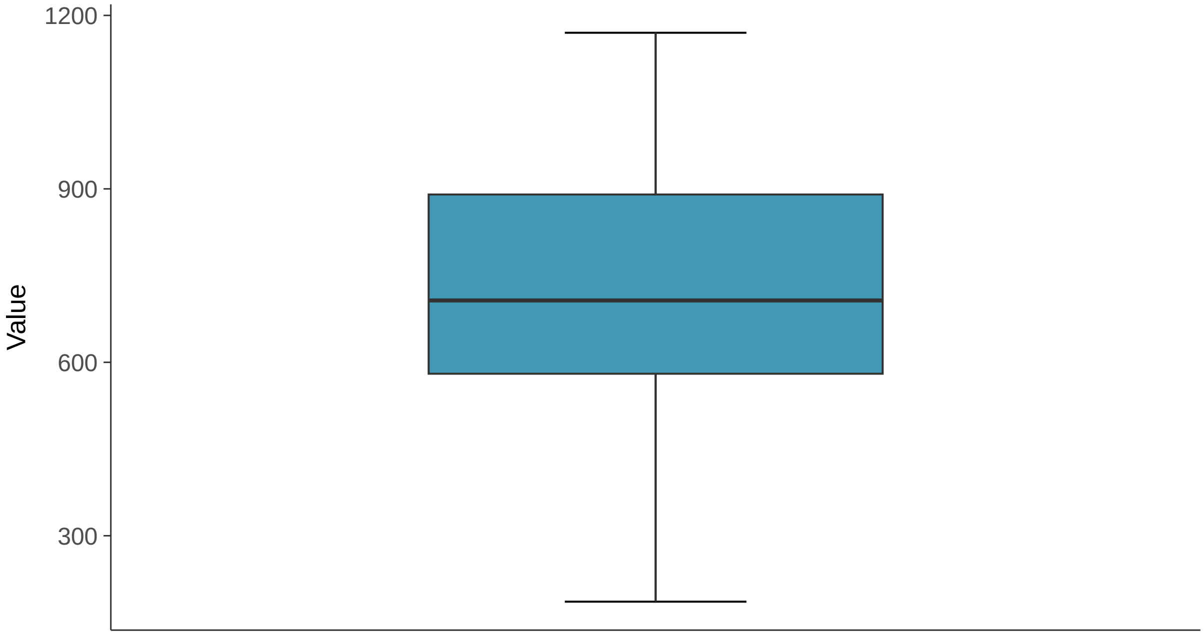
ID: 05_1_05





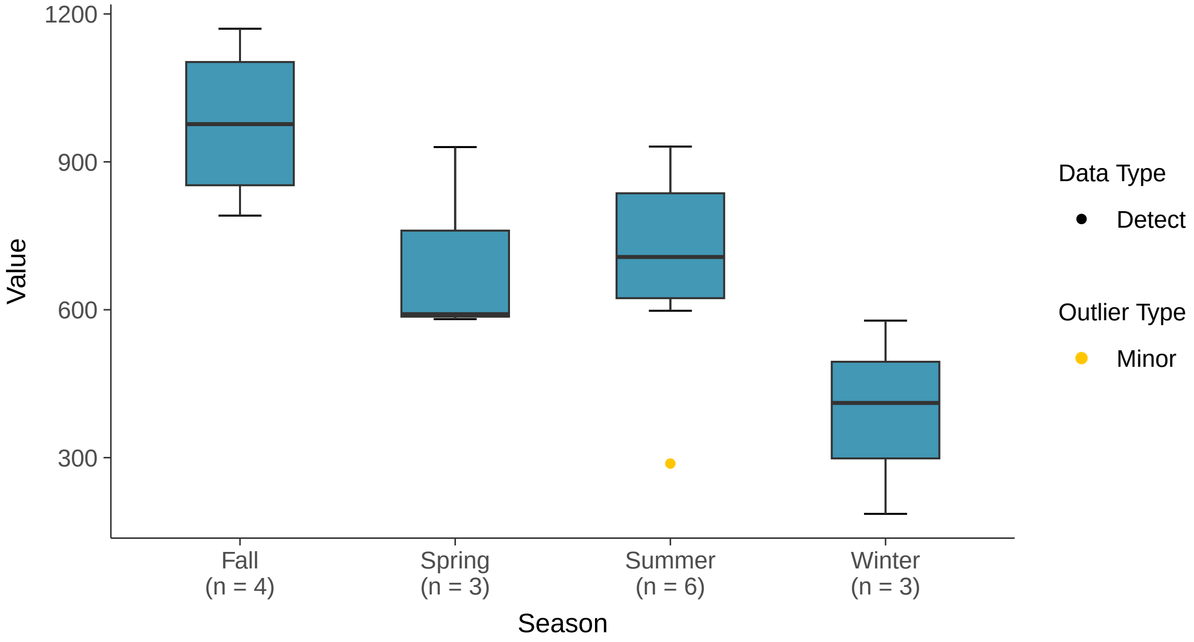
Boxplot

Sulfate, MW-5 (mg/L)



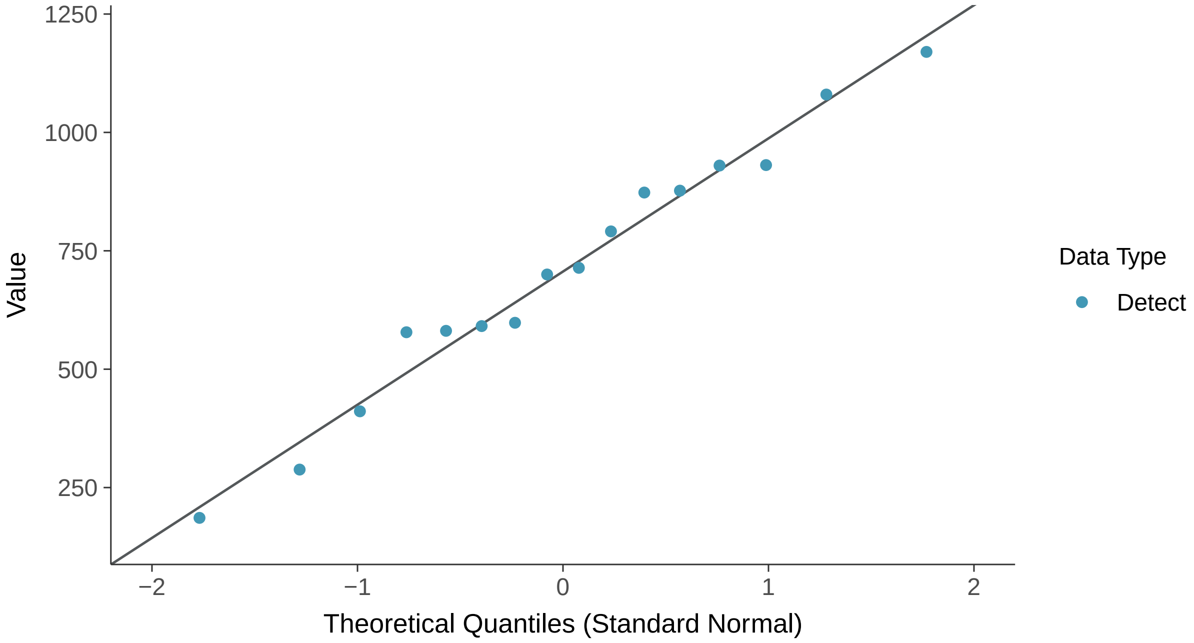
Boxplot by Season

Sulfate, MW-5 (mg/L)



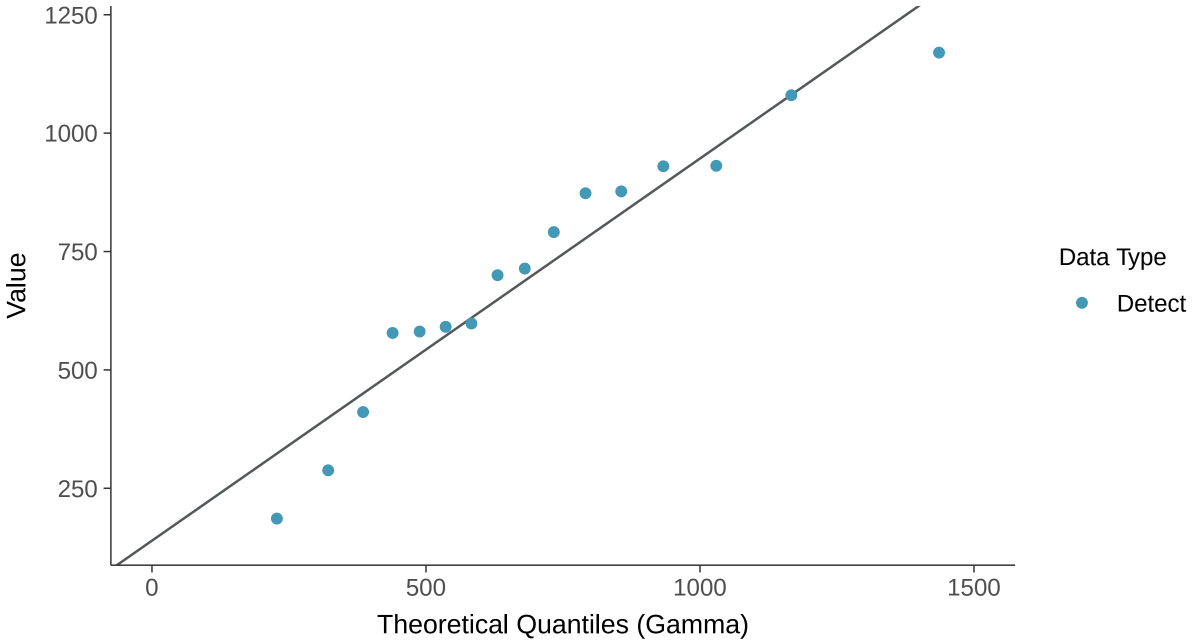
Normal Q-Q plot

Sulfate, MW-5 (mg/L)



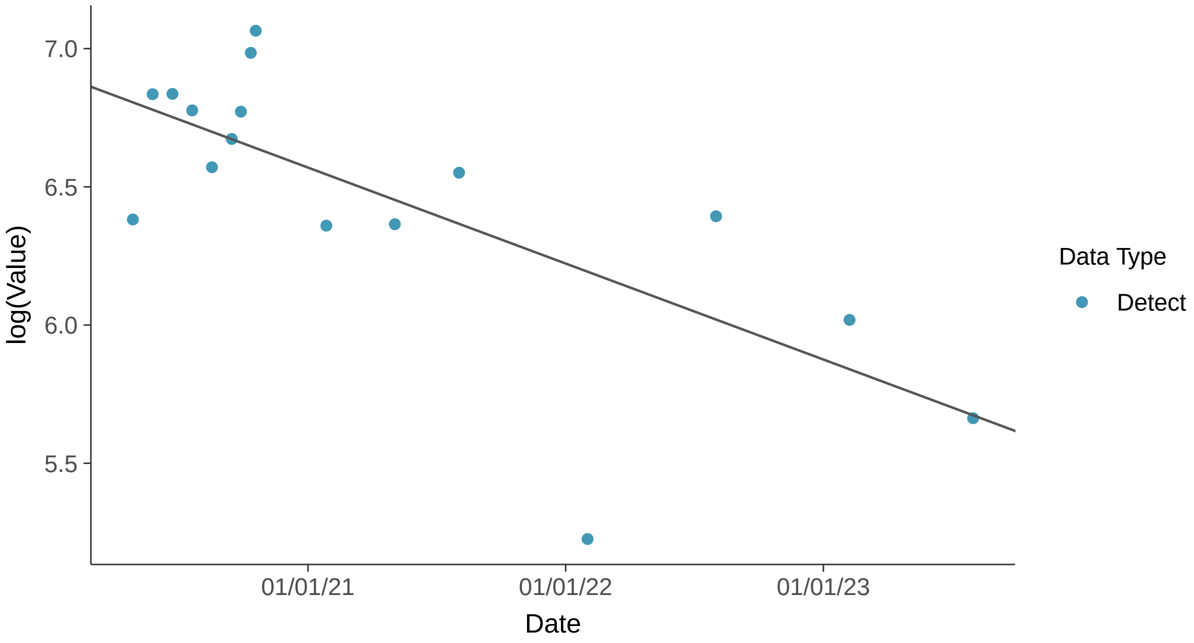
Gamma Q-Q plot

Sulfate, MW-5 (mg/L)



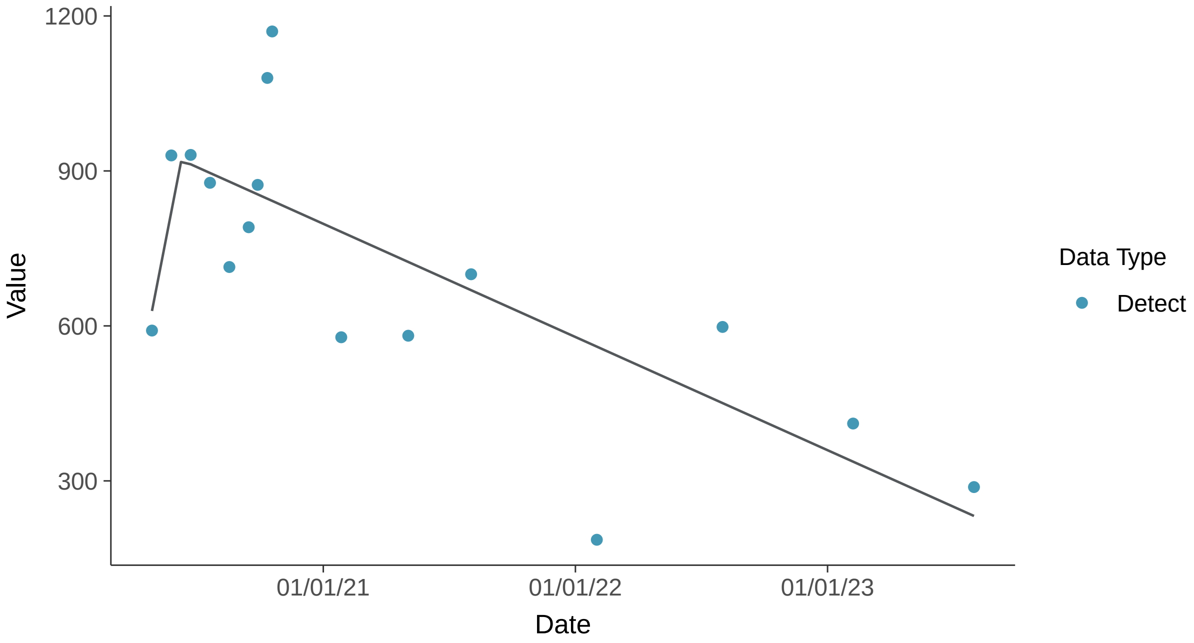
Trend Regression: Lognormal MLE

Sulfate, MW-5 (mg/L)



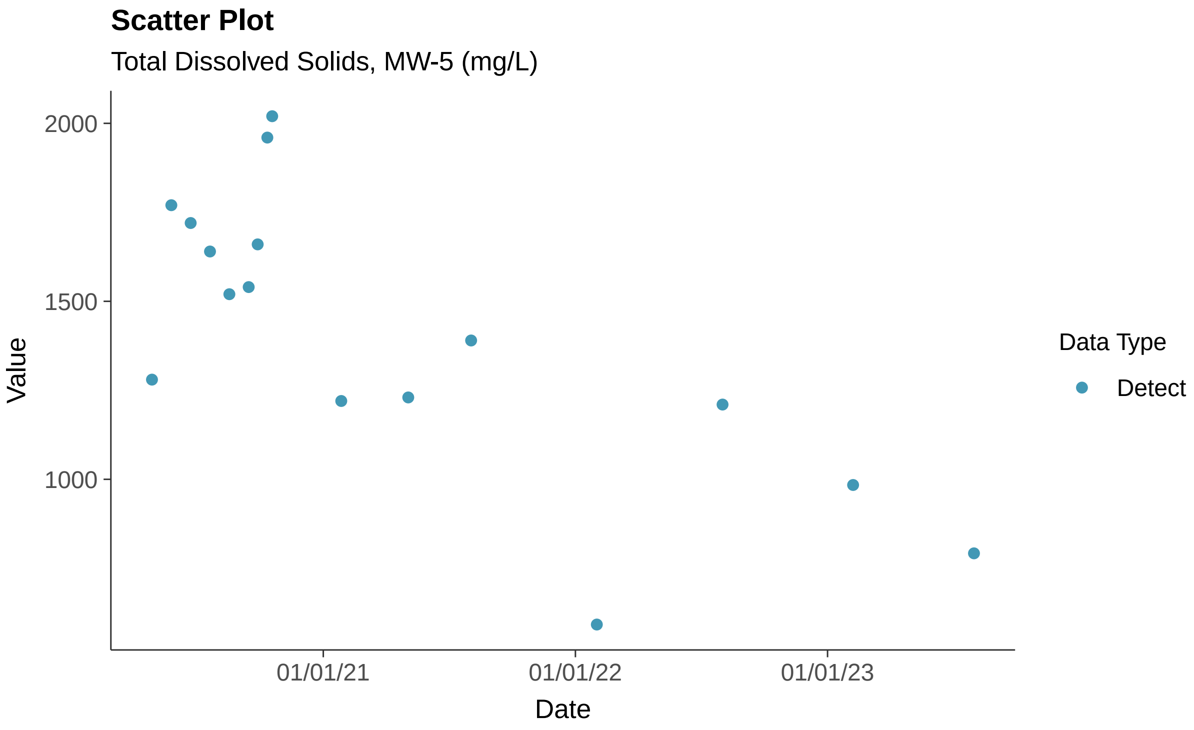
Trend Regression: Piecewise Linear-Linear

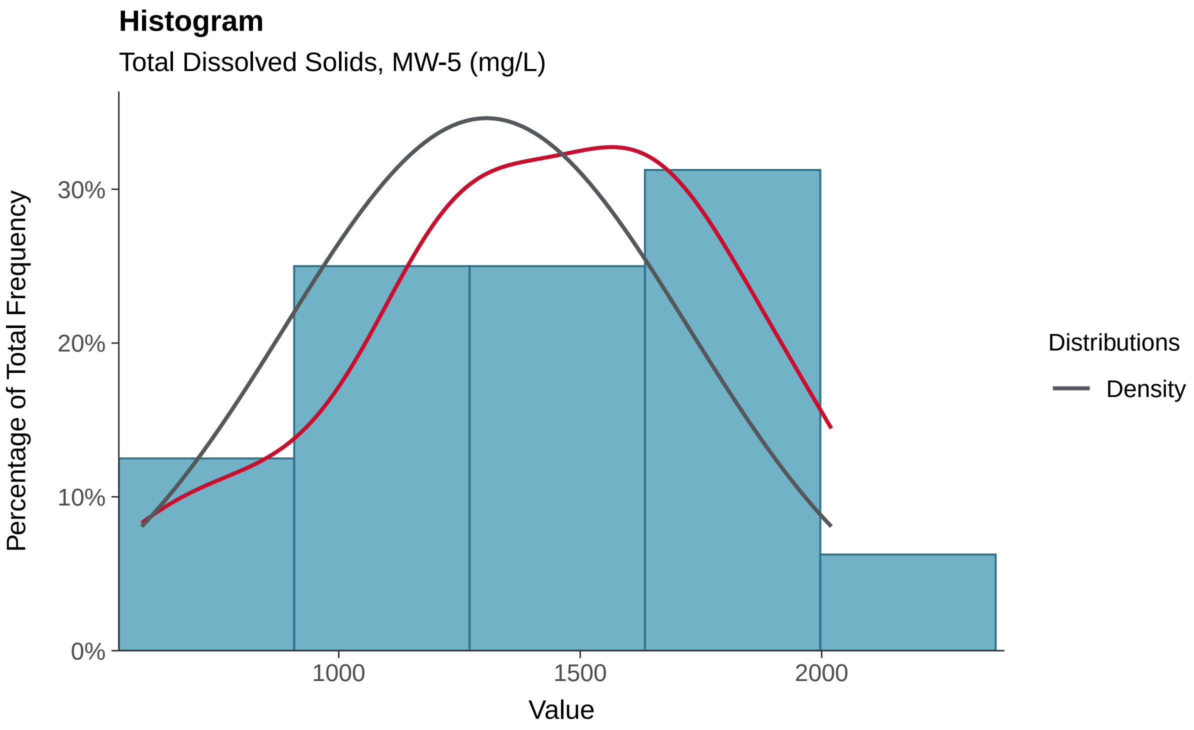
Sulfate, MW-5 (mg/L)



Appendix III: Total Dissolved Solids, MW-5

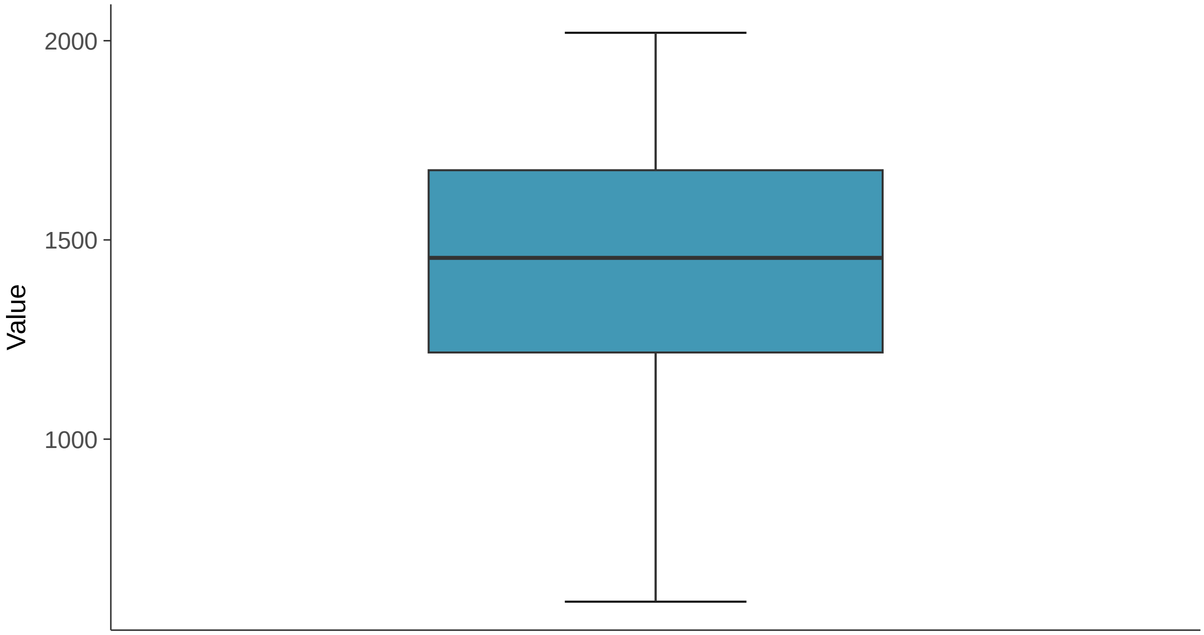
ID: 05_1_06





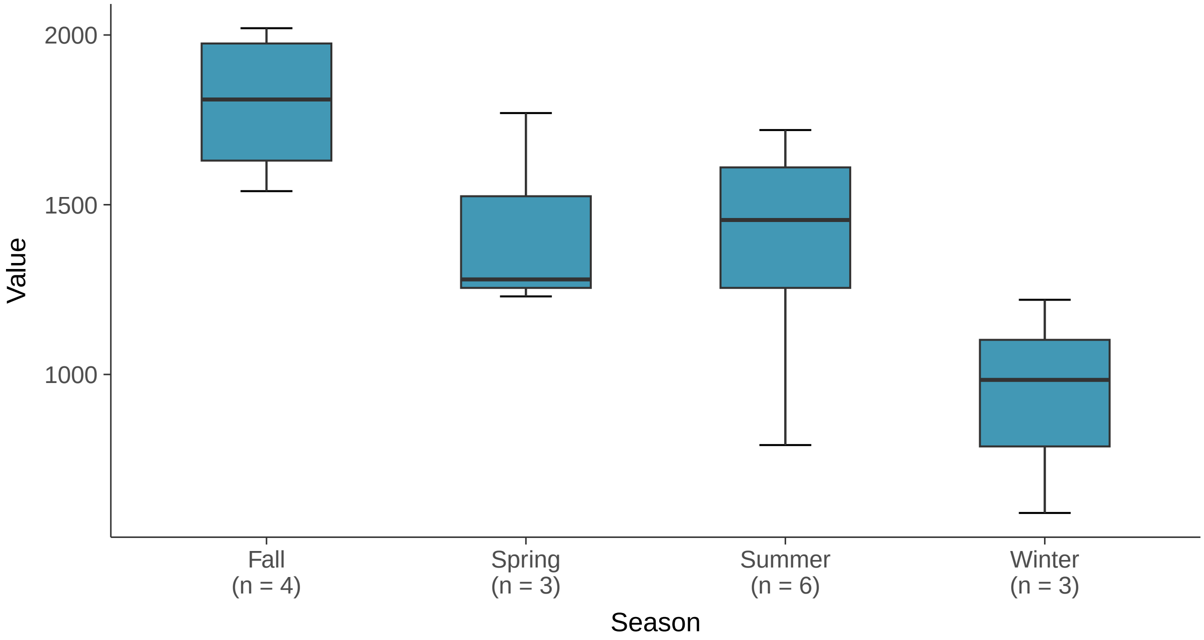
Boxplot

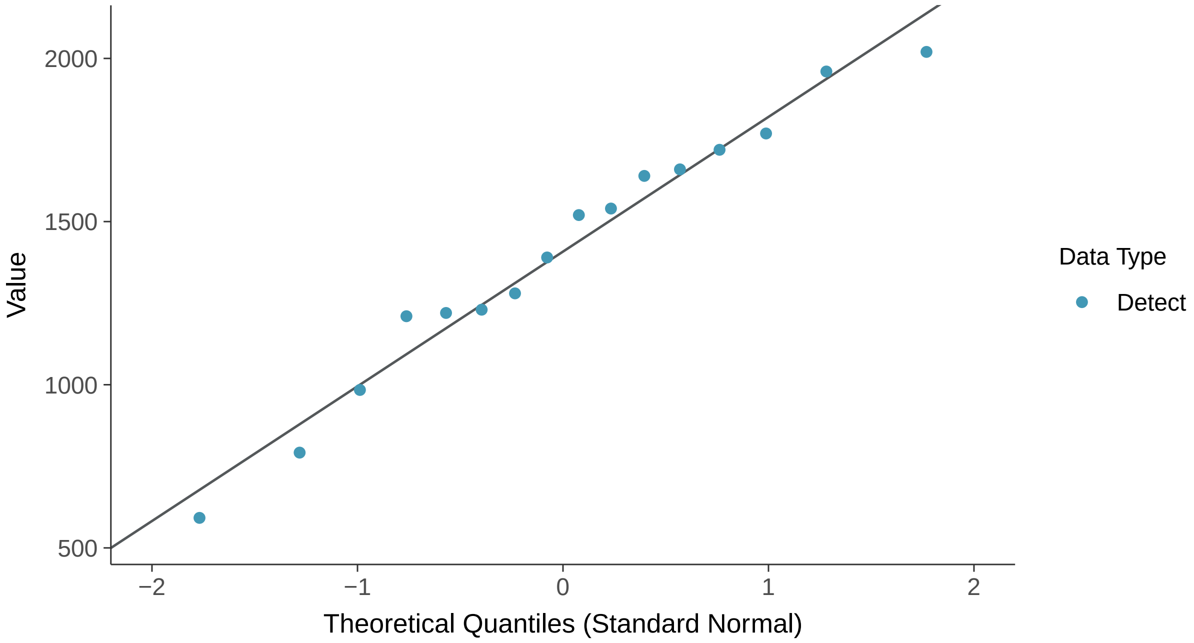
Total Dissolved Solids, MW-5 (mg/L)



Boxplot by Season

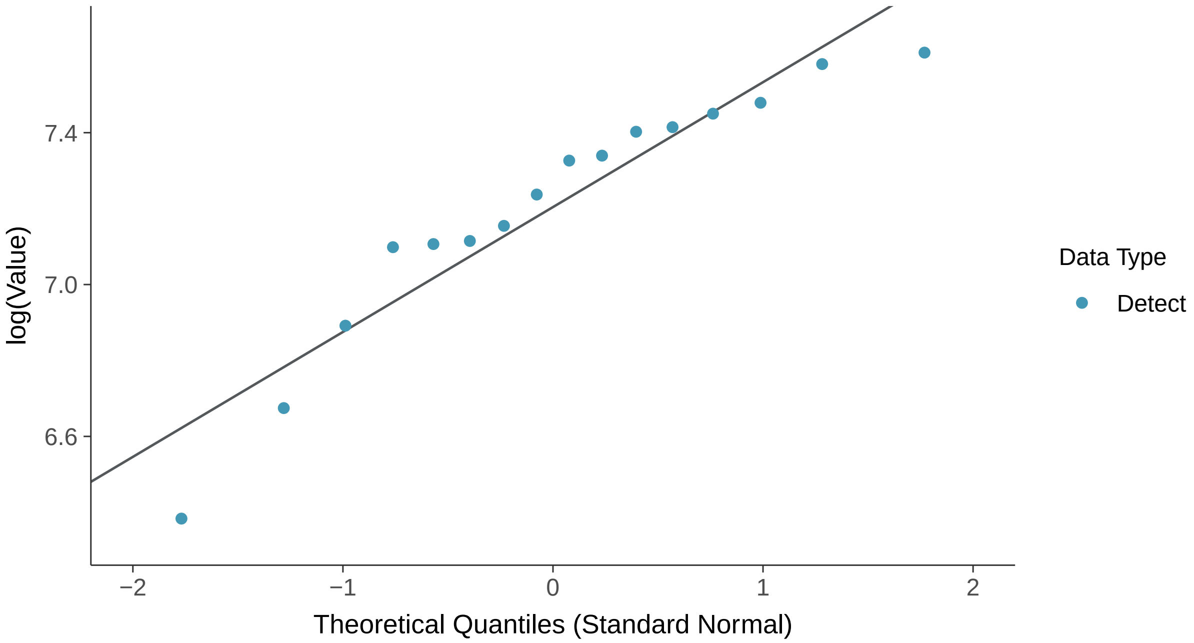
Total Dissolved Solids, MW-5 (mg/L)





Normal Q-Q plot

Total Dissolved Solids, MW-5 (mg/L)

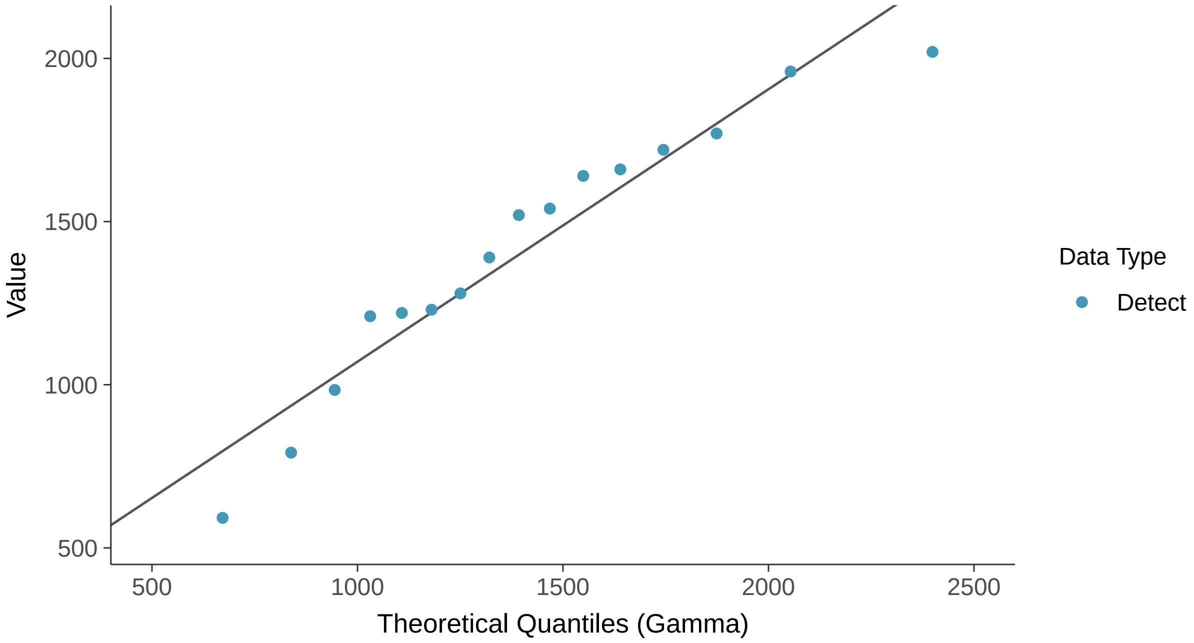


Lognormal Q-Q plot

Total Dissolved Solids, MW-5 (mg/L)

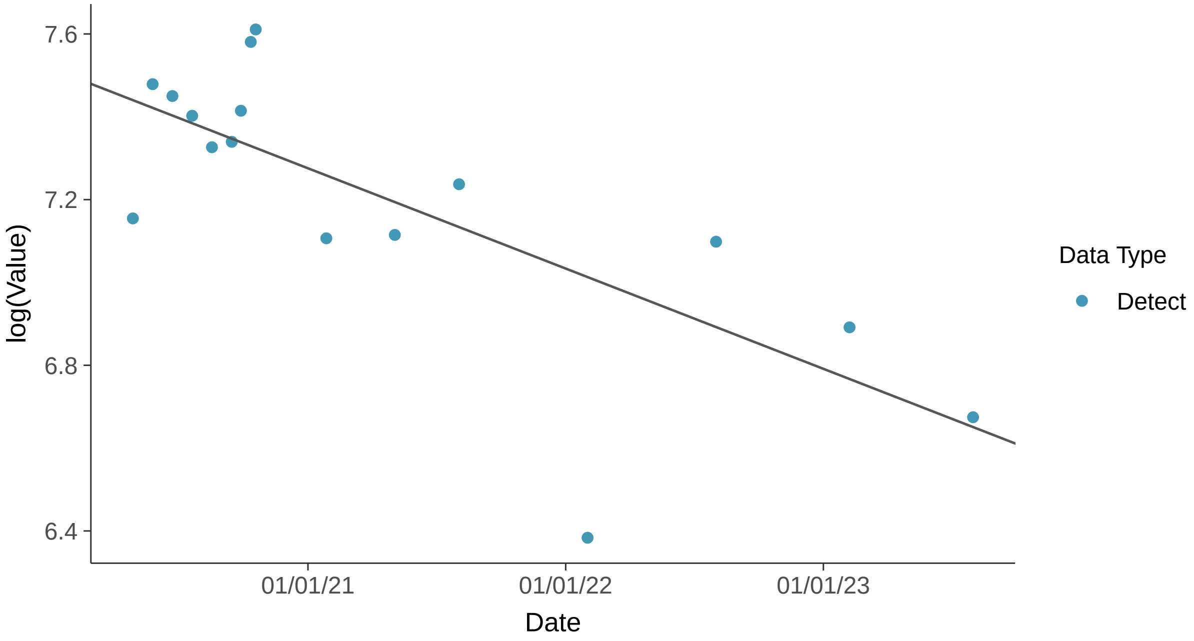
Gamma Q-Q plot

Total Dissolved Solids, MW-5 (mg/L)



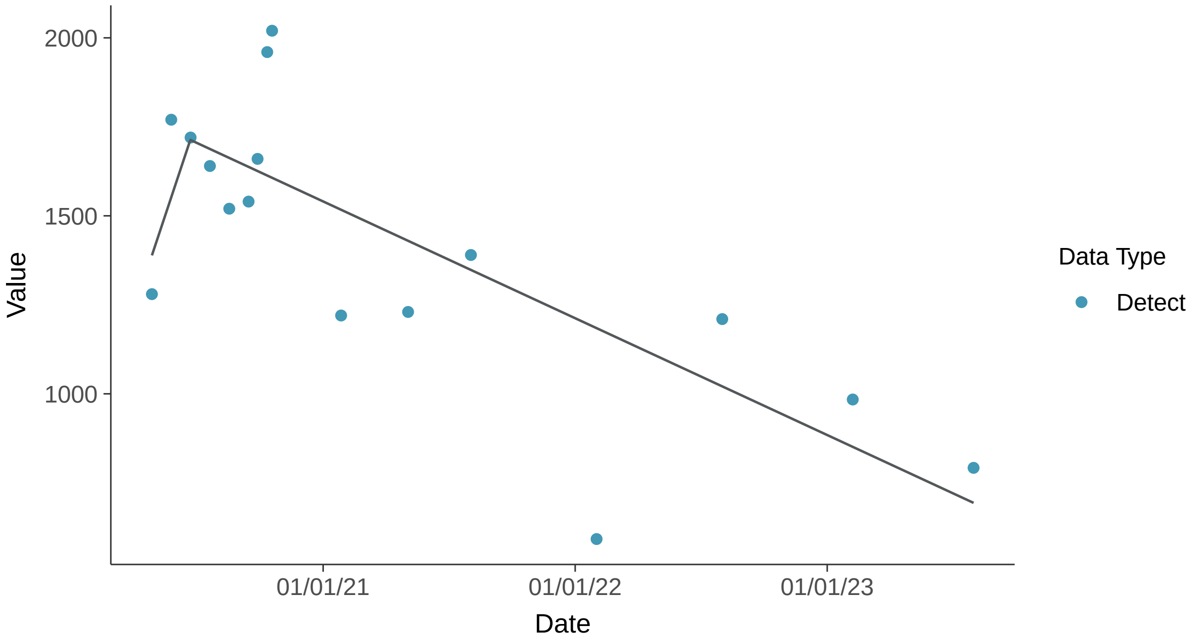
Trend Regression: Lognormal MLE

Total Dissolved Solids, MW-5 (mg/L)



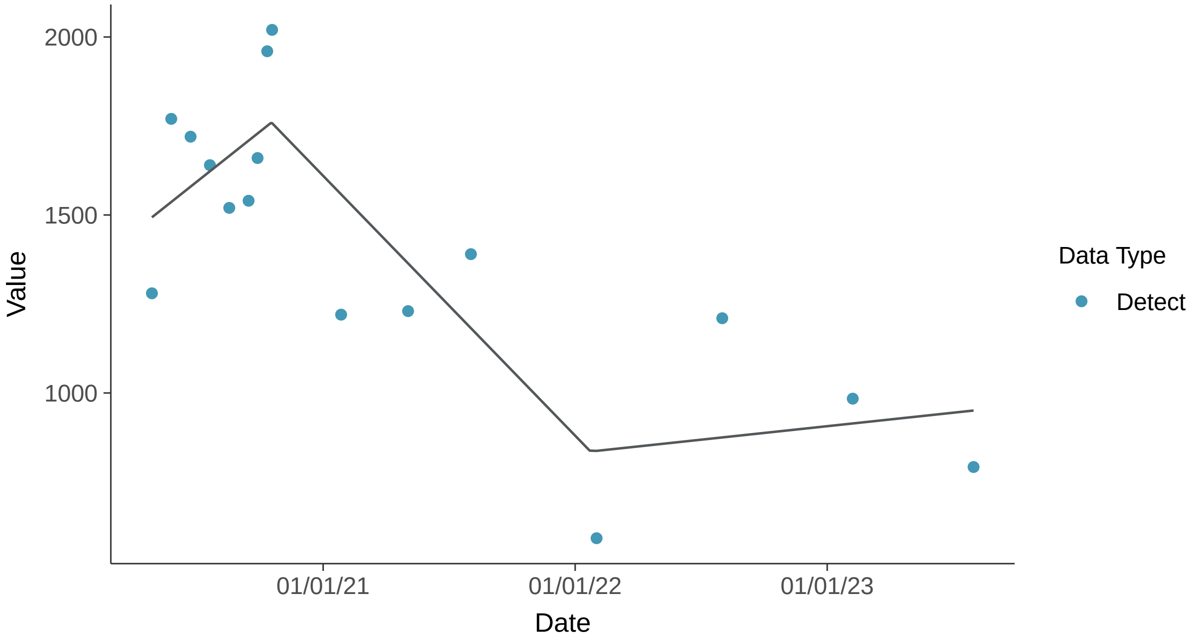
Trend Regression: Piecewise Linear-Linear

Total Dissolved Solids, MW-5 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Total Dissolved Solids, MW-5 (mg/L)

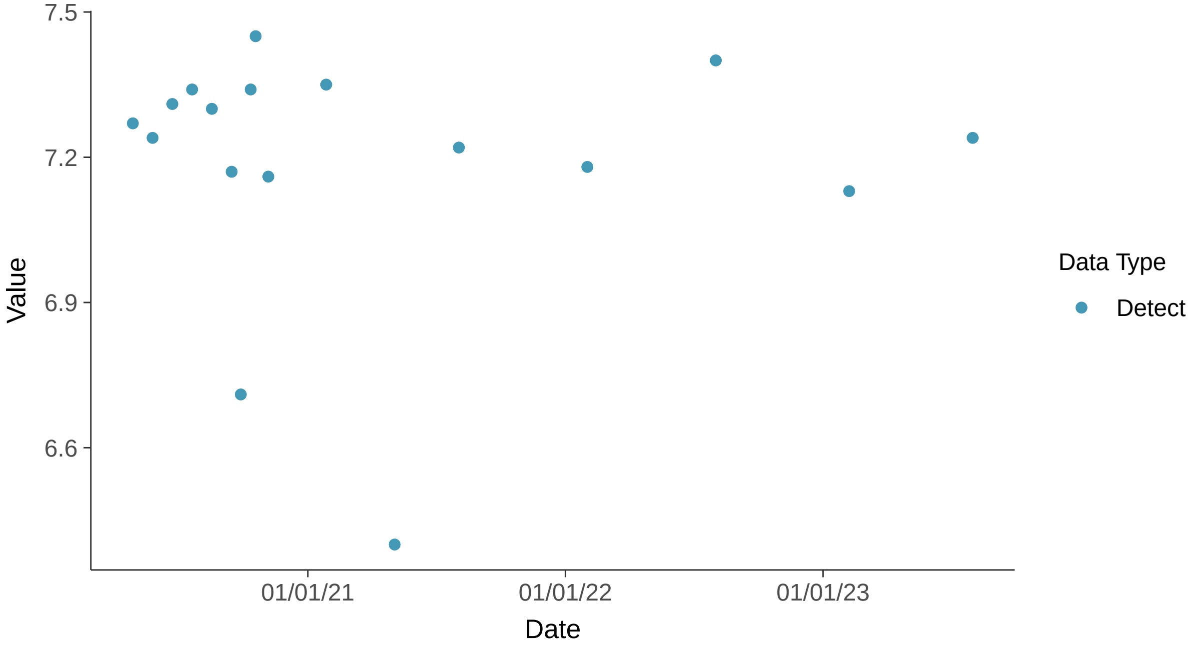


Appendix III: pH, Field, MW-5

ID: 05_1_07

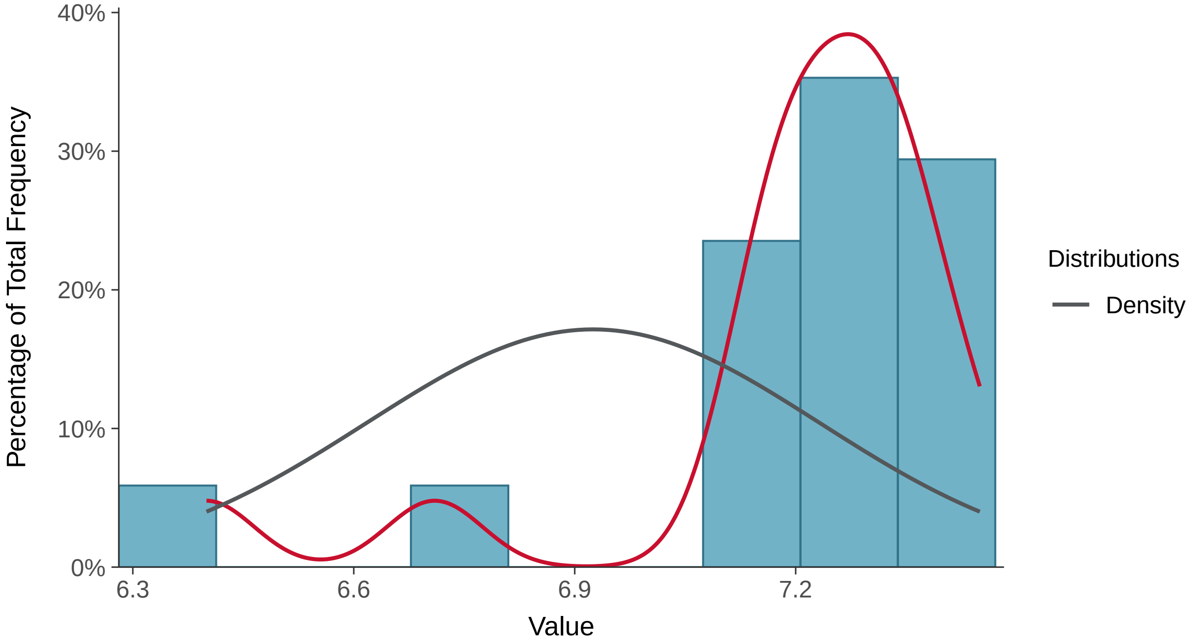
Scatter Plot

pH, Field, MW-5 (su)



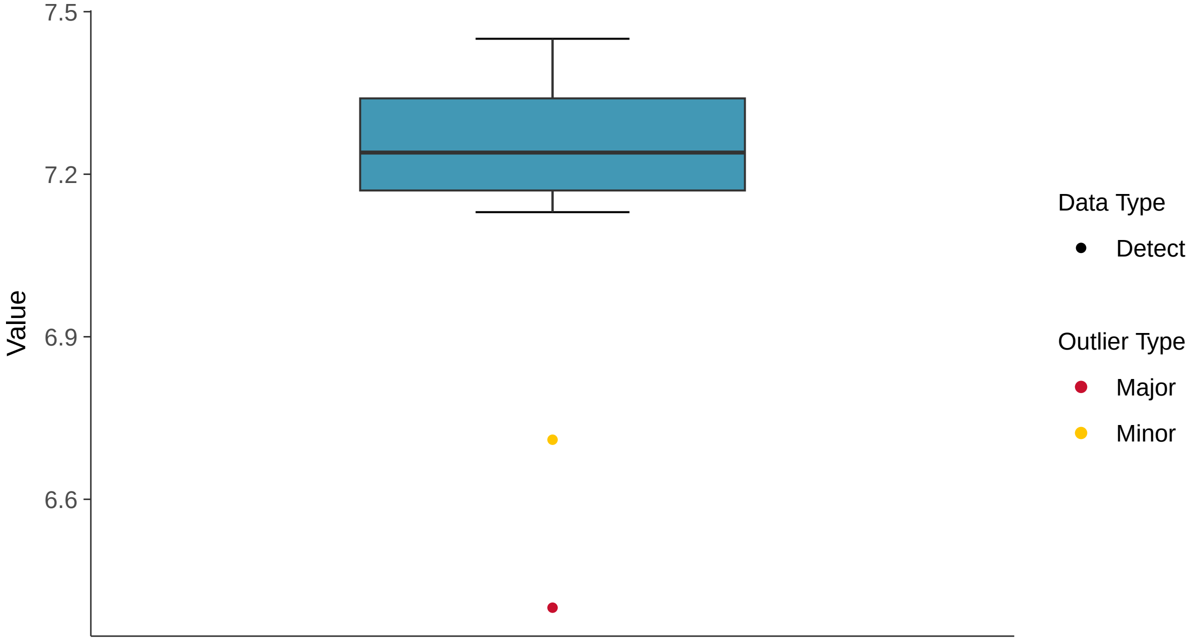
Histogram

pH, Field, MW-5 (su)



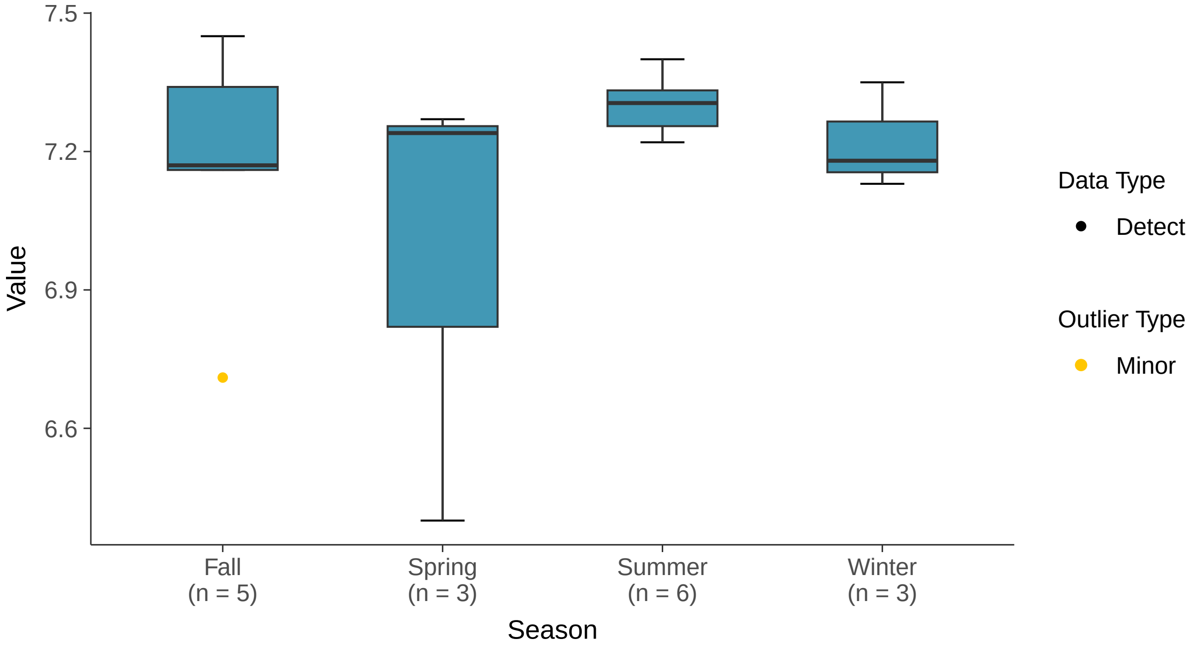
Boxplot

pH, Field, MW-5 (su)



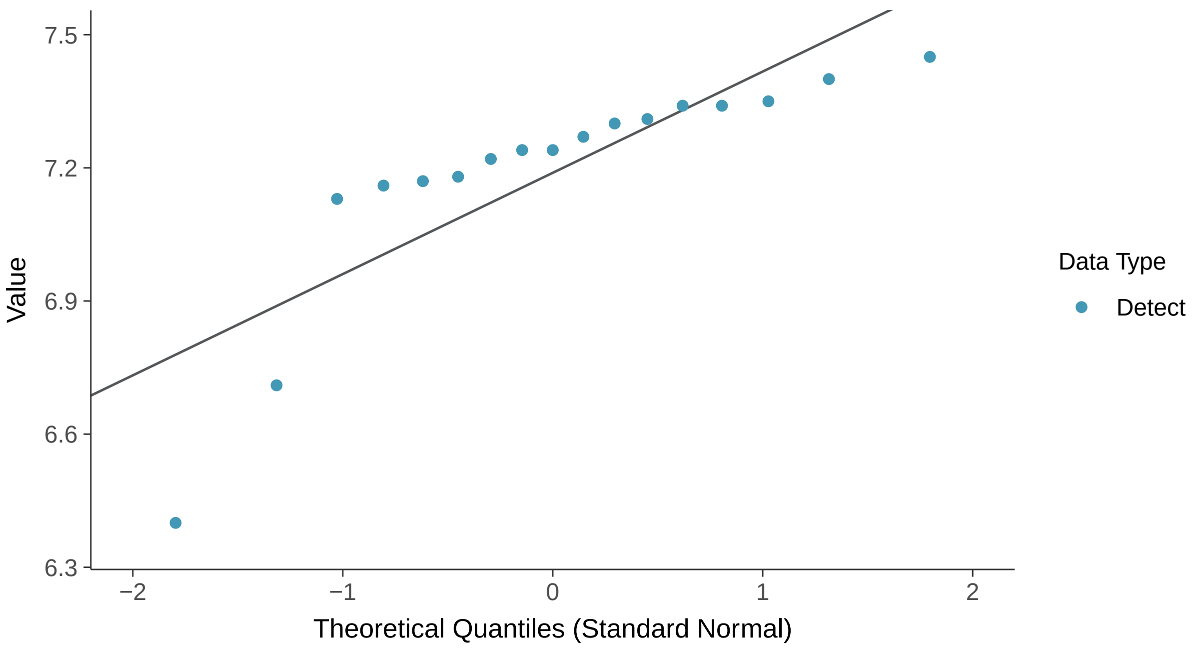
Boxplot by Season

pH, Field, MW-5 (su)



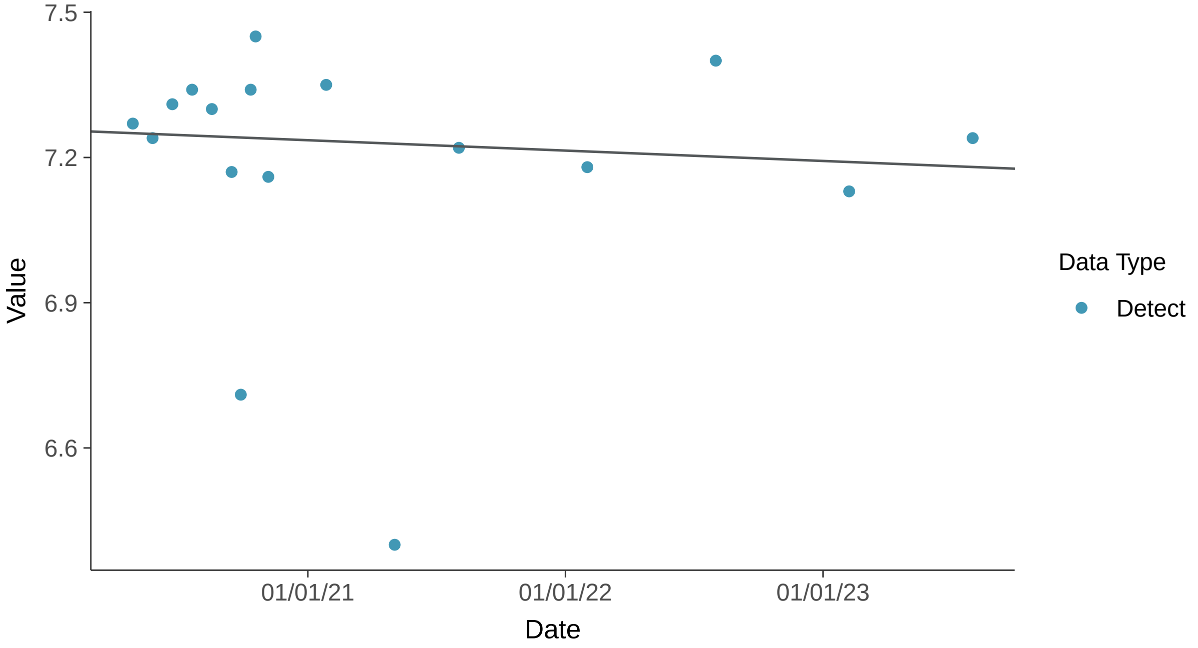
Normal Q-Q plot

pH, Field, MW-5 (su)



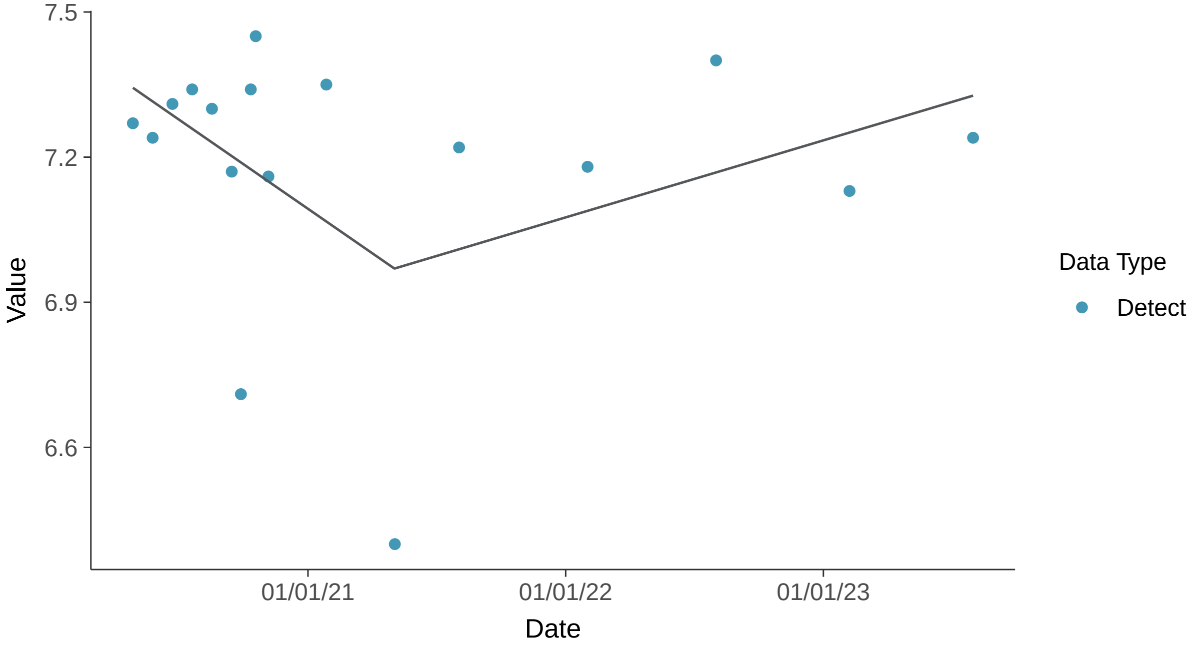
Trend Regression: Mann-Kendall/Theil-Sen Estimate

pH, Field, MW-5 (su)



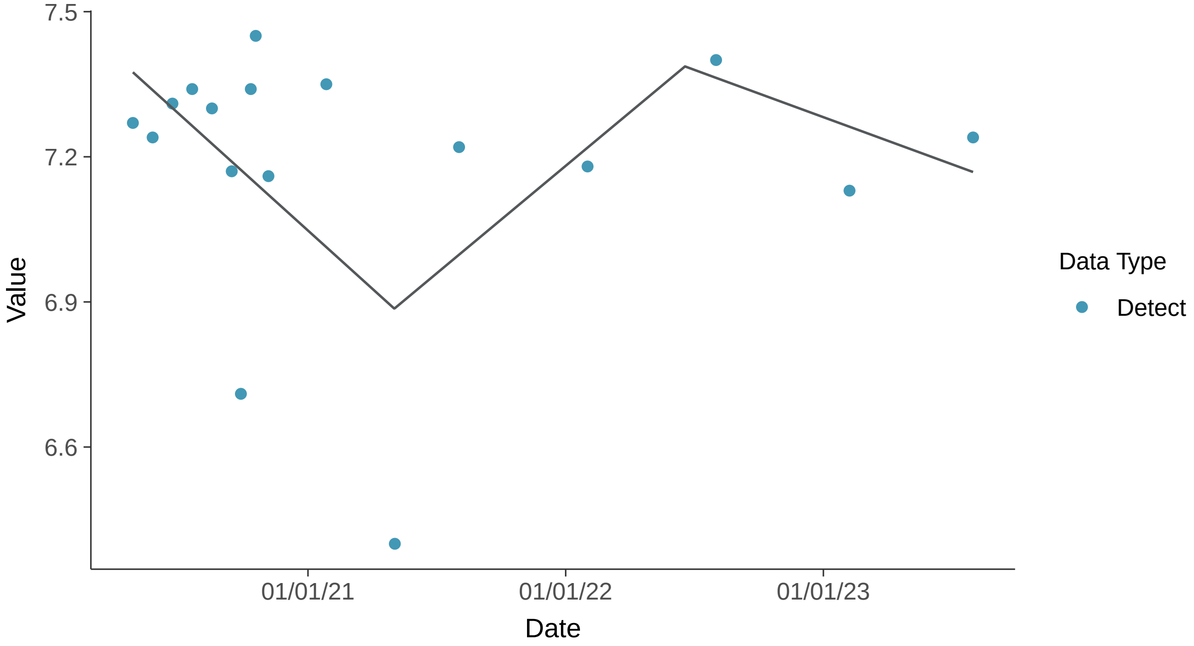
Trend Regression: Piecewise Linear-Linear

pH, Field, MW-5 (su)



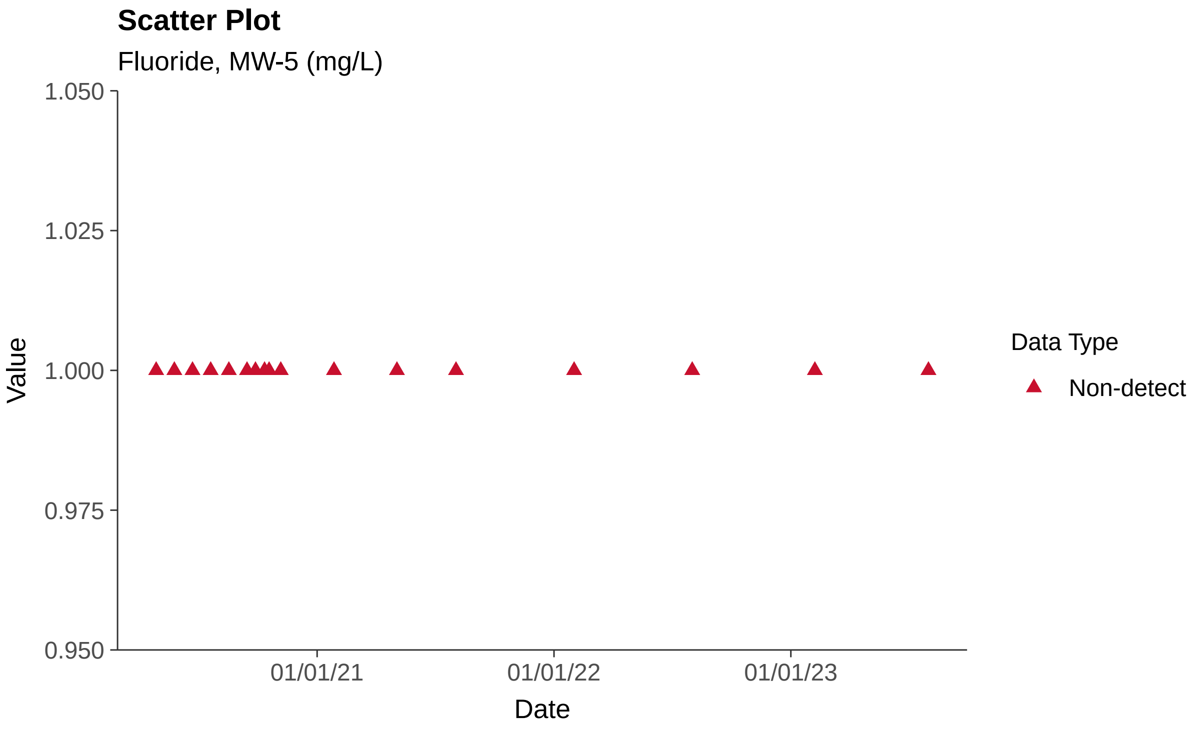
Trend Regression: Piecewise Linear-Linear-Linear

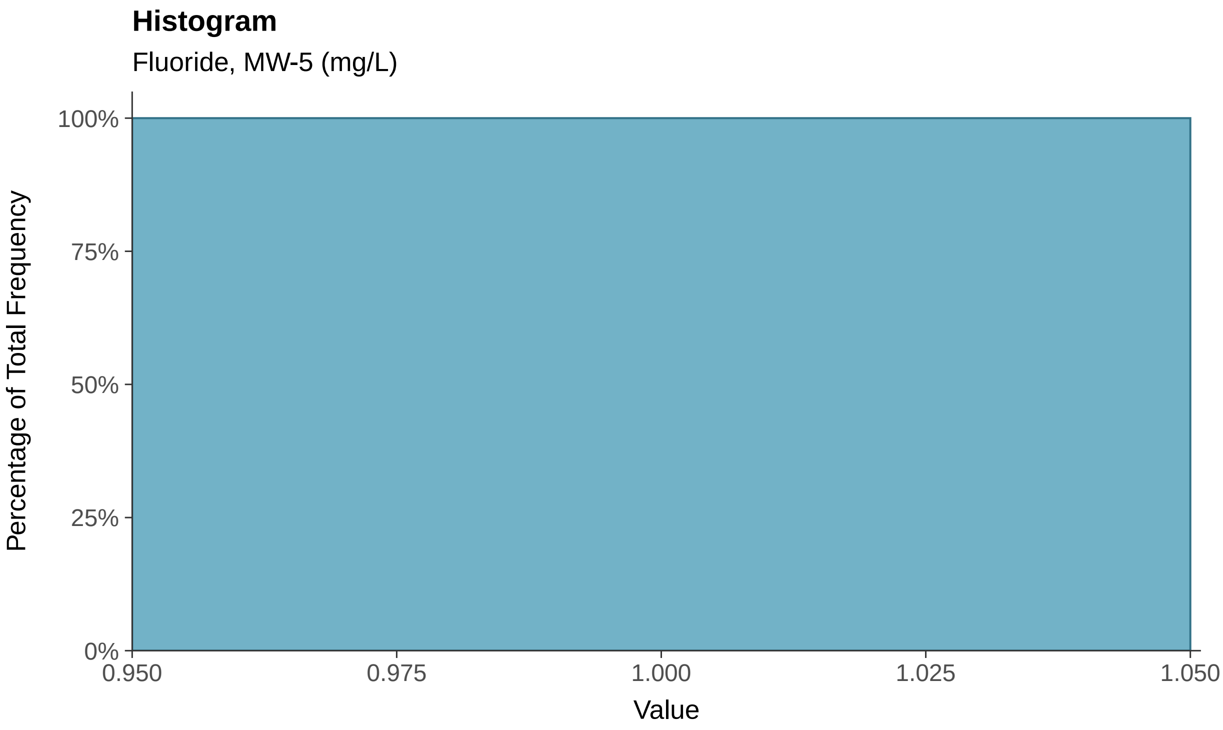
pH, Field, MW-5 (su)



Appendix IV: Fluoride, MW-5

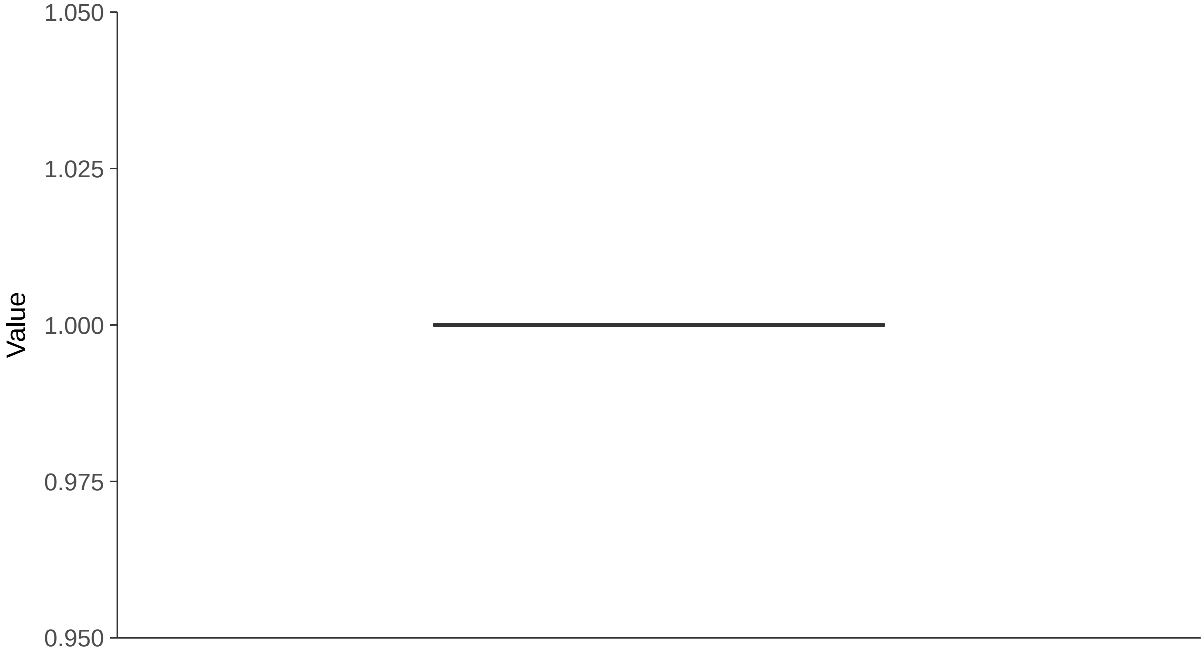
ID: 05_2_04





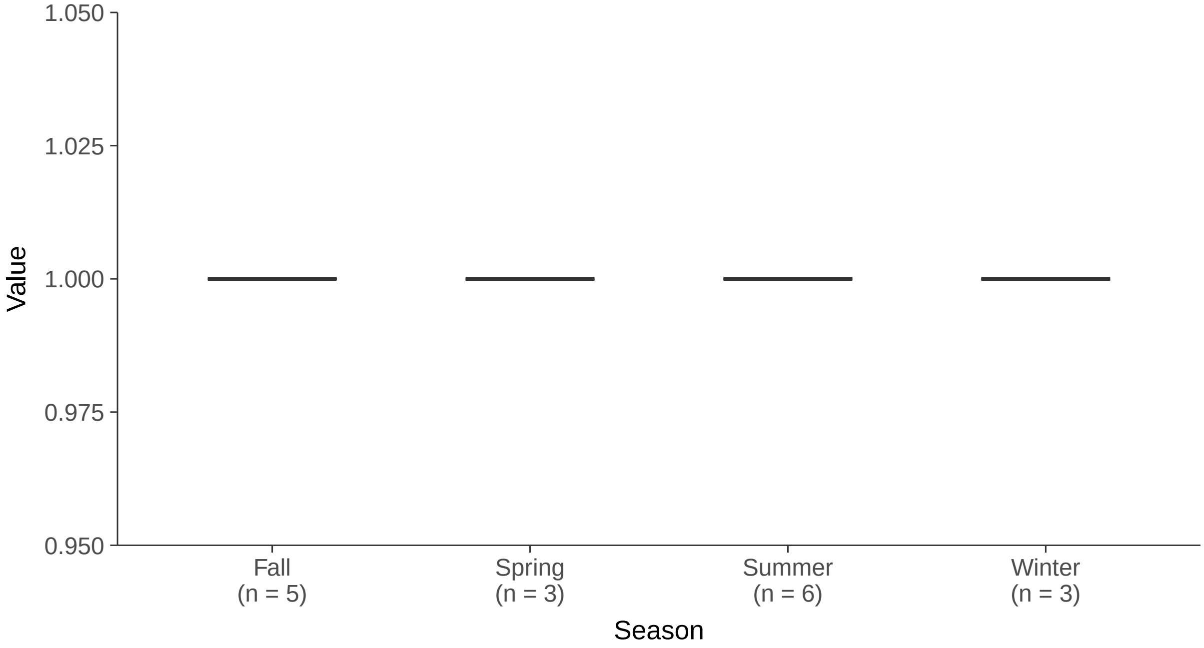
Boxplot

Fluoride, MW-5 (mg/L)



Boxplot by Season

Fluoride, MW-5 (mg/L)

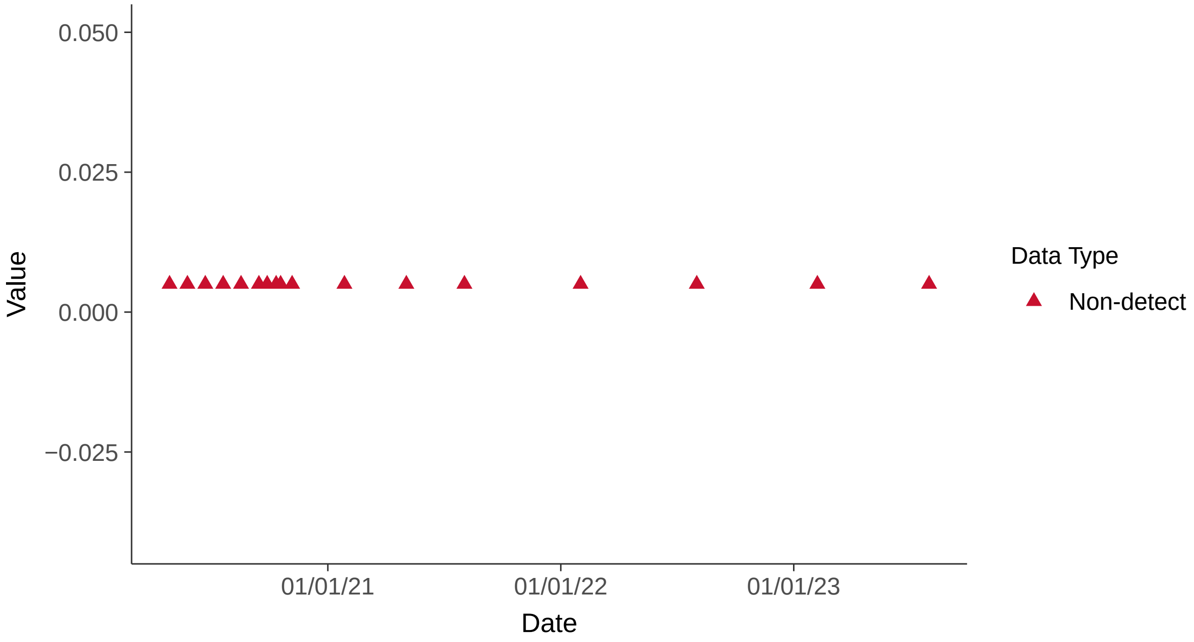


Appendix IV: Antimony, MW-5

ID: 05_2_08

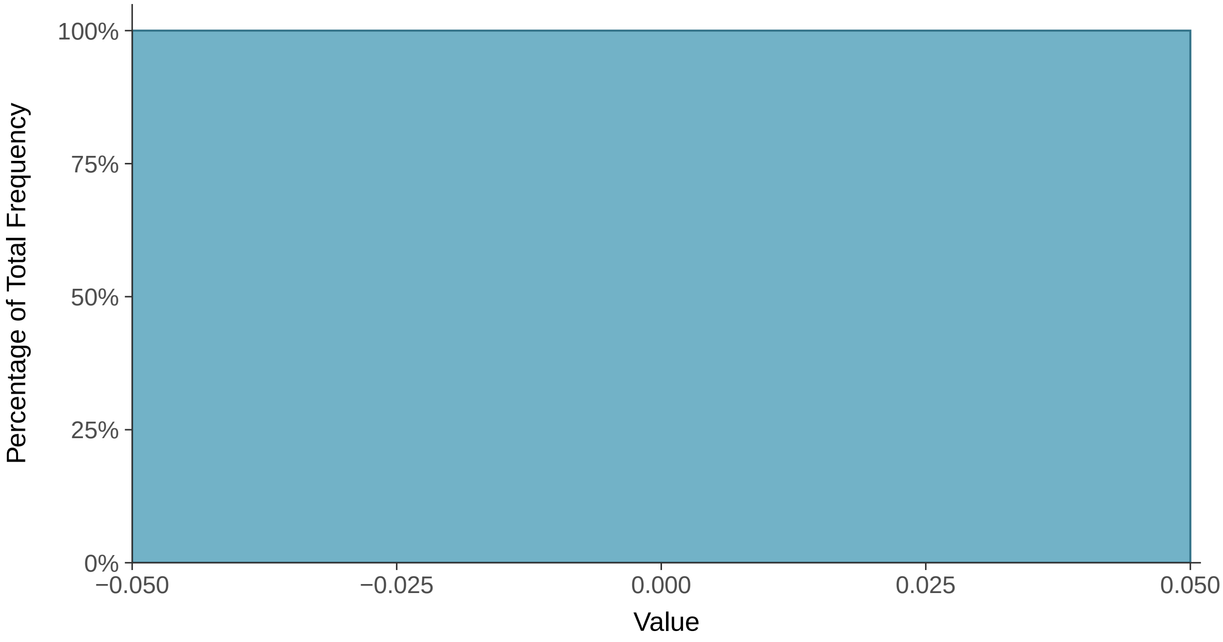
Scatter Plot

Antimony, MW-5 (mg/L)



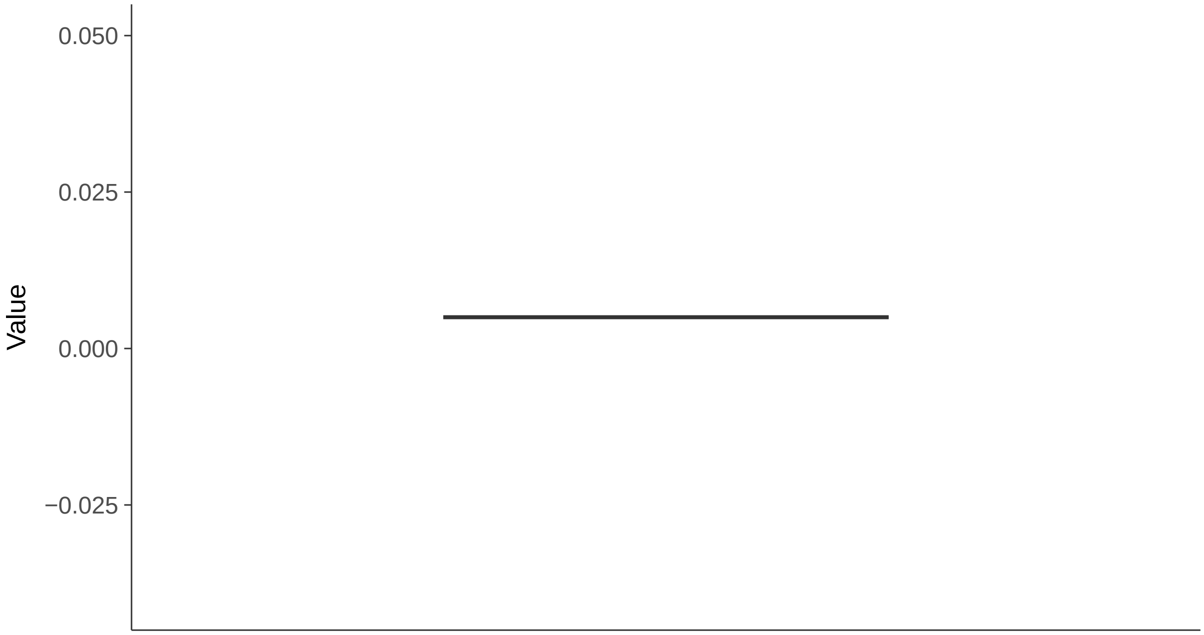
Histogram

Antimony, MW-5 (mg/L)



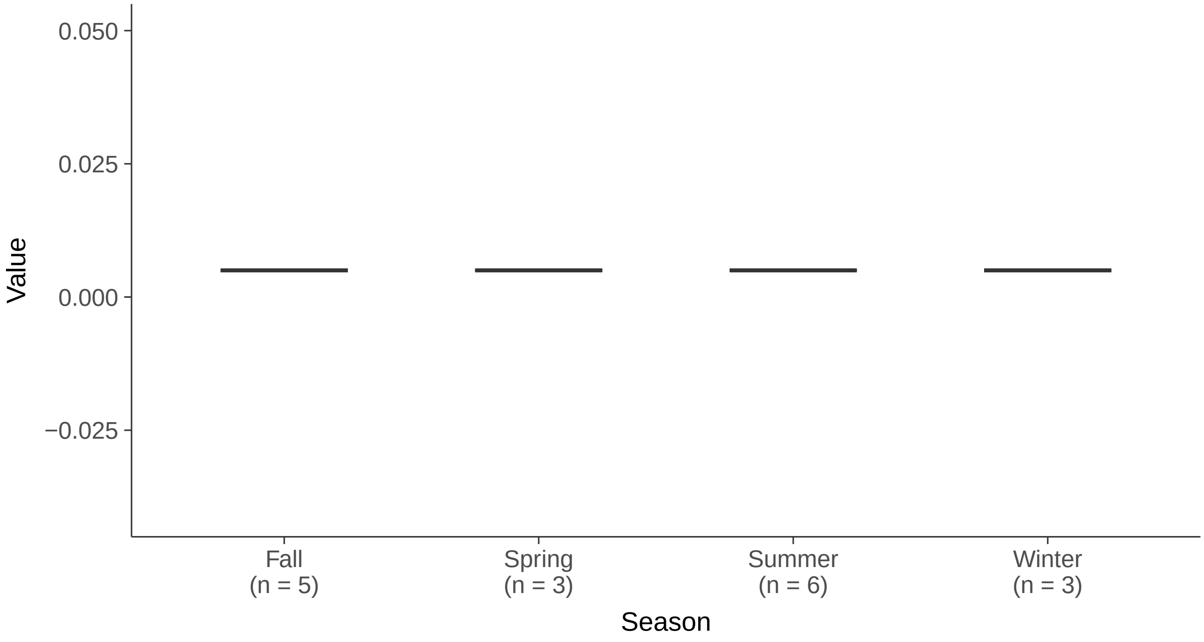
Boxplot

Antimony, MW-5 (mg/L)



Boxplot by Season

Antimony, MW-5 (mg/L)

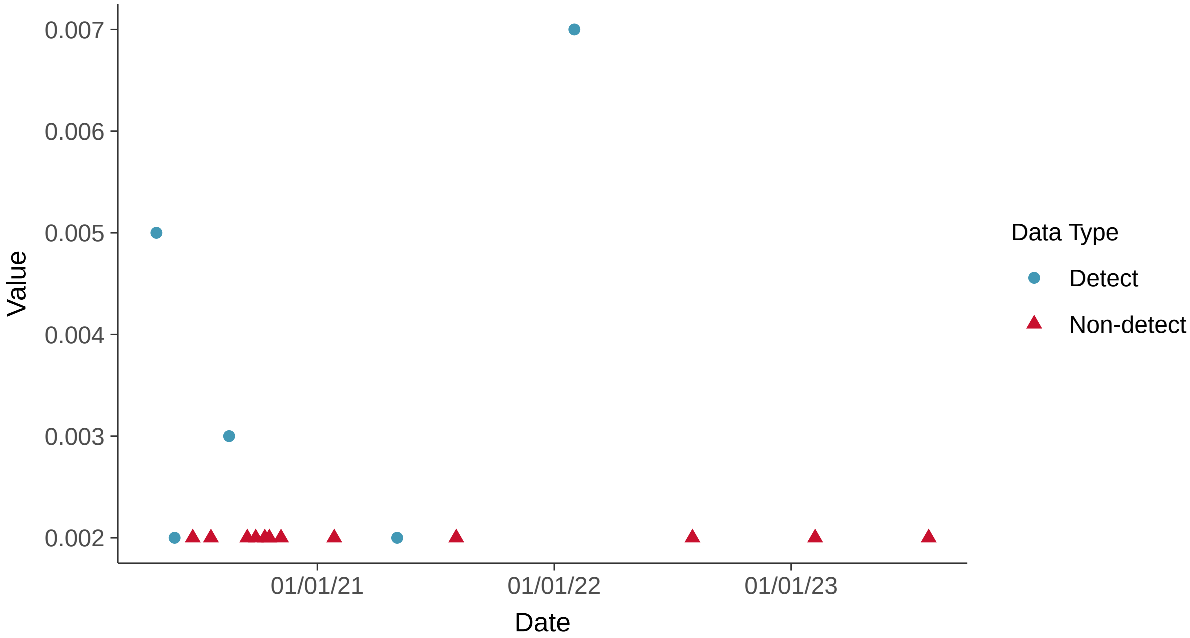


Appendix IV: Arsenic, MW-5

ID: 05_2_09

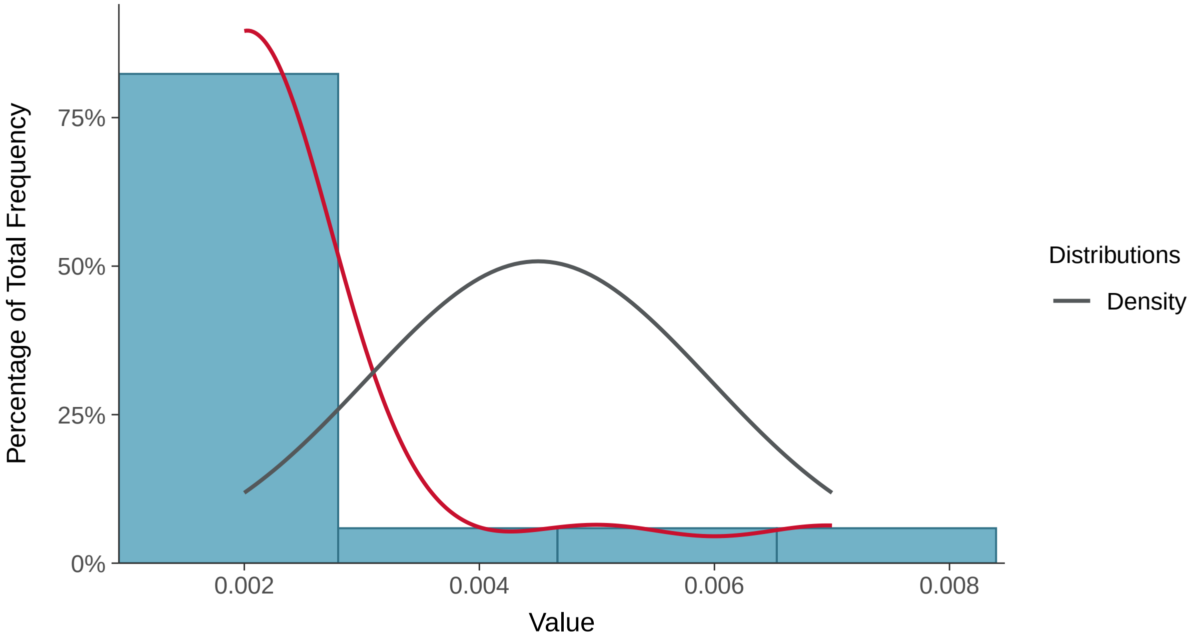
Scatter Plot

Arsenic, MW-5 (mg/L)



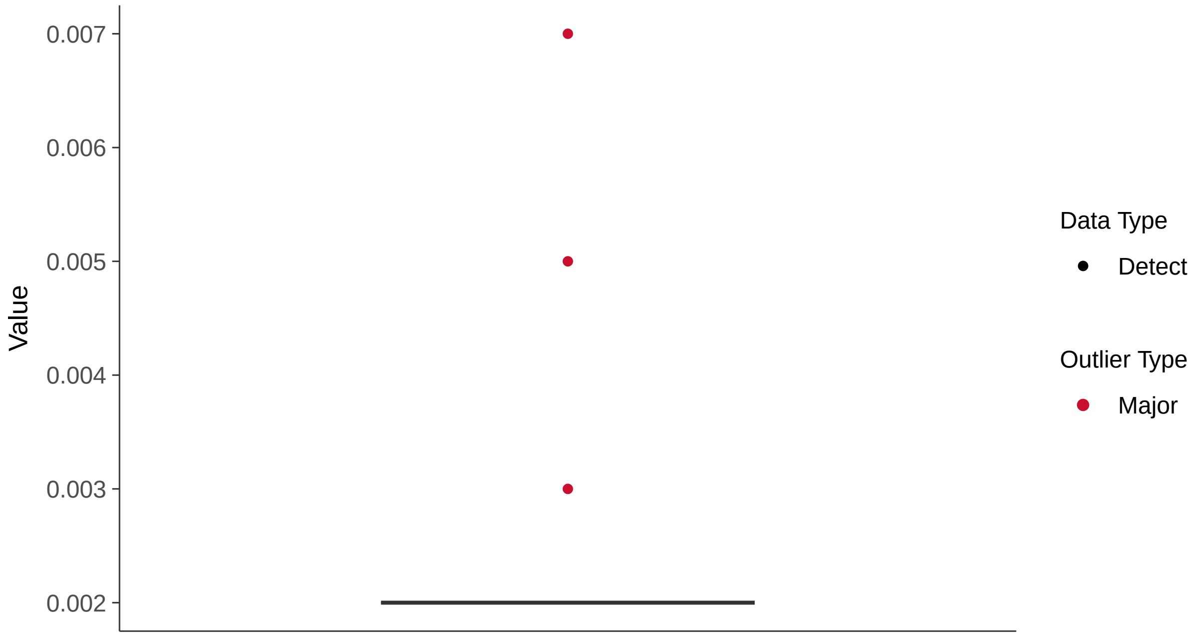
Histogram

Arsenic, MW-5 (mg/L)



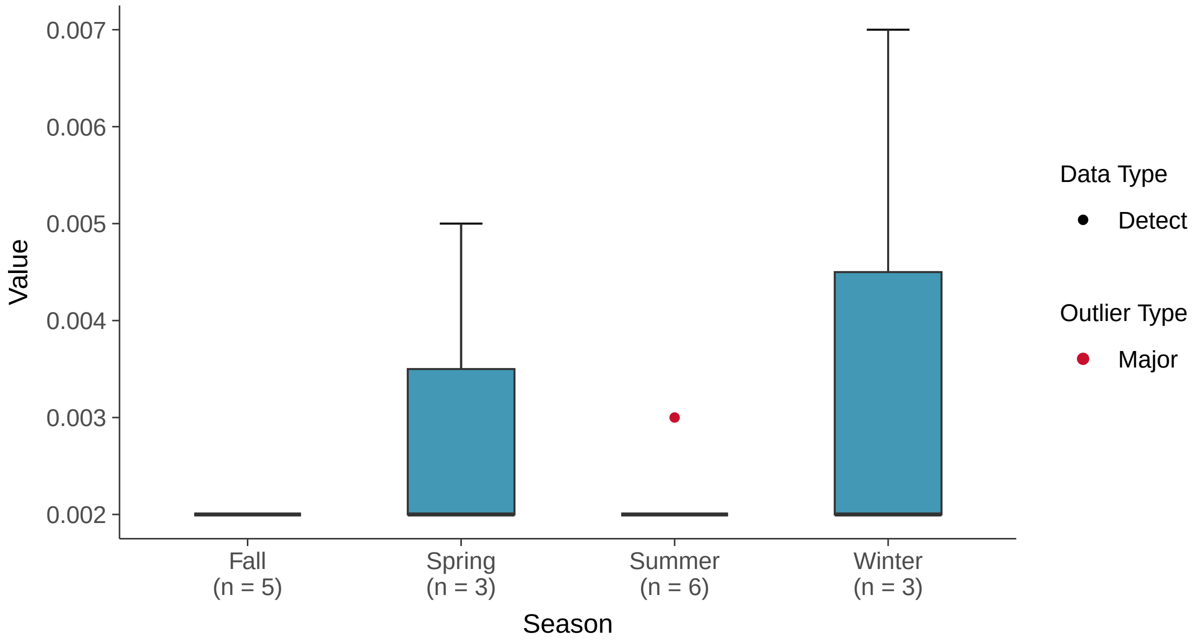
Boxplot

Arsenic, MW-5 (mg/L)



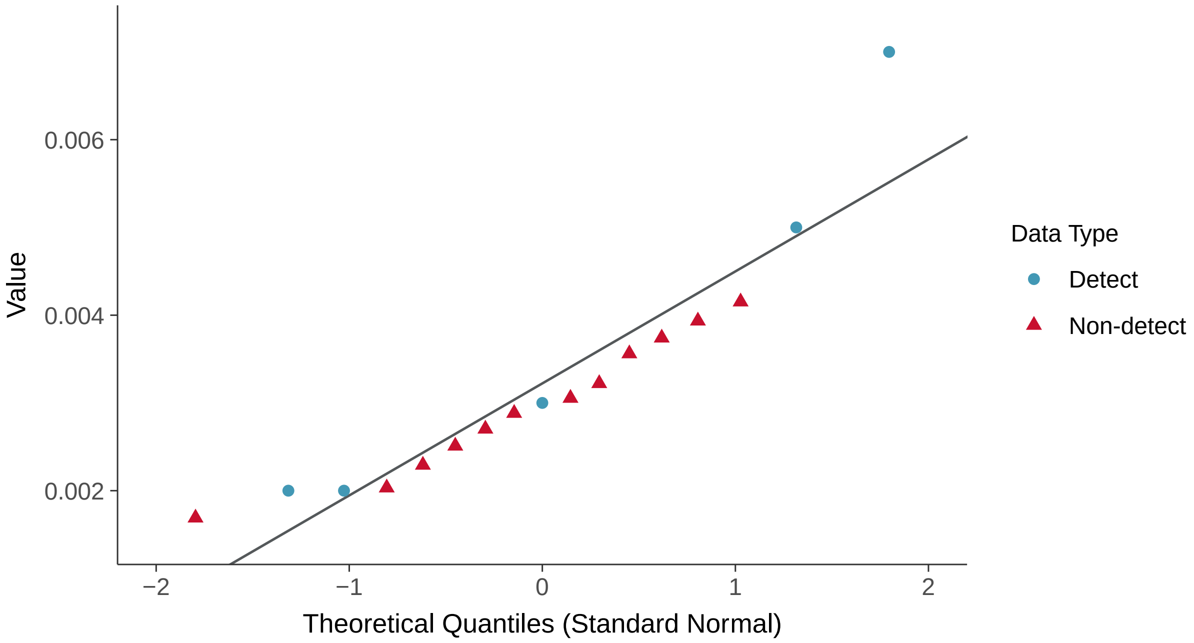
Boxplot by Season

Arsenic, MW-5 (mg/L)



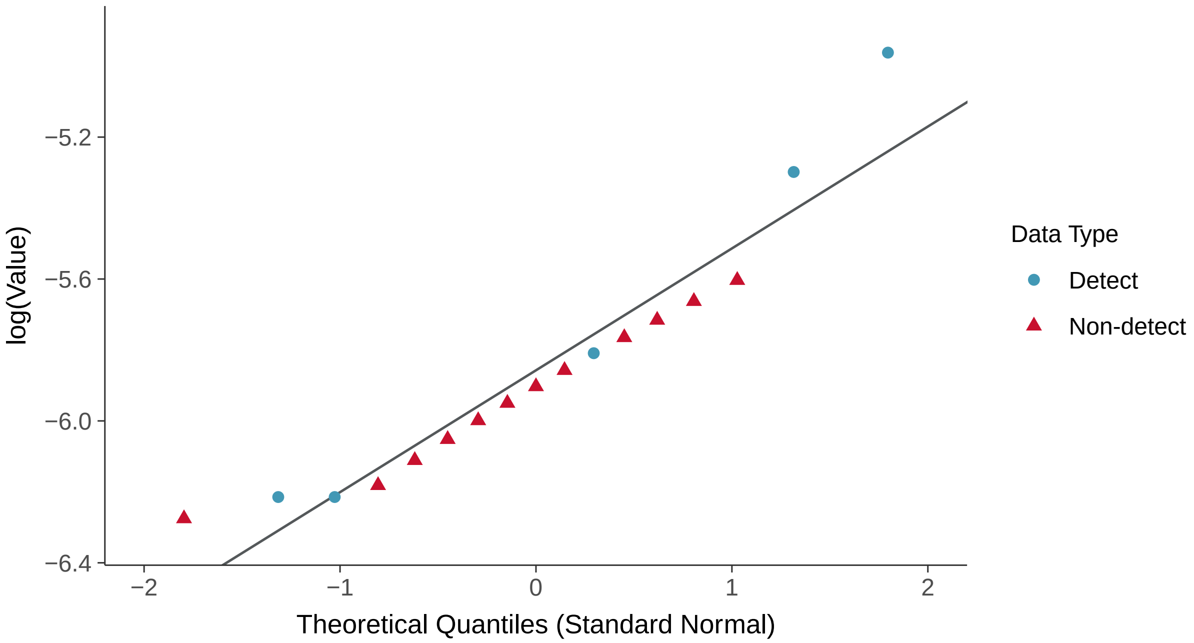
Normal Q-Q plot using ROS Imputed Estimates

Arsenic, MW-5 (mg/L)



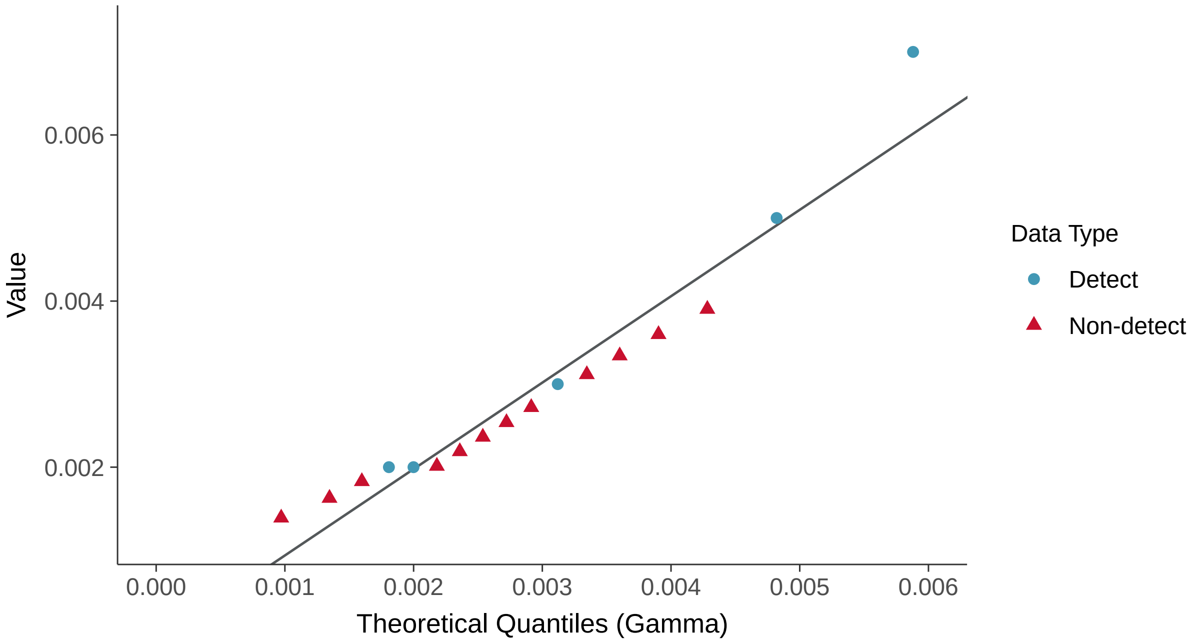
Lognormal Q-Q plot using ROS Imputed Estimates

Arsenic, MW-5 (mg/L)



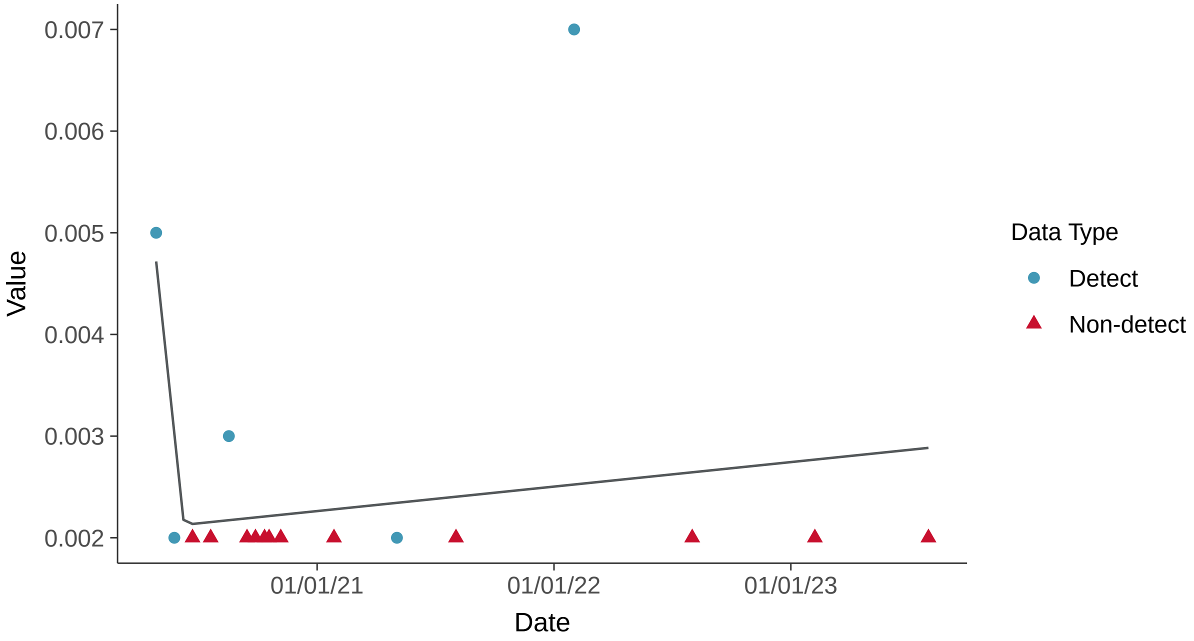
Gamma Q-Q plot using ROS Imputed Estimates

Arsenic, MW-5 (mg/L)



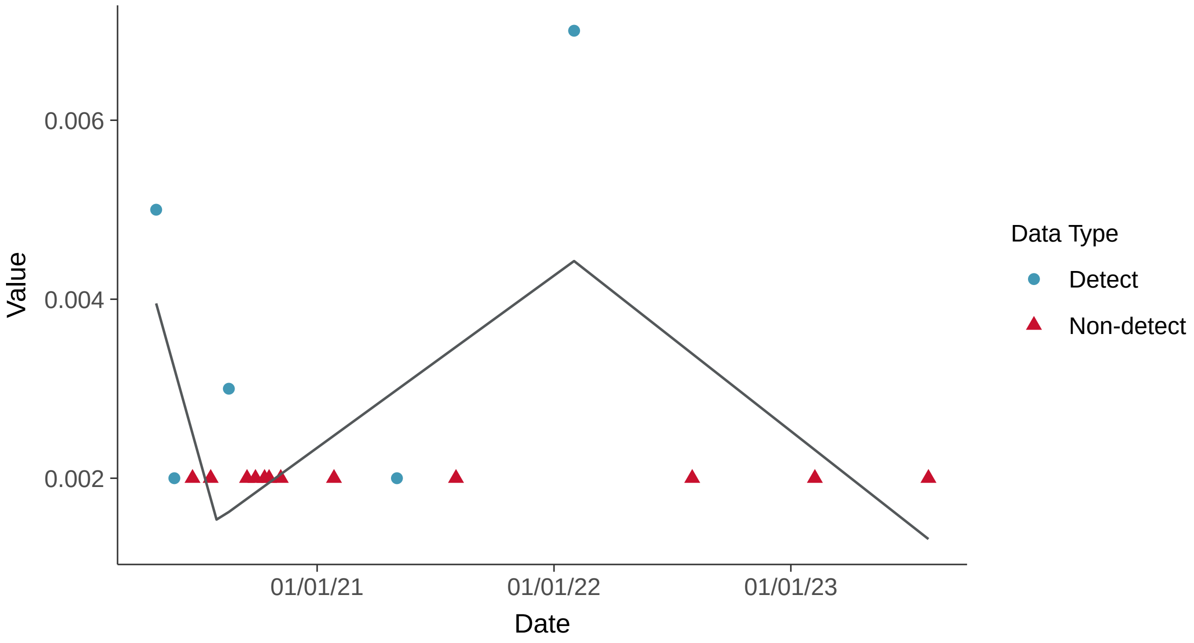
Trend Regression: Piecewise Linear-Linear

Arsenic, MW-5 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Arsenic, MW-5 (mg/L)

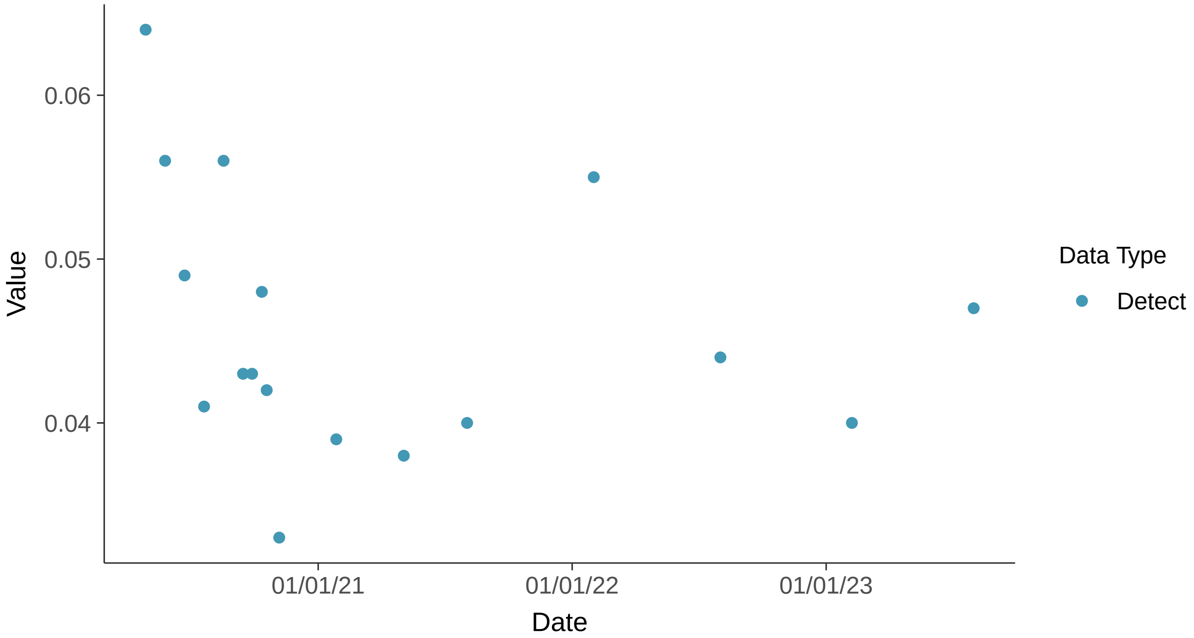


Appendix IV: Barium, MW-5

ID: 05_2_10

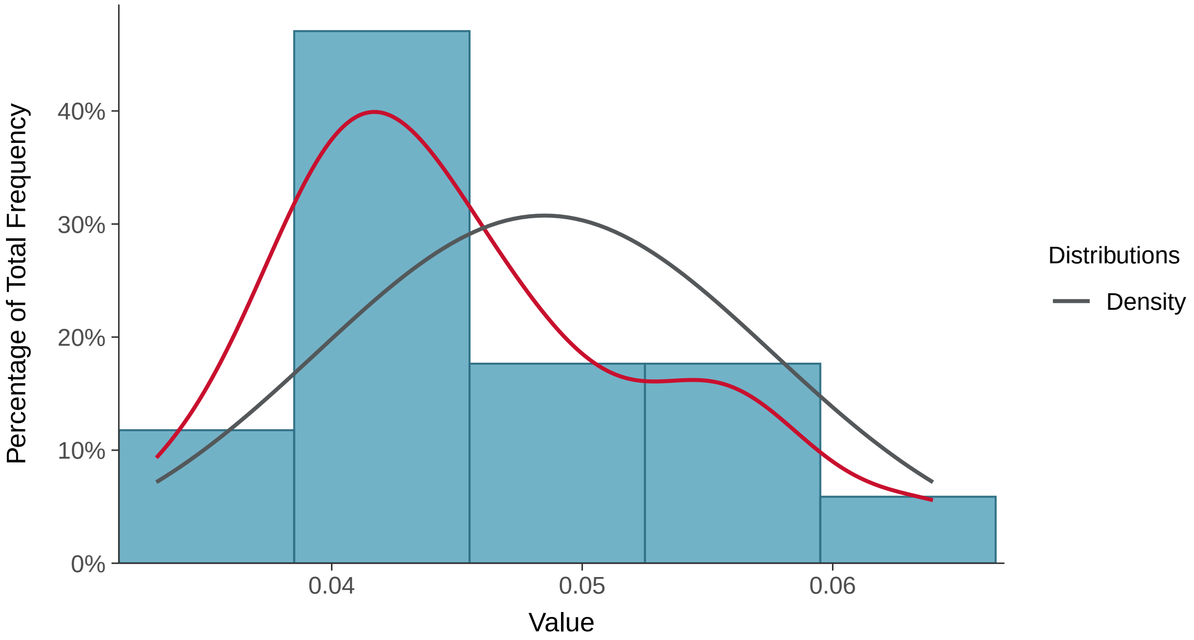
Scatter Plot

Barium, MW-5 (mg/L)



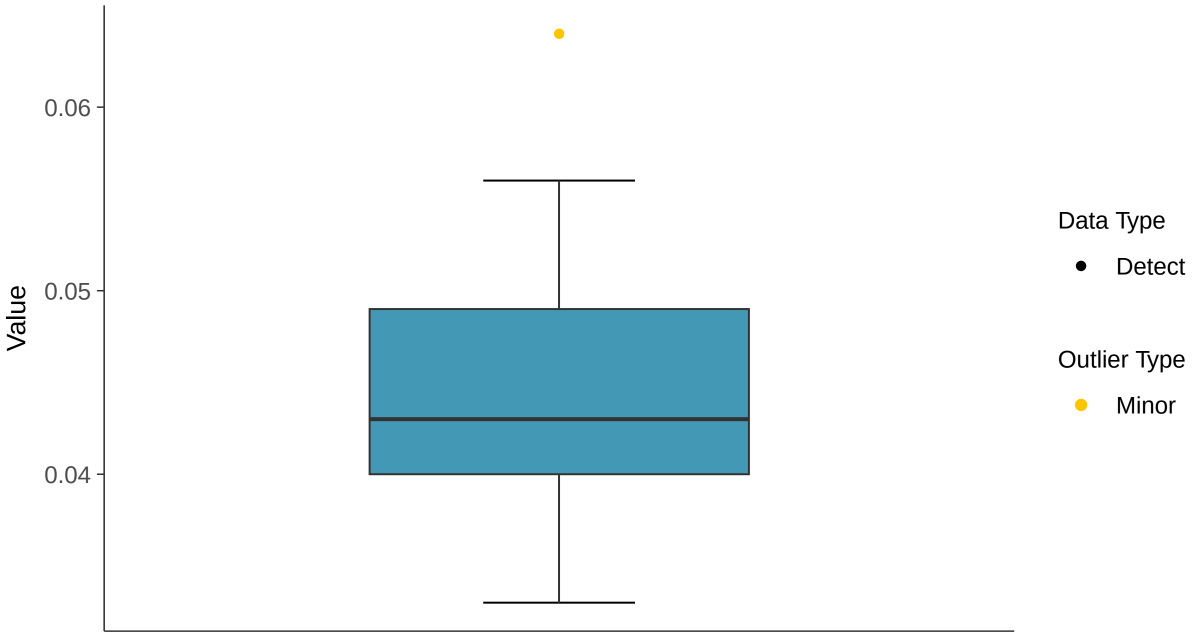
Histogram

Barium, MW-5 (mg/L)



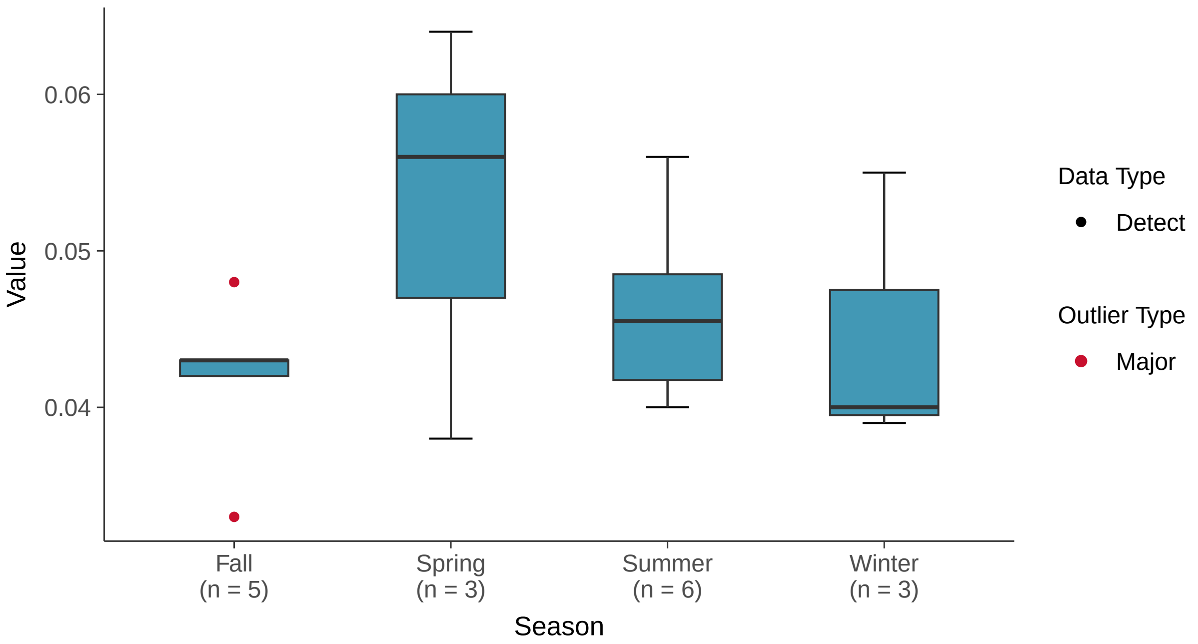
Boxplot

Barium, MW-5 (mg/L)



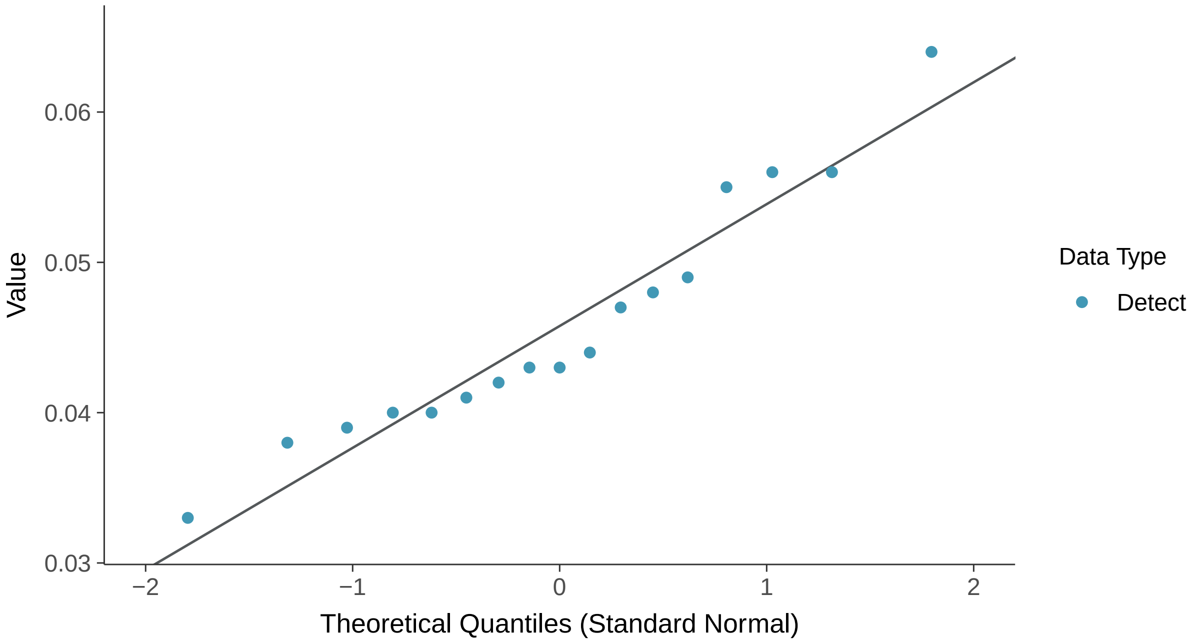
Boxplot by Season

Barium, MW-5 (mg/L)



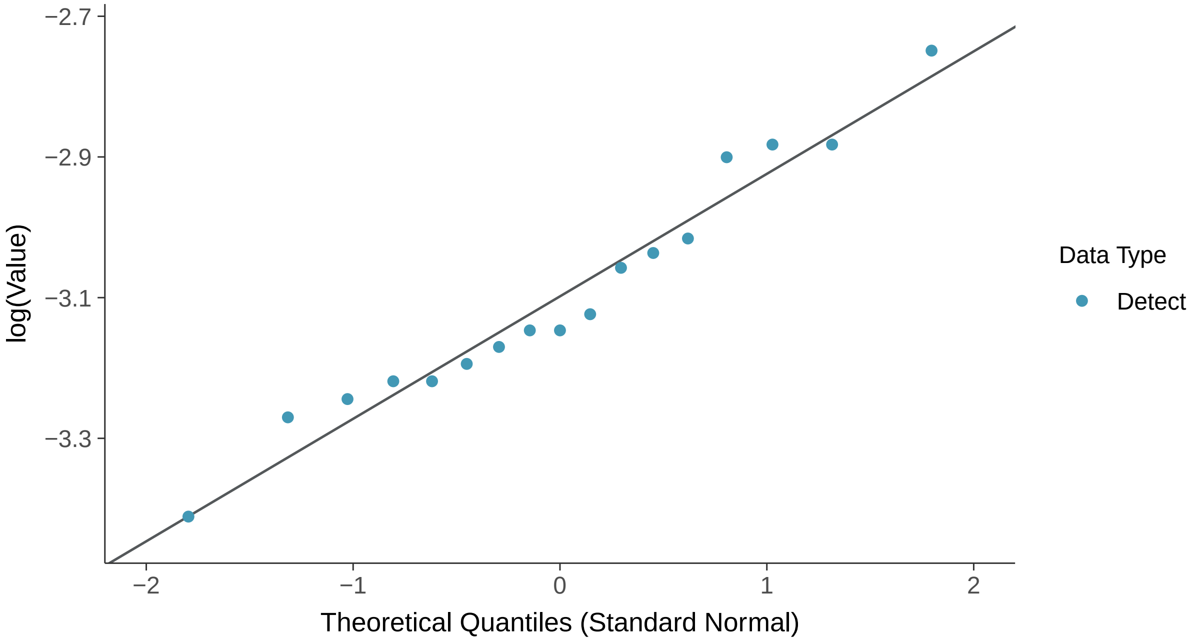
Normal Q-Q plot

Barium, MW-5 (mg/L)



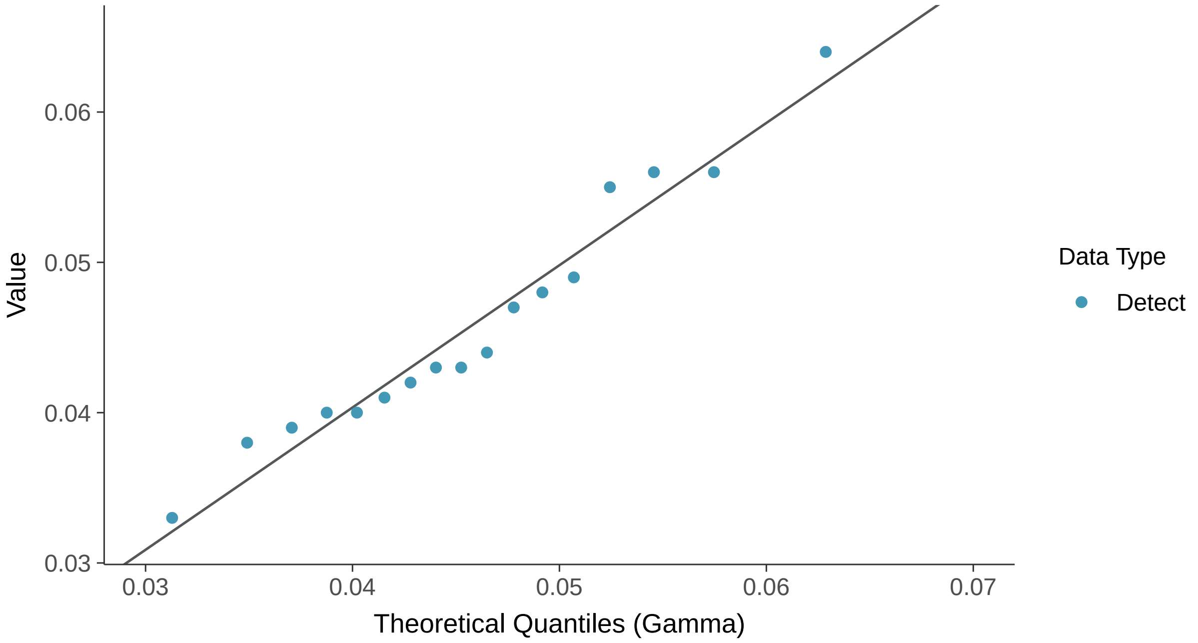
Lognormal Q-Q plot

Barium, MW-5 (mg/L)



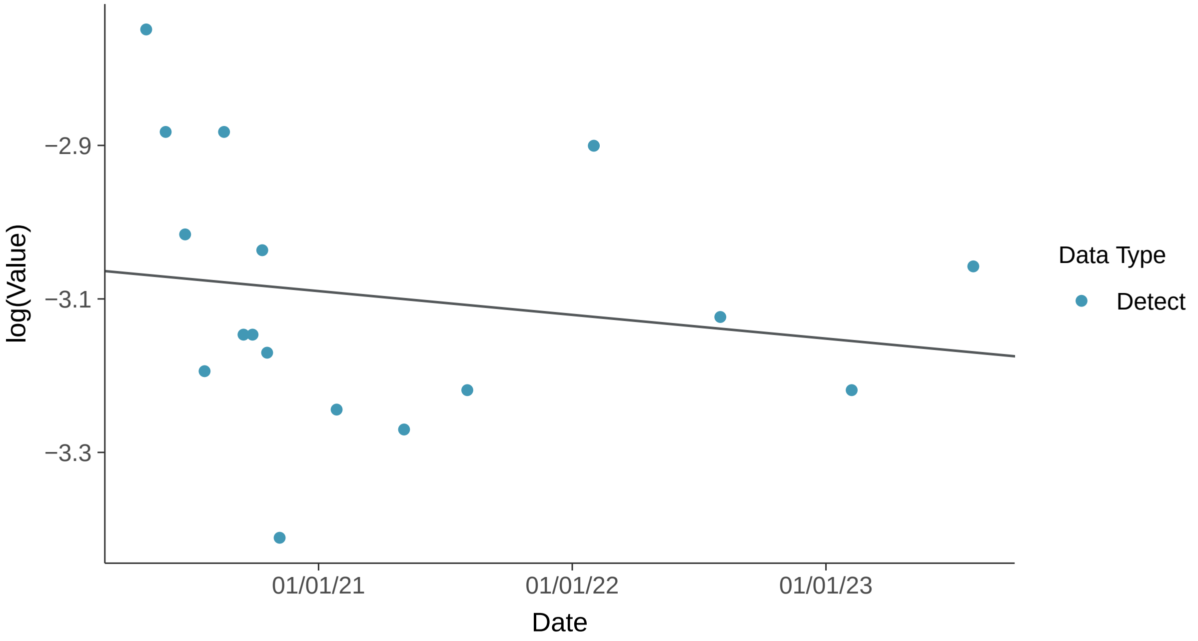
Gamma Q-Q plot

Barium, MW-5 (mg/L)



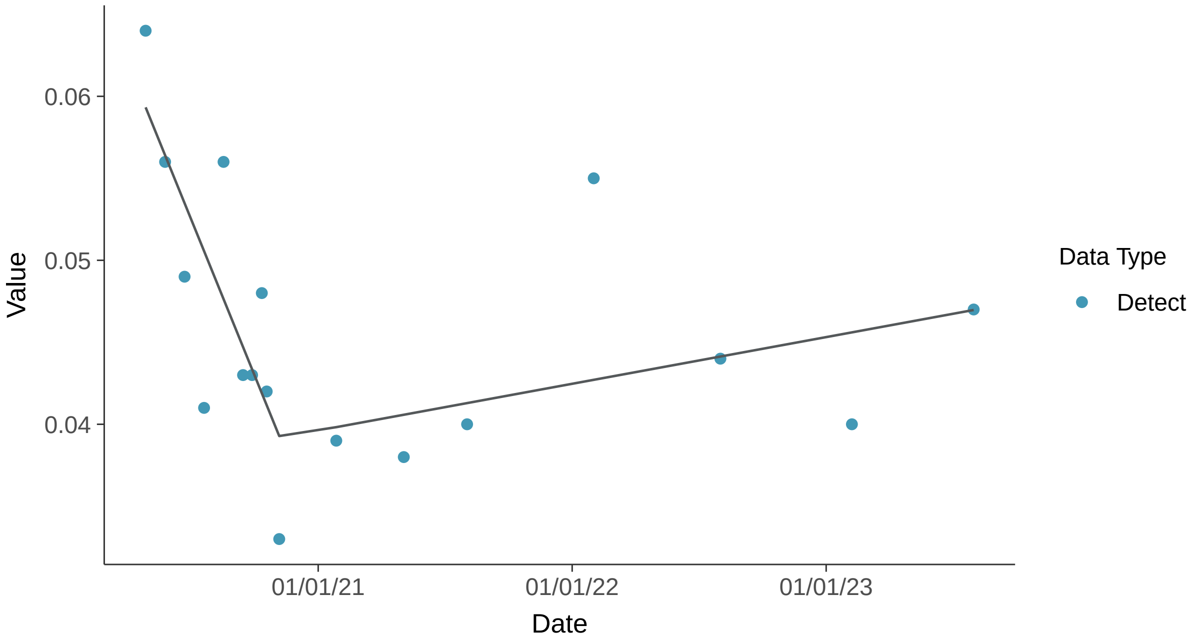
Trend Regression: Lognormal MLE

Barium, MW-5 (mg/L)



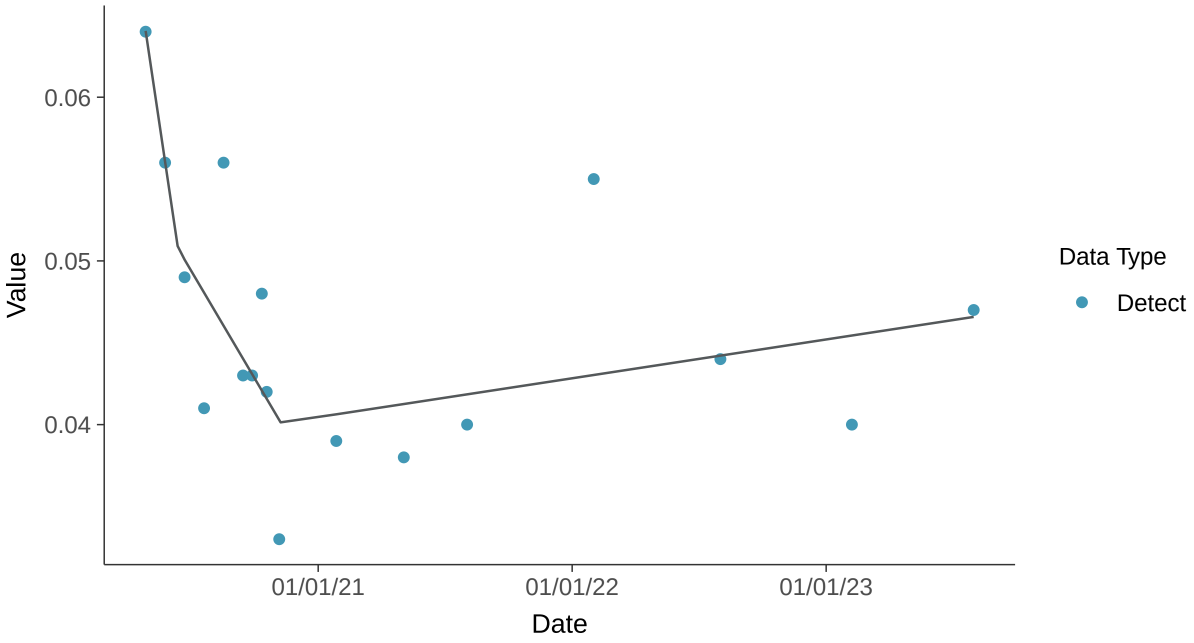
Trend Regression: Piecewise Linear-Linear

Barium, MW-5 (mg/L)



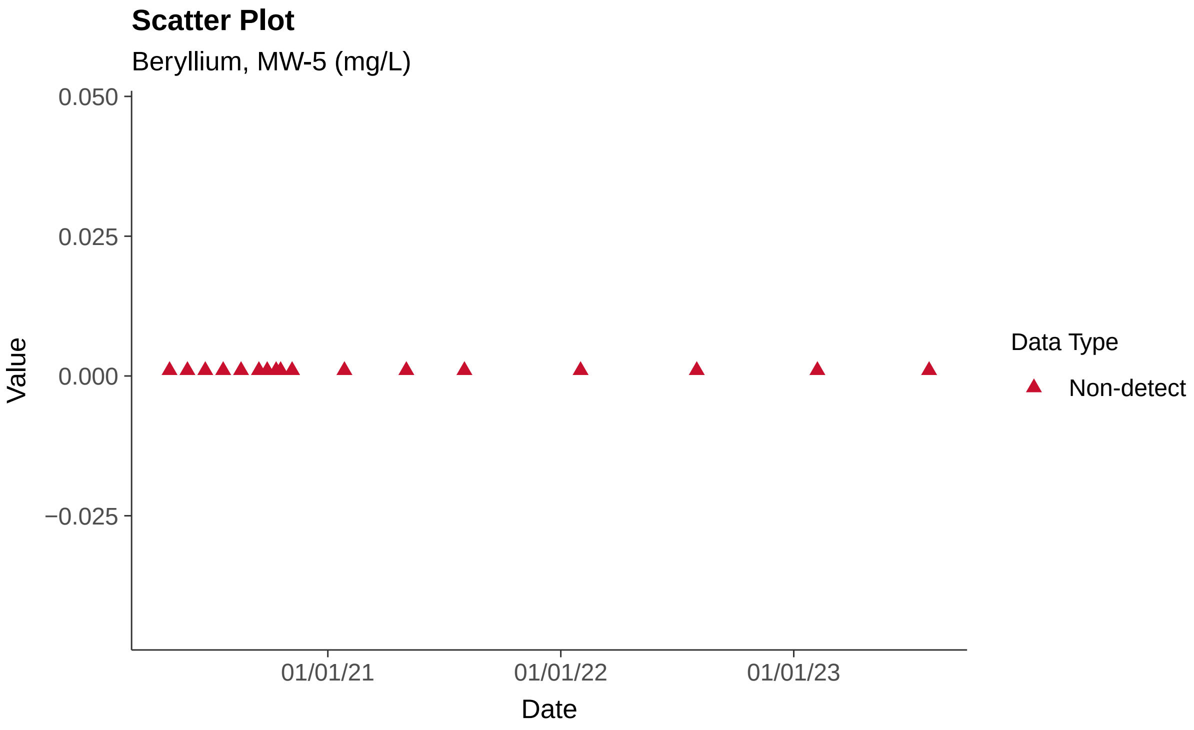
Trend Regression: Piecewise Linear-Linear-Linear

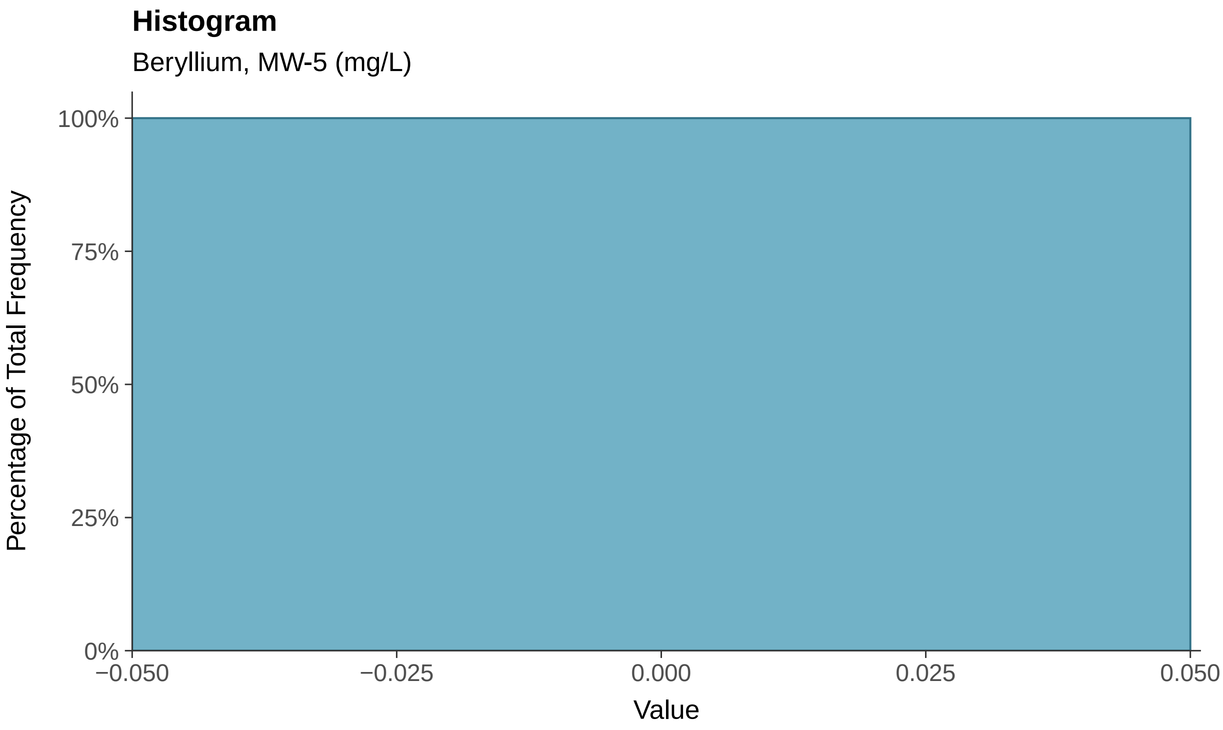
Barium, MW-5 (mg/L)



Appendix IV: Beryllium, MW-5

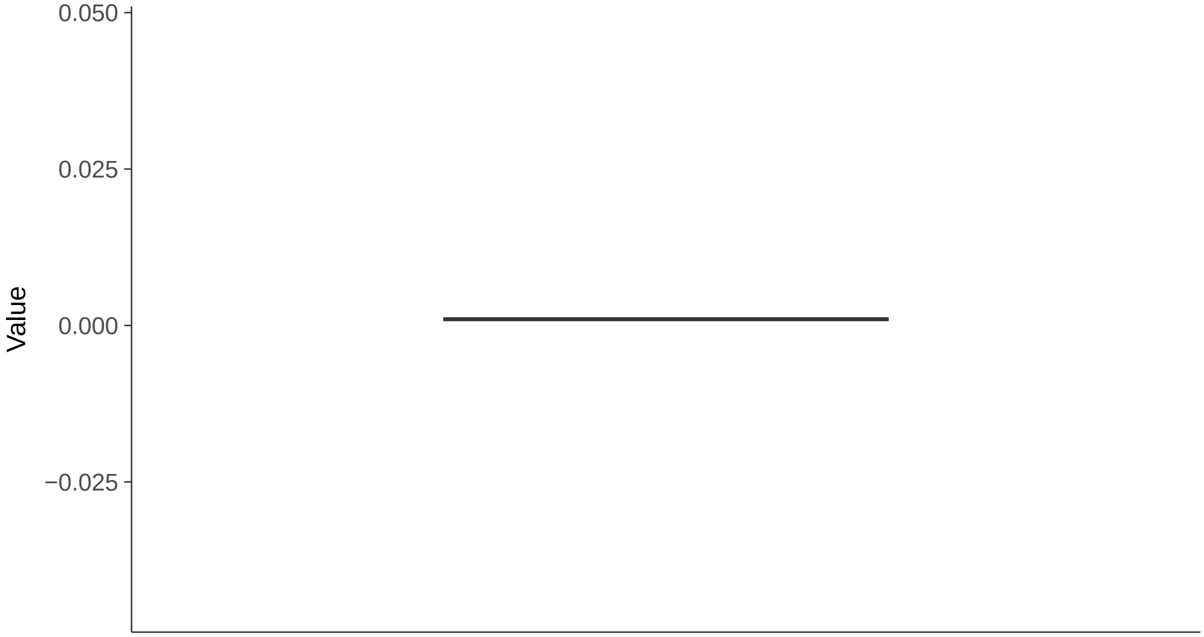
ID: 05_2_11





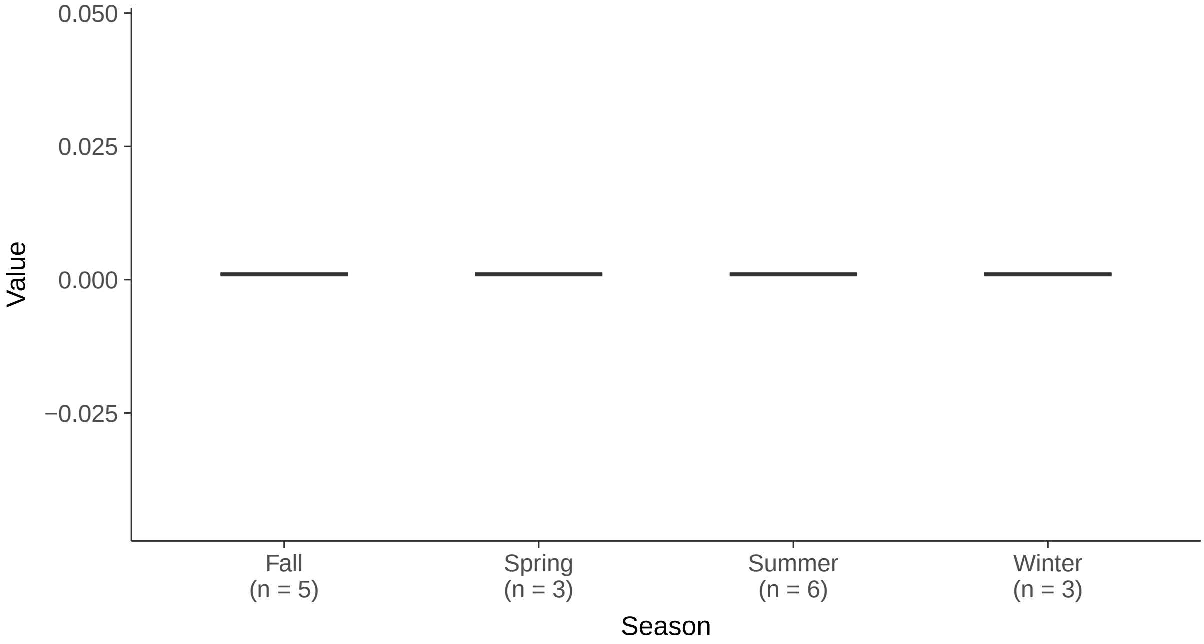
Boxplot

Beryllium, MW-5 (mg/L)



Boxplot by Season

Beryllium, MW-5 (mg/L)

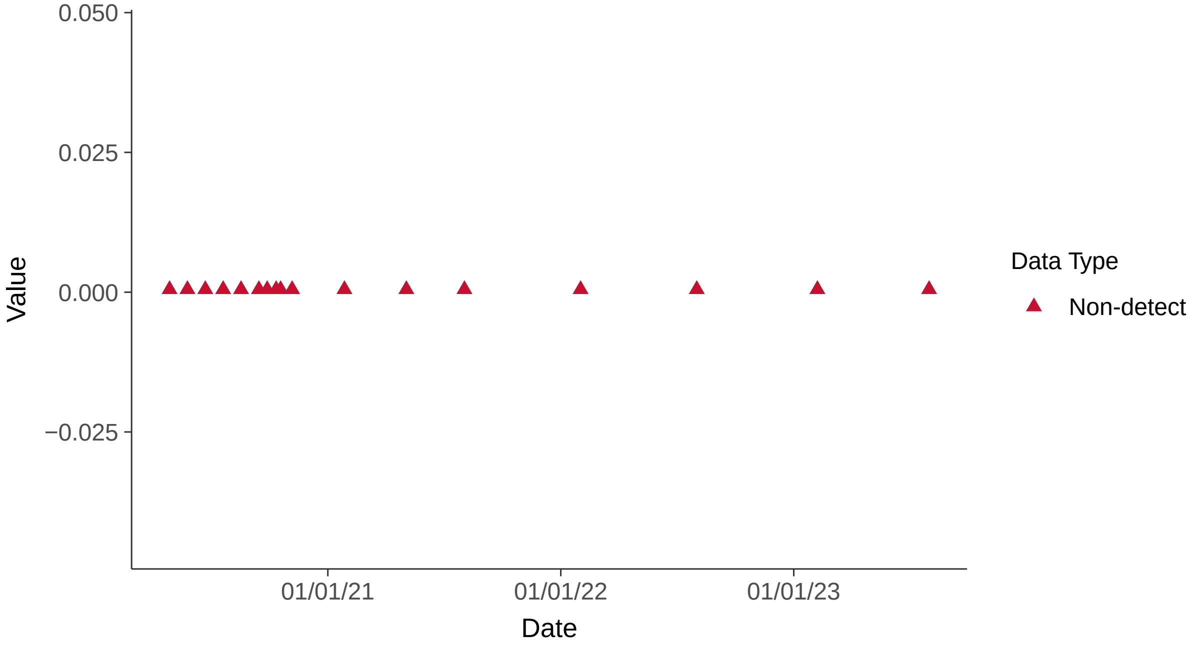


Appendix IV: Cadmium, MW-5

ID: 05_2_12

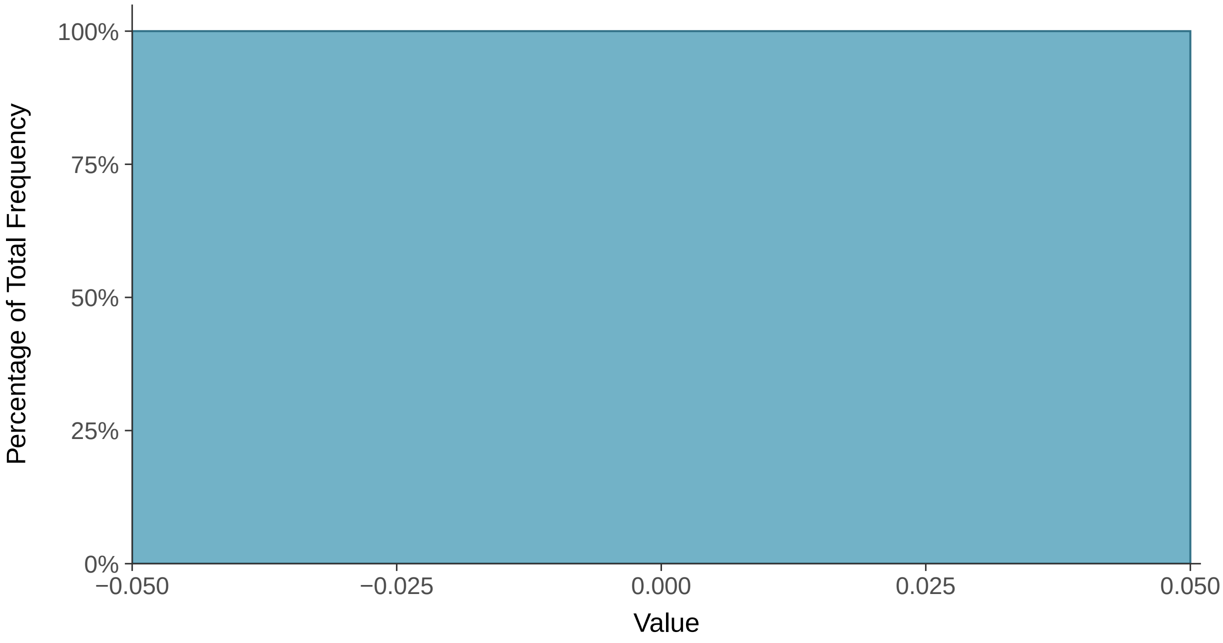
Scatter Plot

Cadmium, MW-5 (mg/L)



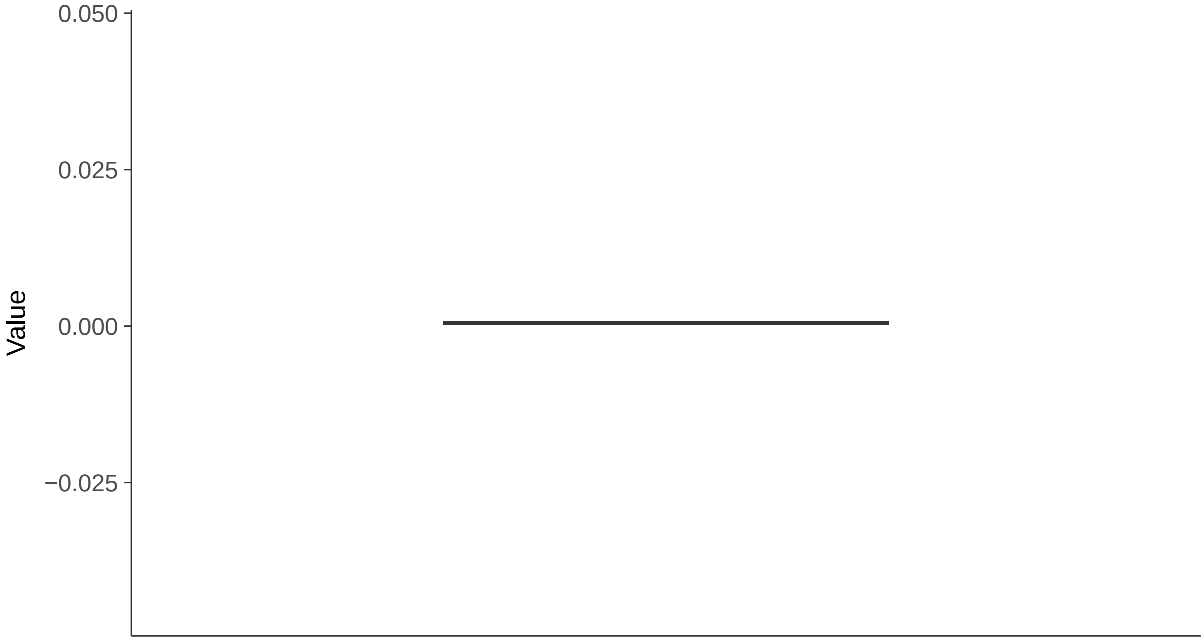
Histogram

Cadmium, MW-5 (mg/L)



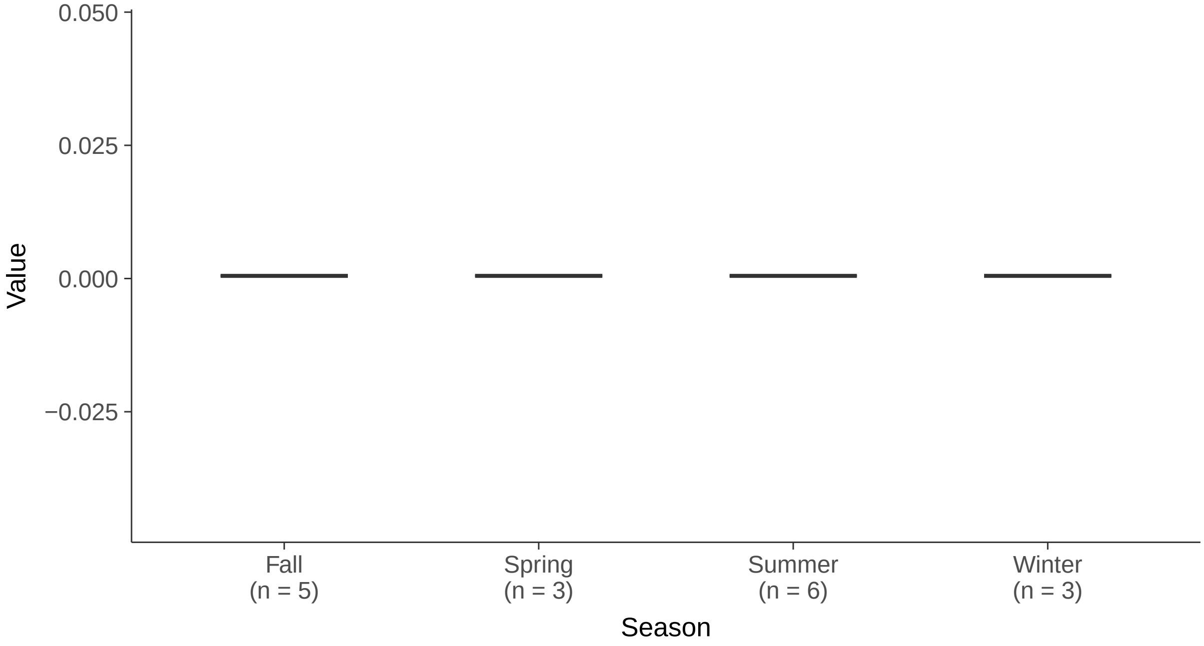
Boxplot

Cadmium, MW-5 (mg/L)



Boxplot by Season

Cadmium, MW-5 (mg/L)

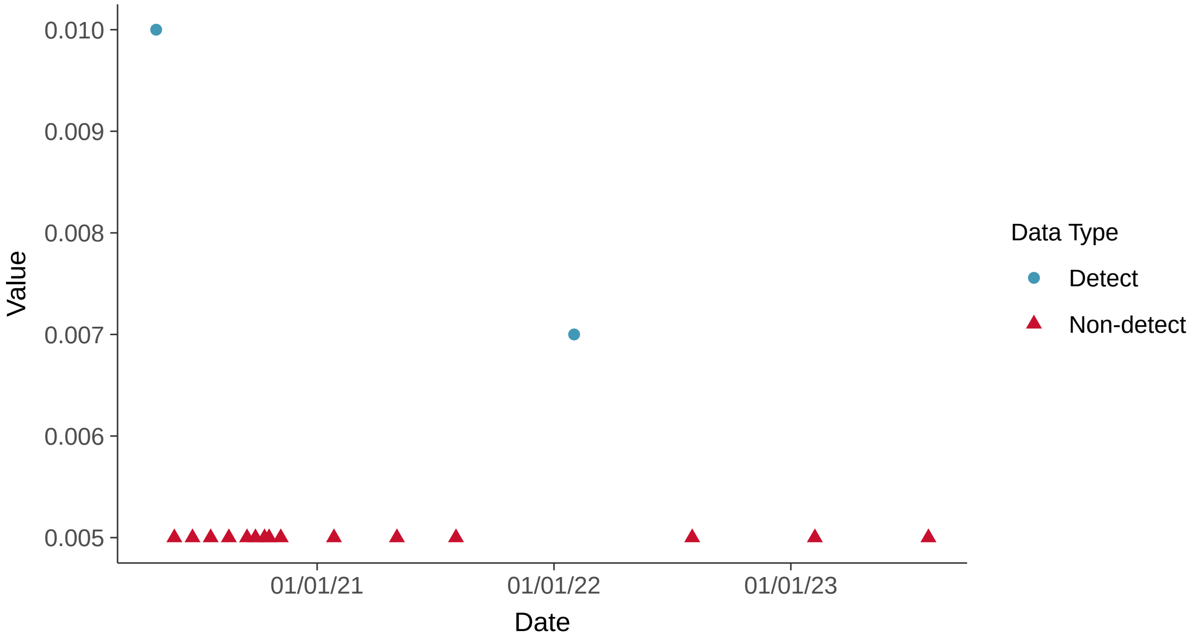


Appendix IV: Chromium, MW-5

ID: 05_2_13

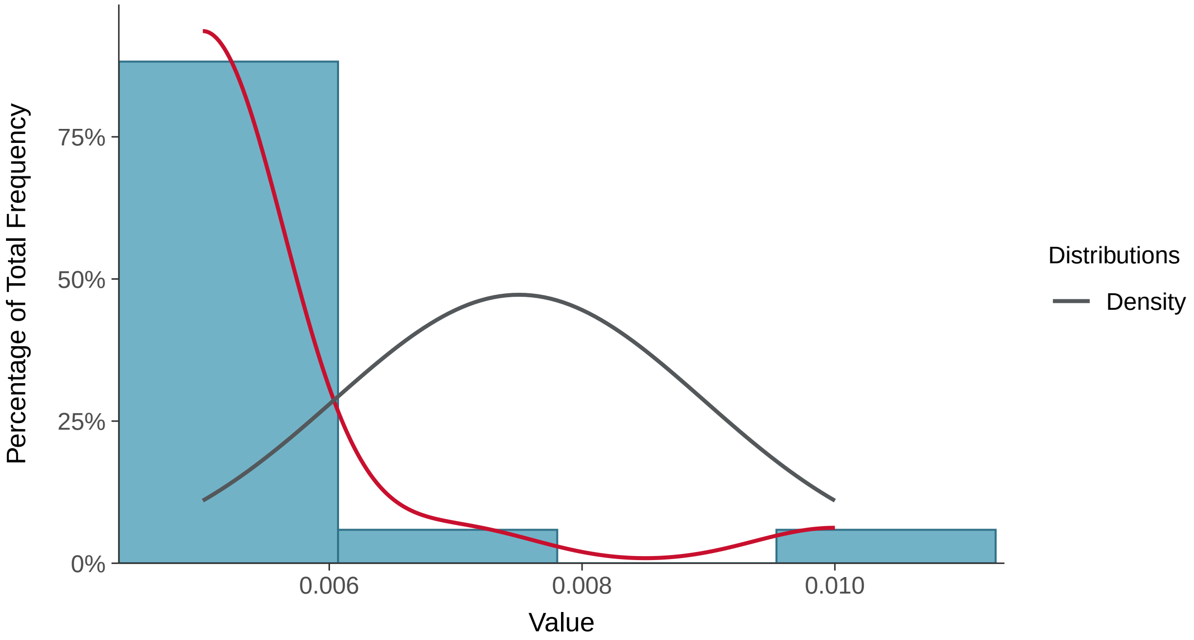
Scatter Plot

Chromium, MW-5 (mg/L)



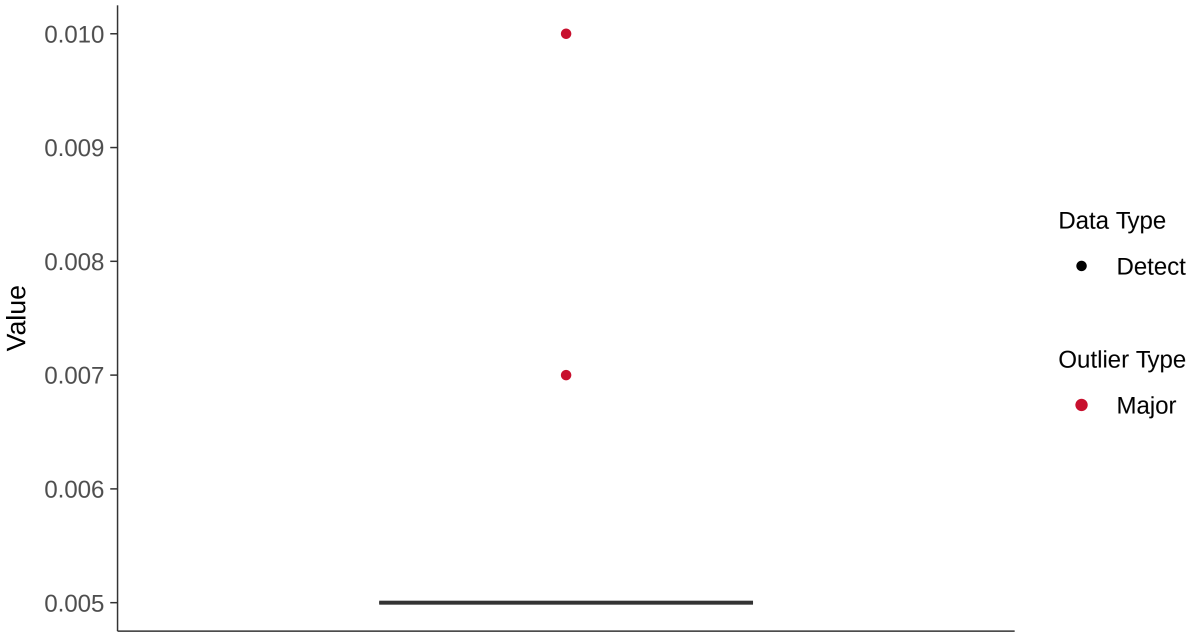
Histogram

Chromium, MW-5 (mg/L)



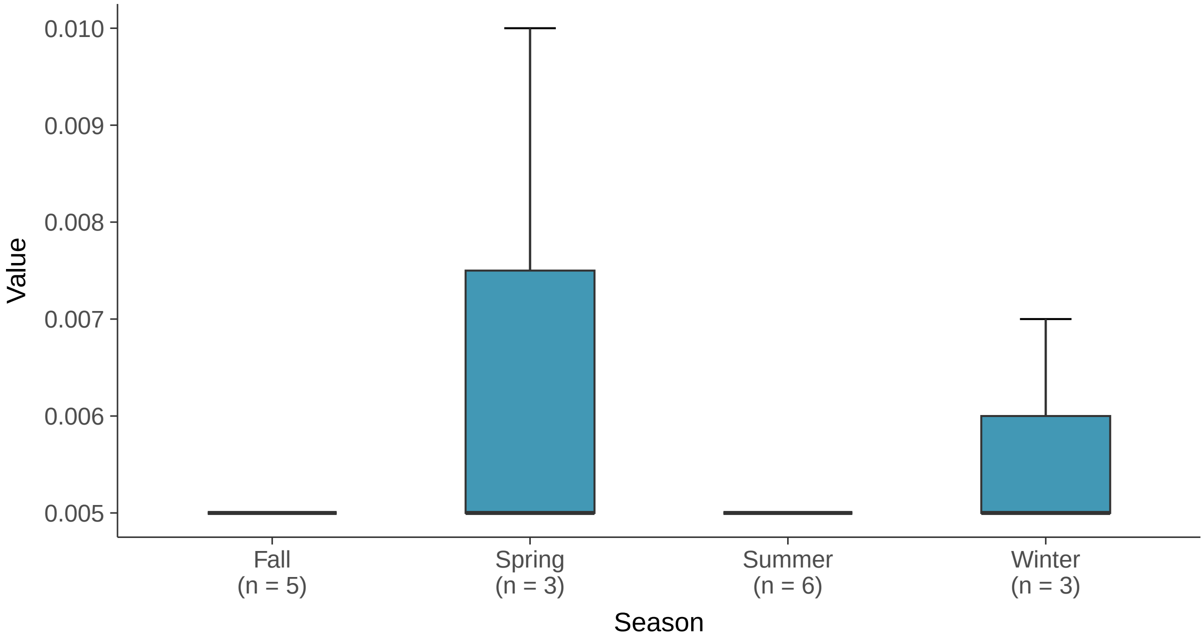
Boxplot

Chromium, MW-5 (mg/L)



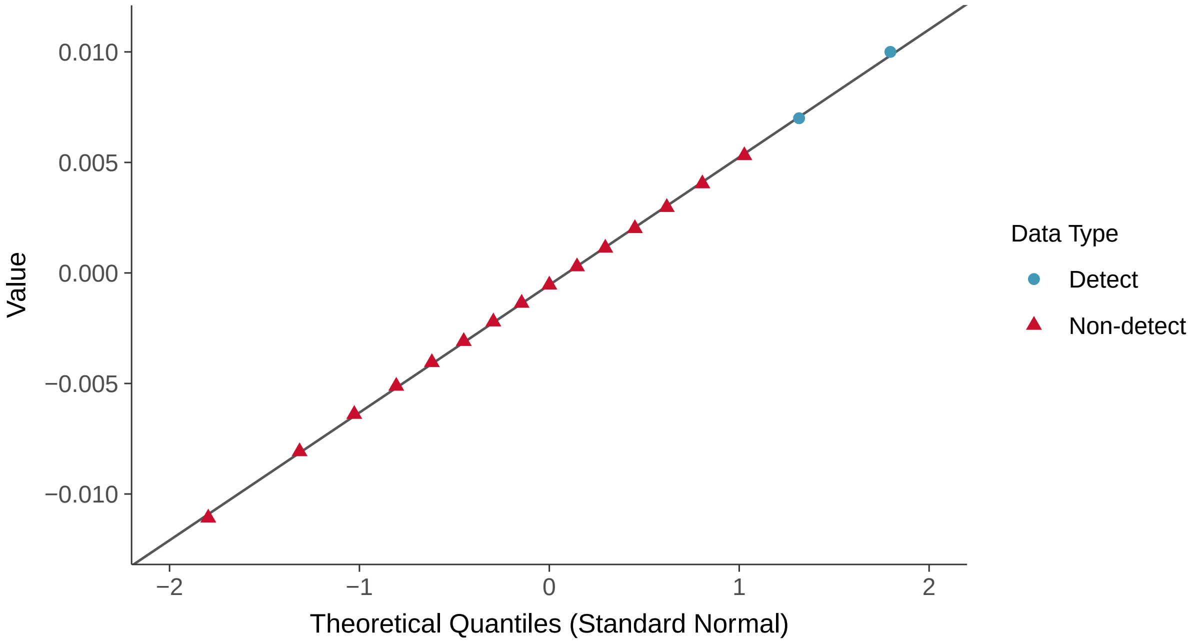
Boxplot by Season

Chromium, MW-5 (mg/L)



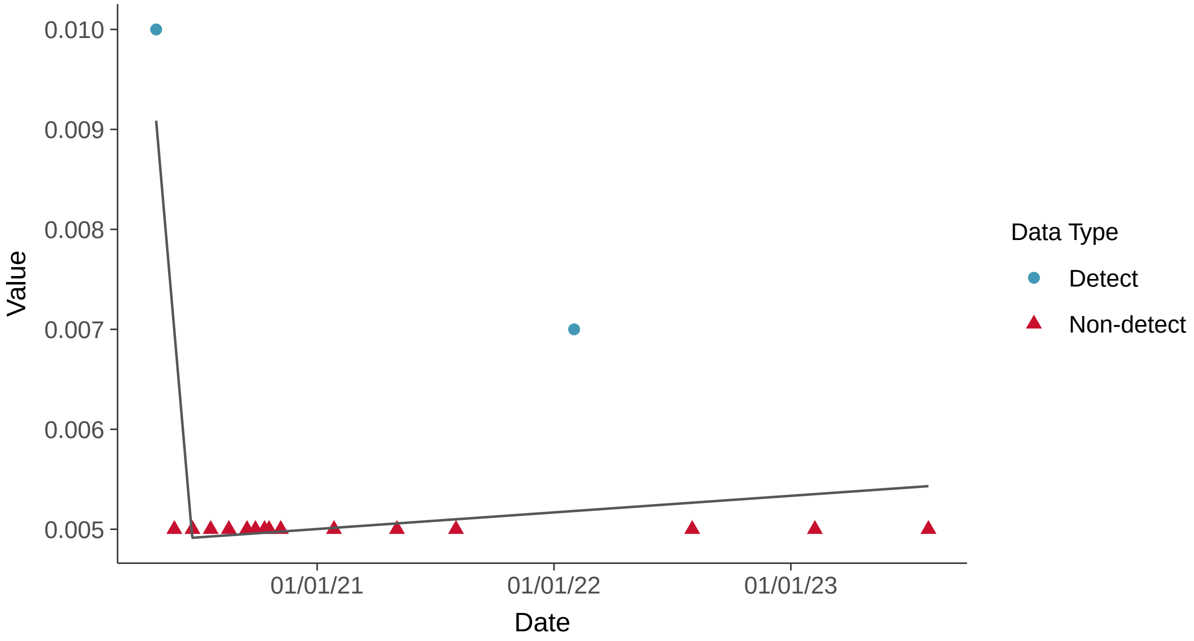
Normal Q-Q plot using ROS Imputed Estimates

Chromium, MW-5 (mg/L)



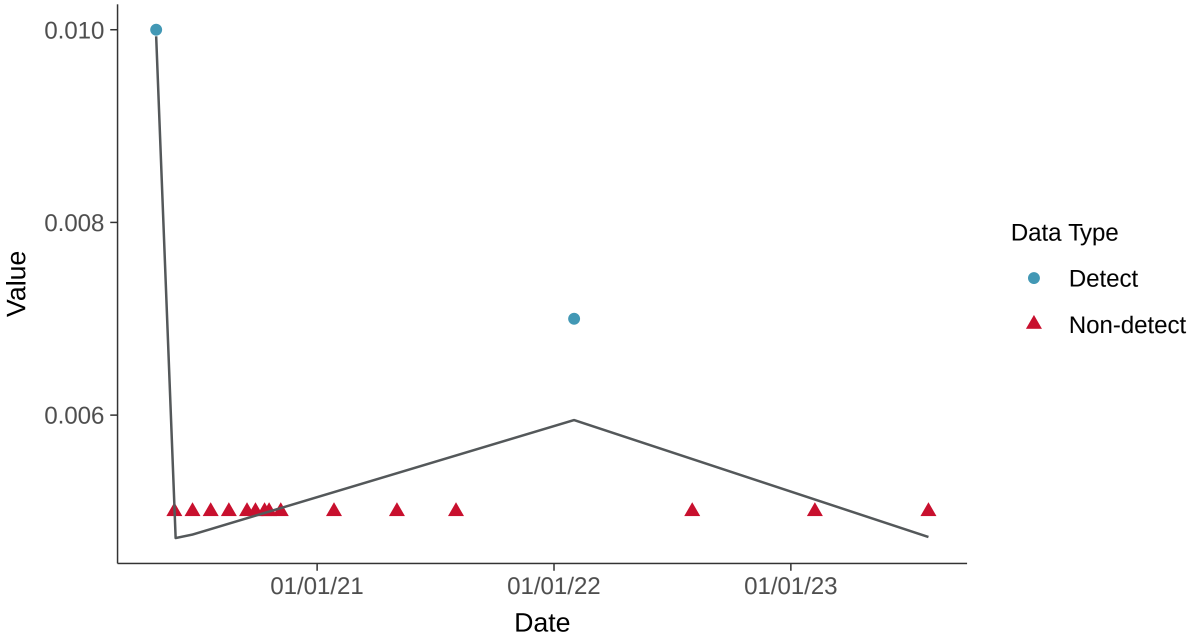
Trend Regression: Piecewise Linear-Linear

Chromium, MW-5 (mg/L)



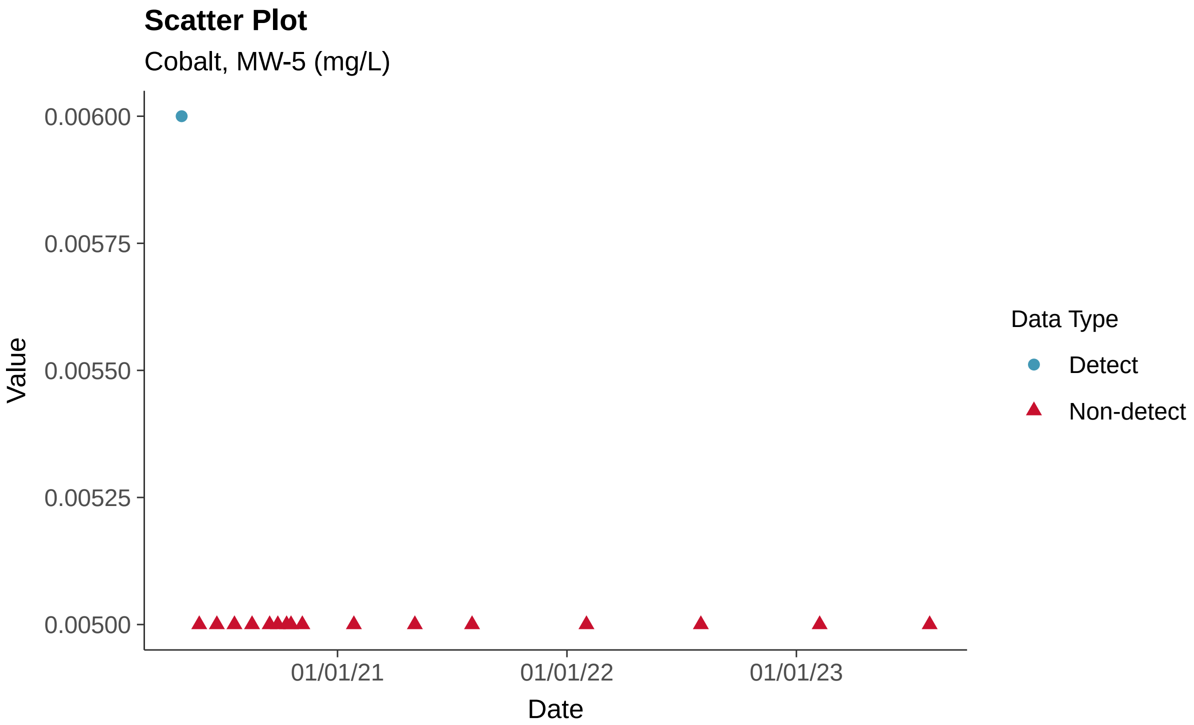
Trend Regression: Piecewise Linear-Linear-Linear

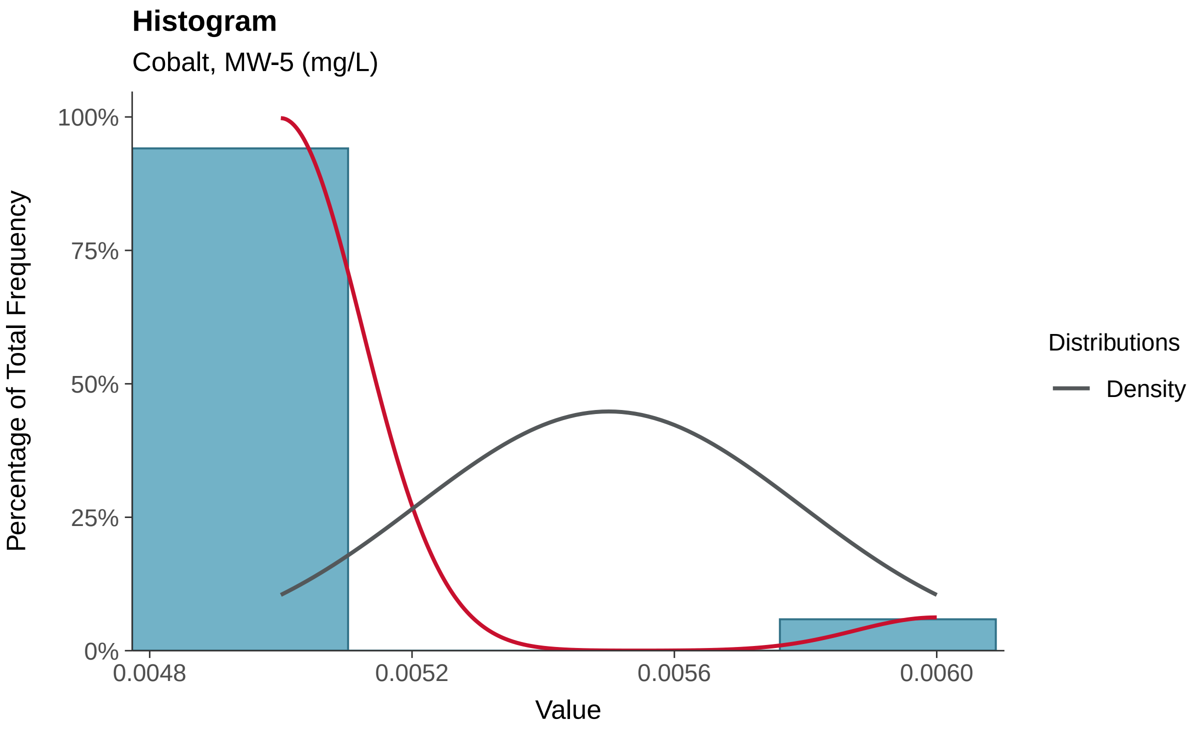
Chromium, MW-5 (mg/L)



Appendix IV: Cobalt, MW-5

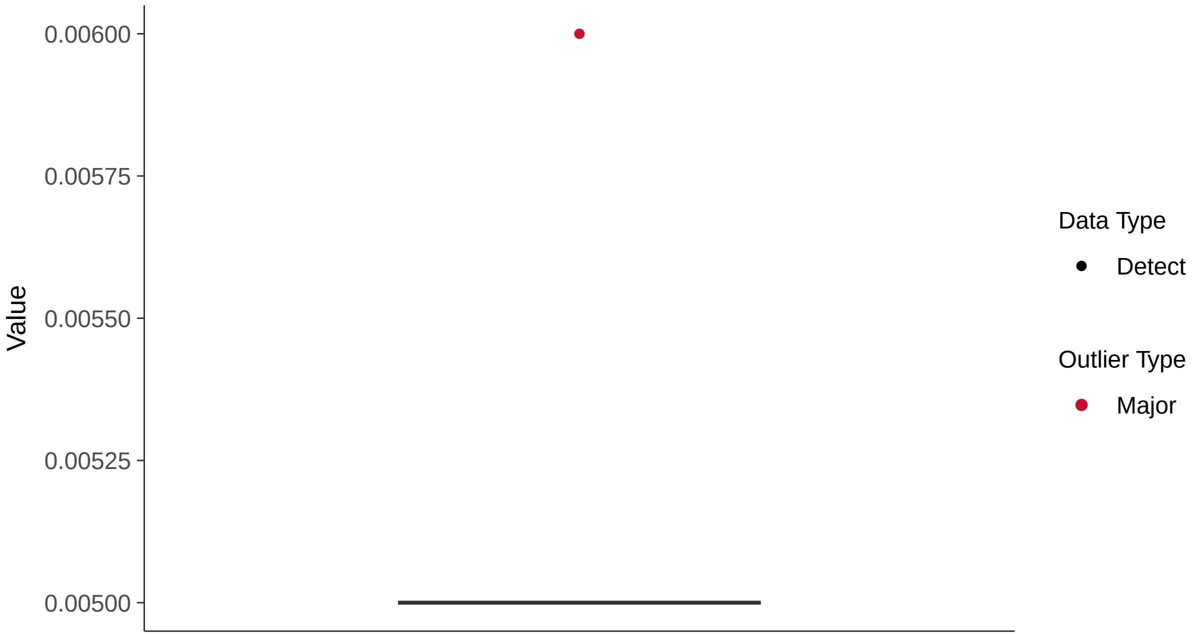
ID: 05_2_14





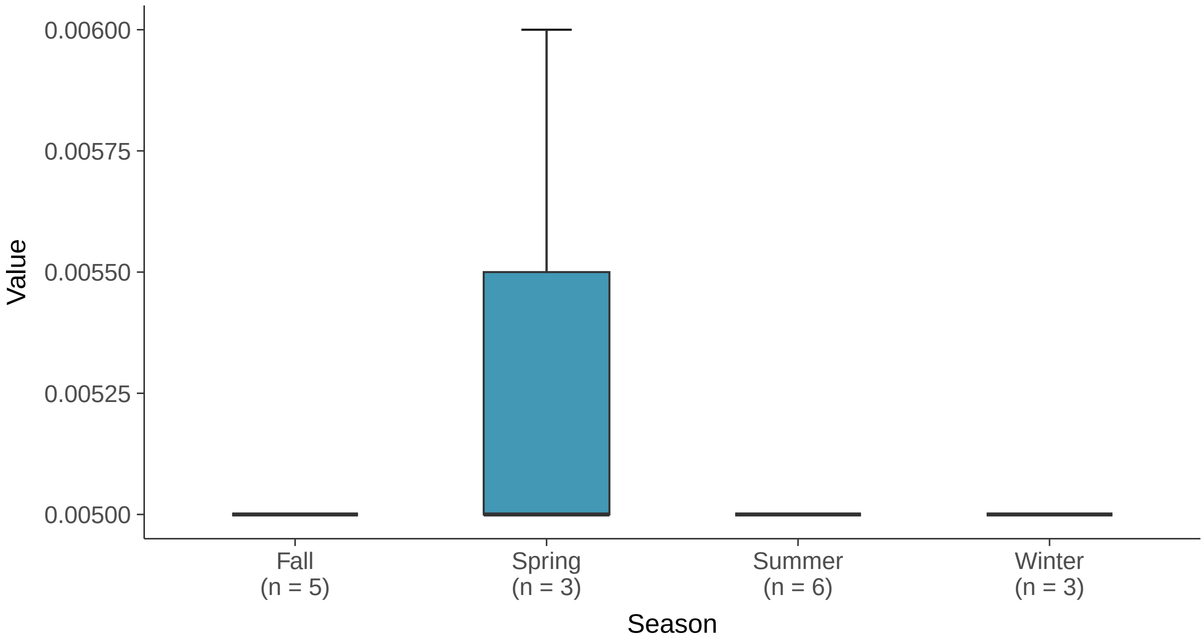
Boxplot

Cobalt, MW-5 (mg/L)



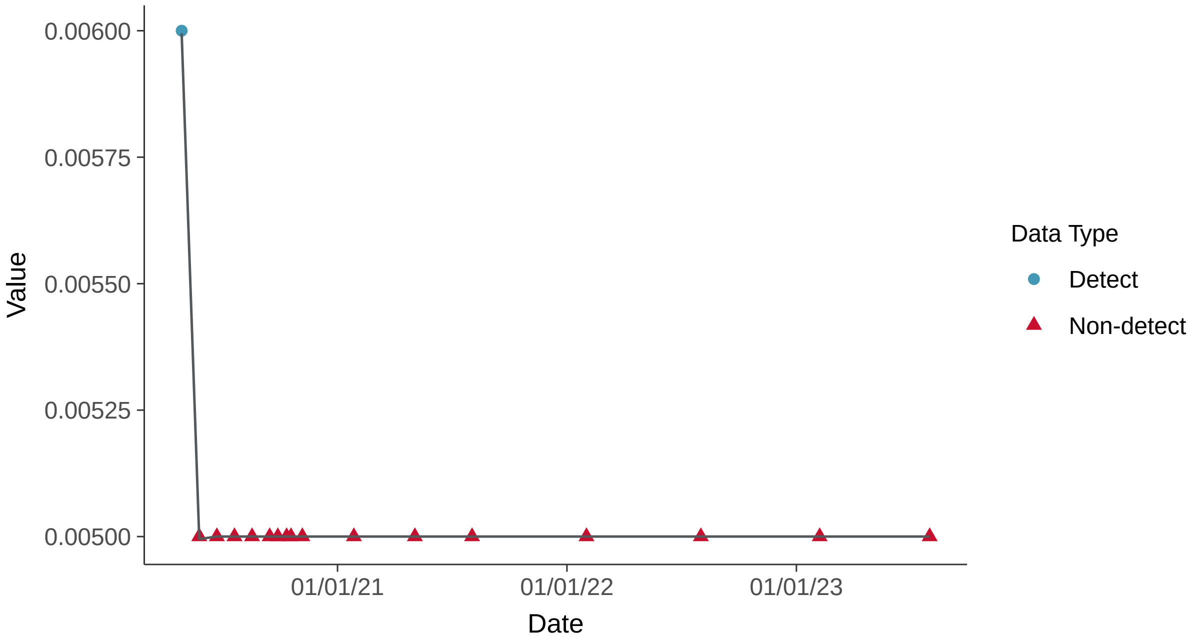
Boxplot by Season

Cobalt, MW-5 (mg/L)



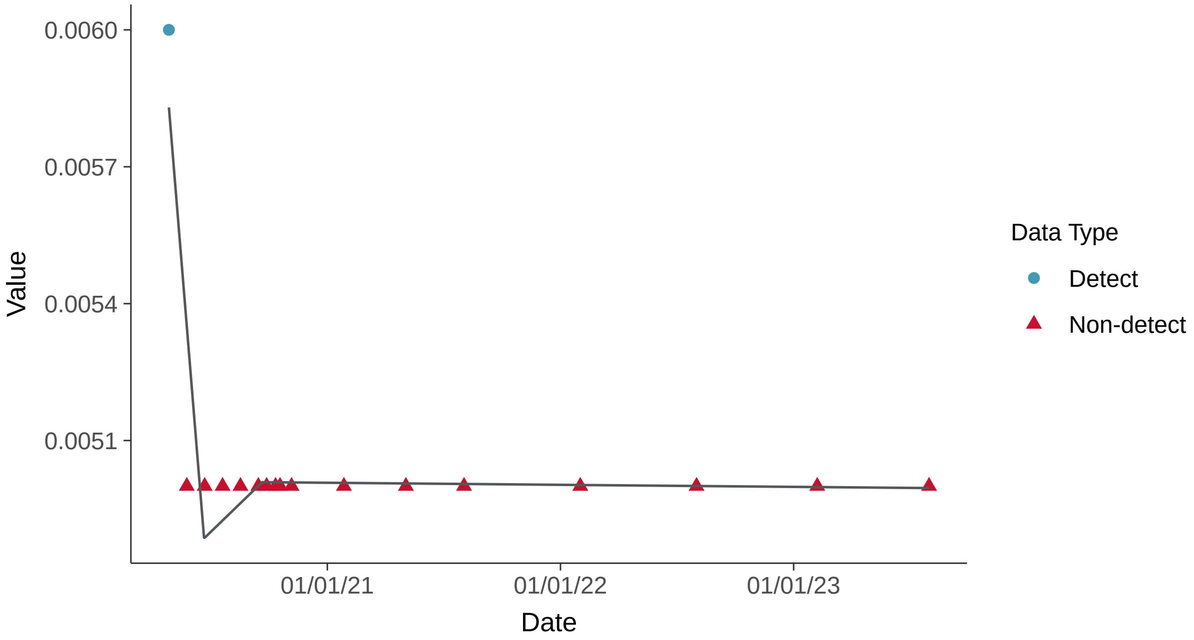
Trend Regression: Piecewise Linear-Linear

Cobalt, MW-5 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Cobalt, MW-5 (mg/L)

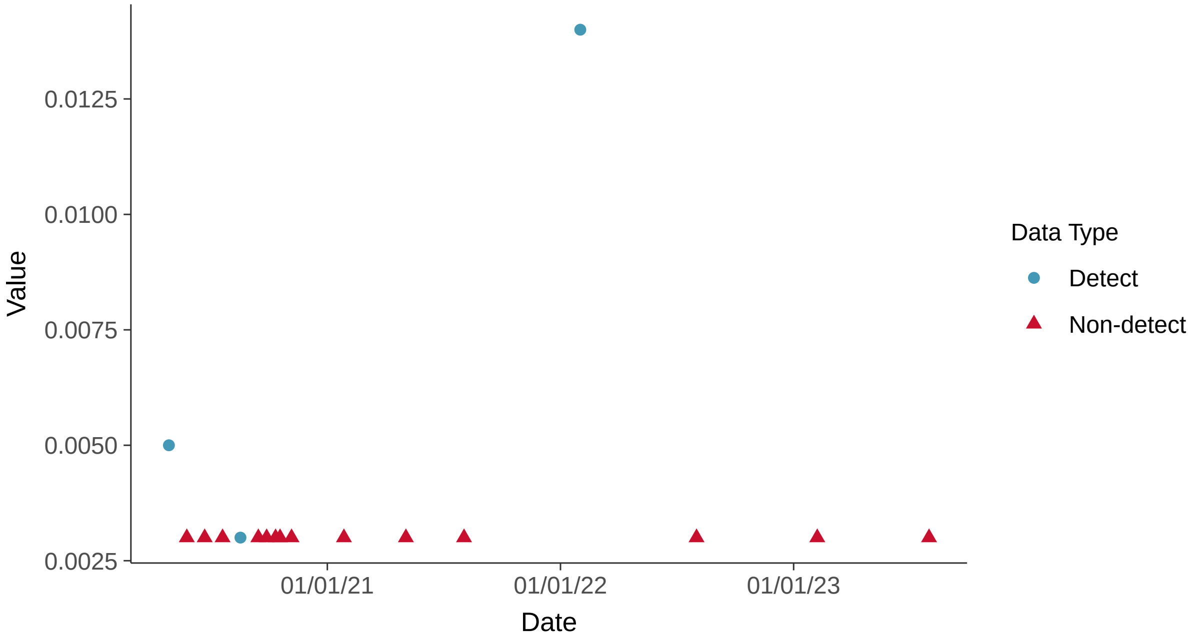


Appendix IV: Lead, MW-5

ID: 05_2_15

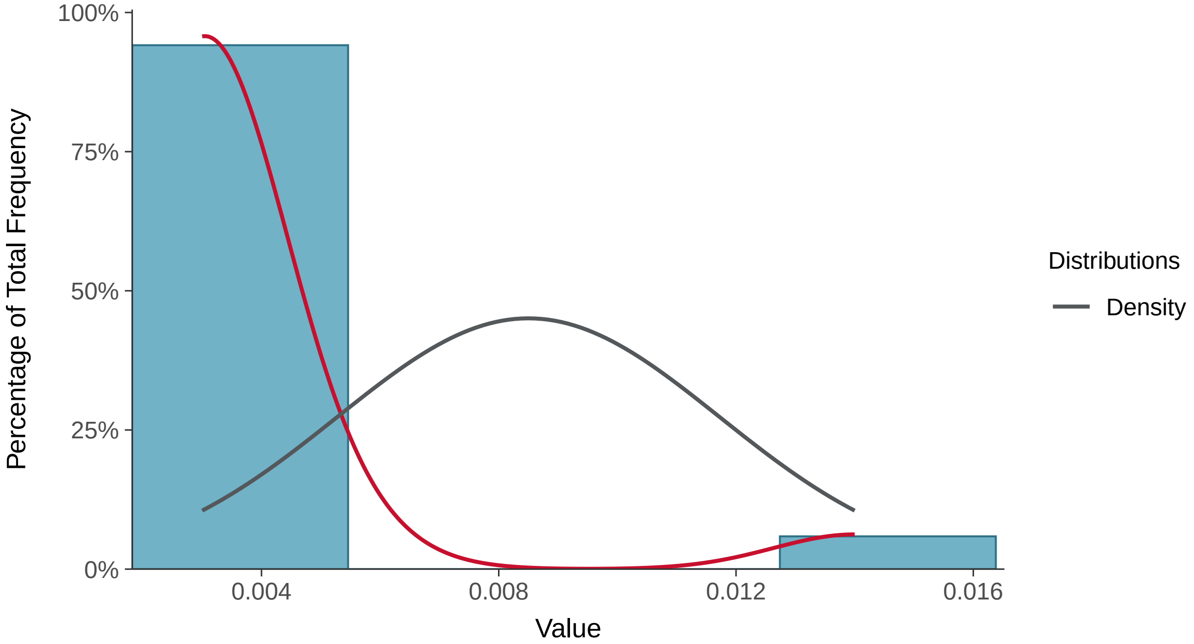
Scatter Plot

Lead, MW-5 (mg/L)



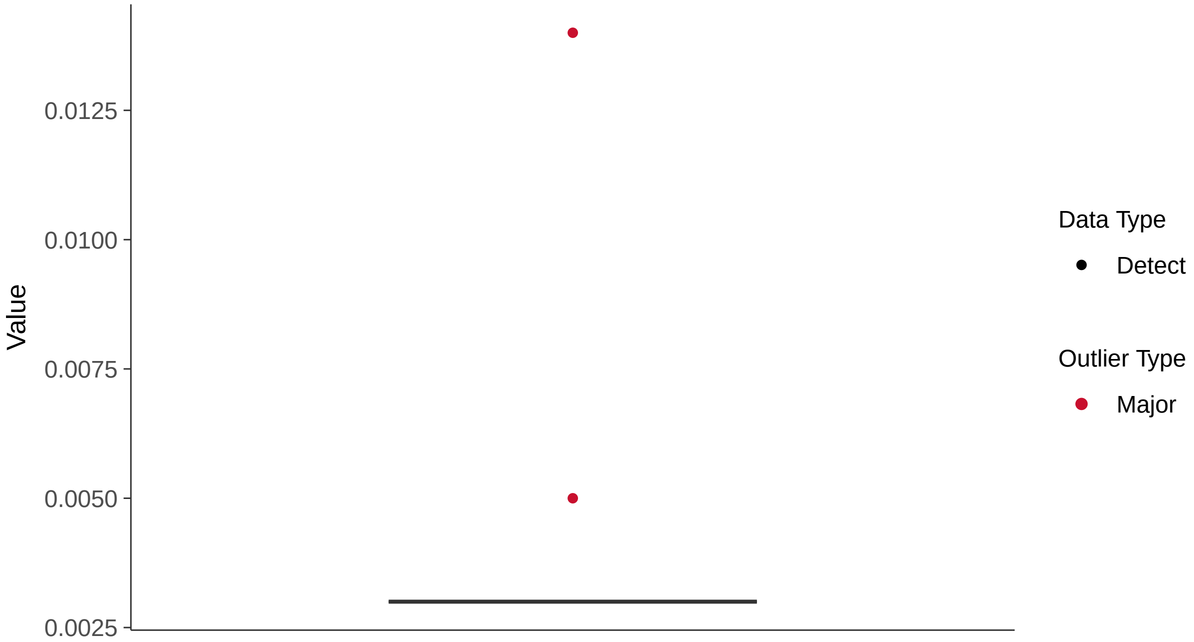
Histogram

Lead, MW-5 (mg/L)



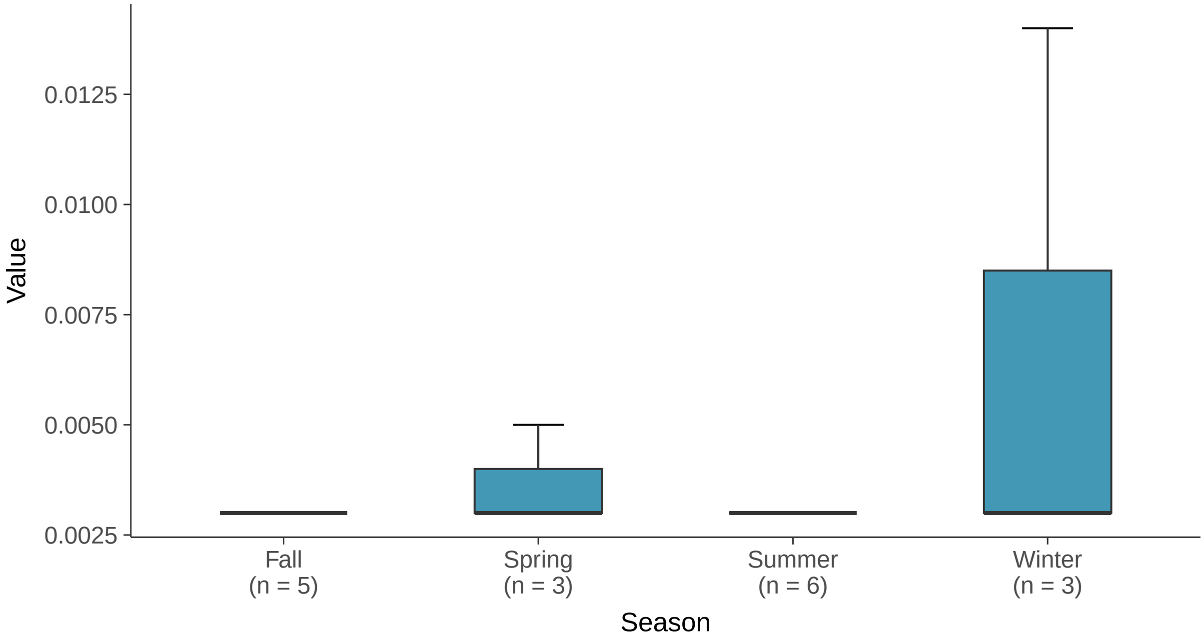
Boxplot

Lead, MW-5 (mg/L)



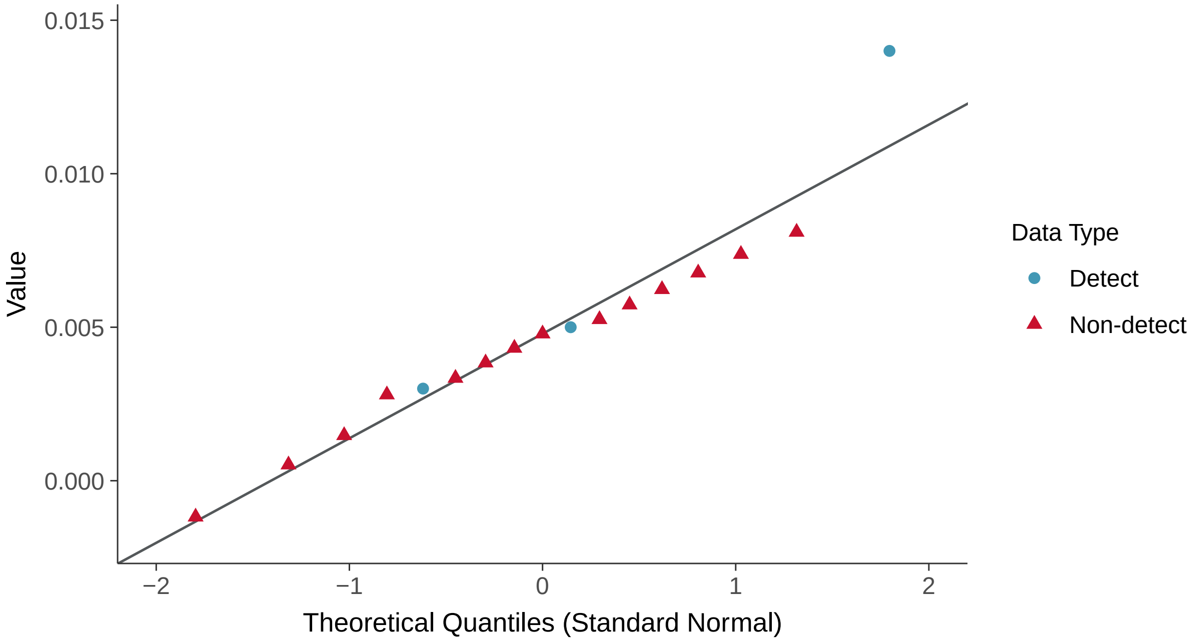
Boxplot by Season

Lead, MW-5 (mg/L)



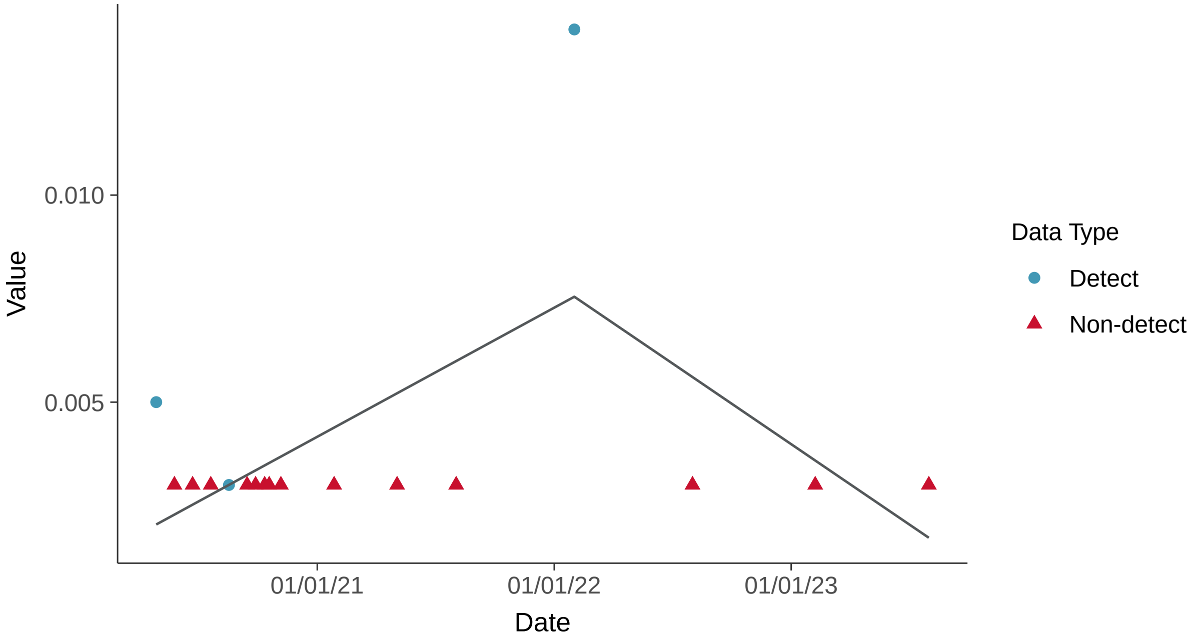
Normal Q-Q plot using ROS Imputed Estimates

Lead, MW-5 (mg/L)



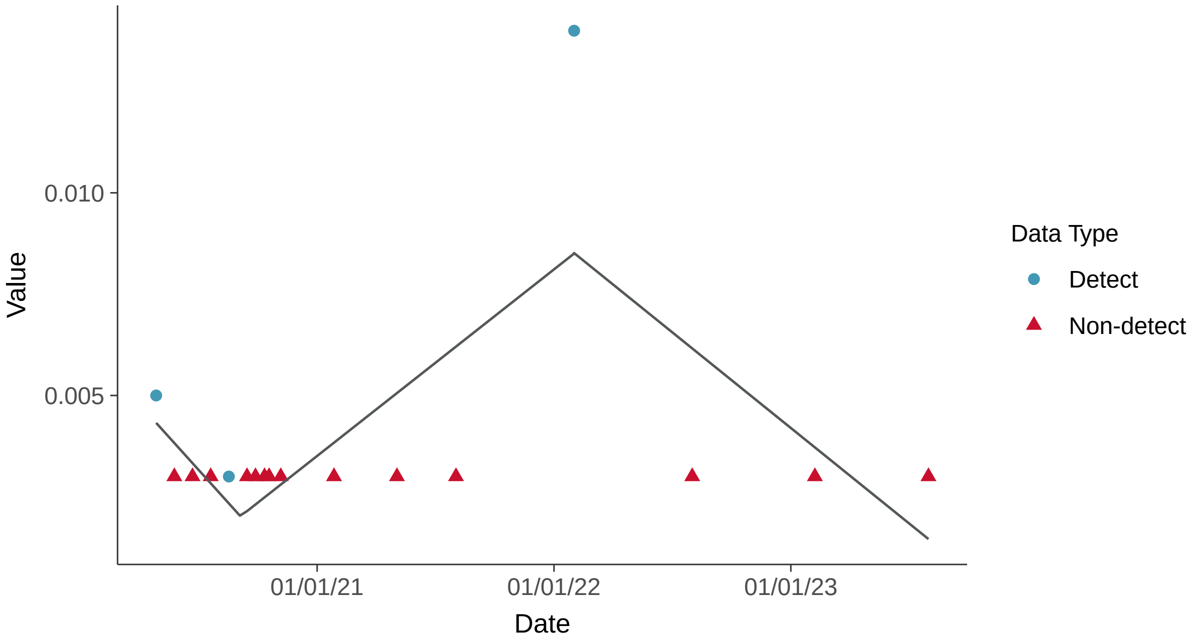
Trend Regression: Piecewise Linear-Linear

Lead, MW-5 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Lead, MW-5 (mg/L)

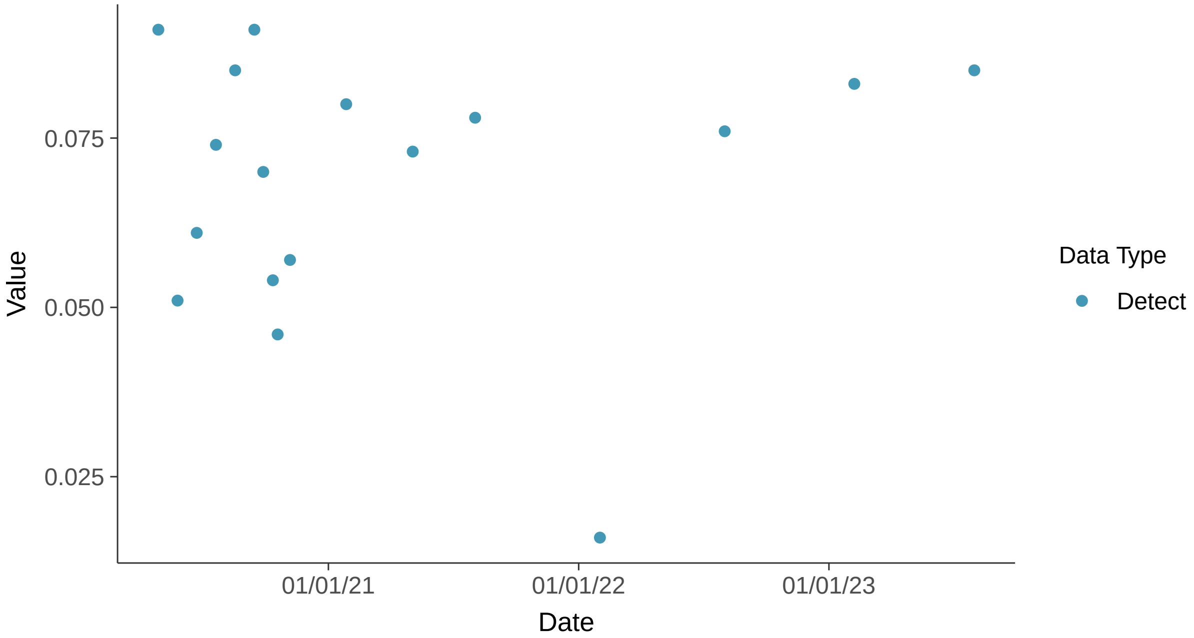


Appendix IV: Lithium, MW-5

ID: 05_2_16

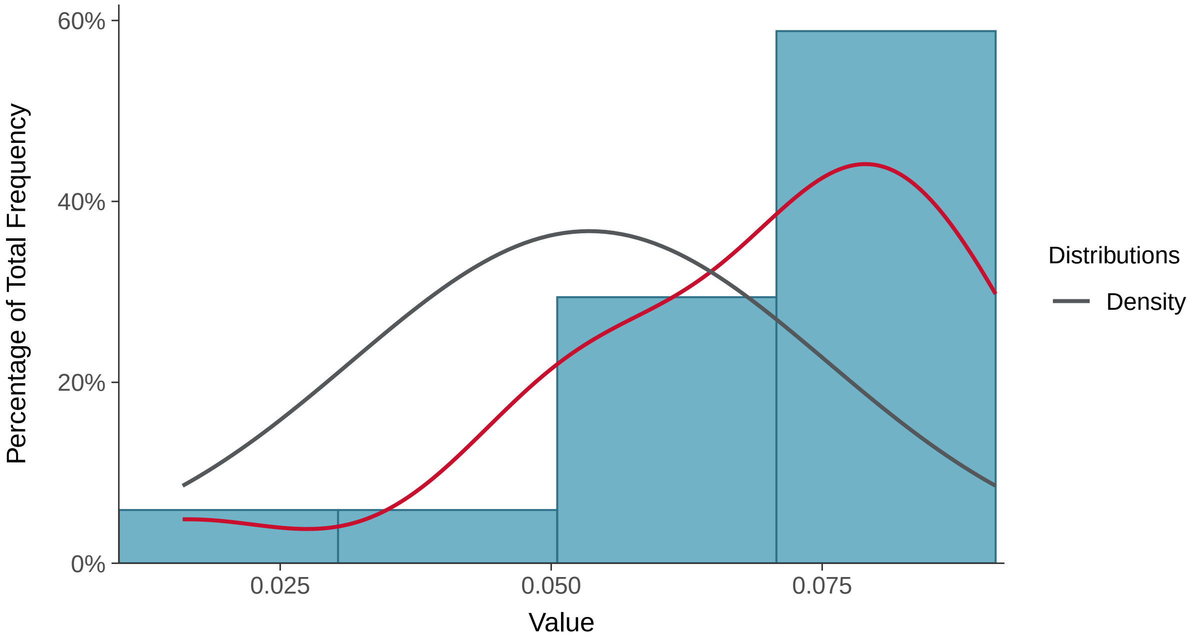
Scatter Plot

Lithium, MW-5 (mg/L)



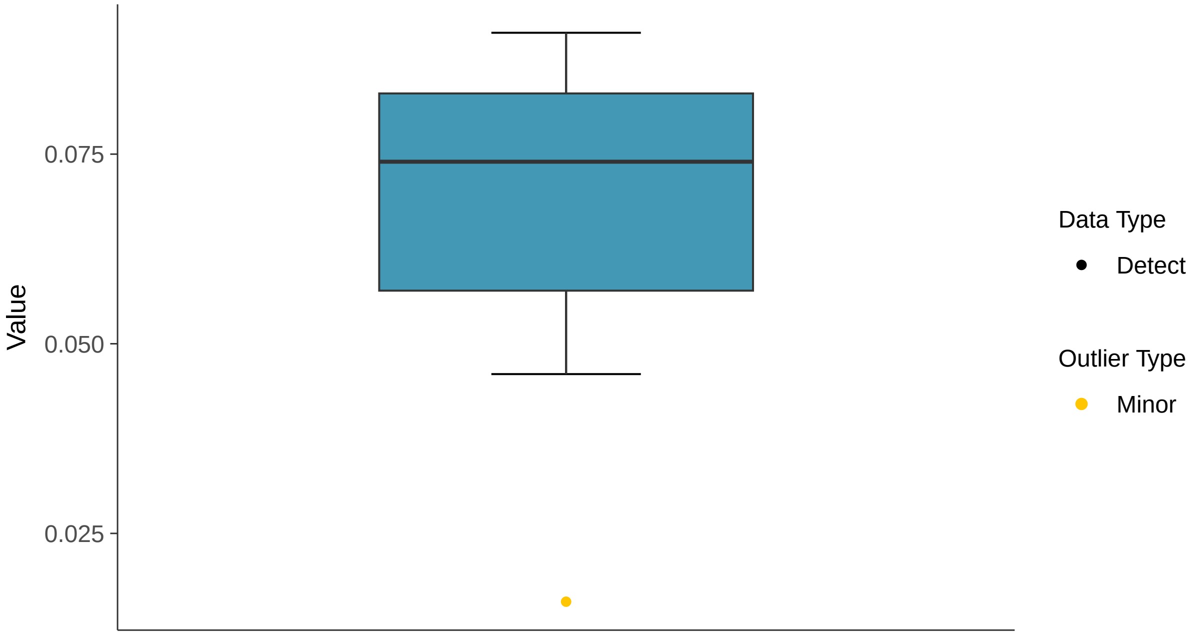
Histogram

Lithium, MW-5 (mg/L)



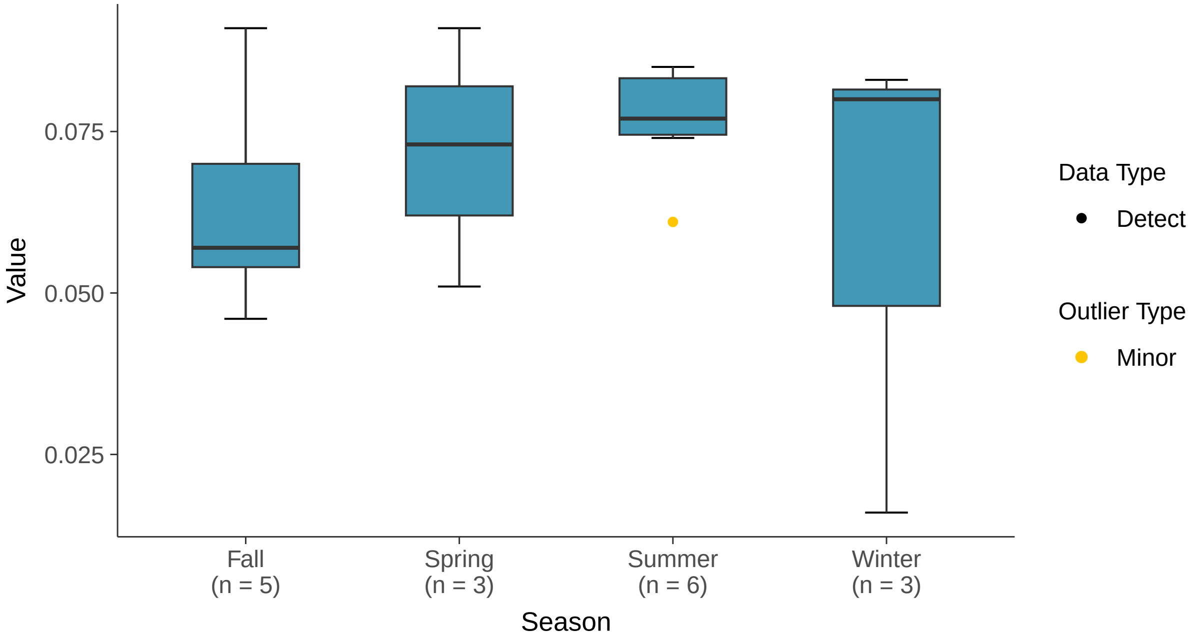
Boxplot

Lithium, MW-5 (mg/L)



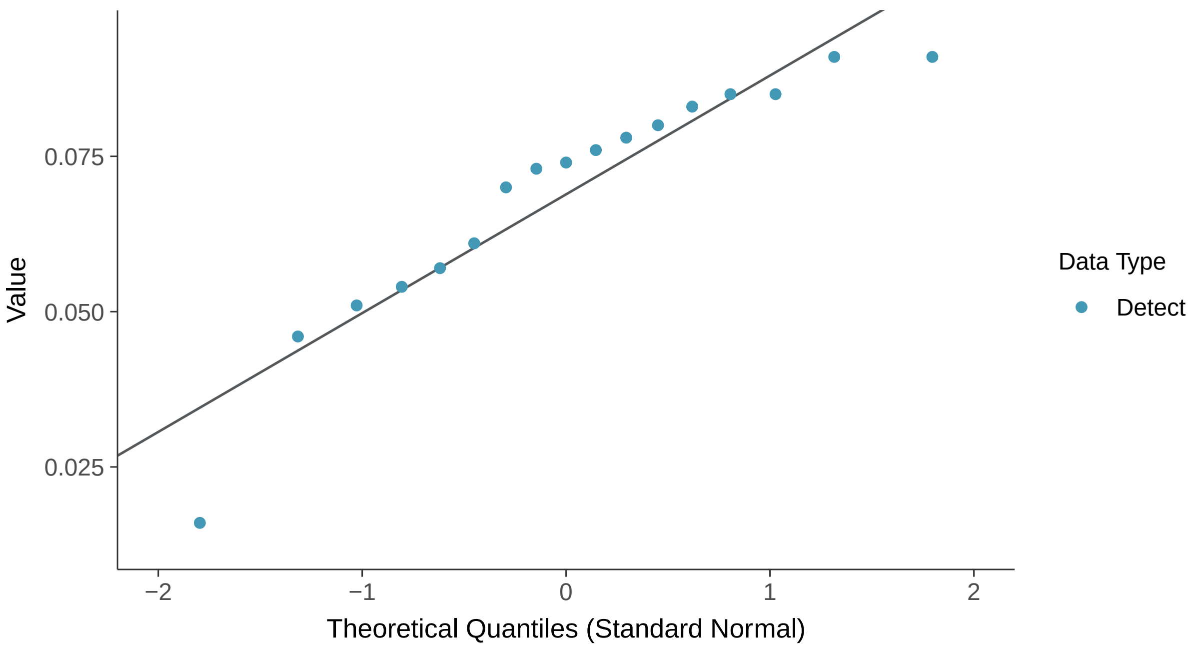
Boxplot by Season

Lithium, MW-5 (mg/L)



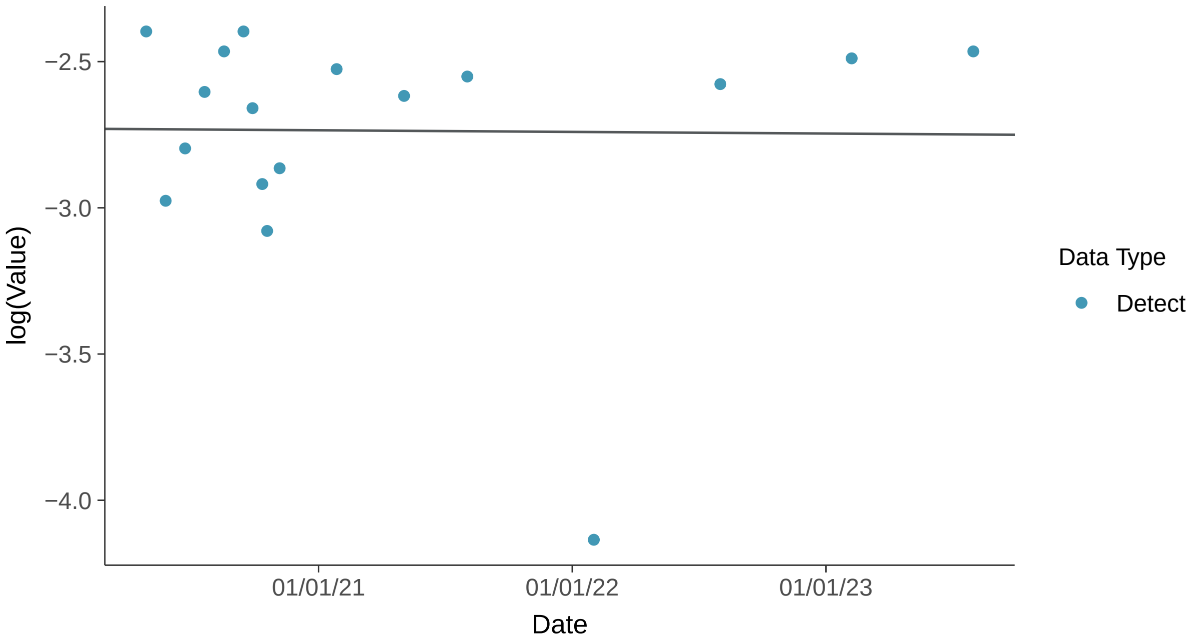
Normal Q-Q plot

Lithium, MW-5 (mg/L)



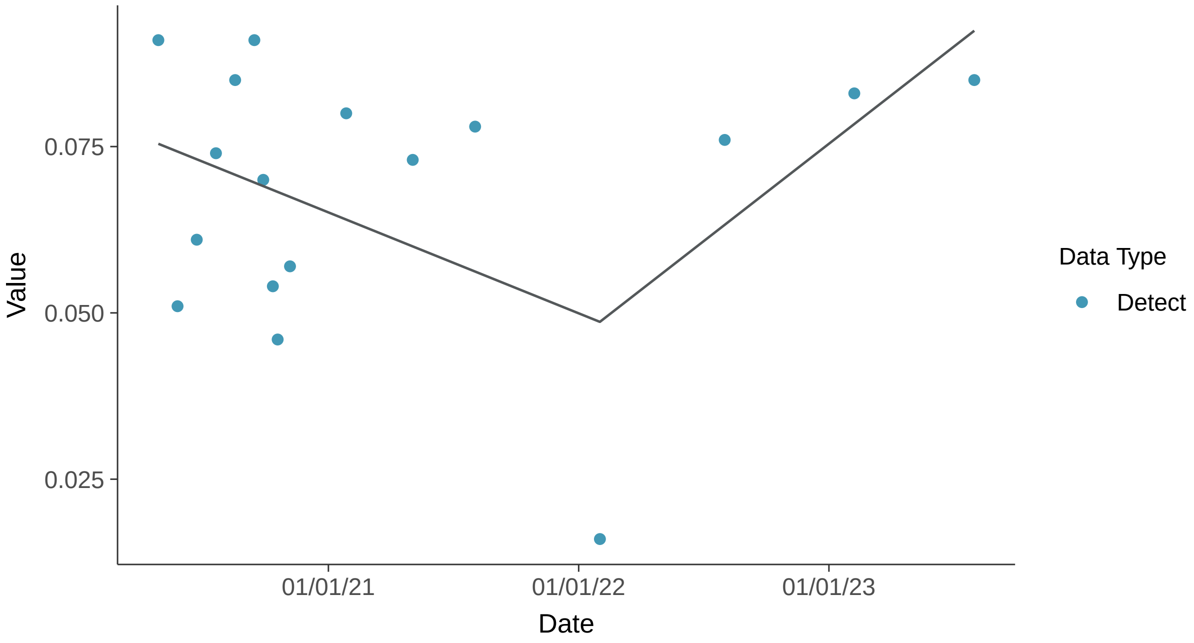
Trend Regression: Lognormal MLE

Lithium, MW-5 (mg/L)



Trend Regression: Piecewise Linear-Linear

Lithium, MW-5 (mg/L)

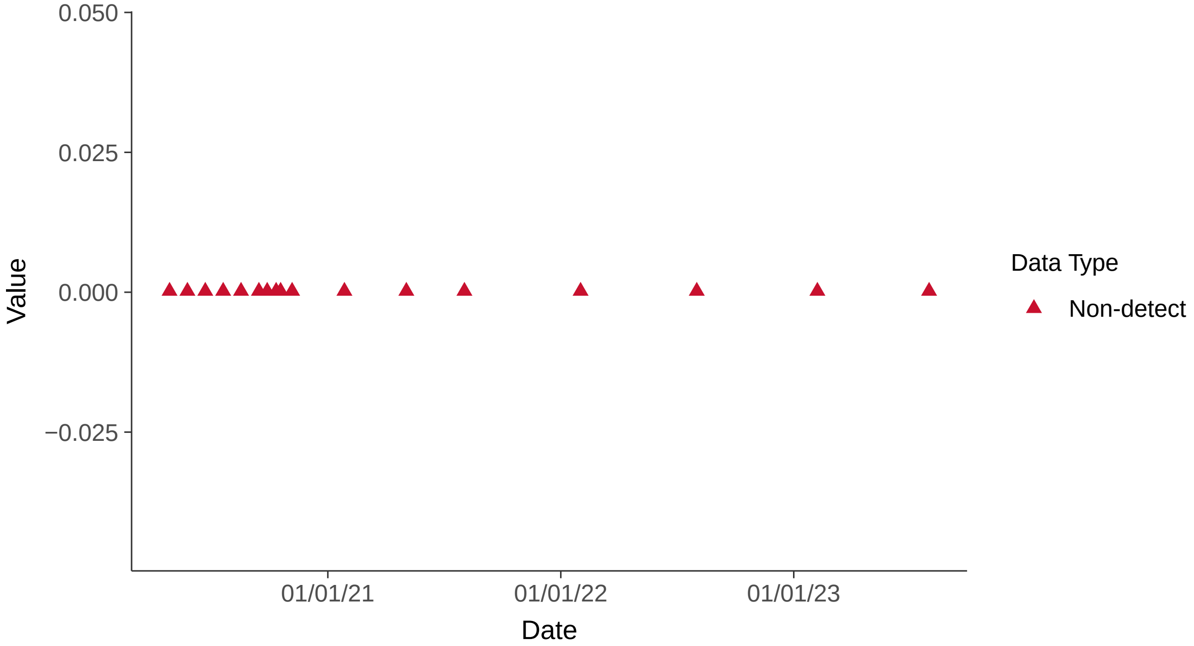


Appendix IV: Mercury, MW-5

ID: 05_2_17

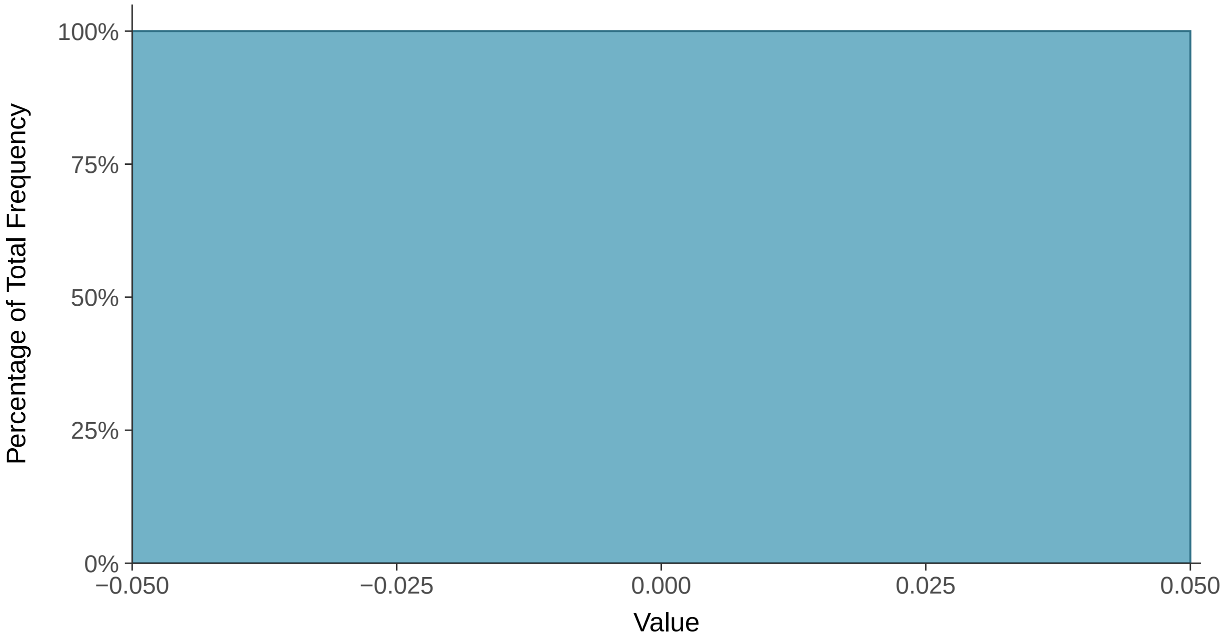
Scatter Plot

Mercury, MW-5 (mg/L)



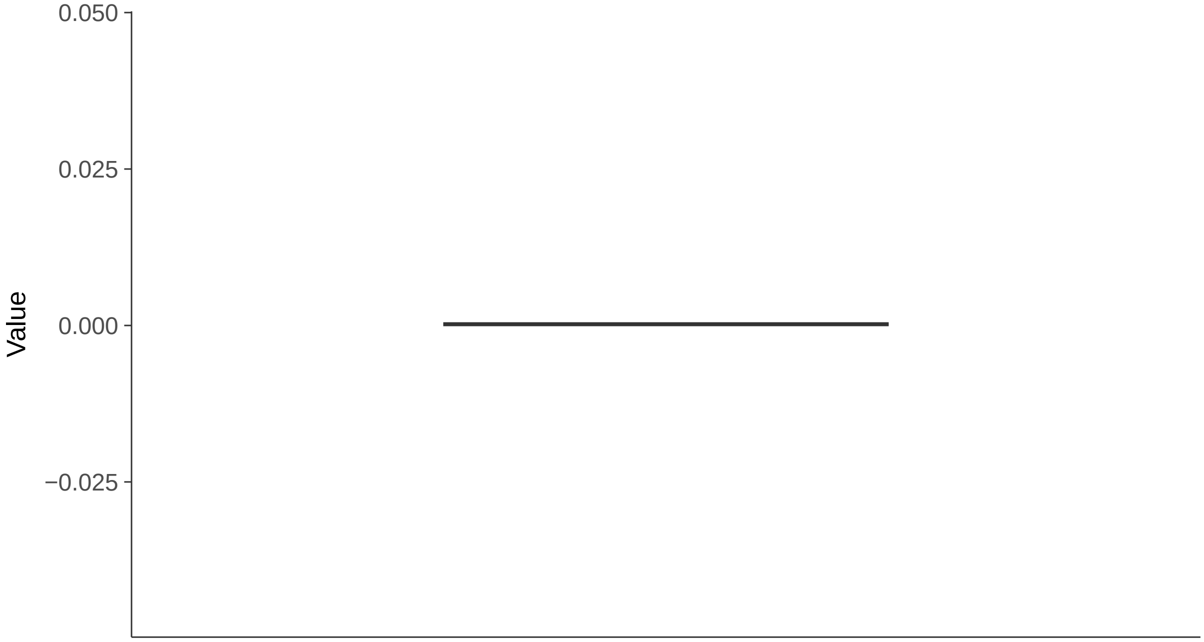
Histogram

Mercury, MW-5 (mg/L)



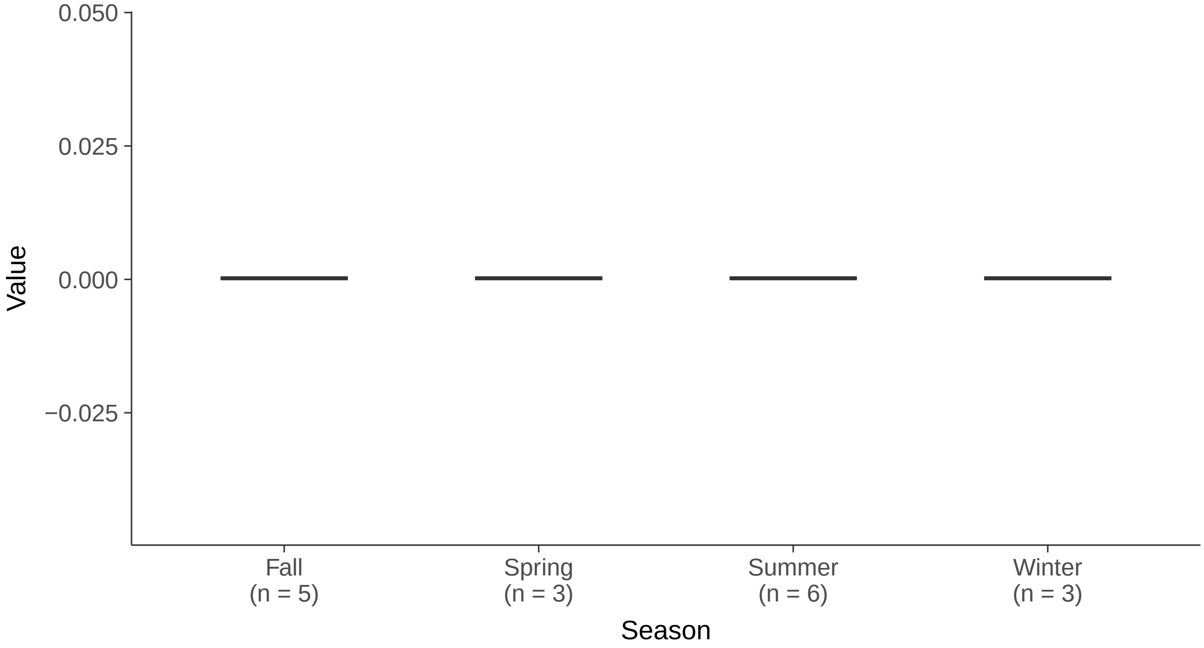
Boxplot

Mercury, MW-5 (mg/L)



Boxplot by Season

Mercury, MW-5 (mg/L)

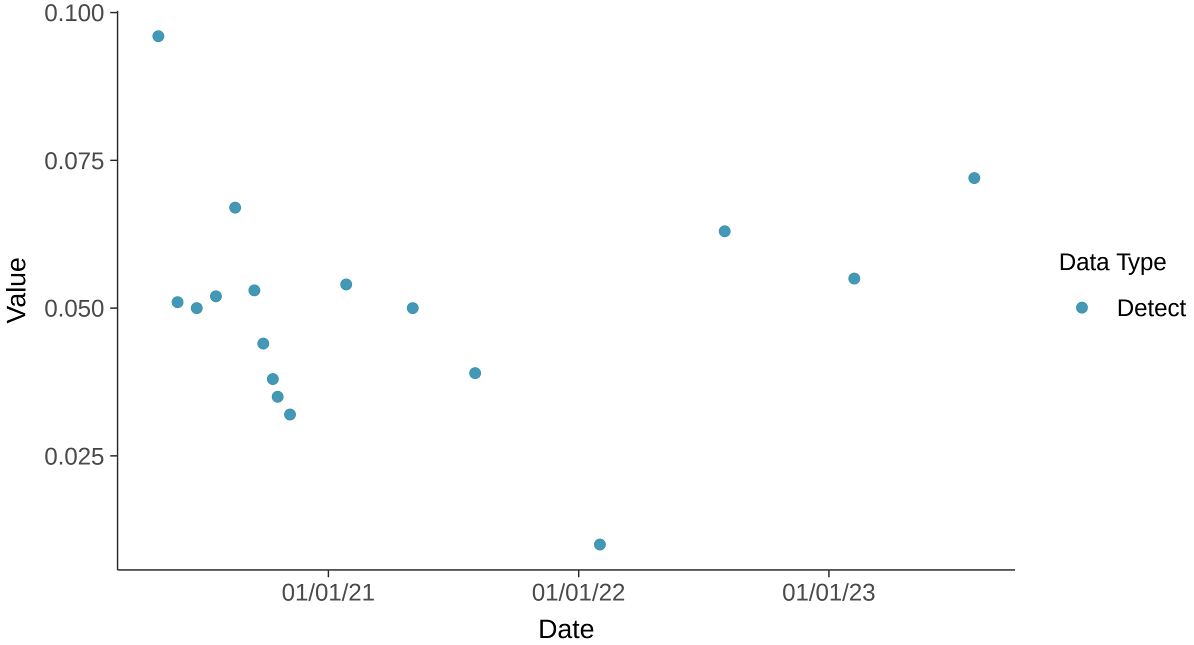


Appendix IV: Molybdenum, MW-5

ID: 05_2_18

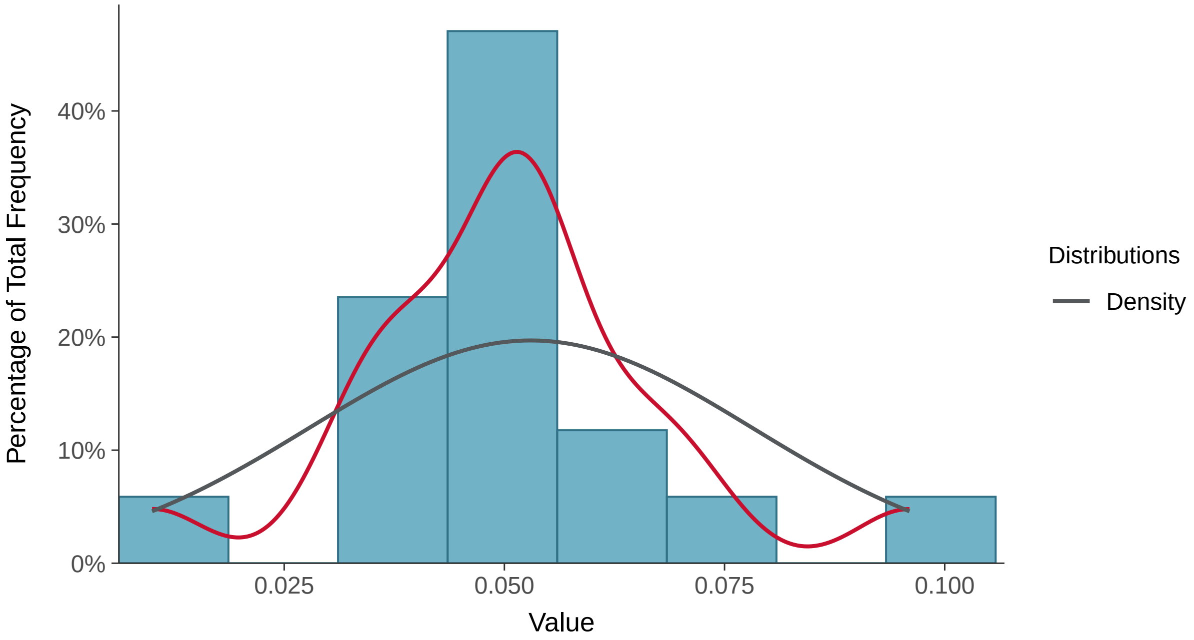
Scatter Plot

Molybdenum, MW-5 (mg/L)



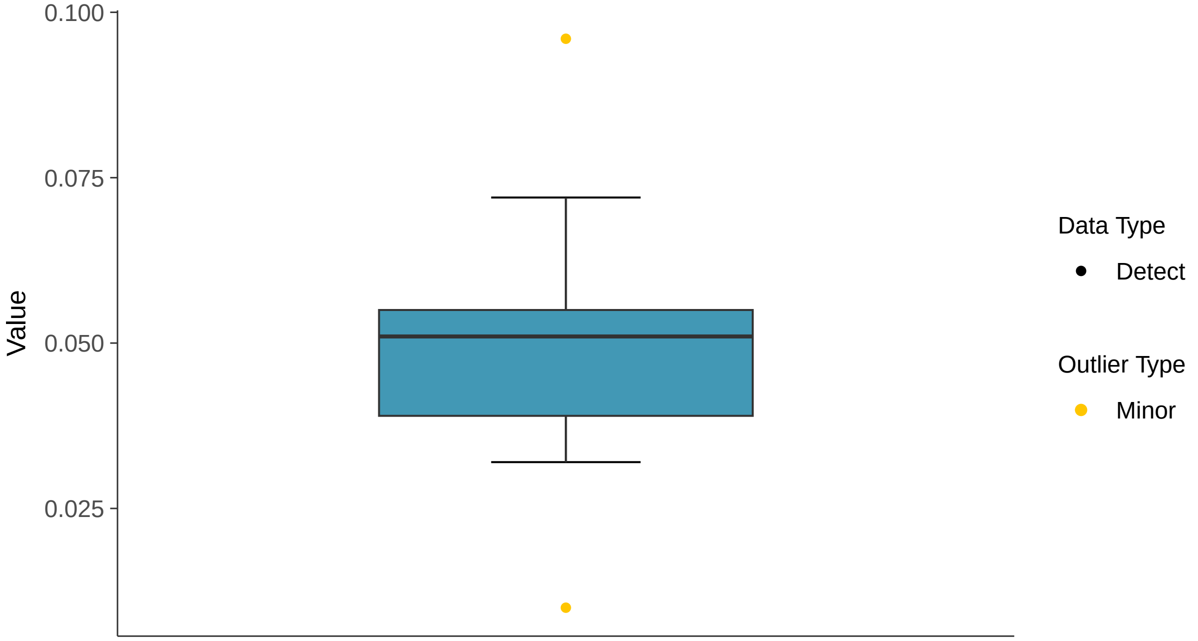
Histogram

Molybdenum, MW-5 (mg/L)



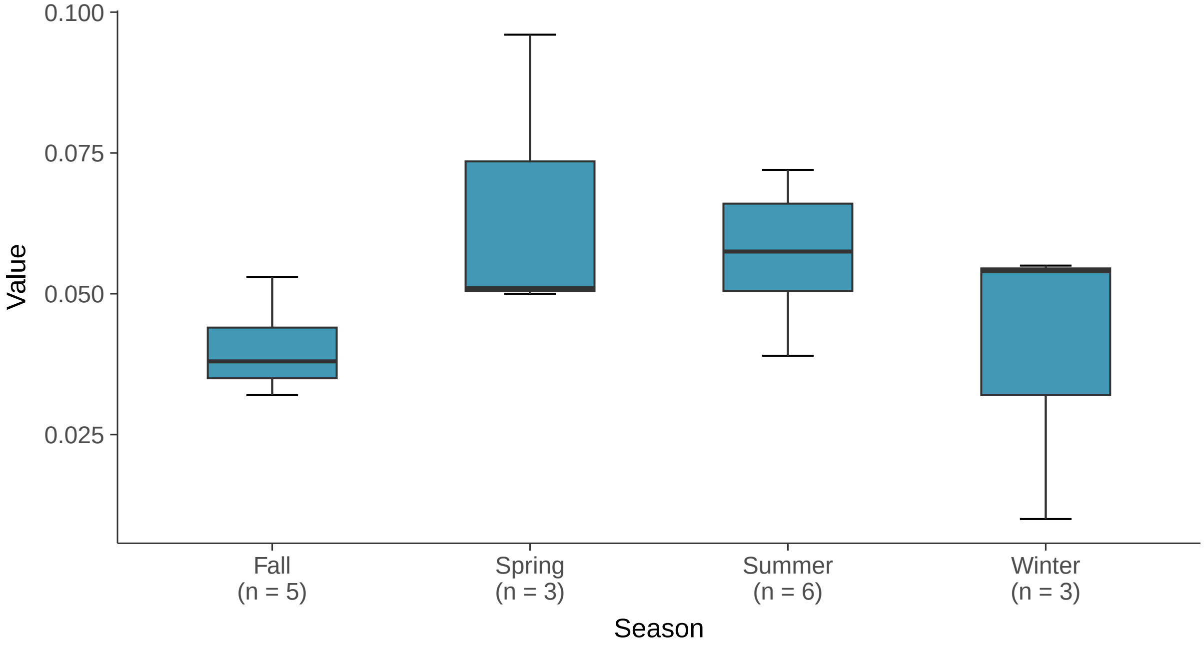
Boxplot

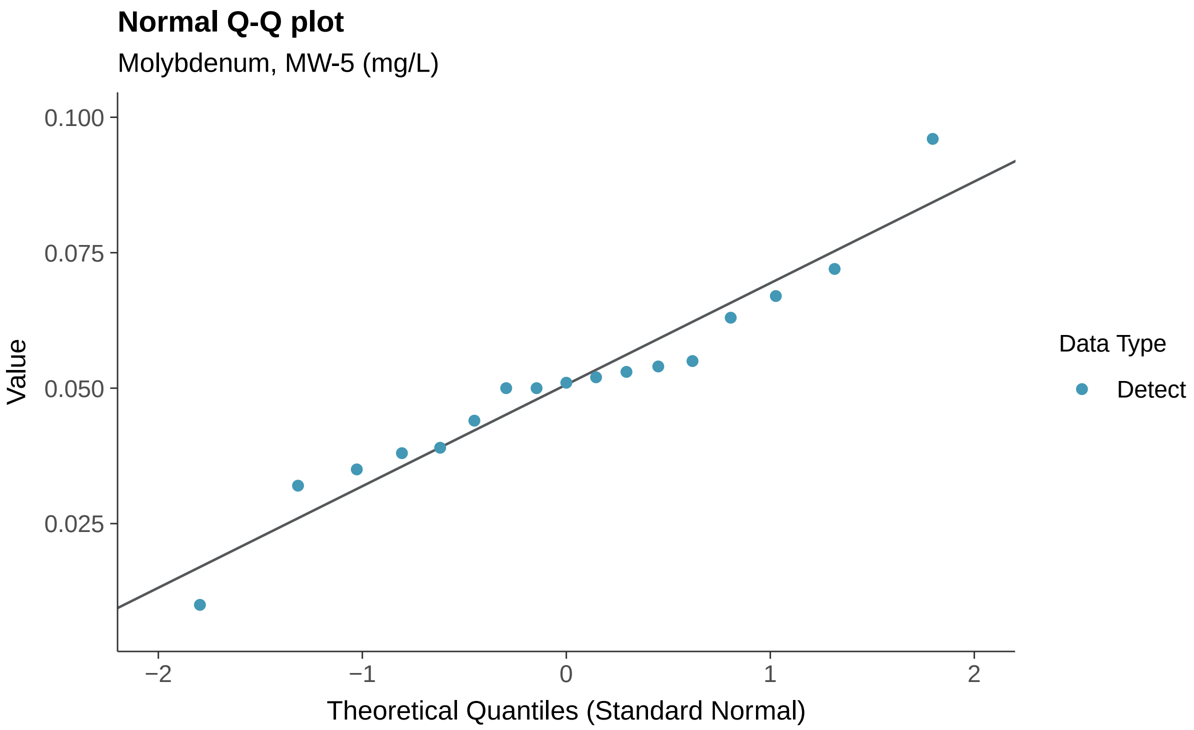
Molybdenum, MW-5 (mg/L)

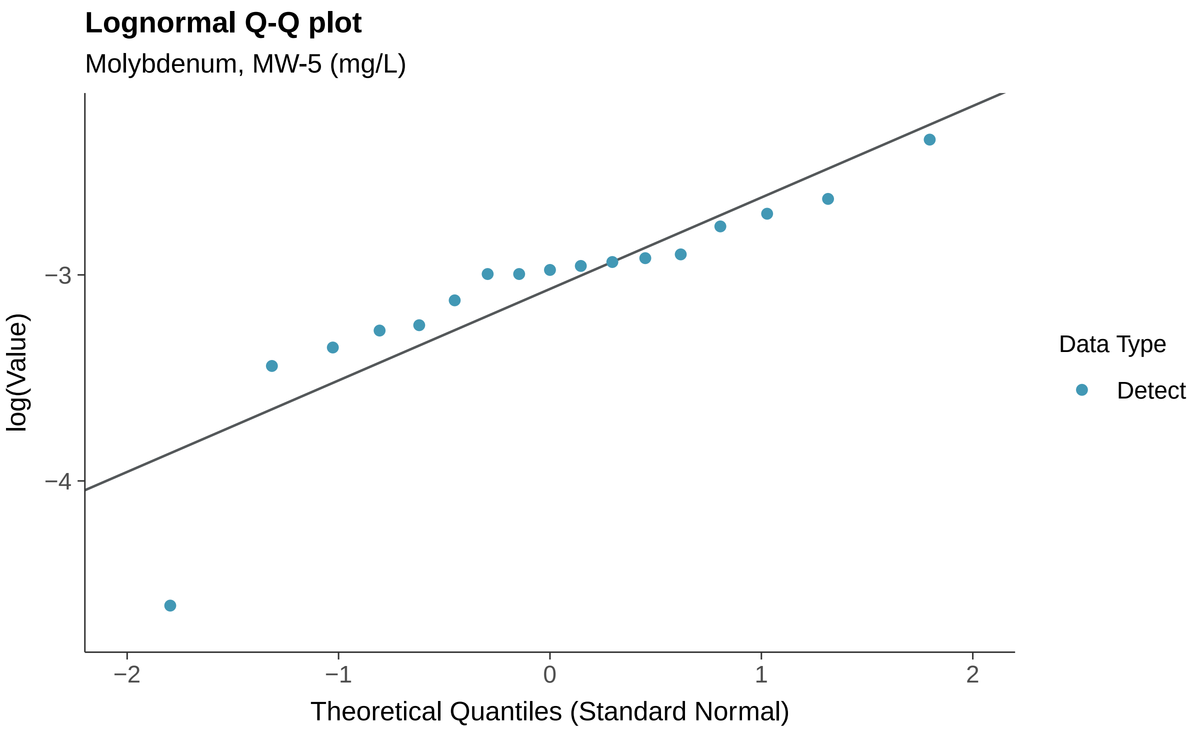


Boxplot by Season

Molybdenum, MW-5 (mg/L)

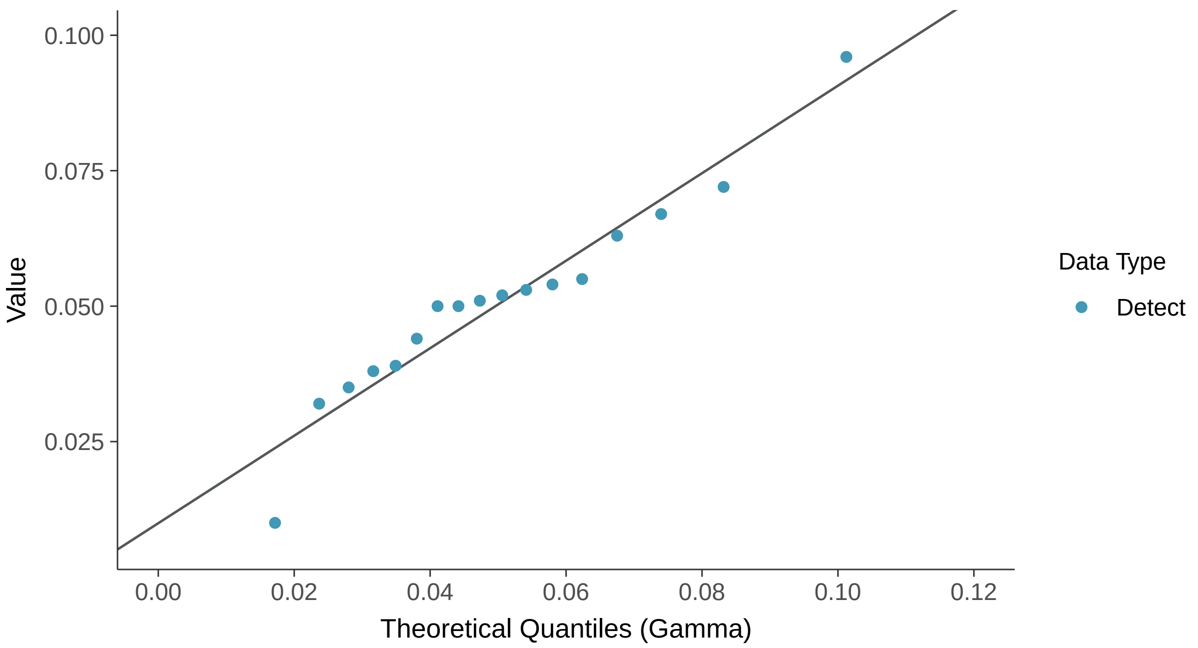



Normal Q-Q plot
Molybdenum, MW-5 (mg/L)
Value
0.100
0.075
0.050
0.025
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Molybdenum, MW-5 (mg/L)
log(Value)
−3
−4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

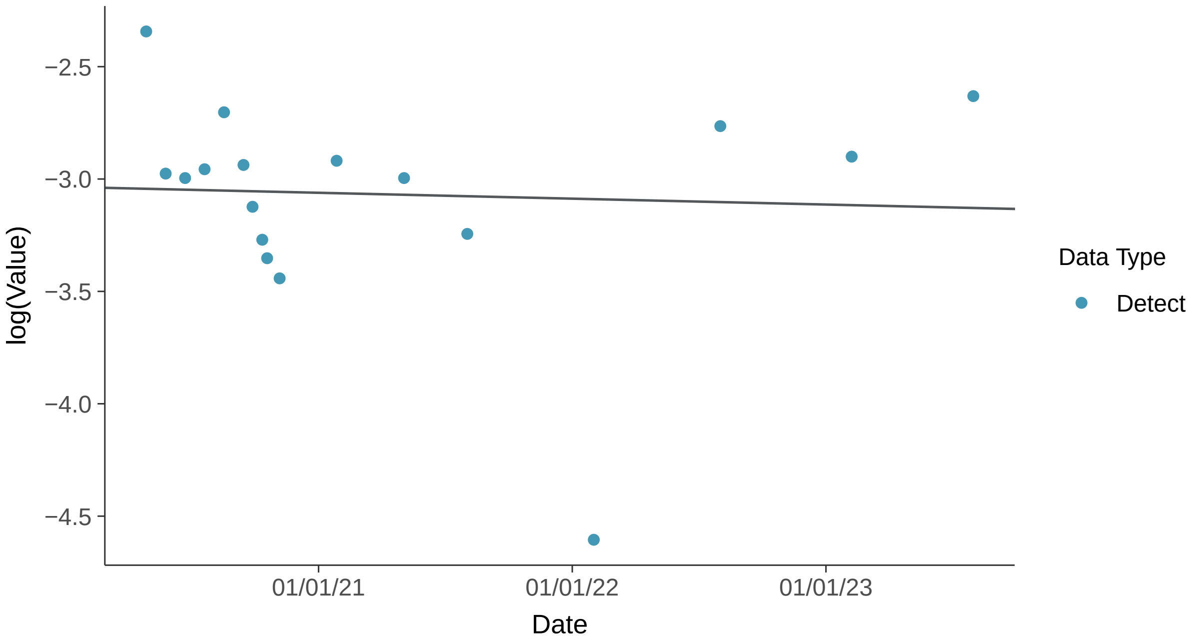
Gamma Q-Q plot

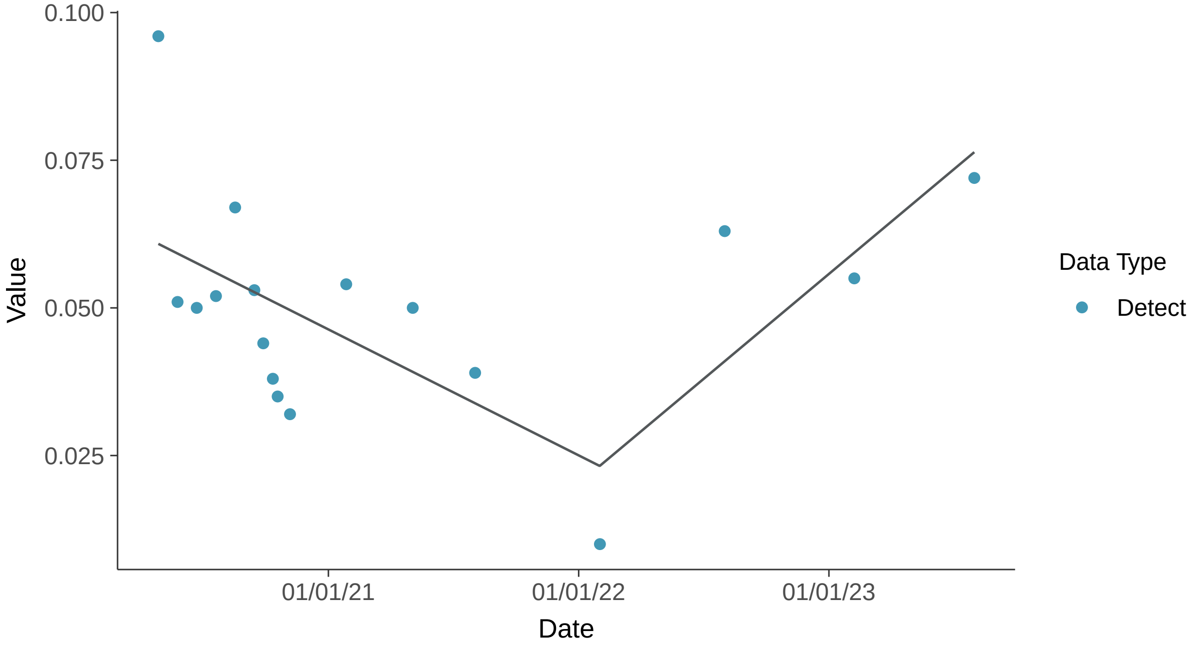
Molybdenum, MW-5 (mg/L)



Trend Regression: Lognormal MLE

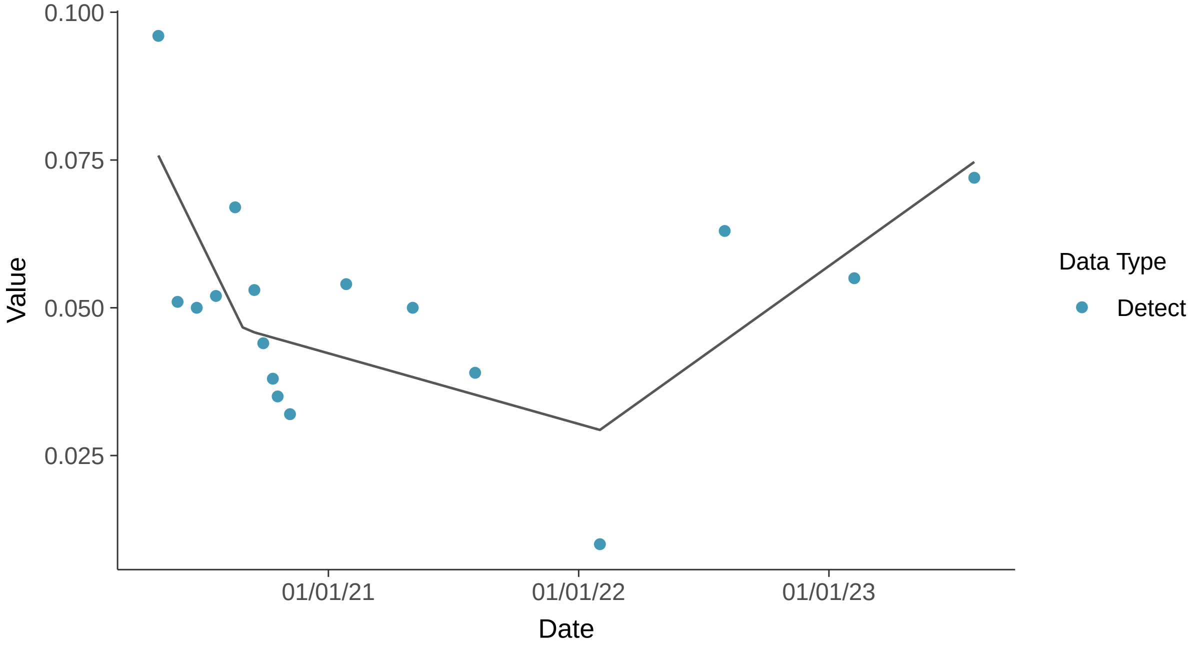
Molybdenum, MW-5 (mg/L)





Trend Regression: Piecewise Linear-Linear

Molybdenum, MW-5 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

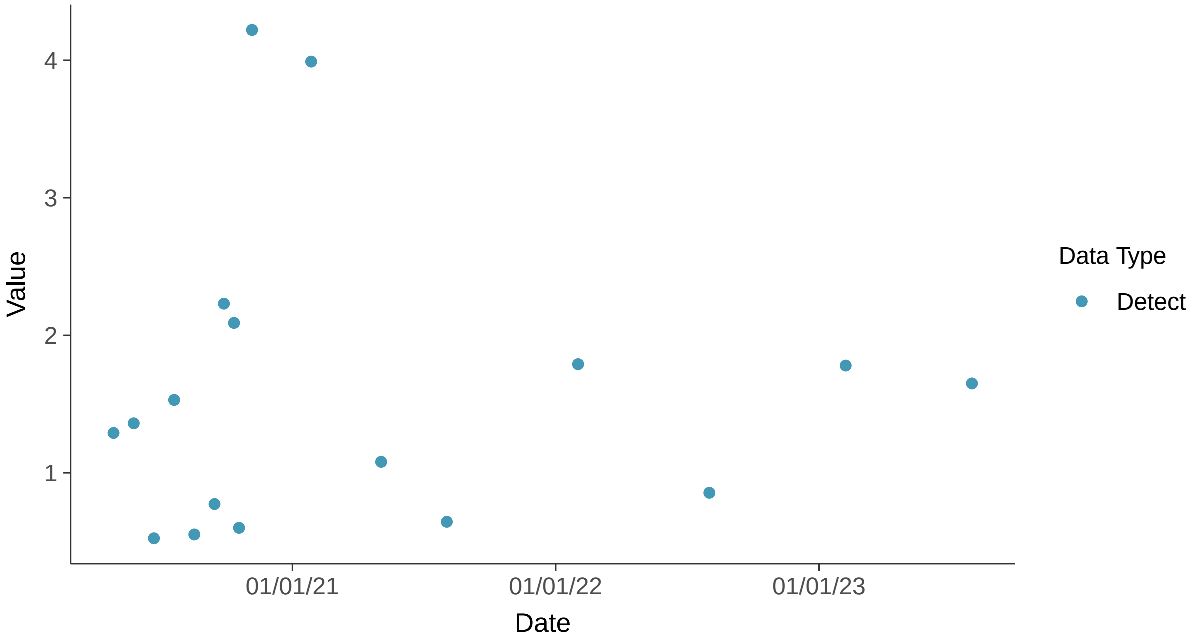
Molybdenum, MW-5 (mg/L)

Appendix IV: Radium-226/228, MW-5

ID: 05_2_20

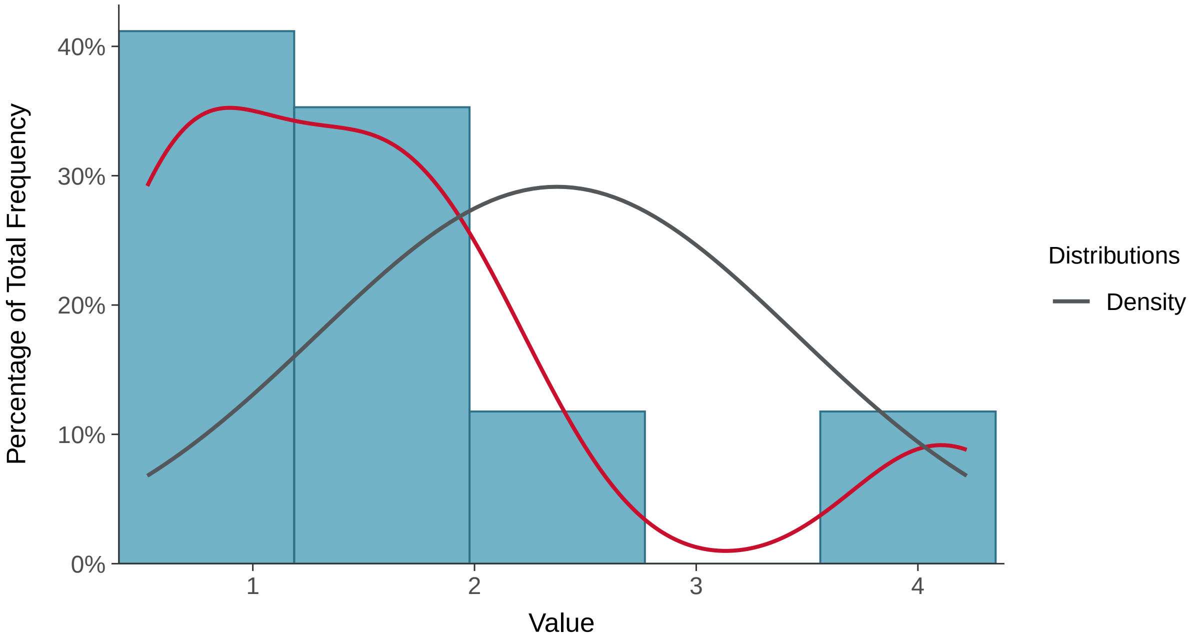
Scatter Plot

Radium-226/228, MW-5 (pCi/L)



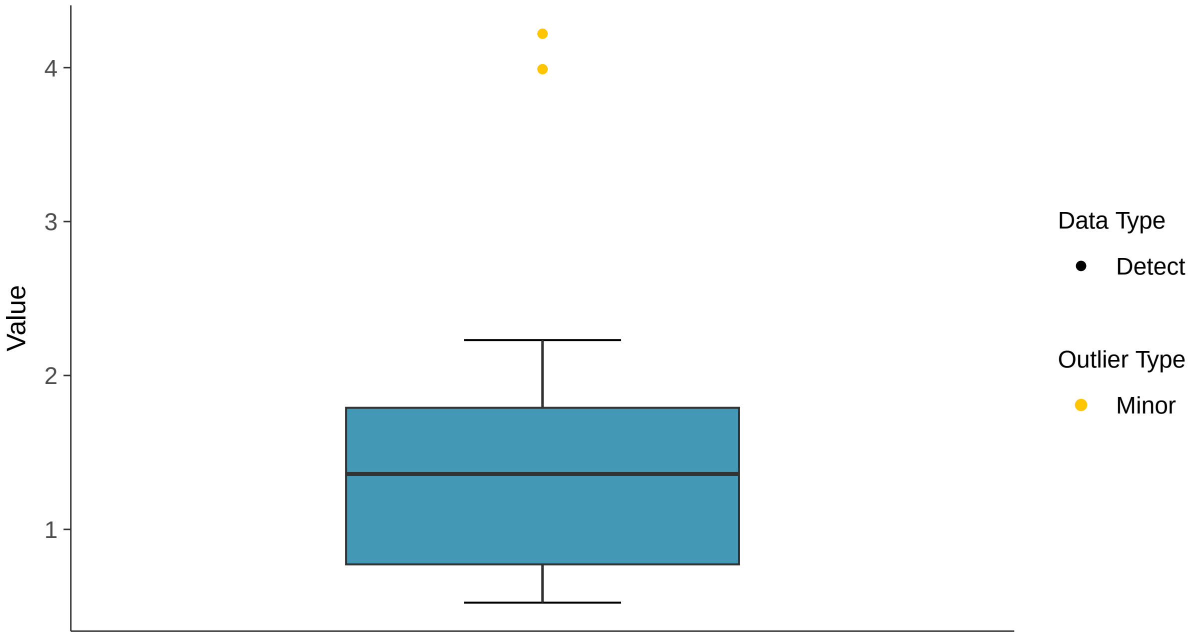
Histogram

Radium-226/228, MW-5 (pCi/L)



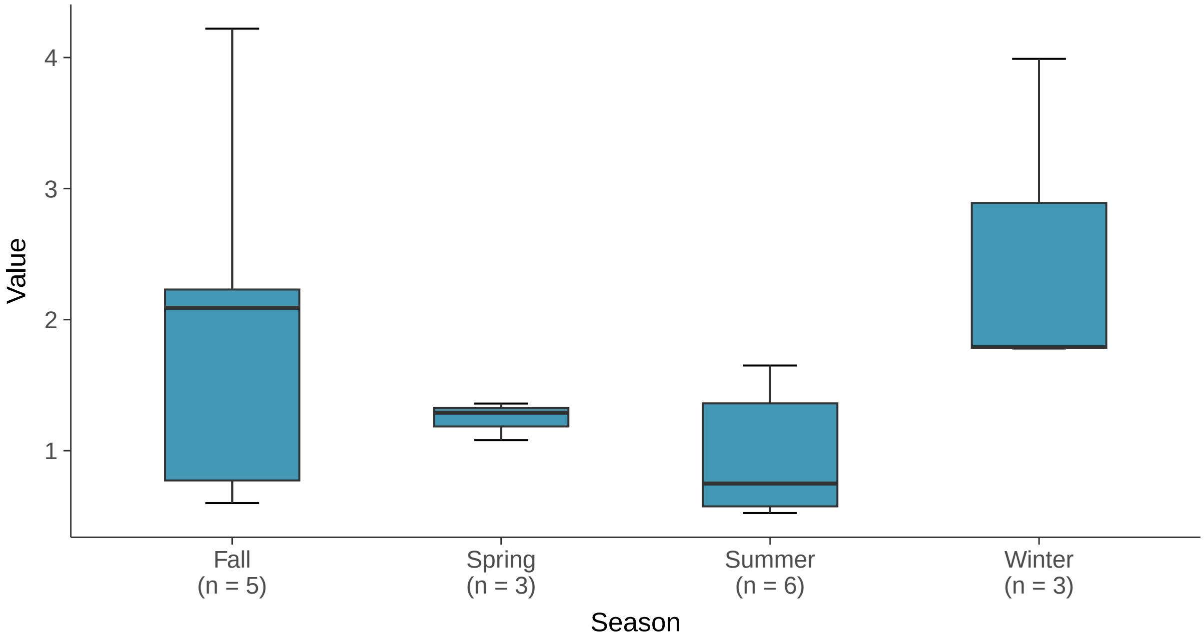
Boxplot

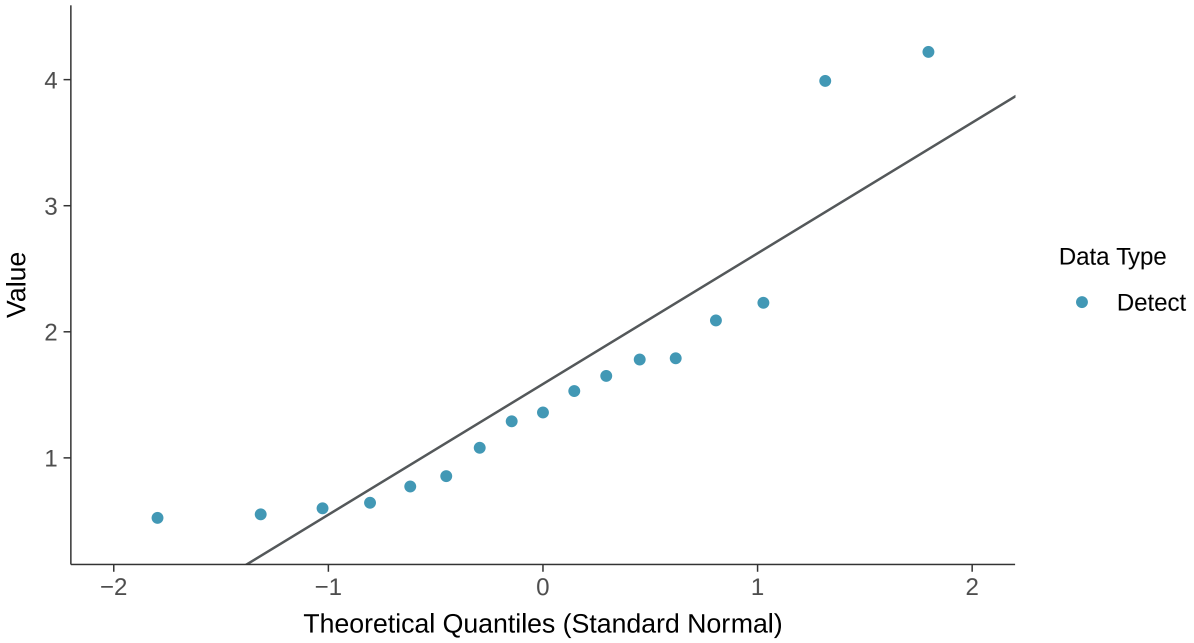
Radium-226/228, MW-5 (pCi/L)



Boxplot by Season

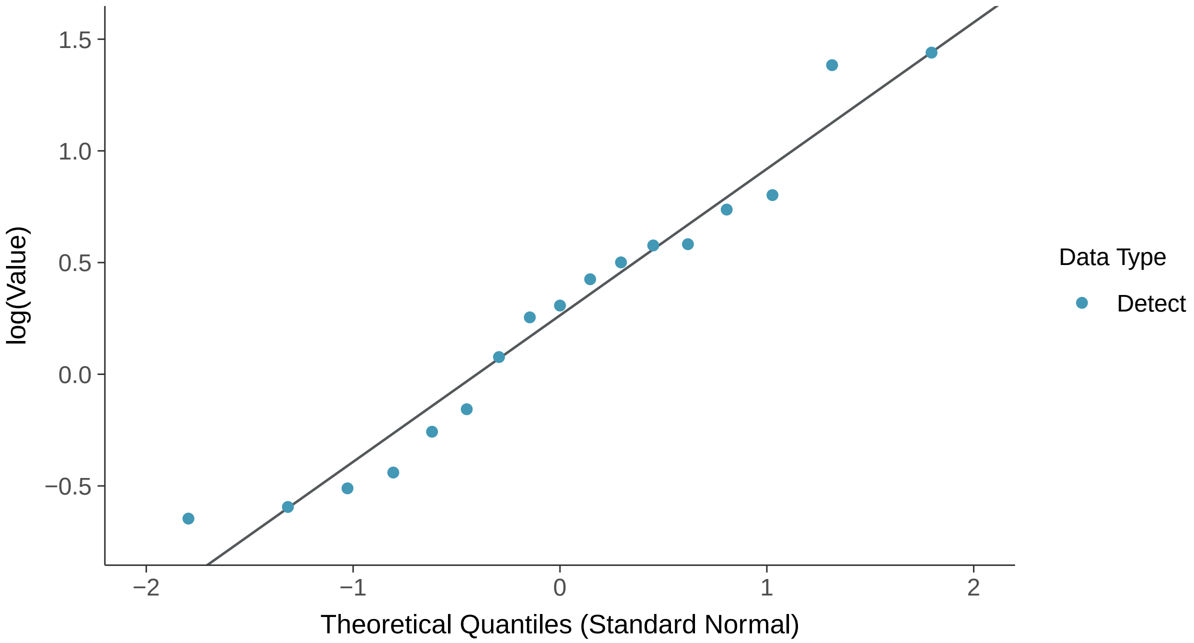
Radium-226/228, MW-5 (pCi/L)





Normal Q-Q plot

Radium-226/228, MW-5 (pCi/L)

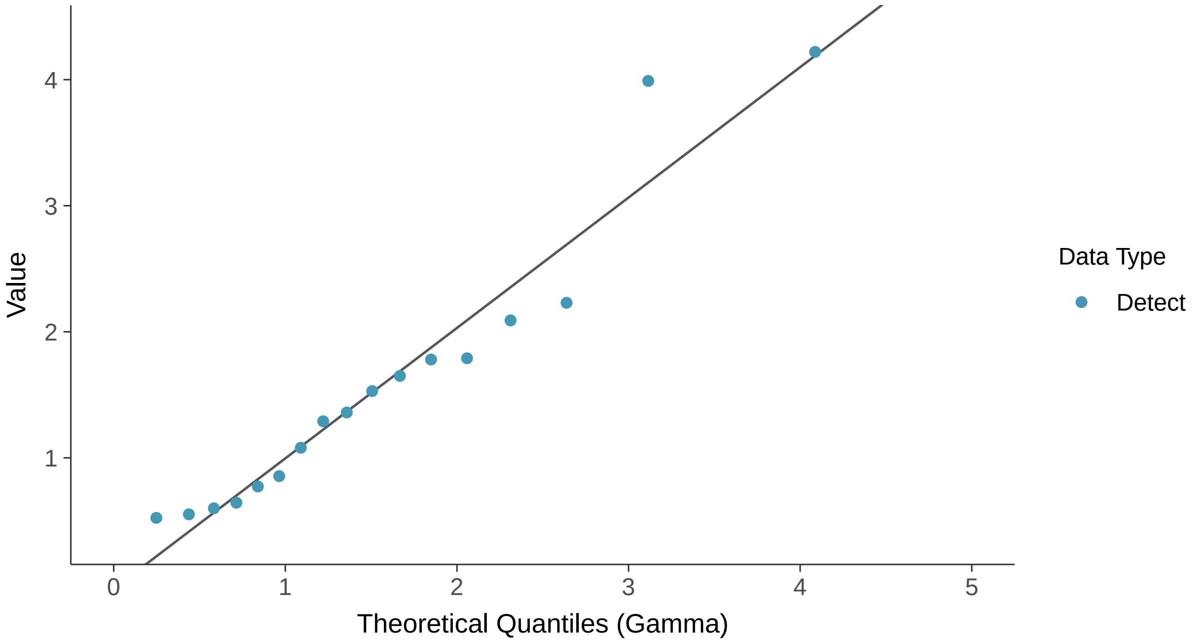


Lognormal Q-Q plot

Radium-226/228, MW-5 (pCi/L)

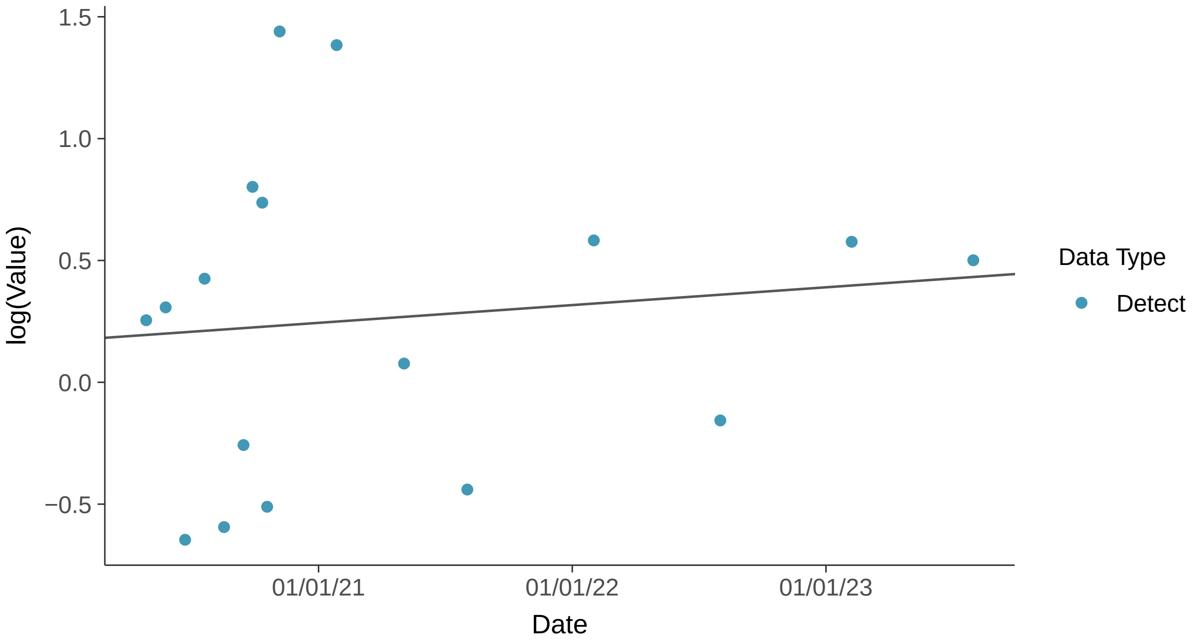
Gamma Q-Q plot

Radium-226/228, MW-5 (pCi/L)



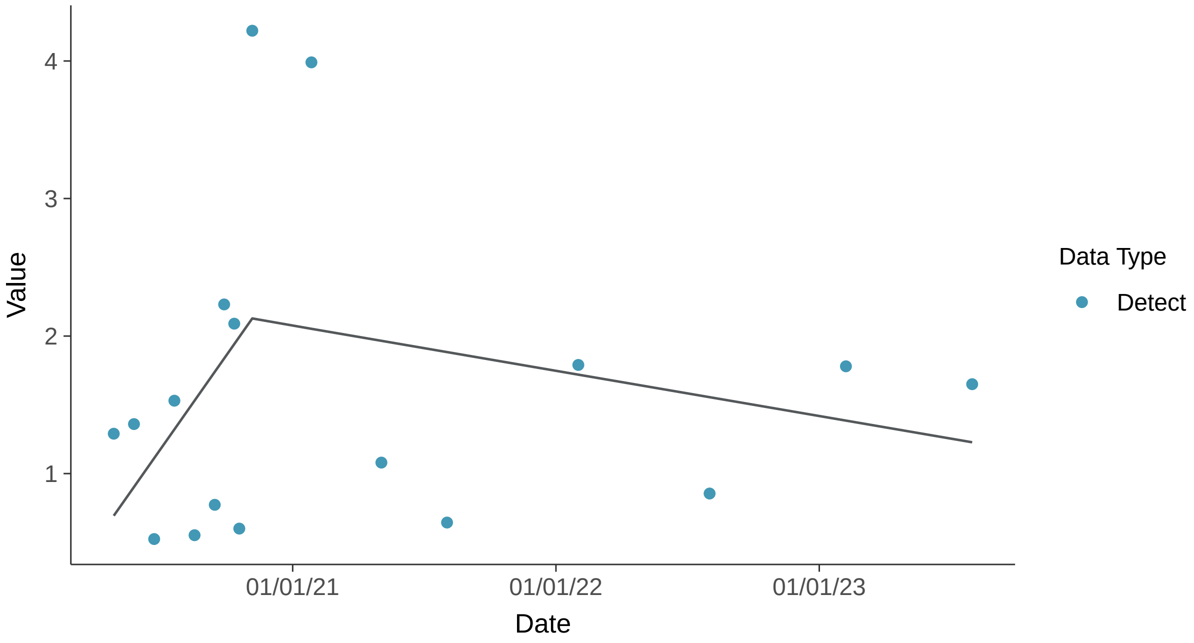
Trend Regression: Lognormal MLE

Radium-226/228, MW-5 (pCi/L)



Trend Regression: Piecewise Linear-Linear

Radium-226/228, MW-5 (pCi/L)

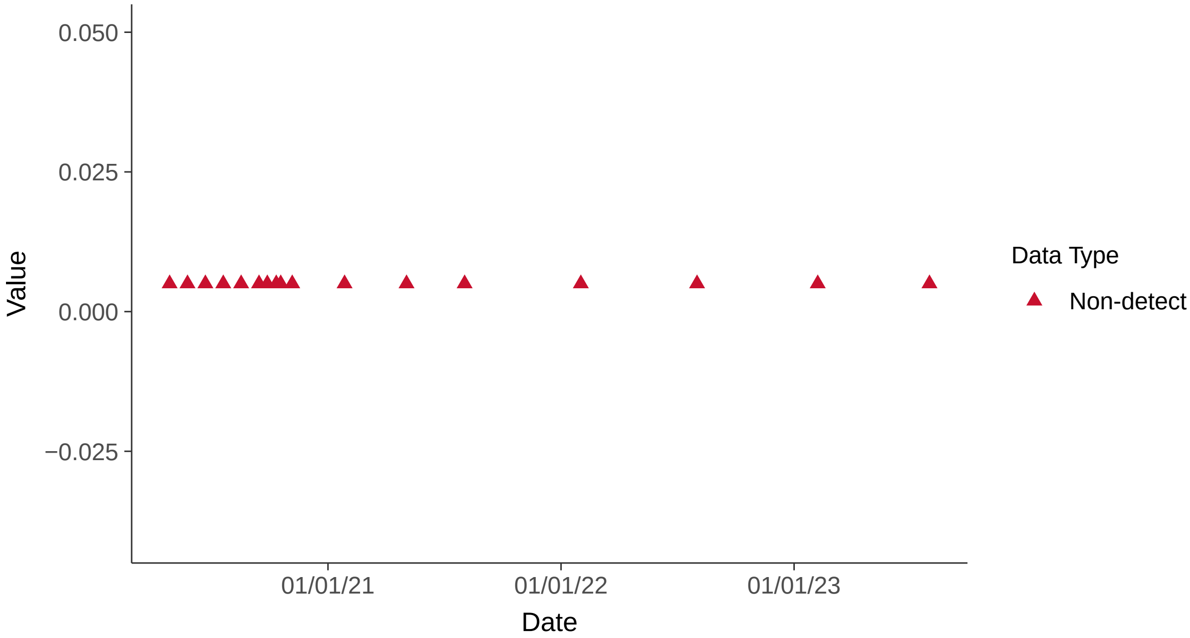


Appendix IV: Selenium, MW-5

ID: 05_2_22

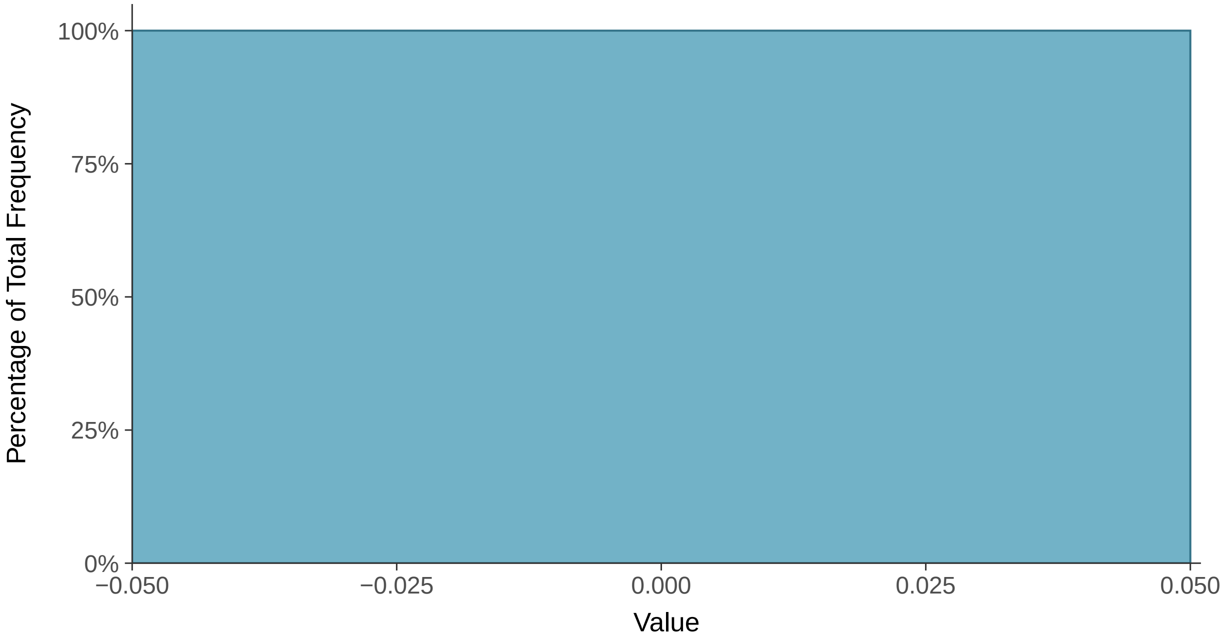
Scatter Plot

Selenium, MW-5 (mg/L)



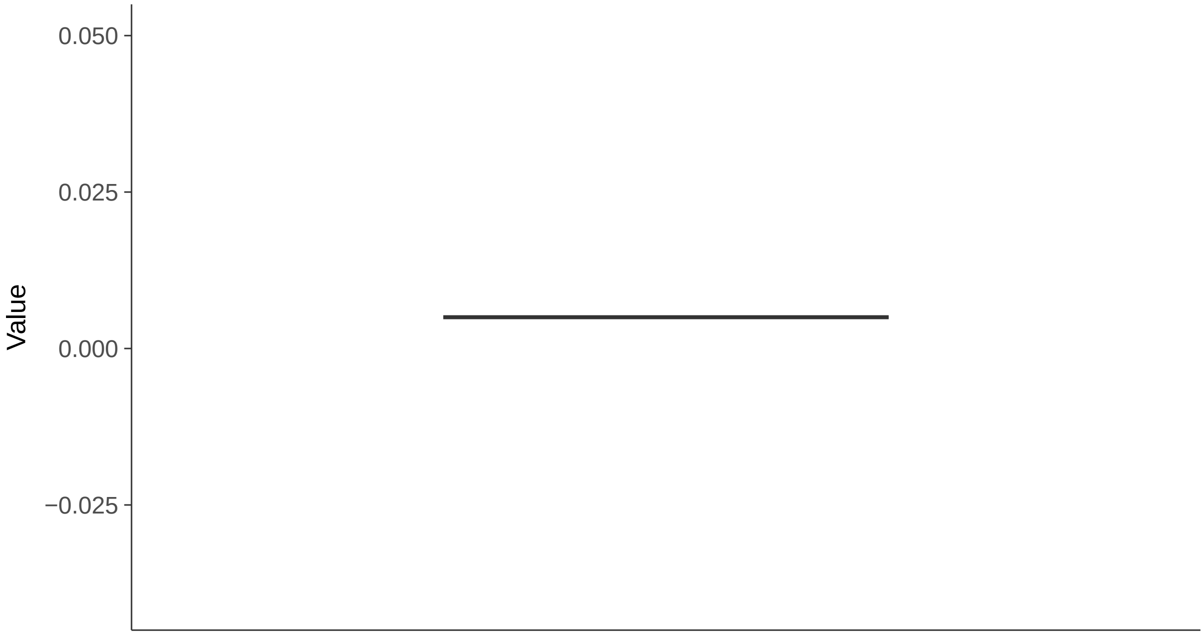
Histogram

Selenium, MW-5 (mg/L)



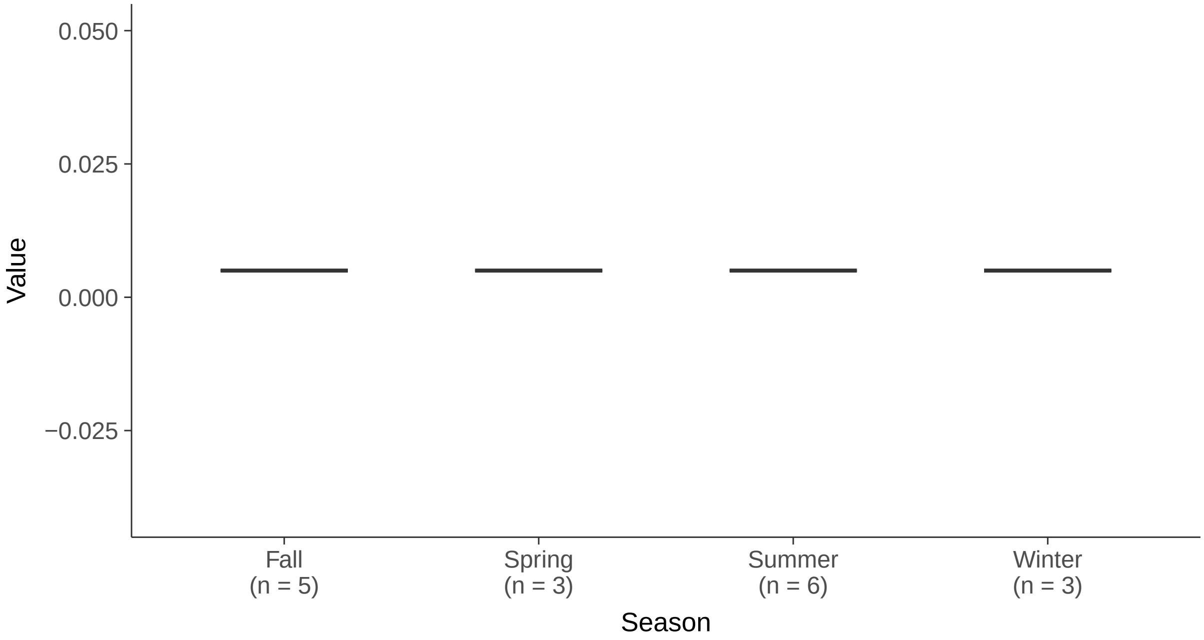
Boxplot

Selenium, MW-5 (mg/L)



Boxplot by Season

Selenium, MW-5 (mg/L)

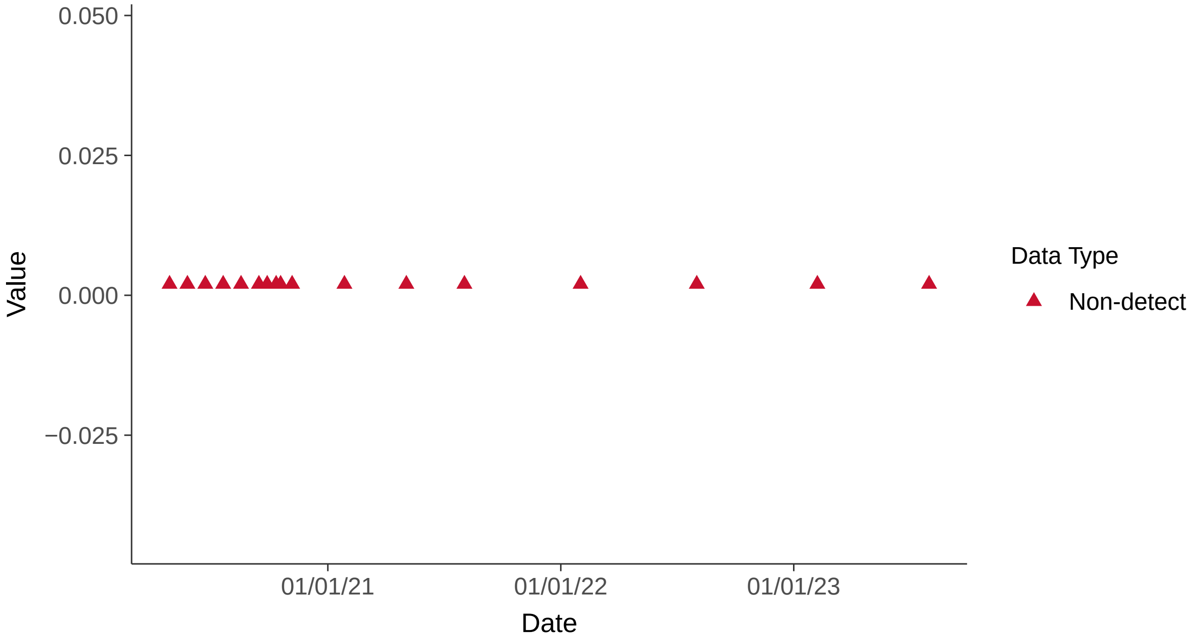


Appendix IV: Thallium, MW-5

ID: 05_2_23

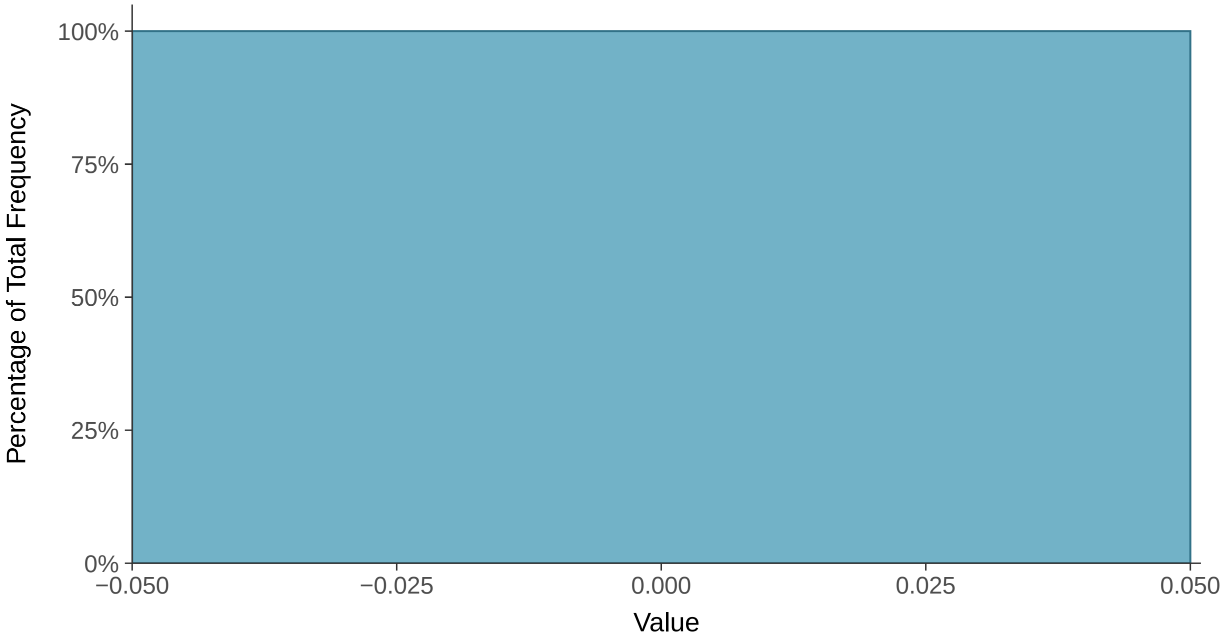
Scatter Plot

Thallium, MW-5 (mg/L)



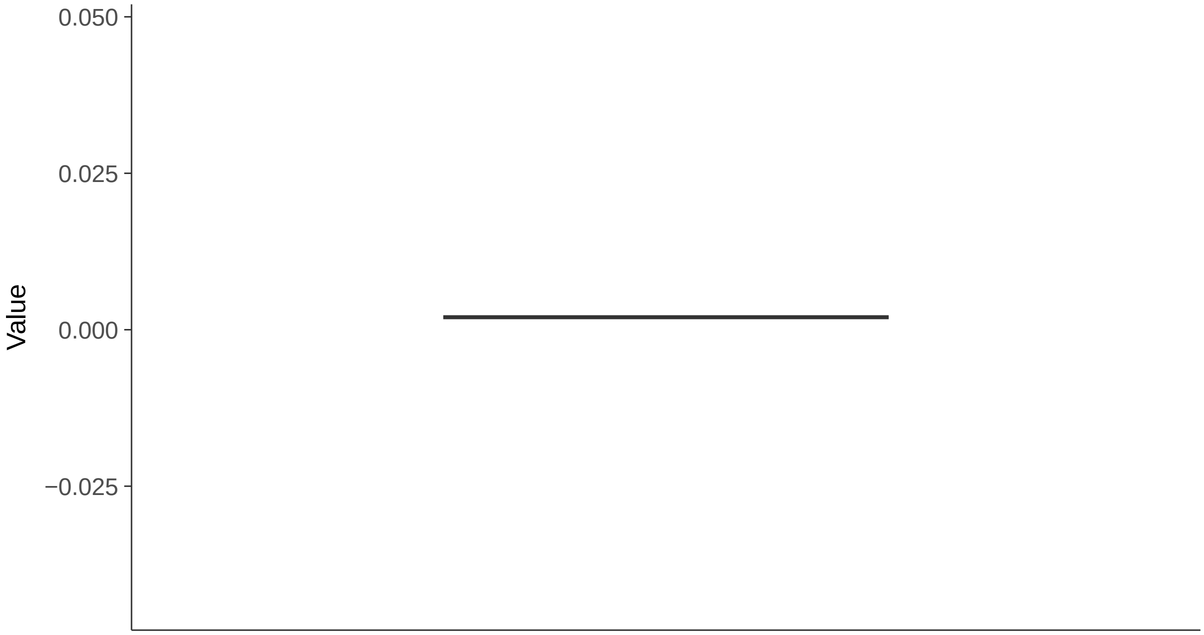
Histogram

Thallium, MW-5 (mg/L)



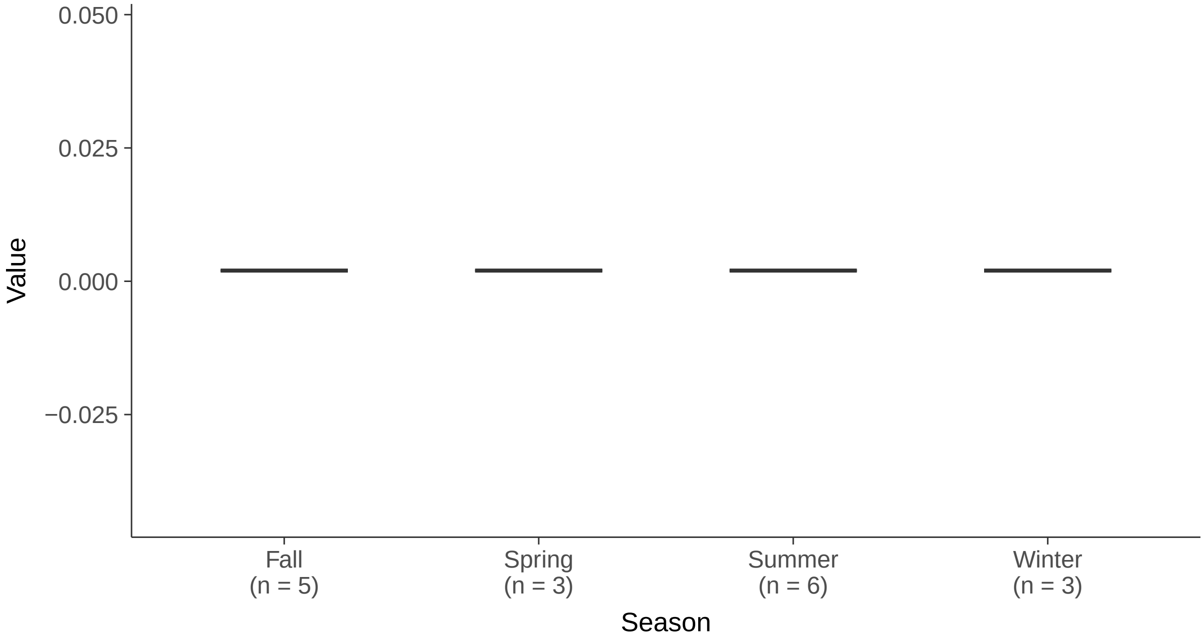
Boxplot

Thallium, MW-5 (mg/L)



Boxplot by Season

Thallium, MW-5 (mg/L)

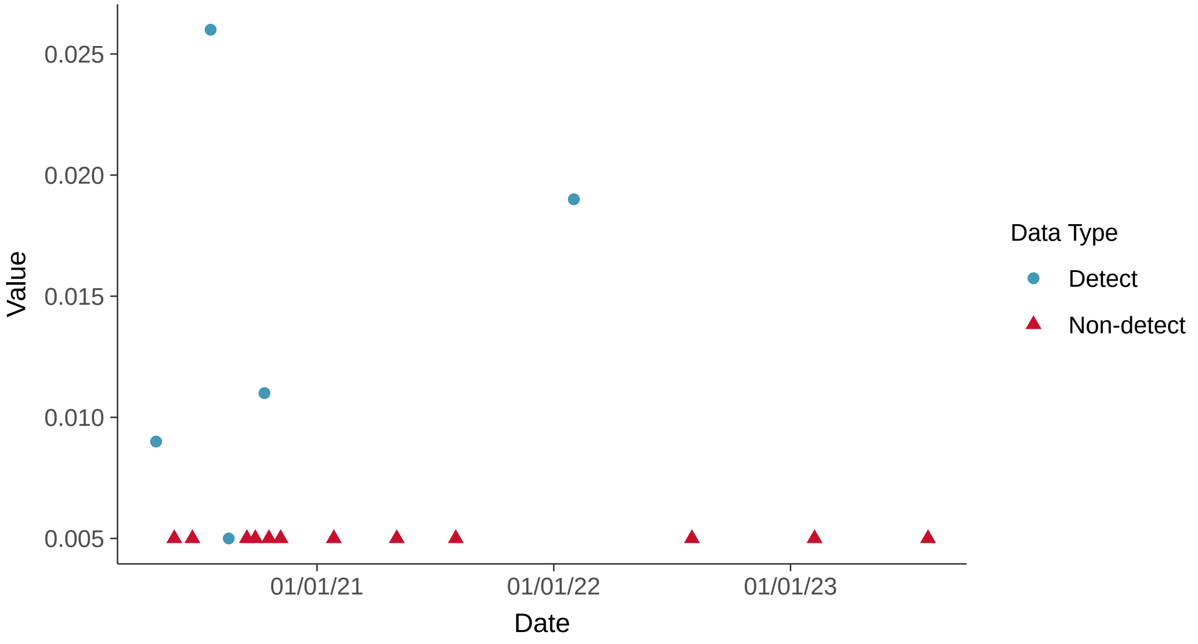


Part 115: Copper, MW-5

ID: 05_5_37

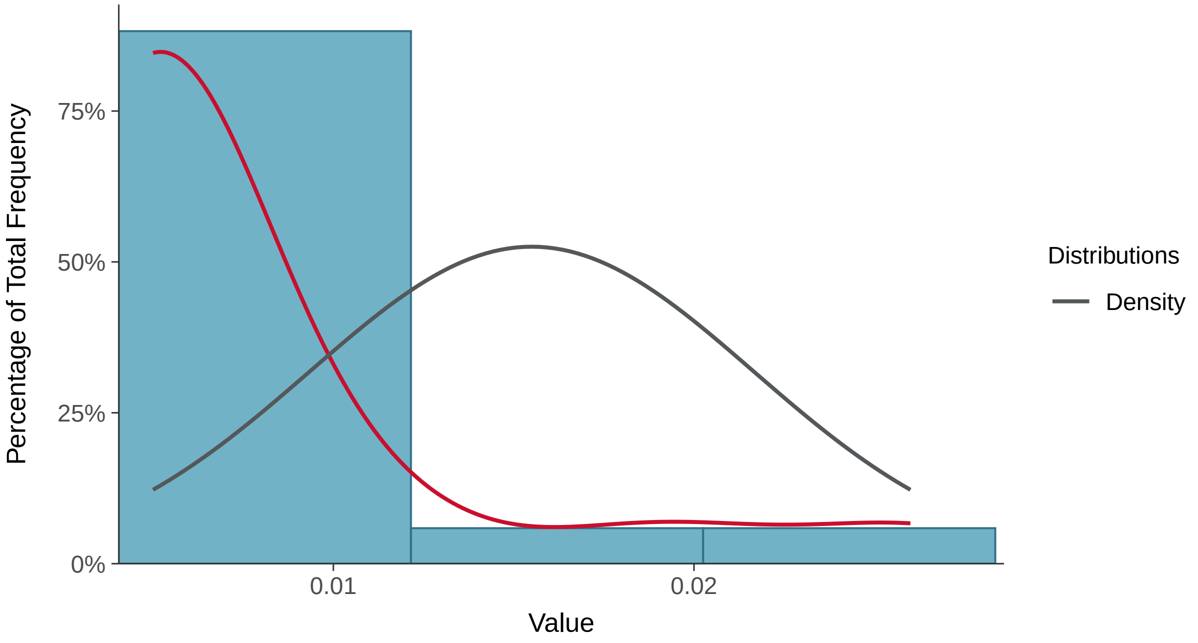
Scatter Plot

Copper, MW-5 (mg/L)



Histogram

Copper, MW-5 (mg/L)

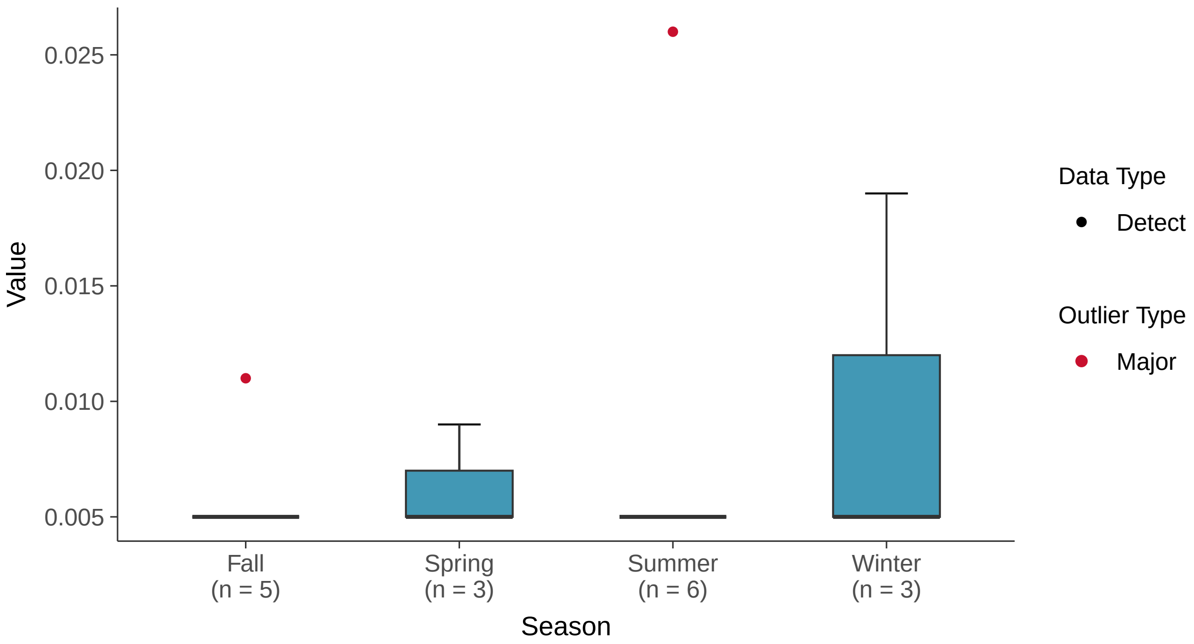


Boxplot

Copper, MW-5 (mg/L)

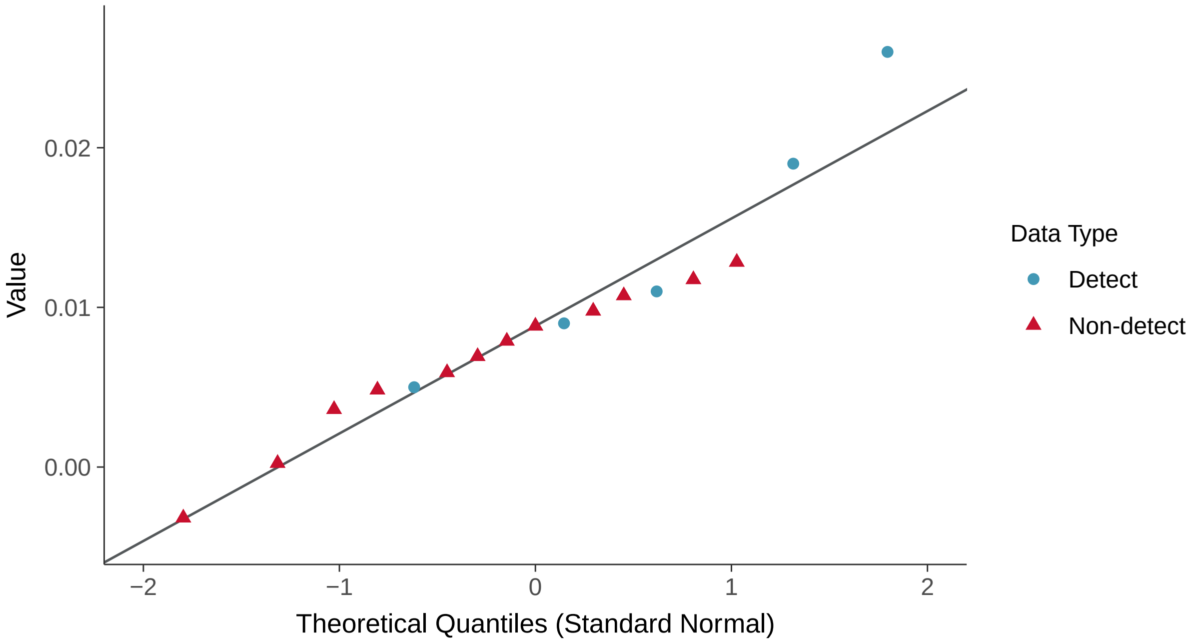
Boxplot by Season

Copper, MW-5 (mg/L)



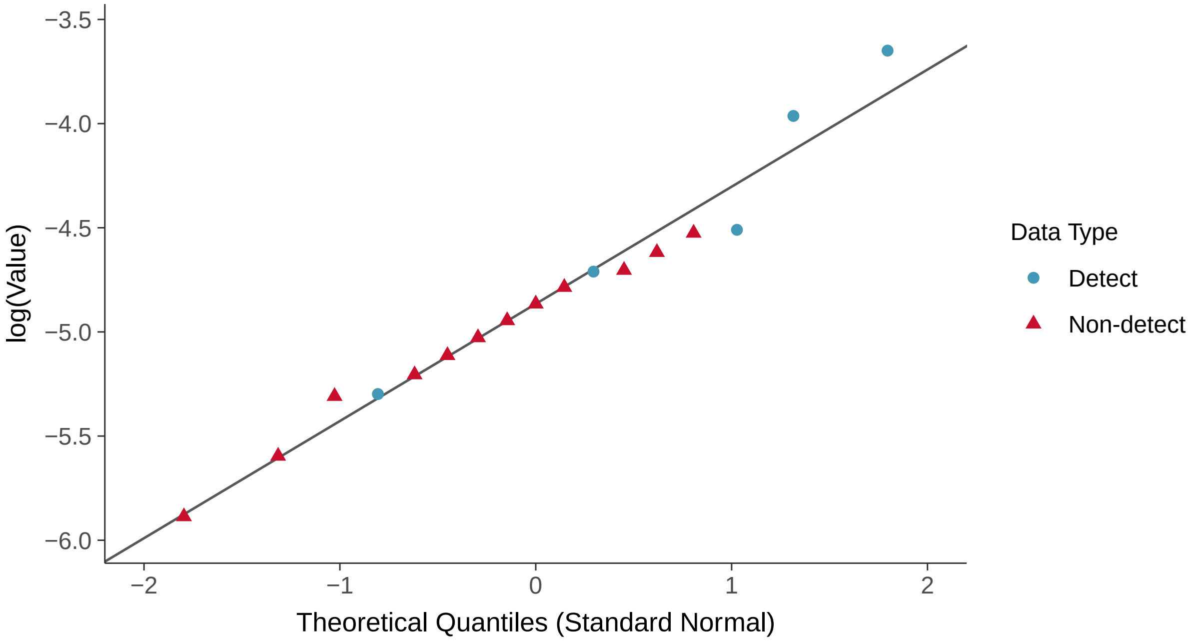
Normal Q-Q plot using ROS Imputed Estimates

Copper, MW-5 (mg/L)



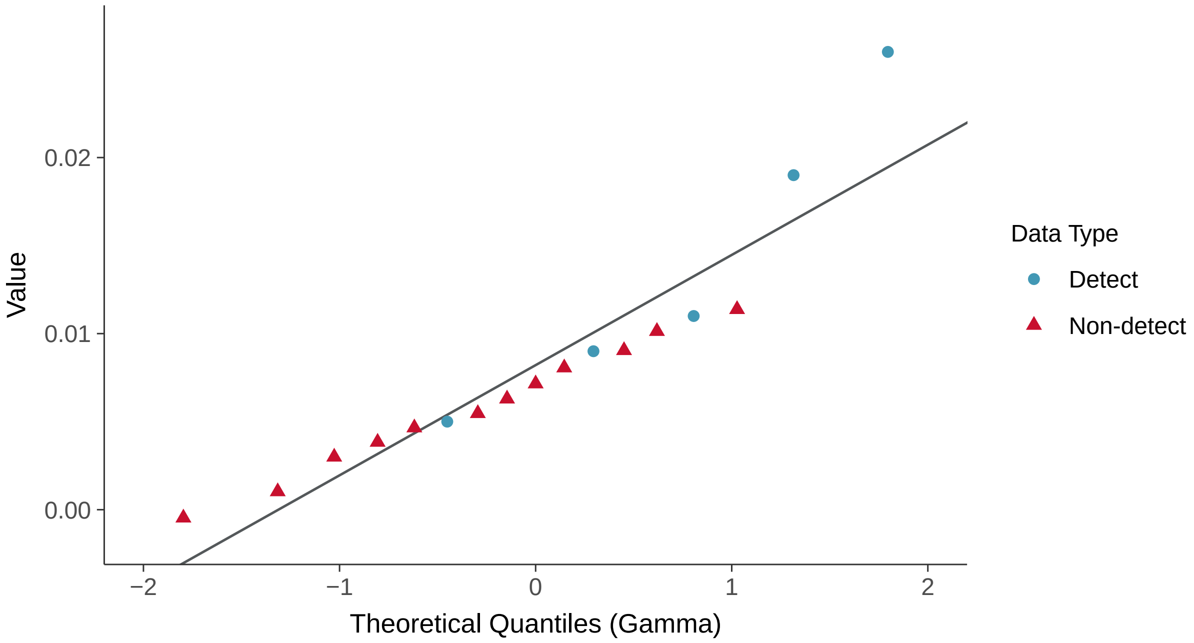
Lognormal Q-Q plot using ROS Imputed Estimates

Copper, MW-5 (mg/L)



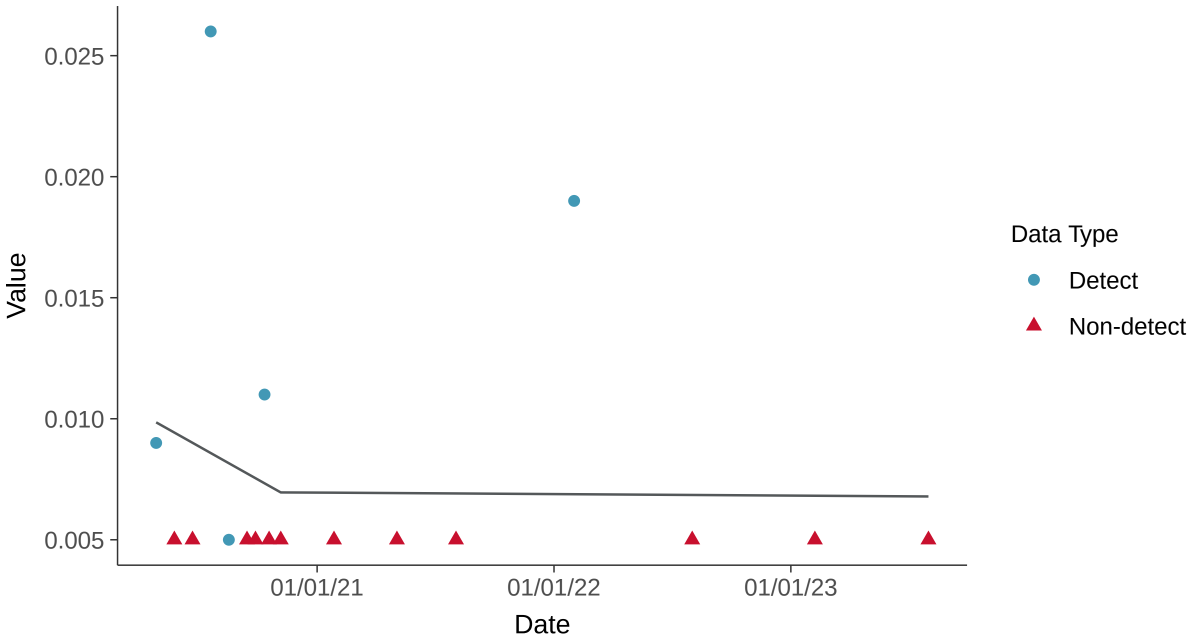
Gamma Q-Q plot using ROS Imputed Estimates

Copper, MW-5 (mg/L)



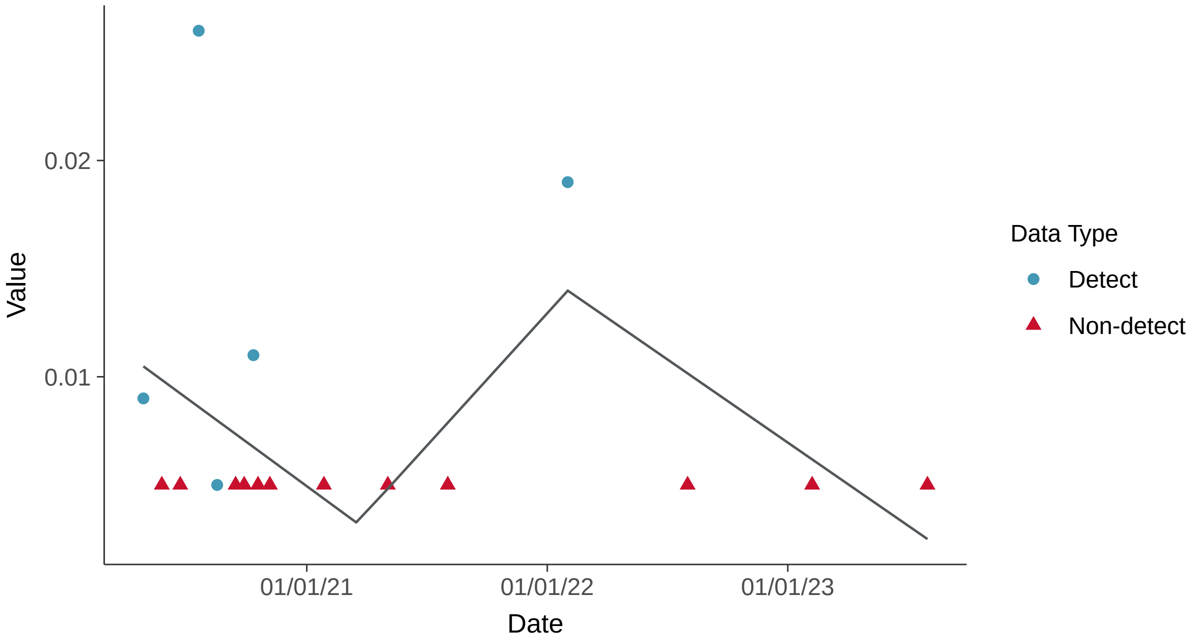
Trend Regression: Piecewise Linear-Linear

Copper, MW-5 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Copper, MW-5 (mg/L)

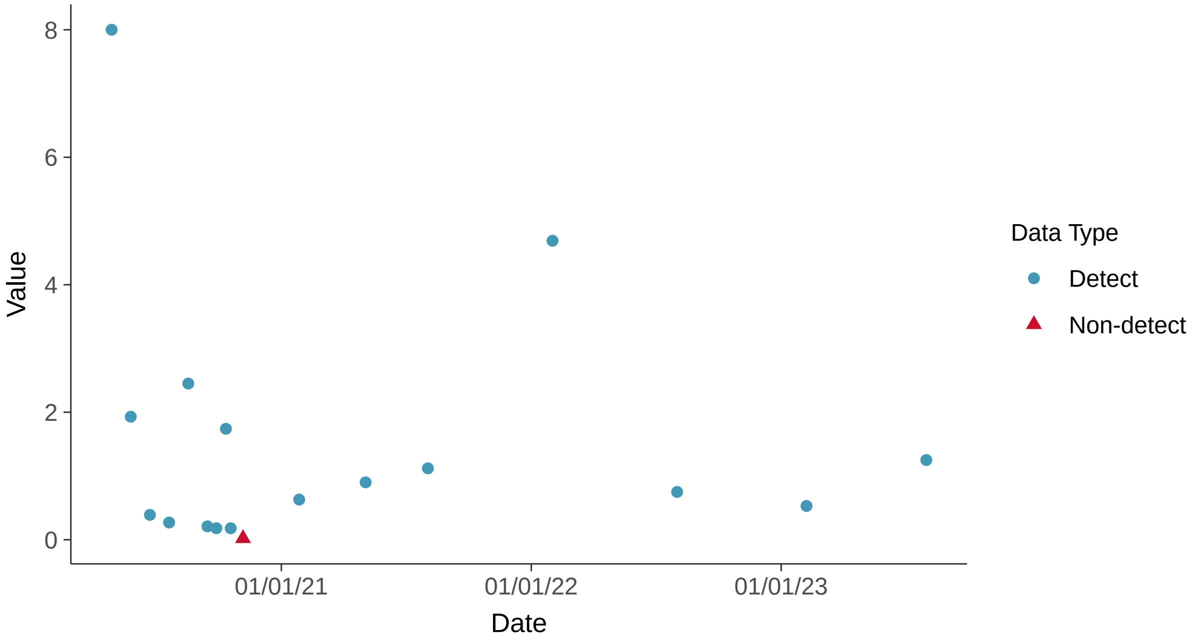


Part 115: Iron, MW-5

ID: 05_5_38

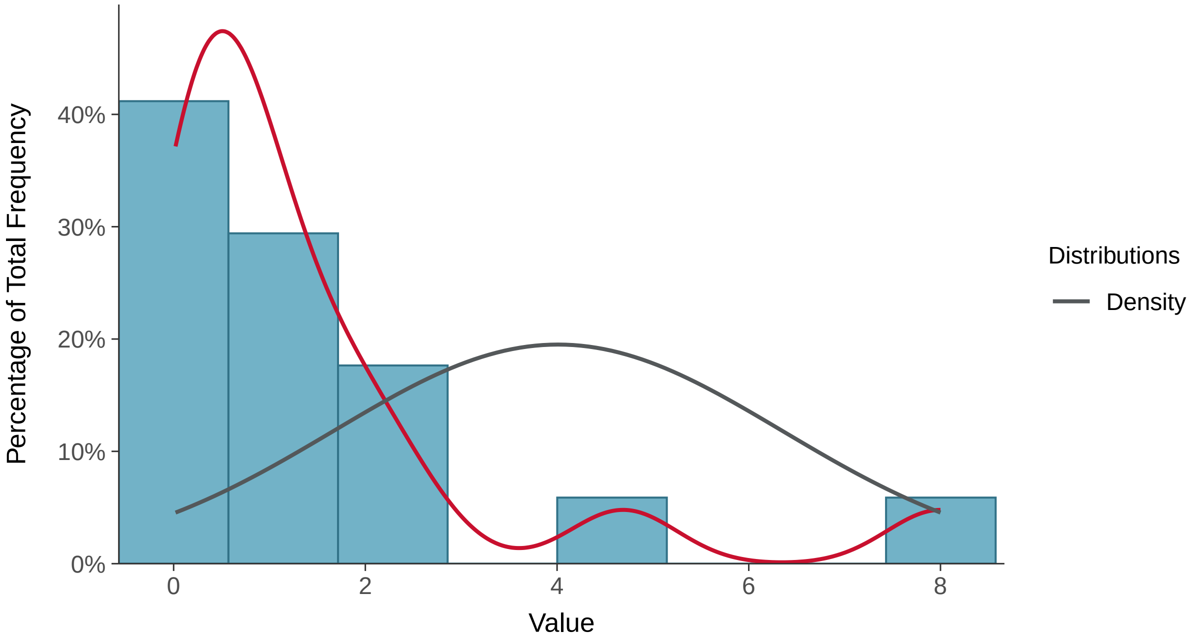
Scatter Plot

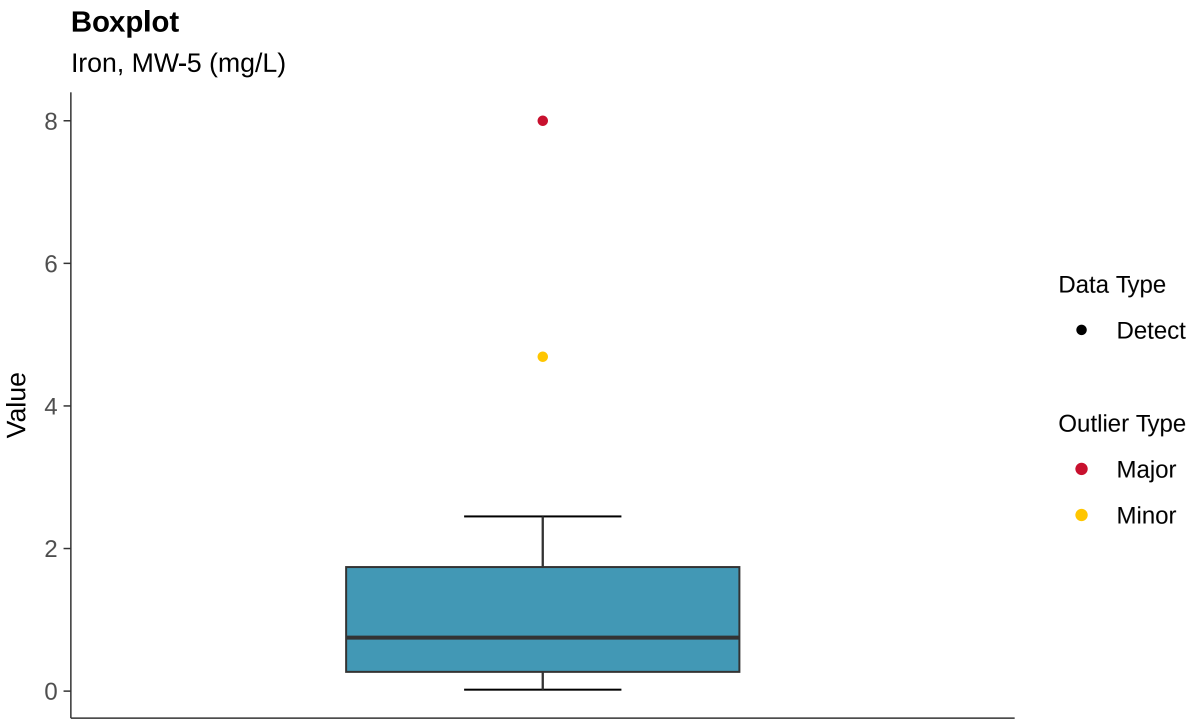
Iron, MW-5 (mg/L)



Histogram

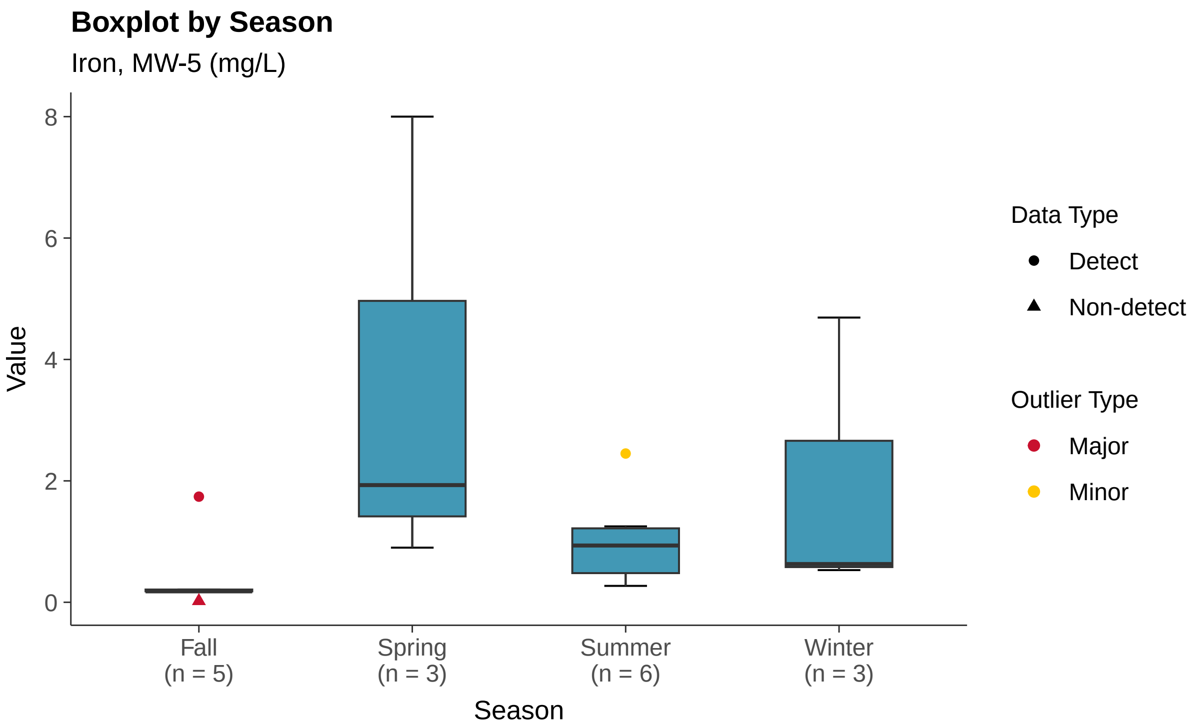
Iron, MW-5 (mg/L)





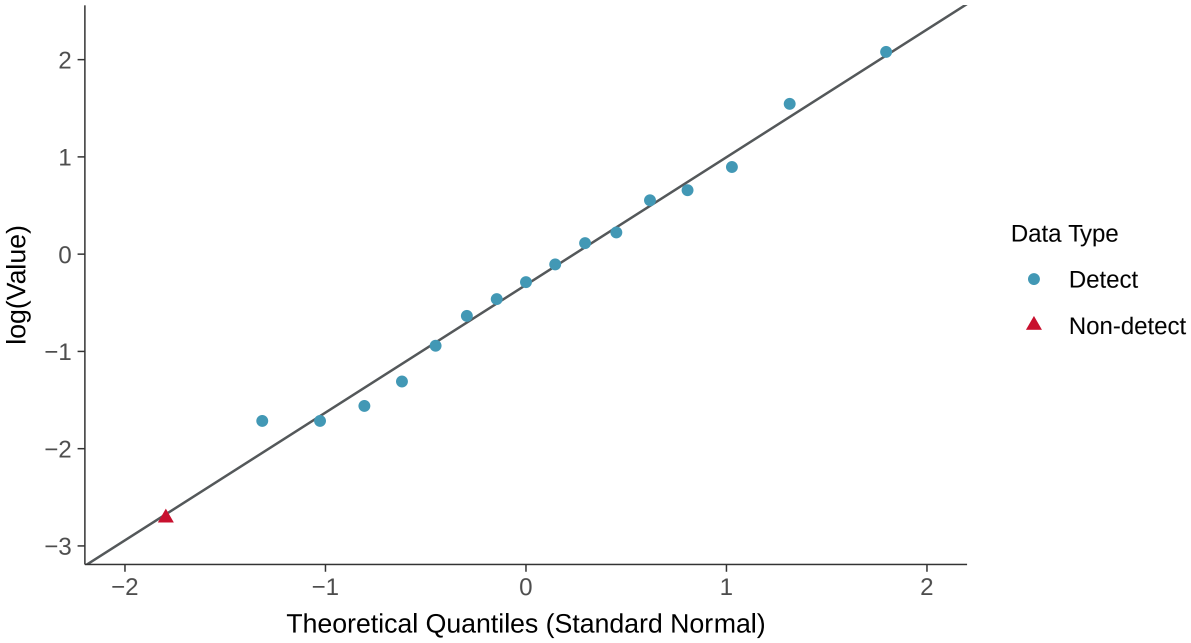
Boxplot

Iron, MW-5 (mg/L)



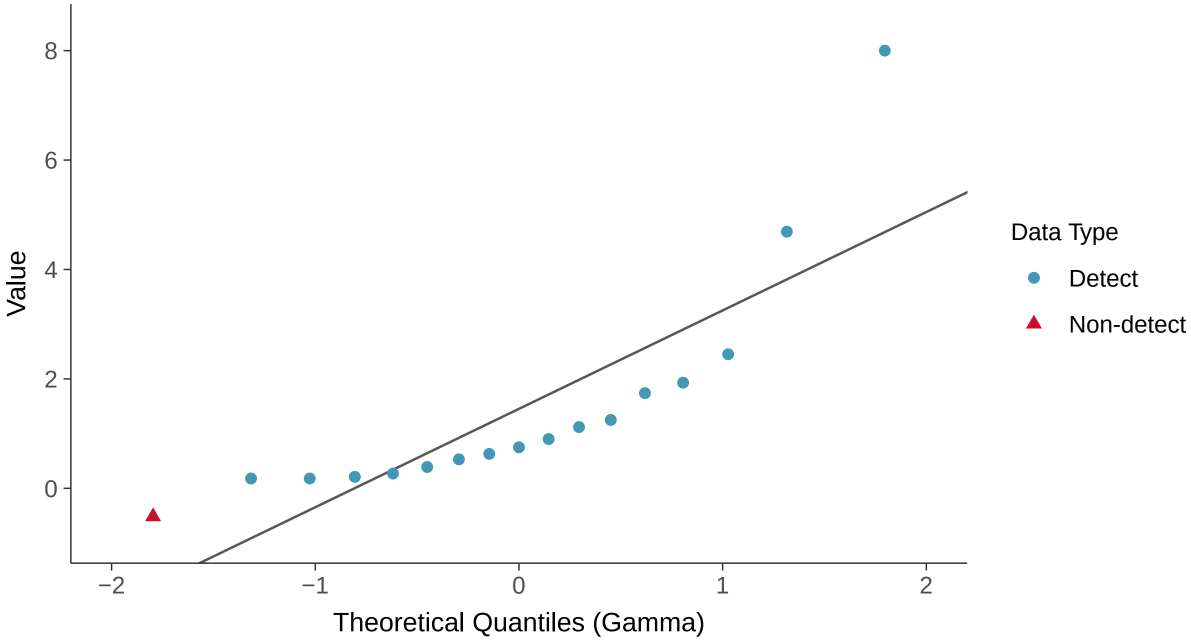
Boxplot by Season

Iron, MW-5 (mg/L)



Lognormal Q-Q plot using ROS Imputed Estimates

Iron, MW-5 (mg/L)

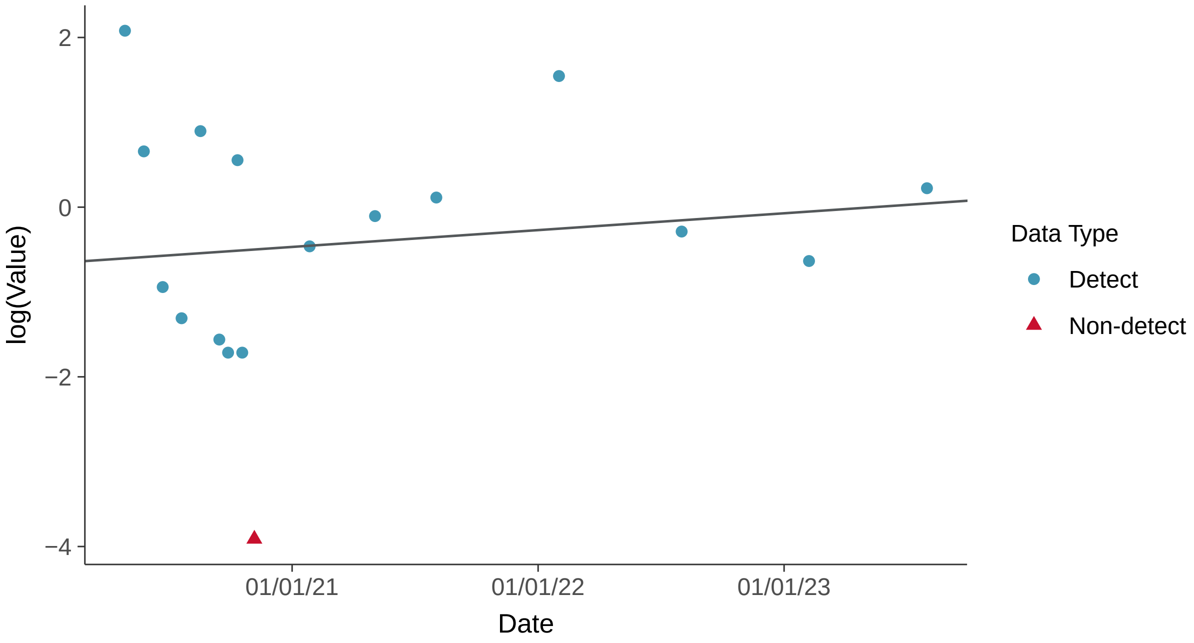


Gamma Q-Q plot using ROS Imputed Estimates

Iron, MW-5 (mg/L)

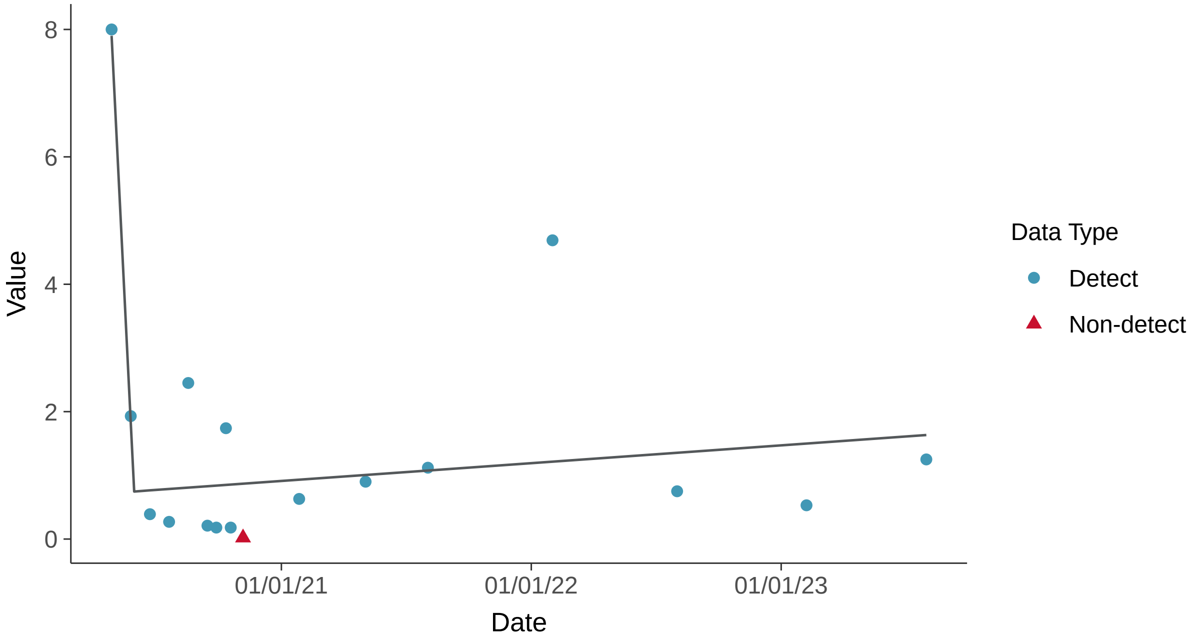
Trend Regression: Lognormal MLE

Iron, MW-5 (mg/L)



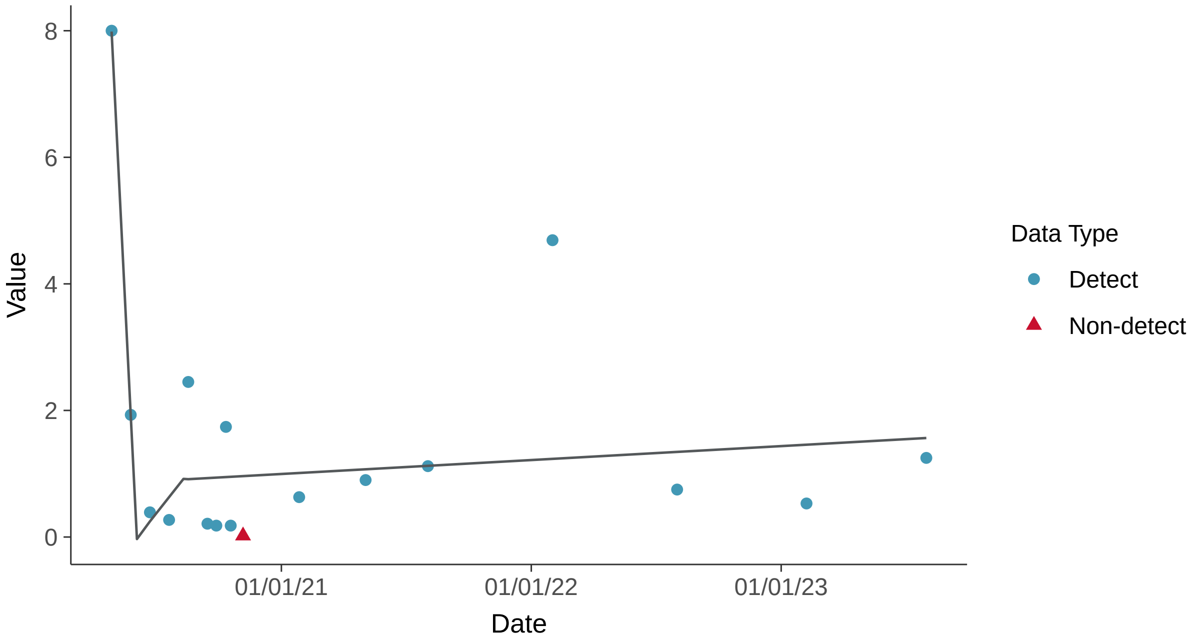
Trend Regression: Piecewise Linear-Linear

Iron, MW-5 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Iron, MW-5 (mg/L)

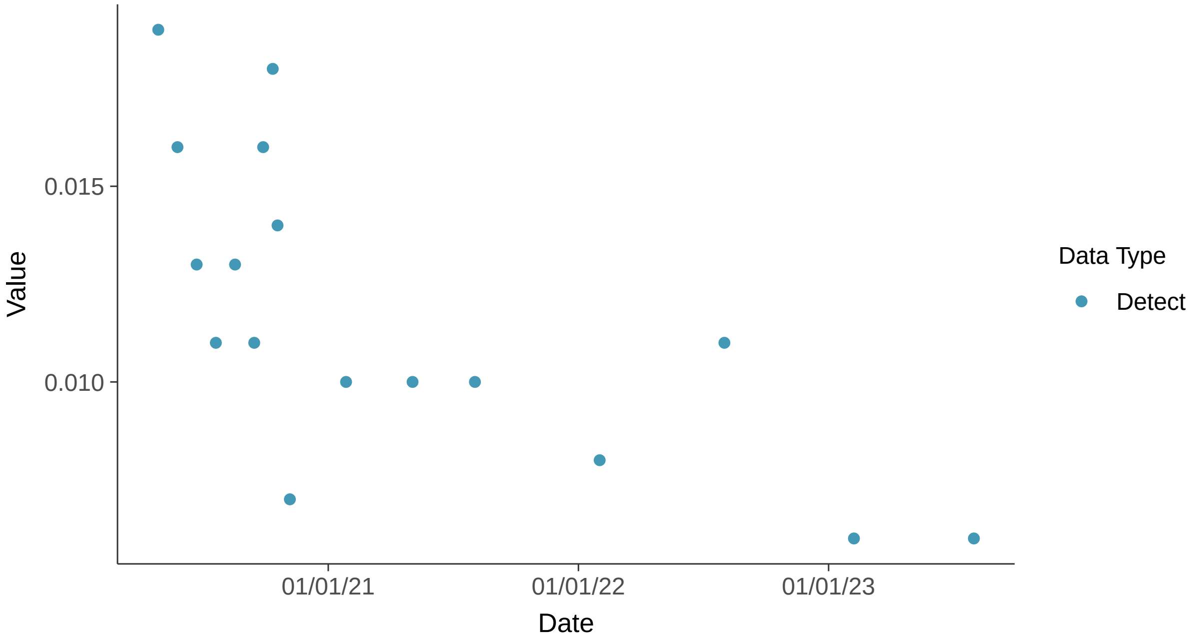


Part 115: Nickel, MW-5

ID: 05_5_39

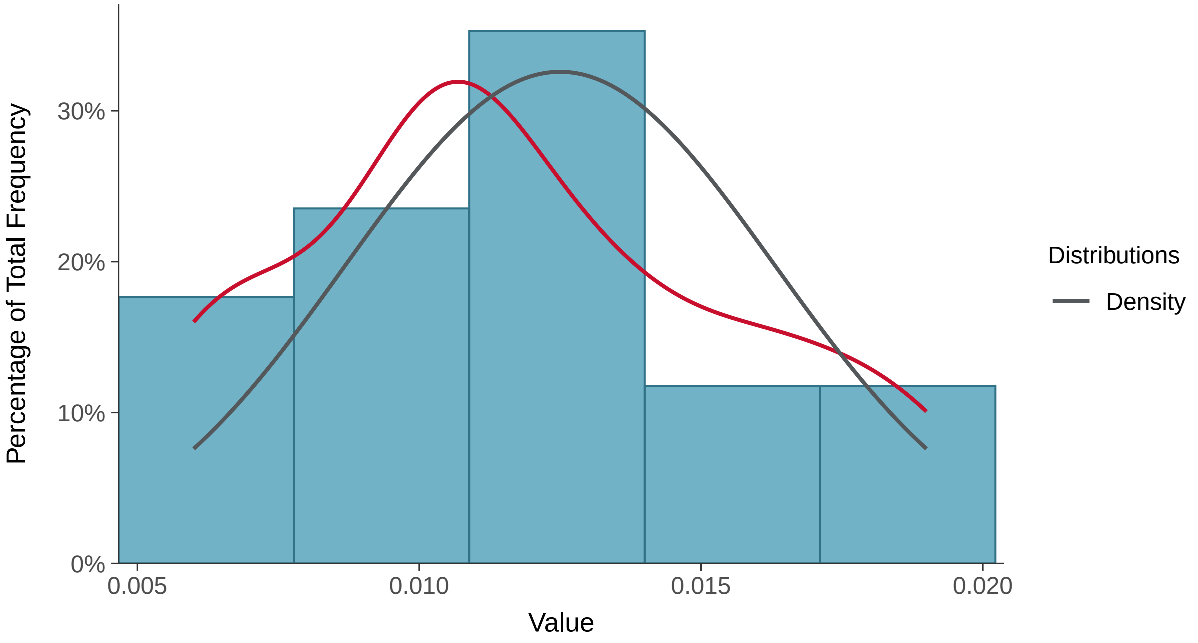
Scatter Plot

Nickel, MW-5 (mg/L)



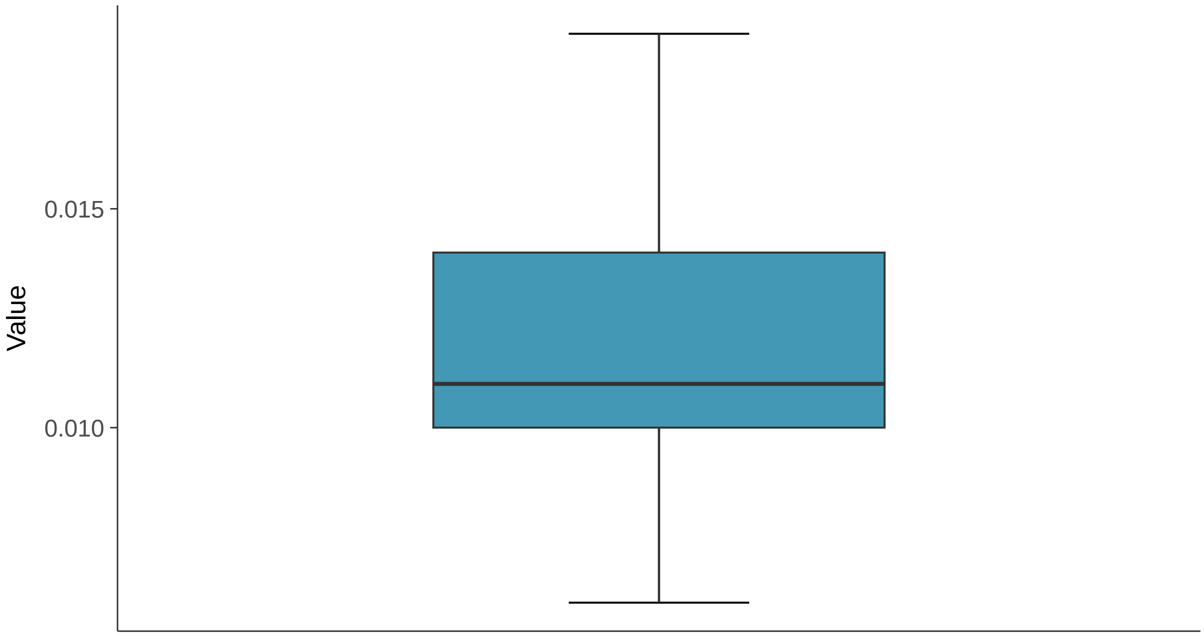
Histogram

Nickel, MW-5 (mg/L)



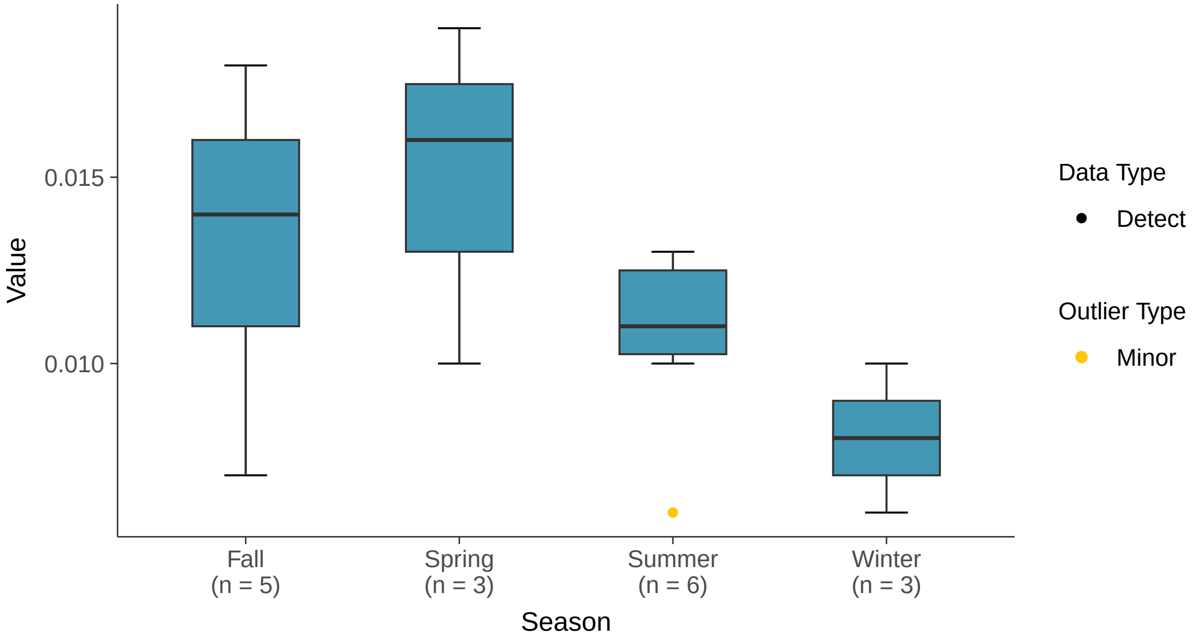
Boxplot

Nickel, MW-5 (mg/L)



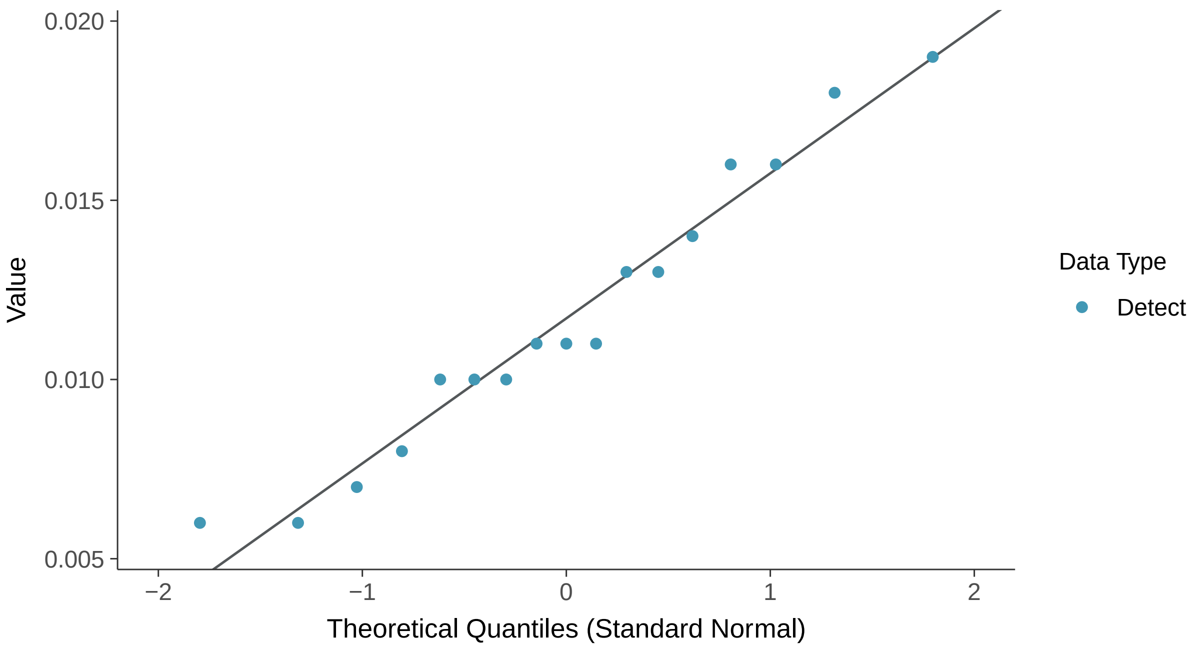
Boxplot by Season

Nickel, MW-5 (mg/L)



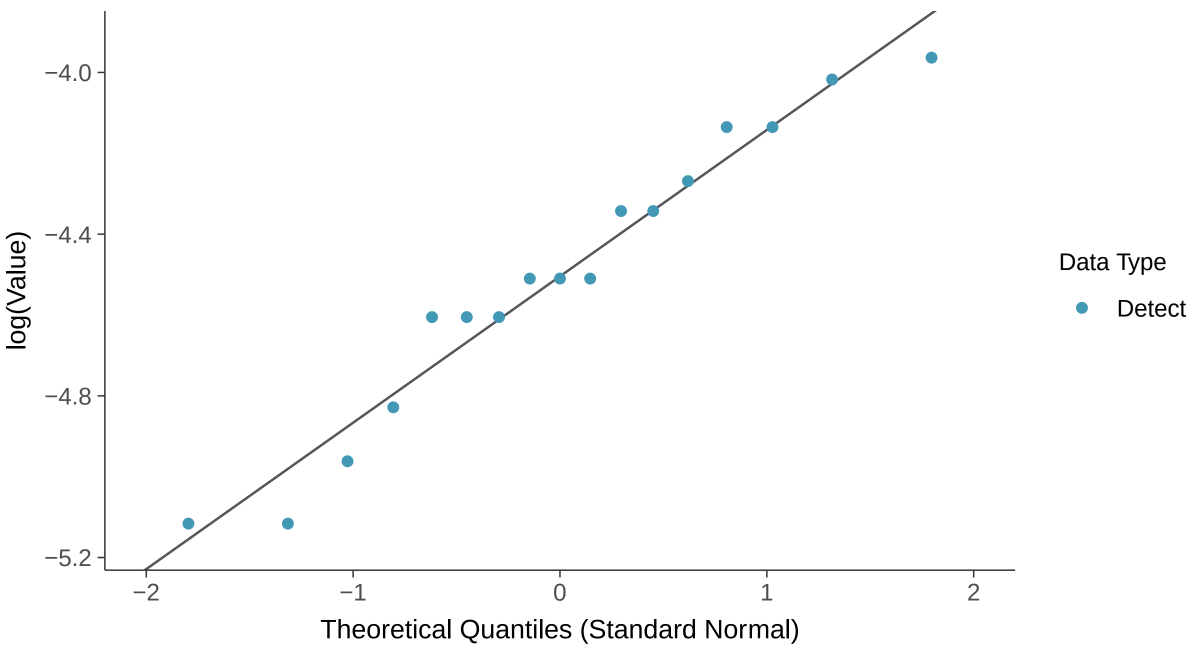
Normal Q-Q plot

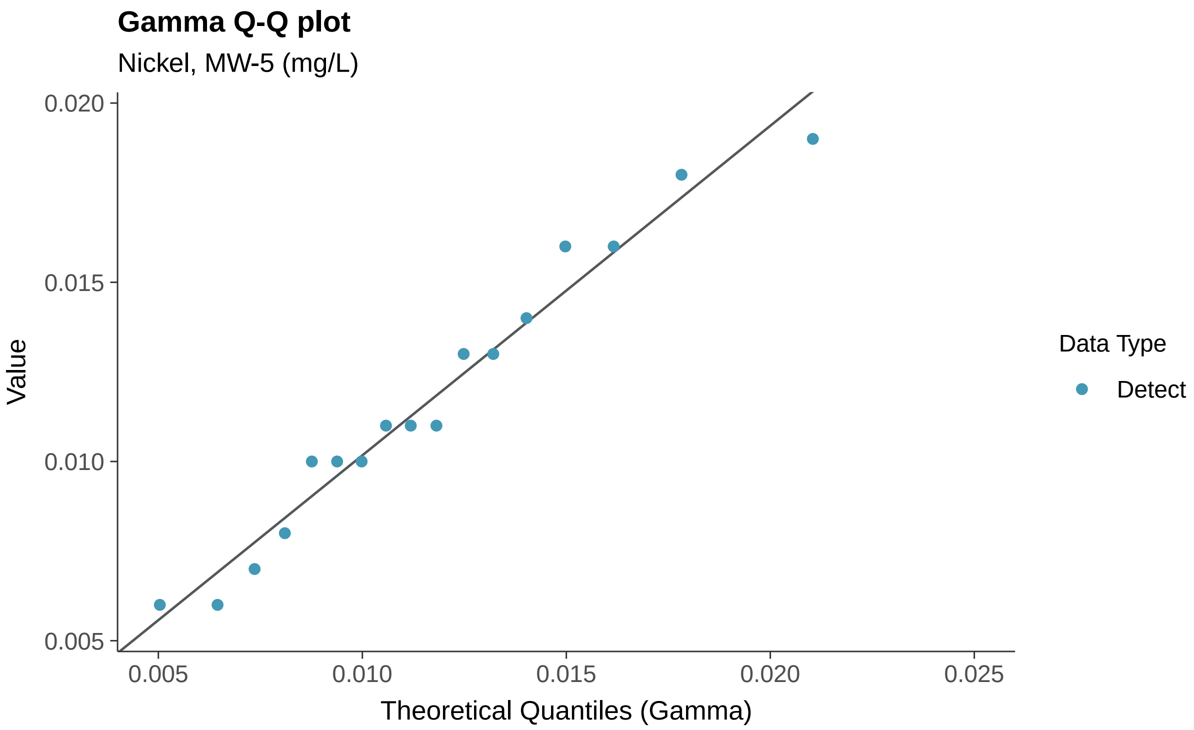
Nickel, MW-5 (mg/L)

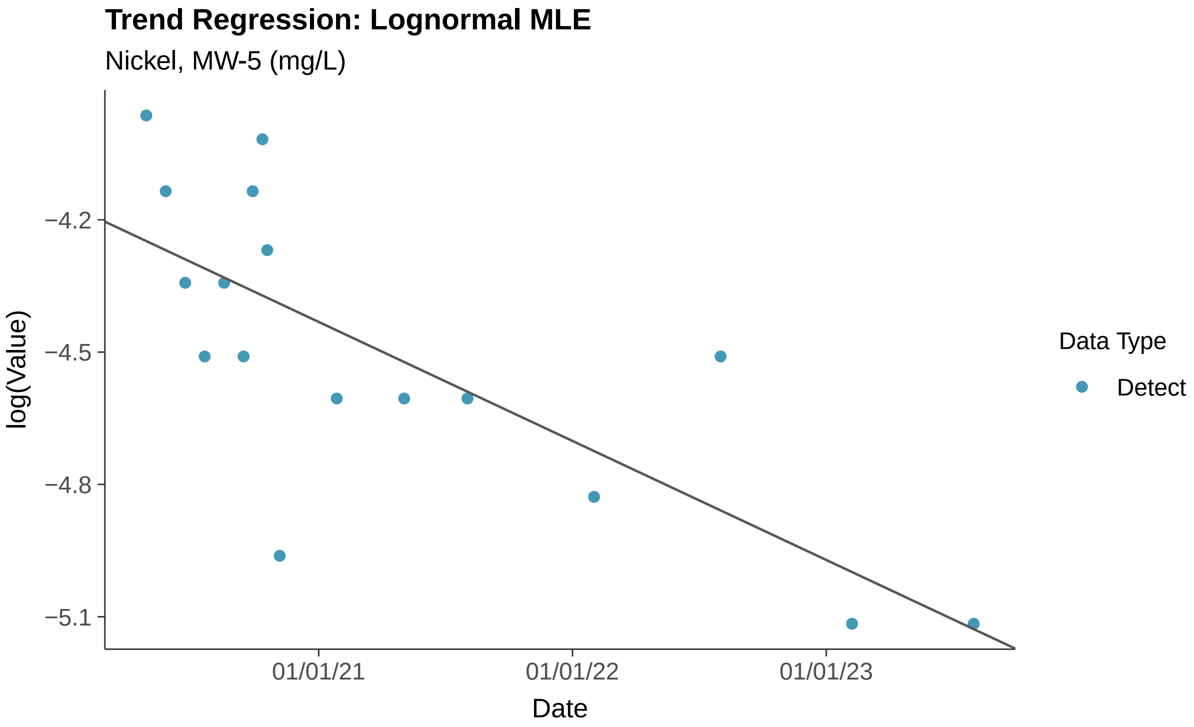


Lognormal Q-Q plot

Nickel, MW-5 (mg/L)

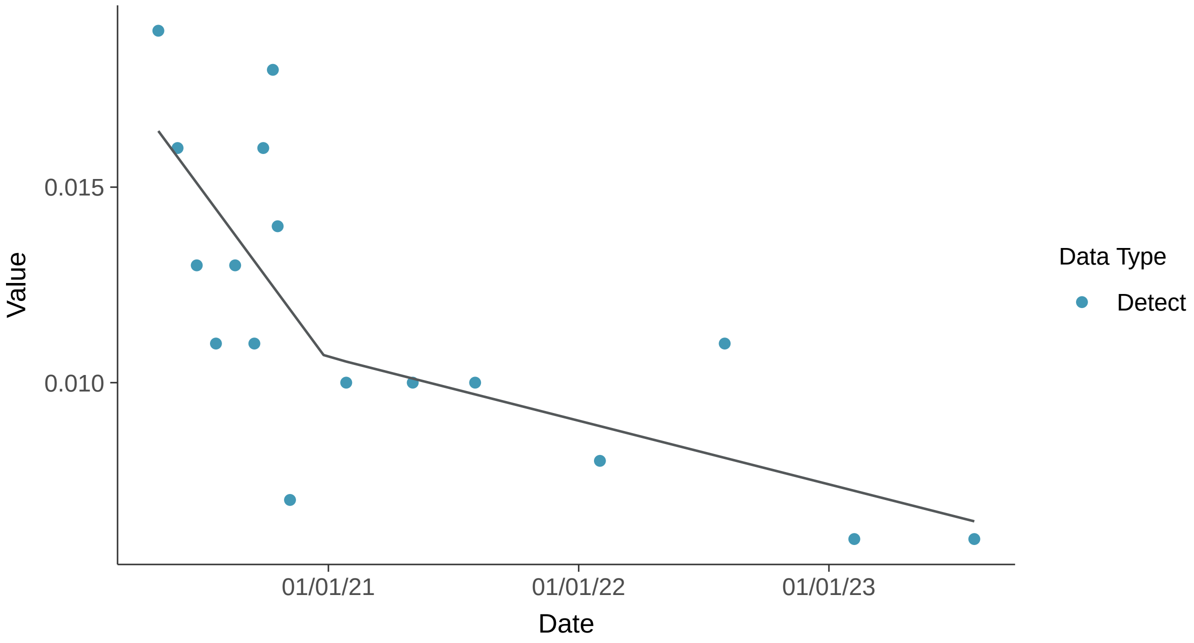



Gamma Q-Q plot
Nickel, MW-5 (mg/L)
Value
0.020
0.015
0.010
0.005
0.005
0.010
0.015
0.020
0.025
Theoretical Quantiles (Gamma)
Data Type
● Detect


Trend Regression: Lognormal MLE
Nickel, MW-5 (mg/L)
log(Value)
−4.2
−4.5
−4.8
−5.1
01/01/21
01/01/22
01/01/23
Date
Data Type
● Detect

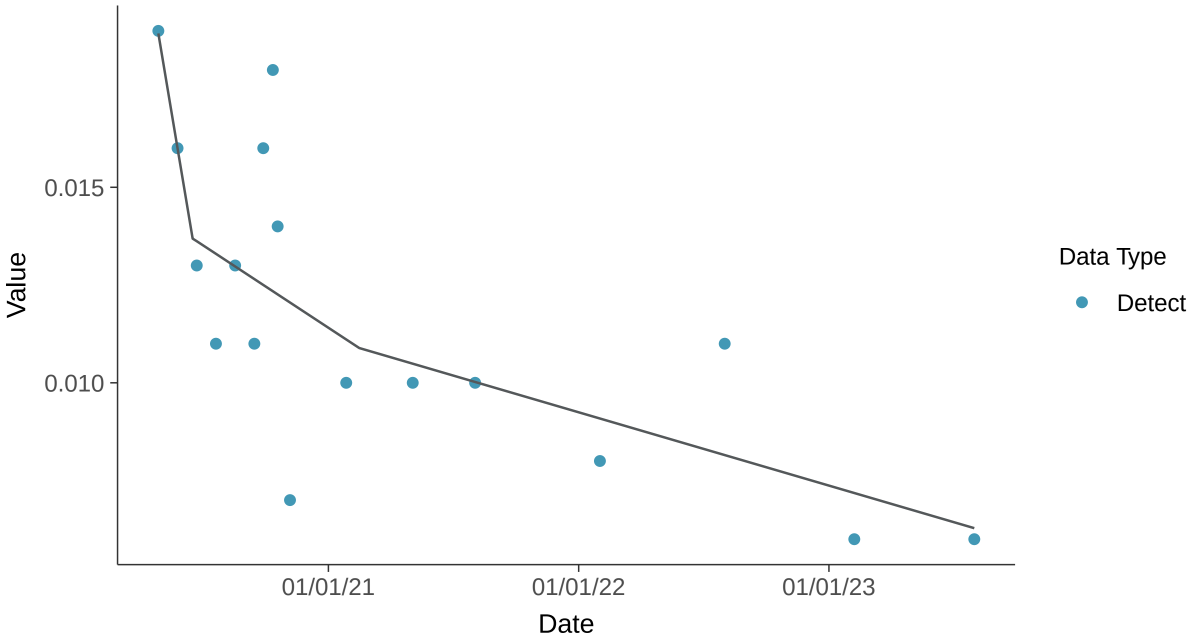
Trend Regression: Piecewise Linear-Linear

Nickel, MW-5 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Nickel, MW-5 (mg/L)

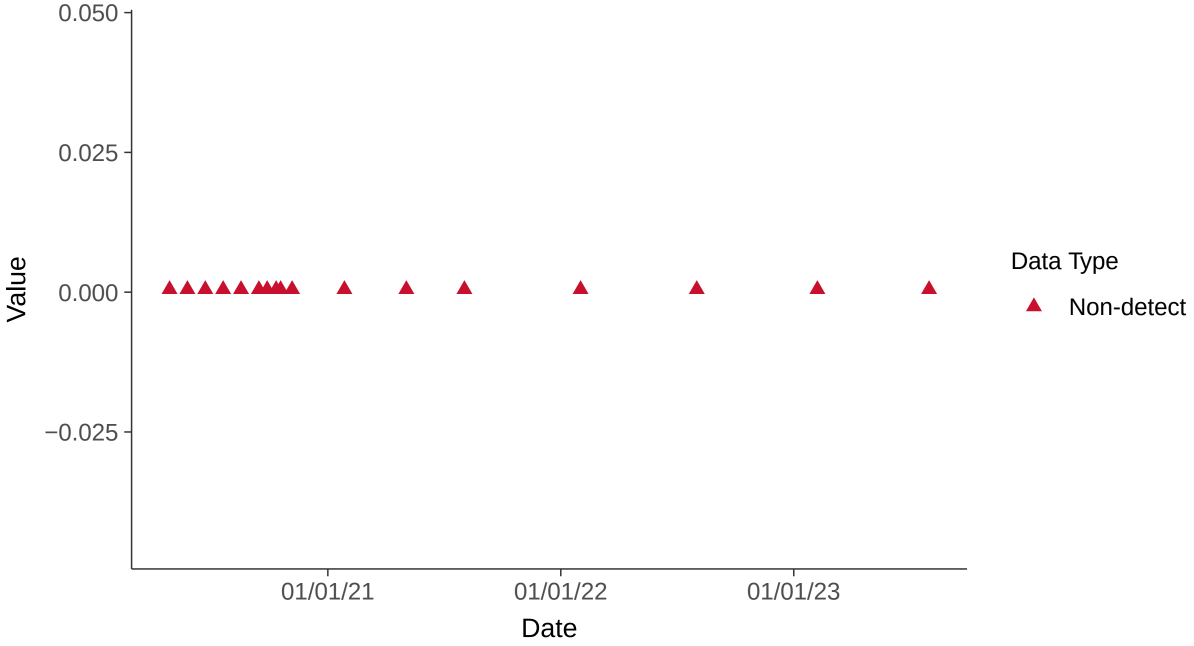


Part 115: Silver, MW-5

ID: 05_5_40

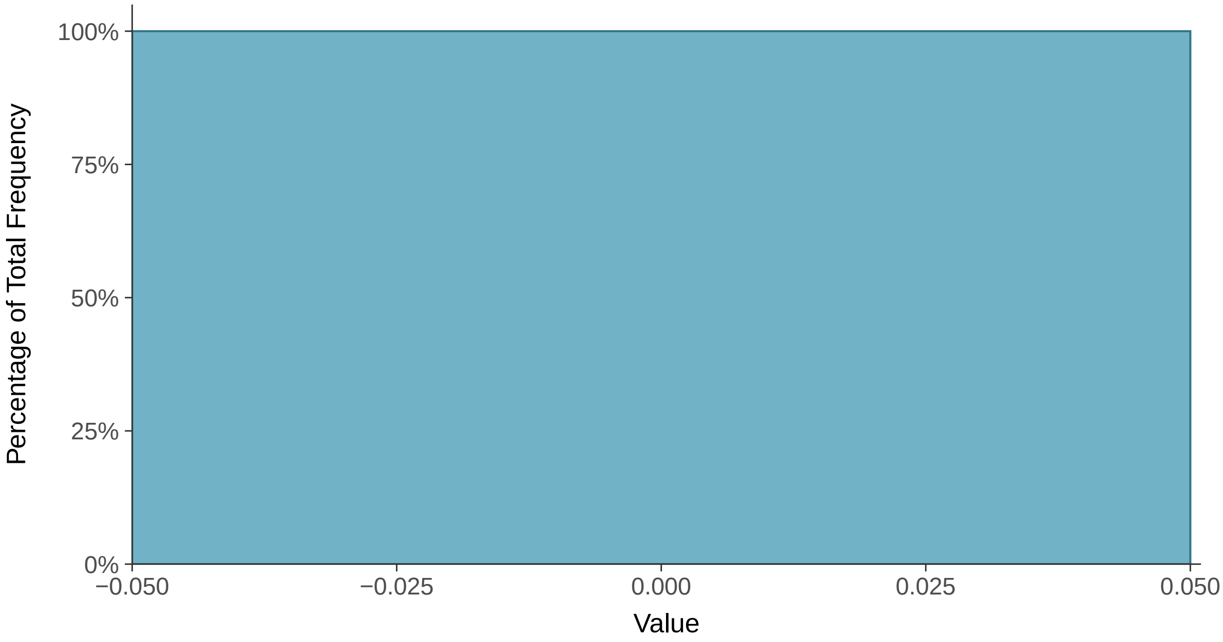
Scatter Plot

Silver, MW-5 (mg/L)



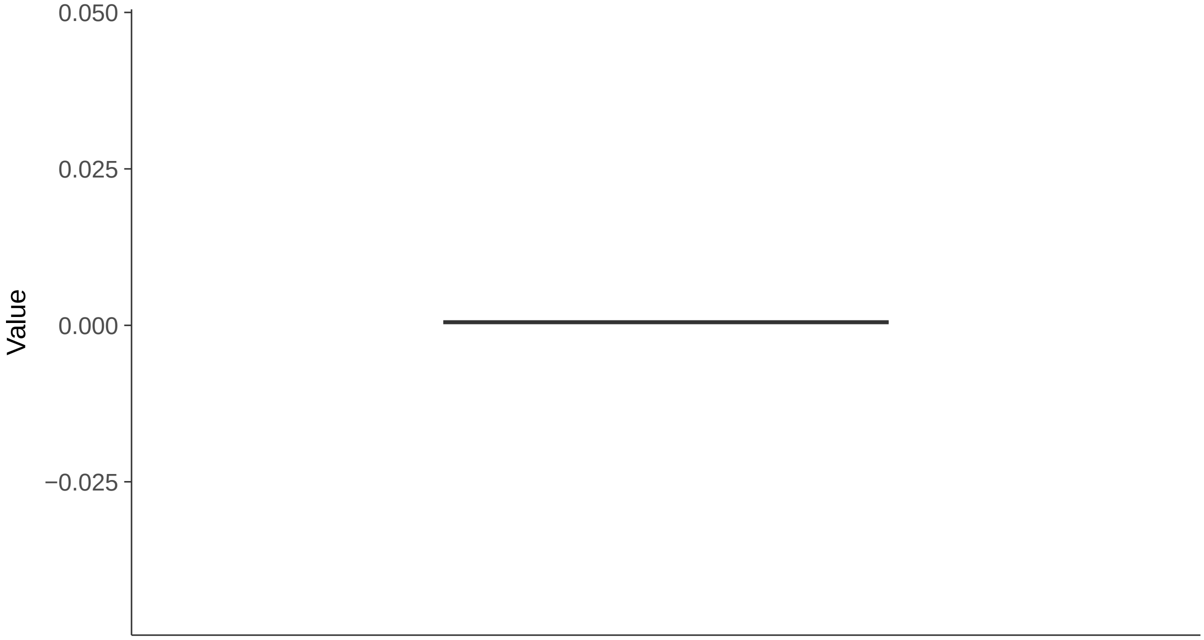
Histogram

Silver, MW-5 (mg/L)



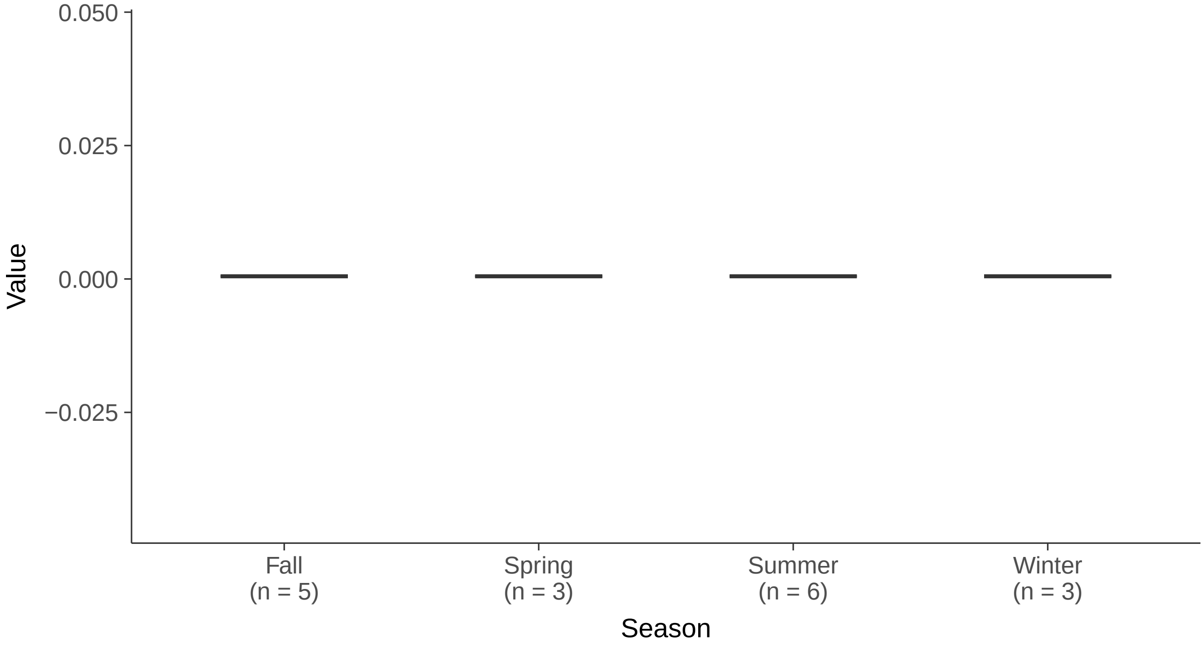
Boxplot

Silver, MW-5 (mg/L)



Boxplot by Season

Silver, MW-5 (mg/L)

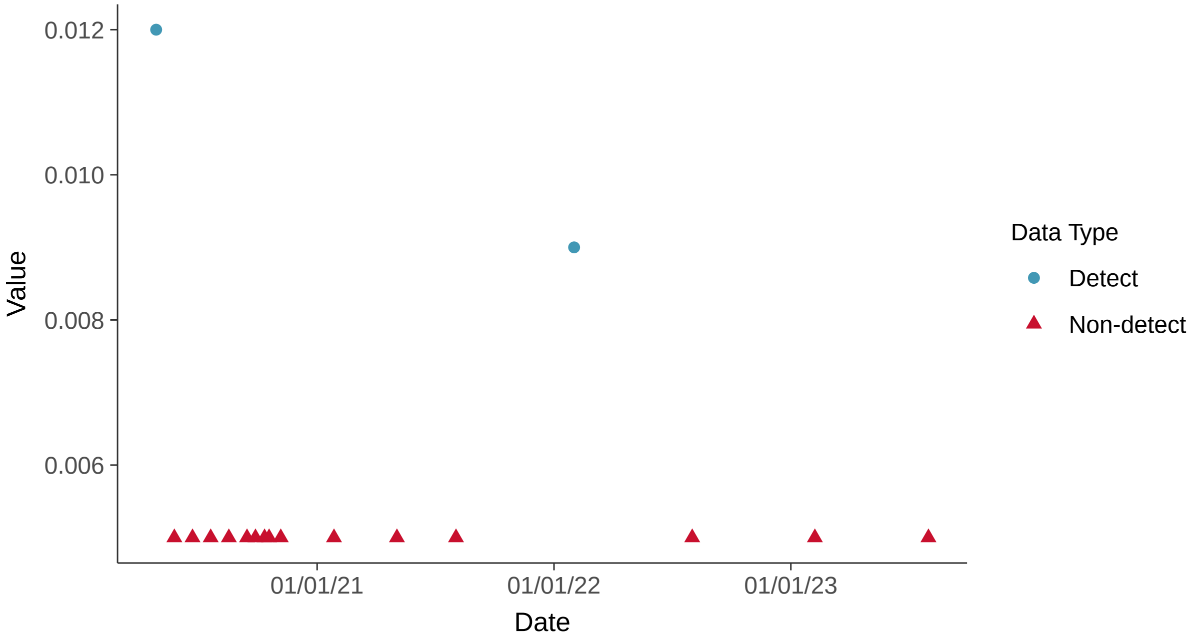


Part 115: Vanadium, MW-5

ID: 05_5_41

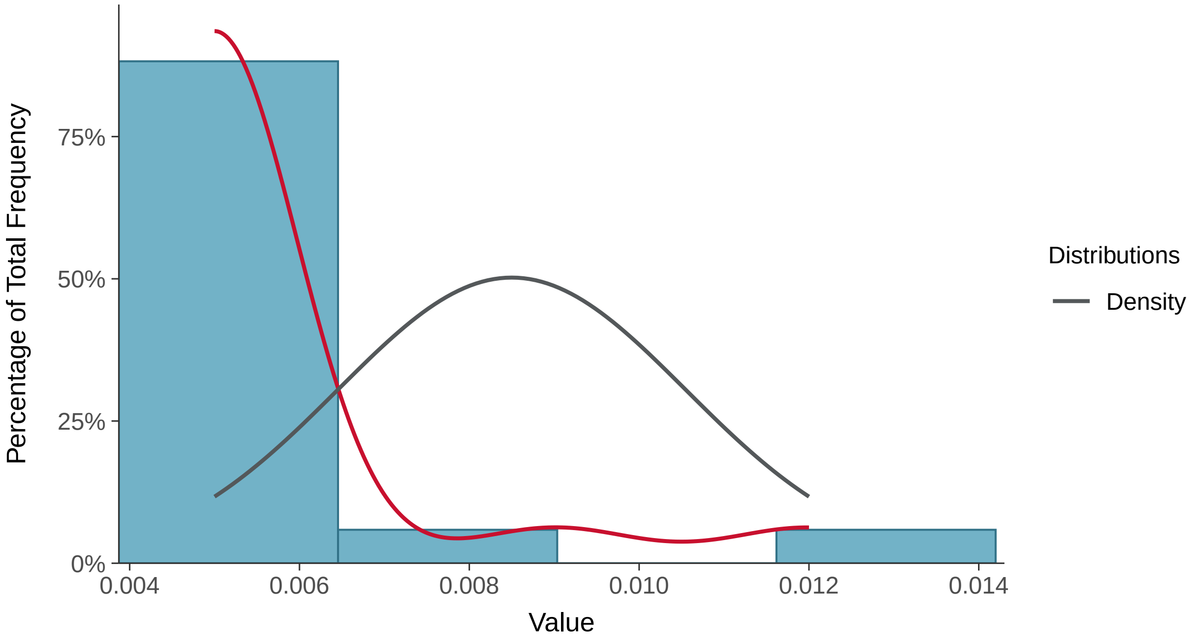
Scatter Plot

Vanadium, MW-5 (mg/L)



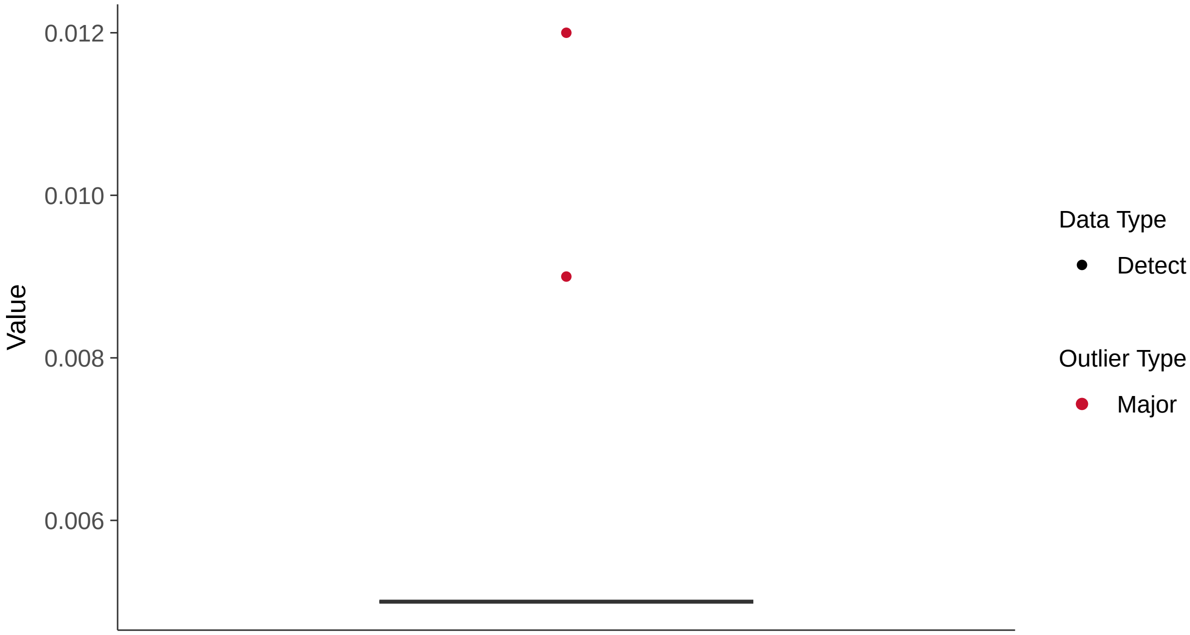
Histogram

Vanadium, MW-5 (mg/L)



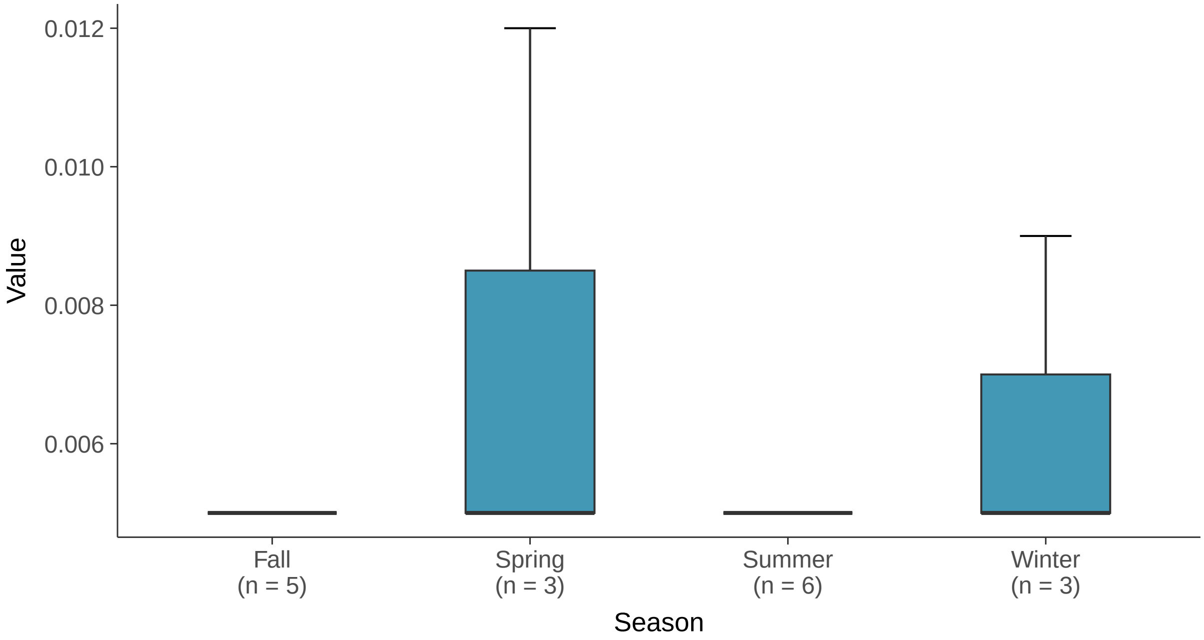
Boxplot

Vanadium, MW-5 (mg/L)



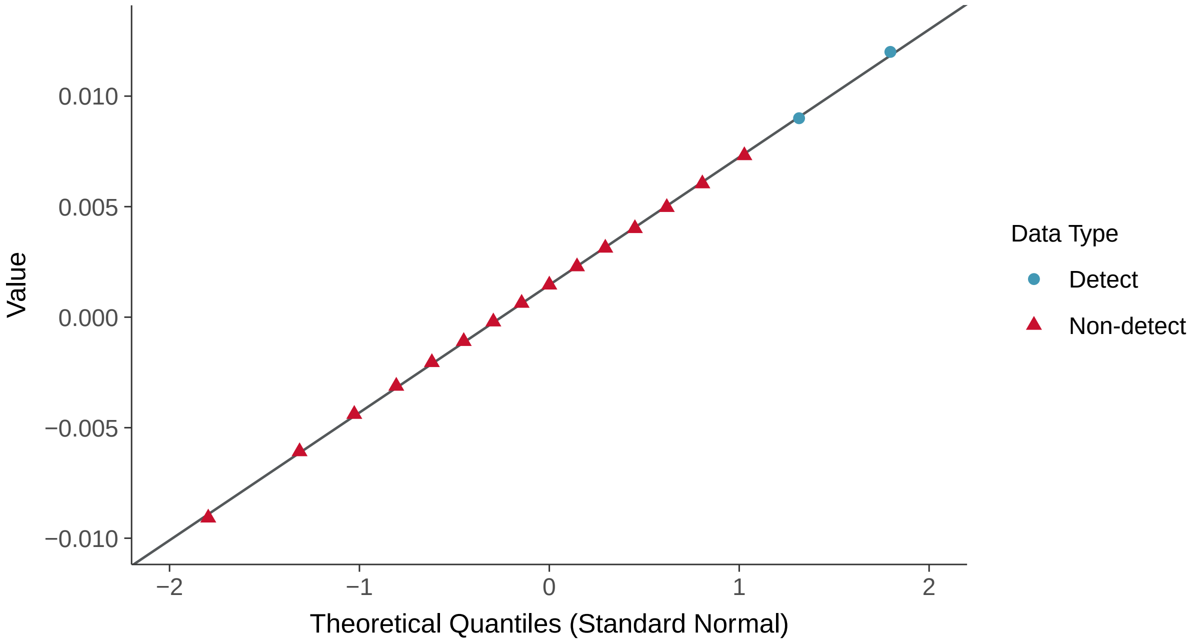
Boxplot by Season

Vanadium, MW-5 (mg/L)



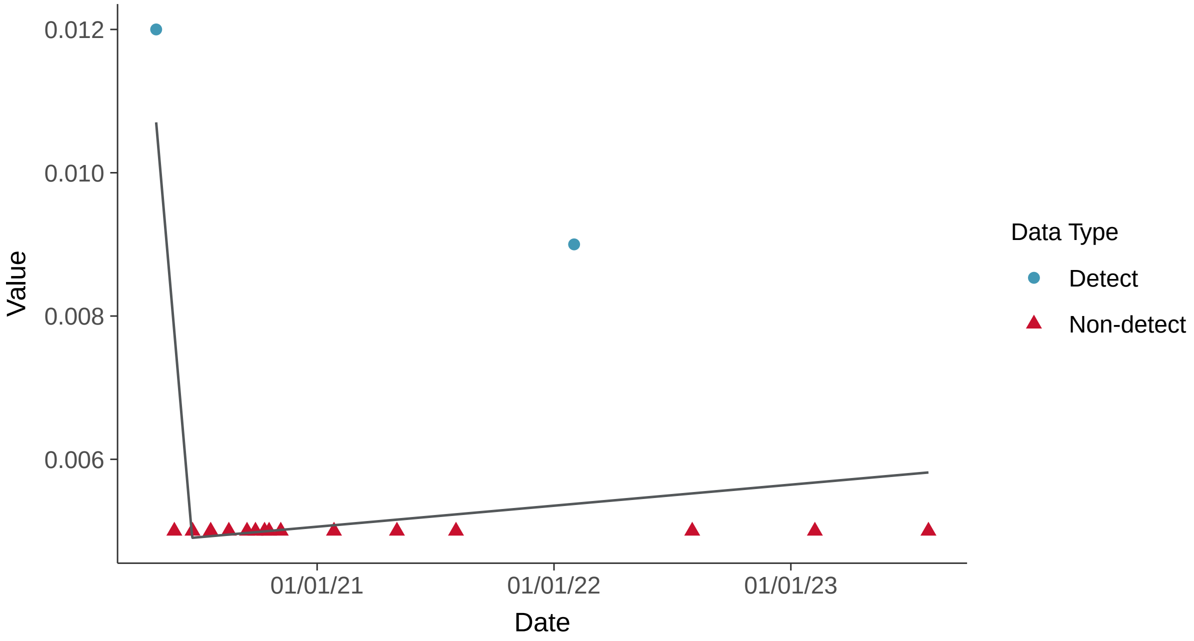
Normal Q-Q plot using ROS Imputed Estimates

Vanadium, MW-5 (mg/L)



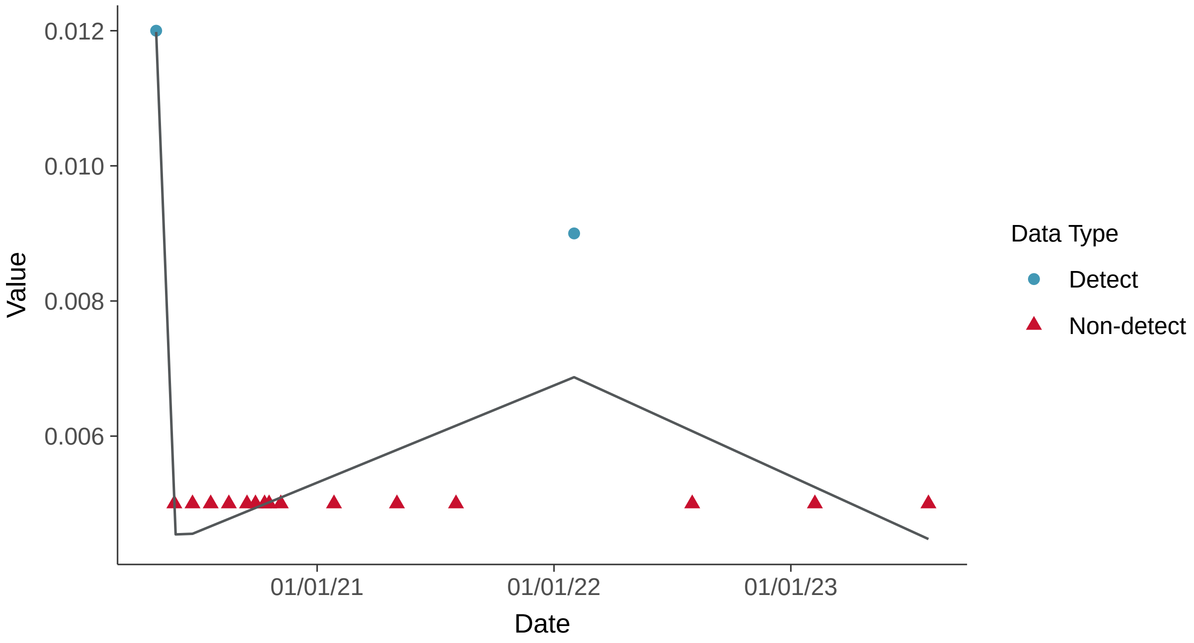
Trend Regression: Piecewise Linear-Linear

Vanadium, MW-5 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Vanadium, MW-5 (mg/L)

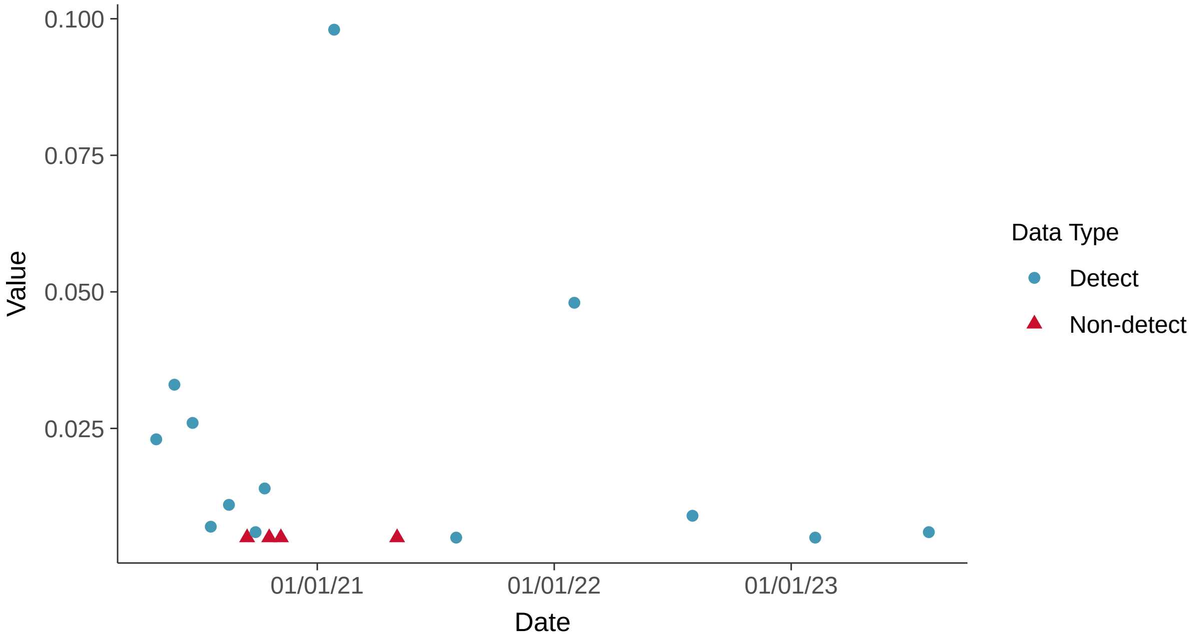


Part 115: Zinc, MW-5

ID: 05_5_42

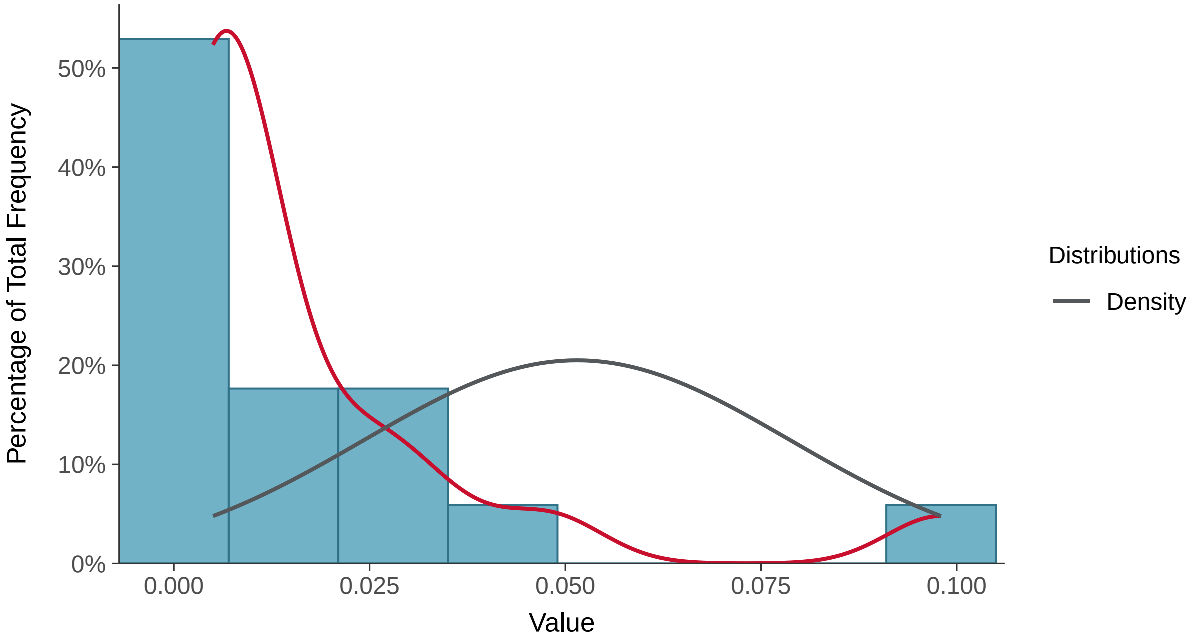
Scatter Plot

Zinc, MW-5 (mg/L)



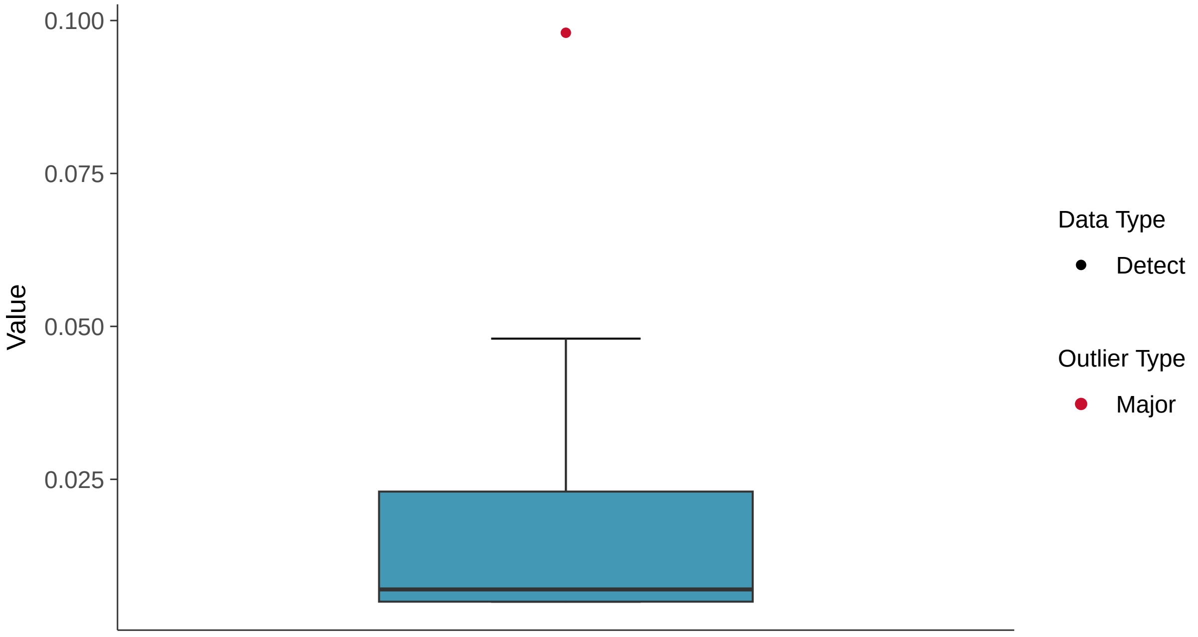
Histogram

Zinc, MW-5 (mg/L)



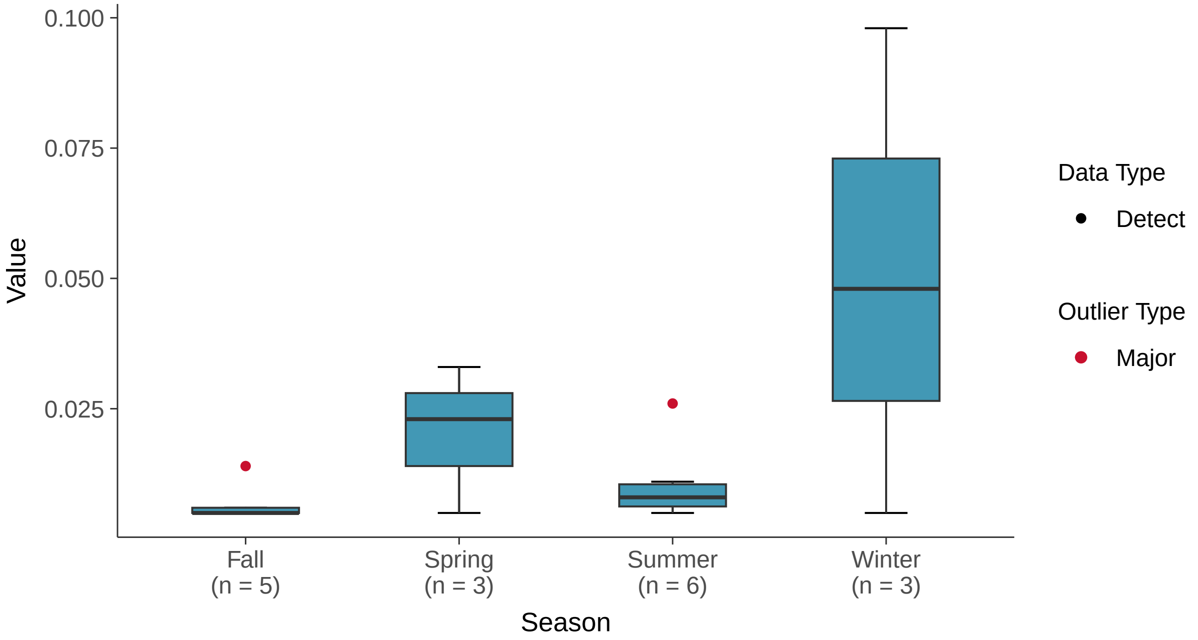
Boxplot

Zinc, MW-5 (mg/L)



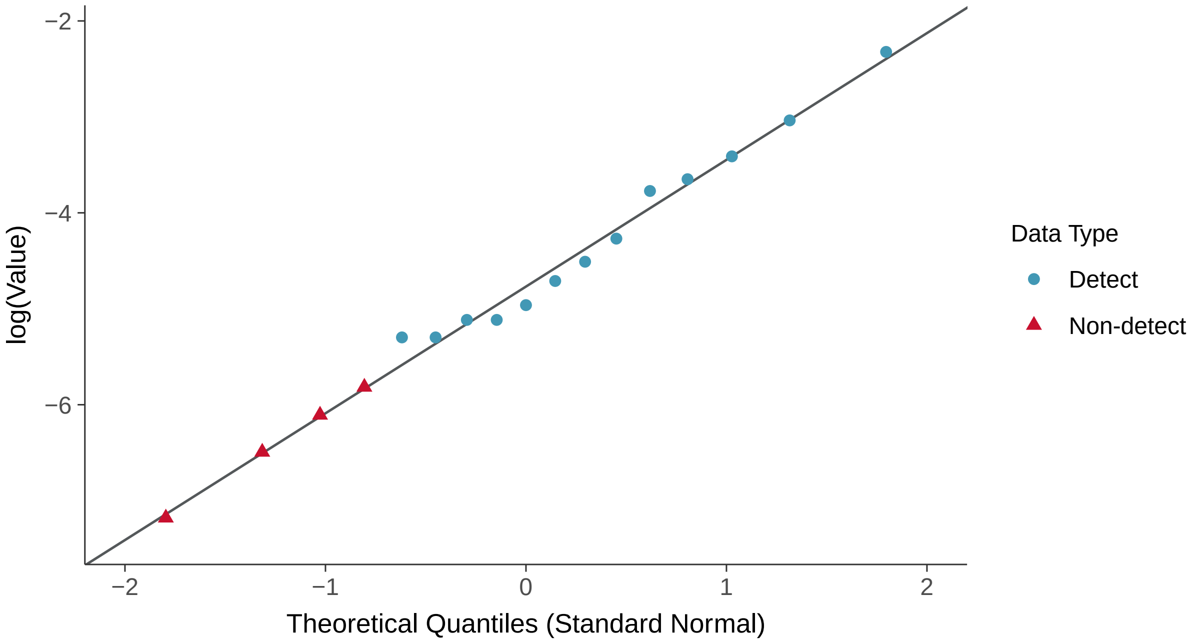
Boxplot by Season

Zinc, MW-5 (mg/L)



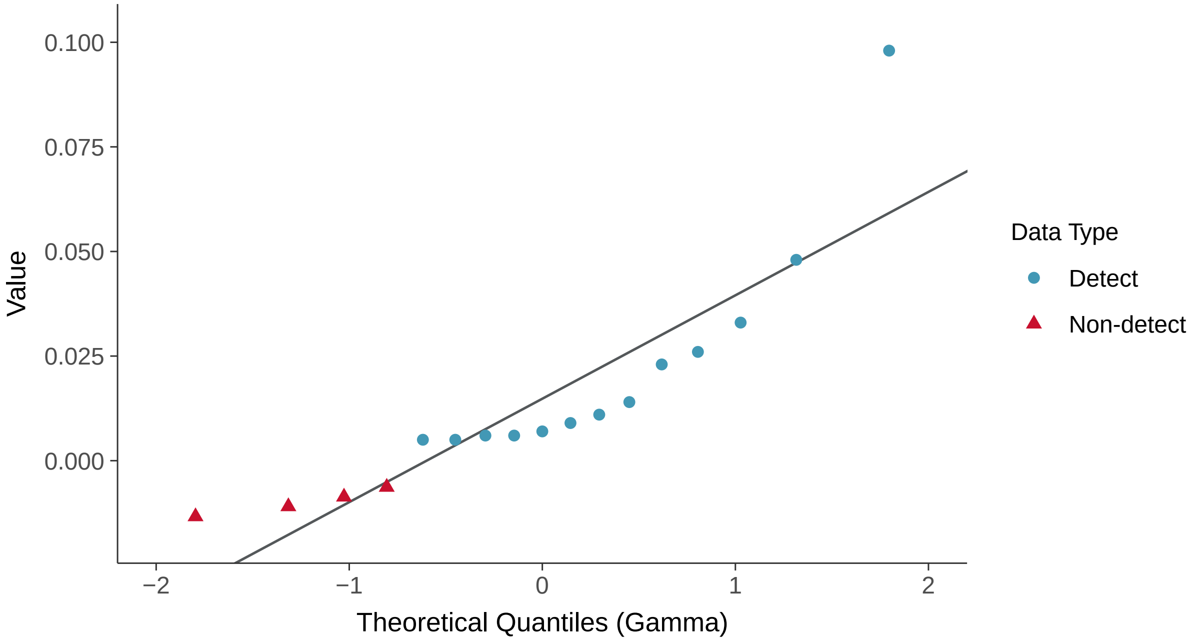
Lognormal Q-Q plot using ROS Imputed Estimates

Zinc, MW-5 (mg/L)



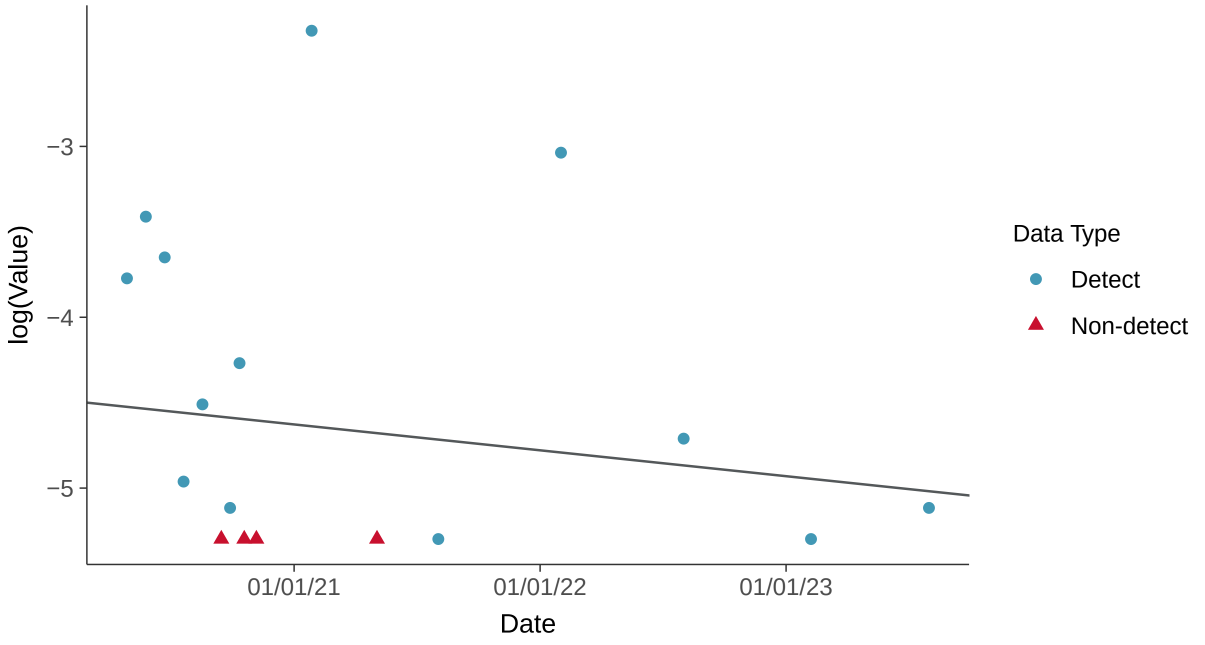
Gamma Q-Q plot using ROS Imputed Estimates

Zinc, MW-5 (mg/L)



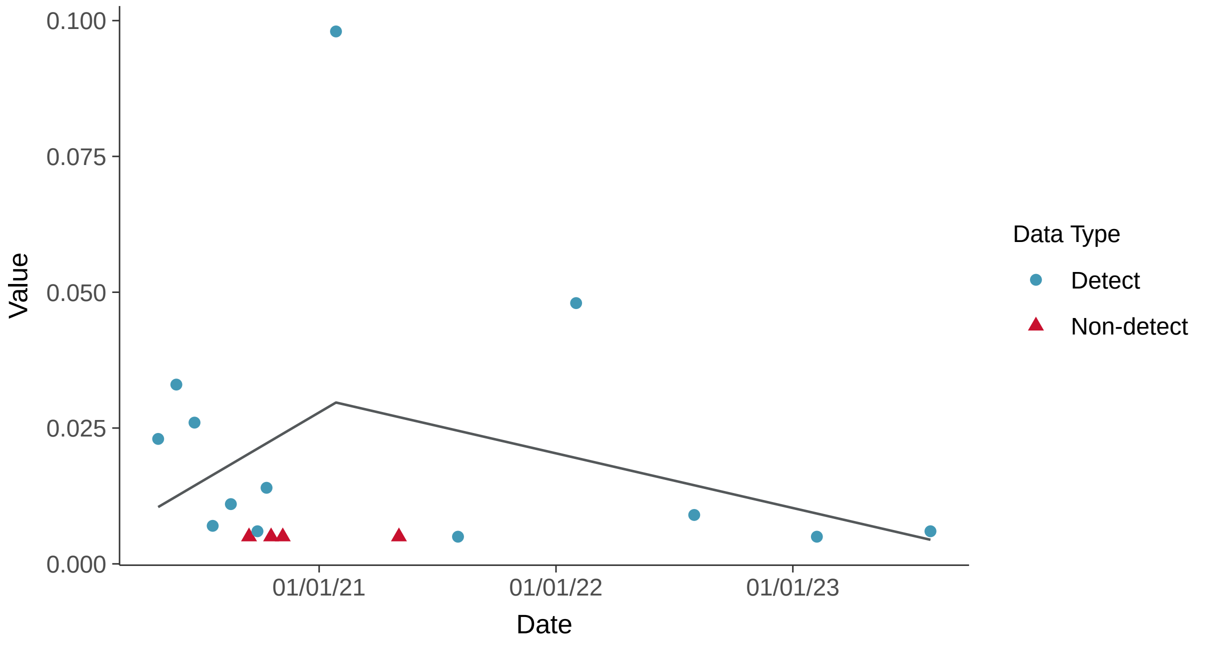
Trend Regression: Lognormal MLE

Zinc, MW-5 (mg/L)



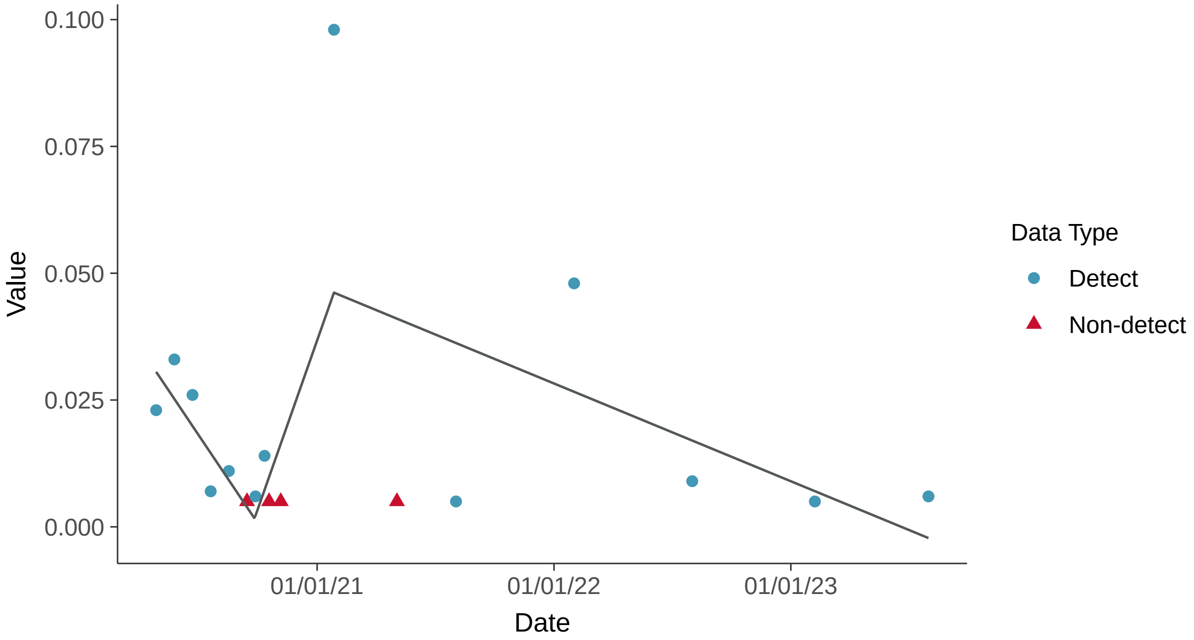
Trend Regression: Piecewise Linear-Linear

Zinc, MW-5 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Zinc, MW-5 (mg/L)

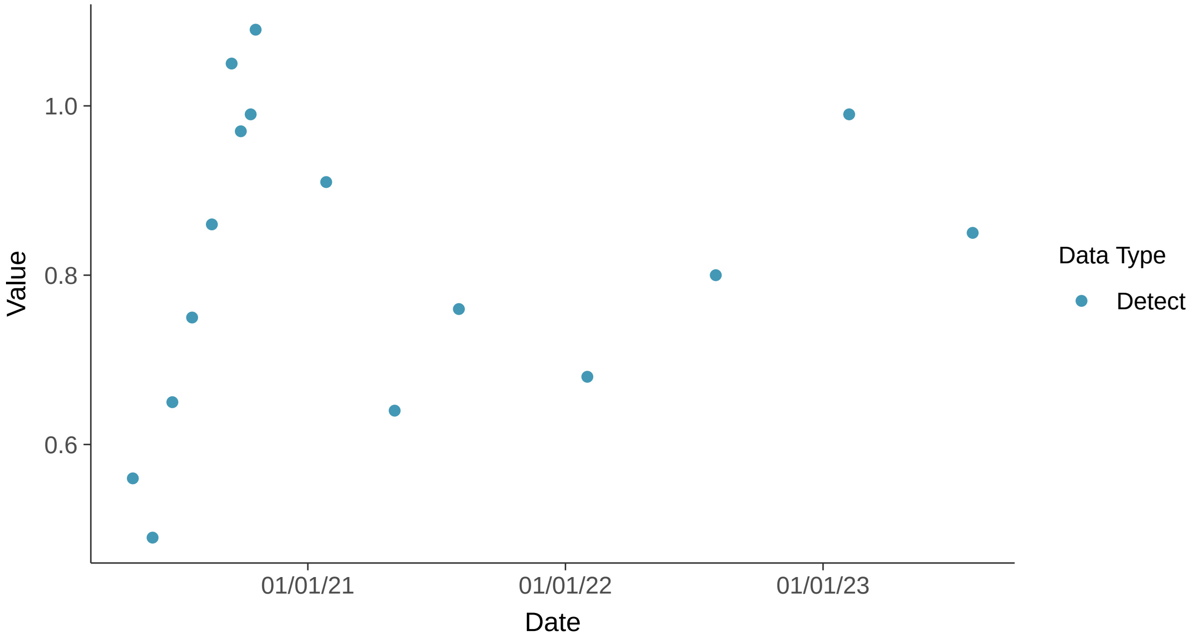


Appendix III: Boron, MW-6

ID: 06_1_01

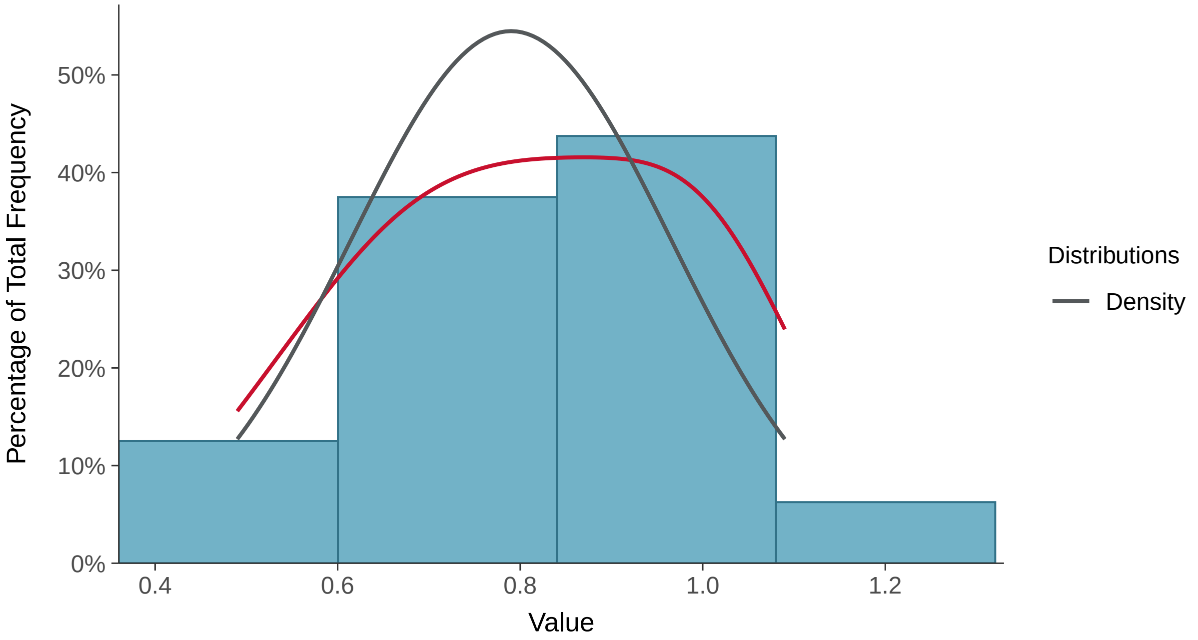
Scatter Plot

Boron, MW-6 (mg/L)



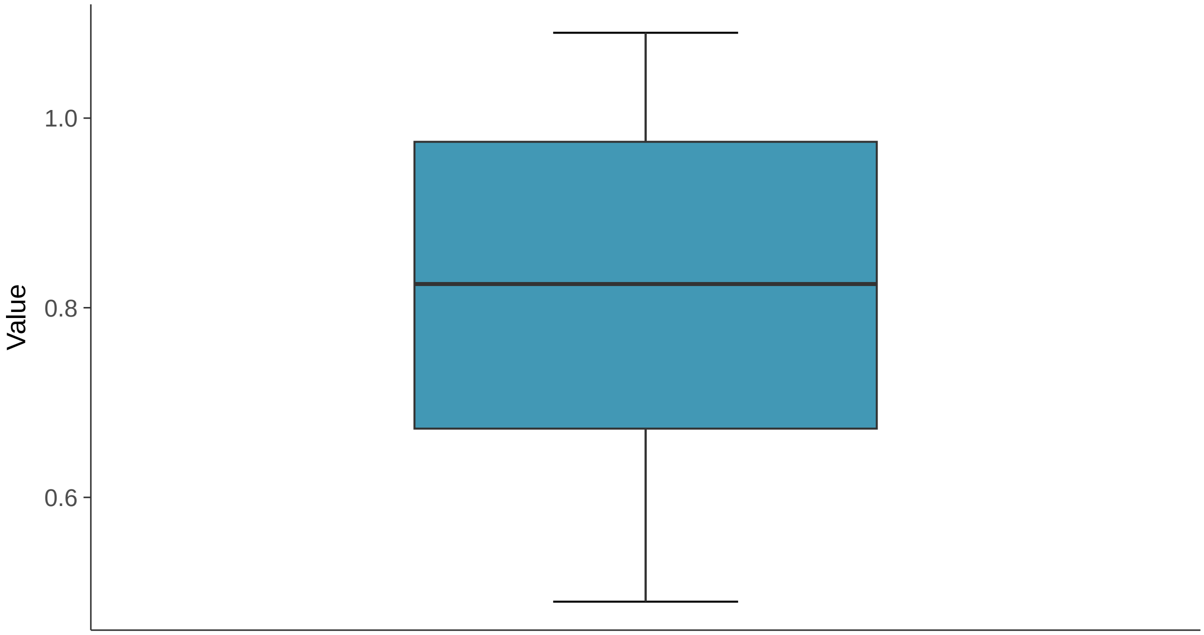
Histogram

Boron, MW-6 (mg/L)



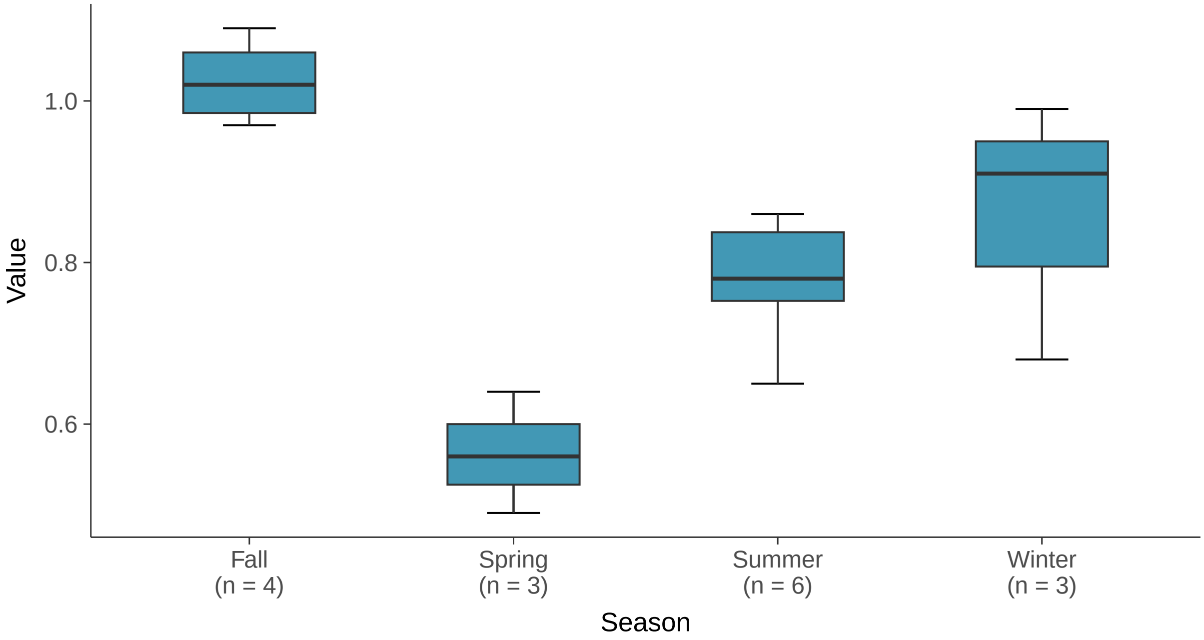
Boxplot

Boron, MW-6 (mg/L)



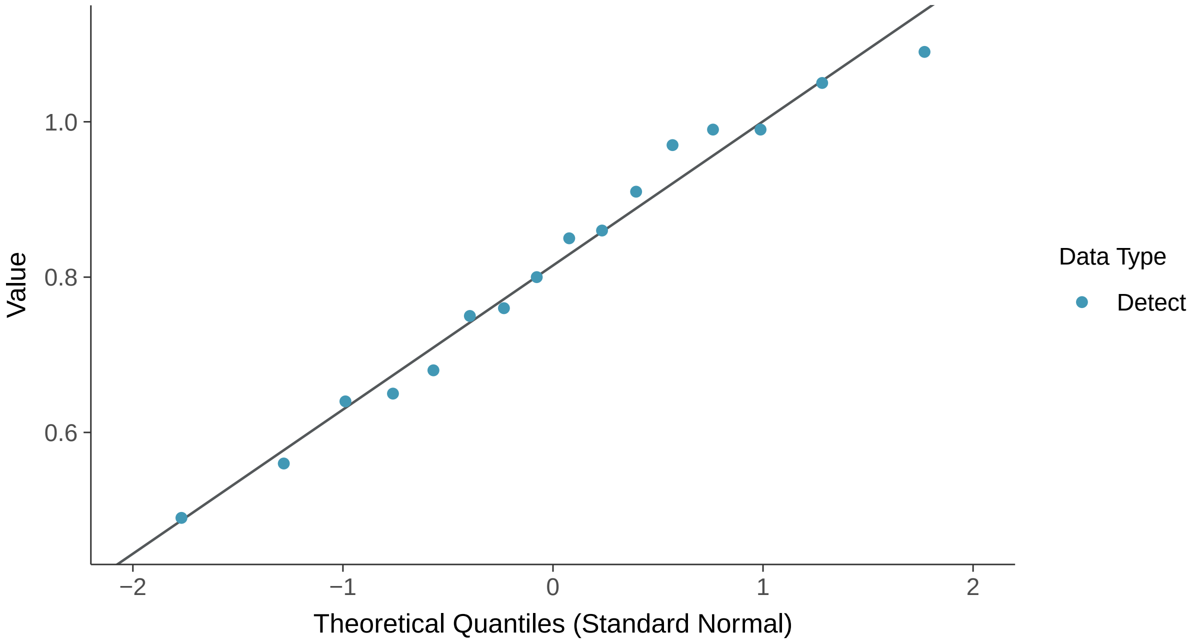
Boxplot by Season

Boron, MW-6 (mg/L)



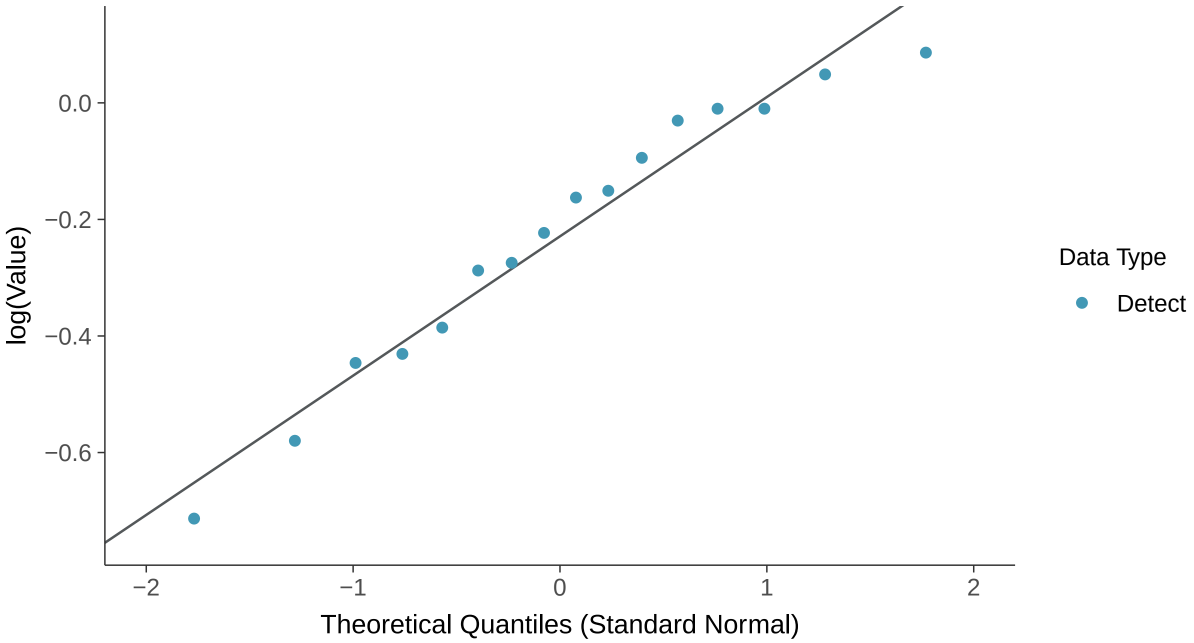
Normal Q-Q plot

Boron, MW-6 (mg/L)



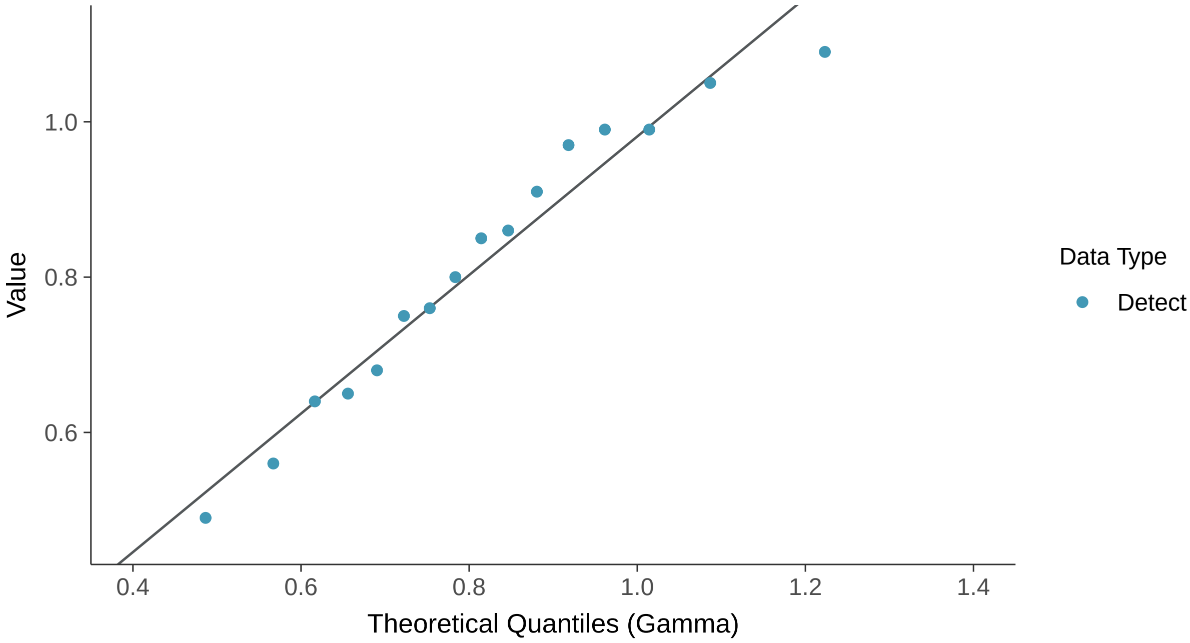
Lognormal Q-Q plot

Boron, MW-6 (mg/L)



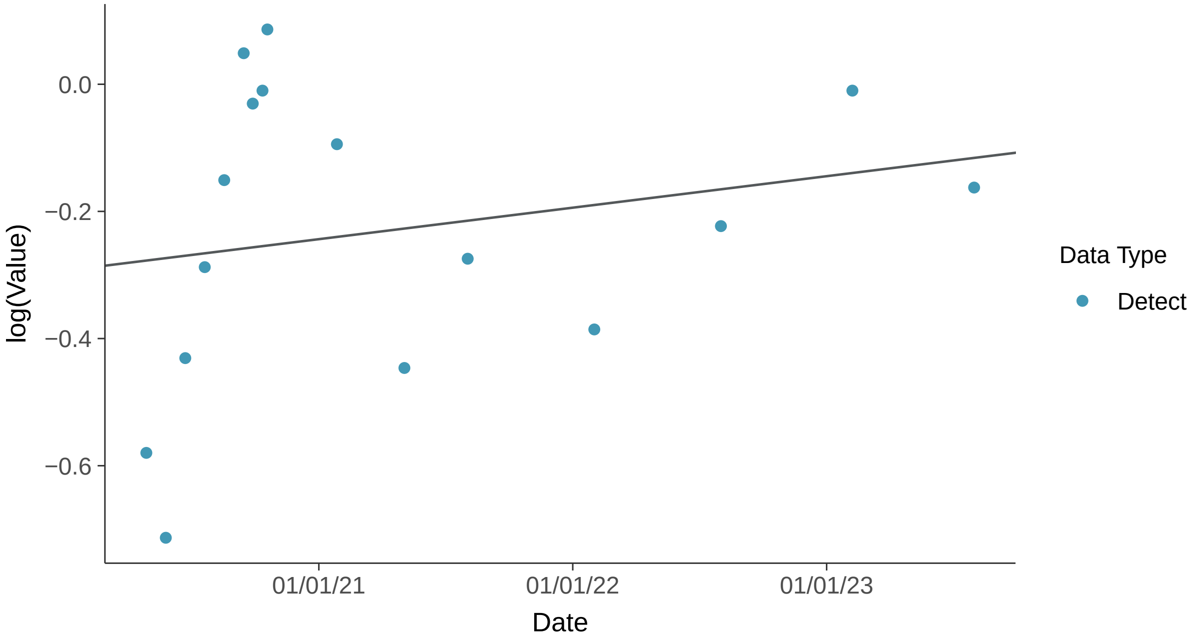
Gamma Q-Q plot

Boron, MW-6 (mg/L)



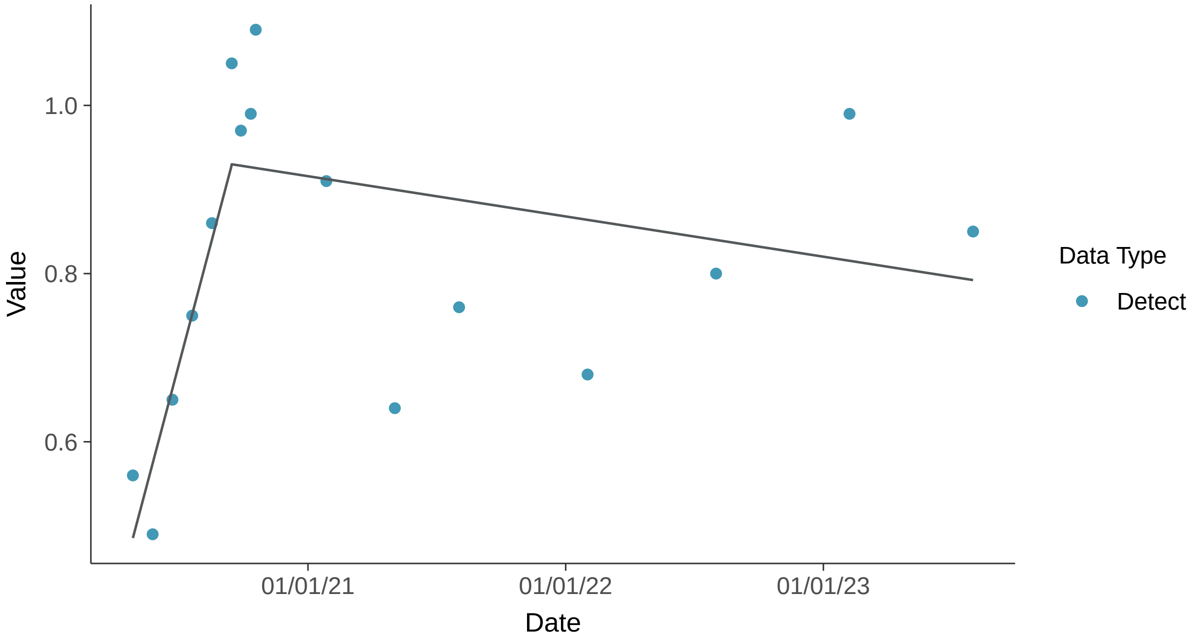
Trend Regression: Lognormal MLE

Boron, MW-6 (mg/L)



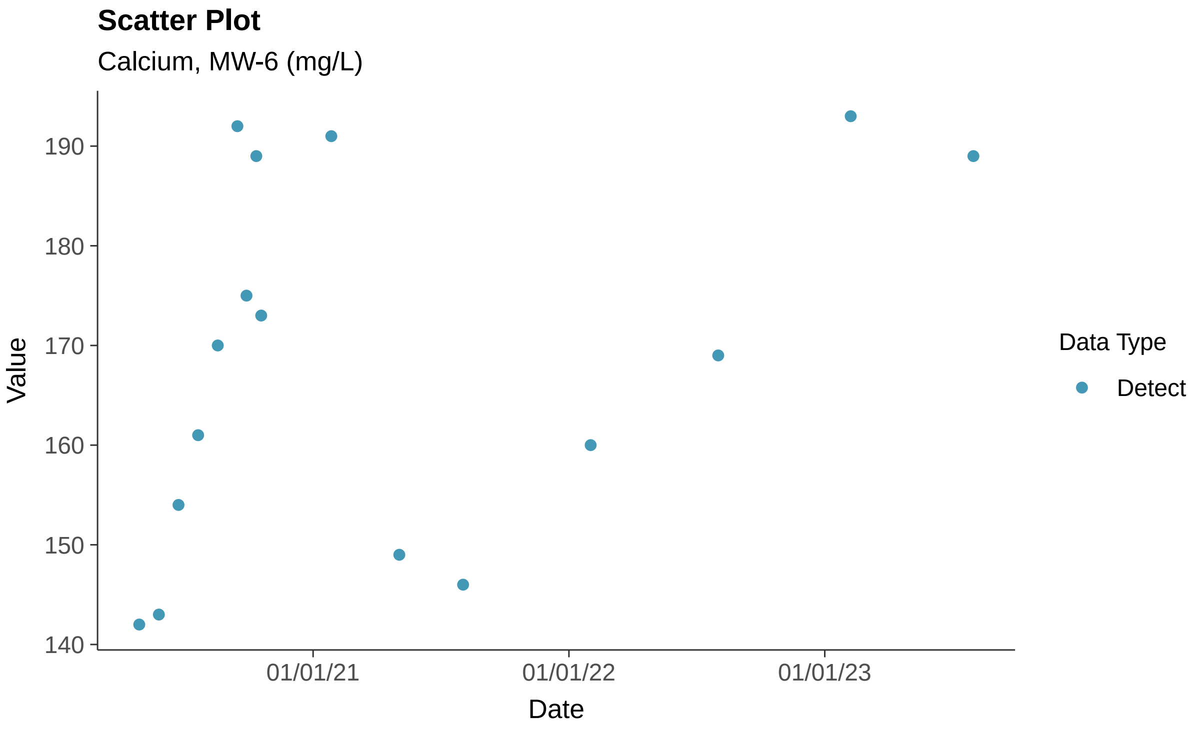
Trend Regression: Piecewise Linear-Linear

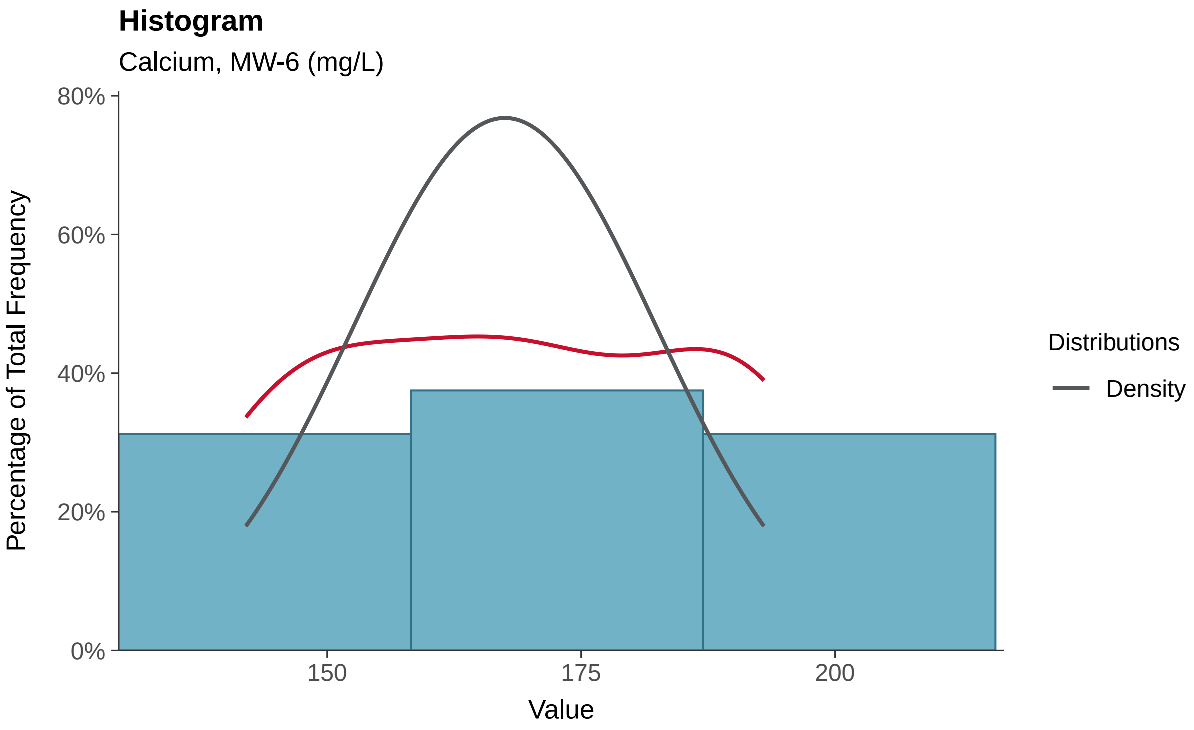
Boron, MW-6 (mg/L)



Appendix III: Calcium, MW-6

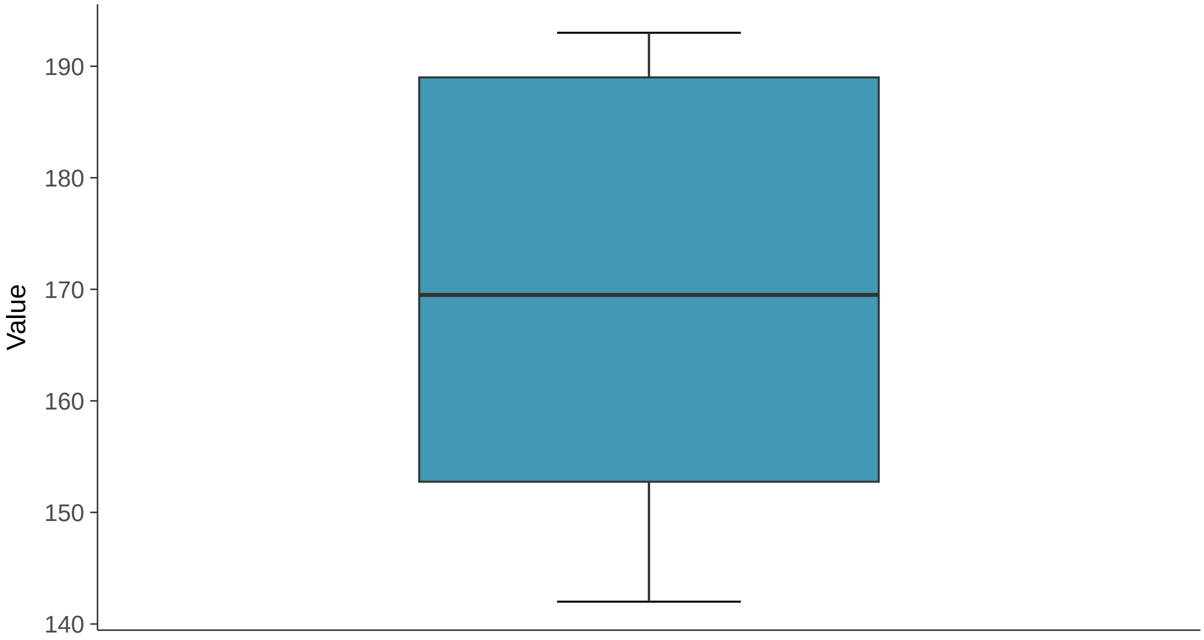
ID: 06_1_02





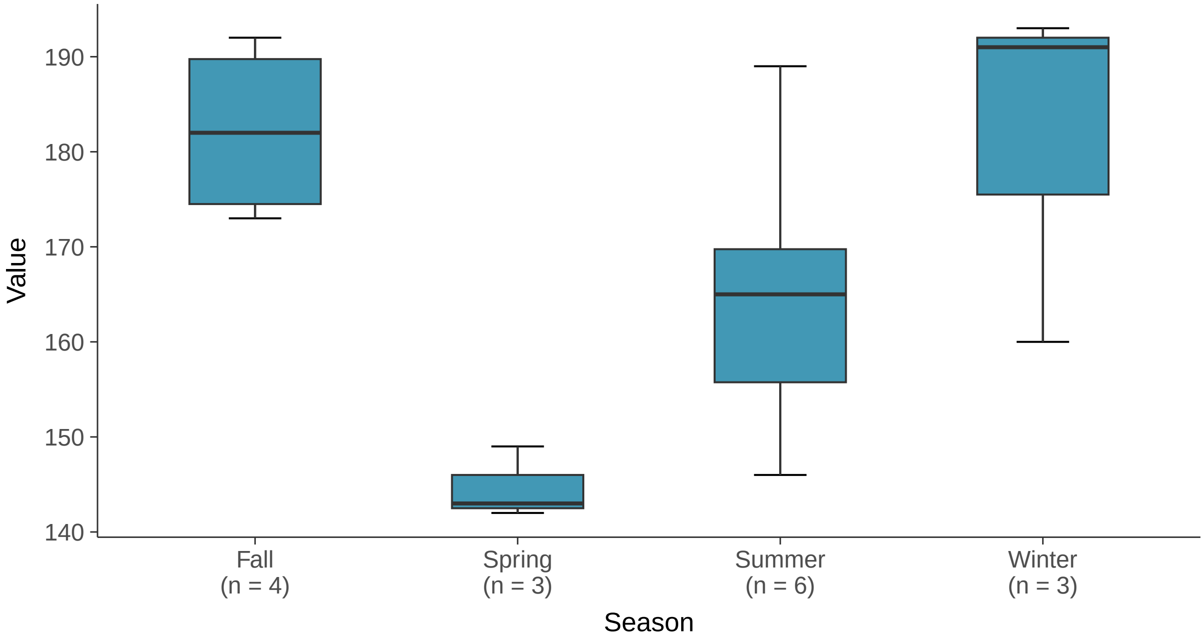
Boxplot

Calcium, MW-6 (mg/L)



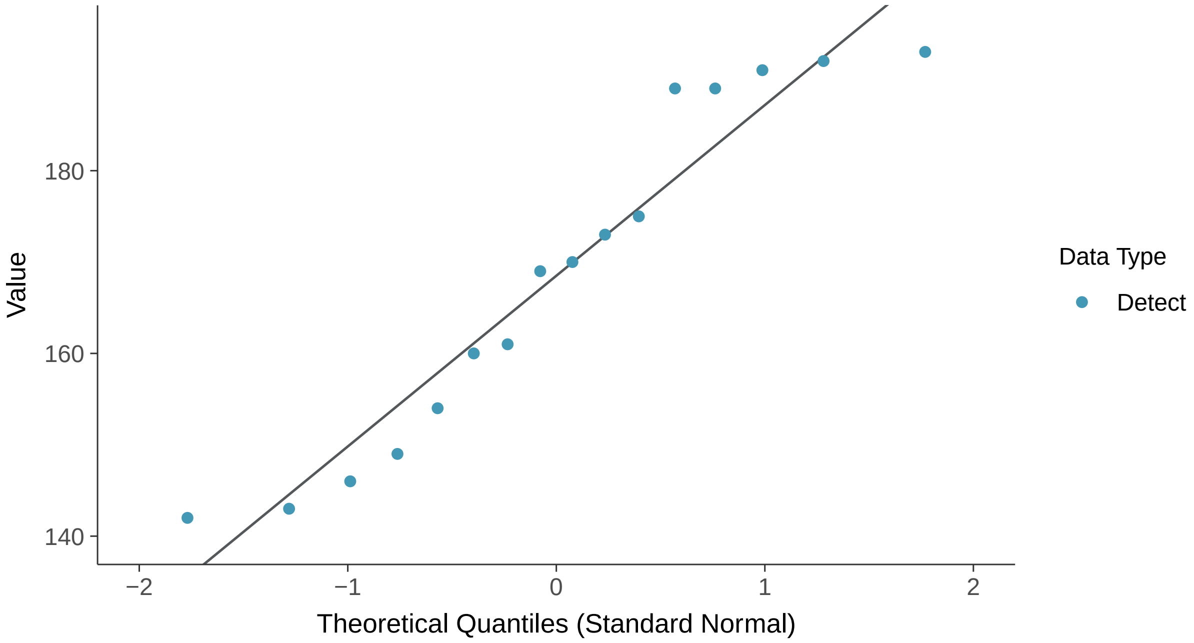
Boxplot by Season

Calcium, MW-6 (mg/L)



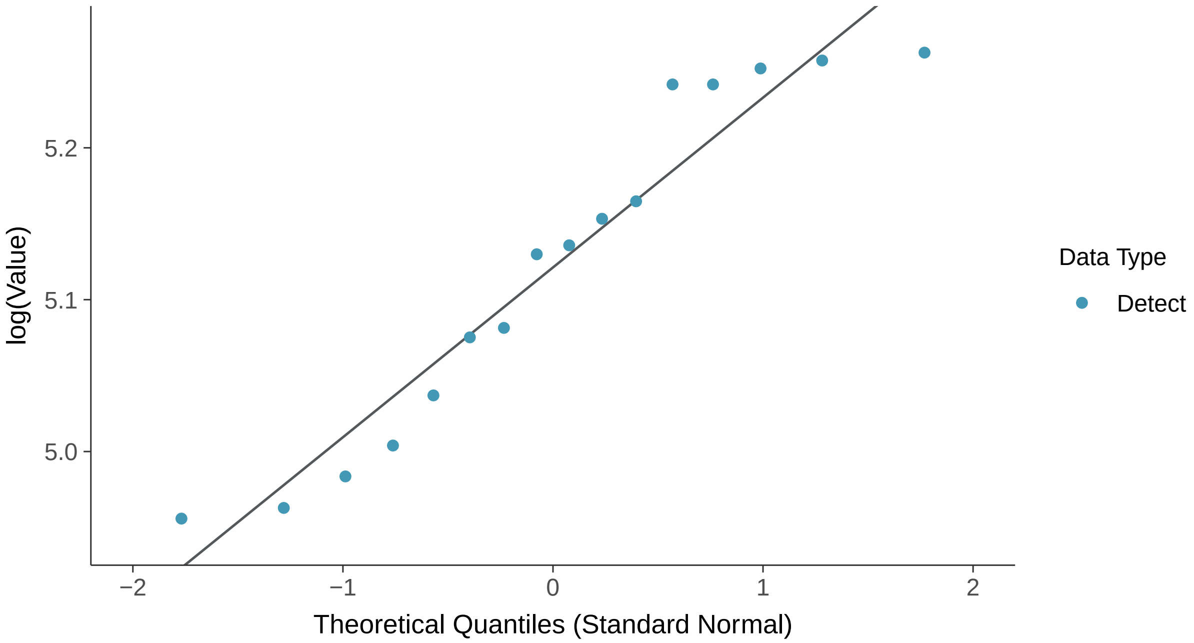
Normal Q-Q plot

Calcium, MW-6 (mg/L)



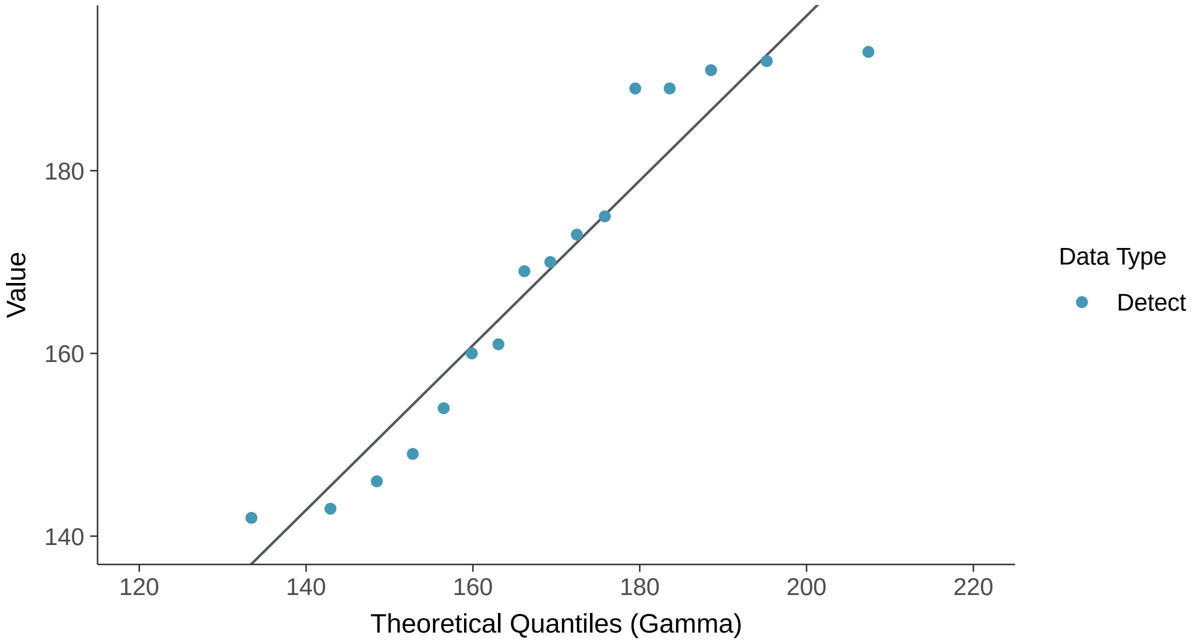
Lognormal Q-Q plot

Calcium, MW-6 (mg/L)



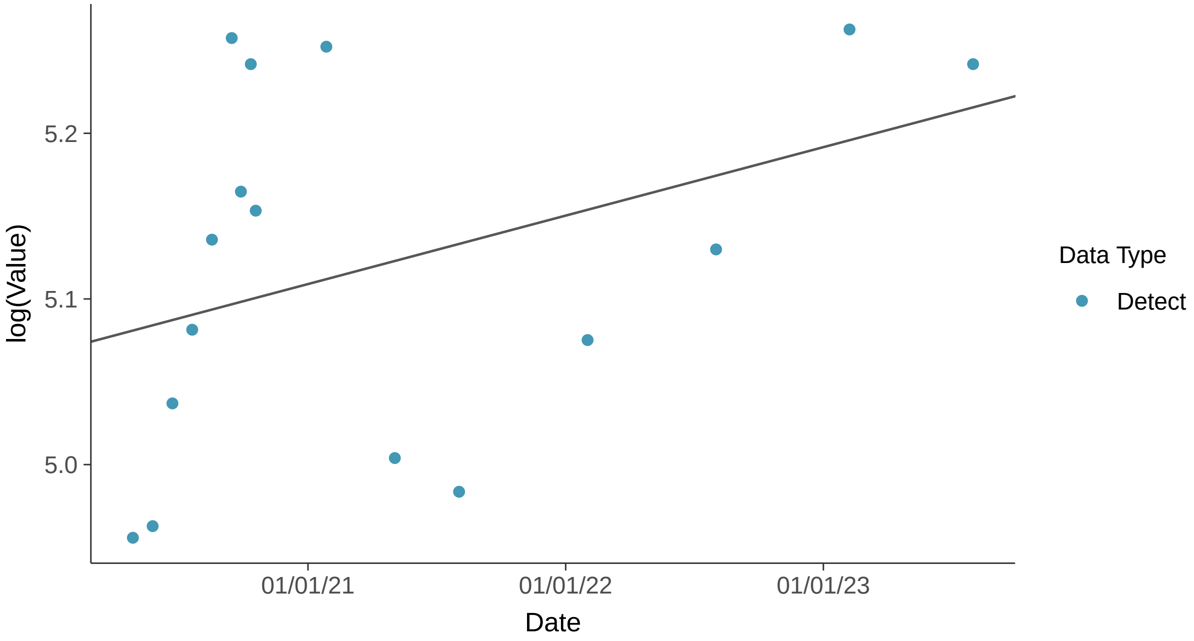
Gamma Q-Q plot

Calcium, MW-6 (mg/L)



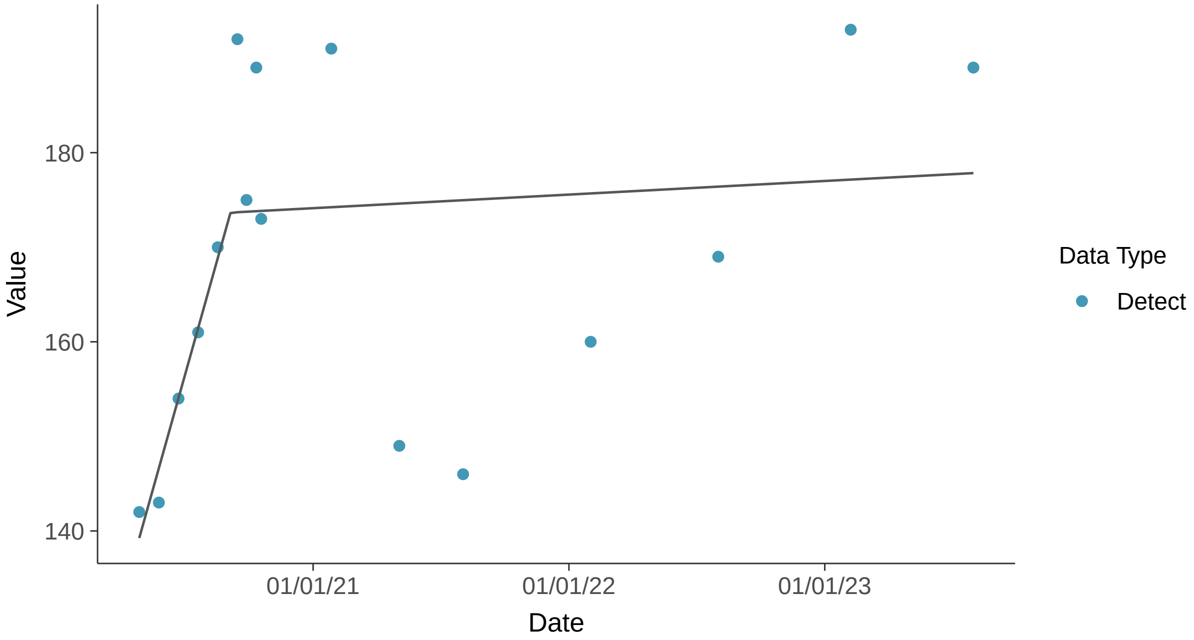
Trend Regression: Lognormal MLE

Calcium, MW-6 (mg/L)



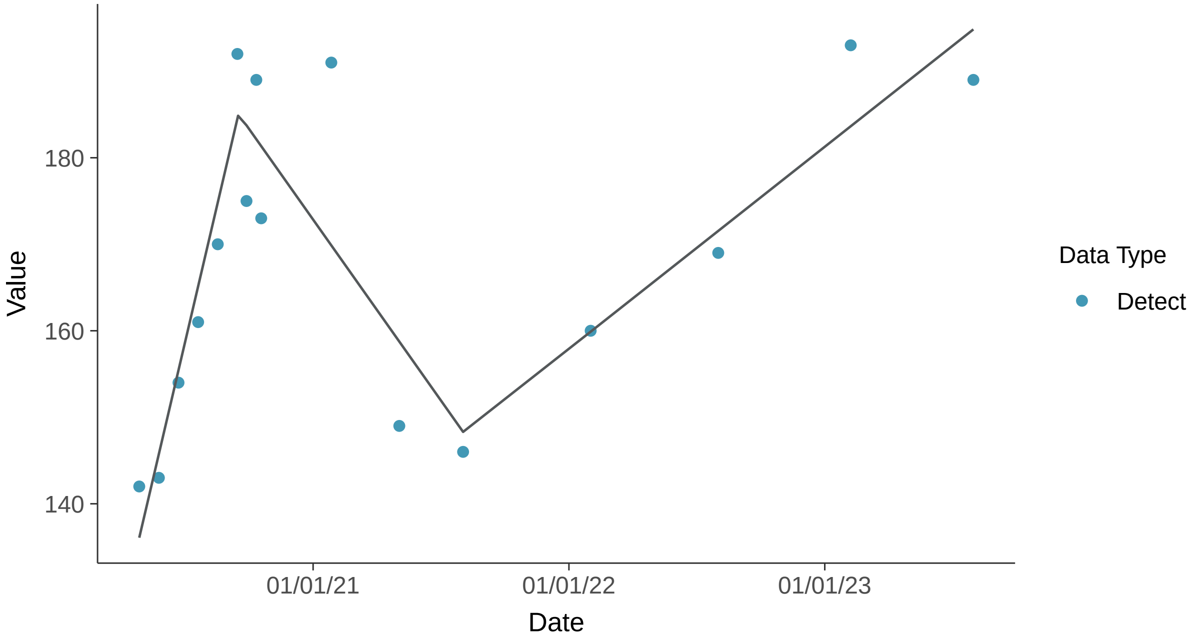
Trend Regression: Piecewise Linear-Linear

Calcium, MW-6 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Calcium, MW-6 (mg/L)

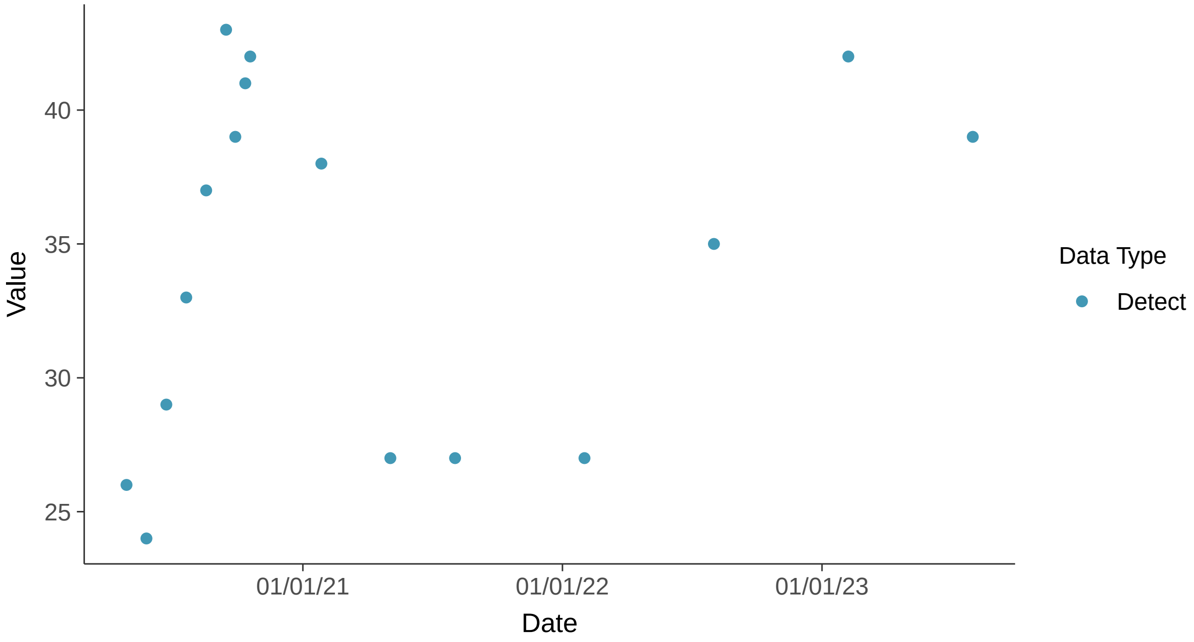


Appendix III: Chloride, MW-6

ID: 06_1_03

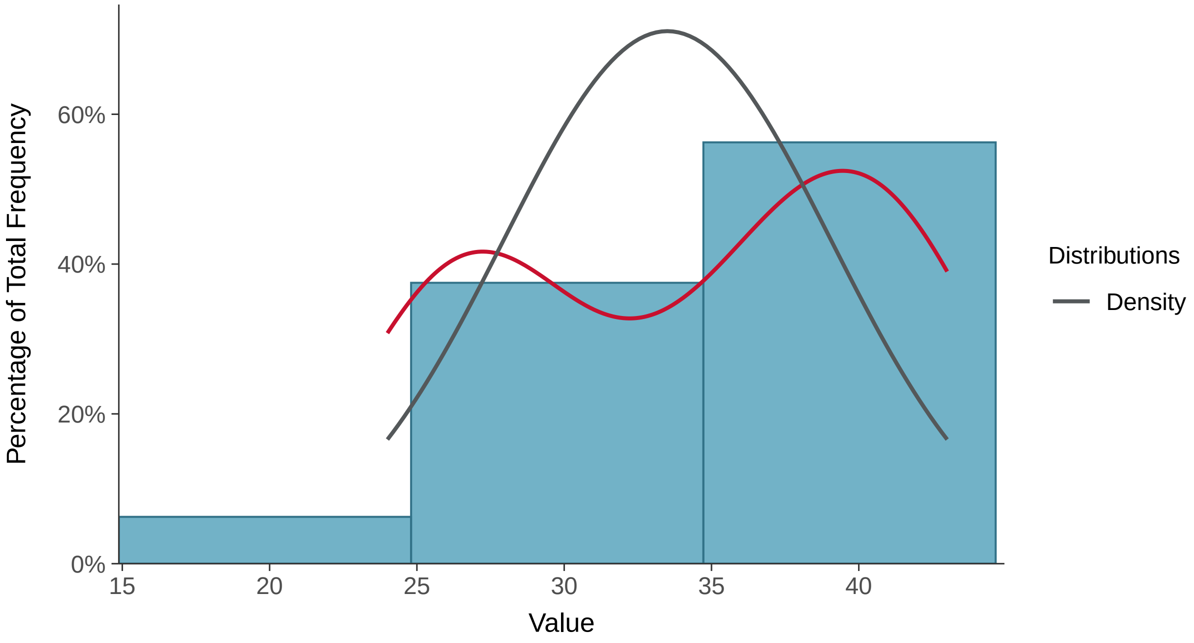
Scatter Plot

Chloride, MW-6 (mg/L)



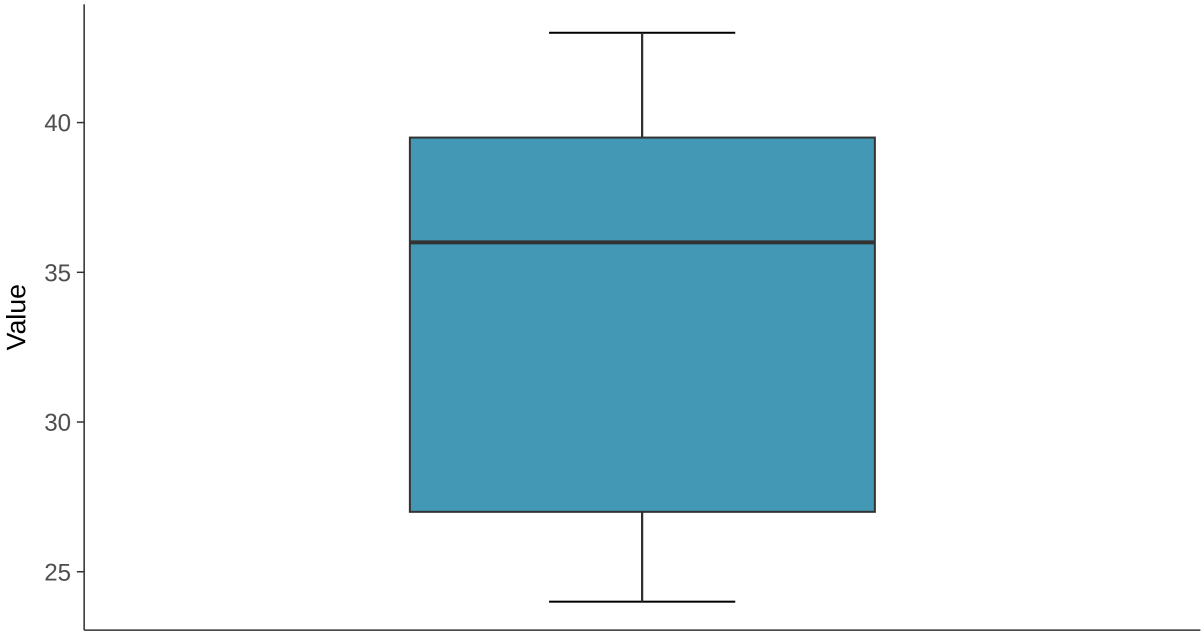
Histogram

Chloride, MW-6 (mg/L)



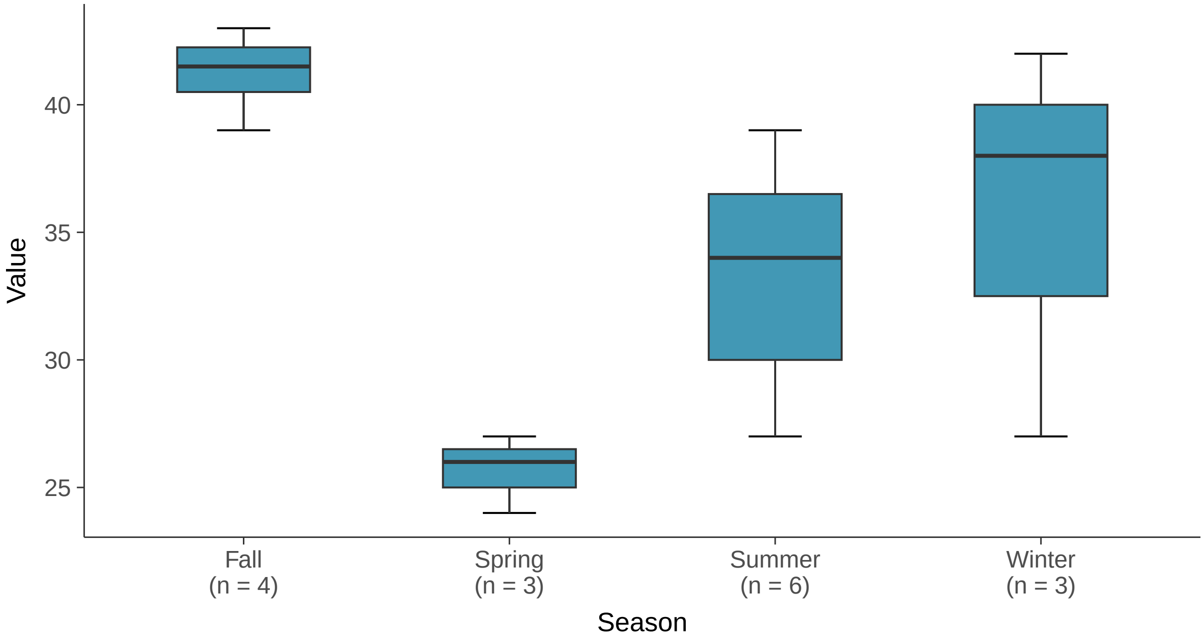
Boxplot

Chloride, MW-6 (mg/L)



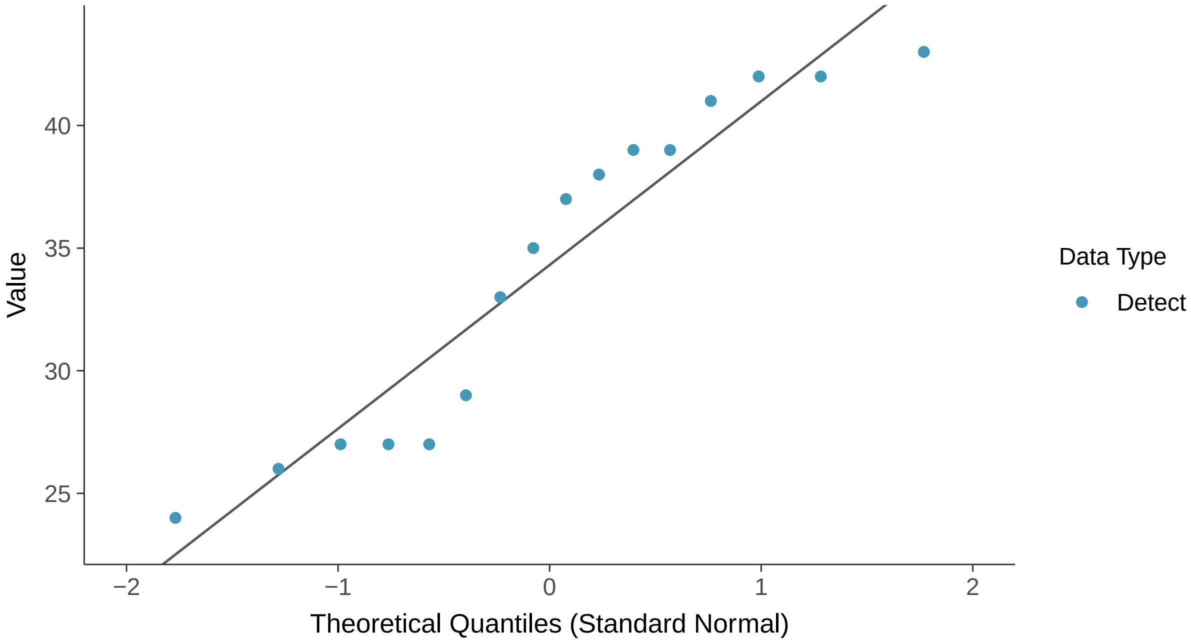
Boxplot by Season

Chloride, MW-6 (mg/L)



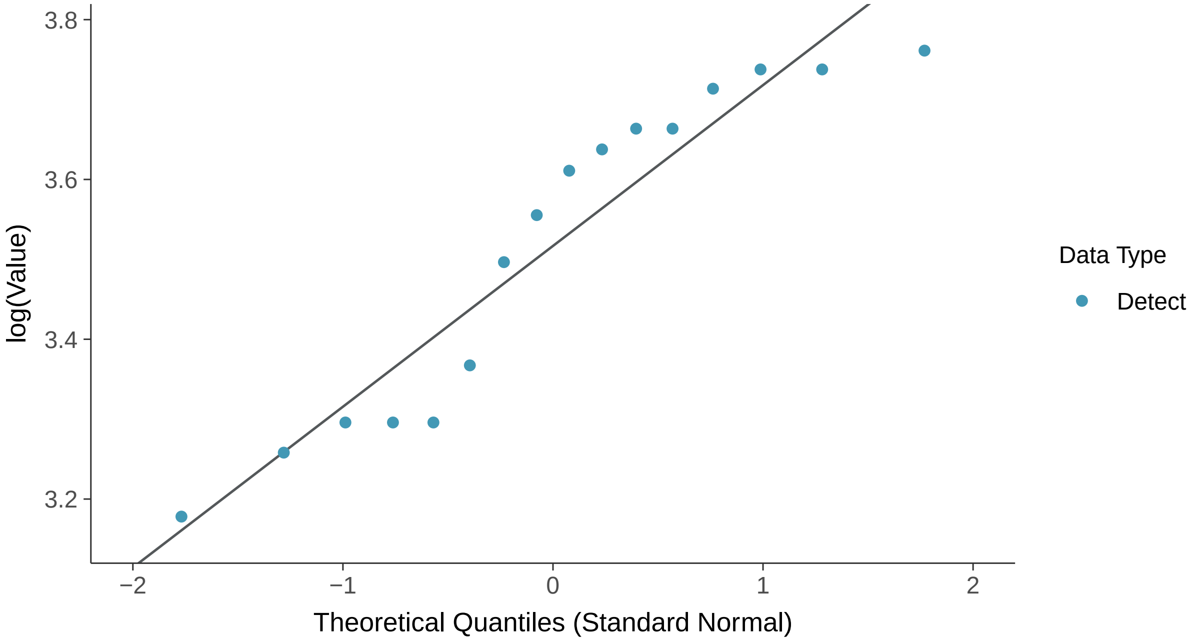
Normal Q-Q plot

Chloride, MW-6 (mg/L)



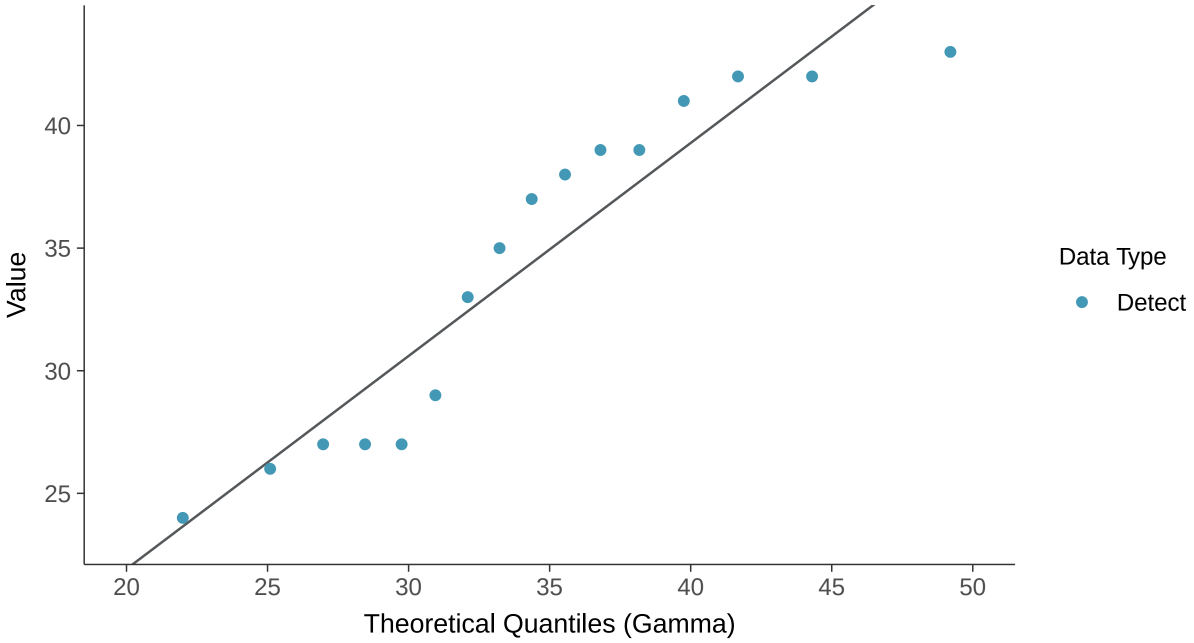
Lognormal Q-Q plot

Chloride, MW-6 (mg/L)



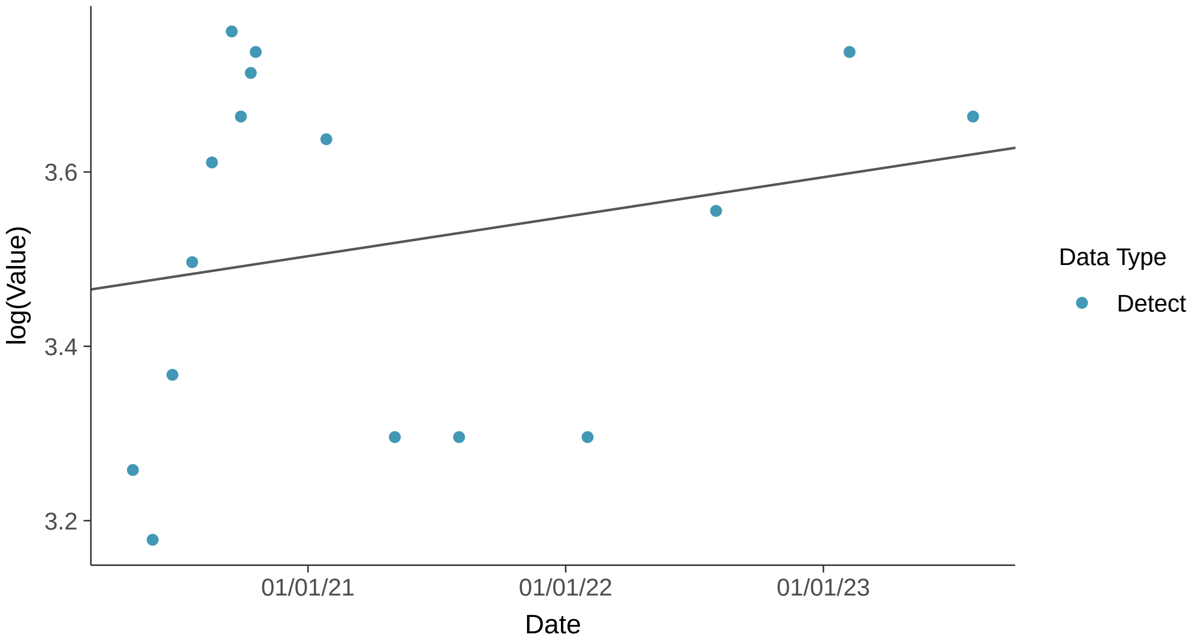
Gamma Q-Q plot

Chloride, MW-6 (mg/L)



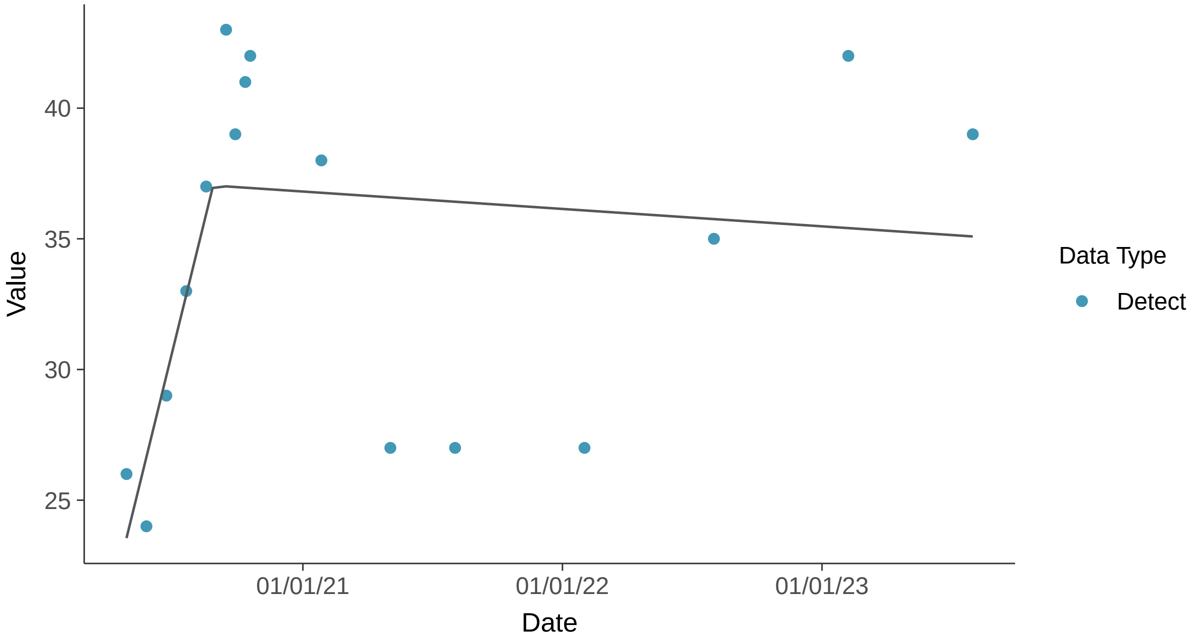
Trend Regression: Lognormal MLE

Chloride, MW-6 (mg/L)



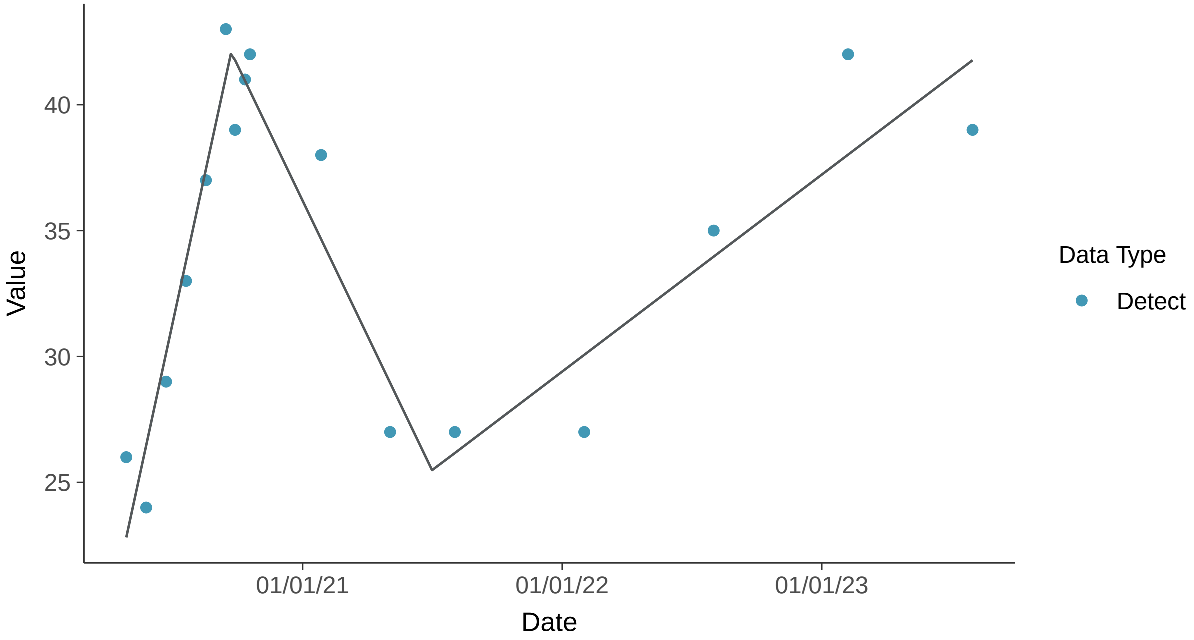
Trend Regression: Piecewise Linear-Linear

Chloride, MW-6 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Chloride, MW-6 (mg/L)

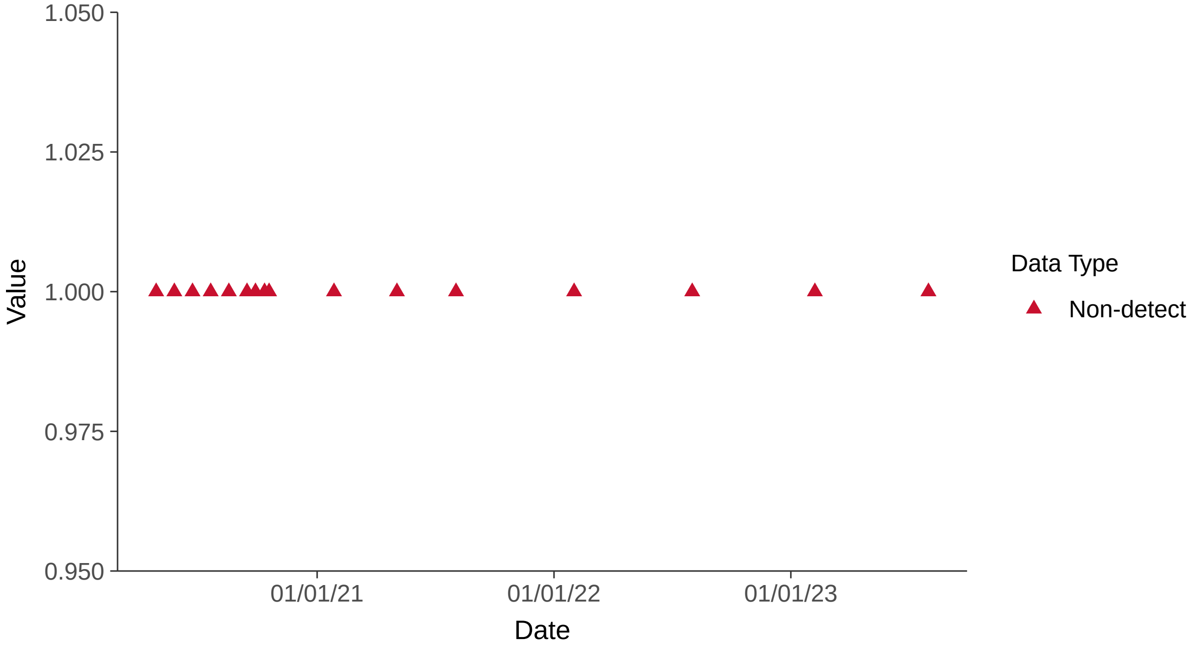


Appendix III: Fluoride, MW-6

ID: 06_1_04

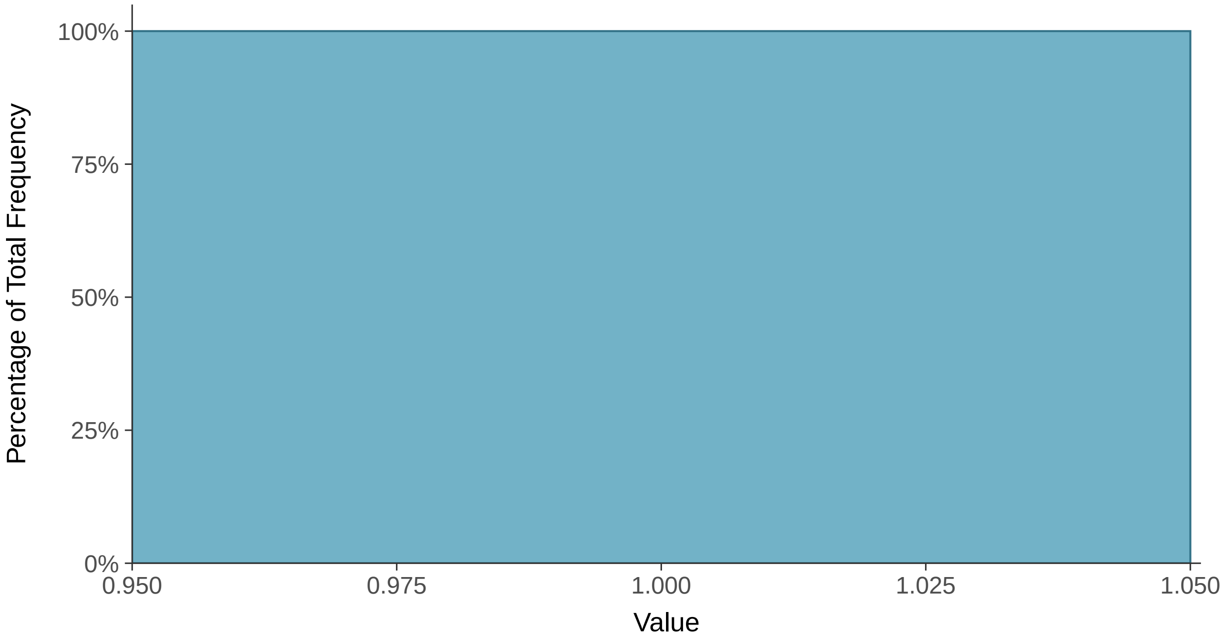
Scatter Plot

Fluoride, MW-6 (mg/L)



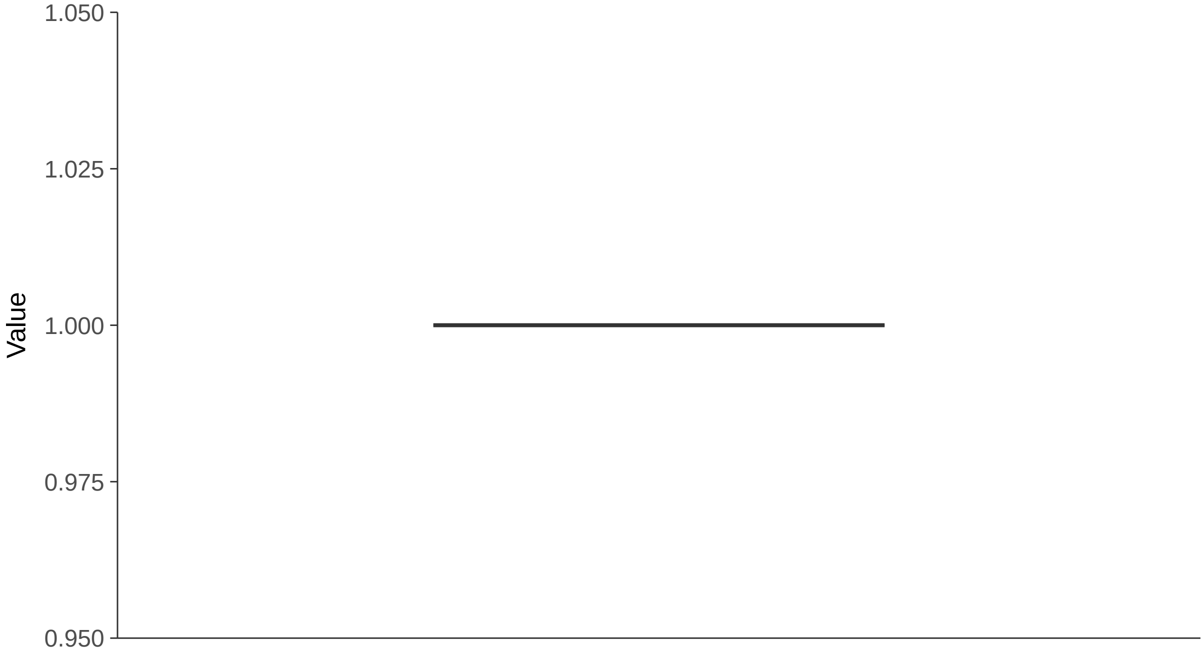
Histogram

Fluoride, MW-6 (mg/L)



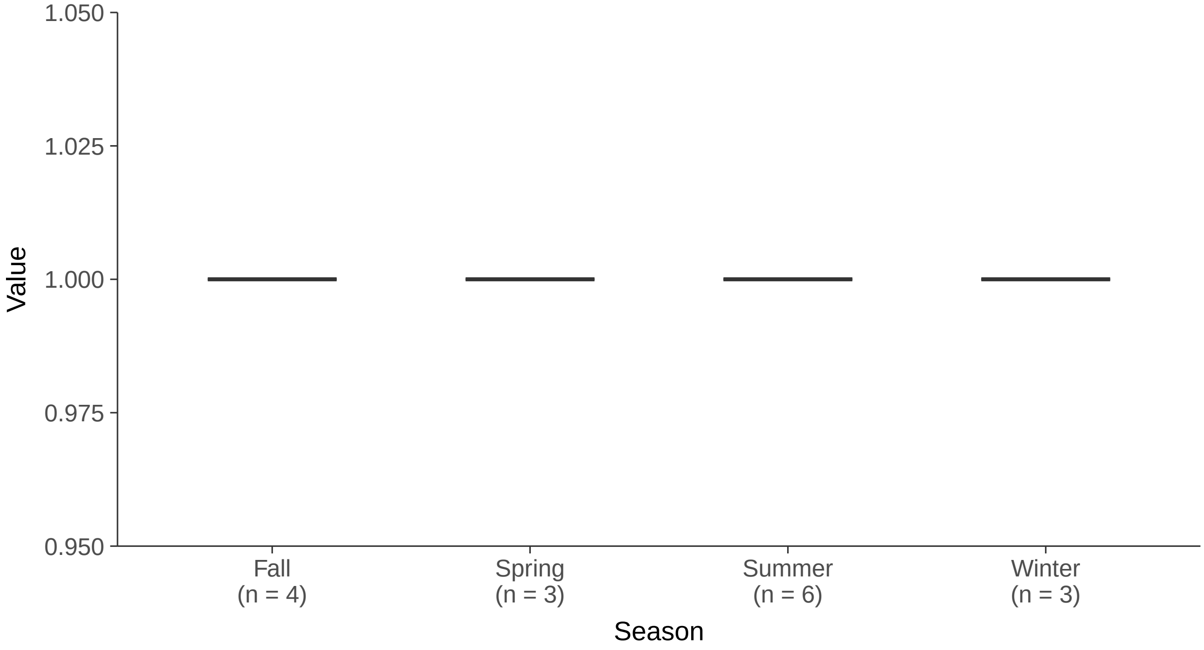
Boxplot

Fluoride, MW-6 (mg/L)



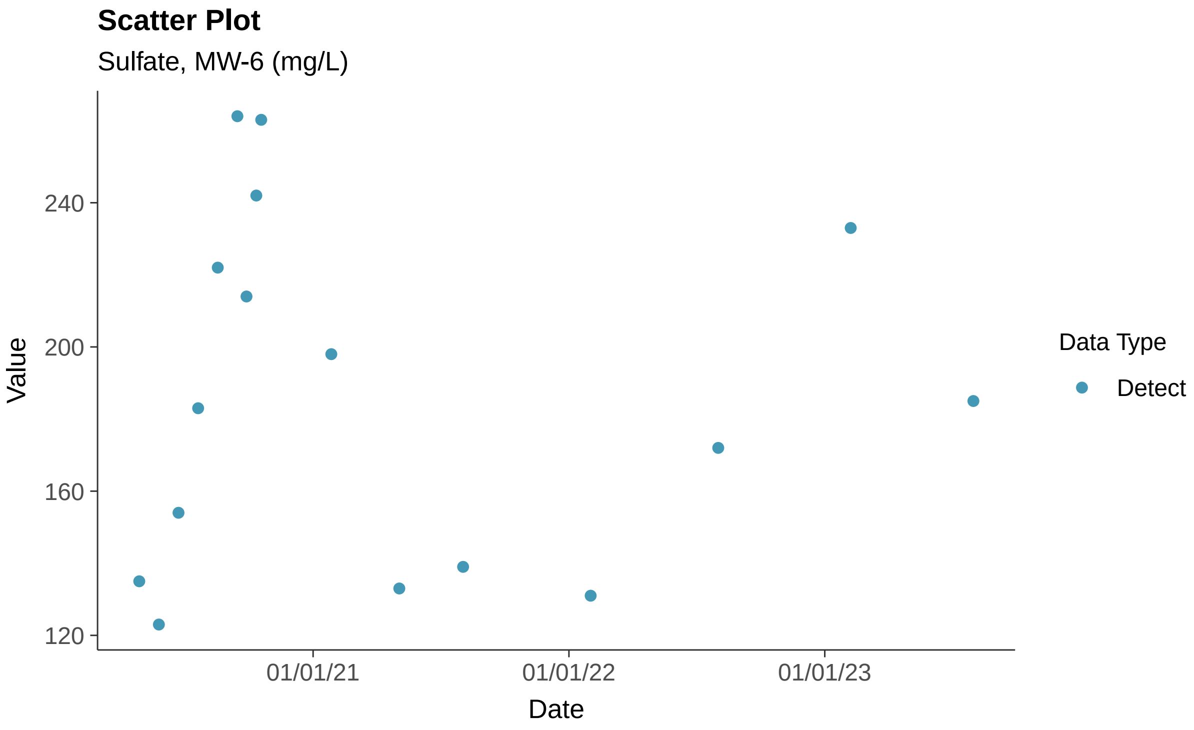
Boxplot by Season

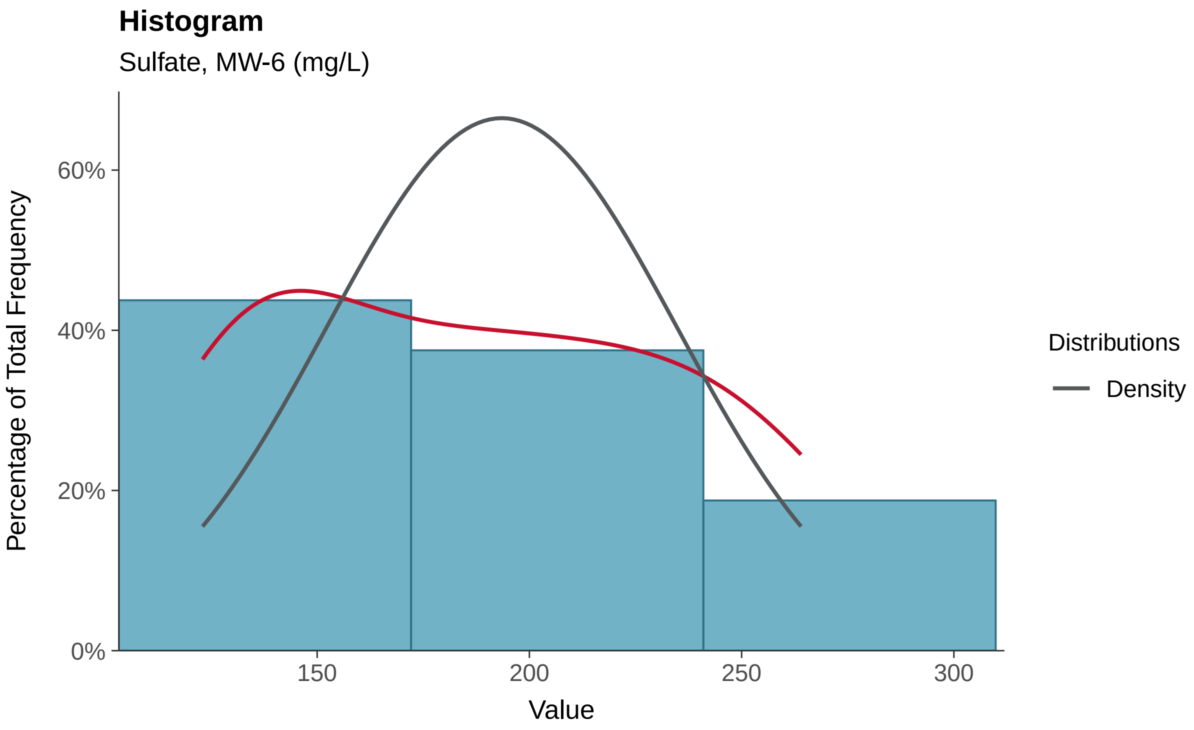
Fluoride, MW-6 (mg/L)



Appendix III: Sulfate, MW-6

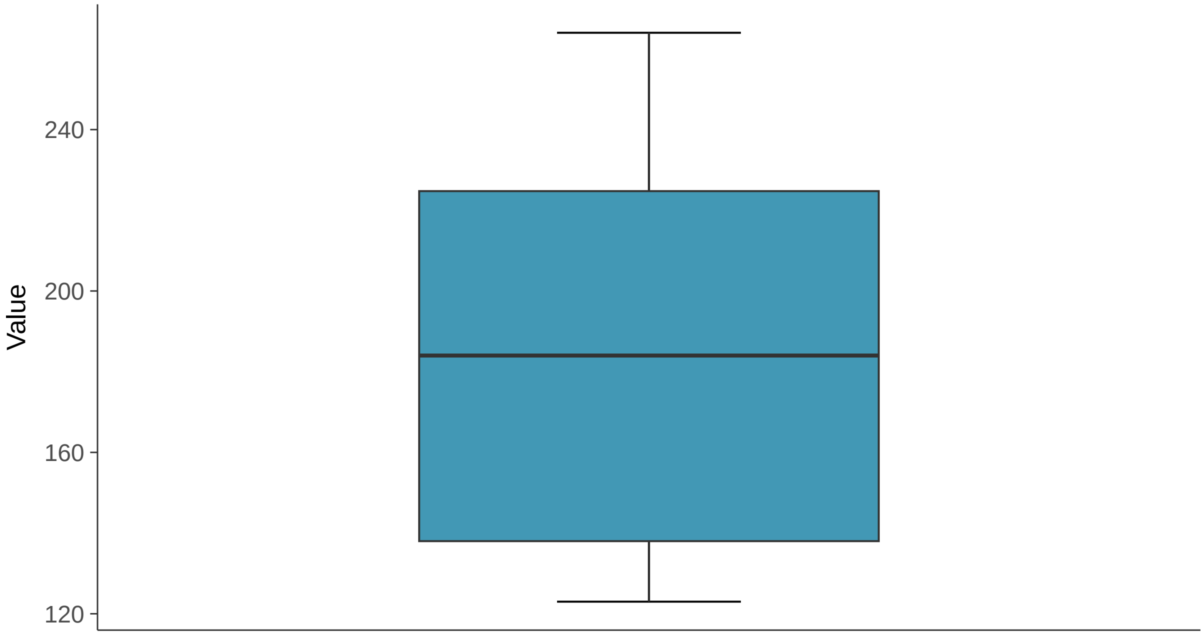
ID: 06_1_05





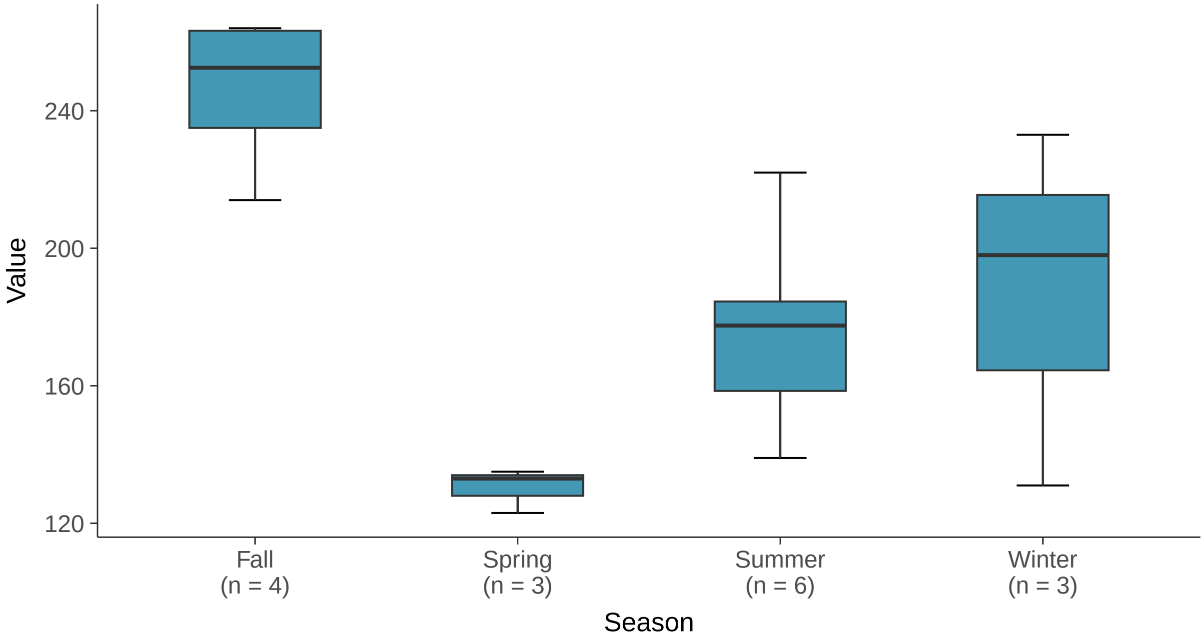
Boxplot

Sulfate, MW-6 (mg/L)



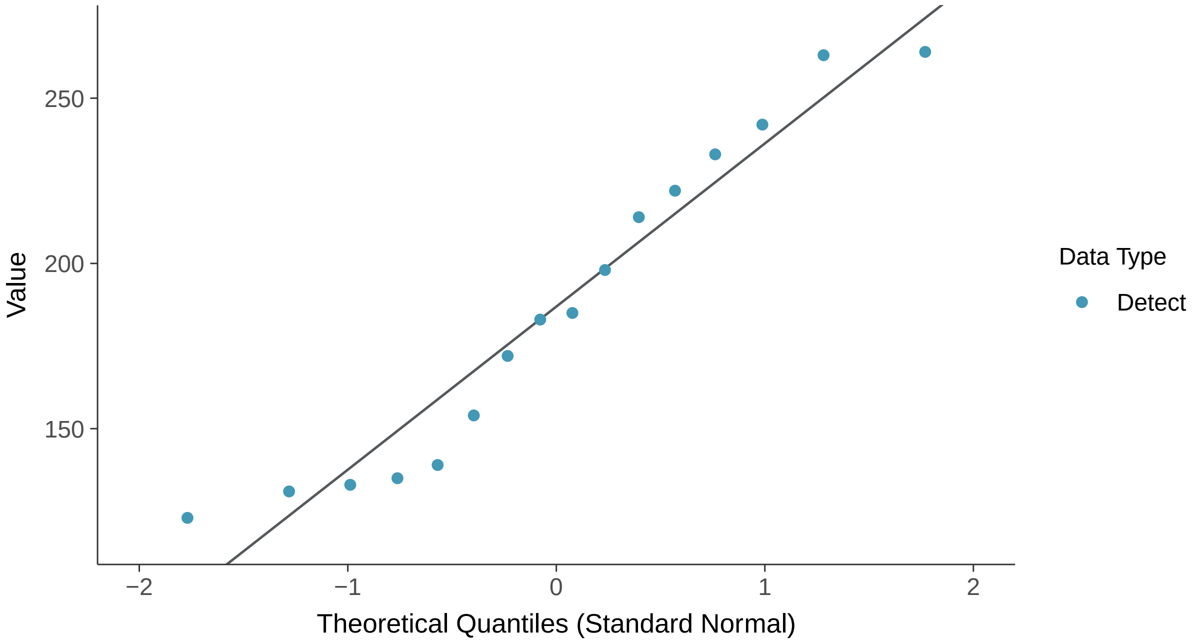
Boxplot by Season

Sulfate, MW-6 (mg/L)



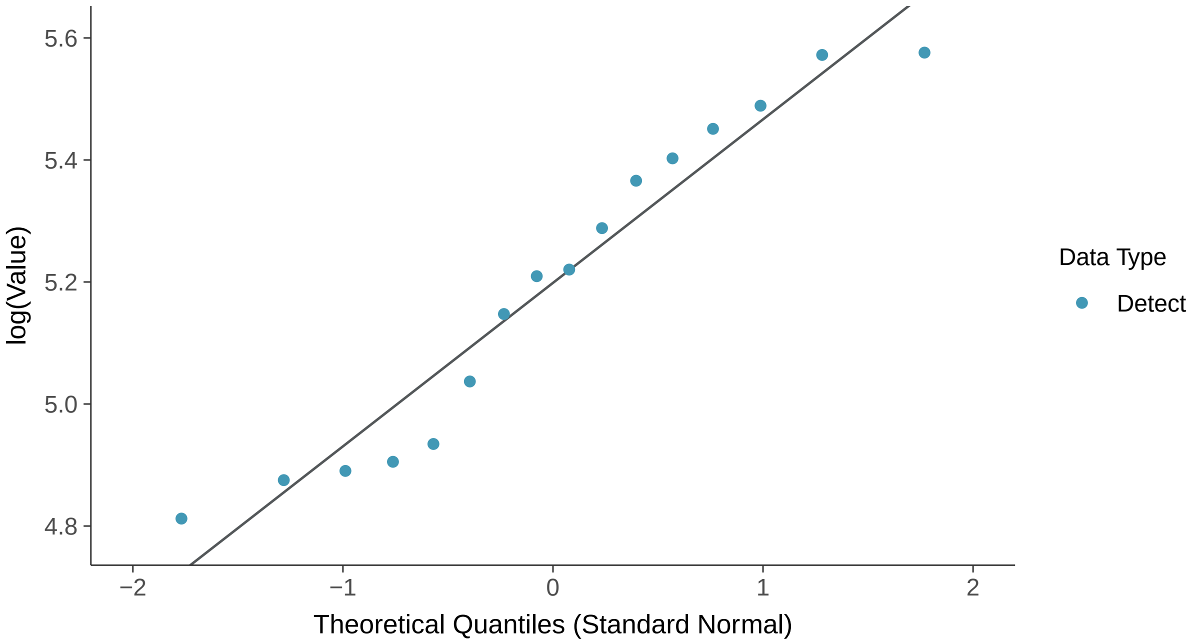
Normal Q-Q plot

Sulfate, MW-6 (mg/L)



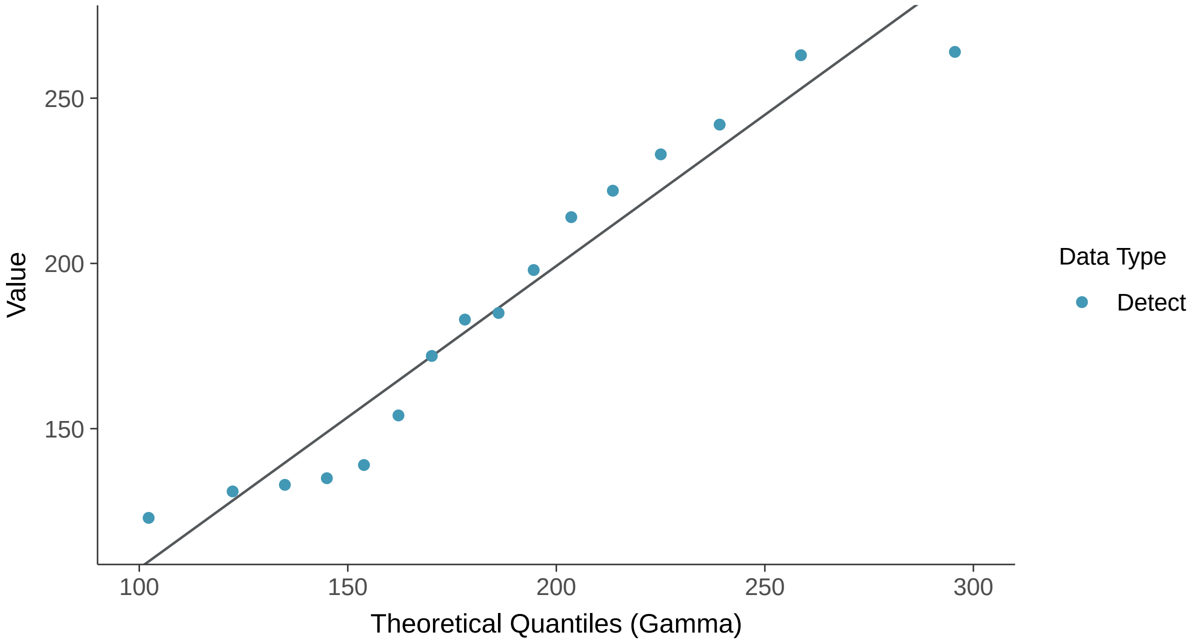
Lognormal Q-Q plot

Sulfate, MW-6 (mg/L)



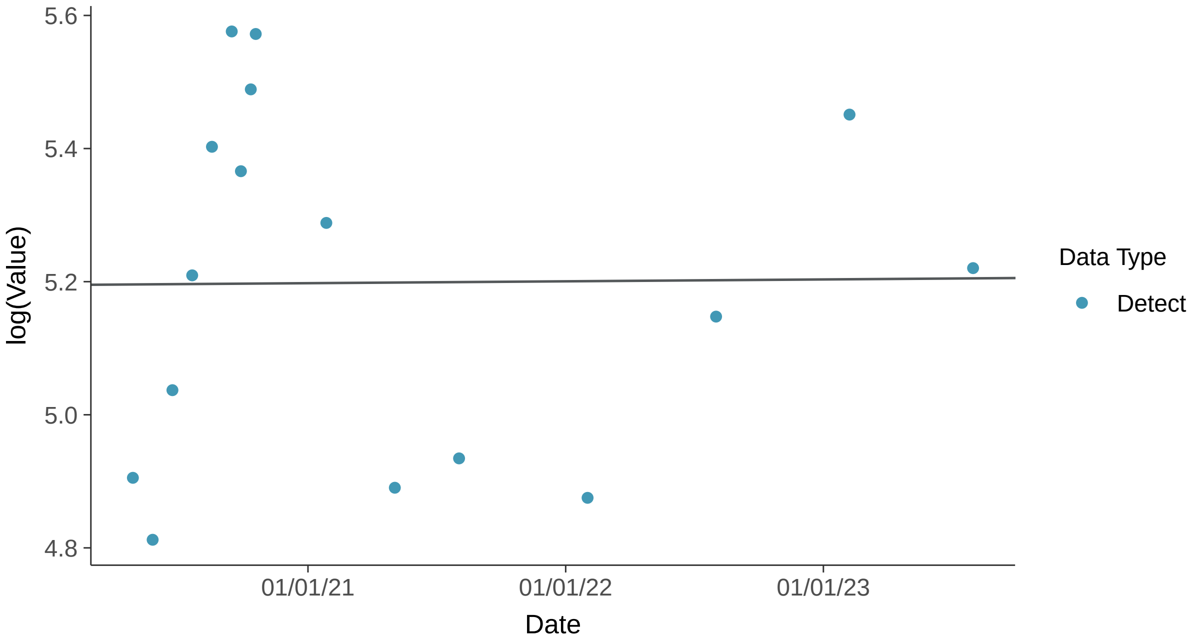
Gamma Q-Q plot

Sulfate, MW-6 (mg/L)



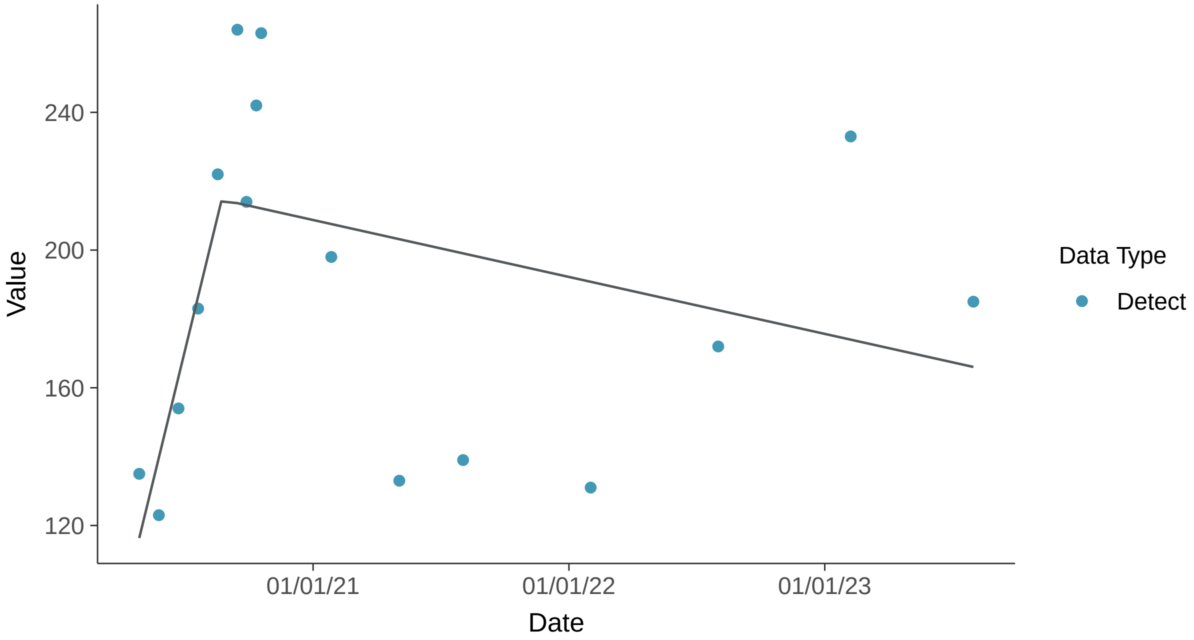
Trend Regression: Lognormal MLE

Sulfate, MW-6 (mg/L)



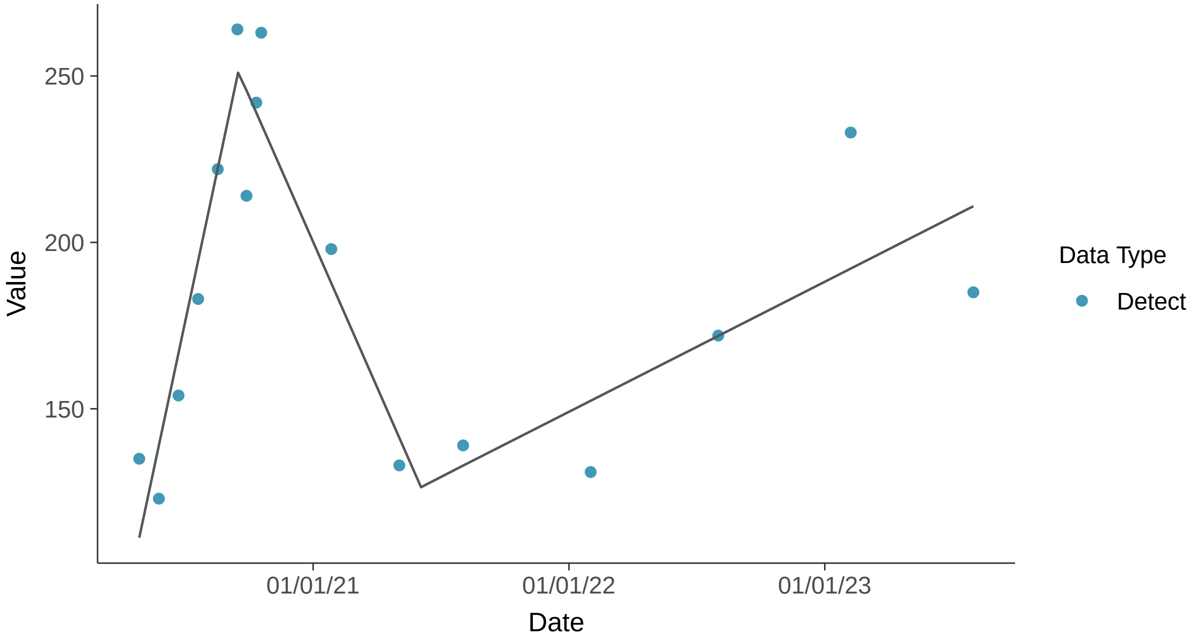
Trend Regression: Piecewise Linear-Linear

Sulfate, MW-6 (mg/L)



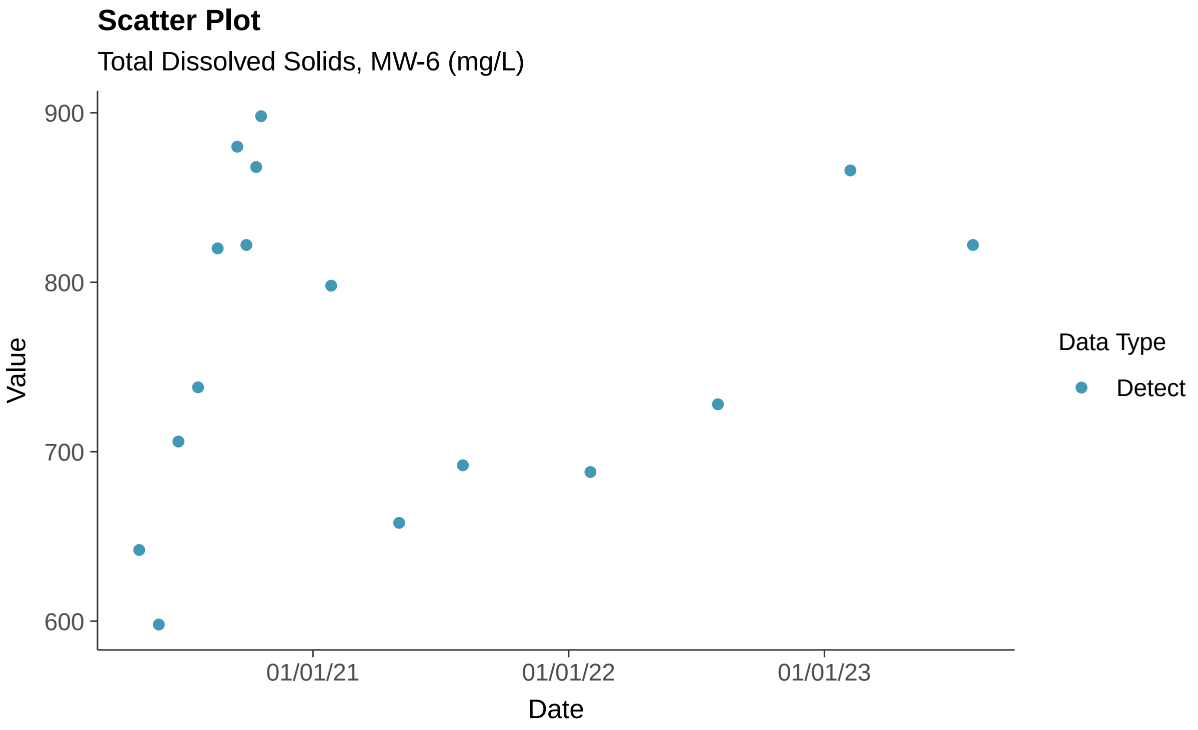
Trend Regression: Piecewise Linear-Linear-Linear

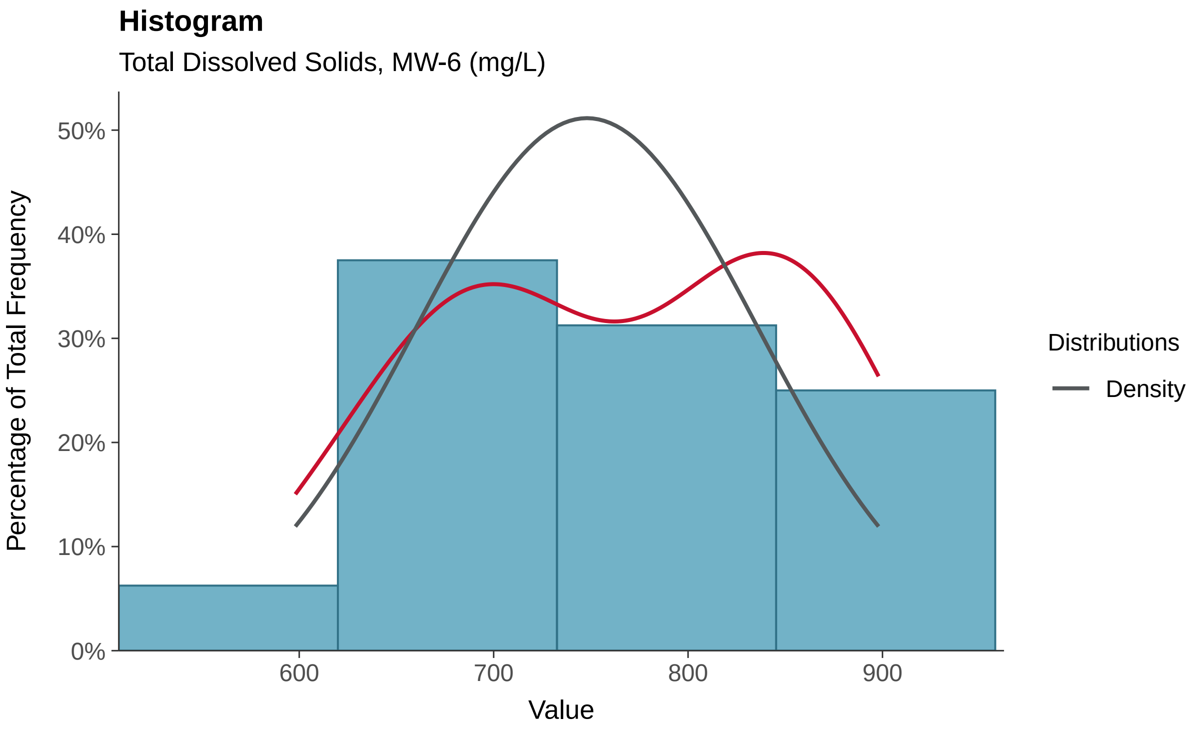
Sulfate, MW-6 (mg/L)



Appendix III: Total Dissolved Solids, MW-6

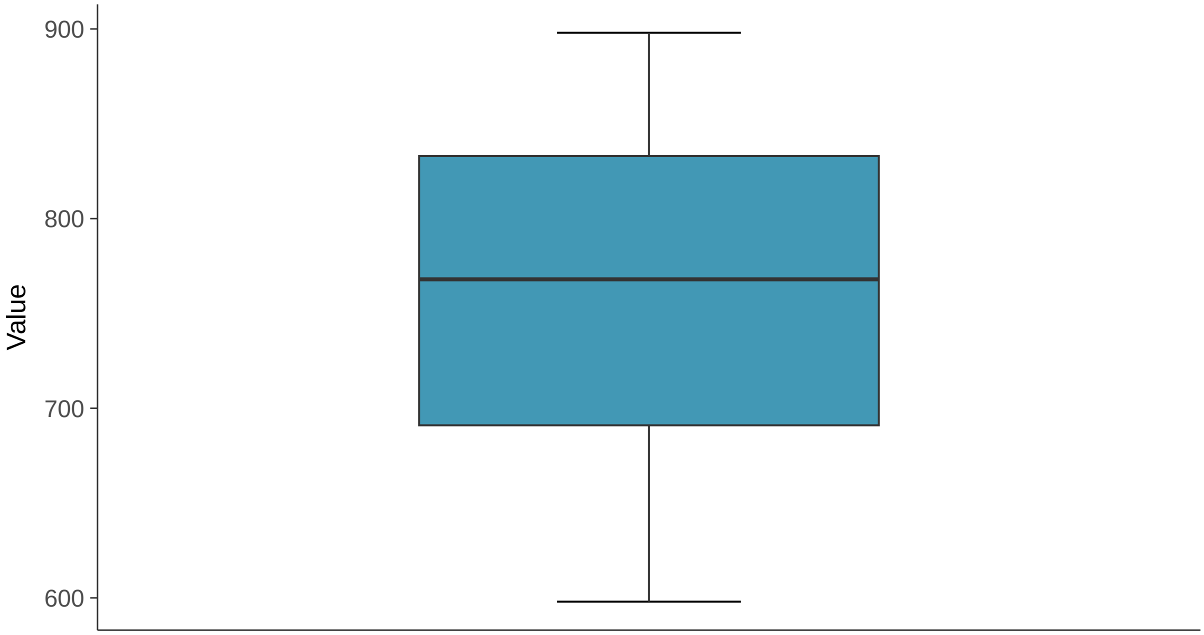
ID: 06_1_06





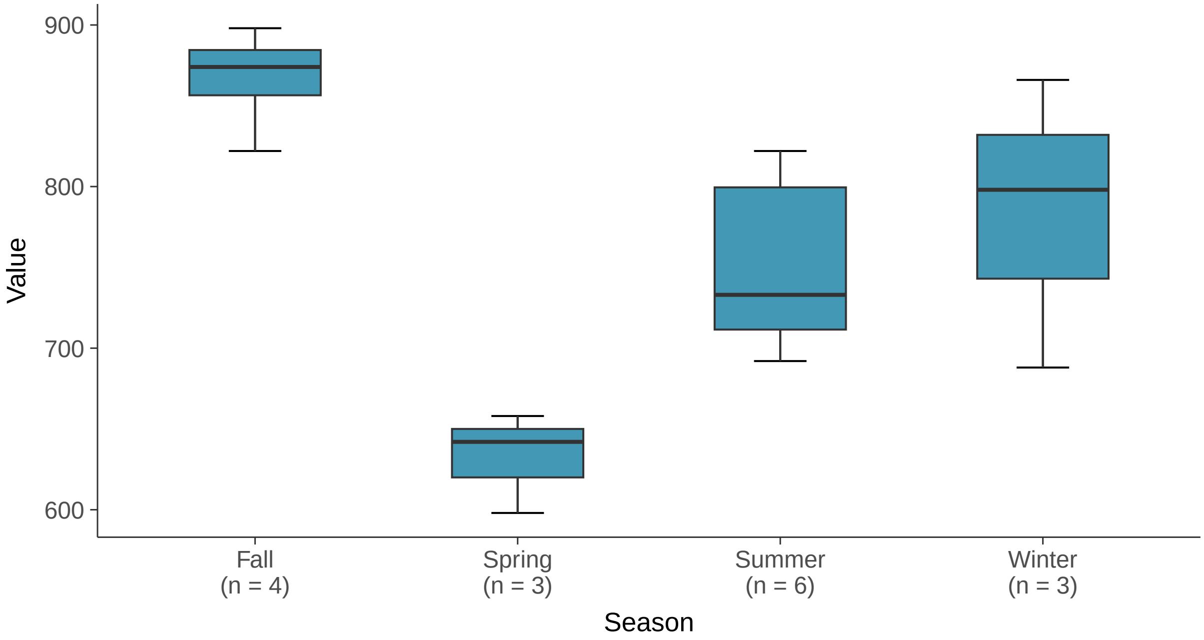
Boxplot

Total Dissolved Solids, MW-6 (mg/L)



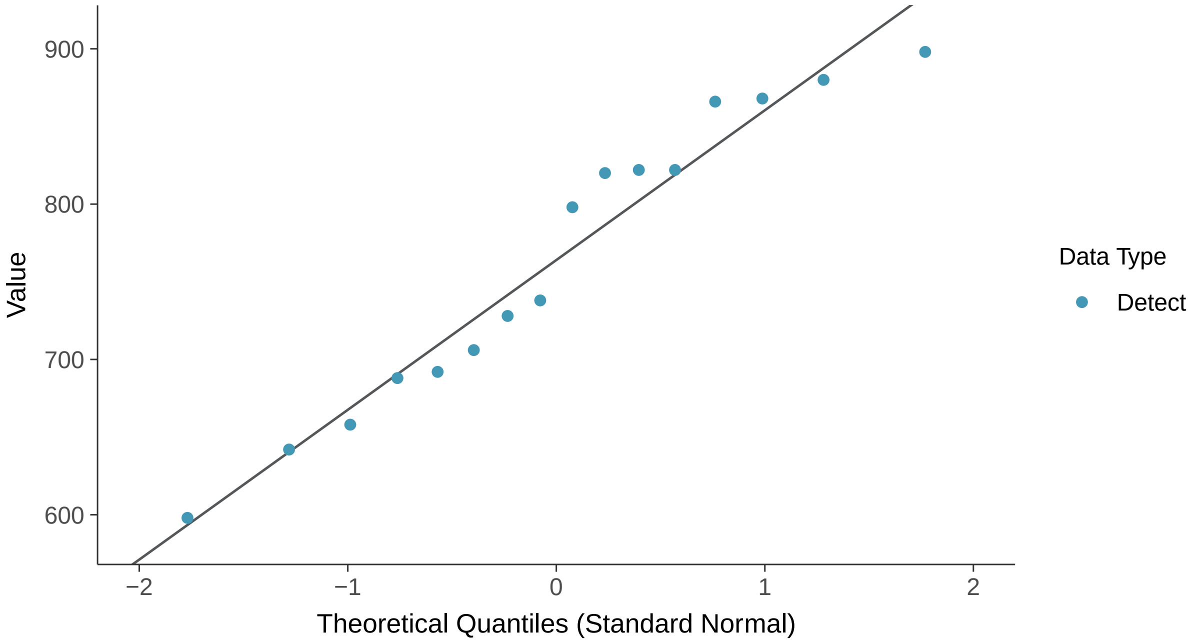
Boxplot by Season

Total Dissolved Solids, MW-6 (mg/L)



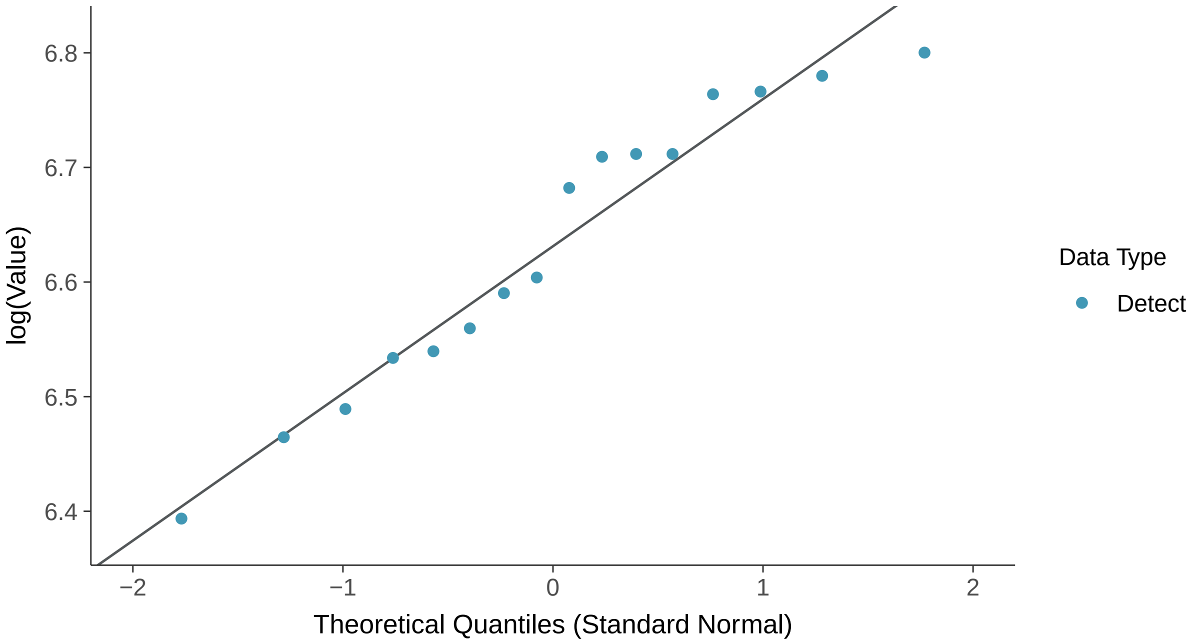
Normal Q-Q plot

Total Dissolved Solids, MW-6 (mg/L)



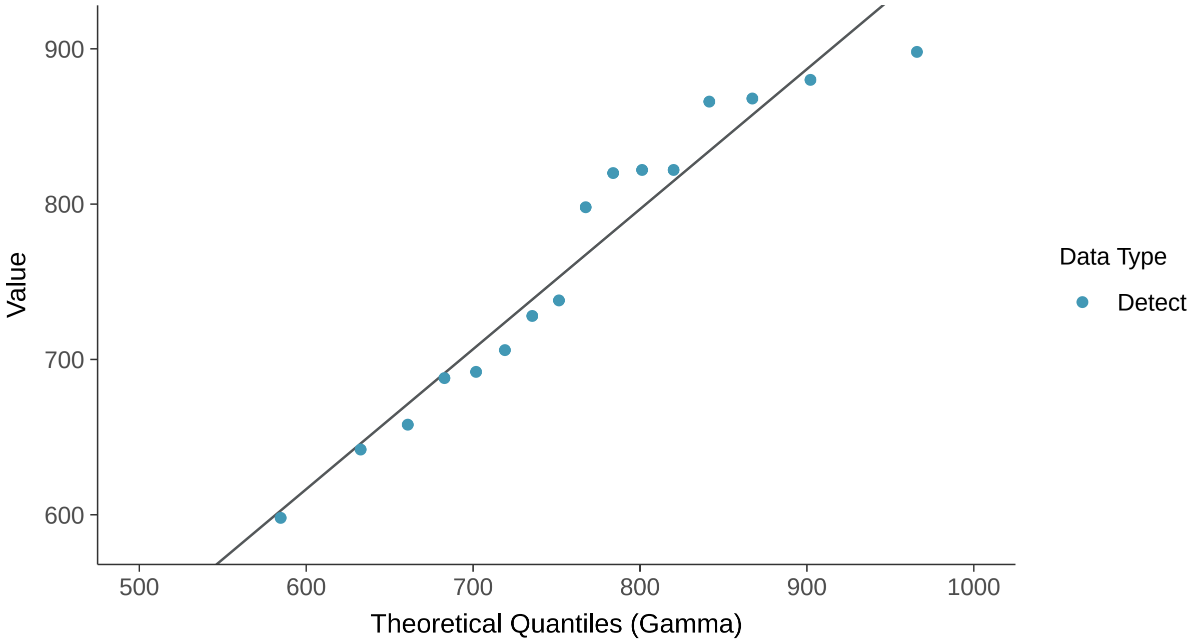
Lognormal Q-Q plot

Total Dissolved Solids, MW-6 (mg/L)



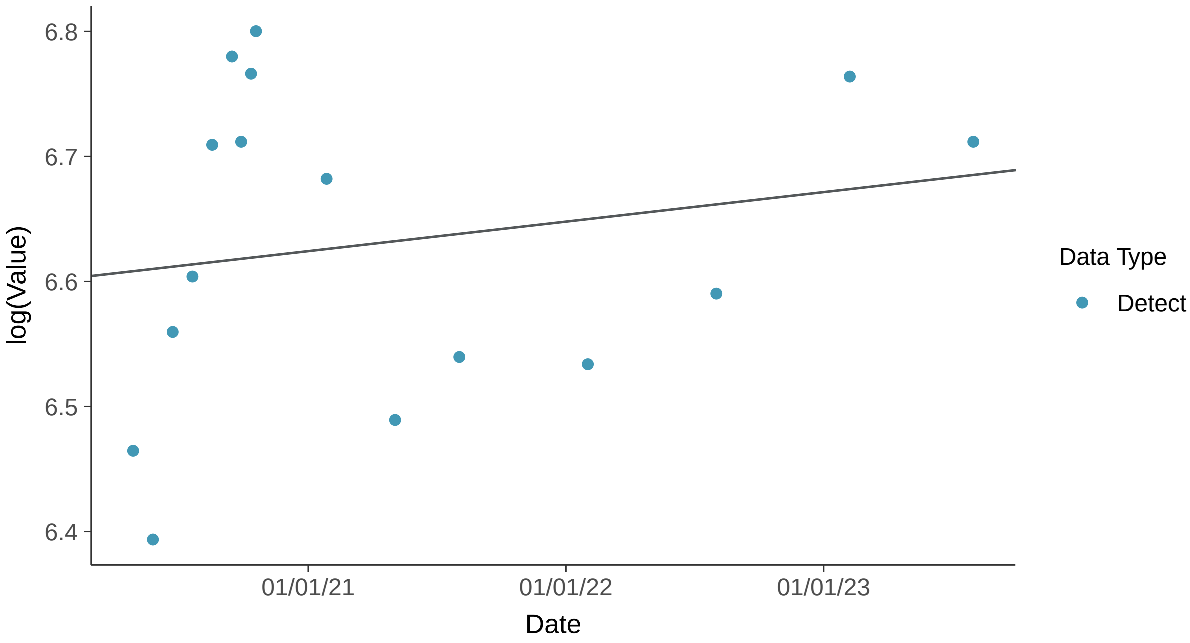
Gamma Q-Q plot

Total Dissolved Solids, MW-6 (mg/L)



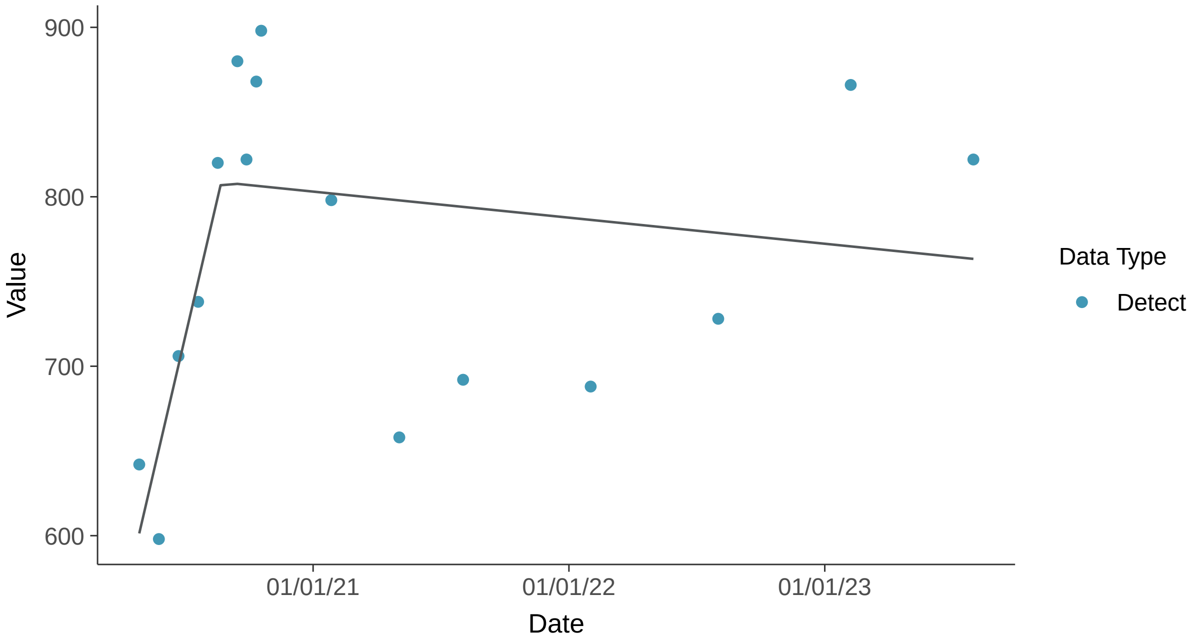
Trend Regression: Lognormal MLE

Total Dissolved Solids, MW-6 (mg/L)



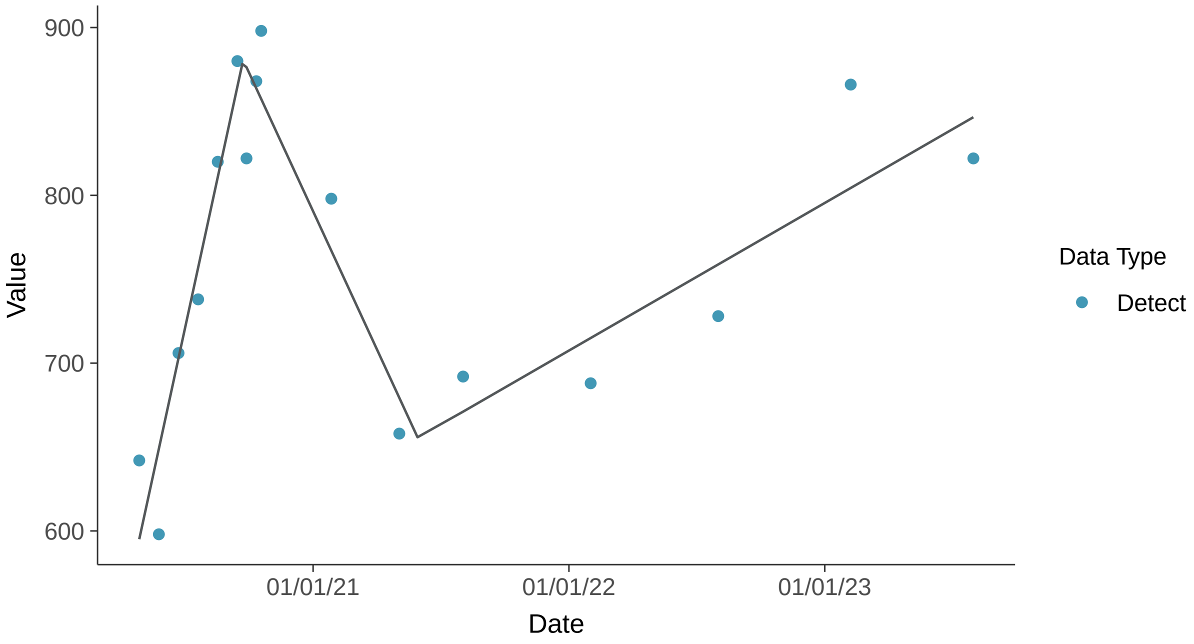
Trend Regression: Piecewise Linear-Linear

Total Dissolved Solids, MW-6 (mg/L)



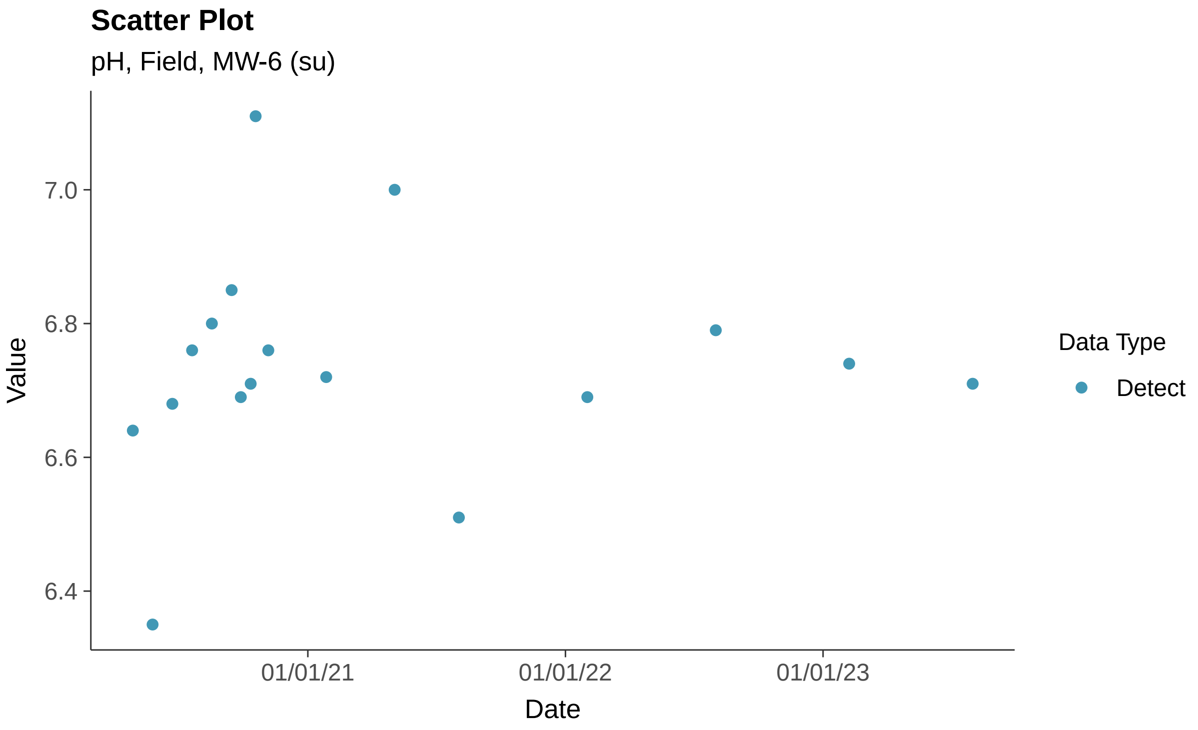
Trend Regression: Piecewise Linear-Linear-Linear

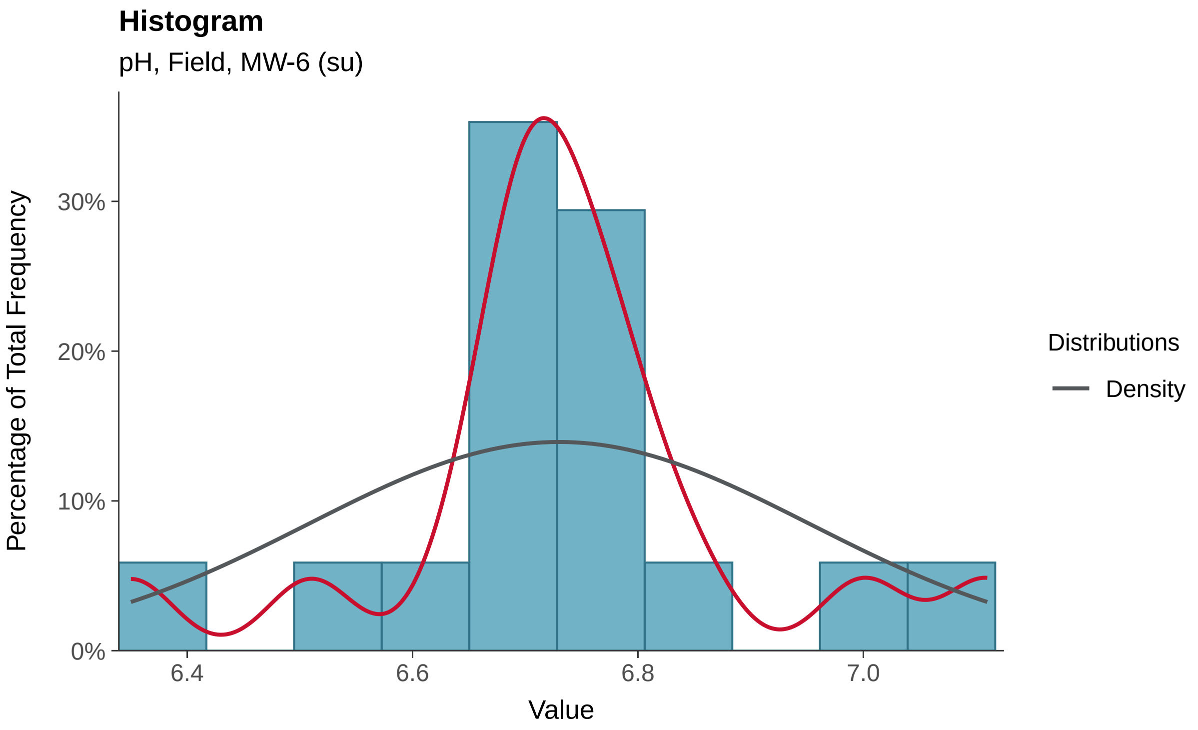
Total Dissolved Solids, MW-6 (mg/L)



Appendix III: pH, Field, MW-6

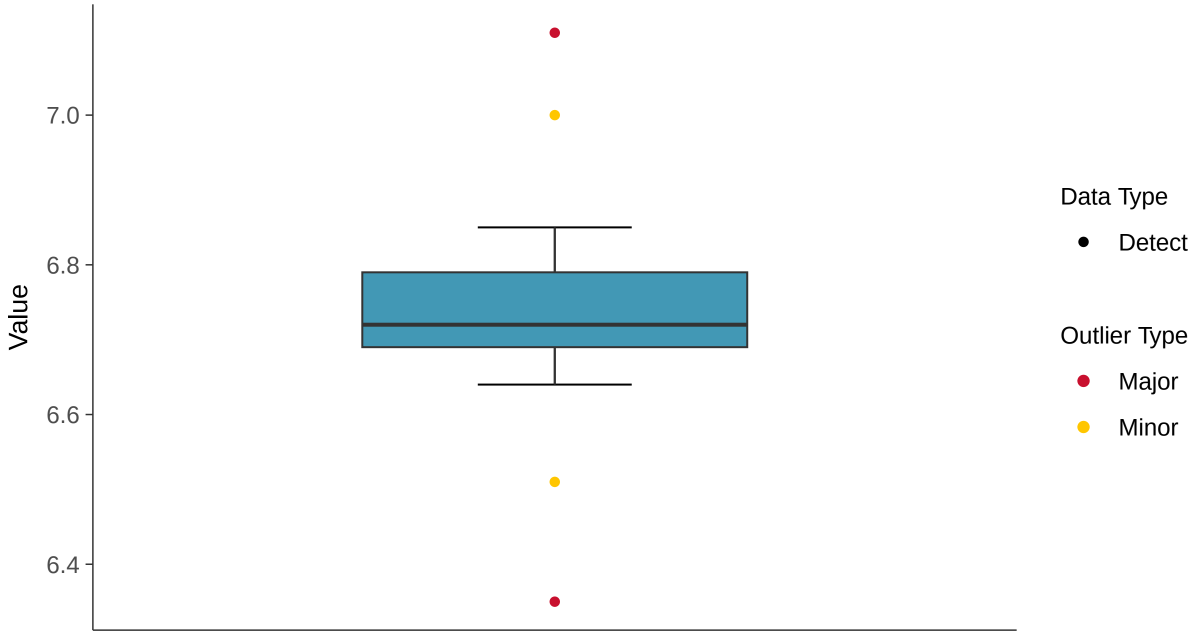
ID: 06_1_07





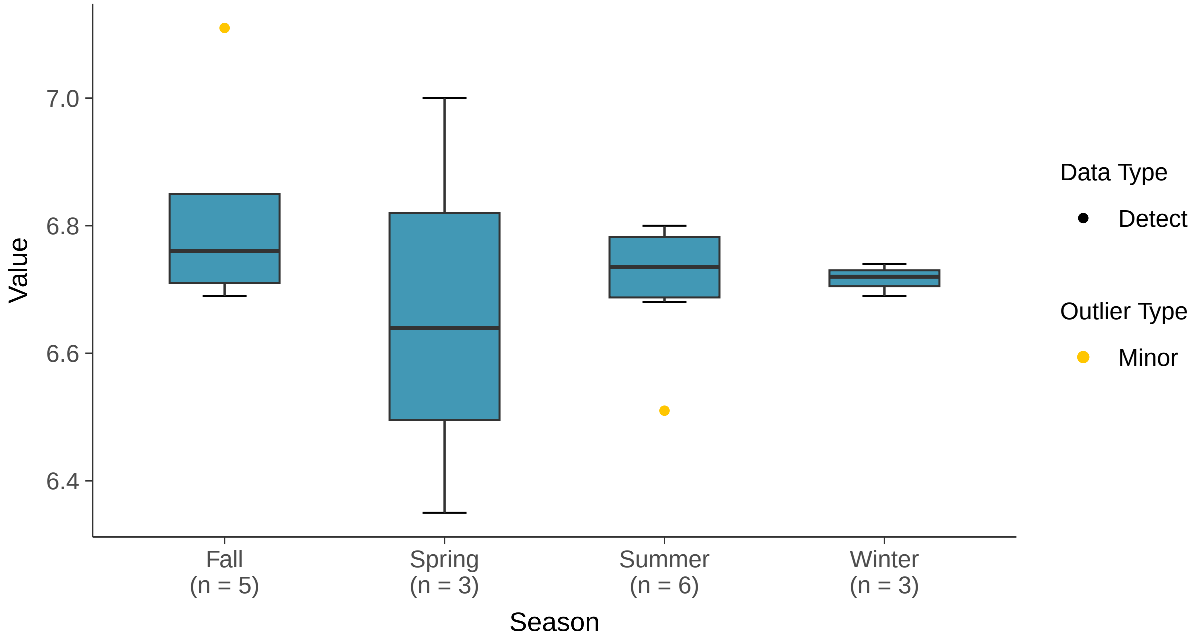
Boxplot

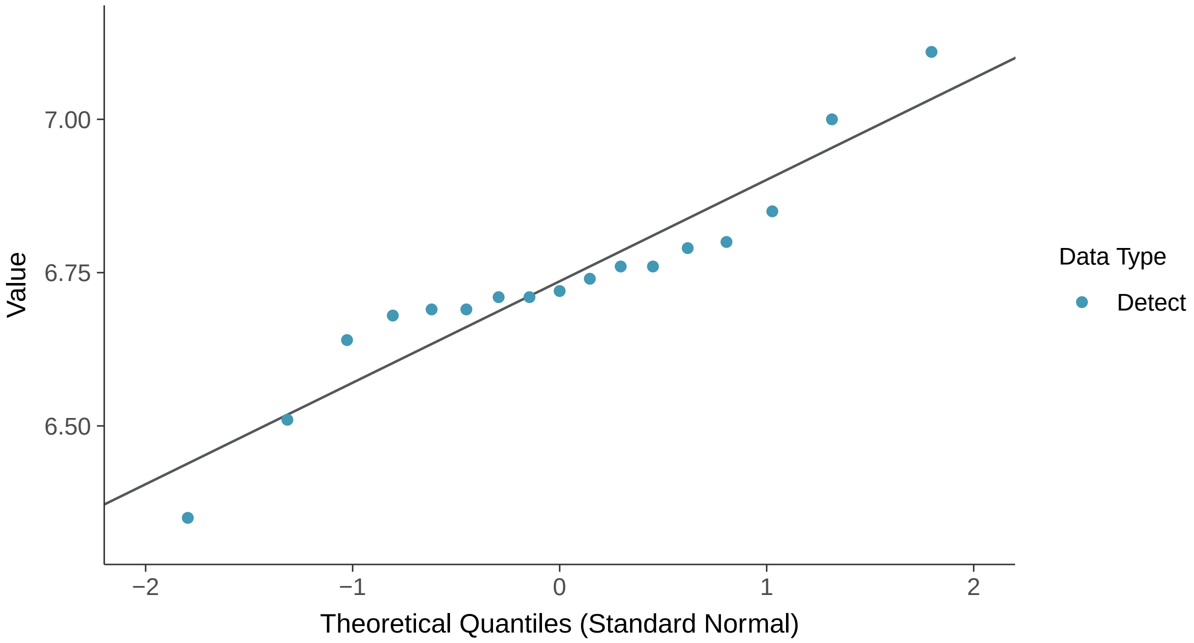
pH, Field, MW-6 (su)



Boxplot by Season

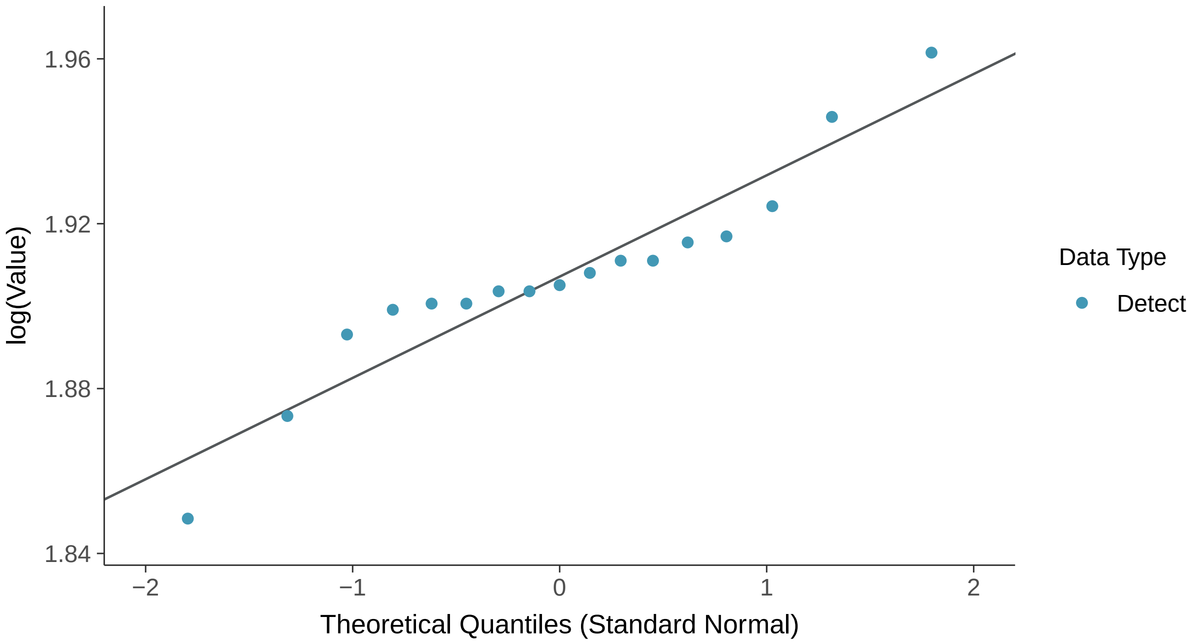
pH, Field, MW-6 (su)





Normal Q-Q plot

pH, Field, MW-6 (su)

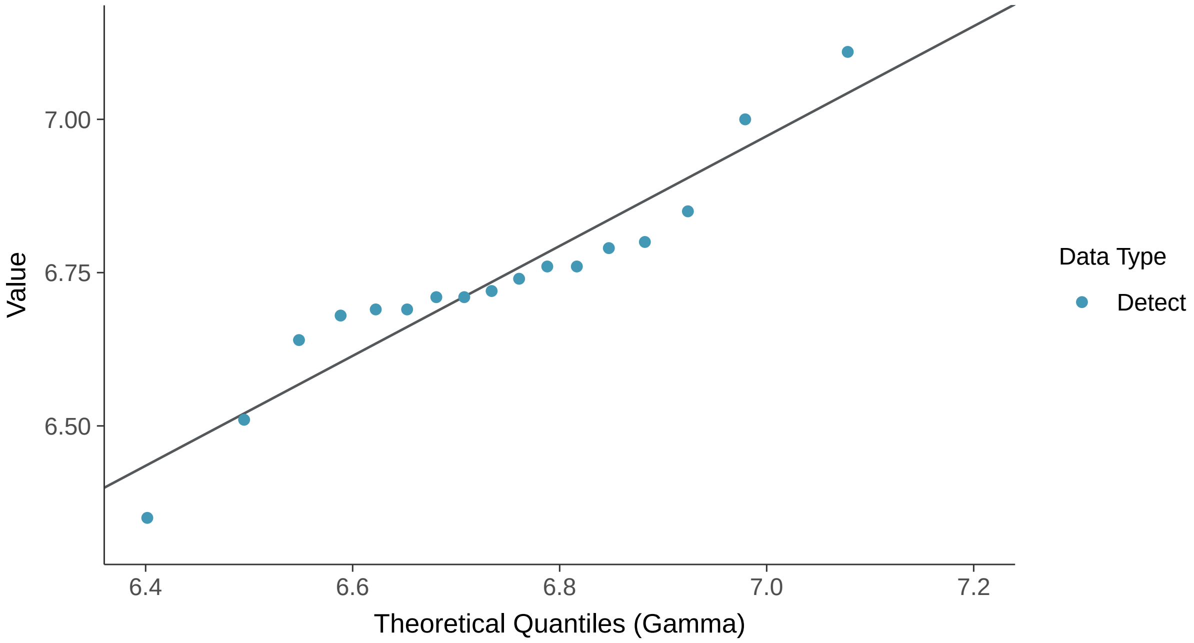


Lognormal Q-Q plot

pH, Field, MW-6 (su)

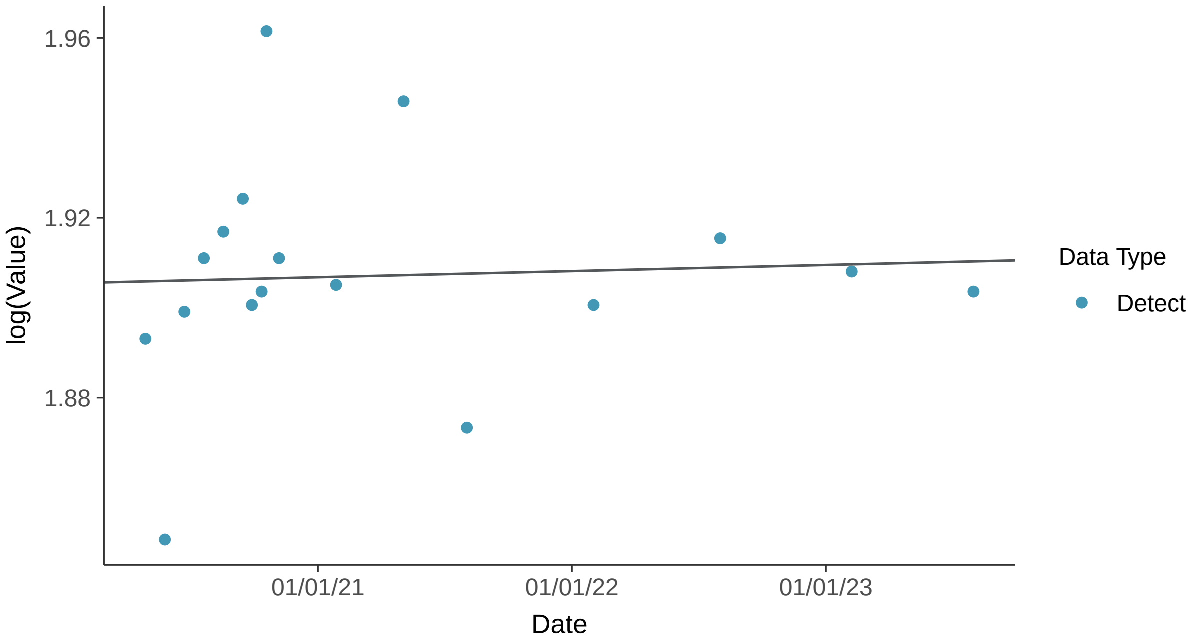
Gamma Q-Q plot

pH, Field, MW-6 (su)



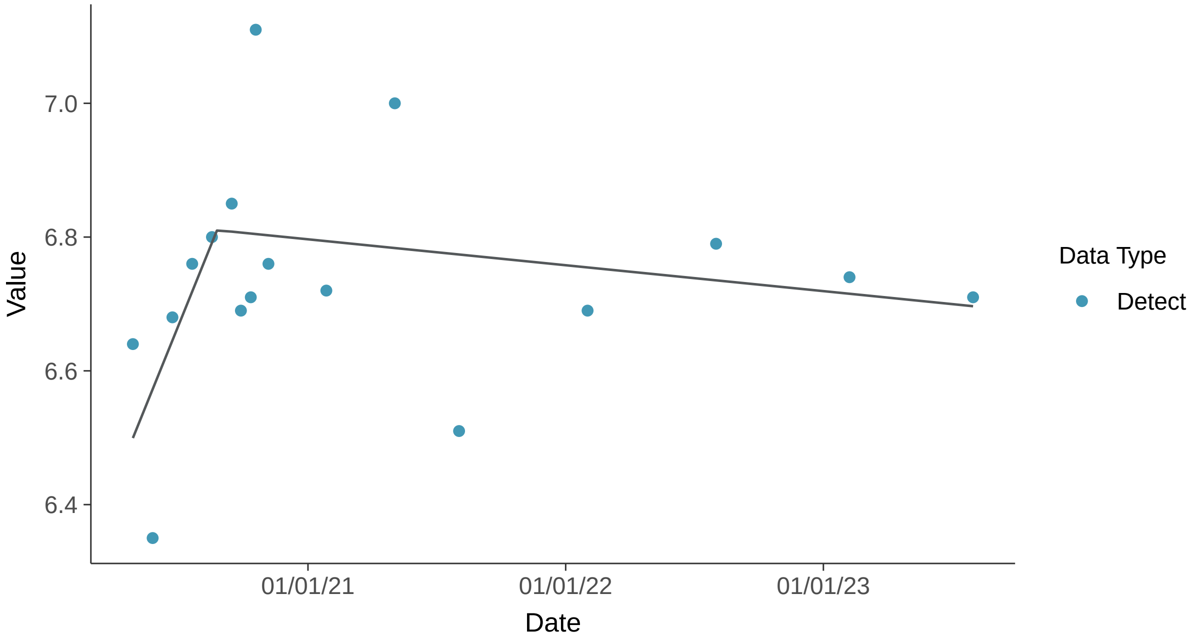
Trend Regression: Lognormal MLE

pH, Field, MW-6 (su)



Trend Regression: Piecewise Linear-Linear

pH, Field, MW-6 (su)

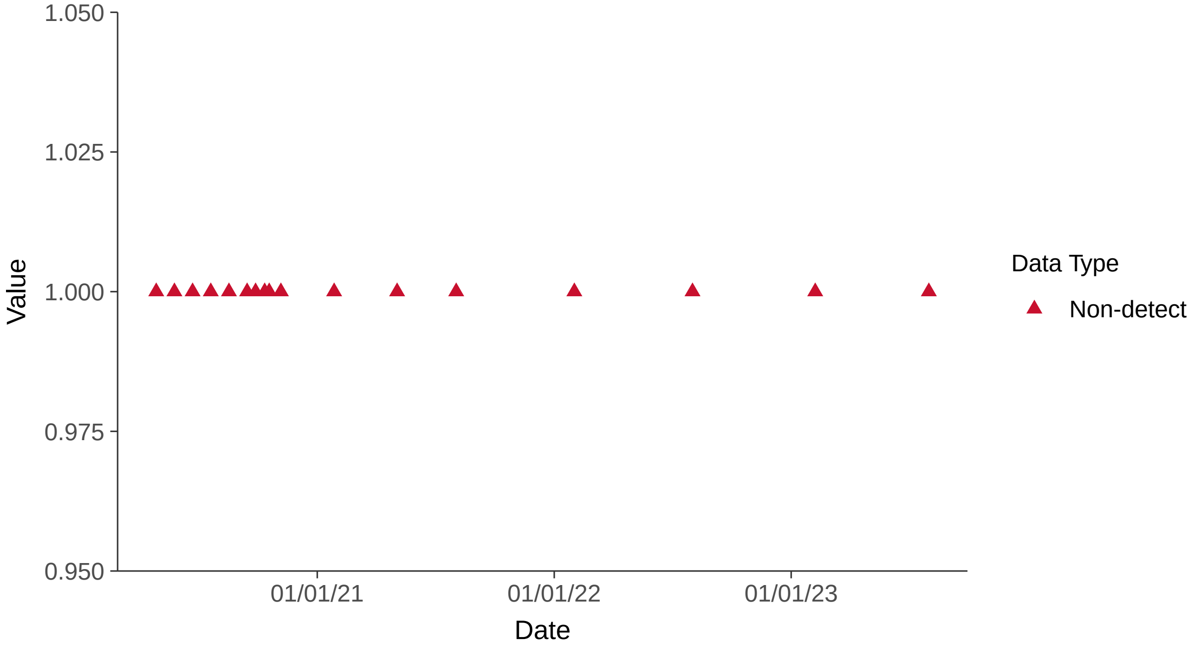


Appendix IV: Fluoride, MW-6

ID: 06_2_04

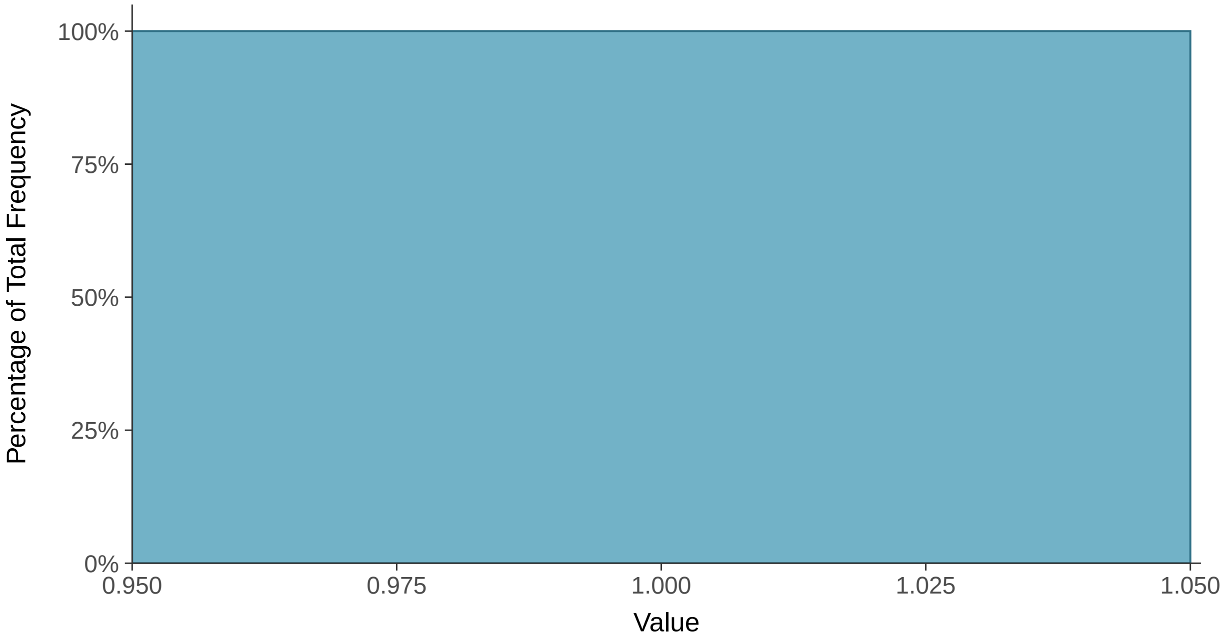
Scatter Plot

Fluoride, MW-6 (mg/L)



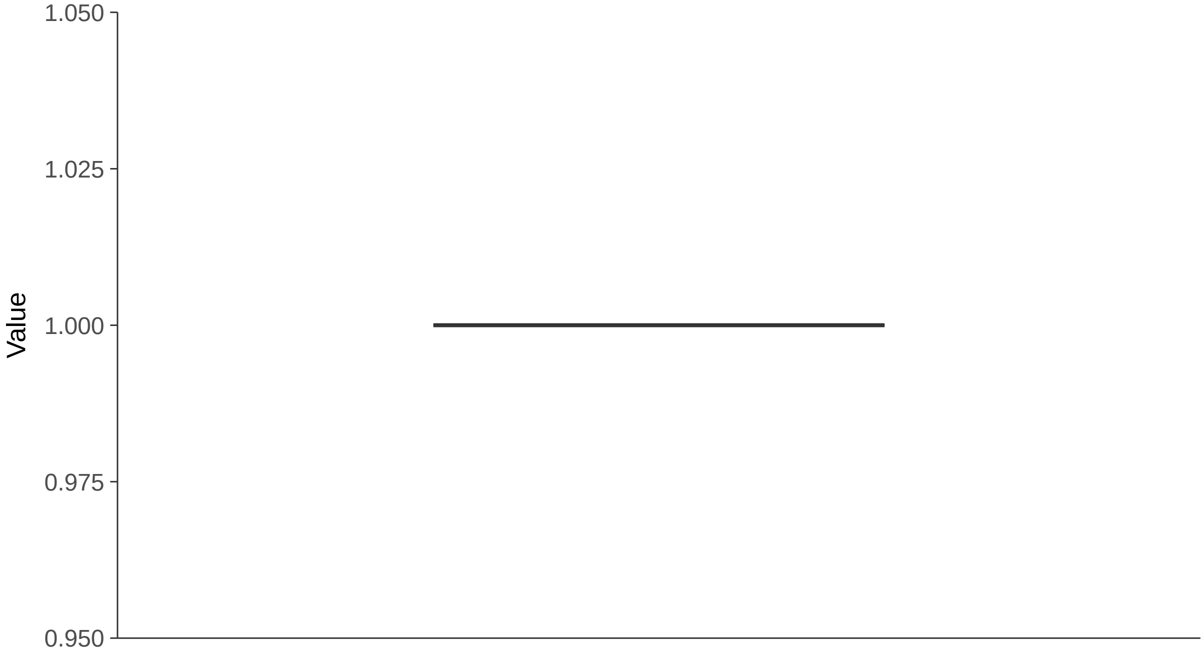
Histogram

Fluoride, MW-6 (mg/L)



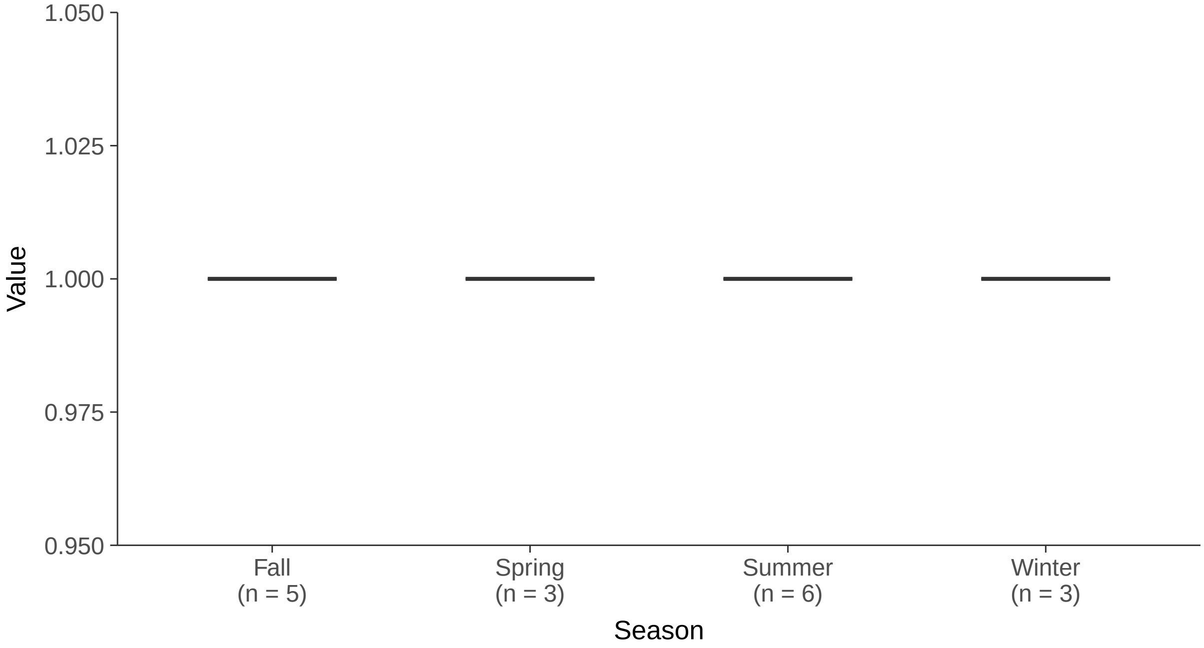
Boxplot

Fluoride, MW-6 (mg/L)



Boxplot by Season

Fluoride, MW-6 (mg/L)

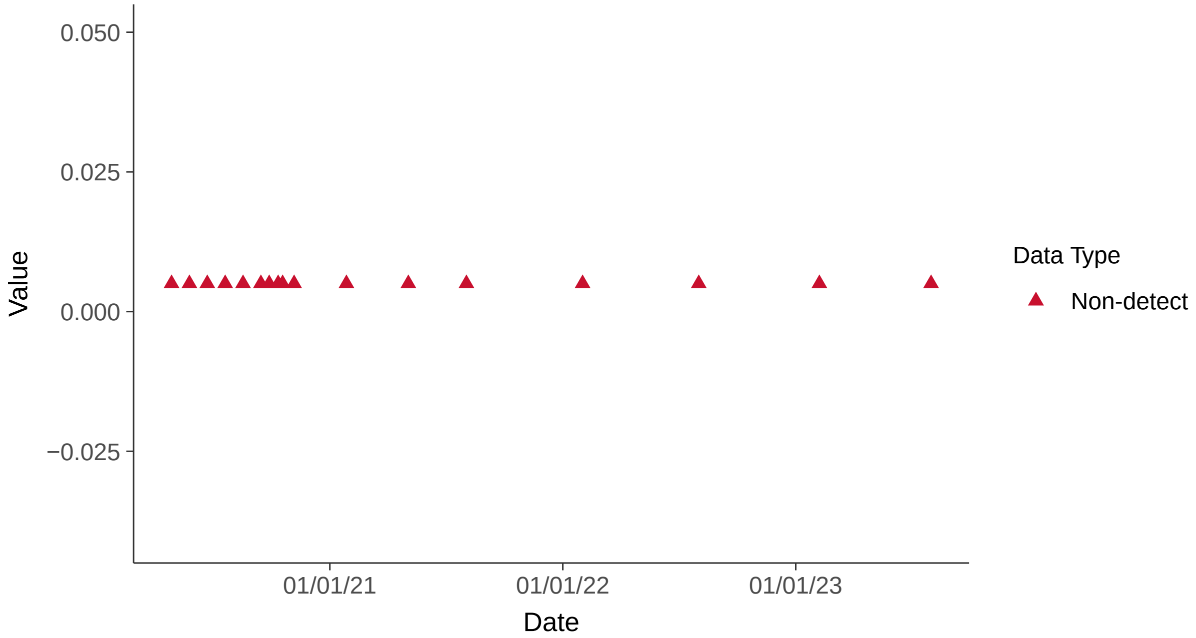


Appendix IV: Antimony, MW-6

ID: 06_2_08

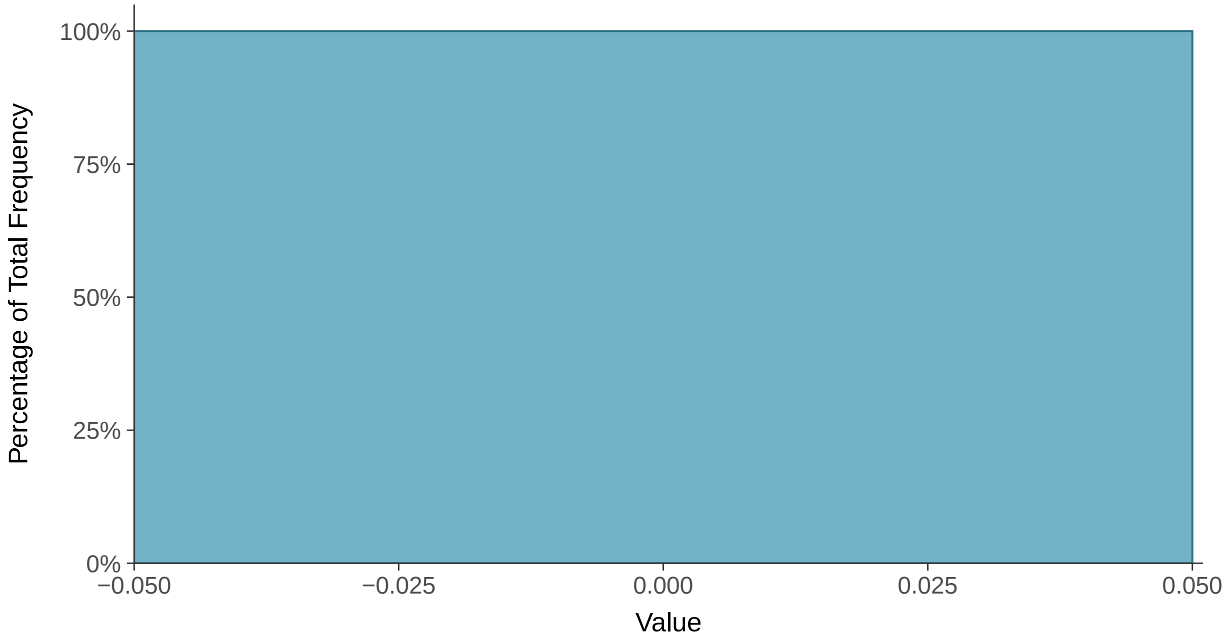
Scatter Plot

Antimony, MW-6 (mg/L)



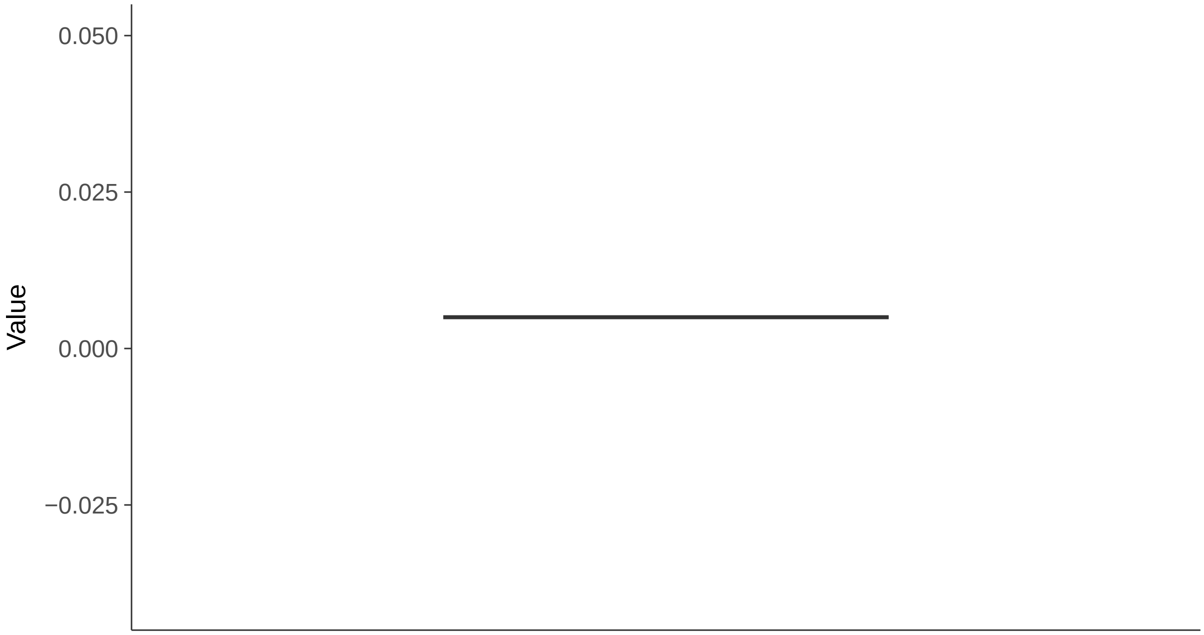
Histogram

Antimony, MW-6 (mg/L)



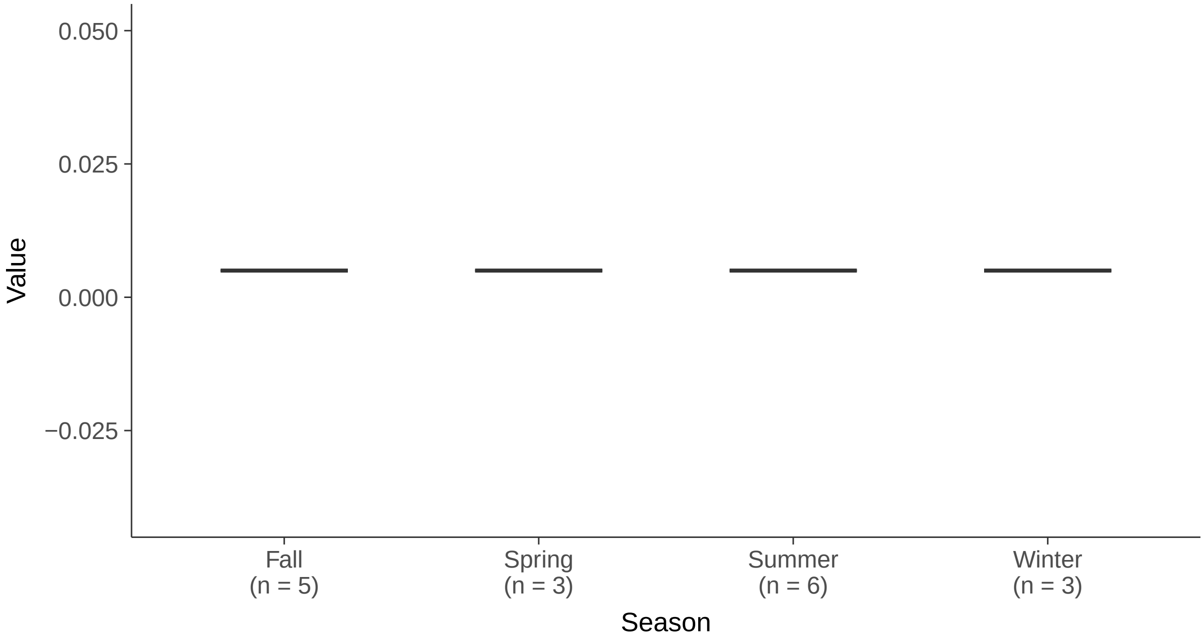
Boxplot

Antimony, MW-6 (mg/L)



Boxplot by Season

Antimony, MW-6 (mg/L)

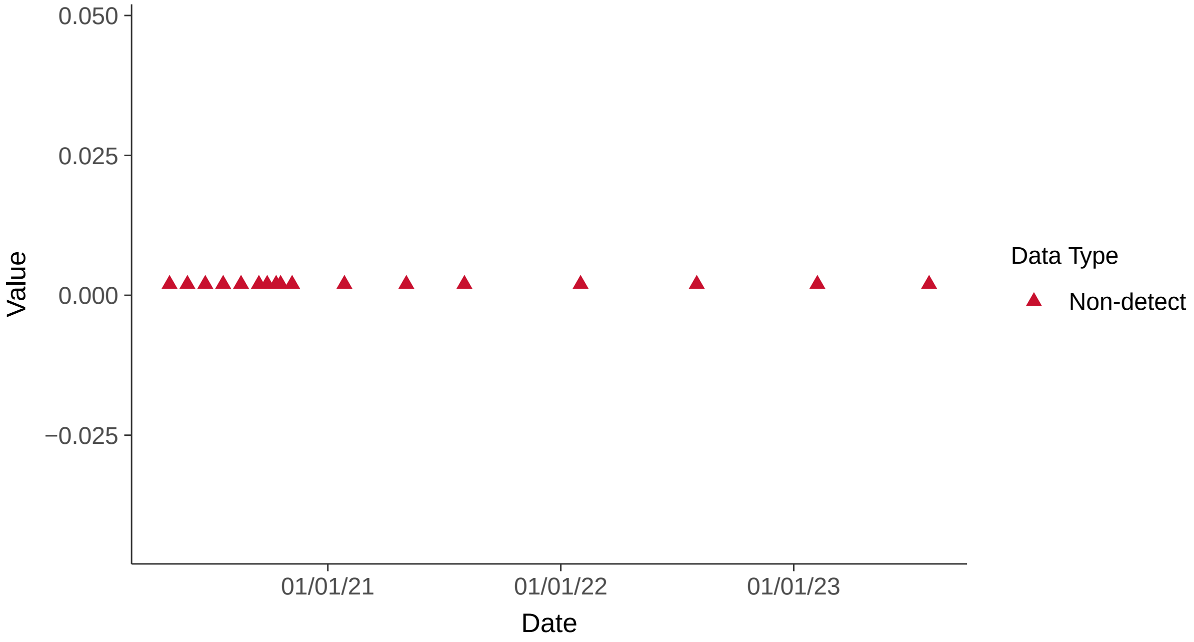


Appendix IV: Arsenic, MW-6

ID: 06_2_09

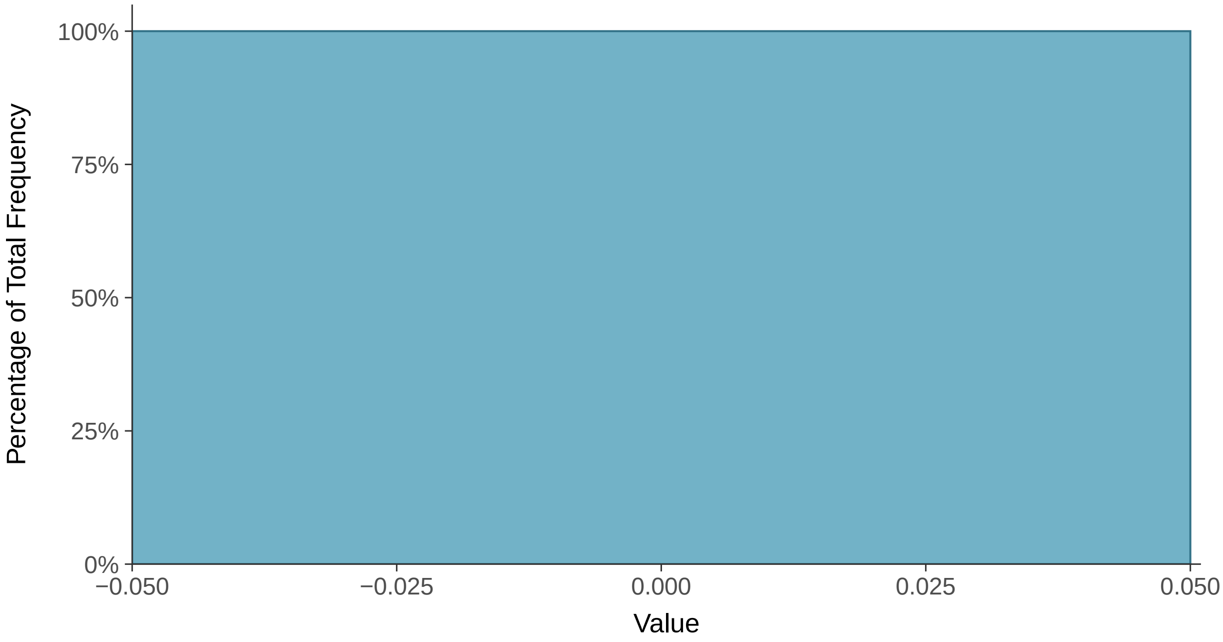
Scatter Plot

Arsenic, MW-6 (mg/L)



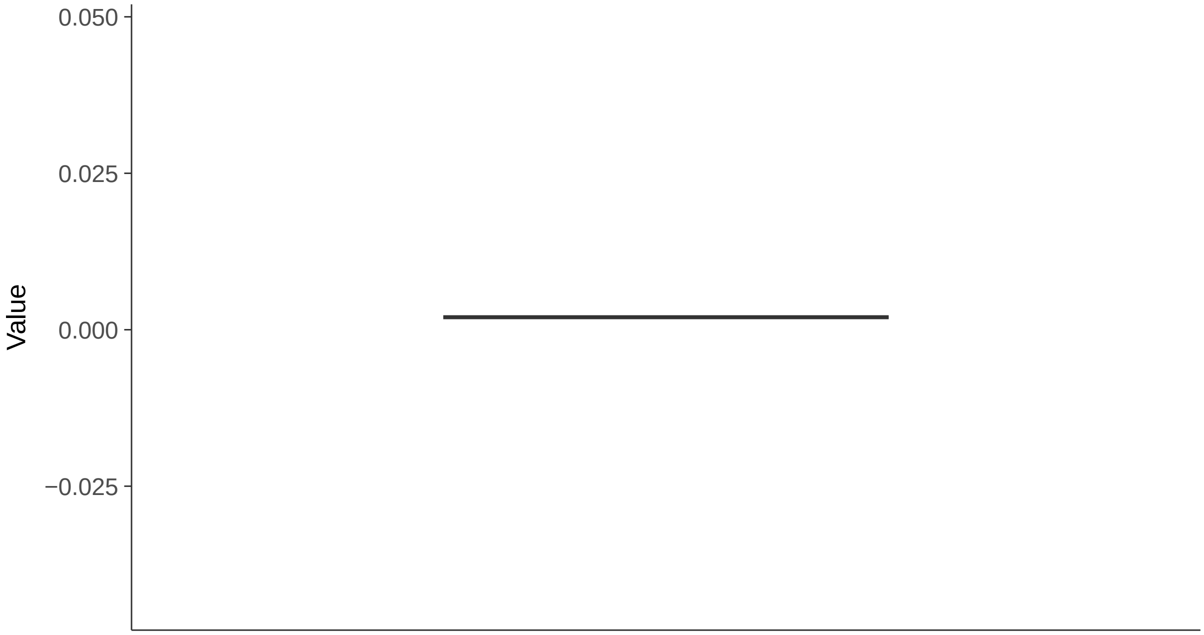
Histogram

Arsenic, MW-6 (mg/L)



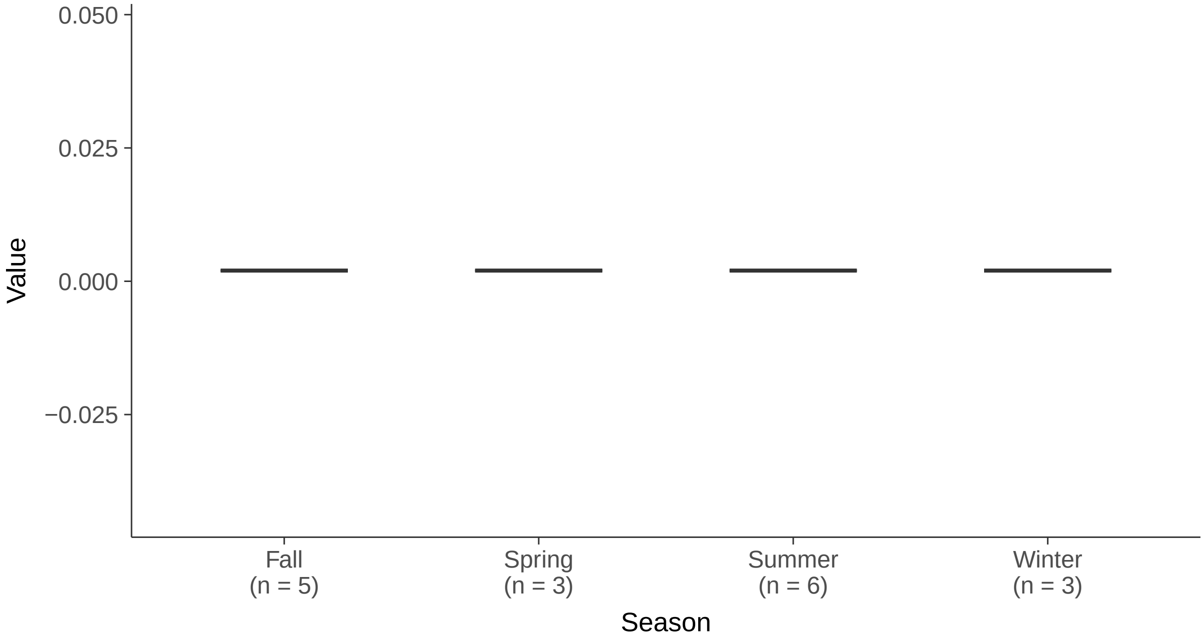
Boxplot

Arsenic, MW-6 (mg/L)



Boxplot by Season

Arsenic, MW-6 (mg/L)

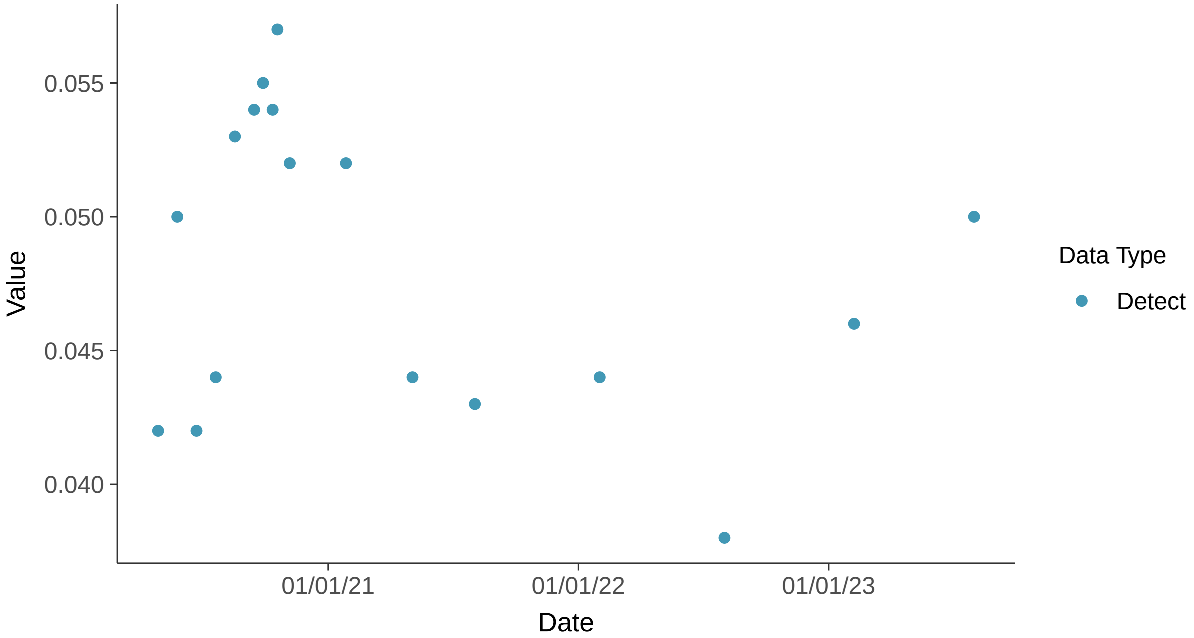


Appendix IV: Barium, MW-6

ID: 06_2_10

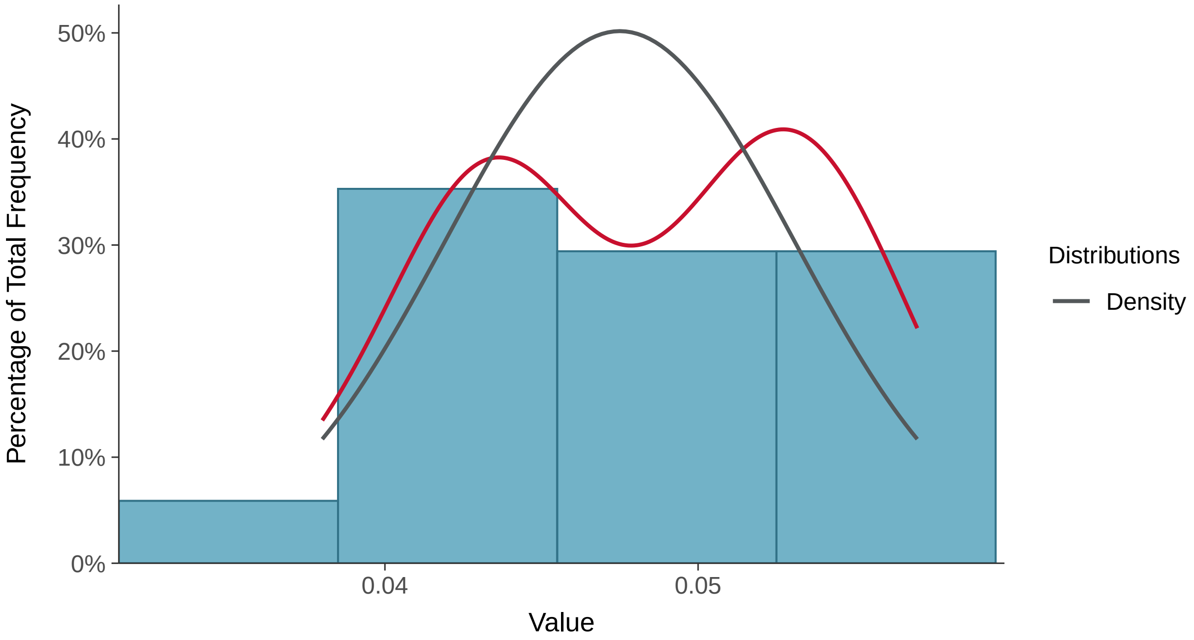
Scatter Plot

Barium, MW-6 (mg/L)



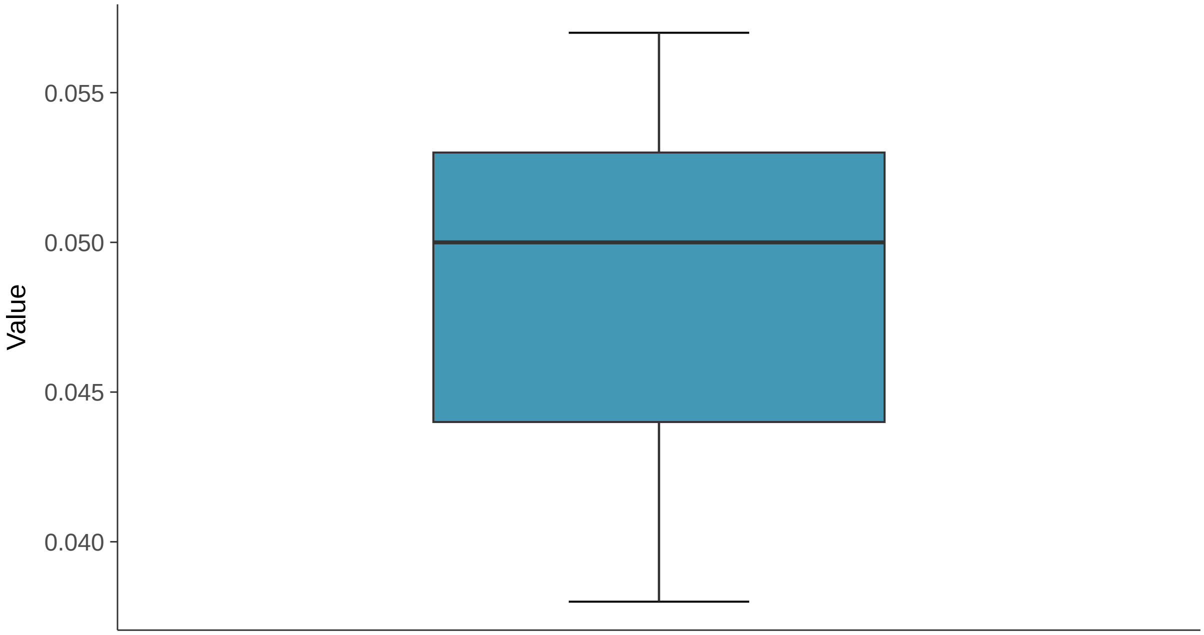
Histogram

Barium, MW-6 (mg/L)



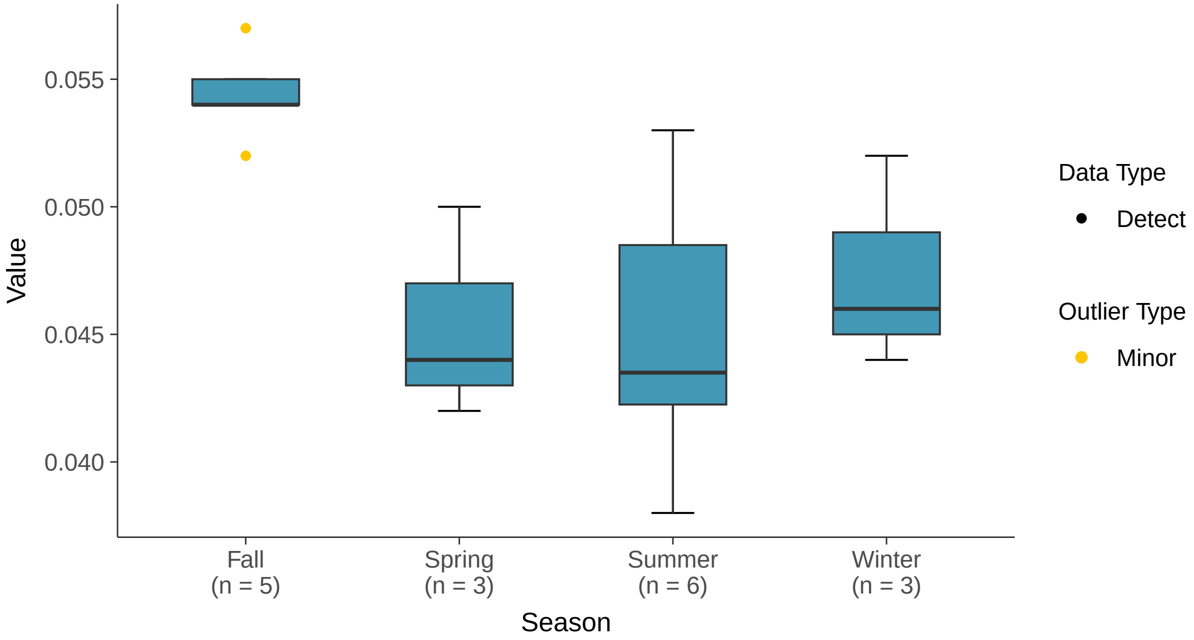
Boxplot

Barium, MW-6 (mg/L)



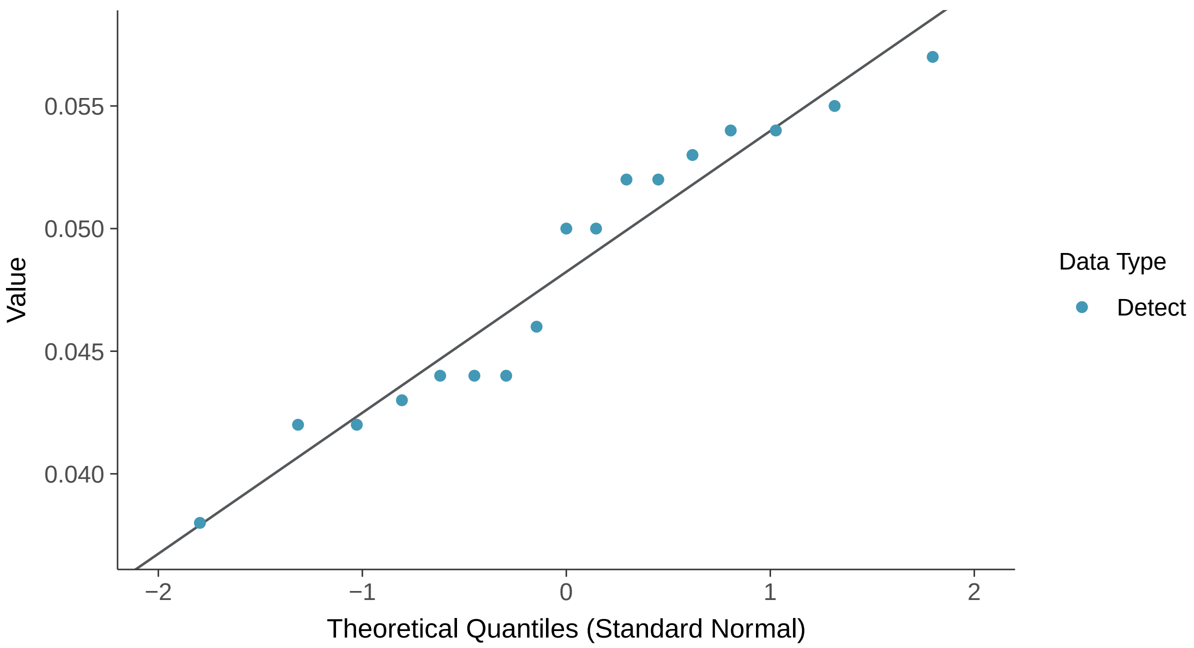
Boxplot by Season

Barium, MW-6 (mg/L)



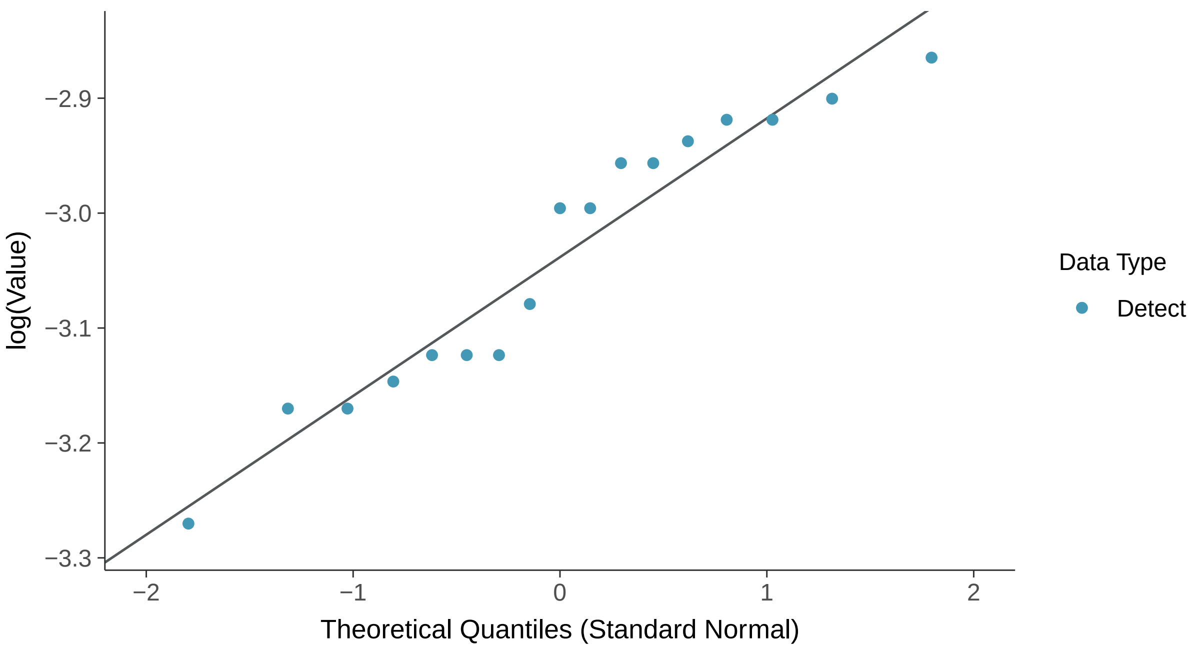
Normal Q-Q plot

Barium, MW-6 (mg/L)



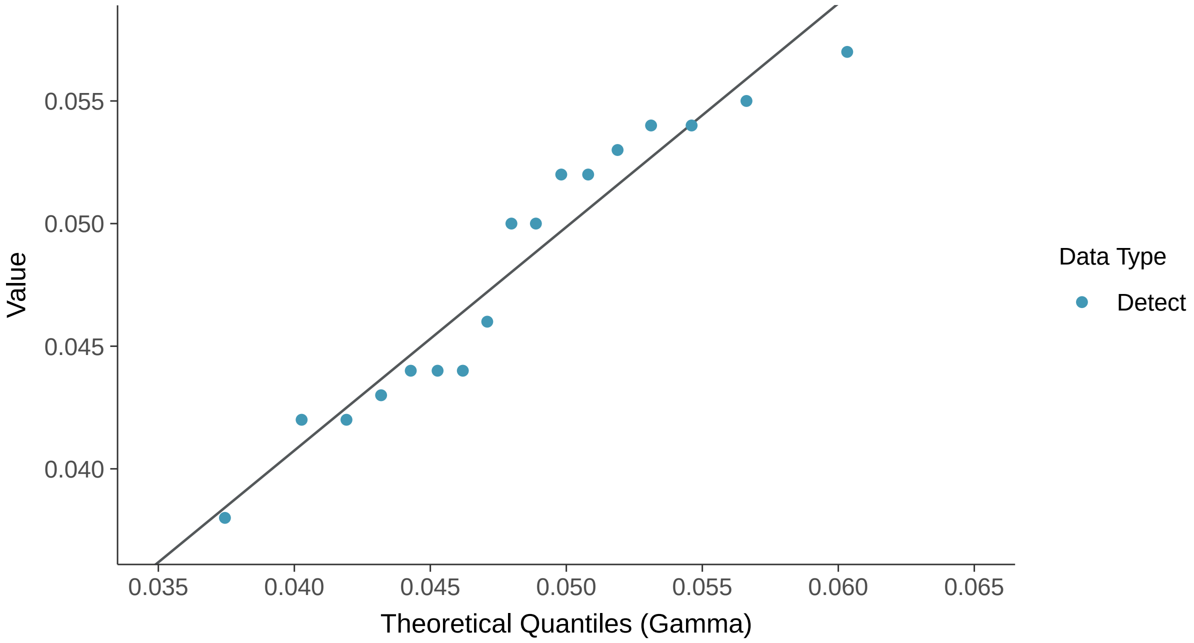
Lognormal Q-Q plot

Barium, MW-6 (mg/L)



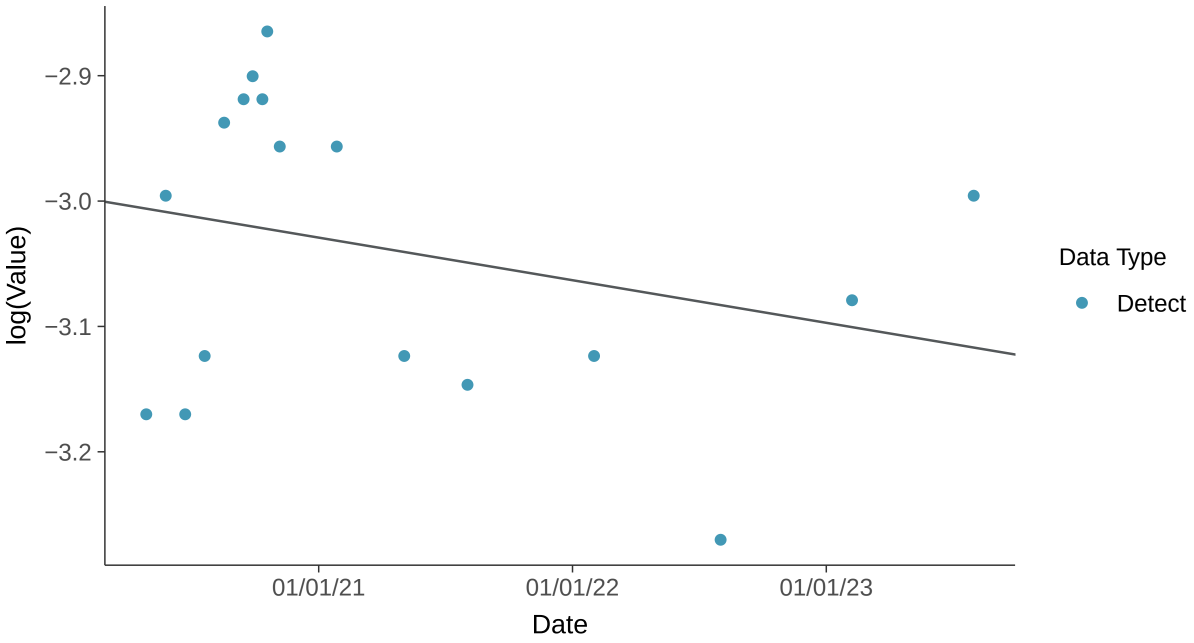
Gamma Q-Q plot

Barium, MW-6 (mg/L)



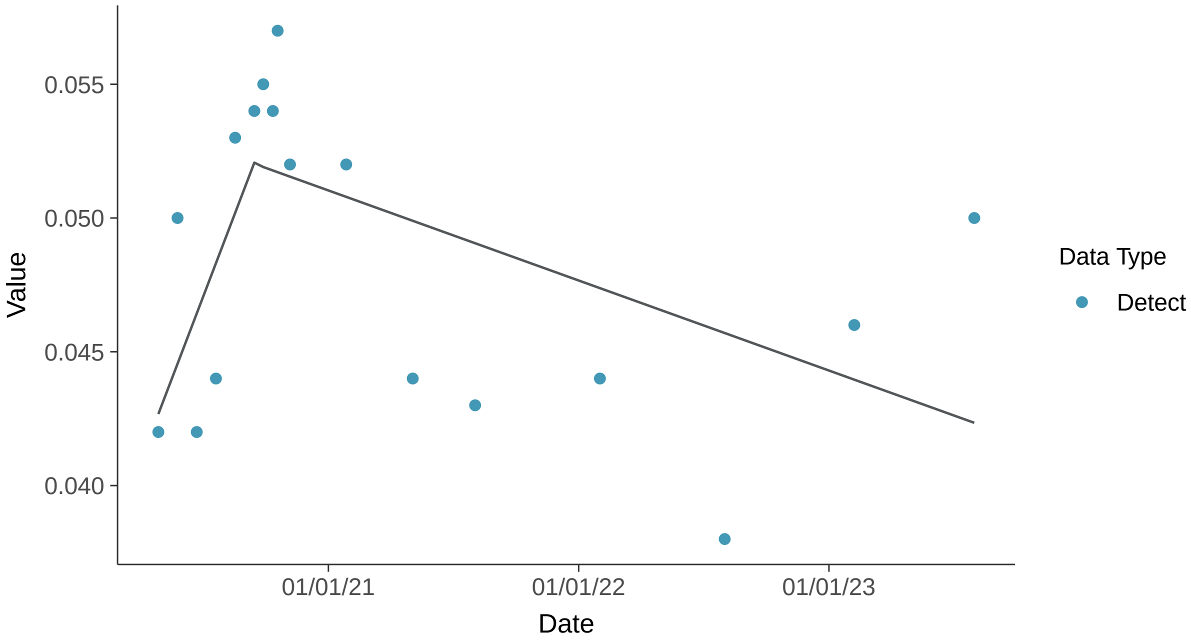
Trend Regression: Lognormal MLE

Barium, MW-6 (mg/L)



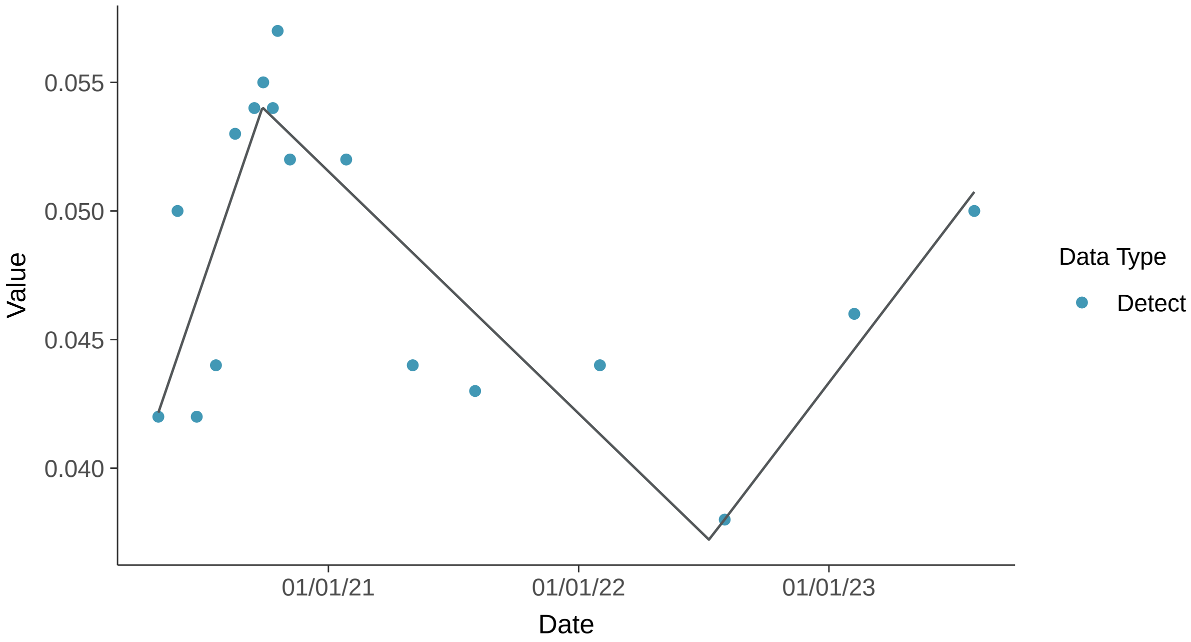
Trend Regression: Piecewise Linear-Linear

Barium, MW-6 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Barium, MW-6 (mg/L)

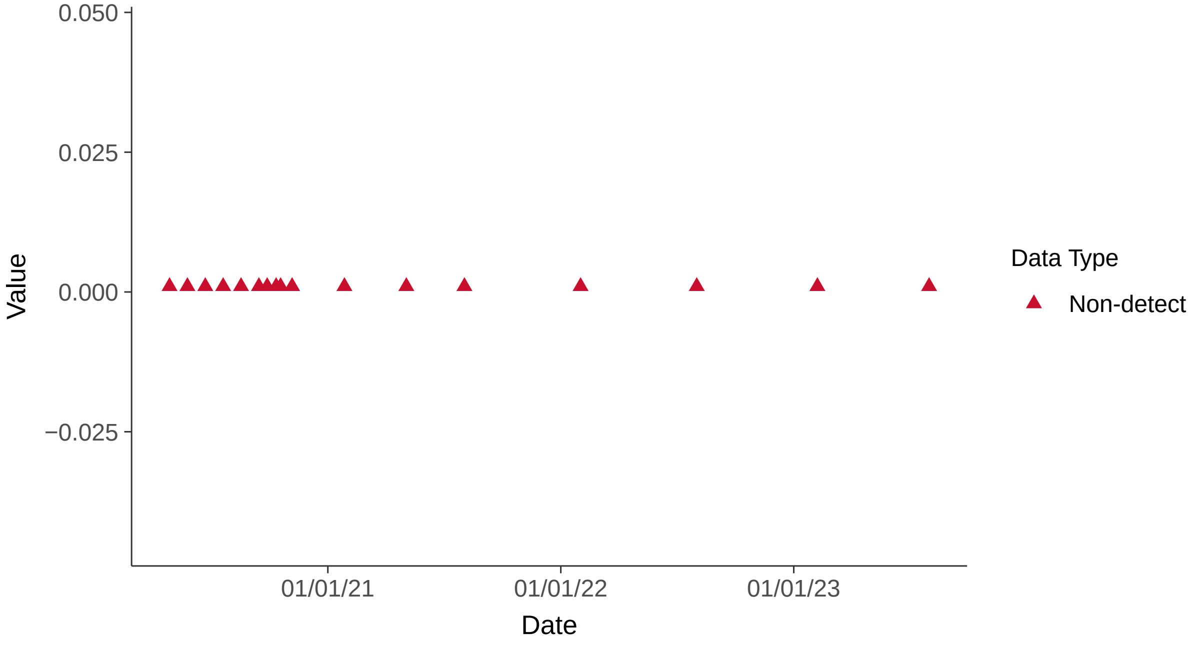


Appendix IV: Beryllium, MW-6

ID: 06_2_11

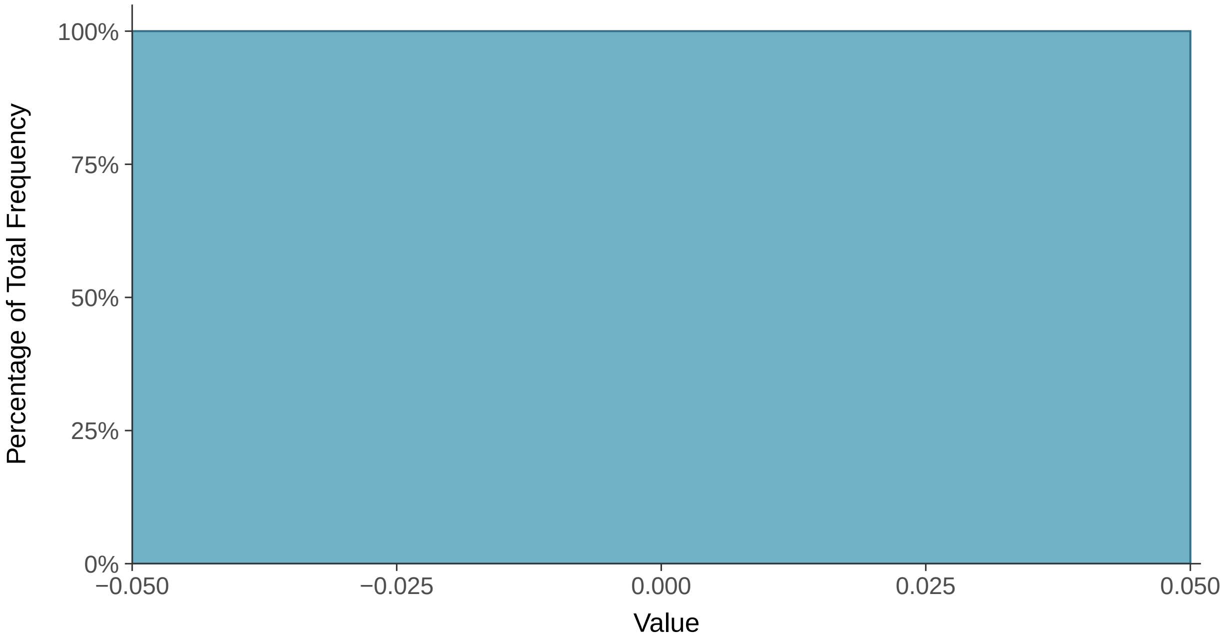
Scatter Plot

Beryllium, MW-6 (mg/L)



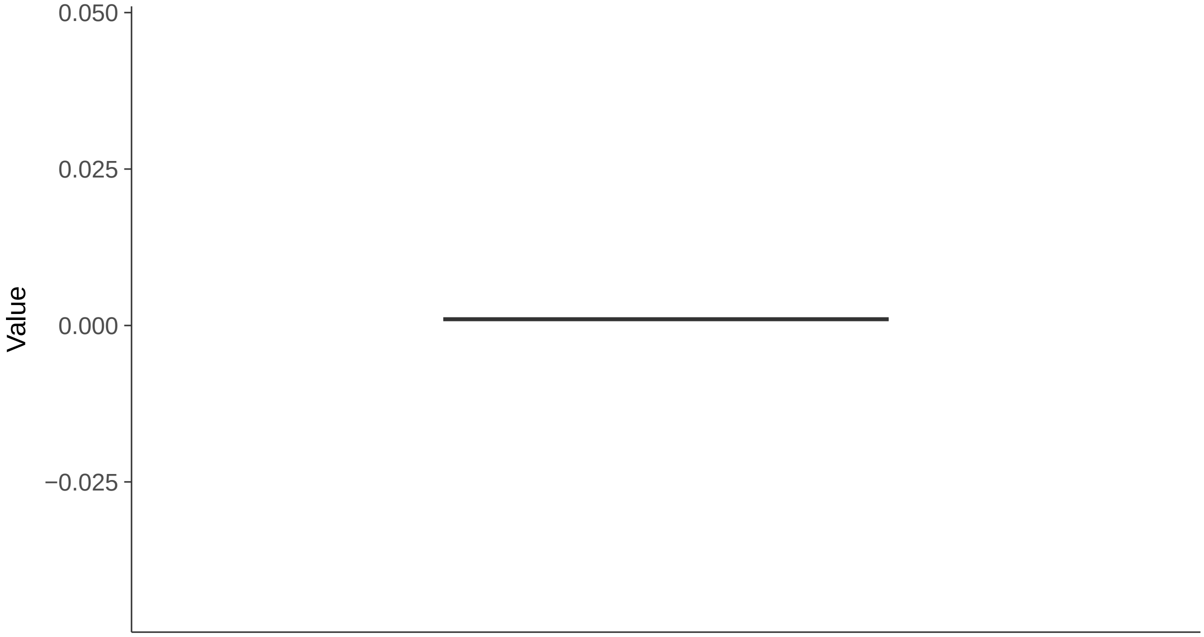
Histogram

Beryllium, MW-6 (mg/L)



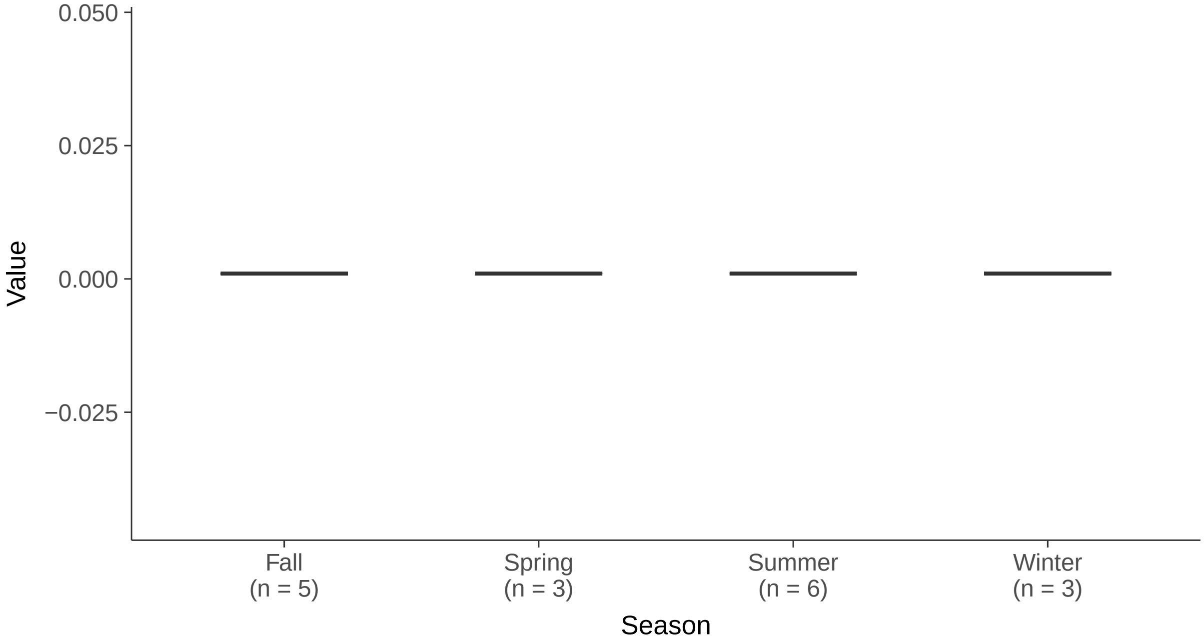
Boxplot

Beryllium, MW-6 (mg/L)



Boxplot by Season

Beryllium, MW-6 (mg/L)

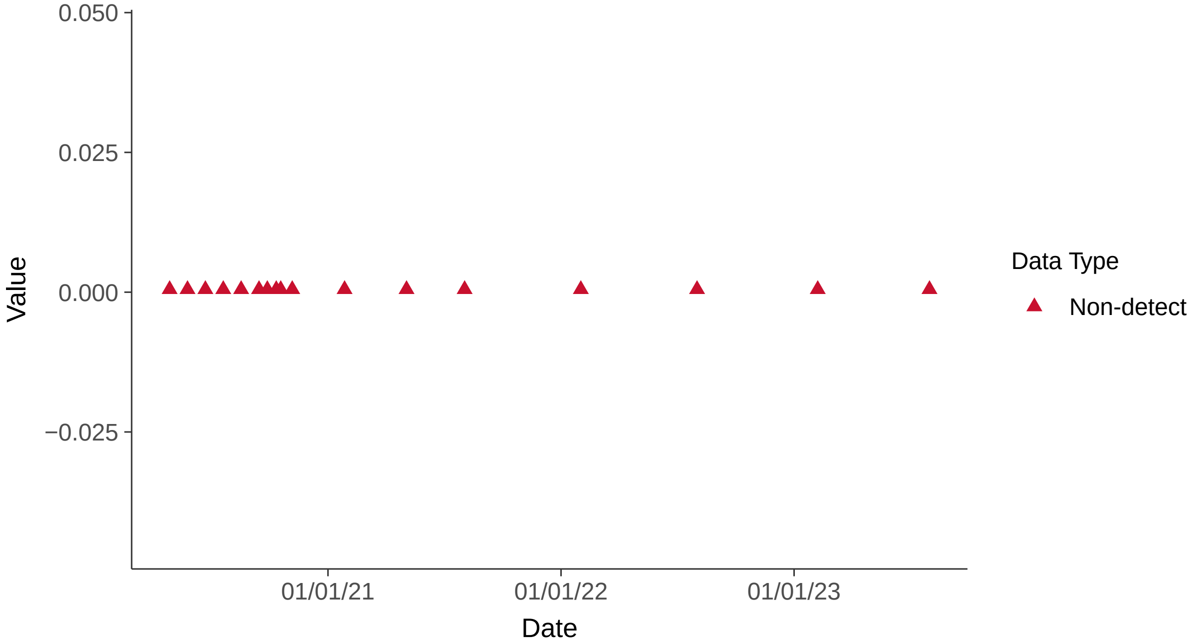


Appendix IV: Cadmium, MW-6

ID: 06_2_12

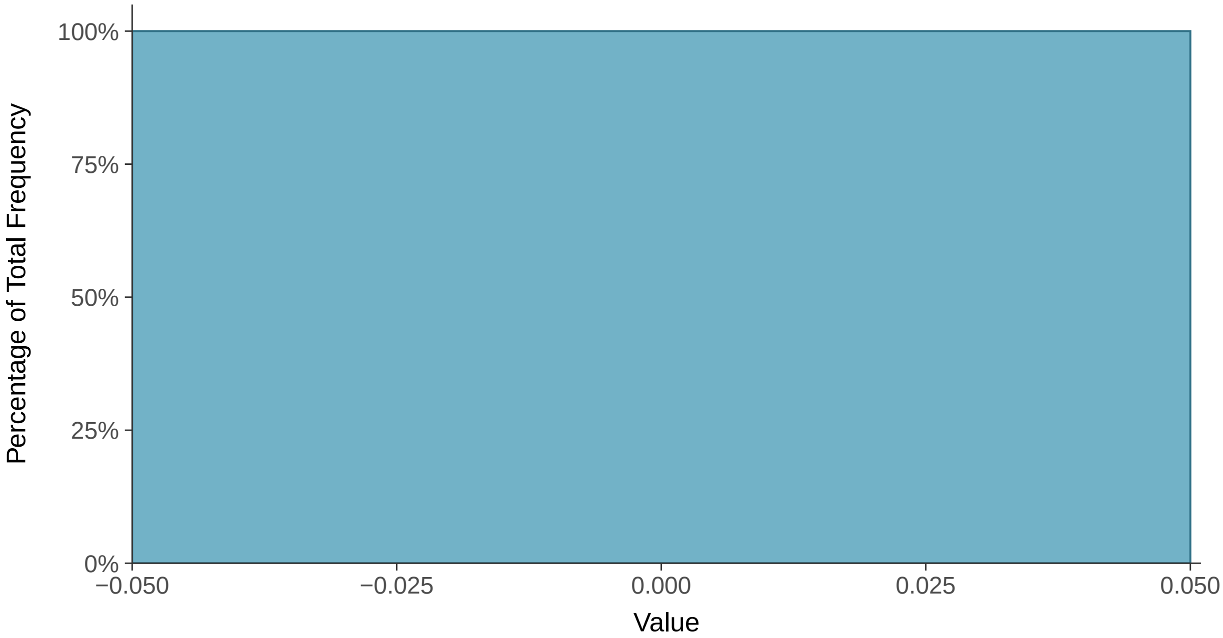
Scatter Plot

Cadmium, MW-6 (mg/L)



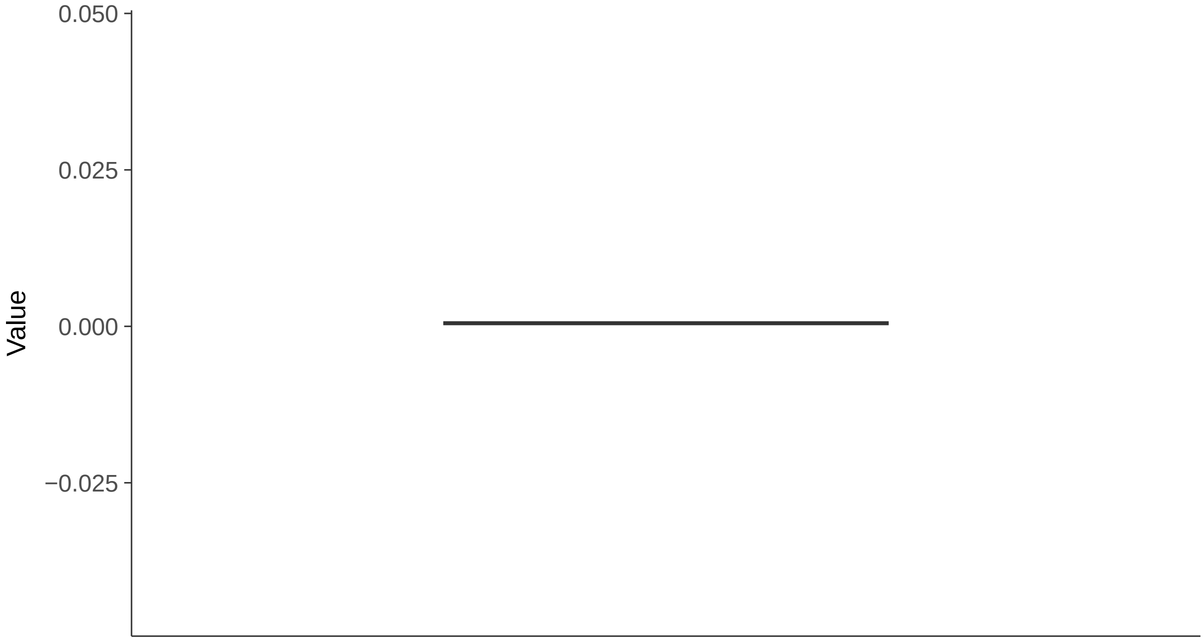
Histogram

Cadmium, MW-6 (mg/L)



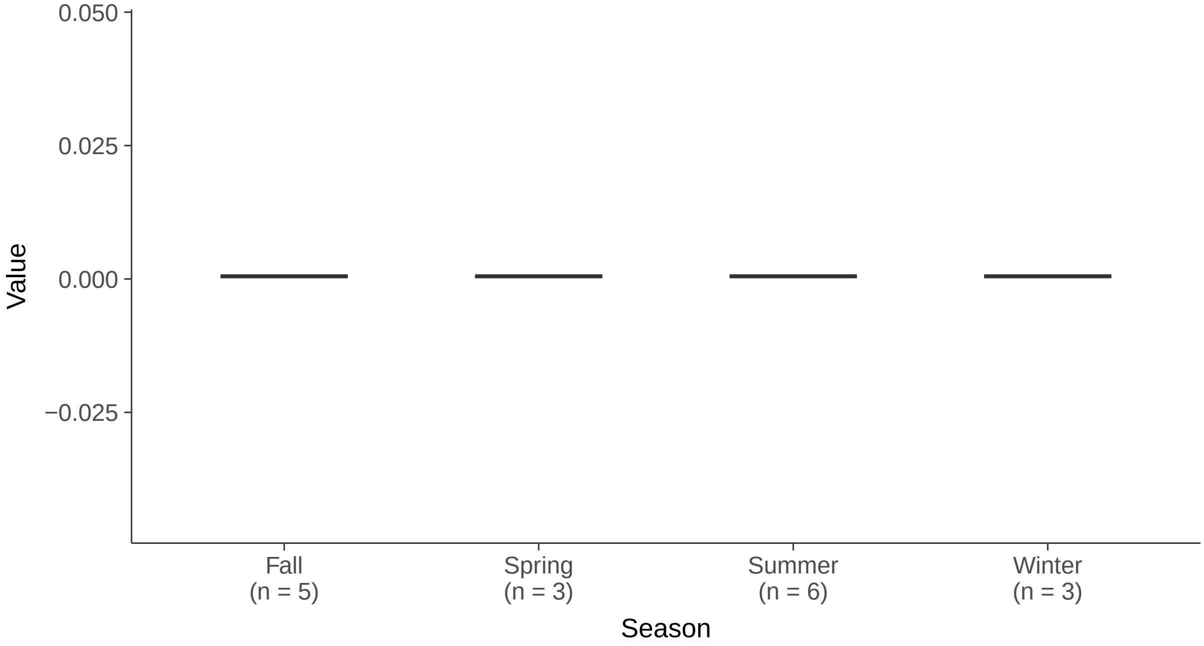
Boxplot

Cadmium, MW-6 (mg/L)



Boxplot by Season

Cadmium, MW-6 (mg/L)

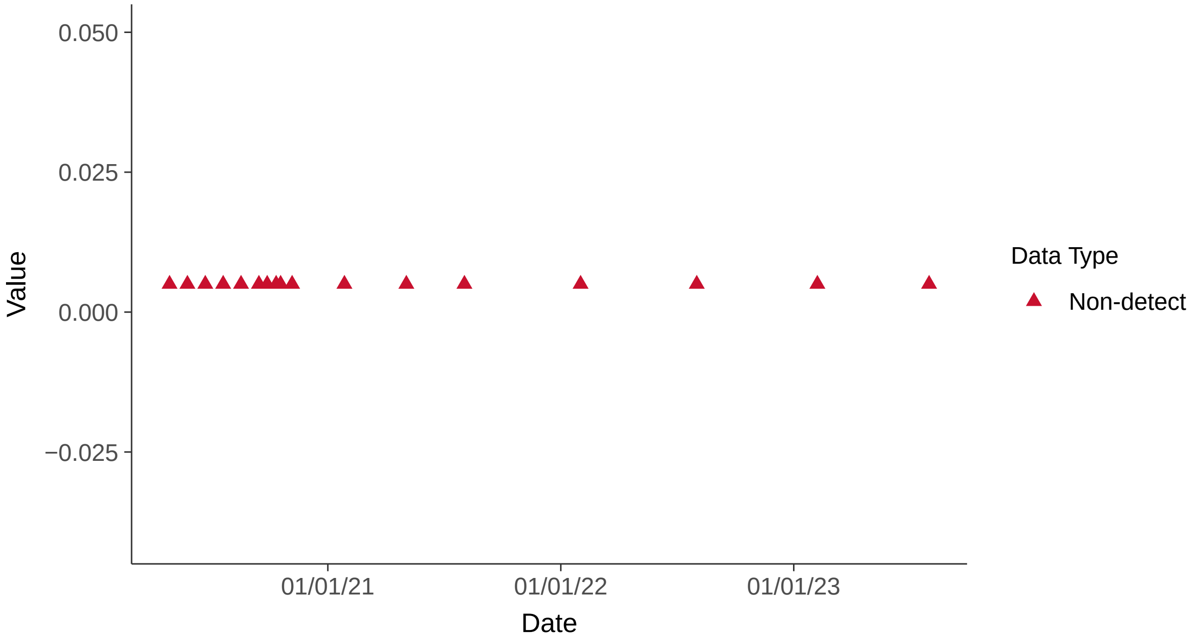


Appendix IV: Chromium, MW-6

ID: 06_2_13

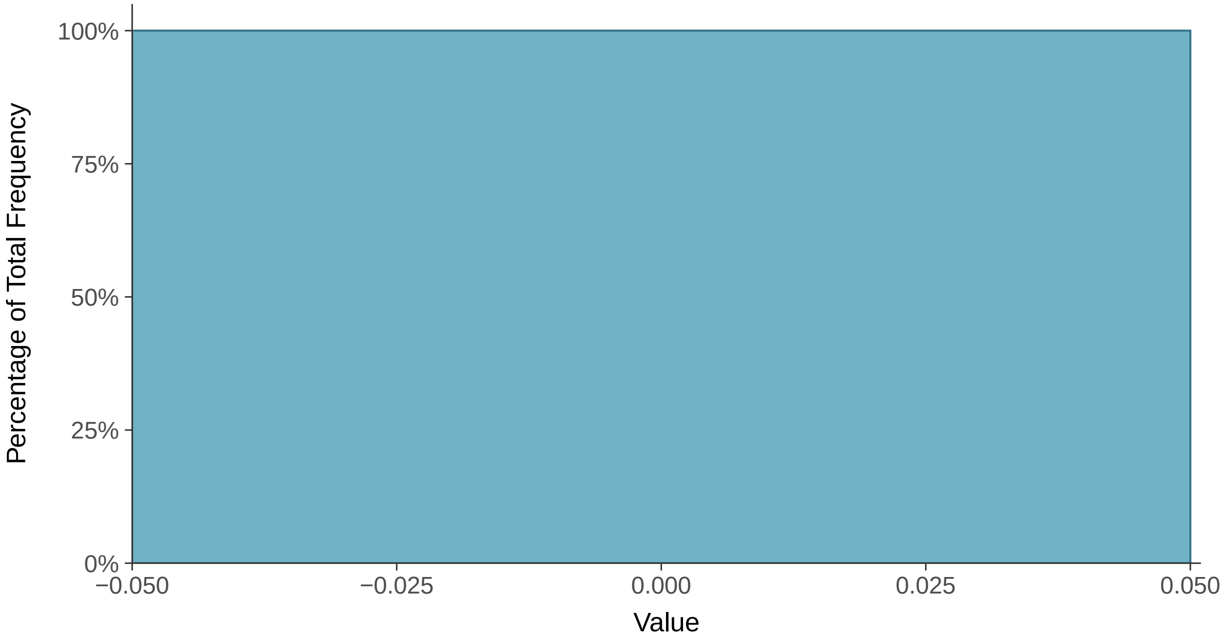
Scatter Plot

Chromium, MW-6 (mg/L)



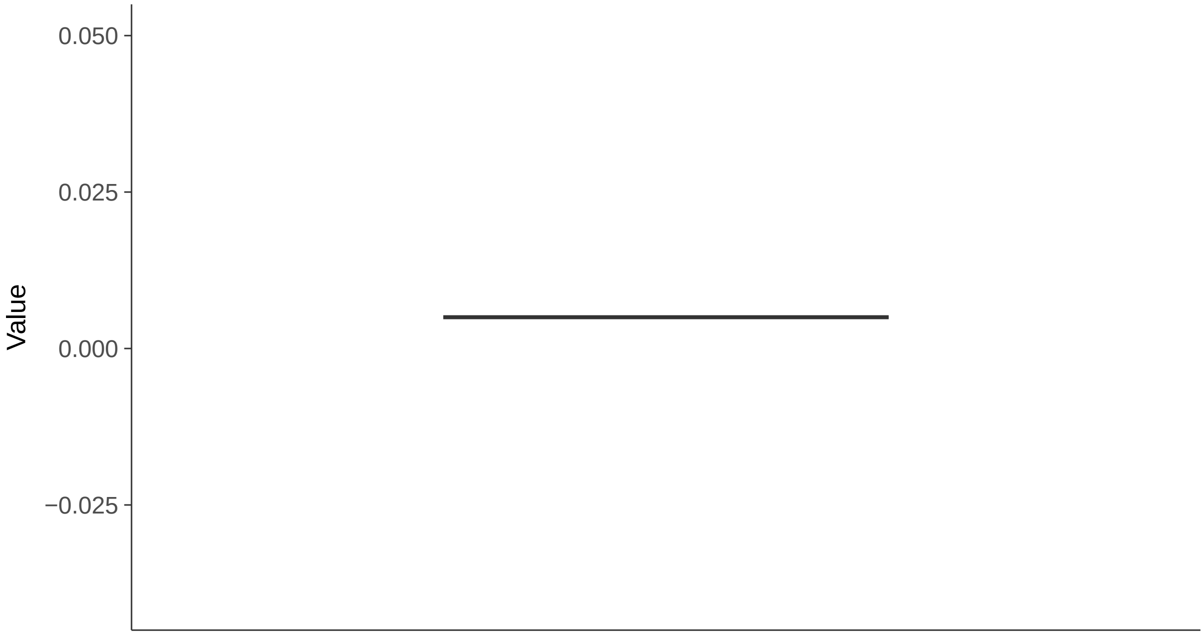
Histogram

Chromium, MW-6 (mg/L)



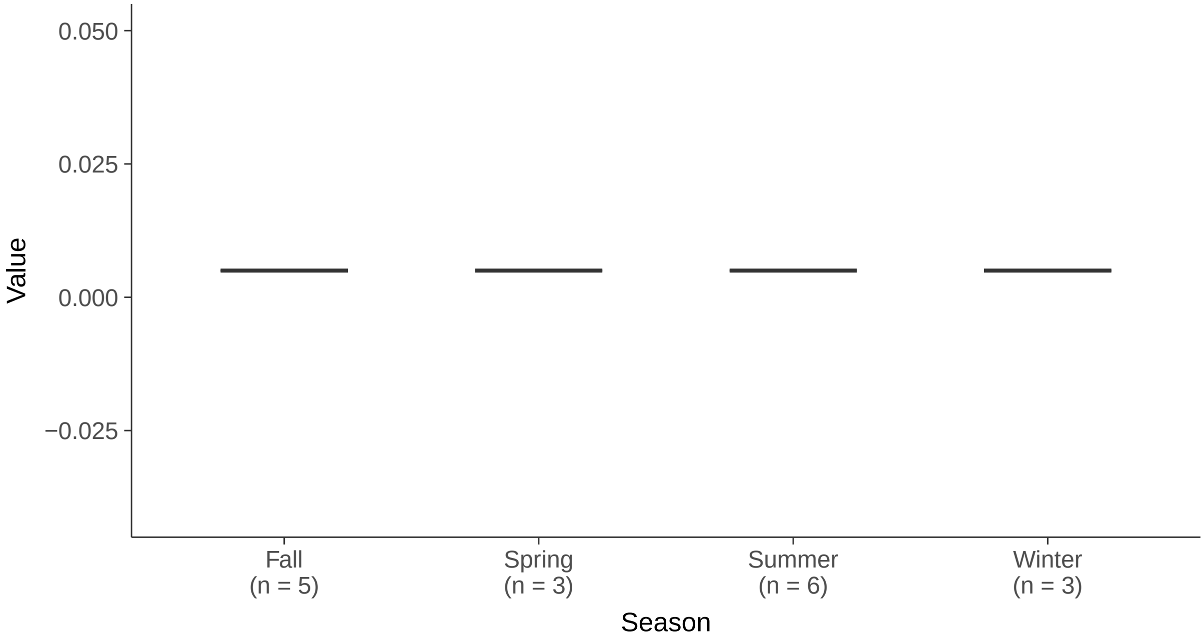
Boxplot

Chromium, MW-6 (mg/L)



Boxplot by Season

Chromium, MW-6 (mg/L)

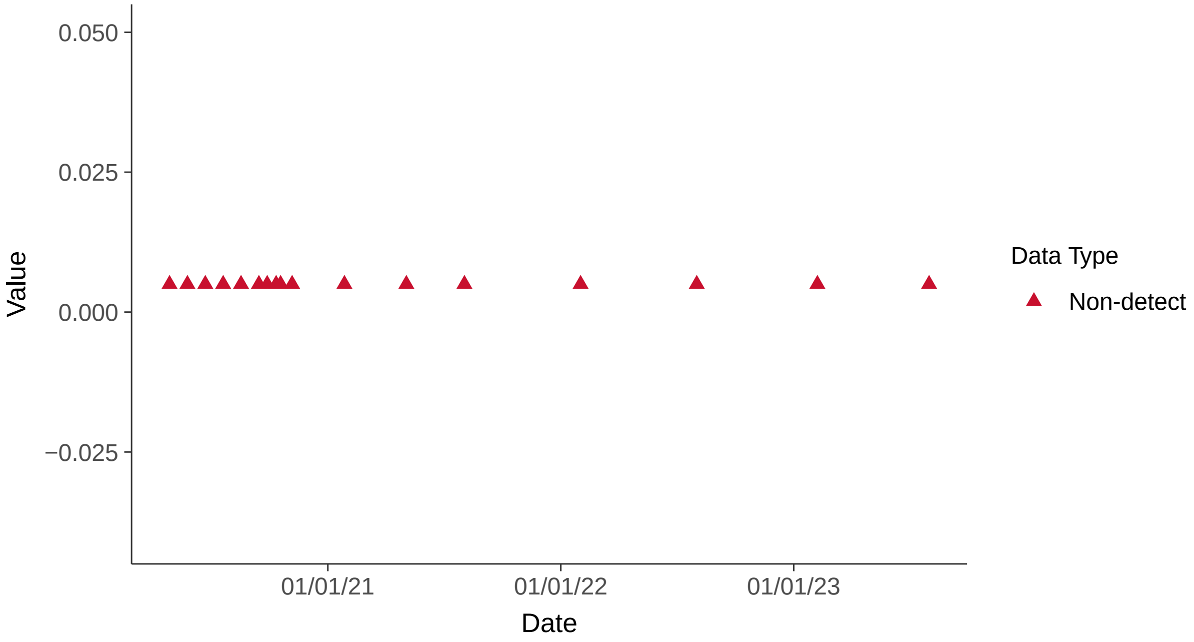


Appendix IV: Cobalt, MW-6

ID: 06_2_14

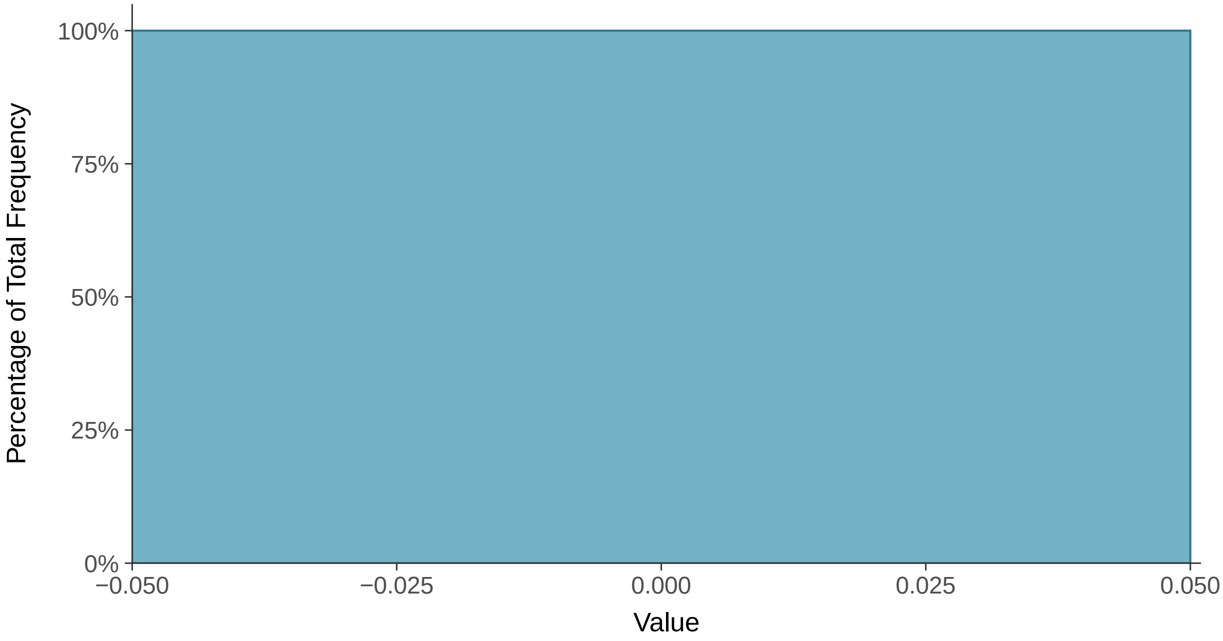
Scatter Plot

Cobalt, MW-6 (mg/L)



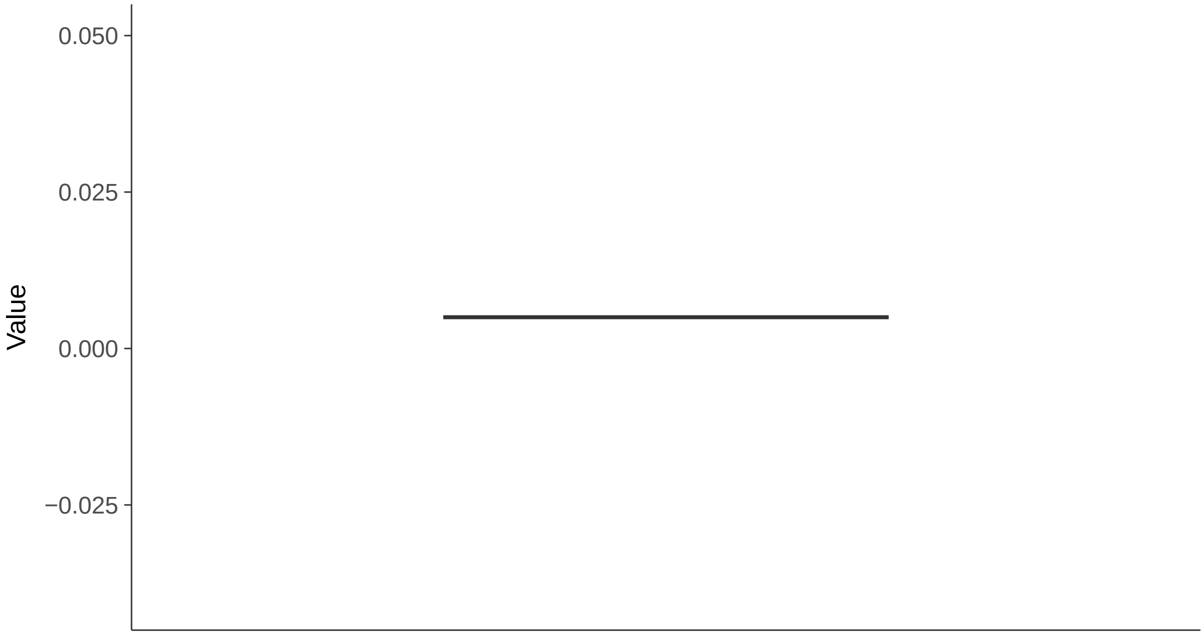
Histogram

Cobalt, MW-6 (mg/L)



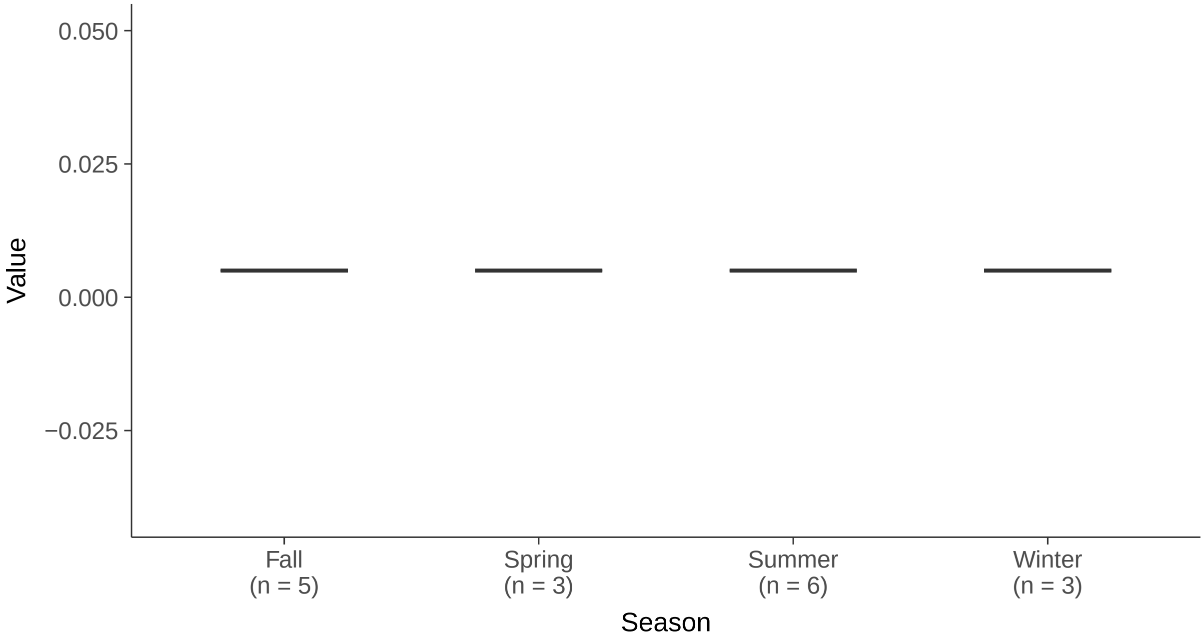
Boxplot

Cobalt, MW-6 (mg/L)



Boxplot by Season

Cobalt, MW-6 (mg/L)

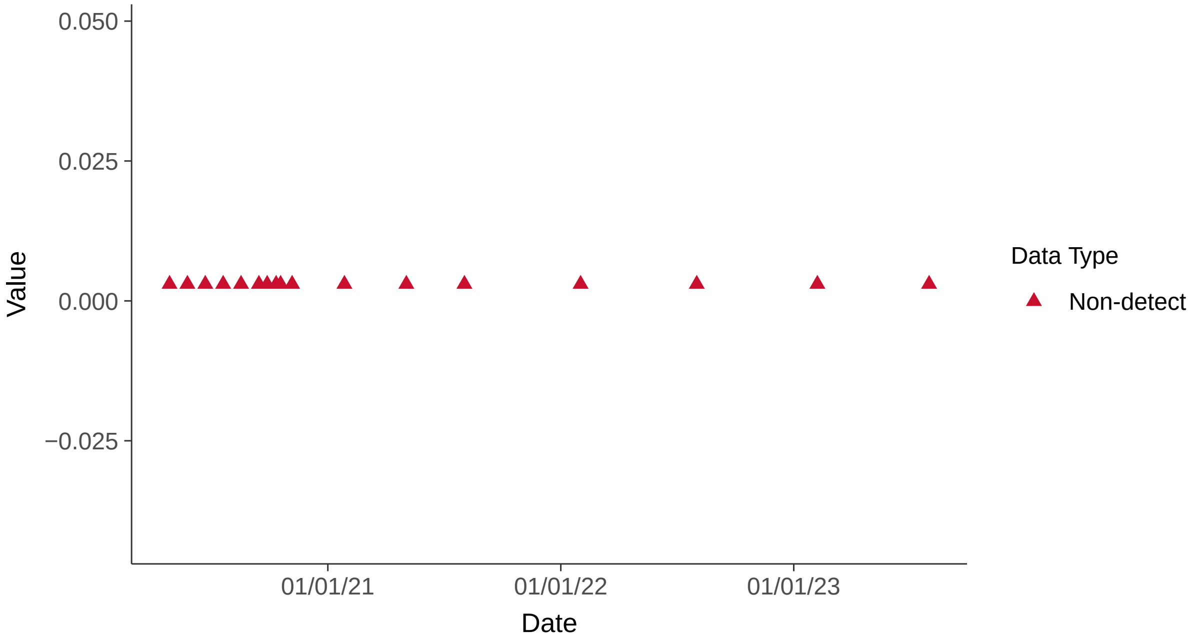


Appendix IV: Lead, MW-6

ID: 06_2_15

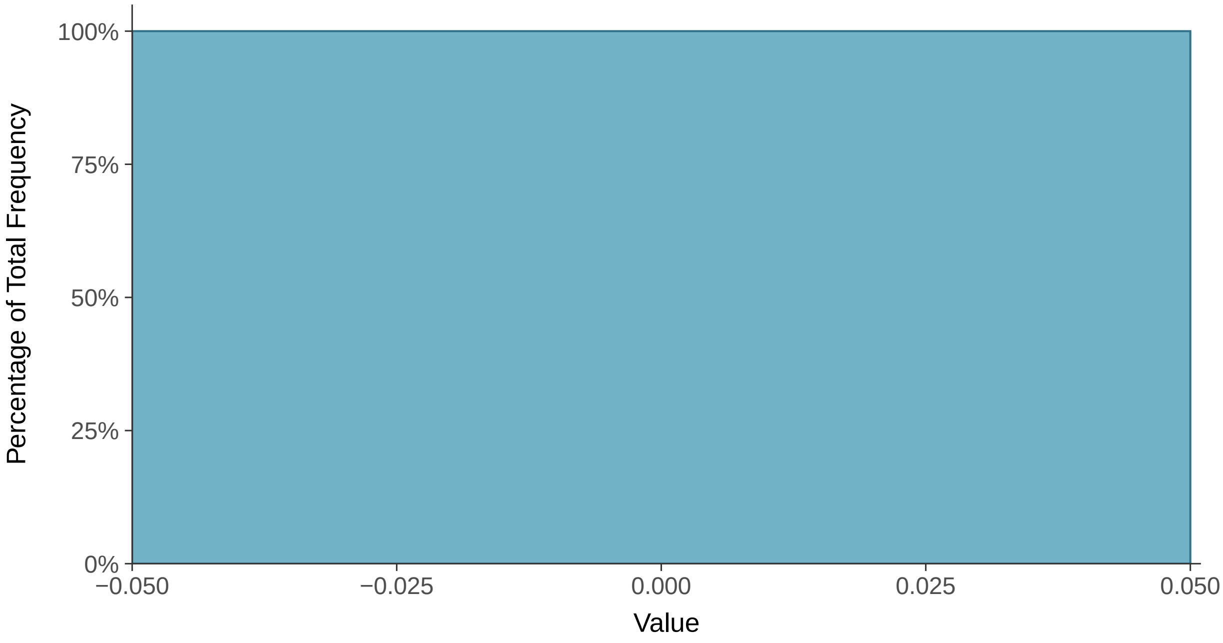
Scatter Plot

Lead, MW-6 (mg/L)



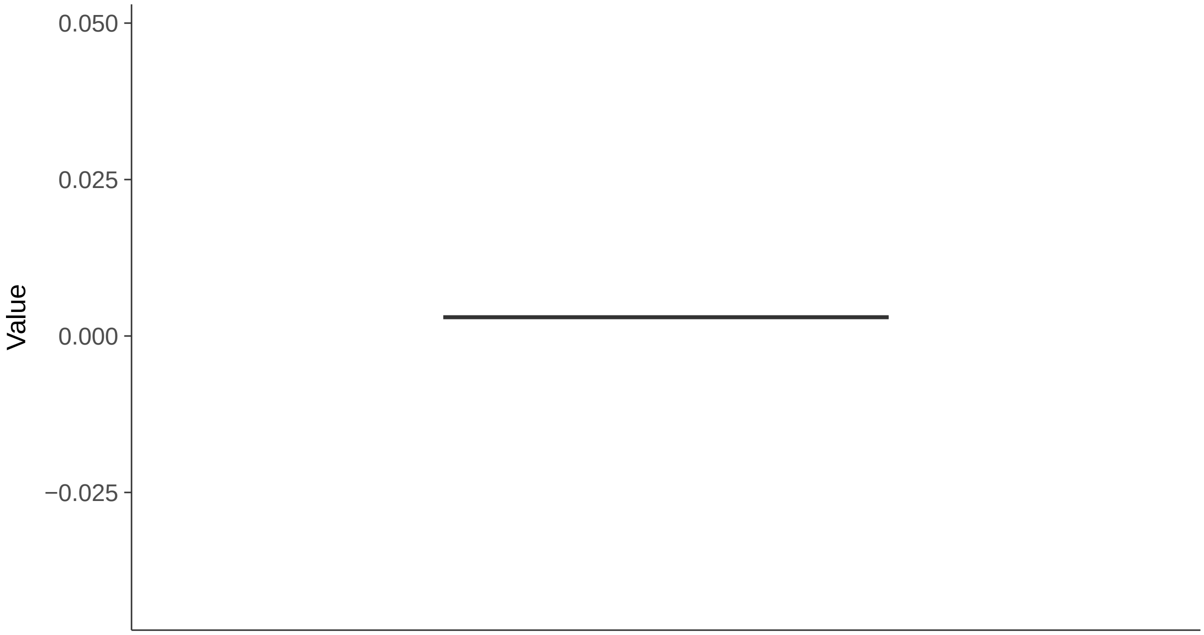
Histogram

Lead, MW-6 (mg/L)



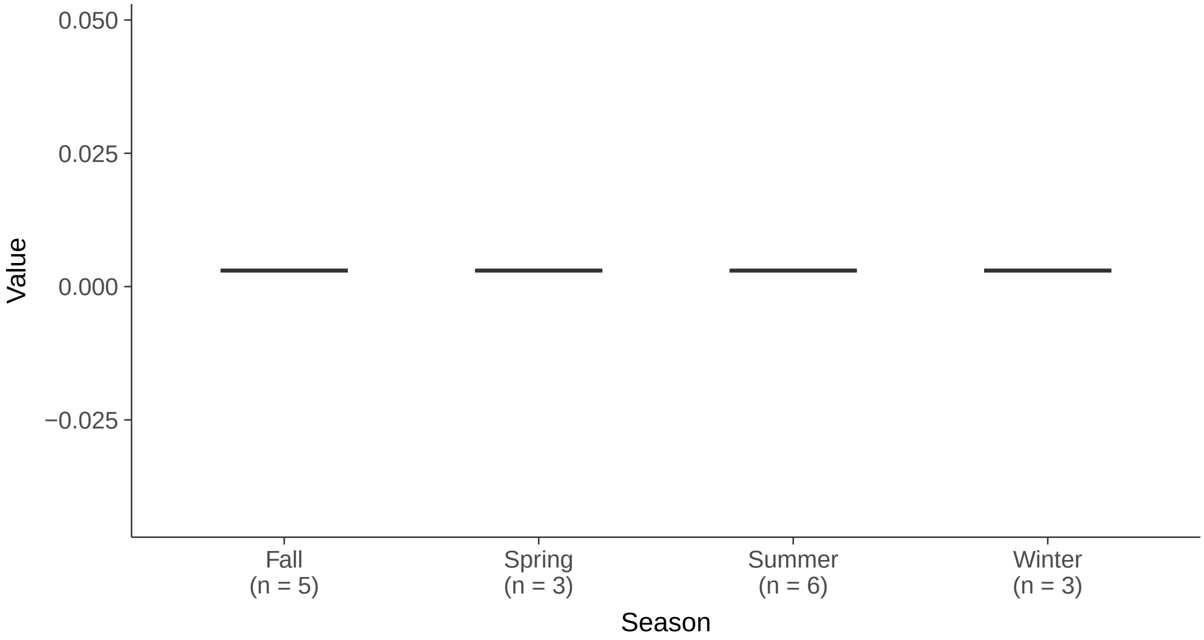
Boxplot

Lead, MW-6 (mg/L)



Boxplot by Season

Lead, MW-6 (mg/L)

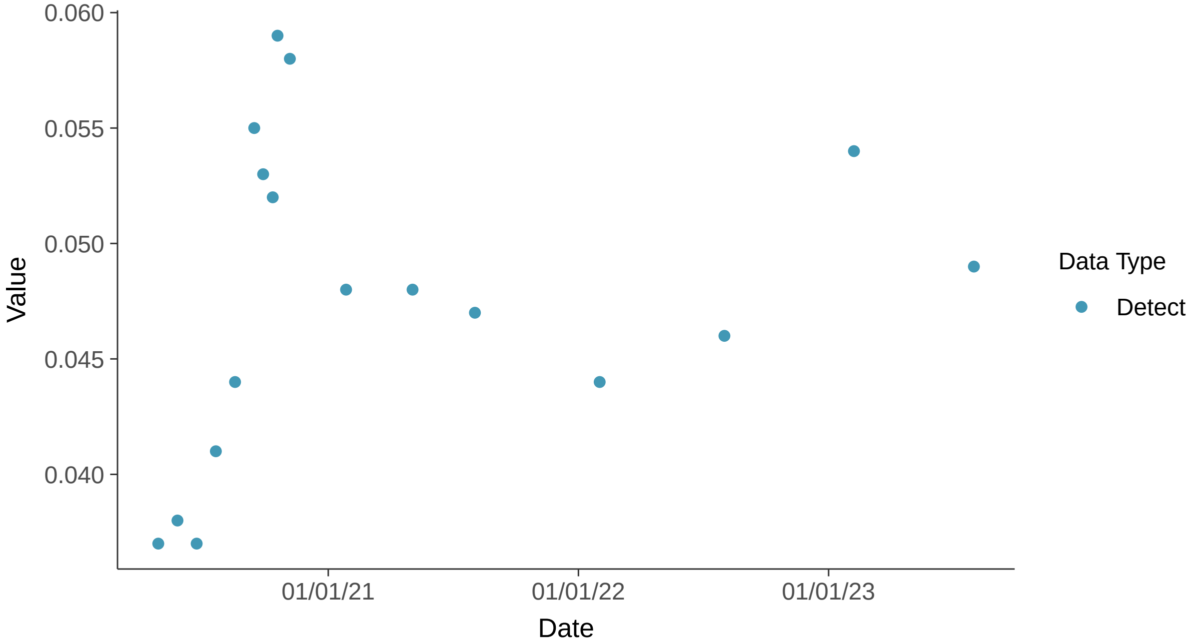


Appendix IV: Lithium, MW-6

ID: 06_2_16

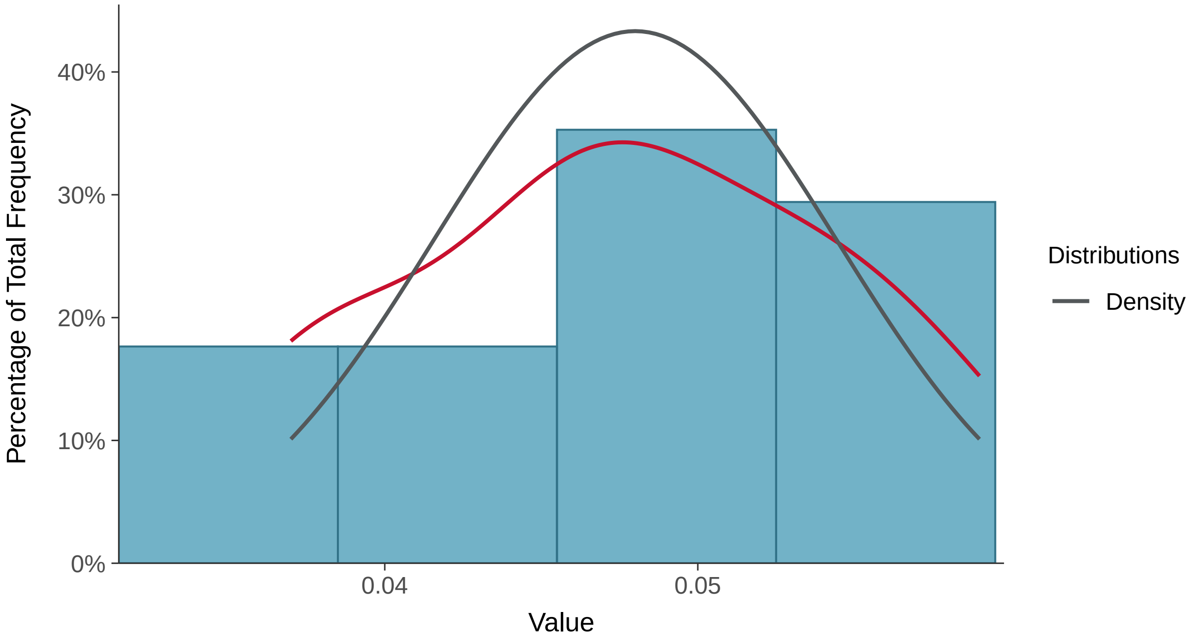
Scatter Plot

Lithium, MW-6 (mg/L)



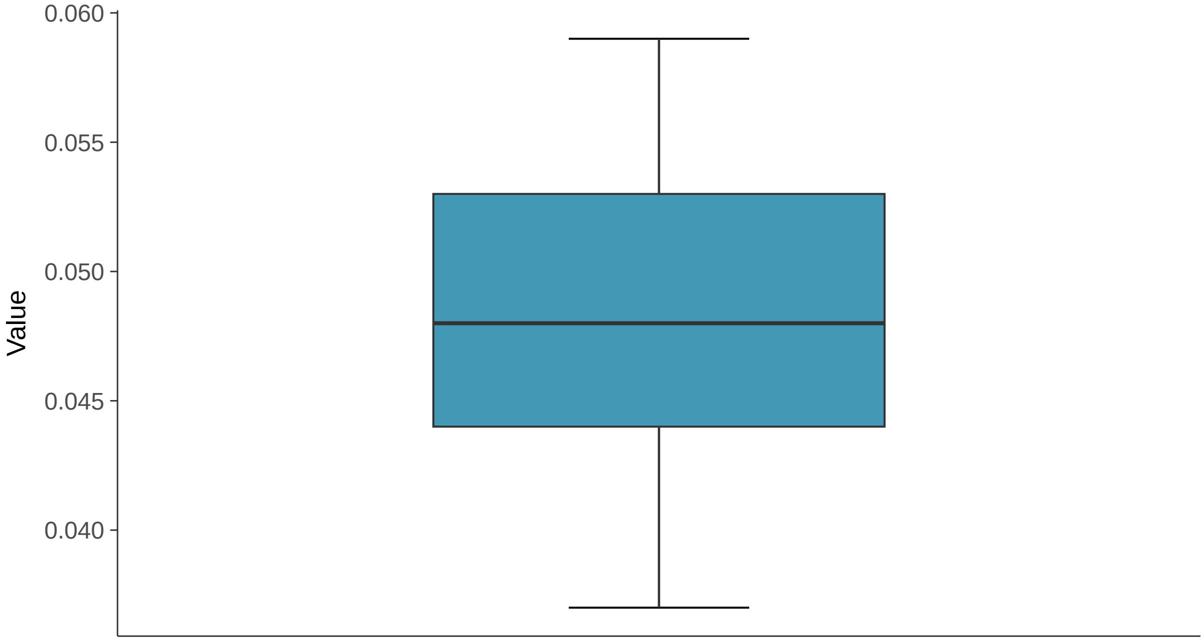
Histogram

Lithium, MW-6 (mg/L)



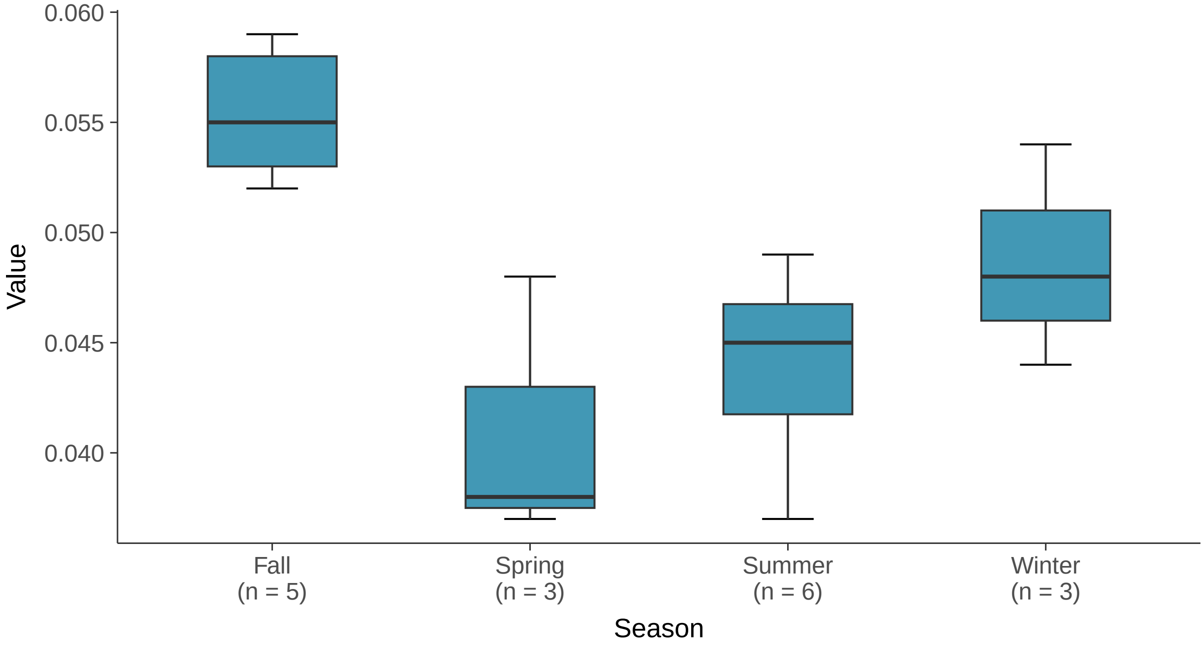
Boxplot

Lithium, MW-6 (mg/L)



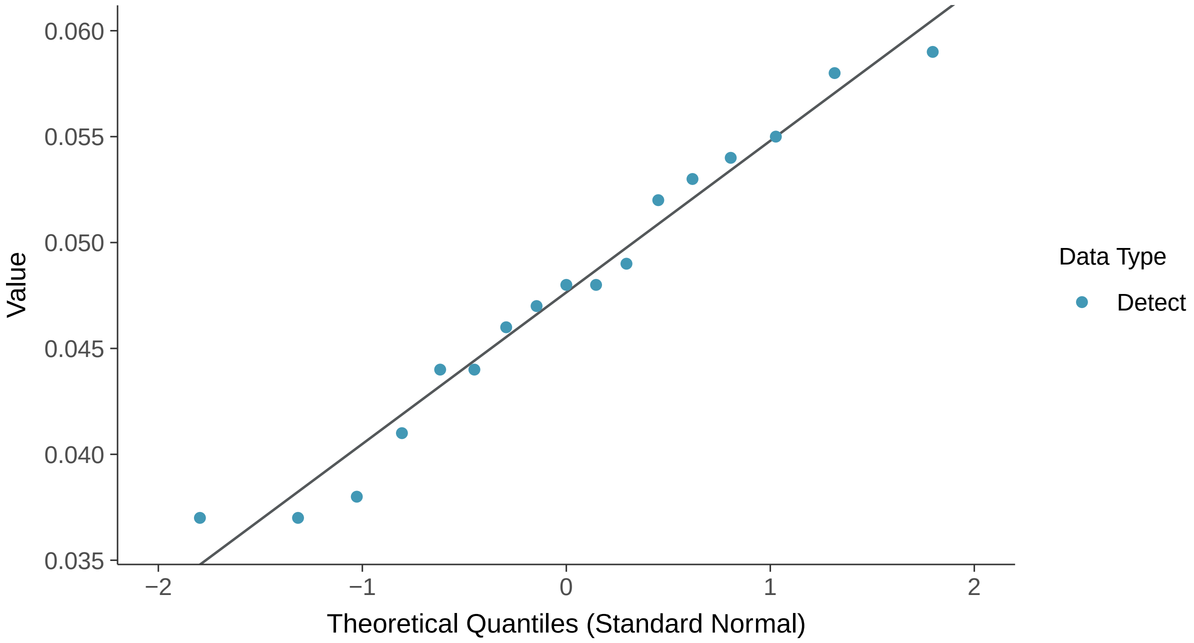
Boxplot by Season

Lithium, MW-6 (mg/L)



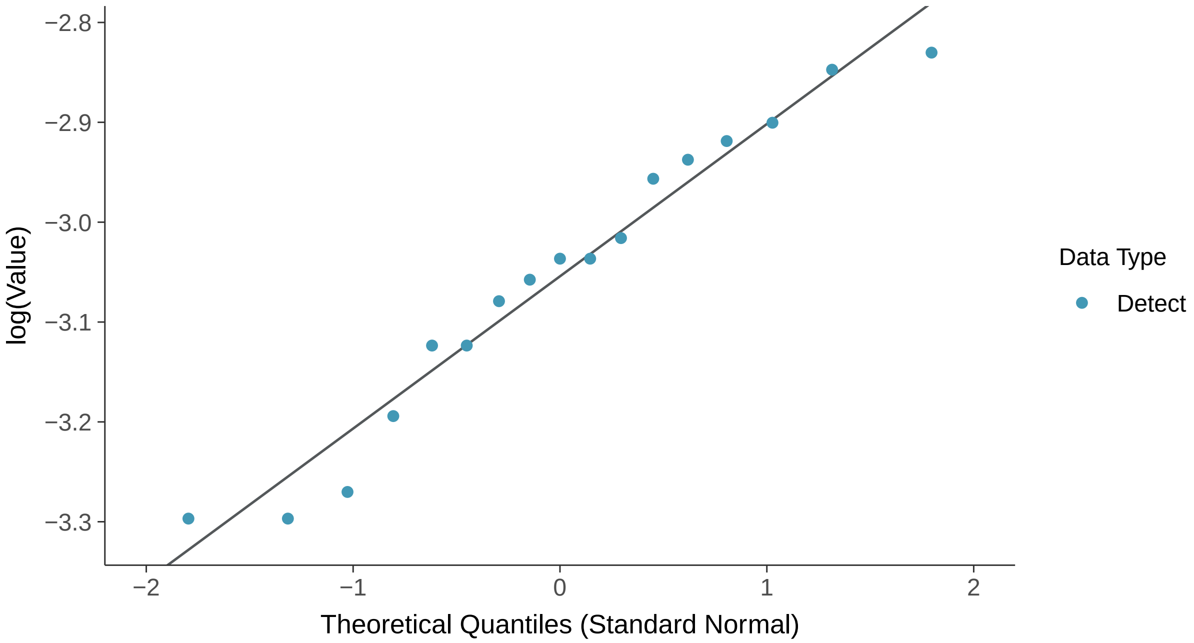
Normal Q-Q plot

Lithium, MW-6 (mg/L)



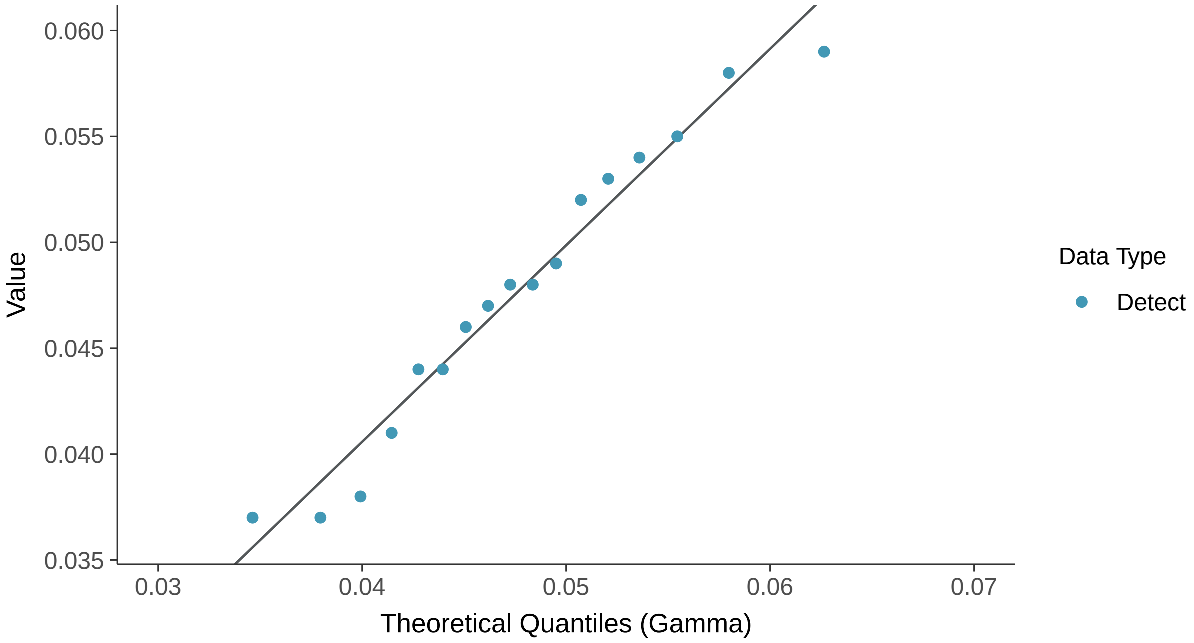
Lognormal Q-Q plot

Lithium, MW-6 (mg/L)



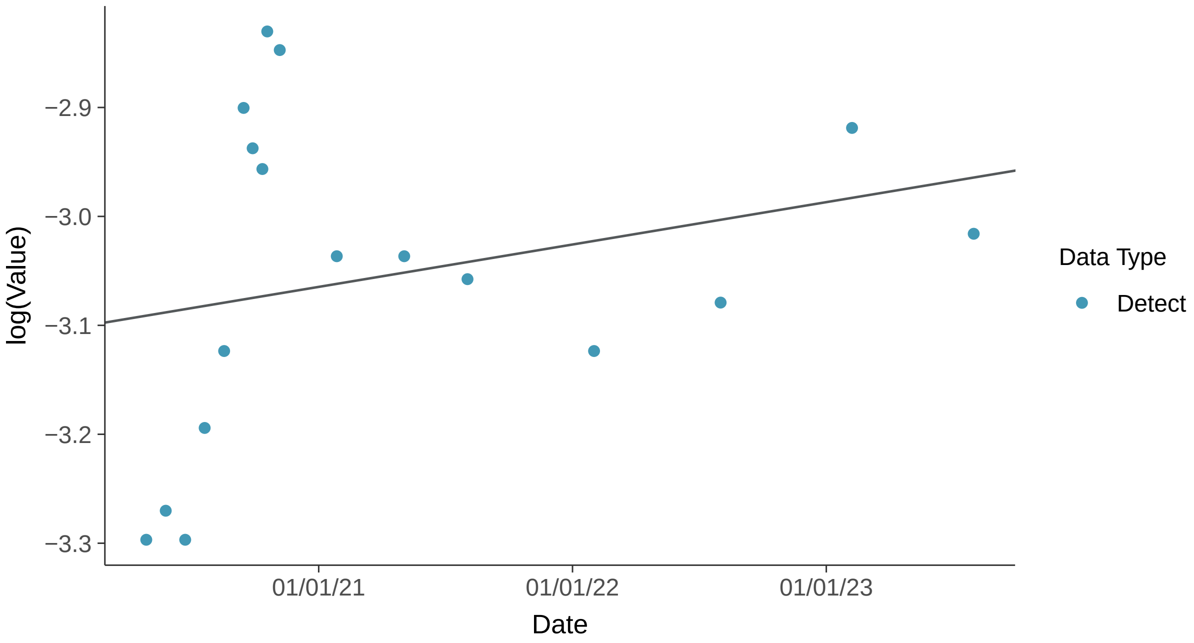
Gamma Q-Q plot

Lithium, MW-6 (mg/L)



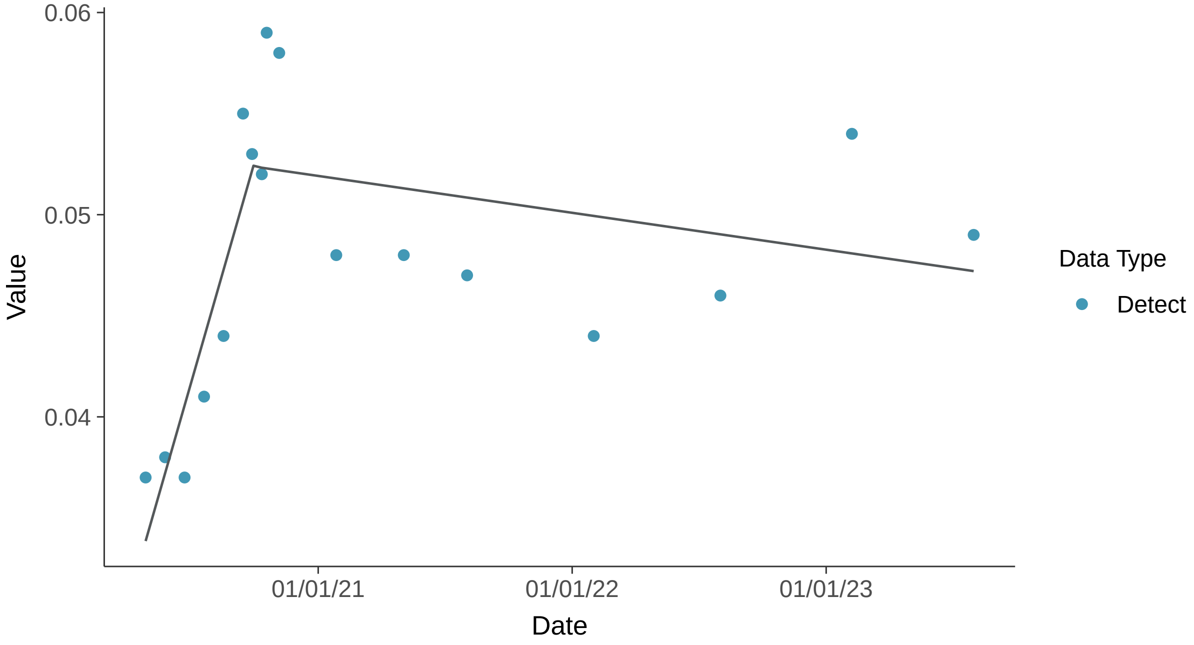
Trend Regression: Lognormal MLE

Lithium, MW-6 (mg/L)



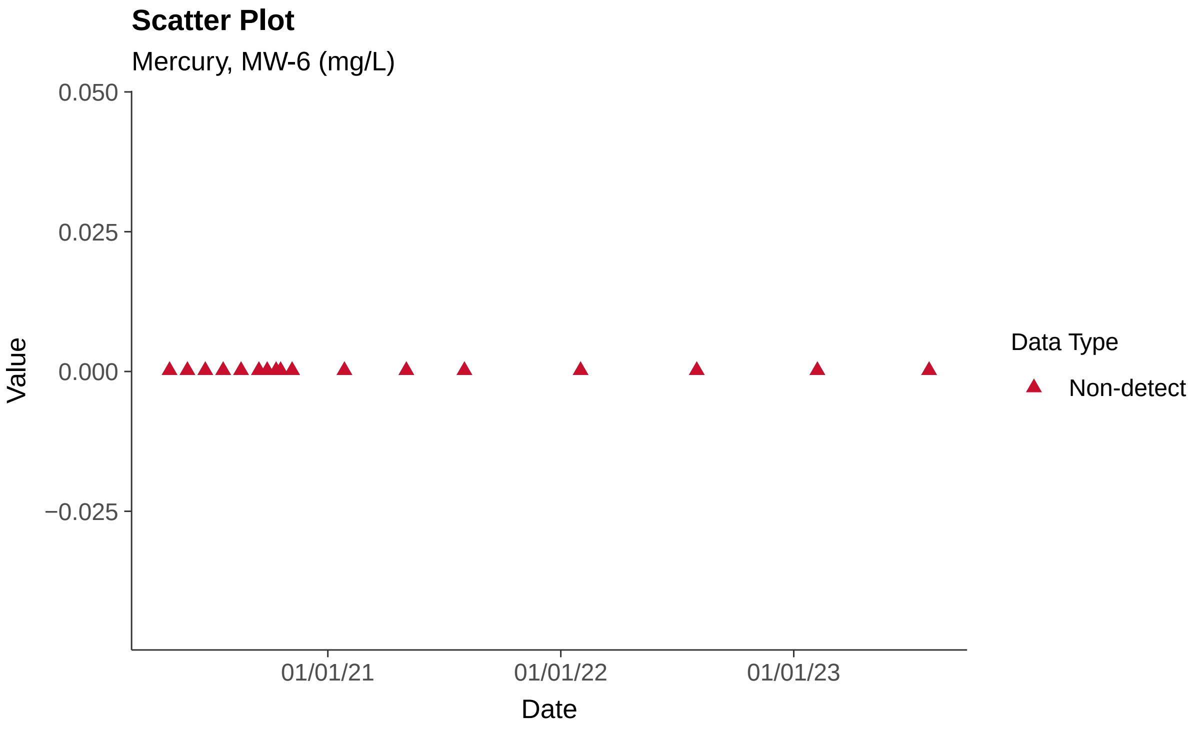
Trend Regression: Piecewise Linear-Linear

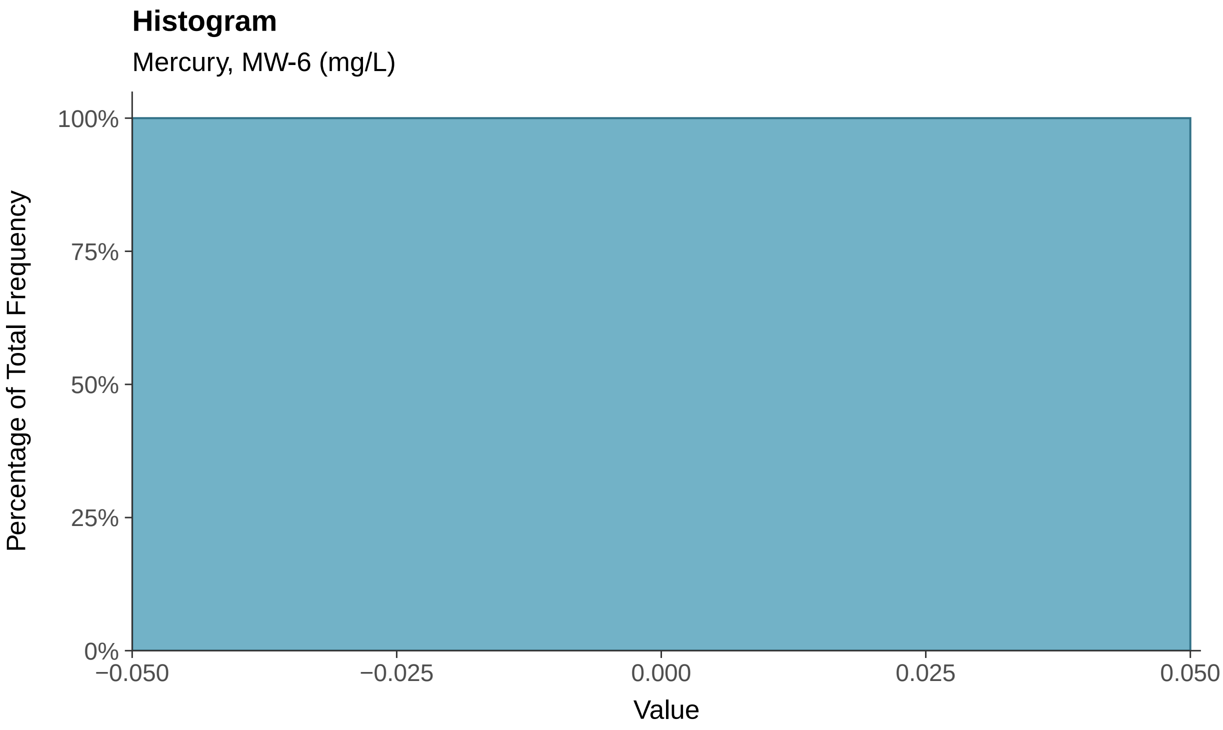
Lithium, MW-6 (mg/L)



Appendix IV: Mercury, MW-6

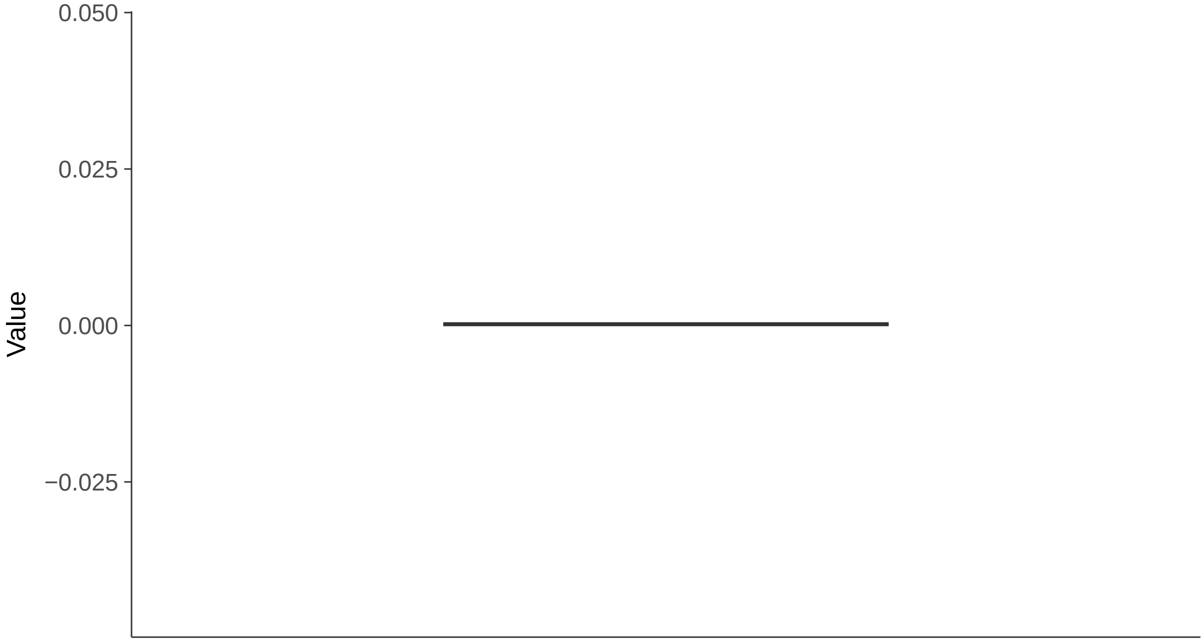
ID: 06_2_17





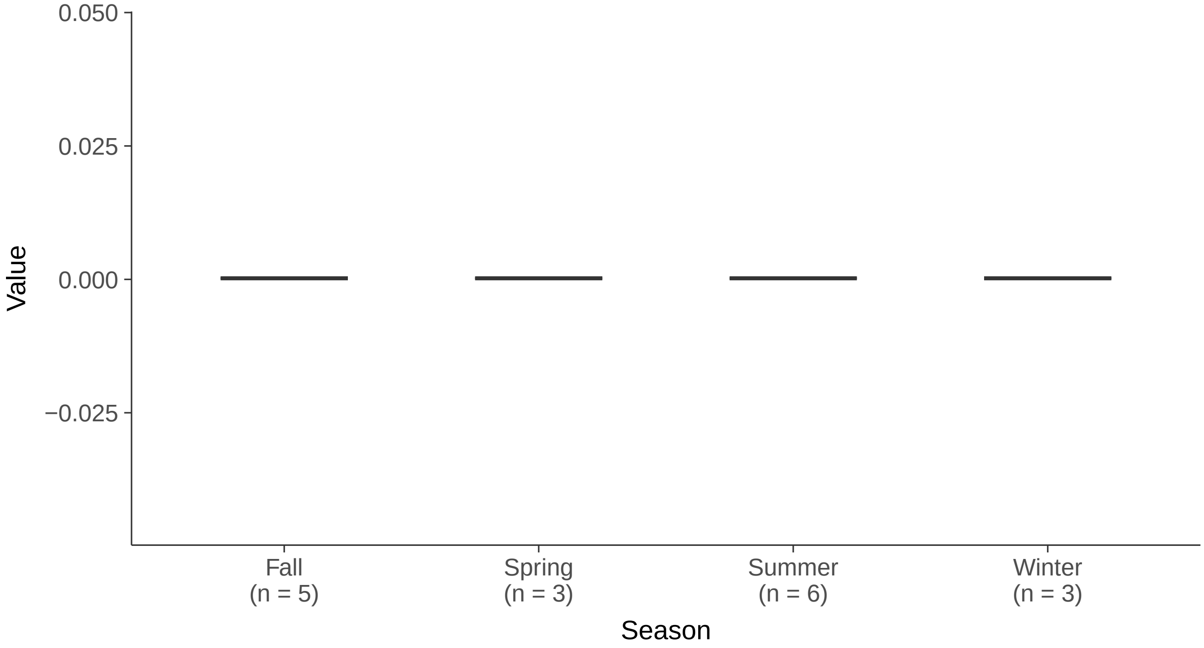
Boxplot

Mercury, MW-6 (mg/L)



Boxplot by Season

Mercury, MW-6 (mg/L)

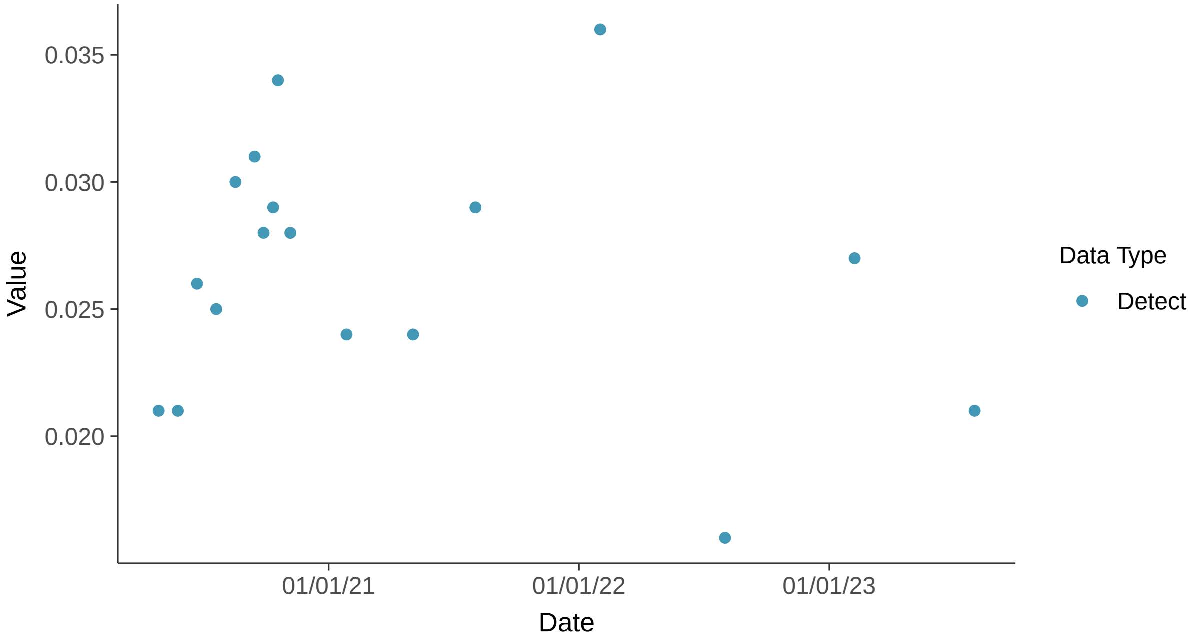


Appendix IV: Molybdenum, MW-6

ID: 06_2_18

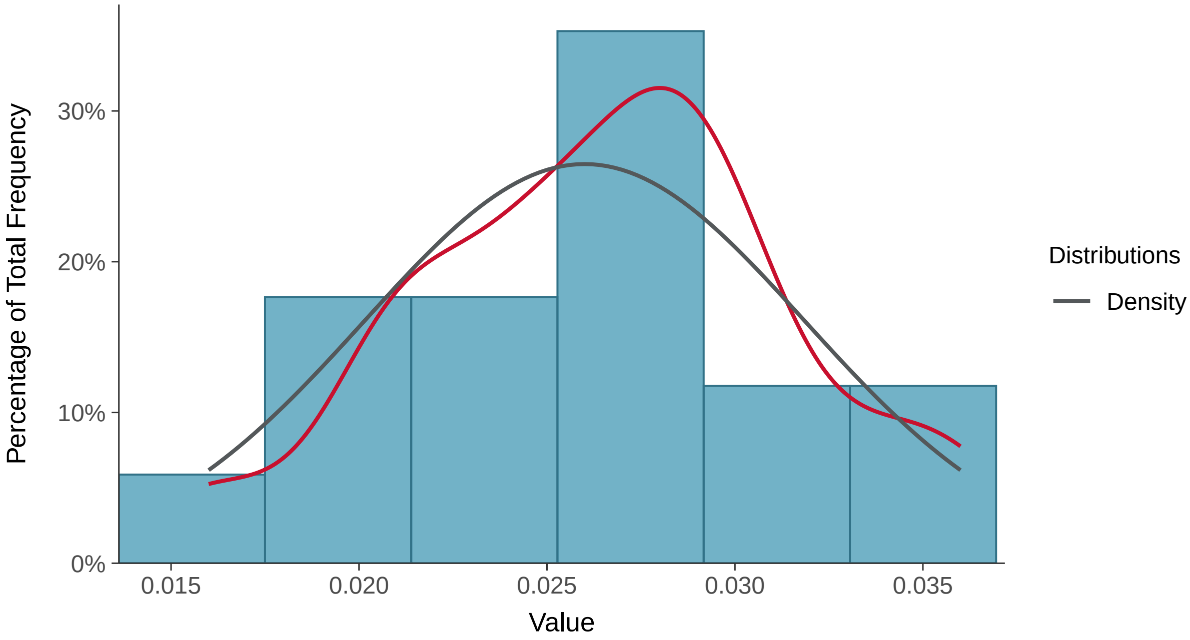
Scatter Plot

Molybdenum, MW-6 (mg/L)



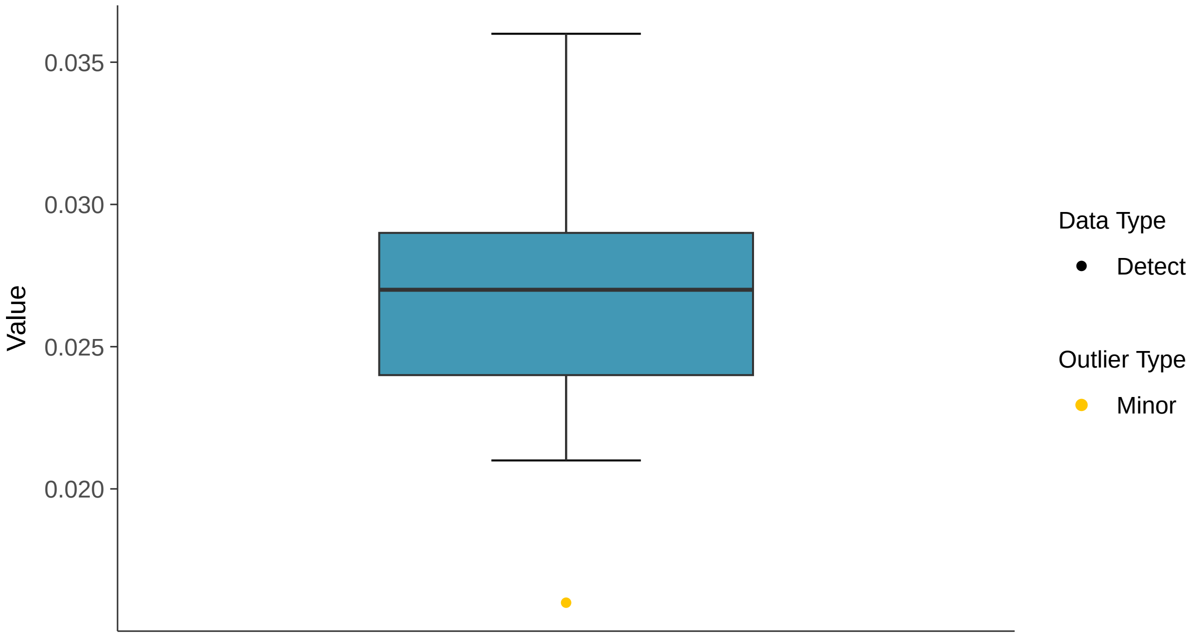
Histogram

Molybdenum, MW-6 (mg/L)



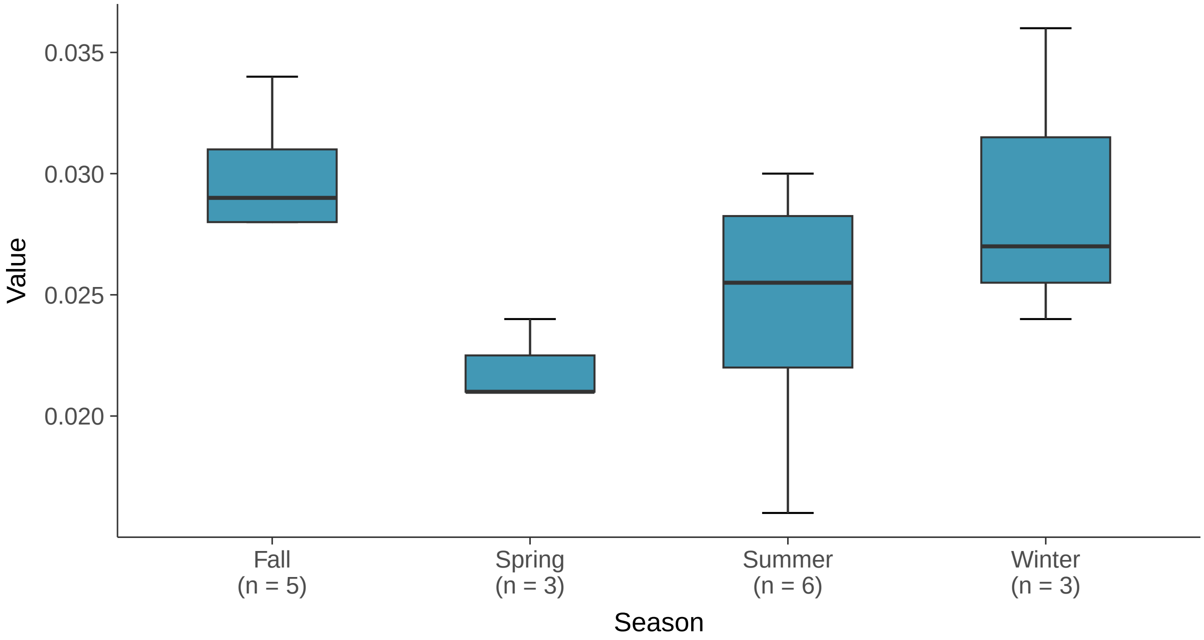
Boxplot

Molybdenum, MW-6 (mg/L)



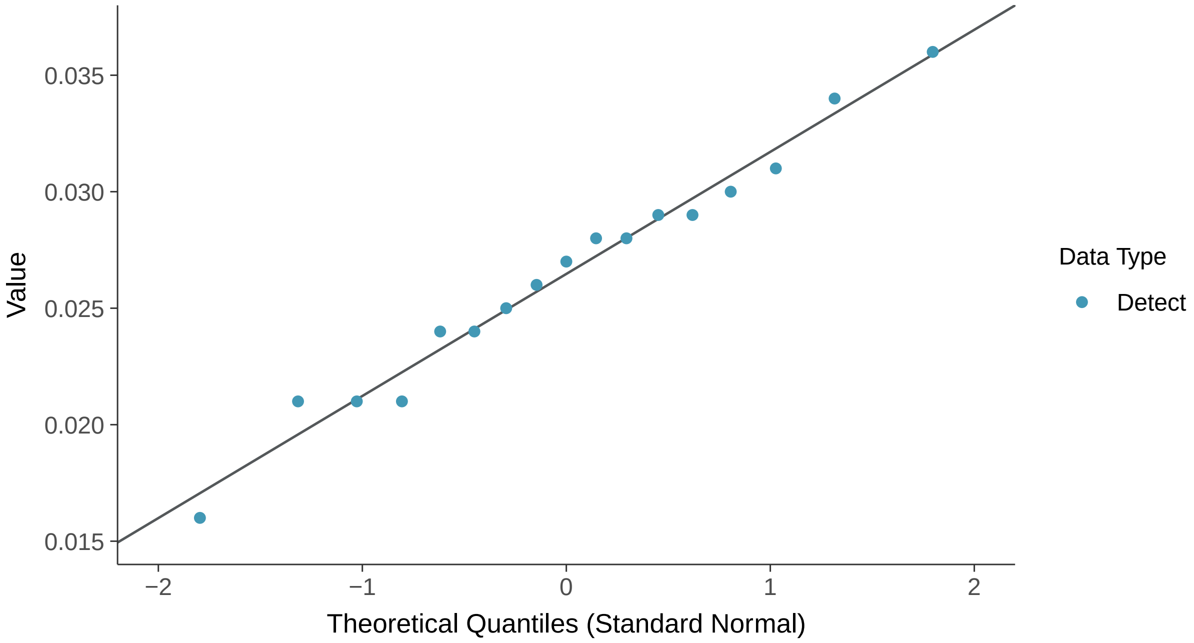
Boxplot by Season

Molybdenum, MW-6 (mg/L)



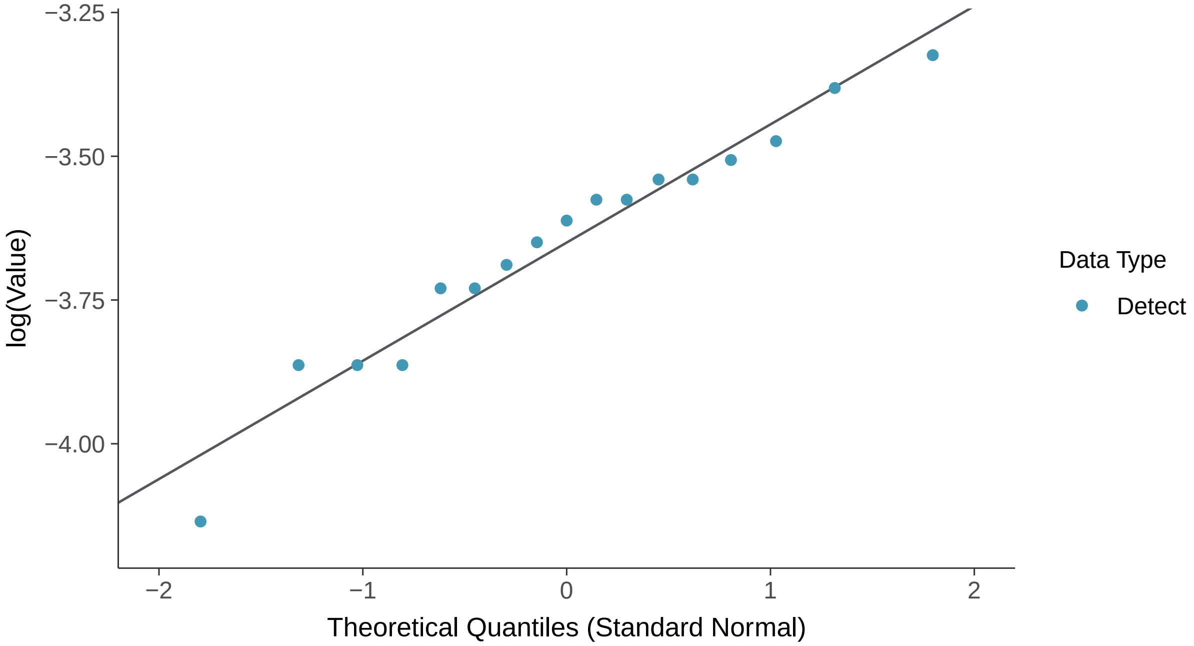
Normal Q-Q plot

Molybdenum, MW-6 (mg/L)



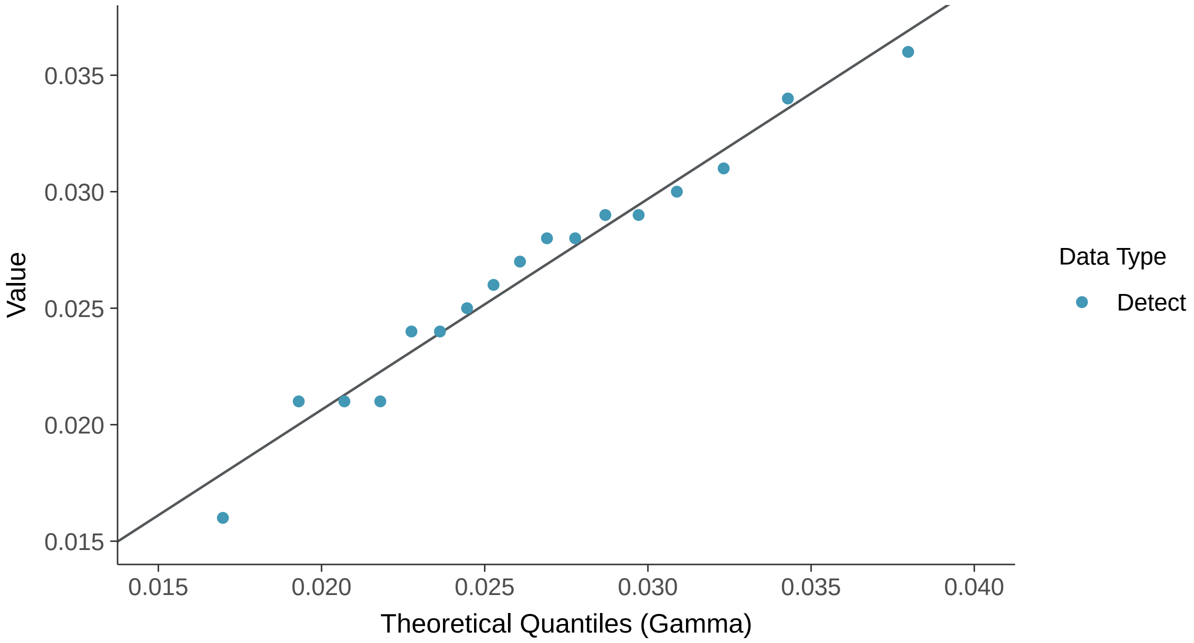
Lognormal Q-Q plot

Molybdenum, MW-6 (mg/L)



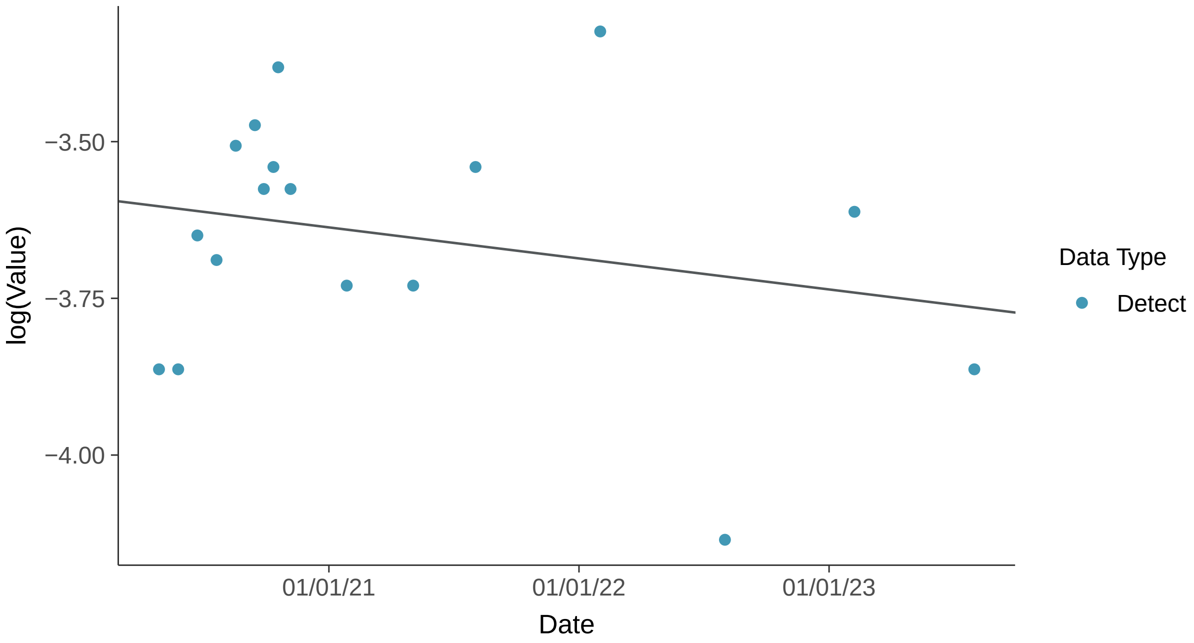
Gamma Q-Q plot

Molybdenum, MW-6 (mg/L)



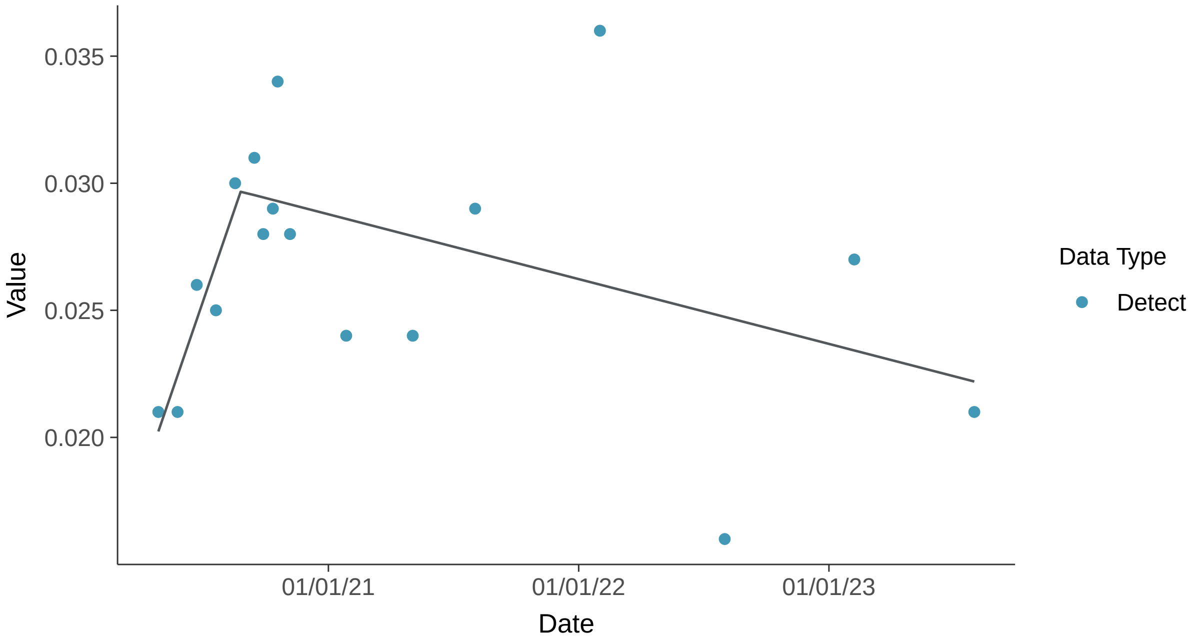
Trend Regression: Lognormal MLE

Molybdenum, MW-6 (mg/L)



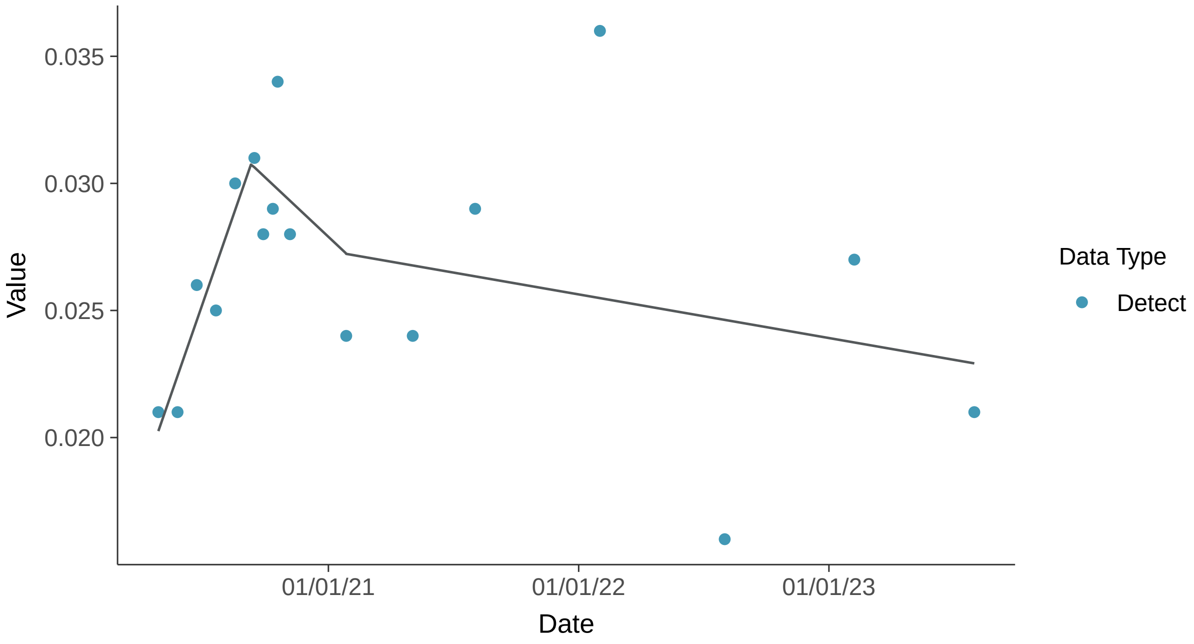
Trend Regression: Piecewise Linear-Linear

Molybdenum, MW-6 (mg/L)



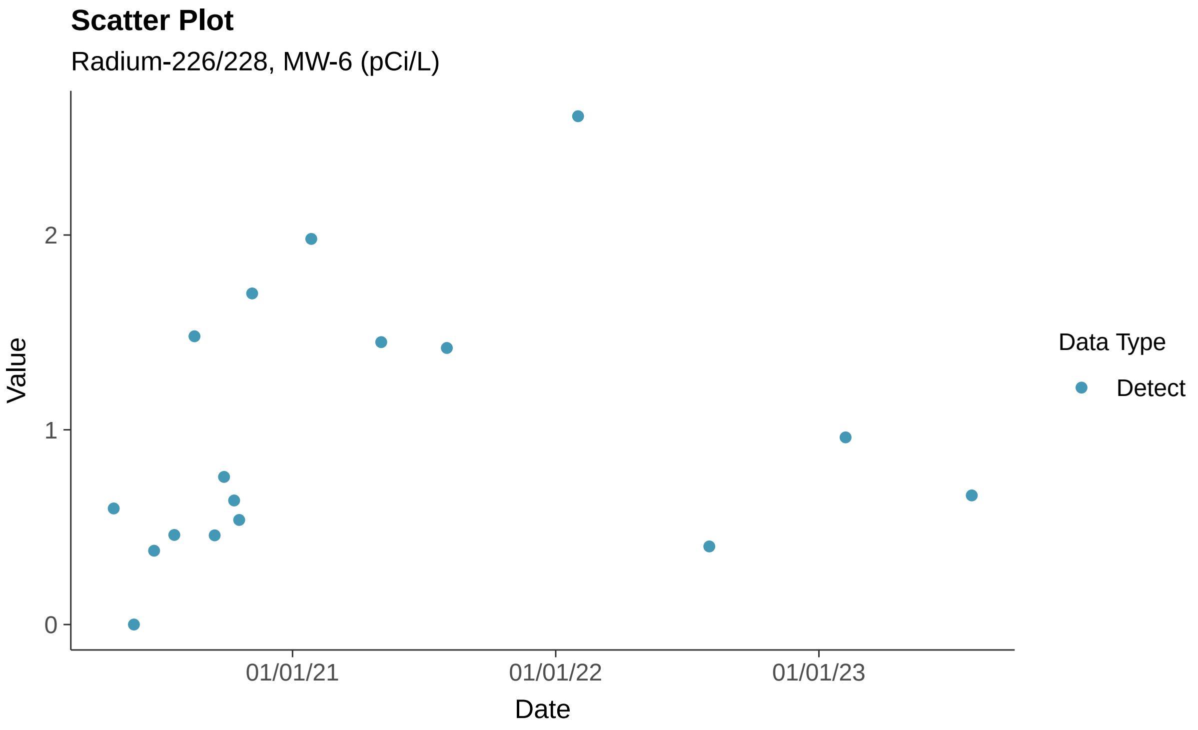
Trend Regression: Piecewise Linear-Linear-Linear

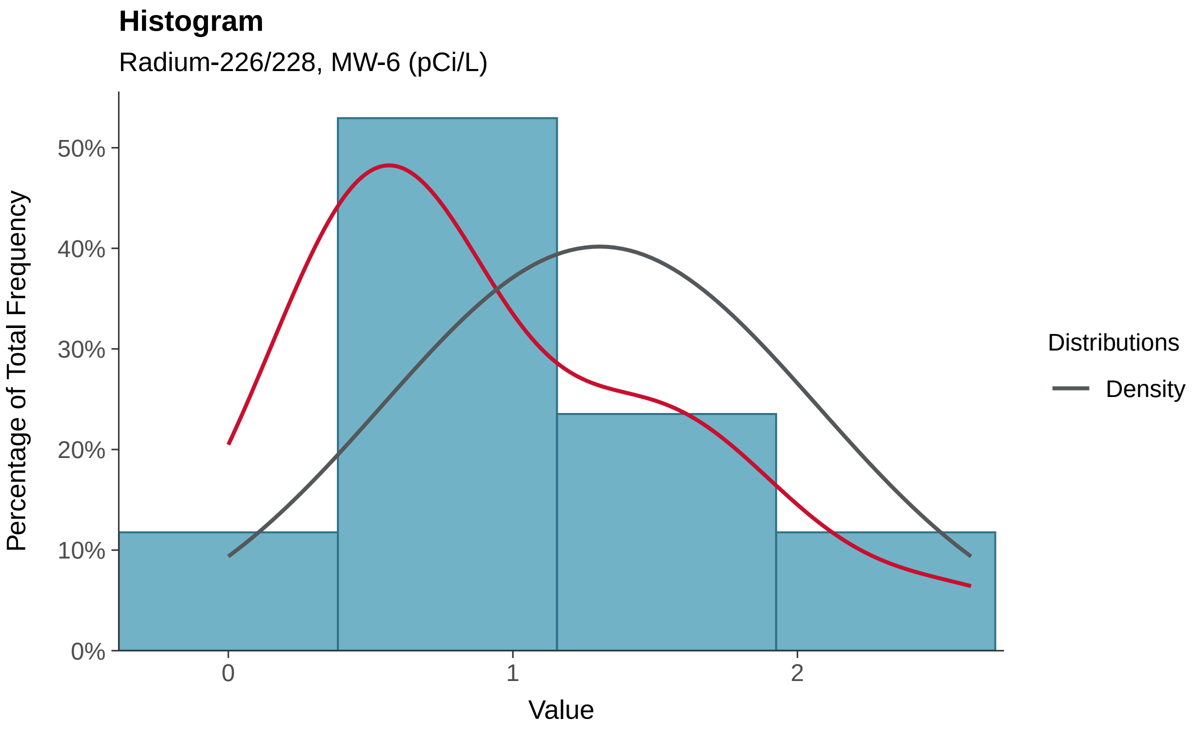
Molybdenum, MW-6 (mg/L)



Appendix IV: Radium-226/228, MW-6

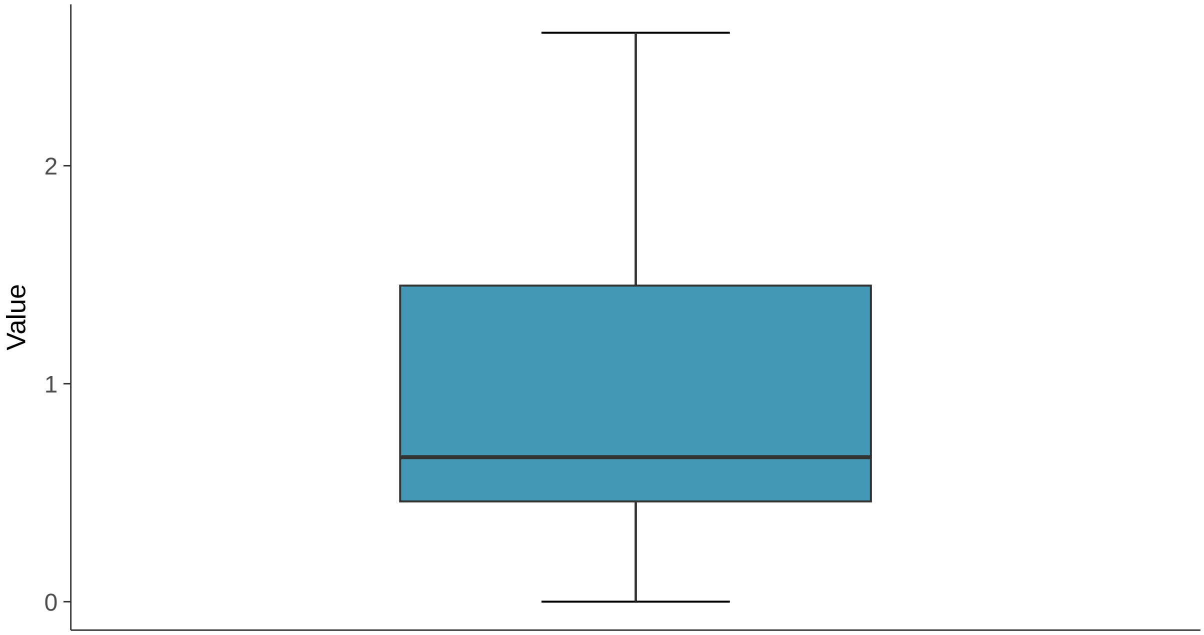
ID: 06_2_20





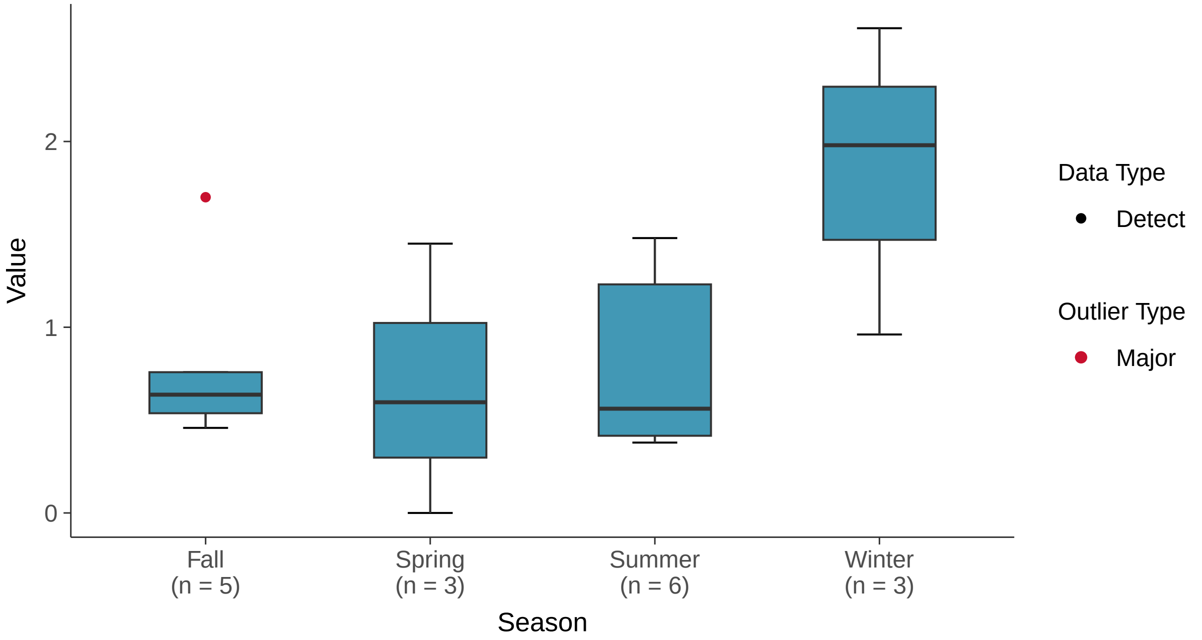
Boxplot

Radium-226/228, MW-6 (pCi/L)



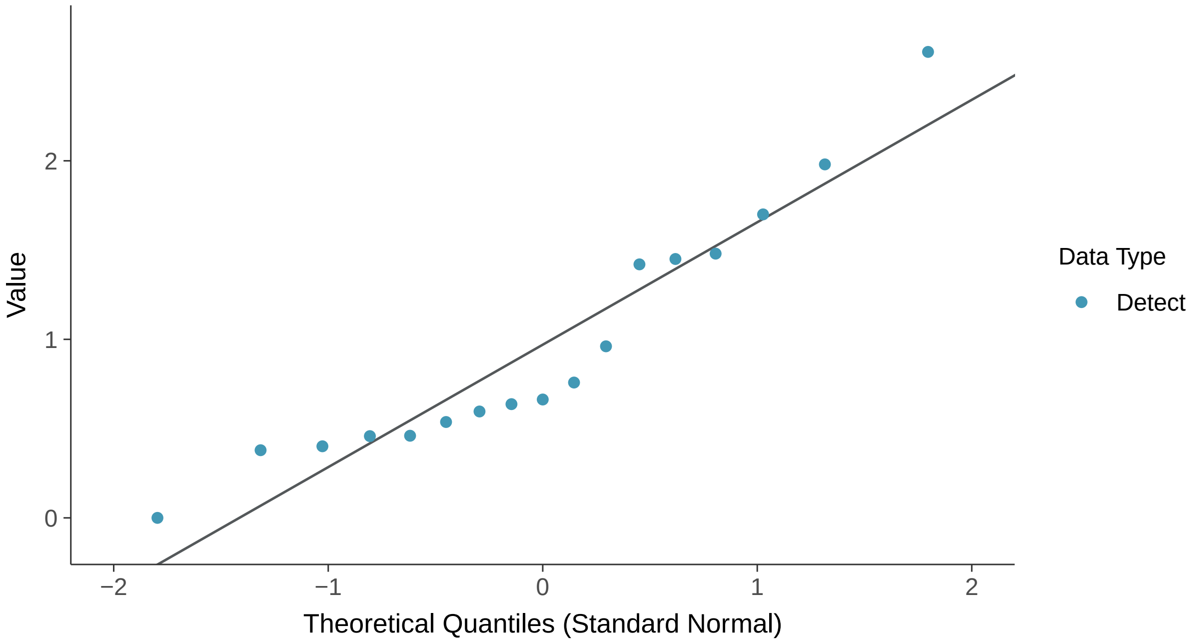
Boxplot by Season

Radium-226/228, MW-6 (pCi/L)



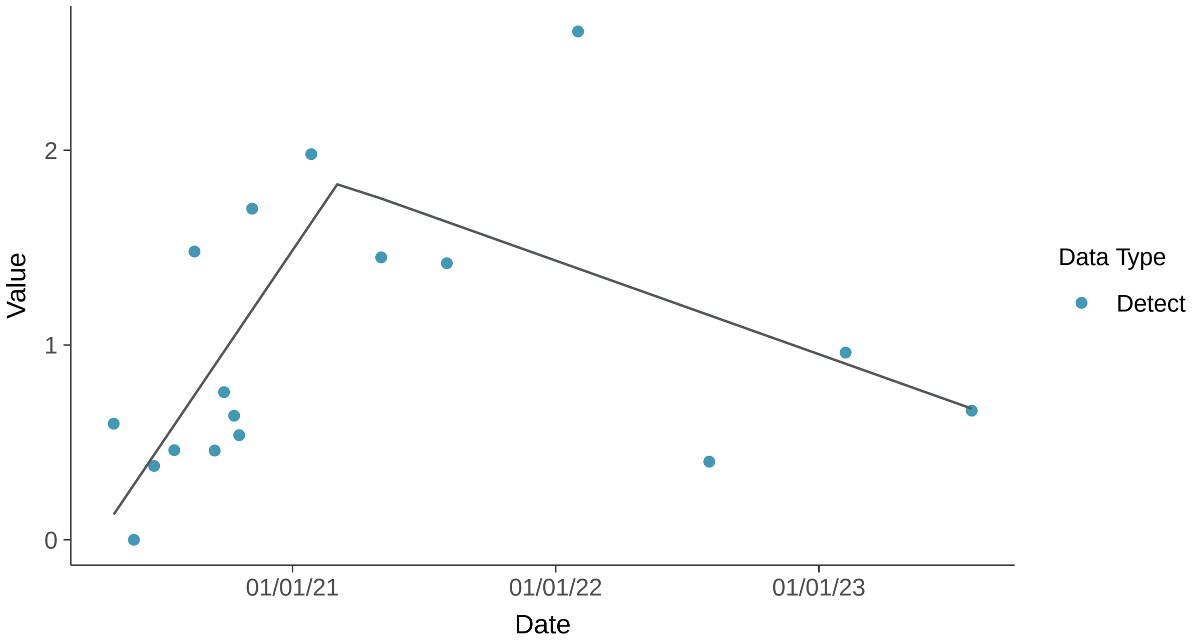
Normal Q-Q plot

Radium-226/228, MW-6 (pCi/L)



Trend Regression: Piecewise Linear-Linear

Radium-226/228, MW-6 (pCi/L)

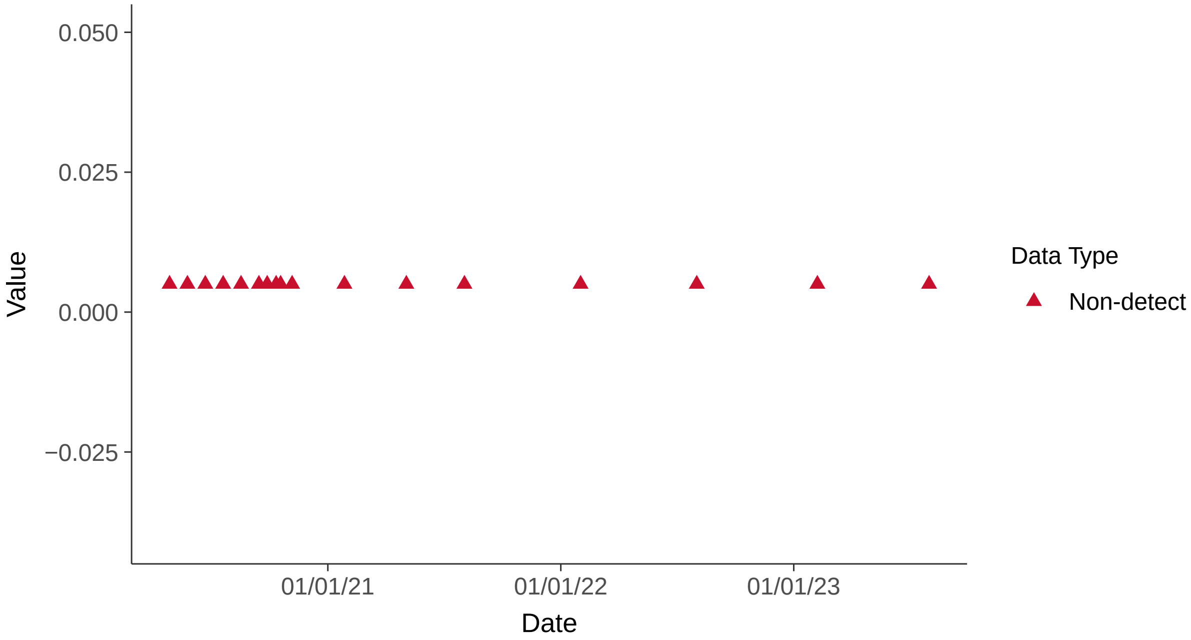


Appendix IV: Selenium, MW-6

ID: 06_2_22

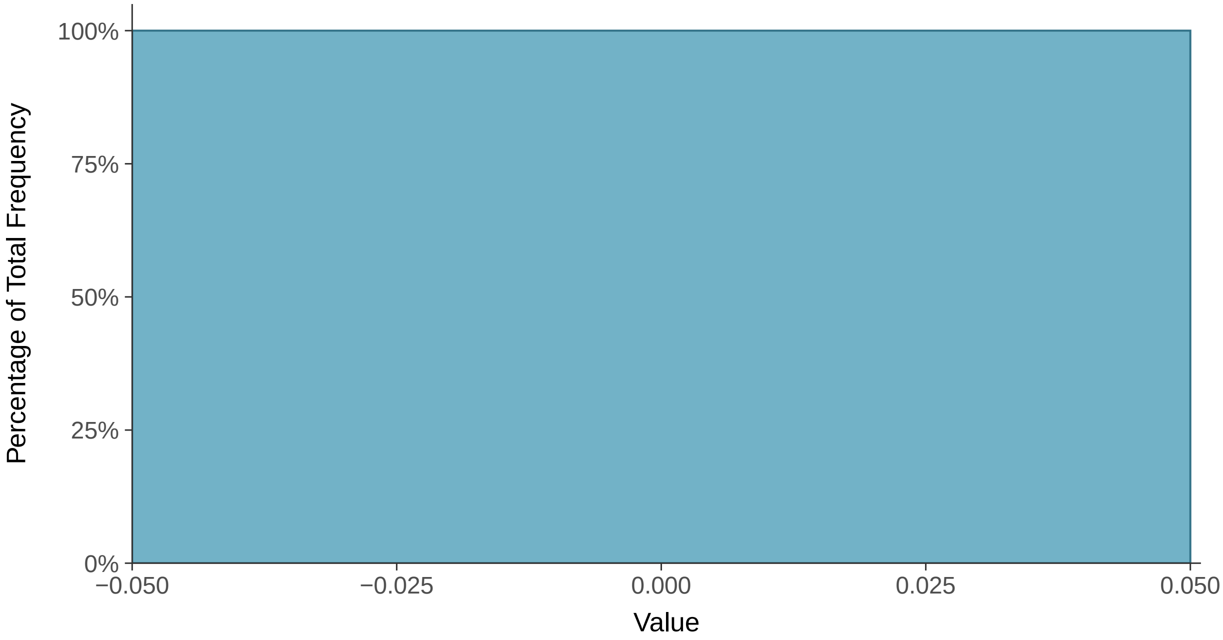
Scatter Plot

Selenium, MW-6 (mg/L)



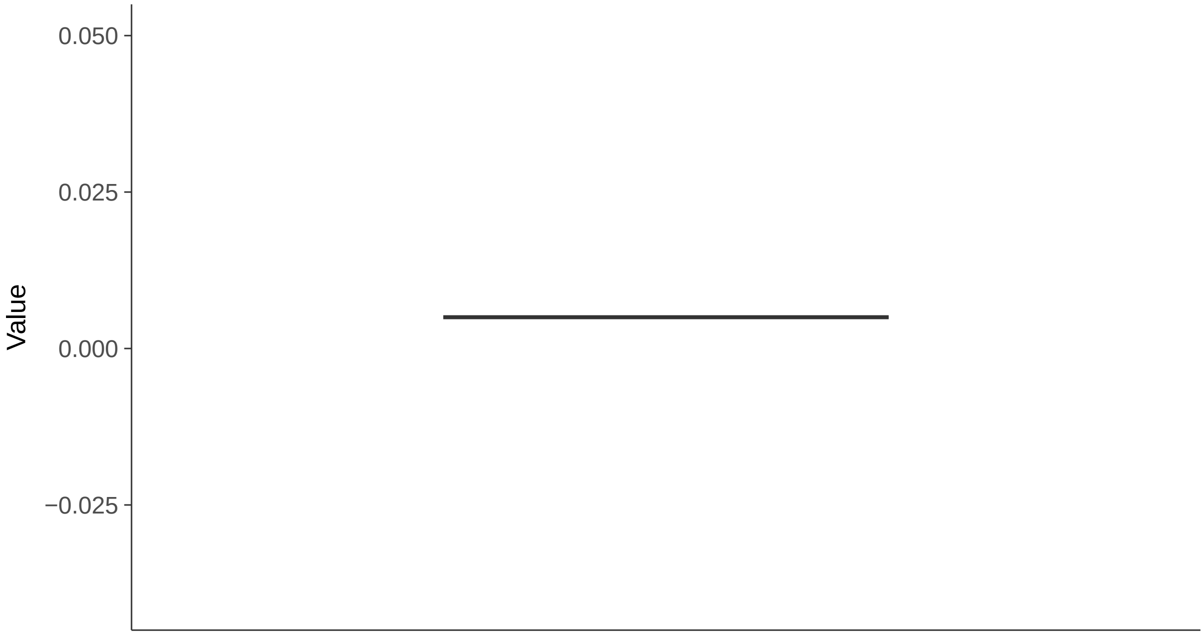
Histogram

Selenium, MW-6 (mg/L)



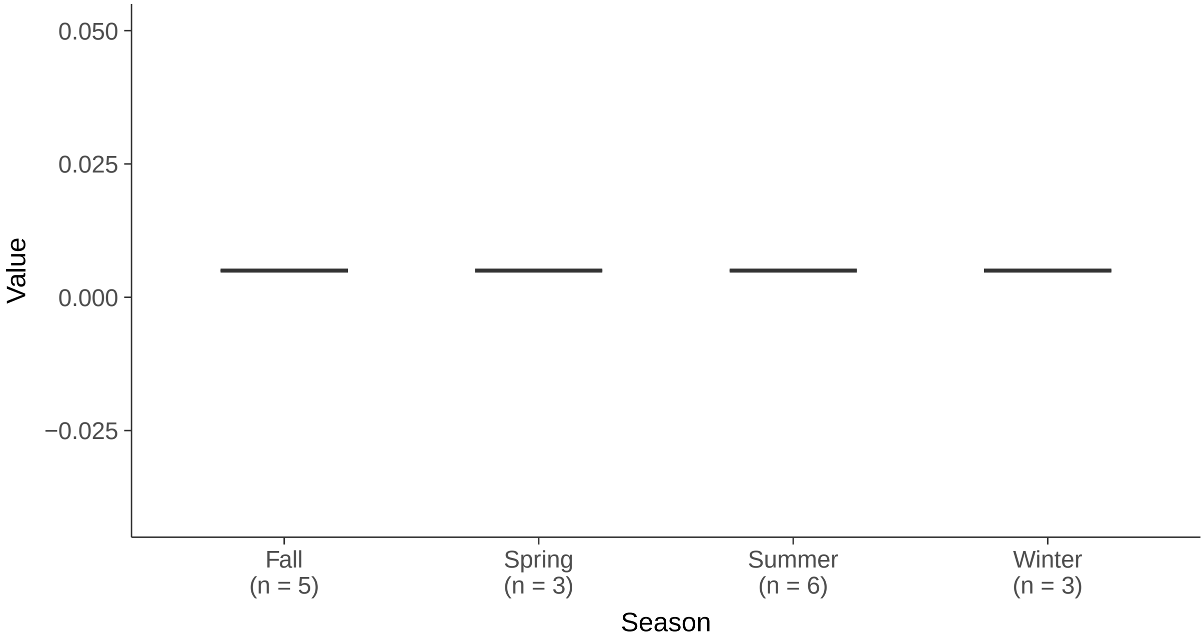
Boxplot

Selenium, MW-6 (mg/L)



Boxplot by Season

Selenium, MW-6 (mg/L)

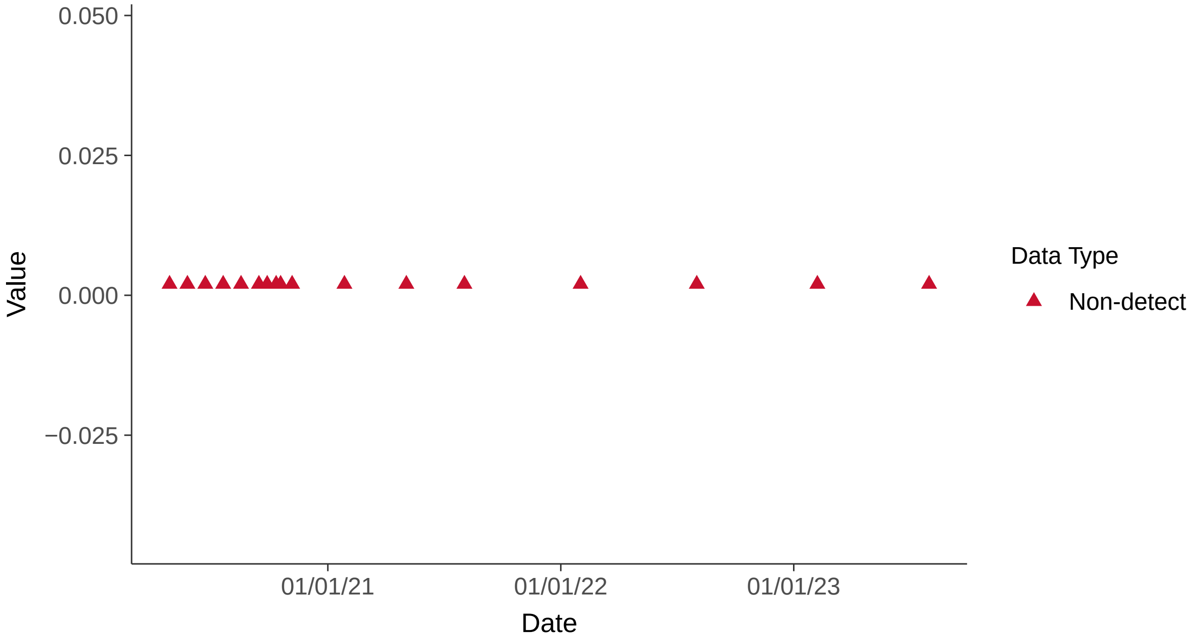


Appendix IV: Thallium, MW-6

ID: 06_2_23

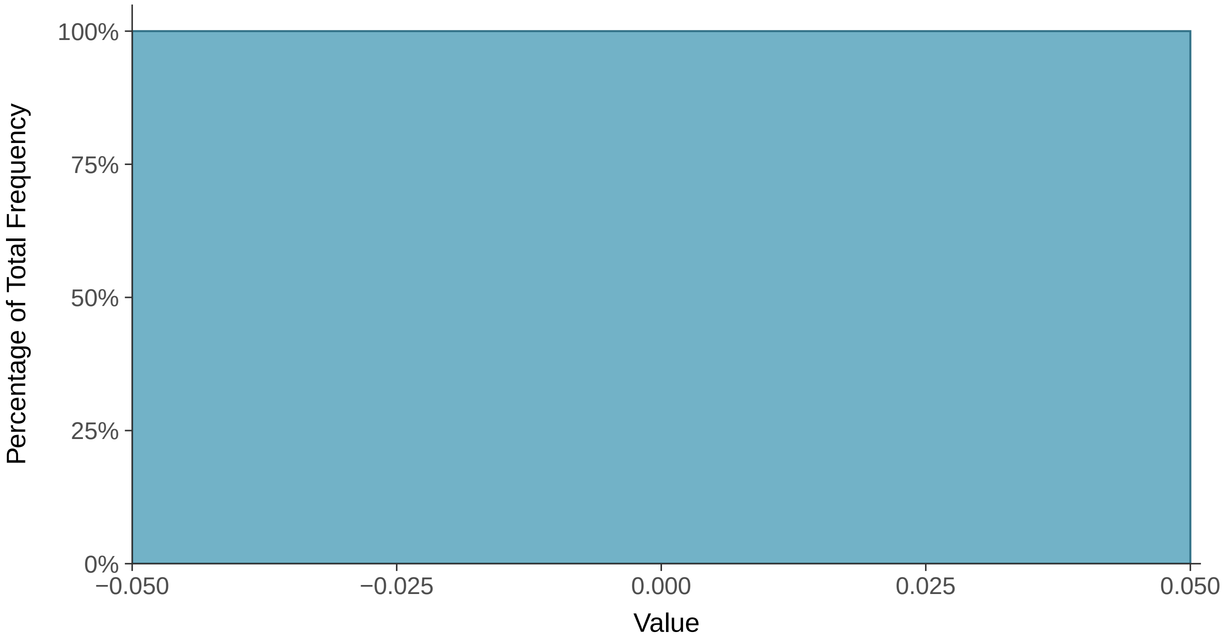
Scatter Plot

Thallium, MW-6 (mg/L)



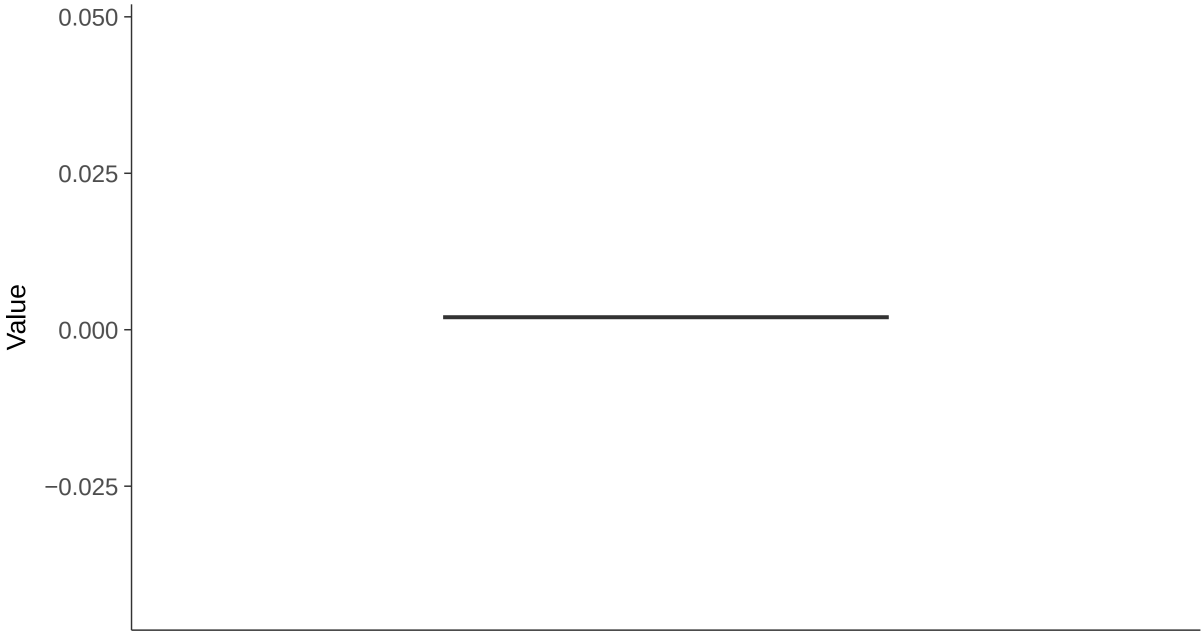
Histogram

Thallium, MW-6 (mg/L)



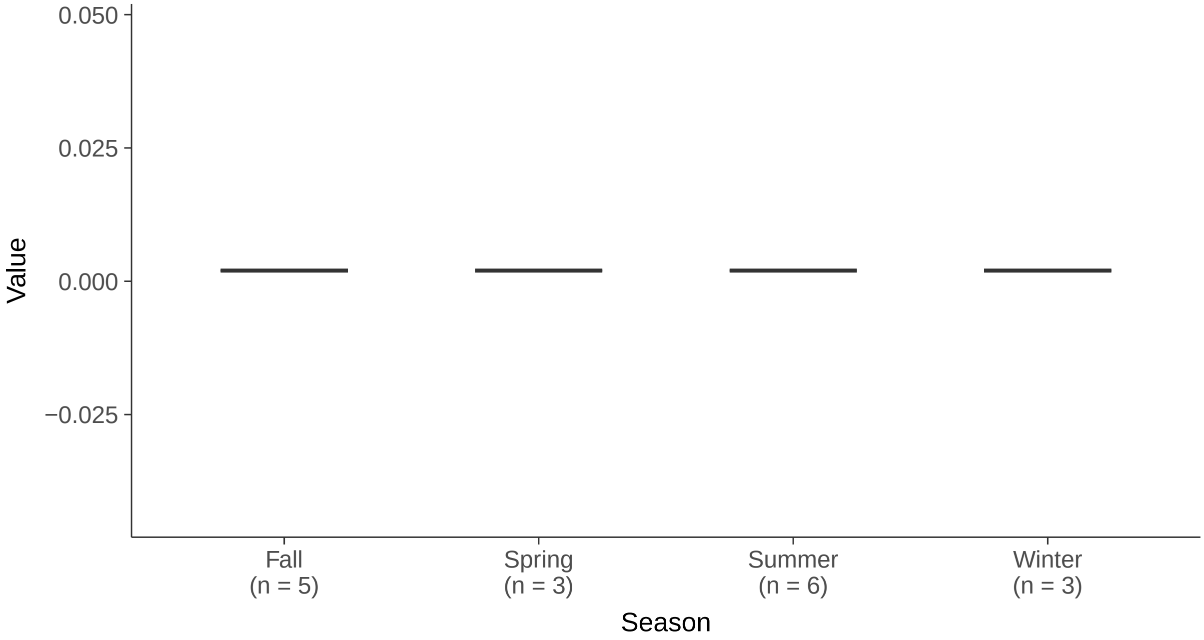
Boxplot

Thallium, MW-6 (mg/L)



Boxplot by Season

Thallium, MW-6 (mg/L)

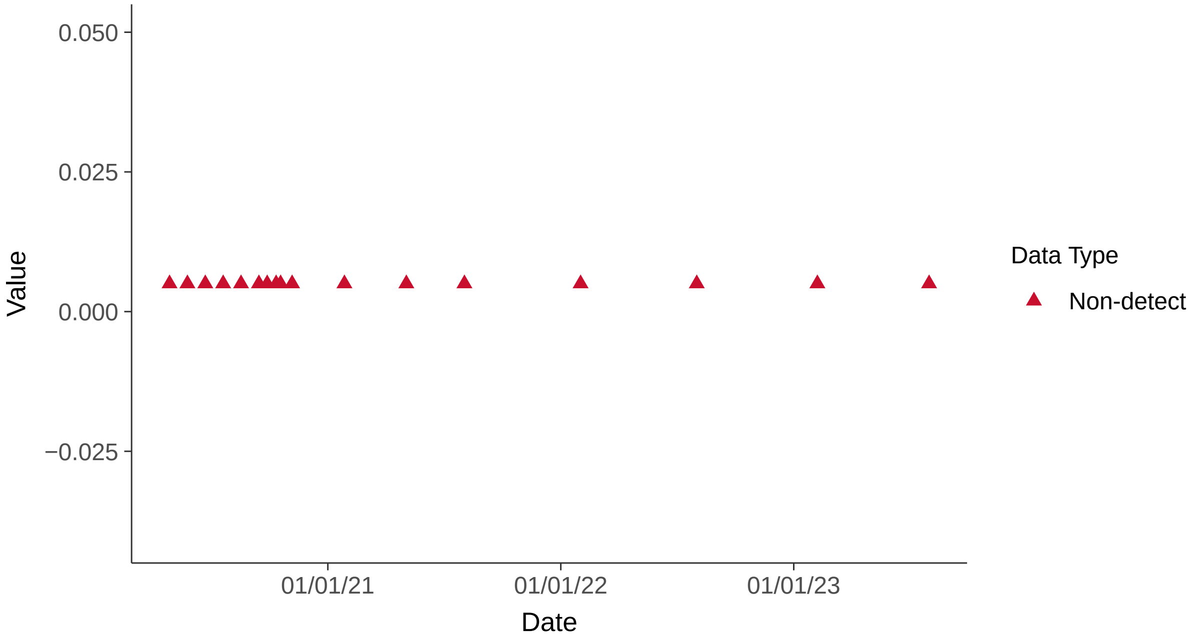


Part 115: Copper, MW-6

ID: 06_5_37

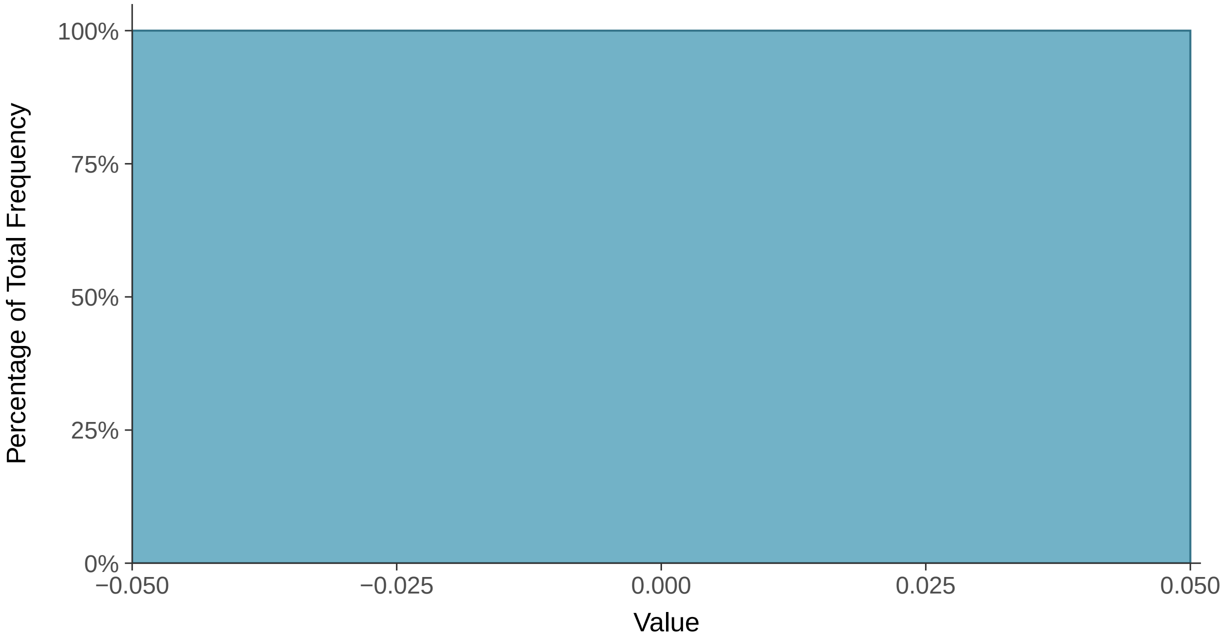
Scatter Plot

Copper, MW-6 (mg/L)



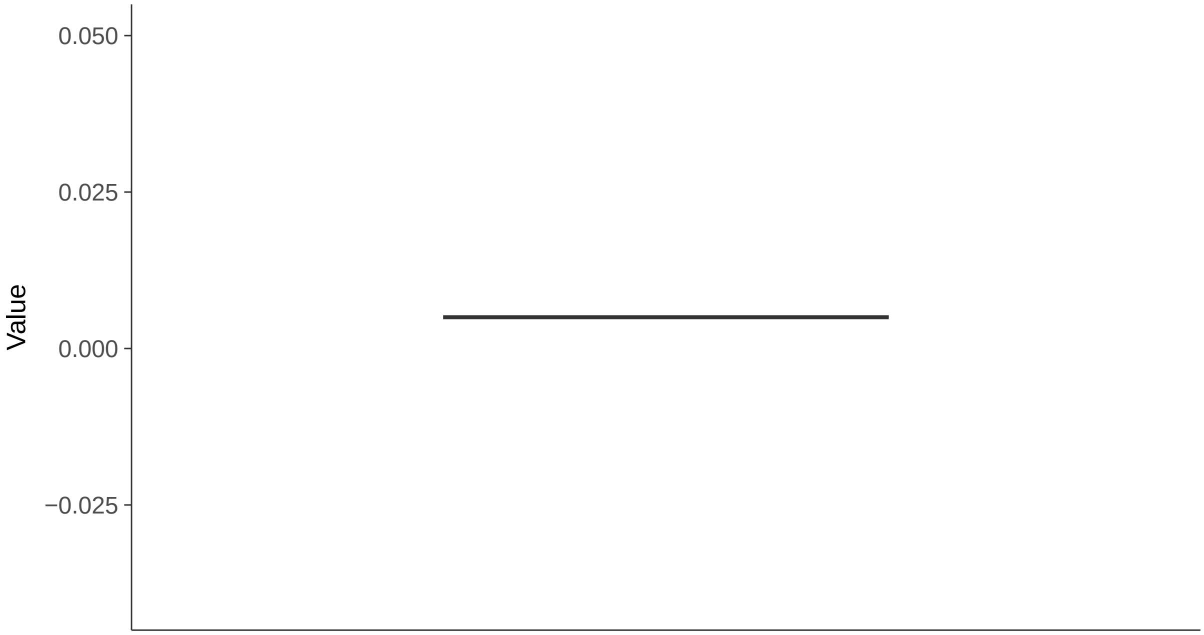
Histogram

Copper, MW-6 (mg/L)



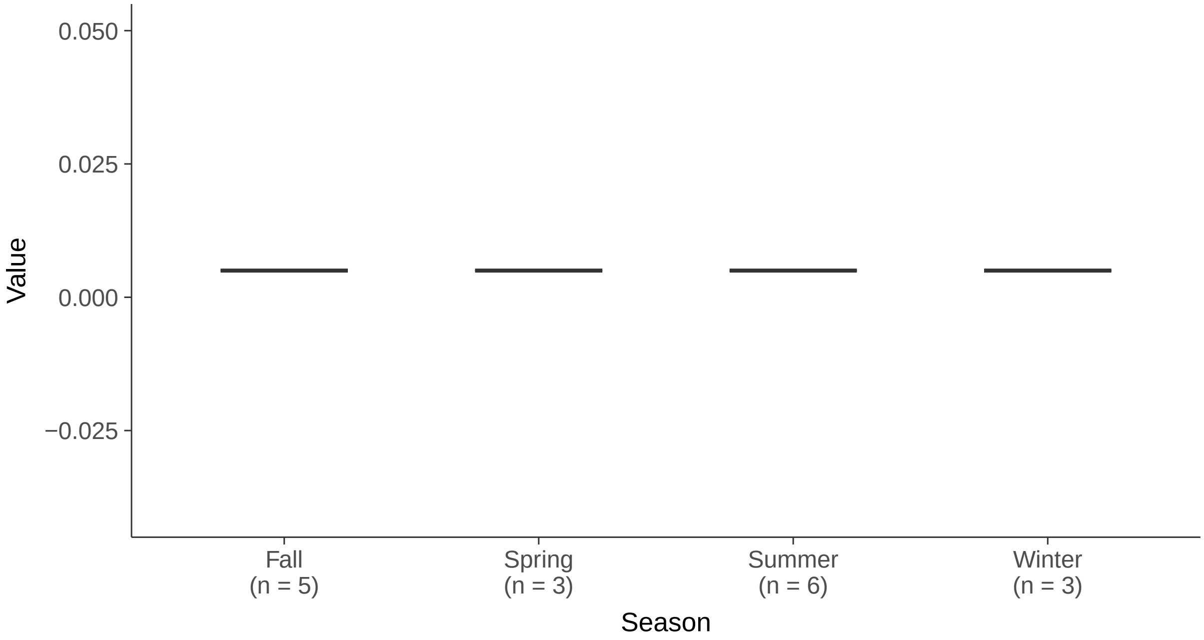
Boxplot

Copper, MW-6 (mg/L)



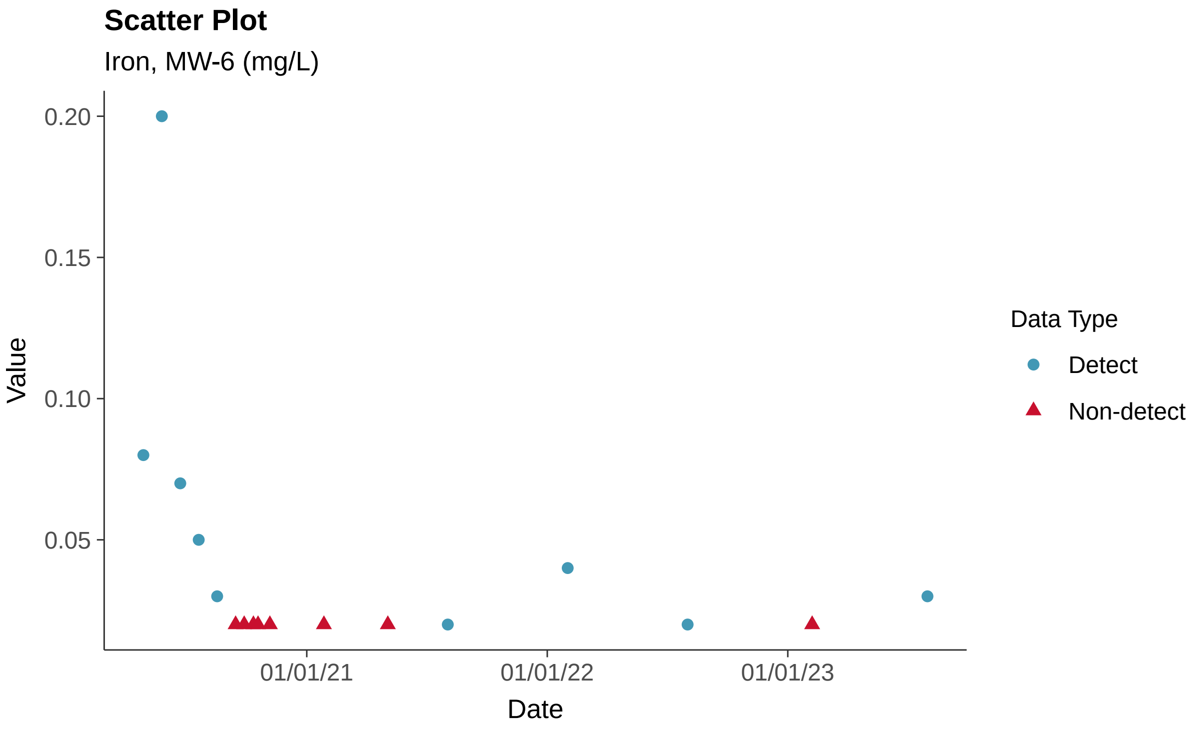
Boxplot by Season

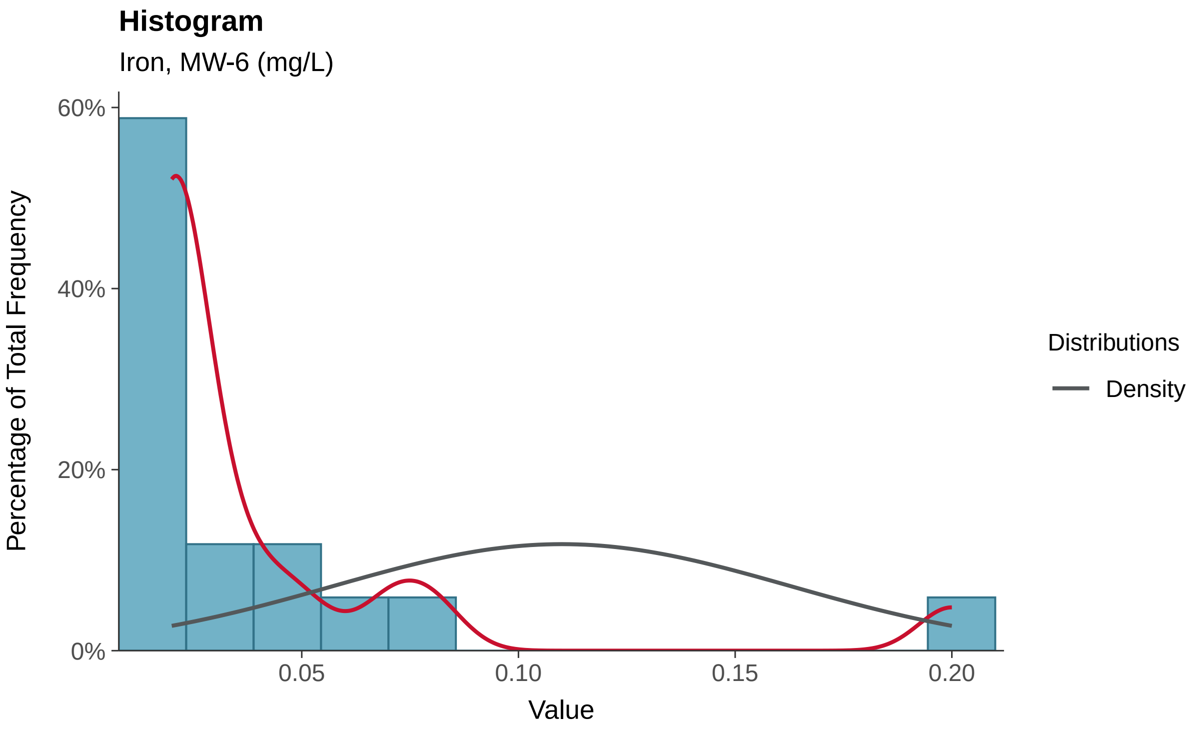
Copper, MW-6 (mg/L)



Part 115: Iron, MW-6

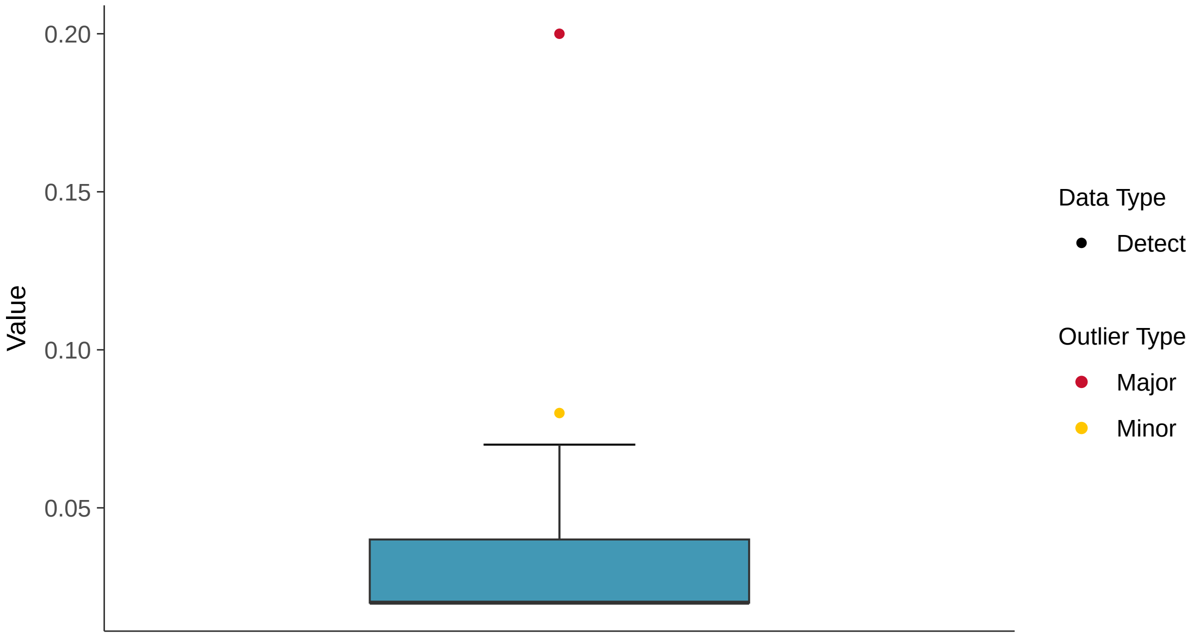
ID: 06_5_38





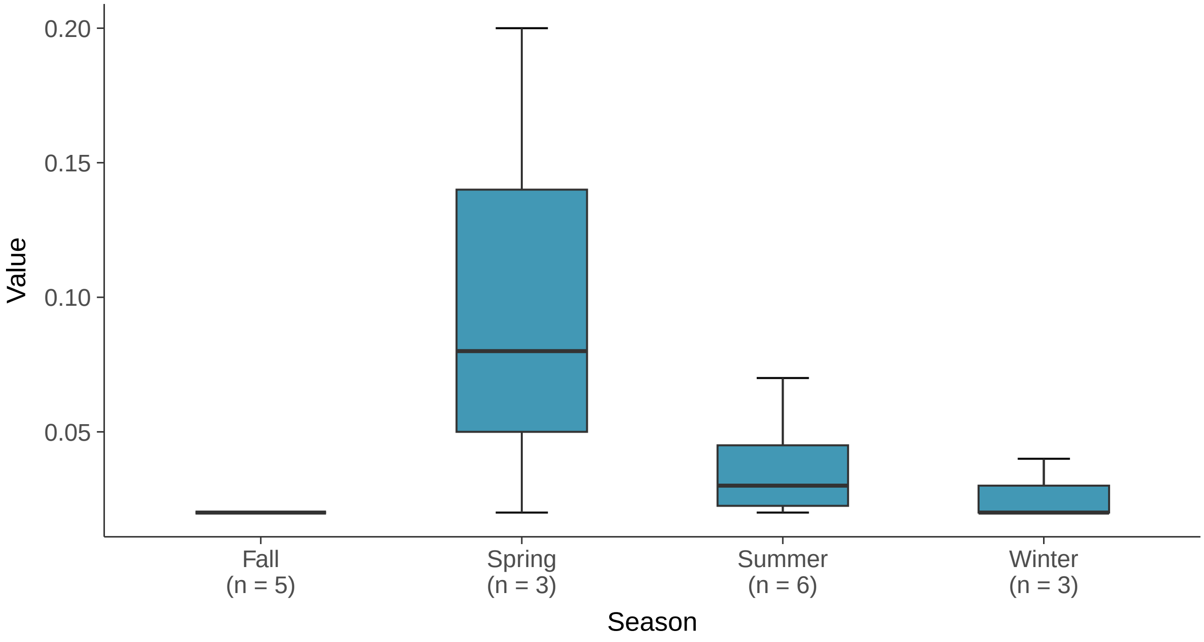
Boxplot

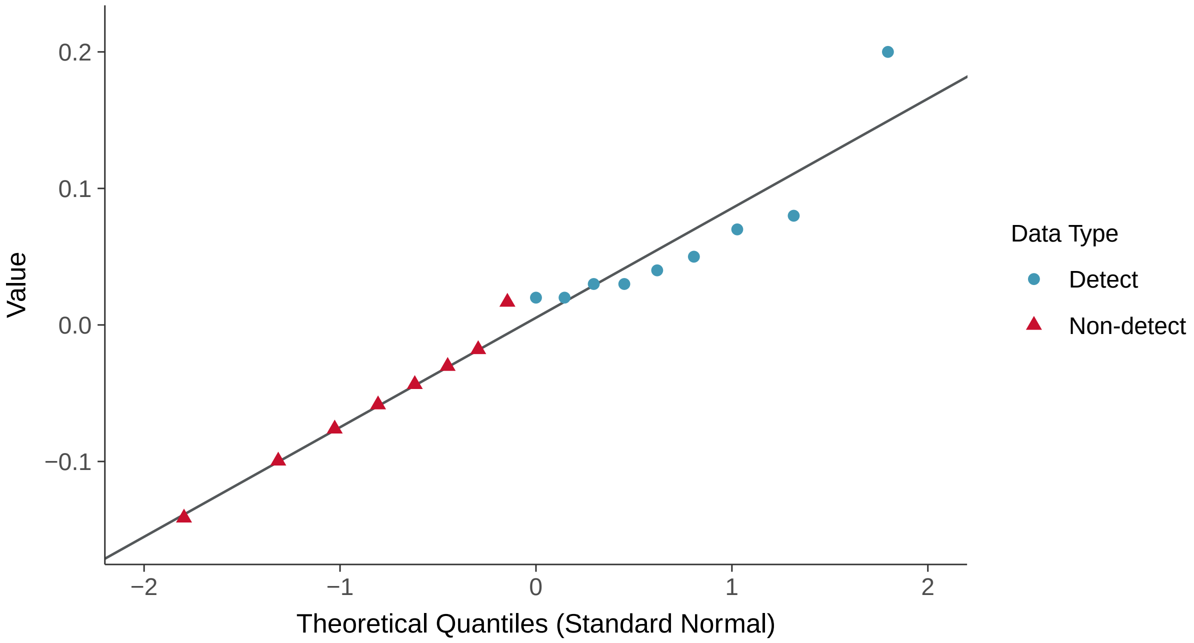
Iron, MW-6 (mg/L)



Boxplot by Season

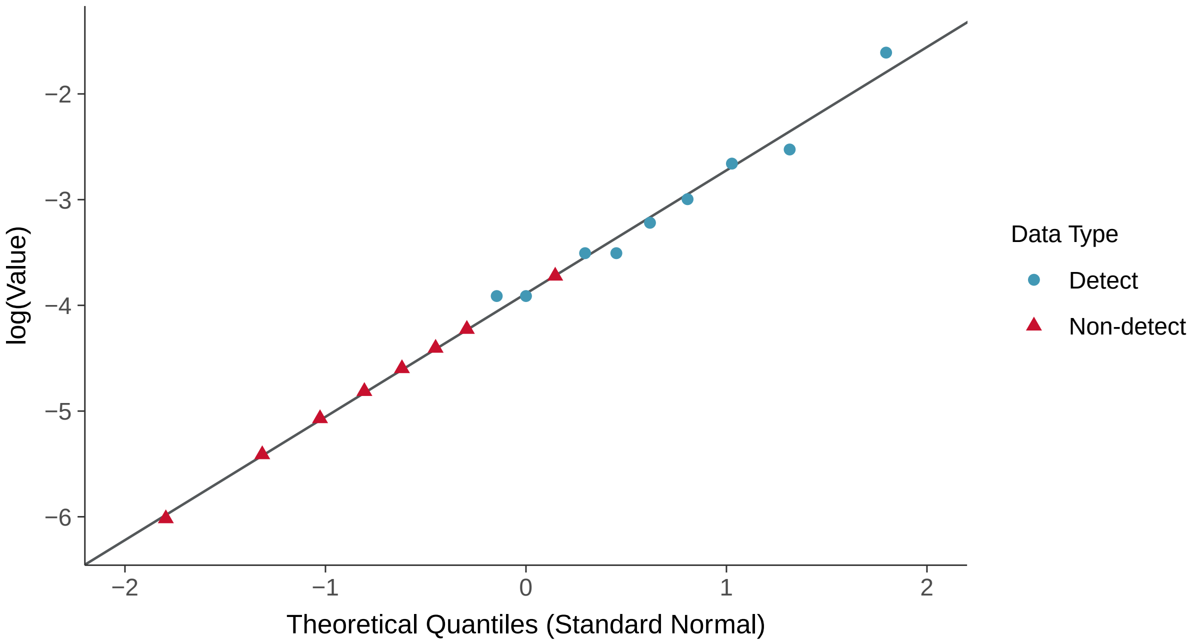
Iron, MW-6 (mg/L)





Normal Q-Q plot using ROS Imputed Estimates

Iron, MW-6 (mg/L)

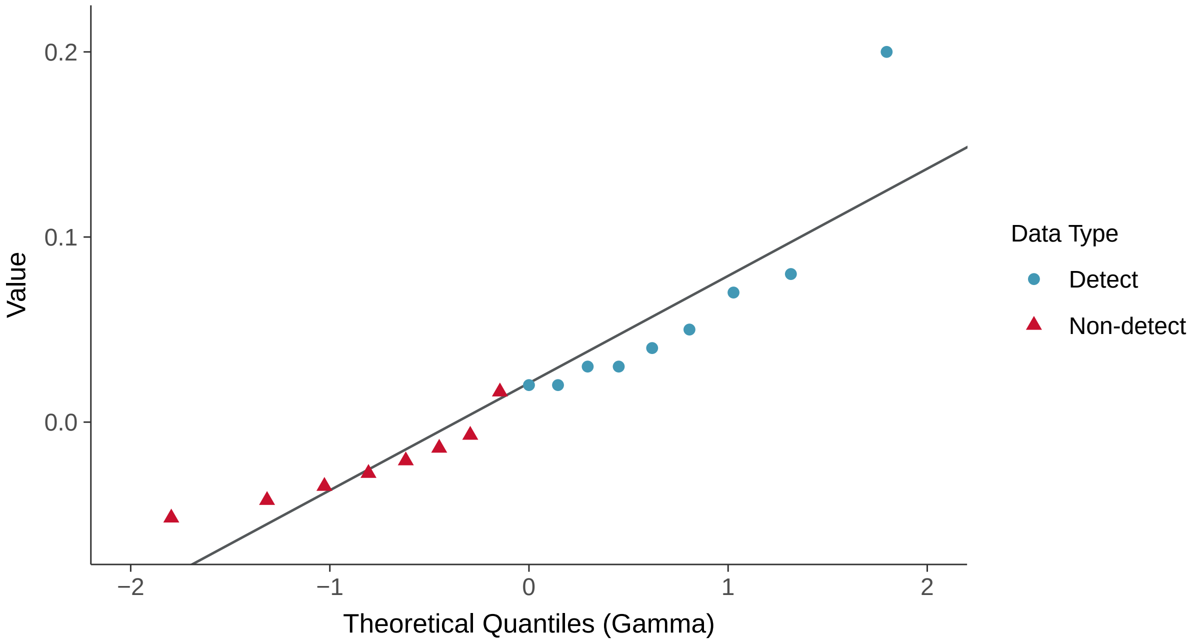


Lognormal Q-Q plot using ROS Imputed Estimates

Iron, MW-6 (mg/L)

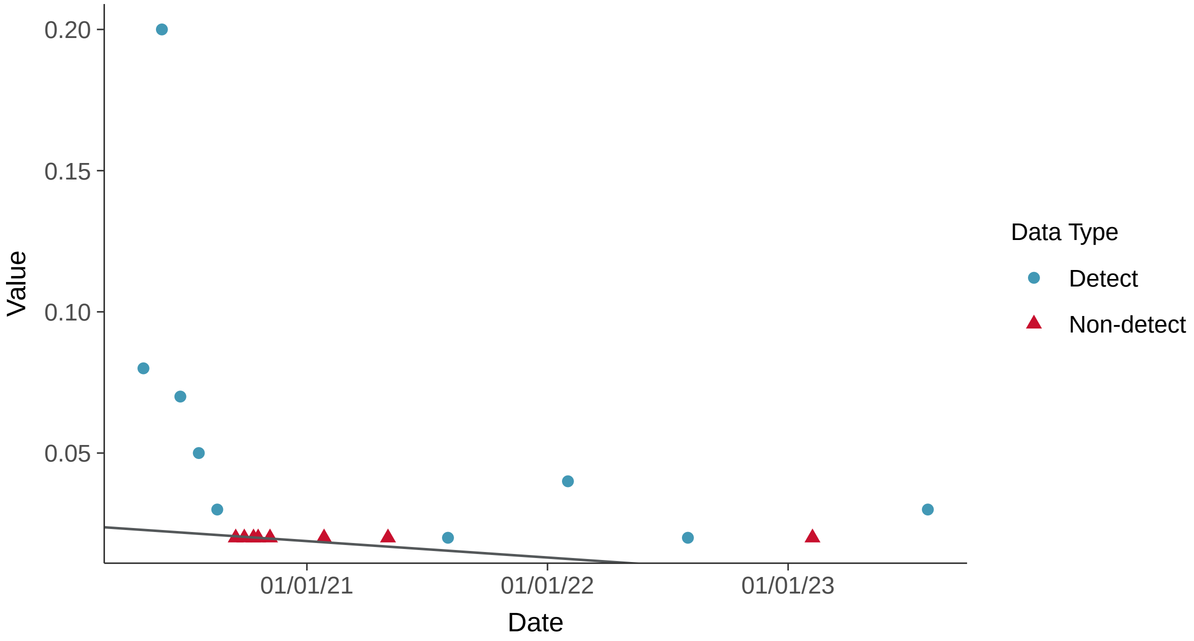
Gamma Q-Q plot using ROS Imputed Estimates

Iron, MW-6 (mg/L)



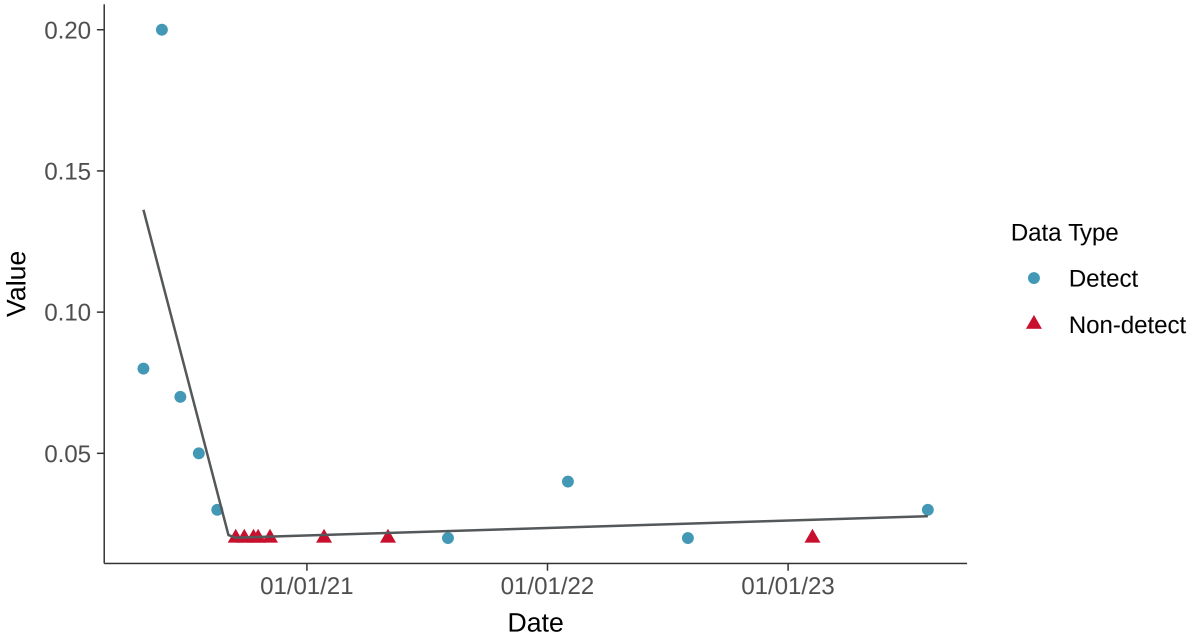
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Iron, MW-6 (mg/L)



Trend Regression: Piecewise Linear-Linear

Iron, MW-6 (mg/L)

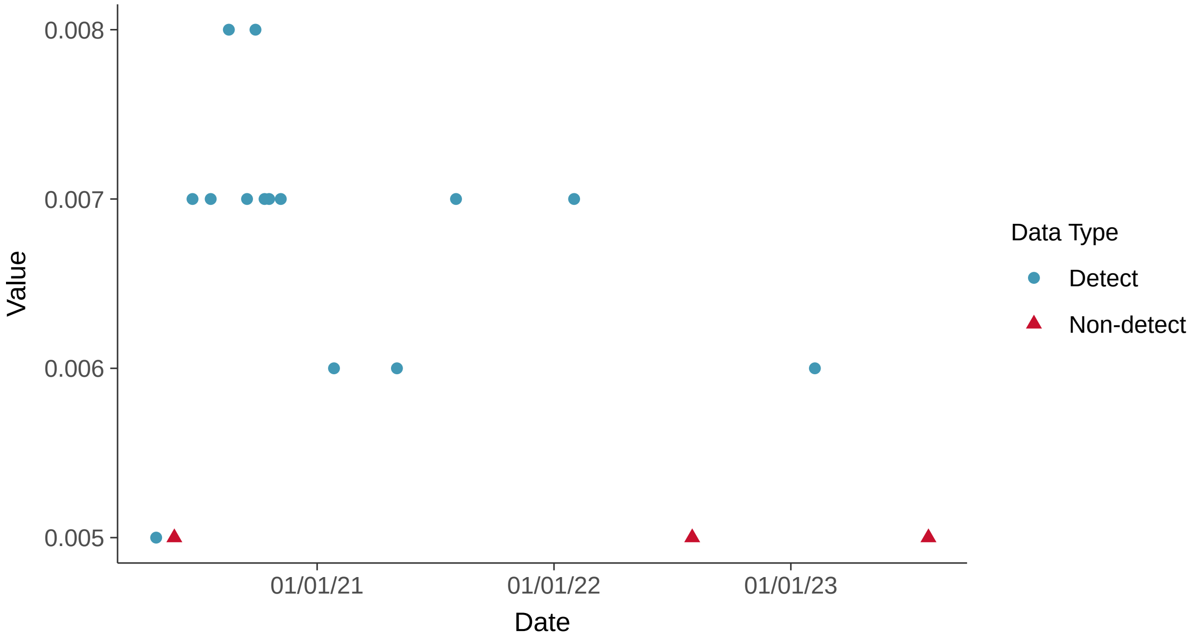


Part 115: Nickel, MW-6

ID: 06_5_39

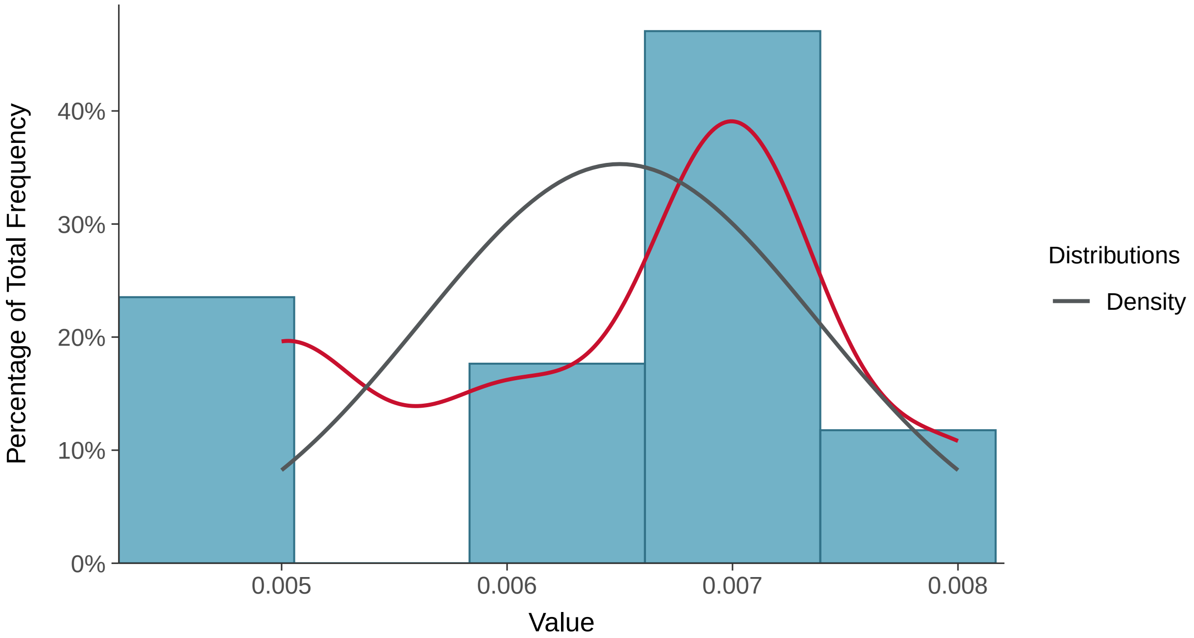
Scatter Plot

Nickel, MW-6 (mg/L)



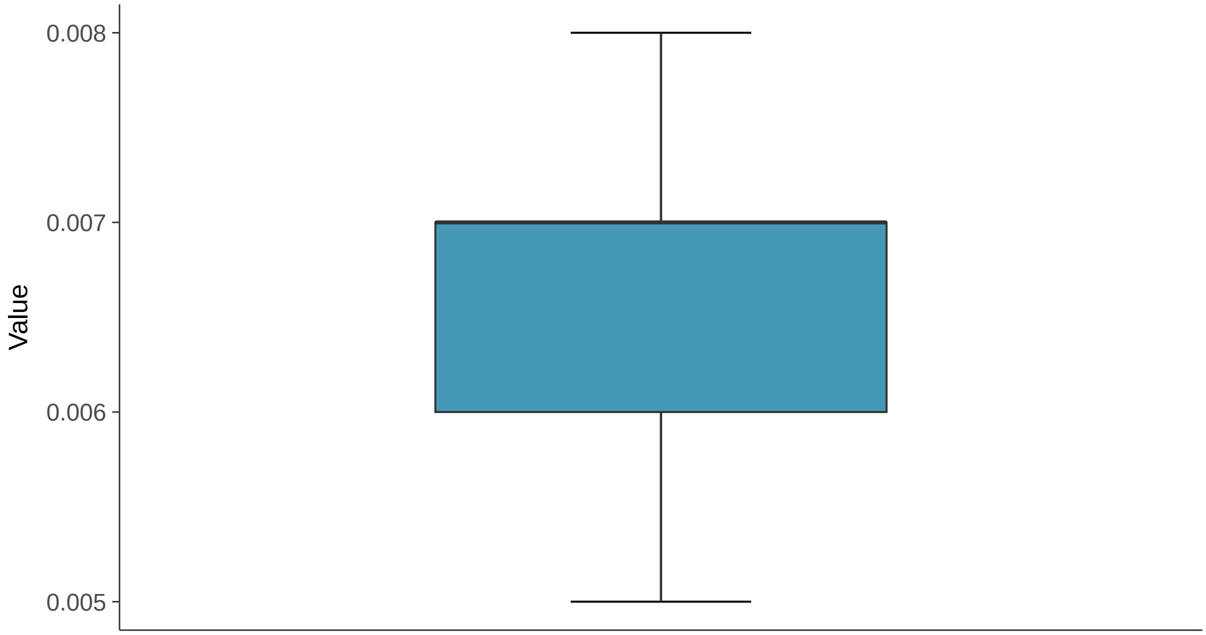
Histogram

Nickel, MW-6 (mg/L)



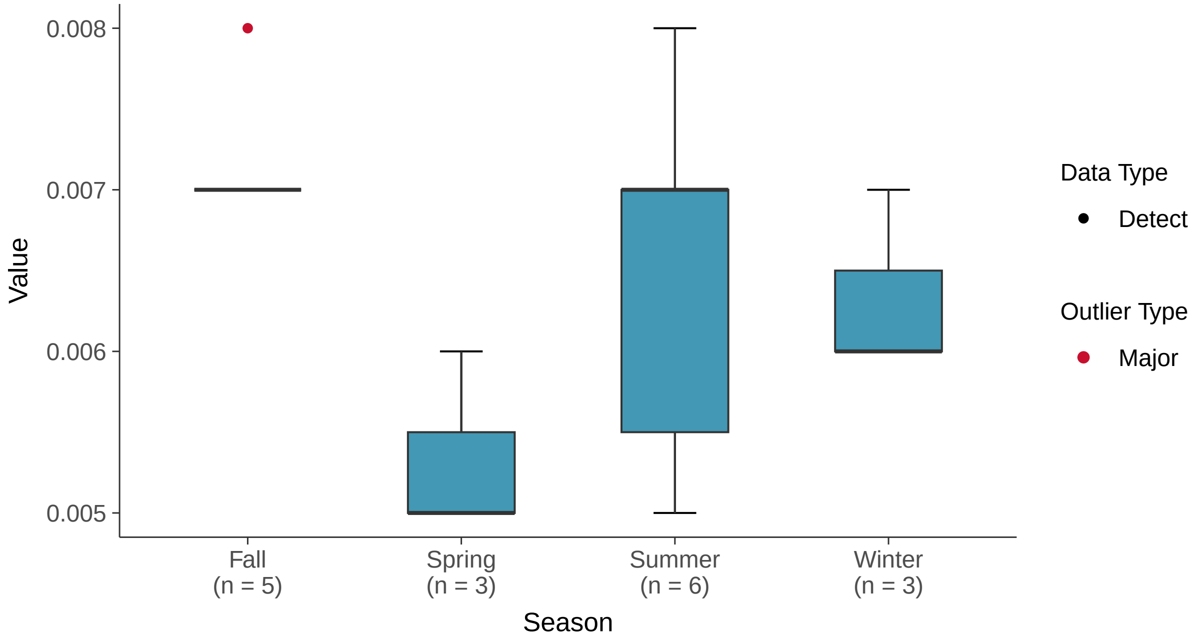
Boxplot

Nickel, MW-6 (mg/L)



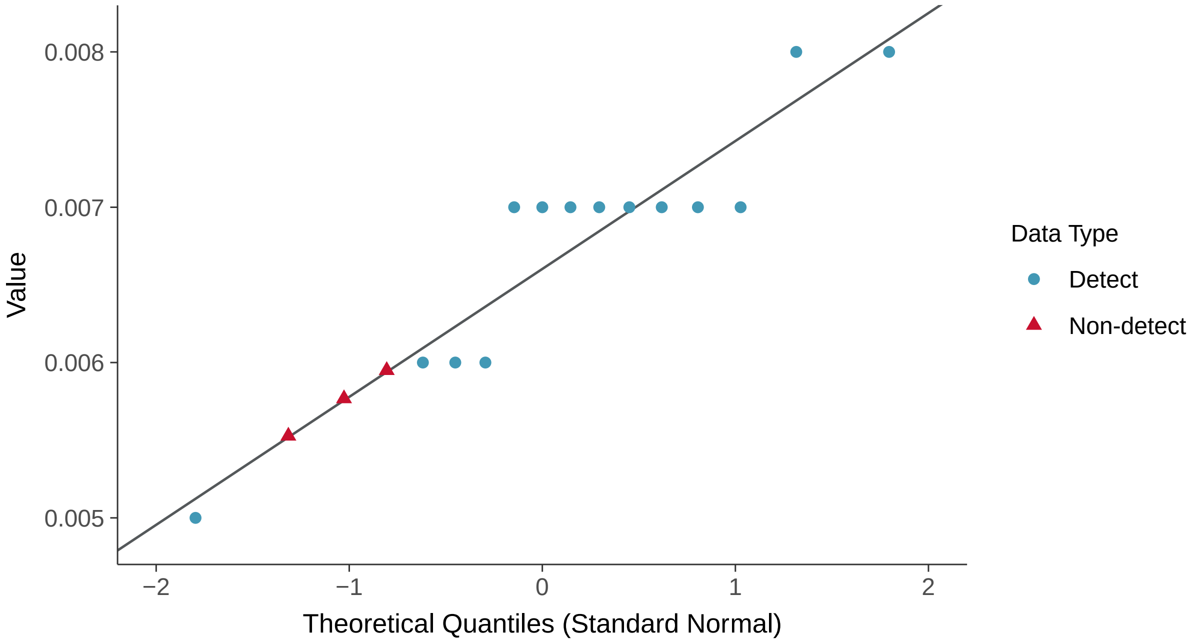
Boxplot by Season

Nickel, MW-6 (mg/L)



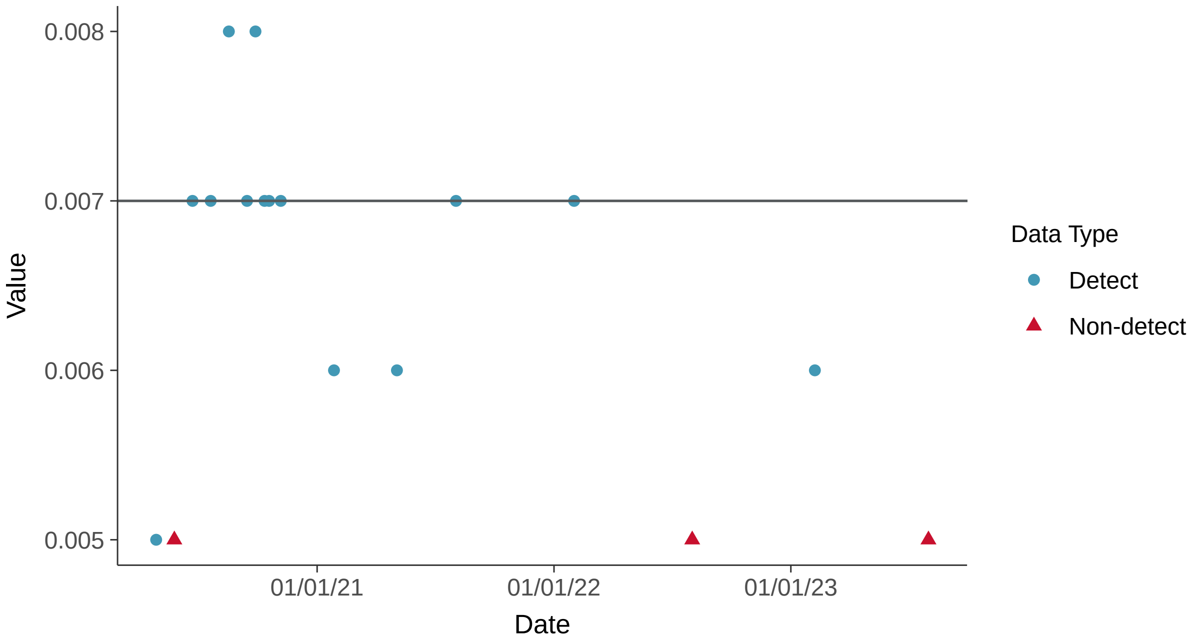
Normal Q-Q plot using ROS Imputed Estimates

Nickel, MW-6 (mg/L)



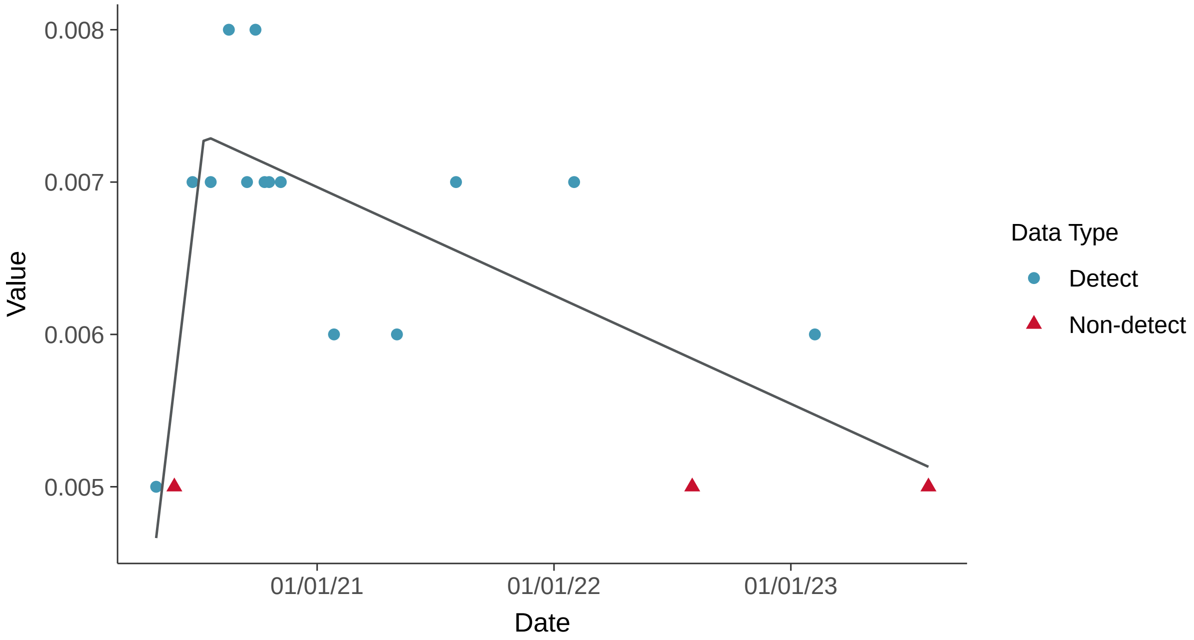
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Nickel, MW-6 (mg/L)



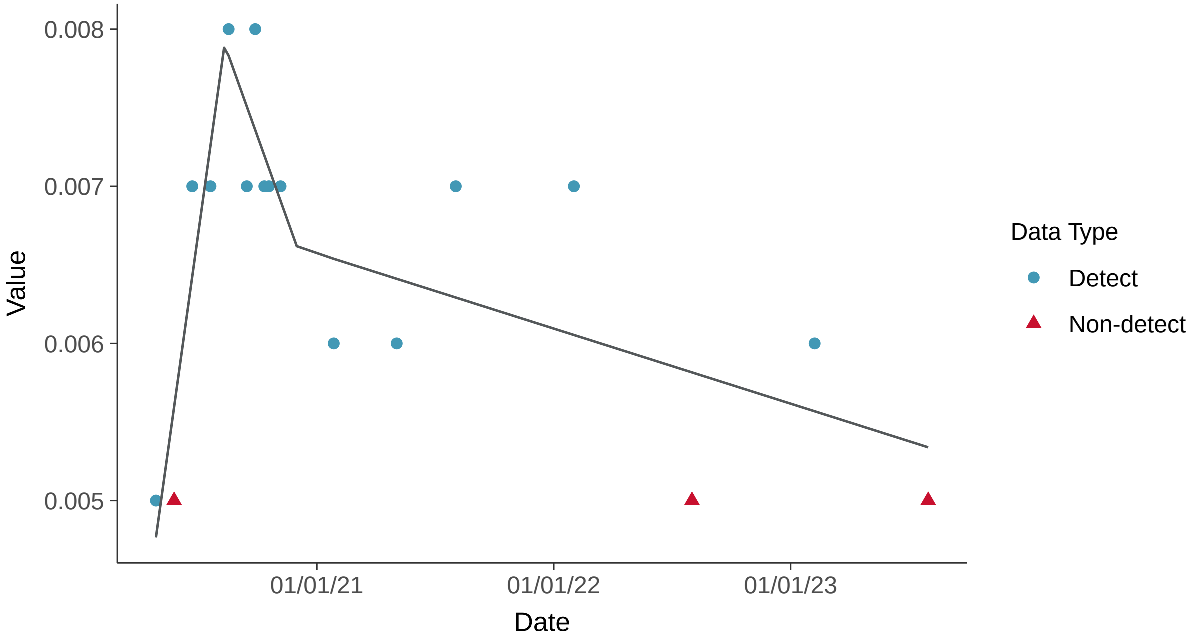
Trend Regression: Piecewise Linear-Linear

Nickel, MW-6 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Nickel, MW-6 (mg/L)

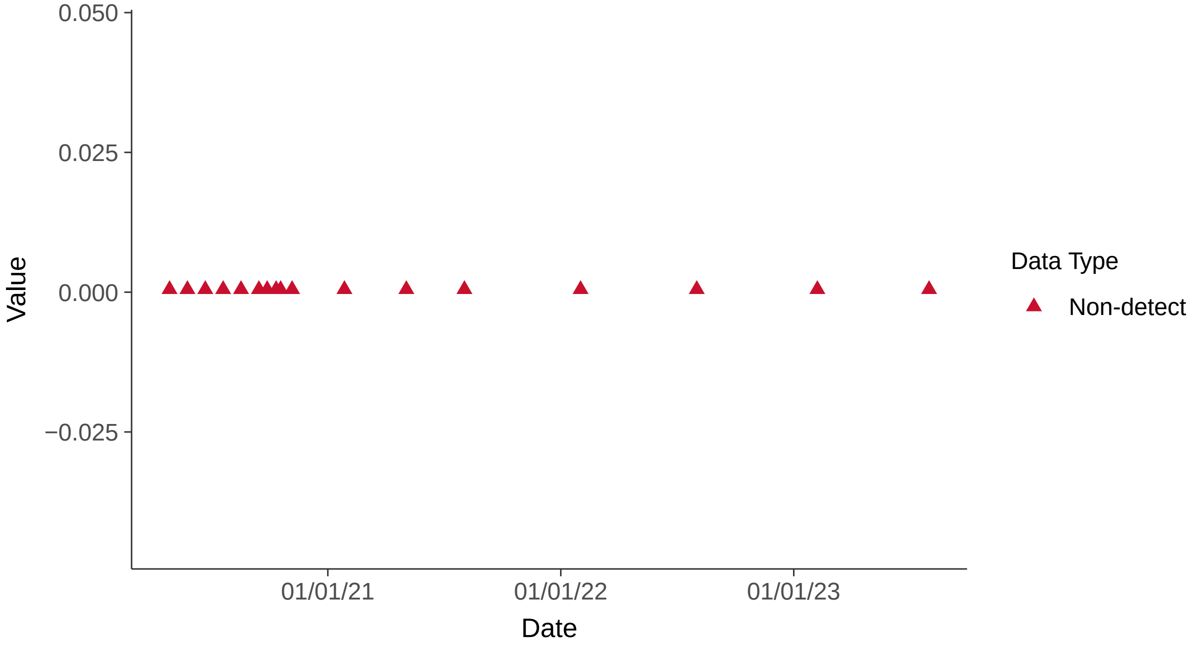


Part 115: Silver, MW-6

ID: 06_5_40

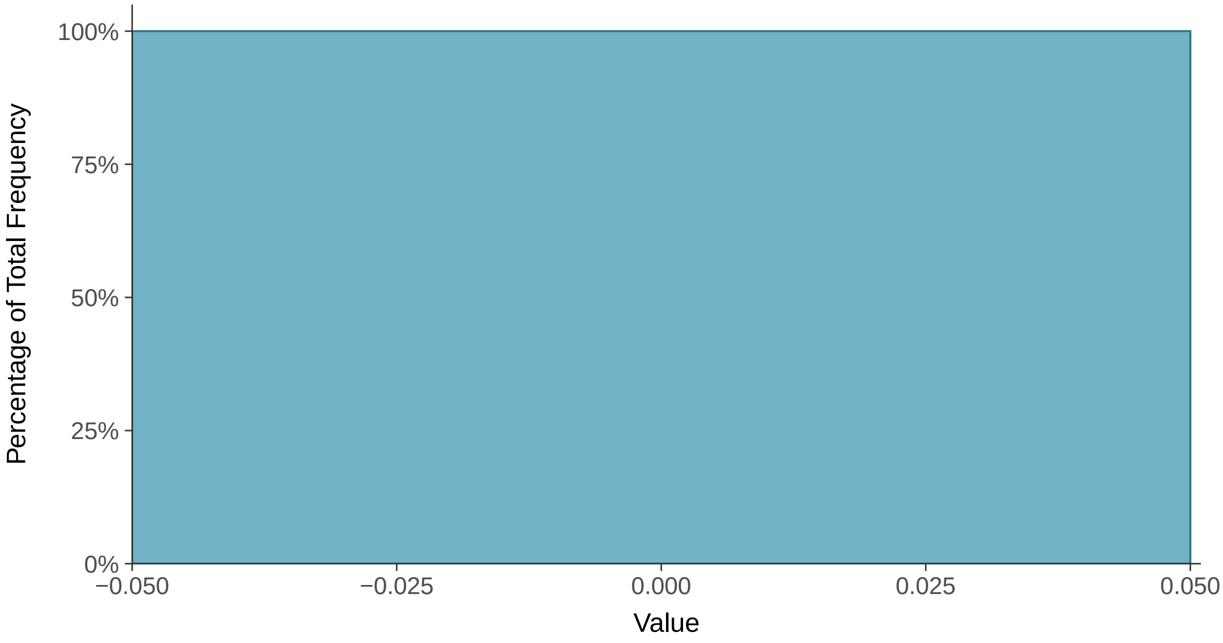
Scatter Plot

Silver, MW-6 (mg/L)



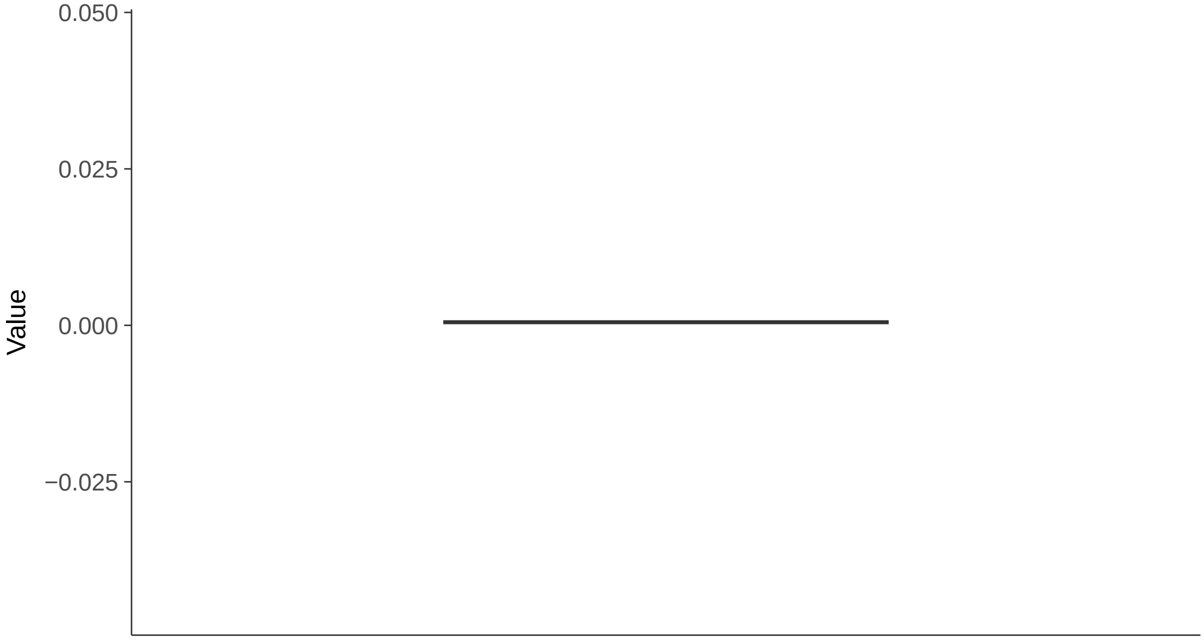
Histogram

Silver, MW-6 (mg/L)



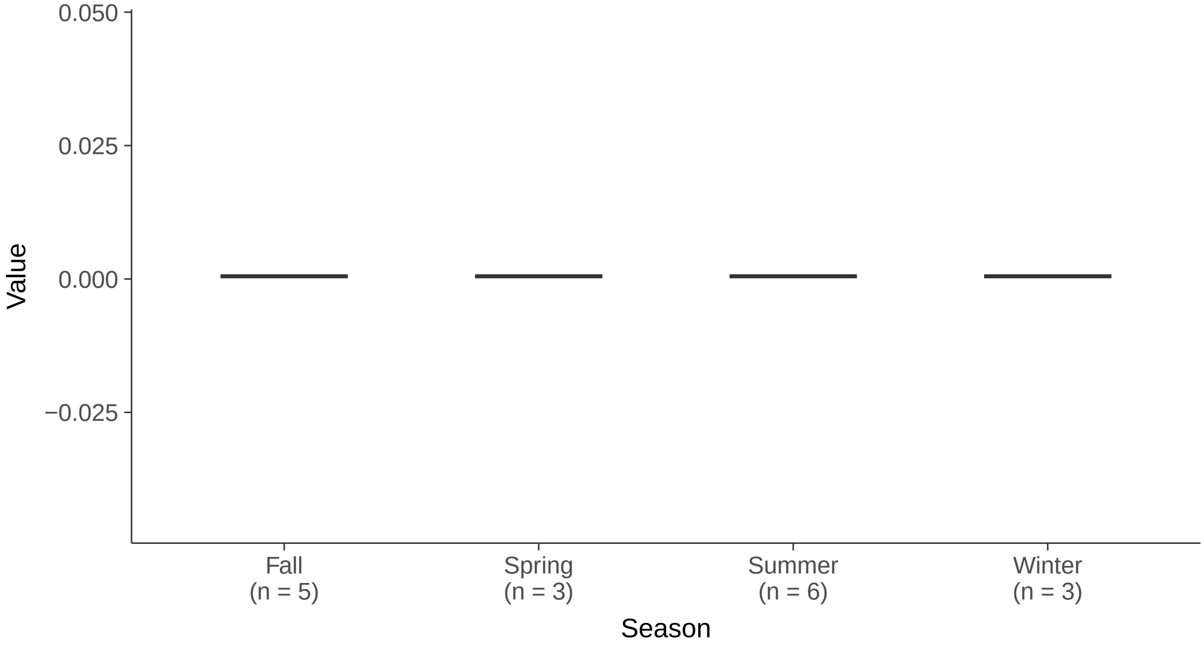
Boxplot

Silver, MW-6 (mg/L)



Boxplot by Season

Silver, MW-6 (mg/L)

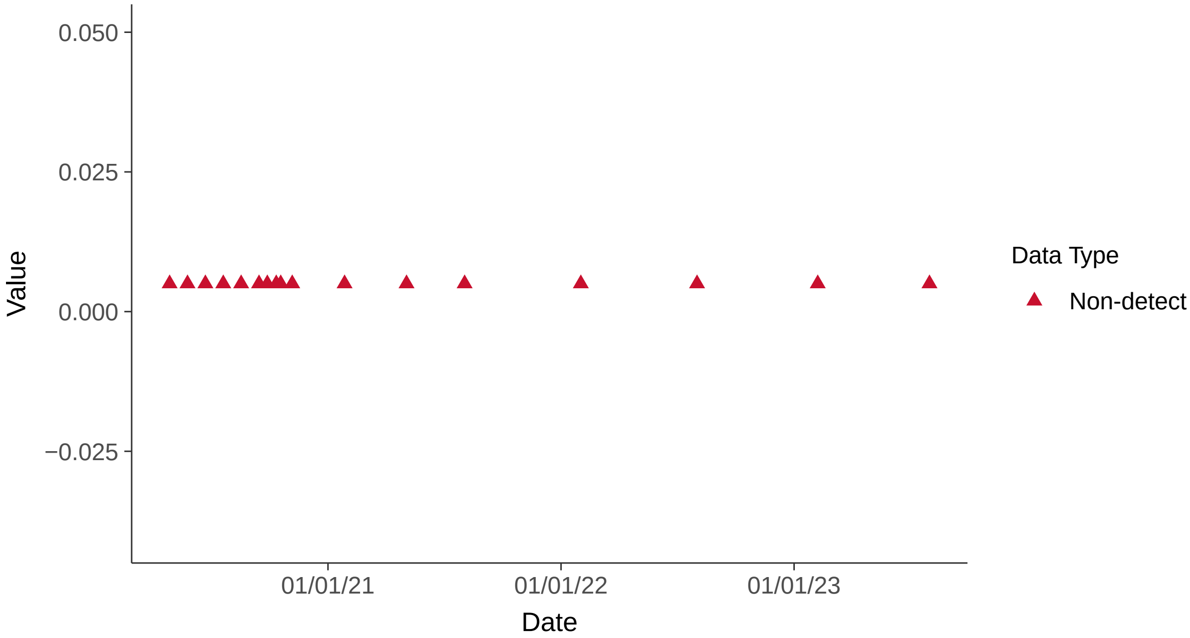


Part 115: Vanadium, MW-6

ID: 06_5_41

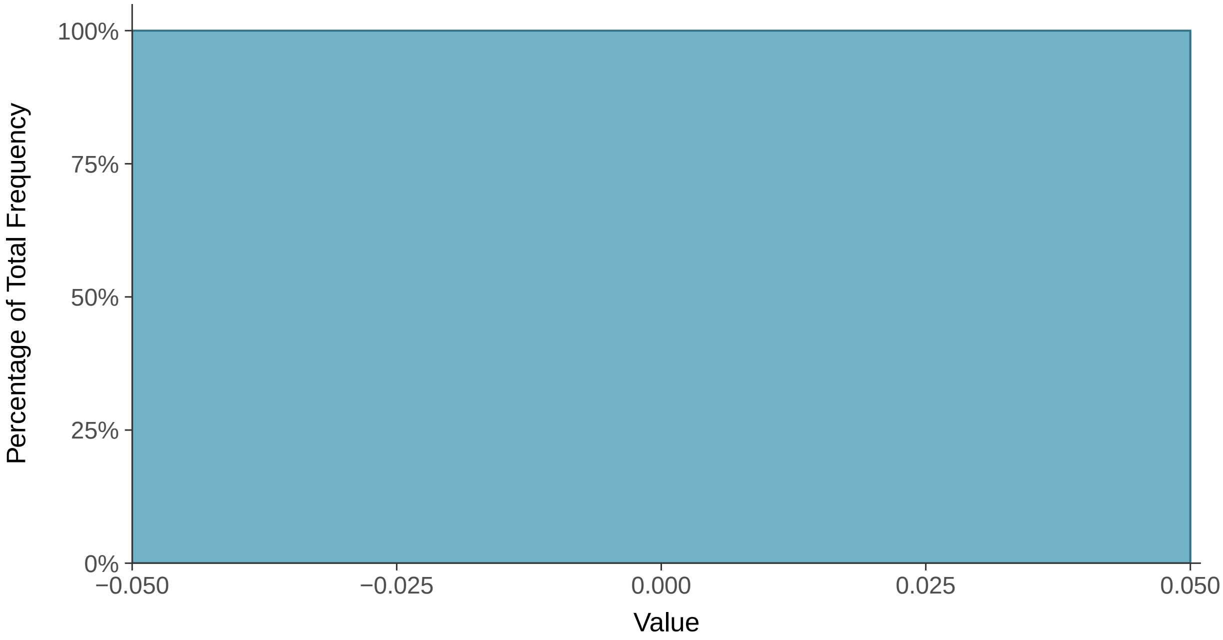
Scatter Plot

Vanadium, MW-6 (mg/L)



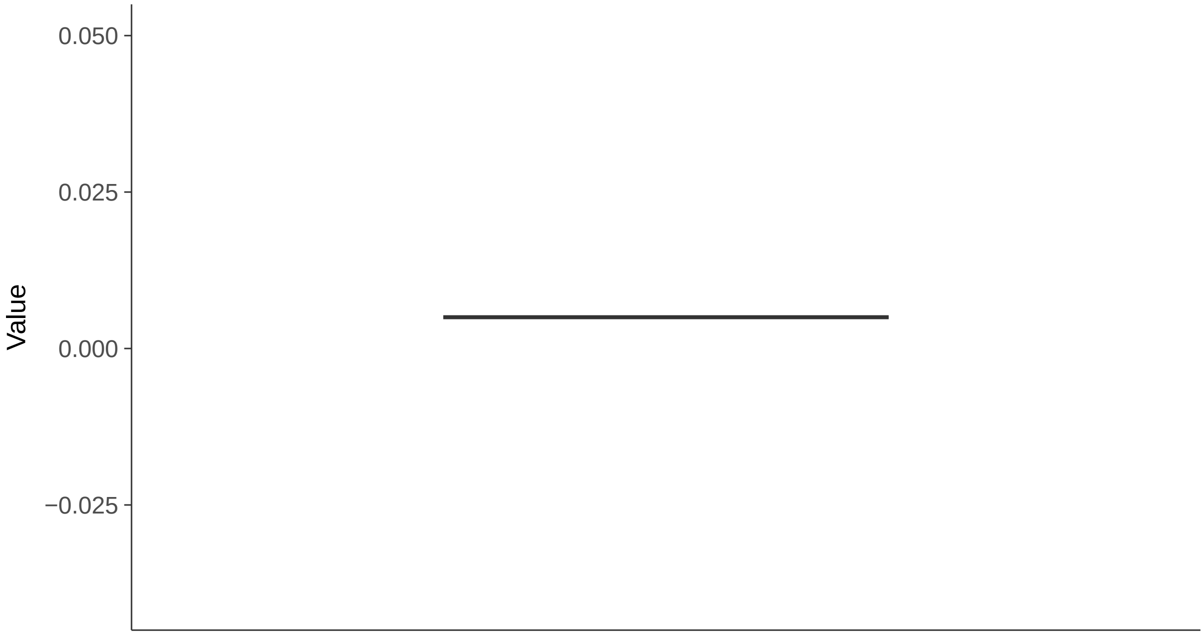
Histogram

Vanadium, MW-6 (mg/L)



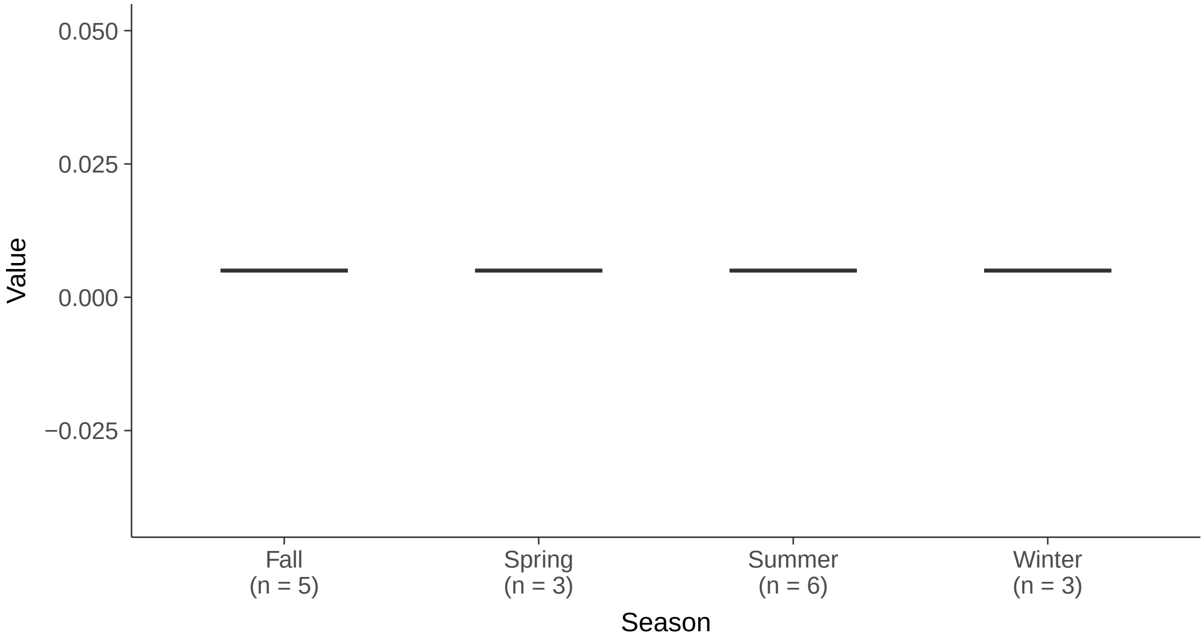
Boxplot

Vanadium, MW-6 (mg/L)



Boxplot by Season

Vanadium, MW-6 (mg/L)

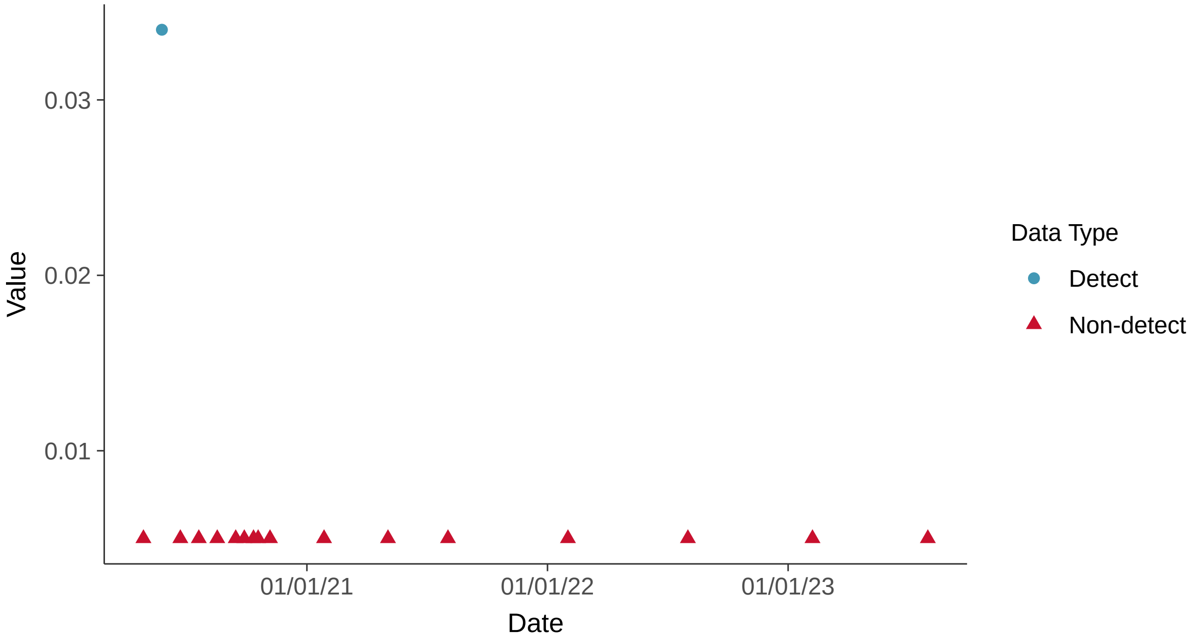


Part 115: Zinc, MW-6

ID: 06_5_42

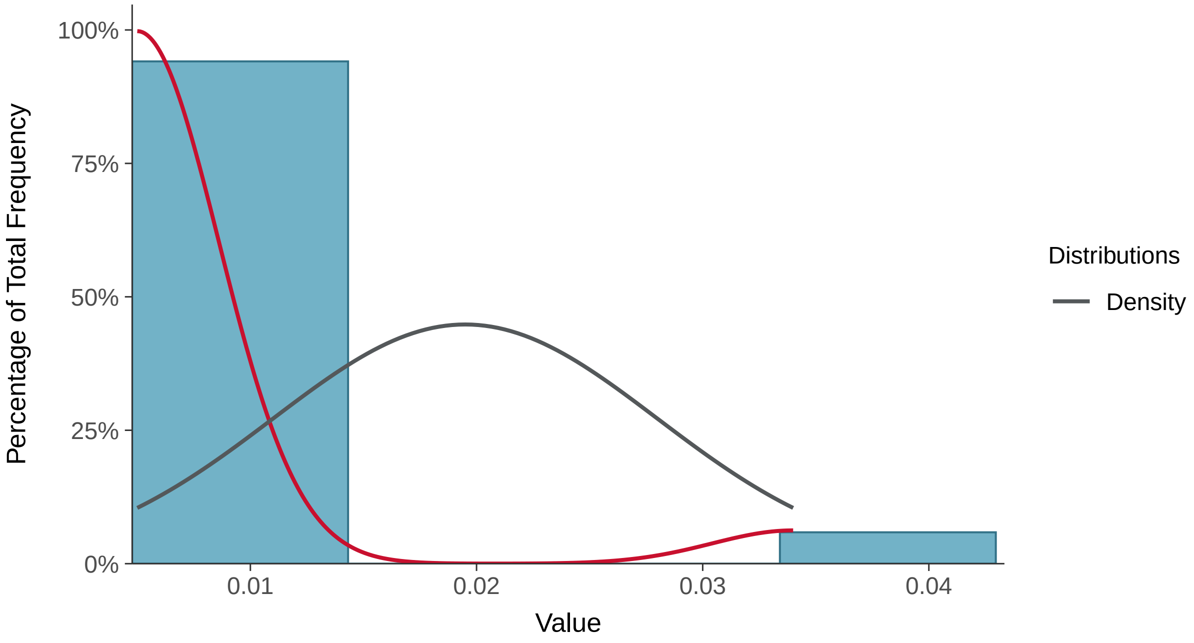
Scatter Plot

Zinc, MW-6 (mg/L)



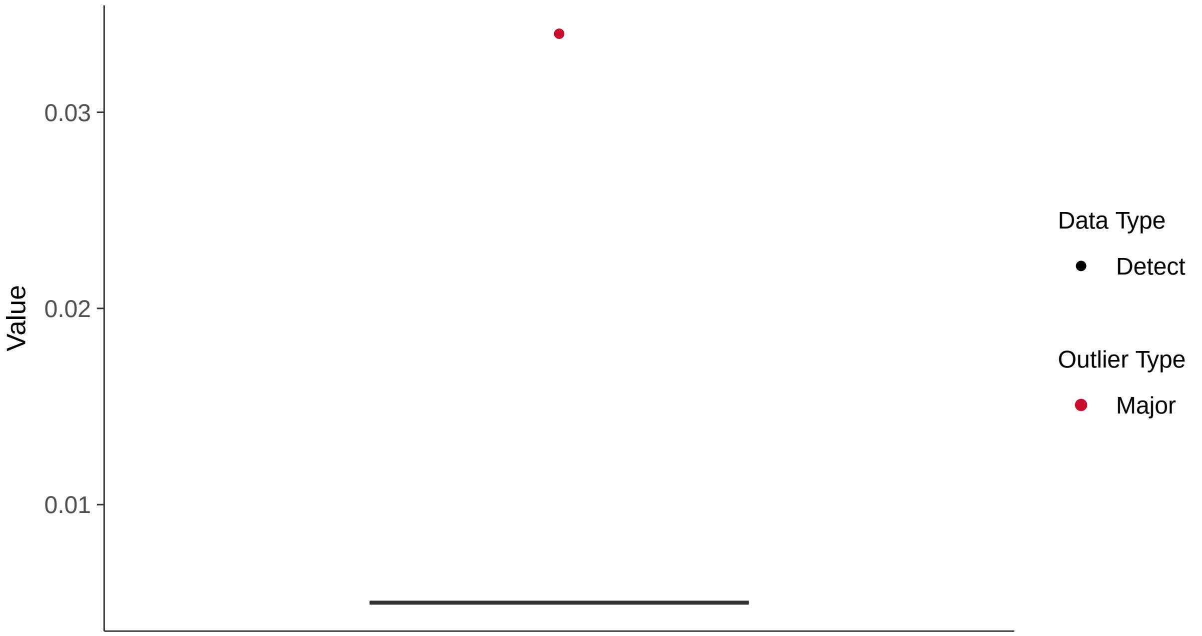
Histogram

Zinc, MW-6 (mg/L)



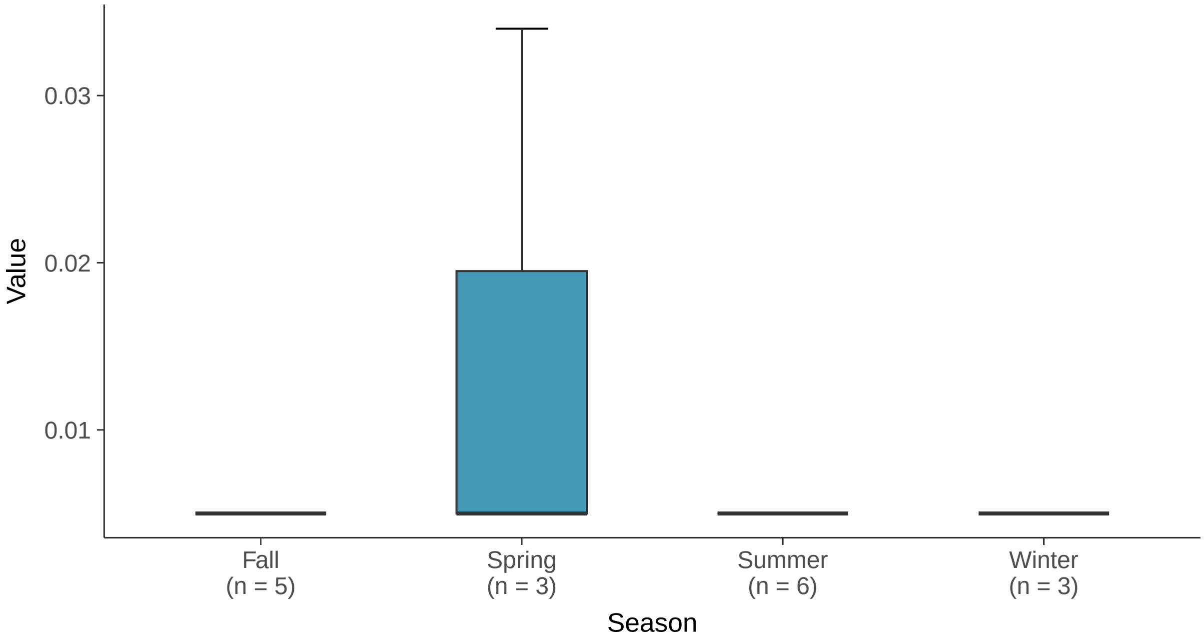
Boxplot

Zinc, MW-6 (mg/L)



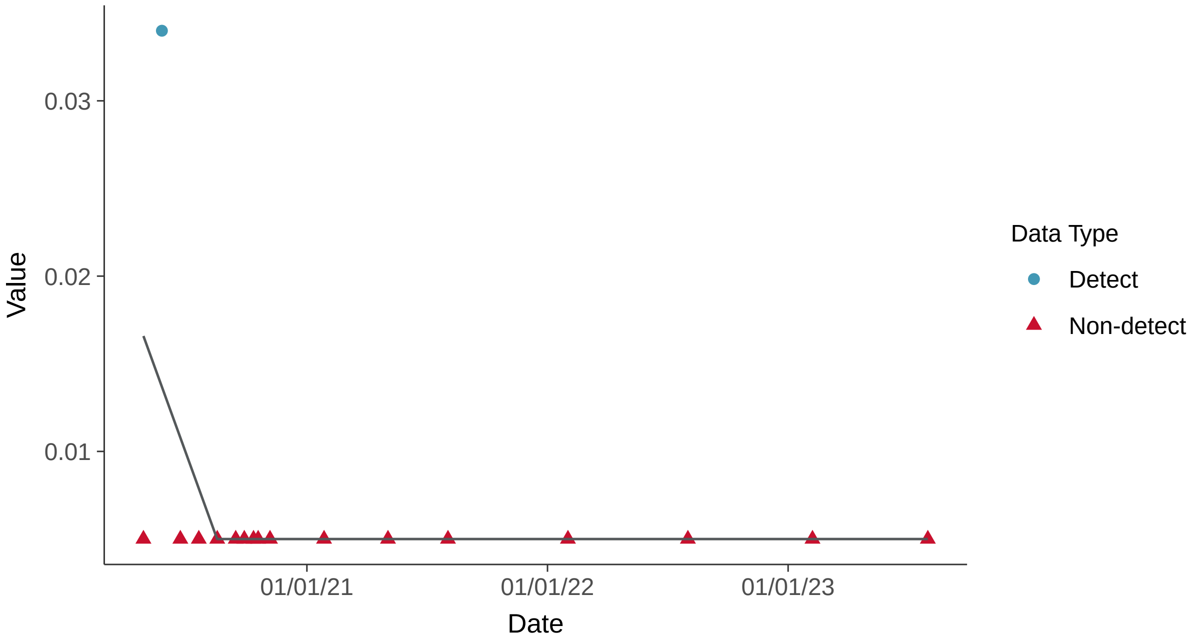
Boxplot by Season

Zinc, MW-6 (mg/L)



Trend Regression: Piecewise Linear-Linear

Zinc, MW-6 (mg/L)

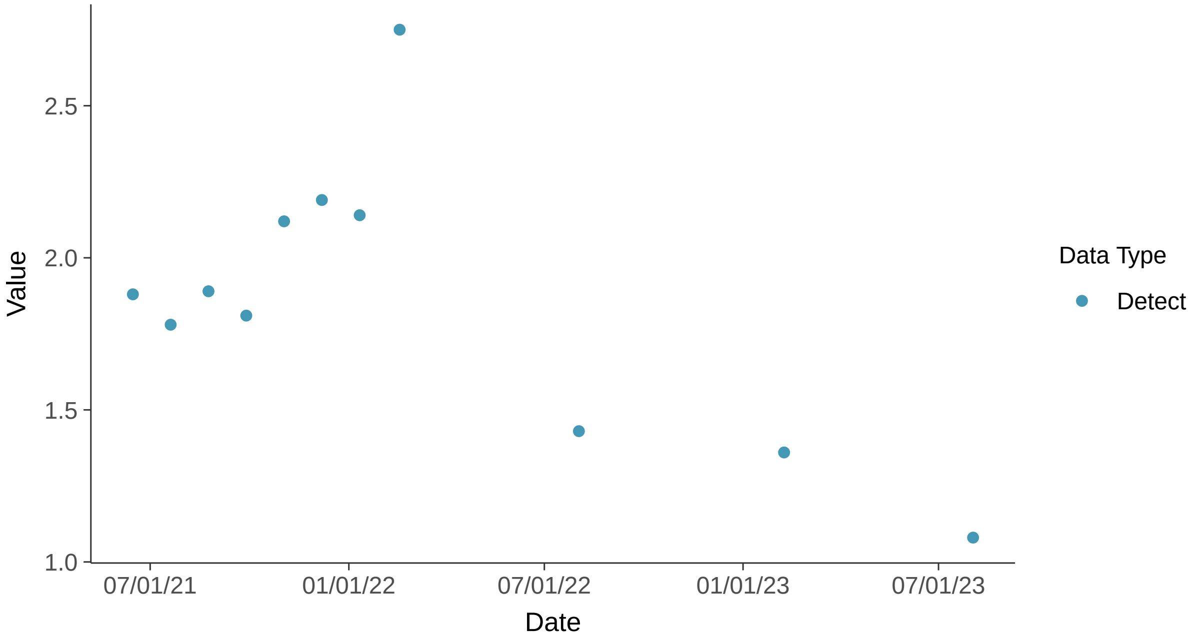


Appendix III: Boron, MW-7

ID: 07_1_01

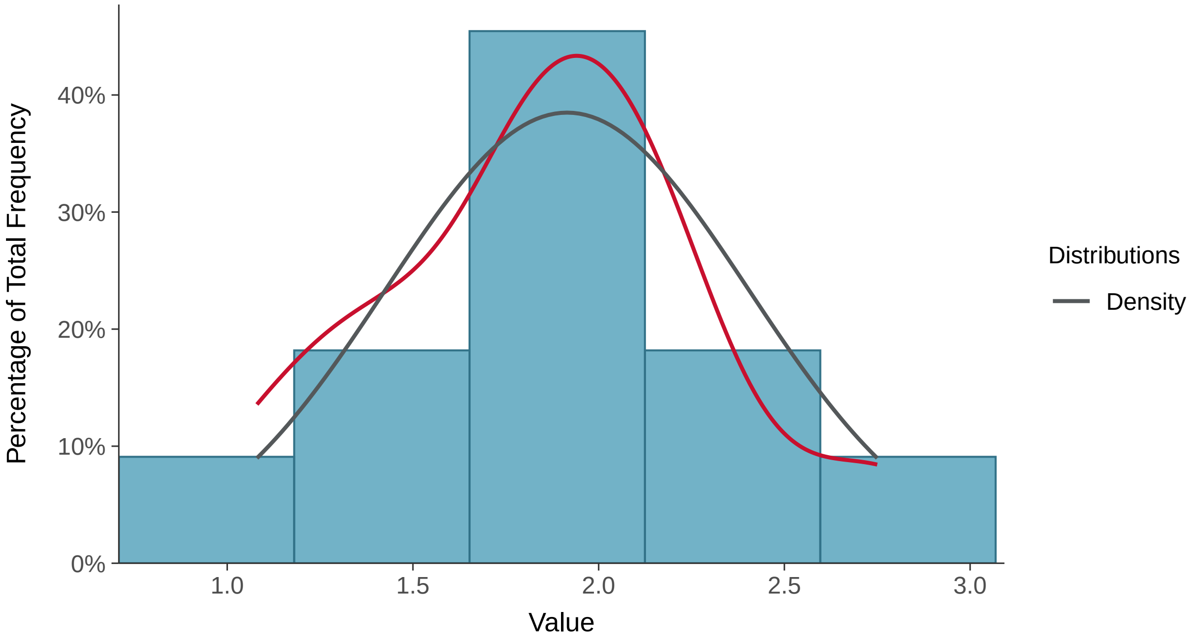
Scatter Plot

Boron, MW-7 (mg/L)



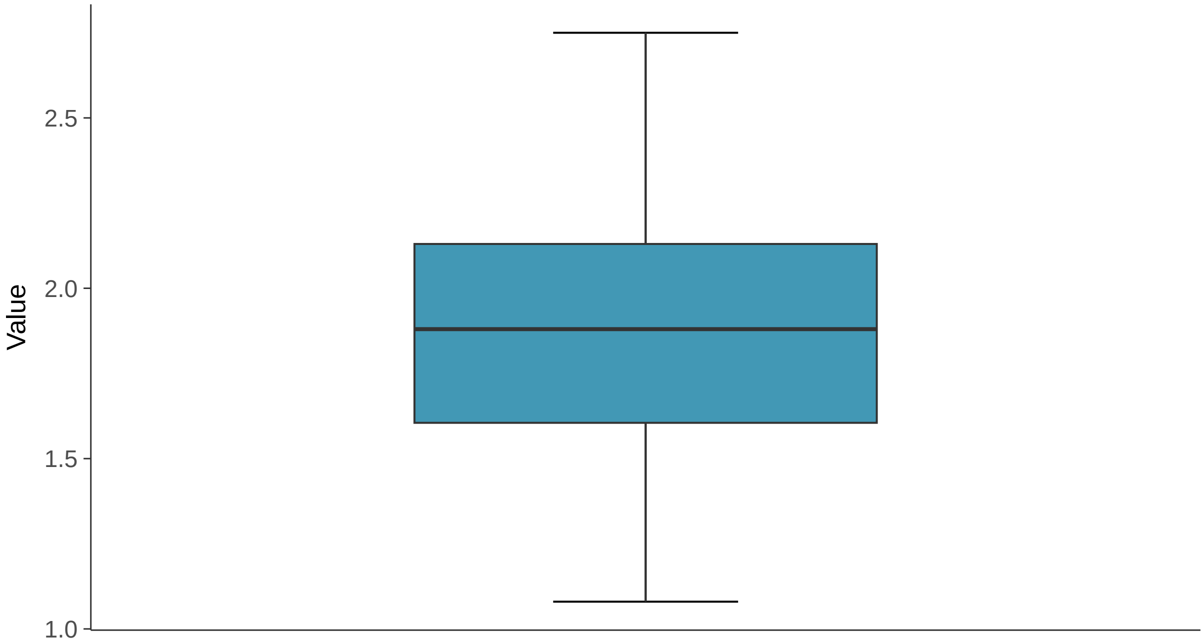
Histogram

Boron, MW-7 (mg/L)



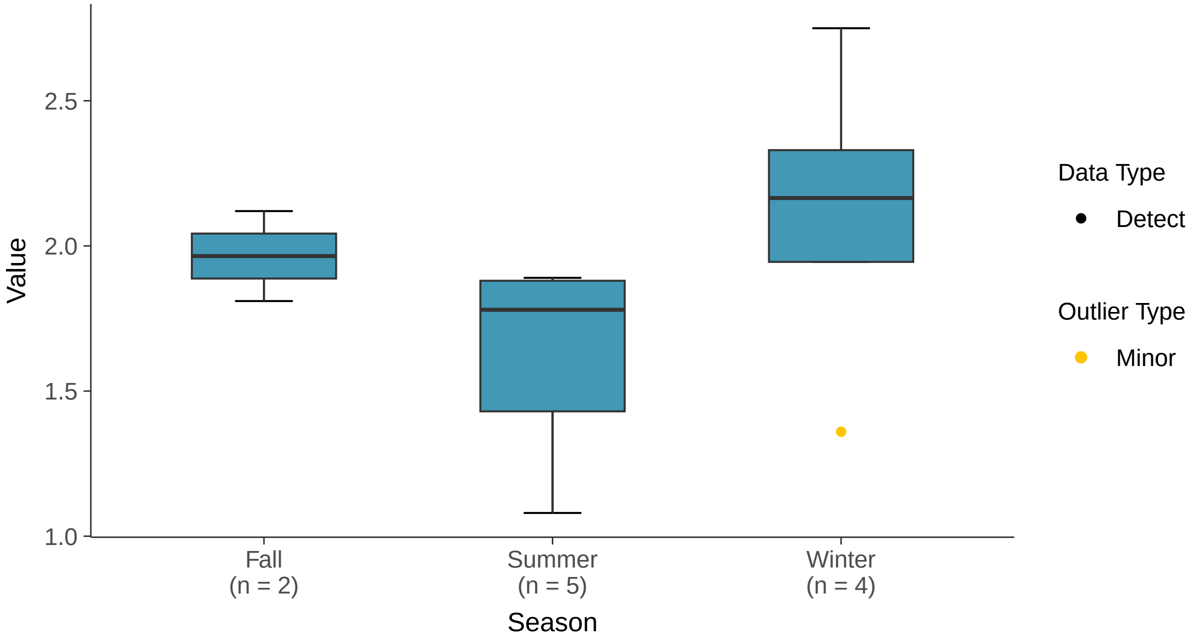
Boxplot

Boron, MW-7 (mg/L)



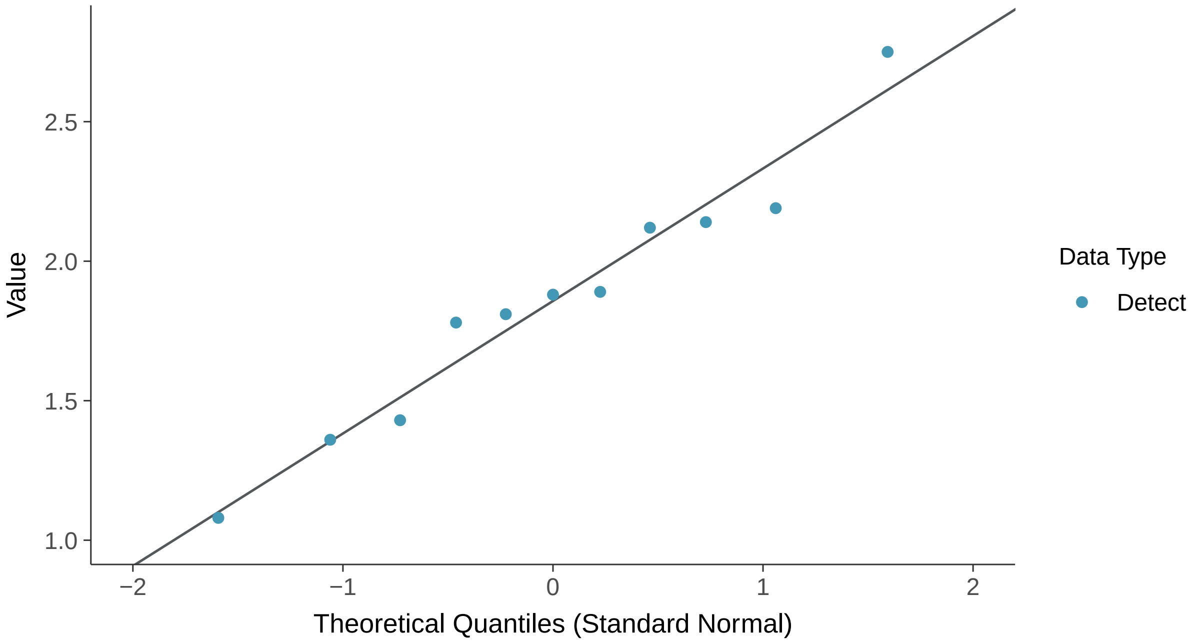
Boxplot by Season

Boron, MW-7 (mg/L)



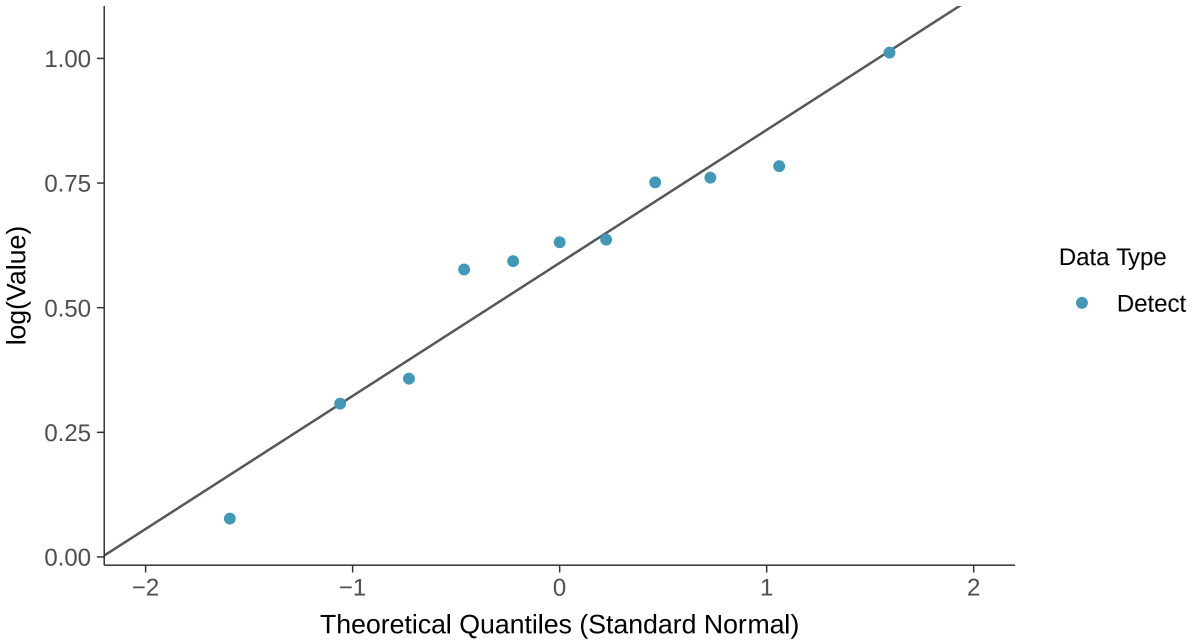
Normal Q-Q plot

Boron, MW-7 (mg/L)



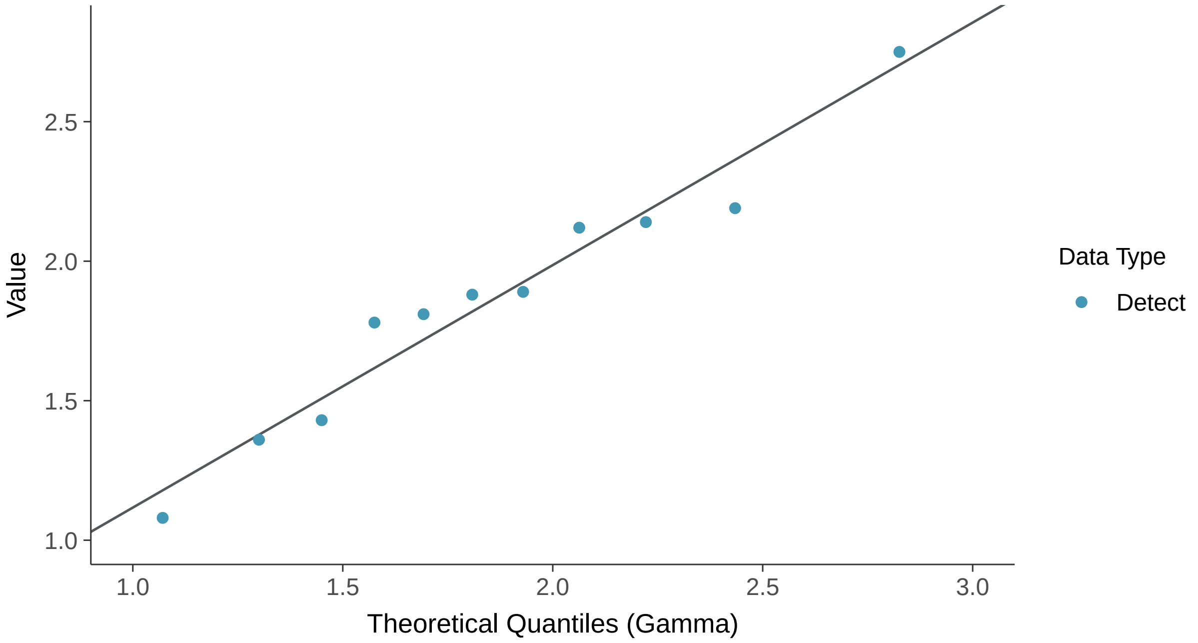
Lognormal Q-Q plot

Boron, MW-7 (mg/L)



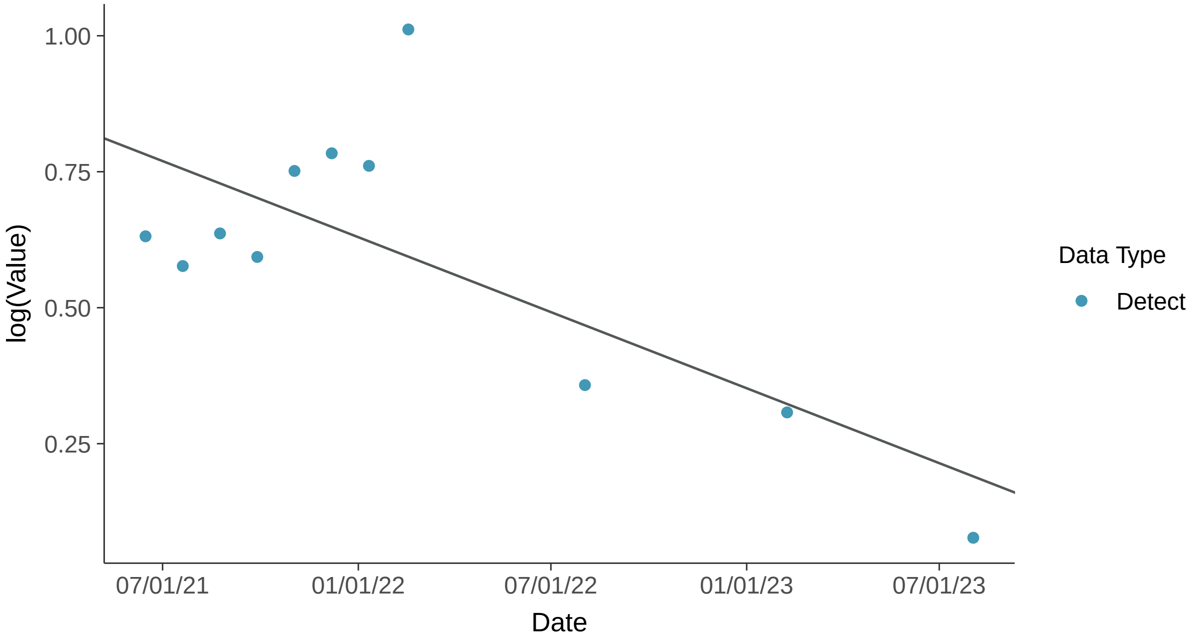
Gamma Q-Q plot

Boron, MW-7 (mg/L)



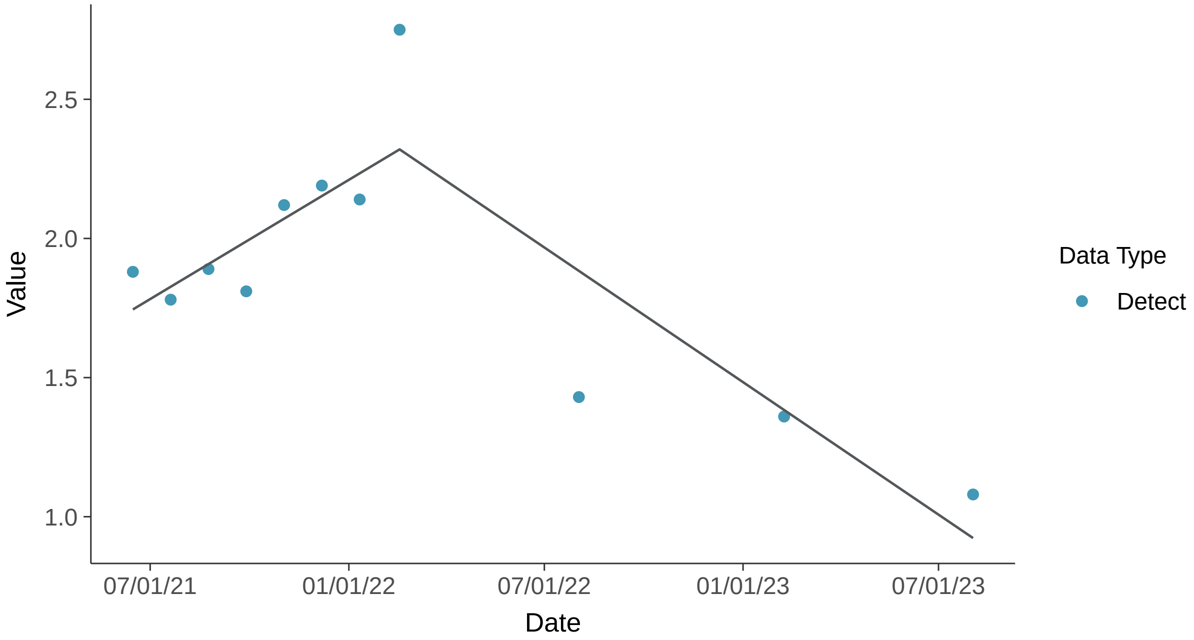
Trend Regression: Lognormal MLE

Boron, MW-7 (mg/L)



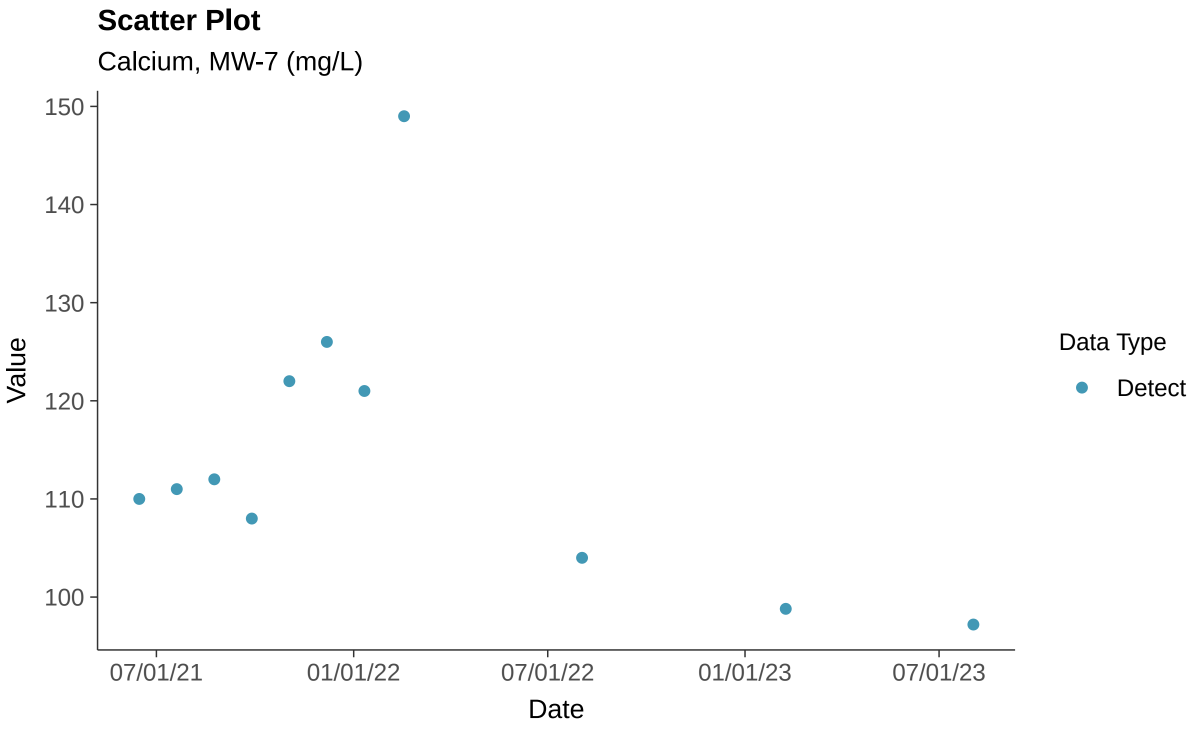
Trend Regression: Piecewise Linear-Linear

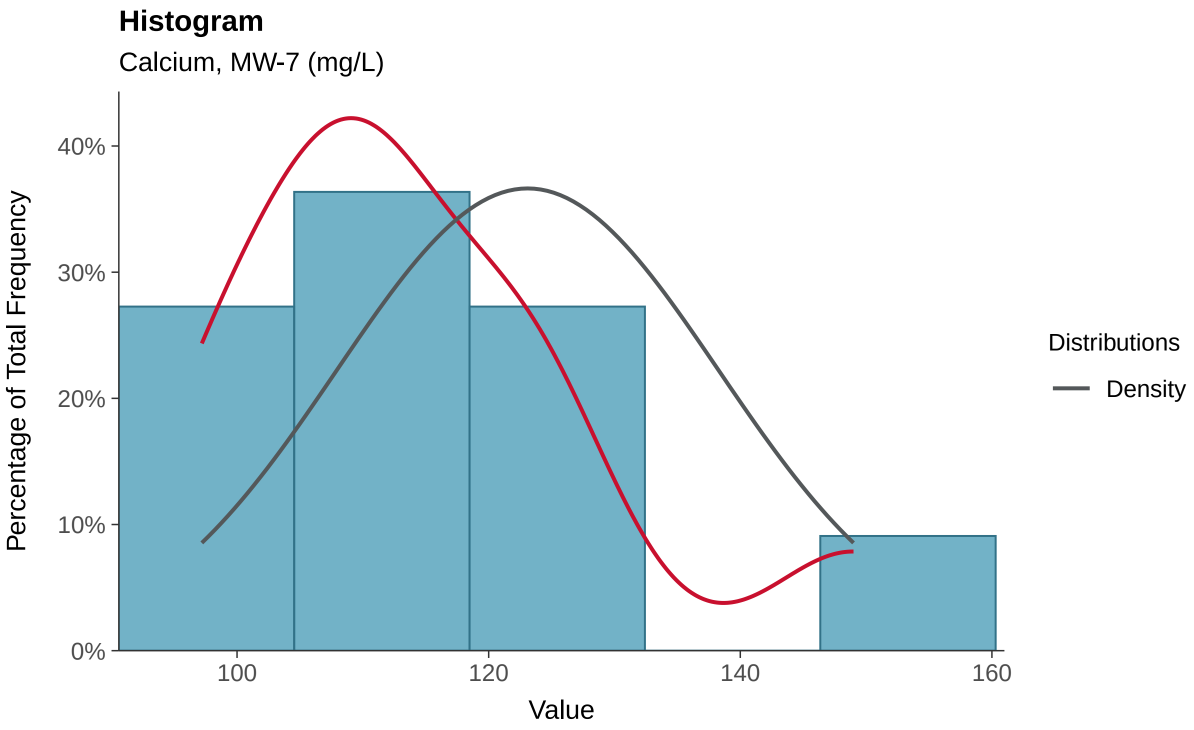
Boron, MW-7 (mg/L)



Appendix III: Calcium, MW-7

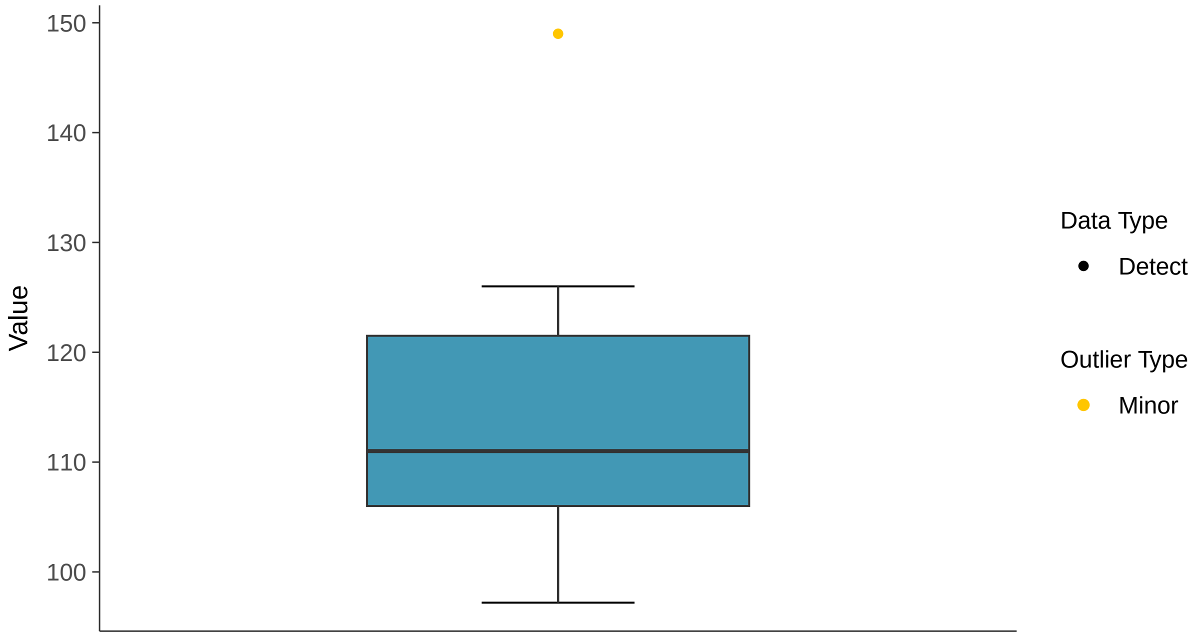
ID: 07_1_02





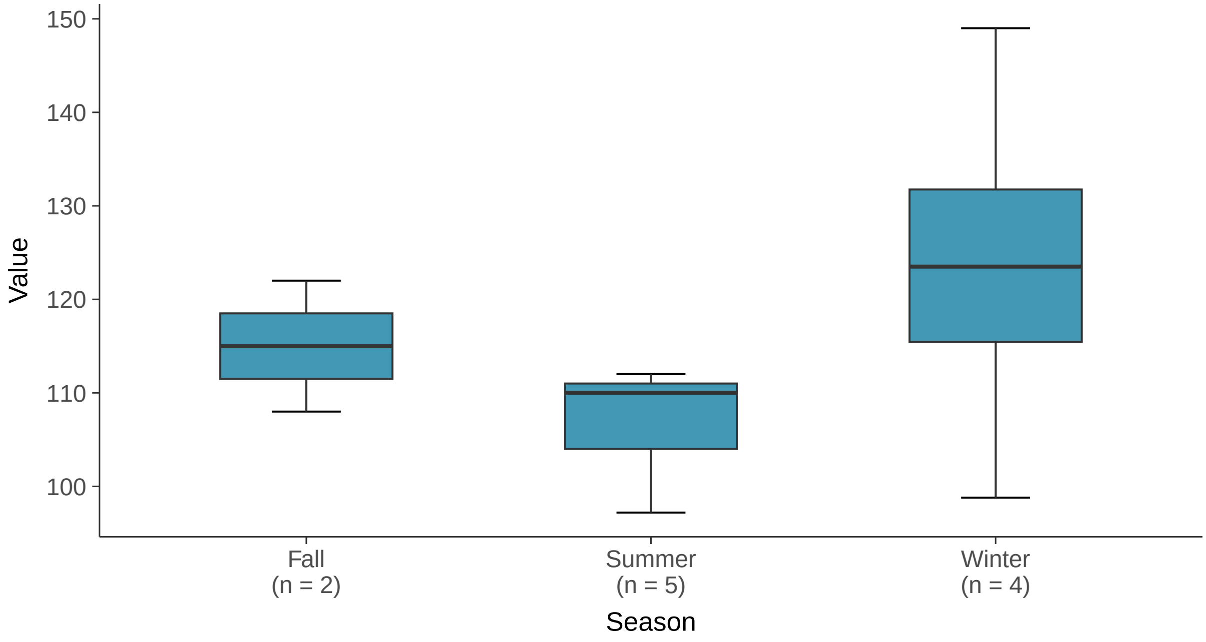
Boxplot

Calcium, MW-7 (mg/L)



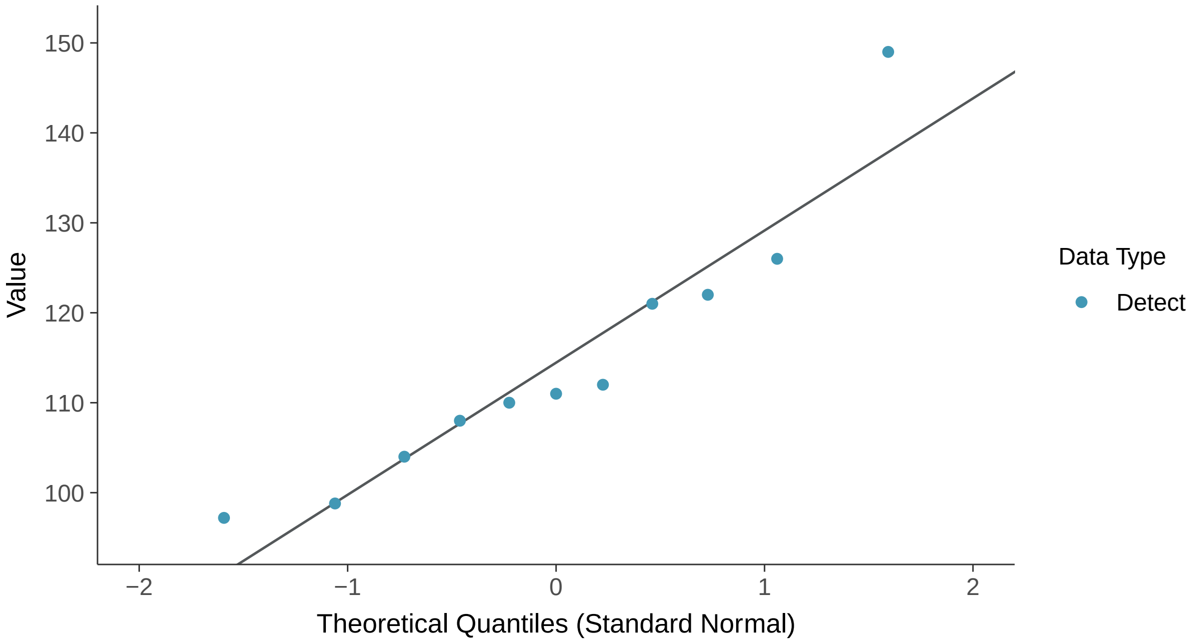
Boxplot by Season

Calcium, MW-7 (mg/L)



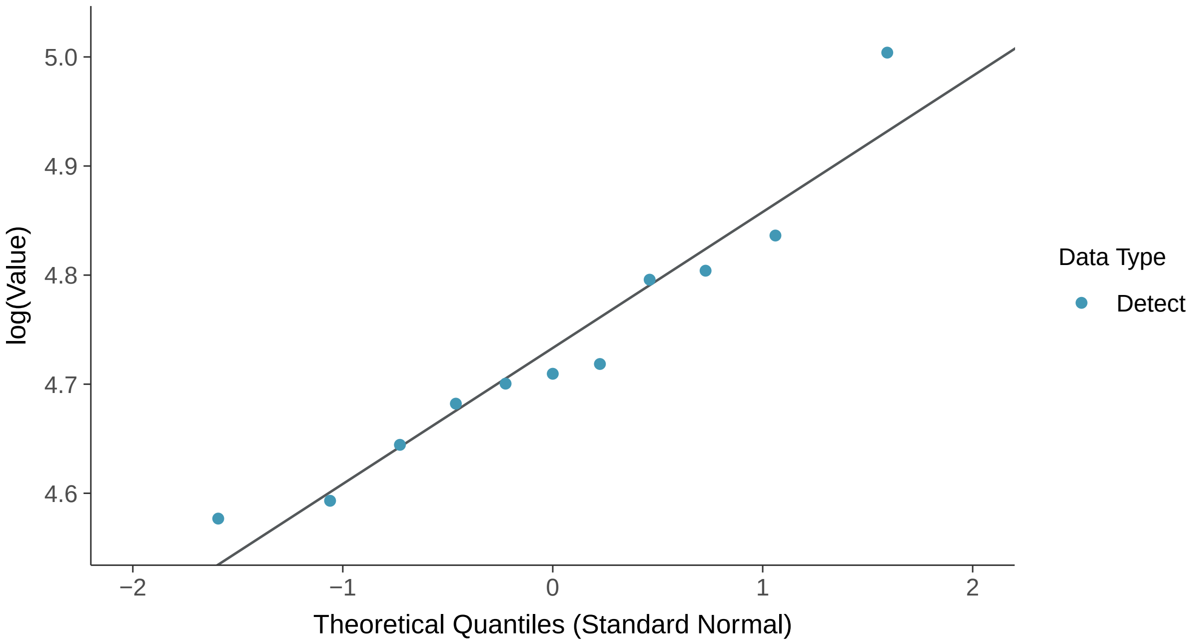
Normal Q-Q plot

Calcium, MW-7 (mg/L)



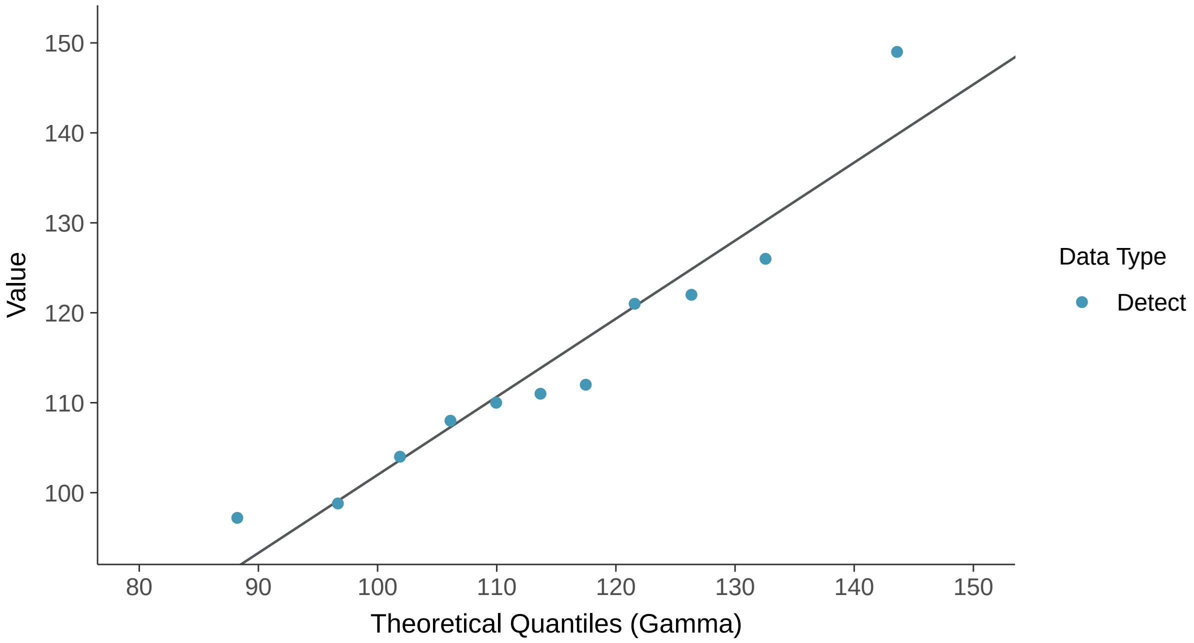
Lognormal Q-Q plot

Calcium, MW-7 (mg/L)



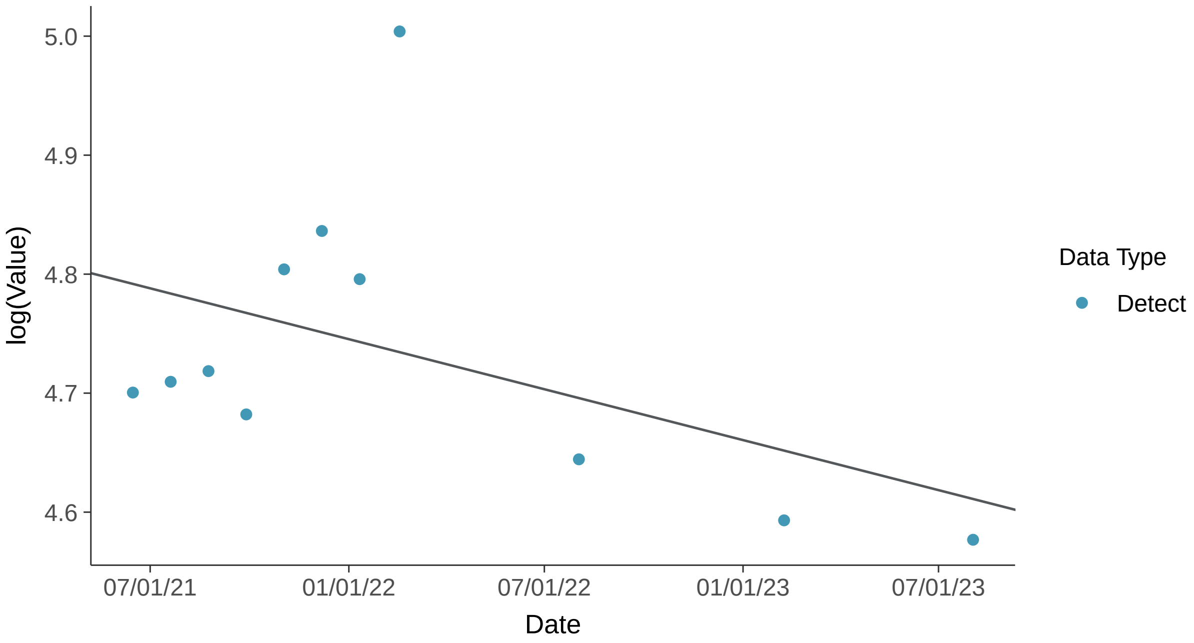
Gamma Q-Q plot

Calcium, MW-7 (mg/L)



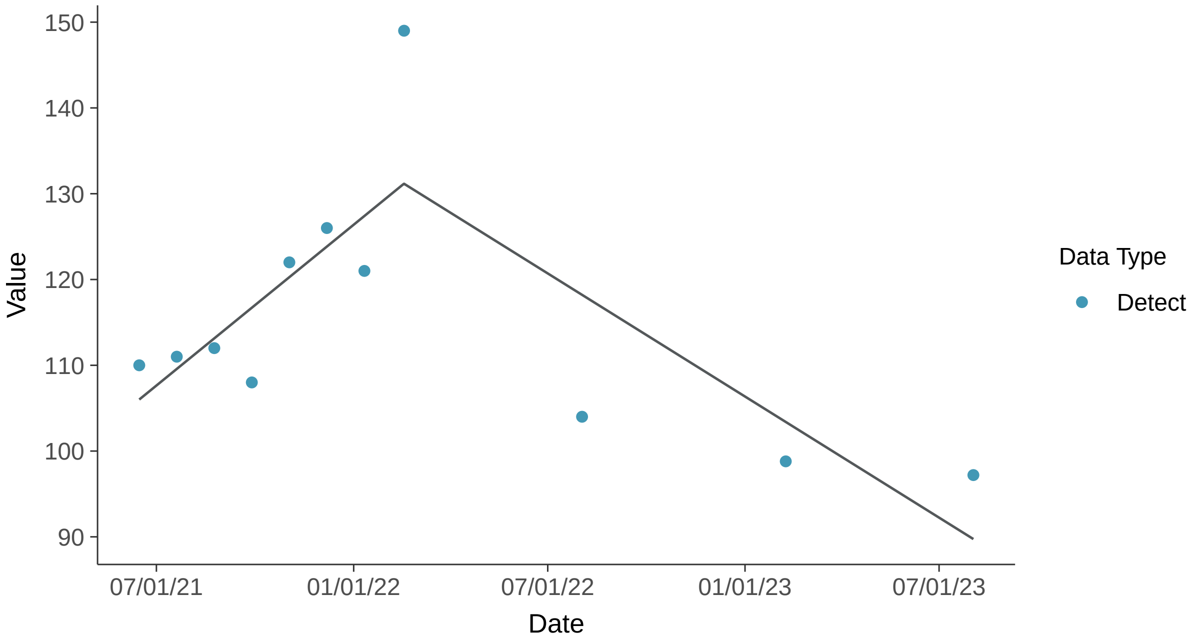
Trend Regression: Lognormal MLE

Calcium, MW-7 (mg/L)



Trend Regression: Piecewise Linear-Linear

Calcium, MW-7 (mg/L)

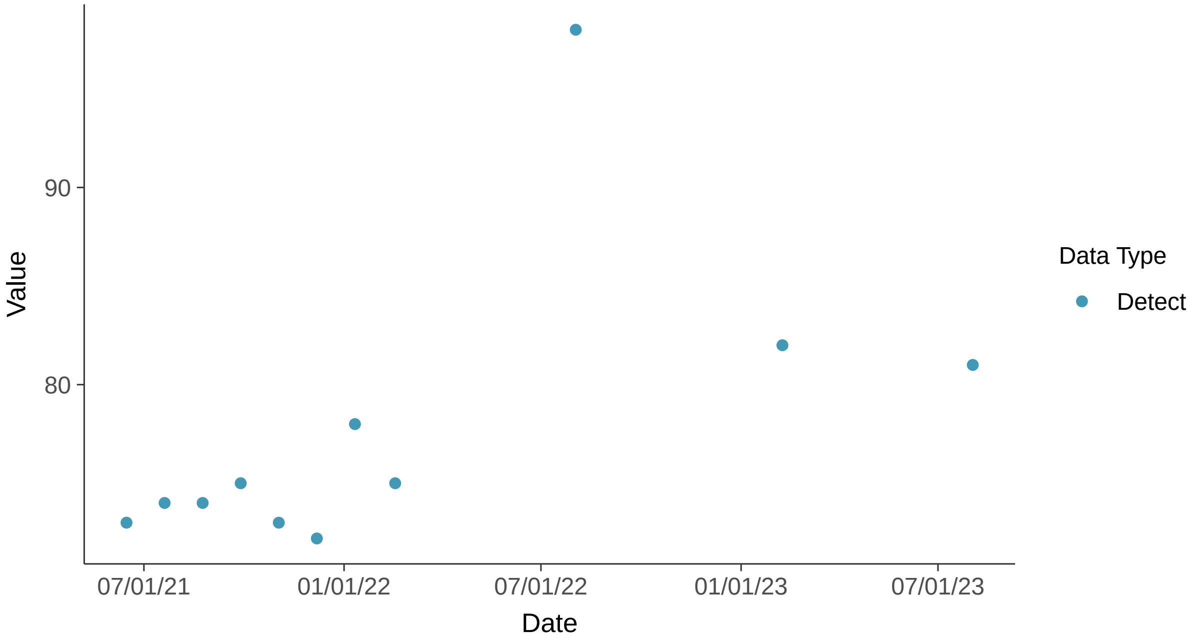


Appendix III: Chloride, MW-7

ID: 07_1_03

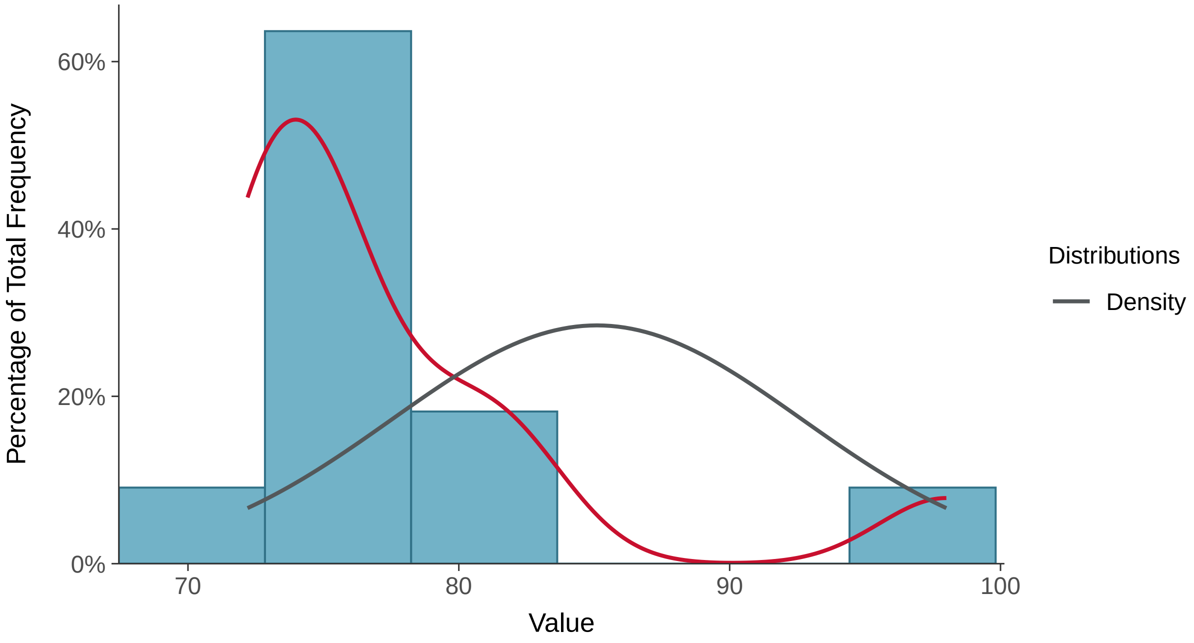
Scatter Plot

Chloride, MW-7 (mg/L)



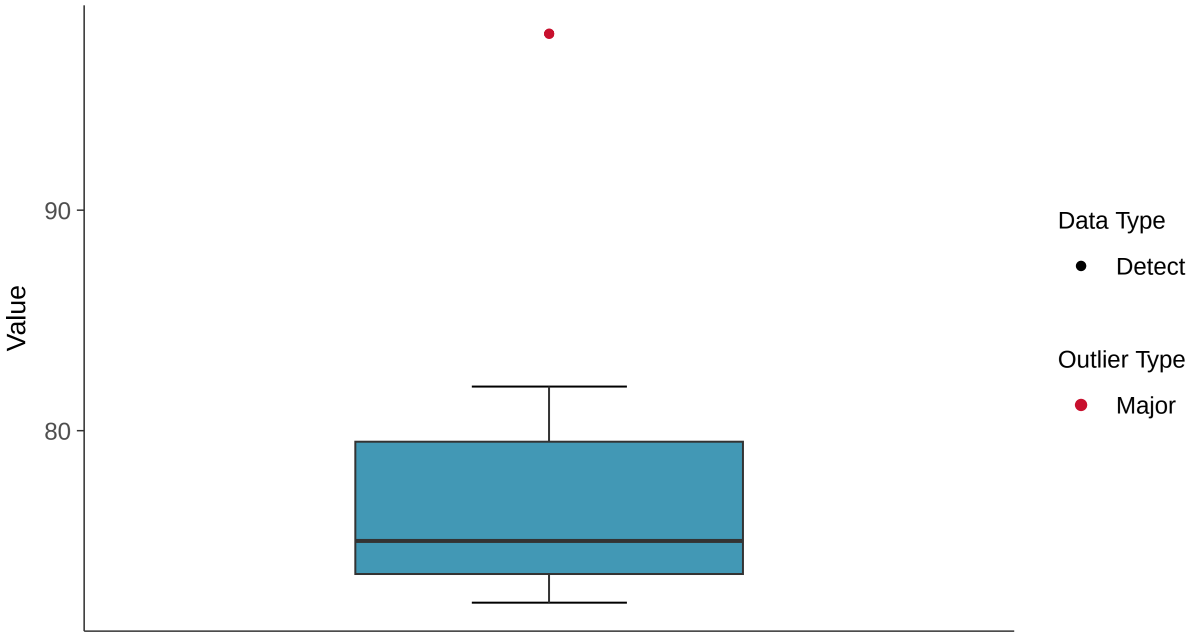
Histogram

Chloride, MW-7 (mg/L)



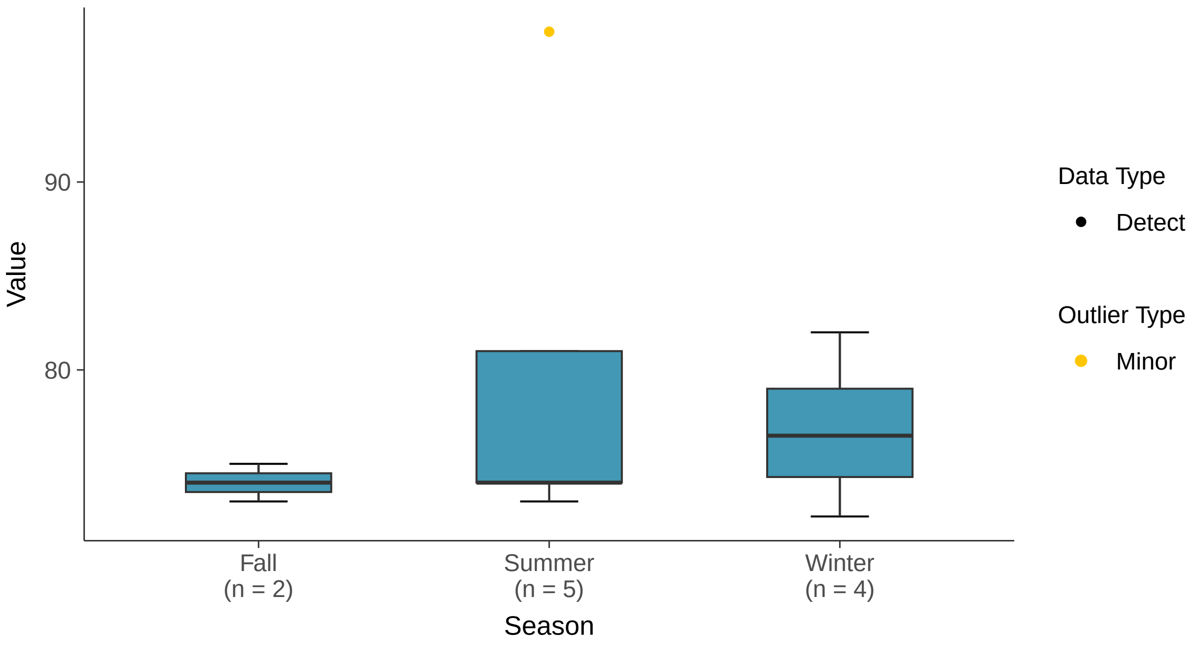
Boxplot

Chloride, MW-7 (mg/L)



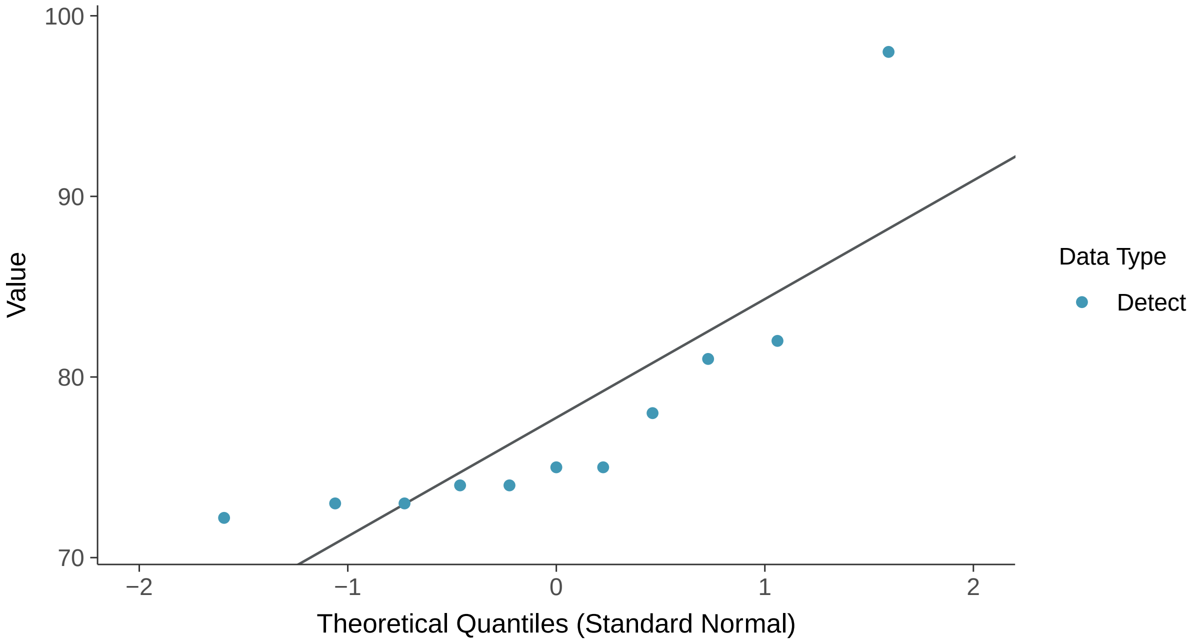
Boxplot by Season

Chloride, MW-7 (mg/L)



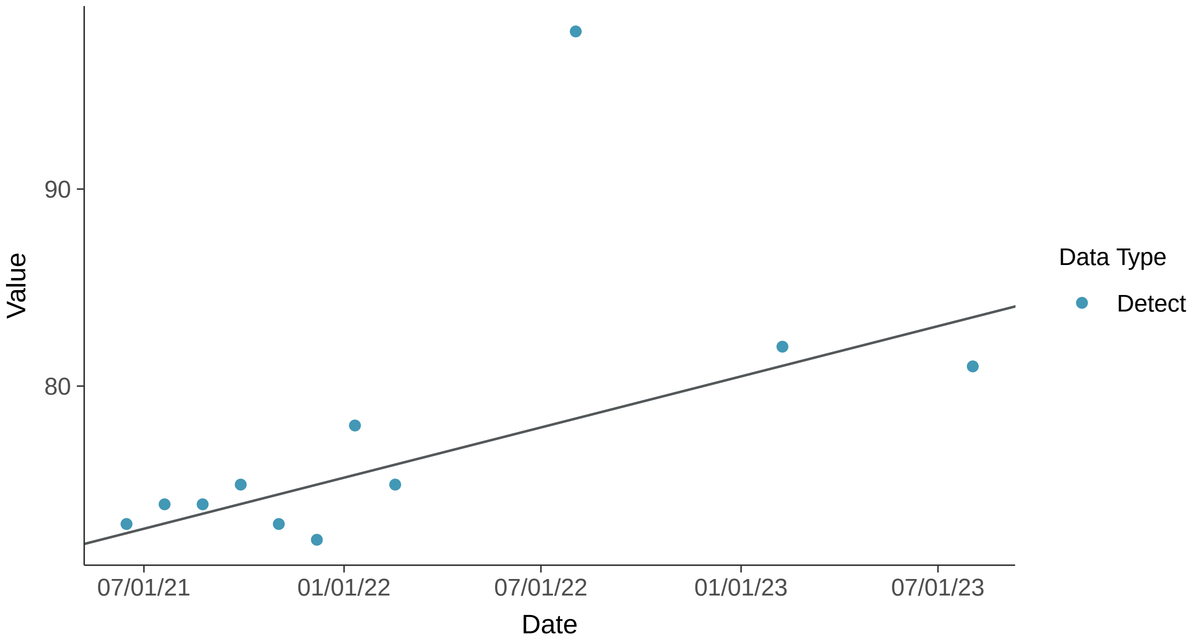
Normal Q-Q plot

Chloride, MW-7 (mg/L)



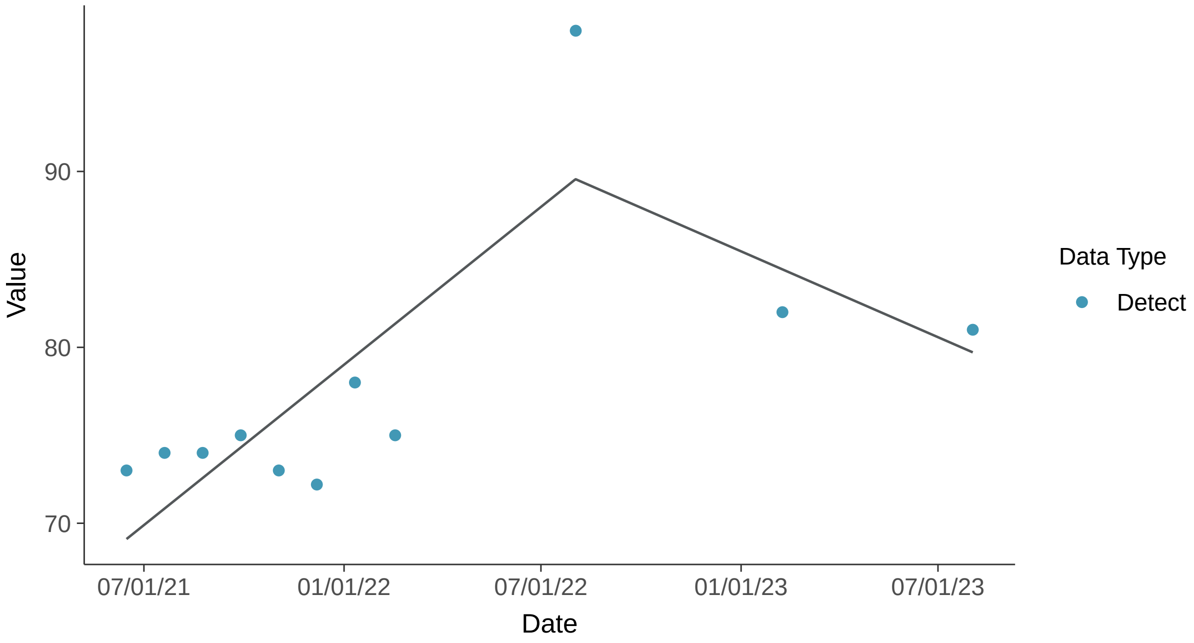
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Chloride, MW-7 (mg/L)



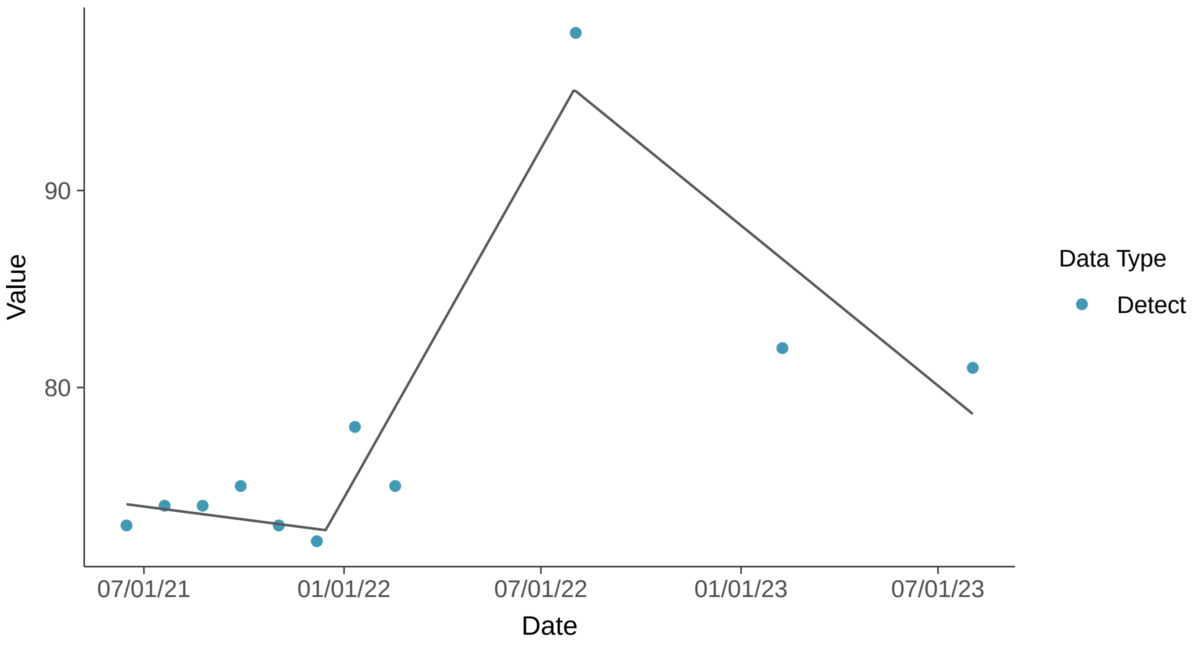
Trend Regression: Piecewise Linear-Linear

Chloride, MW-7 (mg/L)



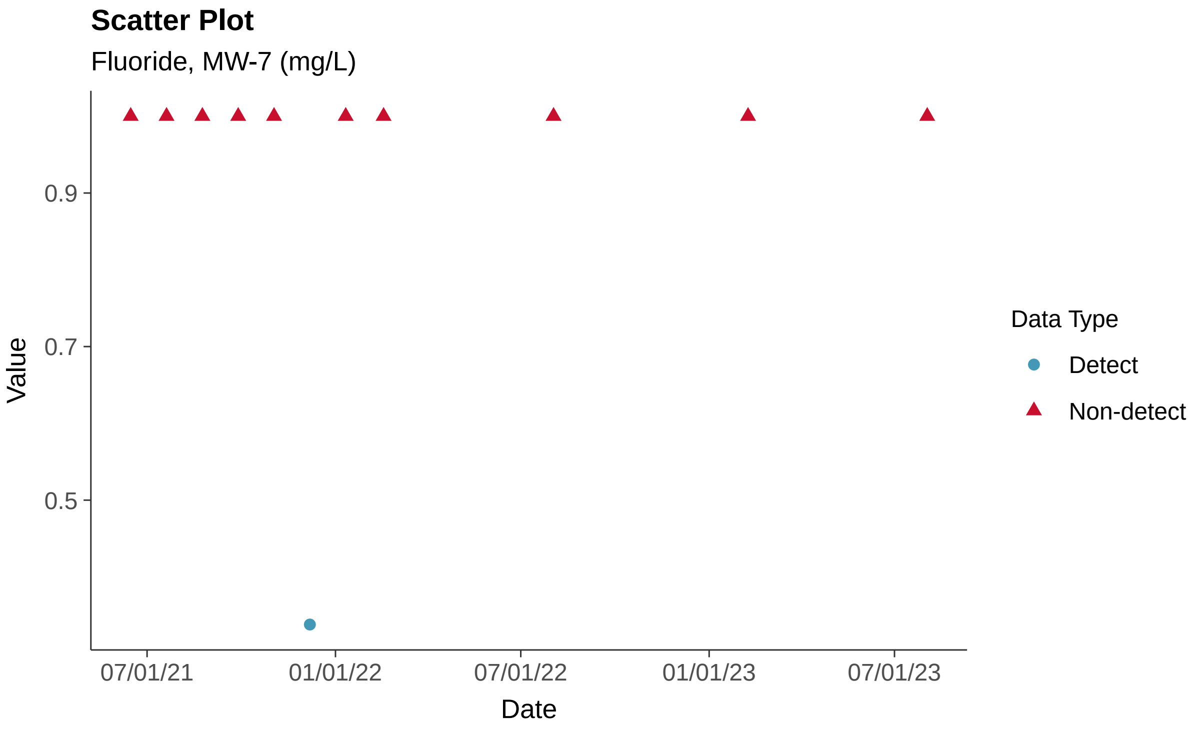
Trend Regression: Piecewise Linear-Linear-Linear

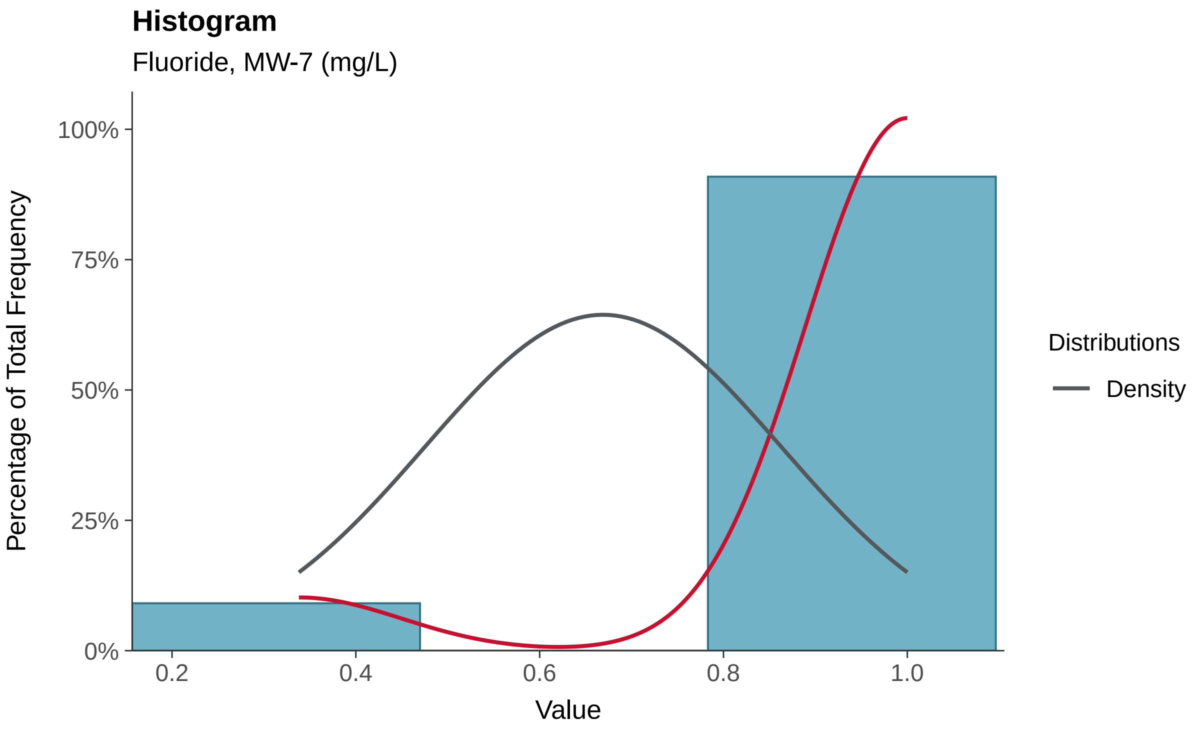
Chloride, MW-7 (mg/L)



Appendix III: Fluoride, MW-7

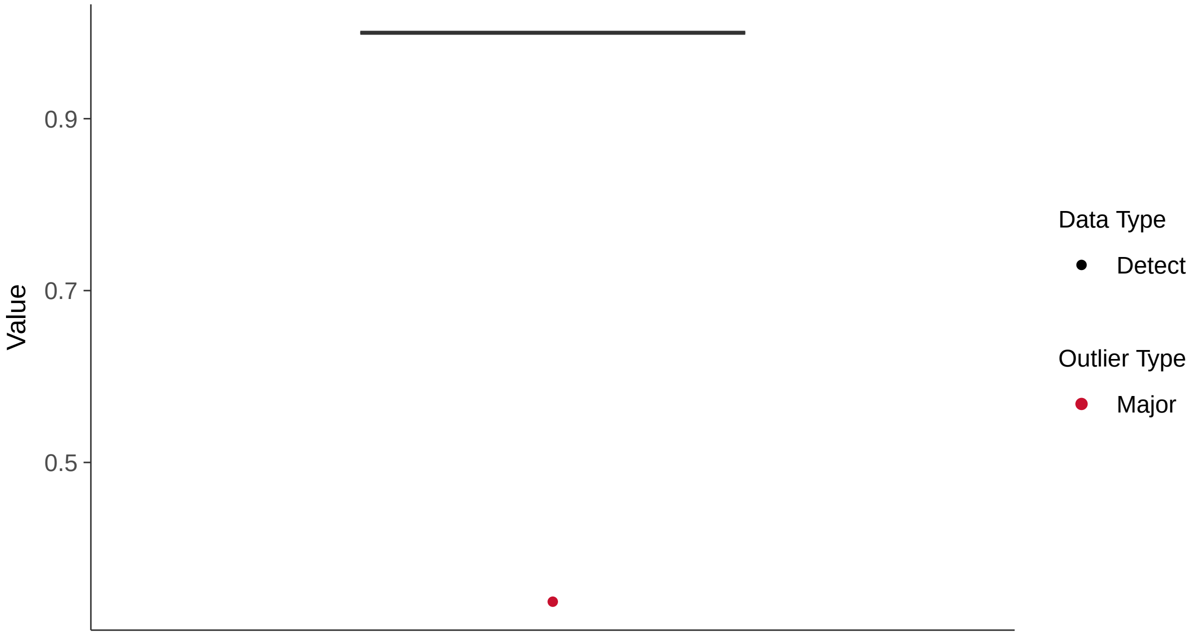
ID: 07_1_04





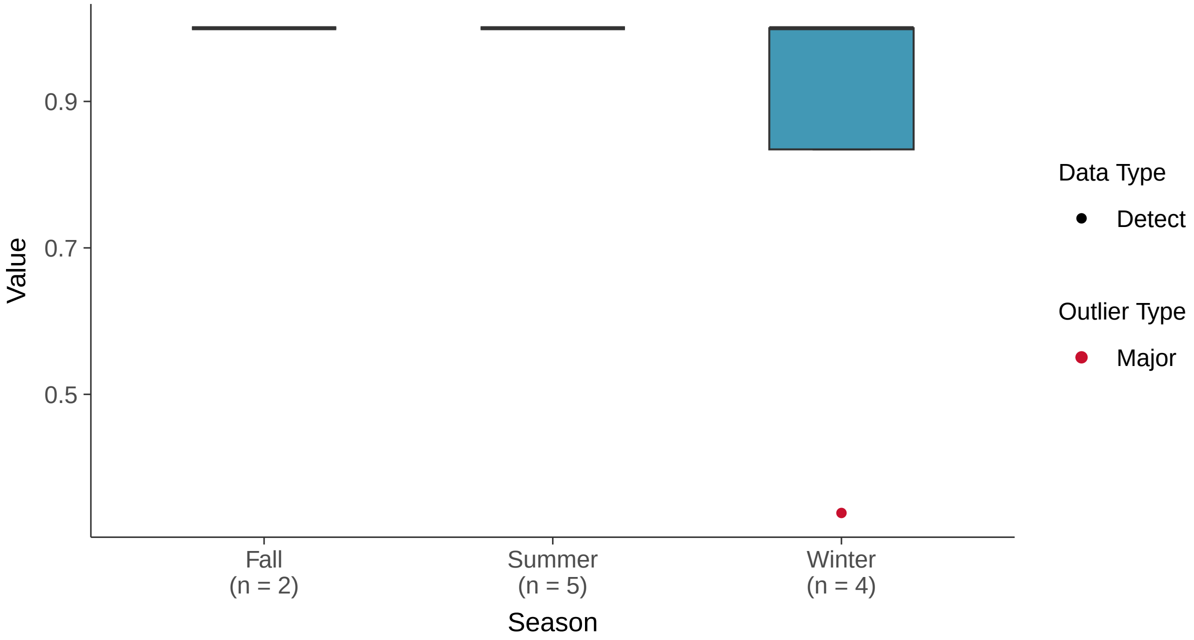
Boxplot

Fluoride, MW-7 (mg/L)



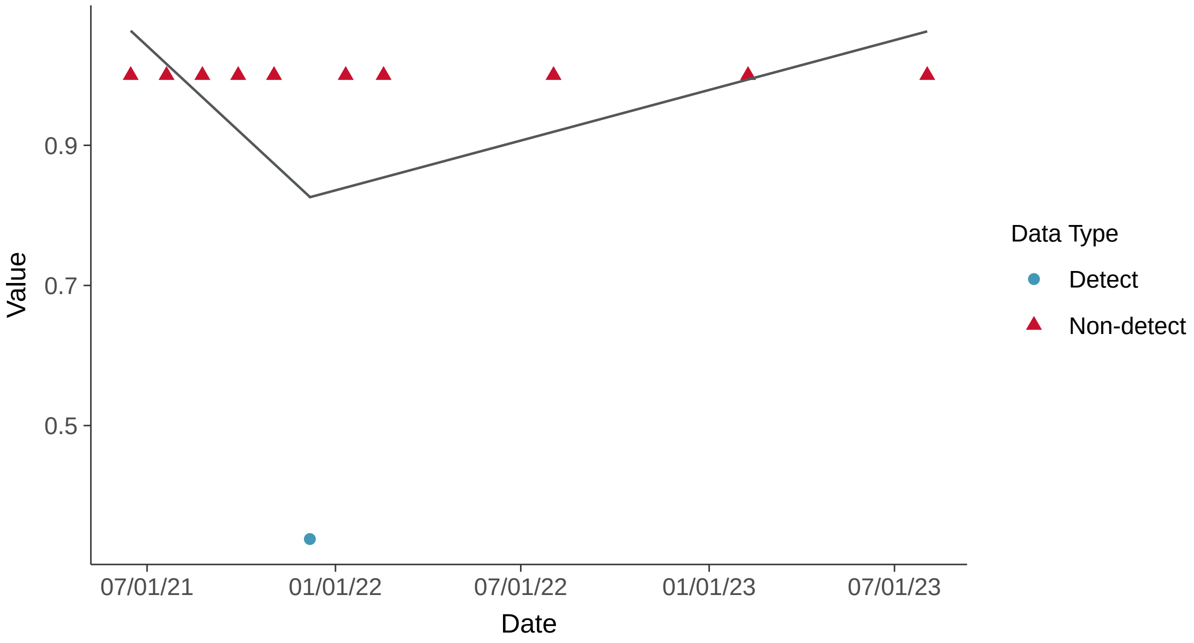
Boxplot by Season

Fluoride, MW-7 (mg/L)



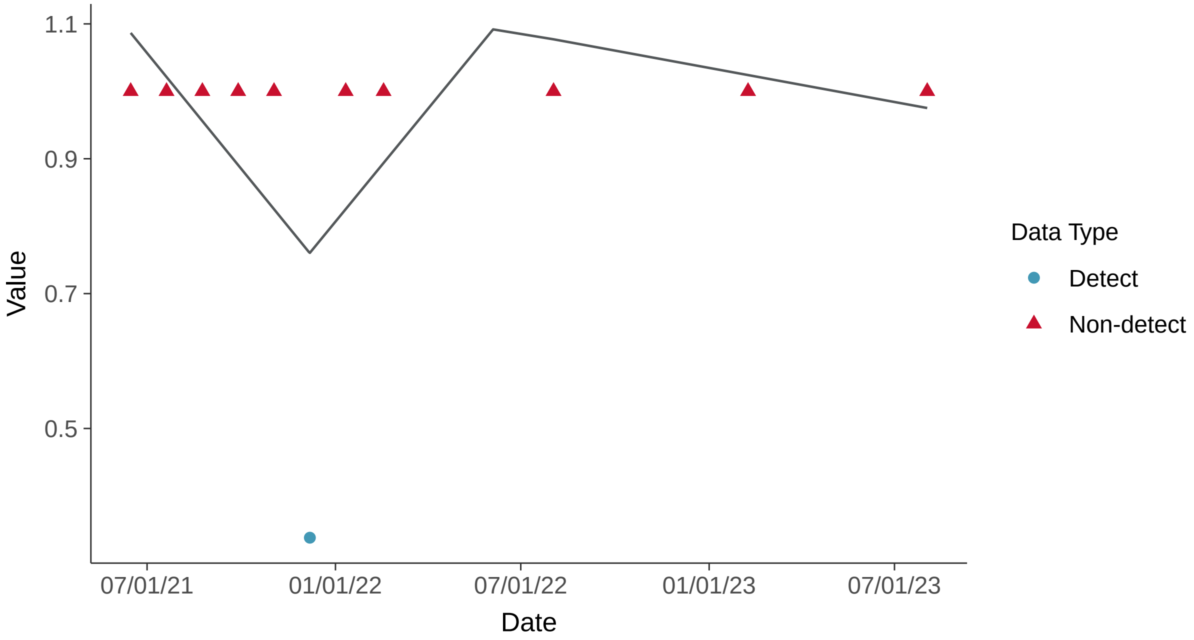
Trend Regression: Piecewise Linear-Linear

Fluoride, MW-7 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Fluoride, MW-7 (mg/L)

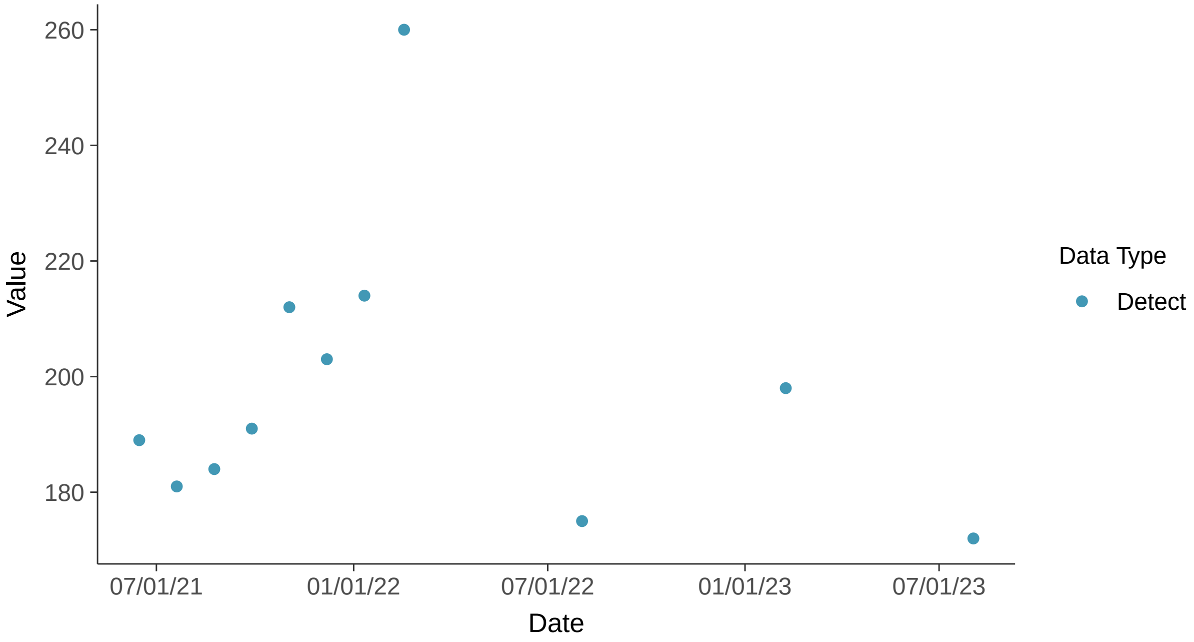


Appendix III: Sulfate, MW-7

ID: 07_1_05

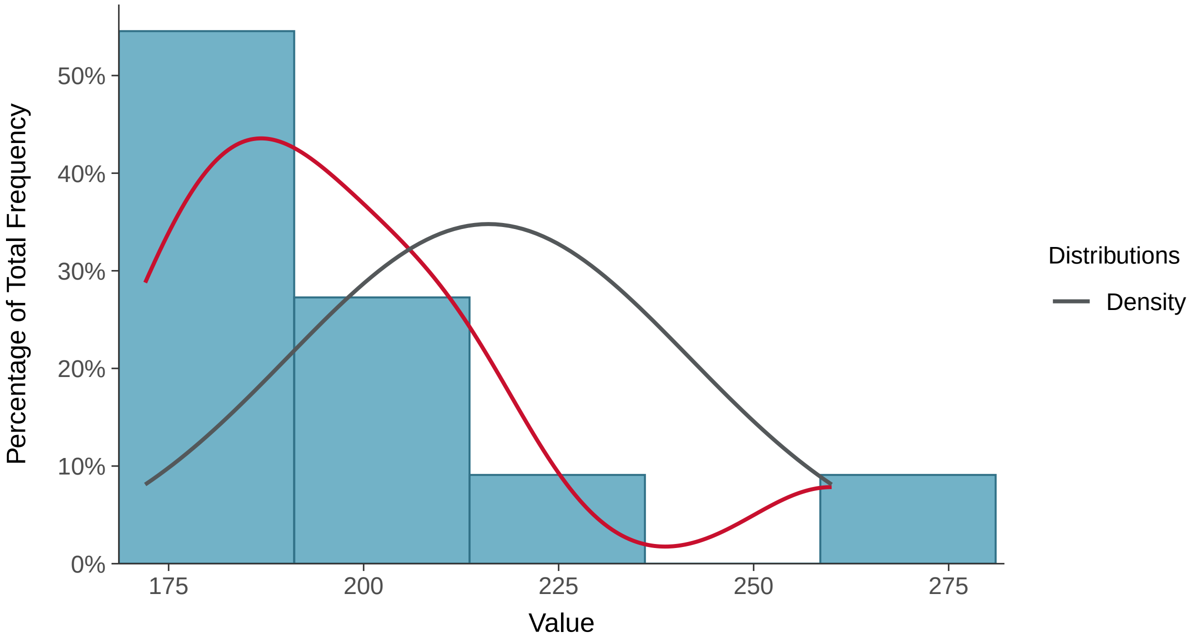
Scatter Plot

Sulfate, MW-7 (mg/L)



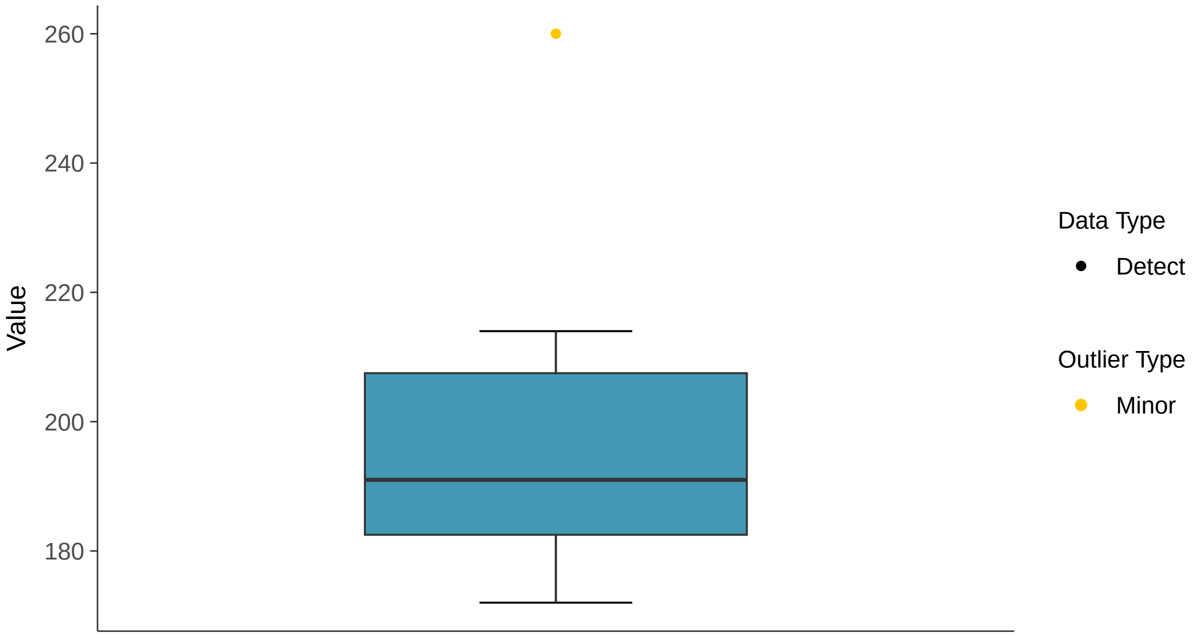
Histogram

Sulfate, MW-7 (mg/L)



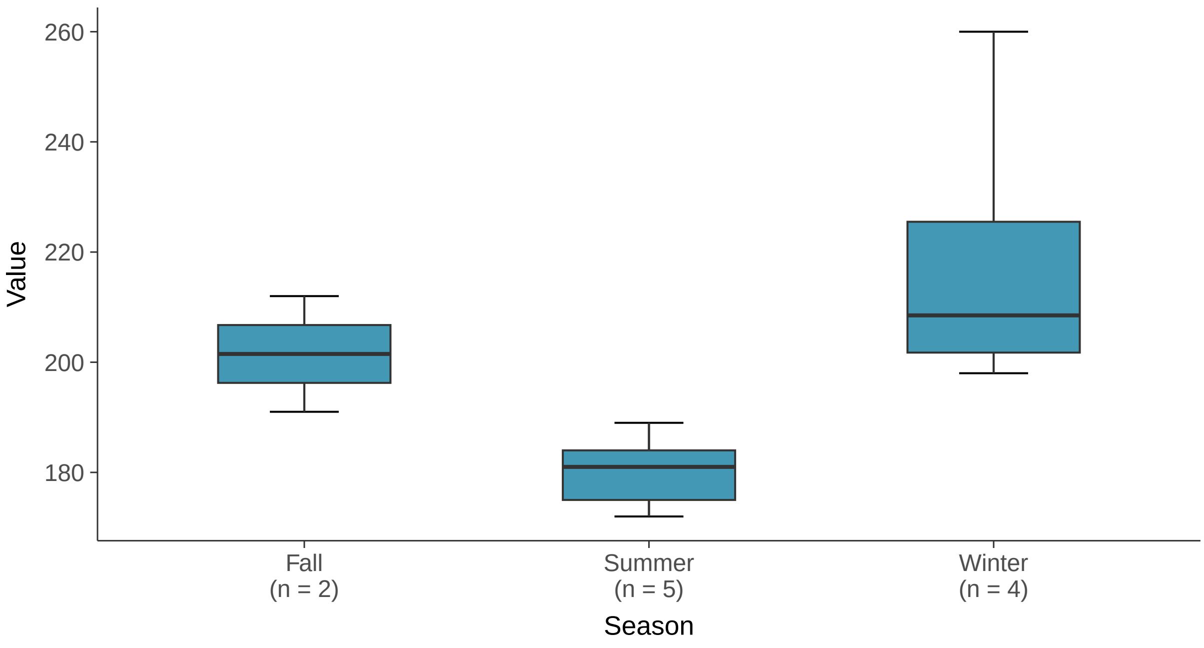
Boxplot

Sulfate, MW-7 (mg/L)



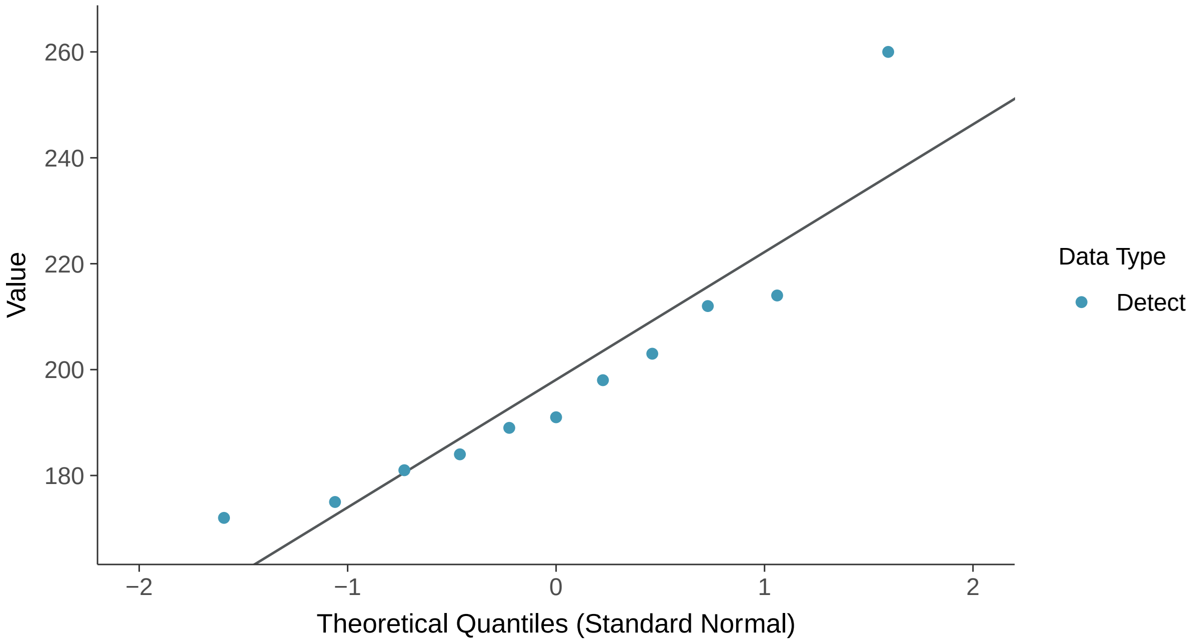
Boxplot by Season

Sulfate, MW-7 (mg/L)



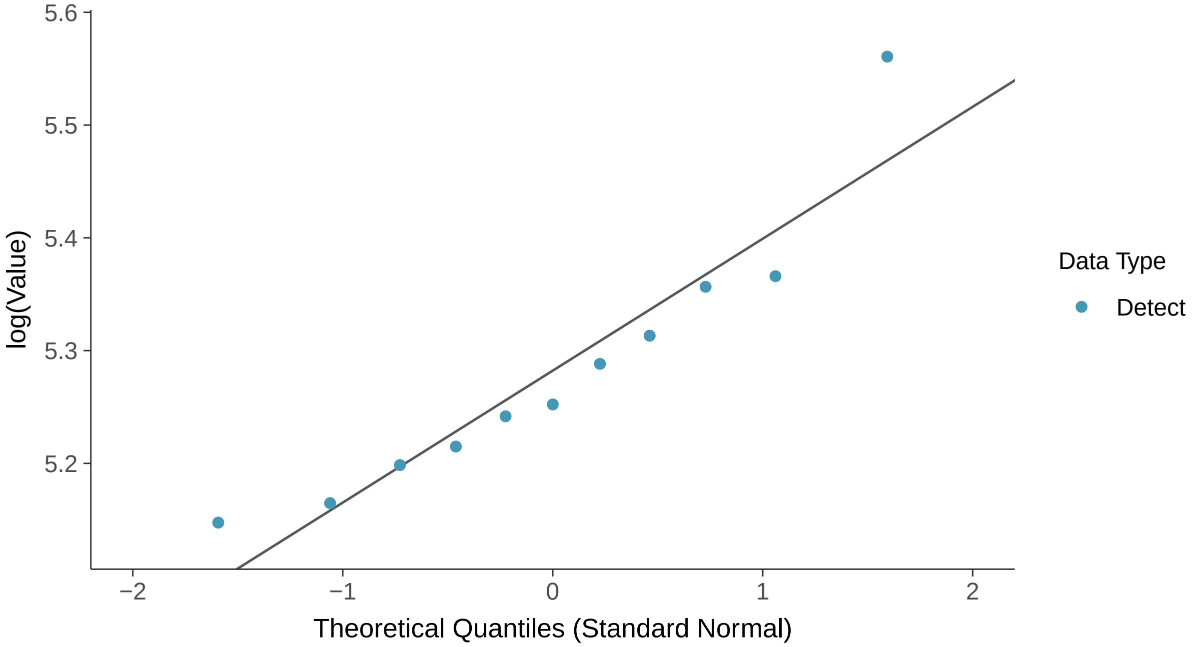
Normal Q-Q plot

Sulfate, MW-7 (mg/L)



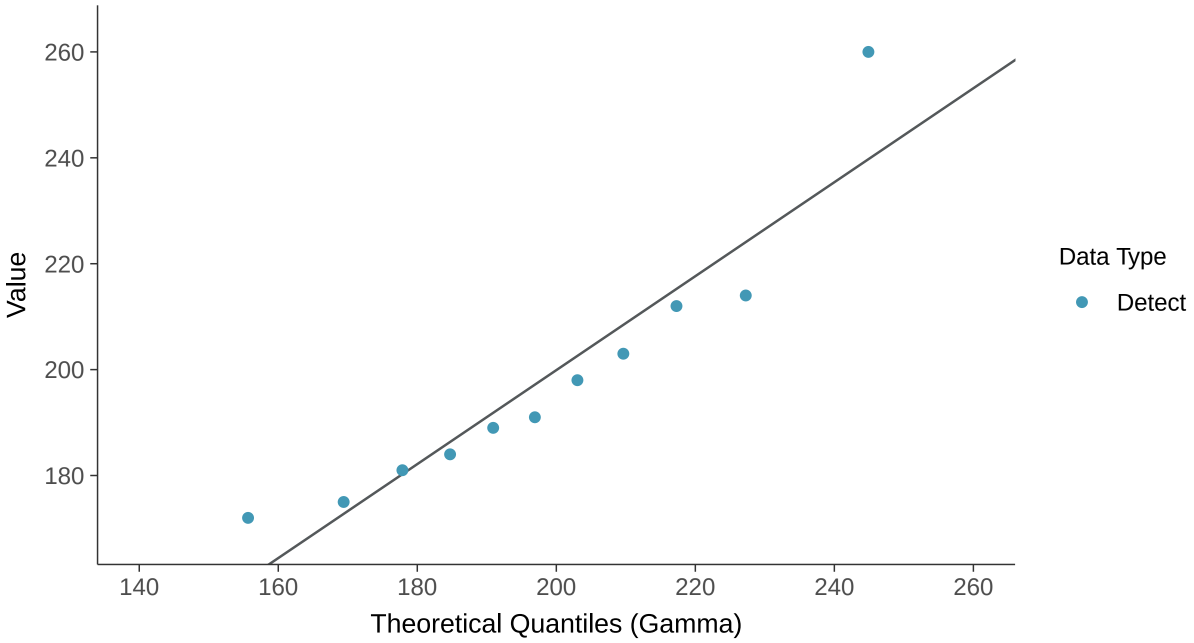
Lognormal Q-Q plot

Sulfate, MW-7 (mg/L)



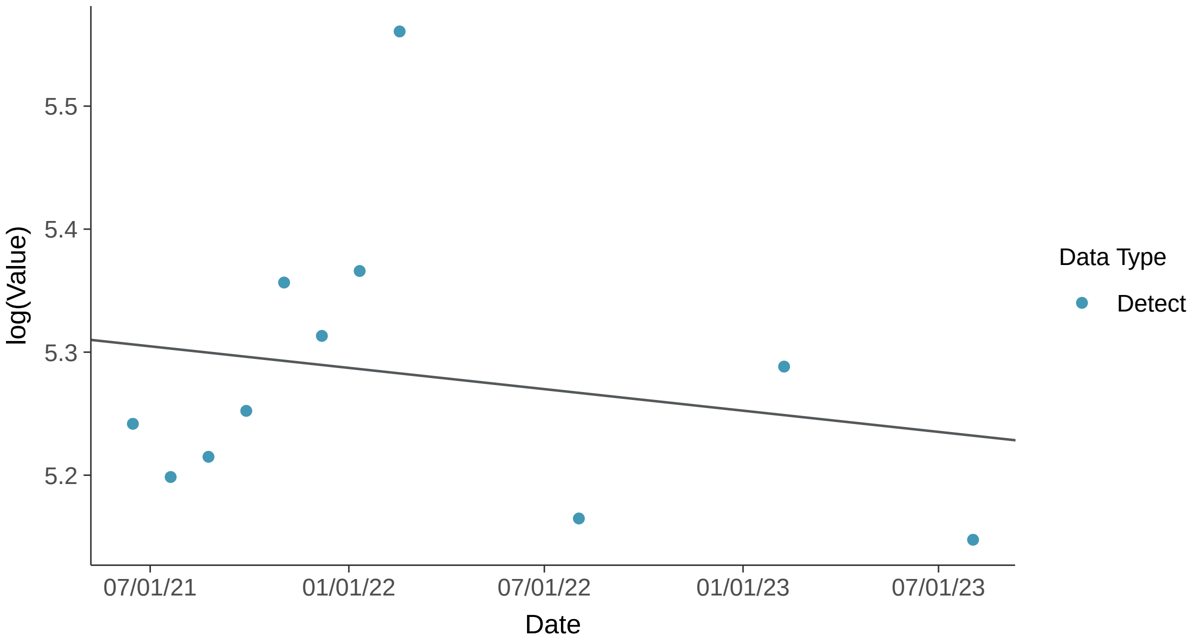
Gamma Q-Q plot

Sulfate, MW-7 (mg/L)



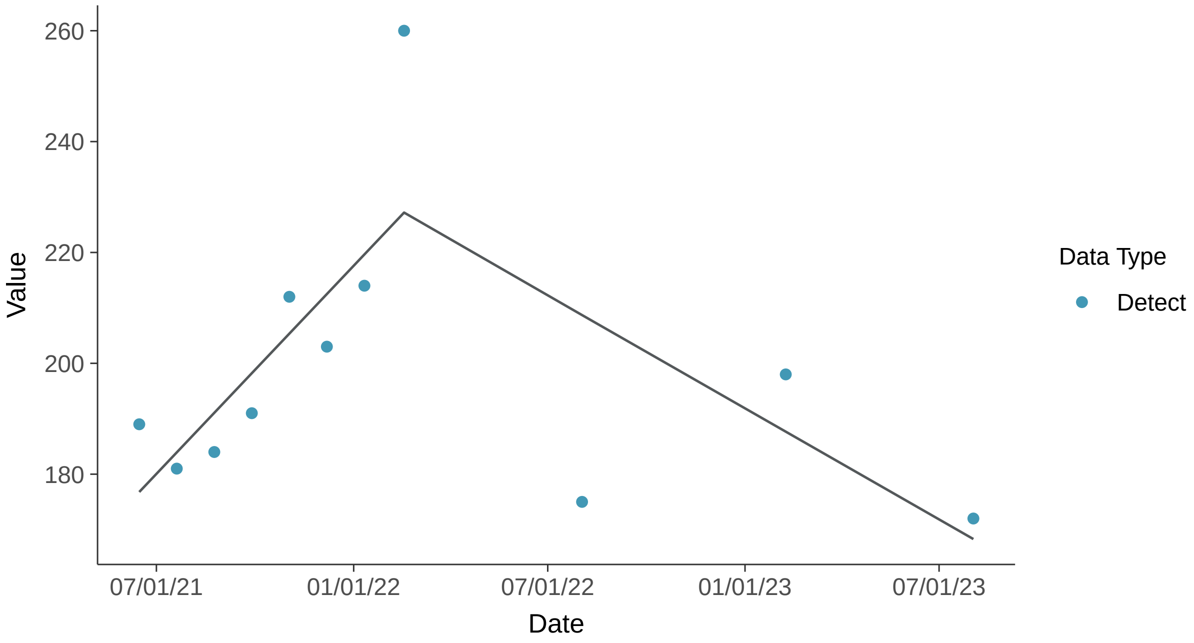
Trend Regression: Lognormal MLE

Sulfate, MW-7 (mg/L)



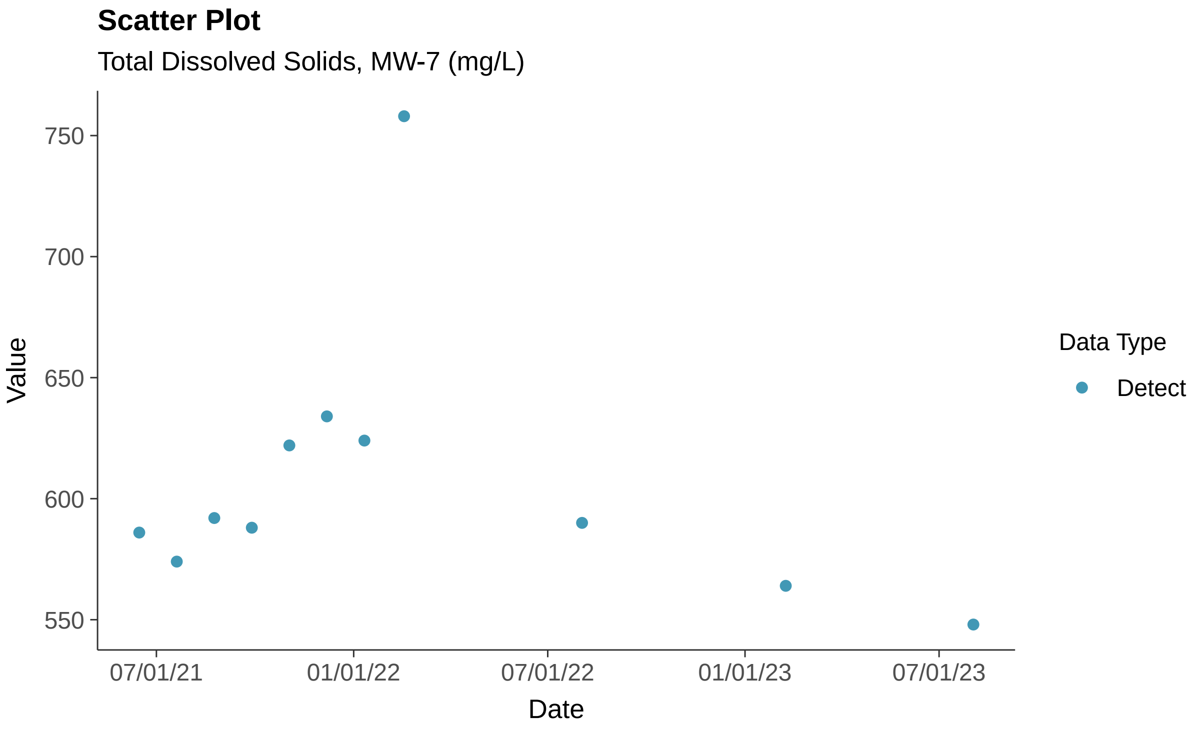
Trend Regression: Piecewise Linear-Linear

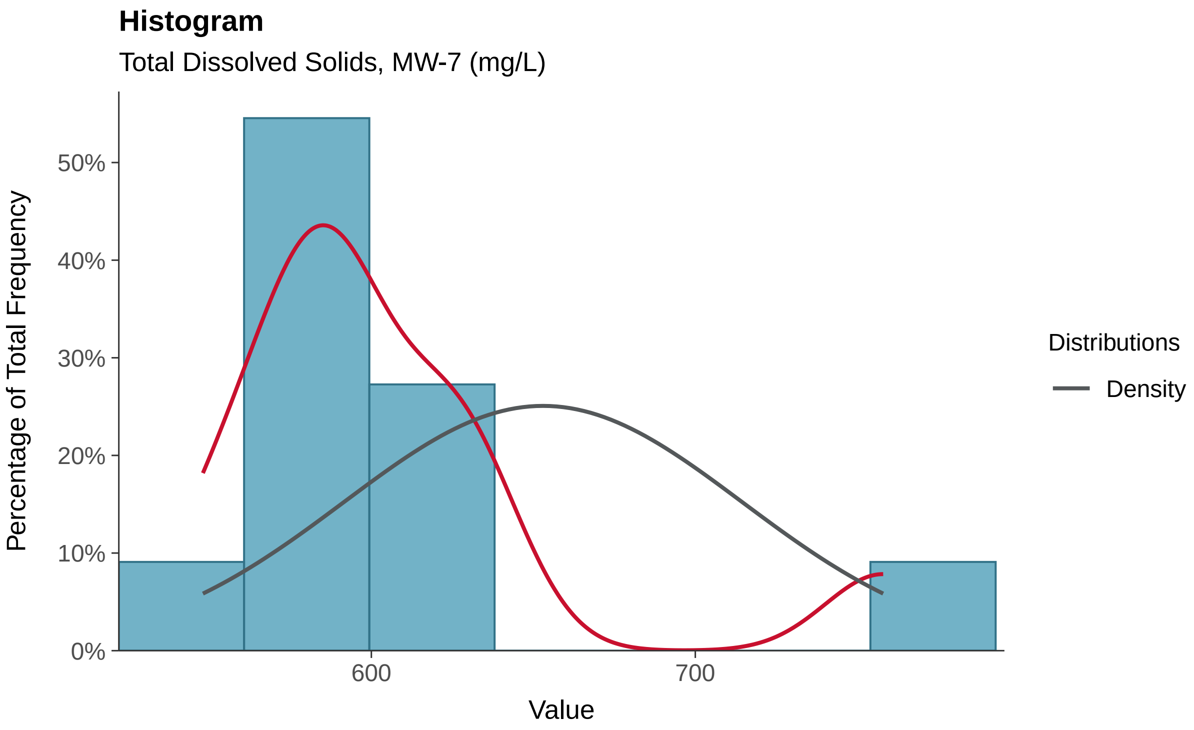
Sulfate, MW-7 (mg/L)



Appendix III: Total Dissolved Solids, MW-7

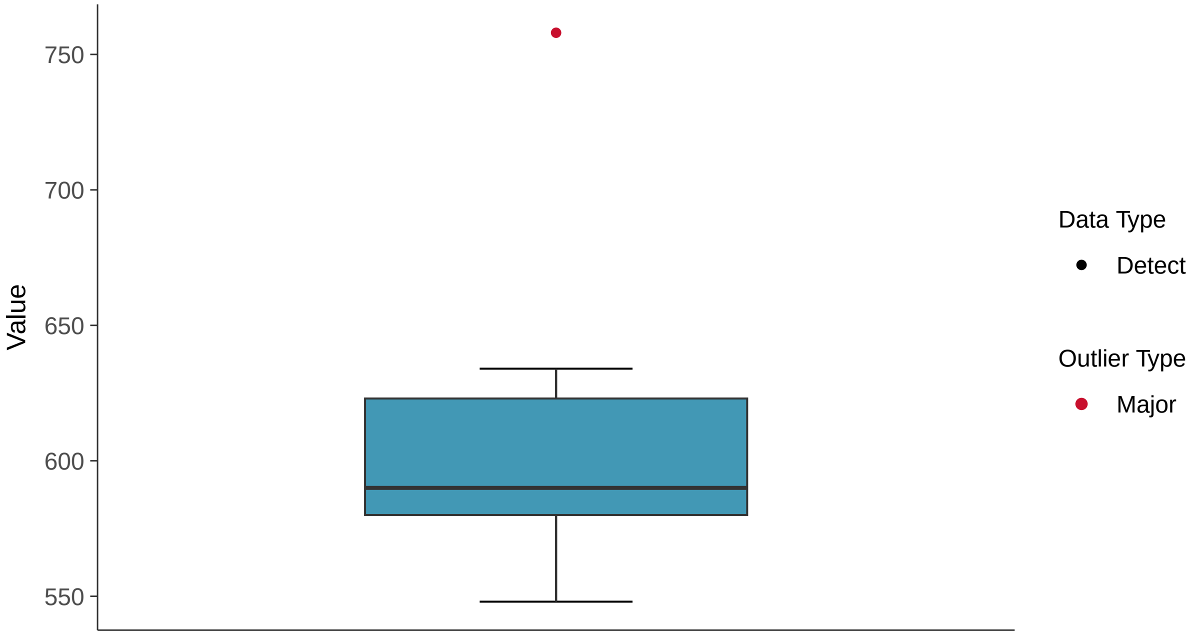
ID: 07_1_06





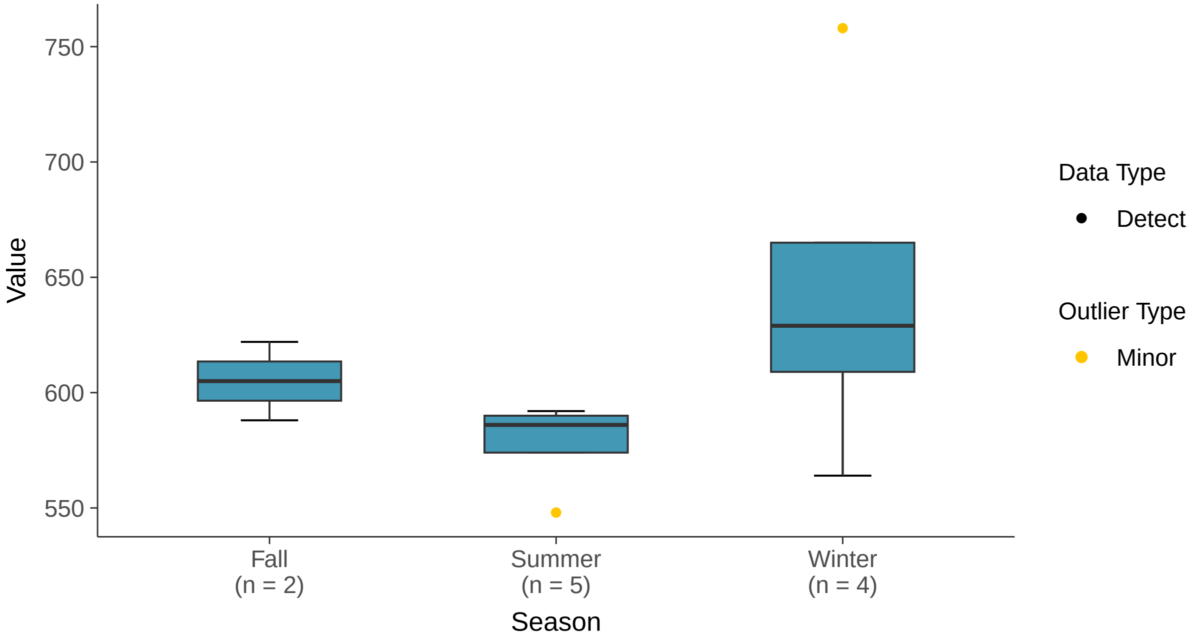
Boxplot

Total Dissolved Solids, MW-7 (mg/L)



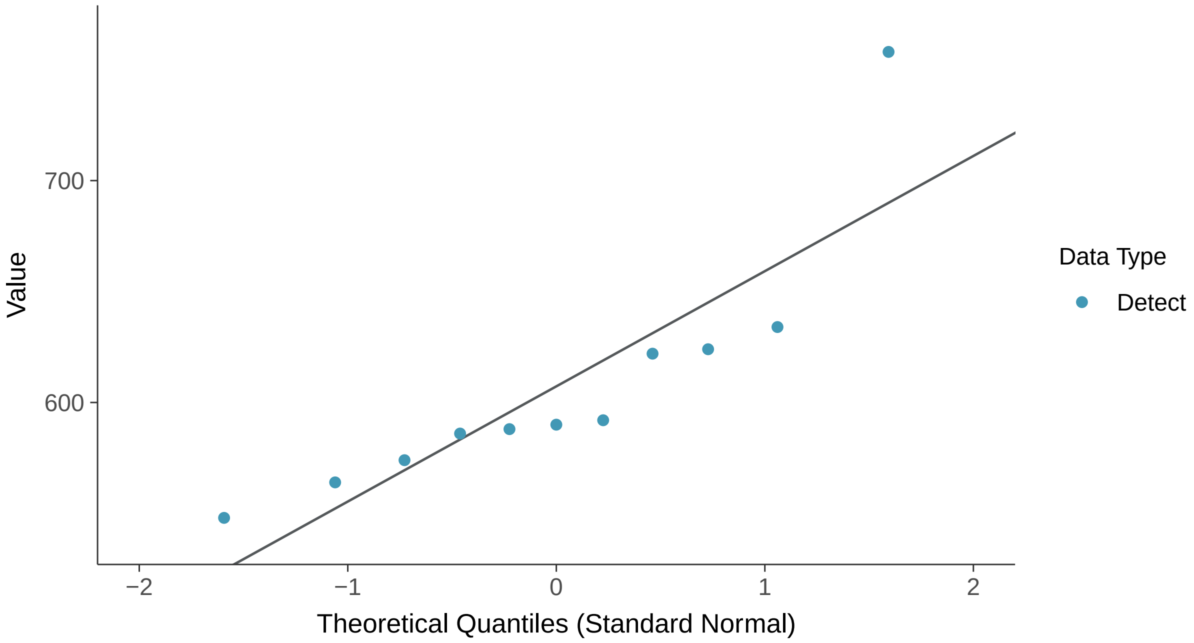
Boxplot by Season

Total Dissolved Solids, MW-7 (mg/L)



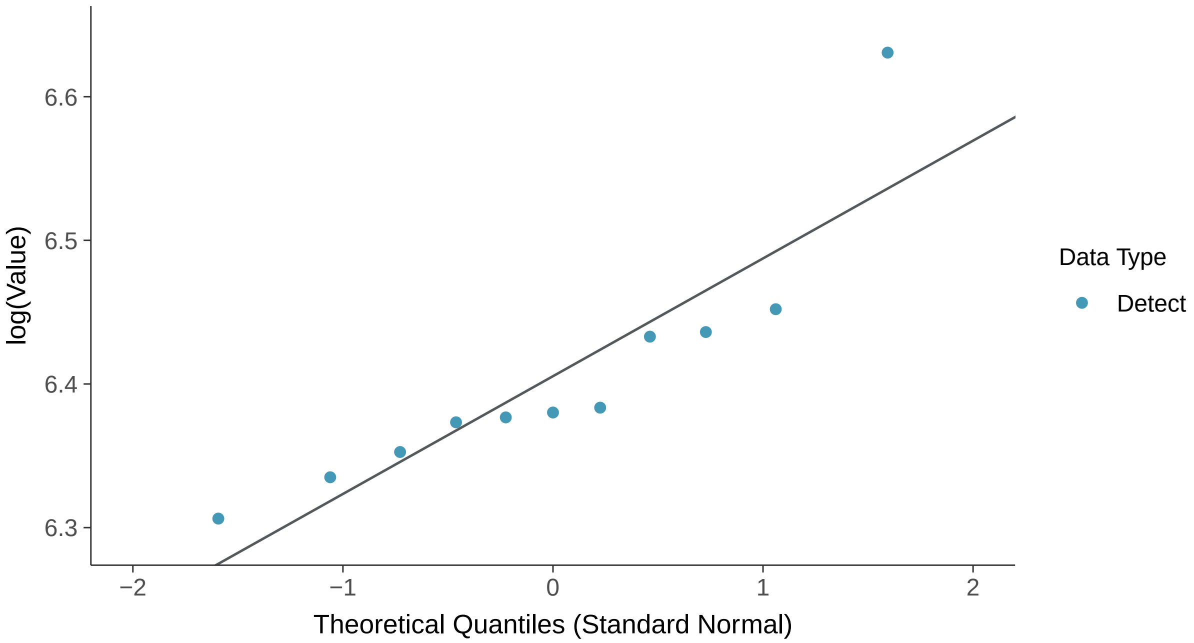
Normal Q-Q plot

Total Dissolved Solids, MW-7 (mg/L)



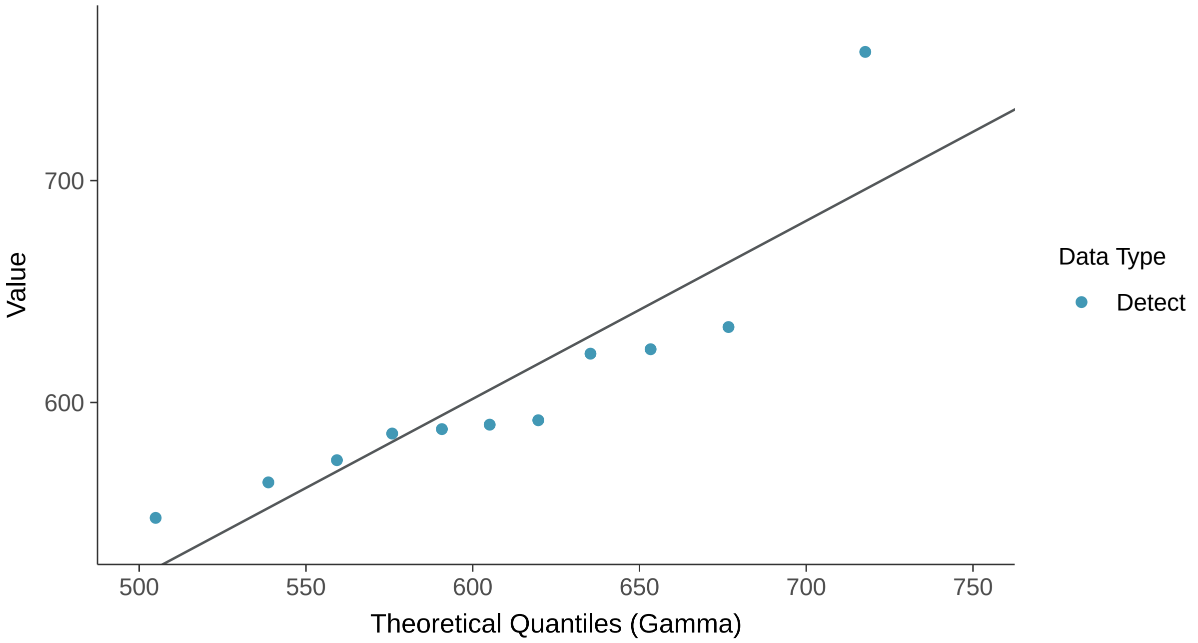
Lognormal Q-Q plot

Total Dissolved Solids, MW-7 (mg/L)



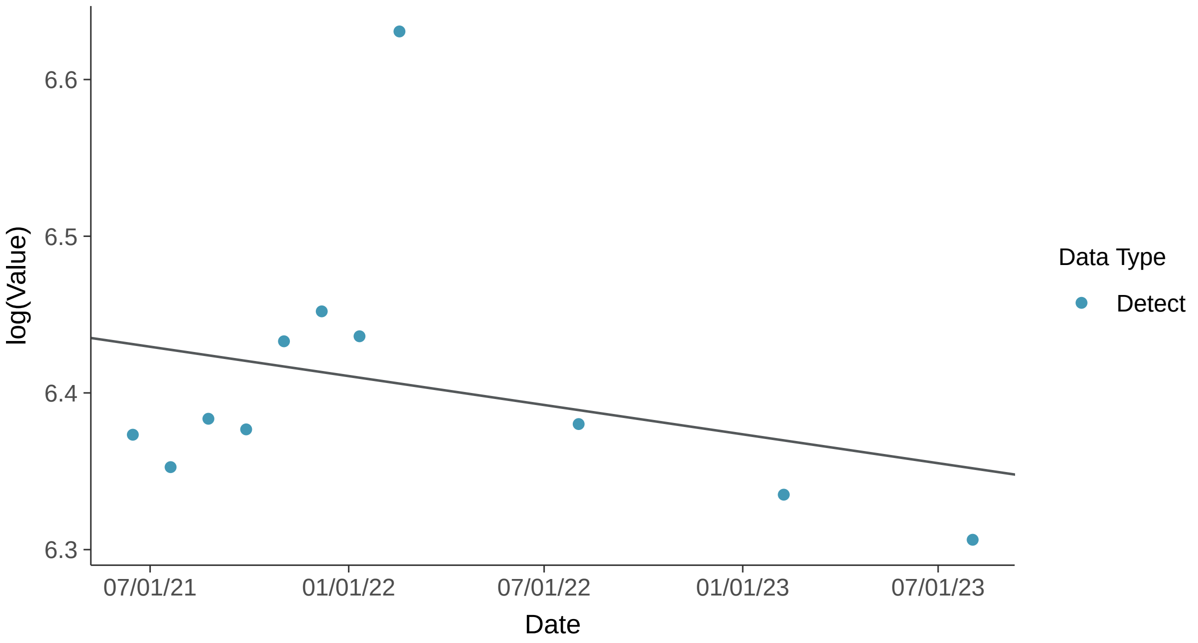
Gamma Q-Q plot

Total Dissolved Solids, MW-7 (mg/L)



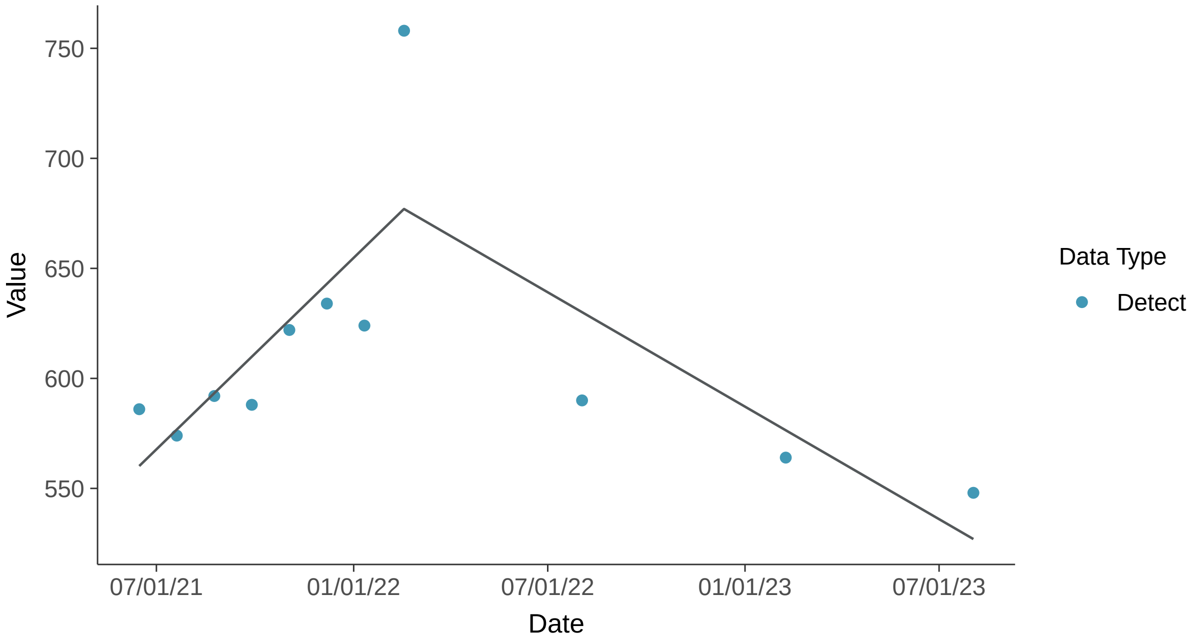
Trend Regression: Lognormal MLE

Total Dissolved Solids, MW-7 (mg/L)



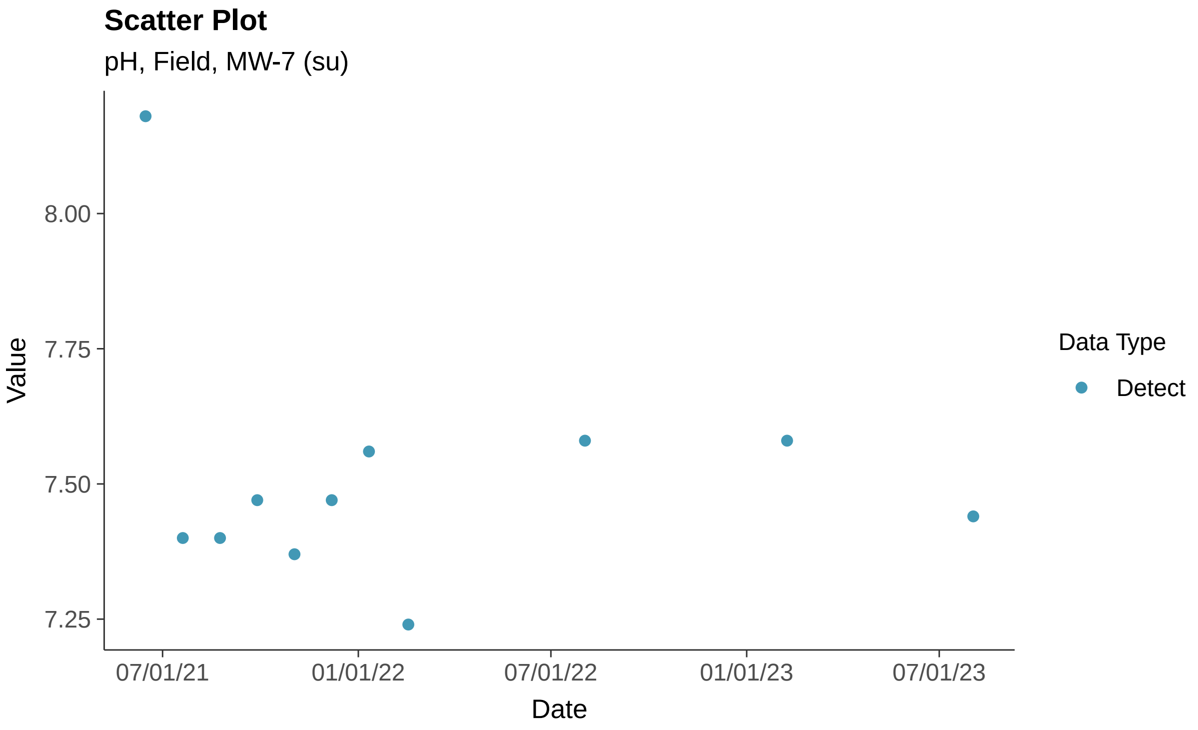
Trend Regression: Piecewise Linear-Linear

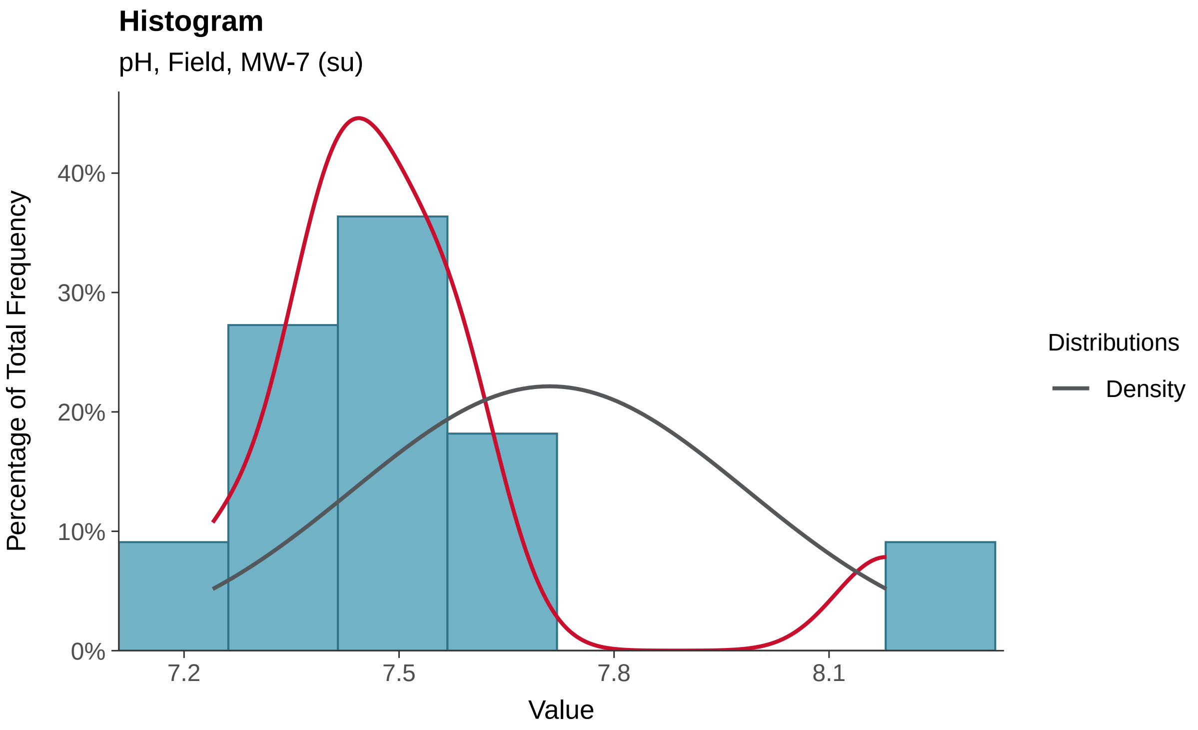
Total Dissolved Solids, MW-7 (mg/L)



Appendix III: pH, Field, MW-7

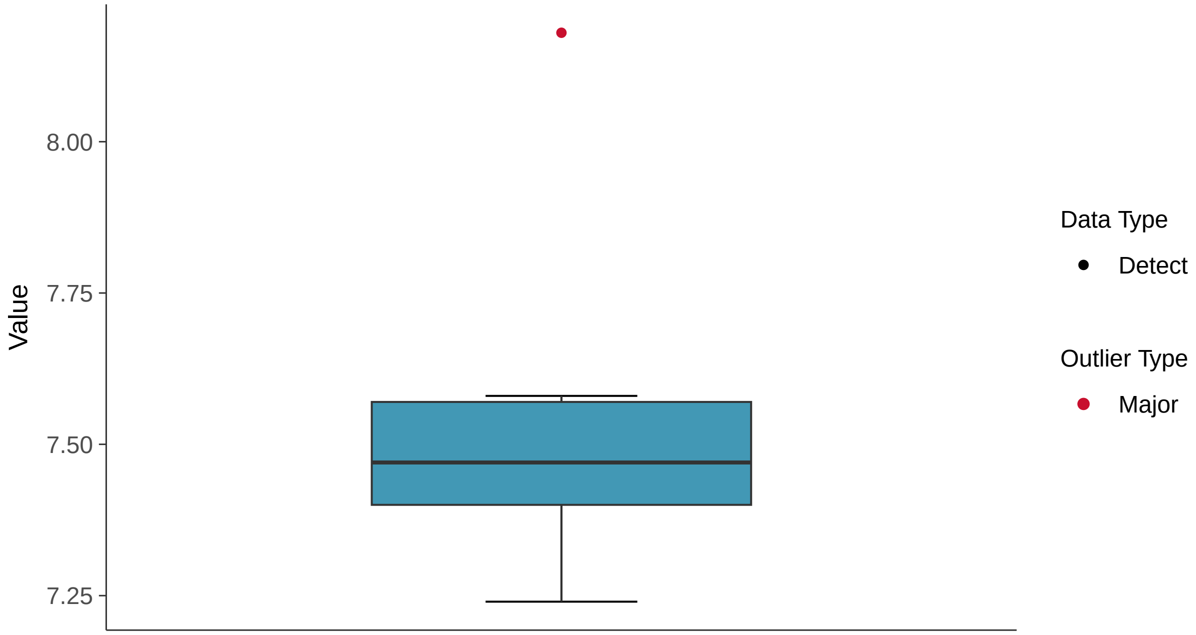
ID: 07_1_07





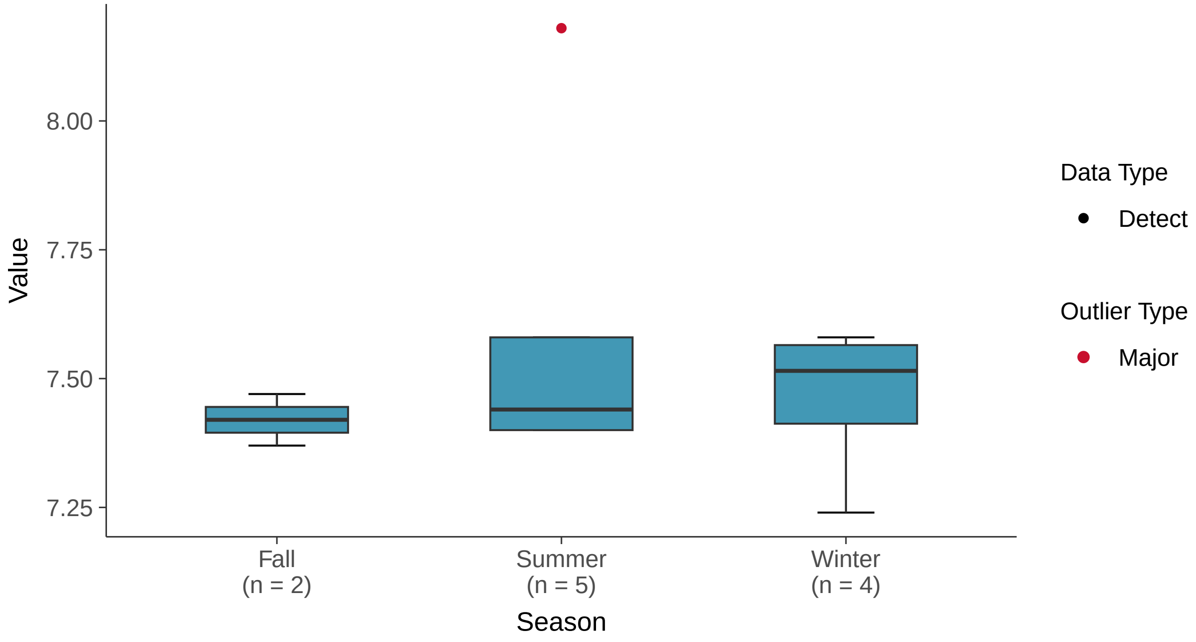
Boxplot

pH, Field, MW-7 (su)



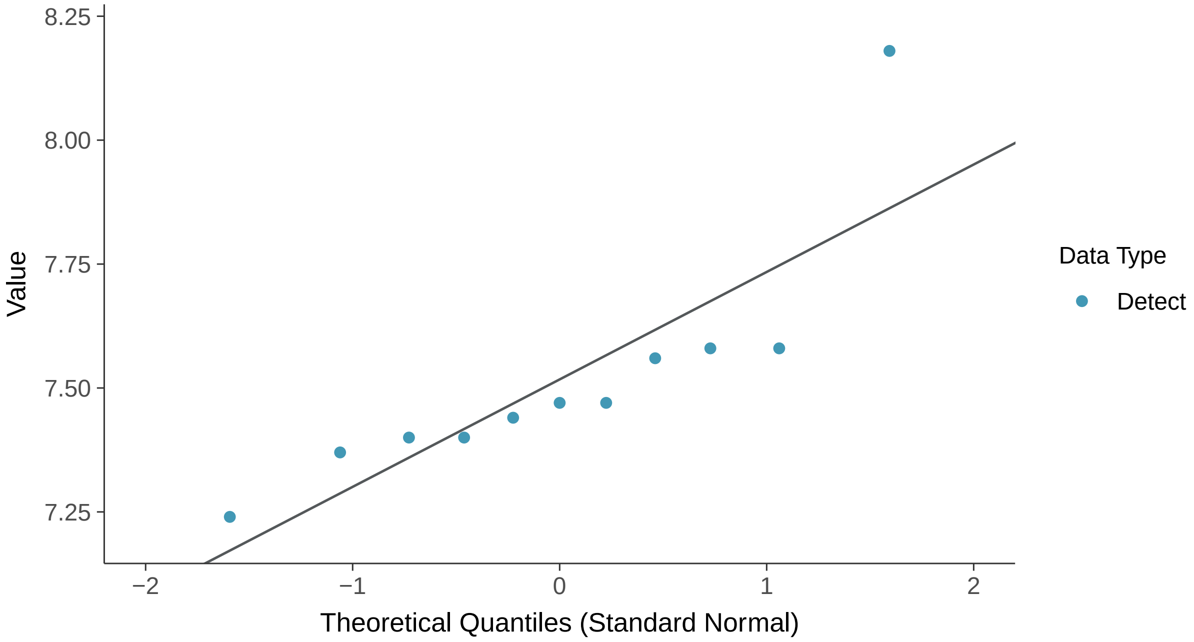
Boxplot by Season

pH, Field, MW-7 (su)



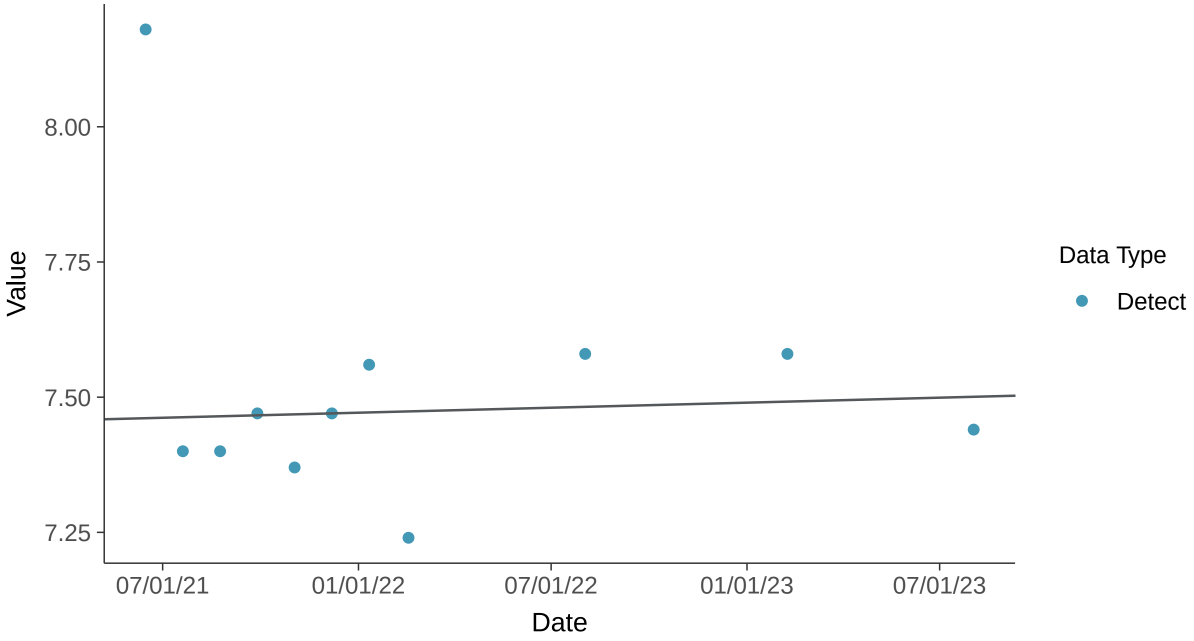
Normal Q-Q plot

pH, Field, MW-7 (su)



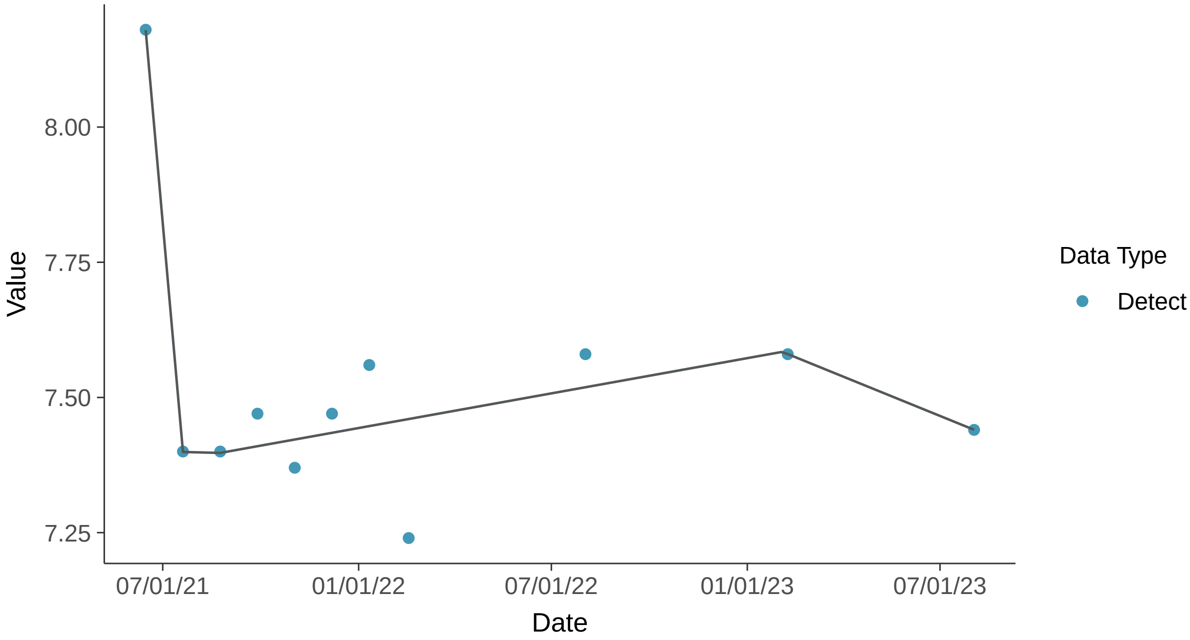
Trend Regression: Mann-Kendall/Theil-Sen Estimate

pH, Field, MW-7 (su)



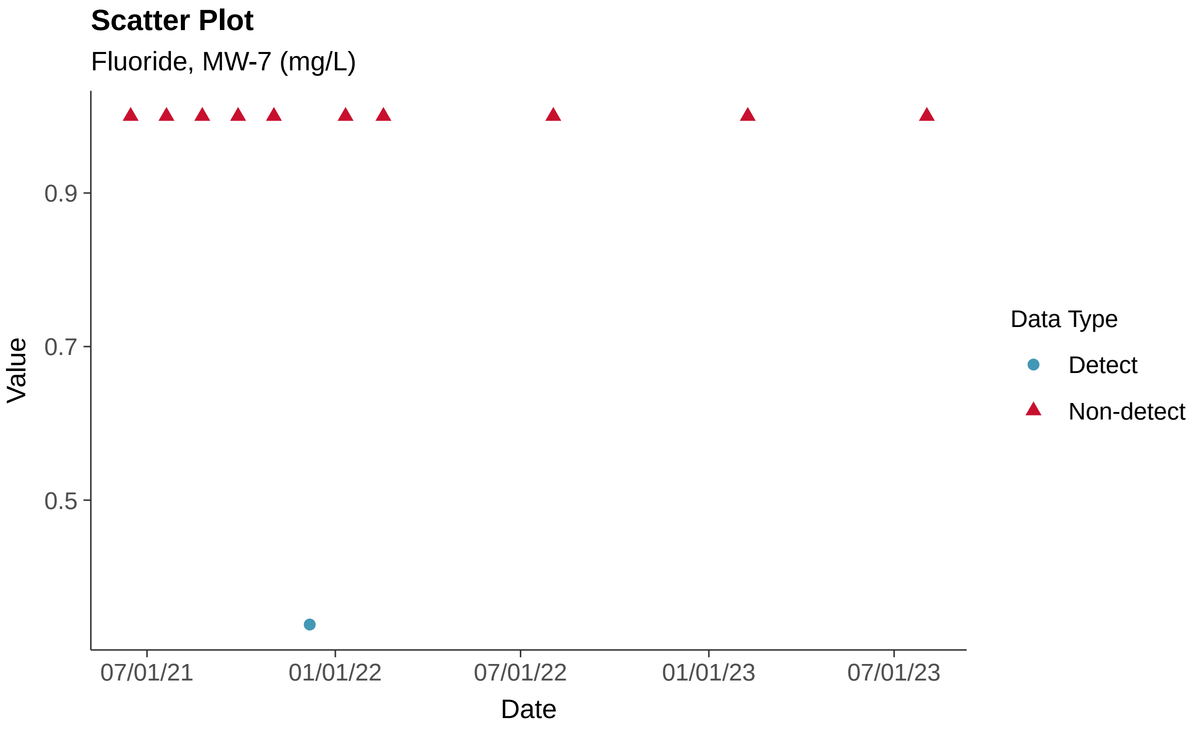
Trend Regression: Piecewise Linear-Linear-Linear

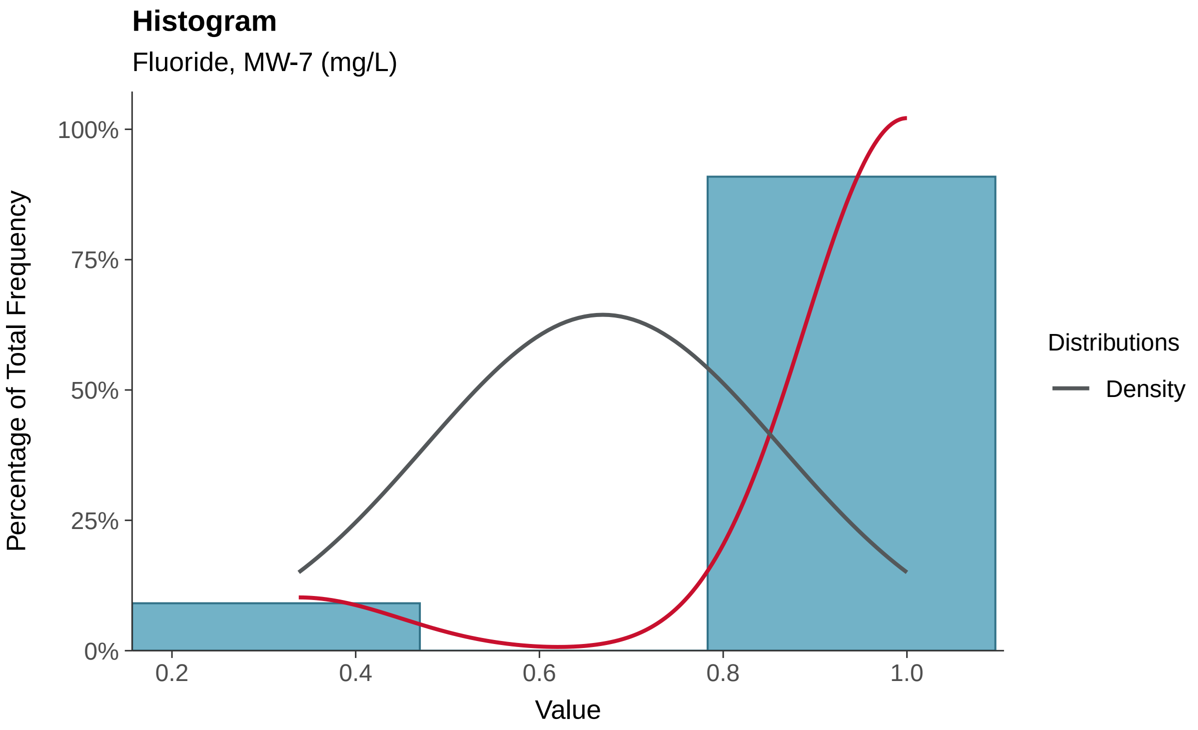
pH, Field, MW-7 (su)



Appendix IV: Fluoride, MW-7

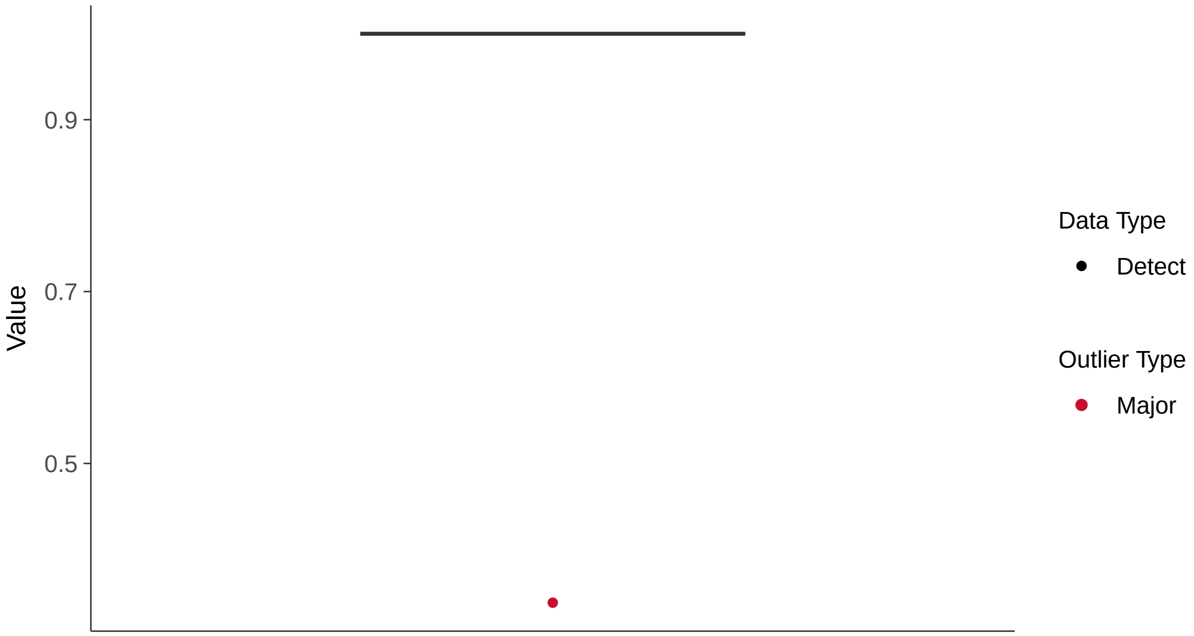
ID: 07_2_04





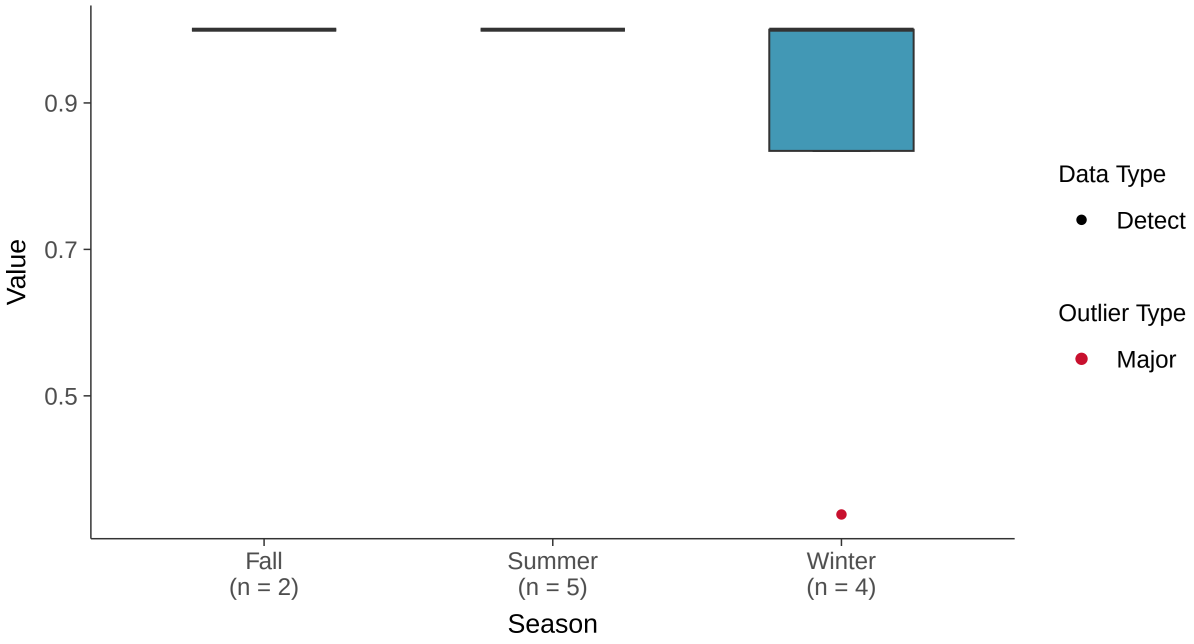
Boxplot

Fluoride, MW-7 (mg/L)



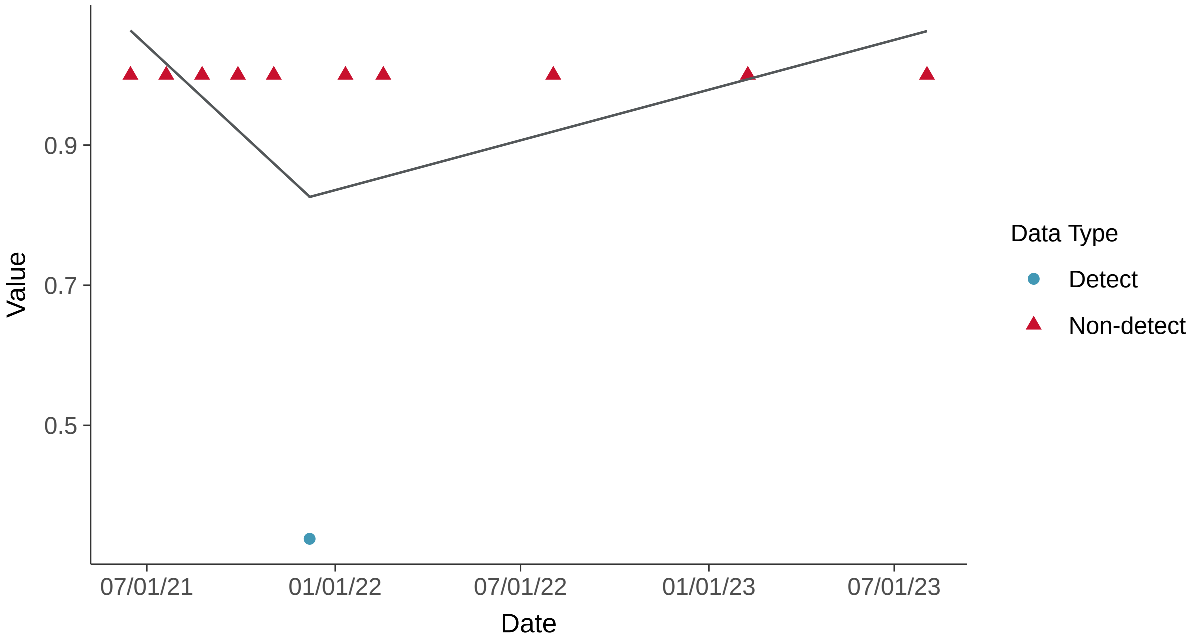
Boxplot by Season

Fluoride, MW-7 (mg/L)



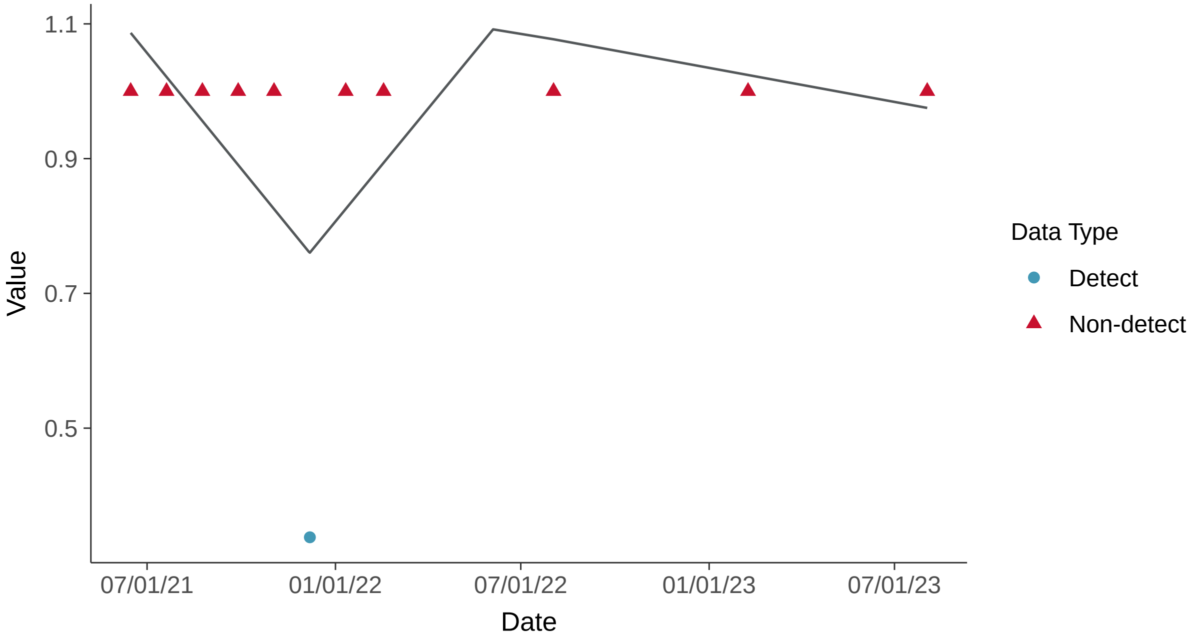
Trend Regression: Piecewise Linear-Linear

Fluoride, MW-7 (mg/L)



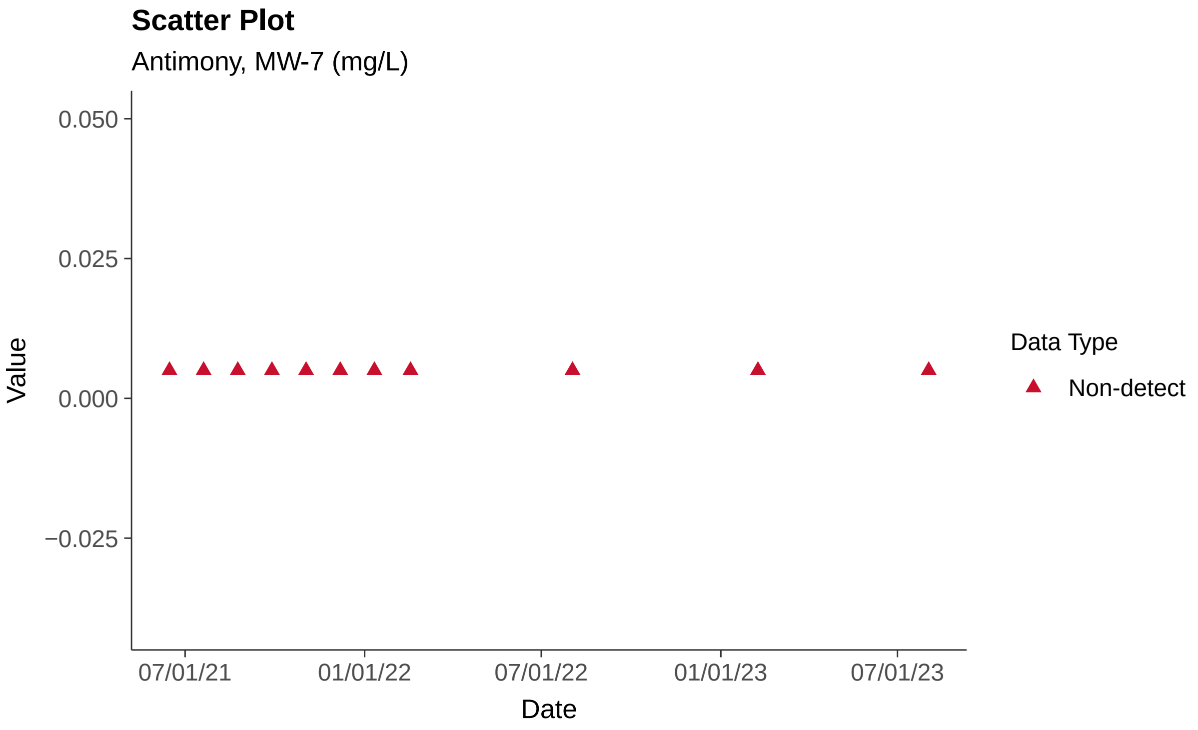
Trend Regression: Piecewise Linear-Linear-Linear

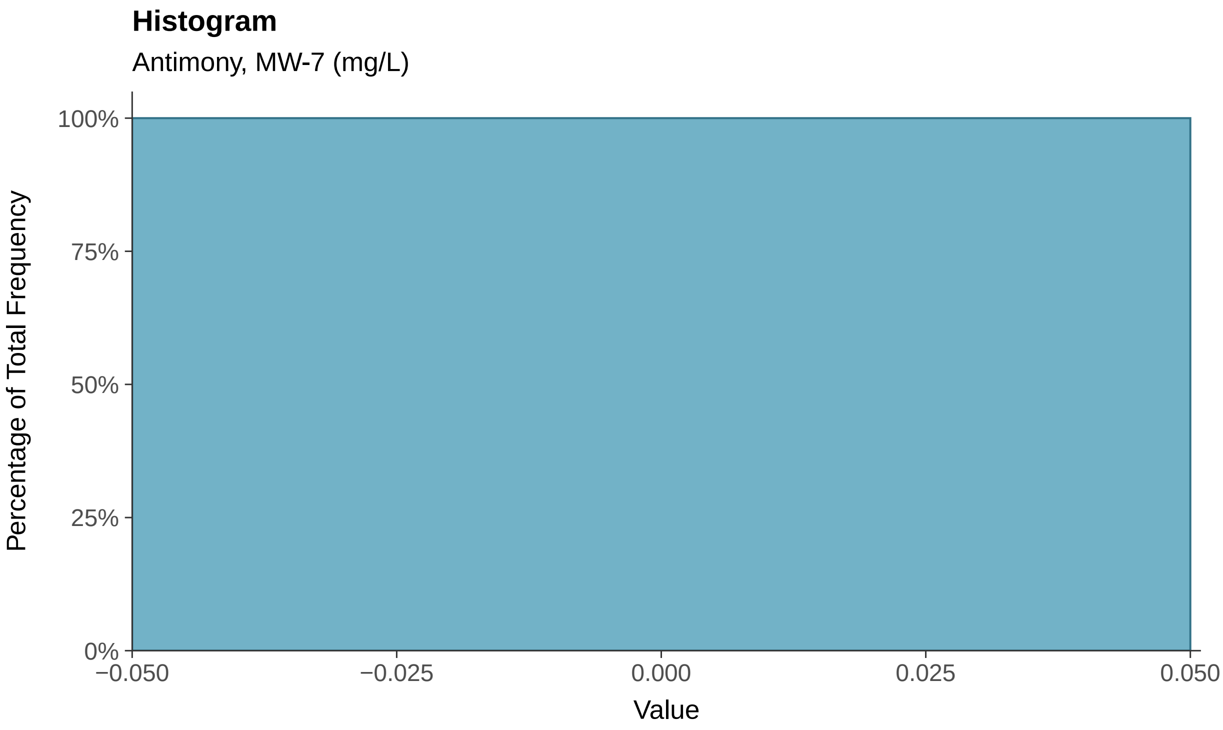
Fluoride, MW-7 (mg/L)



Appendix IV: Antimony, MW-7

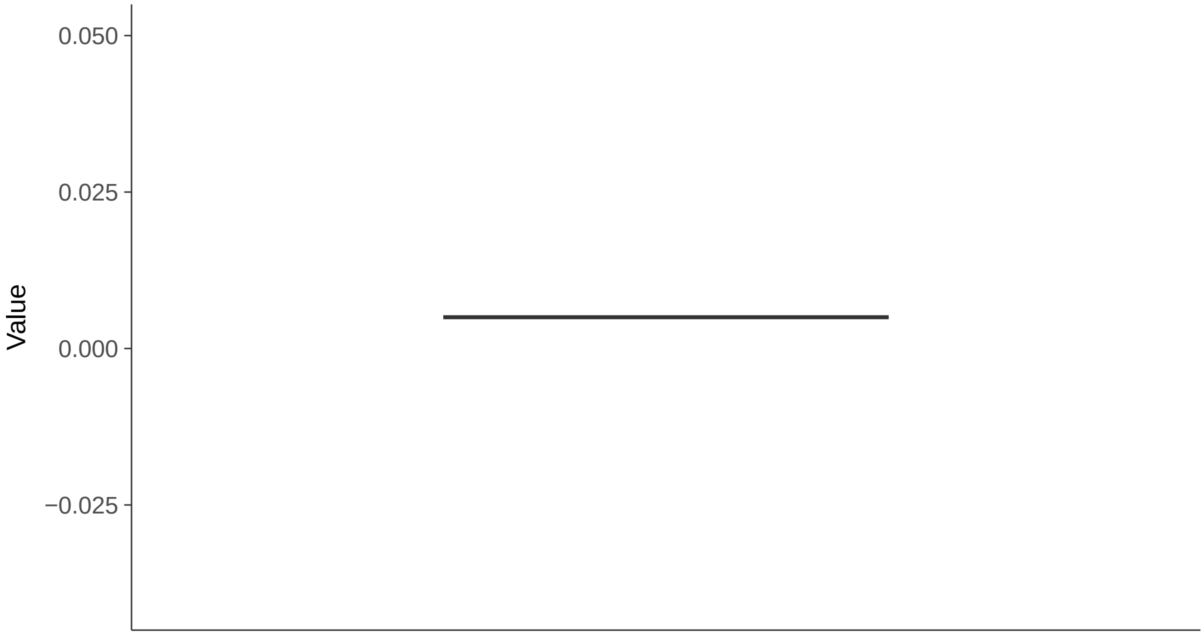
ID: 07_2_08





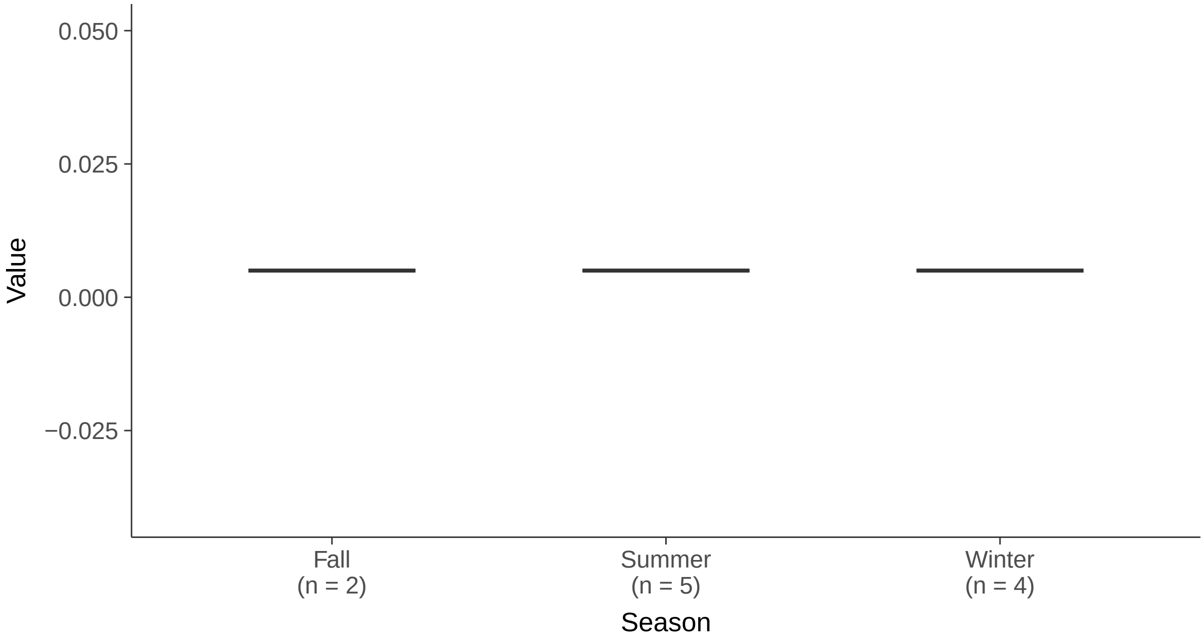
Boxplot

Antimony, MW-7 (mg/L)



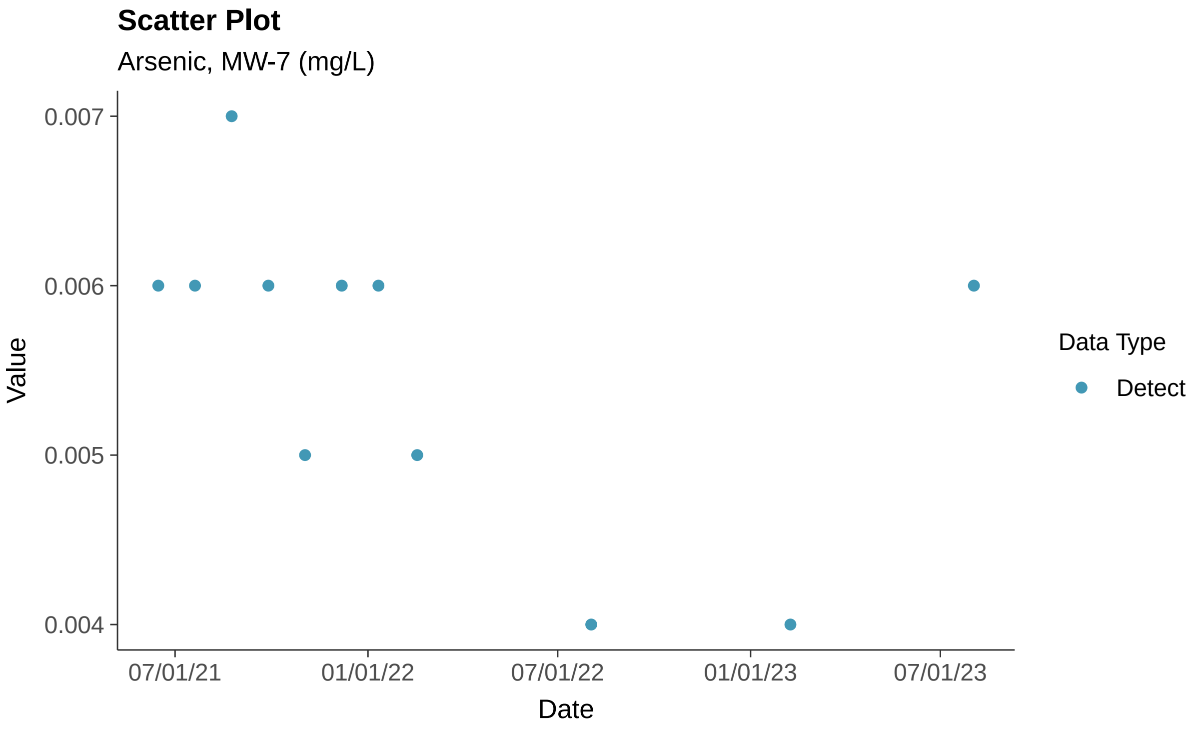
Boxplot by Season

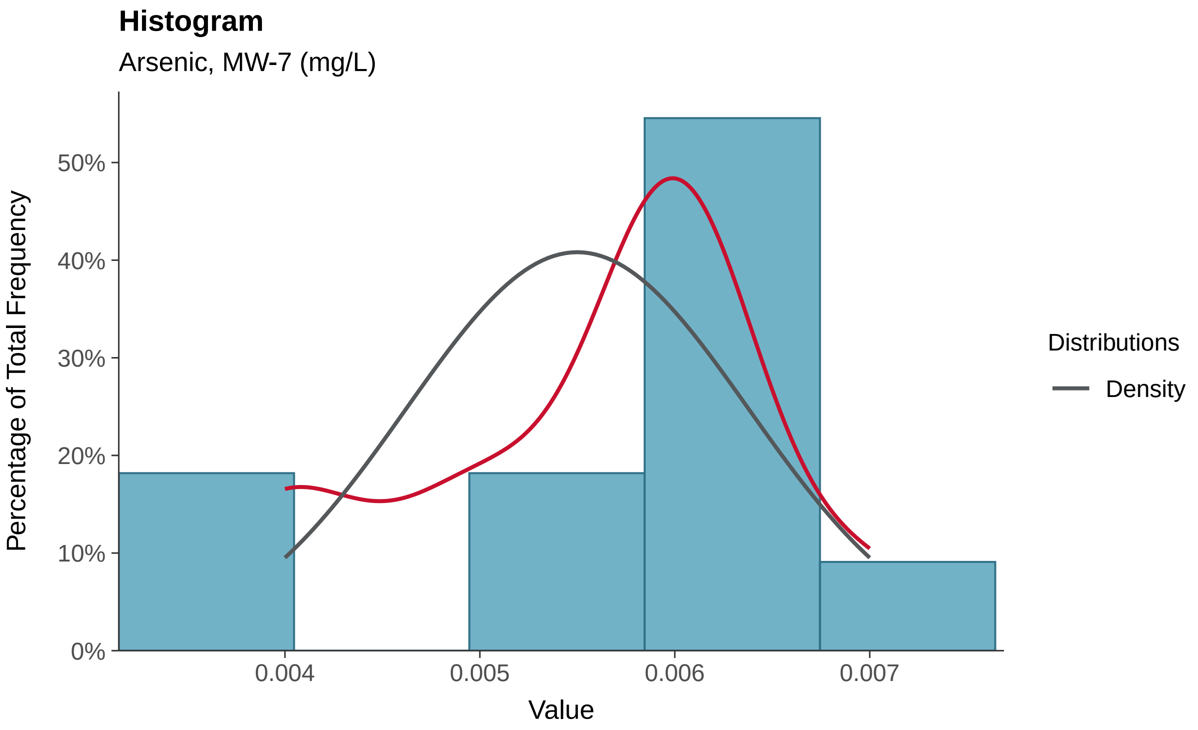
Antimony, MW-7 (mg/L)



Appendix IV: Arsenic, MW-7

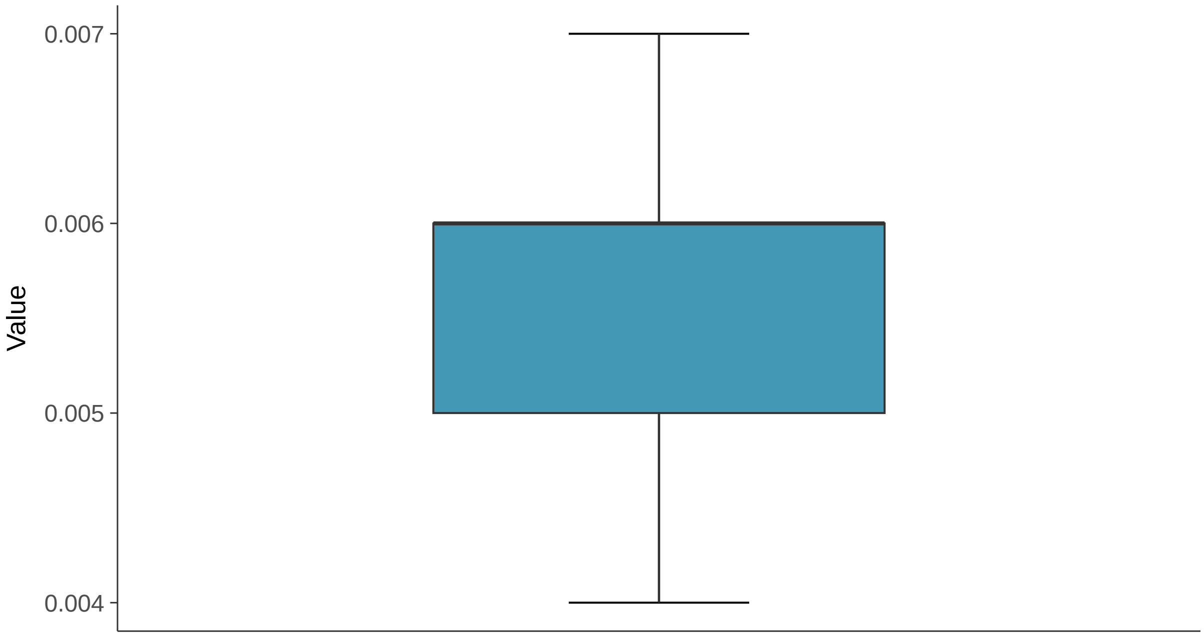
ID: 07_2_09





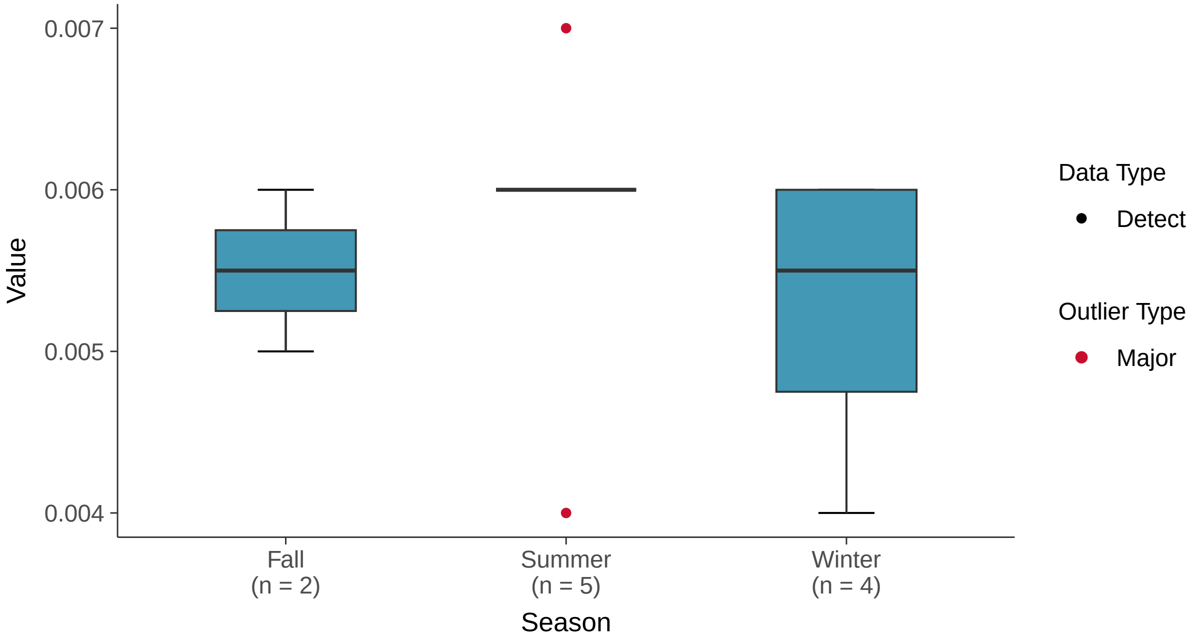
Boxplot

Arsenic, MW-7 (mg/L)



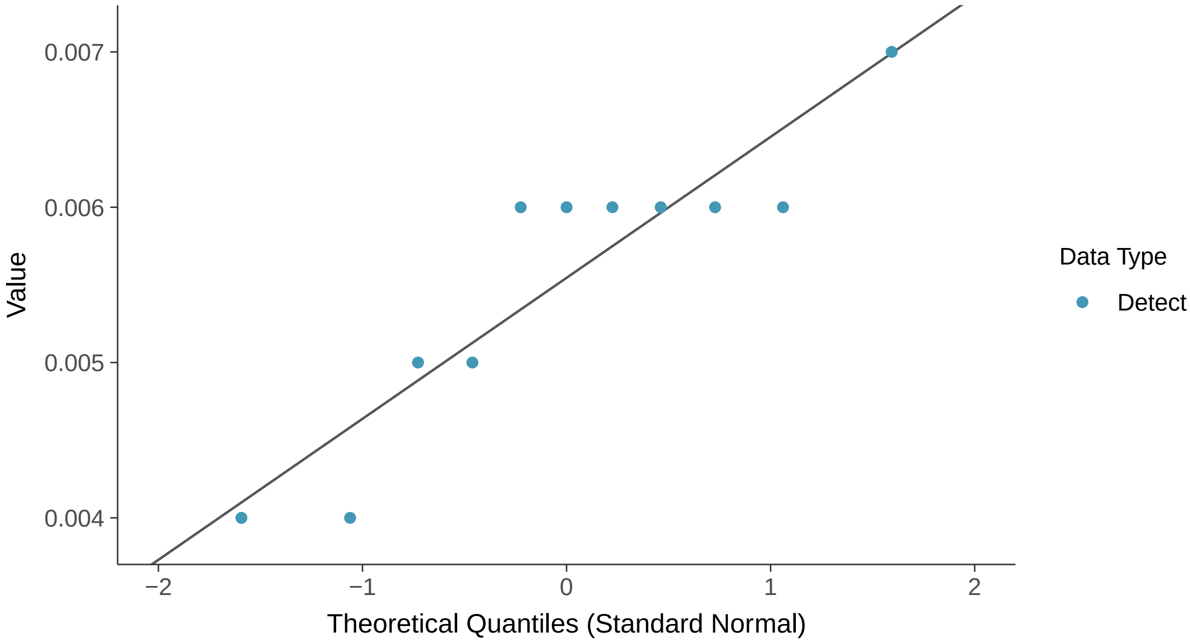
Boxplot by Season

Arsenic, MW-7 (mg/L)



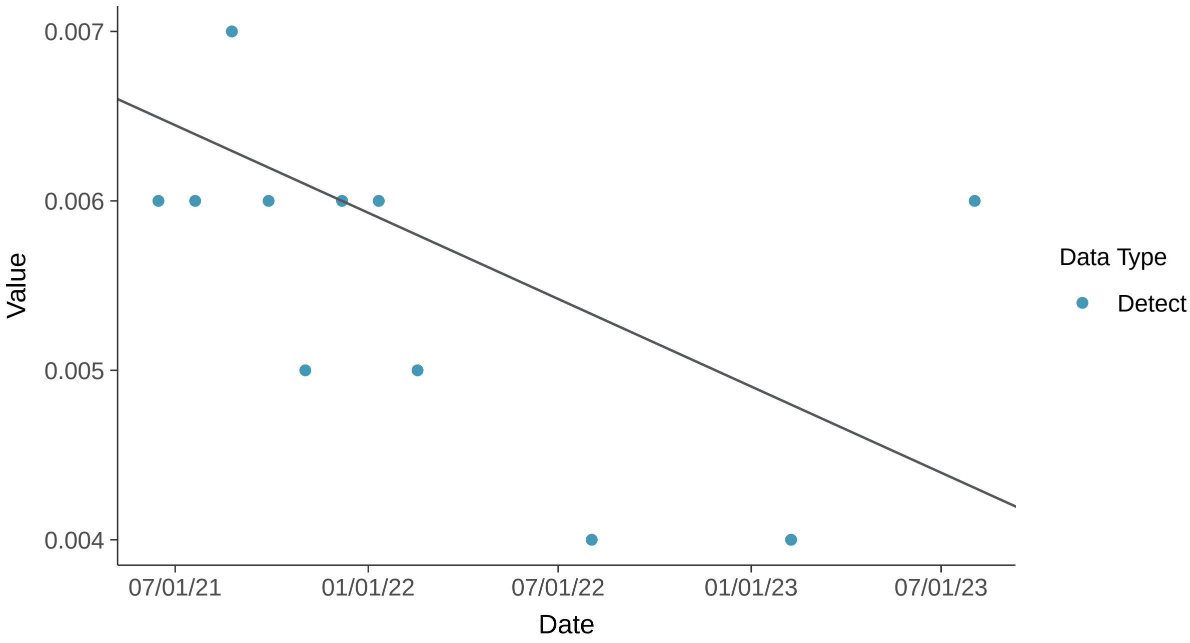
Normal Q-Q plot

Arsenic, MW-7 (mg/L)



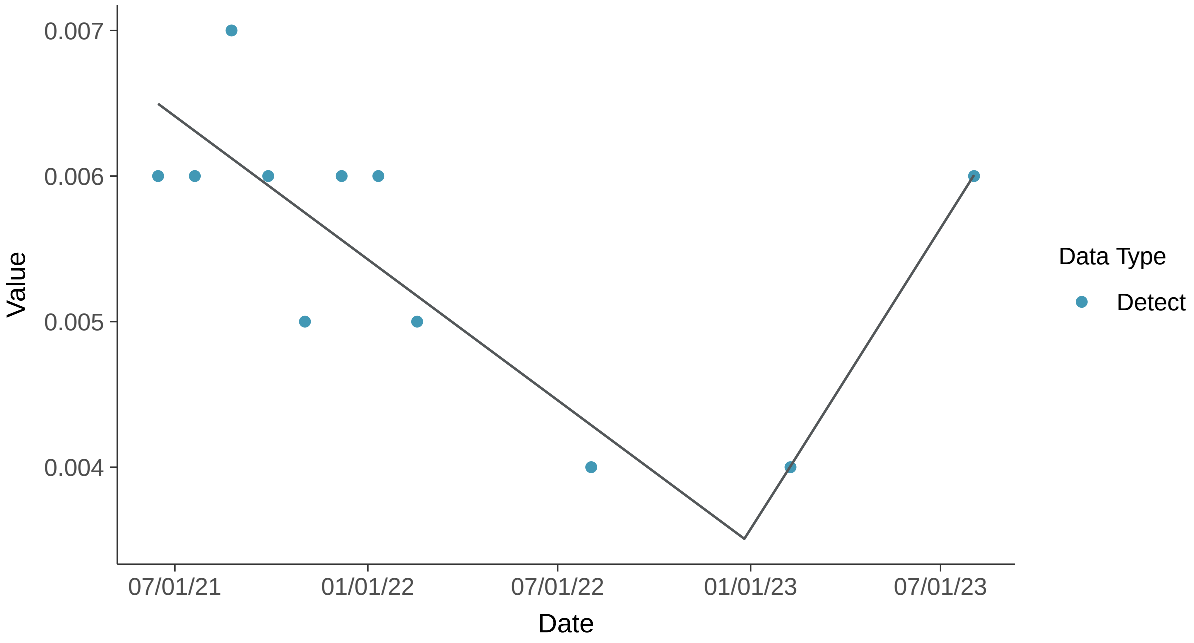
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Arsenic, MW-7 (mg/L)



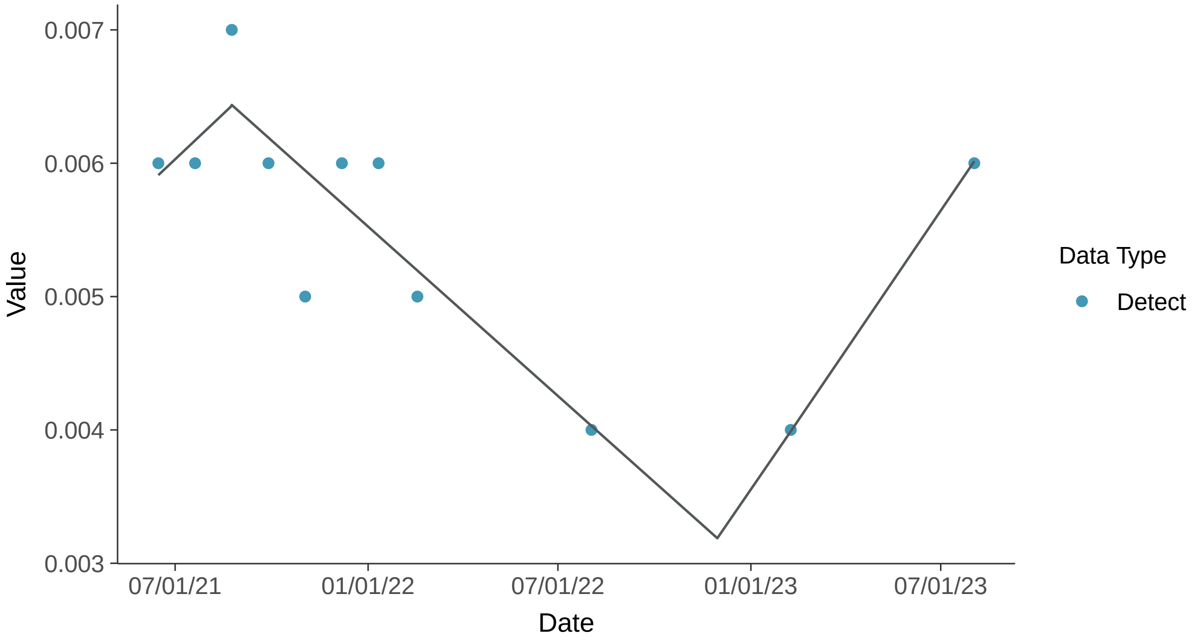
Trend Regression: Piecewise Linear-Linear

Arsenic, MW-7 (mg/L)



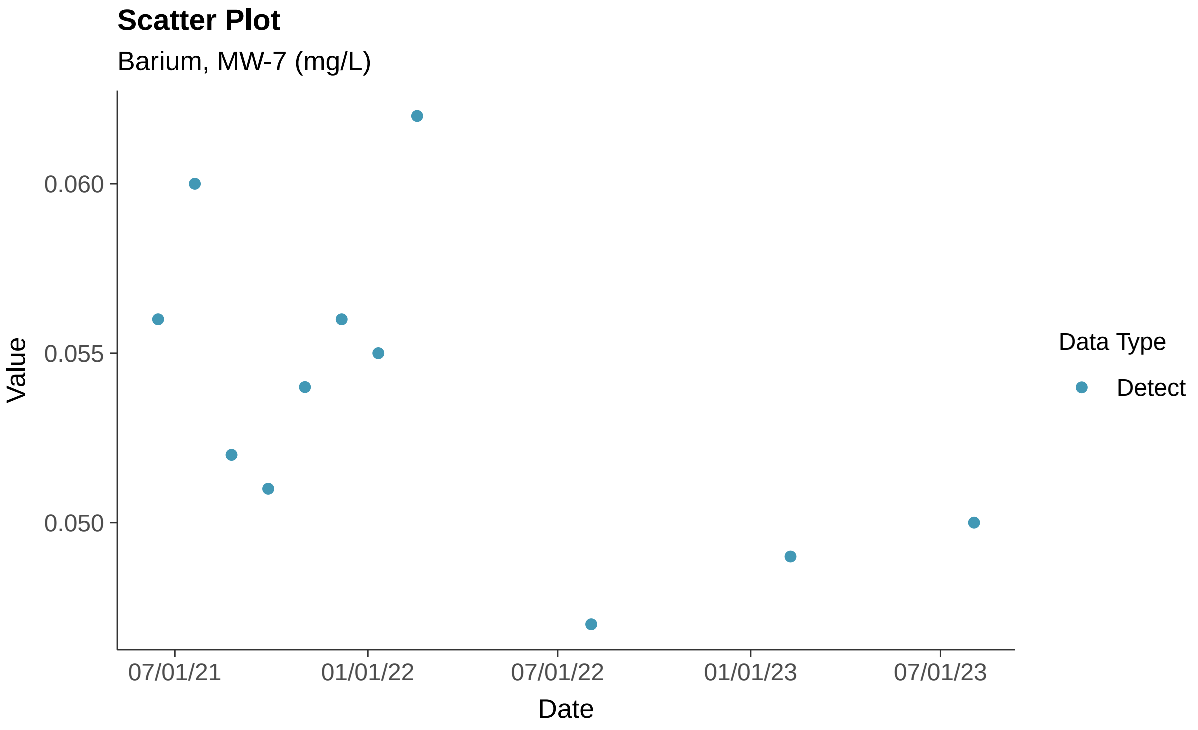
Trend Regression: Piecewise Linear-Linear-Linear

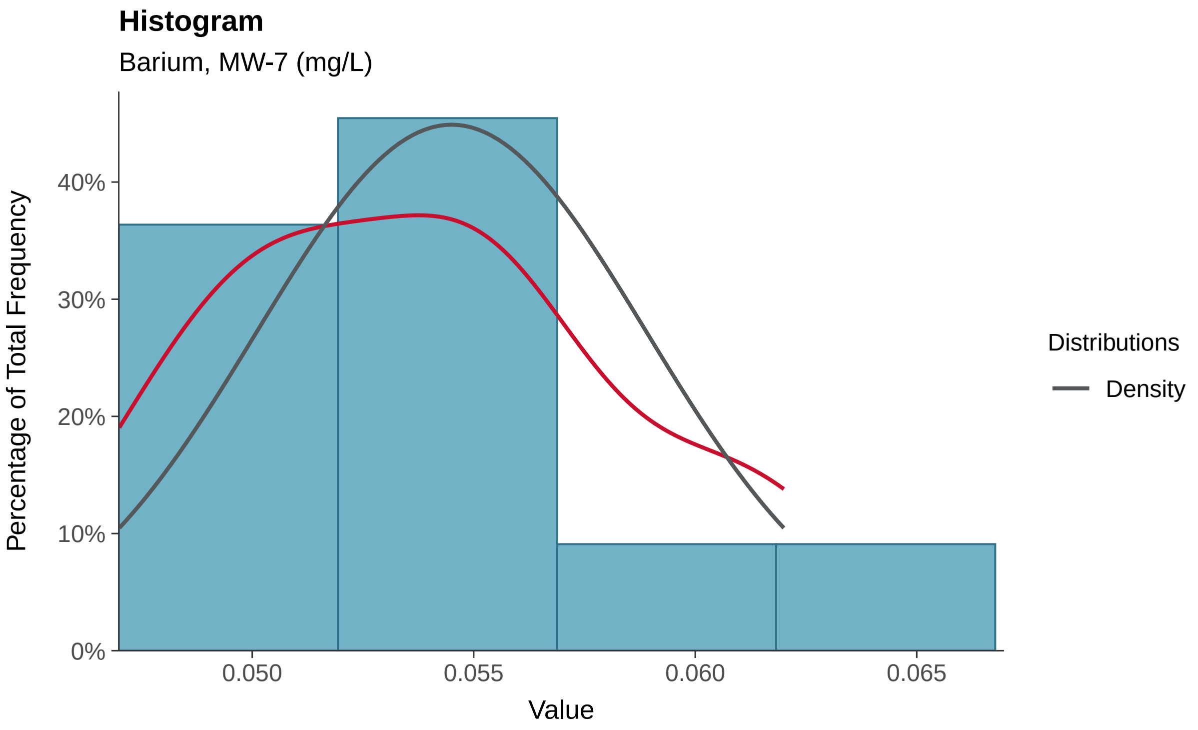
Arsenic, MW-7 (mg/L)



Appendix IV: Barium, MW-7

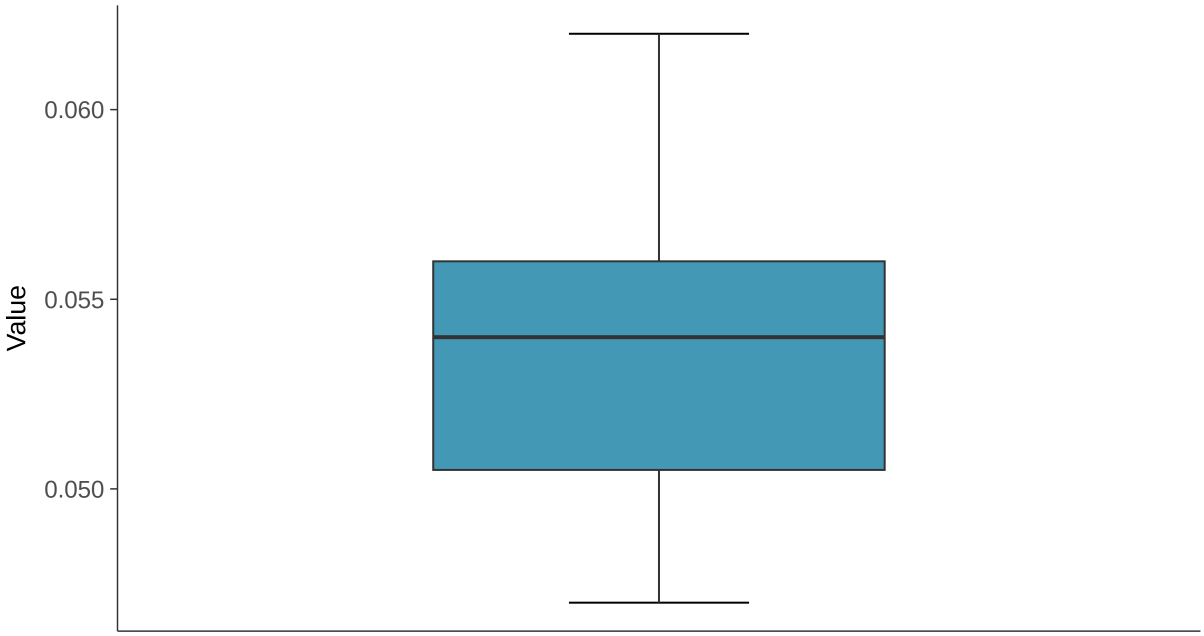
ID: 07_2_10





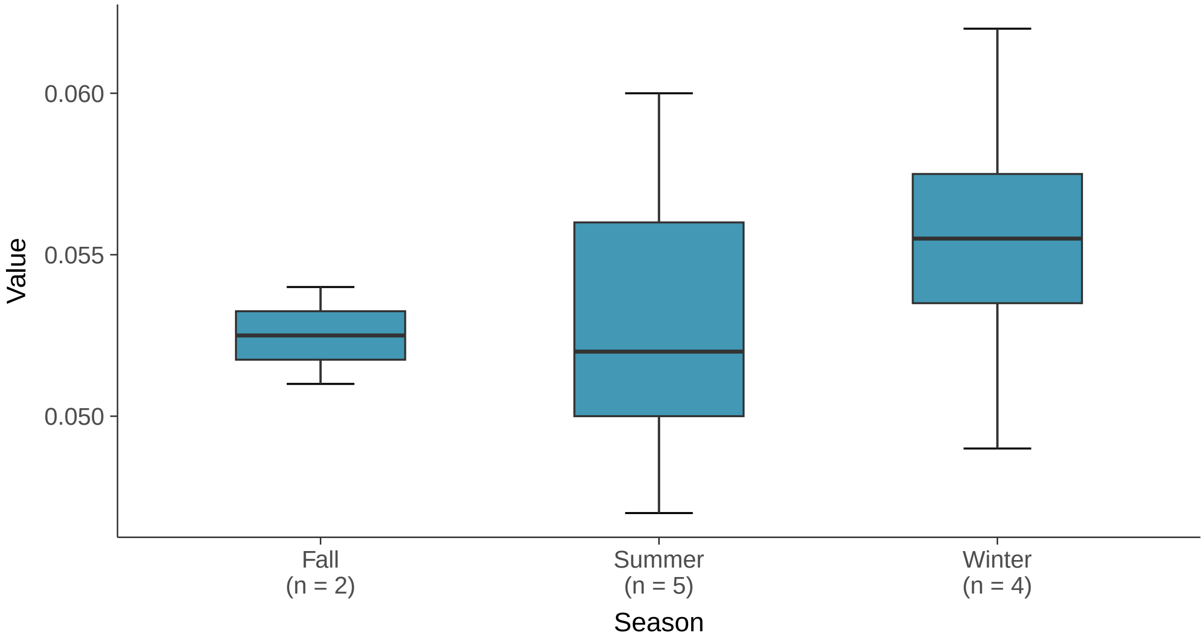
Boxplot

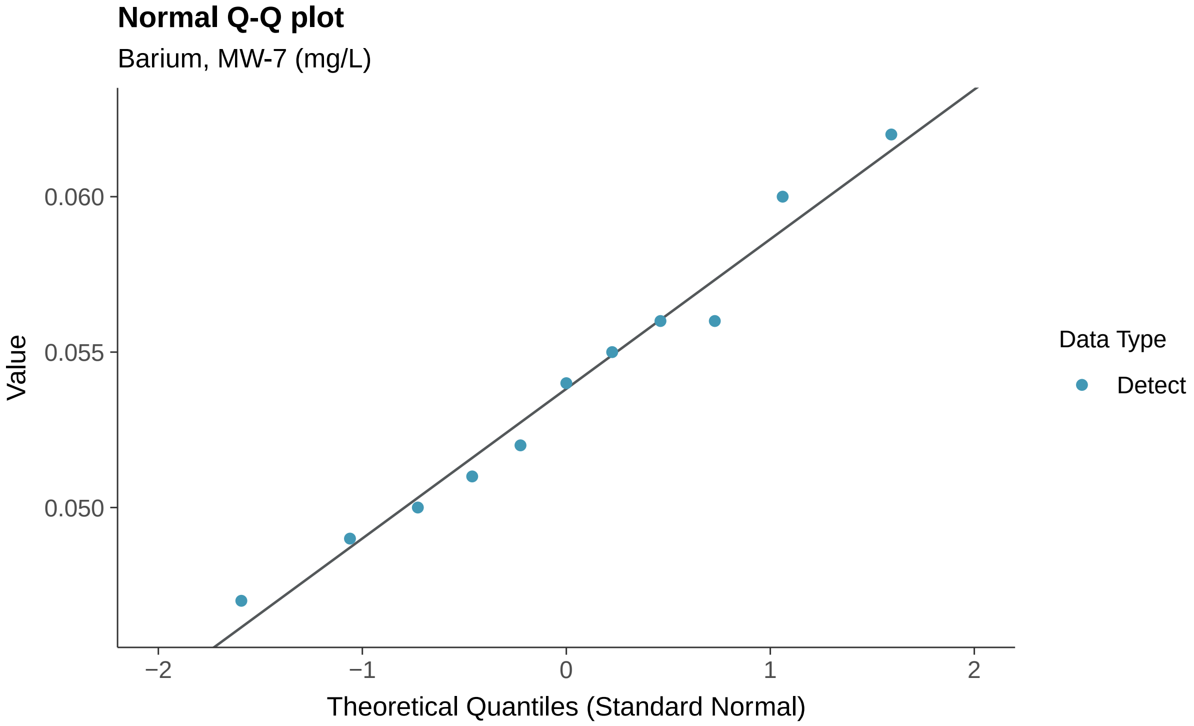
Barium, MW-7 (mg/L)



Boxplot by Season

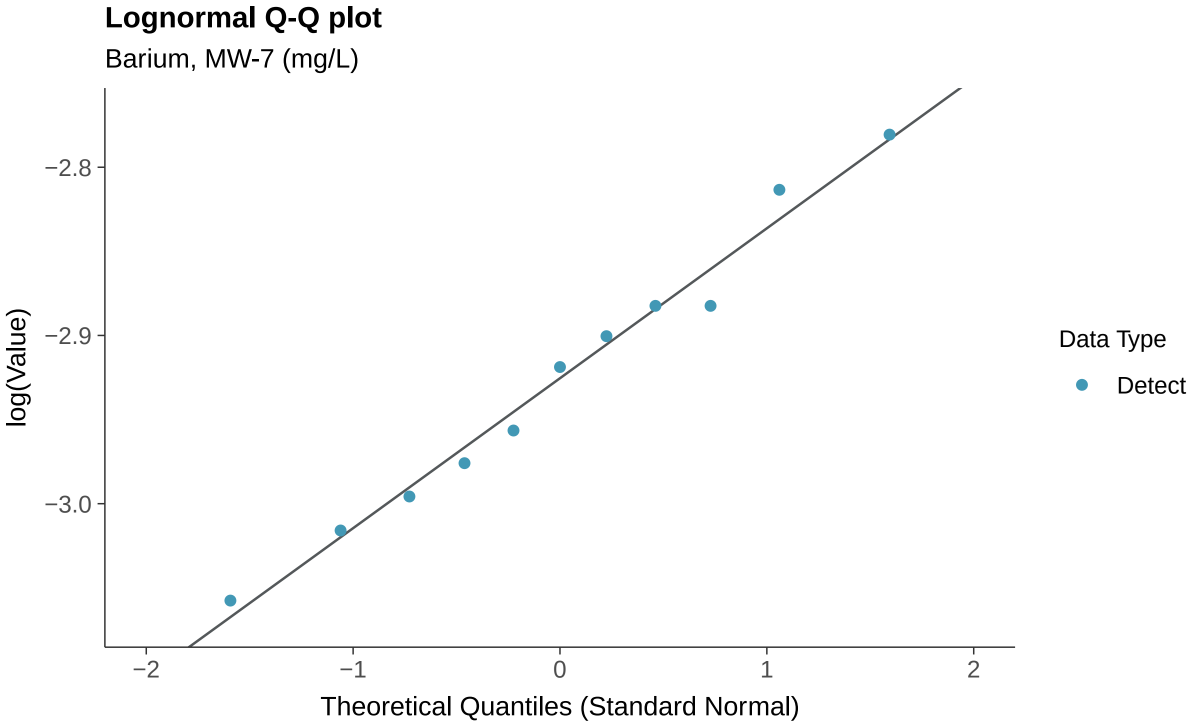
Barium, MW-7 (mg/L)





Normal Q-Q plot

Barium, MW-7 (mg/L)

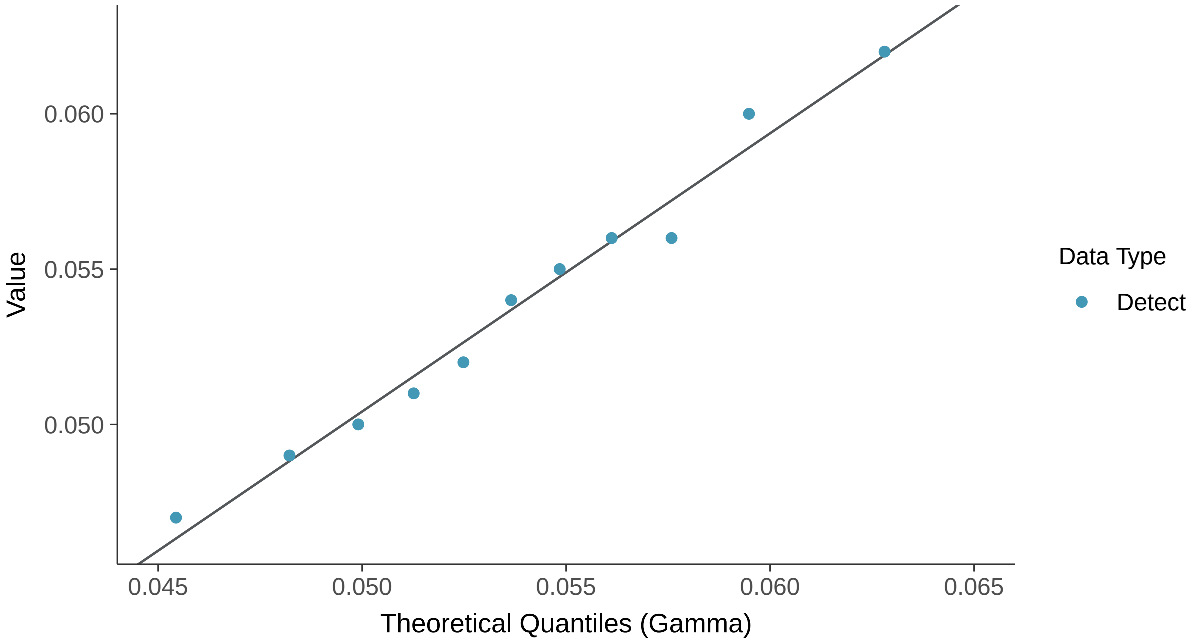


Lognormal Q-Q plot

Barium, MW-7 (mg/L)

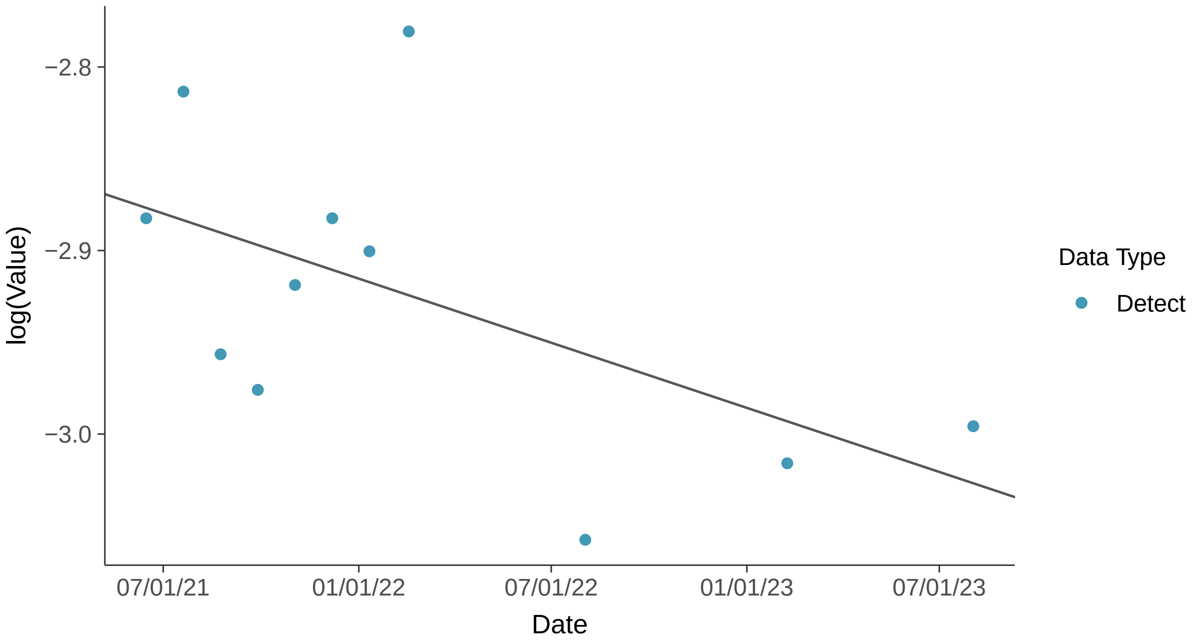
Gamma Q-Q plot

Barium, MW-7 (mg/L)



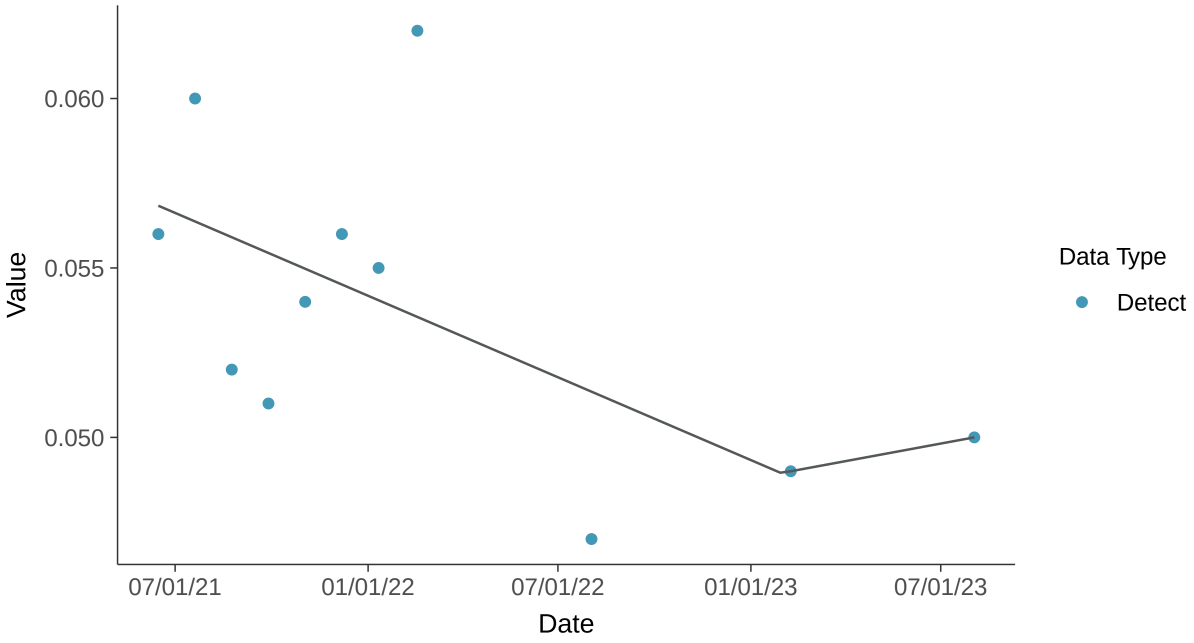
Trend Regression: Lognormal MLE

Barium, MW-7 (mg/L)



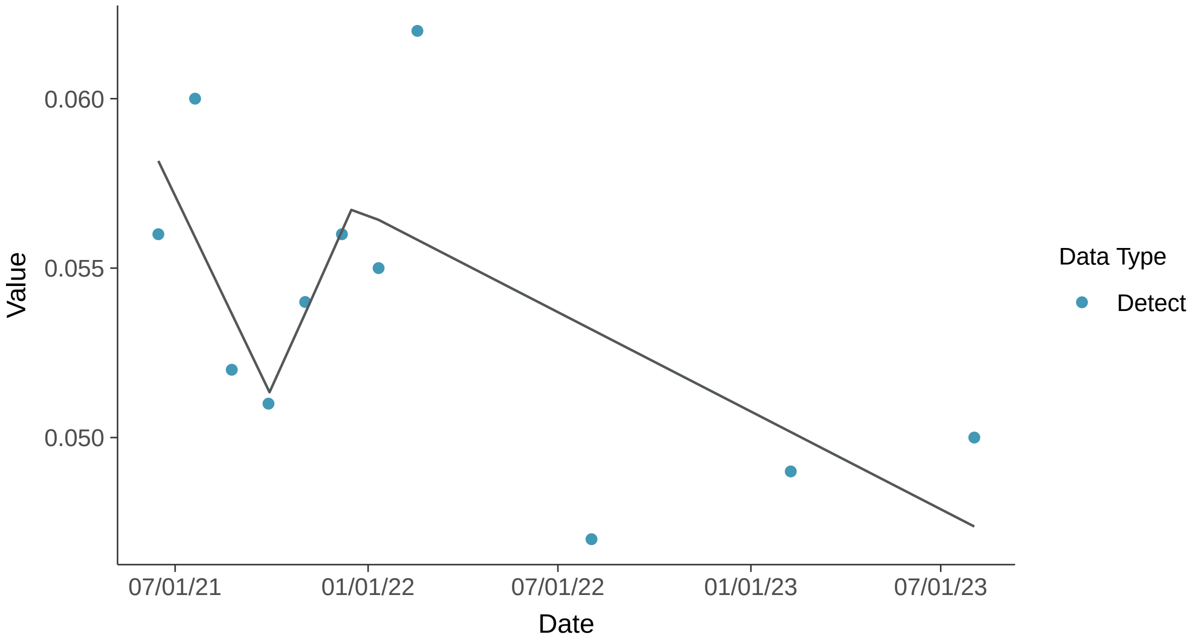
Trend Regression: Piecewise Linear-Linear

Barium, MW-7 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Barium, MW-7 (mg/L)

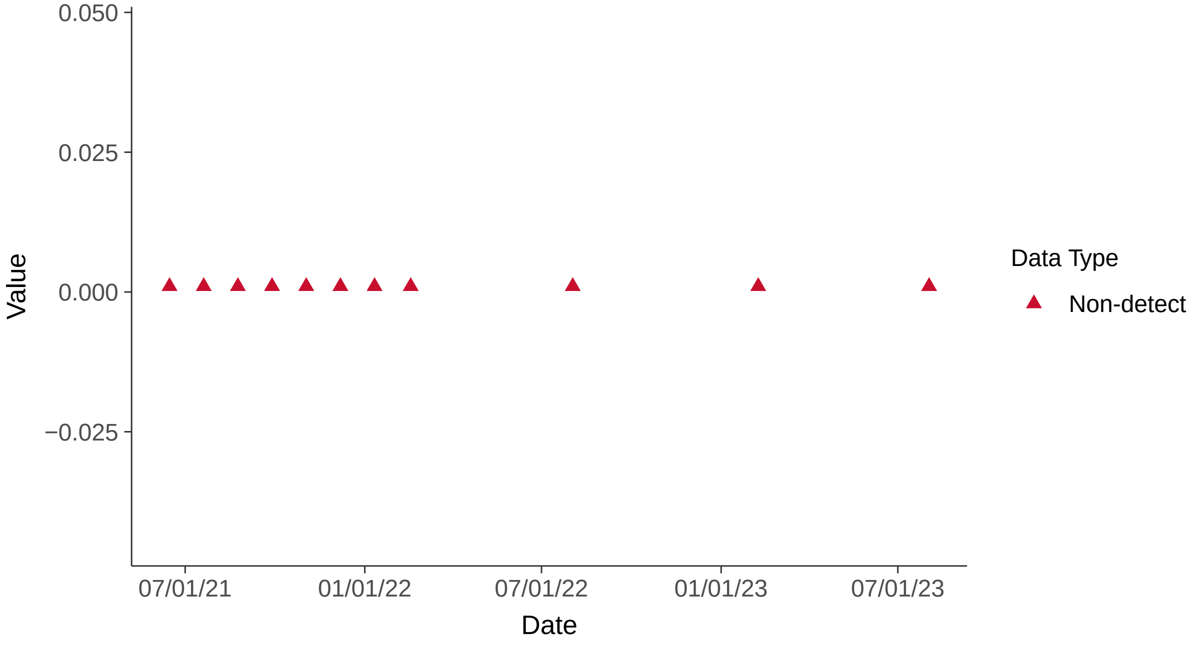


Appendix IV: Beryllium, MW-7

ID: 07_2_11

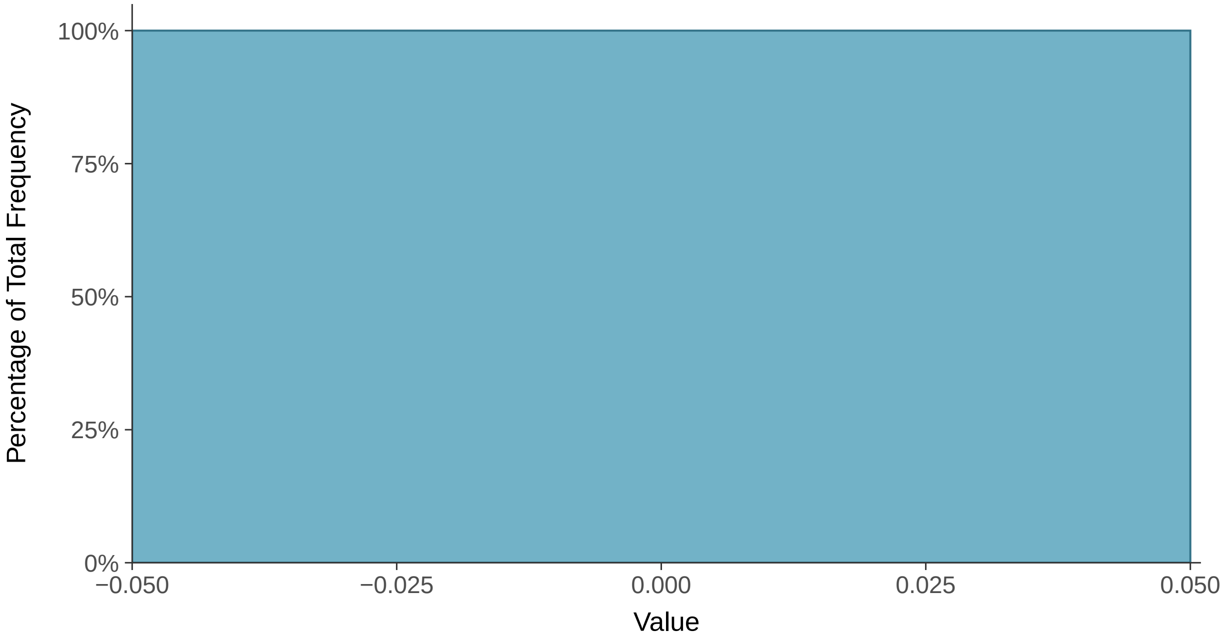
Scatter Plot

Beryllium, MW-7 (mg/L)



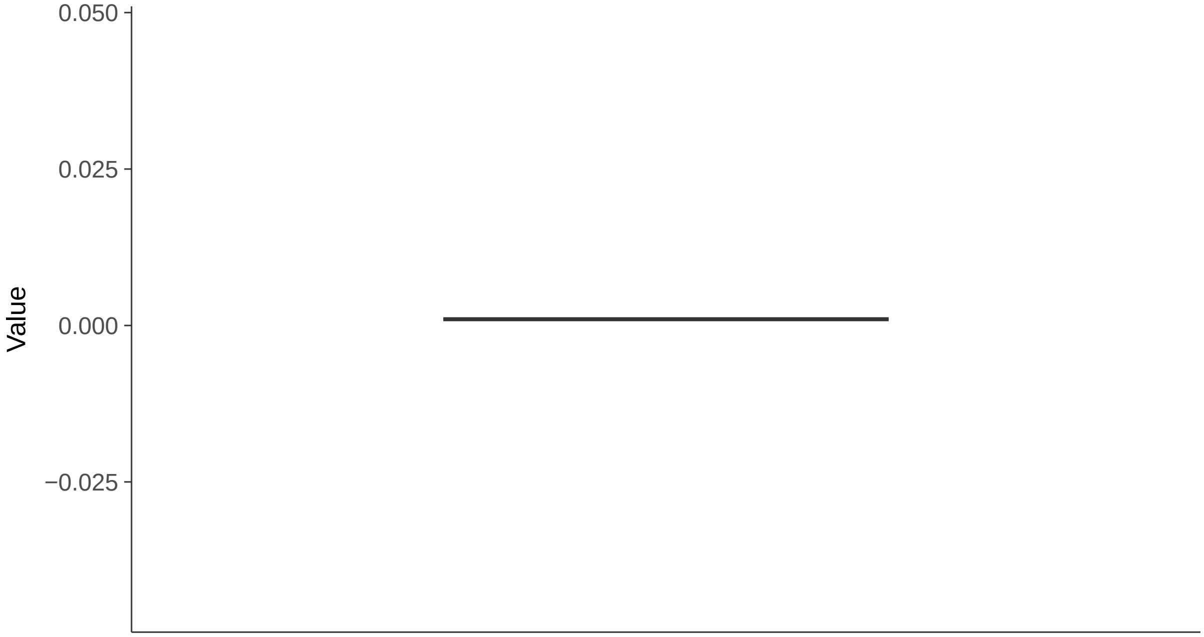
Histogram

Beryllium, MW-7 (mg/L)



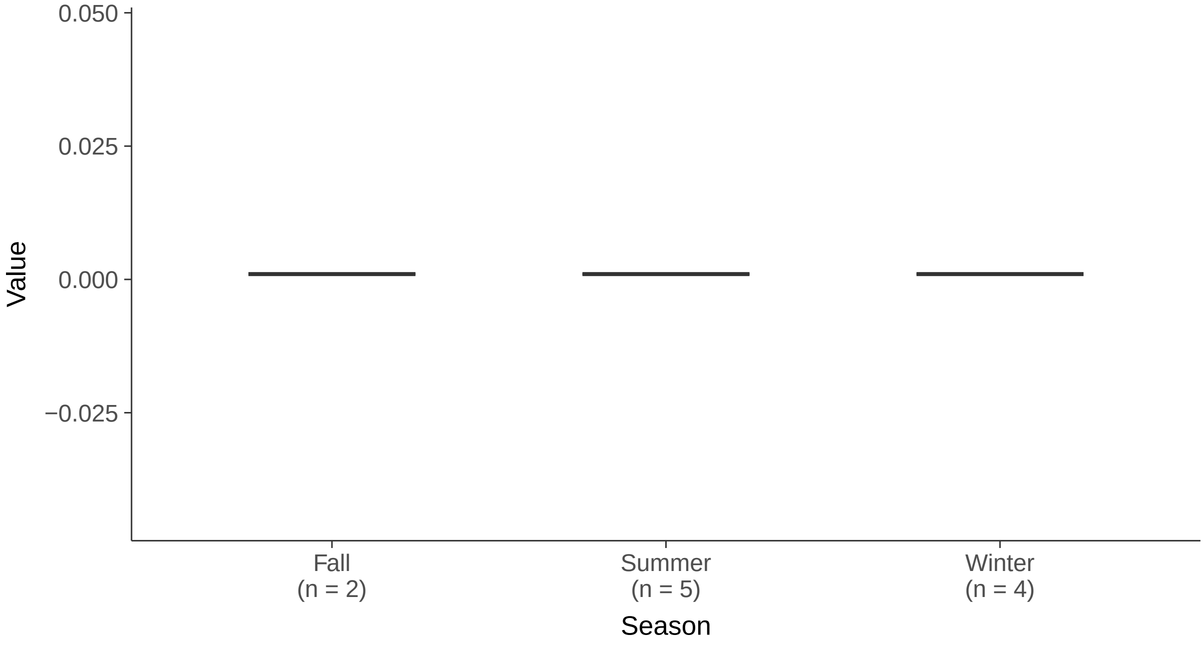
Boxplot

Beryllium, MW-7 (mg/L)



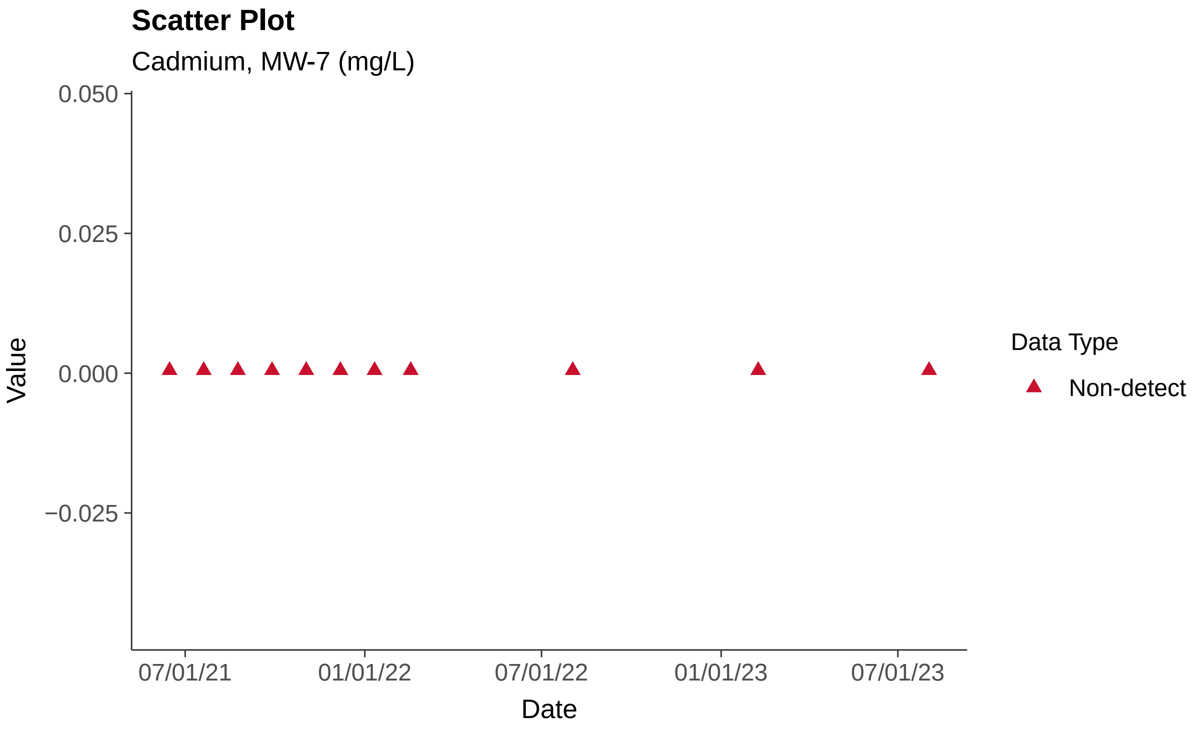
Boxplot by Season

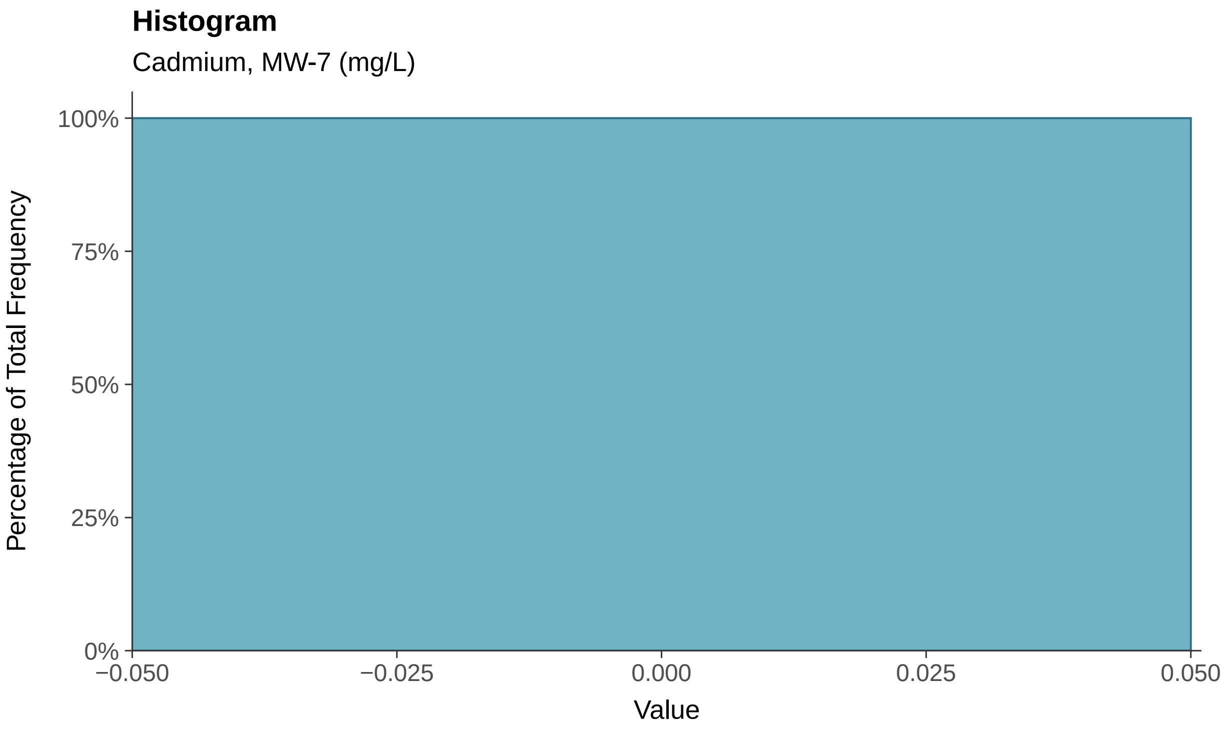
Beryllium, MW-7 (mg/L)



Appendix IV: Cadmium, MW-7

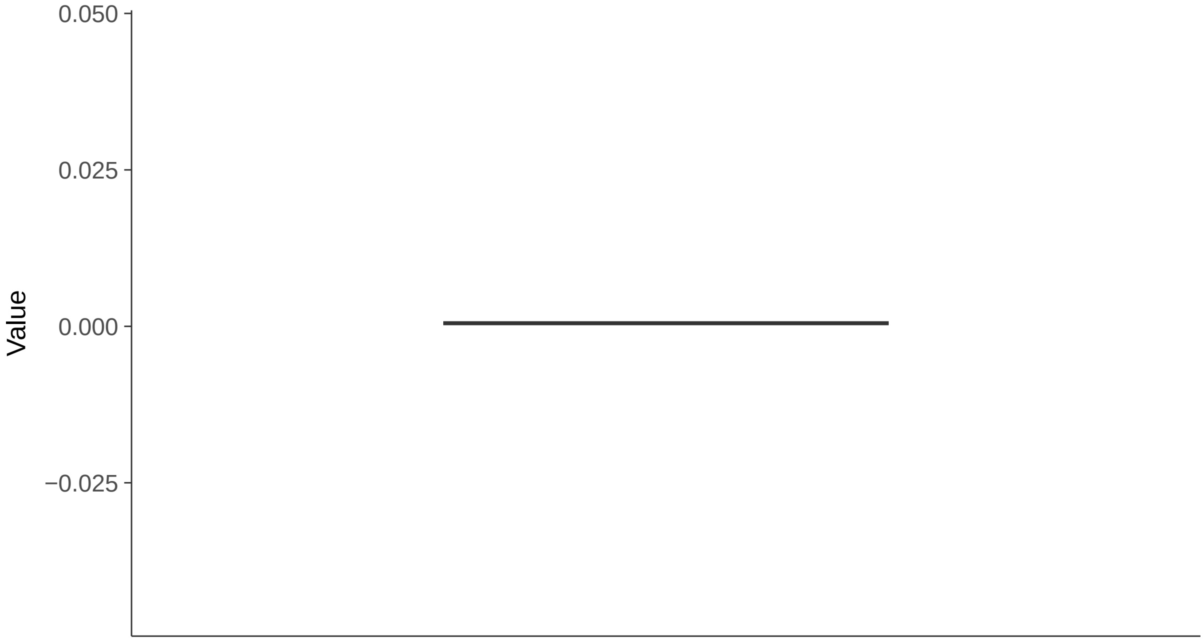
ID: 07_2_12





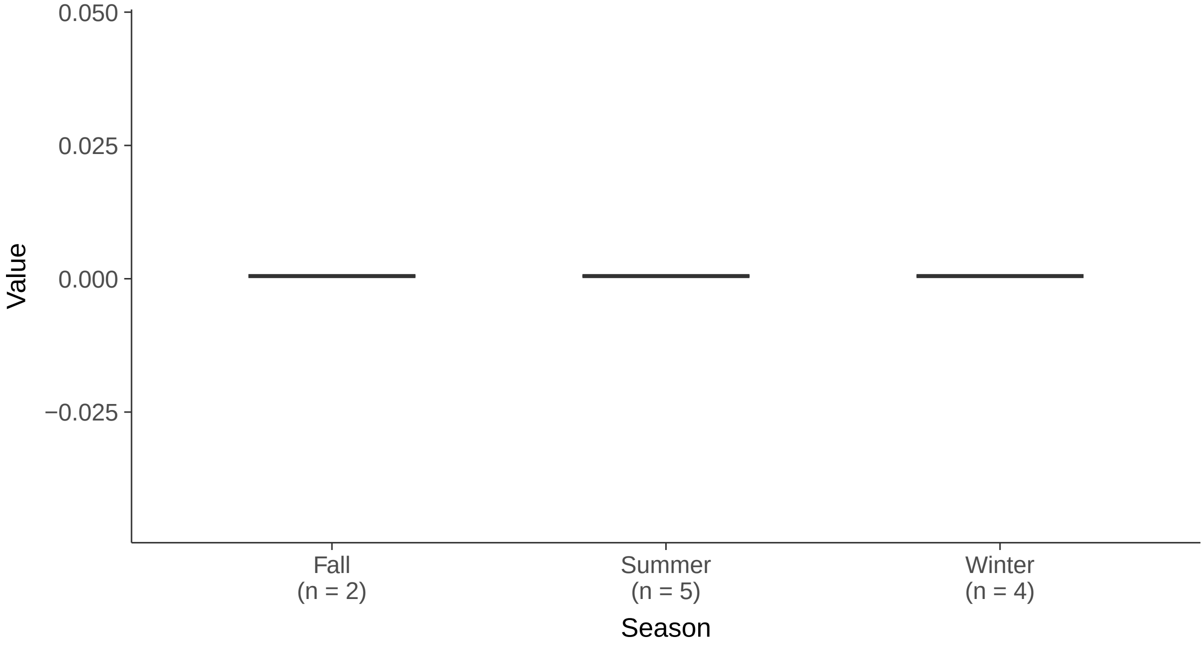
Boxplot

Cadmium, MW-7 (mg/L)



Boxplot by Season

Cadmium, MW-7 (mg/L)

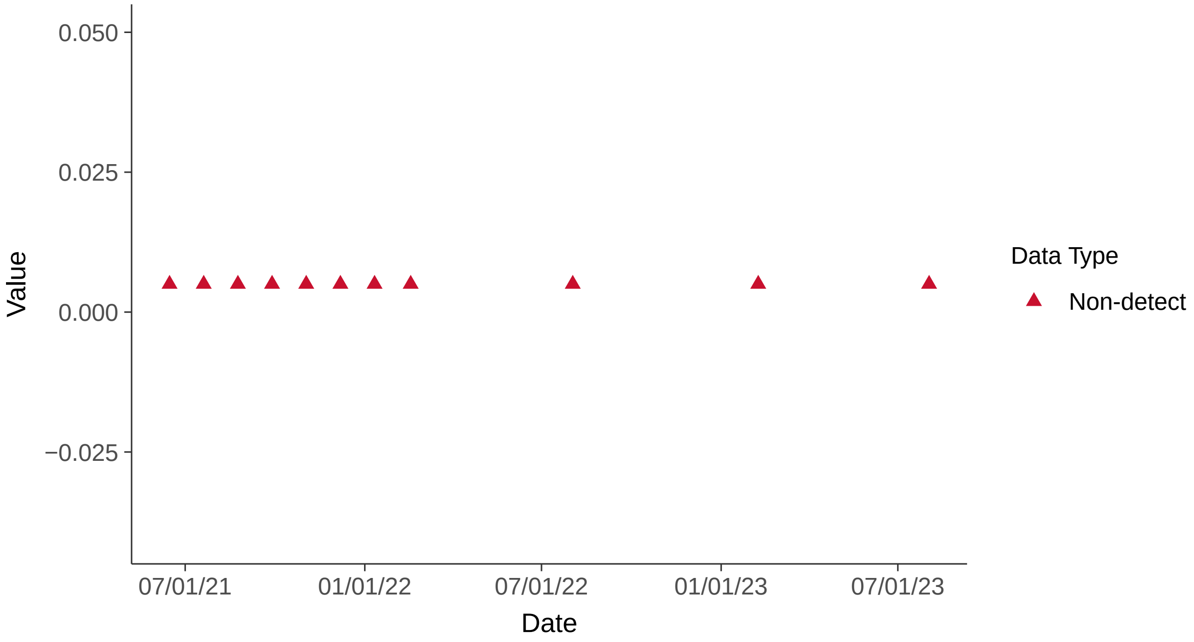


Appendix IV: Chromium, MW-7

ID: 07_2_13

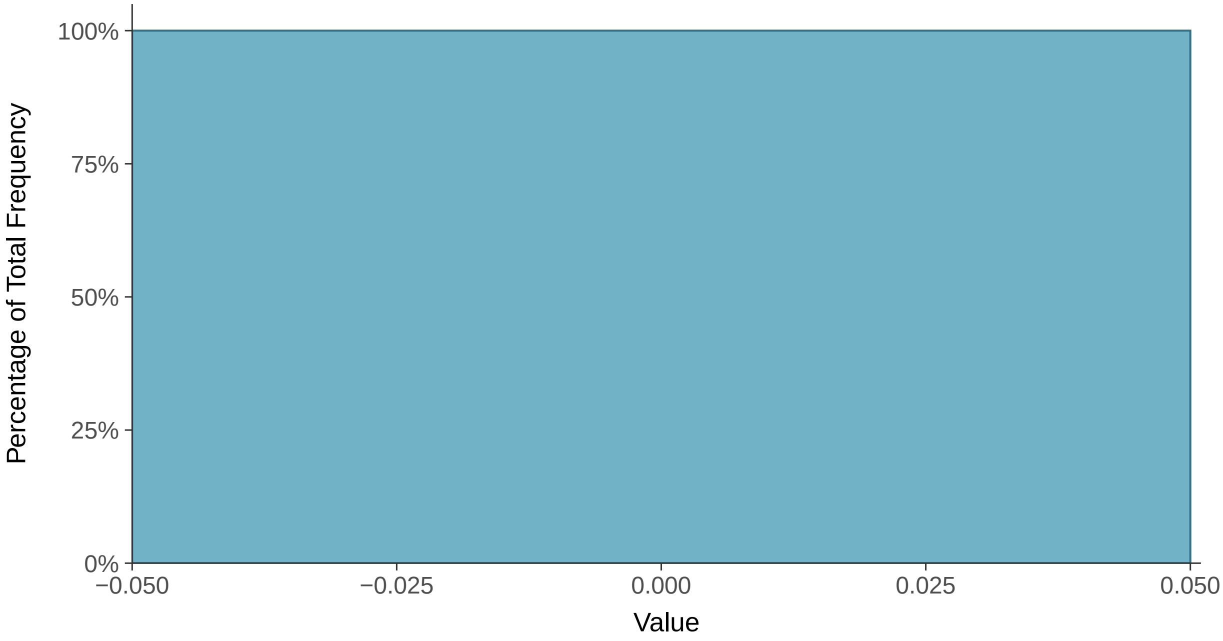
Scatter Plot

Chromium, MW-7 (mg/L)



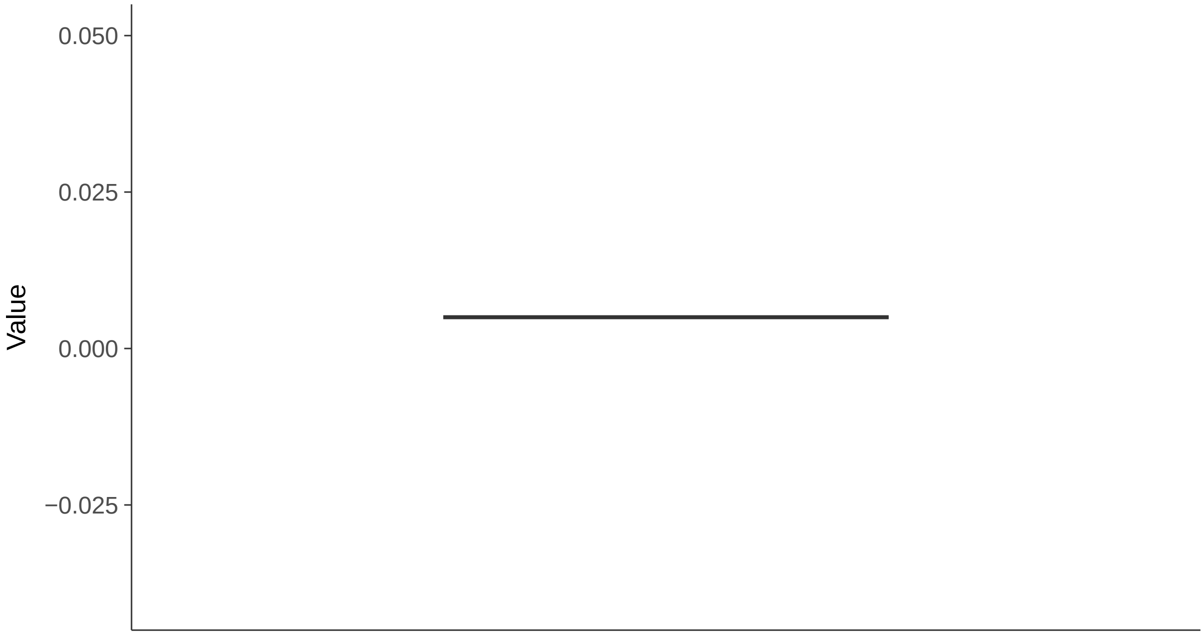
Histogram

Chromium, MW-7 (mg/L)



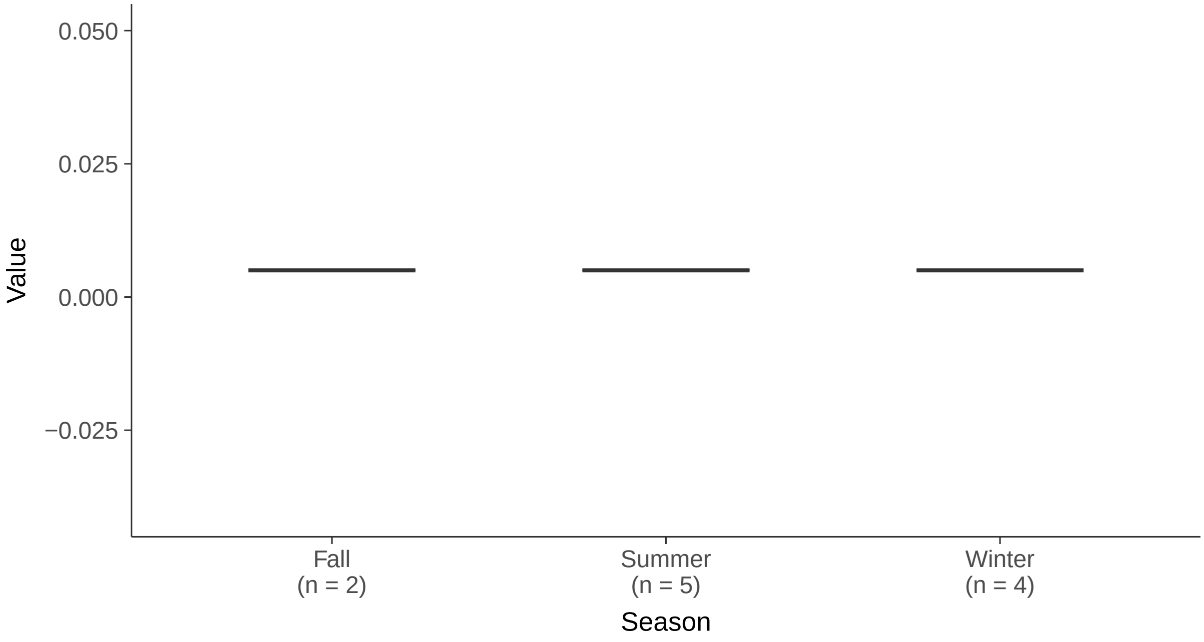
Boxplot

Chromium, MW-7 (mg/L)



Boxplot by Season

Chromium, MW-7 (mg/L)

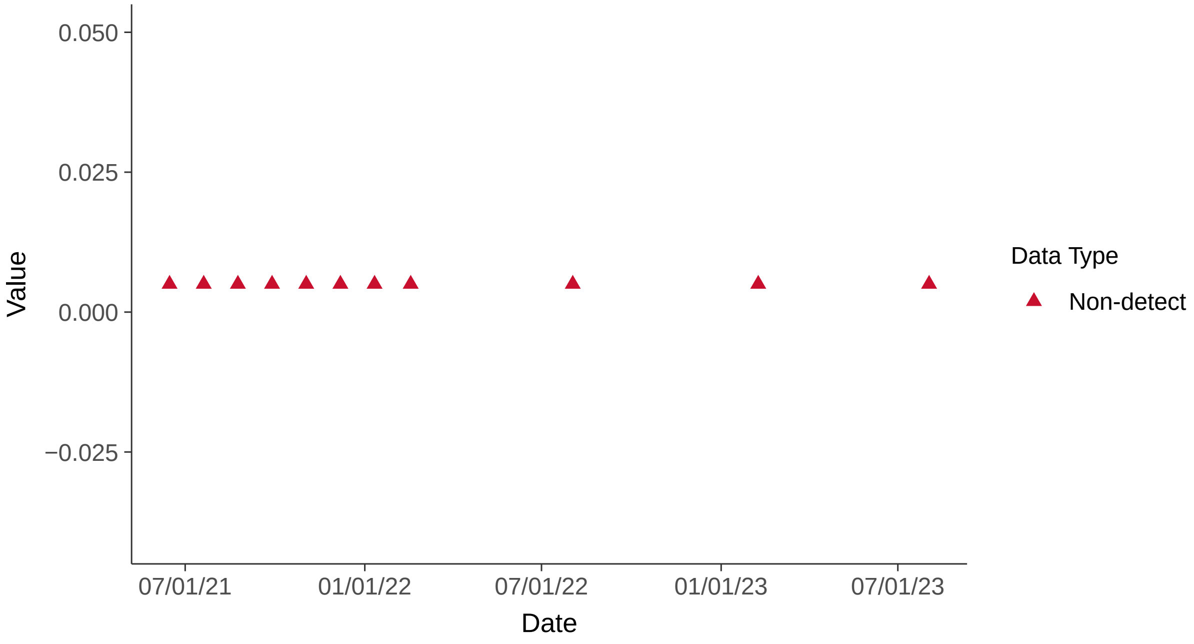


Appendix IV: Cobalt, MW-7

ID: 07_2_14

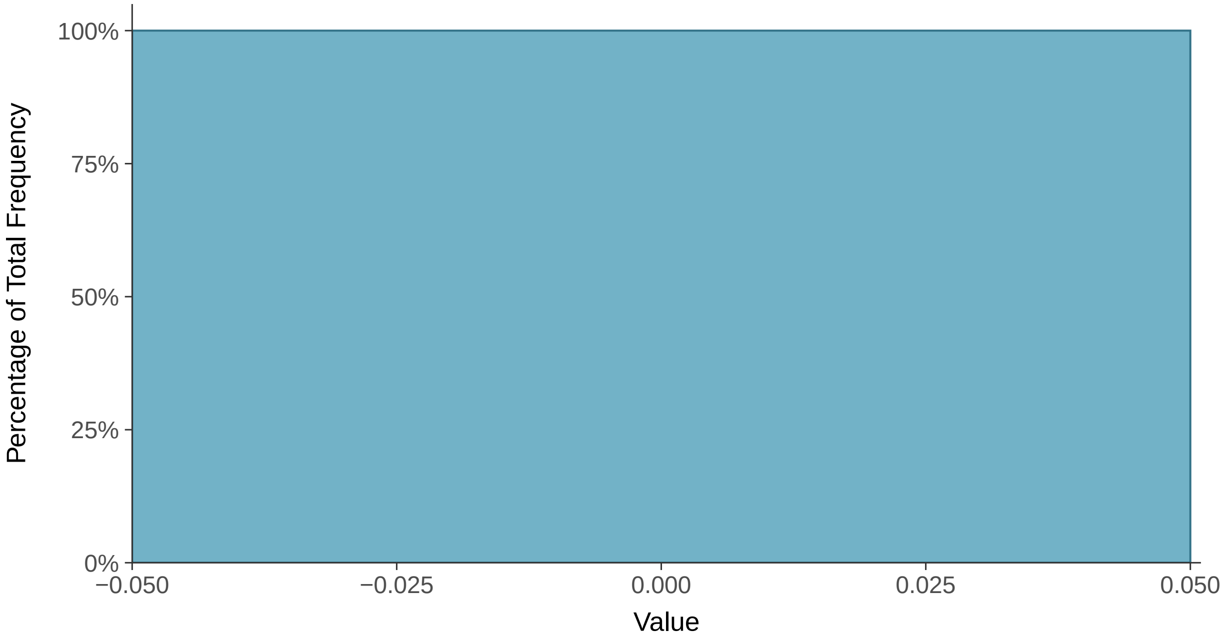
Scatter Plot

Cobalt, MW-7 (mg/L)



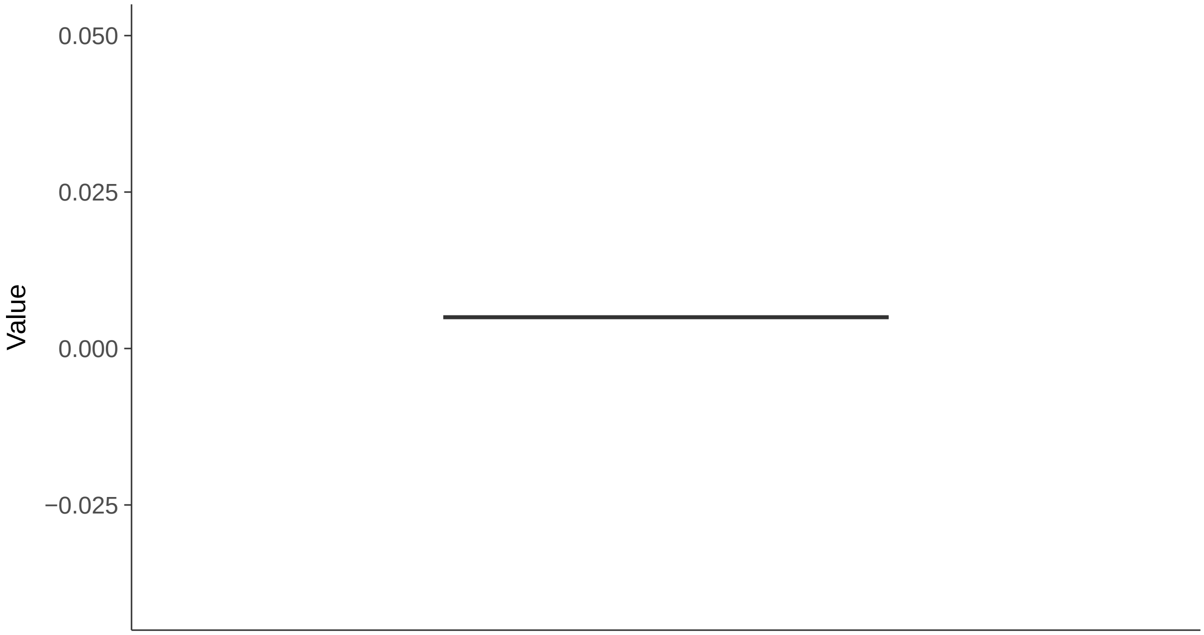
Histogram

Cobalt, MW-7 (mg/L)



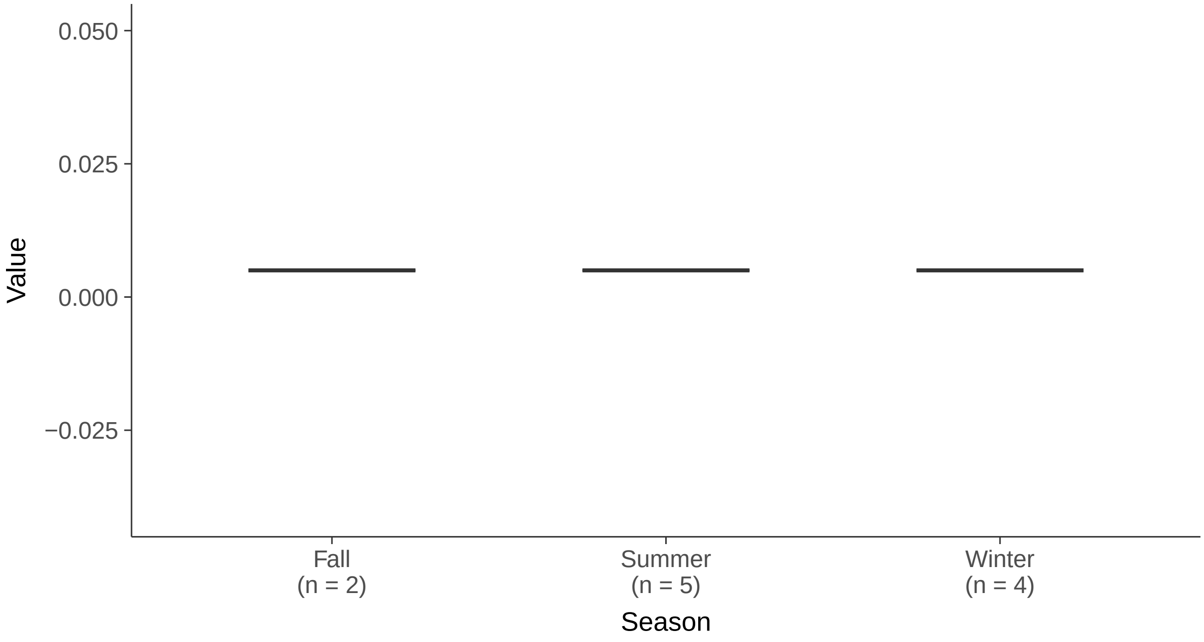
Boxplot

Cobalt, MW-7 (mg/L)



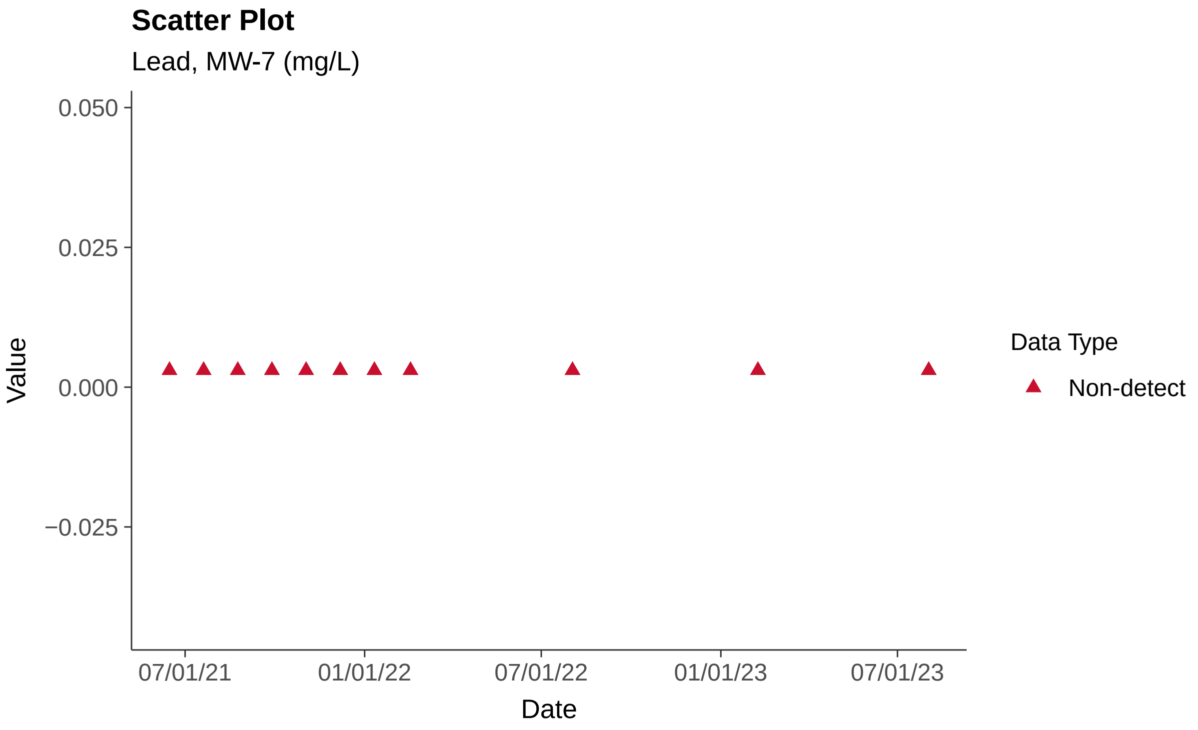
Boxplot by Season

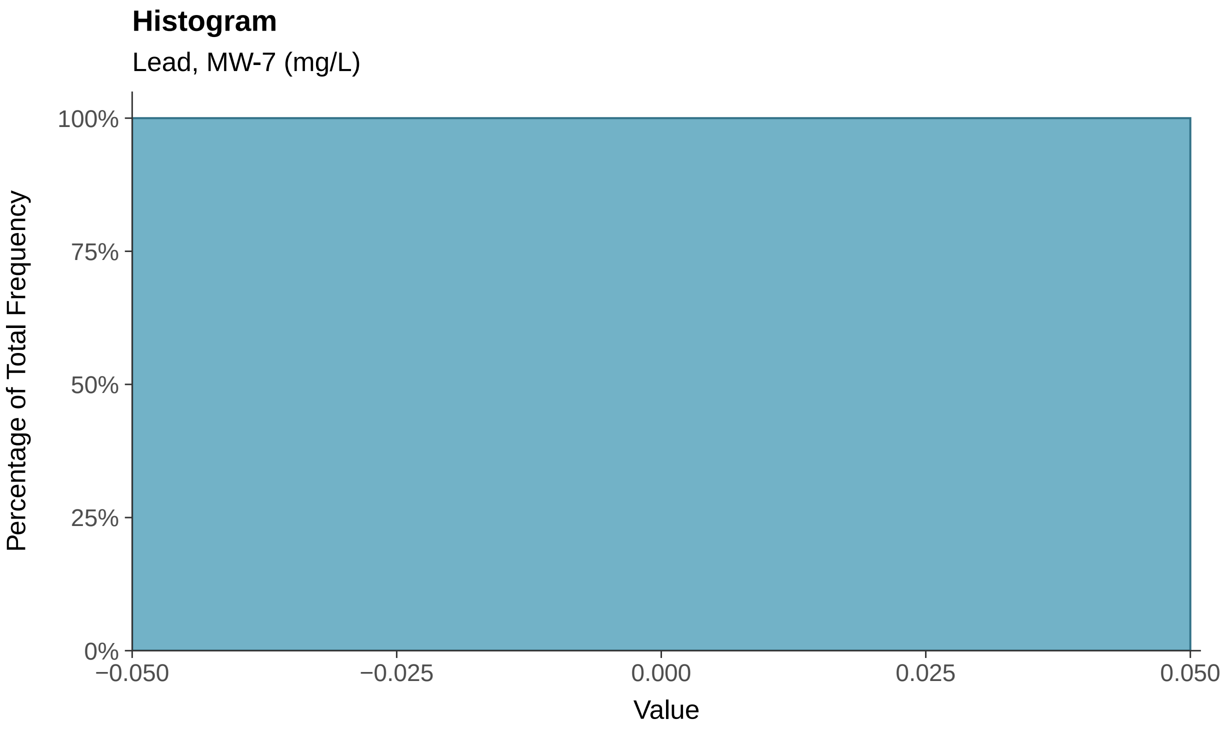
Cobalt, MW-7 (mg/L)



Appendix IV: Lead, MW-7

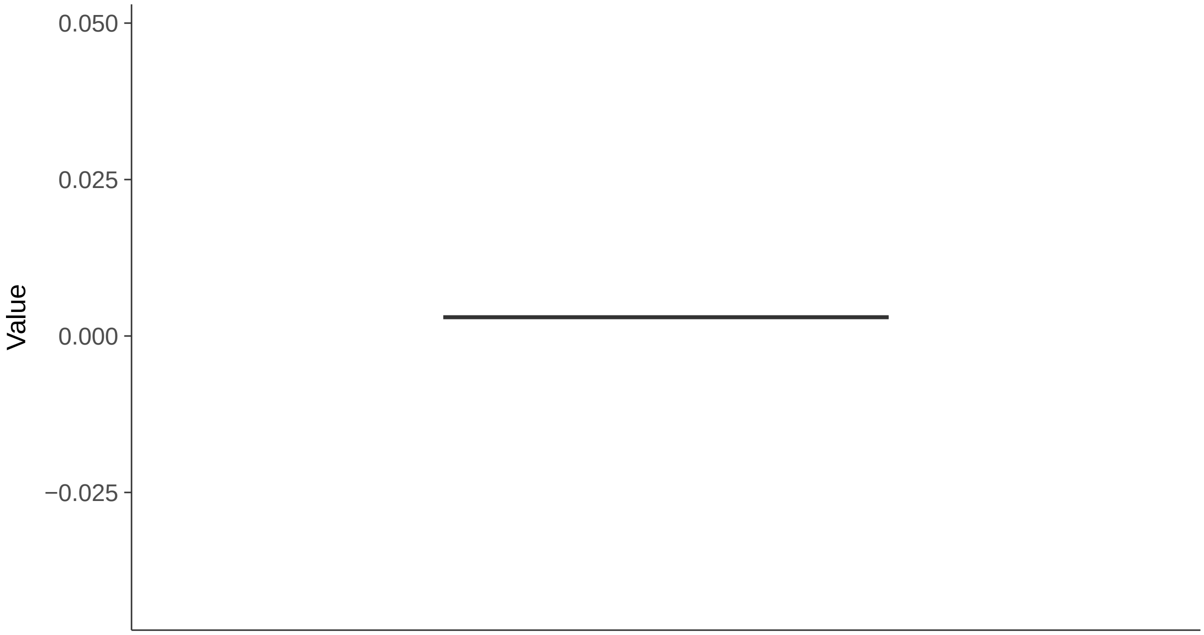
ID: 07_2_15





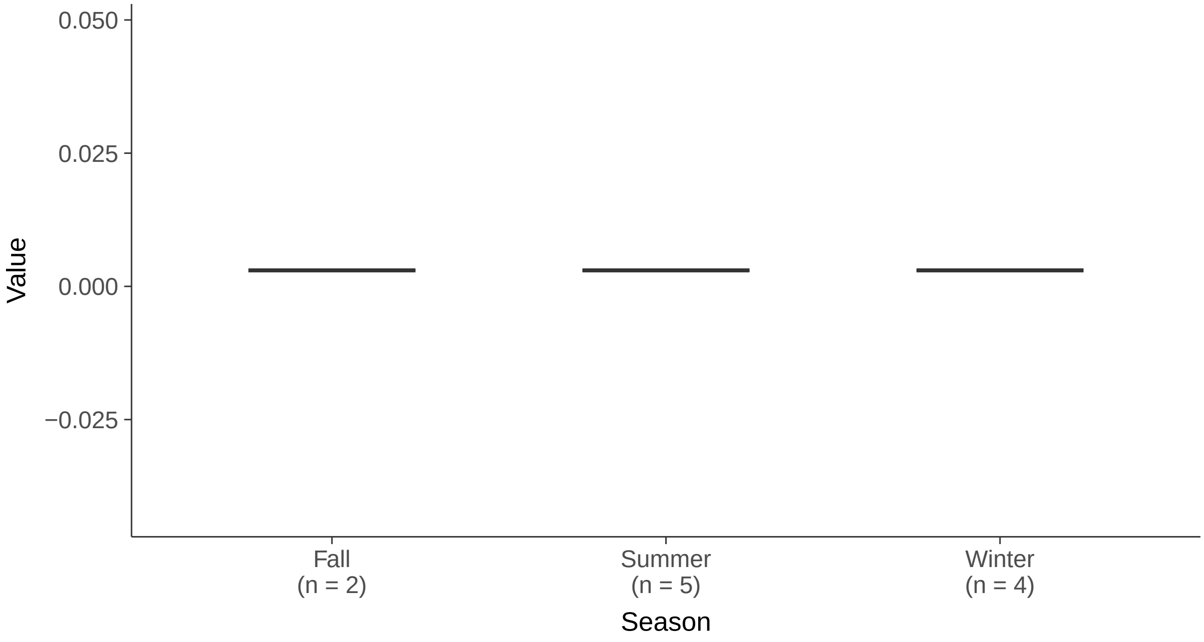
Boxplot

Lead, MW-7 (mg/L)



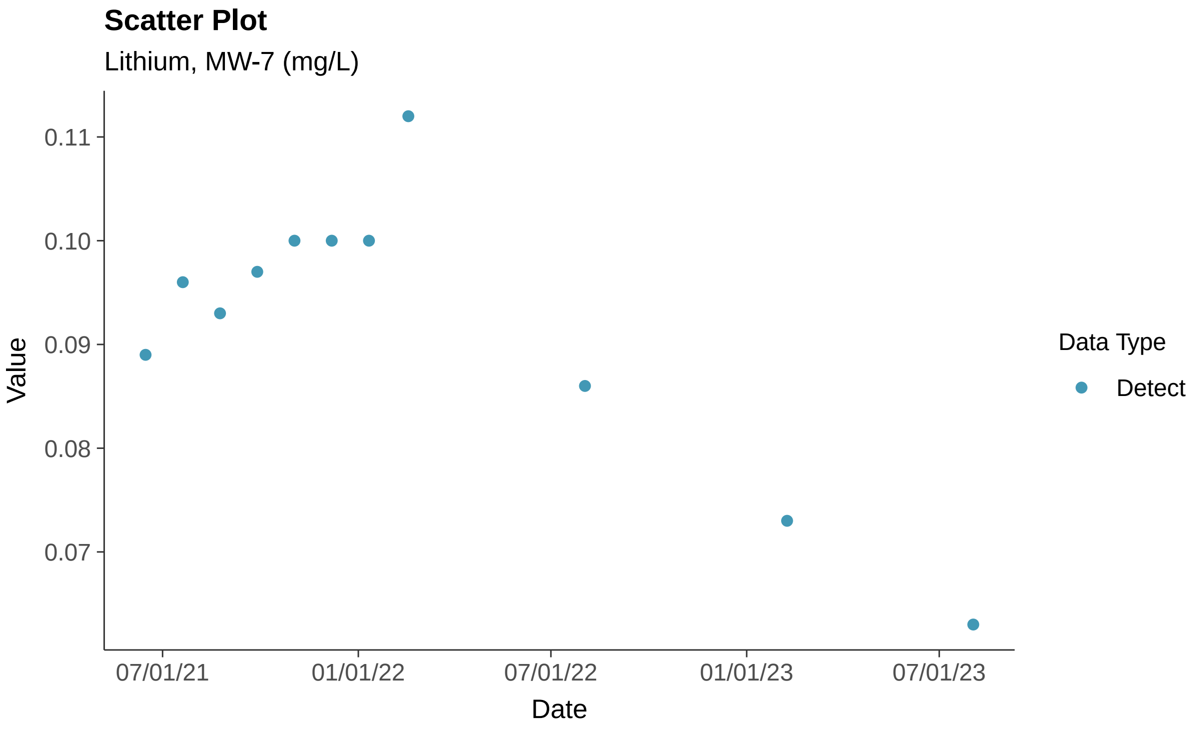
Boxplot by Season

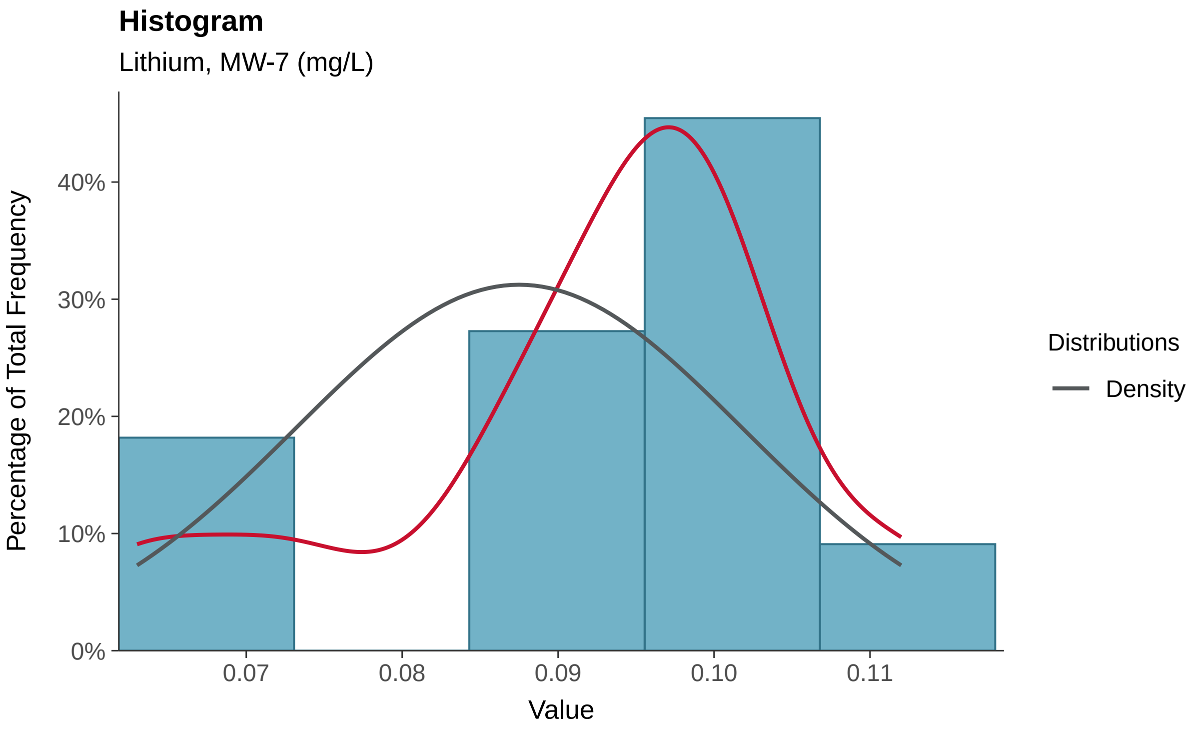
Lead, MW-7 (mg/L)



Appendix IV: Lithium, MW-7

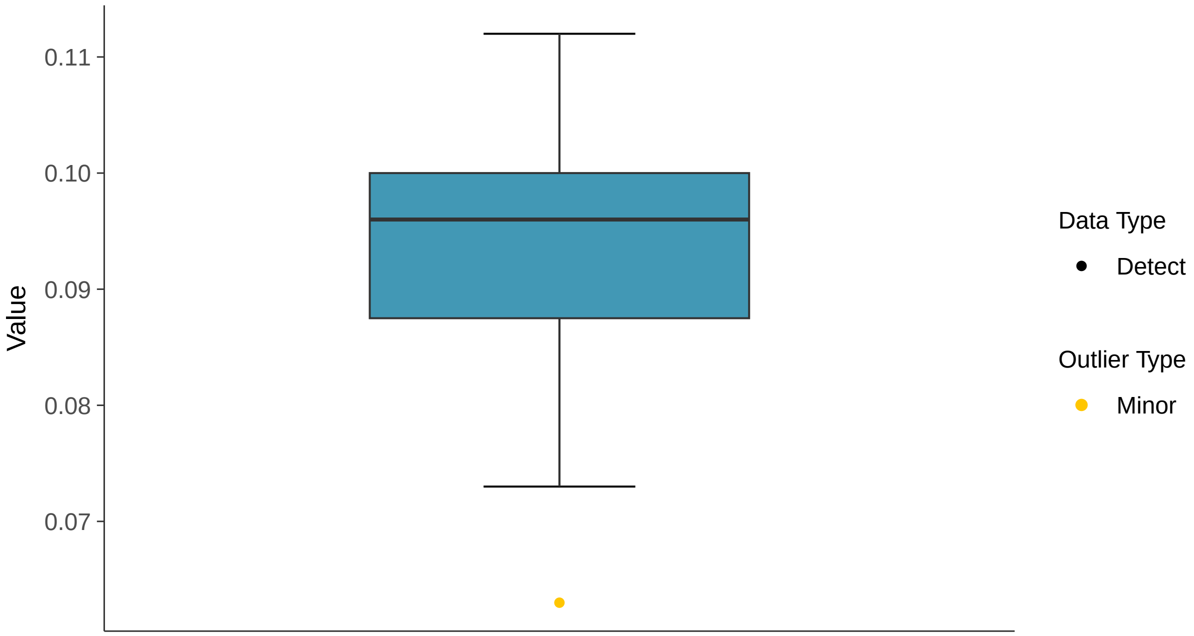
ID: 07_2_16





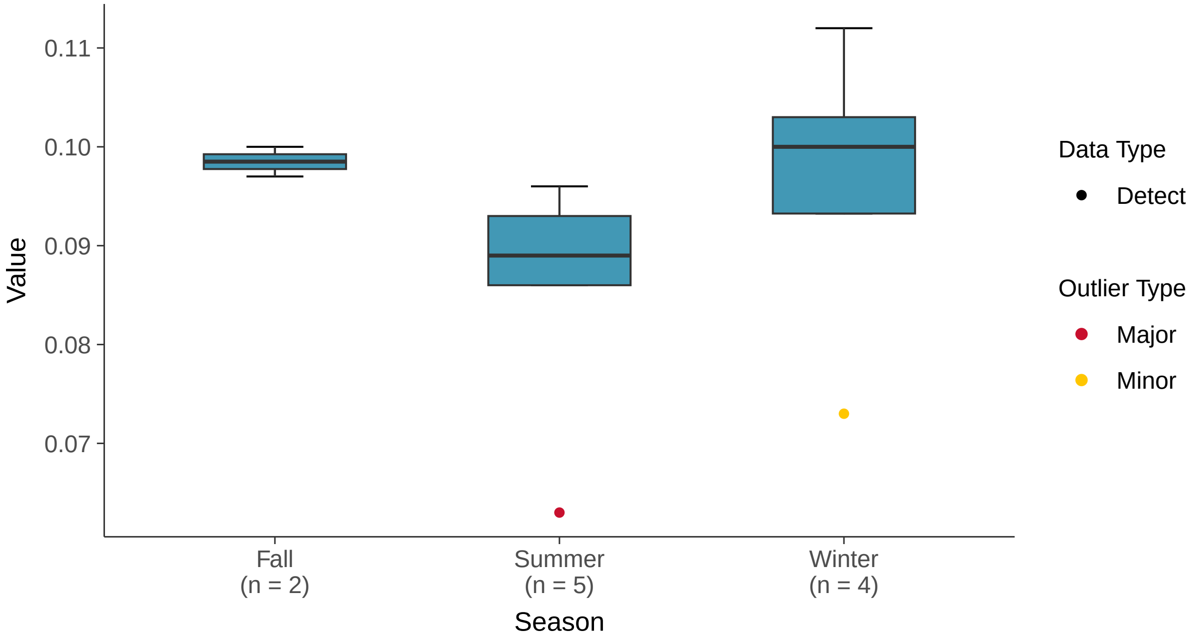
Boxplot

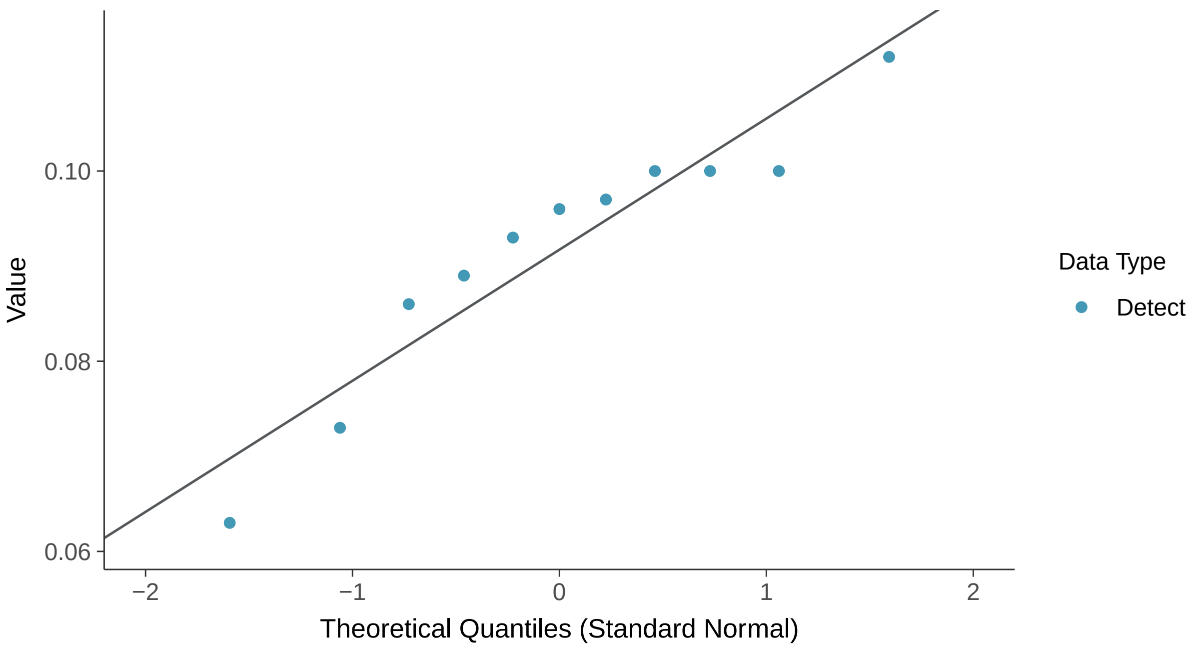
Lithium, MW-7 (mg/L)



Boxplot by Season

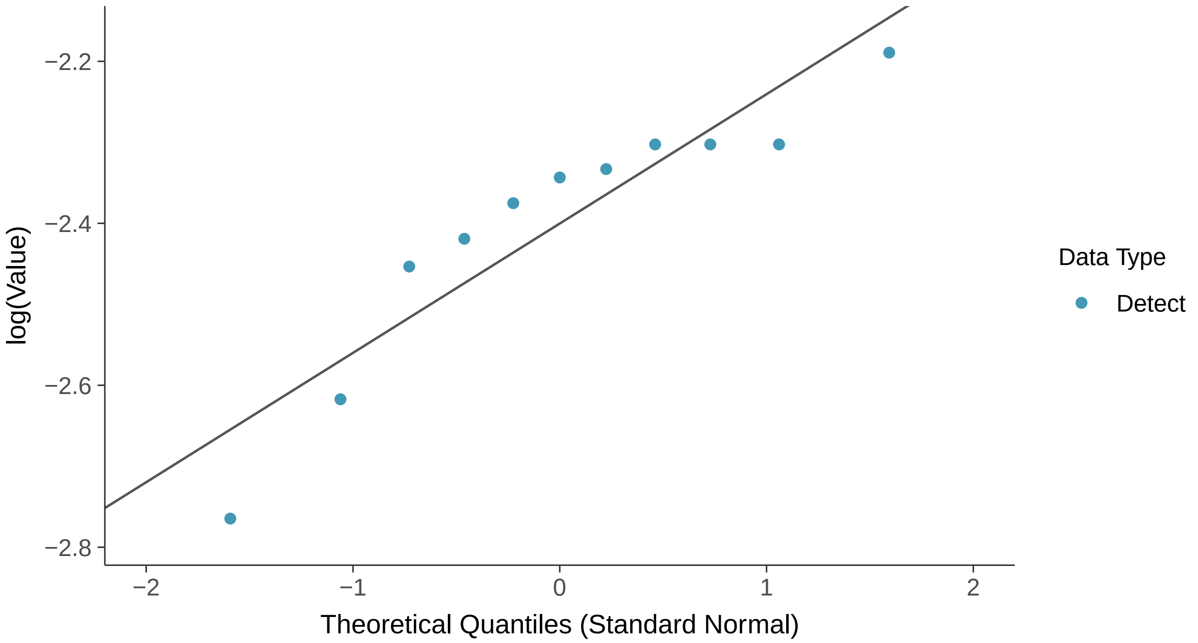
Lithium, MW-7 (mg/L)





Normal Q-Q plot

Lithium, MW-7 (mg/L)

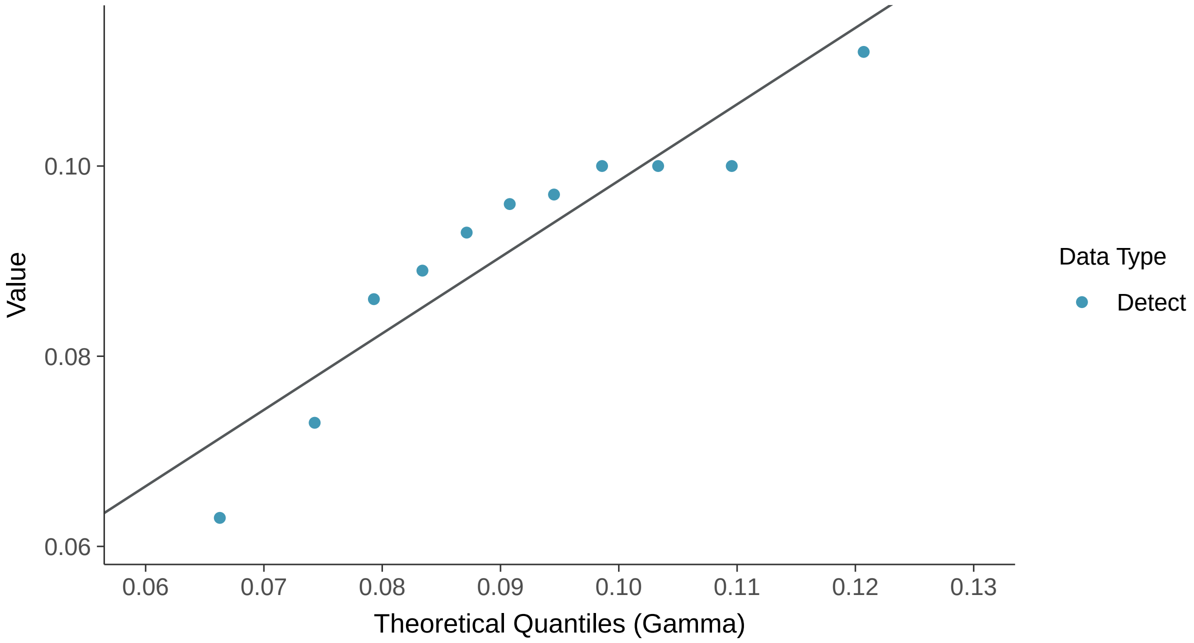


Lognormal Q-Q plot

Lithium, MW-7 (mg/L)

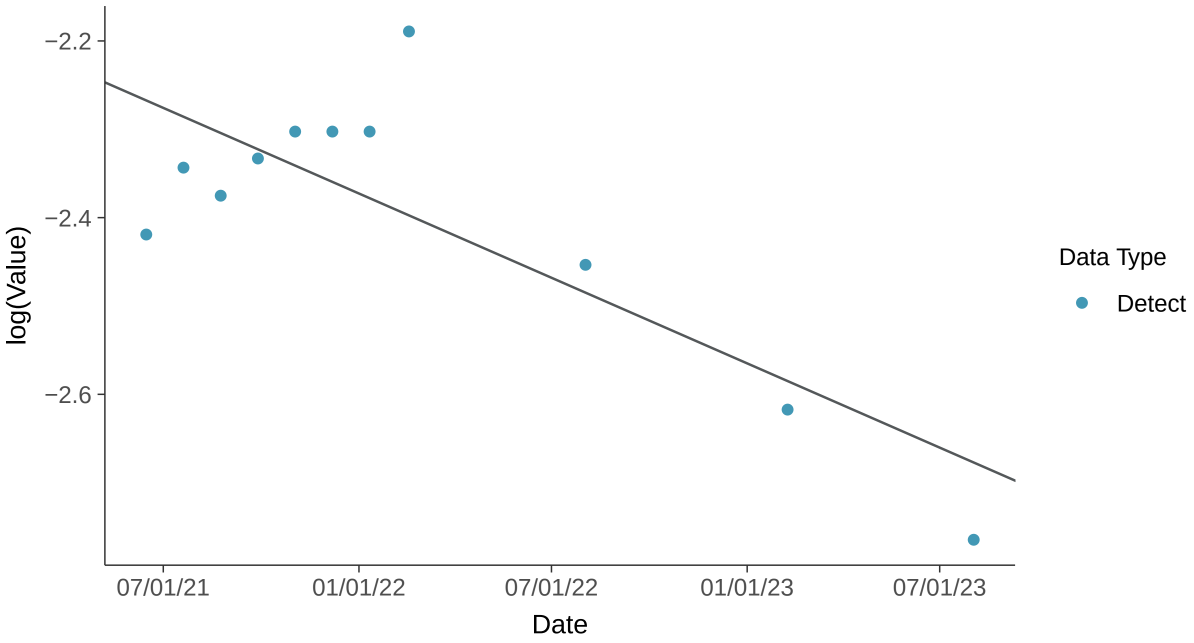
Gamma Q-Q plot

Lithium, MW-7 (mg/L)



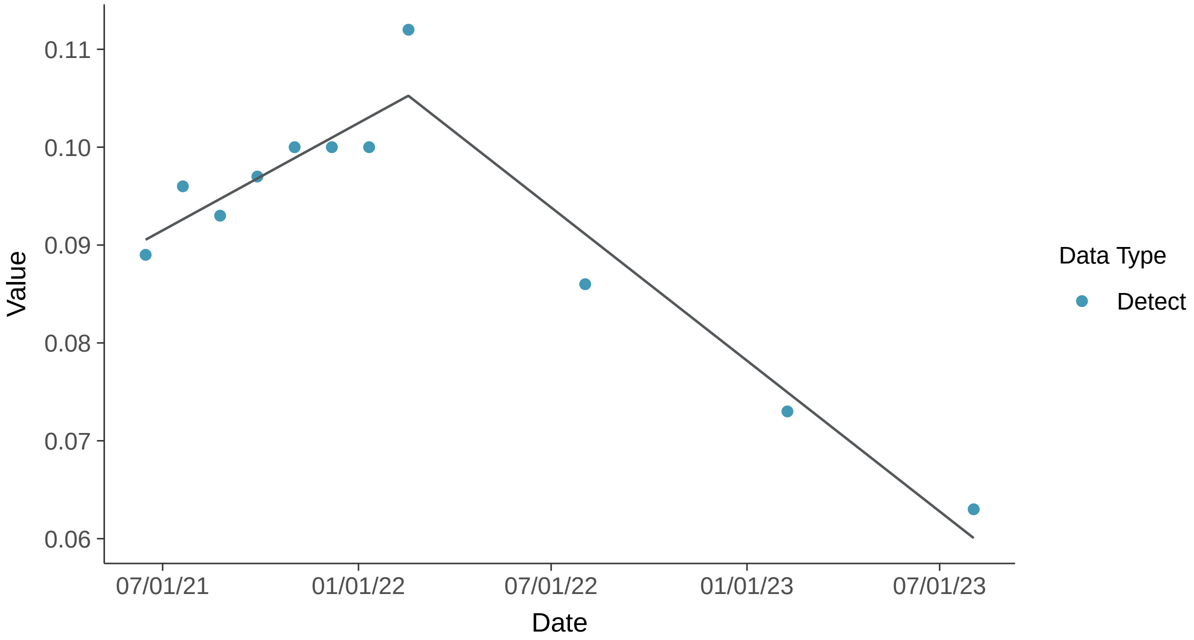
Trend Regression: Lognormal MLE

Lithium, MW-7 (mg/L)



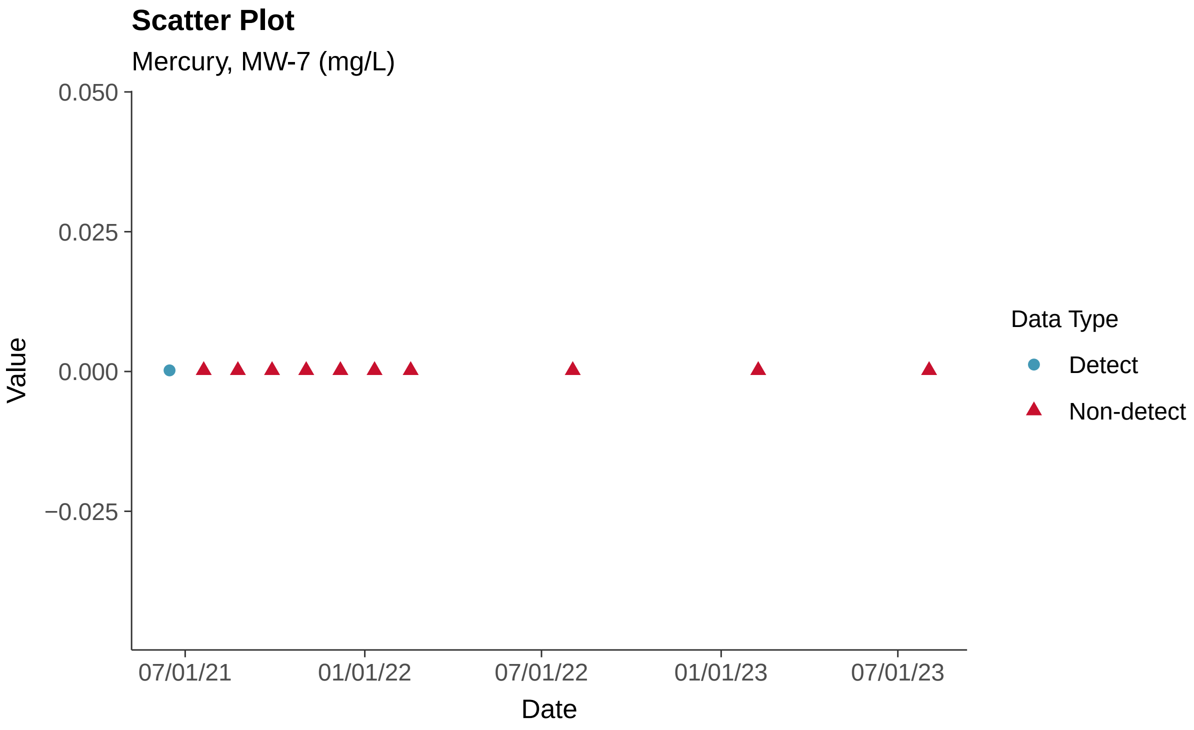
Trend Regression: Piecewise Linear-Linear

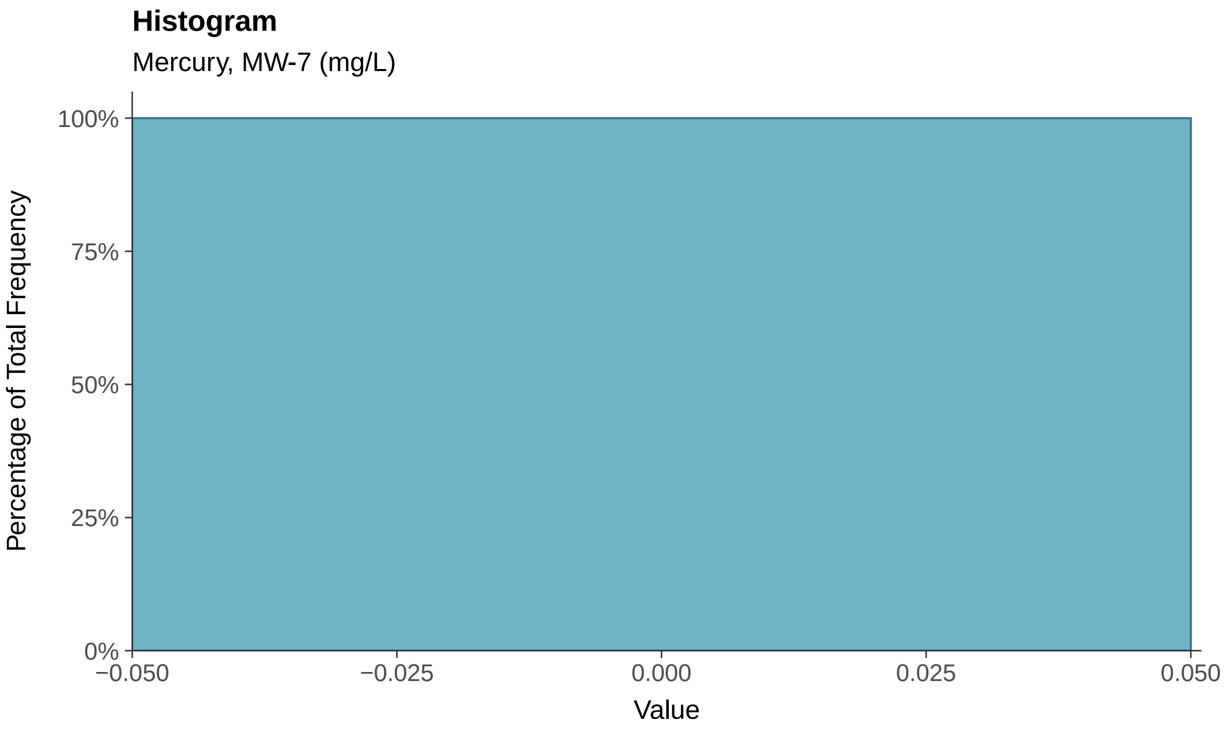
Lithium, MW-7 (mg/L)



Appendix IV: Mercury, MW-7

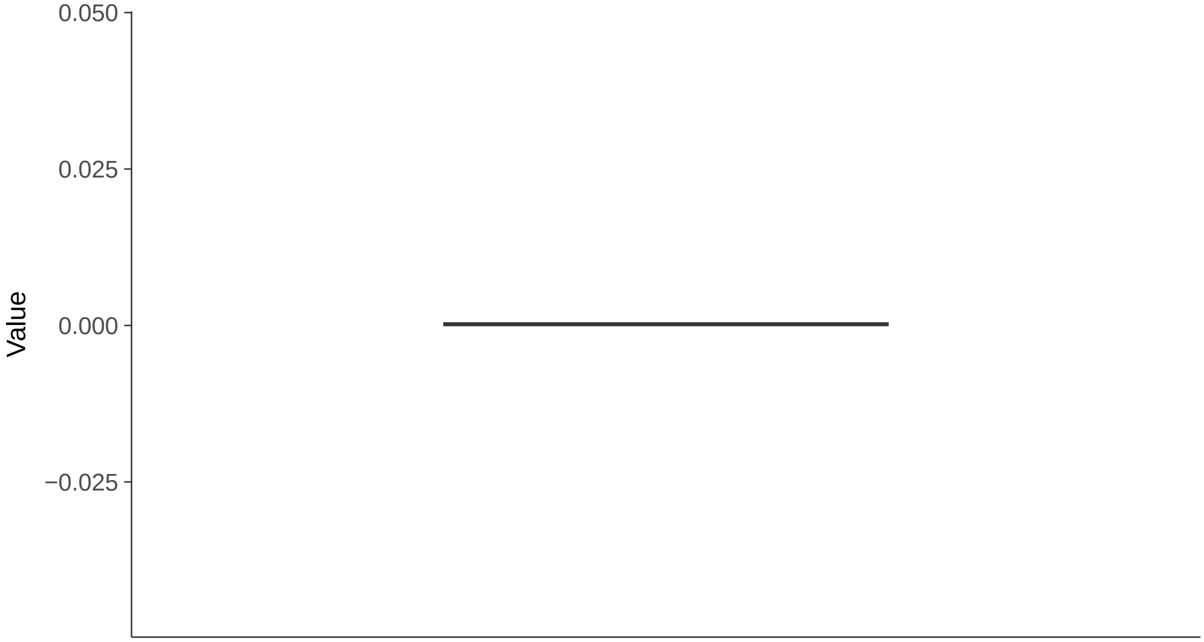
ID: 07_2_17





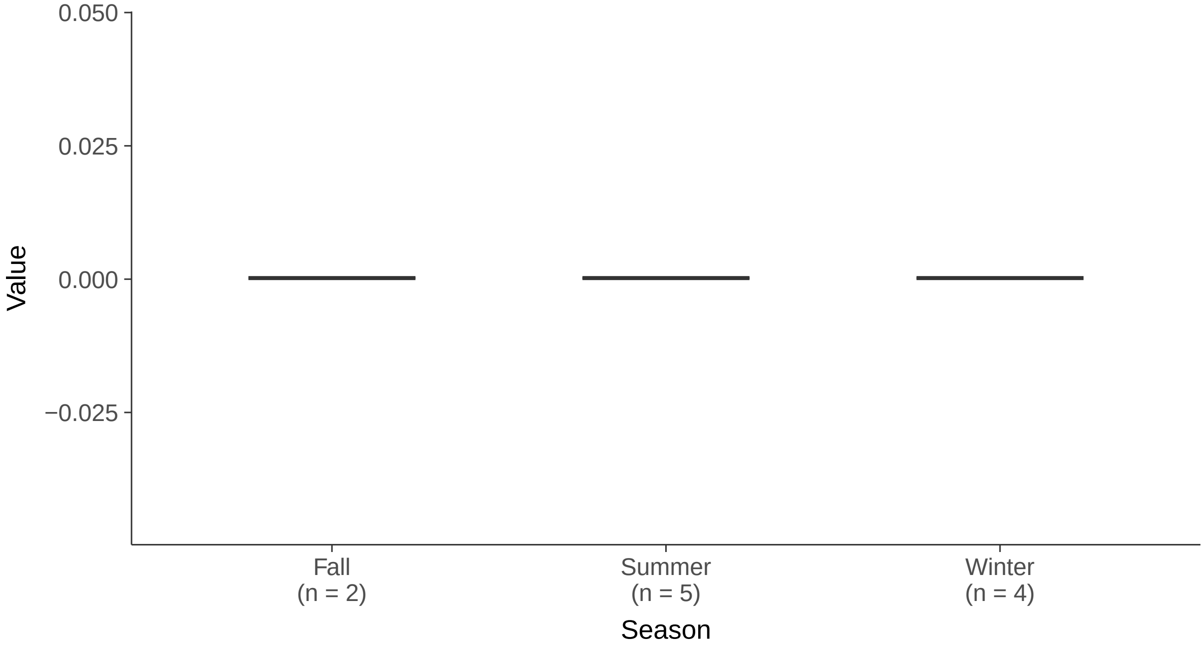
Boxplot

Mercury, MW-7 (mg/L)



Boxplot by Season

Mercury, MW-7 (mg/L)

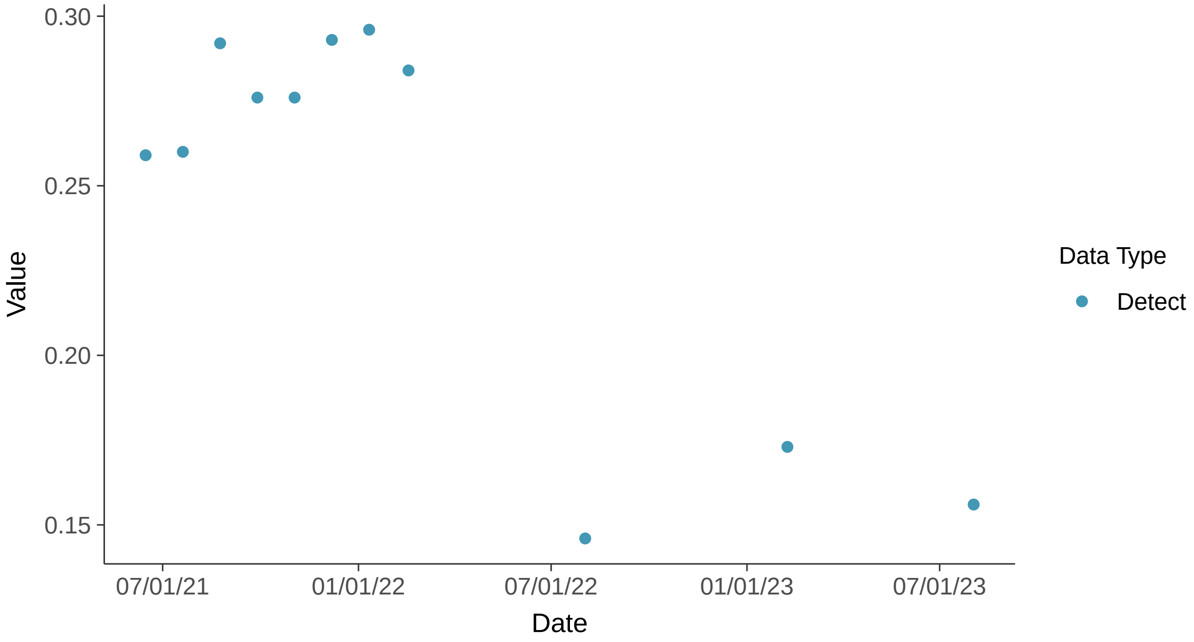


Appendix IV: Molybdenum, MW-7

ID: 07_2_18

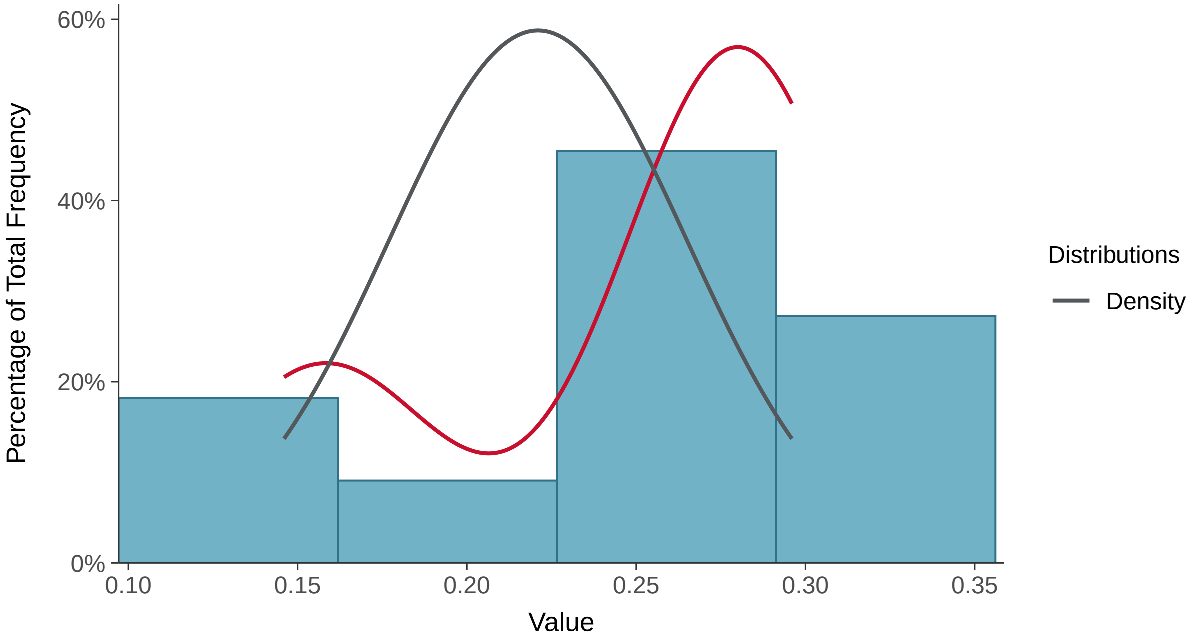
Scatter Plot

Molybdenum, MW-7 (mg/L)



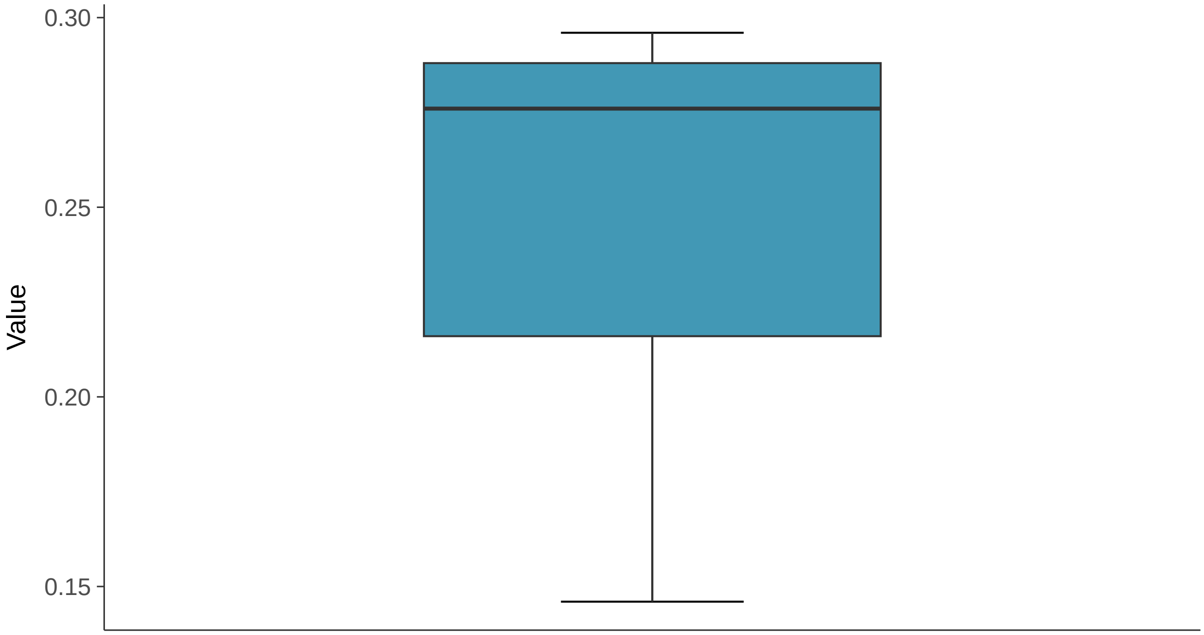
Histogram

Molybdenum, MW-7 (mg/L)



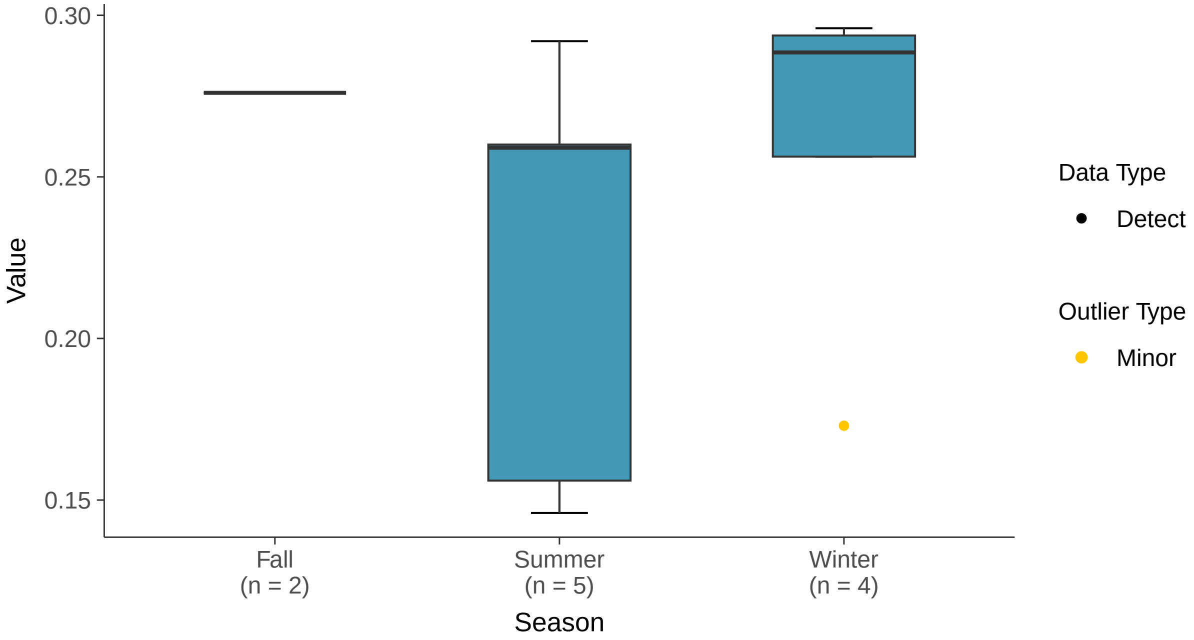
Boxplot

Molybdenum, MW-7 (mg/L)



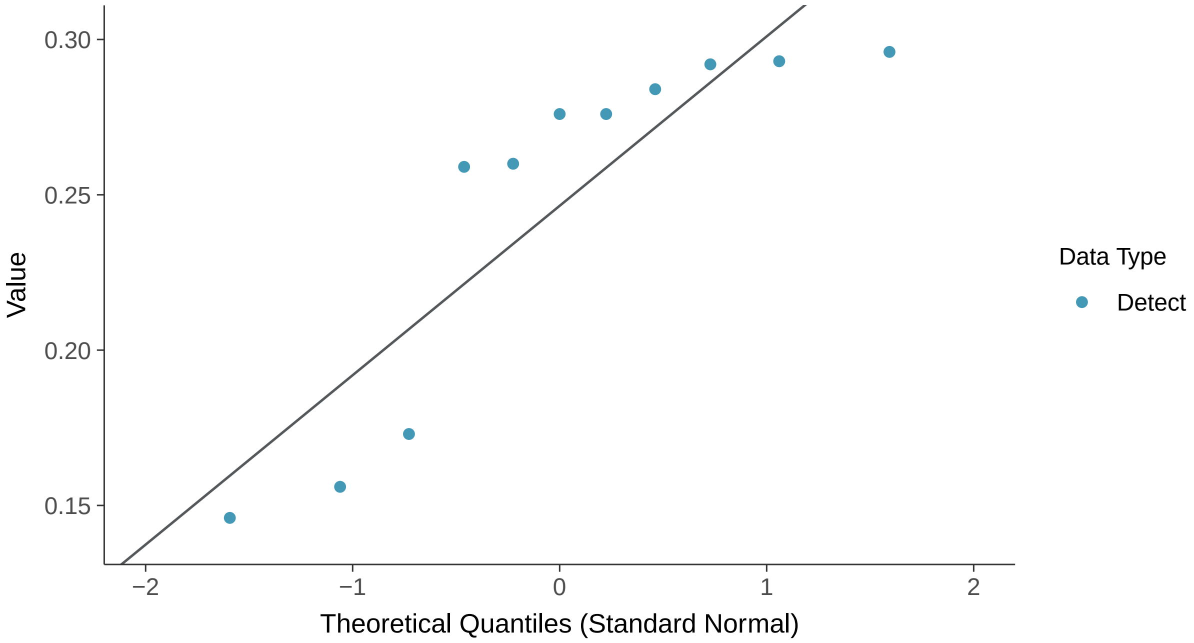
Boxplot by Season

Molybdenum, MW-7 (mg/L)



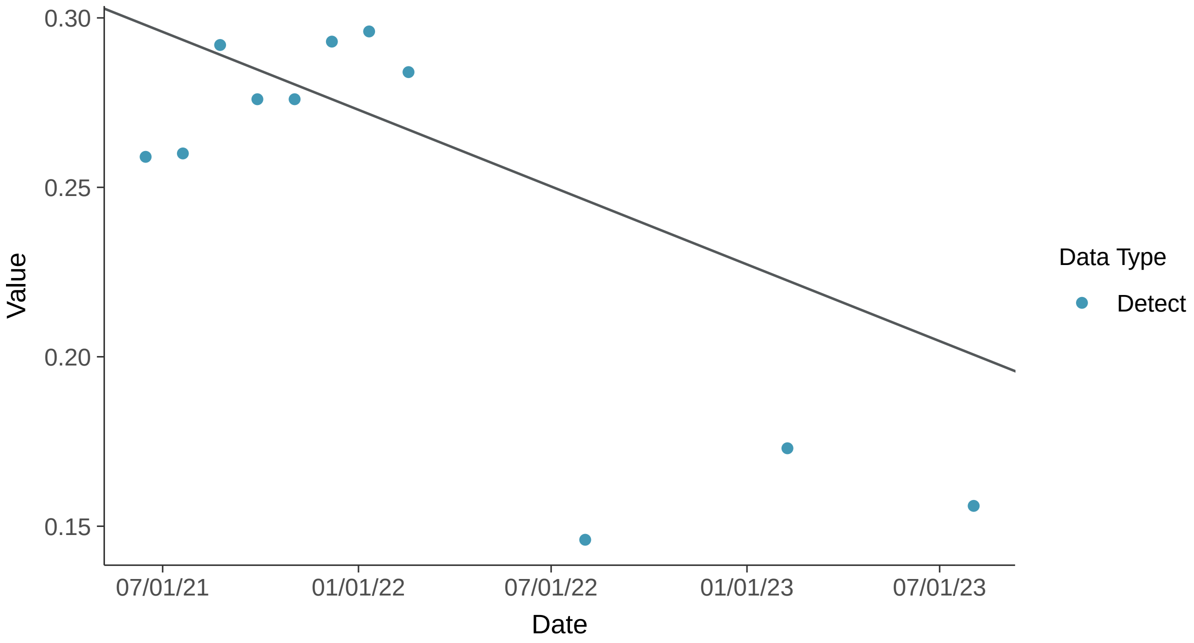
Normal Q-Q plot

Molybdenum, MW-7 (mg/L)



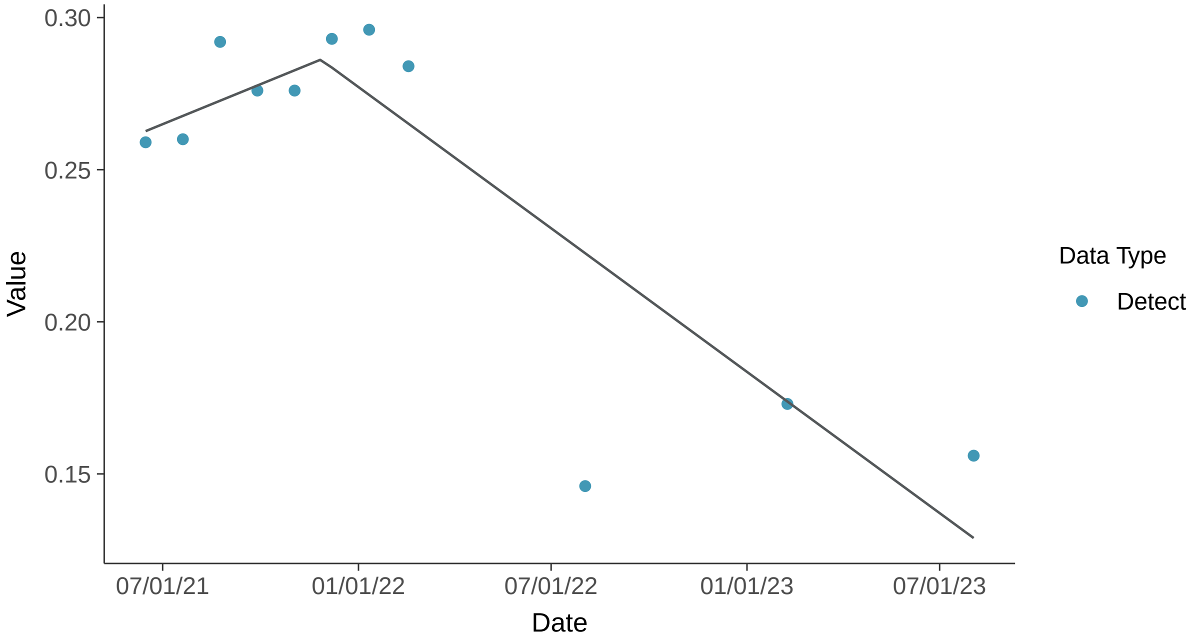
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Molybdenum, MW-7 (mg/L)



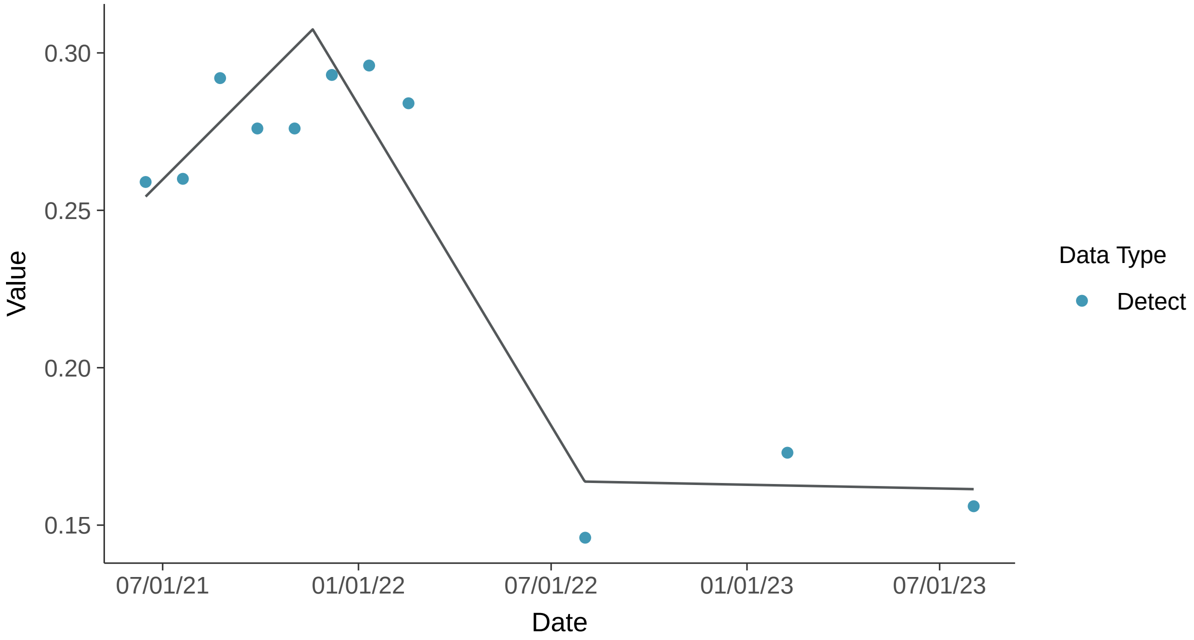
Trend Regression: Piecewise Linear-Linear

Molybdenum, MW-7 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Molybdenum, MW-7 (mg/L)

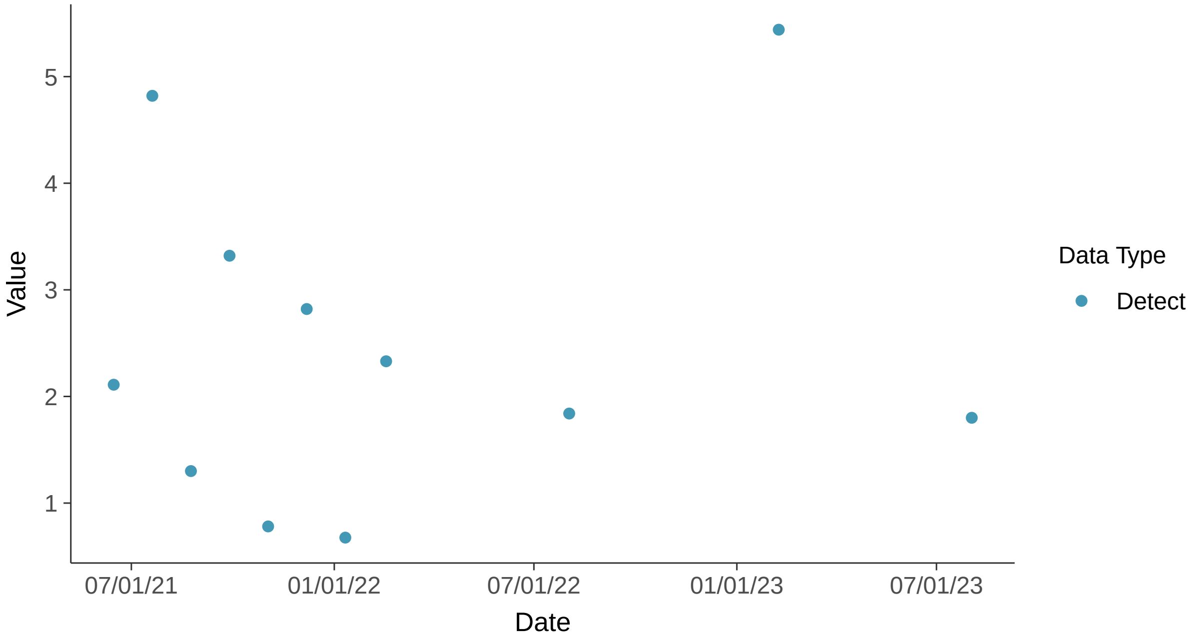


Appendix IV: Radium-226/228, MW-7

ID: 07_2_20

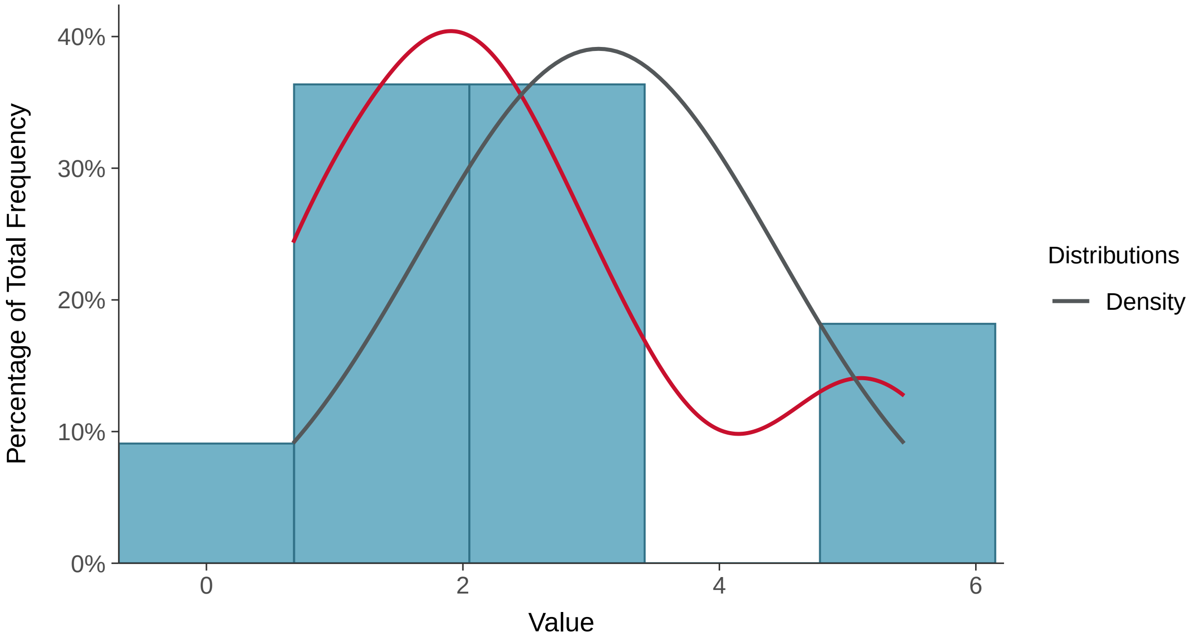
Scatter Plot

Radium-226/228, MW-7 (pCi/L)



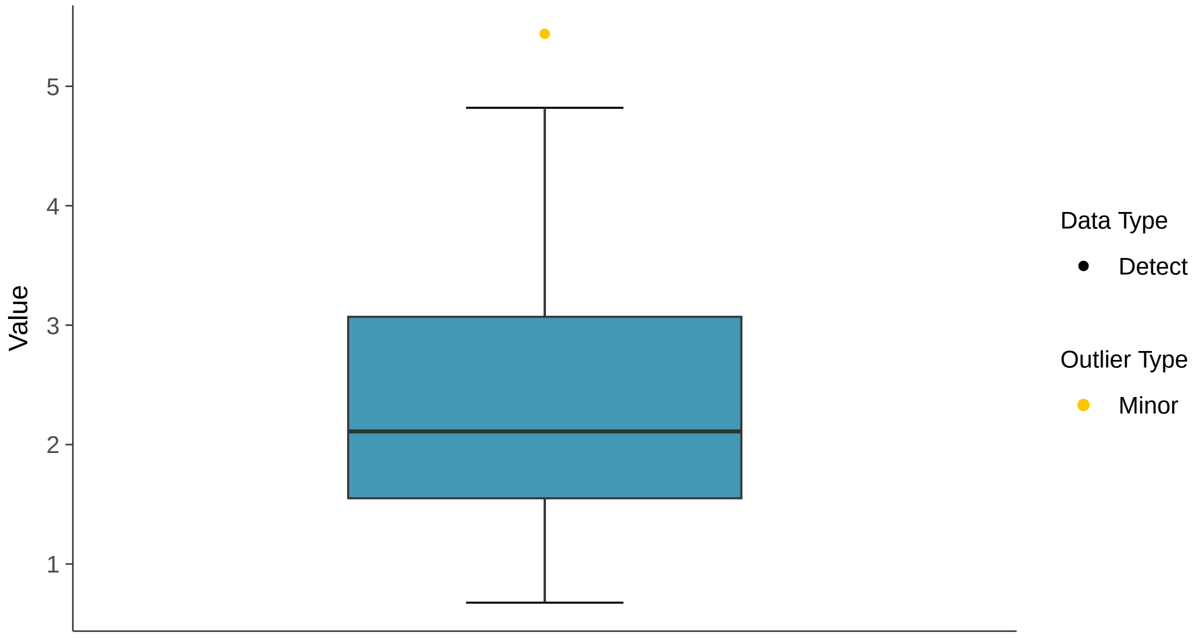
Histogram

Radium-226/228, MW-7 (pCi/L)



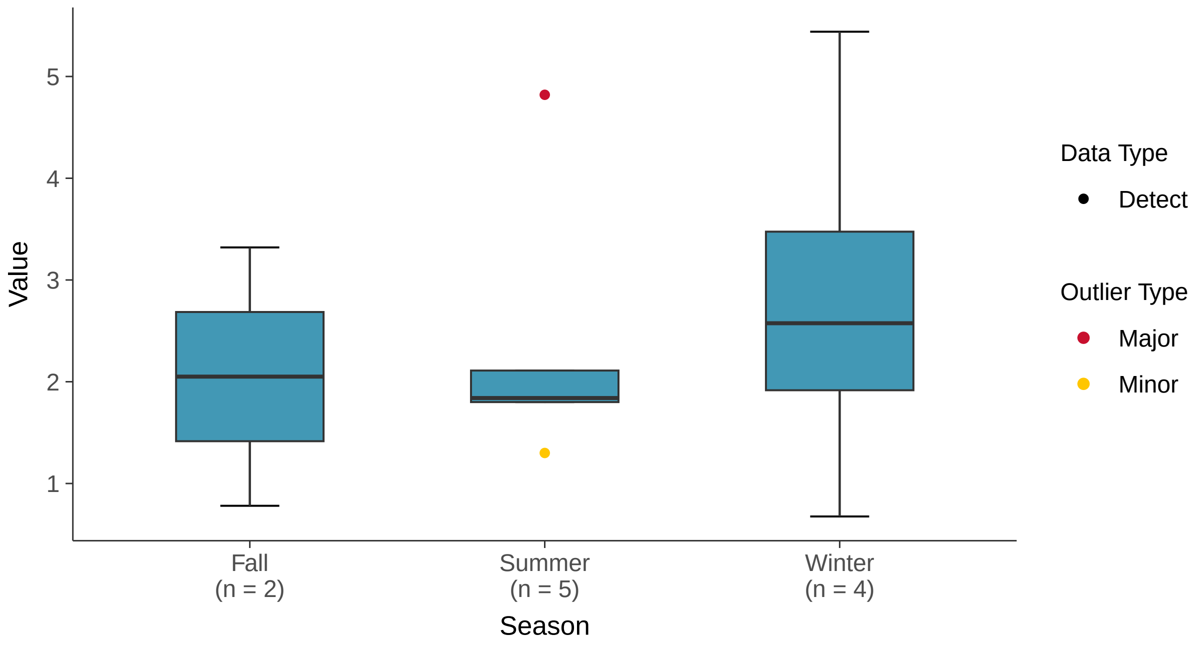
Boxplot

Radium-226/228, MW-7 (pCi/L)



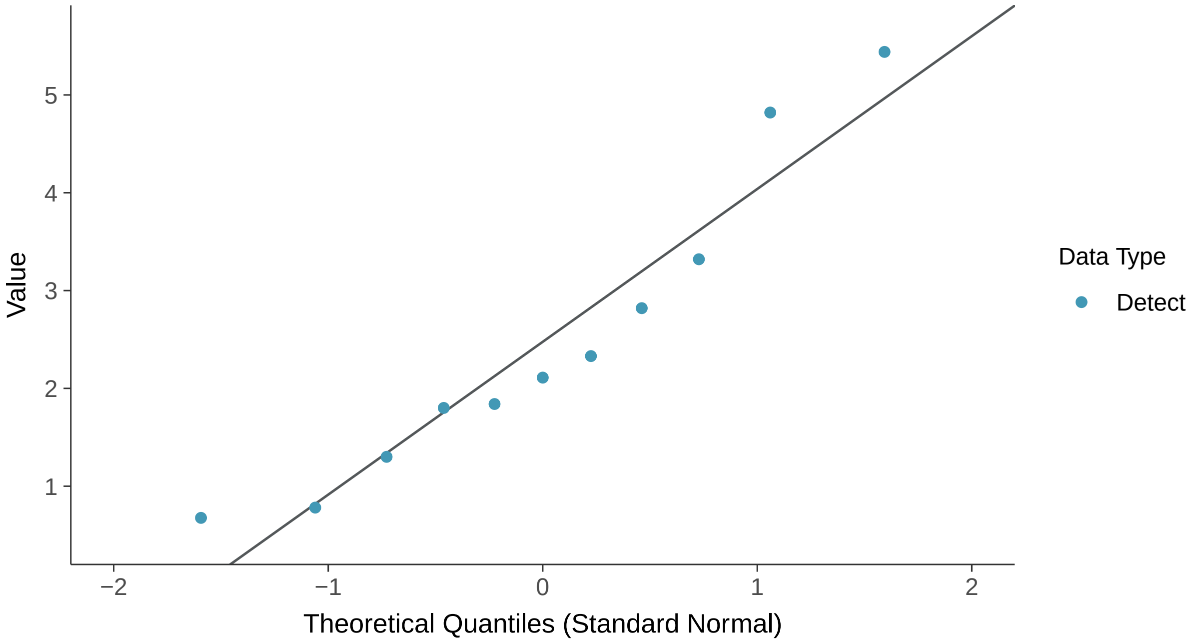
Boxplot by Season

Radium-226/228, MW-7 (pCi/L)



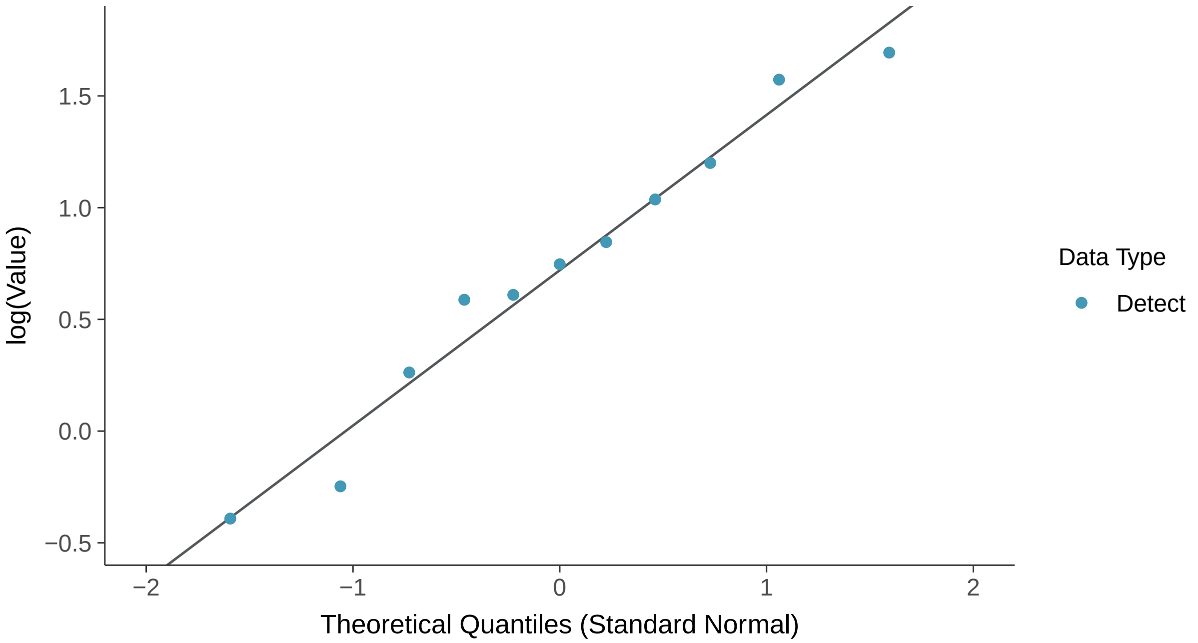
Normal Q-Q plot

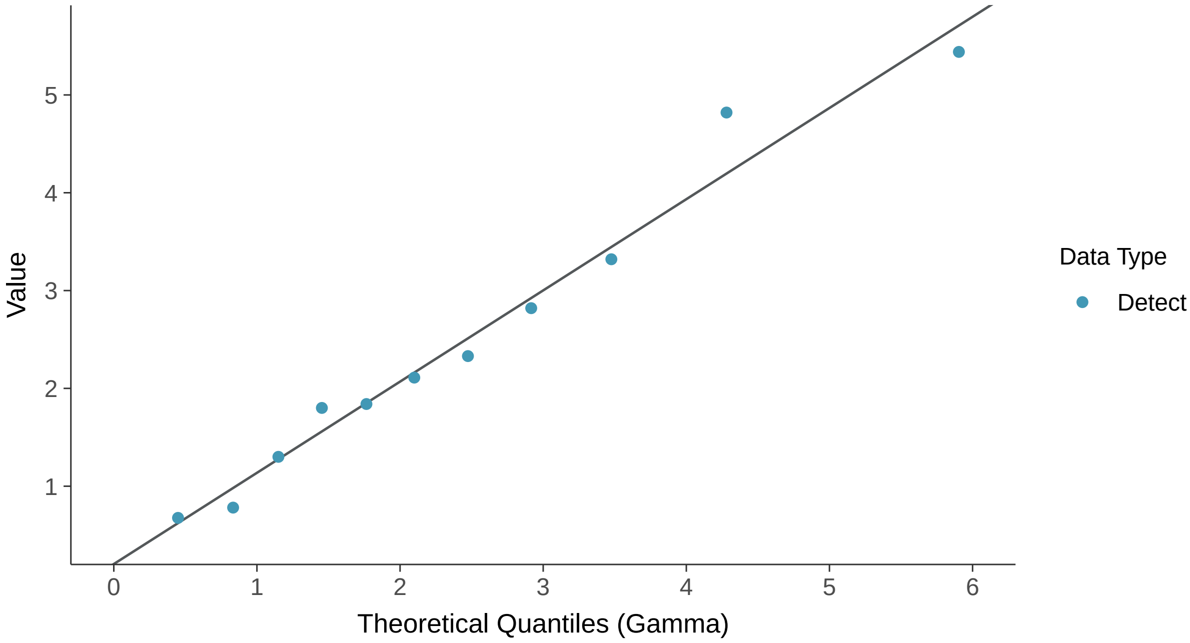
Radium-226/228, MW-7 (pCi/L)



Lognormal Q-Q plot

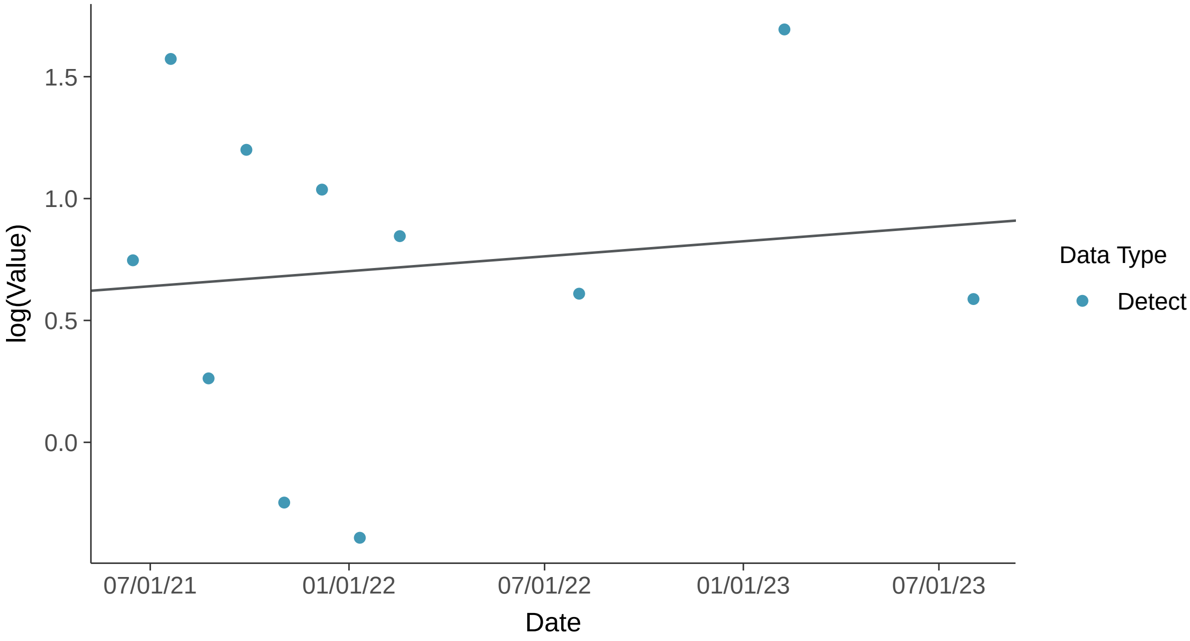
Radium-226/228, MW-7 (pCi/L)





Gamma Q-Q plot

Radium-226/228, MW-7 (pCi/L)

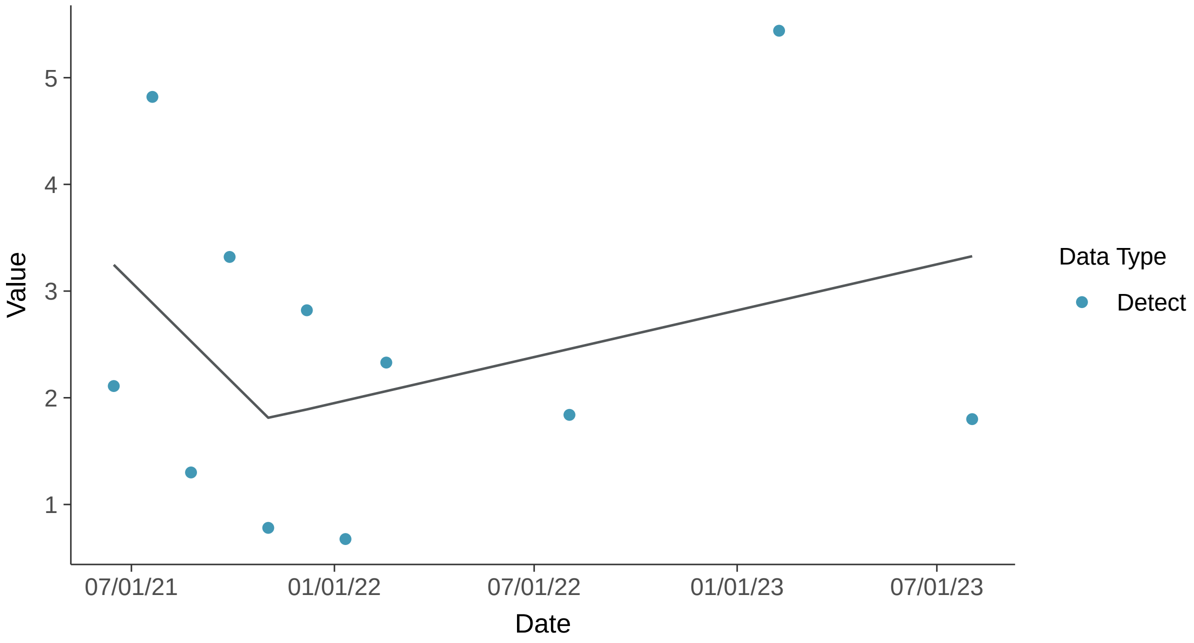


Trend Regression: Lognormal MLE

Radium-226/228, MW-7 (pCi/L)

Trend Regression: Piecewise Linear-Linear

Radium-226/228, MW-7 (pCi/L)

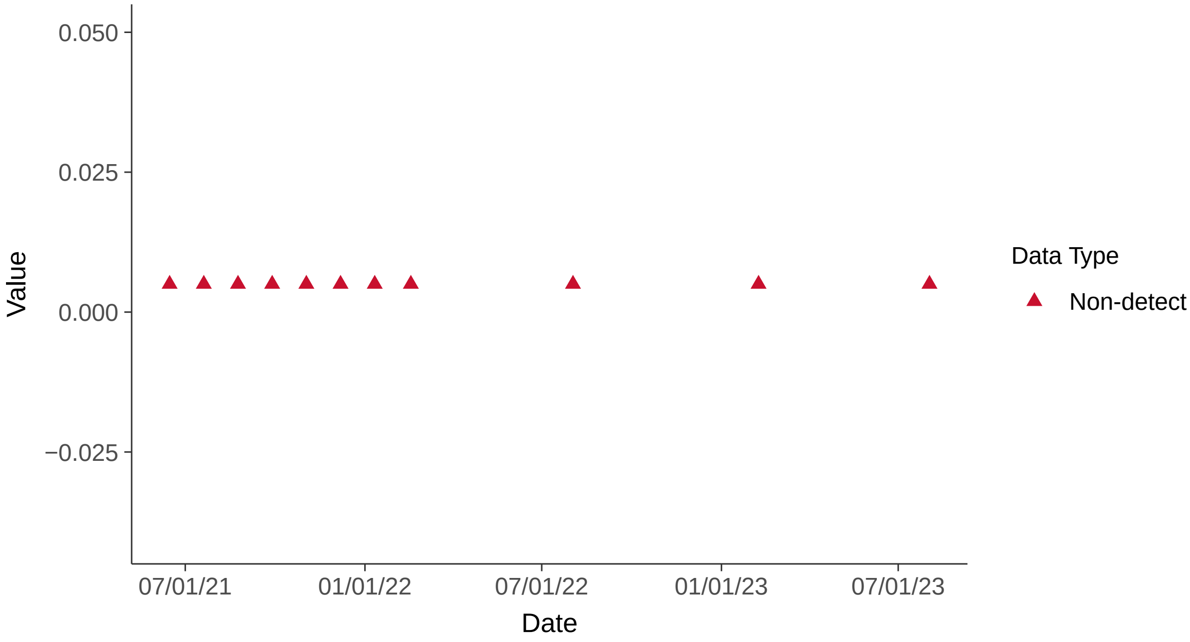


Appendix IV: Selenium, MW-7

ID: 07_2_22

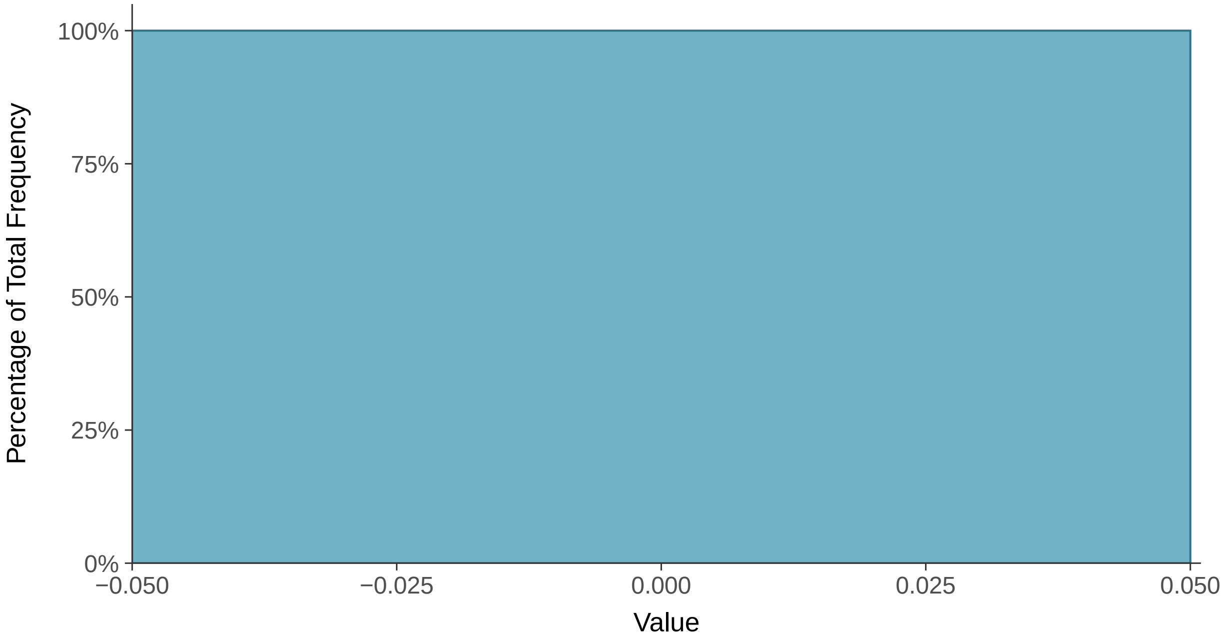
Scatter Plot

Selenium, MW-7 (mg/L)



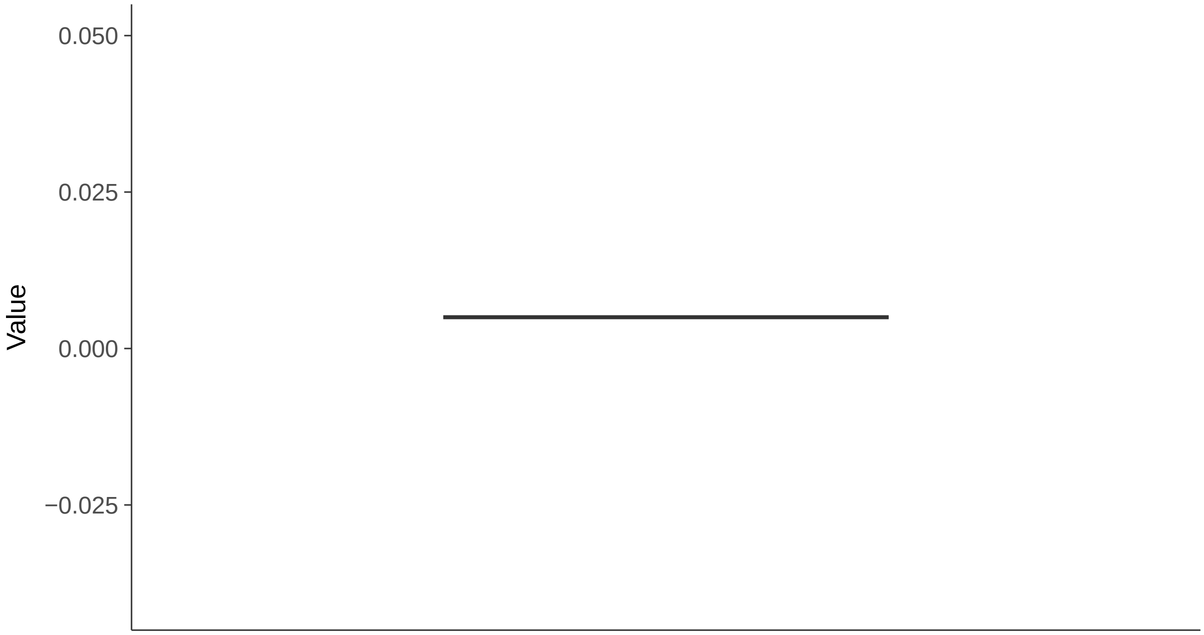
Histogram

Selenium, MW-7 (mg/L)



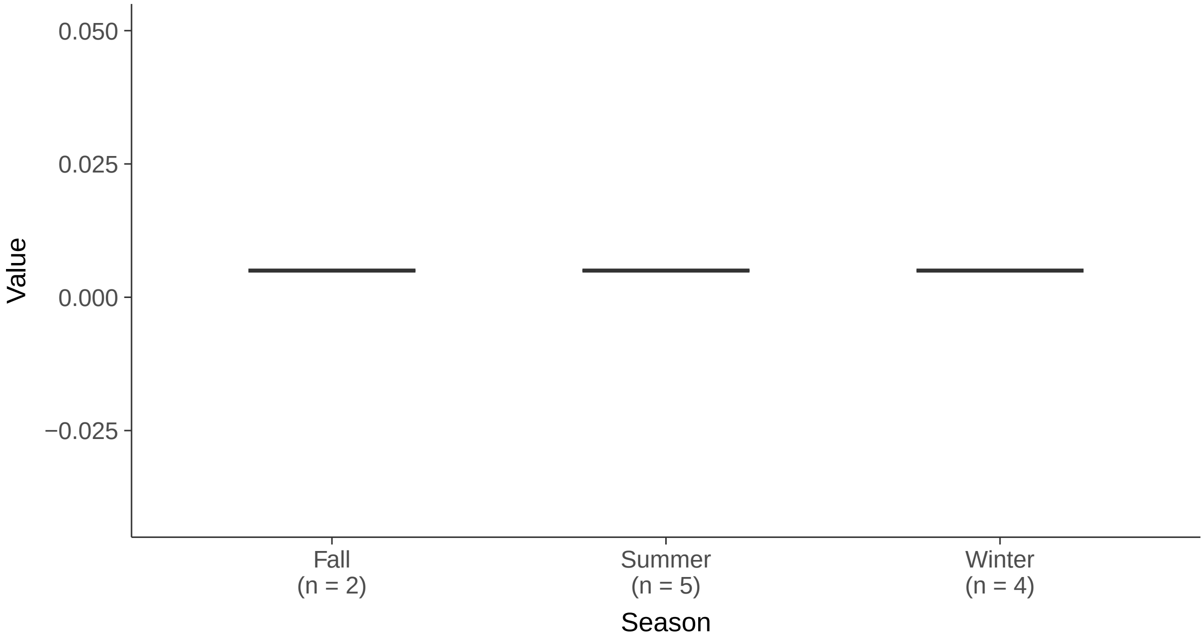
Boxplot

Selenium, MW-7 (mg/L)



Boxplot by Season

Selenium, MW-7 (mg/L)

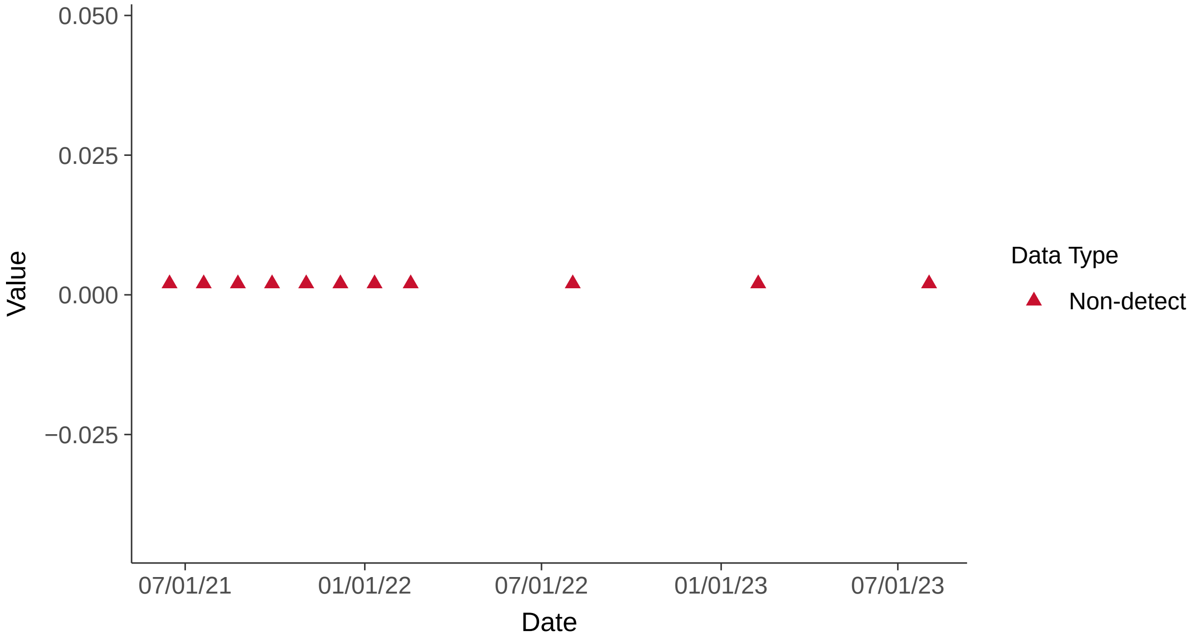


Appendix IV: Thallium, MW-7

ID: 07_2_23

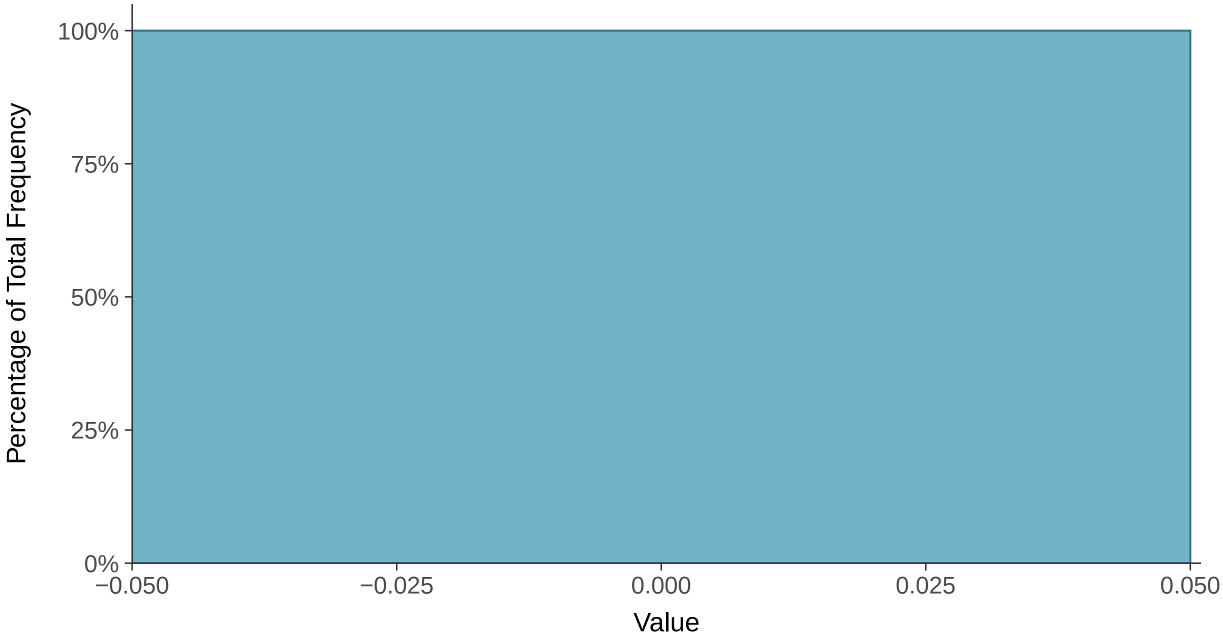
Scatter Plot

Thallium, MW-7 (mg/L)



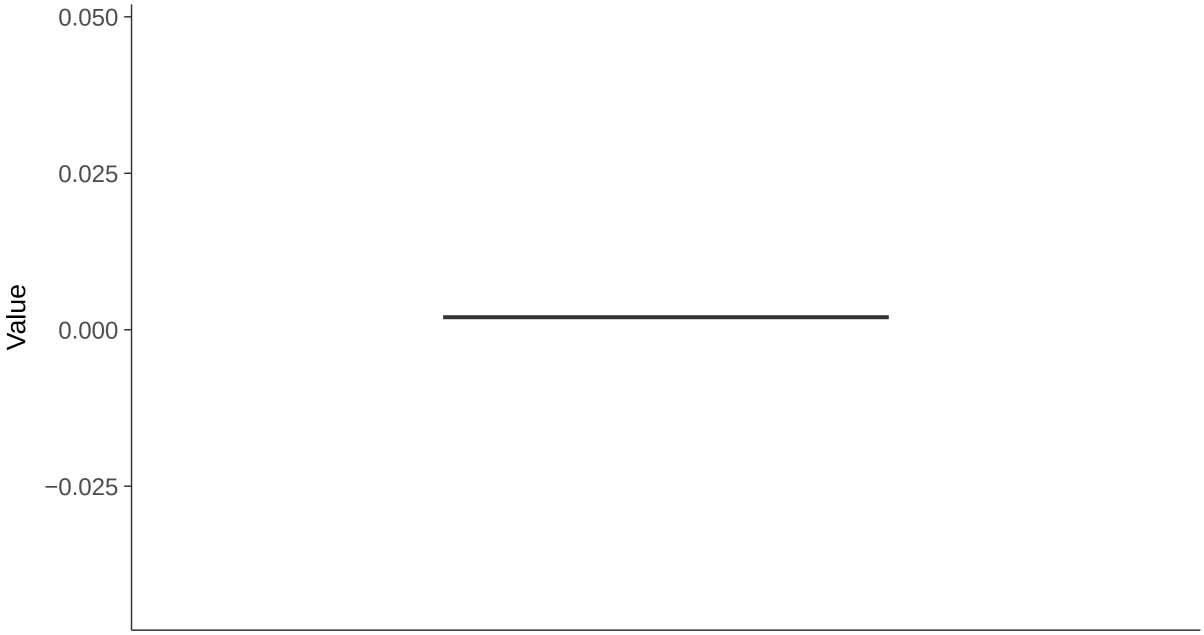
Histogram

Thallium, MW-7 (mg/L)



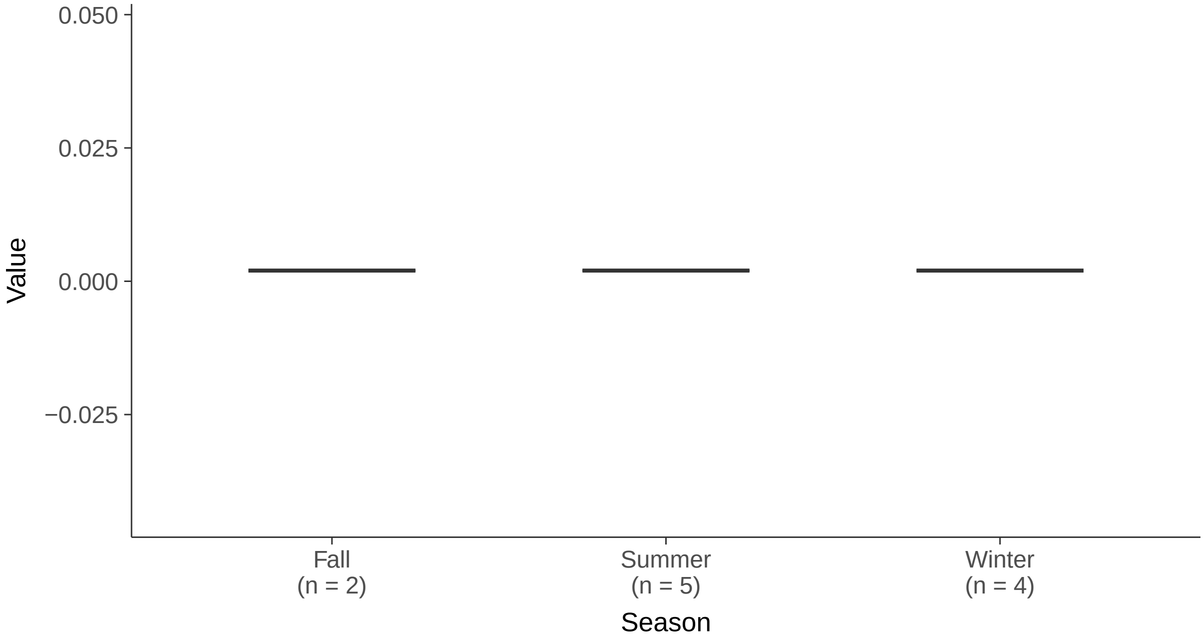
Boxplot

Thallium, MW-7 (mg/L)



Boxplot by Season

Thallium, MW-7 (mg/L)

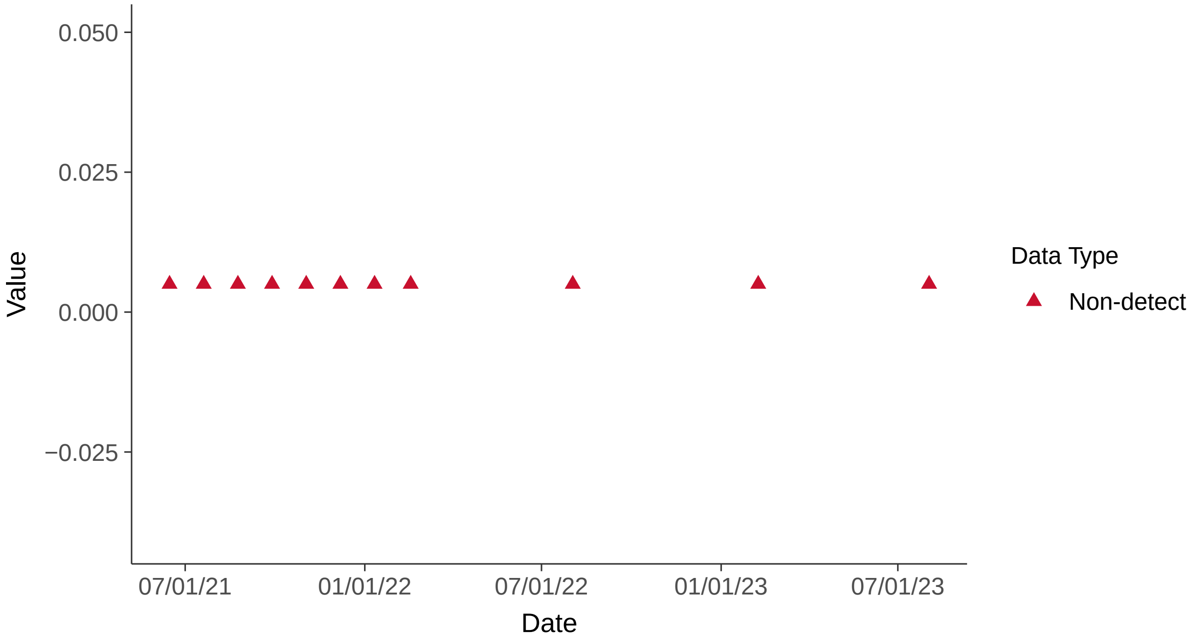


Part 115: Copper, MW-7

ID: 07_5_37

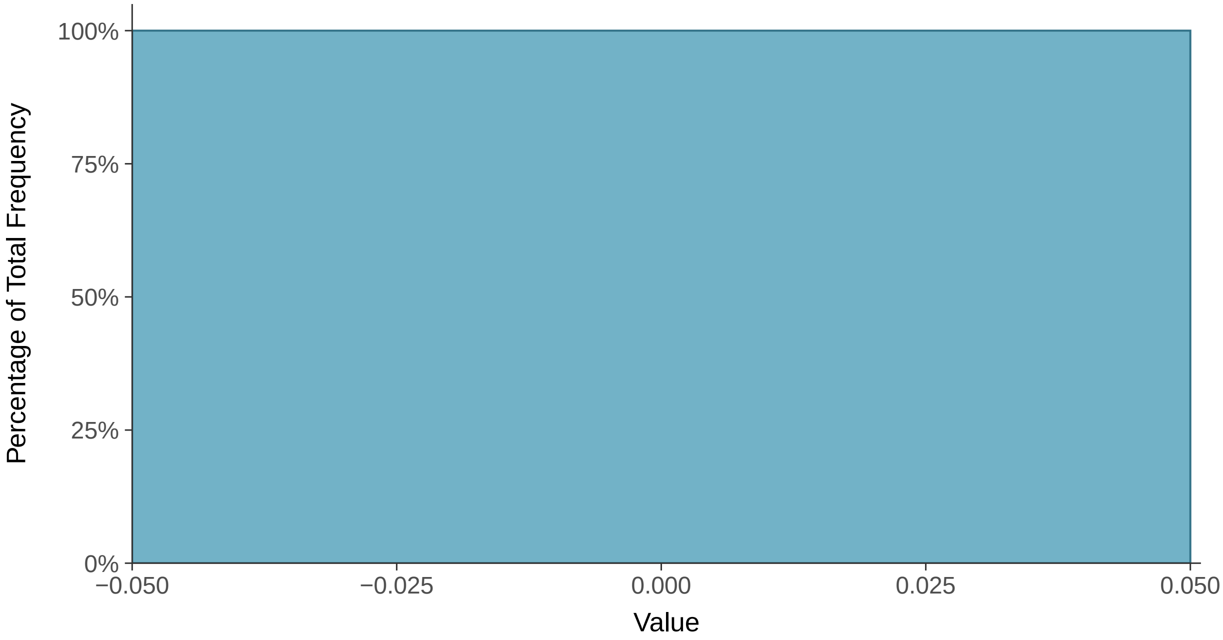
Scatter Plot

Copper, MW-7 (mg/L)



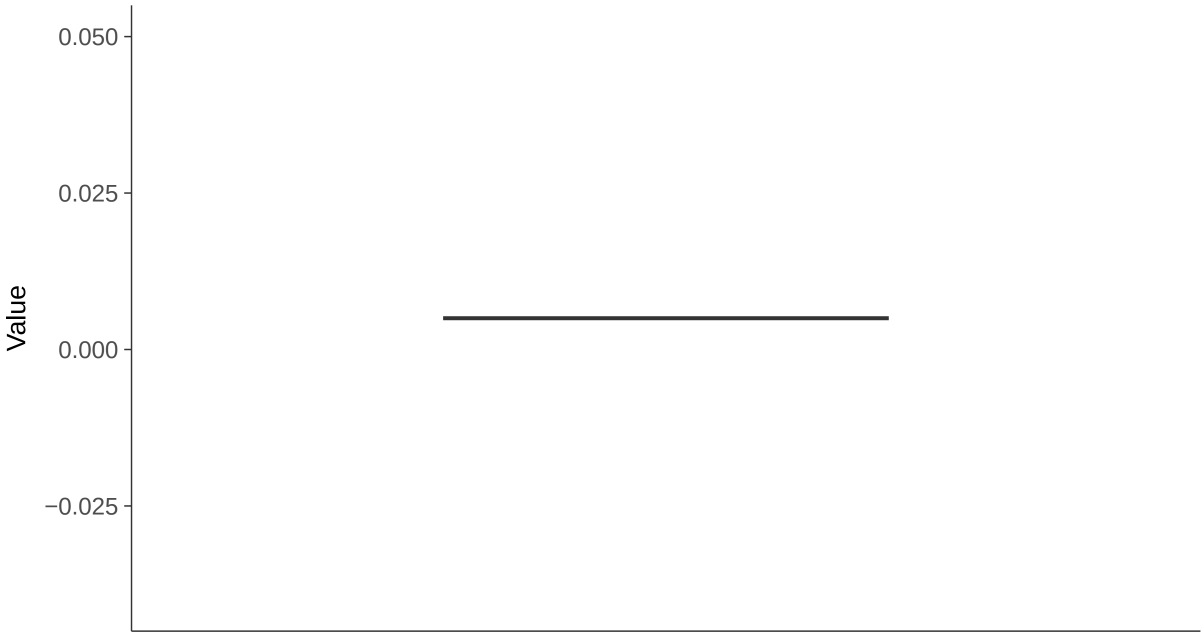
Histogram

Copper, MW-7 (mg/L)



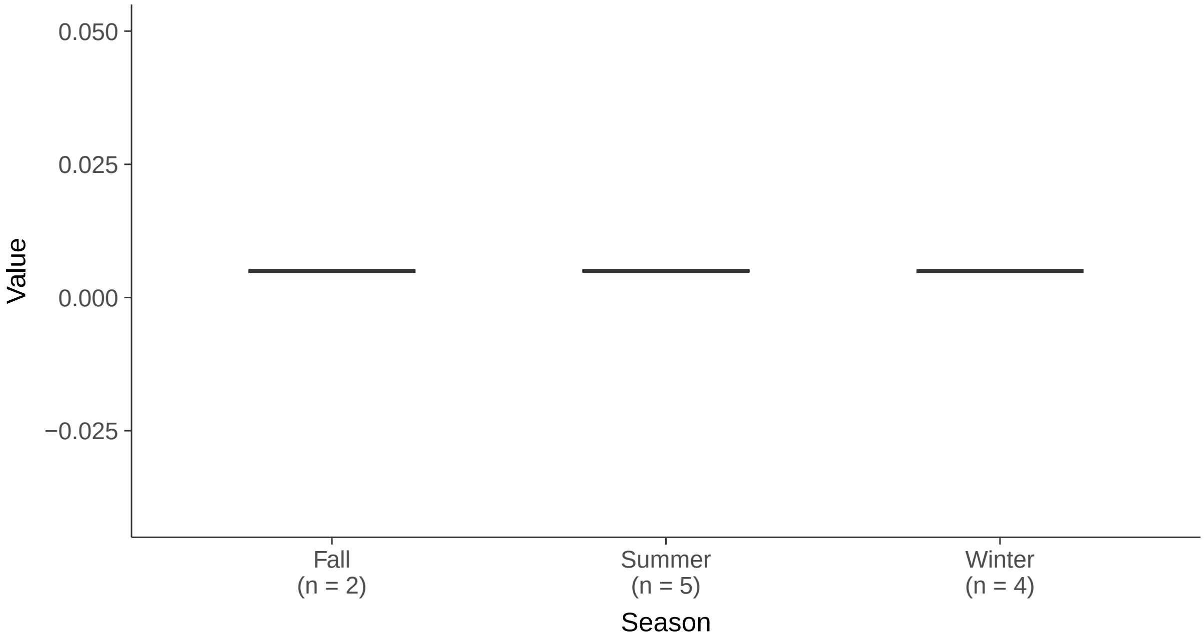
Boxplot

Copper, MW-7 (mg/L)



Boxplot by Season

Copper, MW-7 (mg/L)

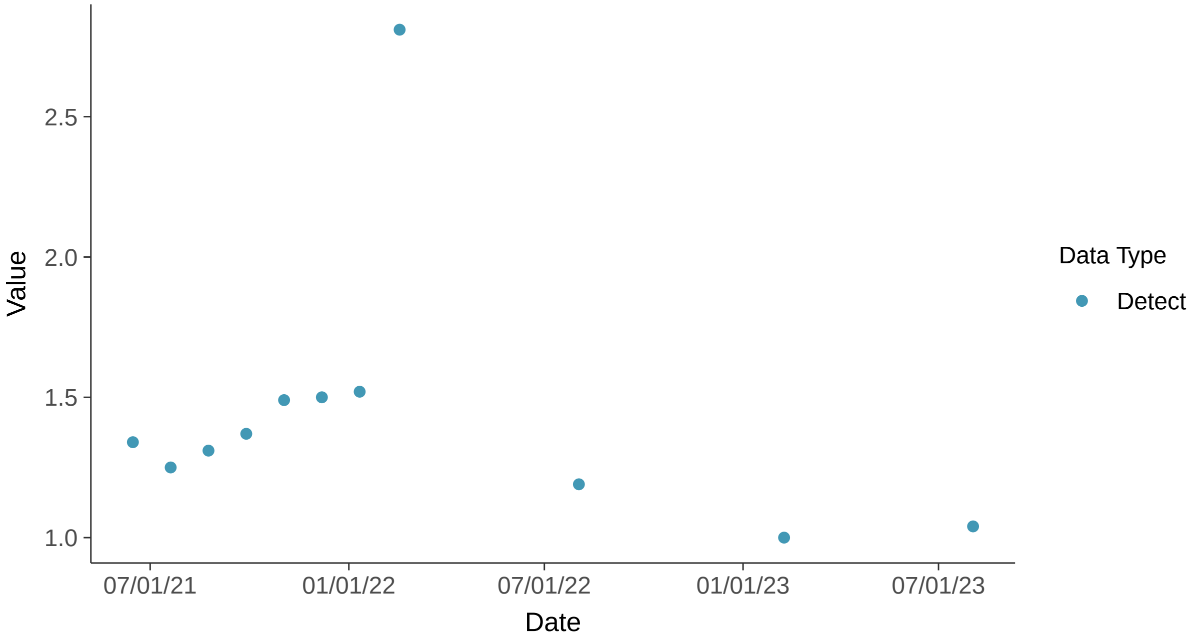


Part 115: Iron, MW-7

ID: 07_5_38

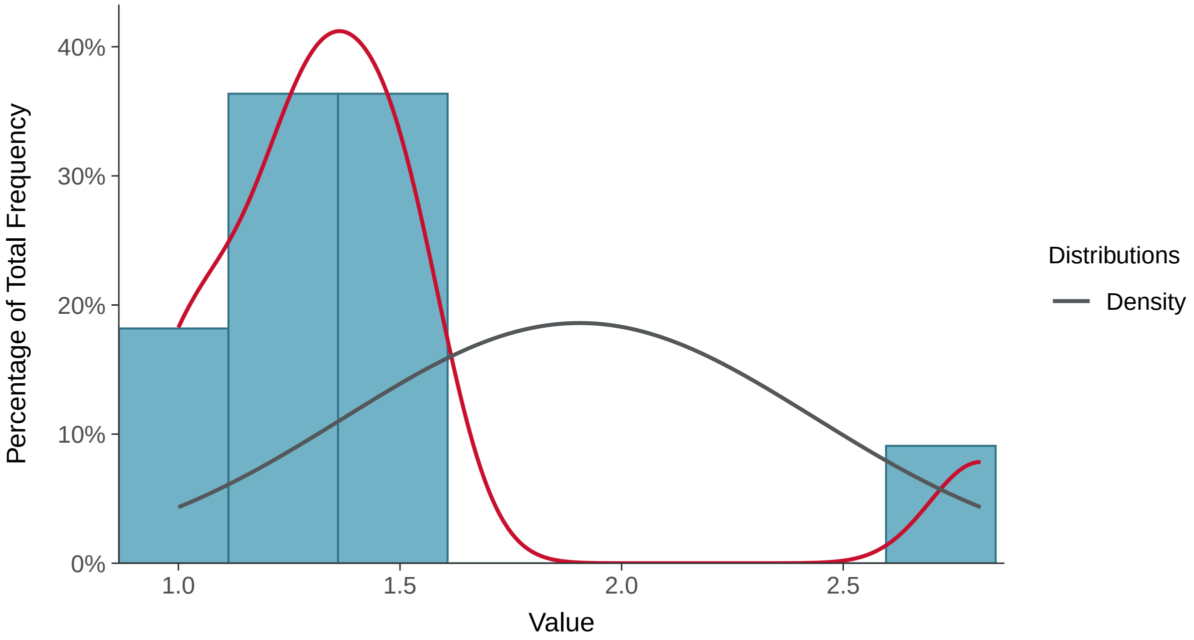
Scatter Plot

Iron, MW-7 (mg/L)



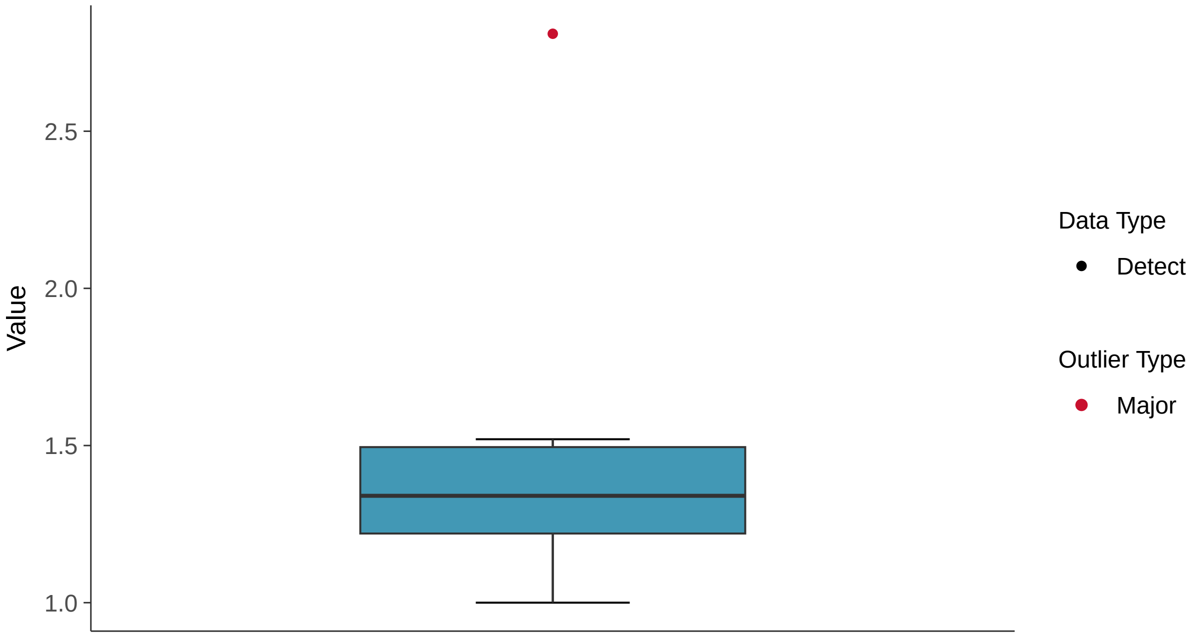
Histogram

Iron, MW-7 (mg/L)



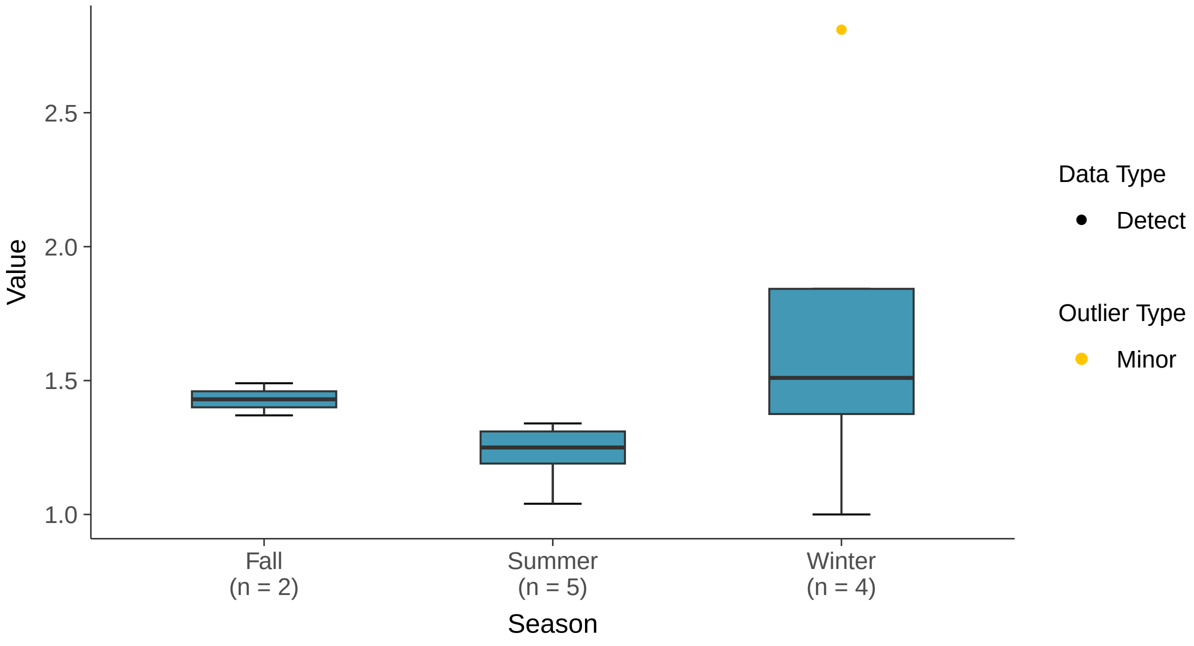
Boxplot

Iron, MW-7 (mg/L)



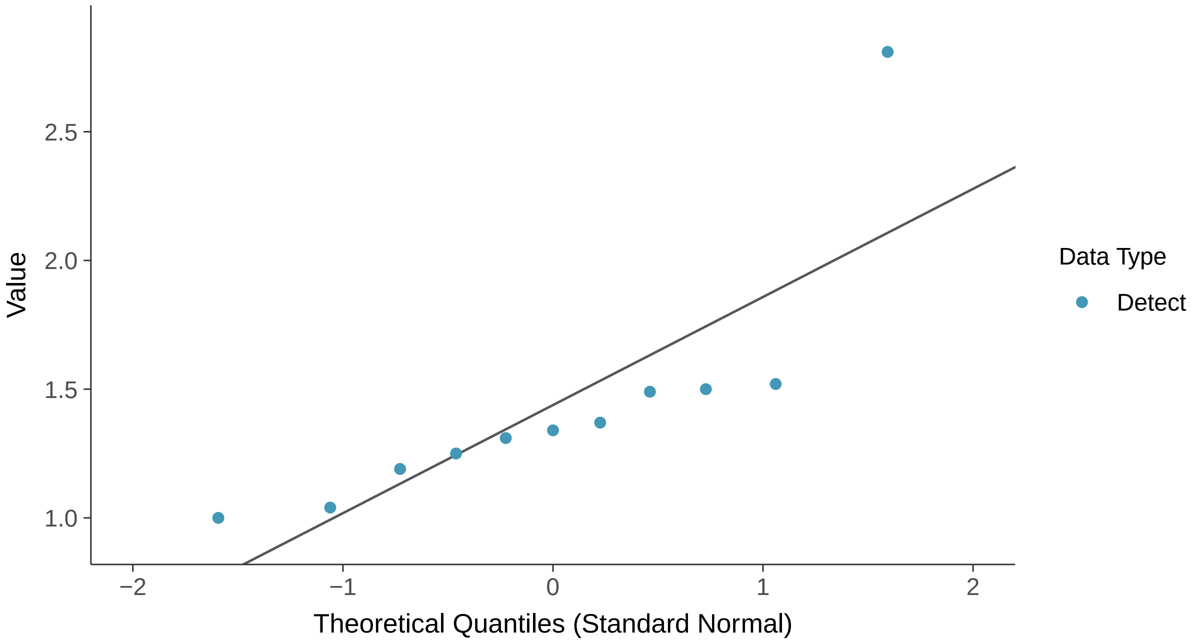
Boxplot by Season

Iron, MW-7 (mg/L)



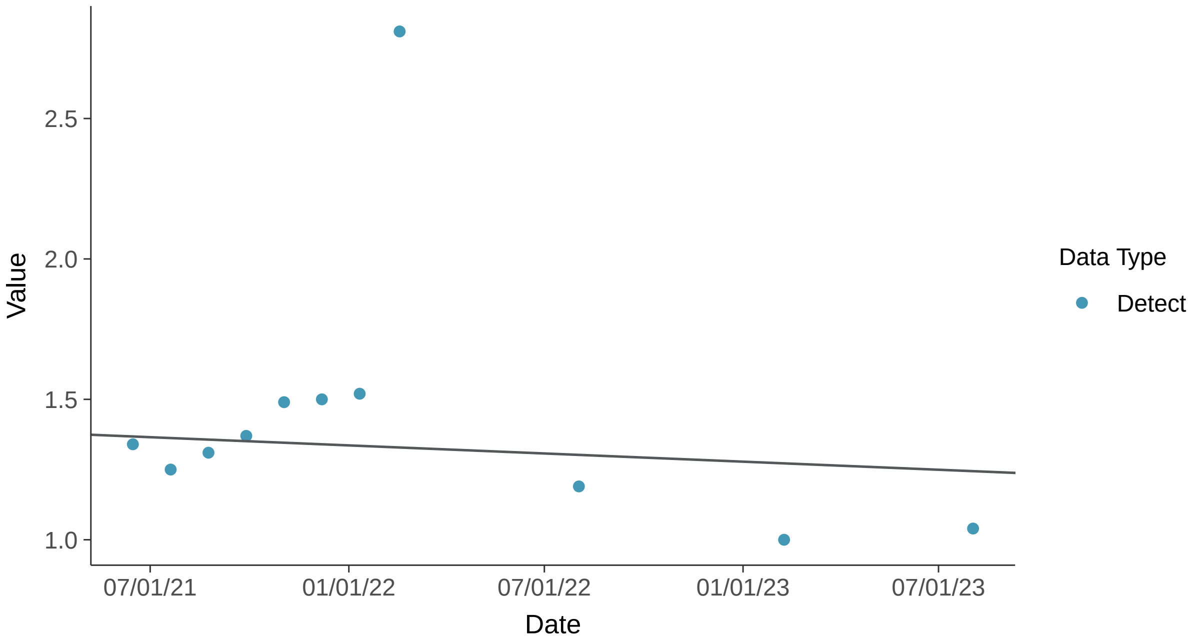
Normal Q-Q plot

Iron, MW-7 (mg/L)



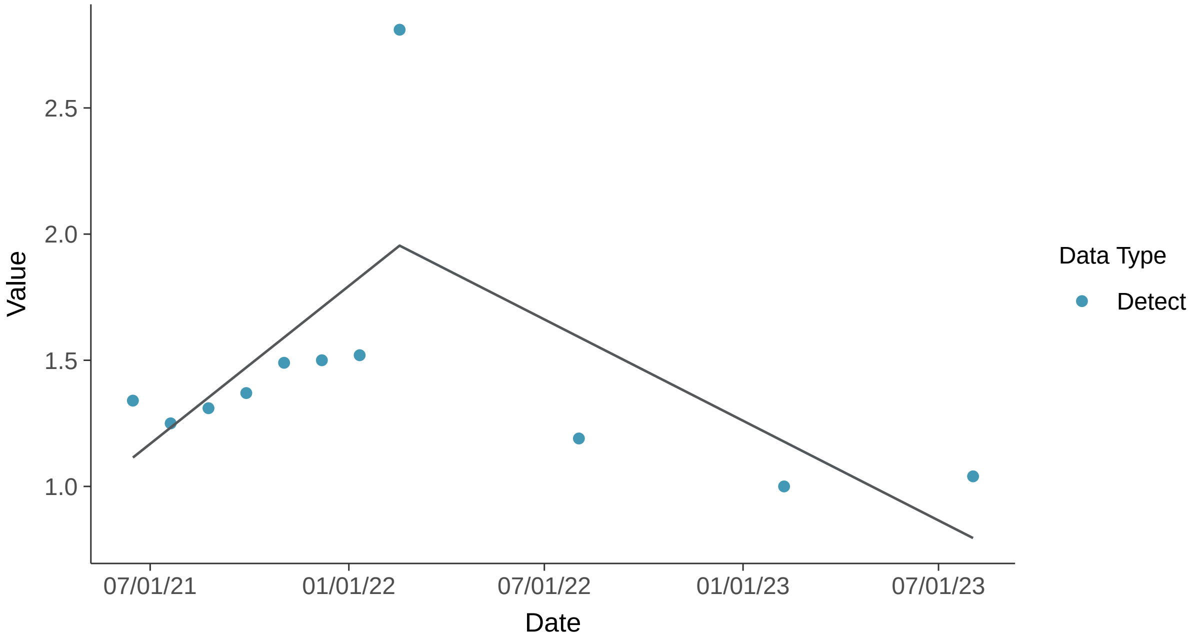
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Iron, MW-7 (mg/L)



Trend Regression: Piecewise Linear-Linear

Iron, MW-7 (mg/L)

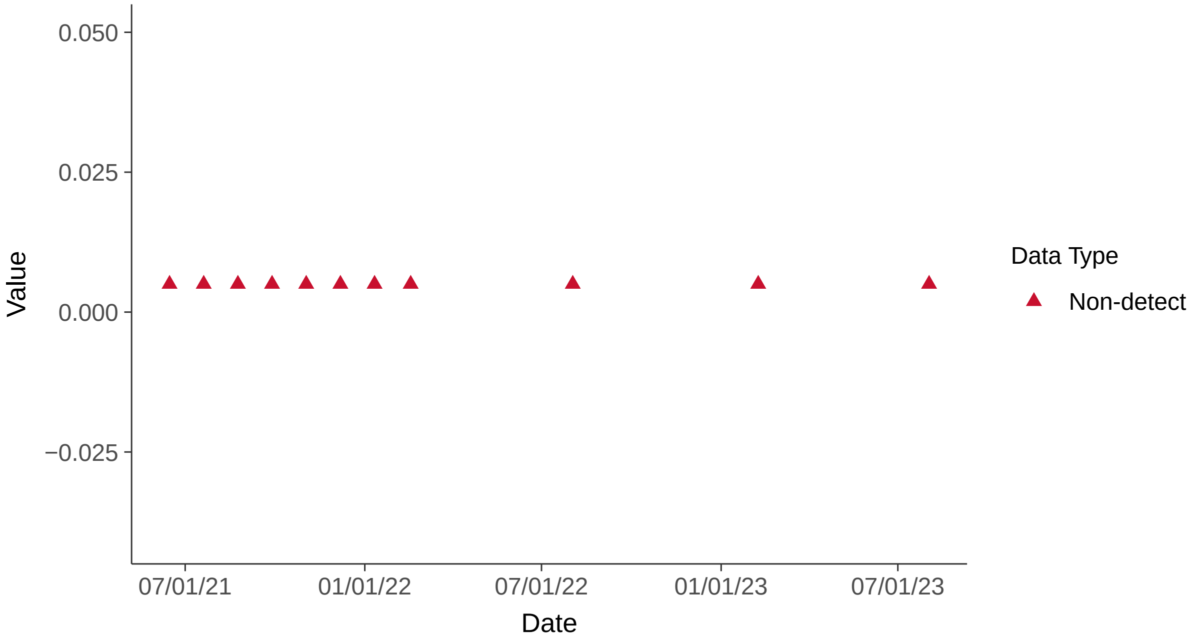


Part 115: Nickel, MW-7

ID: 07_5_39

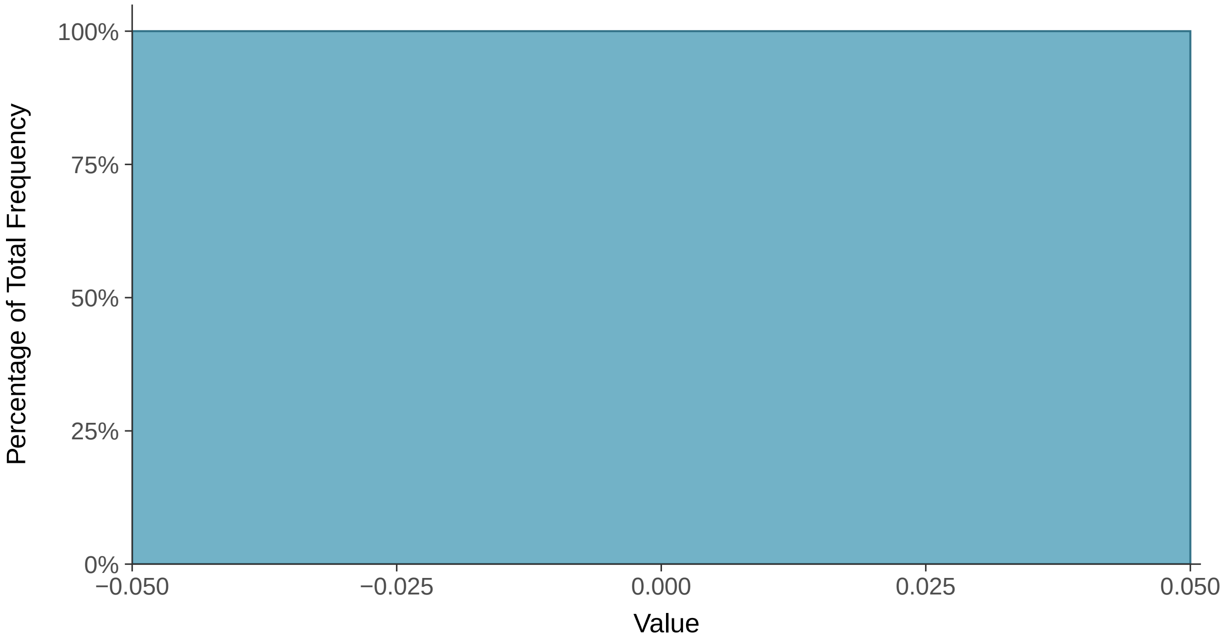
Scatter Plot

Nickel, MW-7 (mg/L)



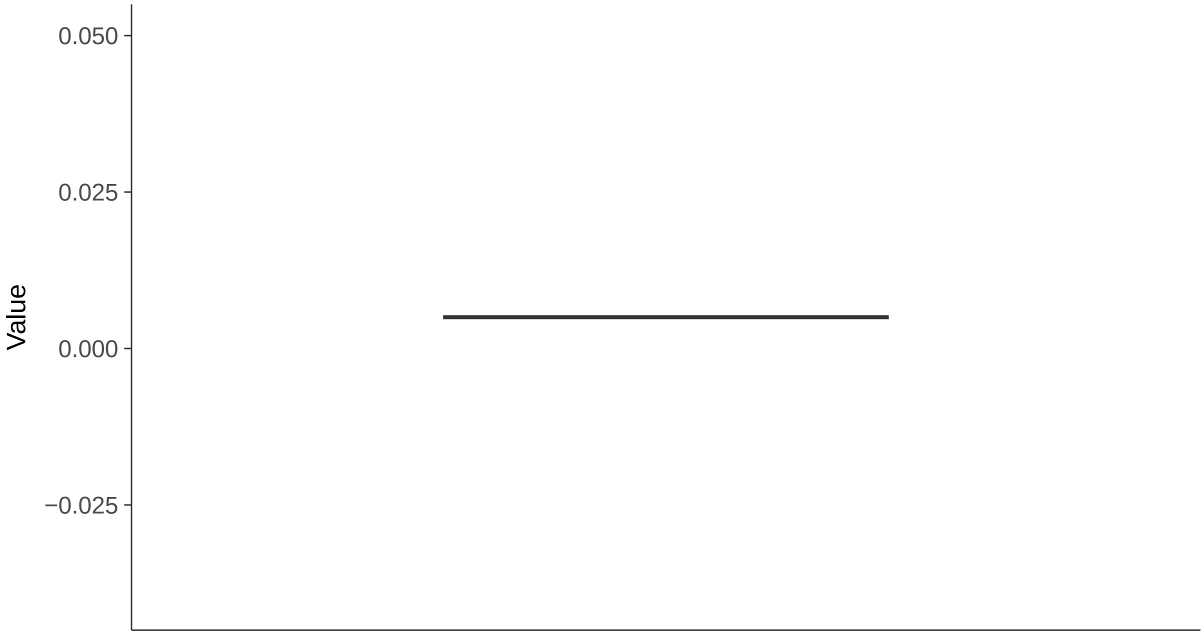
Histogram

Nickel, MW-7 (mg/L)



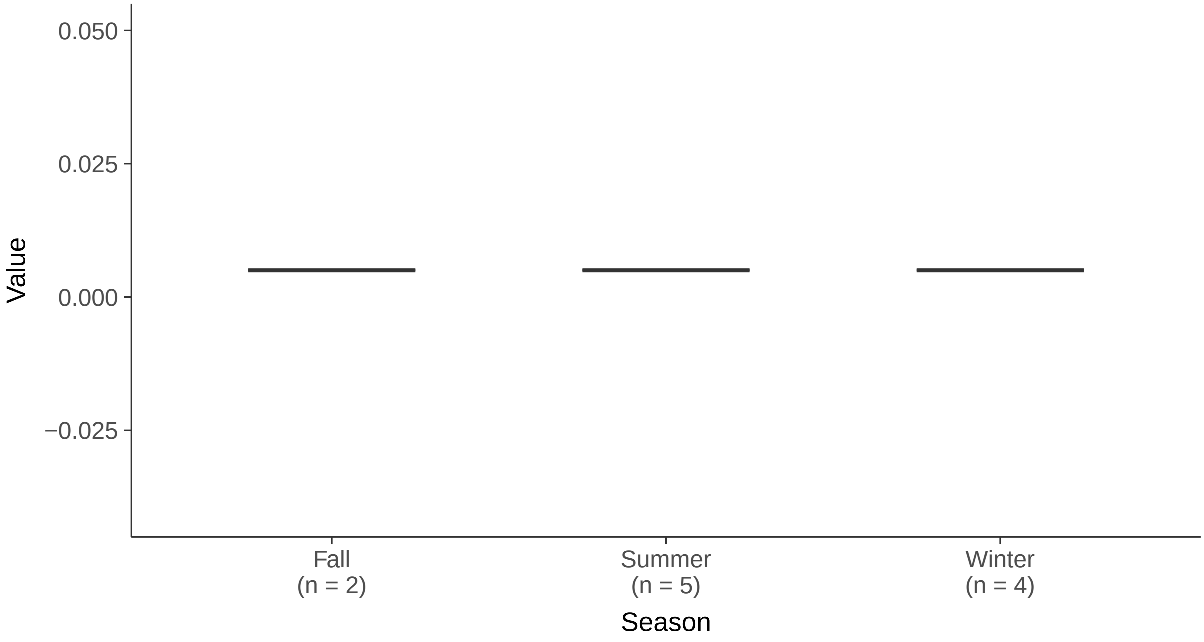
Boxplot

Nickel, MW-7 (mg/L)



Boxplot by Season

Nickel, MW-7 (mg/L)

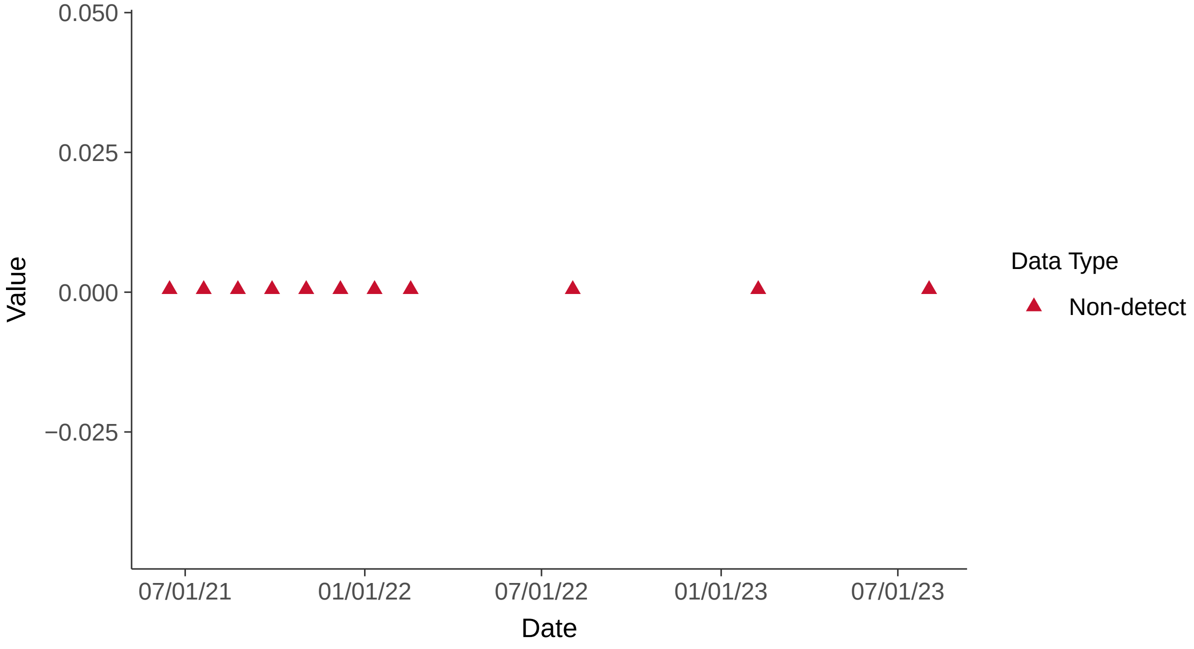


Part 115: Silver, MW-7

ID: 07_5_40

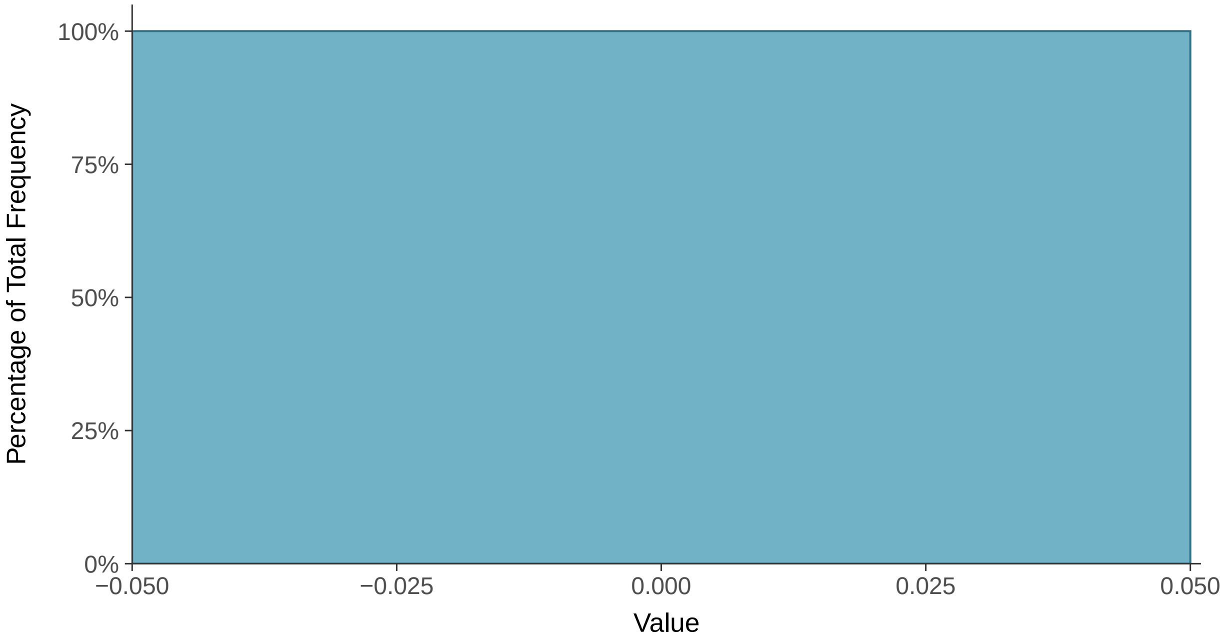
Scatter Plot

Silver, MW-7 (mg/L)



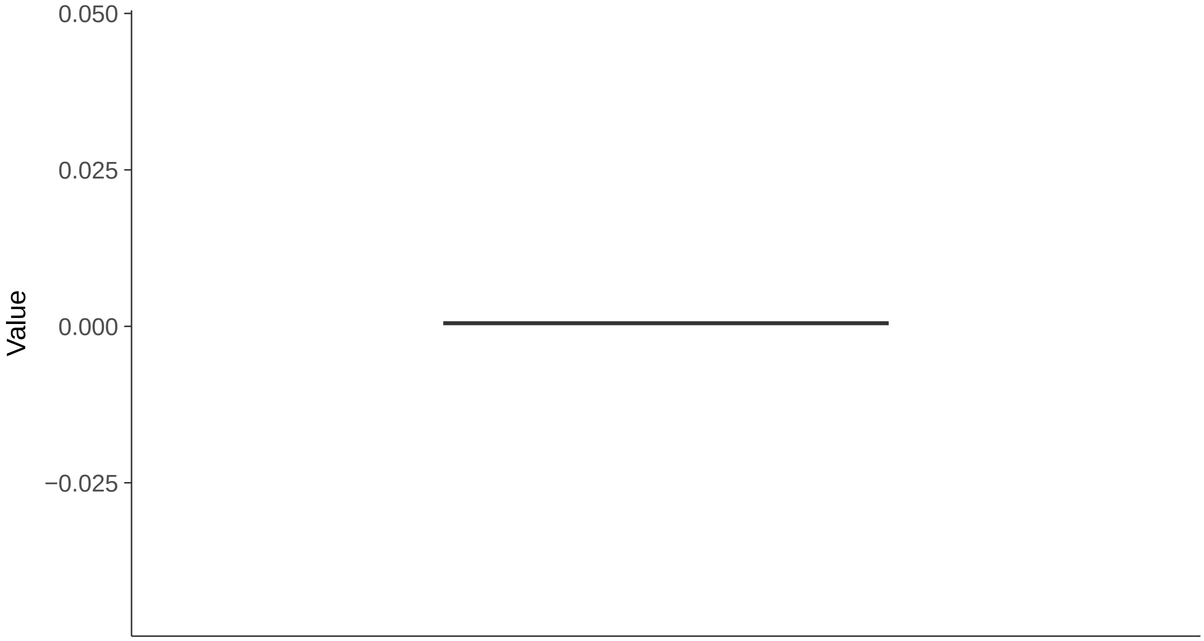
Histogram

Silver, MW-7 (mg/L)



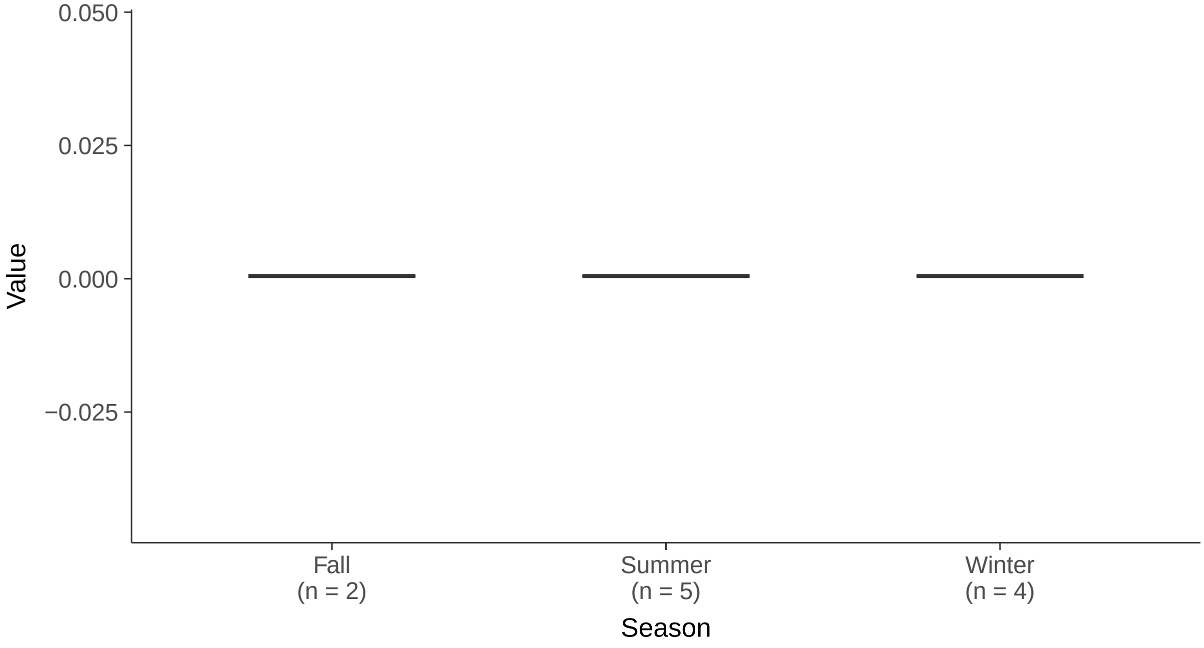
Boxplot

Silver, MW-7 (mg/L)



Boxplot by Season

Silver, MW-7 (mg/L)

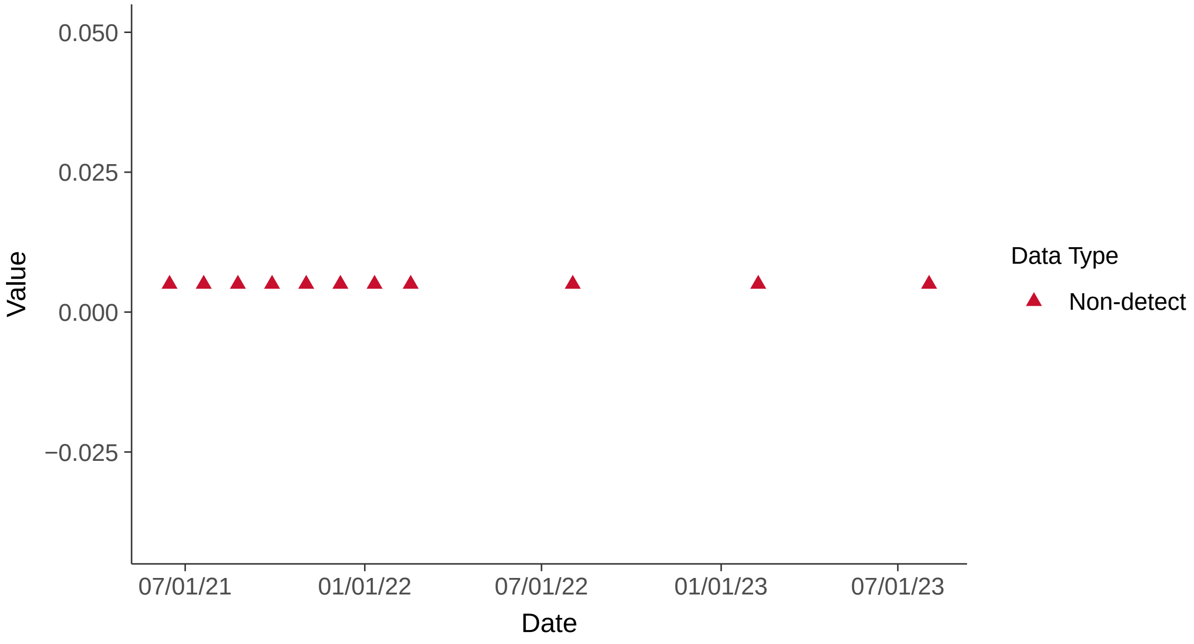


Part 115: Vanadium, MW-7

ID: 07_5_41

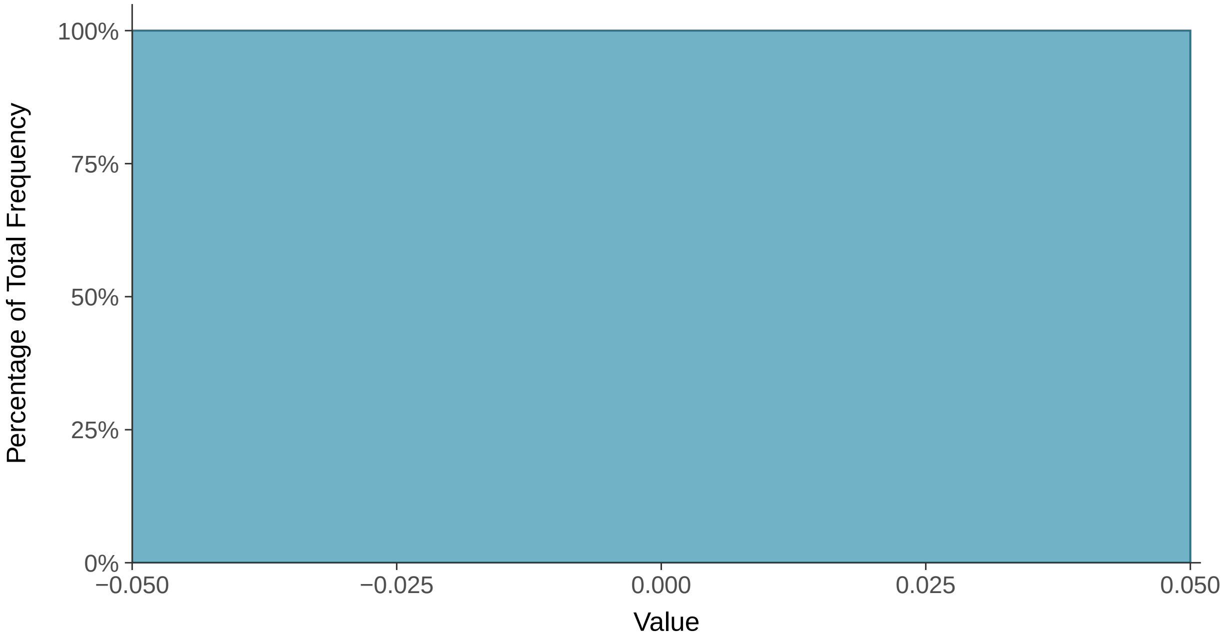
Scatter Plot

Vanadium, MW-7 (mg/L)



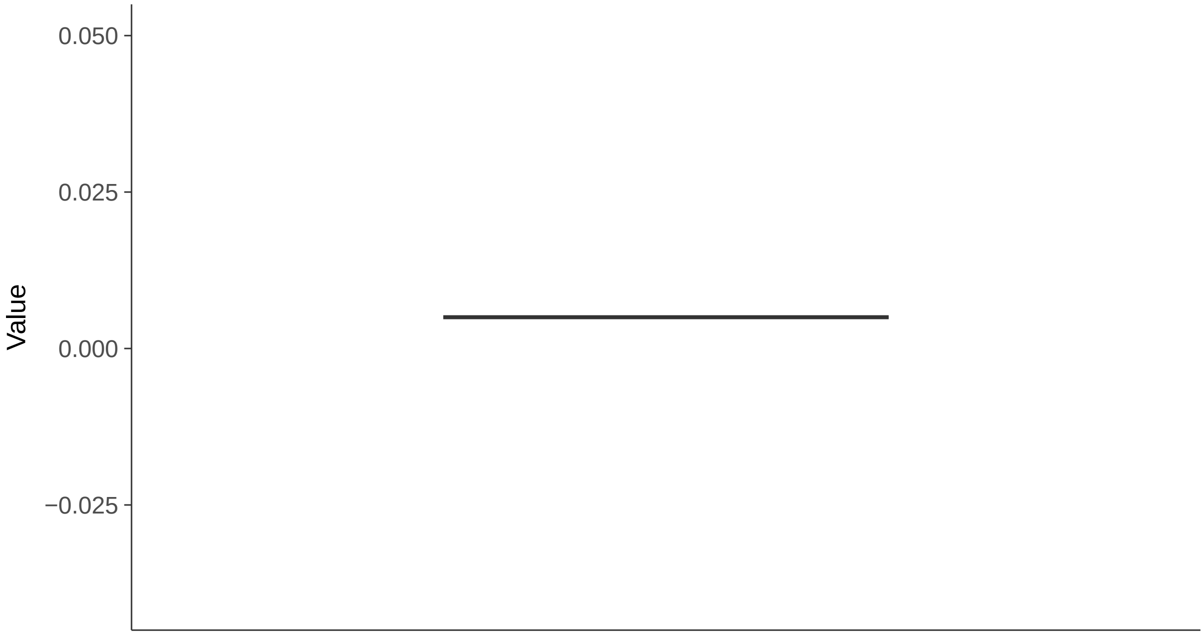
Histogram

Vanadium, MW-7 (mg/L)



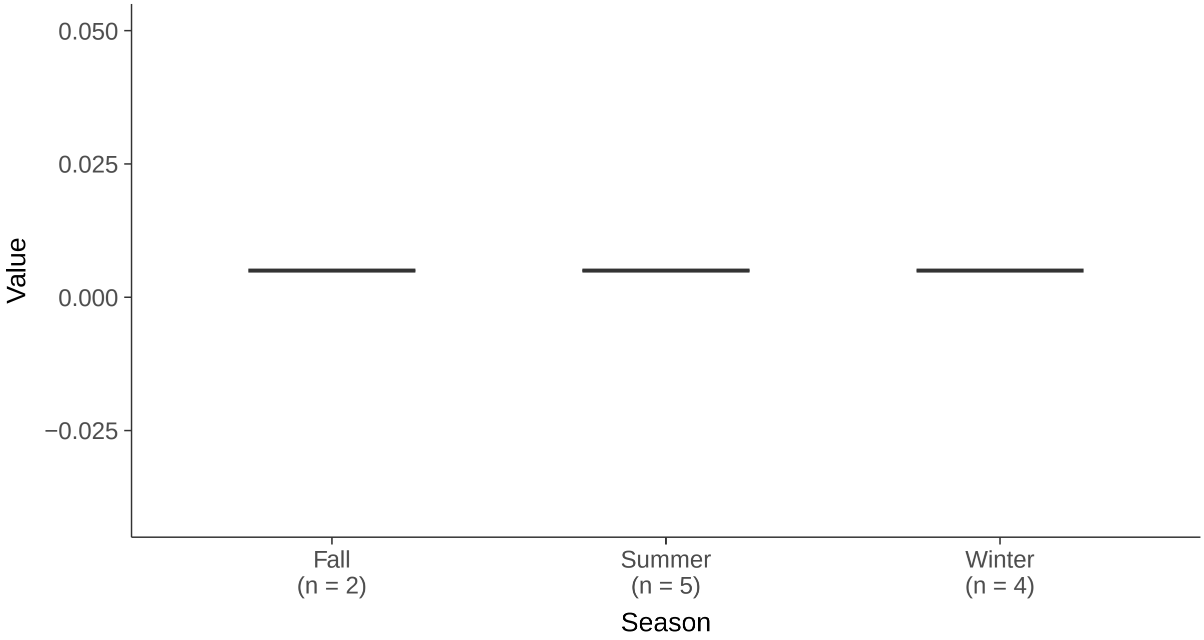
Boxplot

Vanadium, MW-7 (mg/L)



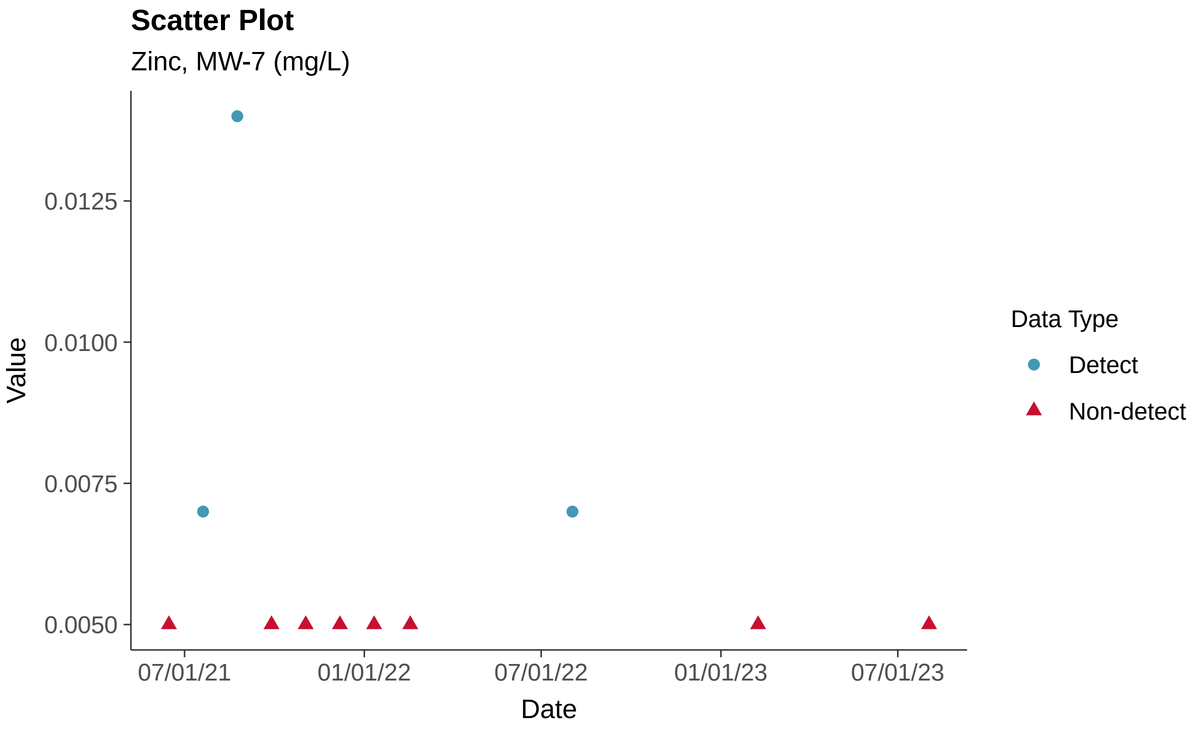
Boxplot by Season

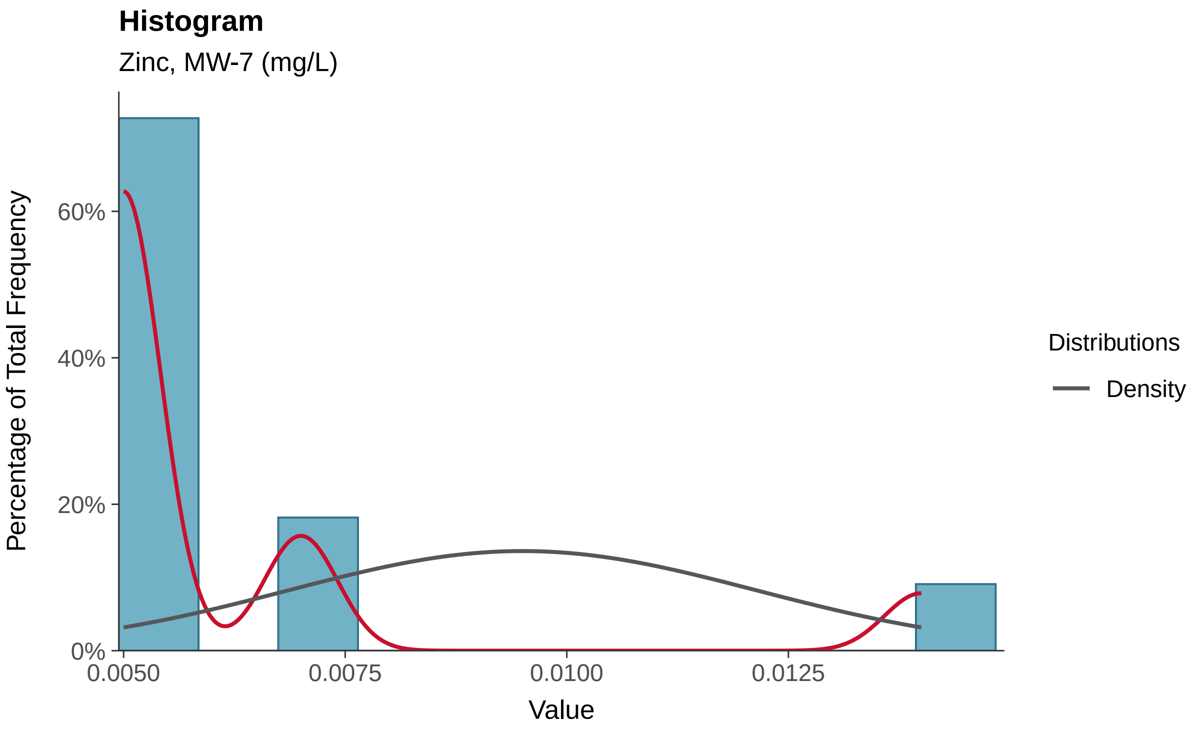
Vanadium, MW-7 (mg/L)



Part 115: Zinc, MW-7

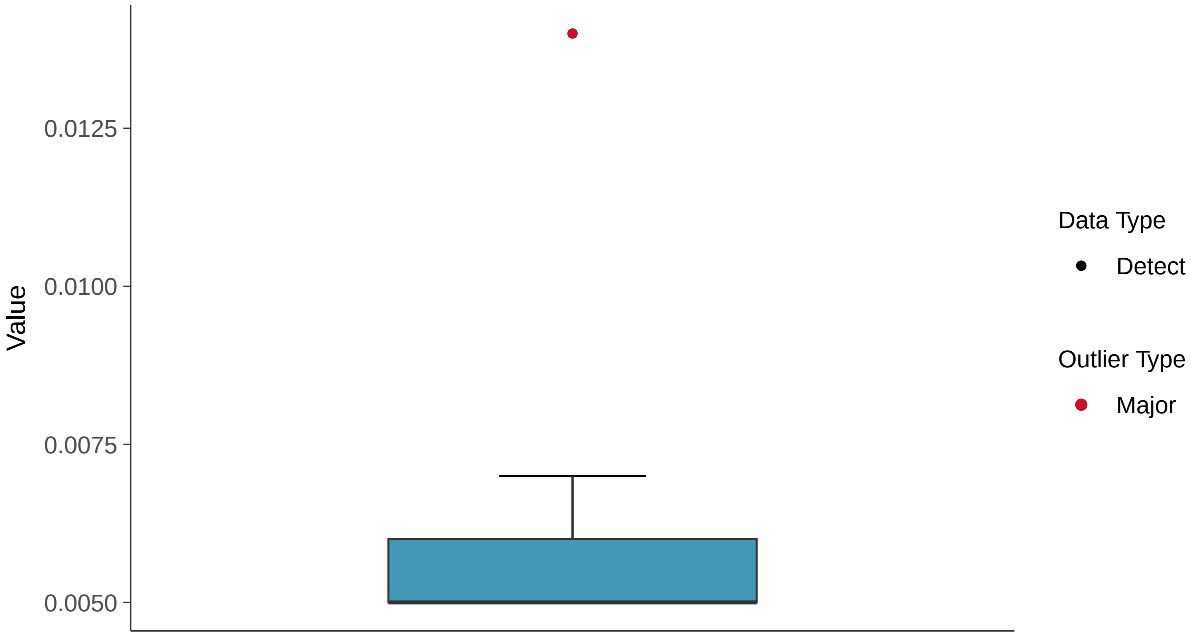
ID: 07_5_42





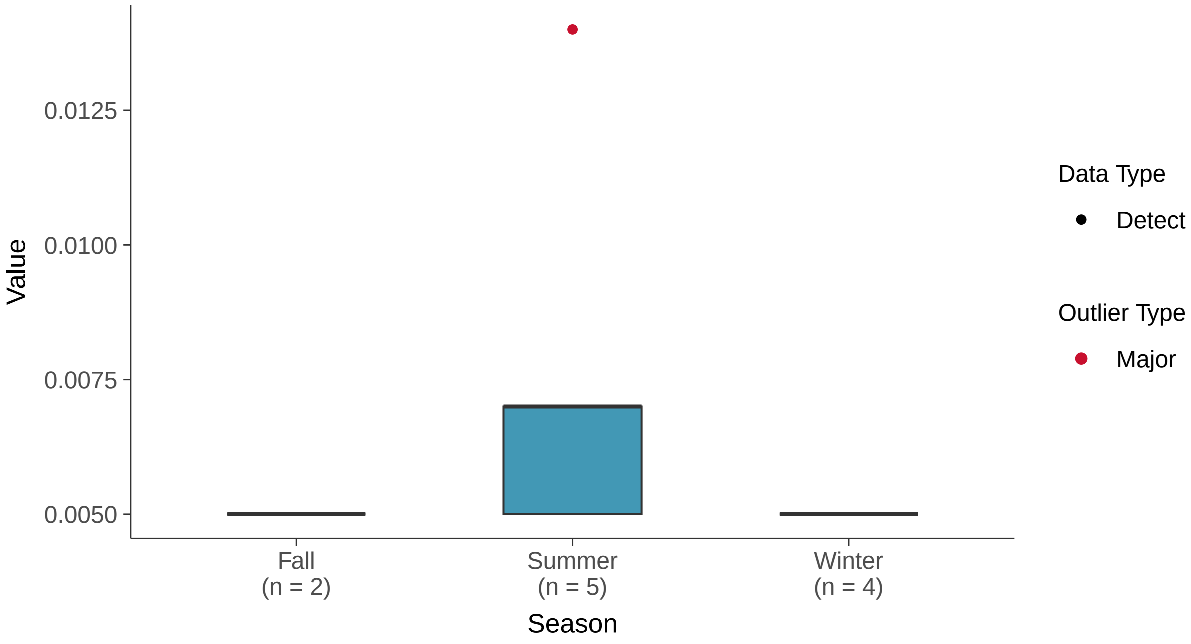
Boxplot

Zinc, MW-7 (mg/L)



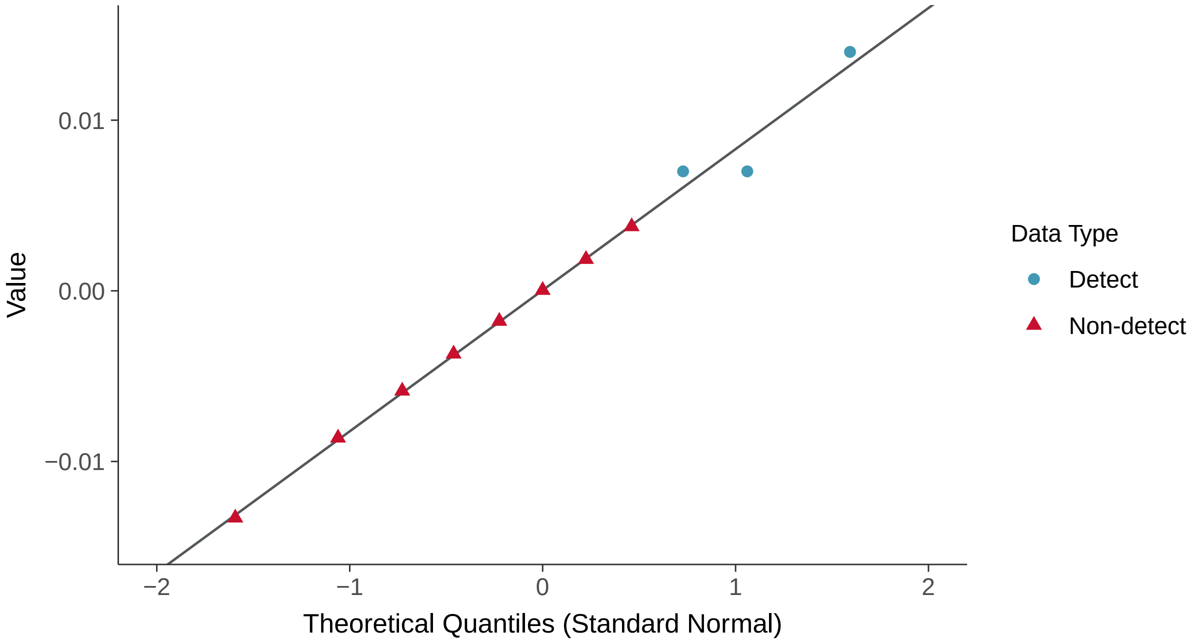
Boxplot by Season

Zinc, MW-7 (mg/L)



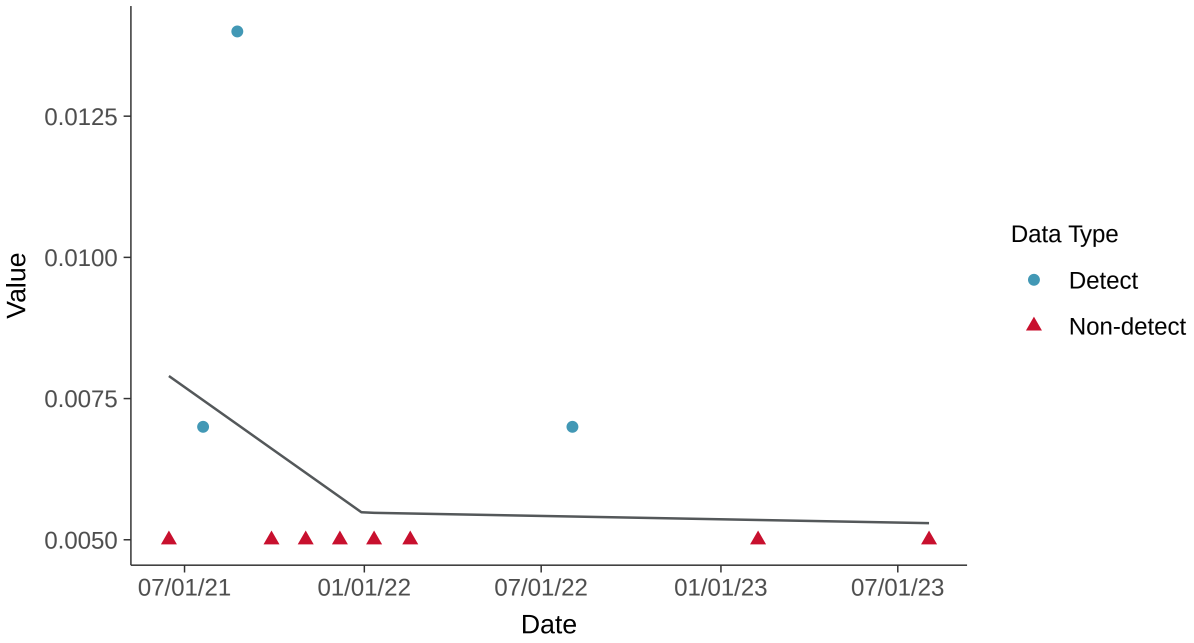
Normal Q-Q plot using ROS Imputed Estimates

Zinc, MW-7 (mg/L)



Trend Regression: Piecewise Linear-Linear

Zinc, MW-7 (mg/L)

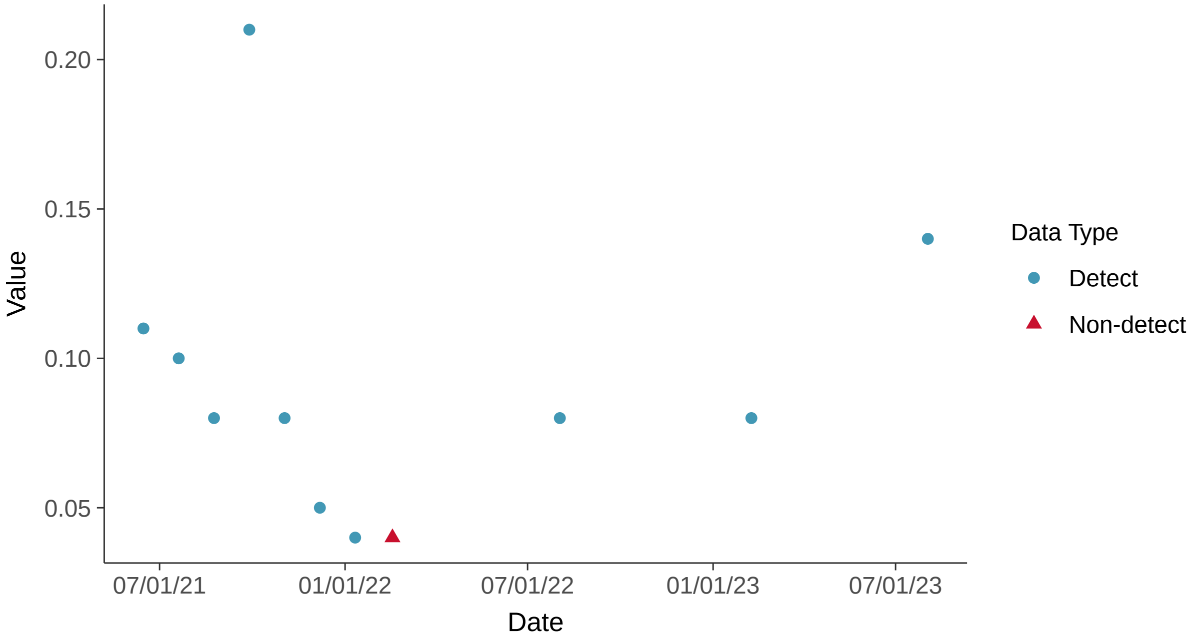


Appendix III: Boron, MW-8

ID: 08_1_01

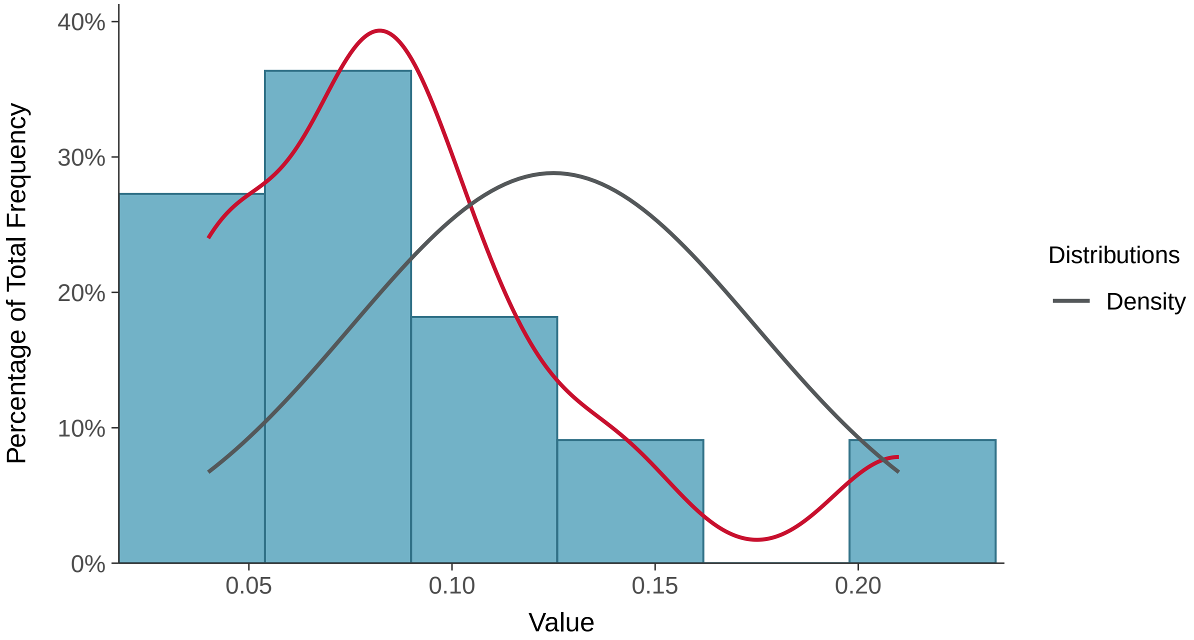
Scatter Plot

Boron, MW-8 (mg/L)



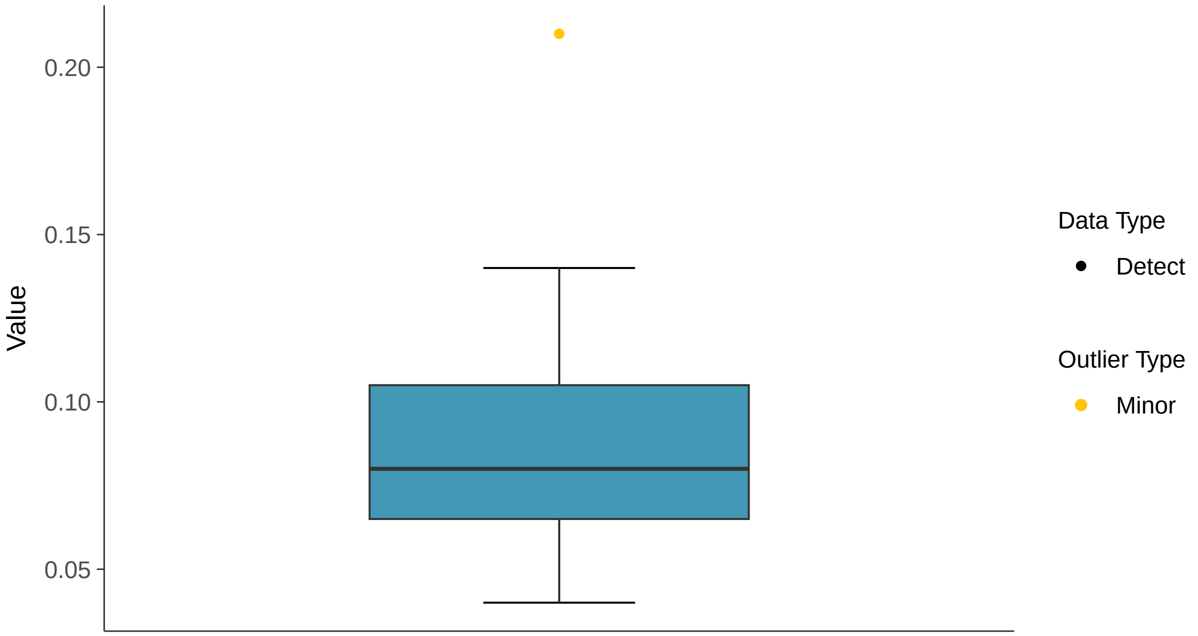
Histogram

Boron, MW-8 (mg/L)



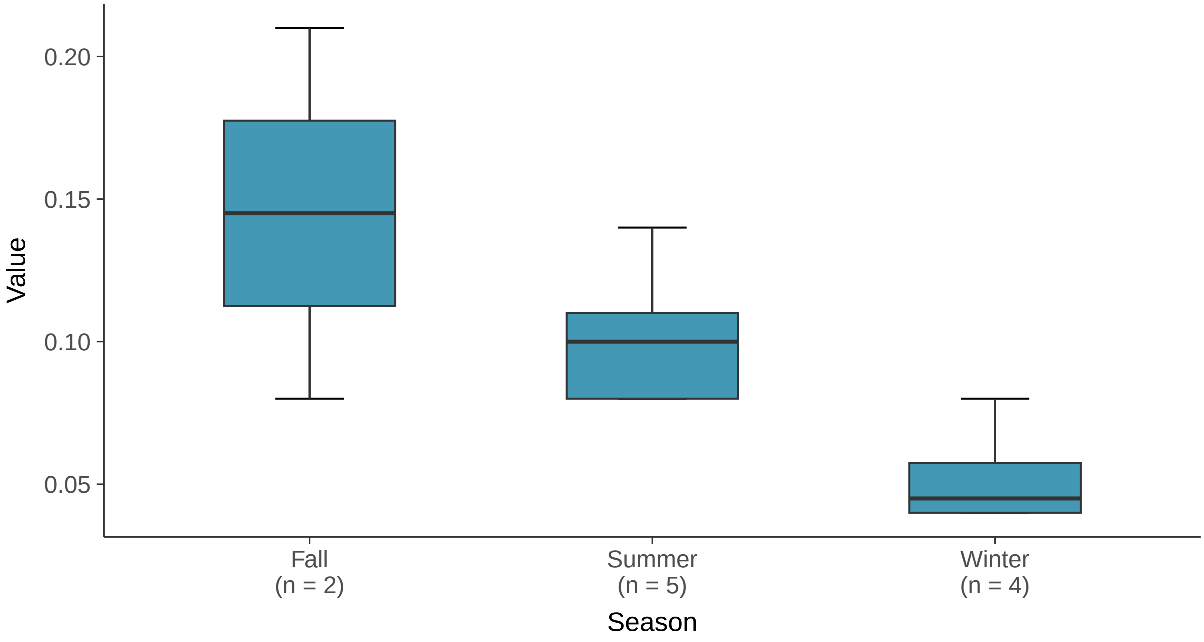
Boxplot

Boron, MW-8 (mg/L)



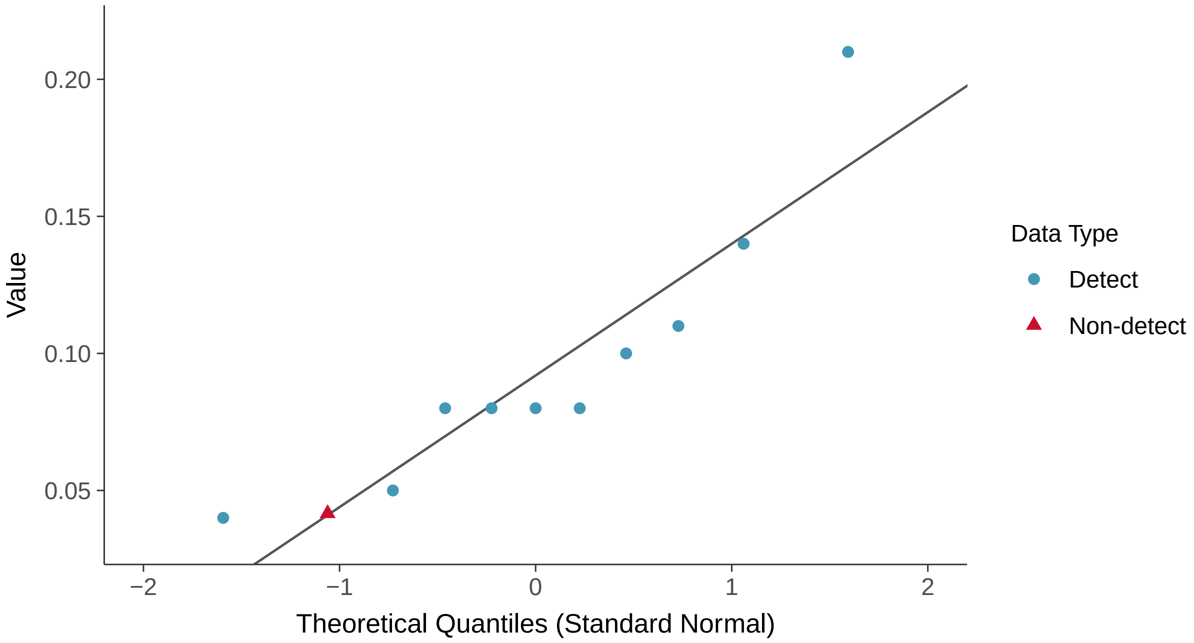
Boxplot by Season

Boron, MW-8 (mg/L)



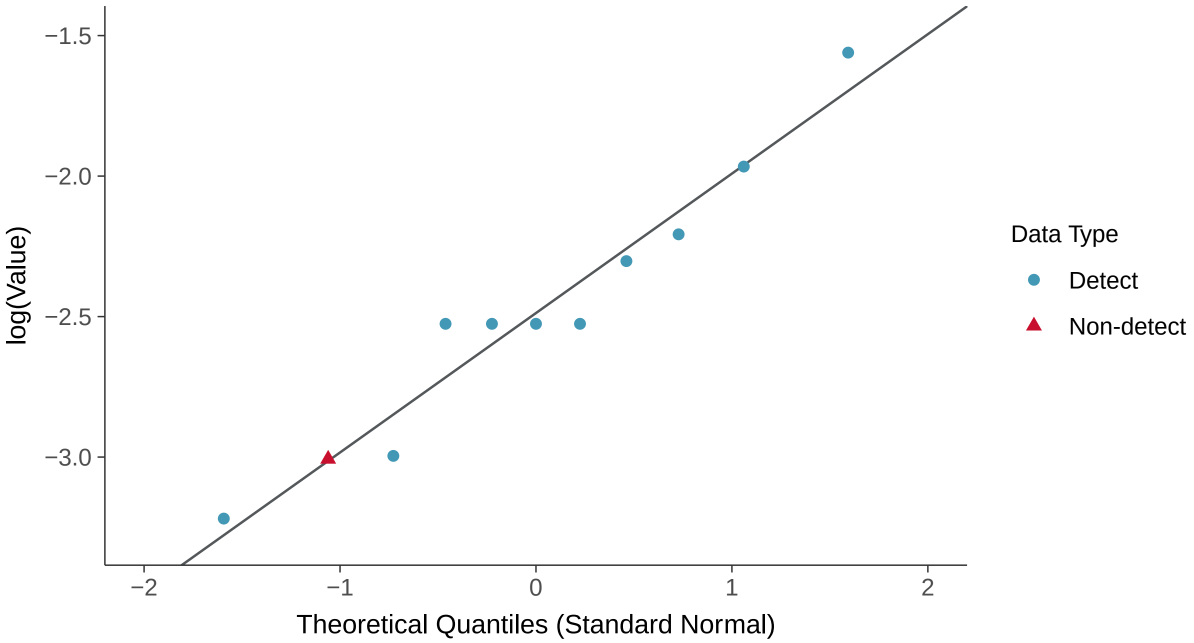
Normal Q-Q plot using ROS Imputed Estimates

Boron, MW-8 (mg/L)



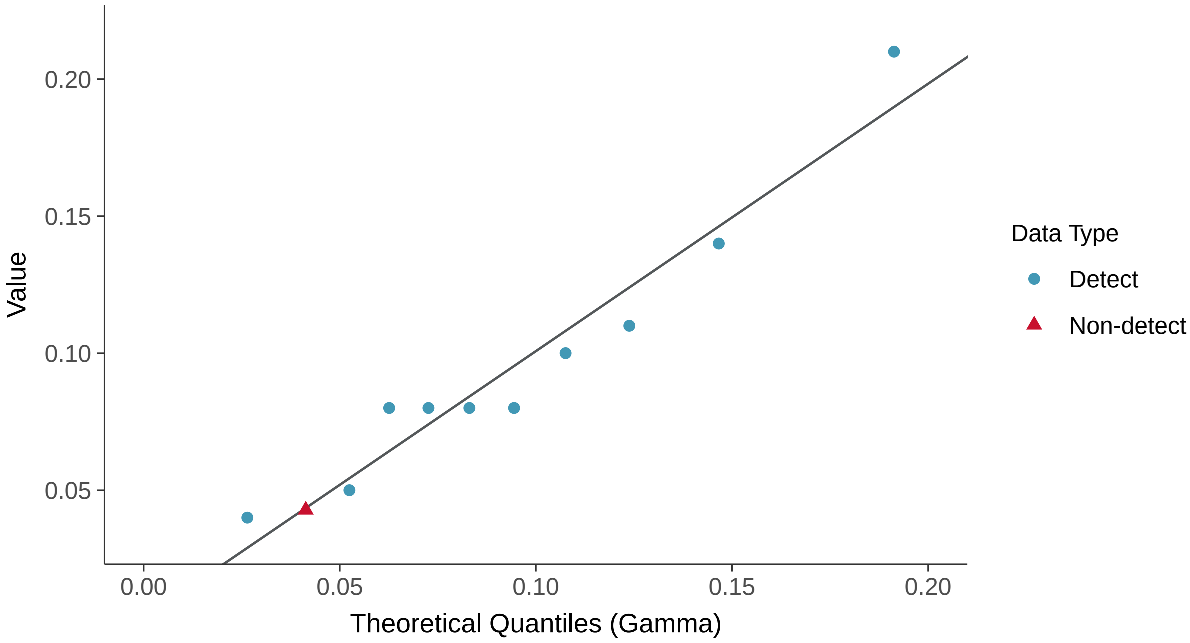
Lognormal Q-Q plot using ROS Imputed Estimates

Boron, MW-8 (mg/L)



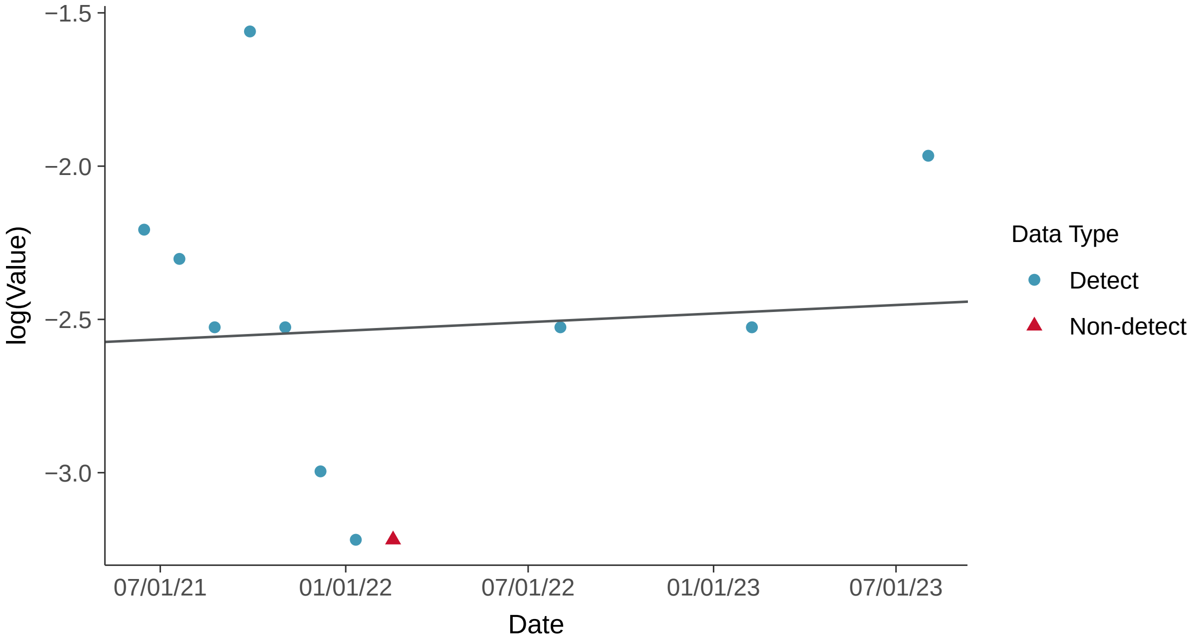
Gamma Q-Q plot using ROS Imputed Estimates

Boron, MW-8 (mg/L)



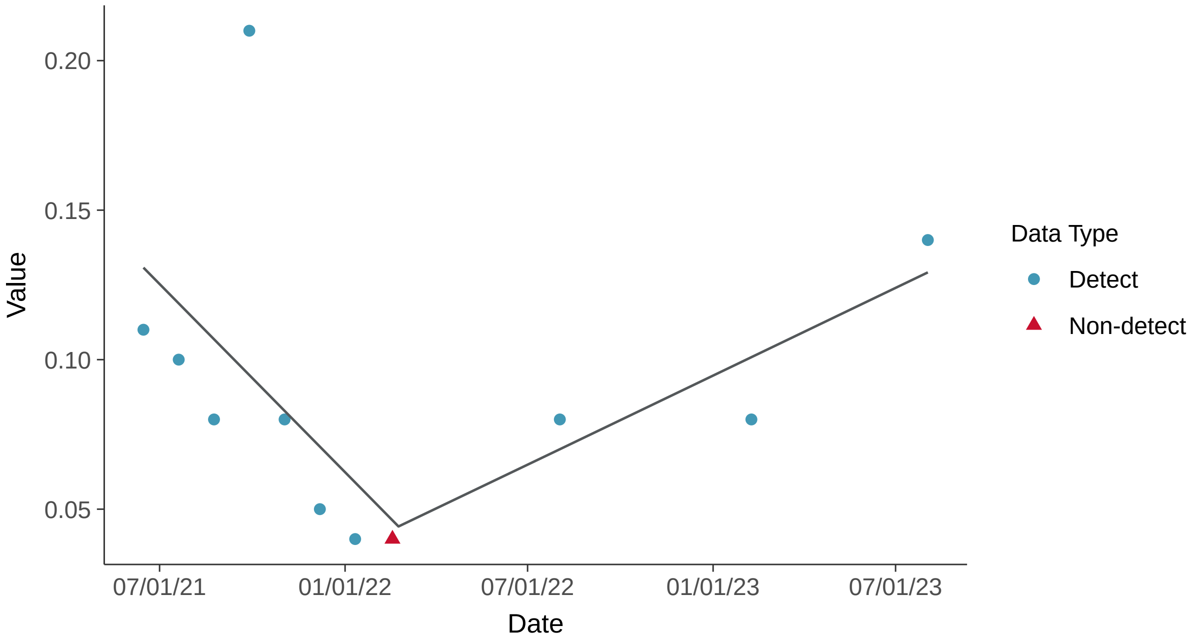
Trend Regression: Lognormal MLE

Boron, MW-8 (mg/L)



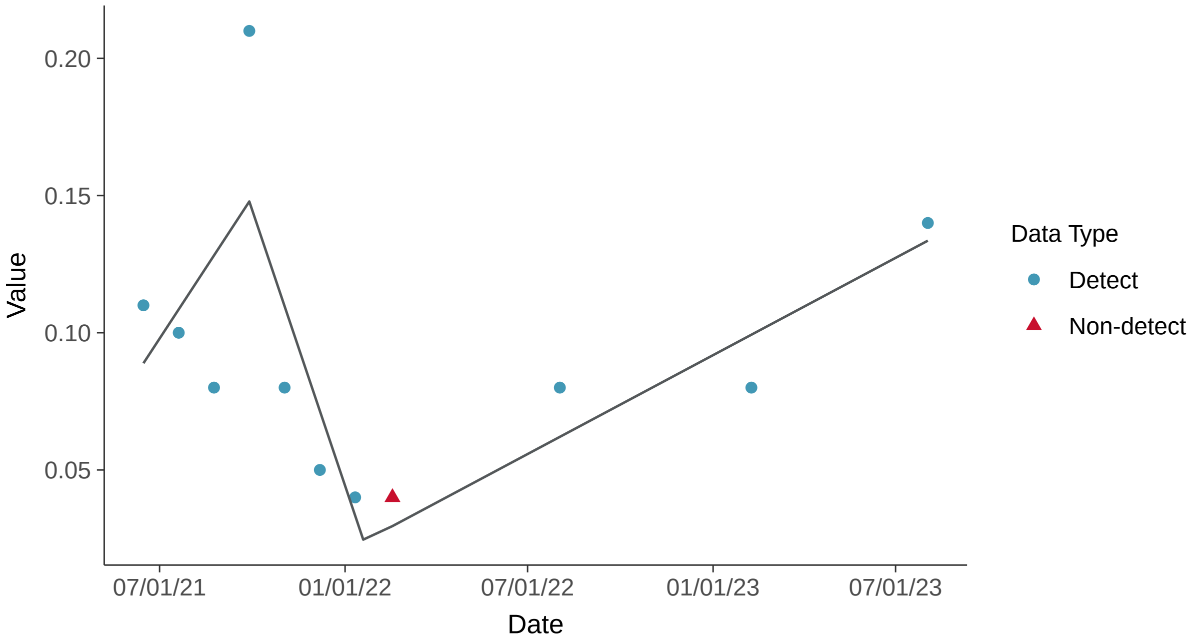
Trend Regression: Piecewise Linear-Linear

Boron, MW-8 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Boron, MW-8 (mg/L)

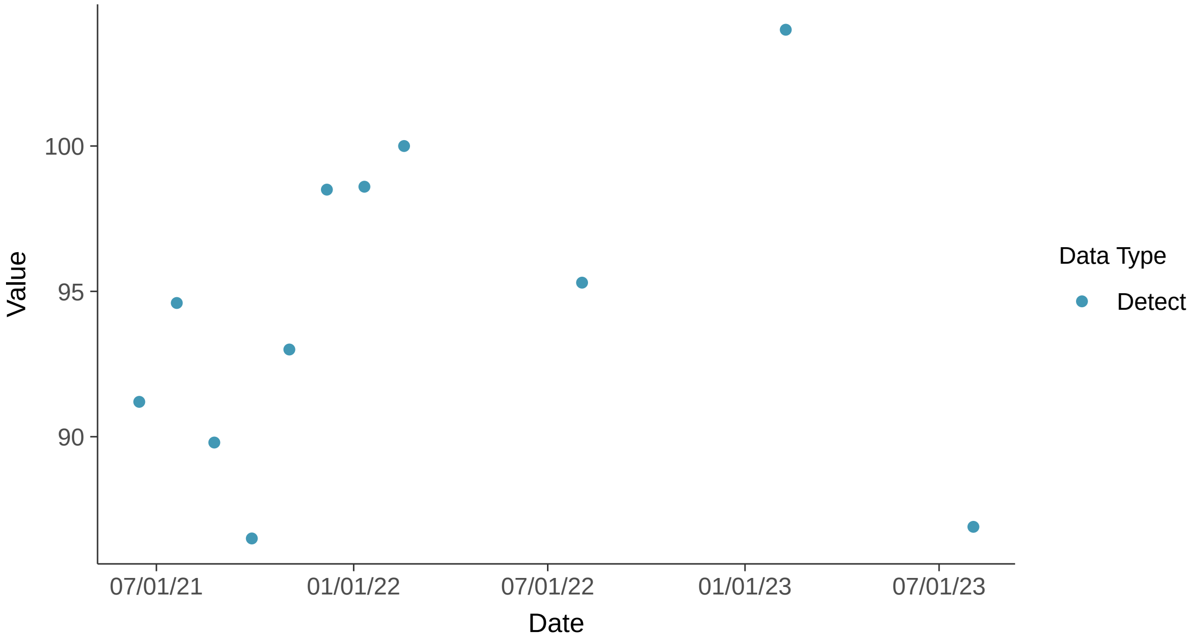


Appendix III: Calcium, MW-8

ID: 08_1_02

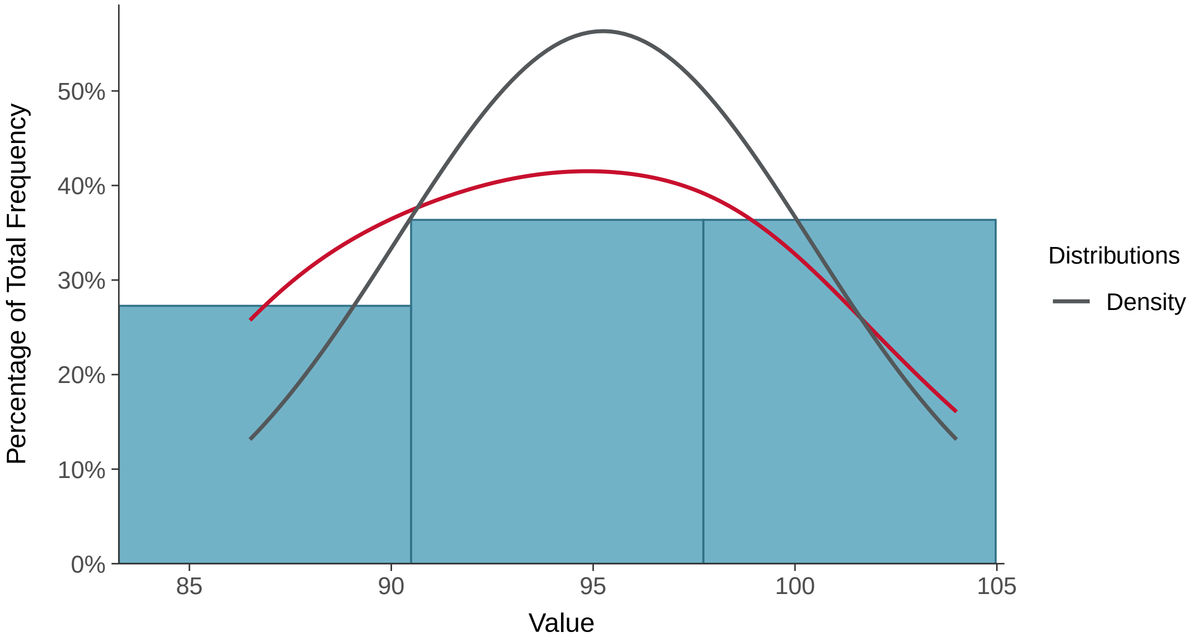
Scatter Plot

Calcium, MW-8 (mg/L)



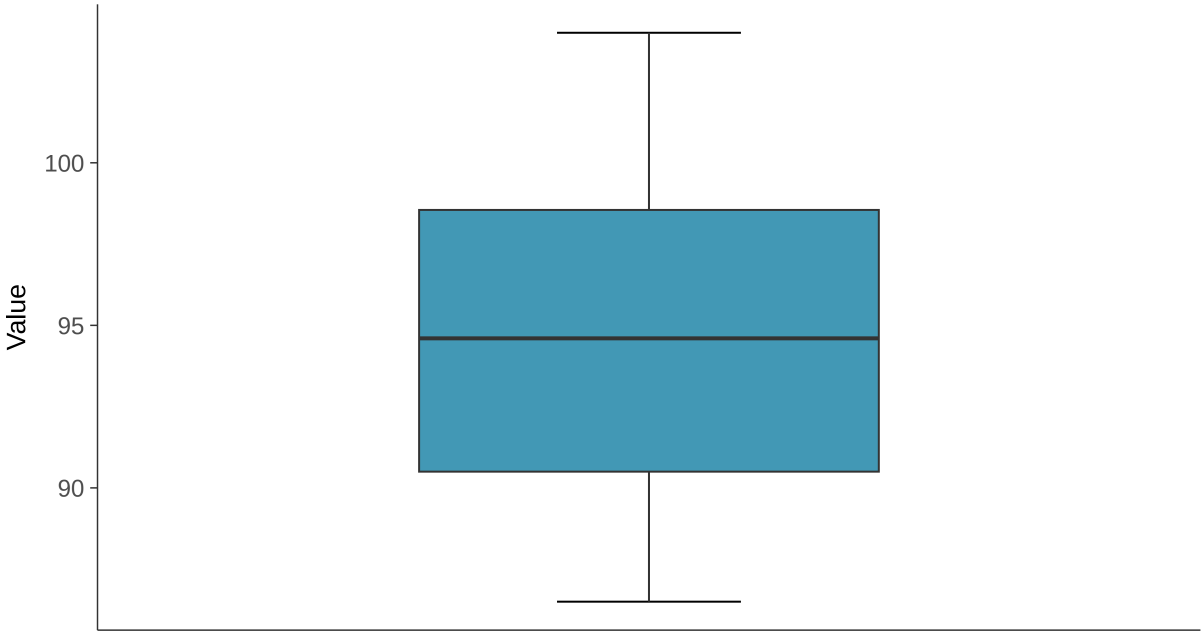
Histogram

Calcium, MW-8 (mg/L)



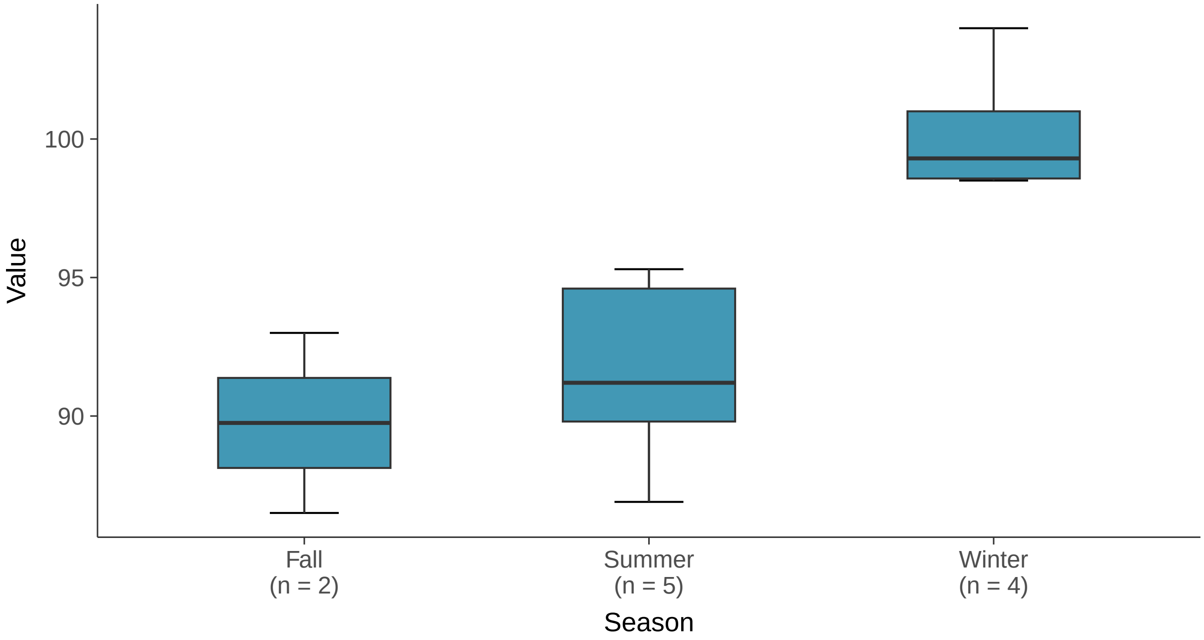
Boxplot

Calcium, MW-8 (mg/L)



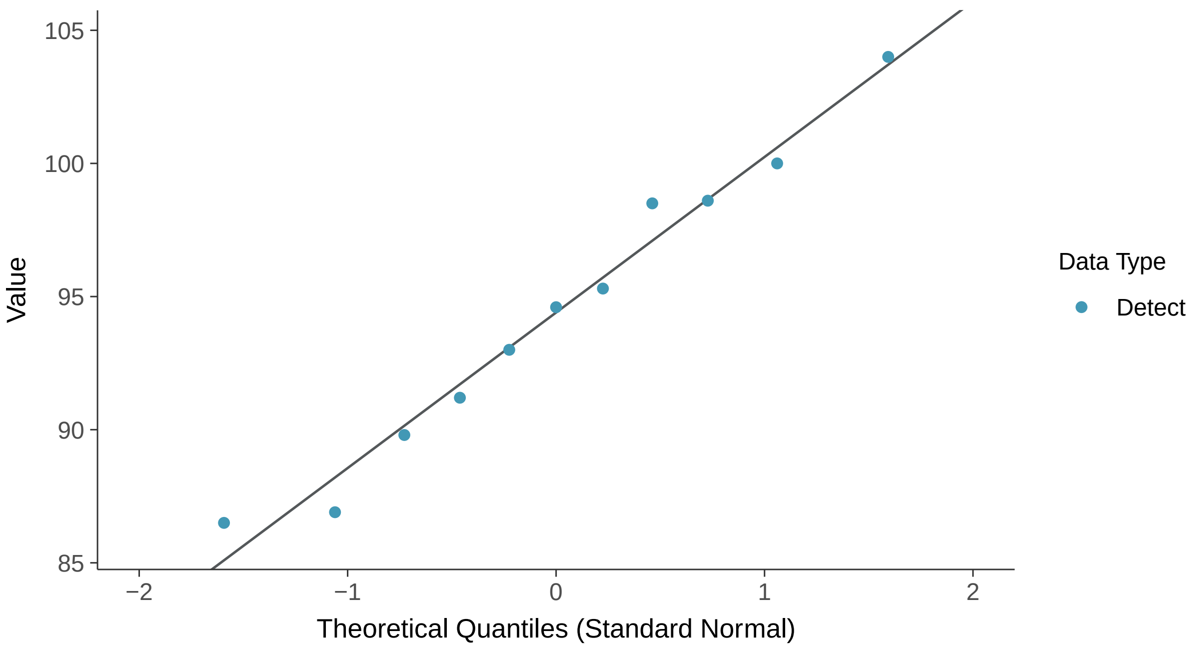
Boxplot by Season

Calcium, MW-8 (mg/L)



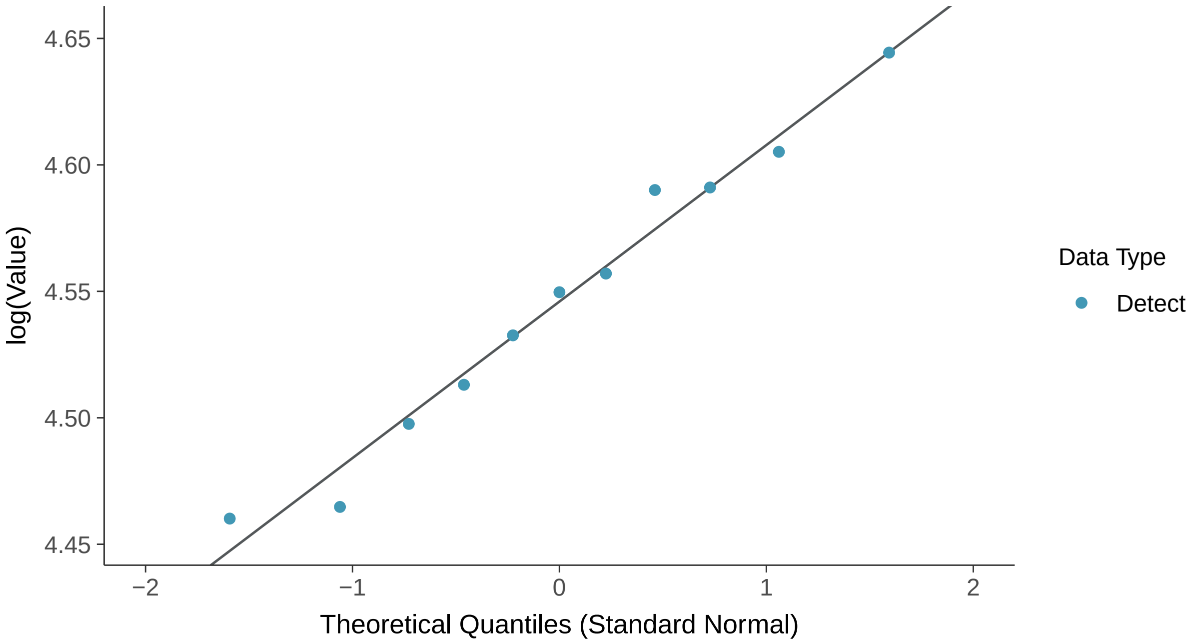
Normal Q-Q plot

Calcium, MW-8 (mg/L)



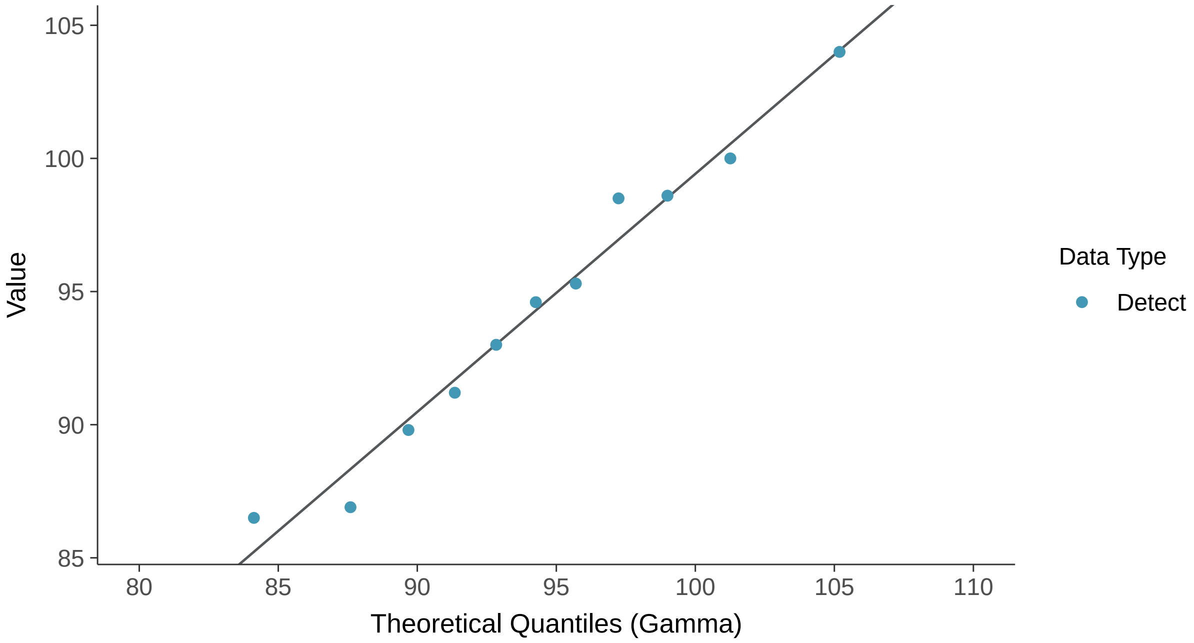
Lognormal Q-Q plot

Calcium, MW-8 (mg/L)



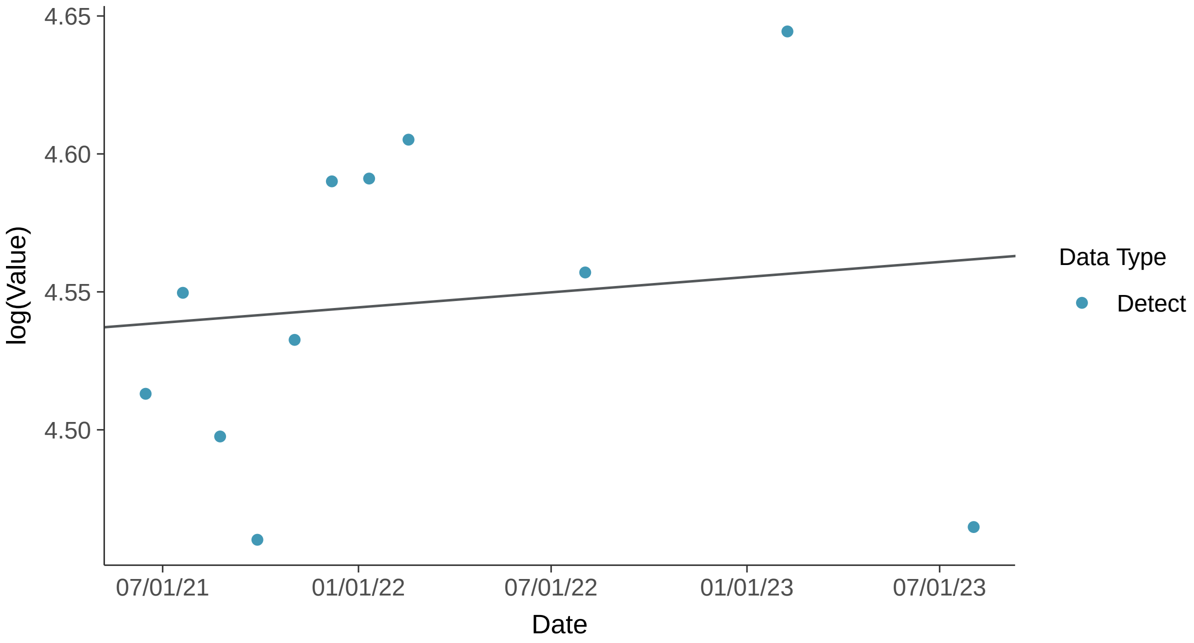
Gamma Q-Q plot

Calcium, MW-8 (mg/L)



Trend Regression: Lognormal MLE

Calcium, MW-8 (mg/L)

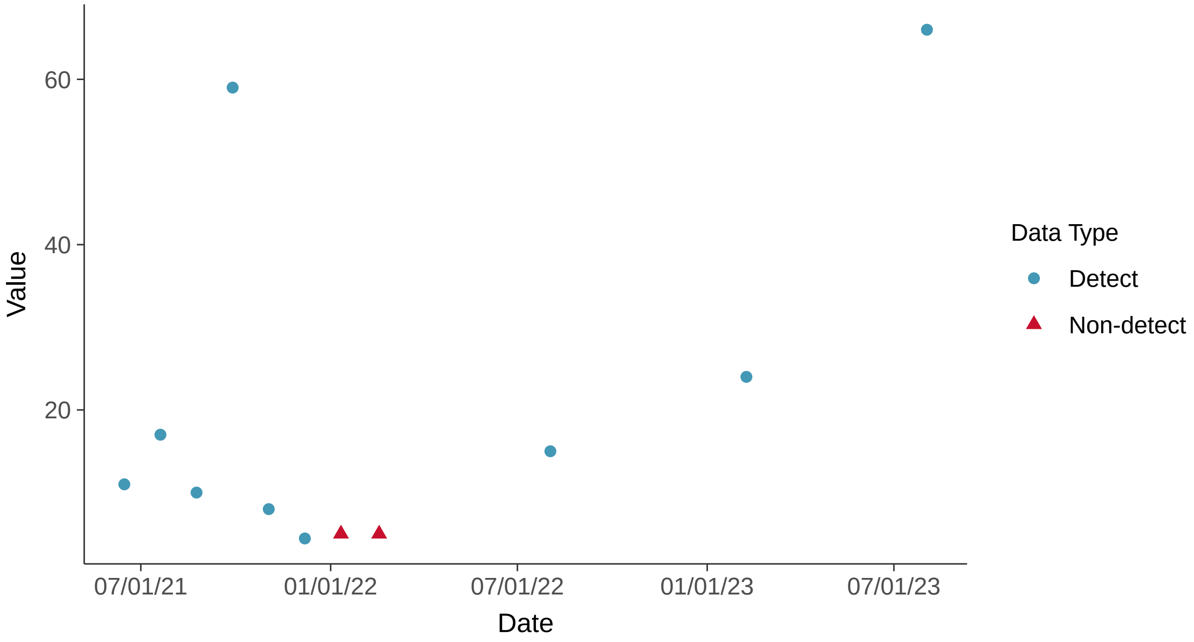


Appendix III: Chloride, MW-8

ID: 08_1_03

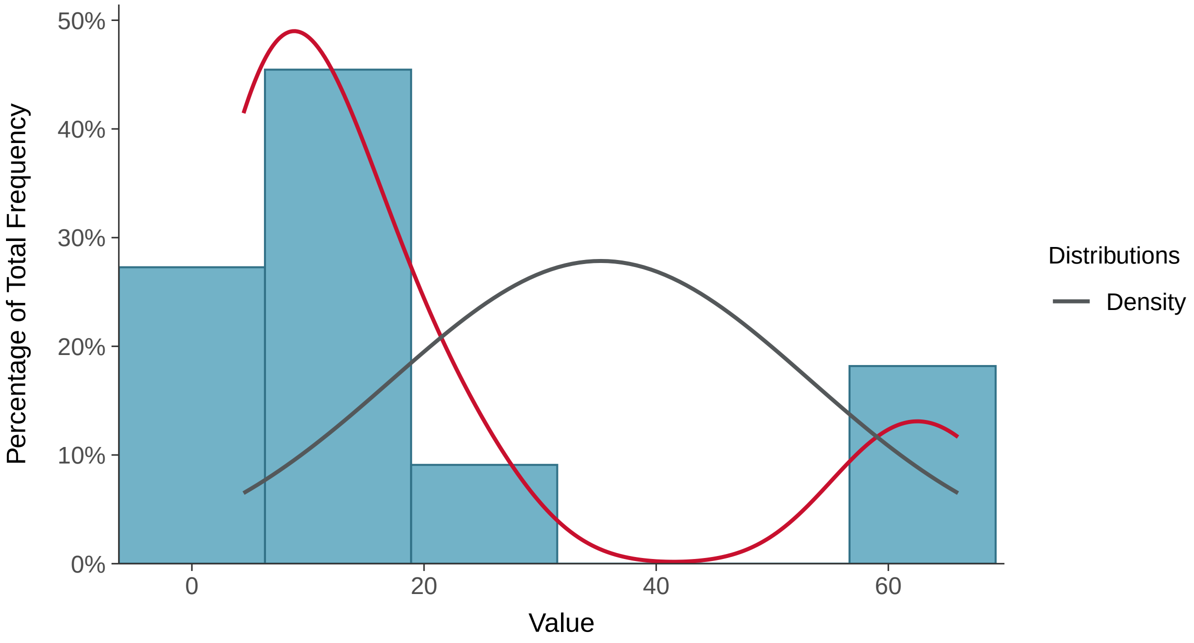
Scatter Plot

Chloride, MW-8 (mg/L)



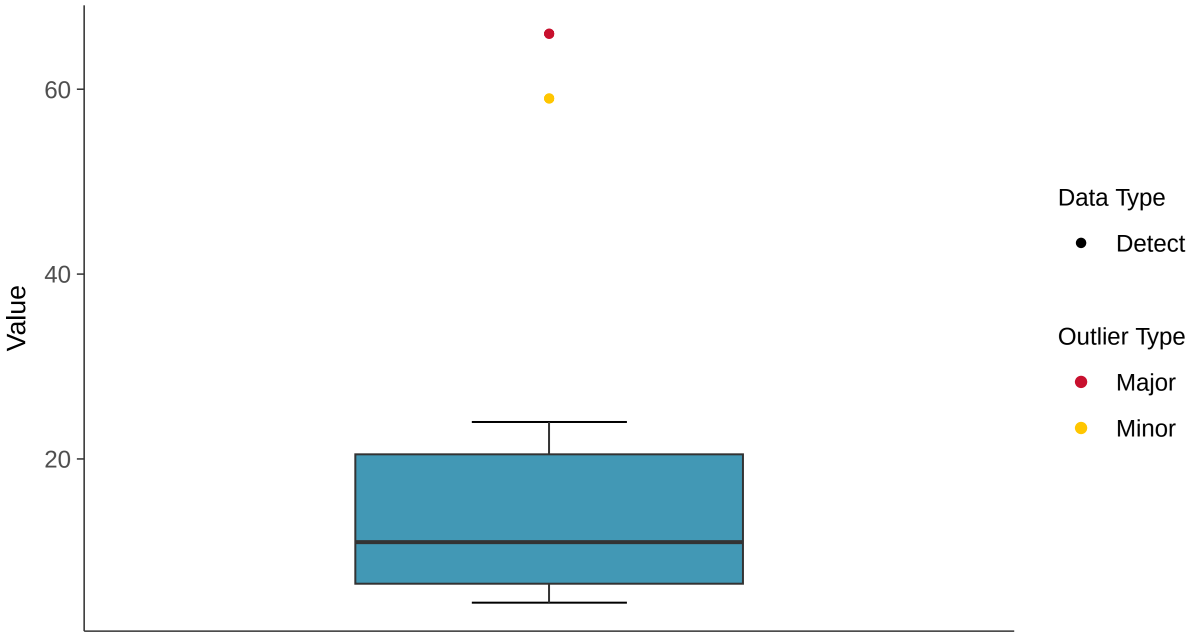
Histogram

Chloride, MW-8 (mg/L)



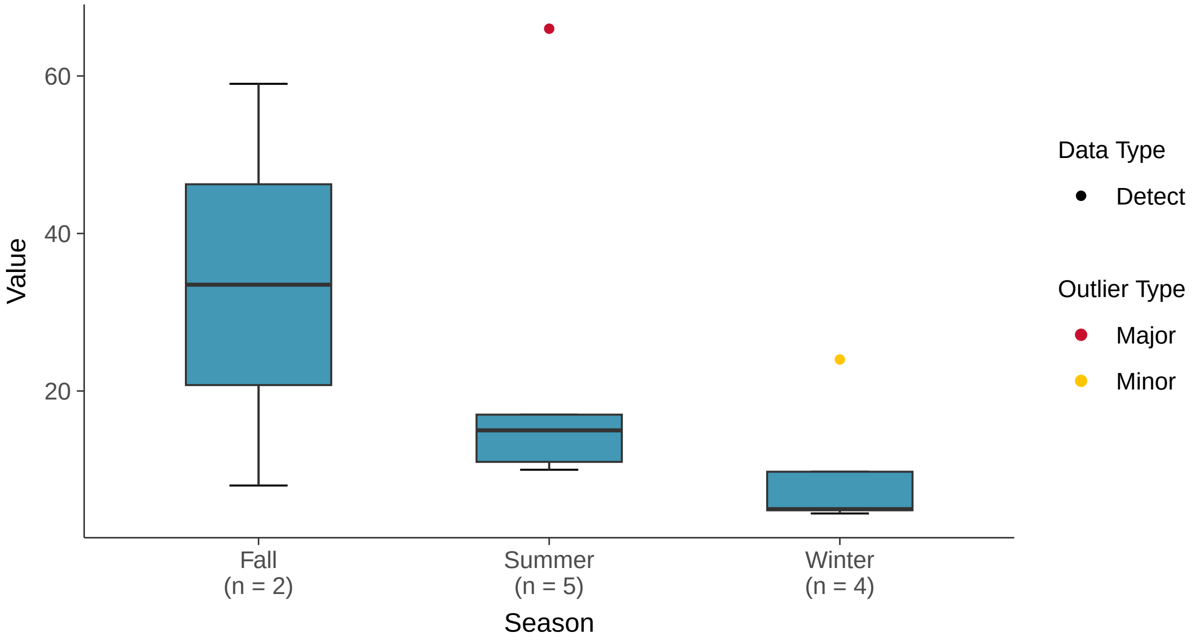
Boxplot

Chloride, MW-8 (mg/L)



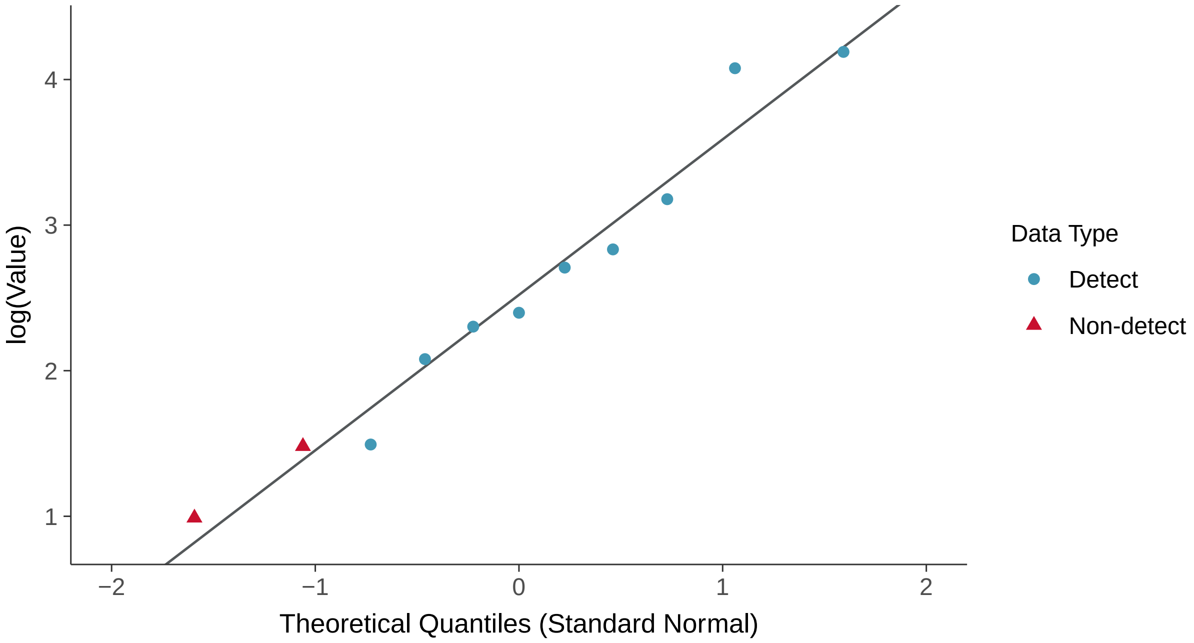
Boxplot by Season

Chloride, MW-8 (mg/L)



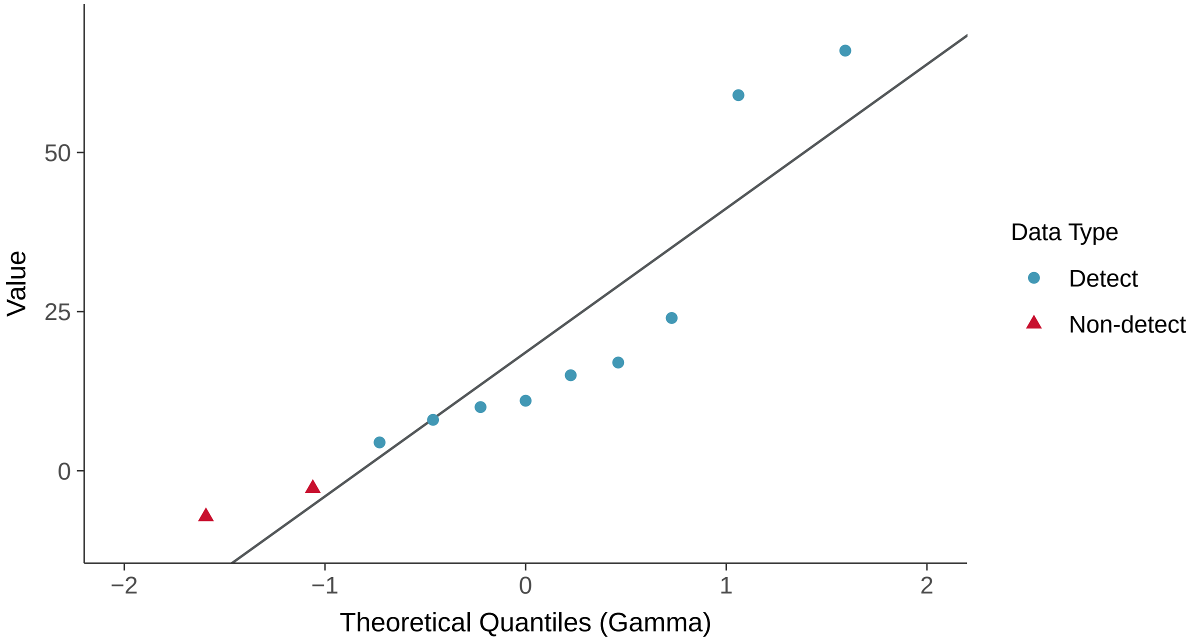
Lognormal Q-Q plot using ROS Imputed Estimates

Chloride, MW-8 (mg/L)



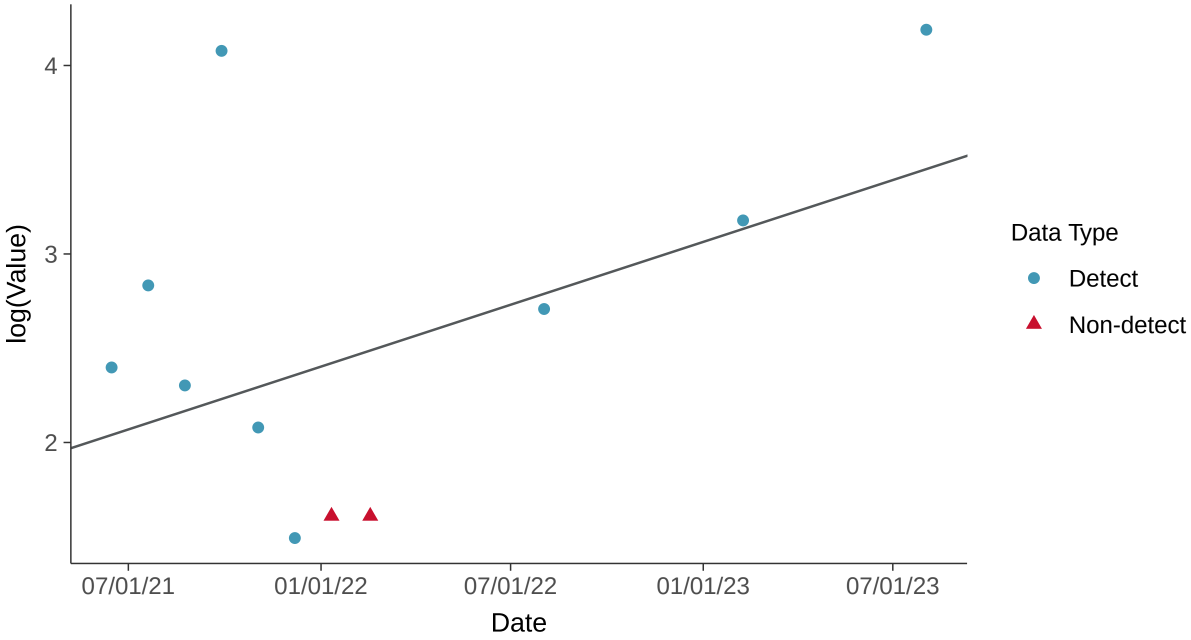
Gamma Q-Q plot using ROS Imputed Estimates

Chloride, MW-8 (mg/L)



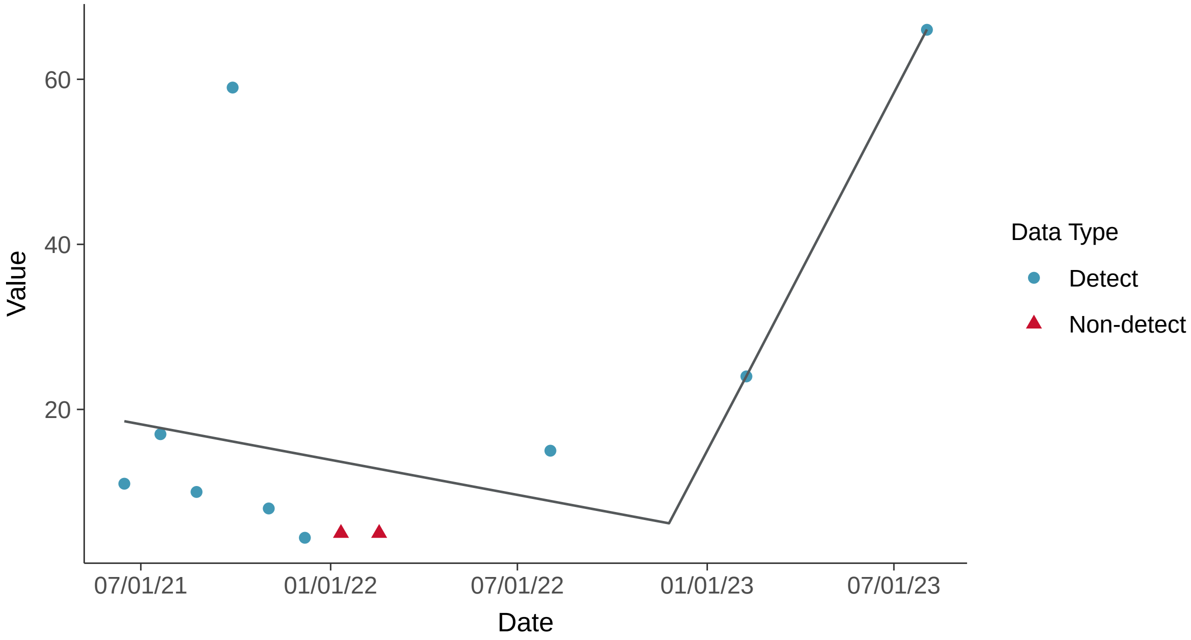
Trend Regression: Lognormal MLE

Chloride, MW-8 (mg/L)



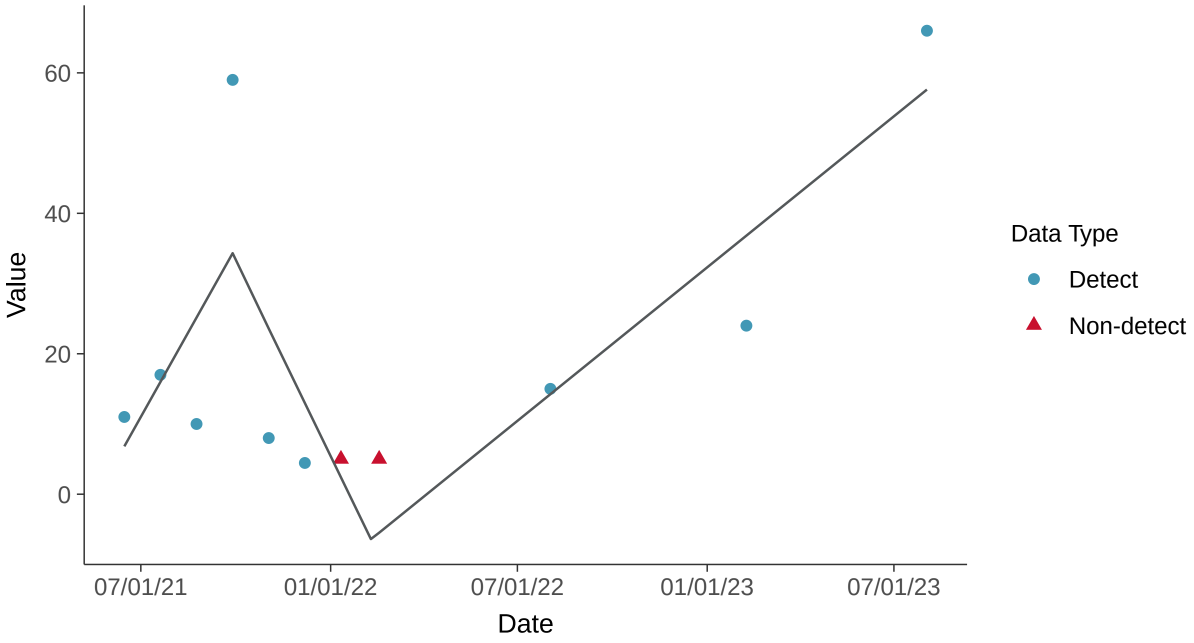
Trend Regression: Piecewise Linear-Linear

Chloride, MW-8 (mg/L)



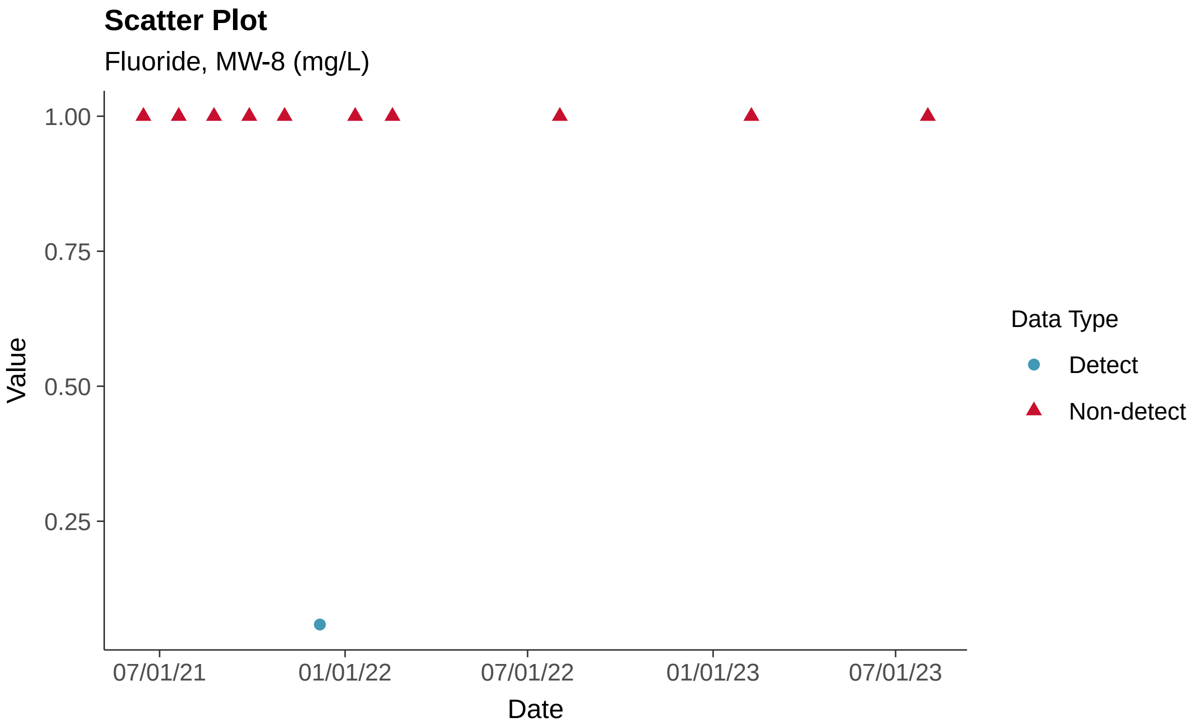
Trend Regression: Piecewise Linear-Linear-Linear

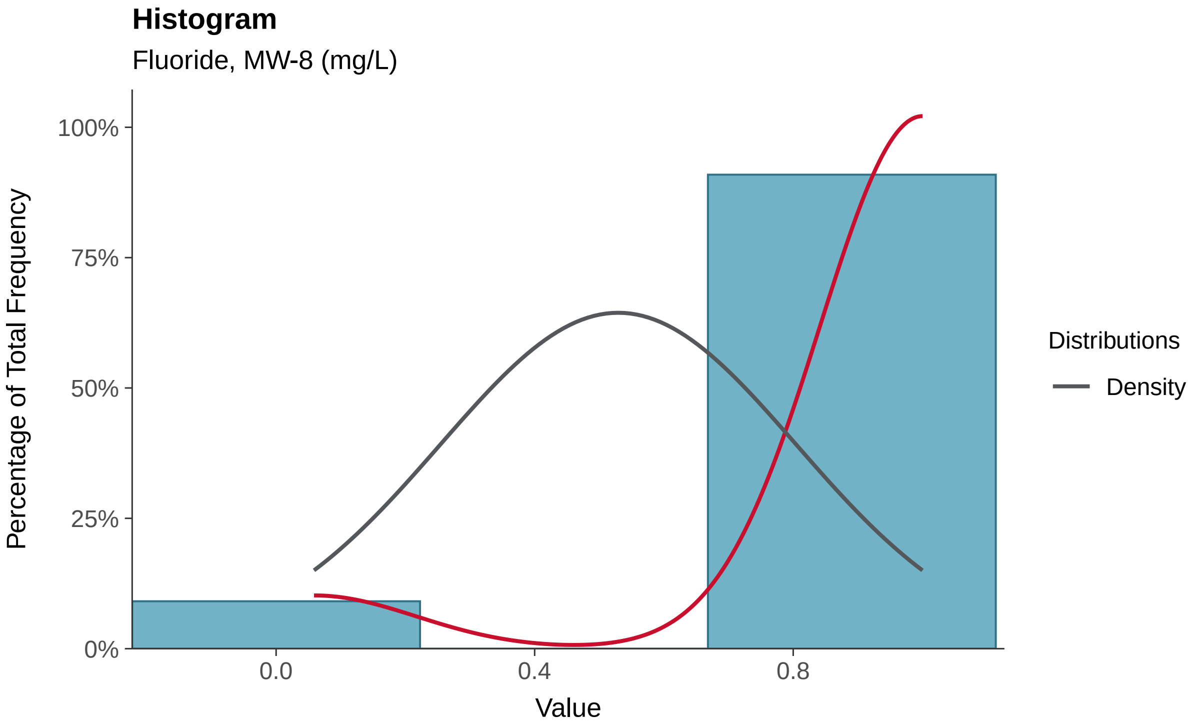
Chloride, MW-8 (mg/L)



Appendix III: Fluoride, MW-8

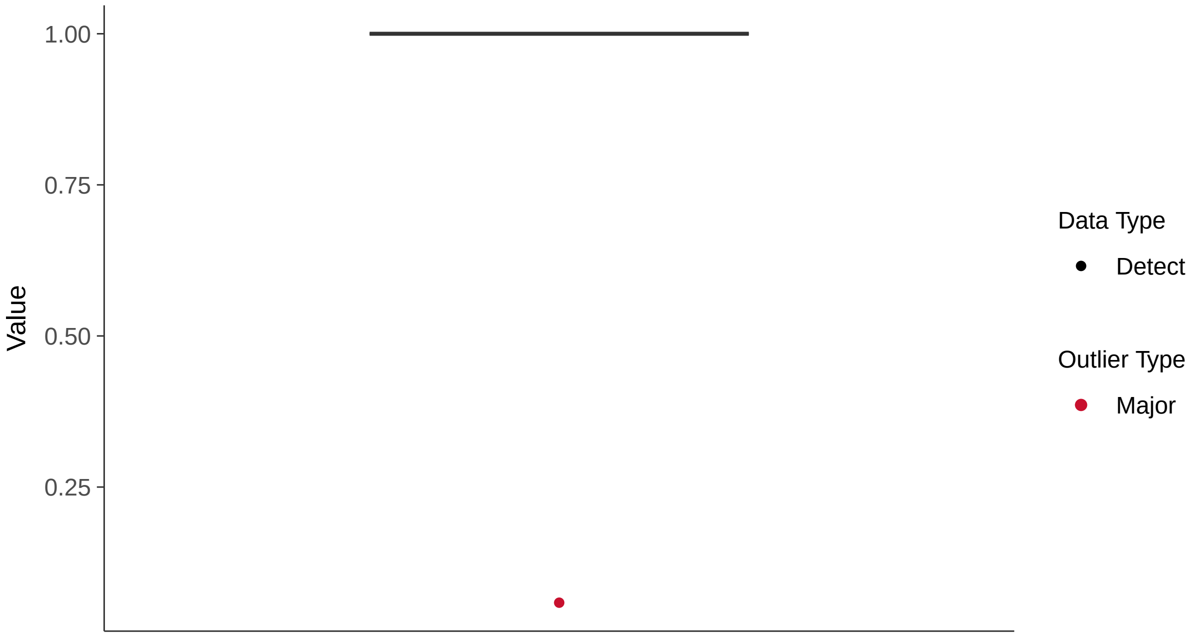
ID: 08_1_04





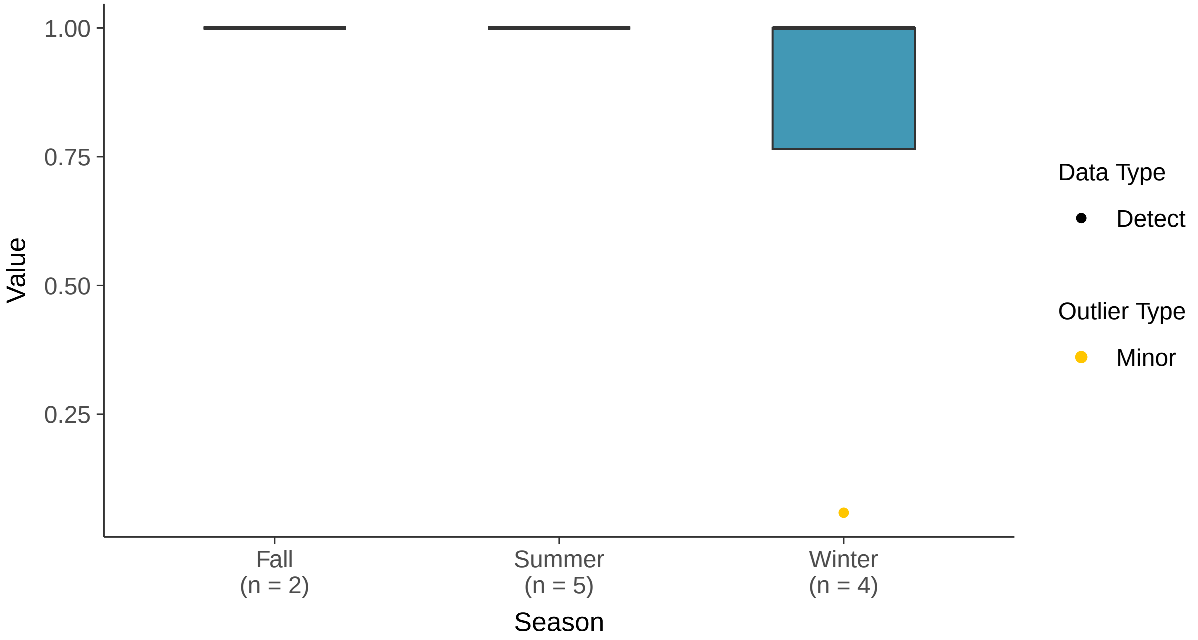
Boxplot

Fluoride, MW-8 (mg/L)



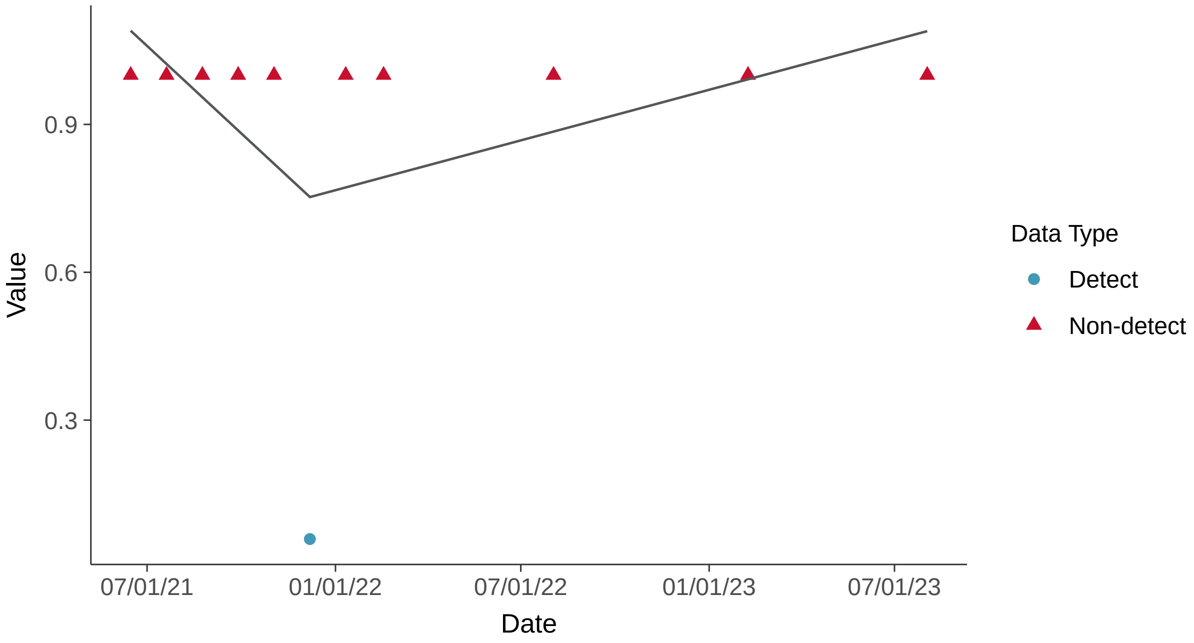
Boxplot by Season

Fluoride, MW-8 (mg/L)



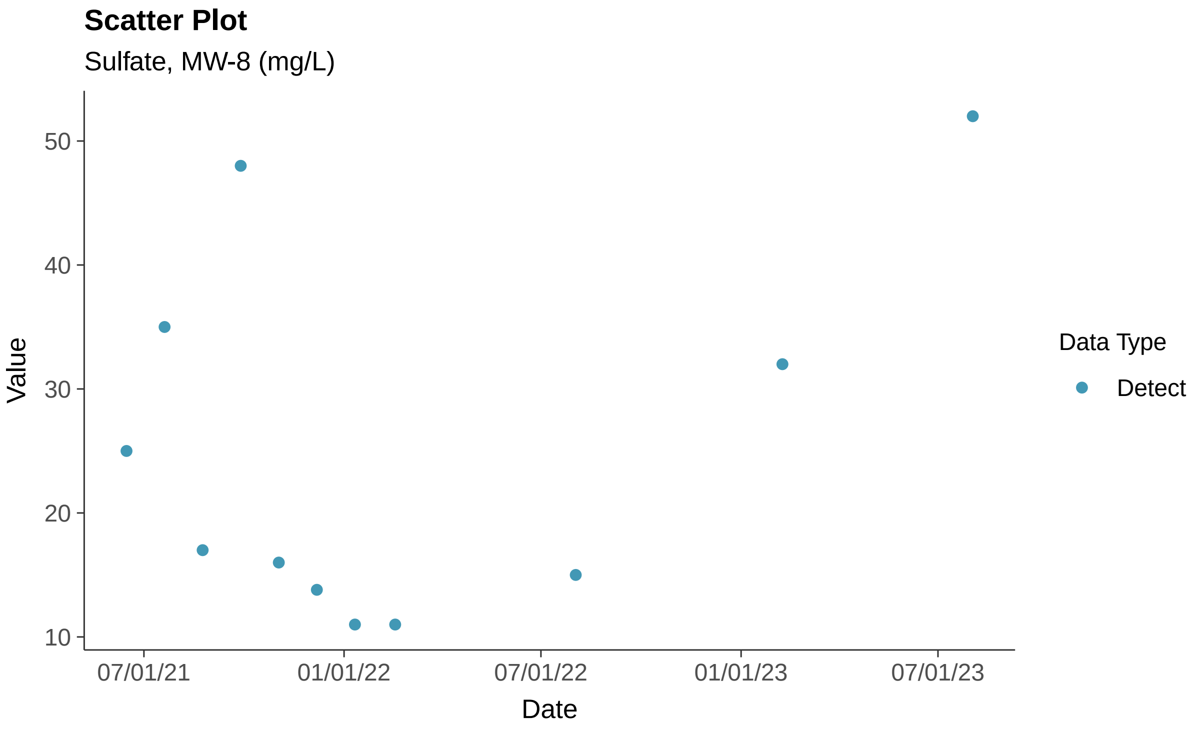
Trend Regression: Piecewise Linear-Linear

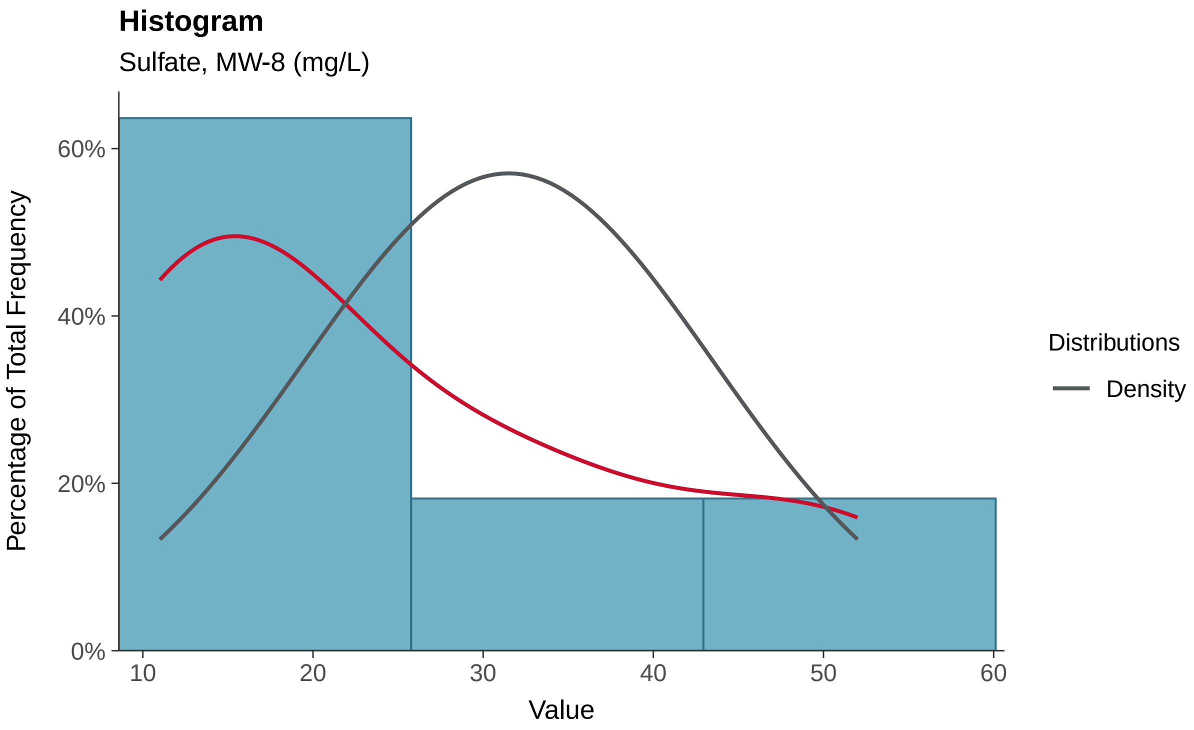
Fluoride, MW-8 (mg/L)



Appendix III: Sulfate, MW-8

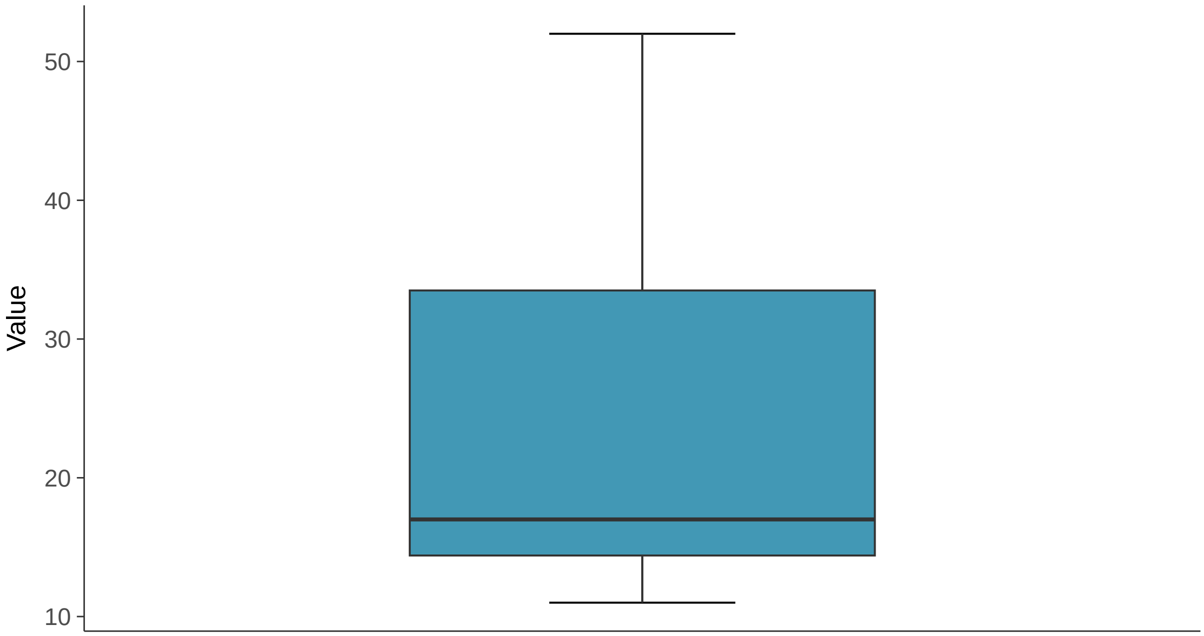
ID: 08_1_05





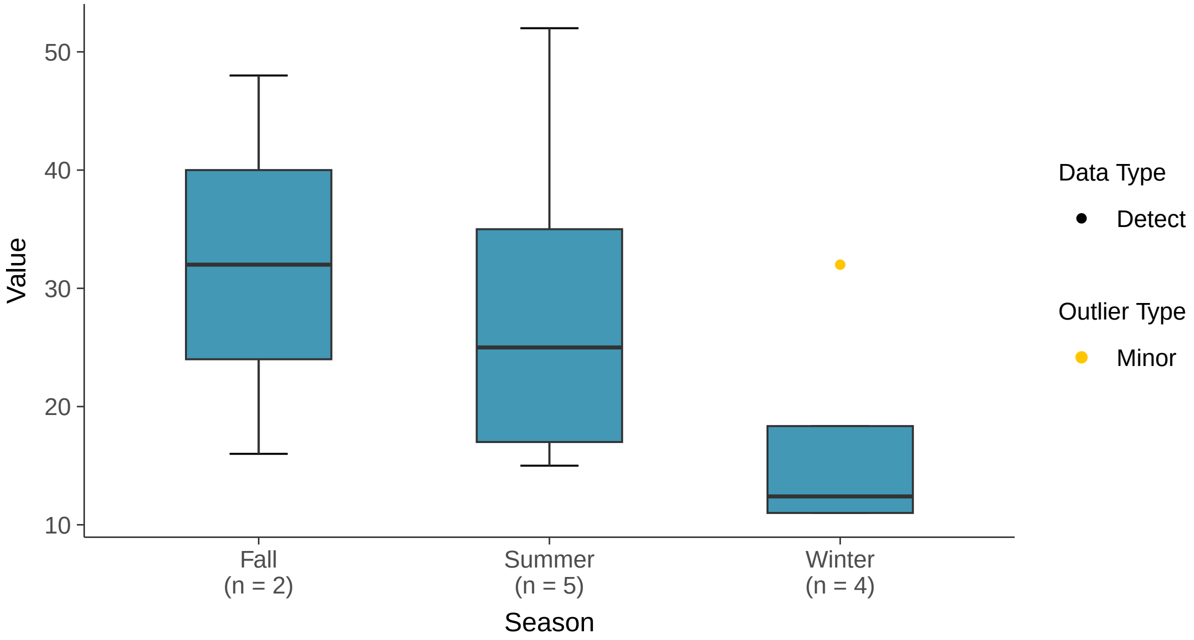
Boxplot

Sulfate, MW-8 (mg/L)



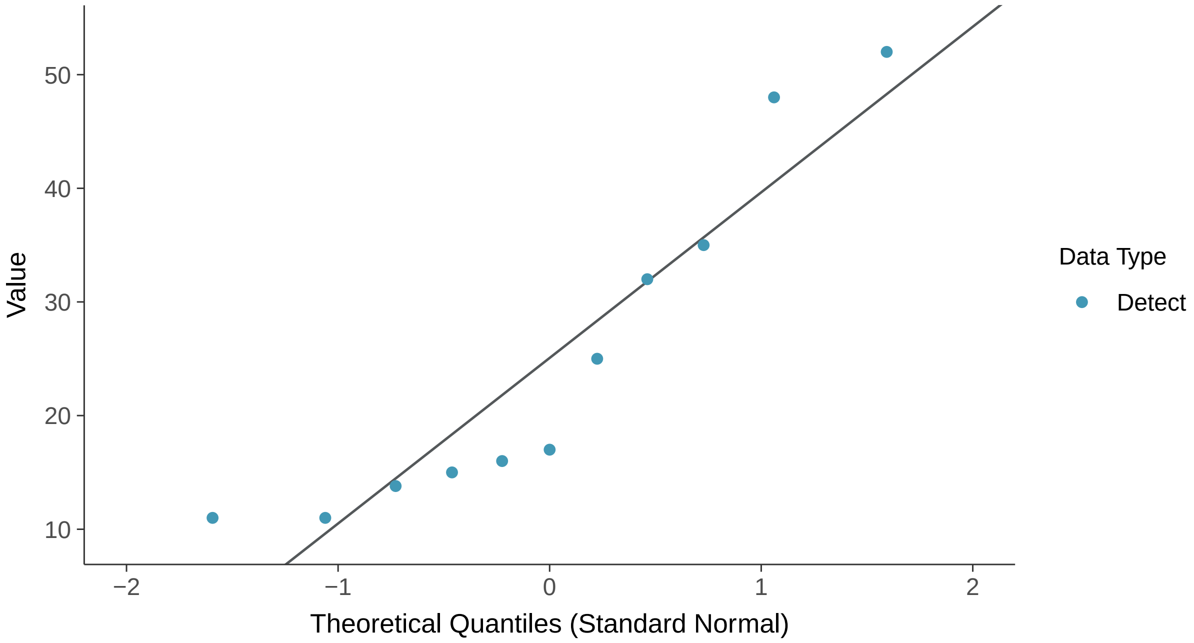
Boxplot by Season

Sulfate, MW-8 (mg/L)



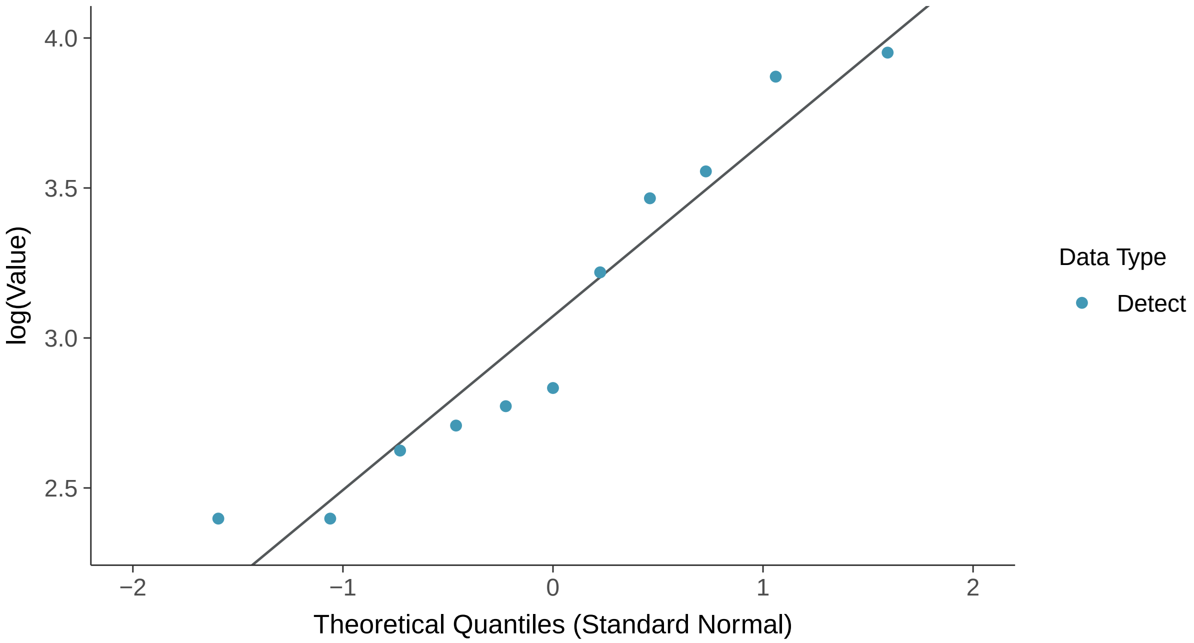
Normal Q-Q plot

Sulfate, MW-8 (mg/L)



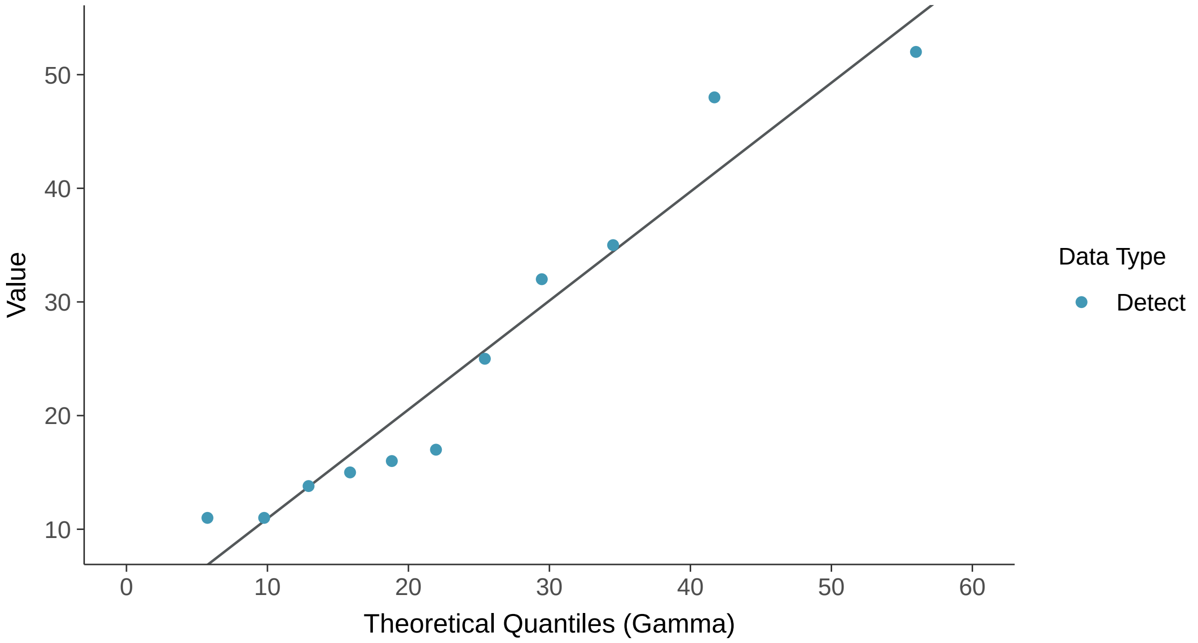
Lognormal Q-Q plot

Sulfate, MW-8 (mg/L)



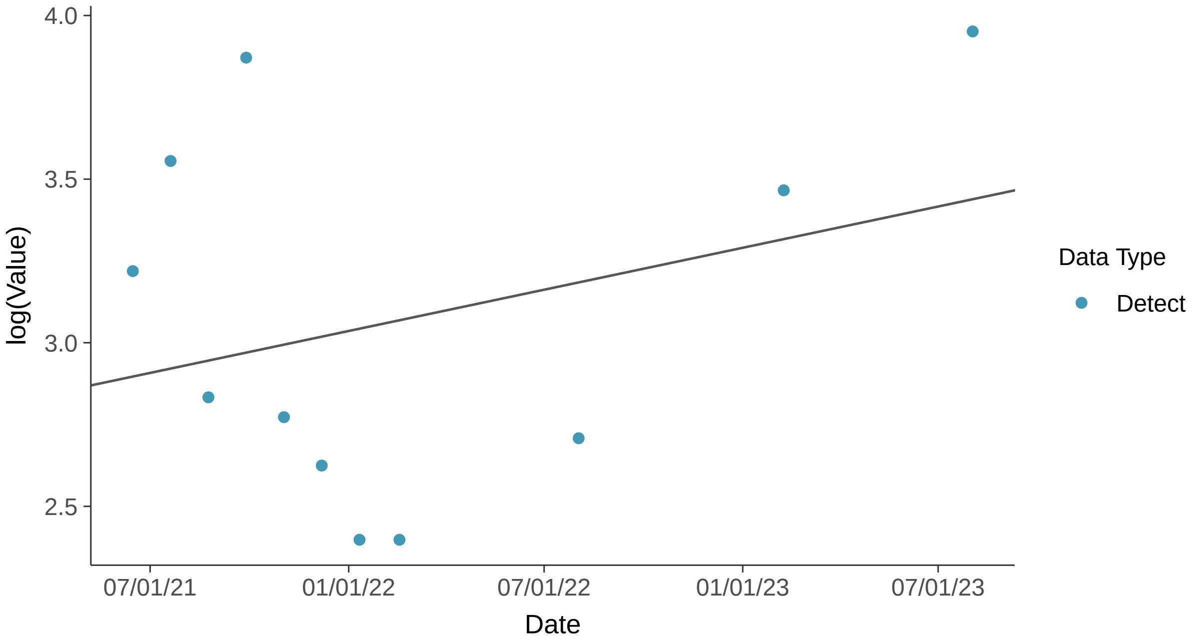
Gamma Q-Q plot

Sulfate, MW-8 (mg/L)



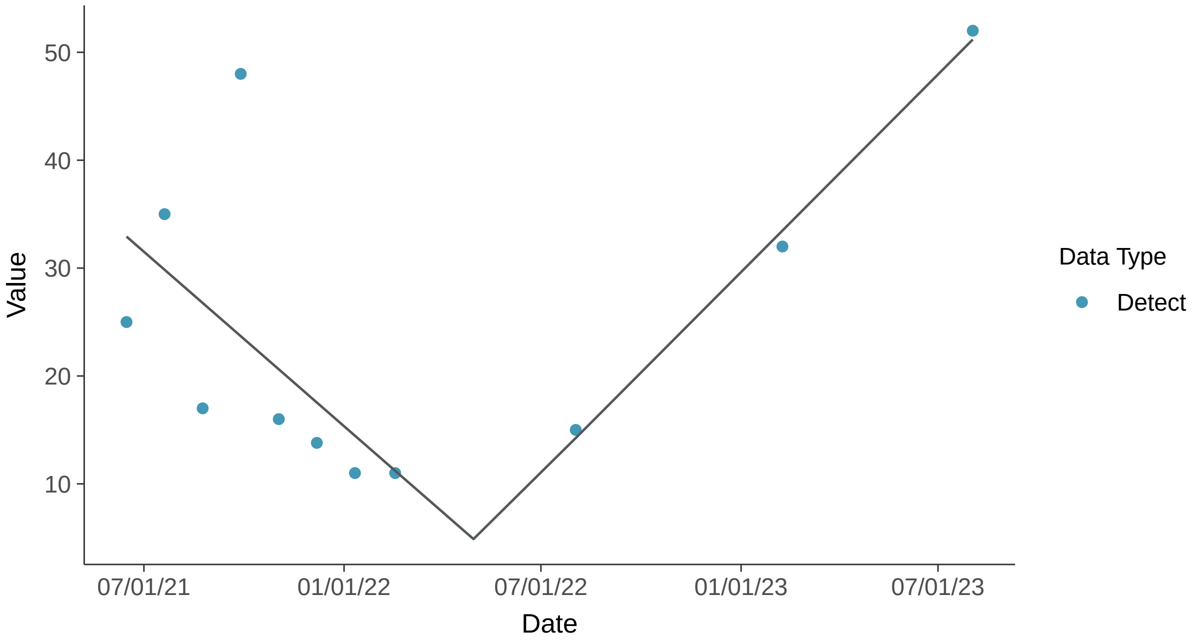
Trend Regression: Lognormal MLE

Sulfate, MW-8 (mg/L)



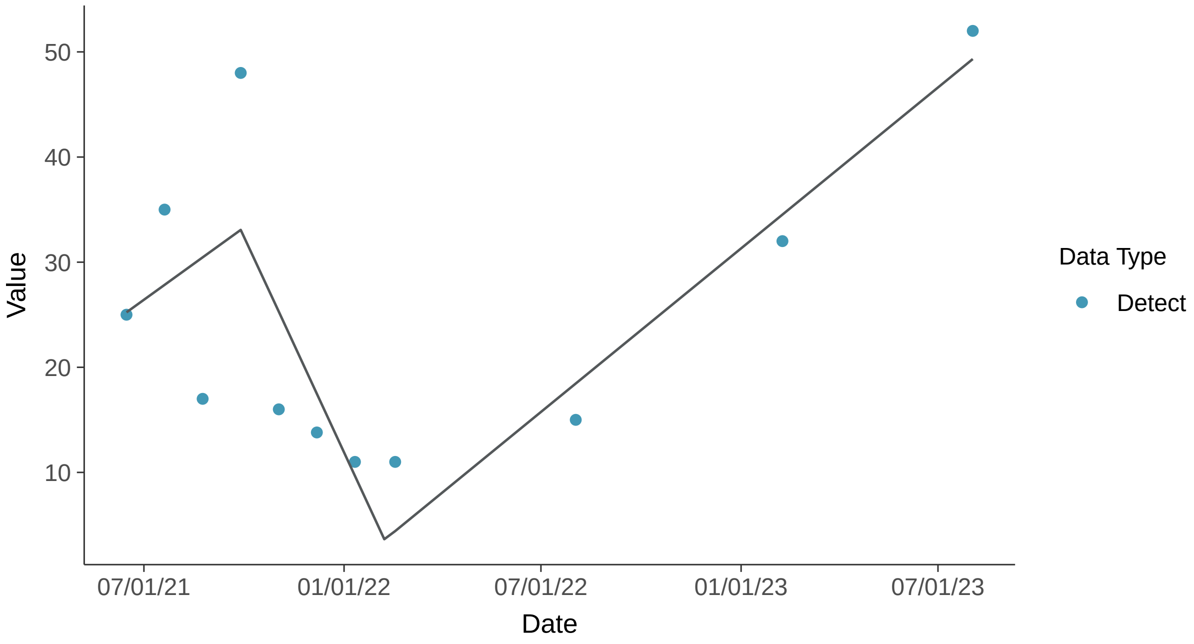
Trend Regression: Piecewise Linear-Linear

Sulfate, MW-8 (mg/L)



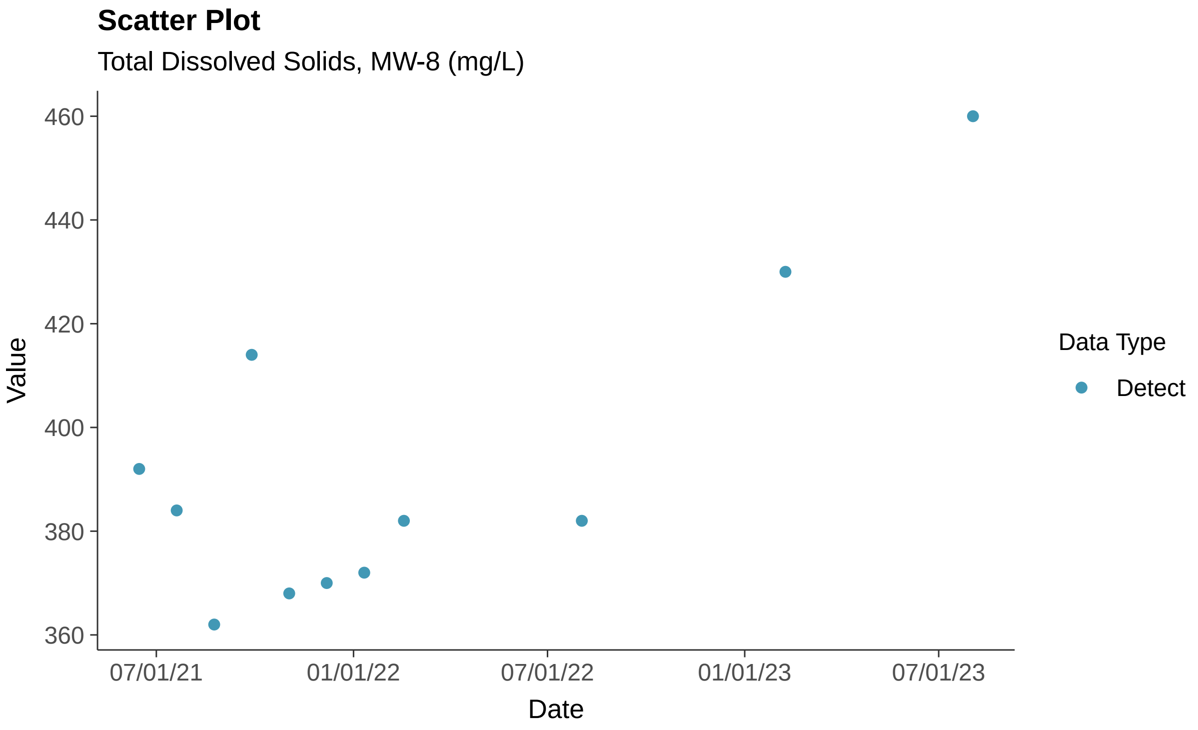
Trend Regression: Piecewise Linear-Linear-Linear

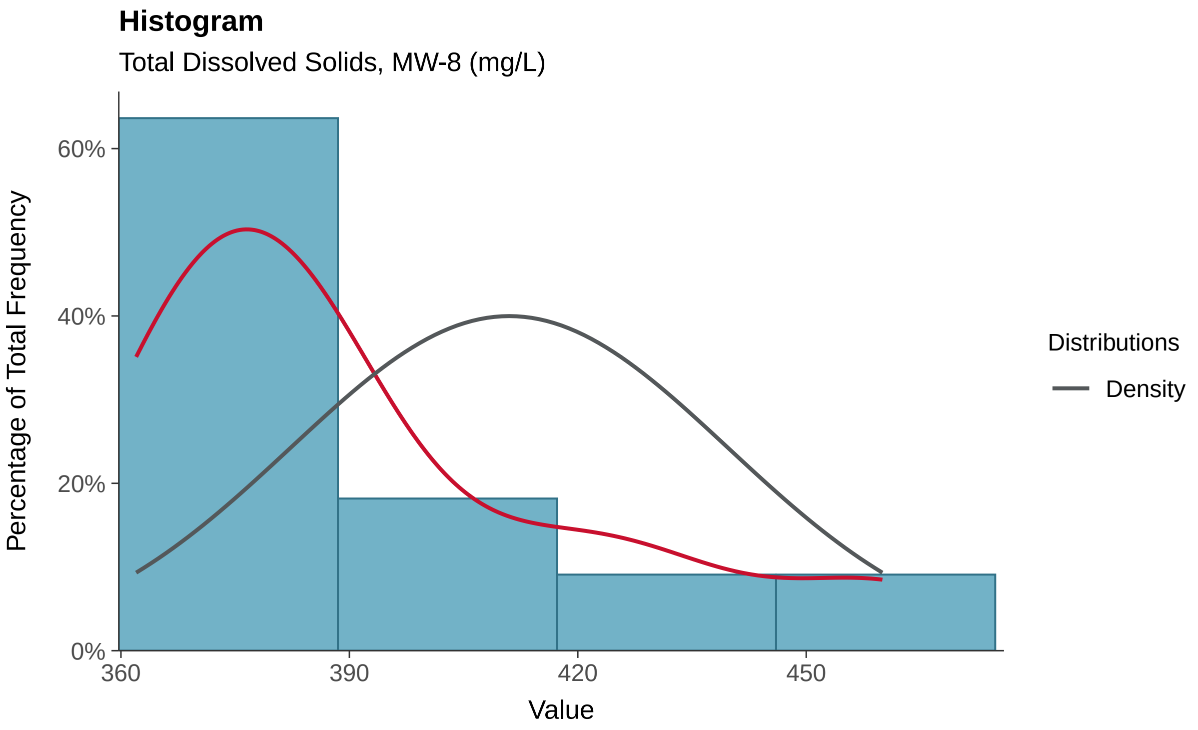
Sulfate, MW-8 (mg/L)



Appendix III: Total Dissolved Solids, MW-8

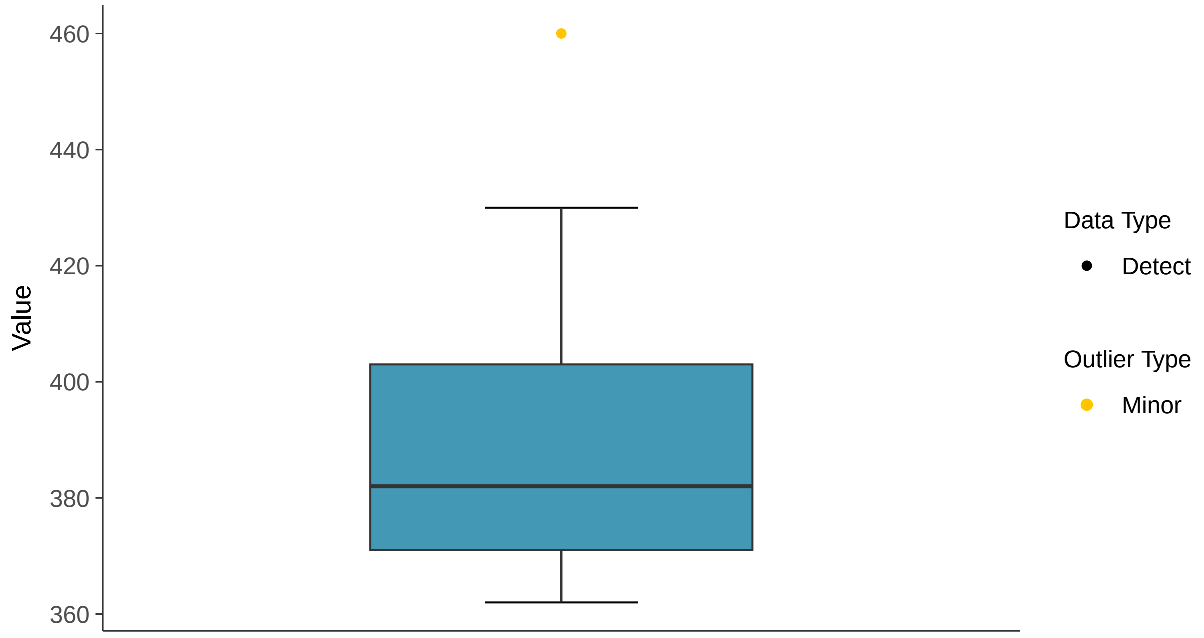
ID: 08_1_06





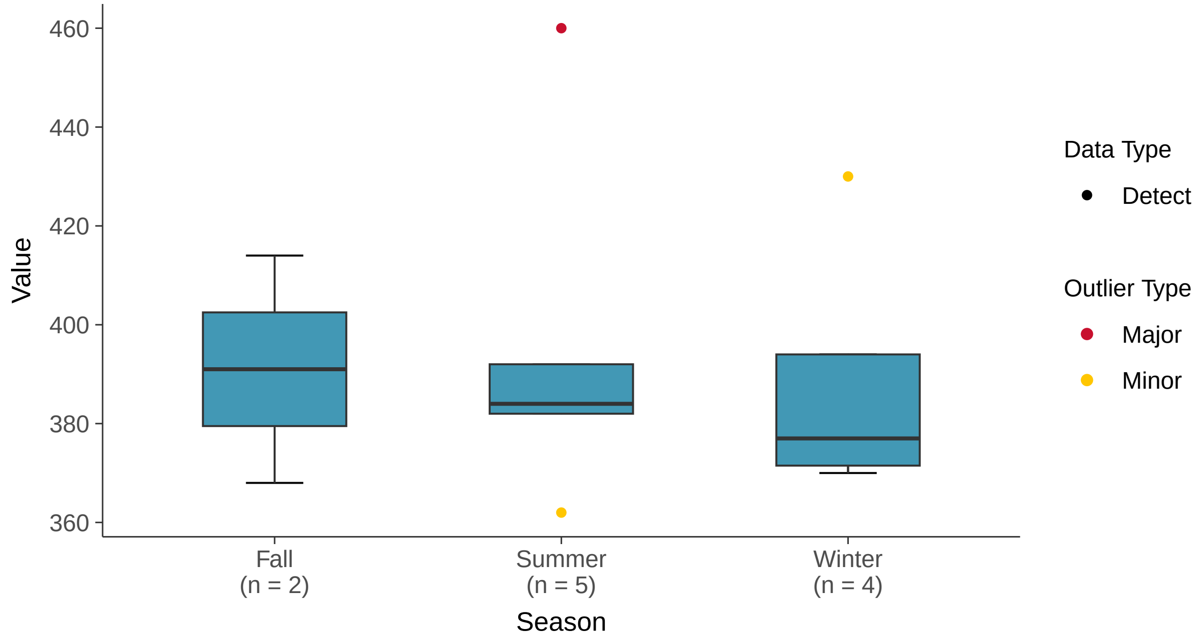
Boxplot

Total Dissolved Solids, MW-8 (mg/L)



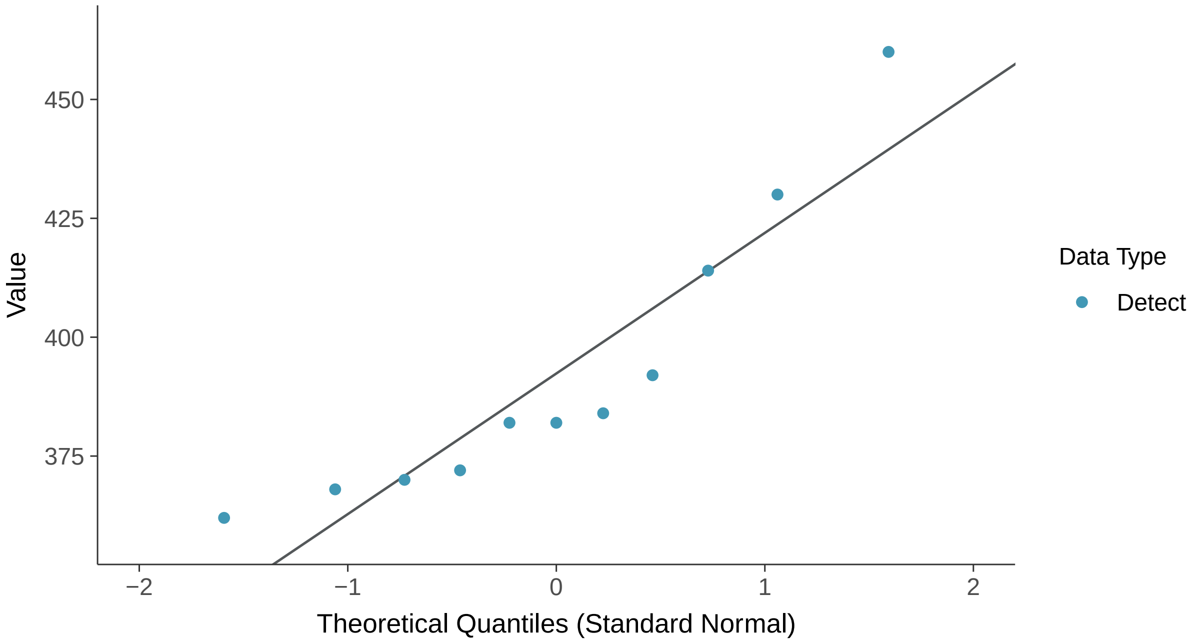
Boxplot by Season

Total Dissolved Solids, MW-8 (mg/L)



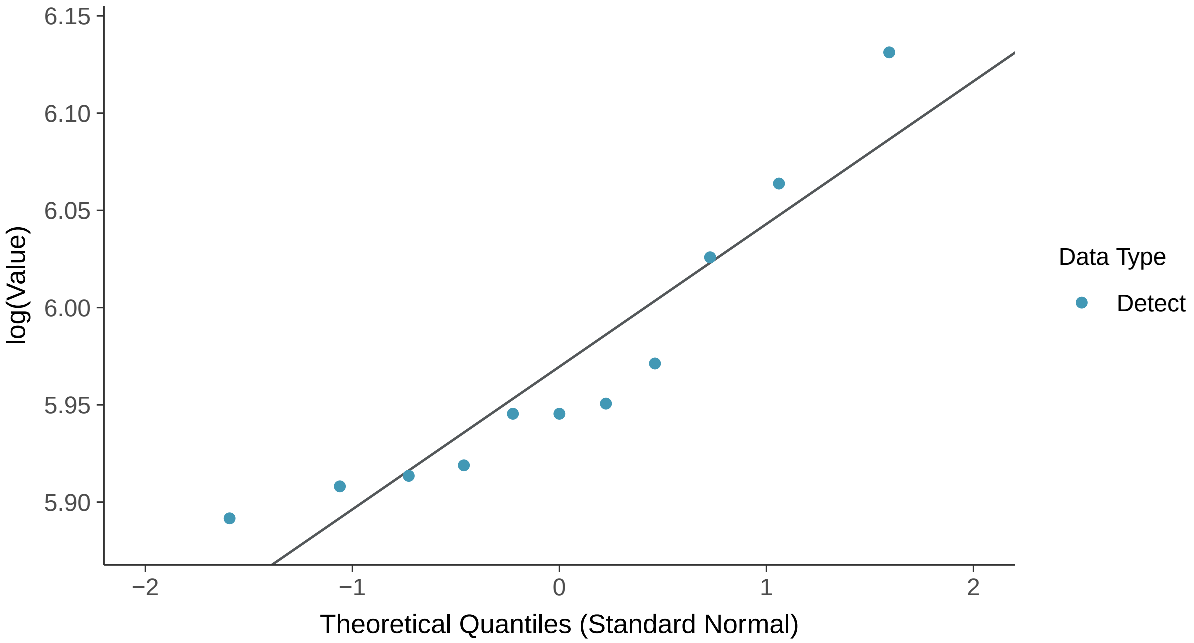
Normal Q-Q plot

Total Dissolved Solids, MW-8 (mg/L)



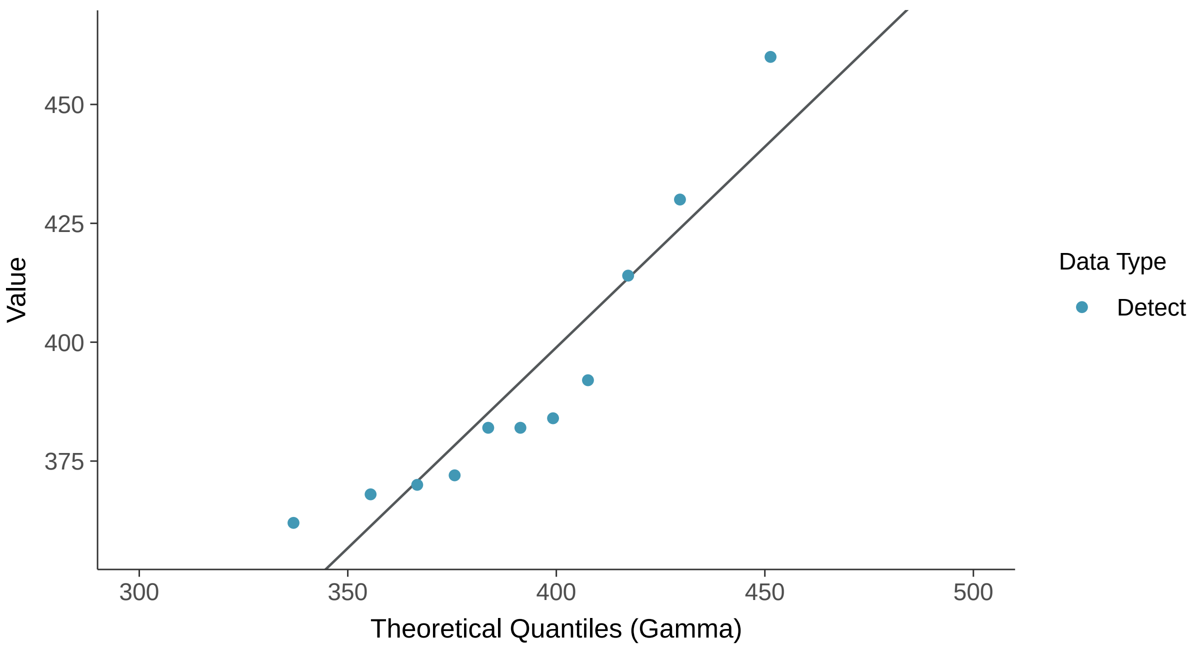
Lognormal Q-Q plot

Total Dissolved Solids, MW-8 (mg/L)



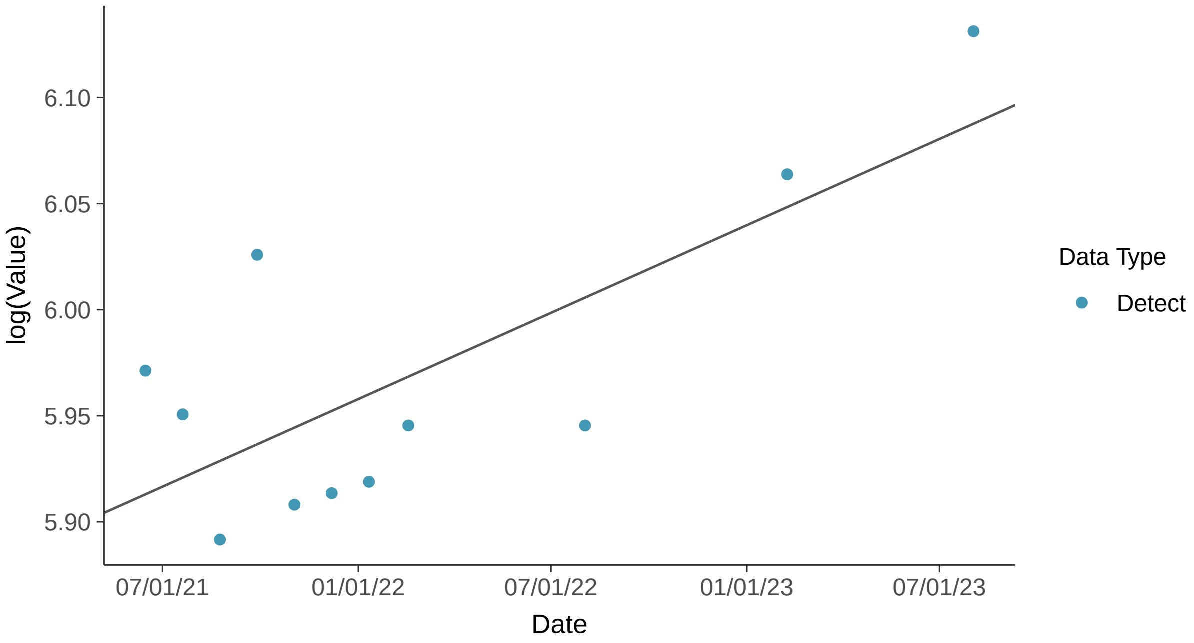
Gamma Q-Q plot

Total Dissolved Solids, MW-8 (mg/L)



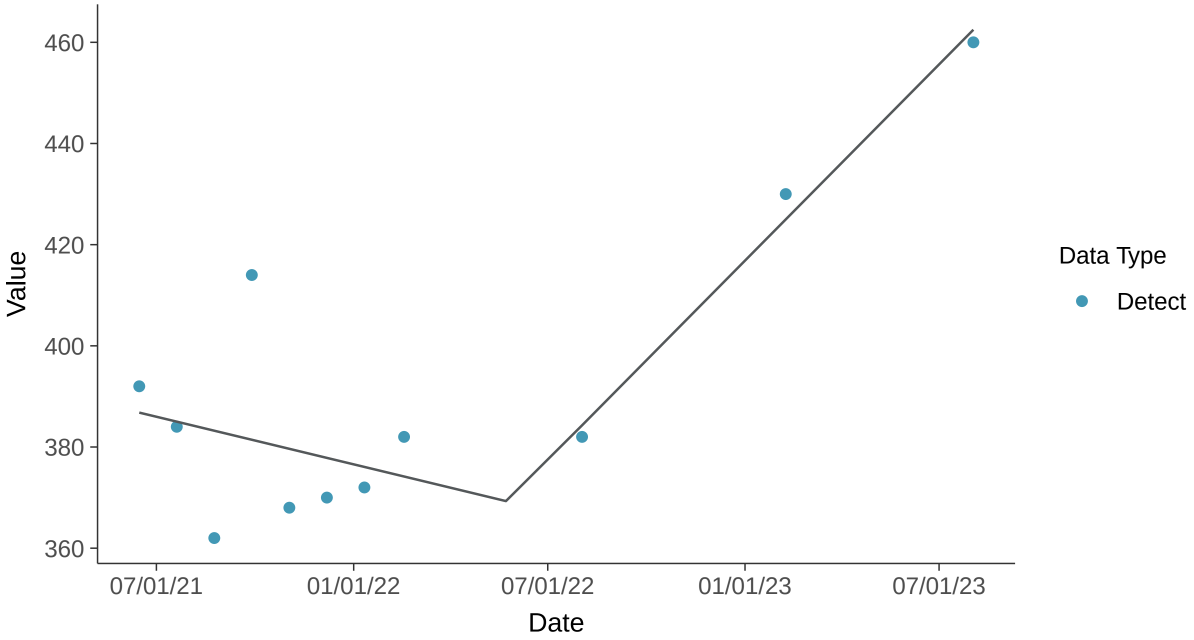
Trend Regression: Lognormal MLE

Total Dissolved Solids, MW-8 (mg/L)



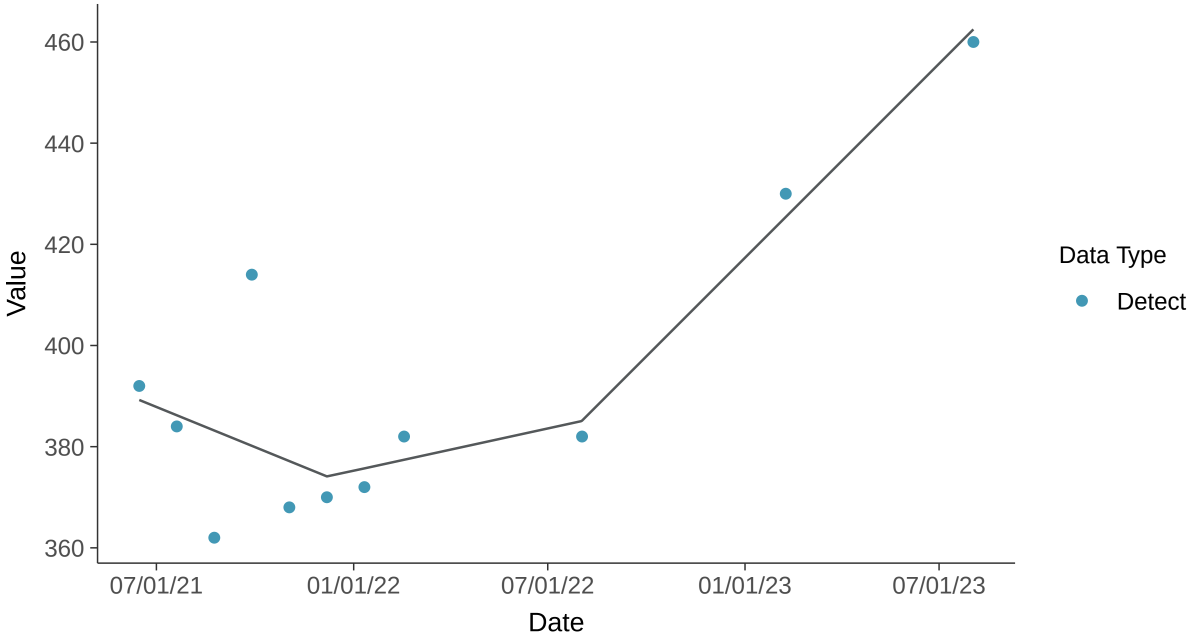
Trend Regression: Piecewise Linear-Linear

Total Dissolved Solids, MW-8 (mg/L)



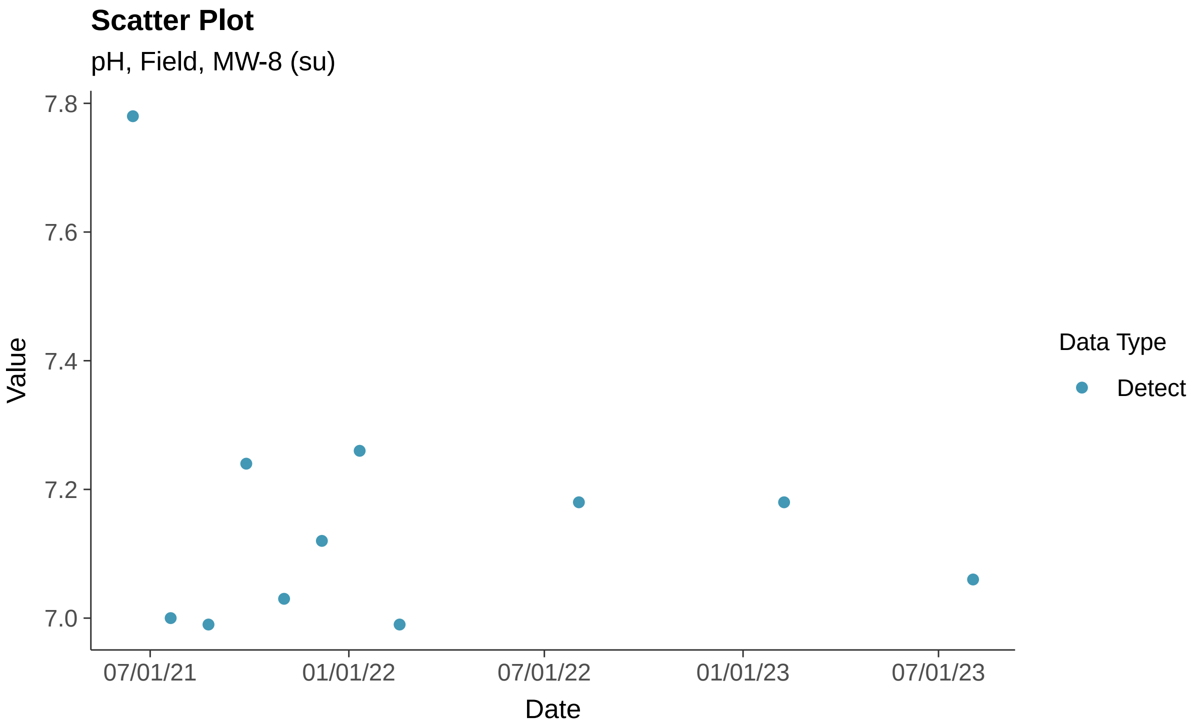
Trend Regression: Piecewise Linear-Linear-Linear

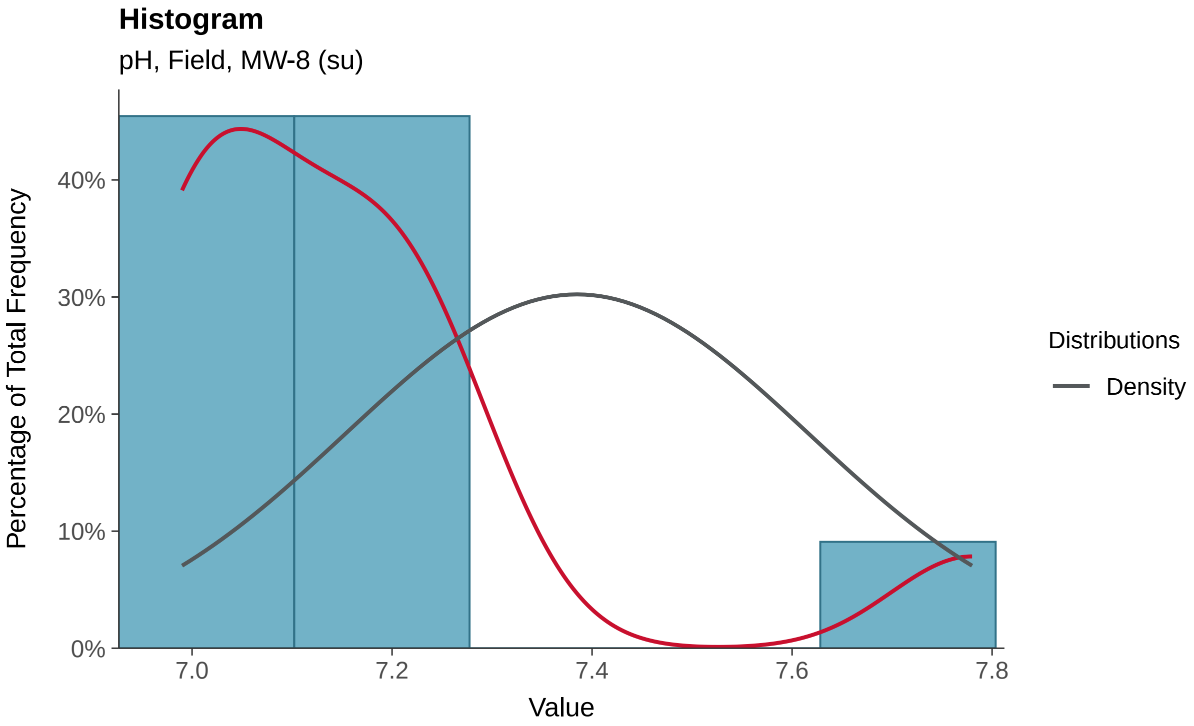
Total Dissolved Solids, MW-8 (mg/L)



Appendix III: pH, Field, MW-8

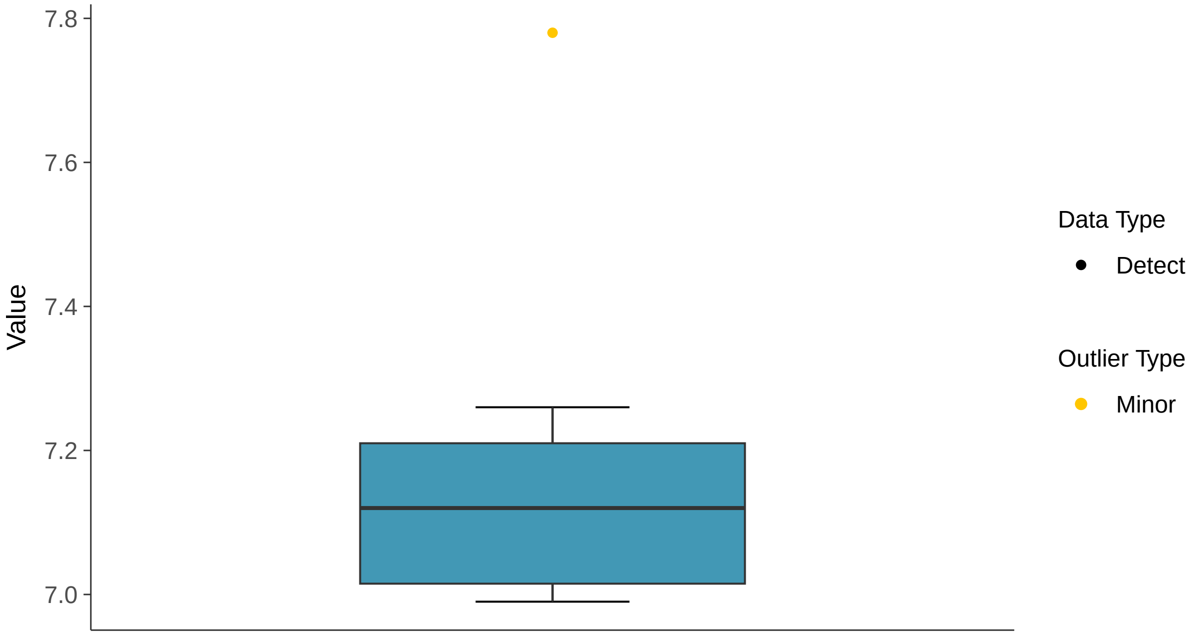
ID: 08_1_07





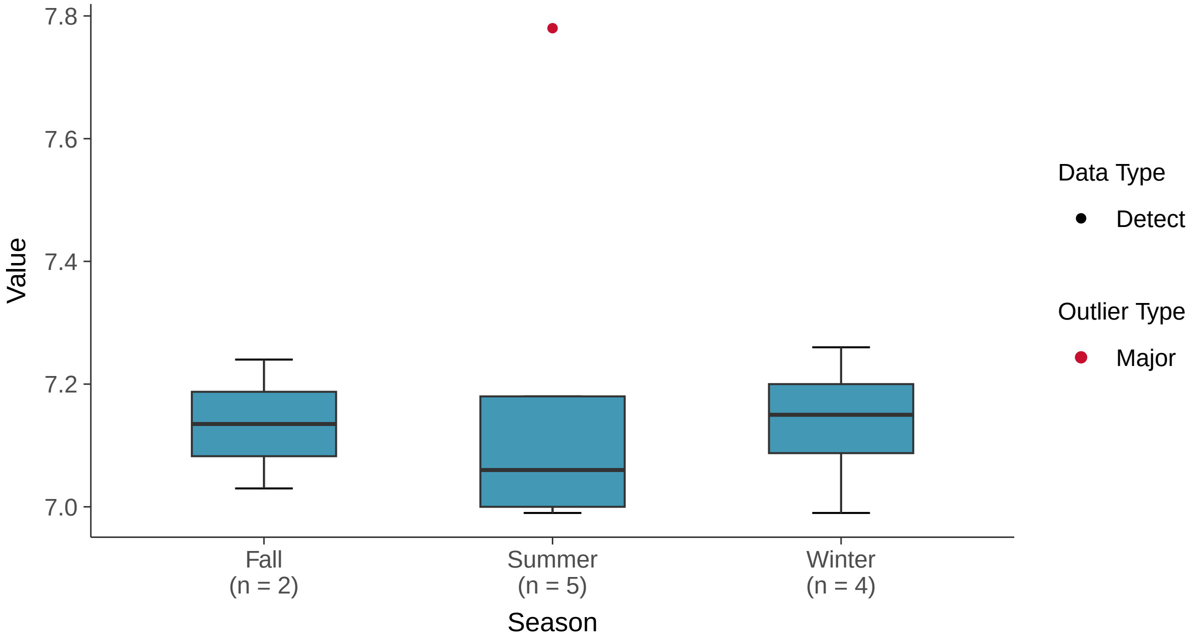
Boxplot

pH, Field, MW-8 (su)



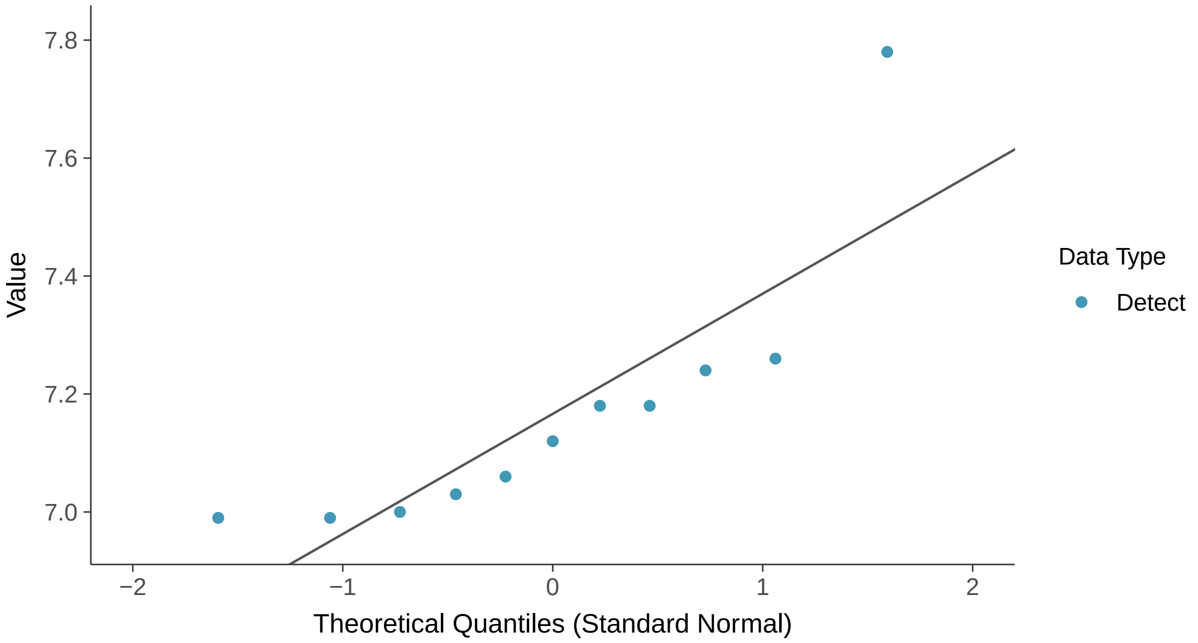
Boxplot by Season

pH, Field, MW-8 (su)



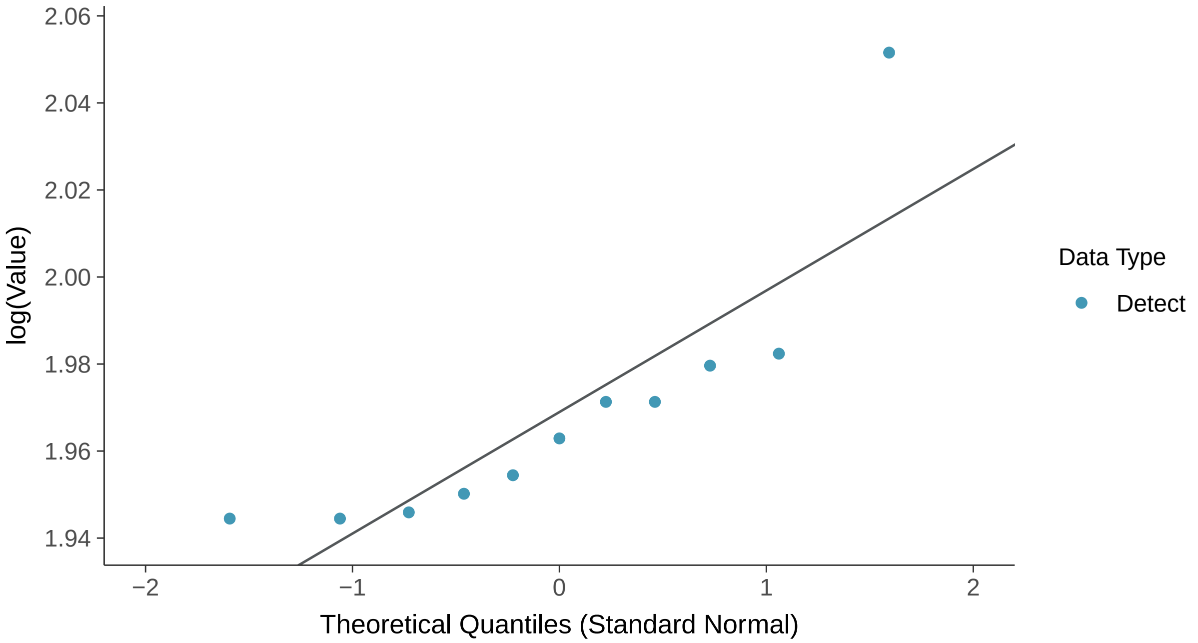
Normal Q-Q plot

pH, Field, MW-8 (su)



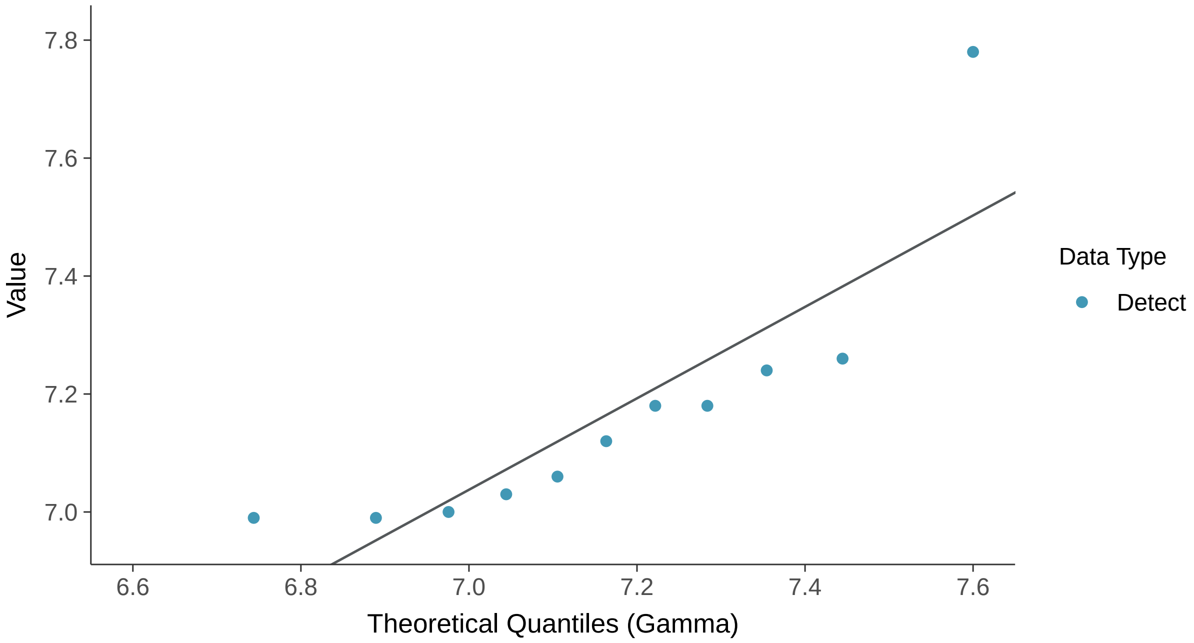
Lognormal Q-Q plot

pH, Field, MW-8 (su)



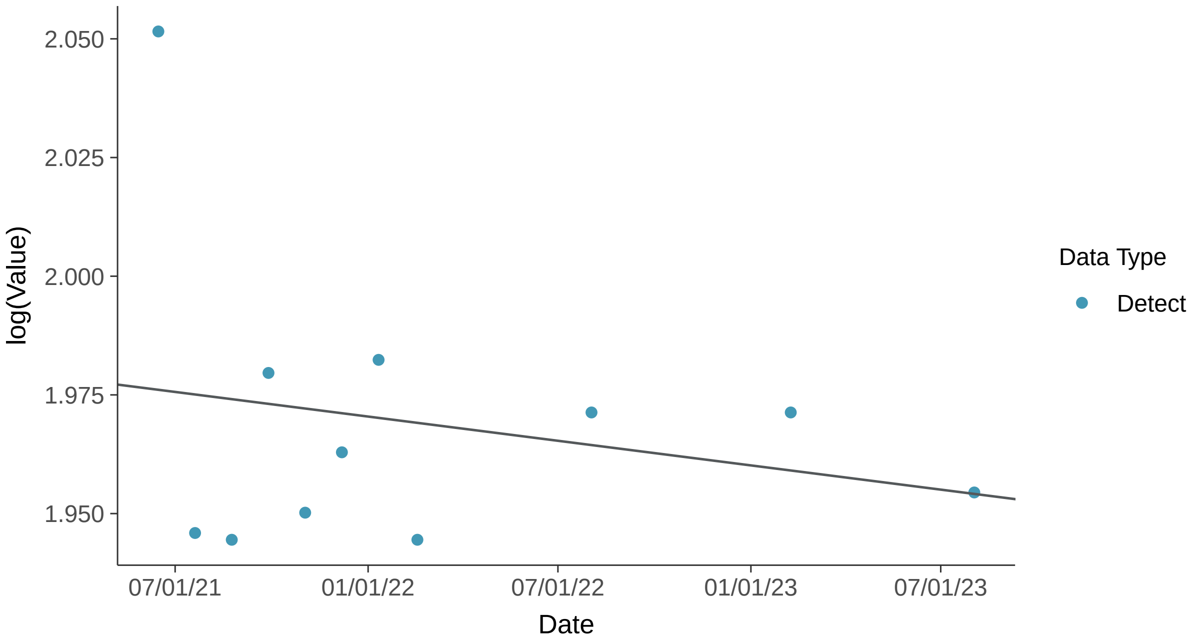
Gamma Q-Q plot

pH, Field, MW-8 (su)



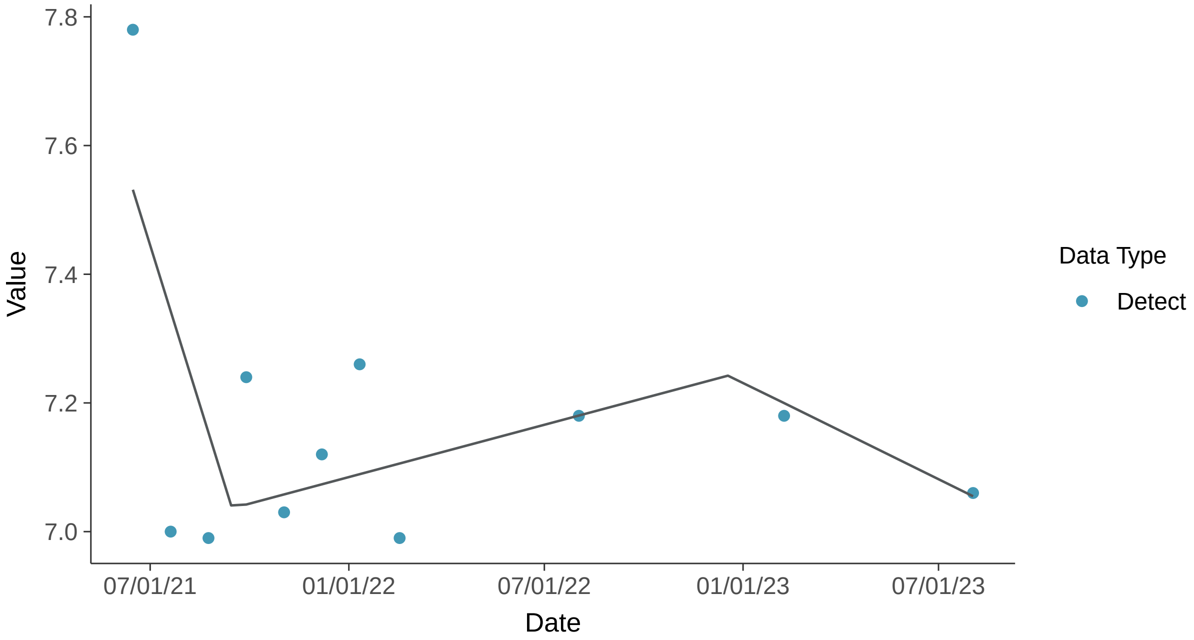
Trend Regression: Lognormal MLE

pH, Field, MW-8 (su)



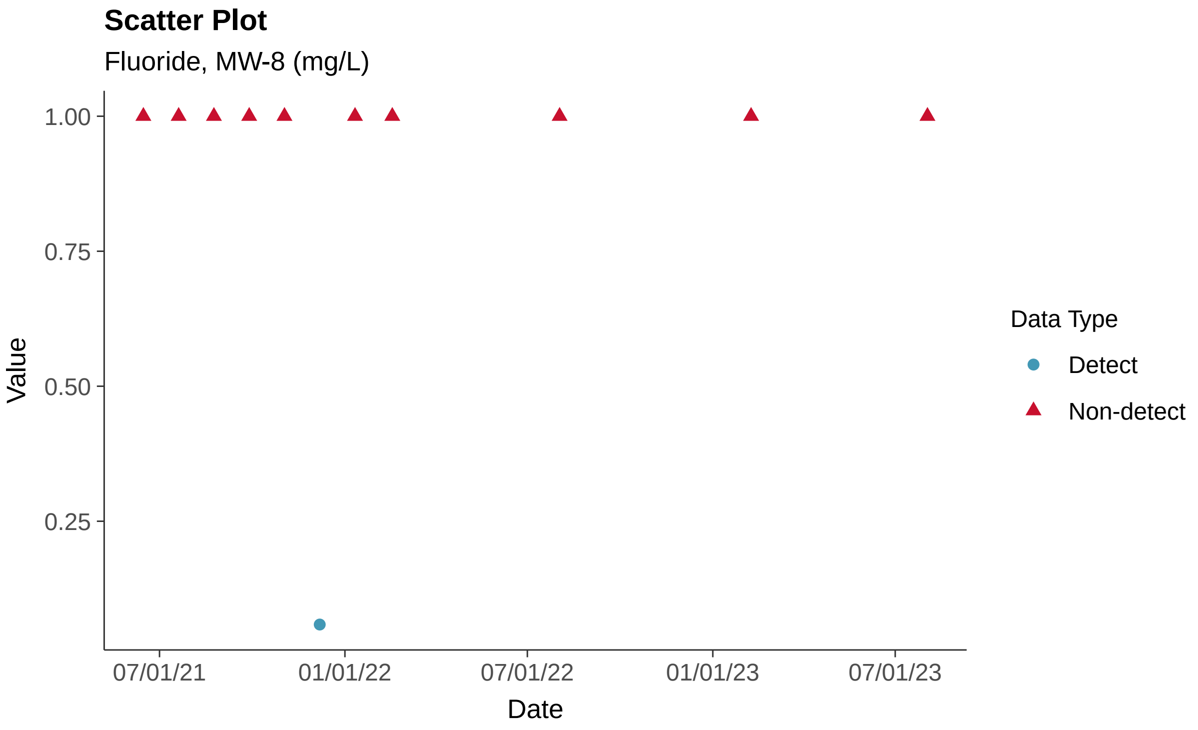
Trend Regression: Piecewise Linear-Linear-Linear

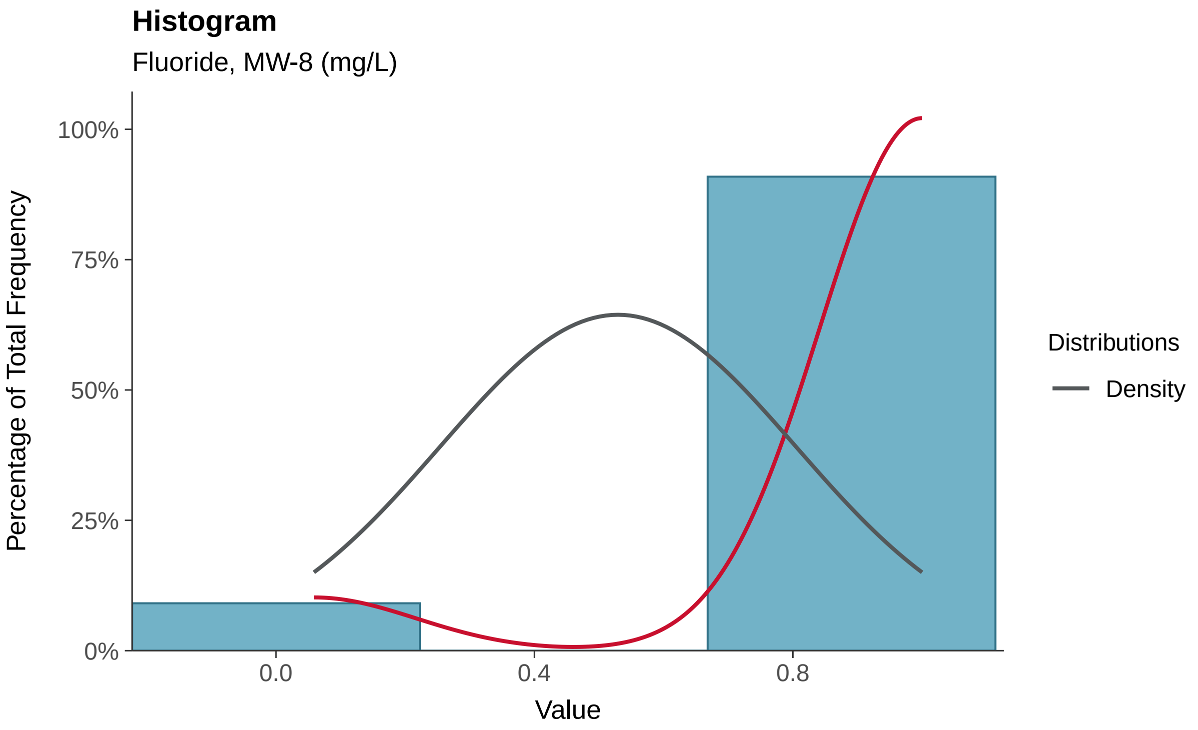
pH, Field, MW-8 (su)



Appendix IV: Fluoride, MW-8

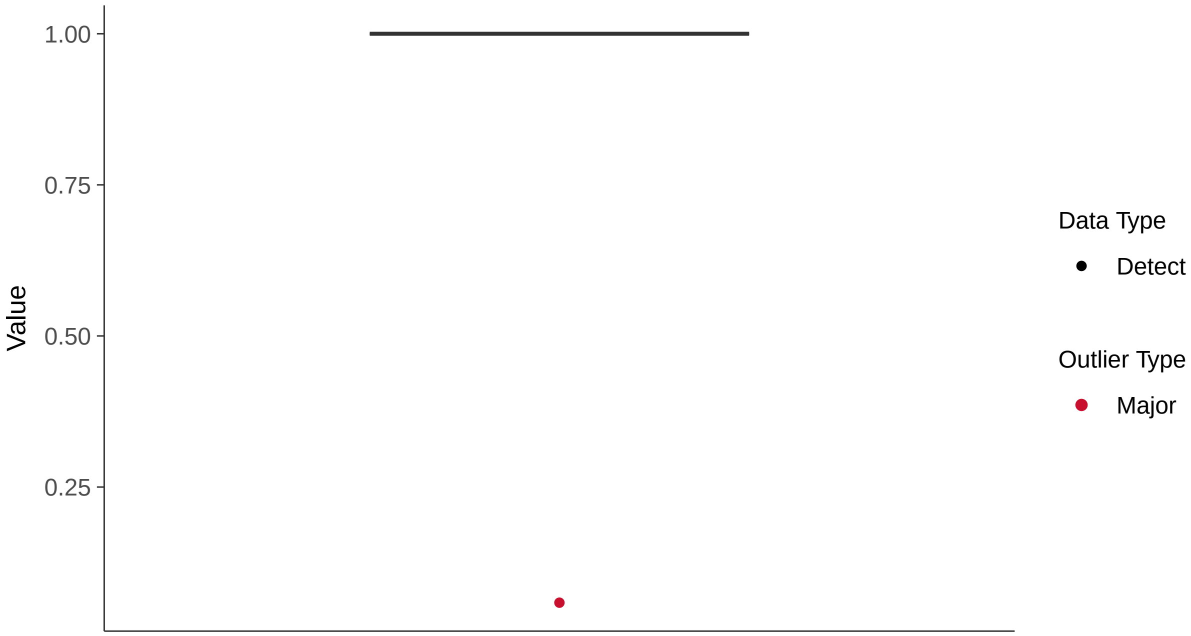
ID: 08_2_04





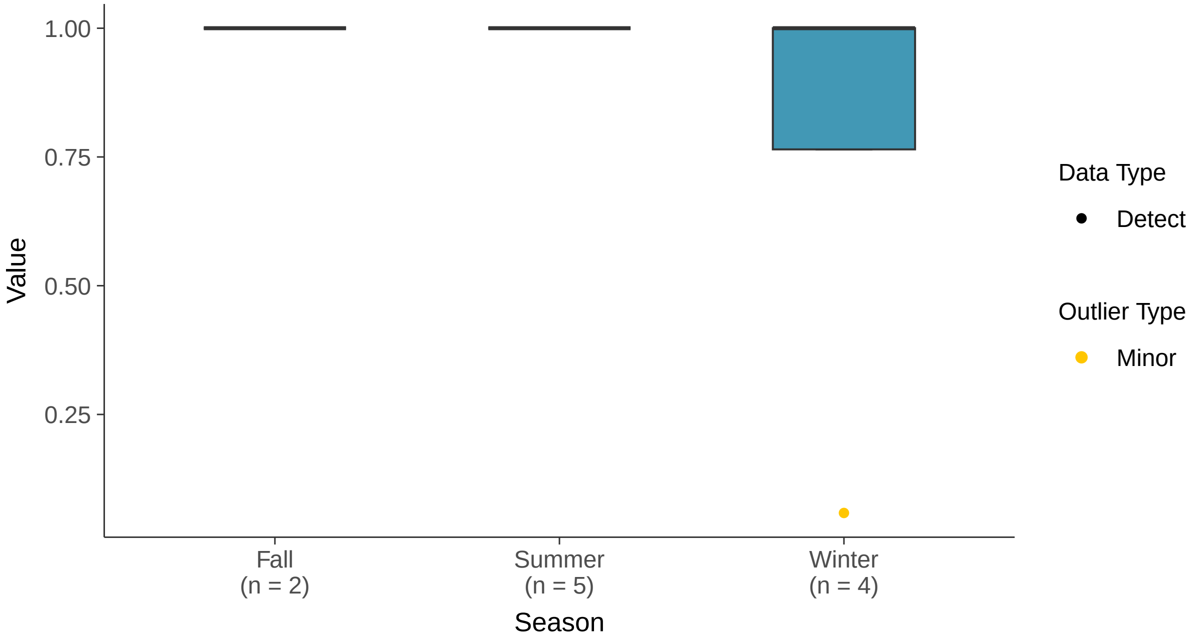
Boxplot

Fluoride, MW-8 (mg/L)



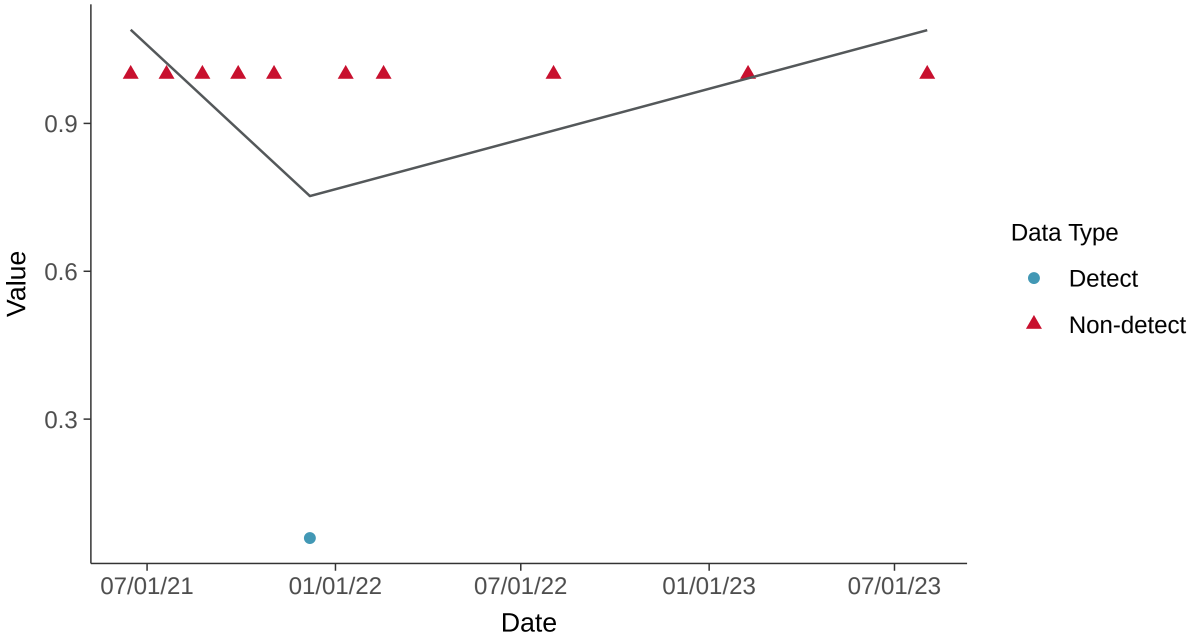
Boxplot by Season

Fluoride, MW-8 (mg/L)



Trend Regression: Piecewise Linear-Linear

Fluoride, MW-8 (mg/L)

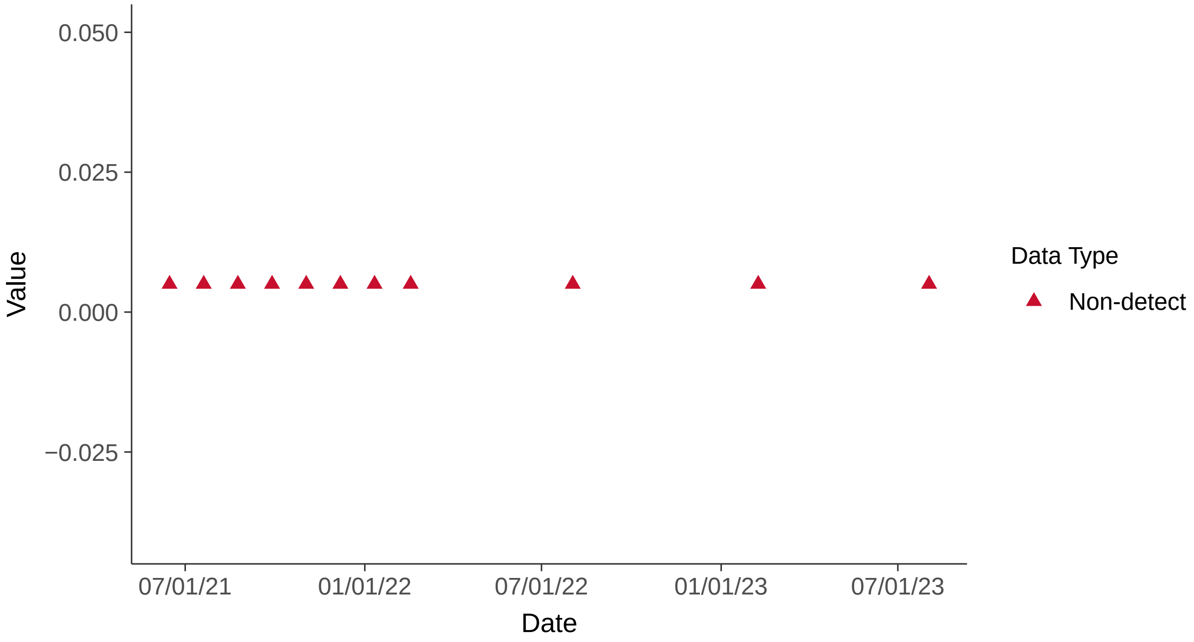


Appendix IV: Antimony, MW-8

ID: 08_2_08

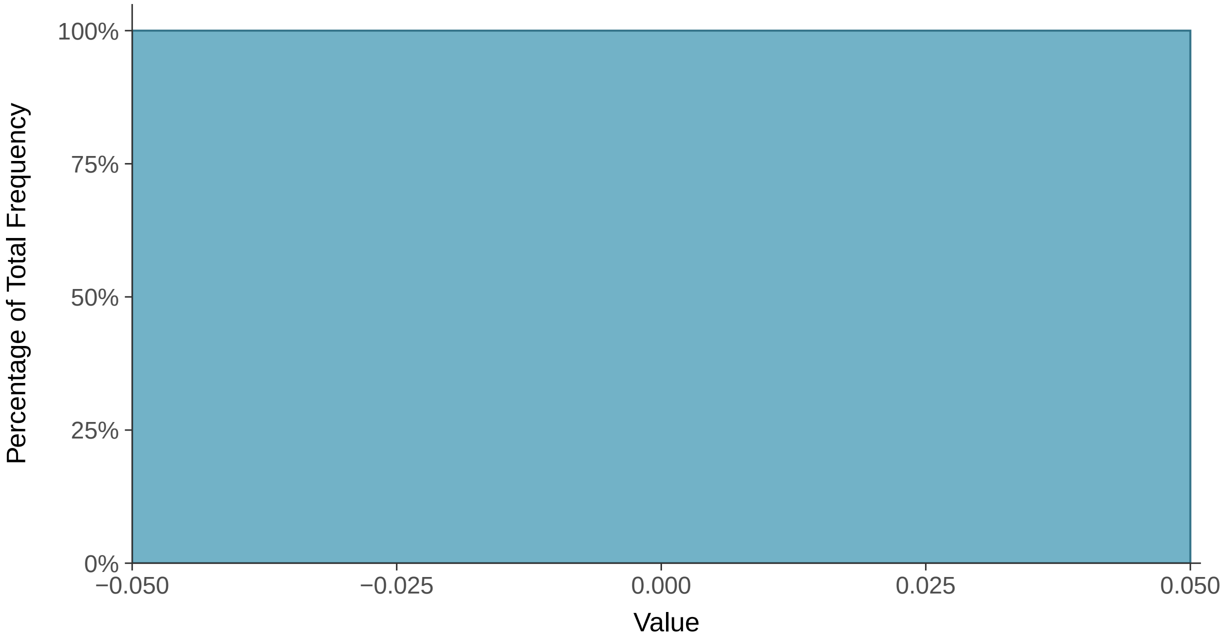
Scatter Plot

Antimony, MW-8 (mg/L)



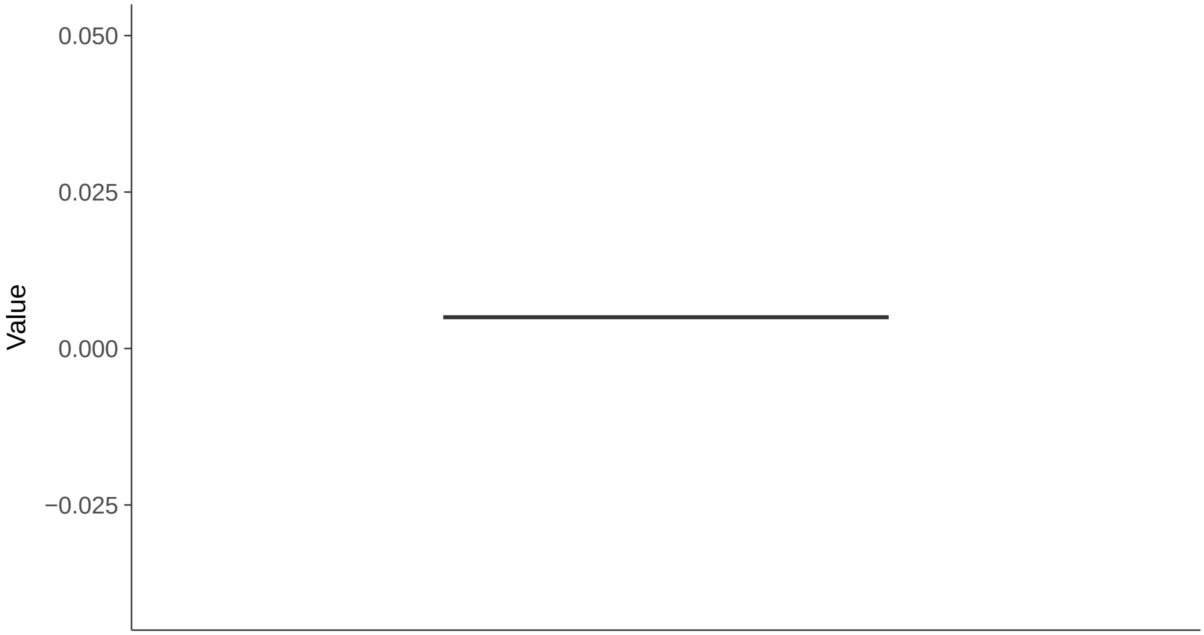
Histogram

Antimony, MW-8 (mg/L)



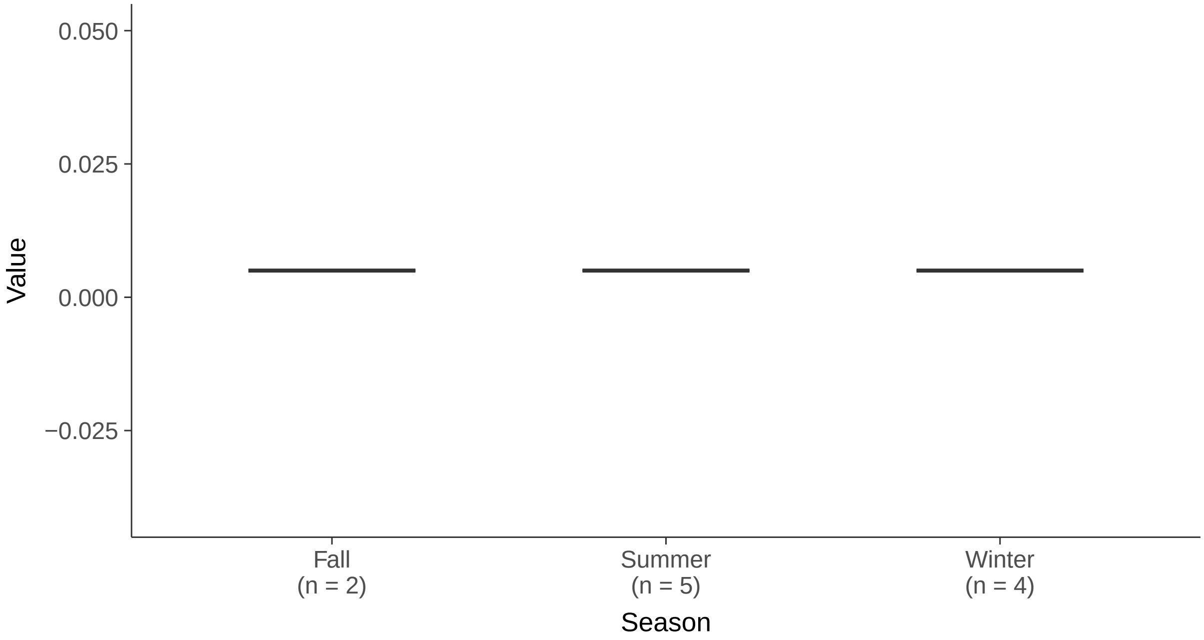
Boxplot

Antimony, MW-8 (mg/L)



Boxplot by Season

Antimony, MW-8 (mg/L)

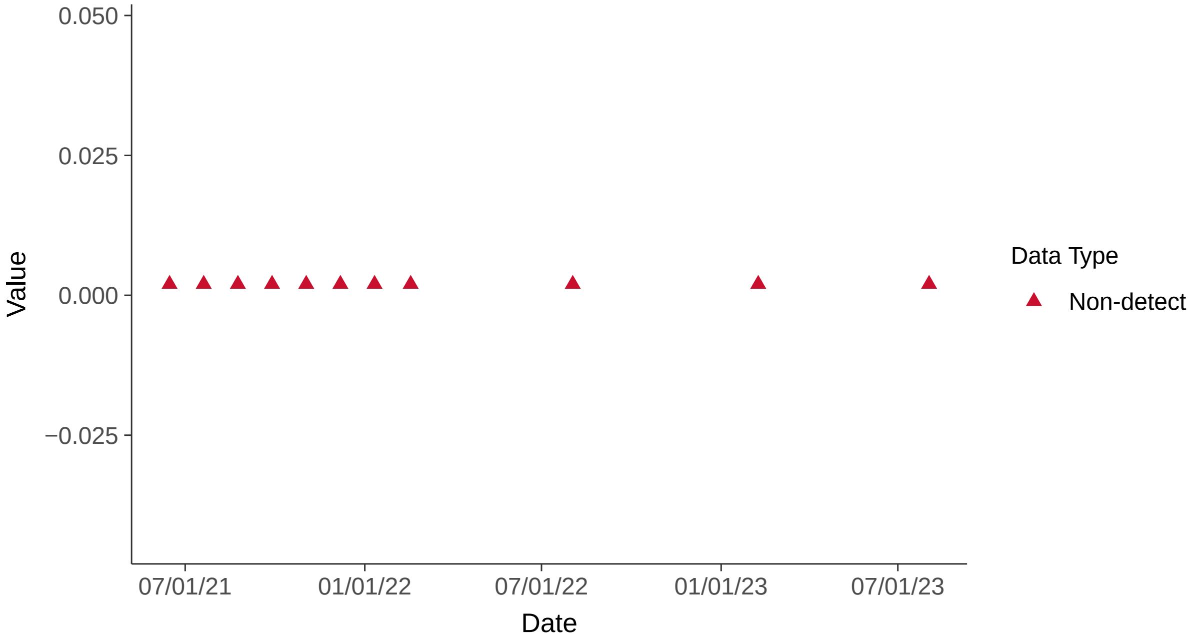


Appendix IV: Arsenic, MW-8

ID: 08_2_09

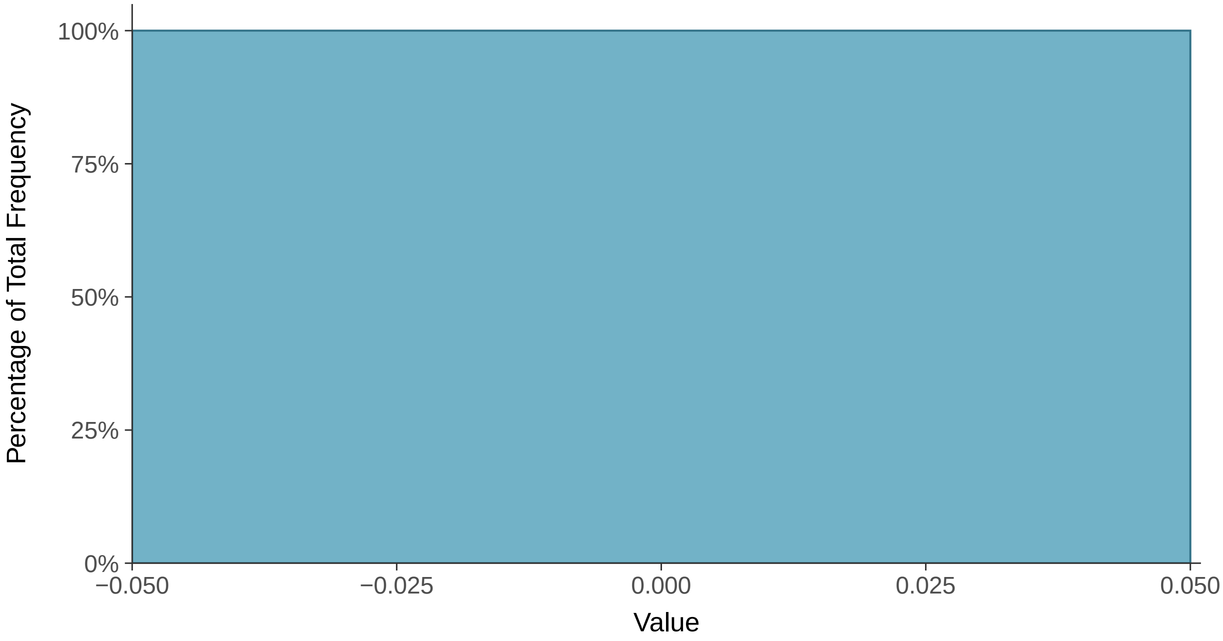
Scatter Plot

Arsenic, MW-8 (mg/L)



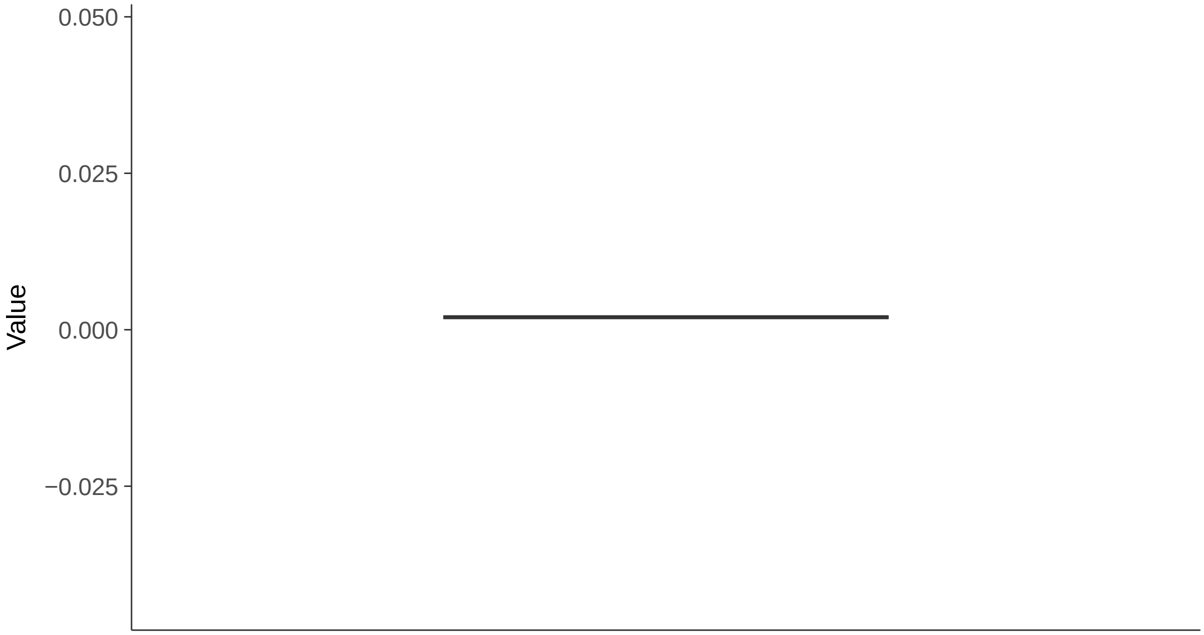
Histogram

Arsenic, MW-8 (mg/L)



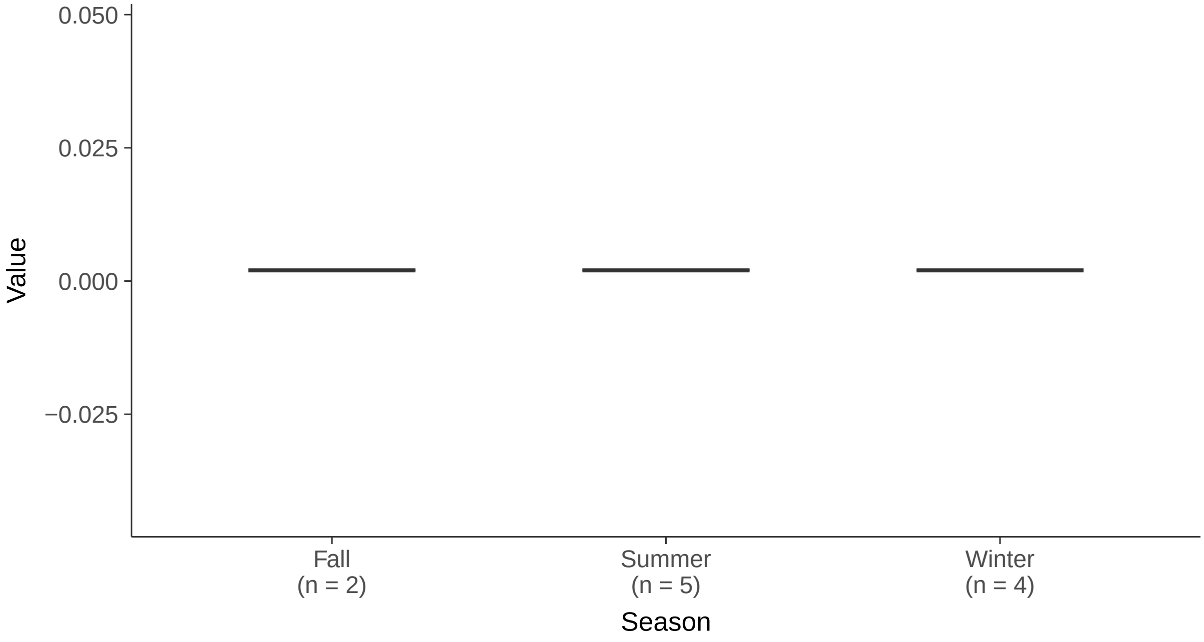
Boxplot

Arsenic, MW-8 (mg/L)



Boxplot by Season

Arsenic, MW-8 (mg/L)

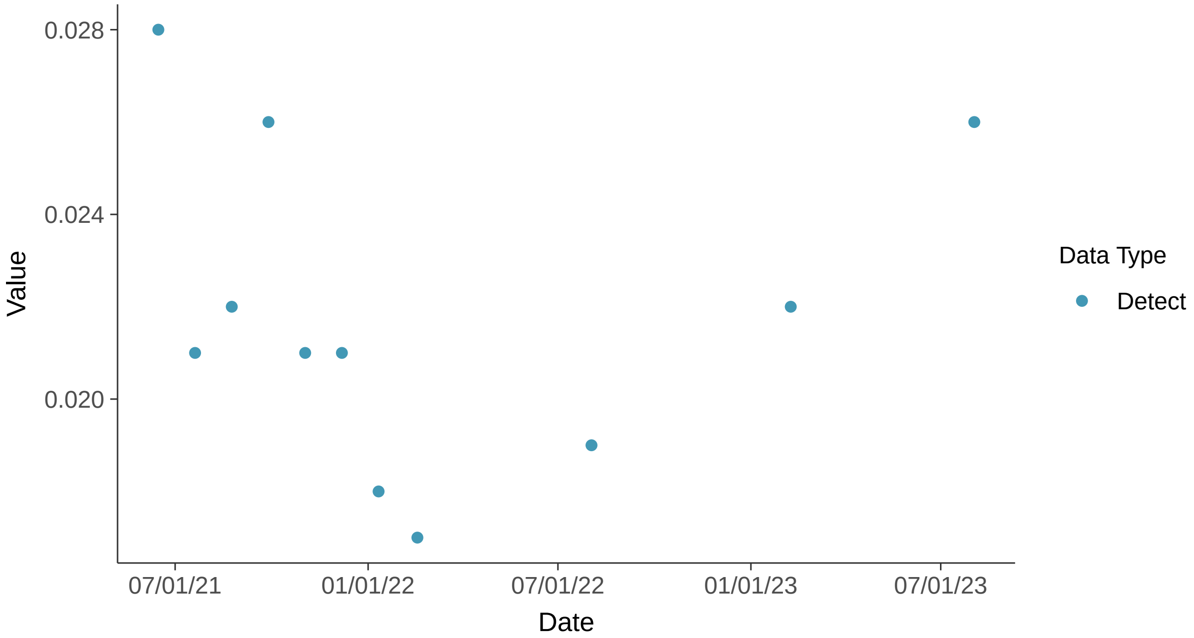


Appendix IV: Barium, MW-8

ID: 08_2_10

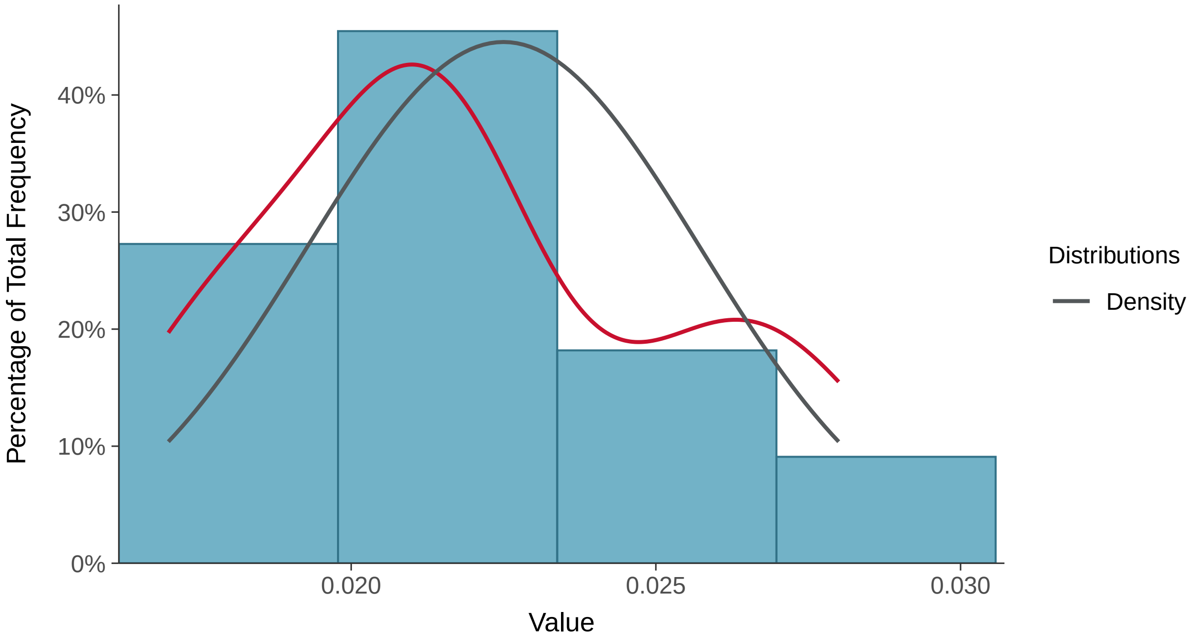
Scatter Plot

Barium, MW-8 (mg/L)



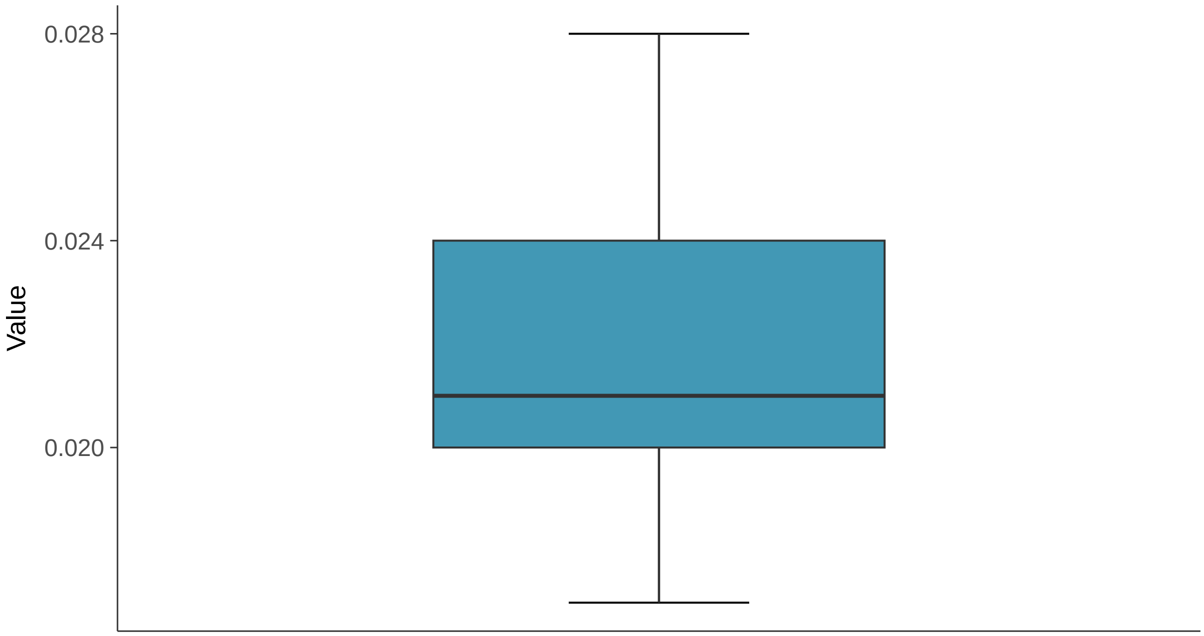
Histogram

Barium, MW-8 (mg/L)



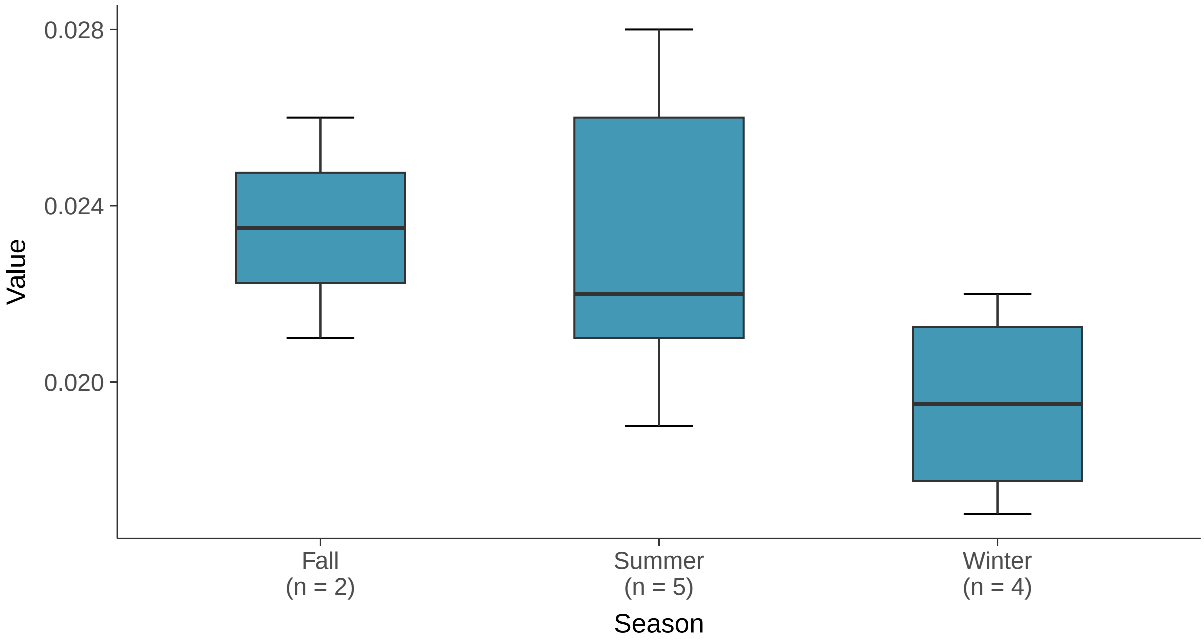
Boxplot

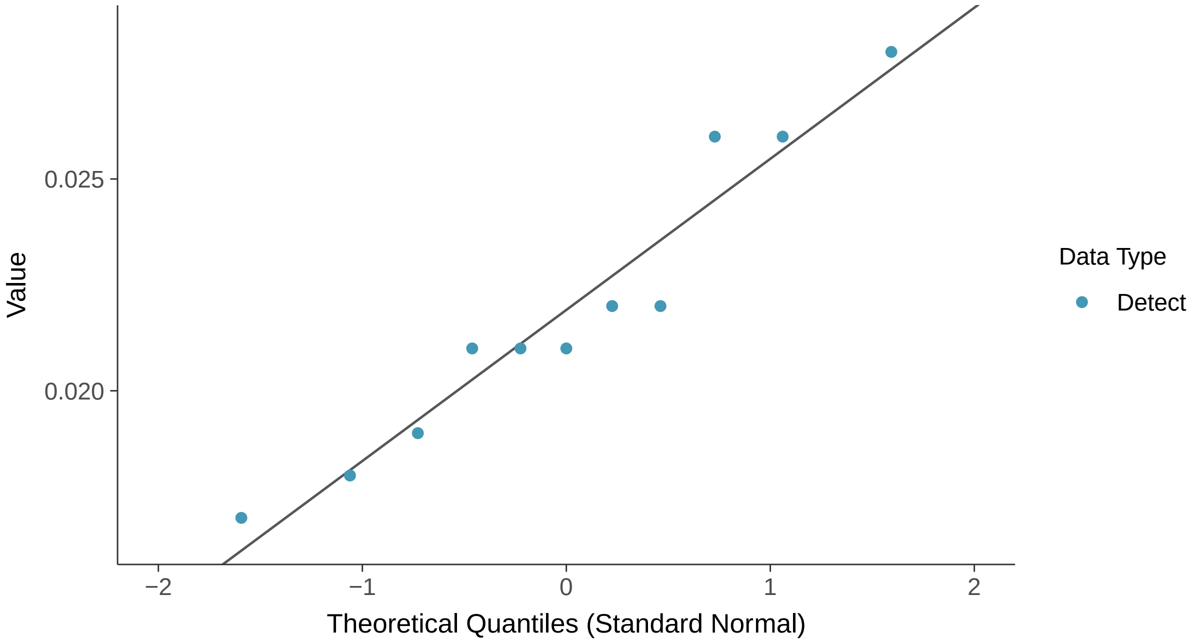
Barium, MW-8 (mg/L)



Boxplot by Season

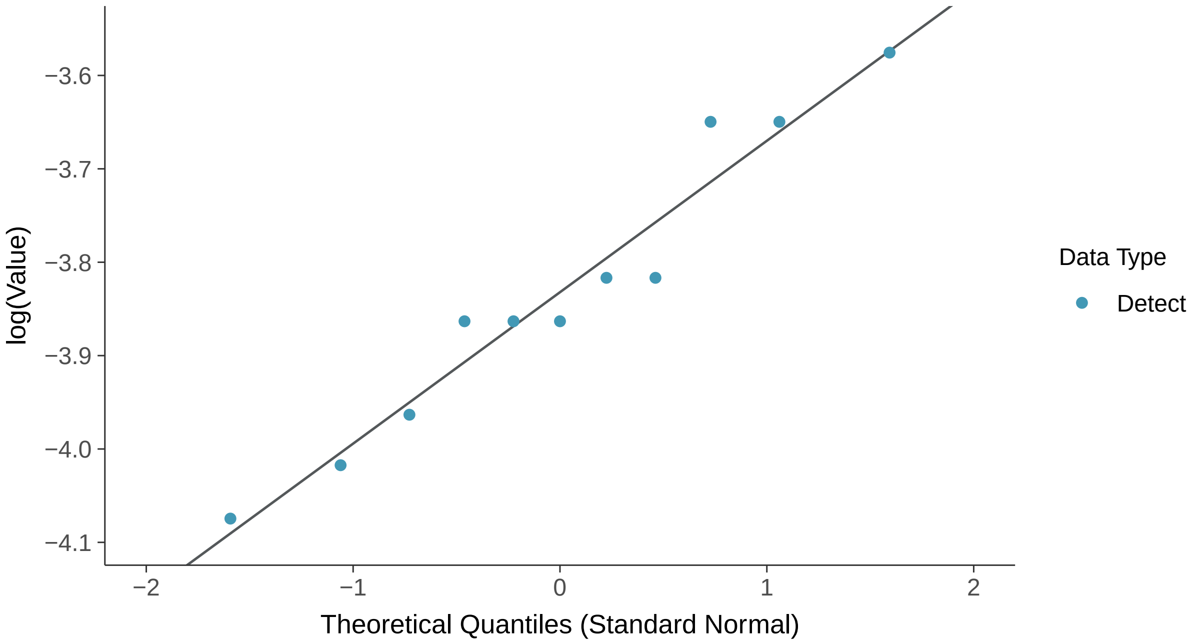
Barium, MW-8 (mg/L)





Normal Q-Q plot

Barium, MW-8 (mg/L)

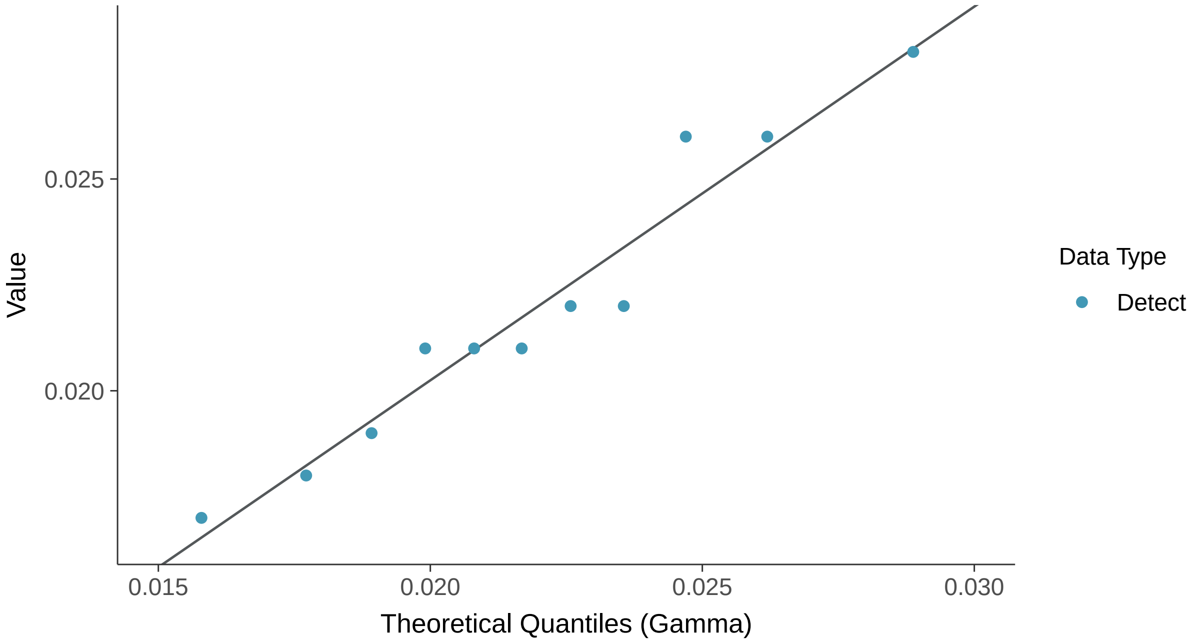


Lognormal Q-Q plot

Barium, MW-8 (mg/L)

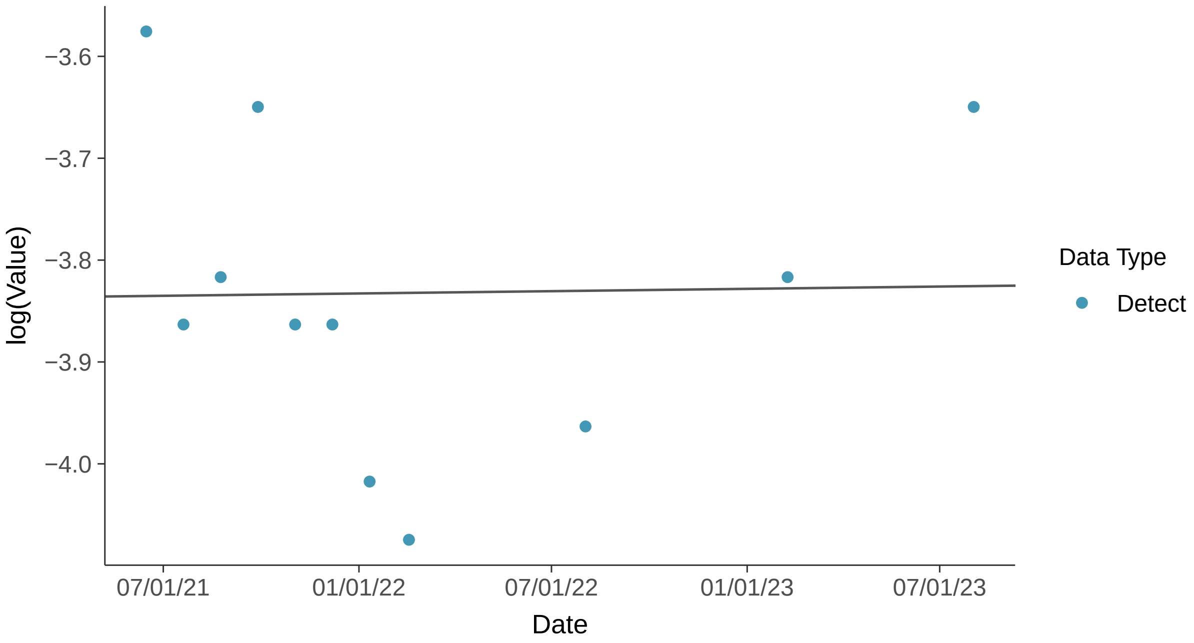
Gamma Q-Q plot

Barium, MW-8 (mg/L)



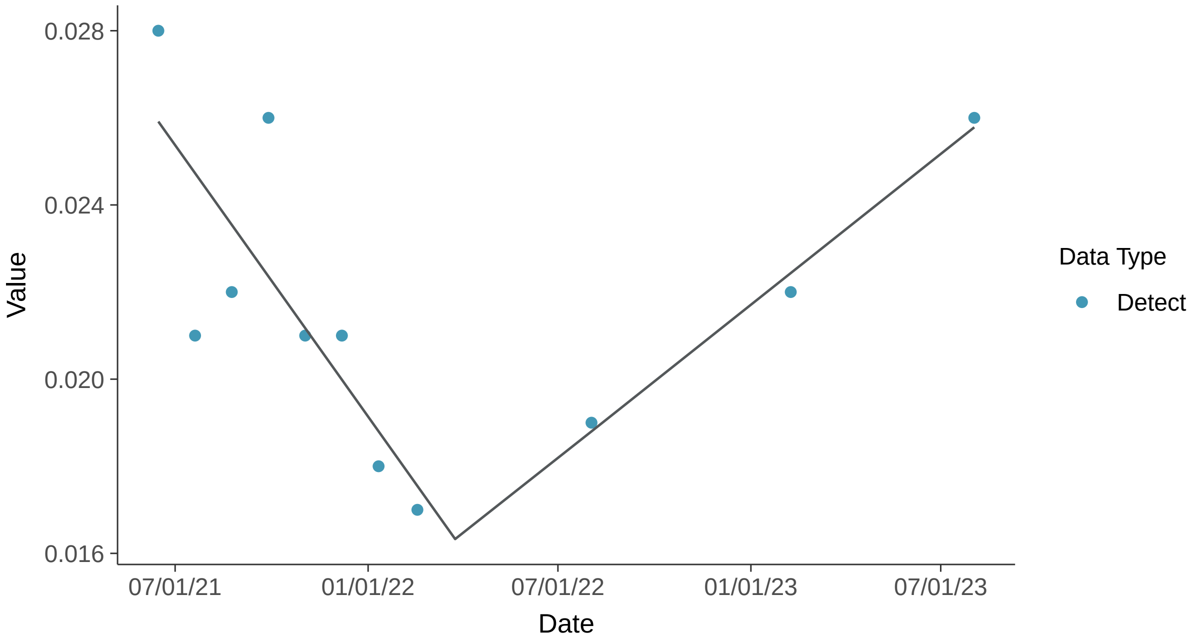
Trend Regression: Lognormal MLE

Barium, MW-8 (mg/L)



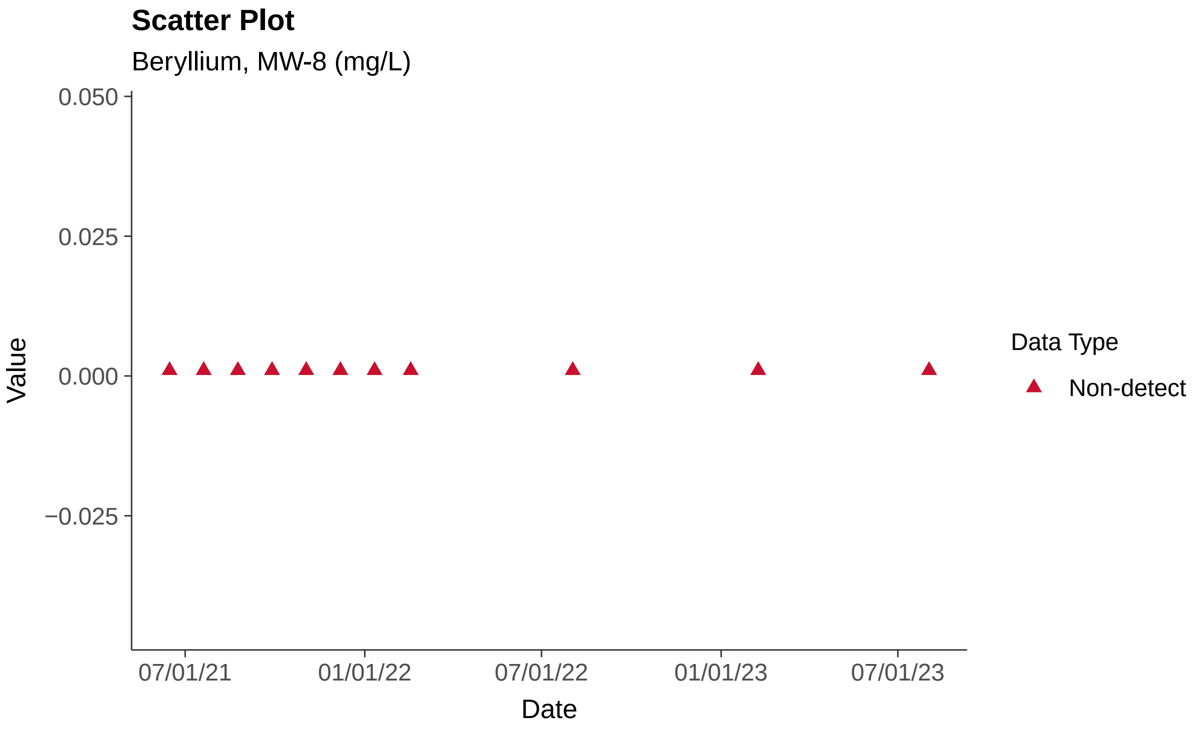
Trend Regression: Piecewise Linear-Linear

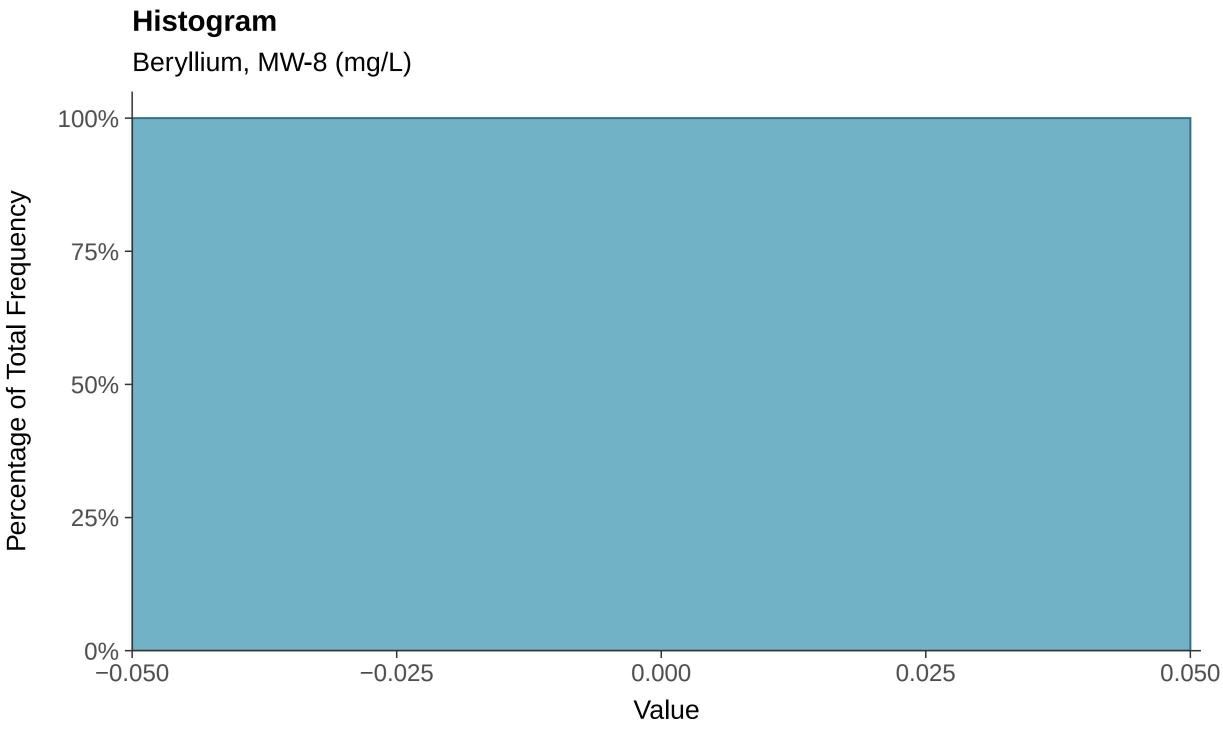
Barium, MW-8 (mg/L)



Appendix IV: Beryllium, MW-8

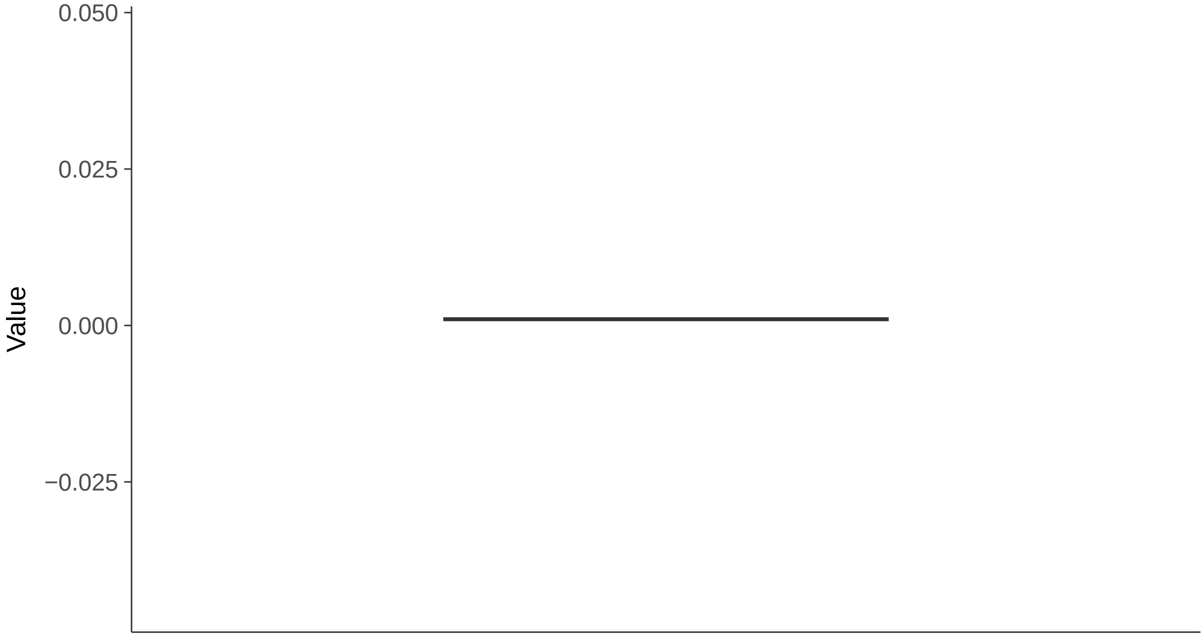
ID: 08_2_11





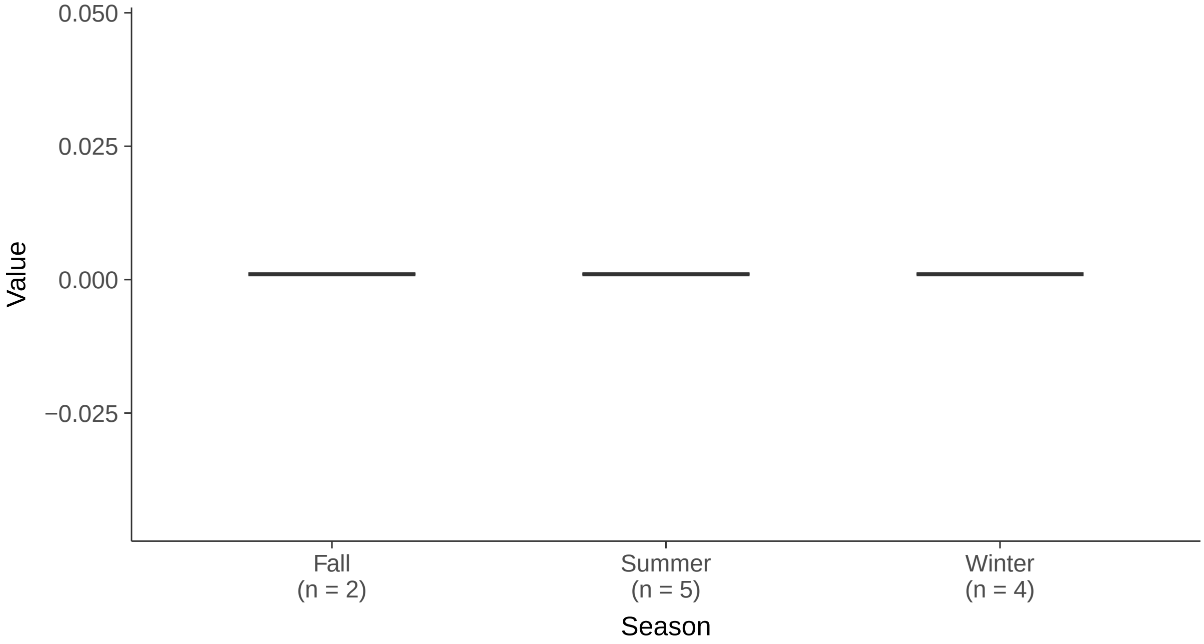
Boxplot

Beryllium, MW-8 (mg/L)



Boxplot by Season

Beryllium, MW-8 (mg/L)

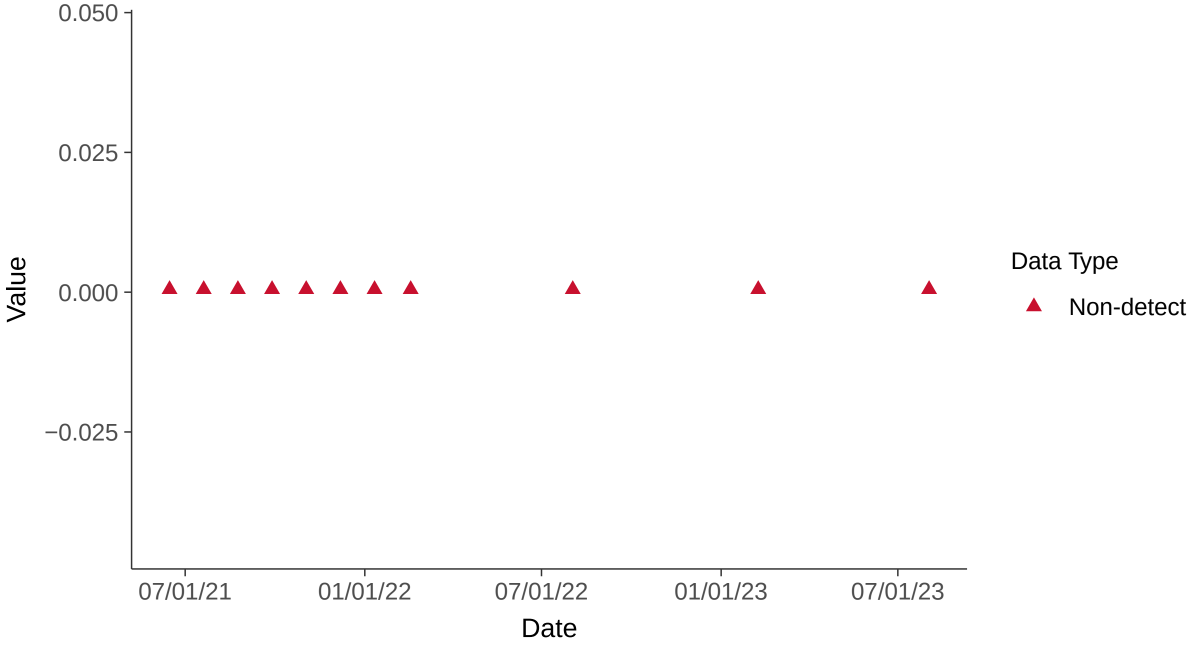


Appendix IV: Cadmium, MW-8

ID: 08_2_12

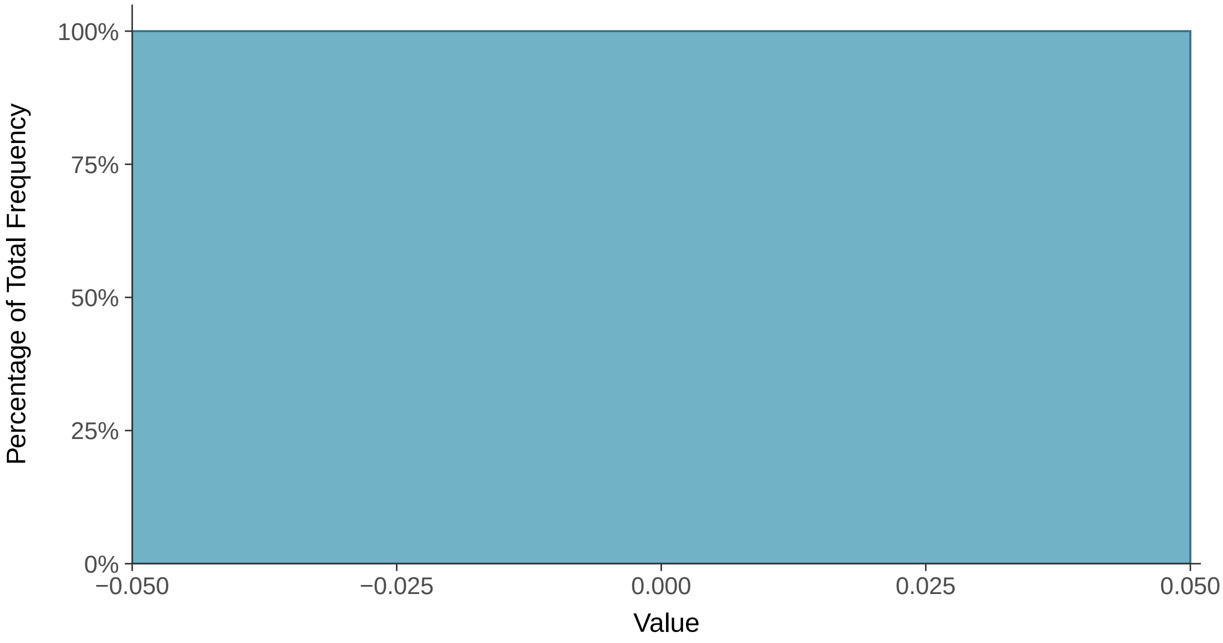
Scatter Plot

Cadmium, MW-8 (mg/L)



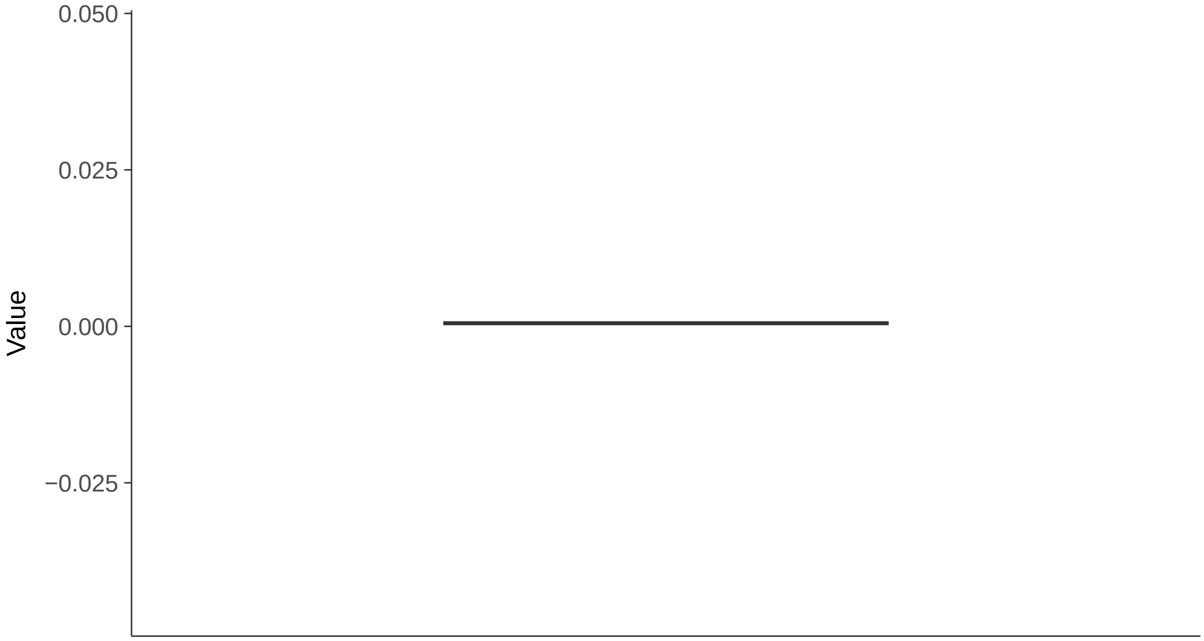
Histogram

Cadmium, MW-8 (mg/L)



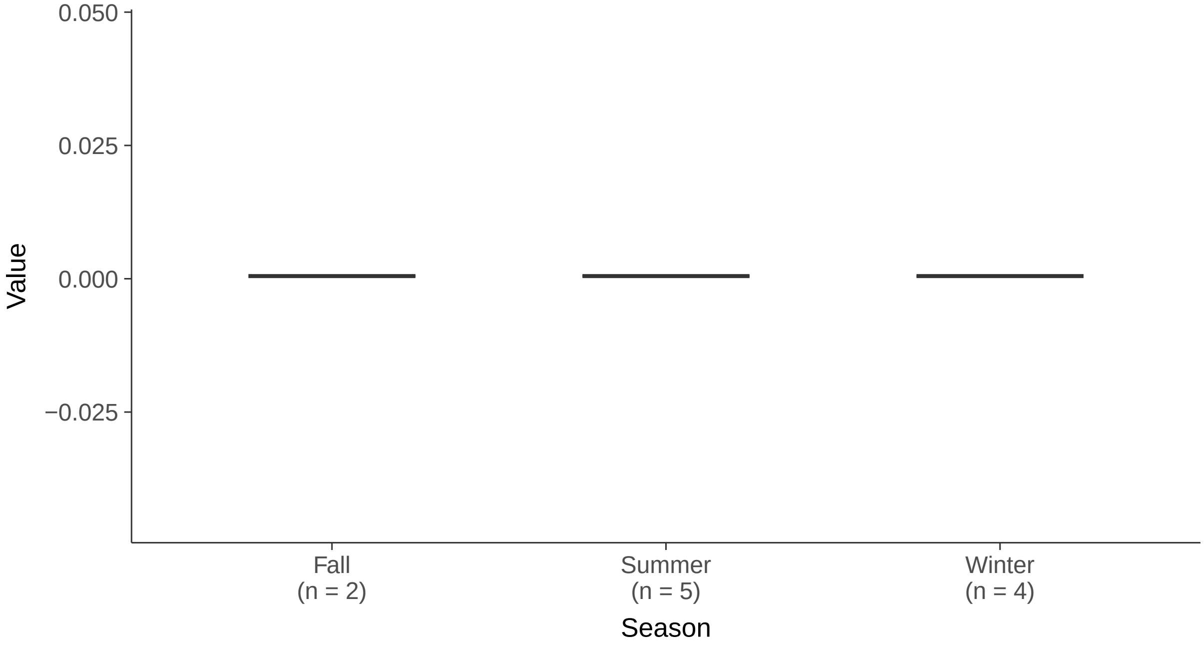
Boxplot

Cadmium, MW-8 (mg/L)



Boxplot by Season

Cadmium, MW-8 (mg/L)

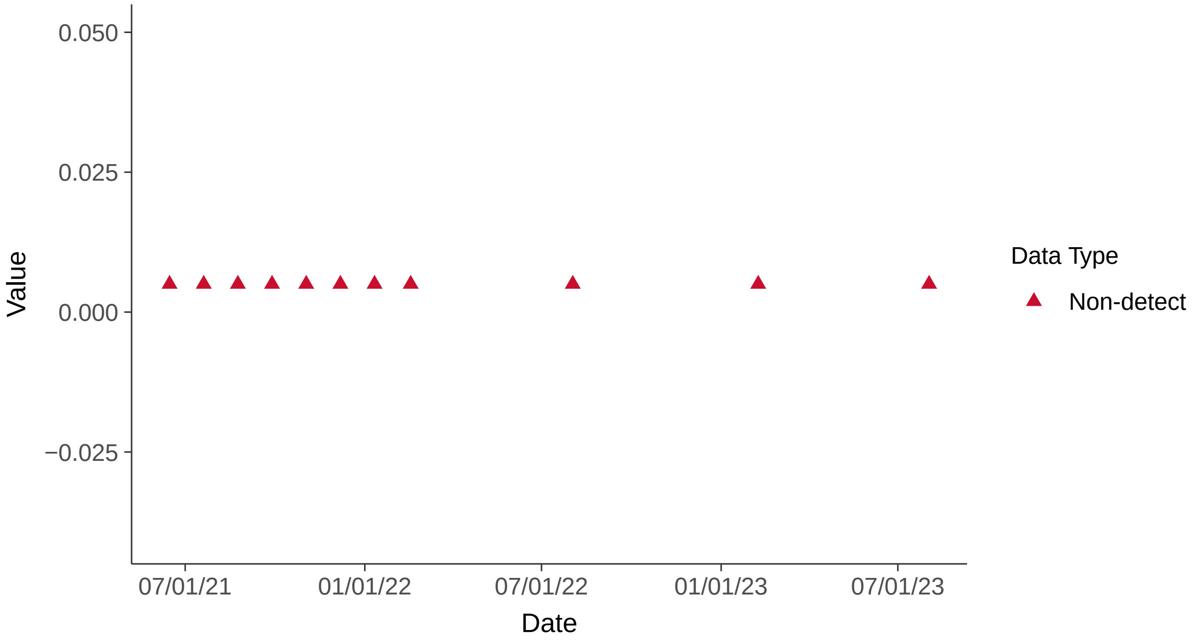


Appendix IV: Chromium, MW-8

ID: 08_2_13

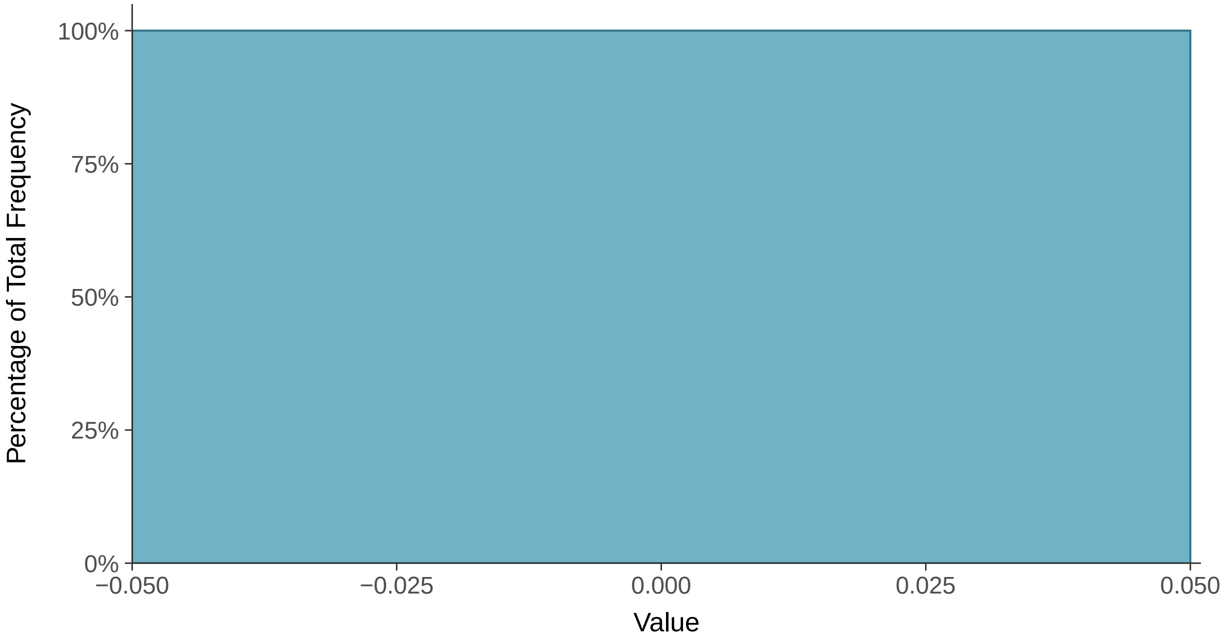
Scatter Plot

Chromium, MW-8 (mg/L)



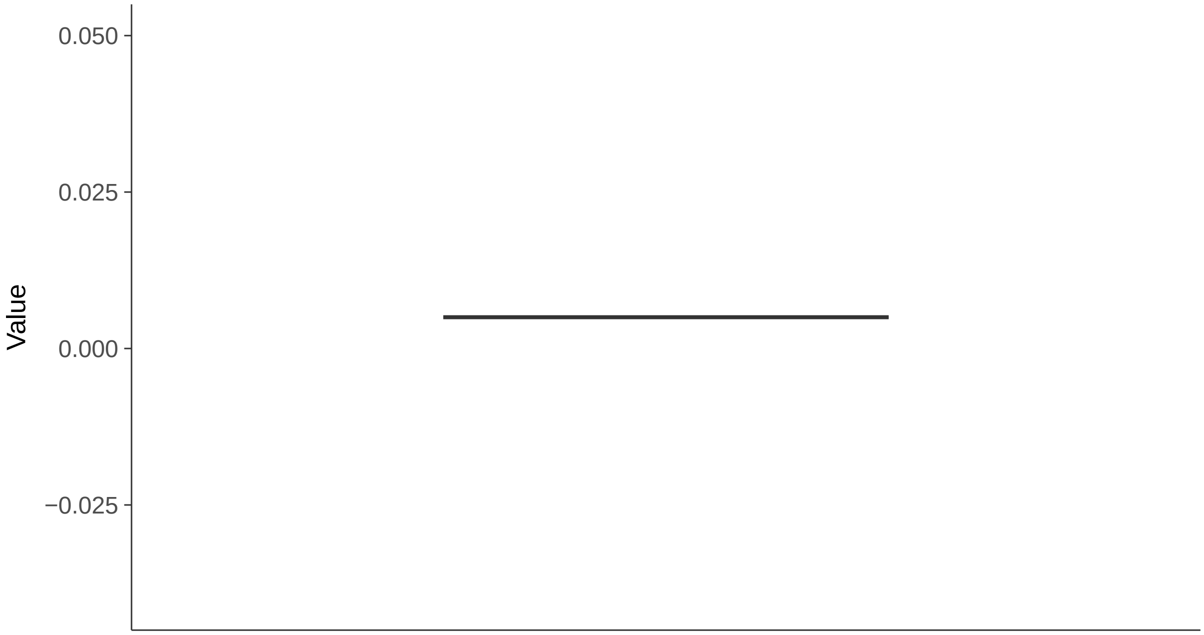
Histogram

Chromium, MW-8 (mg/L)



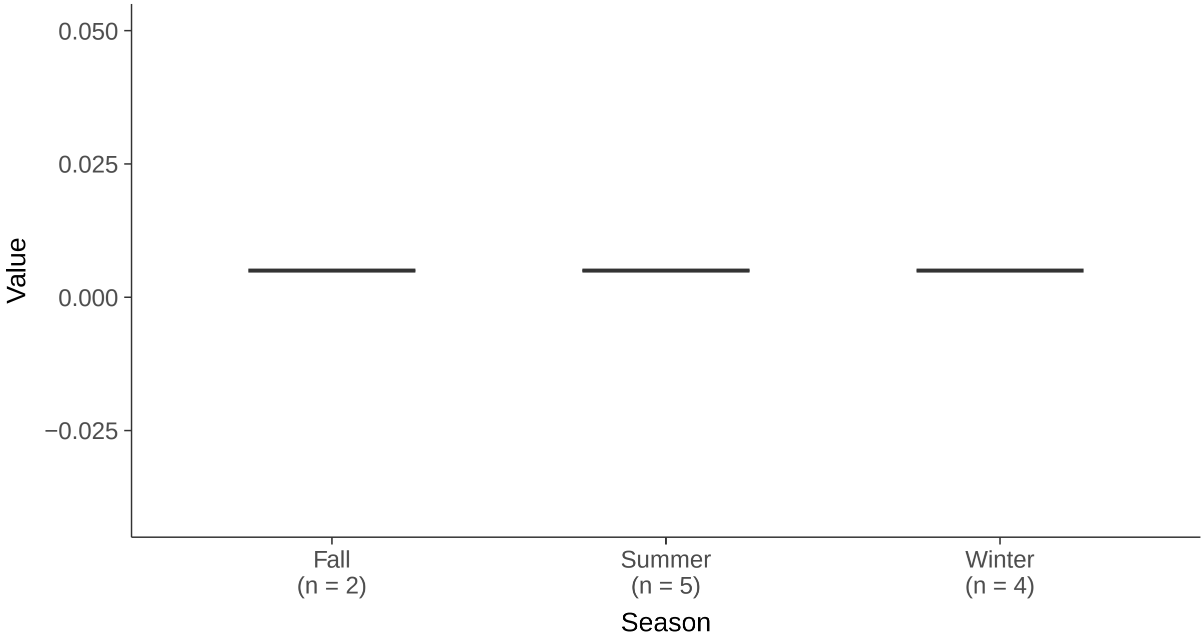
Boxplot

Chromium, MW-8 (mg/L)



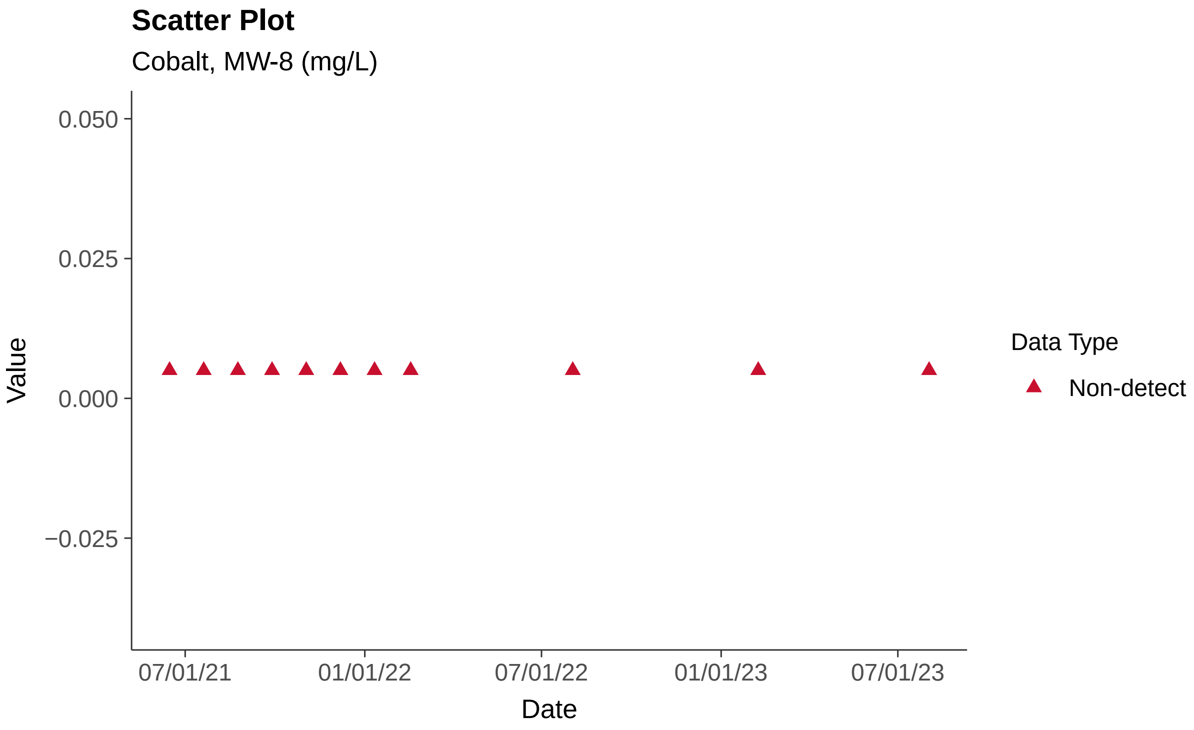
Boxplot by Season

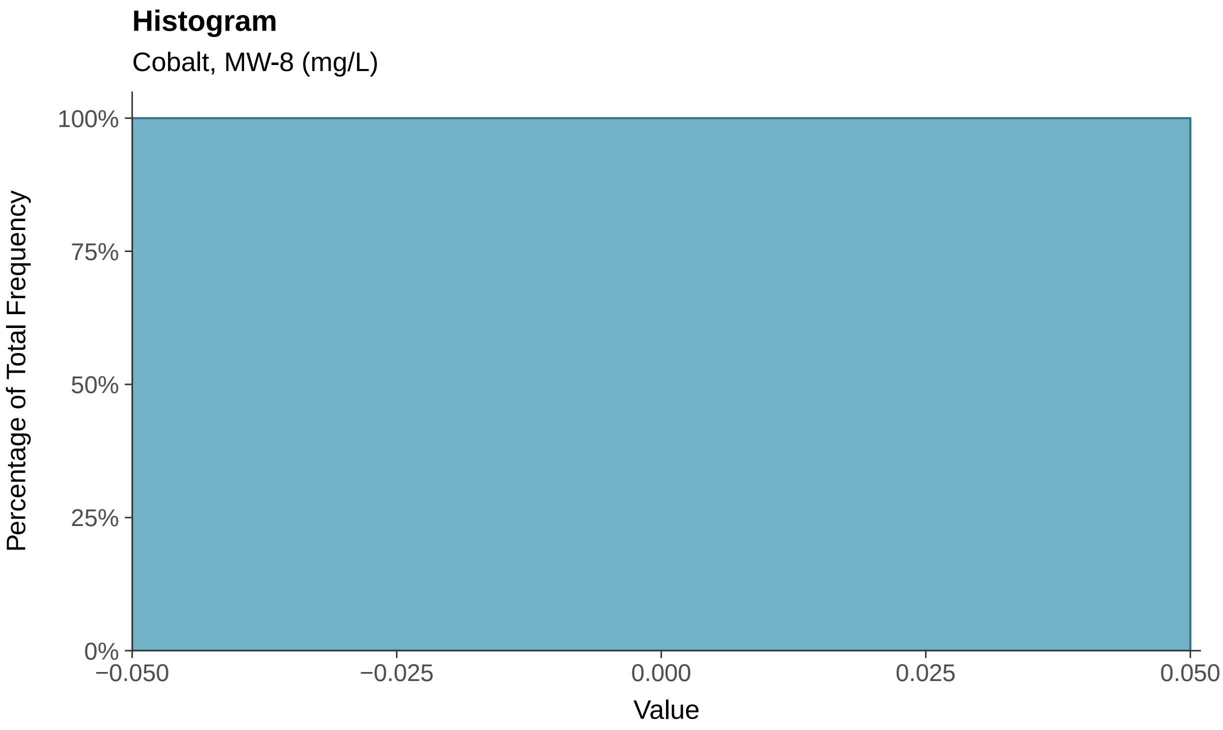
Chromium, MW-8 (mg/L)



Appendix IV: Cobalt, MW-8

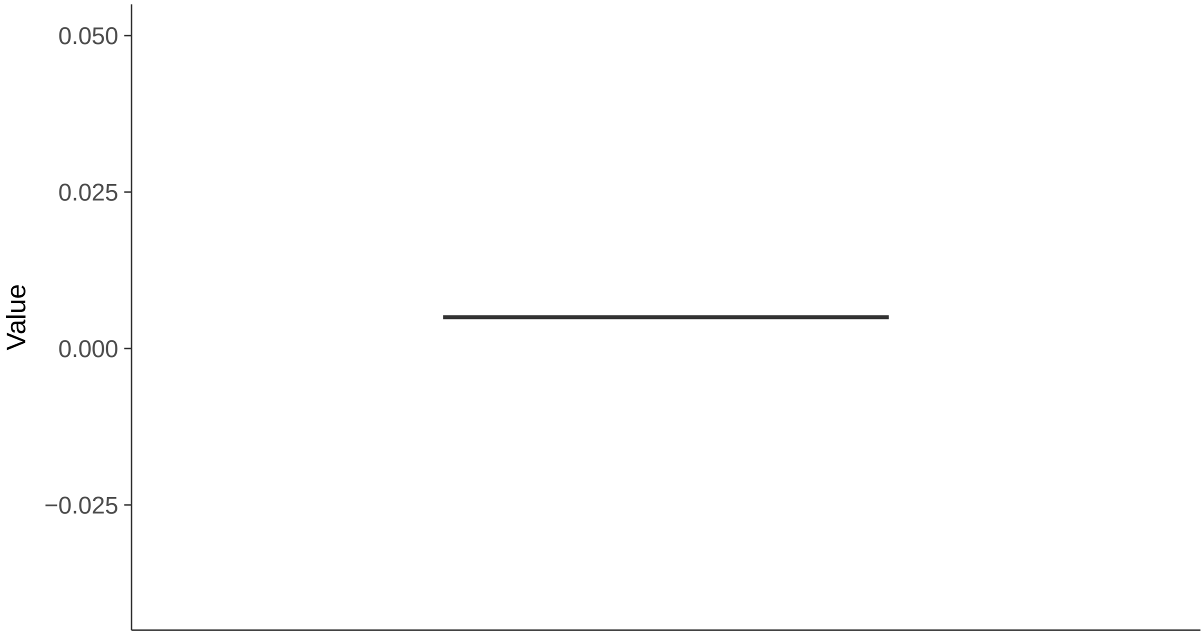
ID: 08_2_14





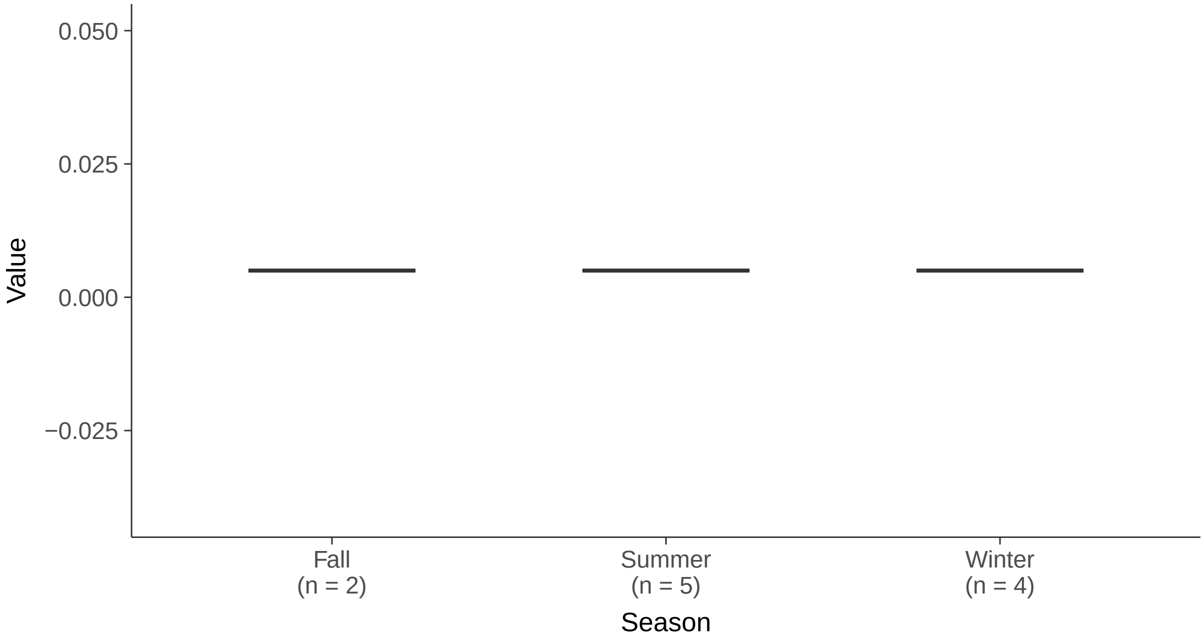
Boxplot

Cobalt, MW-8 (mg/L)



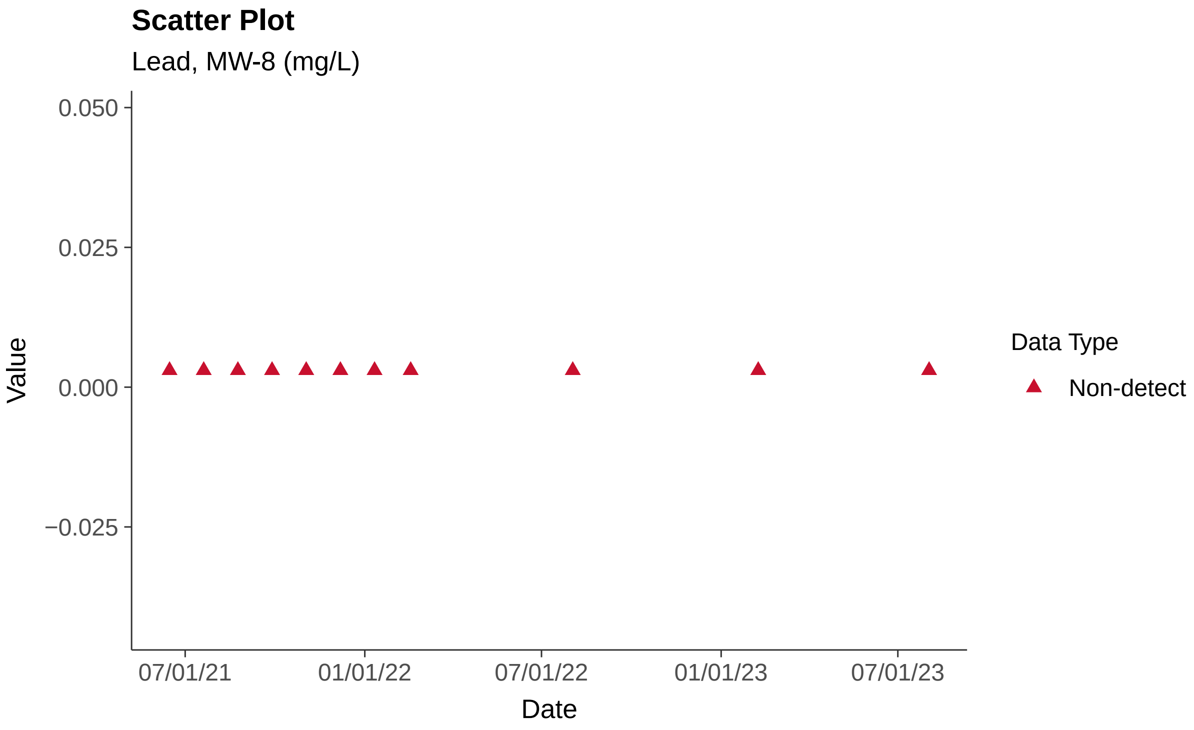
Boxplot by Season

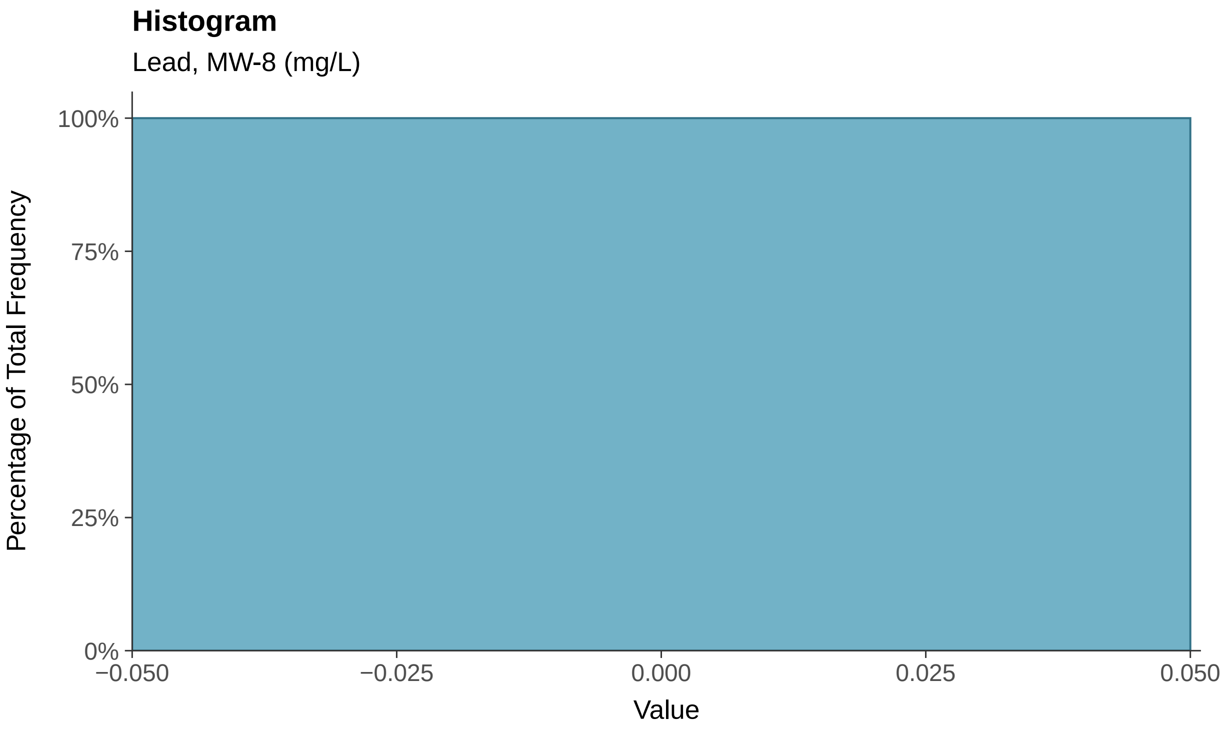
Cobalt, MW-8 (mg/L)



Appendix IV: Lead, MW-8

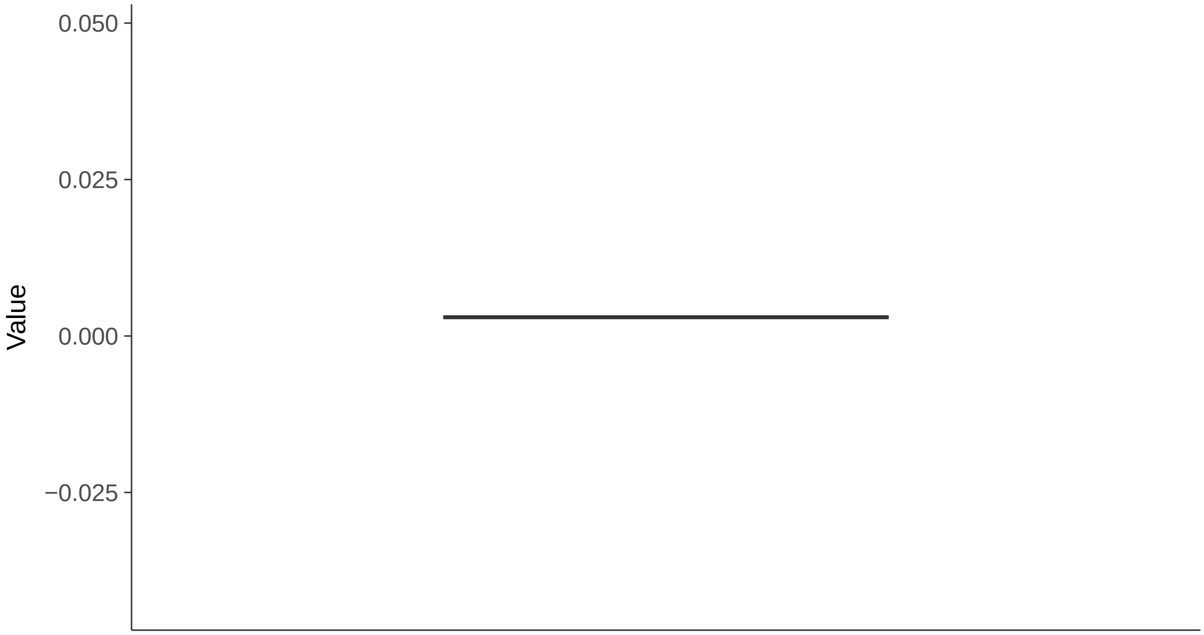
ID: 08_2_15





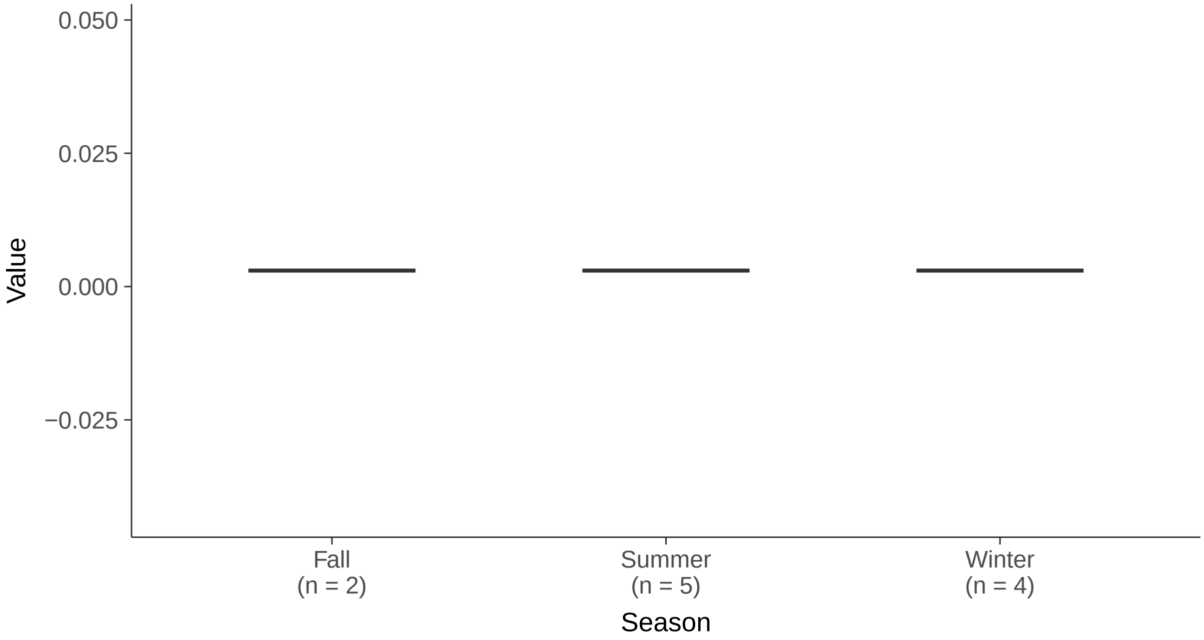
Boxplot

Lead, MW-8 (mg/L)



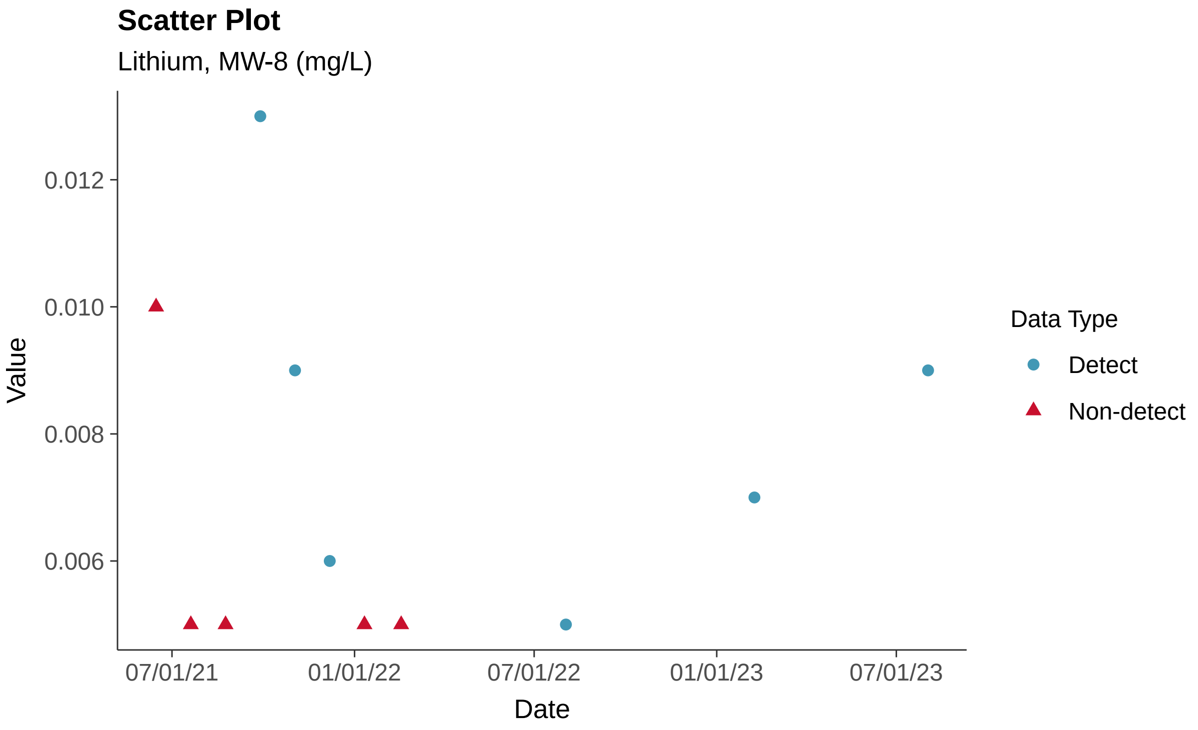
Boxplot by Season

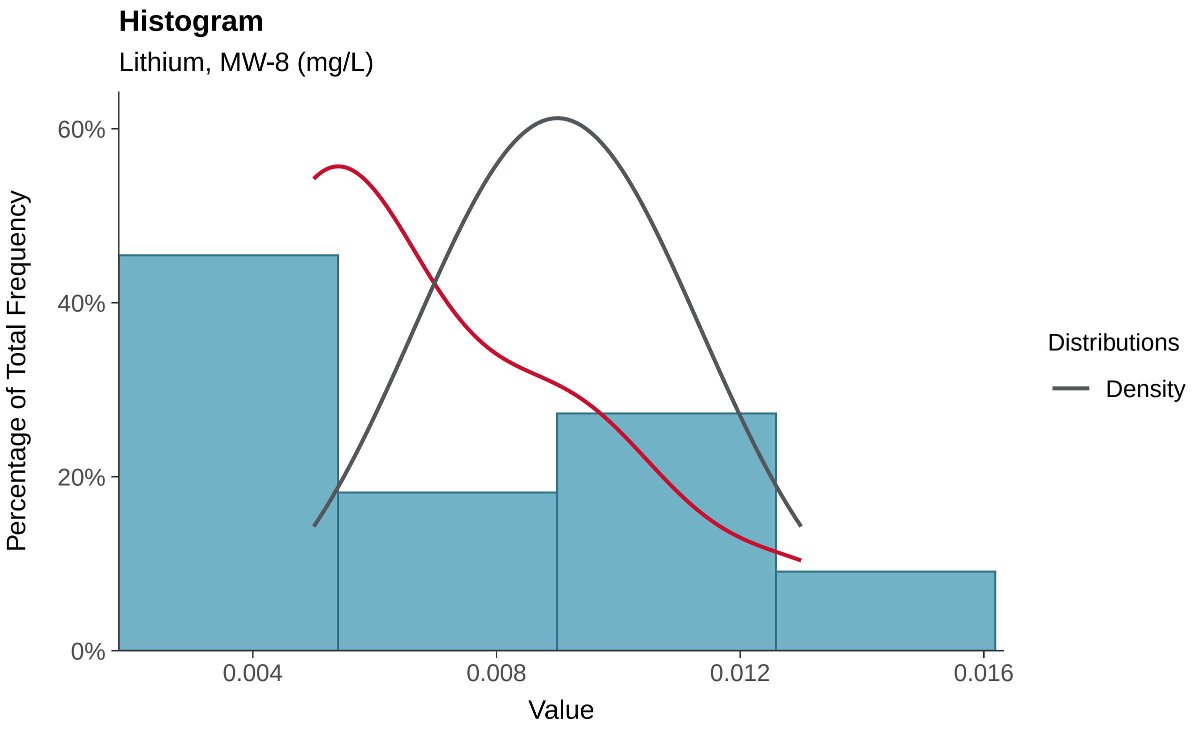
Lead, MW-8 (mg/L)



Appendix IV: Lithium, MW-8

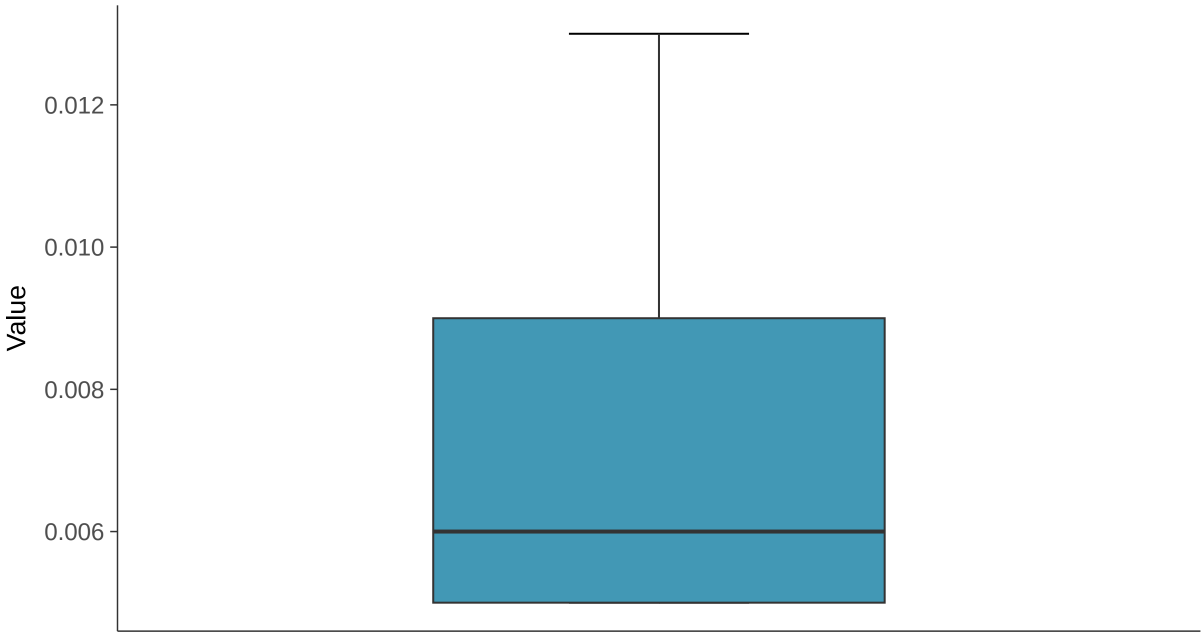
ID: 08_2_16





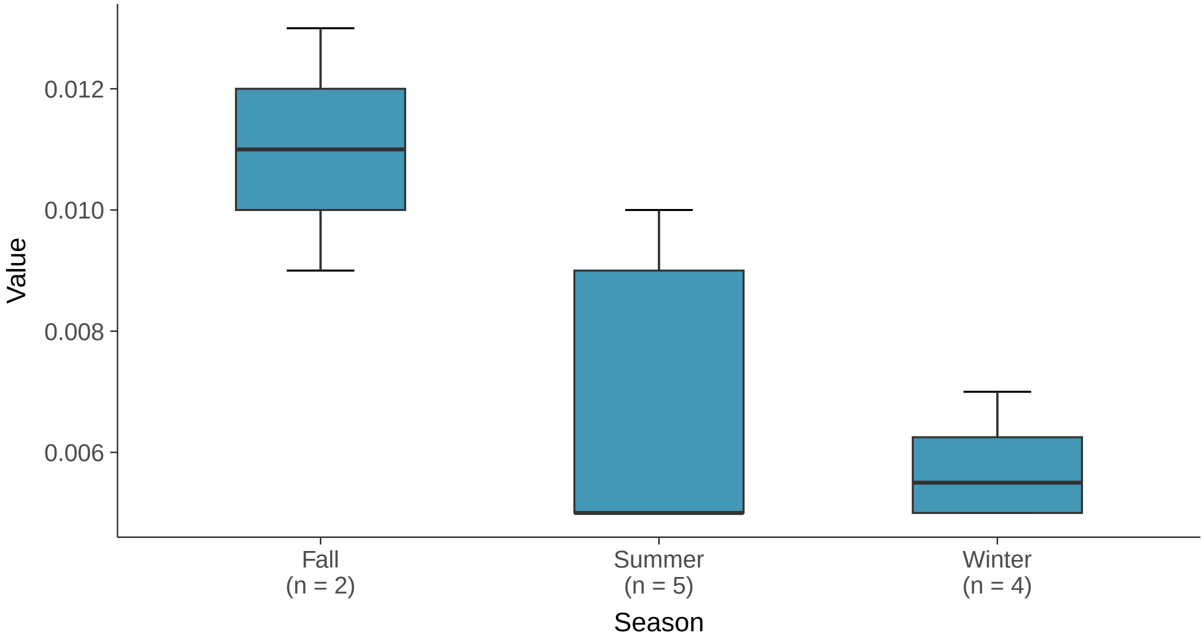
Boxplot

Lithium, MW-8 (mg/L)



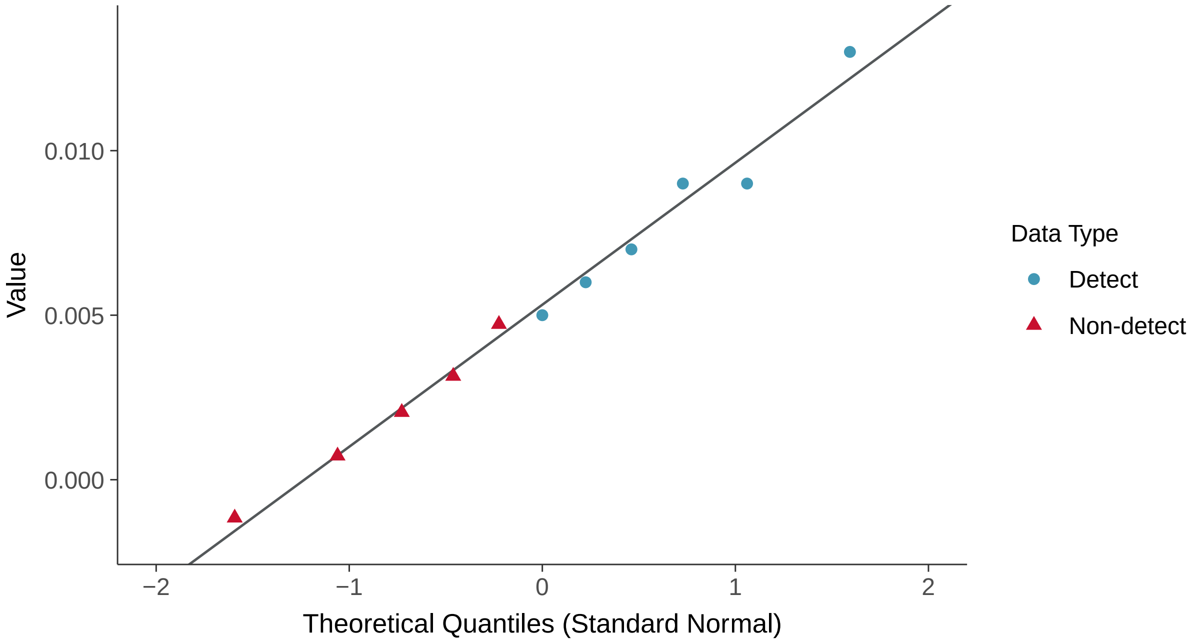
Boxplot by Season

Lithium, MW-8 (mg/L)



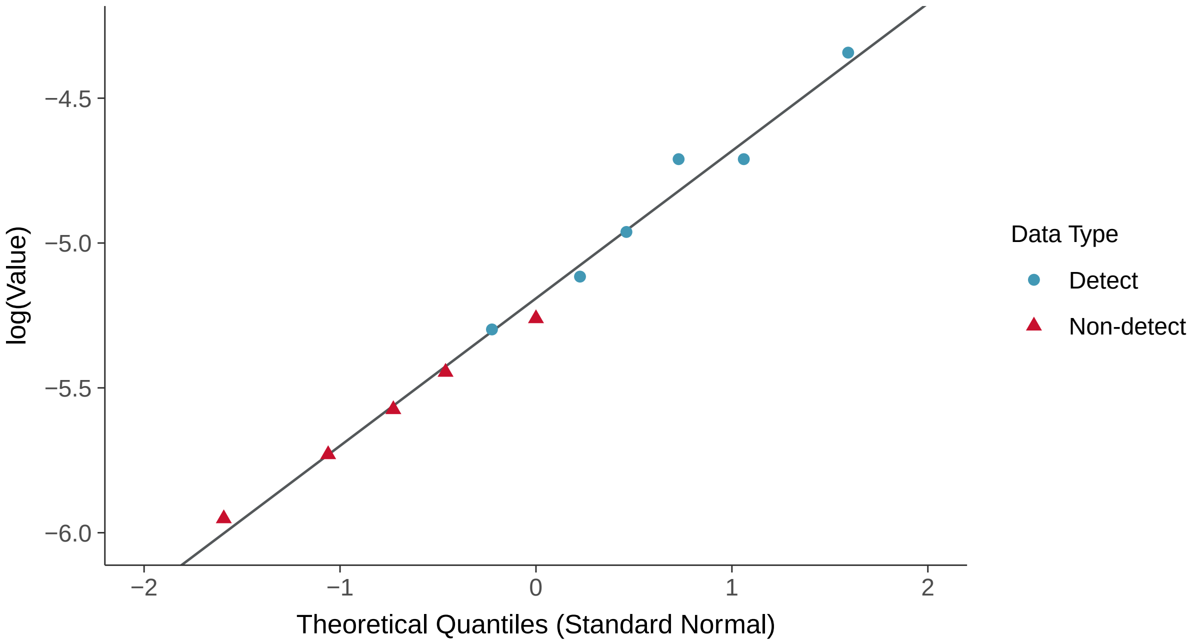
Normal Q-Q plot using ROS Imputed Estimates

Lithium, MW-8 (mg/L)



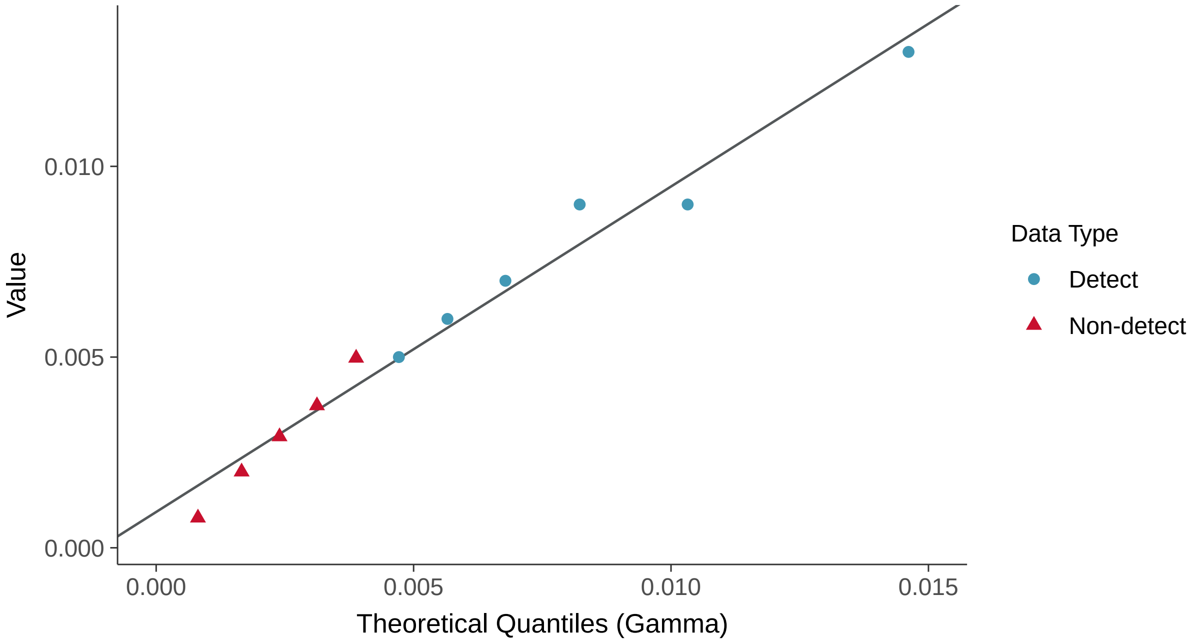
Lognormal Q-Q plot using ROS Imputed Estimates

Lithium, MW-8 (mg/L)



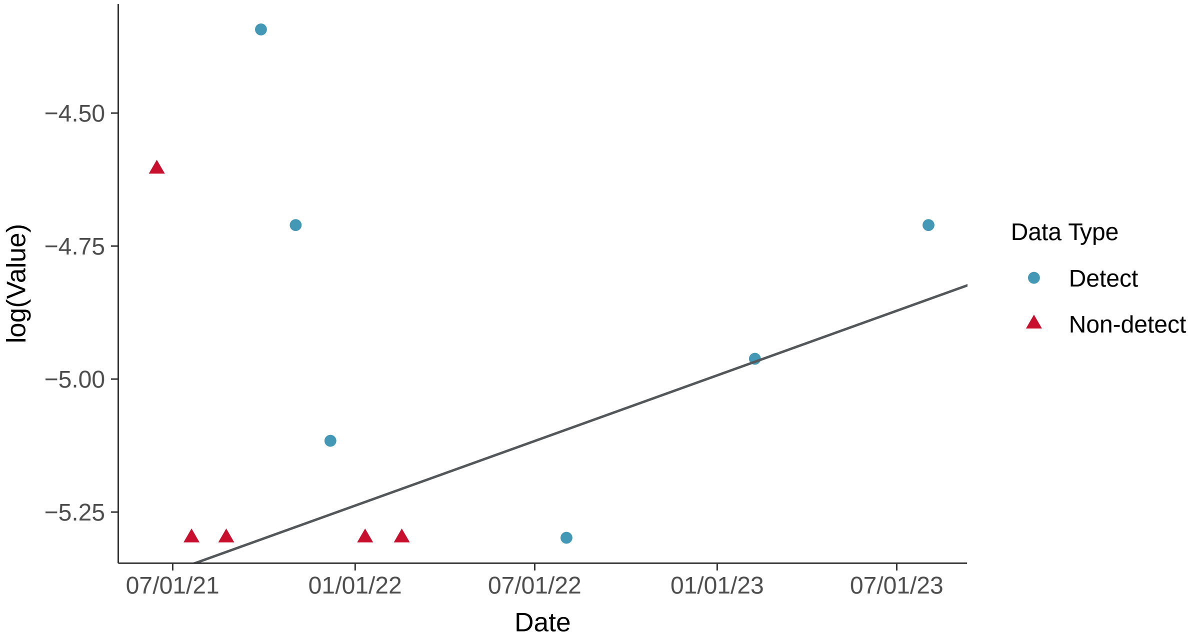
Gamma Q-Q plot using ROS Imputed Estimates

Lithium, MW-8 (mg/L)



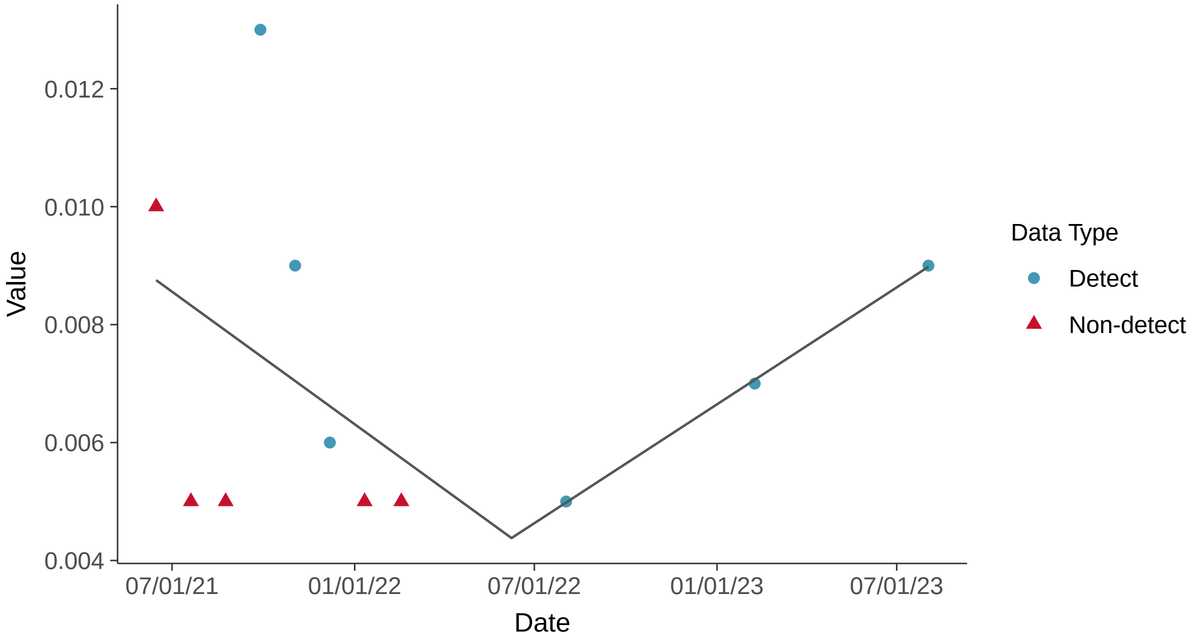
Trend Regression: Lognormal MLE

Lithium, MW-8 (mg/L)



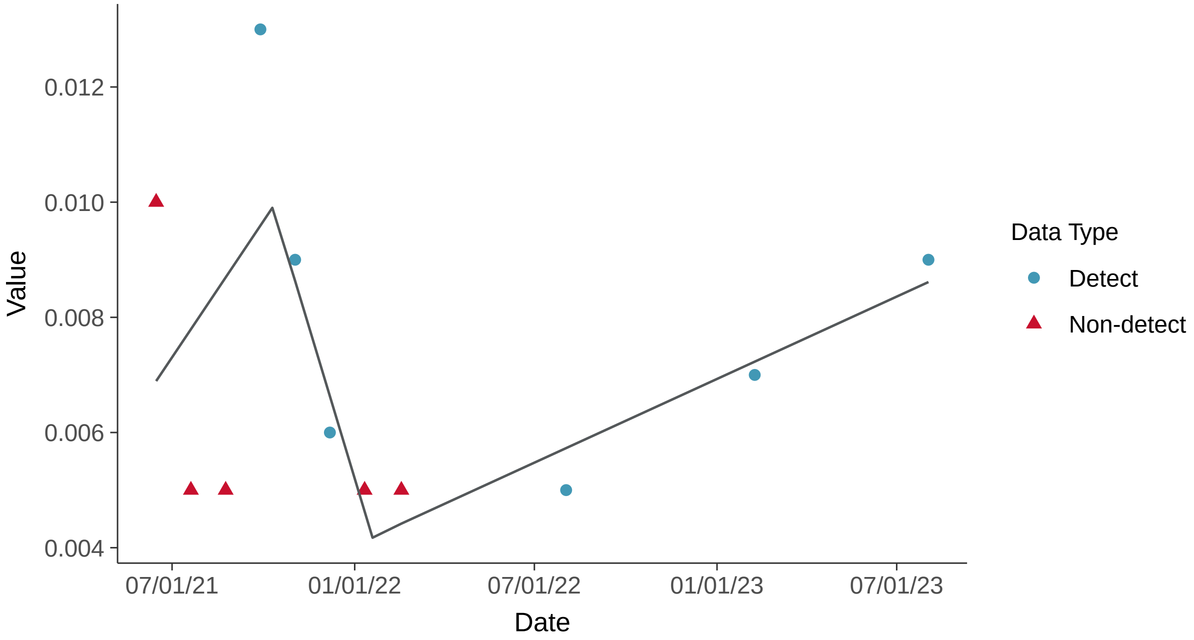
Trend Regression: Piecewise Linear-Linear

Lithium, MW-8 (mg/L)



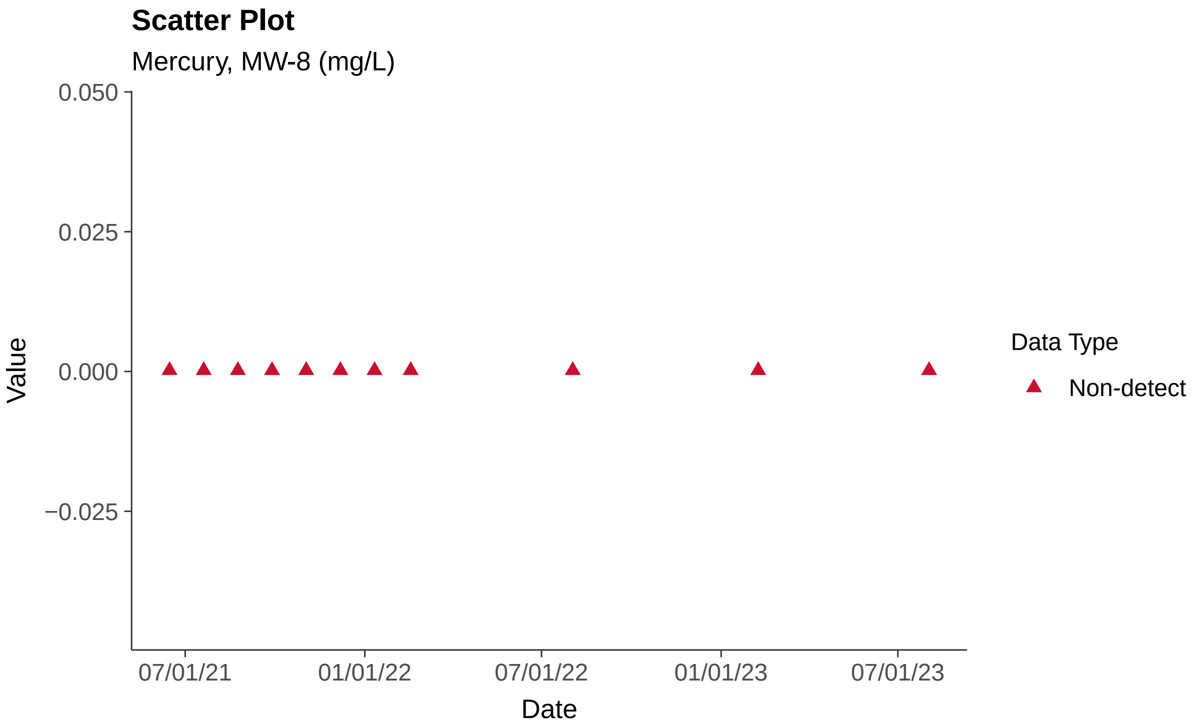
Trend Regression: Piecewise Linear-Linear-Linear

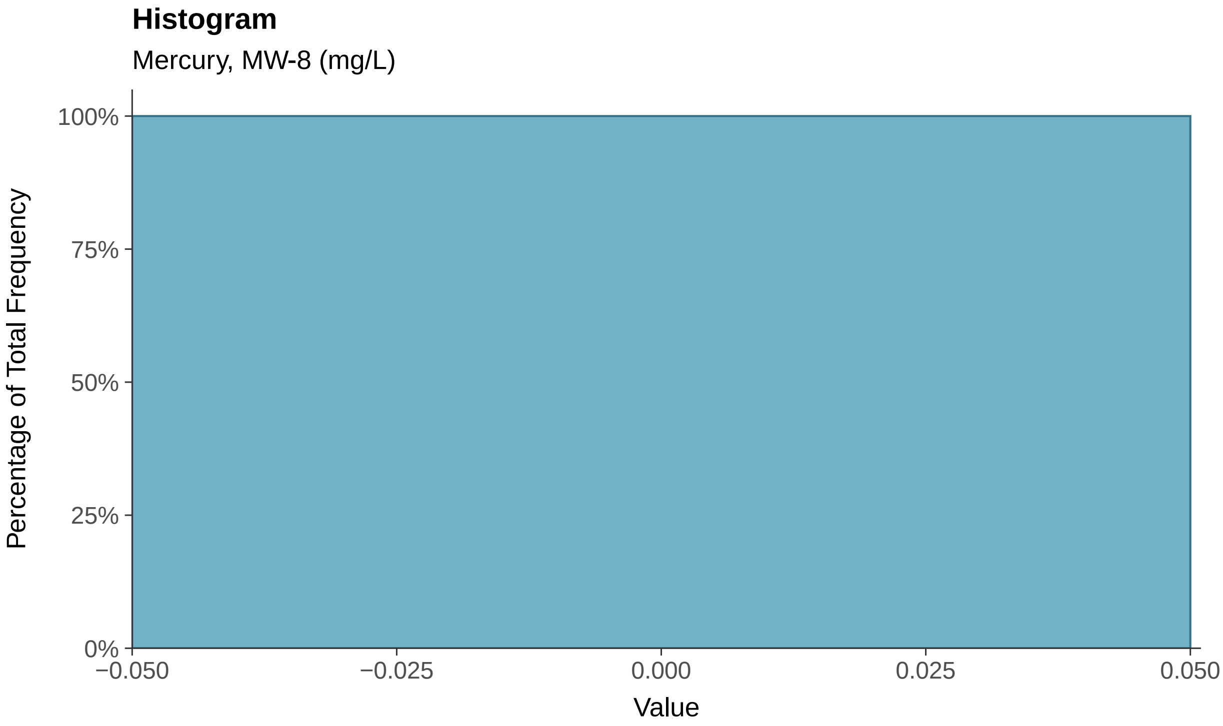
Lithium, MW-8 (mg/L)



Appendix IV: Mercury, MW-8

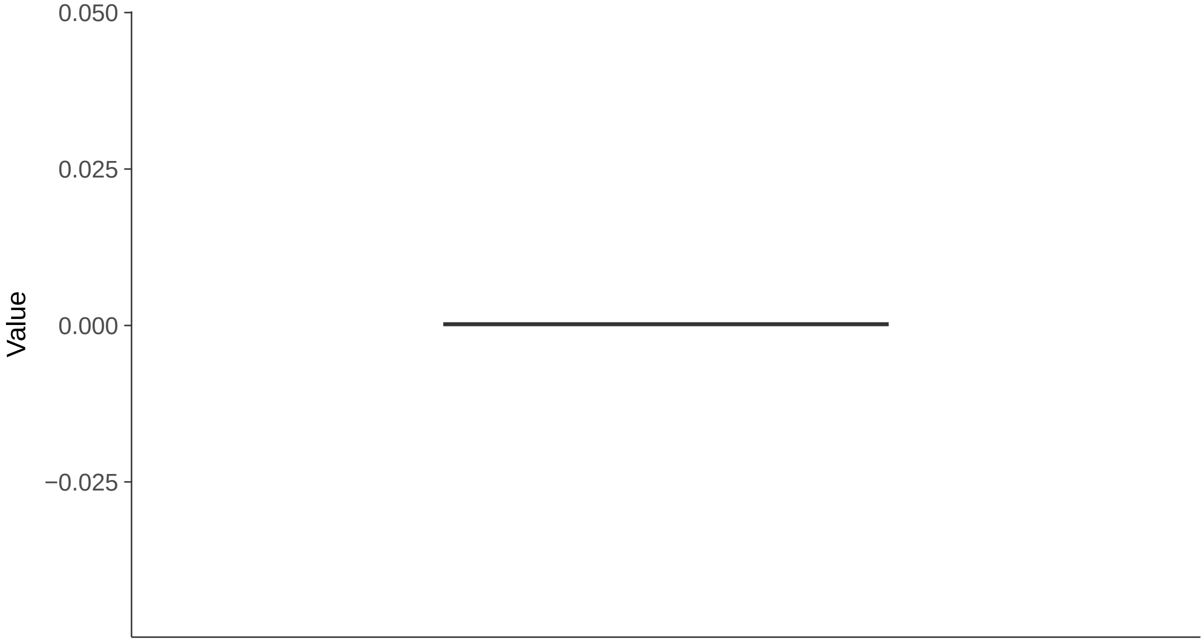
ID: 08_2_17





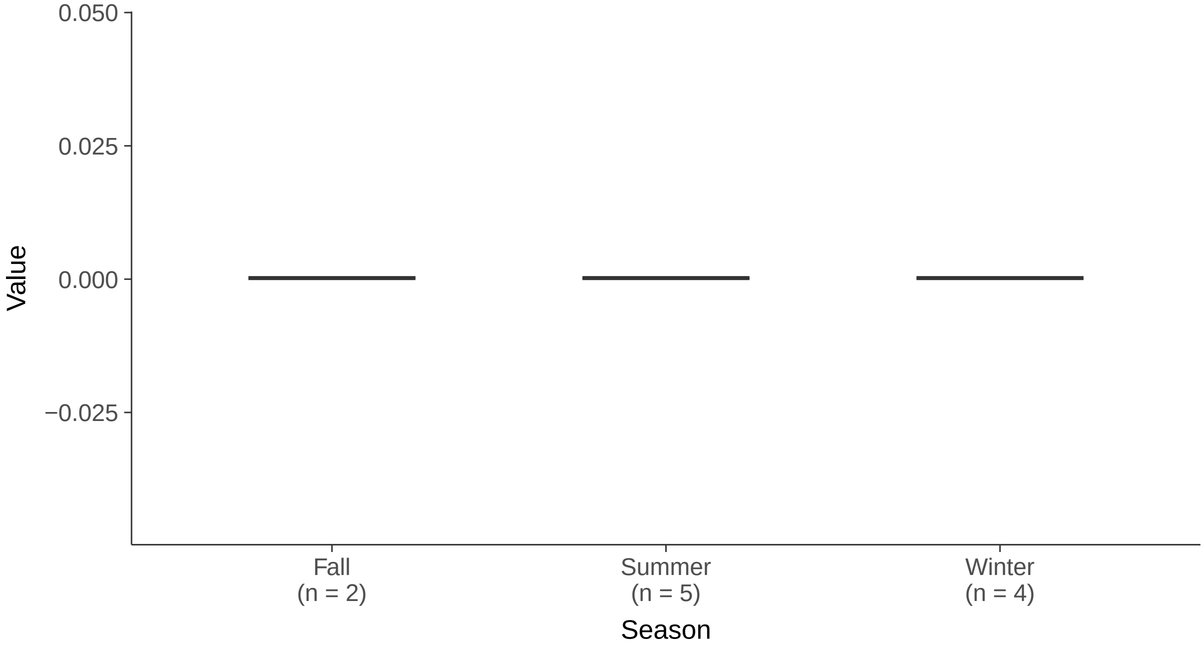
Boxplot

Mercury, MW-8 (mg/L)



Boxplot by Season

Mercury, MW-8 (mg/L)

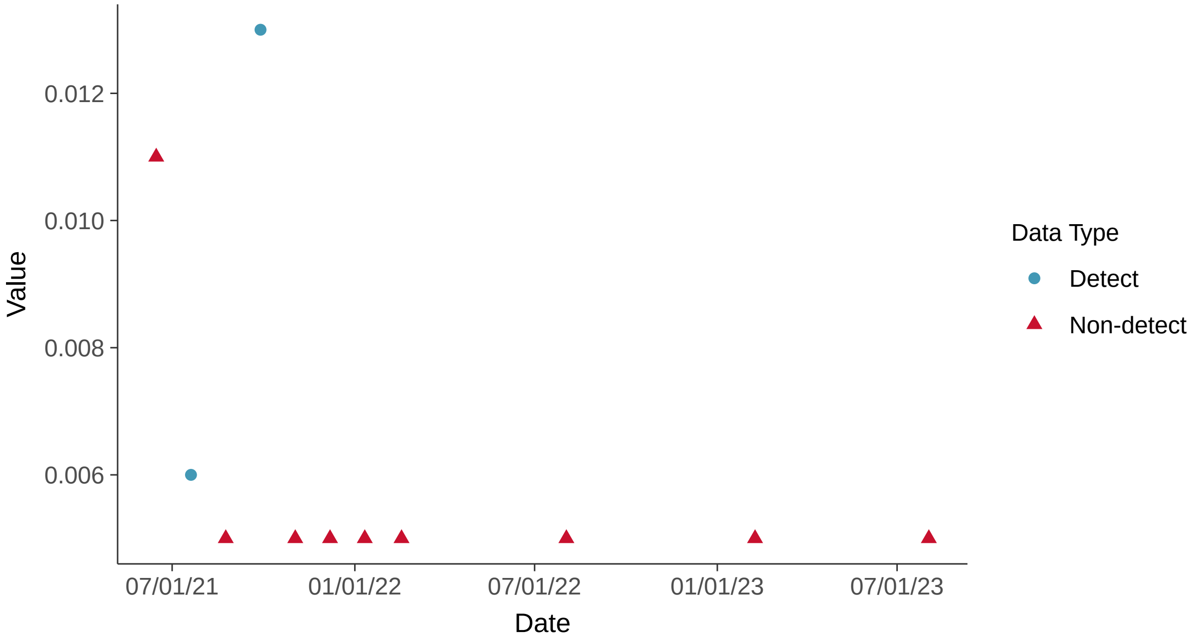


Appendix IV: Molybdenum, MW-8

ID: 08_2_18

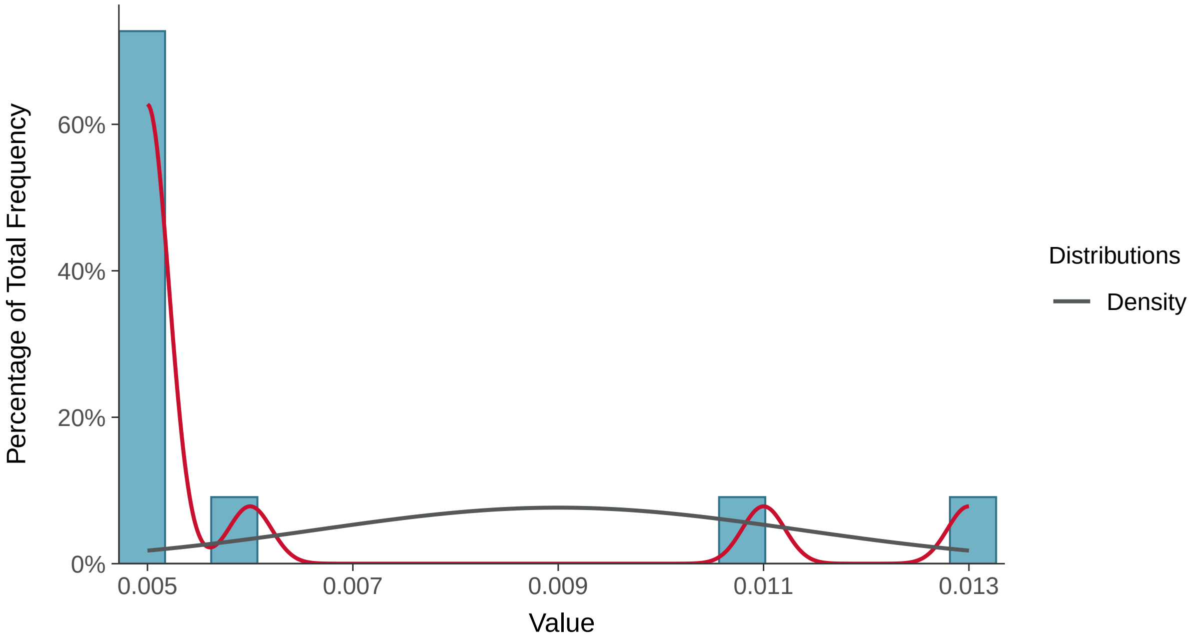
Scatter Plot

Molybdenum, MW-8 (mg/L)



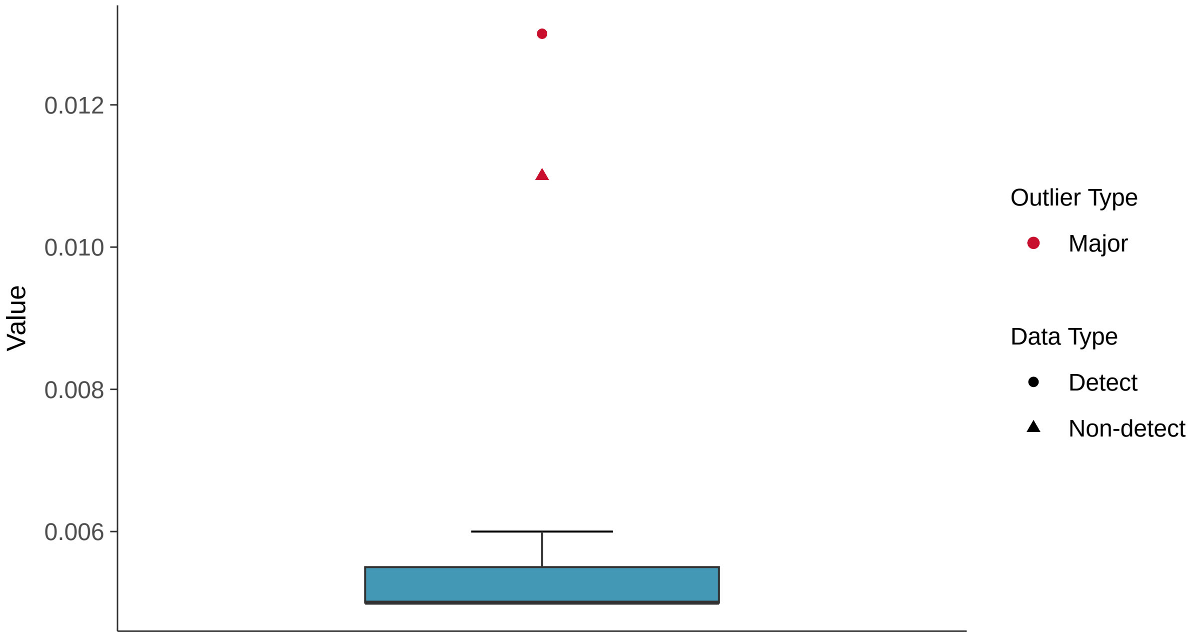
Histogram

Molybdenum, MW-8 (mg/L)



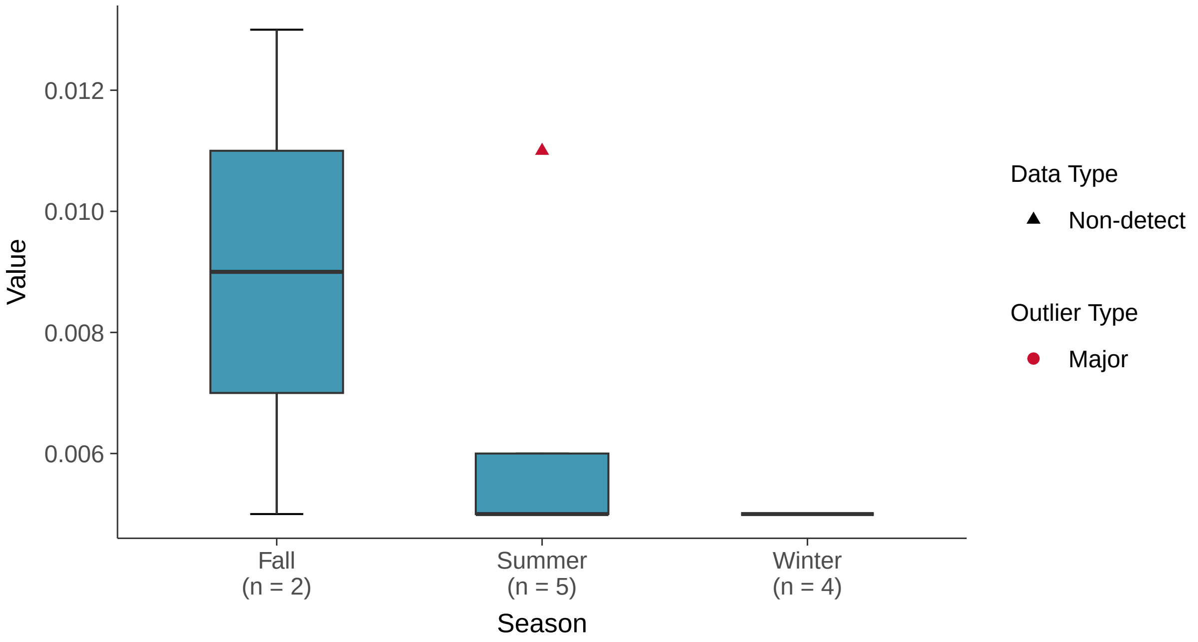
Boxplot

Molybdenum, MW-8 (mg/L)



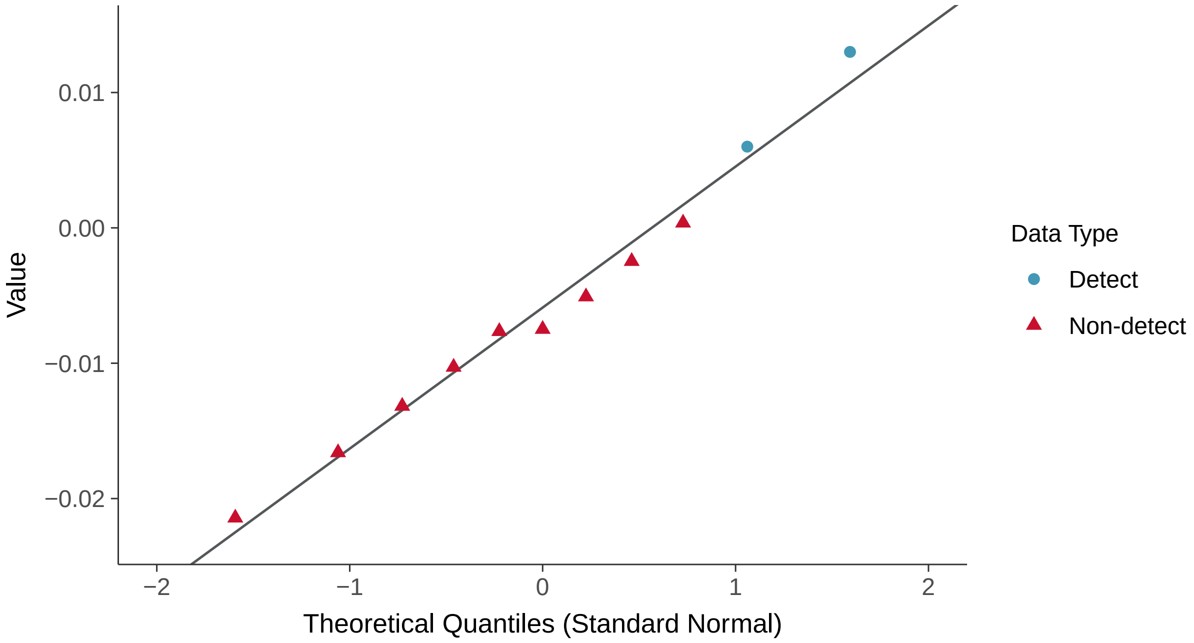
Boxplot by Season

Molybdenum, MW-8 (mg/L)



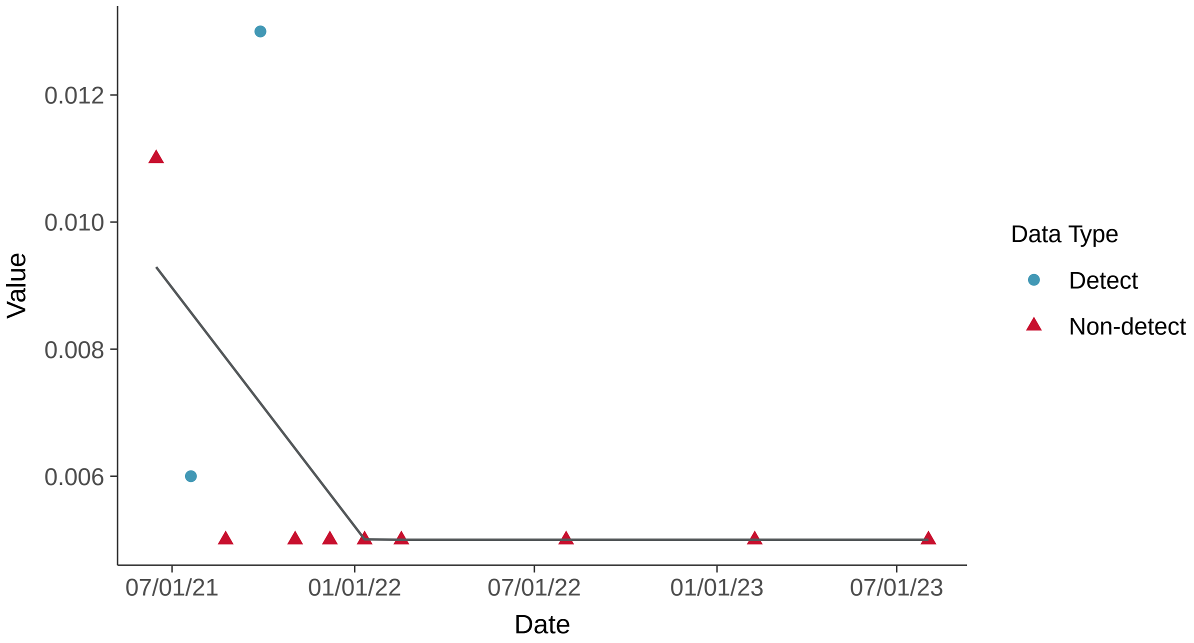
Normal Q-Q plot using ROS Imputed Estimates

Molybdenum, MW-8 (mg/L)



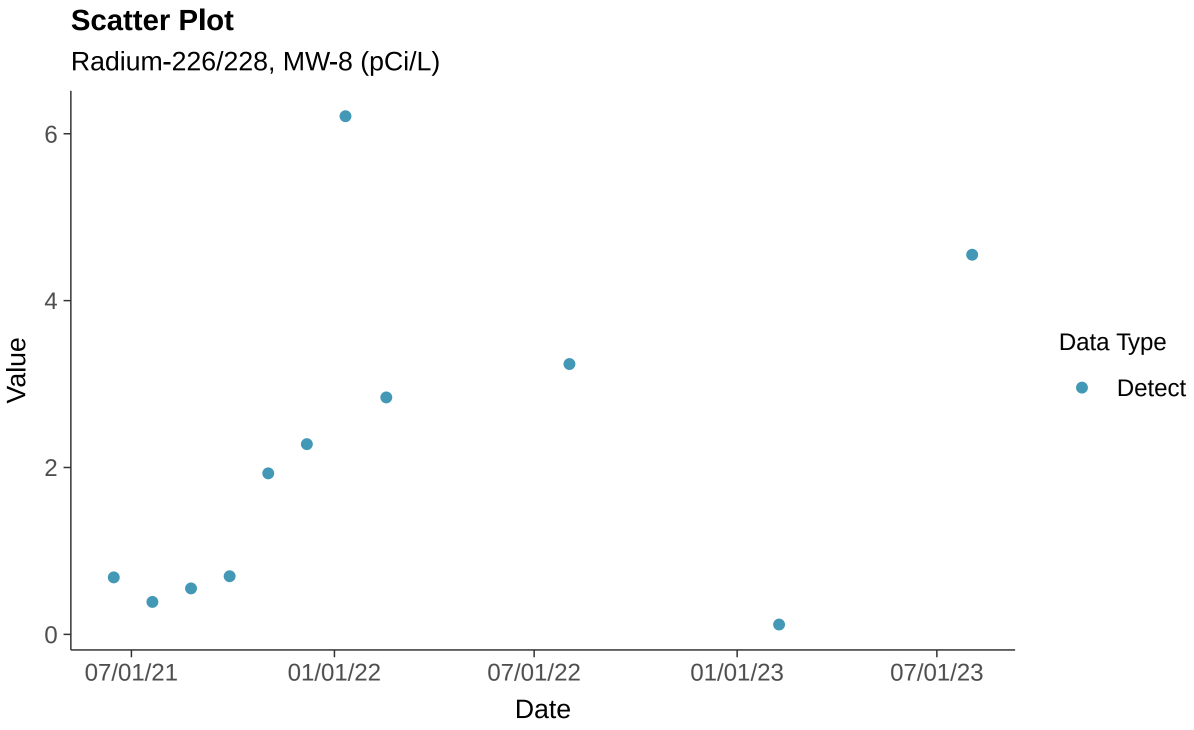
Trend Regression: Piecewise Linear-Linear

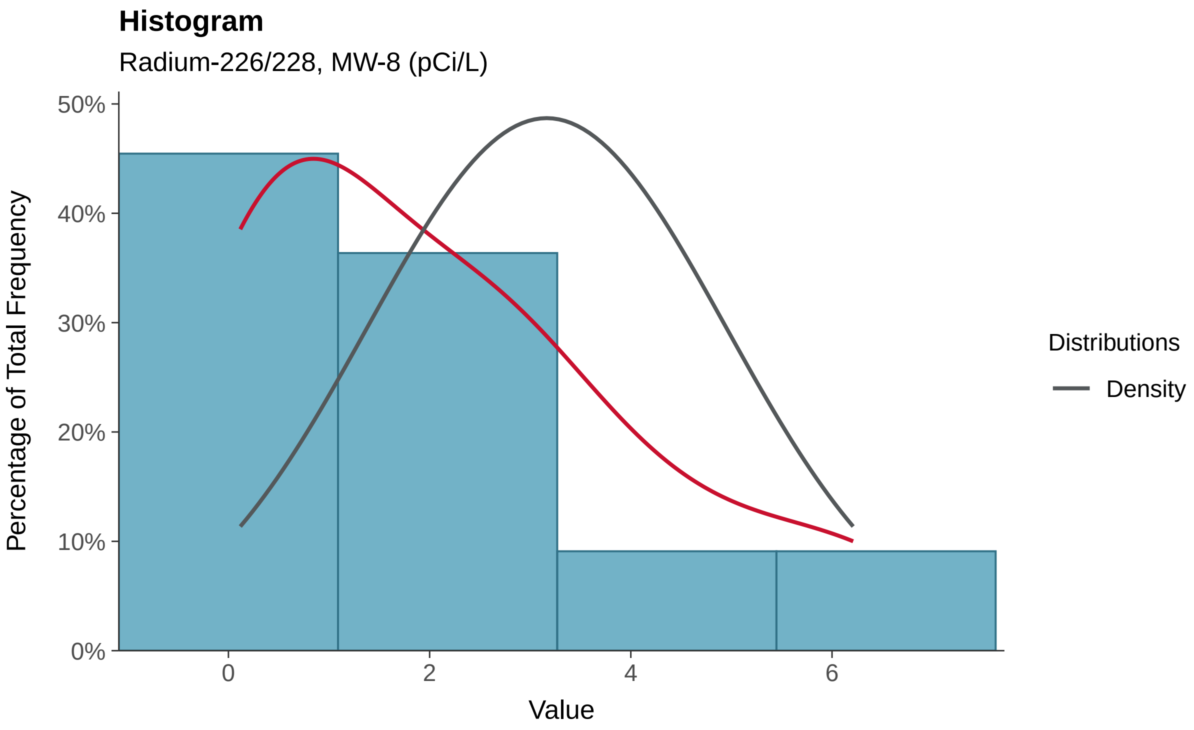
Molybdenum, MW-8 (mg/L)



Appendix IV: Radium-226/228, MW-8

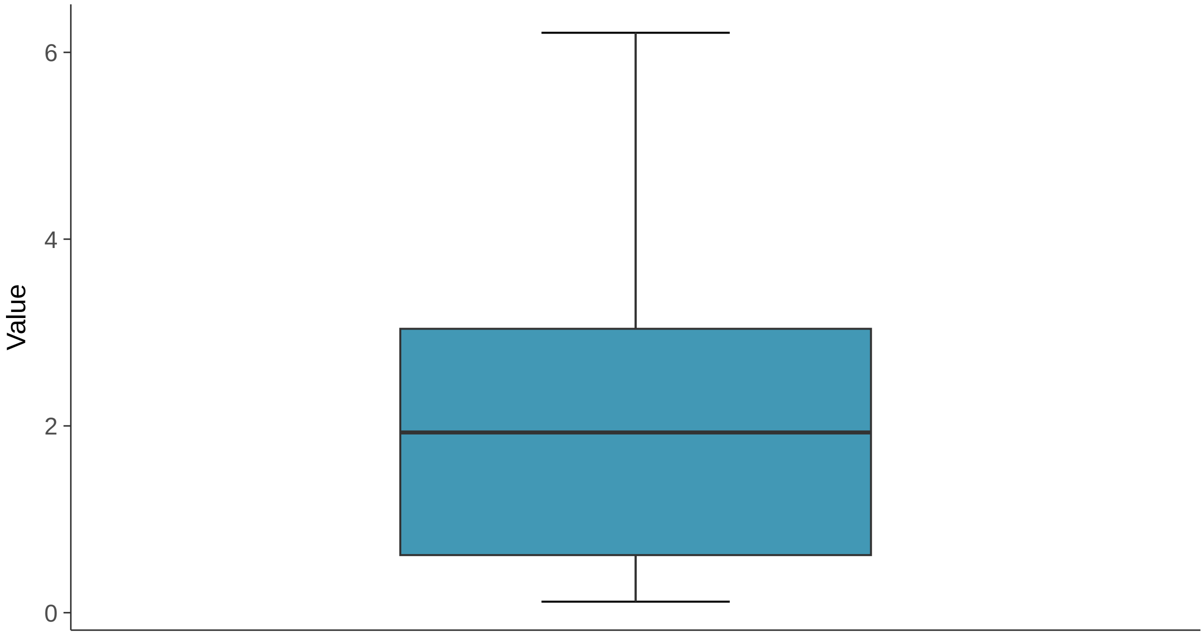
ID: 08_2_20





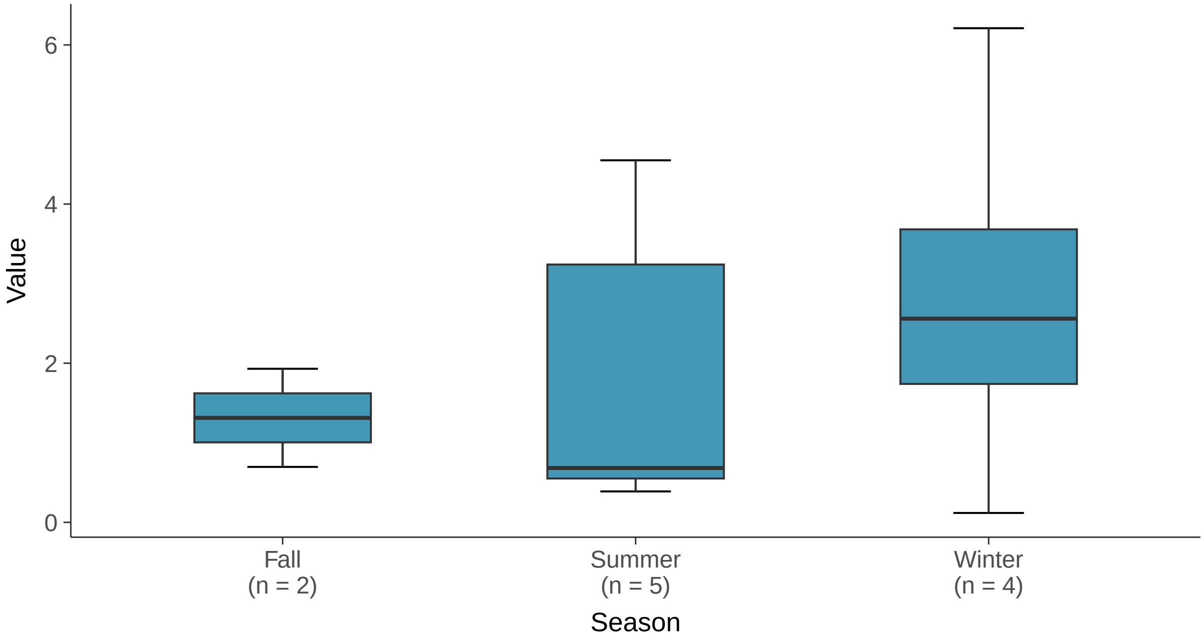
Boxplot

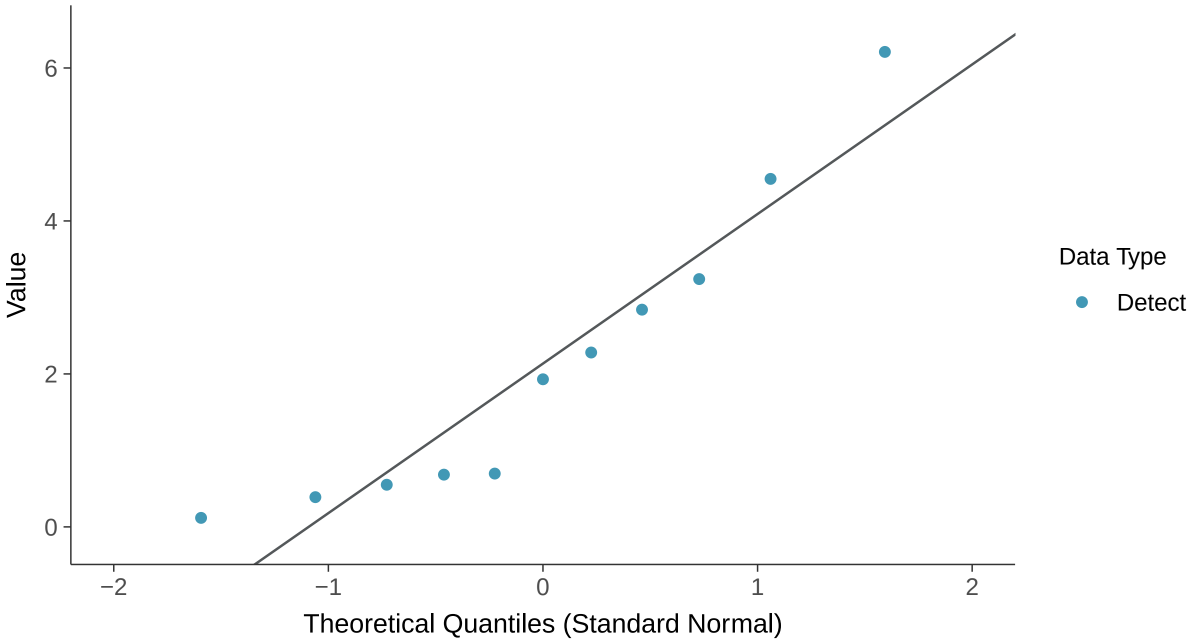
Radium-226/228, MW-8 (pCi/L)



Boxplot by Season

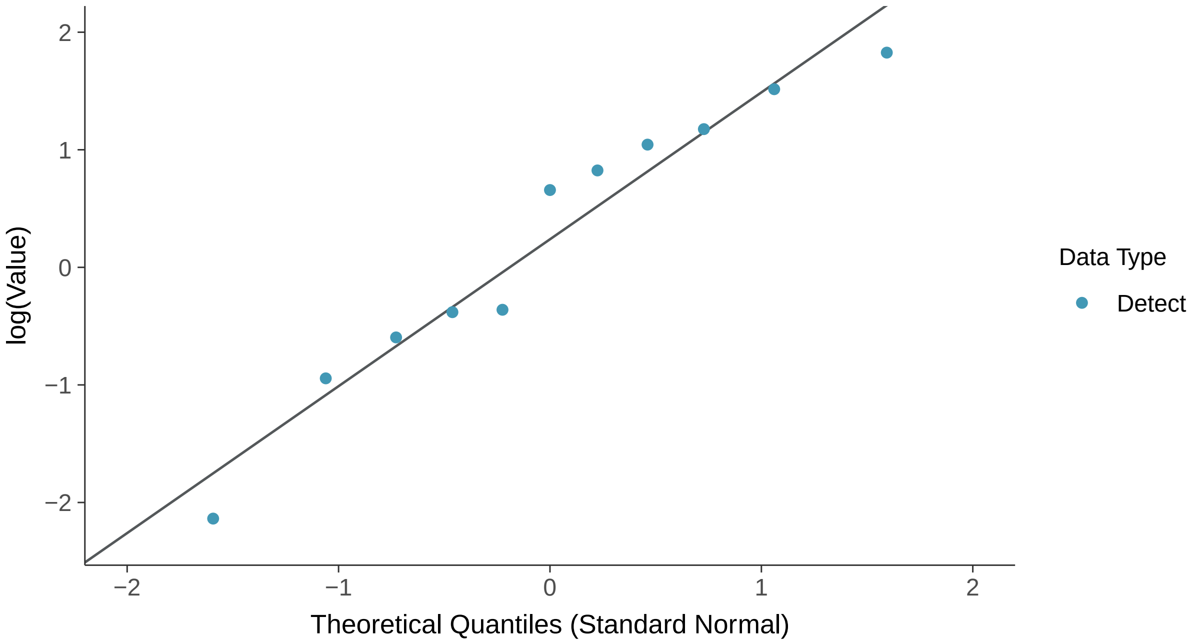
Radium-226/228, MW-8 (pCi/L)





Normal Q-Q plot

Radium-226/228, MW-8 (pCi/L)

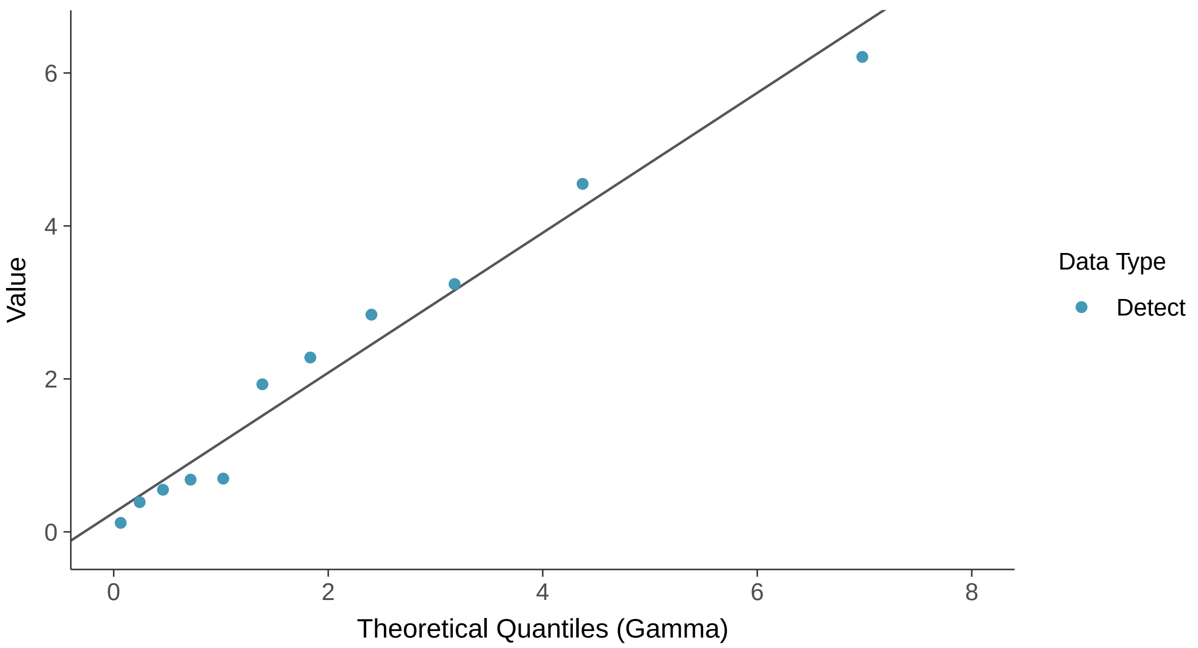


Lognormal Q-Q plot

Radium-226/228, MW-8 (pCi/L)

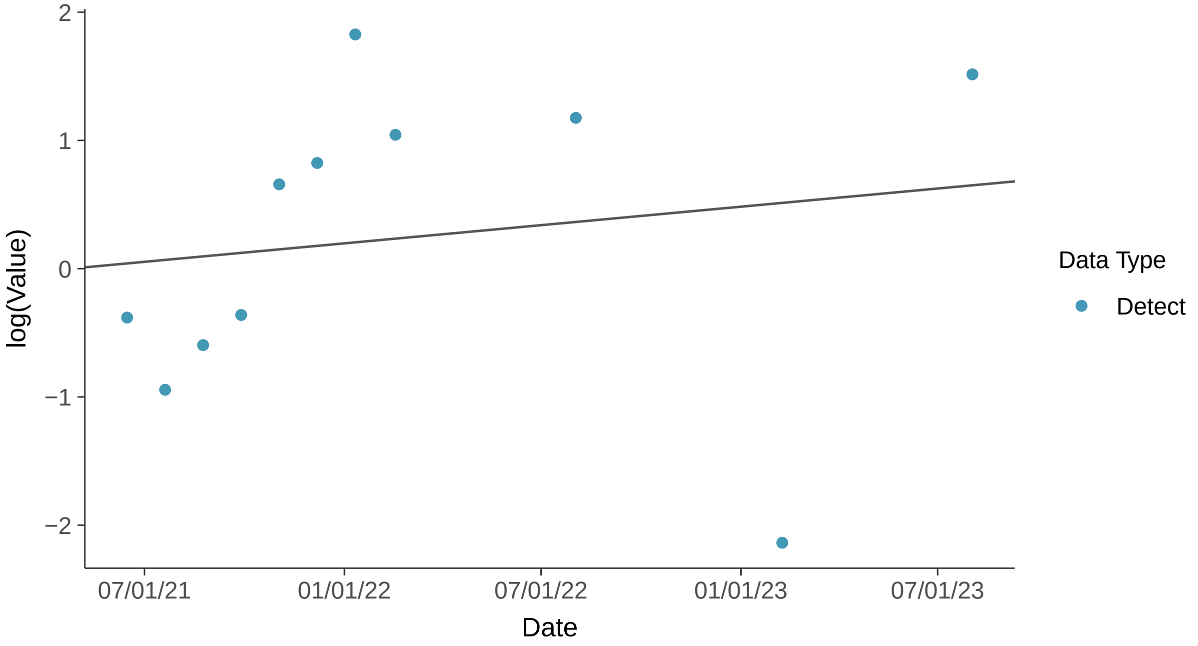
Gamma Q-Q plot

Radium-226/228, MW-8 (pCi/L)



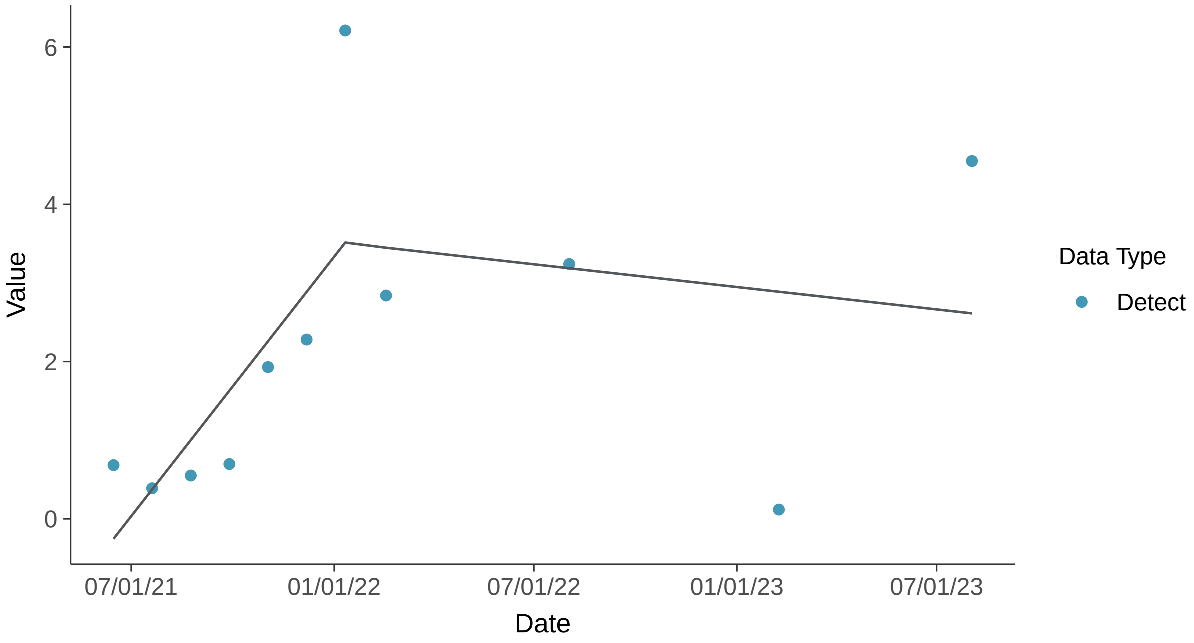
Trend Regression: Lognormal MLE

Radium-226/228, MW-8 (pCi/L)



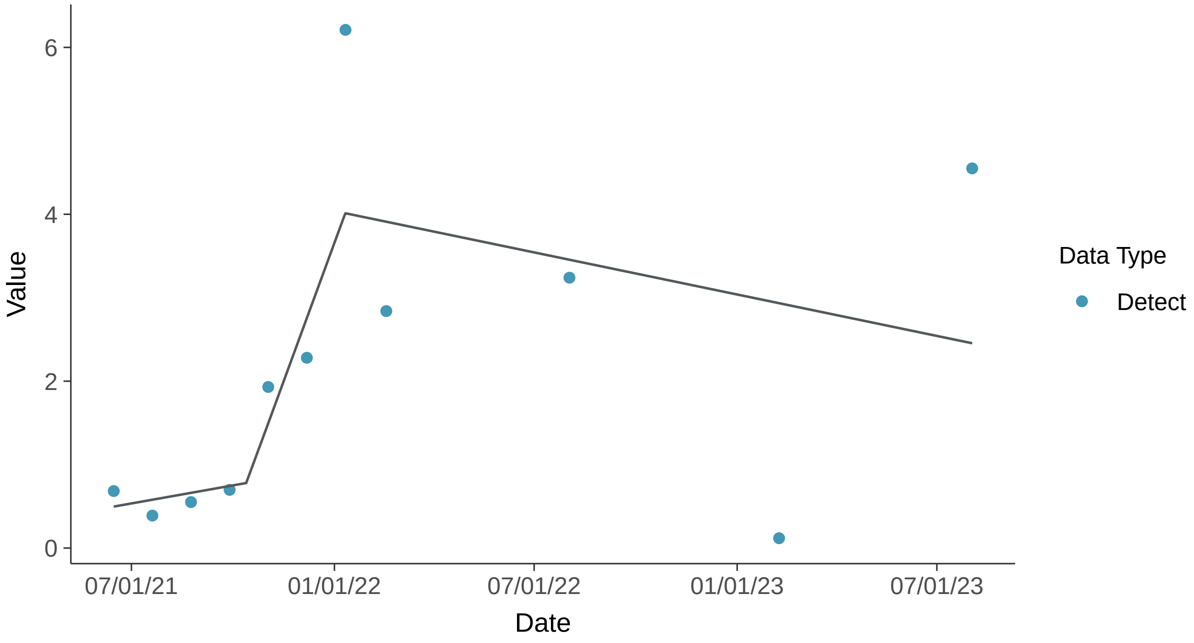
Trend Regression: Piecewise Linear-Linear

Radium-226/228, MW-8 (pCi/L)



Trend Regression: Piecewise Linear-Linear-Linear

Radium-226/228, MW-8 (pCi/L)

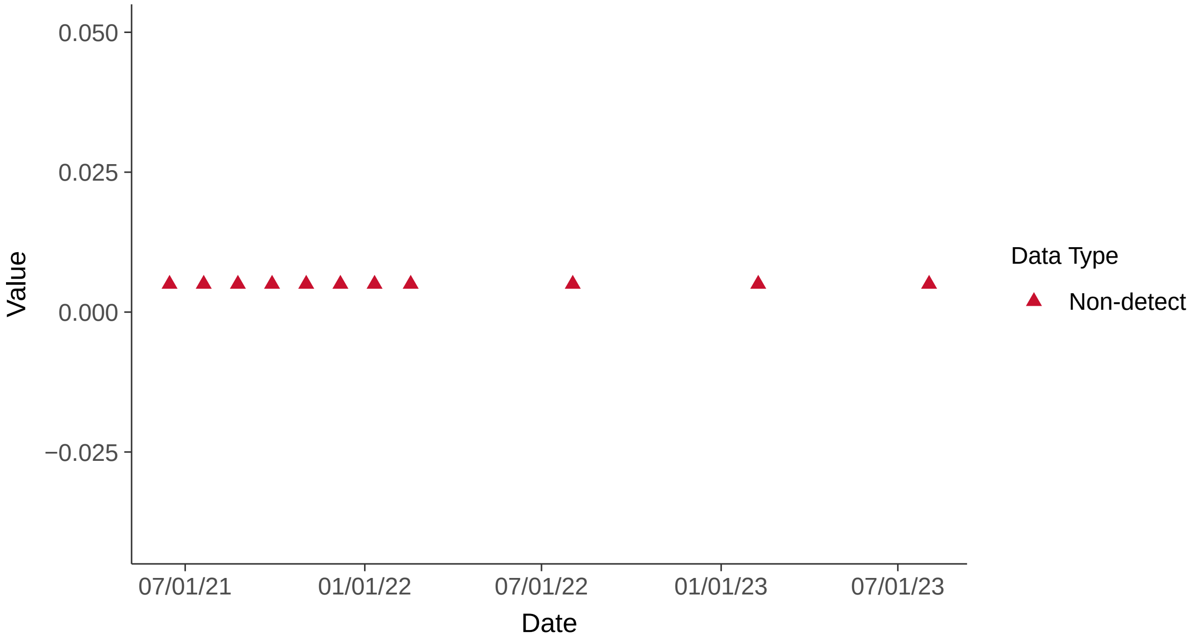


Appendix IV: Selenium, MW-8

ID: 08_2_22

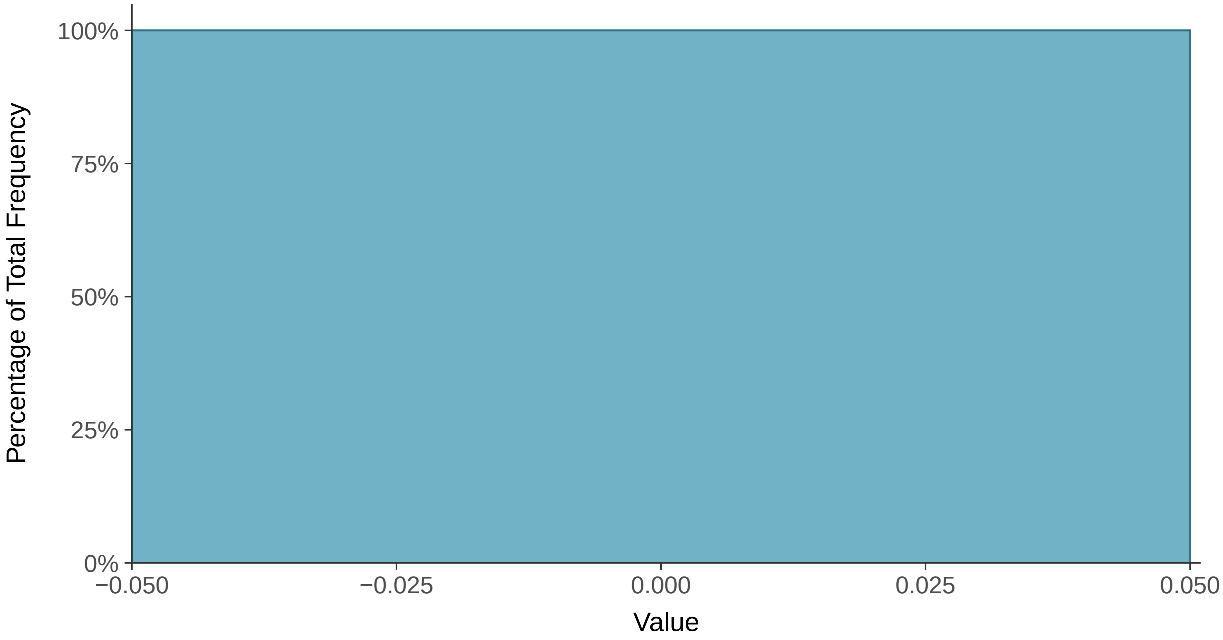
Scatter Plot

Selenium, MW-8 (mg/L)



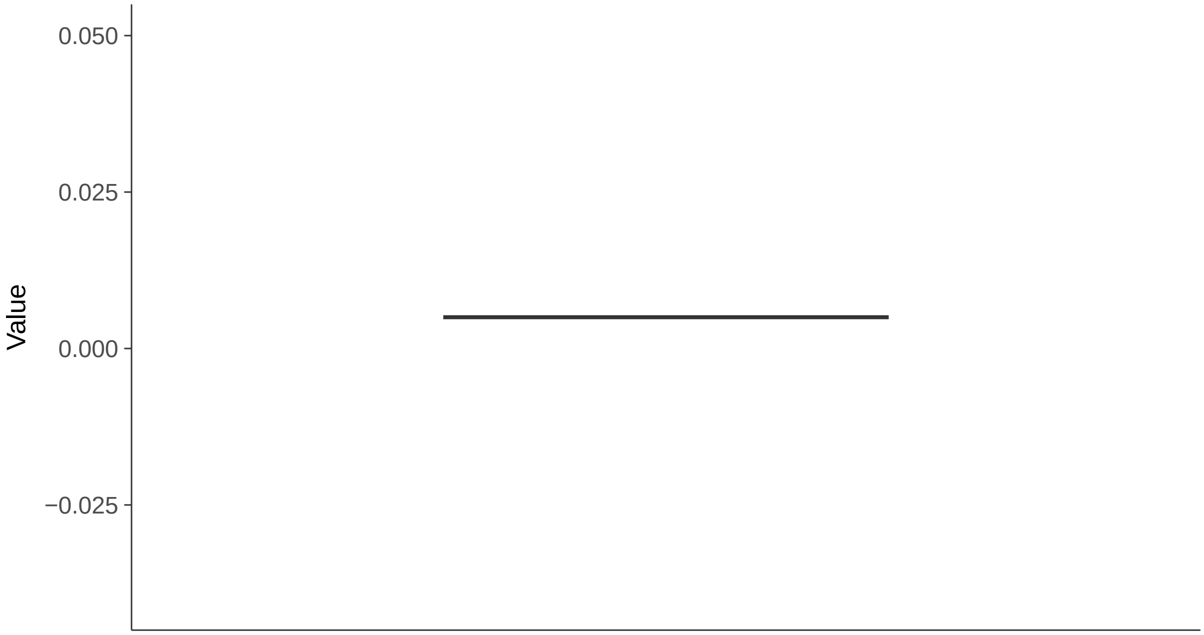
Histogram

Selenium, MW-8 (mg/L)



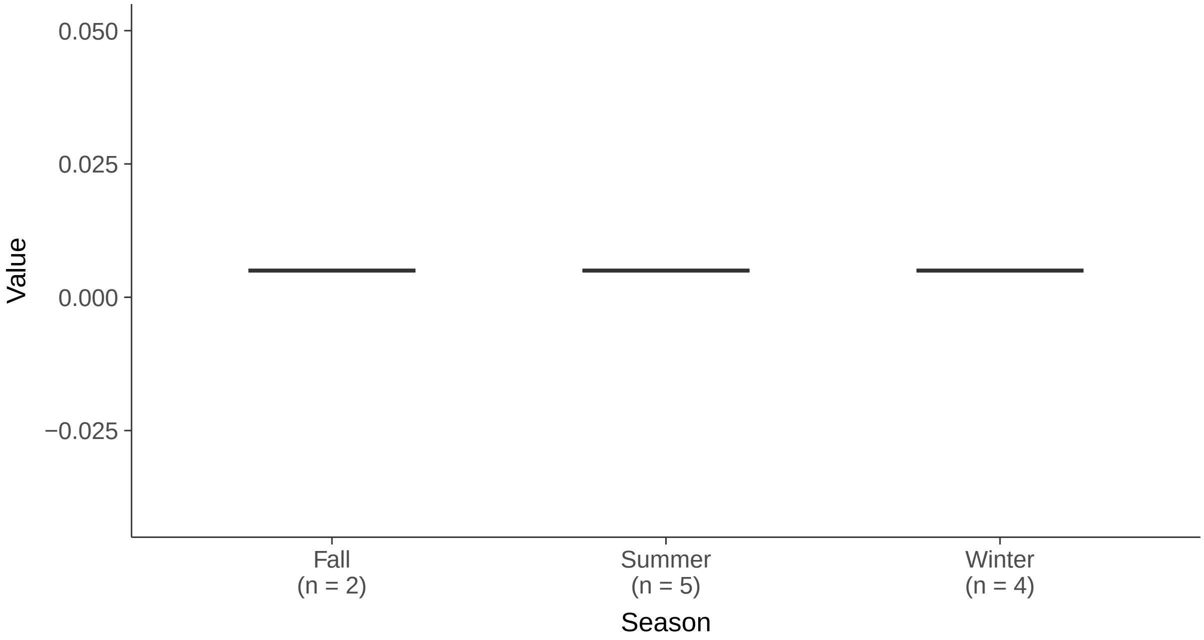
Boxplot

Selenium, MW-8 (mg/L)



Boxplot by Season

Selenium, MW-8 (mg/L)

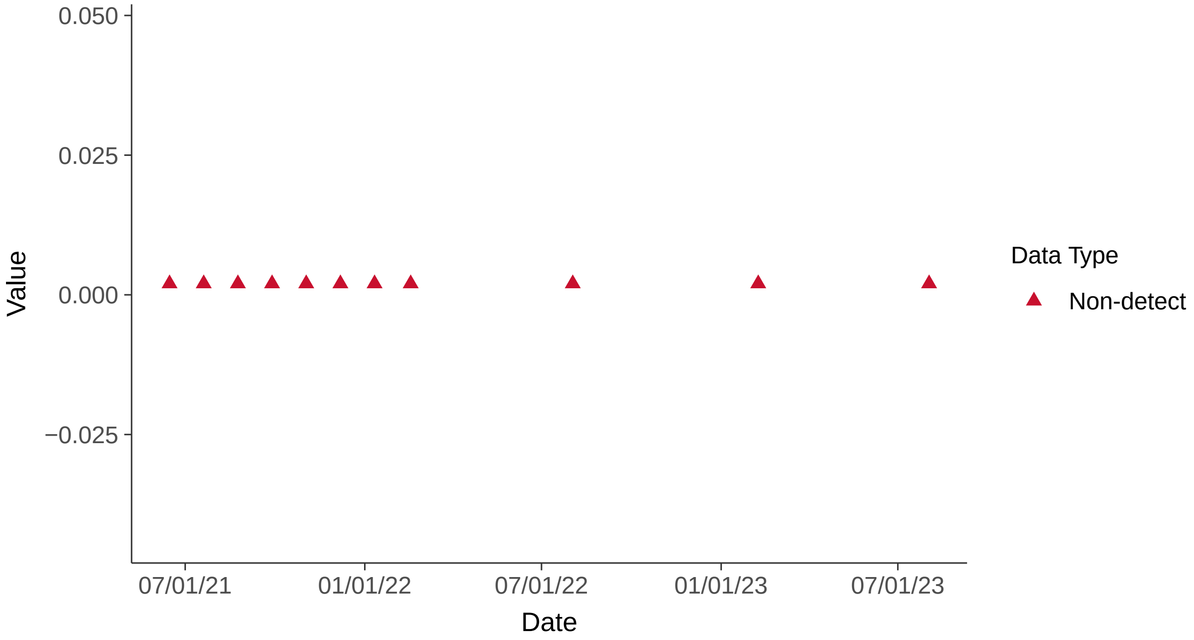


Appendix IV: Thallium, MW-8

ID: 08_2_23

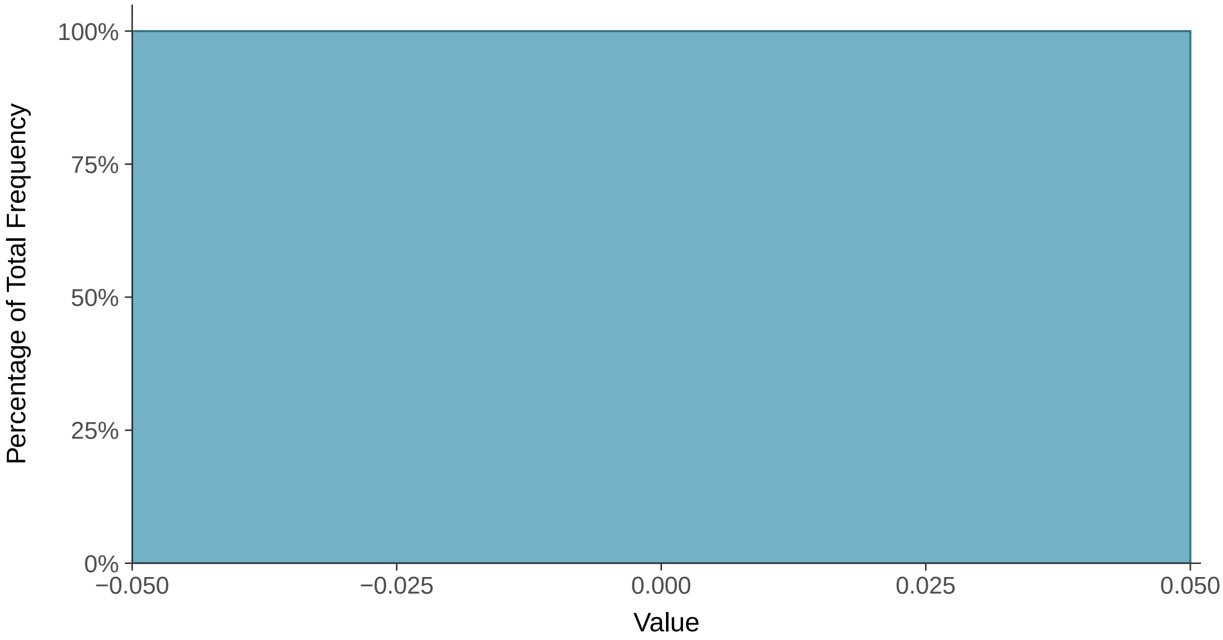
Scatter Plot

Thallium, MW-8 (mg/L)



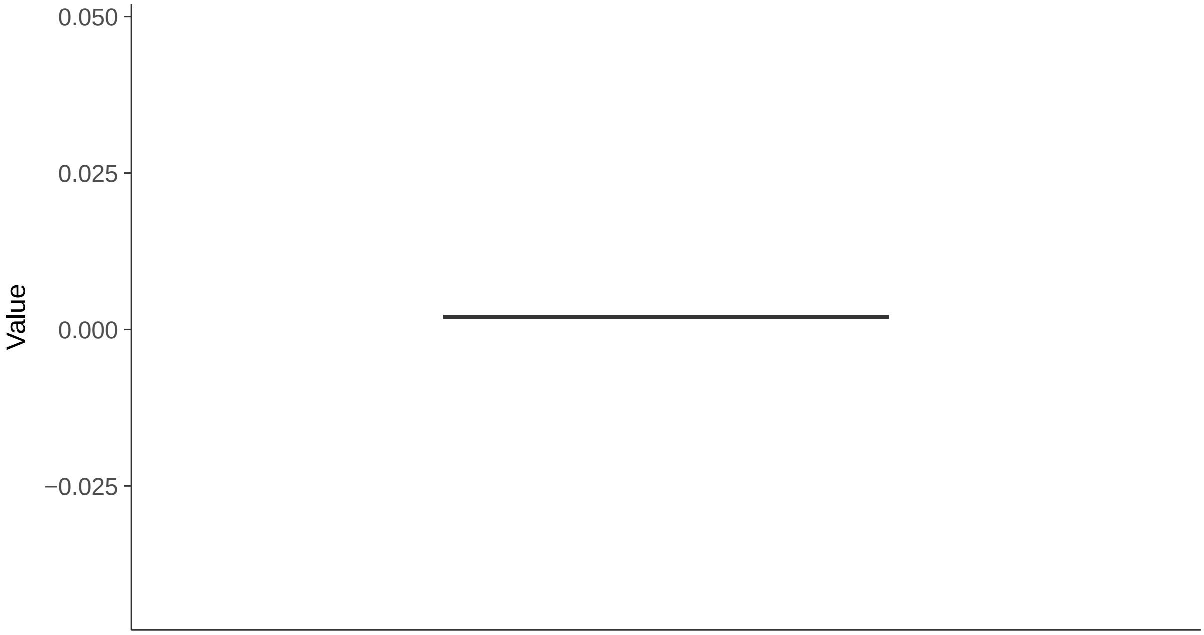
Histogram

Thallium, MW-8 (mg/L)



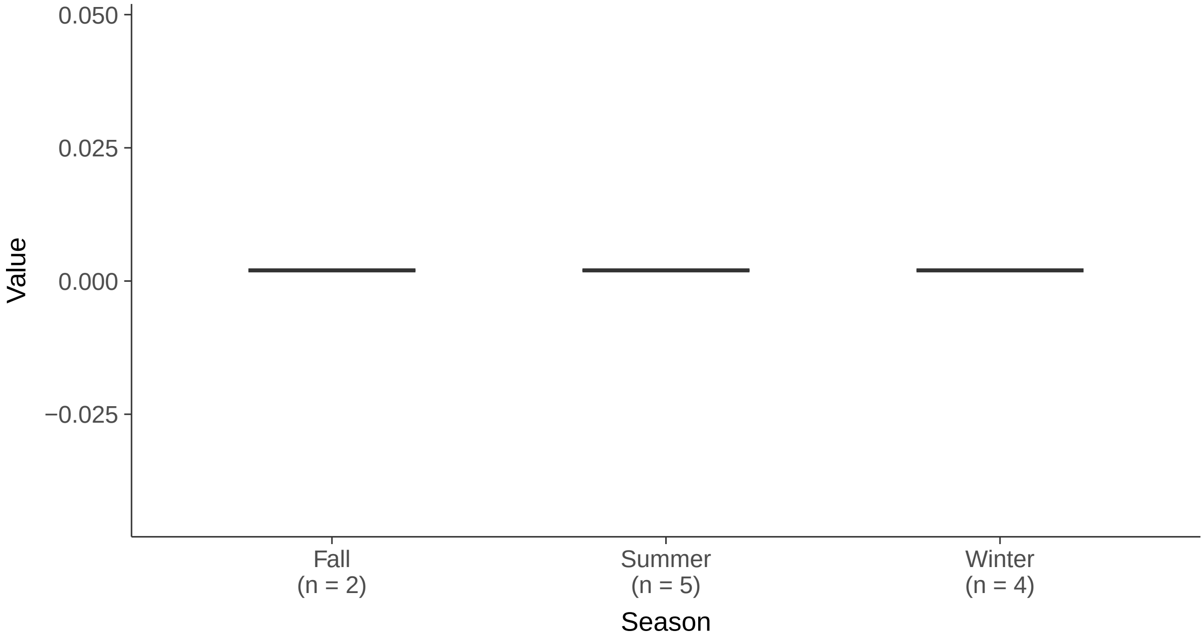
Boxplot

Thallium, MW-8 (mg/L)



Boxplot by Season

Thallium, MW-8 (mg/L)

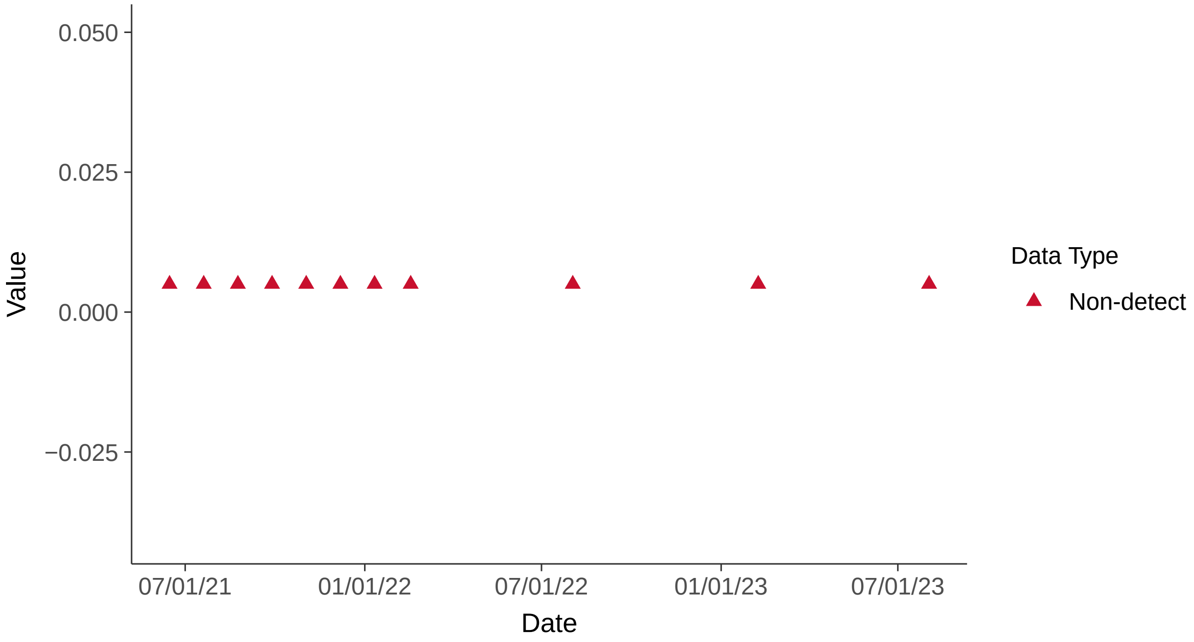


Part 115: Copper, MW-8

ID: 08_5_37

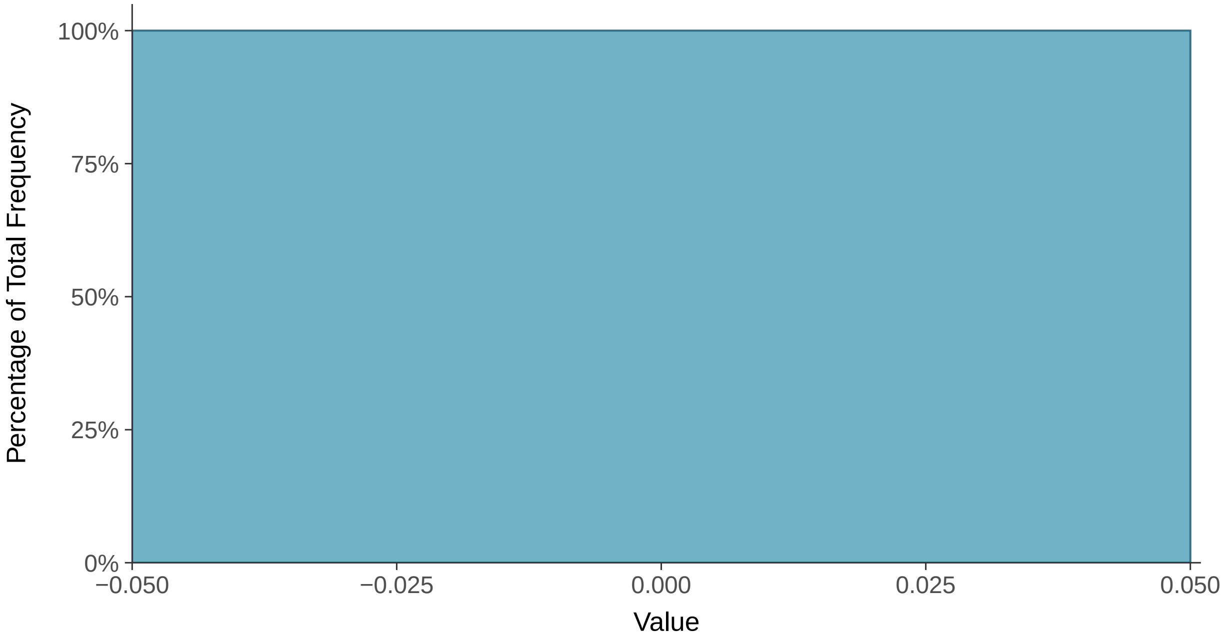
Scatter Plot

Copper, MW-8 (mg/L)



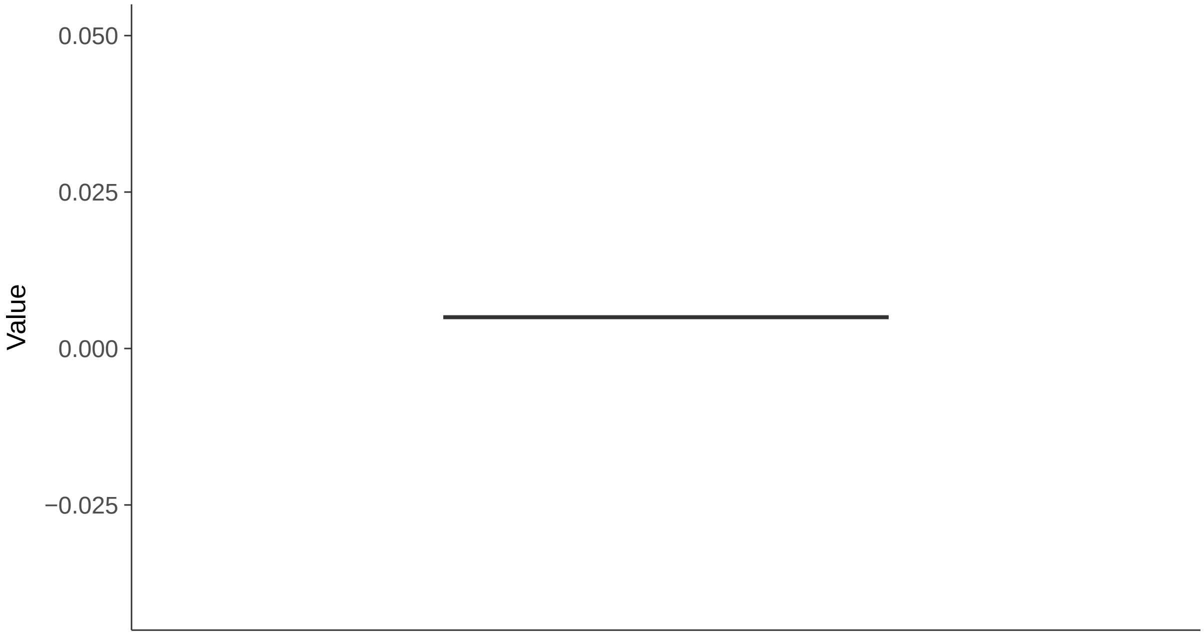
Histogram

Copper, MW-8 (mg/L)



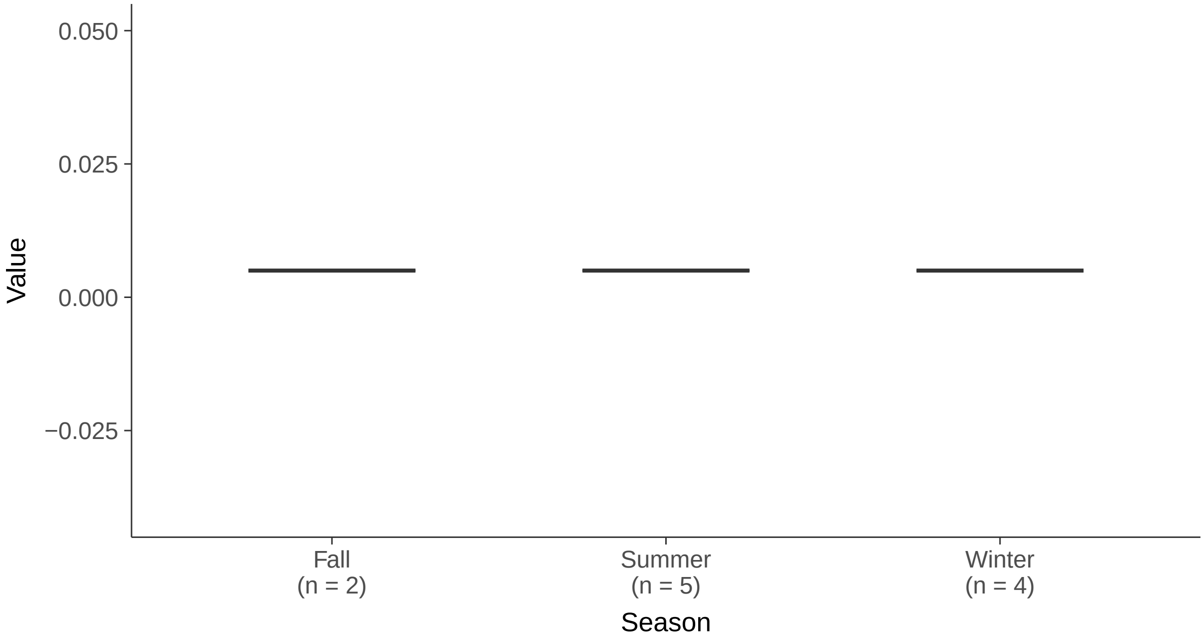
Boxplot

Copper, MW-8 (mg/L)



Boxplot by Season

Copper, MW-8 (mg/L)

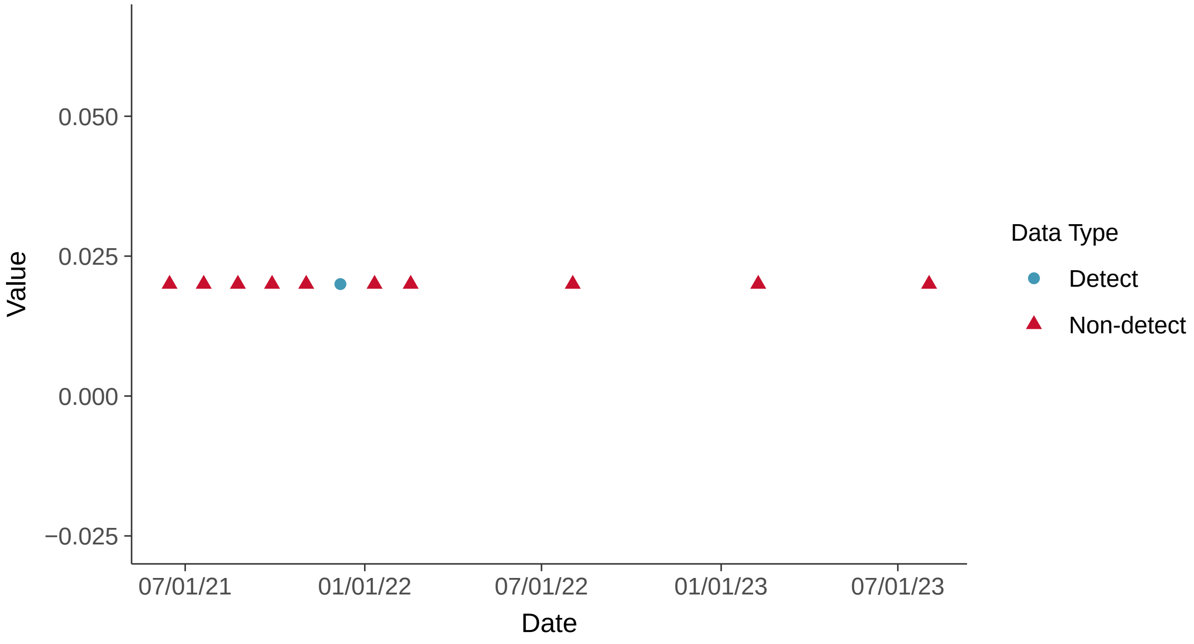


Part 115: Iron, MW-8

ID: 08_5_38

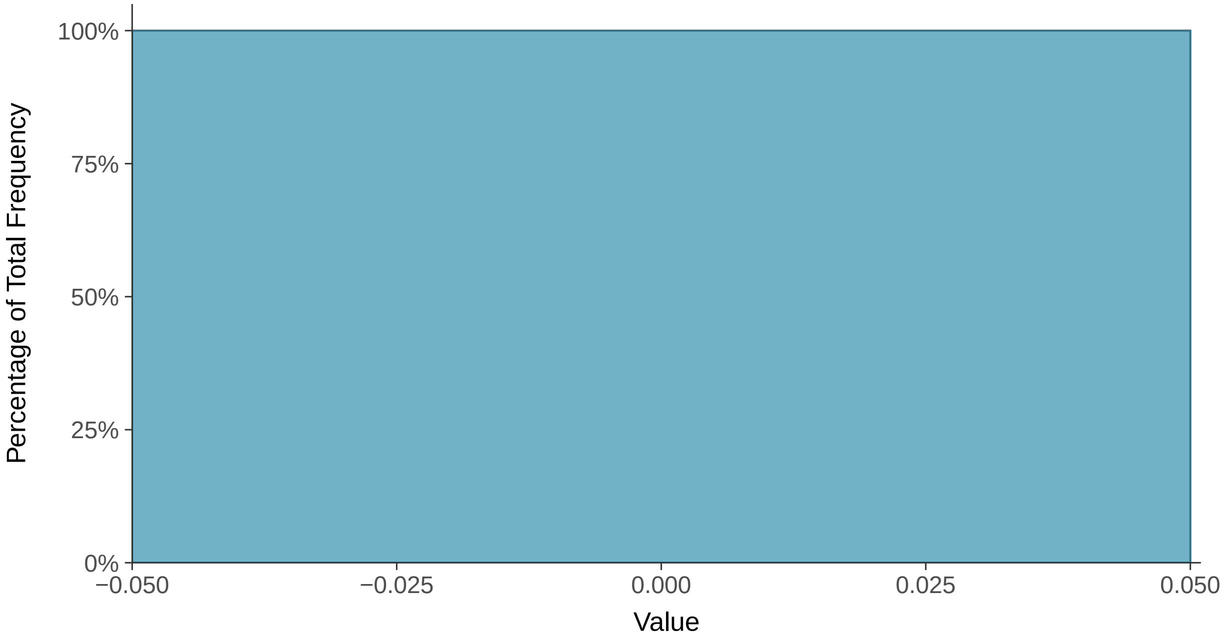
Scatter Plot

Iron, MW-8 (mg/L)



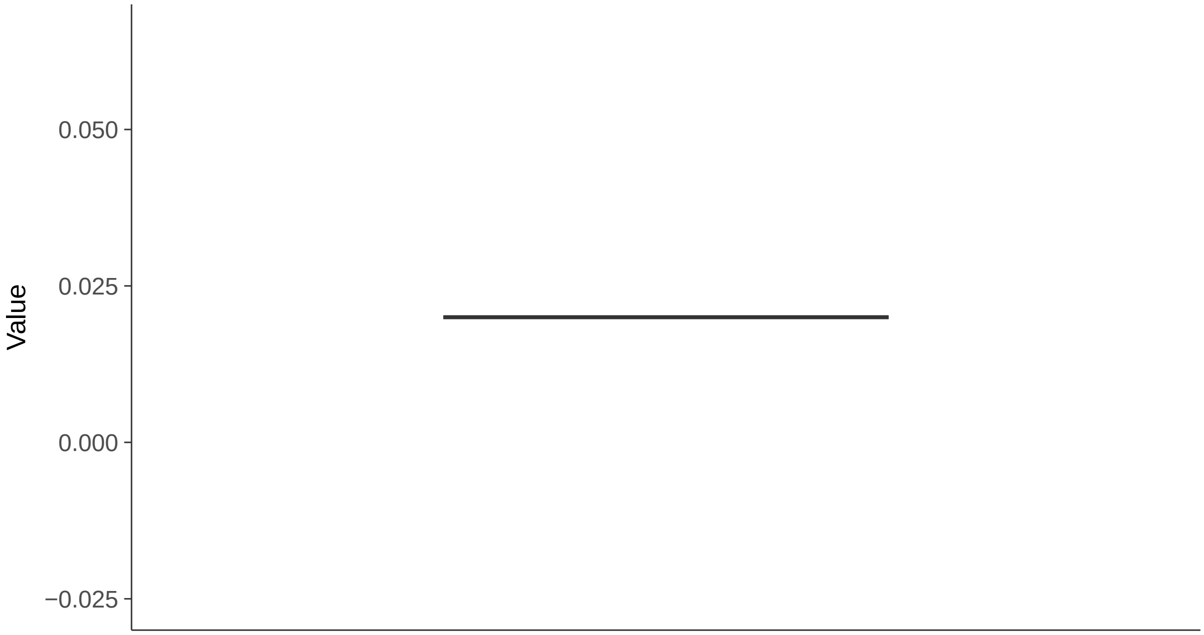
Histogram

Iron, MW-8 (mg/L)



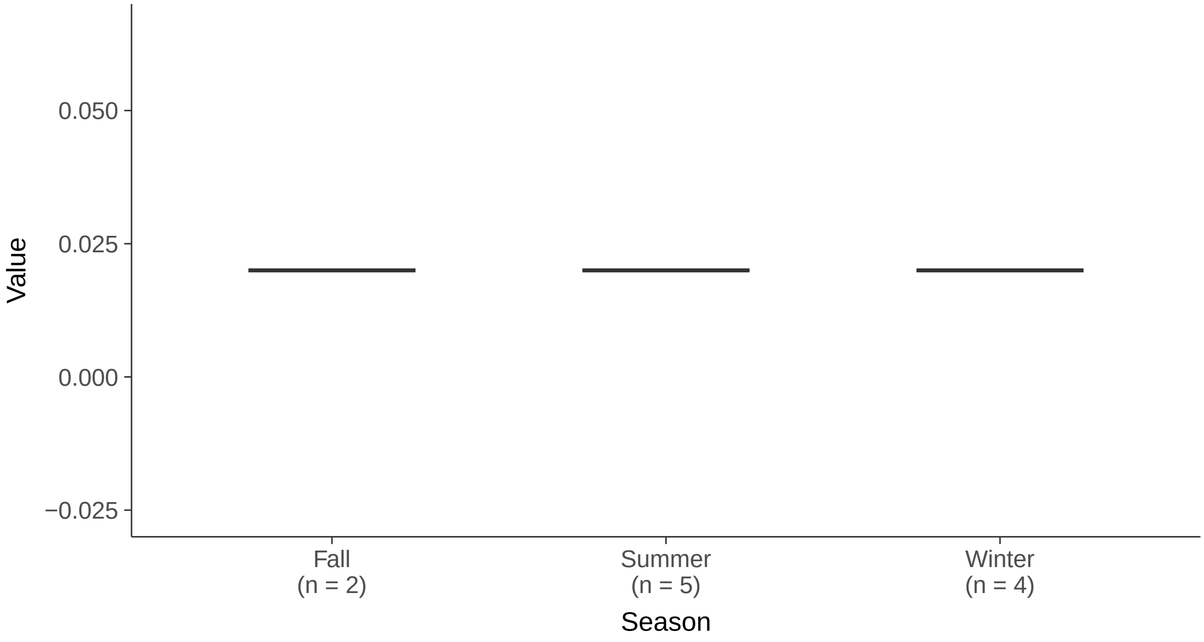
Boxplot

Iron, MW-8 (mg/L)



Boxplot by Season

Iron, MW-8 (mg/L)

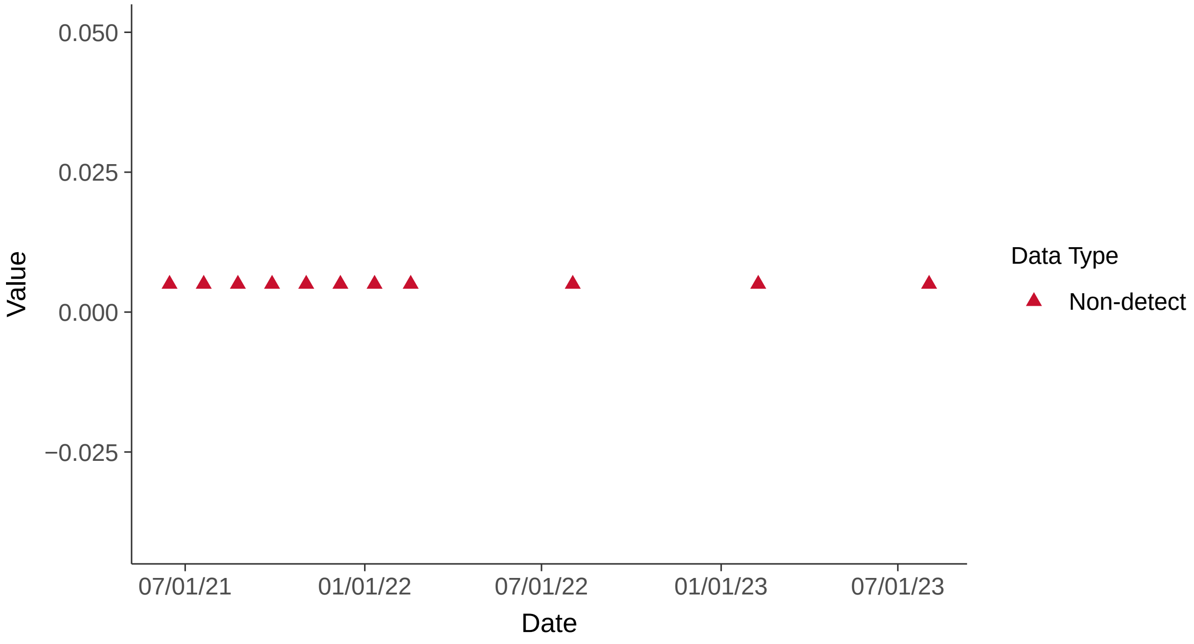


Part 115: Nickel, MW-8

ID: 08_5_39

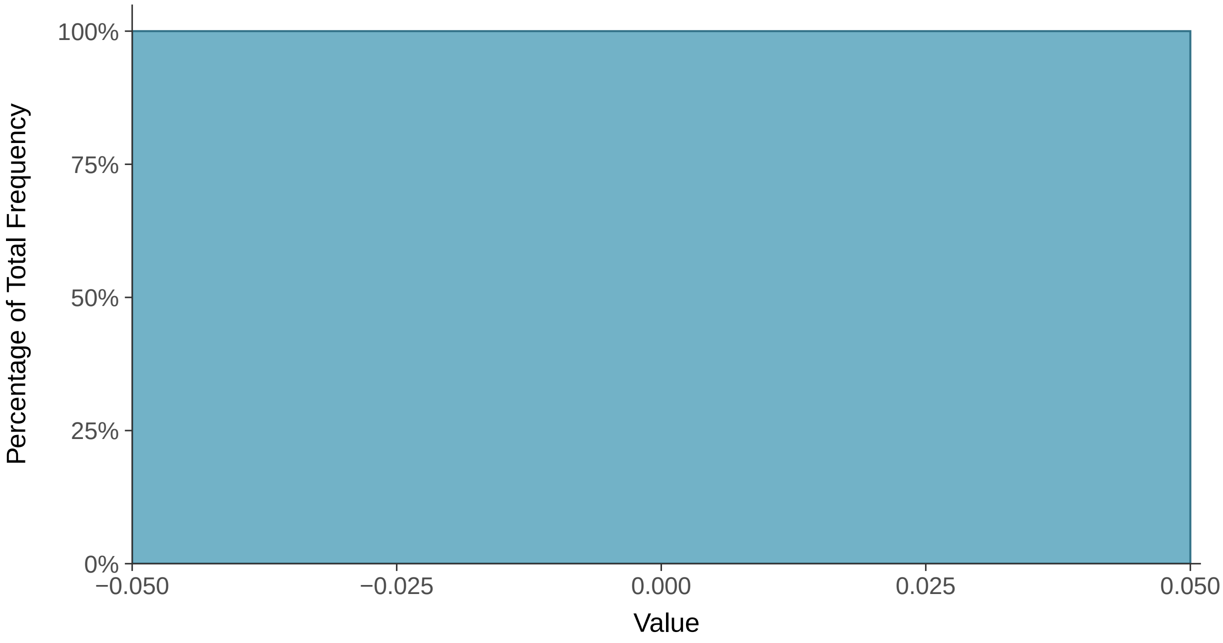
Scatter Plot

Nickel, MW-8 (mg/L)



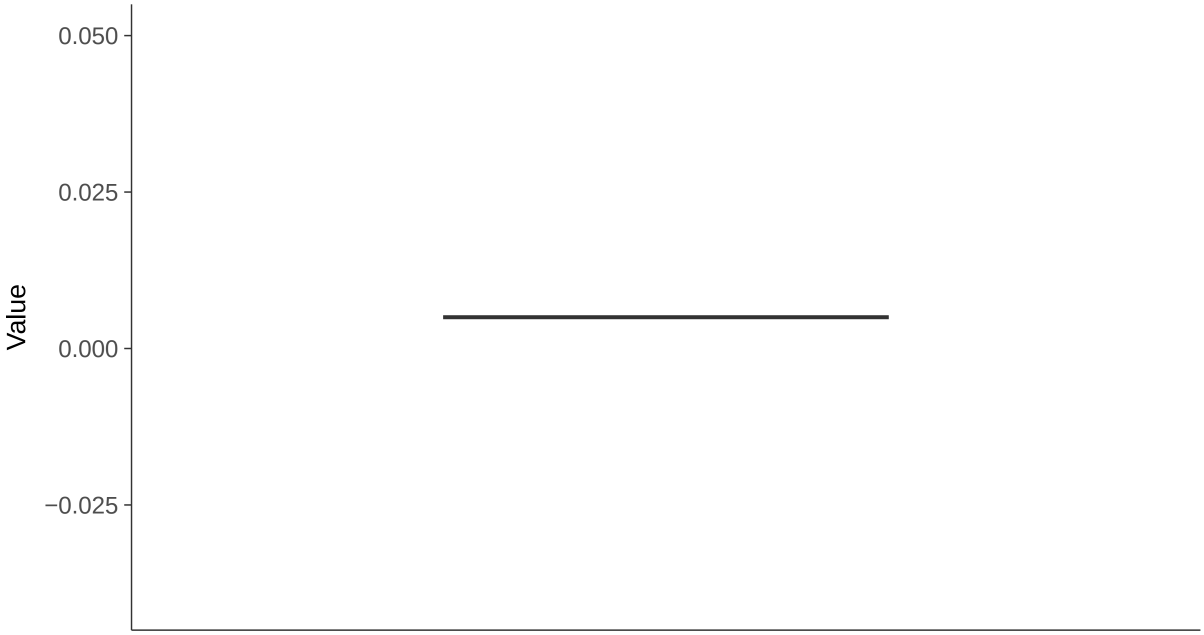
Histogram

Nickel, MW-8 (mg/L)



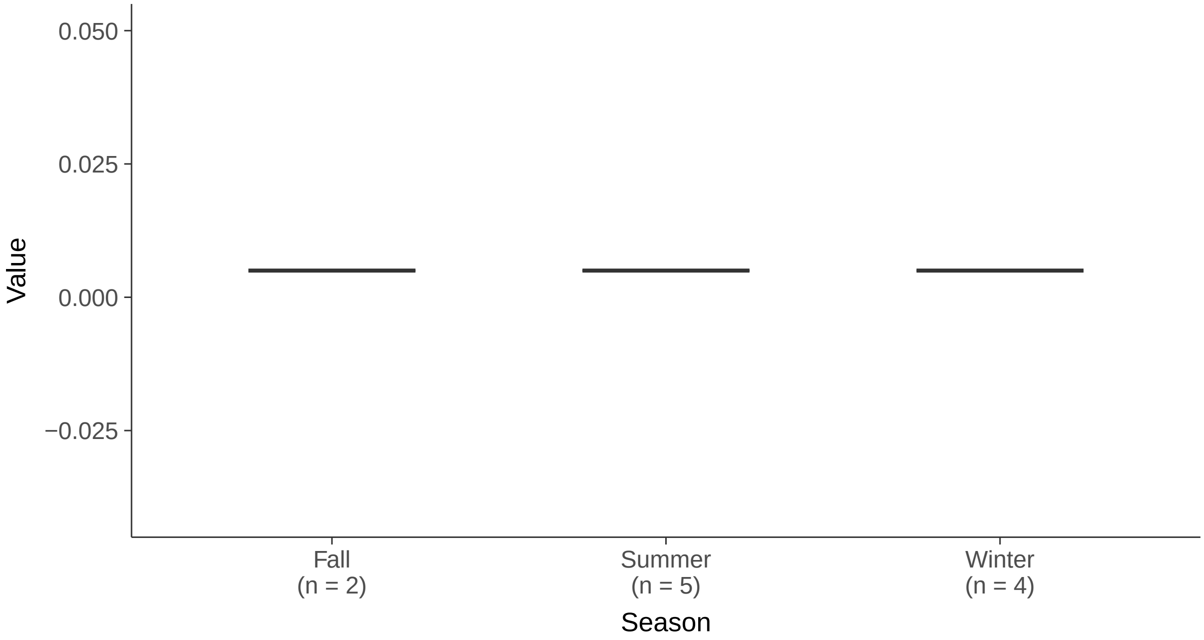
Boxplot

Nickel, MW-8 (mg/L)



Boxplot by Season

Nickel, MW-8 (mg/L)

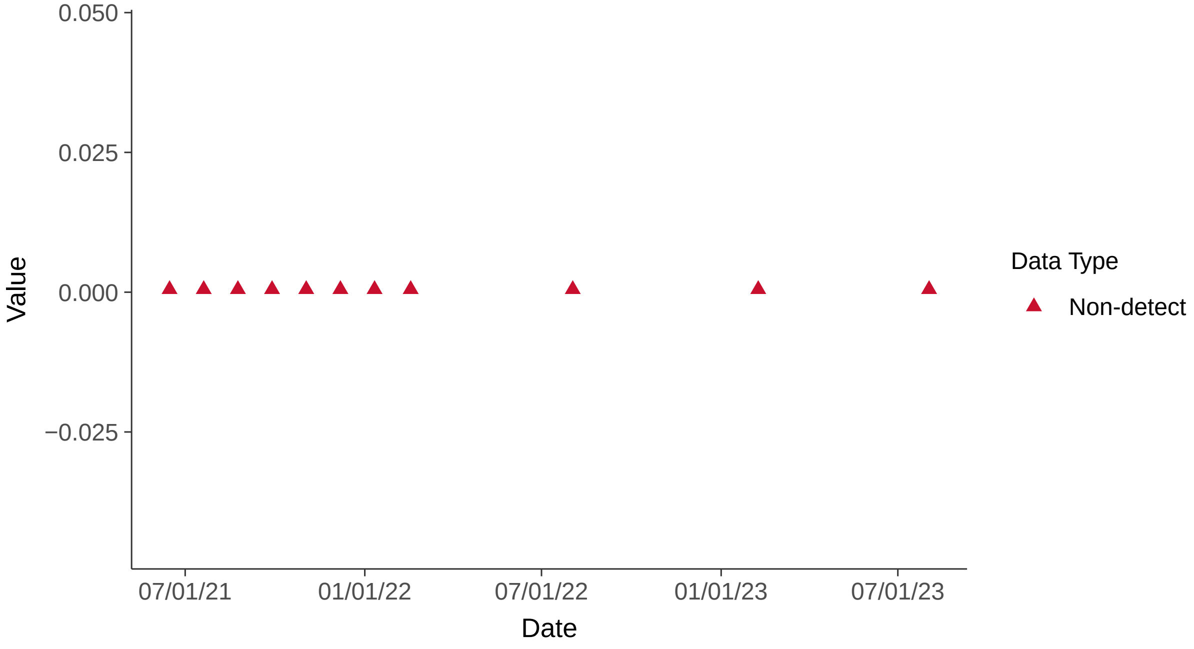


Part 115: Silver, MW-8

ID: 08_5_40

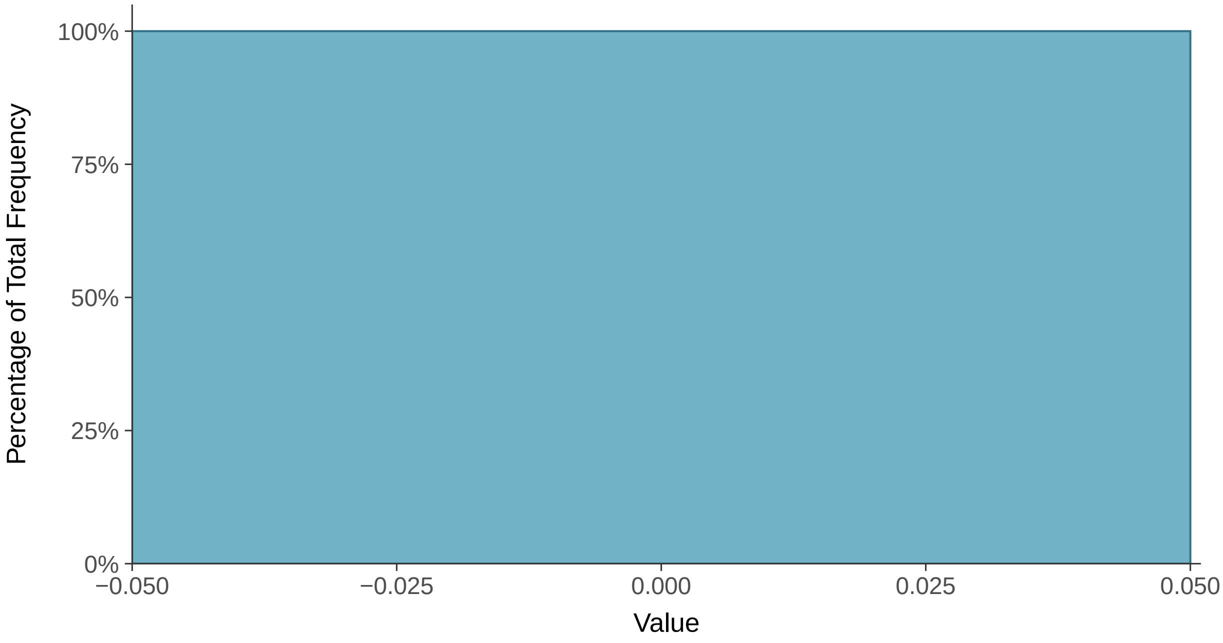
Scatter Plot

Silver, MW-8 (mg/L)



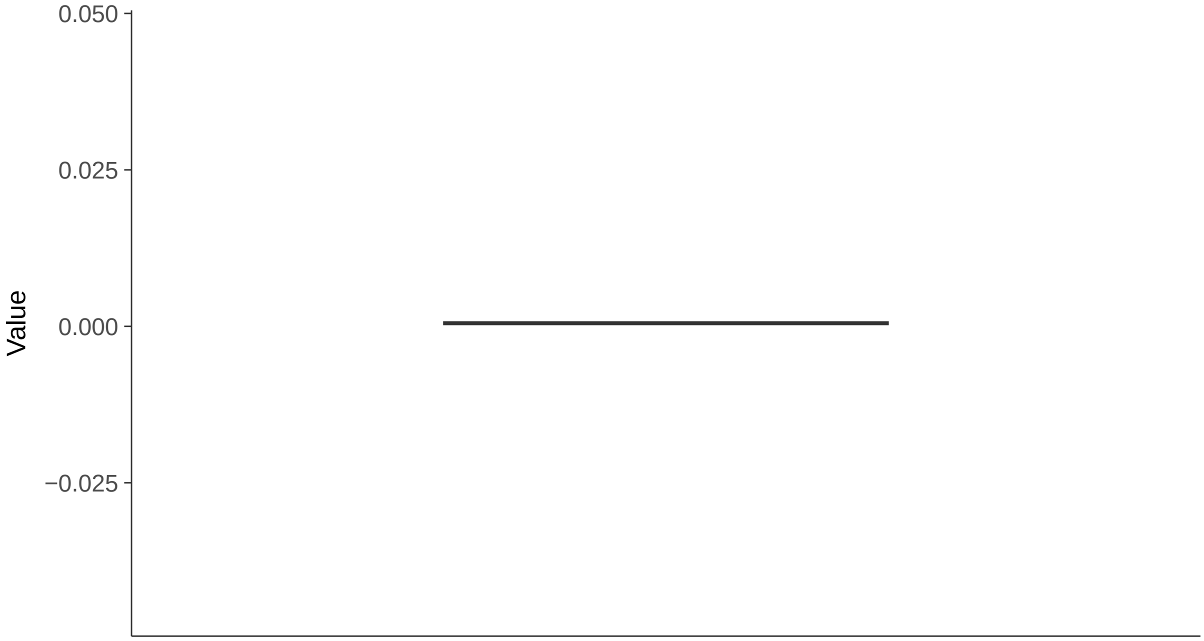
Histogram

Silver, MW-8 (mg/L)



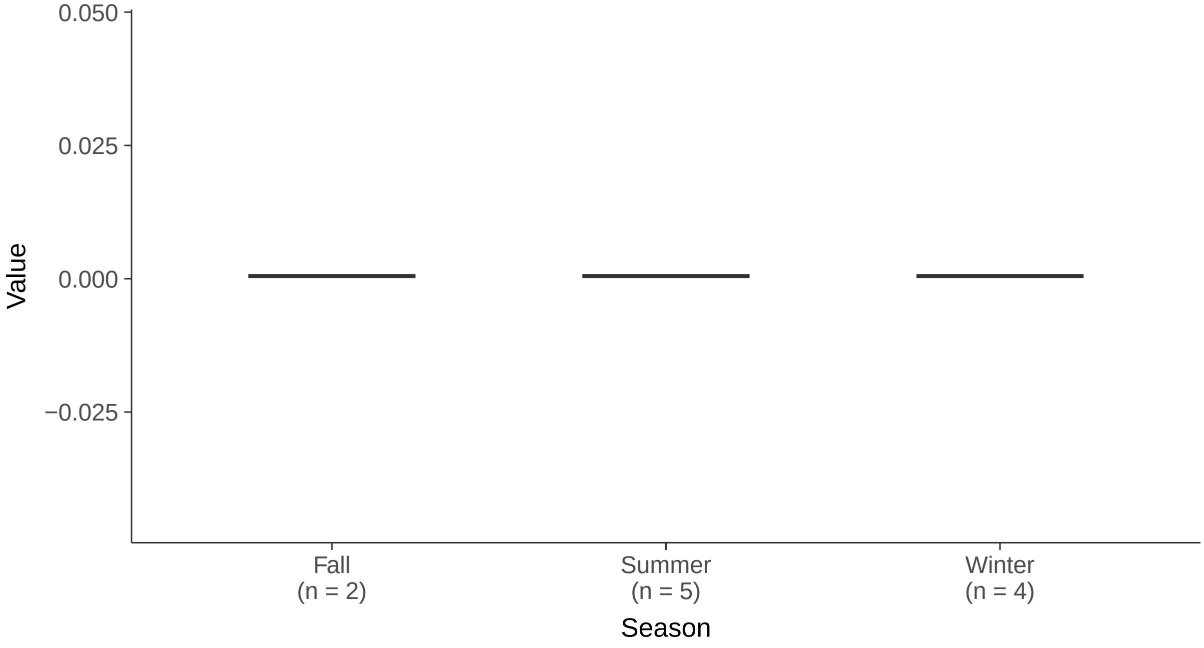
Boxplot

Silver, MW-8 (mg/L)



Boxplot by Season

Silver, MW-8 (mg/L)

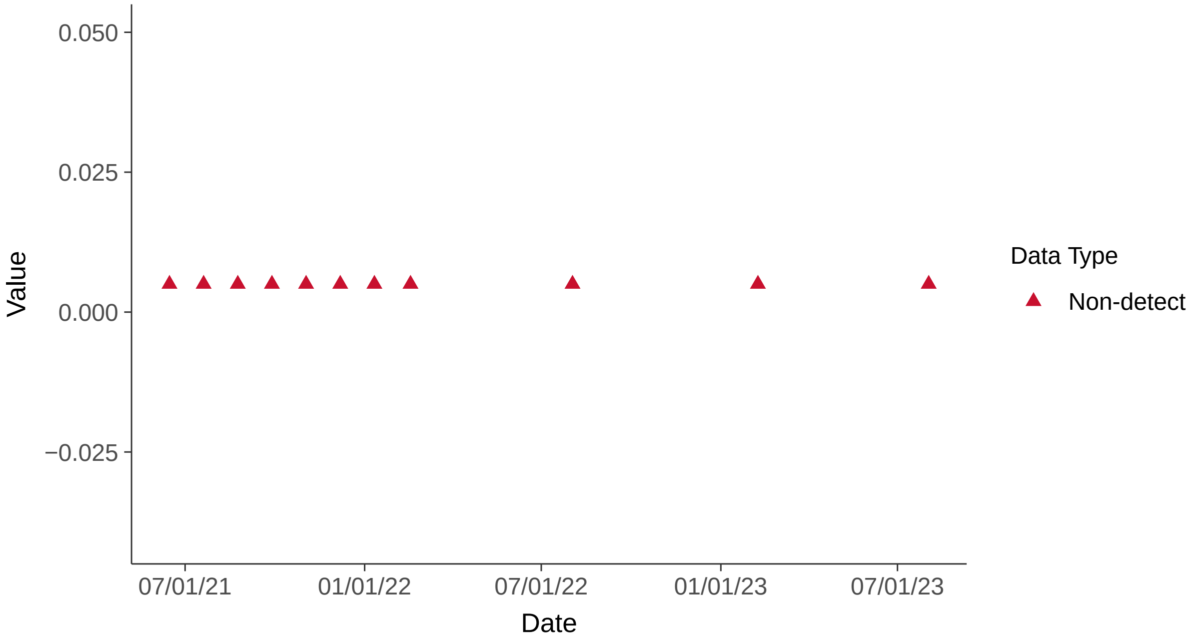


Part 115: Vanadium, MW-8

ID: 08_5_41

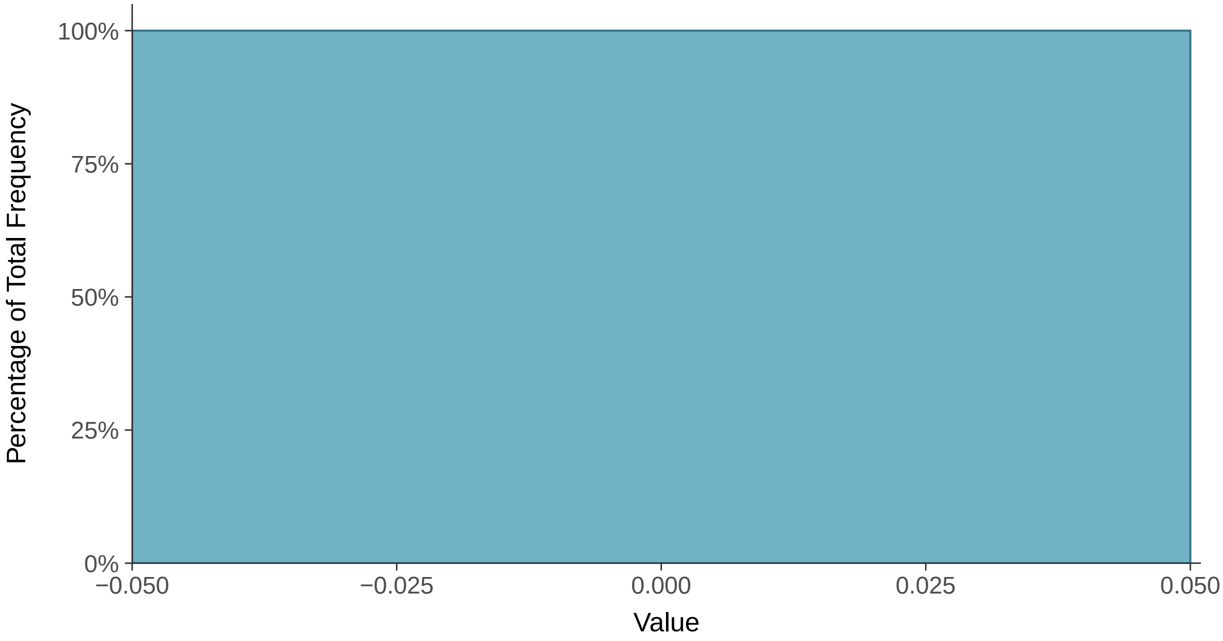
Scatter Plot

Vanadium, MW-8 (mg/L)



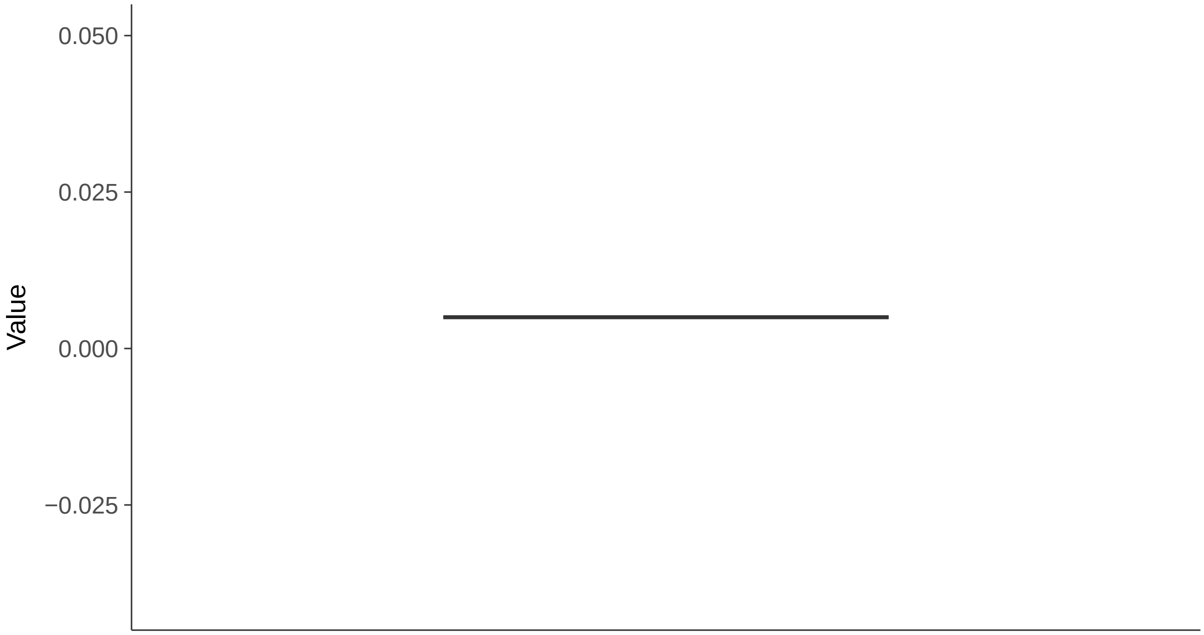
Histogram

Vanadium, MW-8 (mg/L)



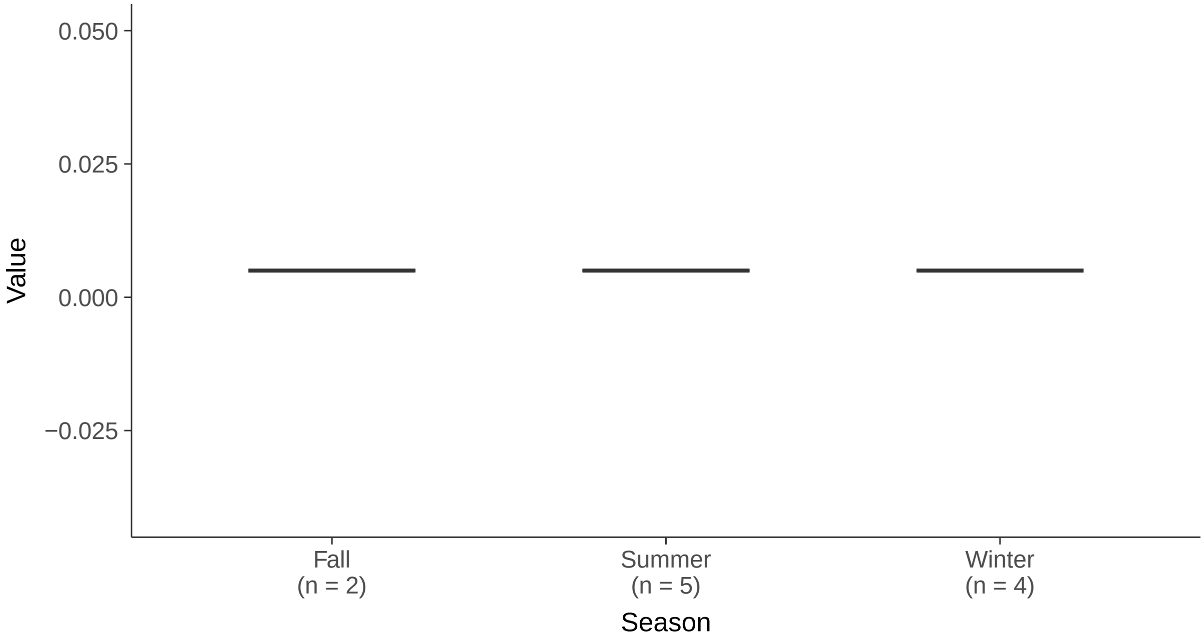
Boxplot

Vanadium, MW-8 (mg/L)



Boxplot by Season

Vanadium, MW-8 (mg/L)

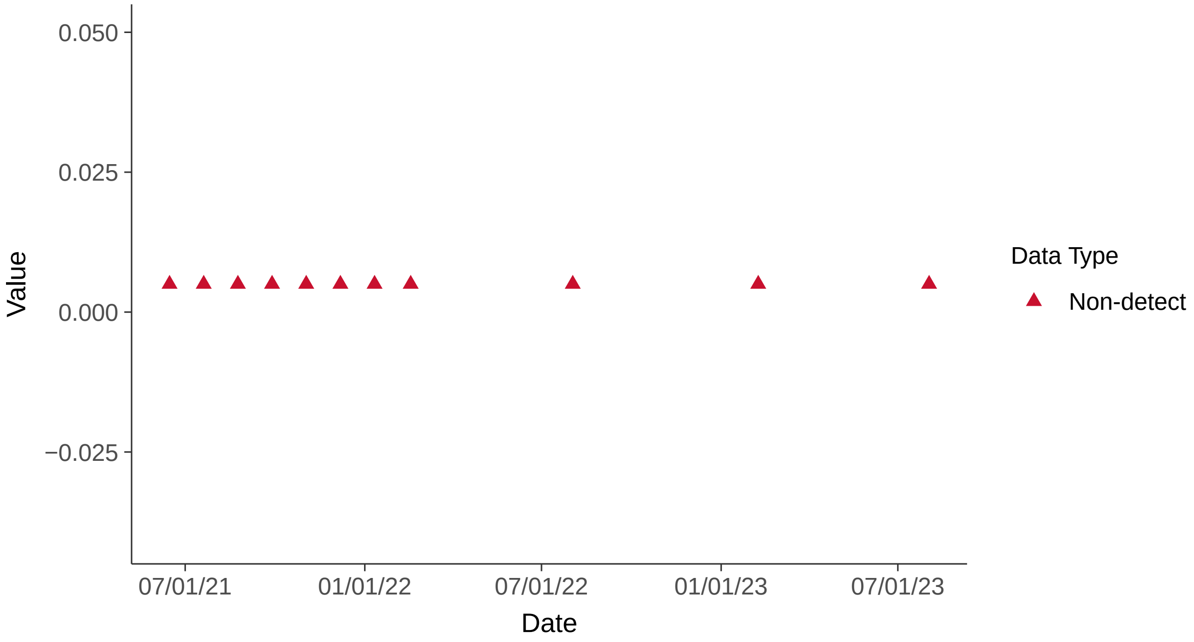


Part 115: Zinc, MW-8

ID: 08_5_42

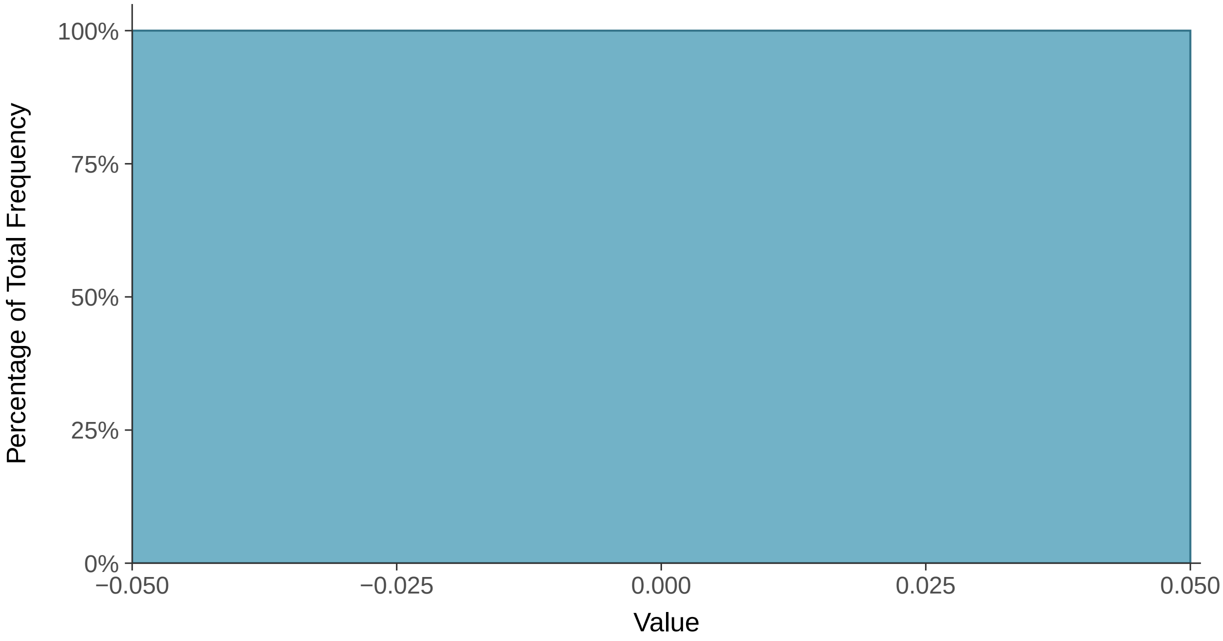
Scatter Plot

Zinc, MW-8 (mg/L)



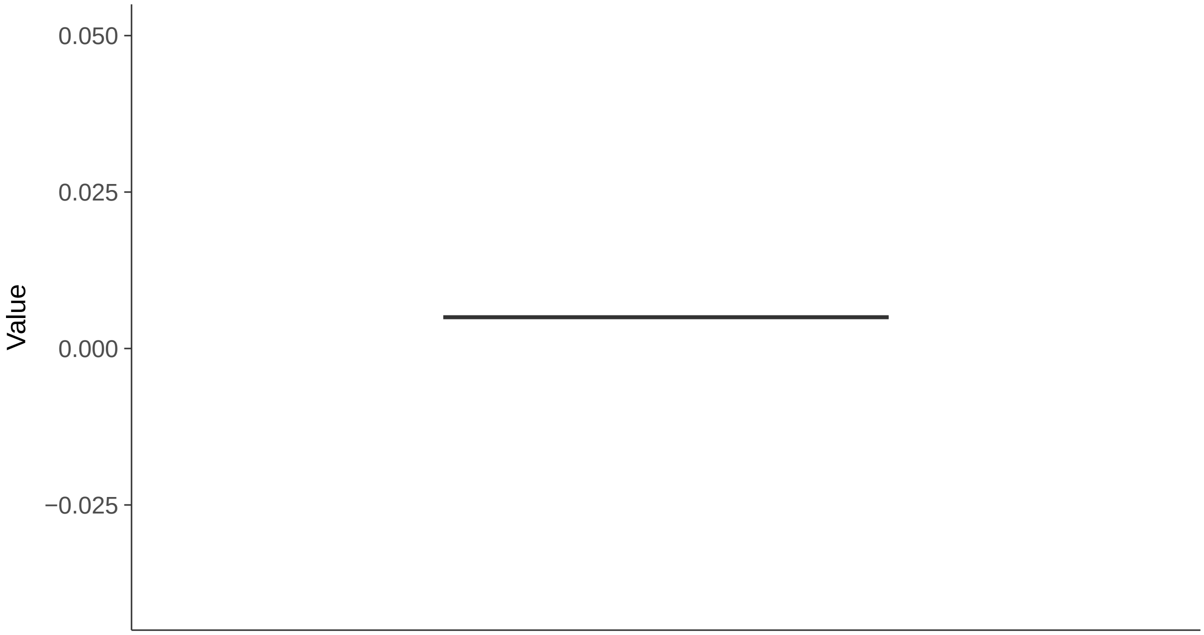
Histogram

Zinc, MW-8 (mg/L)



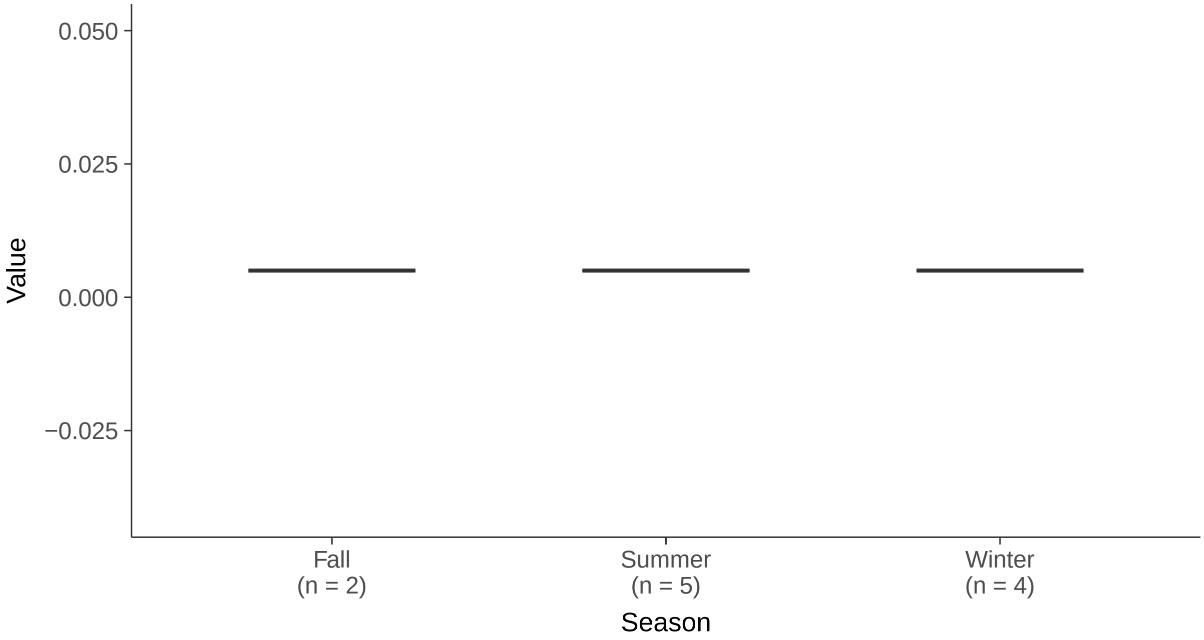
Boxplot

Zinc, MW-8 (mg/L)



Boxplot by Season

Zinc, MW-8 (mg/L)

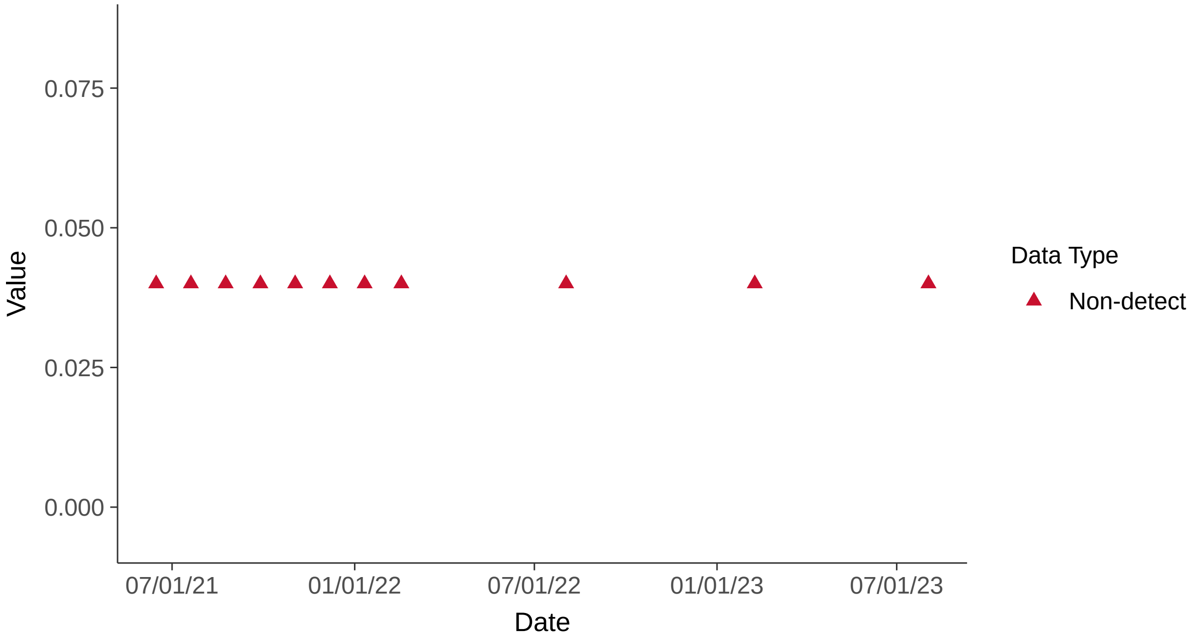


Appendix III: Boron, MW-9

ID: 09_1_01

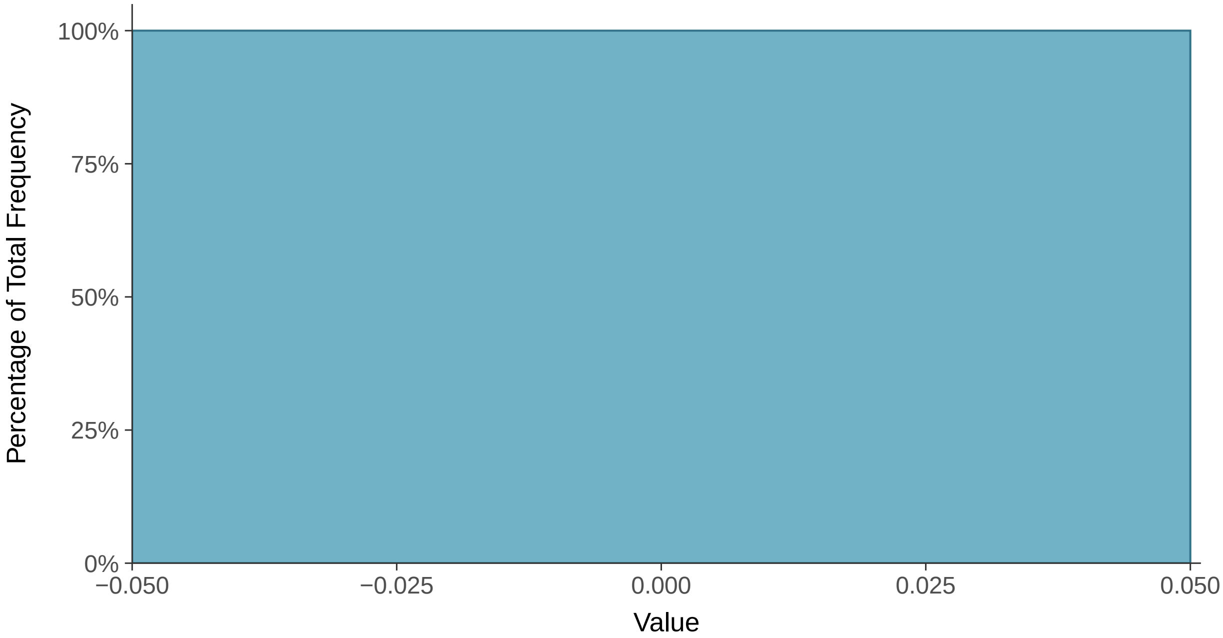
Scatter Plot

Boron, MW-9 (mg/L)



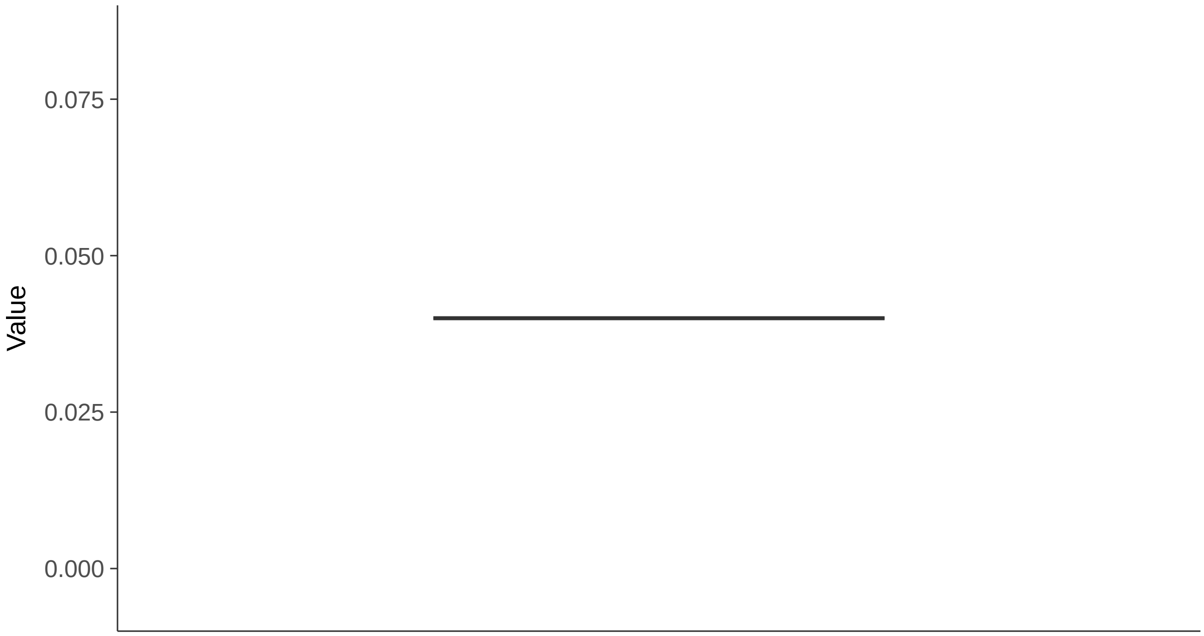
Histogram

Boron, MW-9 (mg/L)



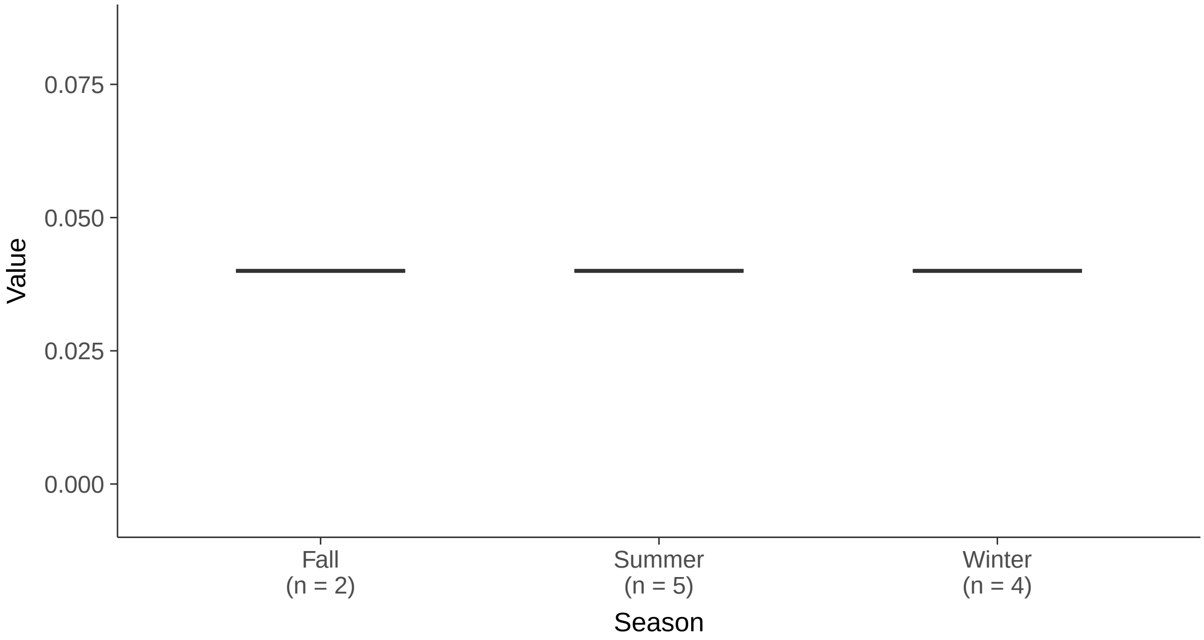
Boxplot

Boron, MW-9 (mg/L)



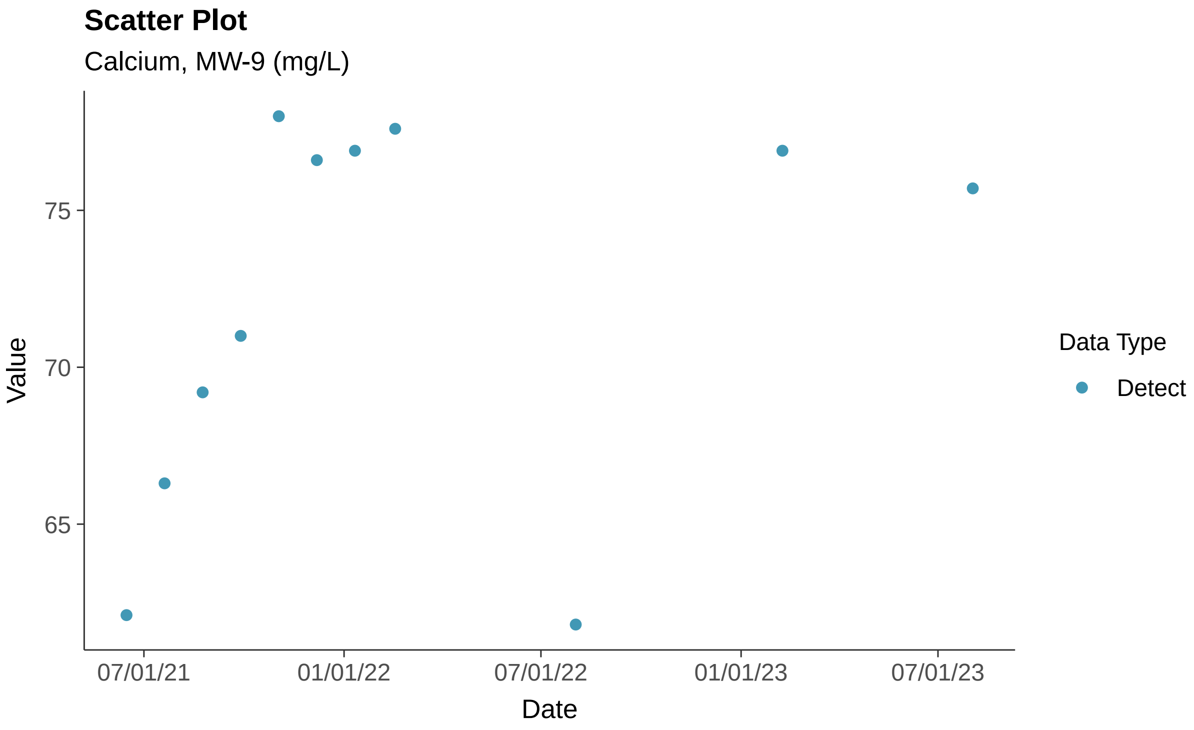
Boxplot by Season

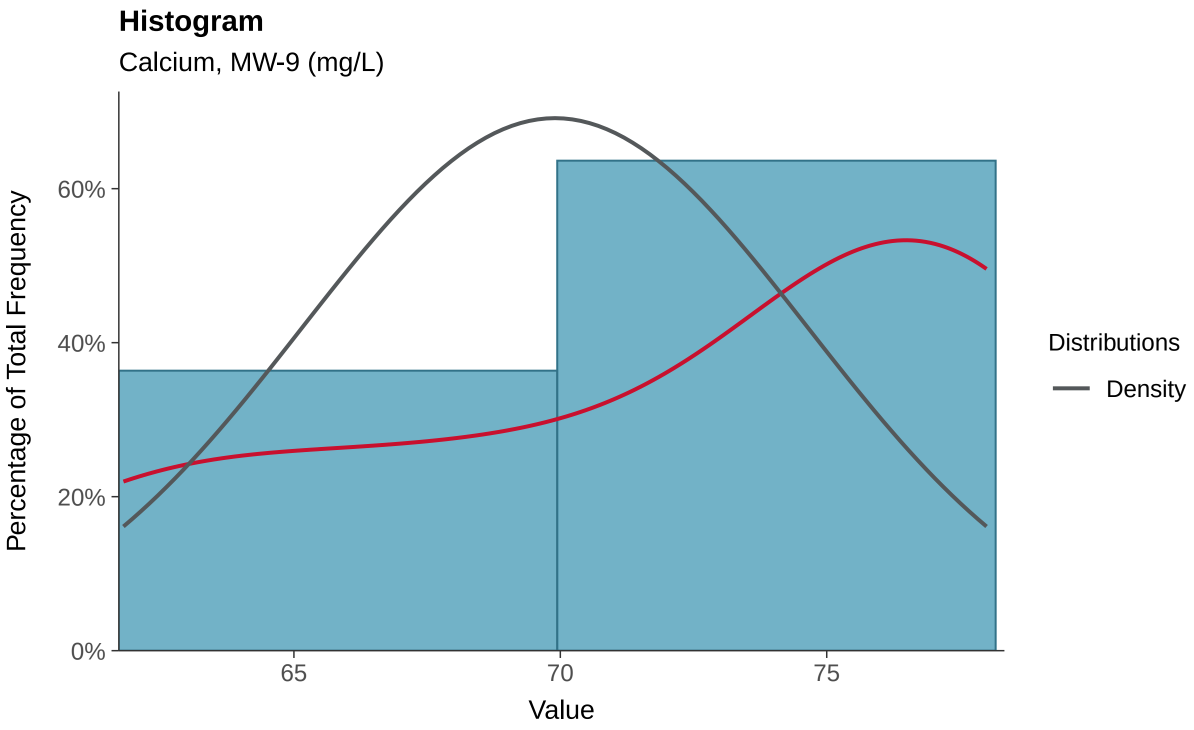
Boron, MW-9 (mg/L)



Appendix III: Calcium, MW-9

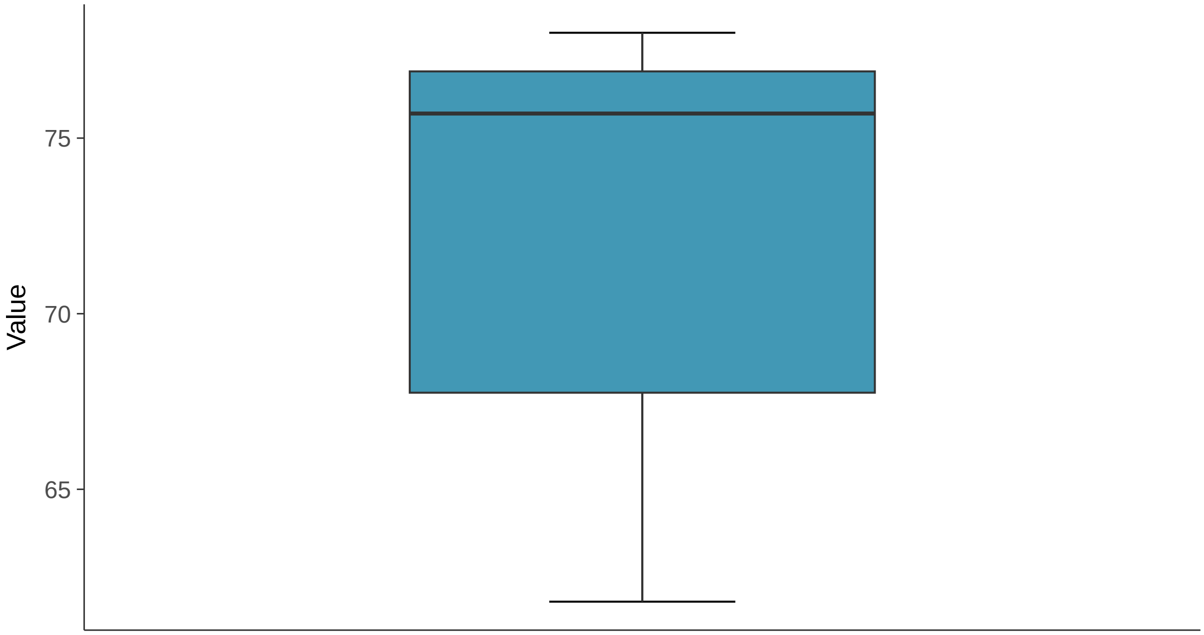
ID: 09_1_02





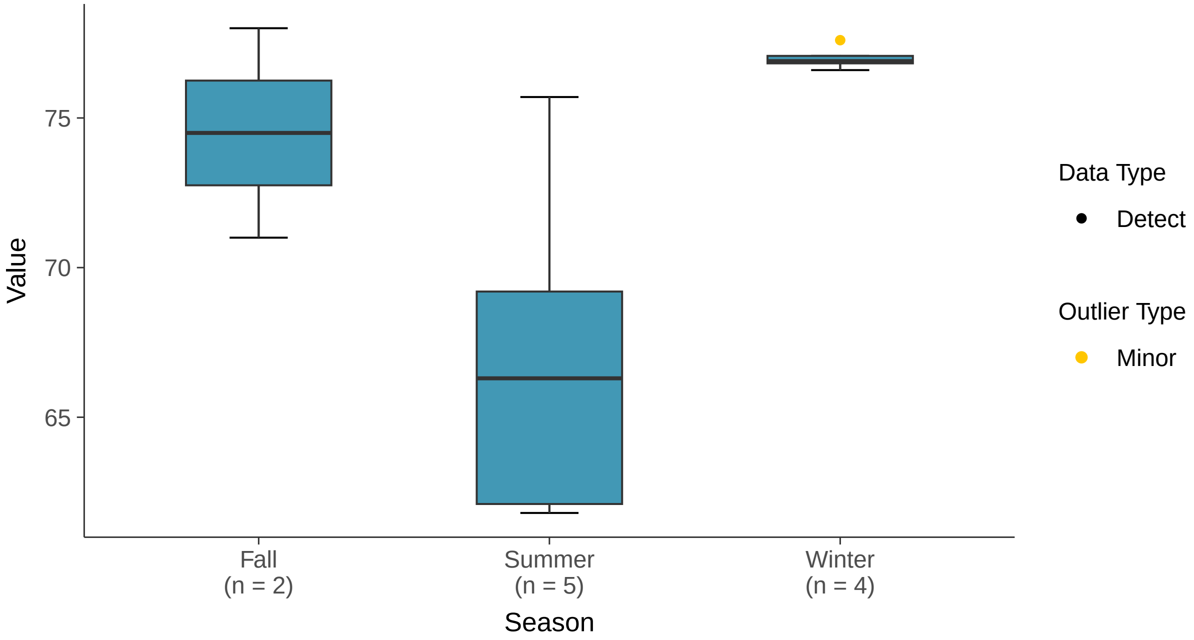
Boxplot

Calcium, MW-9 (mg/L)



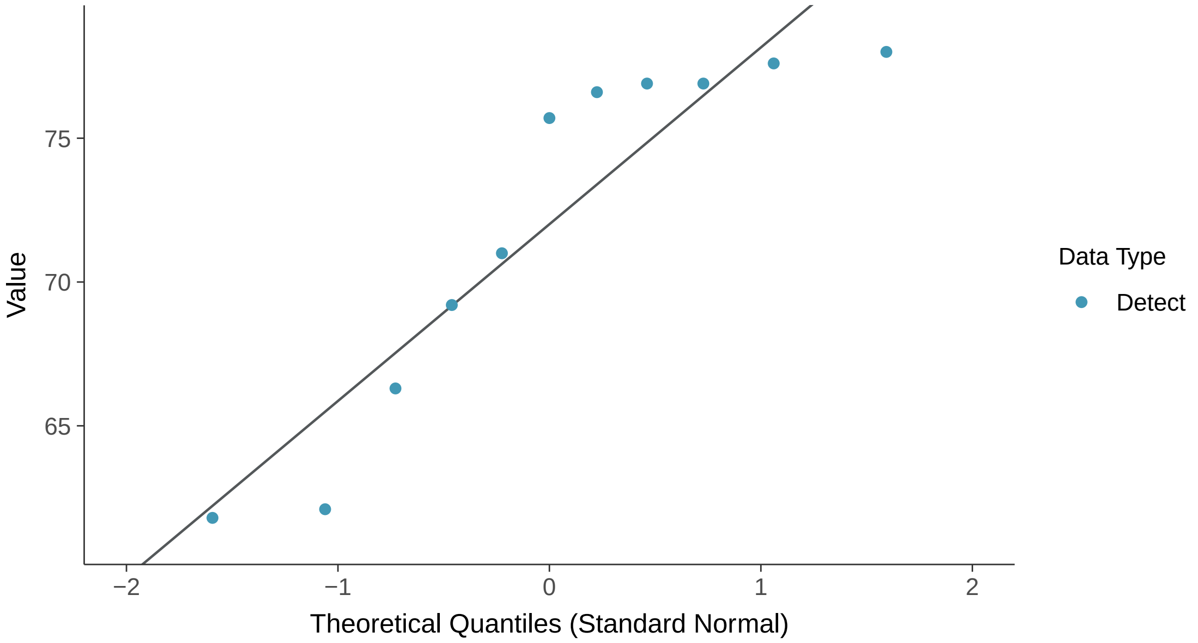
Boxplot by Season

Calcium, MW-9 (mg/L)



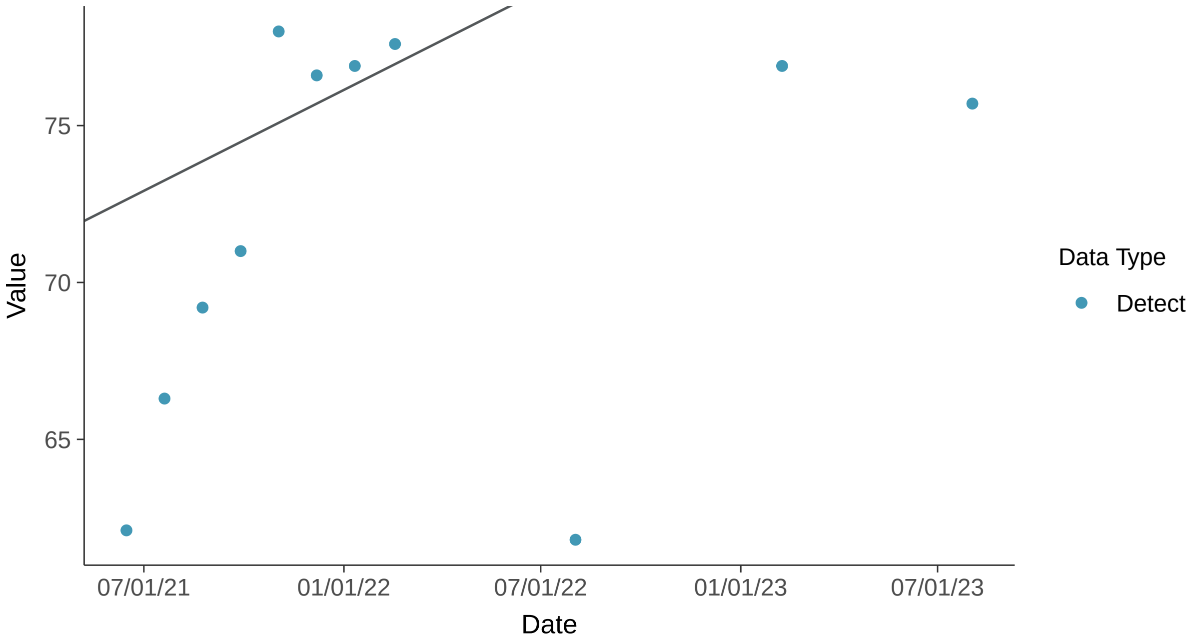
Normal Q-Q plot

Calcium, MW-9 (mg/L)



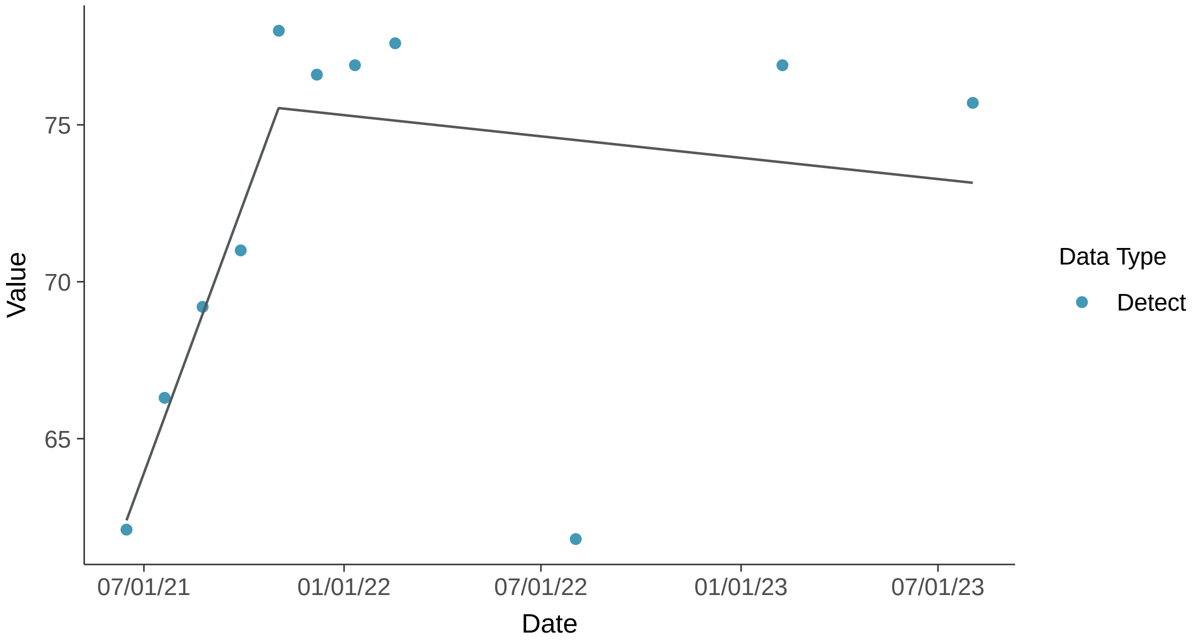
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Calcium, MW-9 (mg/L)



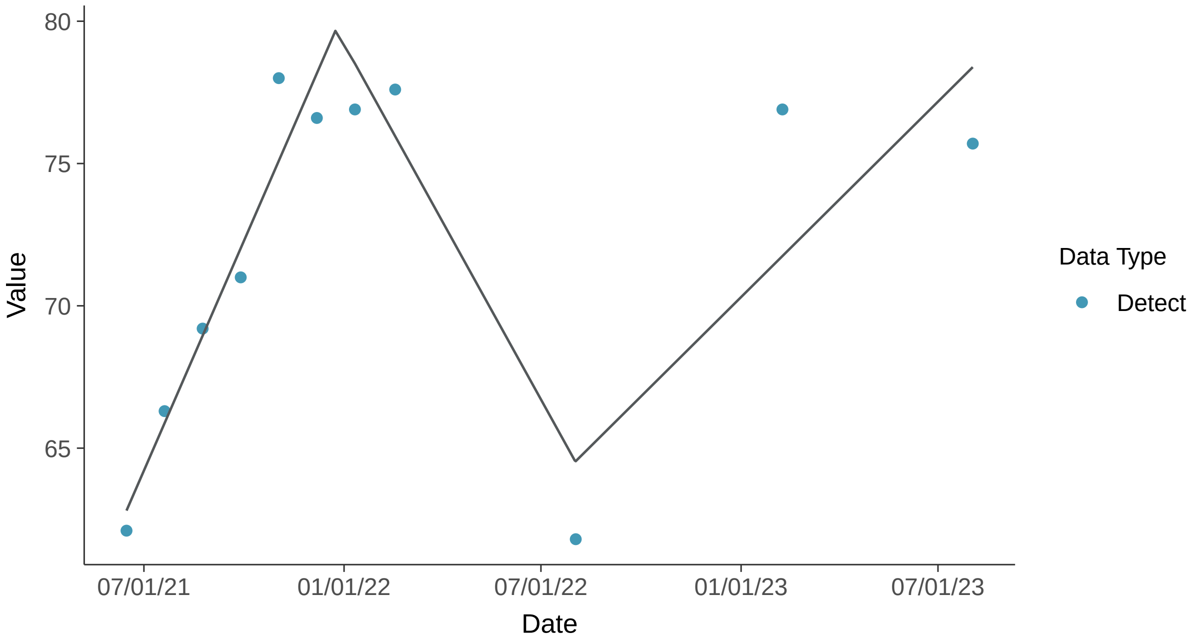
Trend Regression: Piecewise Linear-Linear

Calcium, MW-9 (mg/L)



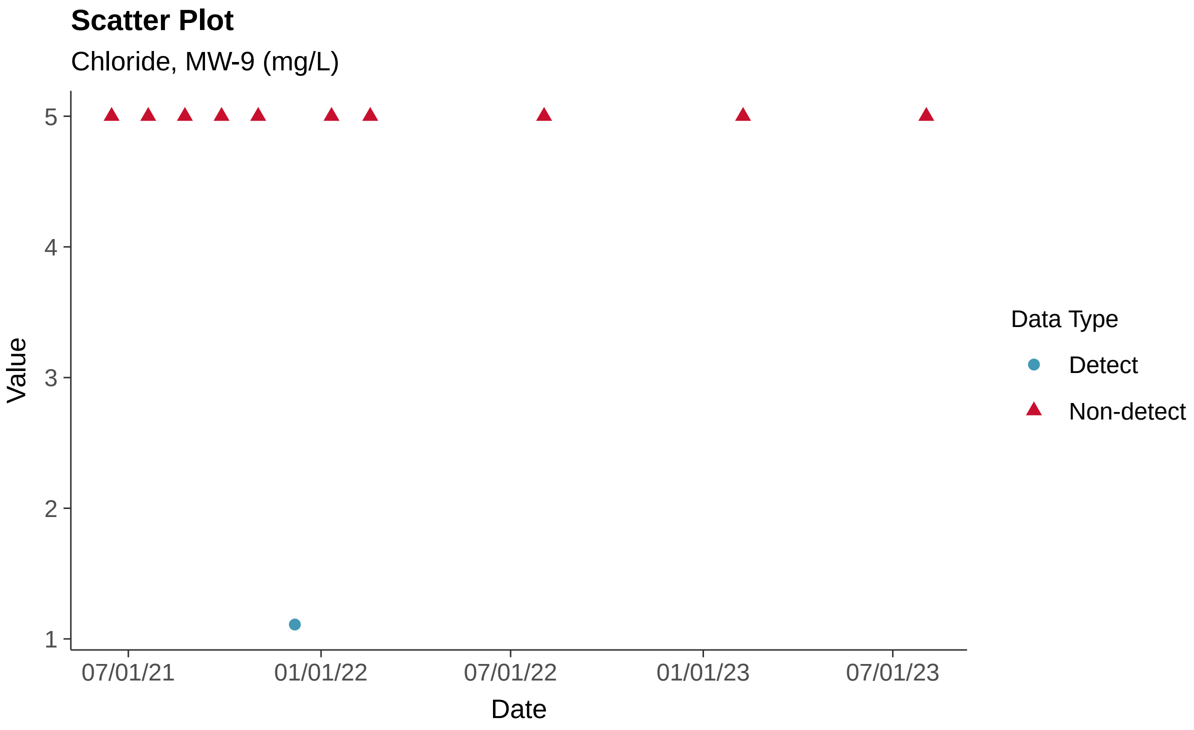
Trend Regression: Piecewise Linear-Linear-Linear

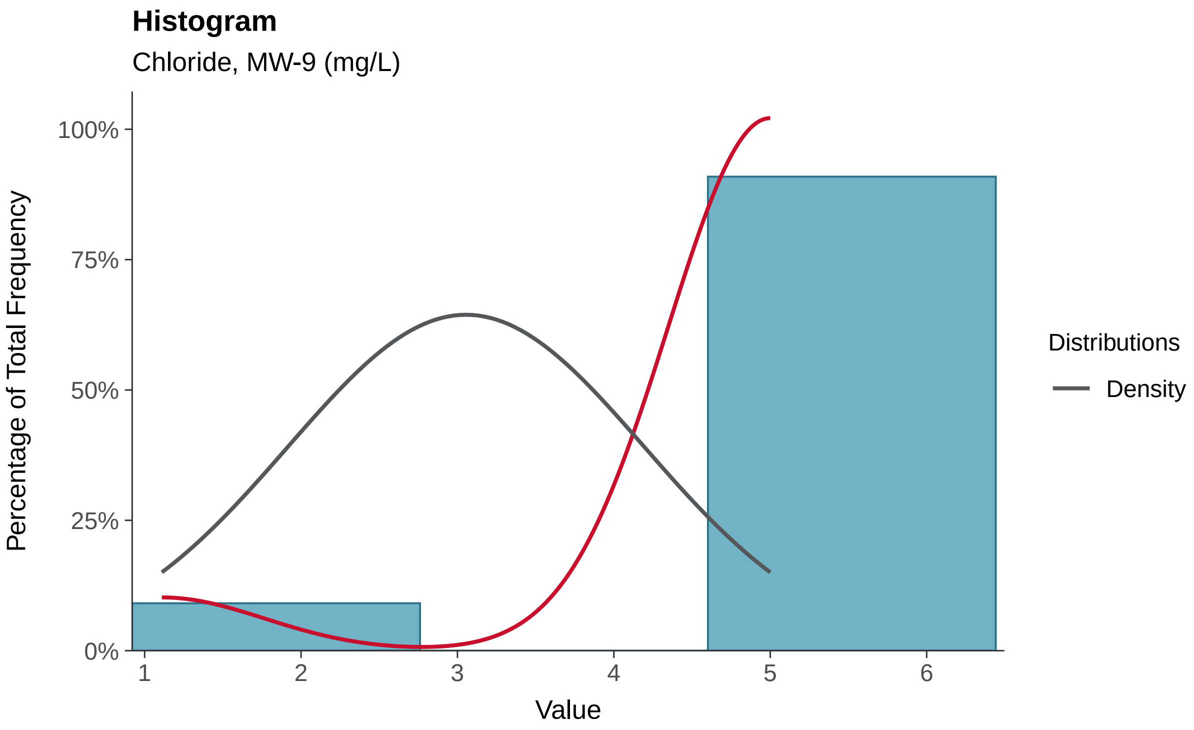
Calcium, MW-9 (mg/L)



Appendix III: Chloride, MW-9

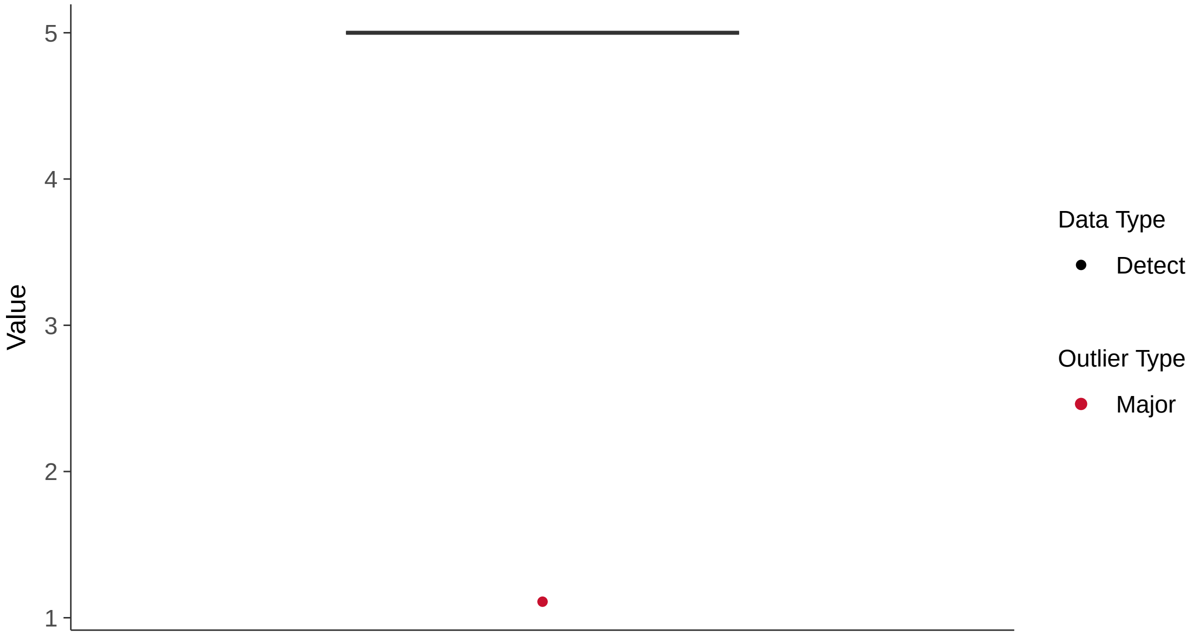
ID: 09_1_03





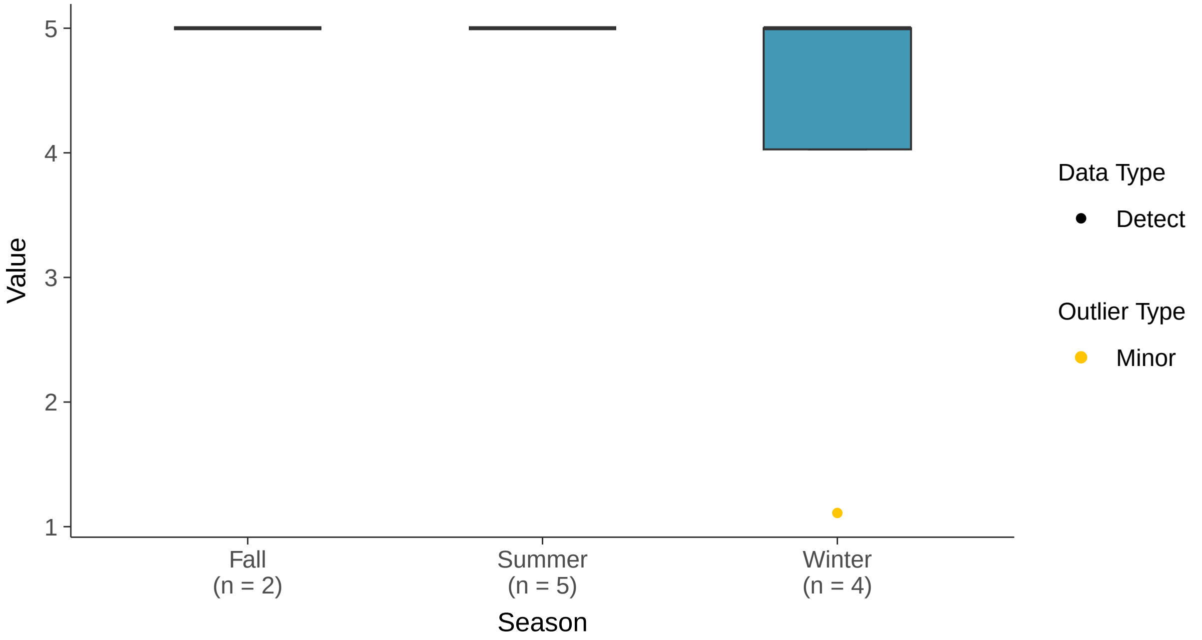
Boxplot

Chloride, MW-9 (mg/L)



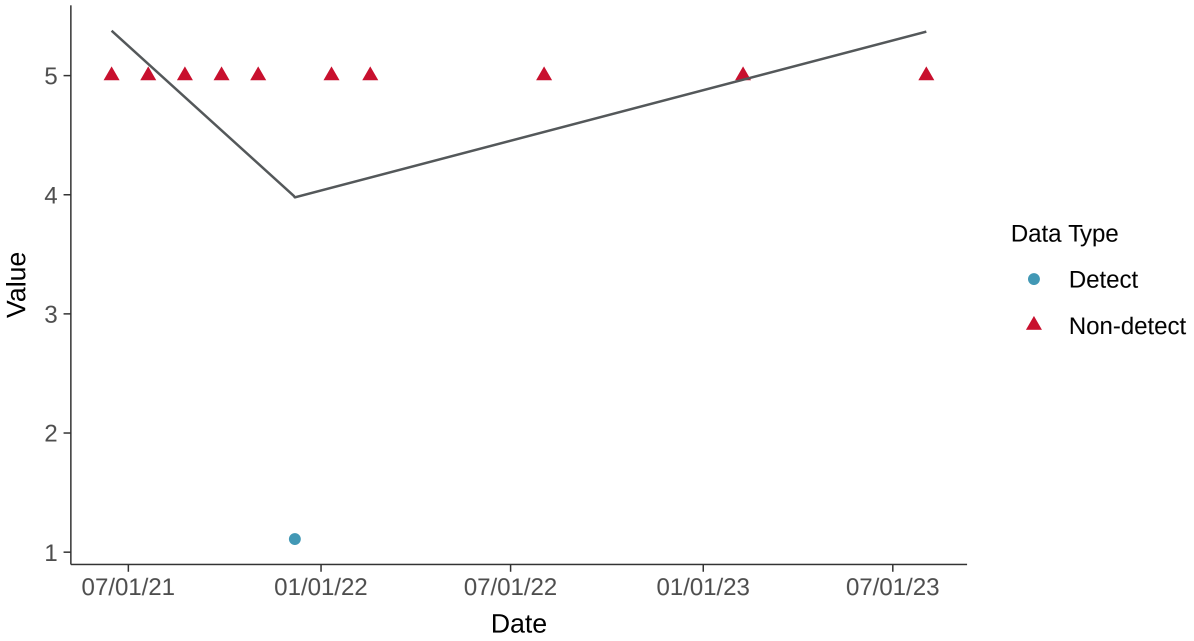
Boxplot by Season

Chloride, MW-9 (mg/L)



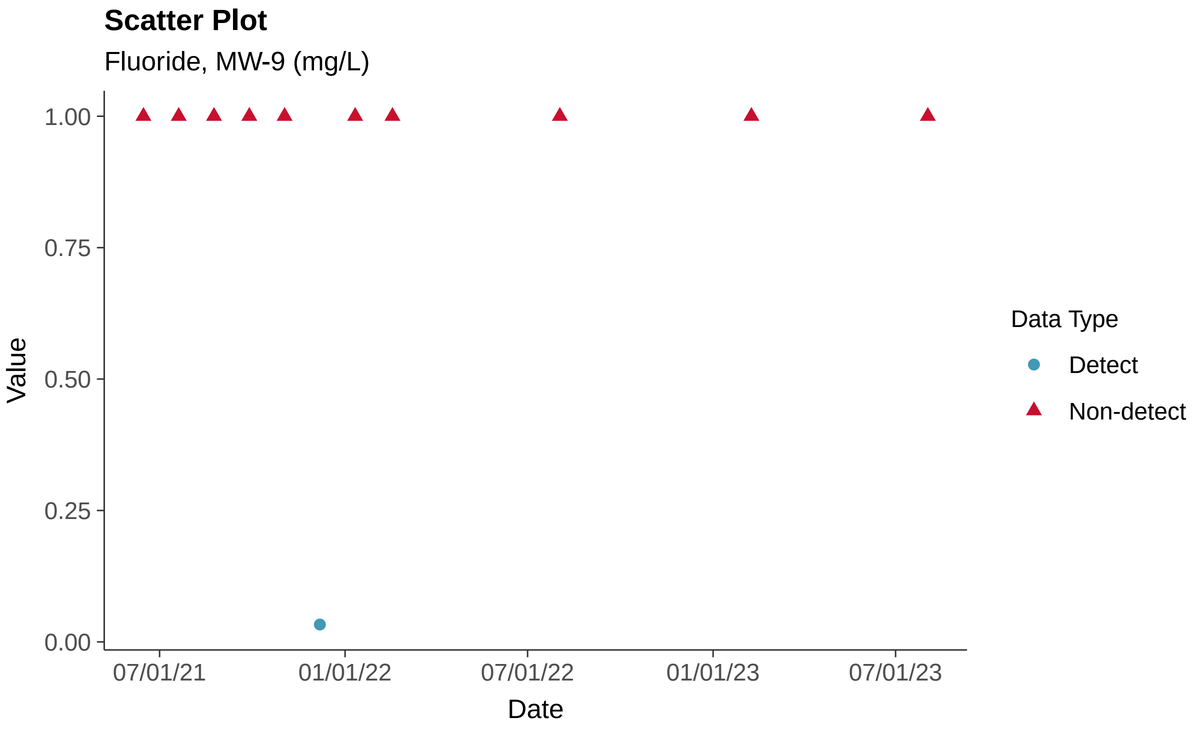
Trend Regression: Piecewise Linear-Linear

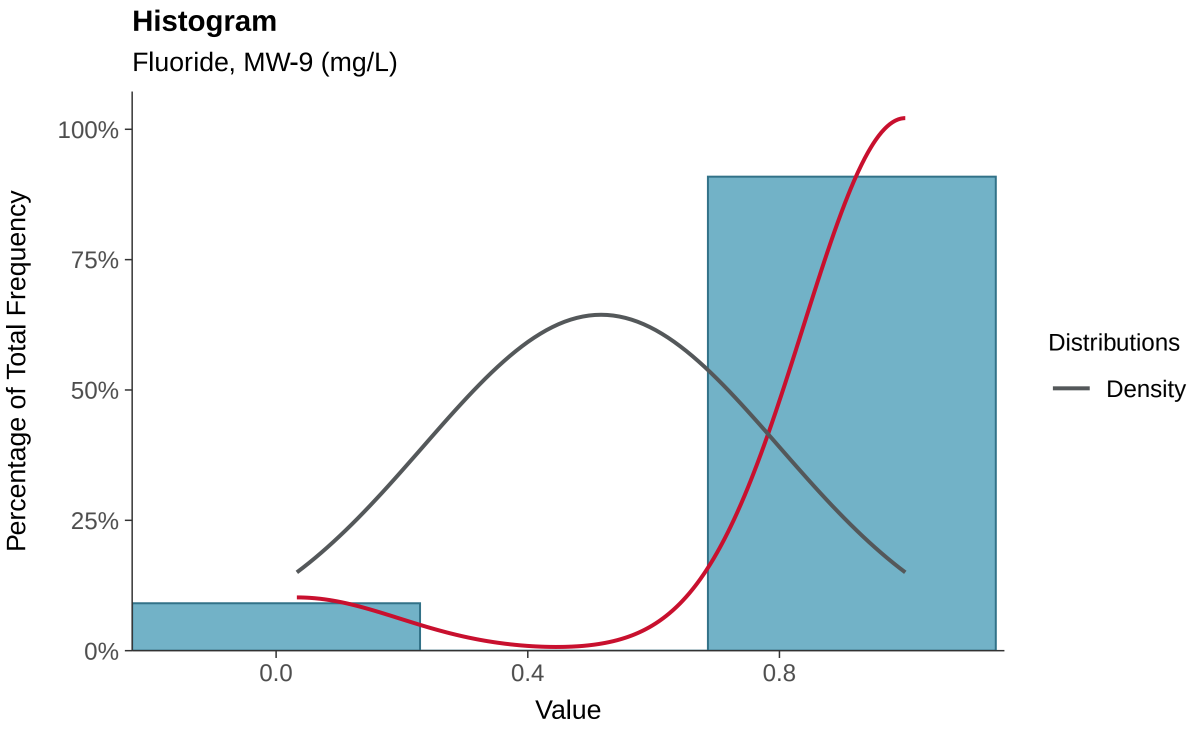
Chloride, MW-9 (mg/L)



Appendix III: Fluoride, MW-9

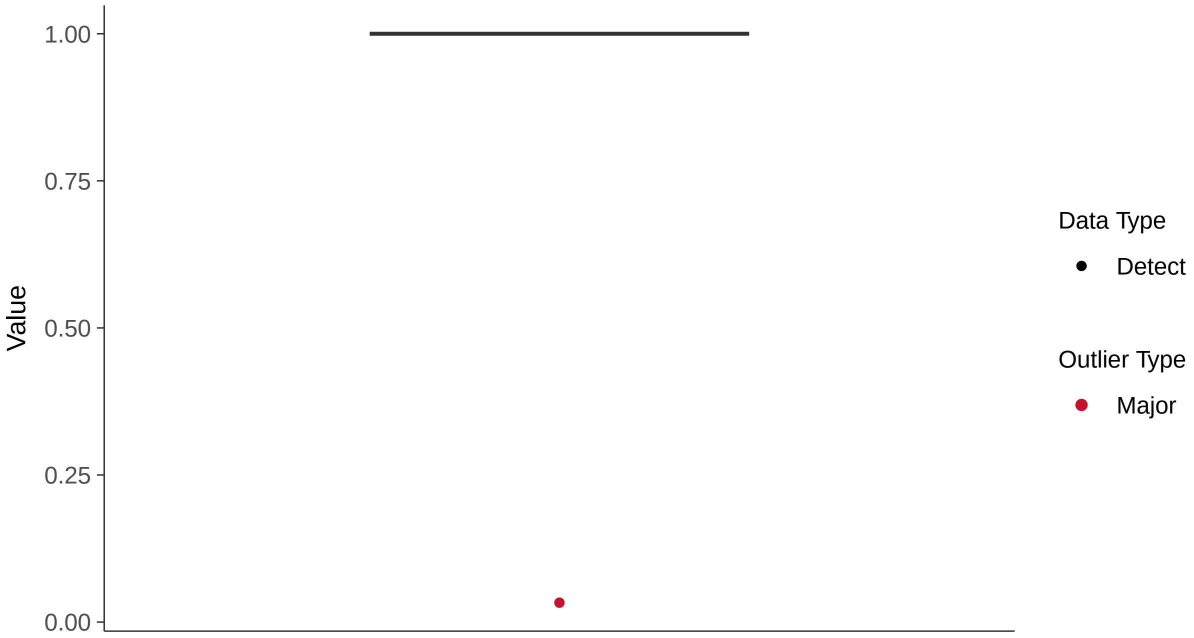
ID: 09_1_04





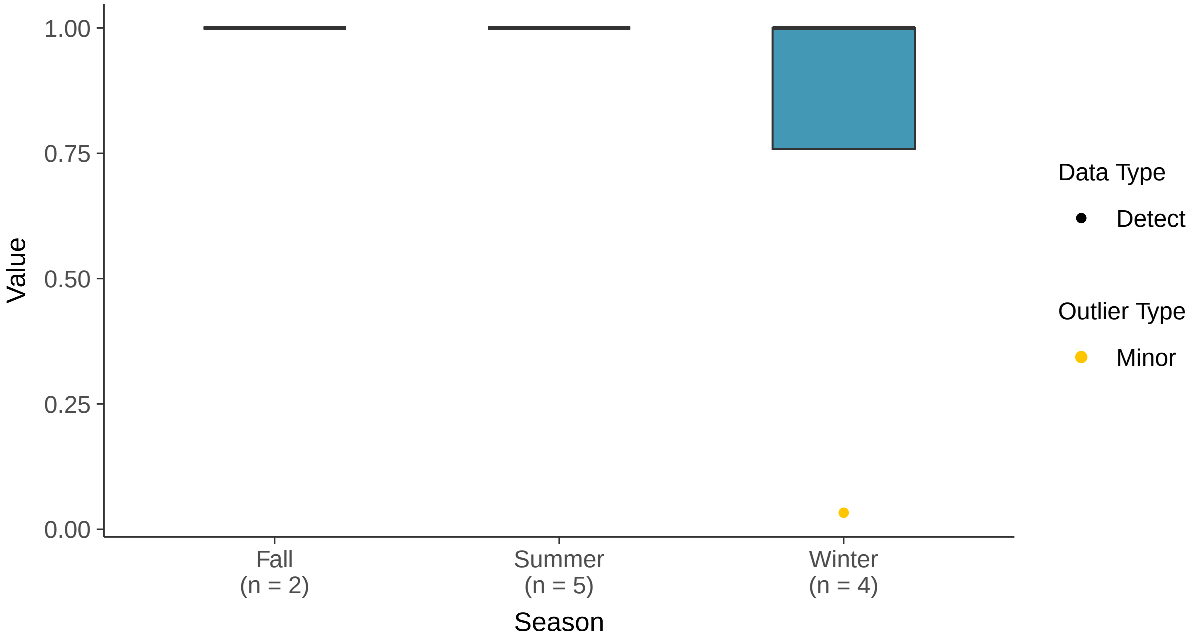
Boxplot

Fluoride, MW-9 (mg/L)



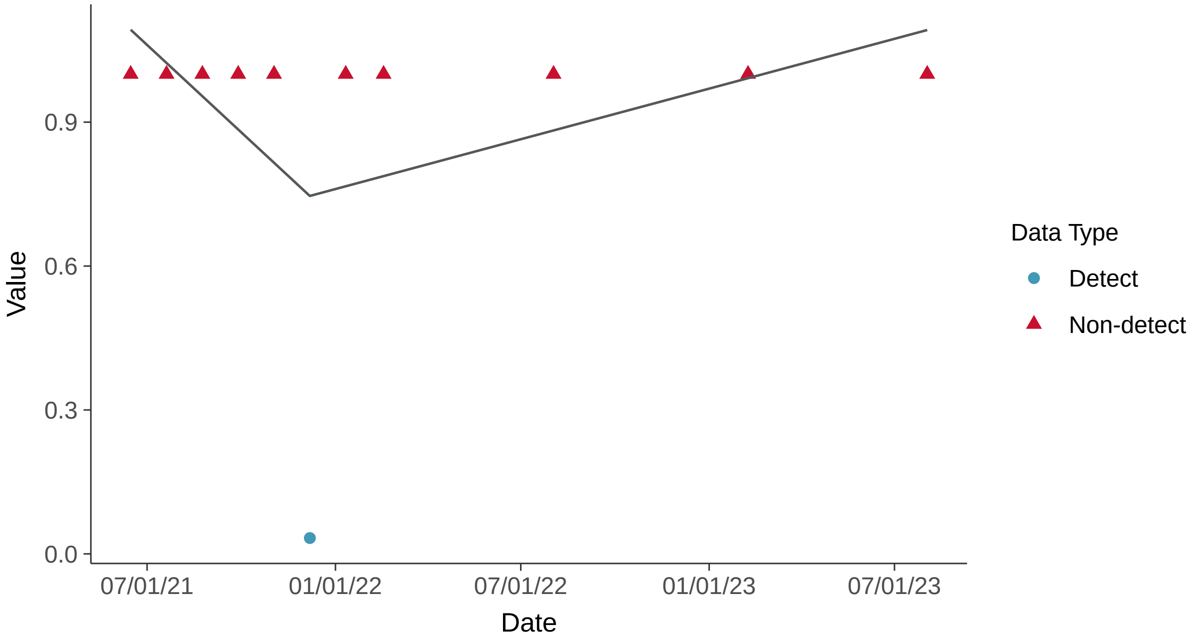
Boxplot by Season

Fluoride, MW-9 (mg/L)



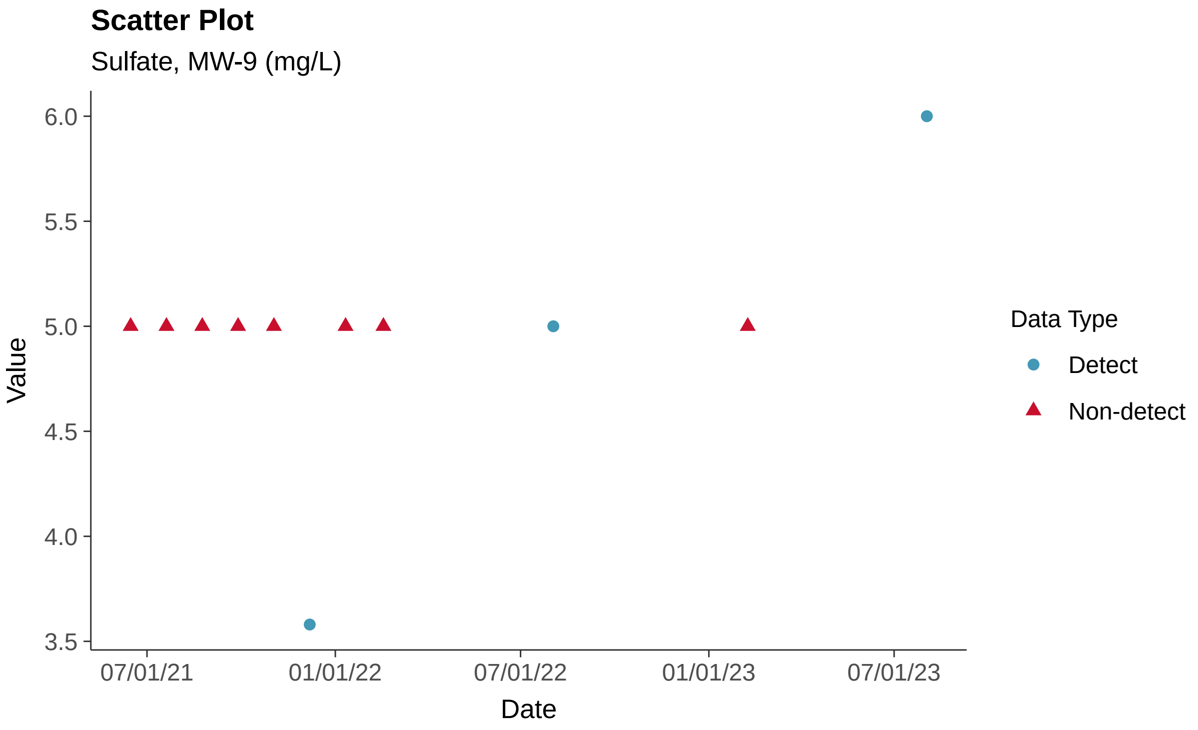
Trend Regression: Piecewise Linear-Linear

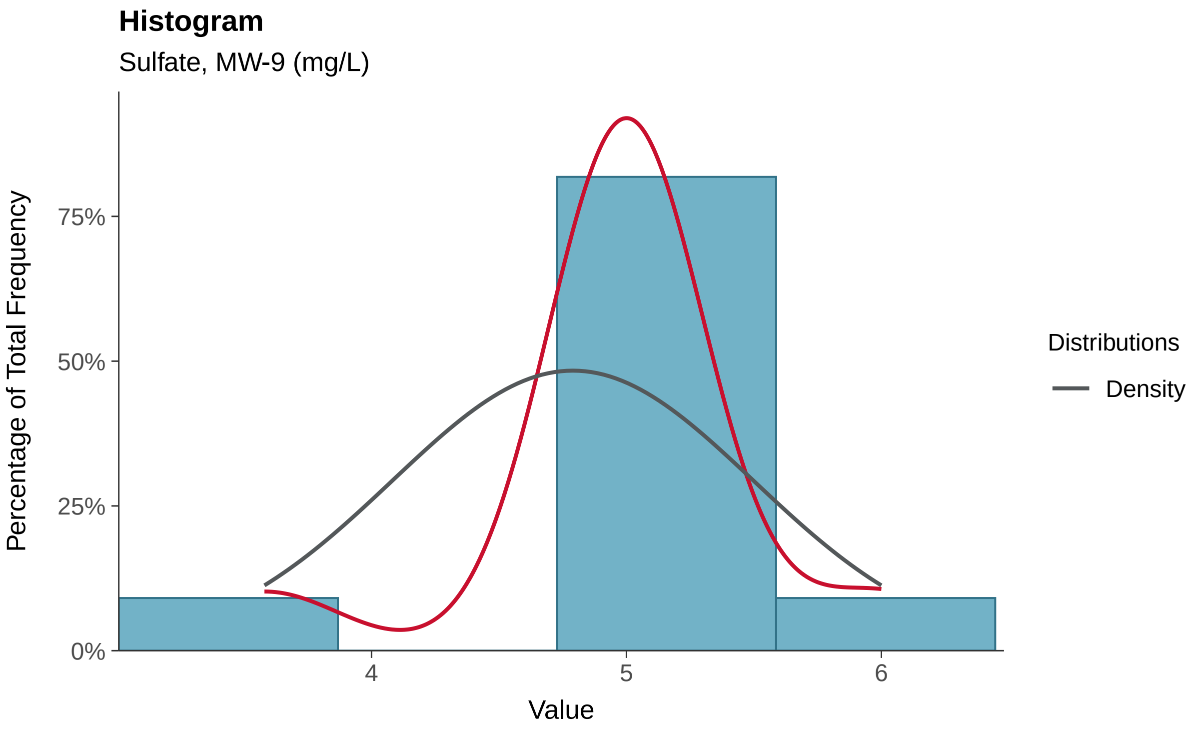
Fluoride, MW-9 (mg/L)



Appendix III: Sulfate, MW-9

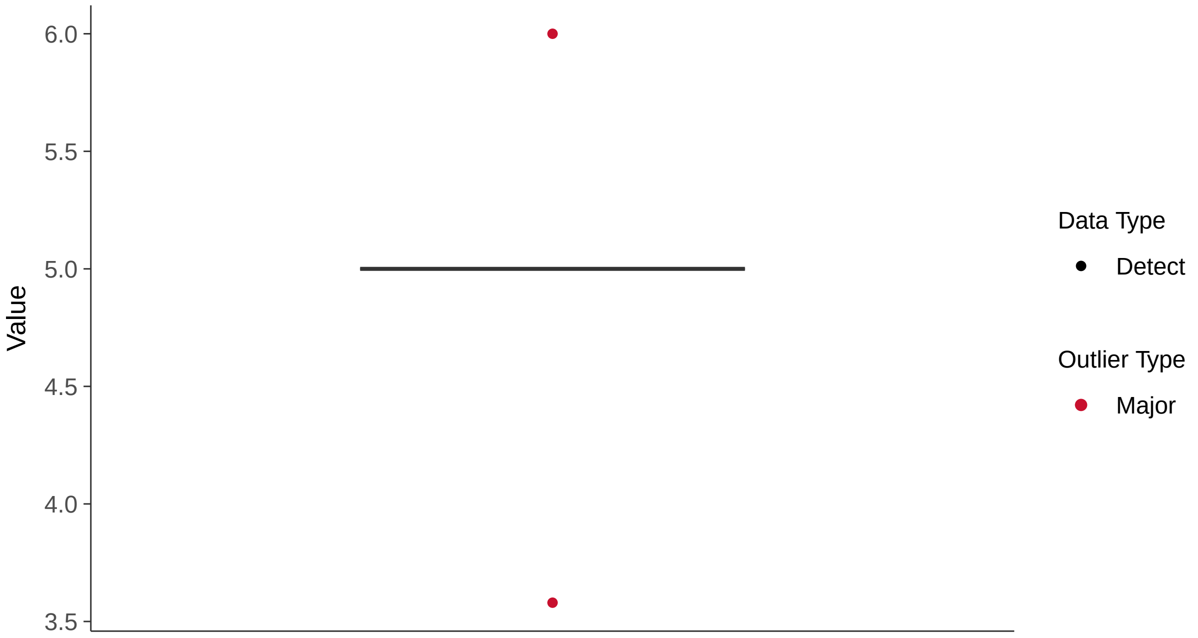
ID: 09_1_05





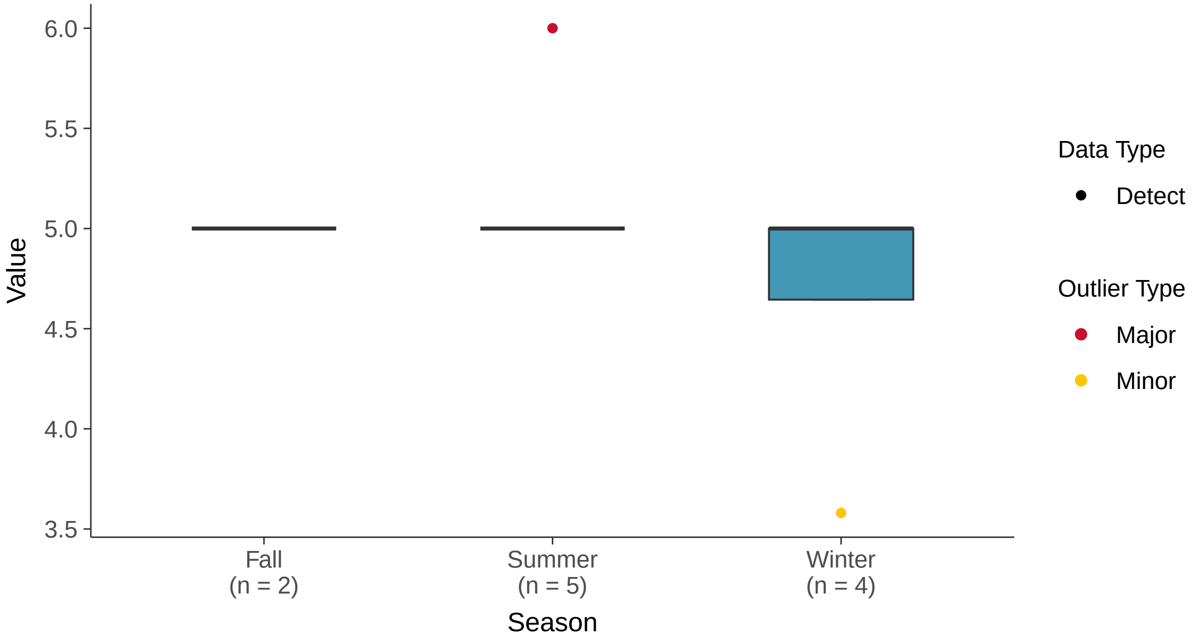
Boxplot

Sulfate, MW-9 (mg/L)



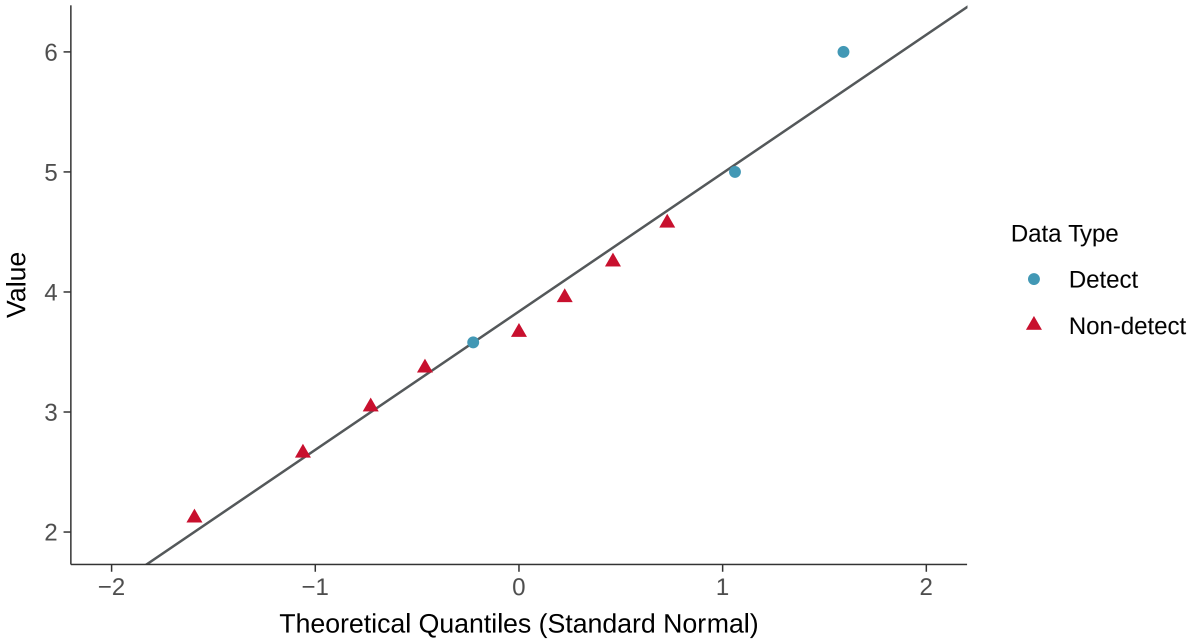
Boxplot by Season

Sulfate, MW-9 (mg/L)



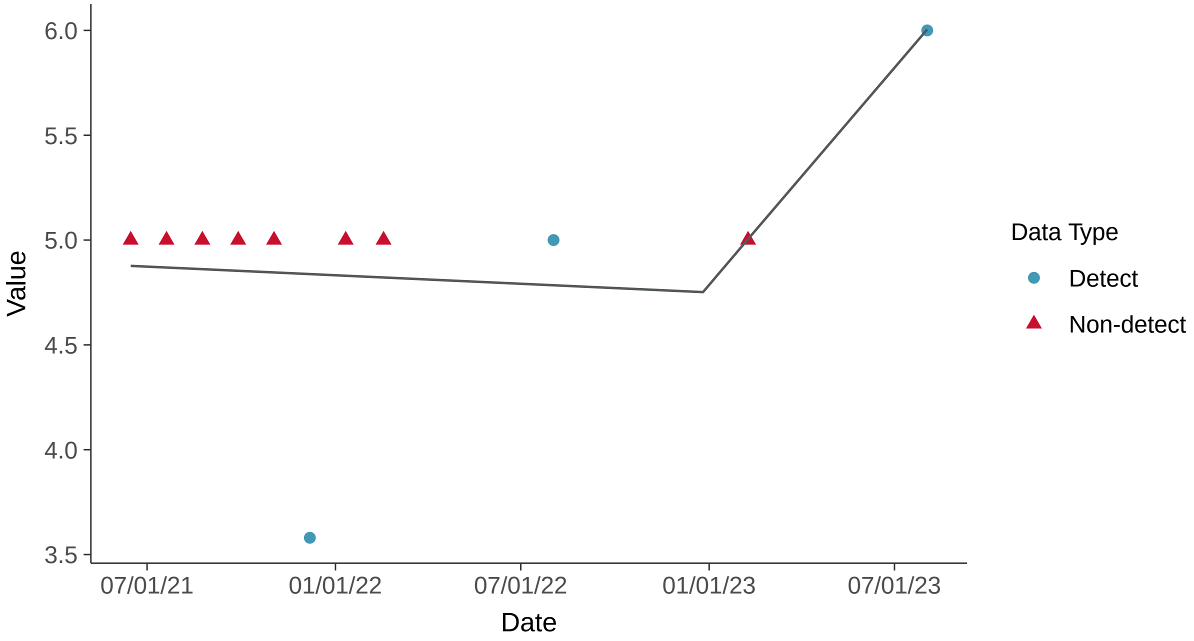
Normal Q-Q plot using ROS Imputed Estimates

Sulfate, MW-9 (mg/L)



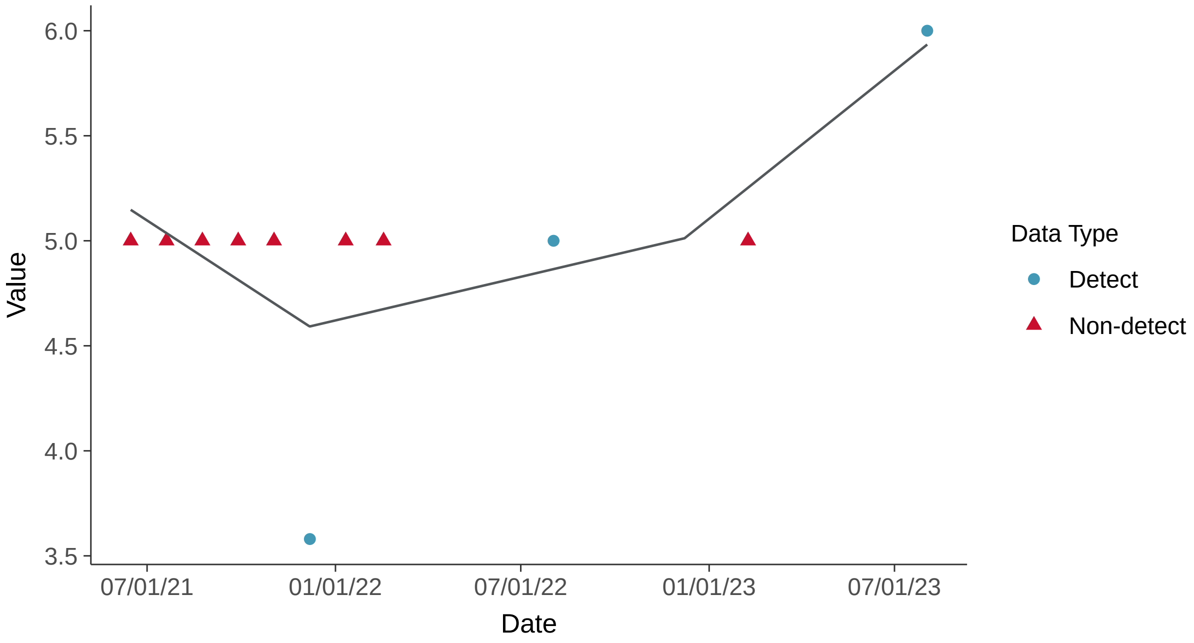
Trend Regression: Piecewise Linear-Linear

Sulfate, MW-9 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Sulfate, MW-9 (mg/L)

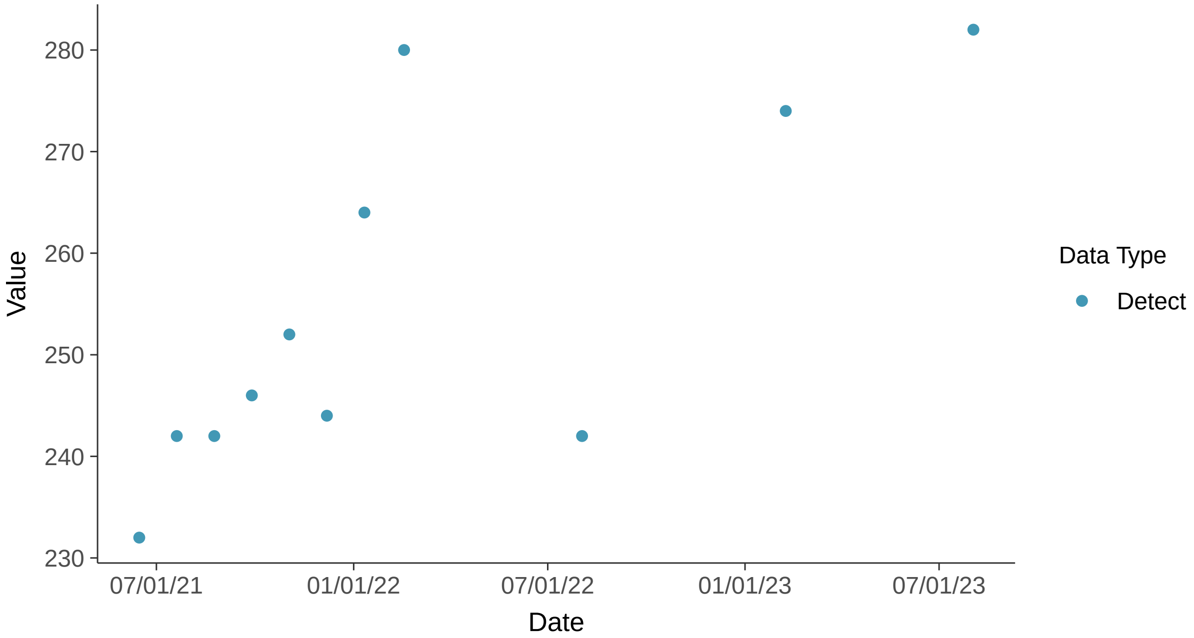


Appendix III: Total Dissolved Solids, MW-9

ID: 09_1_06

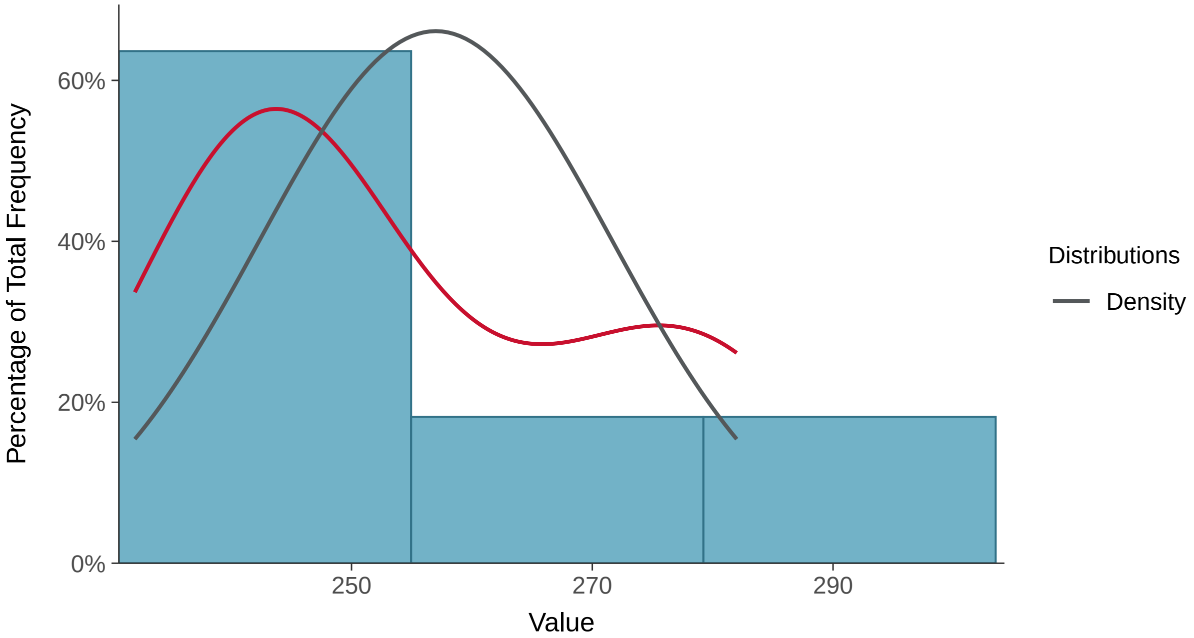
Scatter Plot

Total Dissolved Solids, MW-9 (mg/L)



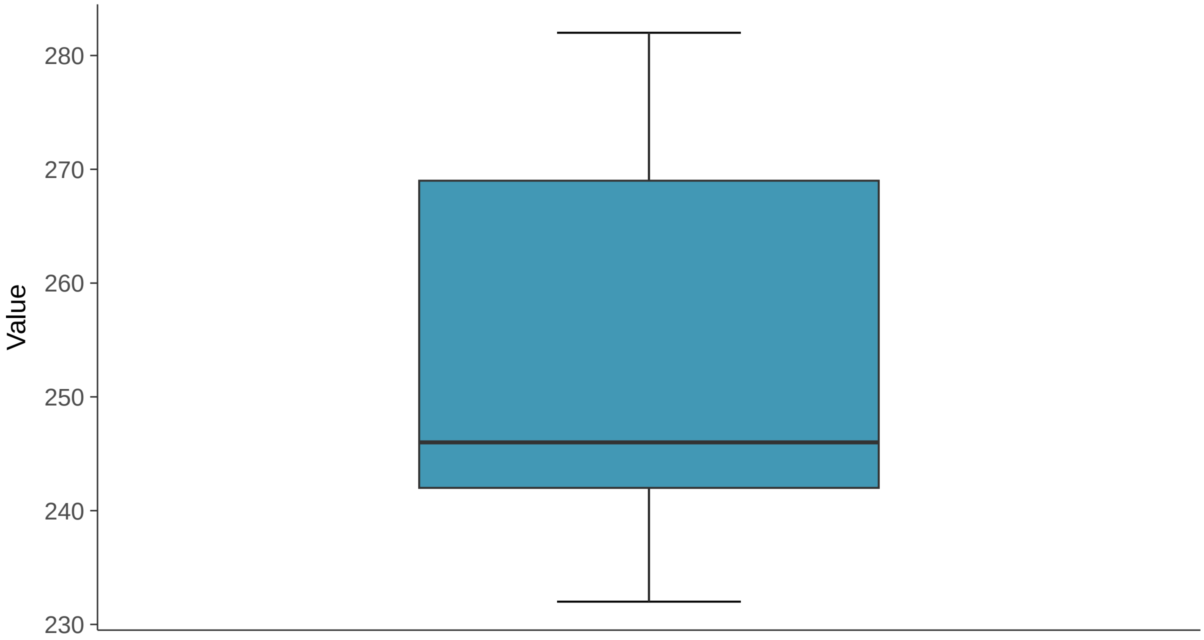
Histogram

Total Dissolved Solids, MW-9 (mg/L)



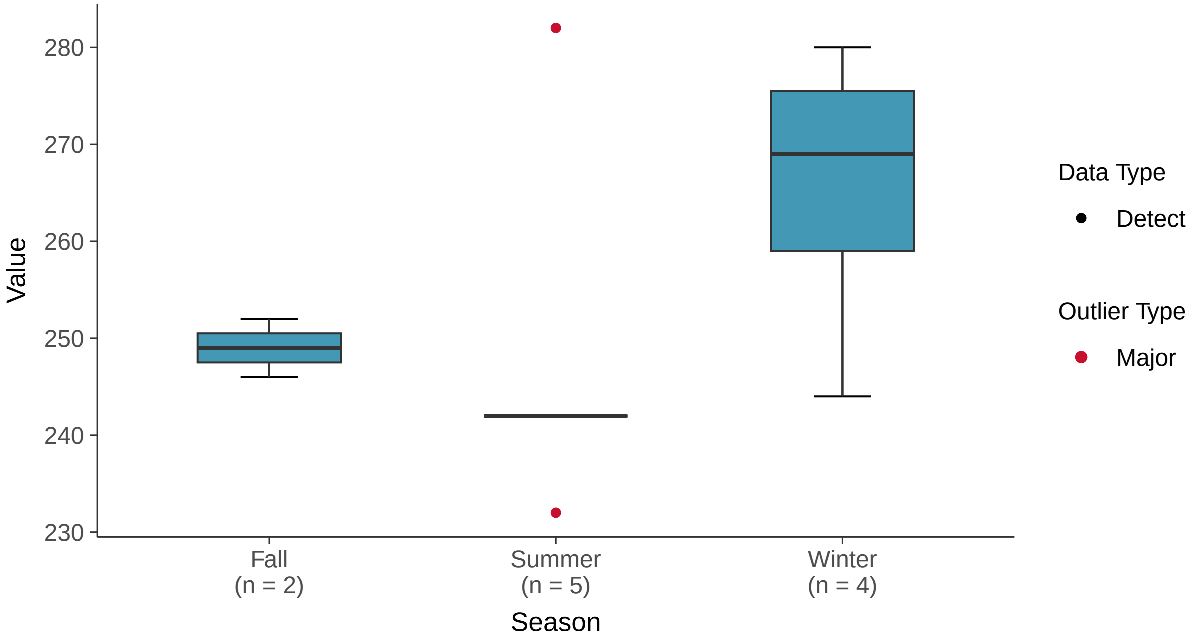
Boxplot

Total Dissolved Solids, MW-9 (mg/L)



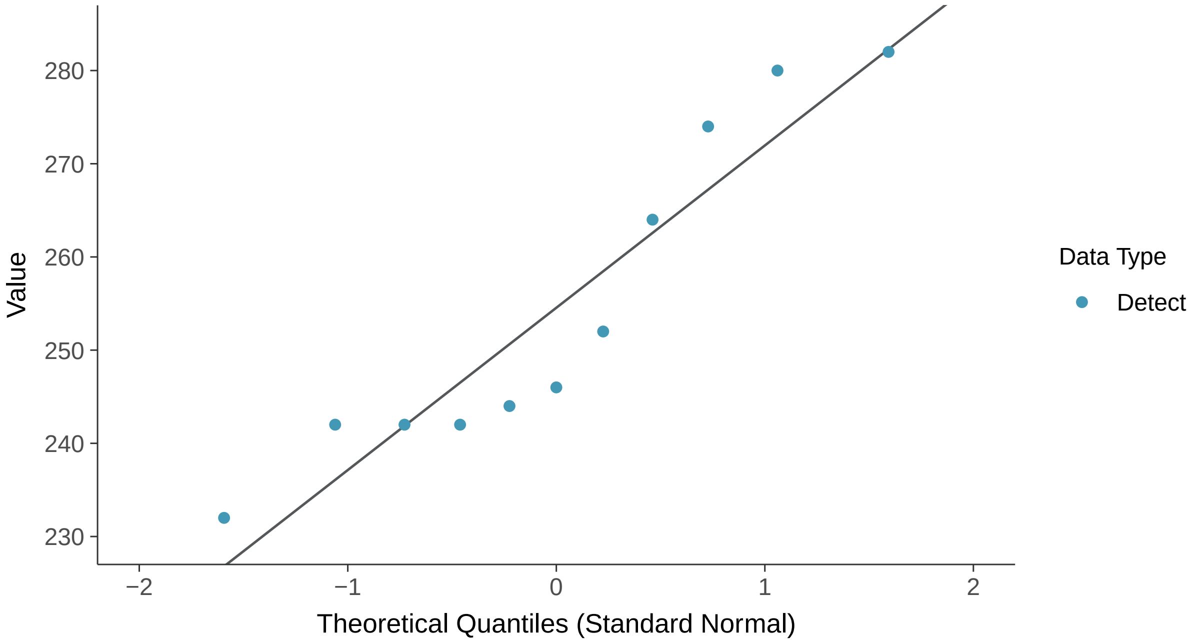
Boxplot by Season

Total Dissolved Solids, MW-9 (mg/L)



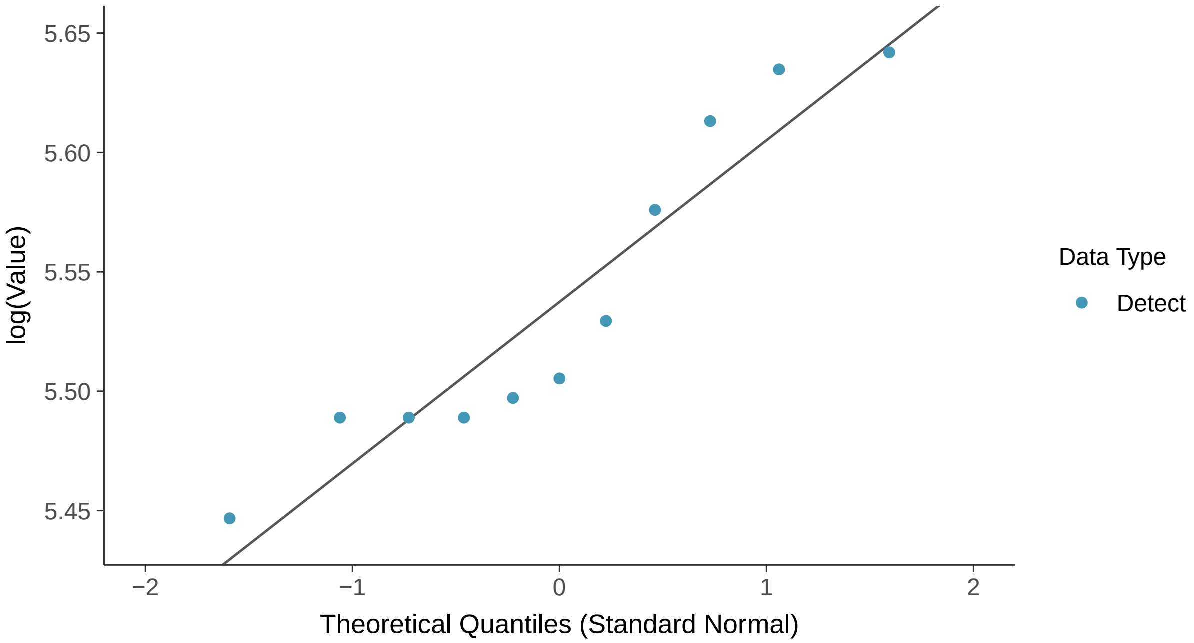
Normal Q-Q plot

Total Dissolved Solids, MW-9 (mg/L)



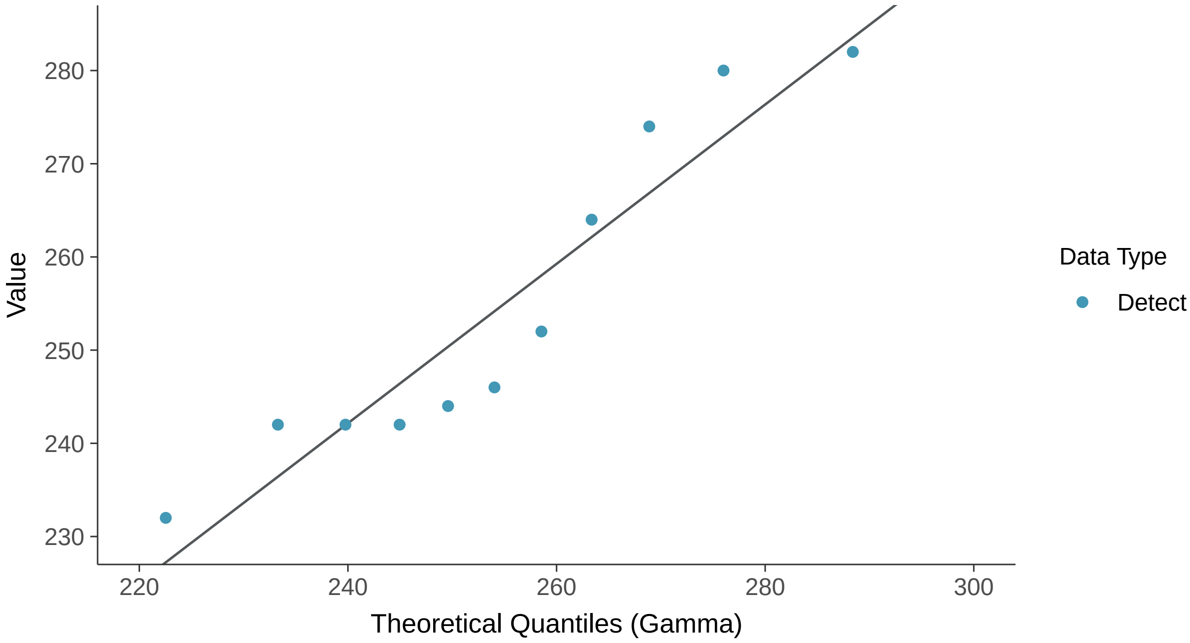
Lognormal Q-Q plot

Total Dissolved Solids, MW-9 (mg/L)



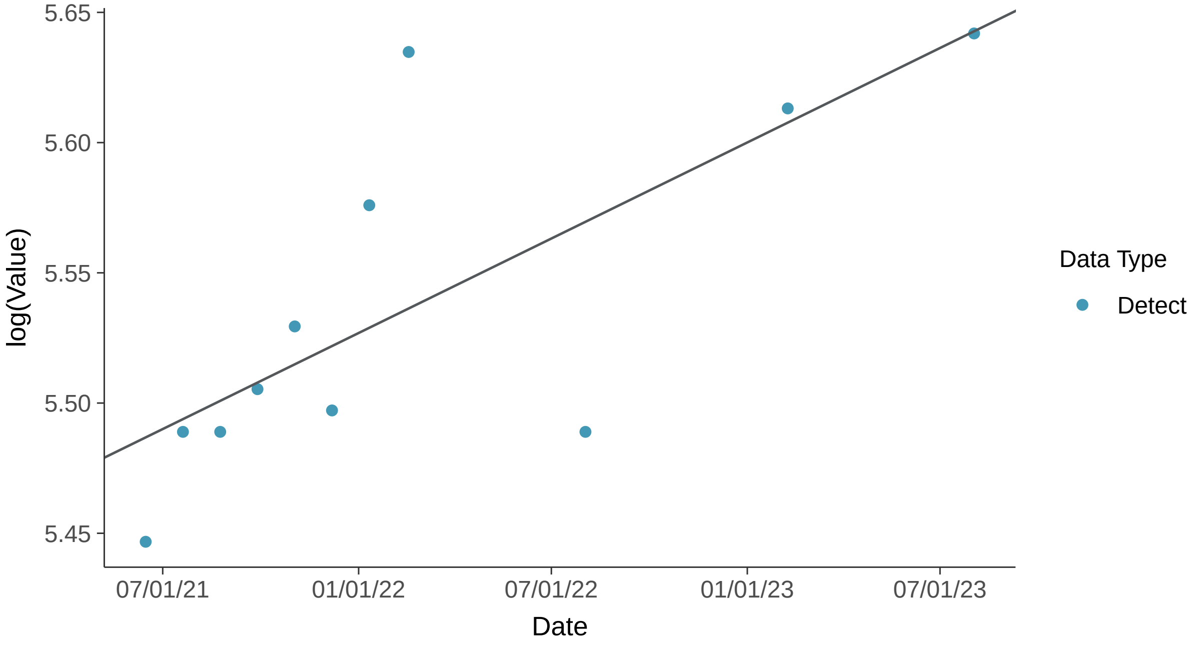
Gamma Q-Q plot

Total Dissolved Solids, MW-9 (mg/L)



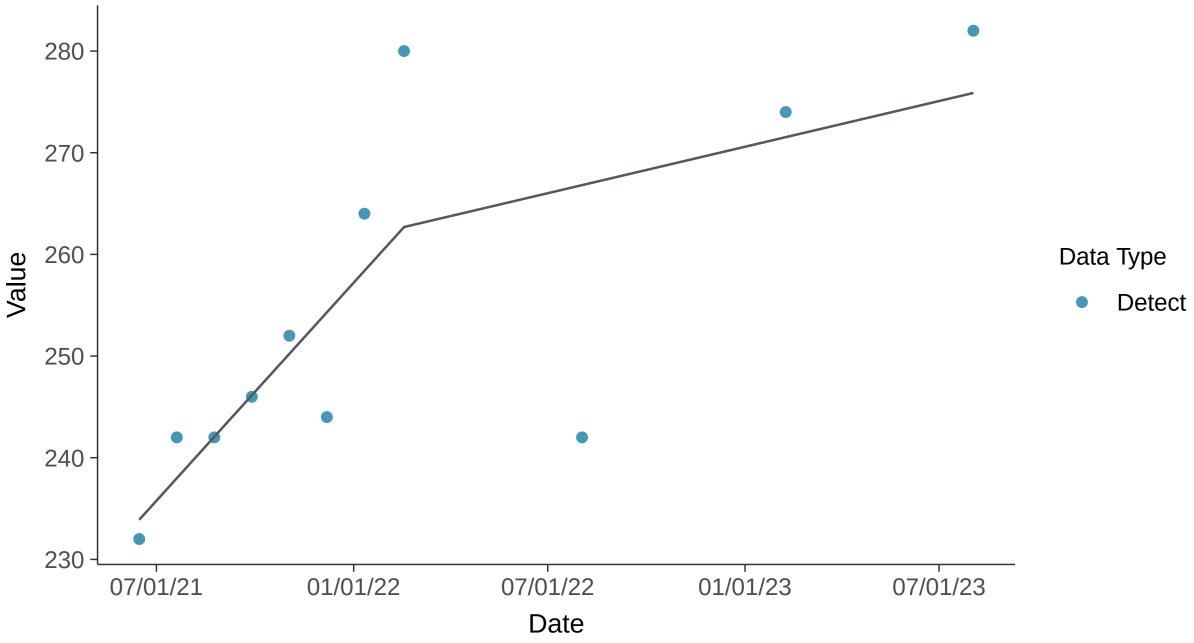
Trend Regression: Lognormal MLE

Total Dissolved Solids, MW-9 (mg/L)



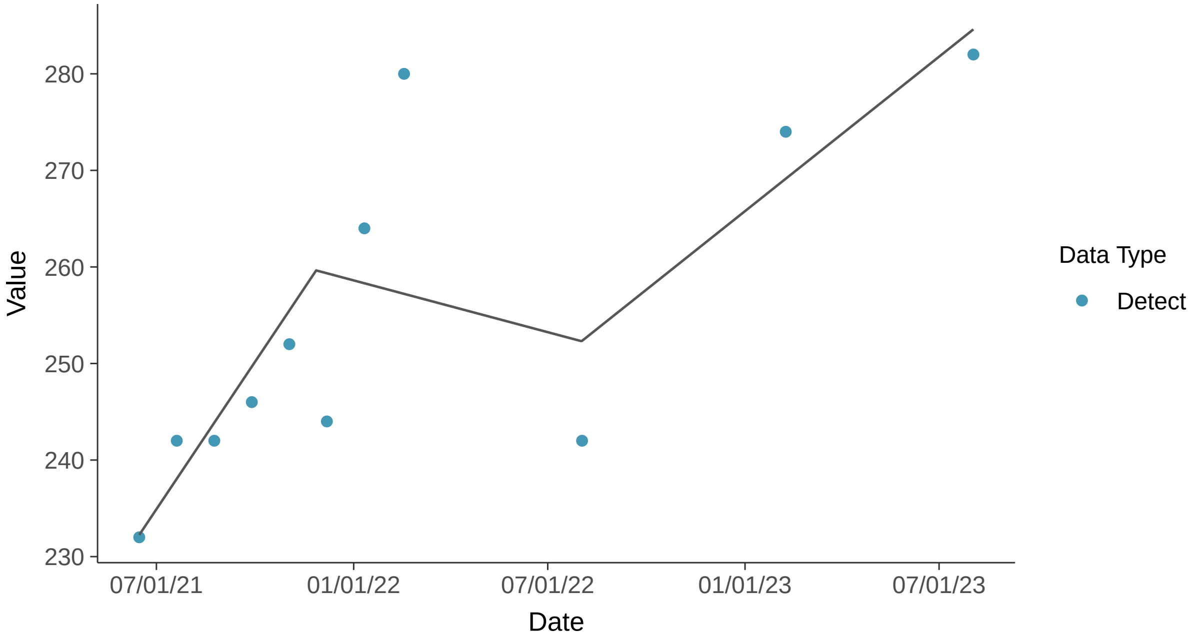
Trend Regression: Piecewise Linear-Linear

Total Dissolved Solids, MW-9 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Total Dissolved Solids, MW-9 (mg/L)

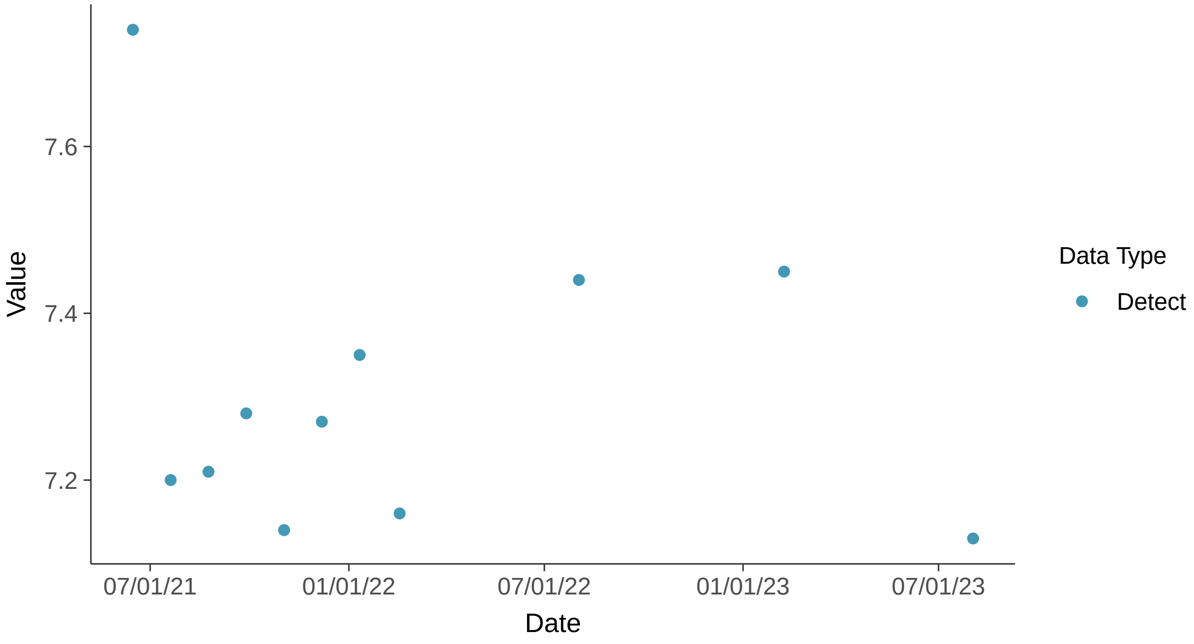


Appendix III: pH, Field, MW-9

ID: 09_1_07

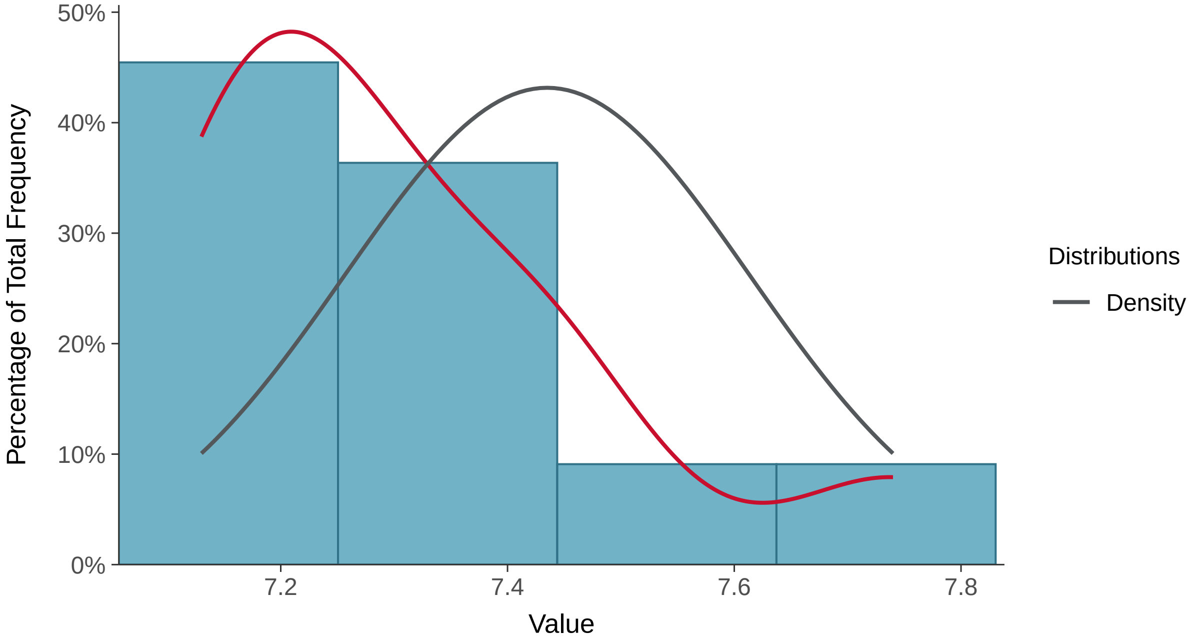
Scatter Plot

pH, Field, MW-9 (su)



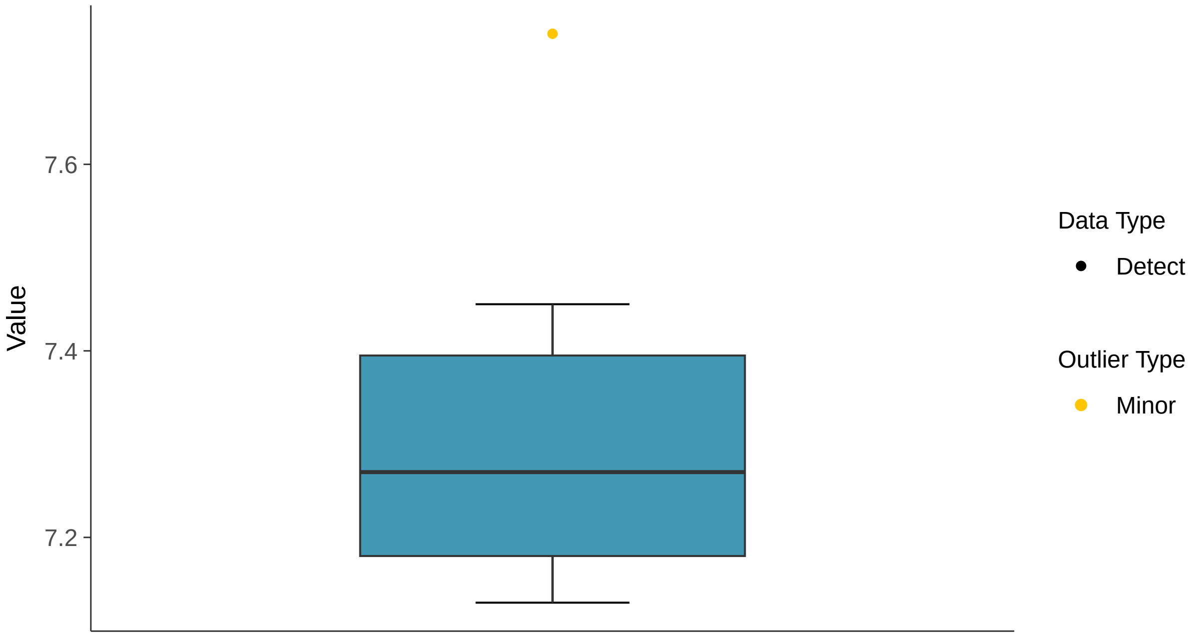
Histogram

pH, Field, MW-9 (su)



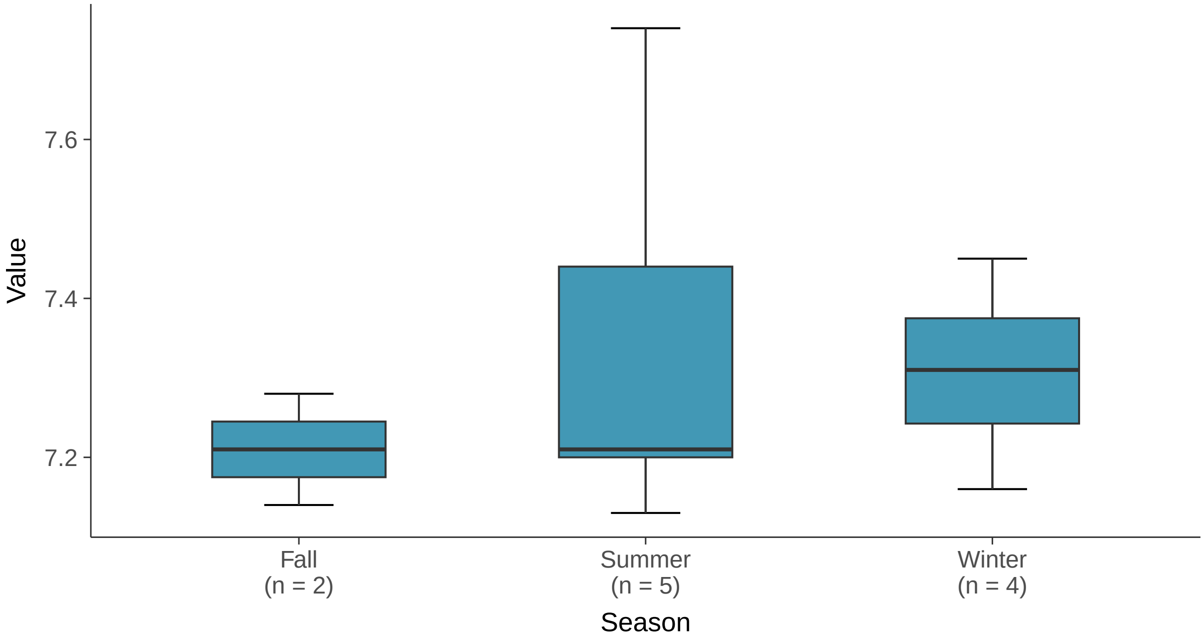
Boxplot

pH, Field, MW-9 (su)



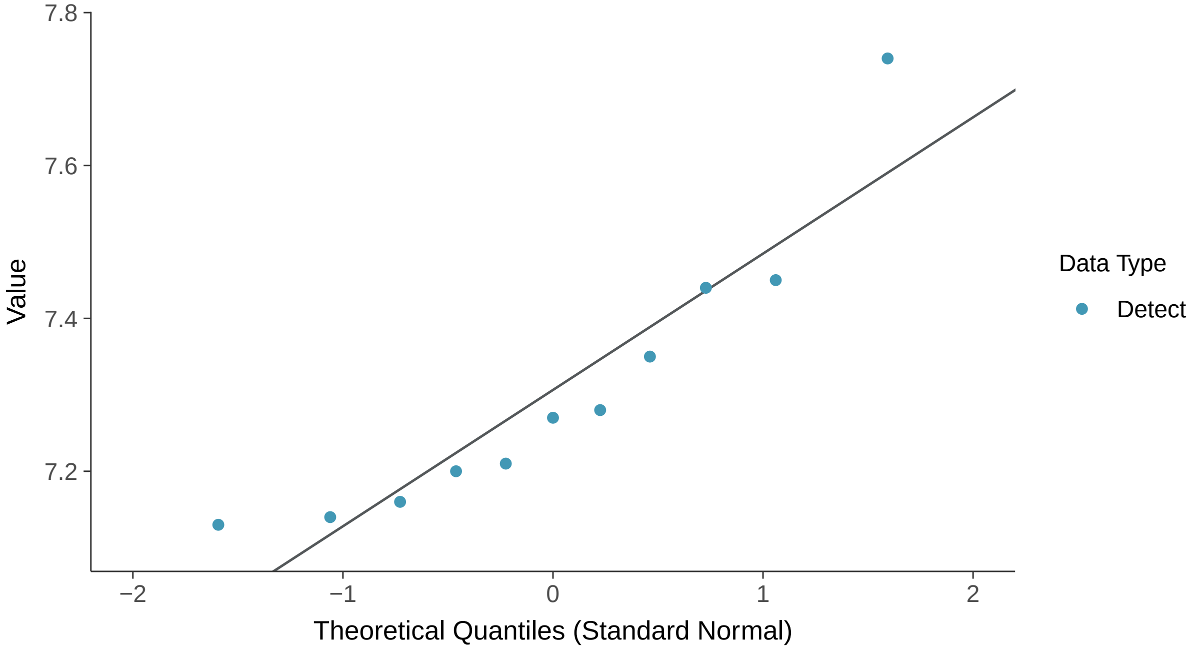
Boxplot by Season

pH, Field, MW-9 (su)



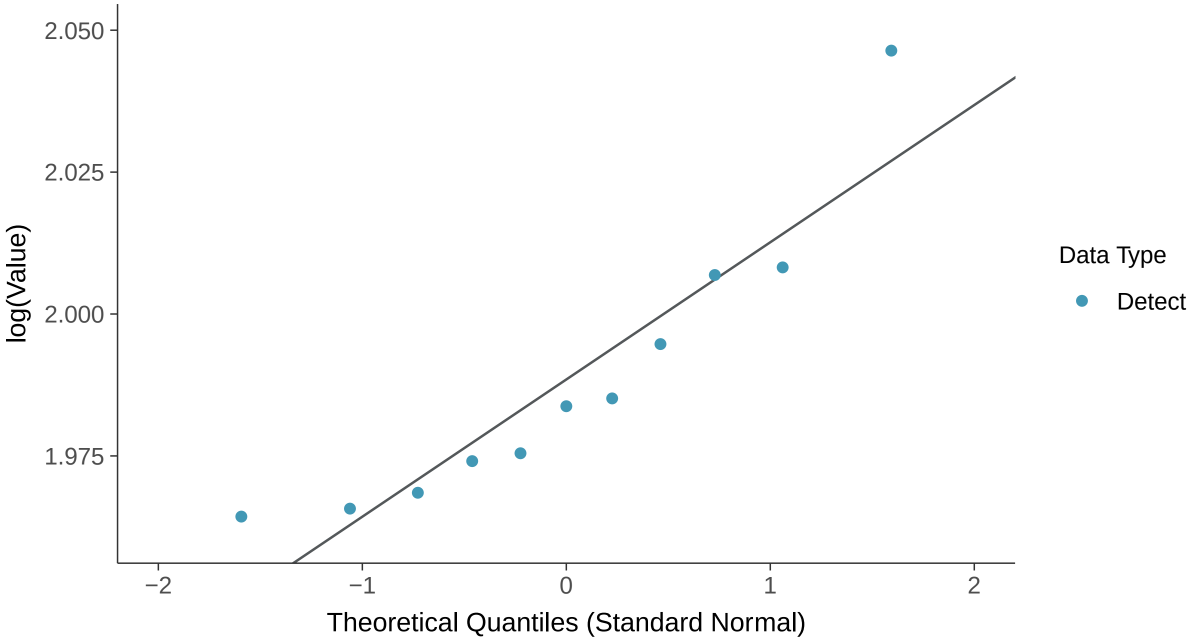
Normal Q-Q plot

pH, Field, MW-9 (su)



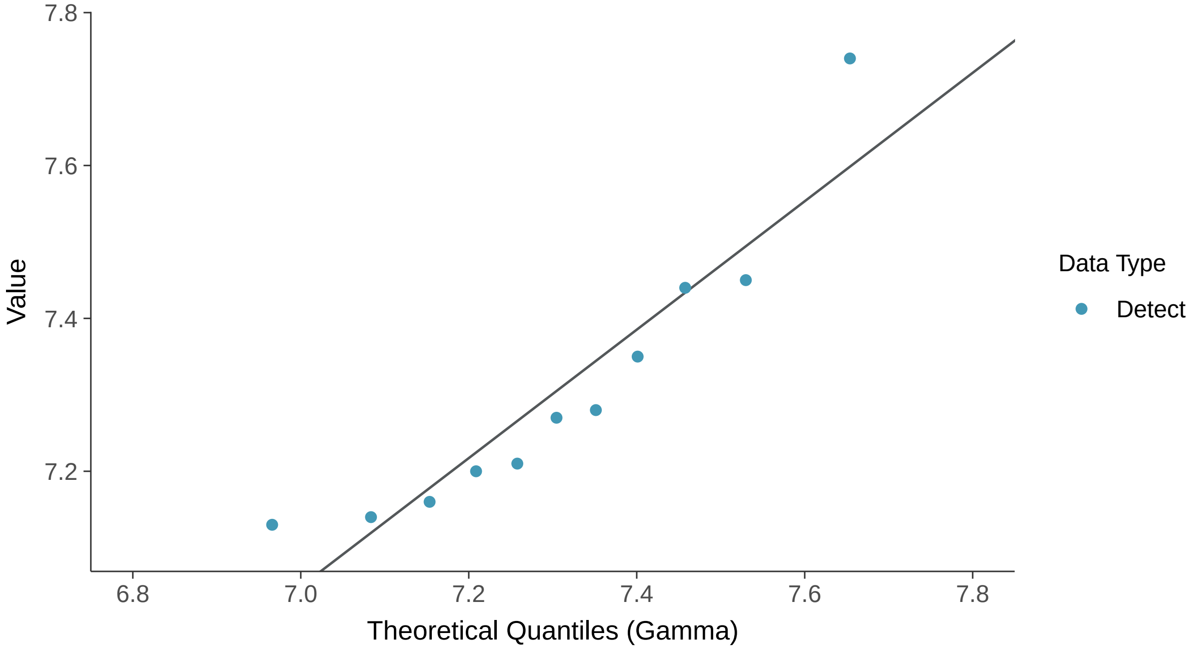
Lognormal Q-Q plot

pH, Field, MW-9 (su)



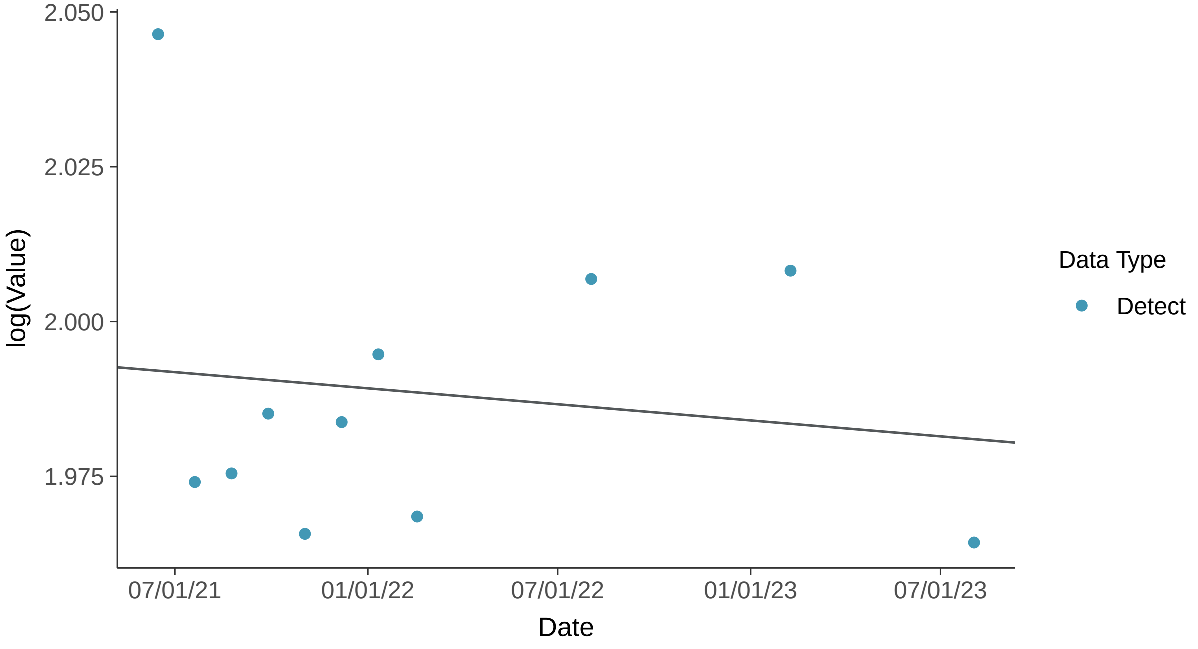
Gamma Q-Q plot

pH, Field, MW-9 (su)



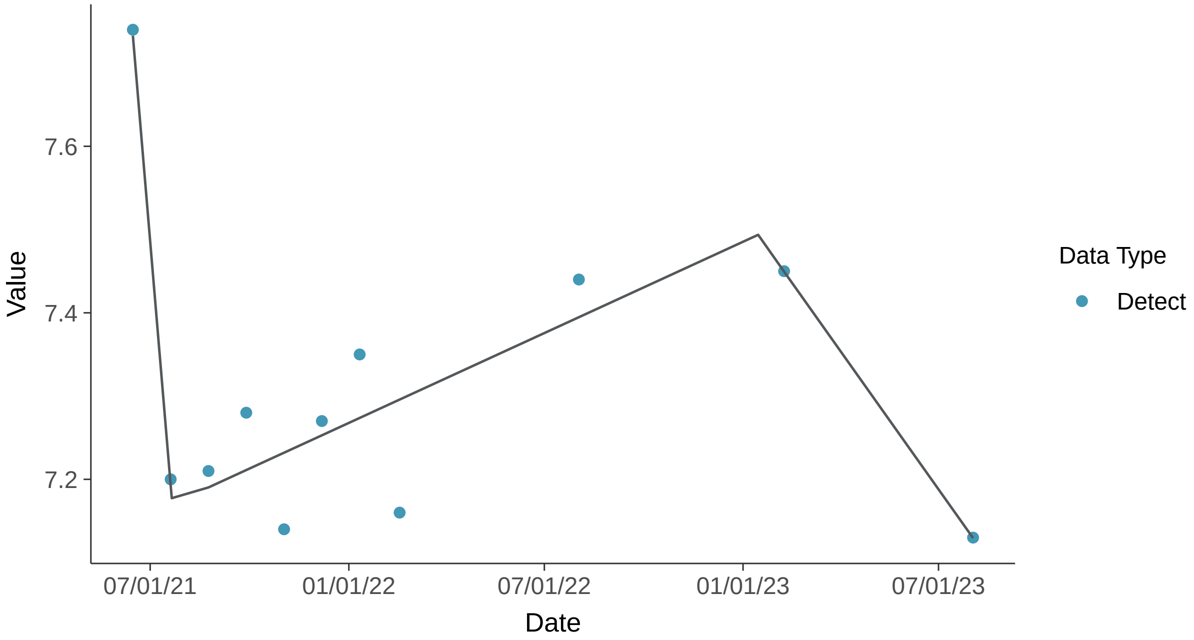
Trend Regression: Lognormal MLE

pH, Field, MW-9 (su)



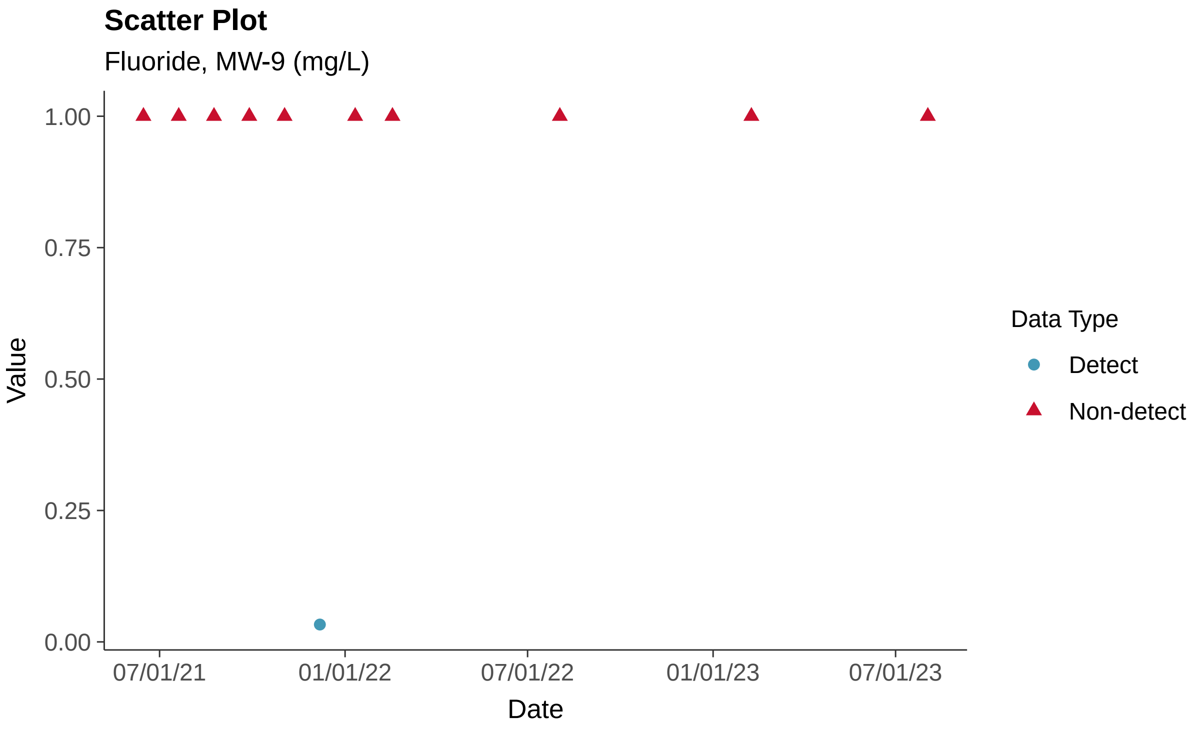
Trend Regression: Piecewise Linear-Linear-Linear

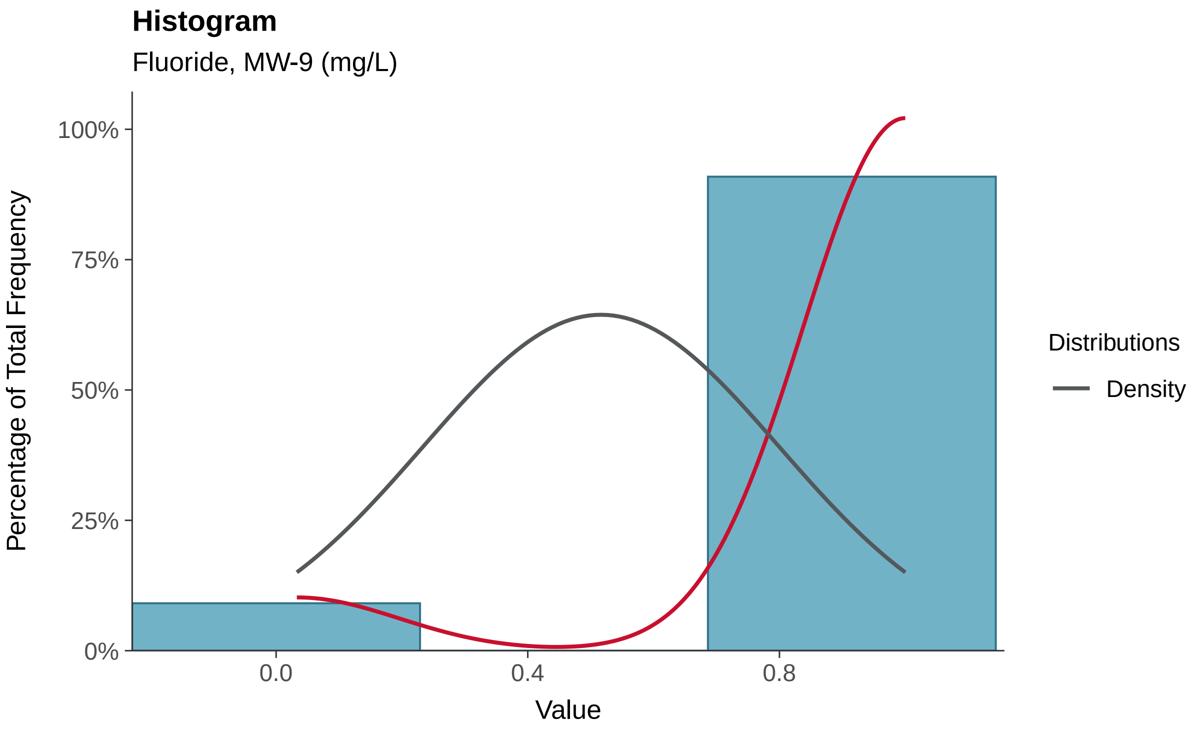
pH, Field, MW-9 (su)



Appendix IV: Fluoride, MW-9

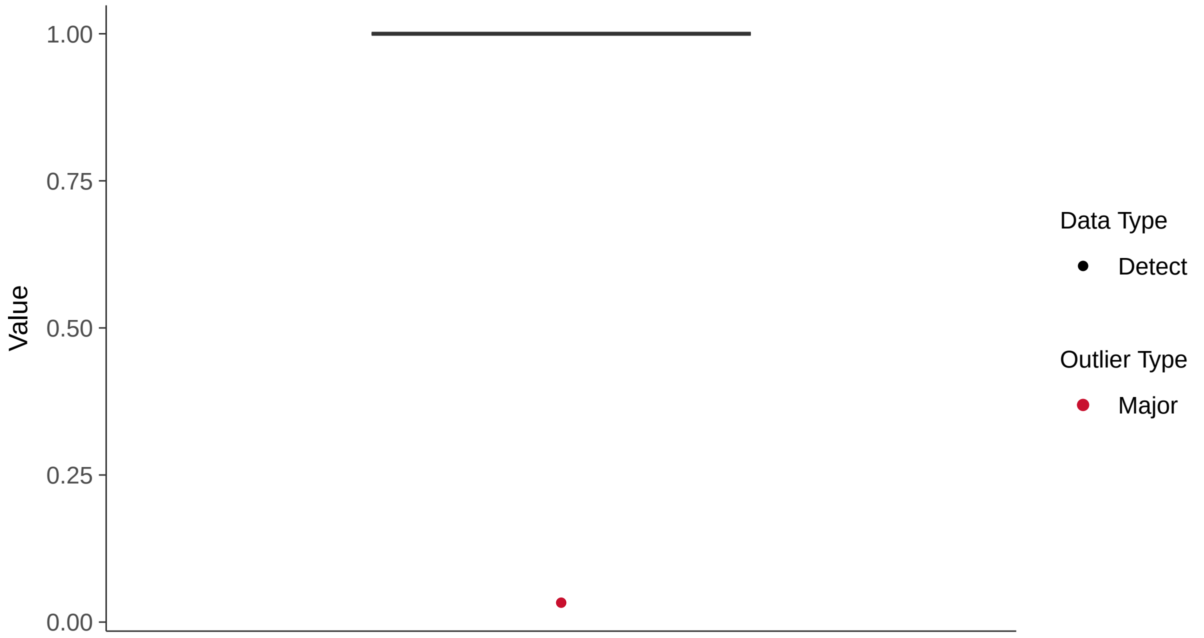
ID: 09_2_04





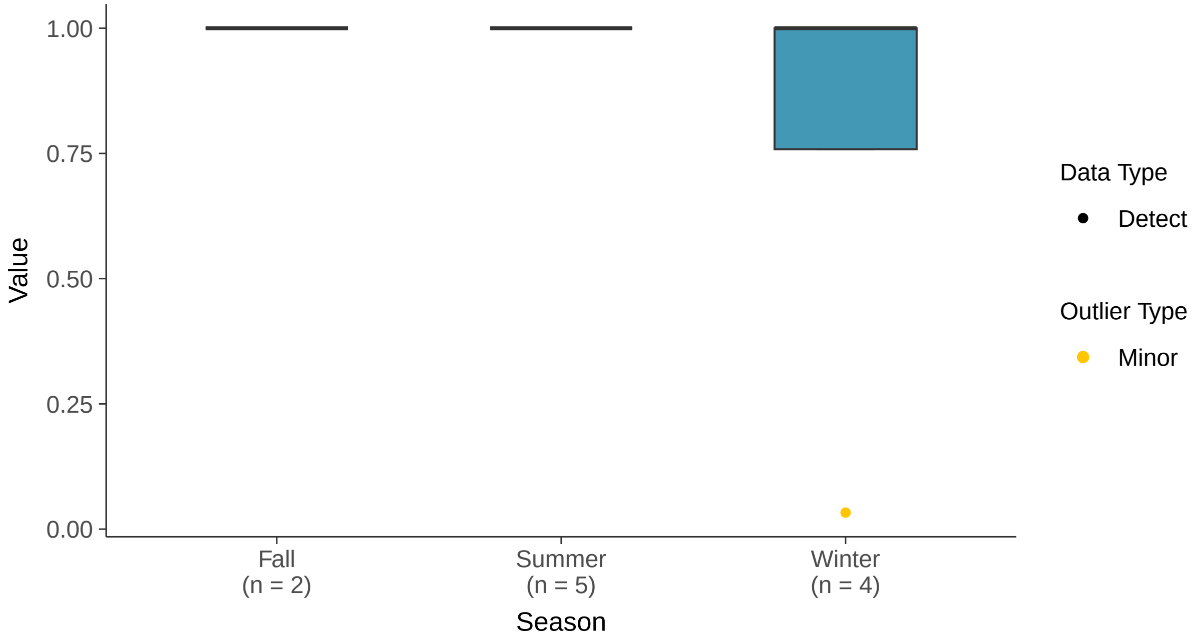
Boxplot

Fluoride, MW-9 (mg/L)



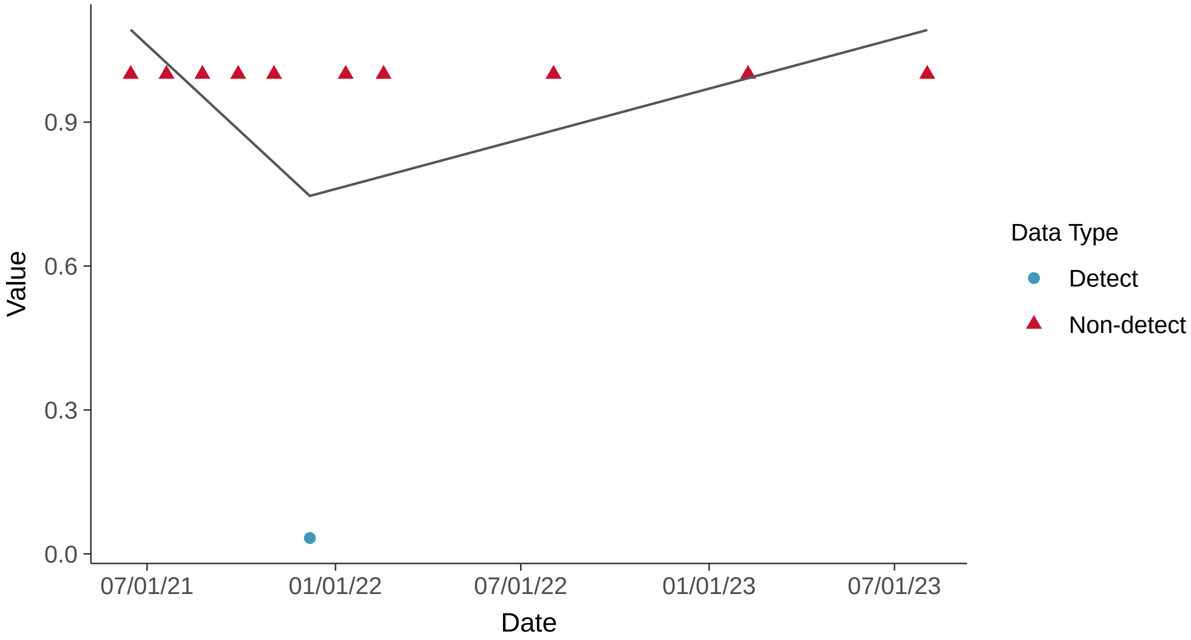
Boxplot by Season

Fluoride, MW-9 (mg/L)



Trend Regression: Piecewise Linear-Linear

Fluoride, MW-9 (mg/L)

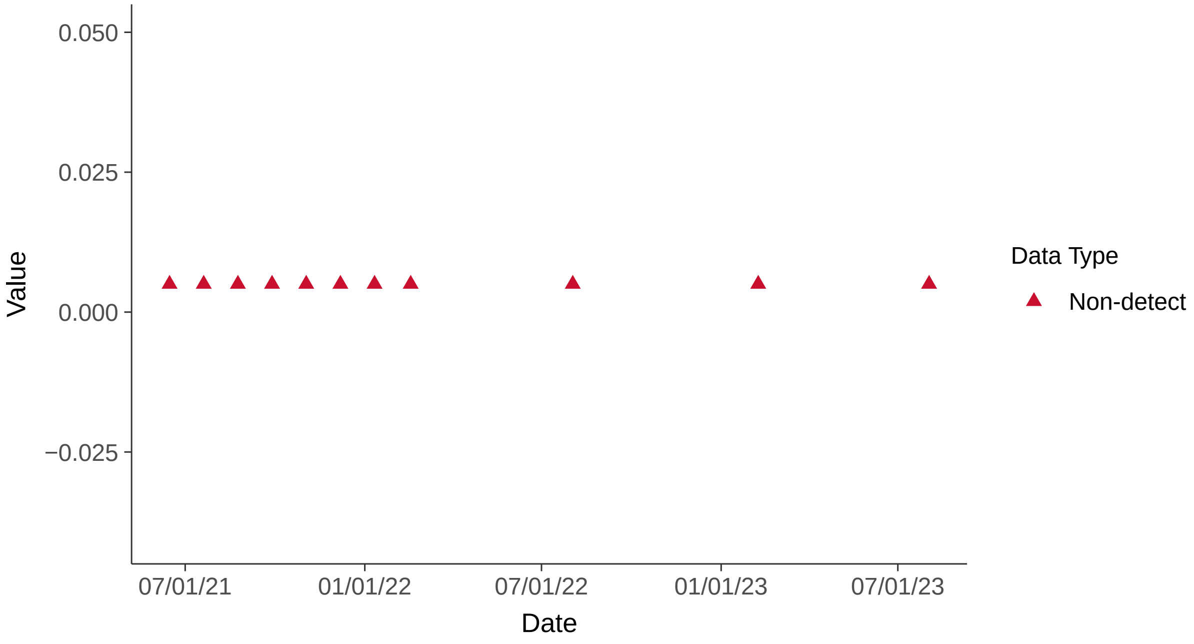


Appendix IV: Antimony, MW-9

ID: 09_2_08

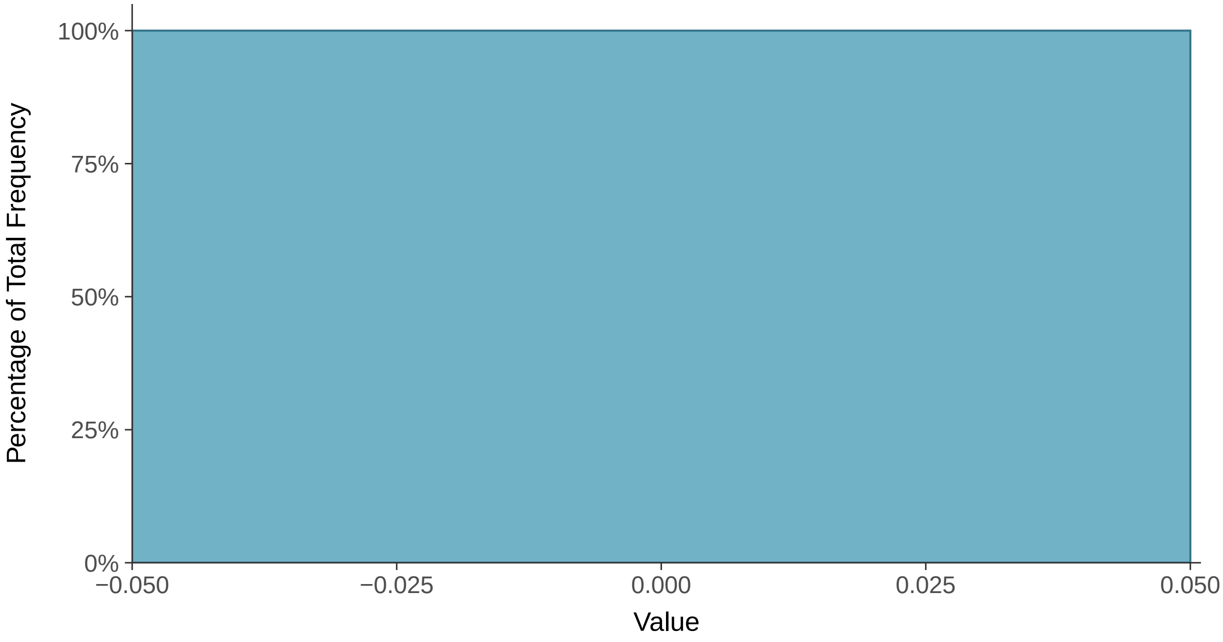
Scatter Plot

Antimony, MW-9 (mg/L)



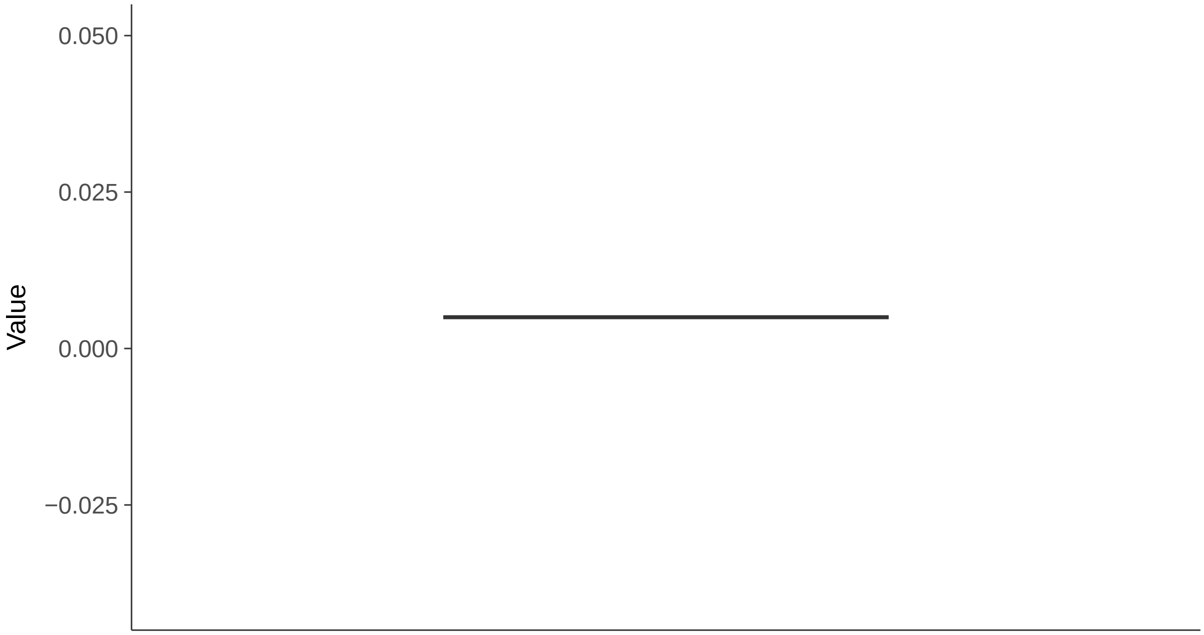
Histogram

Antimony, MW-9 (mg/L)



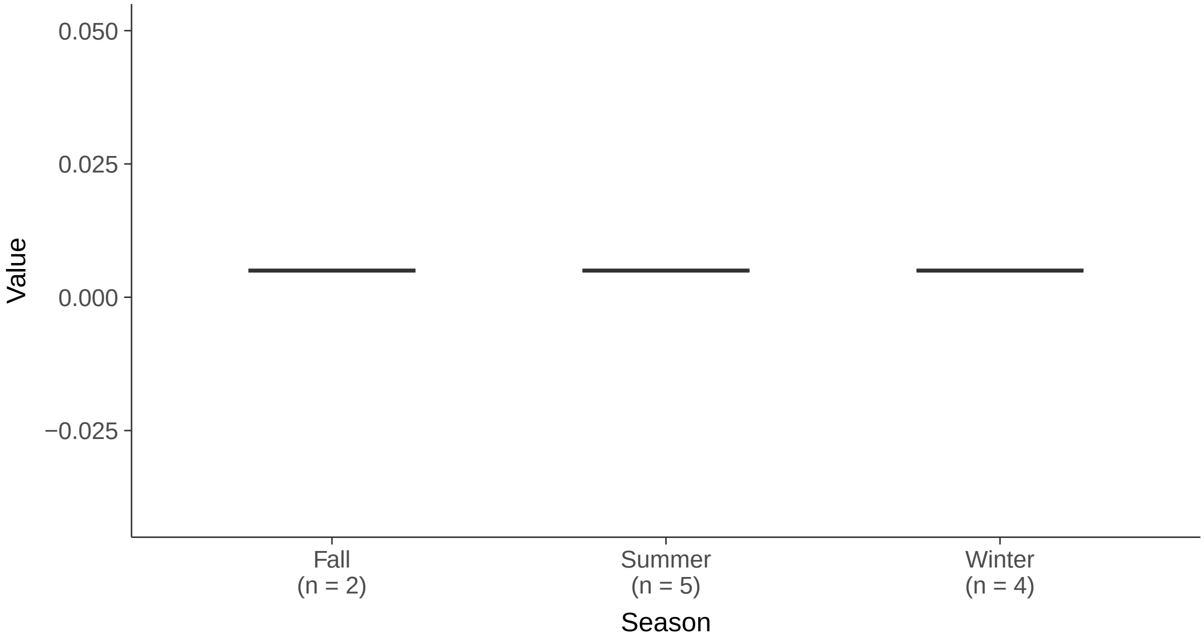
Boxplot

Antimony, MW-9 (mg/L)



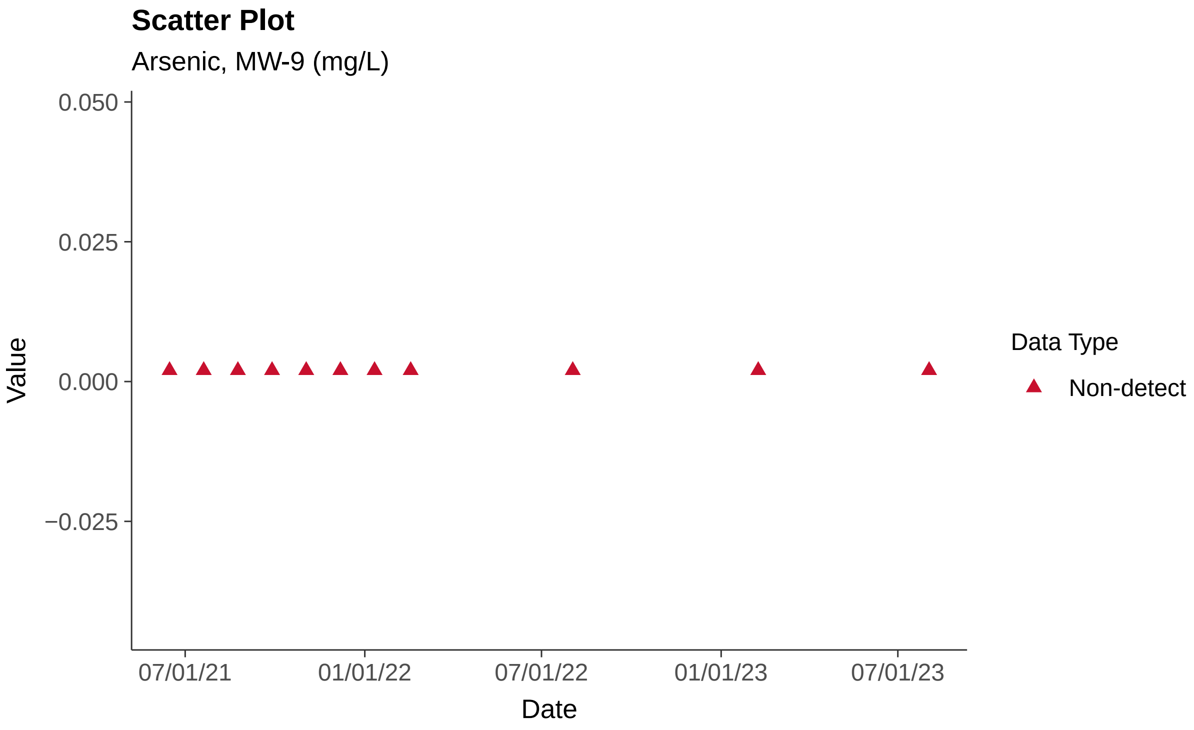
Boxplot by Season

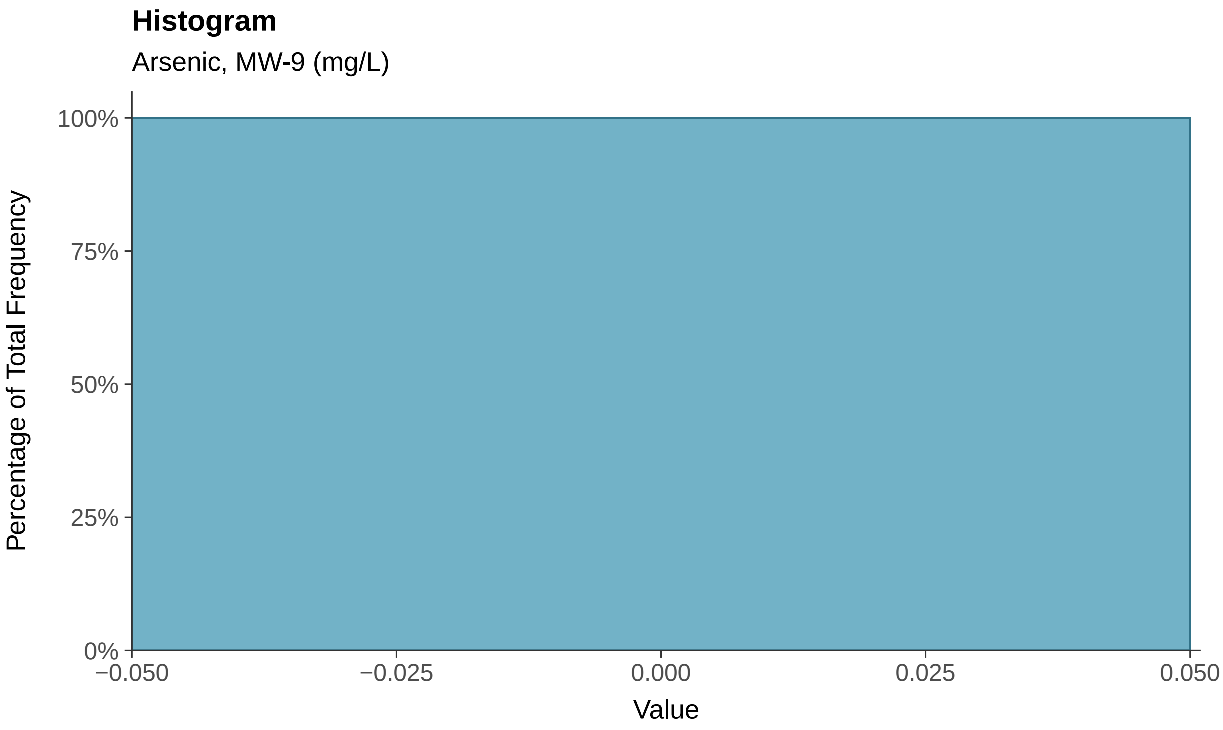
Antimony, MW-9 (mg/L)



Appendix IV: Arsenic, MW-9

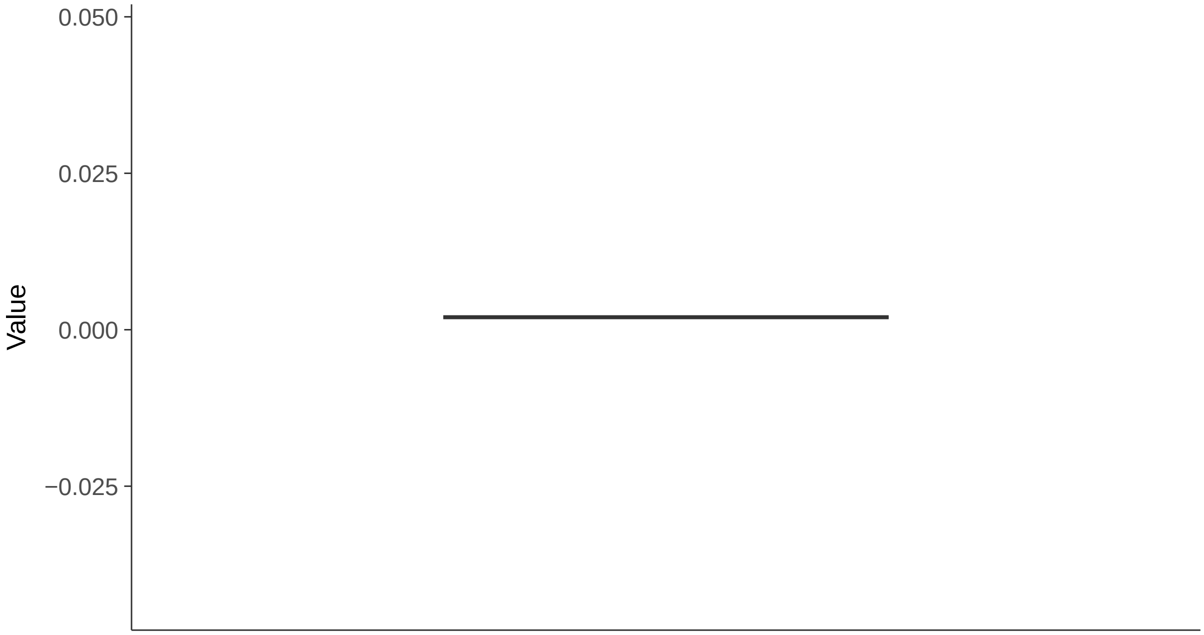
ID: 09_2_09





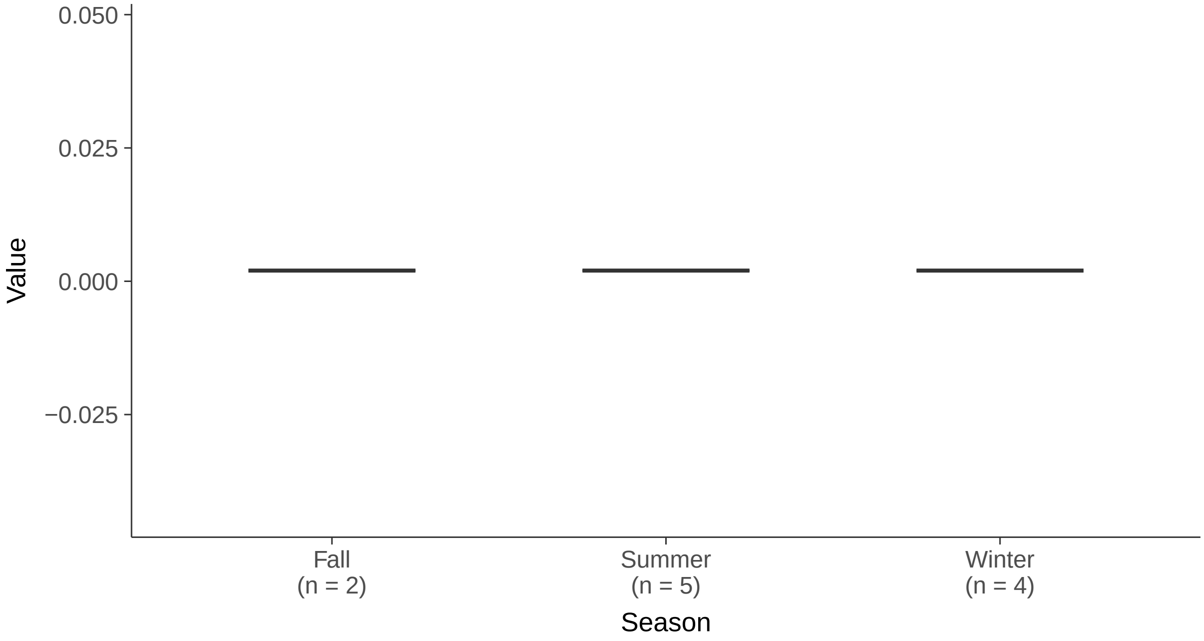
Boxplot

Arsenic, MW-9 (mg/L)



Boxplot by Season

Arsenic, MW-9 (mg/L)

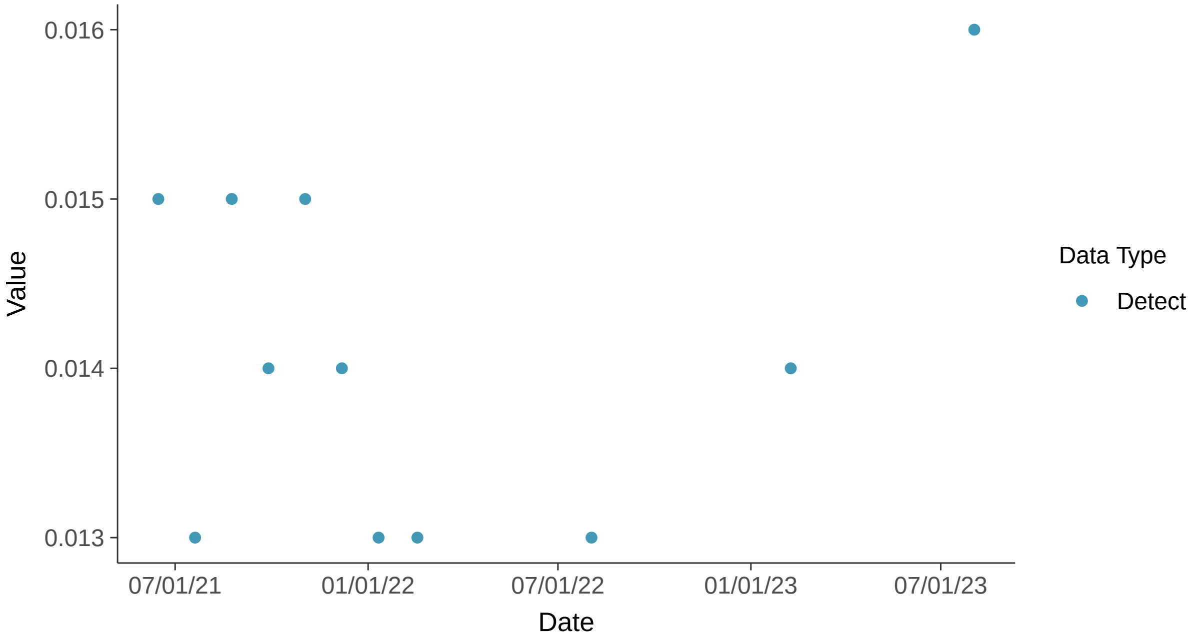


Appendix IV: Barium, MW-9

ID: 09_2_10

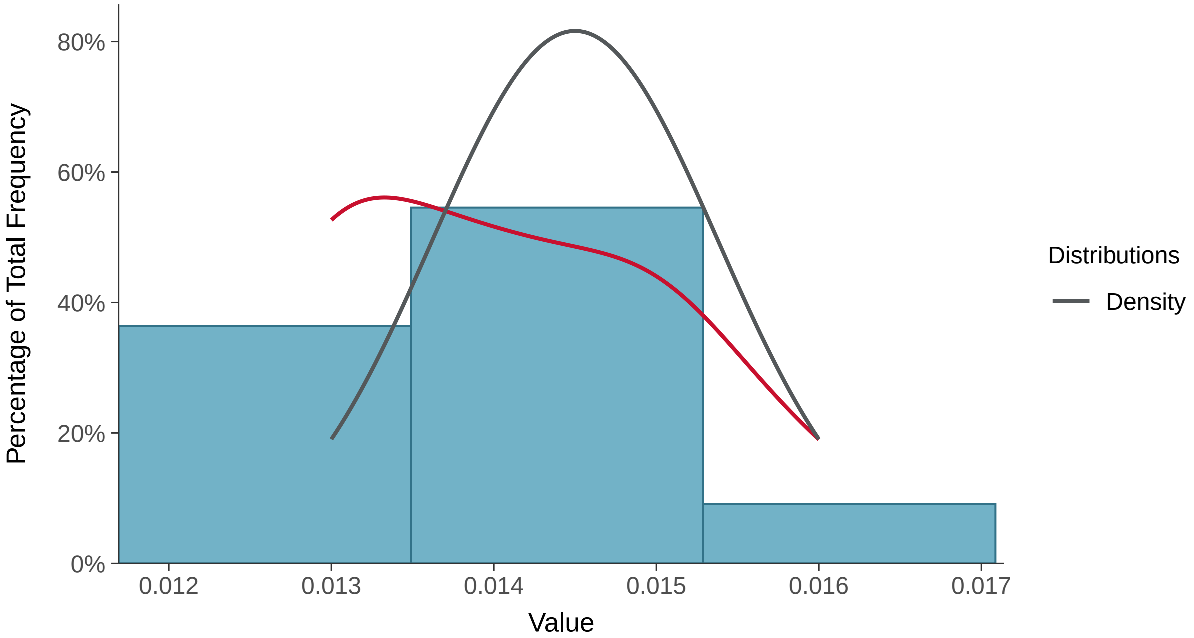
Scatter Plot

Barium, MW-9 (mg/L)



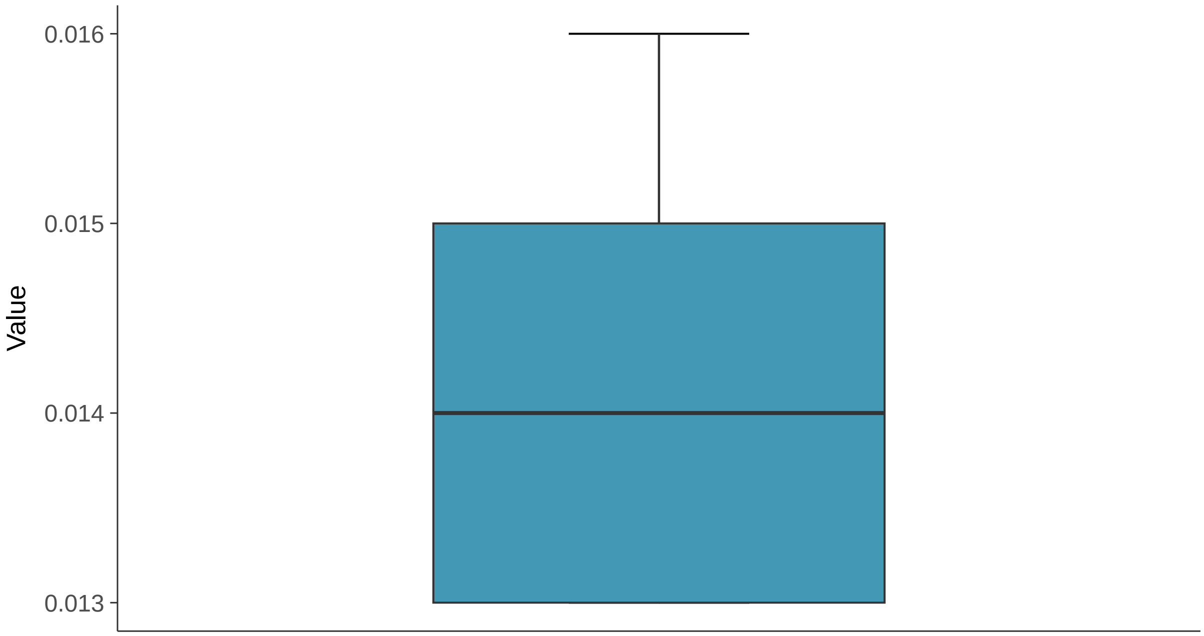
Histogram

Barium, MW-9 (mg/L)



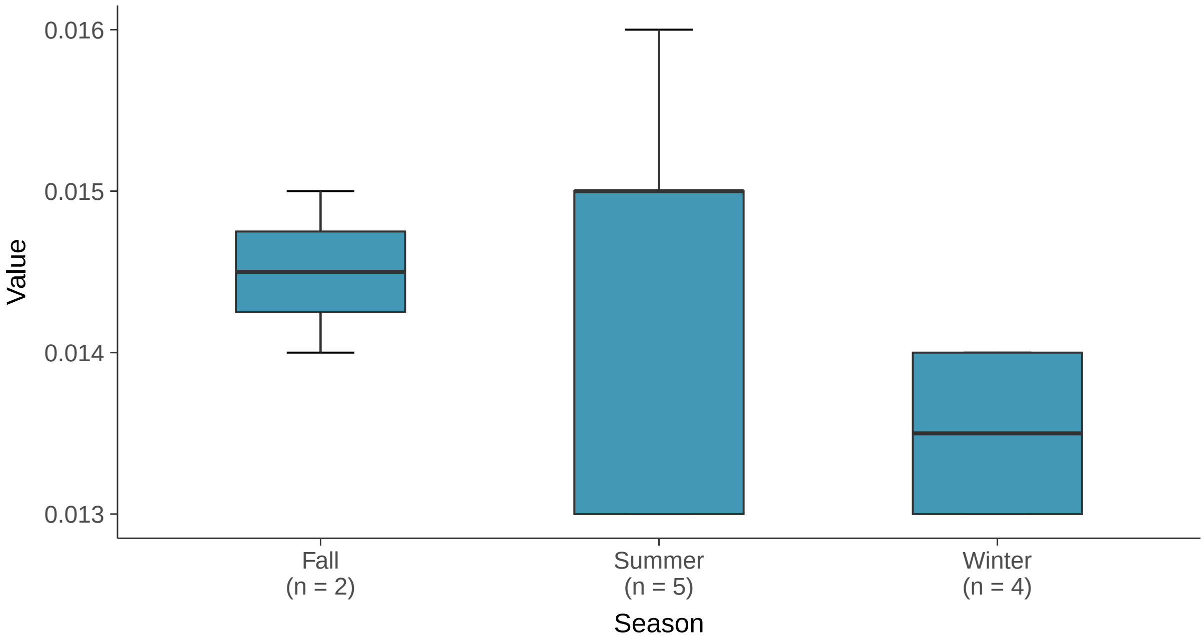
Boxplot

Barium, MW-9 (mg/L)



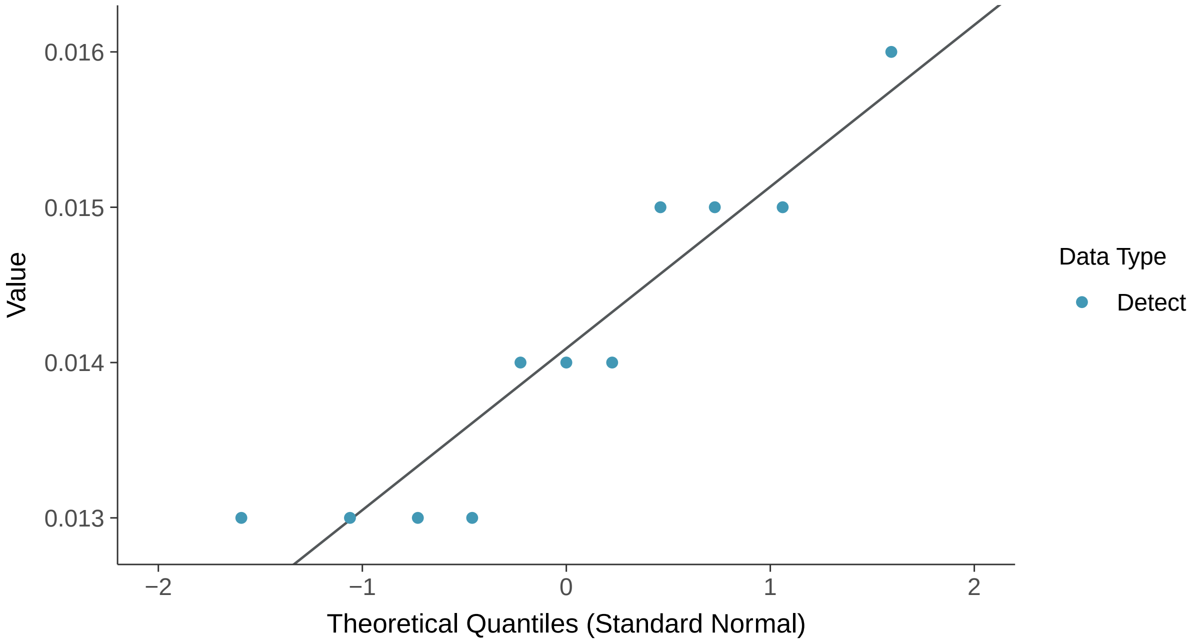
Boxplot by Season

Barium, MW-9 (mg/L)



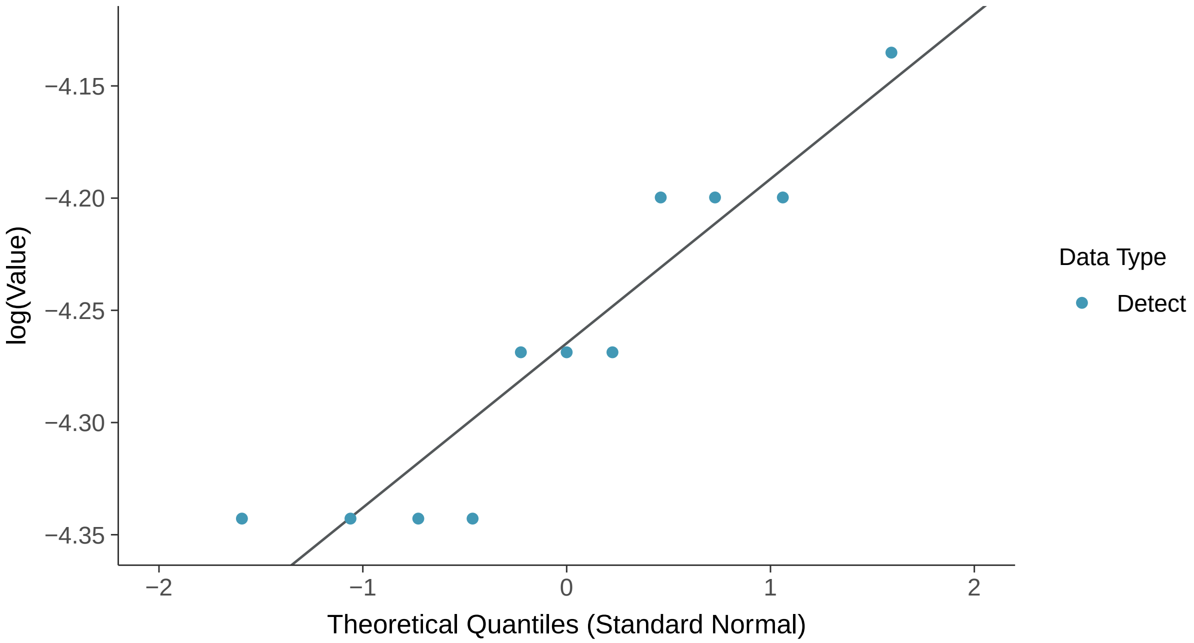
Normal Q-Q plot

Barium, MW-9 (mg/L)



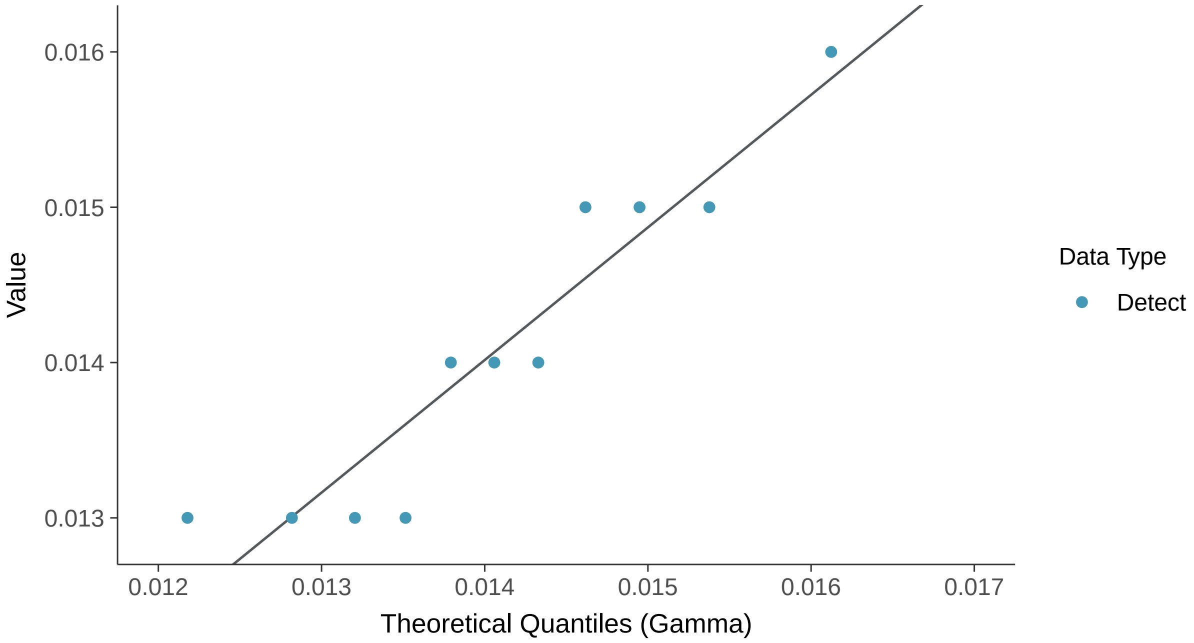
Lognormal Q-Q plot

Barium, MW-9 (mg/L)



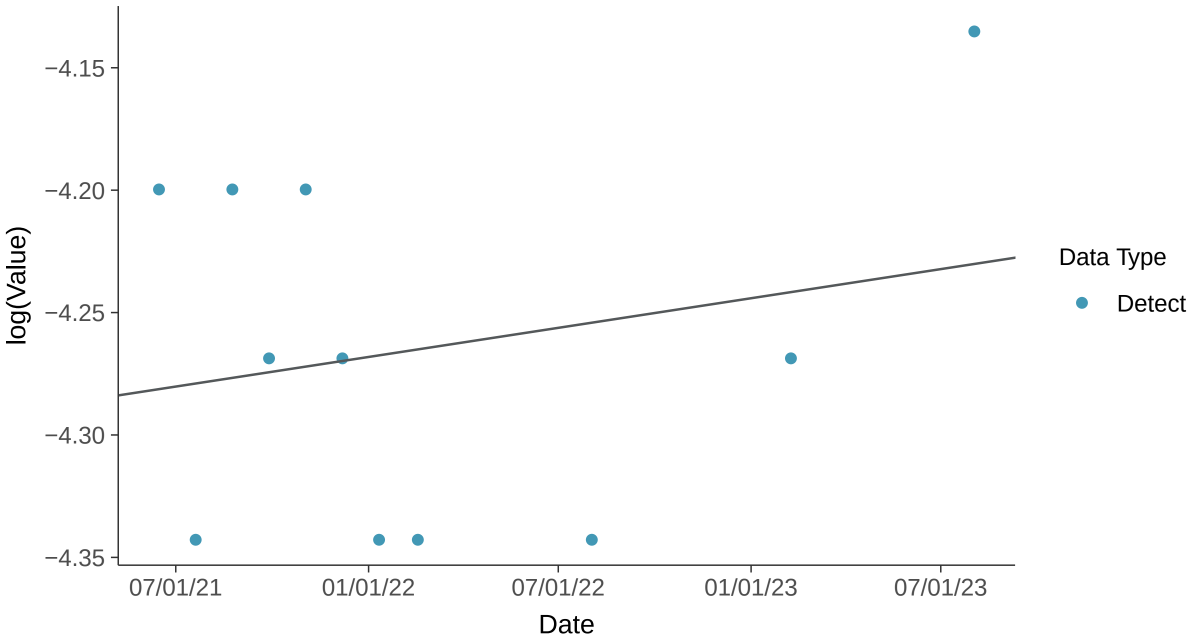
Gamma Q-Q plot

Barium, MW-9 (mg/L)



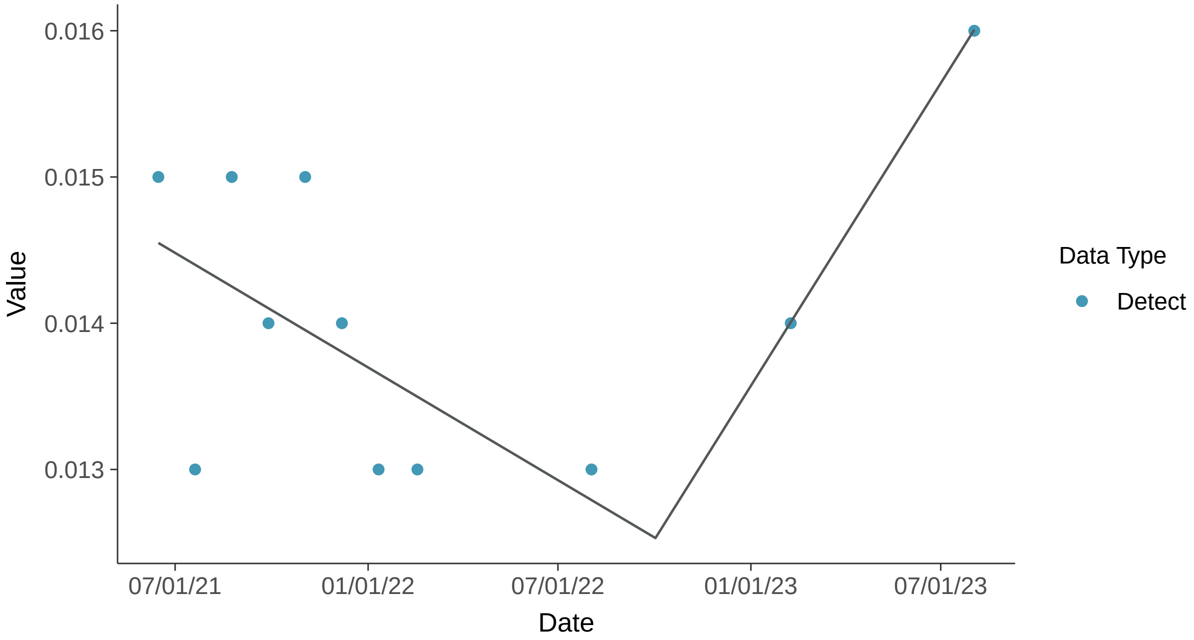
Trend Regression: Lognormal MLE

Barium, MW-9 (mg/L)



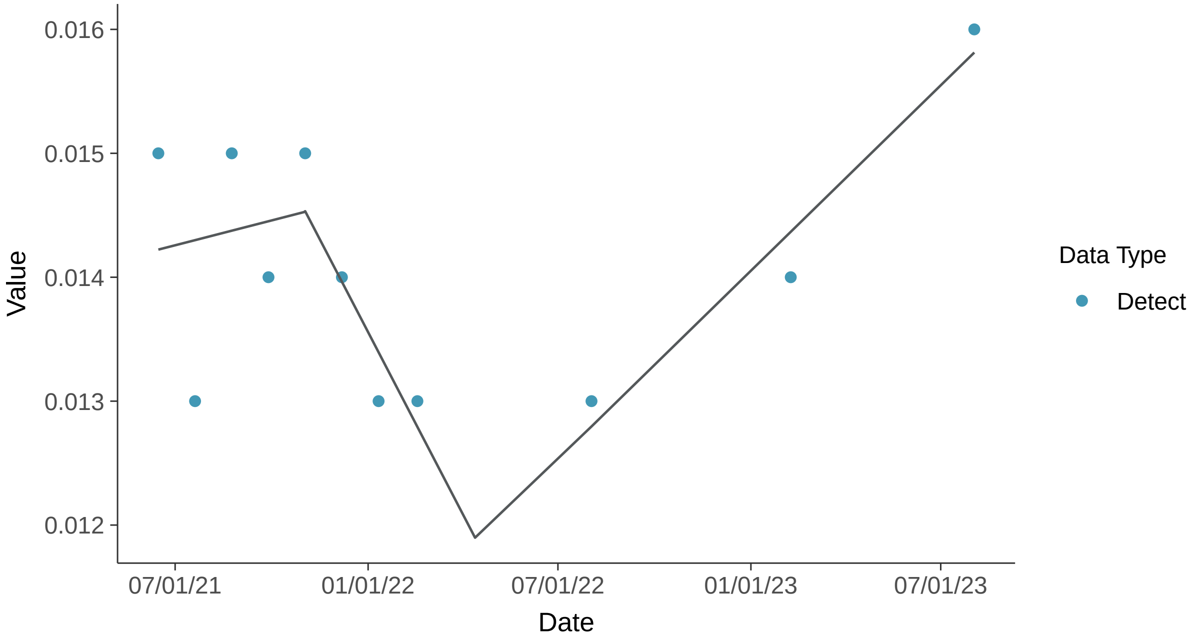
Trend Regression: Piecewise Linear-Linear

Barium, MW-9 (mg/L)



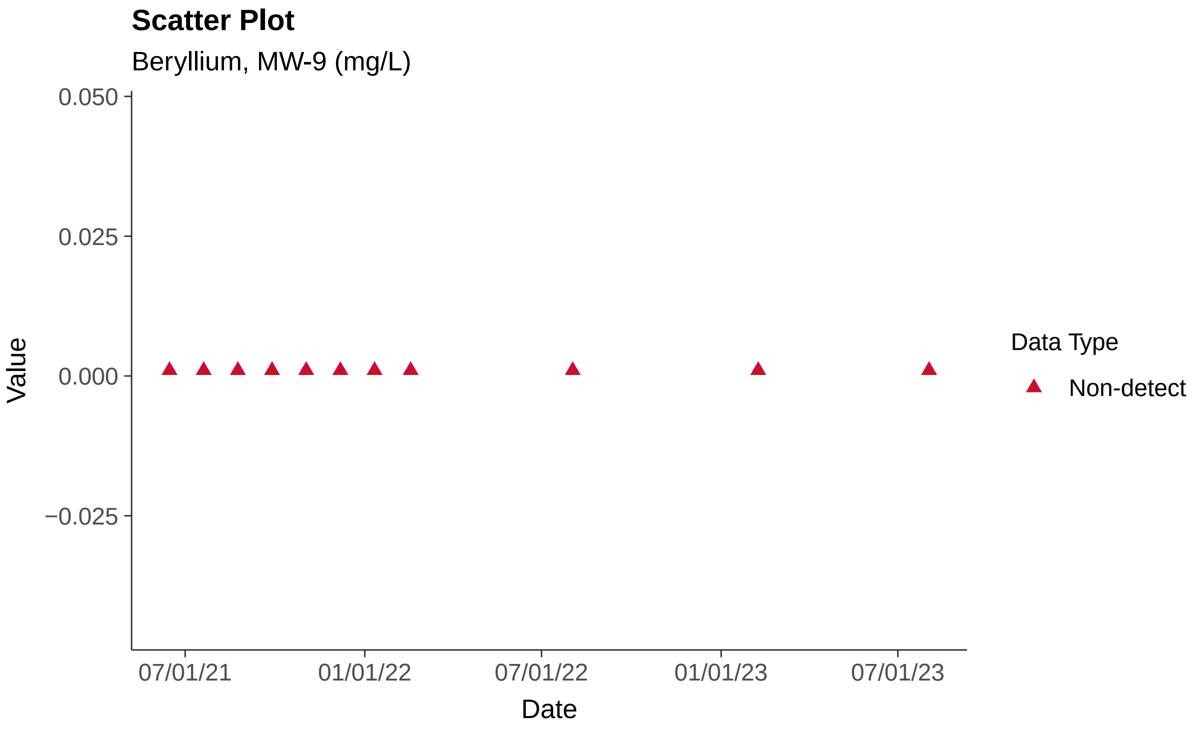
Trend Regression: Piecewise Linear-Linear-Linear

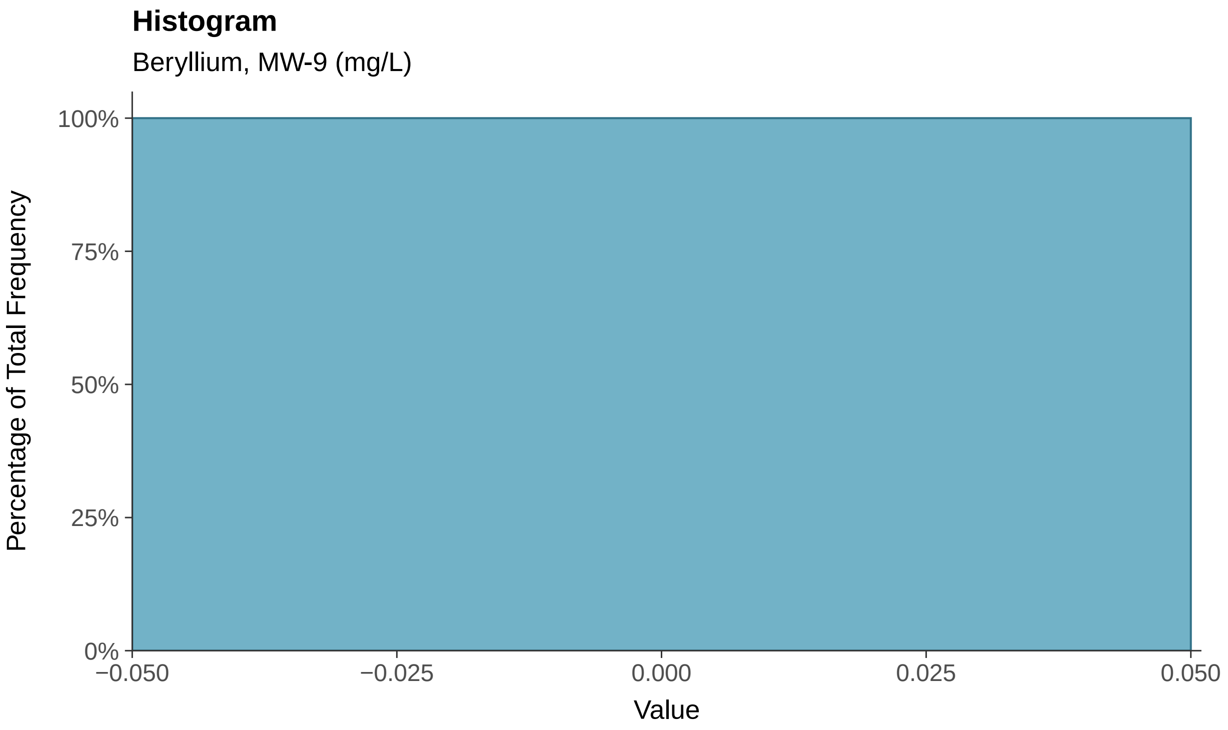
Barium, MW-9 (mg/L)



Appendix IV: Beryllium, MW-9

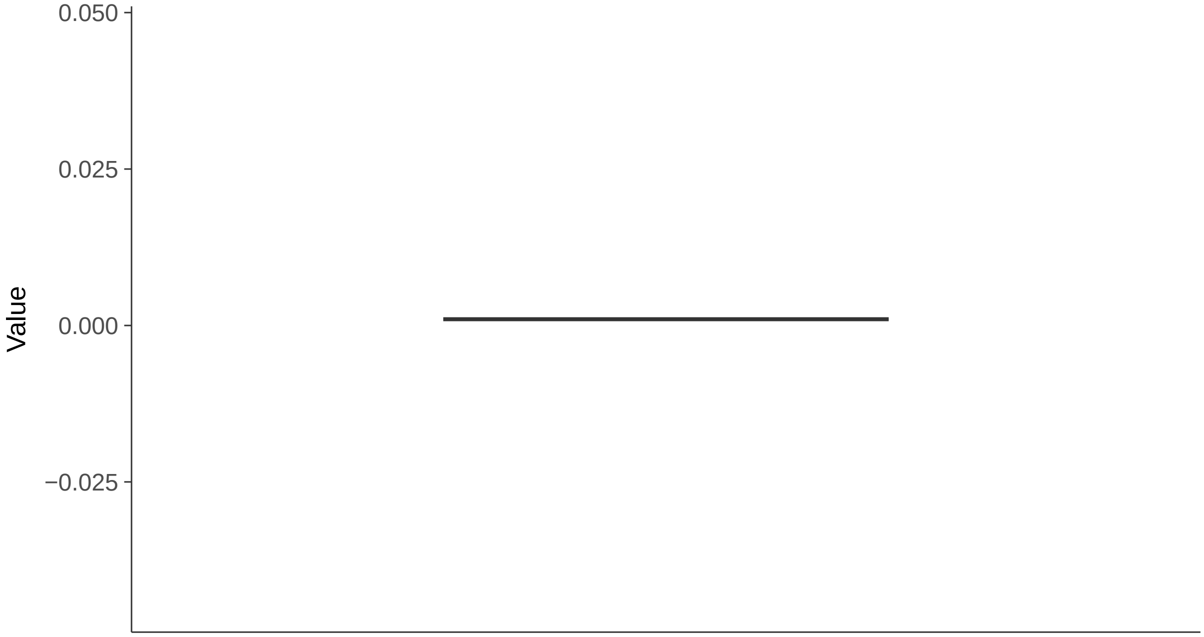
ID: 09_2_11





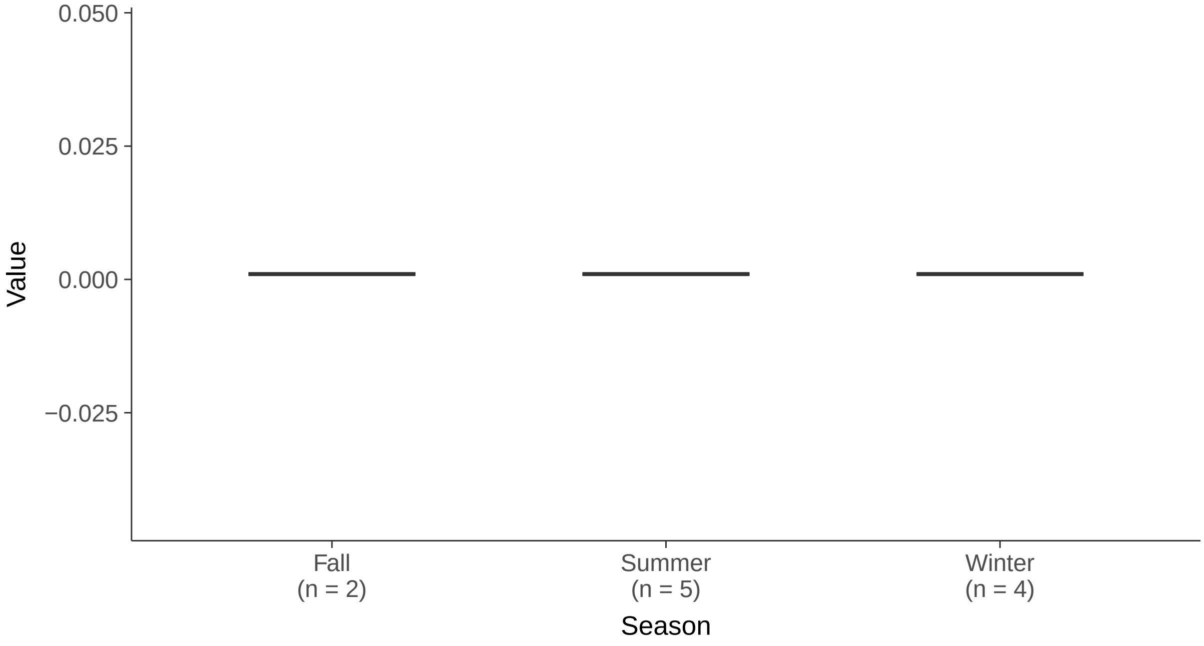
Boxplot

Beryllium, MW-9 (mg/L)



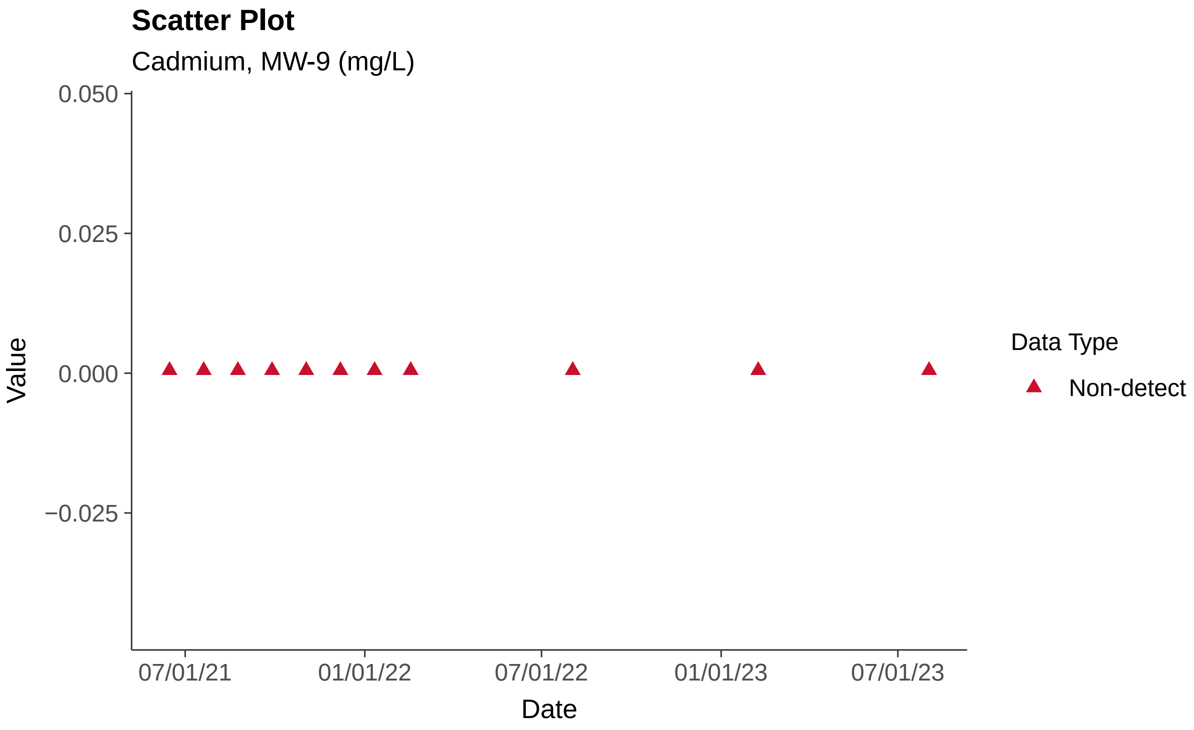
Boxplot by Season

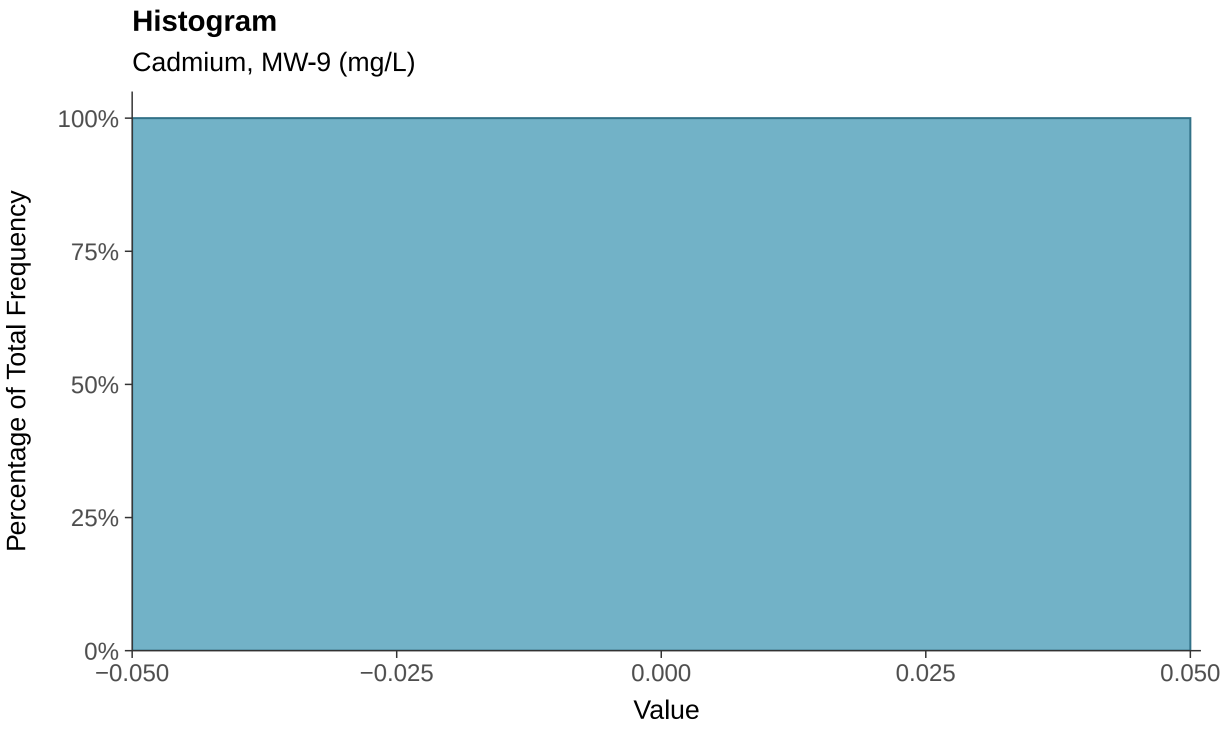
Beryllium, MW-9 (mg/L)



Appendix IV: Cadmium, MW-9

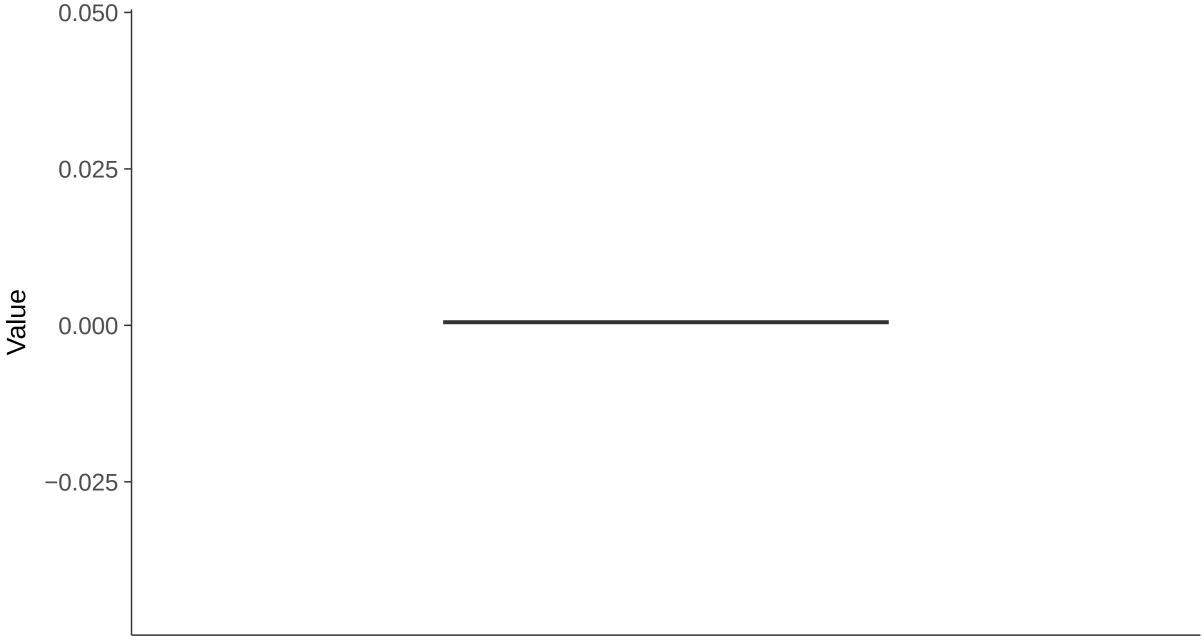
ID: 09_2_12





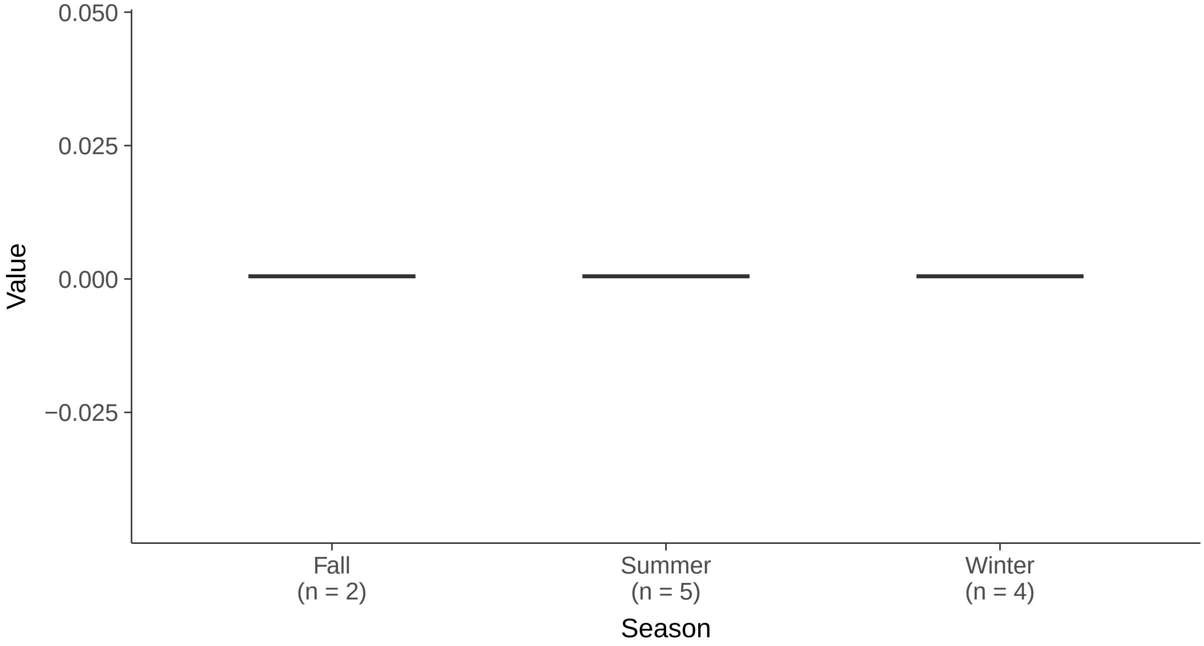
Boxplot

Cadmium, MW-9 (mg/L)



Boxplot by Season

Cadmium, MW-9 (mg/L)

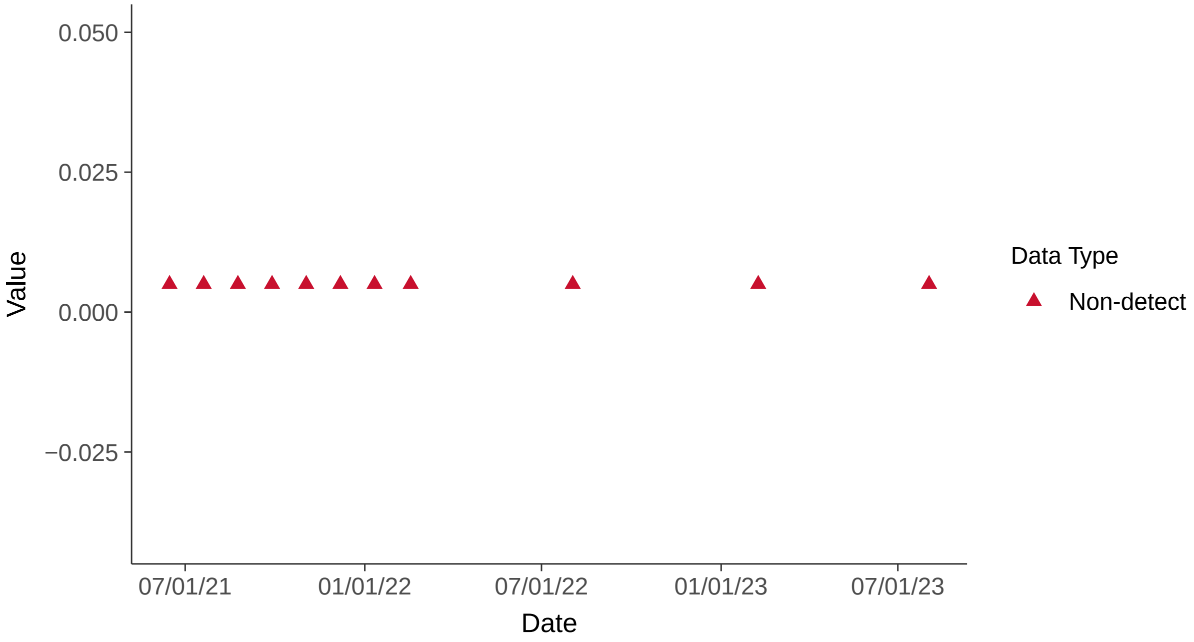


Appendix IV: Chromium, MW-9

ID: 09_2_13

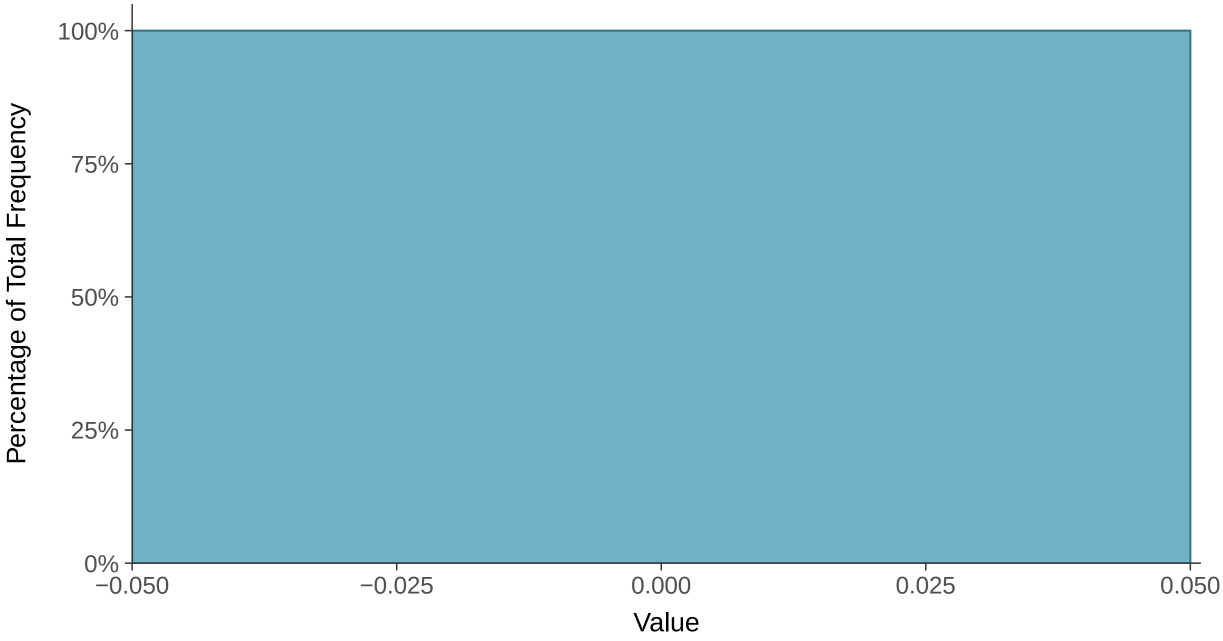
Scatter Plot

Chromium, MW-9 (mg/L)



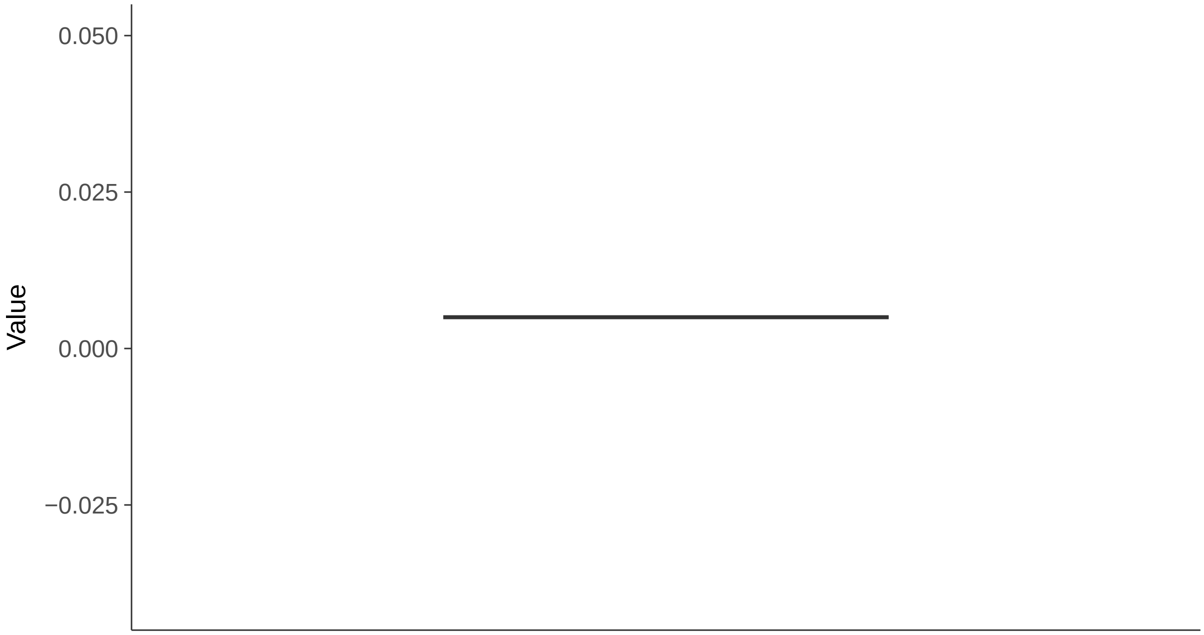
Histogram

Chromium, MW-9 (mg/L)



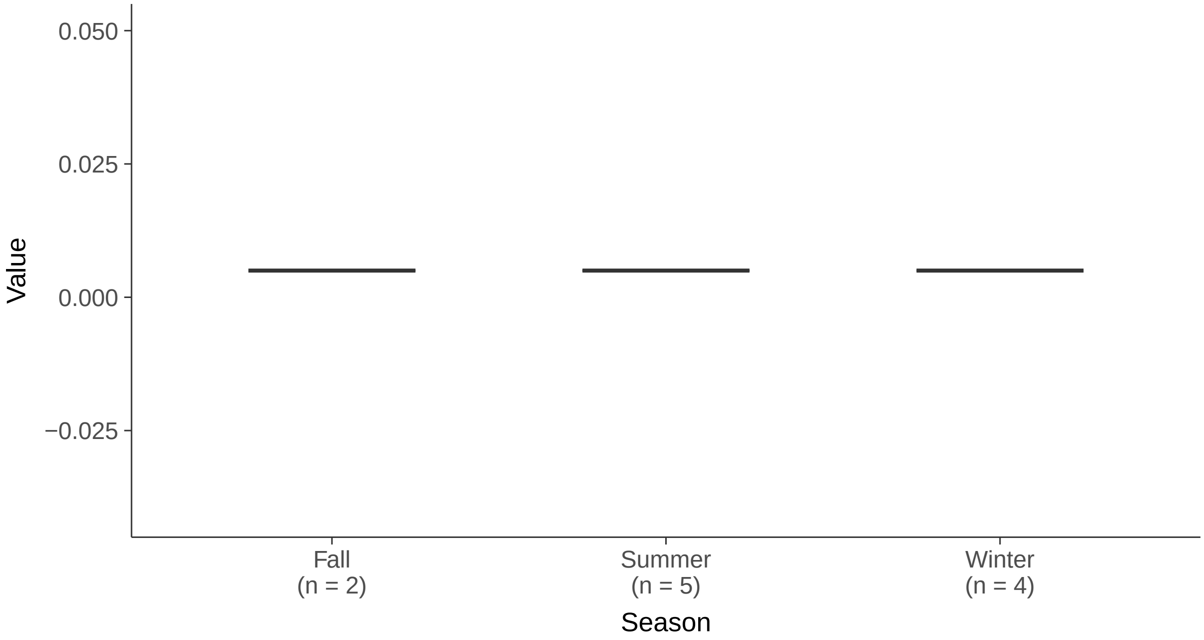
Boxplot

Chromium, MW-9 (mg/L)



Boxplot by Season

Chromium, MW-9 (mg/L)

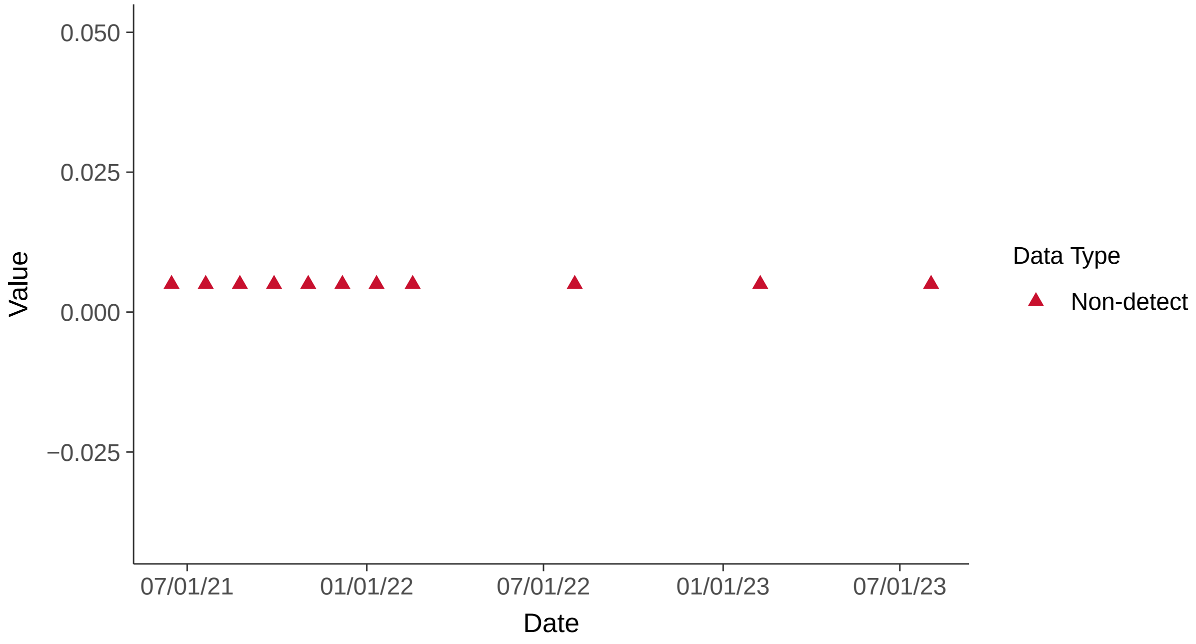


Appendix IV: Cobalt, MW-9

ID: 09_2_14

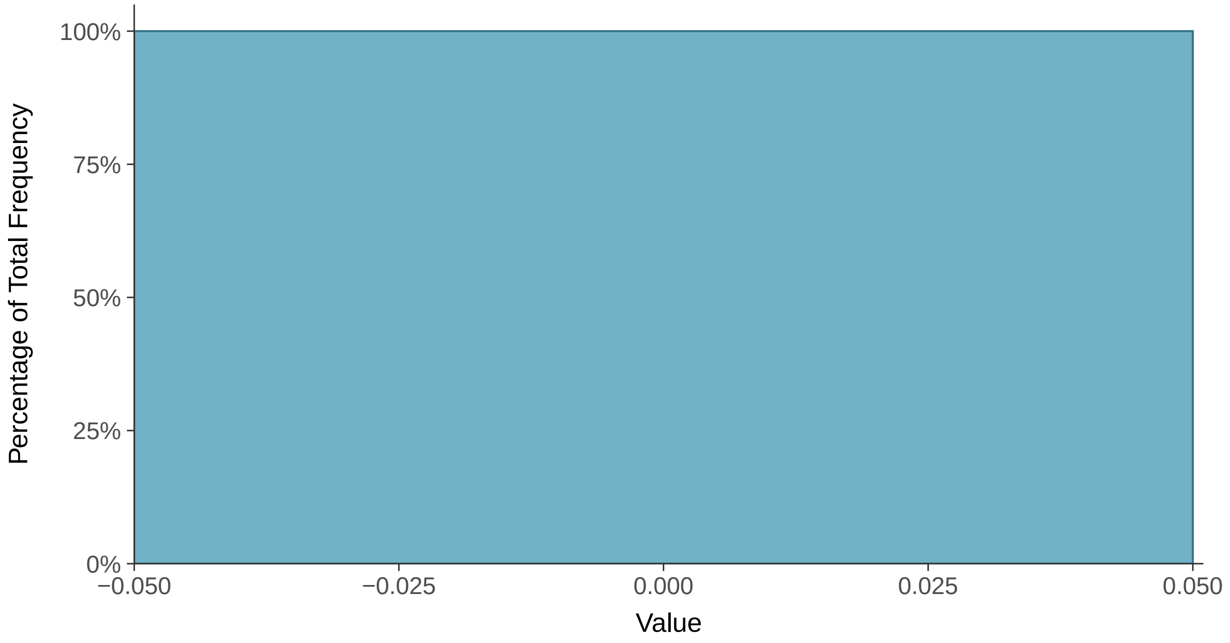
Scatter Plot

Cobalt, MW-9 (mg/L)



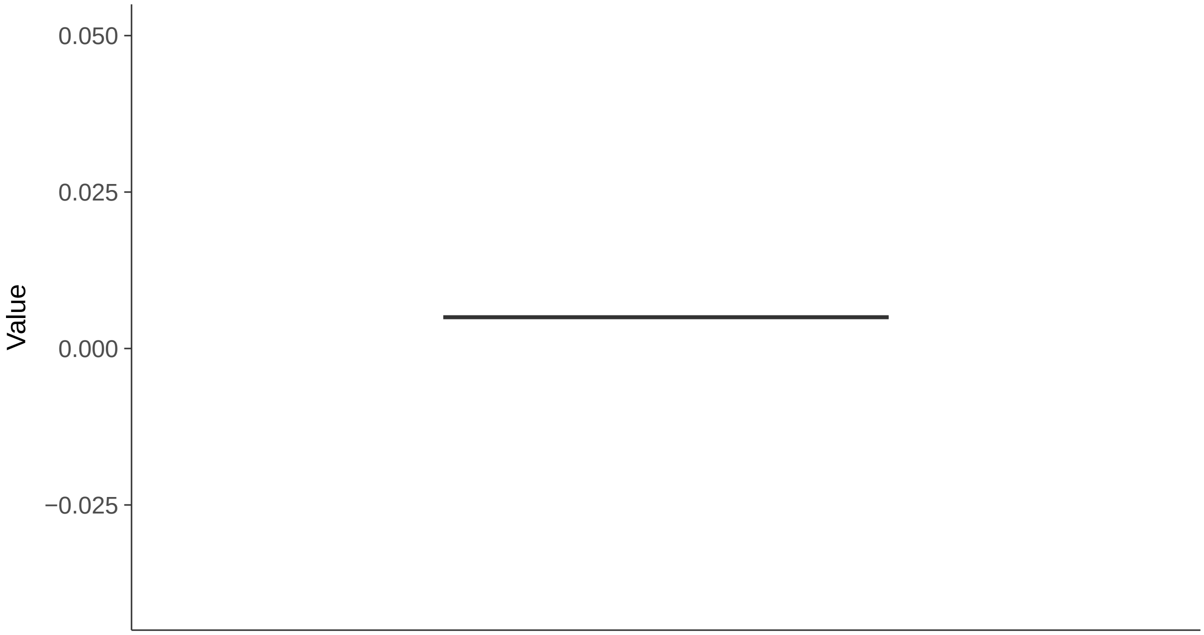
Histogram

Cobalt, MW-9 (mg/L)



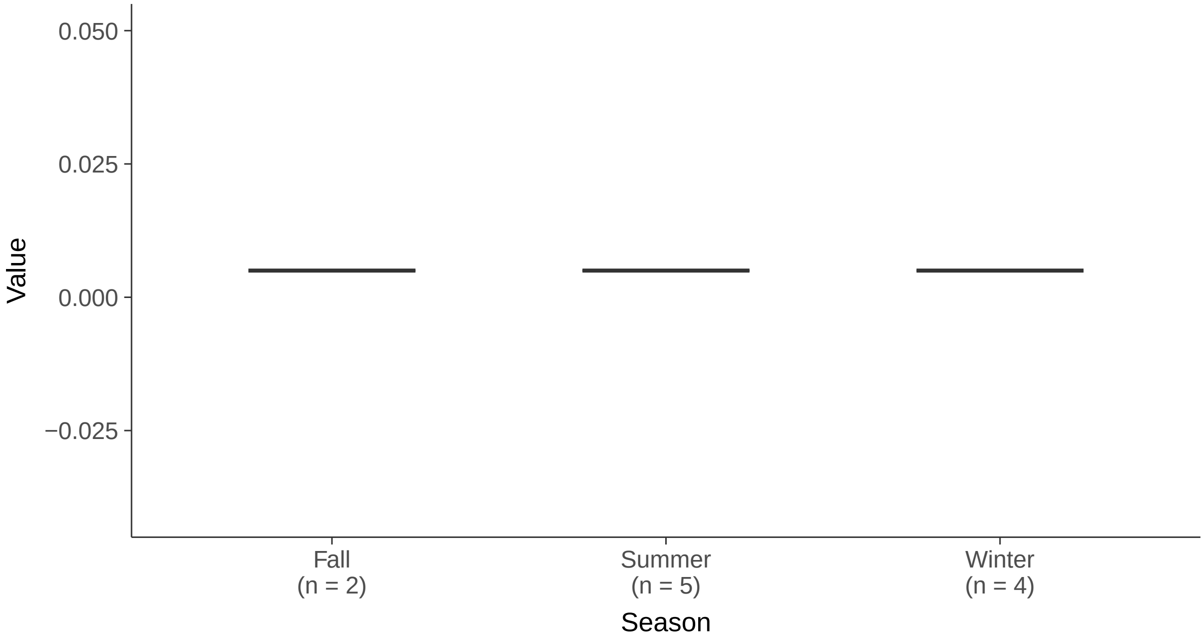
Boxplot

Cobalt, MW-9 (mg/L)



Boxplot by Season

Cobalt, MW-9 (mg/L)

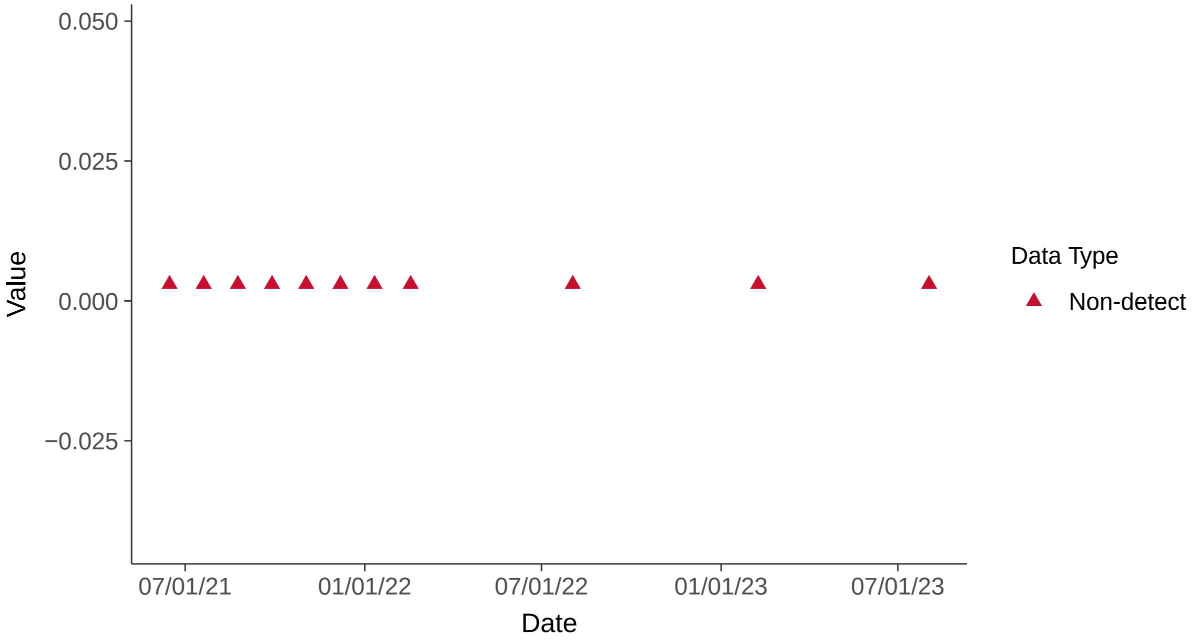


Appendix IV: Lead, MW-9

ID: 09_2_15

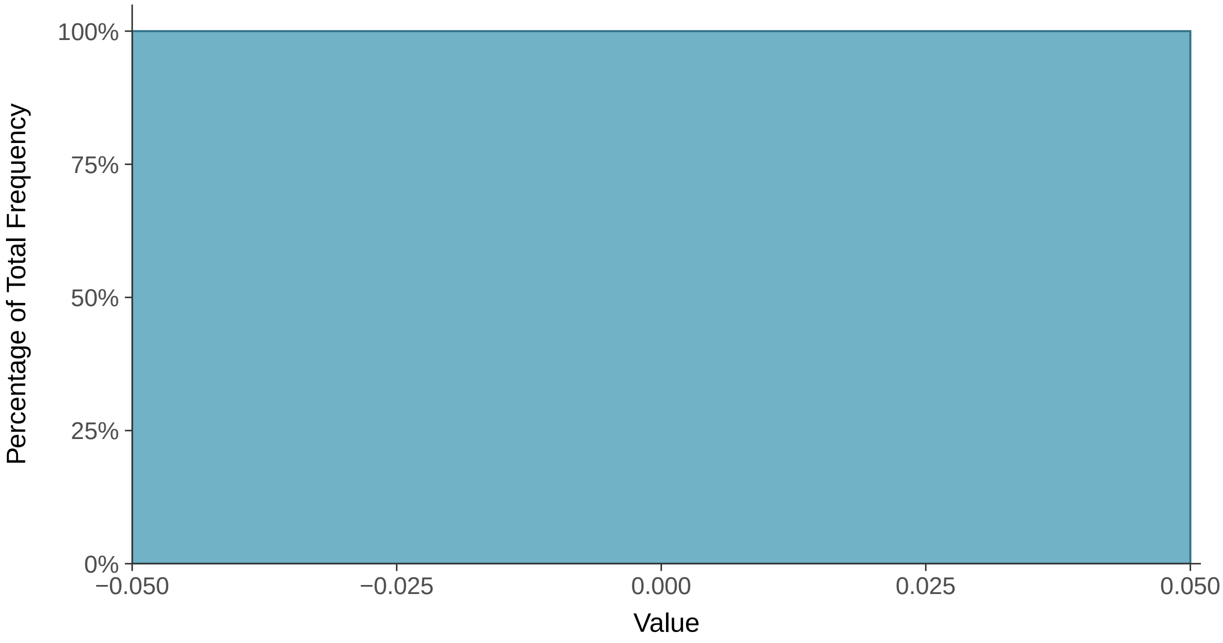
Scatter Plot

Lead, MW-9 (mg/L)



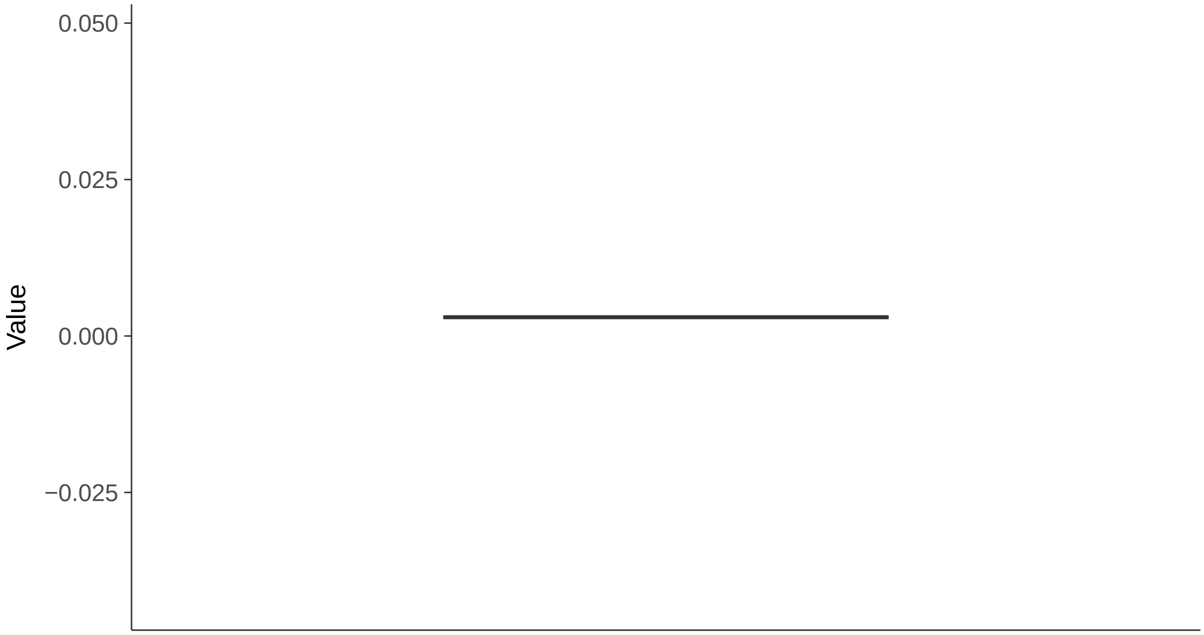
Histogram

Lead, MW-9 (mg/L)



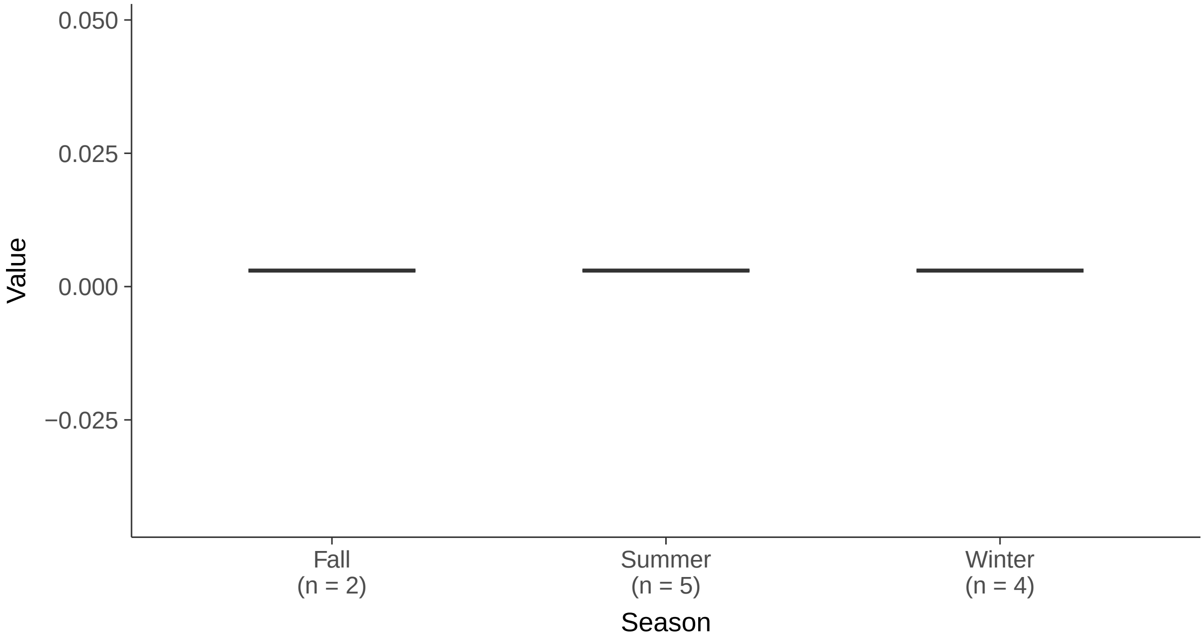
Boxplot

Lead, MW-9 (mg/L)



Boxplot by Season

Lead, MW-9 (mg/L)

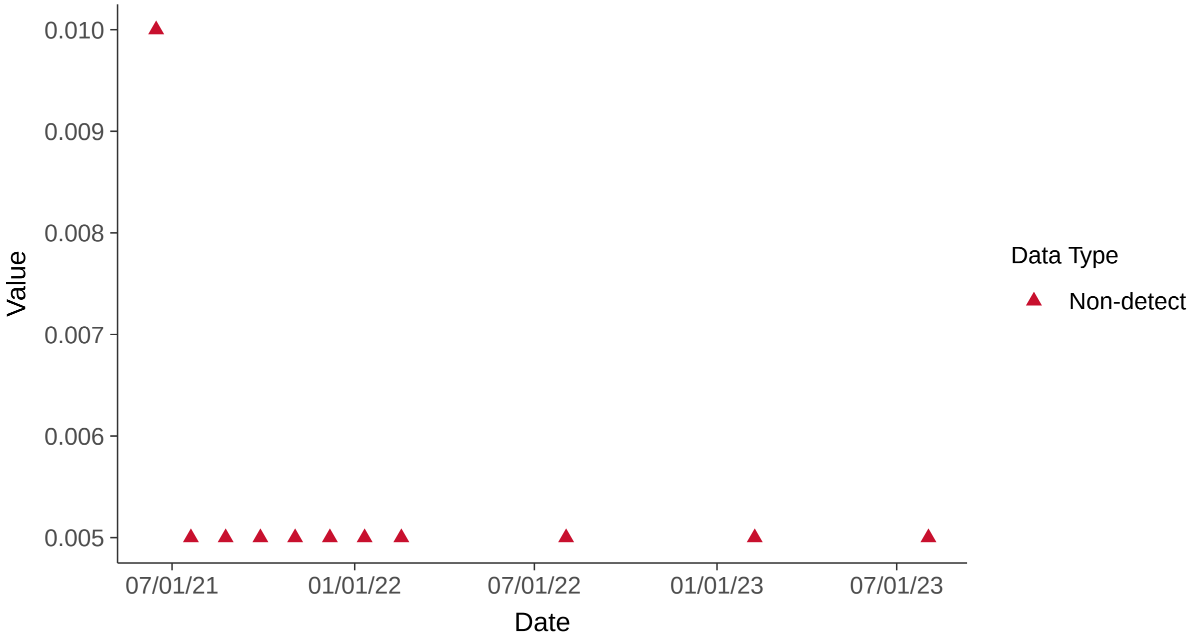


Appendix IV: Lithium, MW-9

ID: 09_2_16

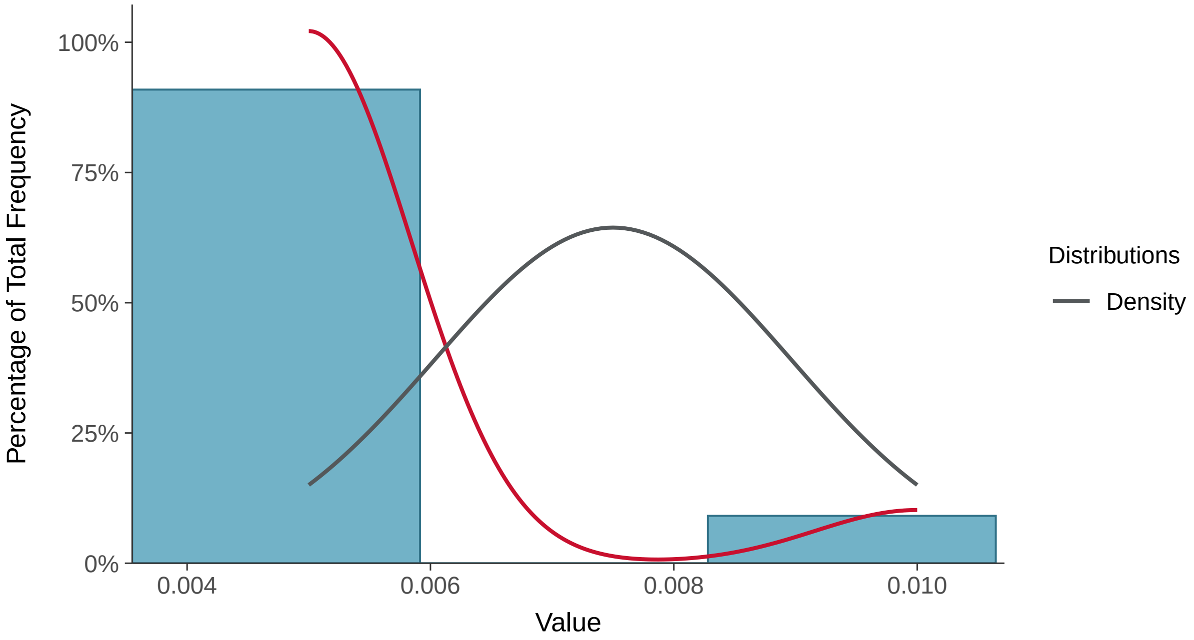
Scatter Plot

Lithium, MW-9 (mg/L)



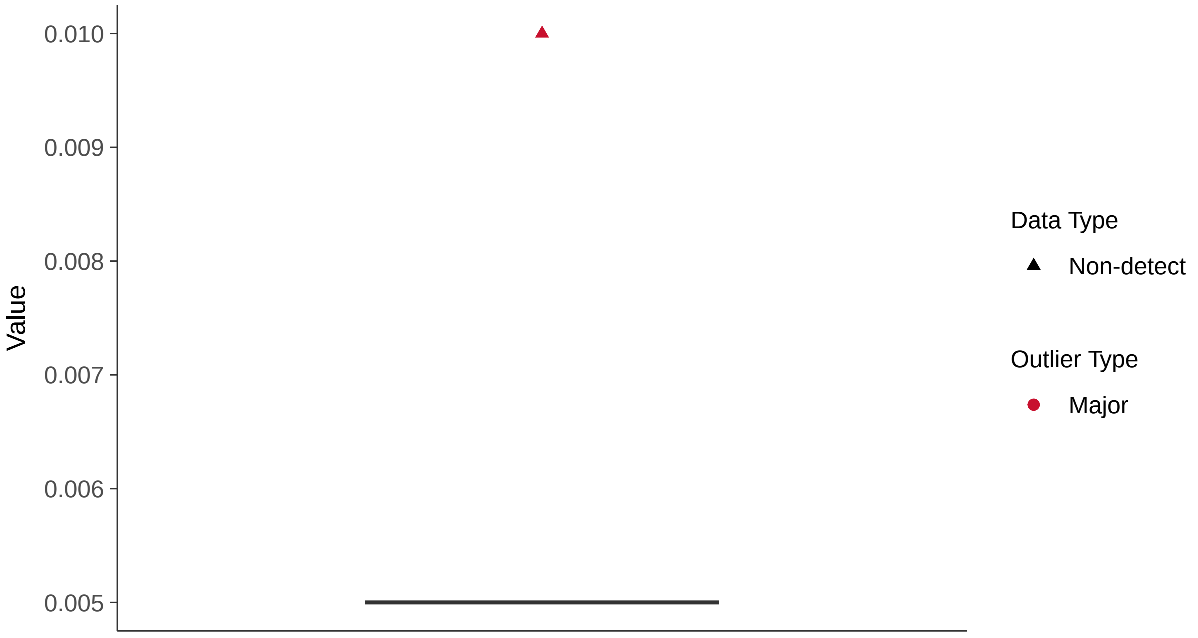
Histogram

Lithium, MW-9 (mg/L)



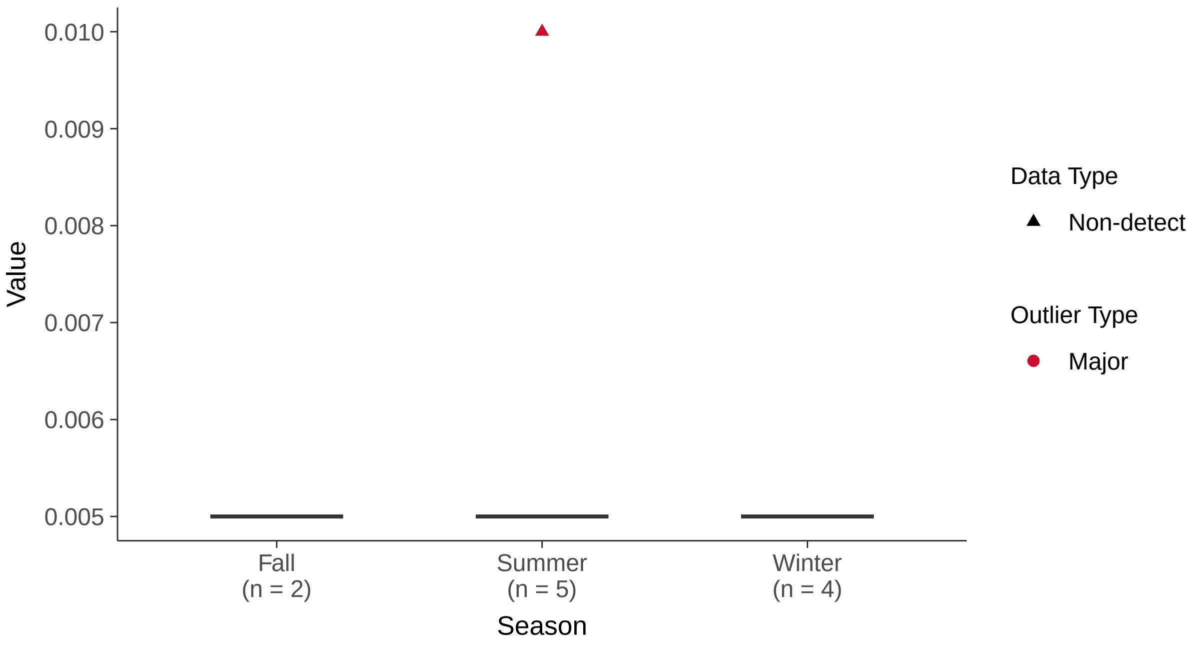
Boxplot

Lithium, MW-9 (mg/L)



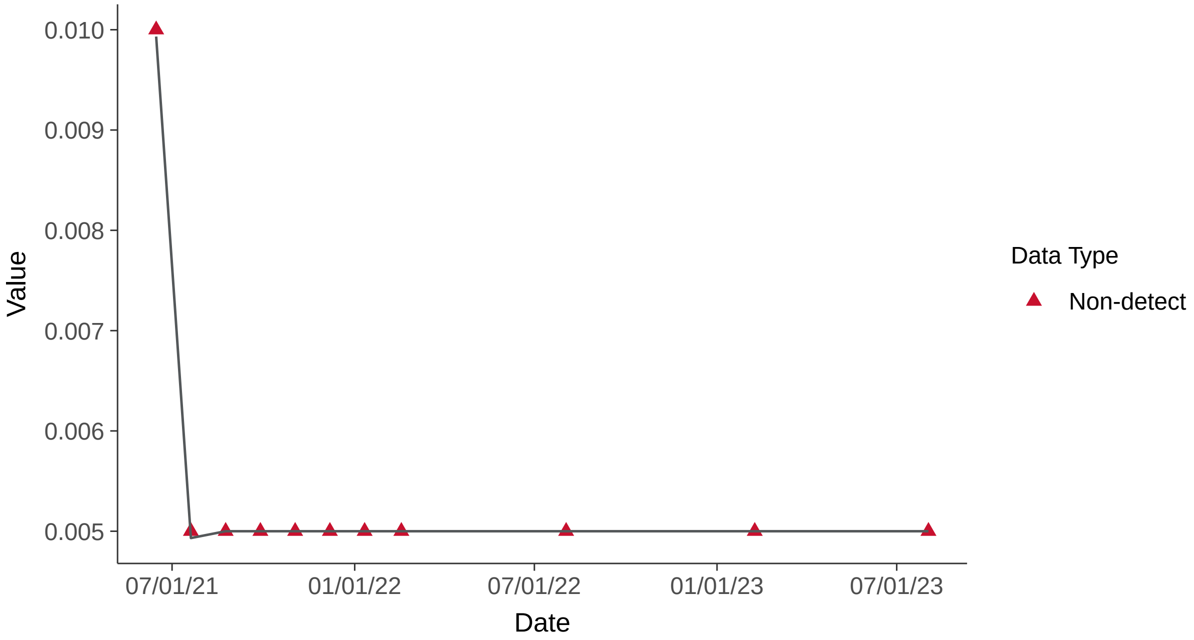
Boxplot by Season

Lithium, MW-9 (mg/L)



Trend Regression: Piecewise Linear-Linear

Lithium, MW-9 (mg/L)

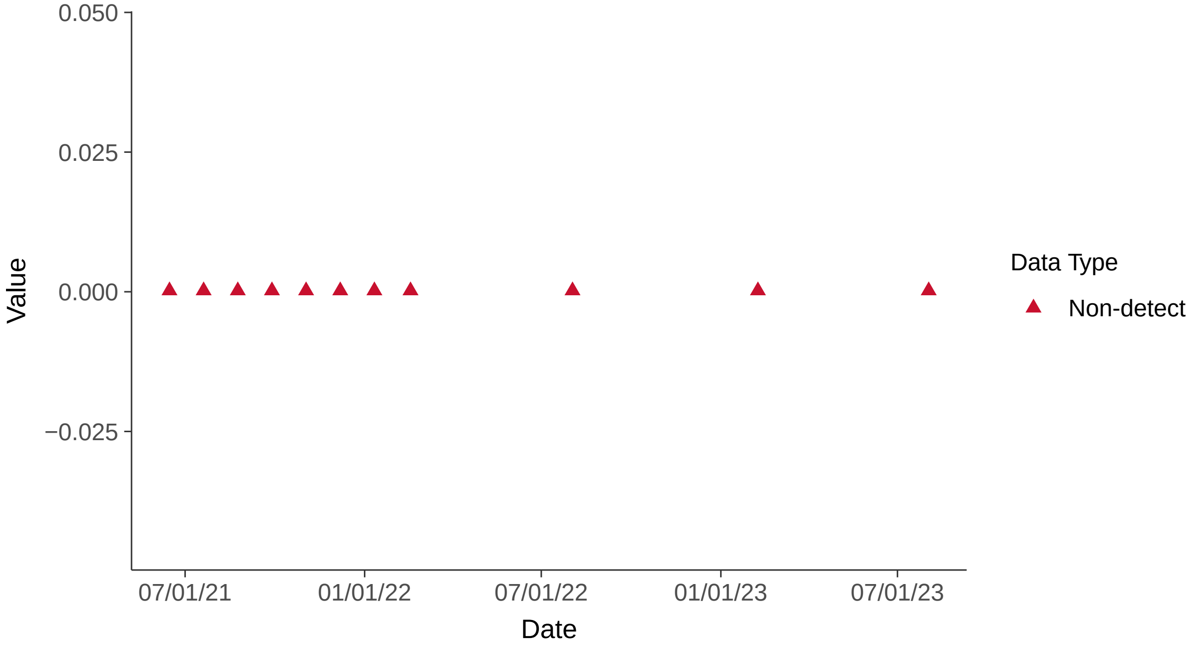


Appendix IV: Mercury, MW-9

ID: 09_2_17

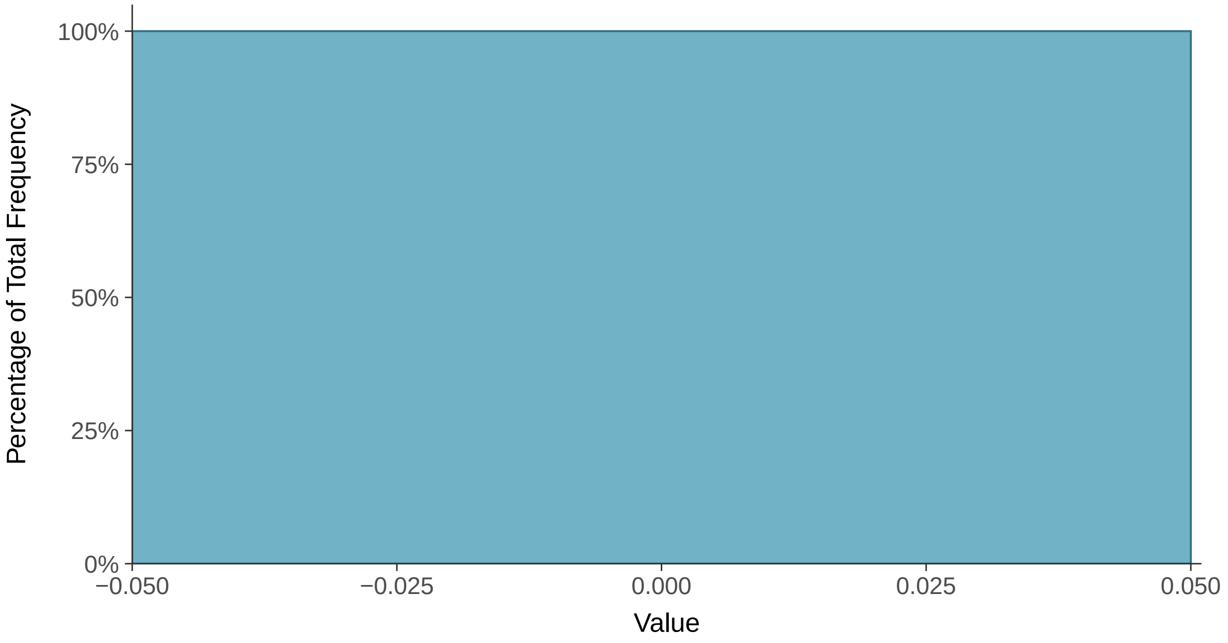
Scatter Plot

Mercury, MW-9 (mg/L)



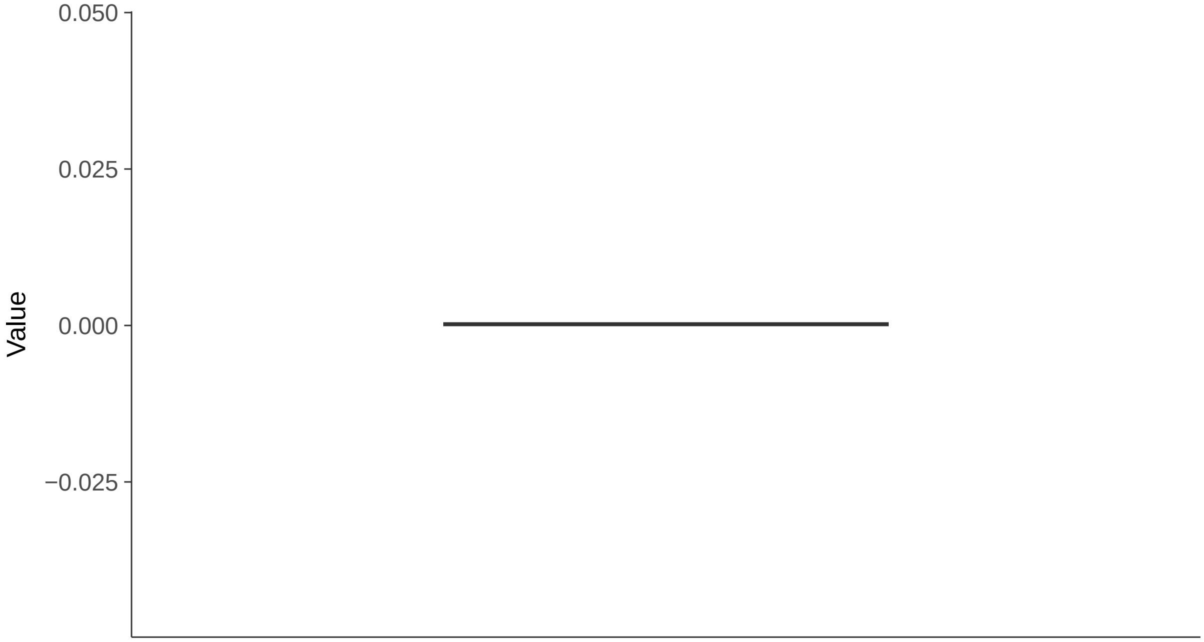
Histogram

Mercury, MW-9 (mg/L)



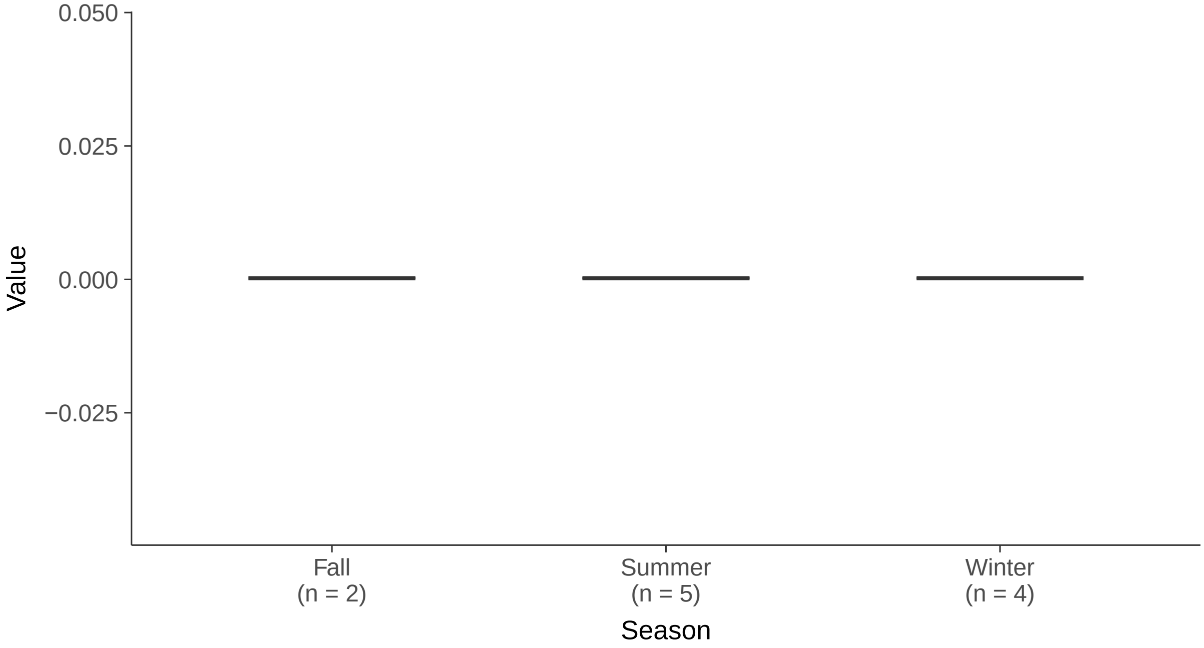
Boxplot

Mercury, MW-9 (mg/L)



Boxplot by Season

Mercury, MW-9 (mg/L)

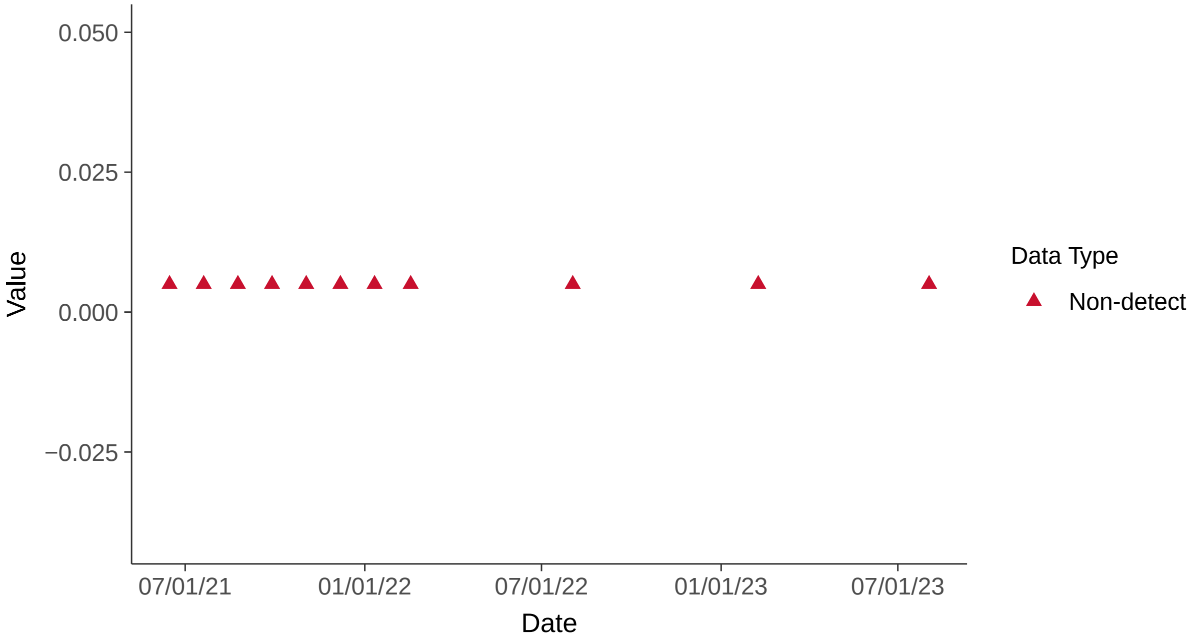


Appendix IV: Molybdenum, MW-9

ID: 09_2_18

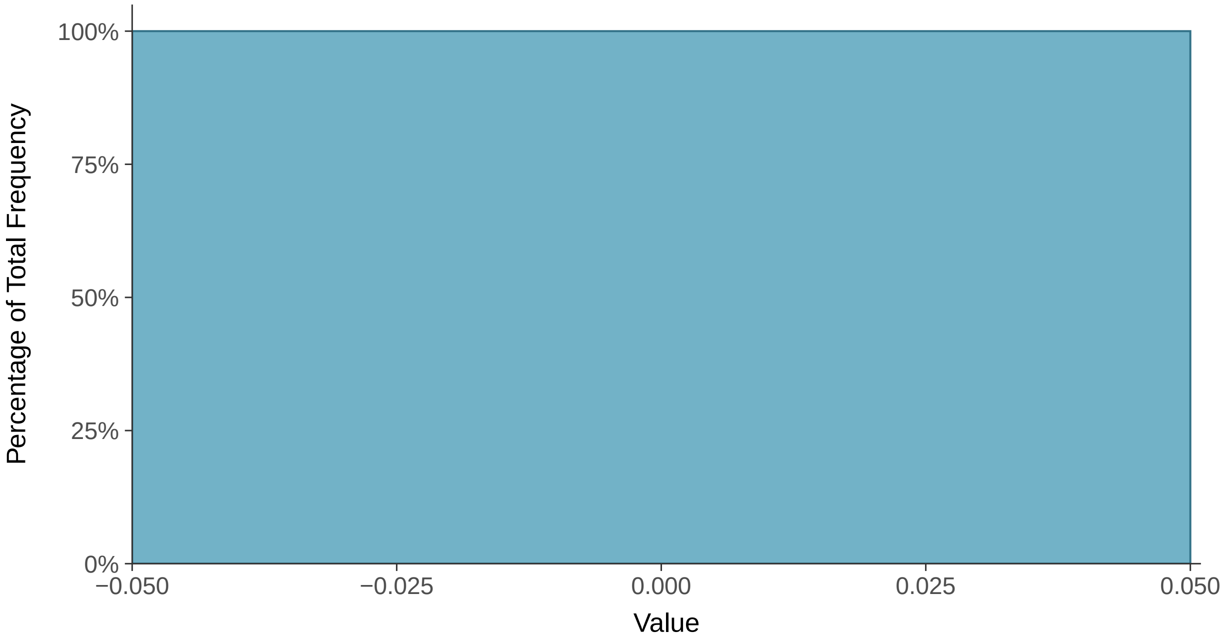
Scatter Plot

Molybdenum, MW-9 (mg/L)



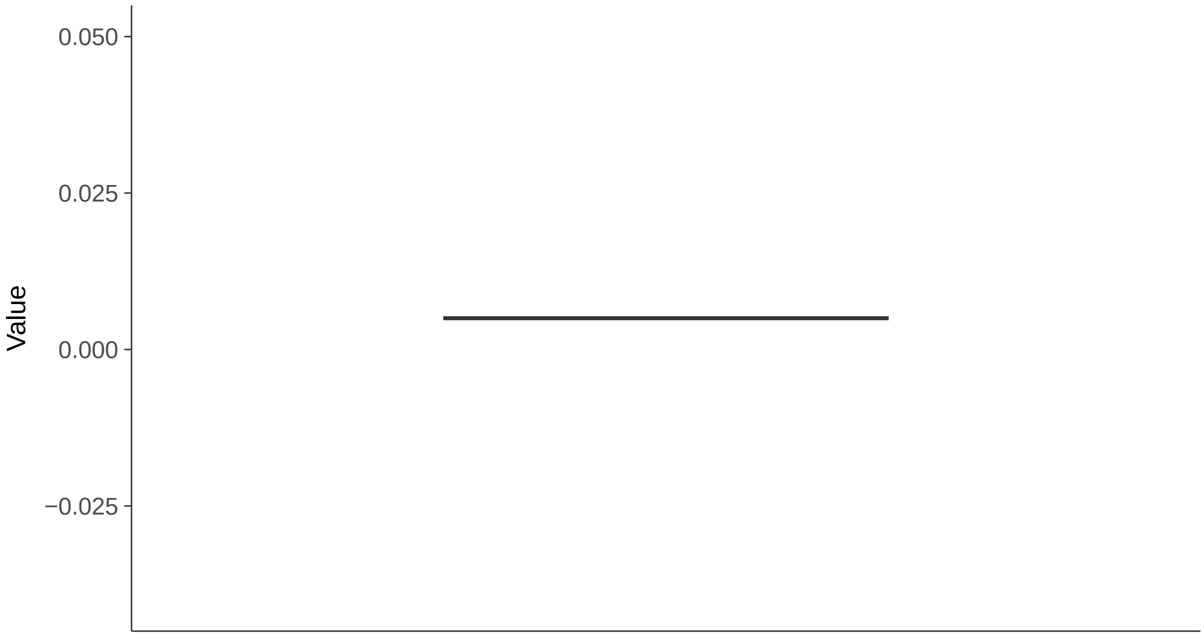
Histogram

Molybdenum, MW-9 (mg/L)



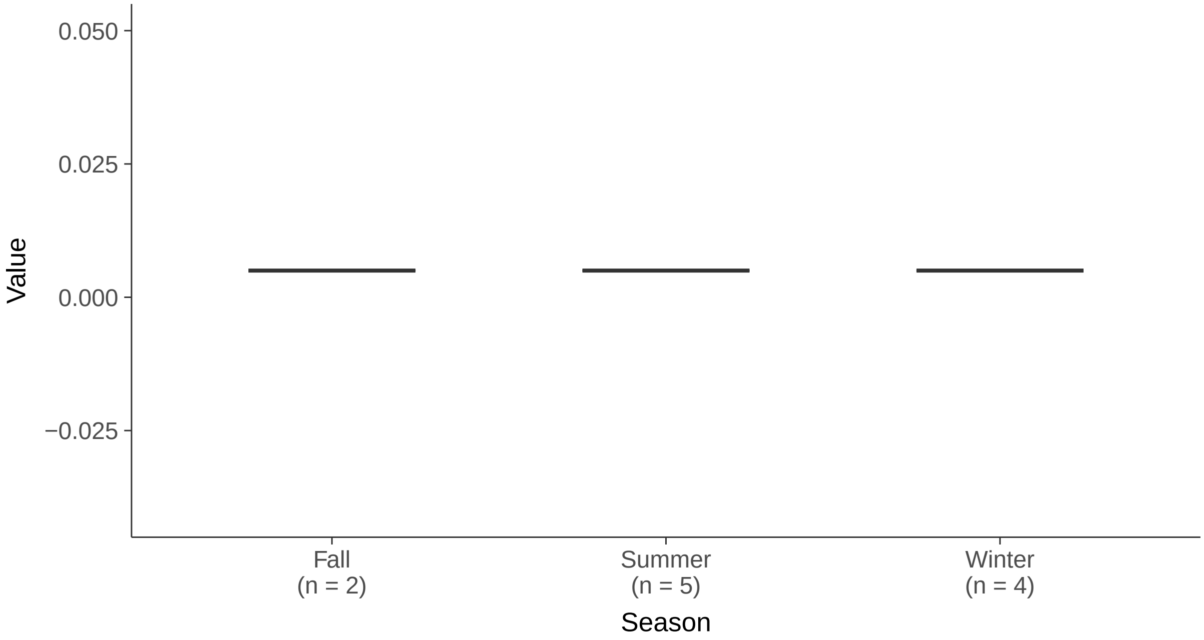
Boxplot

Molybdenum, MW-9 (mg/L)



Boxplot by Season

Molybdenum, MW-9 (mg/L)

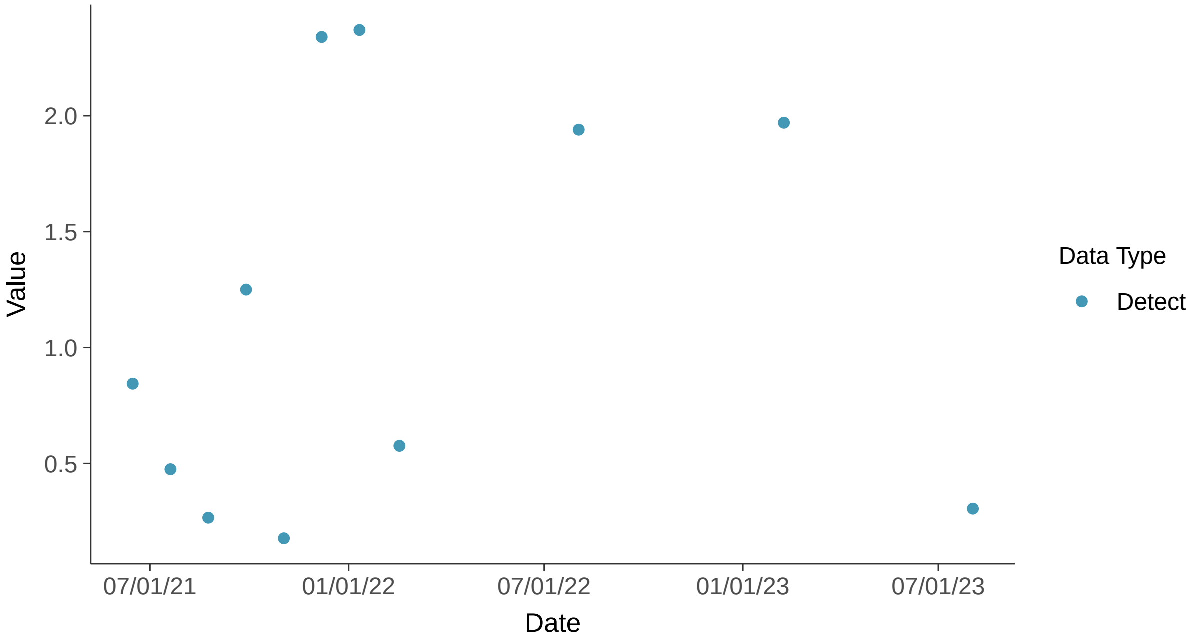


Appendix IV: Radium-226/228, MW-9

ID: 09_2_20

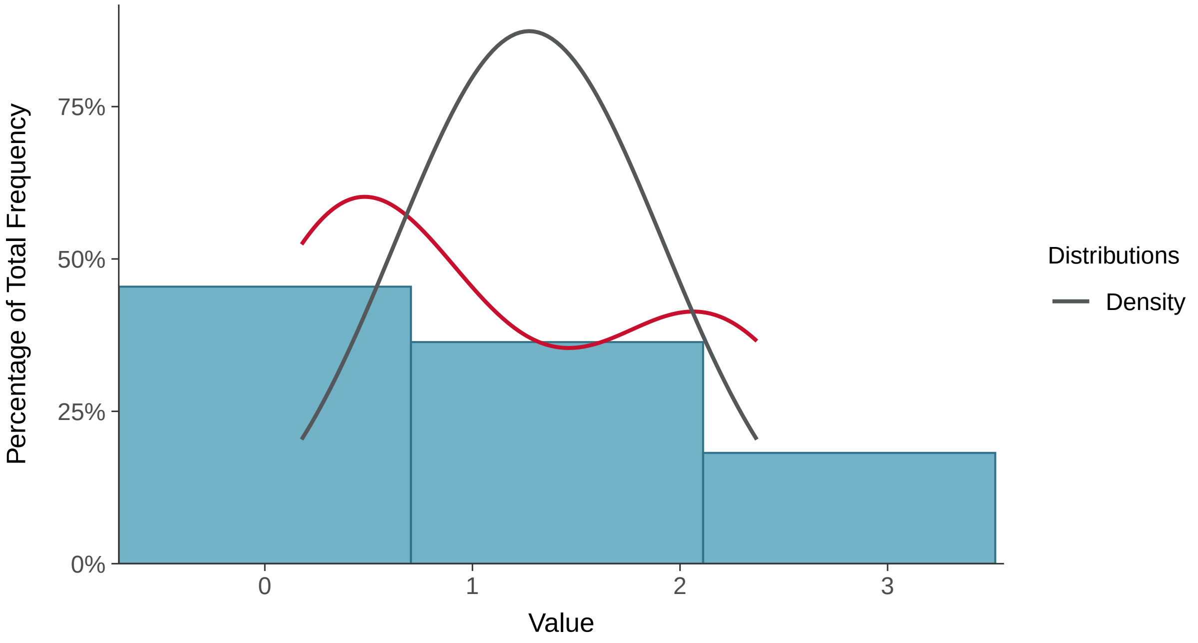
Scatter Plot

Radium-226/228, MW-9 (pCi/L)



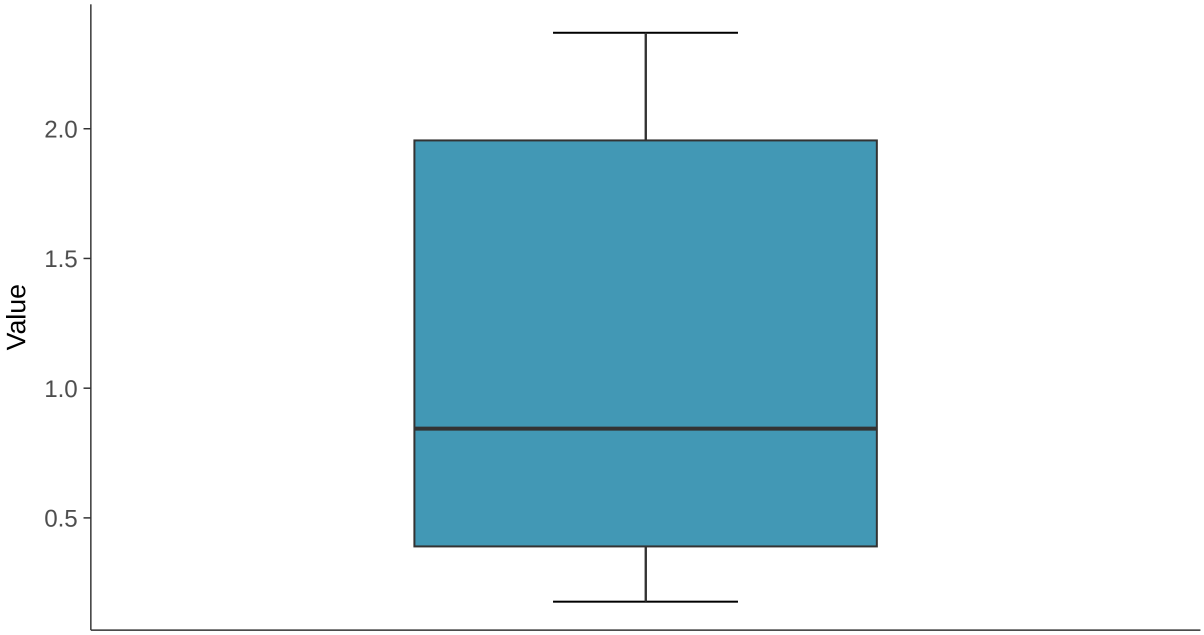
Histogram

Radium-226/228, MW-9 (pCi/L)



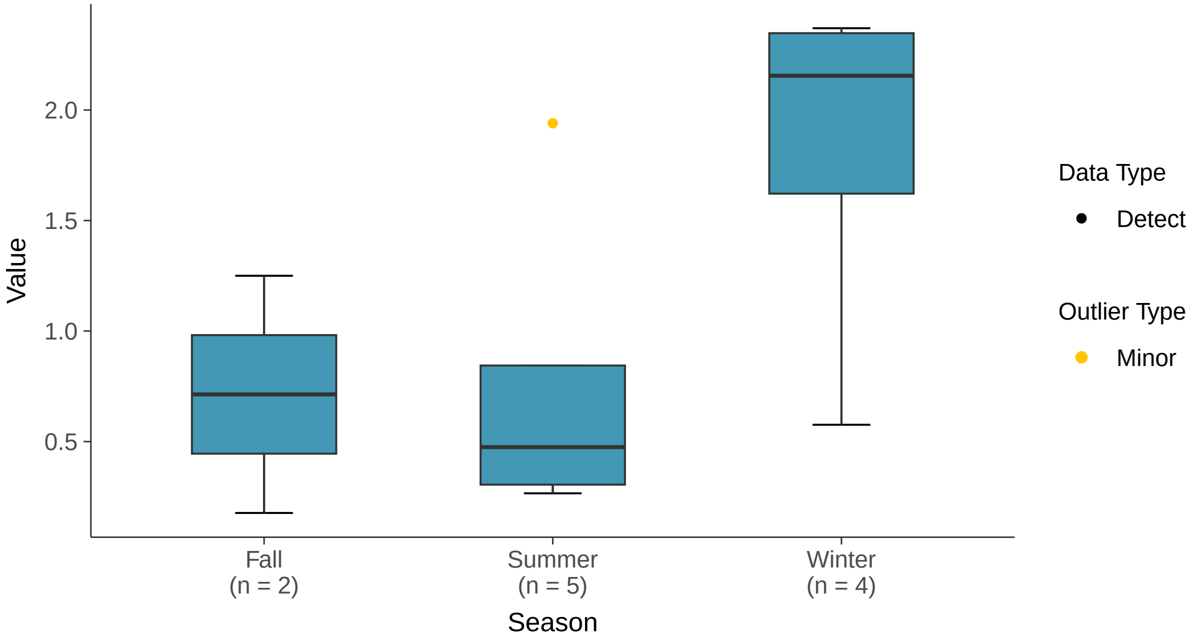
Boxplot

Radium-226/228, MW-9 (pCi/L)



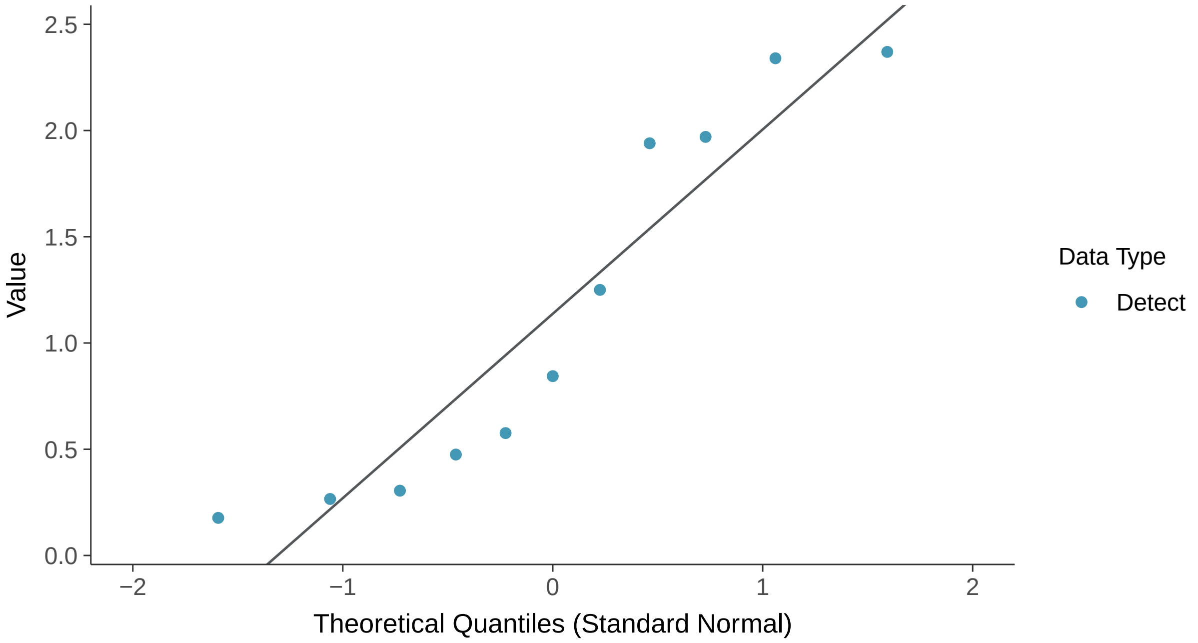
Boxplot by Season

Radium-226/228, MW-9 (pCi/L)



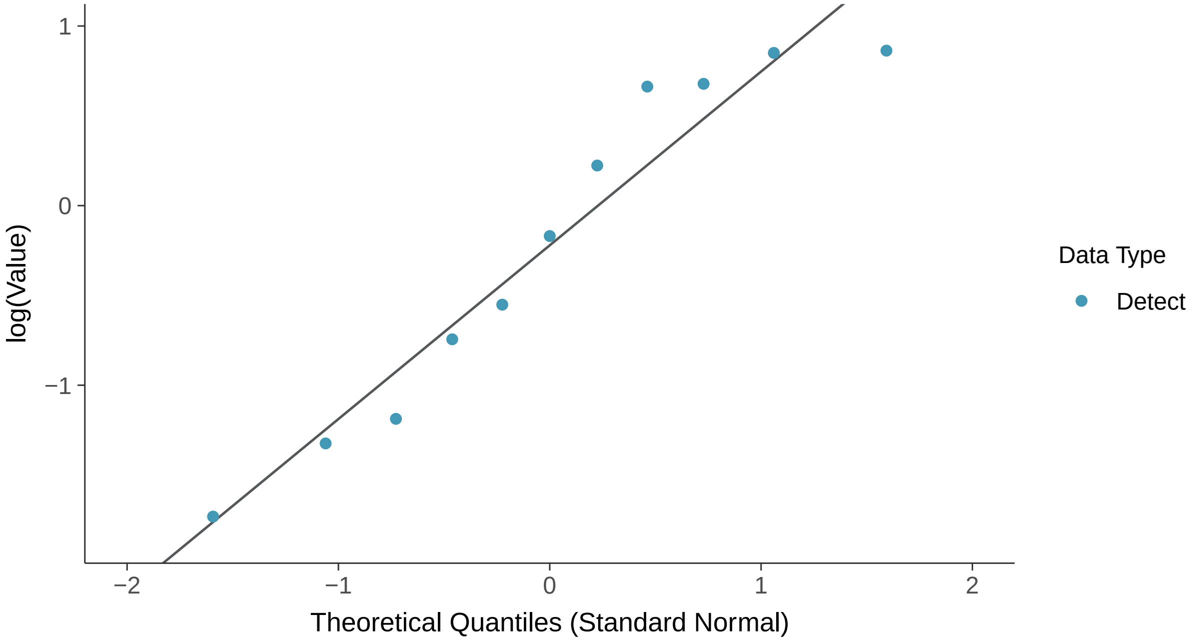
Normal Q-Q plot

Radium-226/228, MW-9 (pCi/L)



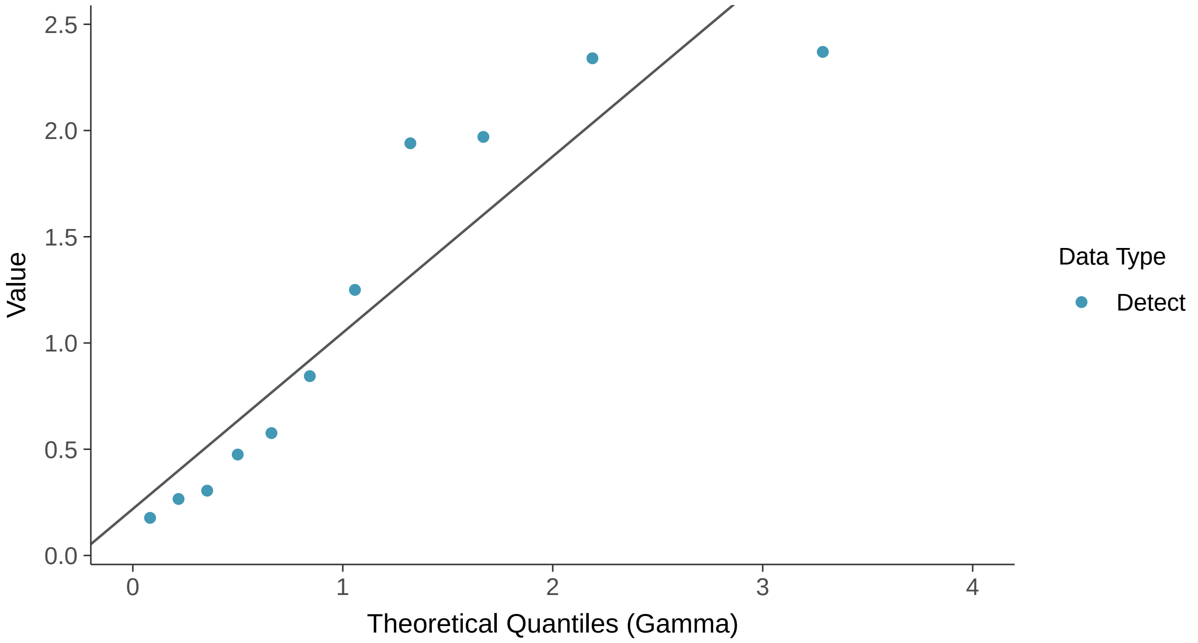
Lognormal Q-Q plot

Radium-226/228, MW-9 (pCi/L)



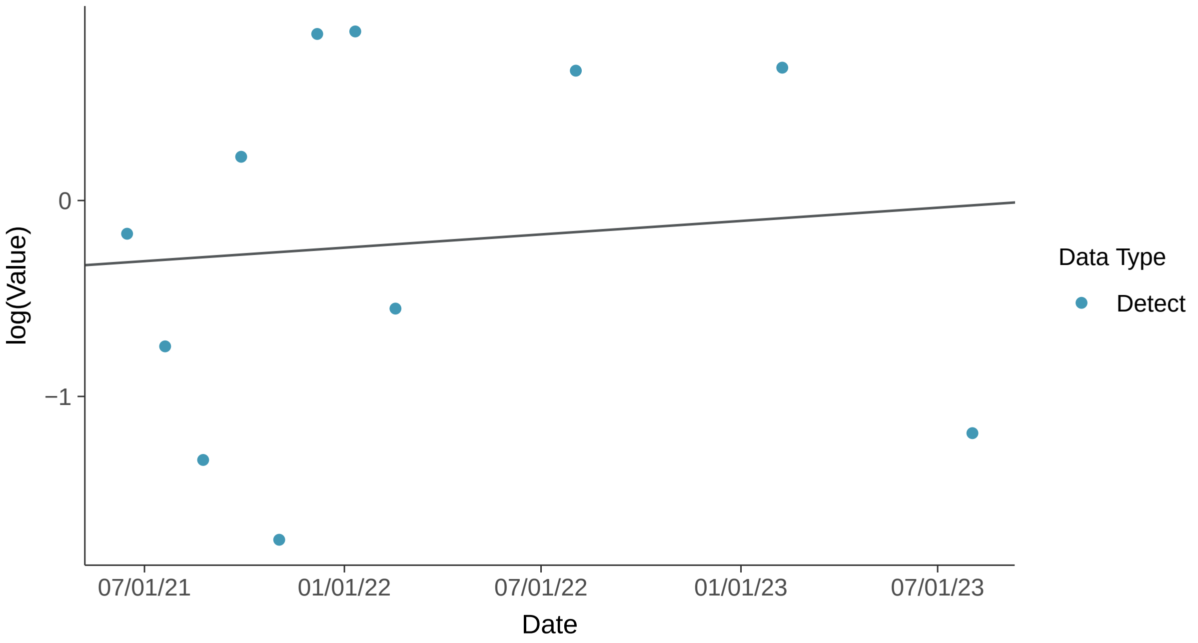
Gamma Q-Q plot

Radium-226/228, MW-9 (pCi/L)



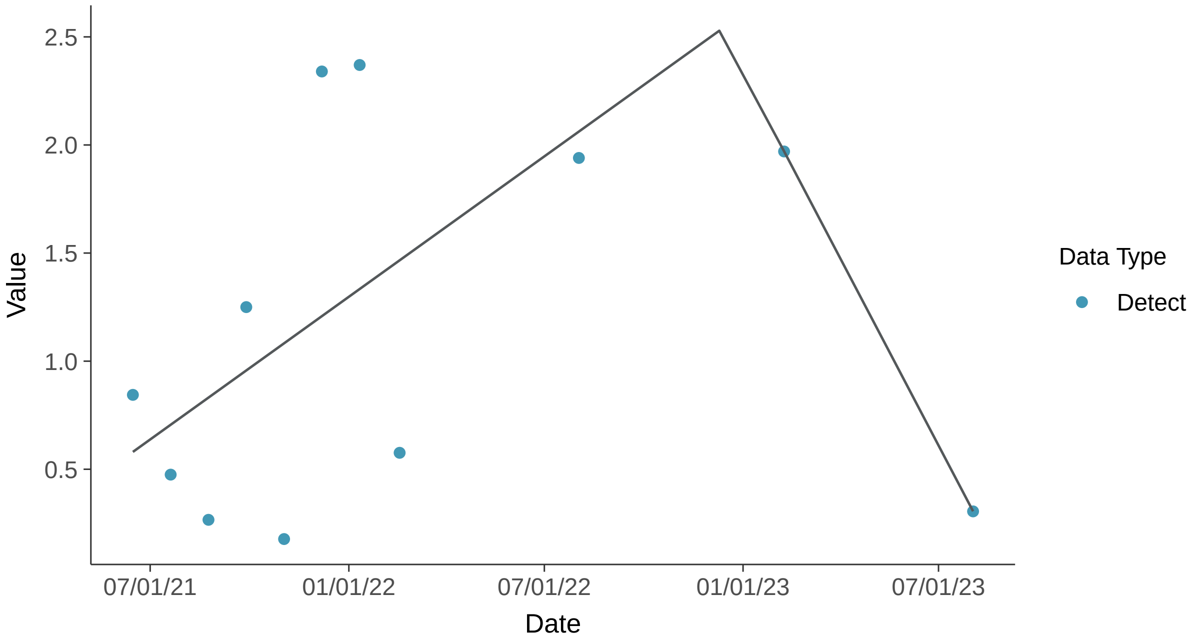
Trend Regression: Lognormal MLE

Radium-226/228, MW-9 (pCi/L)



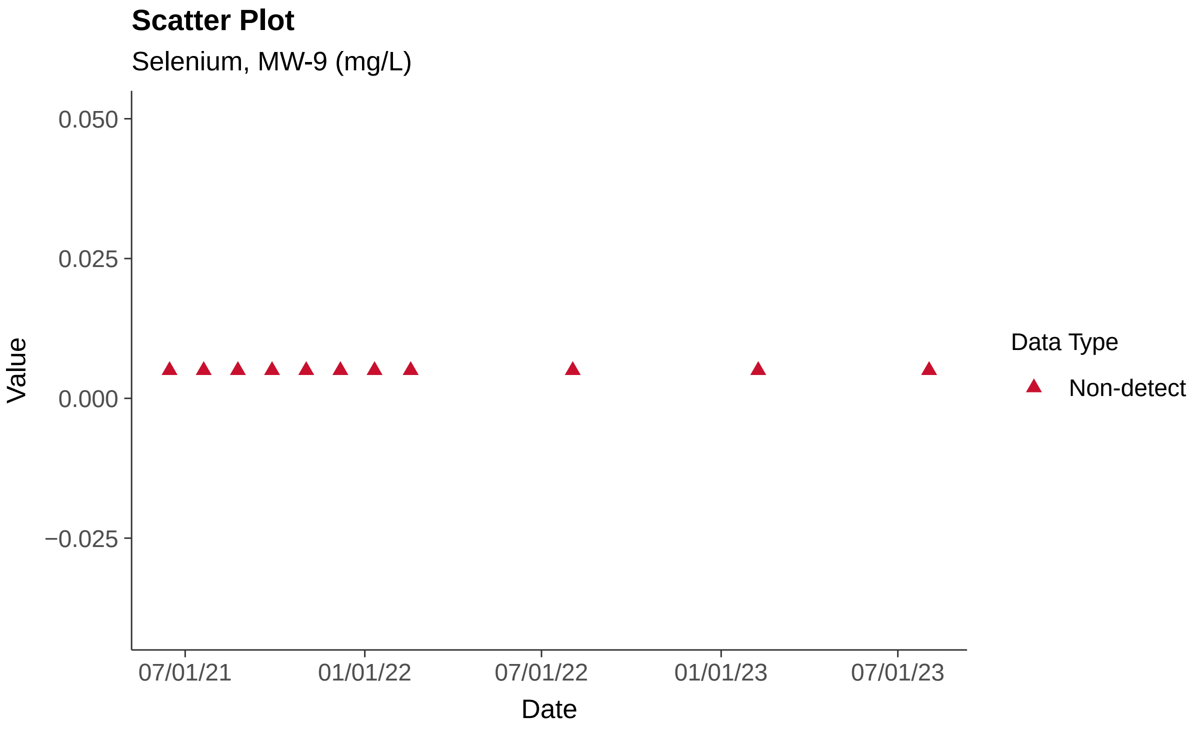
Trend Regression: Piecewise Linear-Linear

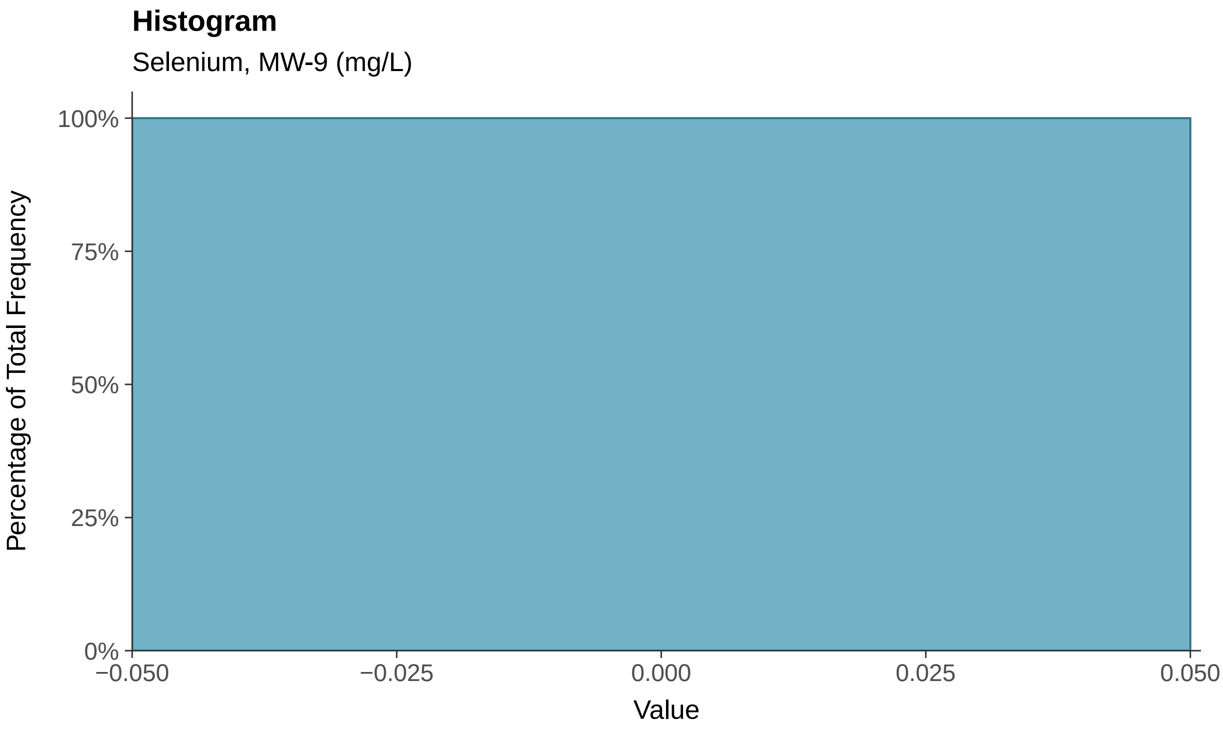
Radium-226/228, MW-9 (pCi/L)



Appendix IV: Selenium, MW-9

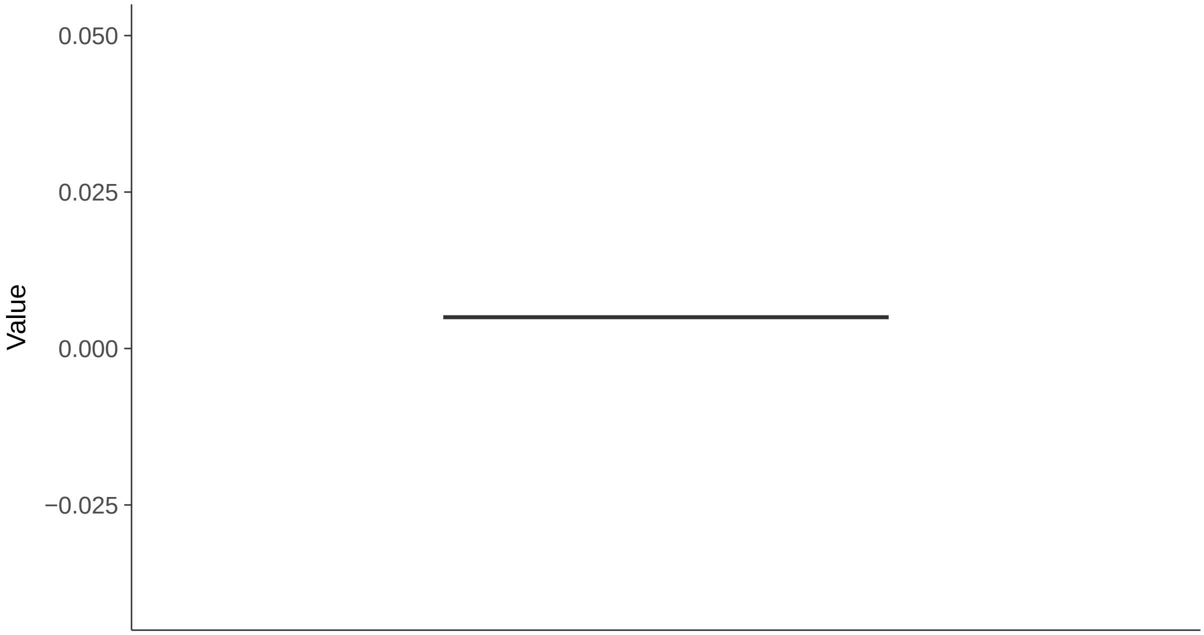
ID: 09_2_22





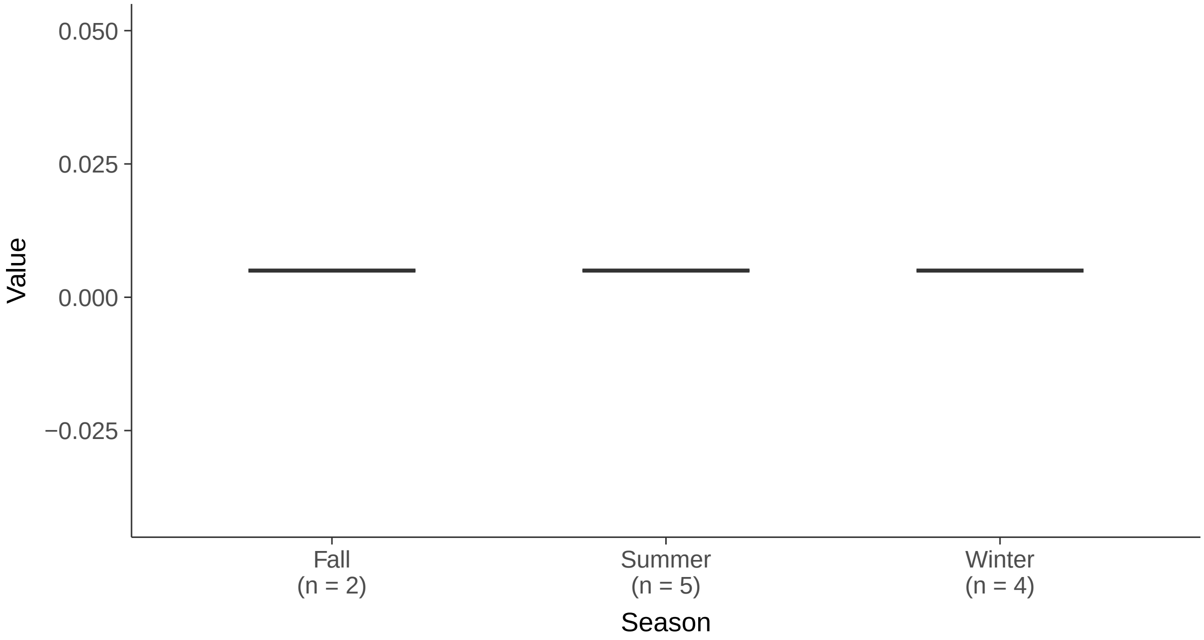
Boxplot

Selenium, MW-9 (mg/L)



Boxplot by Season

Selenium, MW-9 (mg/L)

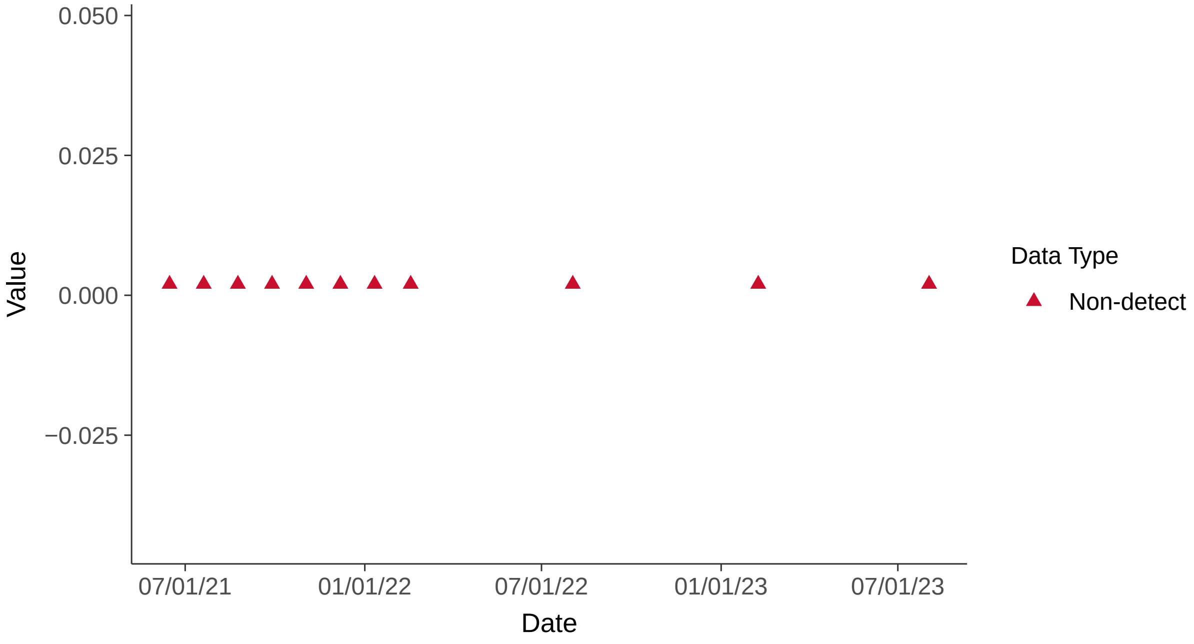


Appendix IV: Thallium, MW-9

ID: 09_2_23

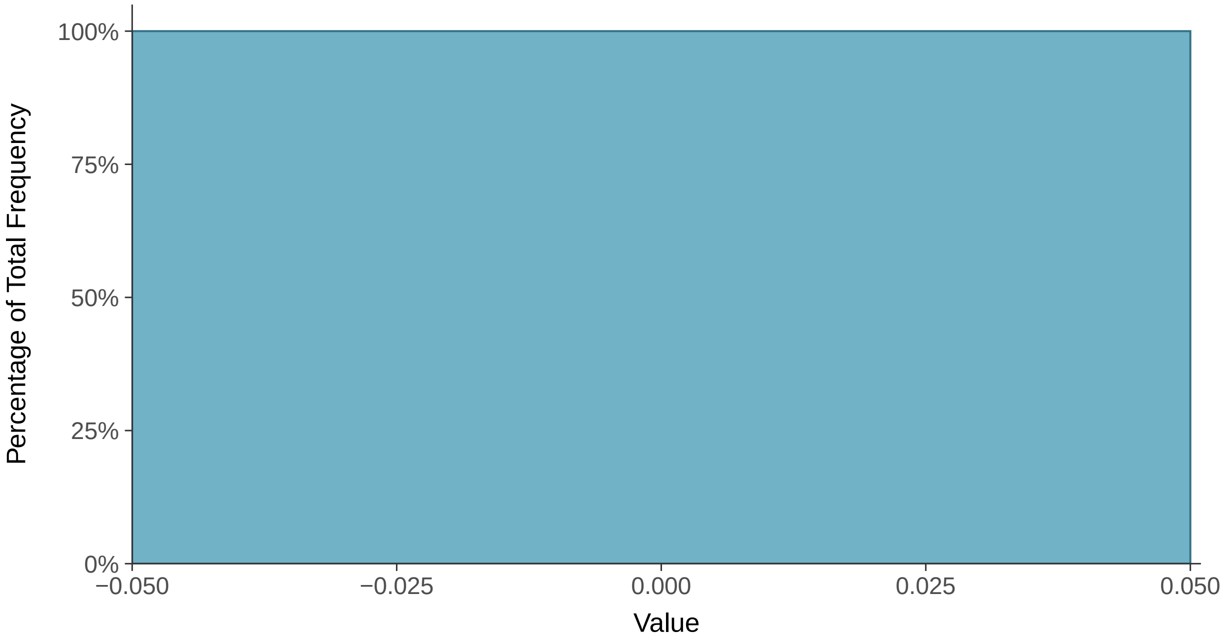
Scatter Plot

Thallium, MW-9 (mg/L)



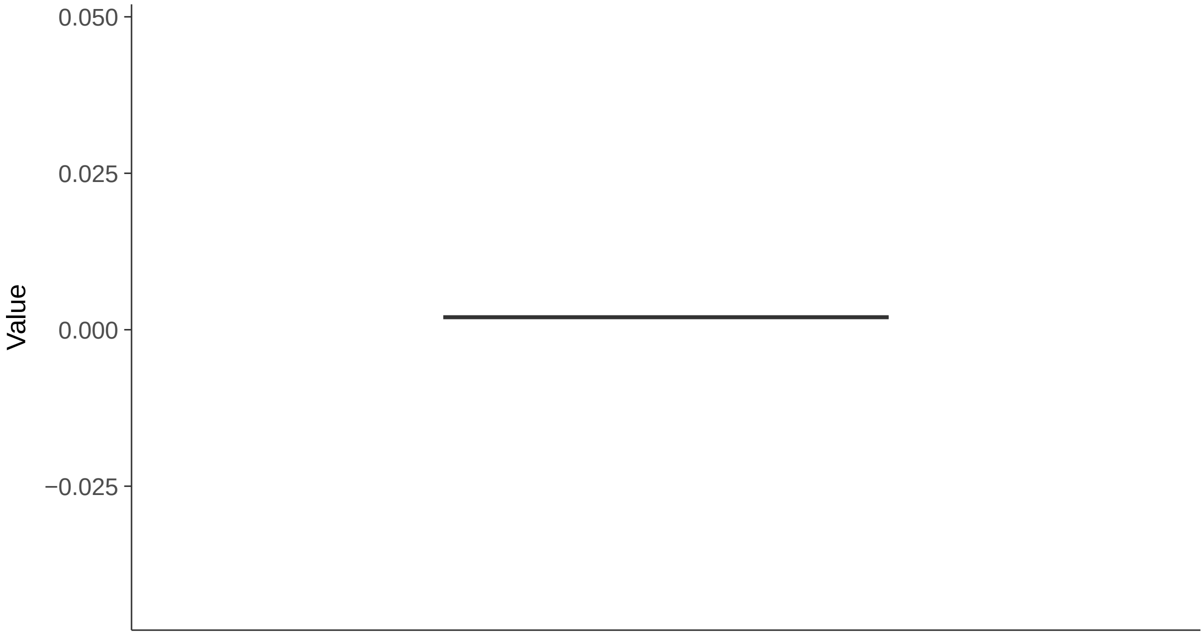
Histogram

Thallium, MW-9 (mg/L)



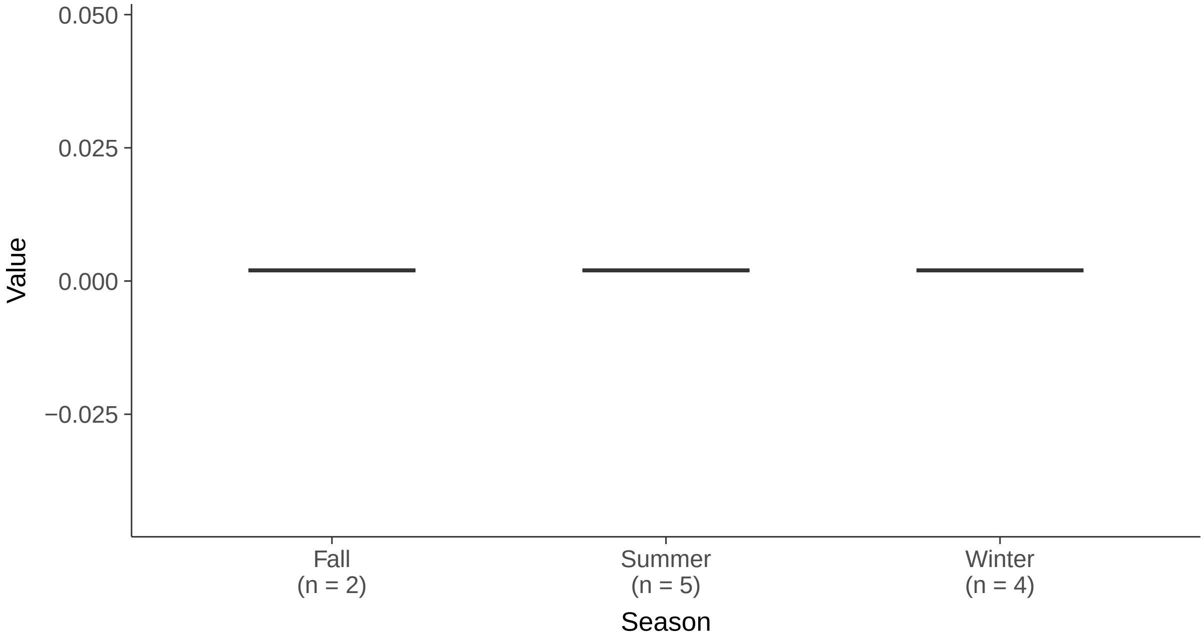
Boxplot

Thallium, MW-9 (mg/L)



Boxplot by Season

Thallium, MW-9 (mg/L)

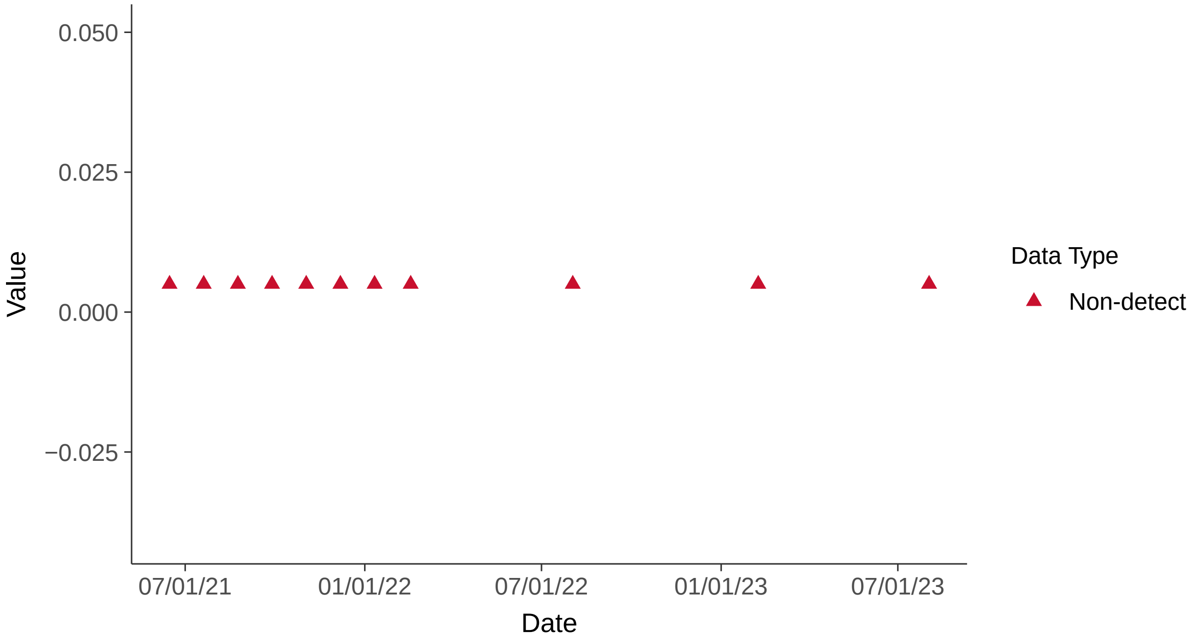


Part 115: Copper, MW-9

ID: 09_5_37

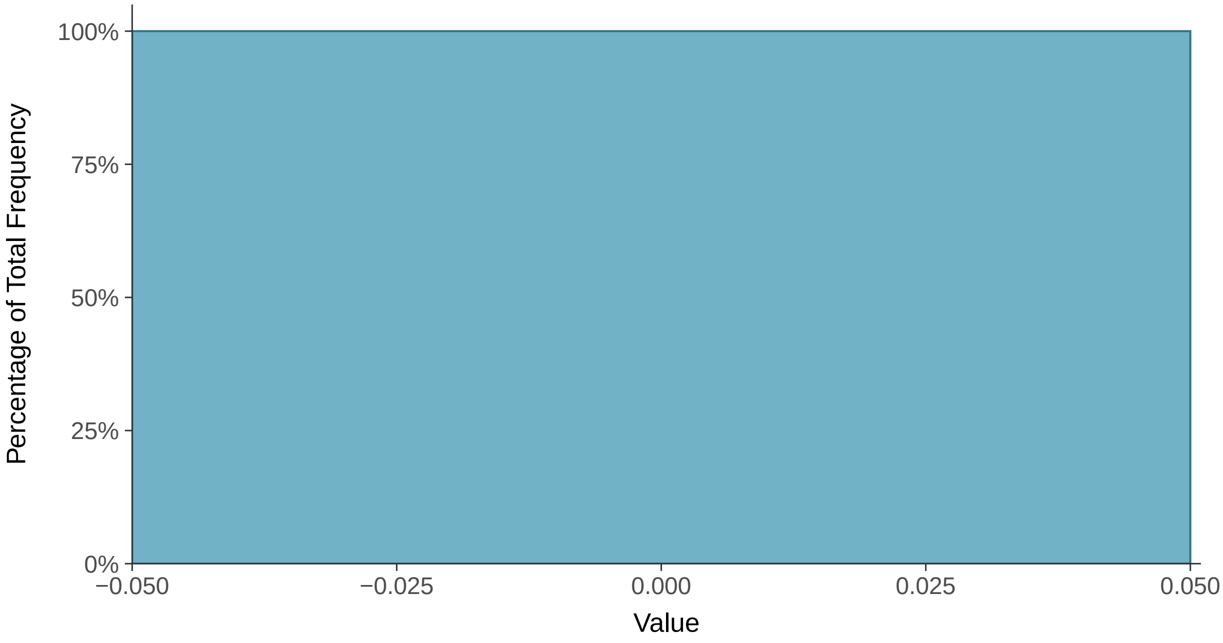
Scatter Plot

Copper, MW-9 (mg/L)



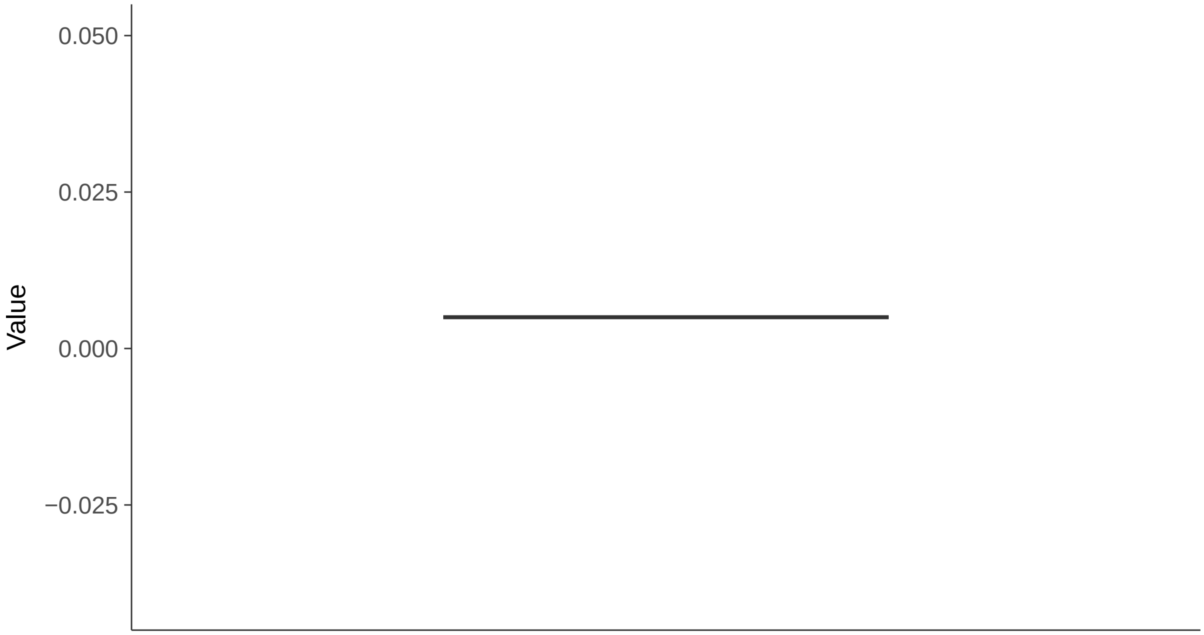
Histogram

Copper, MW-9 (mg/L)



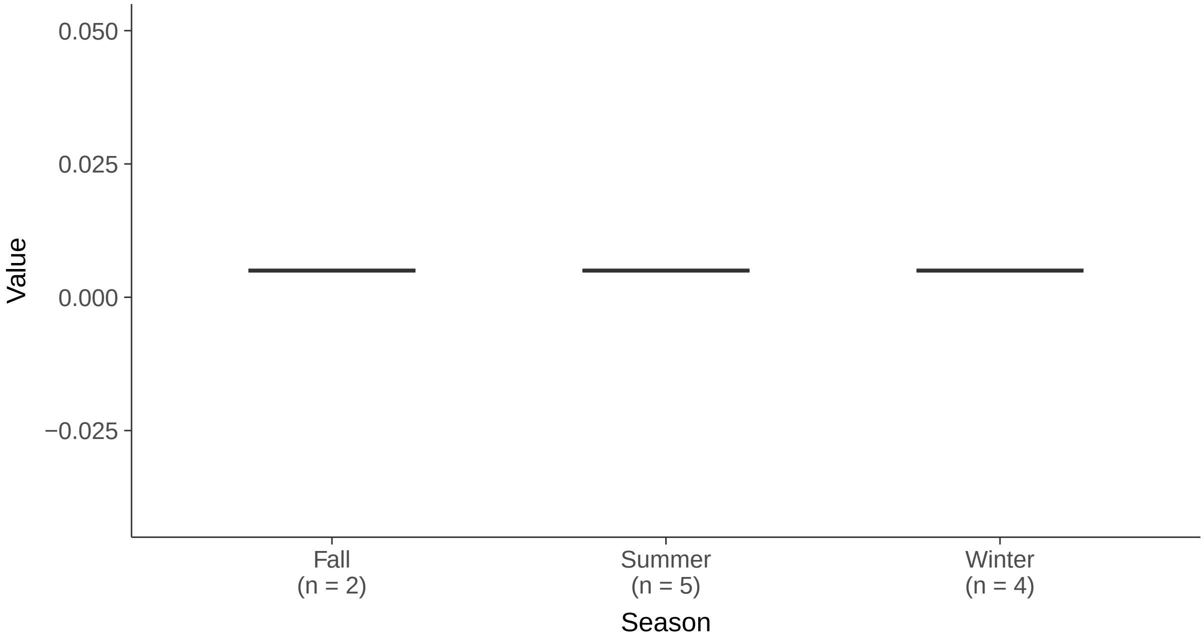
Boxplot

Copper, MW-9 (mg/L)



Boxplot by Season

Copper, MW-9 (mg/L)

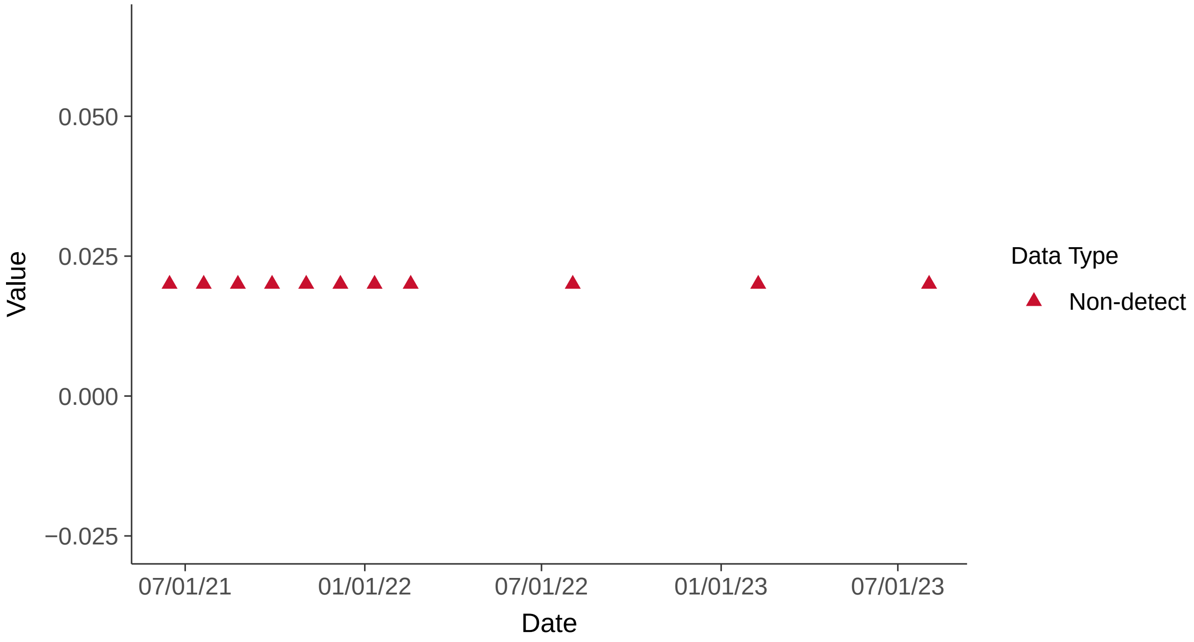


Part 115: Iron, MW-9

ID: 09_5_38

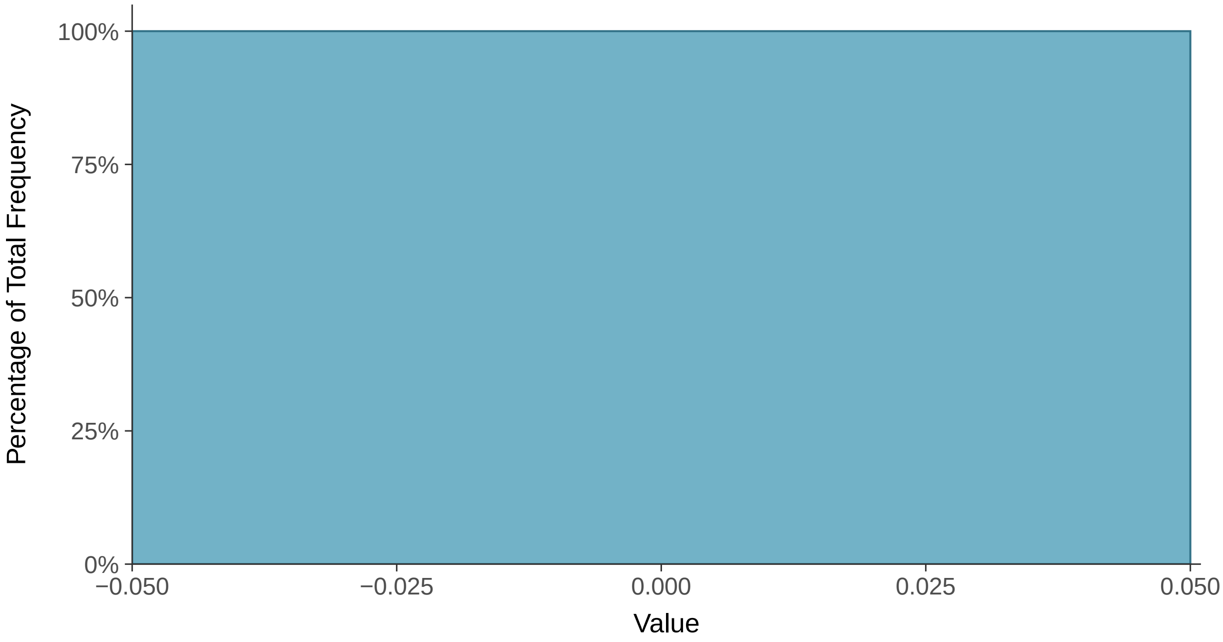
Scatter Plot

Iron, MW-9 (mg/L)



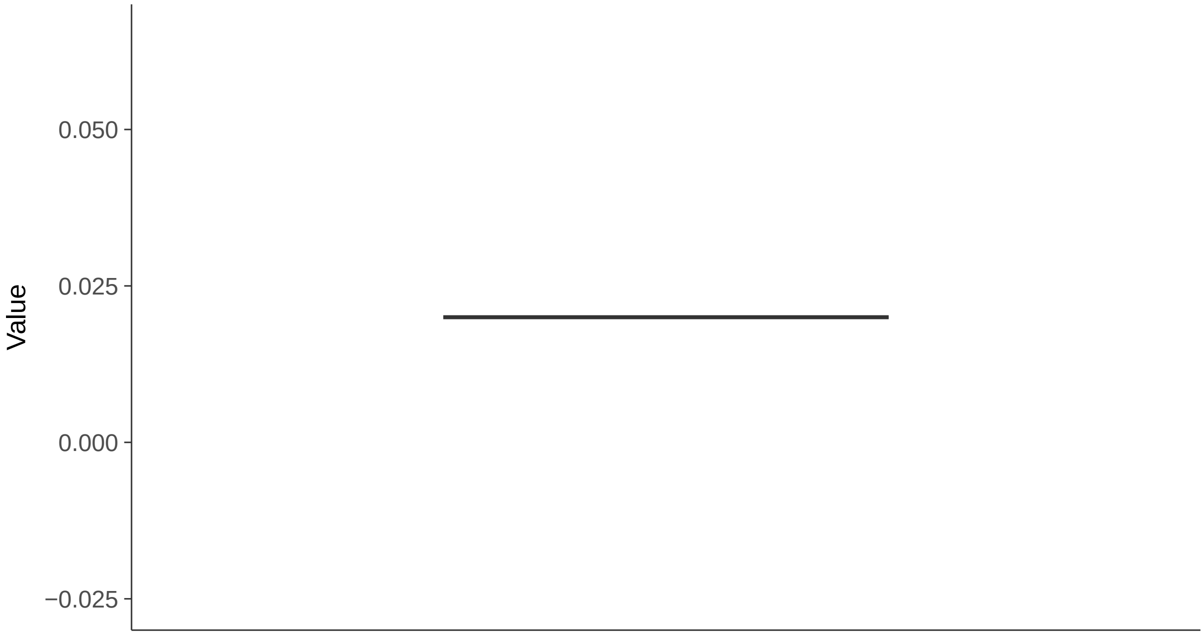
Histogram

Iron, MW-9 (mg/L)



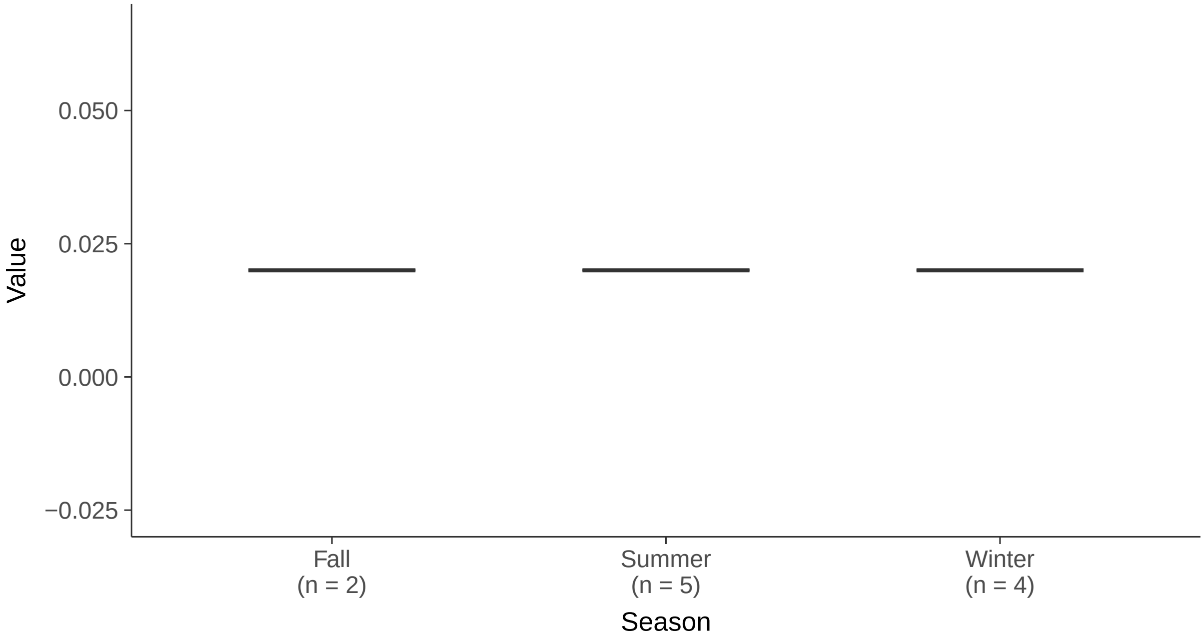
Boxplot

Iron, MW-9 (mg/L)



Boxplot by Season

Iron, MW-9 (mg/L)

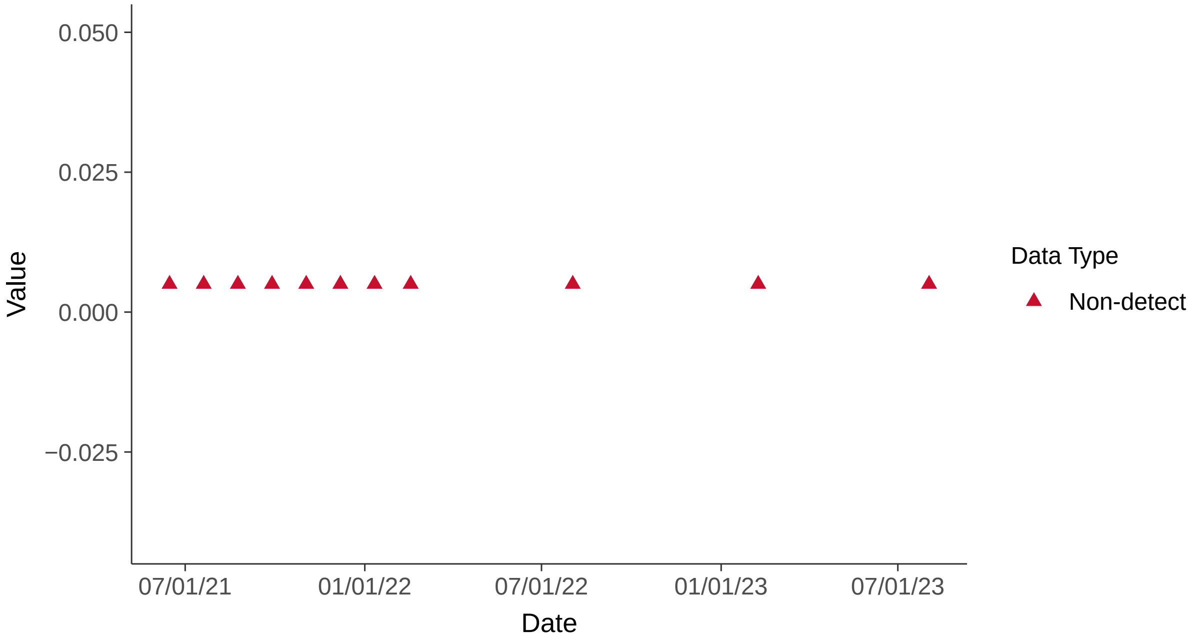


Part 115: Nickel, MW-9

ID: 09_5_39

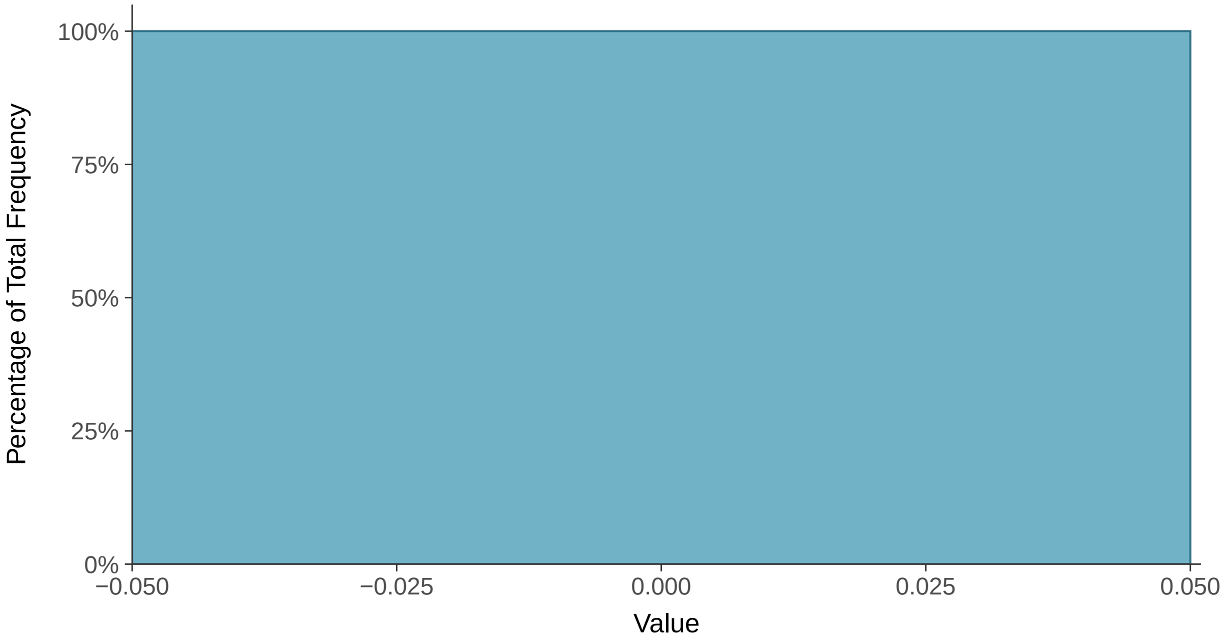
Scatter Plot

Nickel, MW-9 (mg/L)



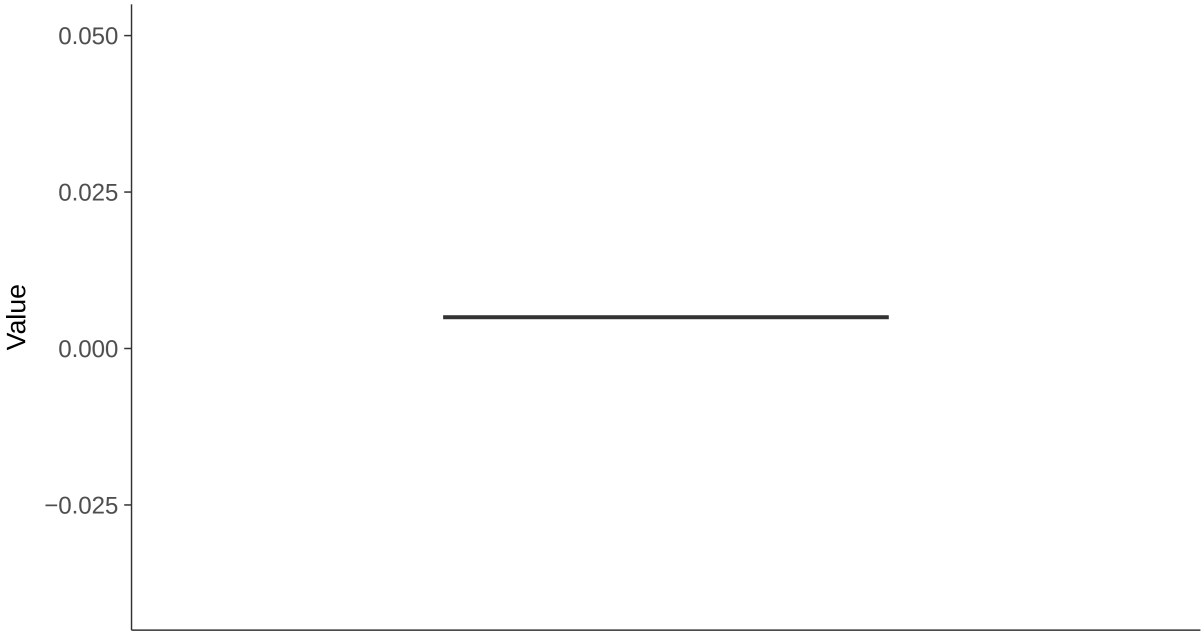
Histogram

Nickel, MW-9 (mg/L)



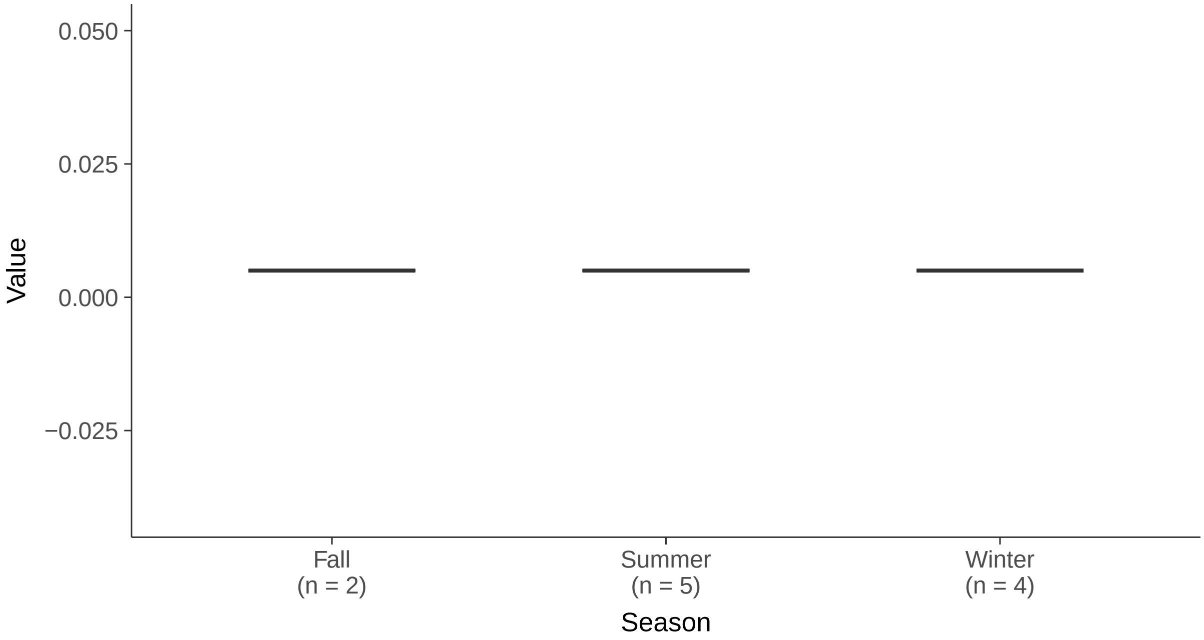
Boxplot

Nickel, MW-9 (mg/L)



Boxplot by Season

Nickel, MW-9 (mg/L)

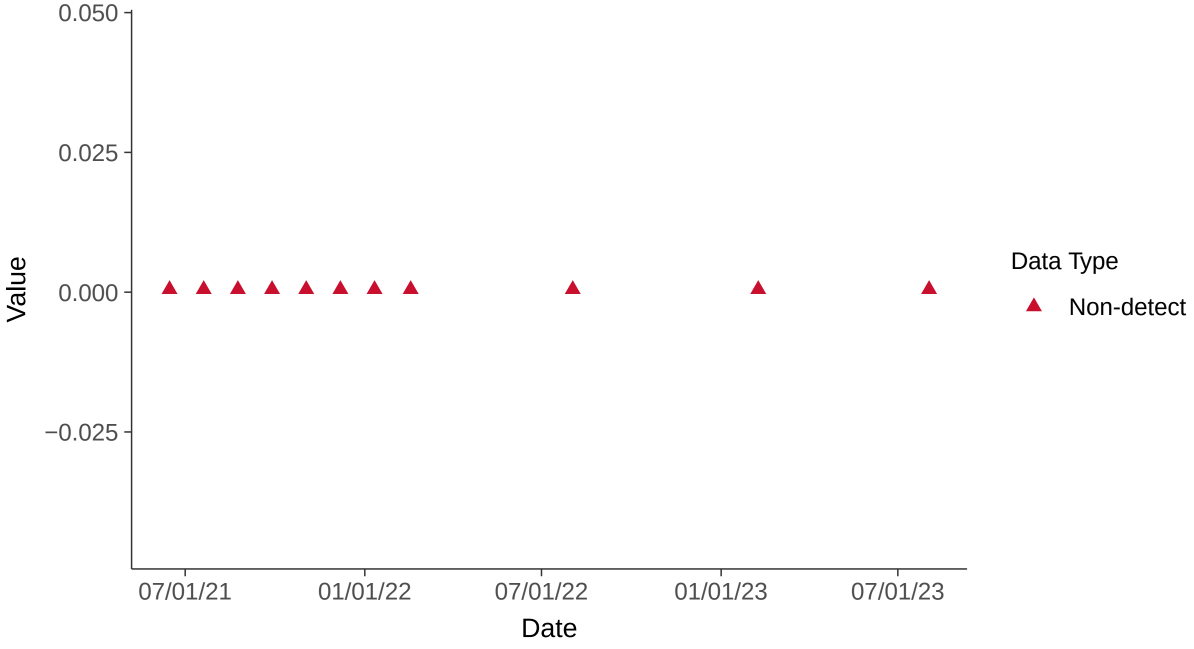


Part 115: Silver, MW-9

ID: 09_5_40

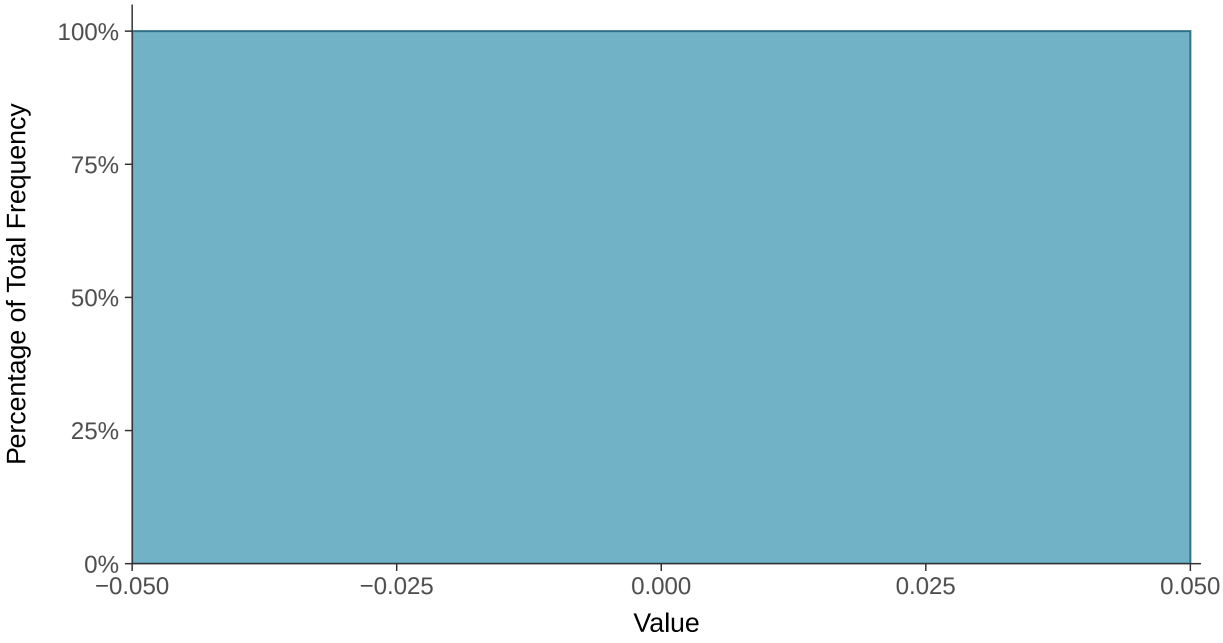
Scatter Plot

Silver, MW-9 (mg/L)



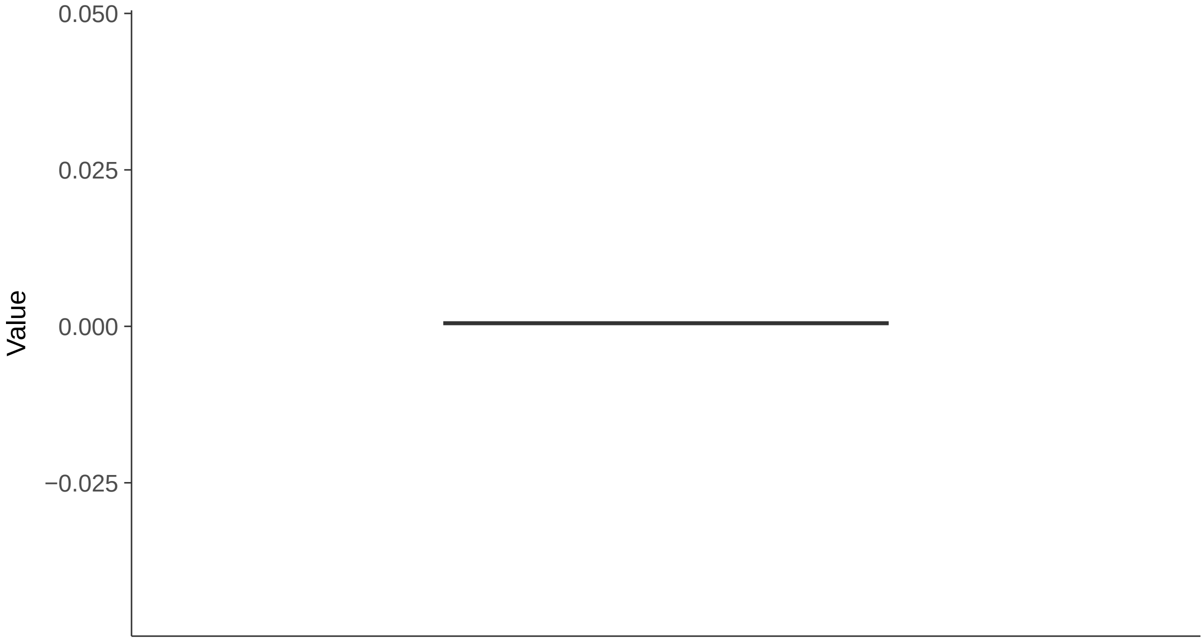
Histogram

Silver, MW-9 (mg/L)



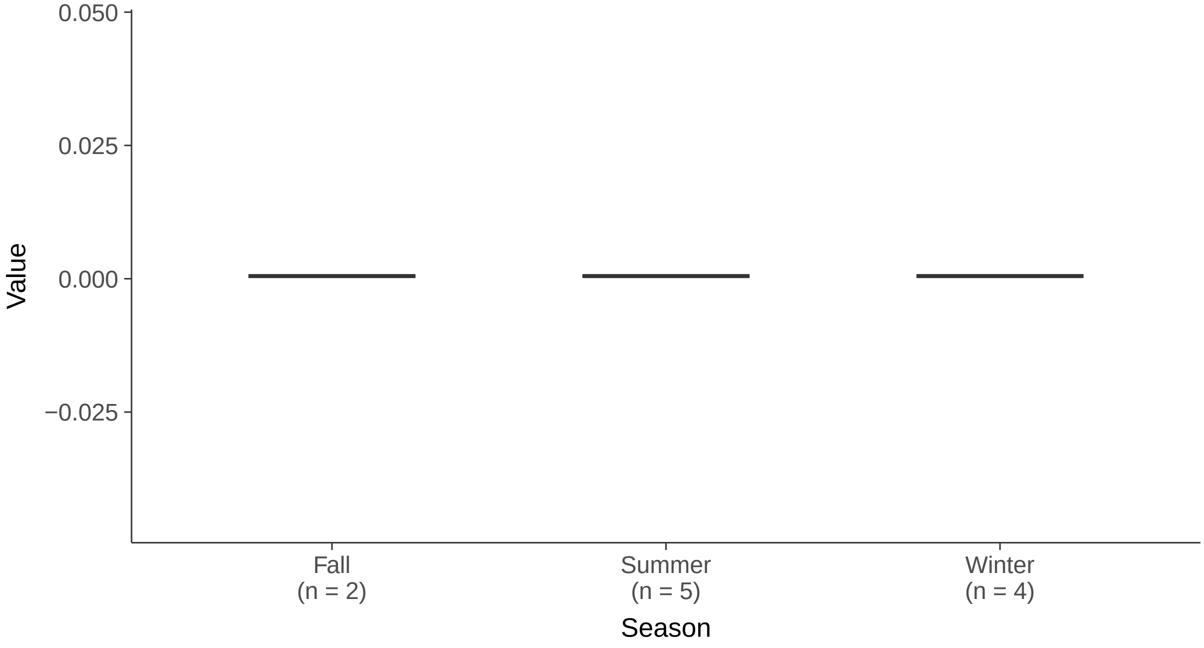
Boxplot

Silver, MW-9 (mg/L)



Boxplot by Season

Silver, MW-9 (mg/L)

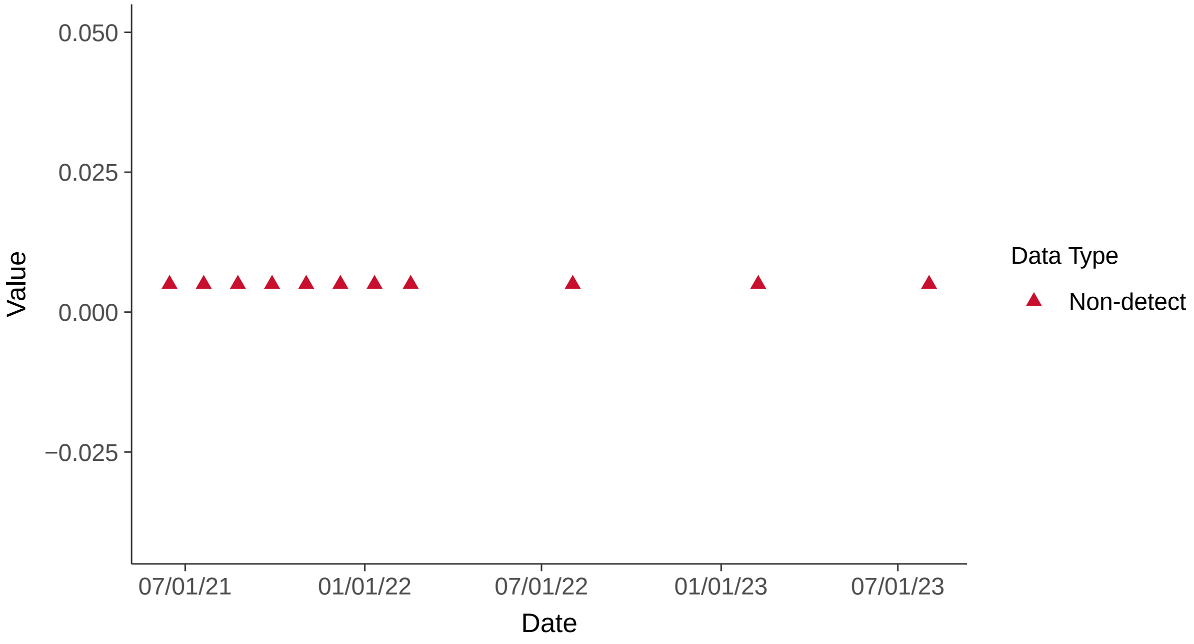


Part 115: Vanadium, MW-9

ID: 09_5_41

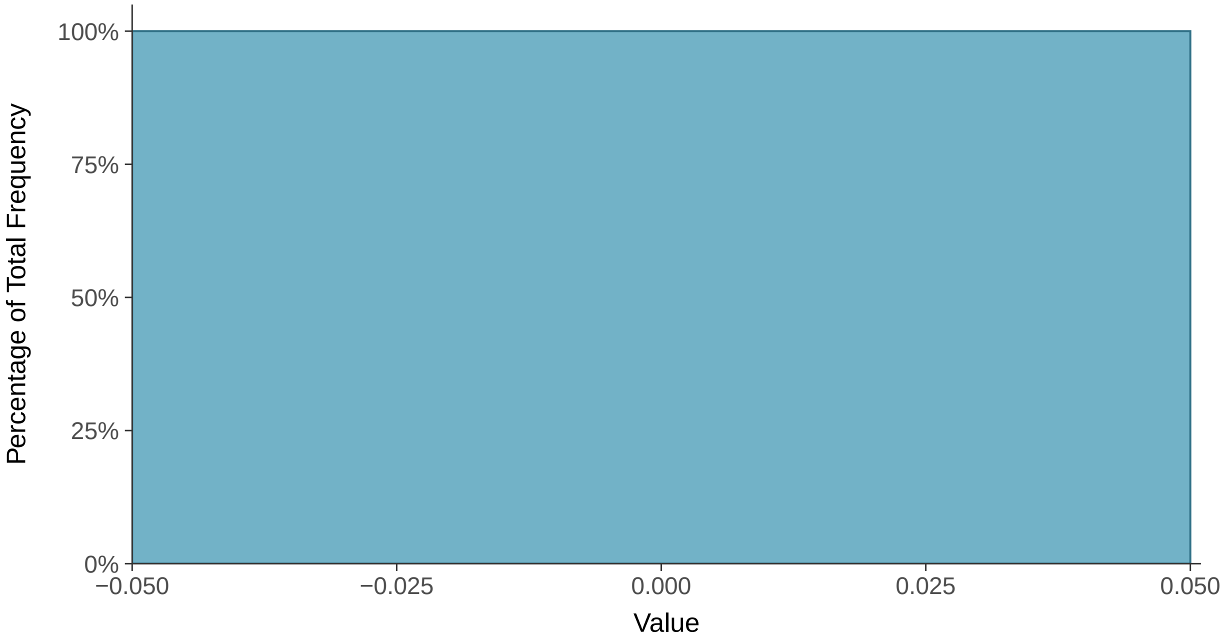
Scatter Plot

Vanadium, MW-9 (mg/L)



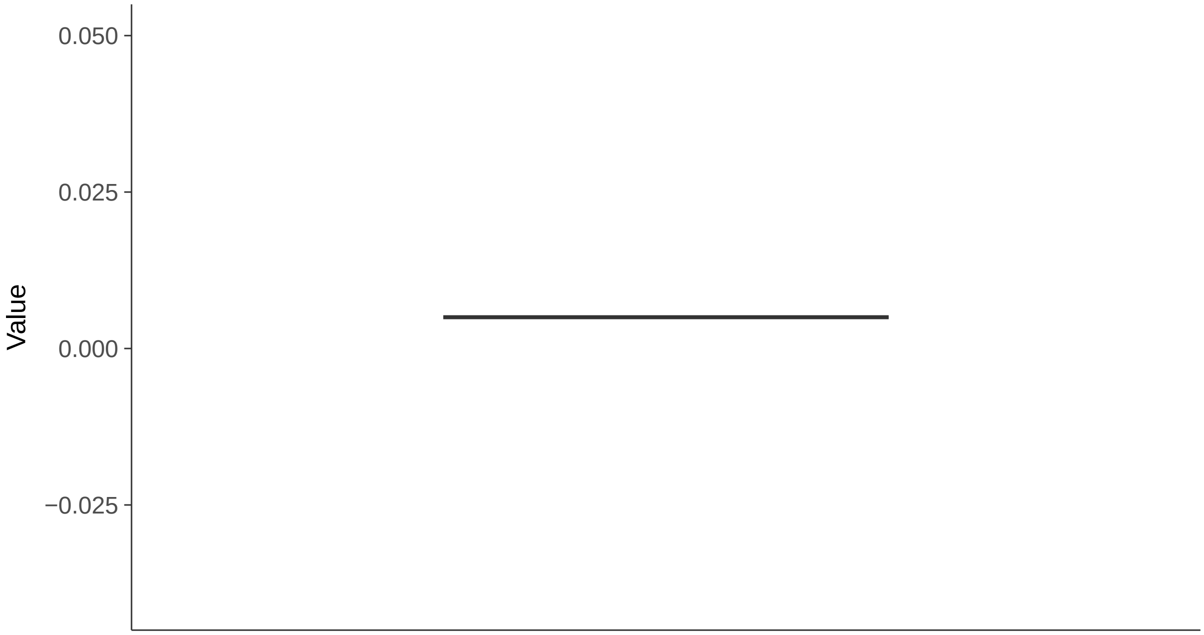
Histogram

Vanadium, MW-9 (mg/L)



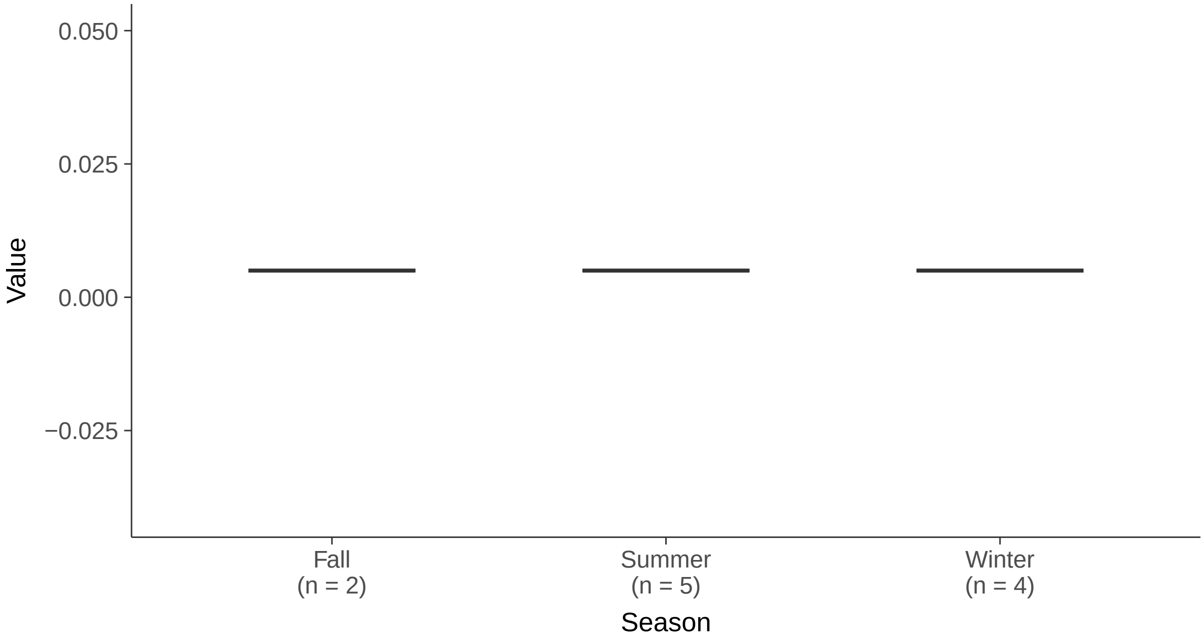
Boxplot

Vanadium, MW-9 (mg/L)



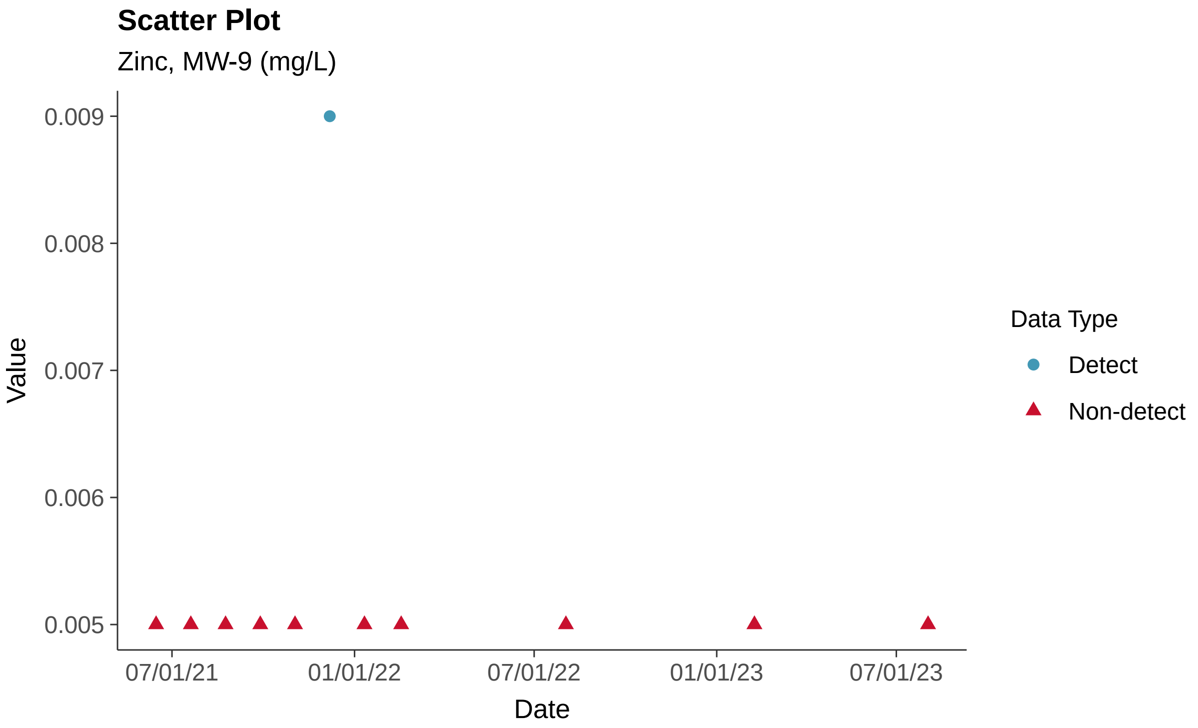
Boxplot by Season

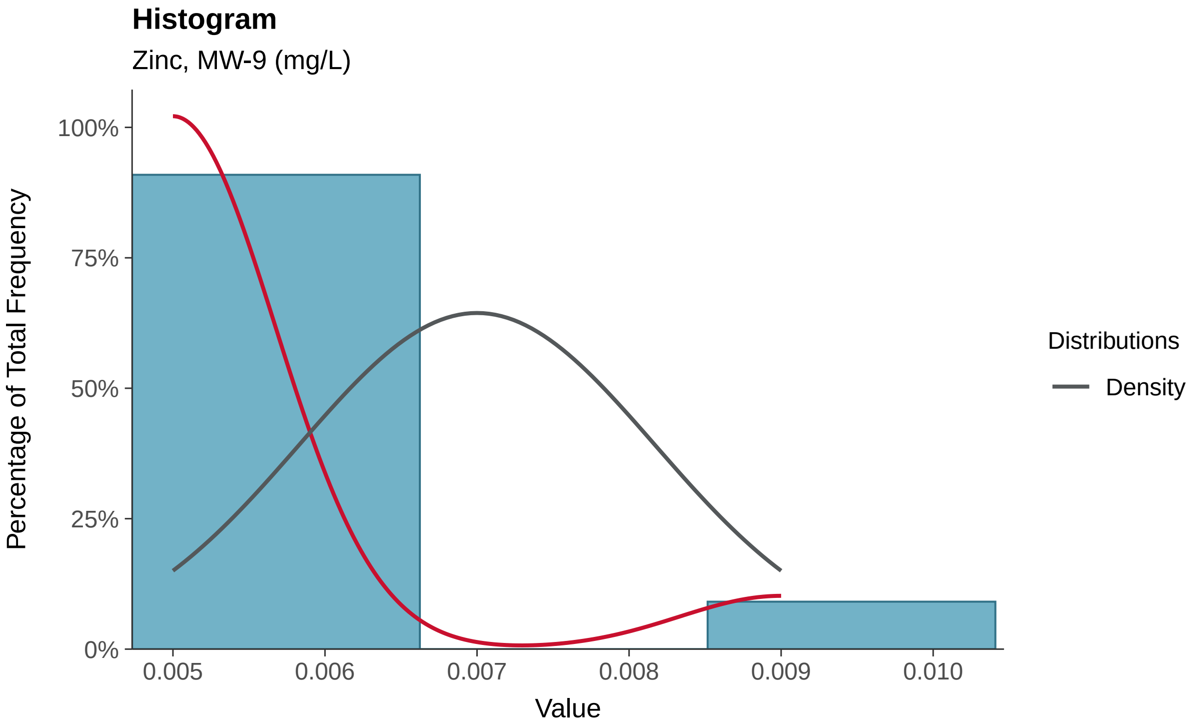
Vanadium, MW-9 (mg/L)



Part 115: Zinc, MW-9

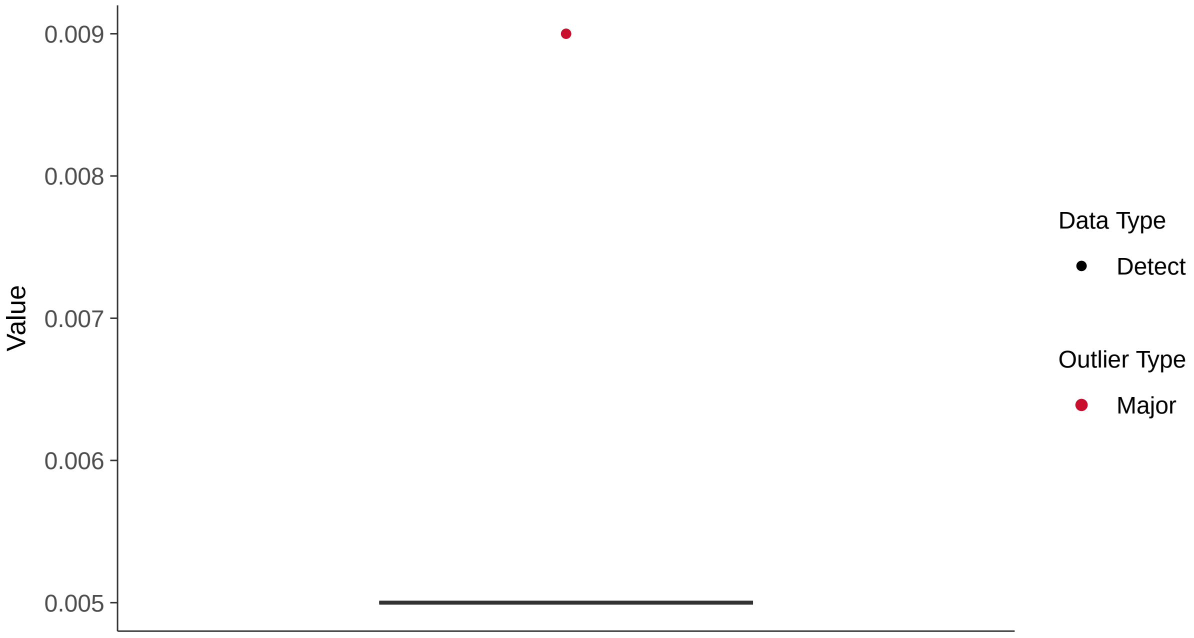
ID: 09_5_42





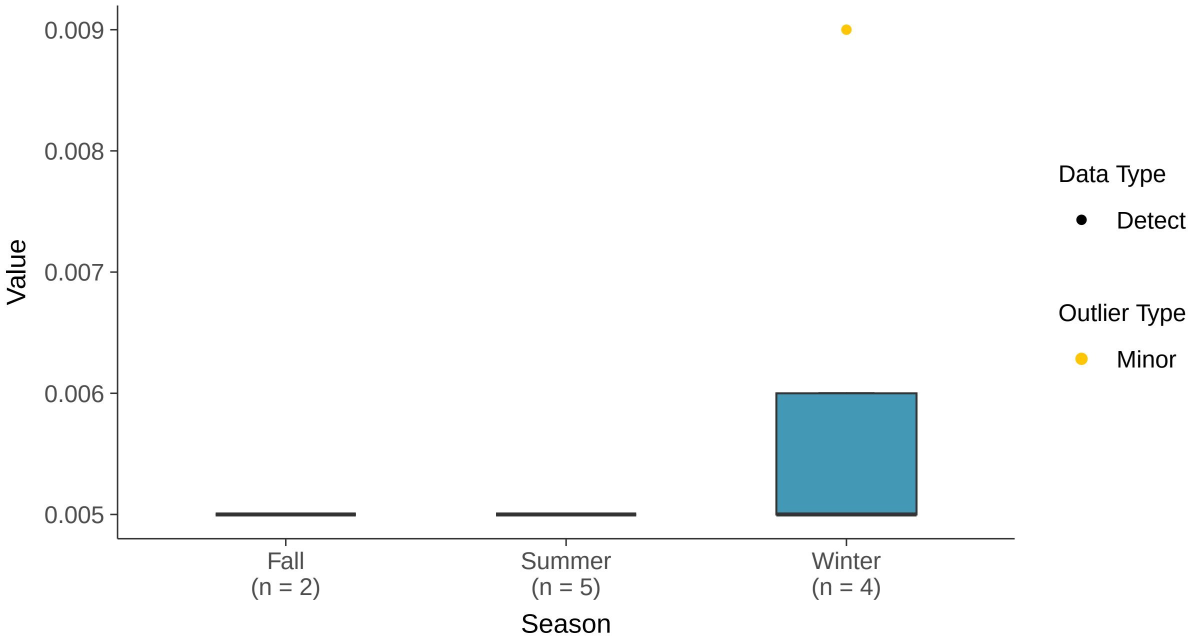
Boxplot

Zinc, MW-9 (mg/L)



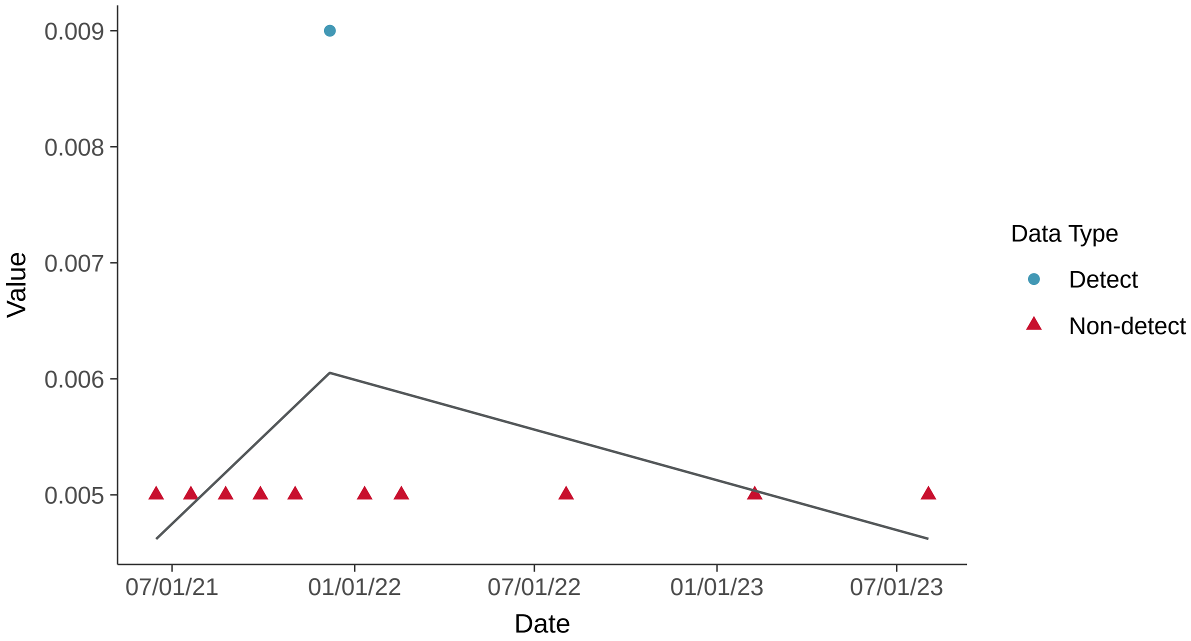
Boxplot by Season

Zinc, MW-9 (mg/L)



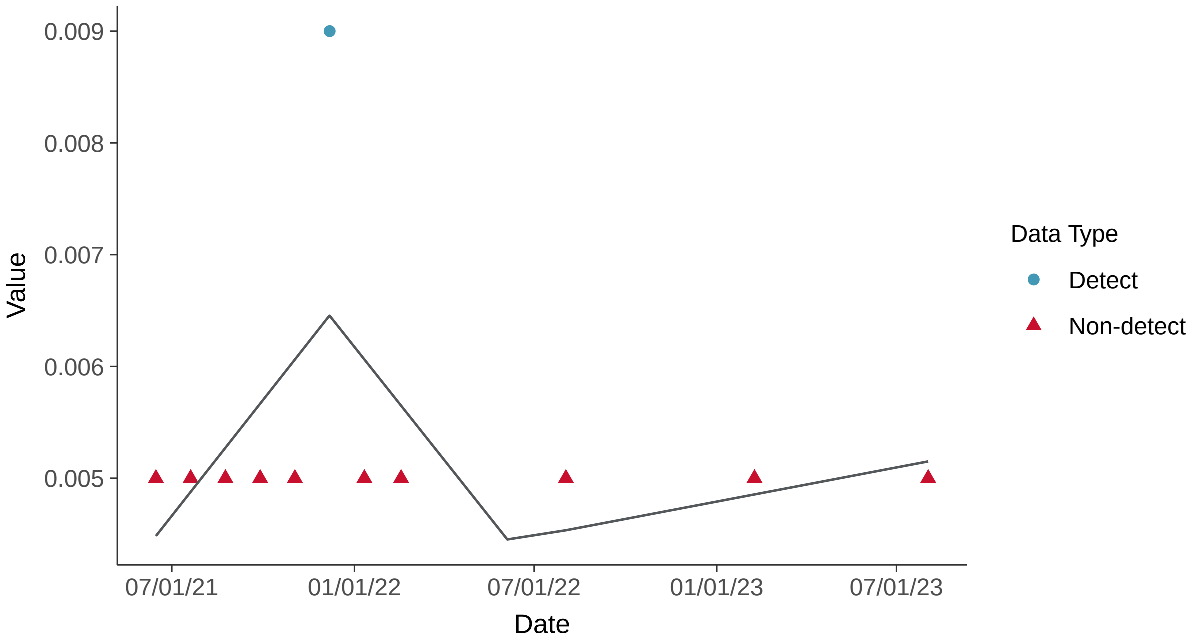
Trend Regression: Piecewise Linear-Linear

Zinc, MW-9 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Zinc, MW-9 (mg/L)

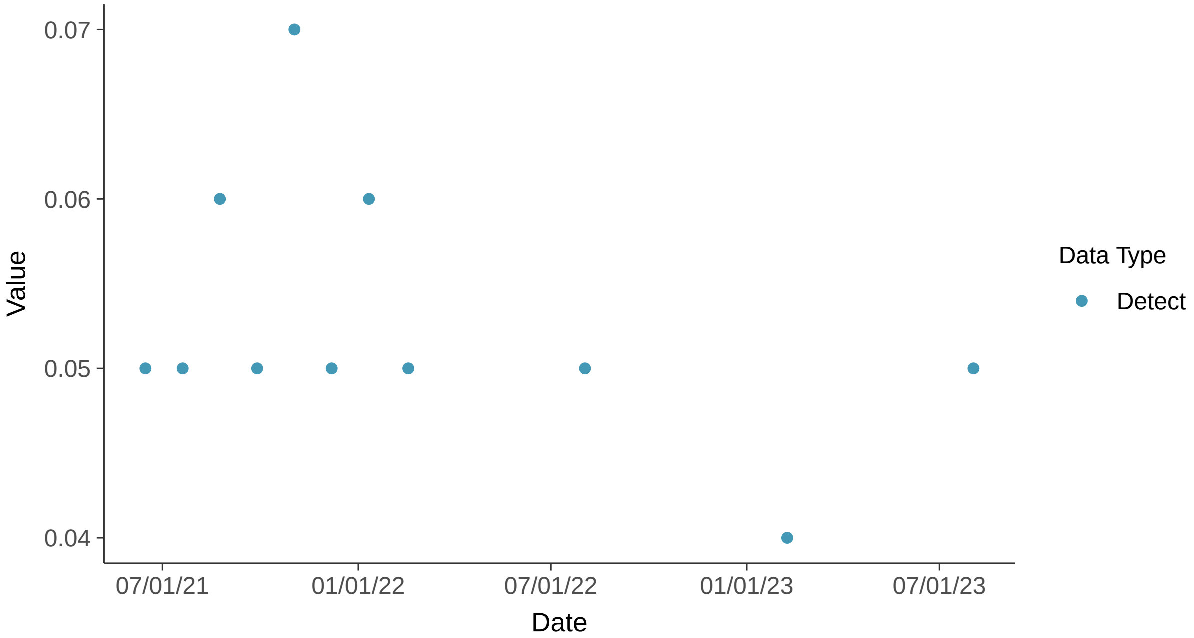


Appendix III: Boron, MW-10

ID: 10_1_01

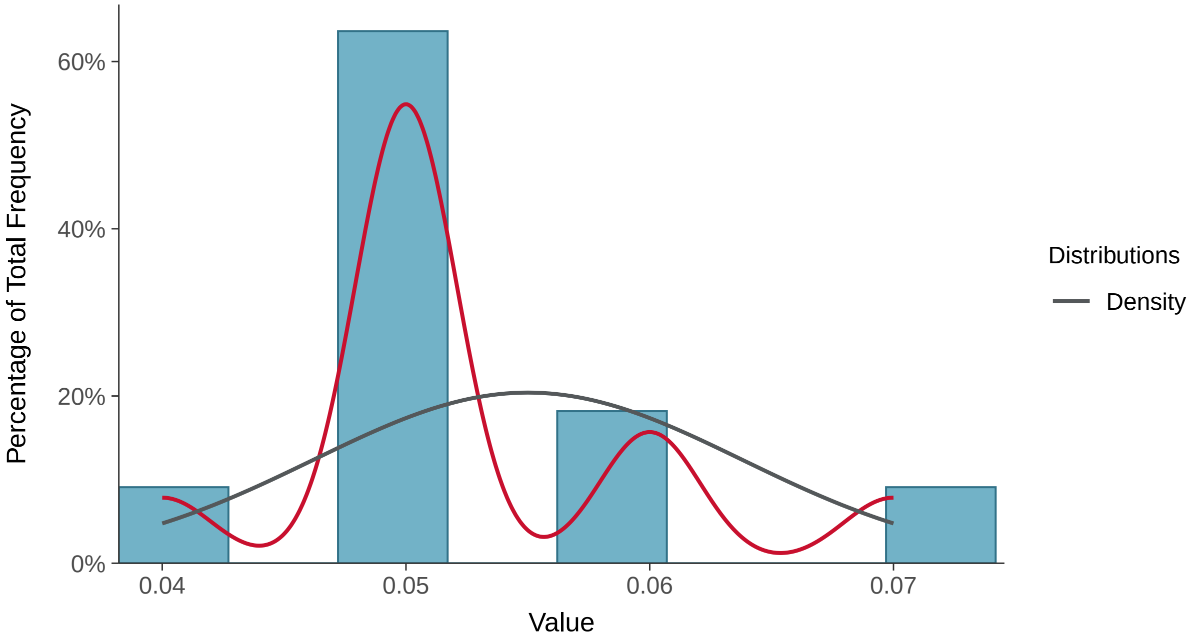
Scatter Plot

Boron, MW-10 (mg/L)



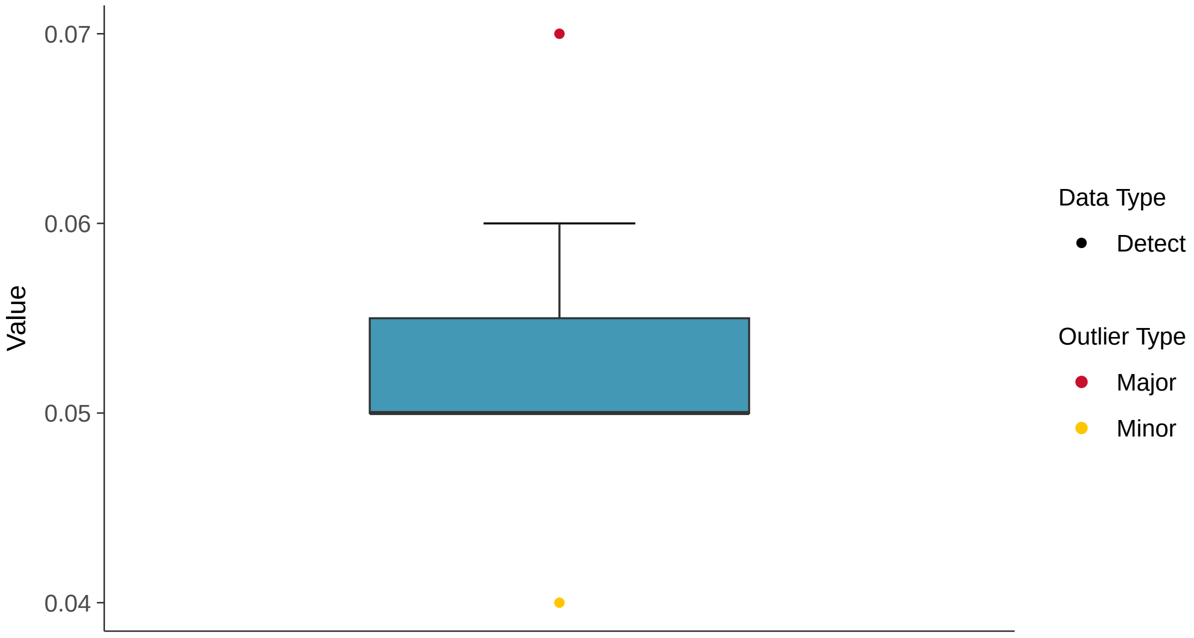
Histogram

Boron, MW-10 (mg/L)



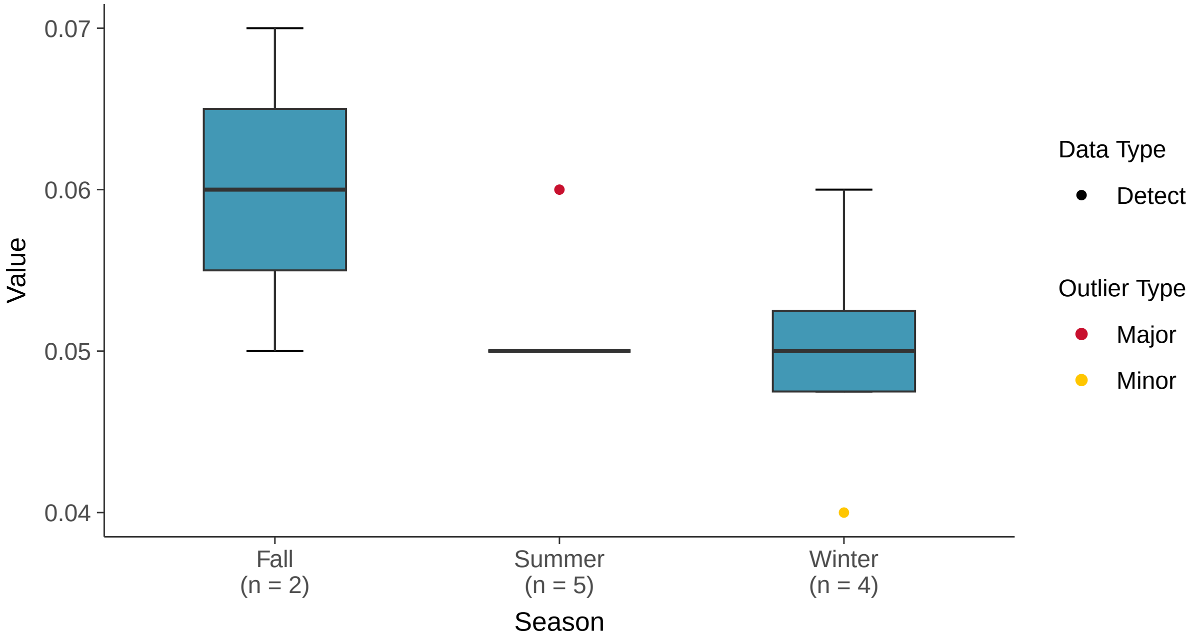
Boxplot

Boron, MW-10 (mg/L)



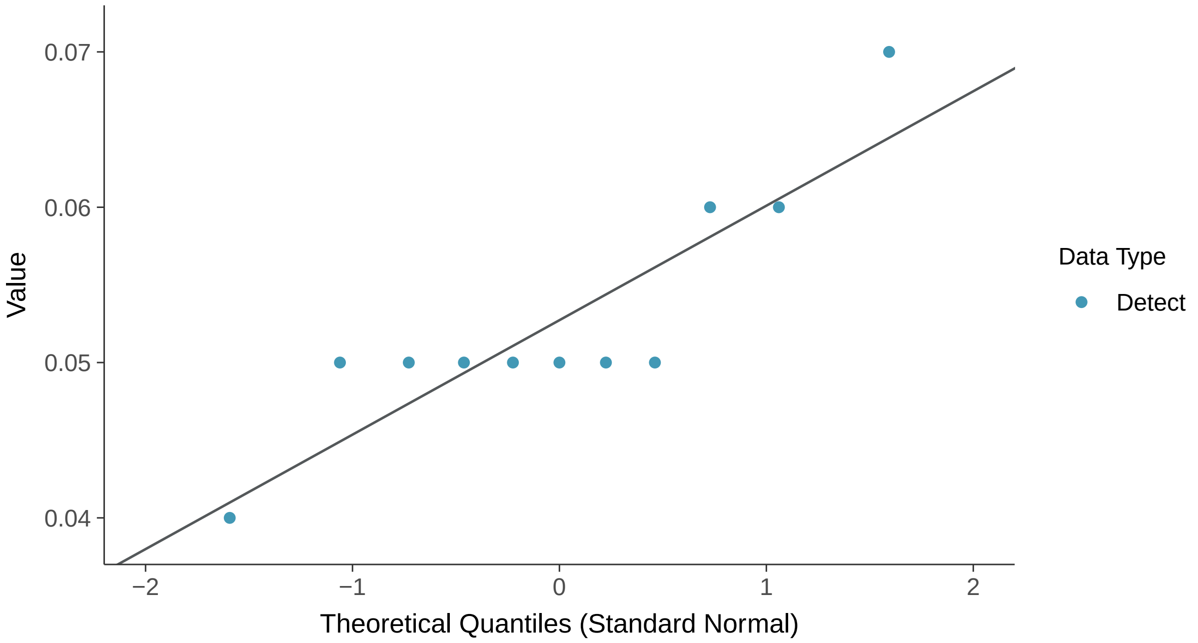
Boxplot by Season

Boron, MW-10 (mg/L)



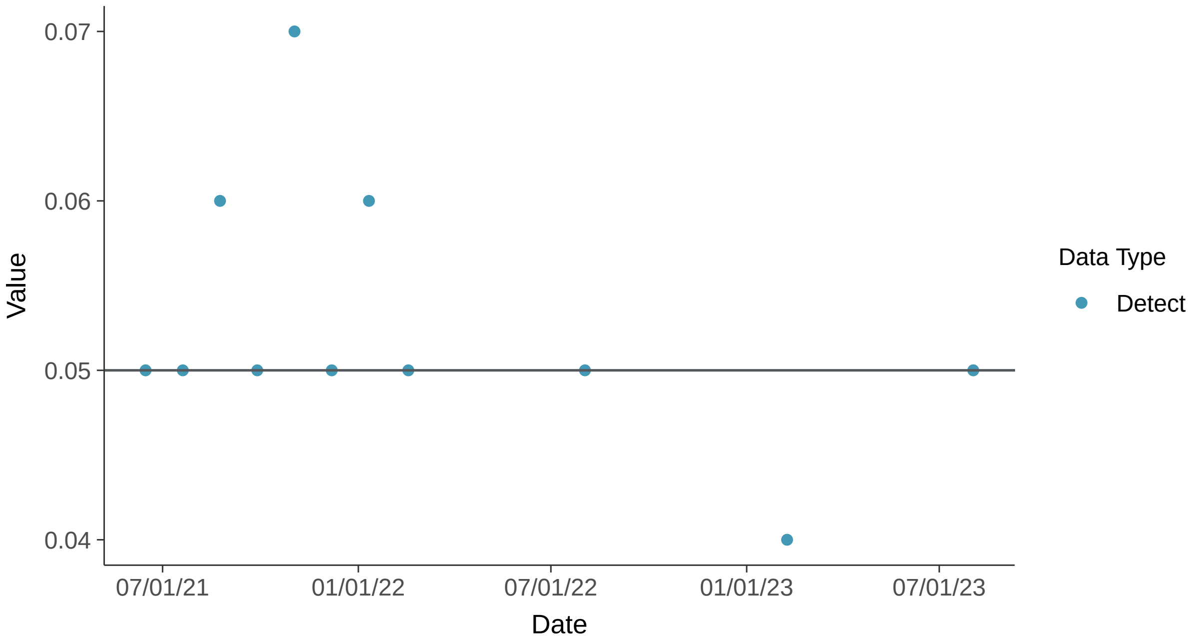
Normal Q-Q plot

Boron, MW-10 (mg/L)



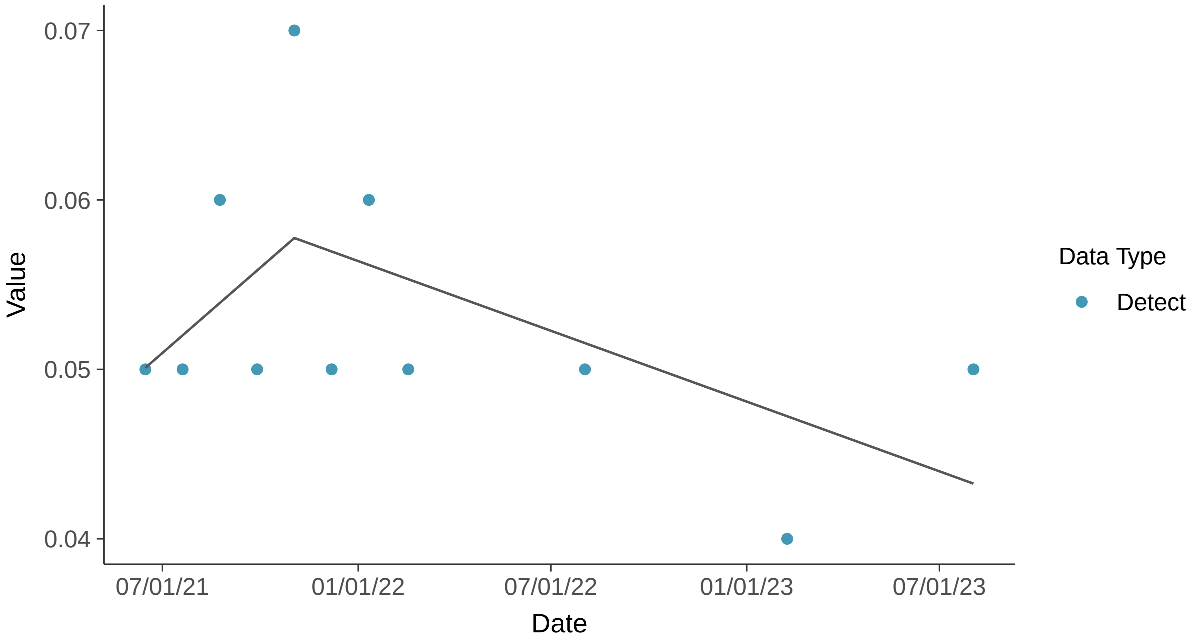
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Boron, MW-10 (mg/L)



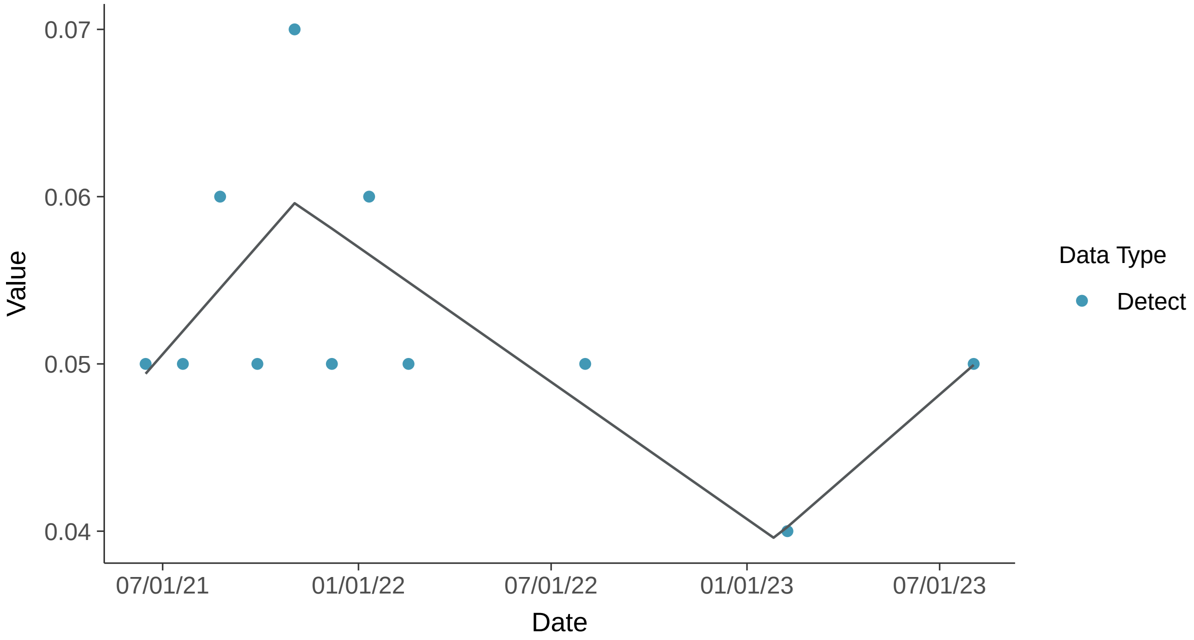
Trend Regression: Piecewise Linear-Linear

Boron, MW-10 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Boron, MW-10 (mg/L)

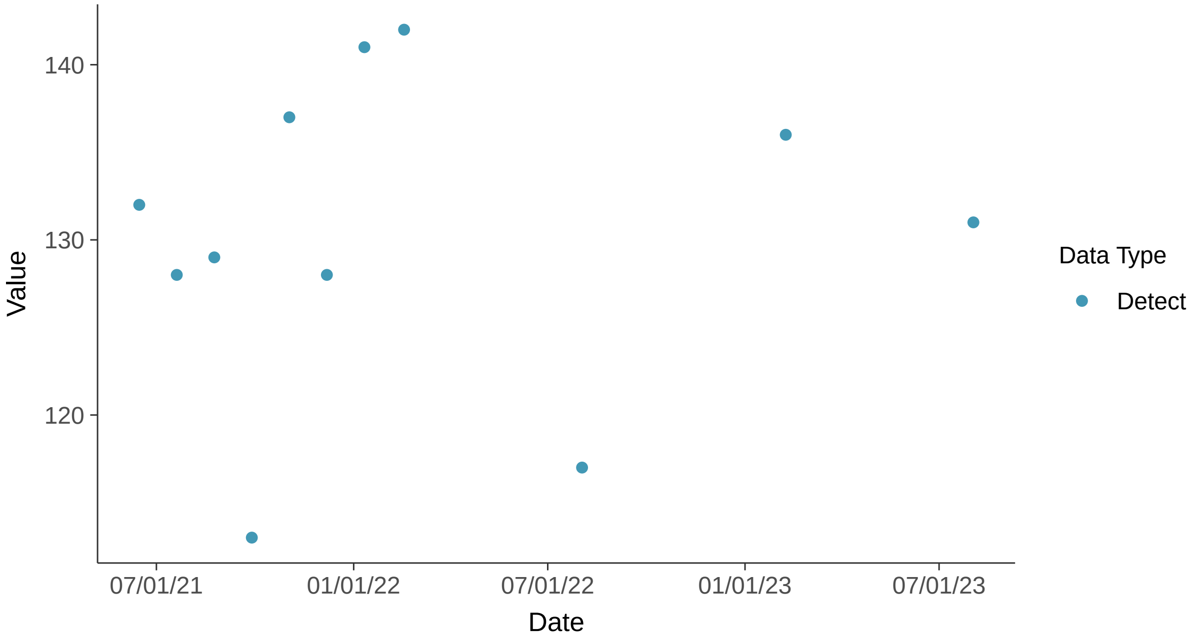


Appendix III: Calcium, MW-10

ID: 10_1_02

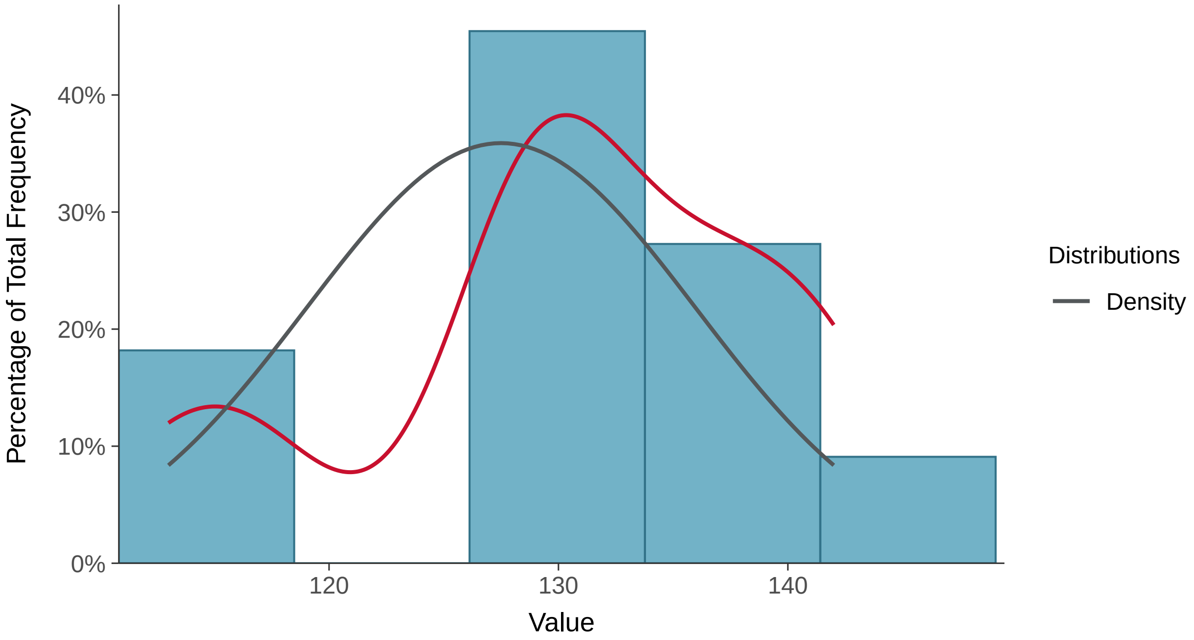
Scatter Plot

Calcium, MW-10 (mg/L)



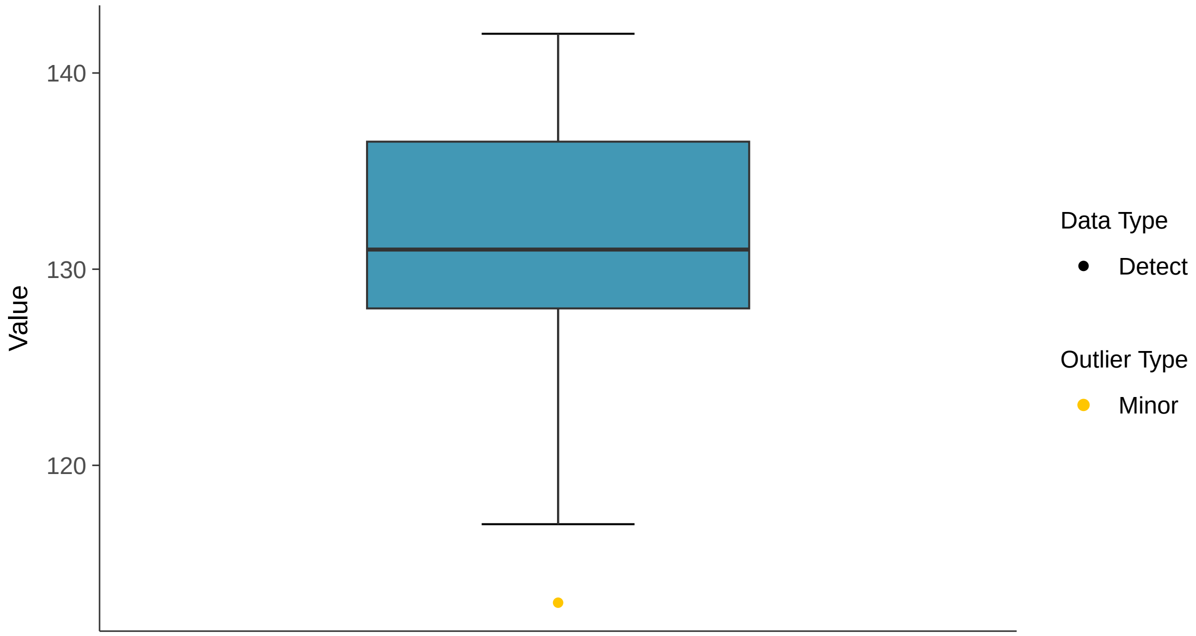
Histogram

Calcium, MW-10 (mg/L)



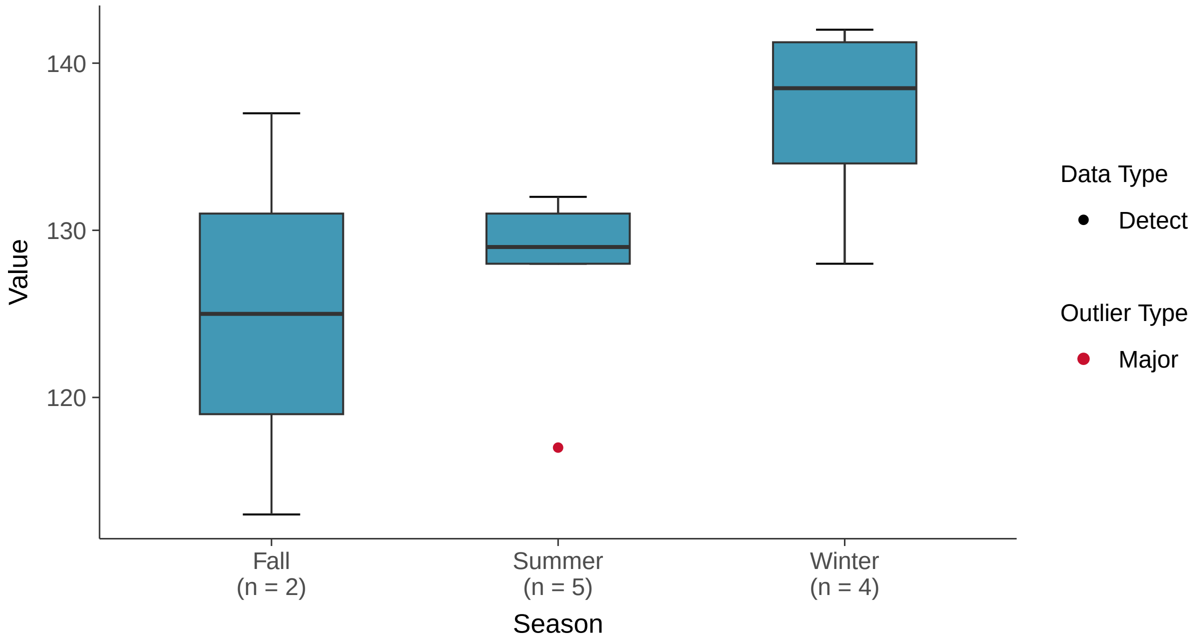
Boxplot

Calcium, MW-10 (mg/L)



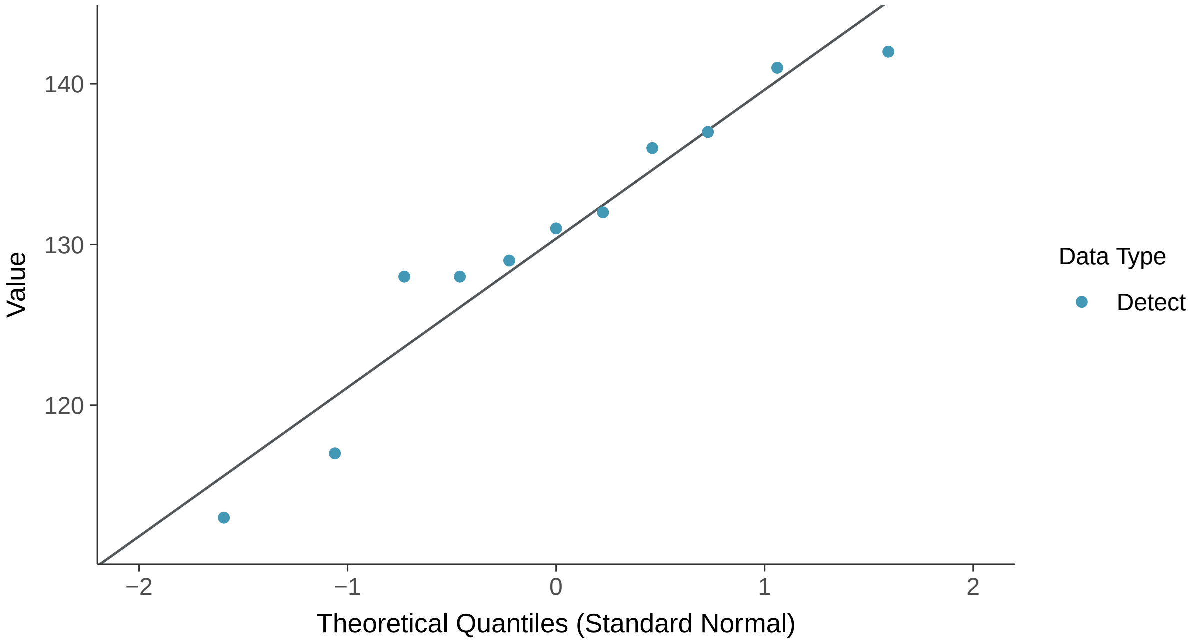
Boxplot by Season

Calcium, MW-10 (mg/L)



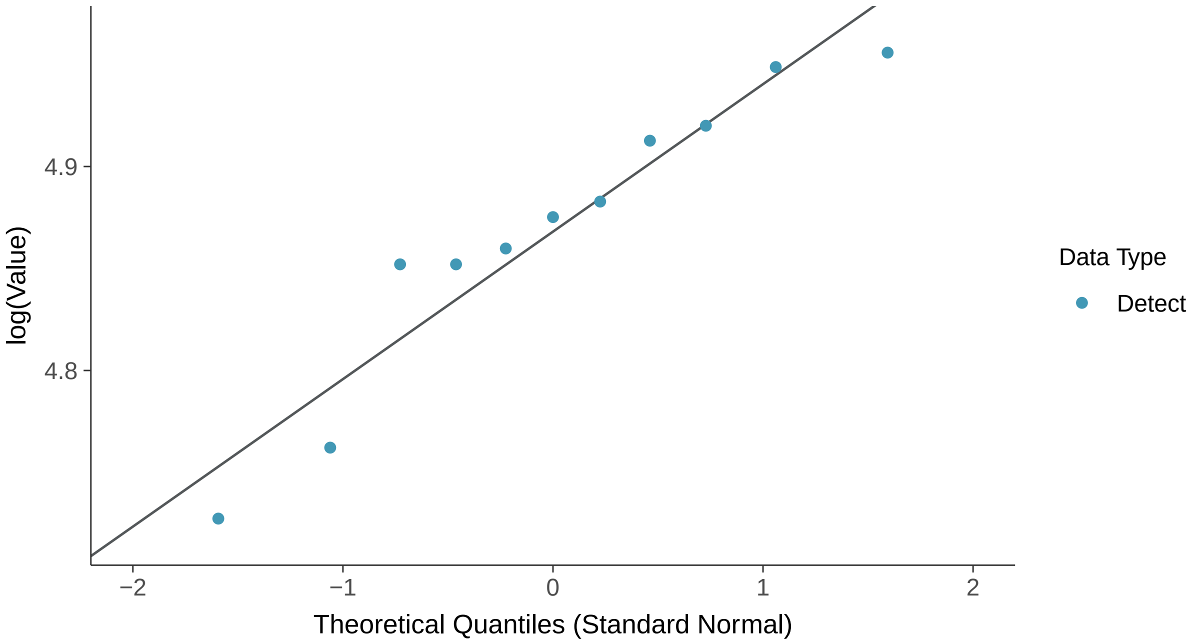
Normal Q-Q plot

Calcium, MW-10 (mg/L)



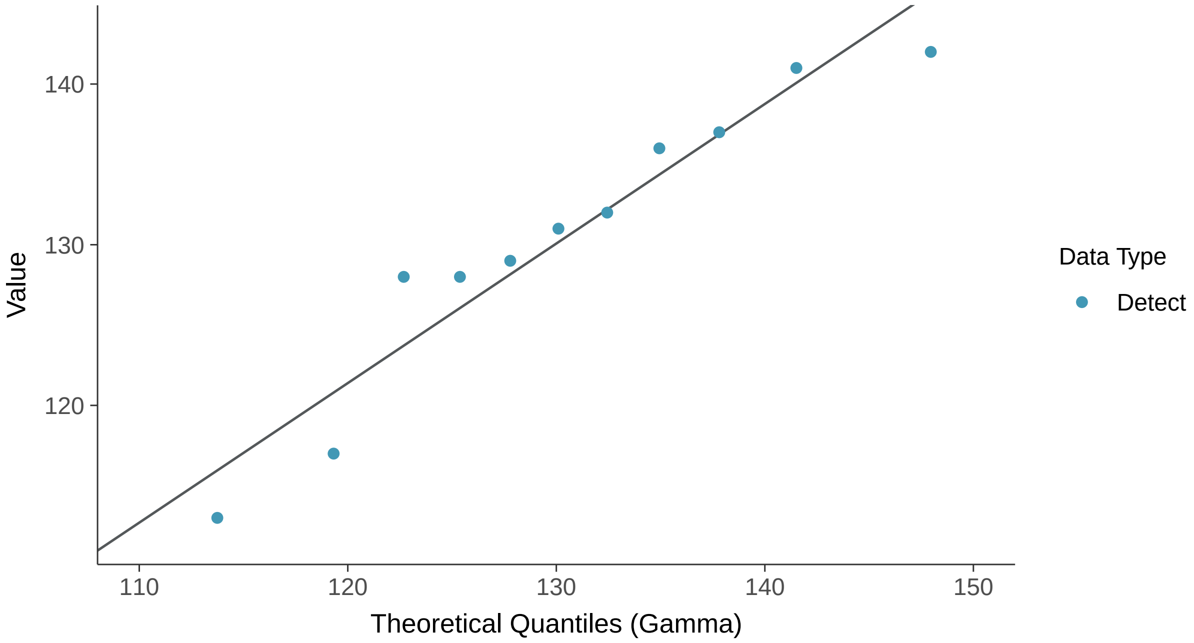
Lognormal Q-Q plot

Calcium, MW-10 (mg/L)



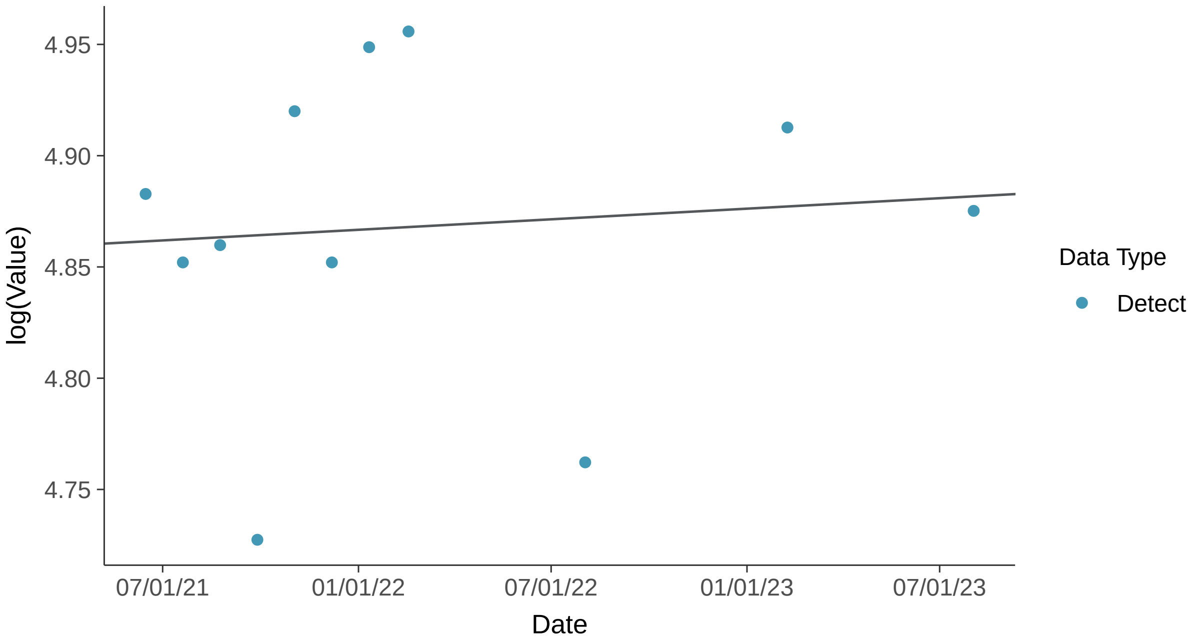
Gamma Q-Q plot

Calcium, MW-10 (mg/L)



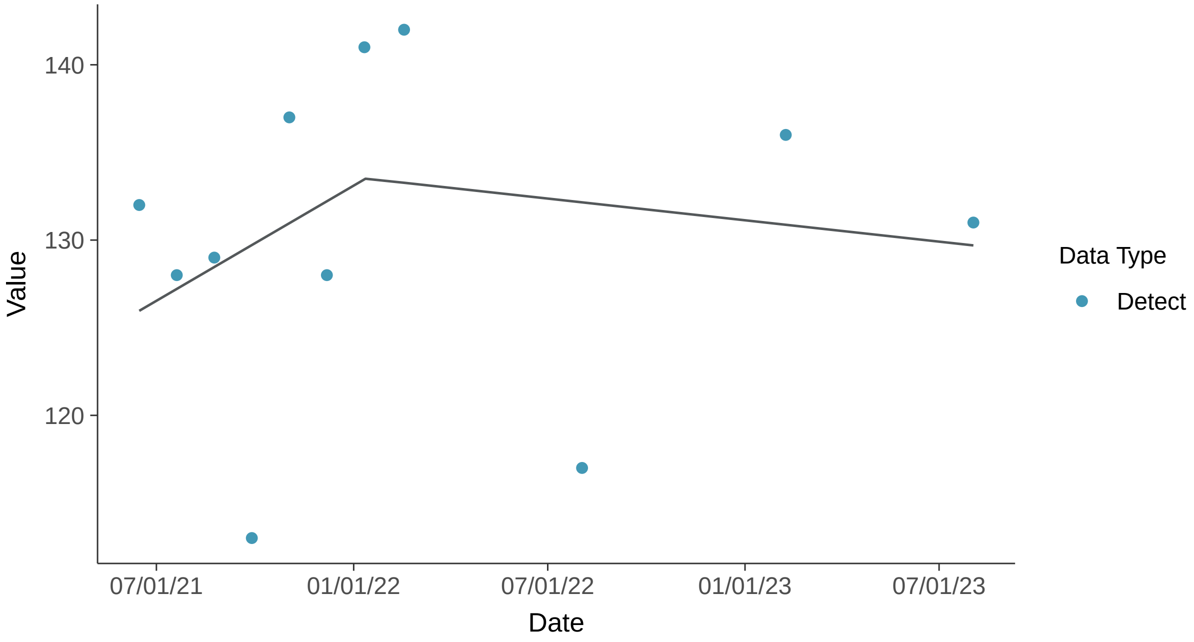
Trend Regression: Lognormal MLE

Calcium, MW-10 (mg/L)



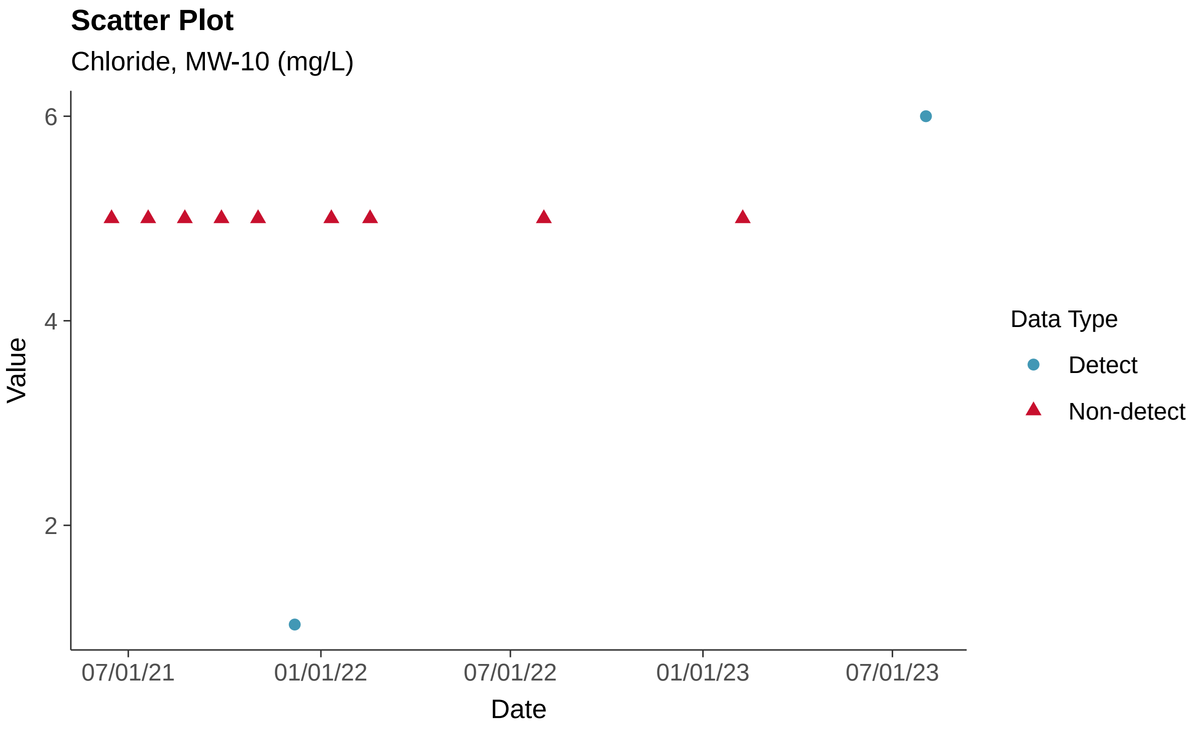
Trend Regression: Piecewise Linear-Linear

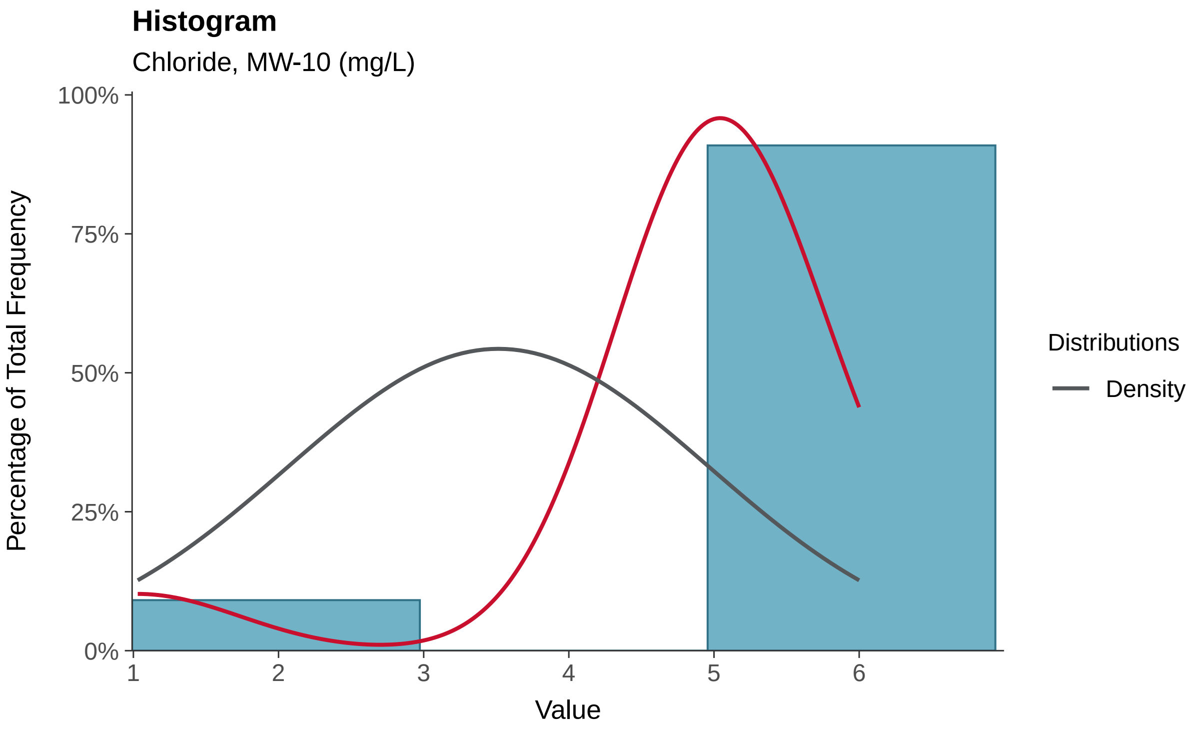
Calcium, MW-10 (mg/L)



Appendix III: Chloride, MW-10

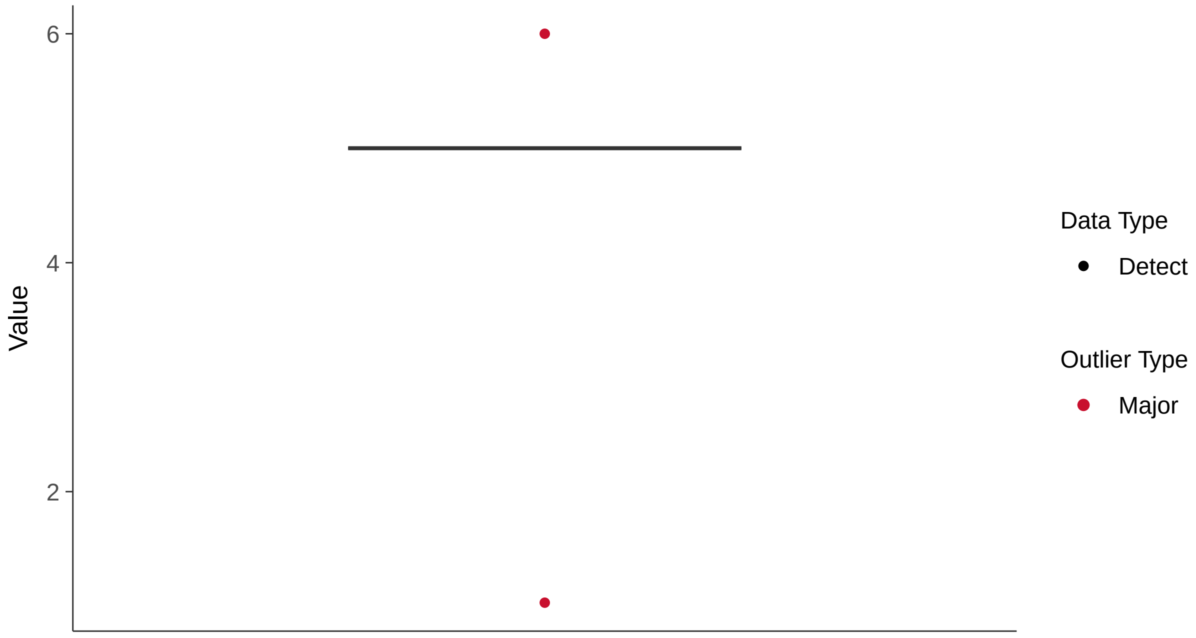
ID: 10_1_03





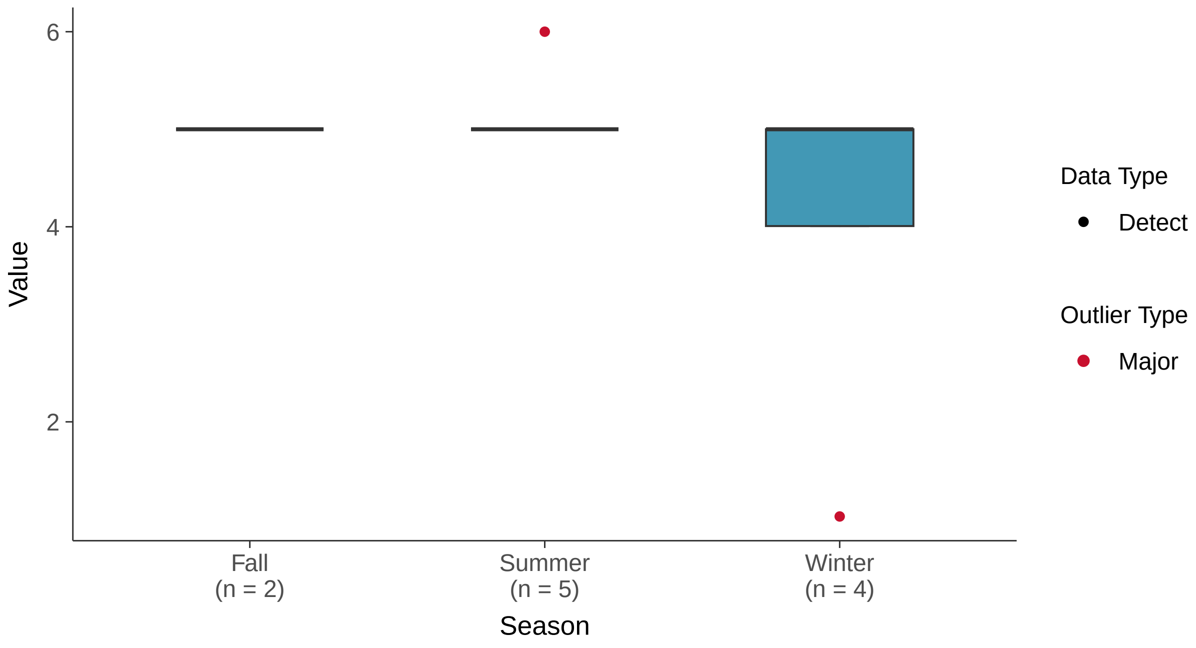
Boxplot

Chloride, MW-10 (mg/L)



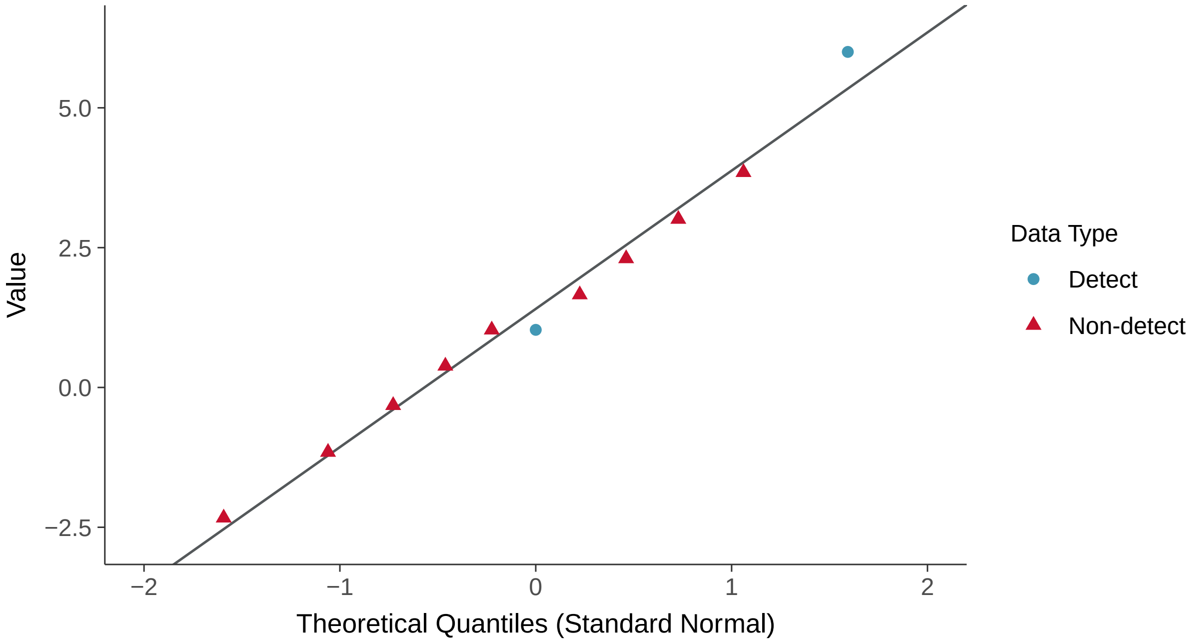
Boxplot by Season

Chloride, MW-10 (mg/L)



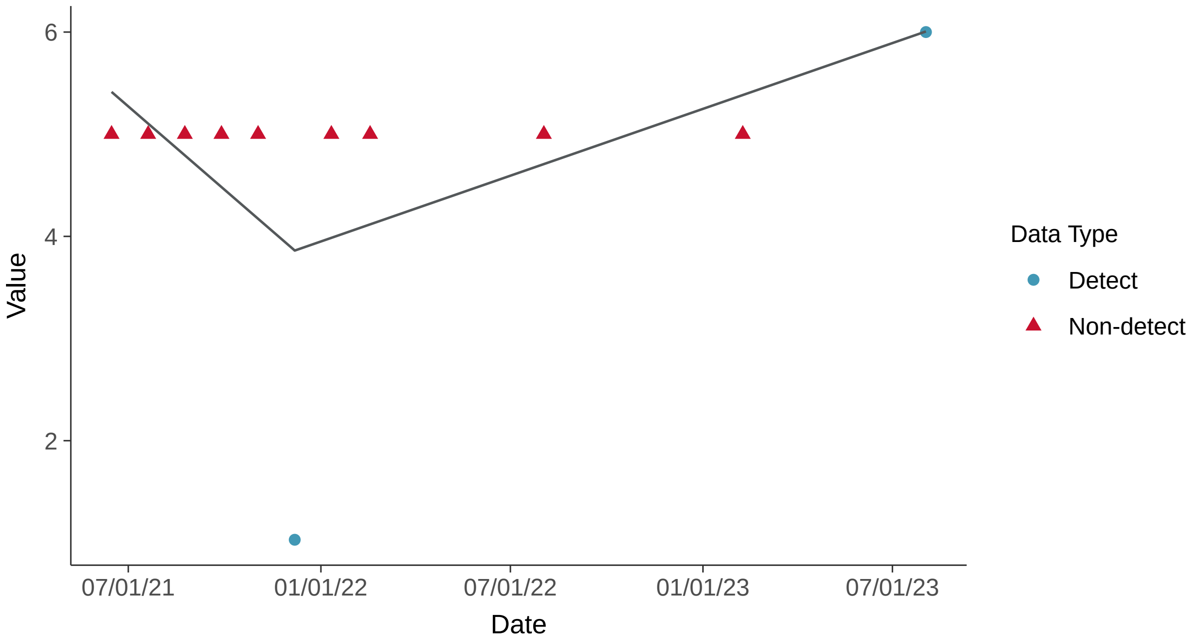
Normal Q-Q plot using ROS Imputed Estimates

Chloride, MW-10 (mg/L)



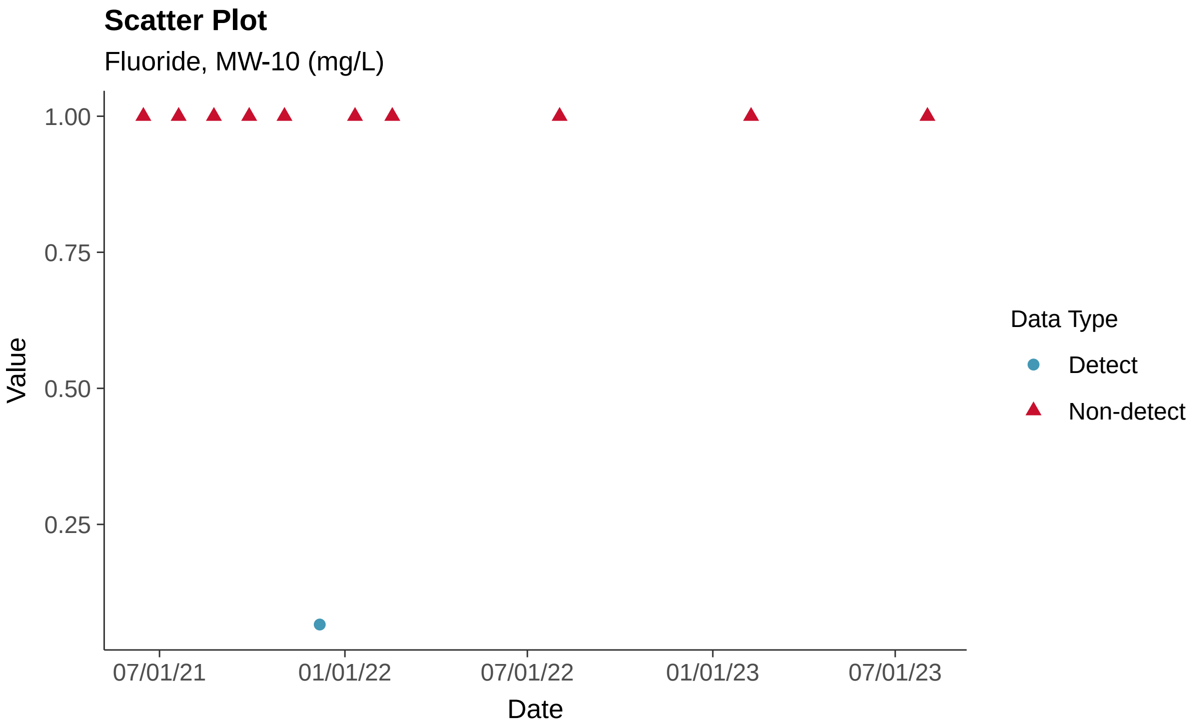
Trend Regression: Piecewise Linear-Linear

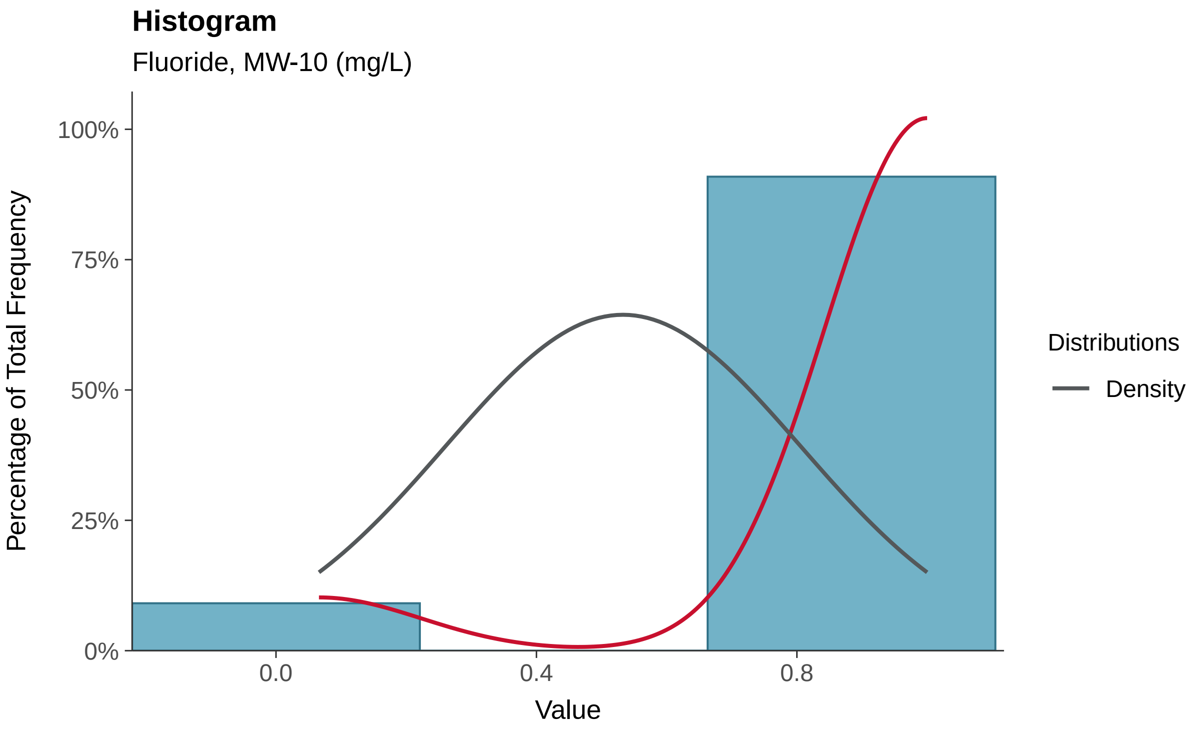
Chloride, MW-10 (mg/L)



Appendix III: Fluoride, MW-10

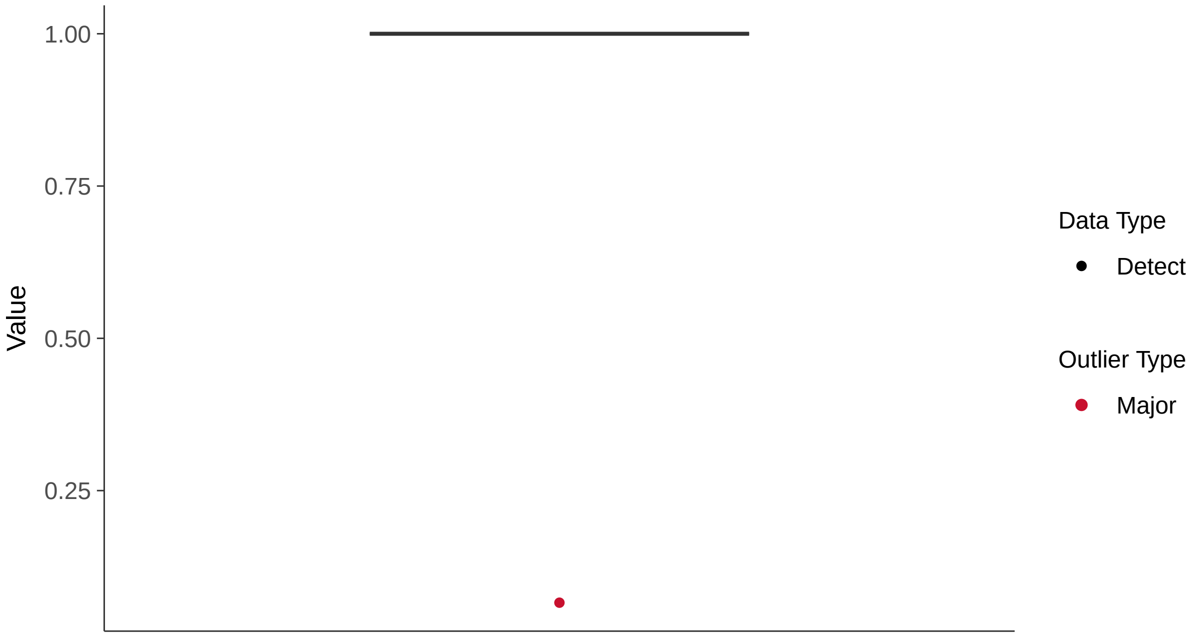
ID: 10_1_04





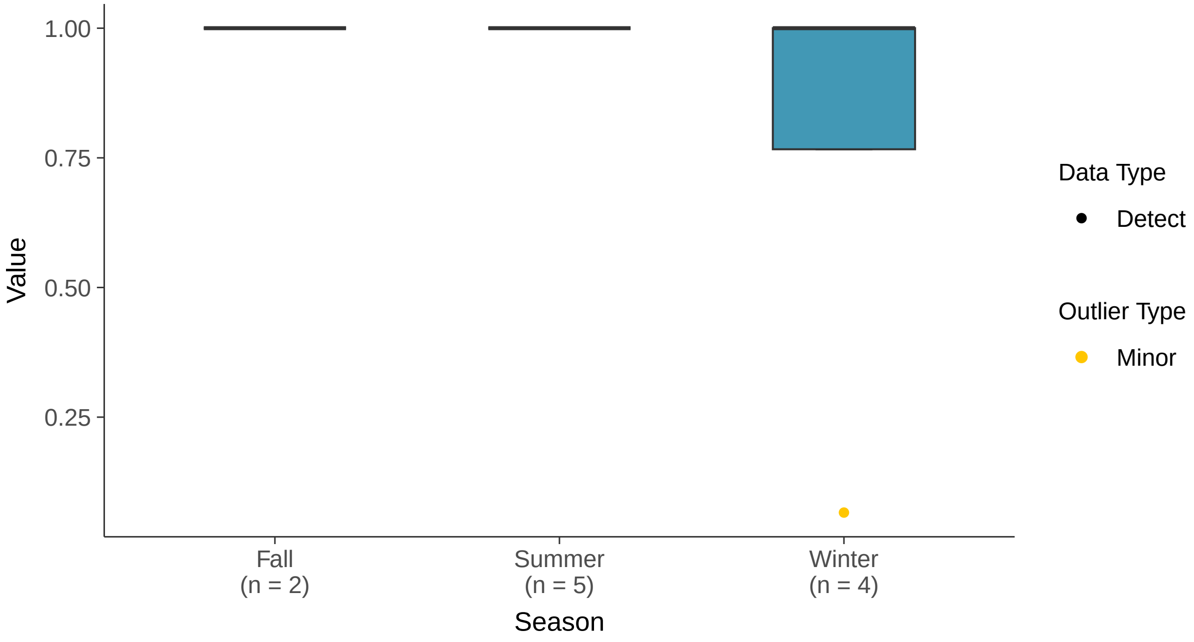
Boxplot

Fluoride, MW-10 (mg/L)



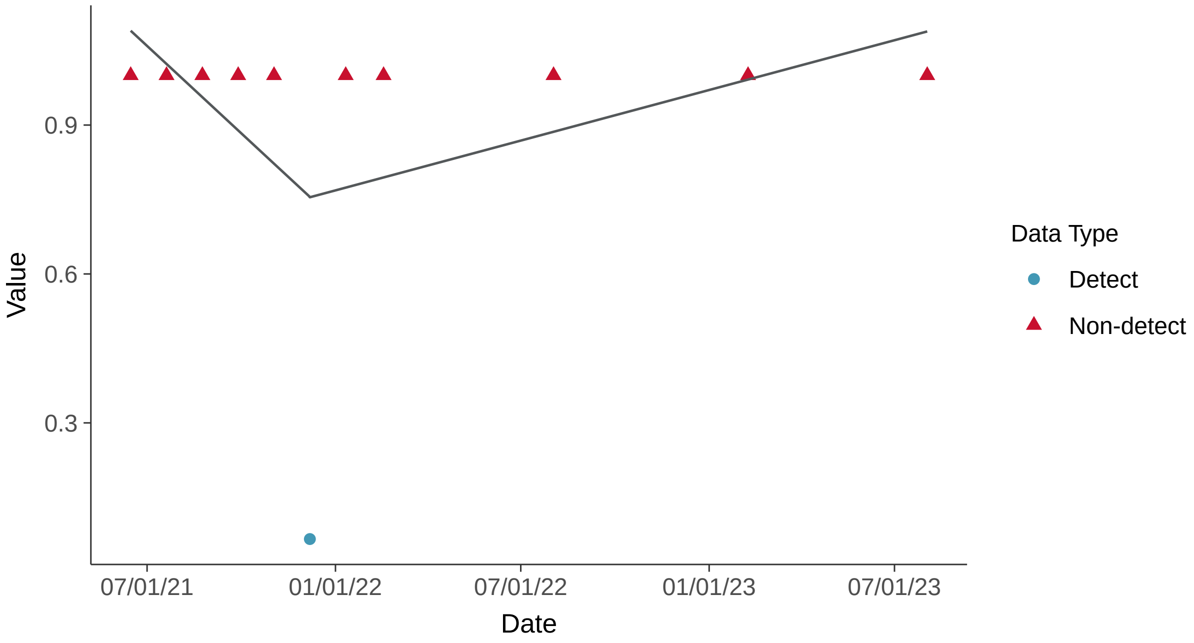
Boxplot by Season

Fluoride, MW-10 (mg/L)



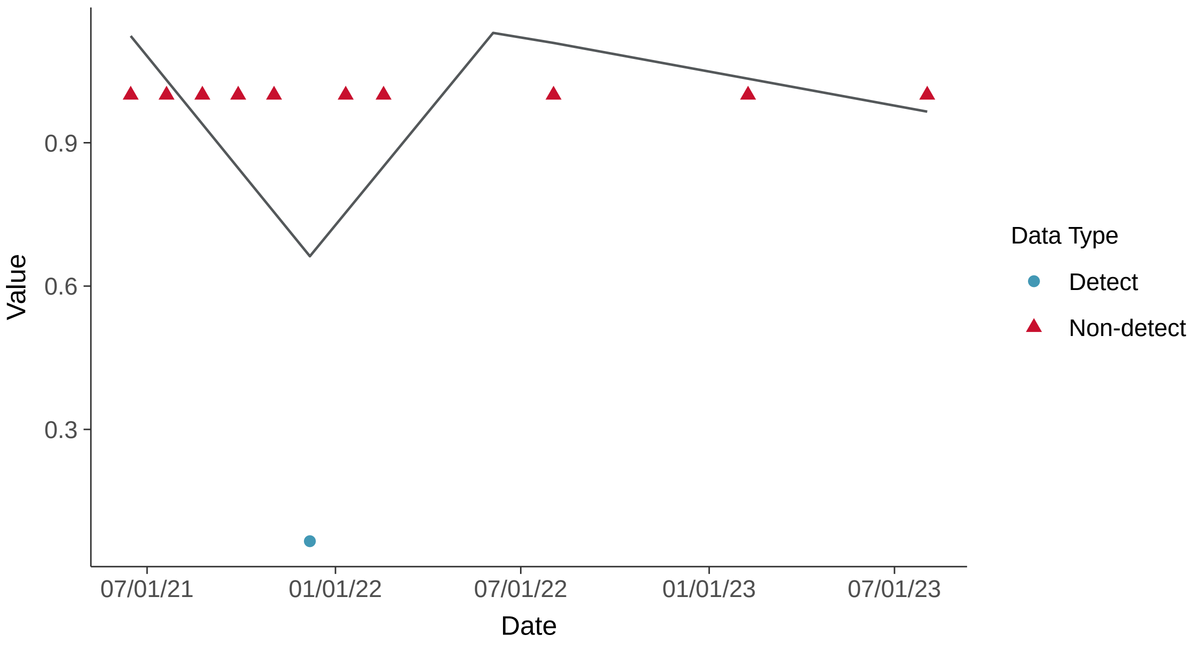
Trend Regression: Piecewise Linear-Linear

Fluoride, MW-10 (mg/L)



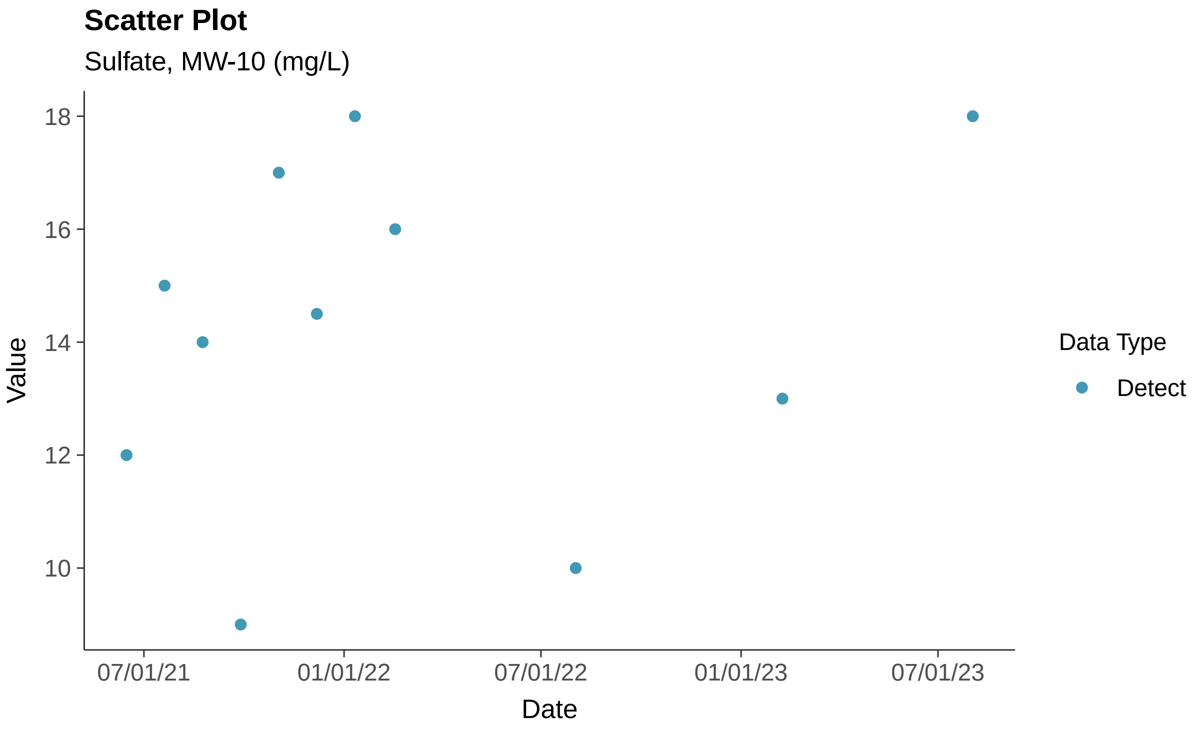
Trend Regression: Piecewise Linear-Linear-Linear

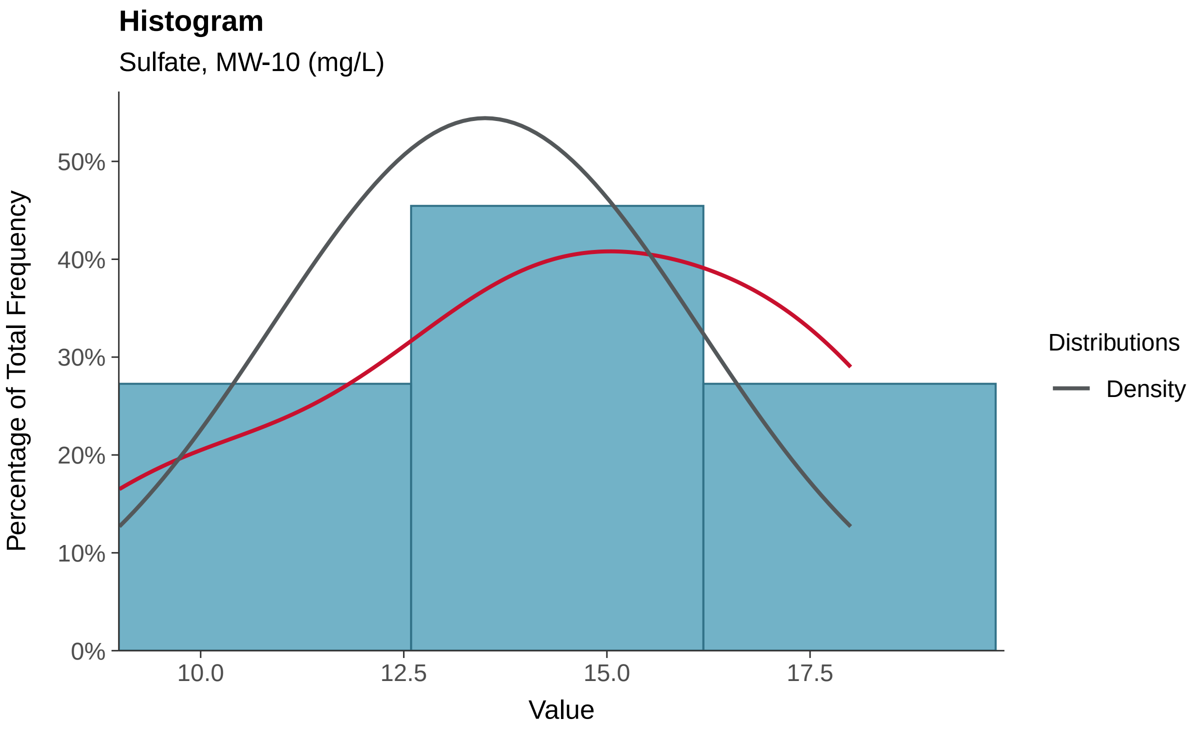
Fluoride, MW-10 (mg/L)



Appendix III: Sulfate, MW-10

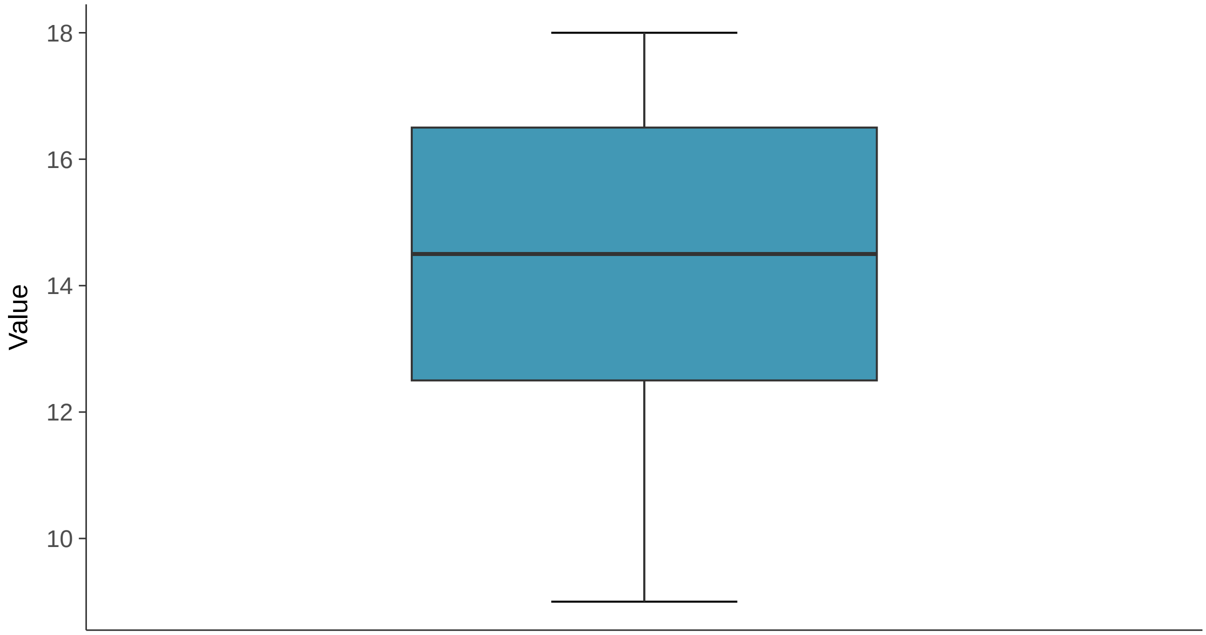
ID: 10_1_05





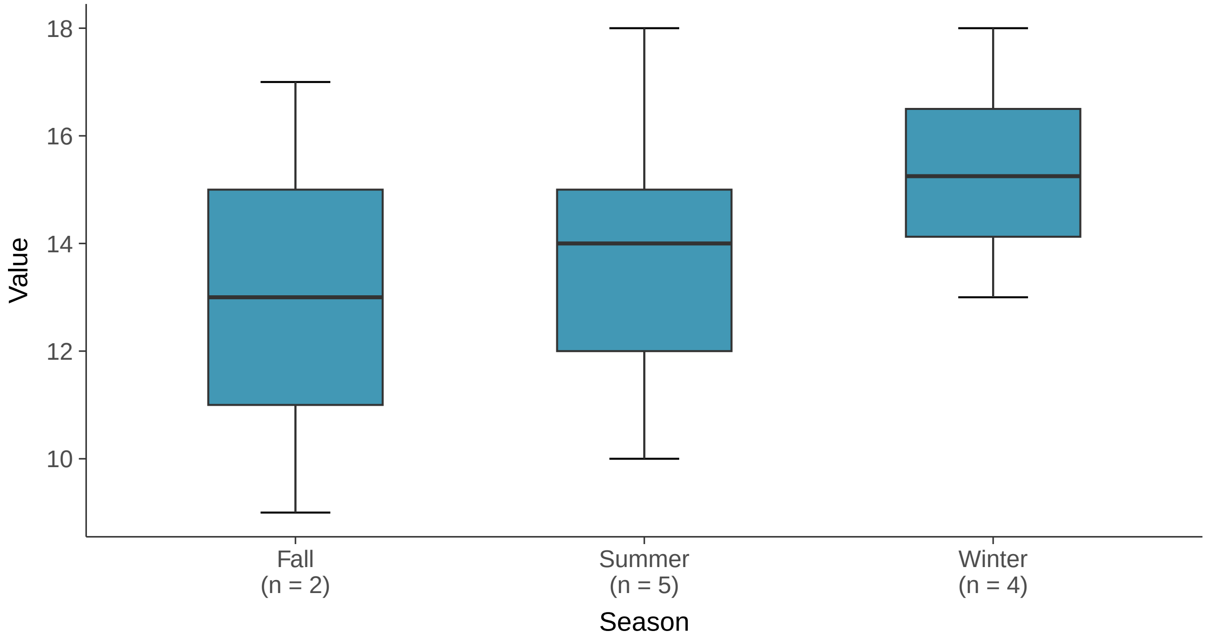
Boxplot

Sulfate, MW-10 (mg/L)



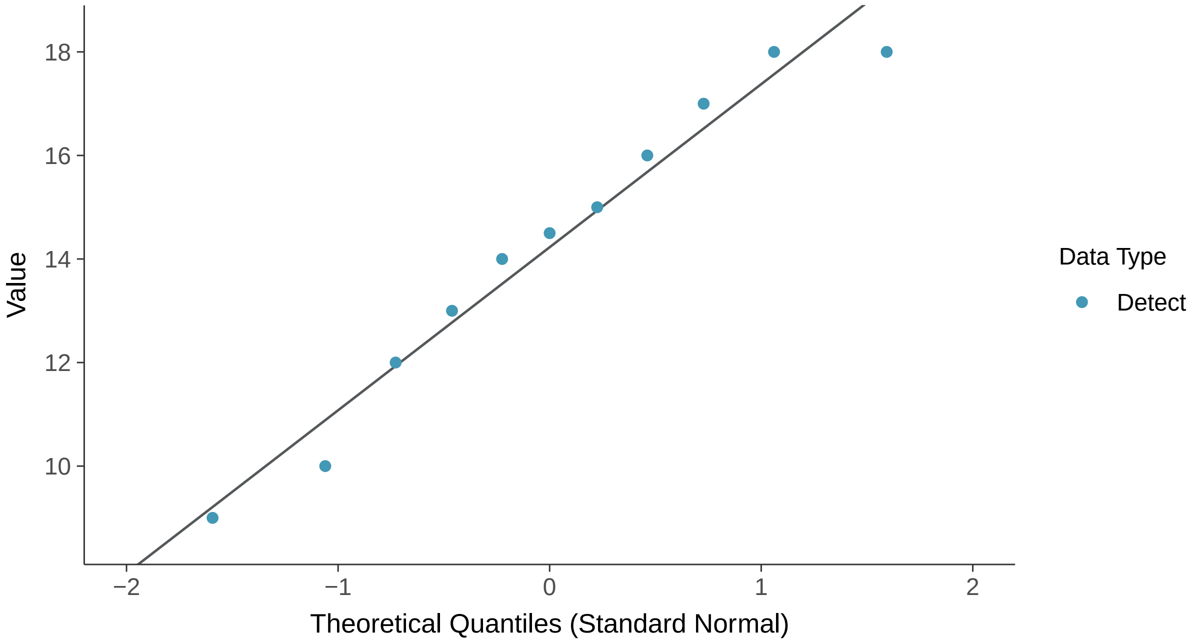
Boxplot by Season

Sulfate, MW-10 (mg/L)



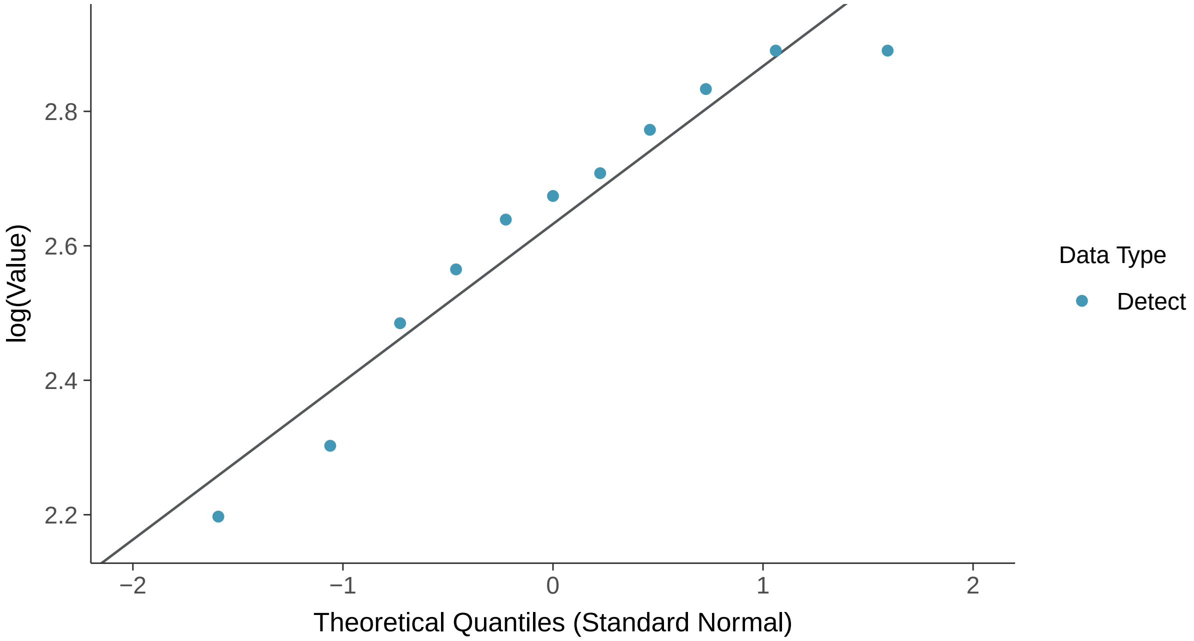
Normal Q-Q plot

Sulfate, MW-10 (mg/L)



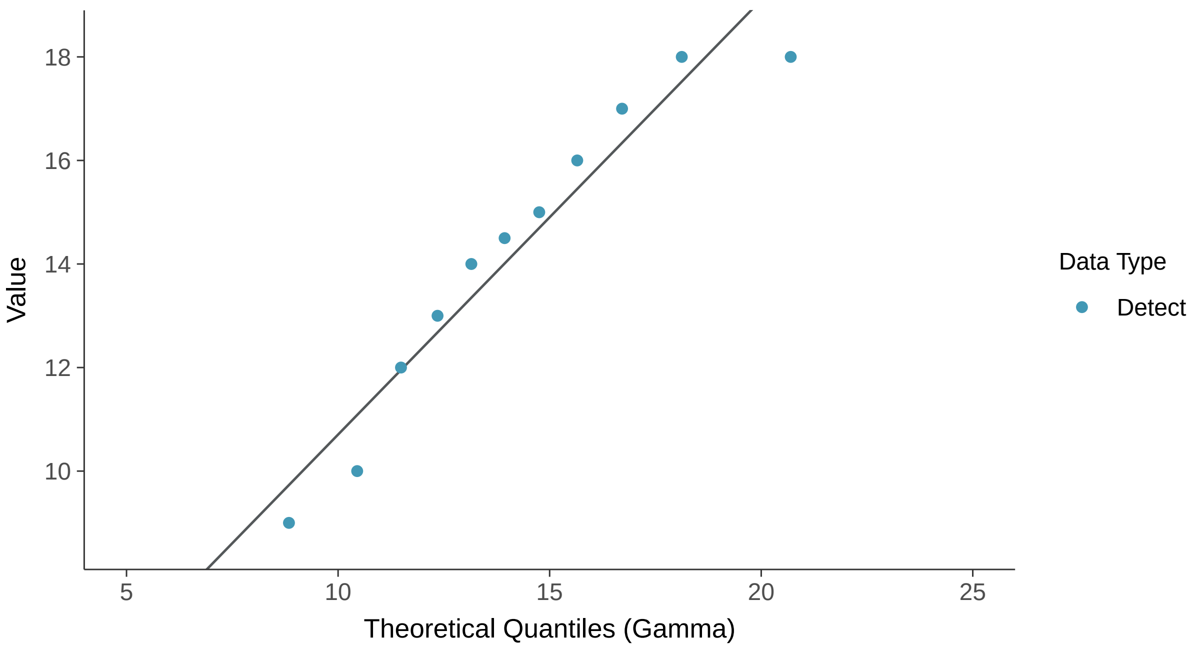
Lognormal Q-Q plot

Sulfate, MW-10 (mg/L)



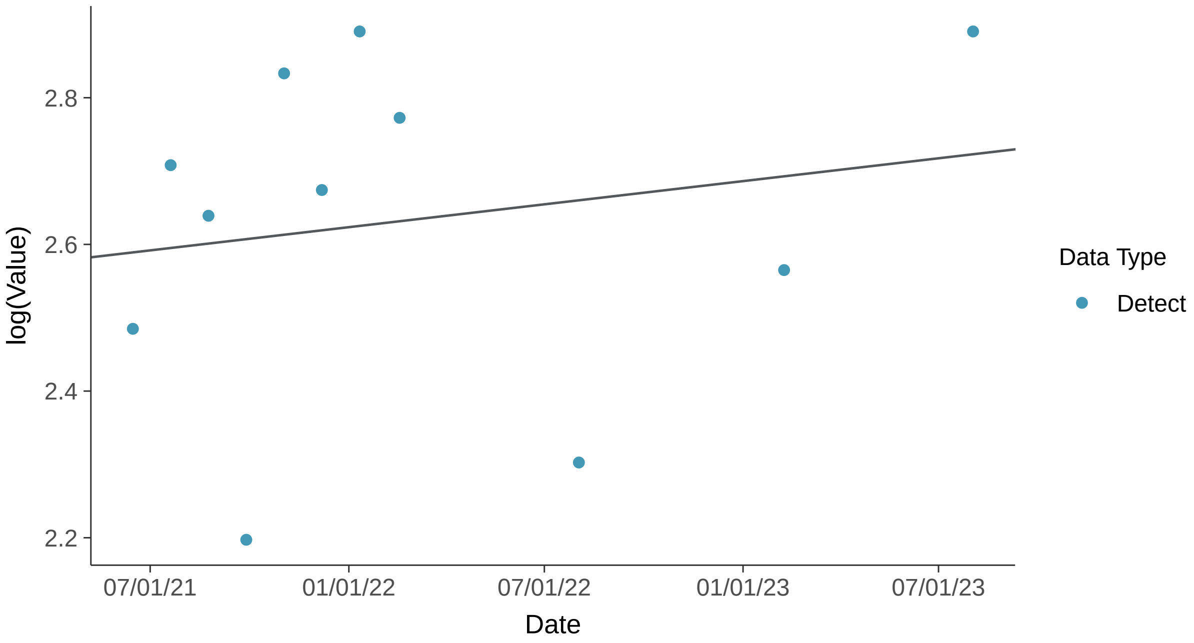
Gamma Q-Q plot

Sulfate, MW-10 (mg/L)



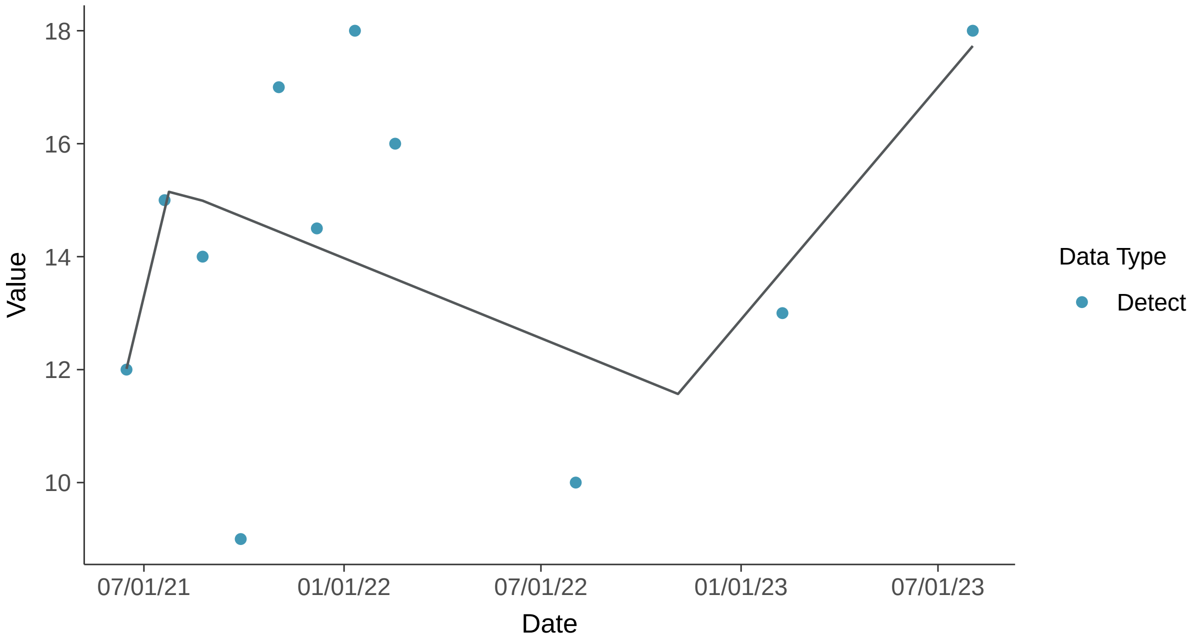
Trend Regression: Lognormal MLE

Sulfate, MW-10 (mg/L)



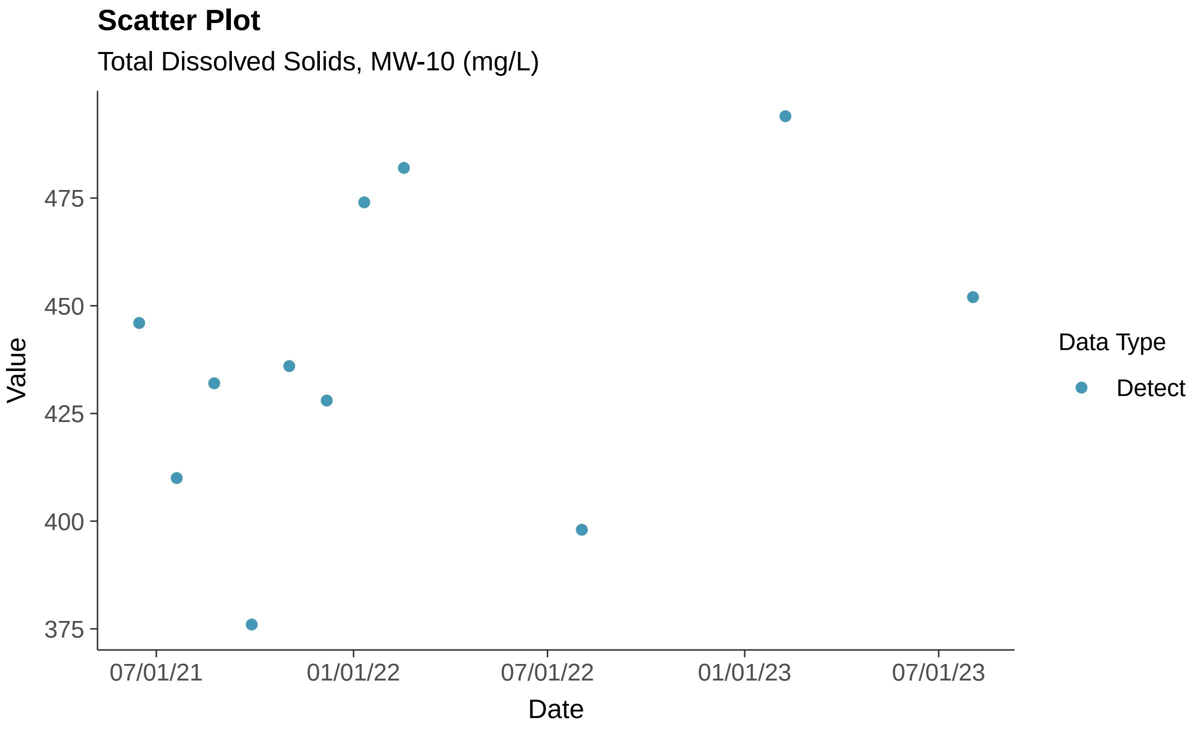
Trend Regression: Piecewise Linear-Linear-Linear

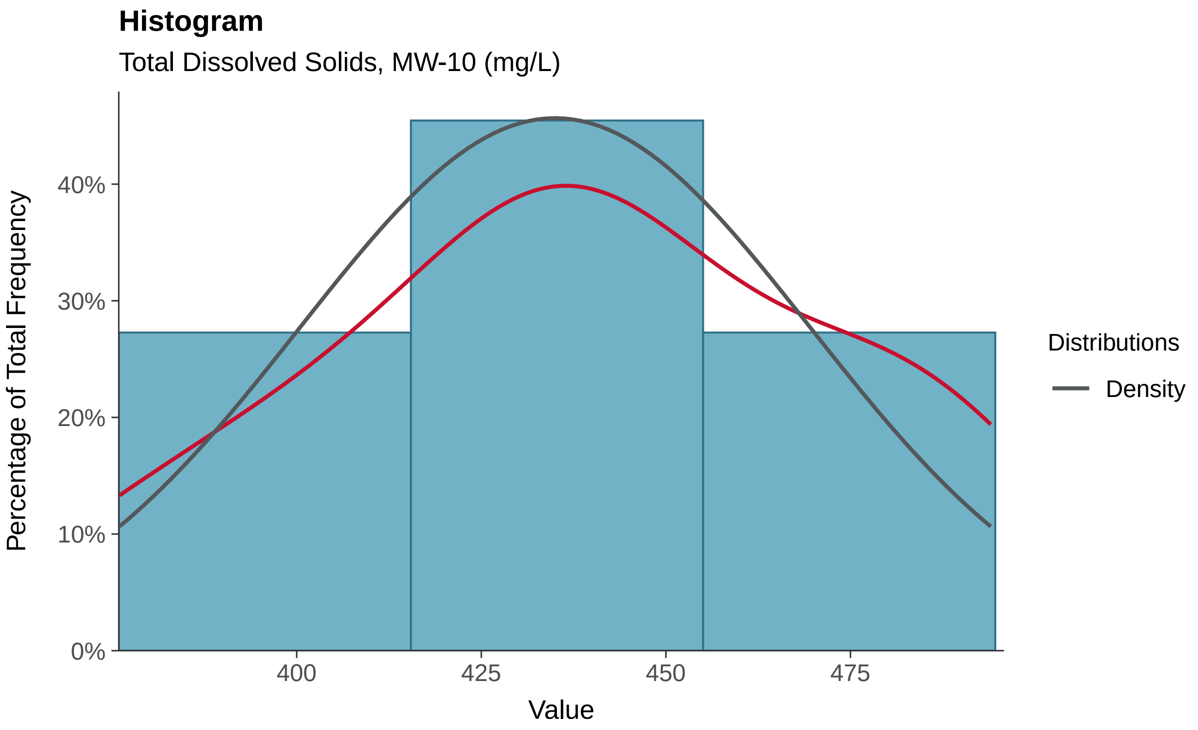
Sulfate, MW-10 (mg/L)



Appendix III: Total Dissolved Solids, MW-10

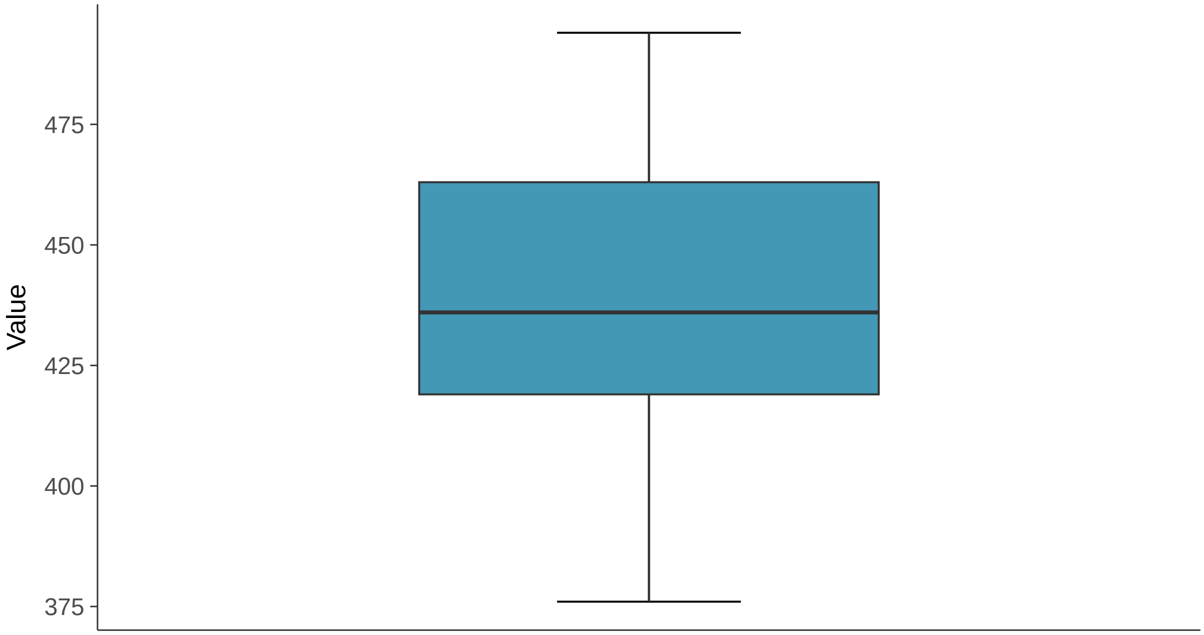
ID: 10_1_06





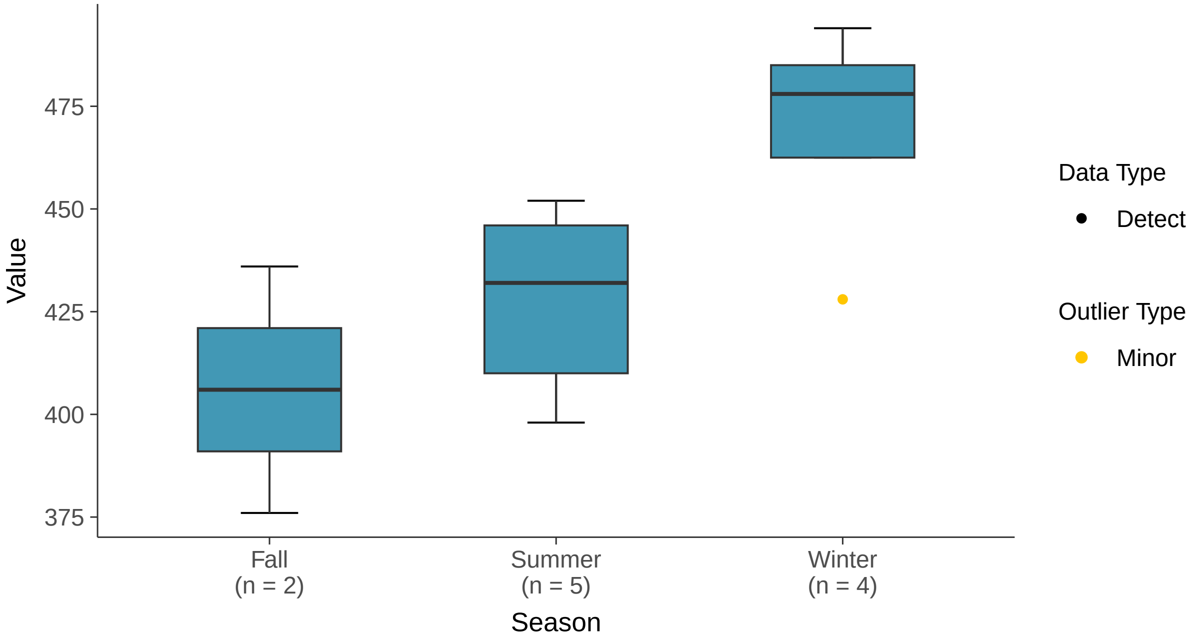
Boxplot

Total Dissolved Solids, MW-10 (mg/L)



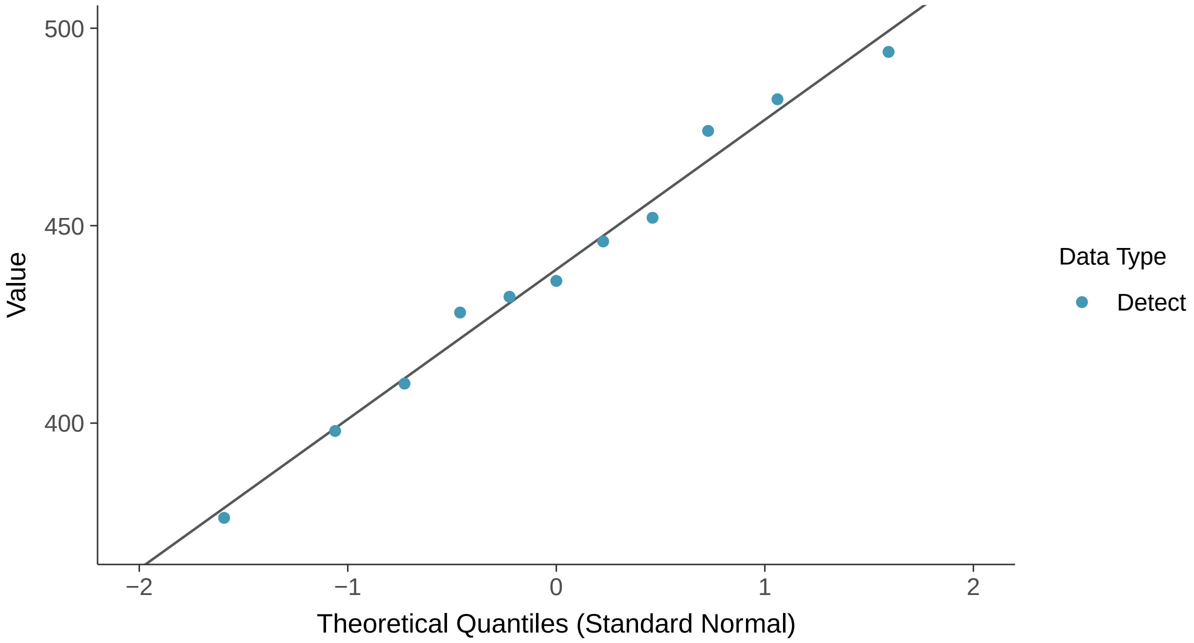
Boxplot by Season

Total Dissolved Solids, MW-10 (mg/L)



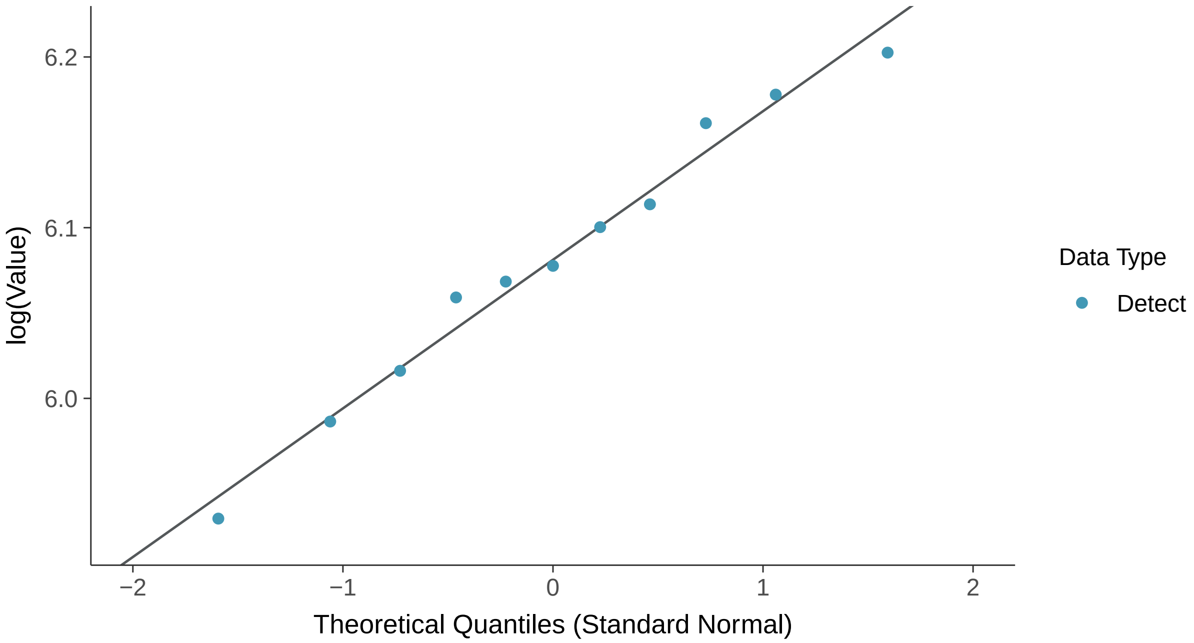
Normal Q-Q plot

Total Dissolved Solids, MW-10 (mg/L)



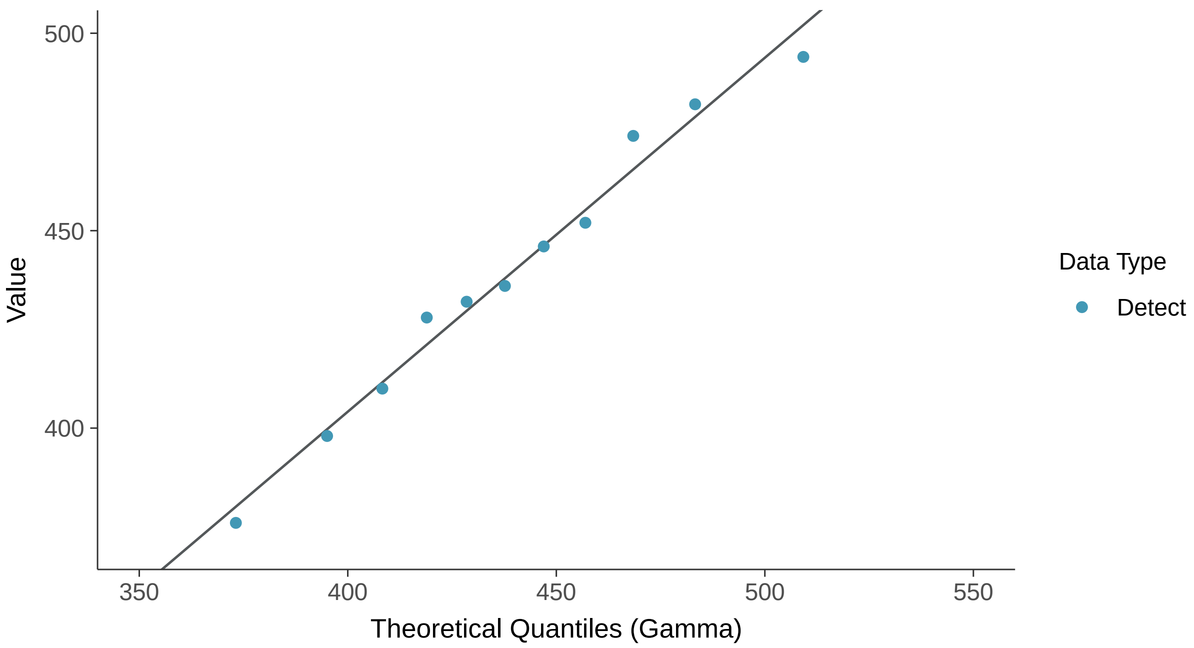
Lognormal Q-Q plot

Total Dissolved Solids, MW-10 (mg/L)



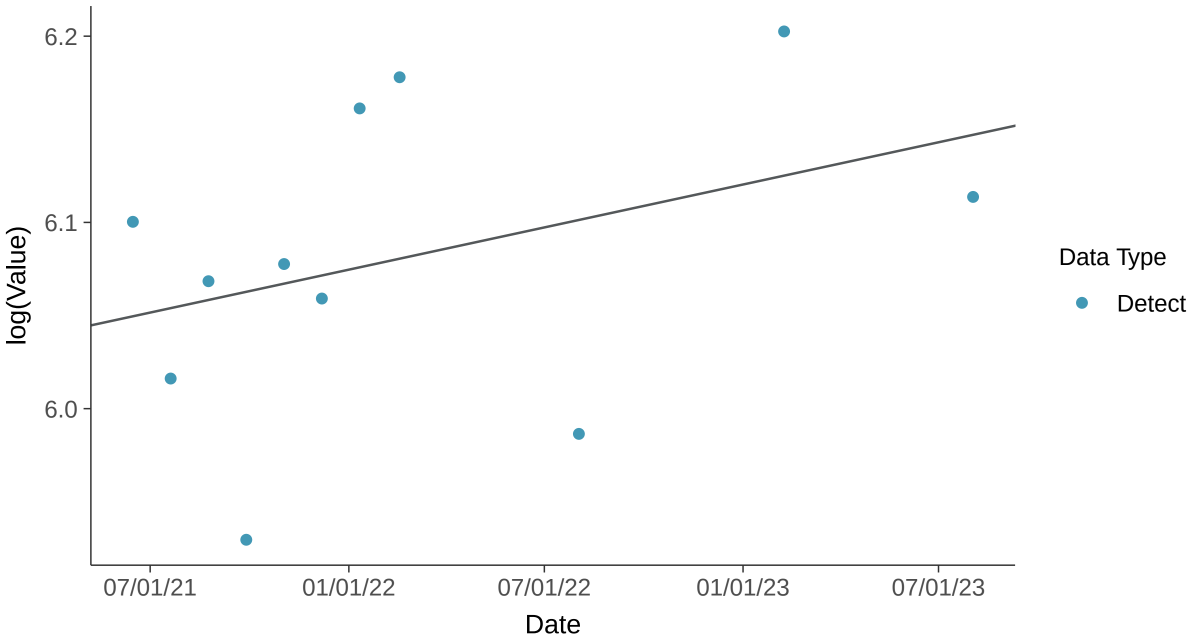
Gamma Q-Q plot

Total Dissolved Solids, MW-10 (mg/L)



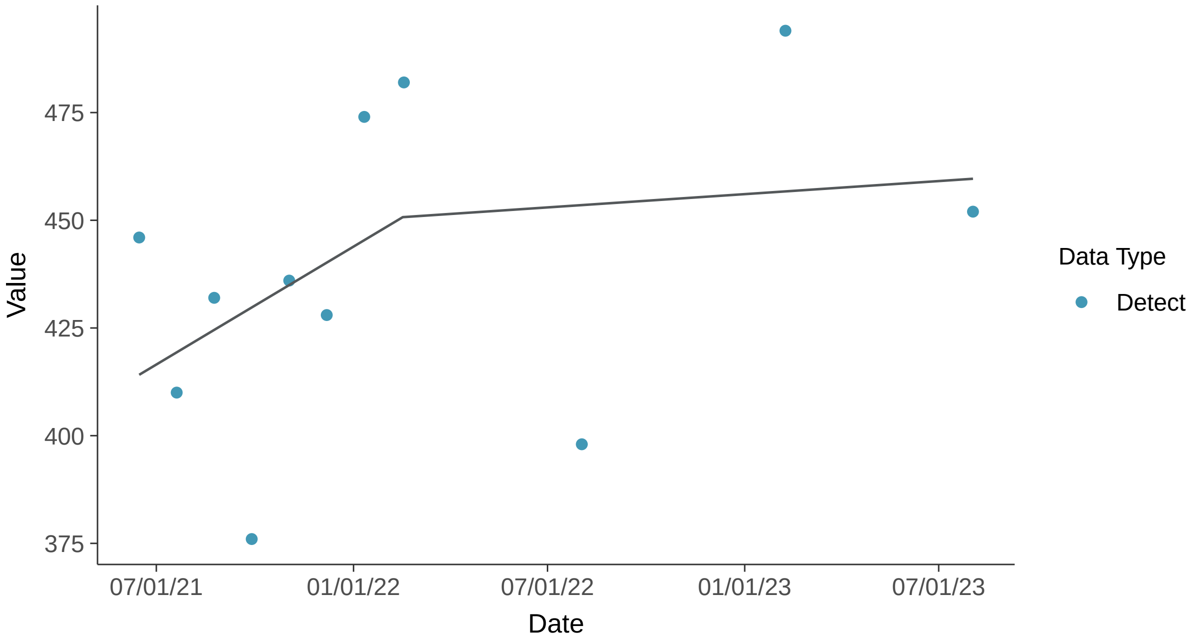
Trend Regression: Lognormal MLE

Total Dissolved Solids, MW-10 (mg/L)



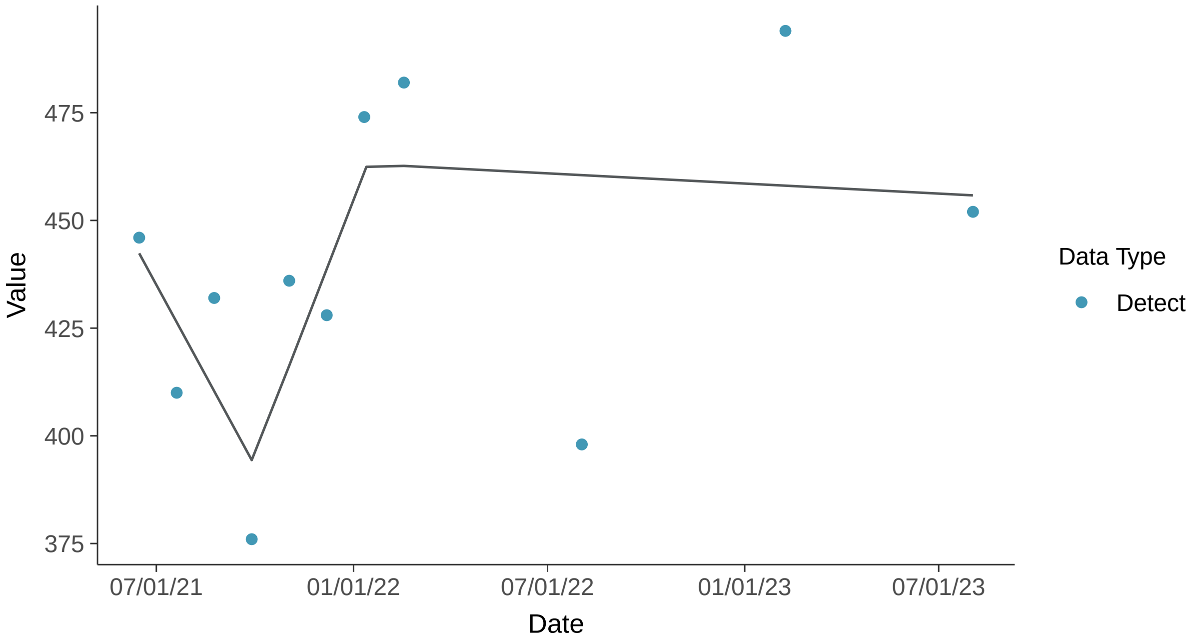
Trend Regression: Piecewise Linear-Linear

Total Dissolved Solids, MW-10 (mg/L)



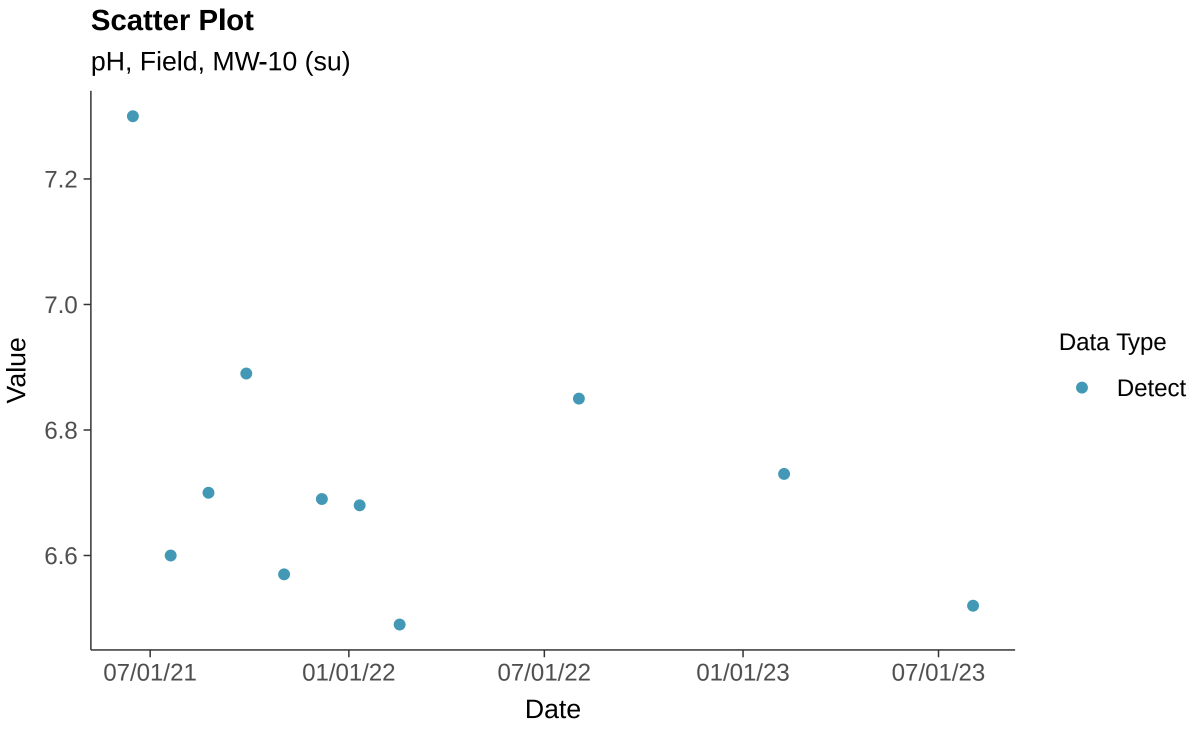
Trend Regression: Piecewise Linear-Linear-Linear

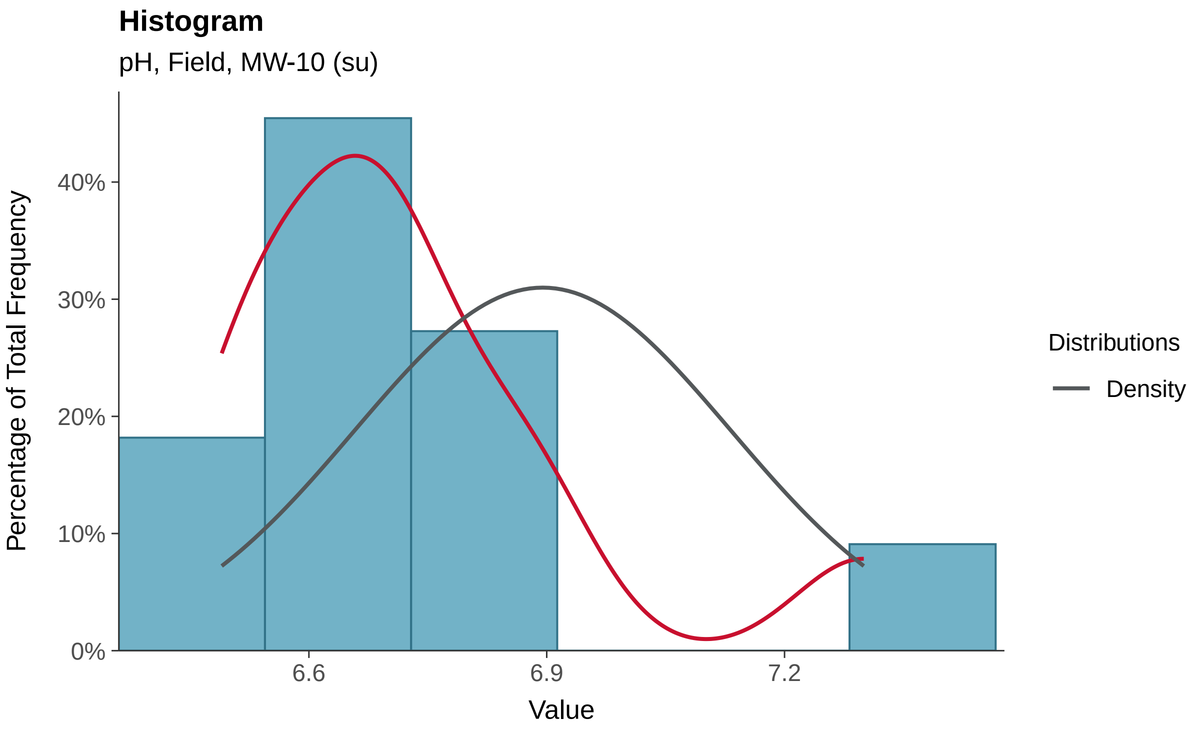
Total Dissolved Solids, MW-10 (mg/L)



Appendix III: pH, Field, MW-10

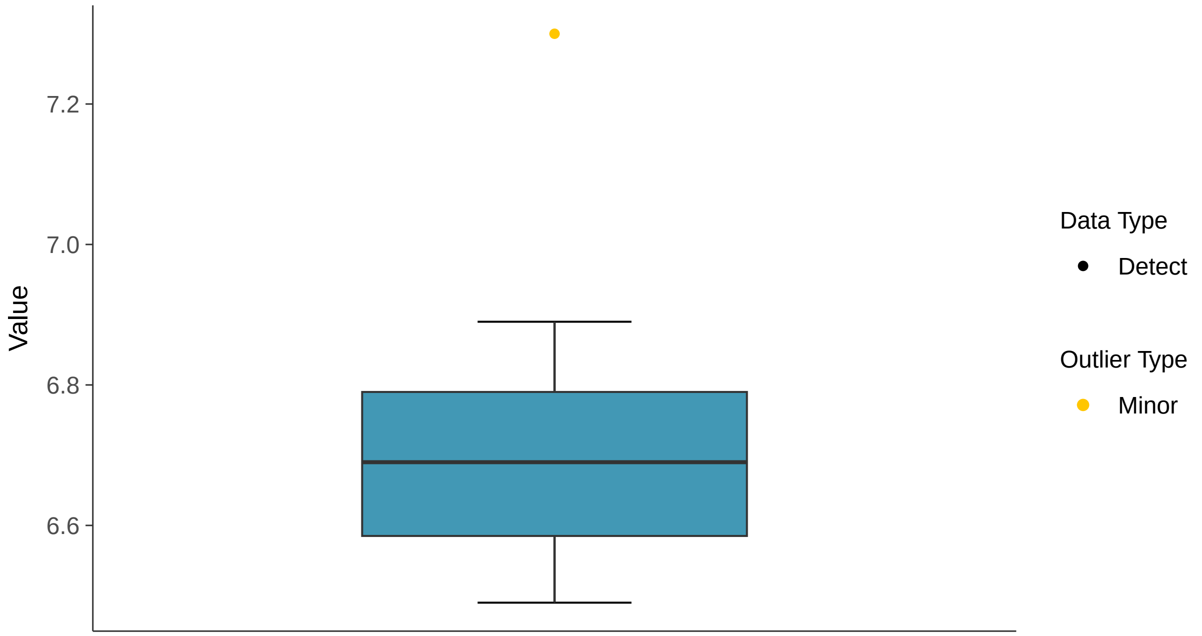
ID: 10_1_07





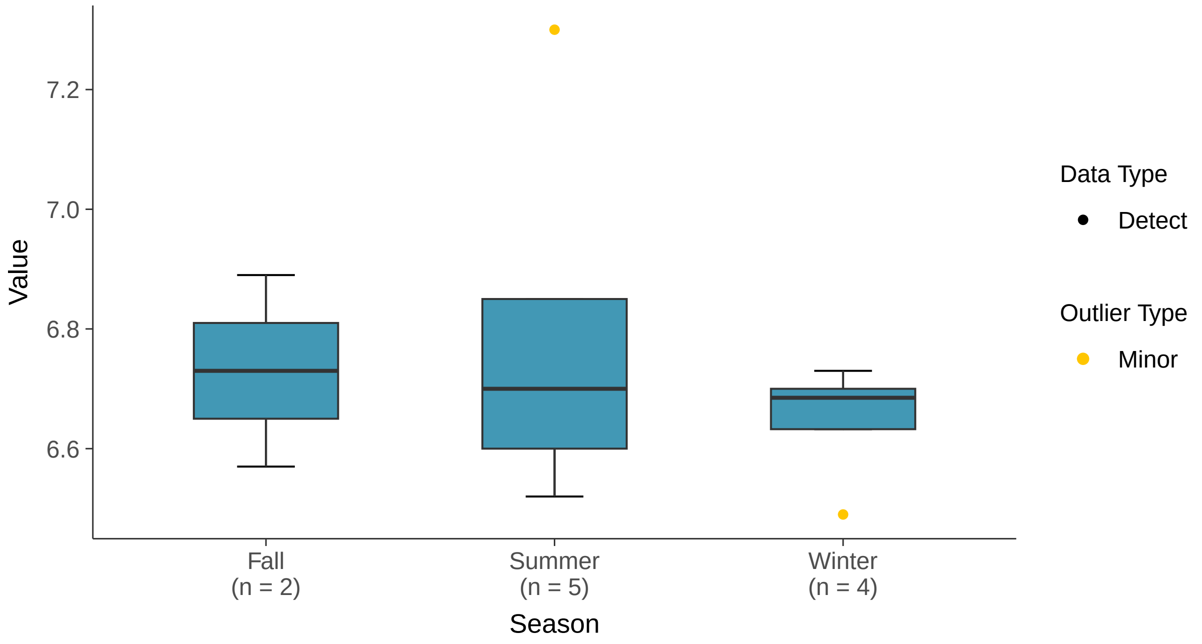
Boxplot

pH, Field, MW-10 (su)



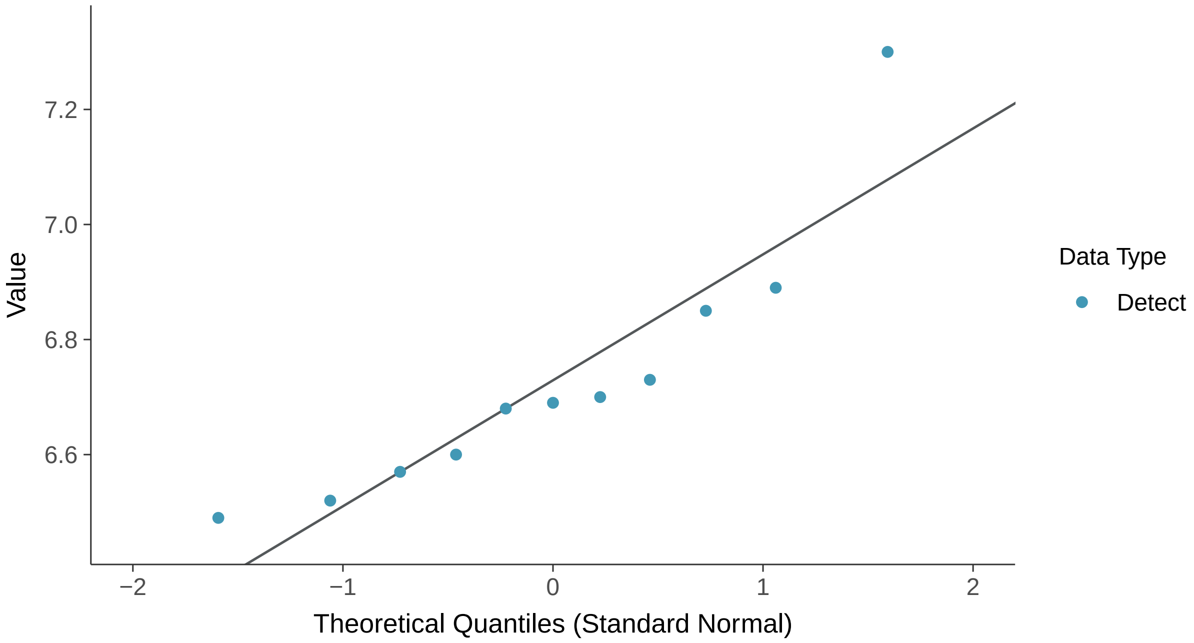
Boxplot by Season

pH, Field, MW-10 (su)



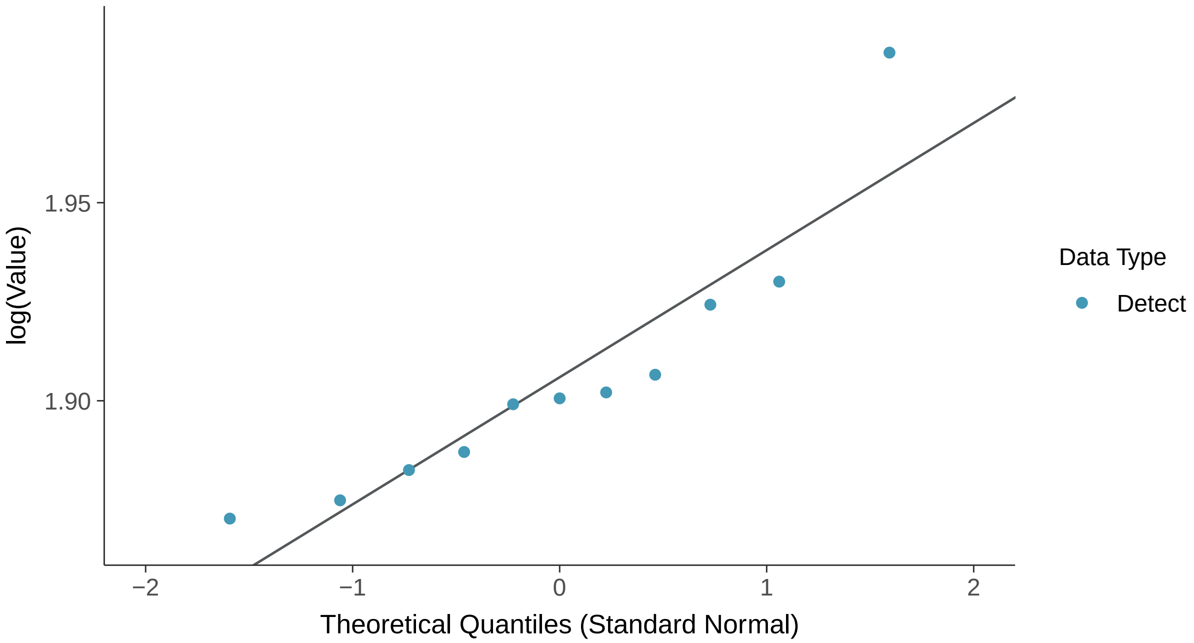
Normal Q-Q plot

pH, Field, MW-10 (su)



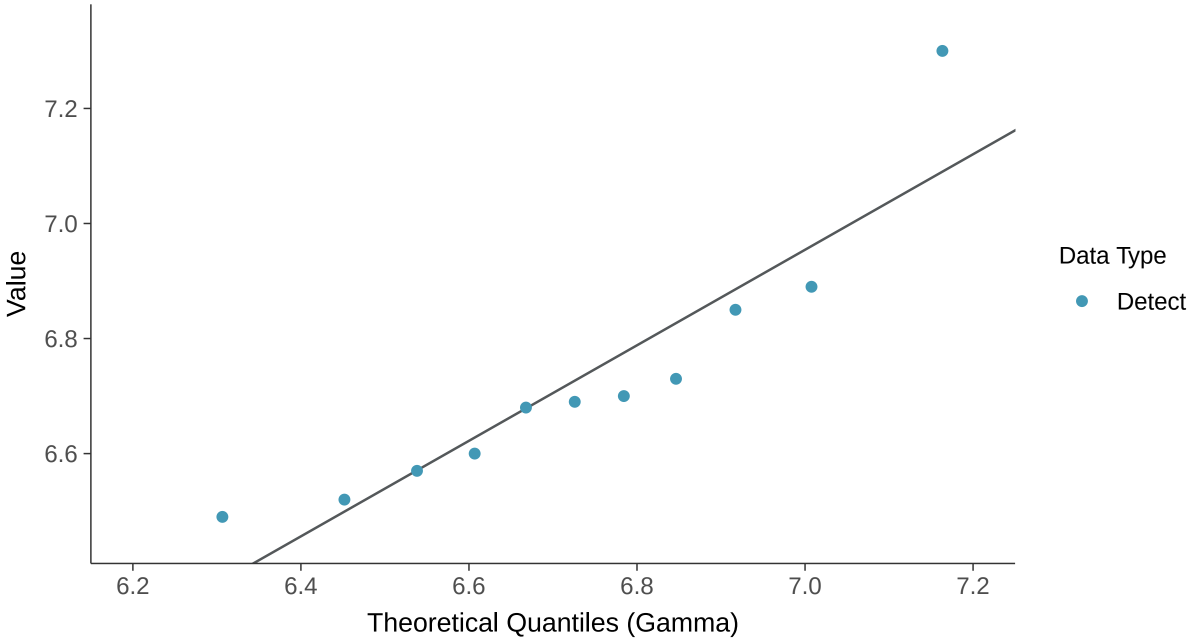
Lognormal Q-Q plot

pH, Field, MW-10 (su)



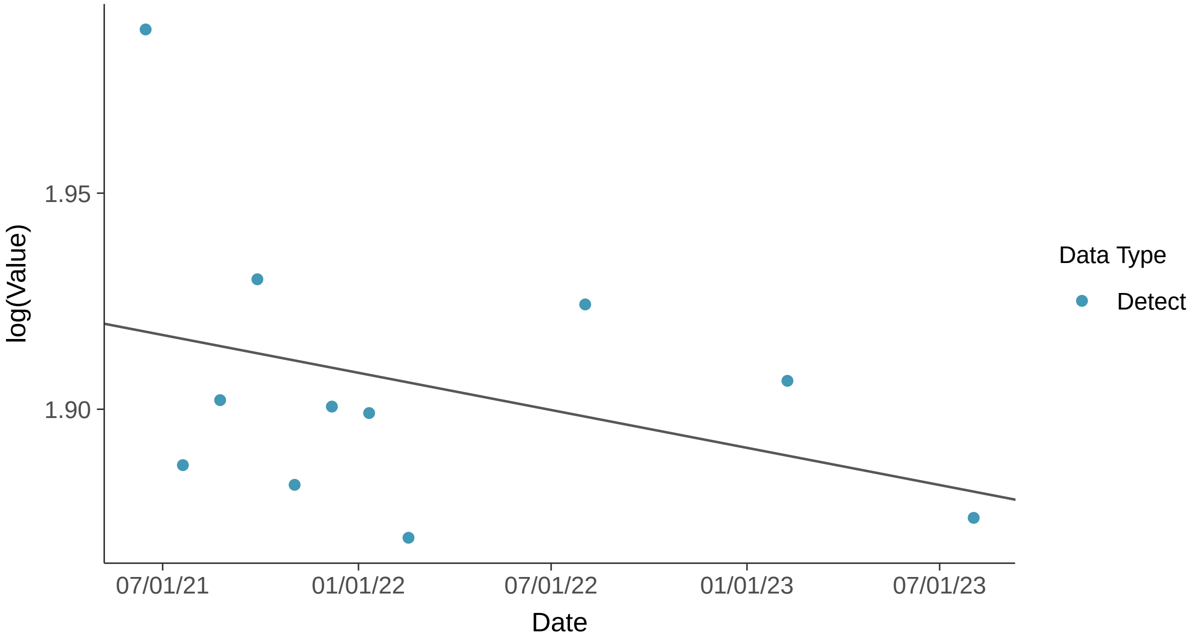
Gamma Q-Q plot

pH, Field, MW-10 (su)



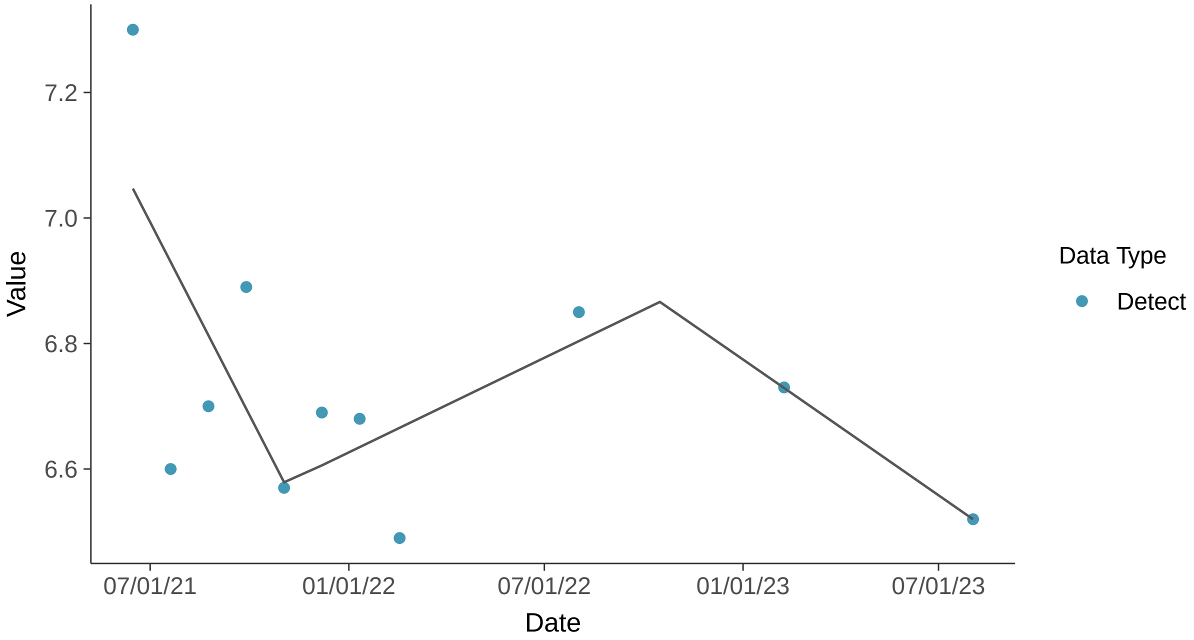
Trend Regression: Lognormal MLE

pH, Field, MW-10 (su)



Trend Regression: Piecewise Linear-Linear-Linear

pH, Field, MW-10 (su)

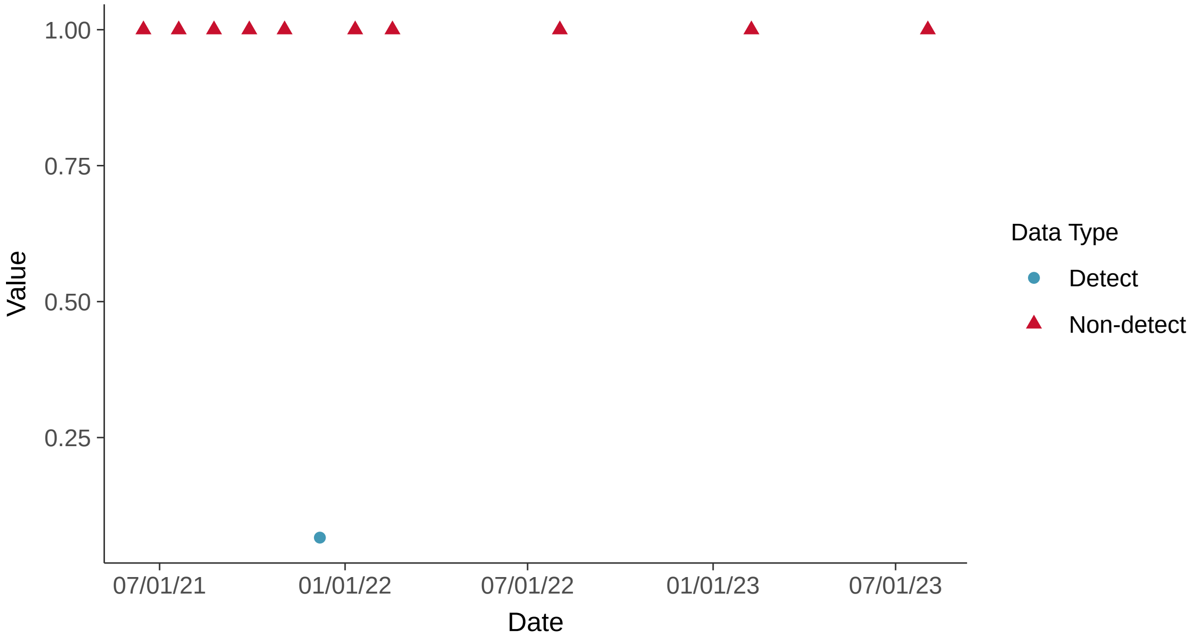


Appendix IV: Fluoride, MW-10

ID: 10_2_04

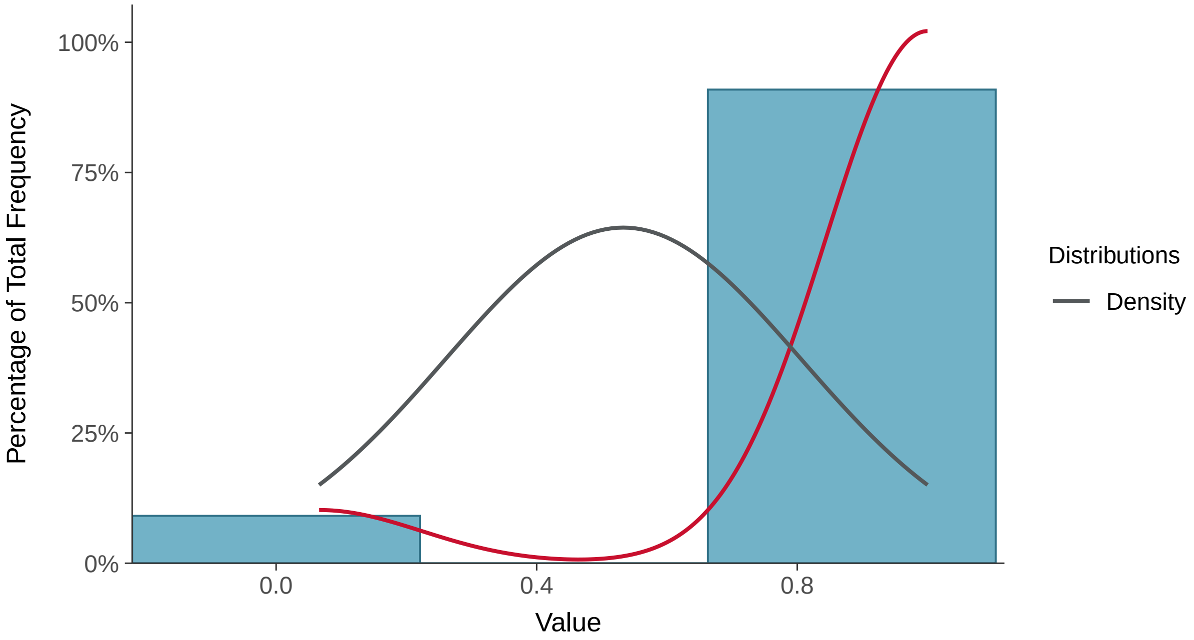
Scatter Plot

Fluoride, MW-10 (mg/L)



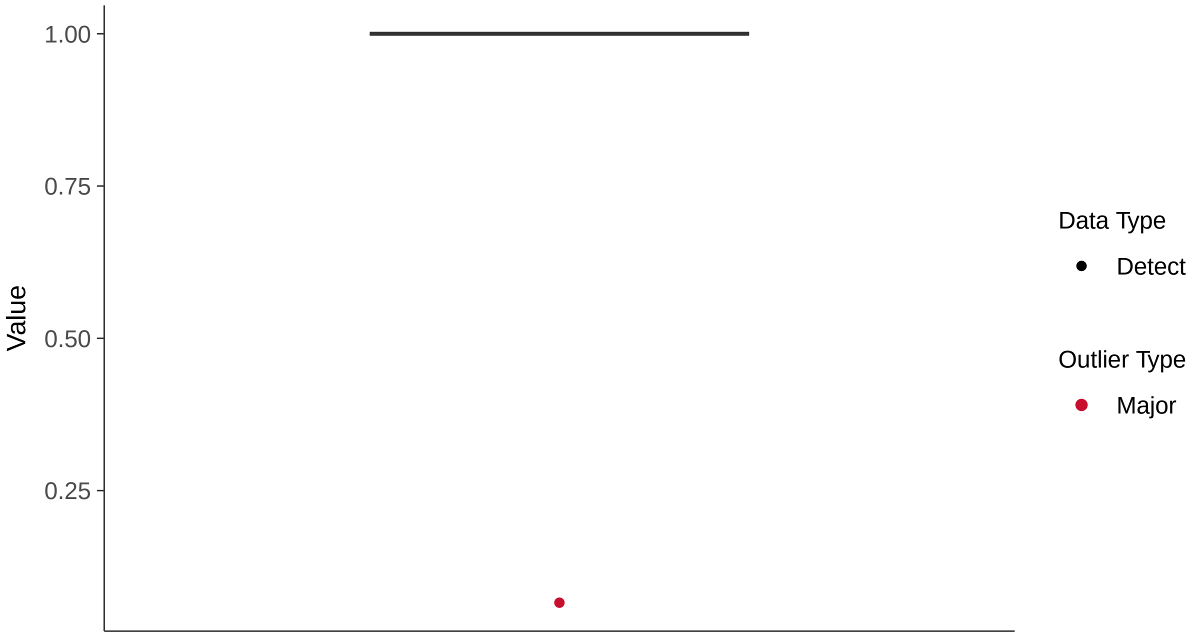
Histogram

Fluoride, MW-10 (mg/L)



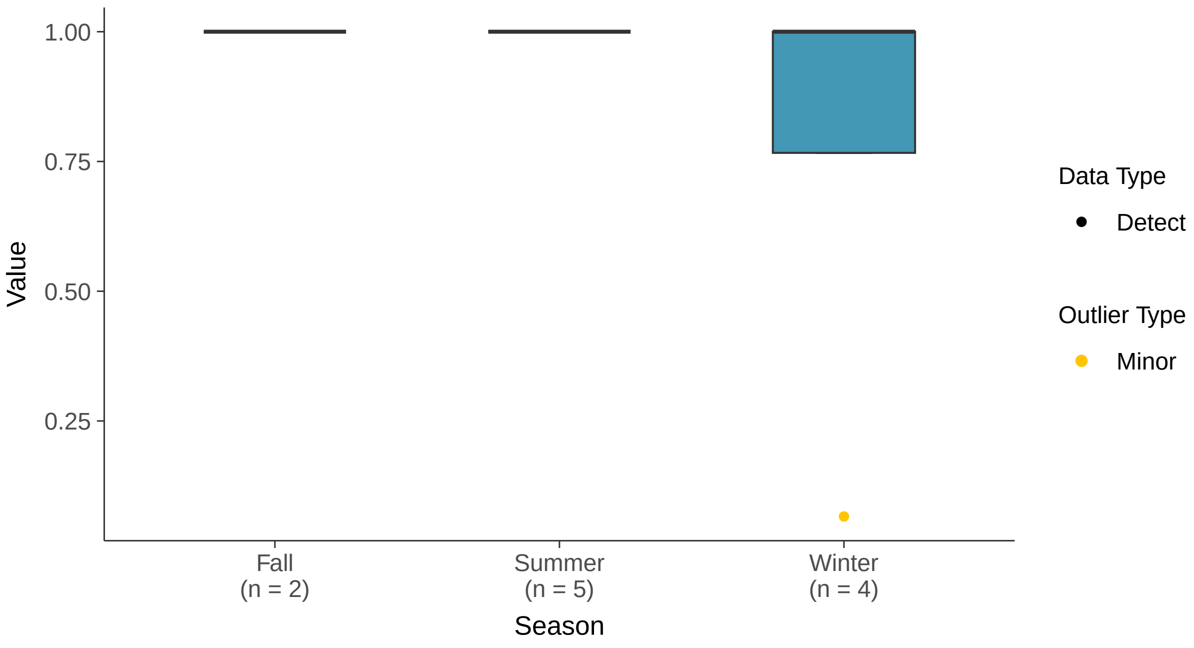
Boxplot

Fluoride, MW-10 (mg/L)



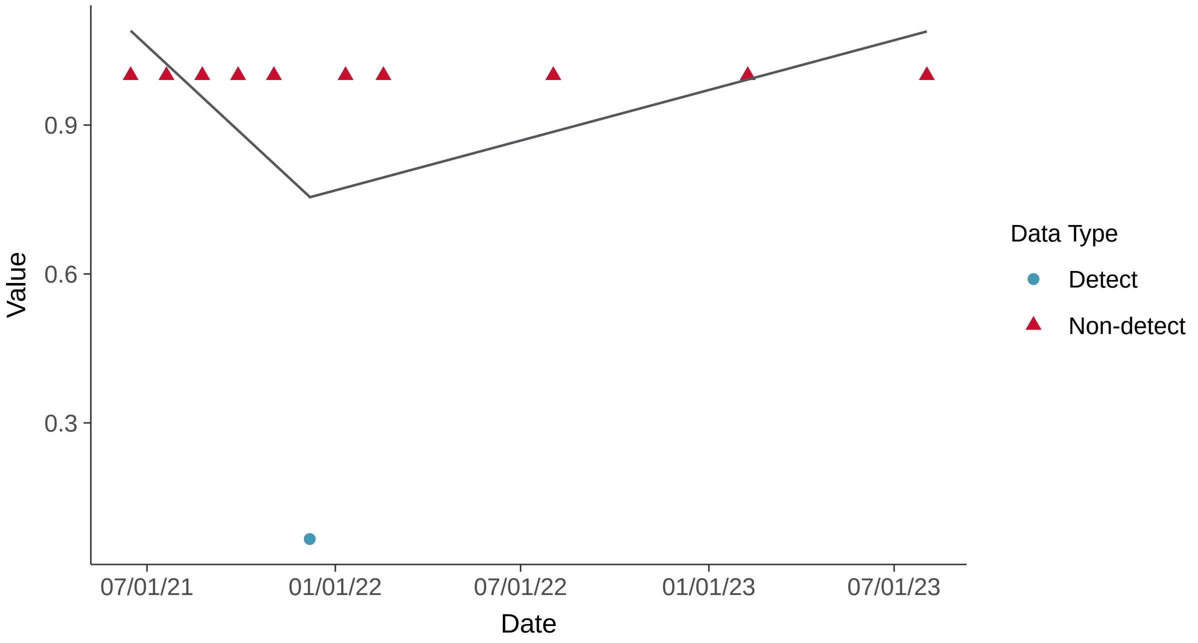
Boxplot by Season

Fluoride, MW-10 (mg/L)



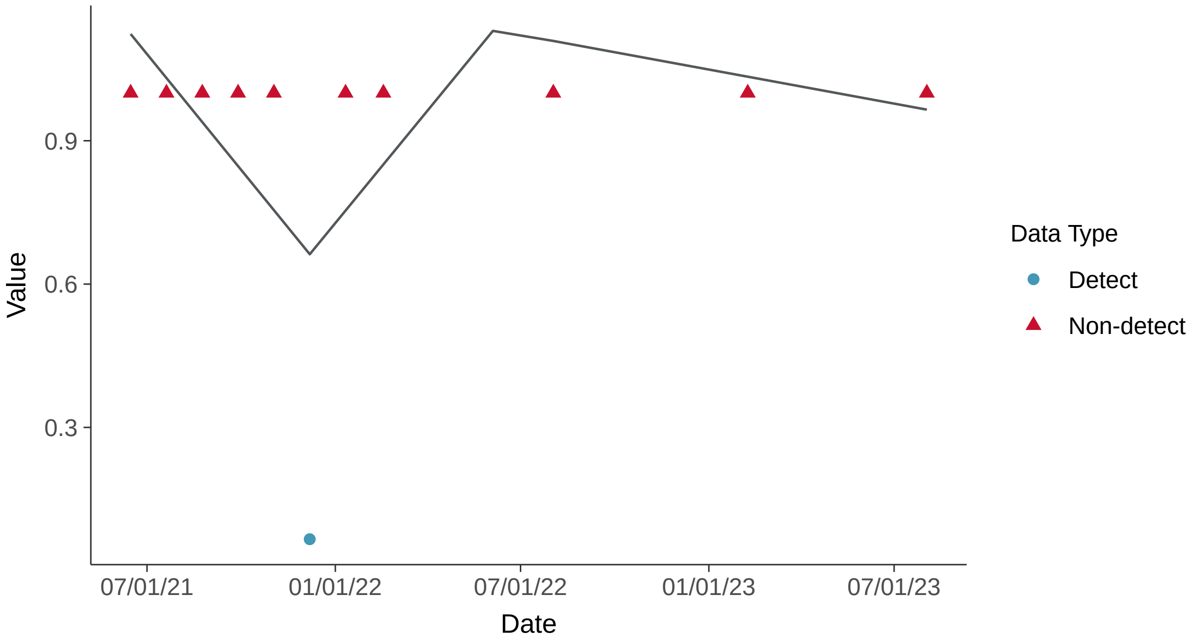
Trend Regression: Piecewise Linear-Linear

Fluoride, MW-10 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Fluoride, MW-10 (mg/L)

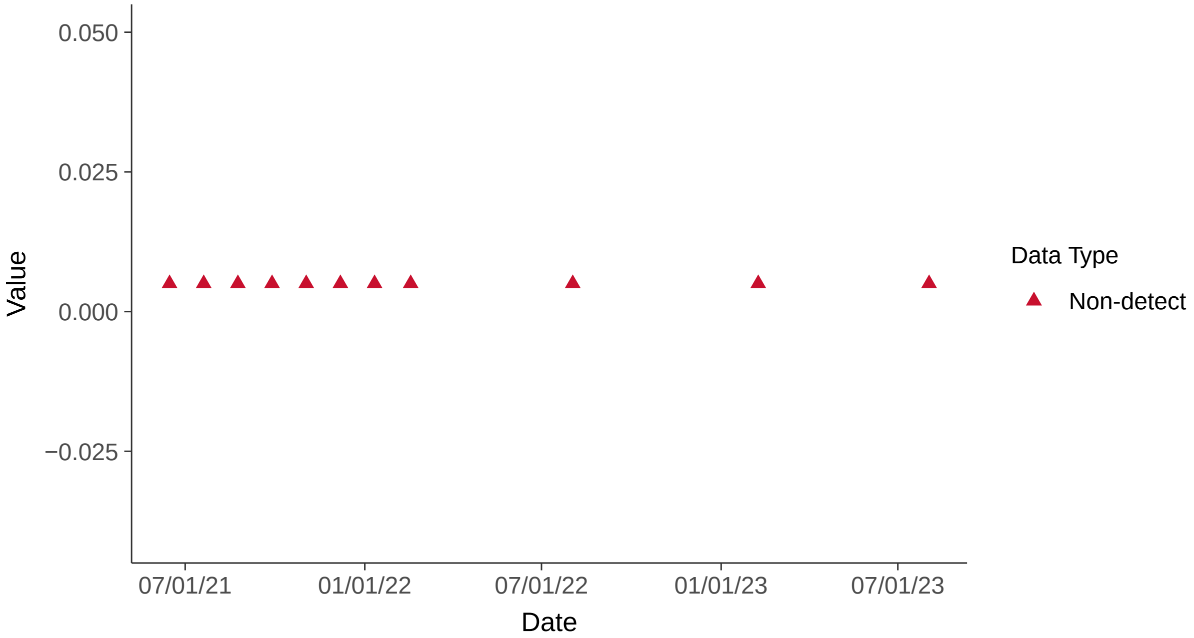


Appendix IV: Antimony, MW-10

ID: 10_2_08

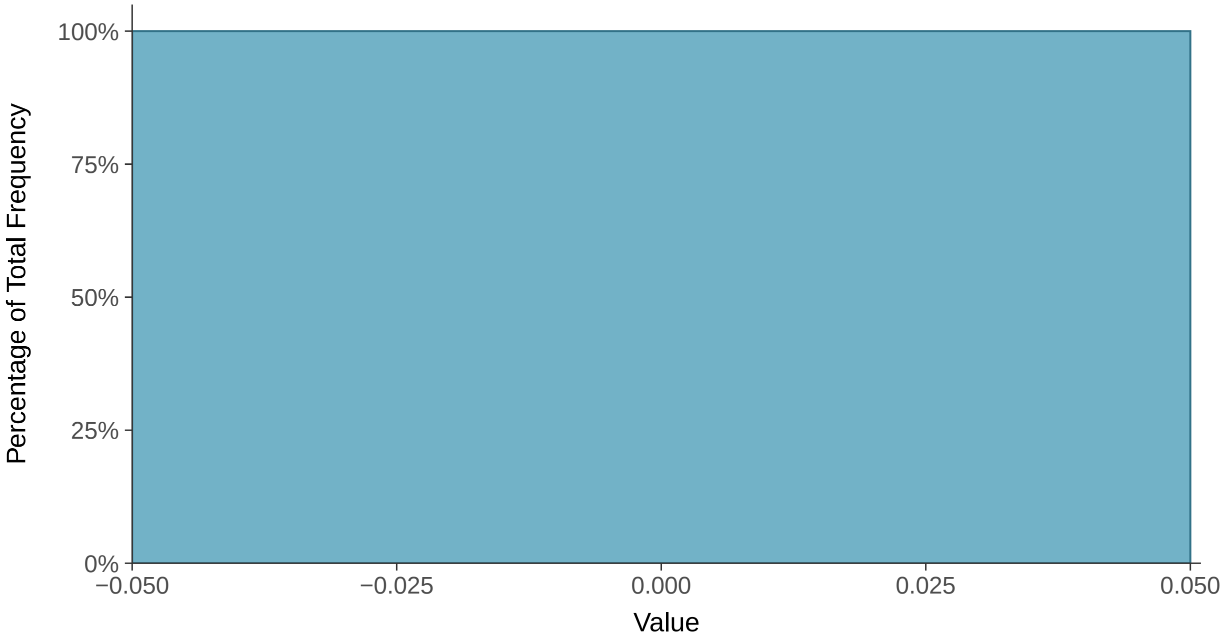
Scatter Plot

Antimony, MW-10 (mg/L)



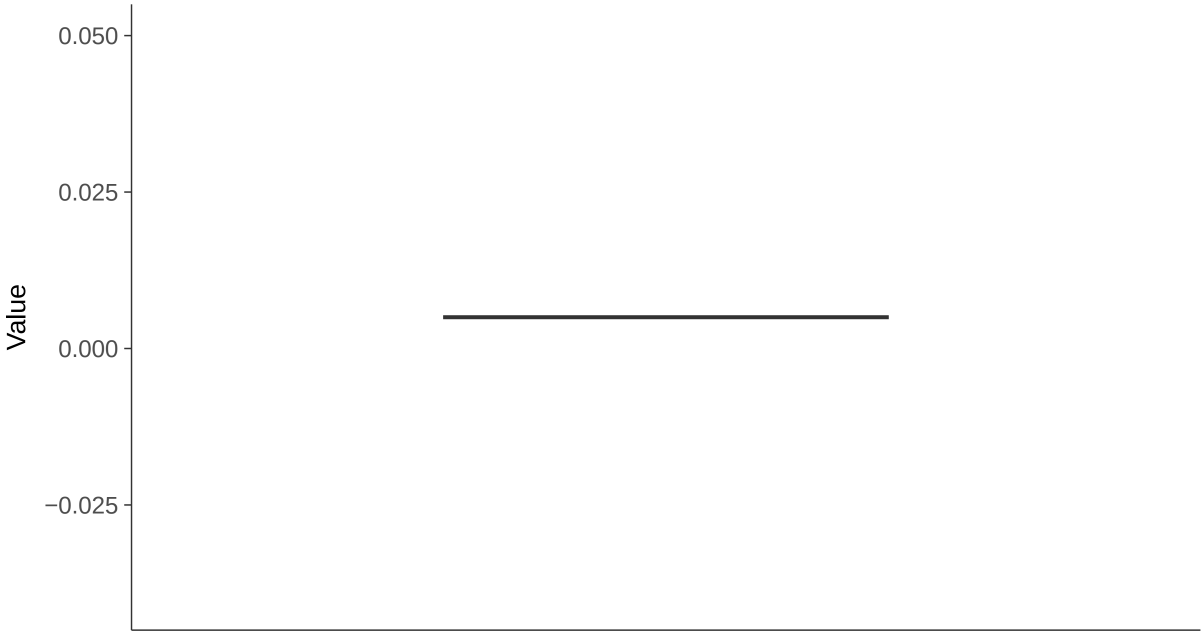
Histogram

Antimony, MW-10 (mg/L)



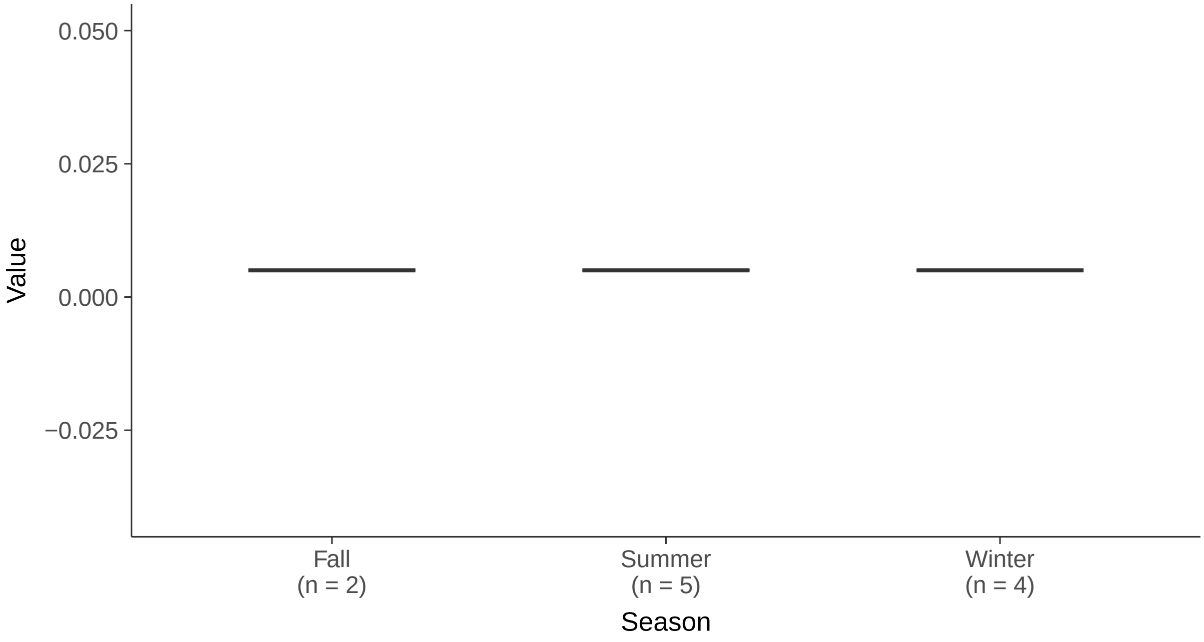
Boxplot

Antimony, MW-10 (mg/L)



Boxplot by Season

Antimony, MW-10 (mg/L)

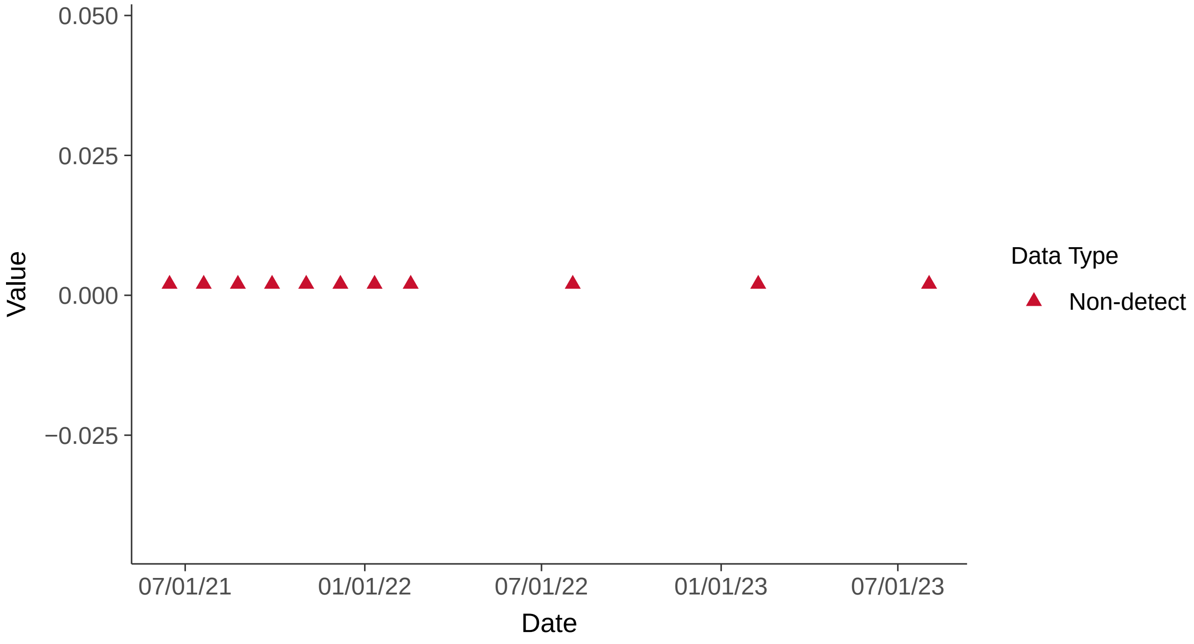


Appendix IV: Arsenic, MW-10

ID: 10_2_09

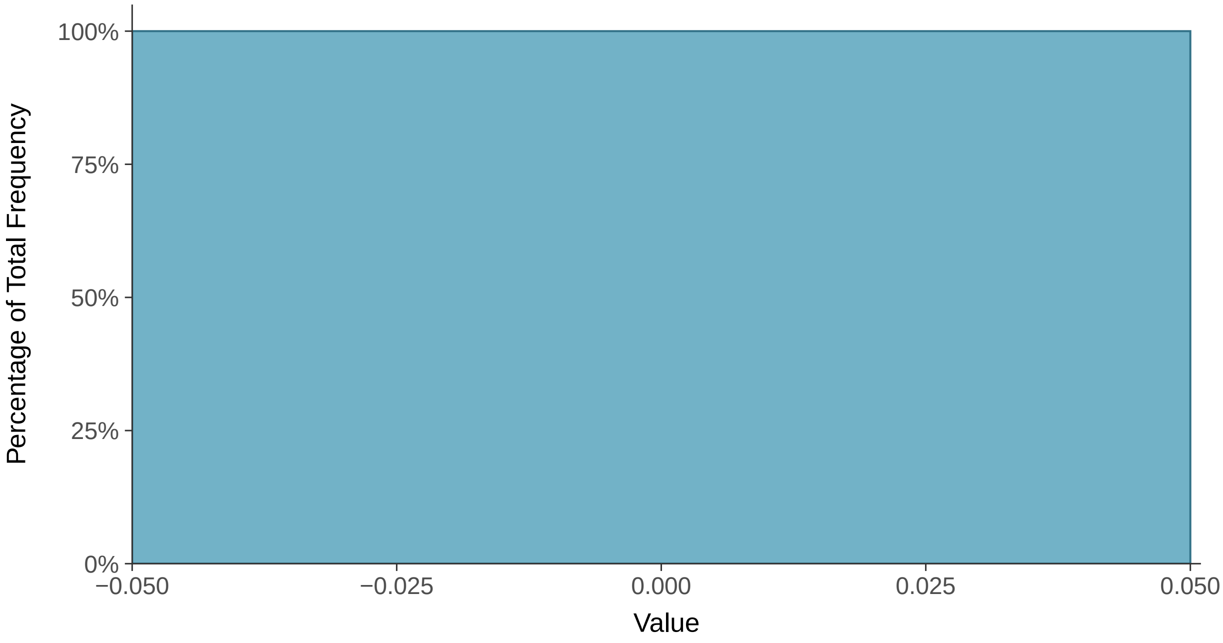
Scatter Plot

Arsenic, MW-10 (mg/L)



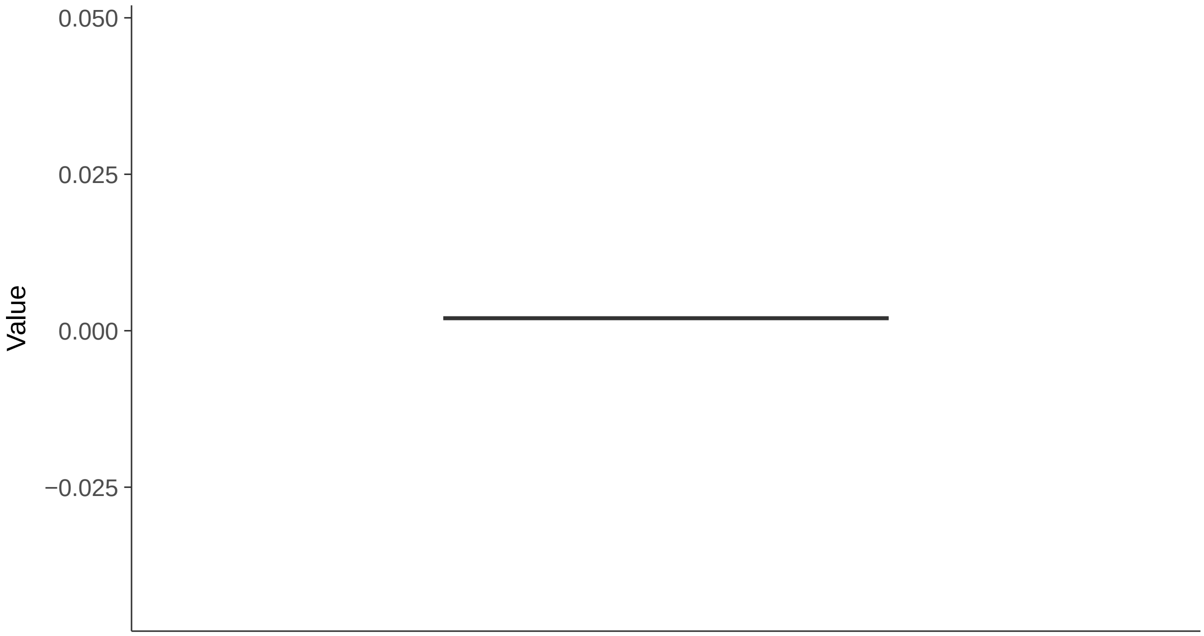
Histogram

Arsenic, MW-10 (mg/L)



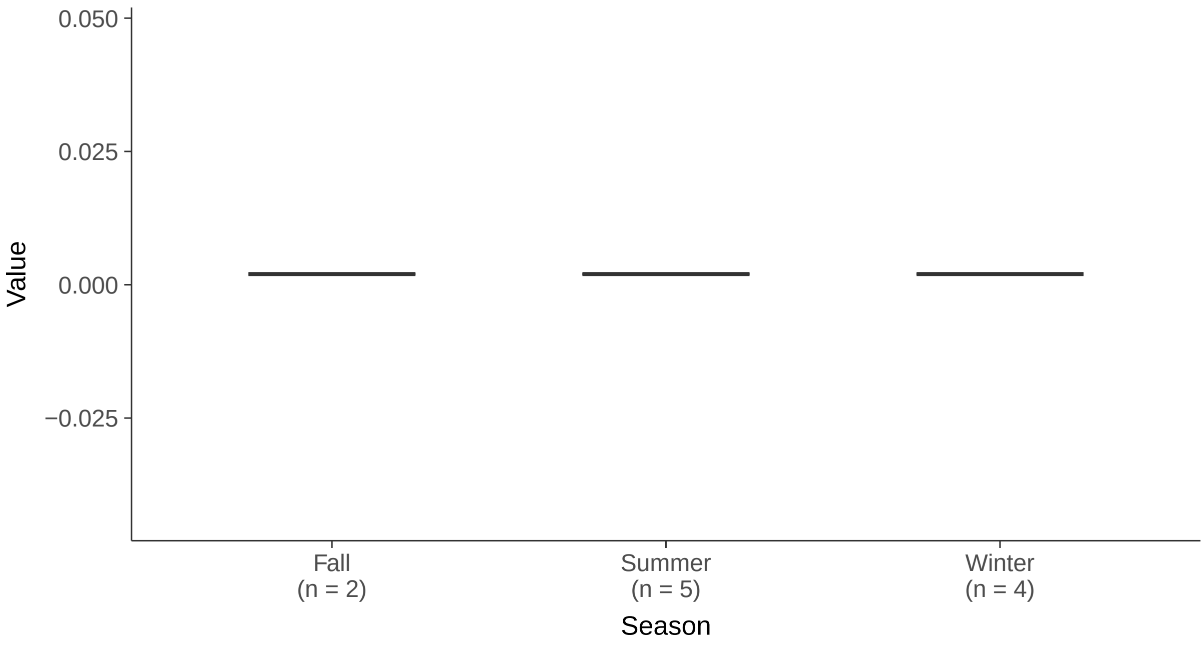
Boxplot

Arsenic, MW-10 (mg/L)



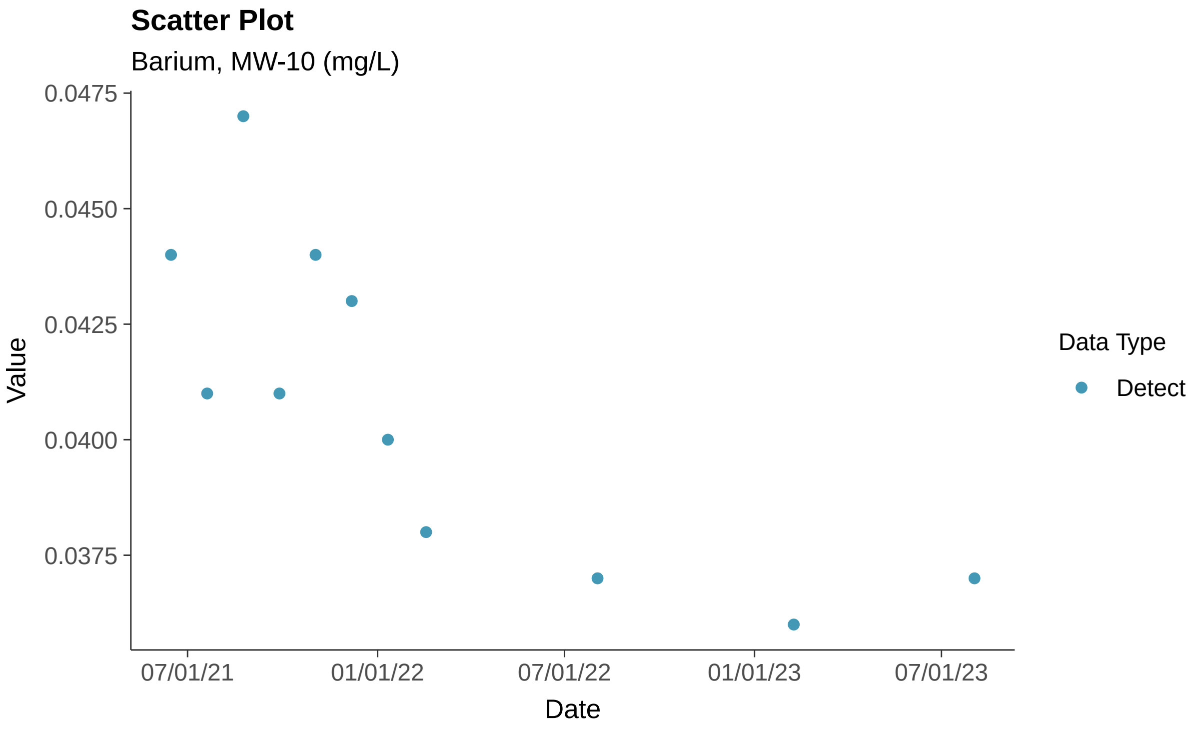
Boxplot by Season

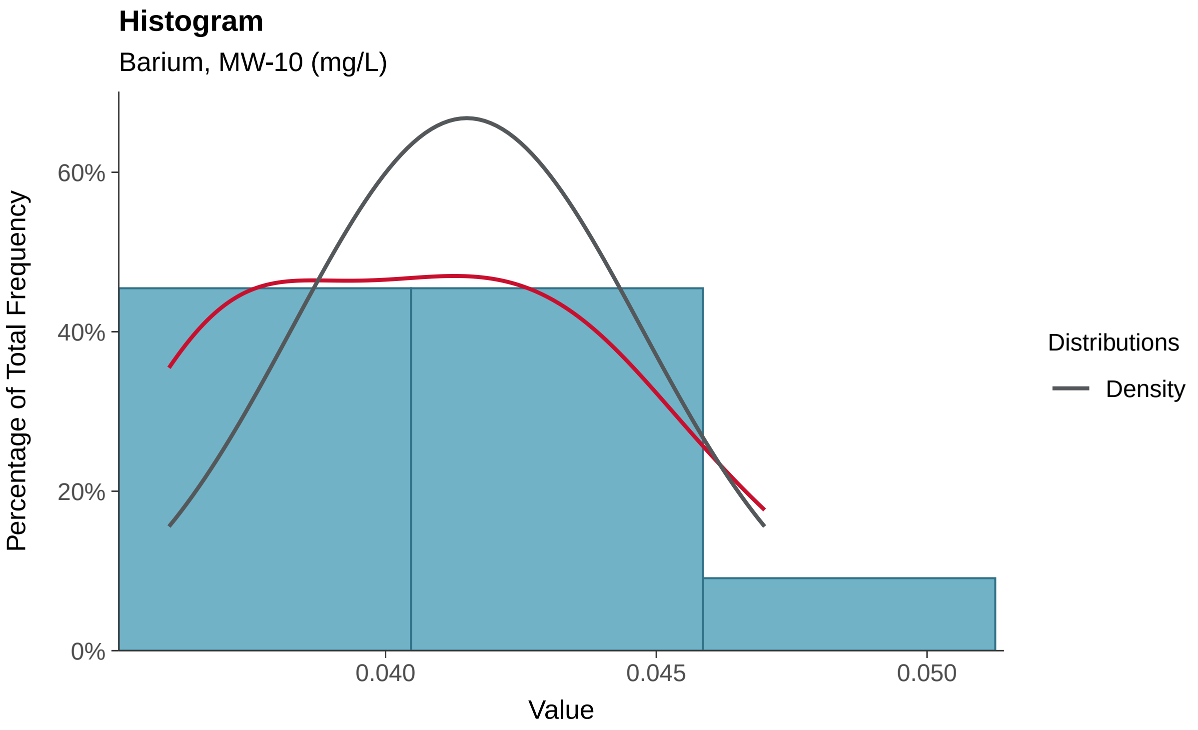
Arsenic, MW-10 (mg/L)



Appendix IV: Barium, MW-10

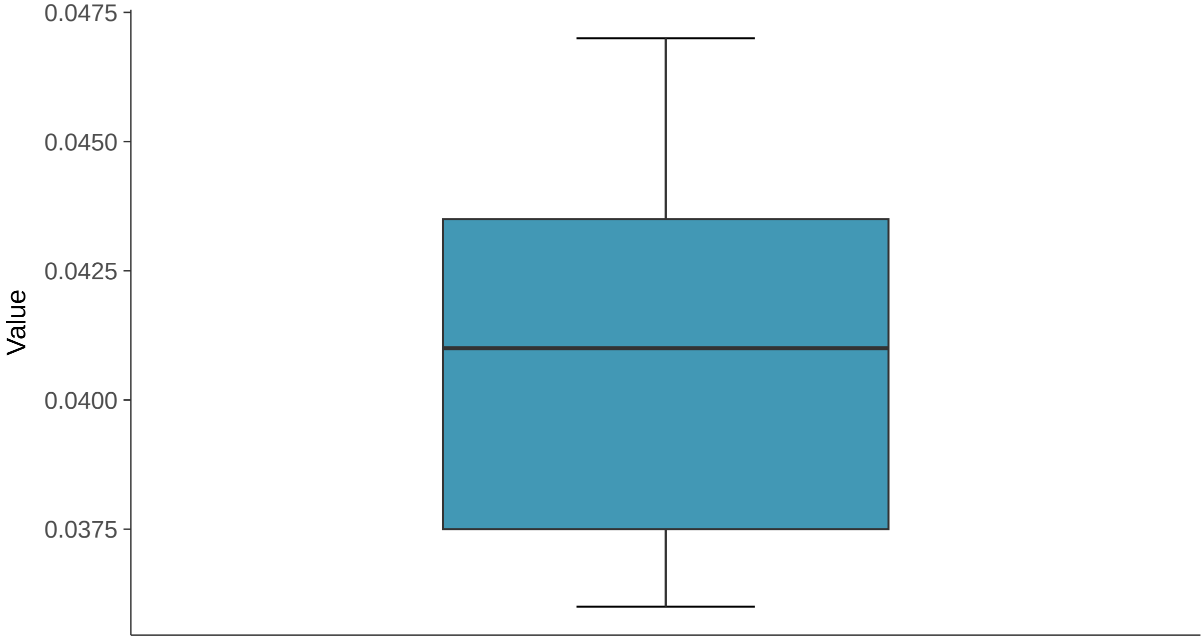
ID: 10_2_10





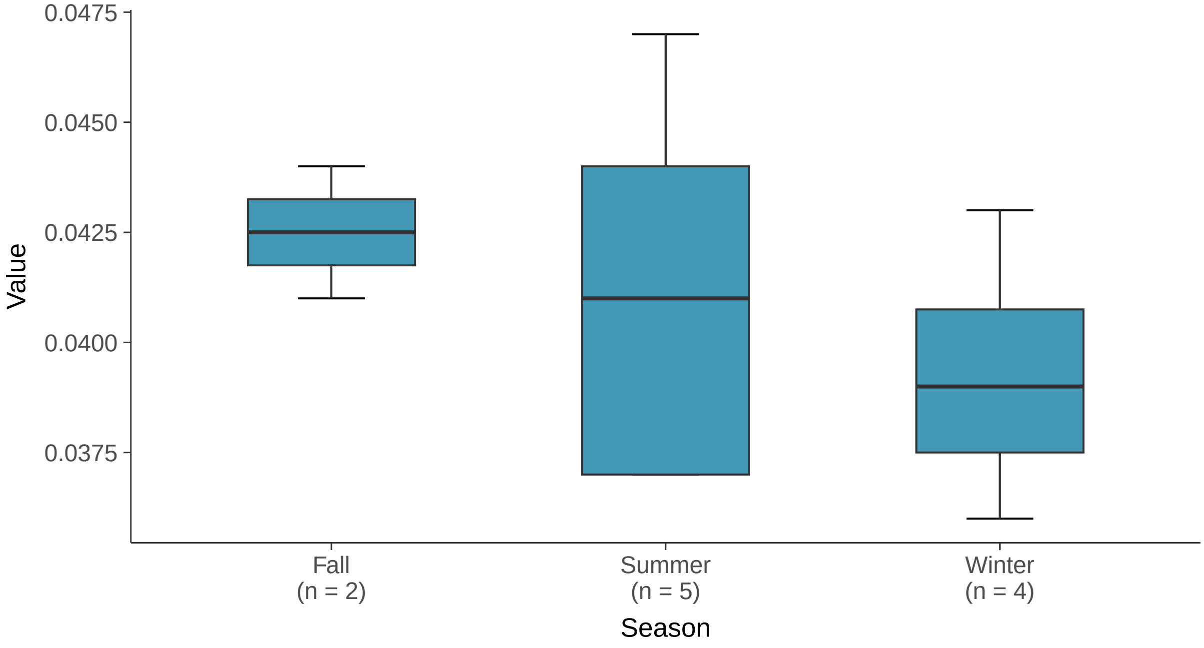
Boxplot

Barium, MW-10 (mg/L)



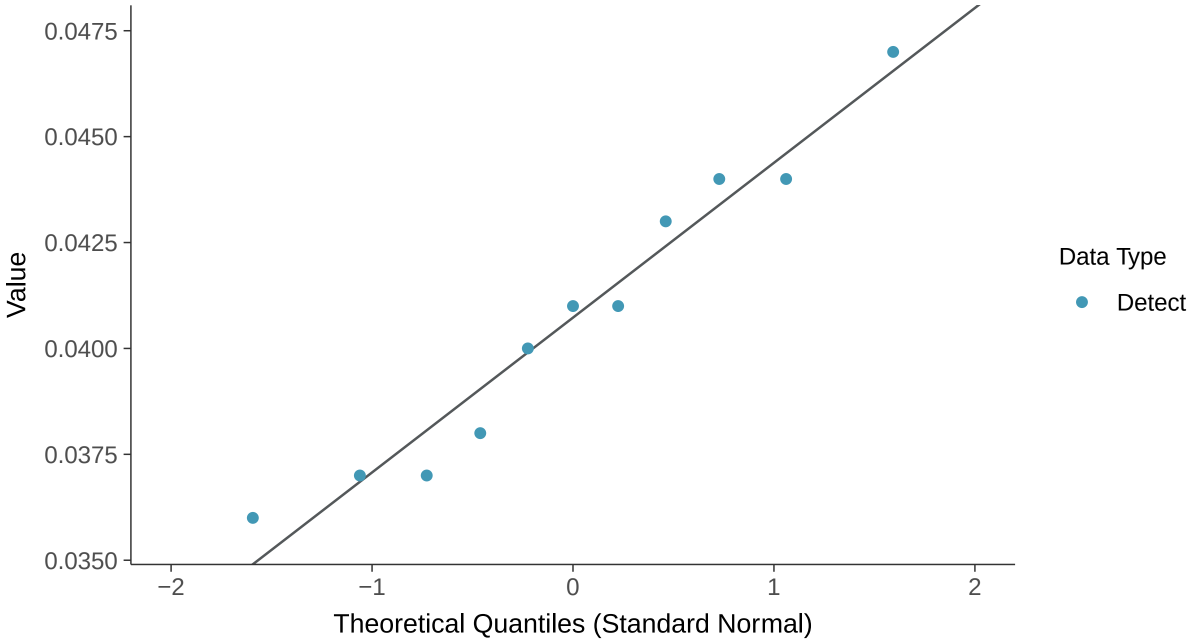
Boxplot by Season

Barium, MW-10 (mg/L)



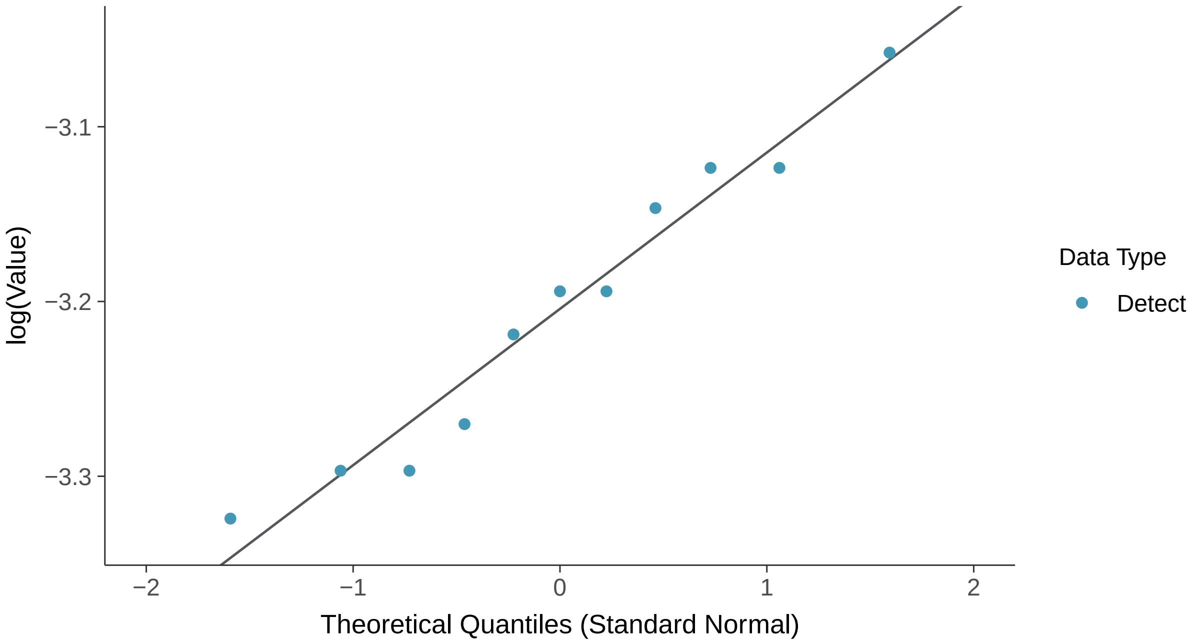
Normal Q-Q plot

Barium, MW-10 (mg/L)



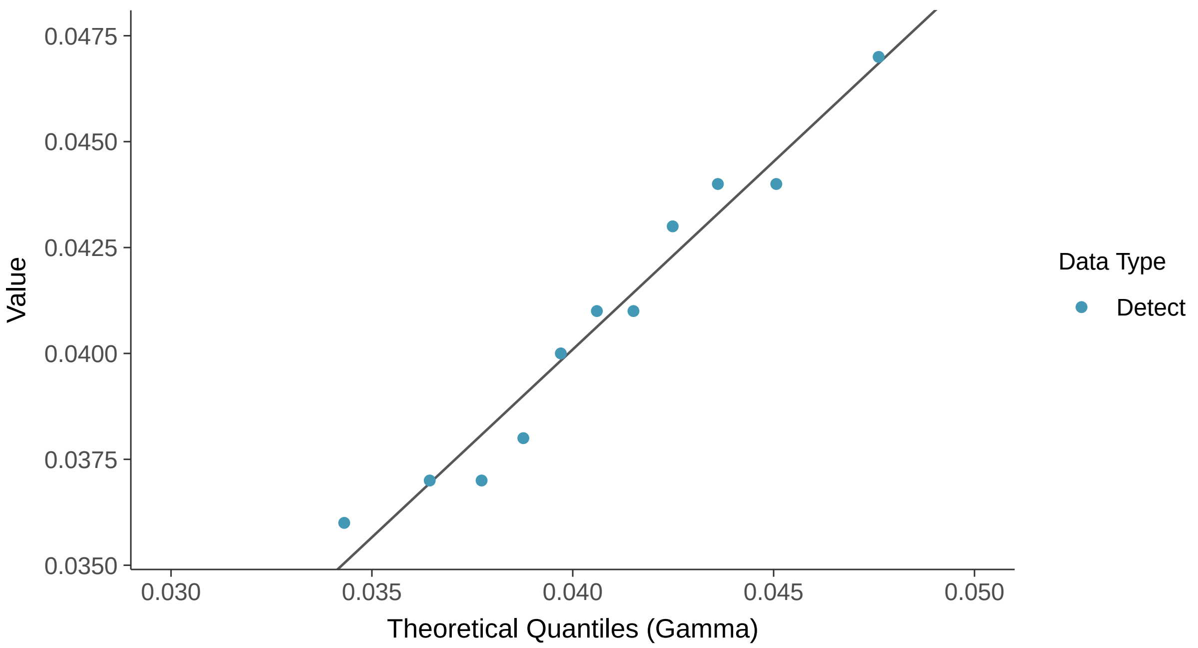
Lognormal Q-Q plot

Barium, MW-10 (mg/L)



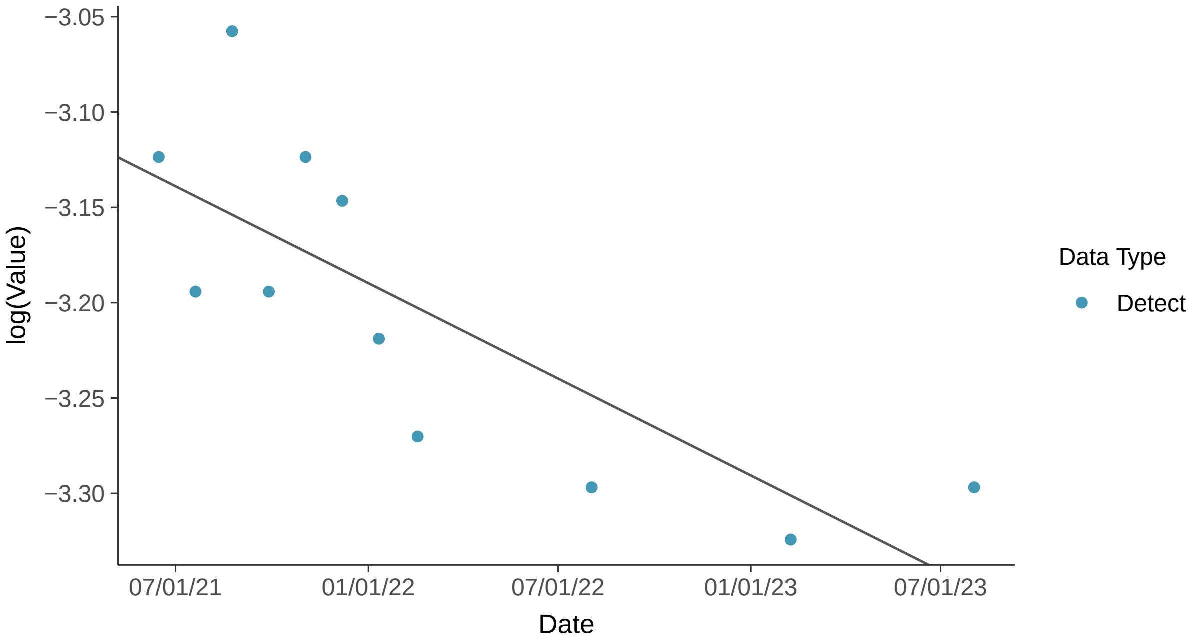
Gamma Q-Q plot

Barium, MW-10 (mg/L)



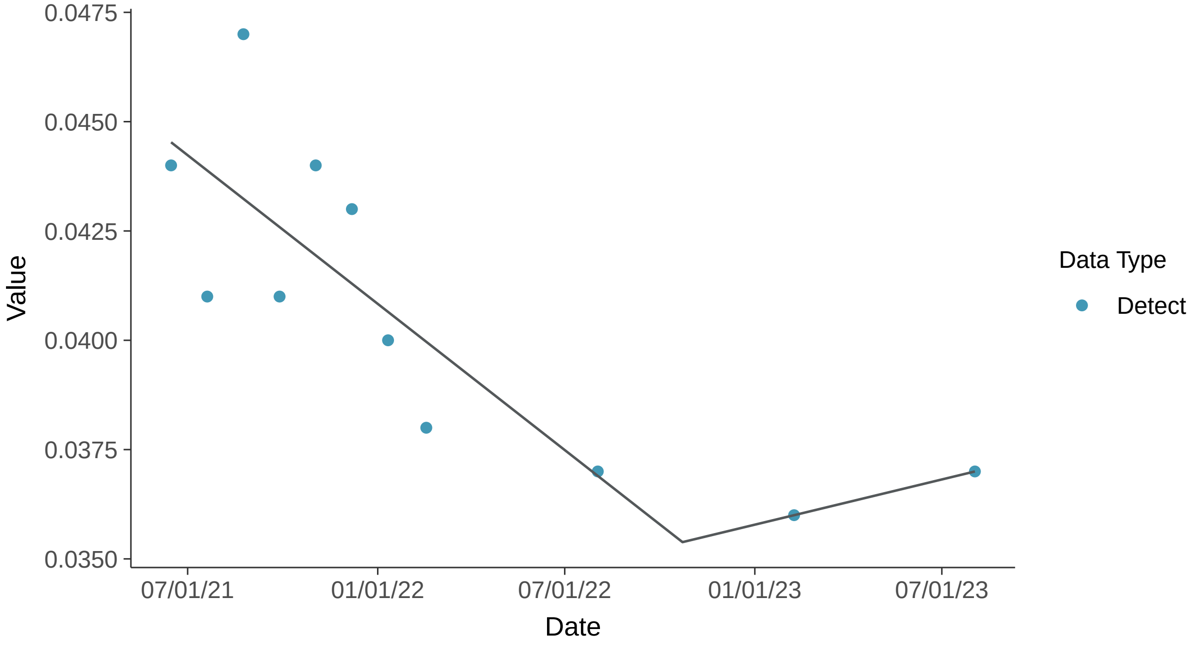
Trend Regression: Lognormal MLE

Barium, MW-10 (mg/L)



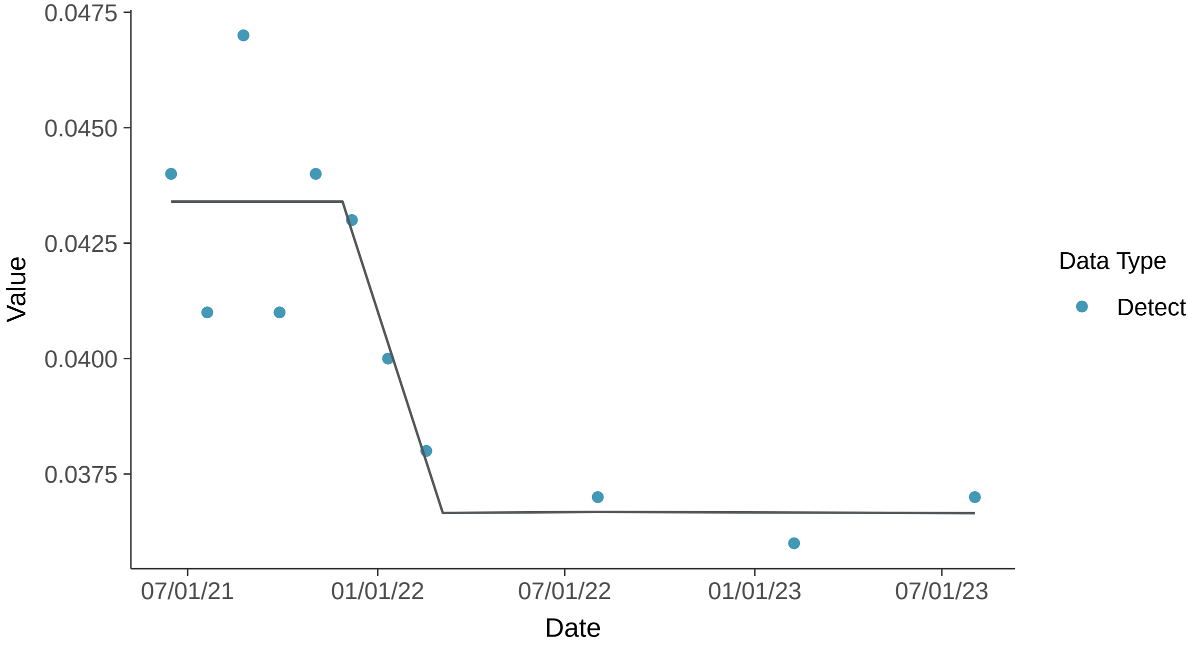
Trend Regression: Piecewise Linear-Linear

Barium, MW-10 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Barium, MW-10 (mg/L)

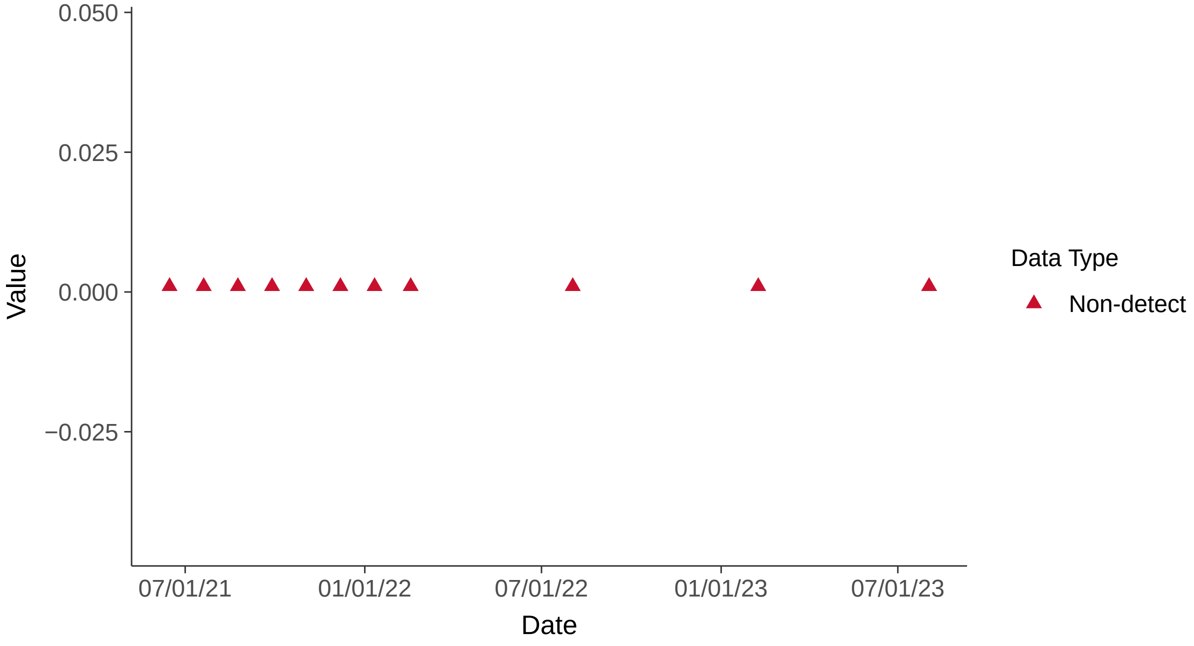


Appendix IV: Beryllium, MW-10

ID: 10_2_11

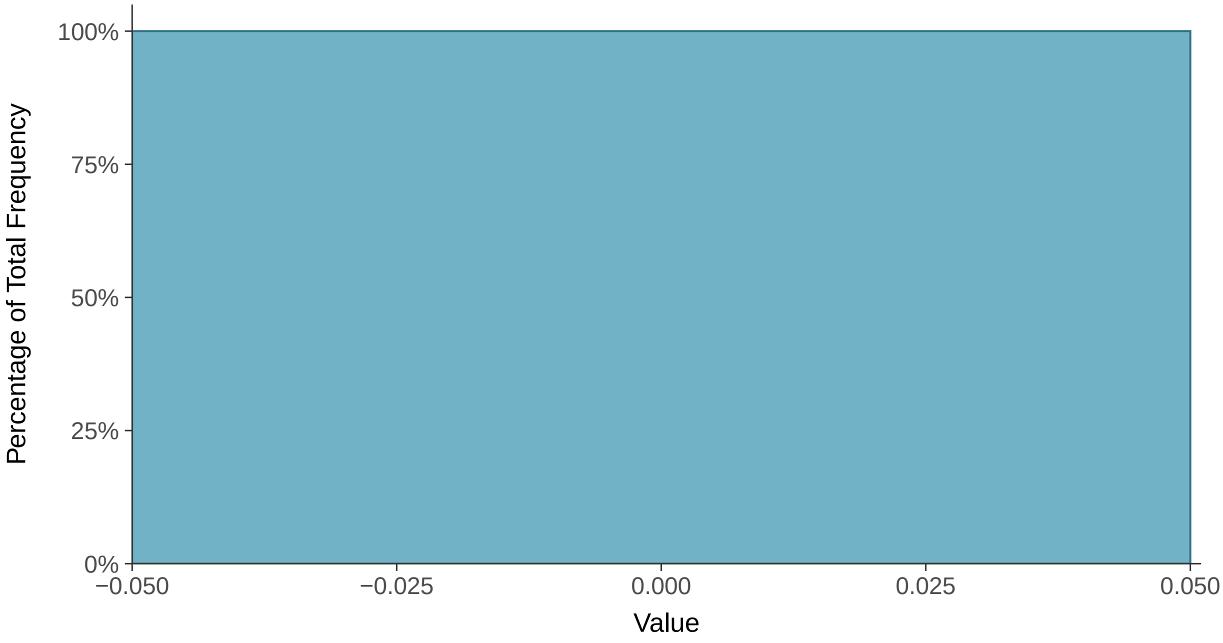
Scatter Plot

Beryllium, MW-10 (mg/L)



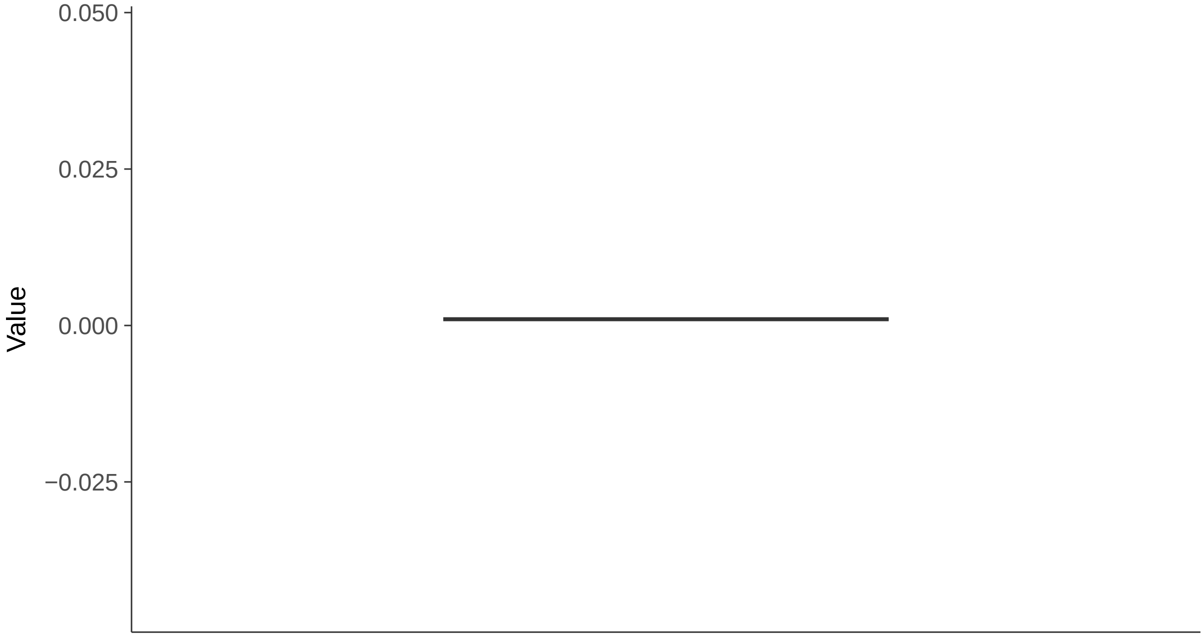
Histogram

Beryllium, MW-10 (mg/L)



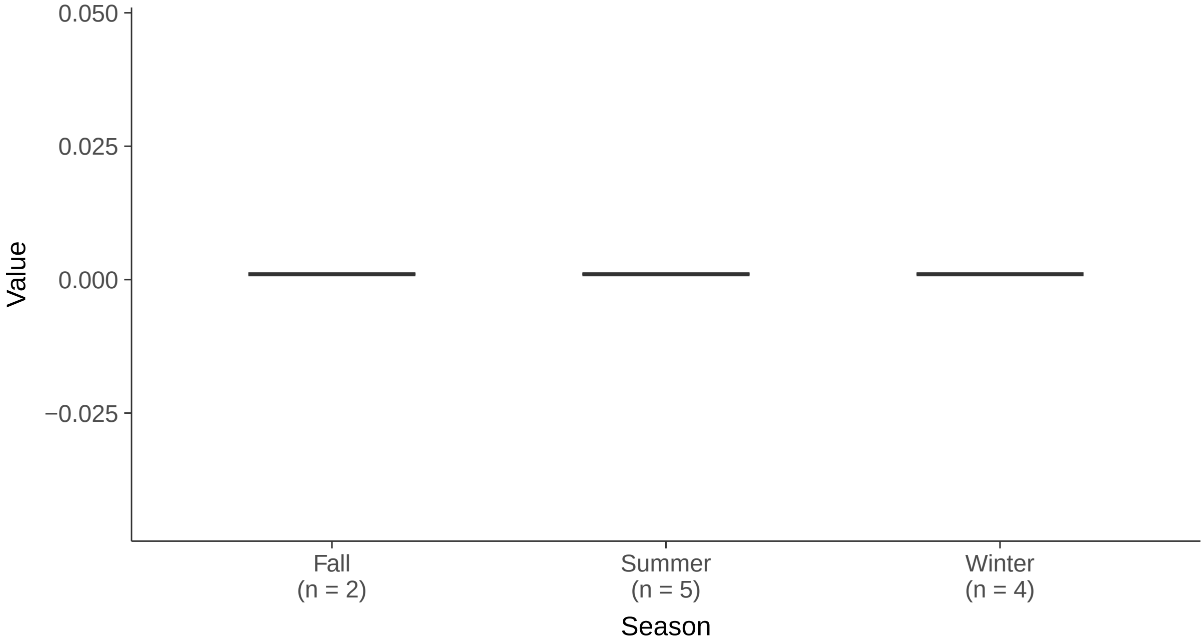
Boxplot

Beryllium, MW-10 (mg/L)



Boxplot by Season

Beryllium, MW-10 (mg/L)

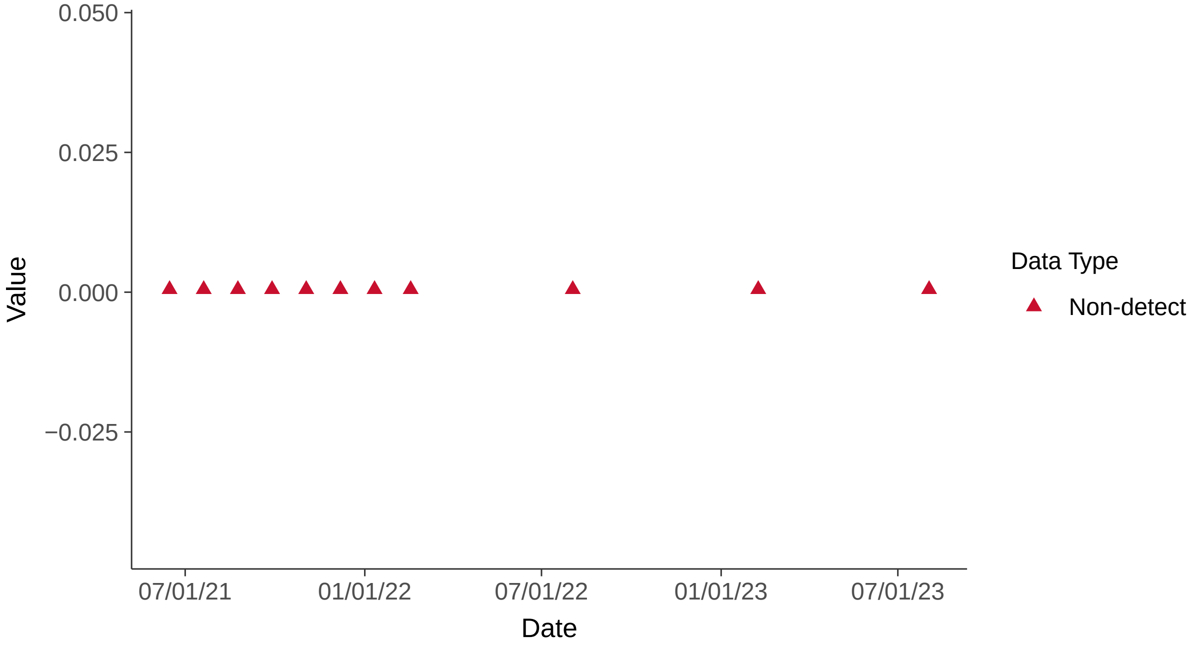


Appendix IV: Cadmium, MW-10

ID: 10_2_12

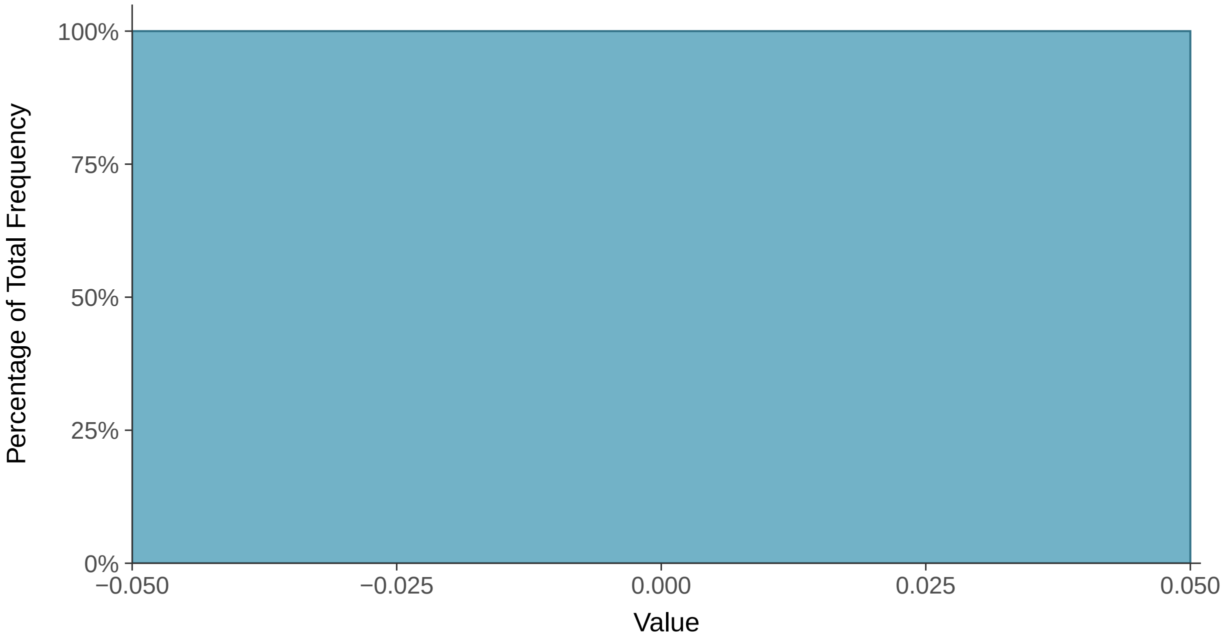
Scatter Plot

Cadmium, MW-10 (mg/L)



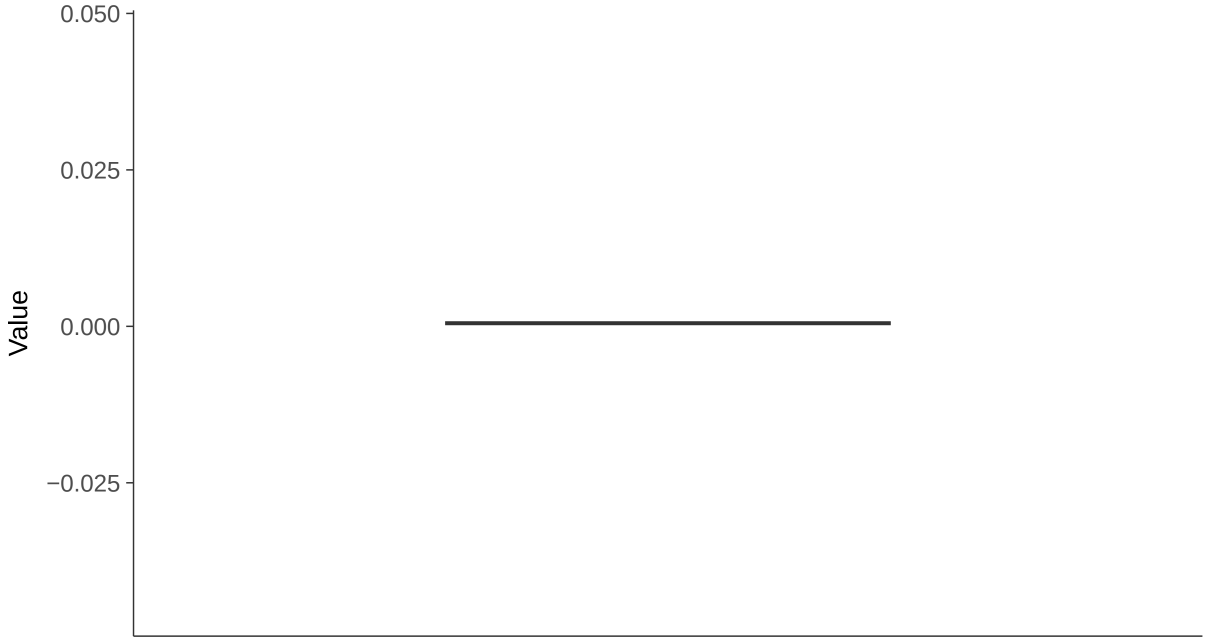
Histogram

Cadmium, MW-10 (mg/L)



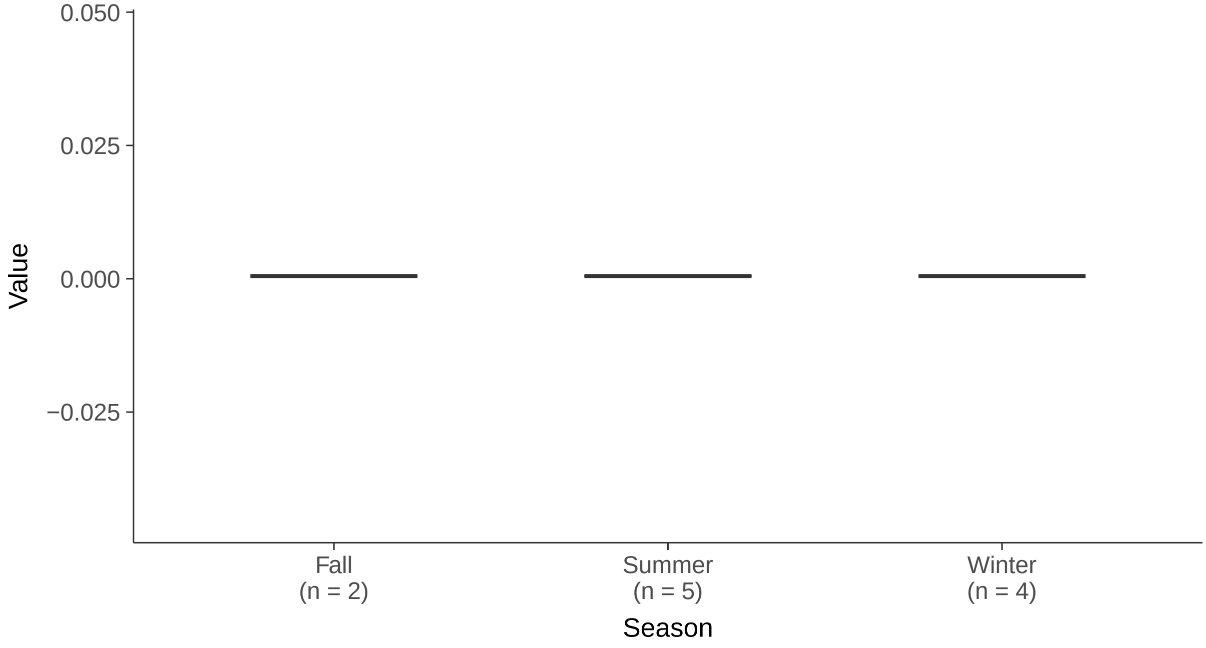
Boxplot

Cadmium, MW-10 (mg/L)



Boxplot by Season

Cadmium, MW-10 (mg/L)

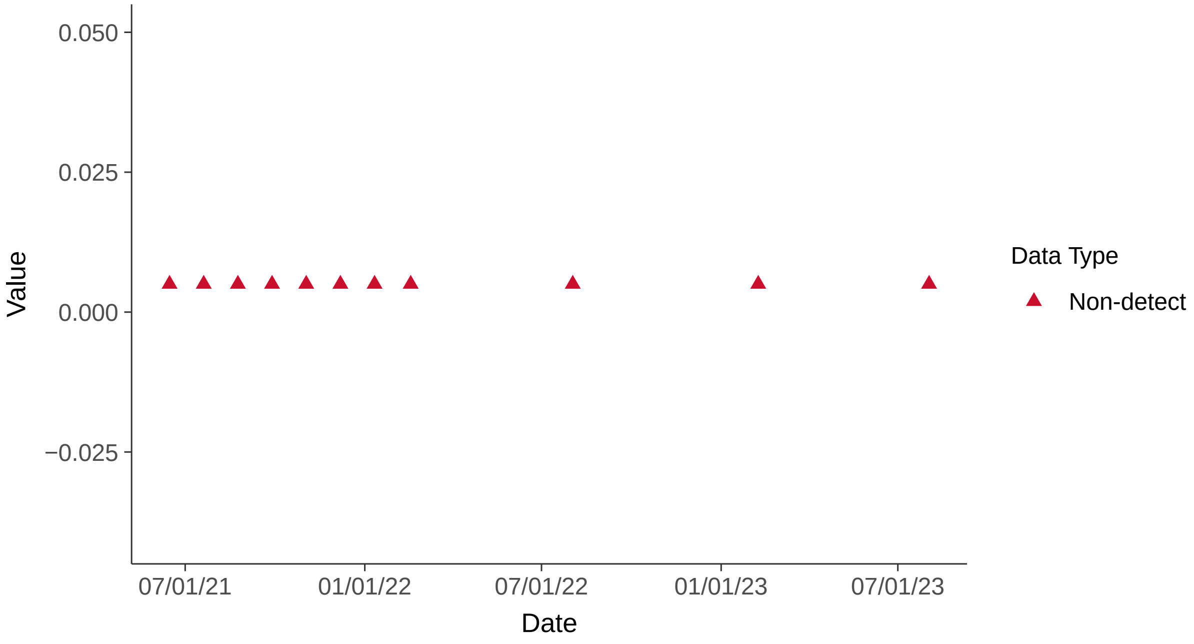


Appendix IV: Chromium, MW-10

ID: 10_2_13

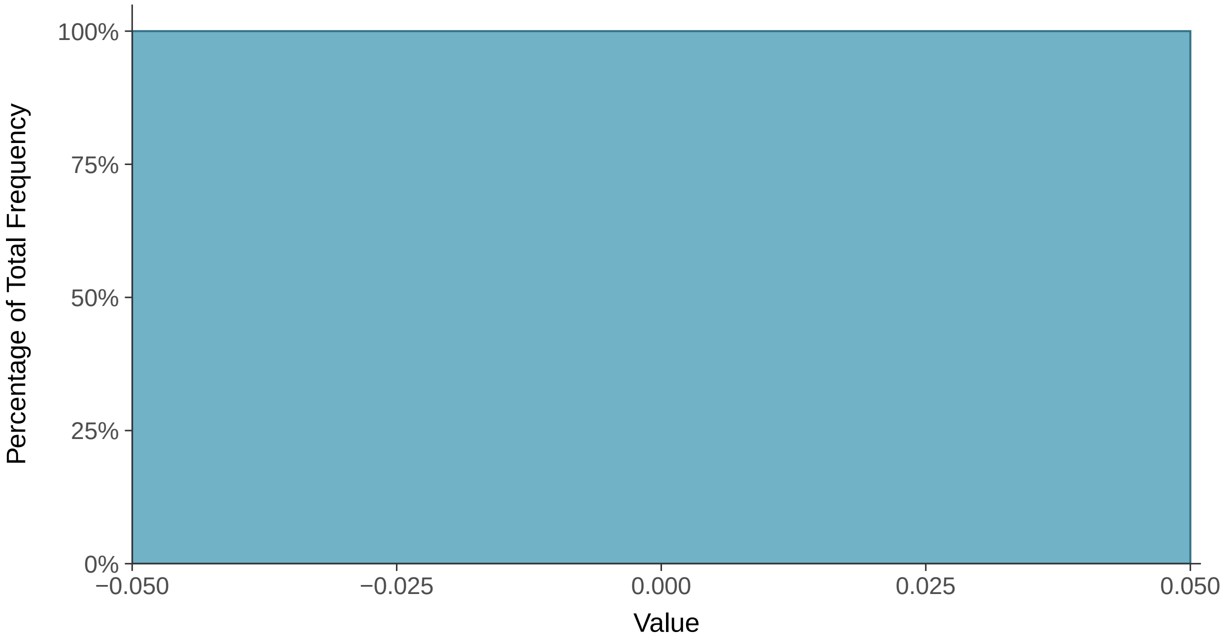
Scatter Plot

Chromium, MW-10 (mg/L)



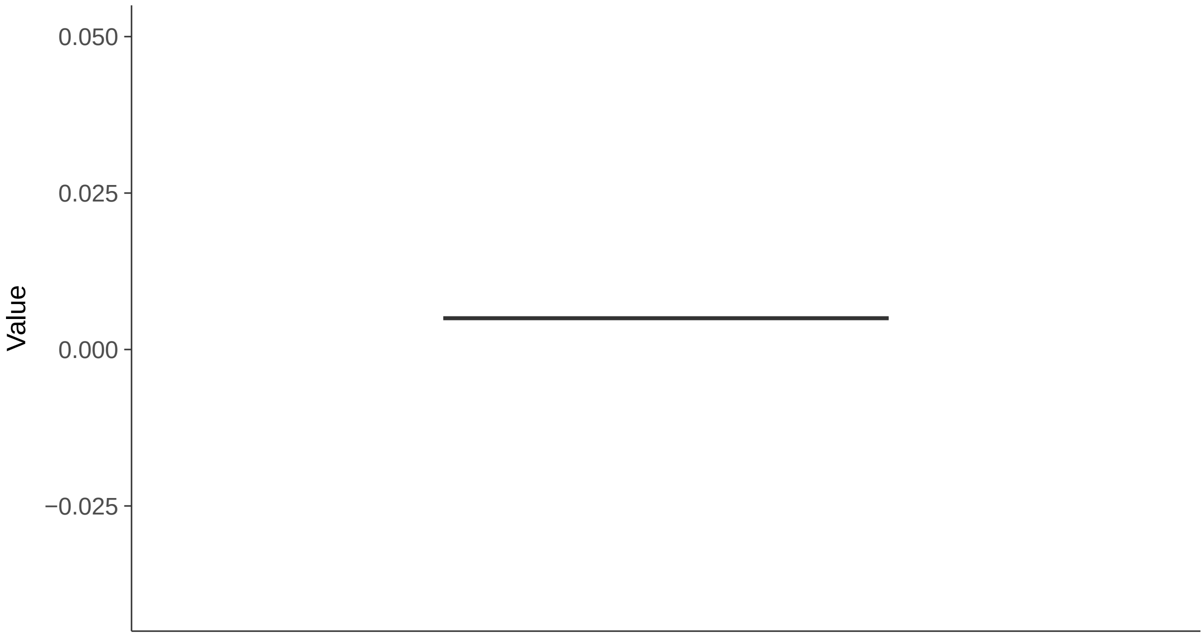
Histogram

Chromium, MW-10 (mg/L)



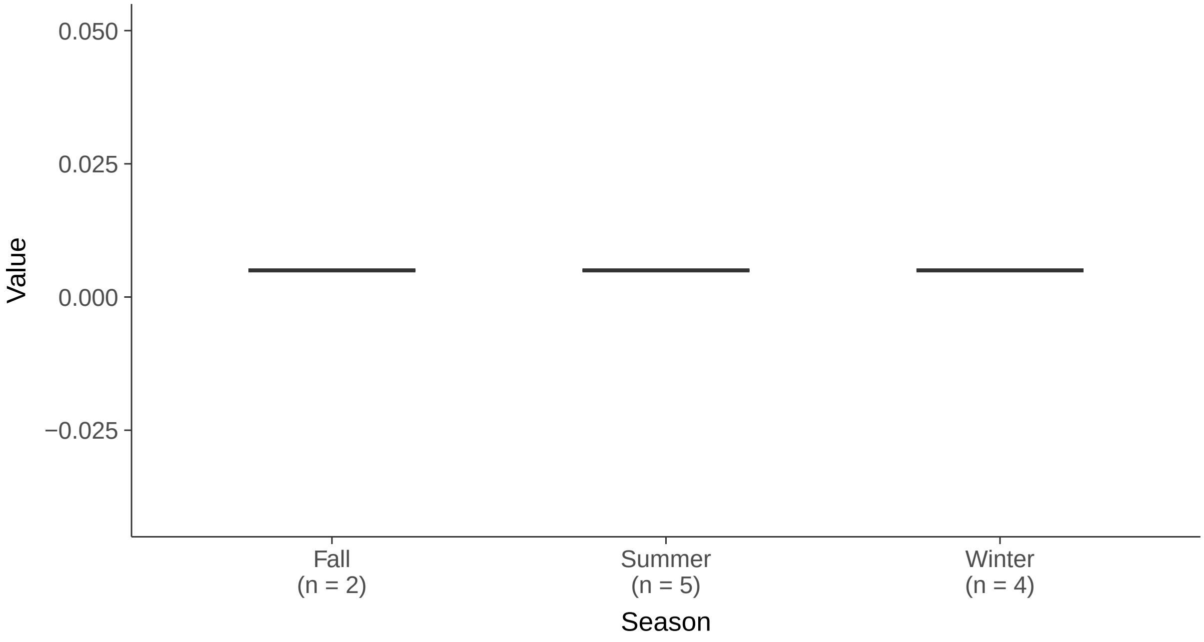
Boxplot

Chromium, MW-10 (mg/L)



Boxplot by Season

Chromium, MW-10 (mg/L)

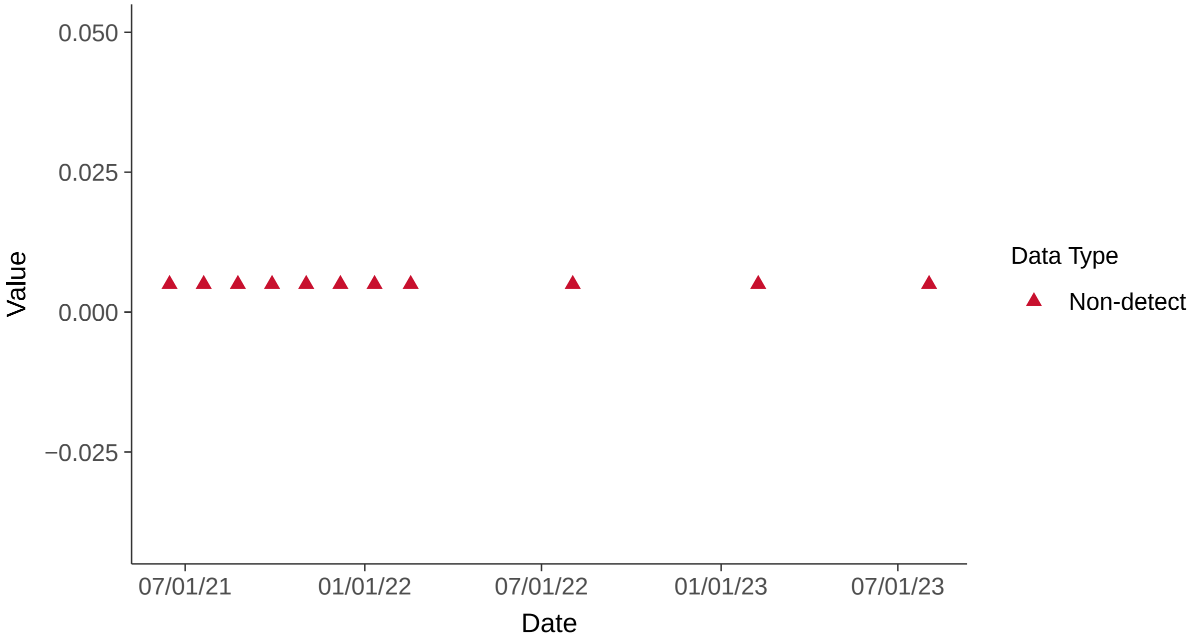


Appendix IV: Cobalt, MW-10

ID: 10_2_14

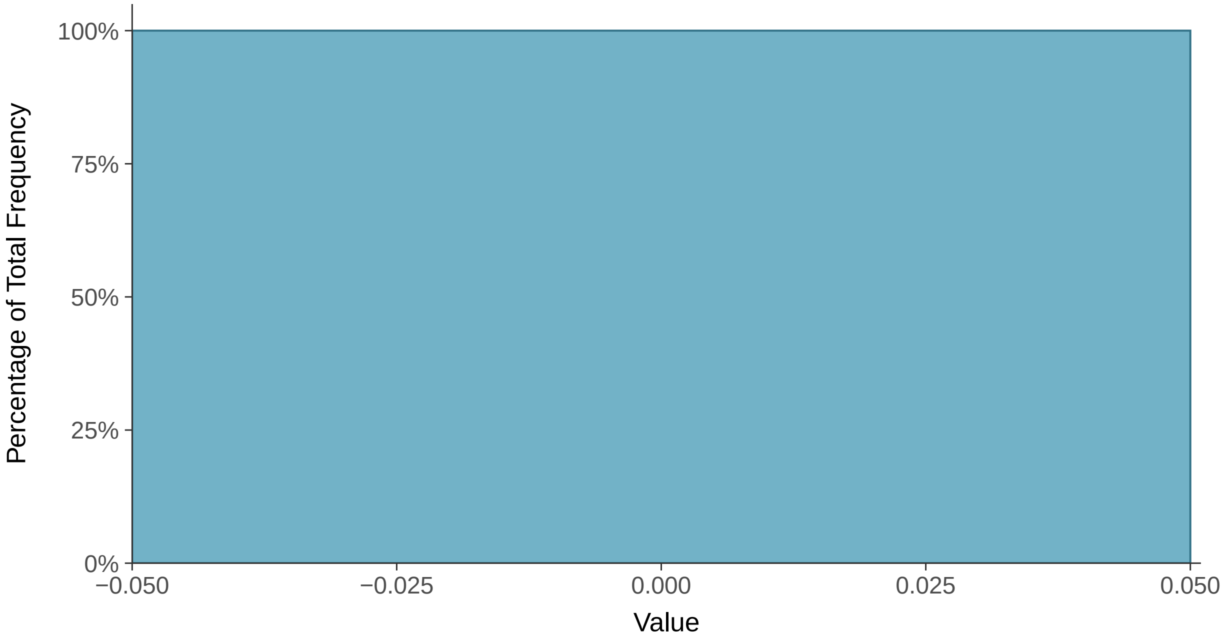
Scatter Plot

Cobalt, MW-10 (mg/L)



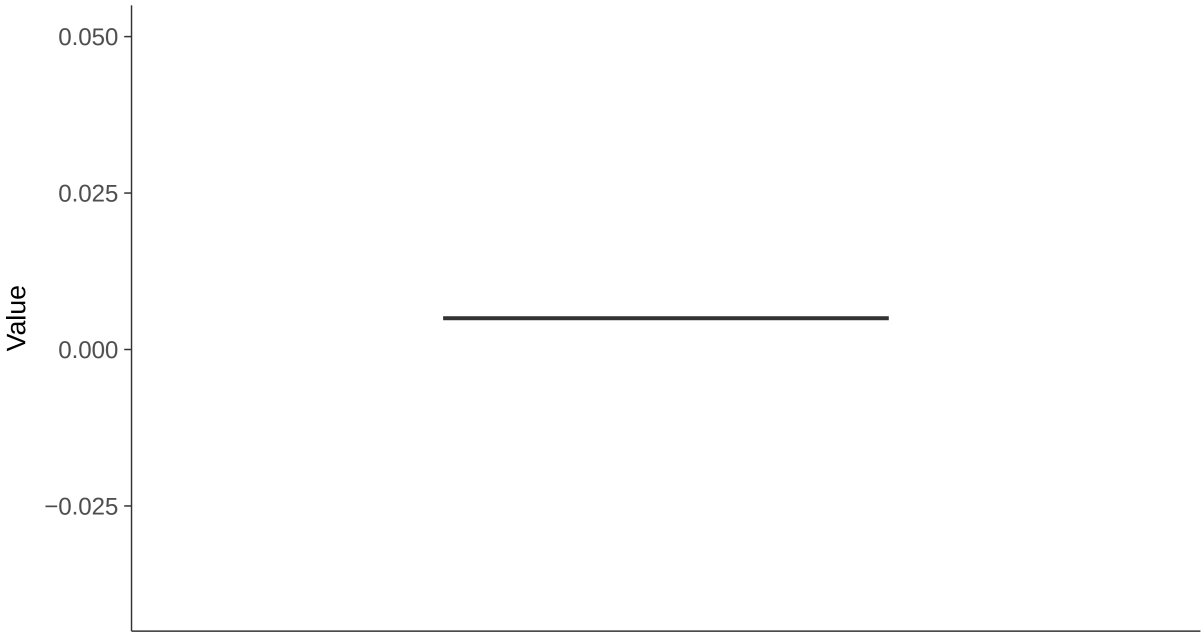
Histogram

Cobalt, MW-10 (mg/L)



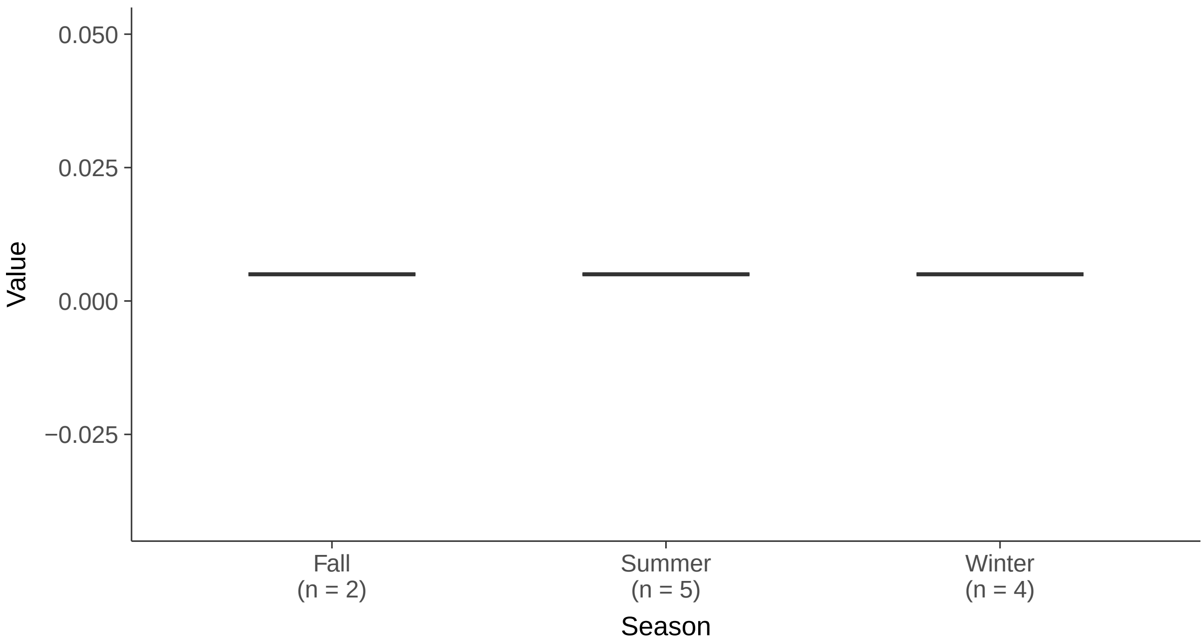
Boxplot

Cobalt, MW-10 (mg/L)



Boxplot by Season

Cobalt, MW-10 (mg/L)

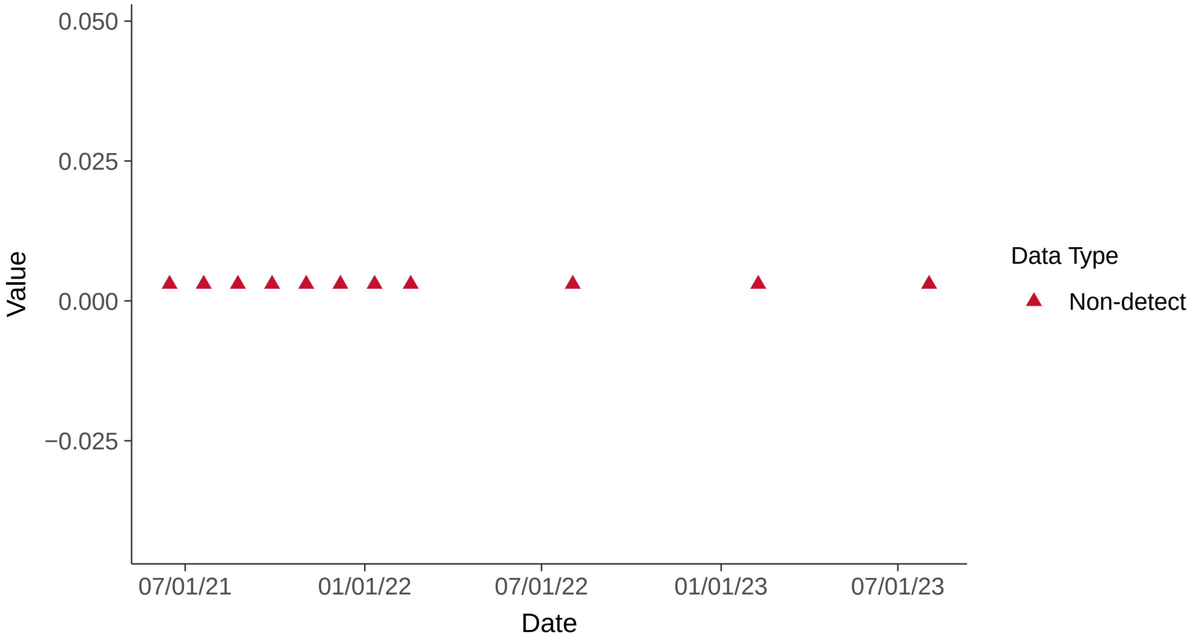


Appendix IV: Lead, MW-10

ID: 10_2_15

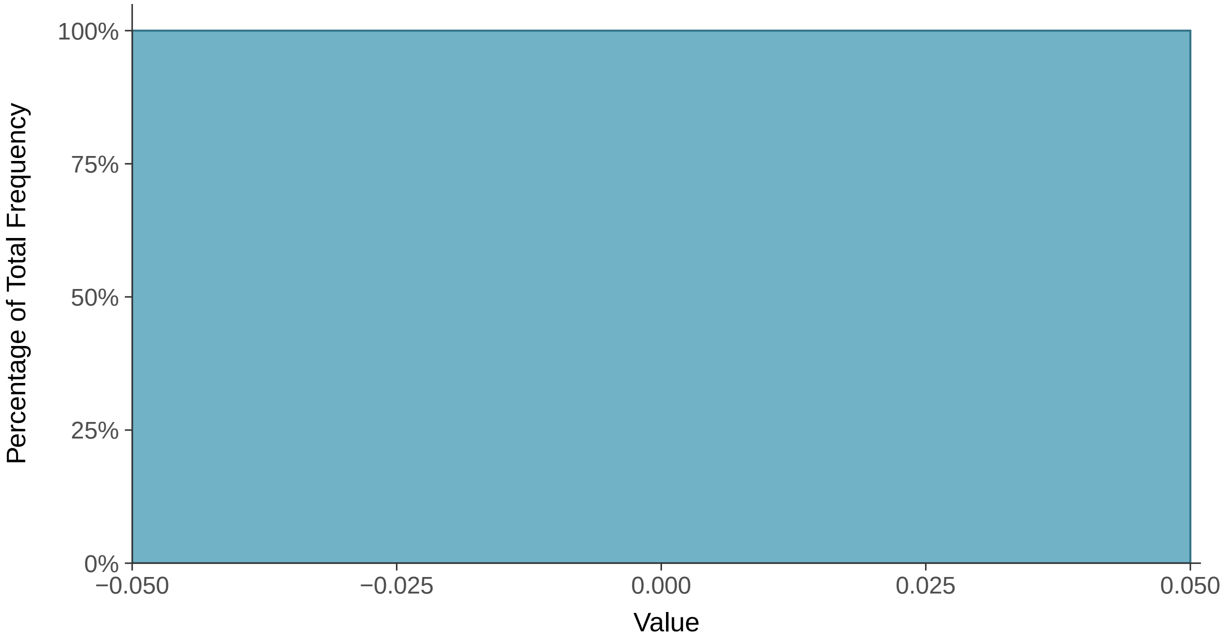
Scatter Plot

Lead, MW-10 (mg/L)



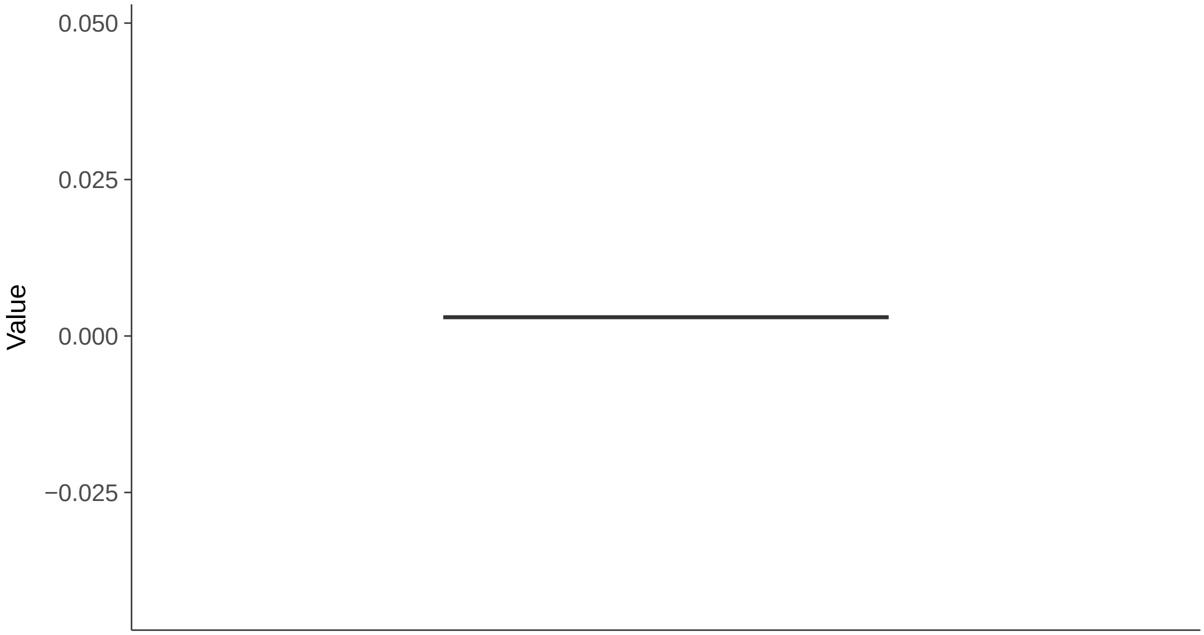
Histogram

Lead, MW-10 (mg/L)



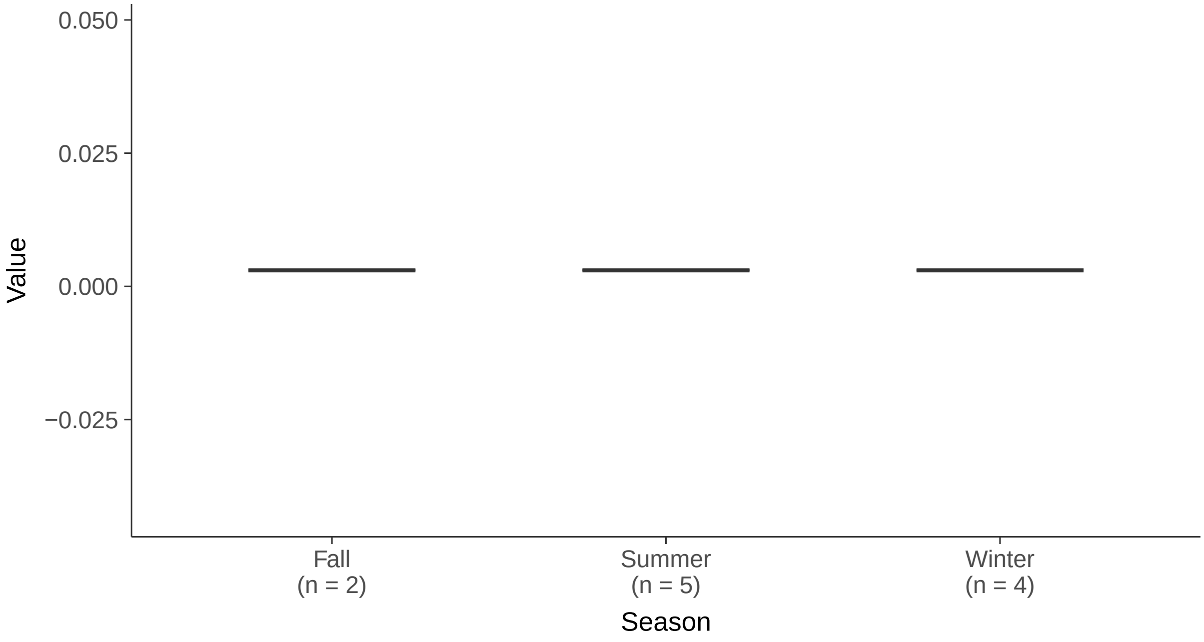
Boxplot

Lead, MW-10 (mg/L)



Boxplot by Season

Lead, MW-10 (mg/L)

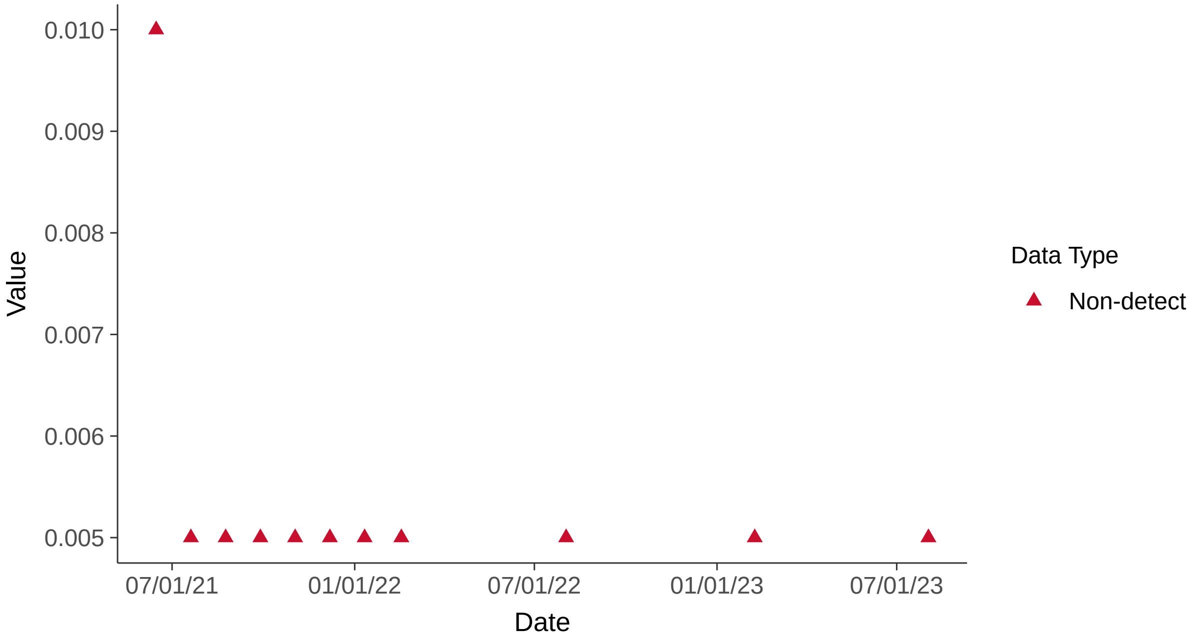


Appendix IV: Lithium, MW-10

ID: 10_2_16

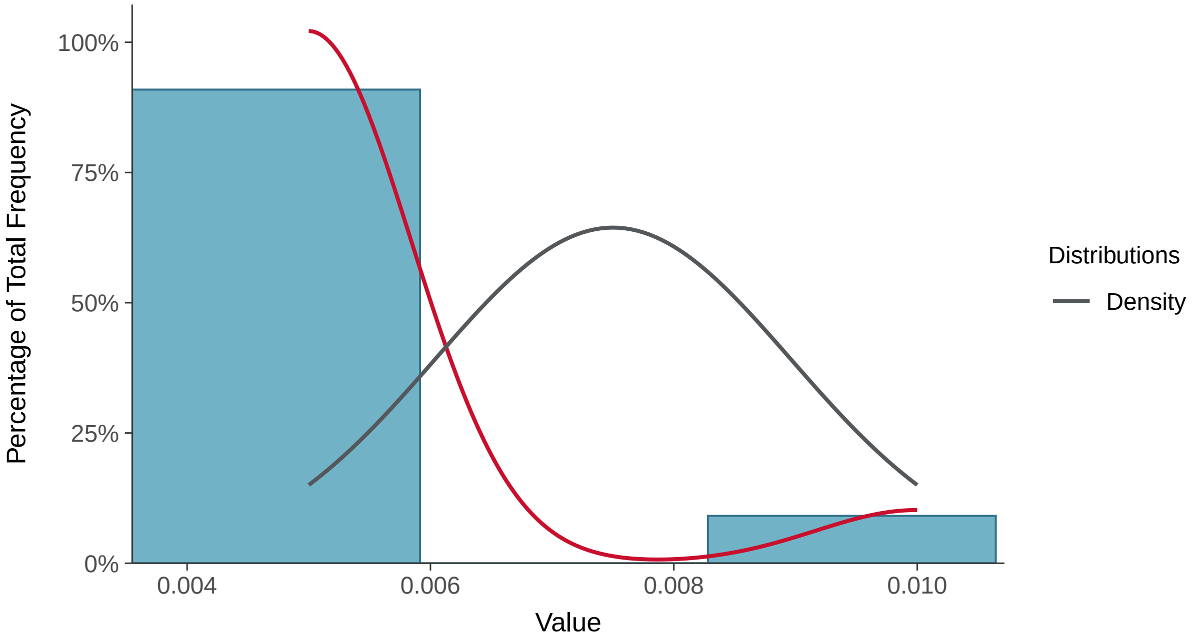
Scatter Plot

Lithium, MW-10 (mg/L)



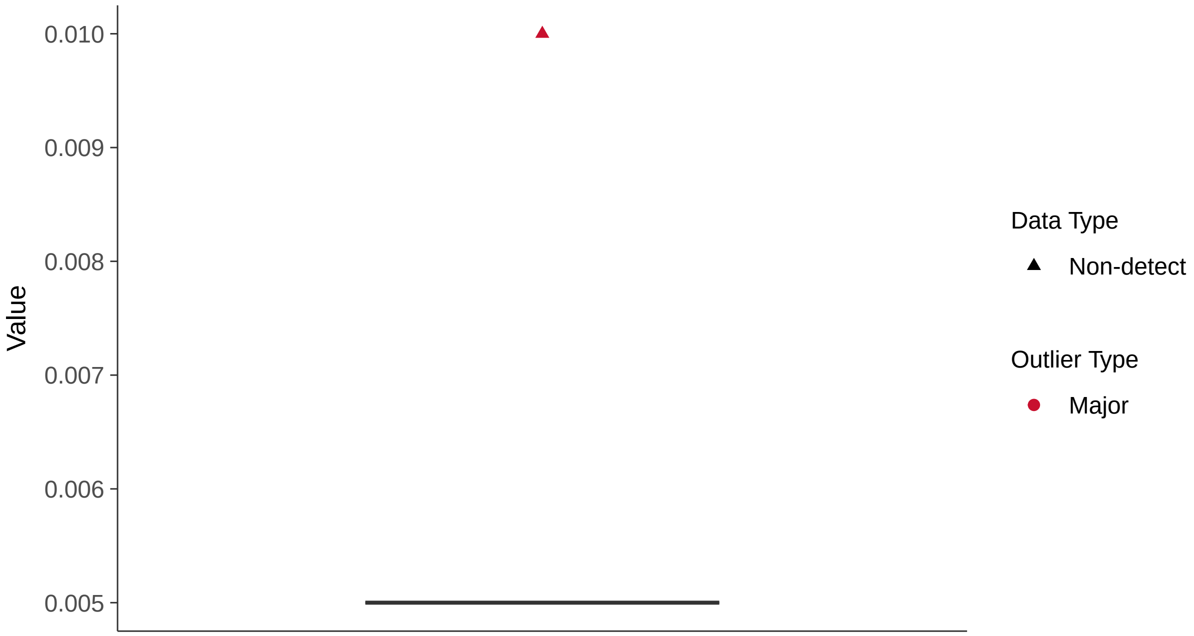
Histogram

Lithium, MW-10 (mg/L)



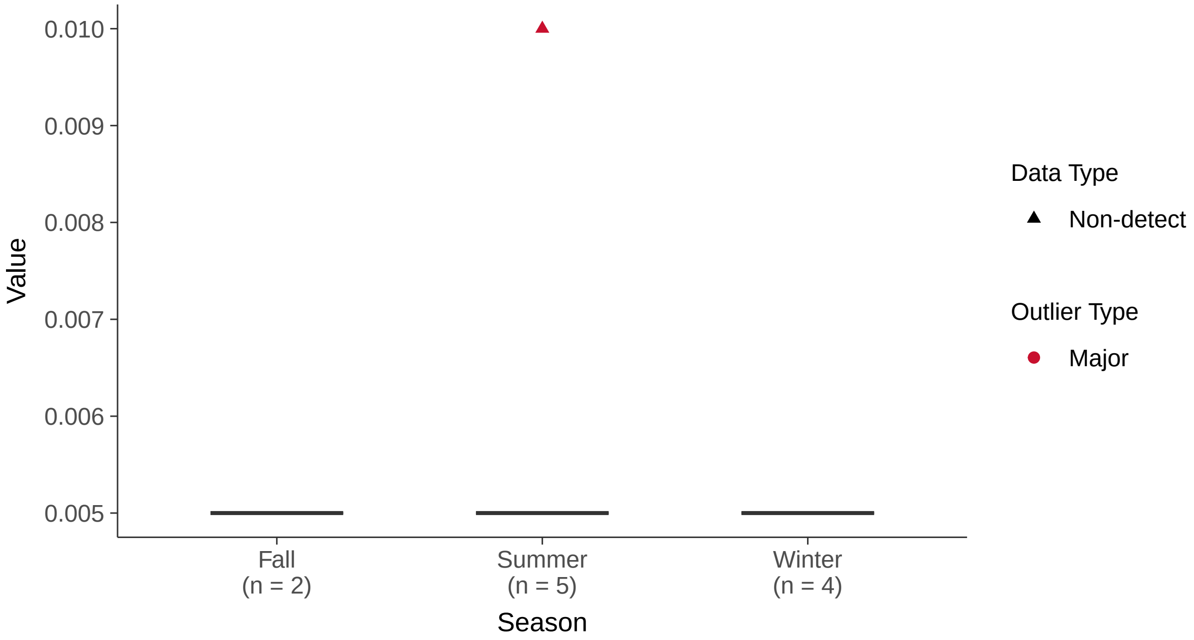
Boxplot

Lithium, MW-10 (mg/L)



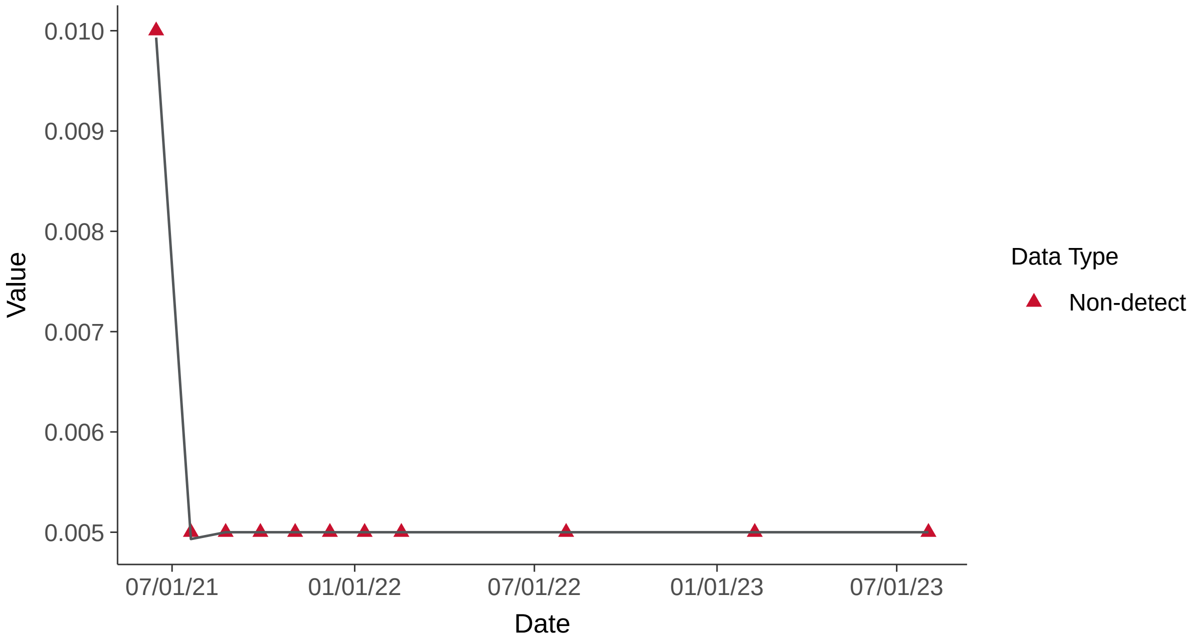
Boxplot by Season

Lithium, MW-10 (mg/L)



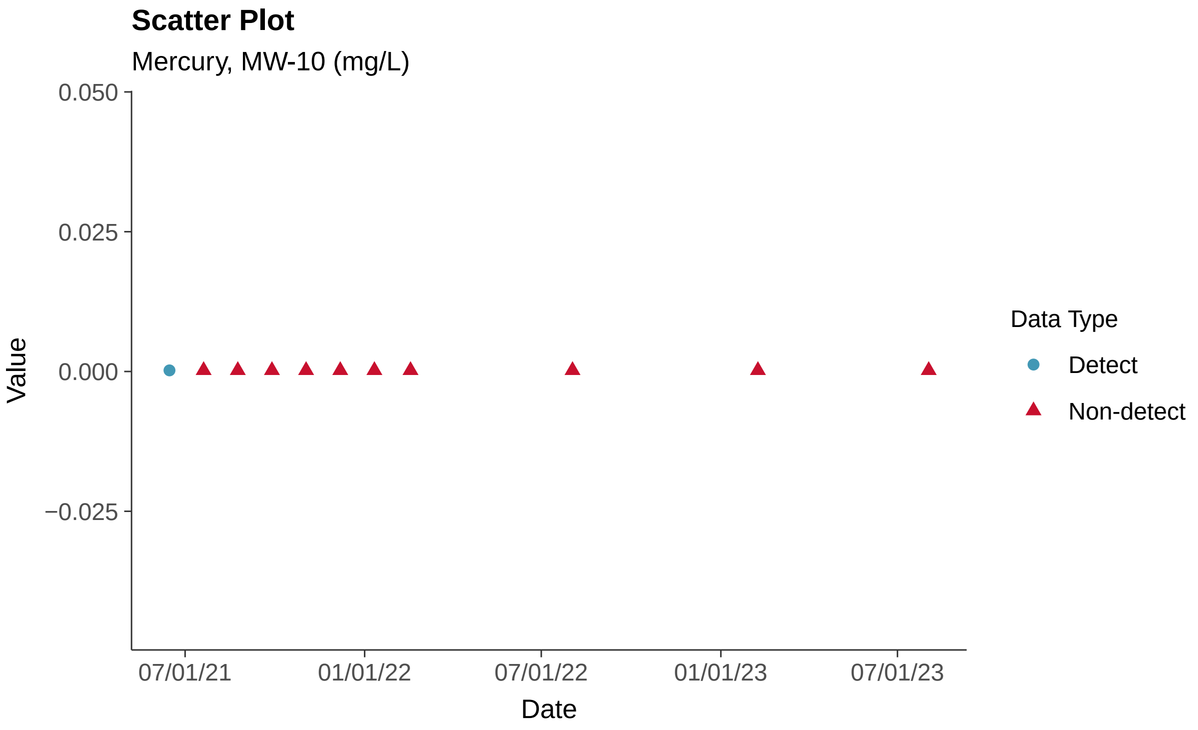
Trend Regression: Piecewise Linear-Linear

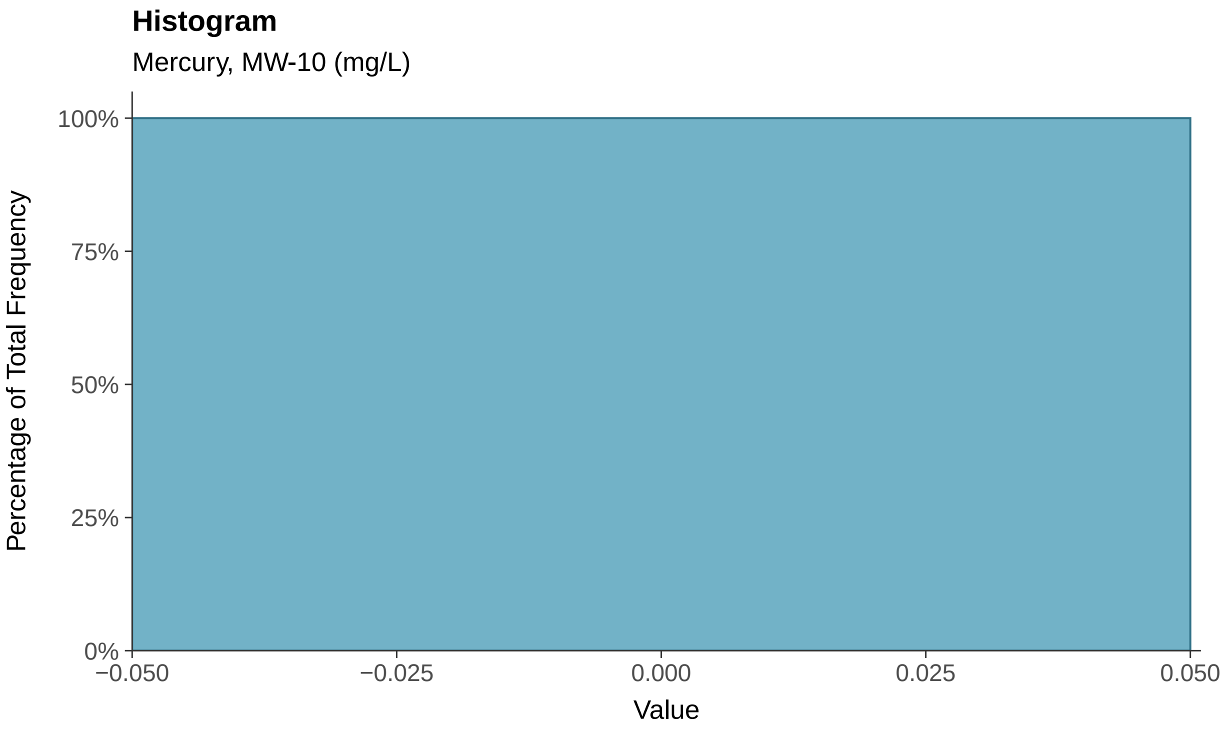
Lithium, MW-10 (mg/L)



Appendix IV: Mercury, MW-10

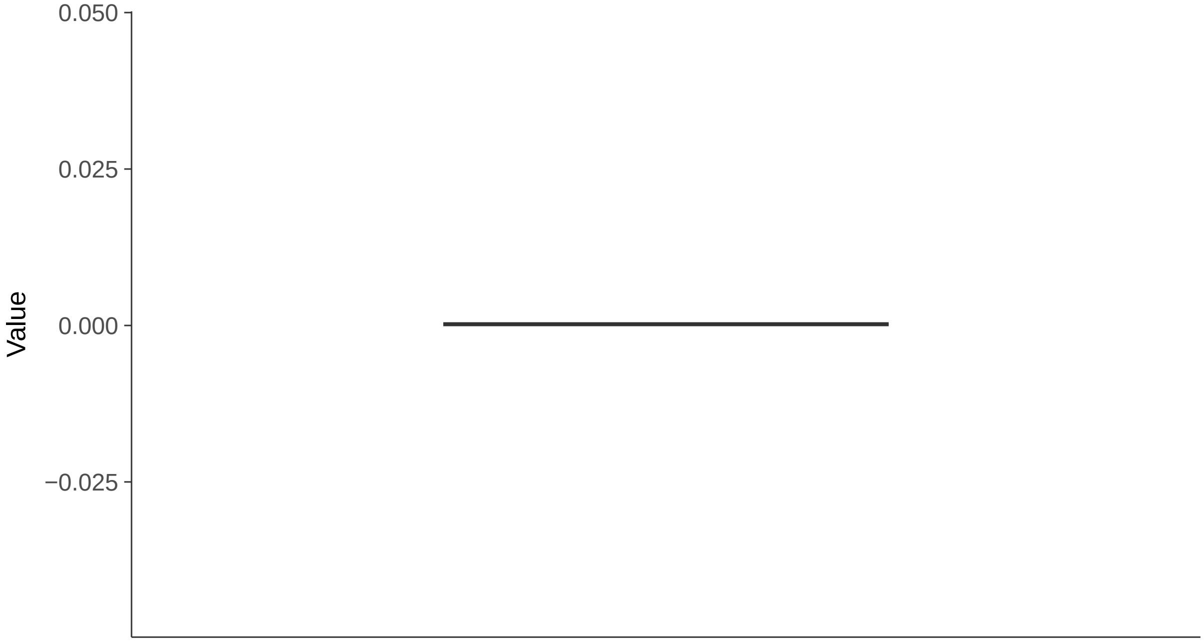
ID: 10_2_17





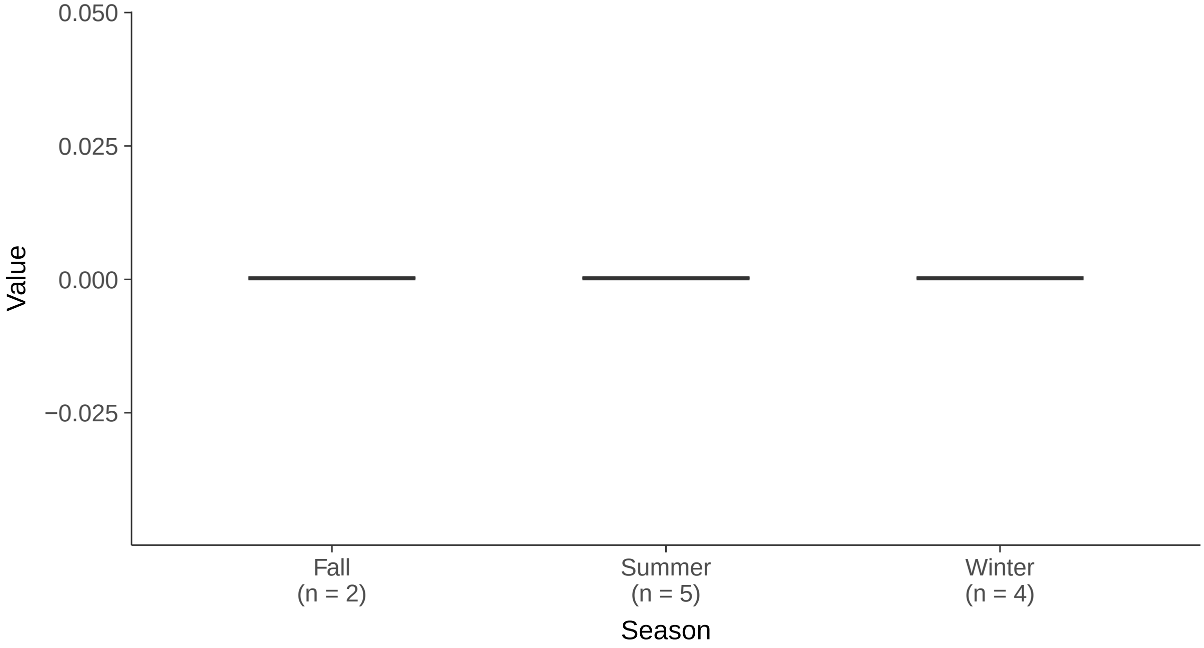
Boxplot

Mercury, MW-10 (mg/L)



Boxplot by Season

Mercury, MW-10 (mg/L)

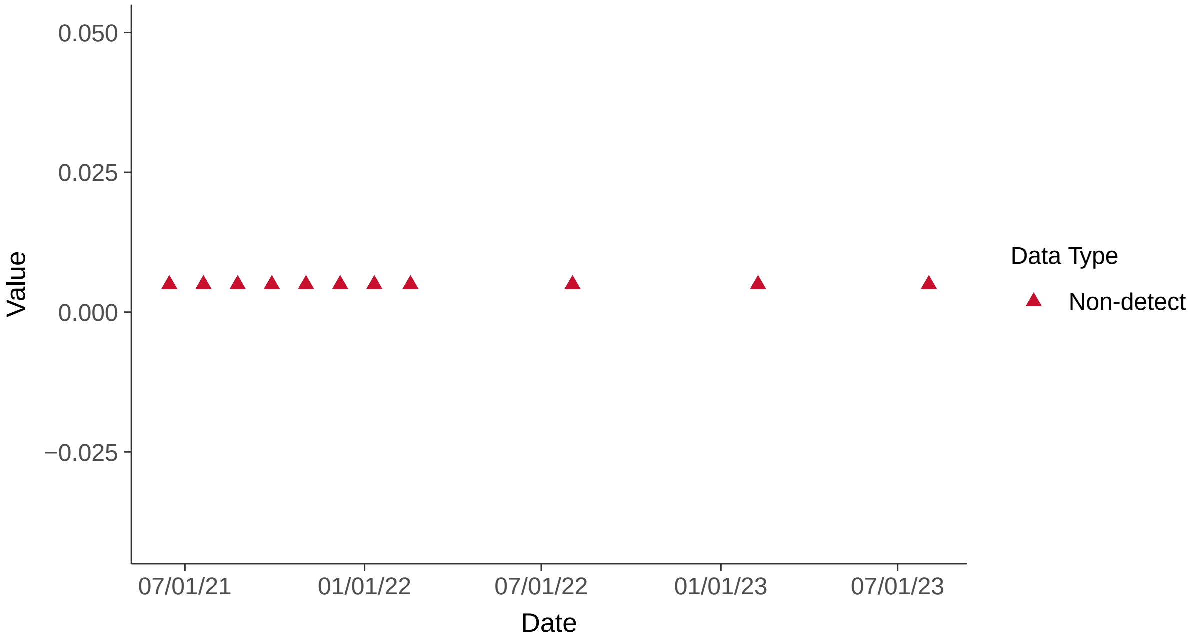


Appendix IV: Molybdenum, MW-10

ID: 10_2_18

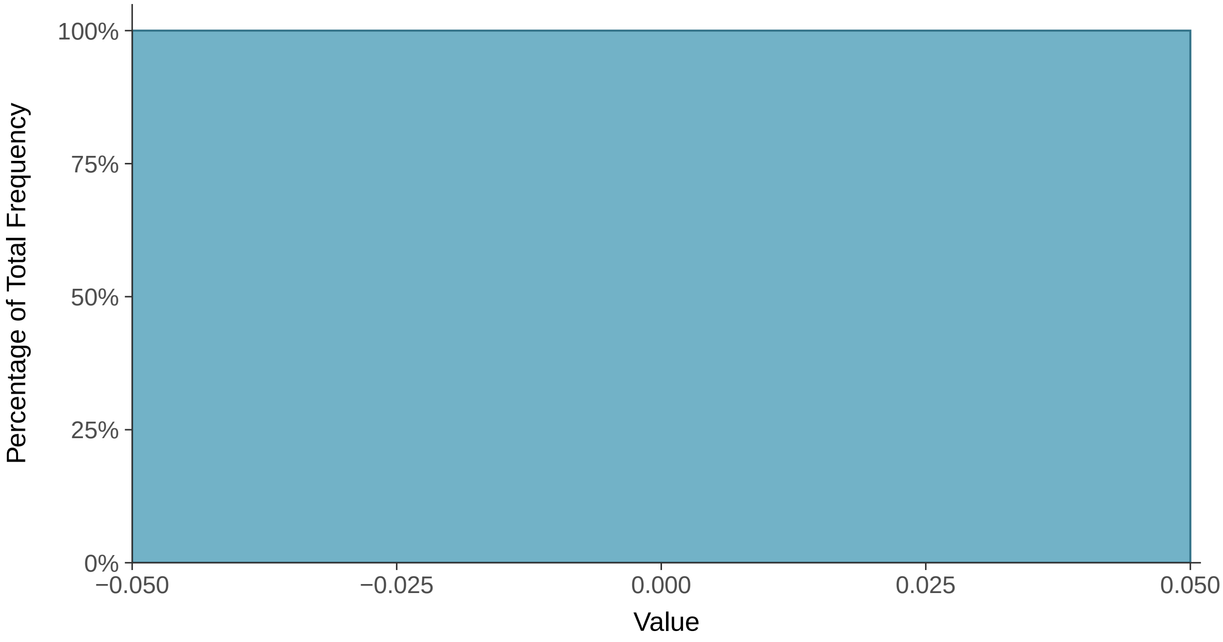
Scatter Plot

Molybdenum, MW-10 (mg/L)



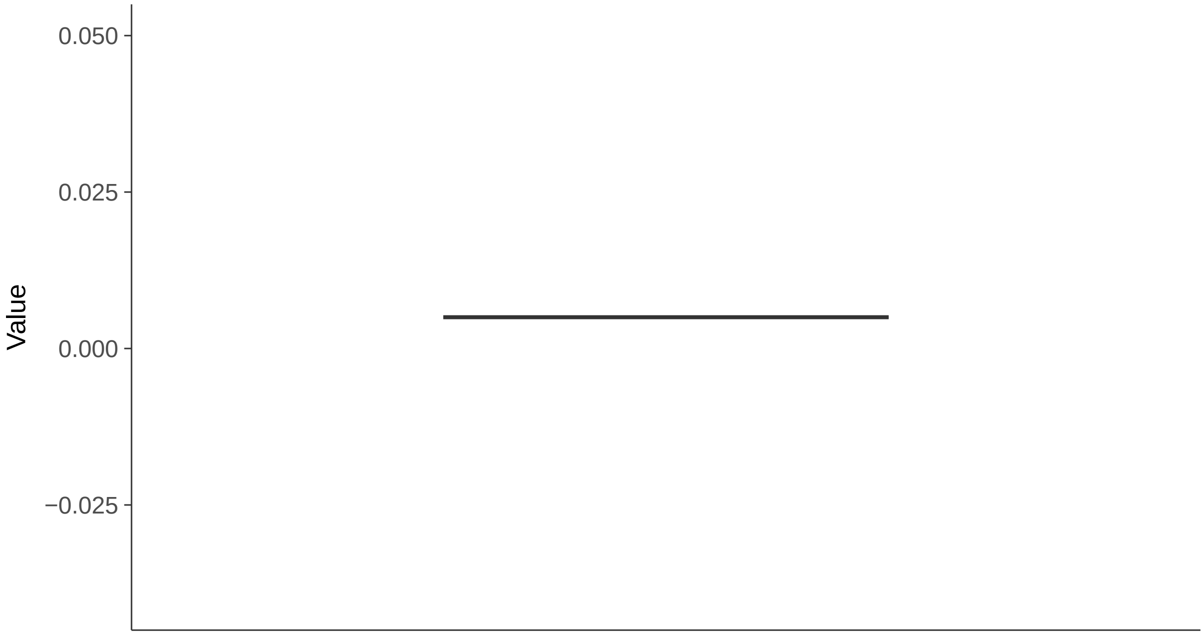
Histogram

Molybdenum, MW-10 (mg/L)



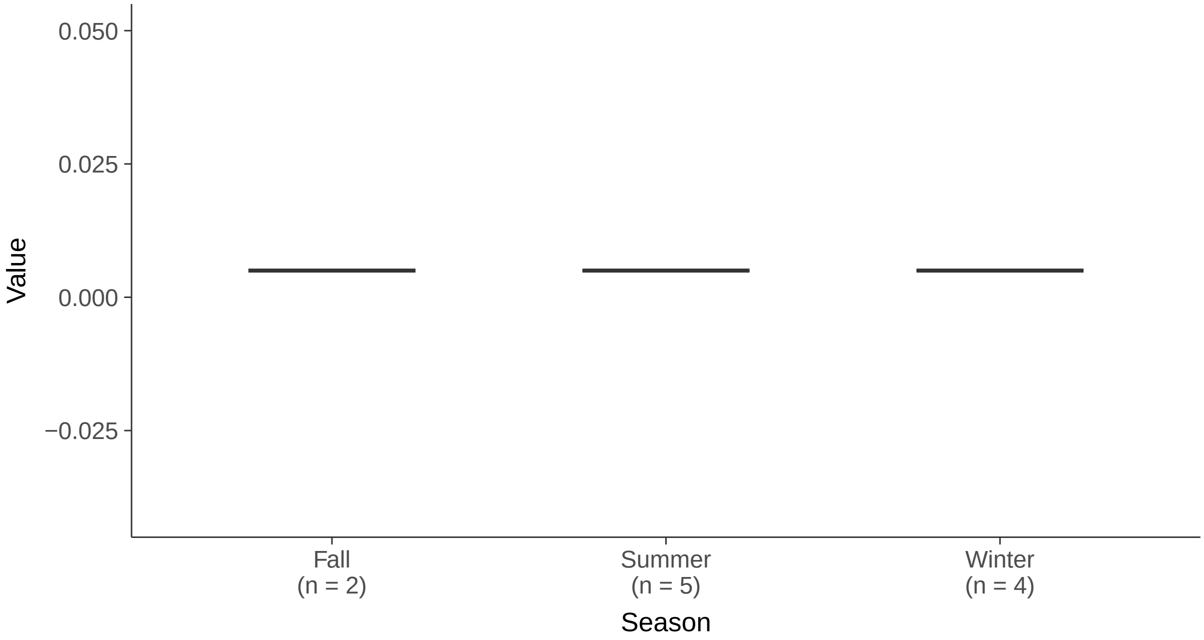
Boxplot

Molybdenum, MW-10 (mg/L)



Boxplot by Season

Molybdenum, MW-10 (mg/L)

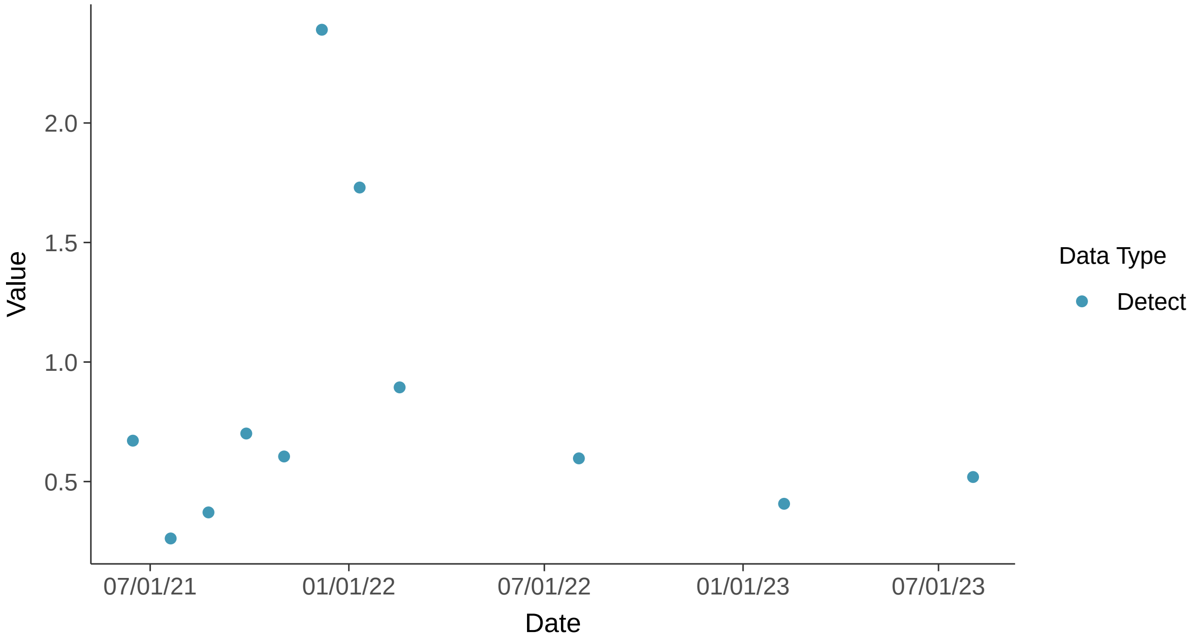


Appendix IV: Radium-226/228, MW-10

ID: 10_2_20

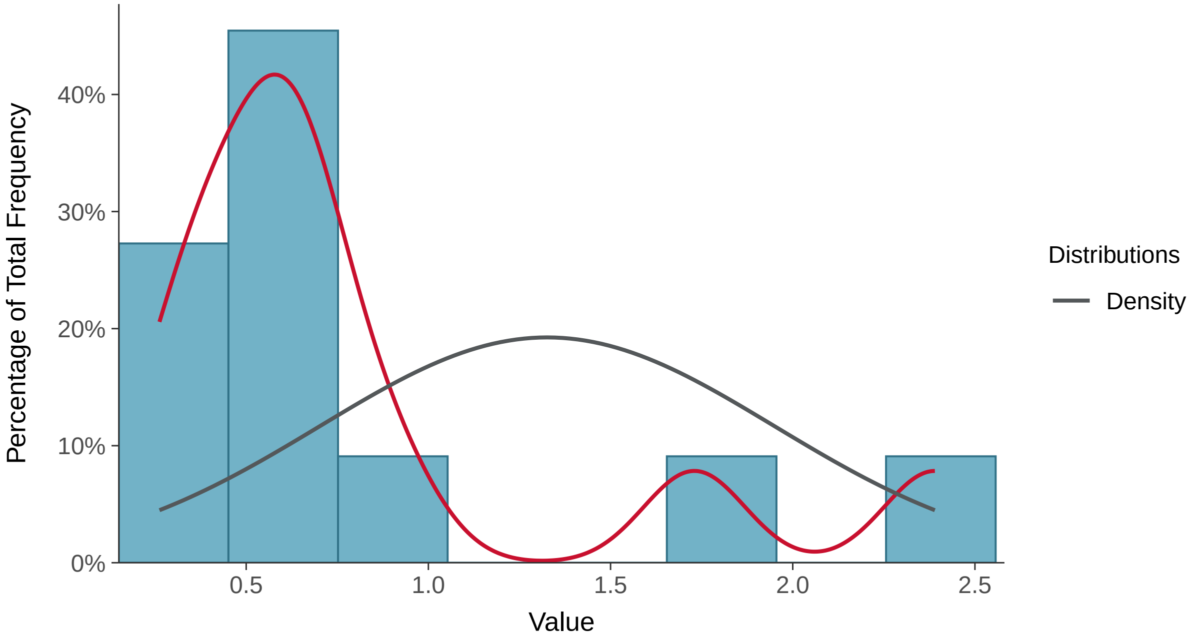
Scatter Plot

Radium-226/228, MW-10 (pCi/L)



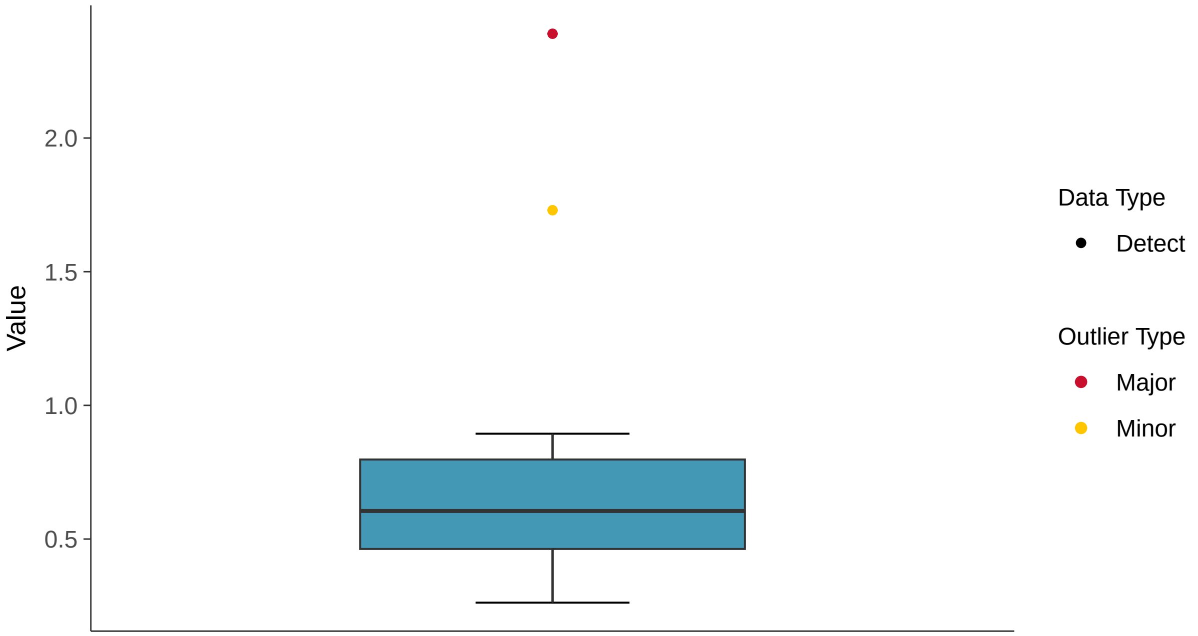
Histogram

Radium-226/228, MW-10 (pCi/L)



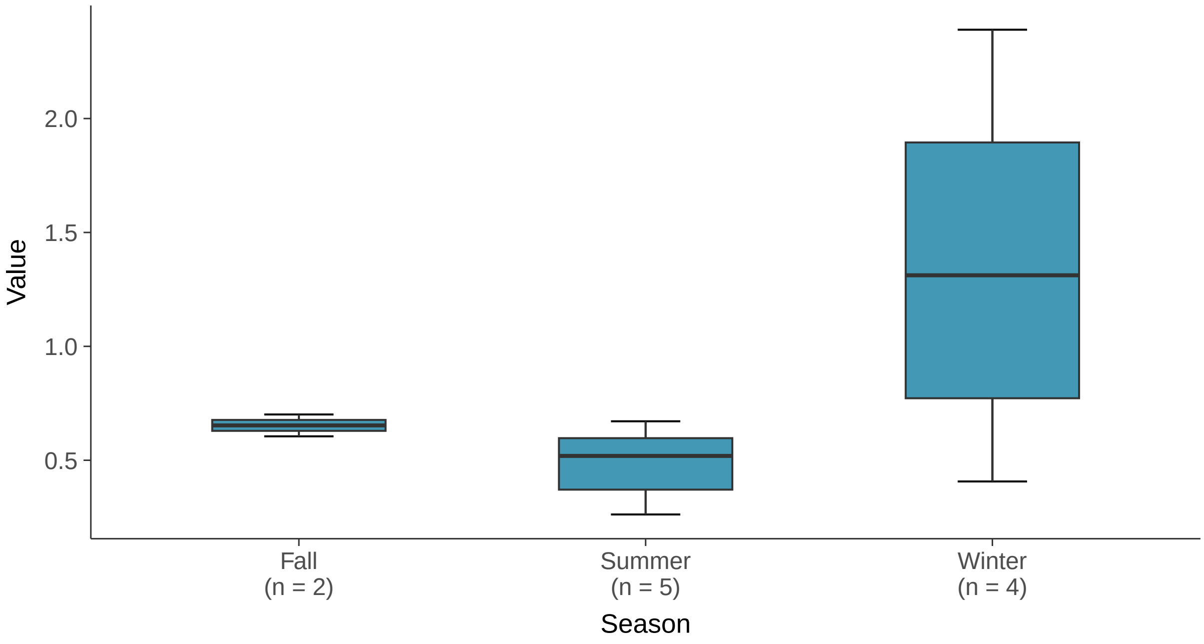
Boxplot

Radium-226/228, MW-10 (pCi/L)



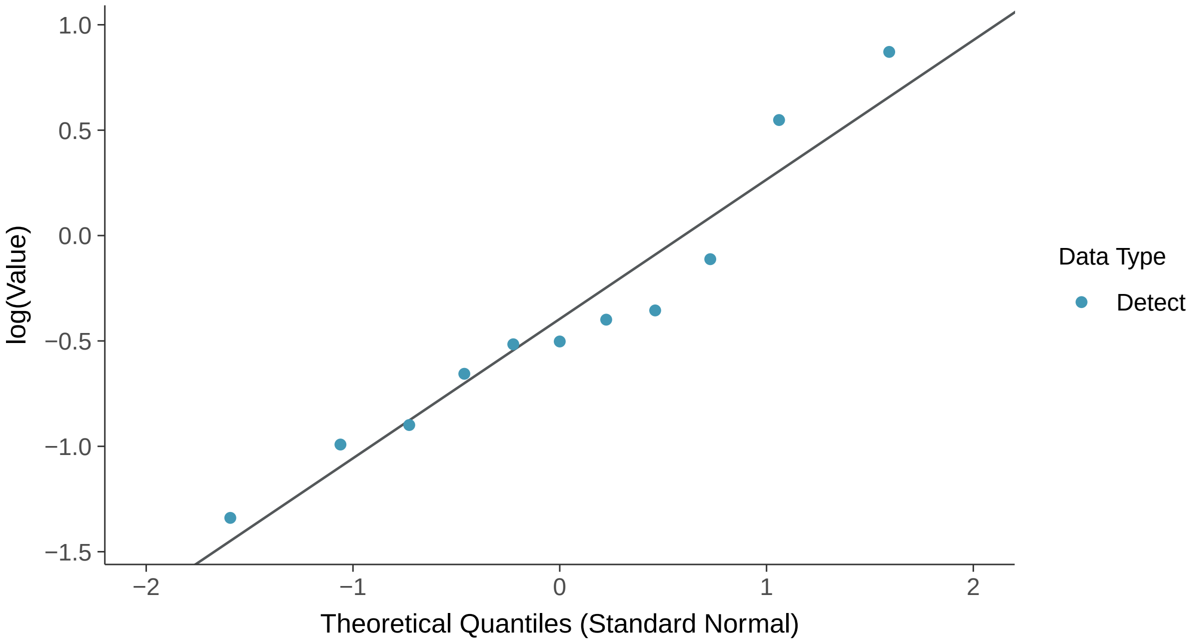
Boxplot by Season

Radium-226/228, MW-10 (pCi/L)



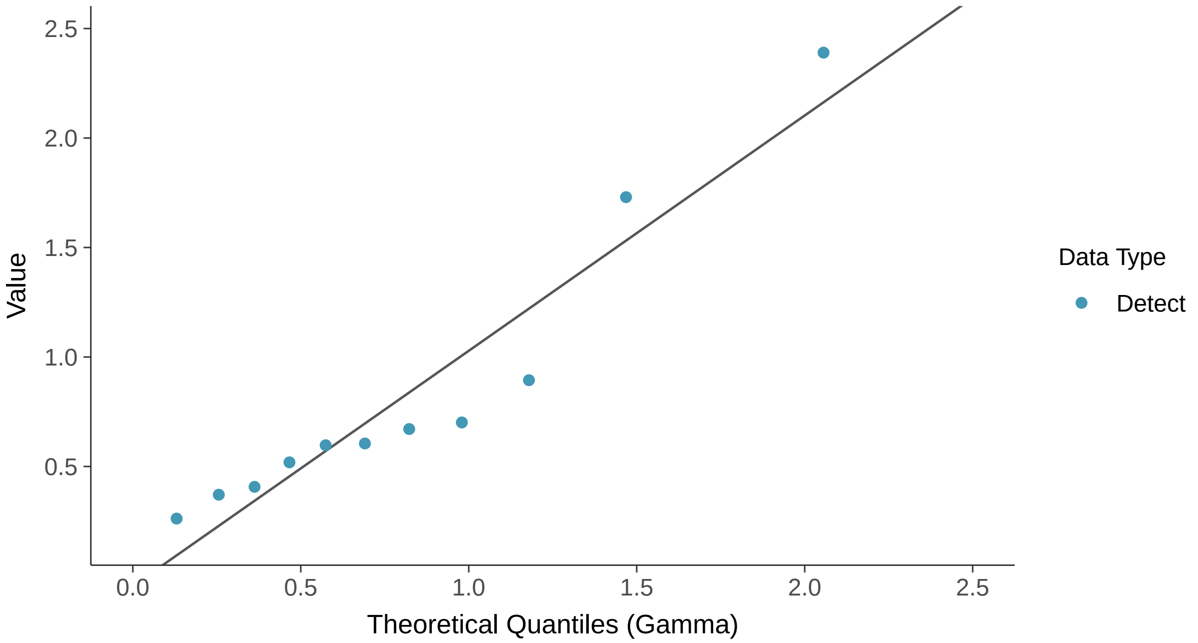
Lognormal Q-Q plot

Radium-226/228, MW-10 (pCi/L)



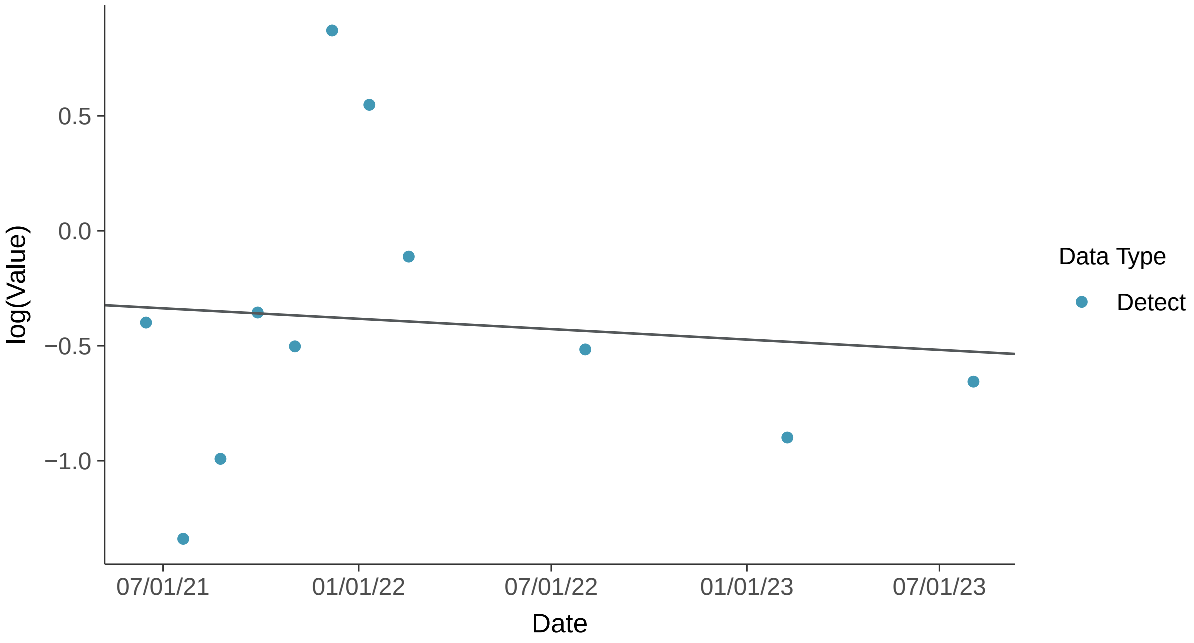
Gamma Q-Q plot

Radium-226/228, MW-10 (pCi/L)



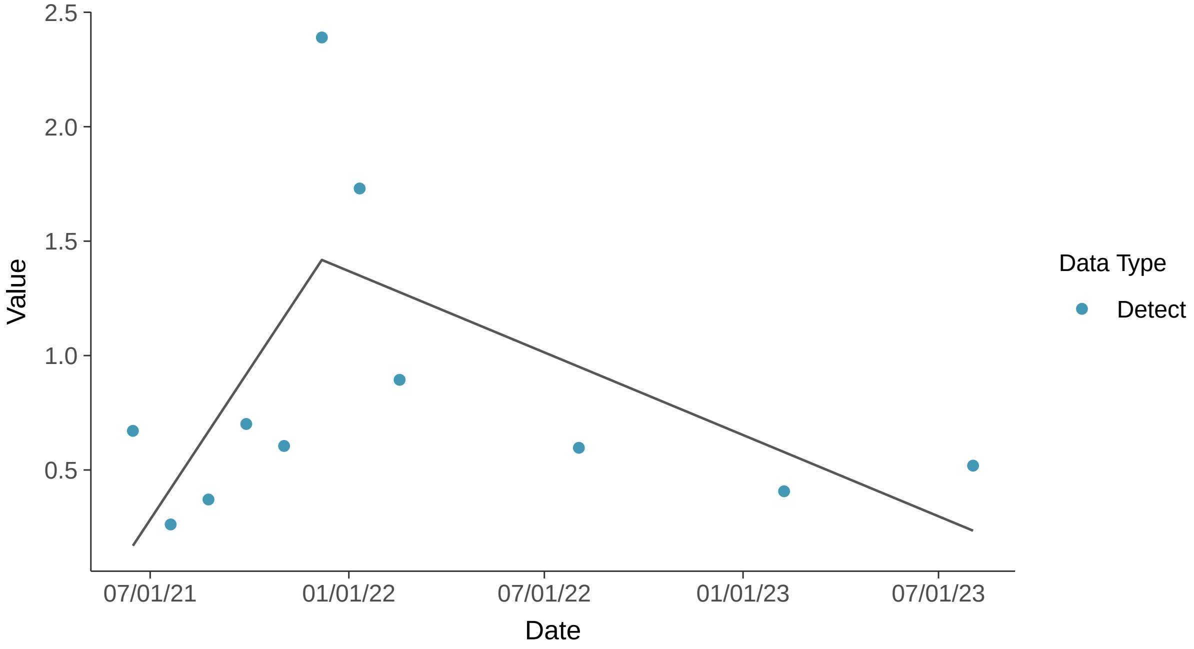
Trend Regression: Lognormal MLE

Radium-226/228, MW-10 (pCi/L)



Trend Regression: Piecewise Linear-Linear

Radium-226/228, MW-10 (pCi/L)

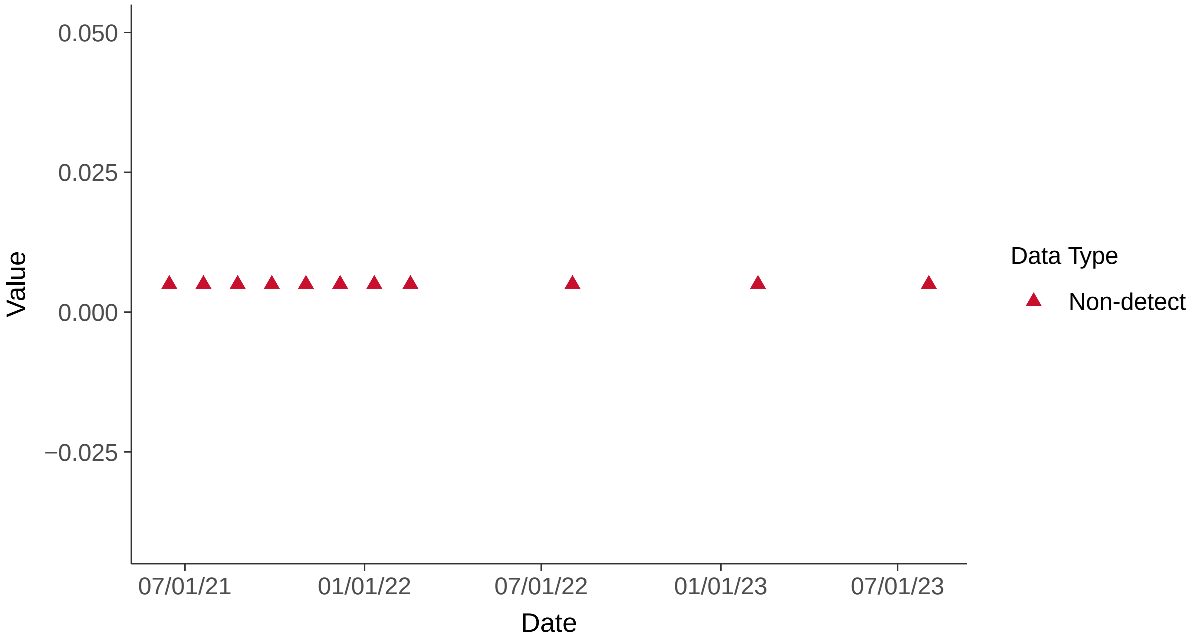


Appendix IV: Selenium, MW-10

ID: 10_2_22

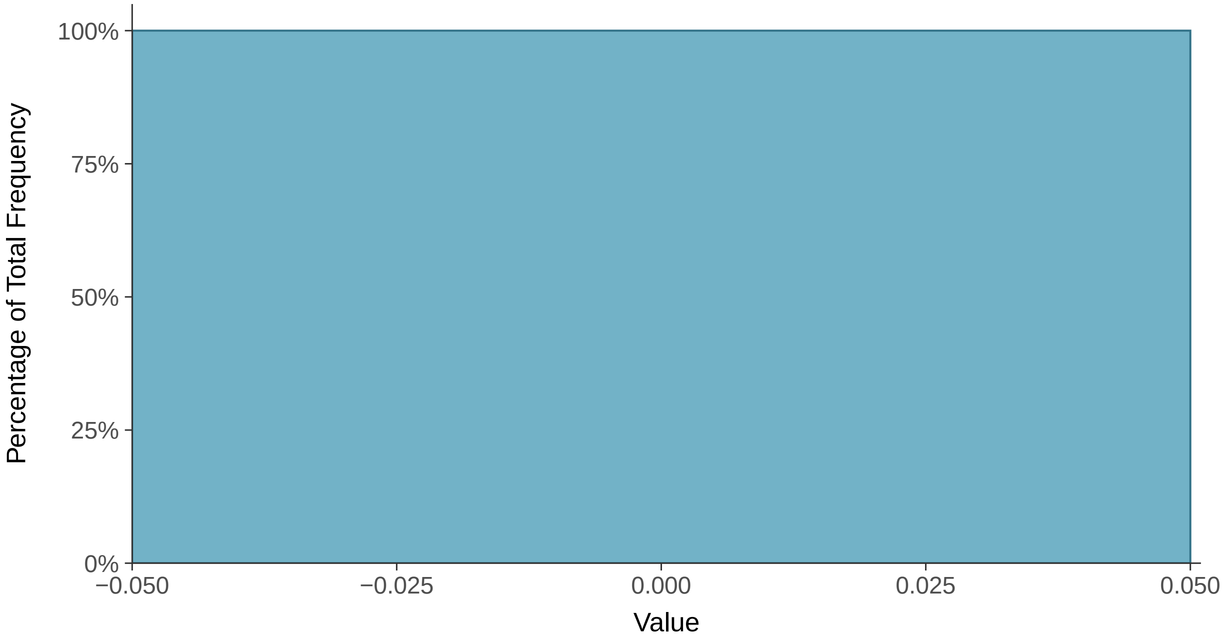
Scatter Plot

Selenium, MW-10 (mg/L)



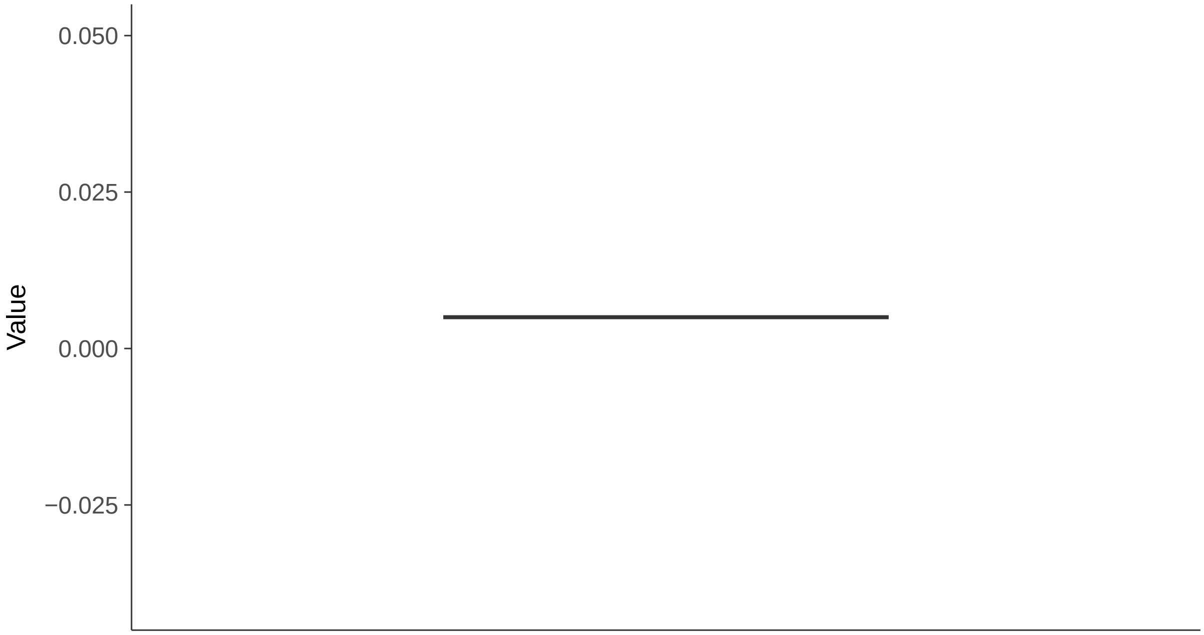
Histogram

Selenium, MW-10 (mg/L)



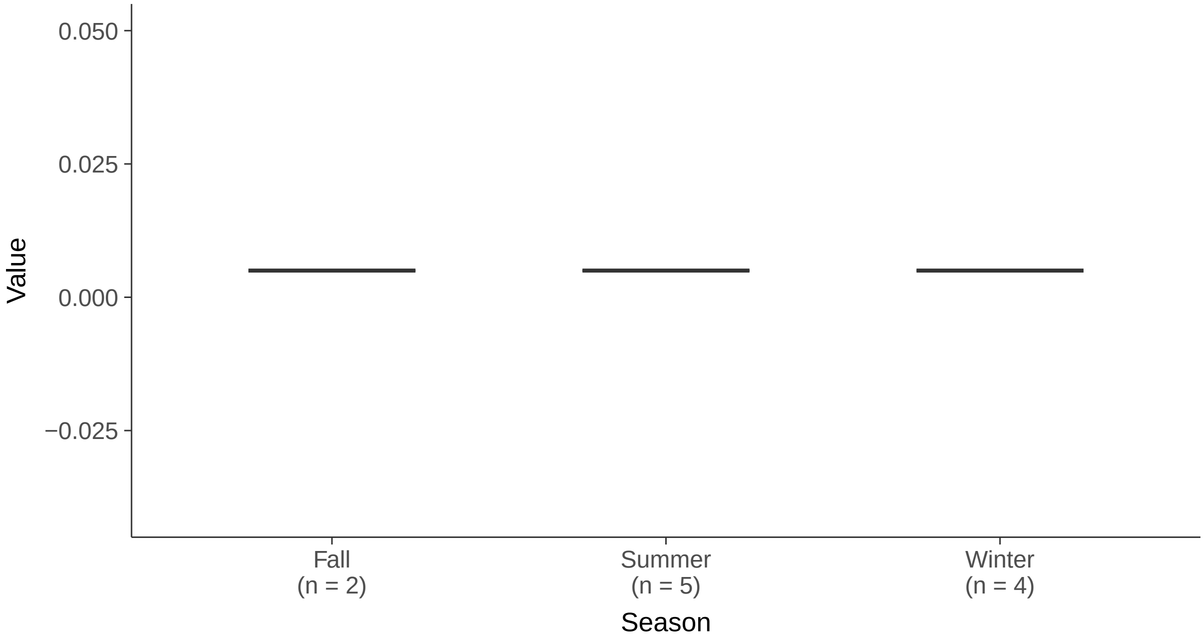
Boxplot

Selenium, MW-10 (mg/L)



Boxplot by Season

Selenium, MW-10 (mg/L)

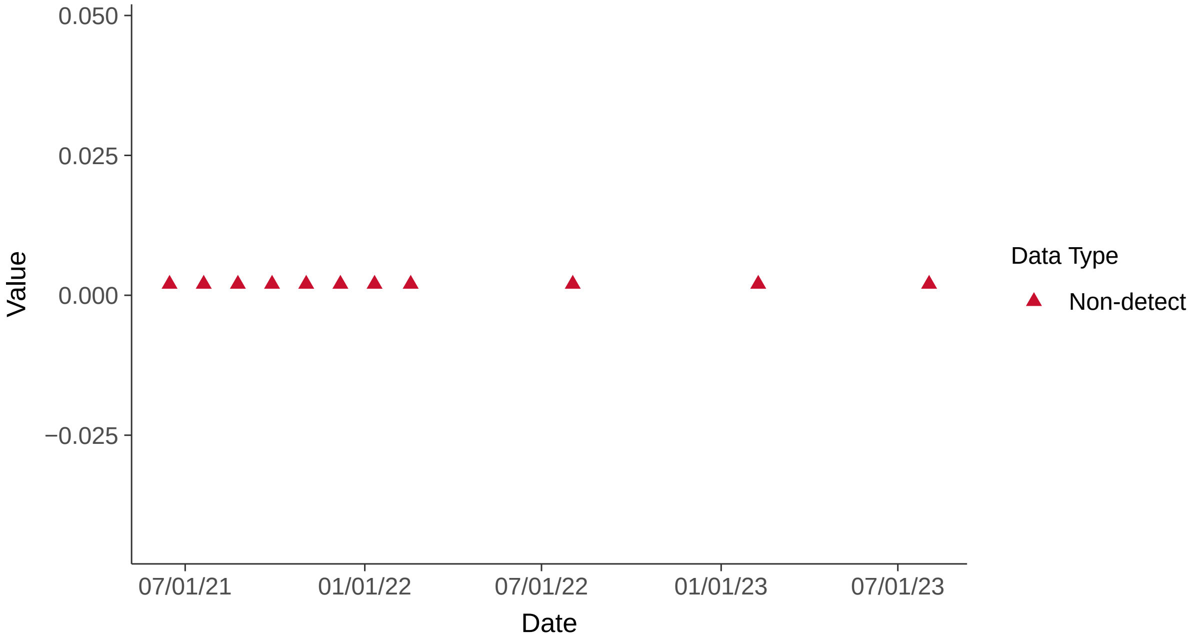


Appendix IV: Thallium, MW-10

ID: 10_2_23

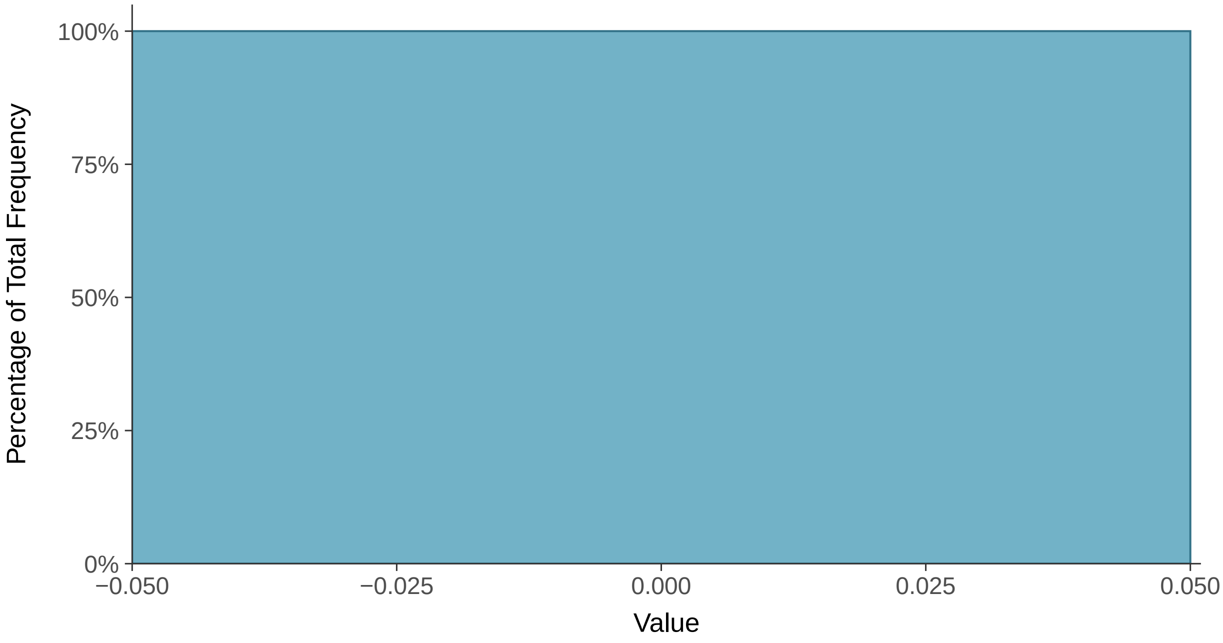
Scatter Plot

Thallium, MW-10 (mg/L)



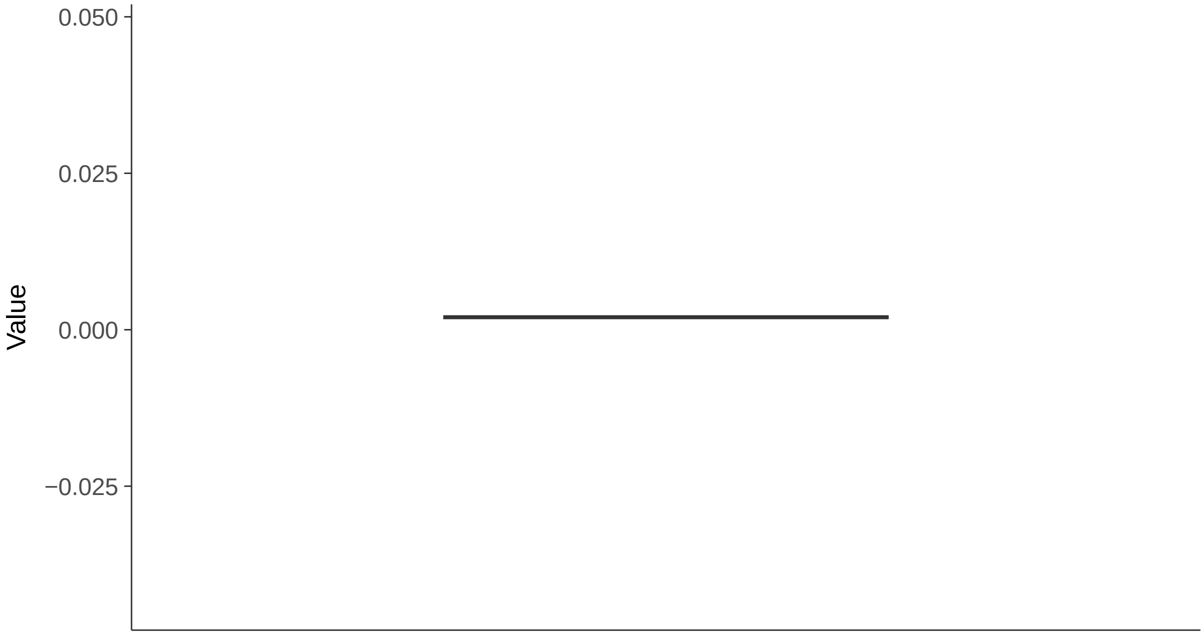
Histogram

Thallium, MW-10 (mg/L)



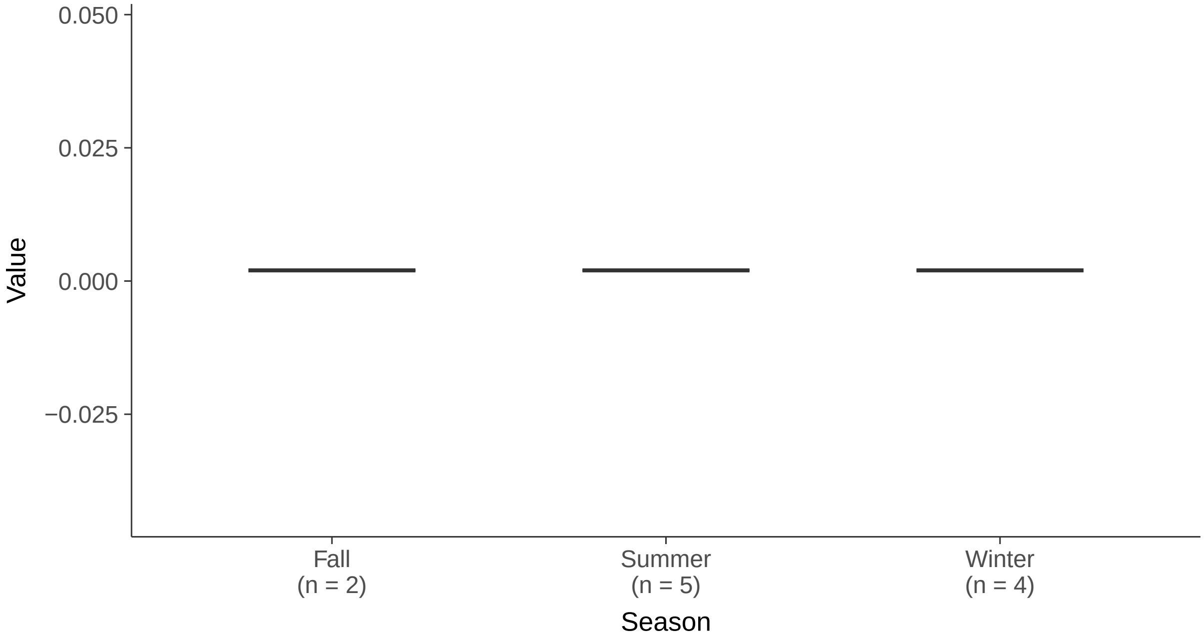
Boxplot

Thallium, MW-10 (mg/L)



Boxplot by Season

Thallium, MW-10 (mg/L)

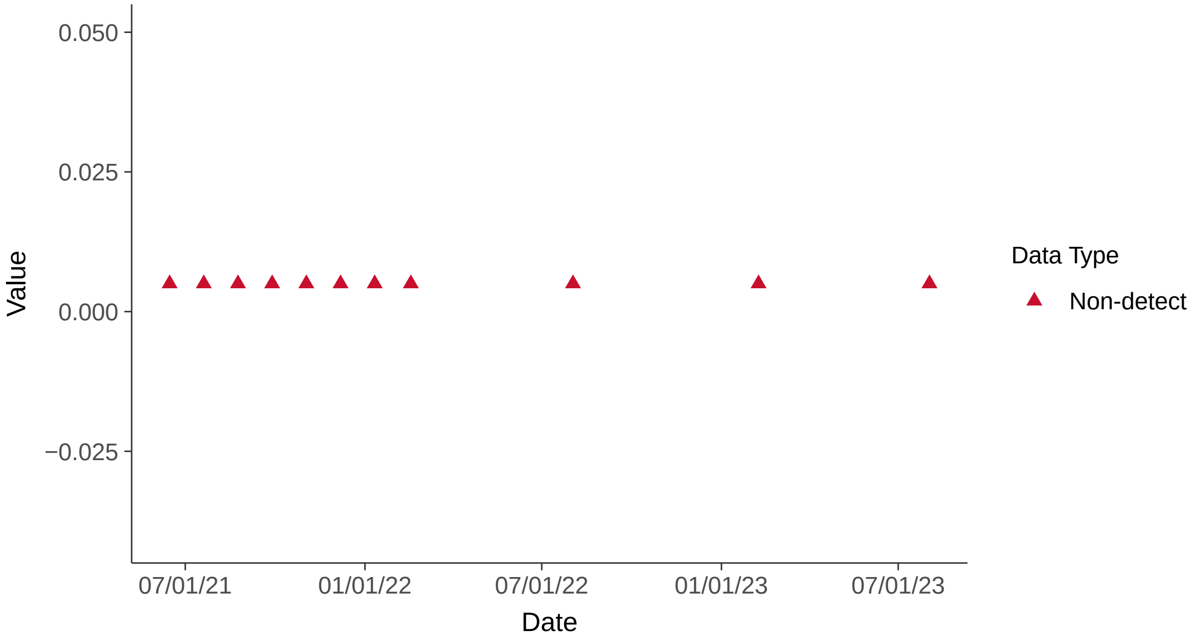


Part 115: Copper, MW-10

ID: 10_5_37

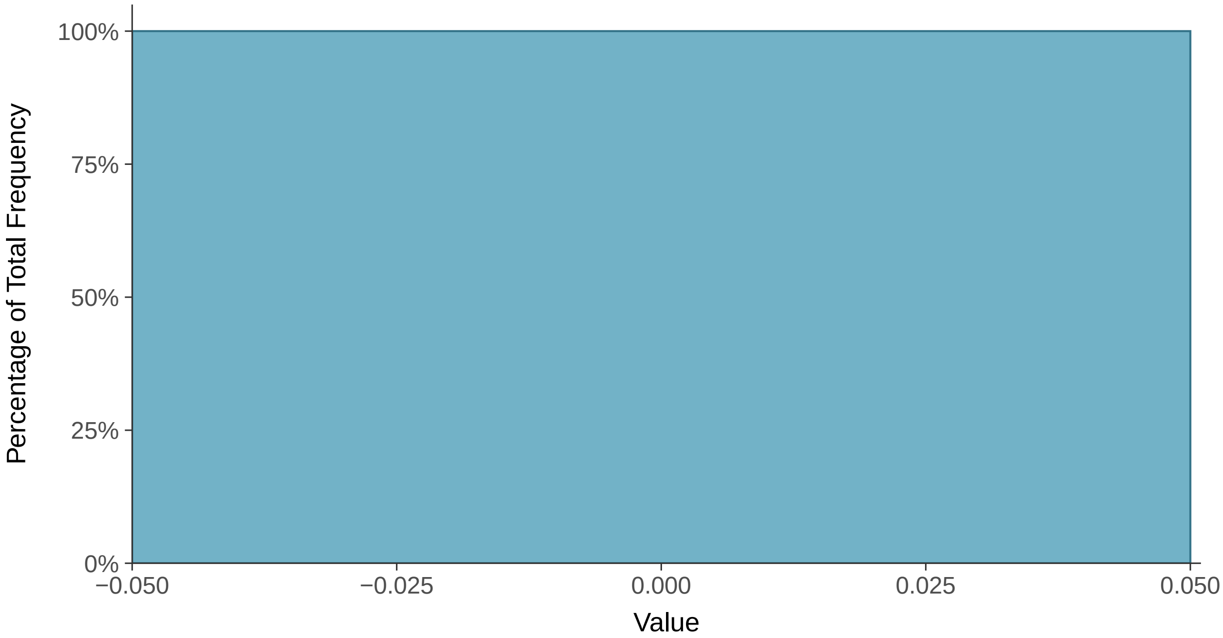
Scatter Plot

Copper, MW-10 (mg/L)



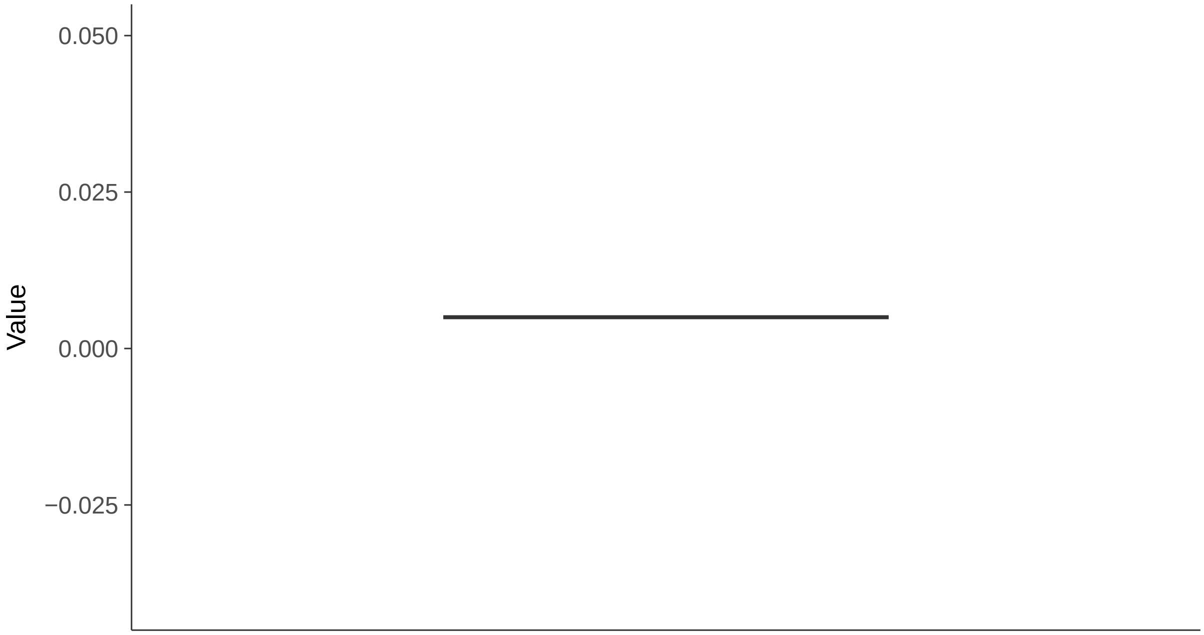
Histogram

Copper, MW-10 (mg/L)



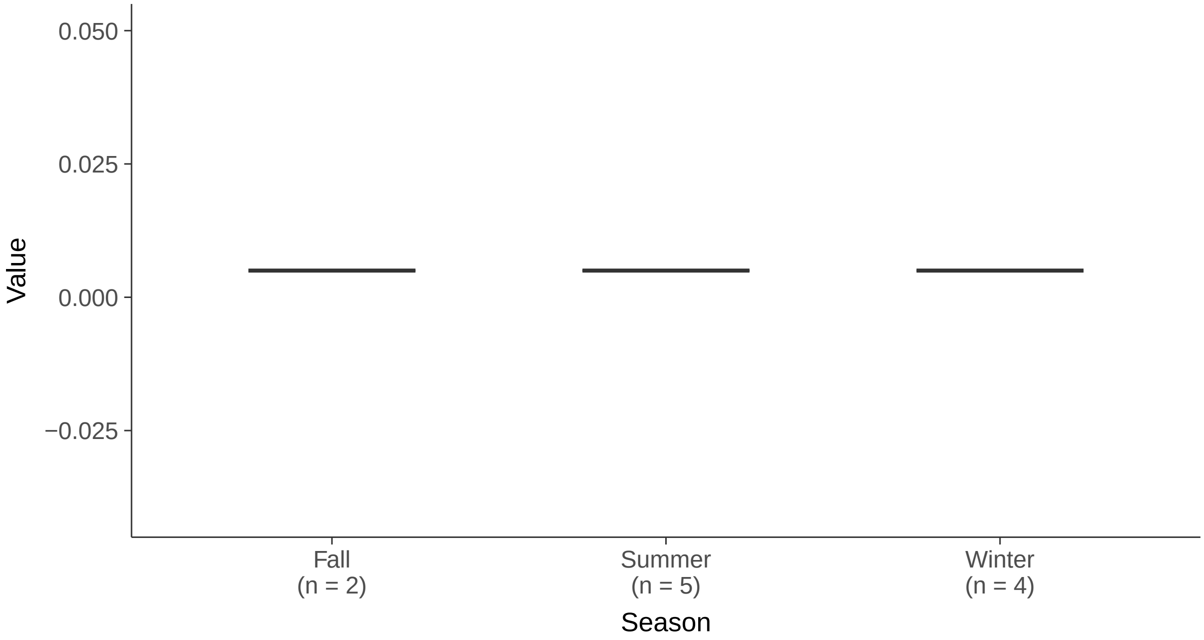
Boxplot

Copper, MW-10 (mg/L)



Boxplot by Season

Copper, MW-10 (mg/L)

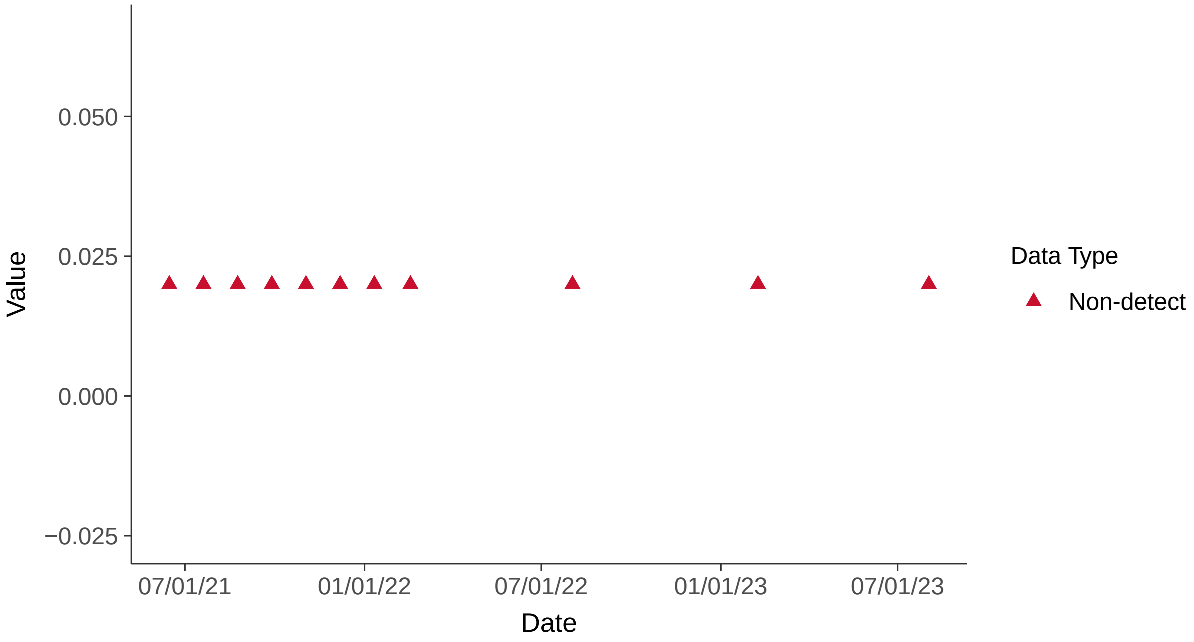


Part 115: Iron, MW-10

ID: 10_5_38

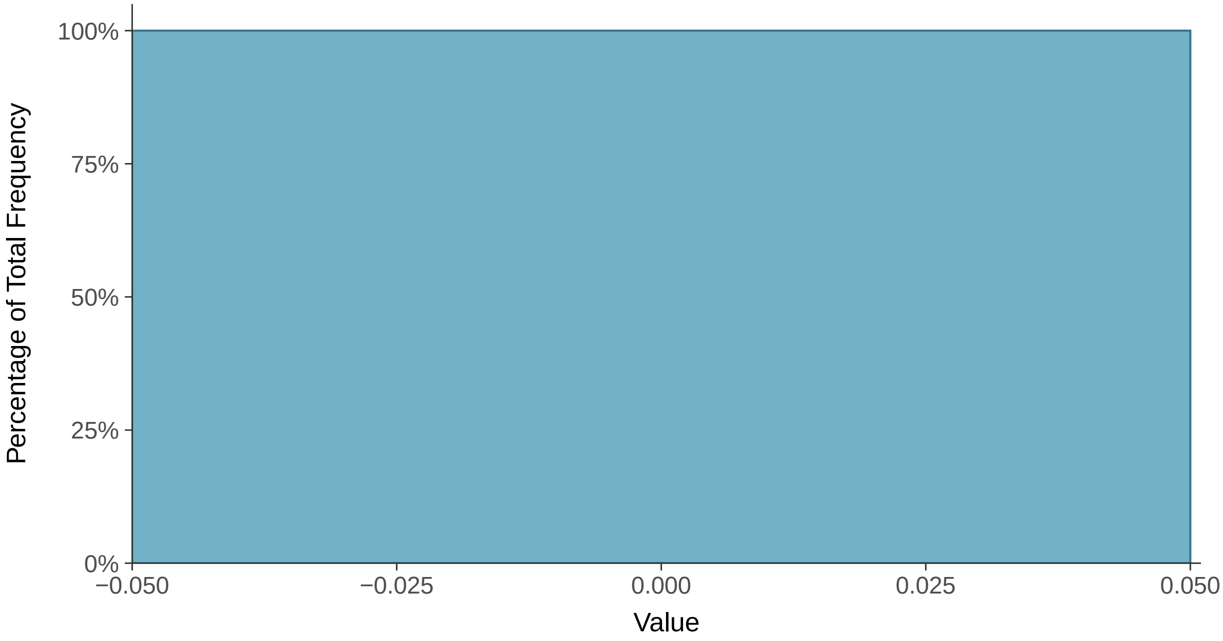
Scatter Plot

Iron, MW-10 (mg/L)



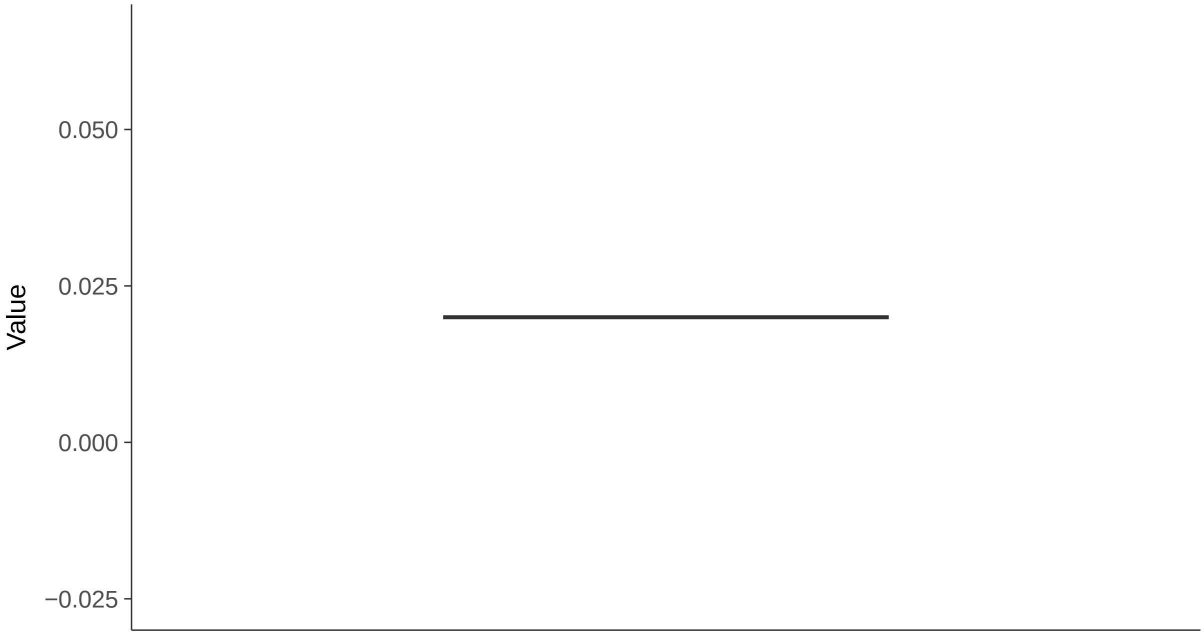
Histogram

Iron, MW-10 (mg/L)



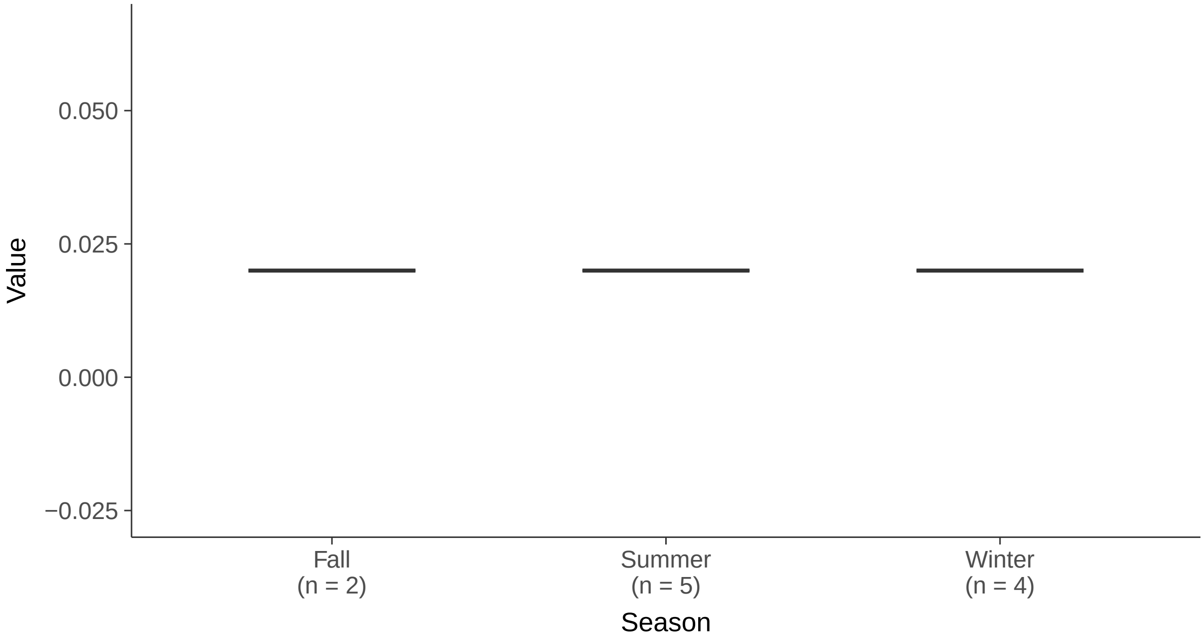
Boxplot

Iron, MW-10 (mg/L)



Boxplot by Season

Iron, MW-10 (mg/L)

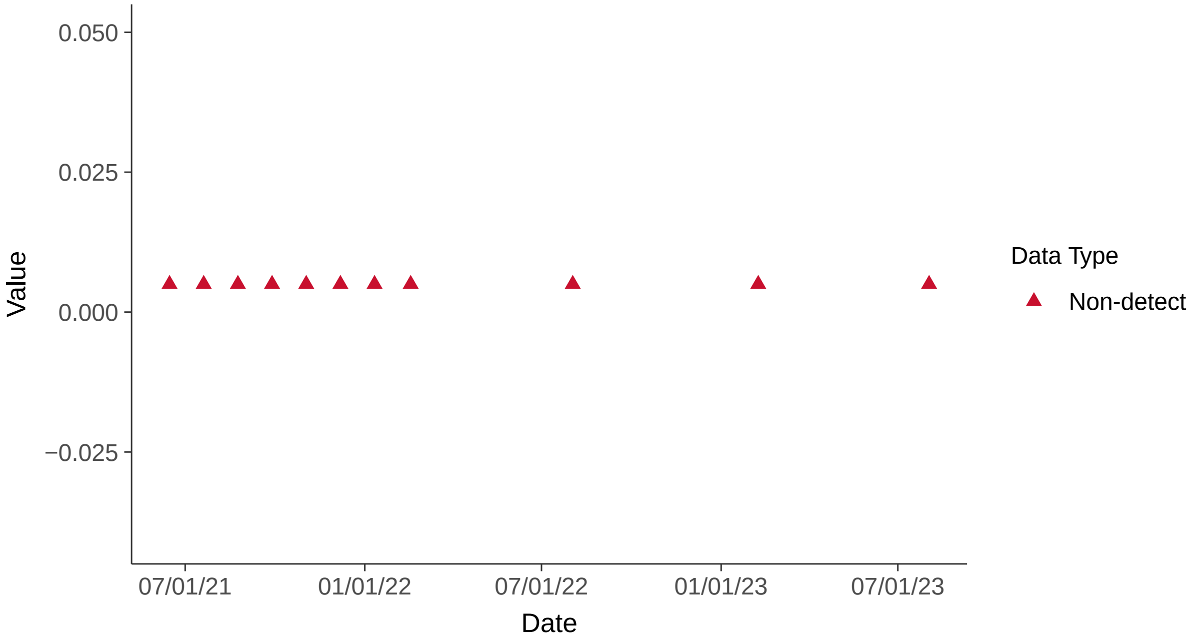


Part 115: Nickel, MW-10

ID: 10_5_39

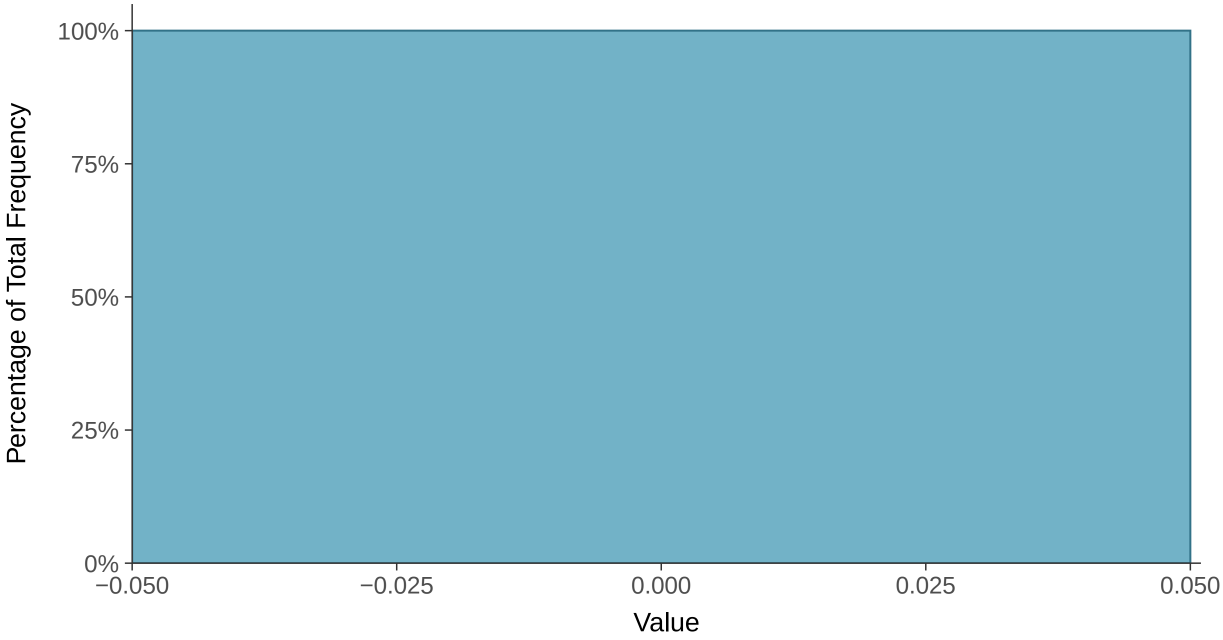
Scatter Plot

Nickel, MW-10 (mg/L)



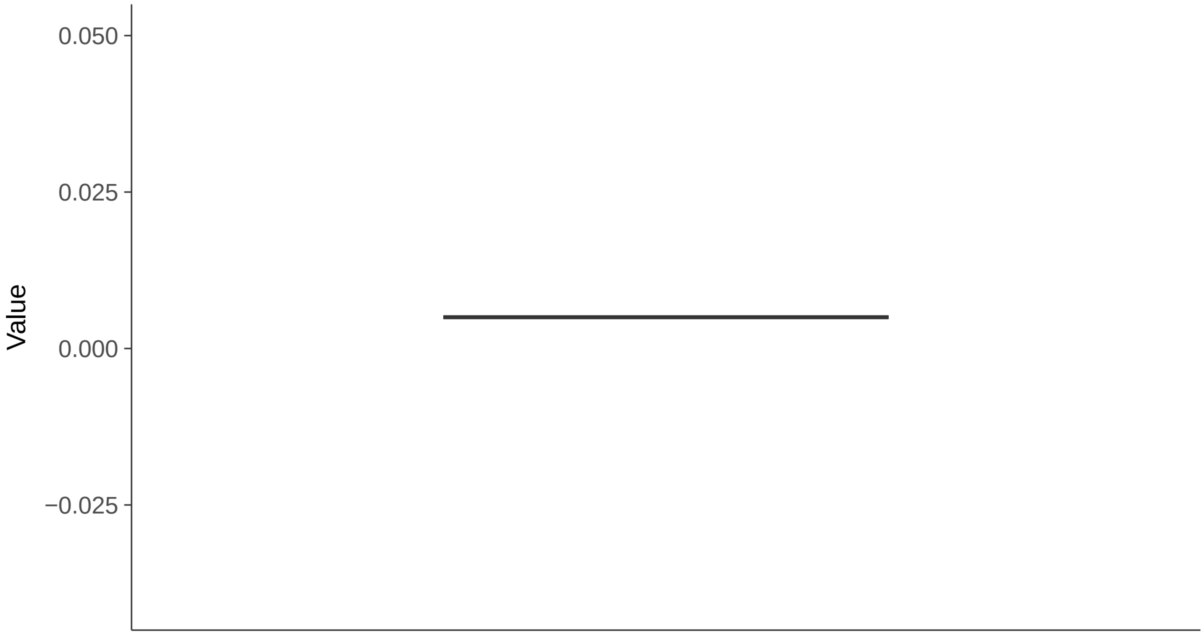
Histogram

Nickel, MW-10 (mg/L)



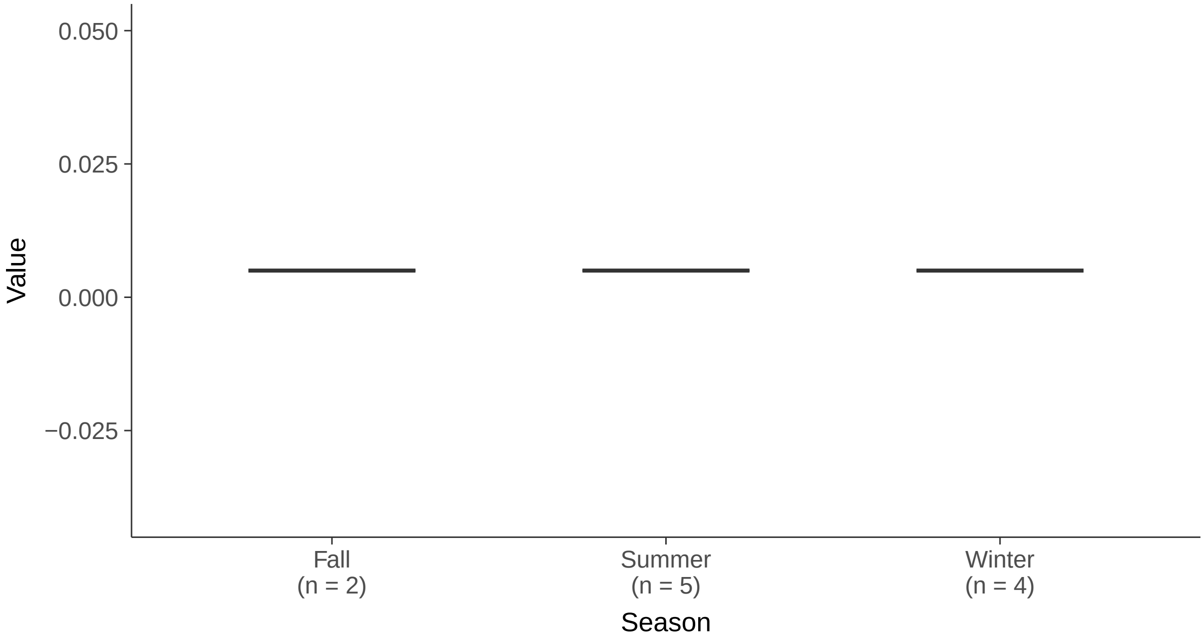
Boxplot

Nickel, MW-10 (mg/L)



Boxplot by Season

Nickel, MW-10 (mg/L)

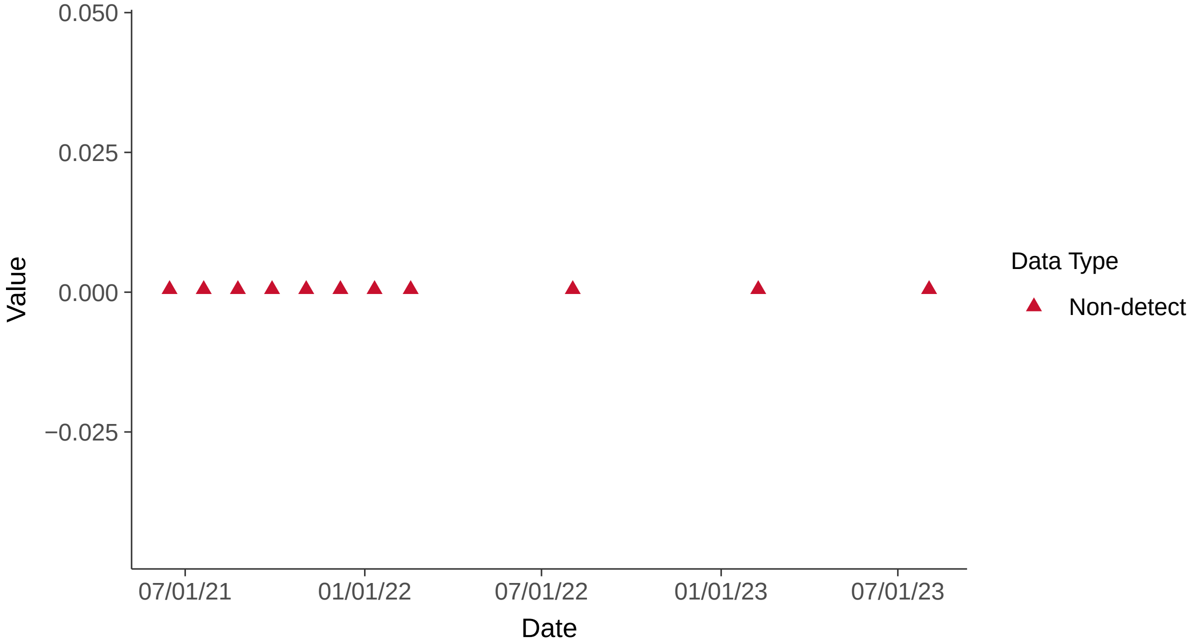


Part 115: Silver, MW-10

ID: 10_5_40

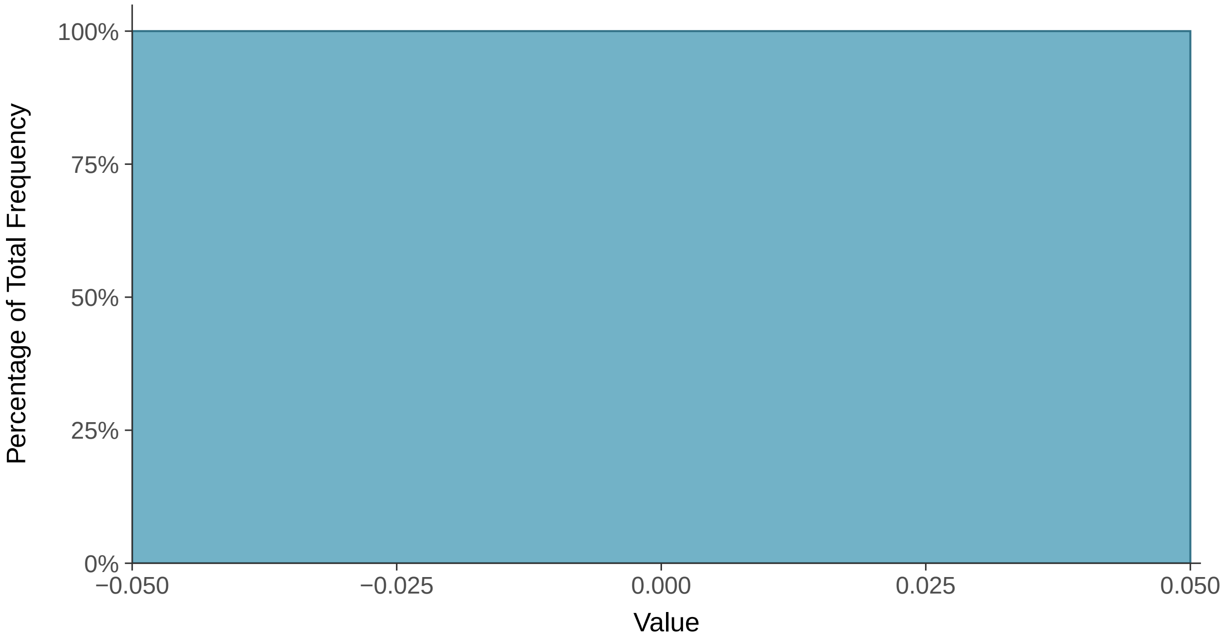
Scatter Plot

Silver, MW-10 (mg/L)



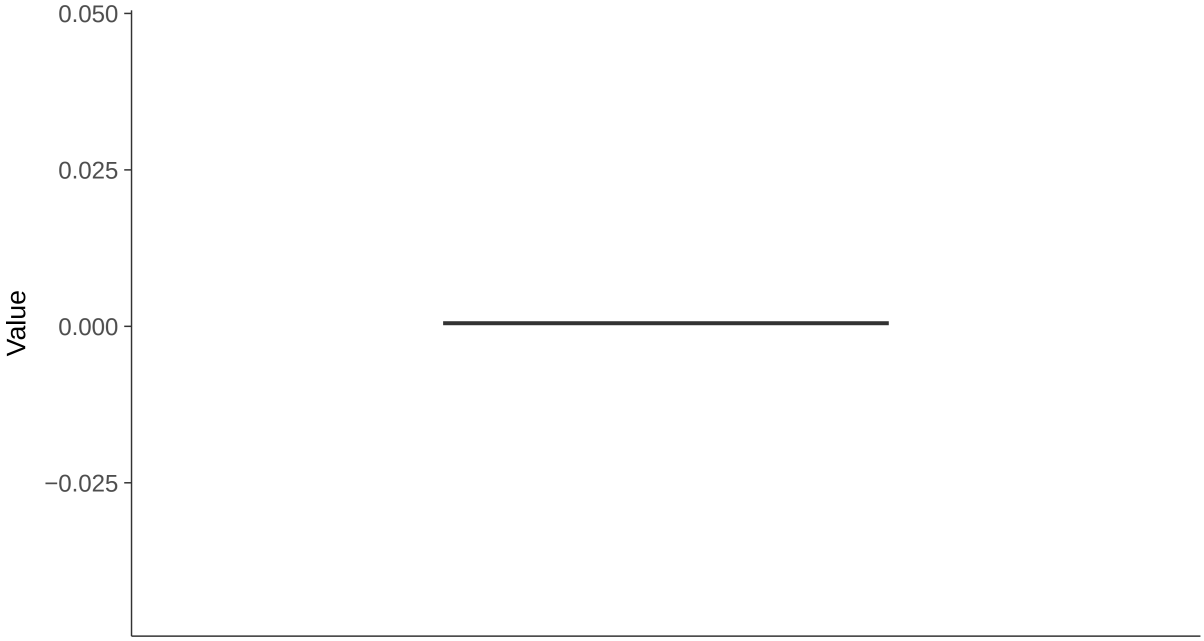
Histogram

Silver, MW-10 (mg/L)



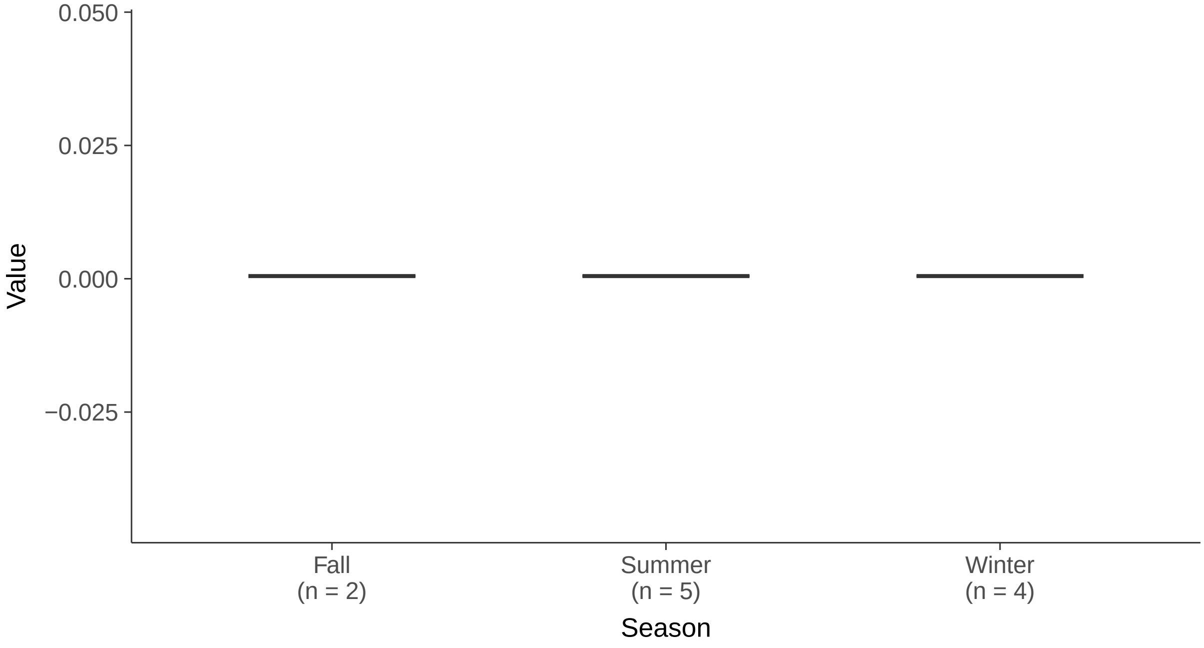
Boxplot

Silver, MW-10 (mg/L)



Boxplot by Season

Silver, MW-10 (mg/L)

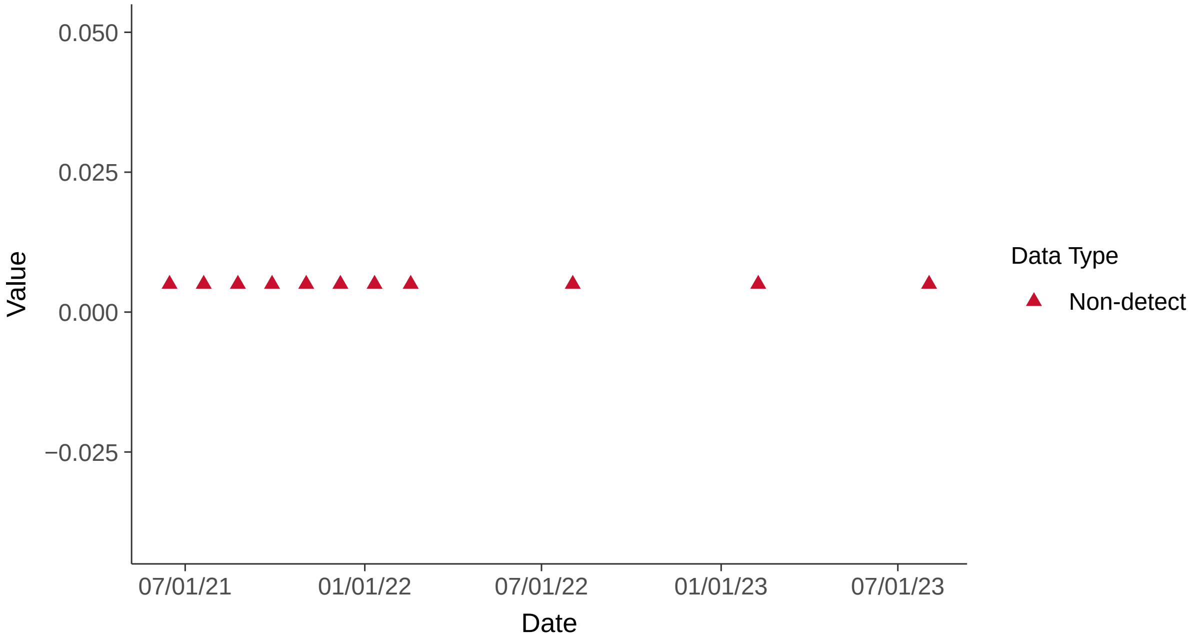


Part 115: Vanadium, MW-10

ID: 10_5_41

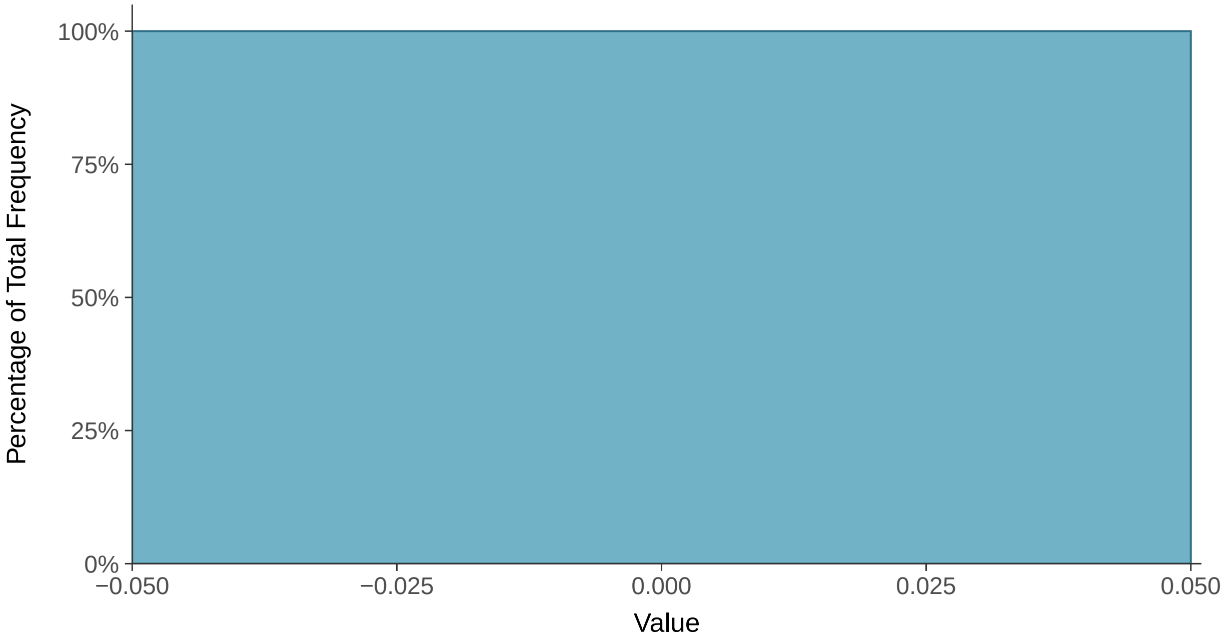
Scatter Plot

Vanadium, MW-10 (mg/L)



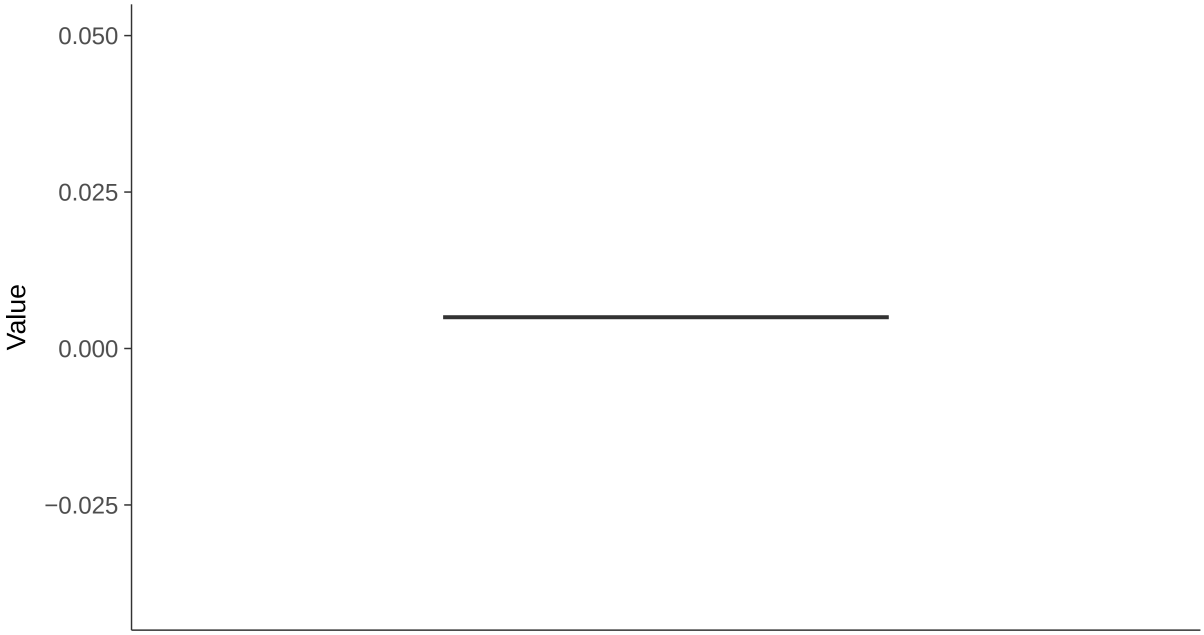
Histogram

Vanadium, MW-10 (mg/L)



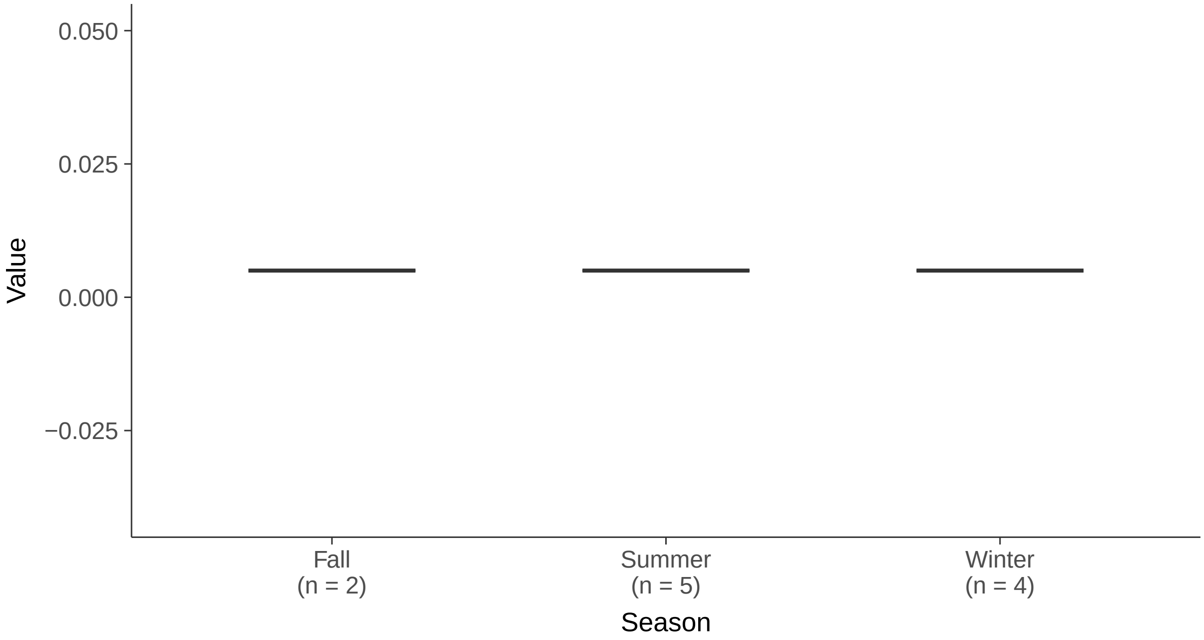
Boxplot

Vanadium, MW-10 (mg/L)



Boxplot by Season

Vanadium, MW-10 (mg/L)

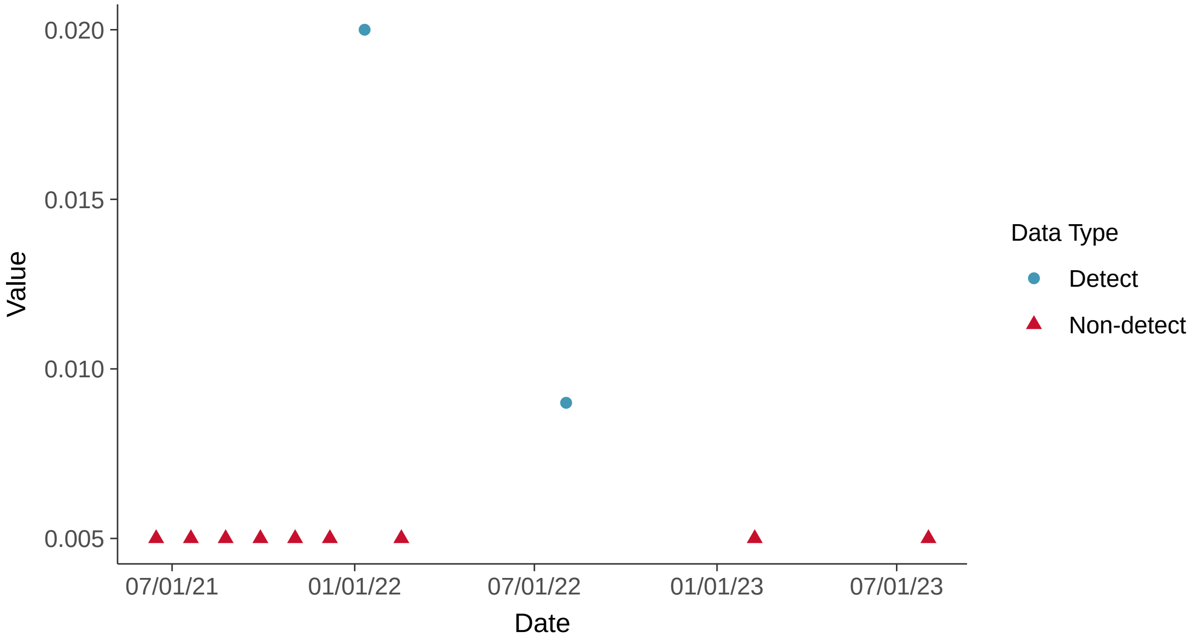


Part 115: Zinc, MW-10

ID: 10_5_42

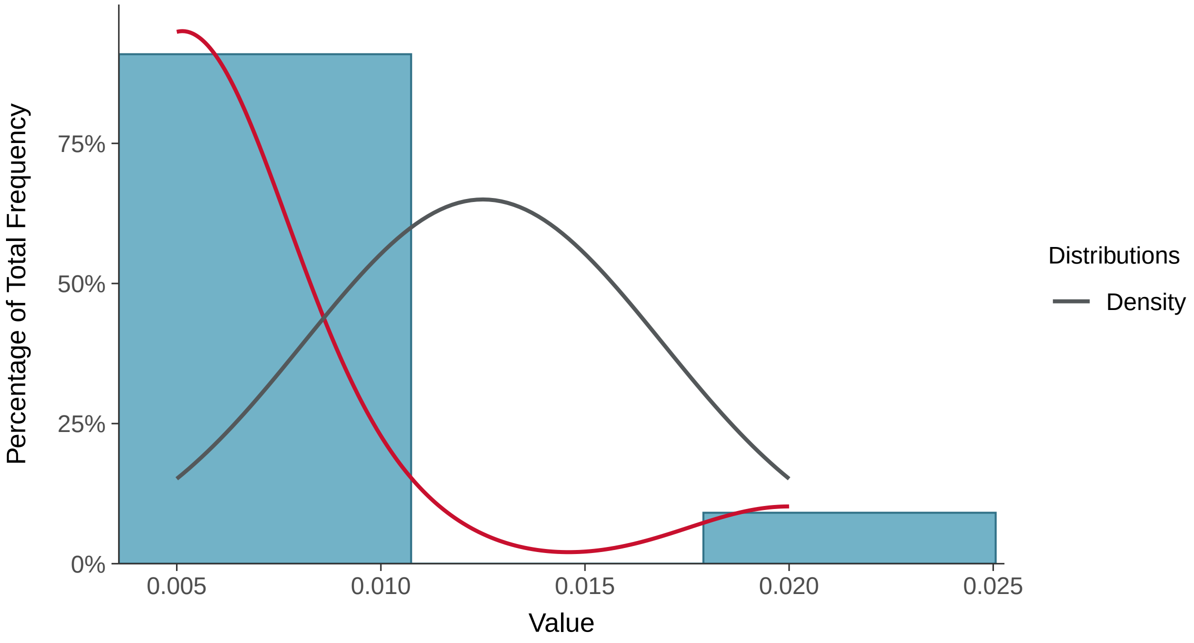
Scatter Plot

Zinc, MW-10 (mg/L)



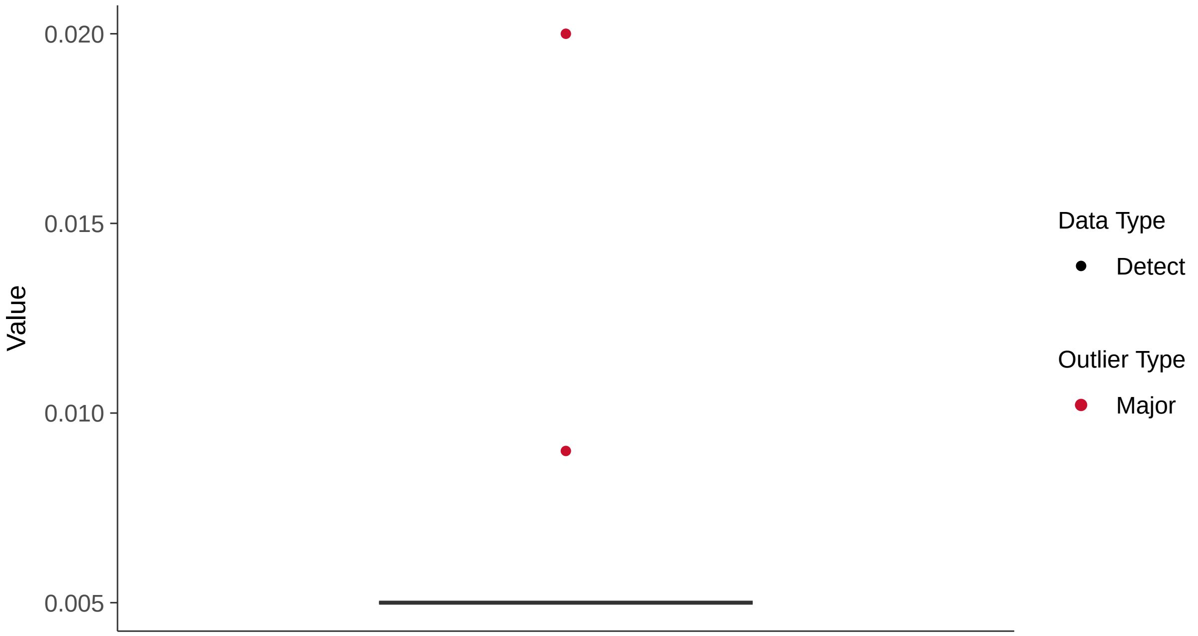
Histogram

Zinc, MW-10 (mg/L)



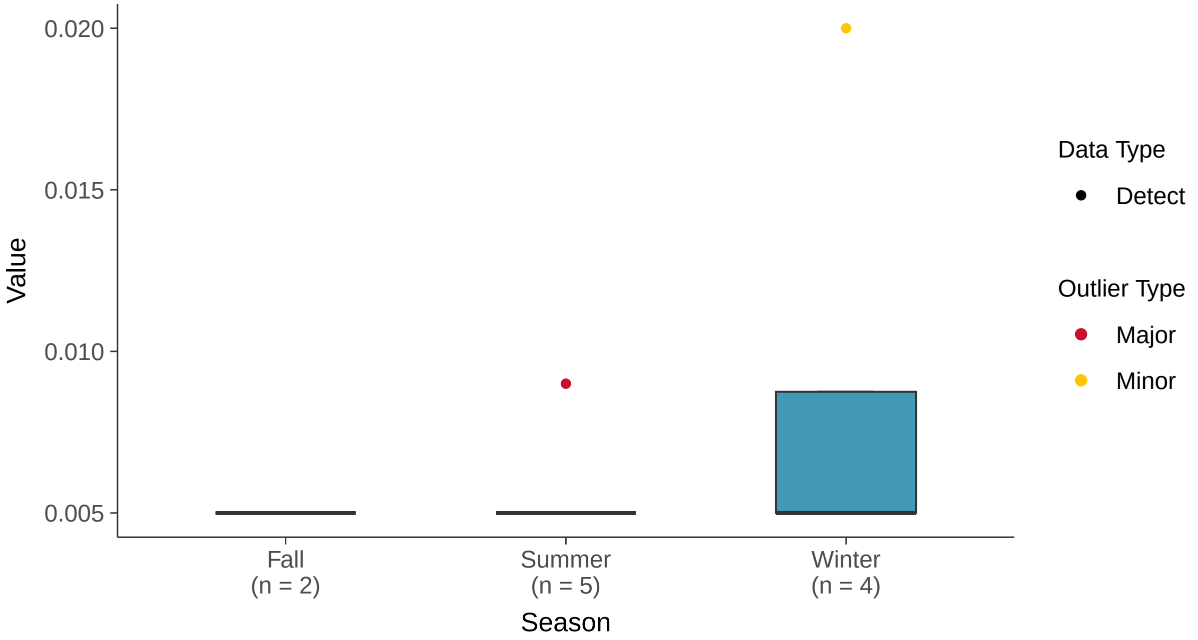
Boxplot

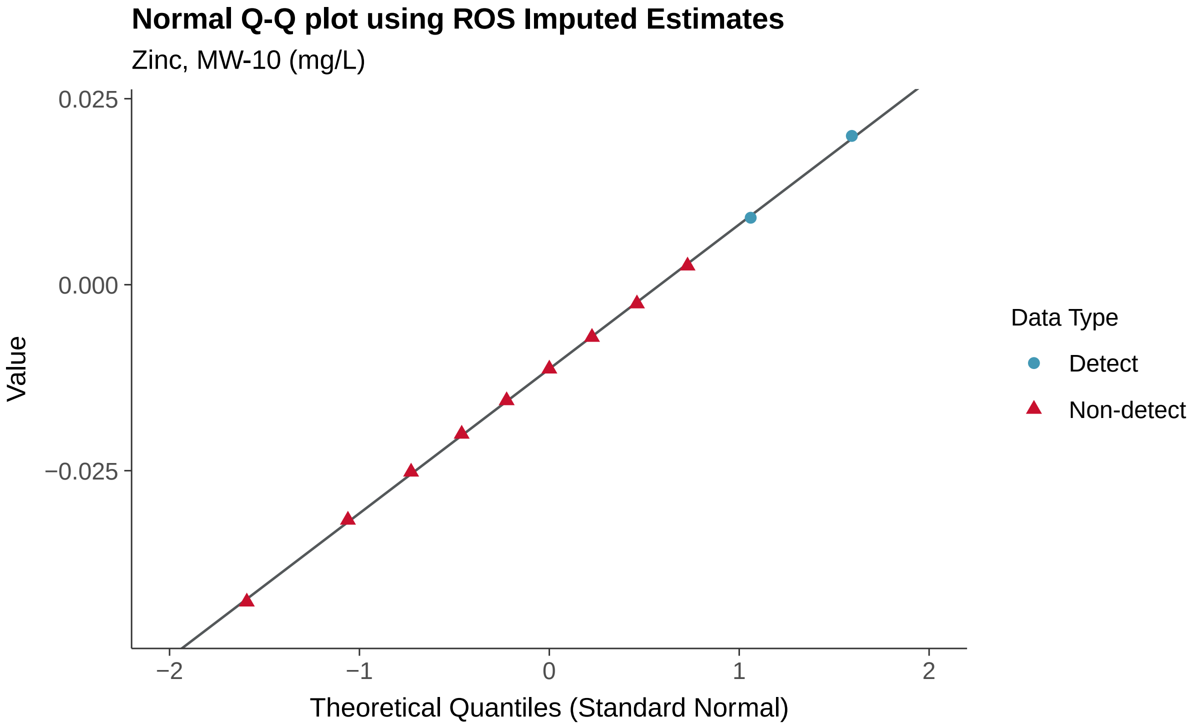
Zinc, MW-10 (mg/L)



Boxplot by Season

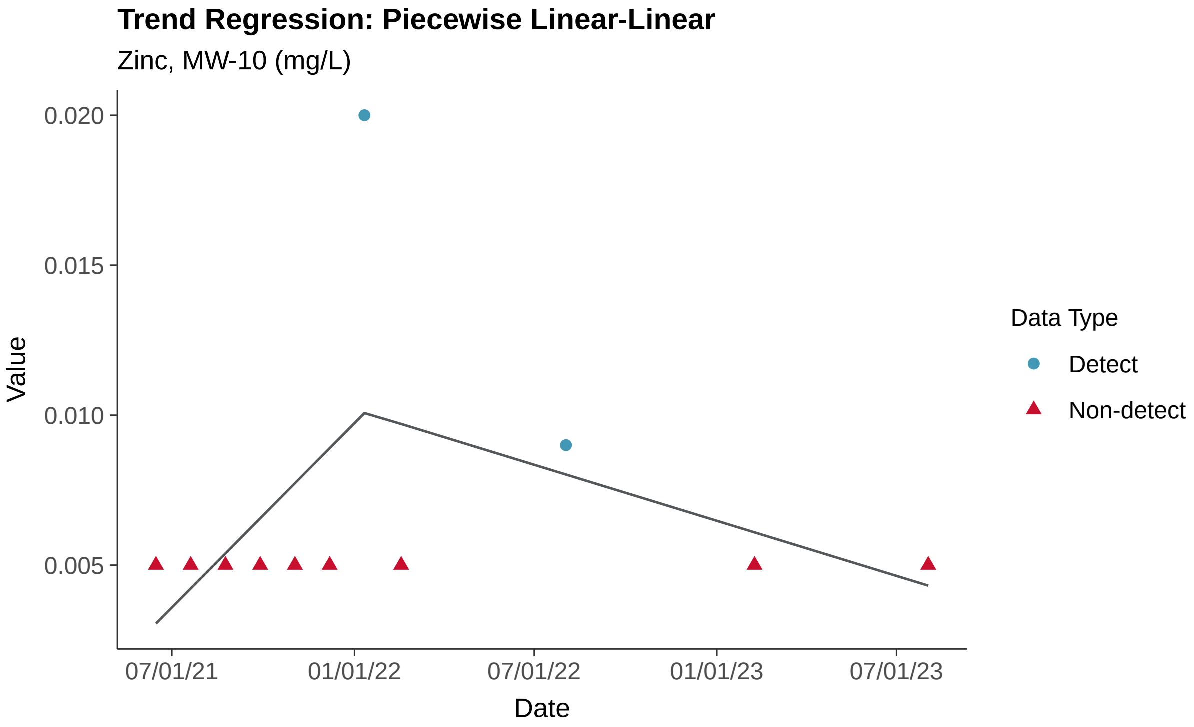
Zinc, MW-10 (mg/L)





Normal Q-Q plot using ROS Imputed Estimates

Zinc, MW-10 (mg/L)

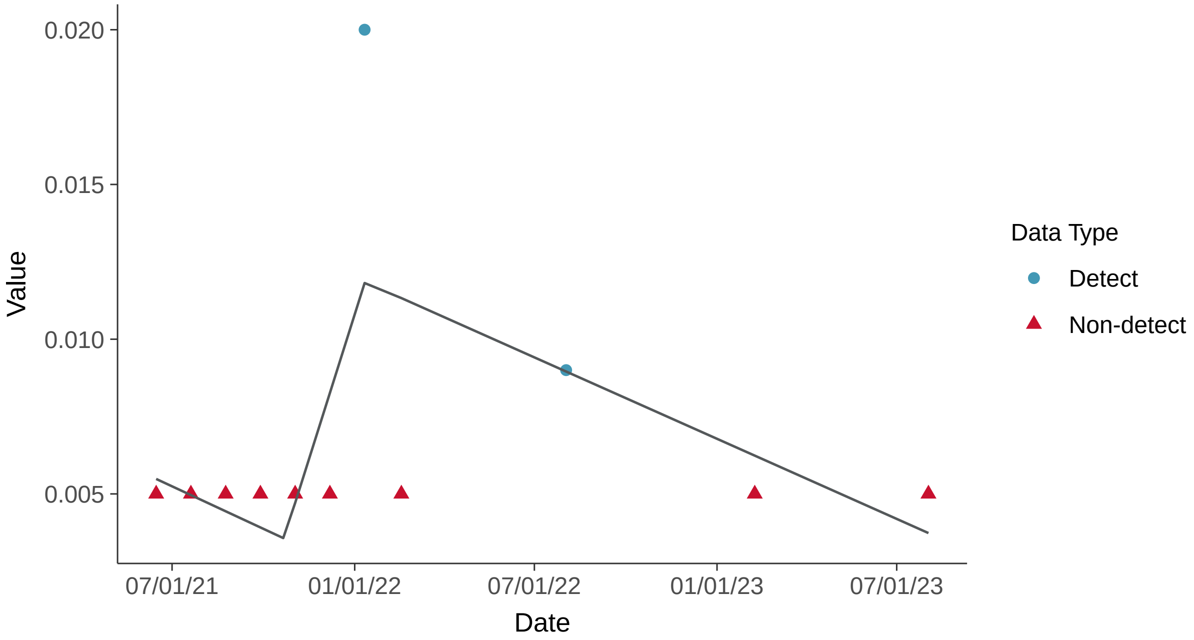


Trend Regression: Piecewise Linear-Linear

Zinc, MW-10 (mg/L)

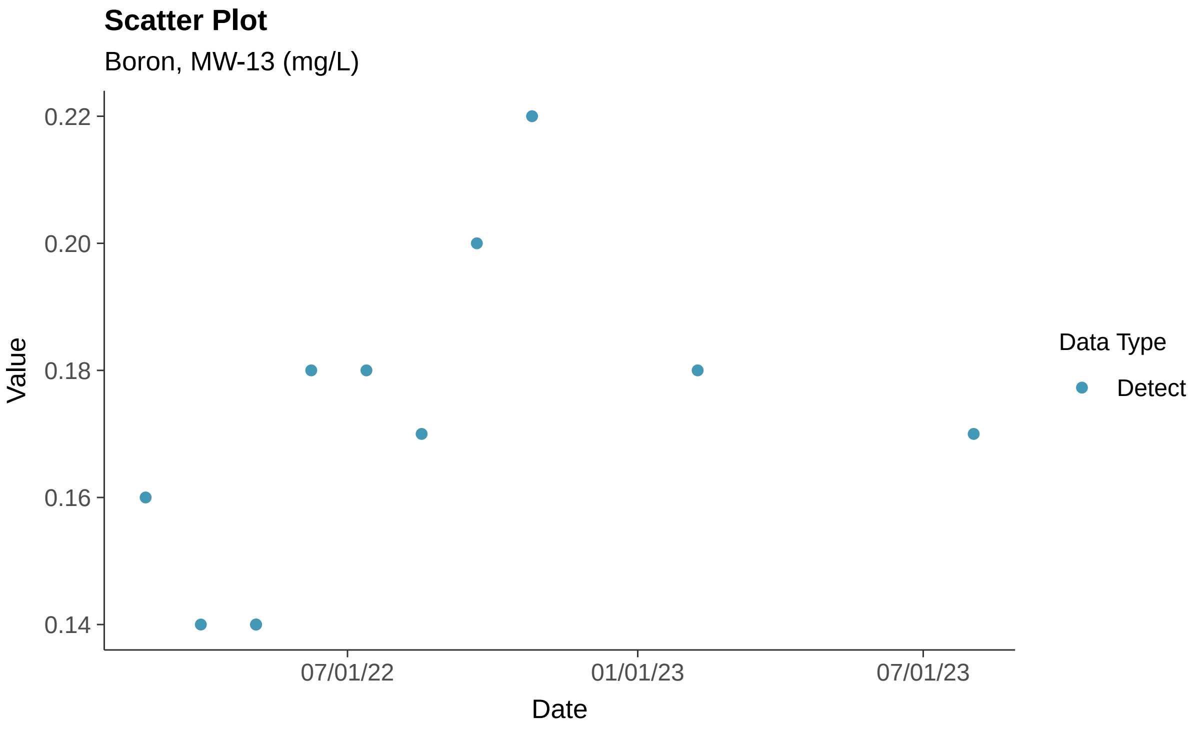
Trend Regression: Piecewise Linear-Linear-Linear

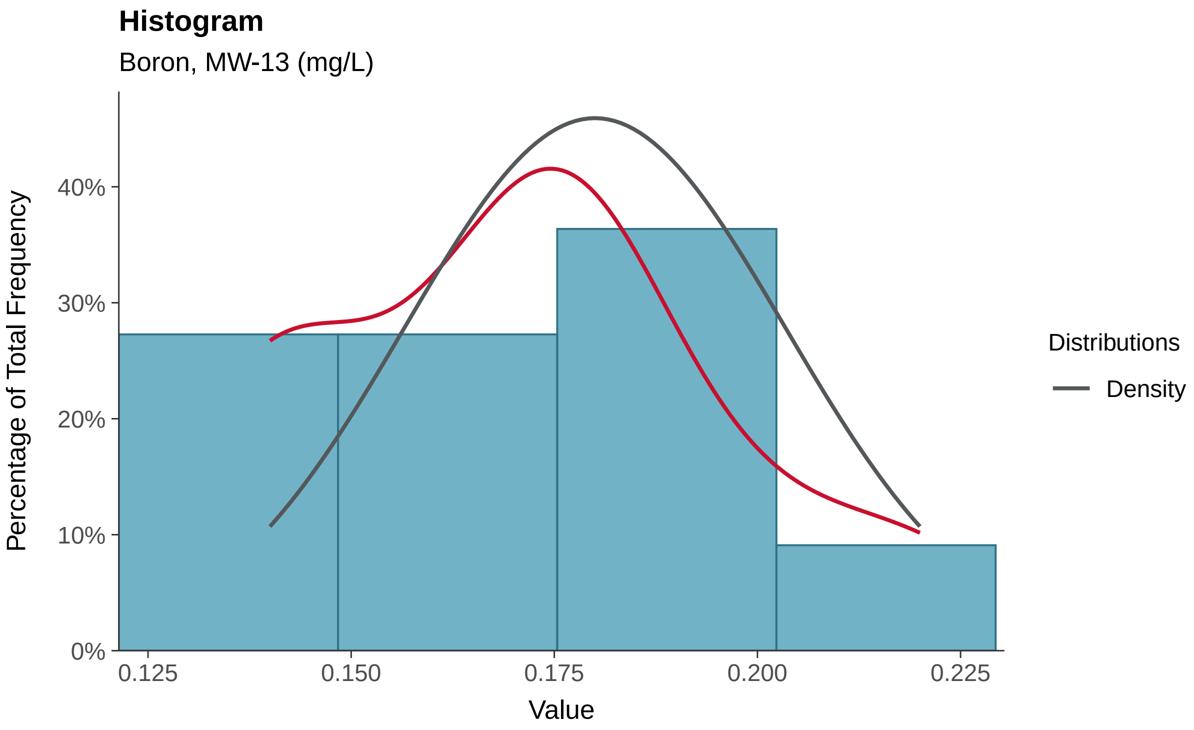
Zinc, MW-10 (mg/L)



Appendix III: Boron, MW-13

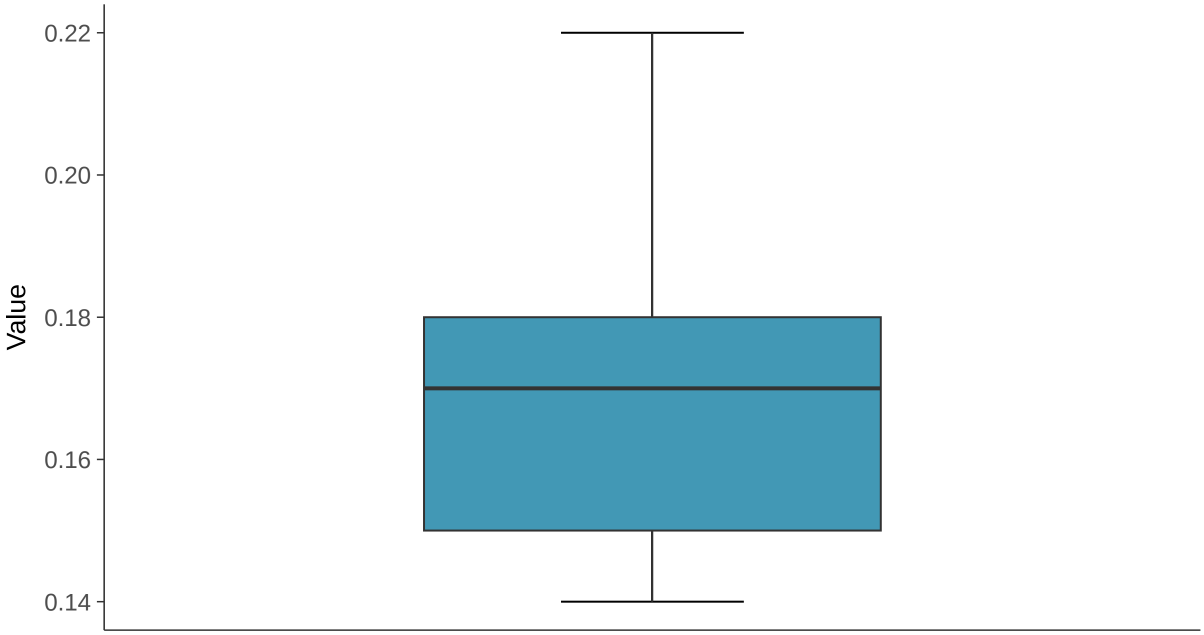
ID: 13_1_01





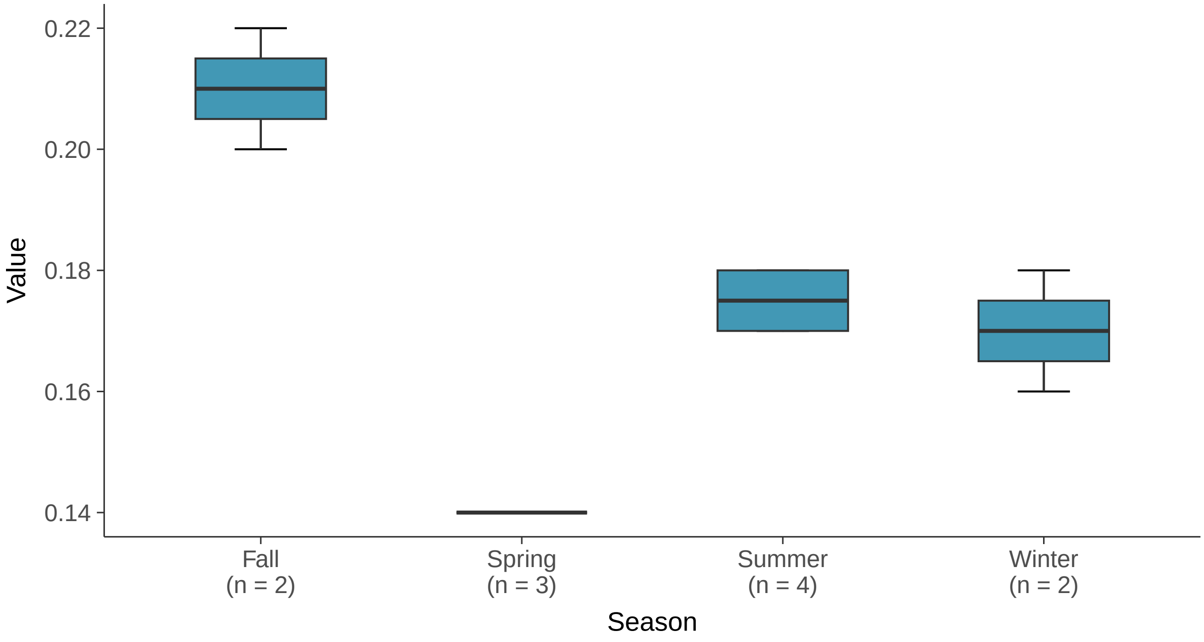
Boxplot

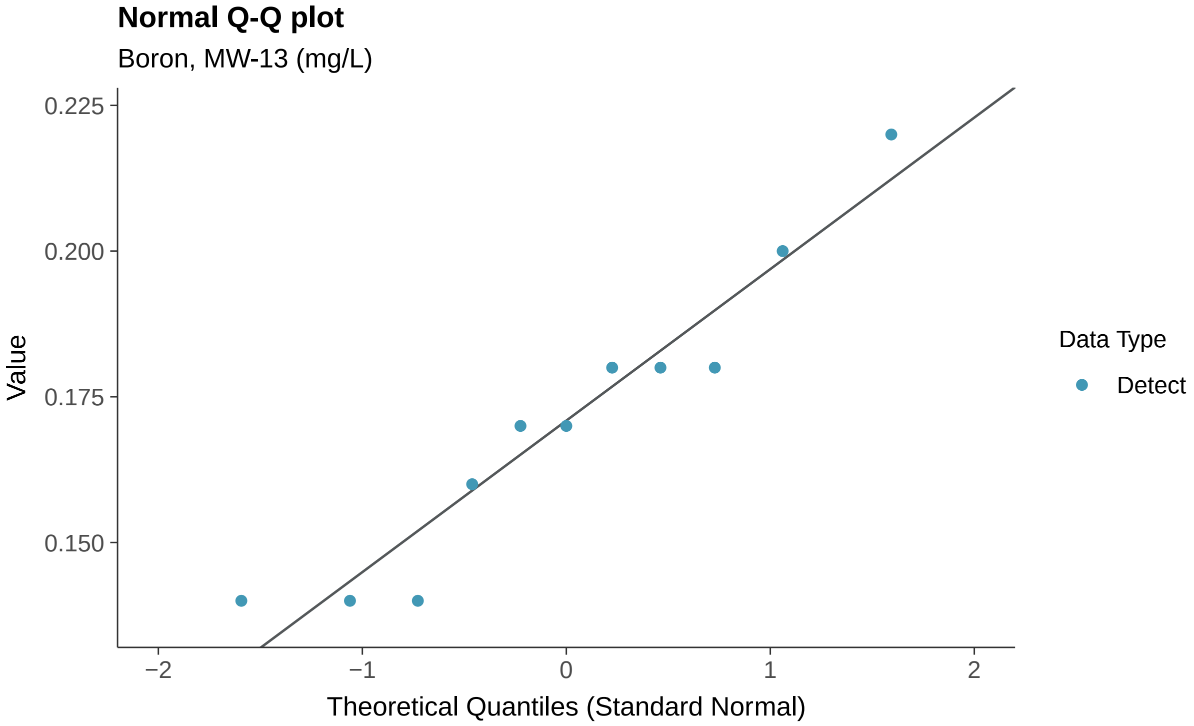
Boron, MW-13 (mg/L)



Boxplot by Season

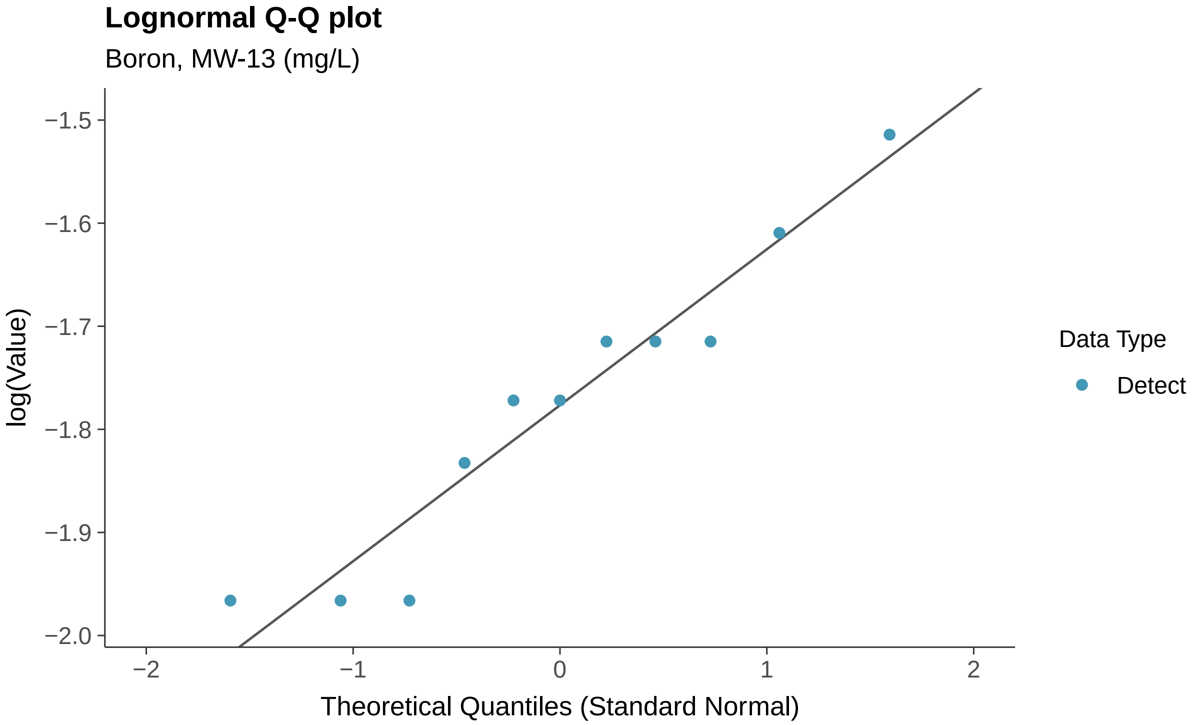
Boron, MW-13 (mg/L)





Normal Q-Q plot

Boron, MW-13 (mg/L)

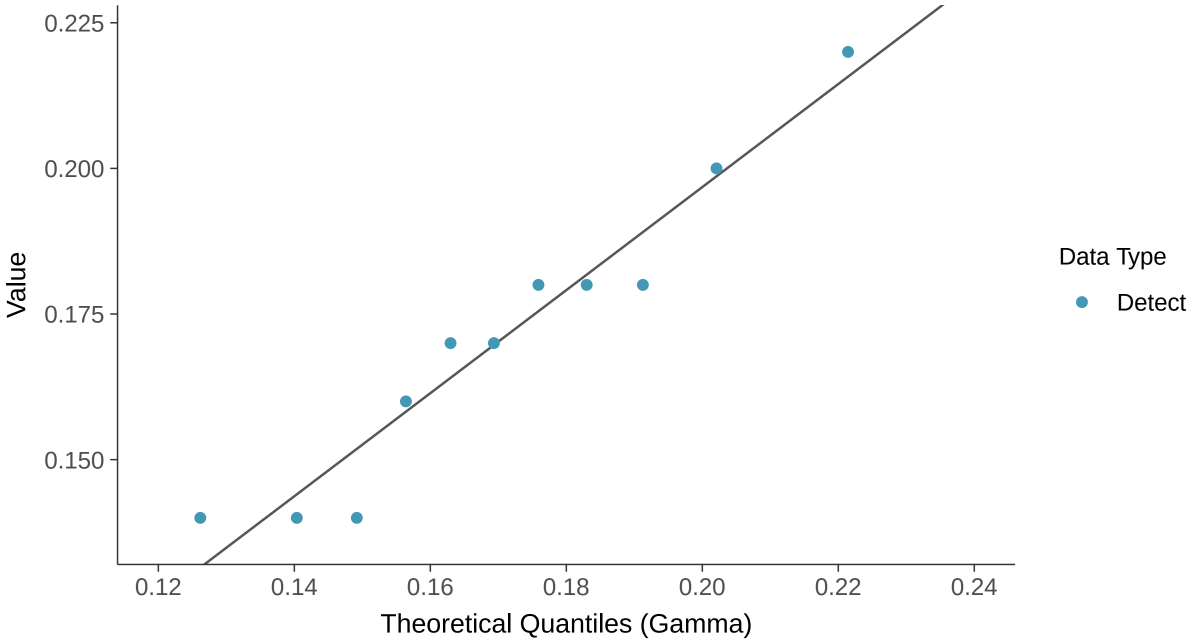


Lognormal Q-Q plot

Boron, MW-13 (mg/L)

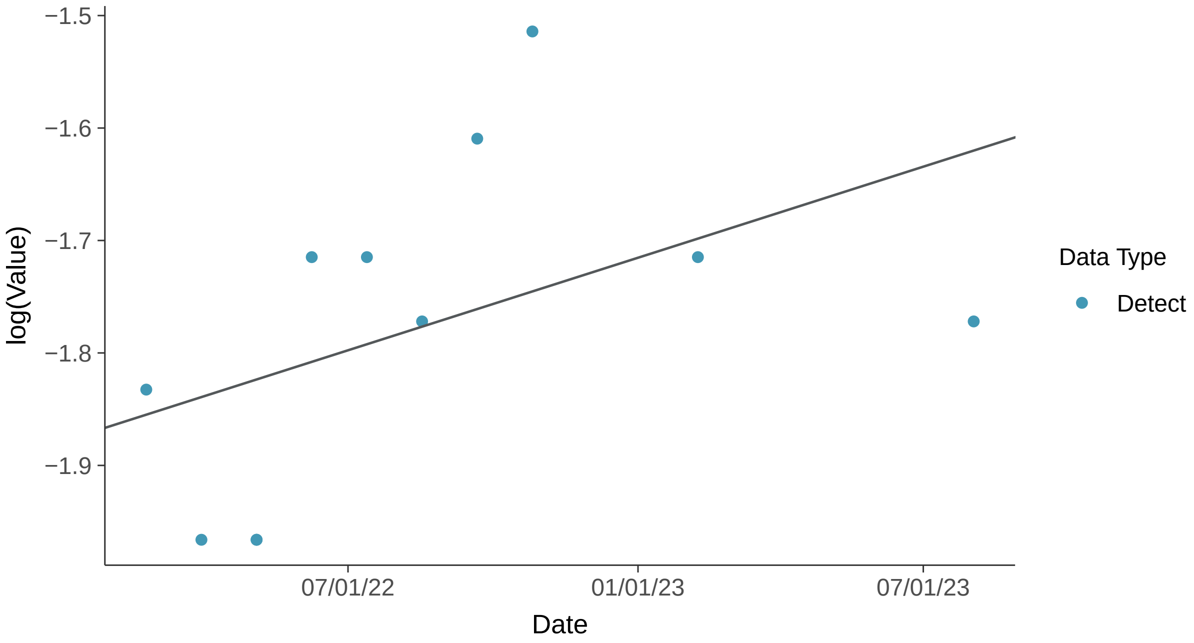
Gamma Q-Q plot

Boron, MW-13 (mg/L)



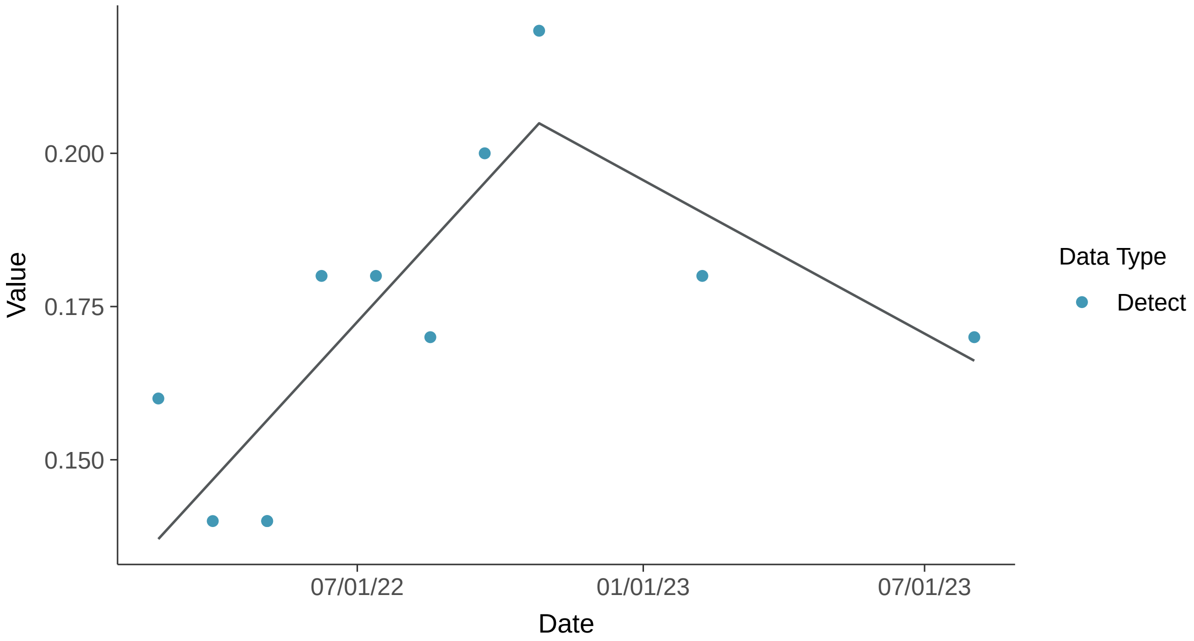
Trend Regression: Lognormal MLE

Boron, MW-13 (mg/L)



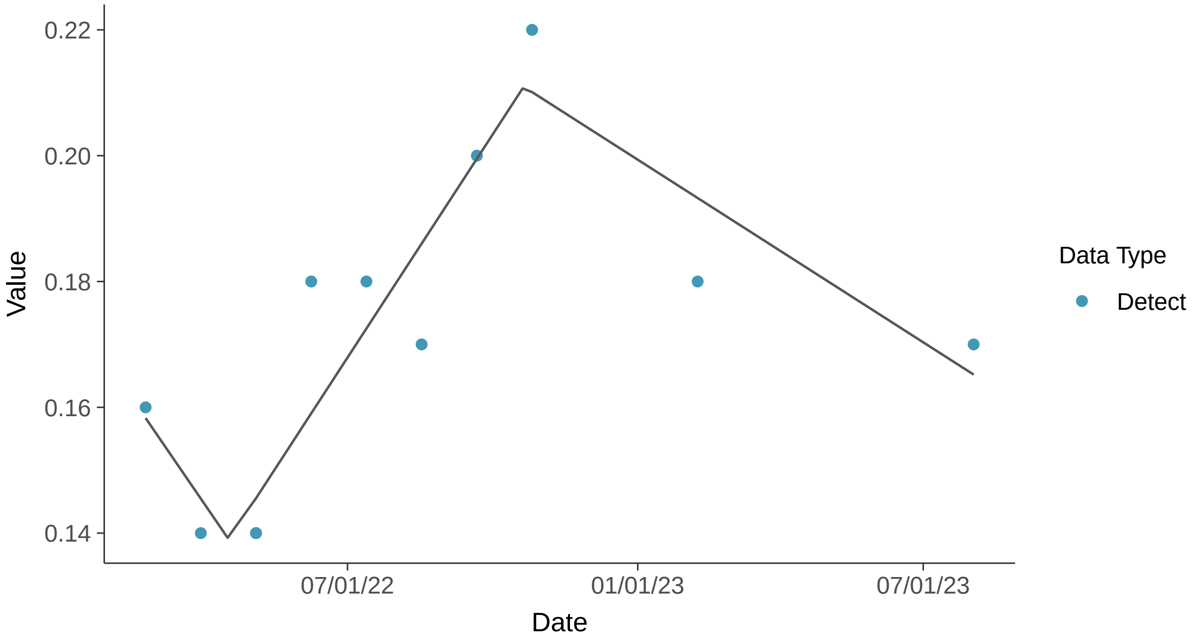
Trend Regression: Piecewise Linear-Linear

Boron, MW-13 (mg/L)



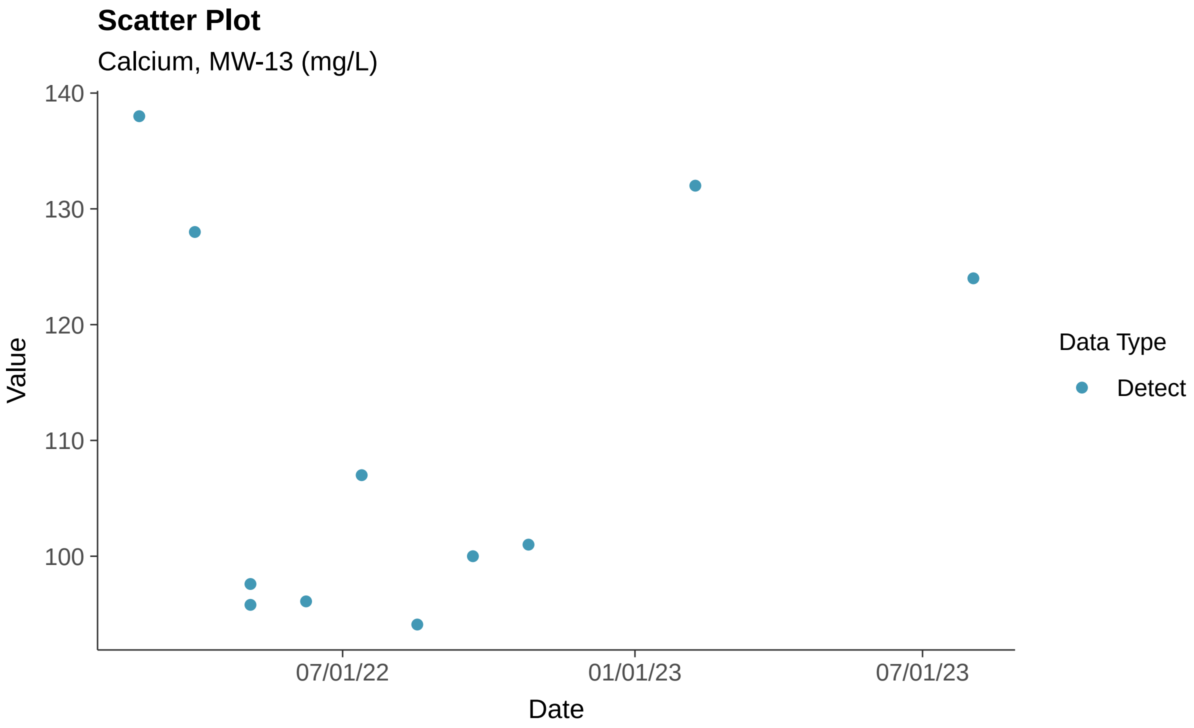
Trend Regression: Piecewise Linear-Linear-Linear

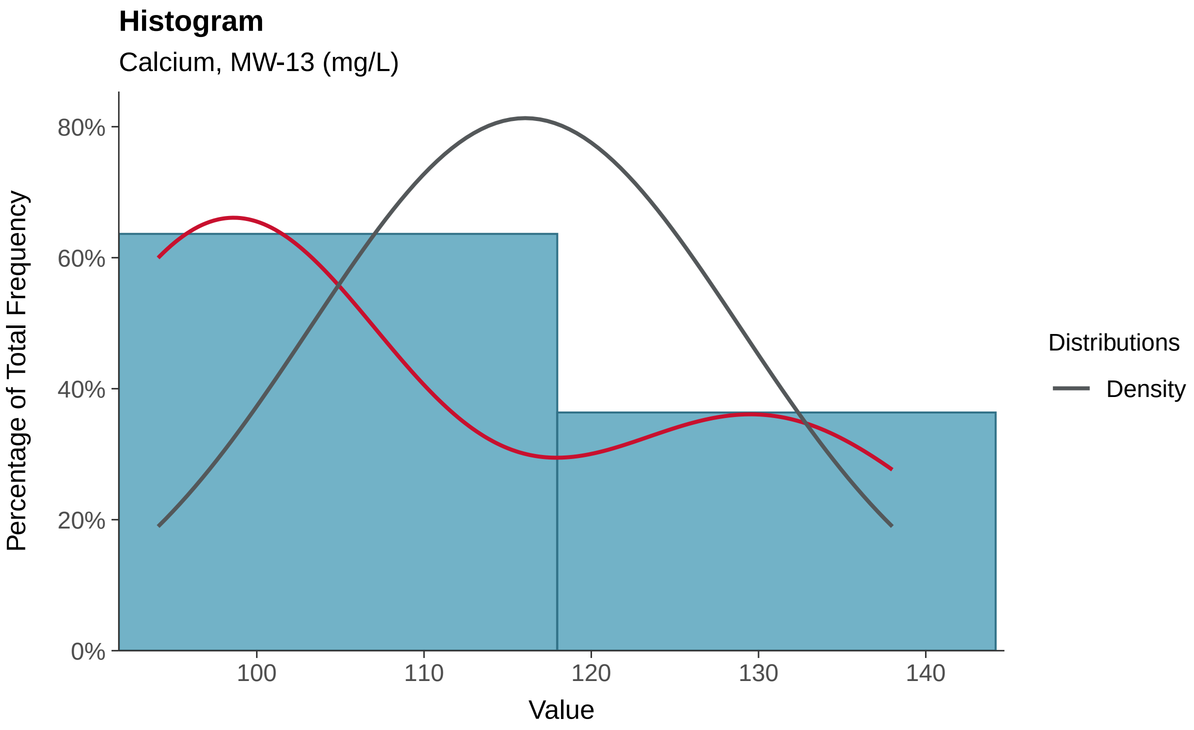
Boron, MW-13 (mg/L)



Appendix III: Calcium, MW-13

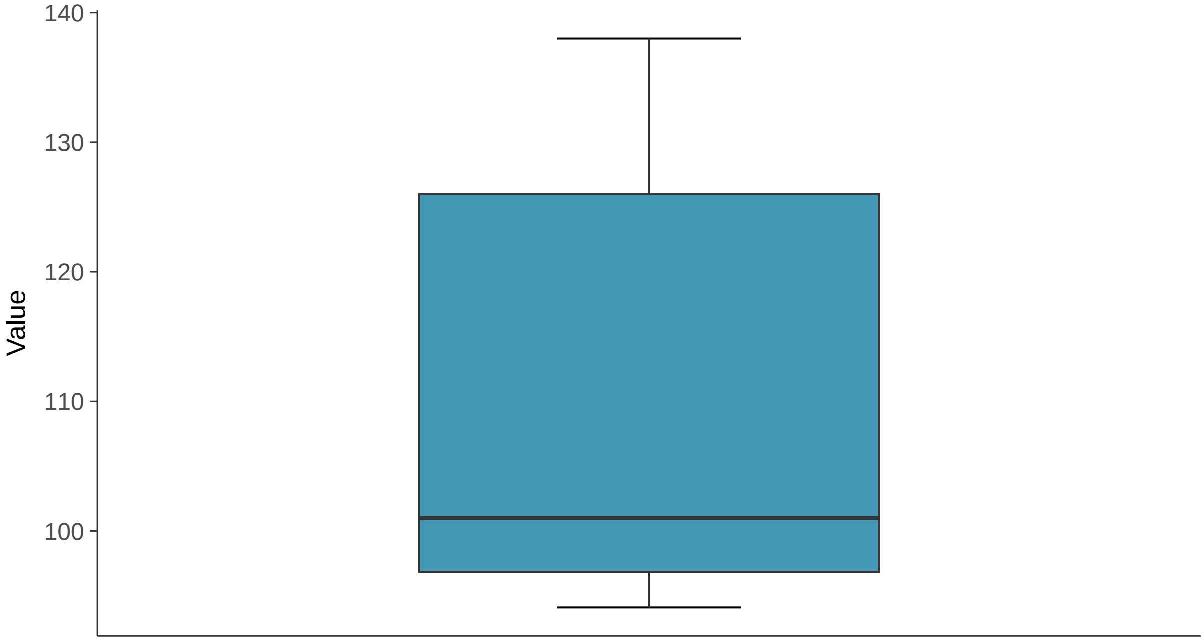
ID: 13_1_02





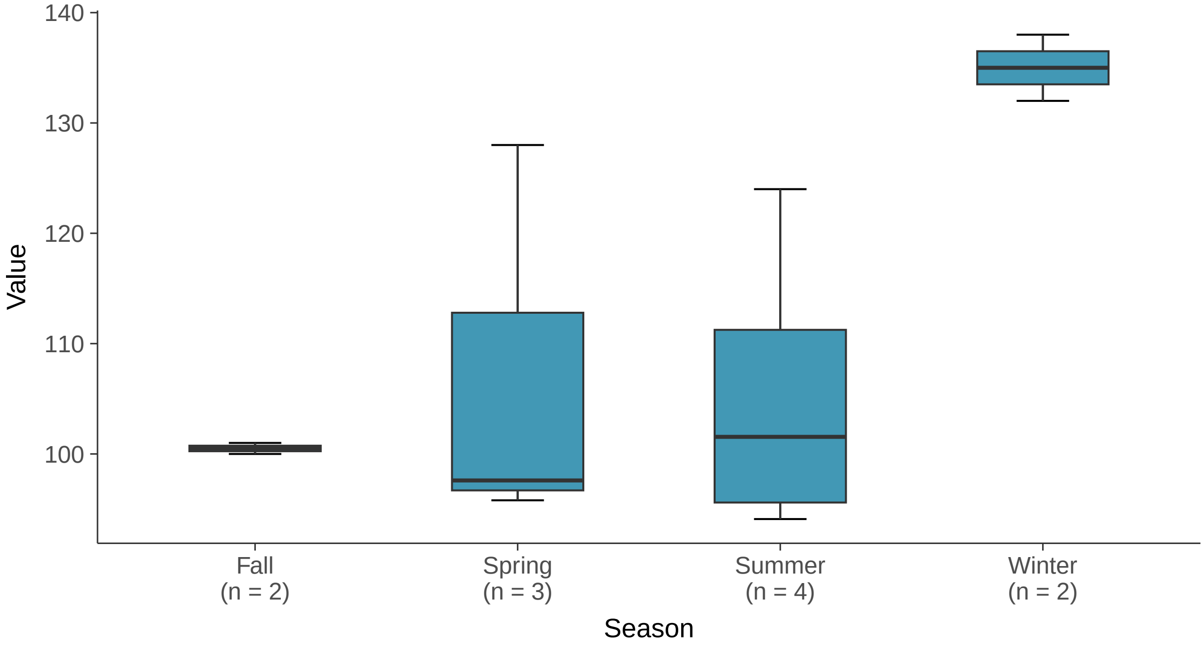
Boxplot

Calcium, MW-13 (mg/L)



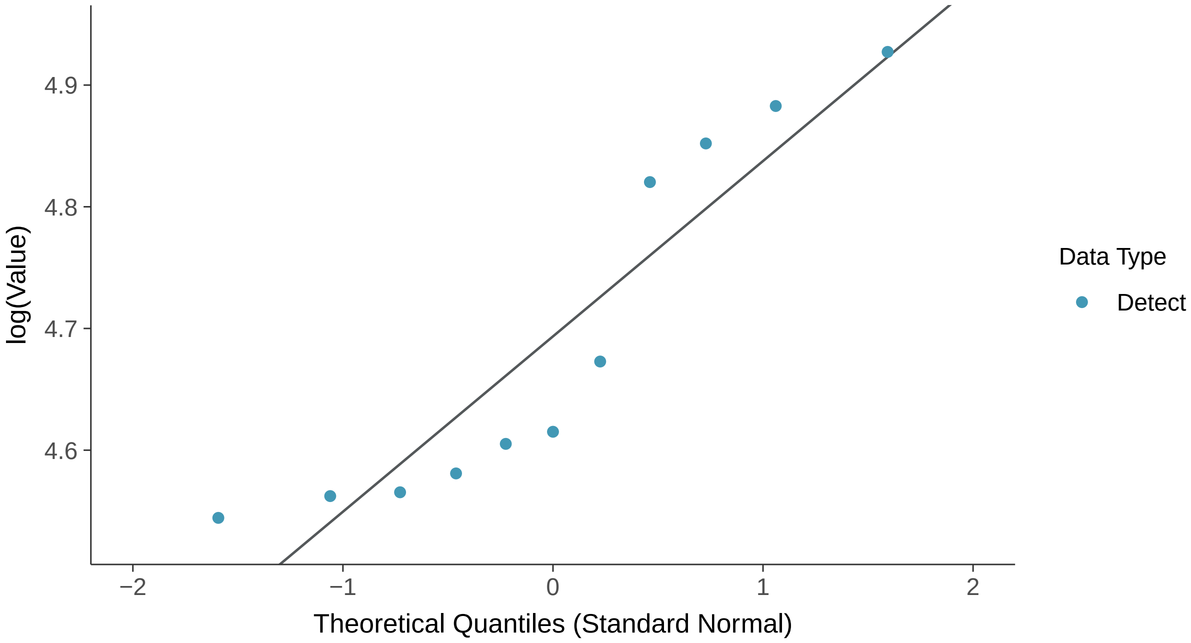
Boxplot by Season

Calcium, MW-13 (mg/L)



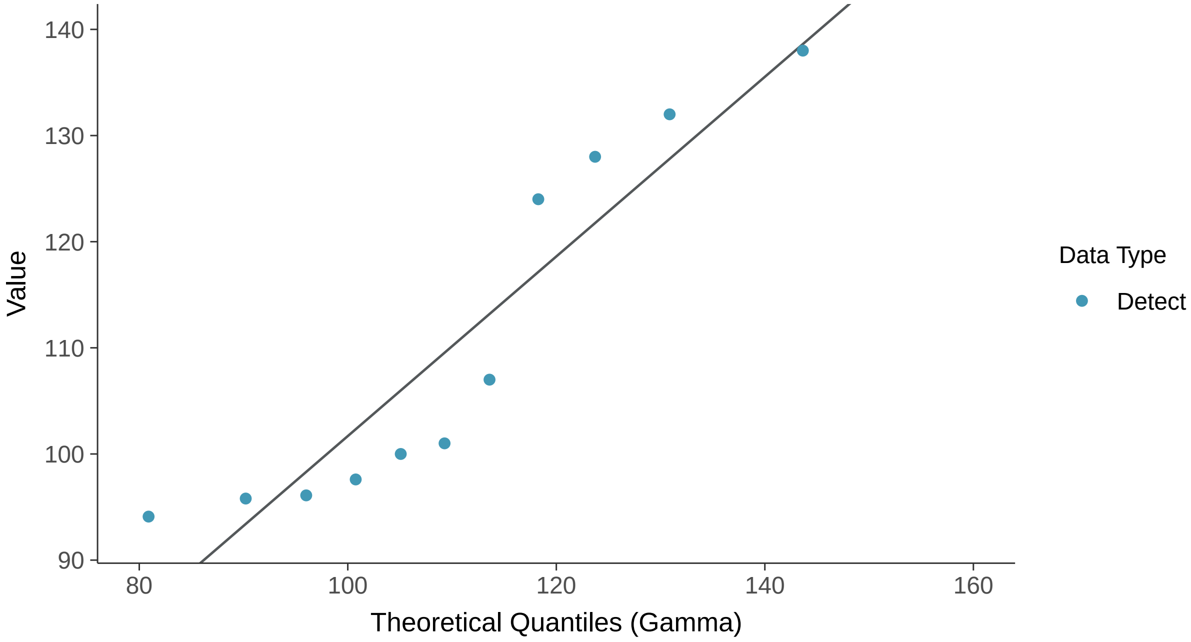
Lognormal Q-Q plot

Calcium, MW-13 (mg/L)



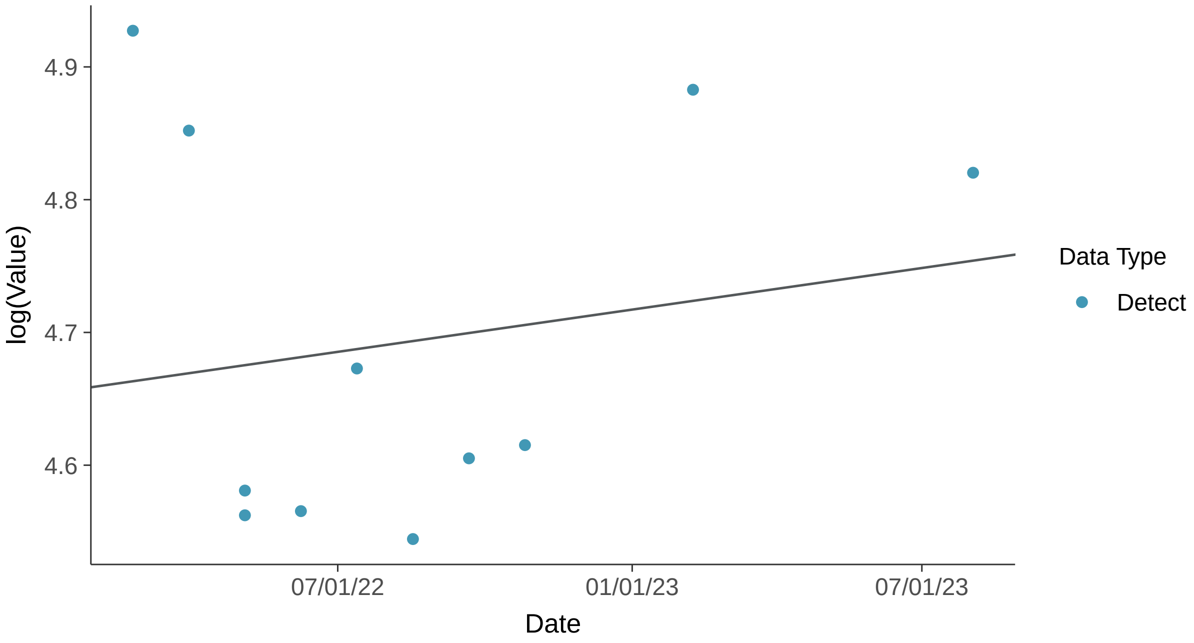
Gamma Q-Q plot

Calcium, MW-13 (mg/L)



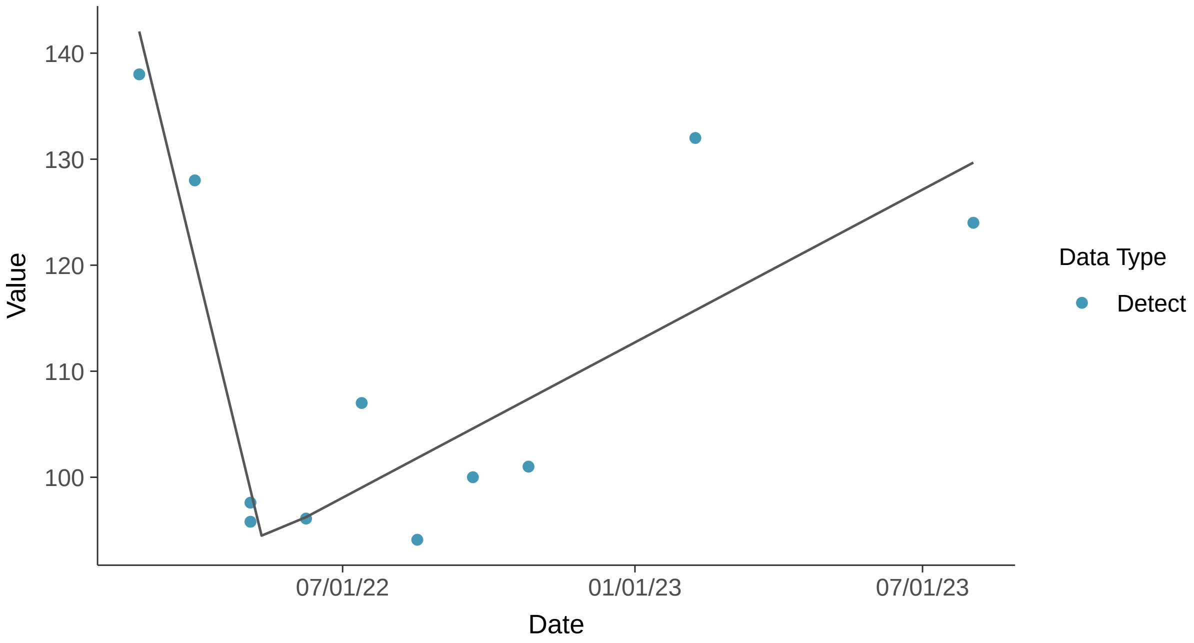
Trend Regression: Lognormal MLE

Calcium, MW-13 (mg/L)



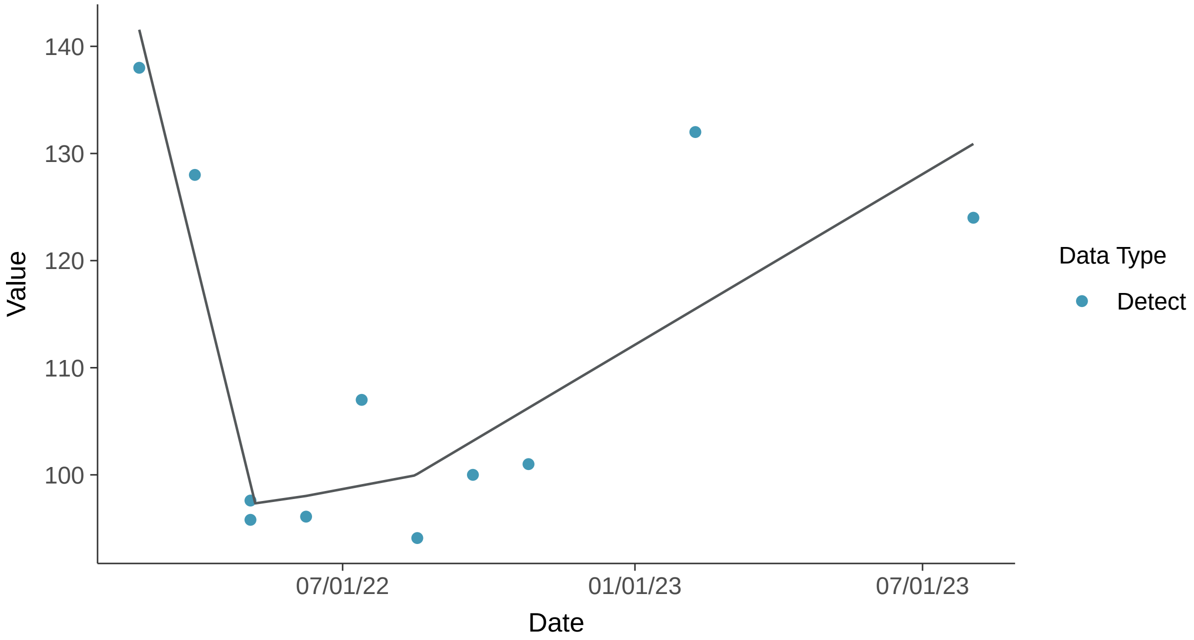
Trend Regression: Piecewise Linear-Linear

Calcium, MW-13 (mg/L)



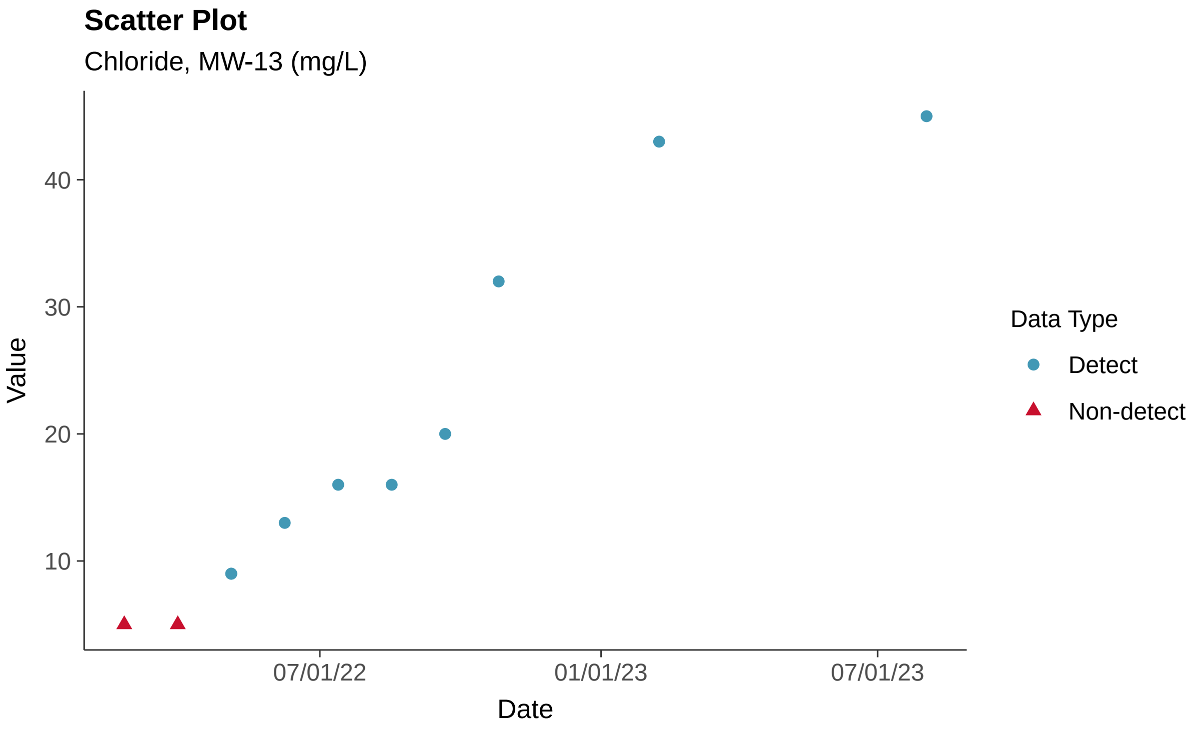
Trend Regression: Piecewise Linear-Linear-Linear

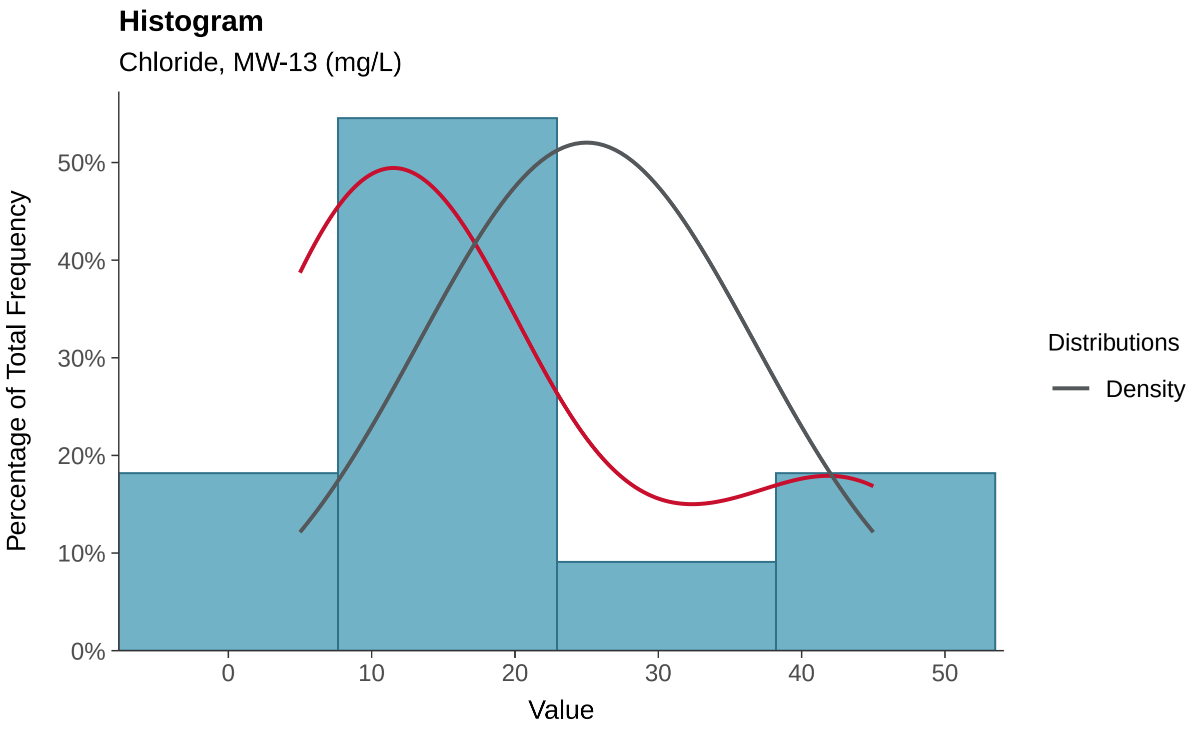
Calcium, MW-13 (mg/L)



Appendix III: Chloride, MW-13

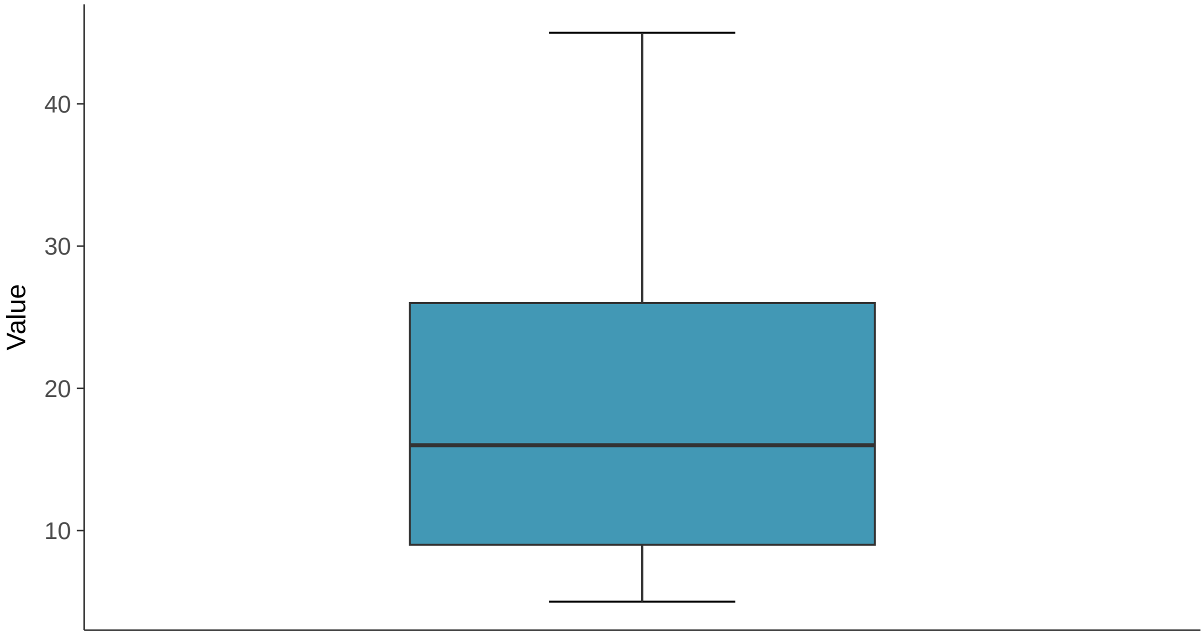
ID: 13_1_03





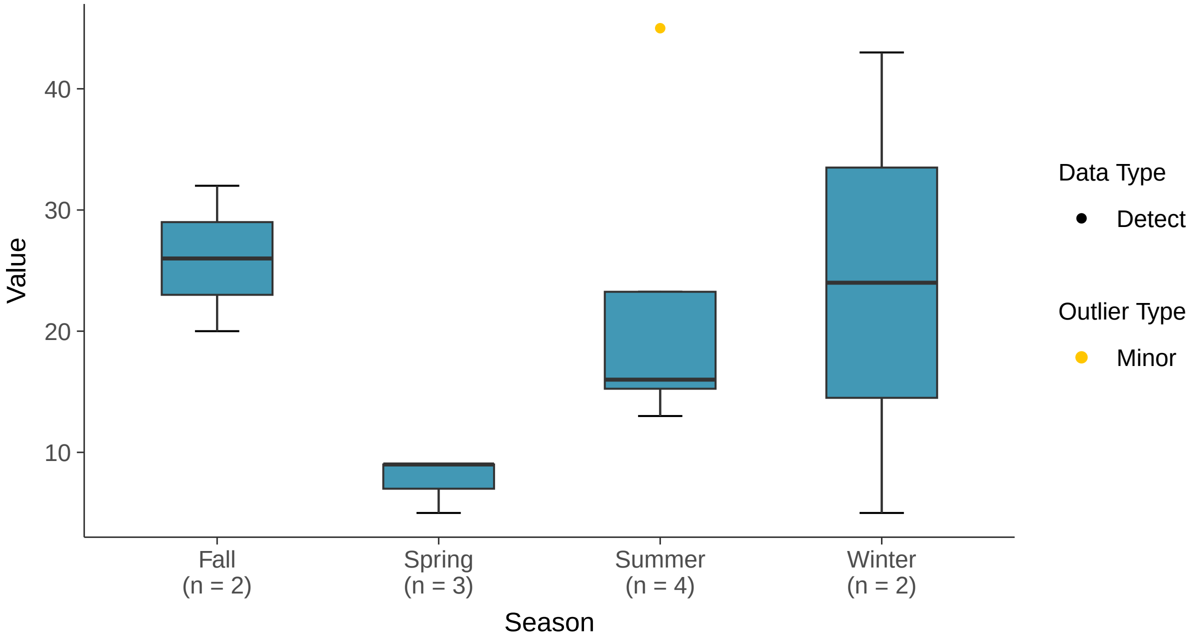
Boxplot

Chloride, MW-13 (mg/L)



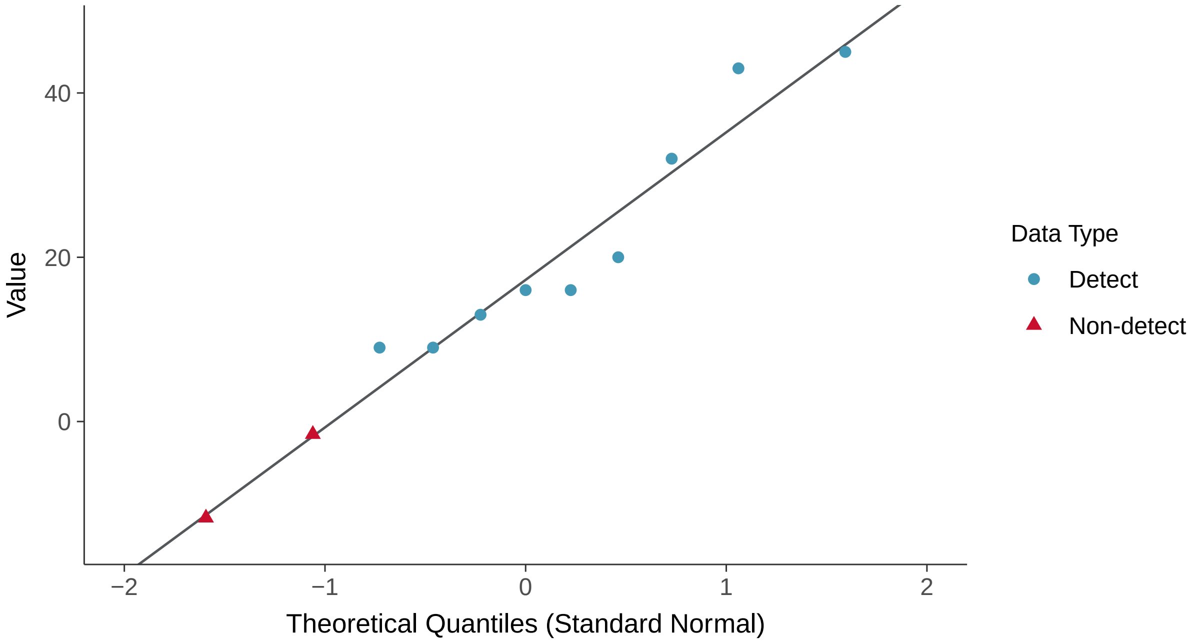
Boxplot by Season

Chloride, MW-13 (mg/L)



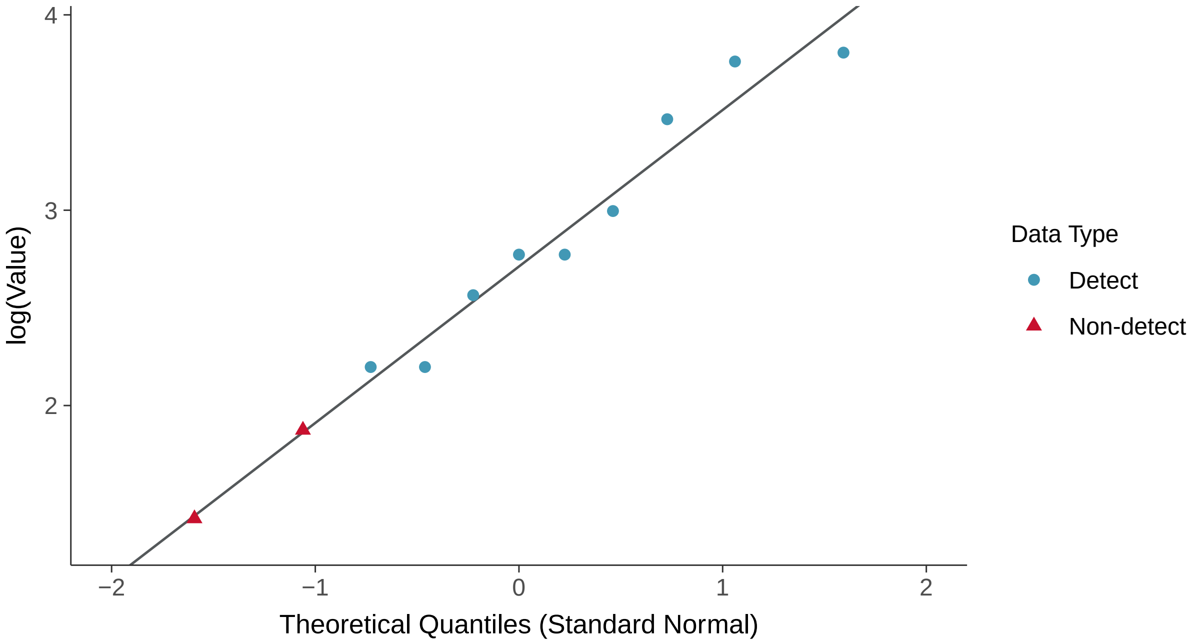
Normal Q-Q plot using ROS Imputed Estimates

Chloride, MW-13 (mg/L)



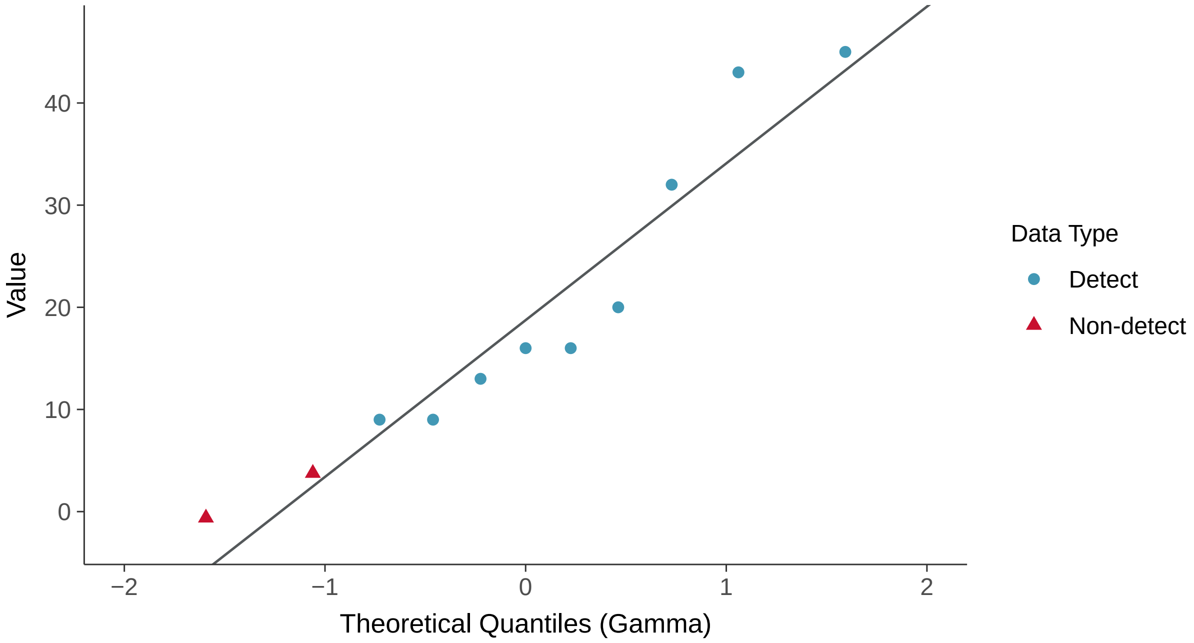
Lognormal Q-Q plot using ROS Imputed Estimates

Chloride, MW-13 (mg/L)



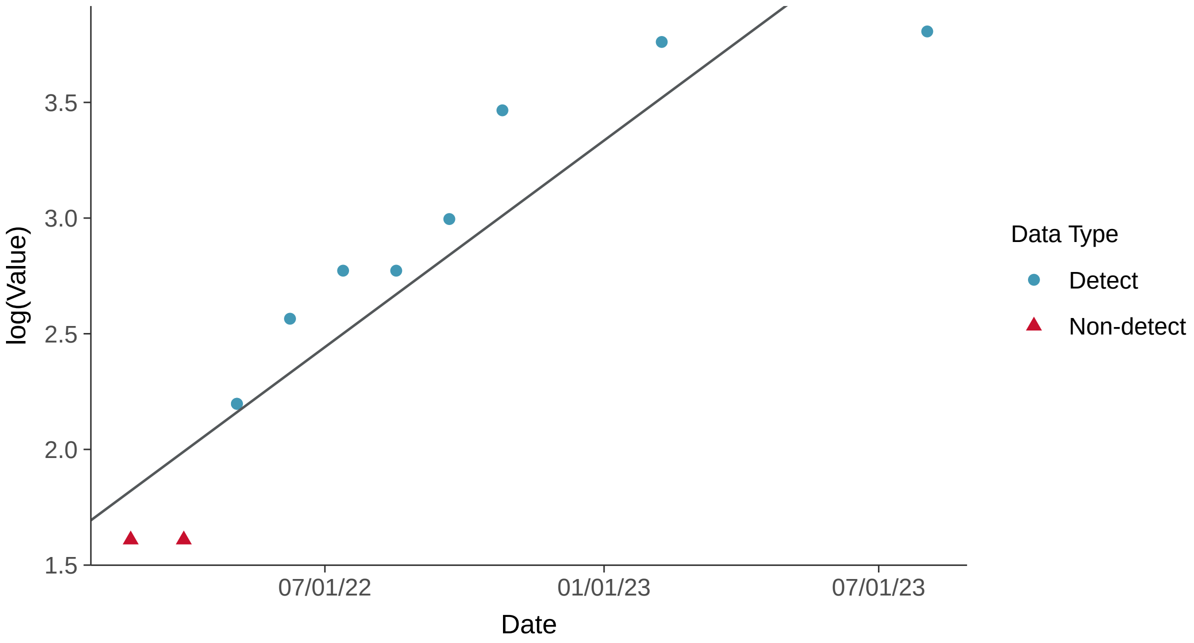
Gamma Q-Q plot using ROS Imputed Estimates

Chloride, MW-13 (mg/L)



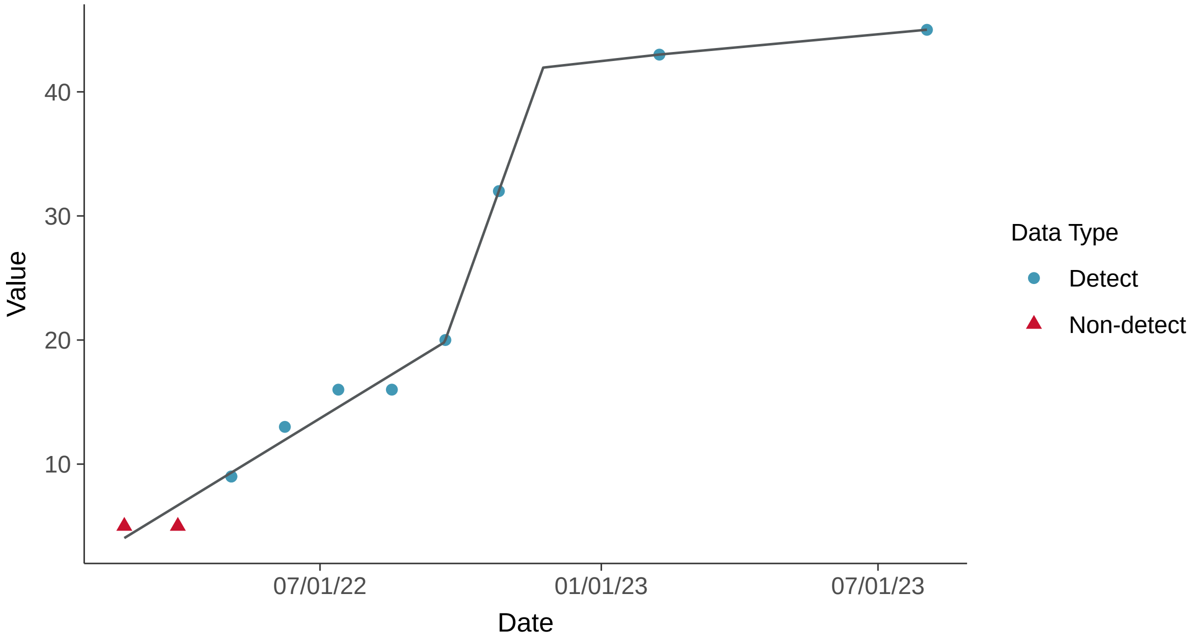
Trend Regression: Lognormal MLE

Chloride, MW-13 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Chloride, MW-13 (mg/L)

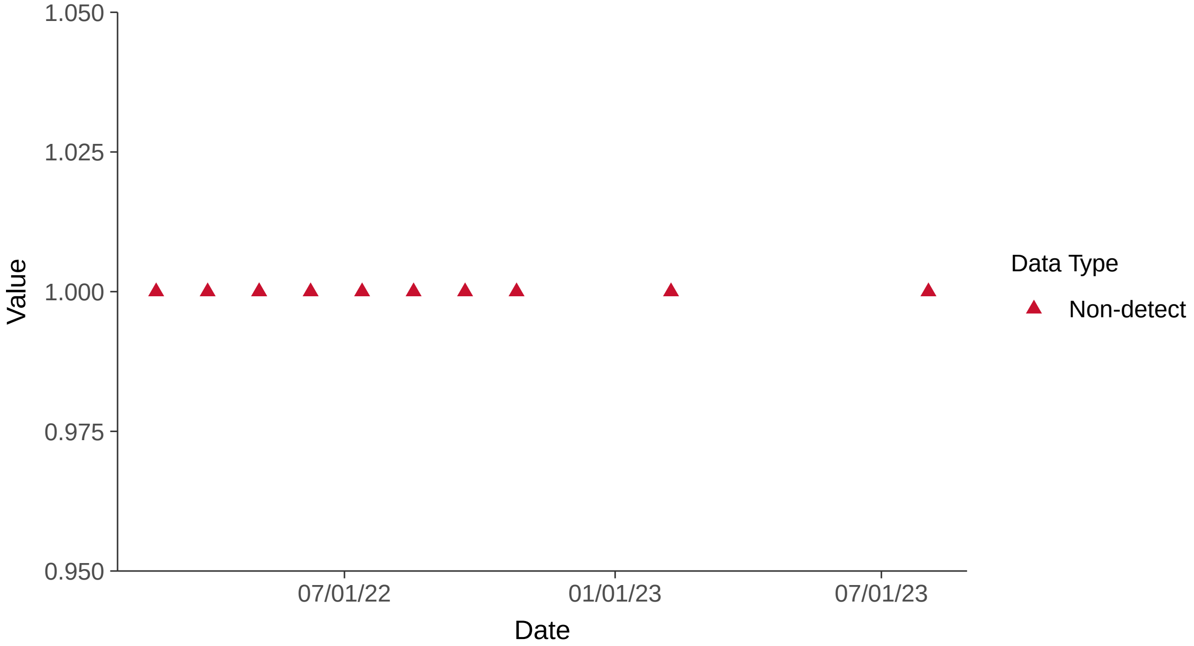


Appendix III: Fluoride, MW-13

ID: 13_1_04

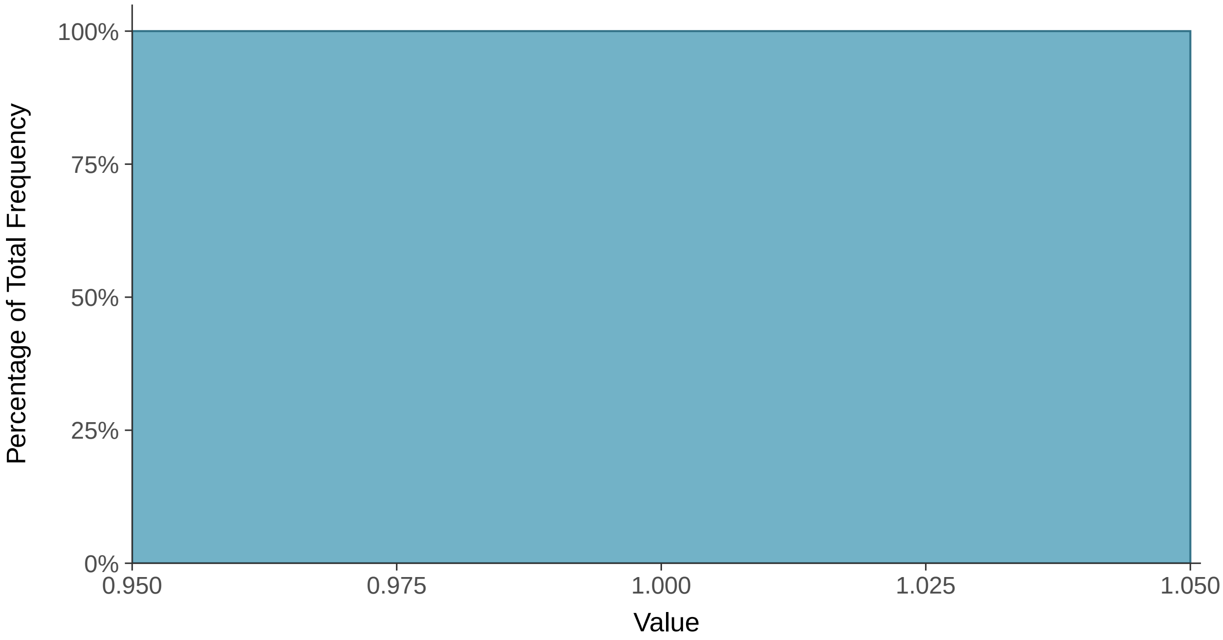
Scatter Plot

Fluoride, MW-13 (mg/L)



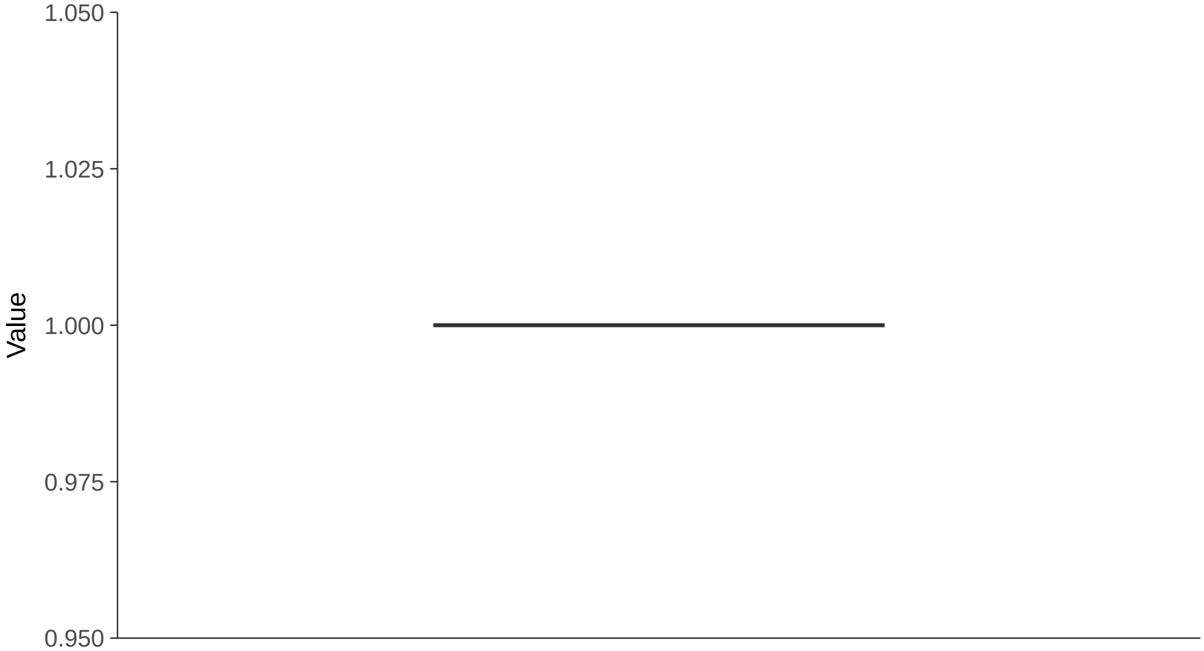
Histogram

Fluoride, MW-13 (mg/L)



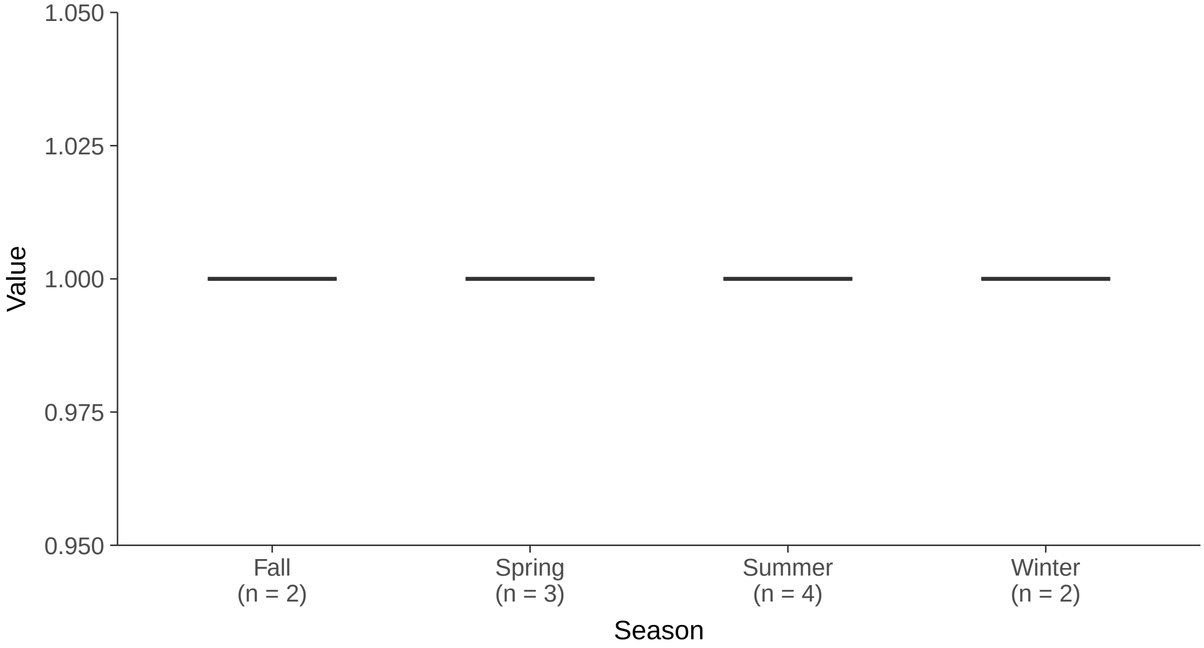
Boxplot

Fluoride, MW-13 (mg/L)



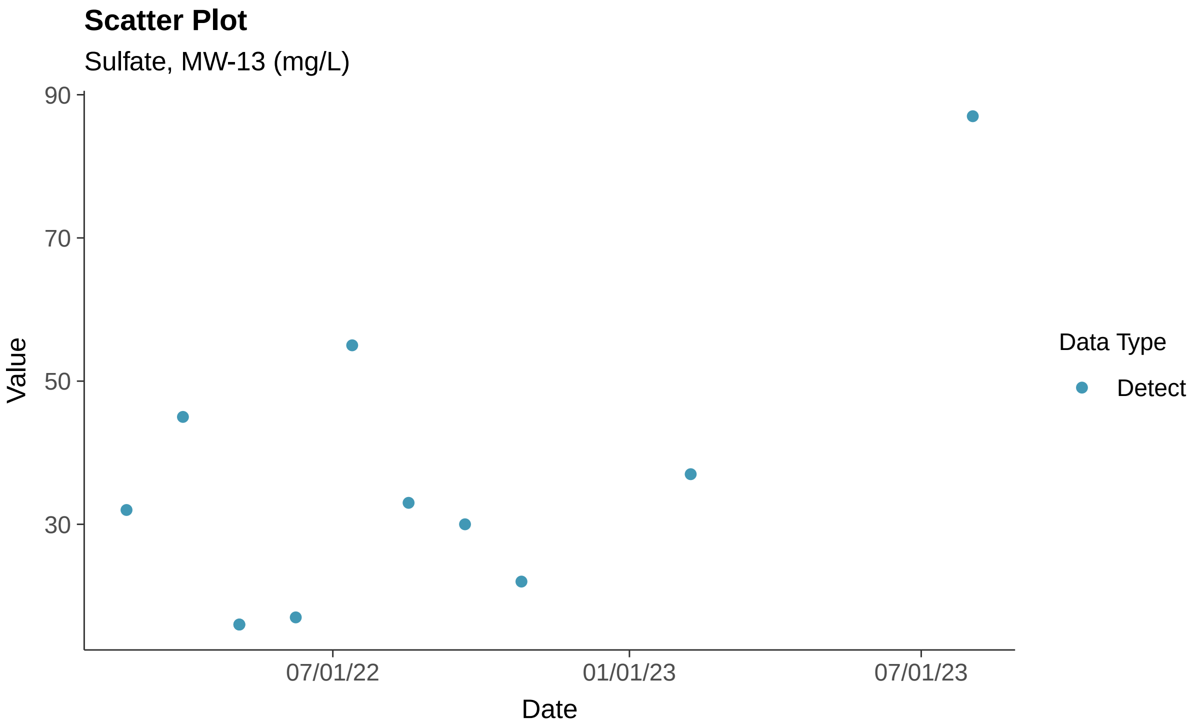
Boxplot by Season

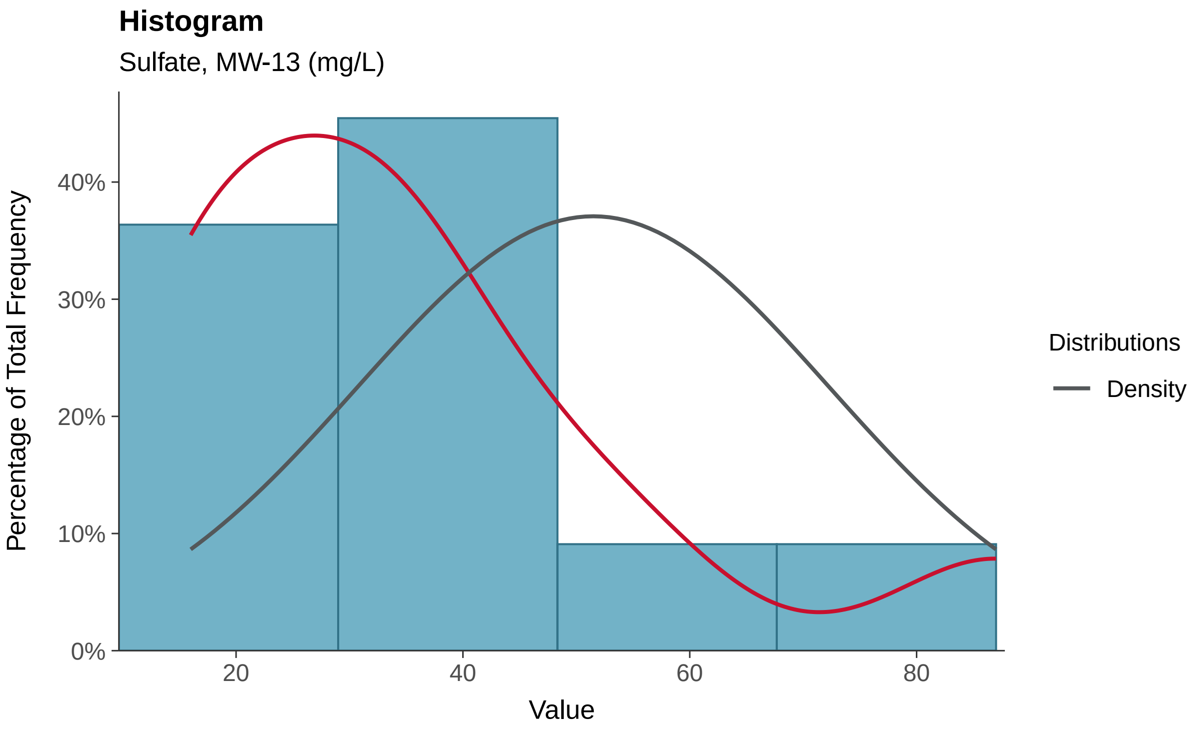
Fluoride, MW-13 (mg/L)



Appendix III: Sulfate, MW-13

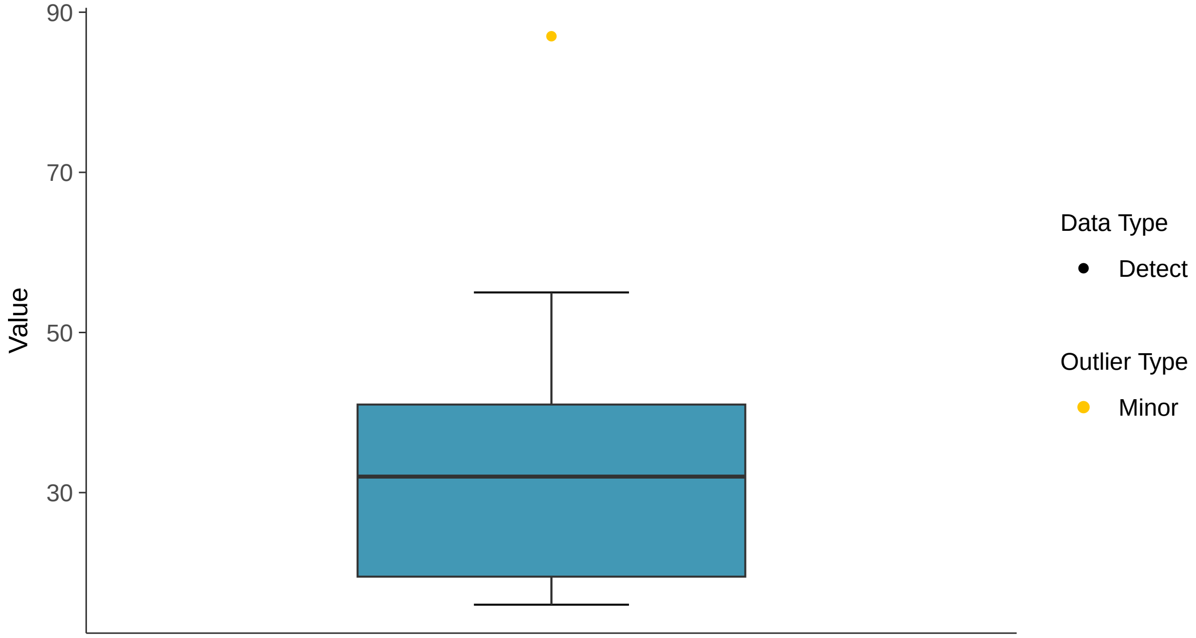
ID: 13_1_05





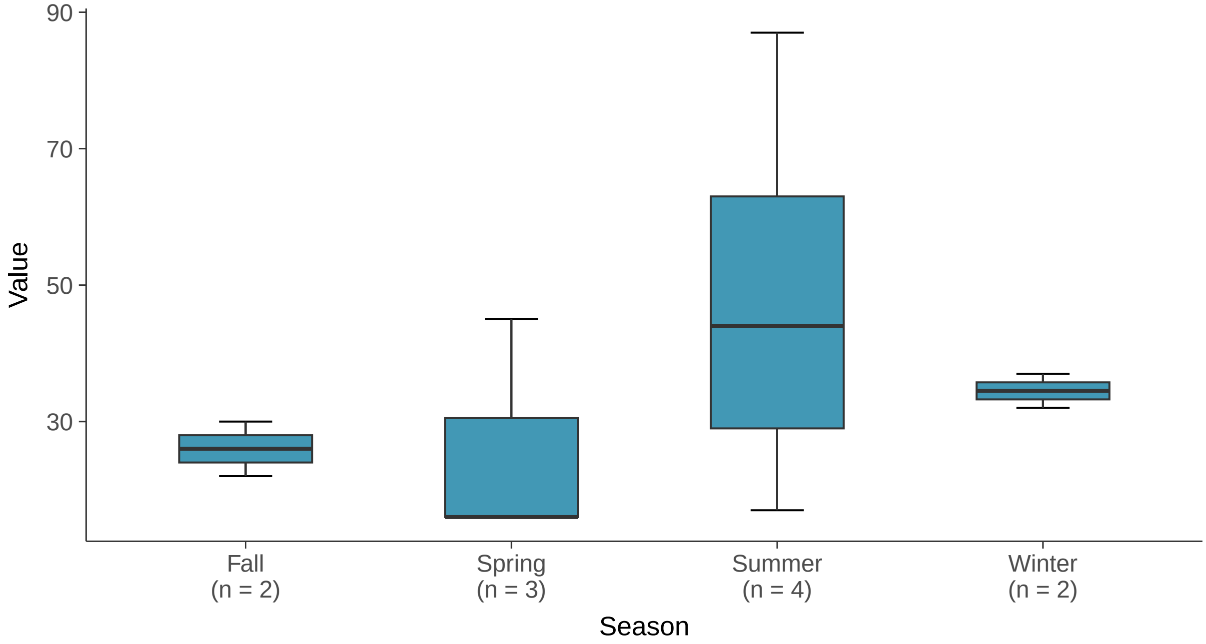
Boxplot

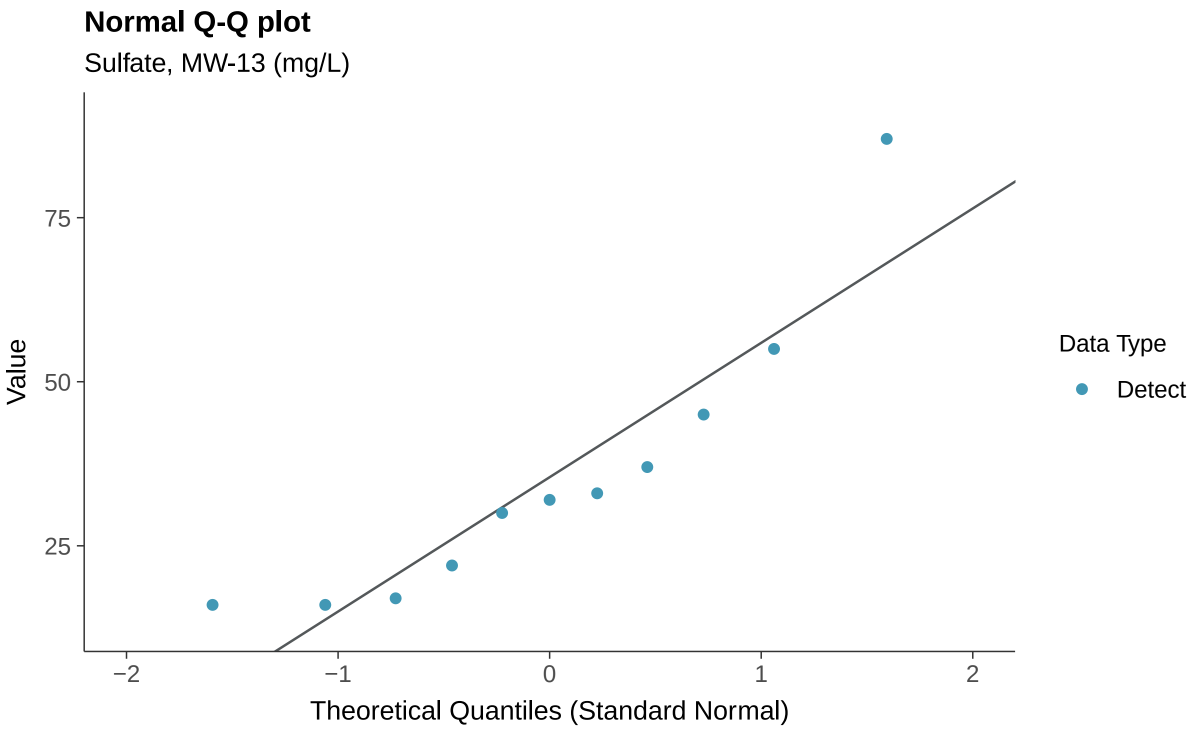
Sulfate, MW-13 (mg/L)



Boxplot by Season

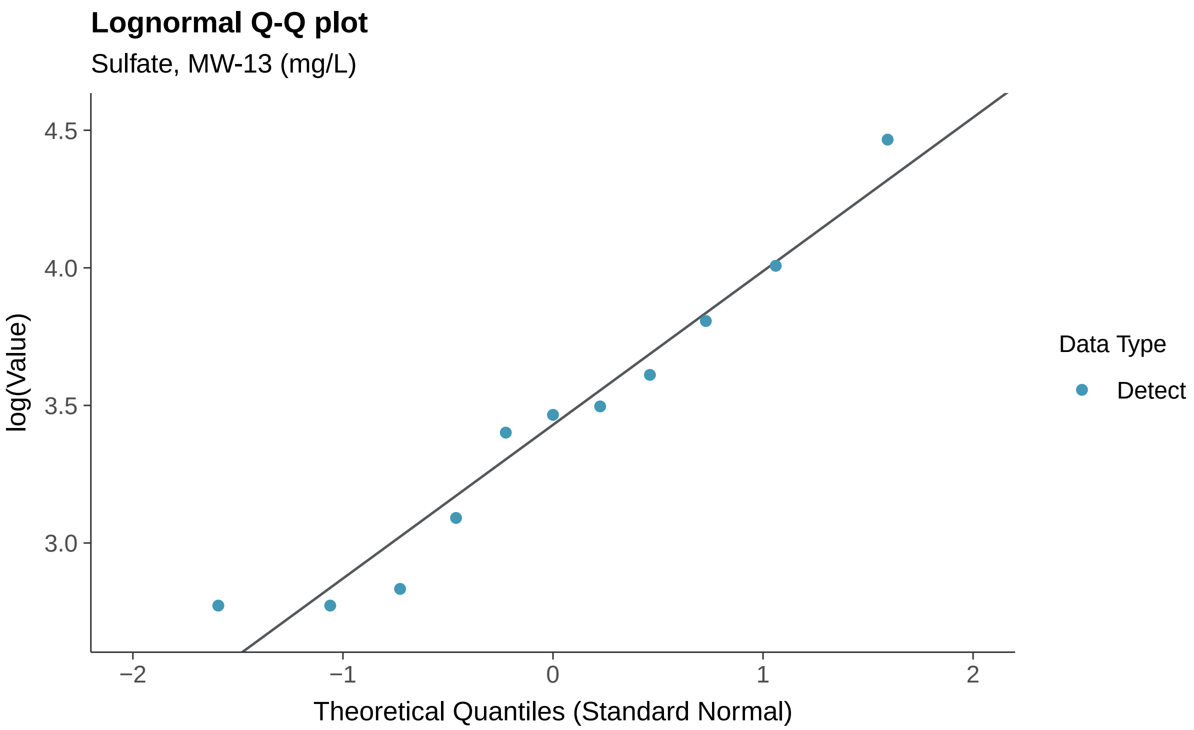
Sulfate, MW-13 (mg/L)





Normal Q-Q plot

Sulfate, MW-13 (mg/L)

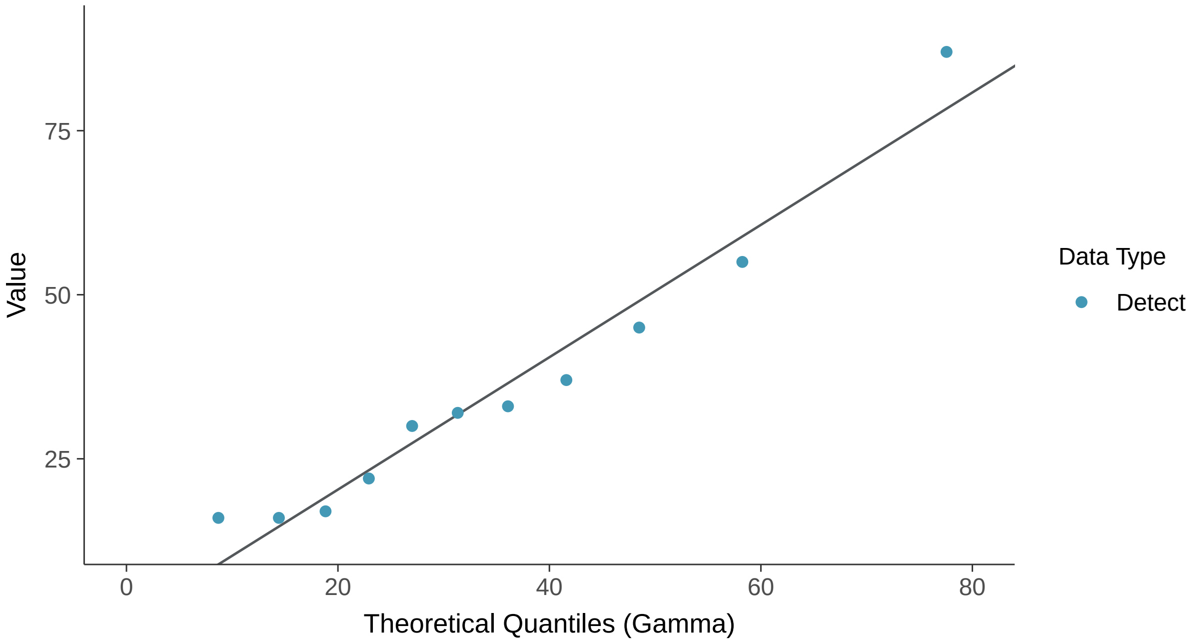


Lognormal Q-Q plot

Sulfate, MW-13 (mg/L)

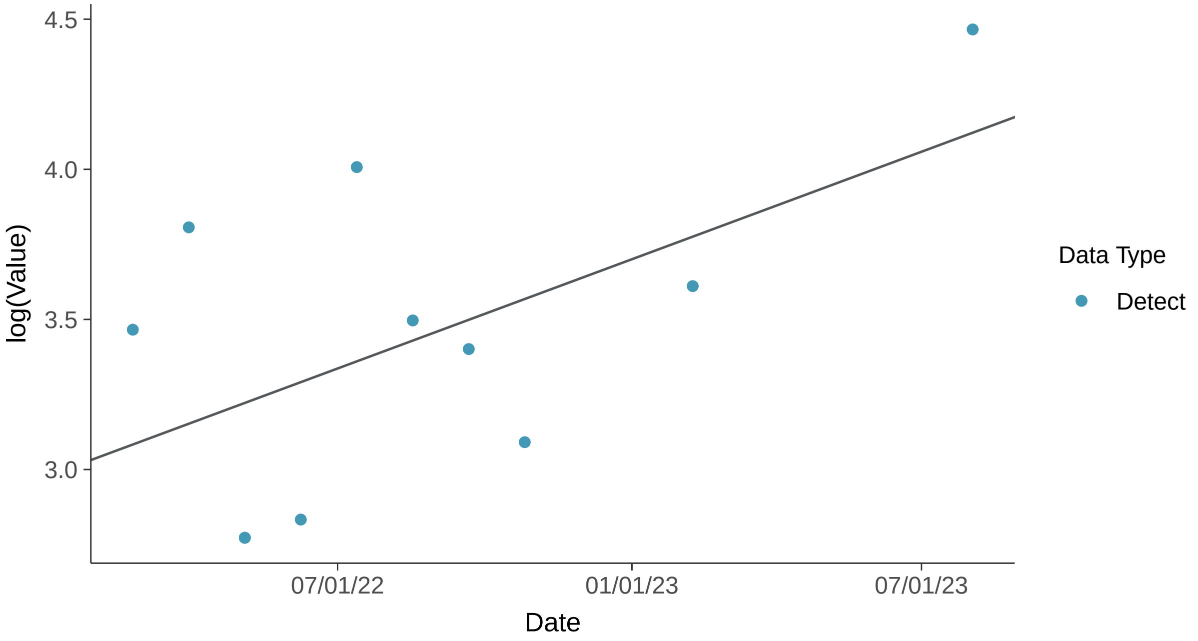
Gamma Q-Q plot

Sulfate, MW-13 (mg/L)



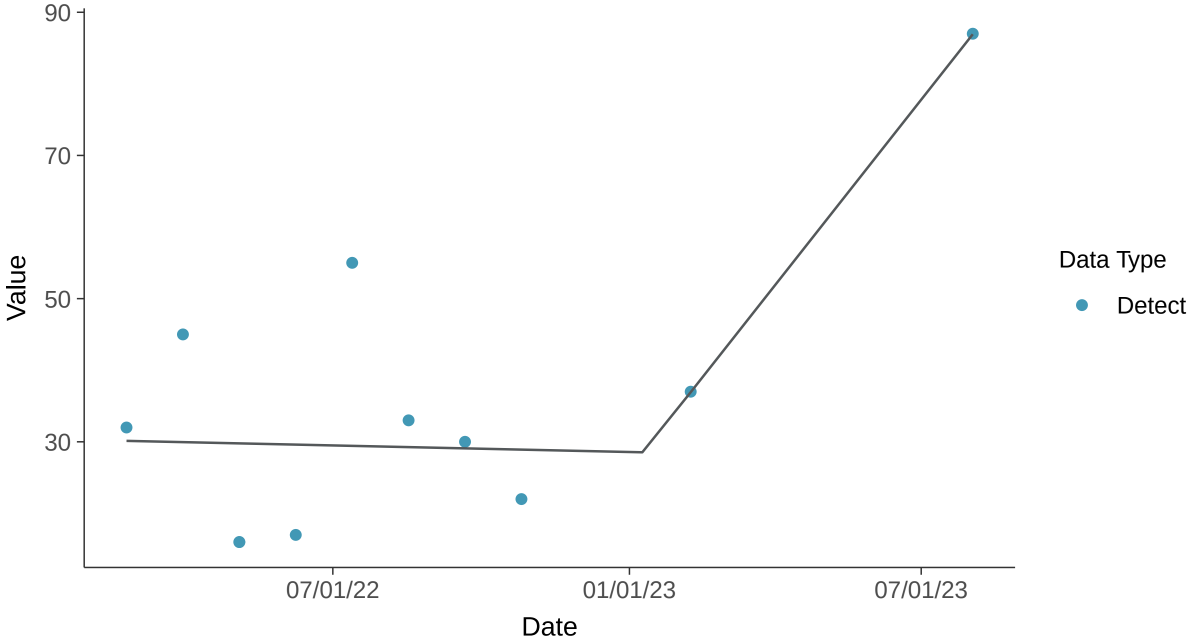
Trend Regression: Lognormal MLE

Sulfate, MW-13 (mg/L)



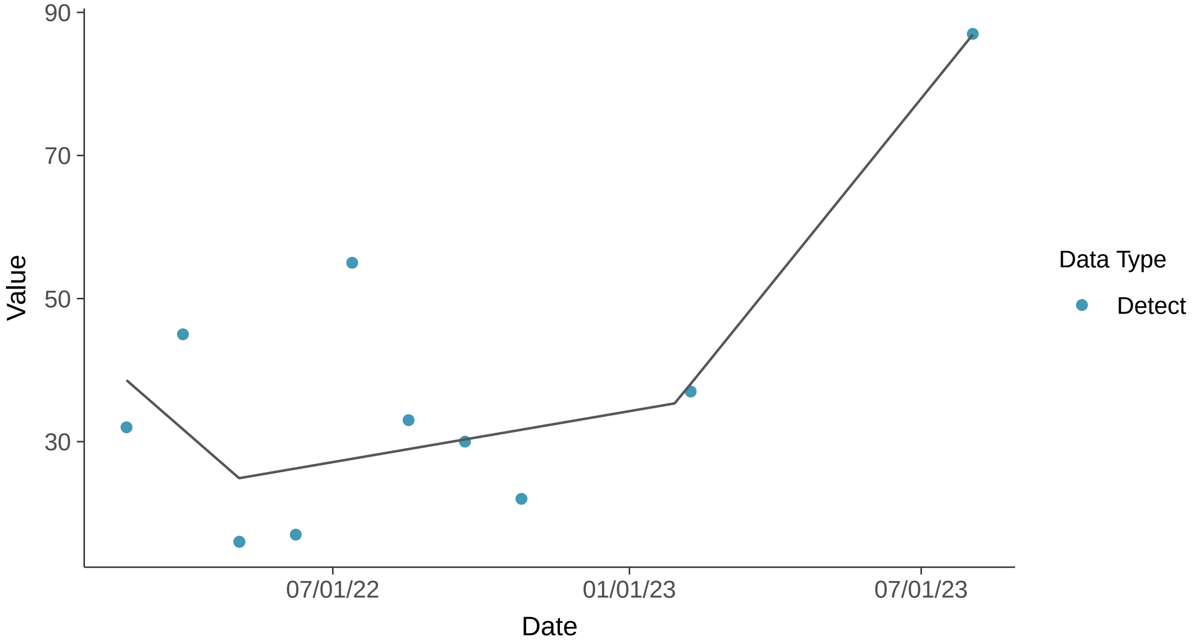
Trend Regression: Piecewise Linear-Linear

Sulfate, MW-13 (mg/L)



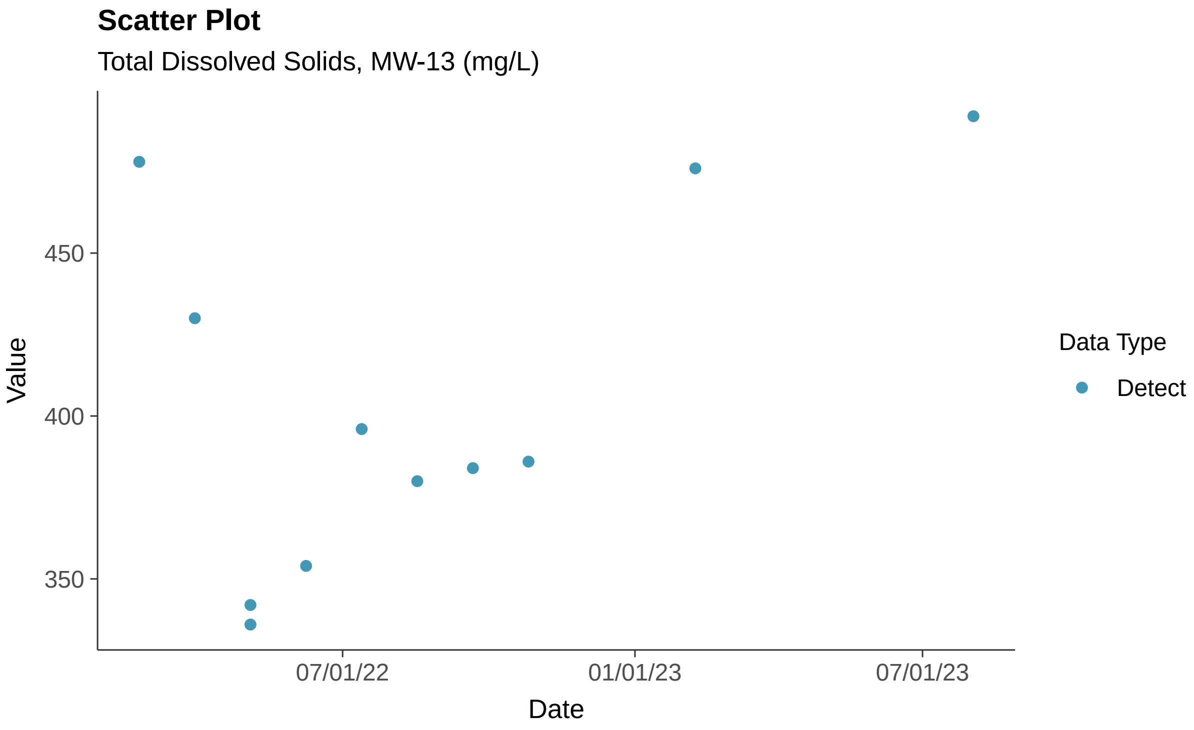
Trend Regression: Piecewise Linear-Linear-Linear

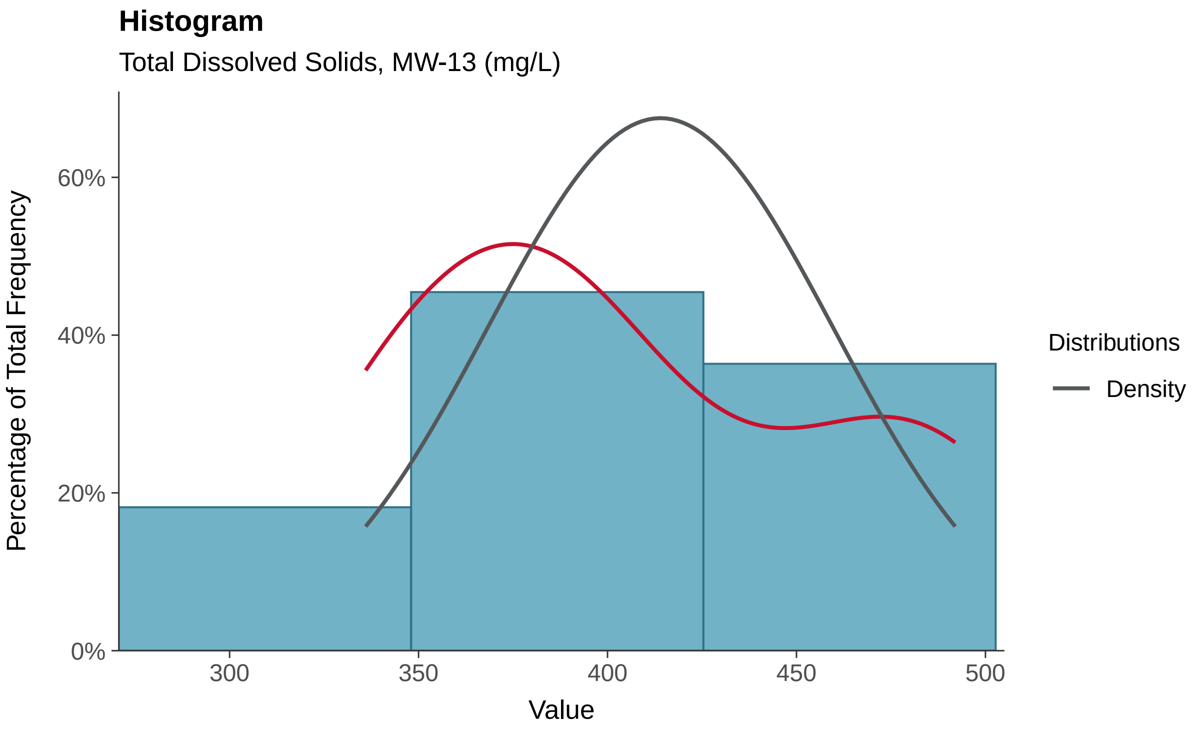
Sulfate, MW-13 (mg/L)



Appendix III: Total Dissolved Solids, MW-13

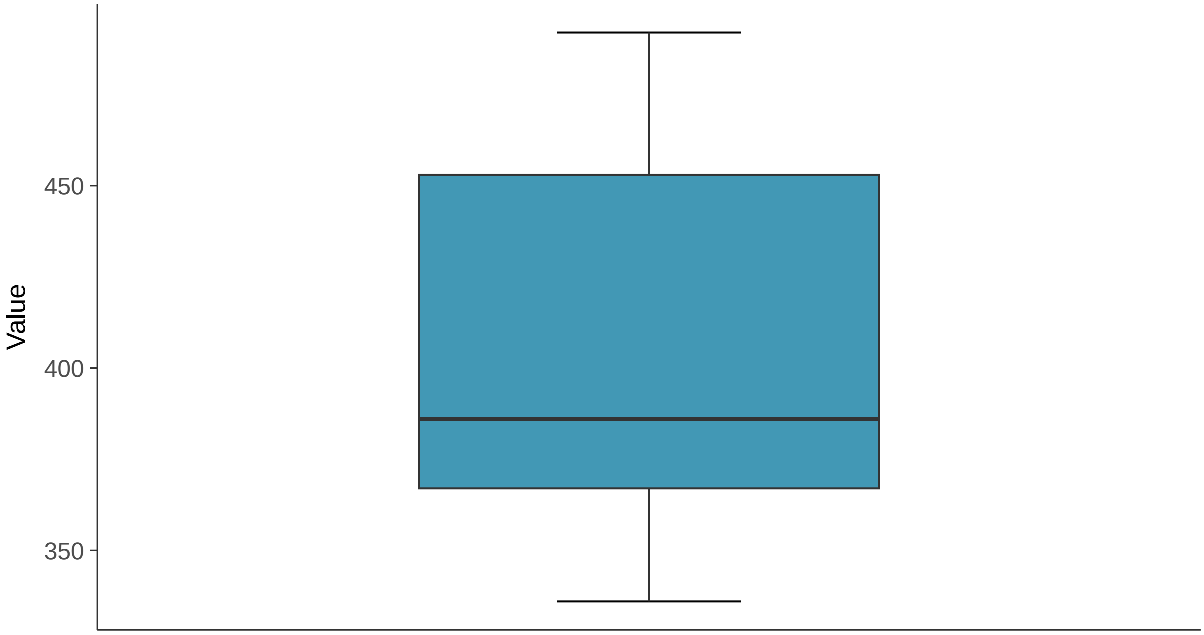
ID: 13_1_06





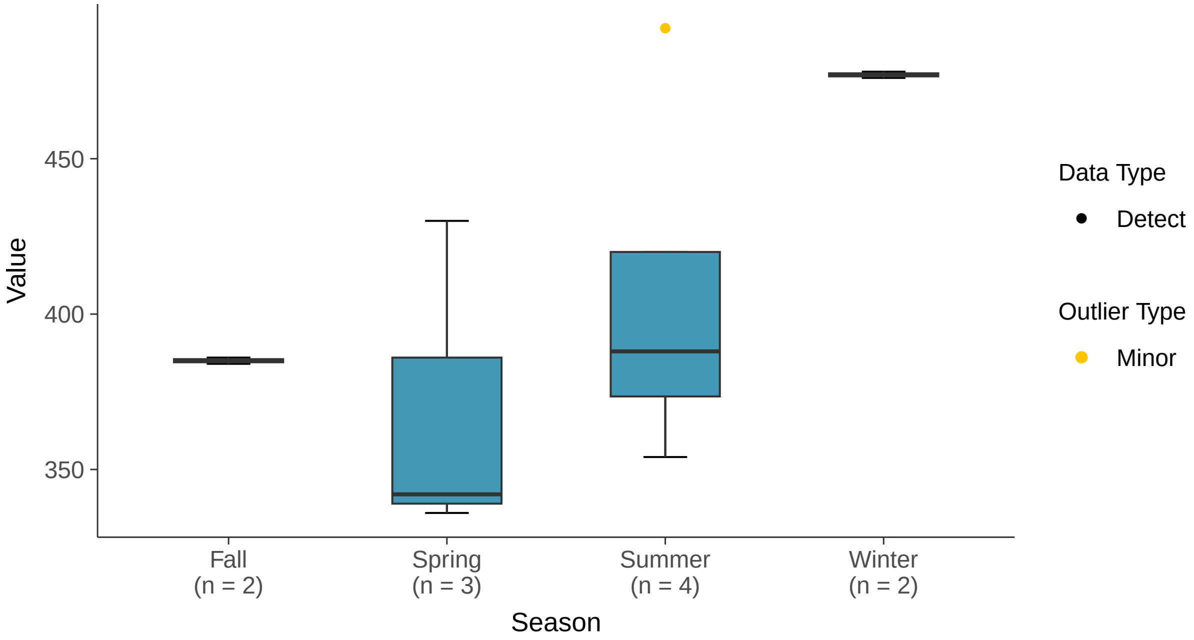
Boxplot

Total Dissolved Solids, MW-13 (mg/L)



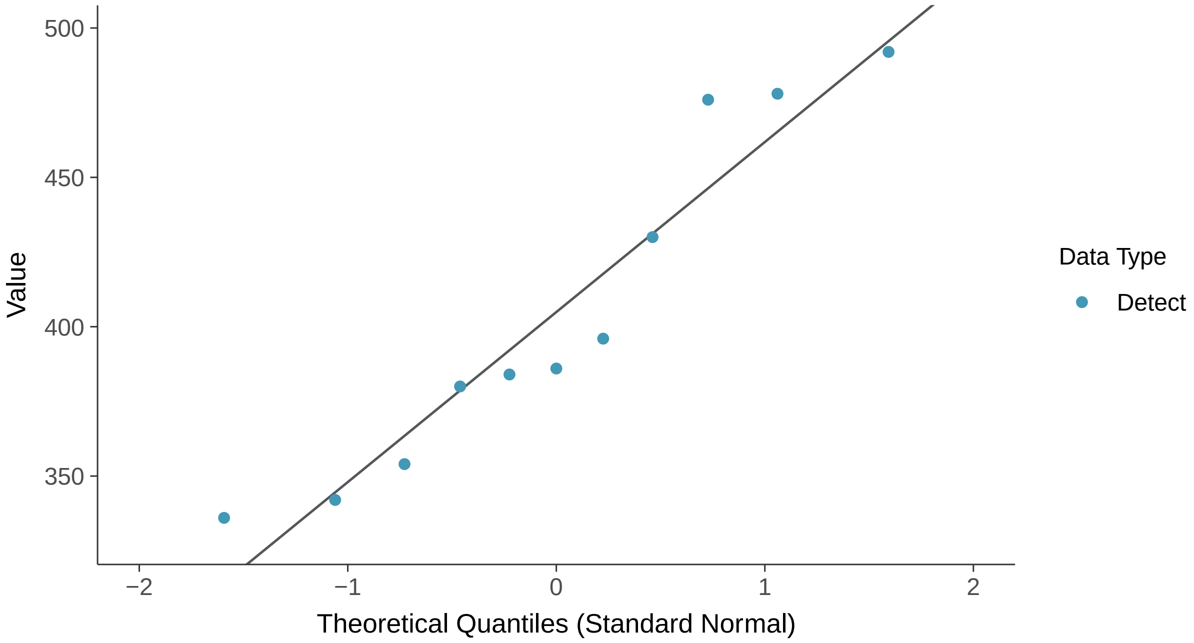
Boxplot by Season

Total Dissolved Solids, MW-13 (mg/L)



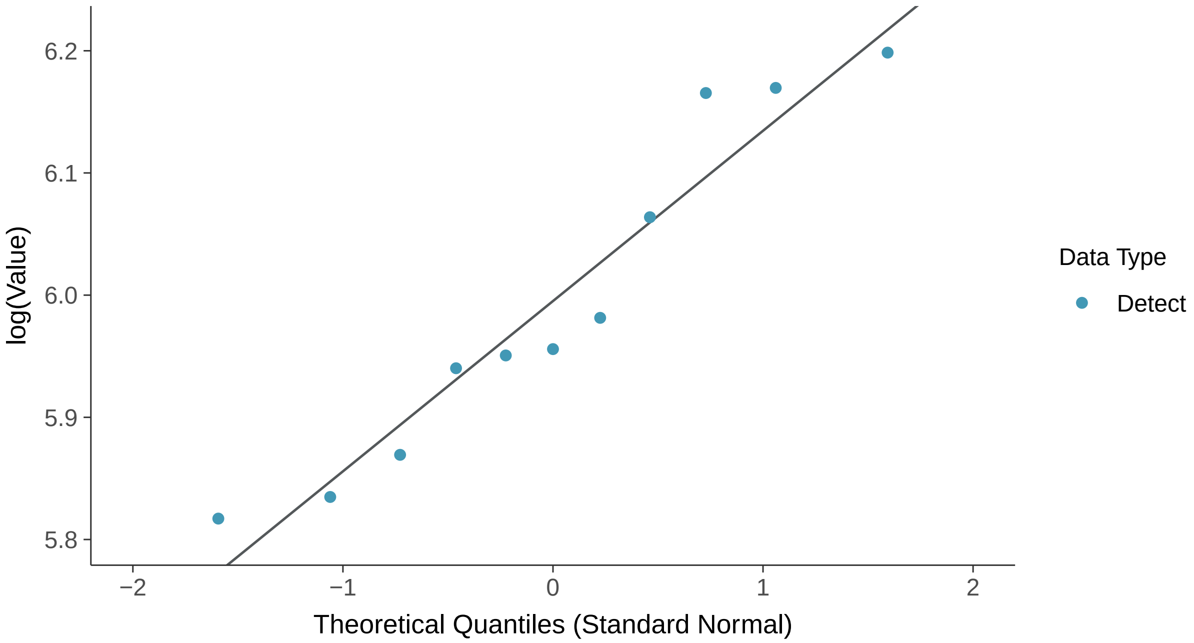
Normal Q-Q plot

Total Dissolved Solids, MW-13 (mg/L)



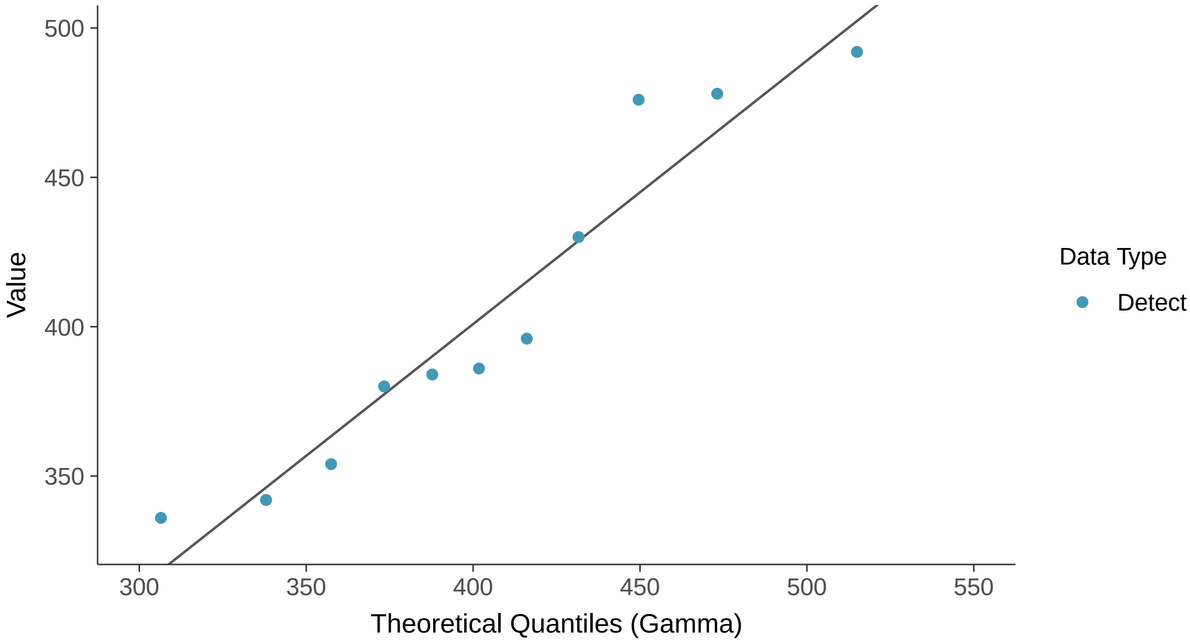
Lognormal Q-Q plot

Total Dissolved Solids, MW-13 (mg/L)



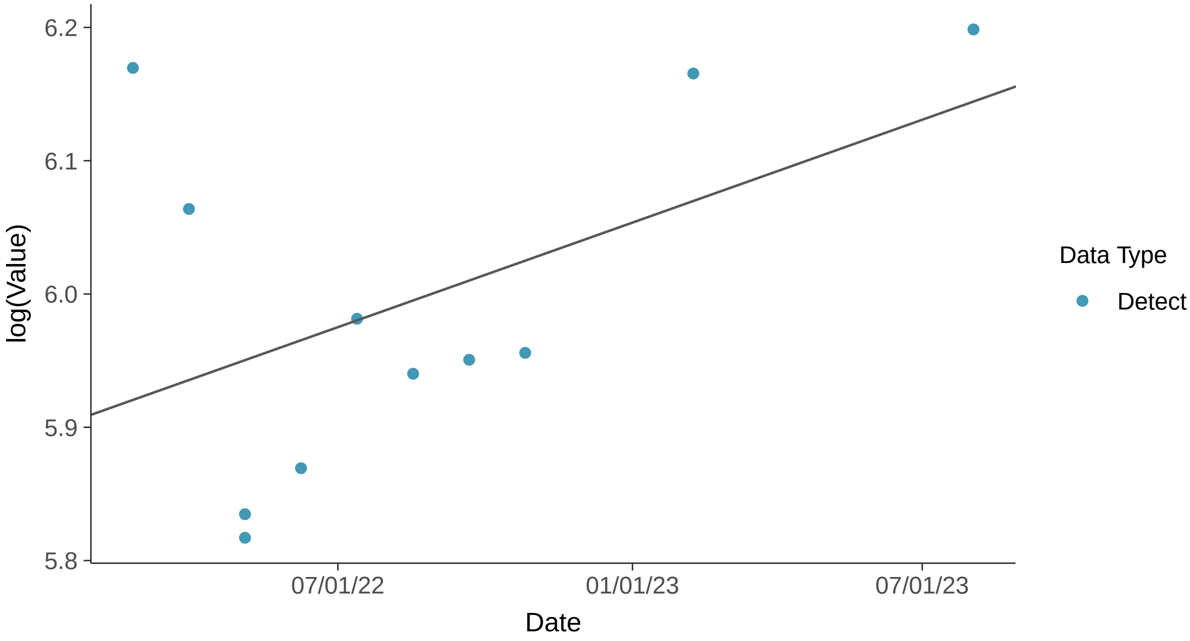
Gamma Q-Q plot

Total Dissolved Solids, MW-13 (mg/L)



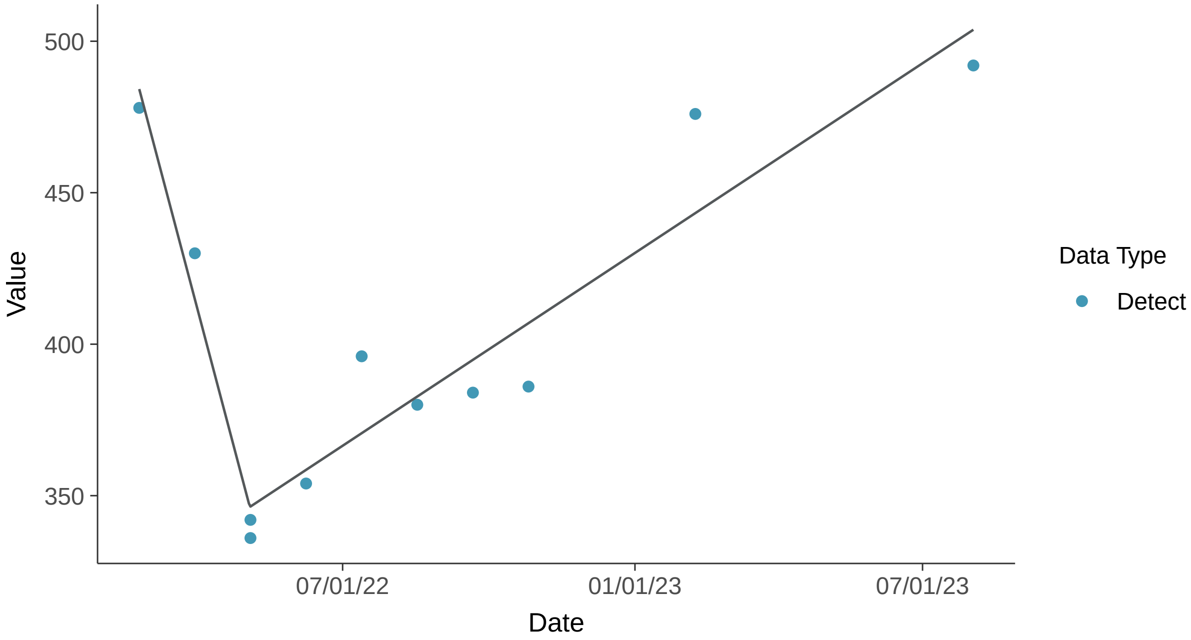
Trend Regression: Lognormal MLE

Total Dissolved Solids, MW-13 (mg/L)



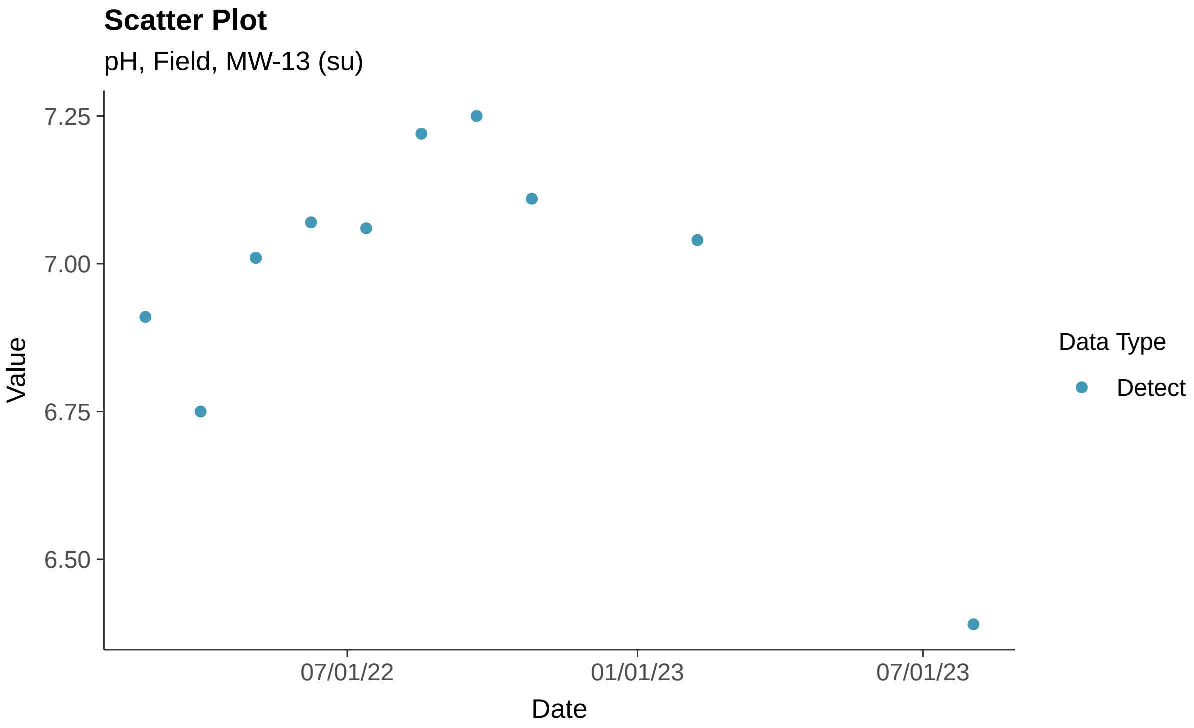
Trend Regression: Piecewise Linear-Linear

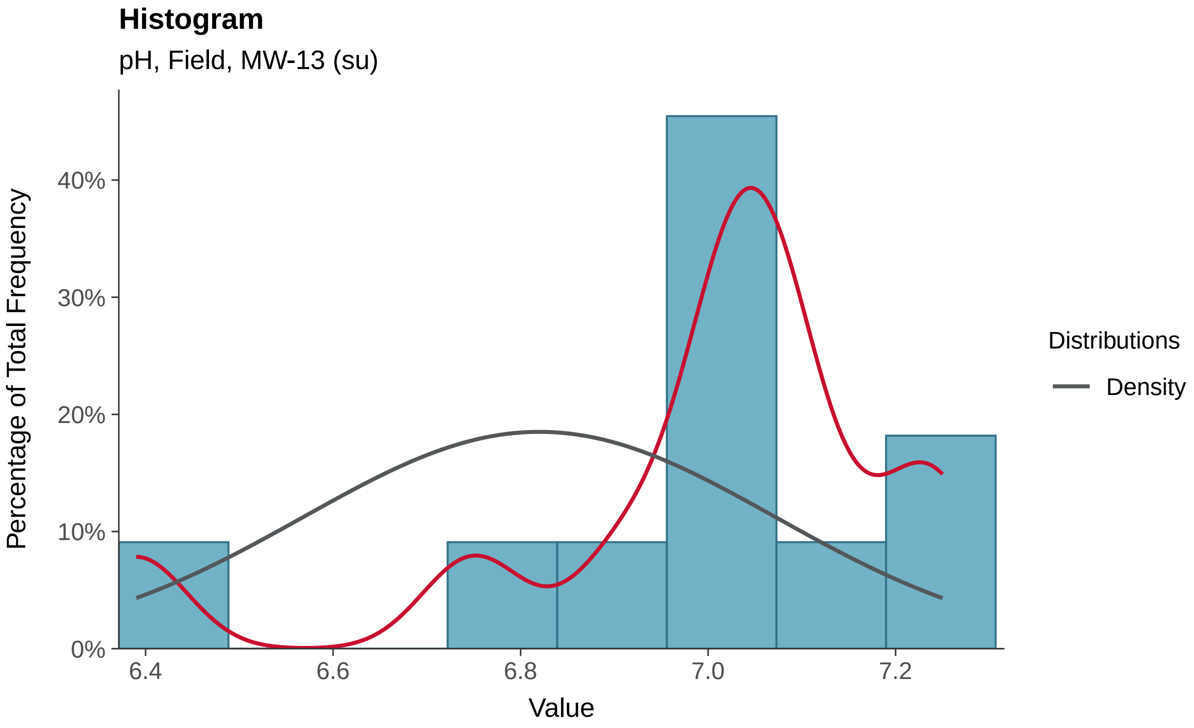
Total Dissolved Solids, MW-13 (mg/L)



Appendix III: pH, Field, MW-13

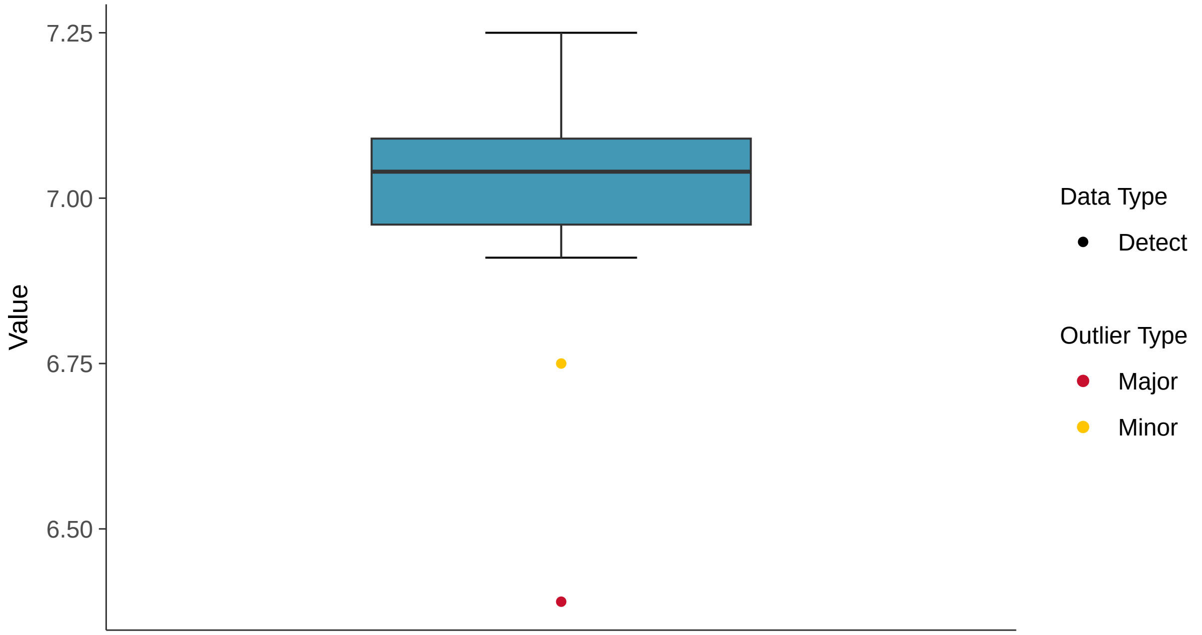
ID: 13_1_07





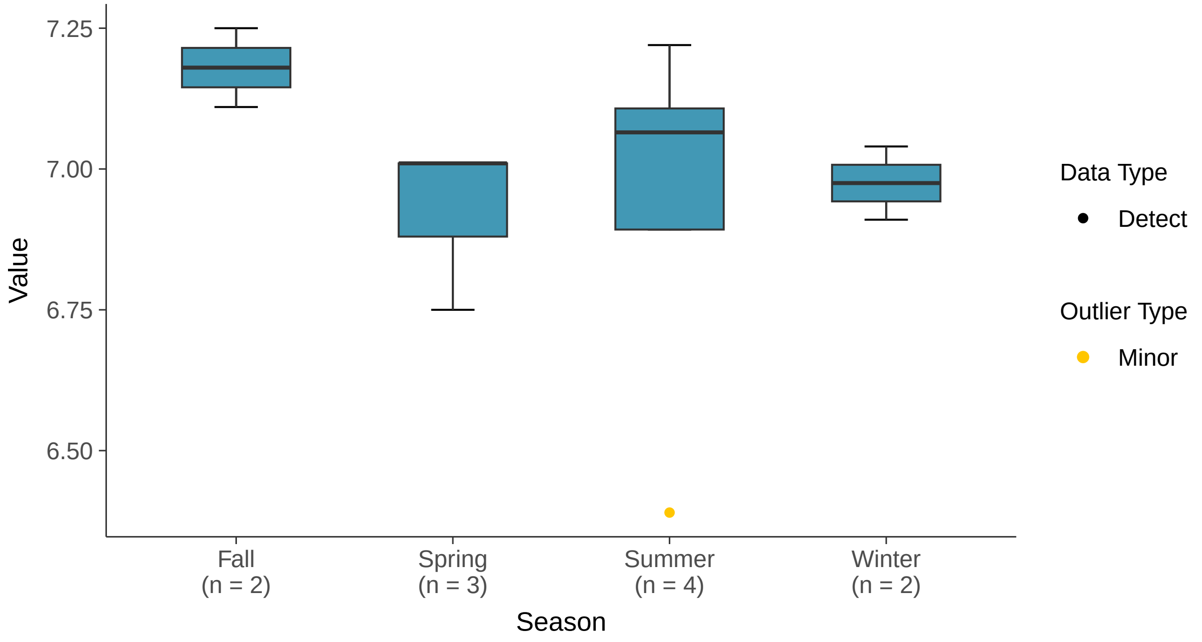
Boxplot

pH, Field, MW-13 (su)



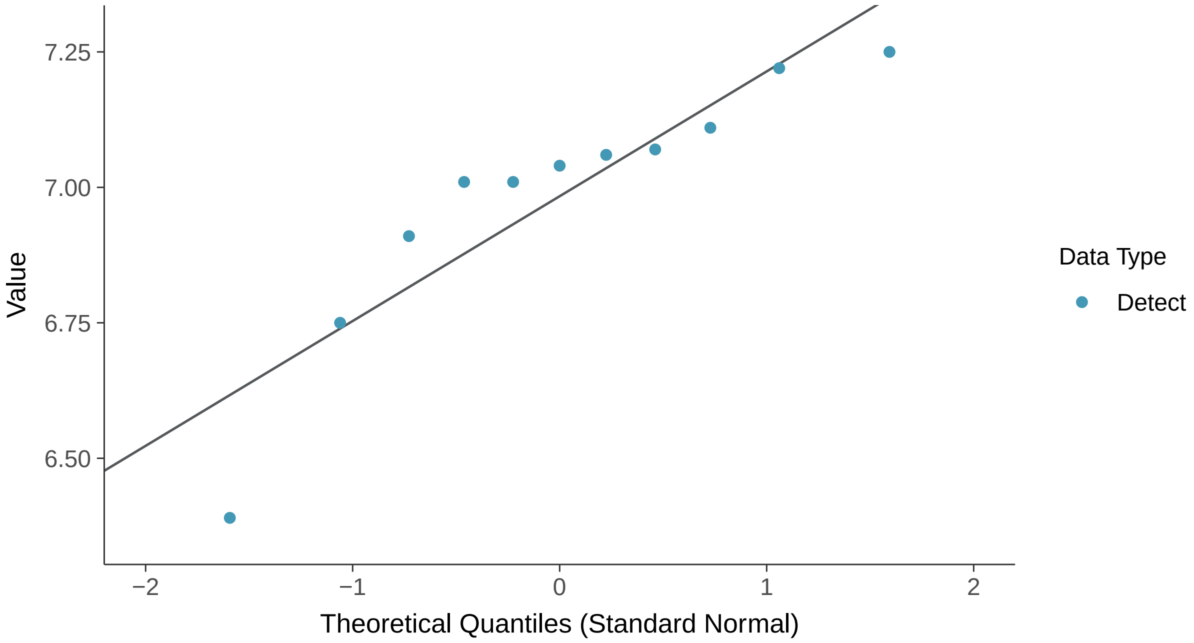
Boxplot by Season

pH, Field, MW-13 (su)



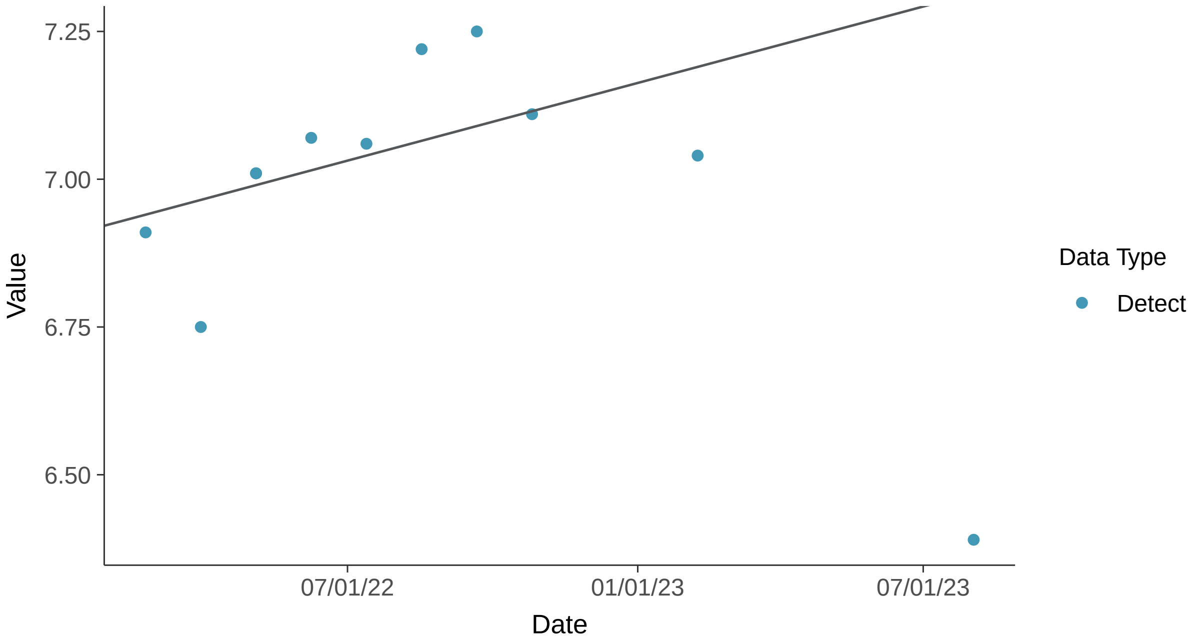
Normal Q-Q plot

pH, Field, MW-13 (su)



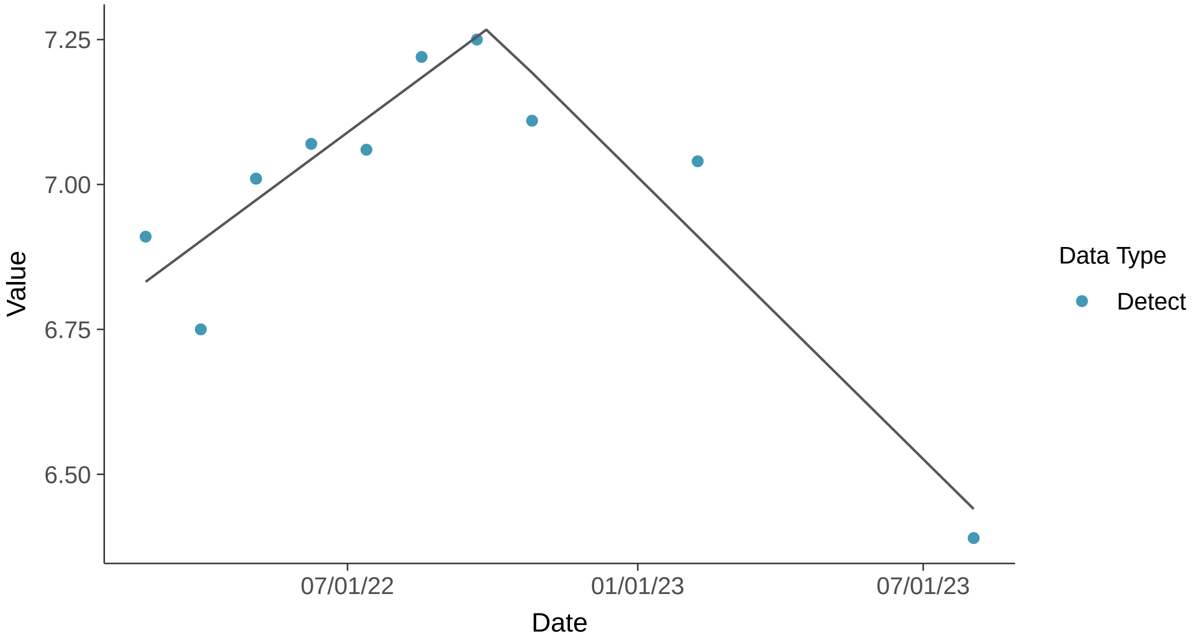
Trend Regression: Mann-Kendall/Theil-Sen Estimate

pH, Field, MW-13 (su)



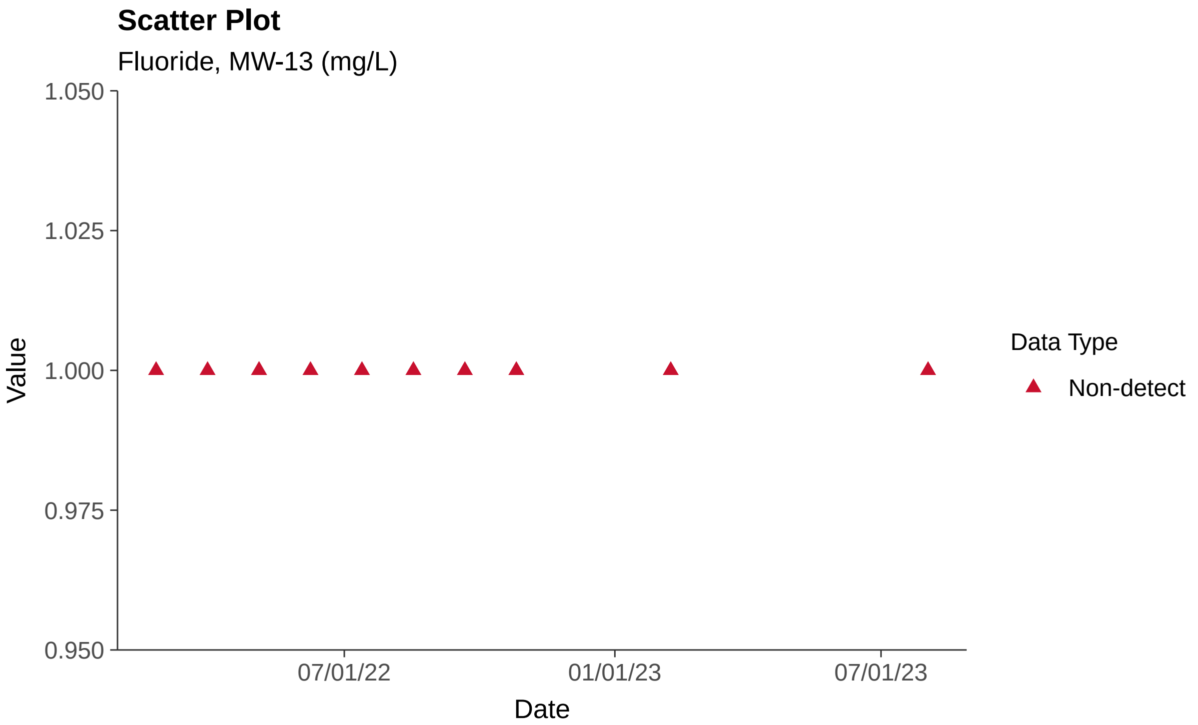
Trend Regression: Piecewise Linear-Linear

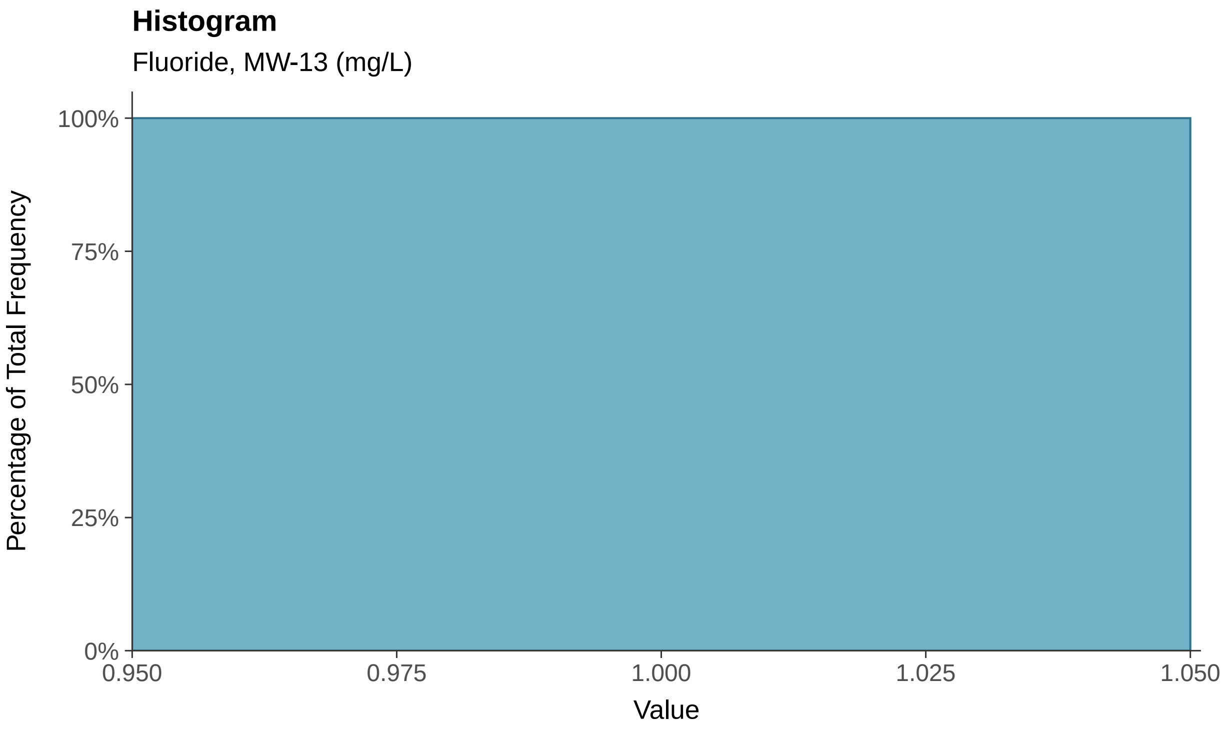
pH, Field, MW-13 (su)



Appendix IV: Fluoride, MW-13

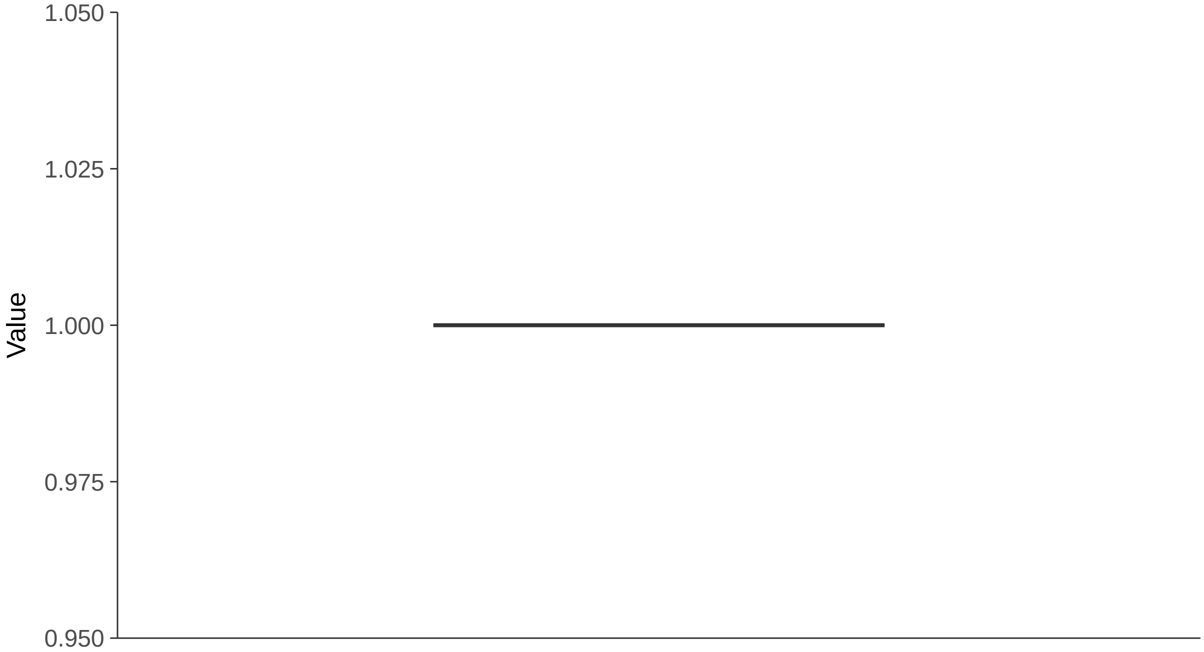
ID: 13_2_04





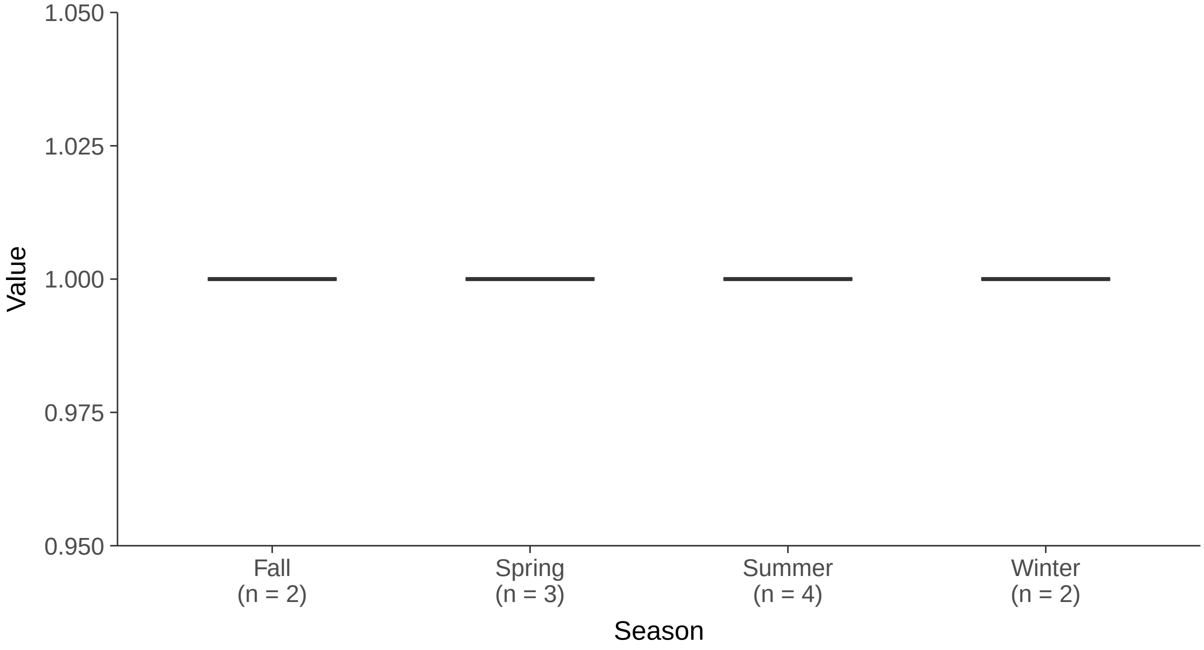
Boxplot

Fluoride, MW-13 (mg/L)



Boxplot by Season

Fluoride, MW-13 (mg/L)

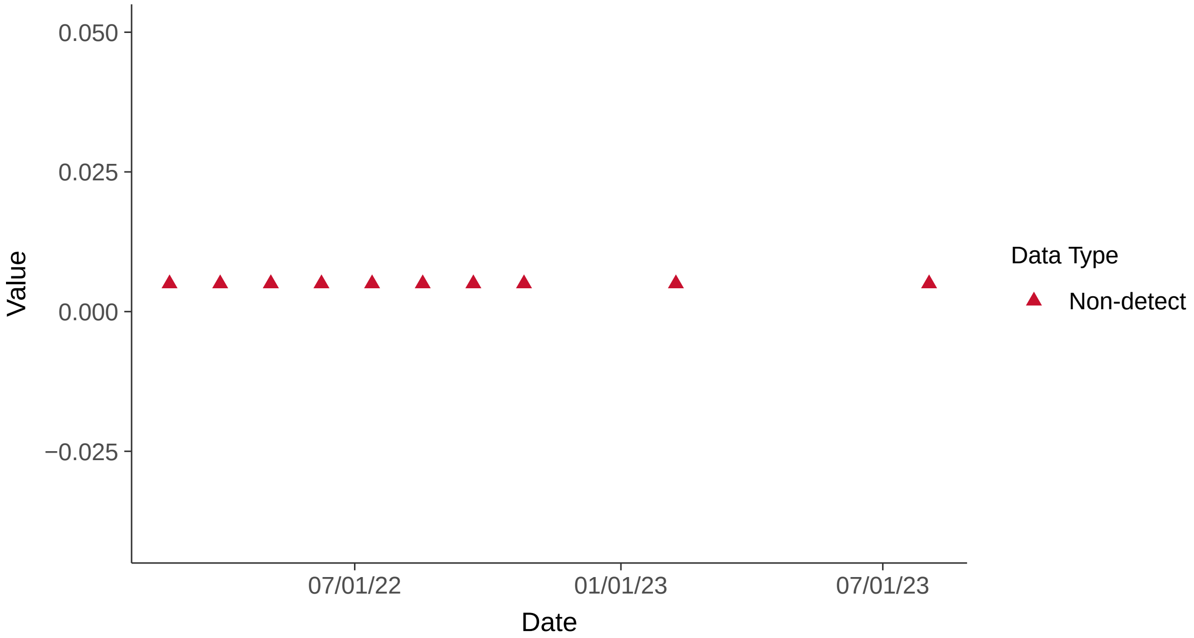


Appendix IV: Antimony, MW-13

ID: 13_2_08

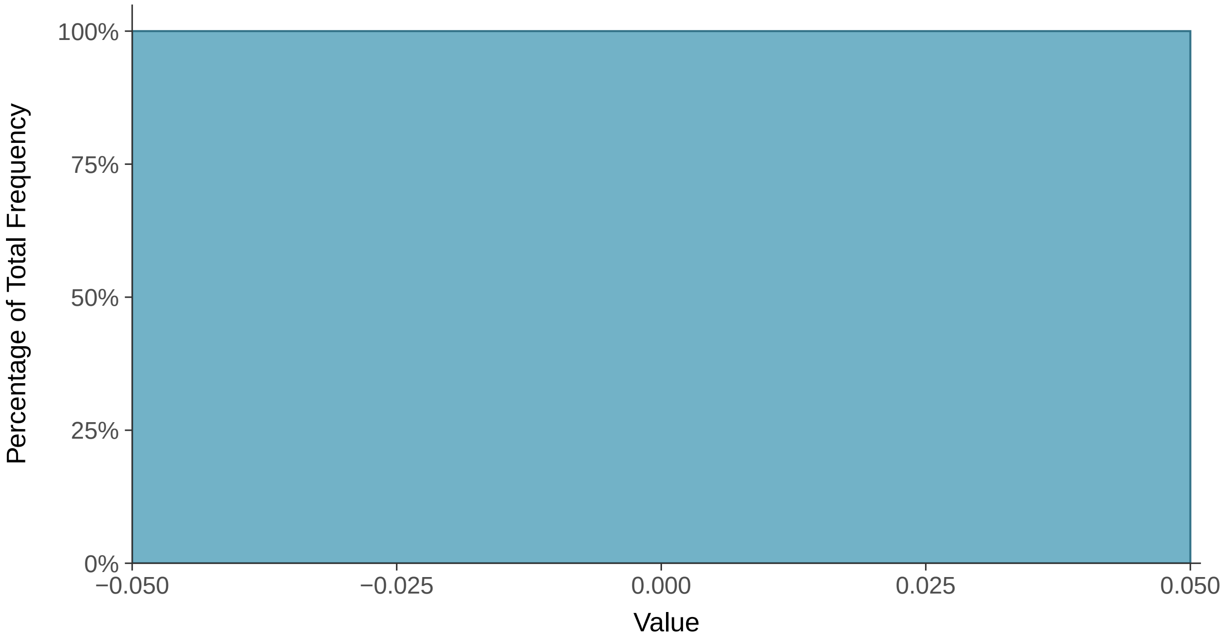
Scatter Plot

Antimony, MW-13 (mg/L)



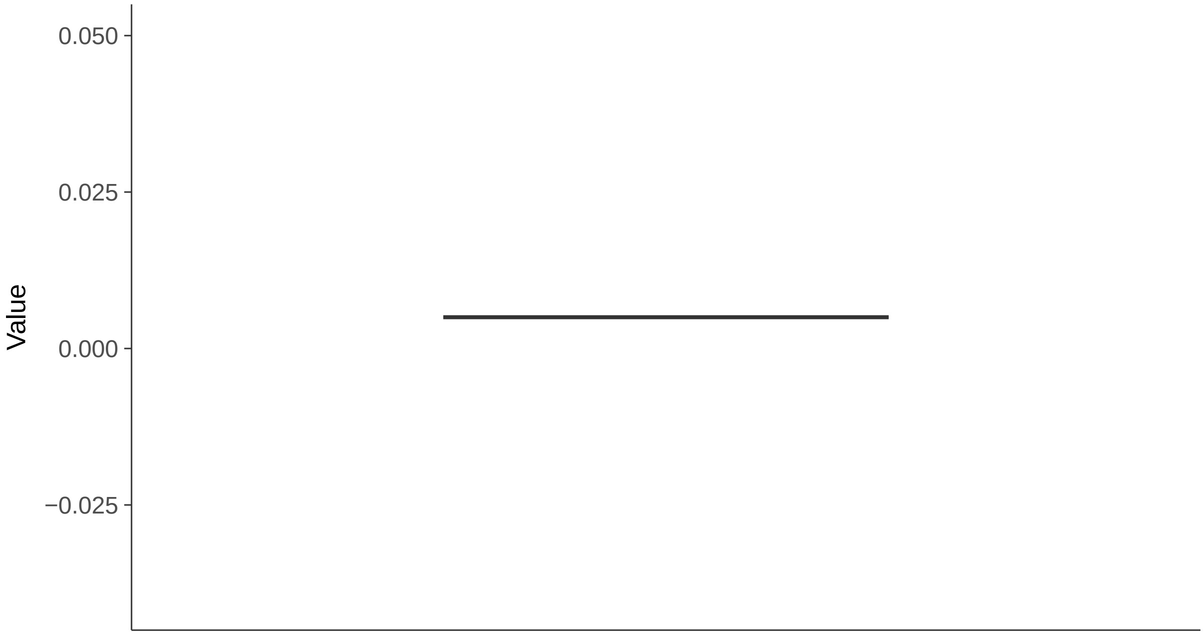
Histogram

Antimony, MW-13 (mg/L)



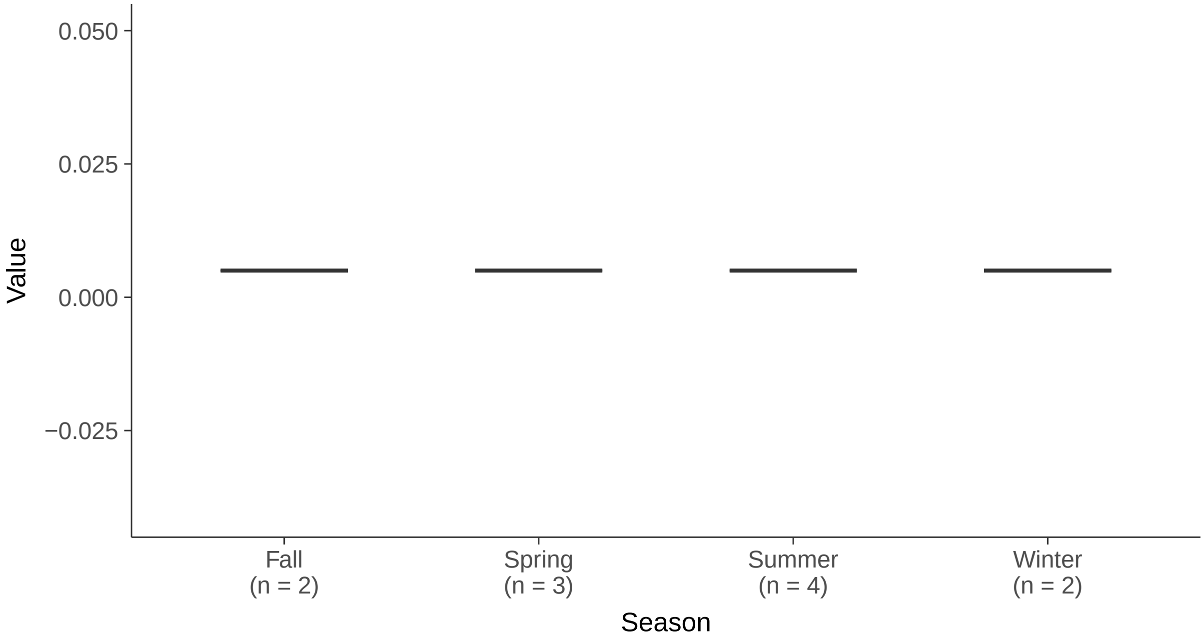
Boxplot

Antimony, MW-13 (mg/L)



Boxplot by Season

Antimony, MW-13 (mg/L)

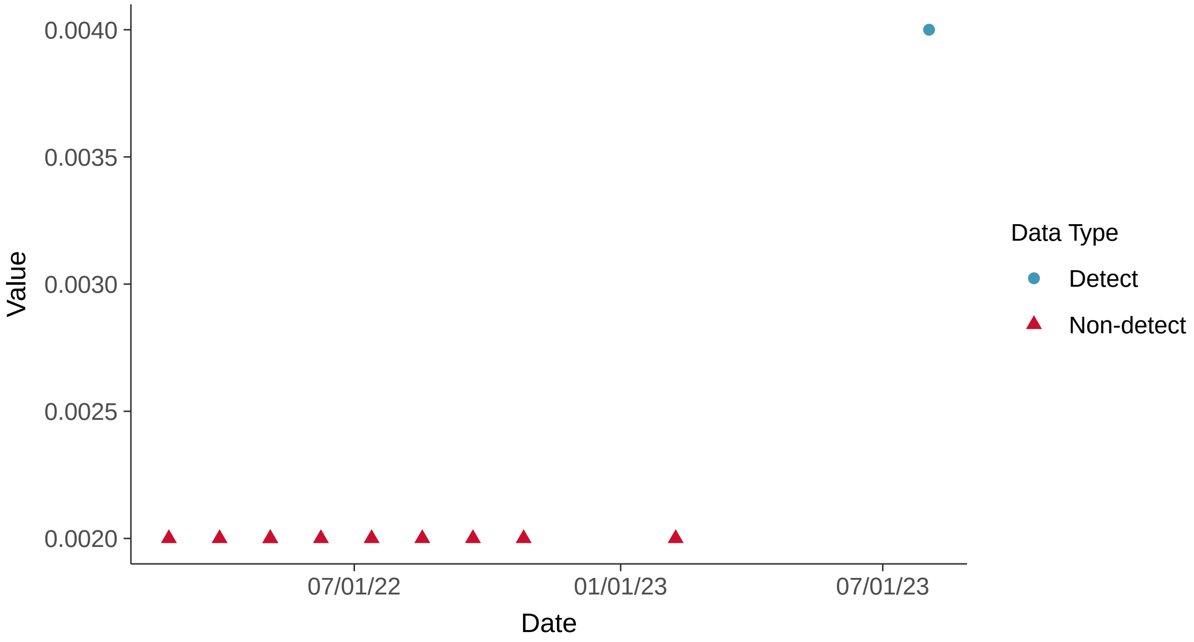


Appendix IV: Arsenic, MW-13

ID: 13_2_09

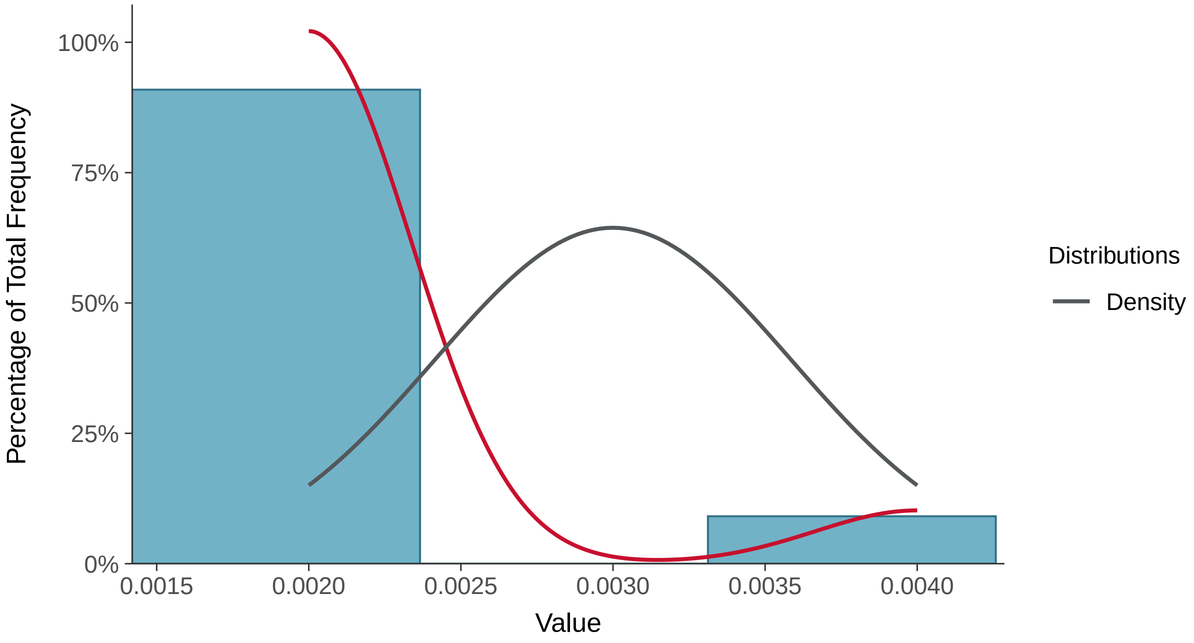
Scatter Plot

Arsenic, MW-13 (mg/L)



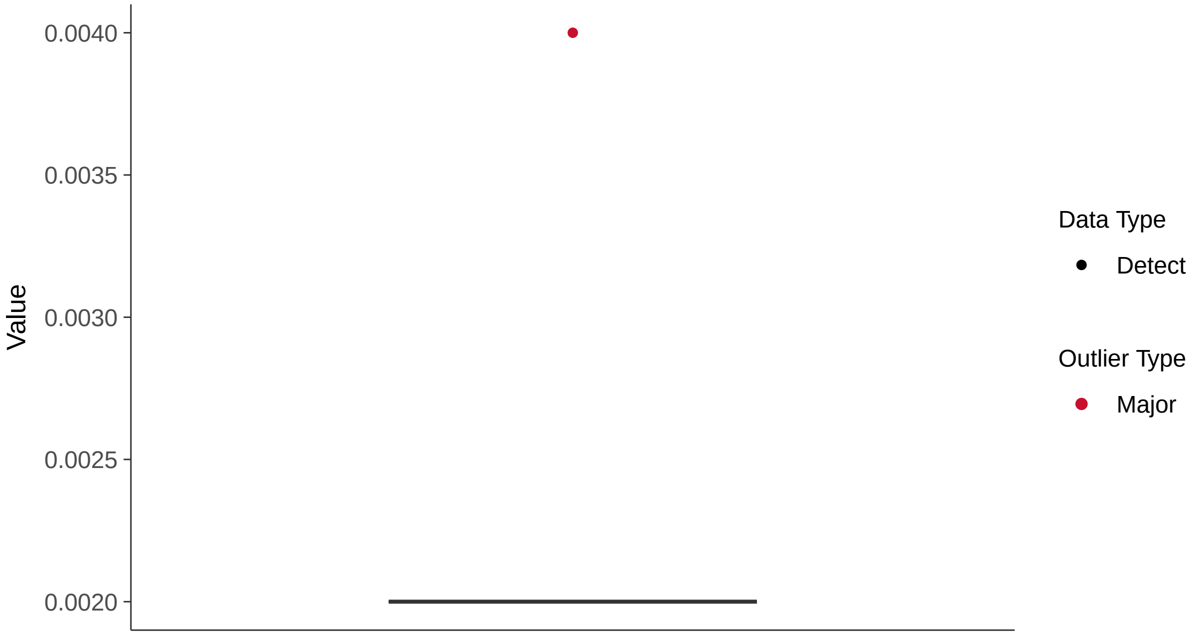
Histogram

Arsenic, MW-13 (mg/L)



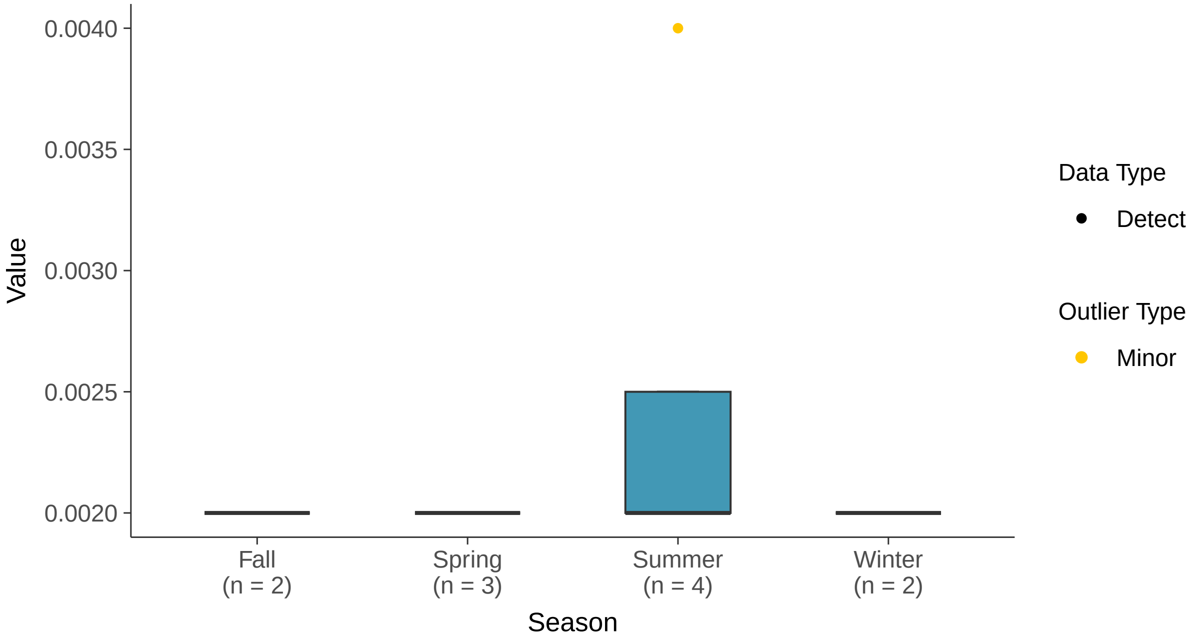
Boxplot

Arsenic, MW-13 (mg/L)



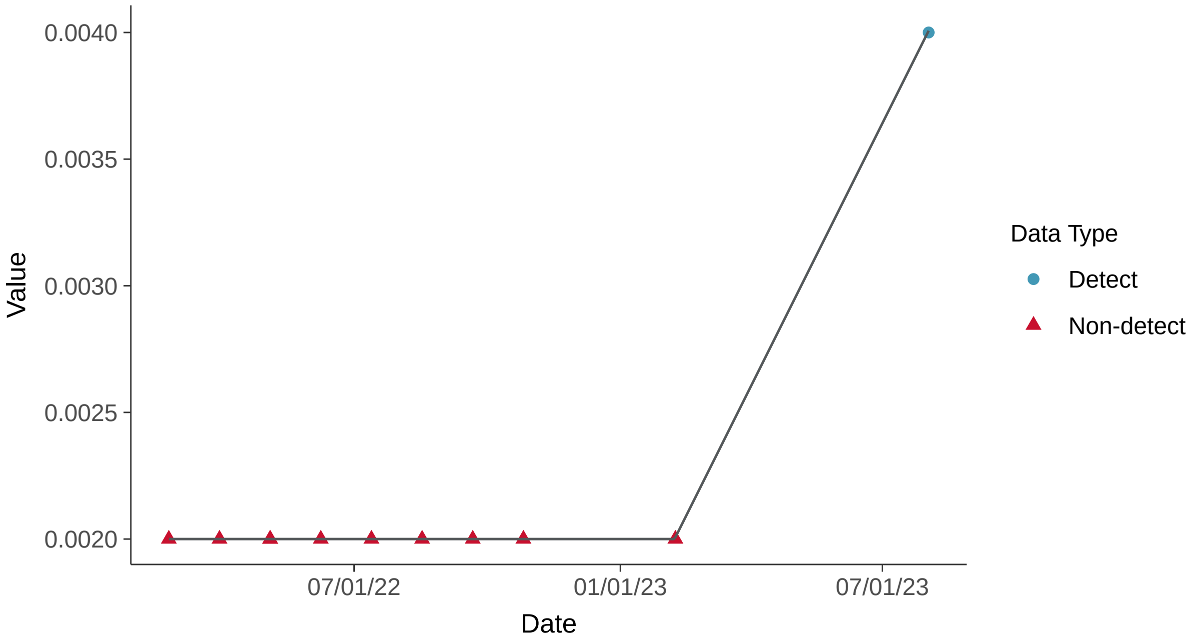
Boxplot by Season

Arsenic, MW-13 (mg/L)



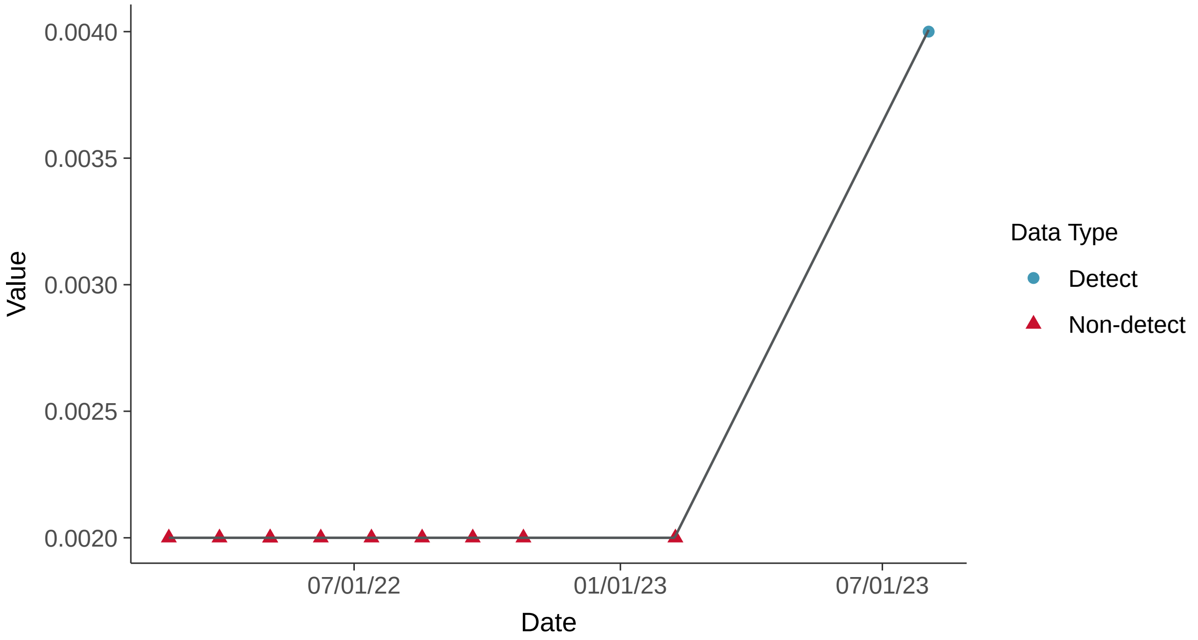
Trend Regression: Piecewise Linear-Linear

Arsenic, MW-13 (mg/L)



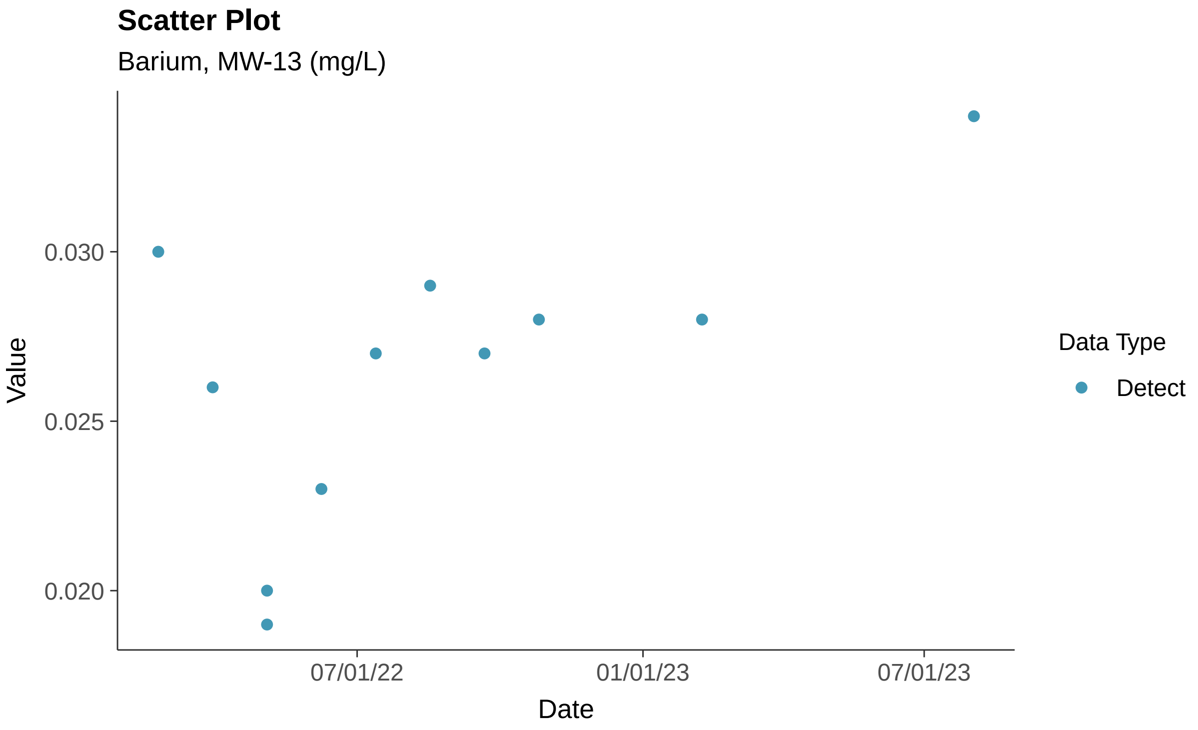
Trend Regression: Piecewise Linear-Linear-Linear

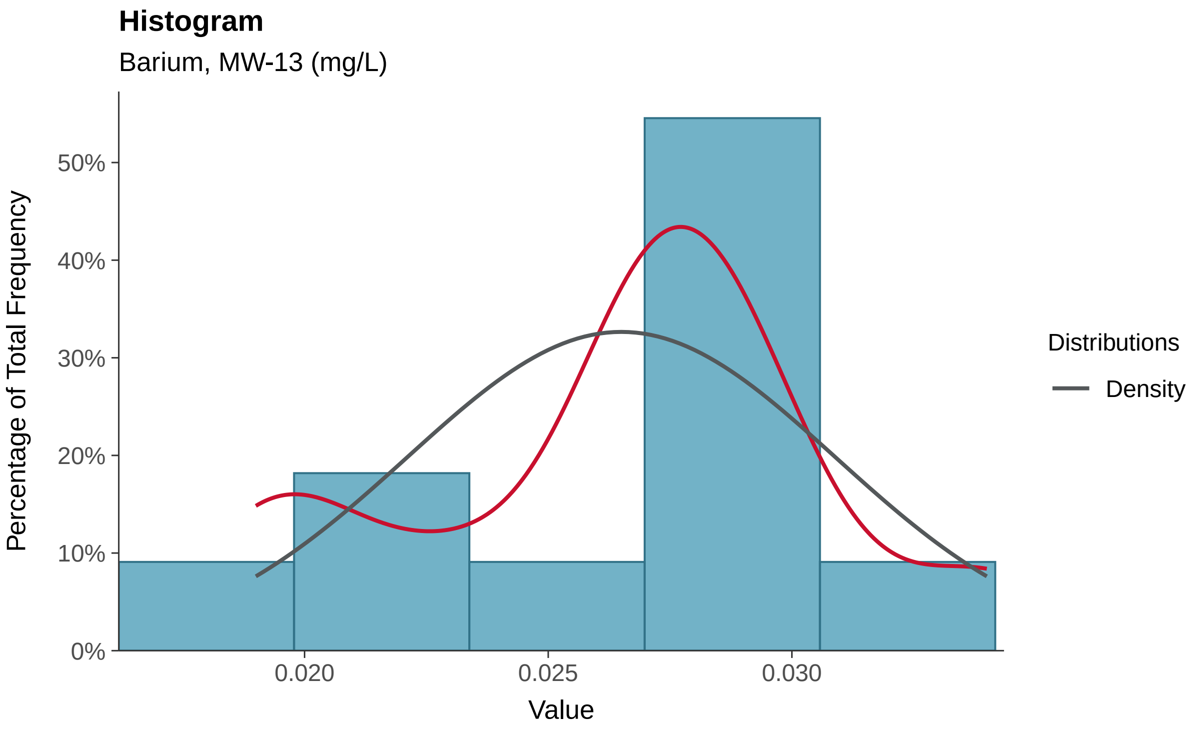
Arsenic, MW-13 (mg/L)



Appendix IV: Barium, MW-13

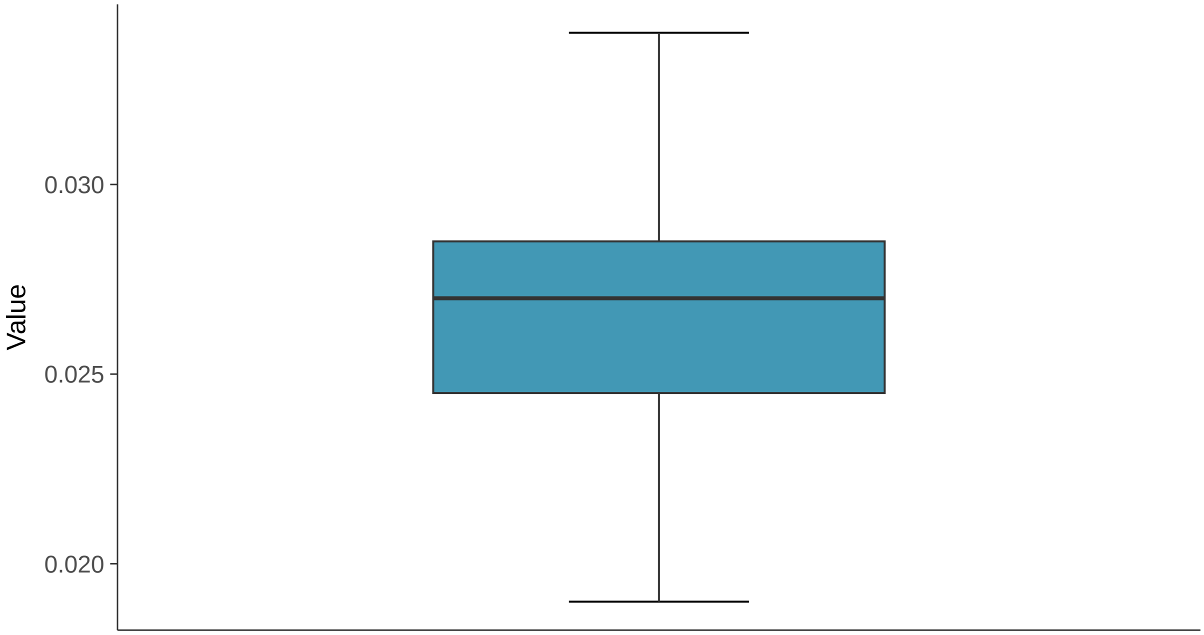
ID: 13_2_10





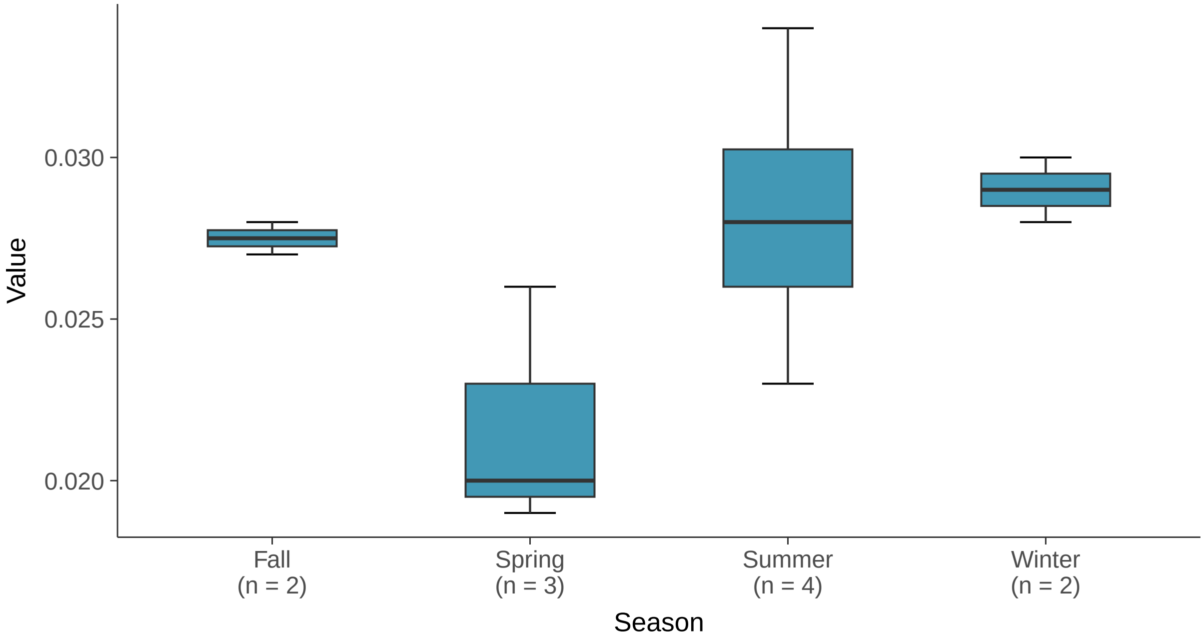
Boxplot

Barium, MW-13 (mg/L)



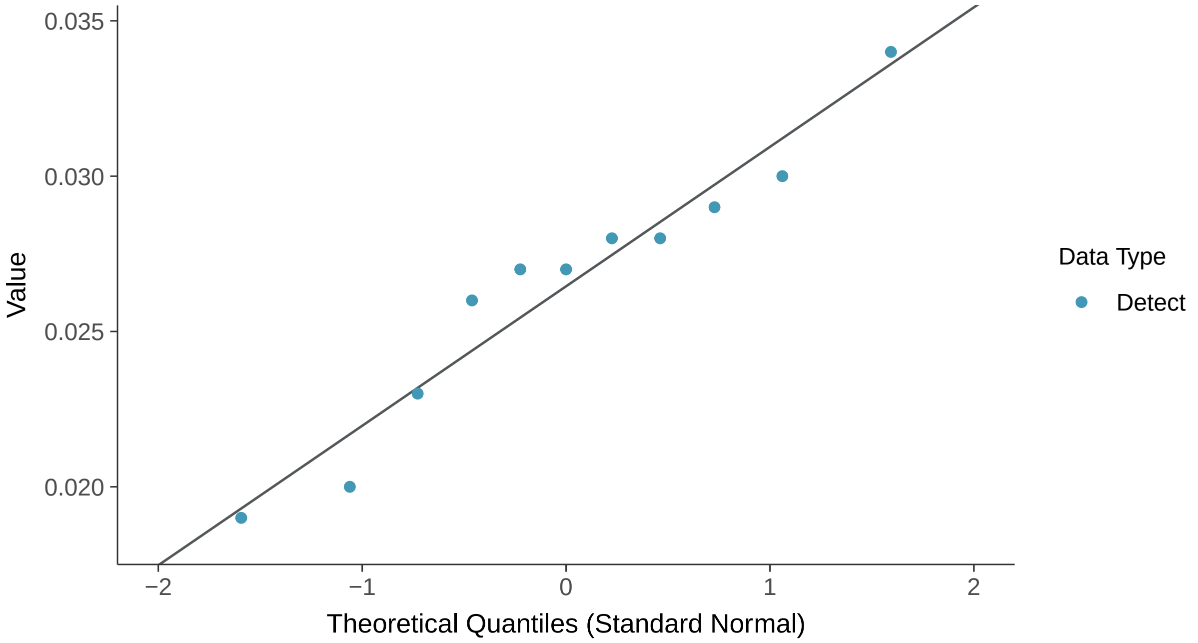
Boxplot by Season

Barium, MW-13 (mg/L)



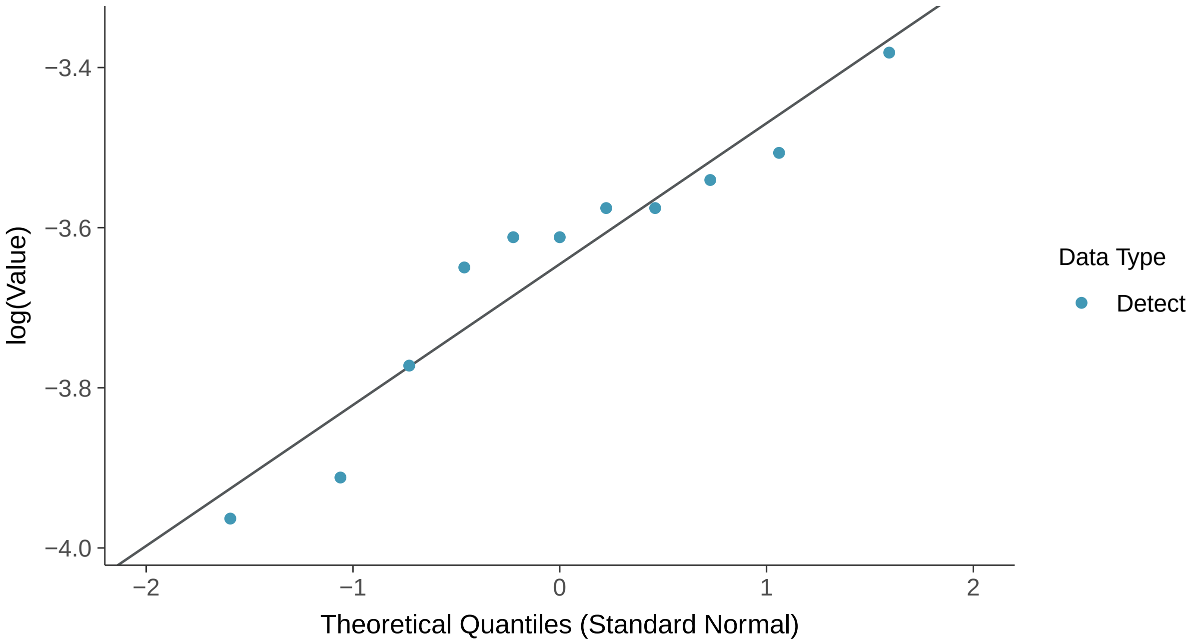
Normal Q-Q plot

Barium, MW-13 (mg/L)



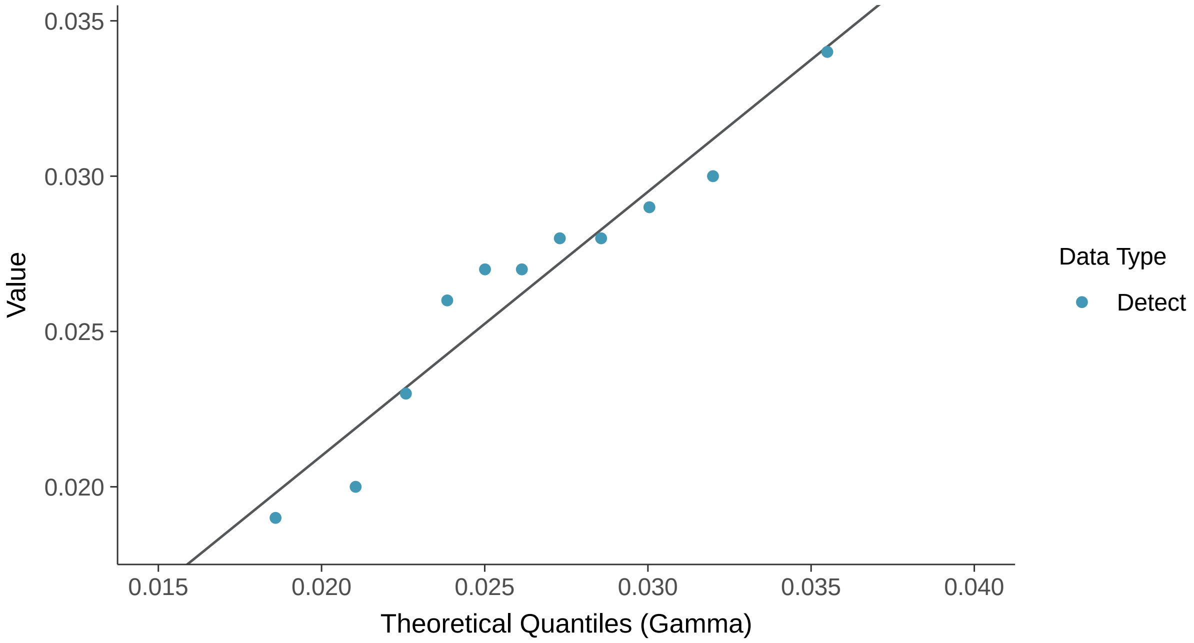
Lognormal Q-Q plot

Barium, MW-13 (mg/L)



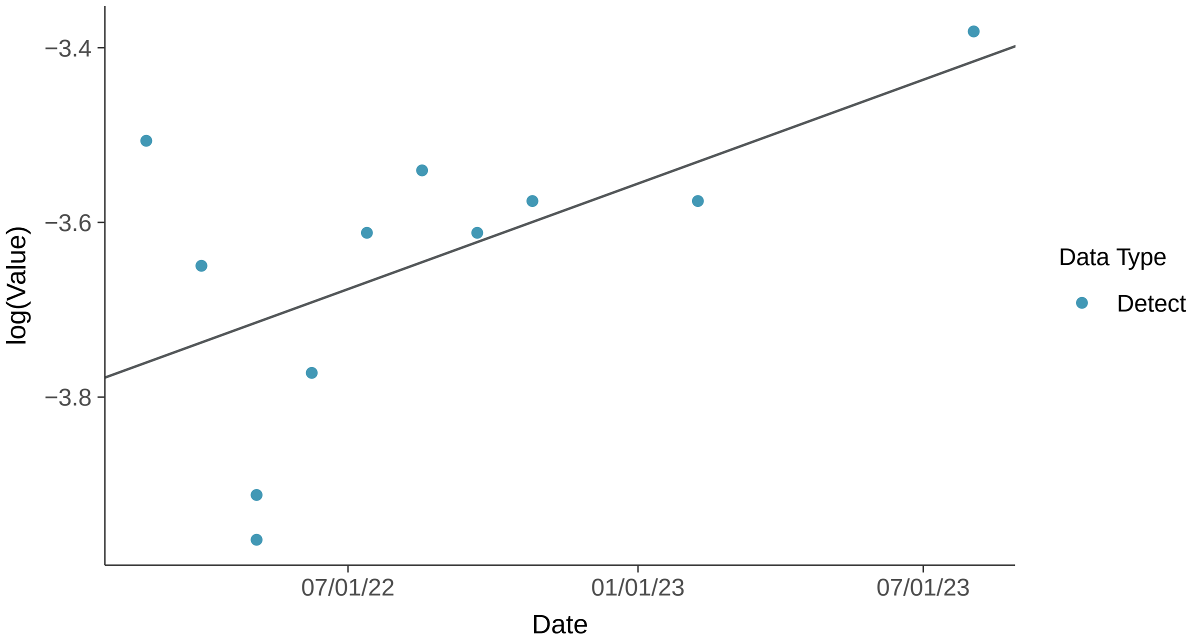
Gamma Q-Q plot

Barium, MW-13 (mg/L)



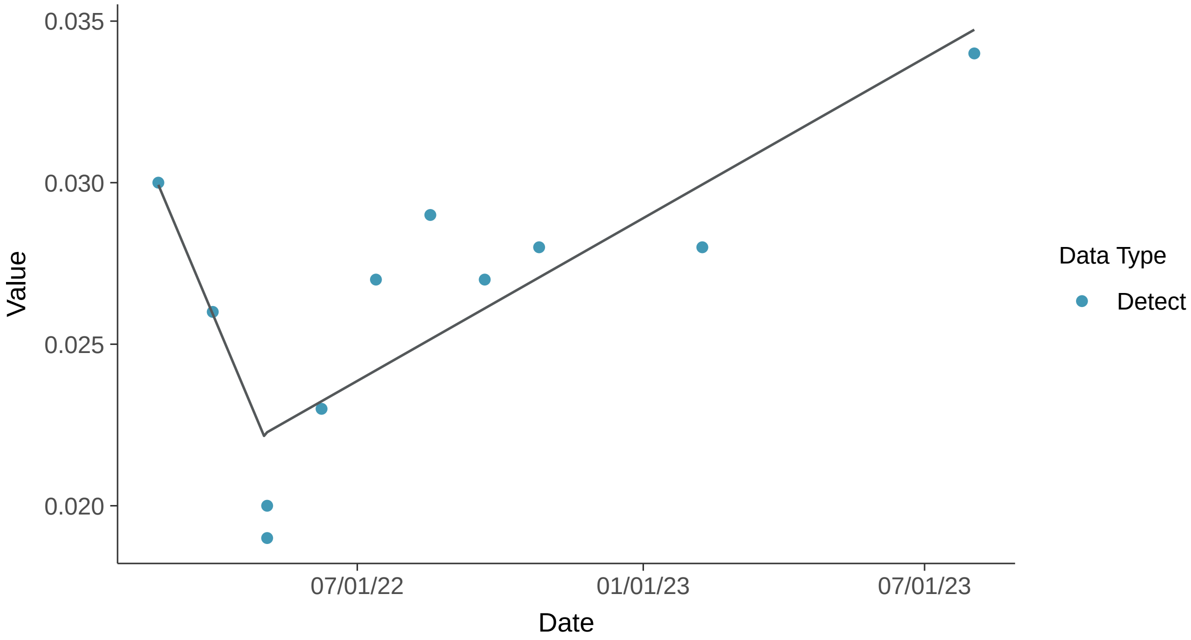
Trend Regression: Lognormal MLE

Barium, MW-13 (mg/L)



Trend Regression: Piecewise Linear-Linear

Barium, MW-13 (mg/L)

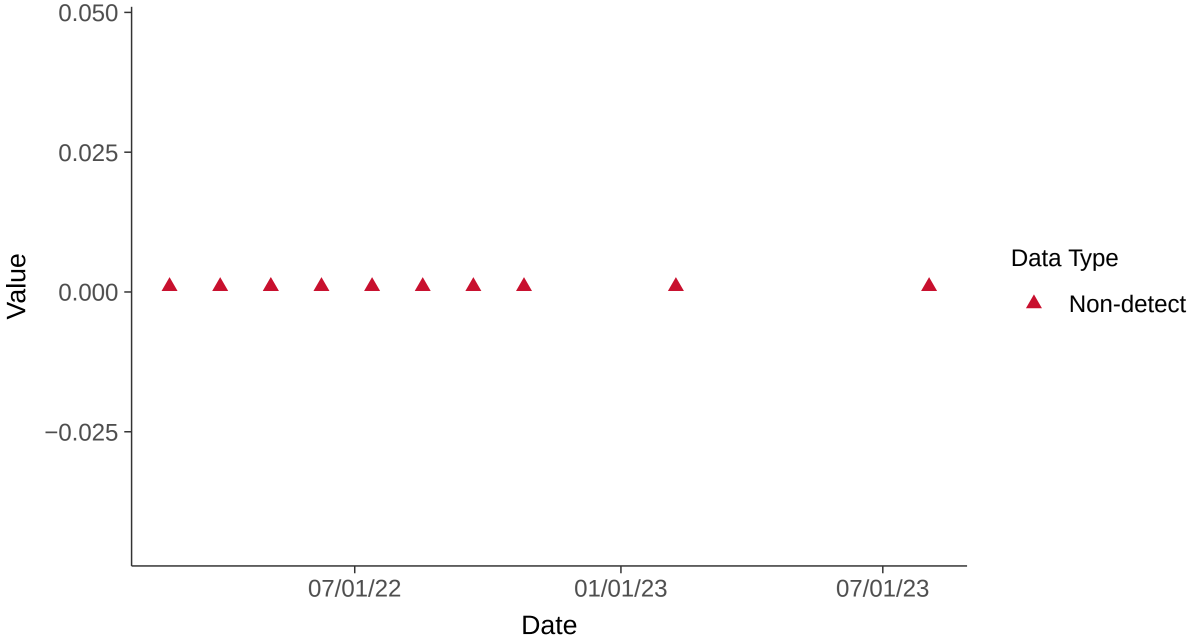


Appendix IV: Beryllium, MW-13

ID: 13_2_11

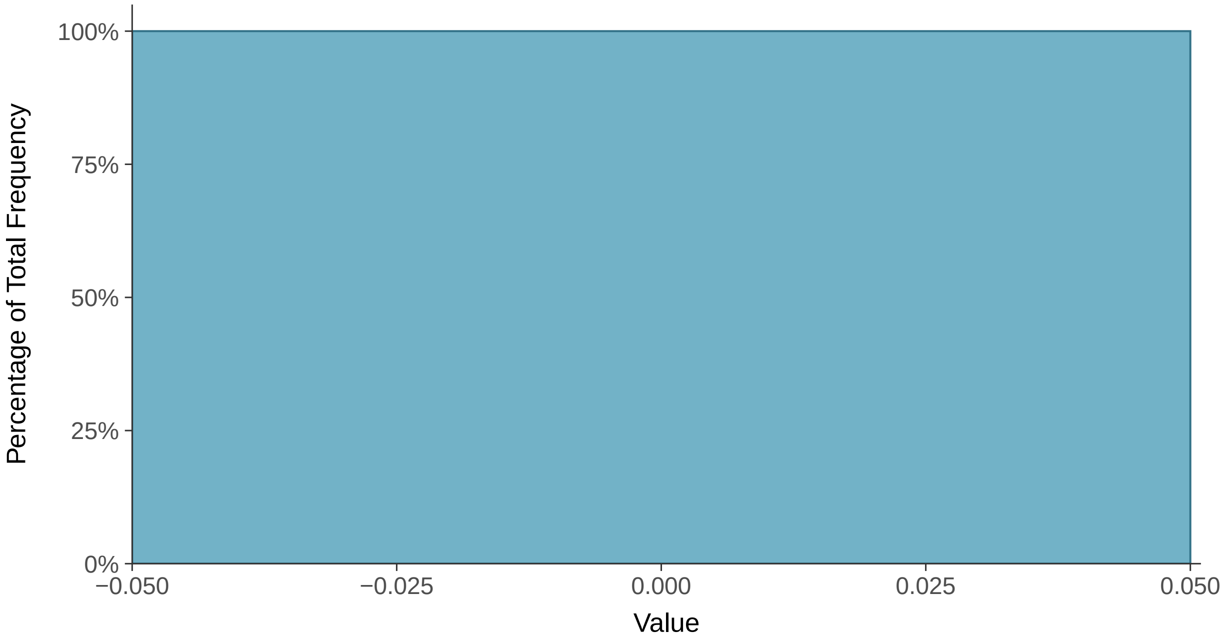
Scatter Plot

Beryllium, MW-13 (mg/L)



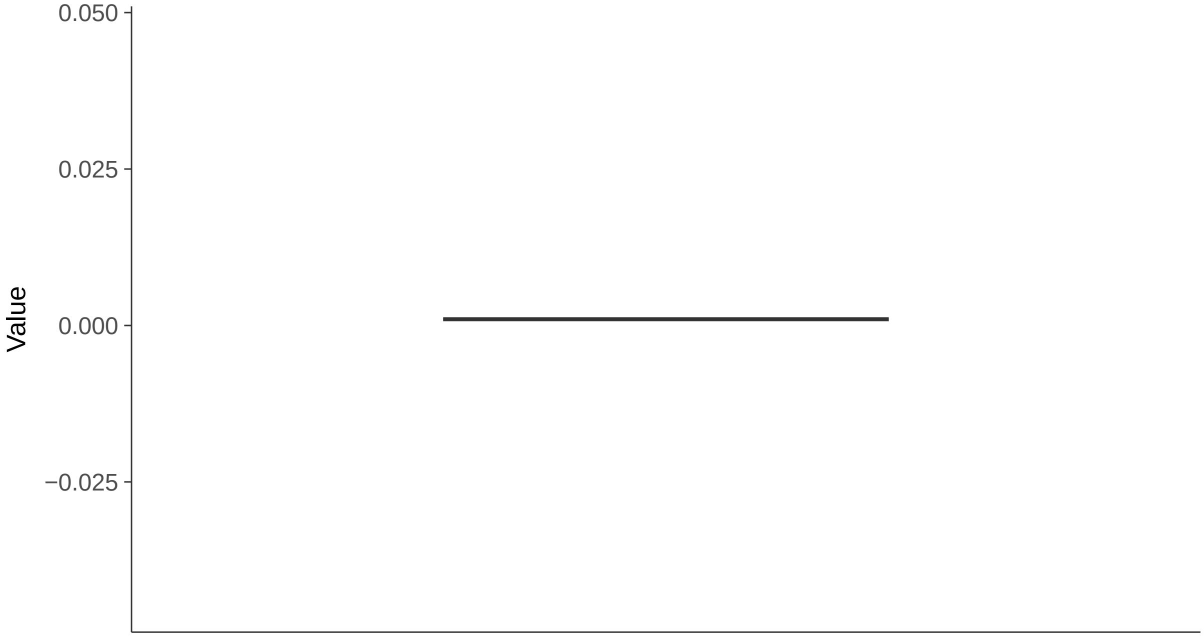
Histogram

Beryllium, MW-13 (mg/L)



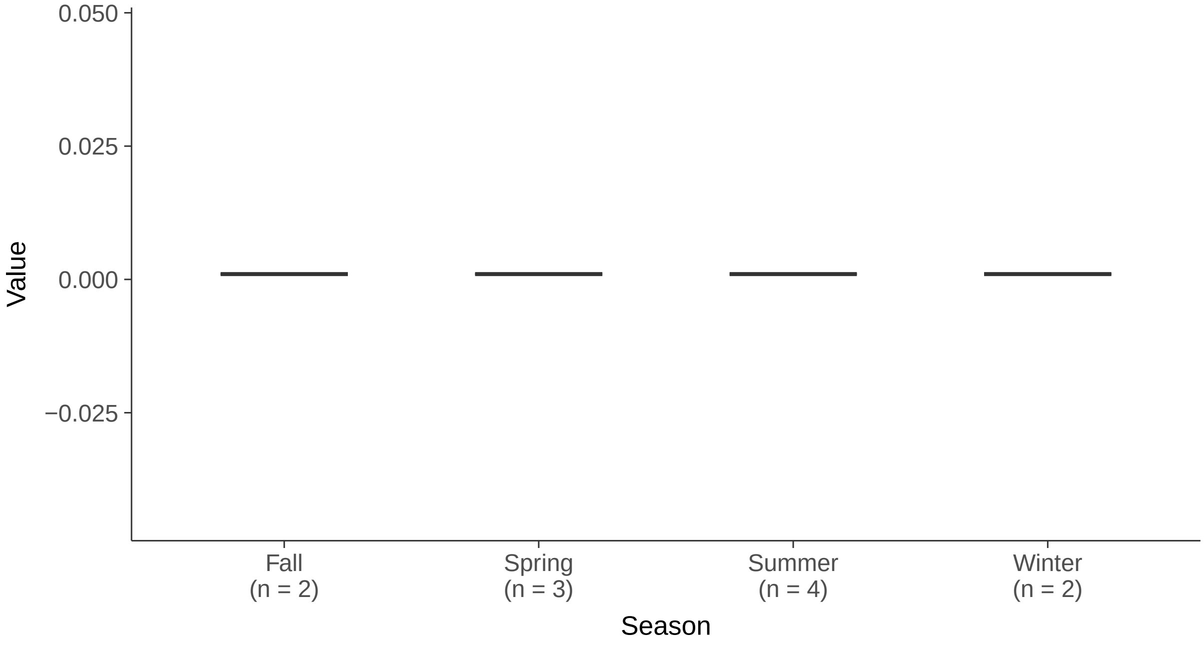
Boxplot

Beryllium, MW-13 (mg/L)



Boxplot by Season

Beryllium, MW-13 (mg/L)

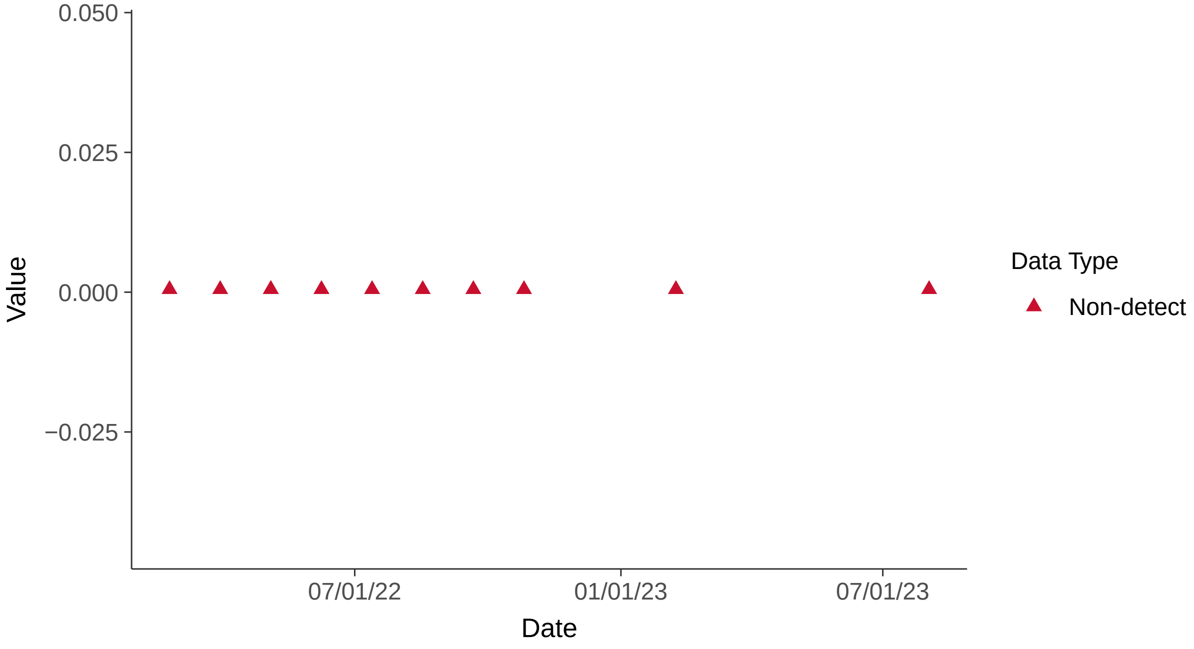


Appendix IV: Cadmium, MW-13

ID: 13_2_12

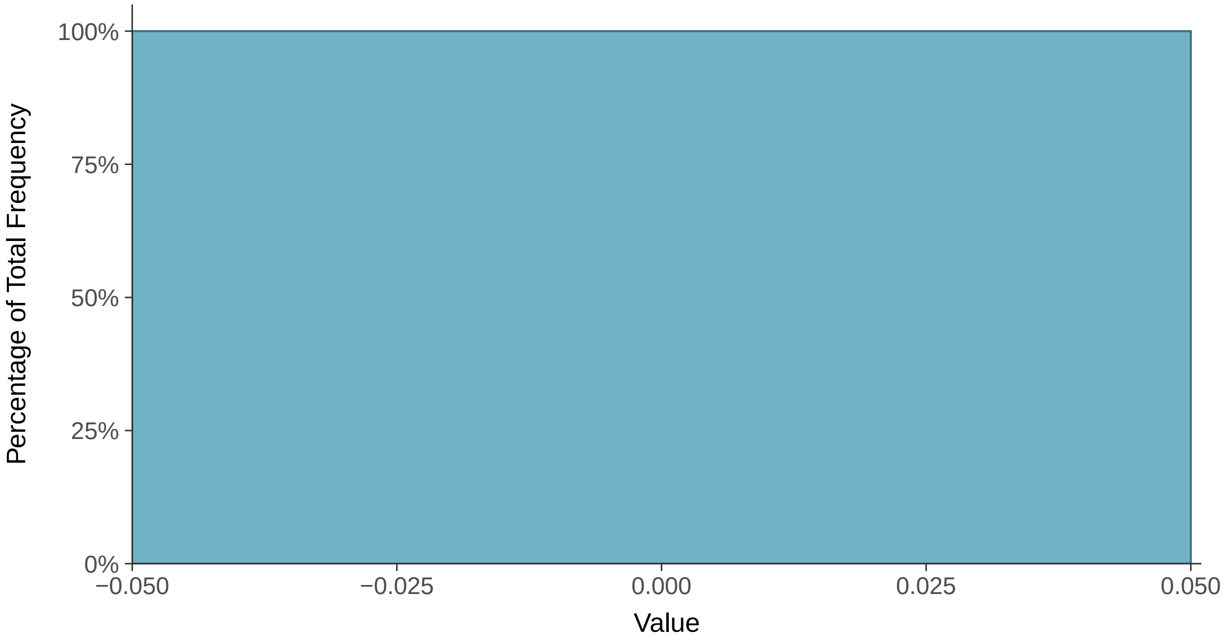
Scatter Plot

Cadmium, MW-13 (mg/L)



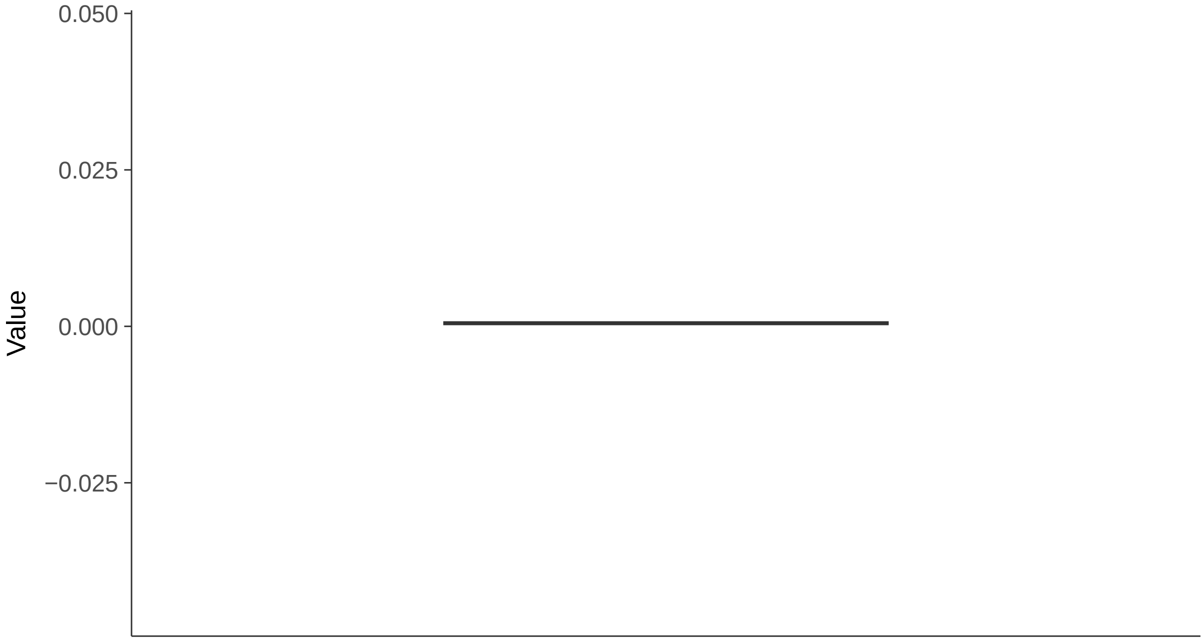
Histogram

Cadmium, MW-13 (mg/L)



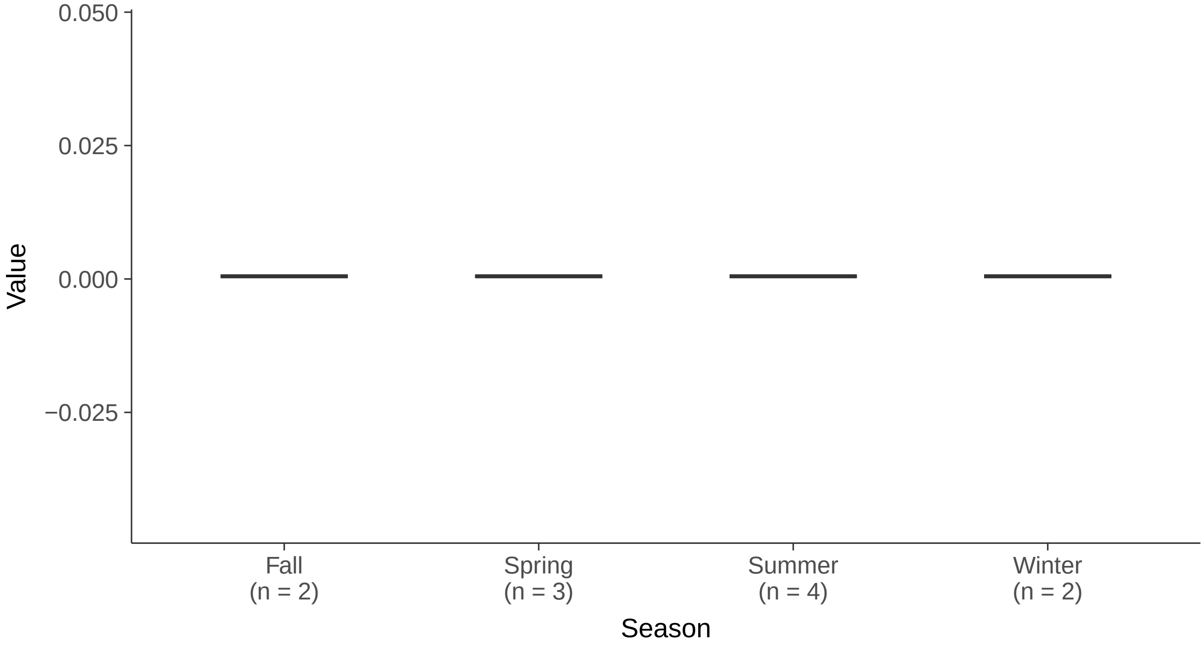
Boxplot

Cadmium, MW-13 (mg/L)



Boxplot by Season

Cadmium, MW-13 (mg/L)

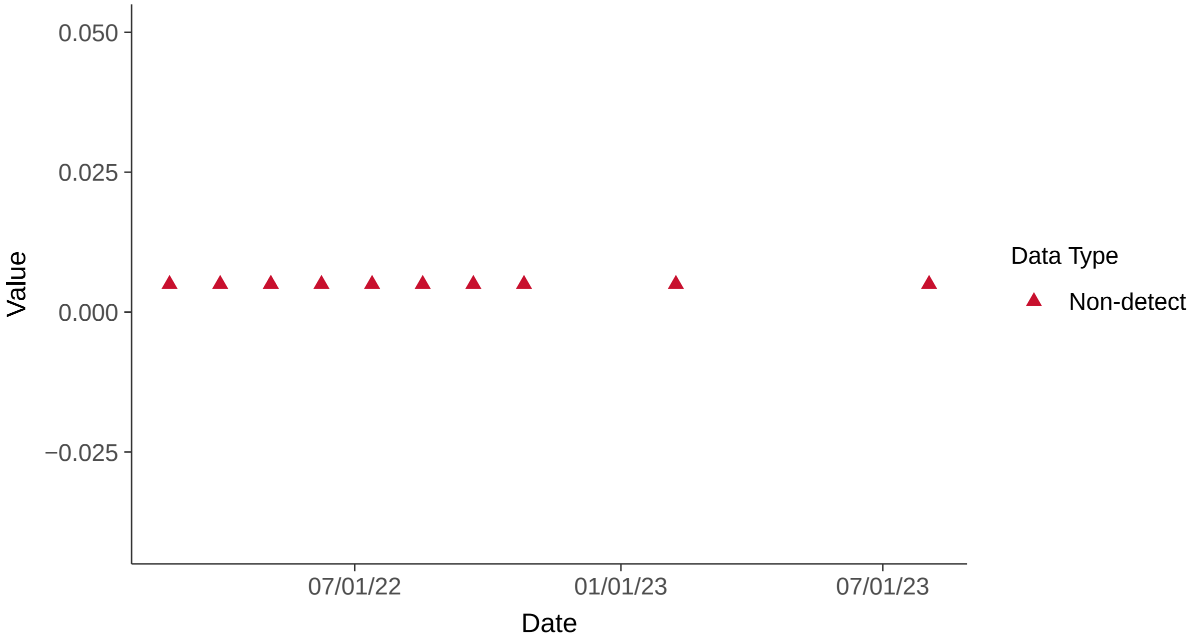


Appendix IV: Chromium, MW-13

ID: 13_2_13

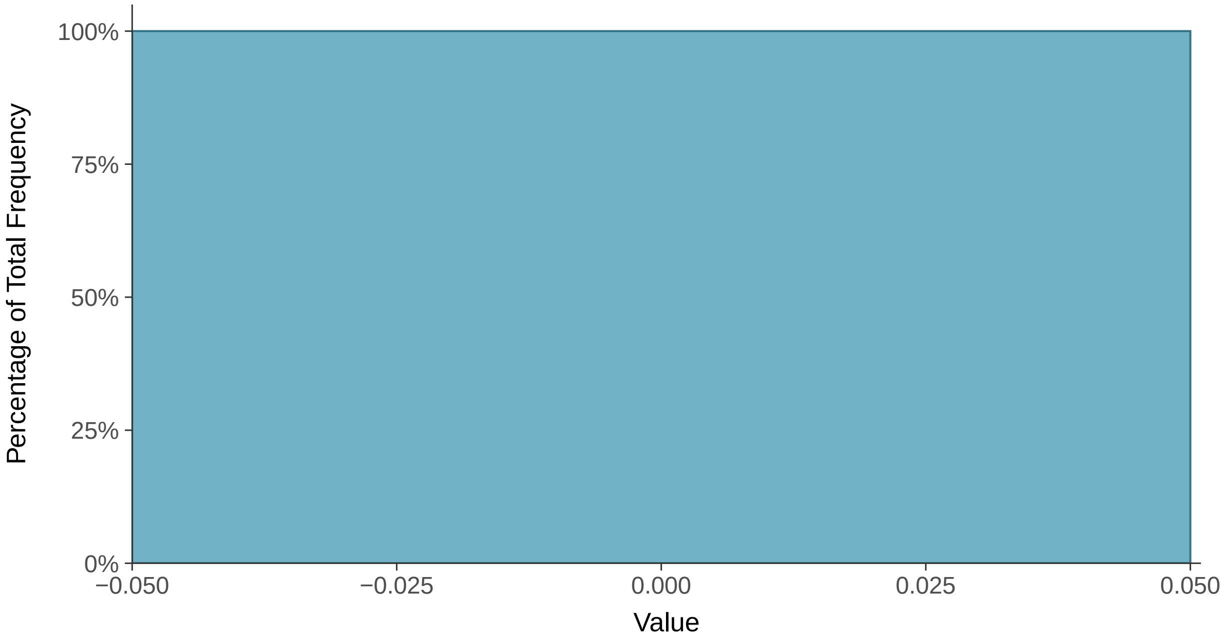
Scatter Plot

Chromium, MW-13 (mg/L)



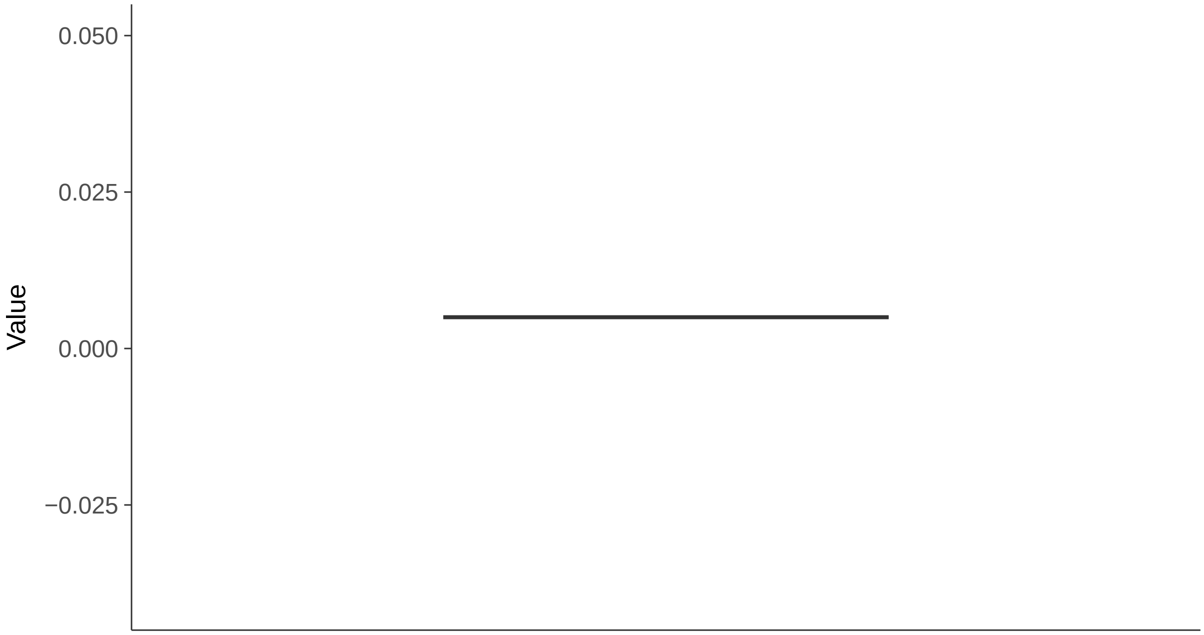
Histogram

Chromium, MW-13 (mg/L)



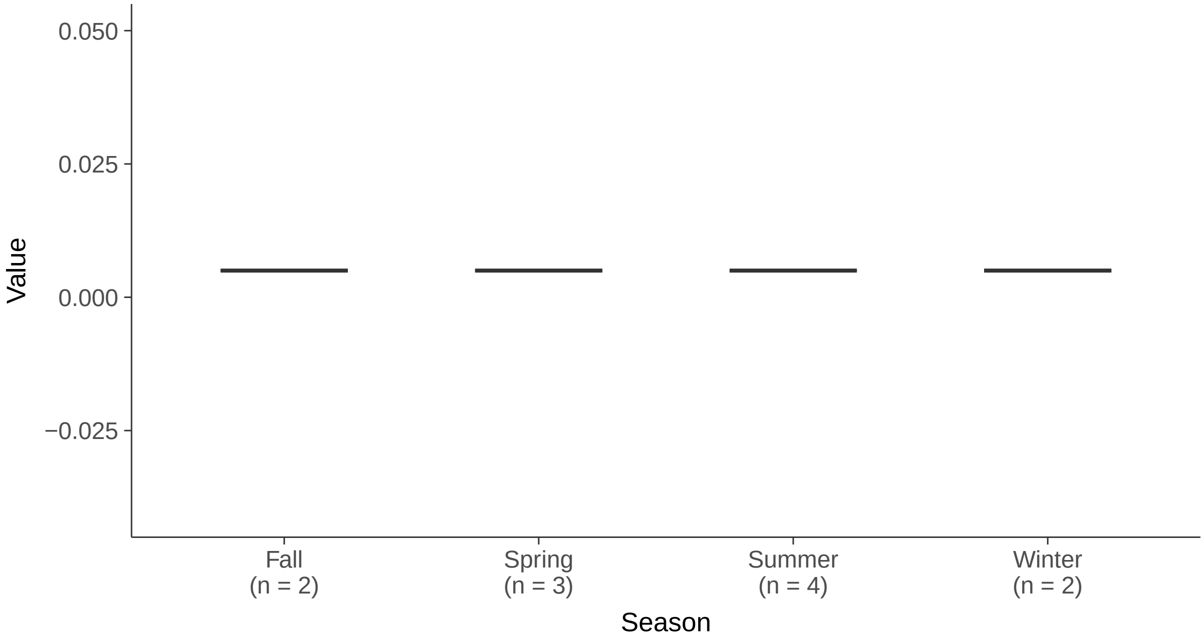
Boxplot

Chromium, MW-13 (mg/L)



Boxplot by Season

Chromium, MW-13 (mg/L)

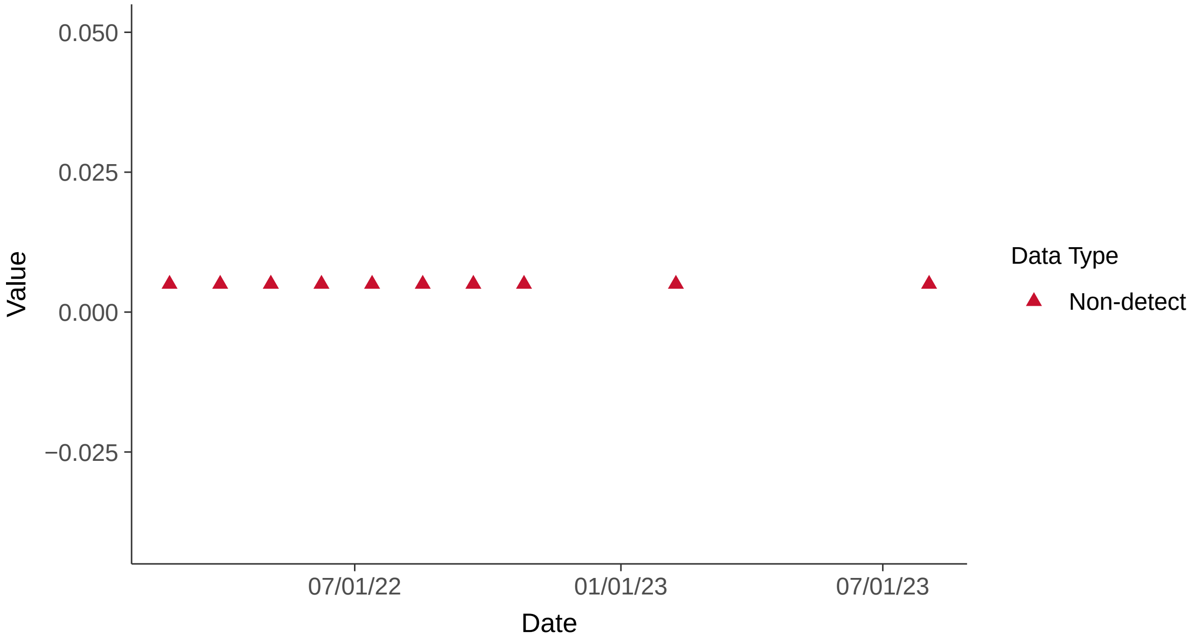


Appendix IV: Cobalt, MW-13

ID: 13_2_14

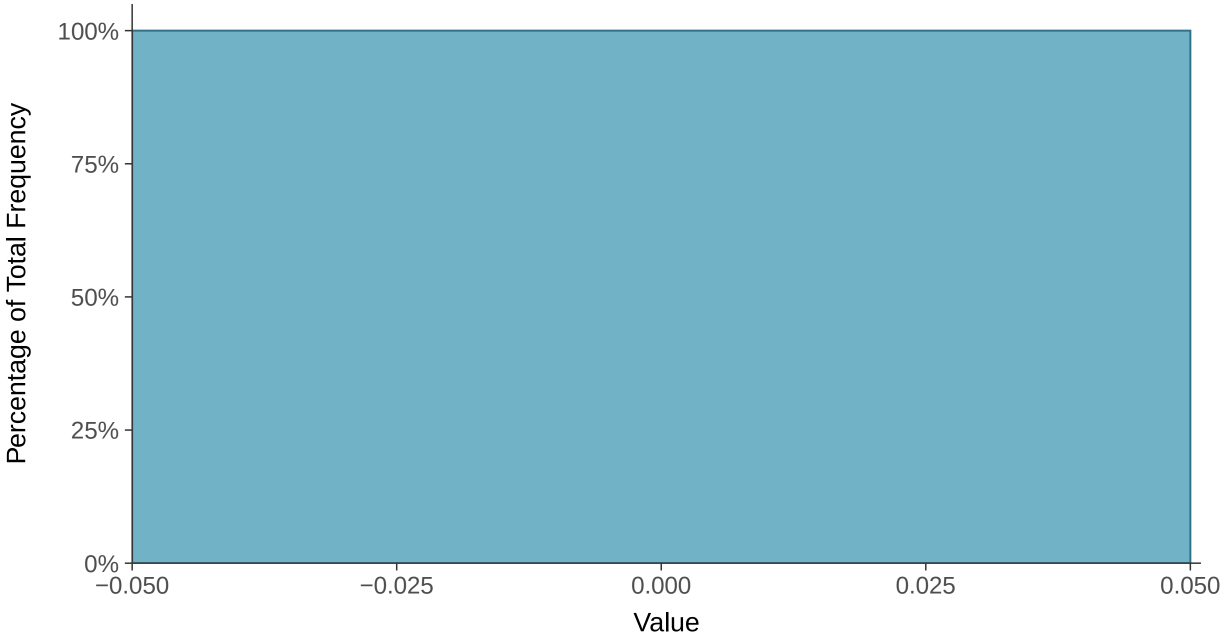
Scatter Plot

Cobalt, MW-13 (mg/L)



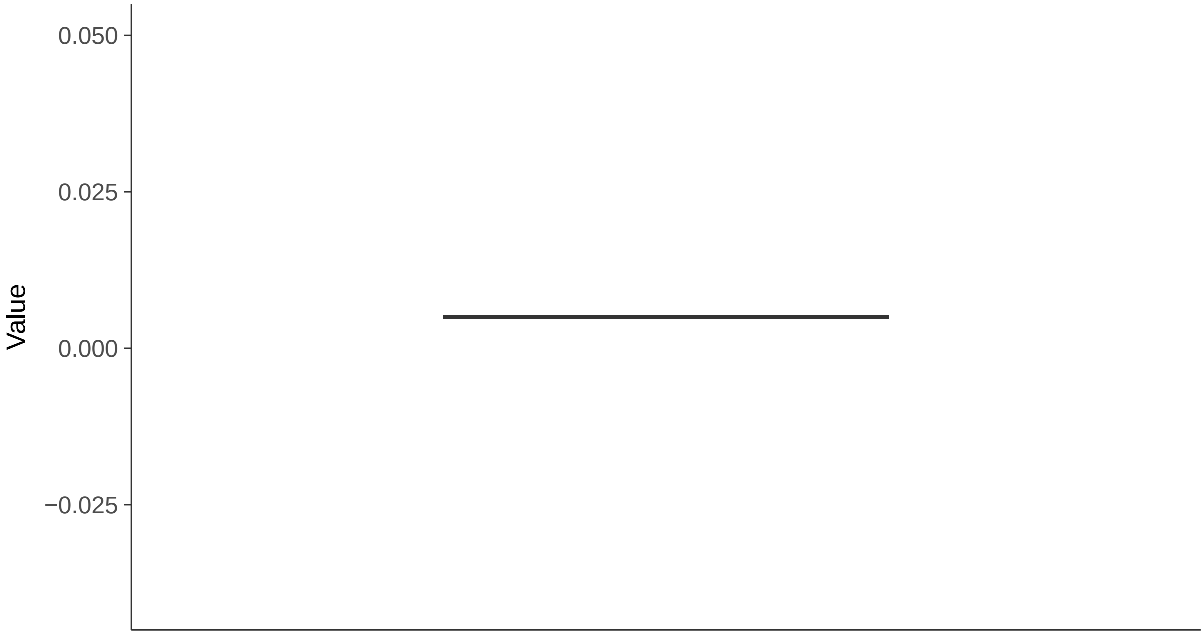
Histogram

Cobalt, MW-13 (mg/L)



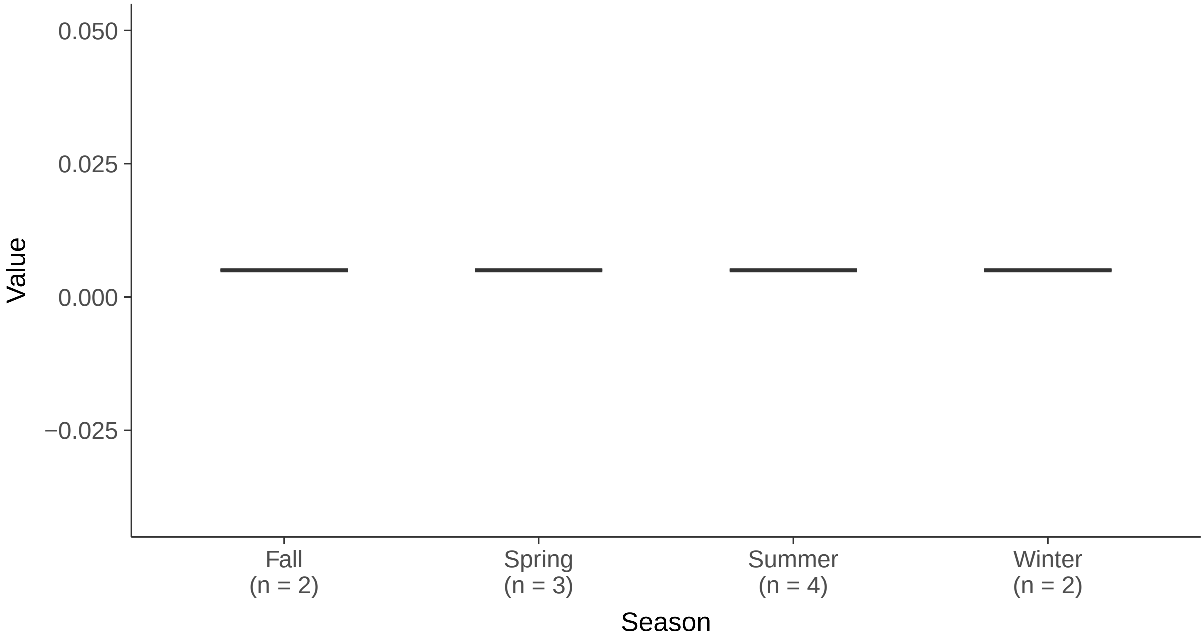
Boxplot

Cobalt, MW-13 (mg/L)



Boxplot by Season

Cobalt, MW-13 (mg/L)

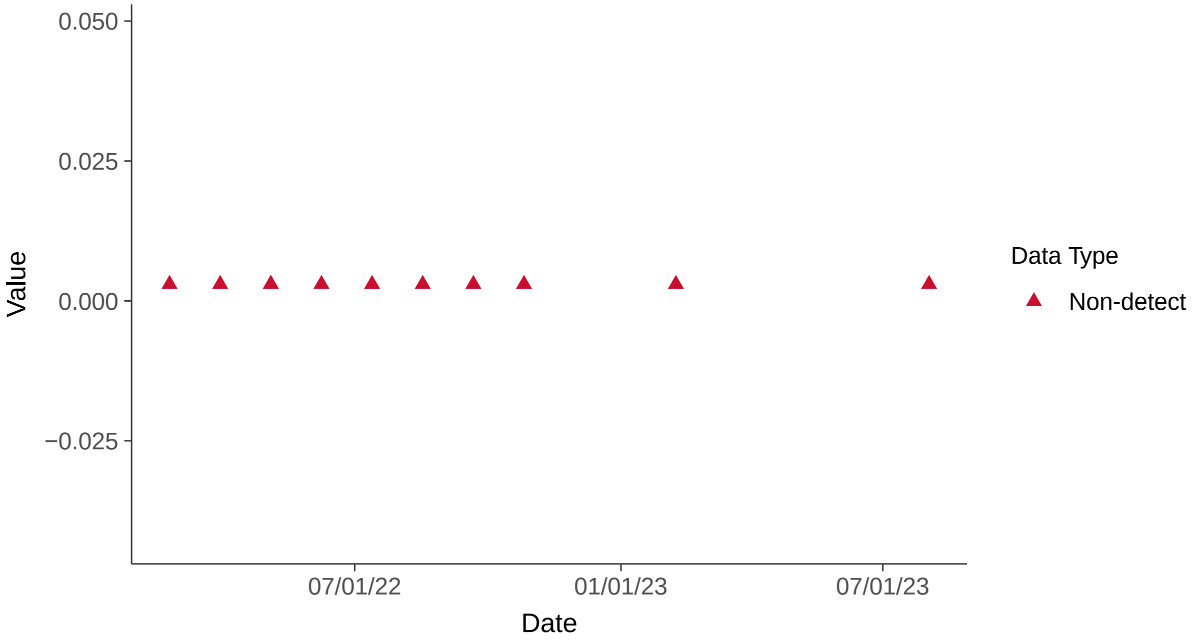


Appendix IV: Lead, MW-13

ID: 13_2_15

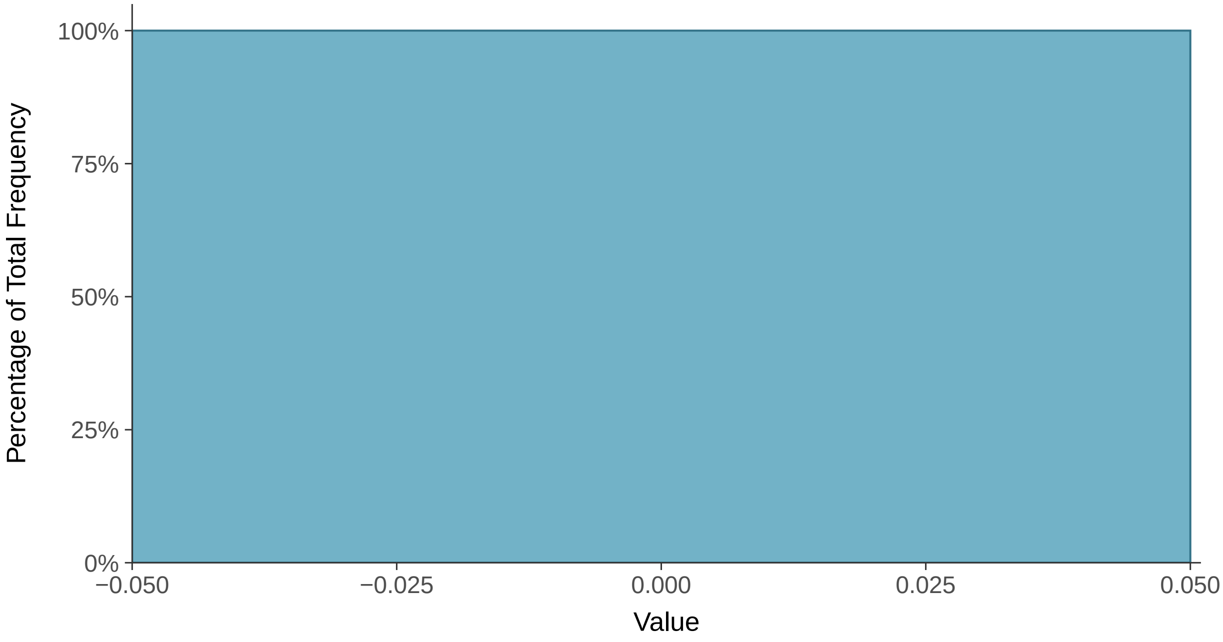
Scatter Plot

Lead, MW-13 (mg/L)



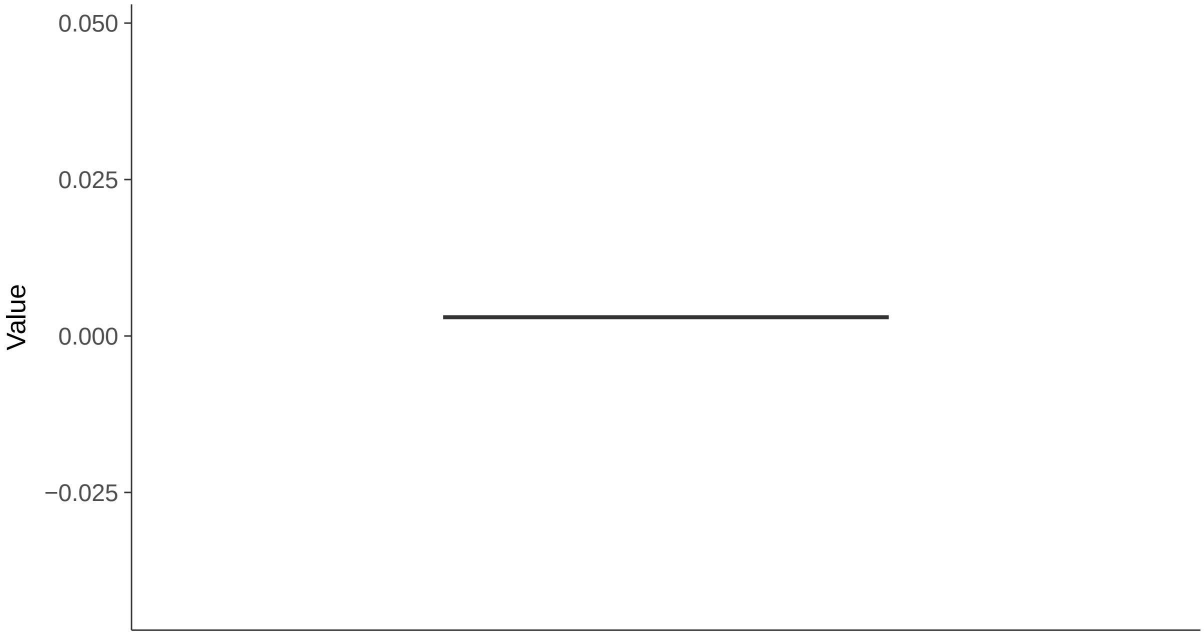
Histogram

Lead, MW-13 (mg/L)



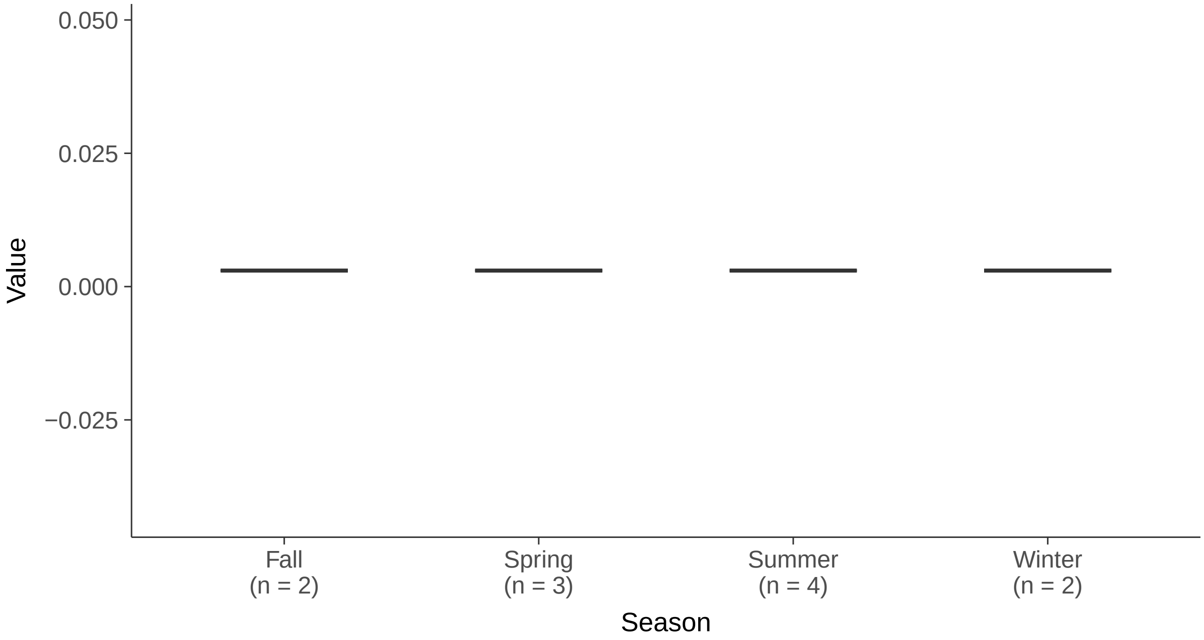
Boxplot

Lead, MW-13 (mg/L)



Boxplot by Season

Lead, MW-13 (mg/L)

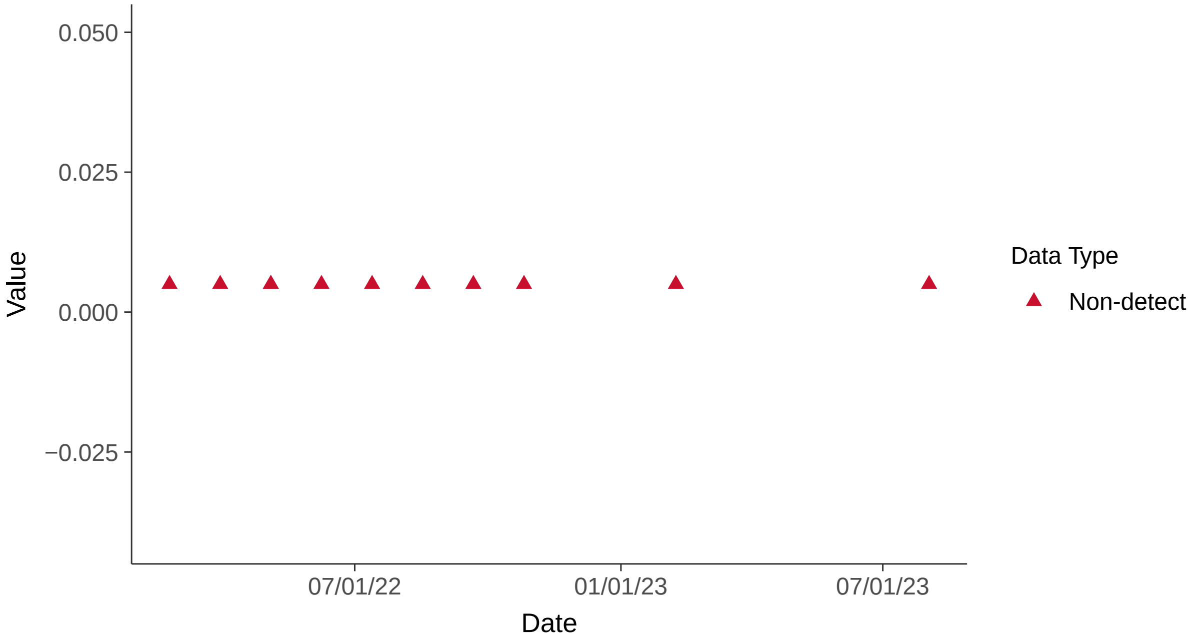


Appendix IV: Lithium, MW-13

ID: 13_2_16

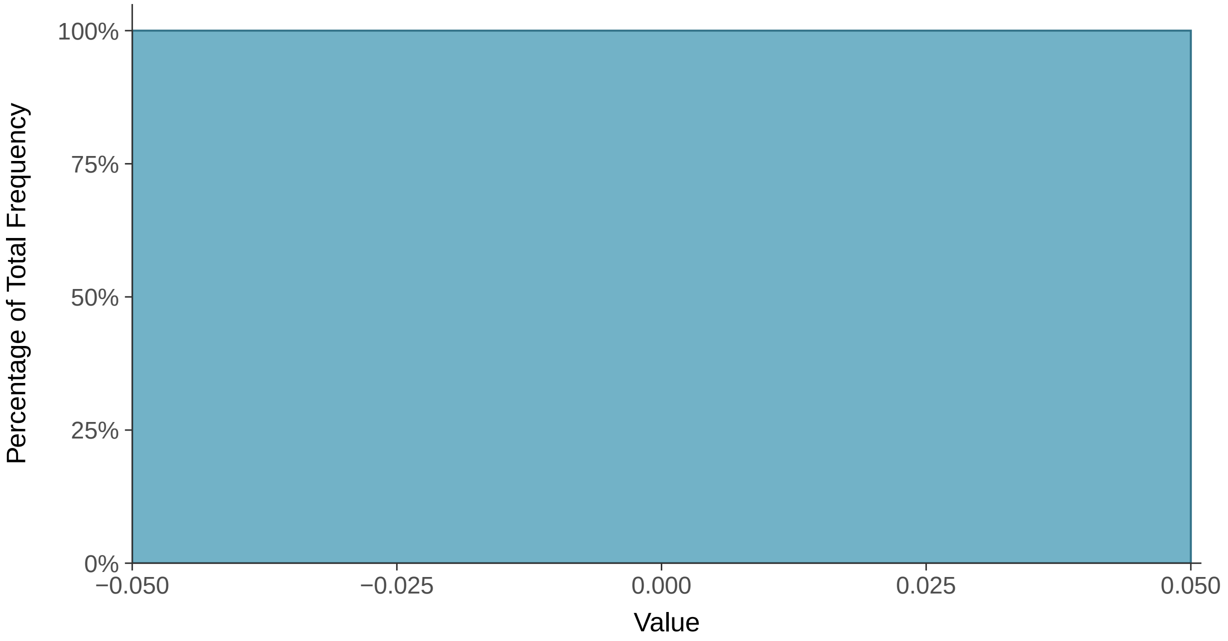
Scatter Plot

Lithium, MW-13 (mg/L)



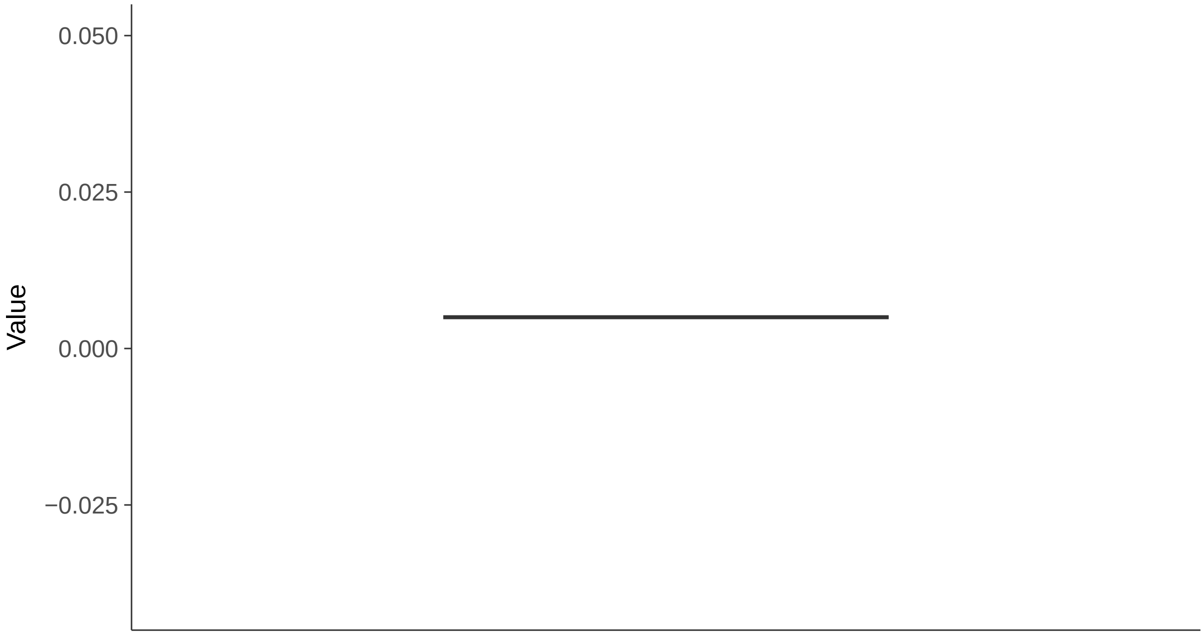
Histogram

Lithium, MW-13 (mg/L)



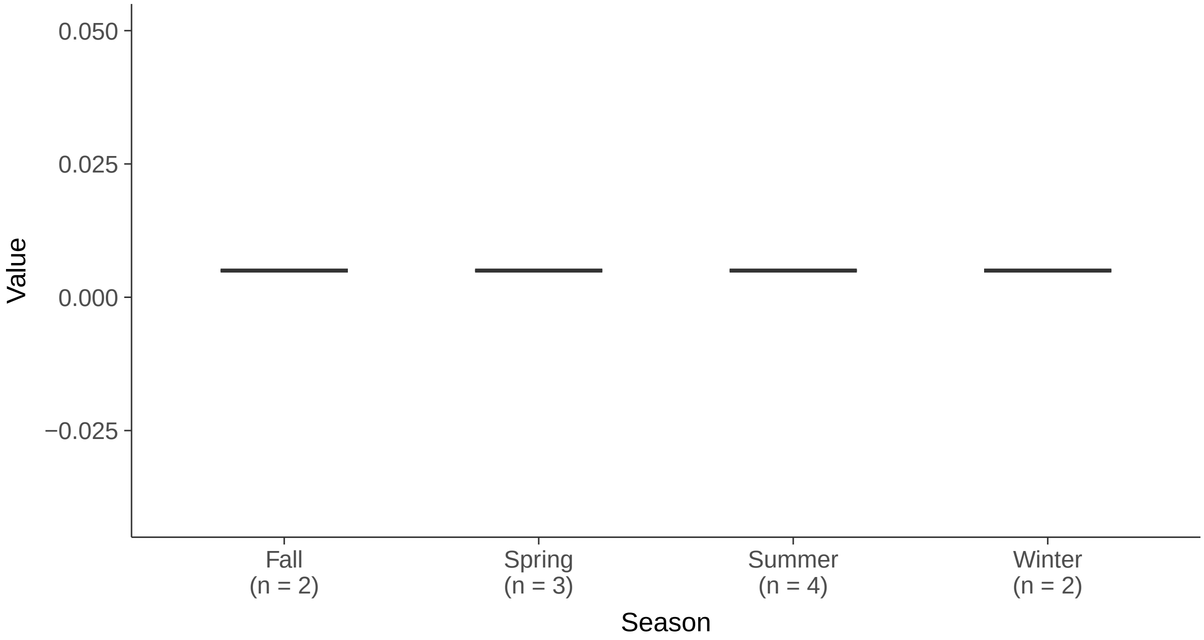
Boxplot

Lithium, MW-13 (mg/L)



Boxplot by Season

Lithium, MW-13 (mg/L)

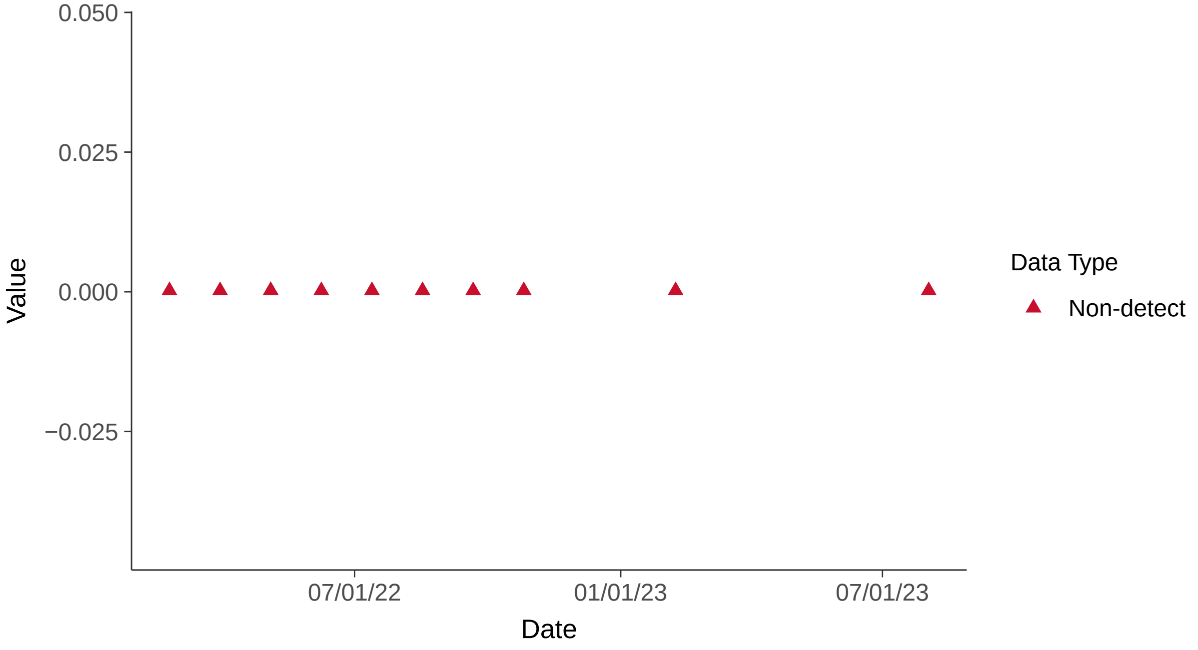


Appendix IV: Mercury, MW-13

ID: 13_2_17

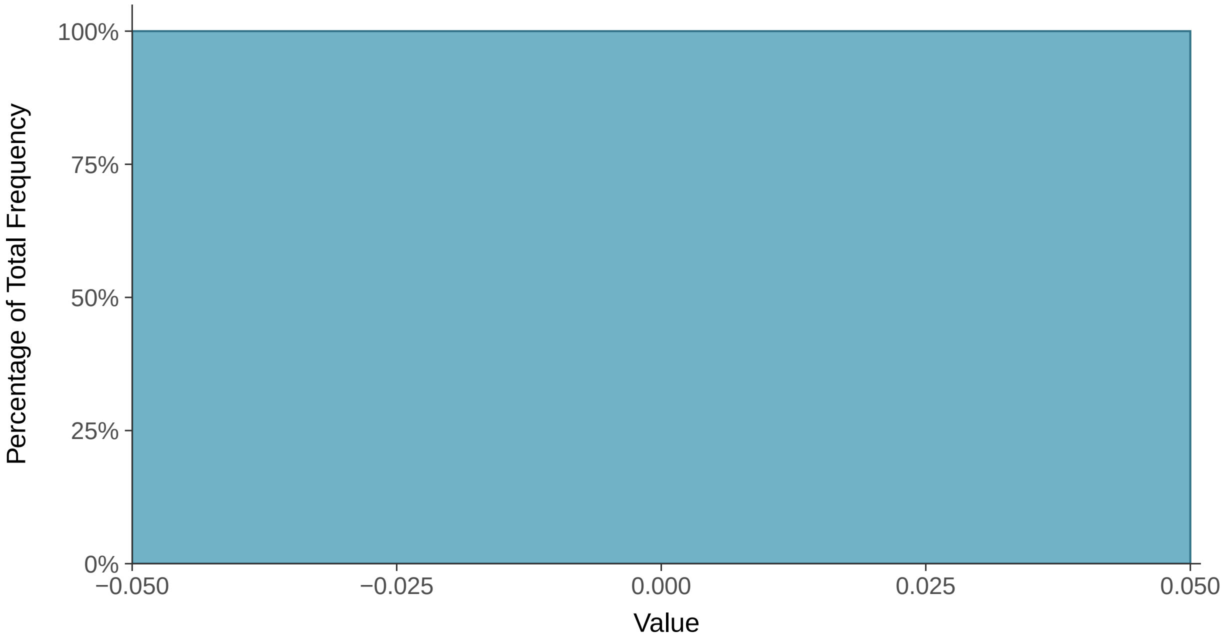
Scatter Plot

Mercury, MW-13 (mg/L)



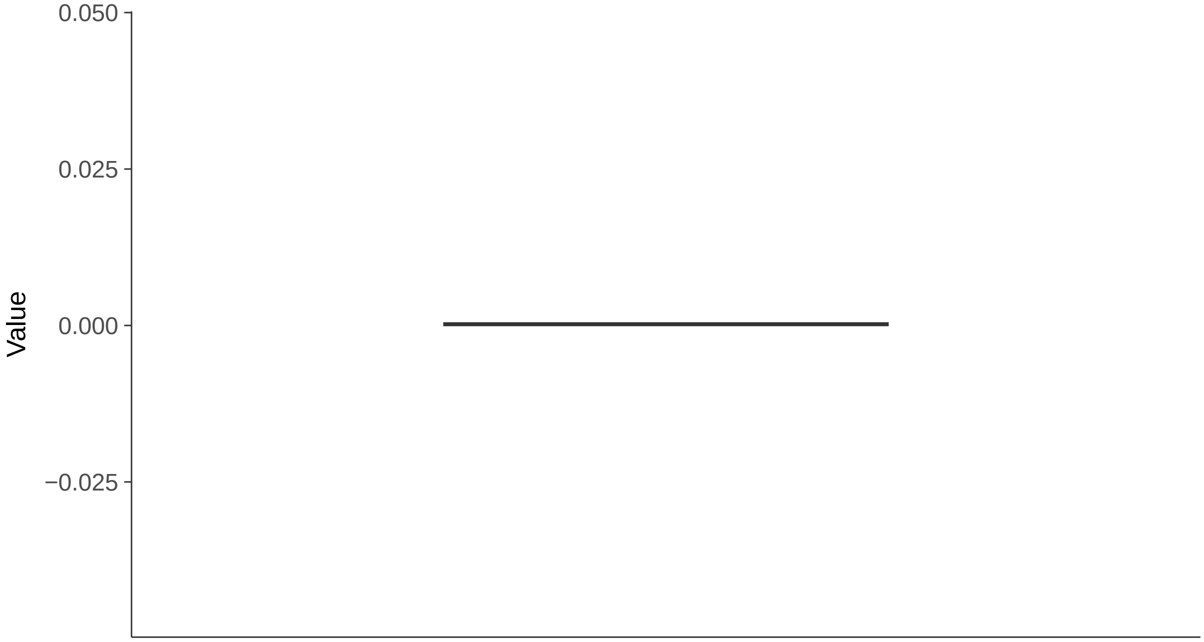
Histogram

Mercury, MW-13 (mg/L)



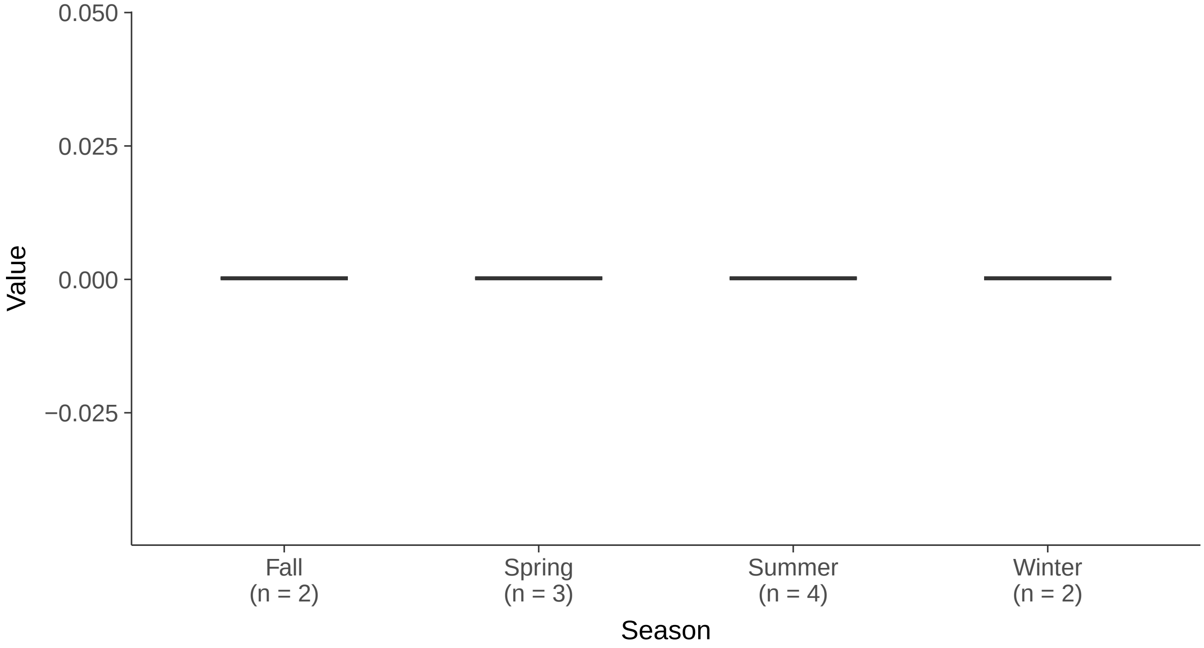
Boxplot

Mercury, MW-13 (mg/L)



Boxplot by Season

Mercury, MW-13 (mg/L)

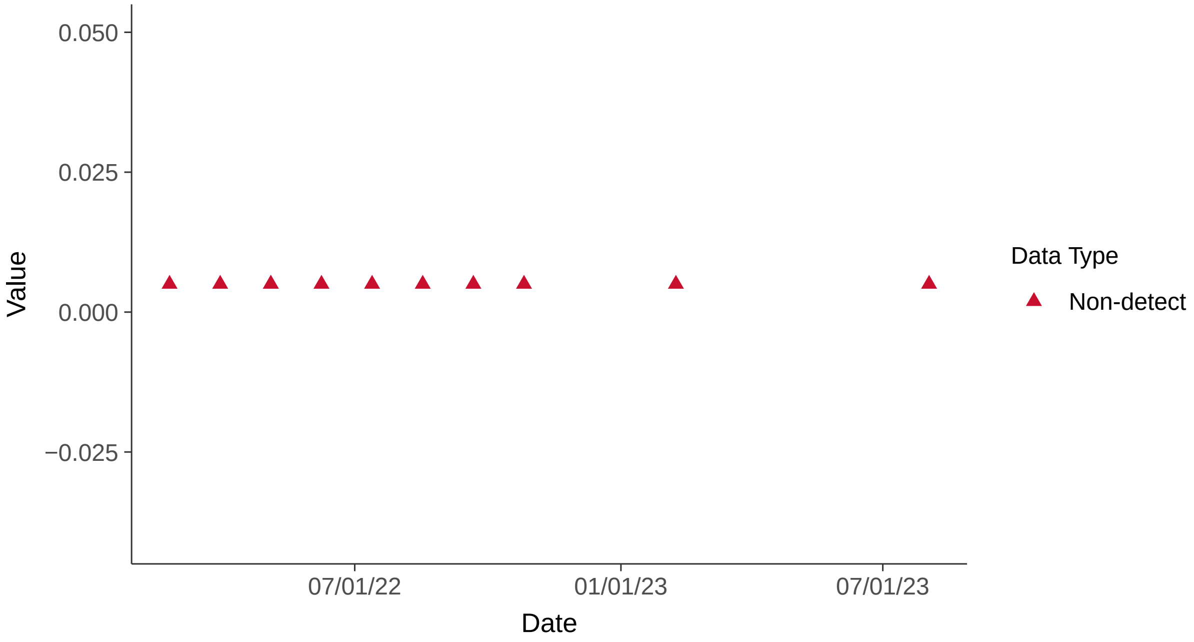


Appendix IV: Molybdenum, MW-13

ID: 13_2_18

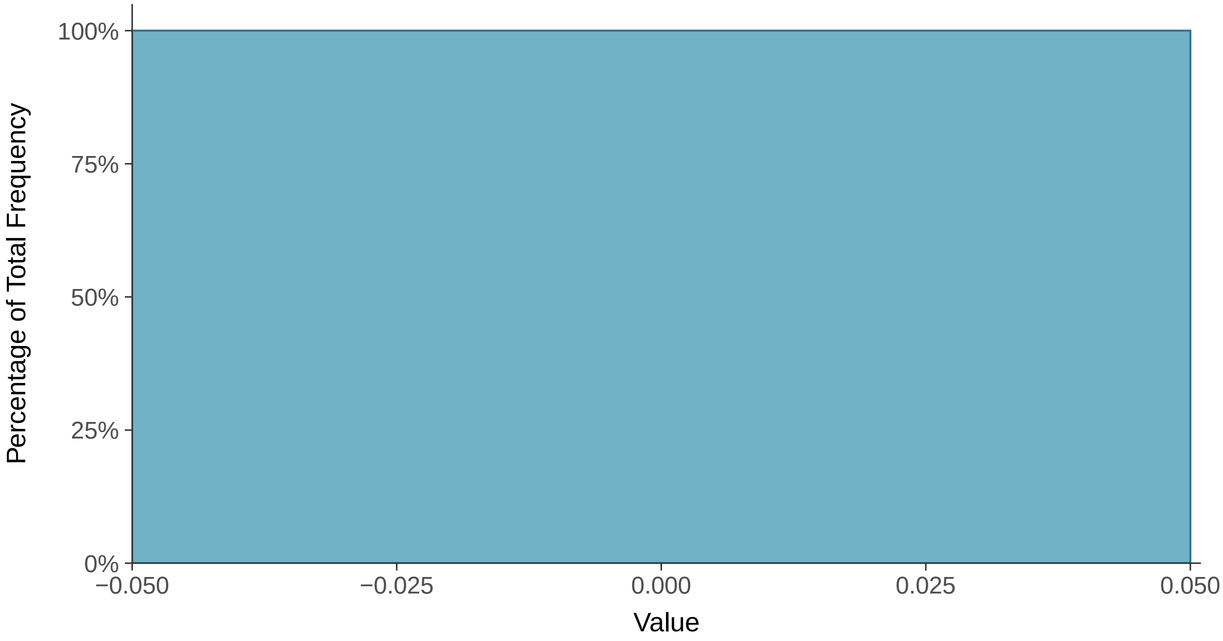
Scatter Plot

Molybdenum, MW-13 (mg/L)



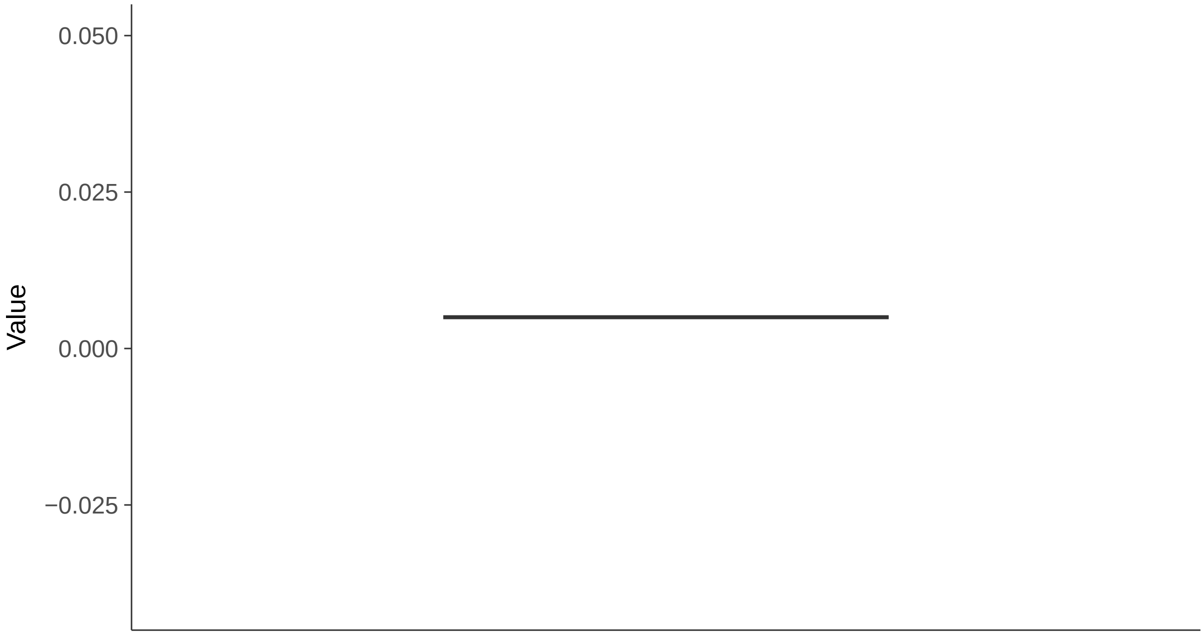
Histogram

Molybdenum, MW-13 (mg/L)



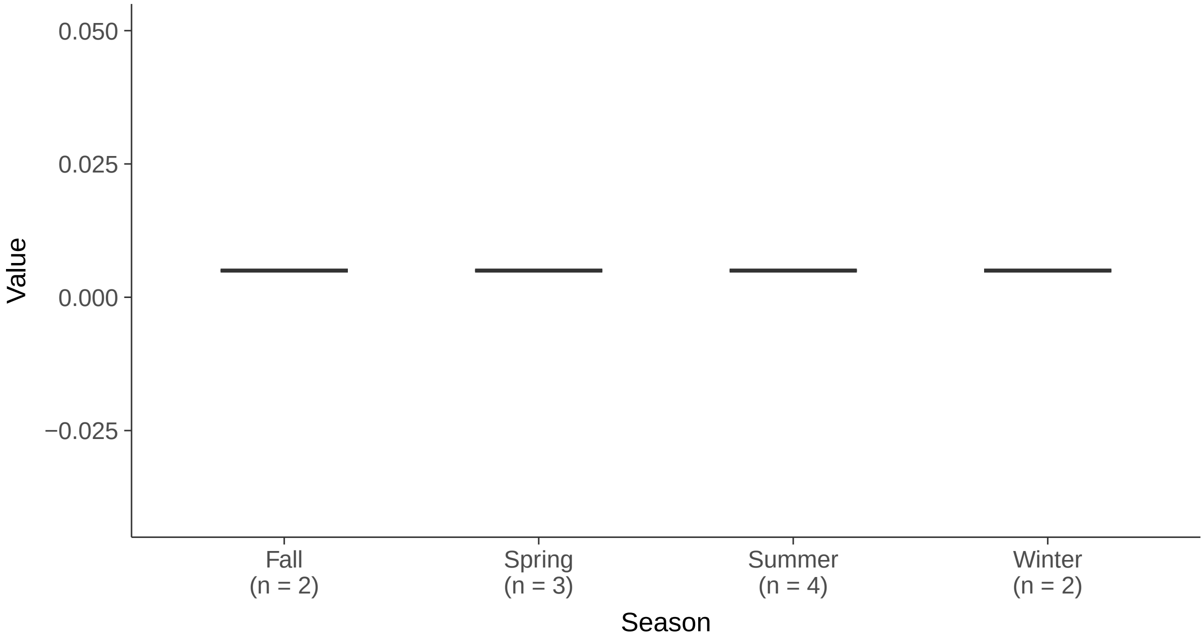
Boxplot

Molybdenum, MW-13 (mg/L)



Boxplot by Season

Molybdenum, MW-13 (mg/L)

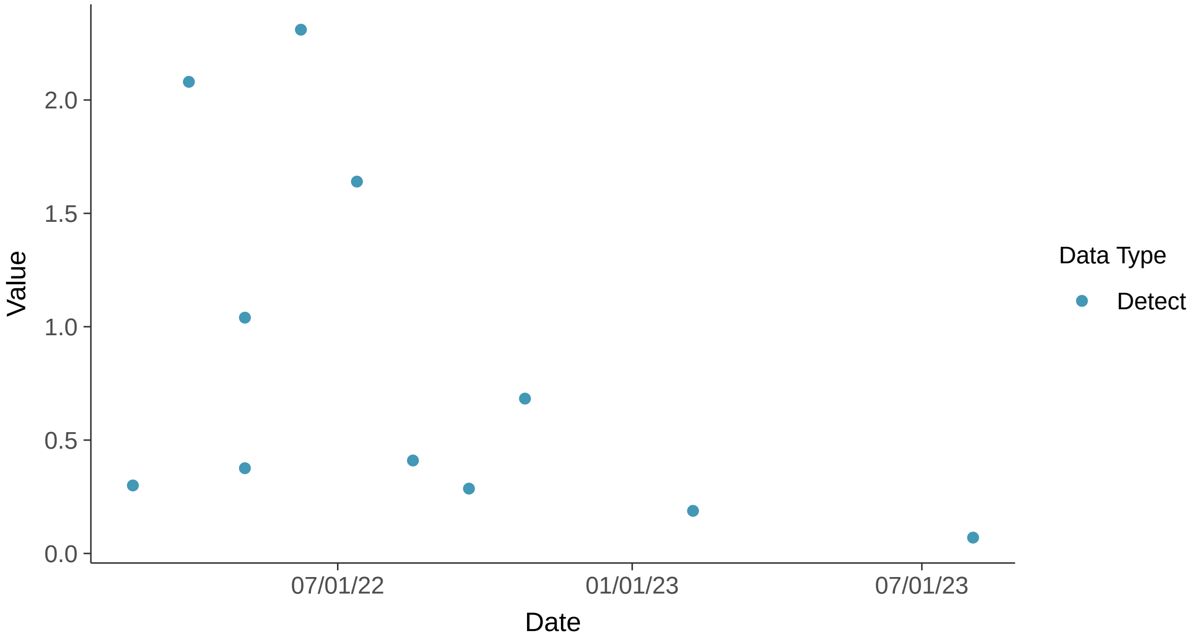


Appendix IV: Radium-226/228, MW-13

ID: 13_2_20

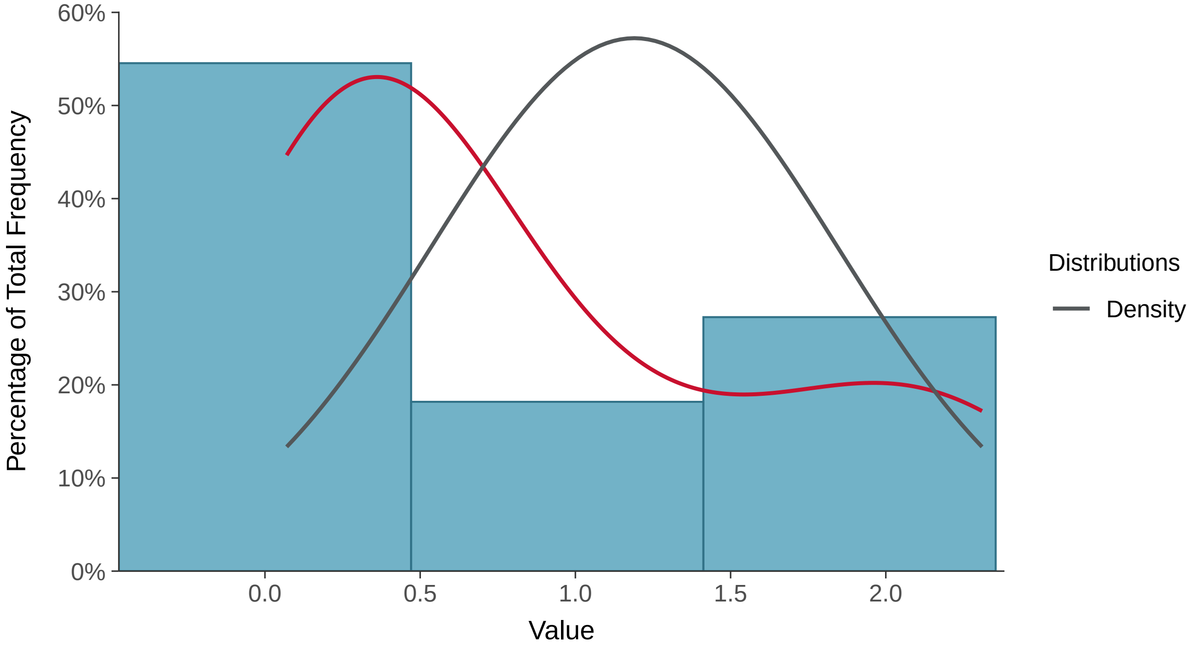
Scatter Plot

Radium-226/228, MW-13 (pCi/L)



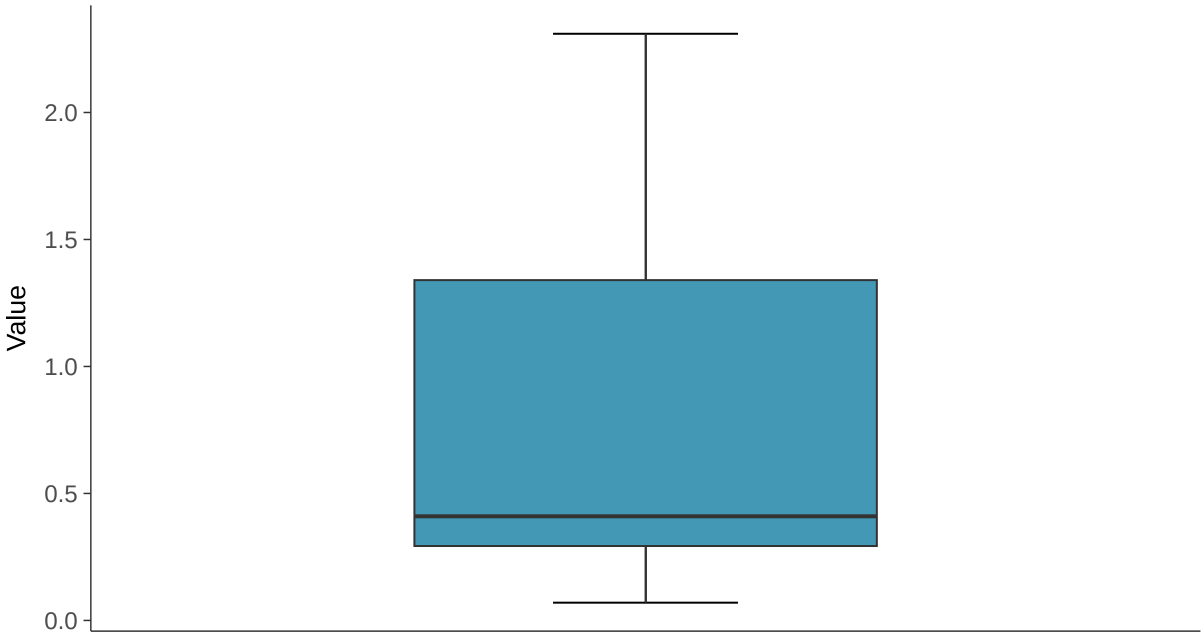
Histogram

Radium-226/228, MW-13 (pCi/L)



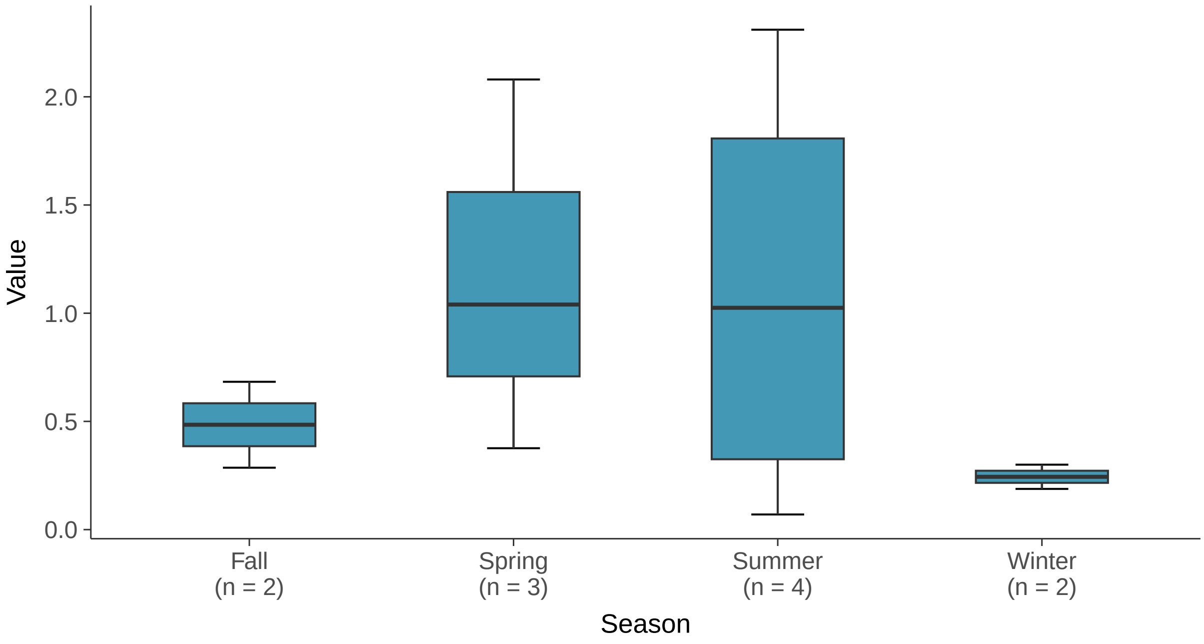
Boxplot

Radium-226/228, MW-13 (pCi/L)



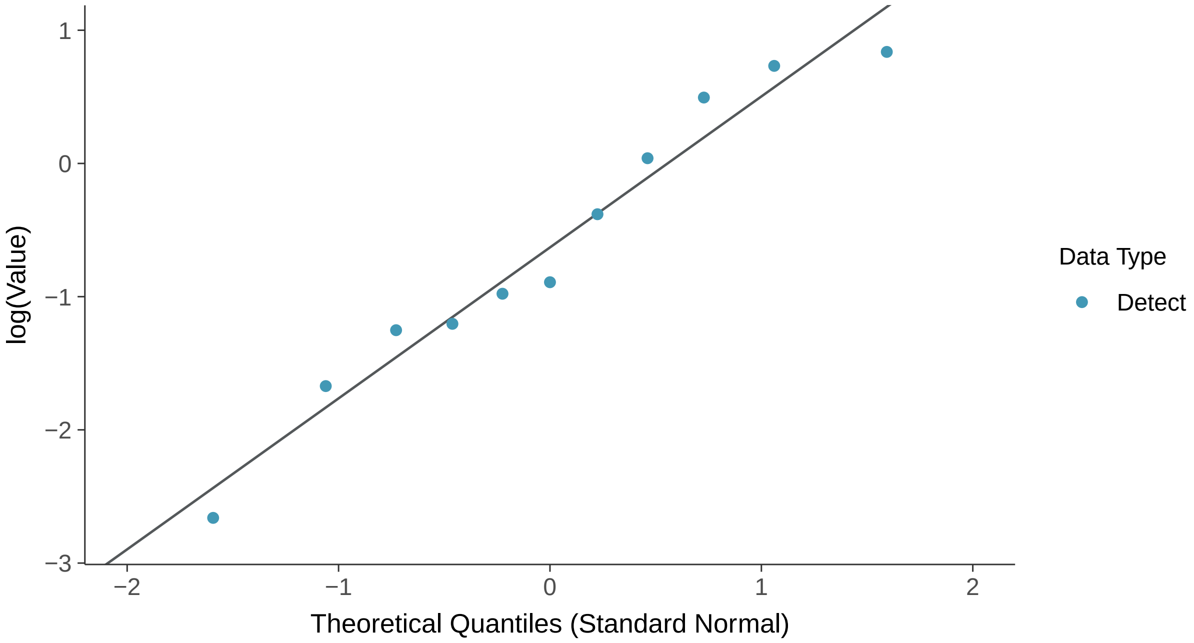
Boxplot by Season

Radium-226/228, MW-13 (pCi/L)



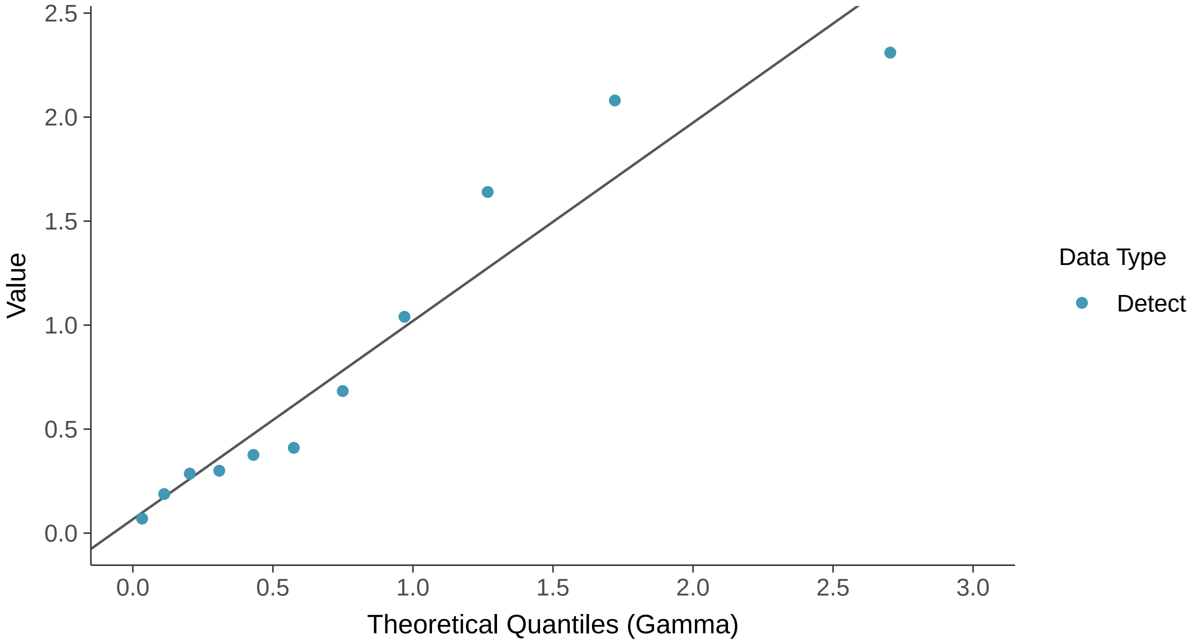
Lognormal Q-Q plot

Radium-226/228, MW-13 (pCi/L)



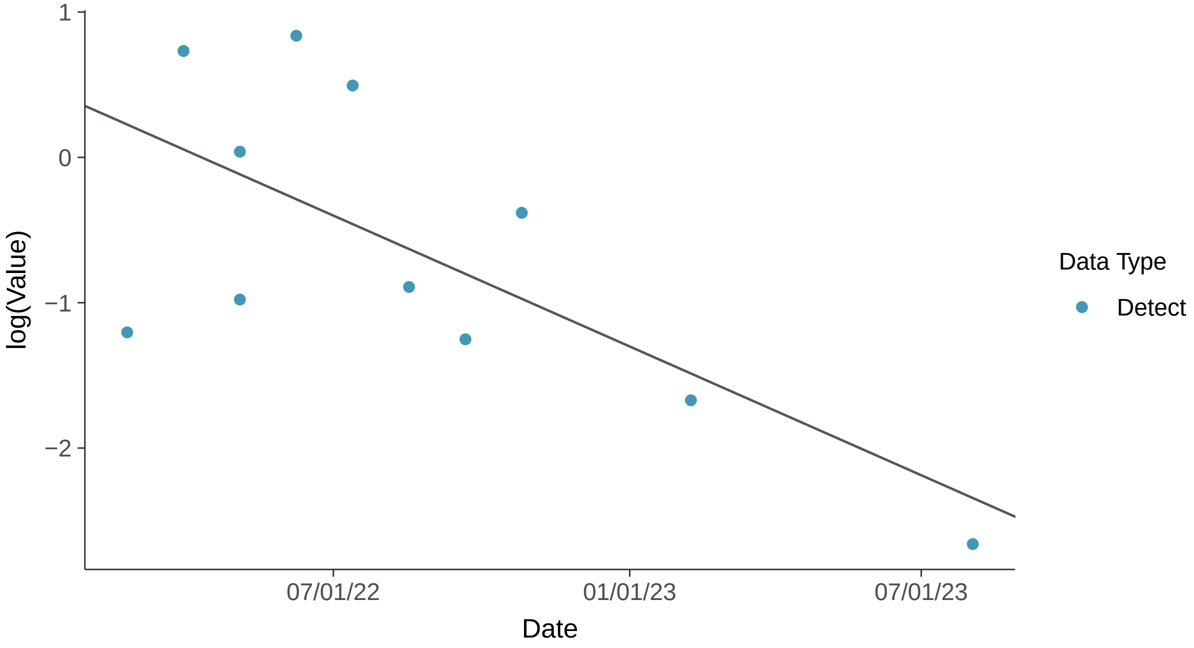
Gamma Q-Q plot

Radium-226/228, MW-13 (pCi/L)



Trend Regression: Lognormal MLE

Radium-226/228, MW-13 (pCi/L)

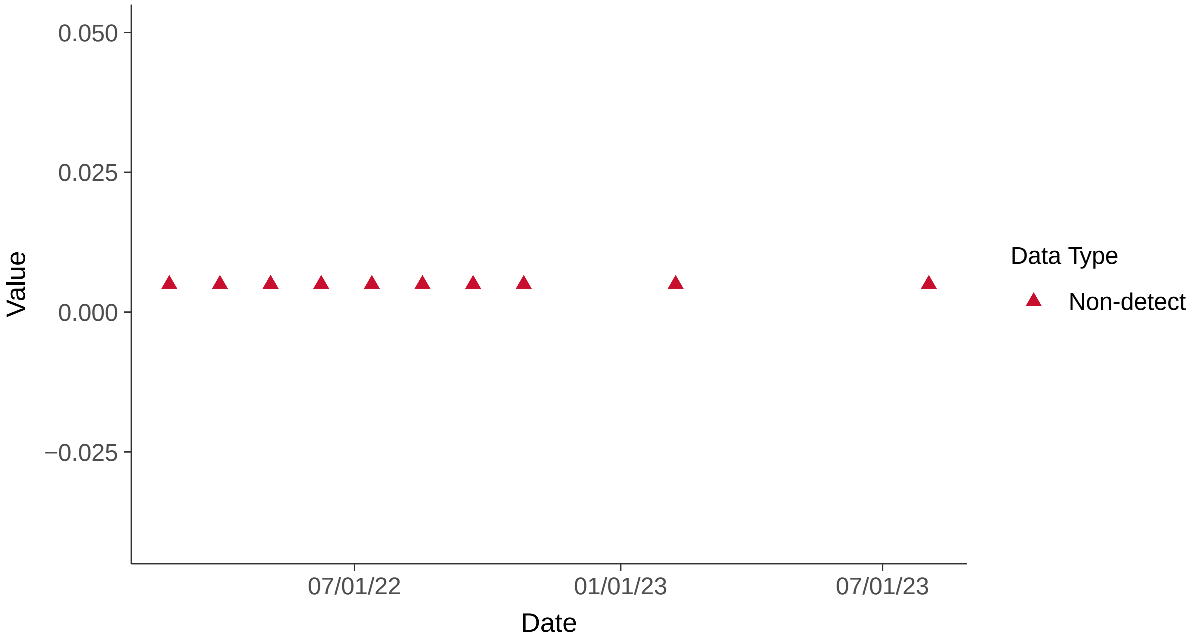


Appendix IV: Selenium, MW-13

ID: 13_2_22

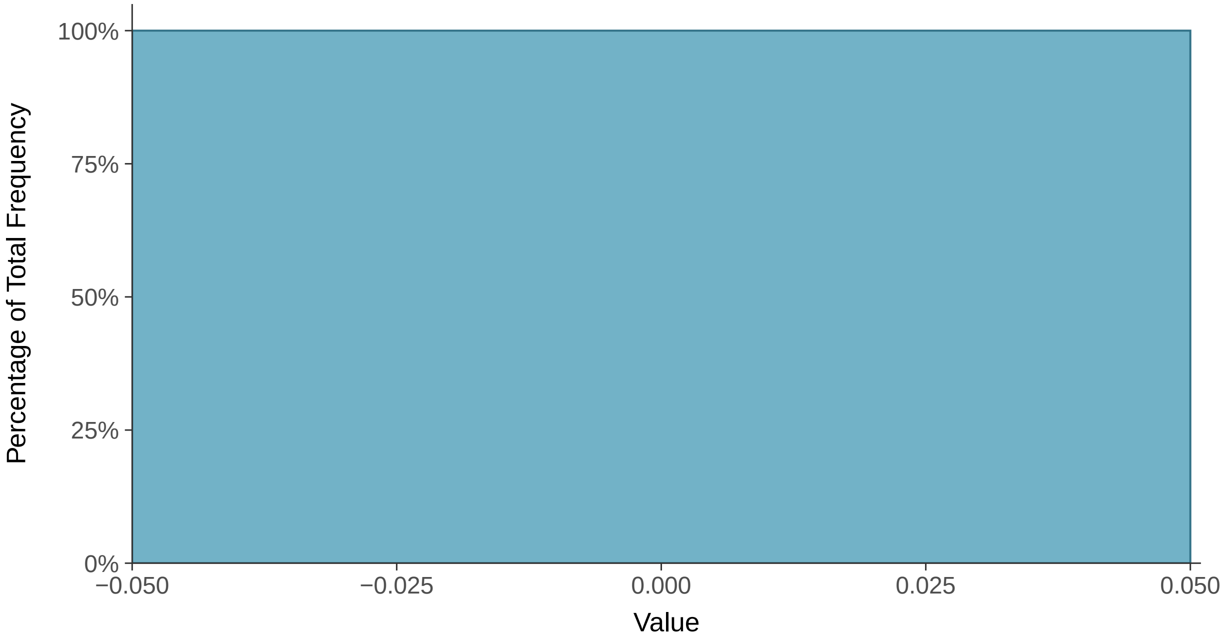
Scatter Plot

Selenium, MW-13 (mg/L)



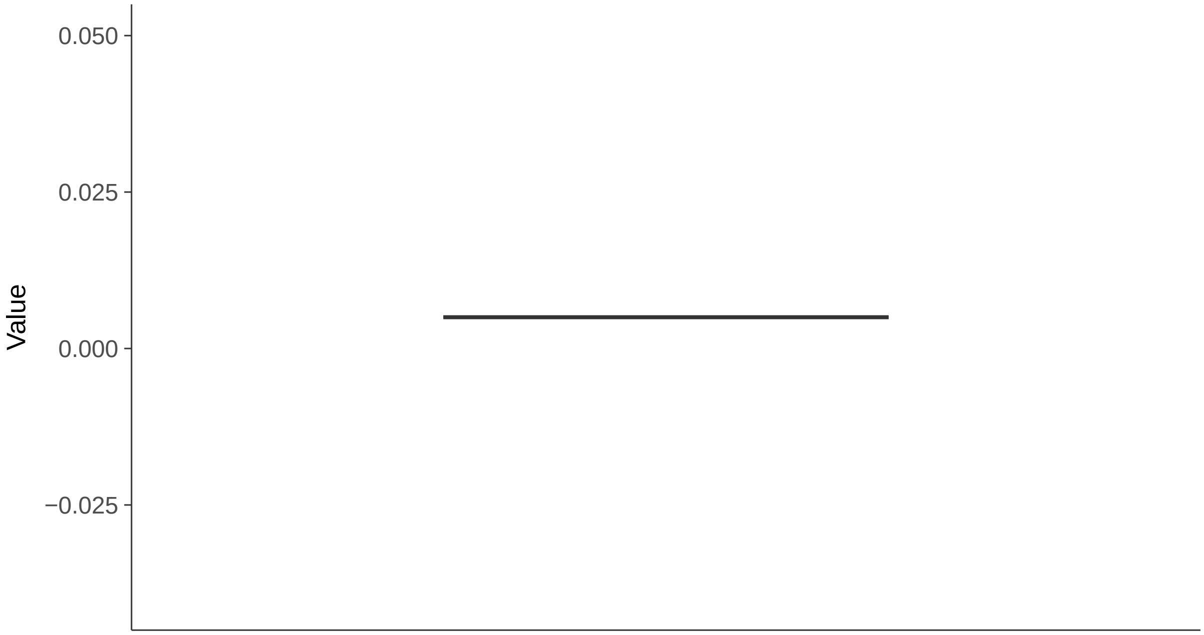
Histogram

Selenium, MW-13 (mg/L)



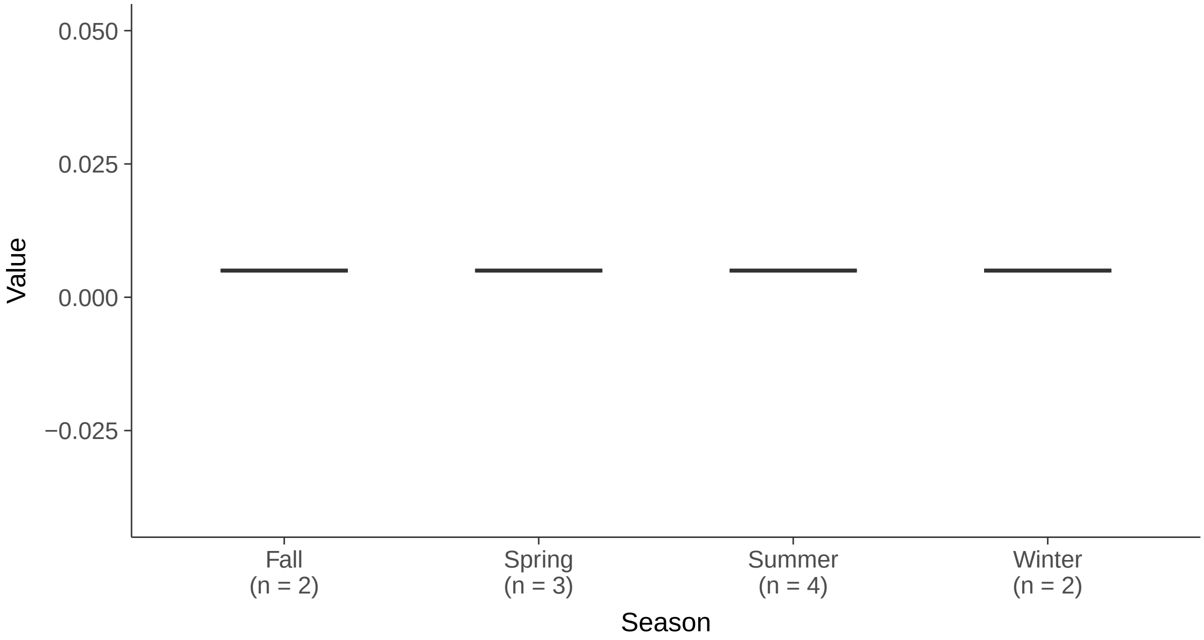
Boxplot

Selenium, MW-13 (mg/L)



Boxplot by Season

Selenium, MW-13 (mg/L)

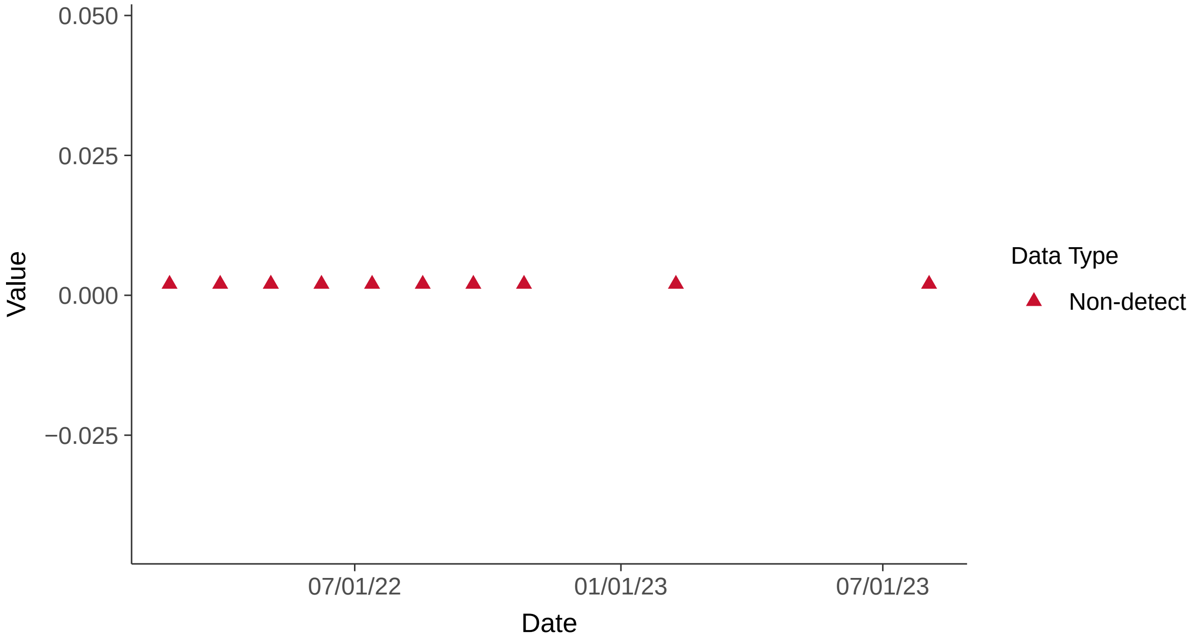


Appendix IV: Thallium, MW-13

ID: 13_2_23

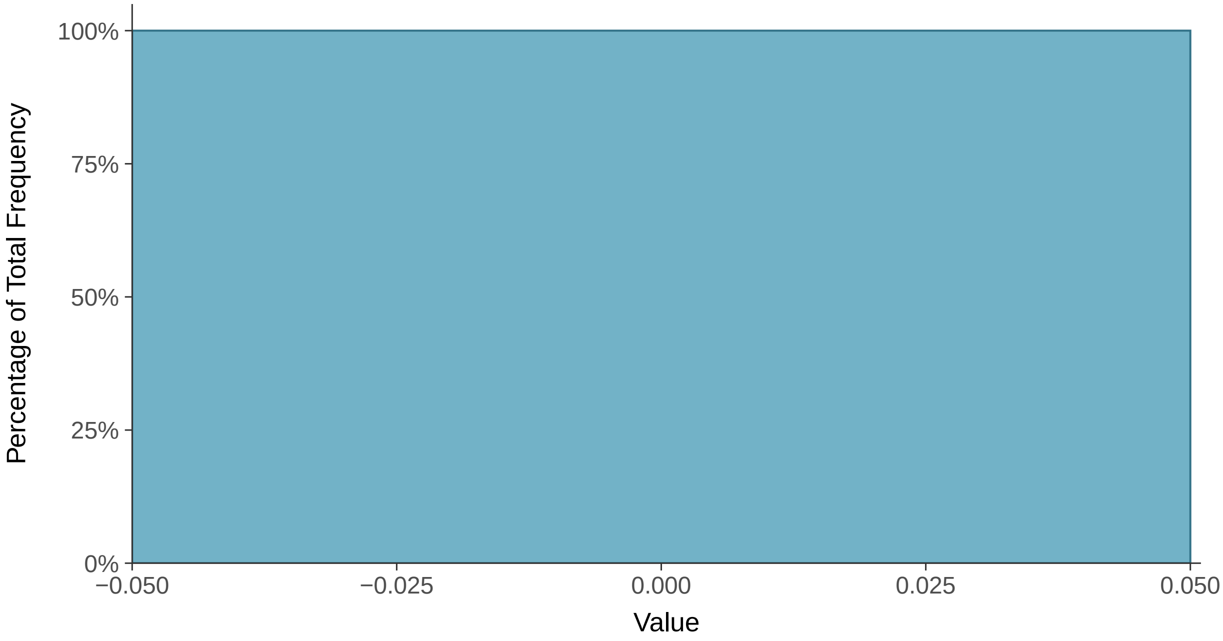
Scatter Plot

Thallium, MW-13 (mg/L)



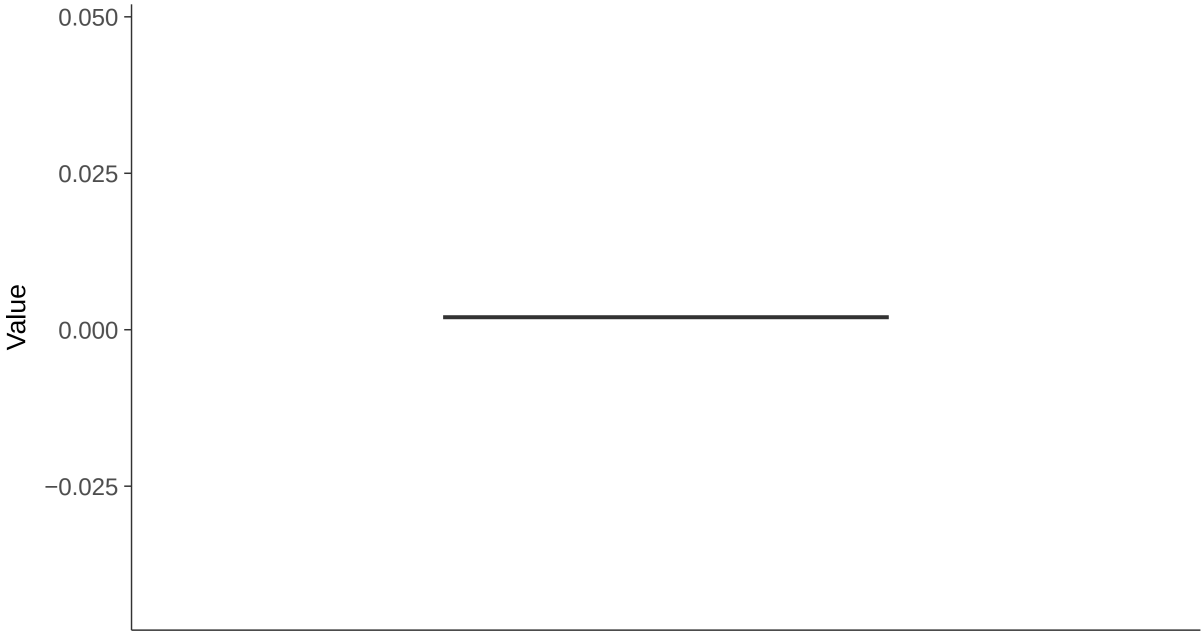
Histogram

Thallium, MW-13 (mg/L)



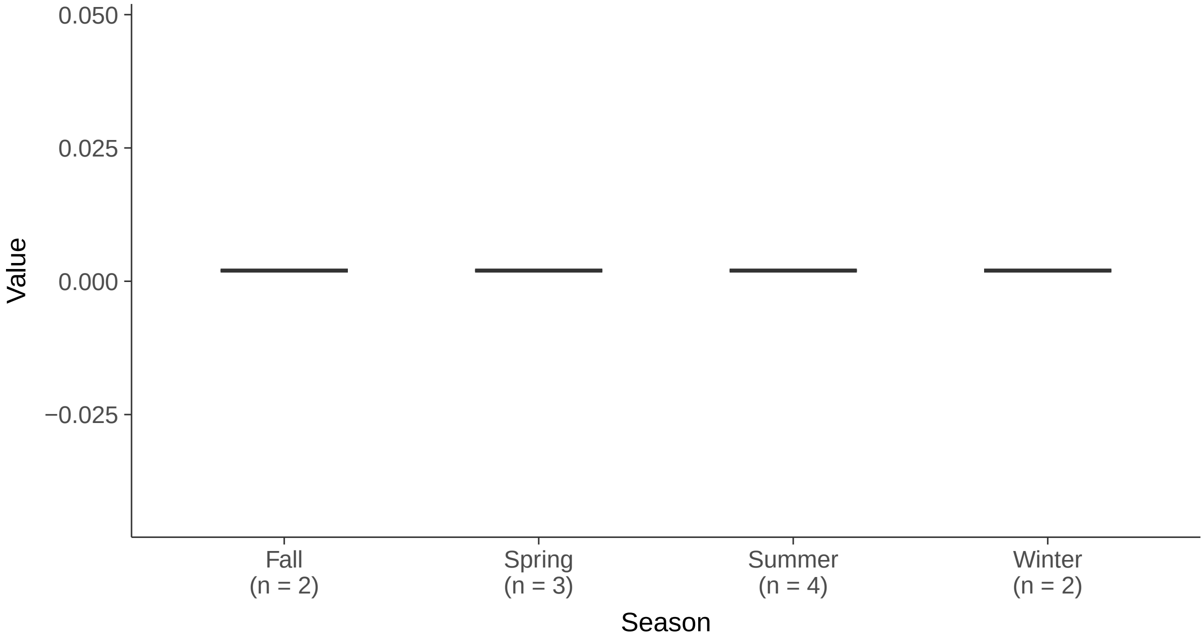
Boxplot

Thallium, MW-13 (mg/L)



Boxplot by Season

Thallium, MW-13 (mg/L)

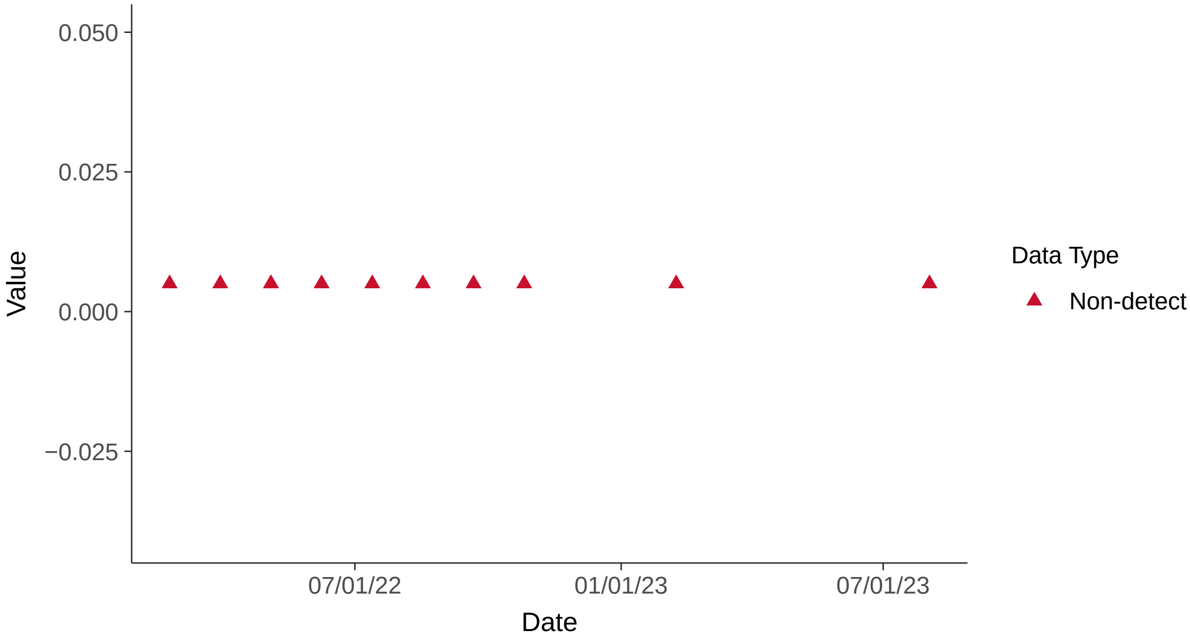


Part 115: Copper, MW-13

ID: 13_5_37

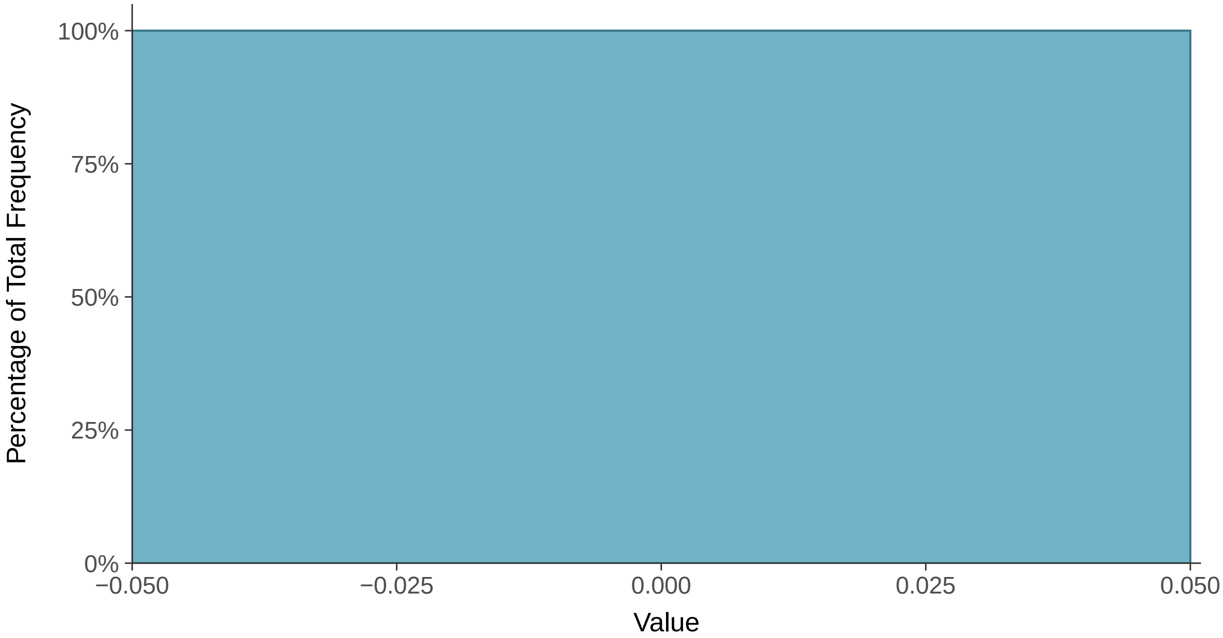
Scatter Plot

Copper, MW-13 (mg/L)



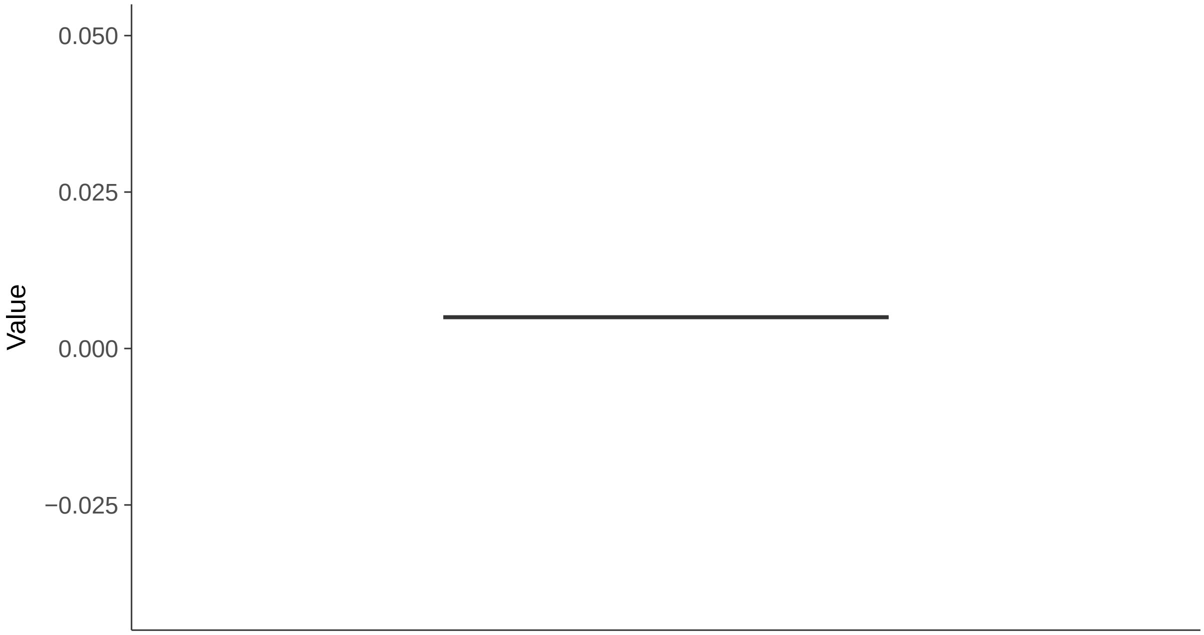
Histogram

Copper, MW-13 (mg/L)



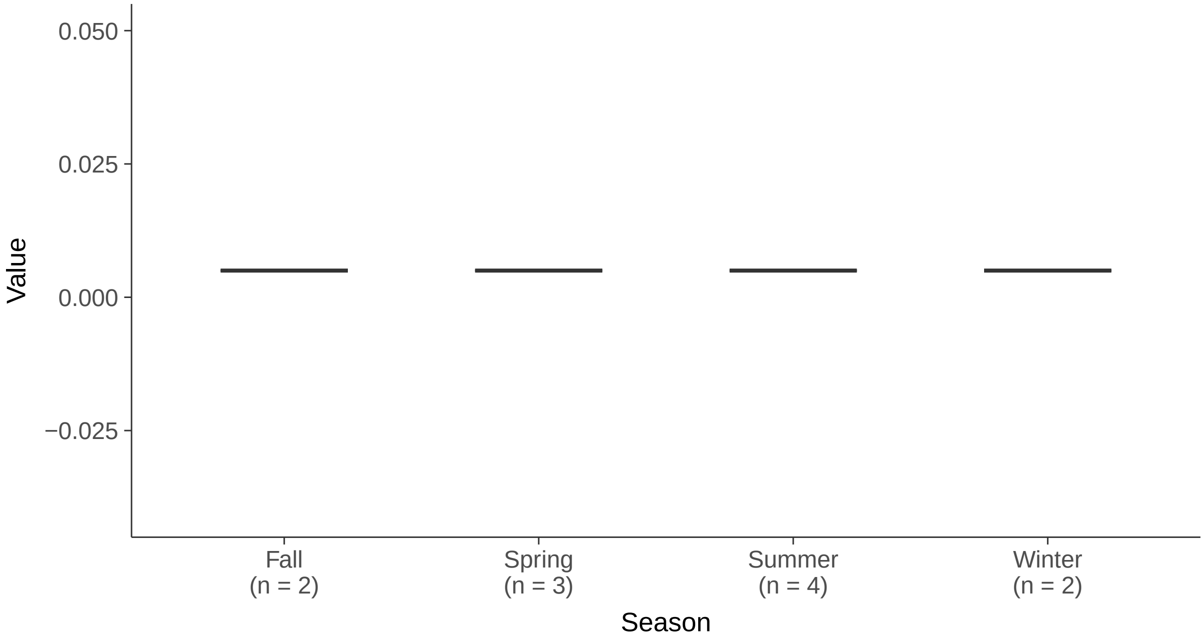
Boxplot

Copper, MW-13 (mg/L)



Boxplot by Season

Copper, MW-13 (mg/L)

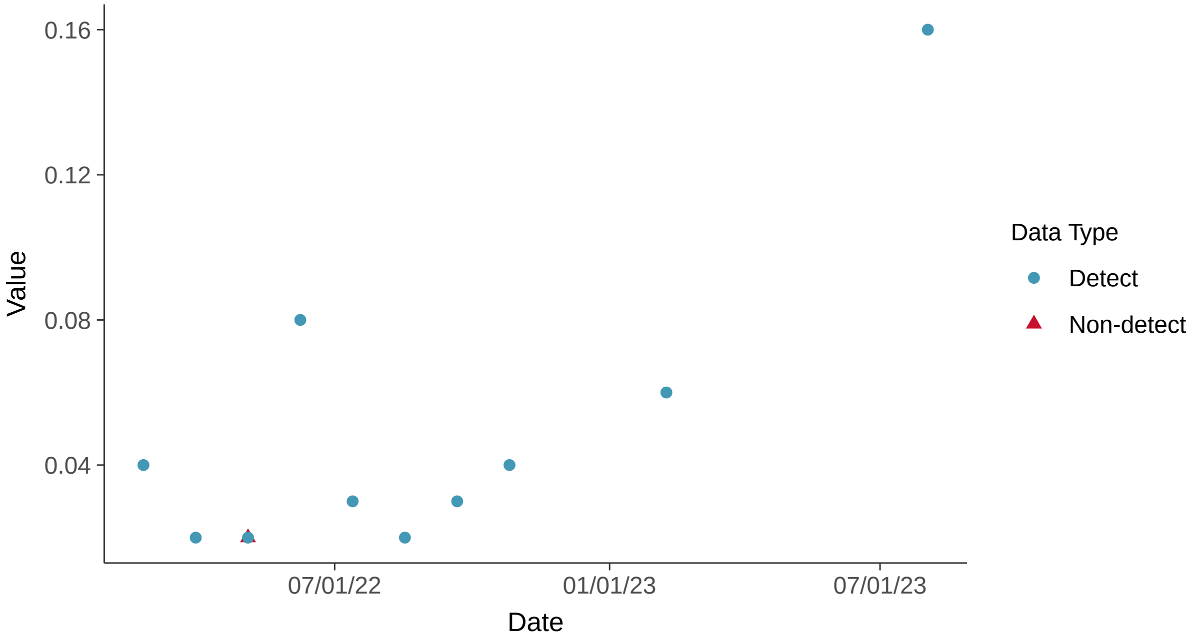


Part 115: Iron, MW-13

ID: 13_5_38

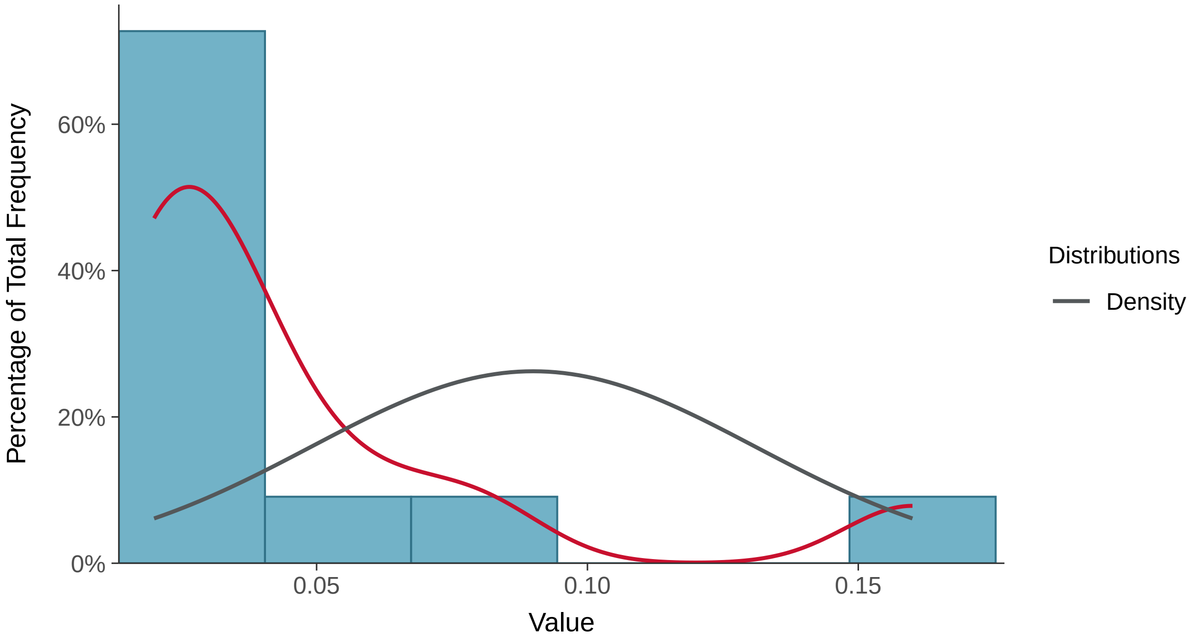
Scatter Plot

Iron, MW-13 (mg/L)



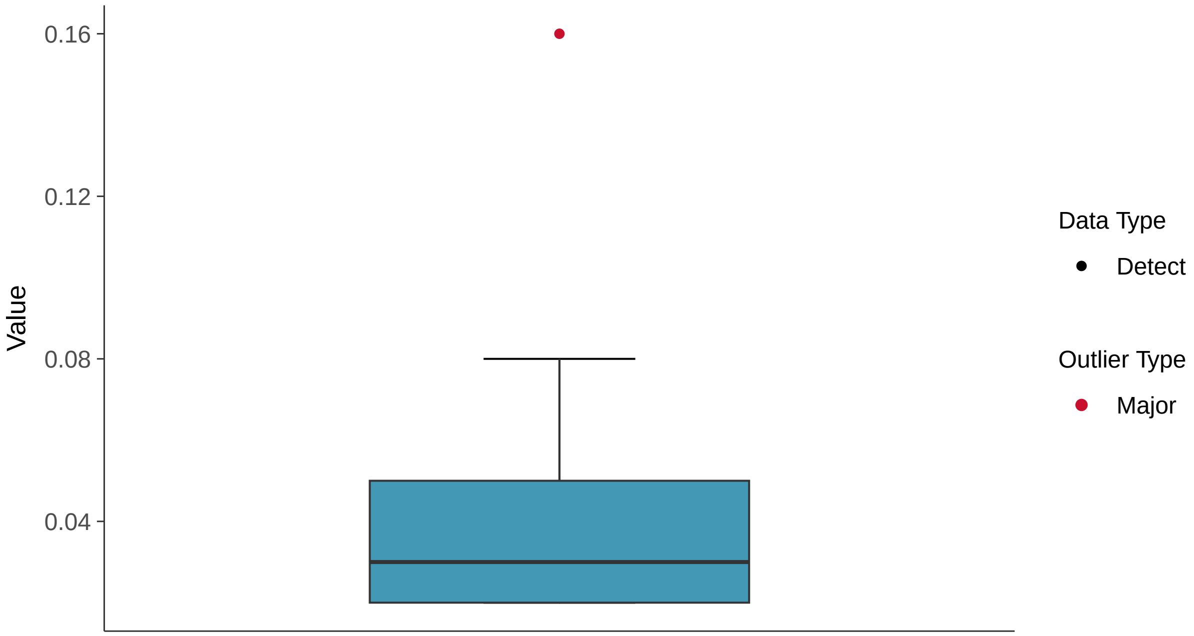
Histogram

Iron, MW-13 (mg/L)



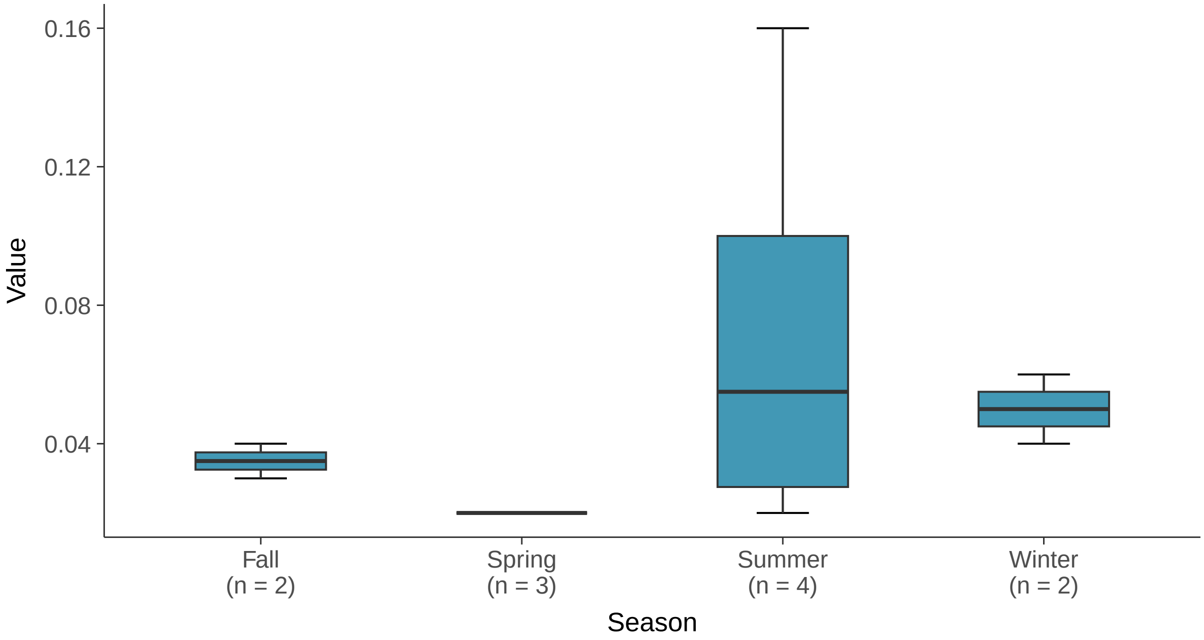
Boxplot

Iron, MW-13 (mg/L)



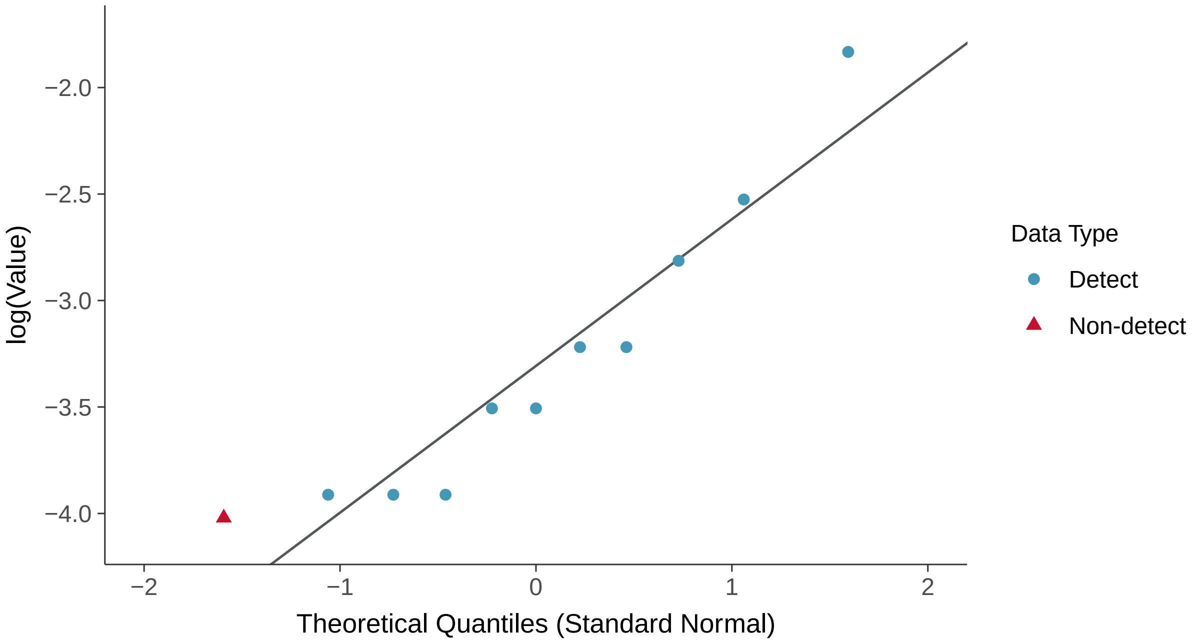
Boxplot by Season

Iron, MW-13 (mg/L)



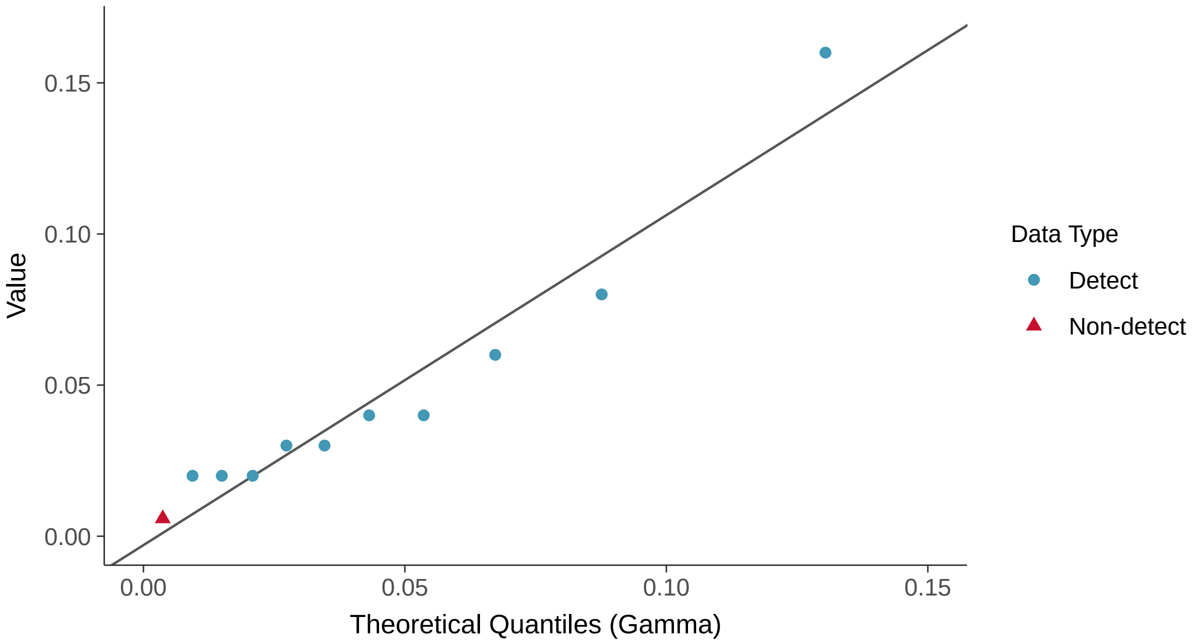
Lognormal Q-Q plot using ROS Imputed Estimates

Iron, MW-13 (mg/L)



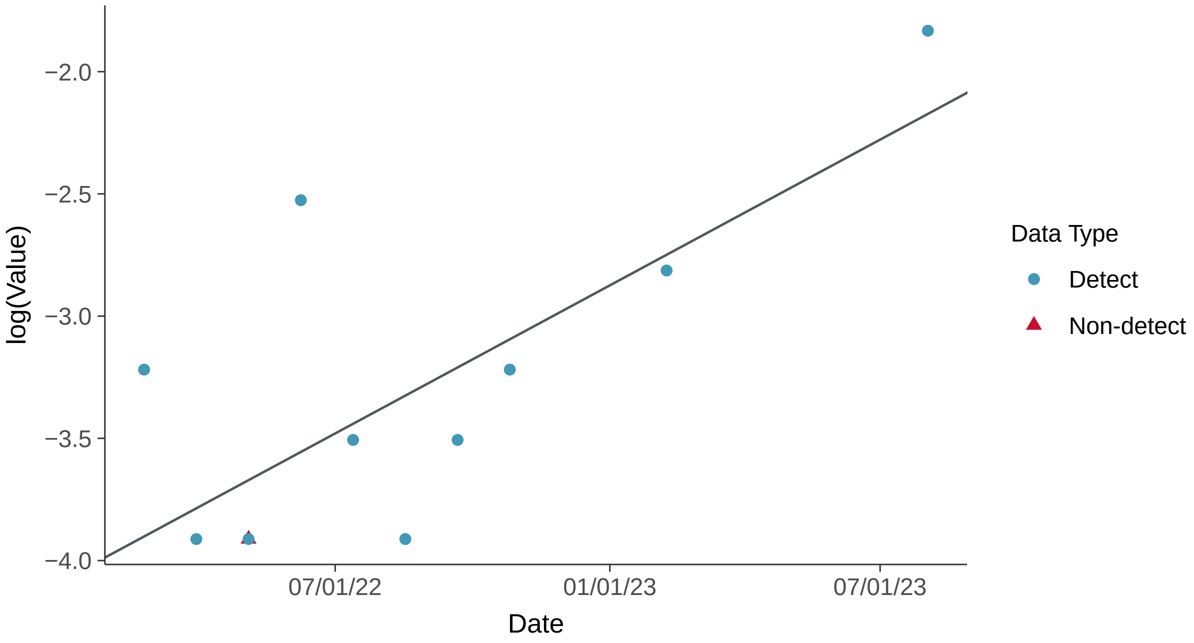
Gamma Q-Q plot using ROS Imputed Estimates

Iron, MW-13 (mg/L)



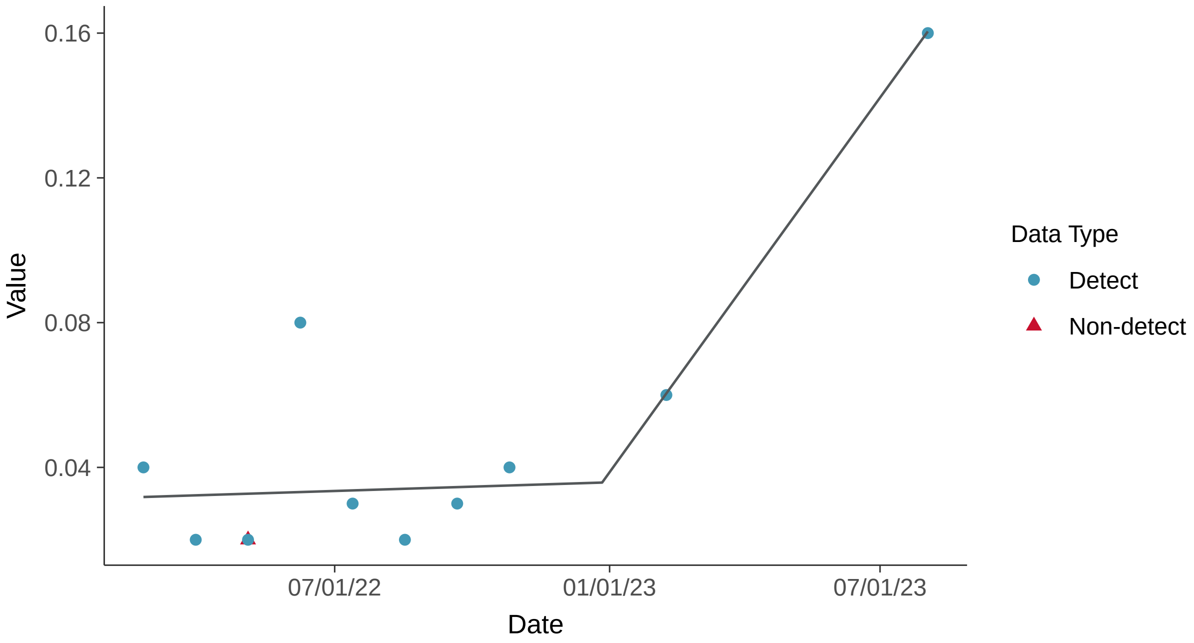
Trend Regression: Lognormal MLE

Iron, MW-13 (mg/L)



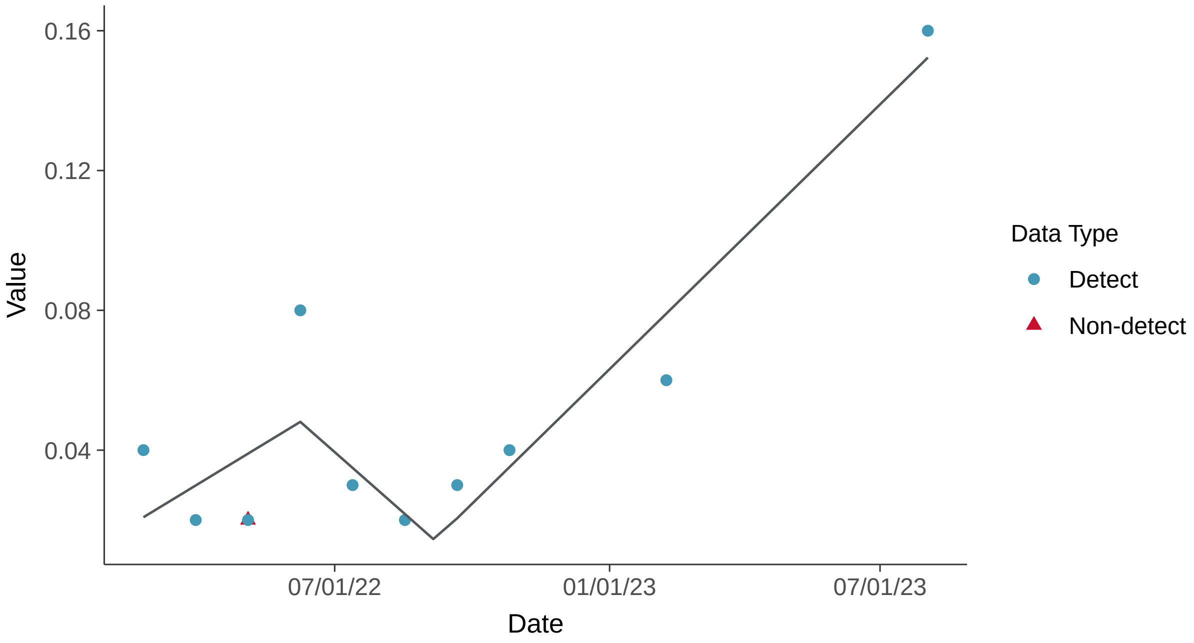
Trend Regression: Piecewise Linear-Linear

Iron, MW-13 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Iron, MW-13 (mg/L)

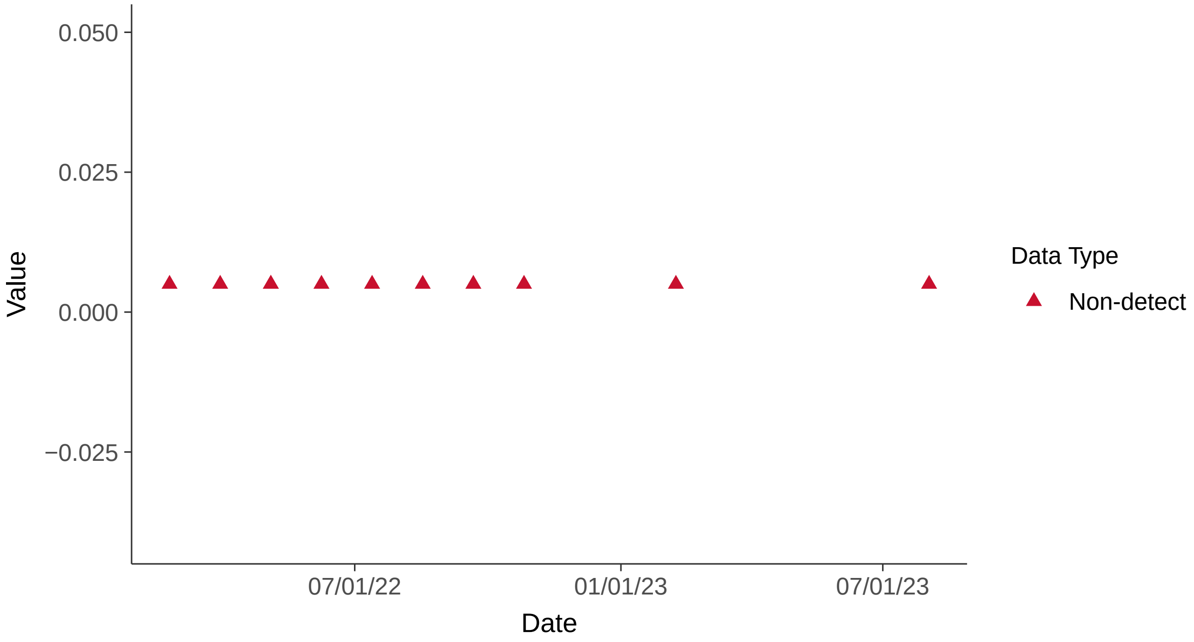


Part 115: Nickel, MW-13

ID: 13_5_39

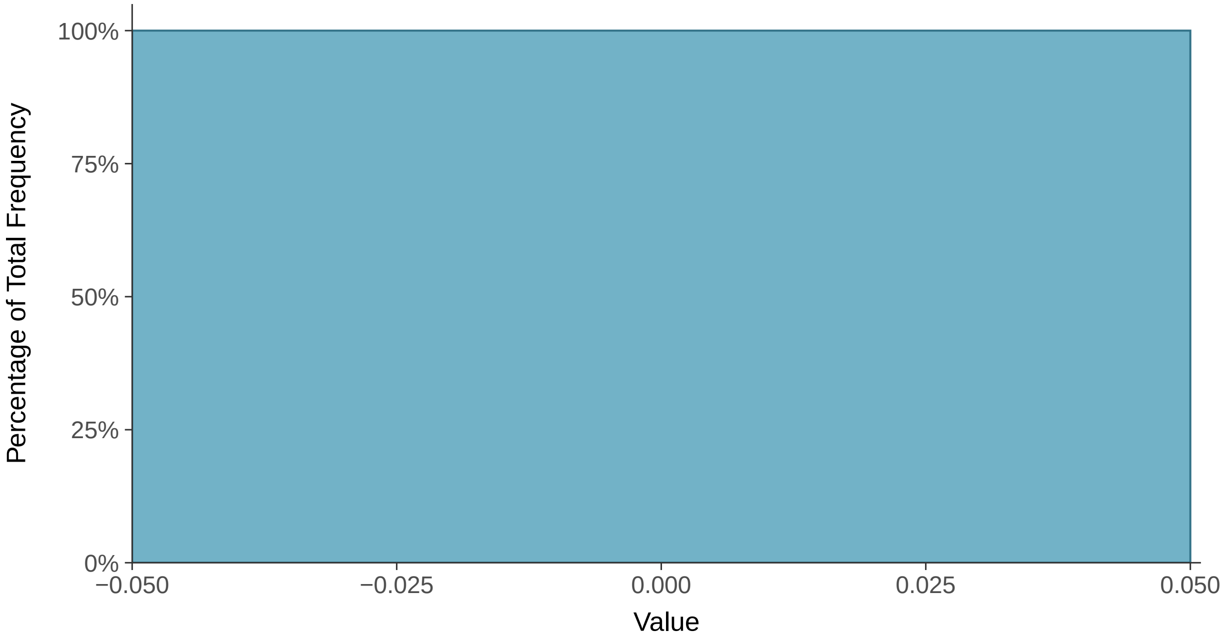
Scatter Plot

Nickel, MW-13 (mg/L)



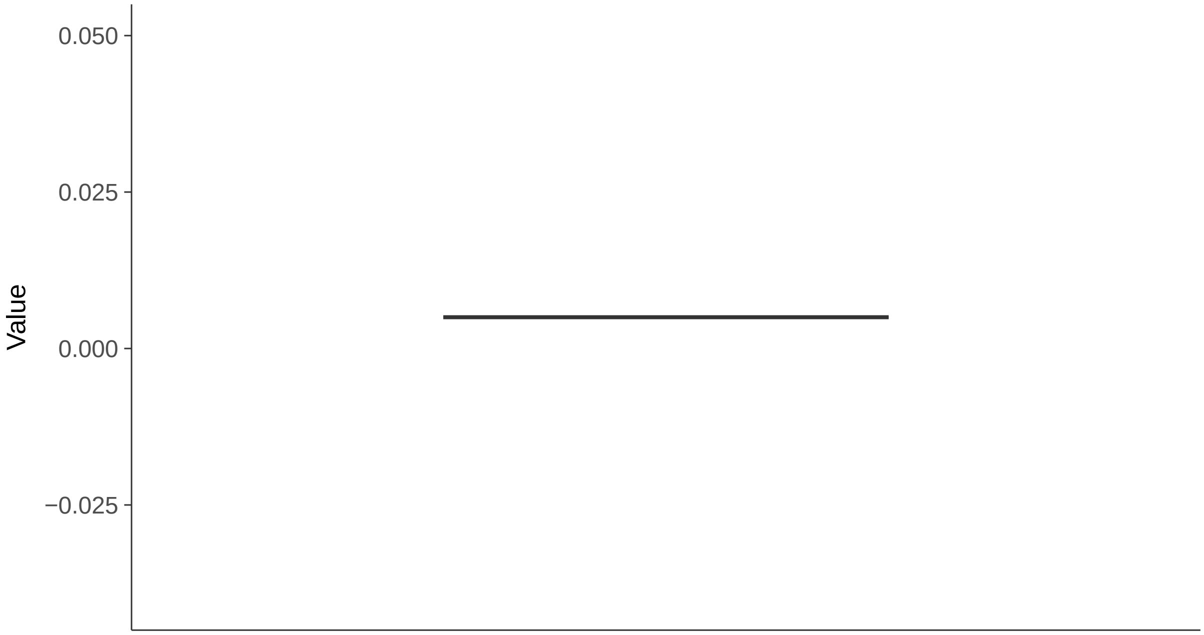
Histogram

Nickel, MW-13 (mg/L)



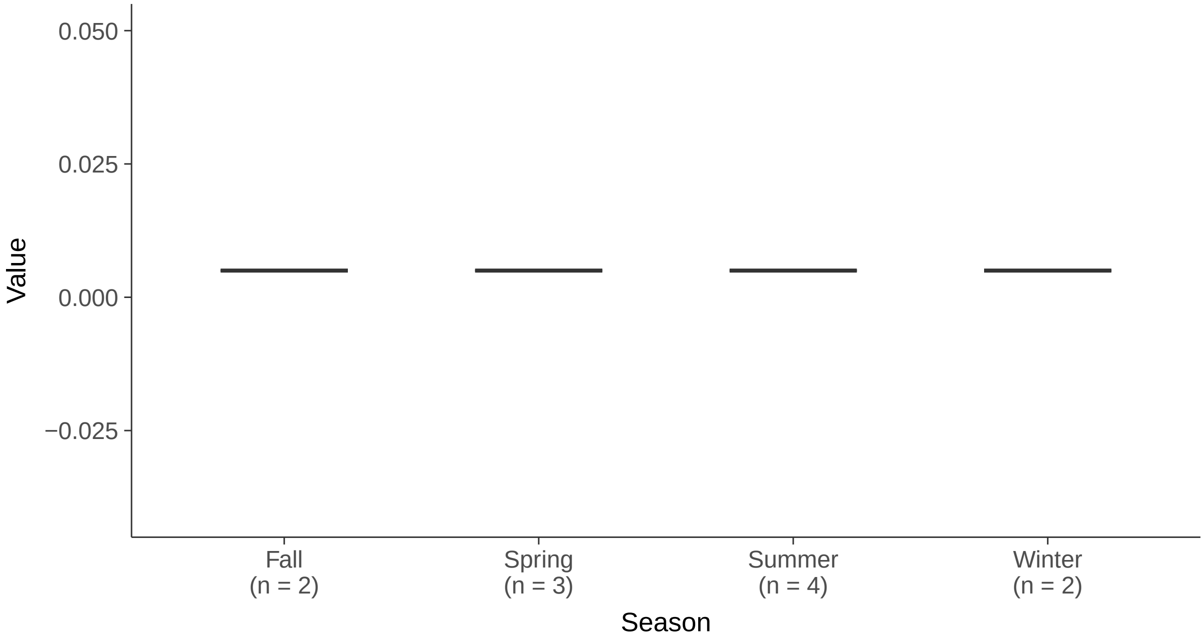
Boxplot

Nickel, MW-13 (mg/L)



Boxplot by Season

Nickel, MW-13 (mg/L)

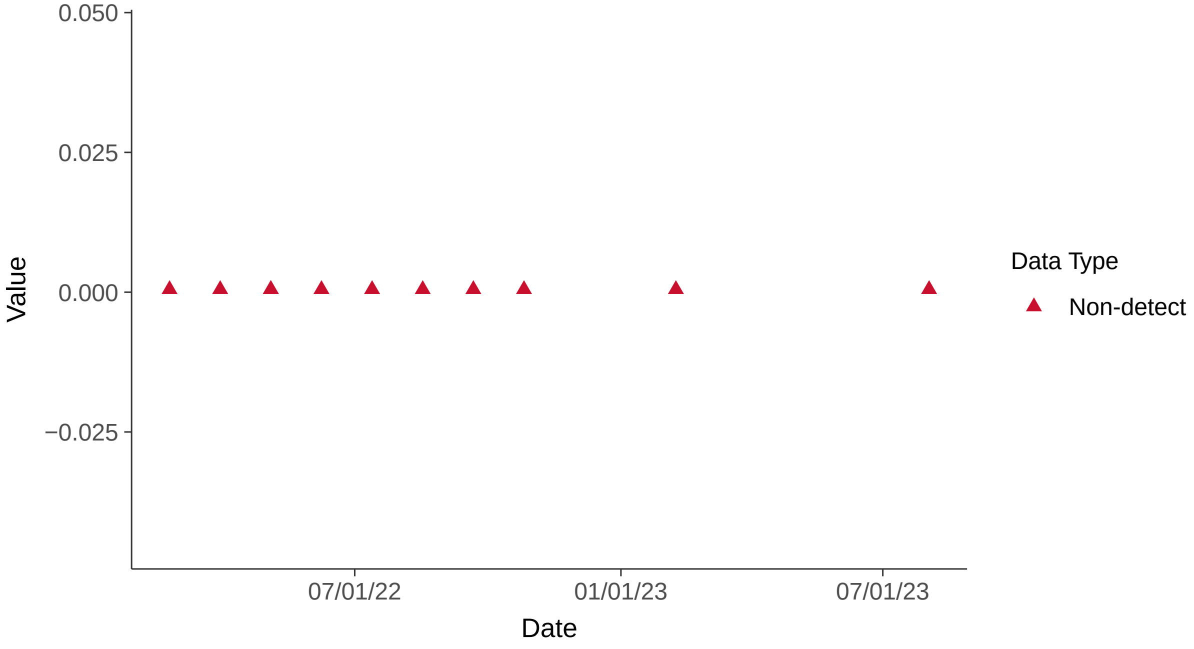


Part 115: Silver, MW-13

ID: 13_5_40

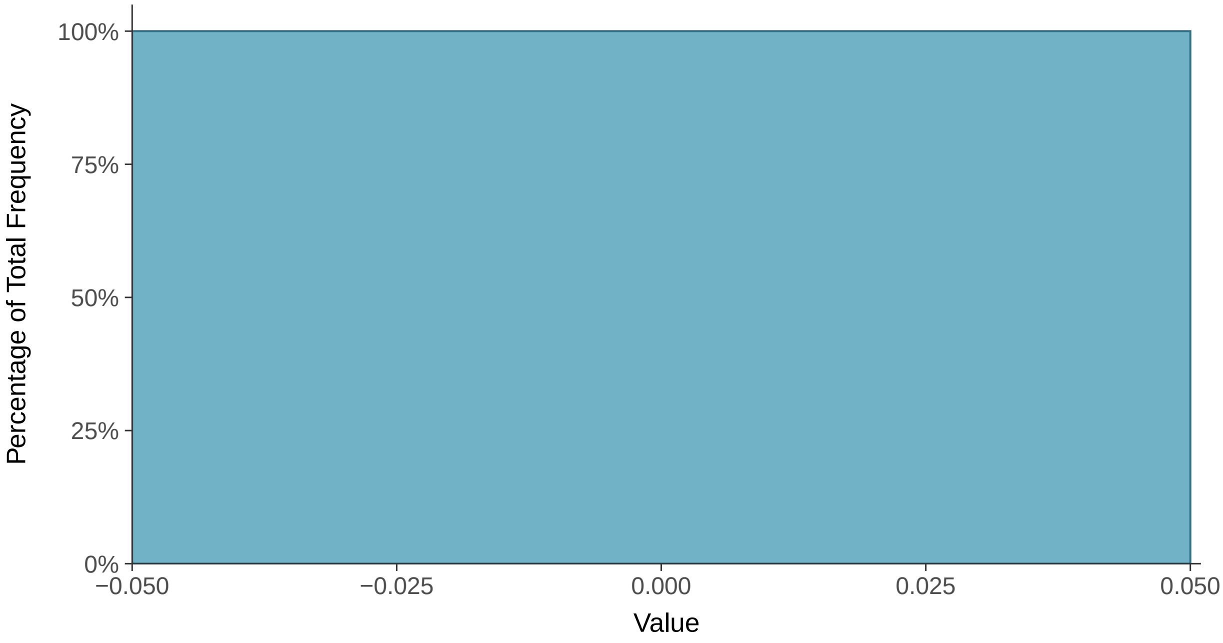
Scatter Plot

Silver, MW-13 (mg/L)



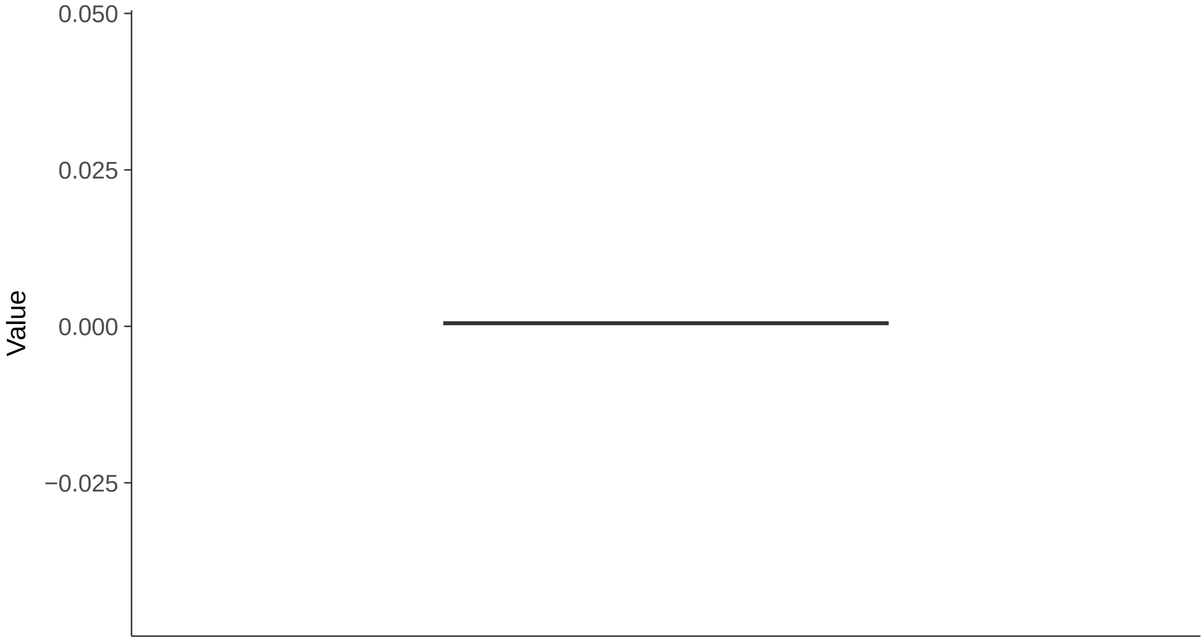
Histogram

Silver, MW-13 (mg/L)



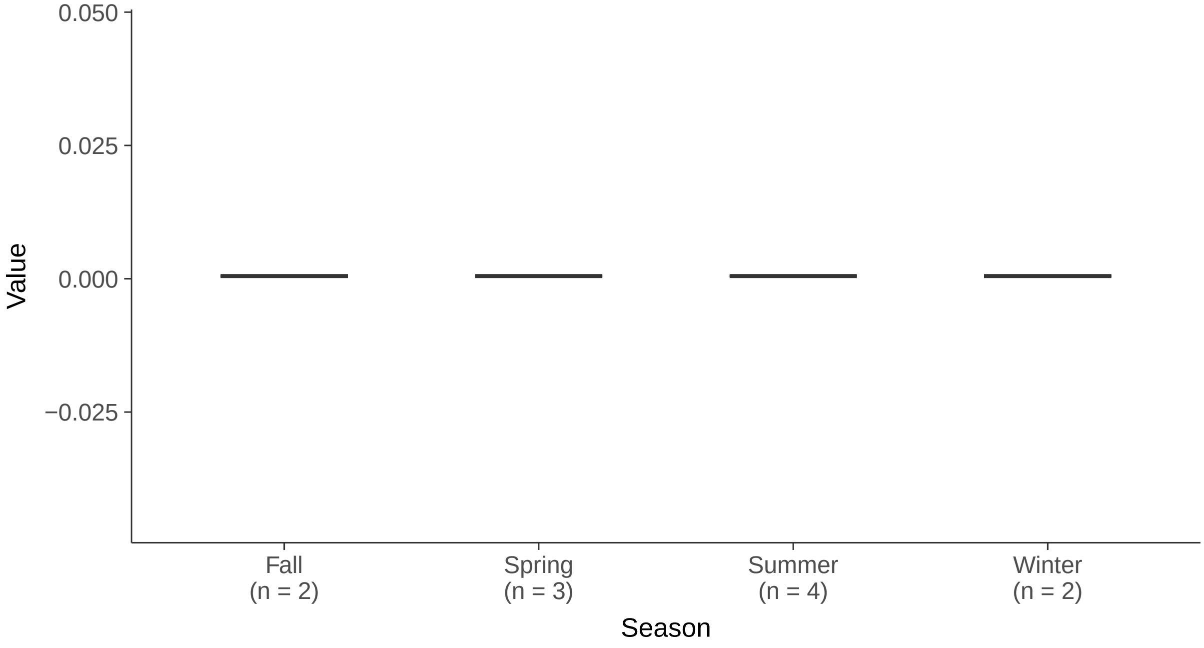
Boxplot

Silver, MW-13 (mg/L)



Boxplot by Season

Silver, MW-13 (mg/L)

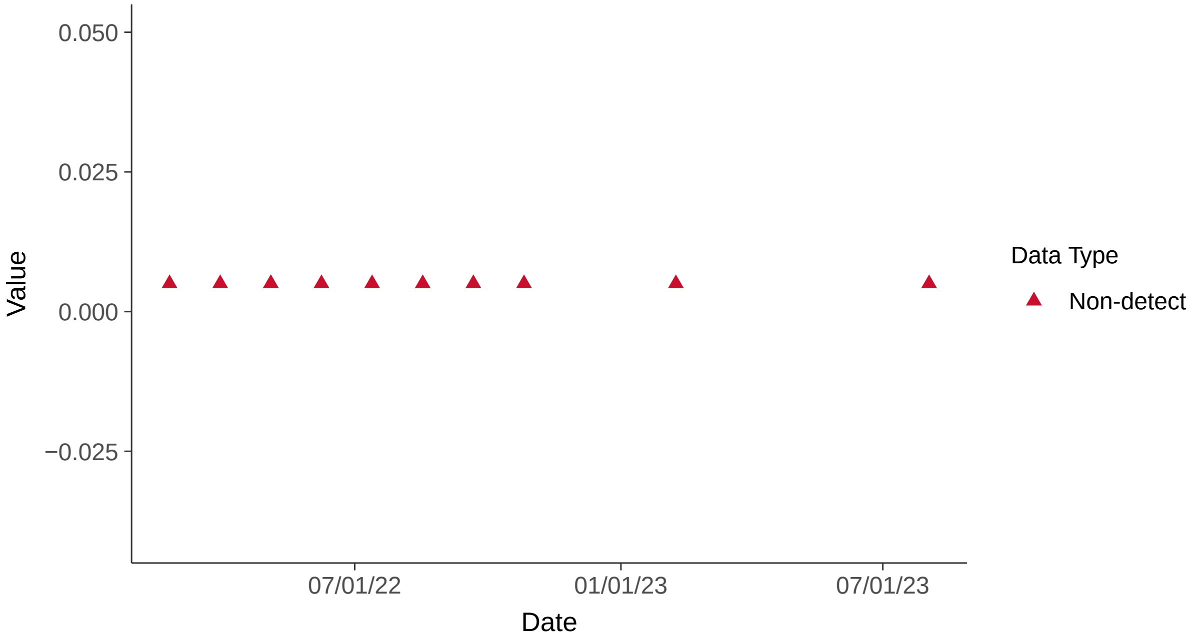


Part 115: Vanadium, MW-13

ID: 13_5_41

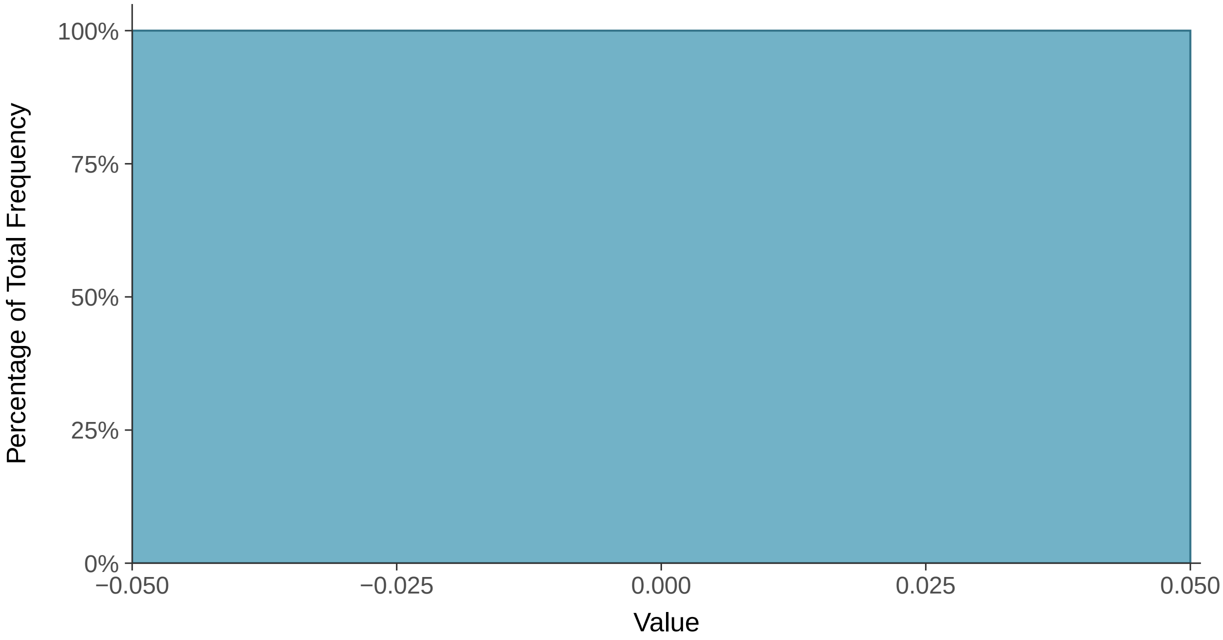
Scatter Plot

Vanadium, MW-13 (mg/L)



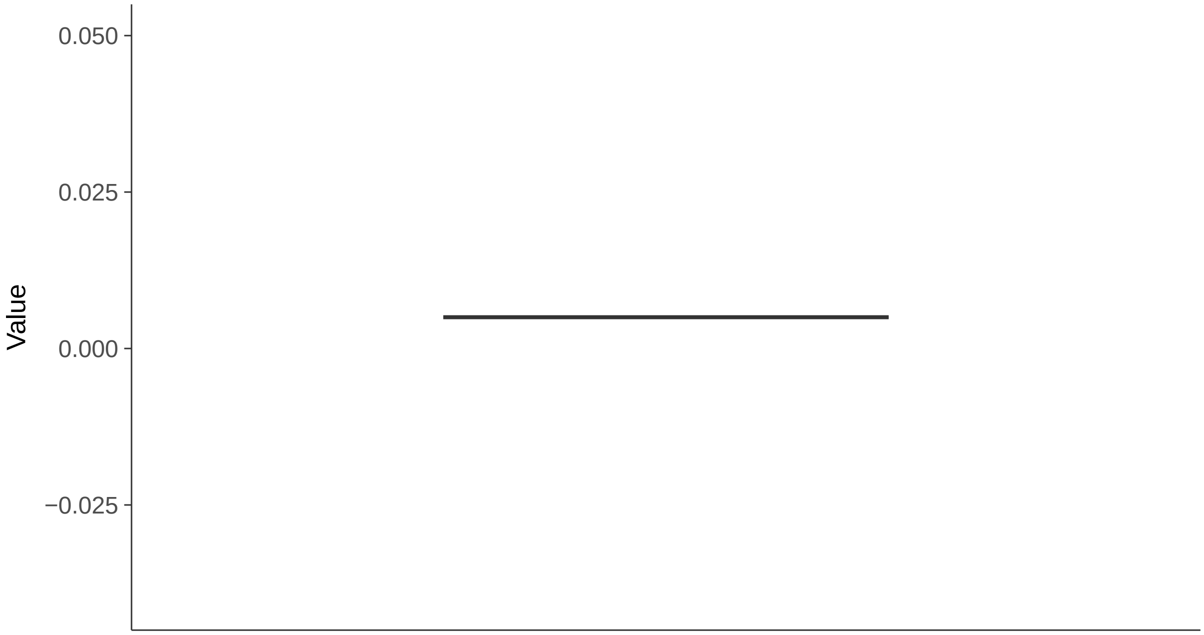
Histogram

Vanadium, MW-13 (mg/L)



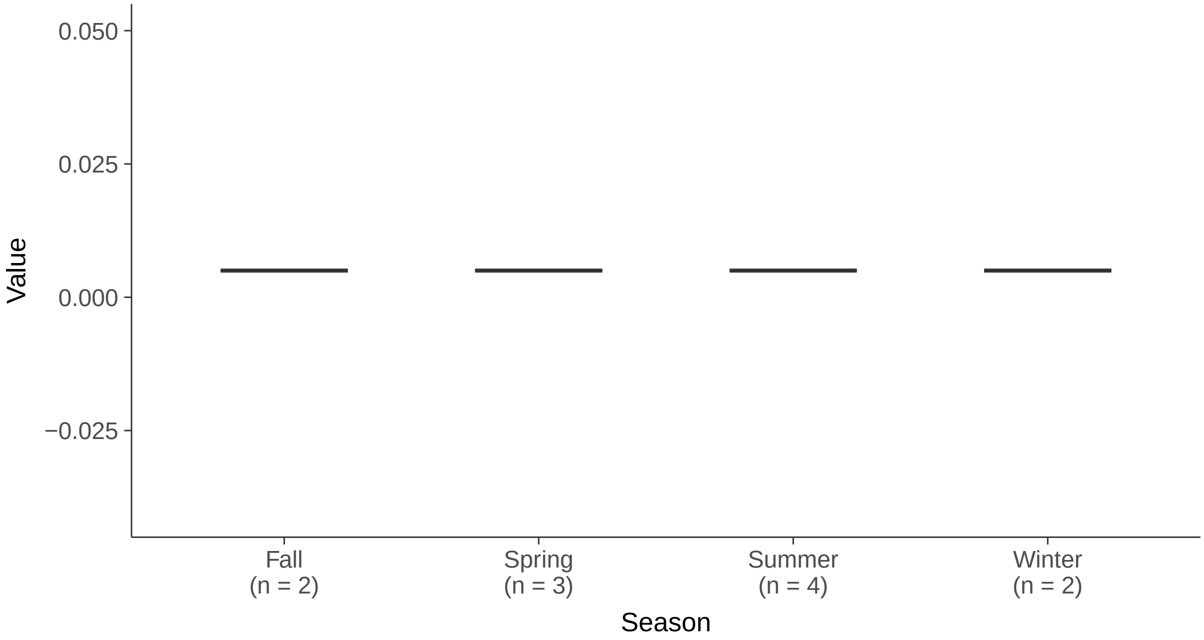
Boxplot

Vanadium, MW-13 (mg/L)



Boxplot by Season

Vanadium, MW-13 (mg/L)

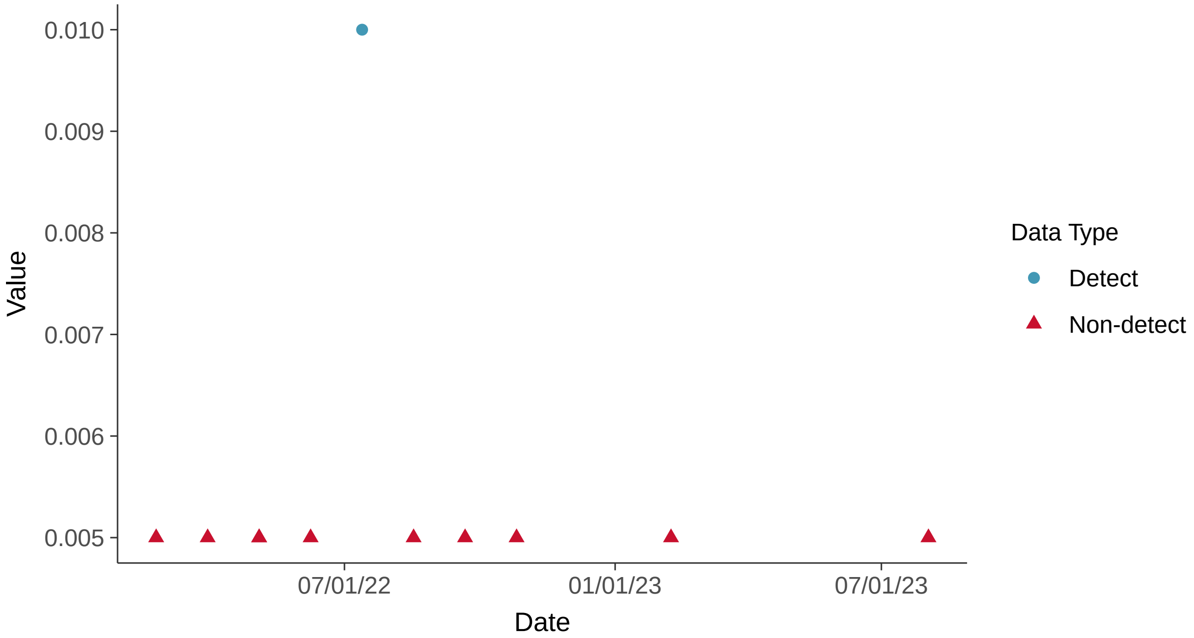


Part 115: Zinc, MW-13

ID: 13_5_42

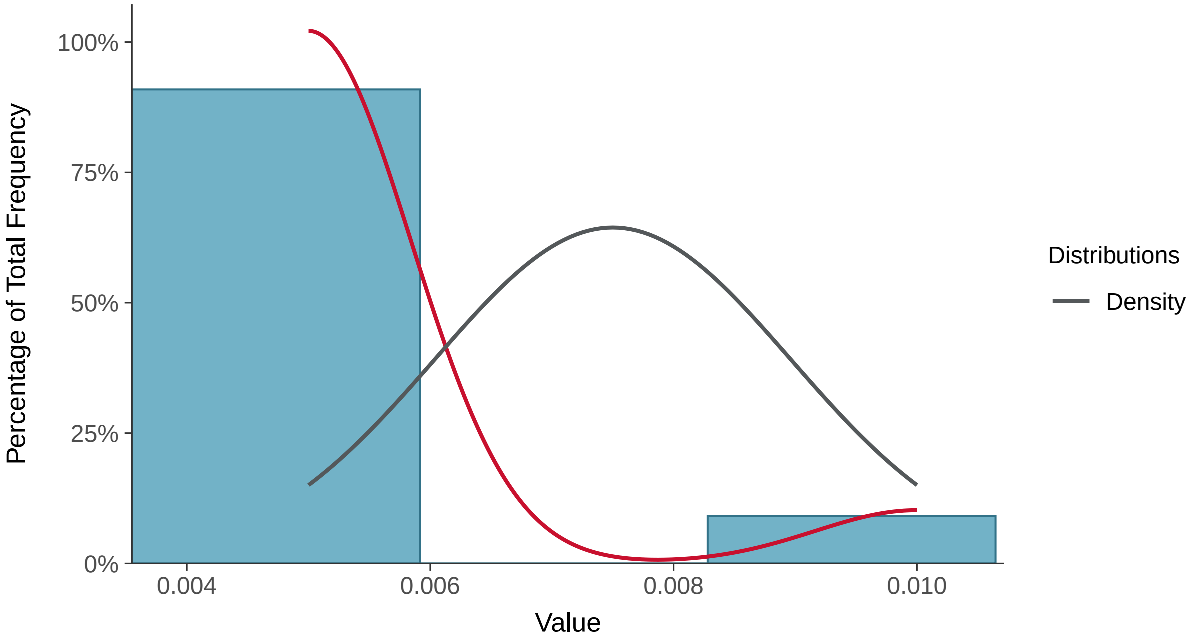
Scatter Plot

Zinc, MW-13 (mg/L)



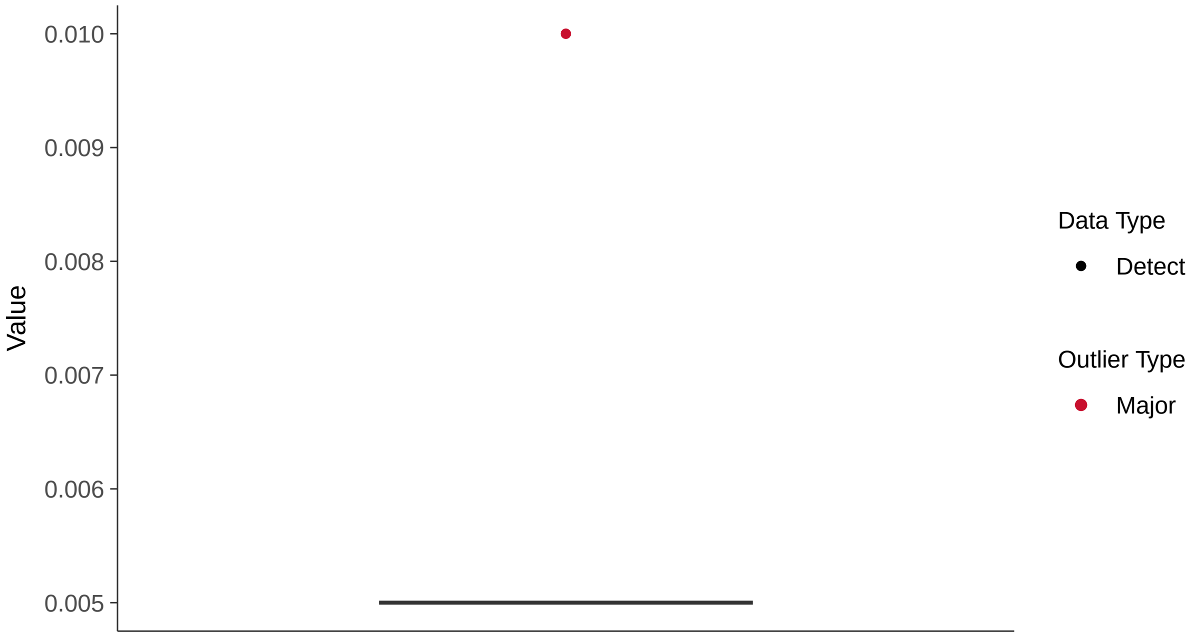
Histogram

Zinc, MW-13 (mg/L)



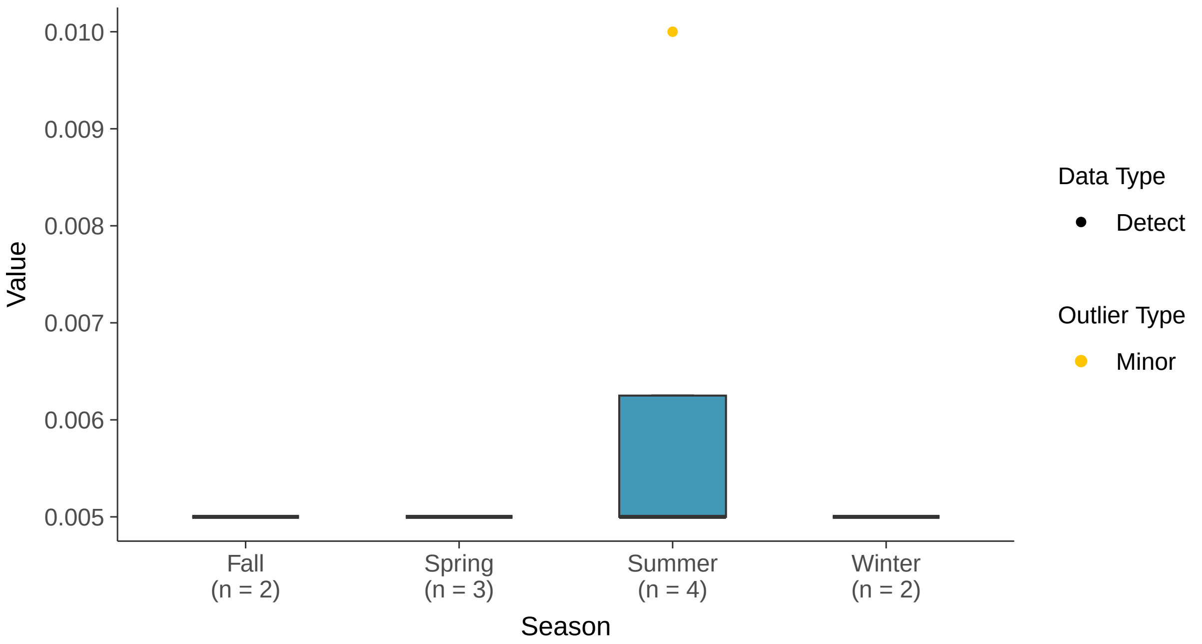
Boxplot

Zinc, MW-13 (mg/L)



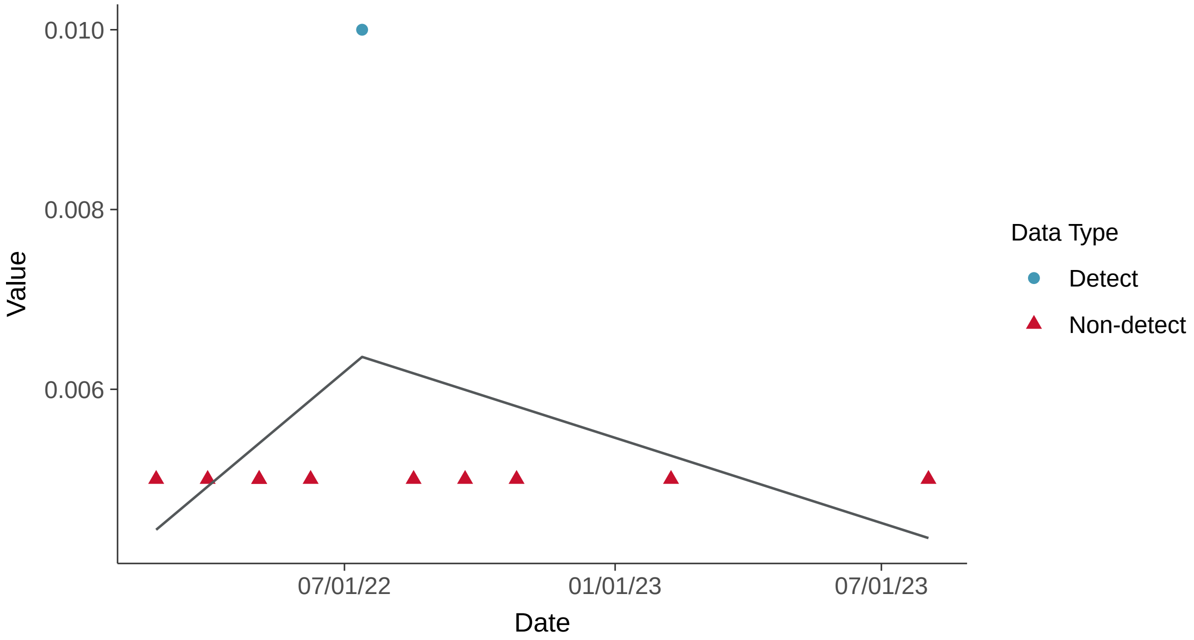
Boxplot by Season

Zinc, MW-13 (mg/L)



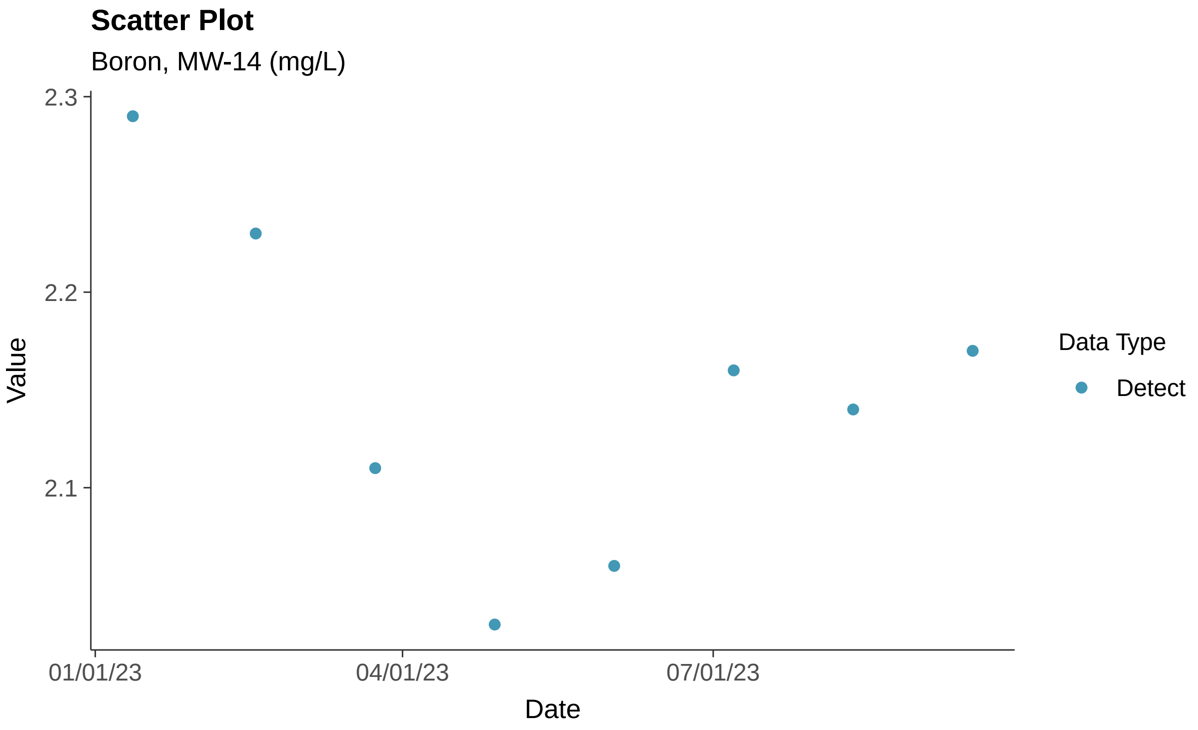
Trend Regression: Piecewise Linear-Linear

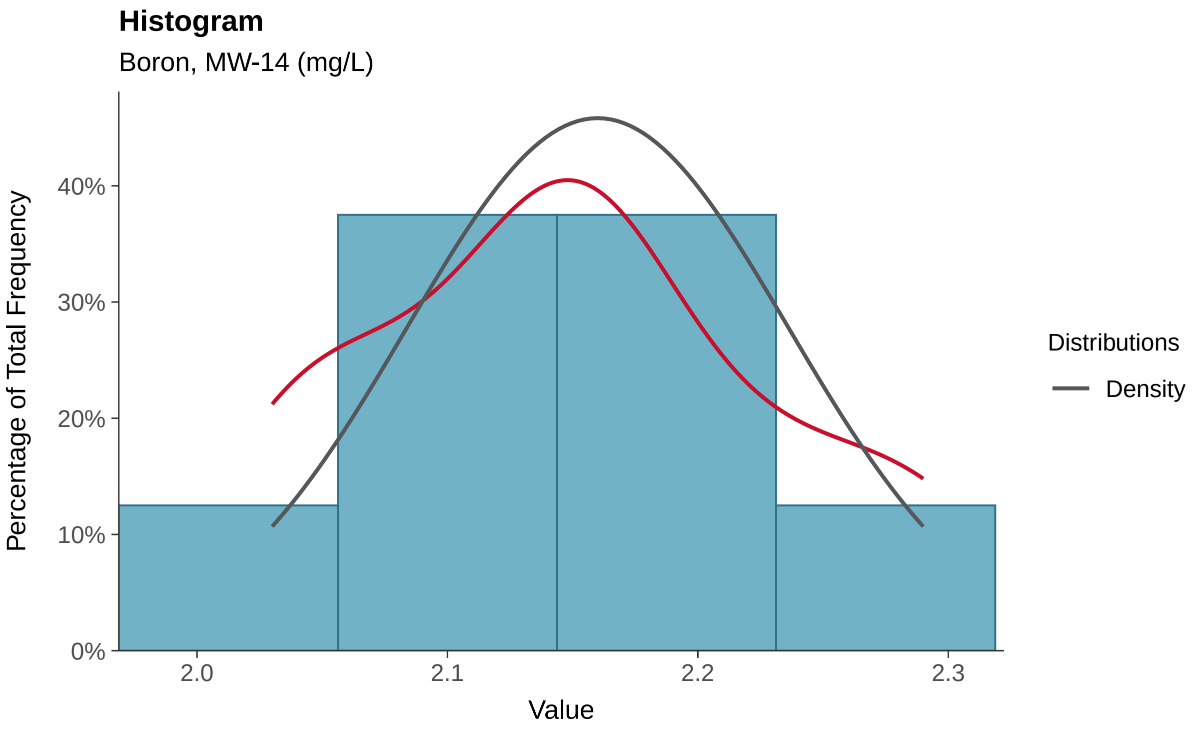
Zinc, MW-13 (mg/L)



Appendix III: Boron, MW-14

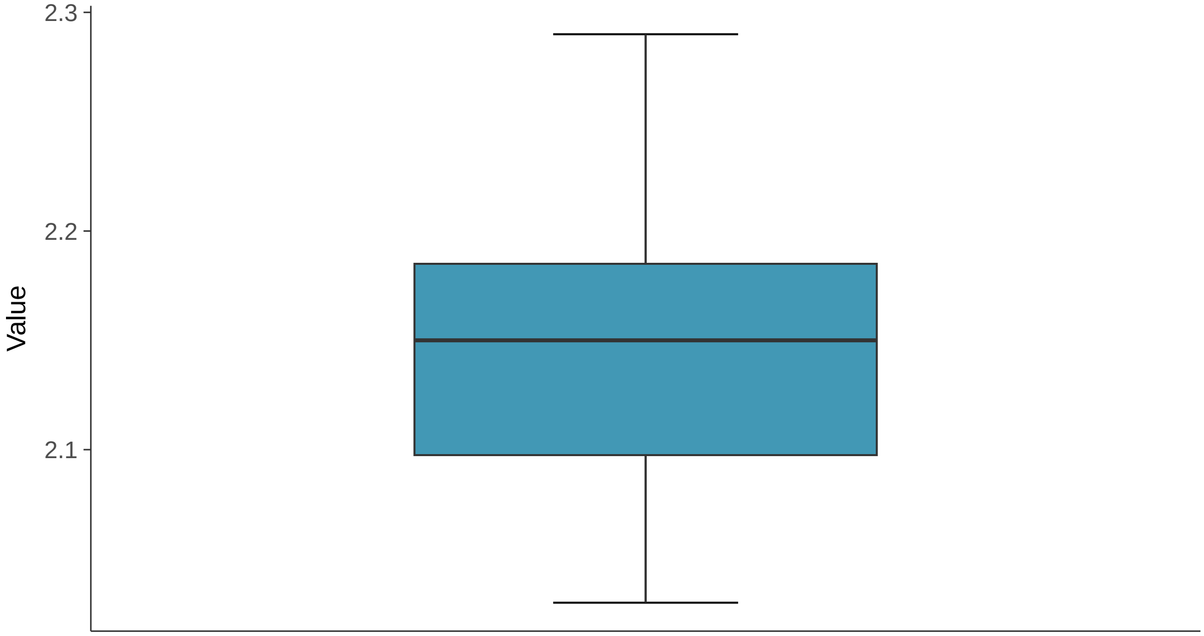
ID: 14_1_01





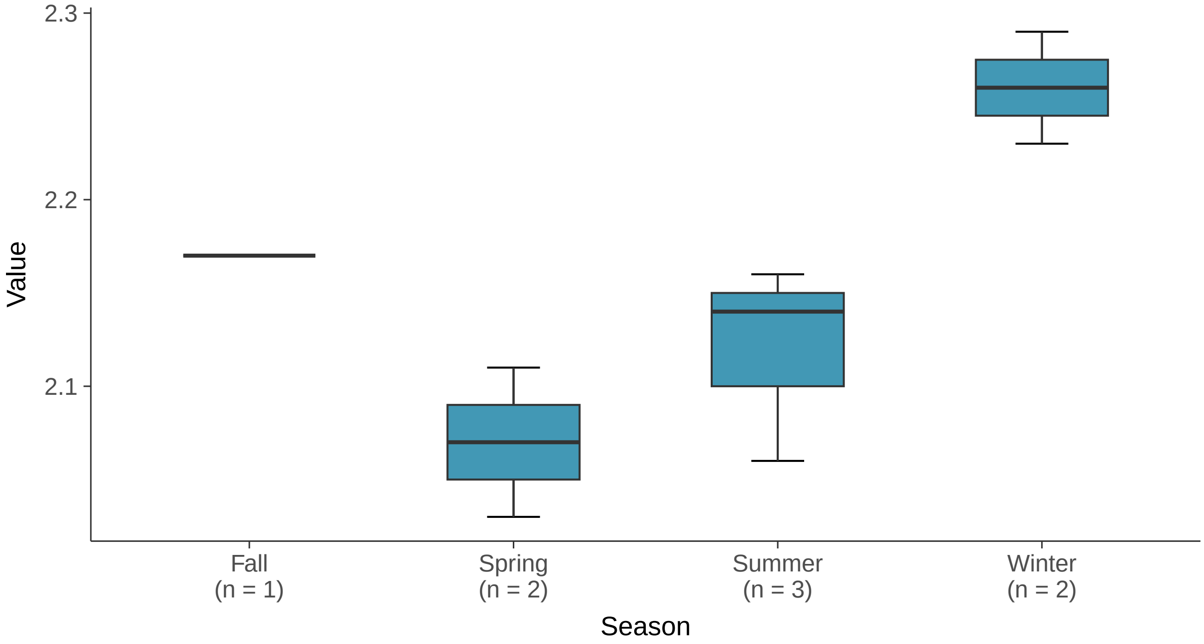
Boxplot

Boron, MW-14 (mg/L)



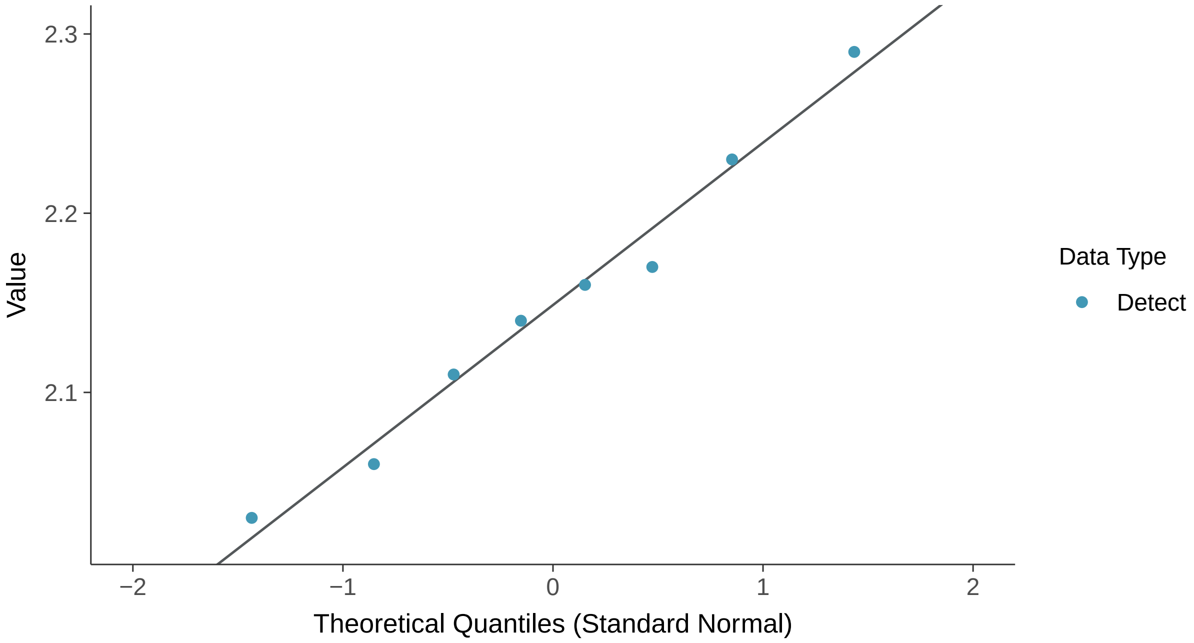
Boxplot by Season

Boron, MW-14 (mg/L)



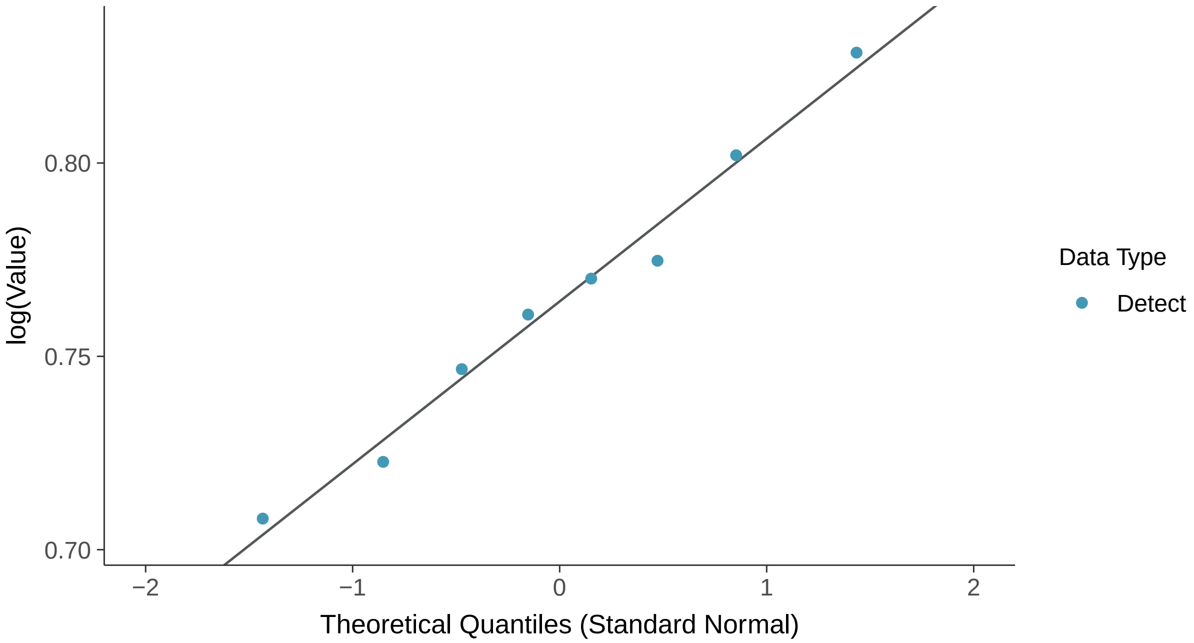
Normal Q-Q plot

Boron, MW-14 (mg/L)



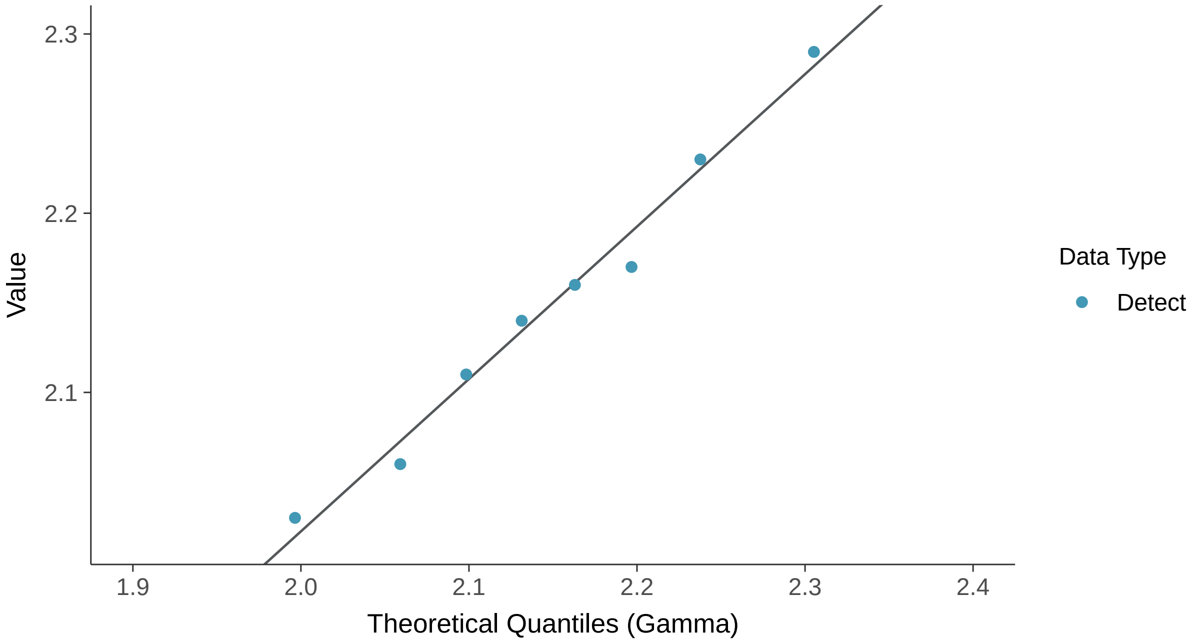
Lognormal Q-Q plot

Boron, MW-14 (mg/L)



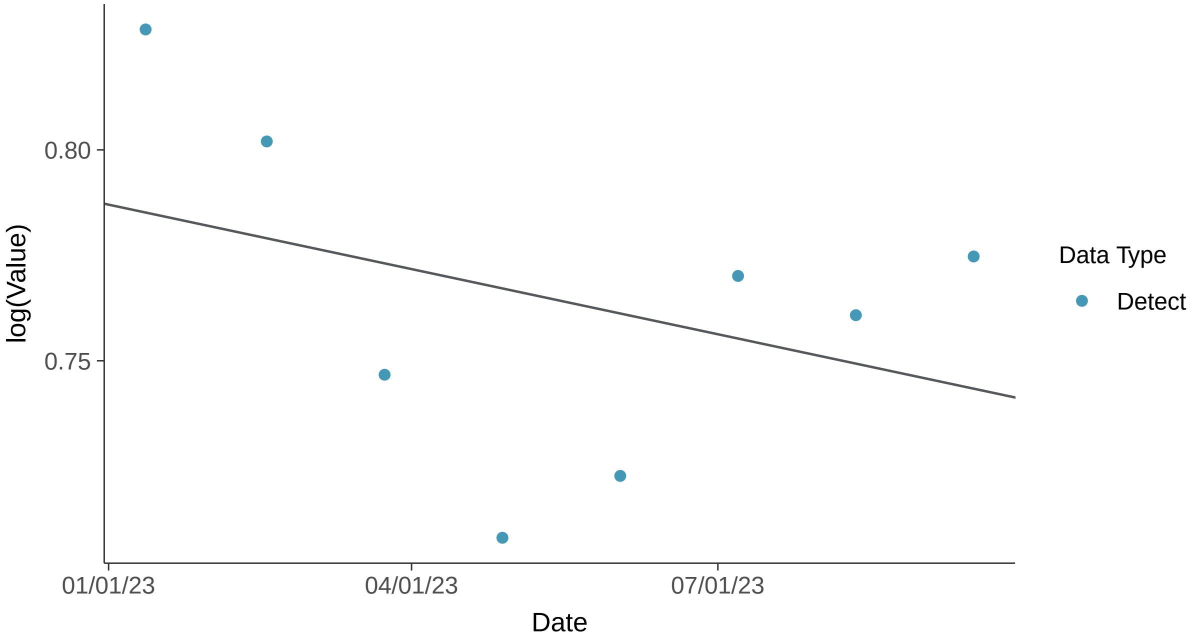
Gamma Q-Q plot

Boron, MW-14 (mg/L)



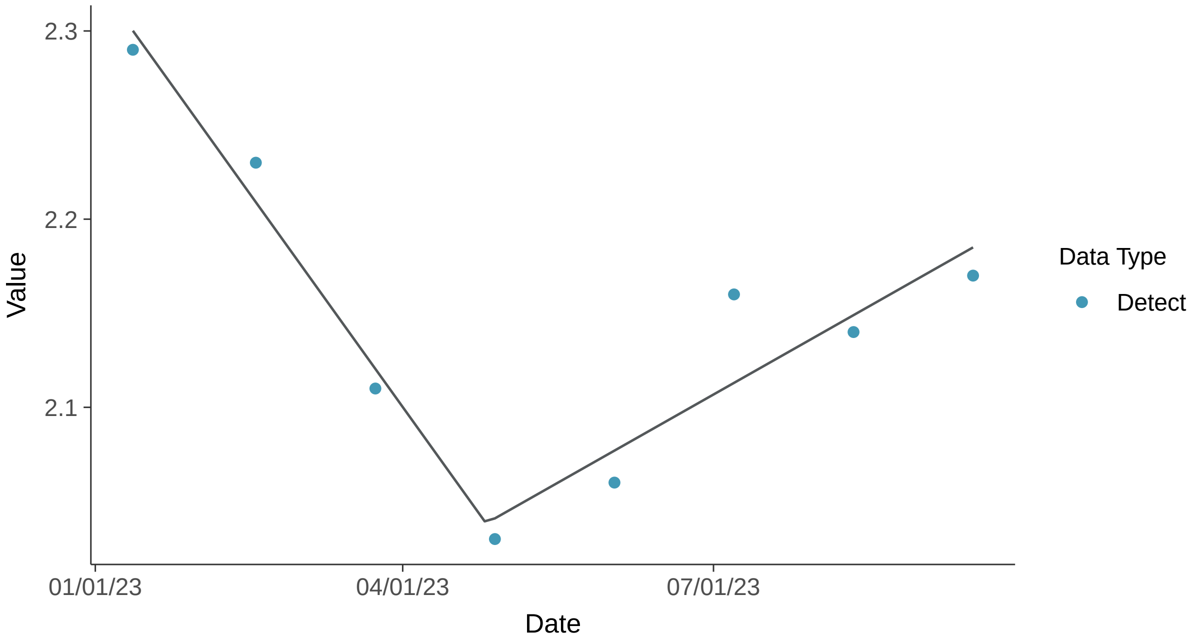
Trend Regression: Lognormal MLE

Boron, MW-14 (mg/L)



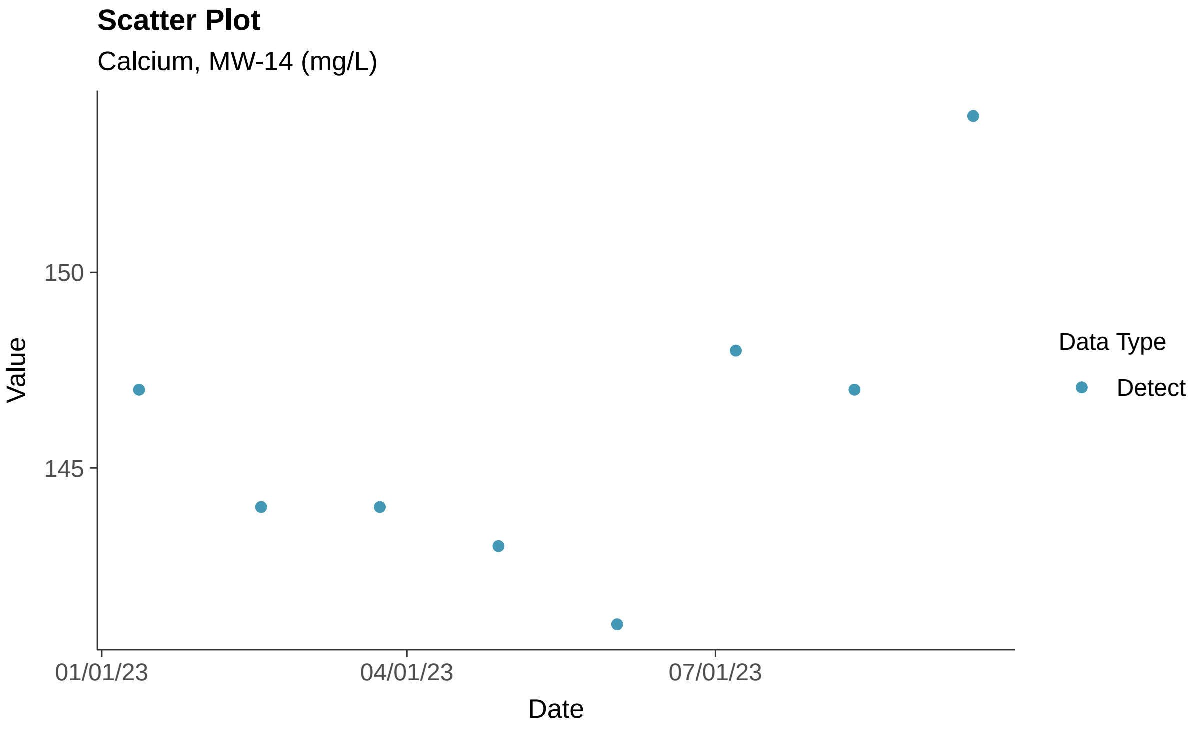
Trend Regression: Piecewise Linear-Linear

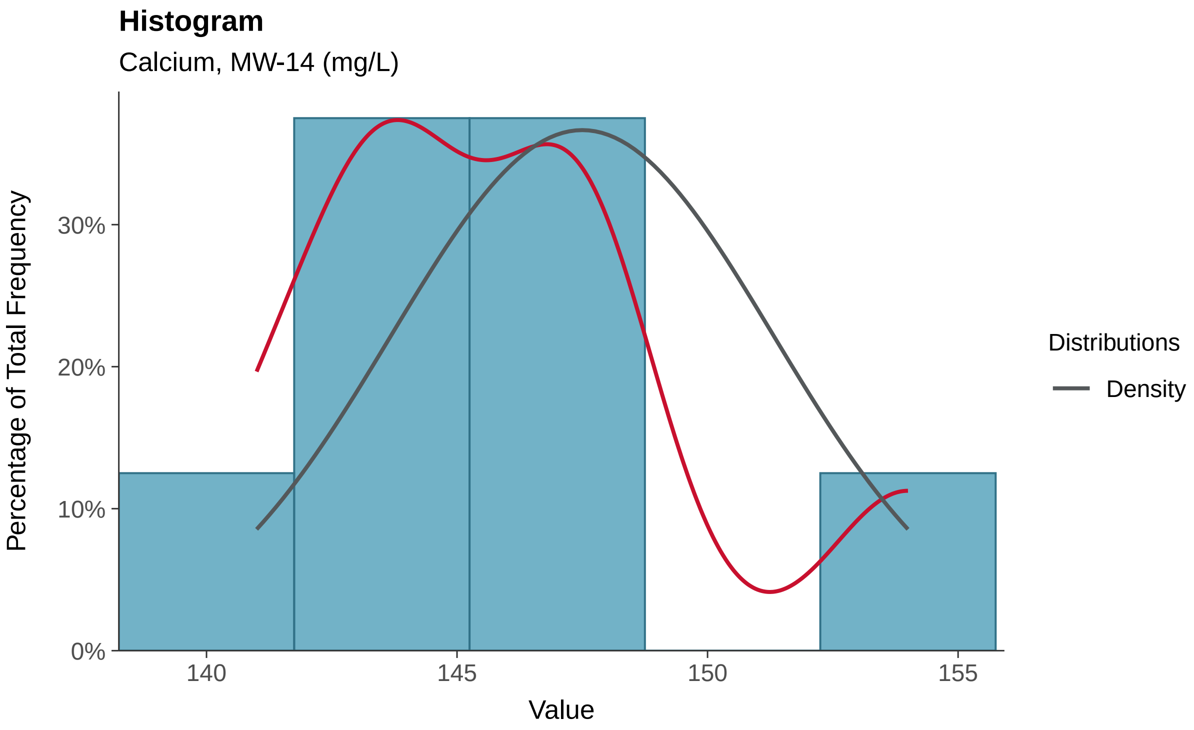
Boron, MW-14 (mg/L)



Appendix III: Calcium, MW-14

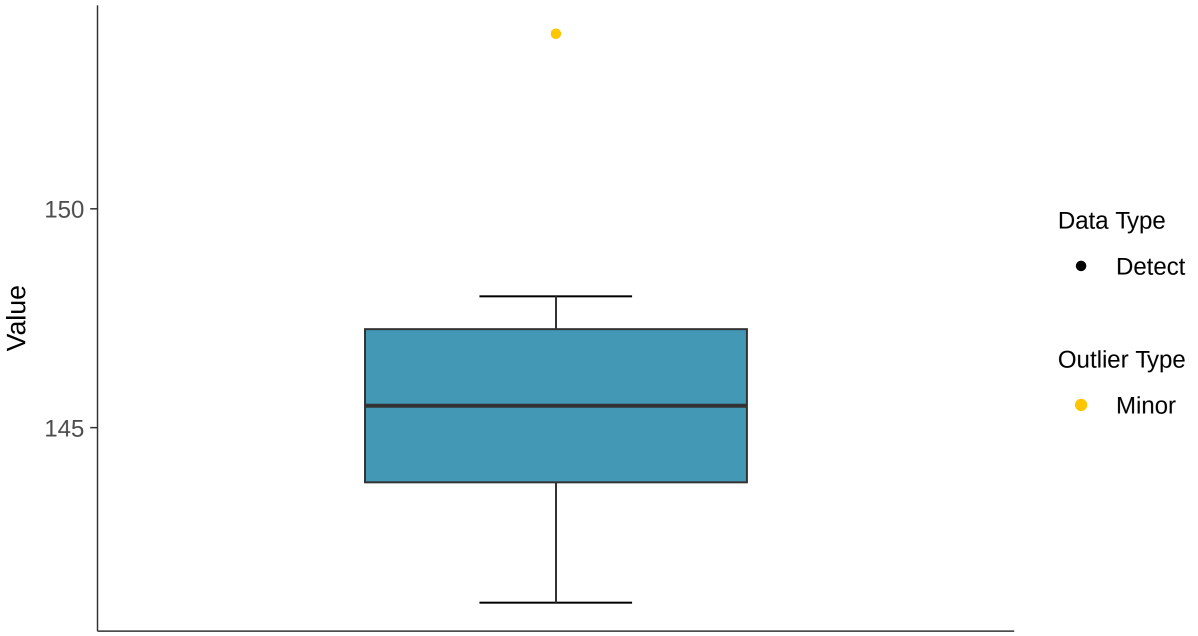
ID: 14_1_02





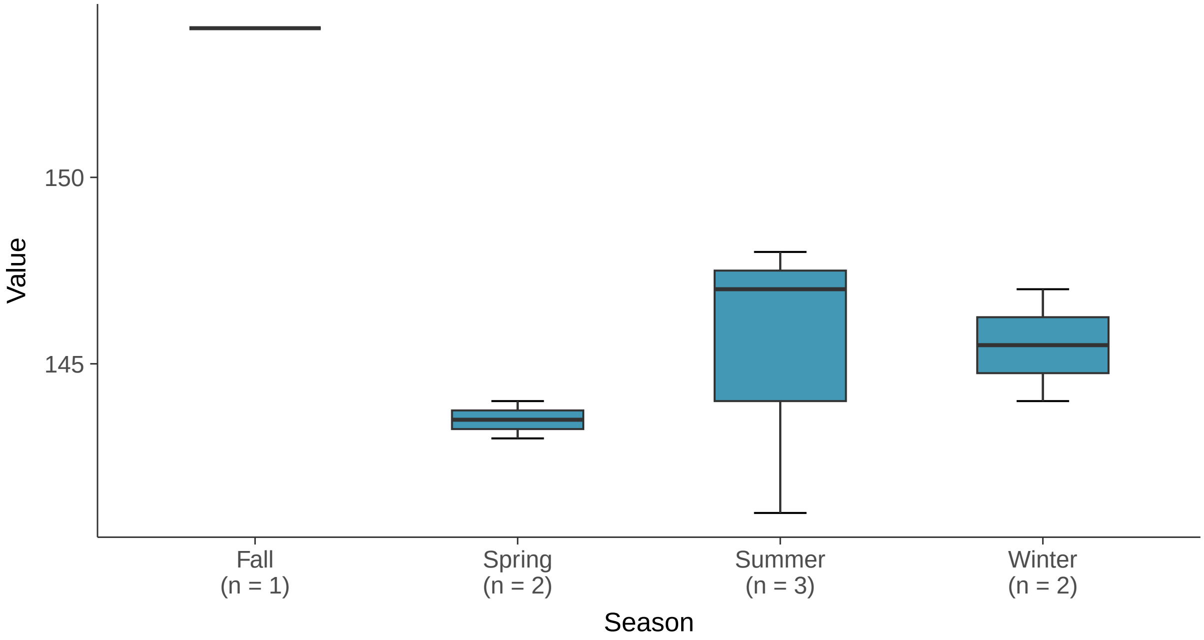
Boxplot

Calcium, MW-14 (mg/L)



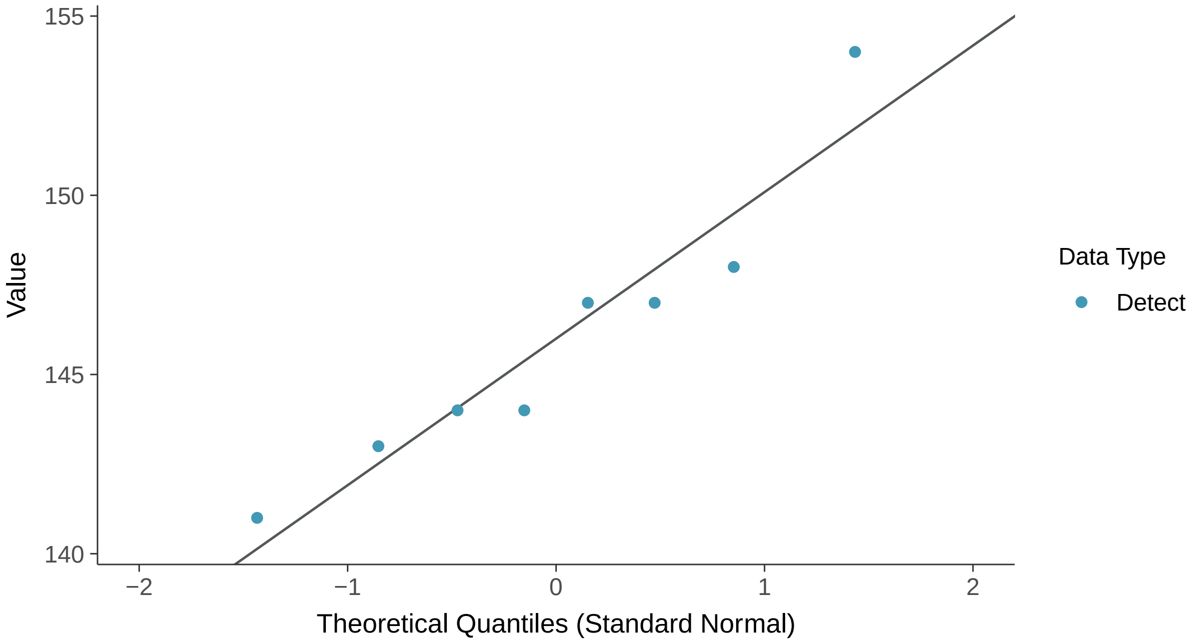
Boxplot by Season

Calcium, MW-14 (mg/L)



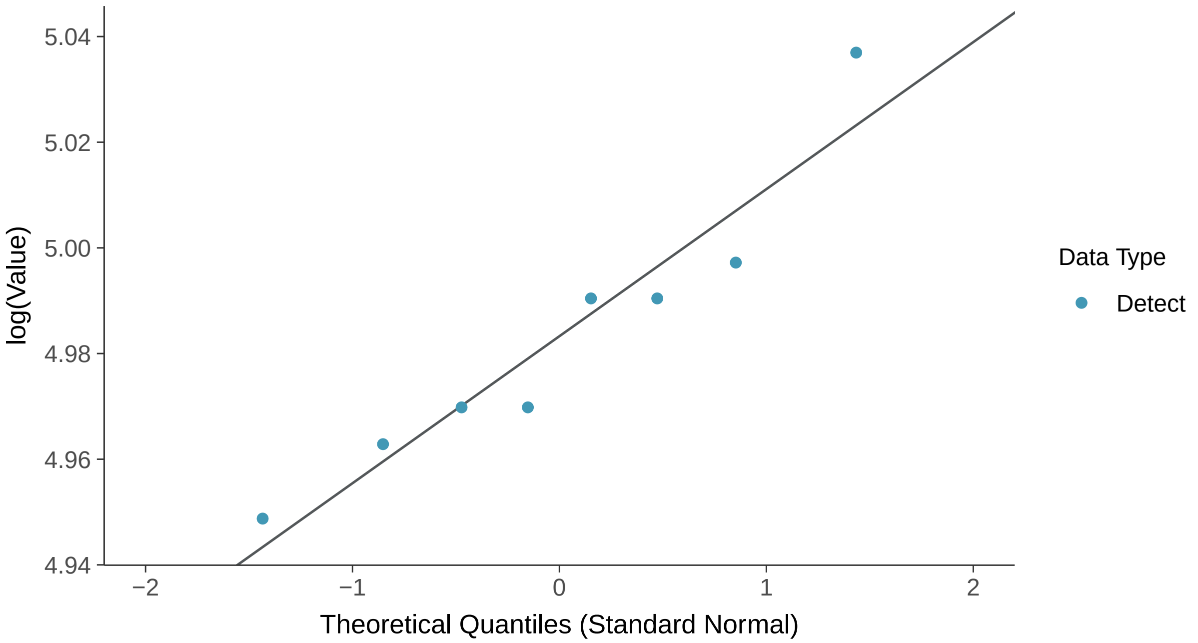
Normal Q-Q plot

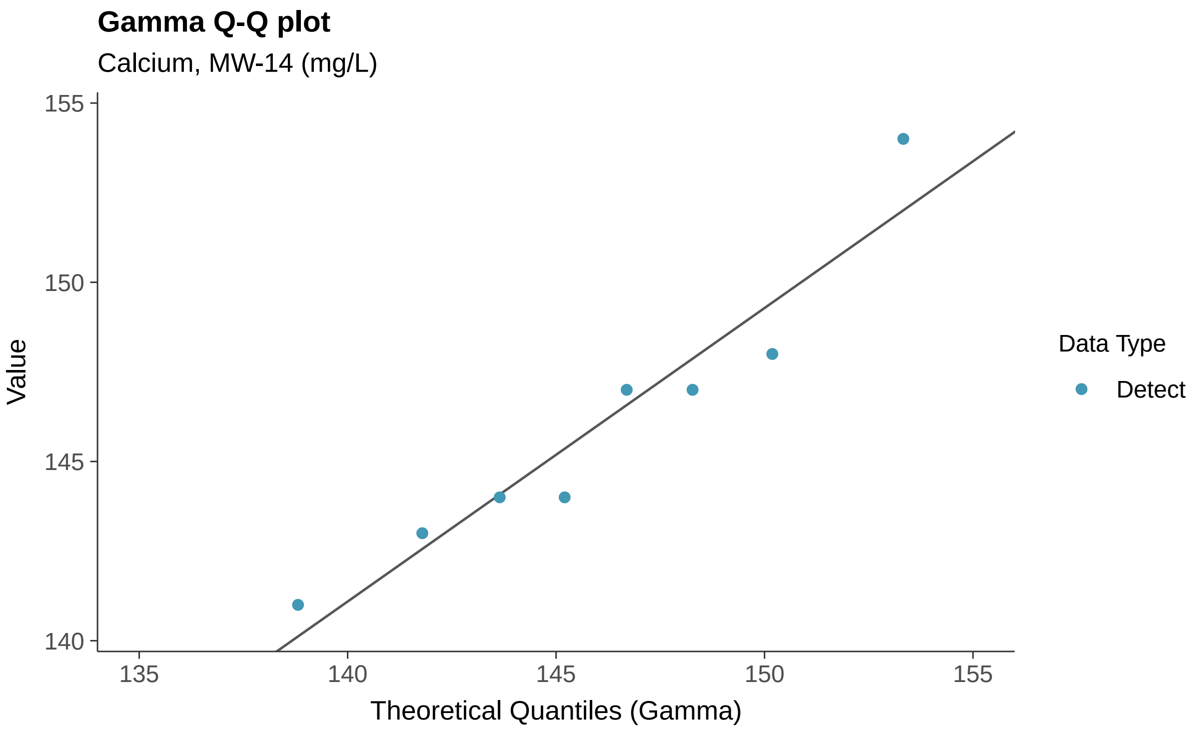
Calcium, MW-14 (mg/L)

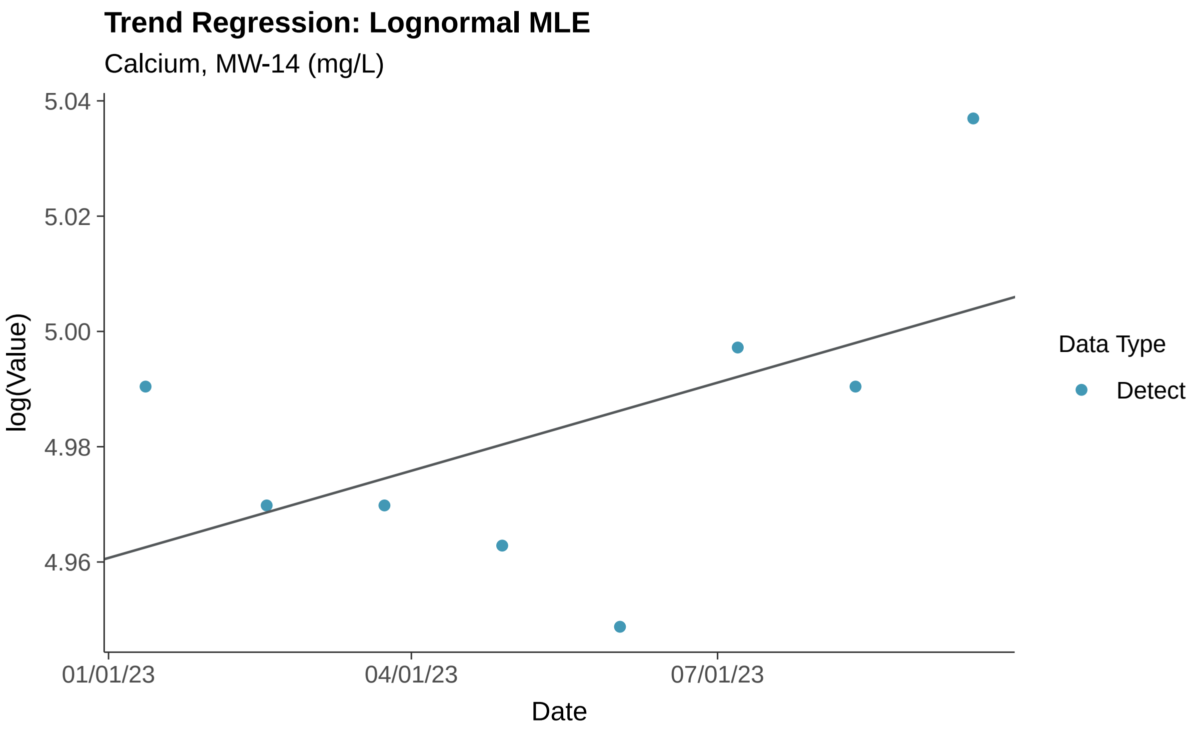


Lognormal Q-Q plot

Calcium, MW-14 (mg/L)

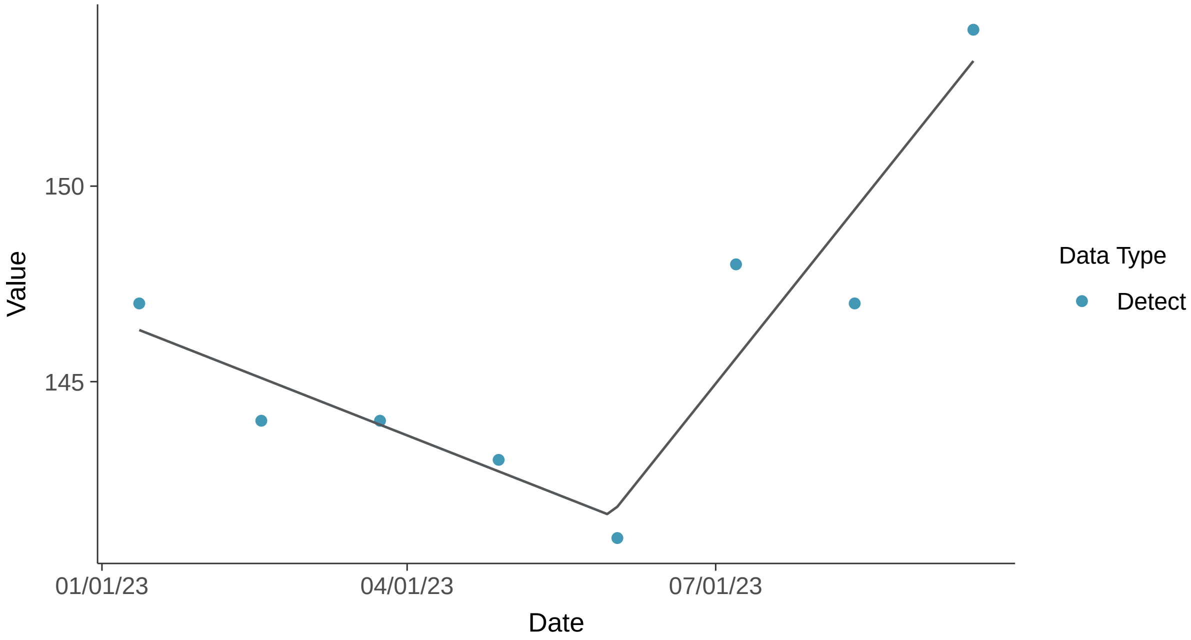



Gamma Q-Q plot
Calcium, MW-14 (mg/L)
Value
155
150
145
140
135
140
145
150
155
Theoretical Quantiles (Gamma)
Data Type
● Detect


Trend Regression: Lognormal MLE
Calcium, MW-14 (mg/L)
log(Value)
5.04
5.02
5.00
4.98
4.96
01/01/23
04/01/23
07/01/23
Date
Data Type
● Detect

Trend Regression: Piecewise Linear-Linear

Calcium, MW-14 (mg/L)

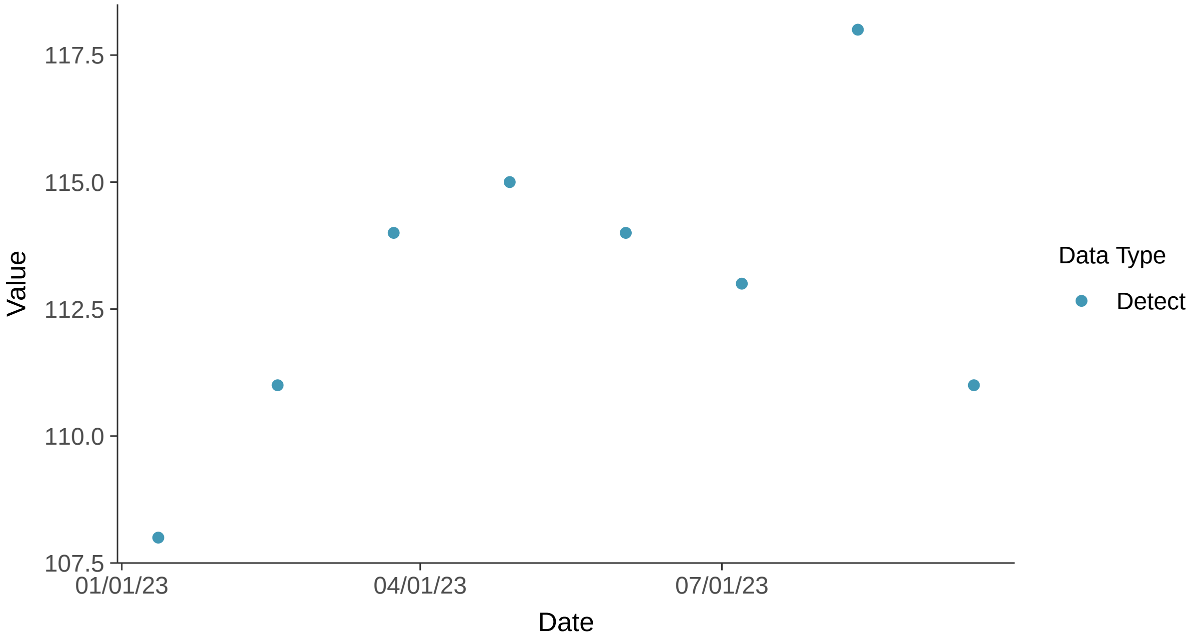


Appendix III: Chloride, MW-14

ID: 14_1_03

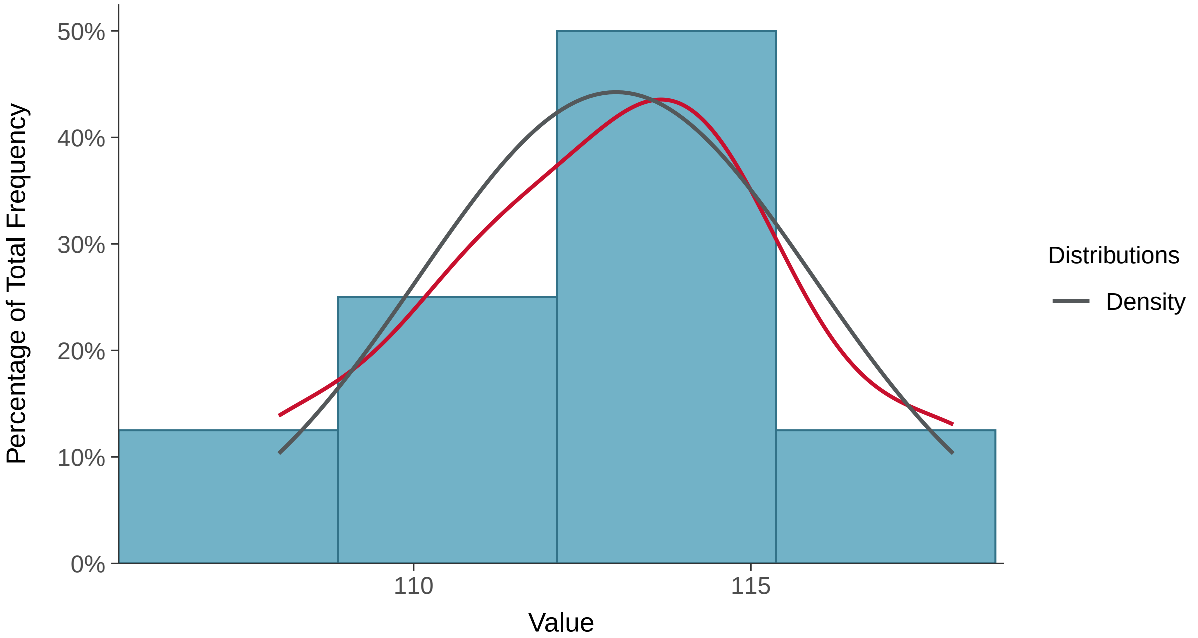
Scatter Plot

Chloride, MW-14 (mg/L)



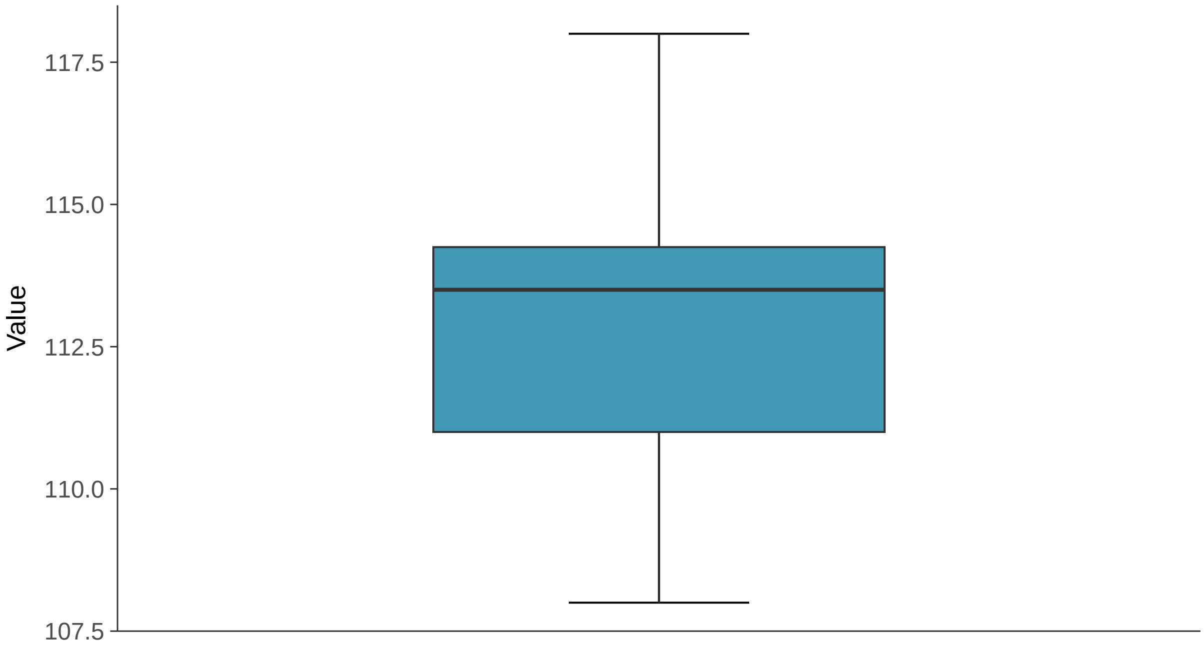
Histogram

Chloride, MW-14 (mg/L)



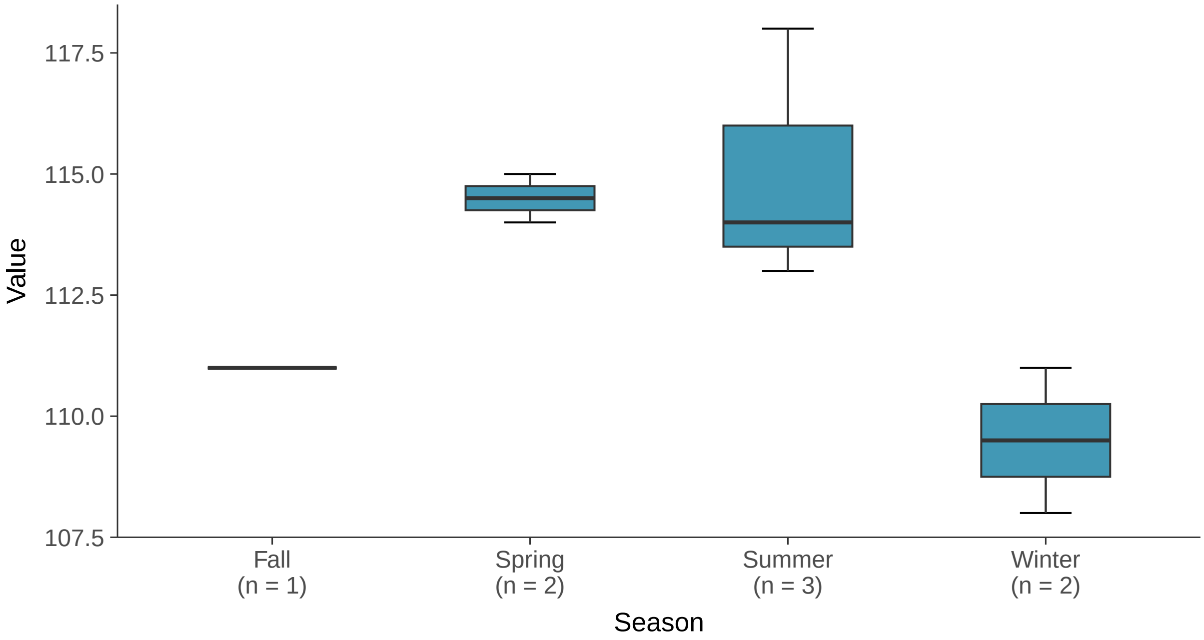
Boxplot

Chloride, MW-14 (mg/L)



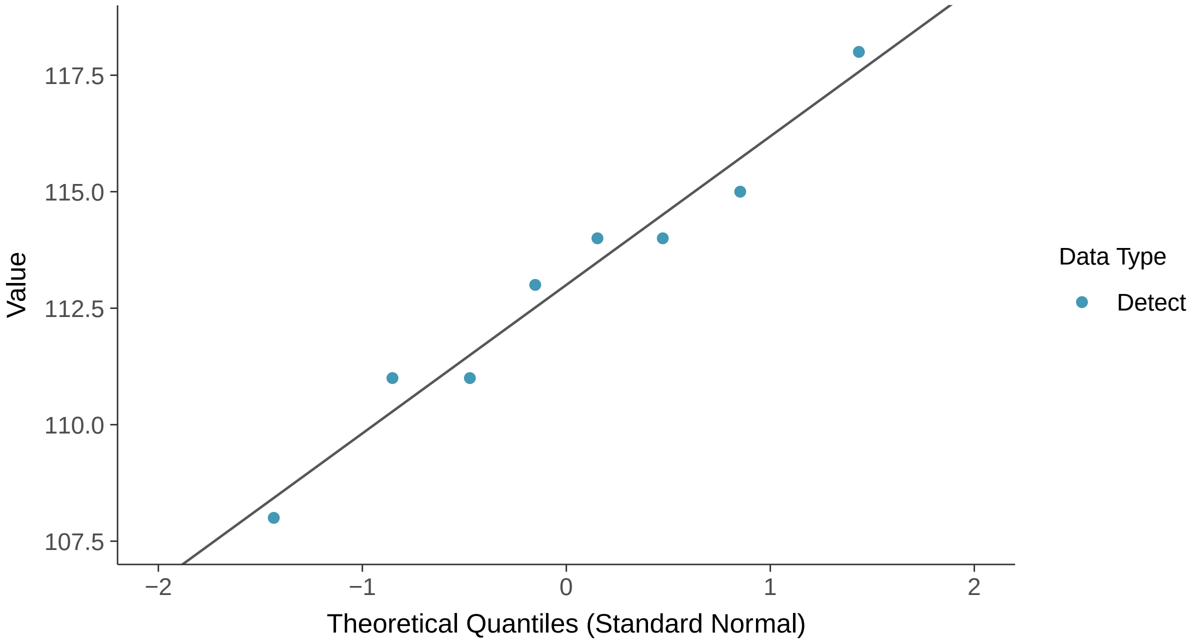
Boxplot by Season

Chloride, MW-14 (mg/L)



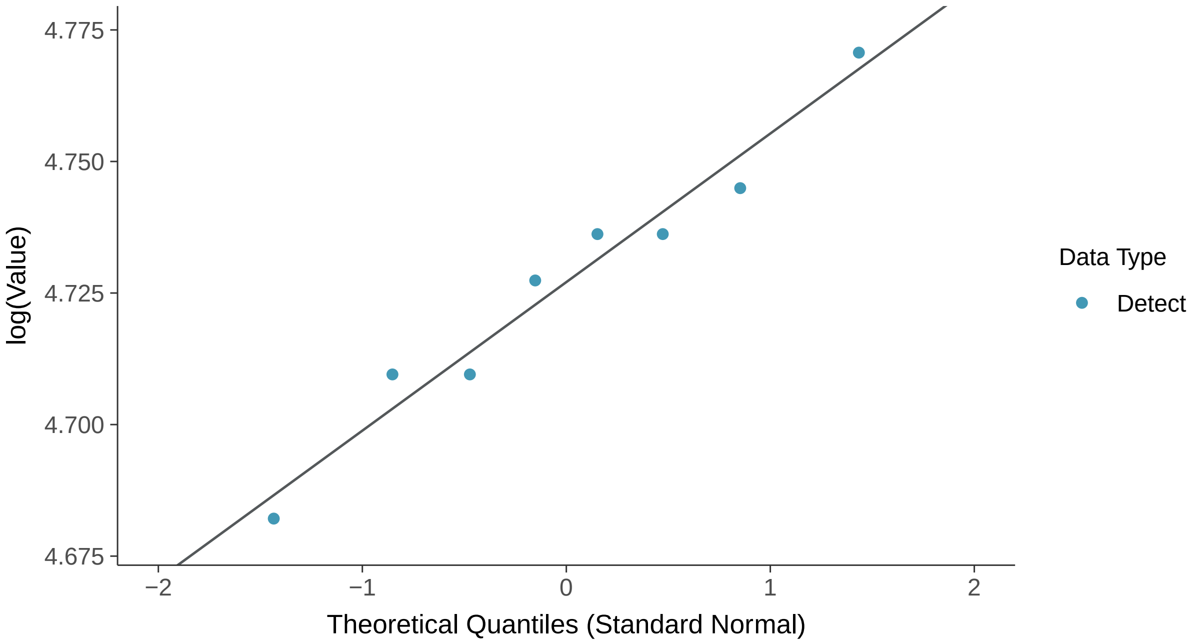
Normal Q-Q plot

Chloride, MW-14 (mg/L)



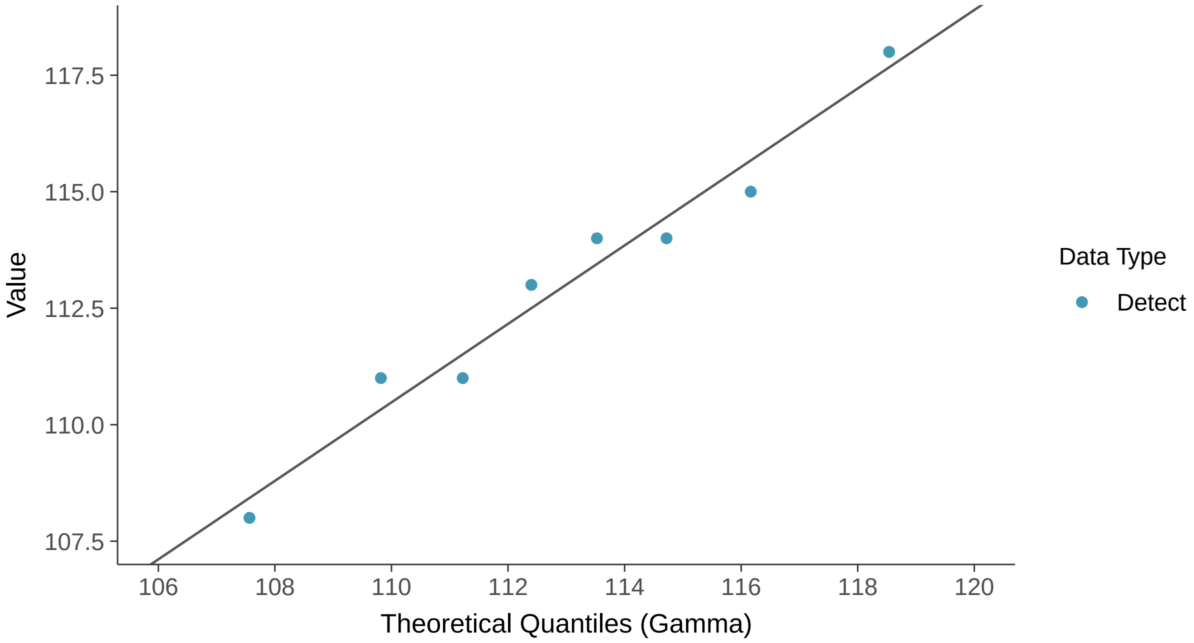
Lognormal Q-Q plot

Chloride, MW-14 (mg/L)



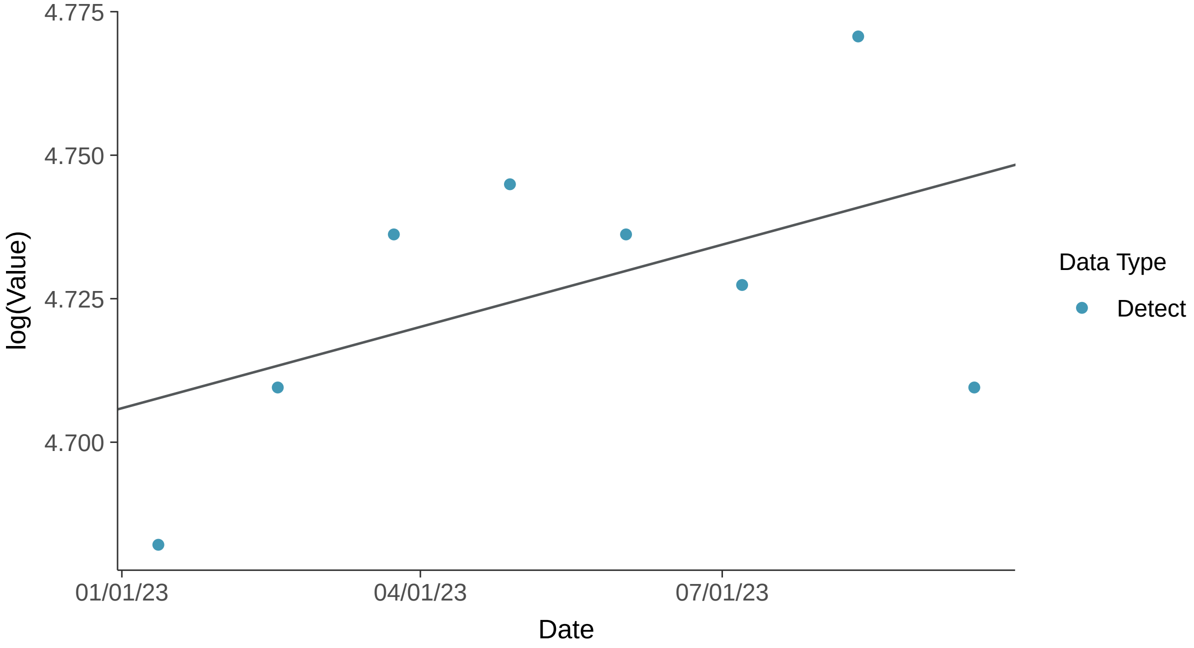
Gamma Q-Q plot

Chloride, MW-14 (mg/L)



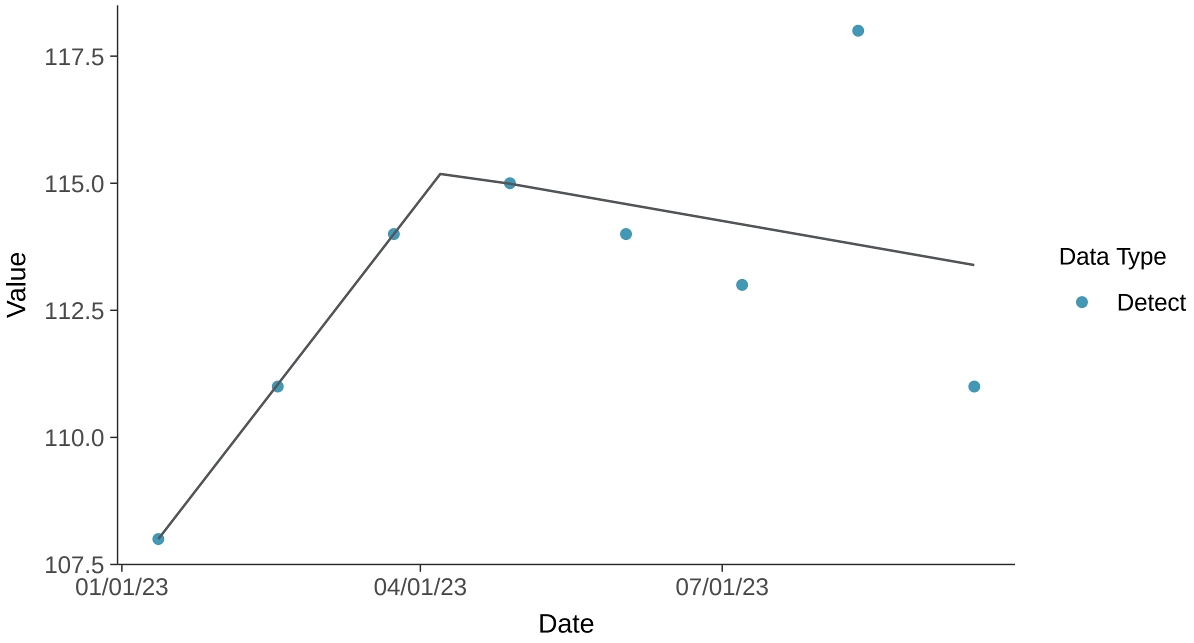
Trend Regression: Lognormal MLE

Chloride, MW-14 (mg/L)



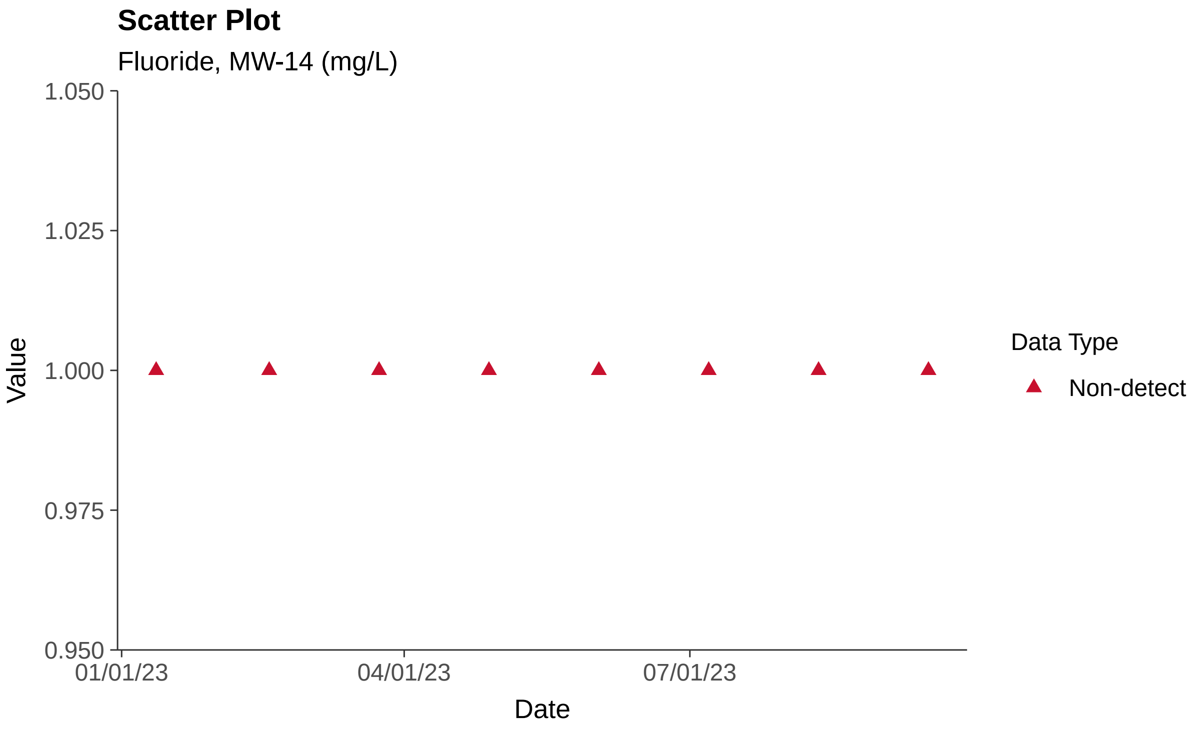
Trend Regression: Piecewise Linear-Linear

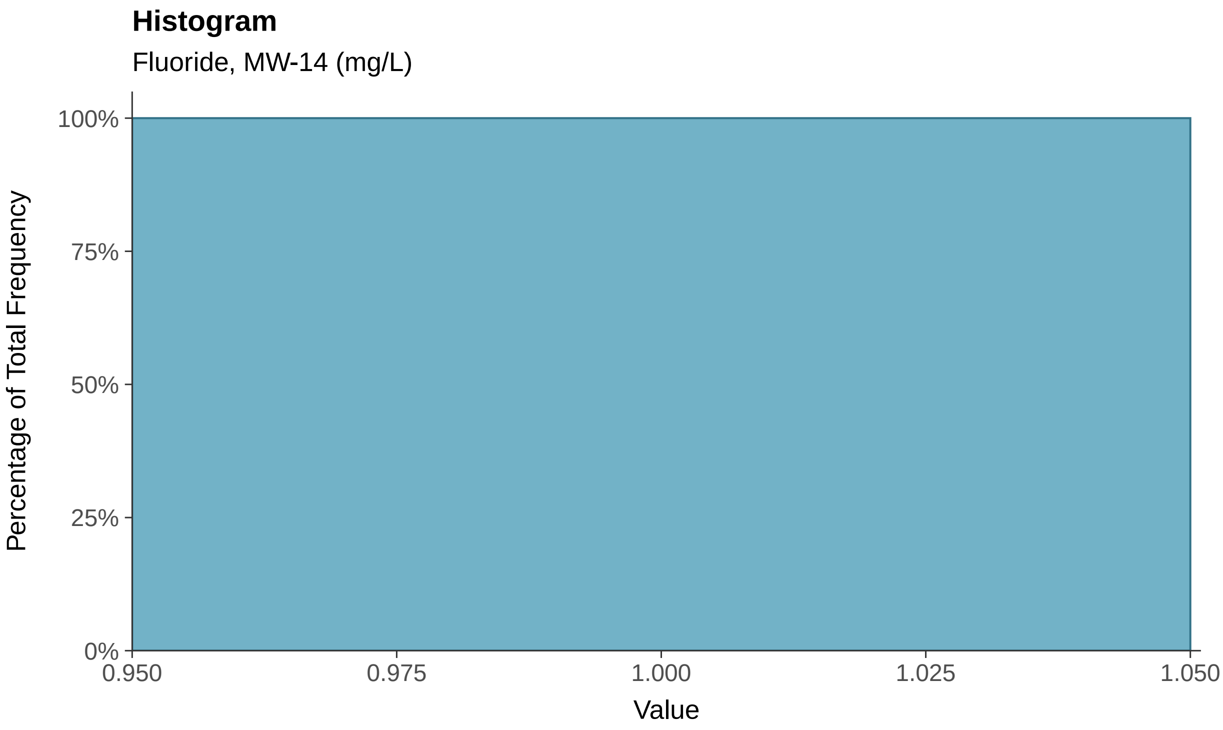
Chloride, MW-14 (mg/L)



Appendix III: Fluoride, MW-14

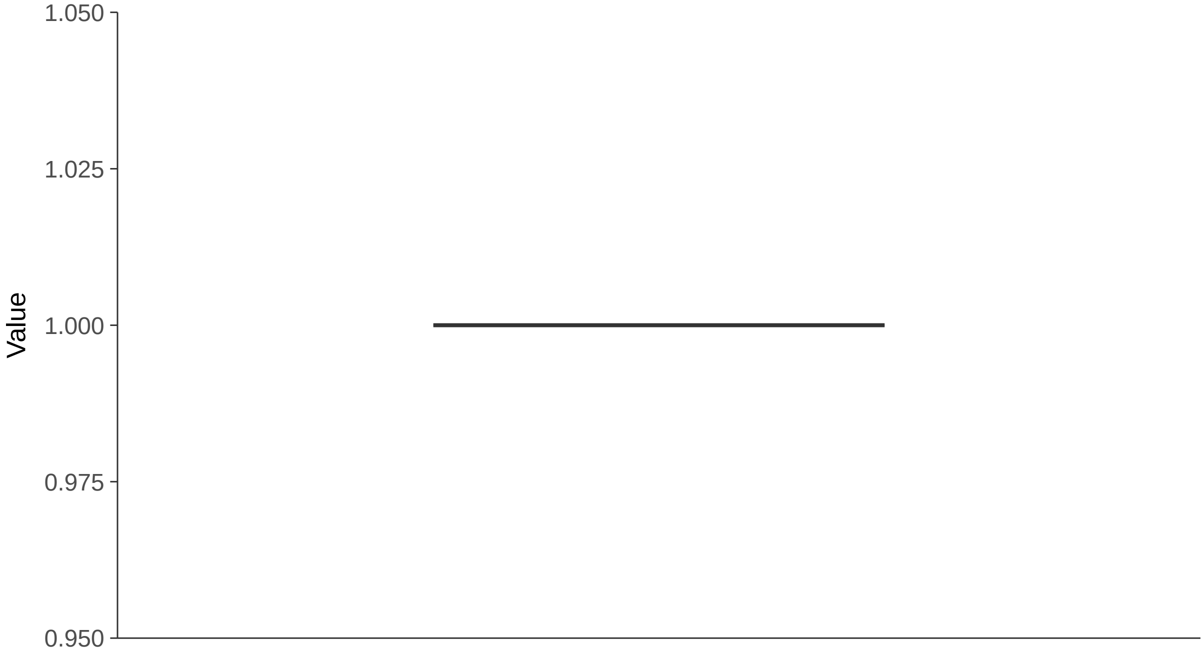
ID: 14_1_04





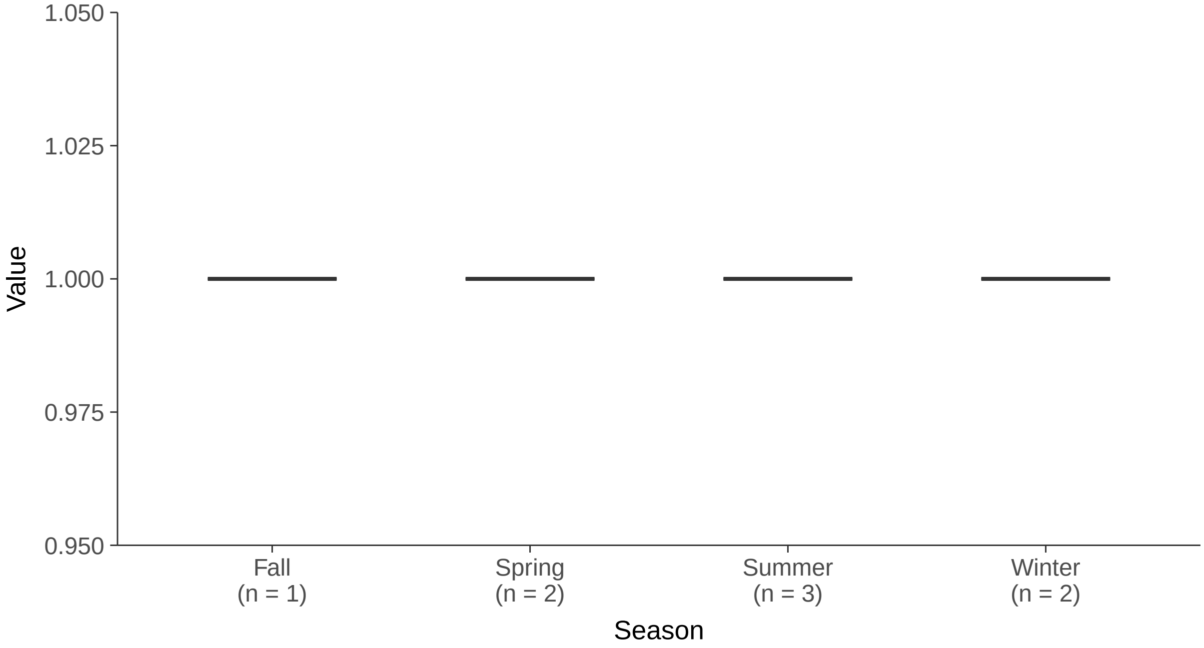
Boxplot

Fluoride, MW-14 (mg/L)



Boxplot by Season

Fluoride, MW-14 (mg/L)

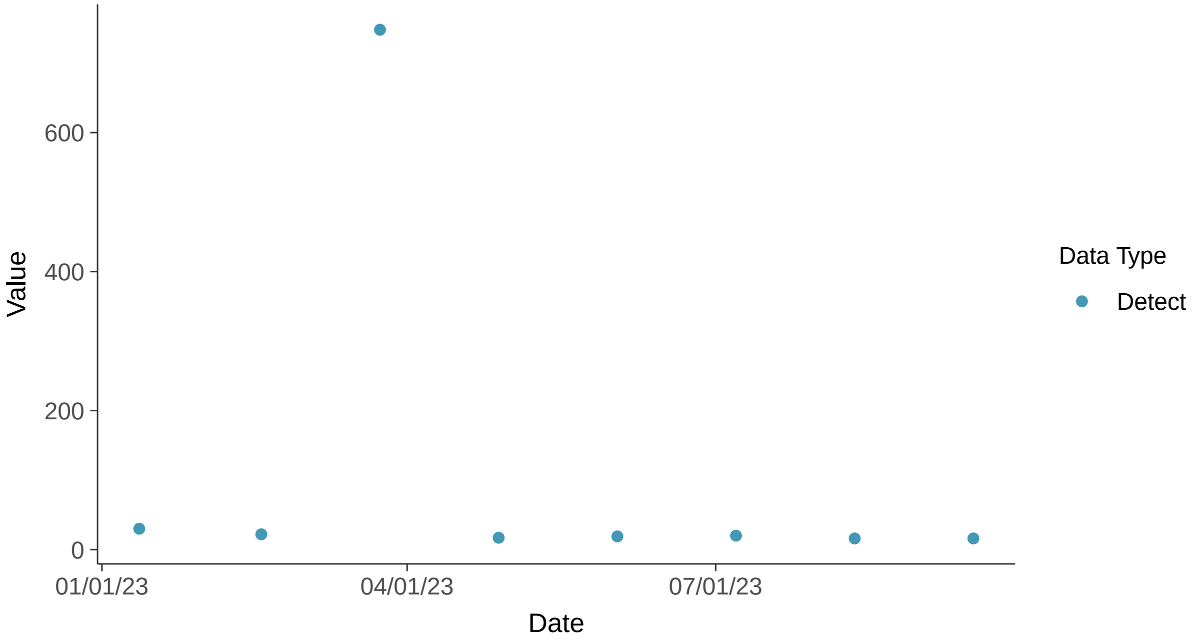


Appendix III: Sulfate, MW-14

ID: 14_1_05

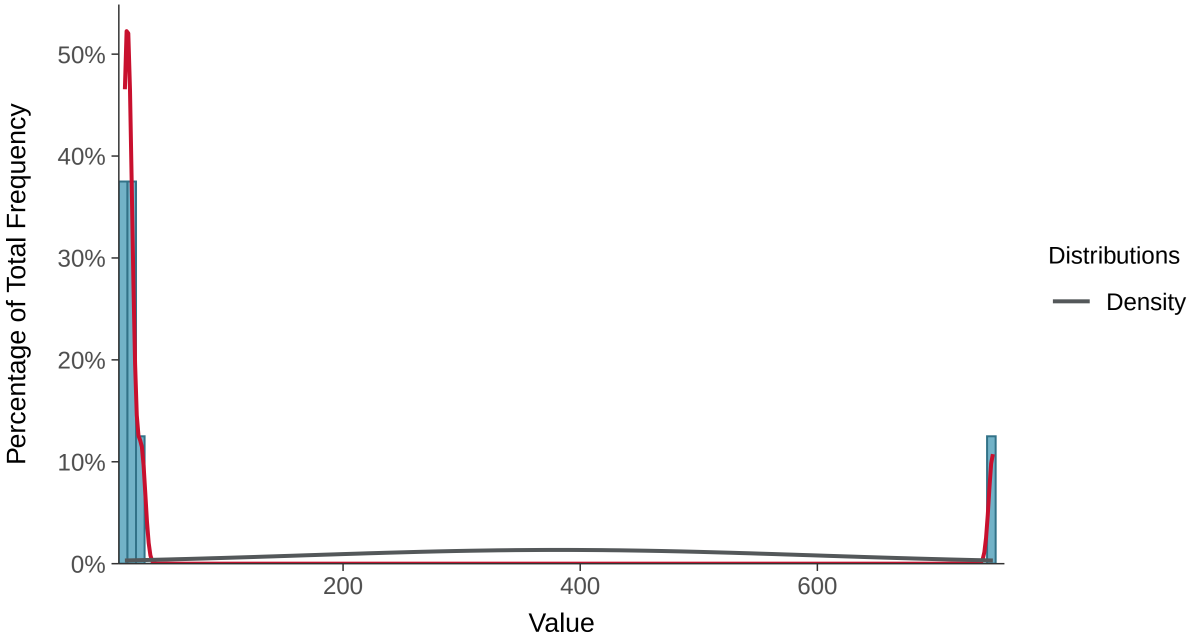
Scatter Plot

Sulfate, MW-14 (mg/L)



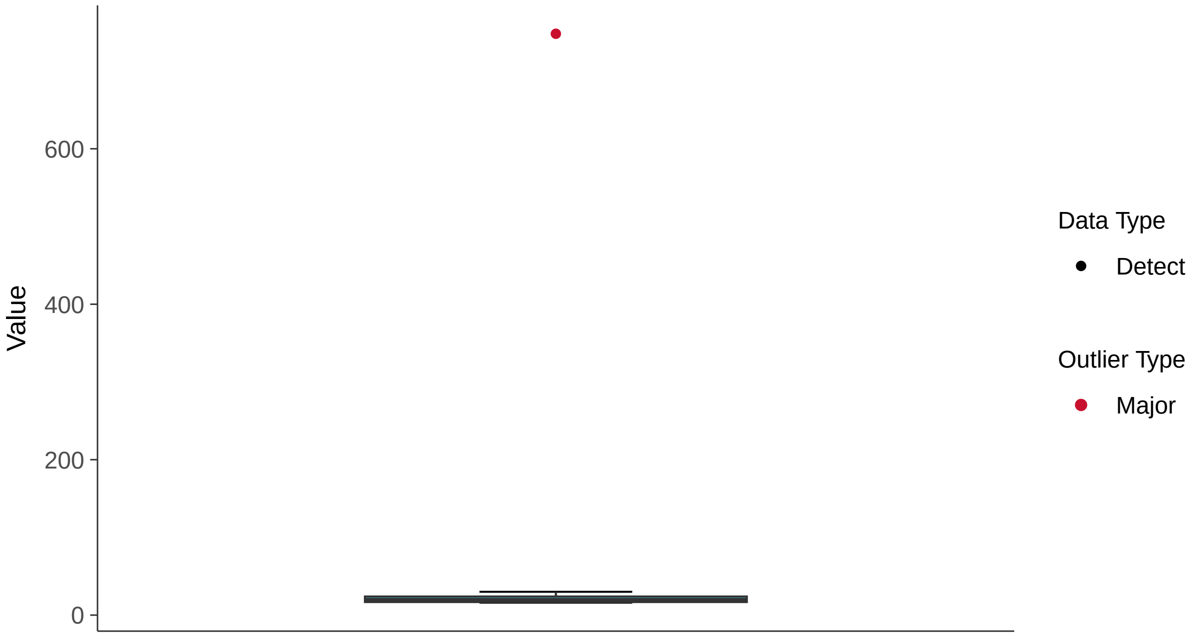
Histogram

Sulfate, MW-14 (mg/L)



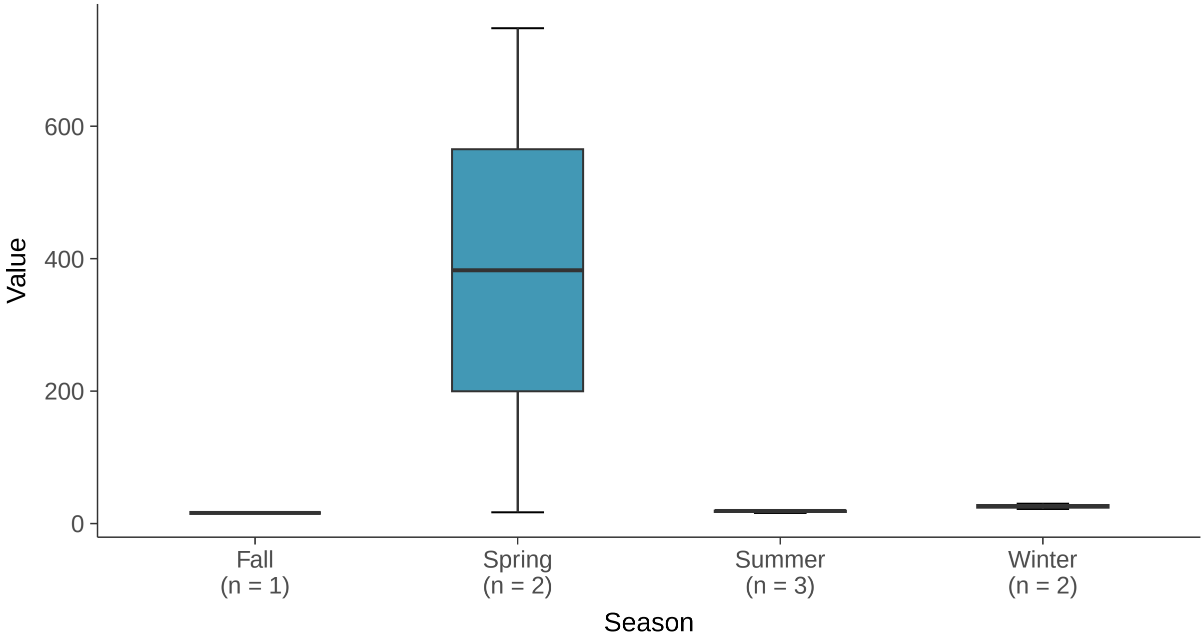
Boxplot

Sulfate, MW-14 (mg/L)



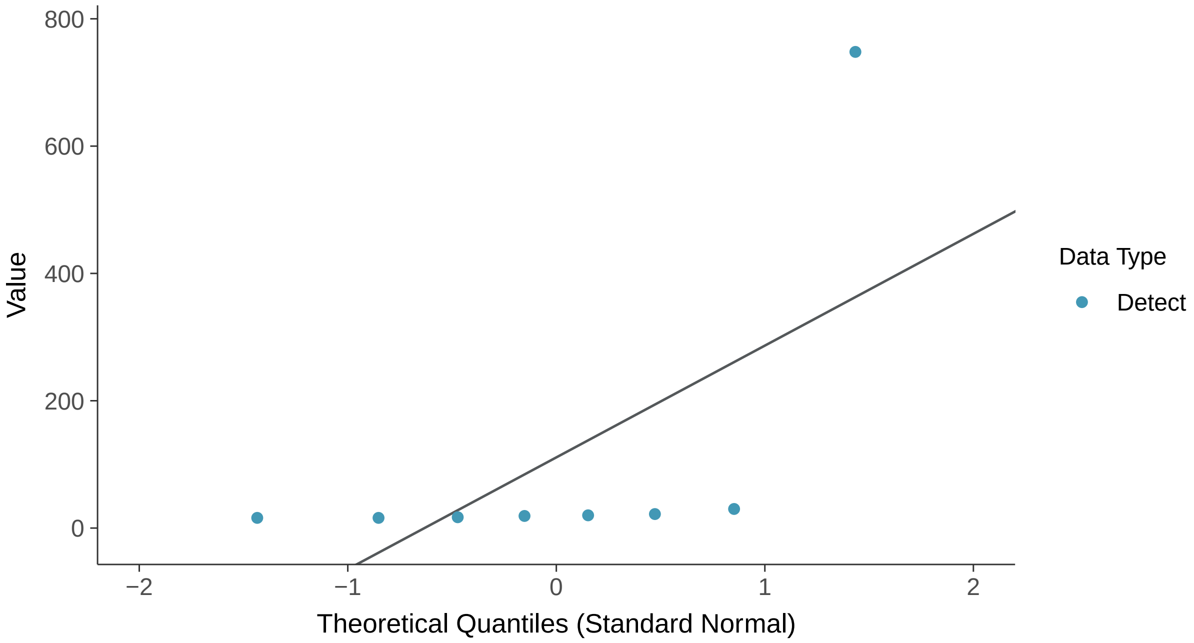
Boxplot by Season

Sulfate, MW-14 (mg/L)



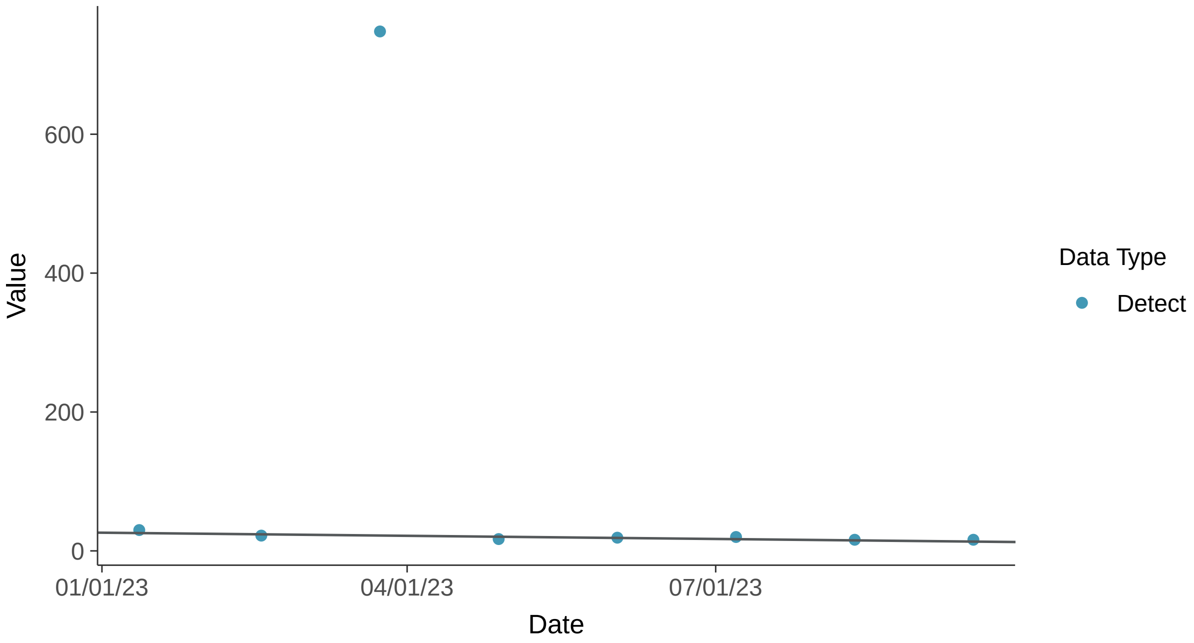
Normal Q-Q plot

Sulfate, MW-14 (mg/L)



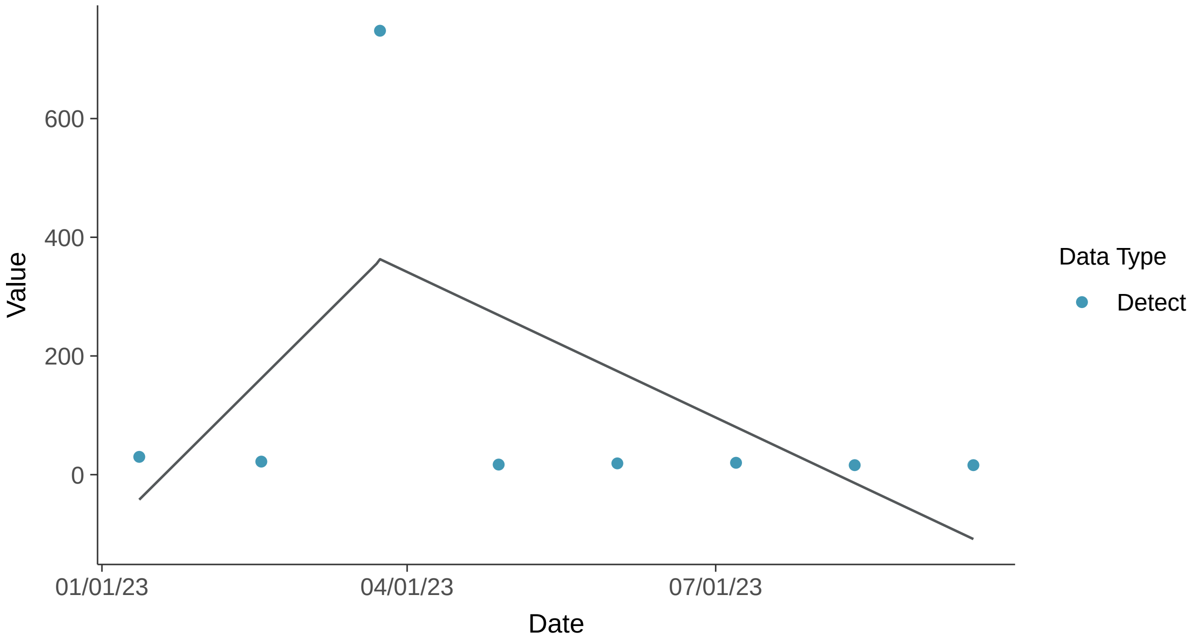
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Sulfate, MW-14 (mg/L)



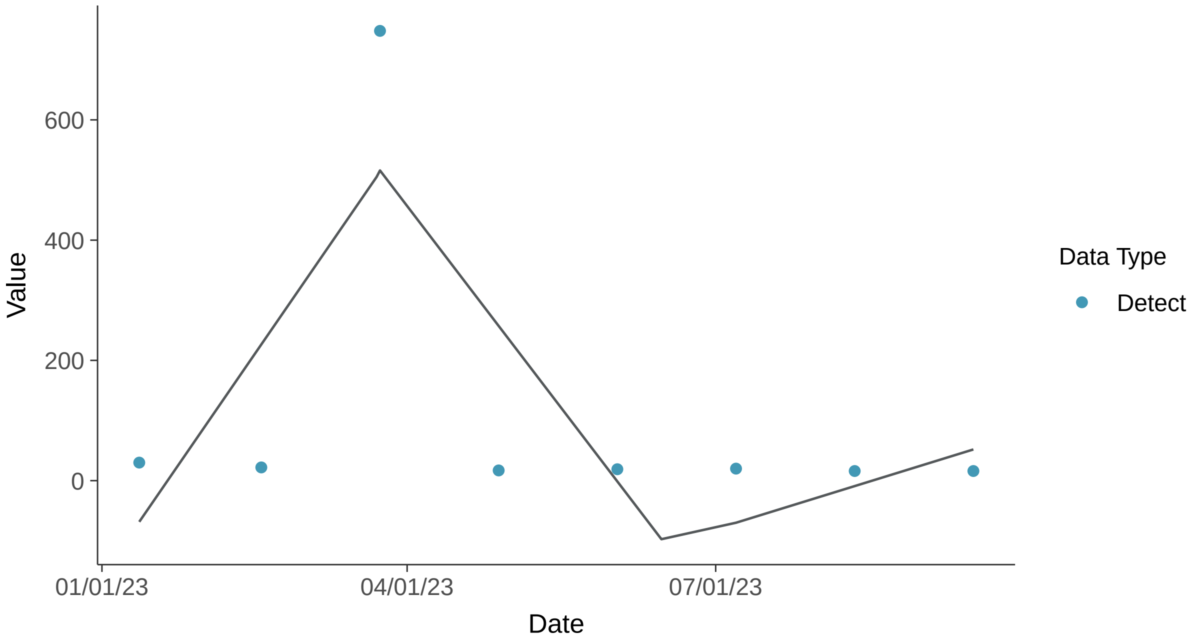
Trend Regression: Piecewise Linear-Linear

Sulfate, MW-14 (mg/L)



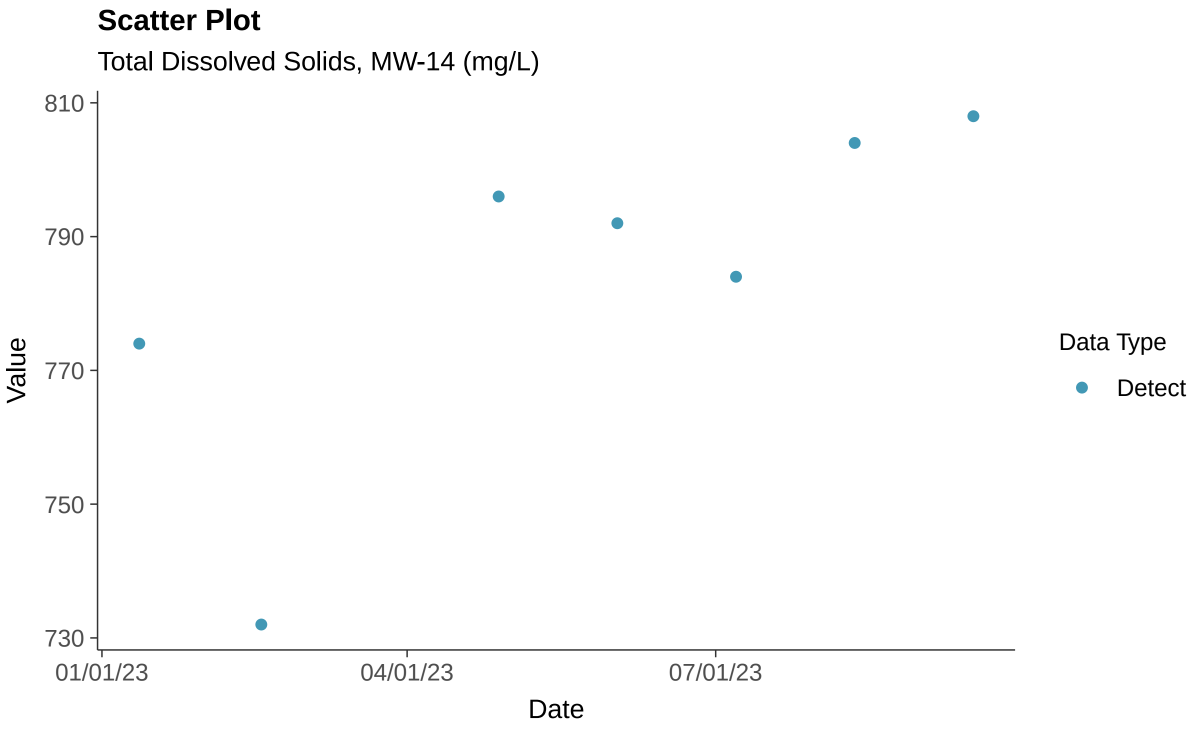
Trend Regression: Piecewise Linear-Linear-Linear

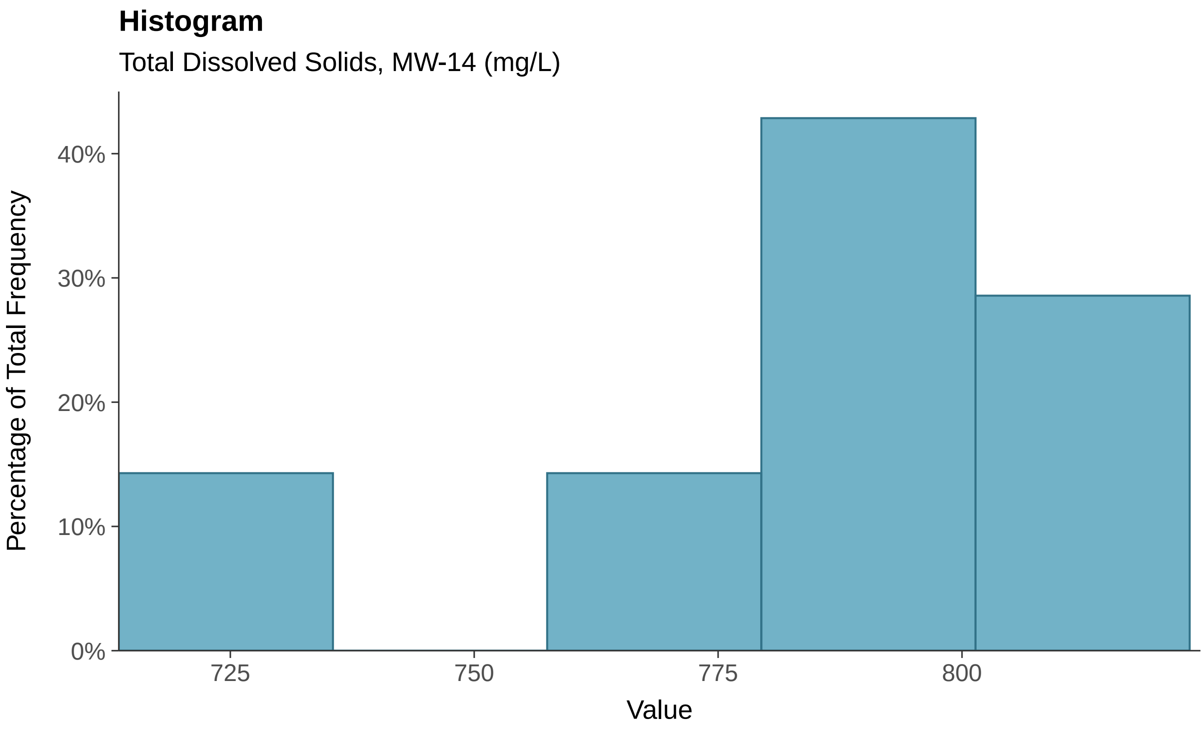
Sulfate, MW-14 (mg/L)



Appendix III: Total Dissolved Solids, MW-14

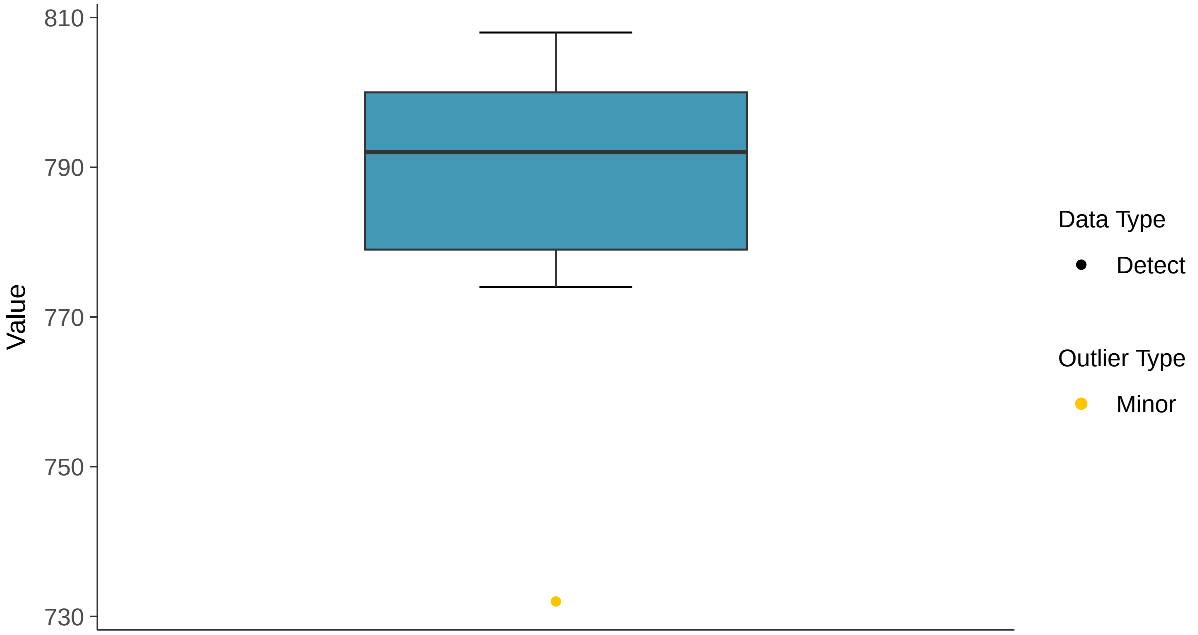
ID: 14_1_06





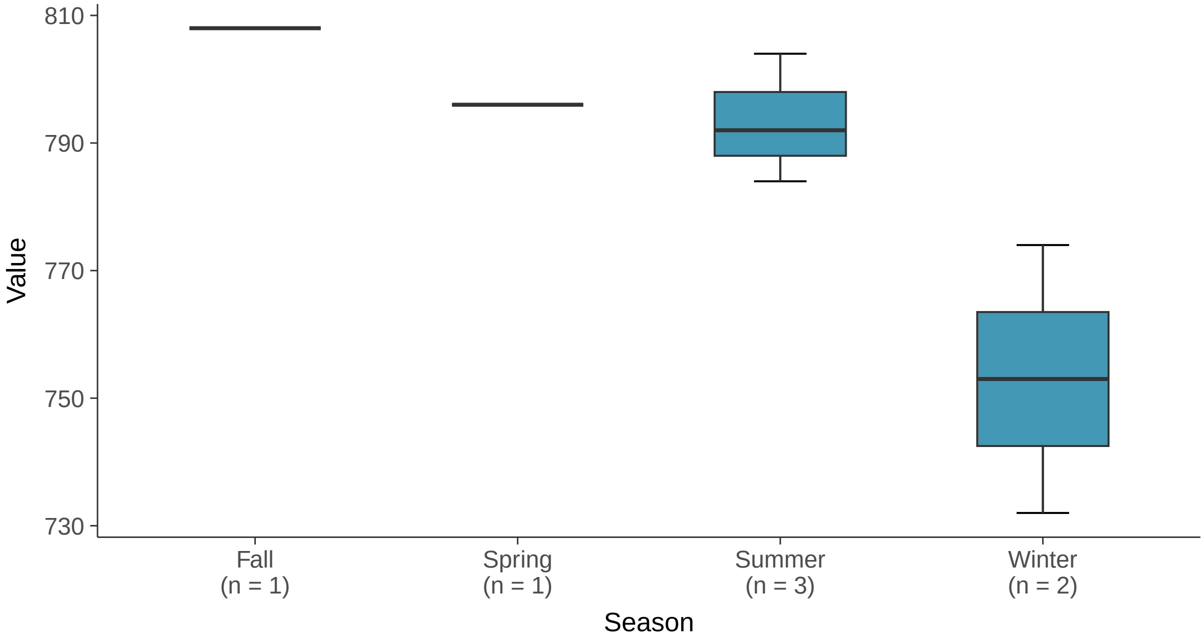
Boxplot

Total Dissolved Solids, MW-14 (mg/L)



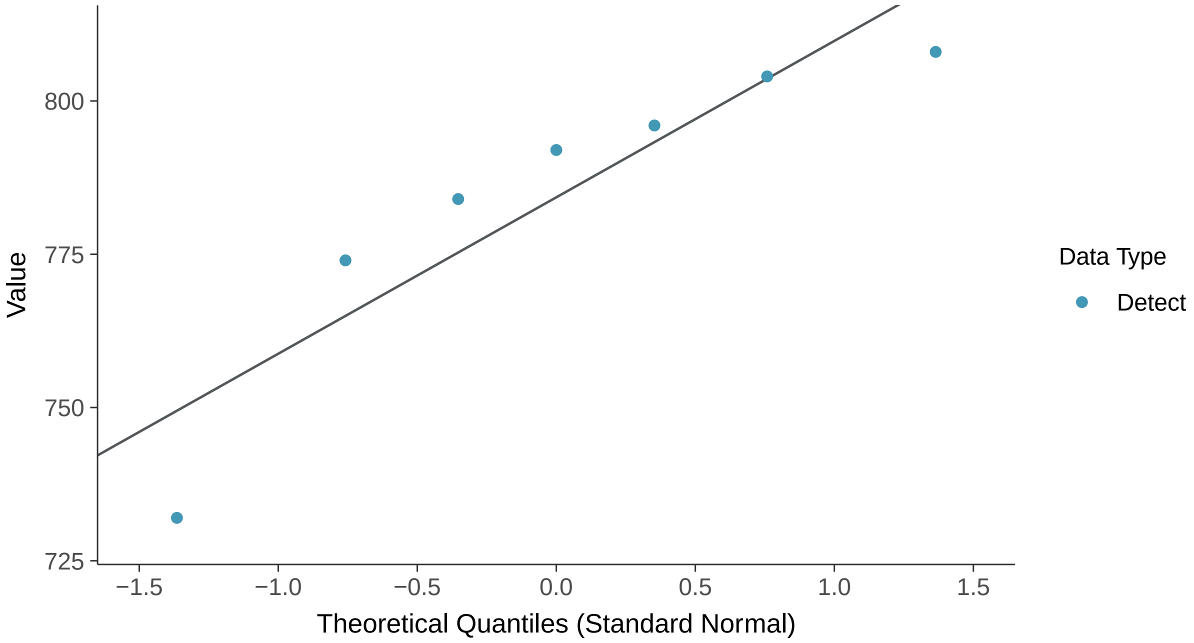
Boxplot by Season

Total Dissolved Solids, MW-14 (mg/L)



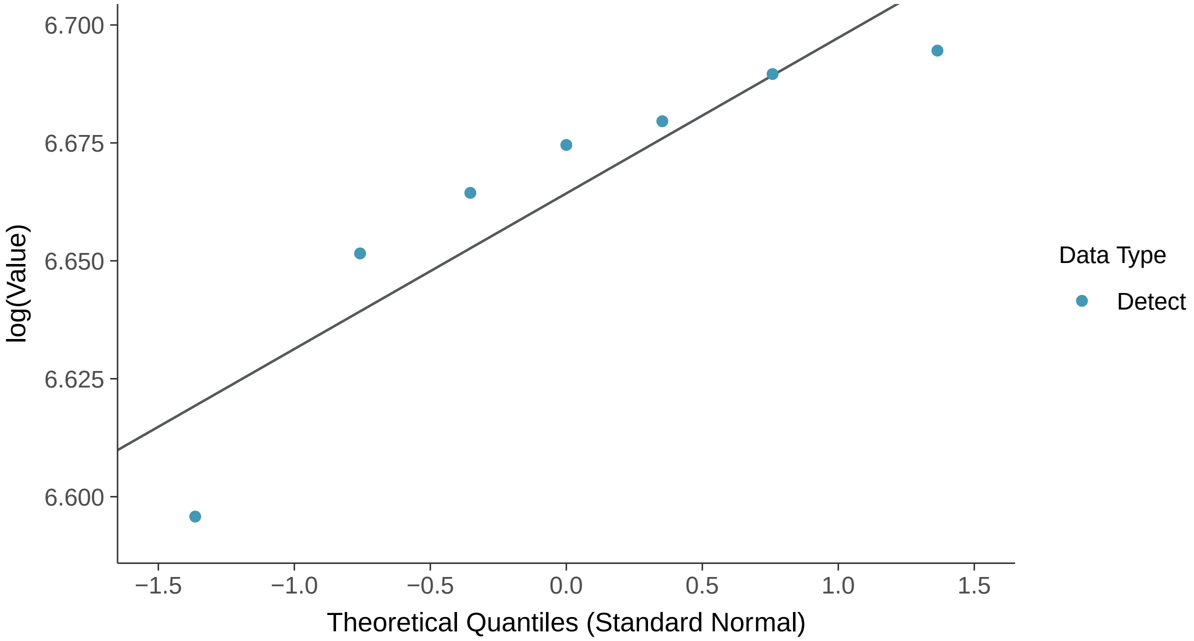
Normal Q-Q plot

Total Dissolved Solids, MW-14 (mg/L)



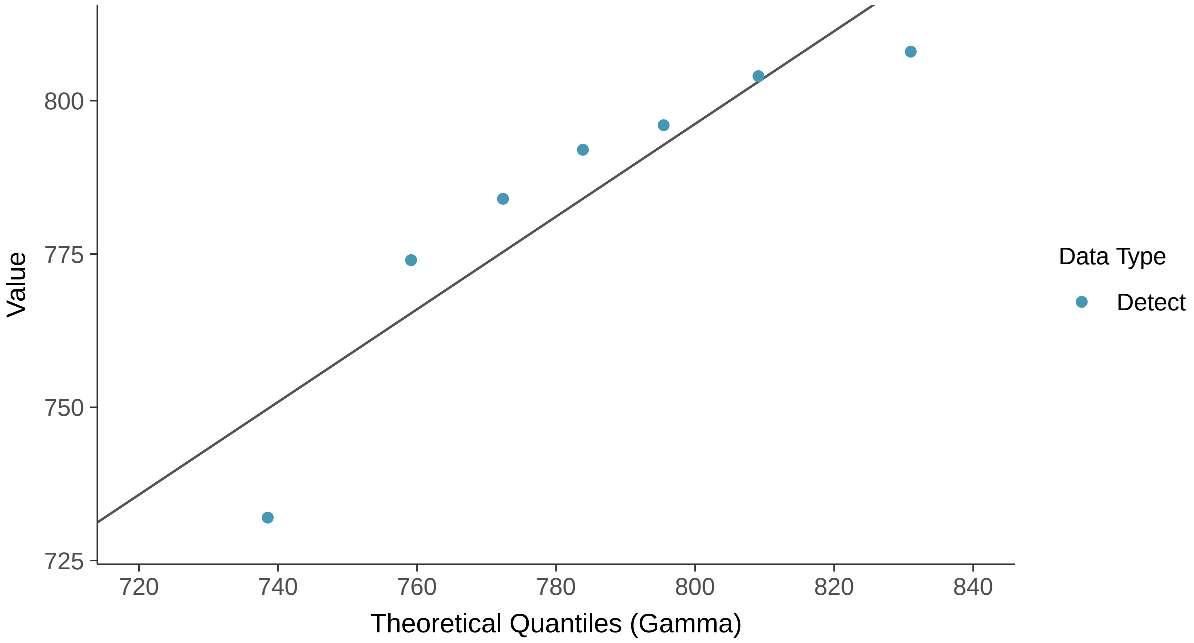
Lognormal Q-Q plot

Total Dissolved Solids, MW-14 (mg/L)



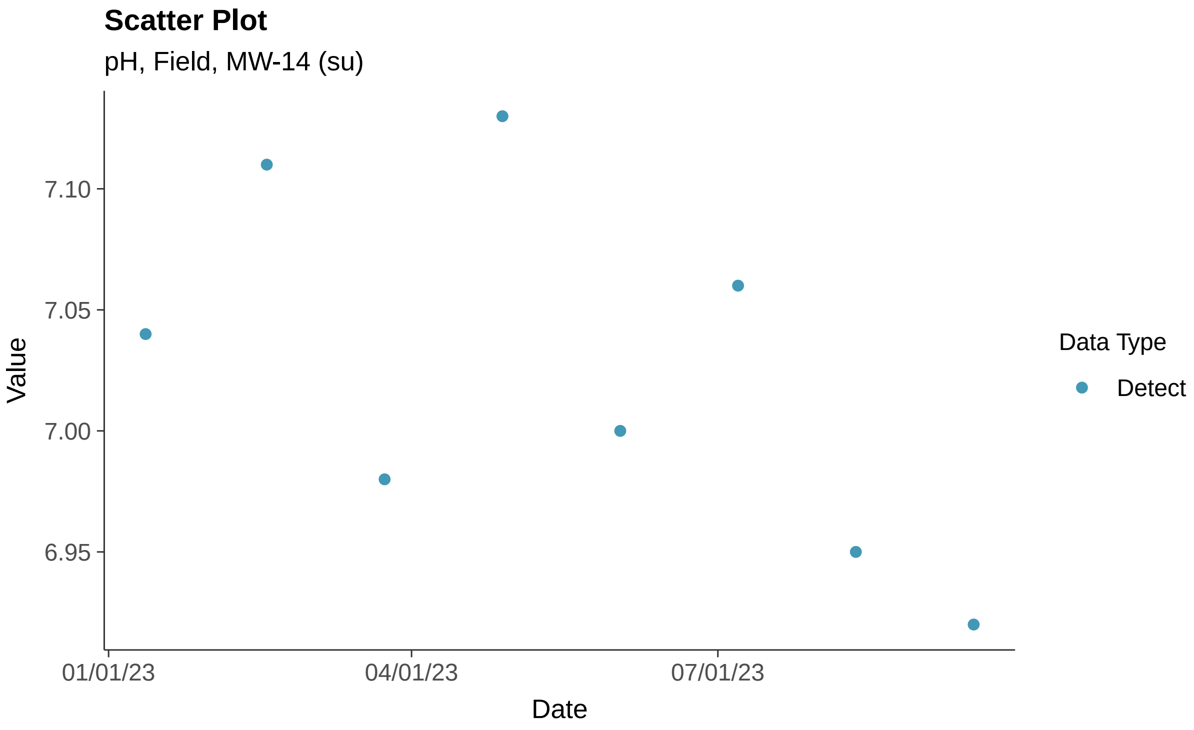
Gamma Q-Q plot

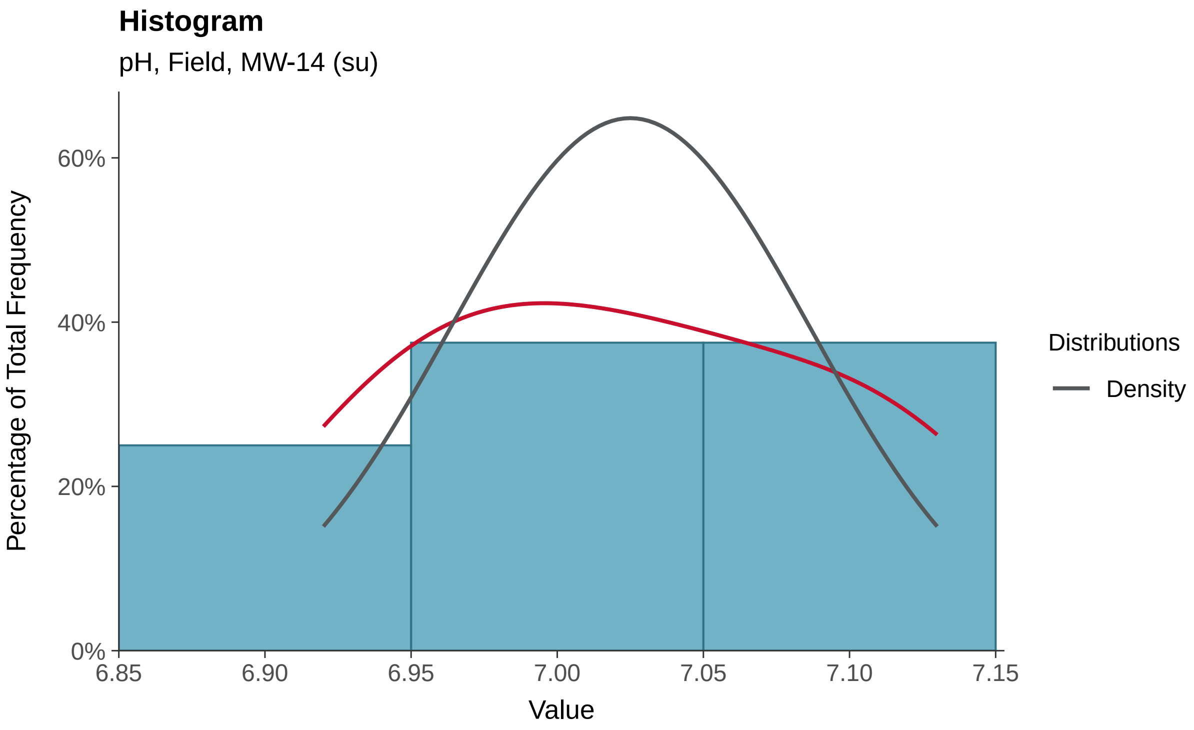
Total Dissolved Solids, MW-14 (mg/L)



Appendix III: pH, Field, MW-14

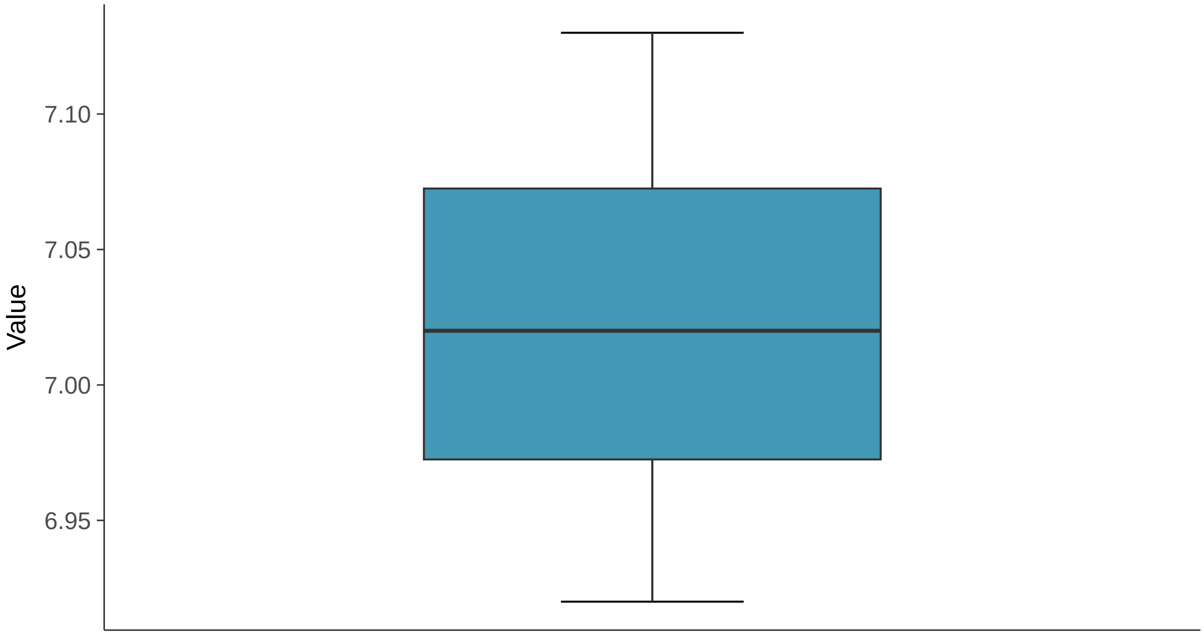
ID: 14_1_07





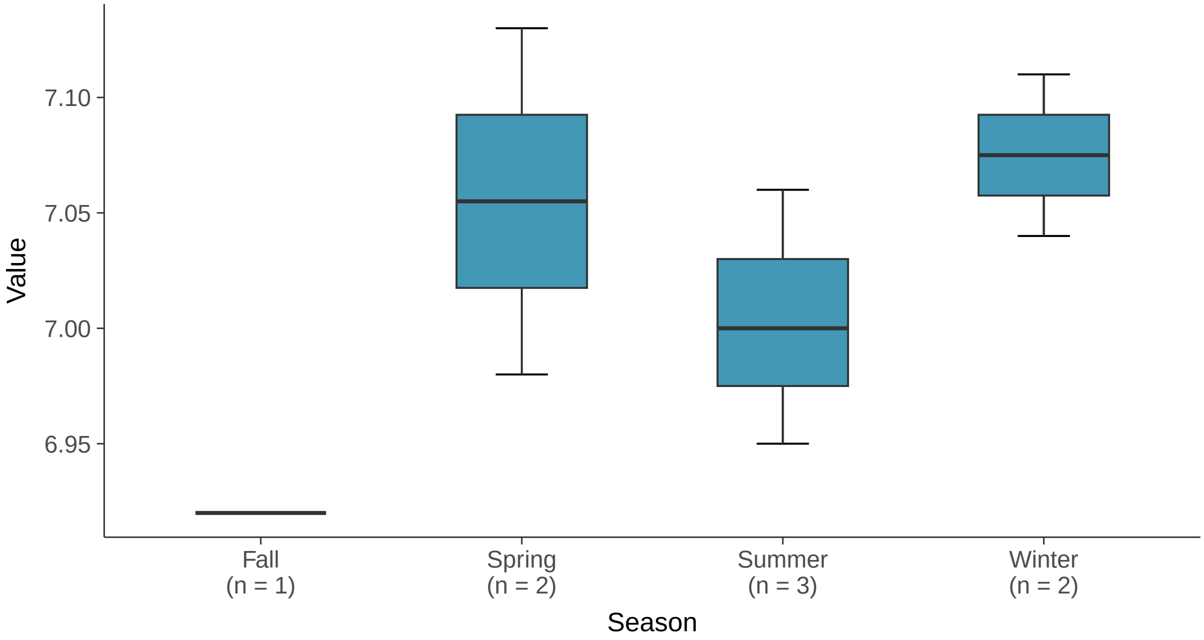
Boxplot

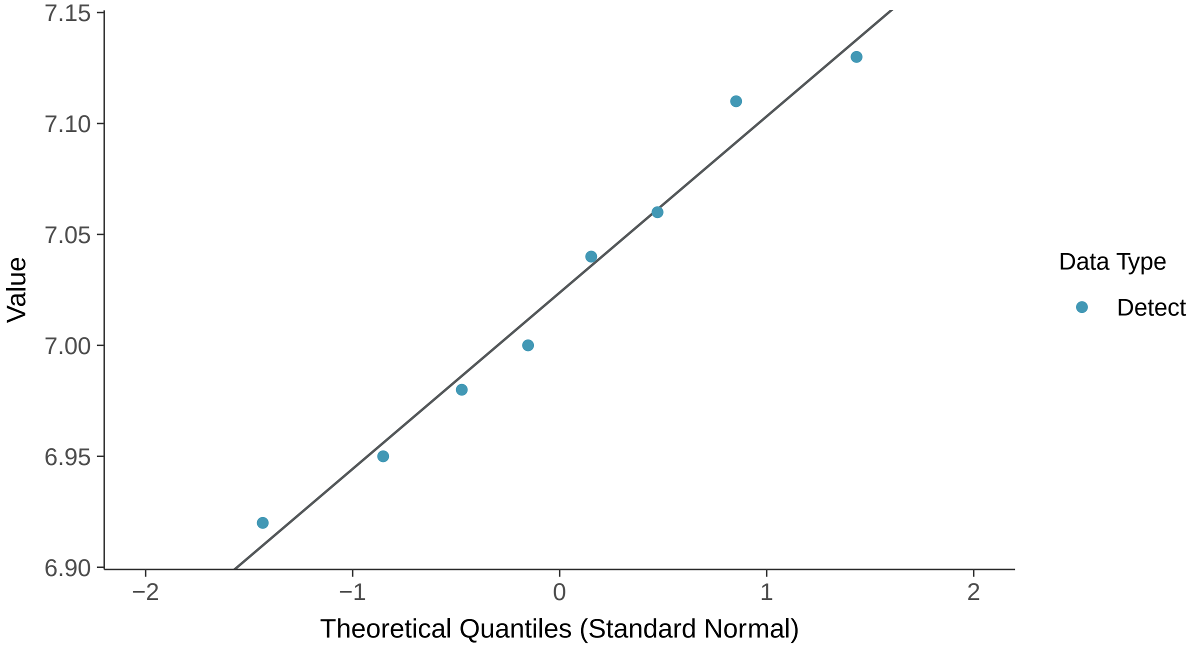
pH, Field, MW-14 (su)



Boxplot by Season

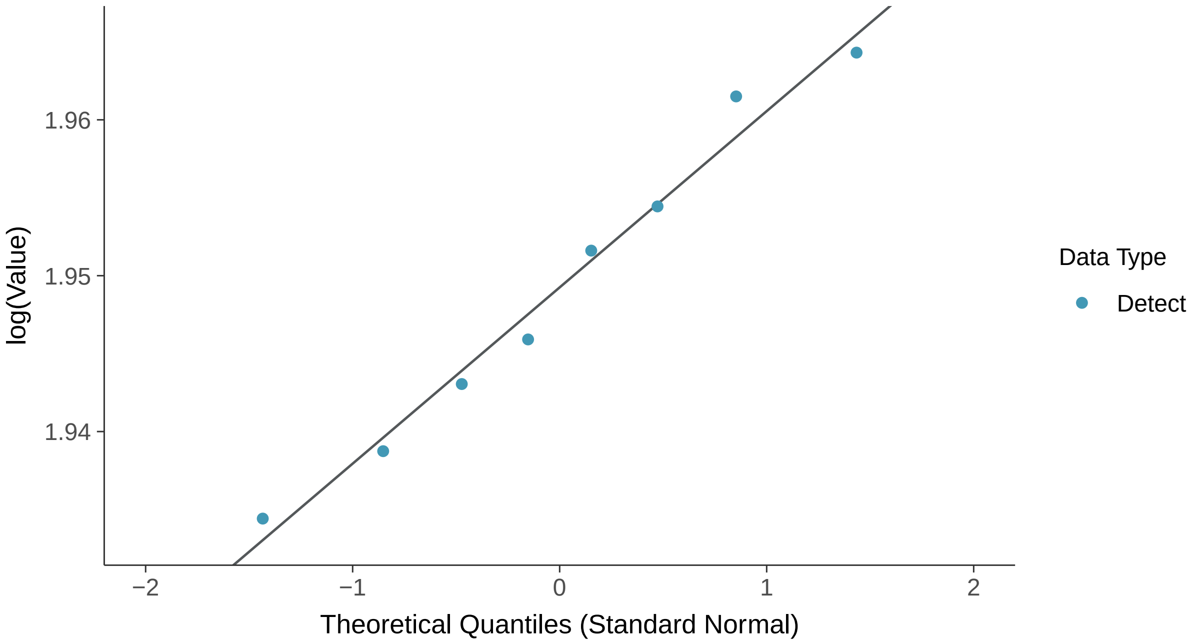
pH, Field, MW-14 (su)





Normal Q-Q plot

pH, Field, MW-14 (su)

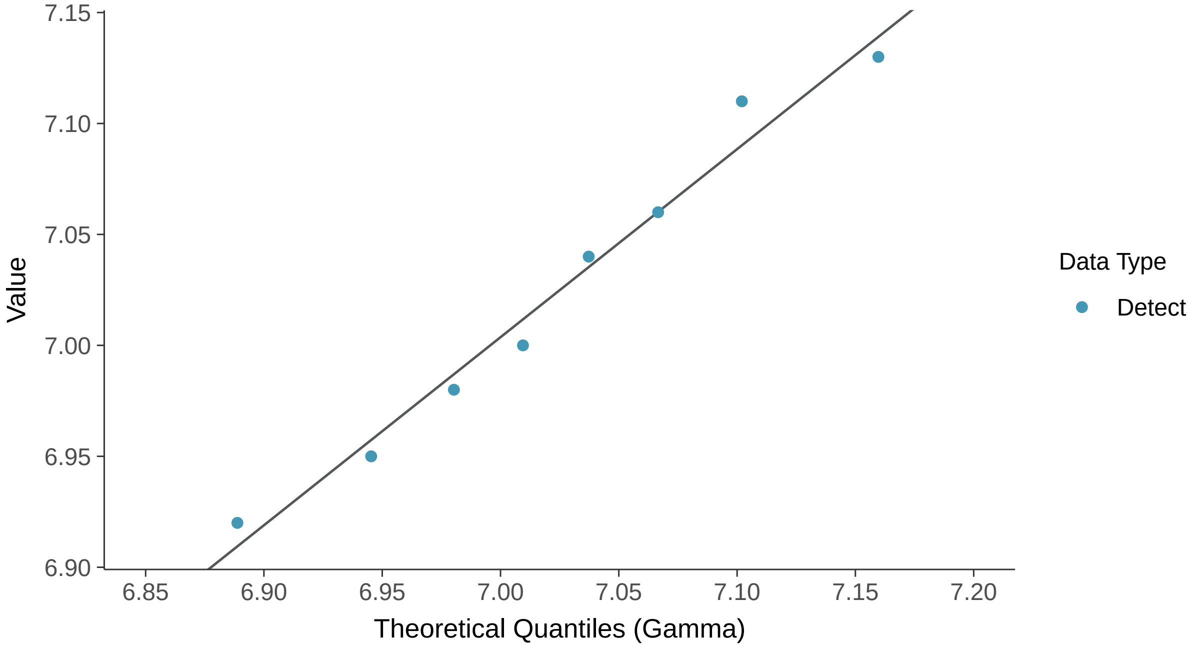


Lognormal Q-Q plot

pH, Field, MW-14 (su)

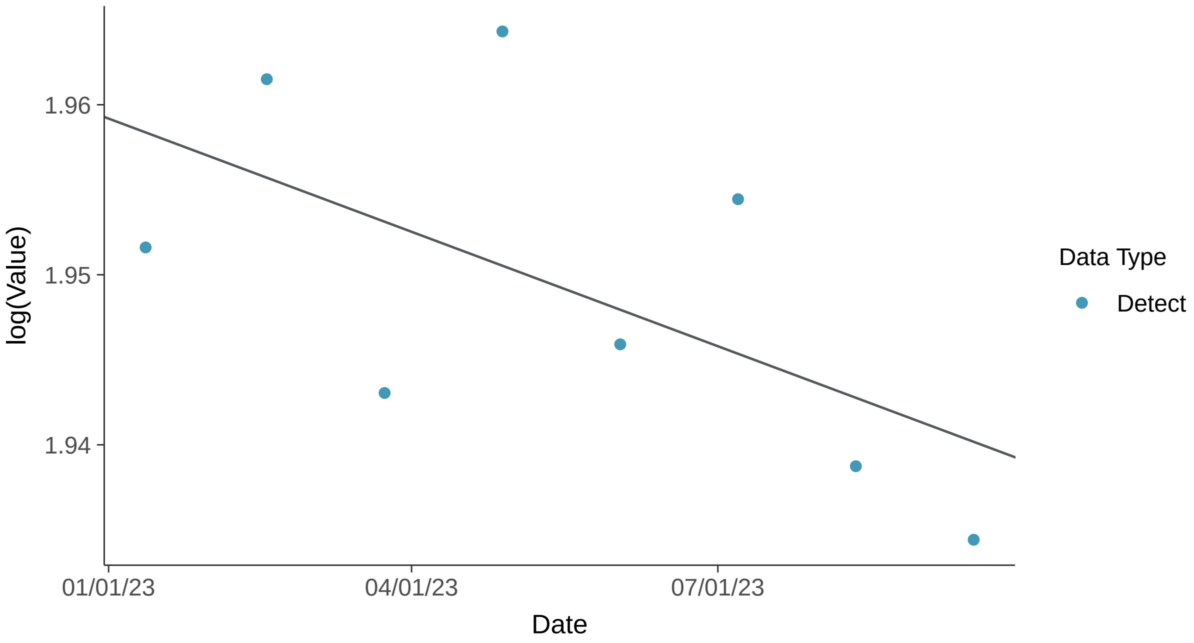
Gamma Q-Q plot

pH, Field, MW-14 (su)



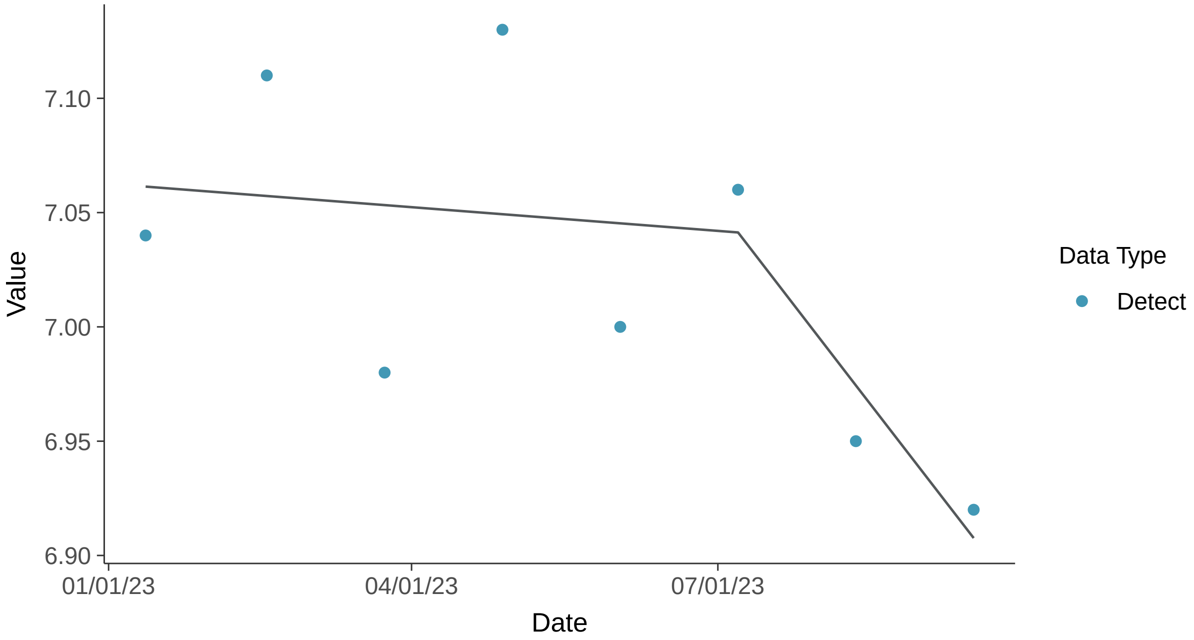
Trend Regression: Lognormal MLE

pH, Field, MW-14 (su)



Trend Regression: Piecewise Linear-Linear

pH, Field, MW-14 (su)

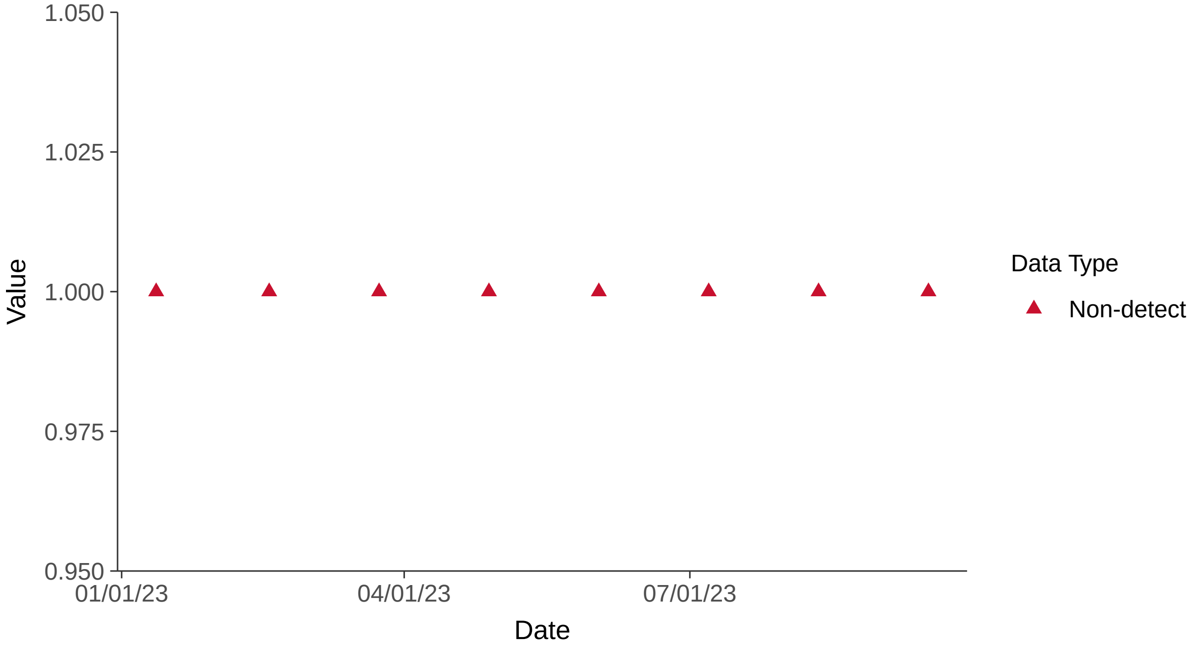


Appendix IV: Fluoride, MW-14

ID: 14_2_04

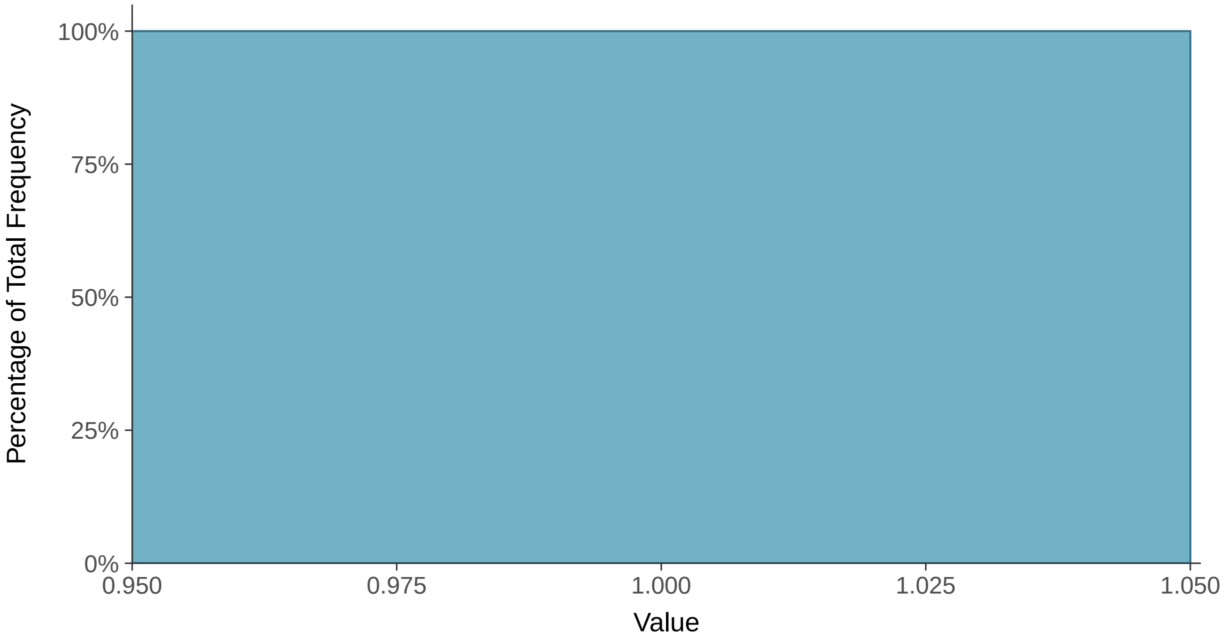
Scatter Plot

Fluoride, MW-14 (mg/L)



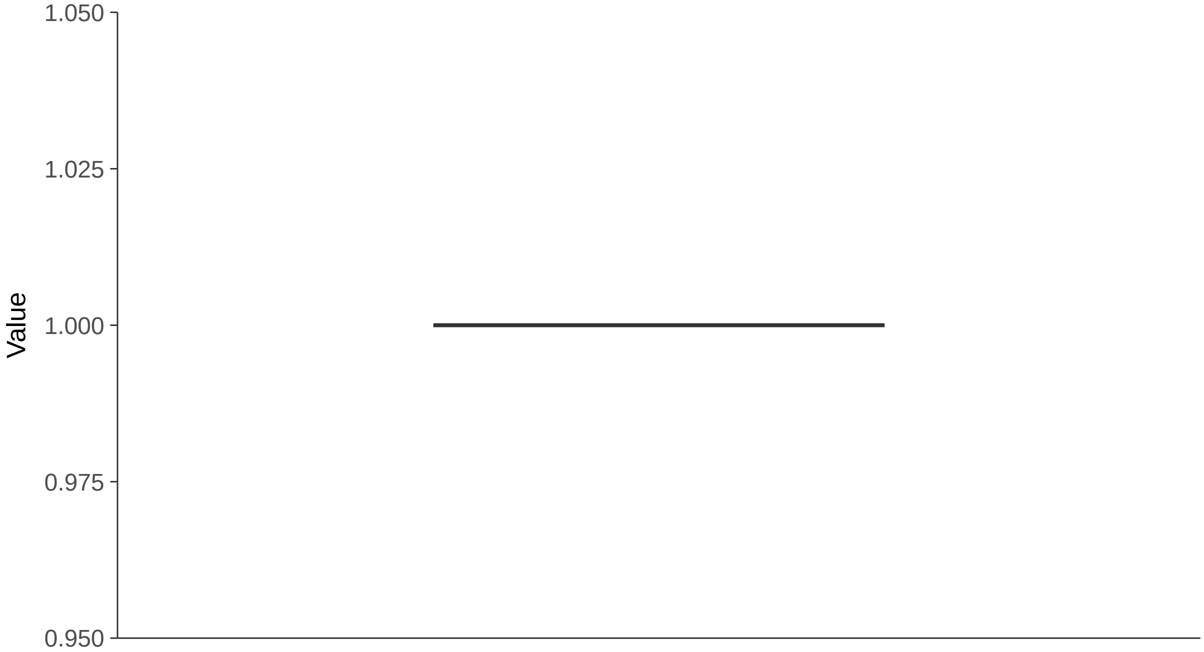
Histogram

Fluoride, MW-14 (mg/L)



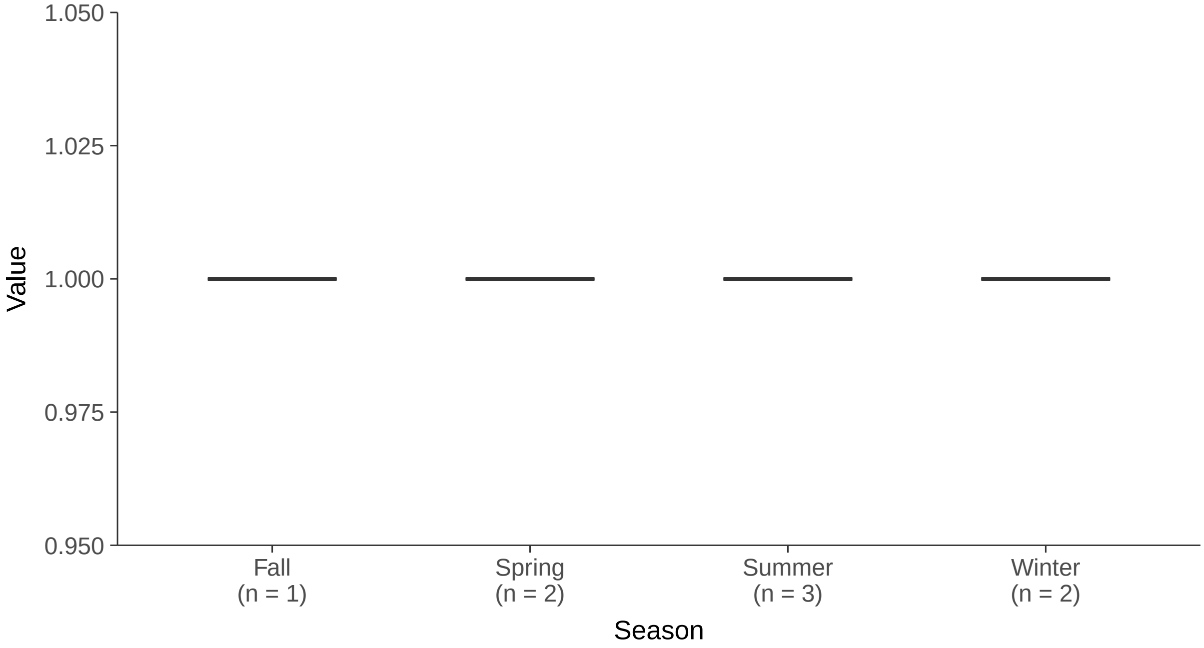
Boxplot

Fluoride, MW-14 (mg/L)



Boxplot by Season

Fluoride, MW-14 (mg/L)

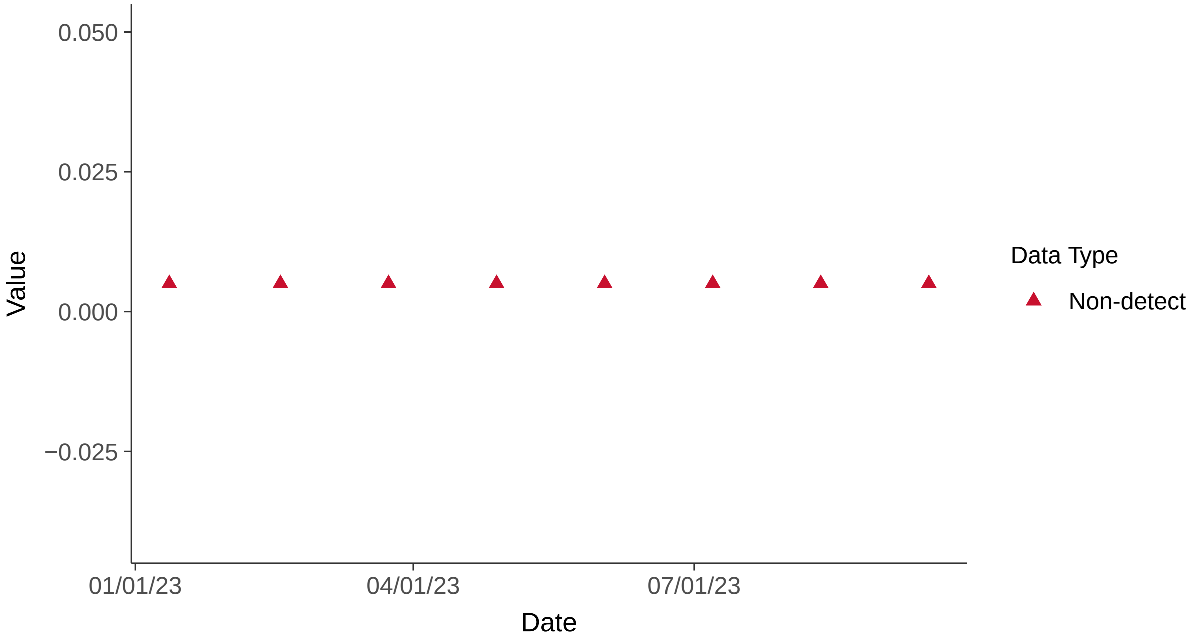


Appendix IV: Antimony, MW-14

ID: 14_2_08

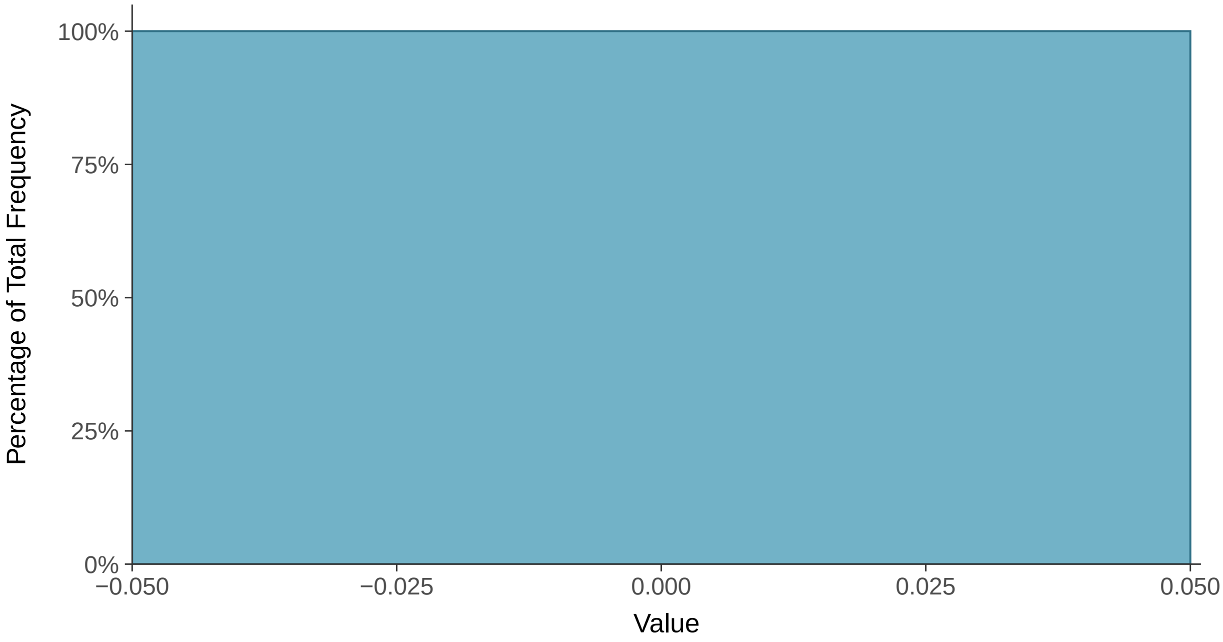
Scatter Plot

Antimony, MW-14 (mg/L)



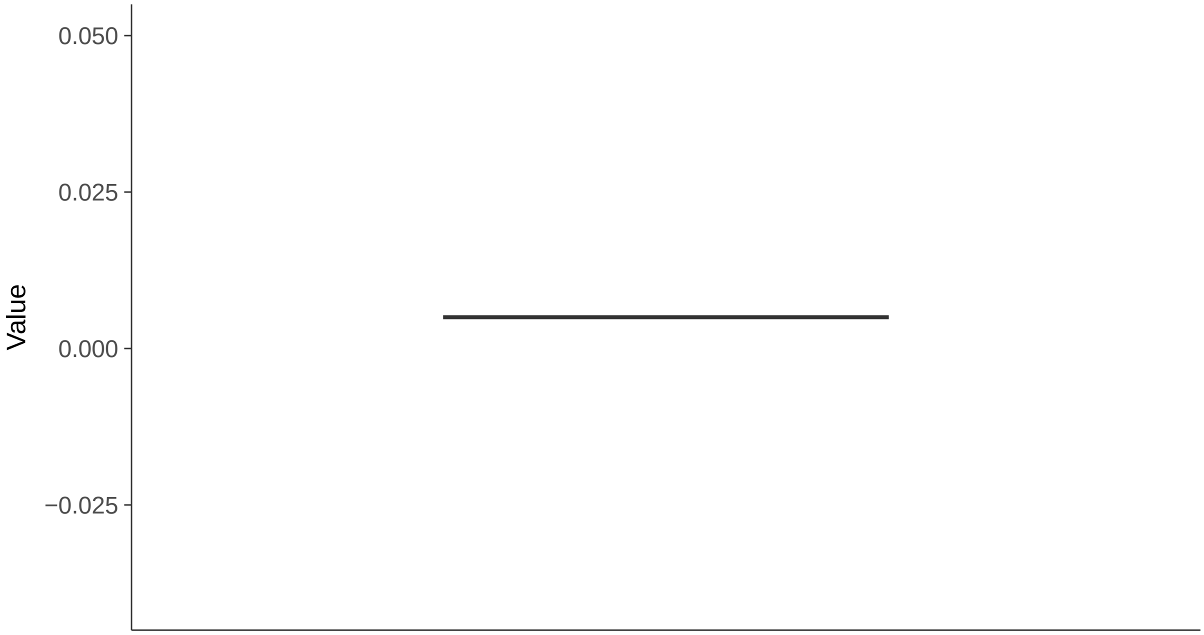
Histogram

Antimony, MW-14 (mg/L)



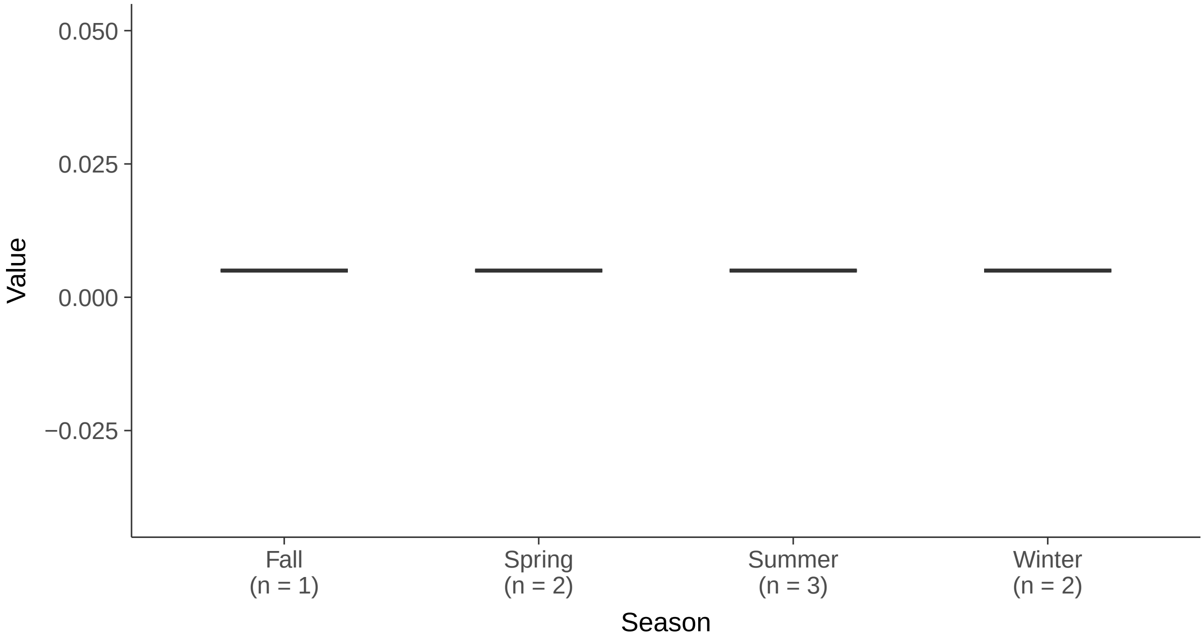
Boxplot

Antimony, MW-14 (mg/L)



Boxplot by Season

Antimony, MW-14 (mg/L)

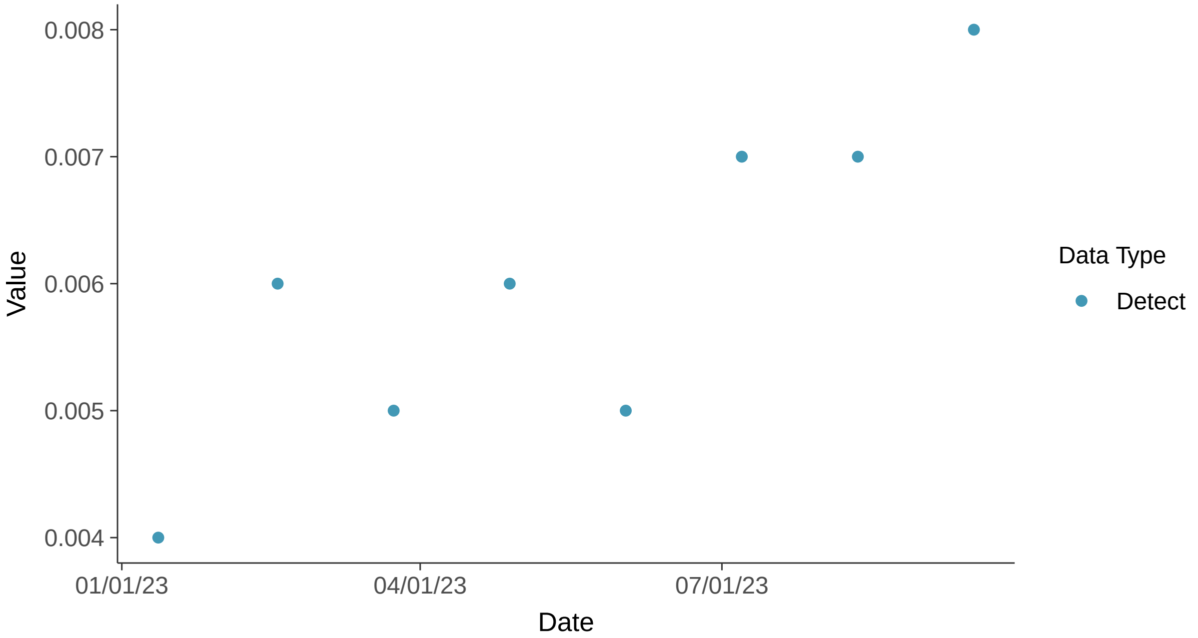


Appendix IV: Arsenic, MW-14

ID: 14_2_09

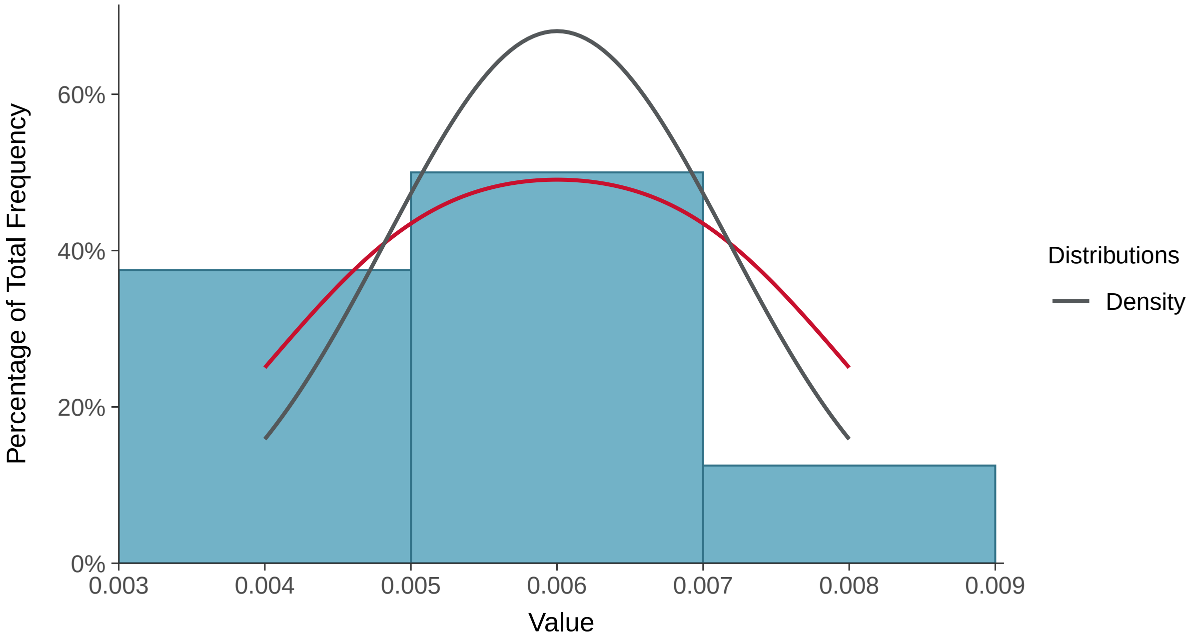
Scatter Plot

Arsenic, MW-14 (mg/L)



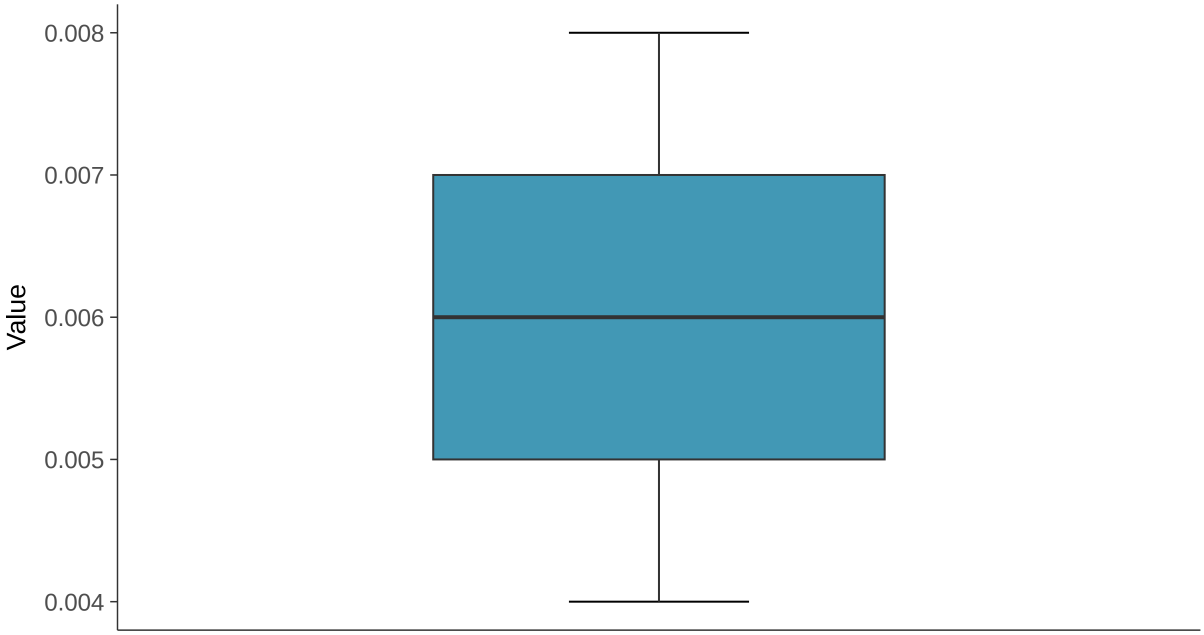
Histogram

Arsenic, MW-14 (mg/L)



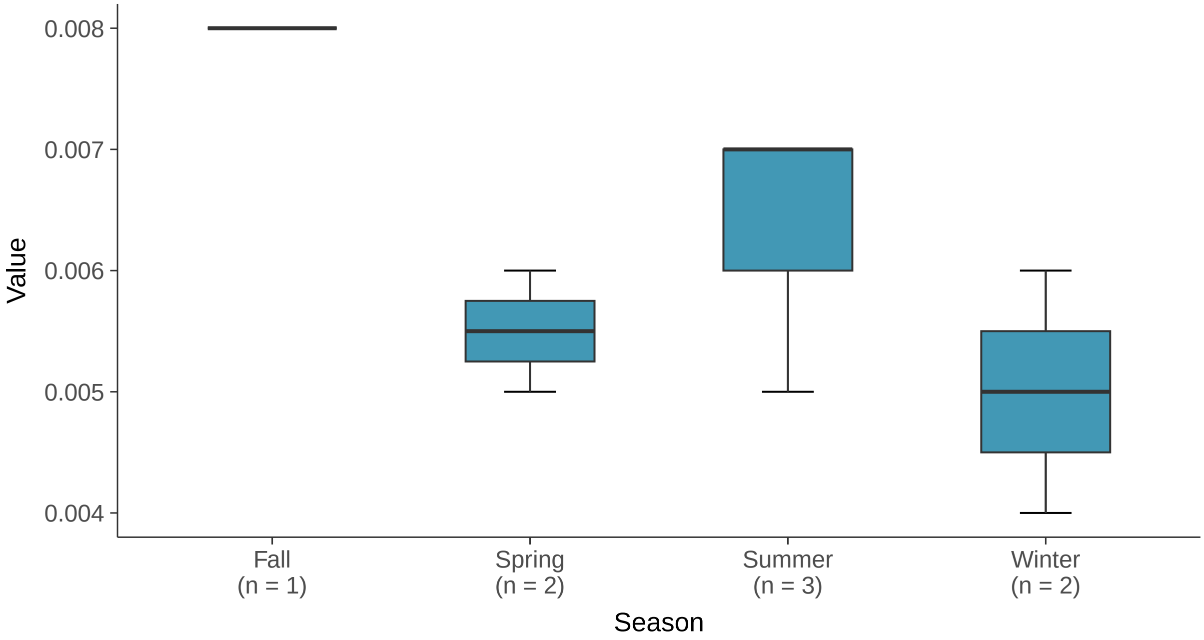
Boxplot

Arsenic, MW-14 (mg/L)



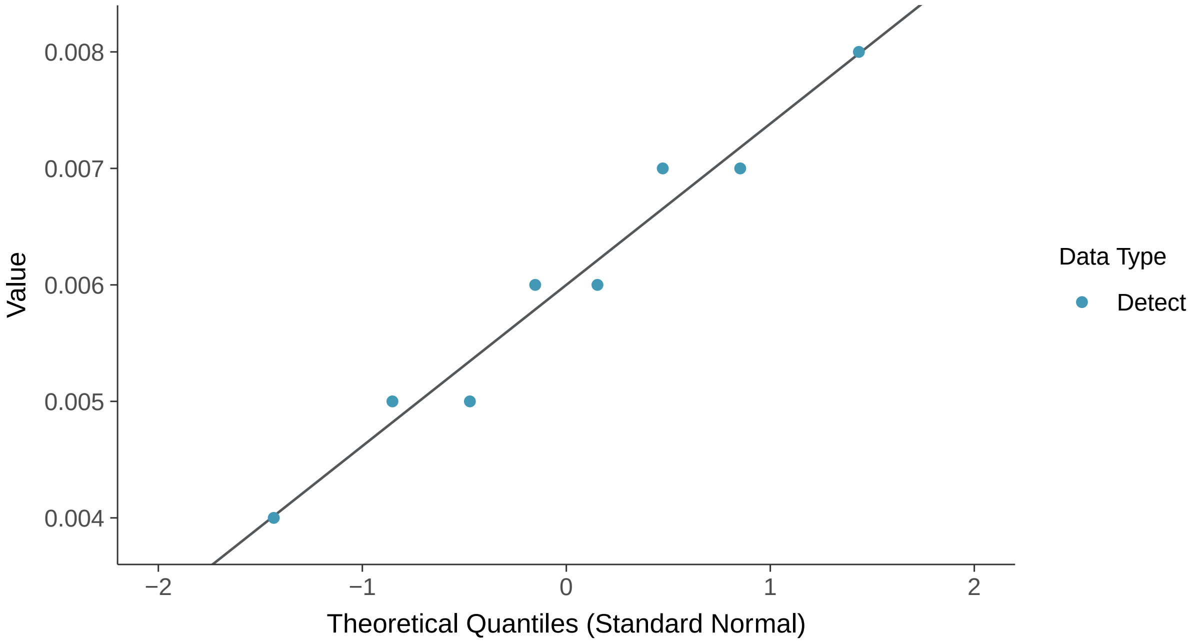
Boxplot by Season

Arsenic, MW-14 (mg/L)



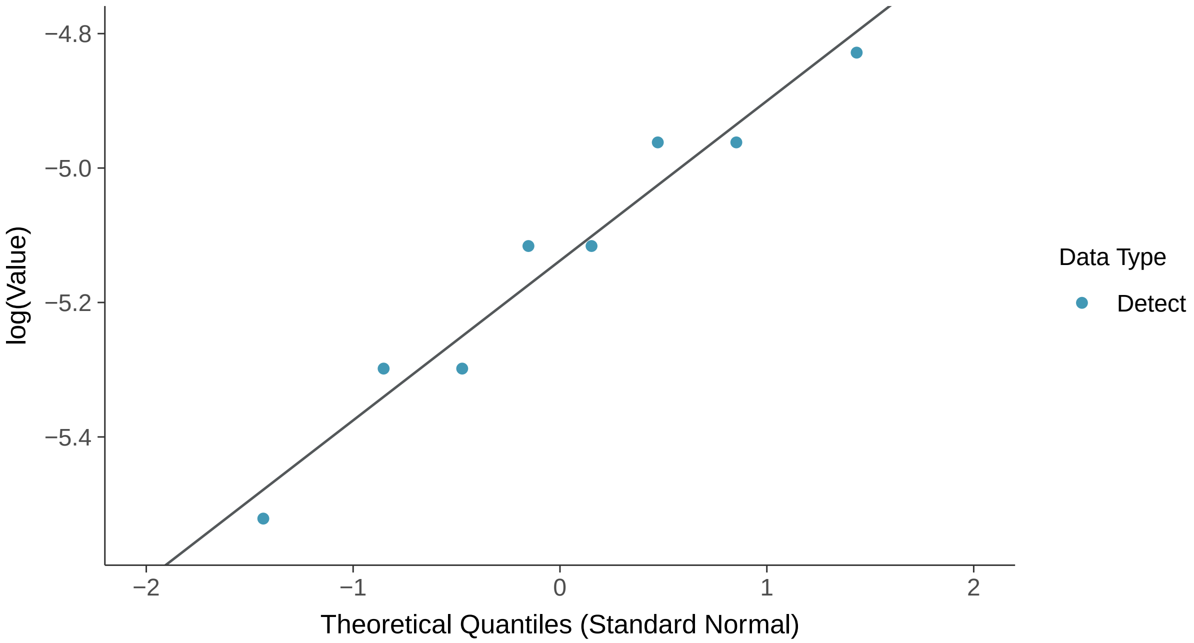
Normal Q-Q plot

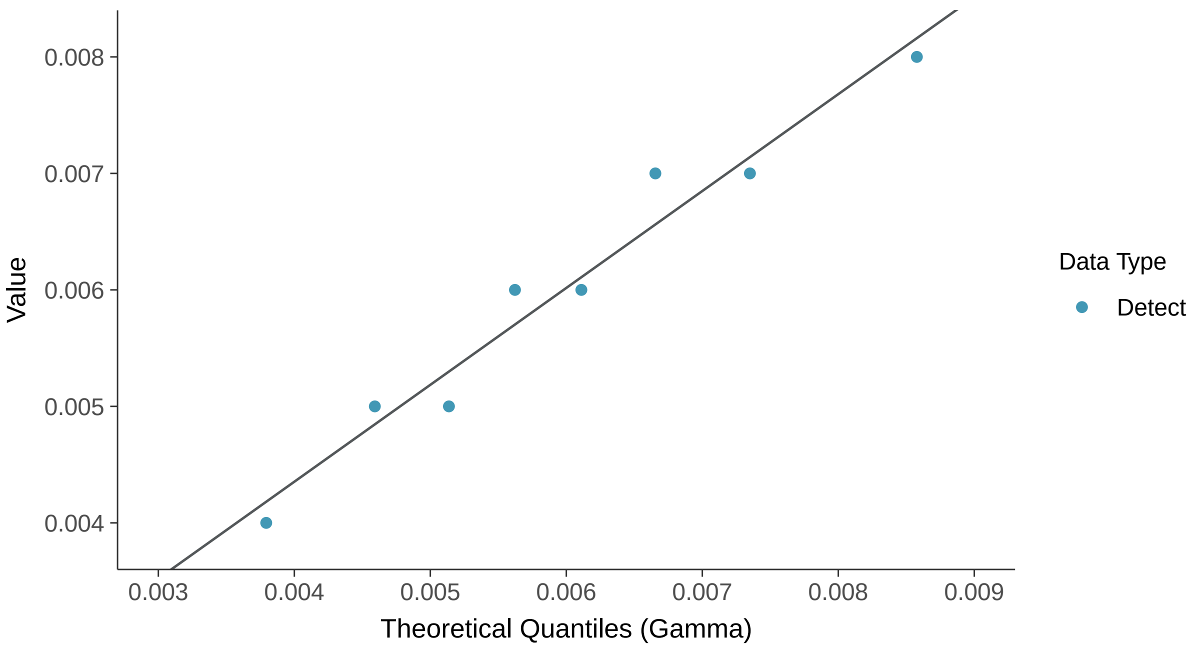
Arsenic, MW-14 (mg/L)



Lognormal Q-Q plot

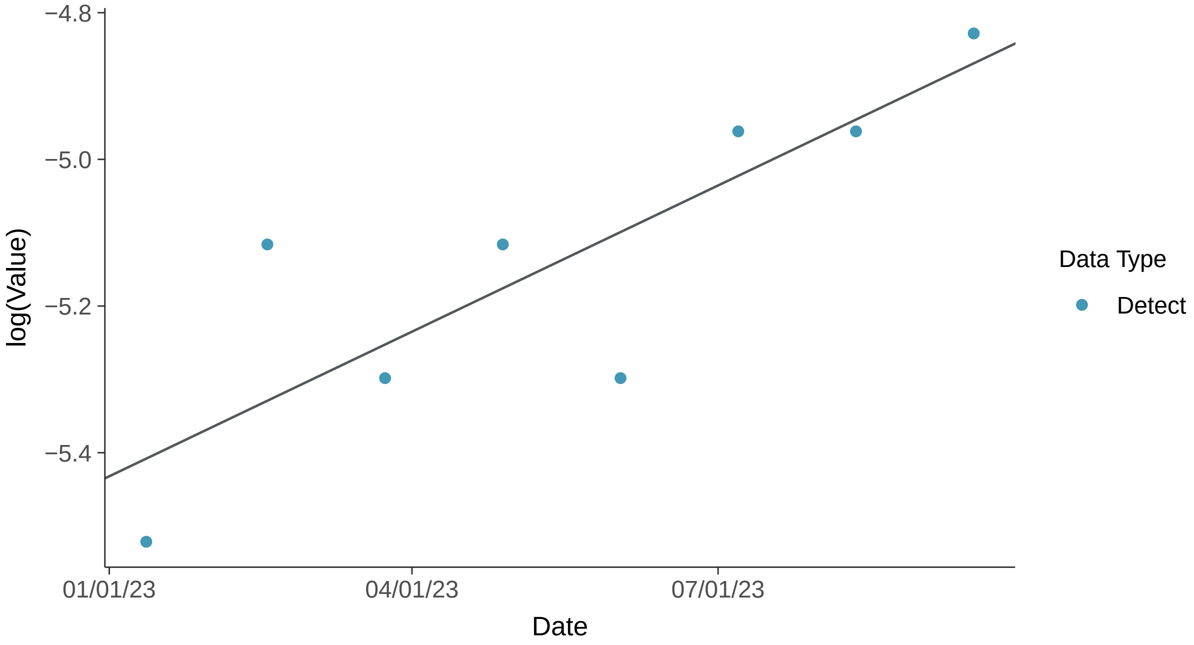
Arsenic, MW-14 (mg/L)





Gamma Q-Q plot

Arsenic, MW-14 (mg/L)

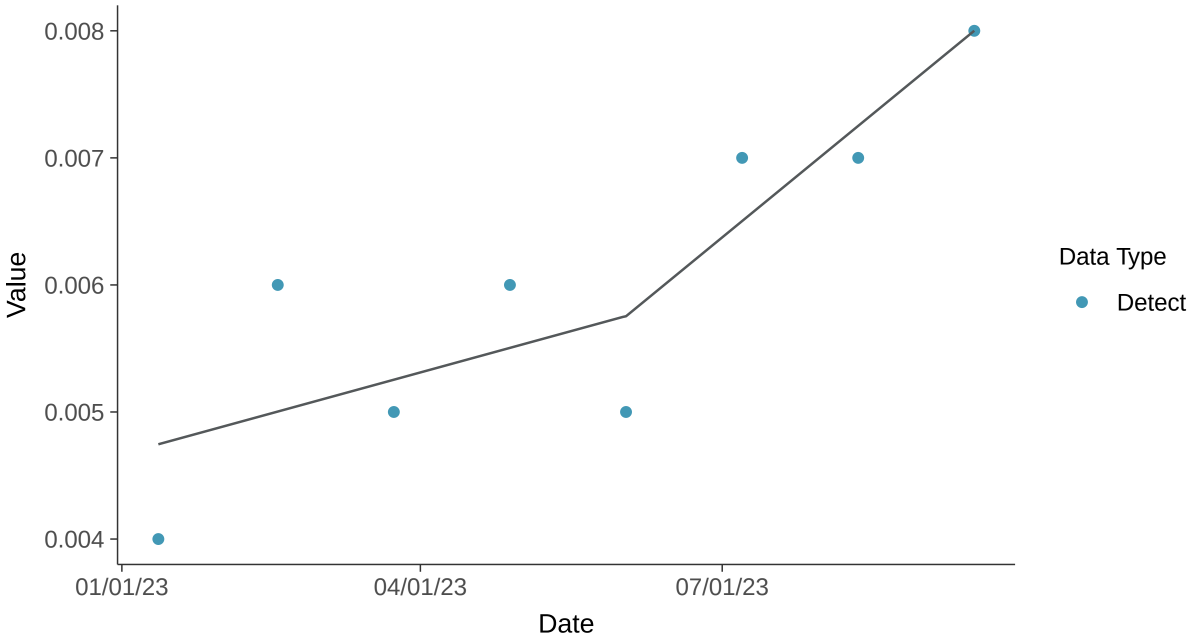


Trend Regression: Lognormal MLE

Arsenic, MW-14 (mg/L)

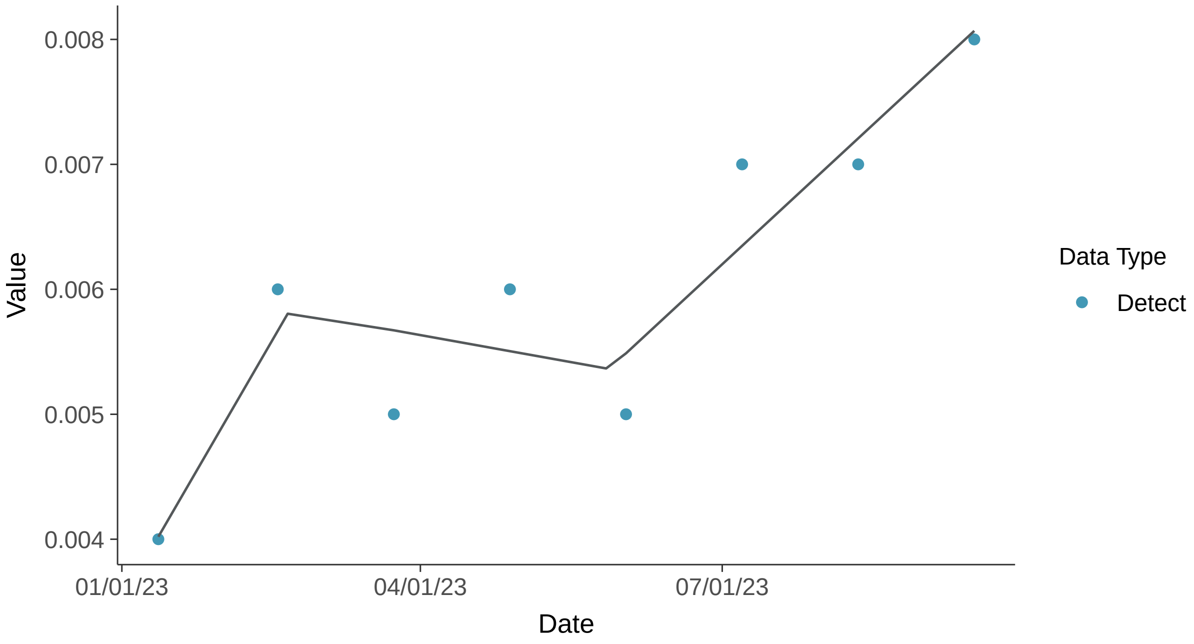
Trend Regression: Piecewise Linear-Linear

Arsenic, MW-14 (mg/L)



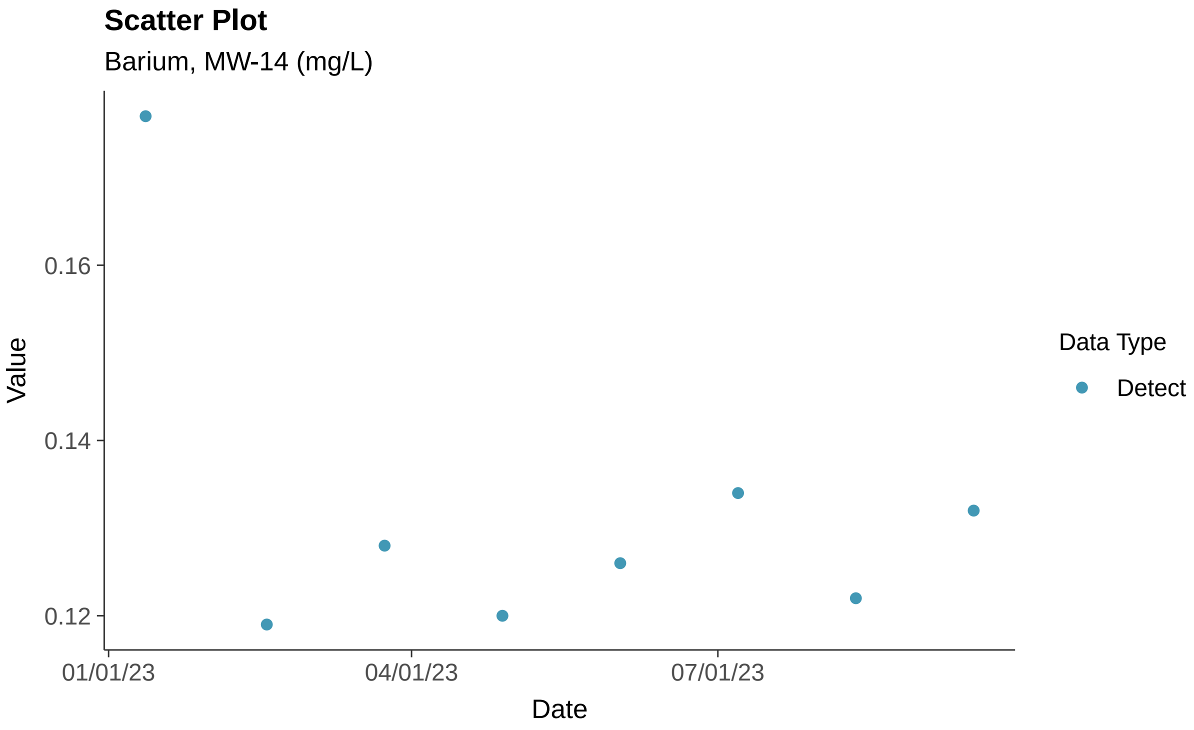
Trend Regression: Piecewise Linear-Linear-Linear

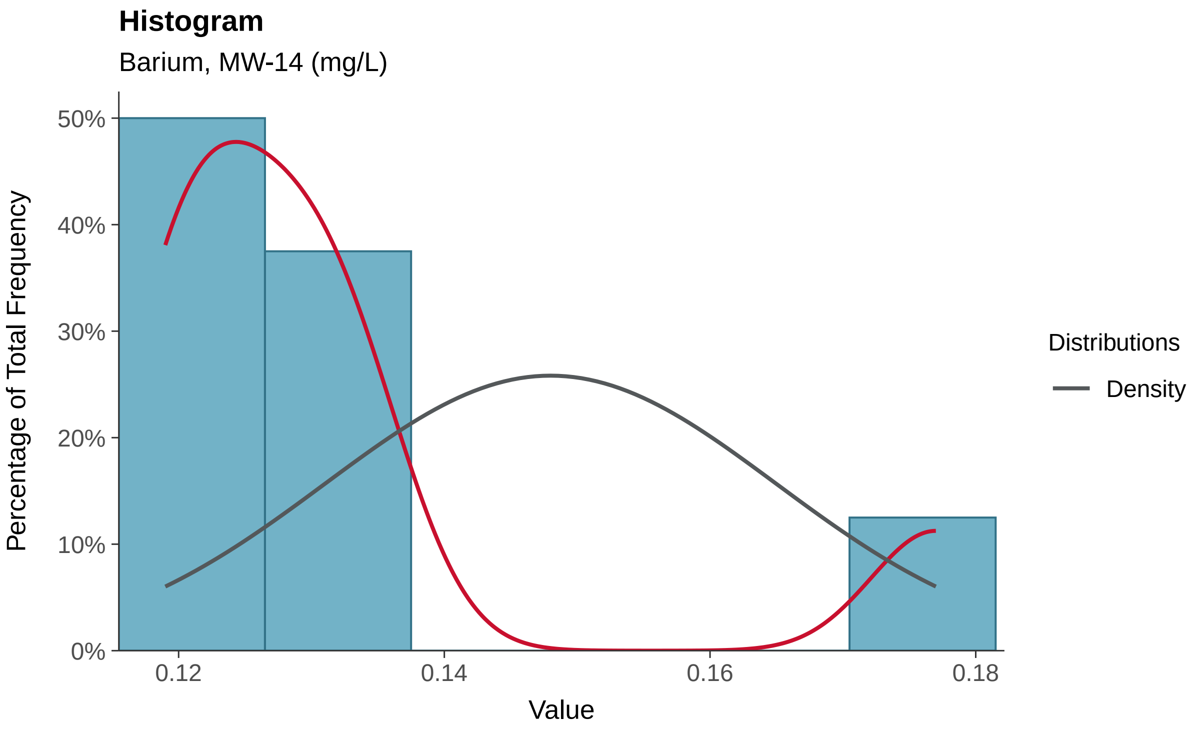
Arsenic, MW-14 (mg/L)



Appendix IV: Barium, MW-14

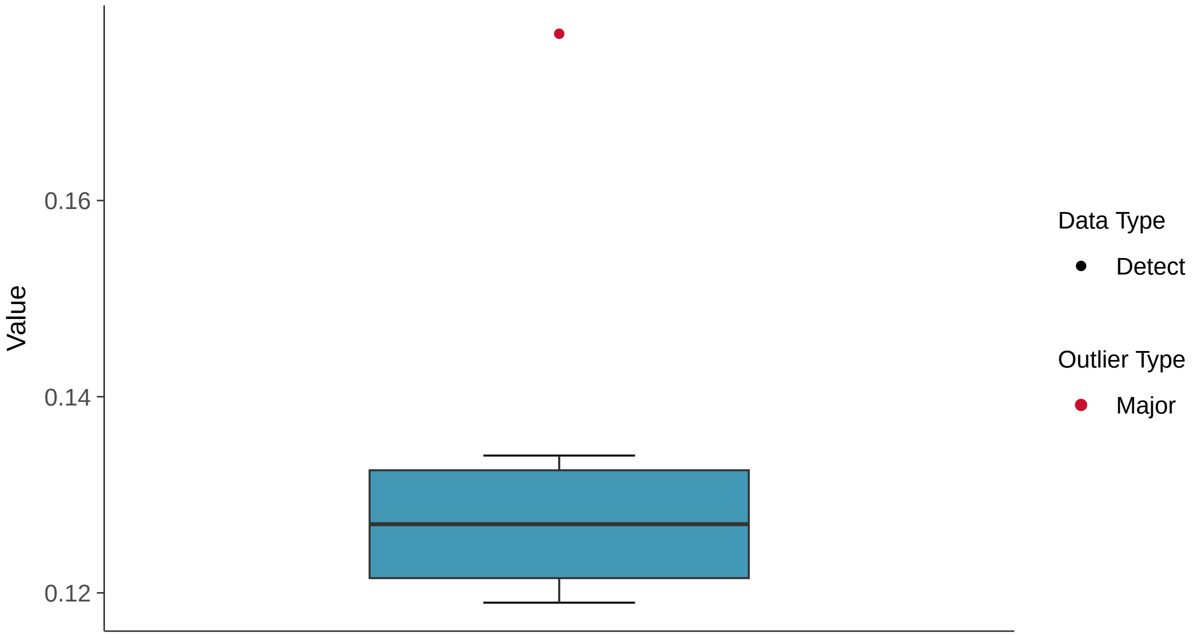
ID: 14_2_10





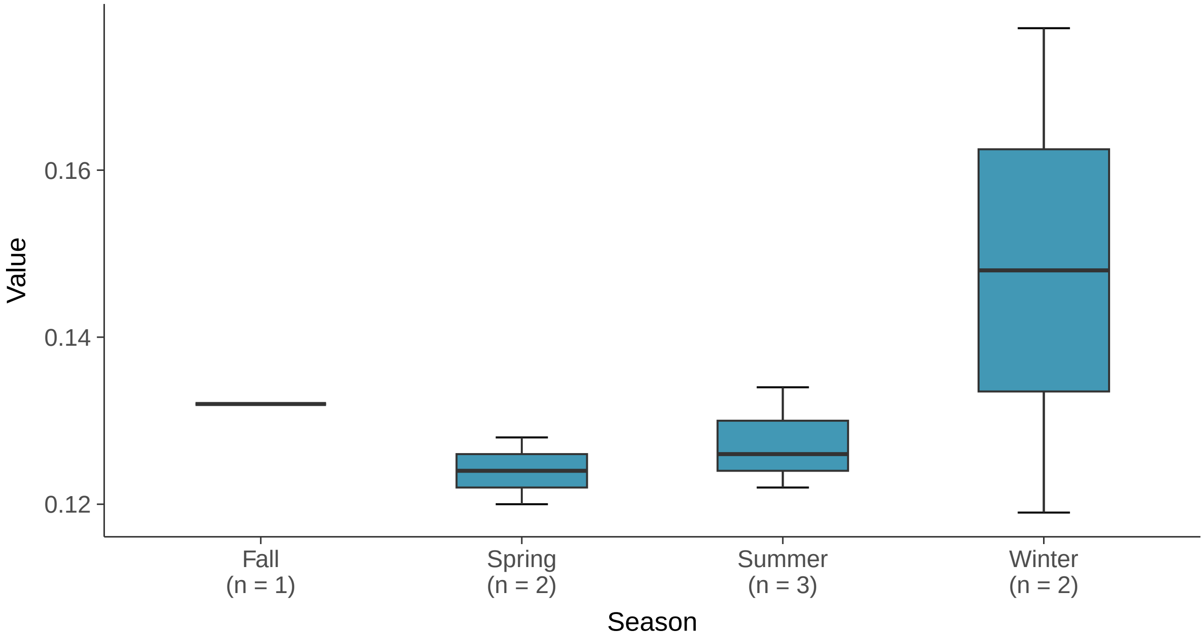
Boxplot

Barium, MW-14 (mg/L)



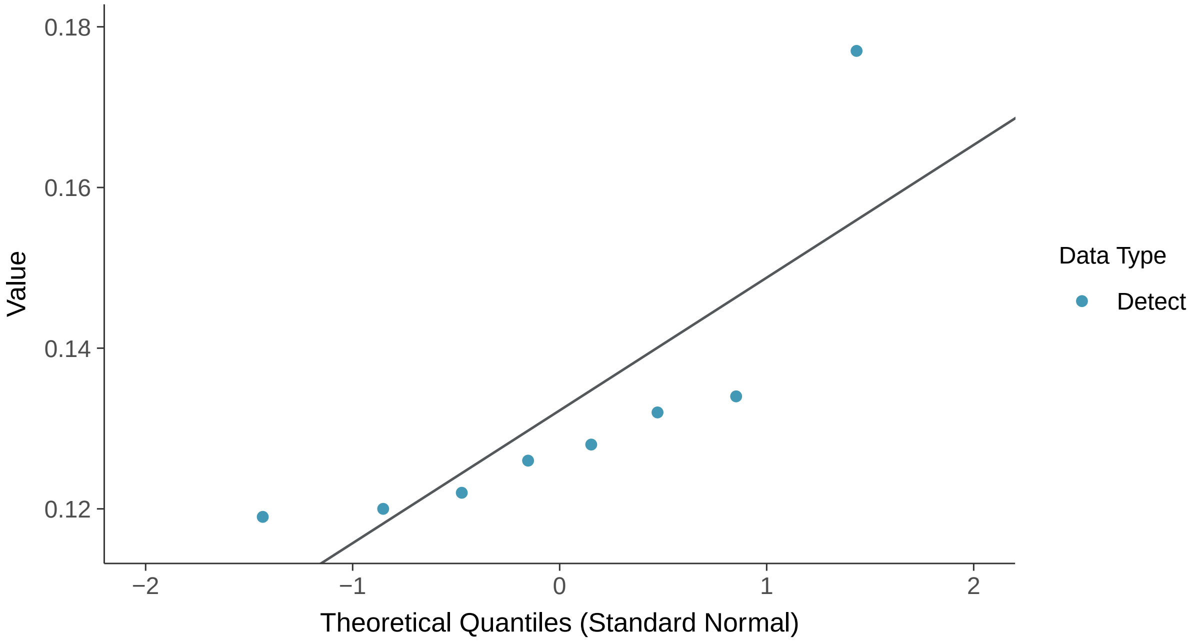
Boxplot by Season

Barium, MW-14 (mg/L)



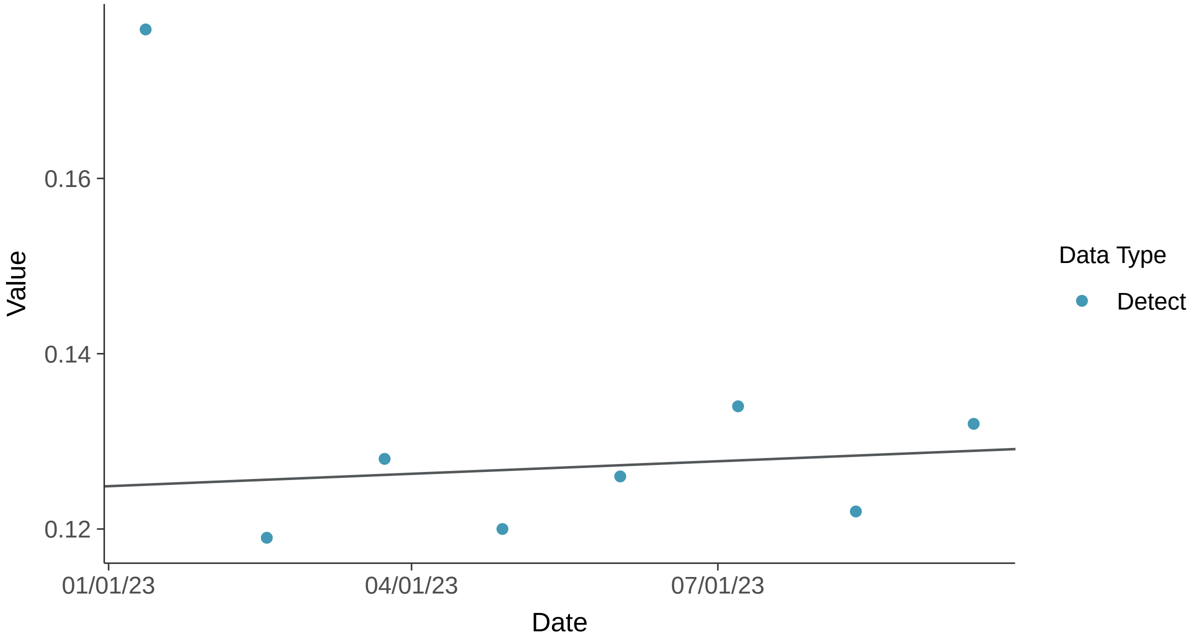
Normal Q-Q plot

Barium, MW-14 (mg/L)



Trend Regression: Mann-Kendall/Theil-Sen Estimate

Barium, MW-14 (mg/L)

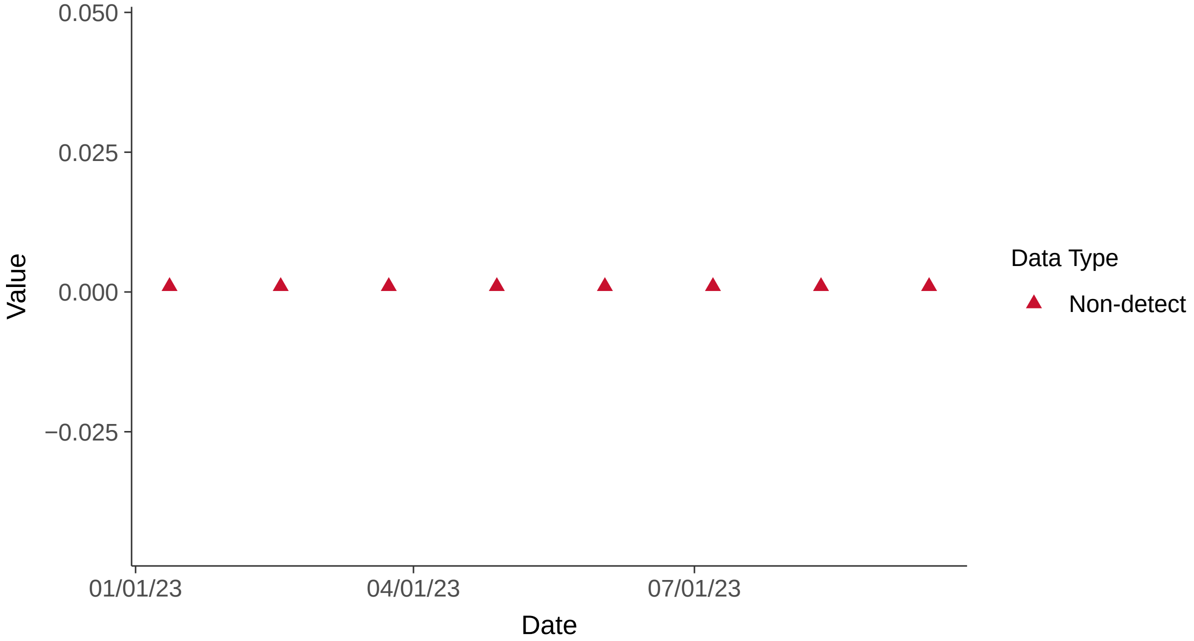


Appendix IV: Beryllium, MW-14

ID: 14_2_11

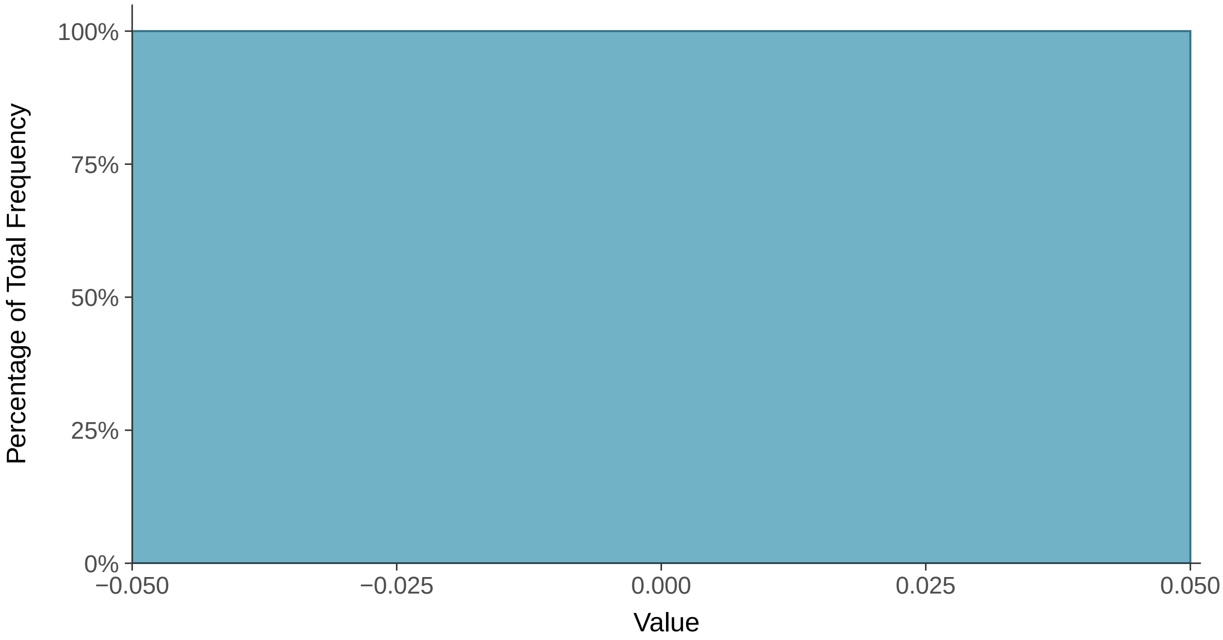
Scatter Plot

Beryllium, MW-14 (mg/L)



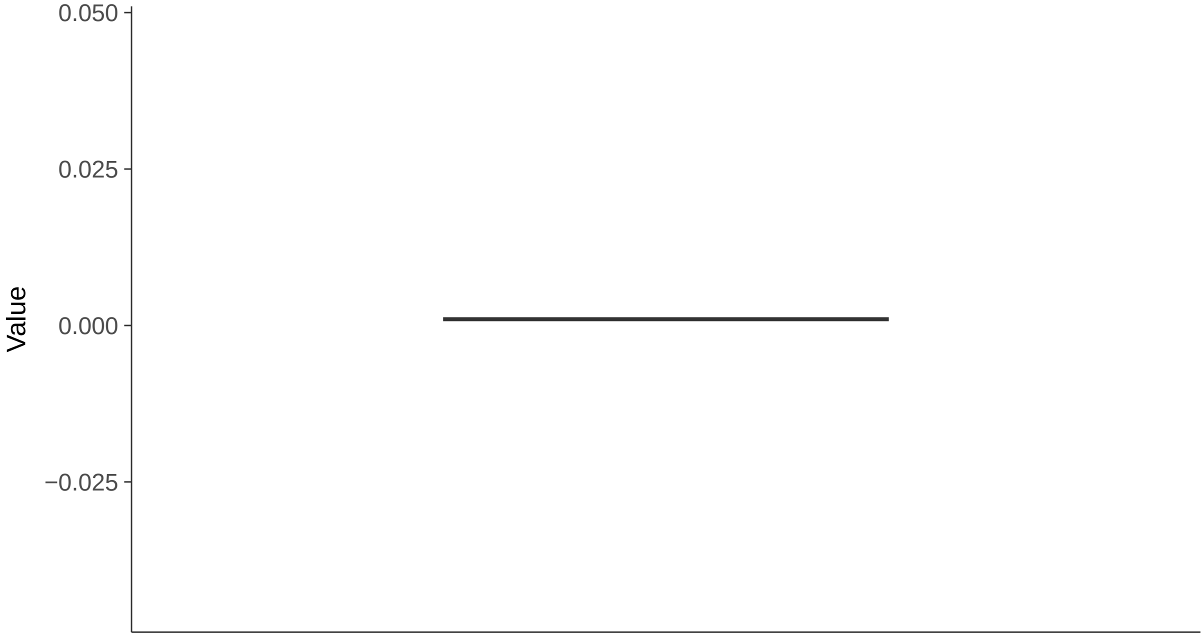
Histogram

Beryllium, MW-14 (mg/L)



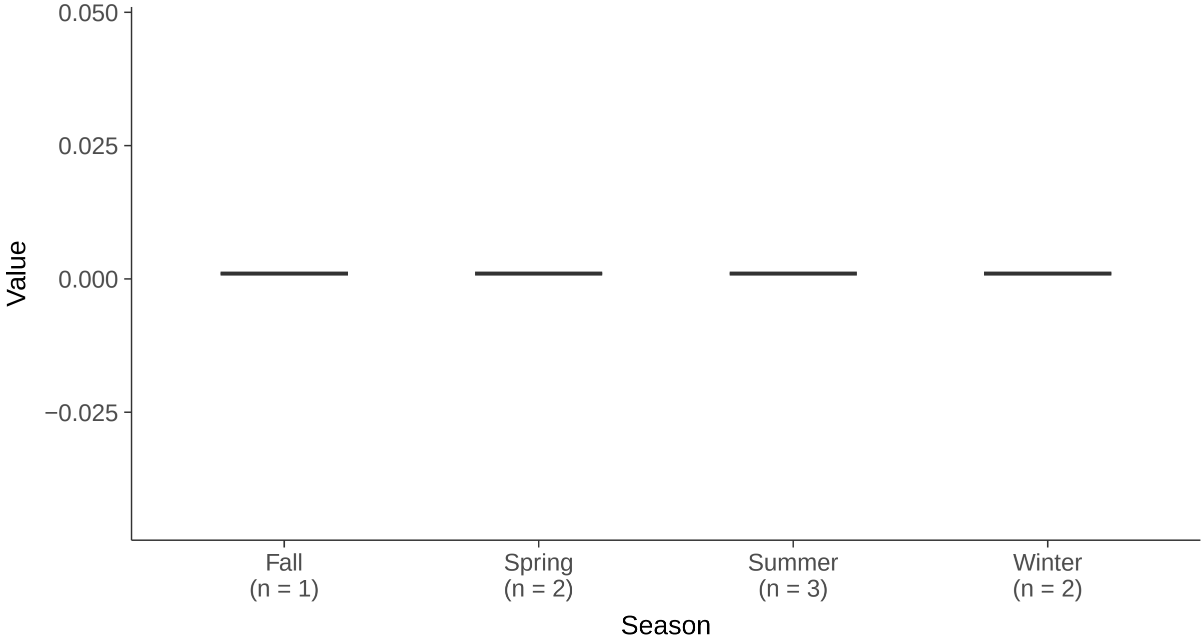
Boxplot

Beryllium, MW-14 (mg/L)



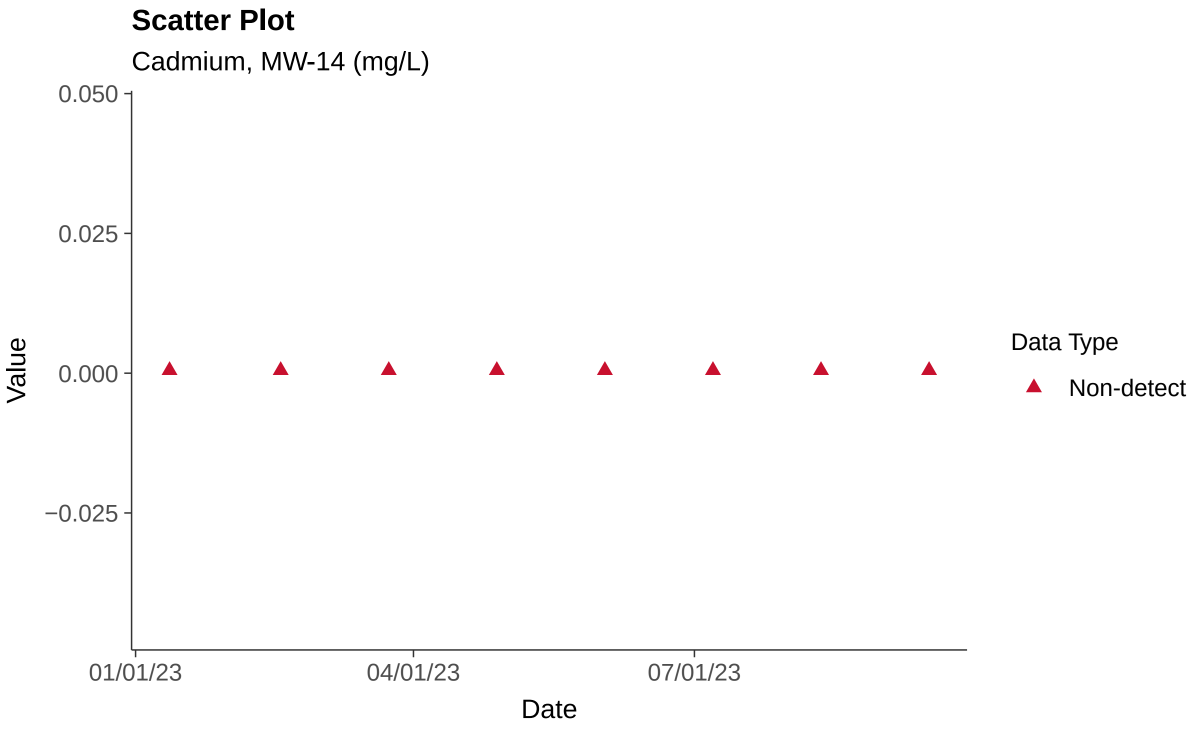
Boxplot by Season

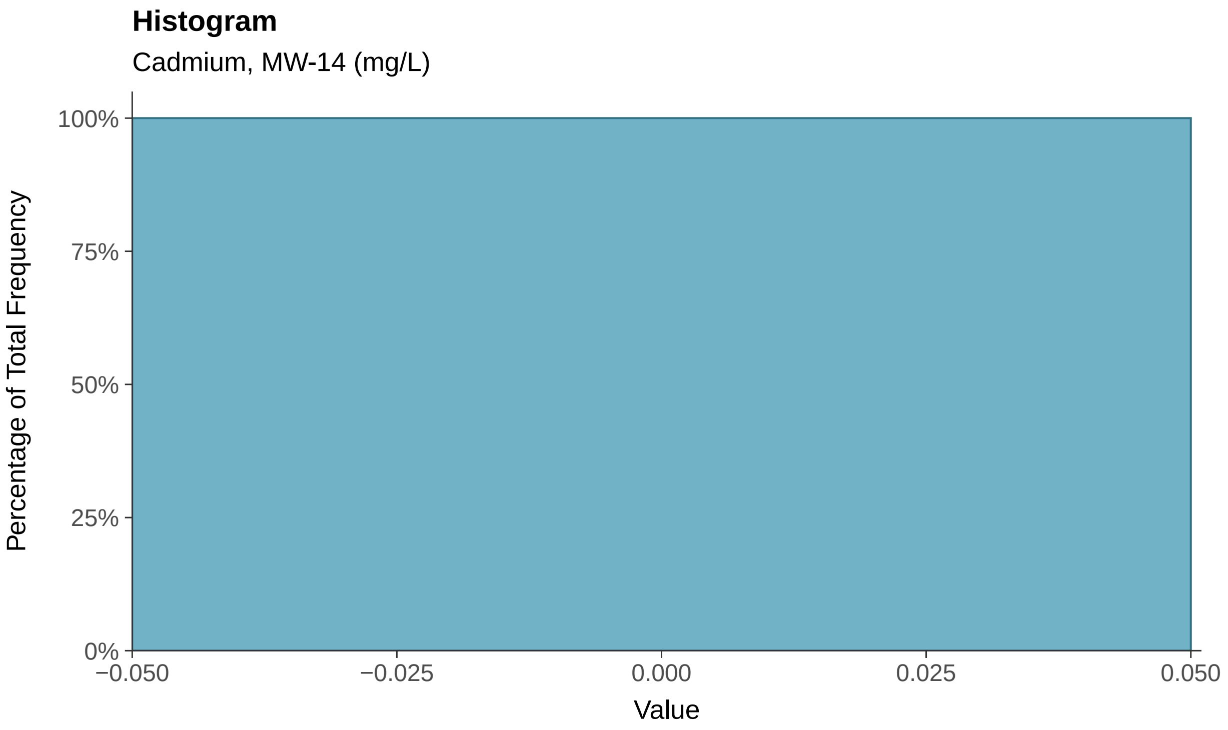
Beryllium, MW-14 (mg/L)



Appendix IV: Cadmium, MW-14

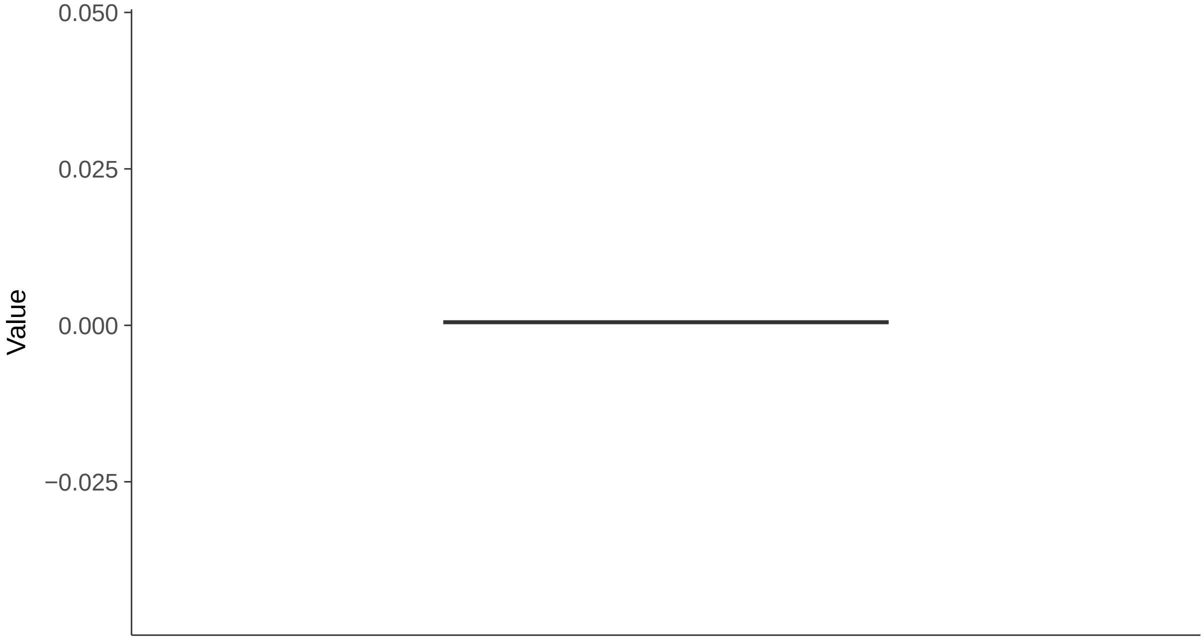
ID: 14_2_12





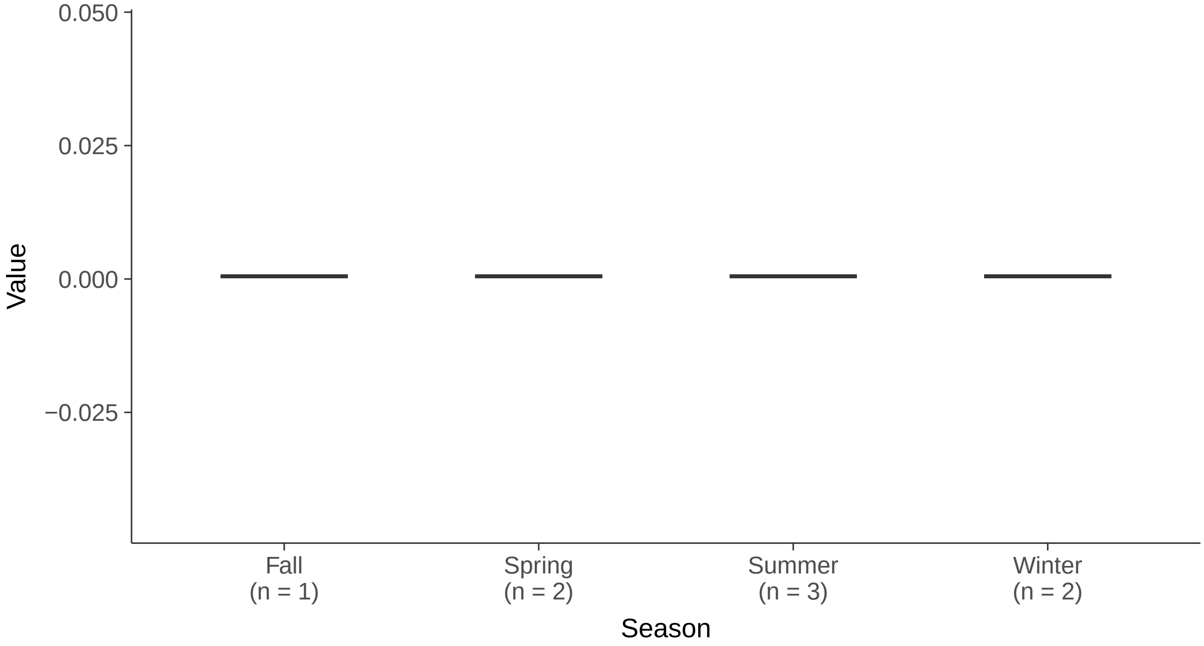
Boxplot

Cadmium, MW-14 (mg/L)



Boxplot by Season

Cadmium, MW-14 (mg/L)

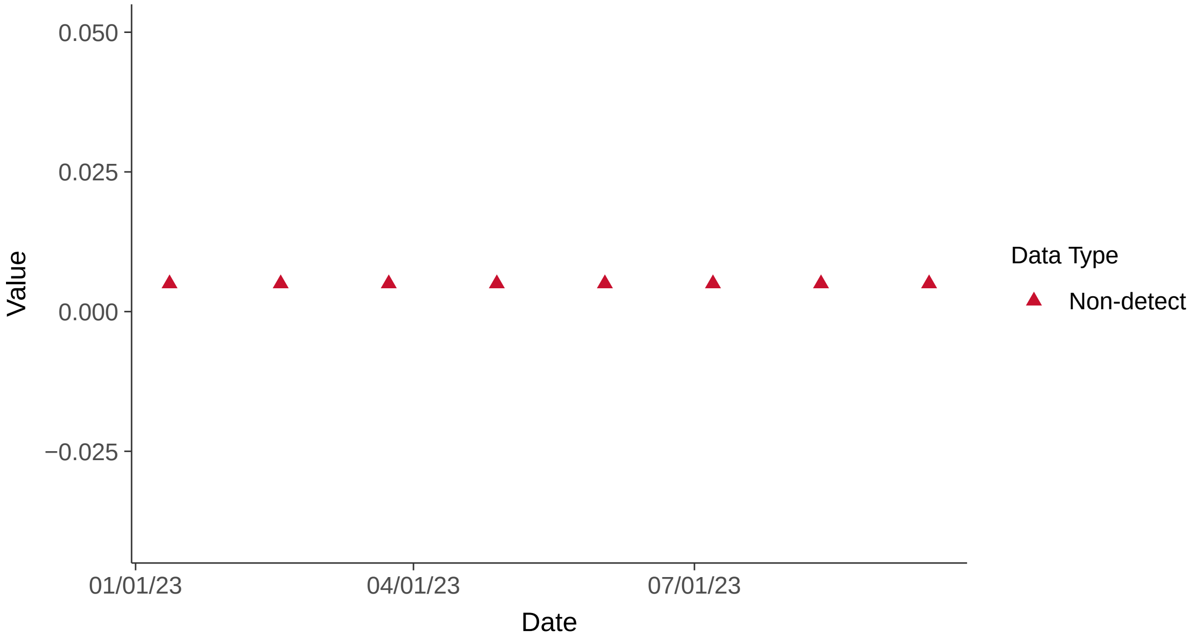


Appendix IV: Chromium, MW-14

ID: 14_2_13

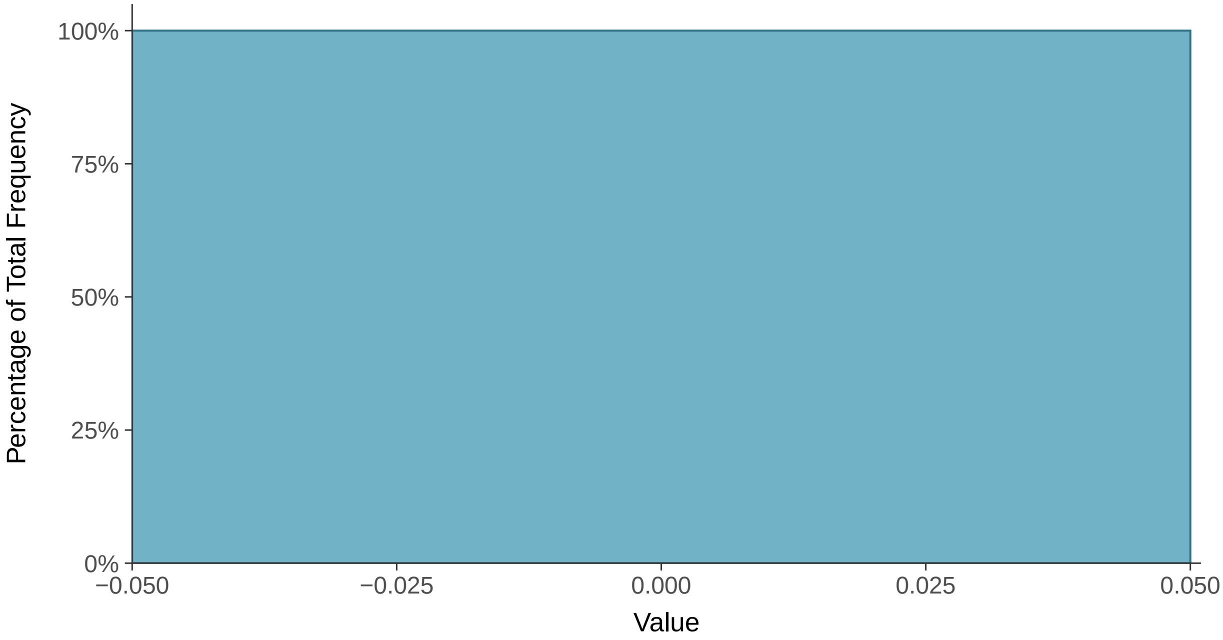
Scatter Plot

Chromium, MW-14 (mg/L)



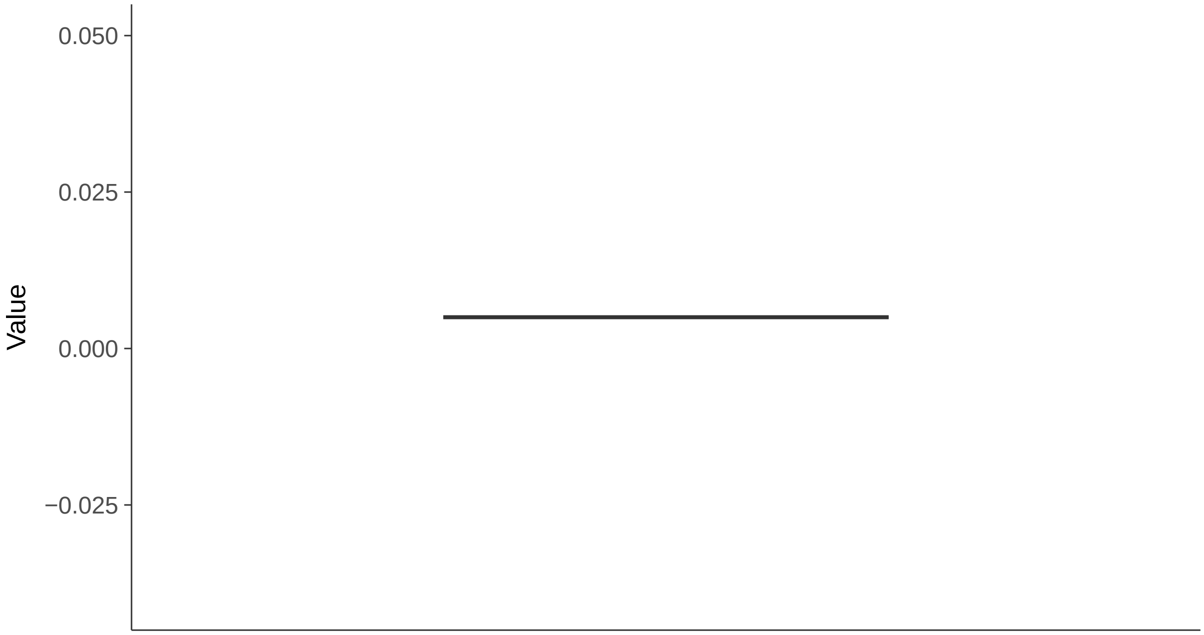
Histogram

Chromium, MW-14 (mg/L)



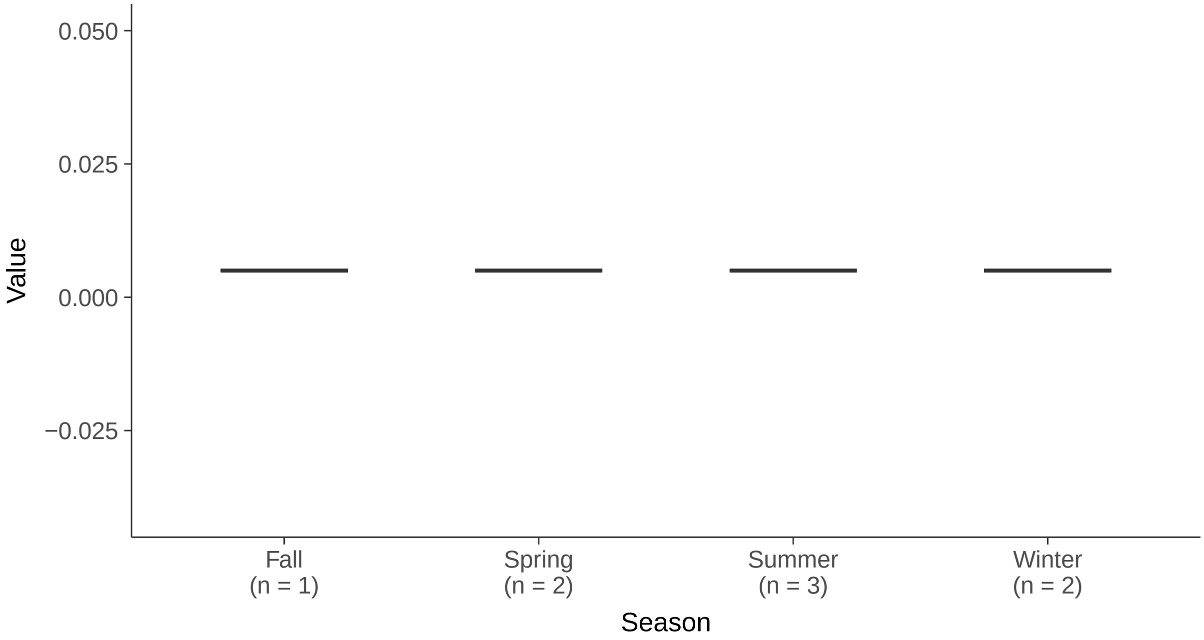
Boxplot

Chromium, MW-14 (mg/L)



Boxplot by Season

Chromium, MW-14 (mg/L)

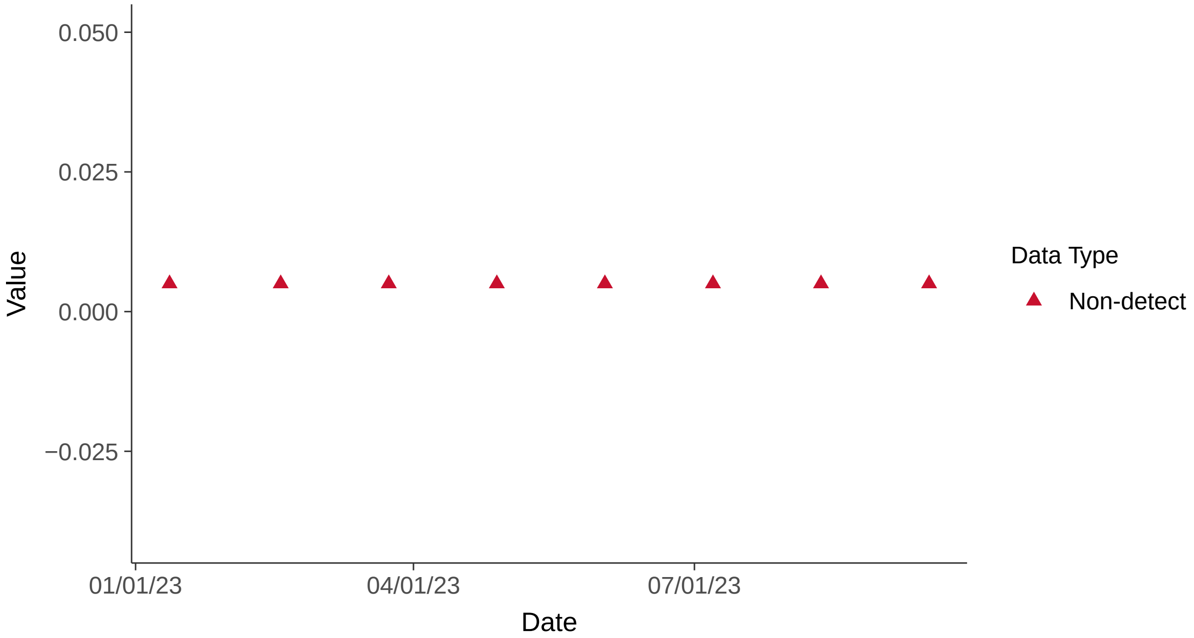


Appendix IV: Cobalt, MW-14

ID: 14_2_14

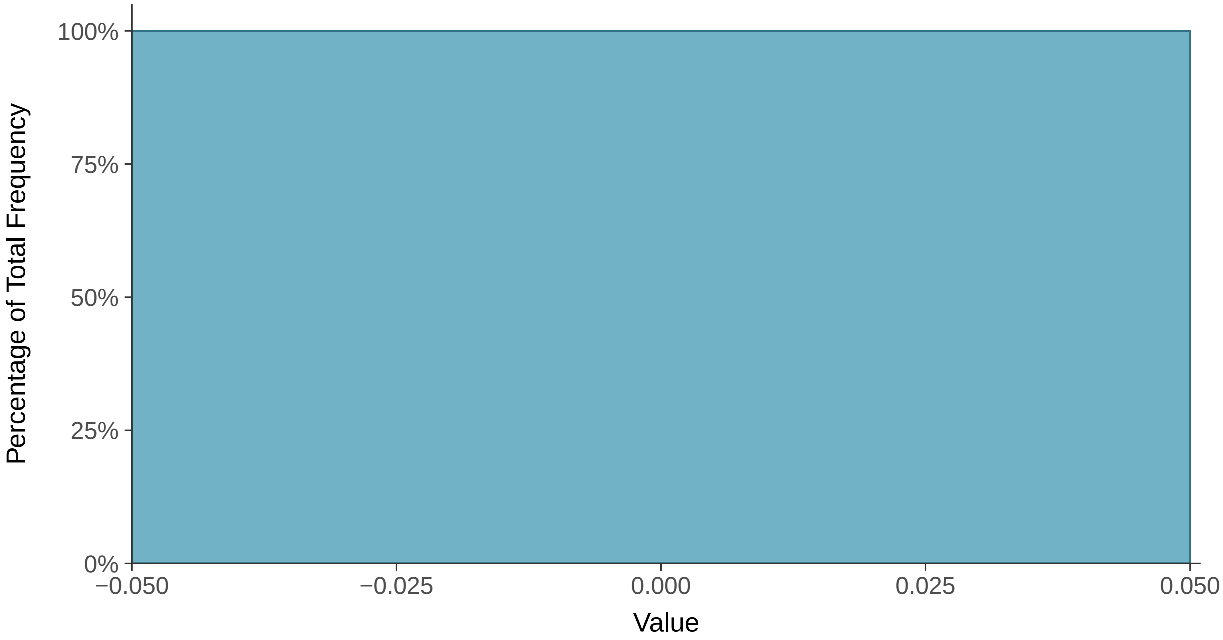
Scatter Plot

Cobalt, MW-14 (mg/L)



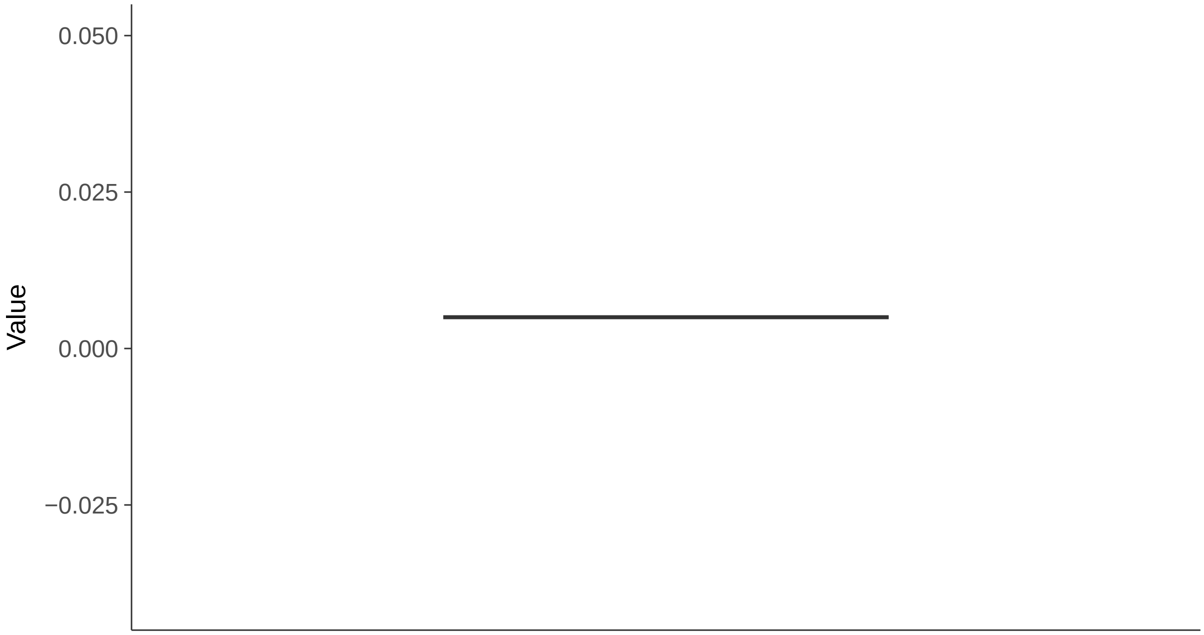
Histogram

Cobalt, MW-14 (mg/L)



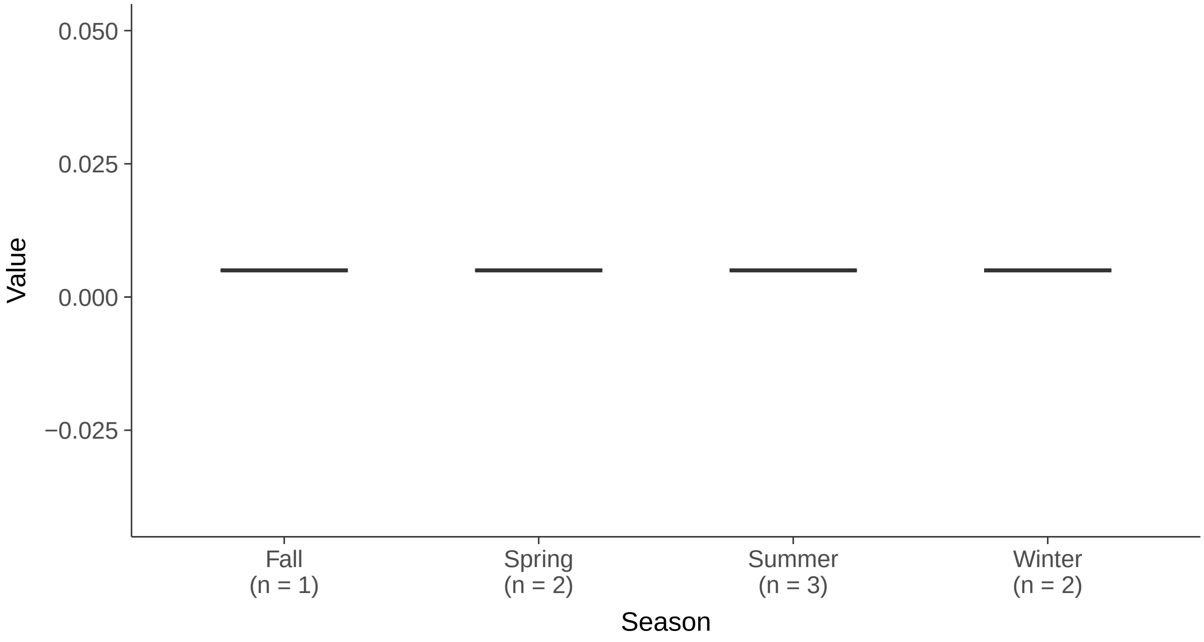
Boxplot

Cobalt, MW-14 (mg/L)



Boxplot by Season

Cobalt, MW-14 (mg/L)

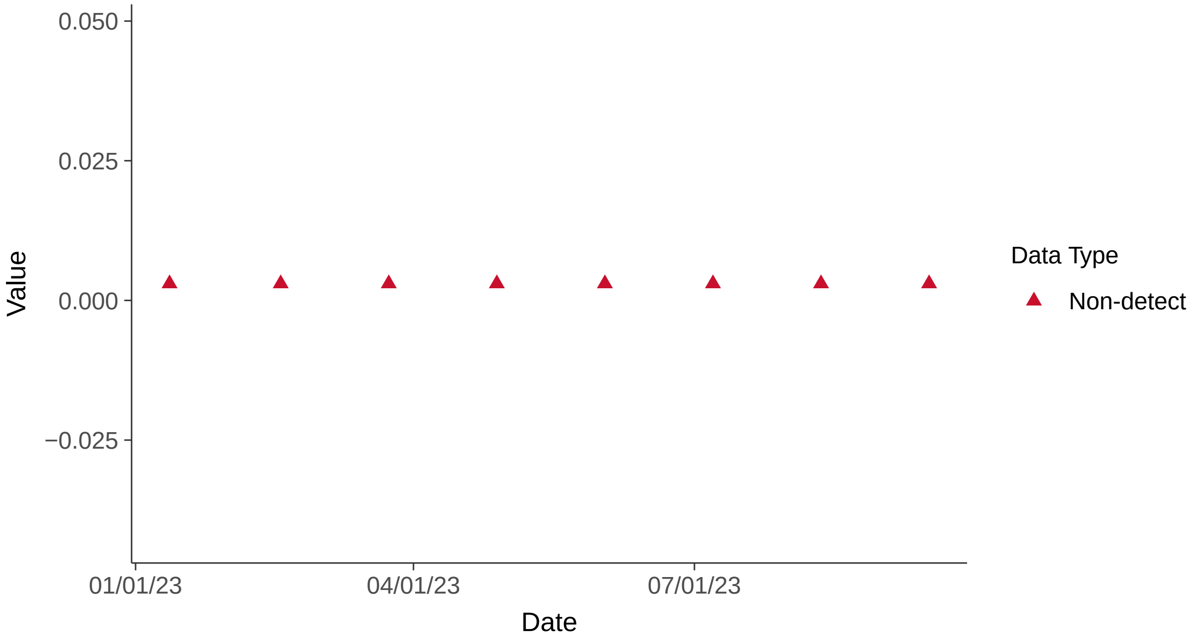


Appendix IV: Lead, MW-14

ID: 14_2_15

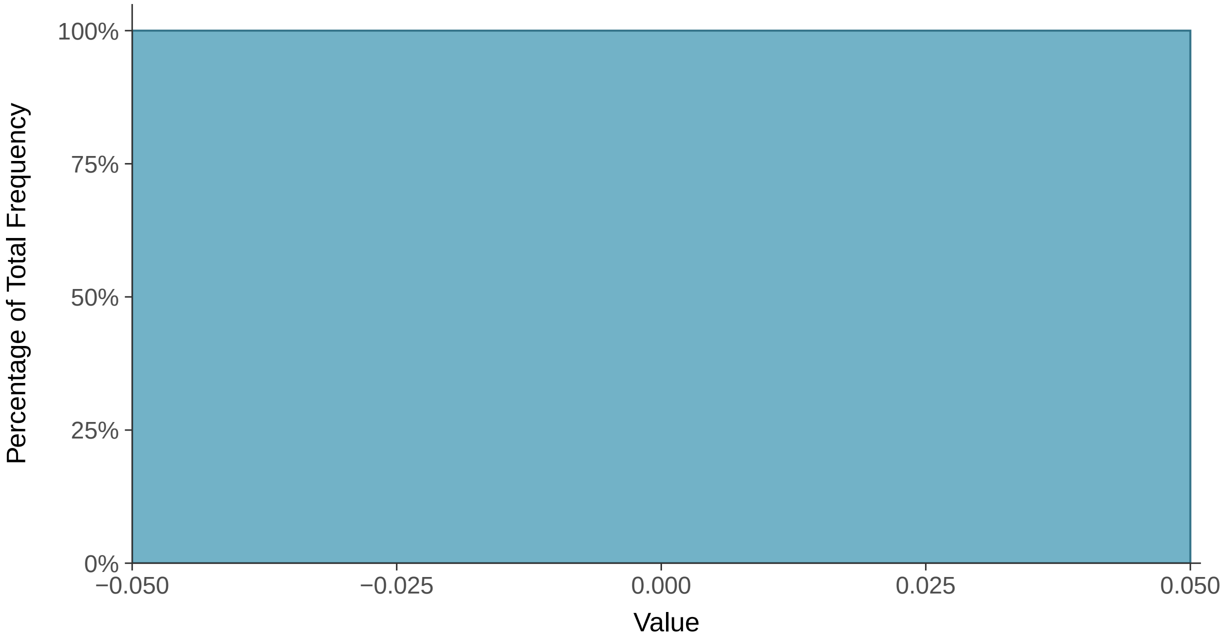
Scatter Plot

Lead, MW-14 (mg/L)



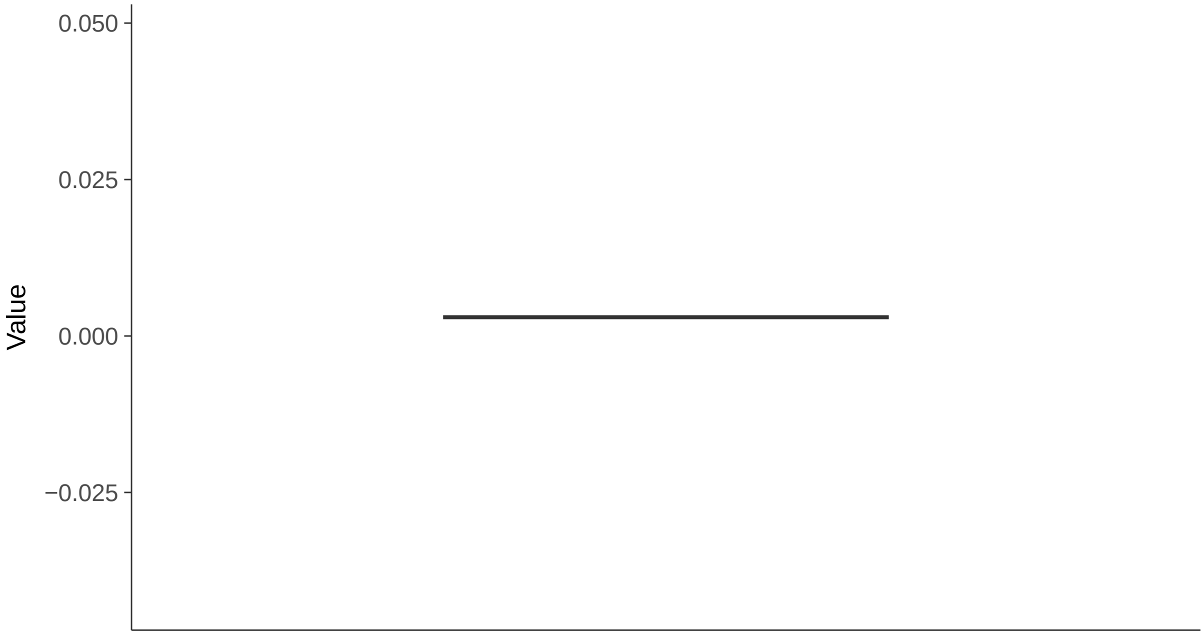
Histogram

Lead, MW-14 (mg/L)



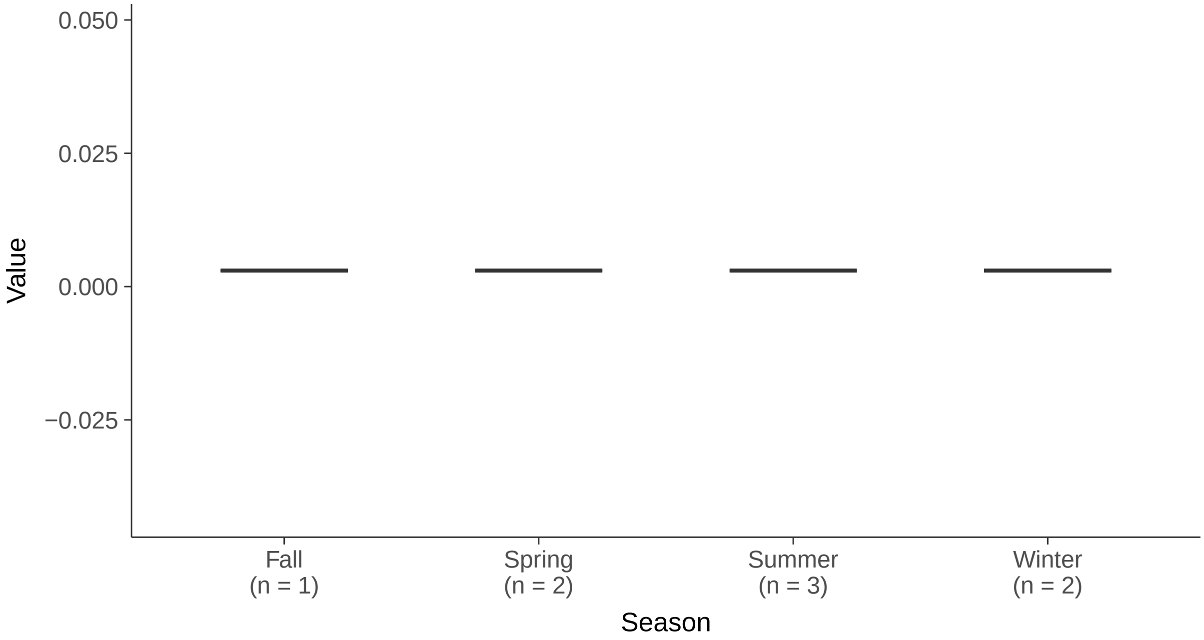
Boxplot

Lead, MW-14 (mg/L)



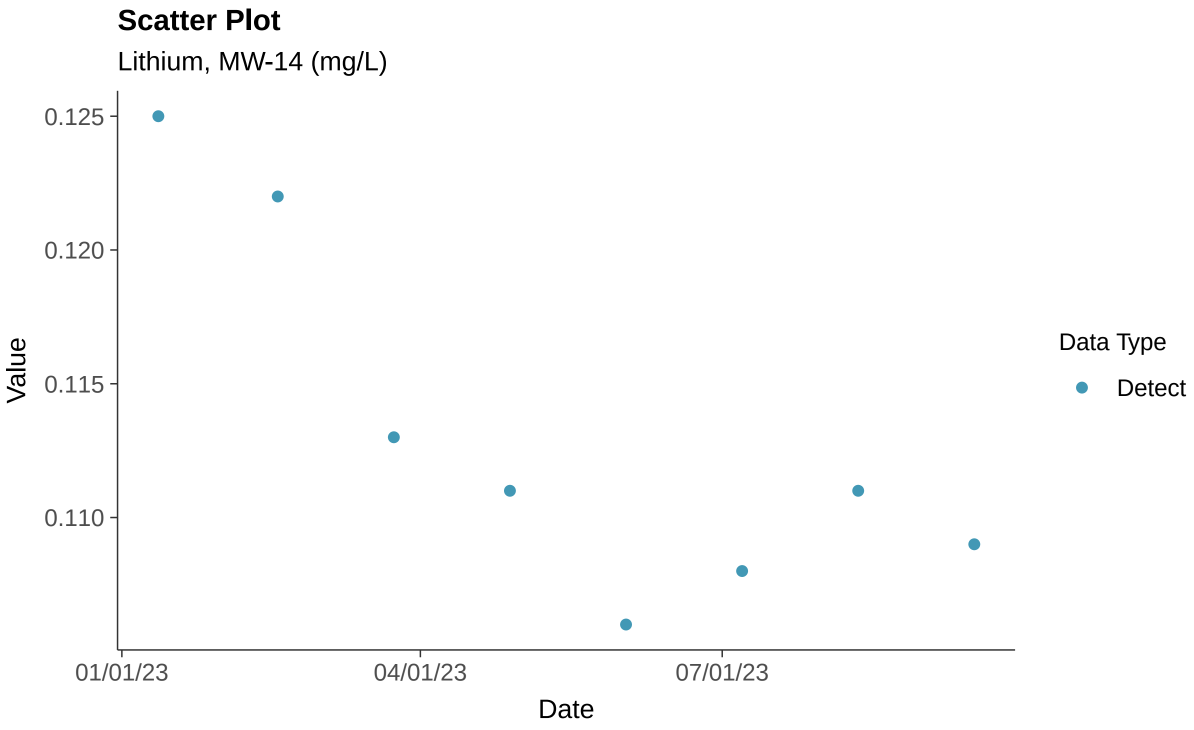
Boxplot by Season

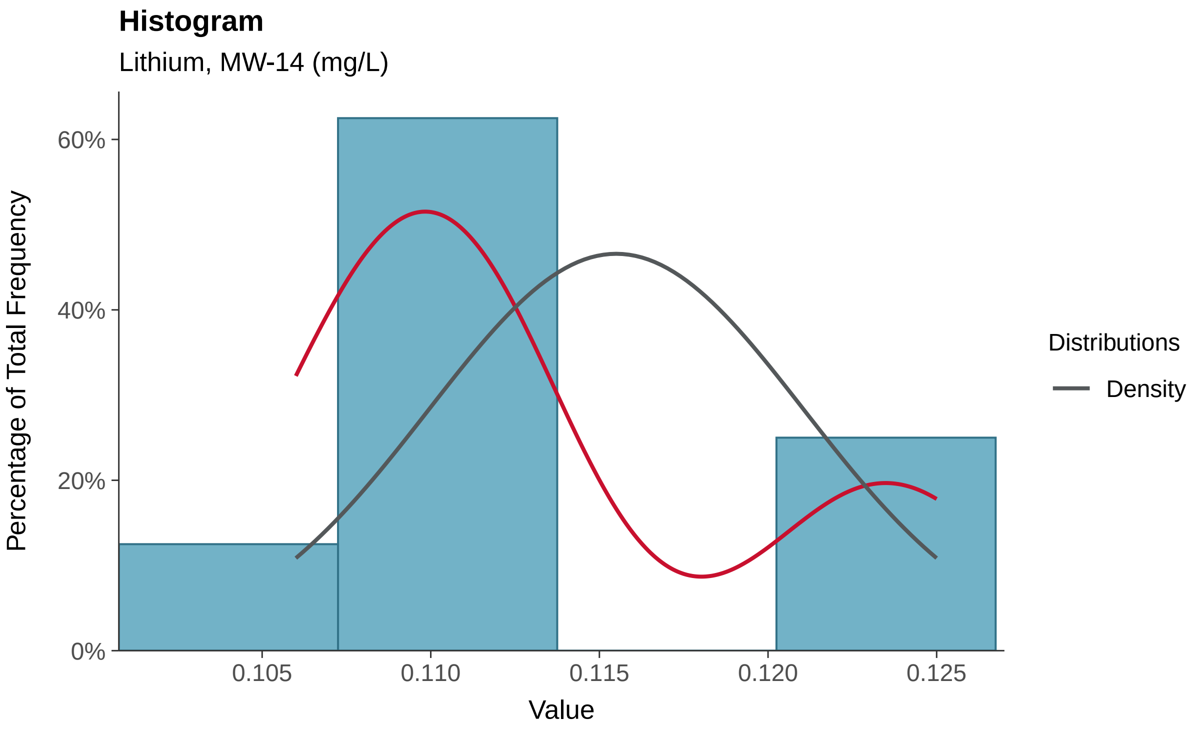
Lead, MW-14 (mg/L)



Appendix IV: Lithium, MW-14

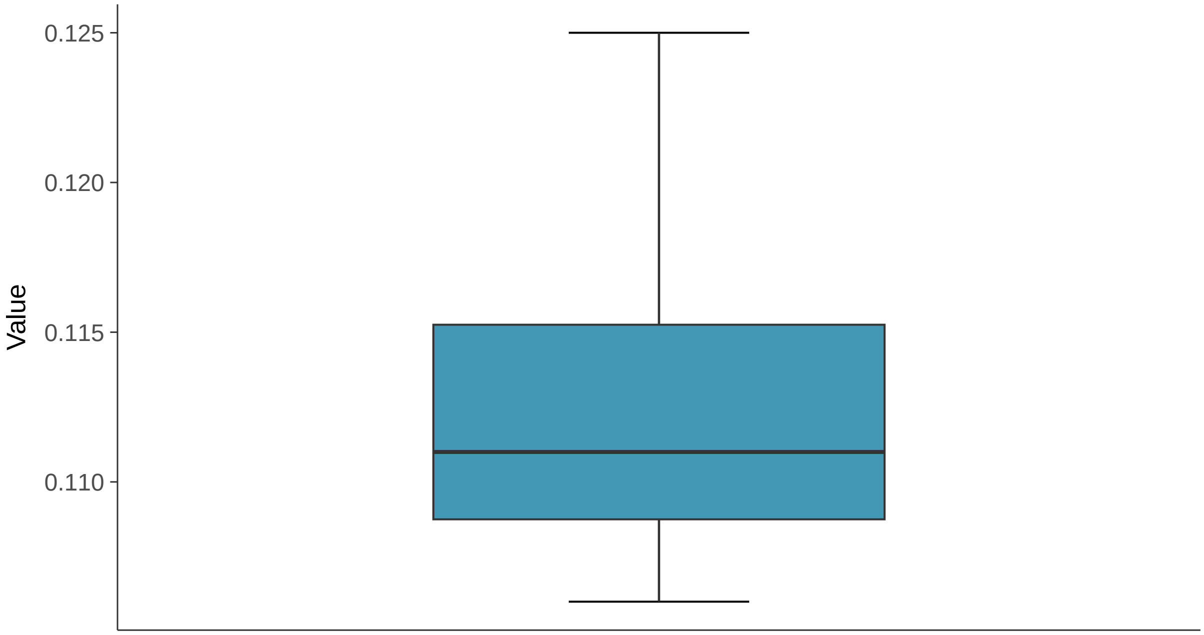
ID: 14_2_16





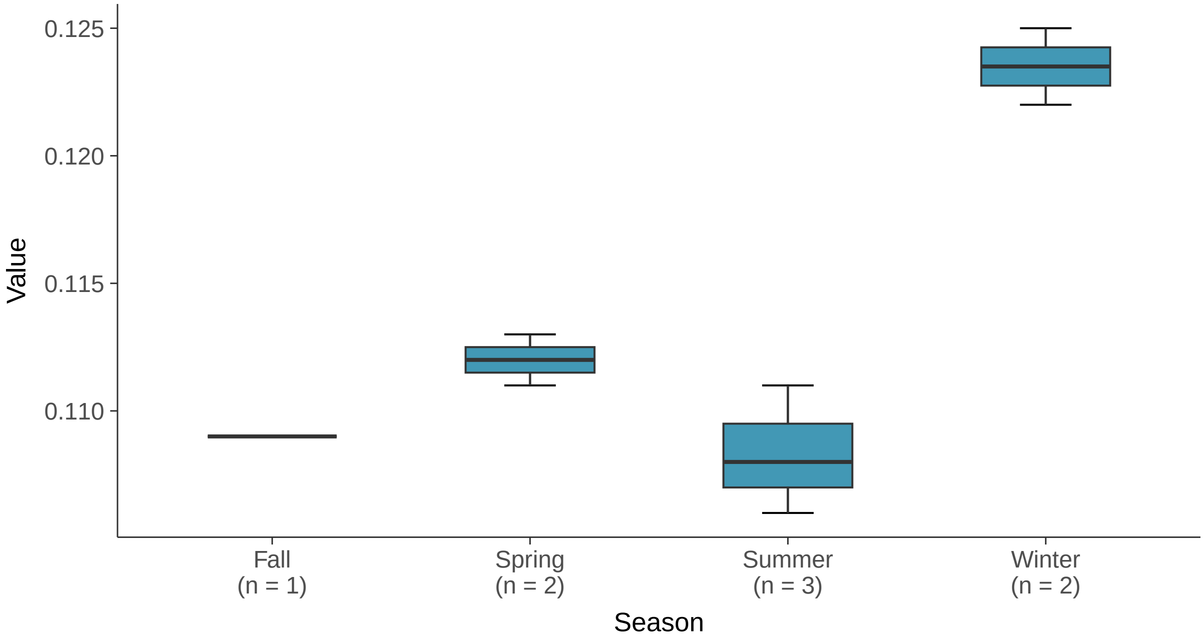
Boxplot

Lithium, MW-14 (mg/L)



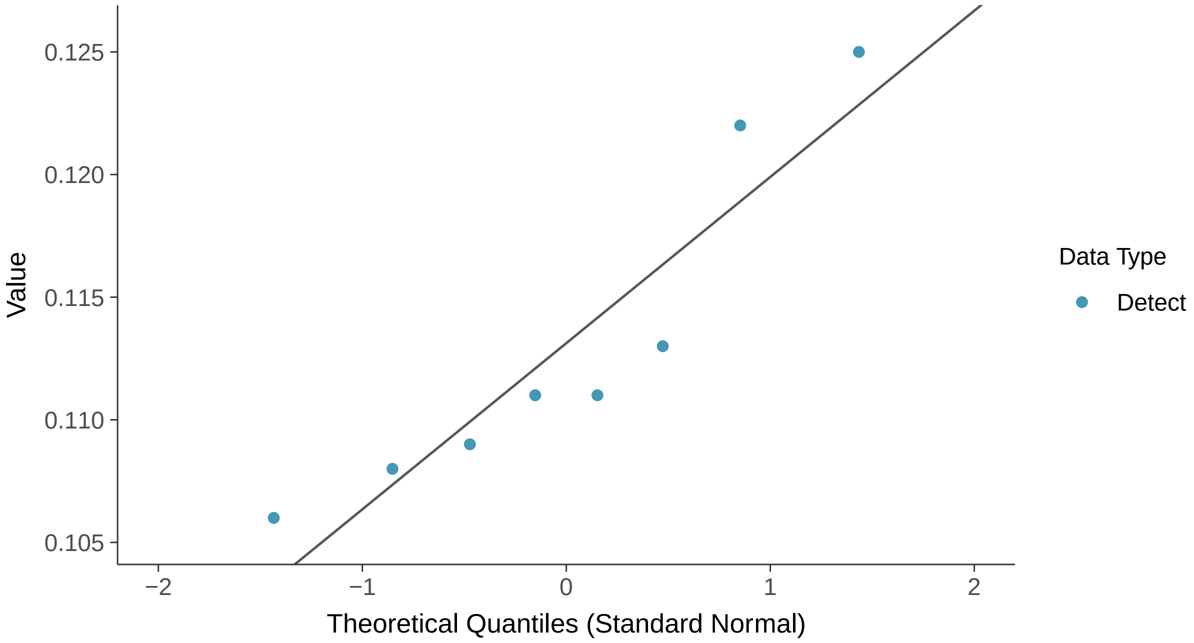
Boxplot by Season

Lithium, MW-14 (mg/L)



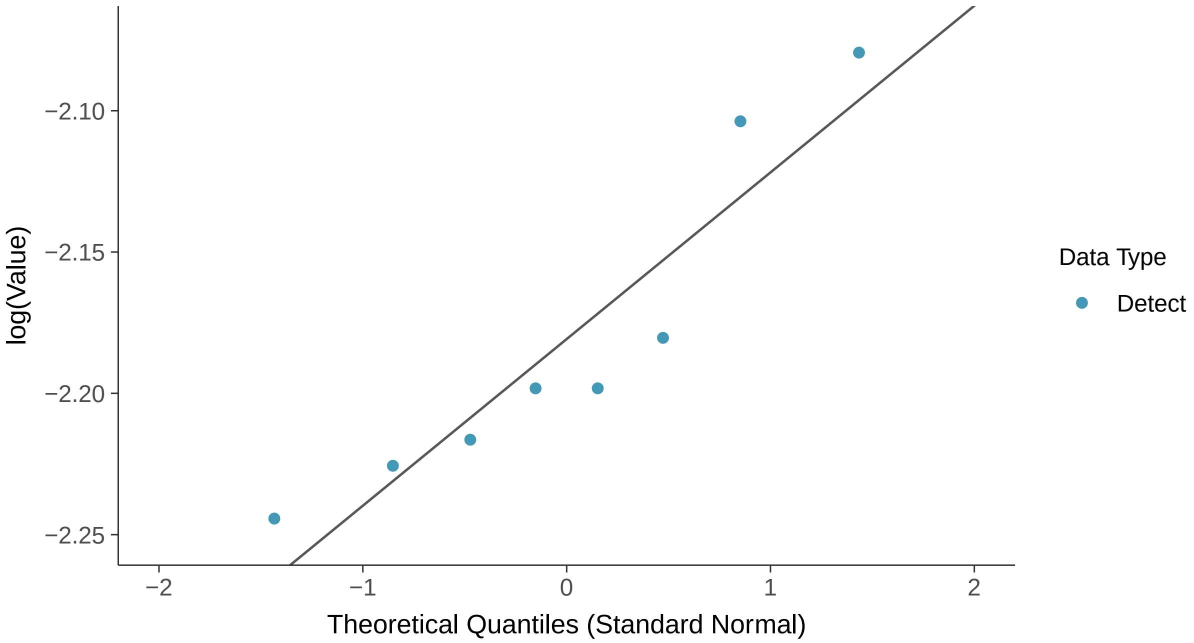
Normal Q-Q plot

Lithium, MW-14 (mg/L)



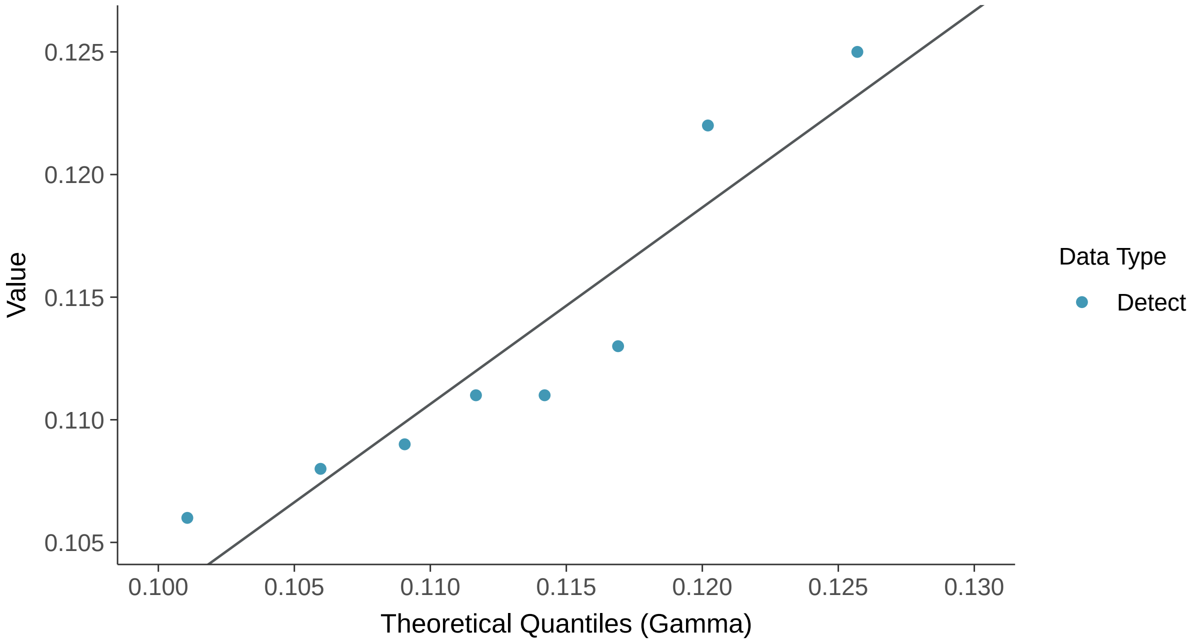
Lognormal Q-Q plot

Lithium, MW-14 (mg/L)



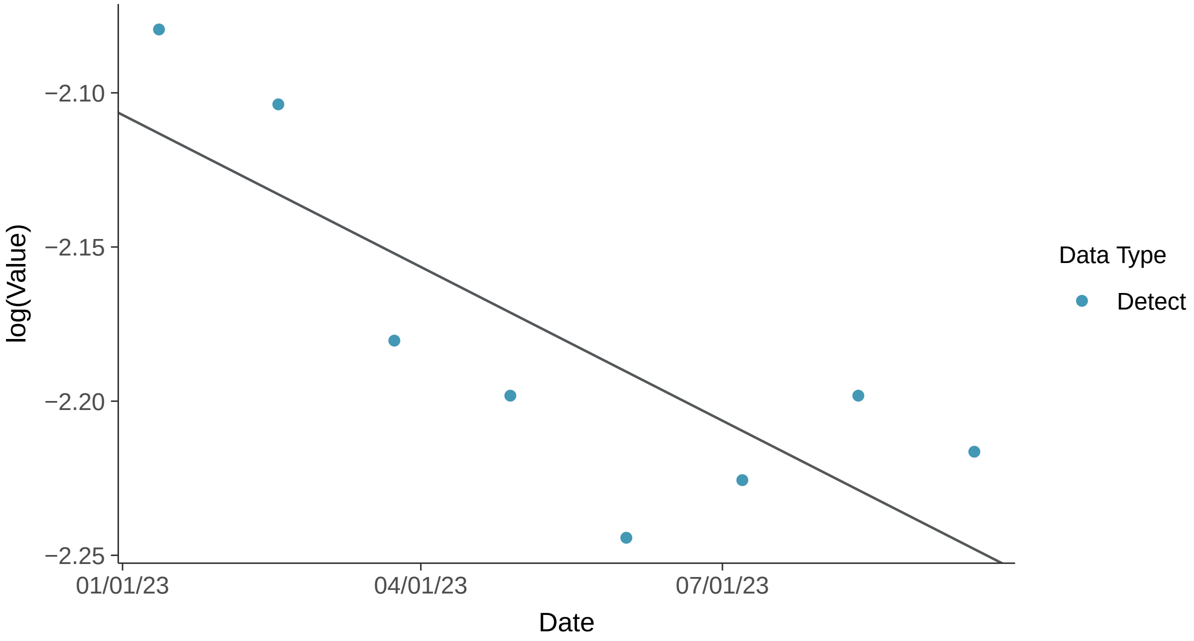
Gamma Q-Q plot

Lithium, MW-14 (mg/L)



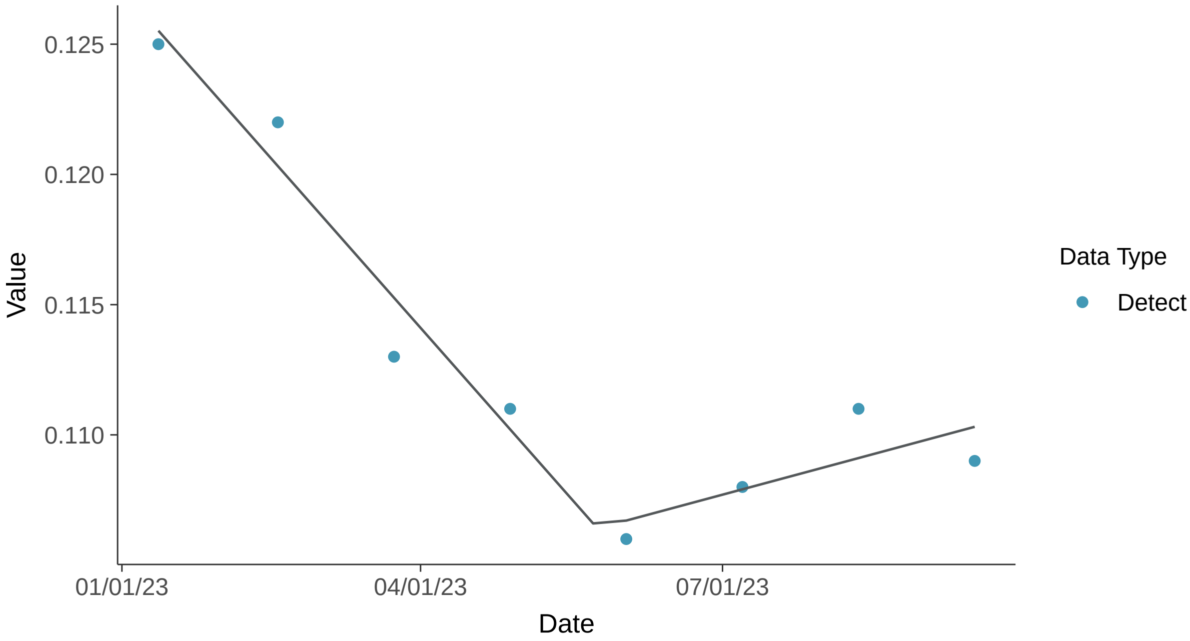
Trend Regression: Lognormal MLE

Lithium, MW-14 (mg/L)



Trend Regression: Piecewise Linear-Linear

Lithium, MW-14 (mg/L)

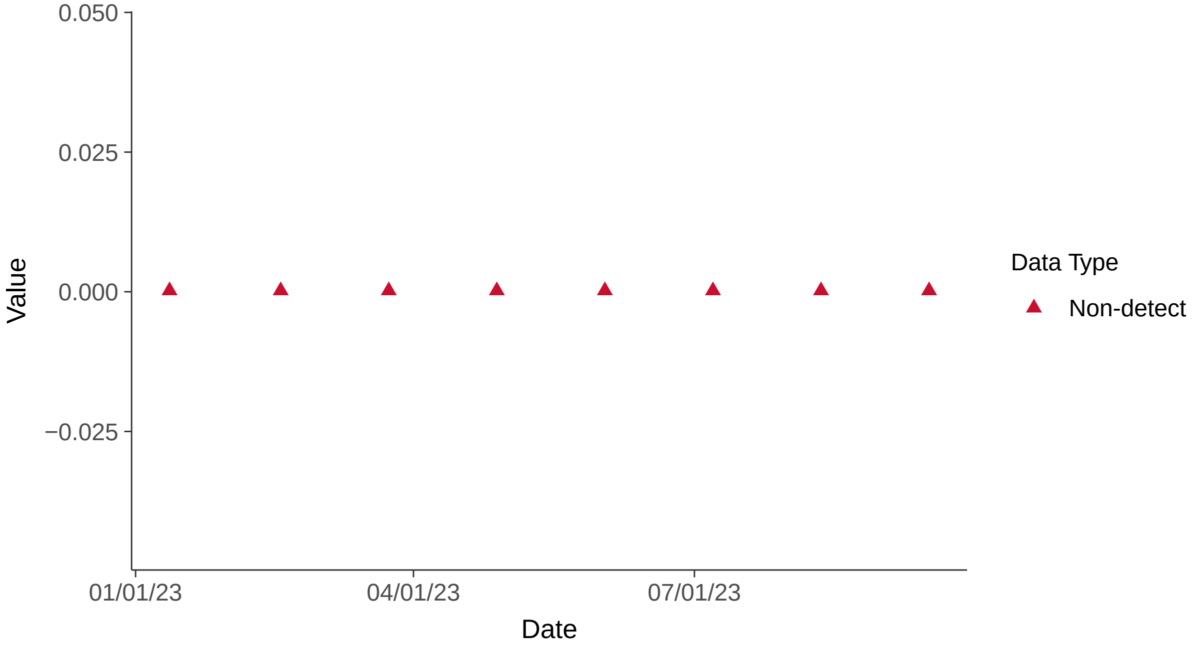


Appendix IV: Mercury, MW-14

ID: 14_2_17

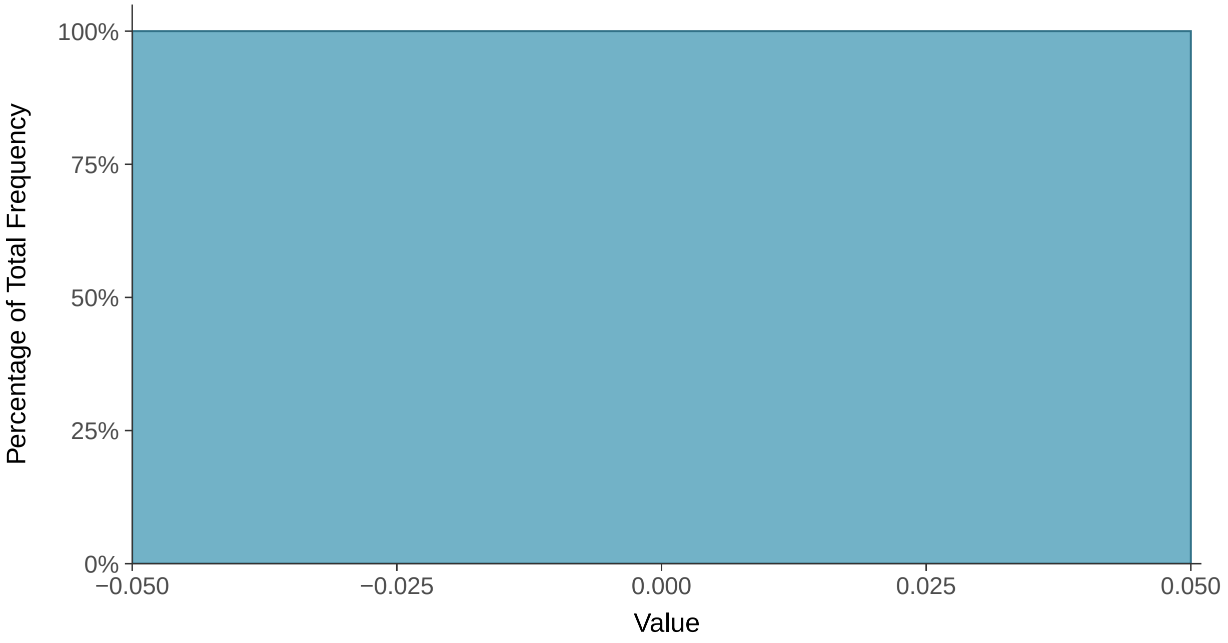
Scatter Plot

Mercury, MW-14 (mg/L)



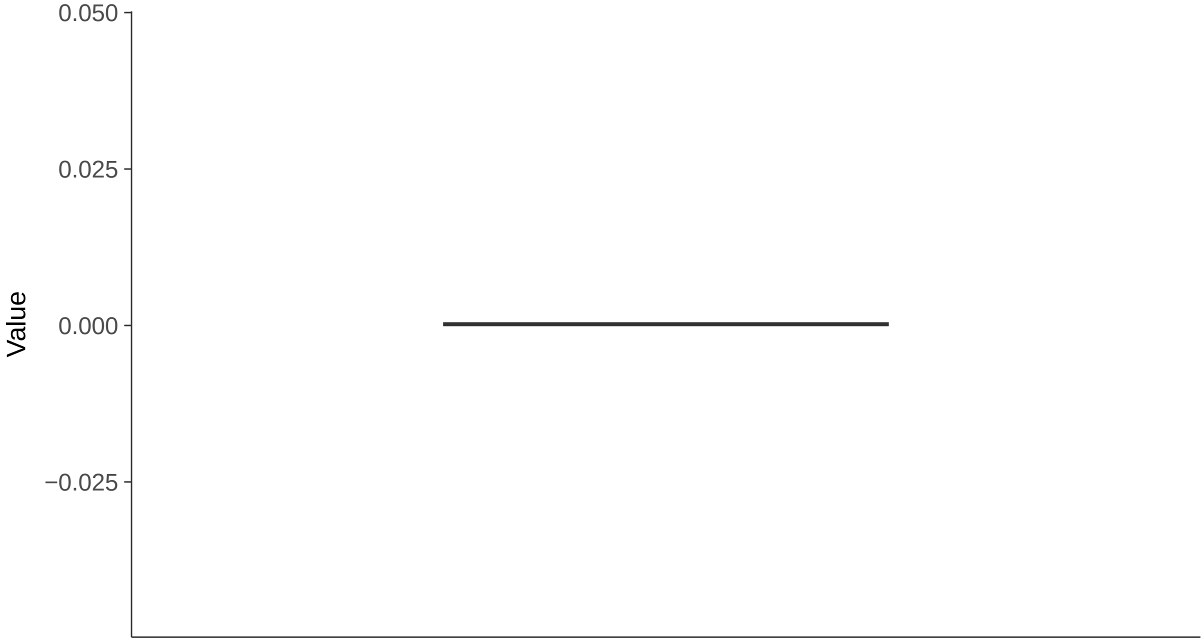
Histogram

Mercury, MW-14 (mg/L)



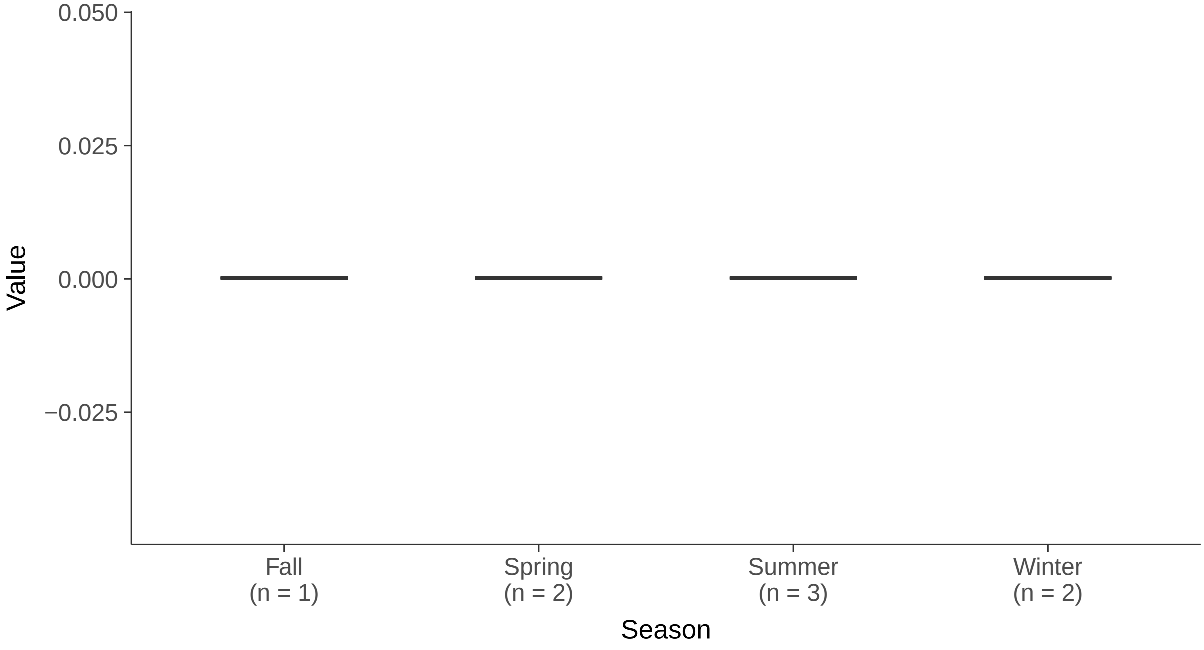
Boxplot

Mercury, MW-14 (mg/L)



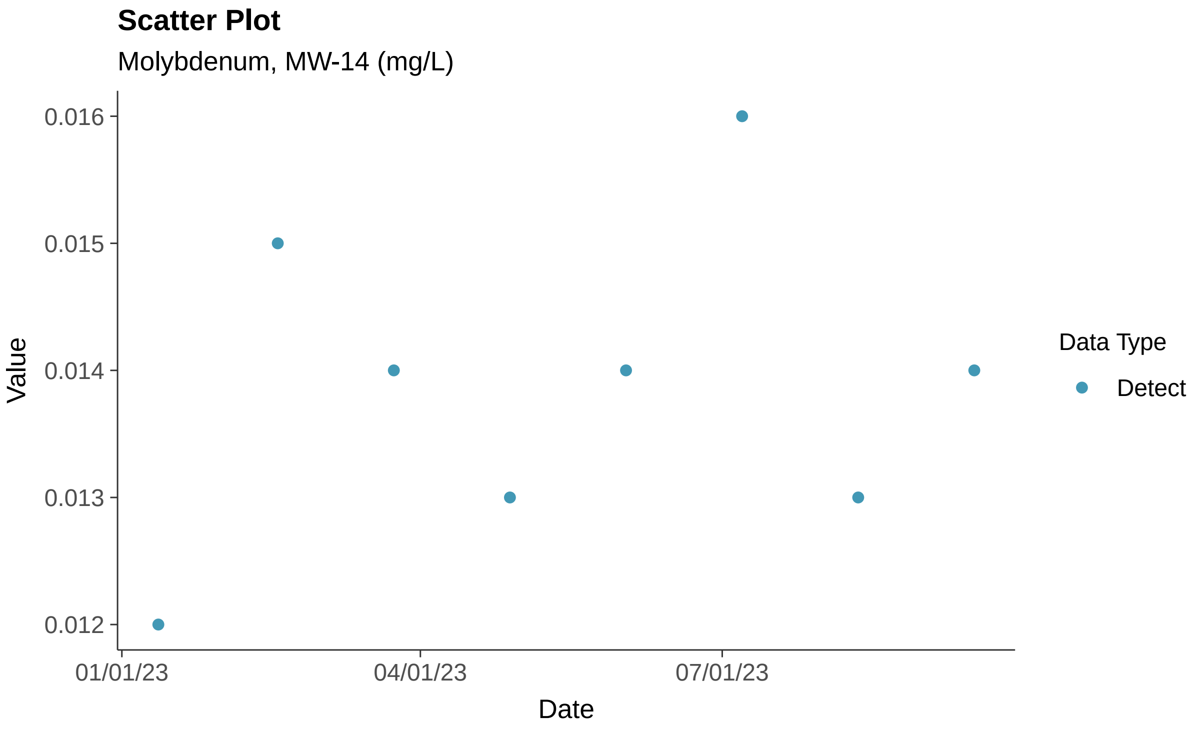
Boxplot by Season

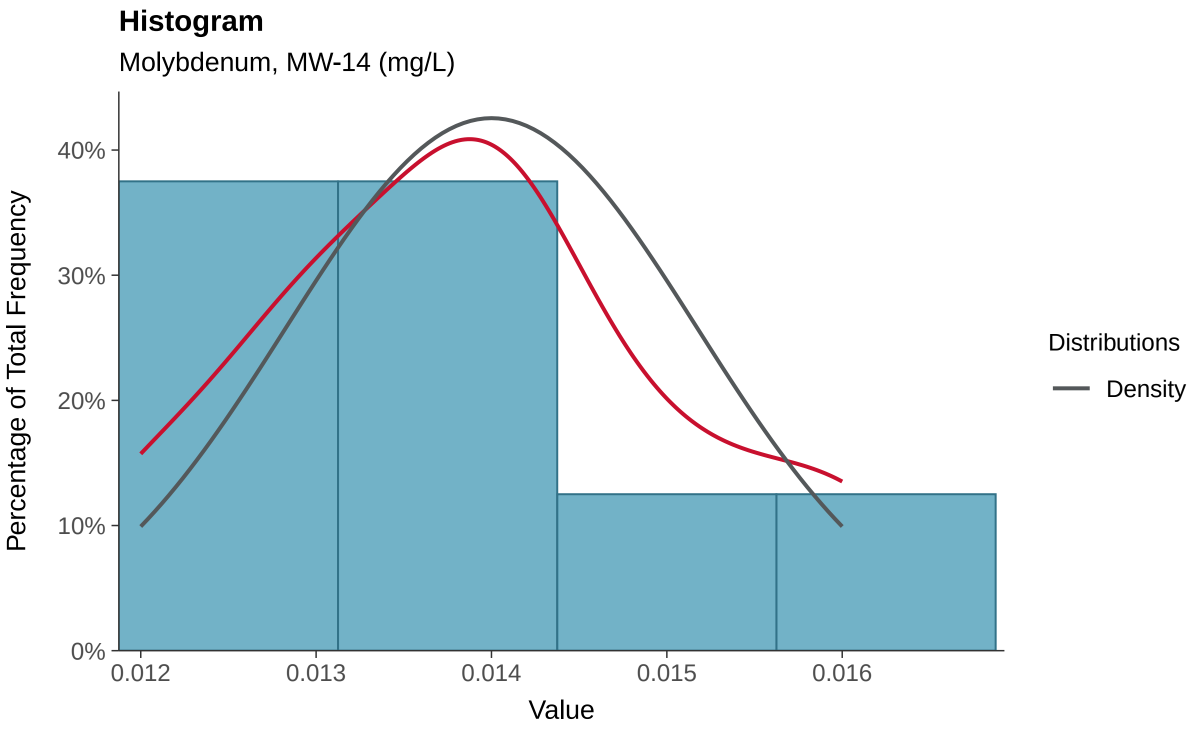
Mercury, MW-14 (mg/L)



Appendix IV: Molybdenum, MW-14

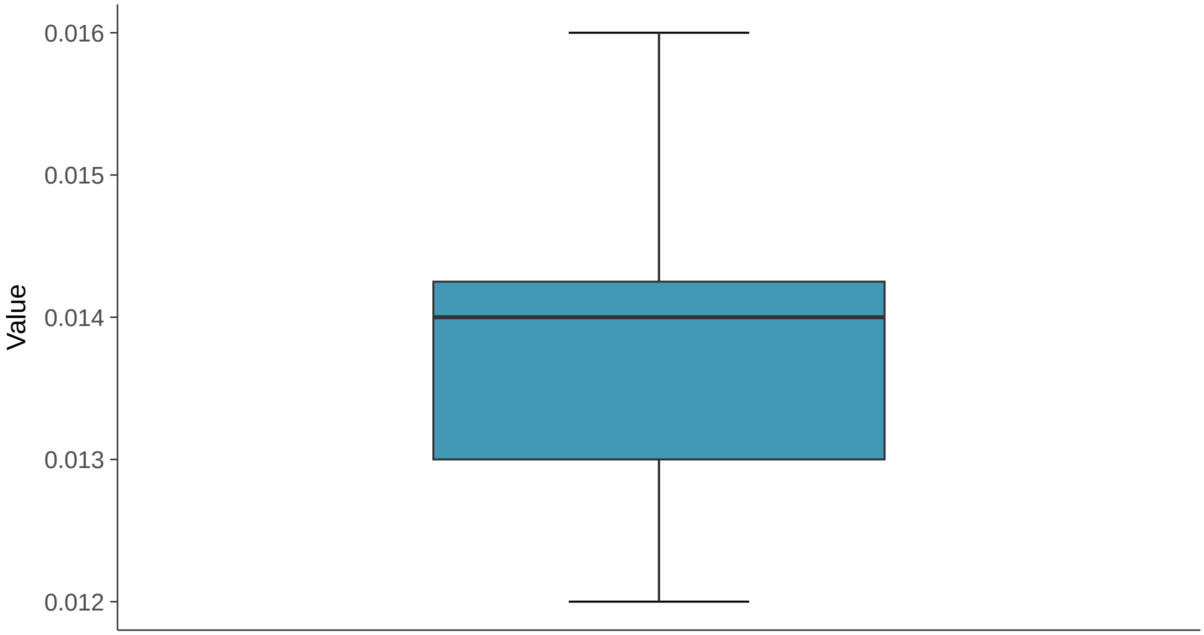
ID: 14_2_18





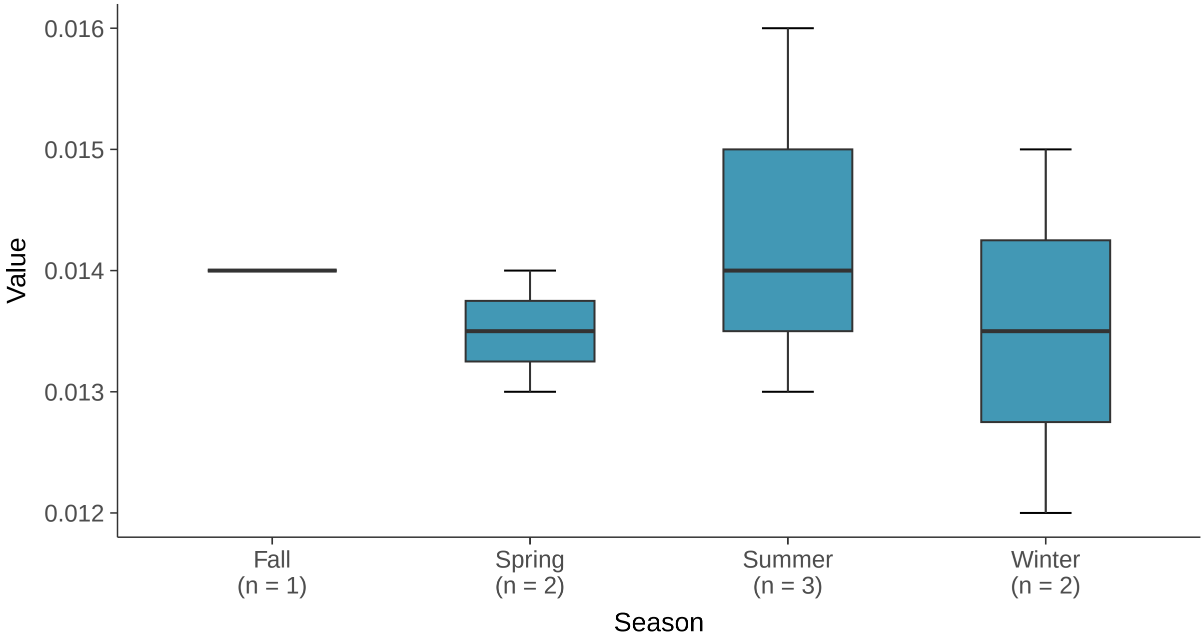
Boxplot

Molybdenum, MW-14 (mg/L)



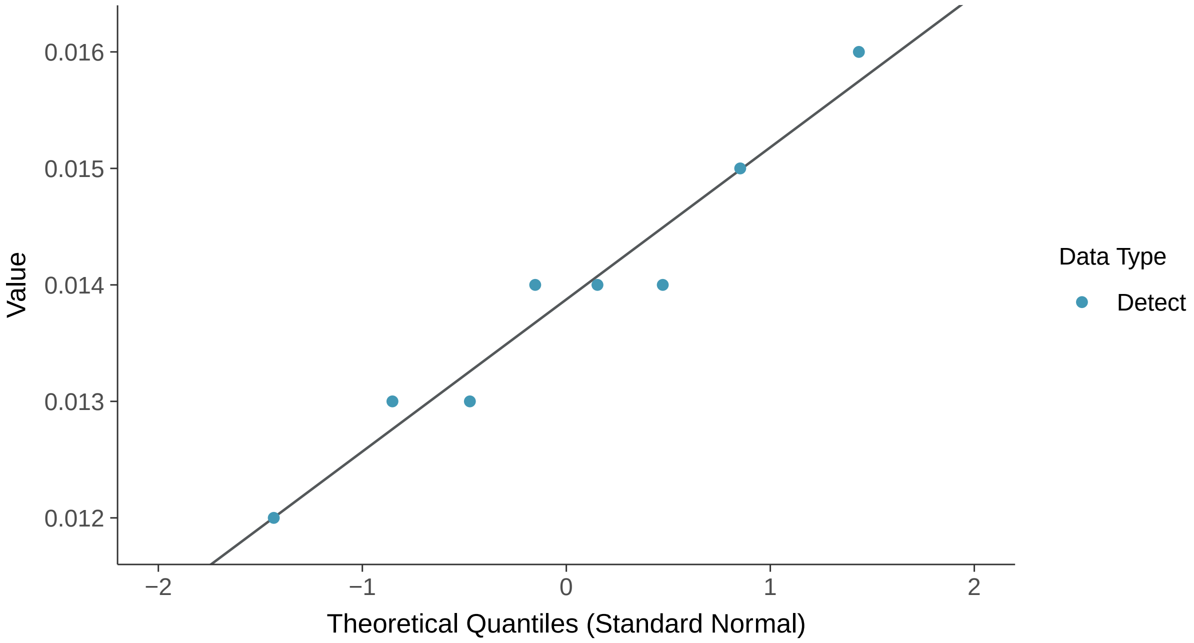
Boxplot by Season

Molybdenum, MW-14 (mg/L)



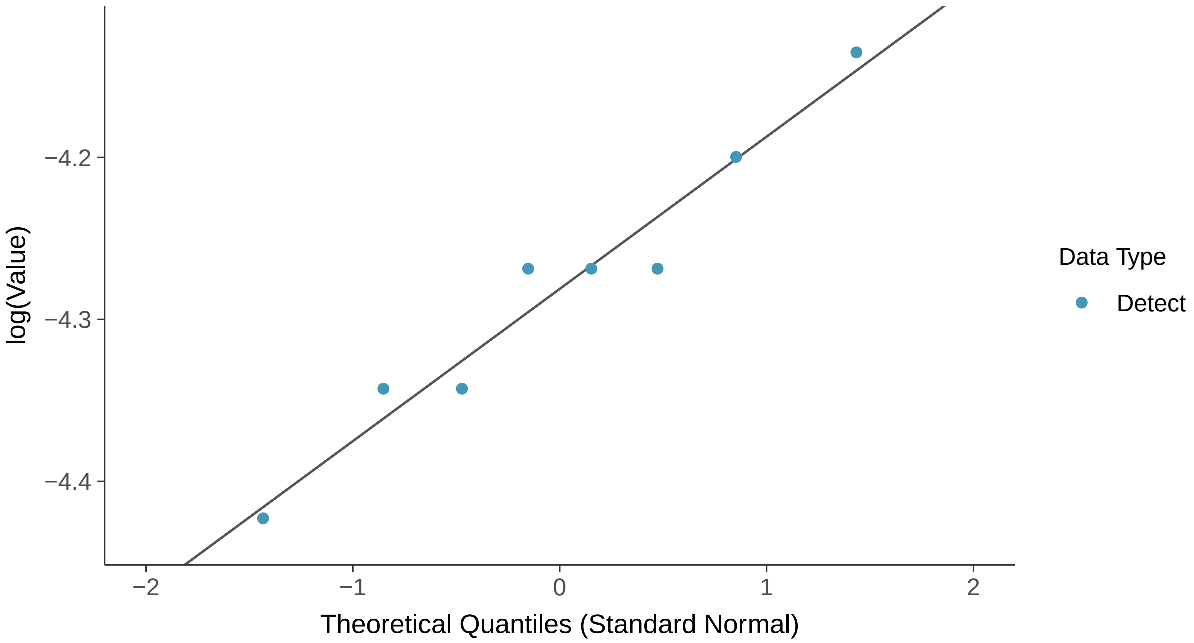
Normal Q-Q plot

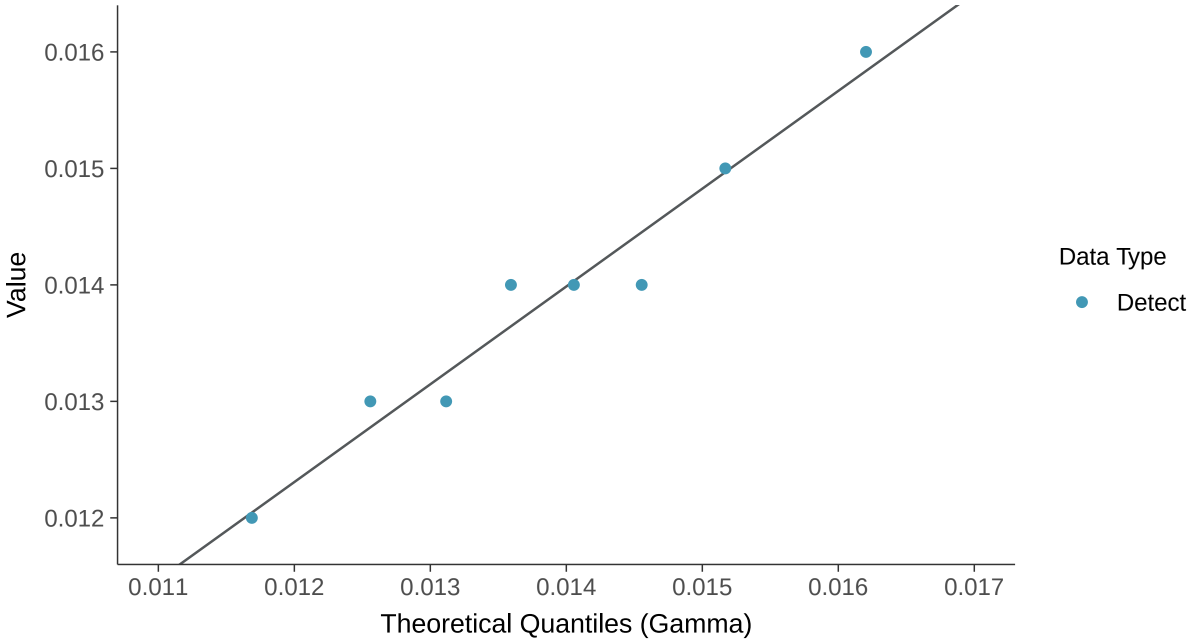
Molybdenum, MW-14 (mg/L)



Lognormal Q-Q plot

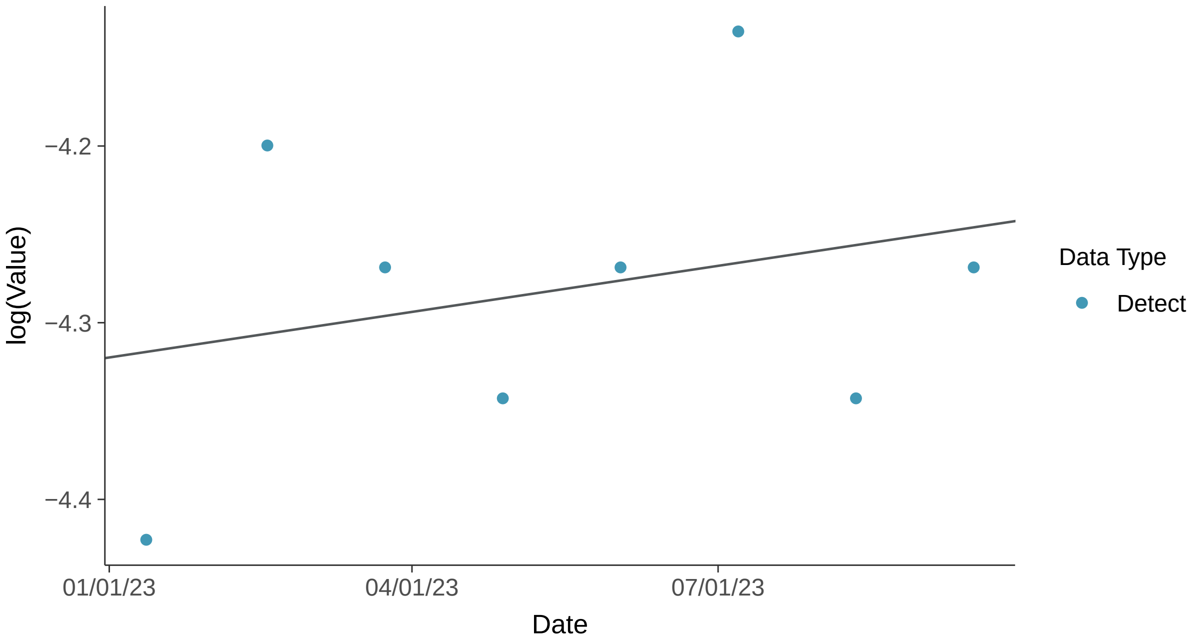
Molybdenum, MW-14 (mg/L)





Gamma Q-Q plot

Molybdenum, MW-14 (mg/L)



Trend Regression: Lognormal MLE

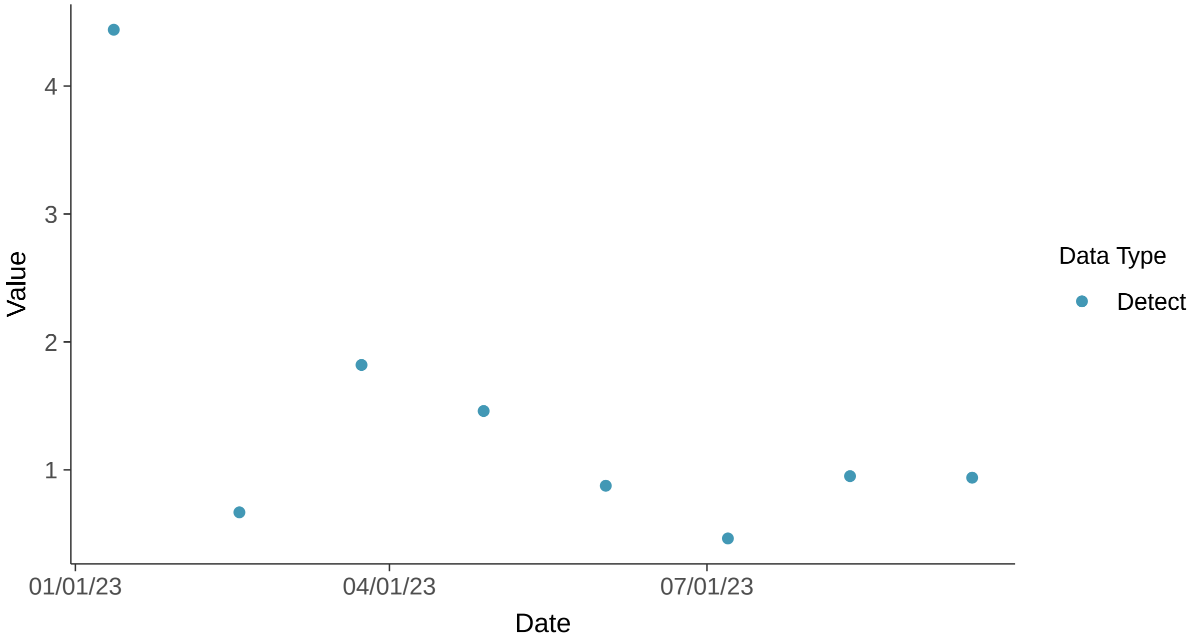
Molybdenum, MW-14 (mg/L)

Appendix IV: Radium-226/228, MW-14

ID: 14_2_20

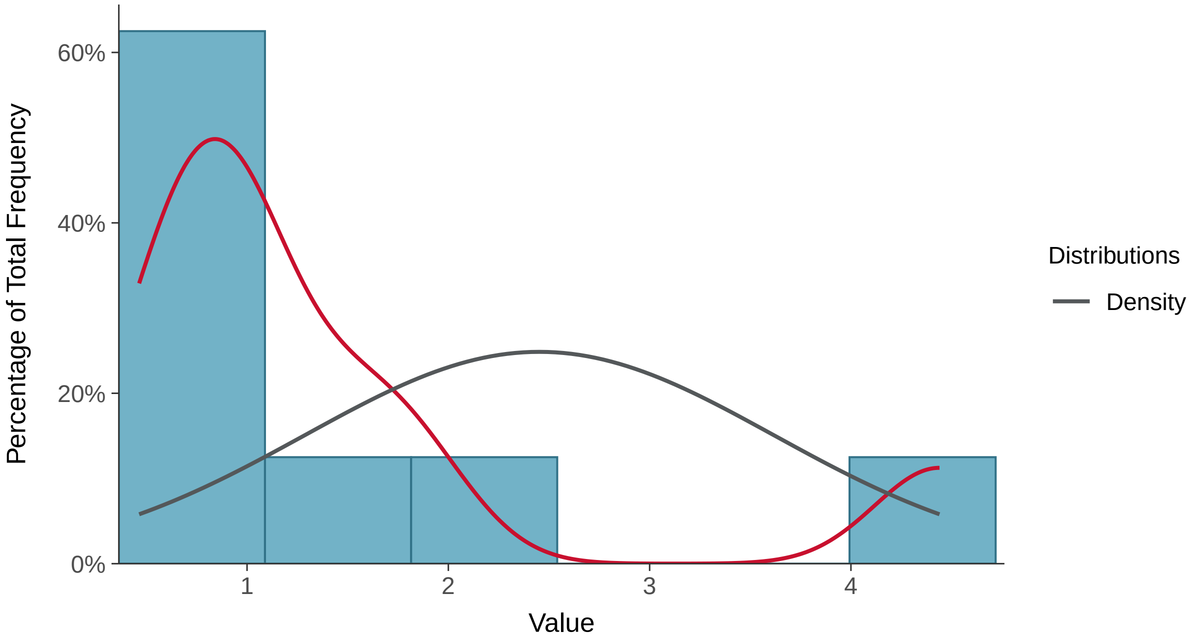
Scatter Plot

Radium-226/228, MW-14 (pCi/L)



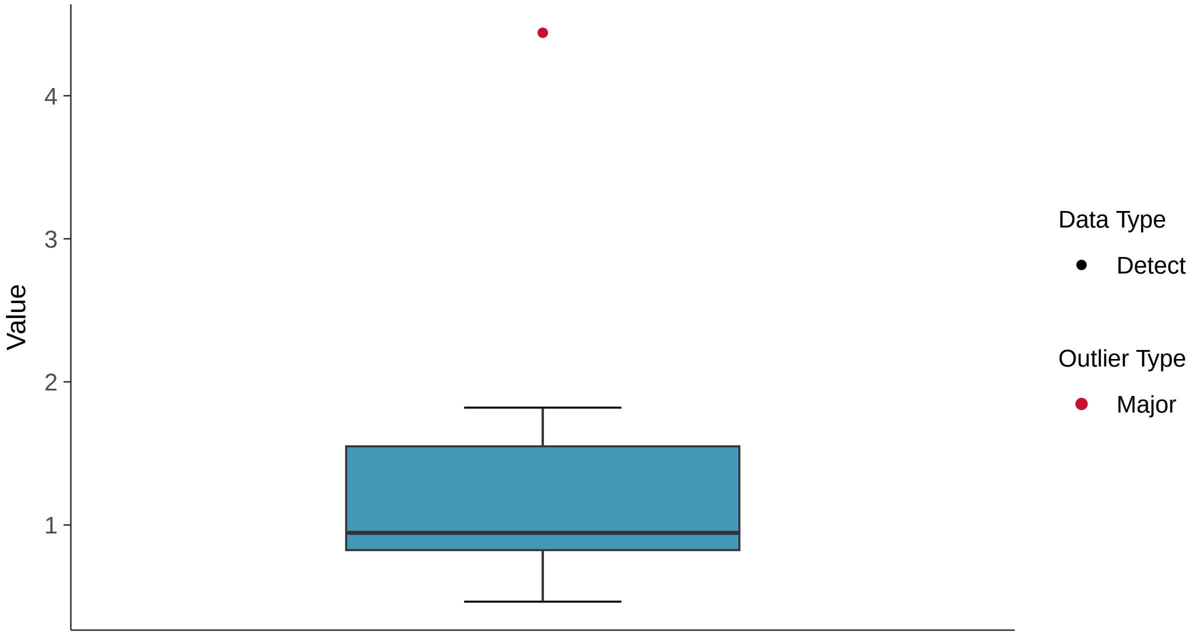
Histogram

Radium-226/228, MW-14 (pCi/L)



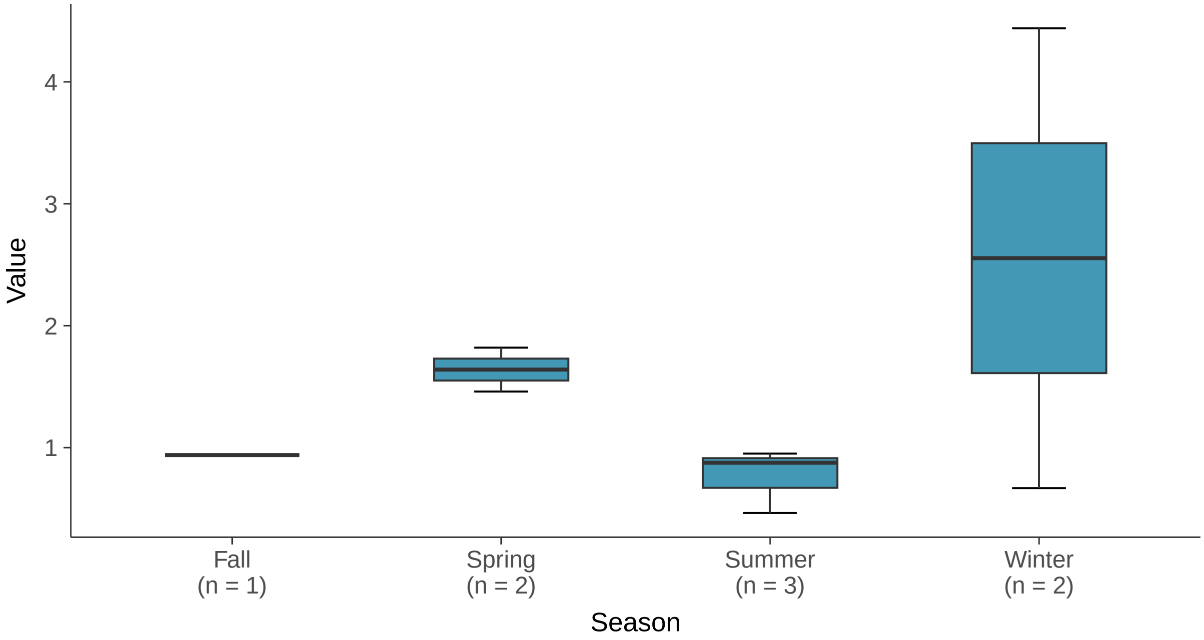
Boxplot

Radium-226/228, MW-14 (pCi/L)



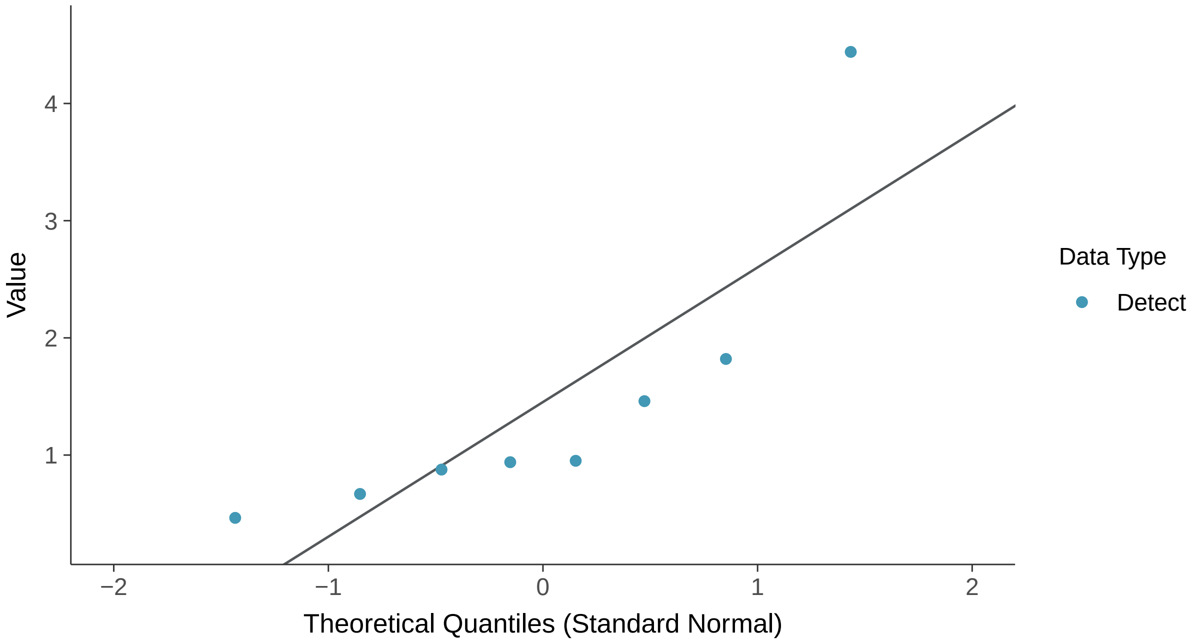
Boxplot by Season

Radium-226/228, MW-14 (pCi/L)



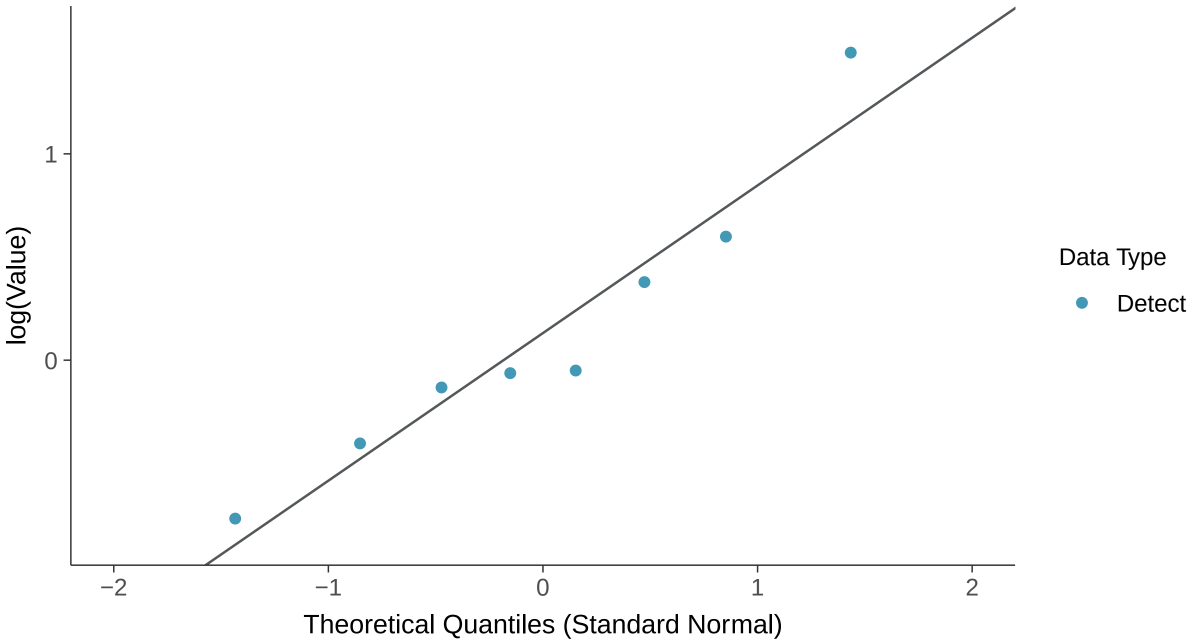
Normal Q-Q plot

Radium-226/228, MW-14 (pCi/L)



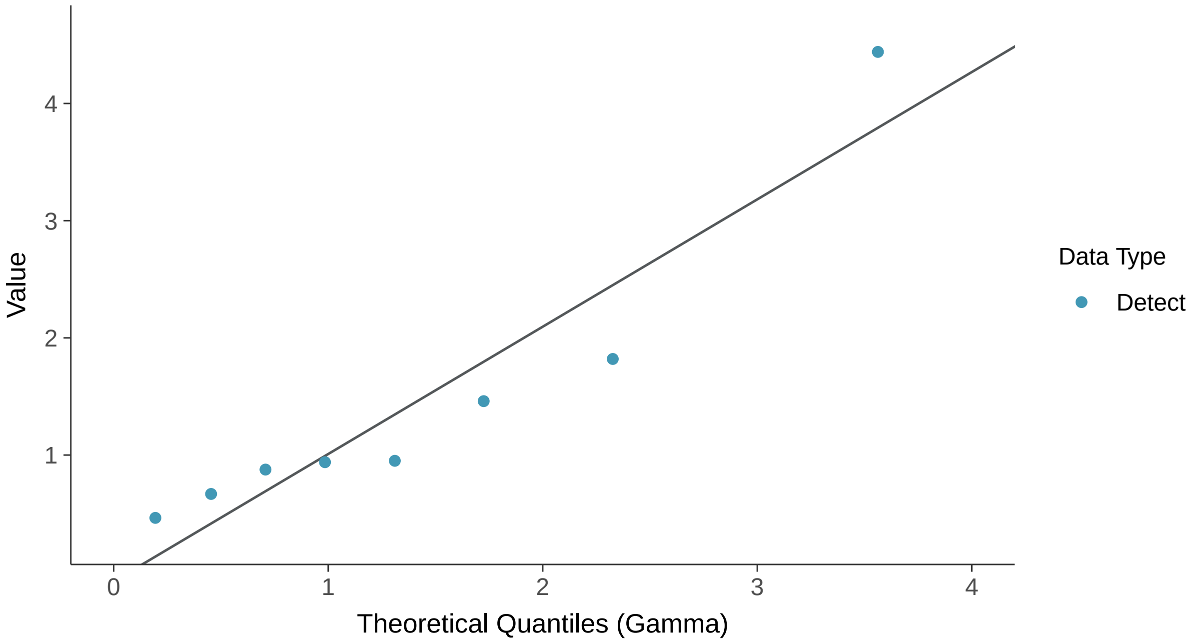
Lognormal Q-Q plot

Radium-226/228, MW-14 (pCi/L)



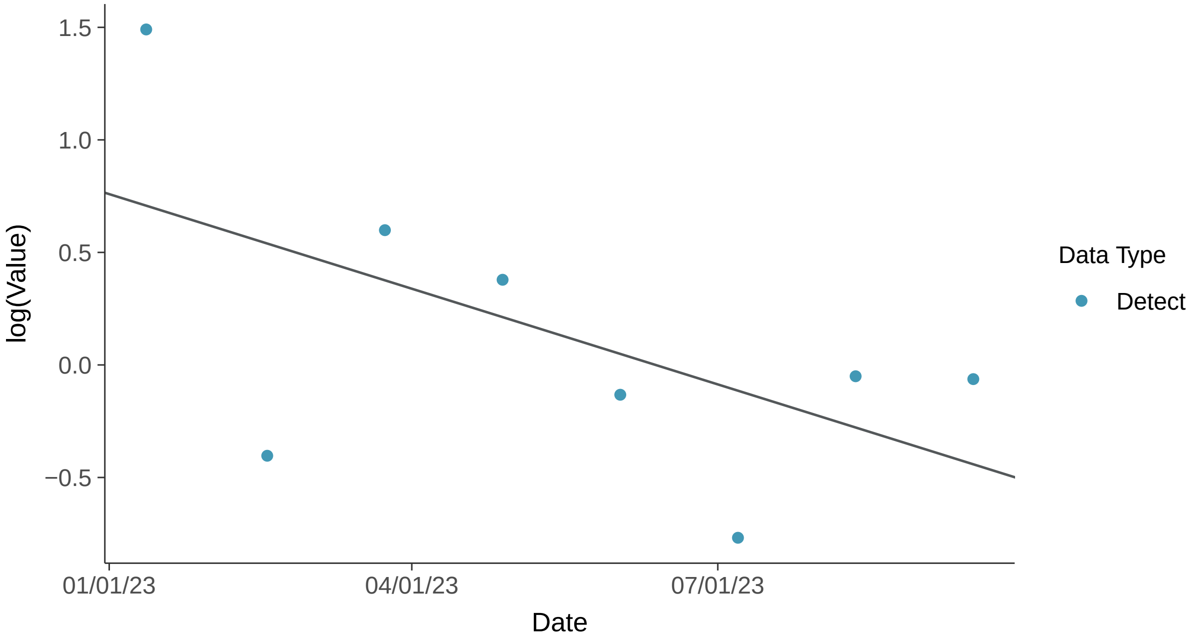
Gamma Q-Q plot

Radium-226/228, MW-14 (pCi/L)



Trend Regression: Lognormal MLE

Radium-226/228, MW-14 (pCi/L)

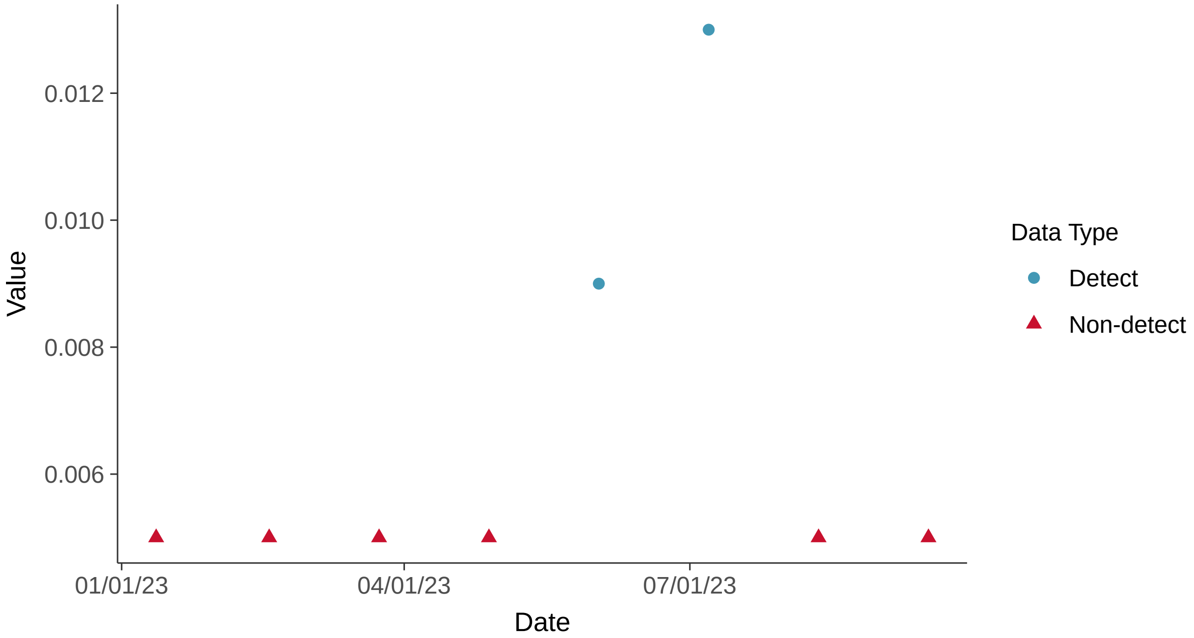


Appendix IV: Selenium, MW-14

ID: 14_2_22

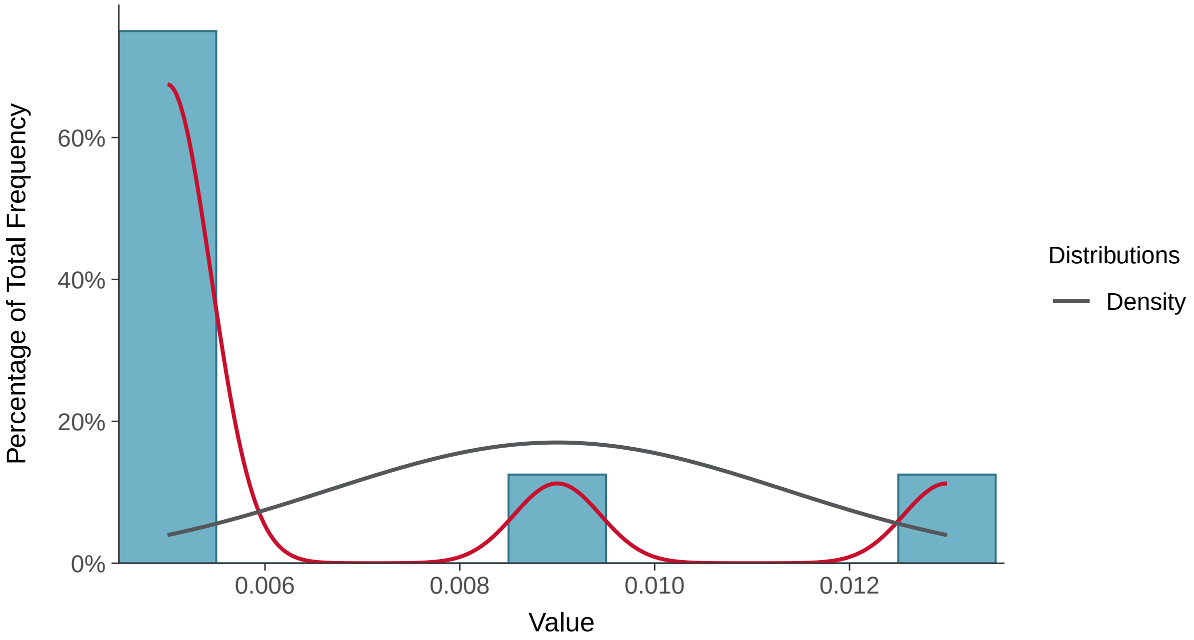
Scatter Plot

Selenium, MW-14 (mg/L)



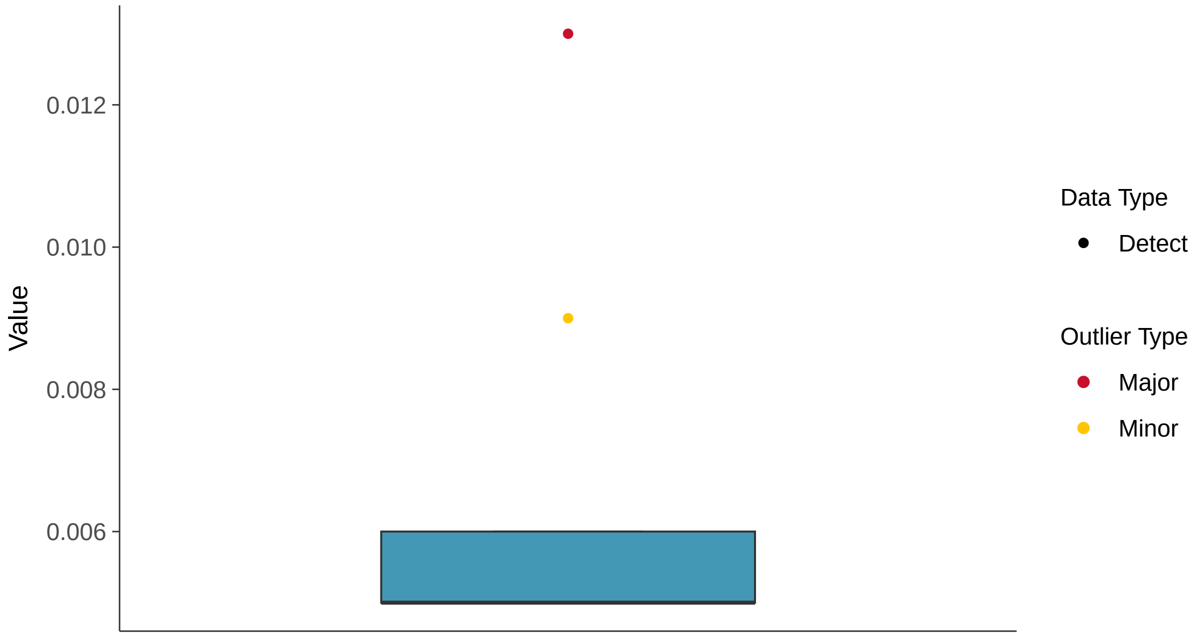
Histogram

Selenium, MW-14 (mg/L)



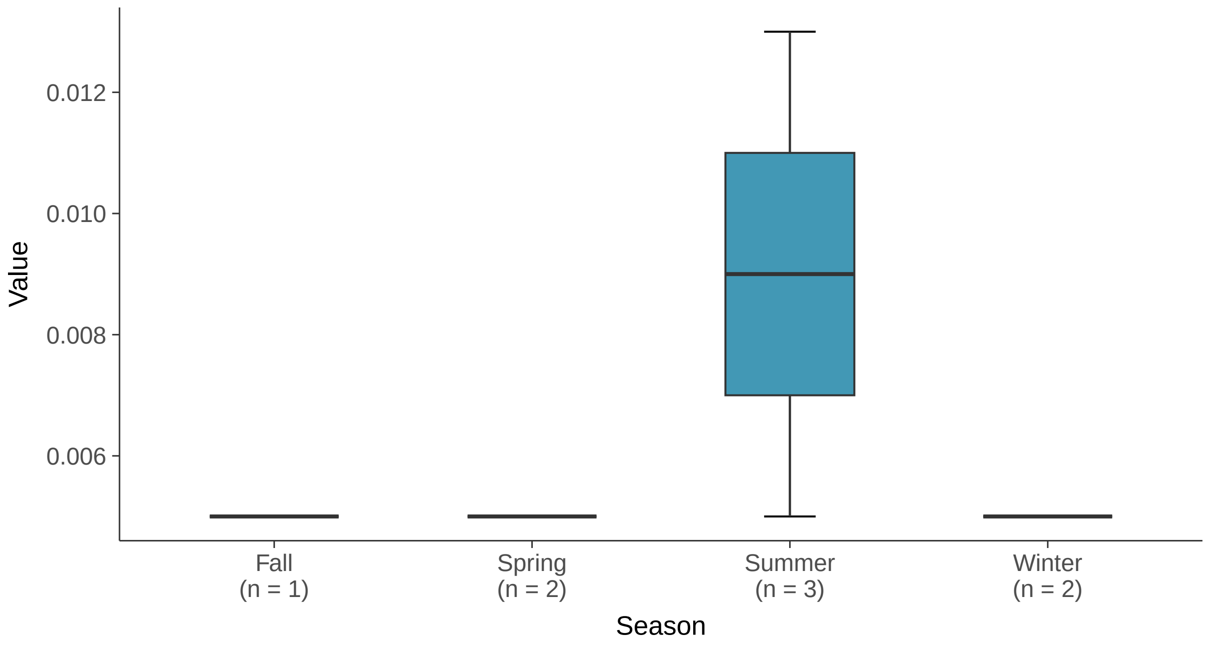
Boxplot

Selenium, MW-14 (mg/L)



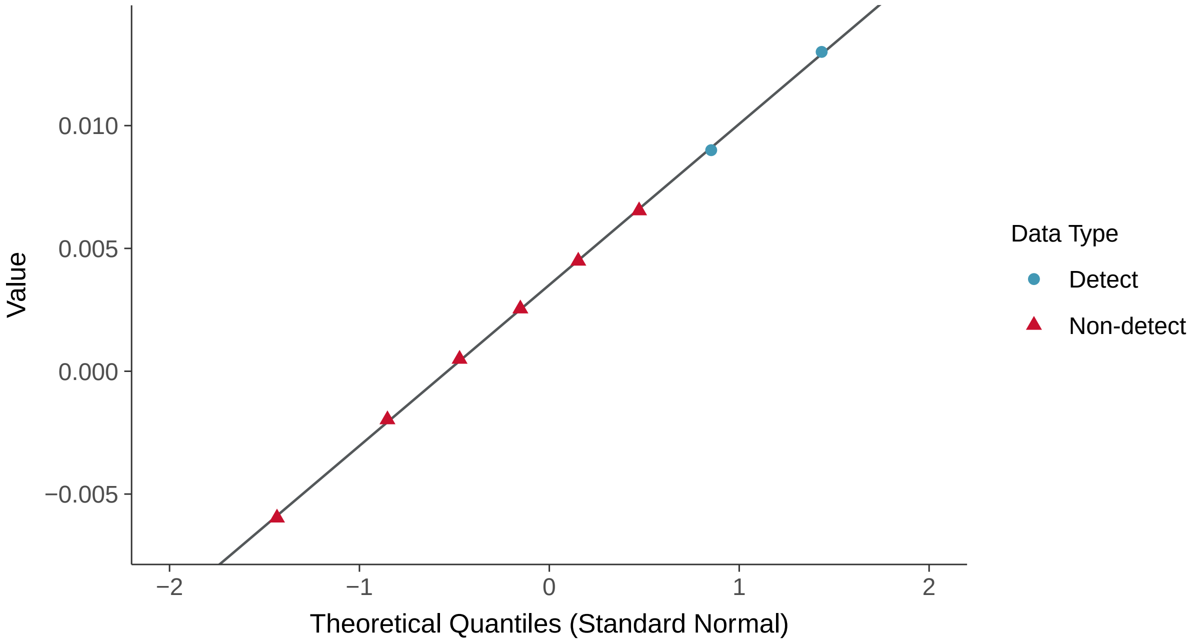
Boxplot by Season

Selenium, MW-14 (mg/L)



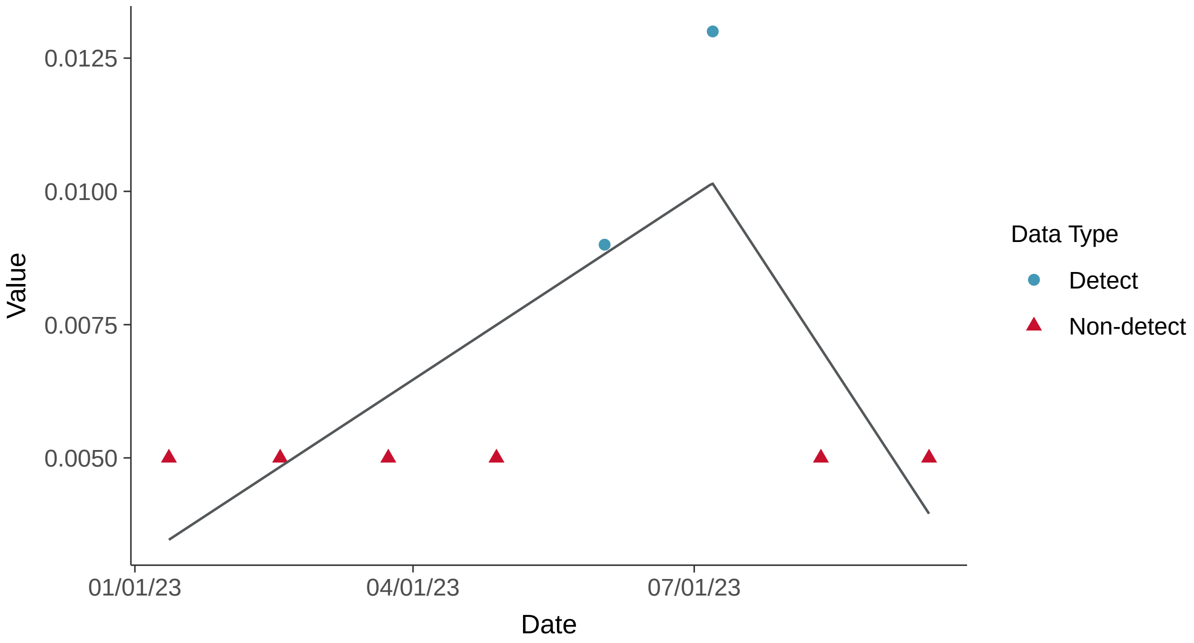
Normal Q-Q plot using ROS Imputed Estimates

Selenium, MW-14 (mg/L)



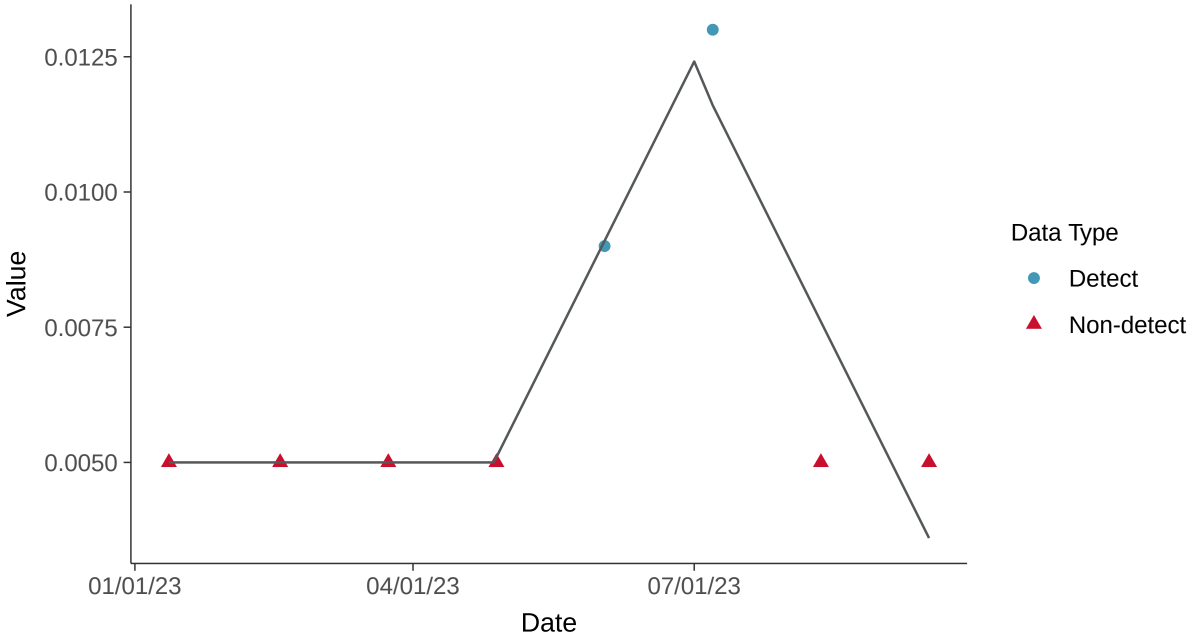
Trend Regression: Piecewise Linear-Linear

Selenium, MW-14 (mg/L)



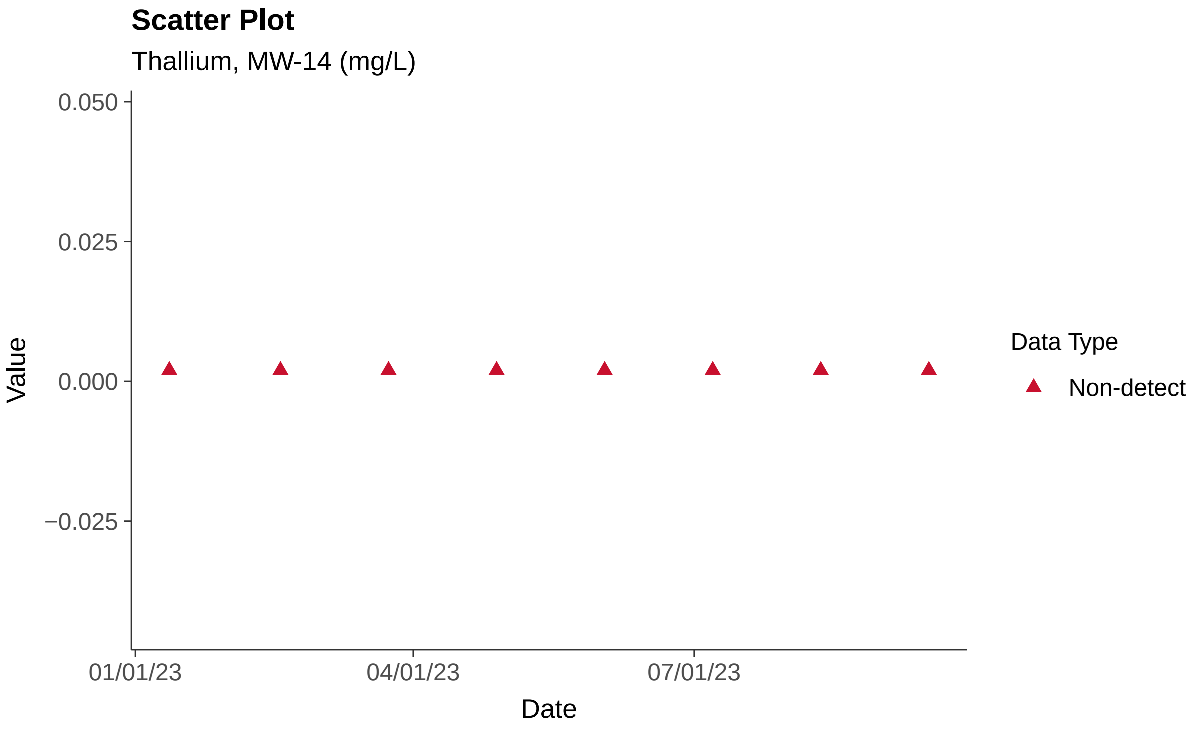
Trend Regression: Piecewise Linear-Linear-Linear

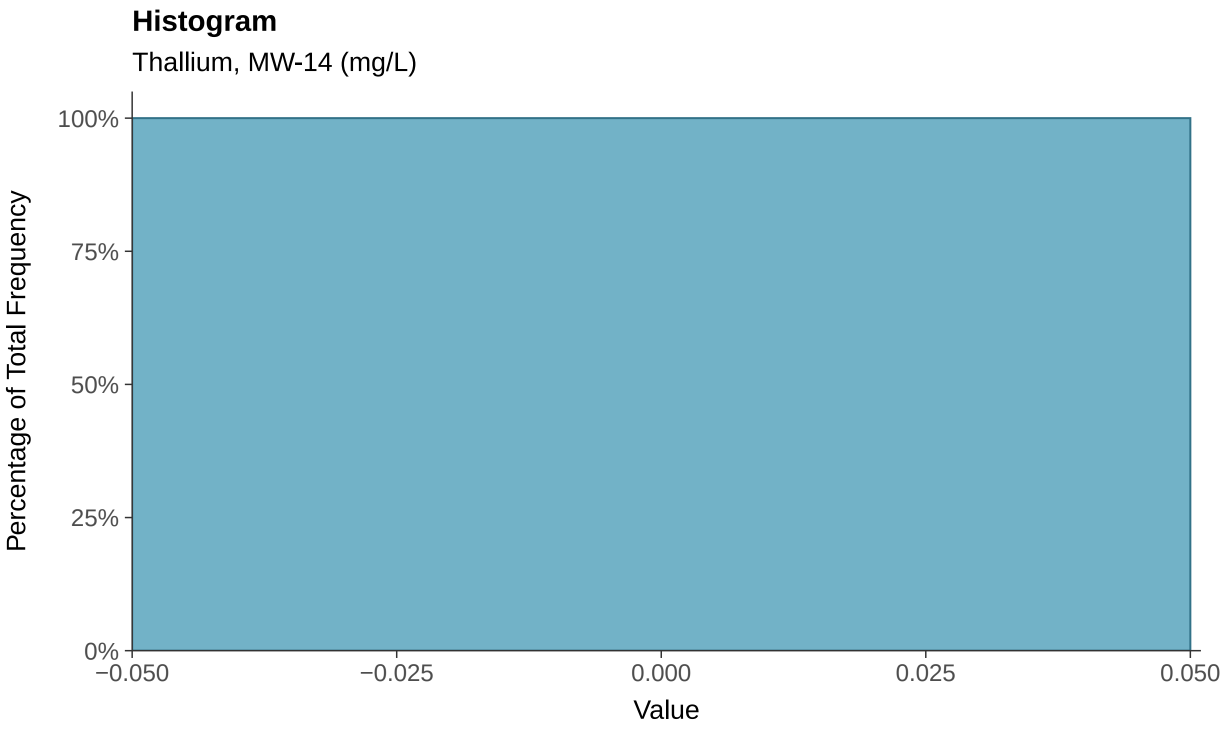
Selenium, MW-14 (mg/L)



Appendix IV: Thallium, MW-14

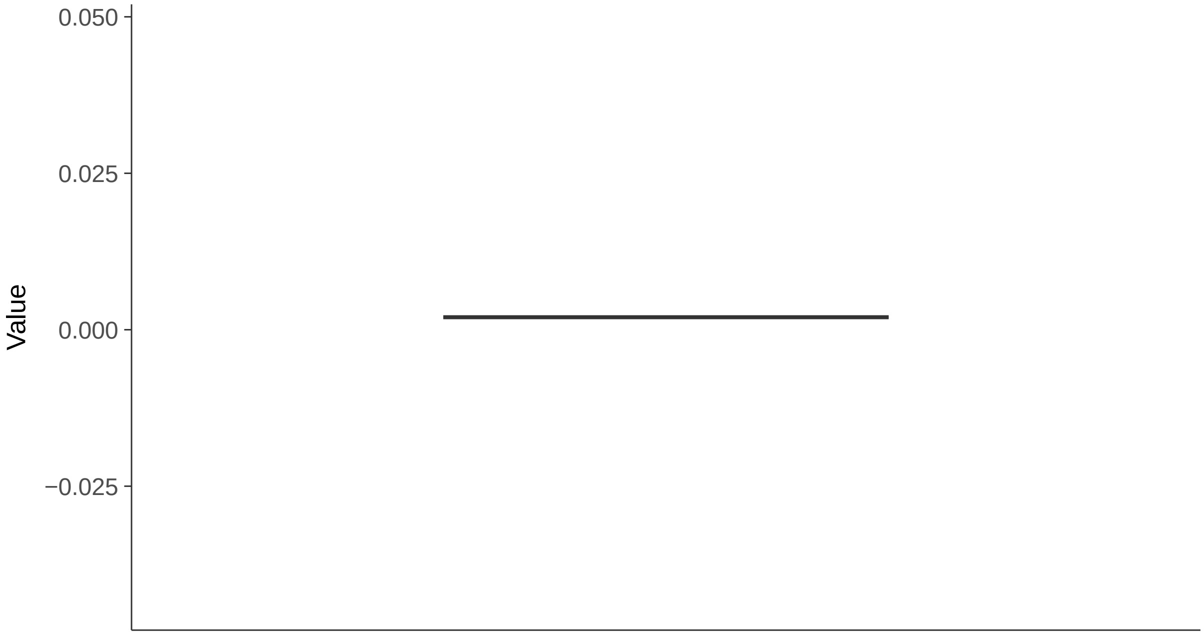
ID: 14_2_23





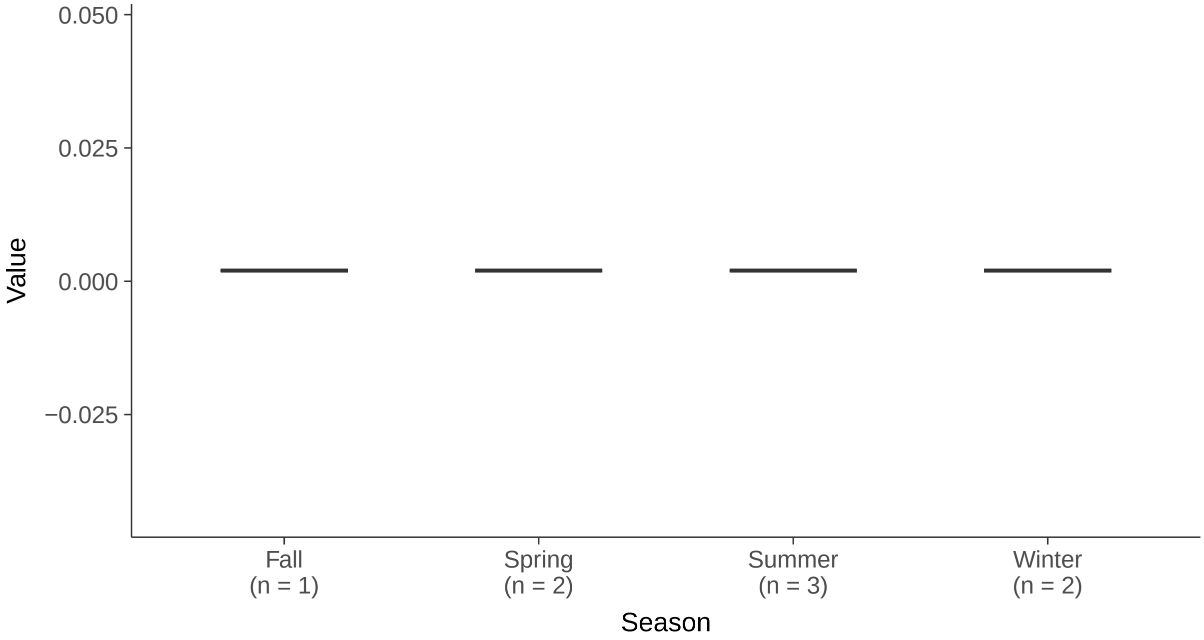
Boxplot

Thallium, MW-14 (mg/L)



Boxplot by Season

Thallium, MW-14 (mg/L)

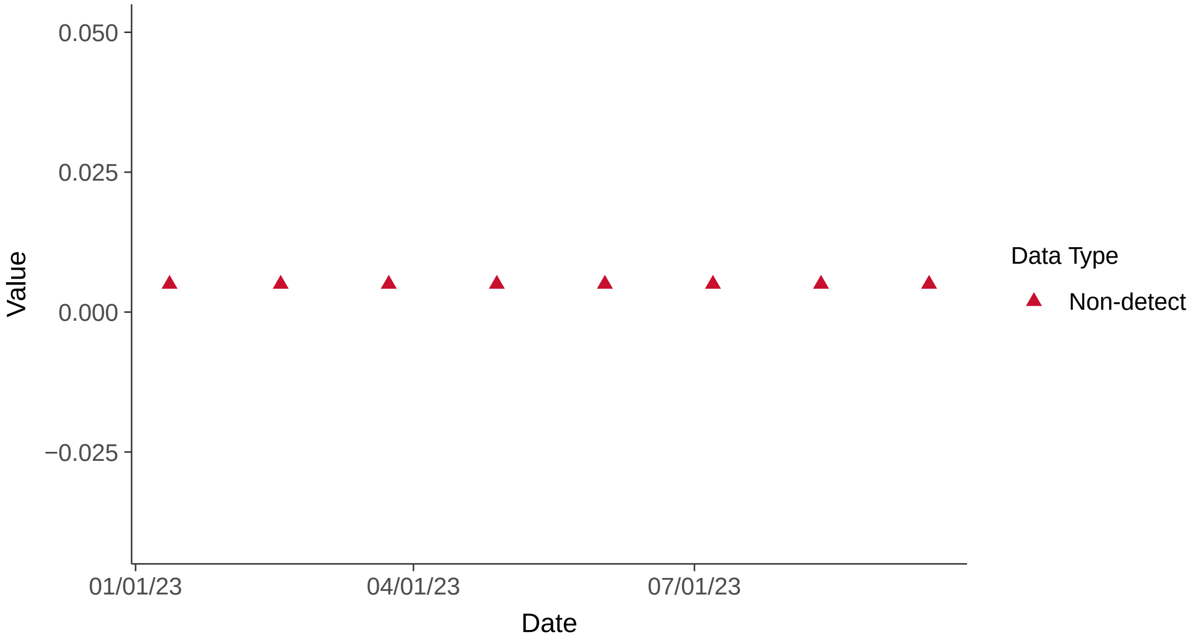


Part 115: Copper, MW-14

ID: 14_5_37

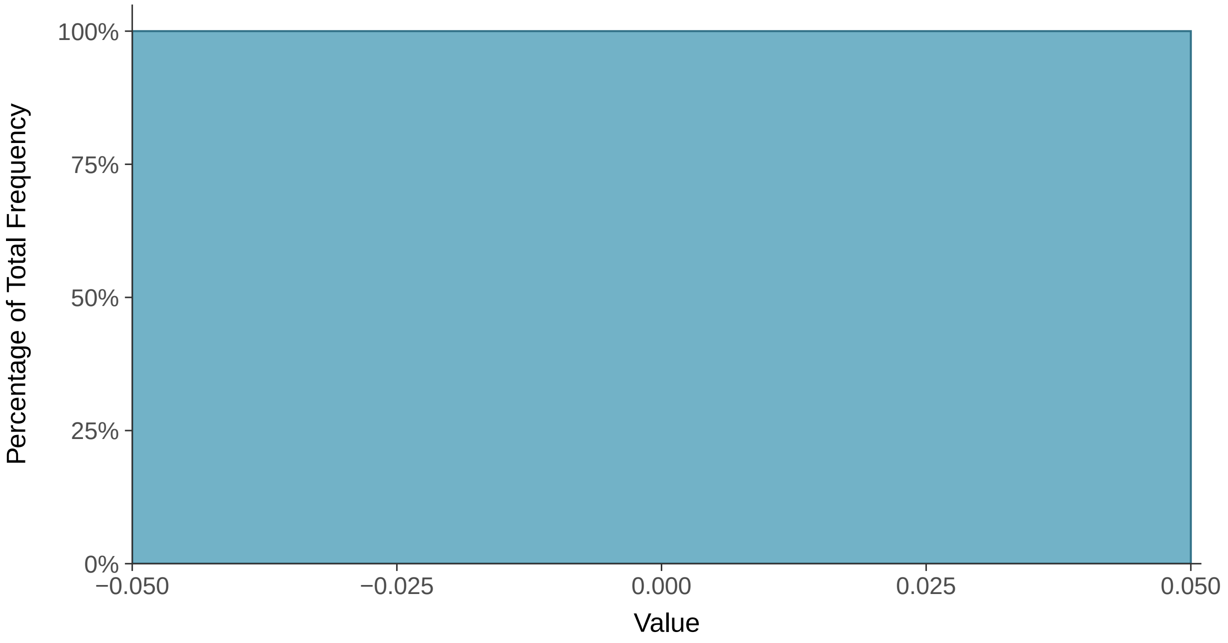
Scatter Plot

Copper, MW-14 (mg/L)



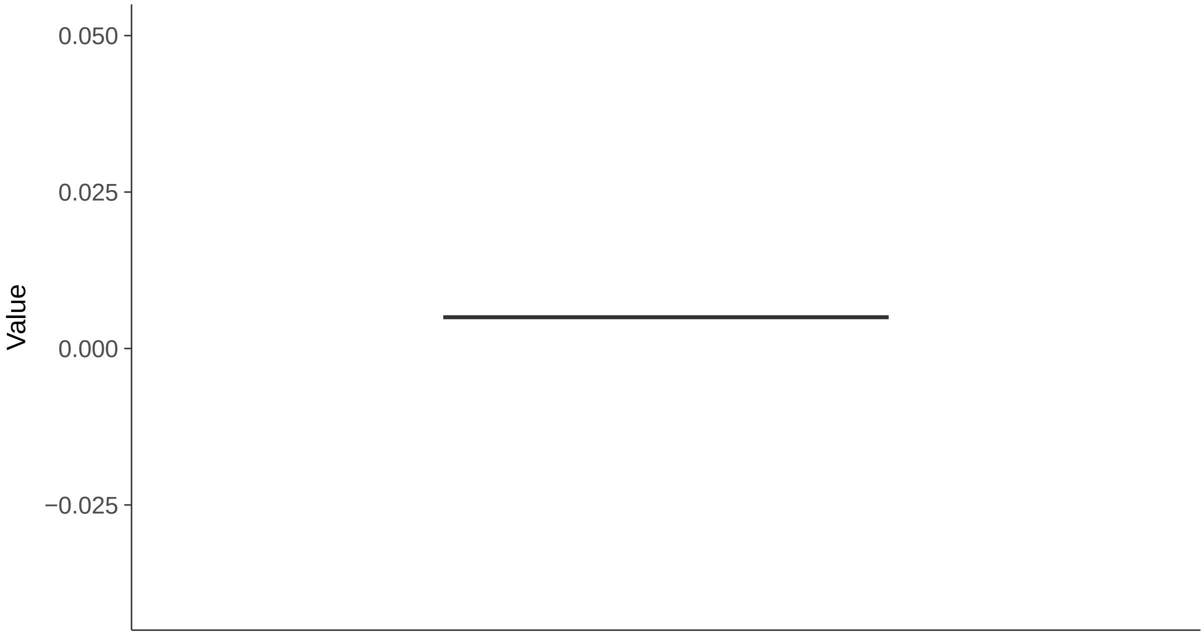
Histogram

Copper, MW-14 (mg/L)



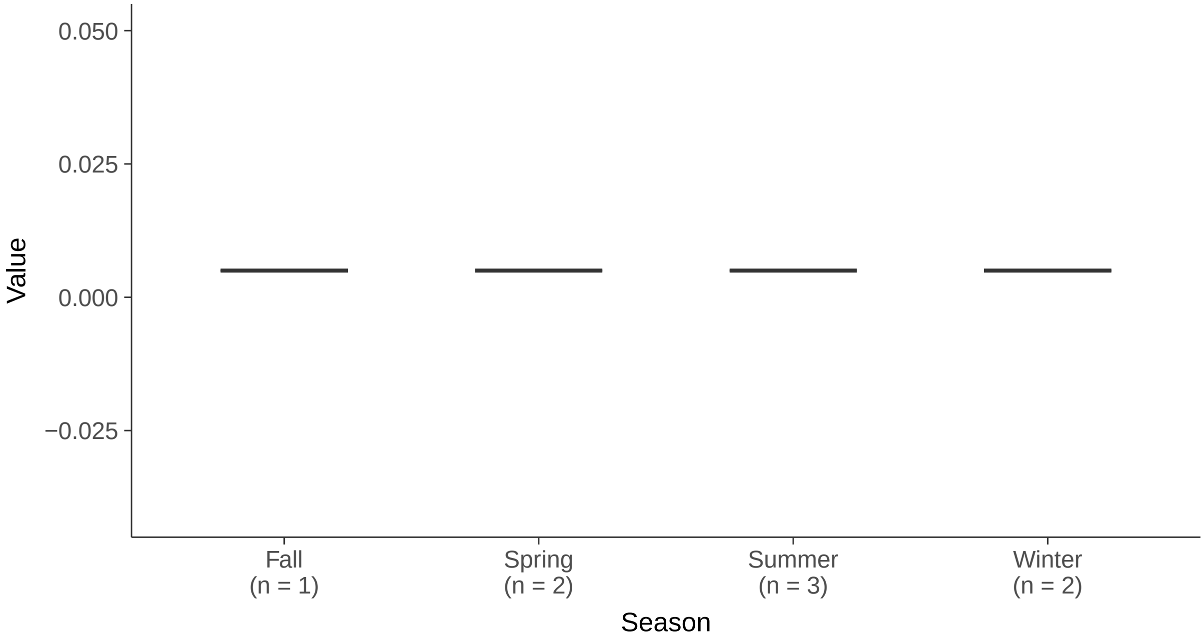
Boxplot

Copper, MW-14 (mg/L)



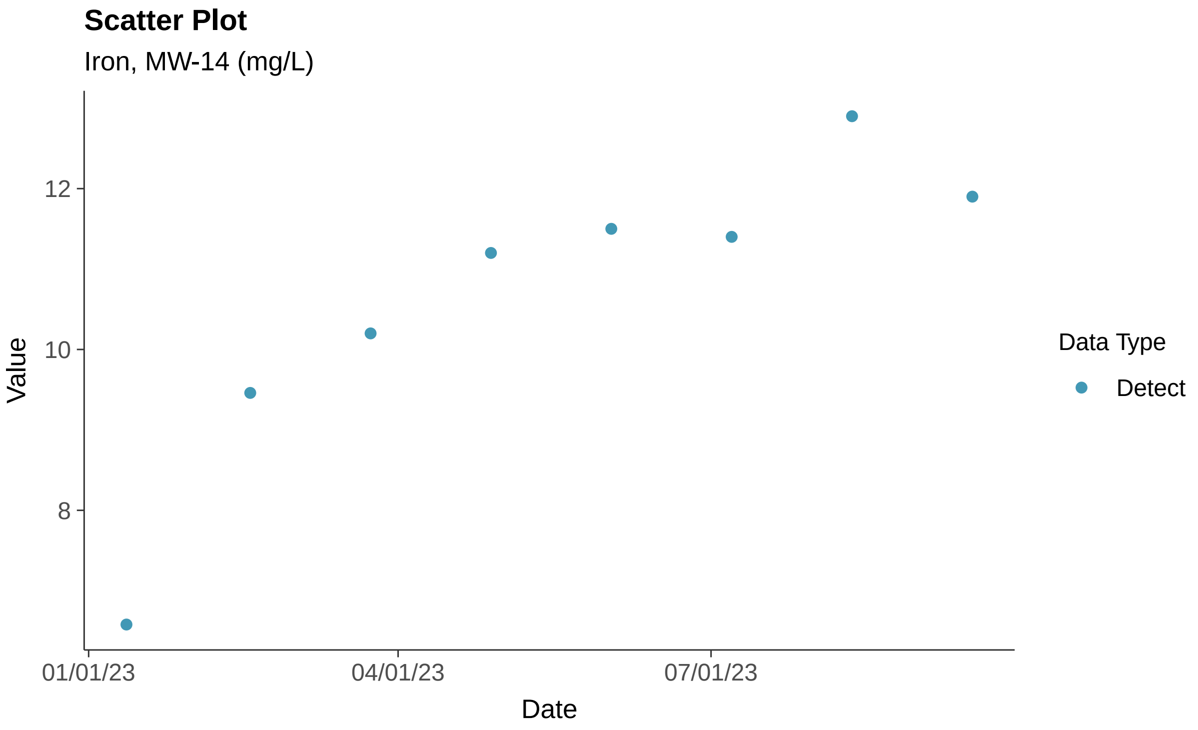
Boxplot by Season

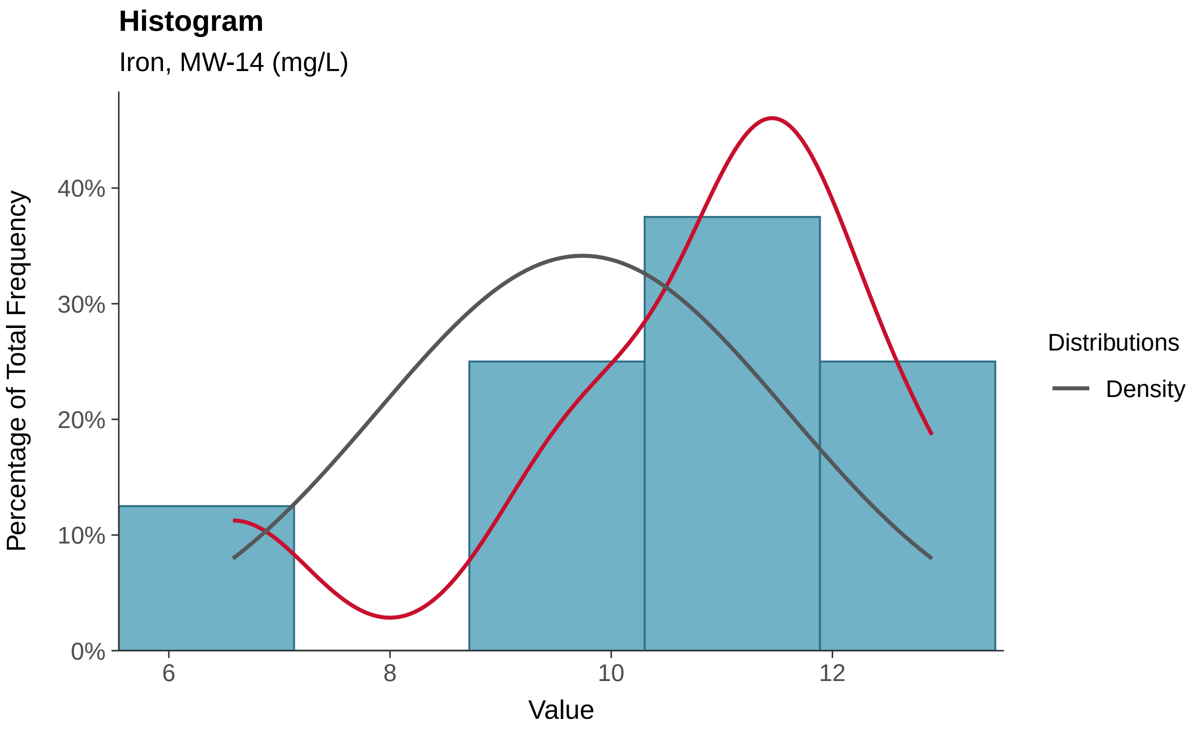
Copper, MW-14 (mg/L)



Part 115: Iron, MW-14

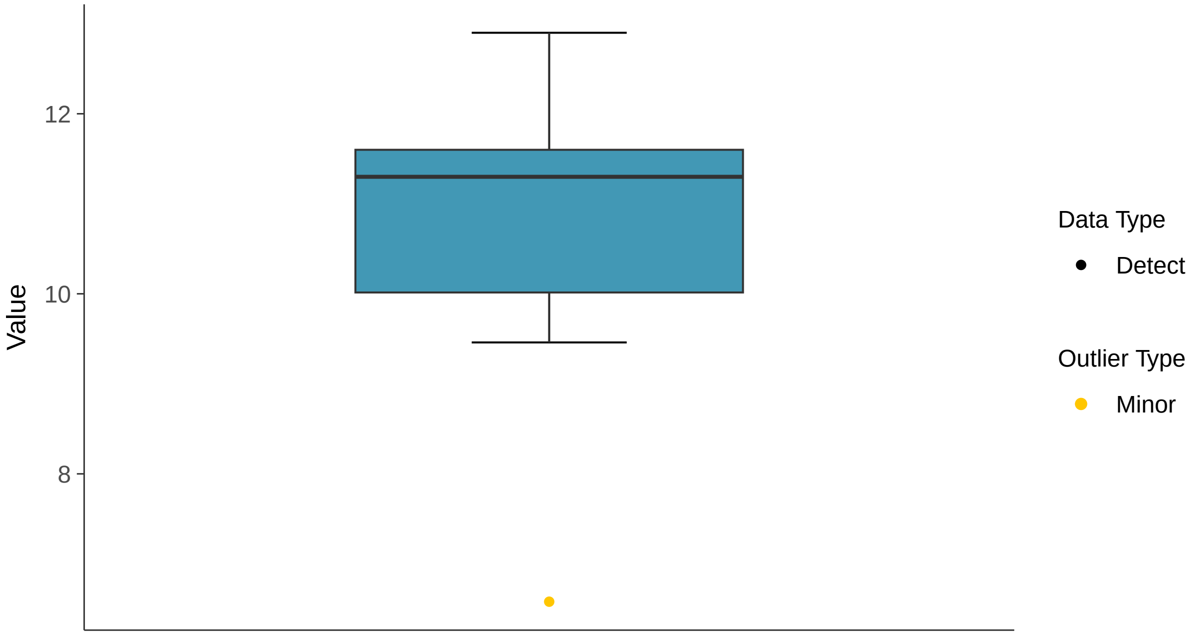
ID: 14_5_38





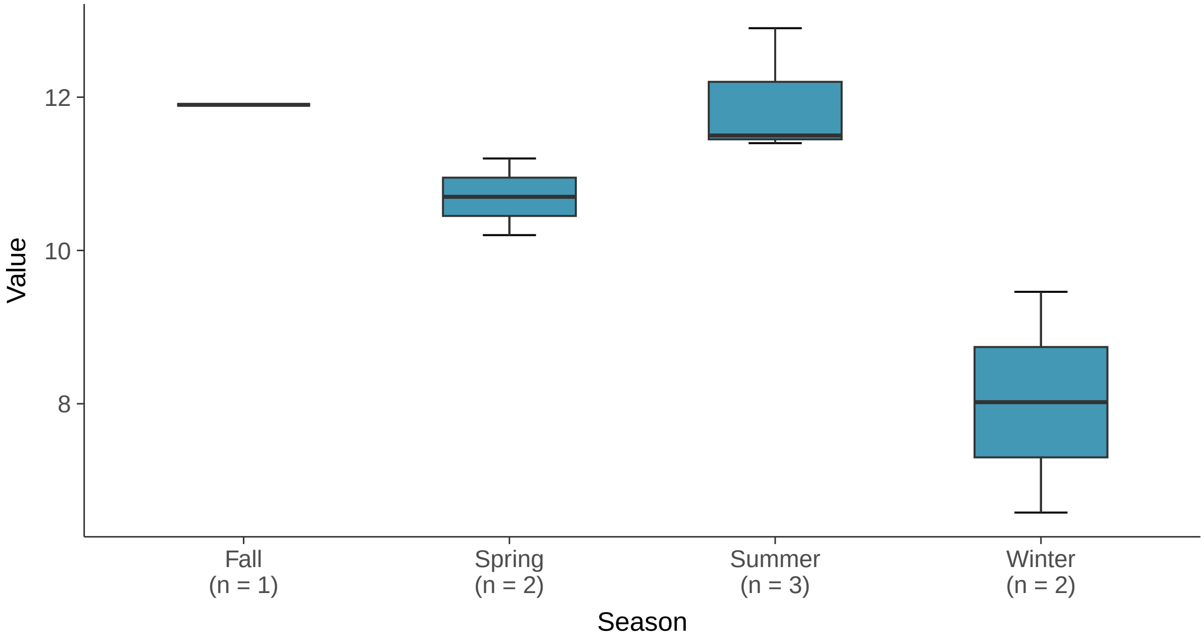
Boxplot

Iron, MW-14 (mg/L)



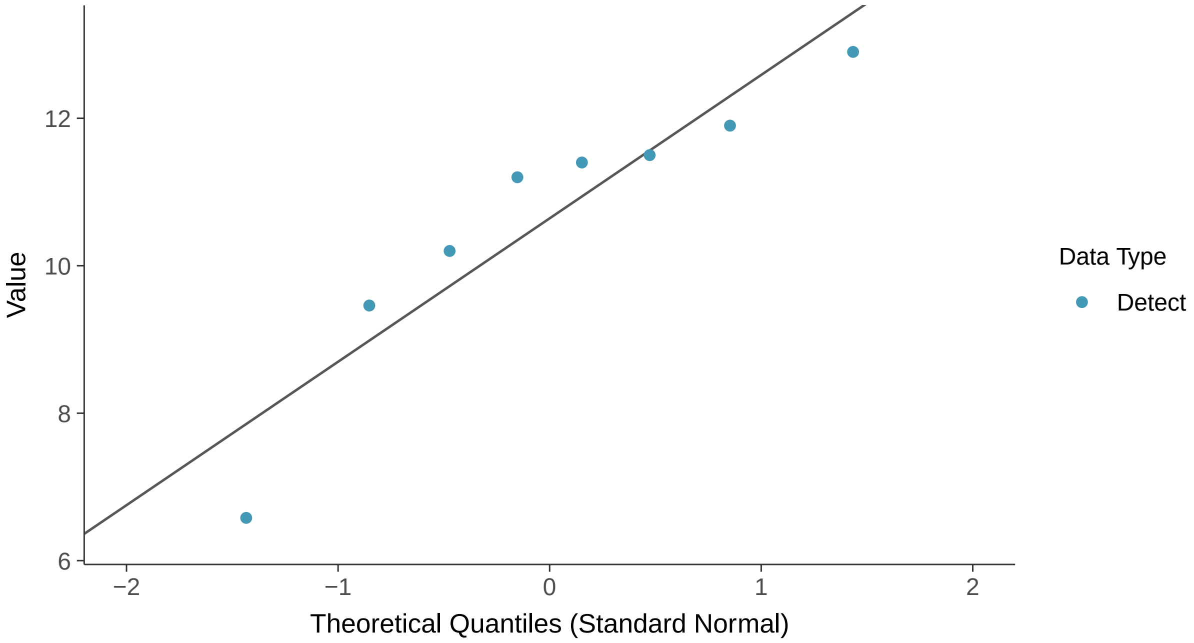
Boxplot by Season

Iron, MW-14 (mg/L)



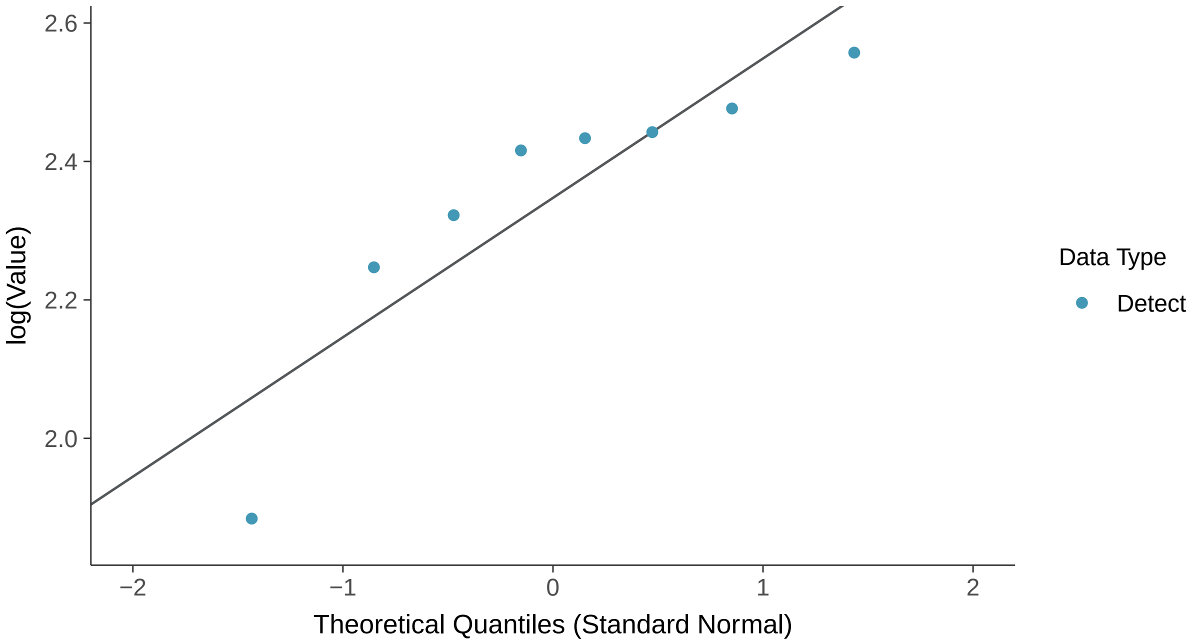
Normal Q-Q plot

Iron, MW-14 (mg/L)



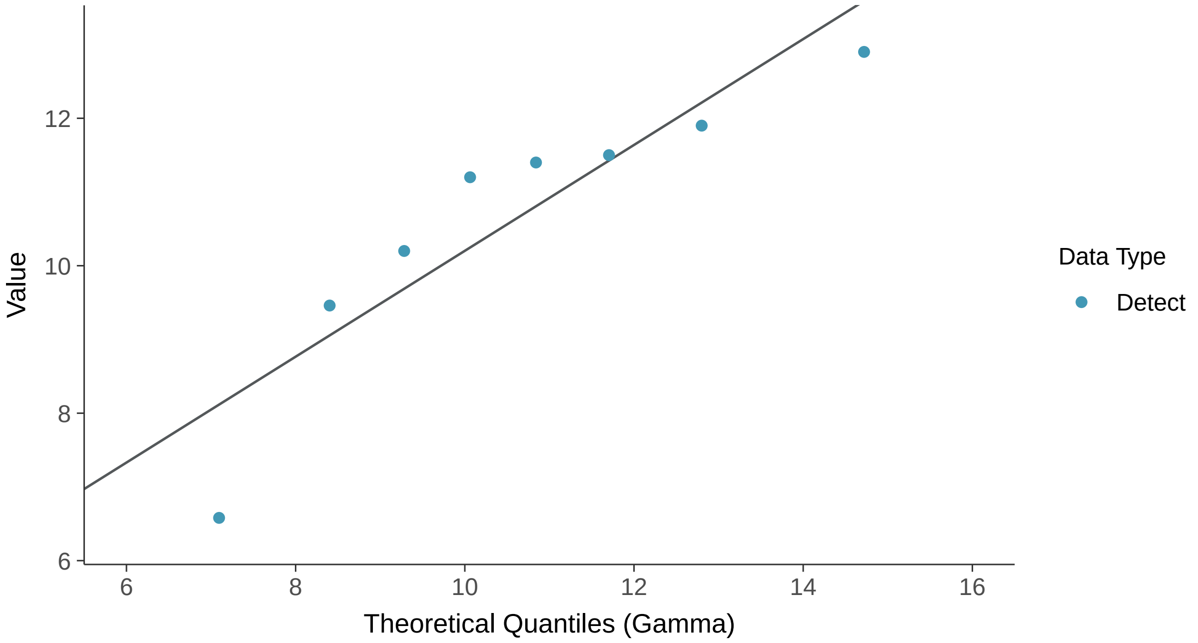
Lognormal Q-Q plot

Iron, MW-14 (mg/L)



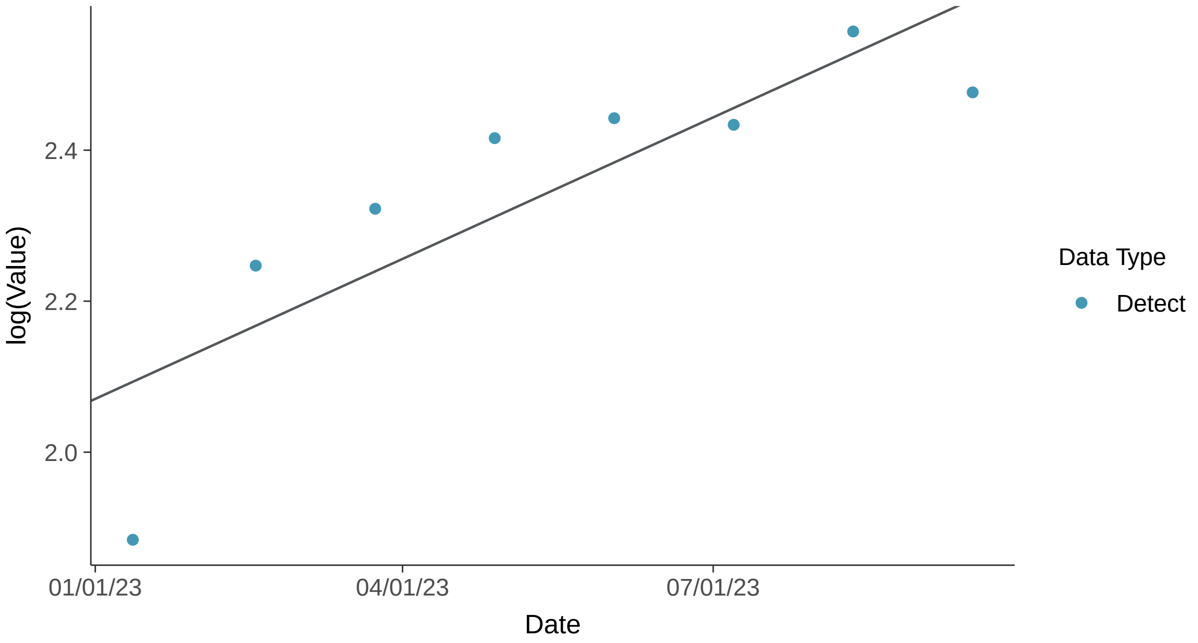
Gamma Q-Q plot

Iron, MW-14 (mg/L)



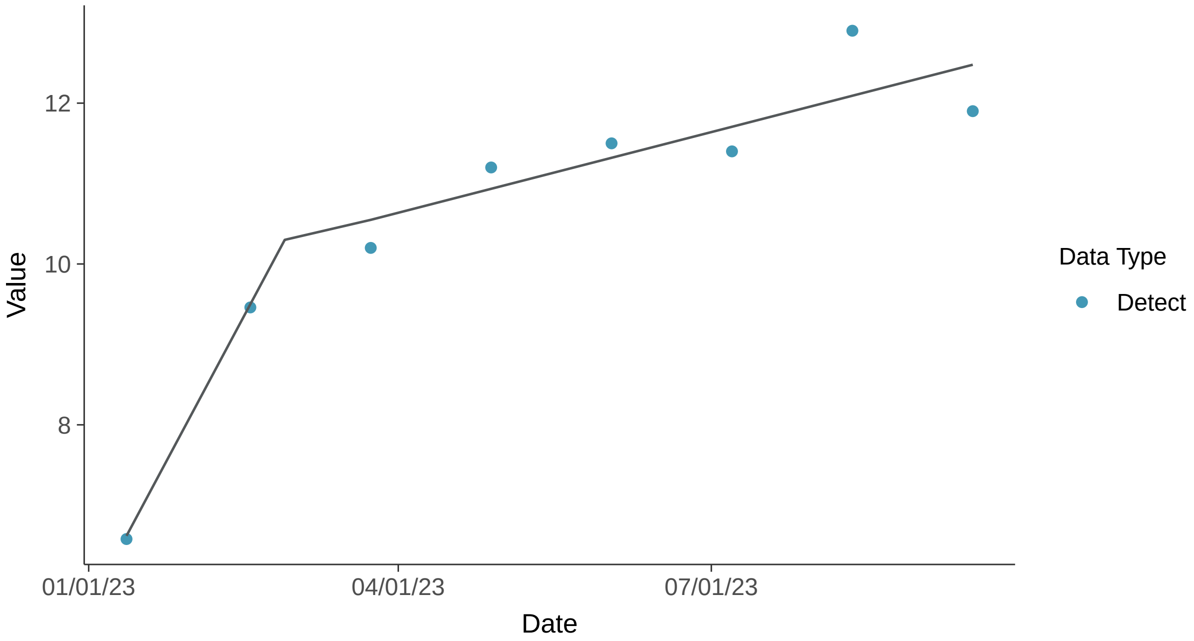
Trend Regression: Lognormal MLE

Iron, MW-14 (mg/L)



Trend Regression: Piecewise Linear-Linear

Iron, MW-14 (mg/L)

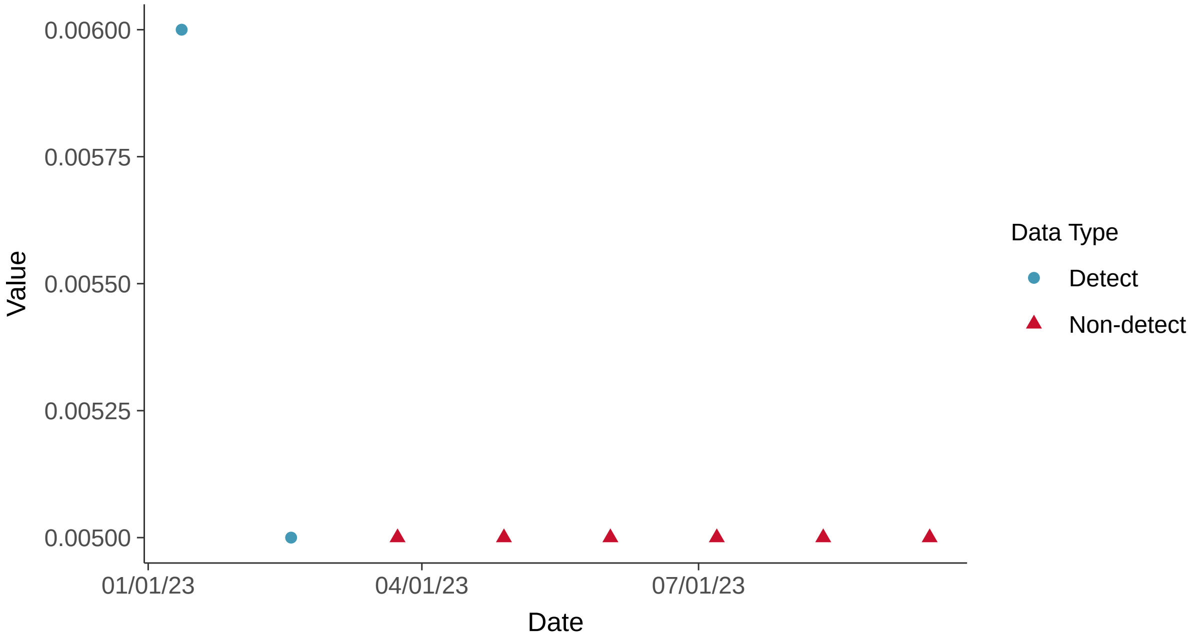


Part 115: Nickel, MW-14

ID: 14_5_39

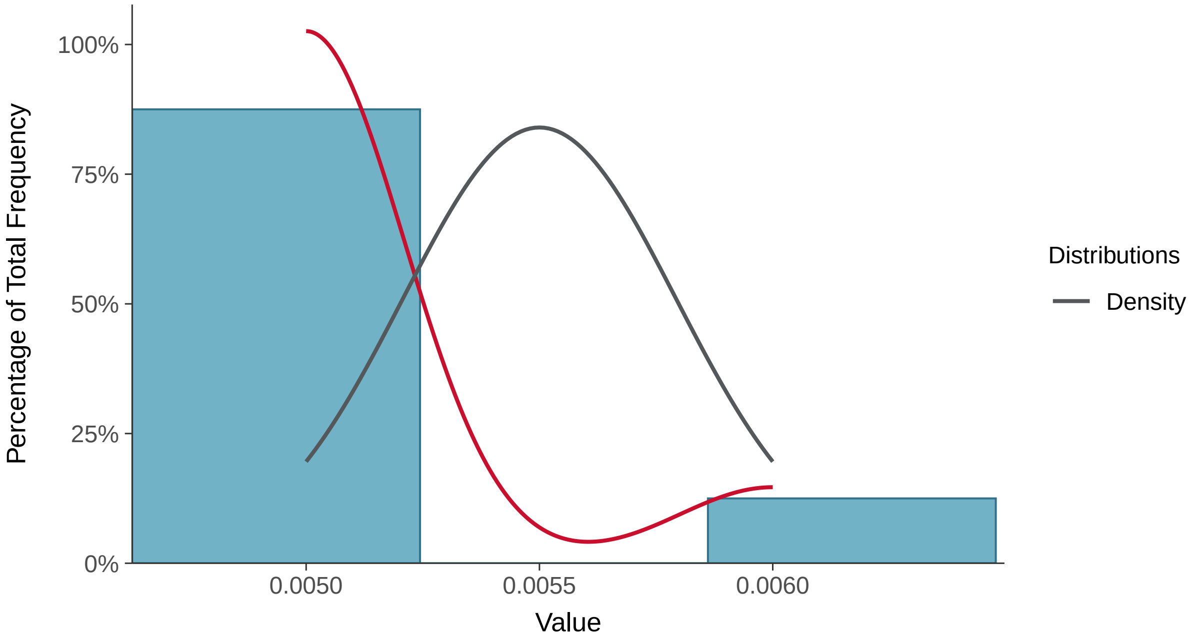
Scatter Plot

Nickel, MW-14 (mg/L)



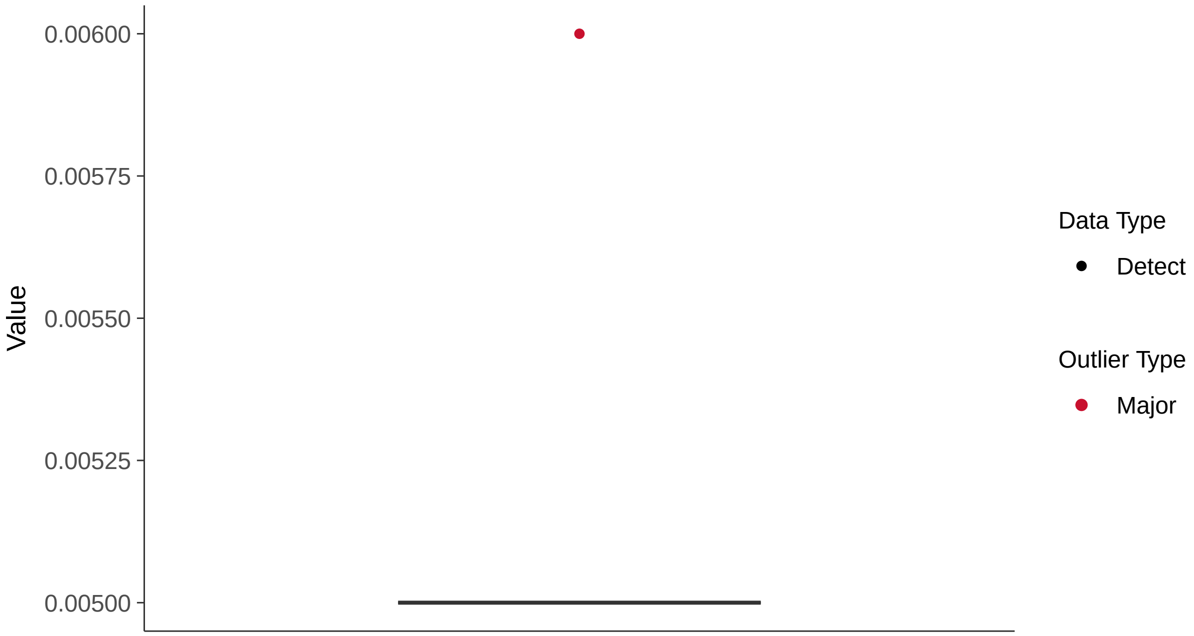
Histogram

Nickel, MW-14 (mg/L)



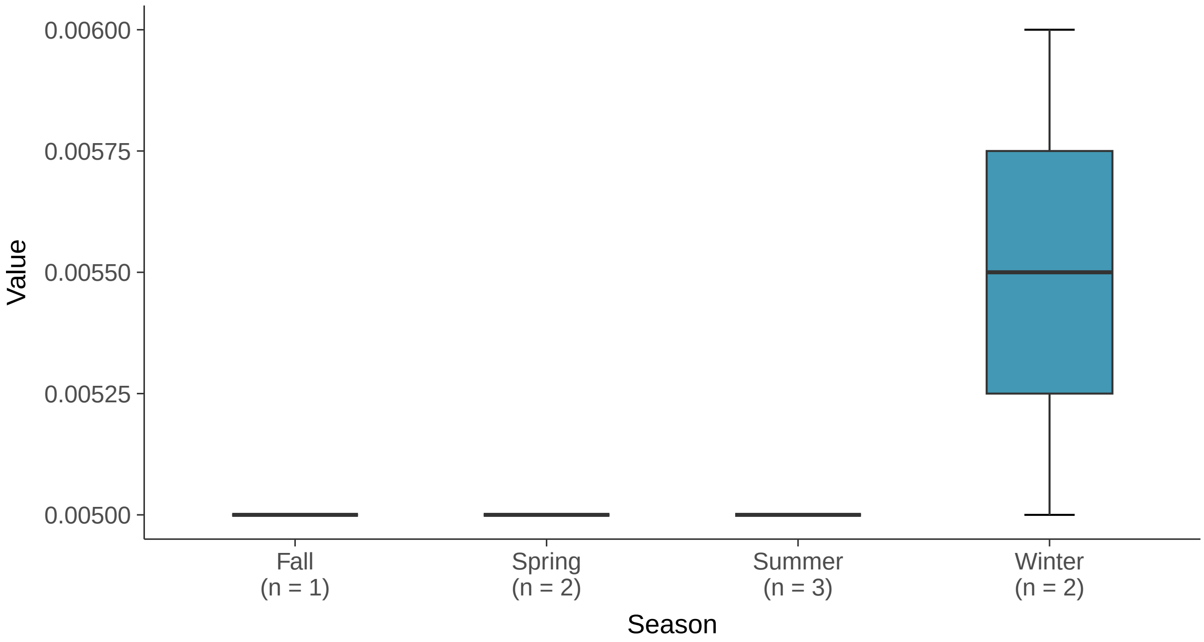
Boxplot

Nickel, MW-14 (mg/L)



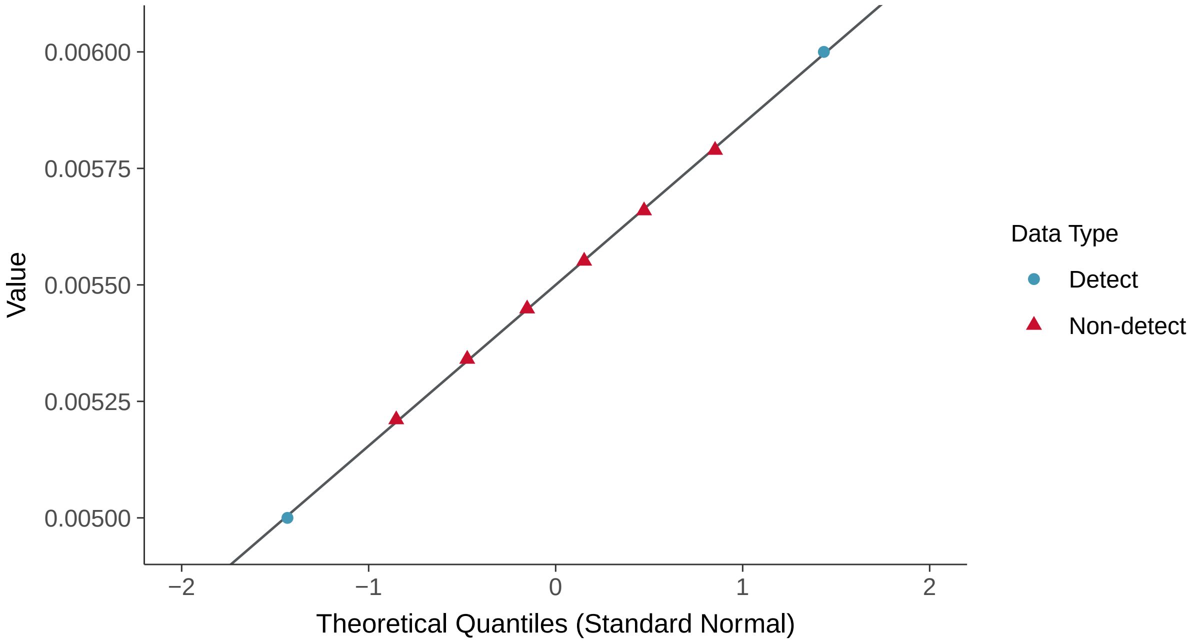
Boxplot by Season

Nickel, MW-14 (mg/L)



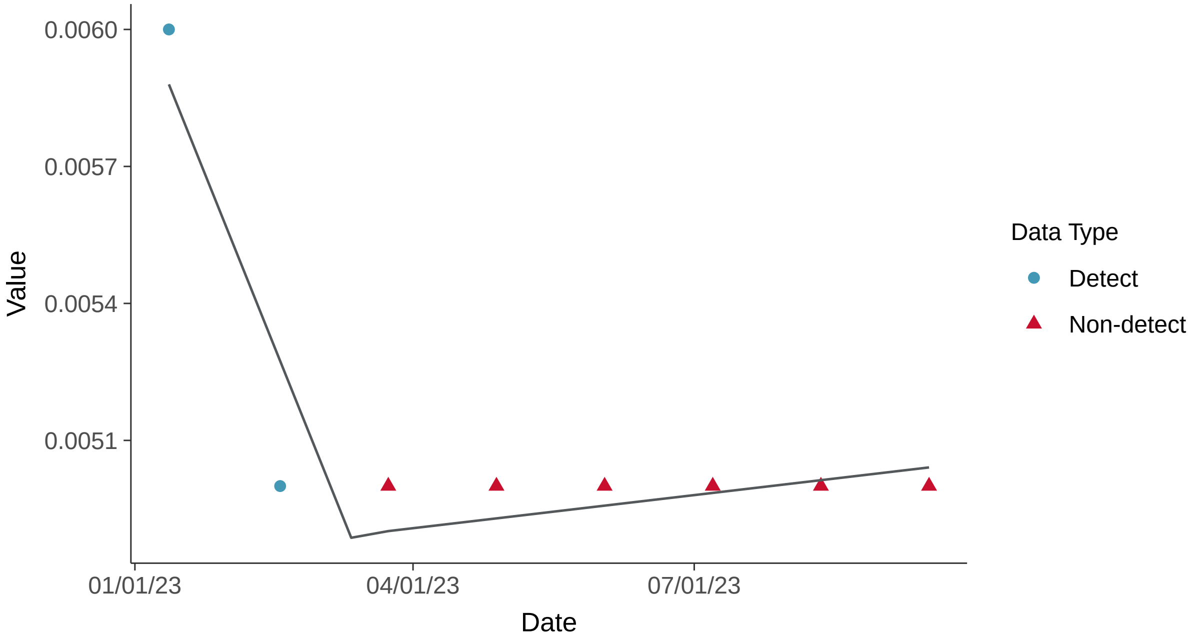
Normal Q-Q plot using ROS Imputed Estimates

Nickel, MW-14 (mg/L)



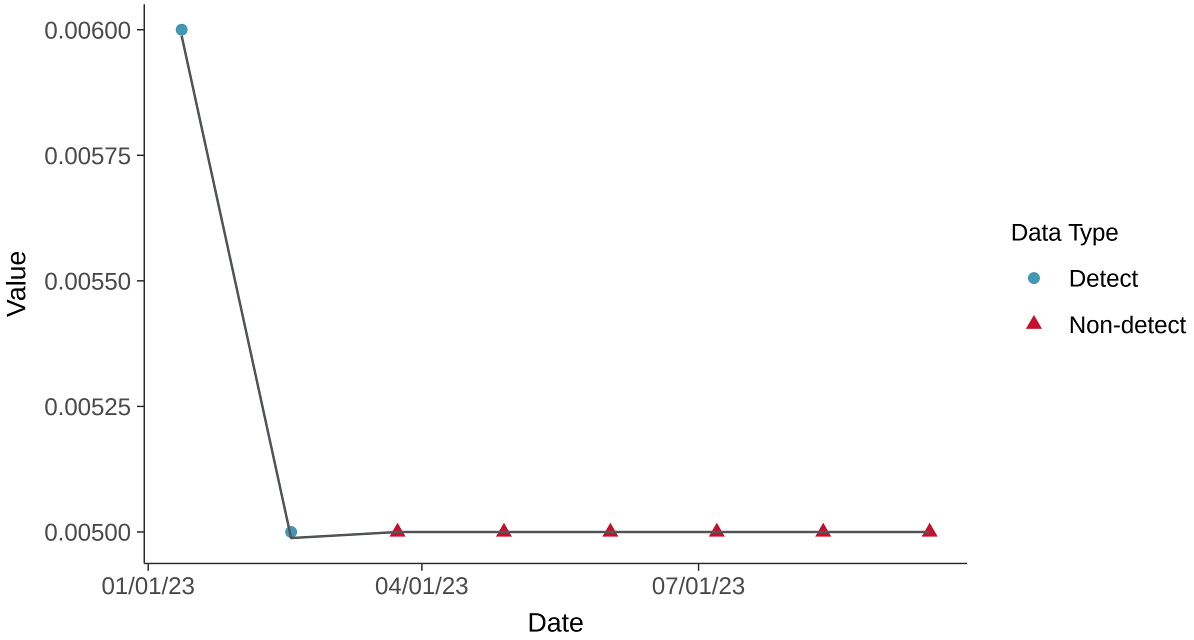
Trend Regression: Piecewise Linear-Linear

Nickel, MW-14 (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Nickel, MW-14 (mg/L)

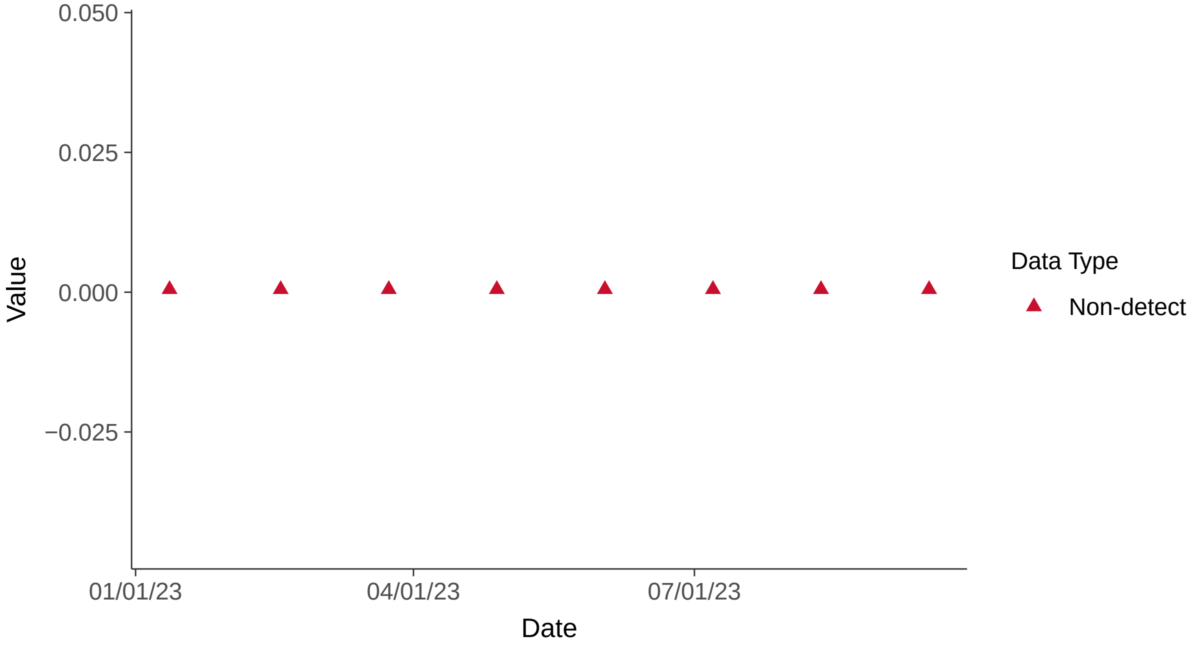


Part 115: Silver, MW-14

ID: 14_5_40

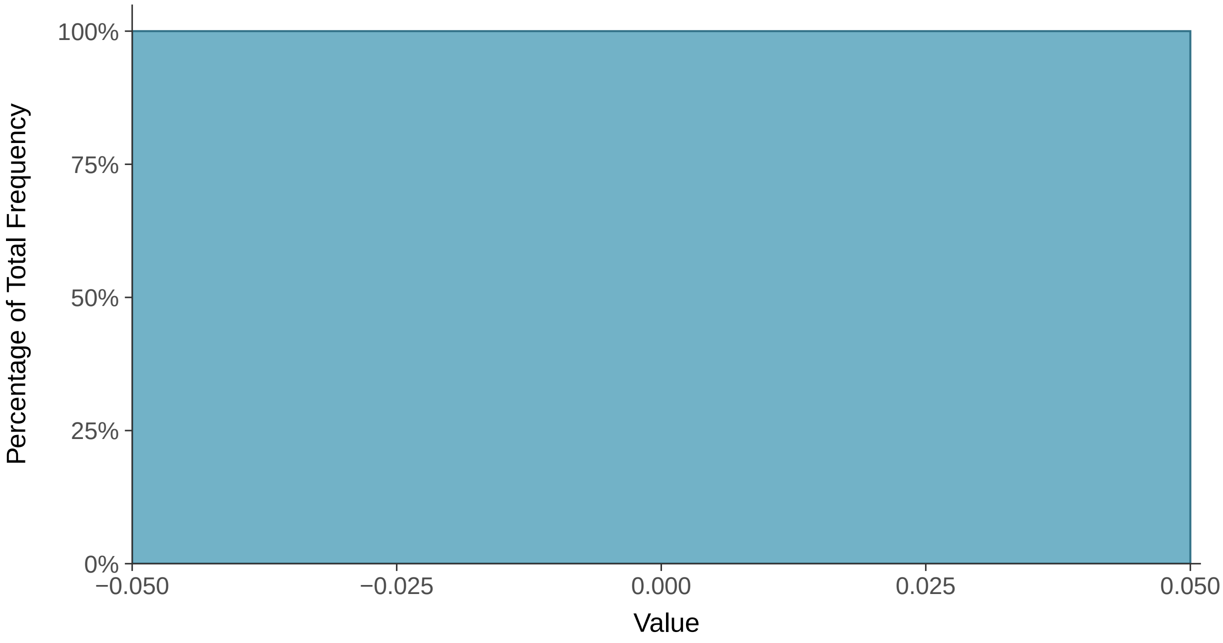
Scatter Plot

Silver, MW-14 (mg/L)



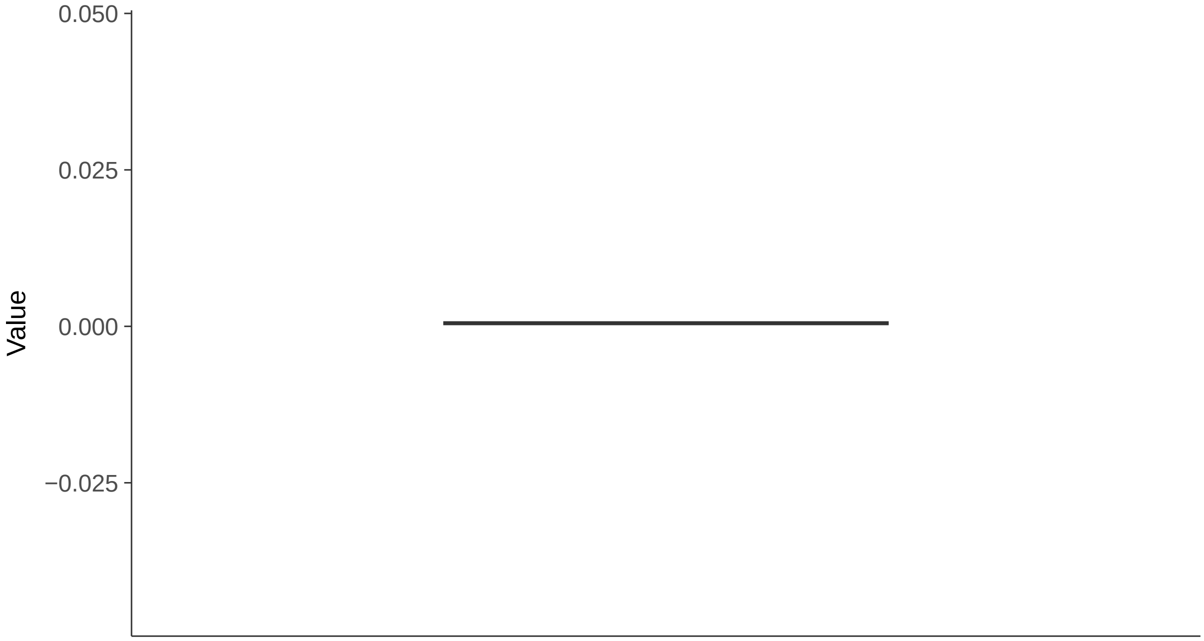
Histogram

Silver, MW-14 (mg/L)



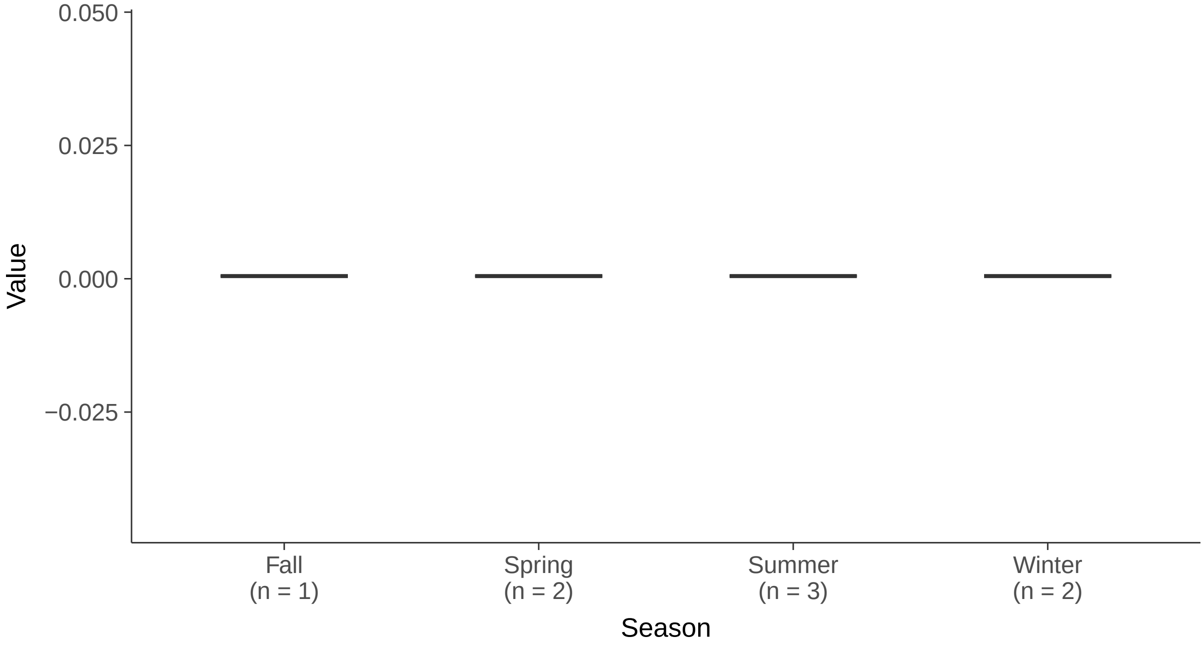
Boxplot

Silver, MW-14 (mg/L)



Boxplot by Season

Silver, MW-14 (mg/L)

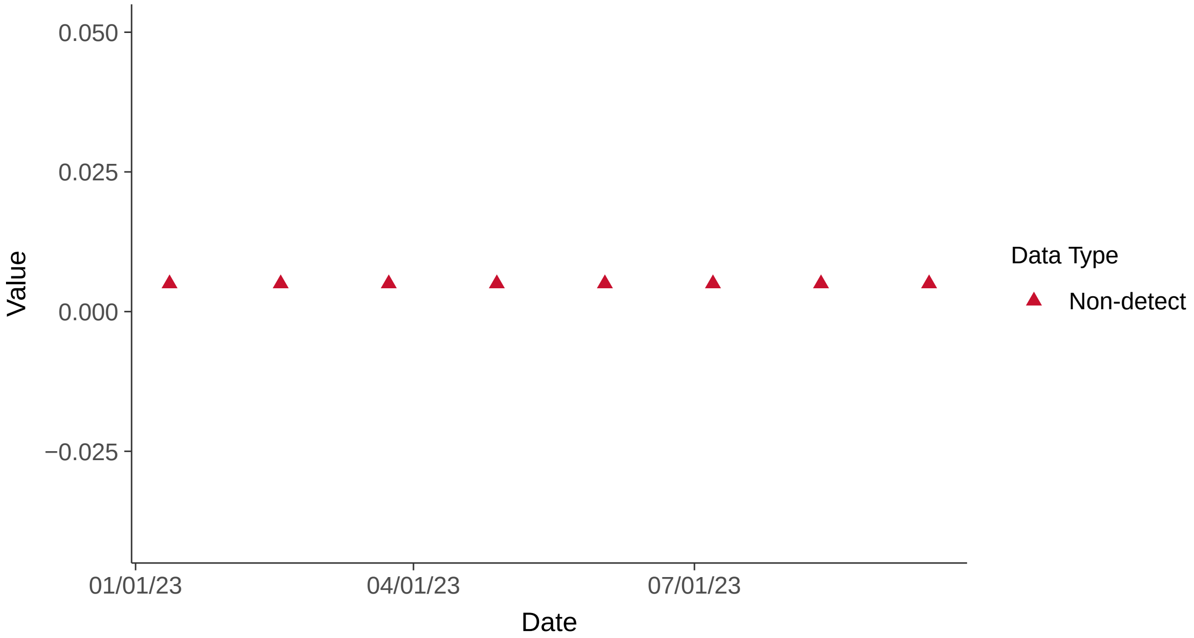


Part 115: Vanadium, MW-14

ID: 14_5_41

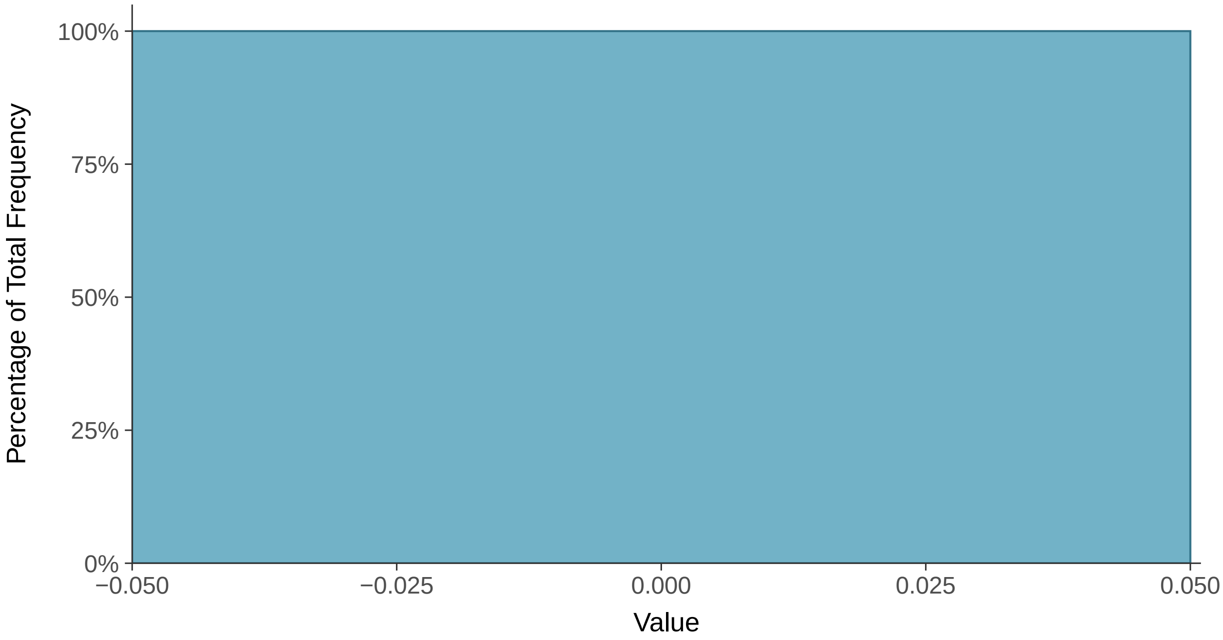
Scatter Plot

Vanadium, MW-14 (mg/L)



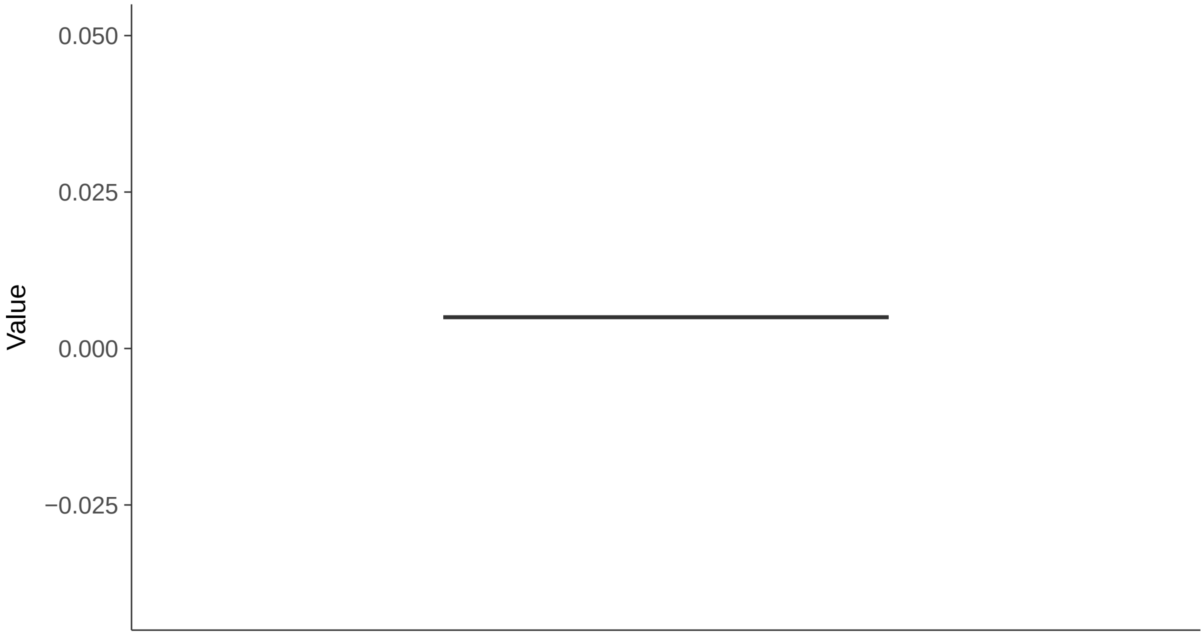
Histogram

Vanadium, MW-14 (mg/L)



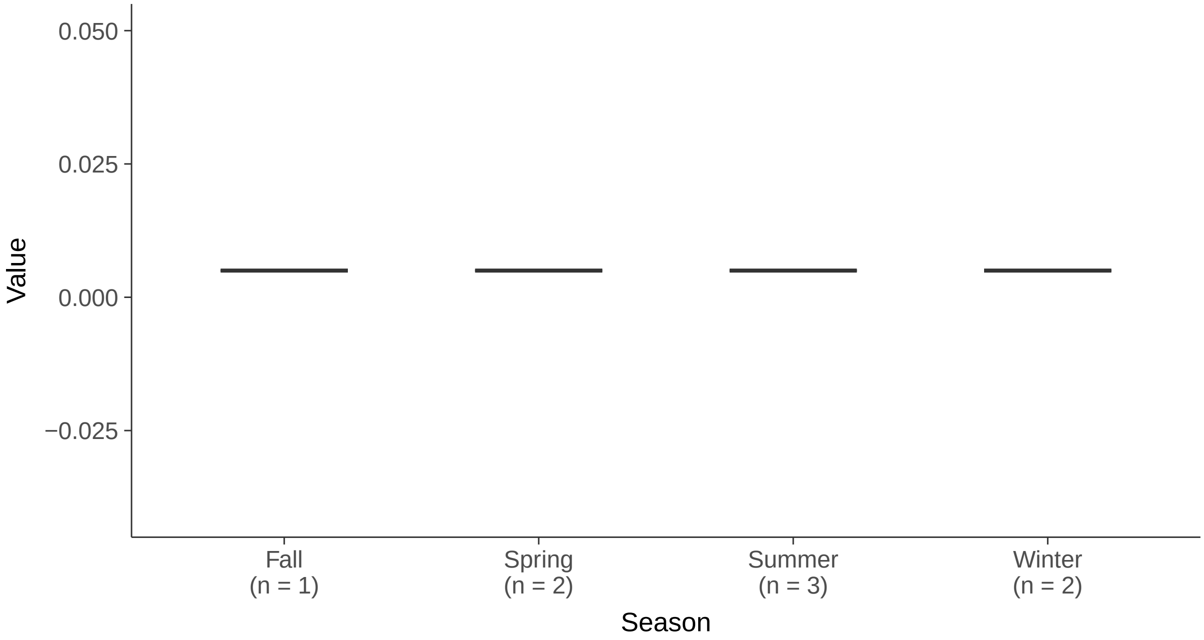
Boxplot

Vanadium, MW-14 (mg/L)



Boxplot by Season

Vanadium, MW-14 (mg/L)

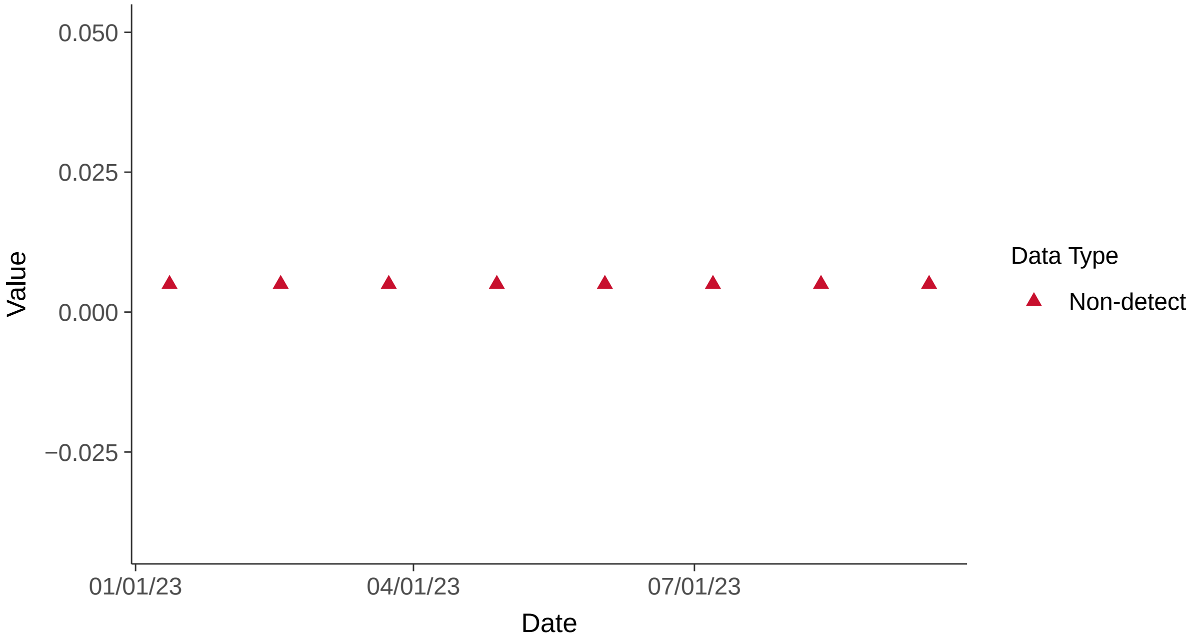


Part 115: Zinc, MW-14

ID: 14_5_42

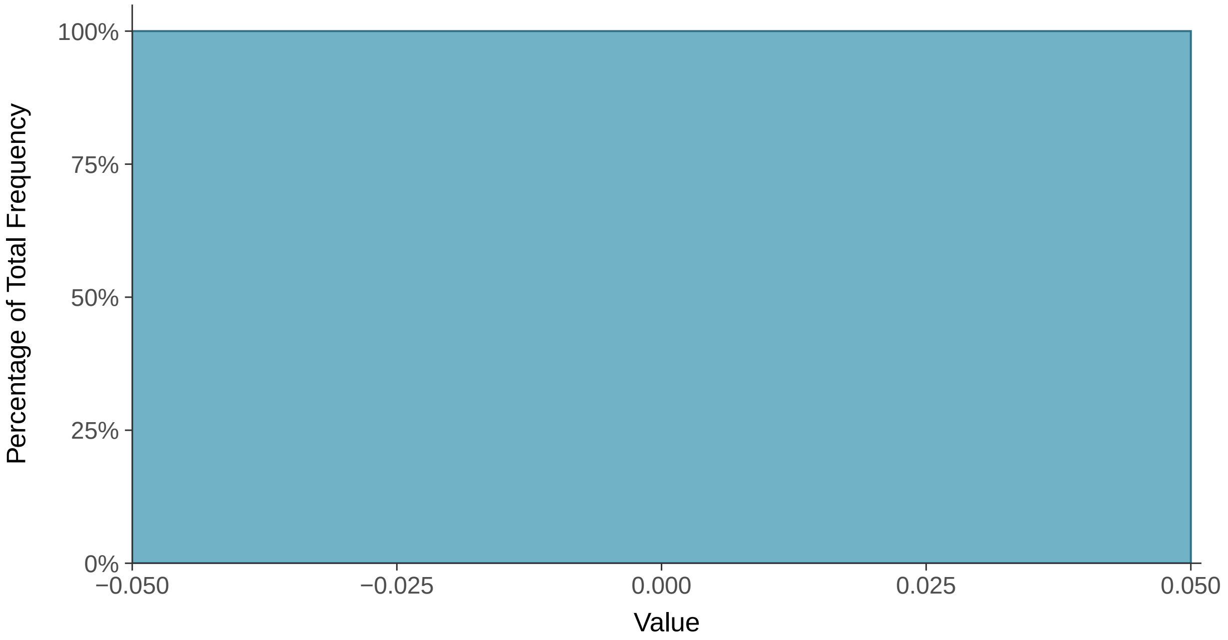
Scatter Plot

Zinc, MW-14 (mg/L)



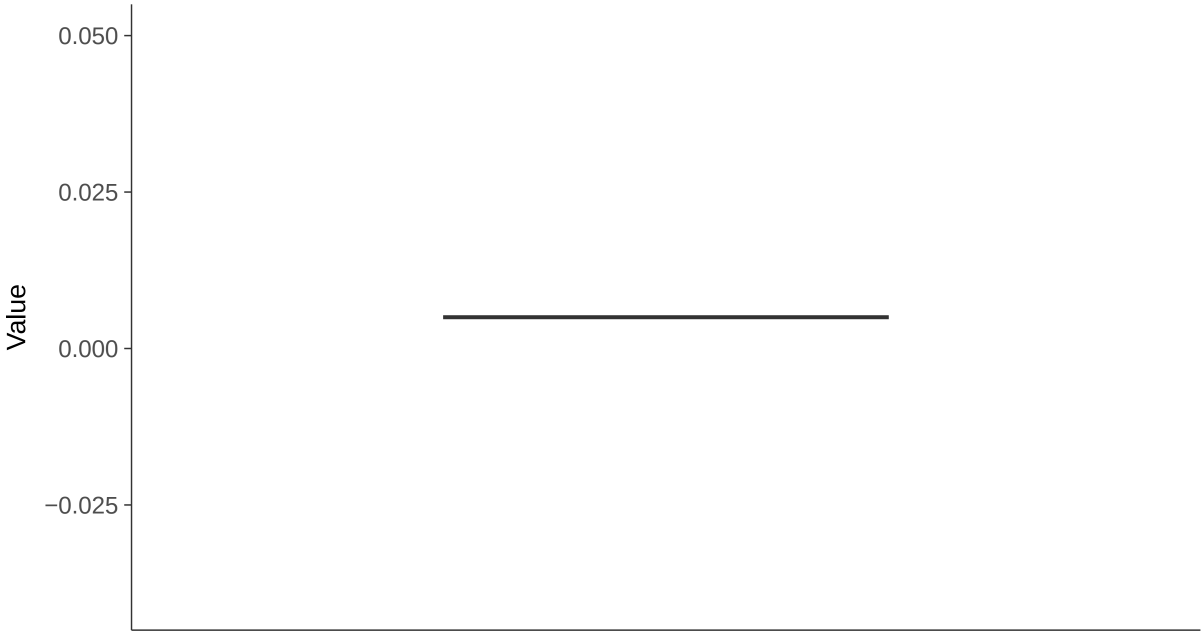
Histogram

Zinc, MW-14 (mg/L)



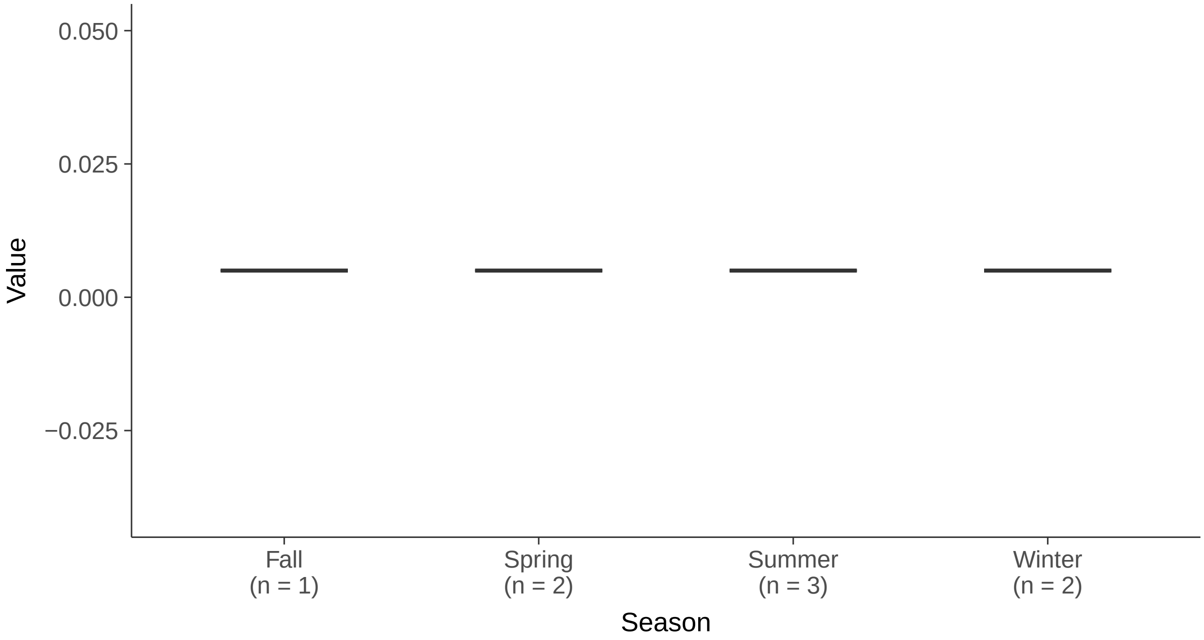
Boxplot

Zinc, MW-14 (mg/L)



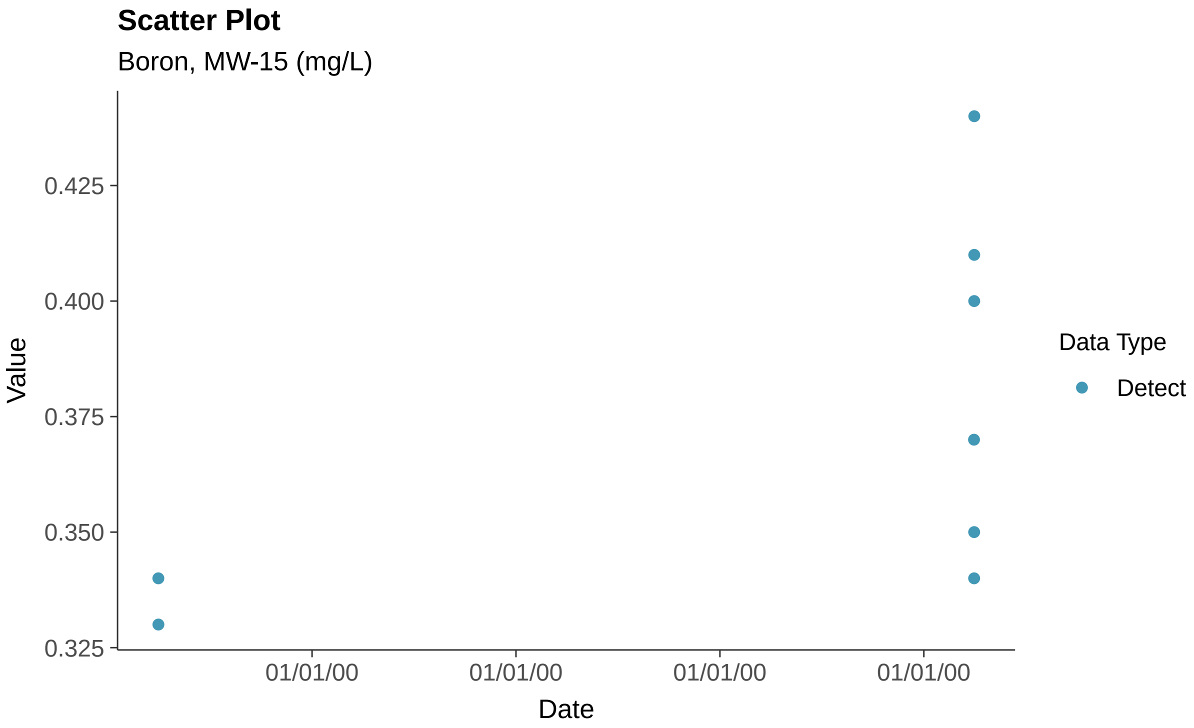
Boxplot by Season

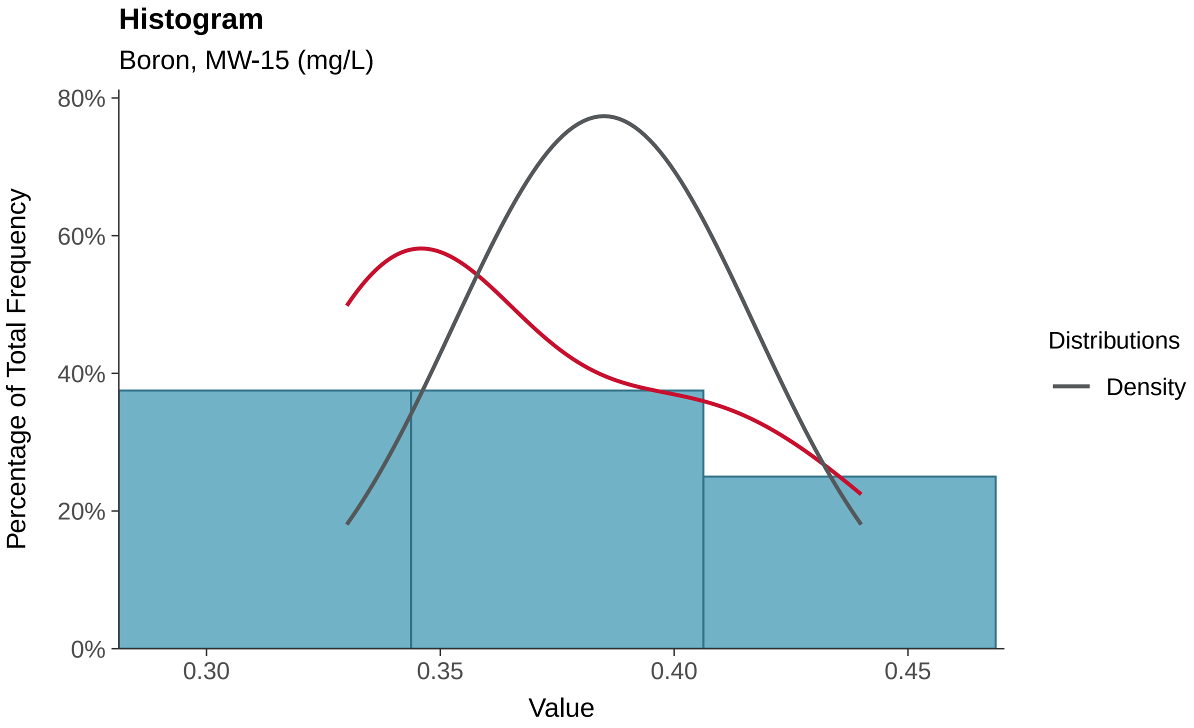
Zinc, MW-14 (mg/L)



Appendix III: Boron, MW-15

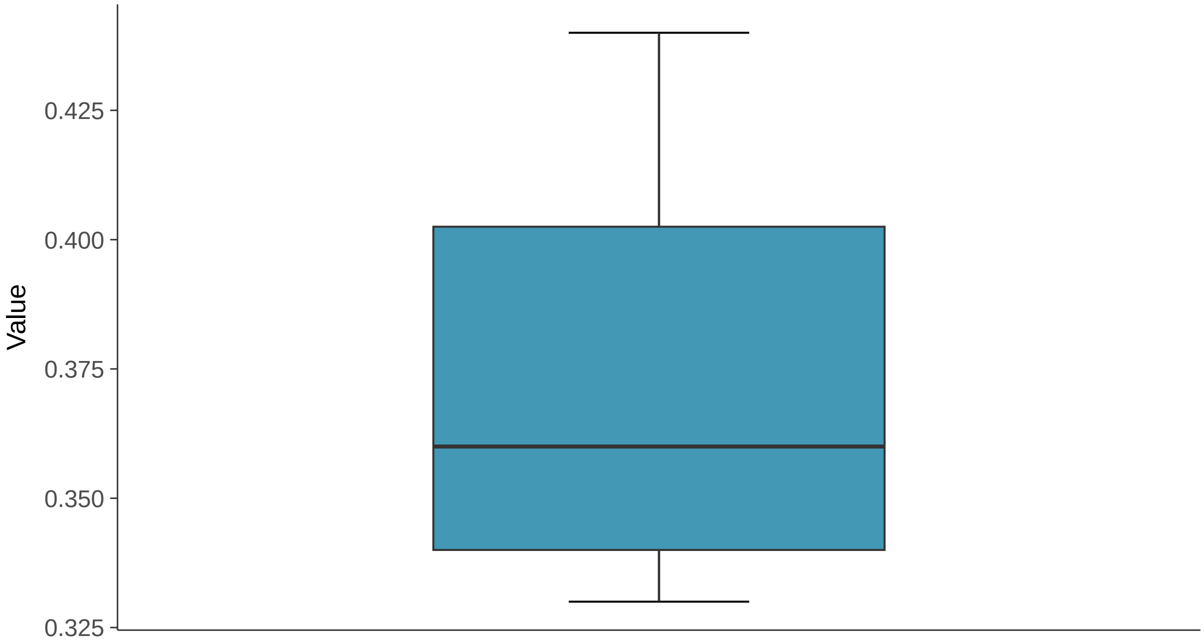
ID: 15_1_01





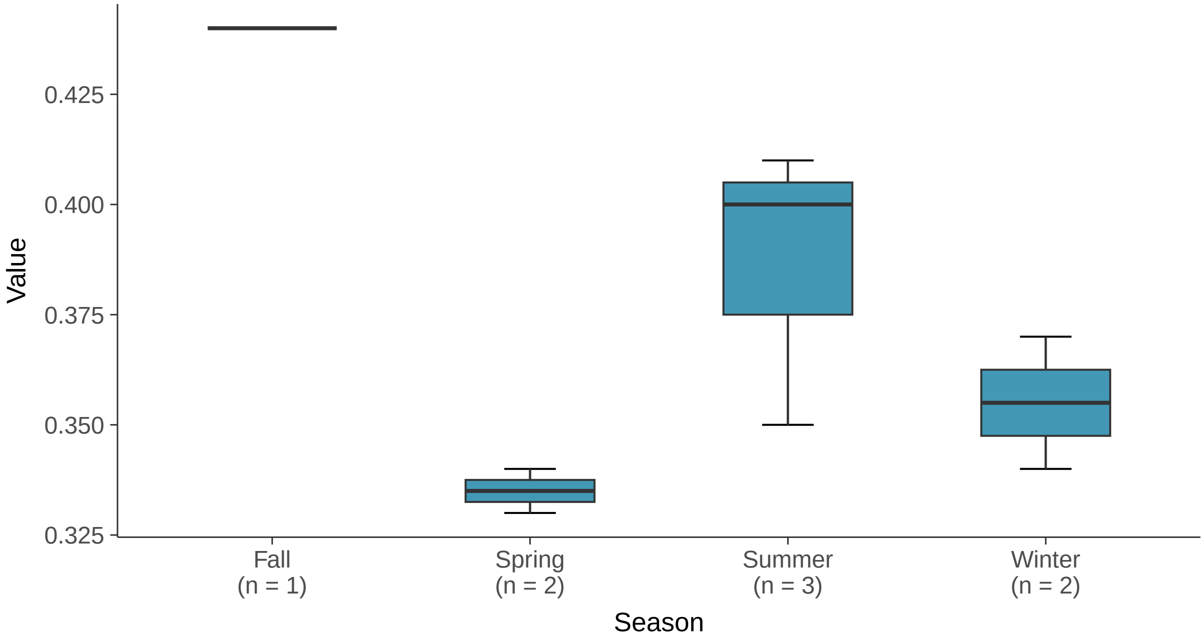
Boxplot

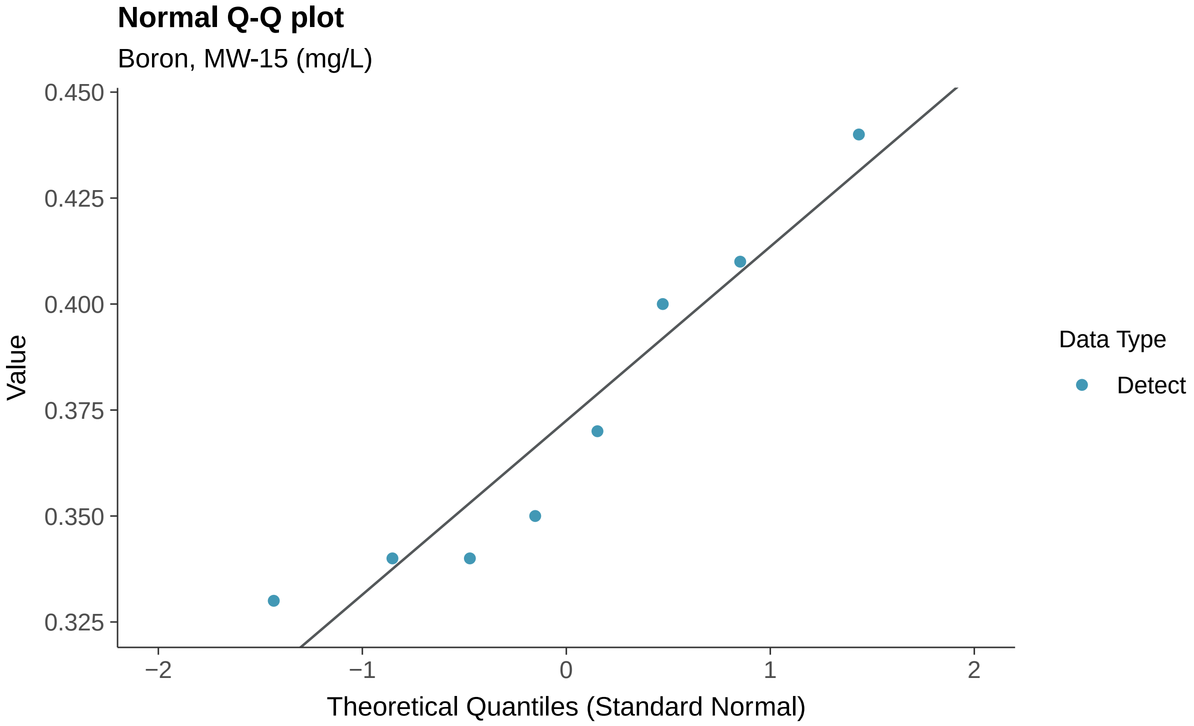
Boron, MW-15 (mg/L)

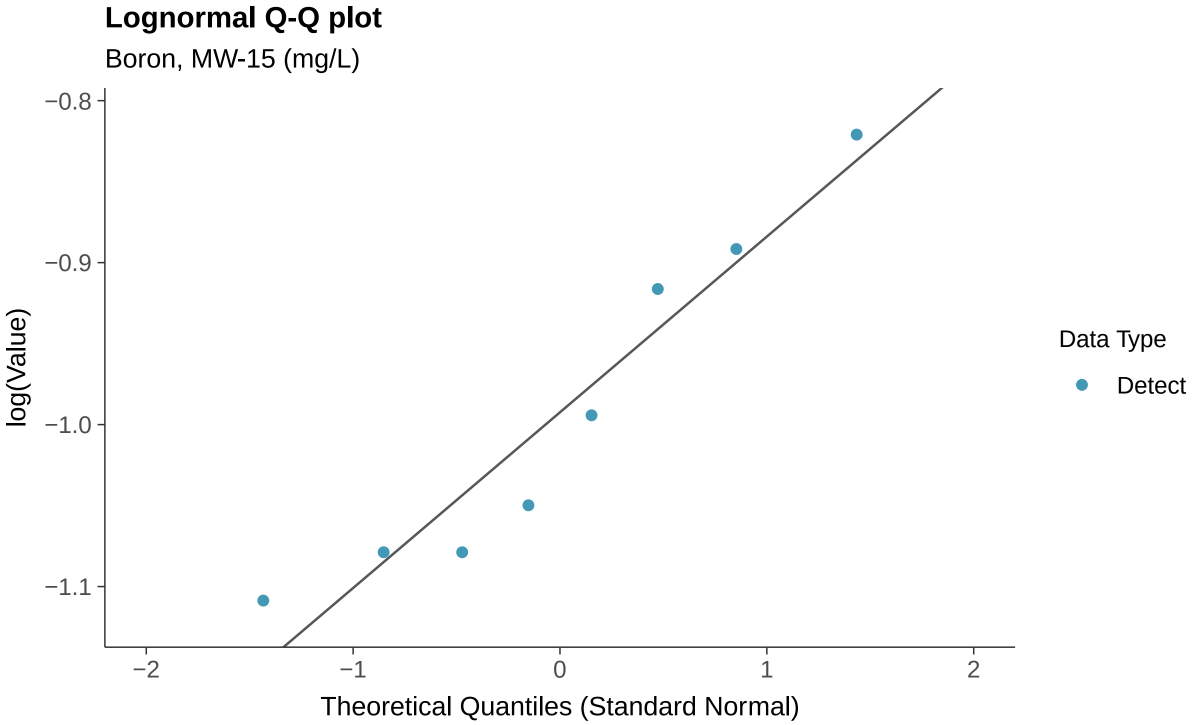


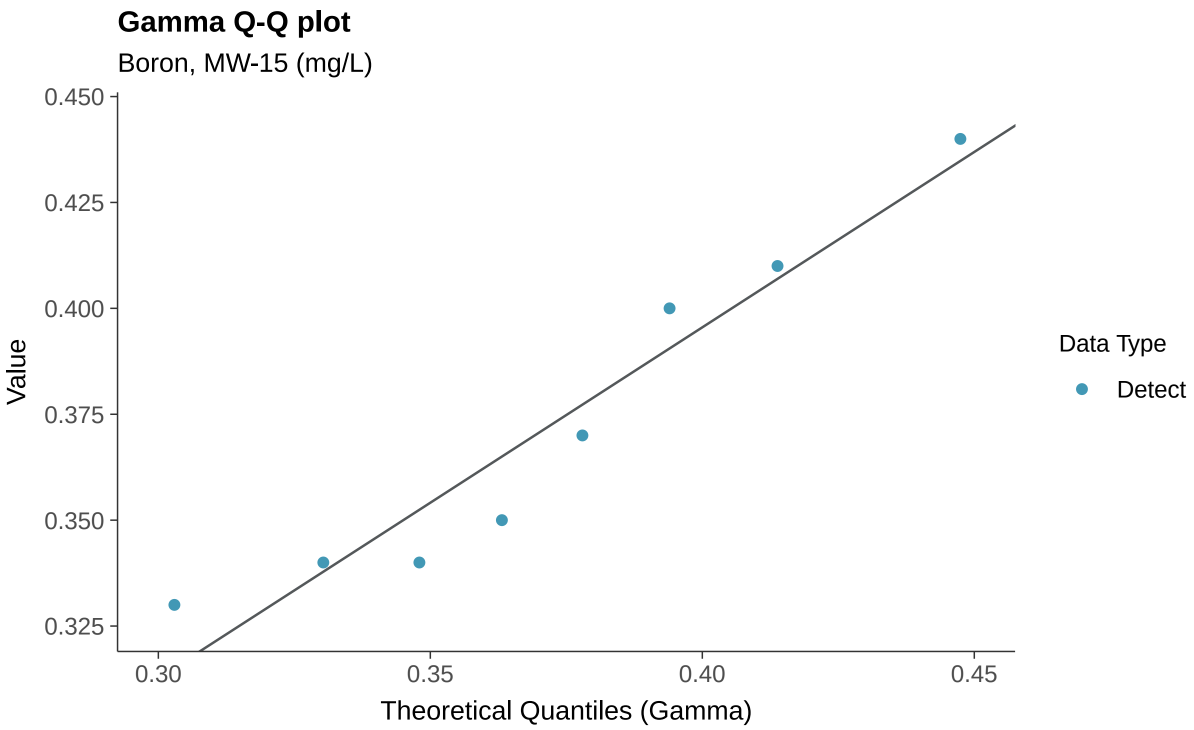
Boxplot by Season

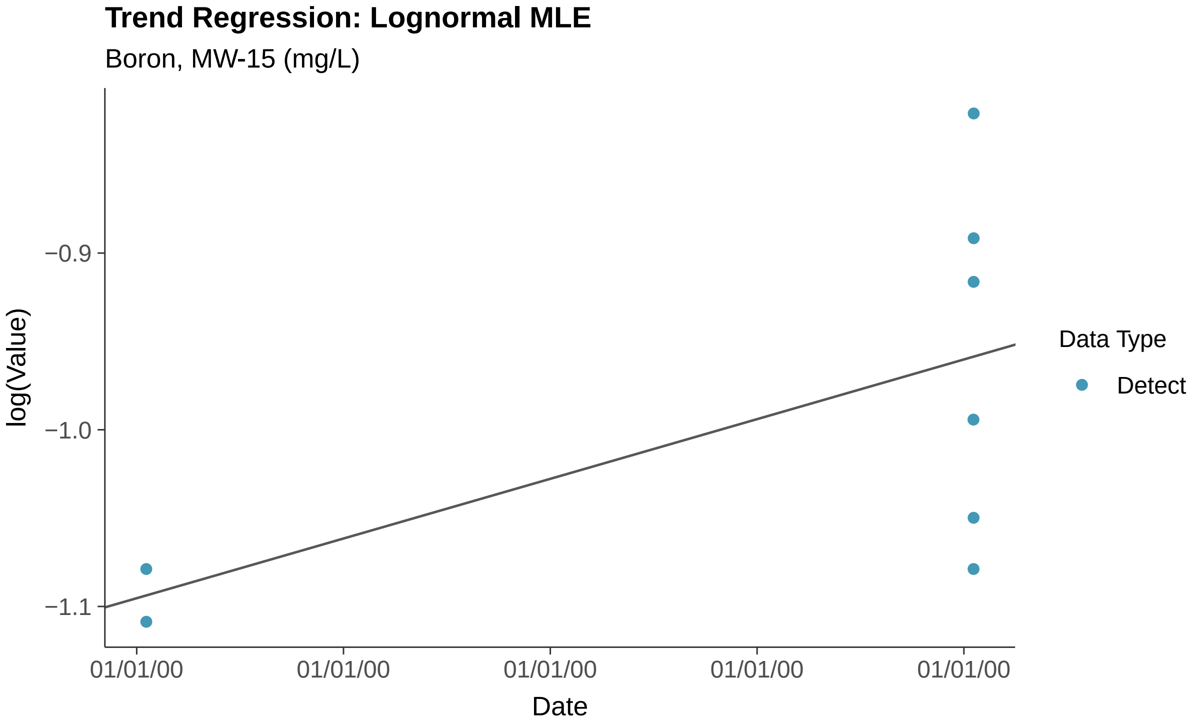
Boron, MW-15 (mg/L)




Normal Q-Q plot
Boron, MW-15 (mg/L)
Value
0.450
0.425
0.400
0.375
0.350
0.325
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
● Detect

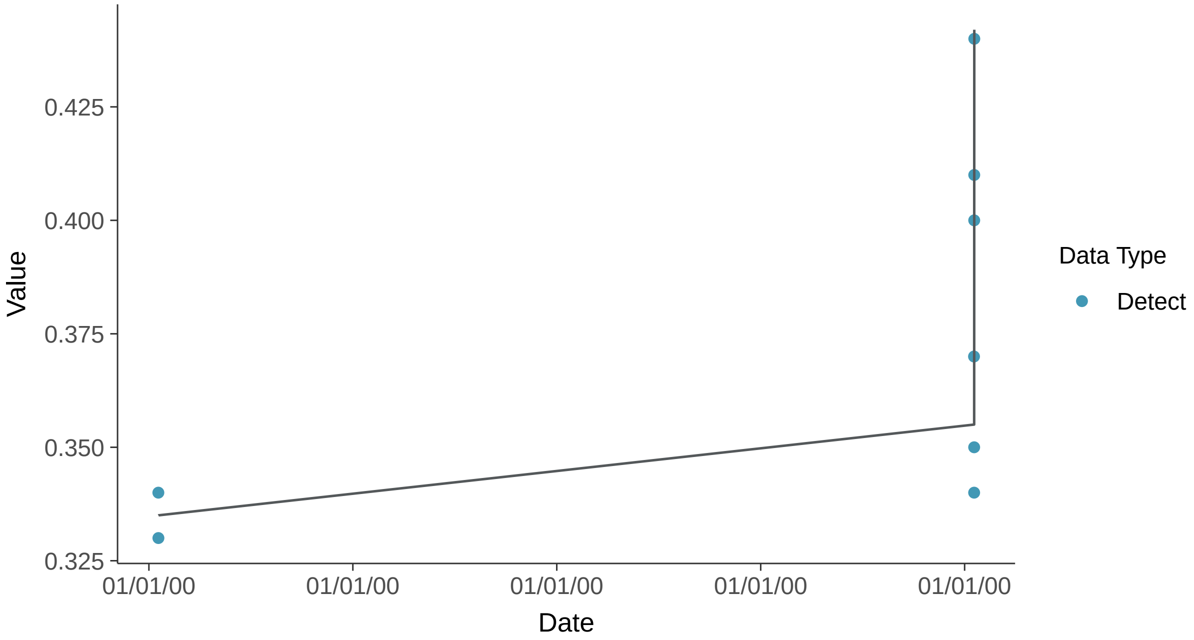

Lognormal Q-Q plot
Boron, MW-15 (mg/L)
log(Value)
−0.8
−0.9
−1.0
−1.1
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
● Detect


Gamma Q-Q plot
Boron, MW-15 (mg/L)
Value
0.450
0.425
0.400
0.375
0.350
0.325
0.30
0.35
0.40
0.45
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Boron, MW-15 (mg/L)
log(Value)
−0.9
−1.0
−1.1
01/01/00
01/01/00
01/01/00
01/01/00
01/01/00
Date
Data Type
Detect

Trend Regression: Piecewise Linear-Linear

Boron, MW-15 (mg/L)

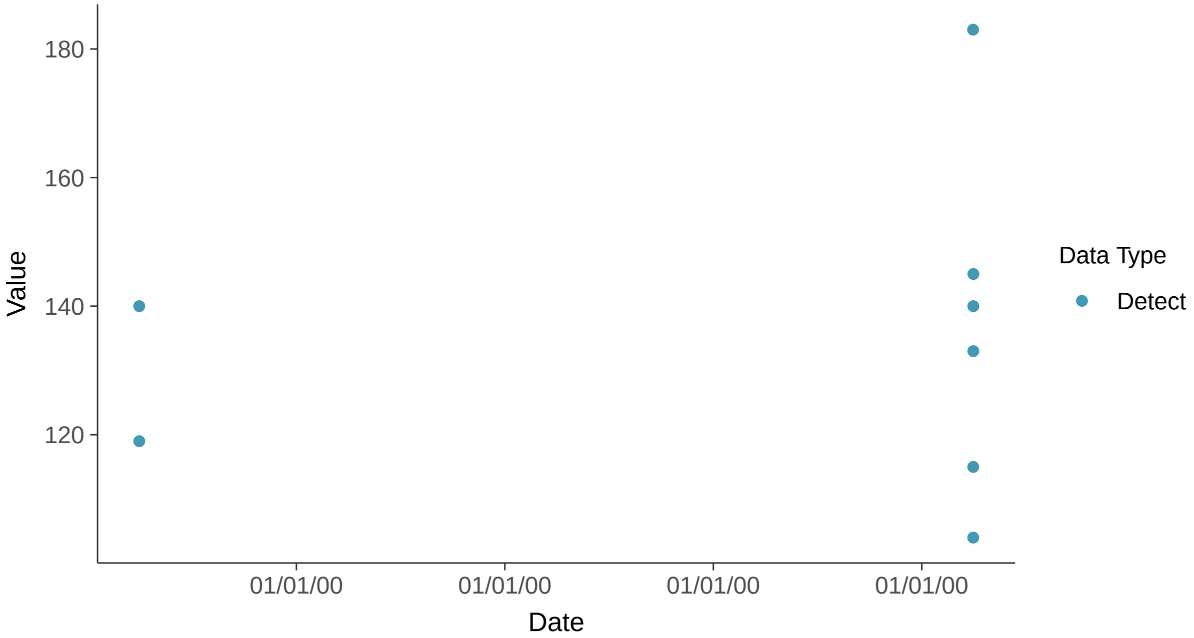


Appendix III: Calcium, MW-15

ID: 15_1_02

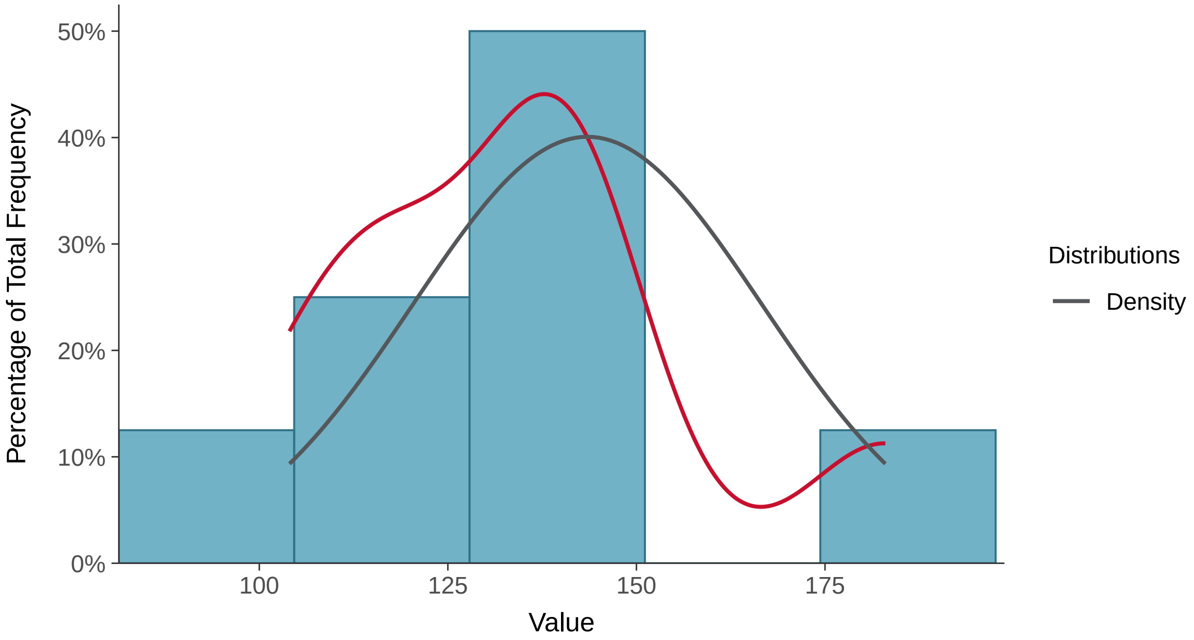
Scatter Plot

Calcium, MW-15 (mg/L)



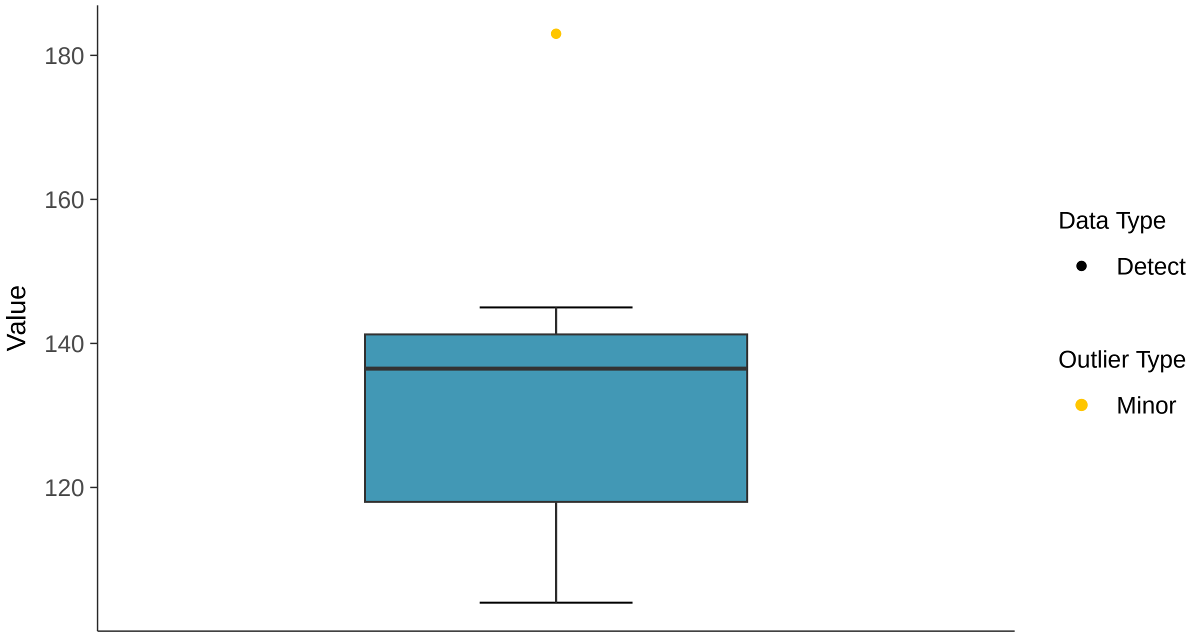
Histogram

Calcium, MW-15 (mg/L)



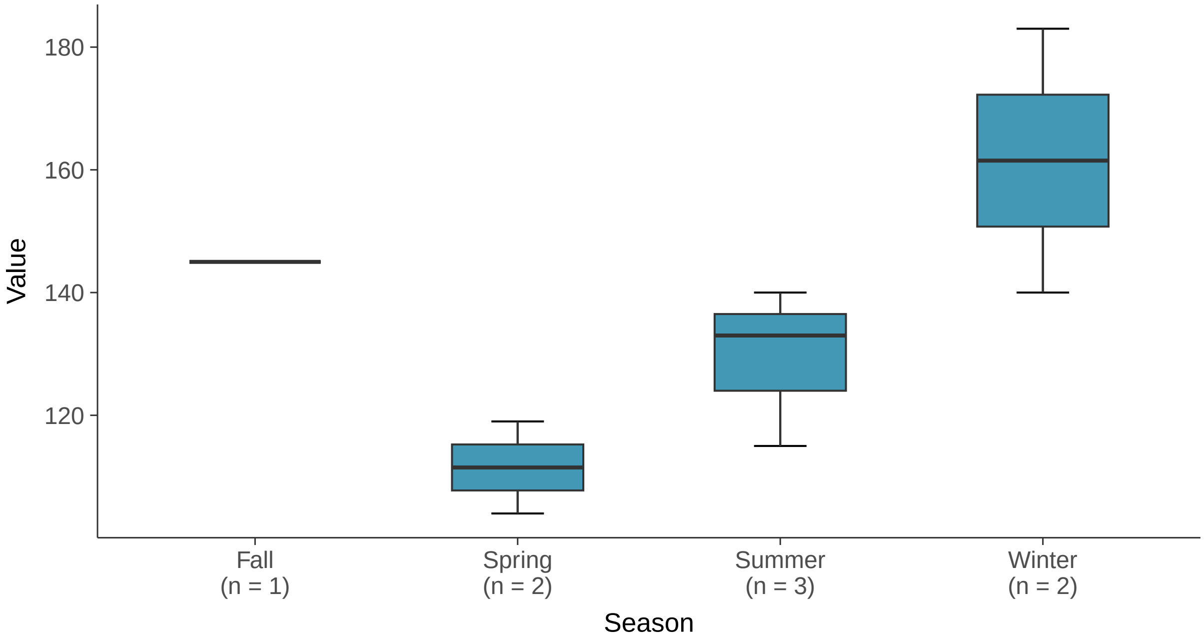
Boxplot

Calcium, MW-15 (mg/L)



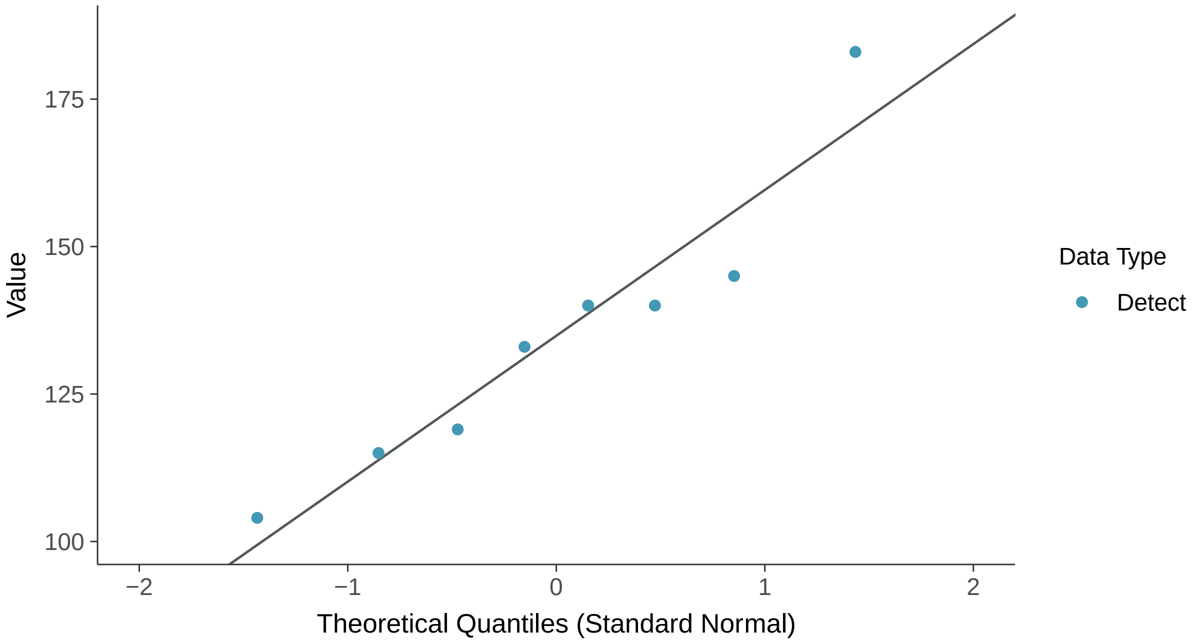
Boxplot by Season

Calcium, MW-15 (mg/L)



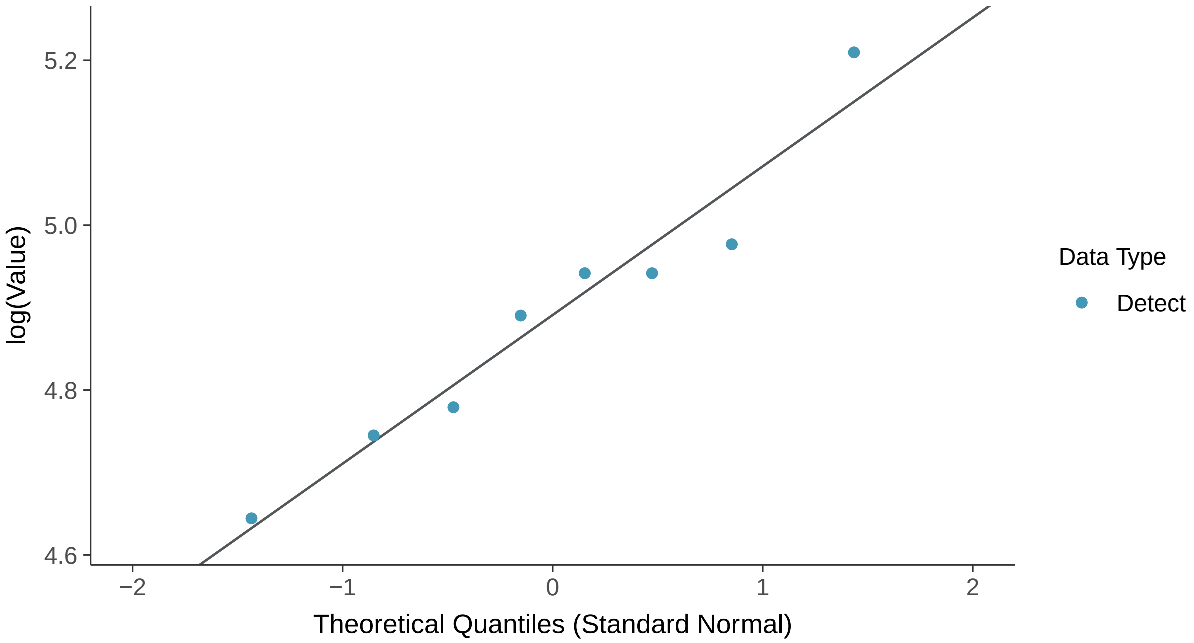
Normal Q-Q plot

Calcium, MW-15 (mg/L)



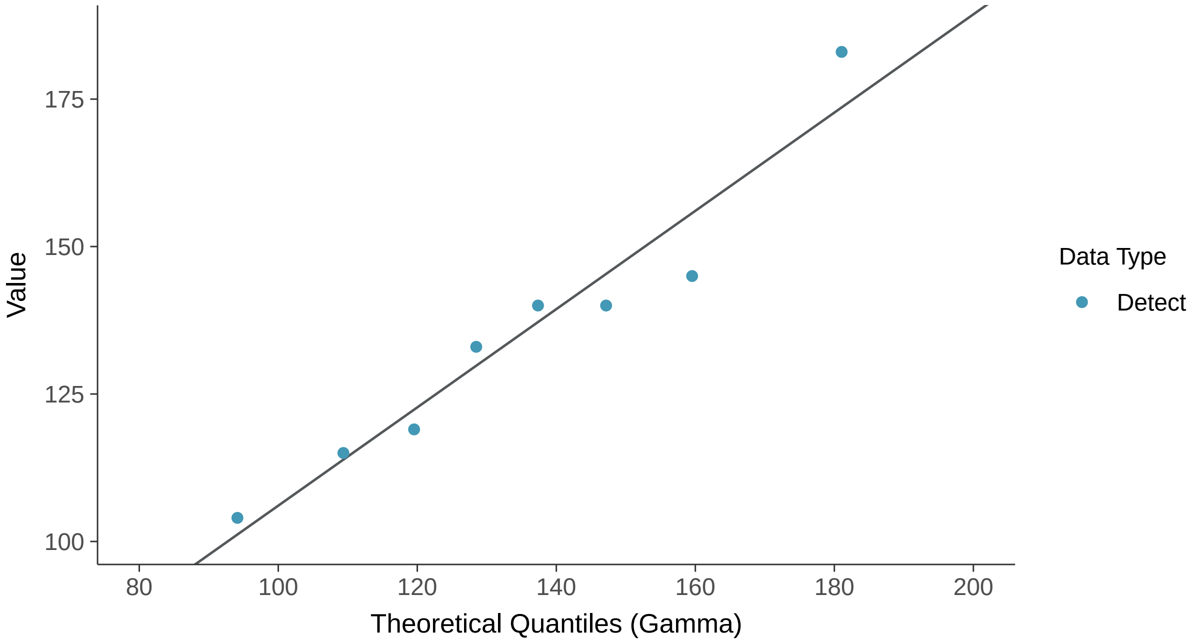
Lognormal Q-Q plot

Calcium, MW-15 (mg/L)



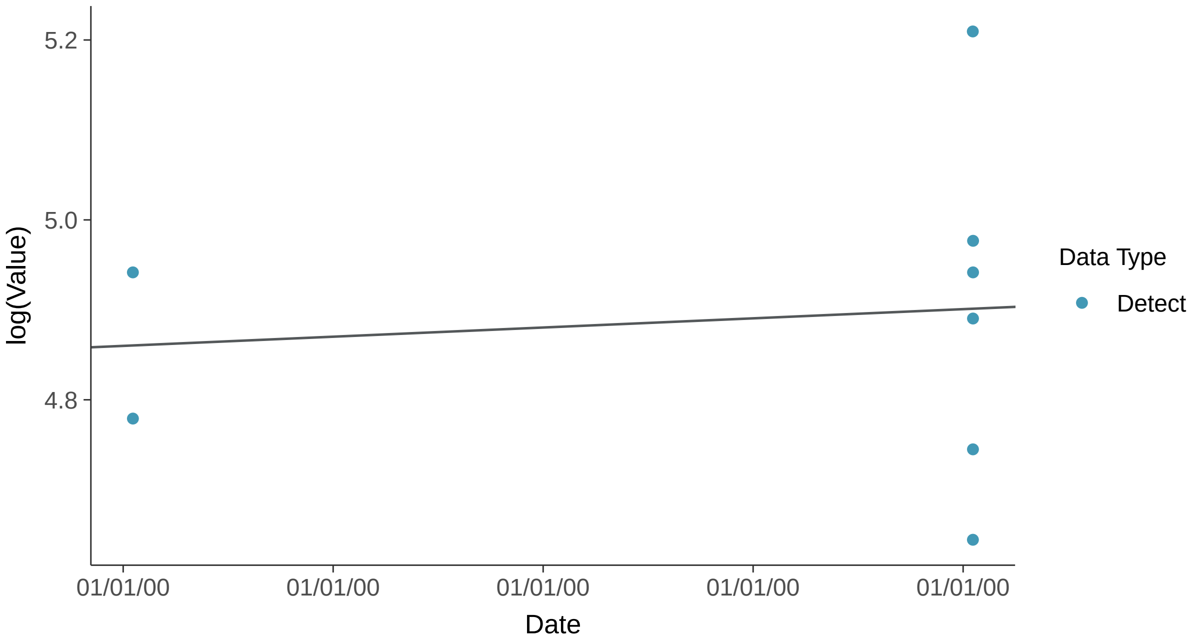
Gamma Q-Q plot

Calcium, MW-15 (mg/L)



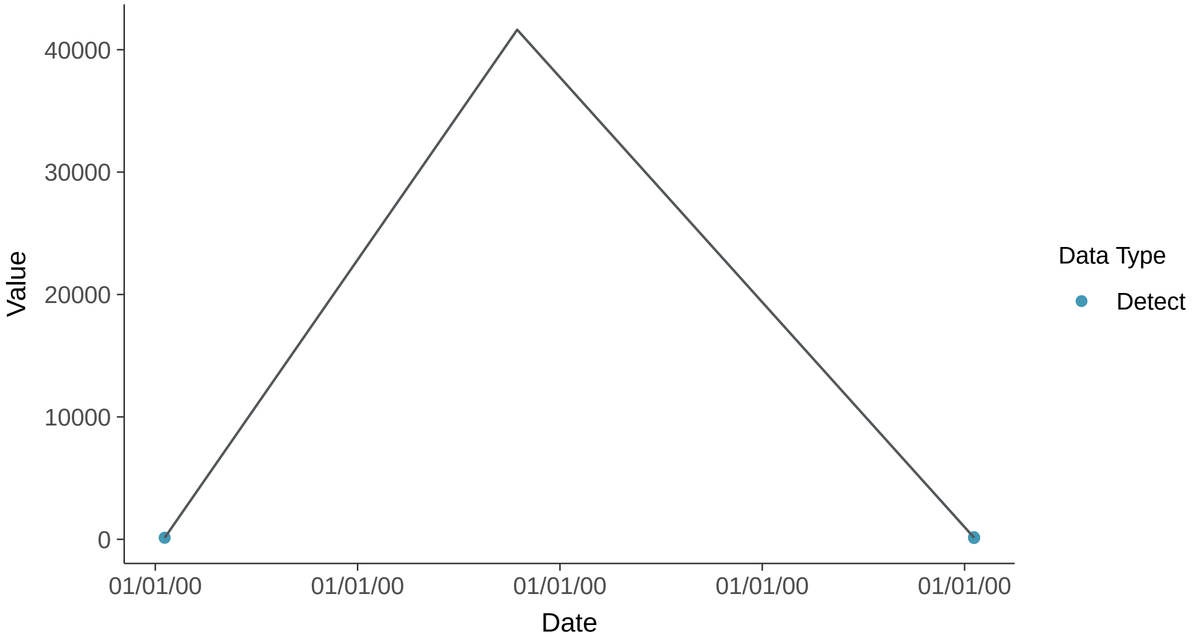
Trend Regression: Lognormal MLE

Calcium, MW-15 (mg/L)



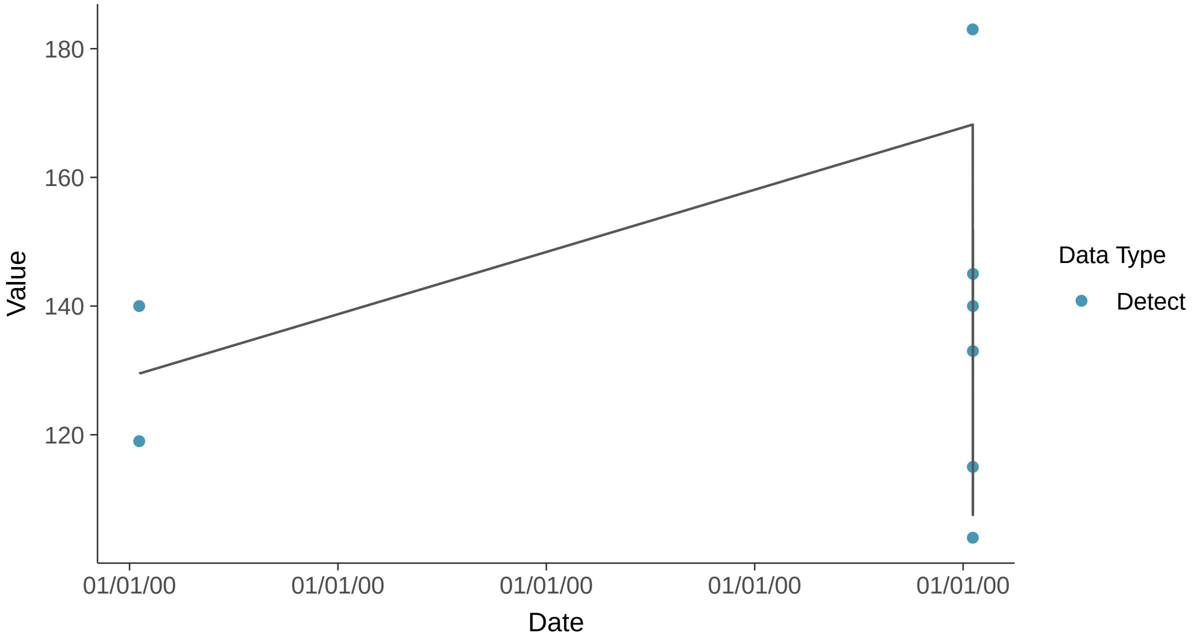
Trend Regression: Piecewise Linear-Linear

Calcium, MW-15 (mg/L)



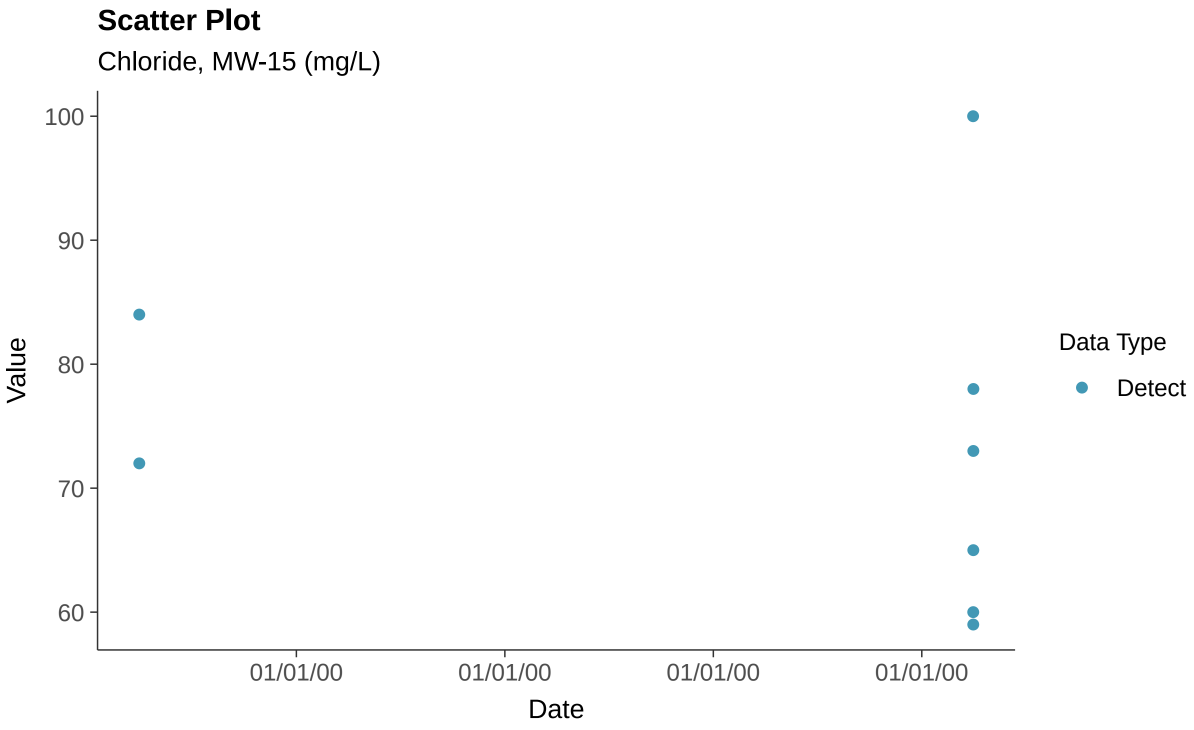
Trend Regression: Piecewise Linear-Linear-Linear

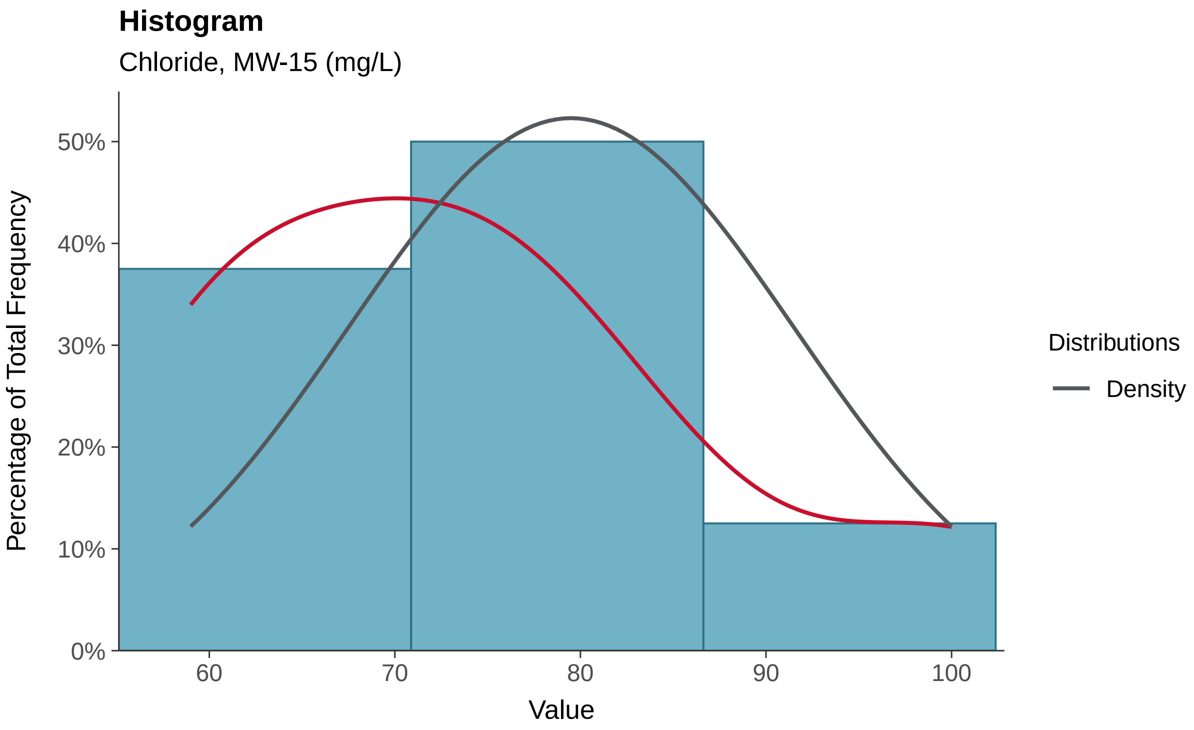
Calcium, MW-15 (mg/L)



Appendix III: Chloride, MW-15

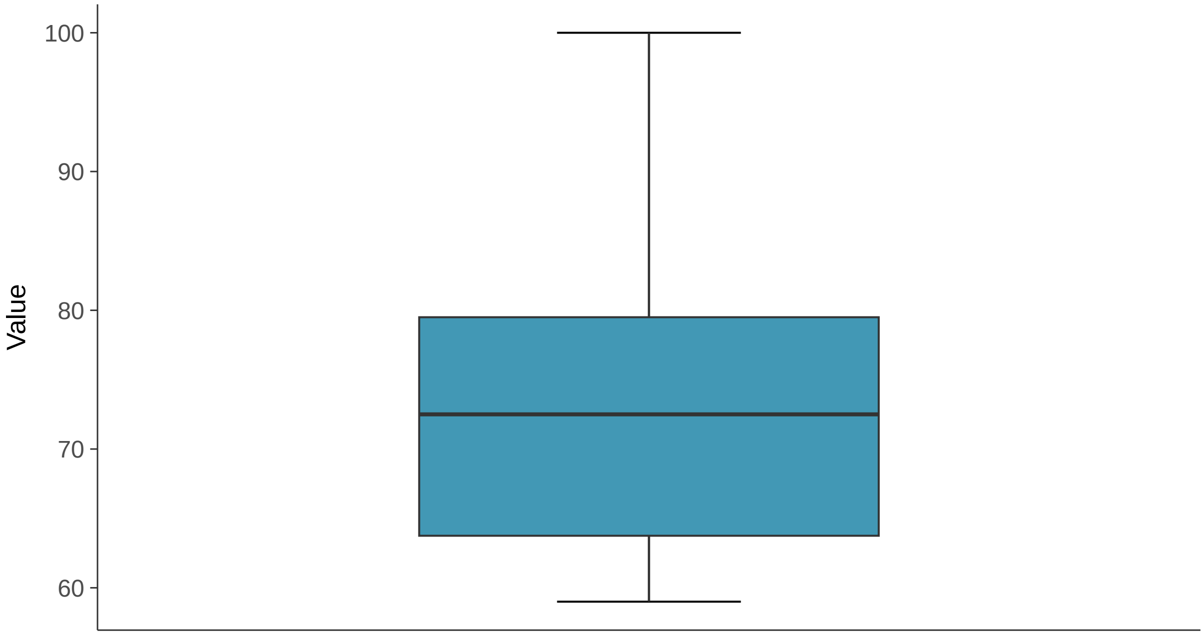
ID: 15_1_03





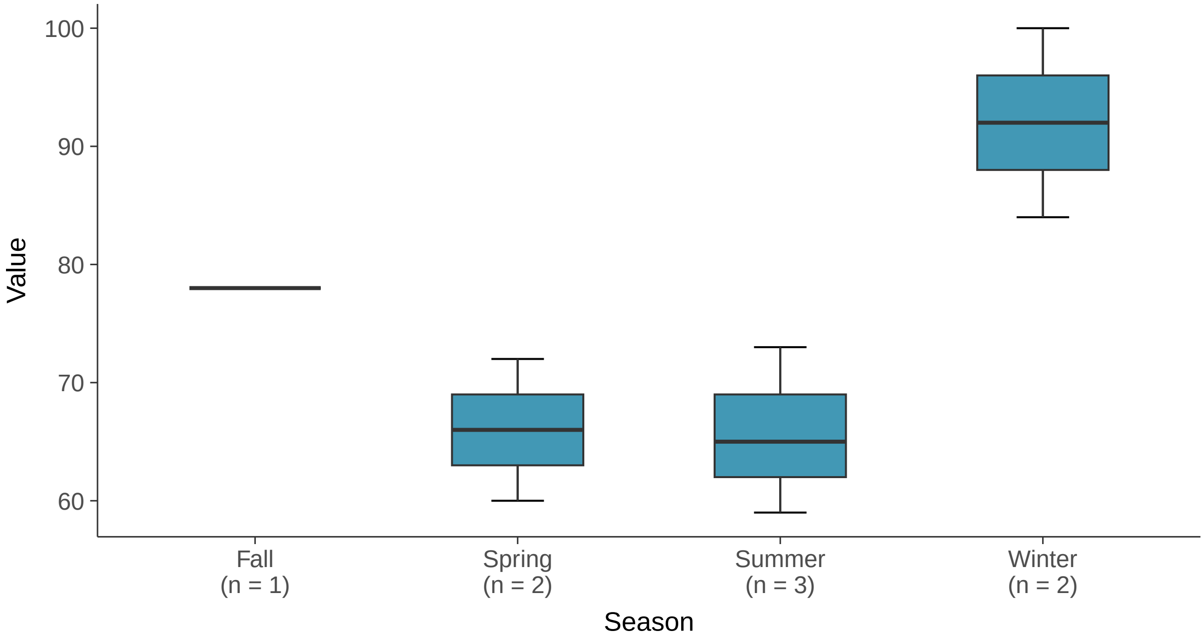
Boxplot

Chloride, MW-15 (mg/L)



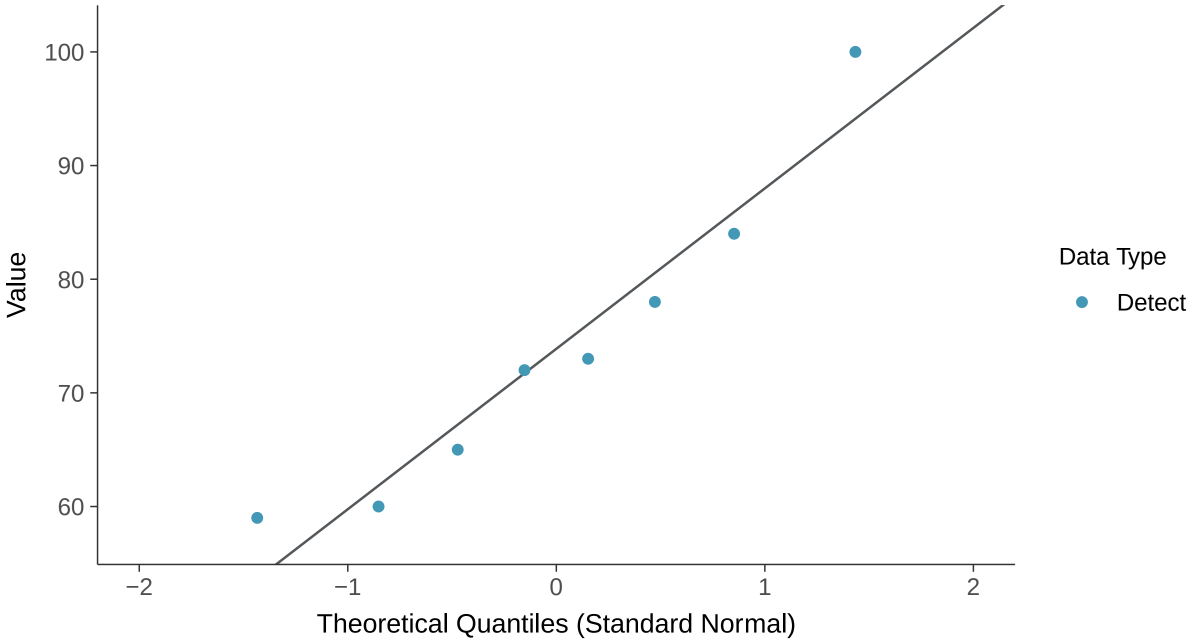
Boxplot by Season

Chloride, MW-15 (mg/L)



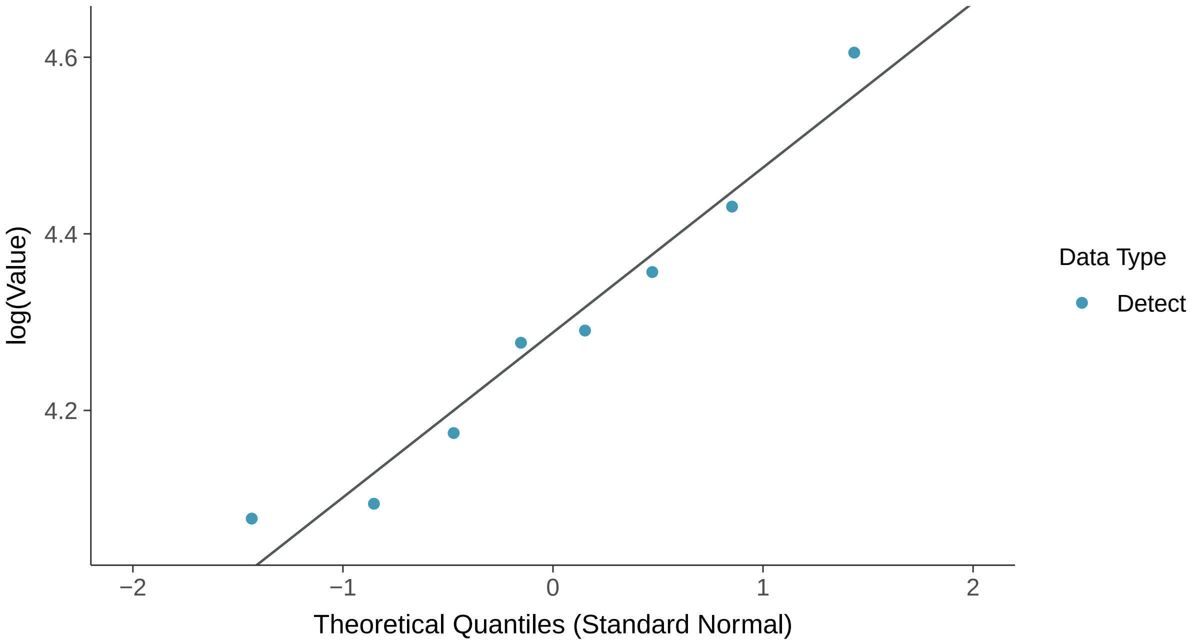
Normal Q-Q plot

Chloride, MW-15 (mg/L)



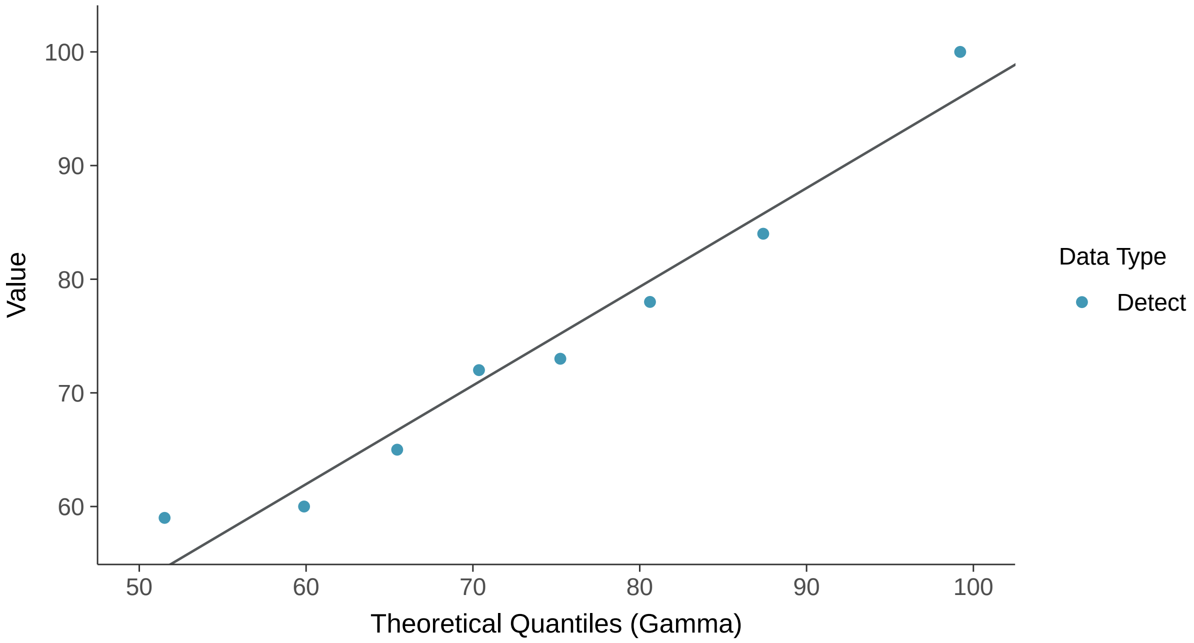
Lognormal Q-Q plot

Chloride, MW-15 (mg/L)



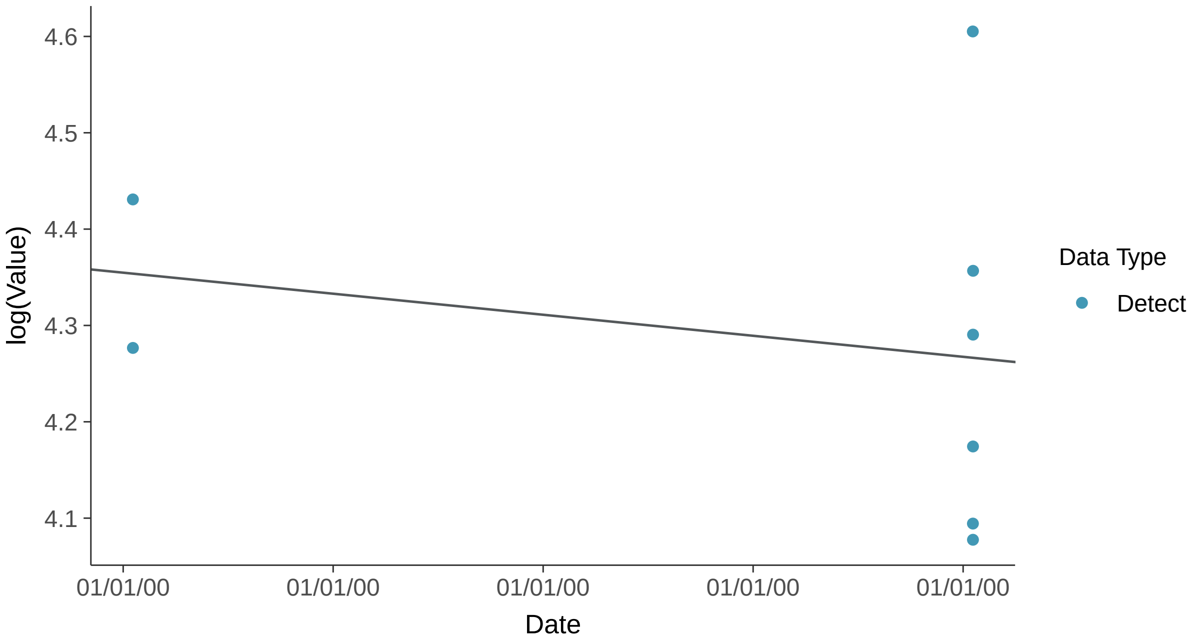
Gamma Q-Q plot

Chloride, MW-15 (mg/L)



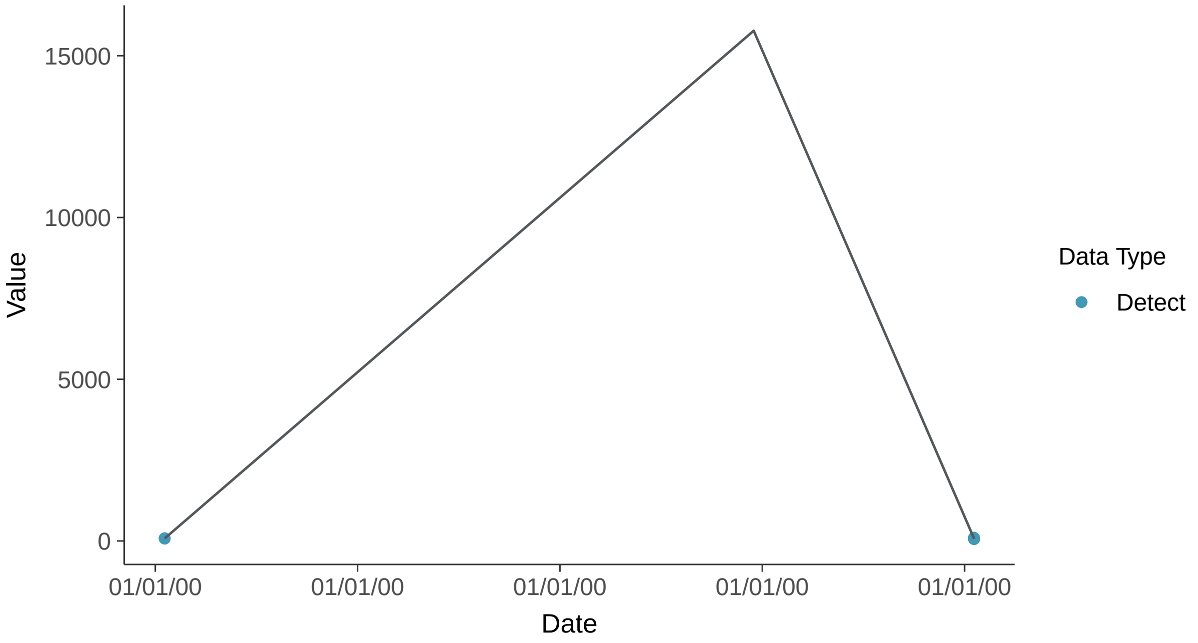
Trend Regression: Lognormal MLE

Chloride, MW-15 (mg/L)



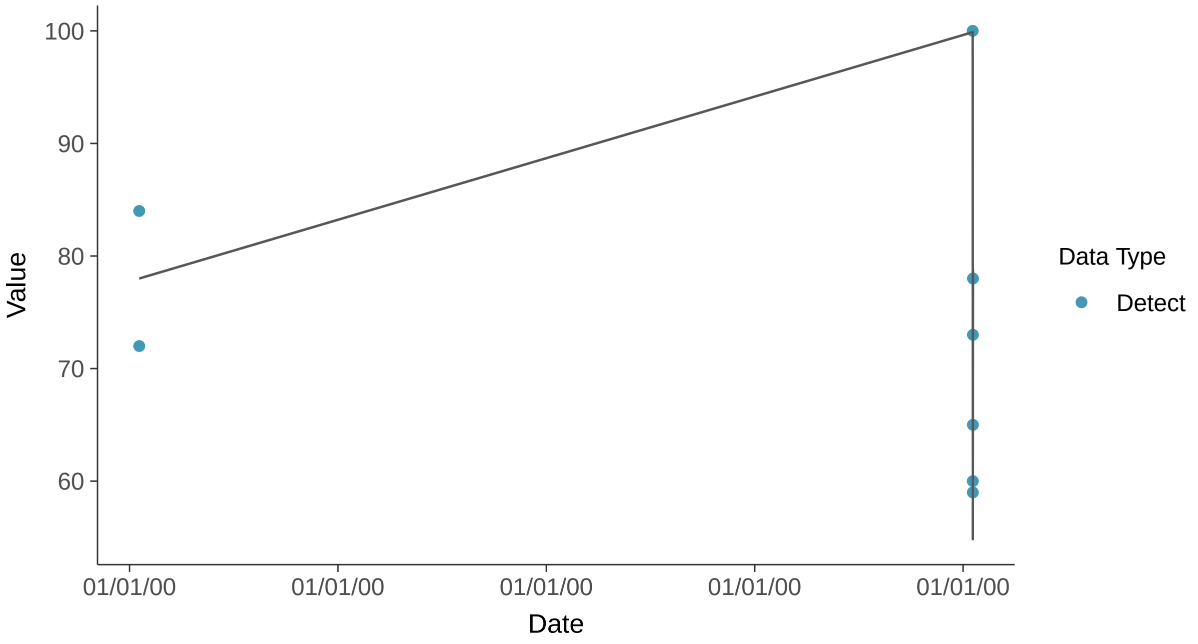
Trend Regression: Piecewise Linear-Linear

Chloride, MW-15 (mg/L)



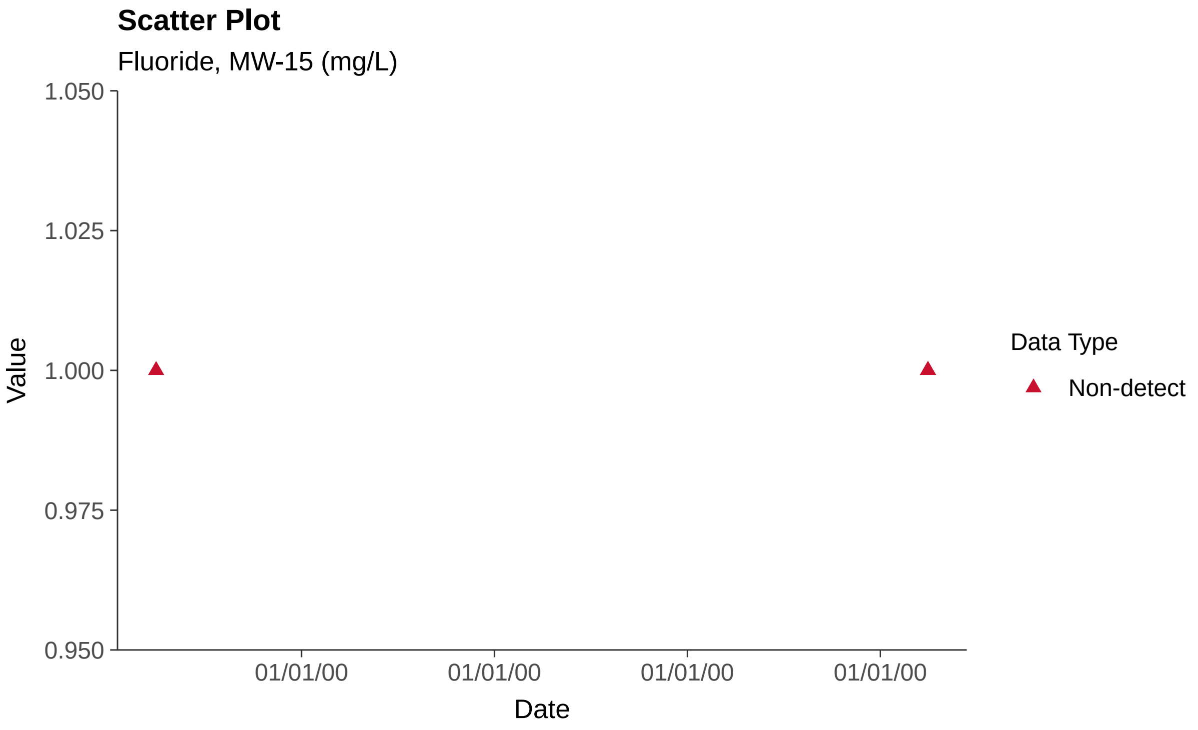
Trend Regression: Piecewise Linear-Linear-Linear

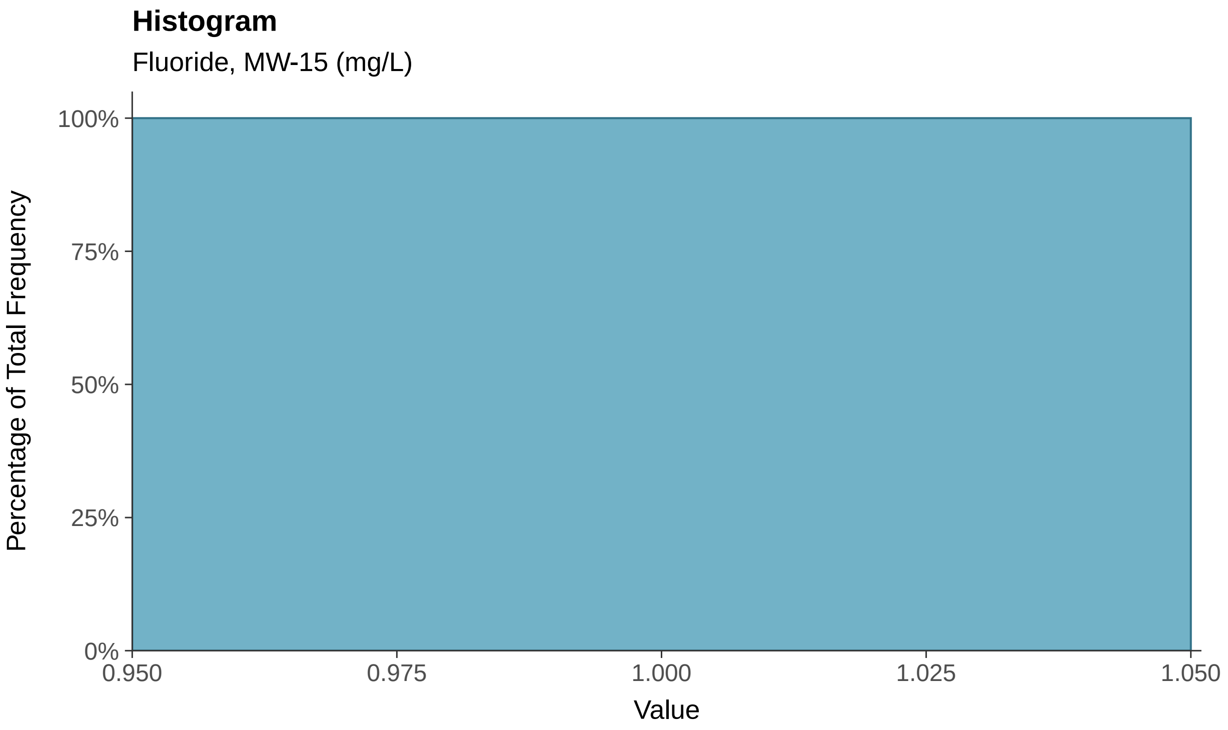
Chloride, MW-15 (mg/L)



Appendix III: Fluoride, MW-15

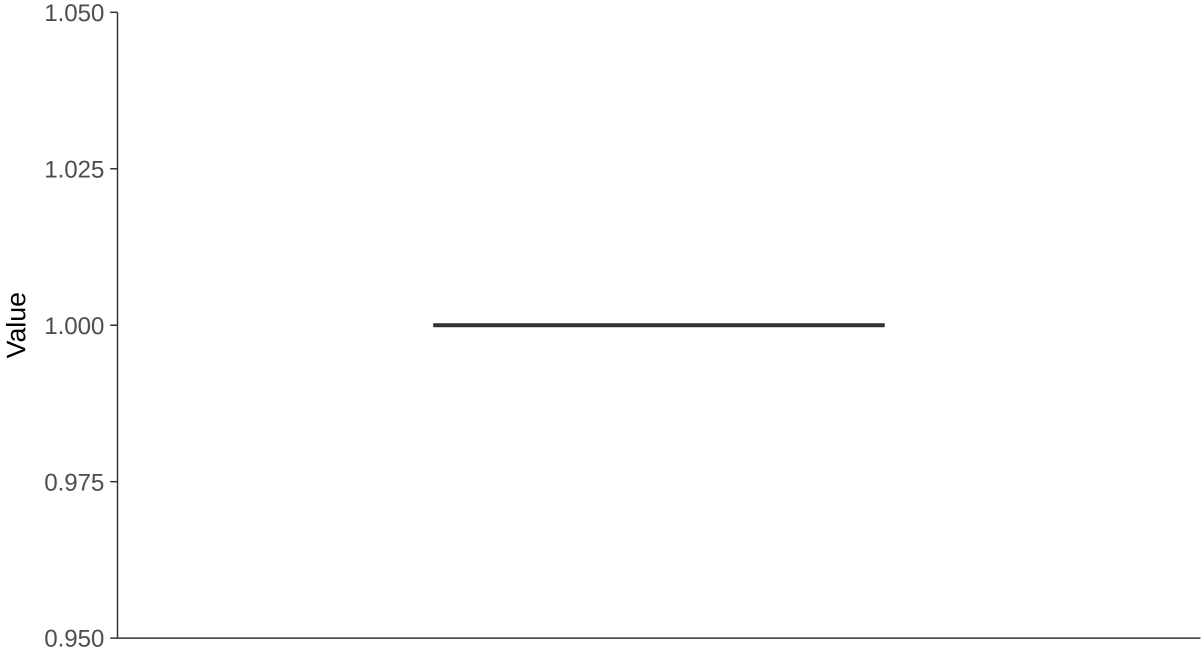
ID: 15_1_04





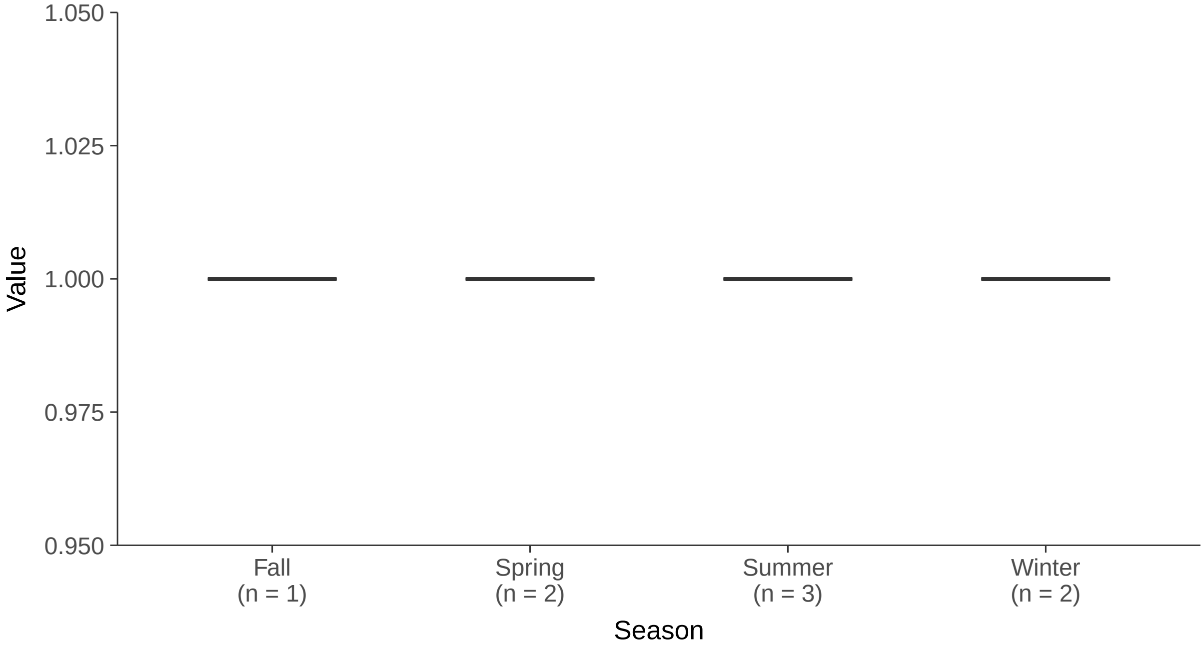
Boxplot

Fluoride, MW-15 (mg/L)



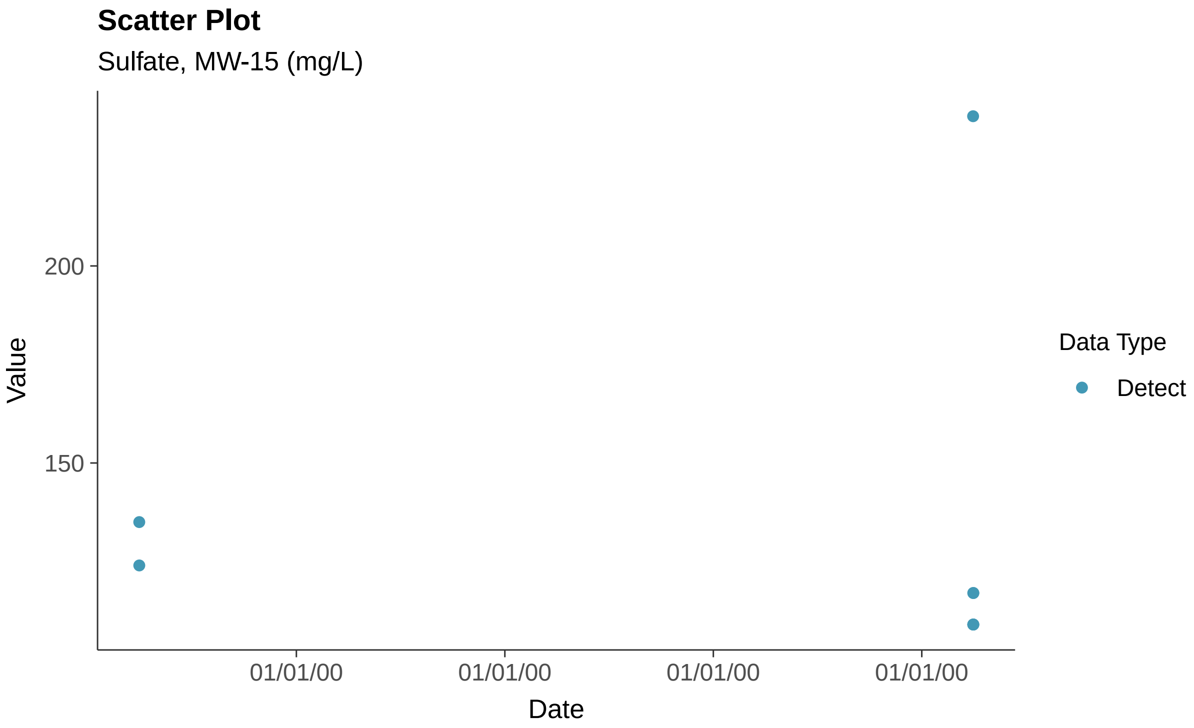
Boxplot by Season

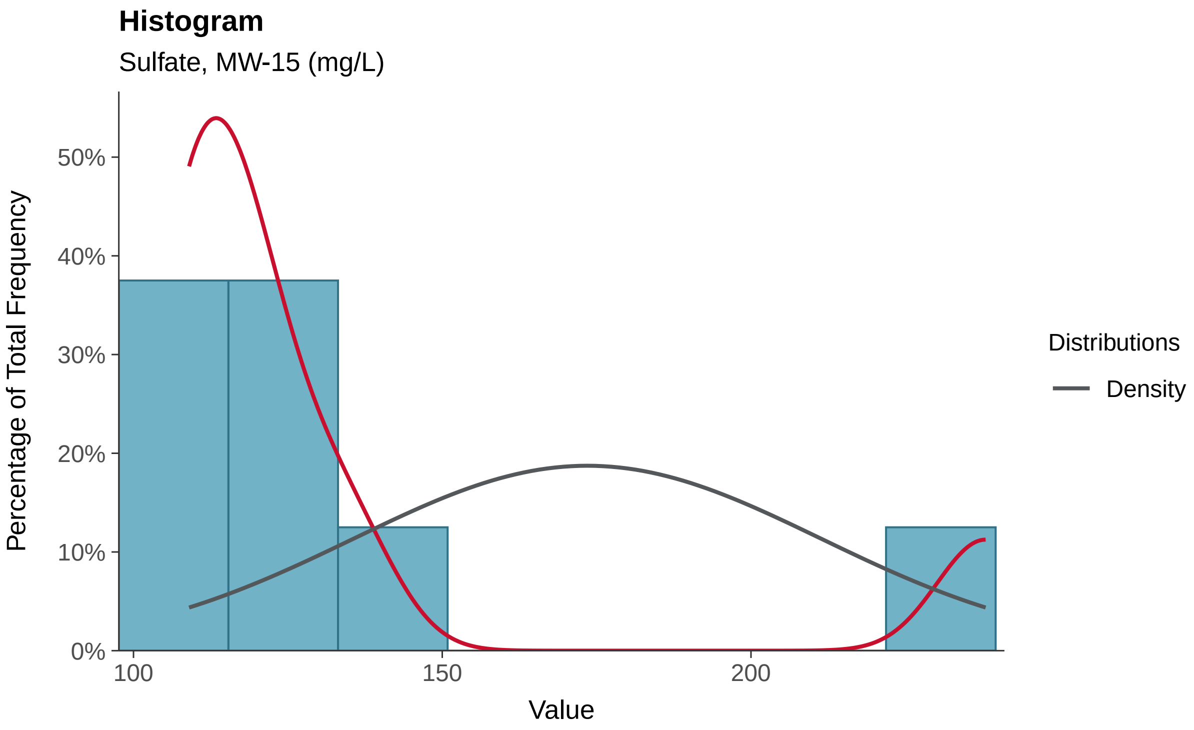
Fluoride, MW-15 (mg/L)



Appendix III: Sulfate, MW-15

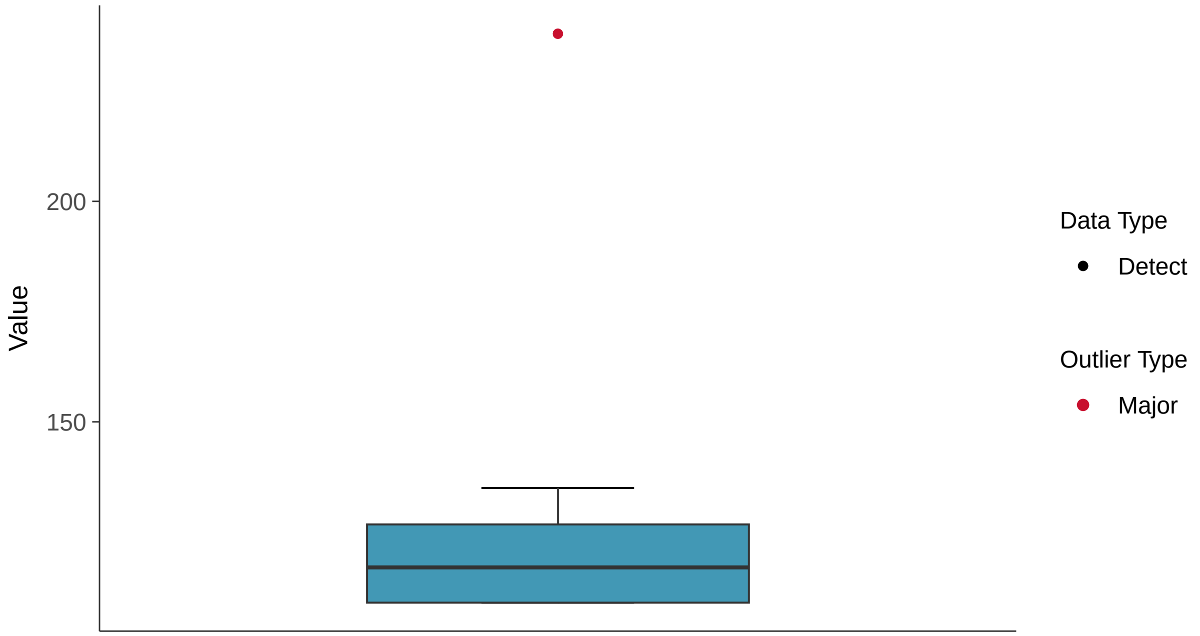
ID: 15_1_05





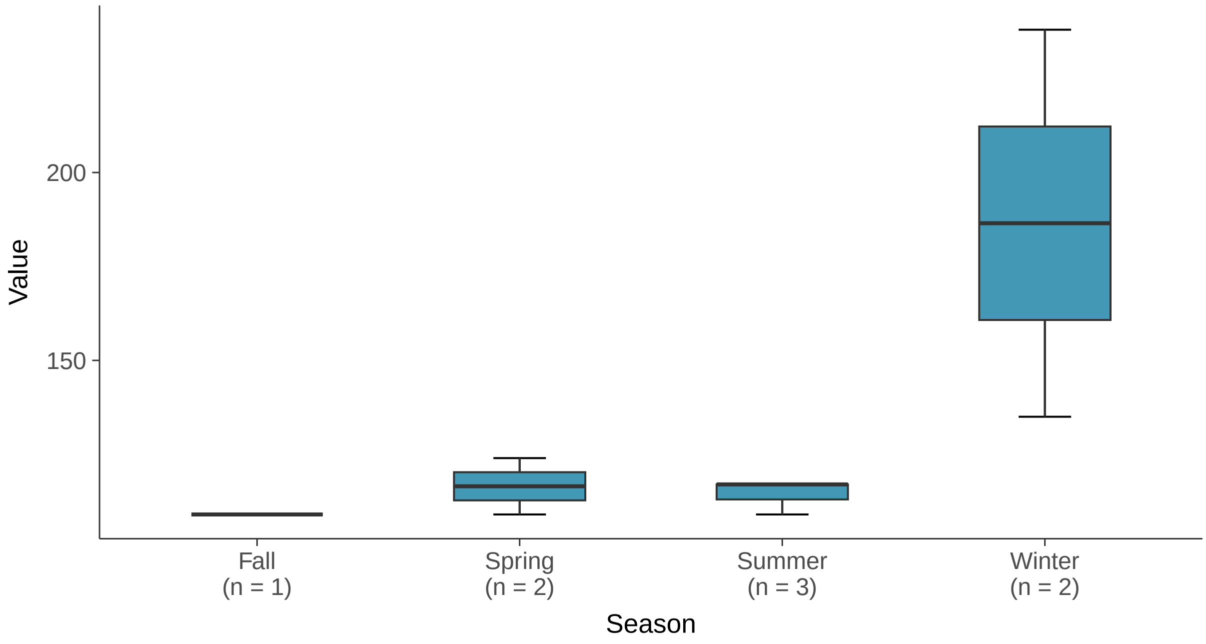
Boxplot

Sulfate, MW-15 (mg/L)



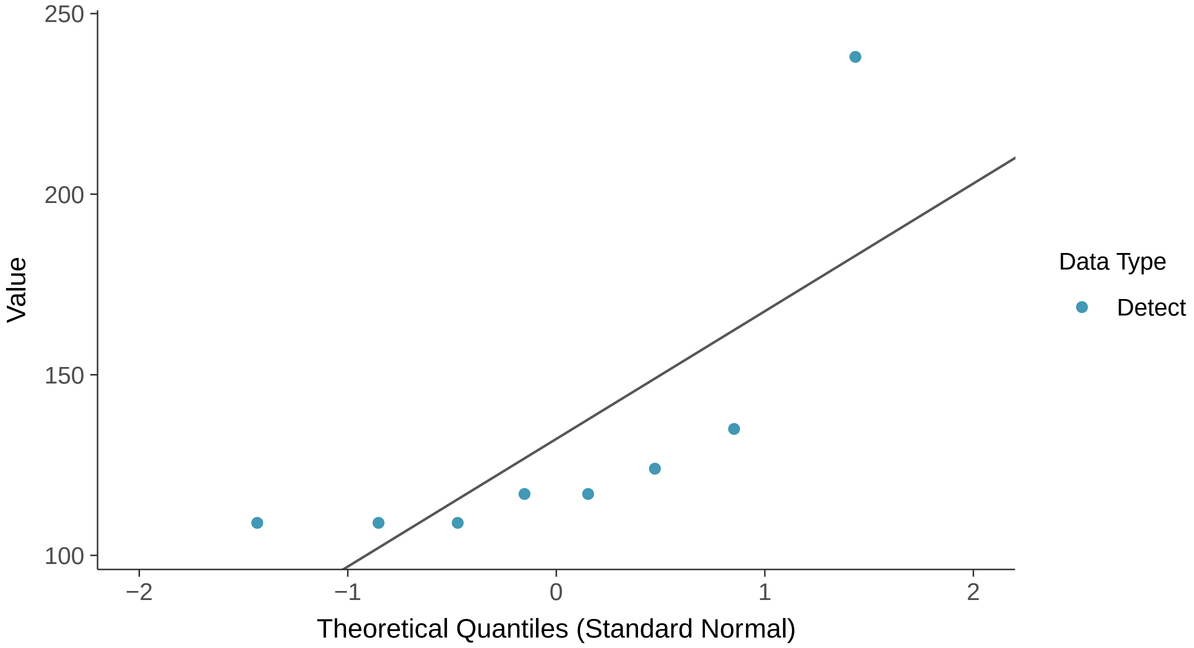
Boxplot by Season

Sulfate, MW-15 (mg/L)



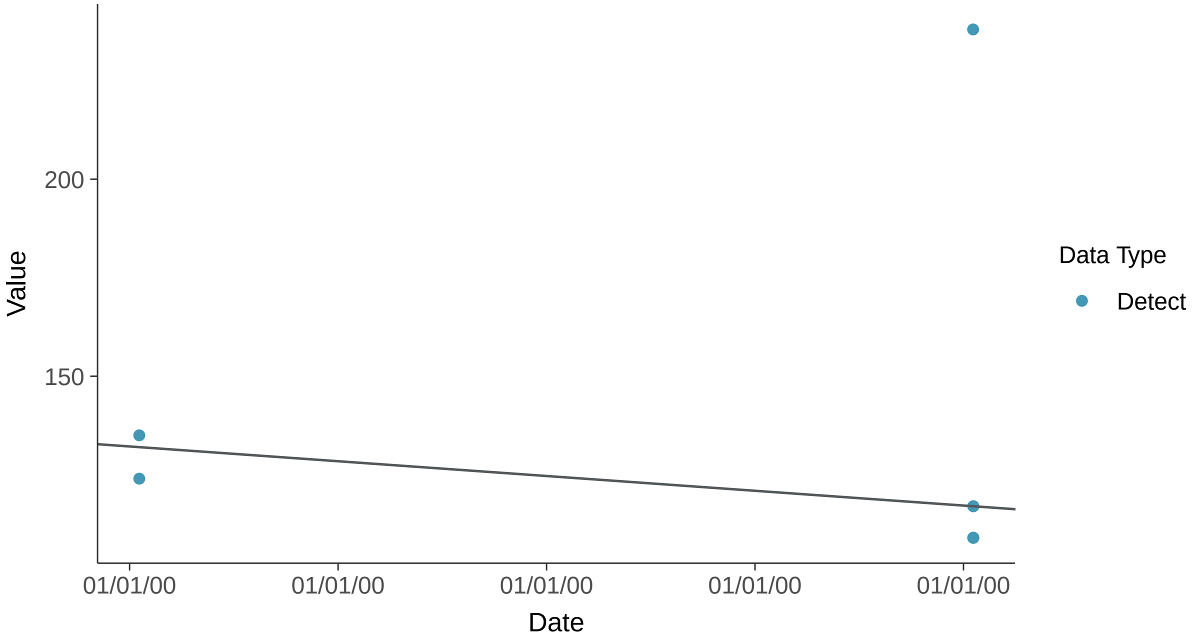
Normal Q-Q plot

Sulfate, MW-15 (mg/L)



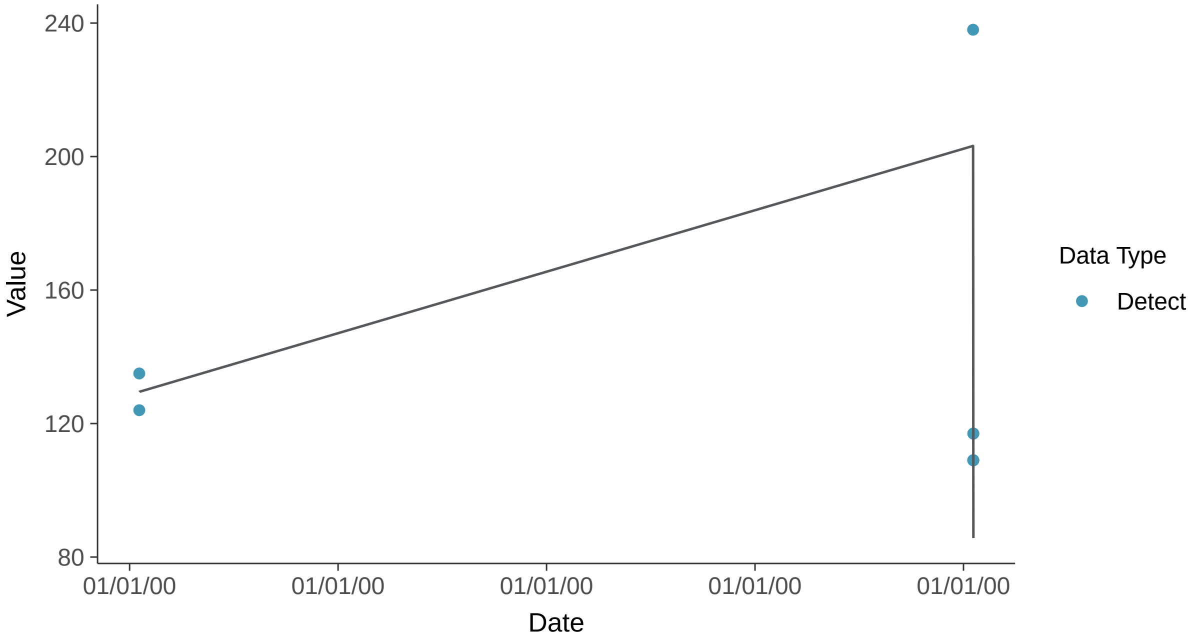
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Sulfate, MW-15 (mg/L)



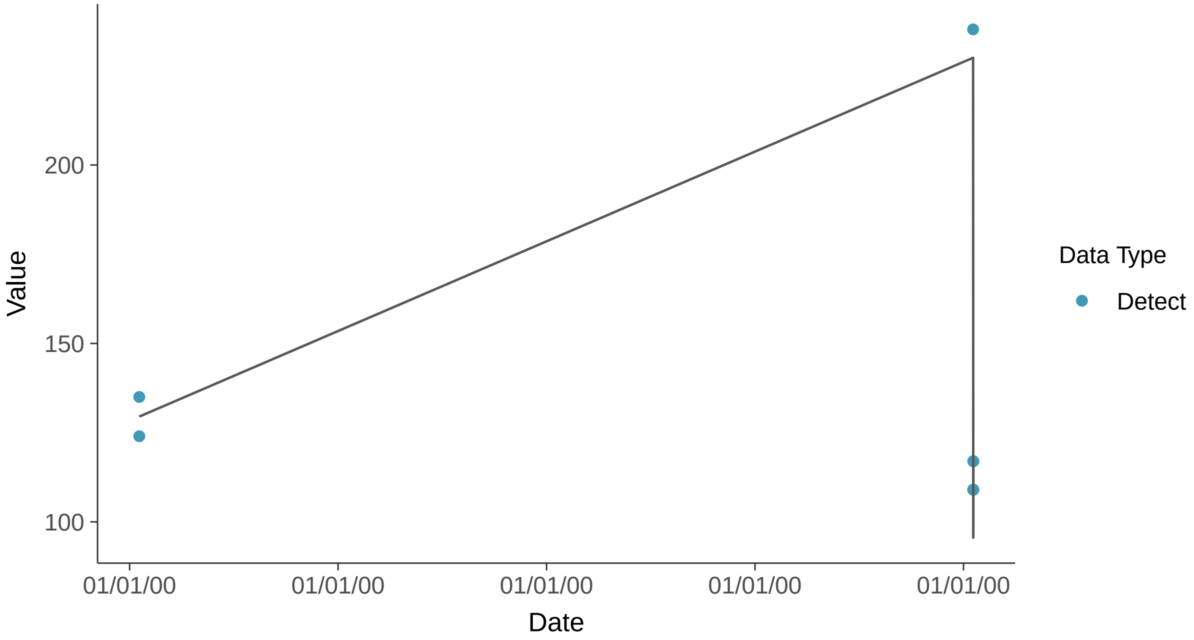
Trend Regression: Piecewise Linear-Linear

Sulfate, MW-15 (mg/L)



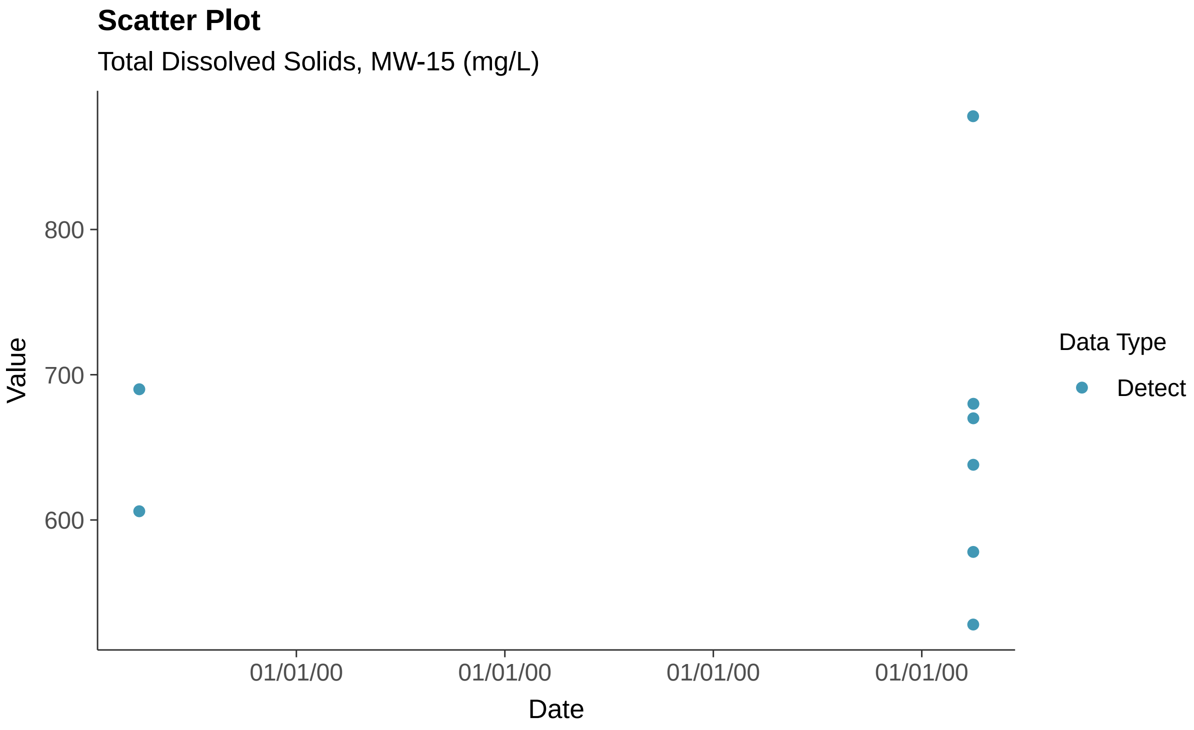
Trend Regression: Piecewise Linear-Linear-Linear

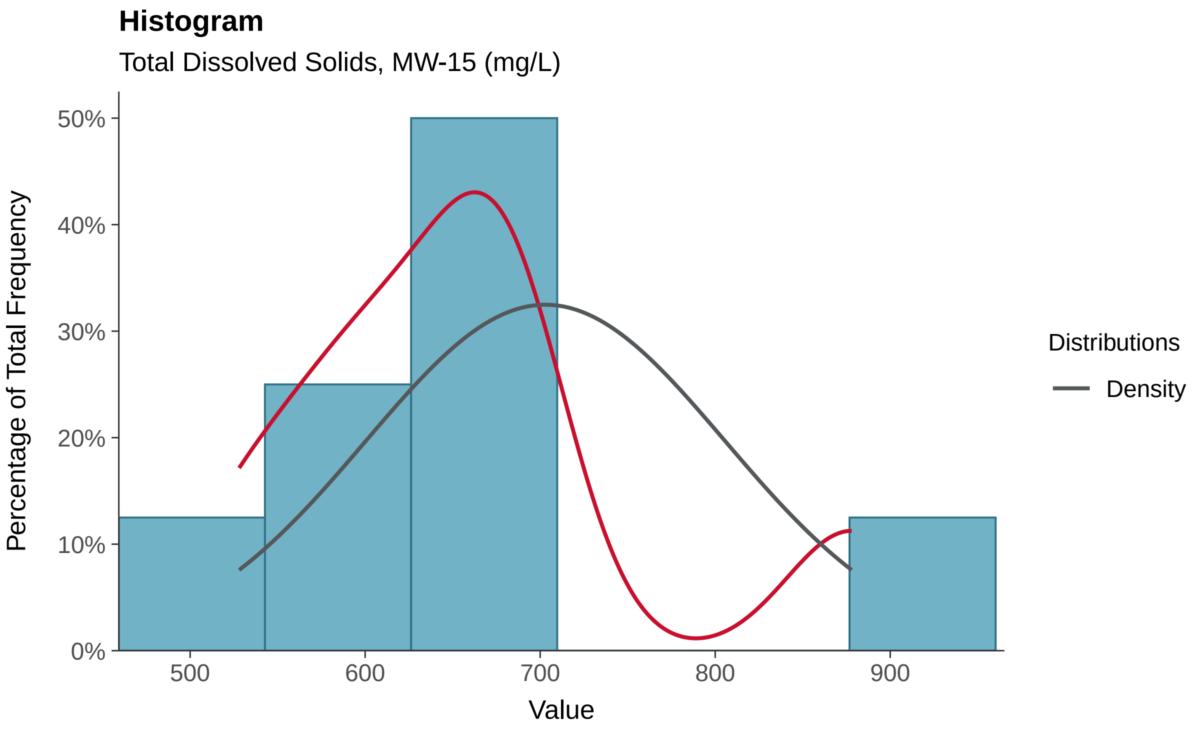
Sulfate, MW-15 (mg/L)



Appendix III: Total Dissolved Solids, MW-15

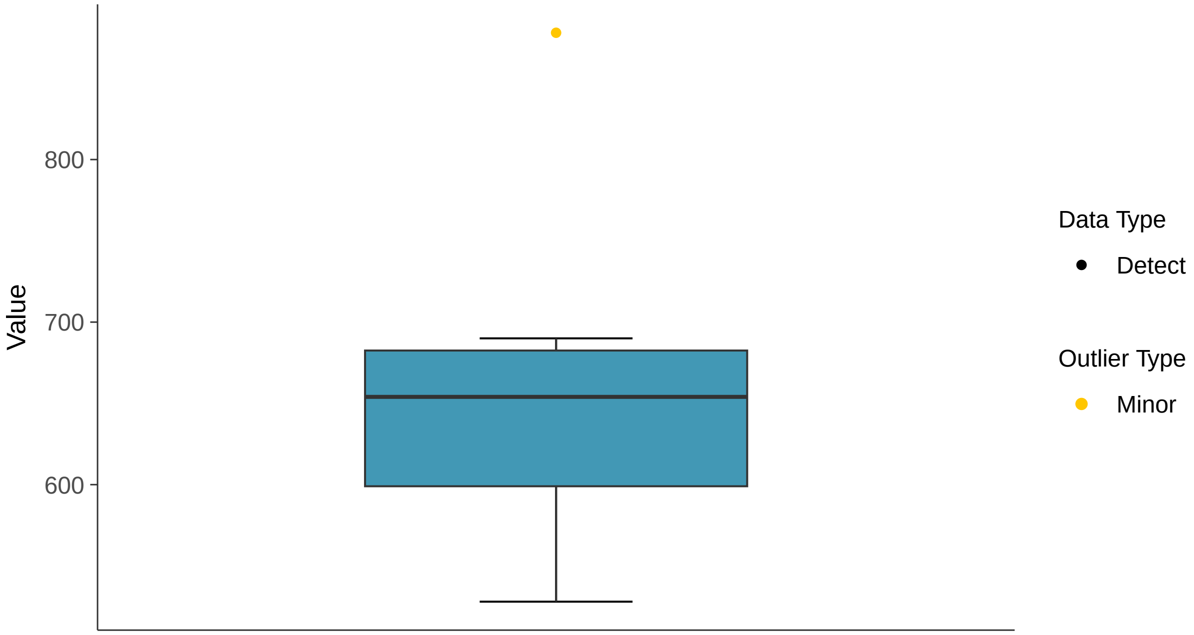
ID: 15_1_06





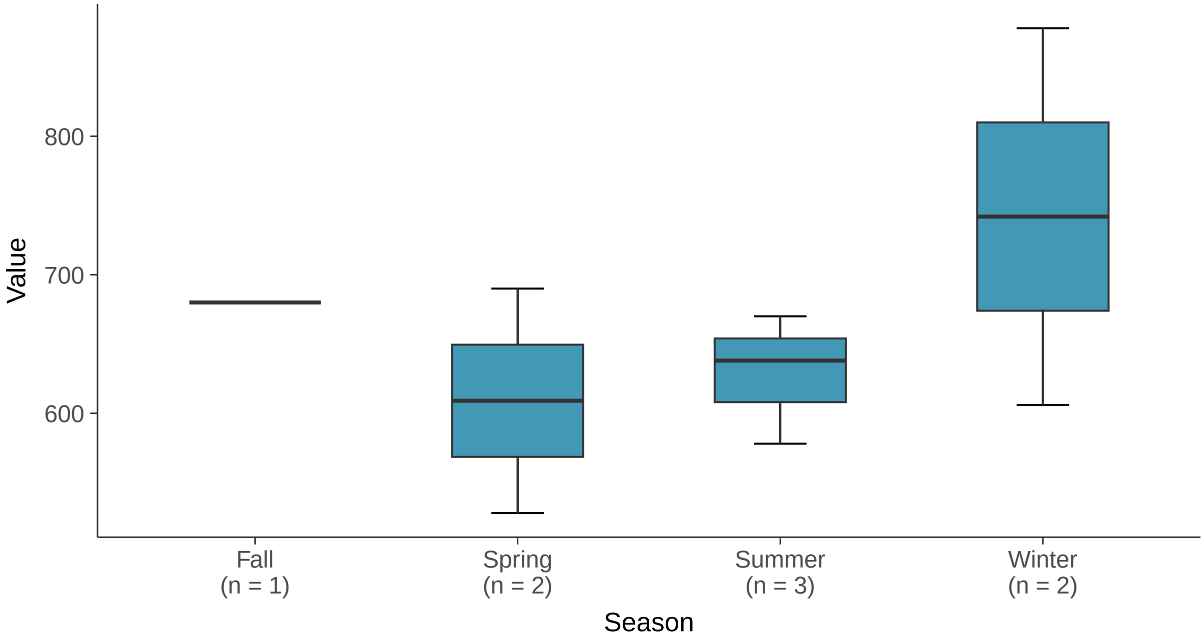
Boxplot

Total Dissolved Solids, MW-15 (mg/L)



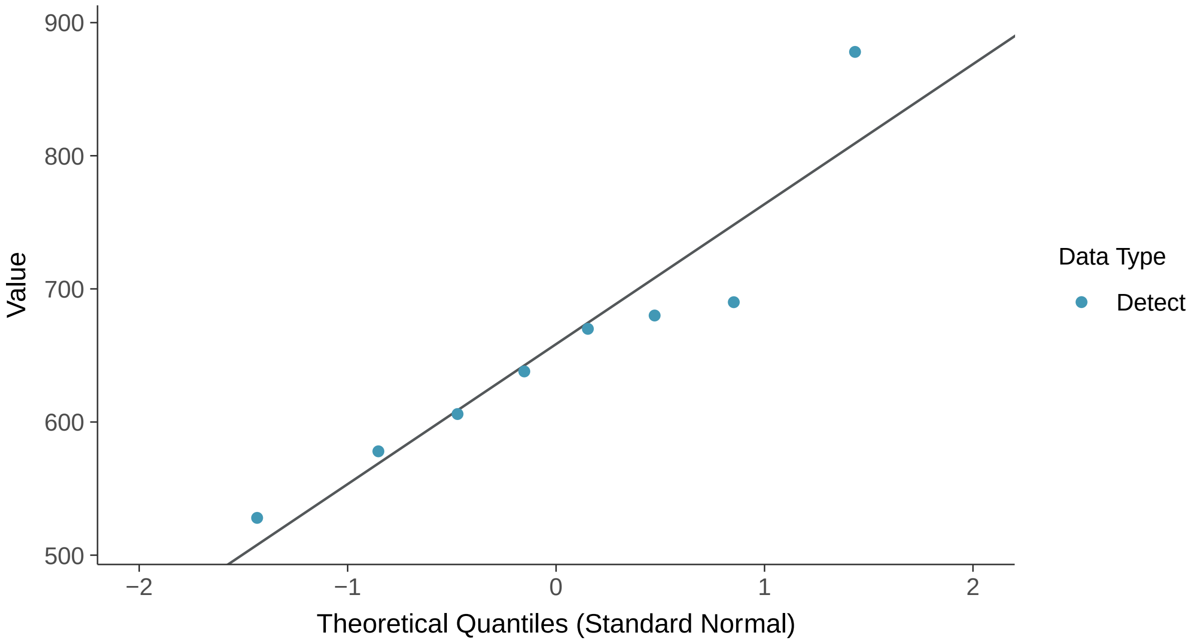
Boxplot by Season

Total Dissolved Solids, MW-15 (mg/L)



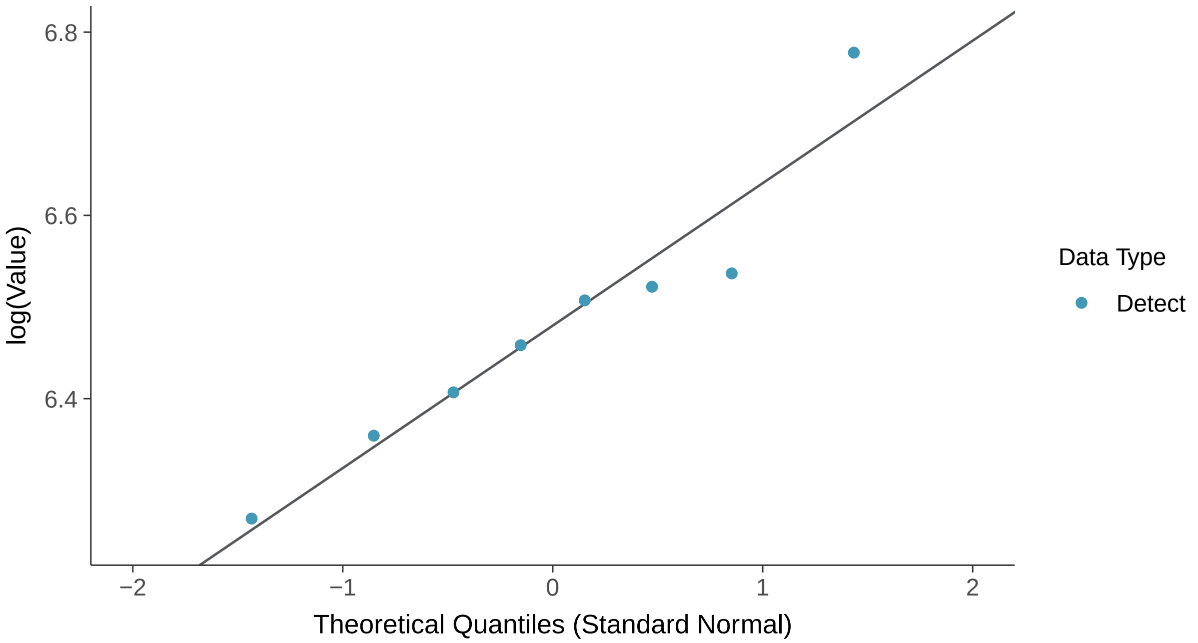
Normal Q-Q plot

Total Dissolved Solids, MW-15 (mg/L)



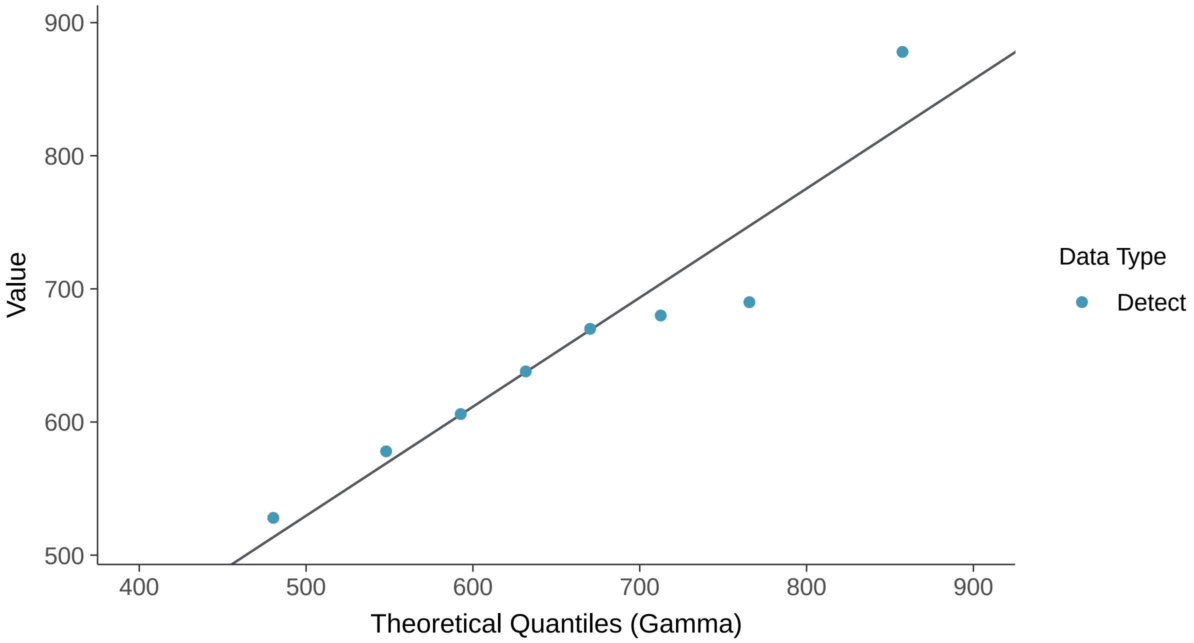
Lognormal Q-Q plot

Total Dissolved Solids, MW-15 (mg/L)



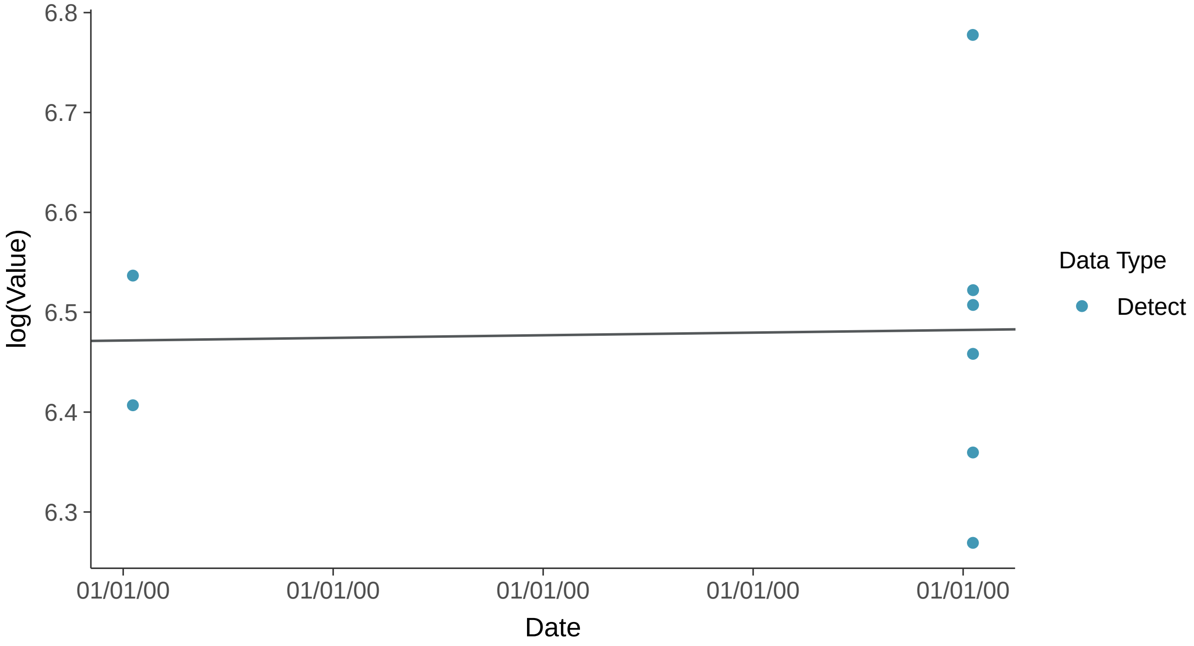
Gamma Q-Q plot

Total Dissolved Solids, MW-15 (mg/L)



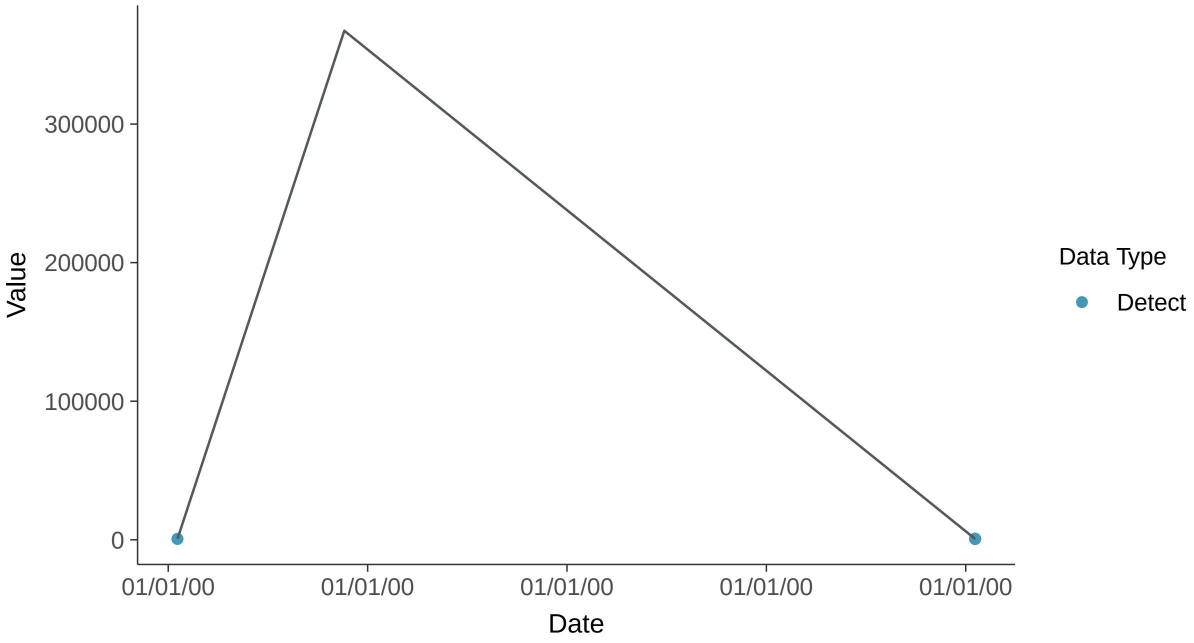
Trend Regression: Lognormal MLE

Total Dissolved Solids, MW-15 (mg/L)



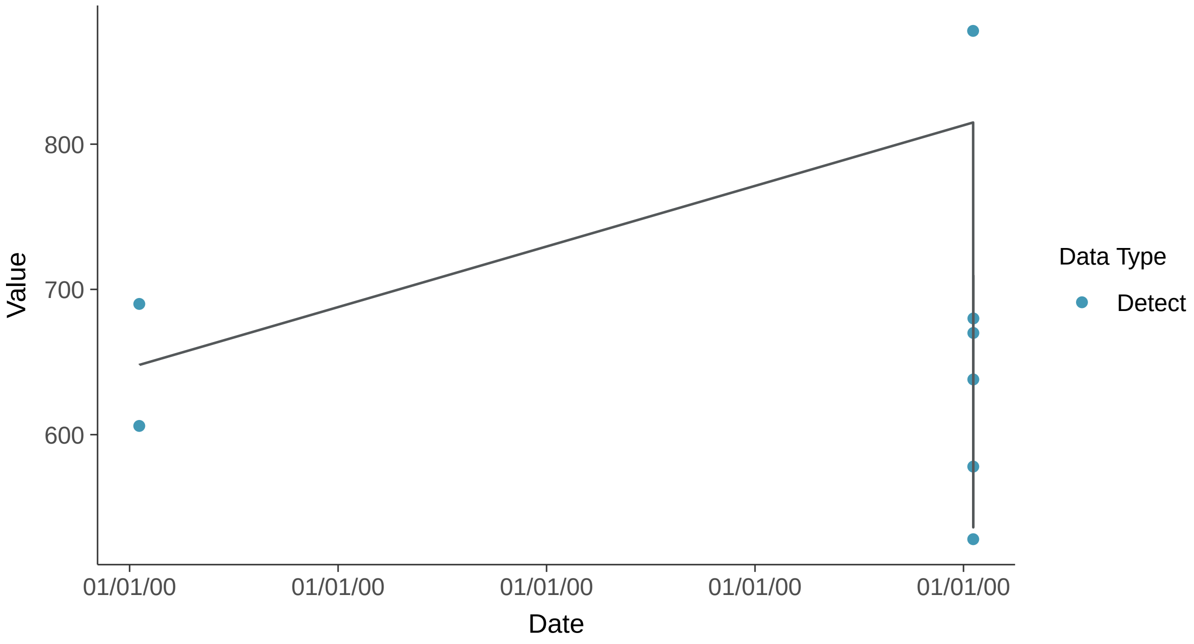
Trend Regression: Piecewise Linear-Linear

Total Dissolved Solids, MW-15 (mg/L)



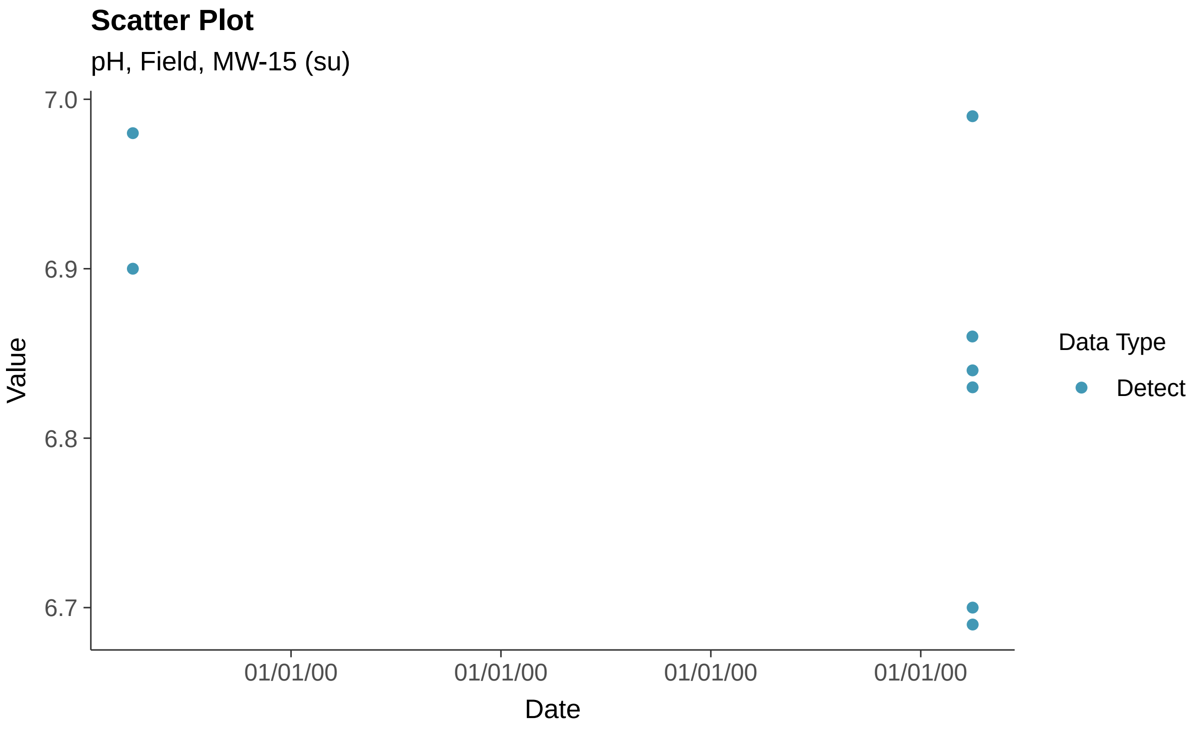
Trend Regression: Piecewise Linear-Linear-Linear

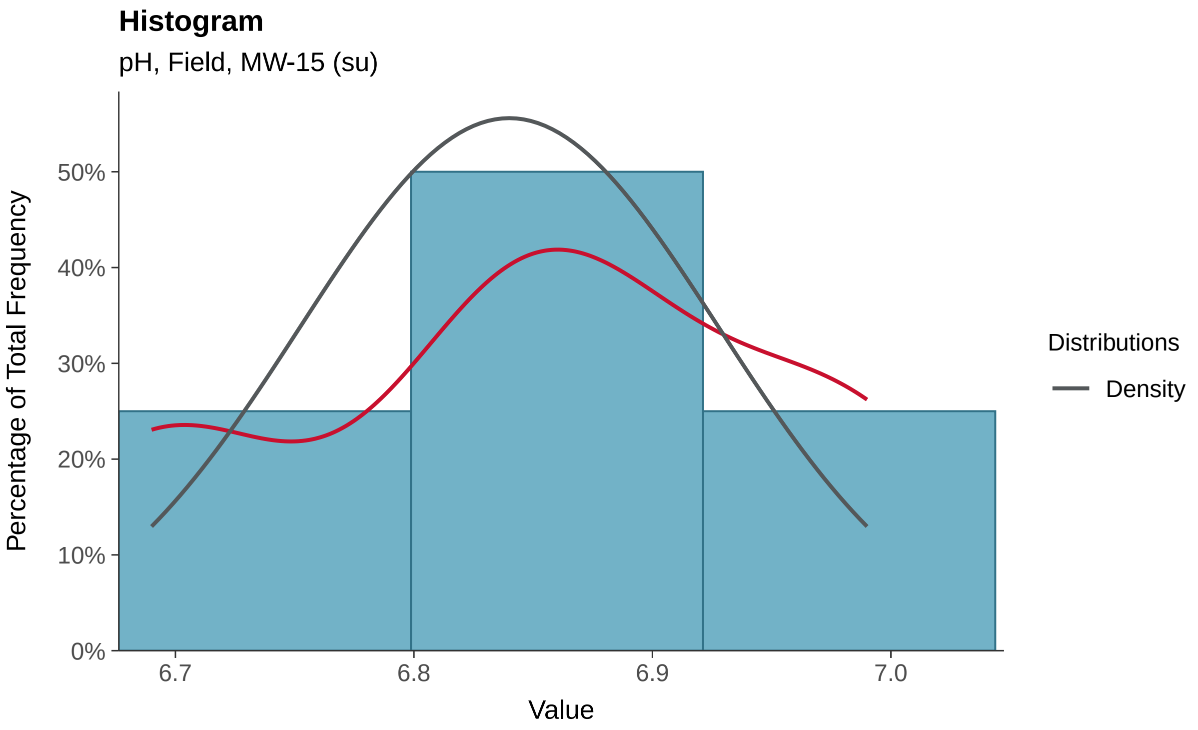
Total Dissolved Solids, MW-15 (mg/L)



Appendix III: pH, Field, MW-15

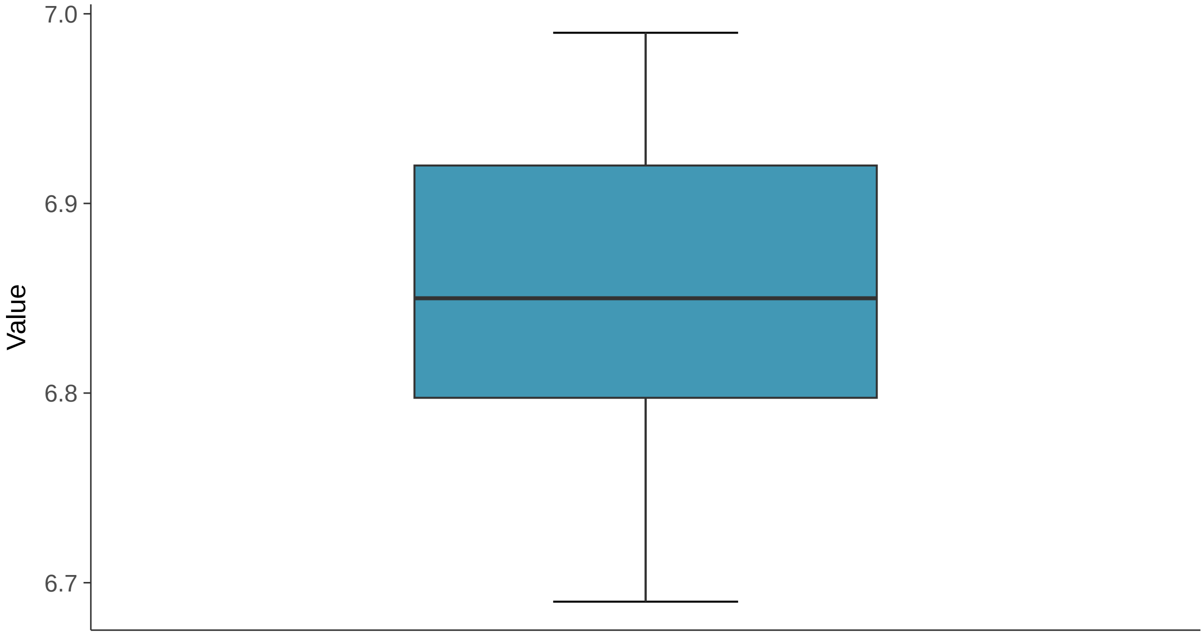
ID: 15_1_07





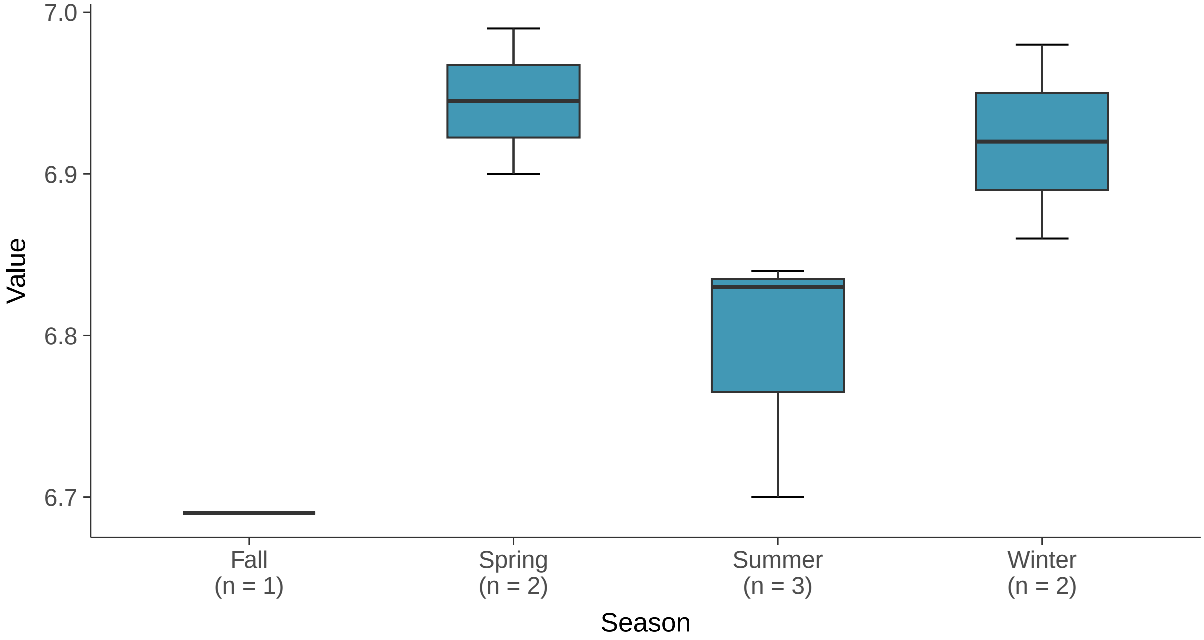
Boxplot

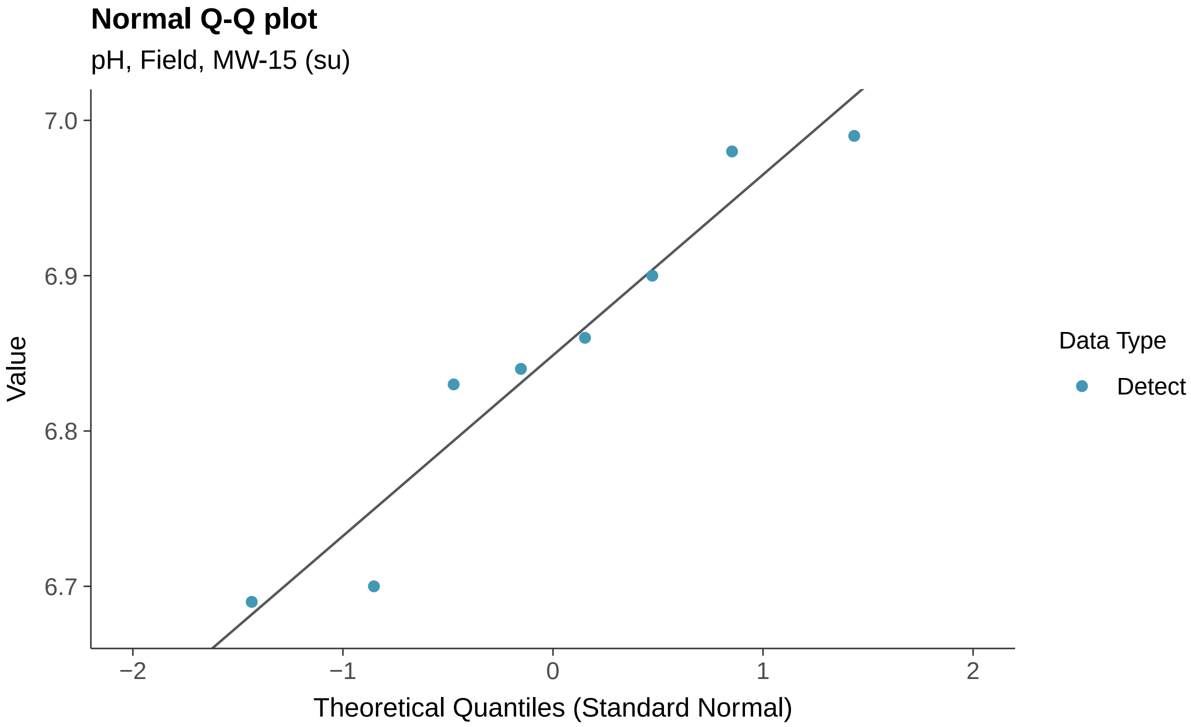
pH, Field, MW-15 (su)

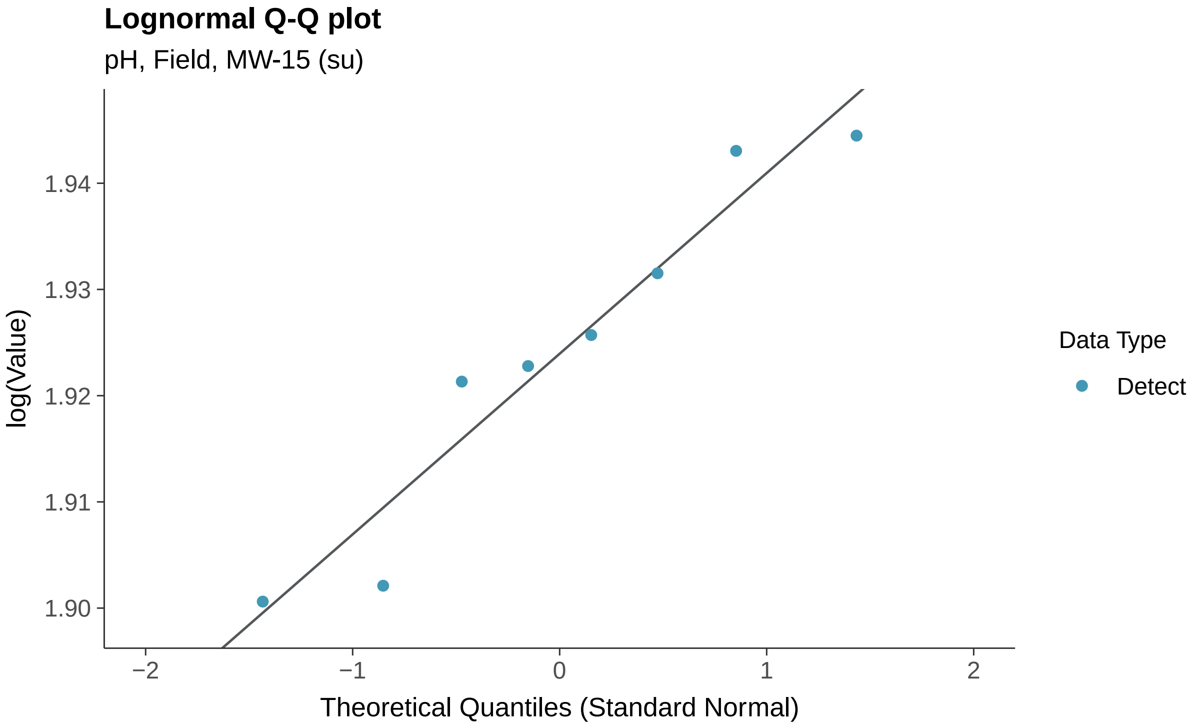


Boxplot by Season

pH, Field, MW-15 (su)

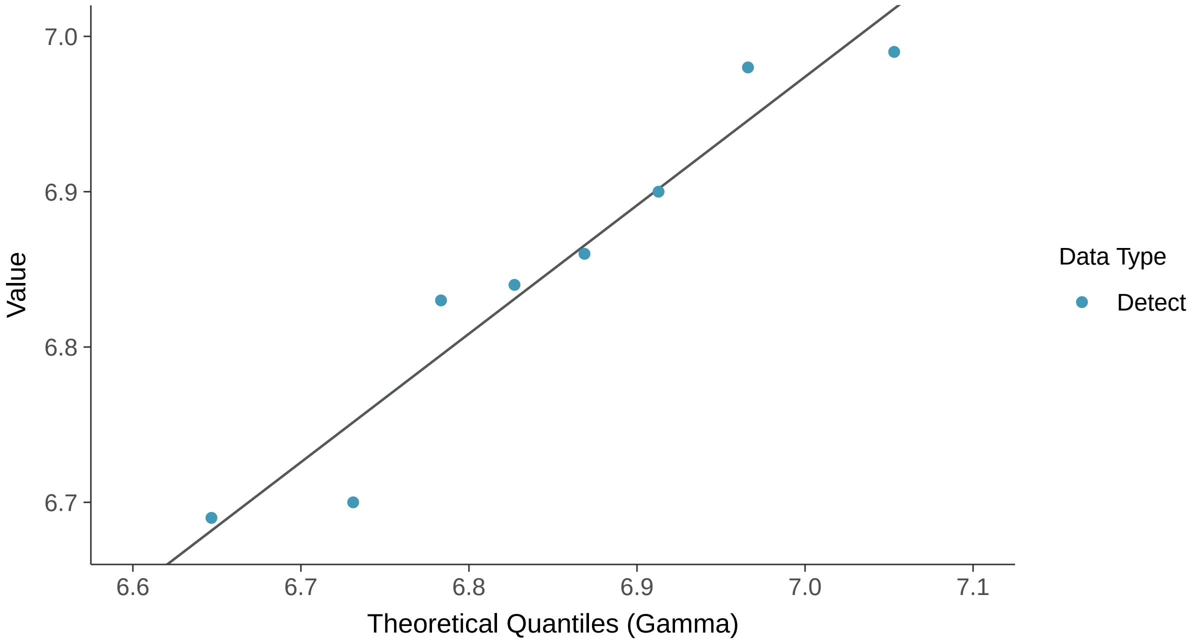



Normal Q-Q plot
pH, Field, MW-15 (su)
Value
7.0
6.9
6.8
6.7
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
● Detect


Lognormal Q-Q plot
pH, Field, MW-15 (su)
log(Value)
1.94
1.93
1.92
1.91
1.90
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
● Detect

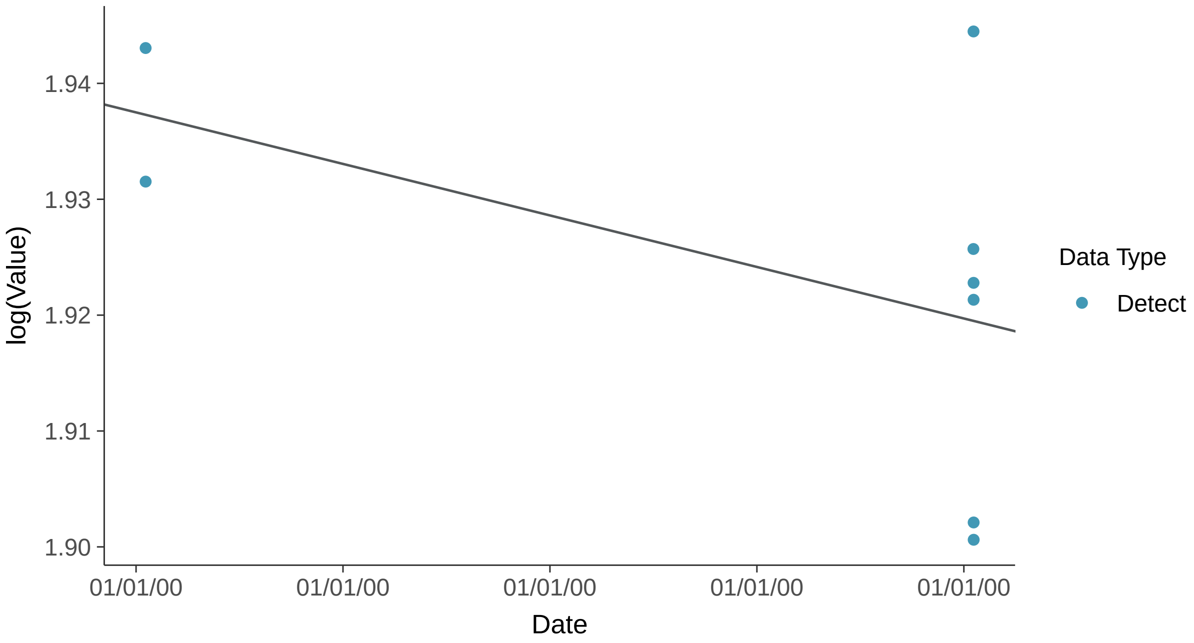
Gamma Q-Q plot

pH, Field, MW-15 (su)



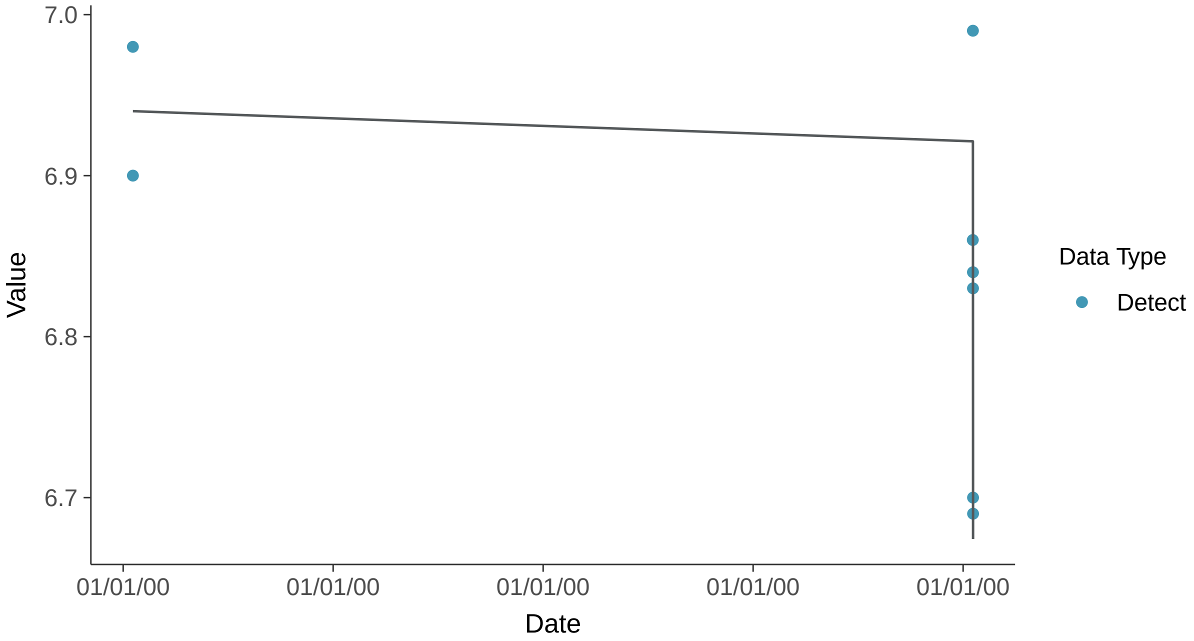
Trend Regression: Lognormal MLE

pH, Field, MW-15 (su)



Trend Regression: Piecewise Linear-Linear

pH, Field, MW-15 (su)

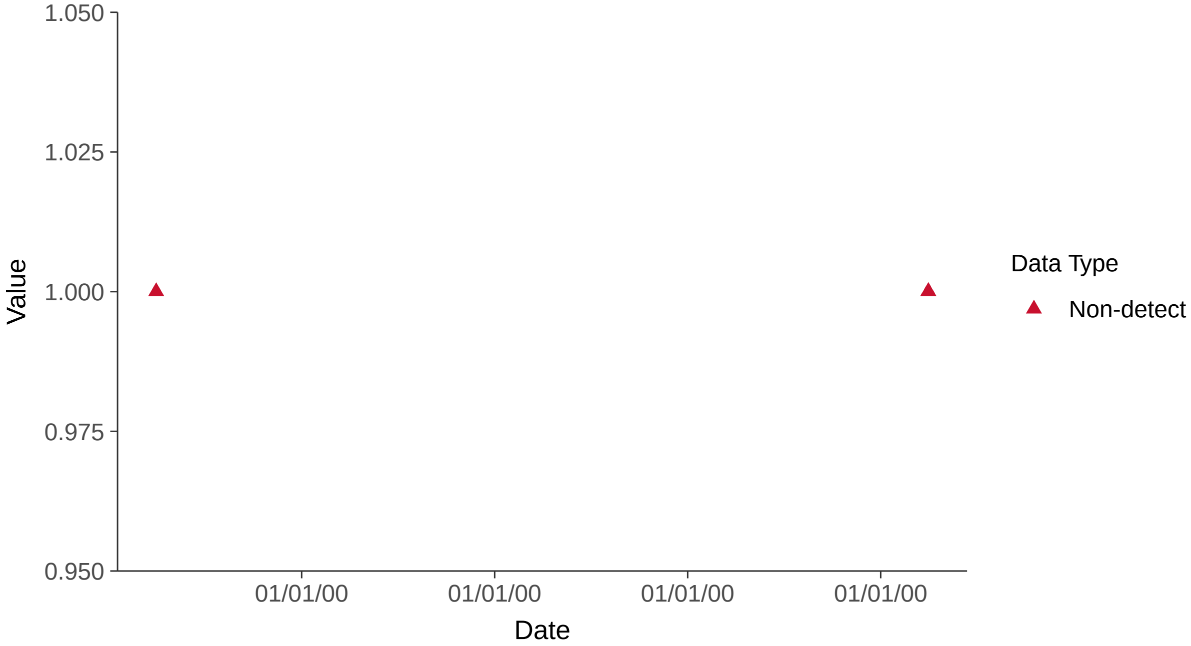


Appendix IV: Fluoride, MW-15

ID: 15_2_04

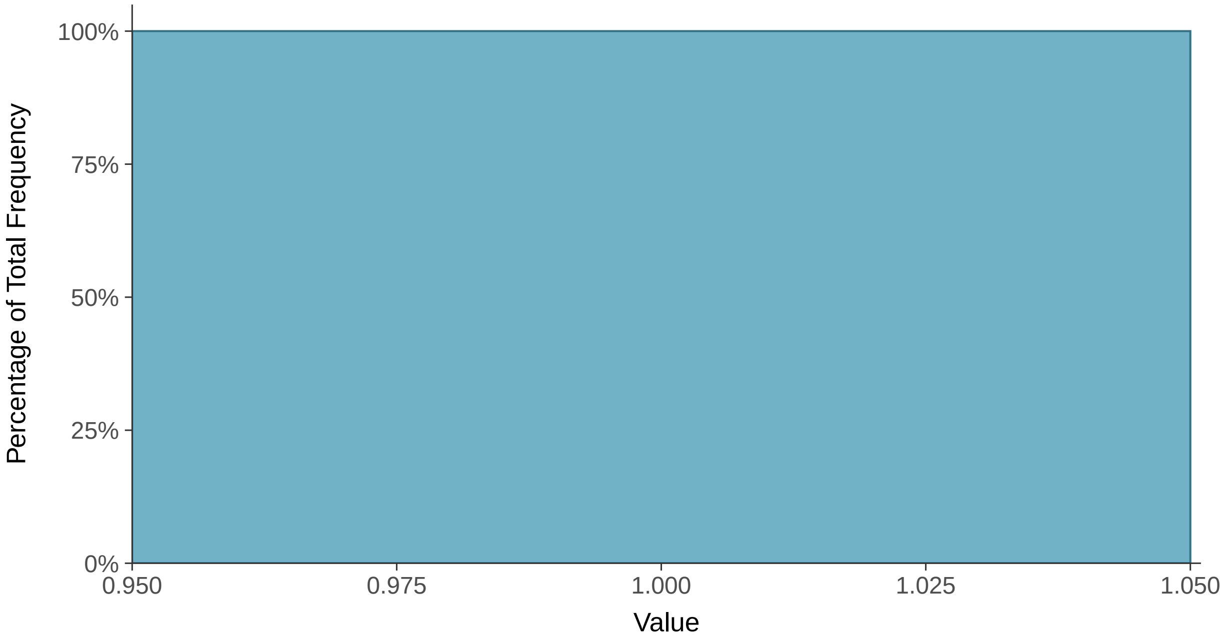
Scatter Plot

Fluoride, MW-15 (mg/L)



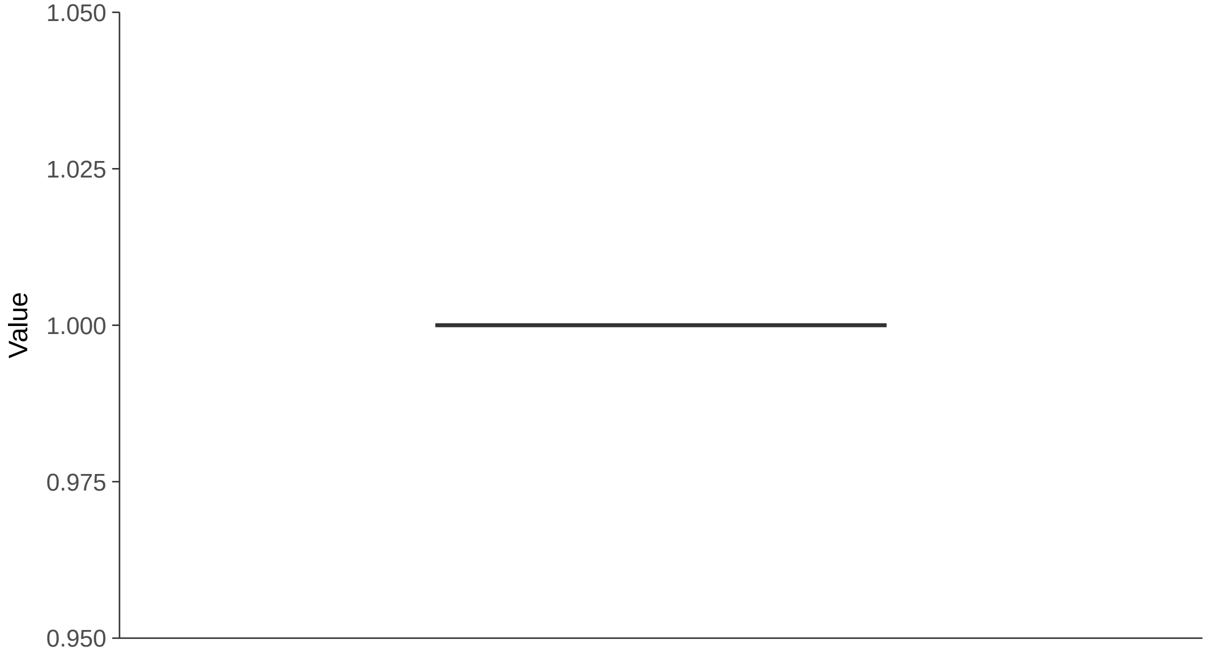
Histogram

Fluoride, MW-15 (mg/L)



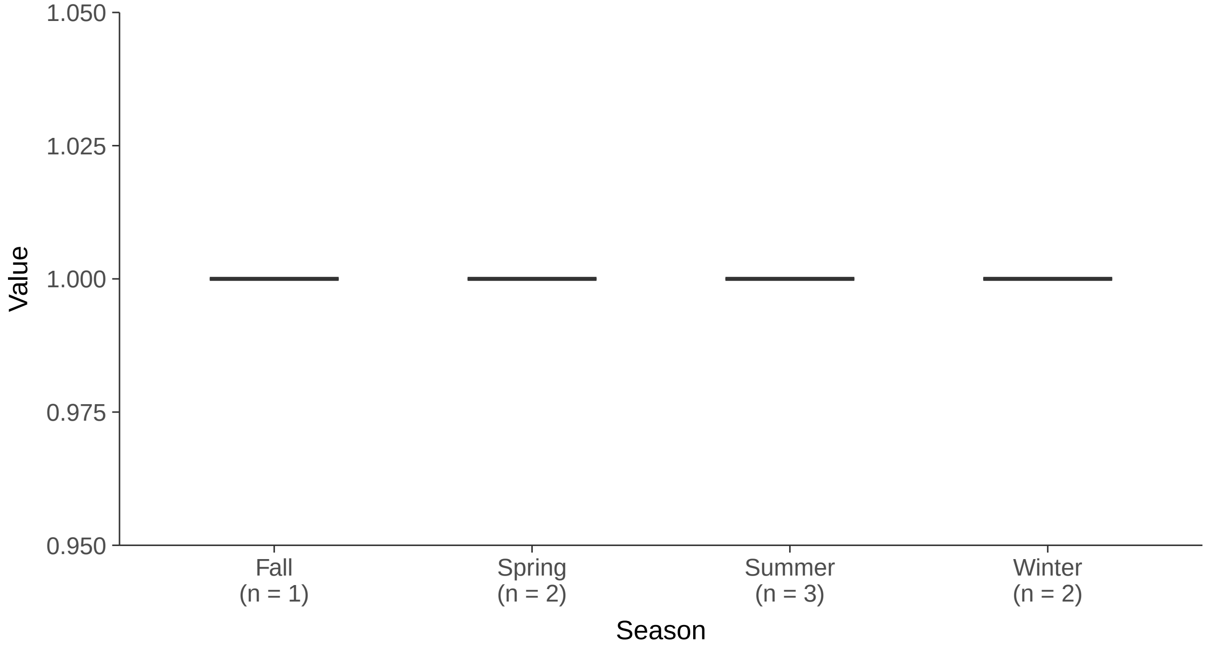
Boxplot

Fluoride, MW-15 (mg/L)



Boxplot by Season

Fluoride, MW-15 (mg/L)

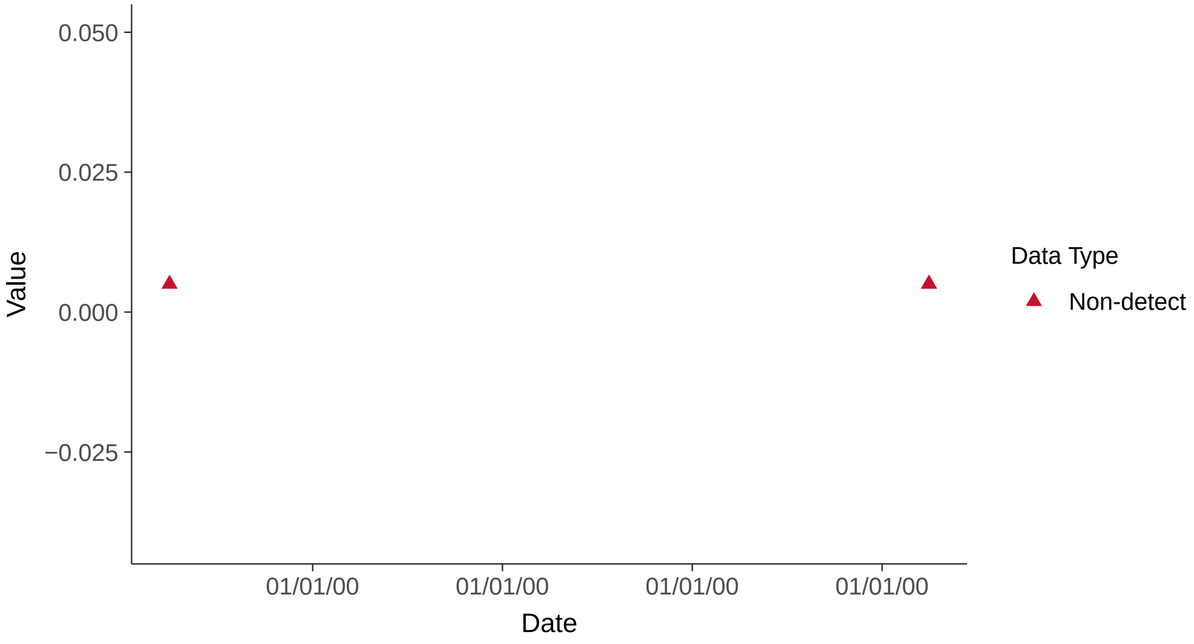


Appendix IV: Antimony, MW-15

ID: 15_2_08

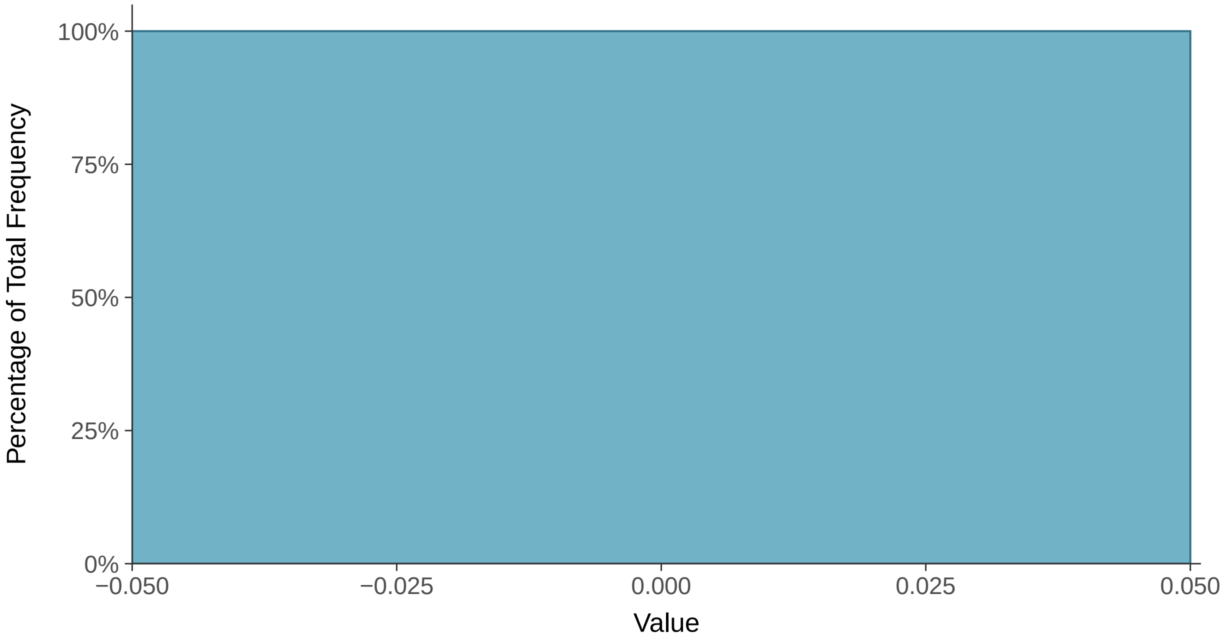
Scatter Plot

Antimony, MW-15 (mg/L)



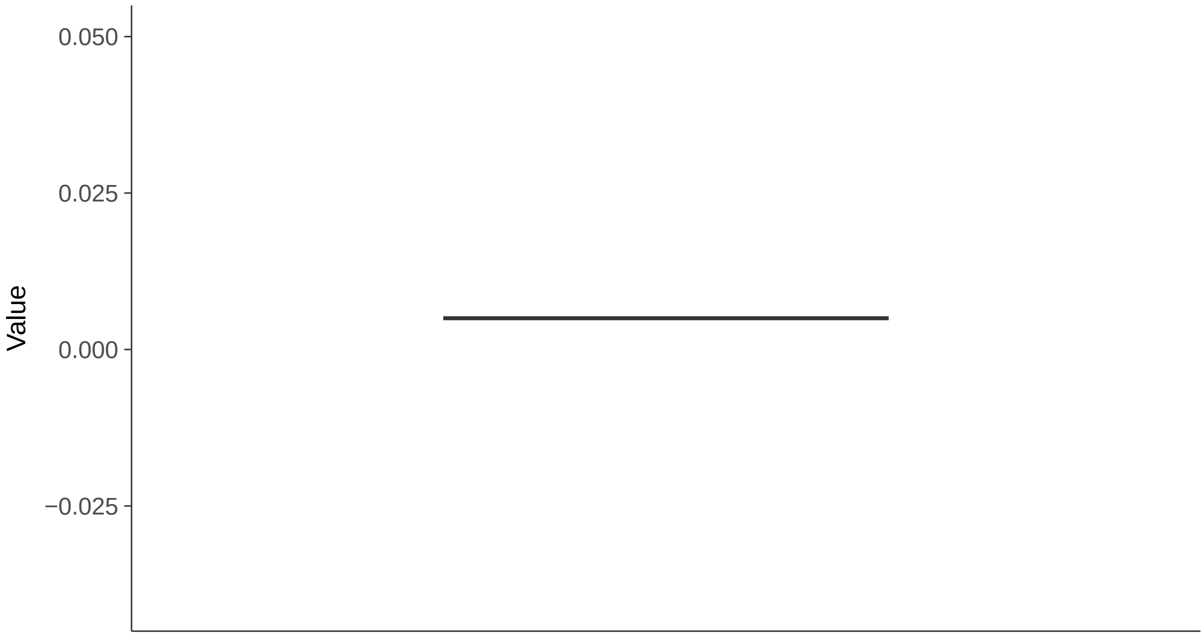
Histogram

Antimony, MW-15 (mg/L)



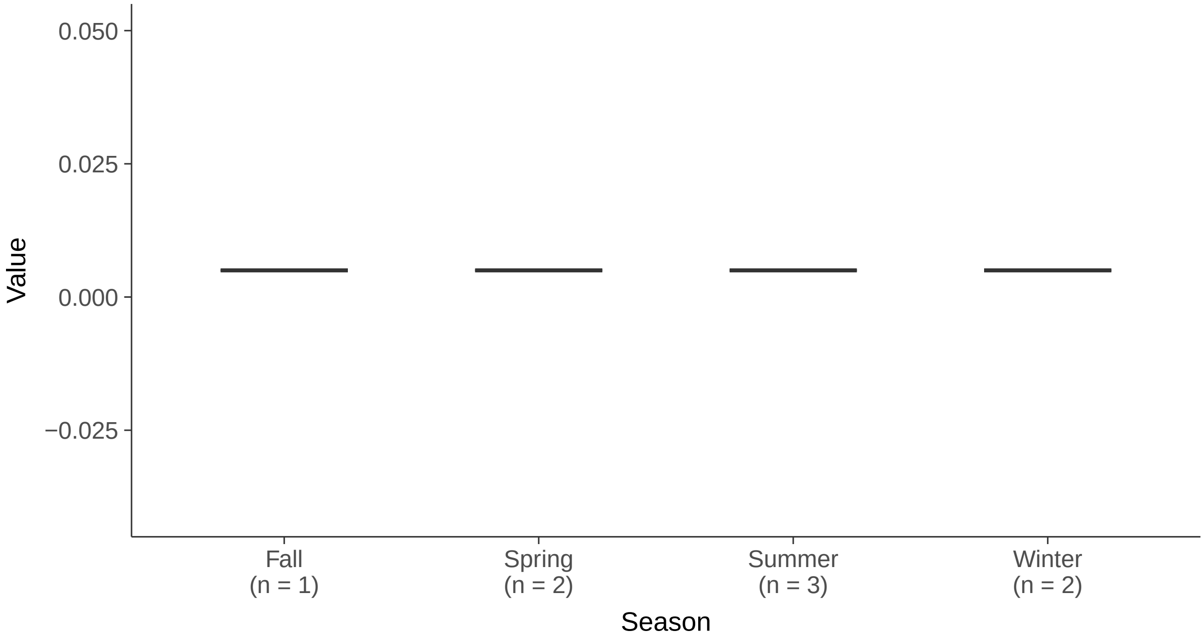
Boxplot

Antimony, MW-15 (mg/L)



Boxplot by Season

Antimony, MW-15 (mg/L)

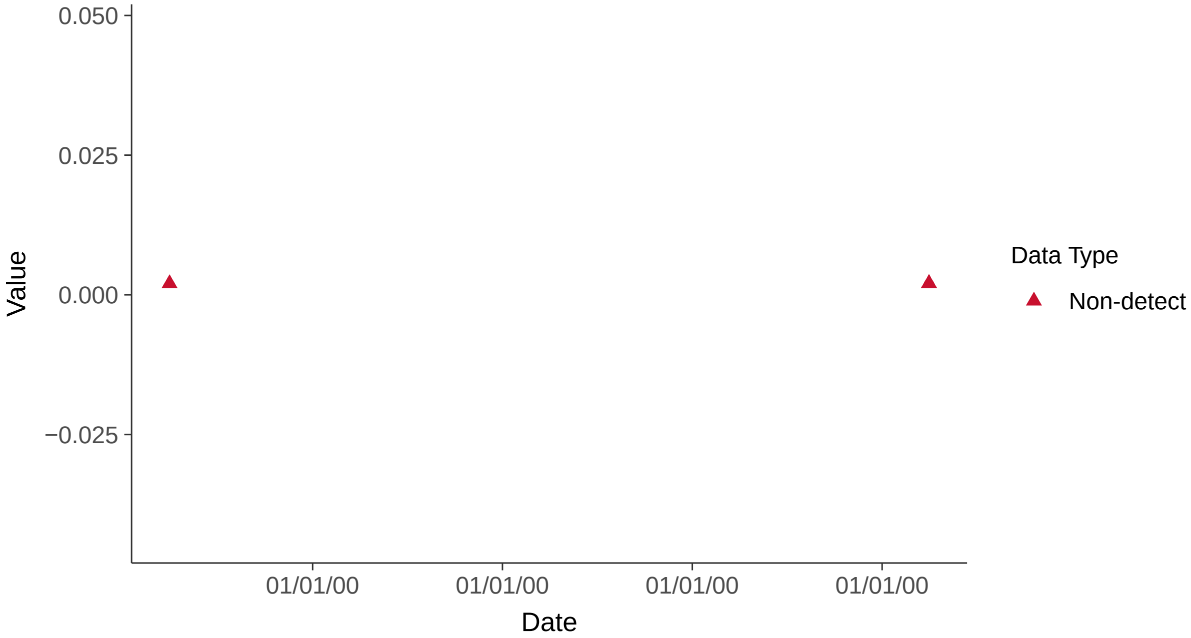


Appendix IV: Arsenic, MW-15

ID: 15_2_09

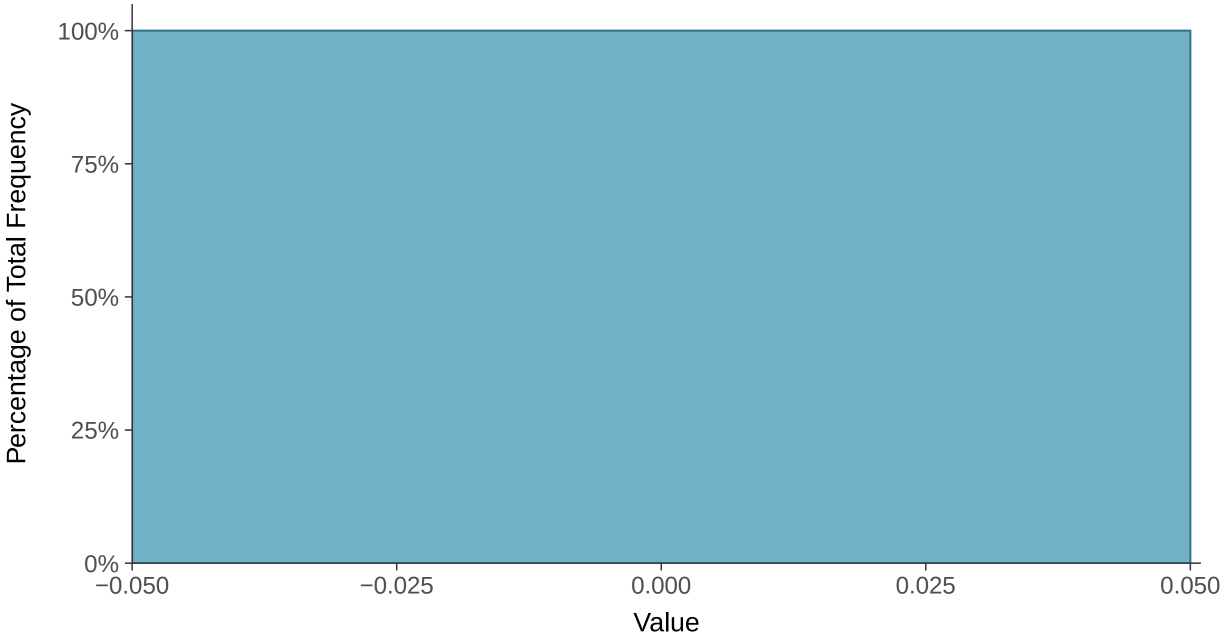
Scatter Plot

Arsenic, MW-15 (mg/L)



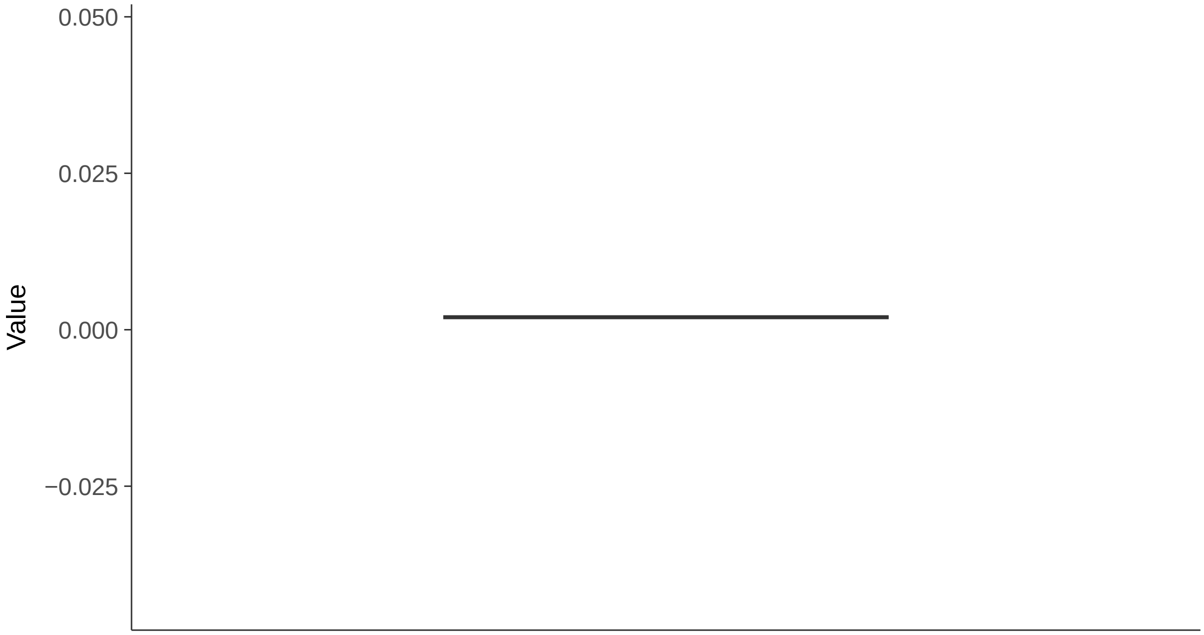
Histogram

Arsenic, MW-15 (mg/L)



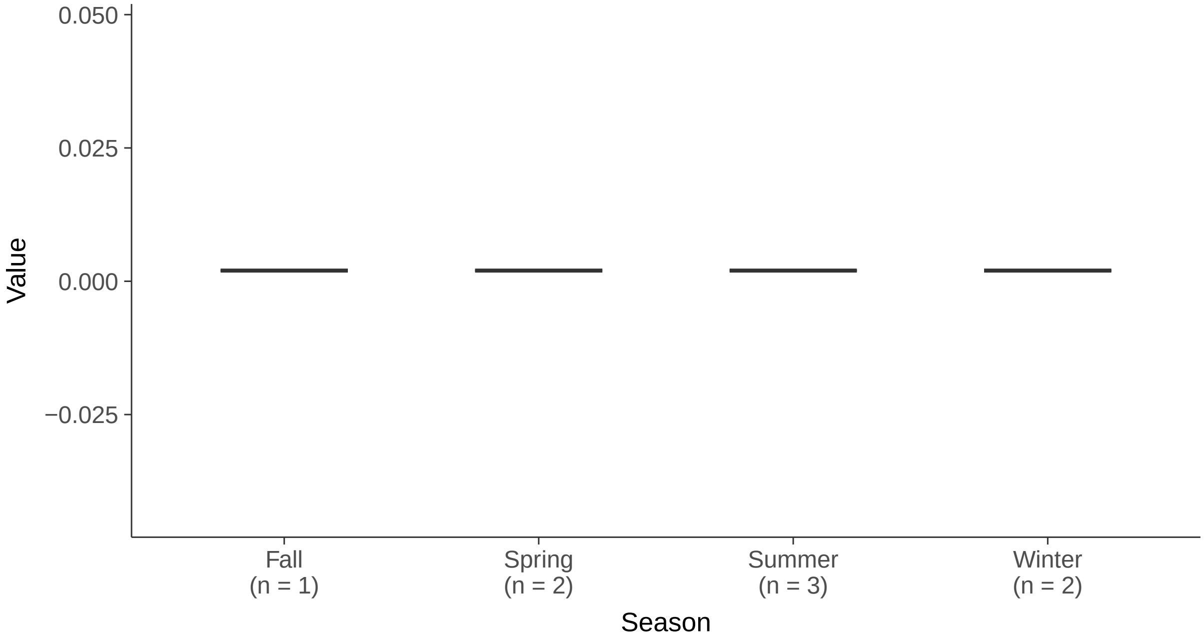
Boxplot

Arsenic, MW-15 (mg/L)



Boxplot by Season

Arsenic, MW-15 (mg/L)

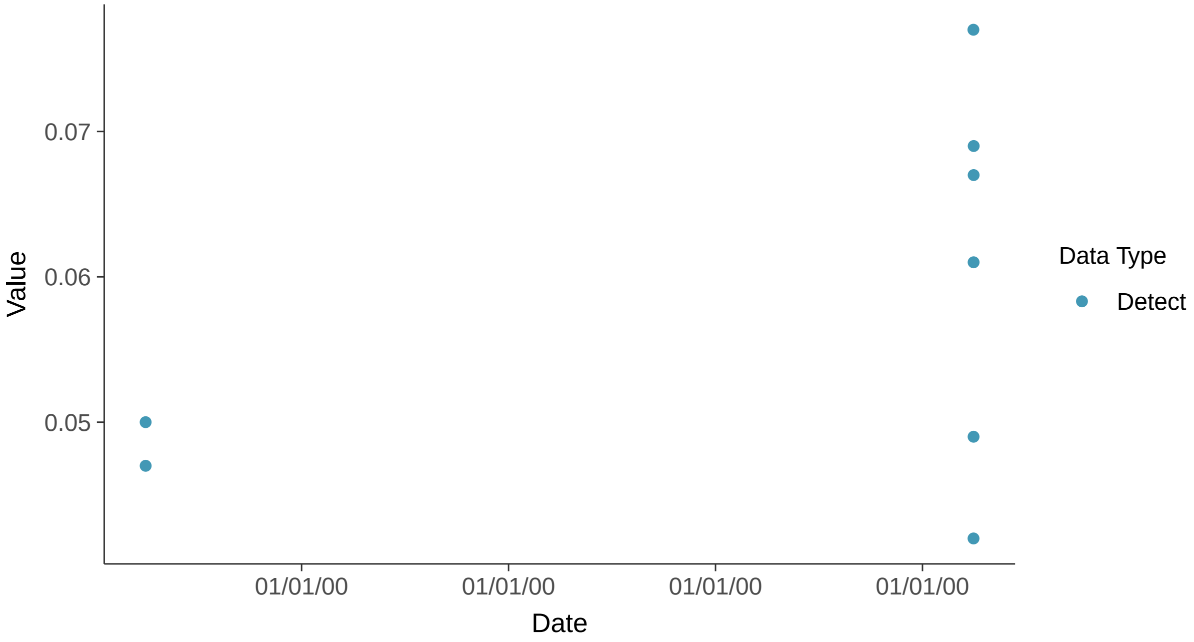


Appendix IV: Barium, MW-15

ID: 15_2_10

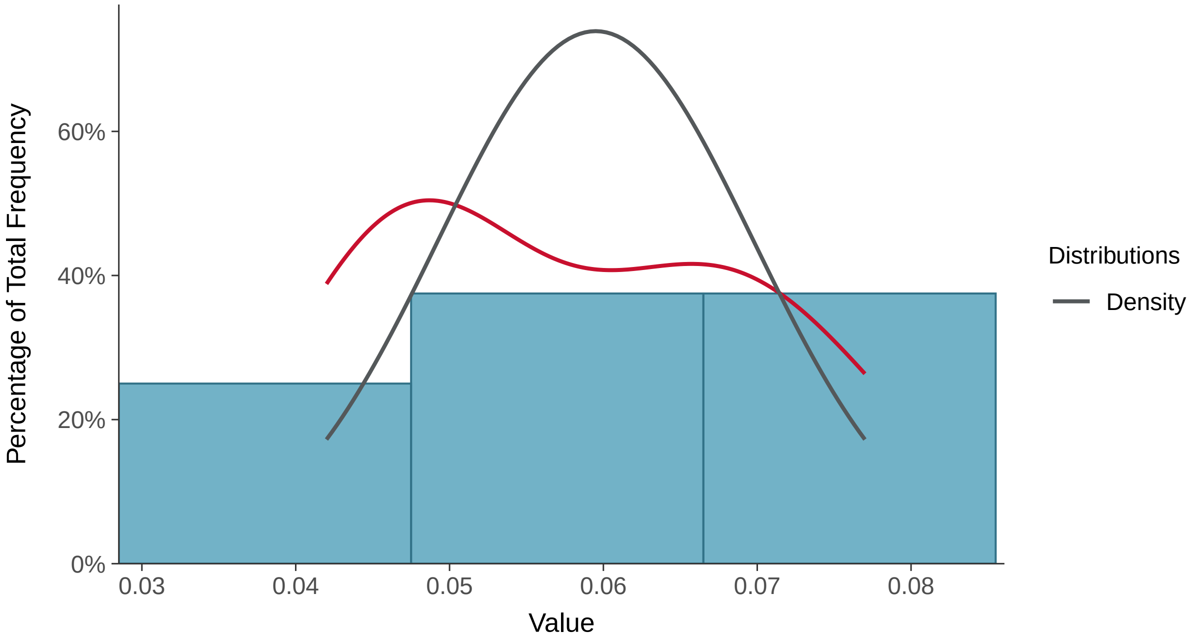
Scatter Plot

Barium, MW-15 (mg/L)



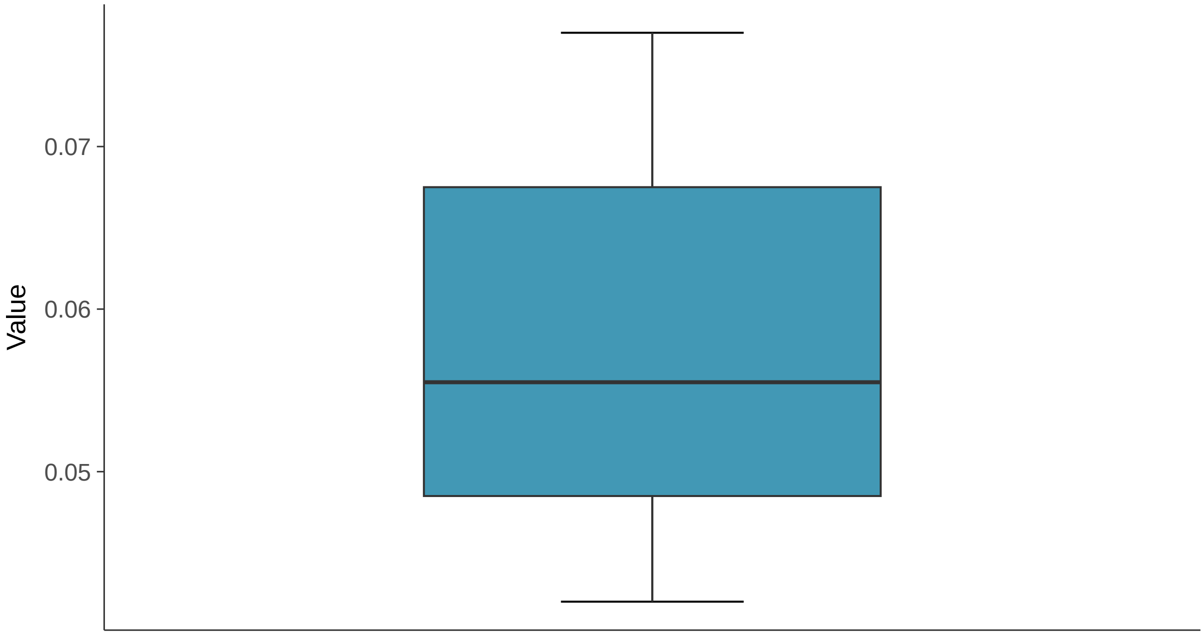
Histogram

Barium, MW-15 (mg/L)



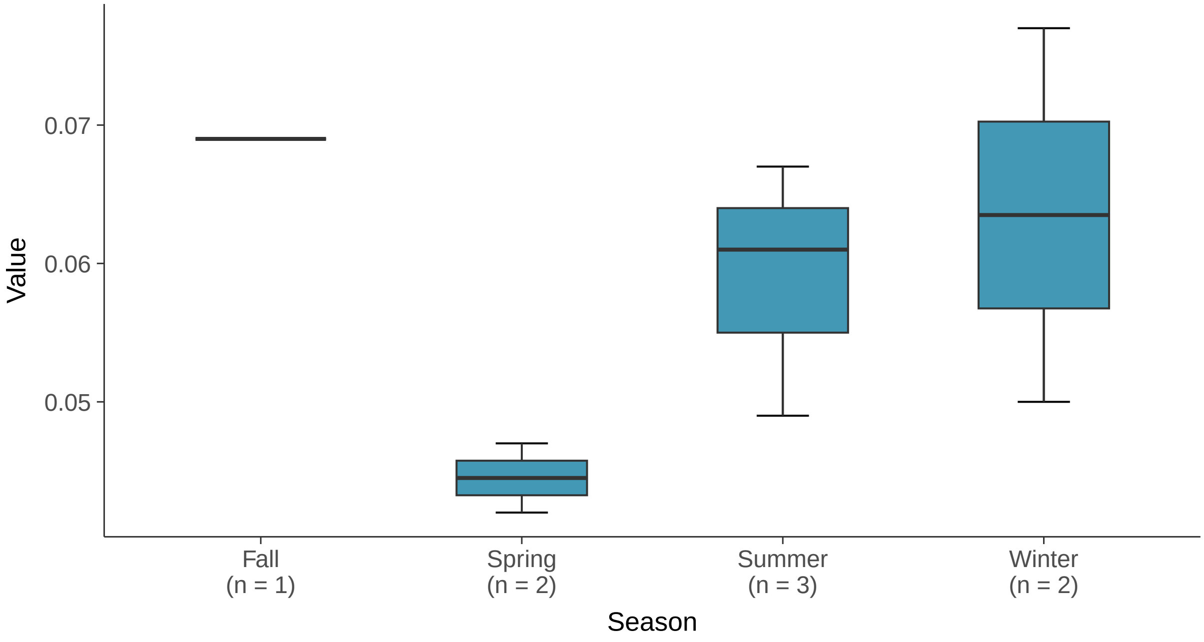
Boxplot

Barium, MW-15 (mg/L)



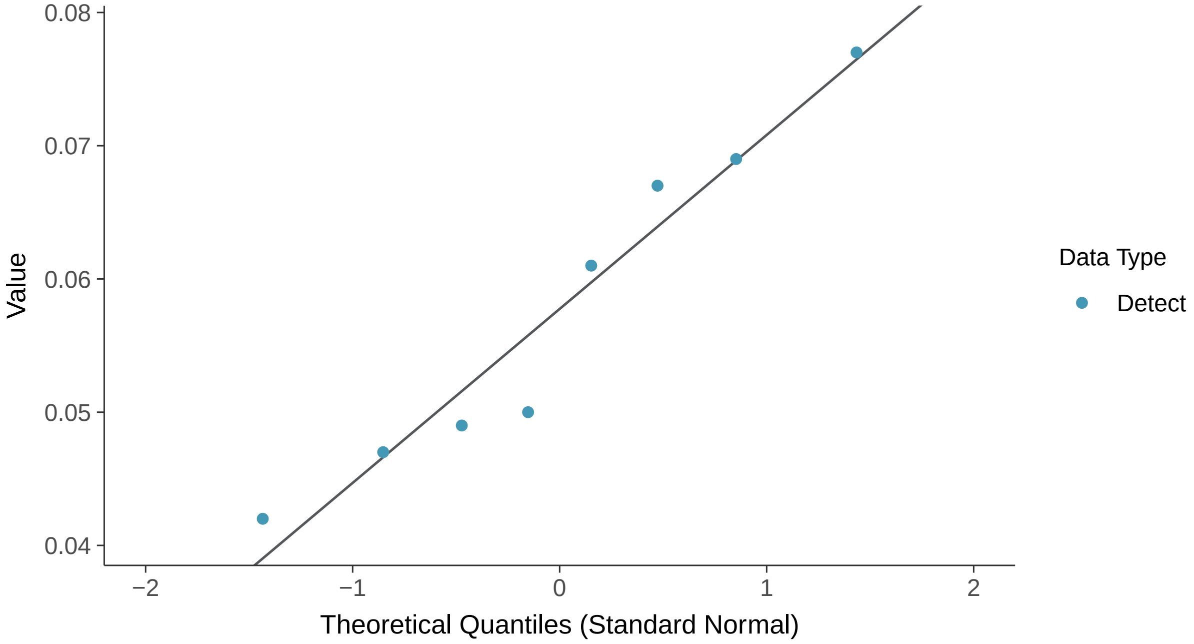
Boxplot by Season

Barium, MW-15 (mg/L)



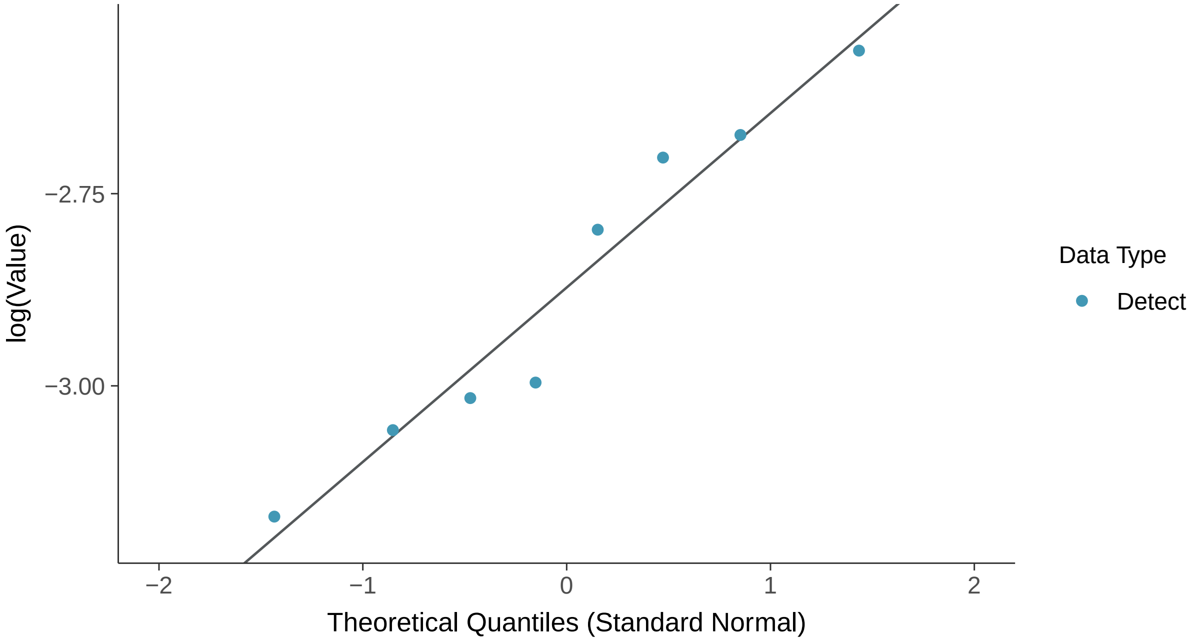
Normal Q-Q plot

Barium, MW-15 (mg/L)



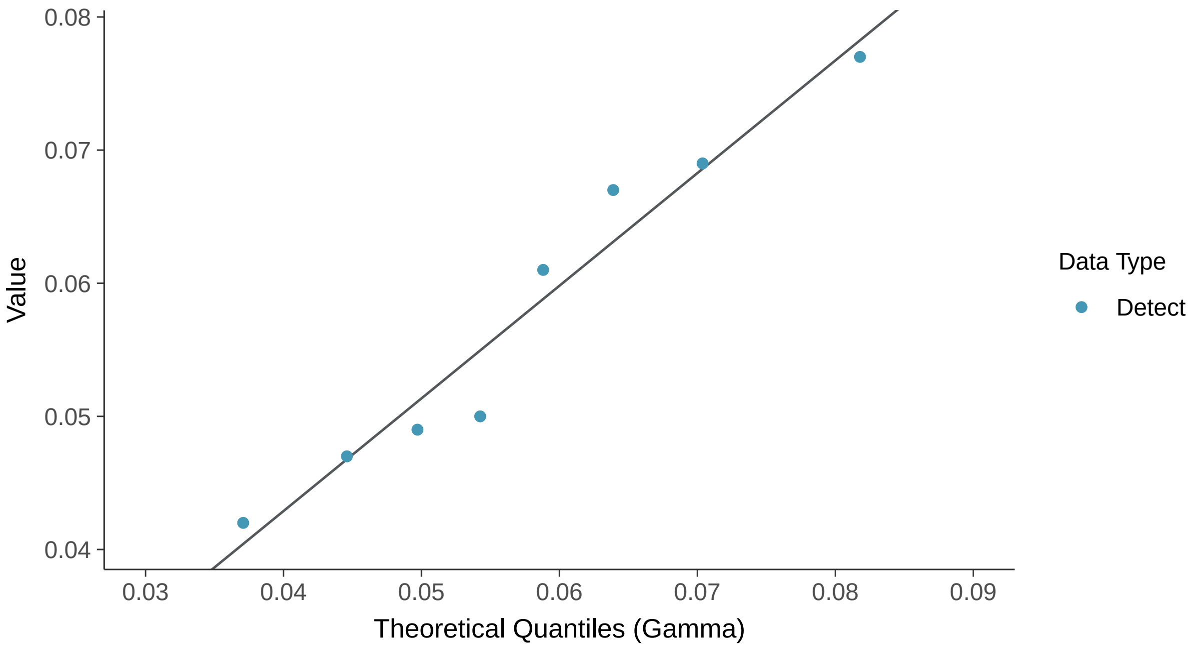
Lognormal Q-Q plot

Barium, MW-15 (mg/L)



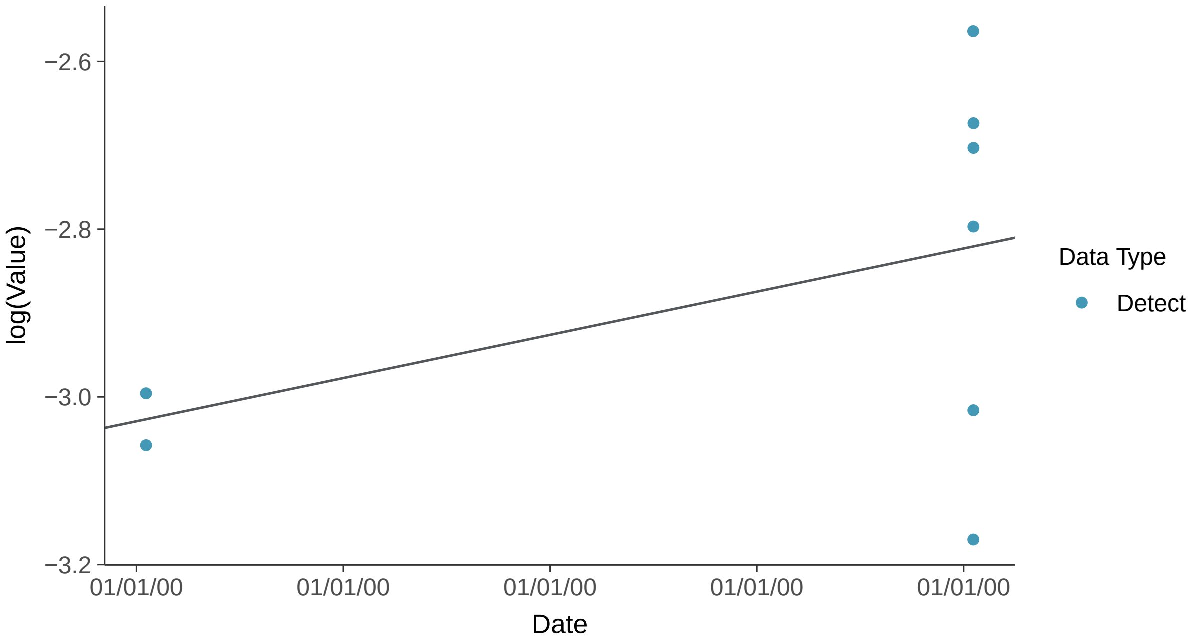
Gamma Q-Q plot

Barium, MW-15 (mg/L)



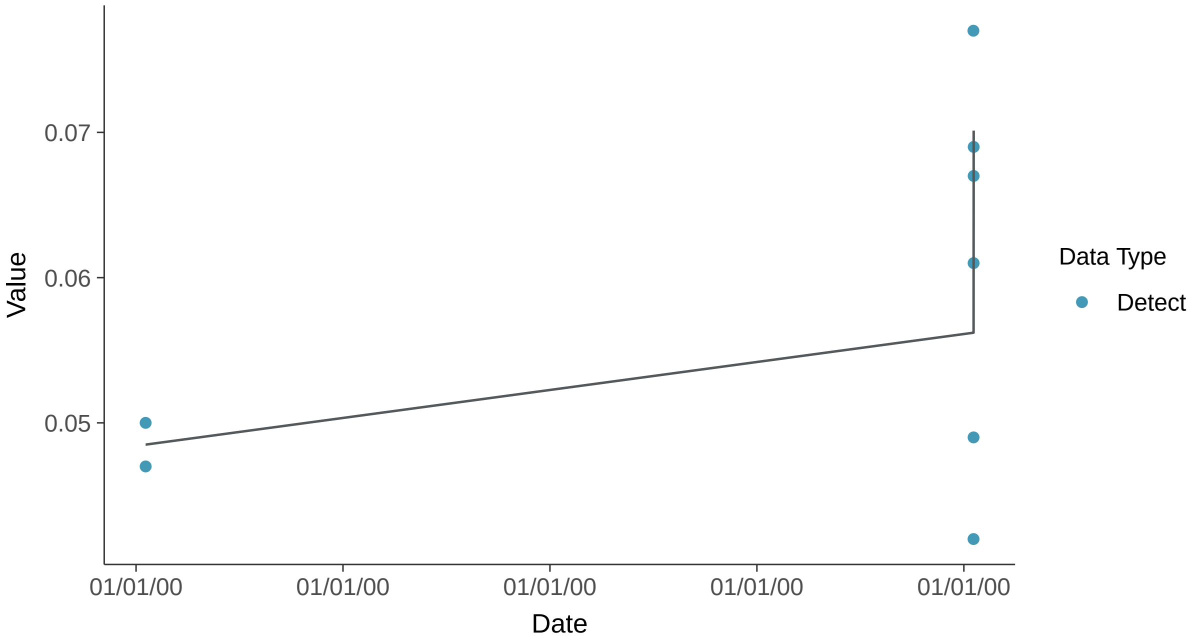
Trend Regression: Lognormal MLE

Barium, MW-15 (mg/L)



Trend Regression: Piecewise Linear-Linear

Barium, MW-15 (mg/L)

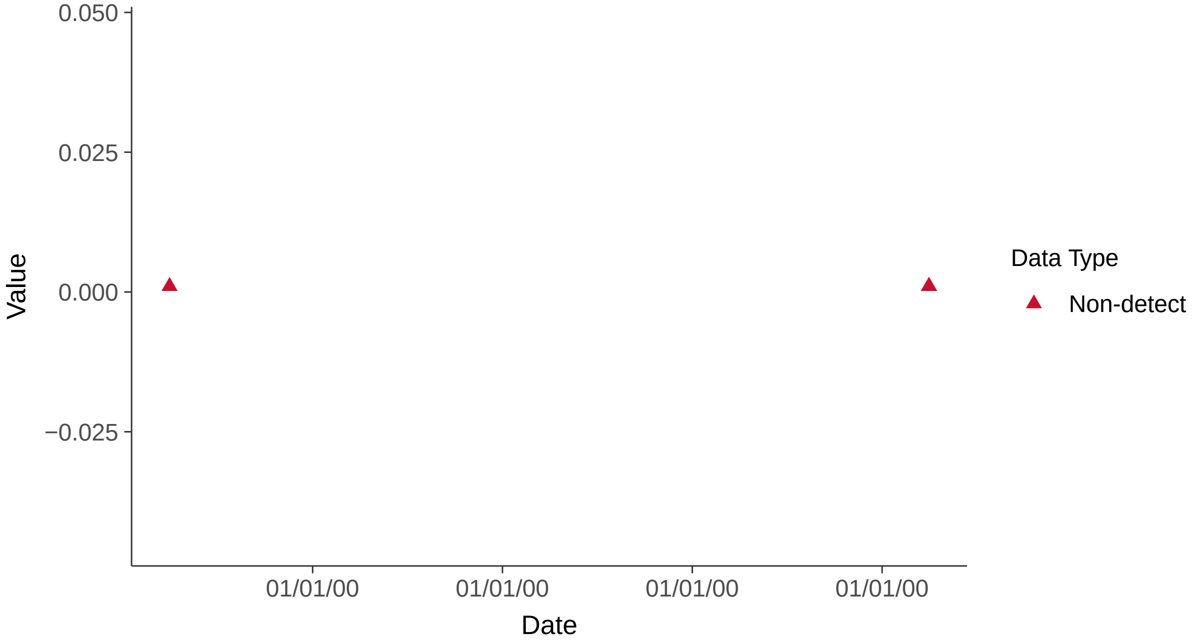


Appendix IV: Beryllium, MW-15

ID: 15_2_11

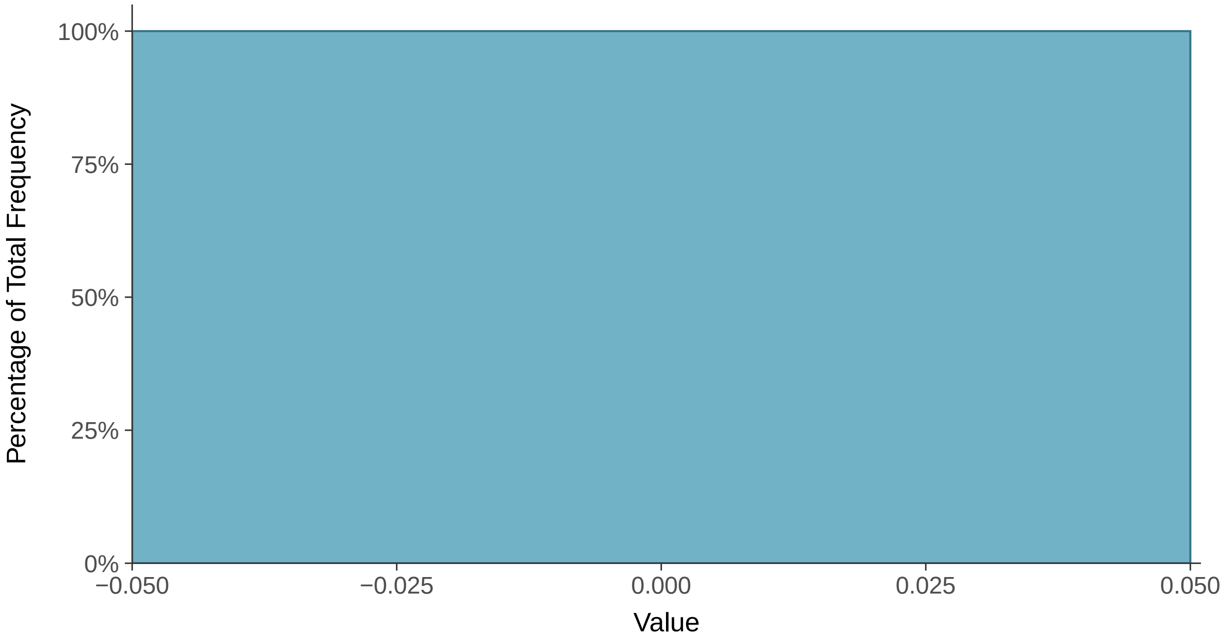
Scatter Plot

Beryllium, MW-15 (mg/L)



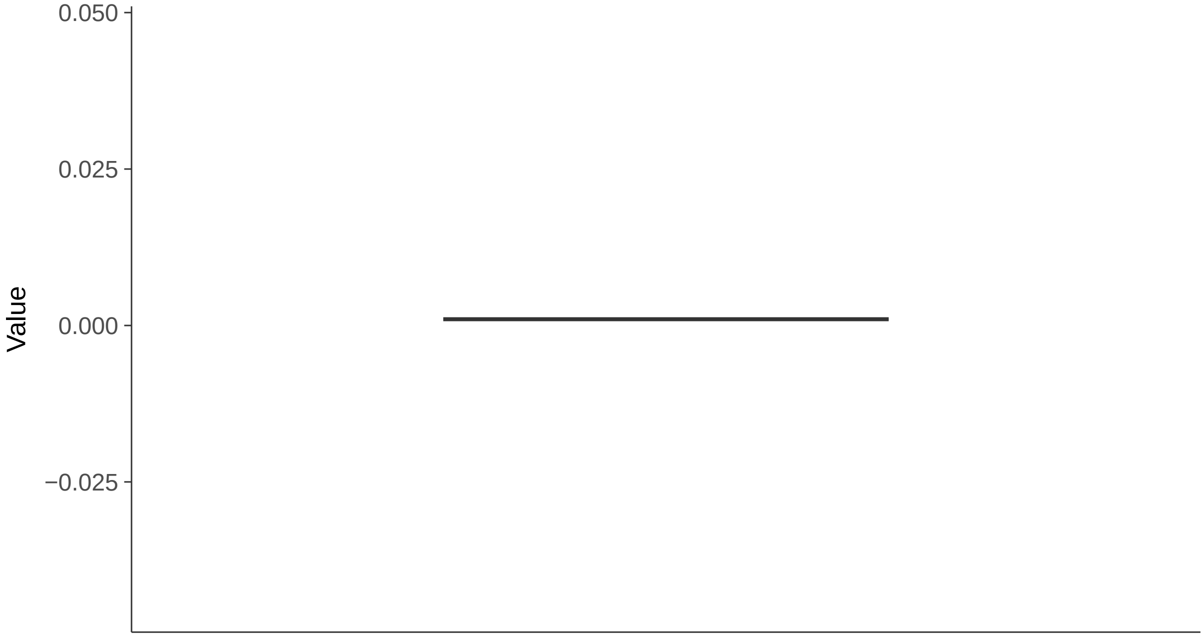
Histogram

Beryllium, MW-15 (mg/L)



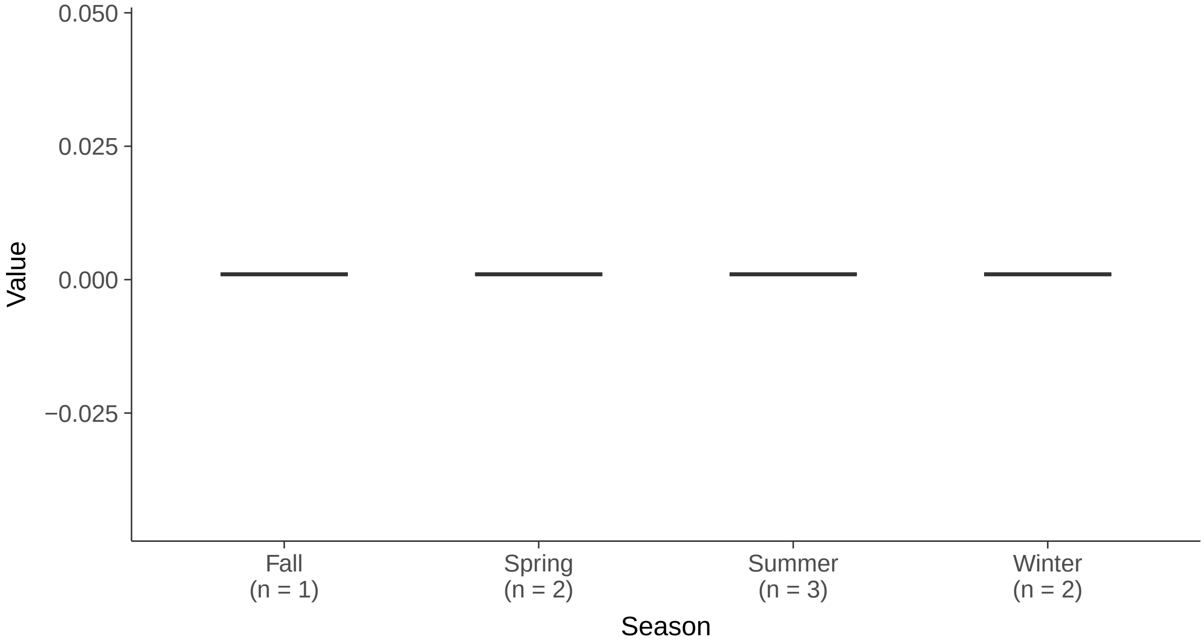
Boxplot

Beryllium, MW-15 (mg/L)



Boxplot by Season

Beryllium, MW-15 (mg/L)

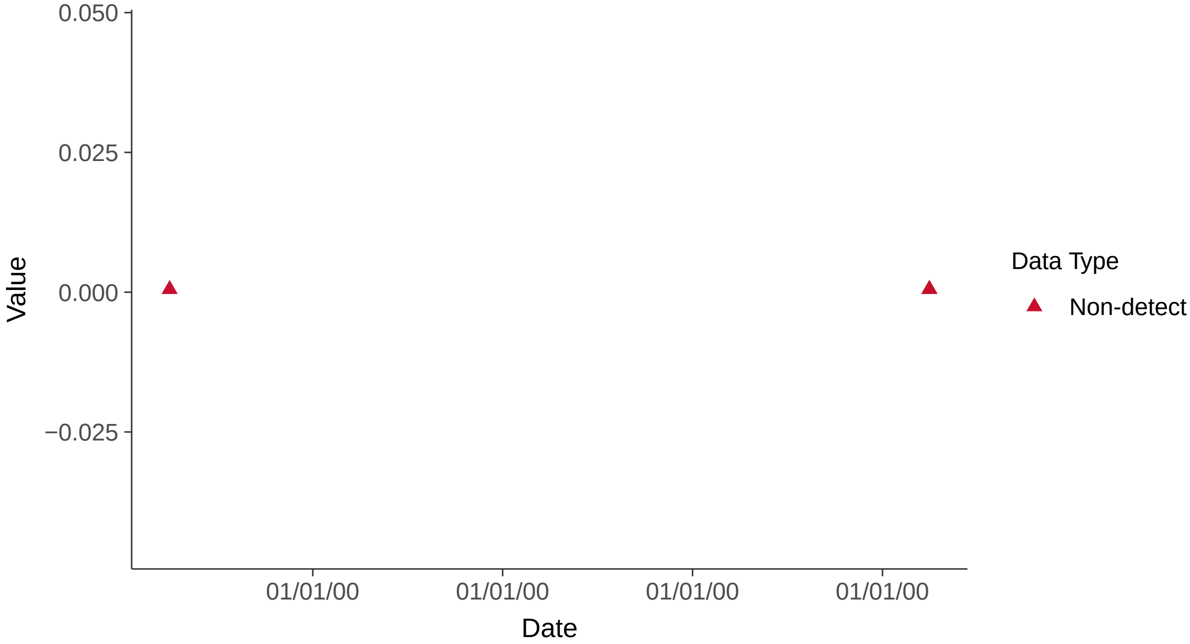


Appendix IV: Cadmium, MW-15

ID: 15_2_12

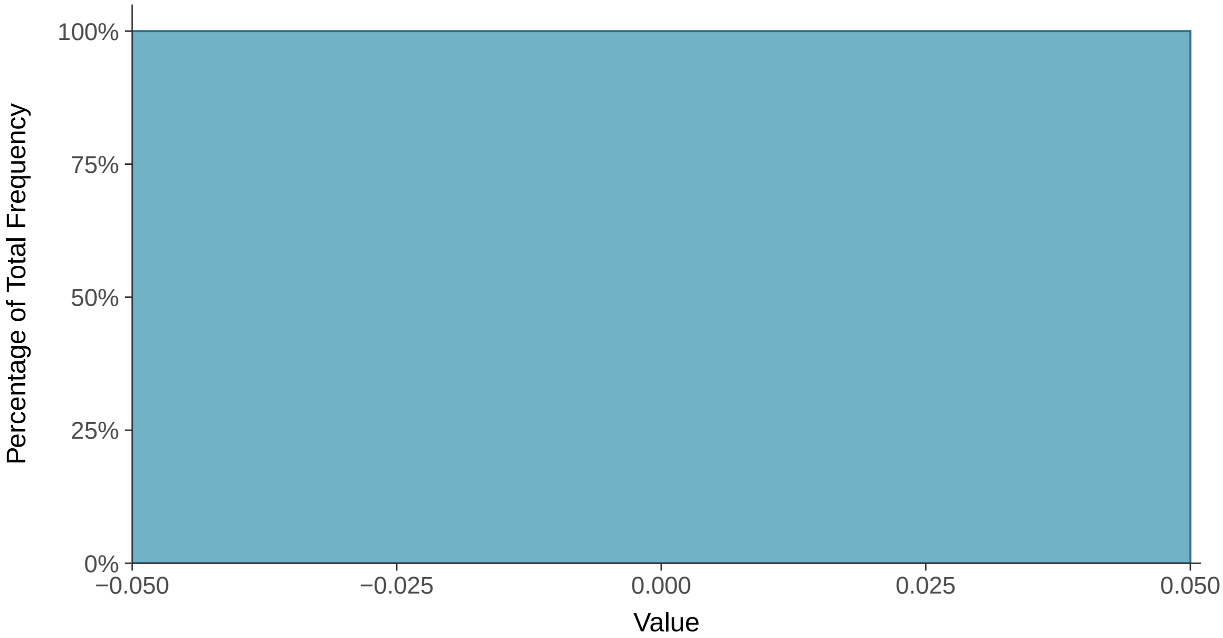
Scatter Plot

Cadmium, MW-15 (mg/L)



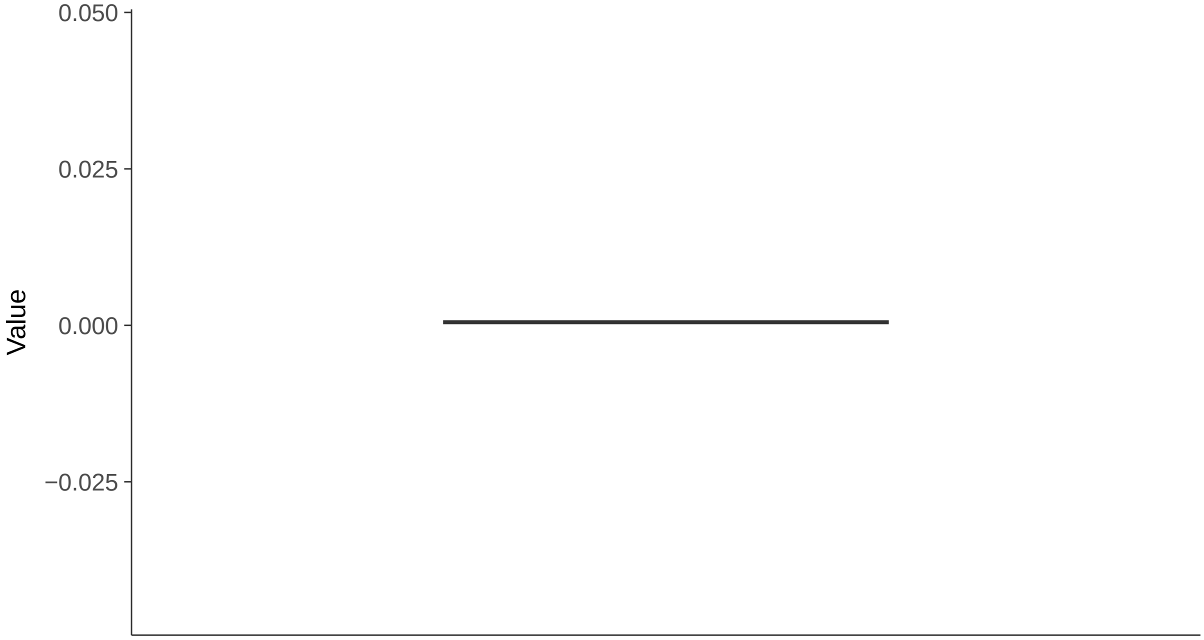
Histogram

Cadmium, MW-15 (mg/L)



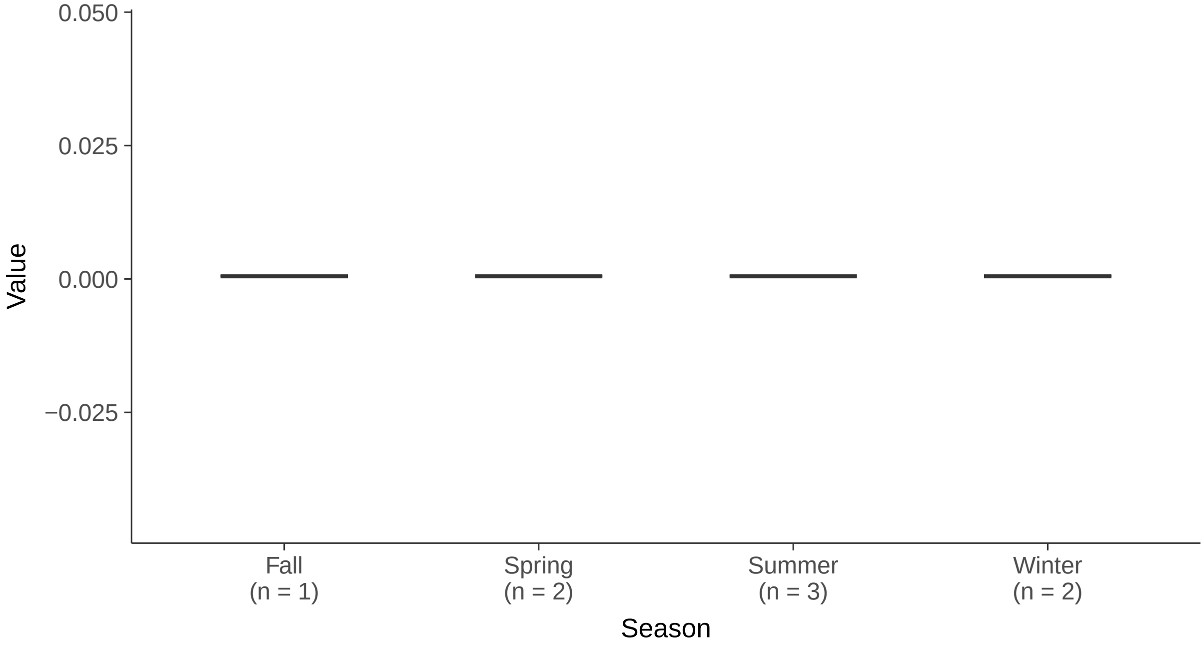
Boxplot

Cadmium, MW-15 (mg/L)



Boxplot by Season

Cadmium, MW-15 (mg/L)

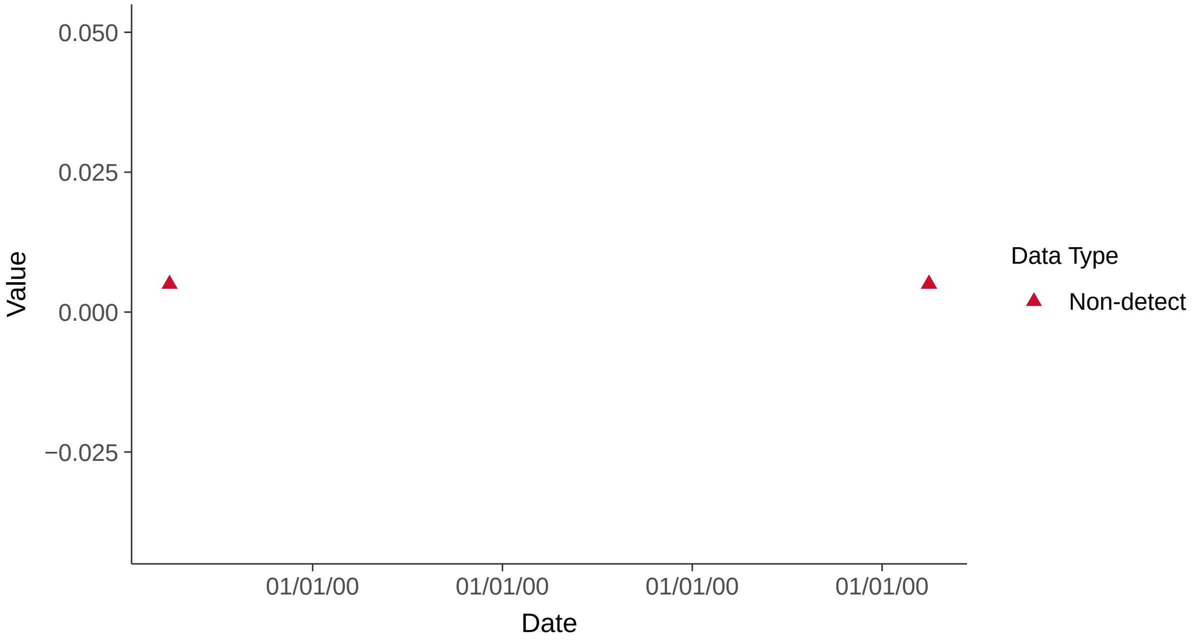


Appendix IV: Chromium, MW-15

ID: 15_2_13

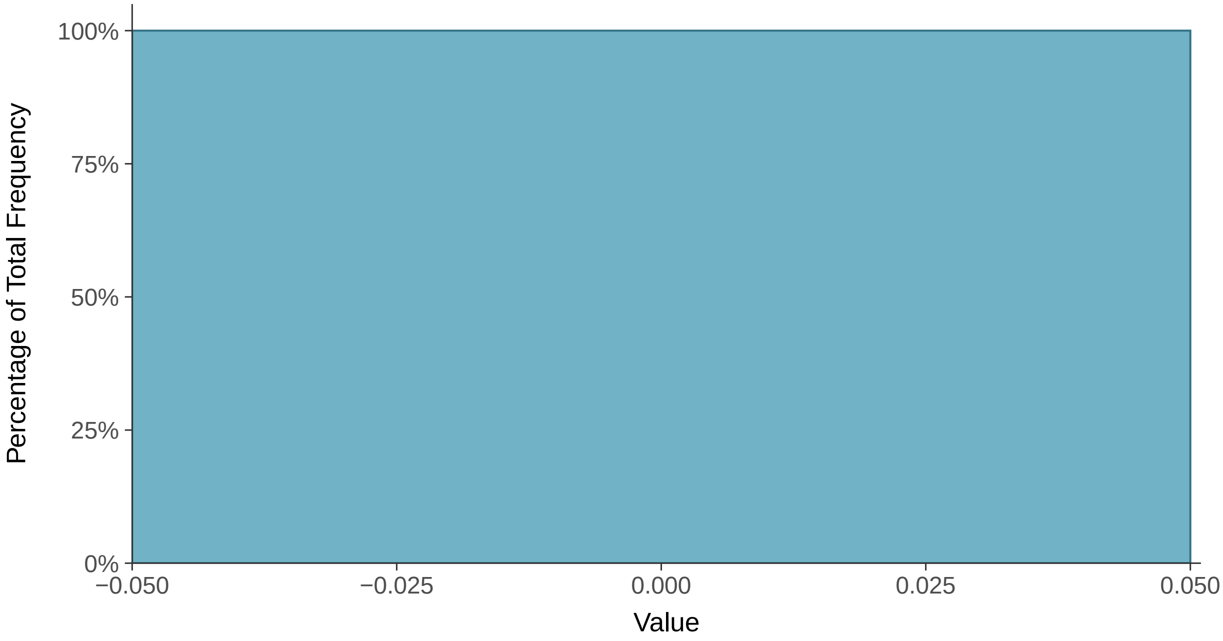
Scatter Plot

Chromium, MW-15 (mg/L)



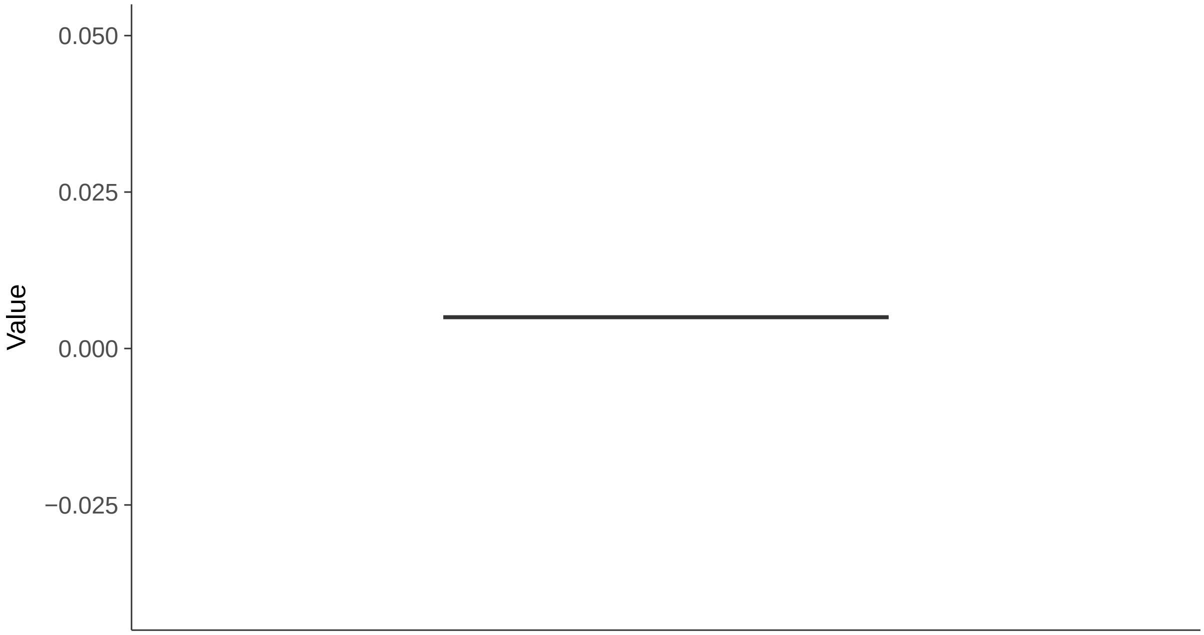
Histogram

Chromium, MW-15 (mg/L)



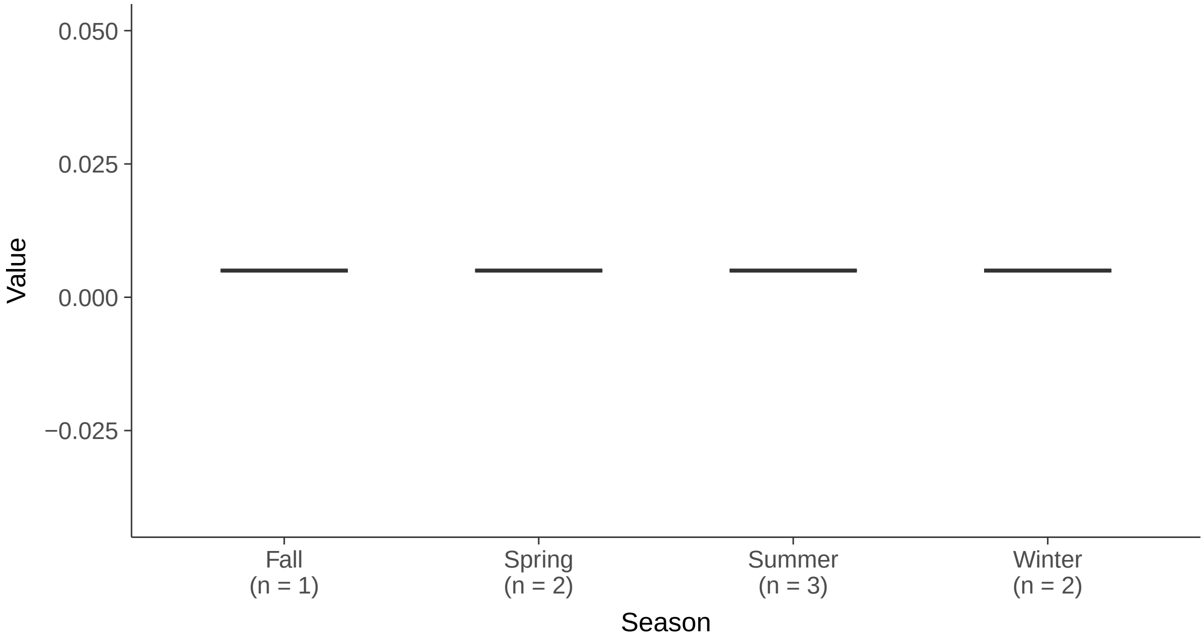
Boxplot

Chromium, MW-15 (mg/L)



Boxplot by Season

Chromium, MW-15 (mg/L)

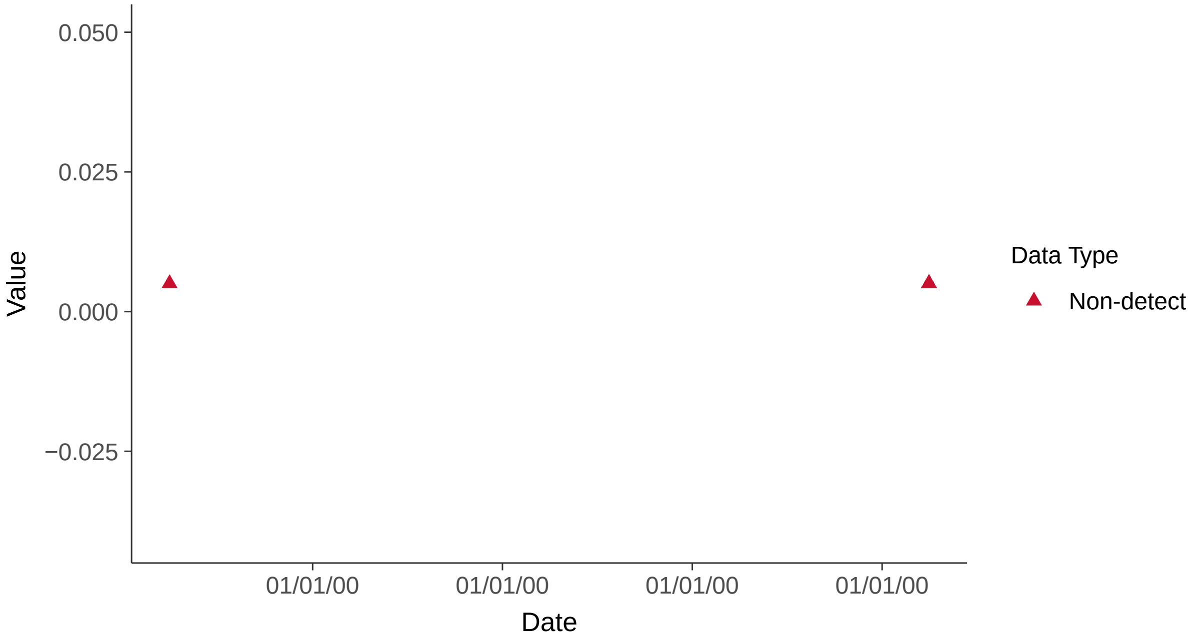


Appendix IV: Cobalt, MW-15

ID: 15_2_14

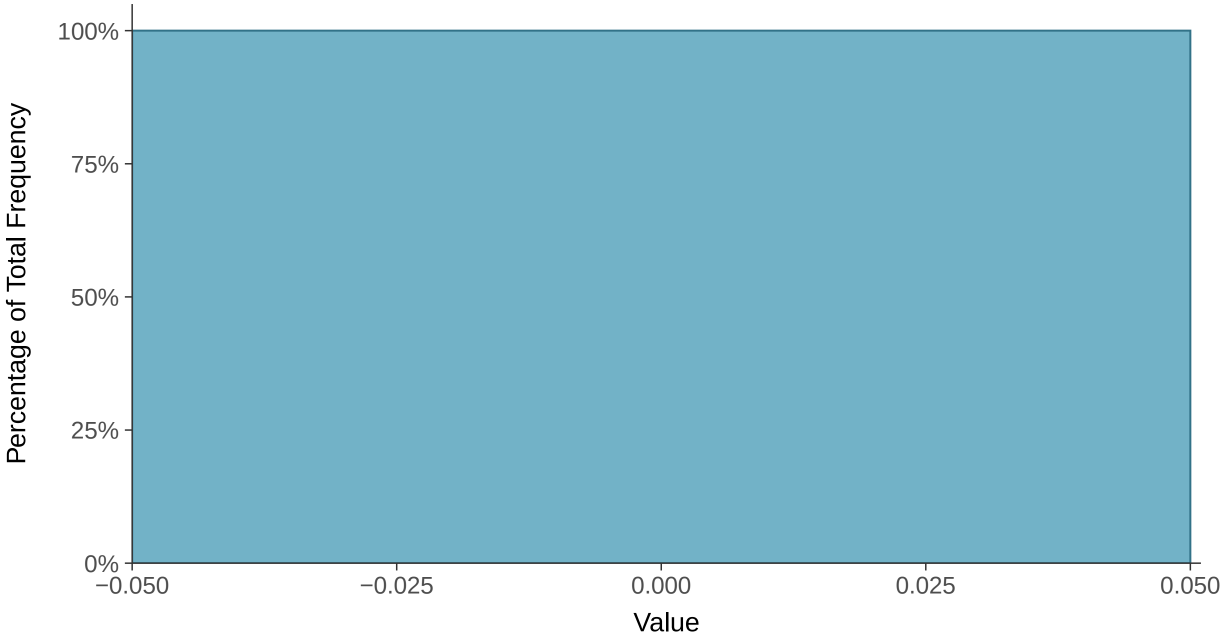
Scatter Plot

Cobalt, MW-15 (mg/L)



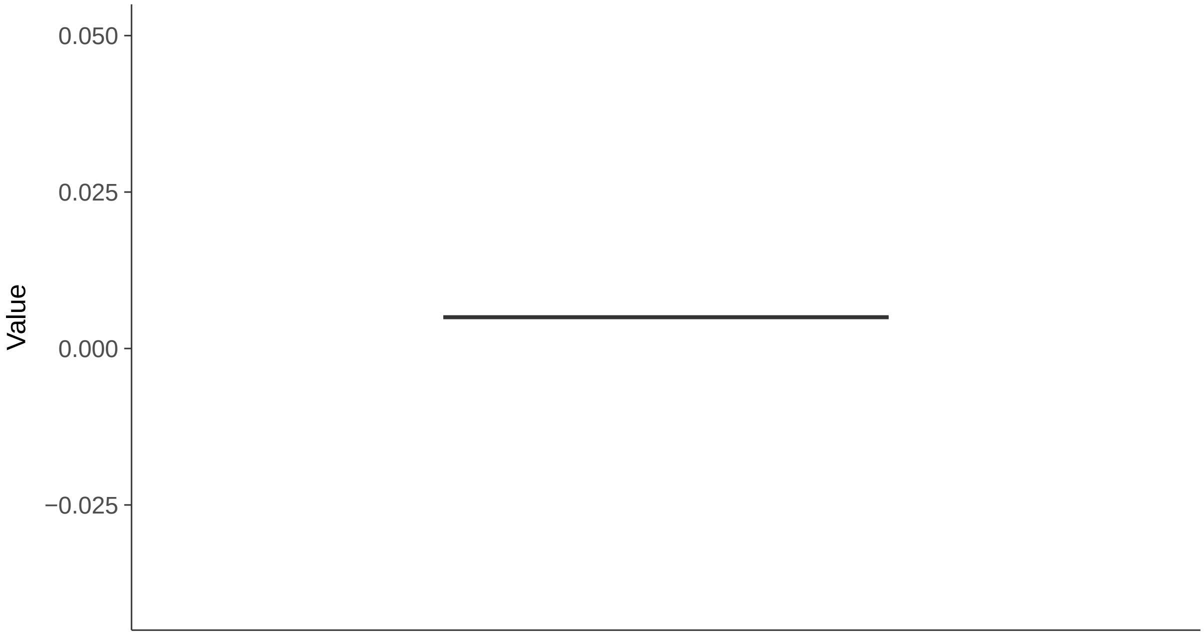
Histogram

Cobalt, MW-15 (mg/L)



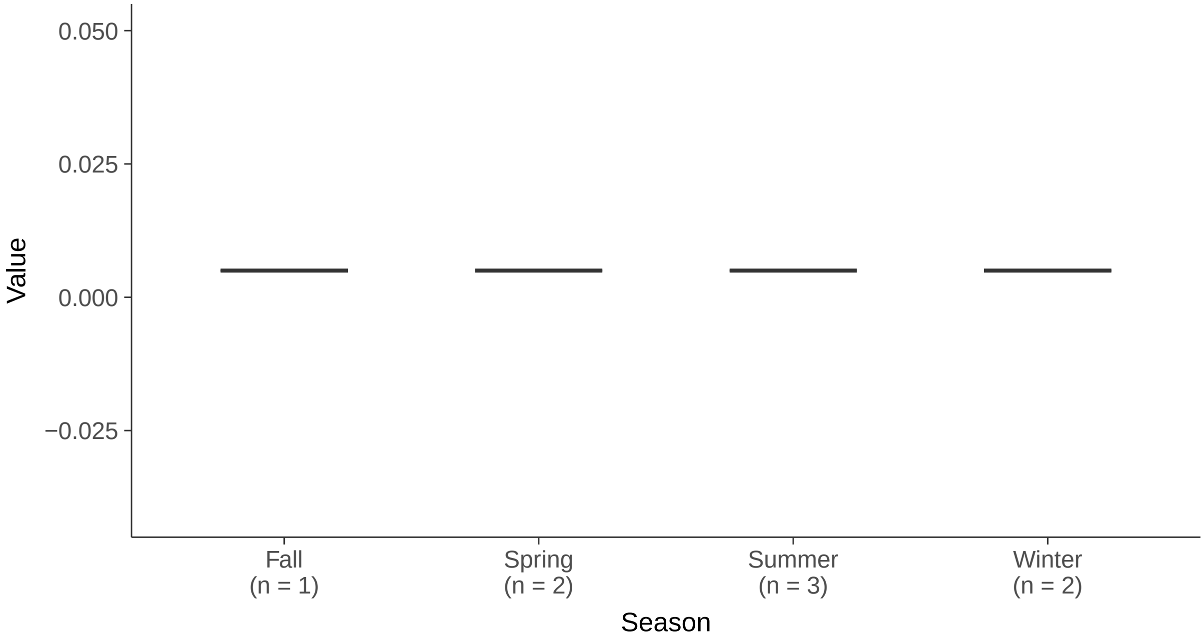
Boxplot

Cobalt, MW-15 (mg/L)



Boxplot by Season

Cobalt, MW-15 (mg/L)

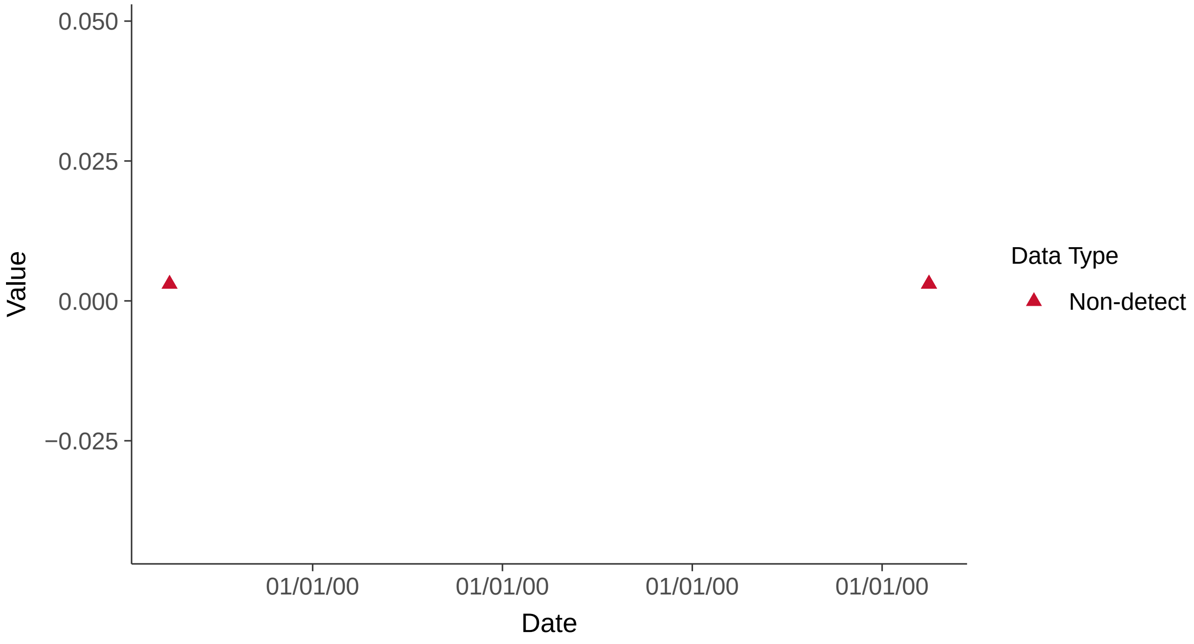


Appendix IV: Lead, MW-15

ID: 15_2_15

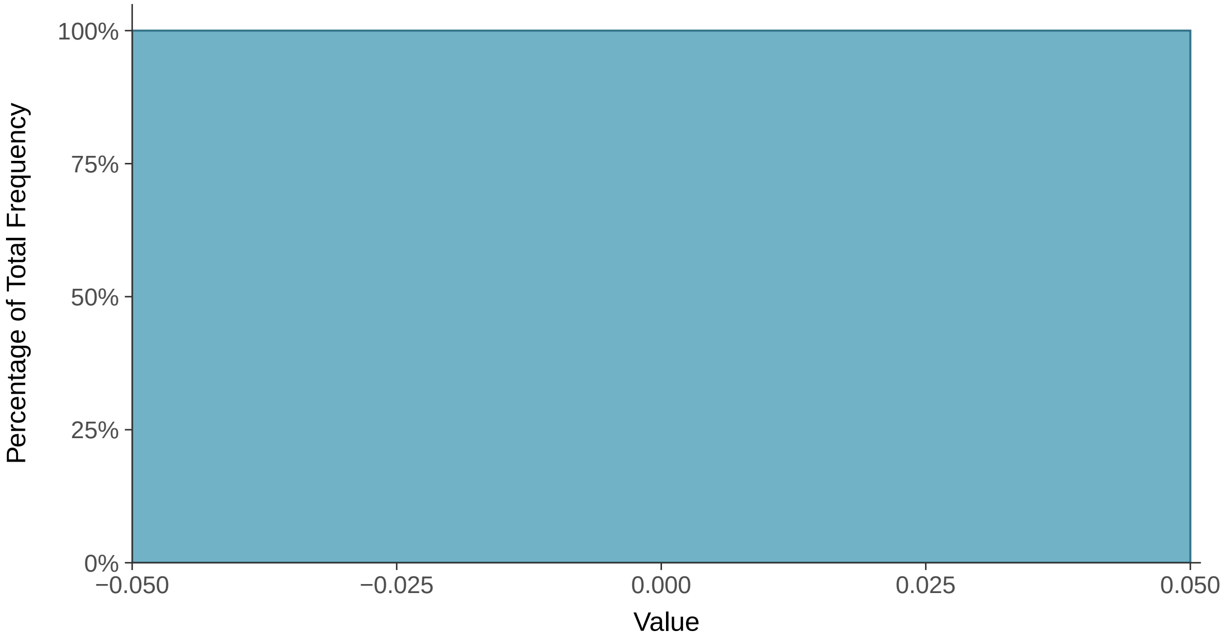
Scatter Plot

Lead, MW-15 (mg/L)



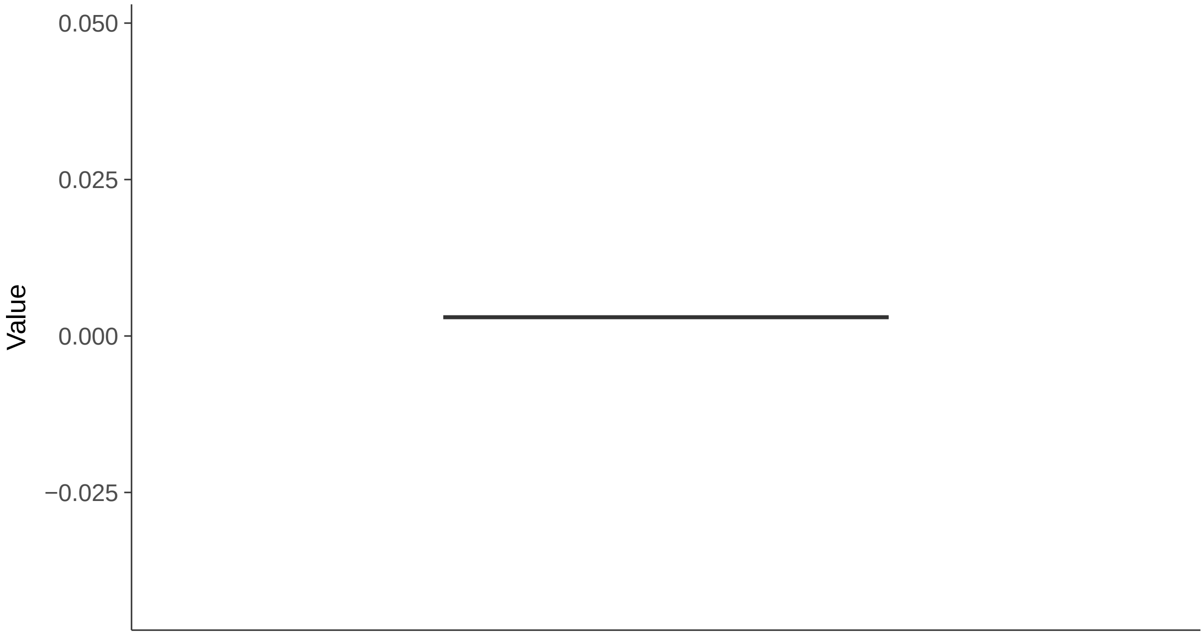
Histogram

Lead, MW-15 (mg/L)



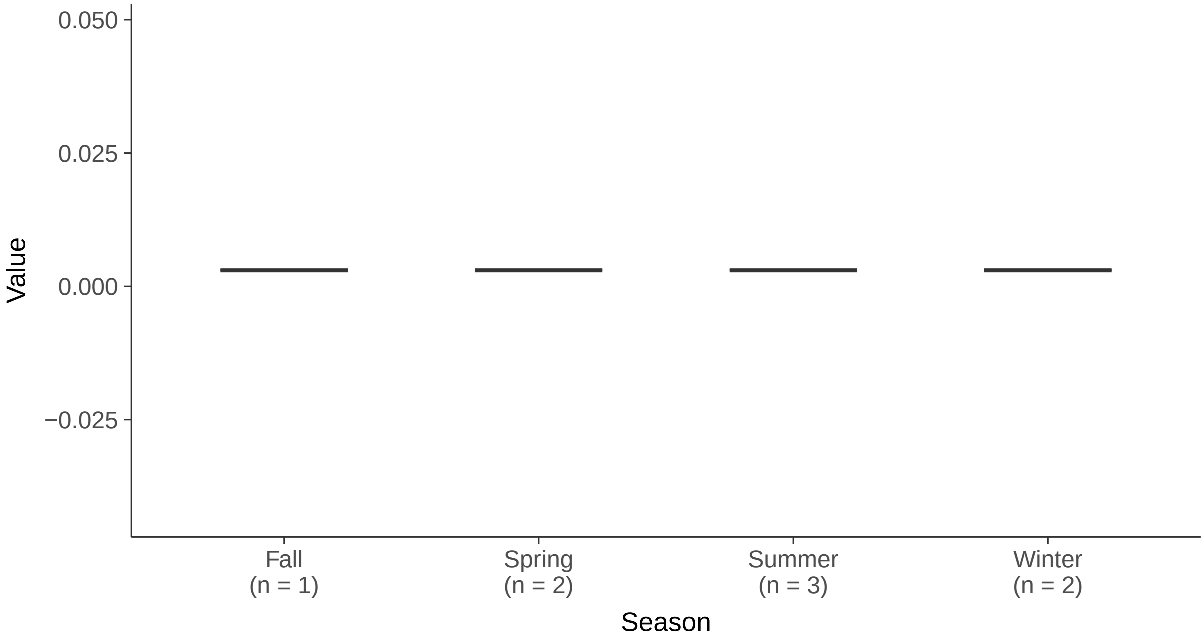
Boxplot

Lead, MW-15 (mg/L)



Boxplot by Season

Lead, MW-15 (mg/L)

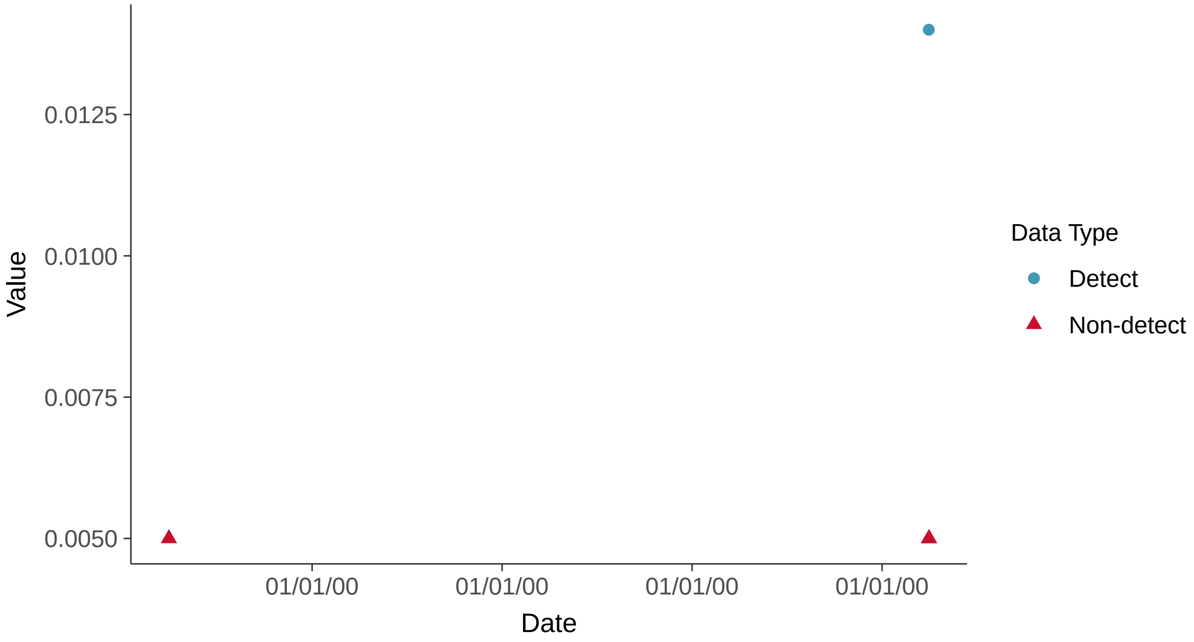


Appendix IV: Lithium, MW-15

ID: 15_2_16

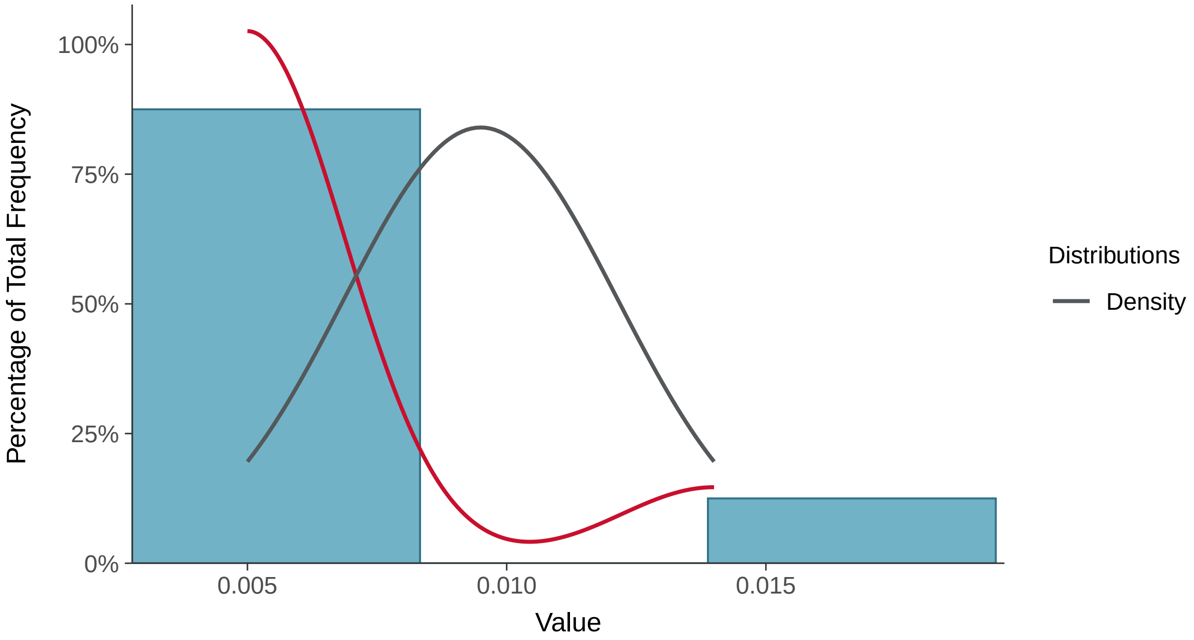
Scatter Plot

Lithium, MW-15 (mg/L)



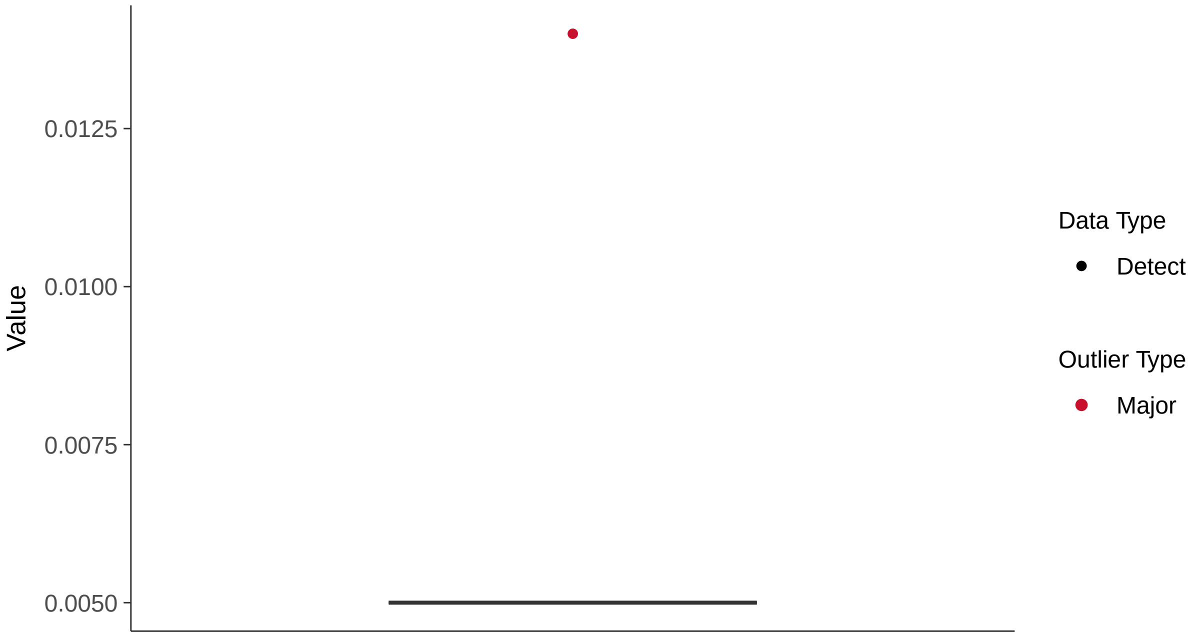
Histogram

Lithium, MW-15 (mg/L)



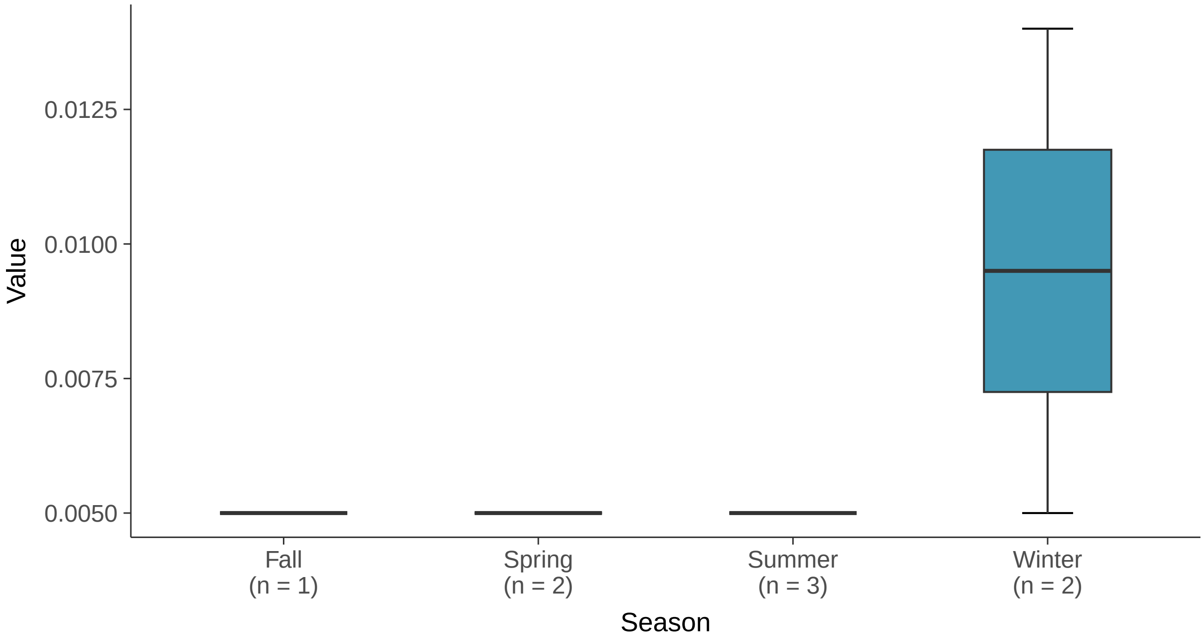
Boxplot

Lithium, MW-15 (mg/L)



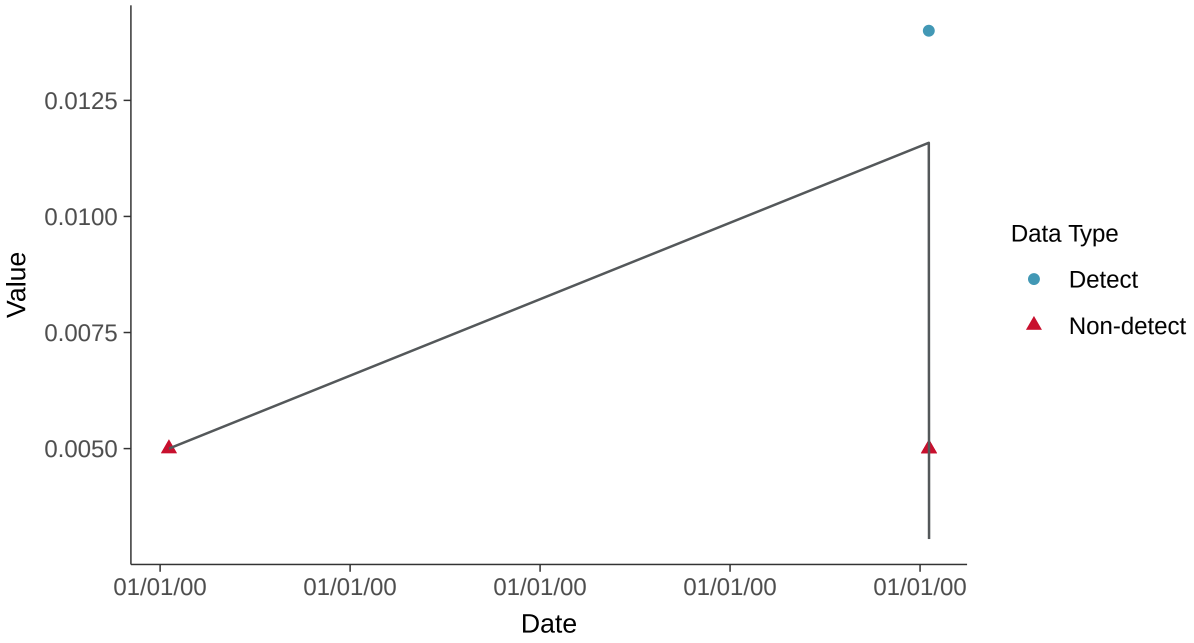
Boxplot by Season

Lithium, MW-15 (mg/L)



Trend Regression: Piecewise Linear-Linear

Lithium, MW-15 (mg/L)

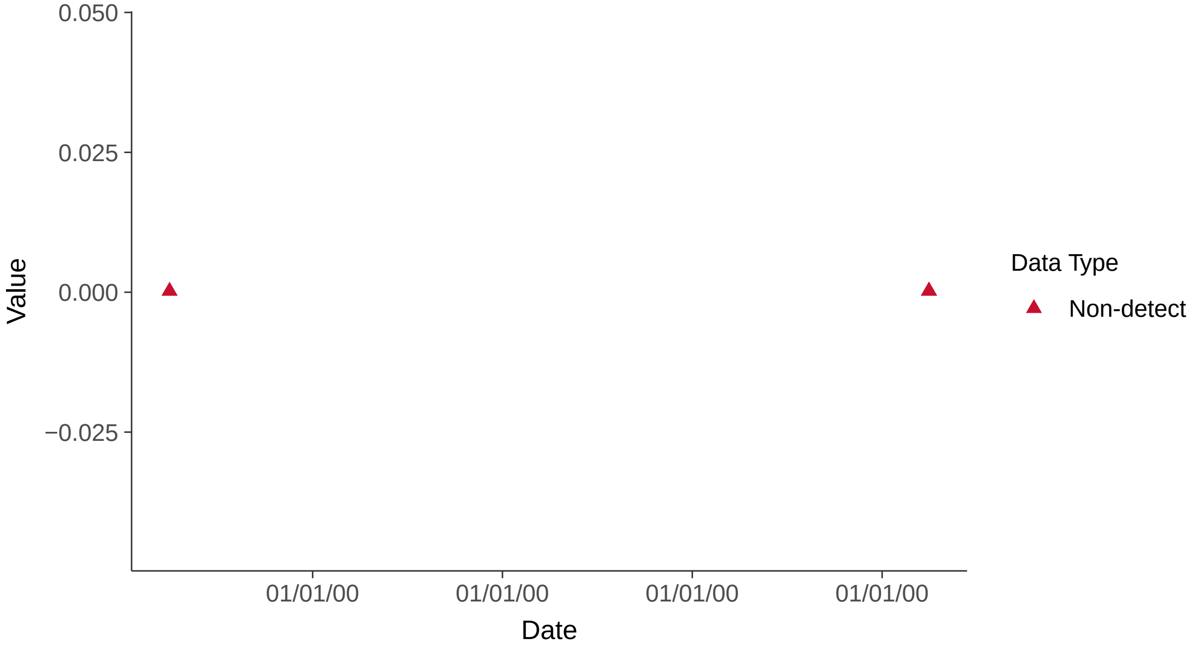


Appendix IV: Mercury, MW-15

ID: 15_2_17

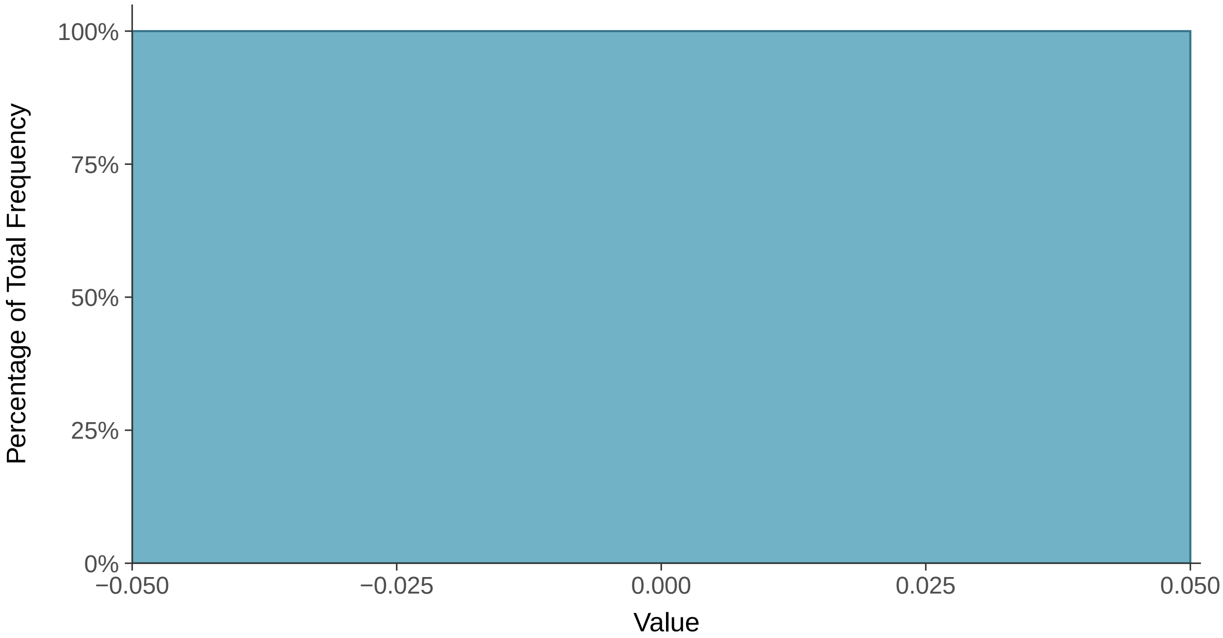
Scatter Plot

Mercury, MW-15 (mg/L)



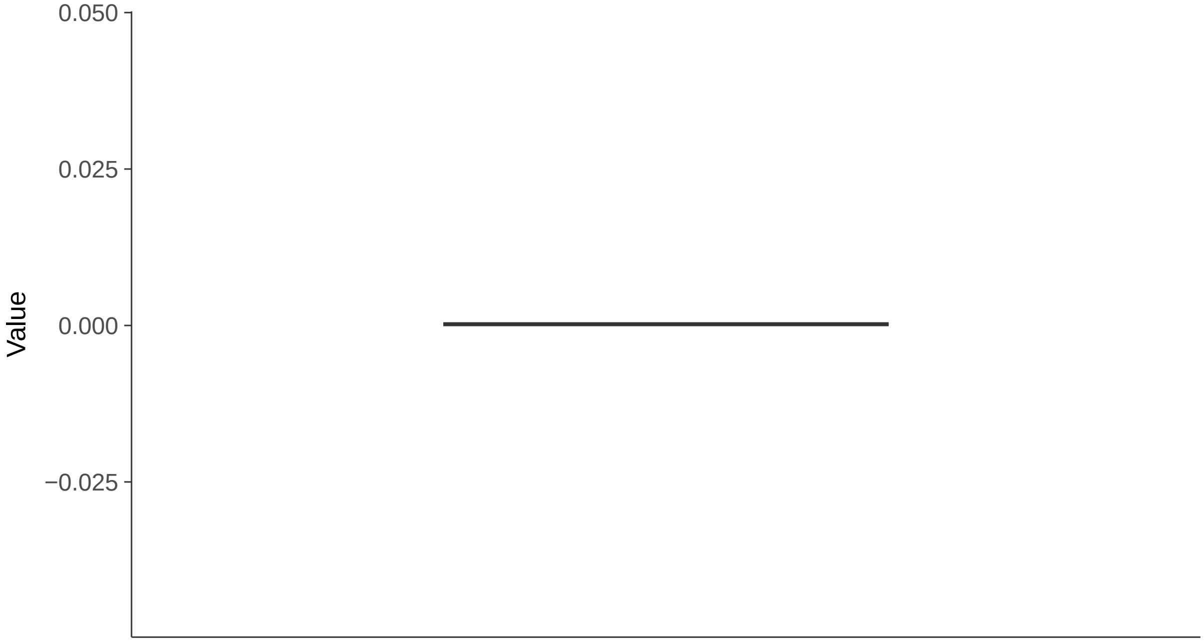
Histogram

Mercury, MW-15 (mg/L)



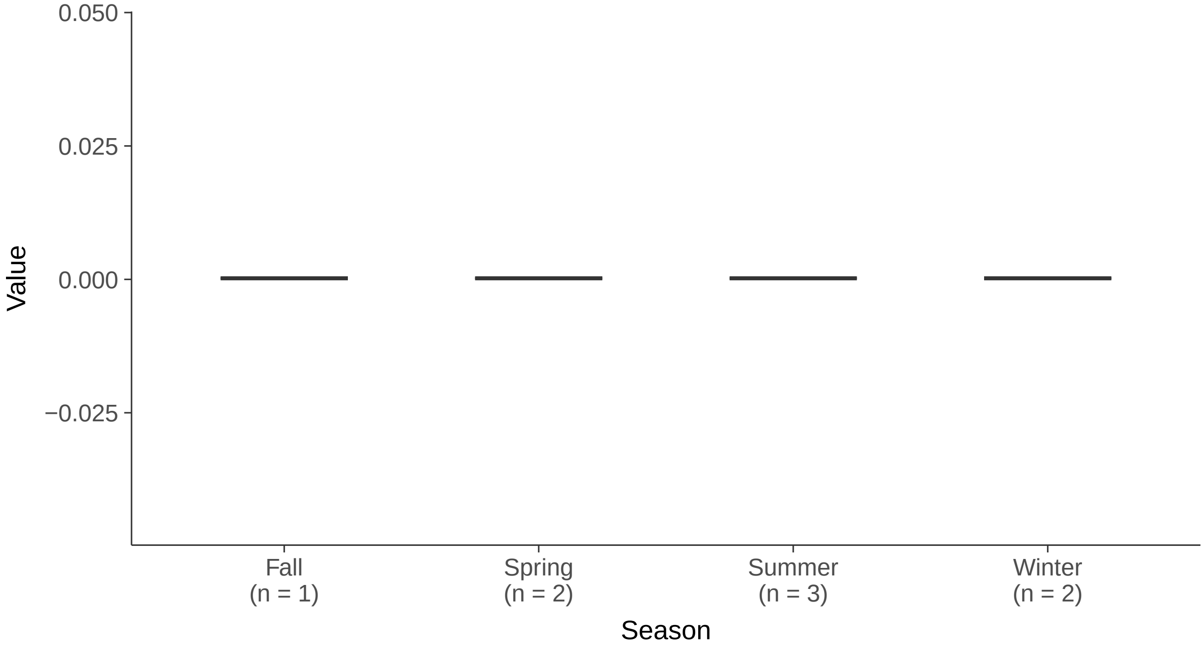
Boxplot

Mercury, MW-15 (mg/L)



Boxplot by Season

Mercury, MW-15 (mg/L)

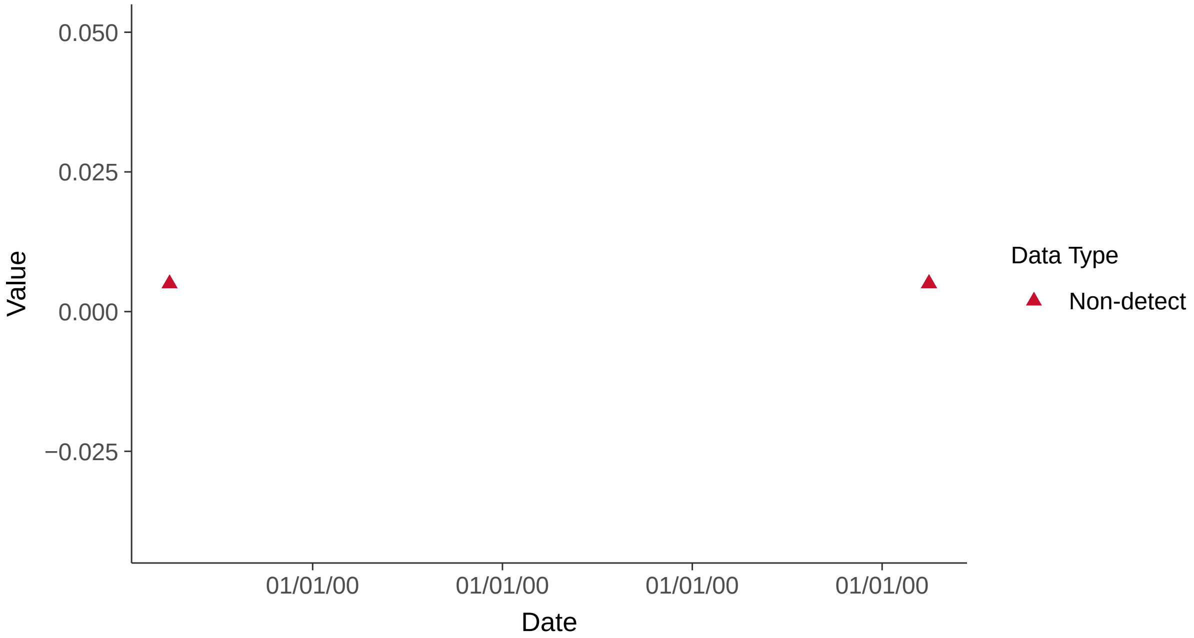


Appendix IV: Molybdenum, MW-15

ID: 15_2_18

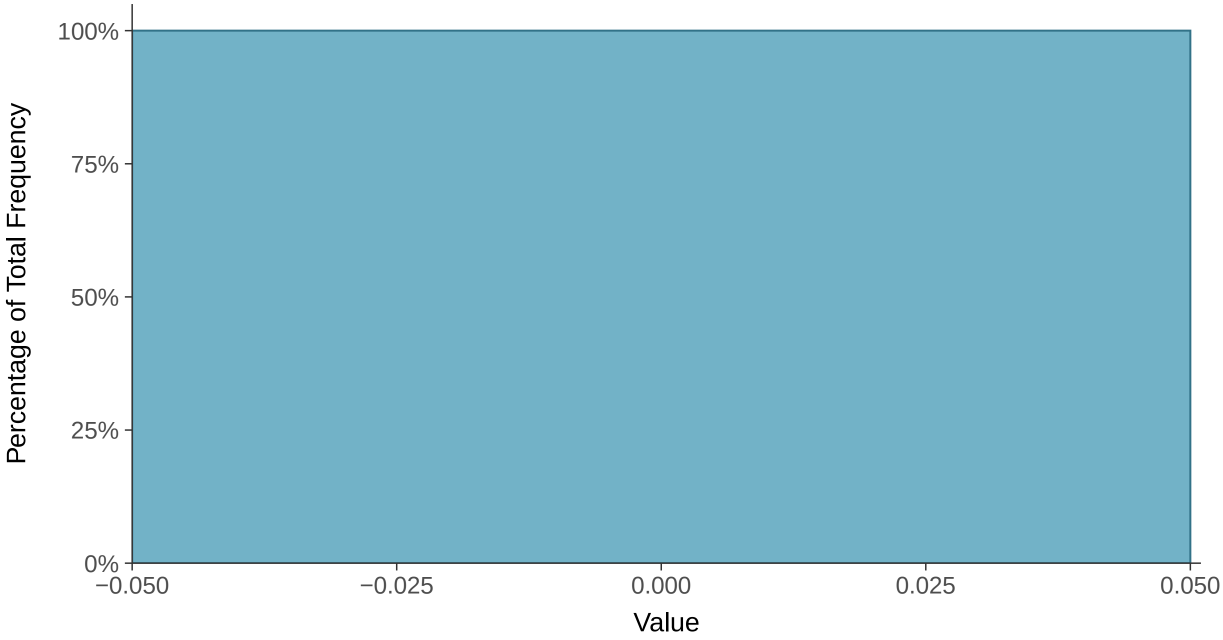
Scatter Plot

Molybdenum, MW-15 (mg/L)



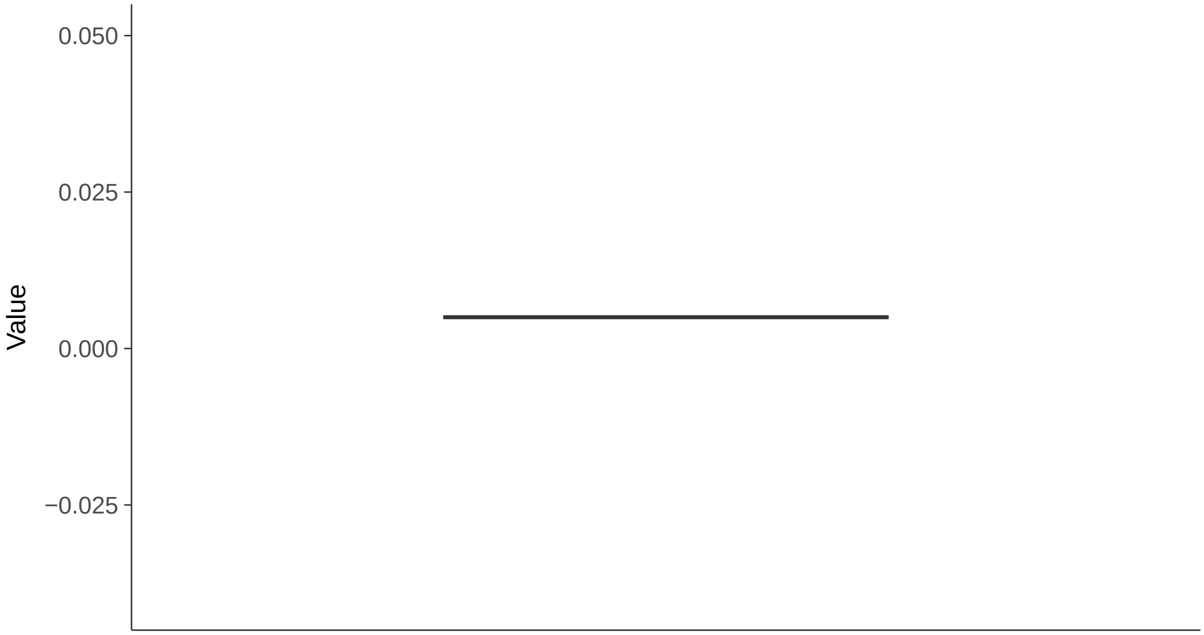
Histogram

Molybdenum, MW-15 (mg/L)



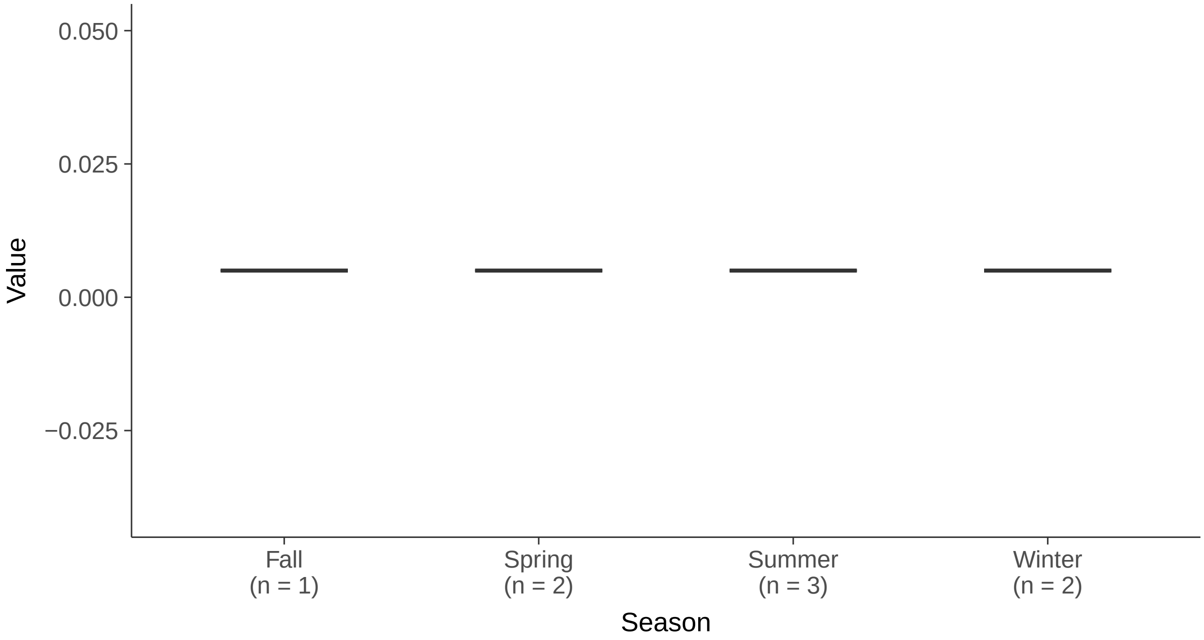
Boxplot

Molybdenum, MW-15 (mg/L)



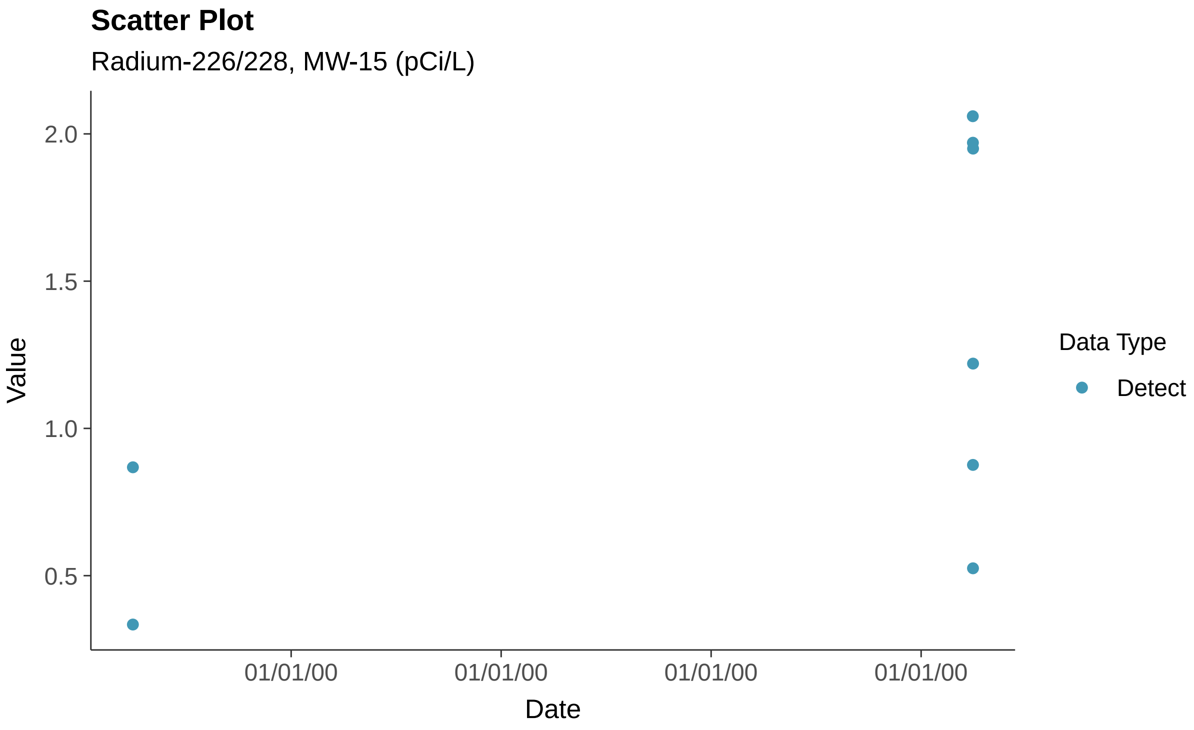
Boxplot by Season

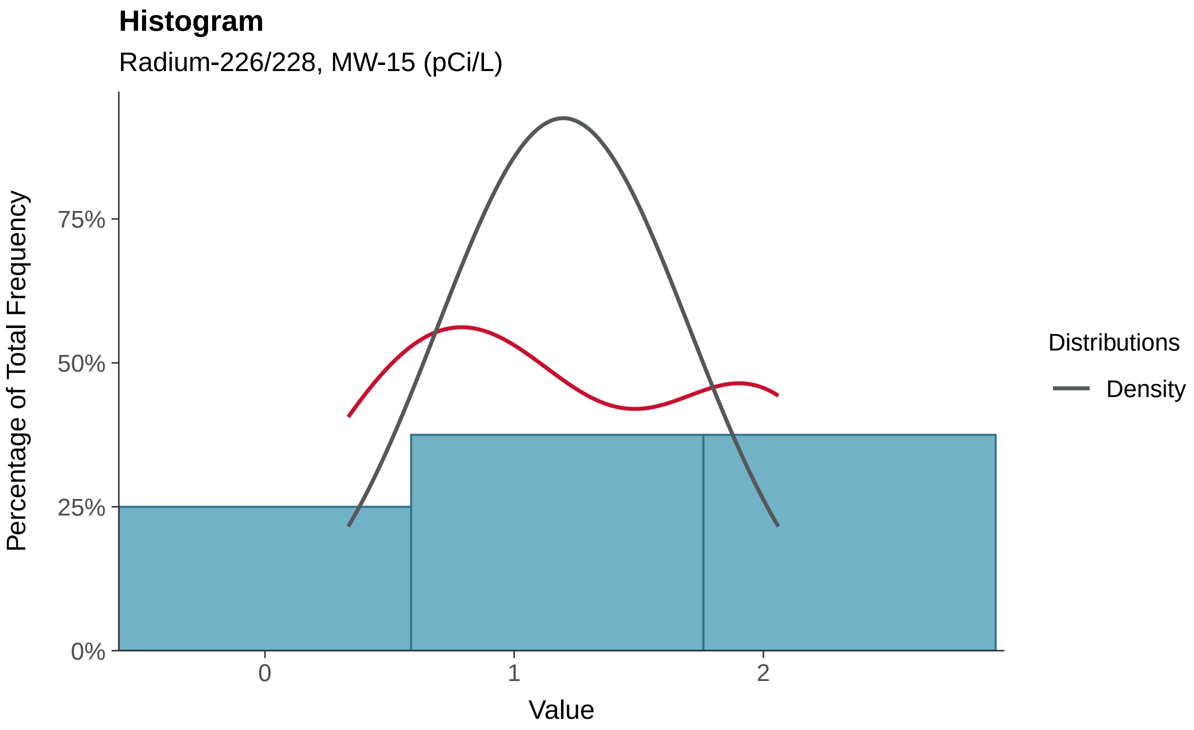
Molybdenum, MW-15 (mg/L)



Appendix IV: Radium-226/228, MW-15

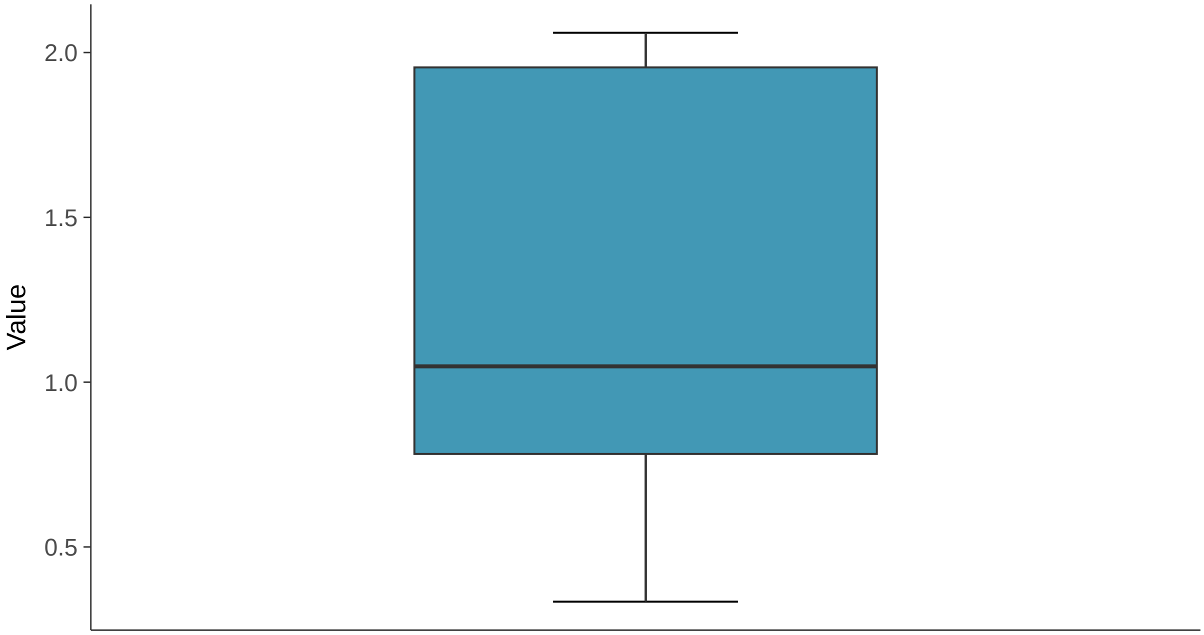
ID: 15_2_20





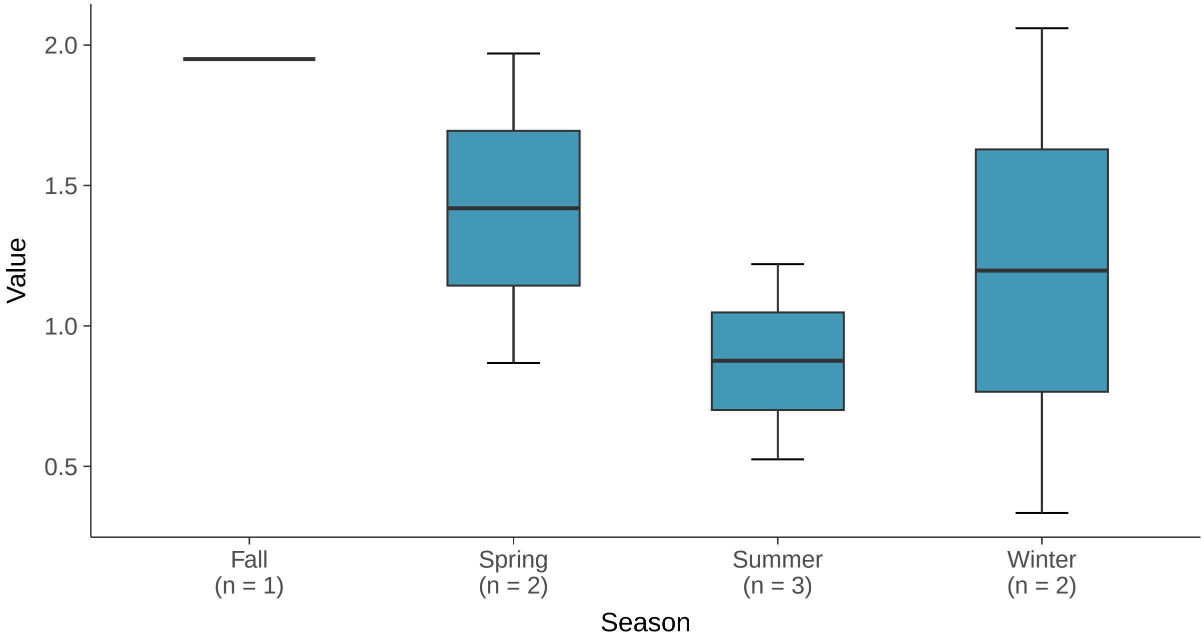
Boxplot

Radium-226/228, MW-15 (pCi/L)



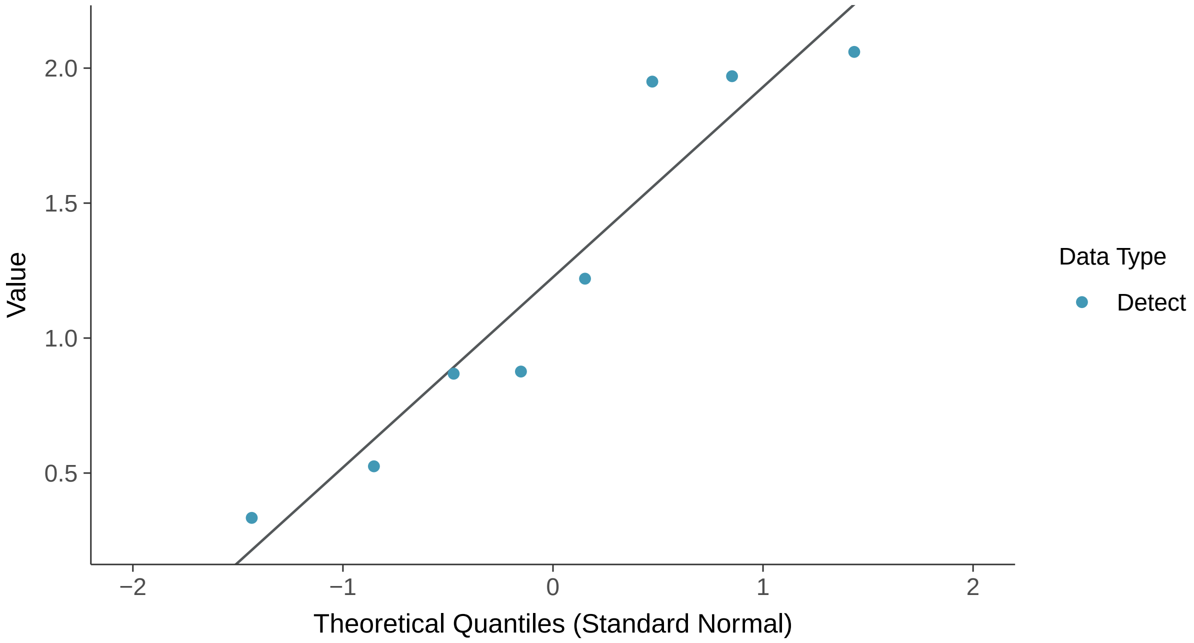
Boxplot by Season

Radium-226/228, MW-15 (pCi/L)



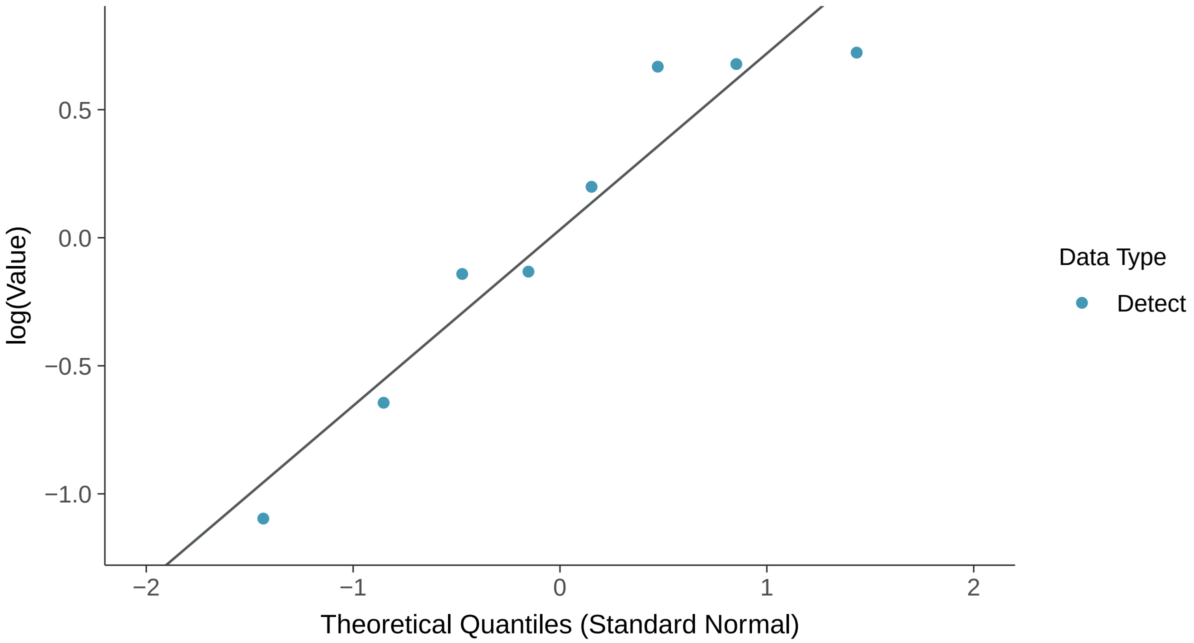
Normal Q-Q plot

Radium-226/228, MW-15 (pCi/L)



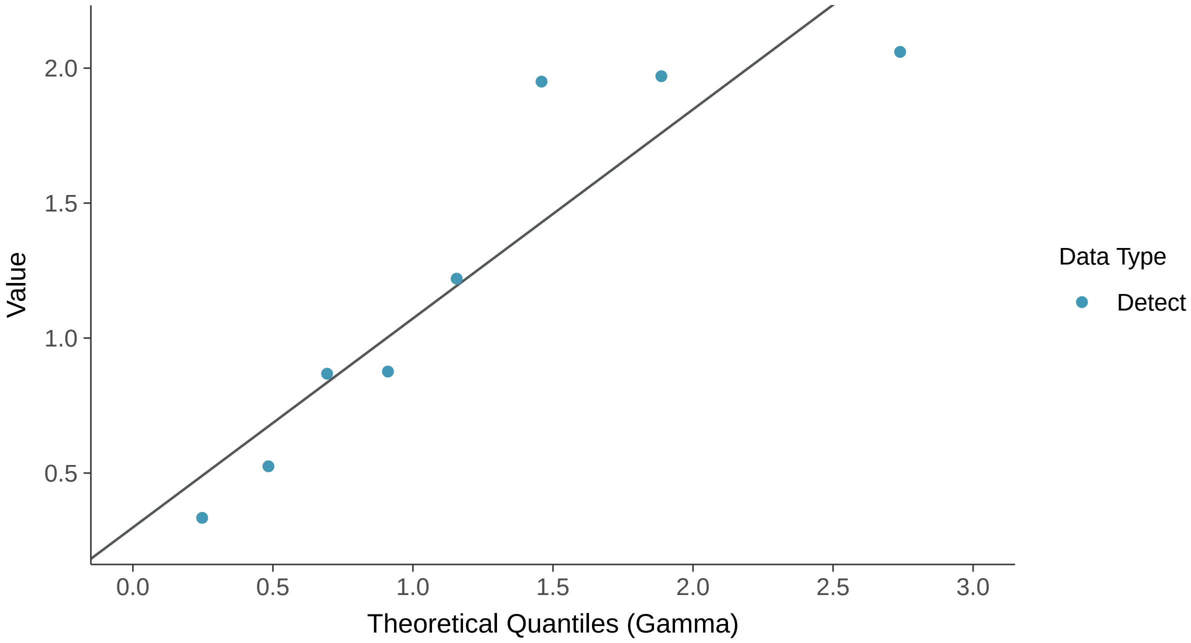
Lognormal Q-Q plot

Radium-226/228, MW-15 (pCi/L)



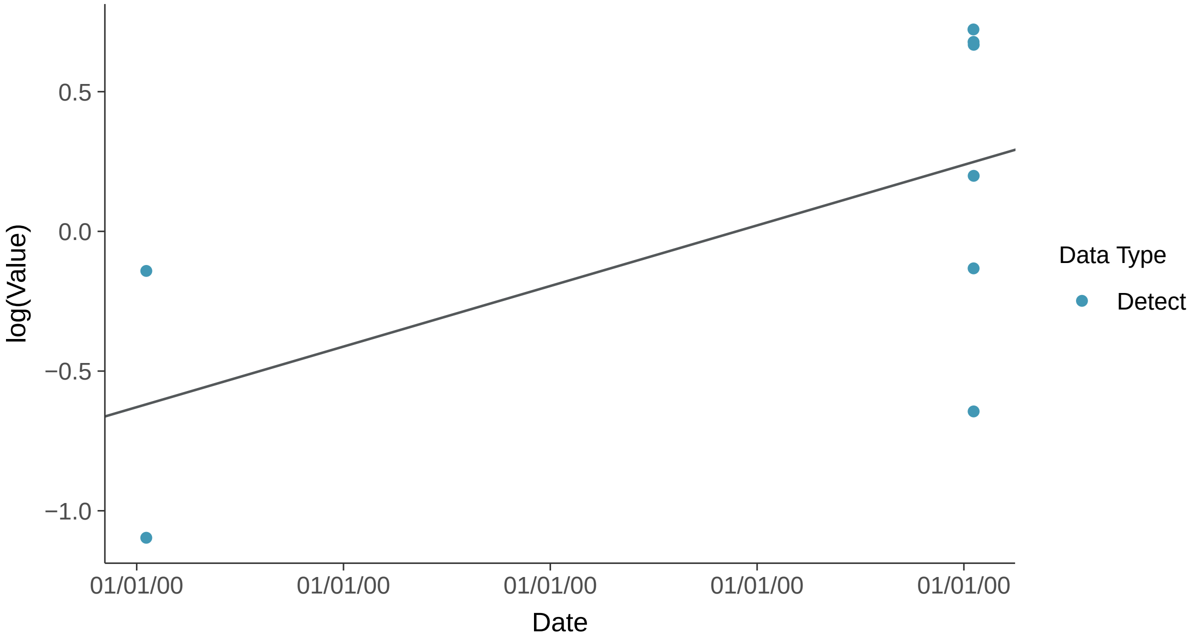
Gamma Q-Q plot

Radium-226/228, MW-15 (pCi/L)



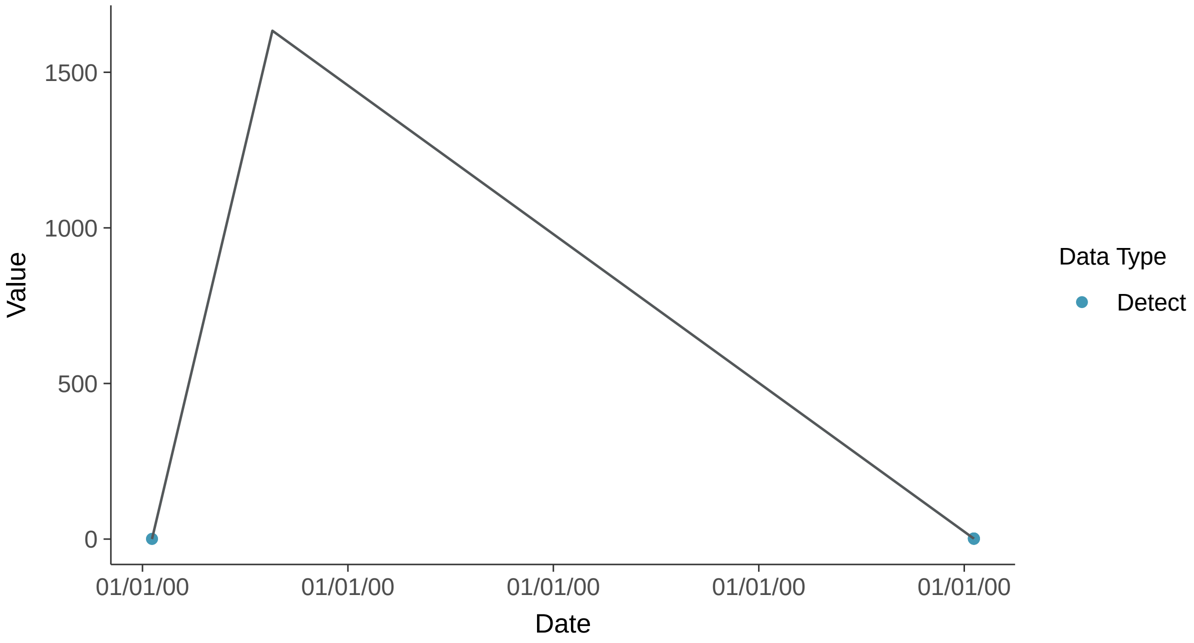
Trend Regression: Lognormal MLE

Radium-226/228, MW-15 (pCi/L)



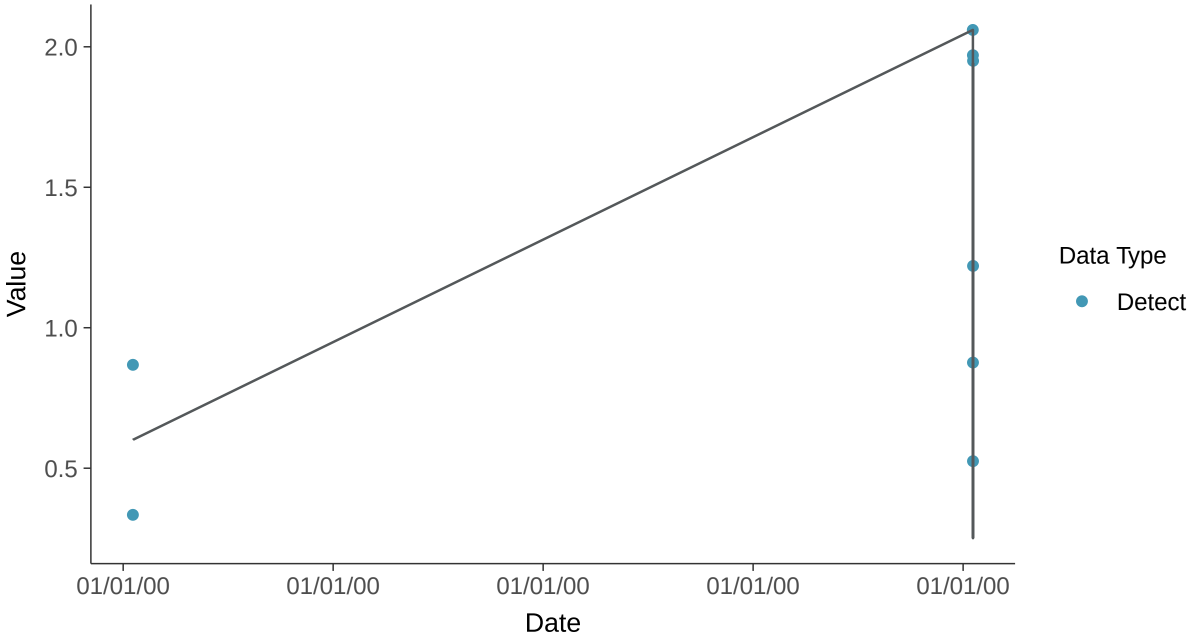
Trend Regression: Piecewise Linear-Linear

Radium-226/228, MW-15 (pCi/L)



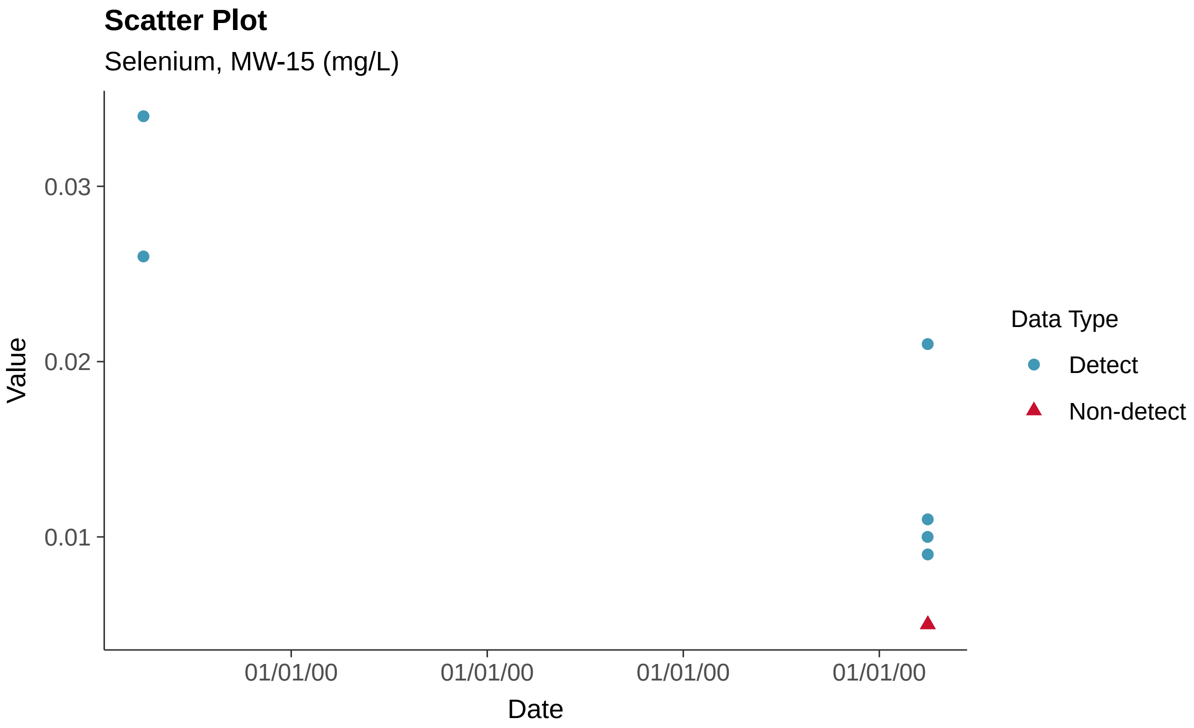
Trend Regression: Piecewise Linear-Linear-Linear

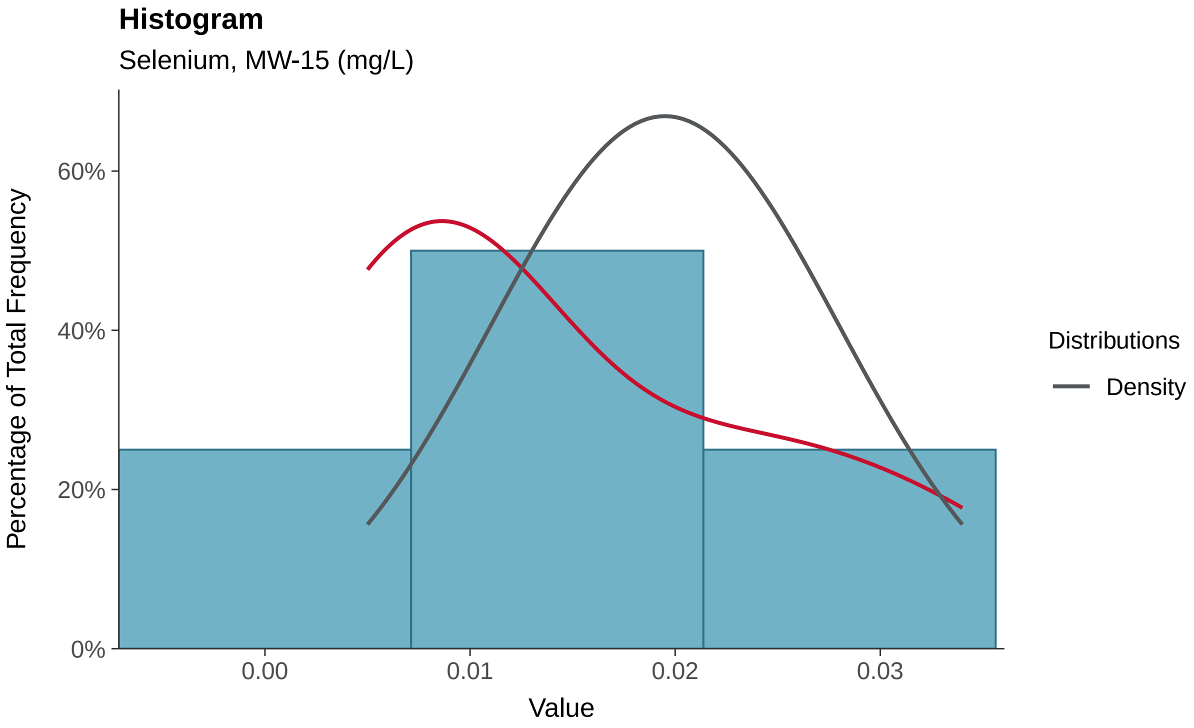
Radium-226/228, MW-15 (pCi/L)



Appendix IV: Selenium, MW-15

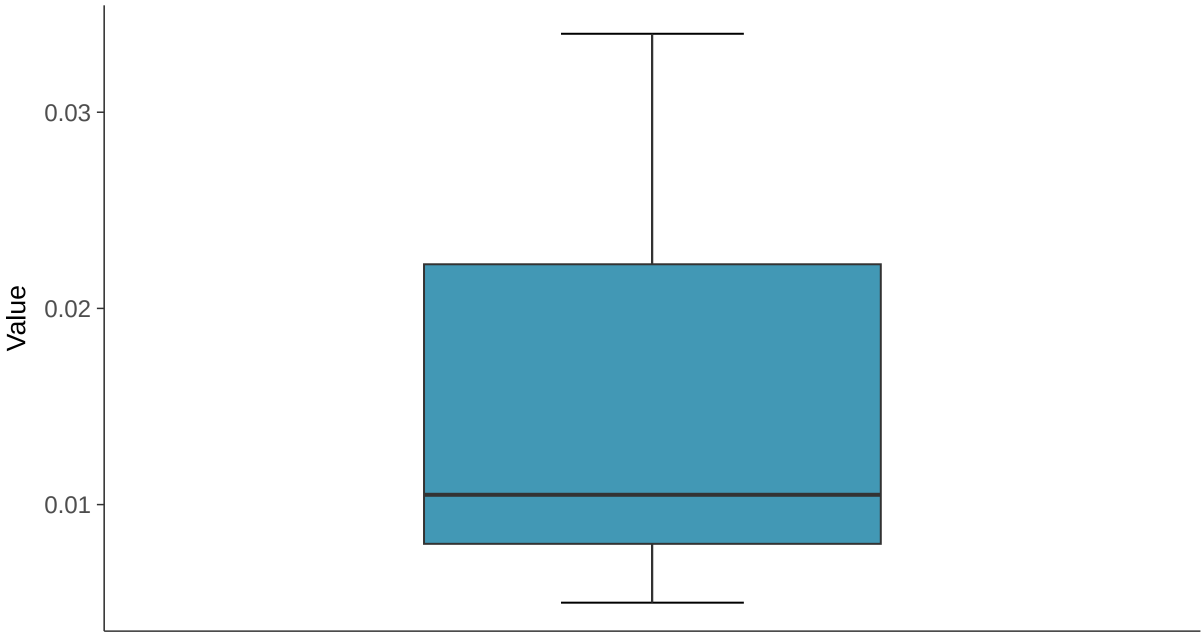
ID: 15_2_22





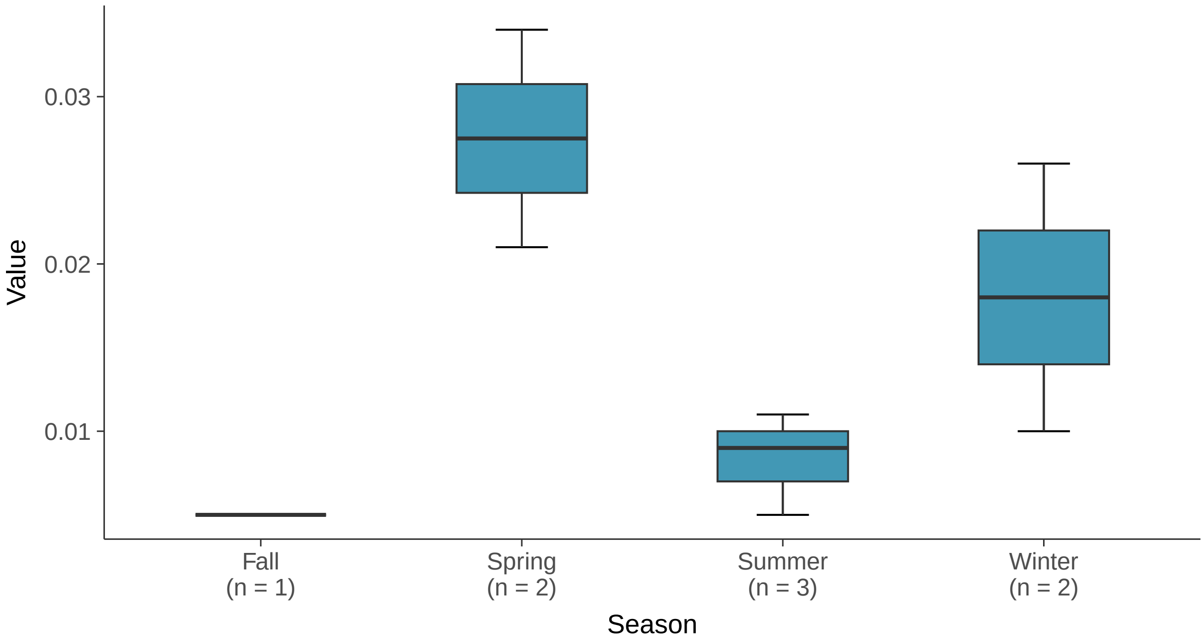
Boxplot

Selenium, MW-15 (mg/L)



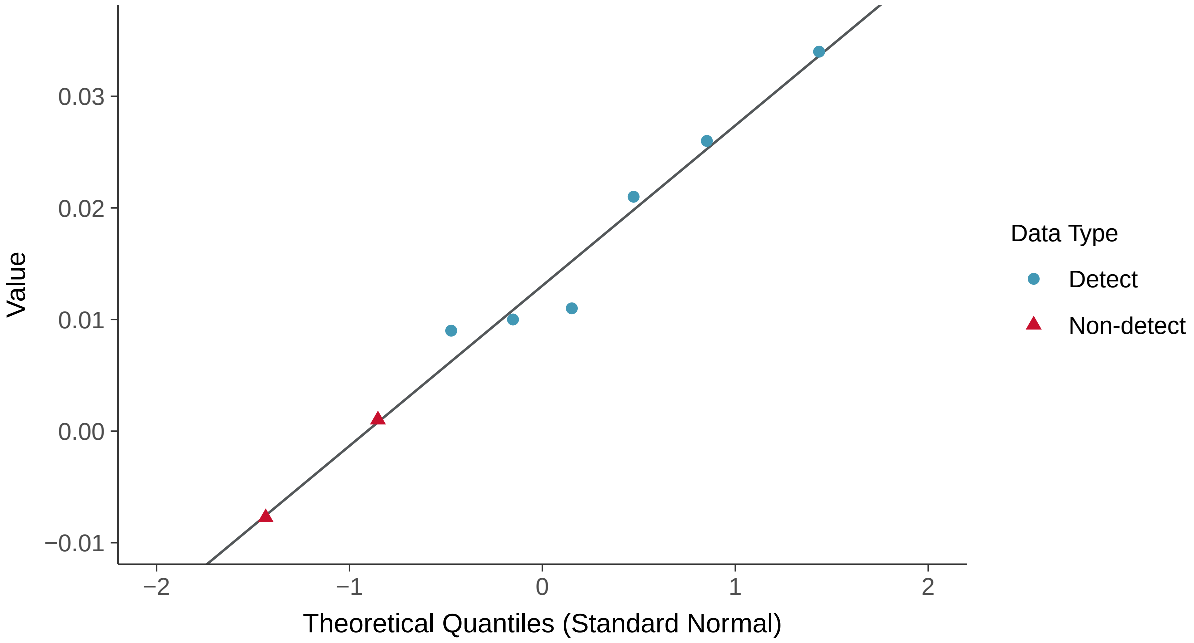
Boxplot by Season

Selenium, MW-15 (mg/L)



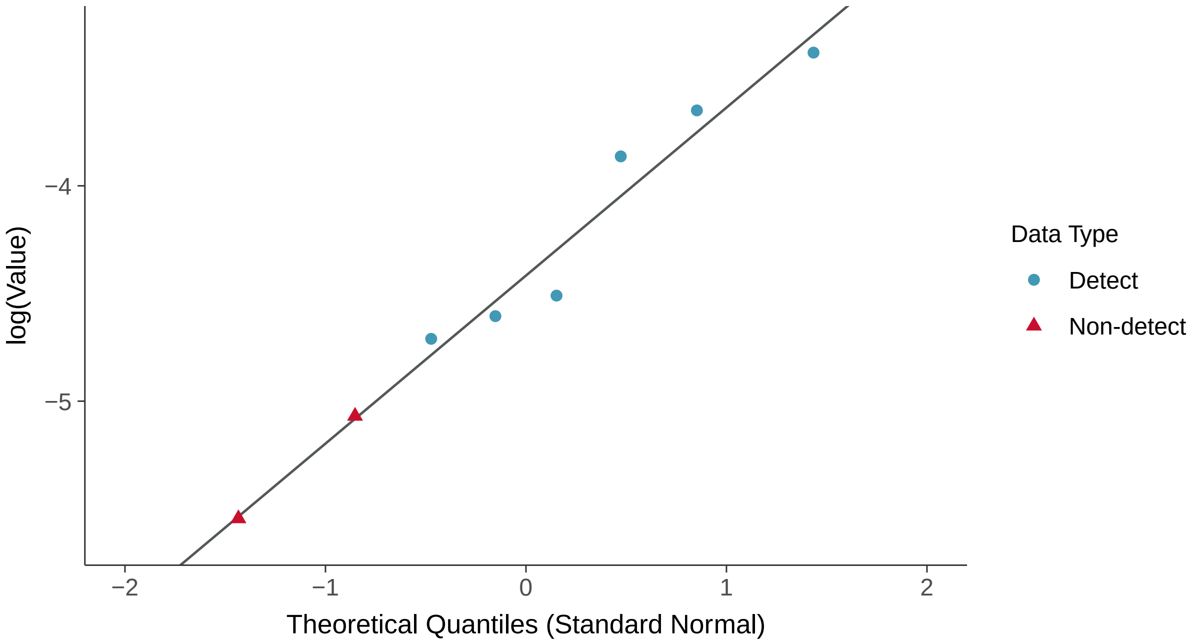
Normal Q-Q plot using ROS Imputed Estimates

Selenium, MW-15 (mg/L)



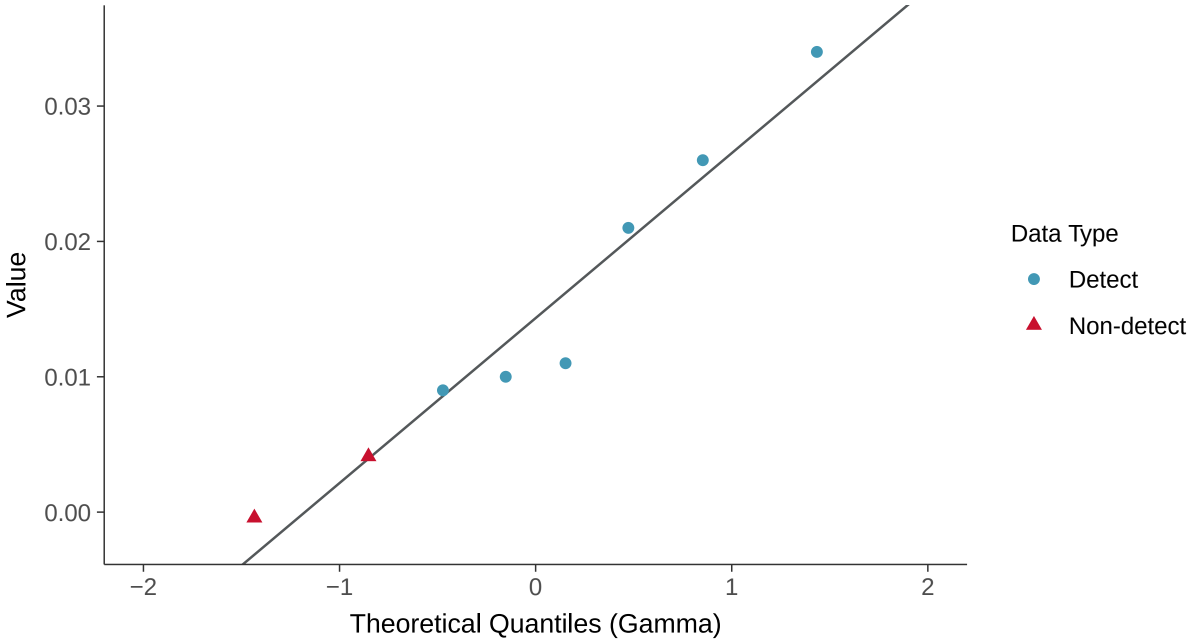
Lognormal Q-Q plot using ROS Imputed Estimates

Selenium, MW-15 (mg/L)



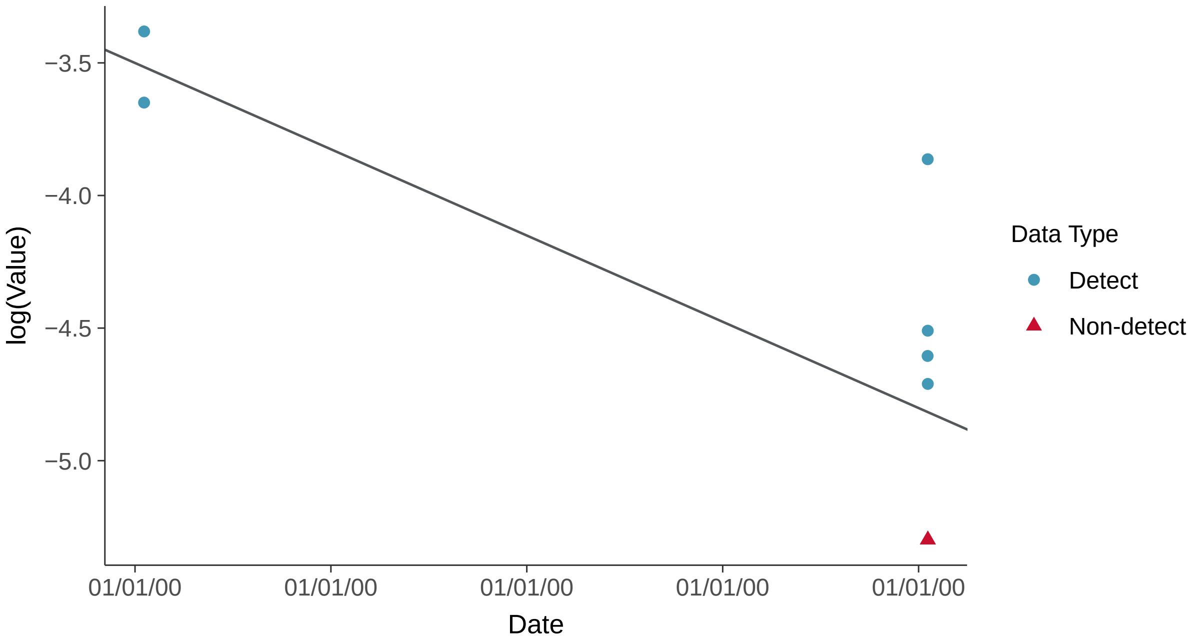
Gamma Q-Q plot using ROS Imputed Estimates

Selenium, MW-15 (mg/L)



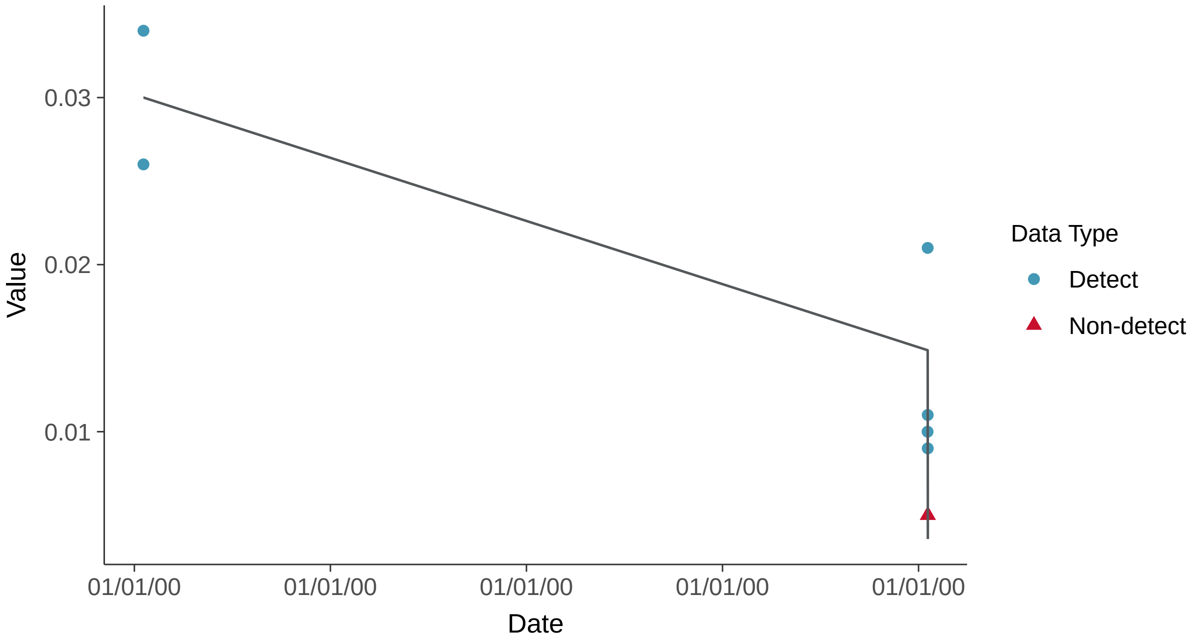
Trend Regression: Lognormal MLE

Selenium, MW-15 (mg/L)



Trend Regression: Piecewise Linear-Linear

Selenium, MW-15 (mg/L)

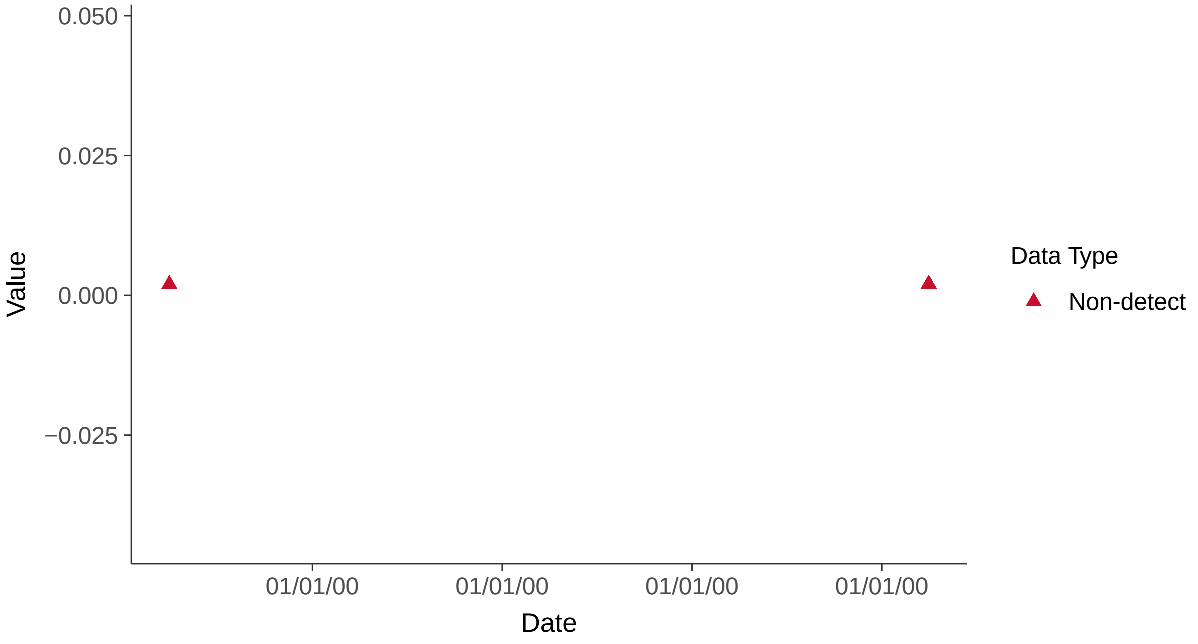


Appendix IV: Thallium, MW-15

ID: 15_2_23

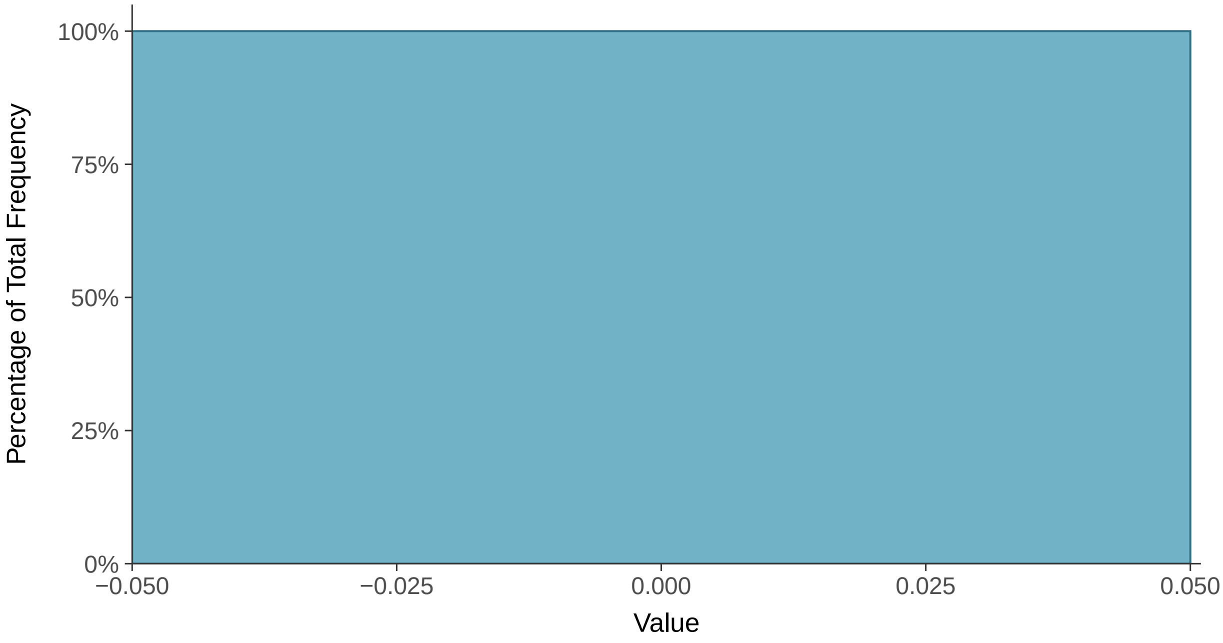
Scatter Plot

Thallium, MW-15 (mg/L)



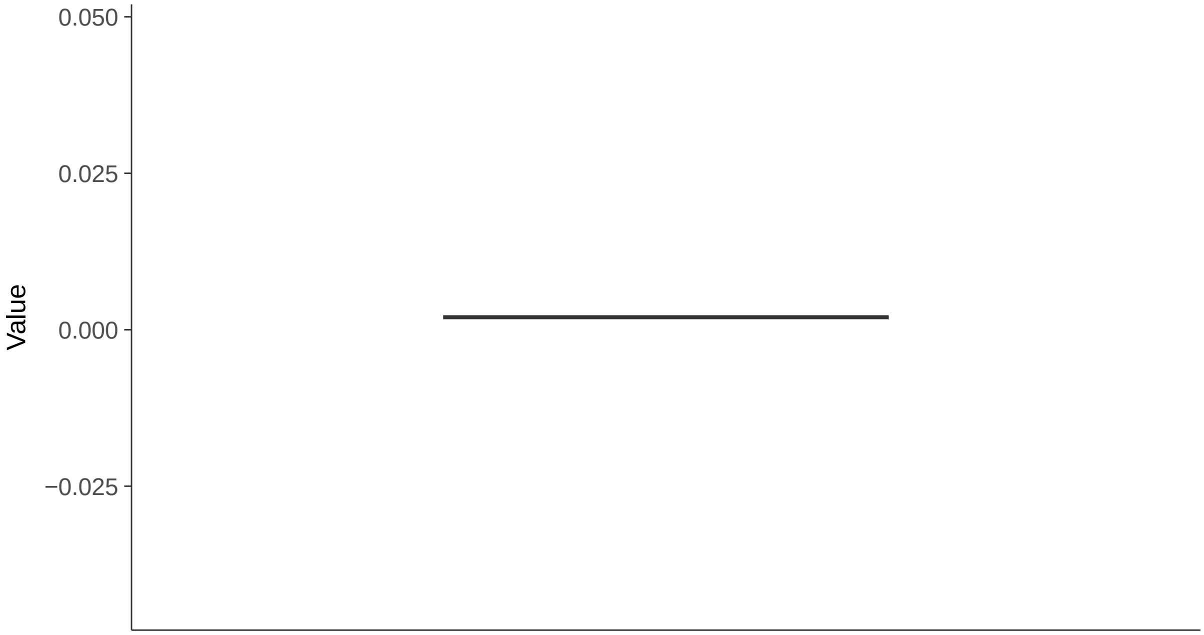
Histogram

Thallium, MW-15 (mg/L)



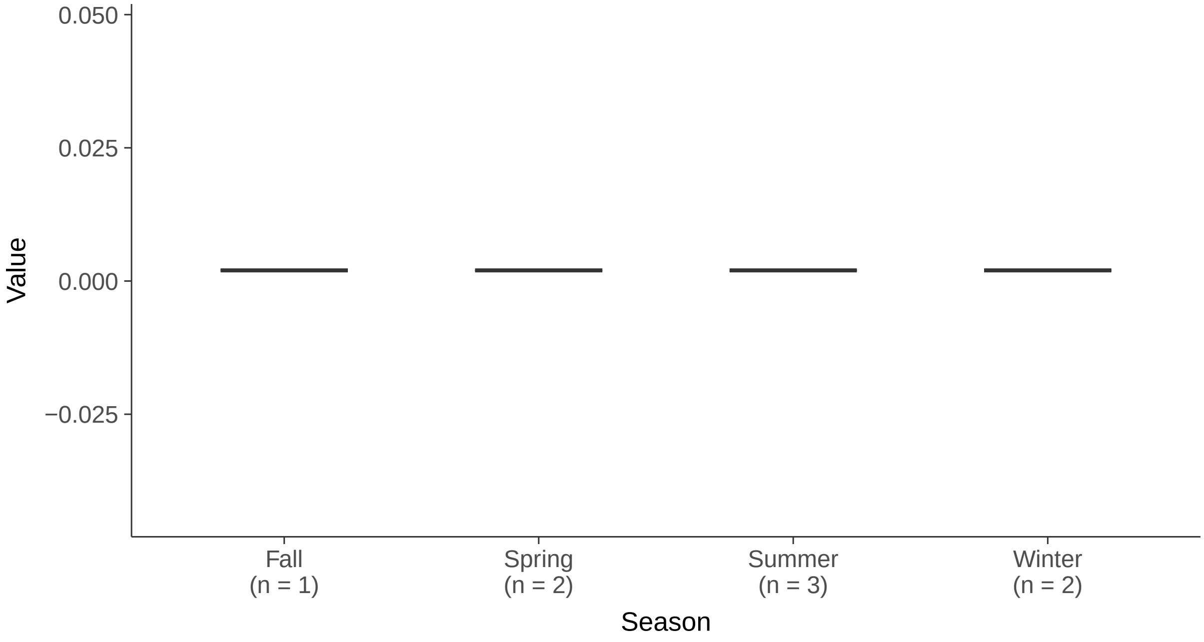
Boxplot

Thallium, MW-15 (mg/L)



Boxplot by Season

Thallium, MW-15 (mg/L)

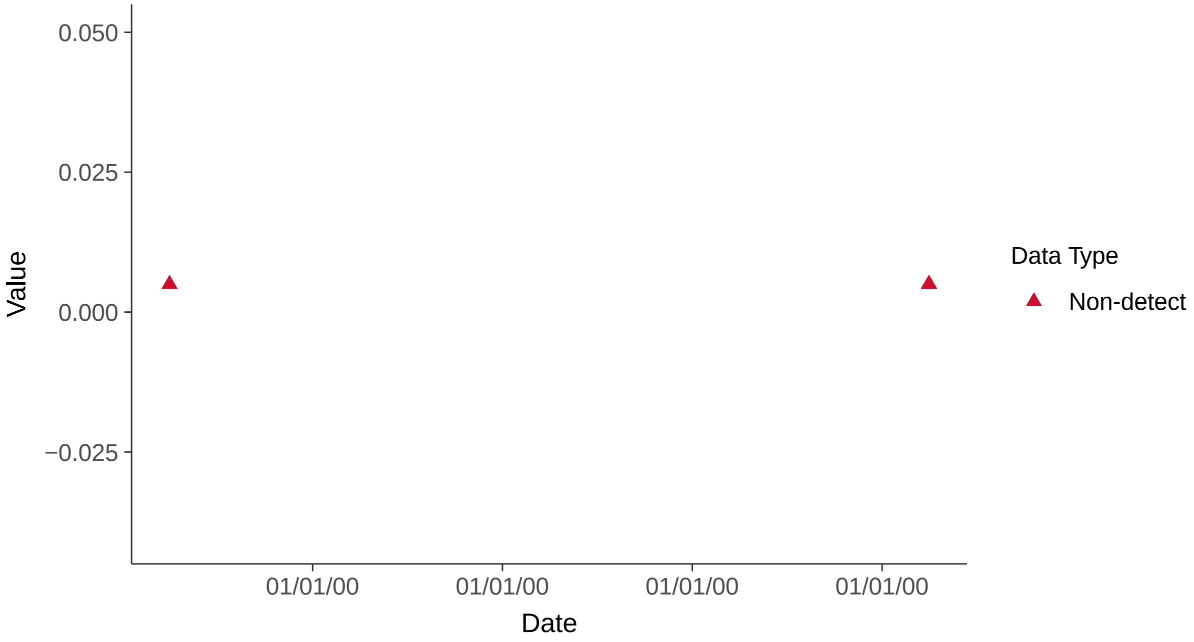


Part 115: Copper, MW-15

ID: 15_5_37

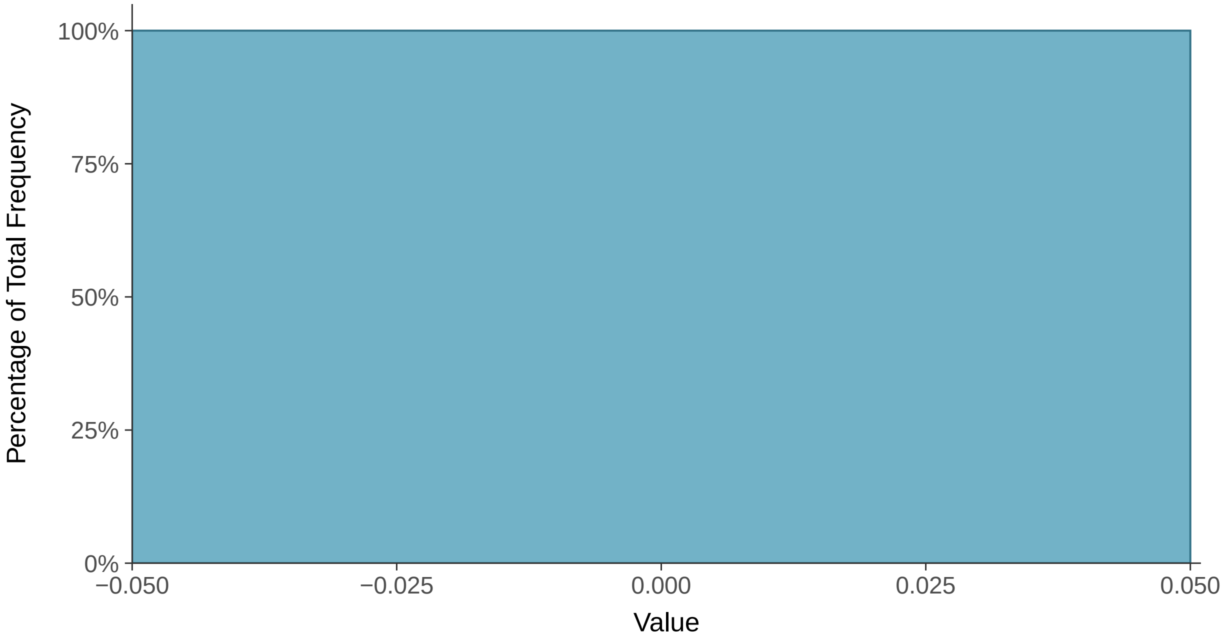
Scatter Plot

Copper, MW-15 (mg/L)



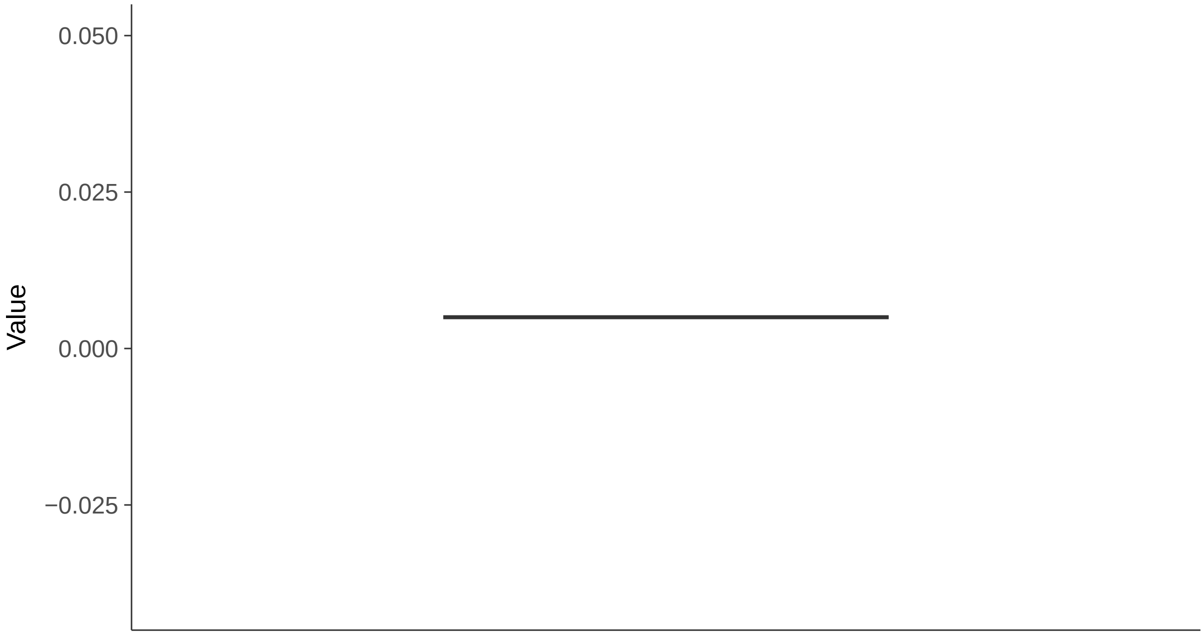
Histogram

Copper, MW-15 (mg/L)



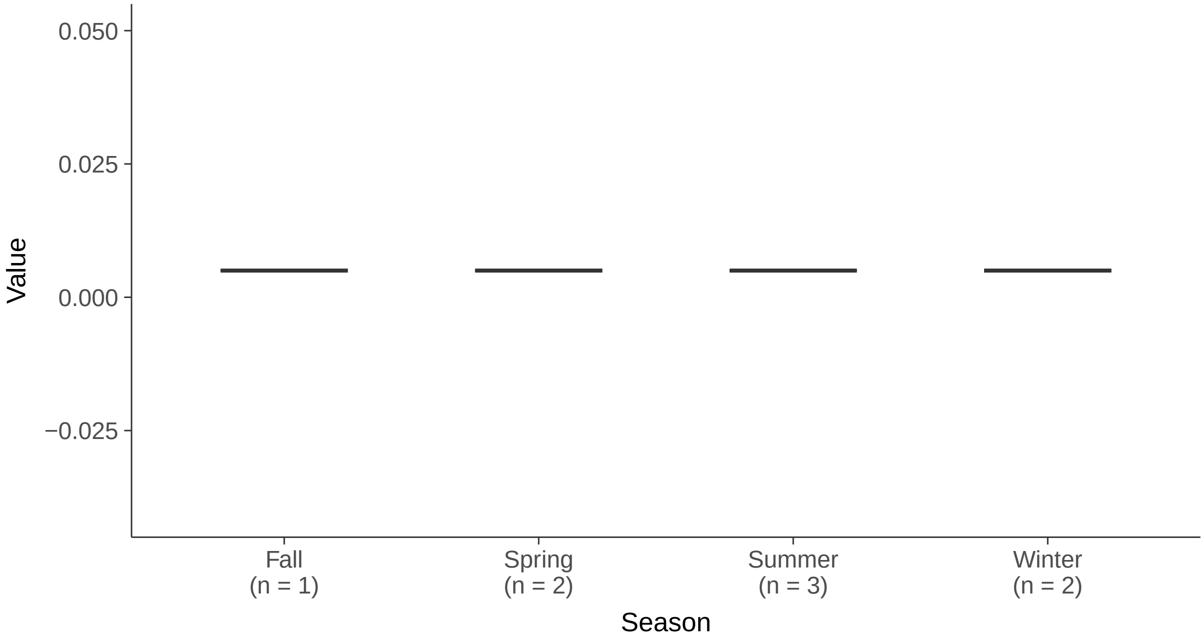
Boxplot

Copper, MW-15 (mg/L)



Boxplot by Season

Copper, MW-15 (mg/L)

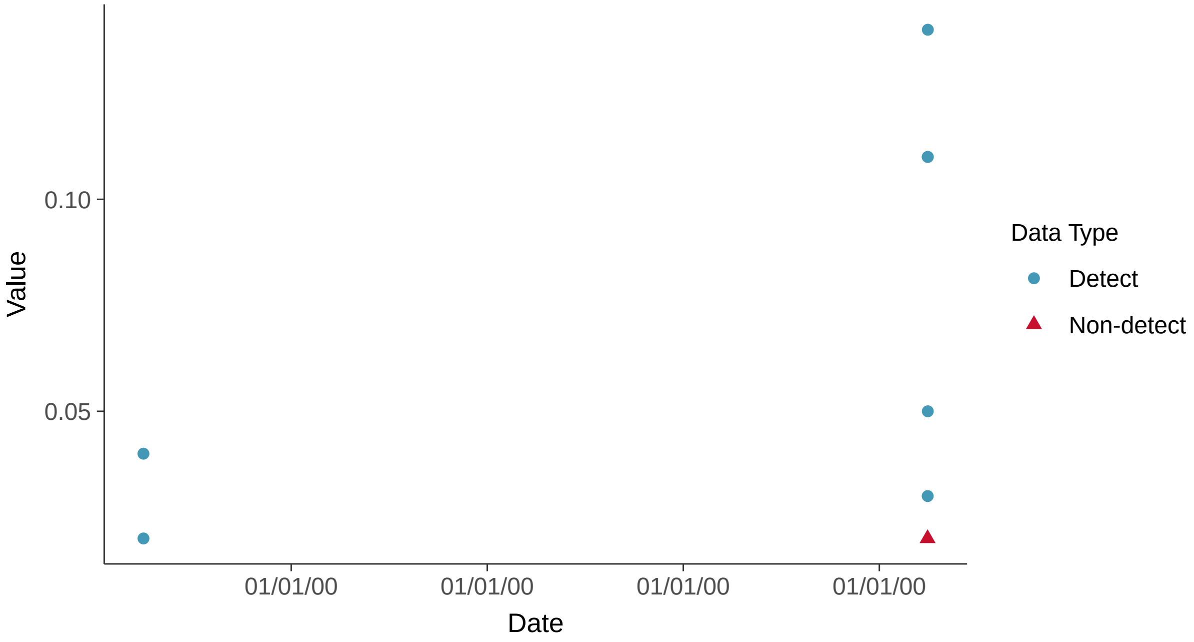


Part 115: Iron, MW-15

ID: 15_5_38

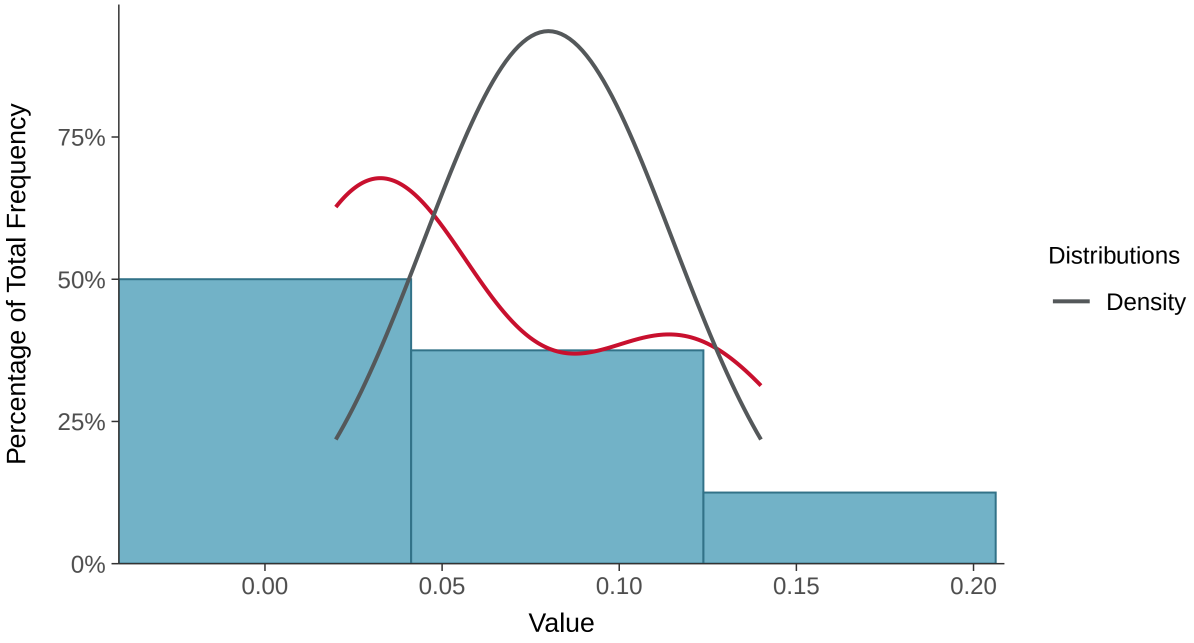
Scatter Plot

Iron, MW-15 (mg/L)



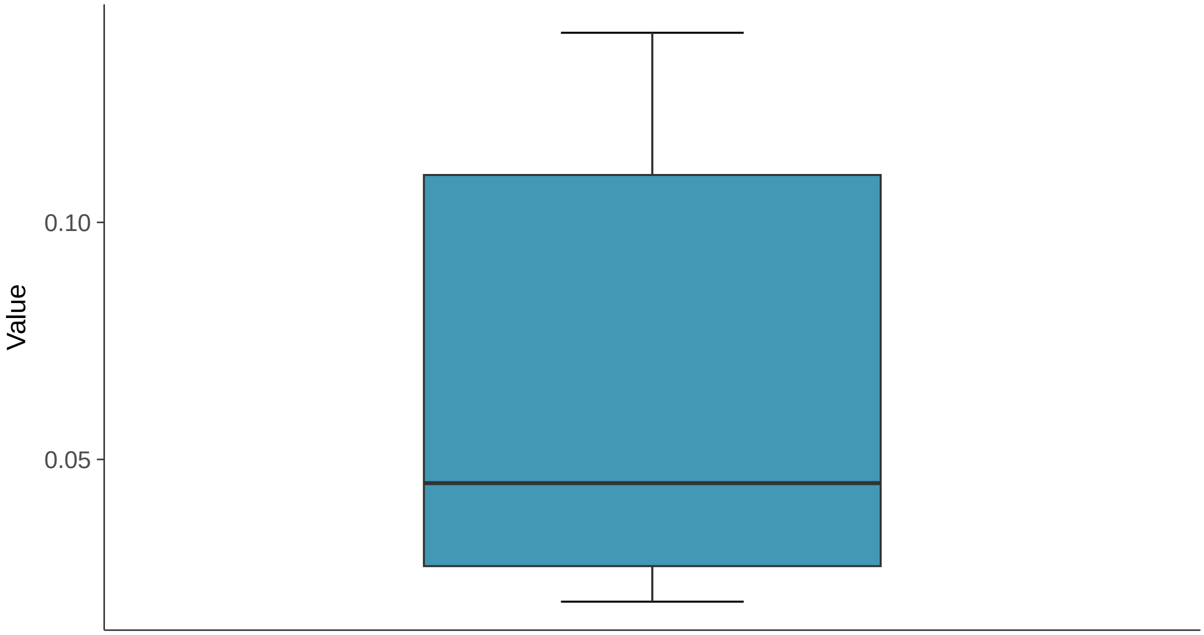
Histogram

Iron, MW-15 (mg/L)



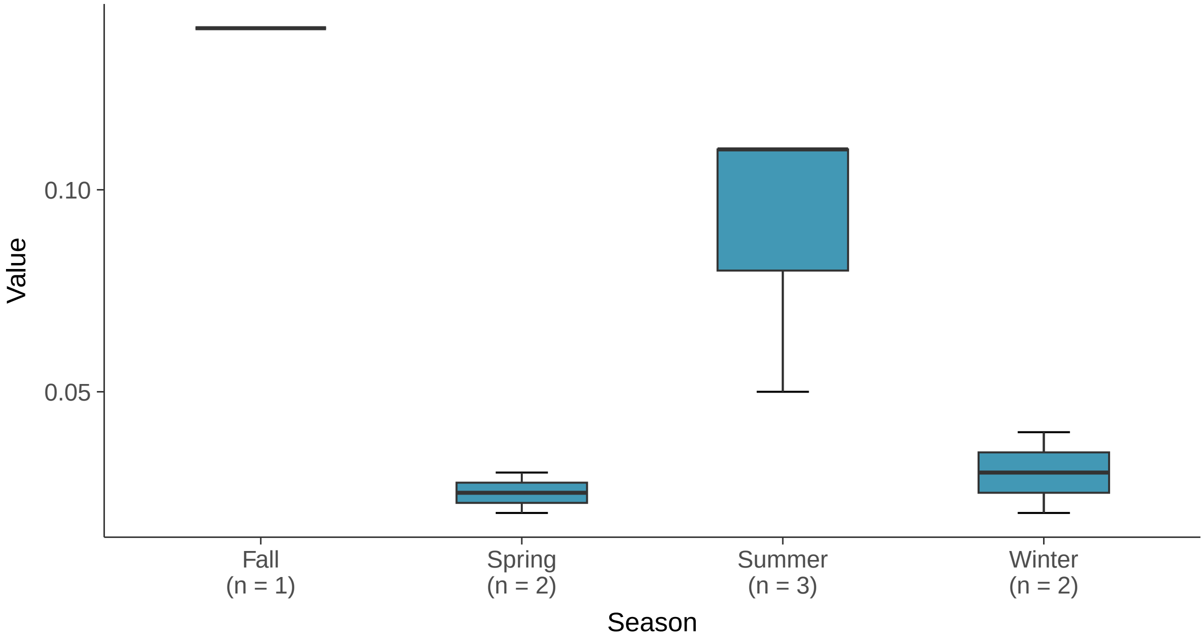
Boxplot

Iron, MW-15 (mg/L)



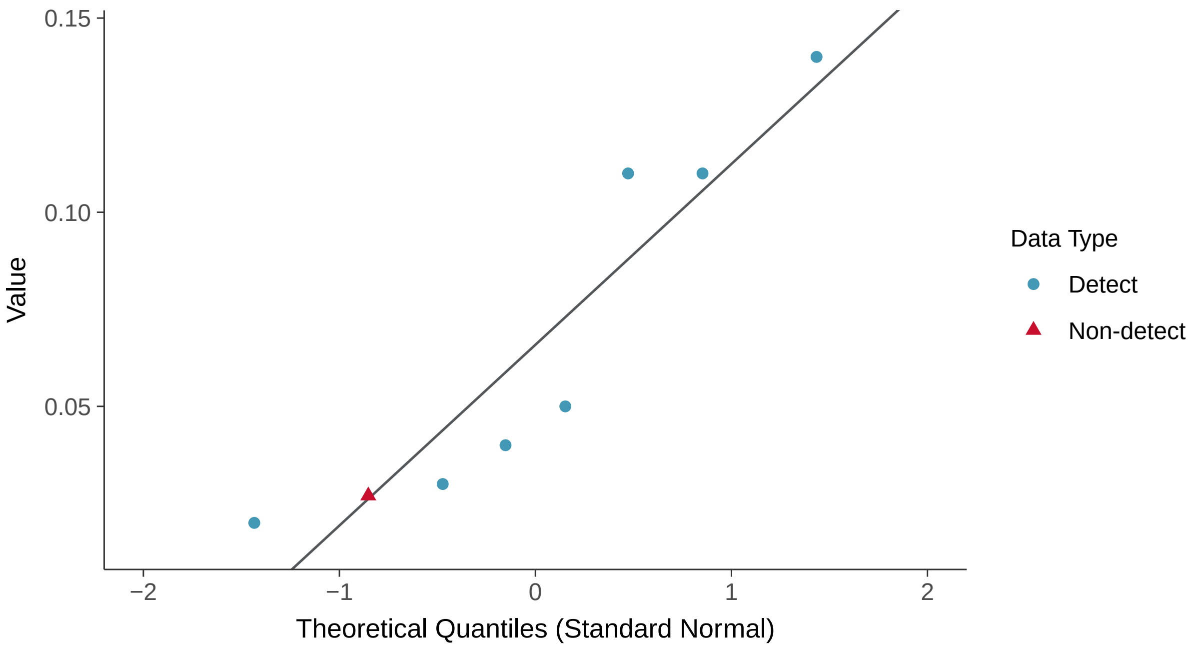
Boxplot by Season

Iron, MW-15 (mg/L)



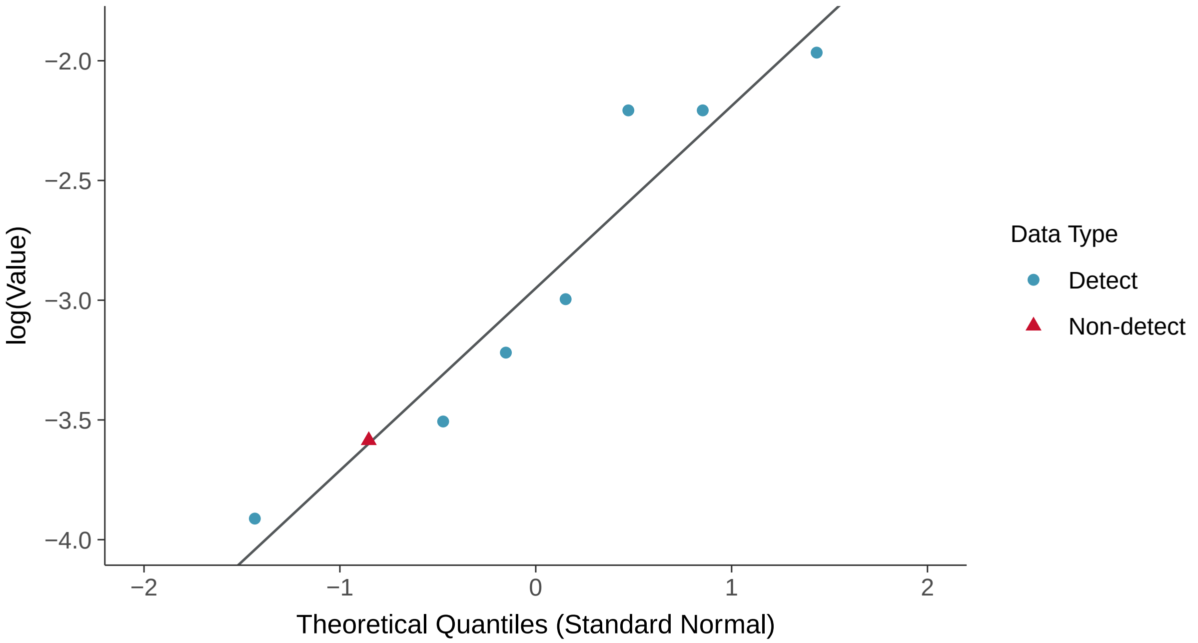
Normal Q-Q plot using ROS Imputed Estimates

Iron, MW-15 (mg/L)



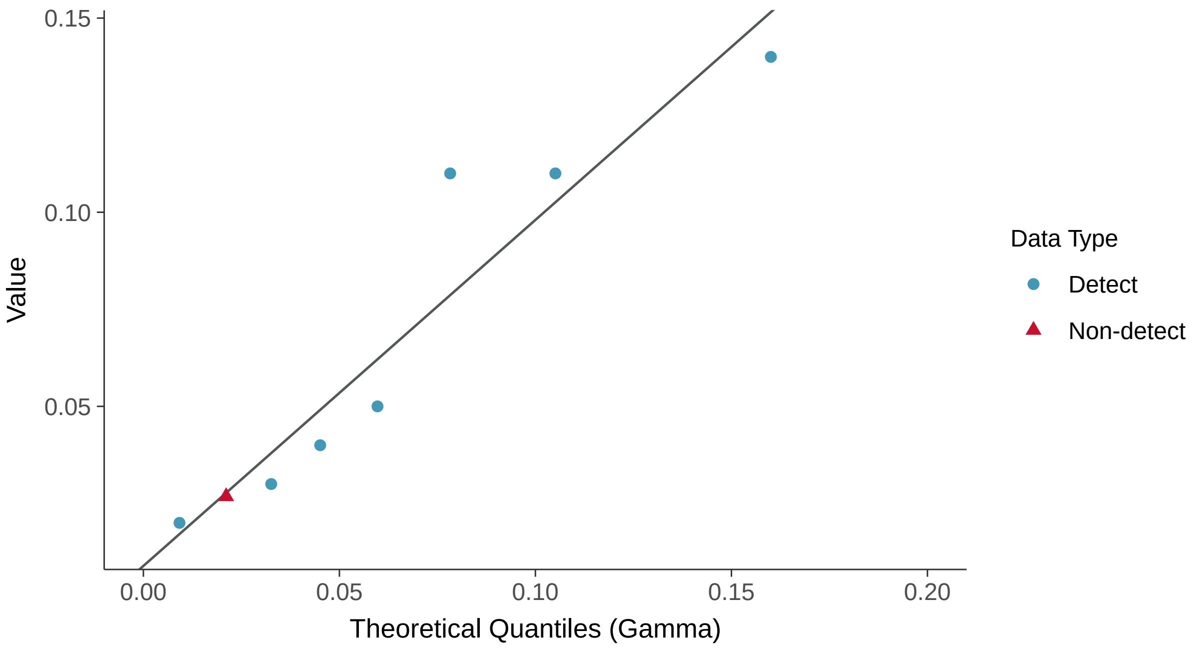
Lognormal Q-Q plot using ROS Imputed Estimates

Iron, MW-15 (mg/L)



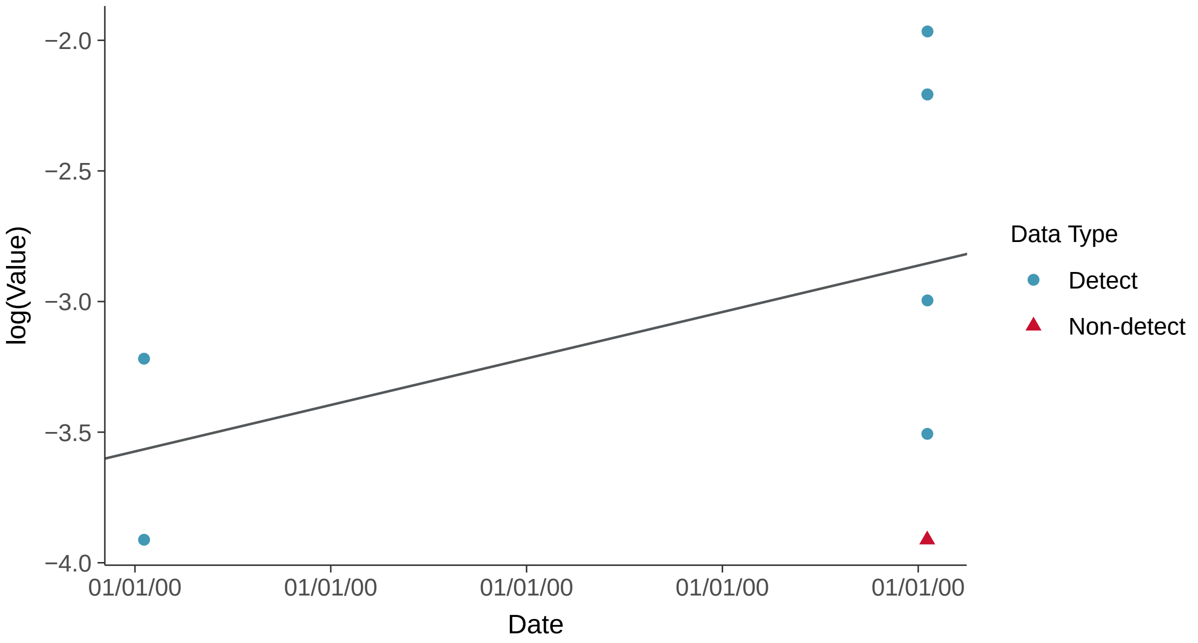
Gamma Q-Q plot using ROS Imputed Estimates

Iron, MW-15 (mg/L)



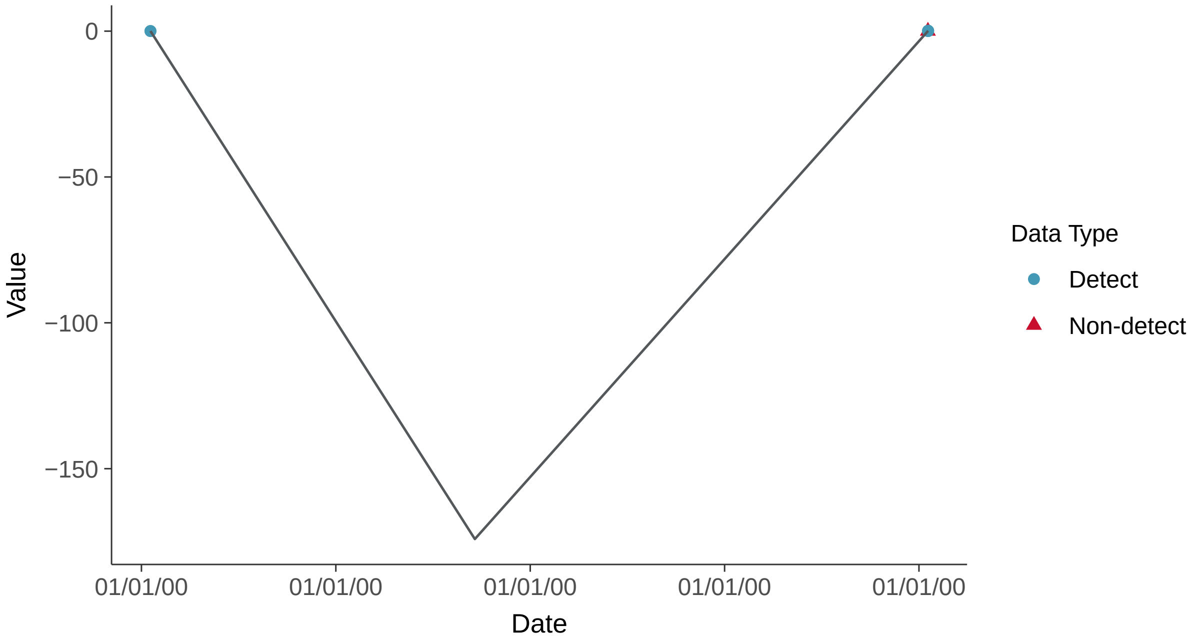
Trend Regression: Lognormal MLE

Iron, MW-15 (mg/L)



Trend Regression: Piecewise Linear-Linear

Iron, MW-15 (mg/L)

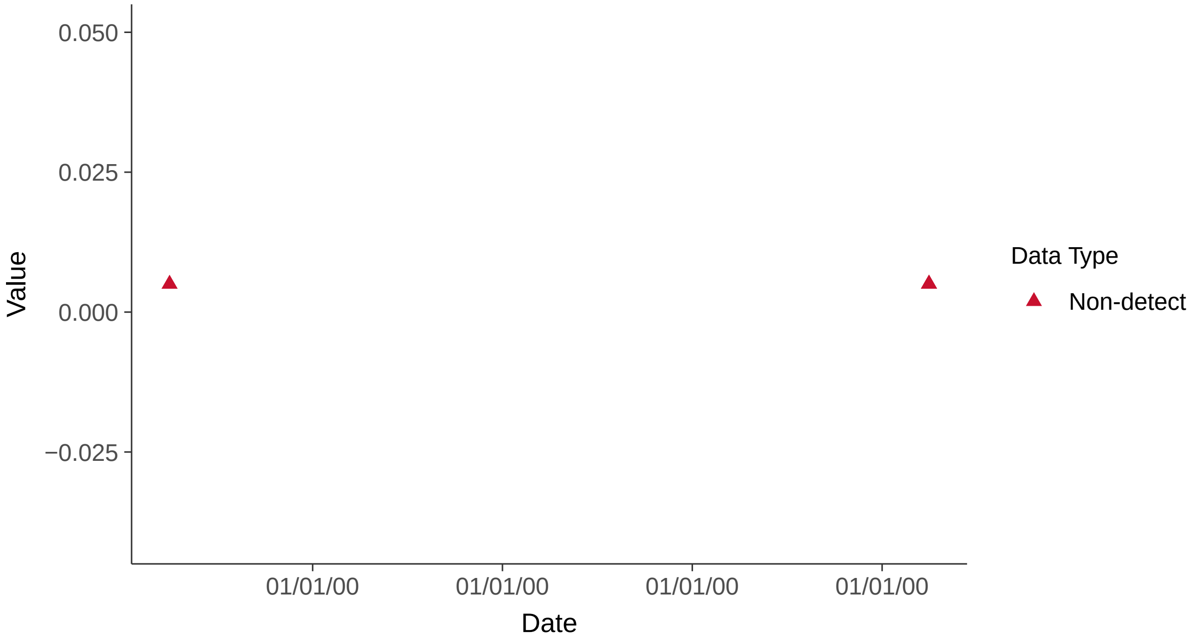


Part 115: Nickel, MW-15

ID: 15_5_39

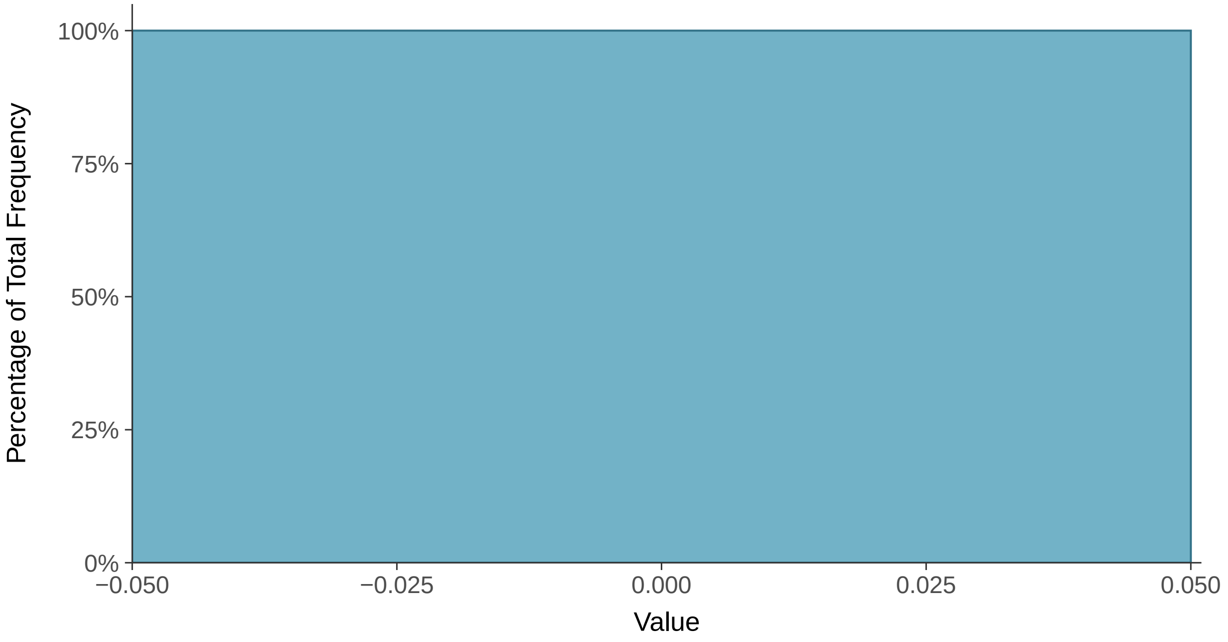
Scatter Plot

Nickel, MW-15 (mg/L)



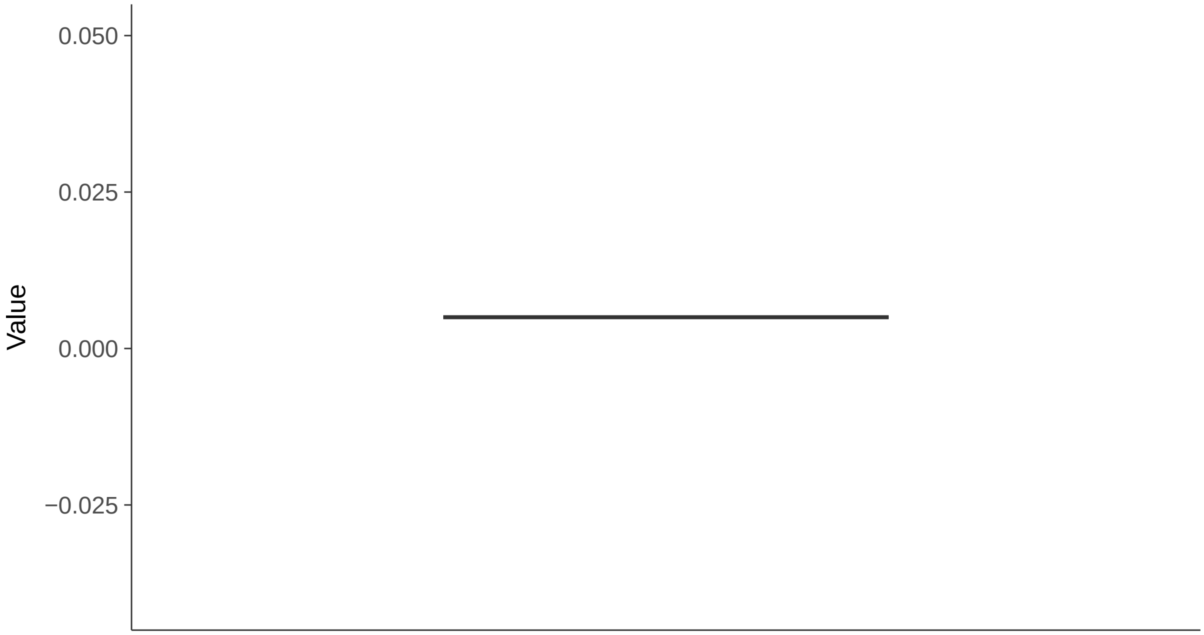
Histogram

Nickel, MW-15 (mg/L)



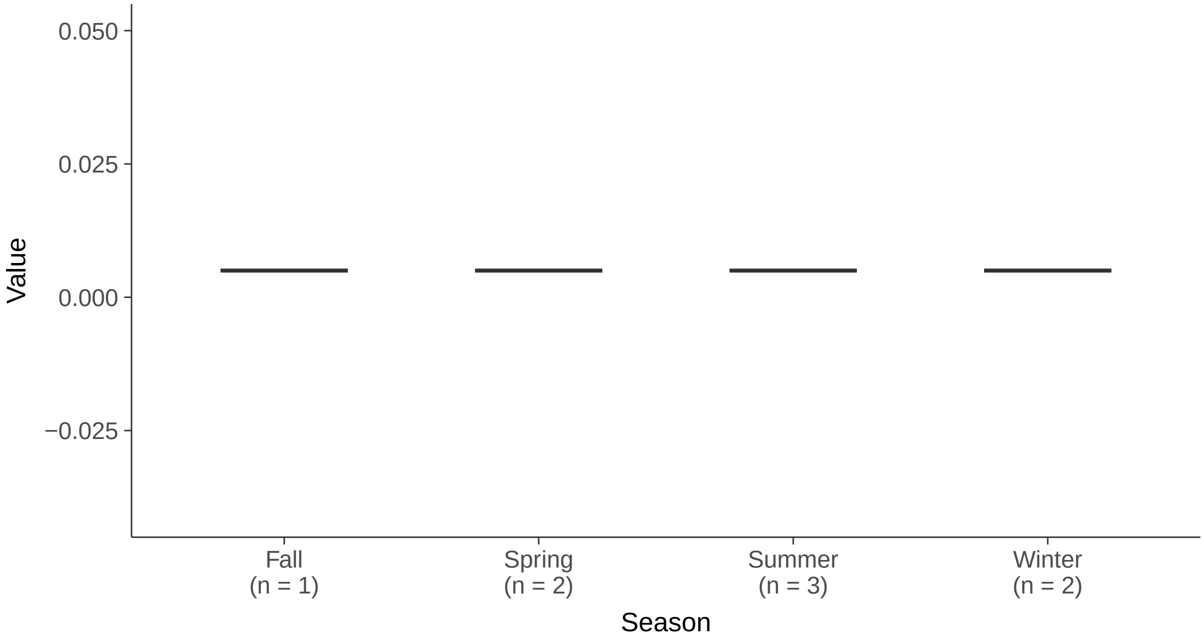
Boxplot

Nickel, MW-15 (mg/L)



Boxplot by Season

Nickel, MW-15 (mg/L)

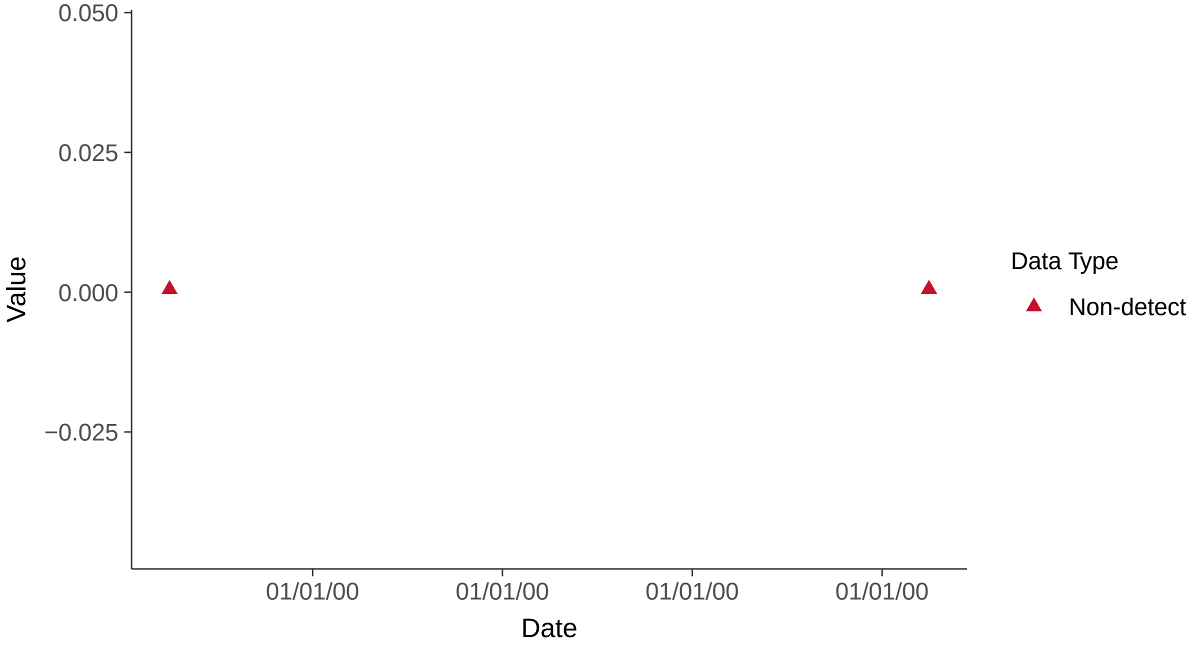


Part 115: Silver, MW-15

ID: 15_5_40

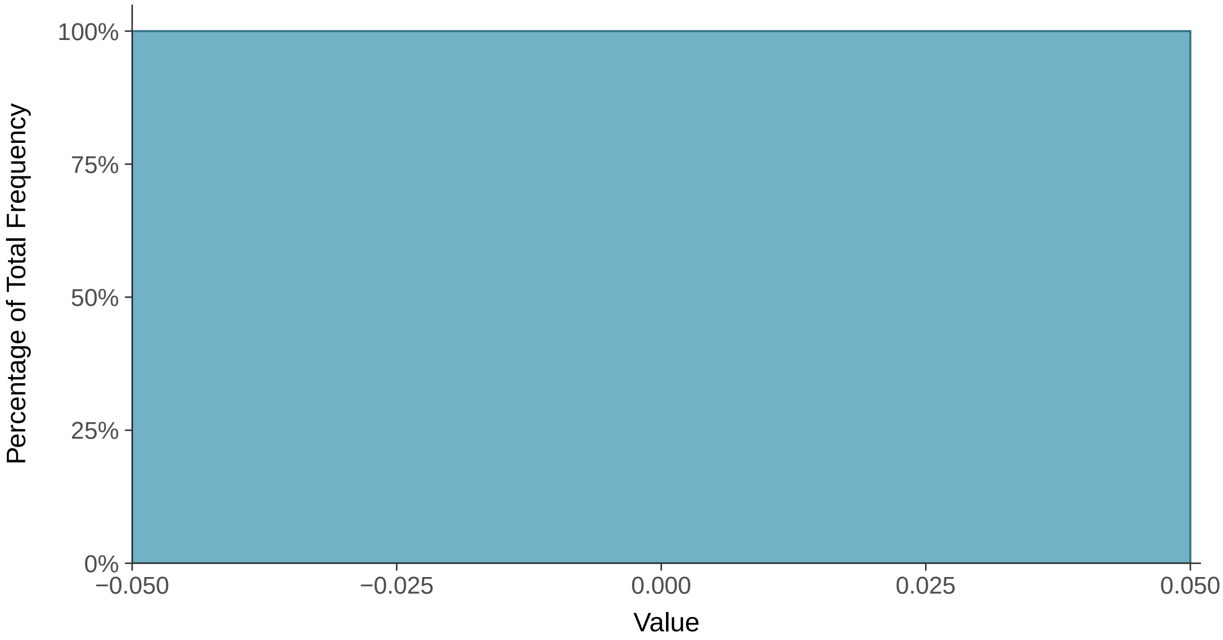
Scatter Plot

Silver, MW-15 (mg/L)



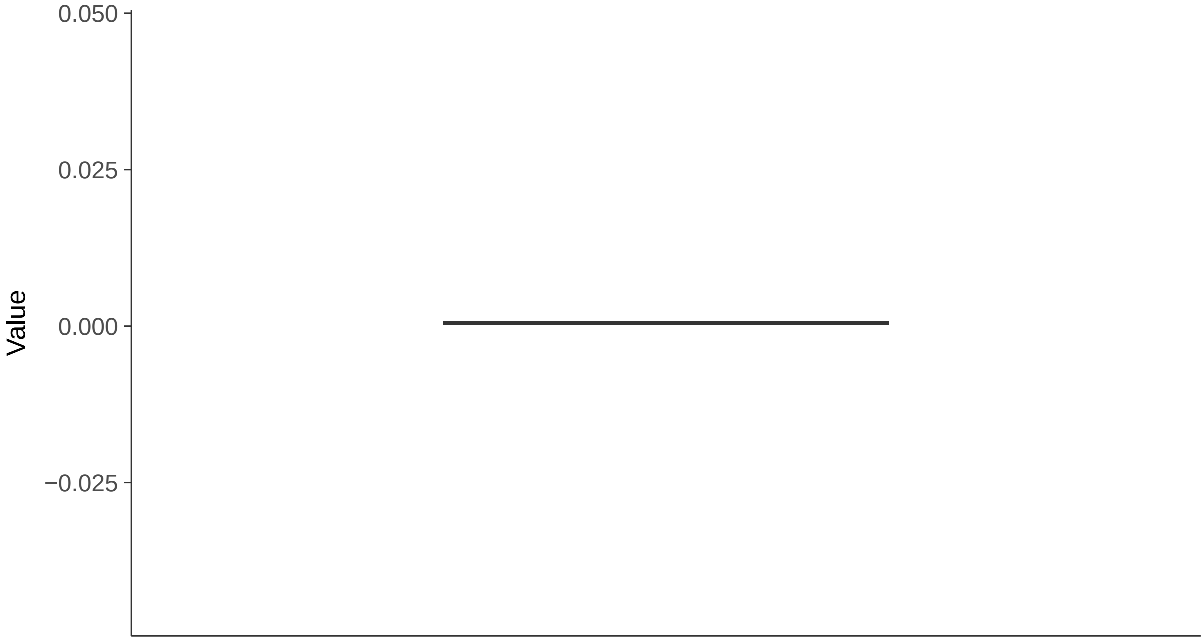
Histogram

Silver, MW-15 (mg/L)



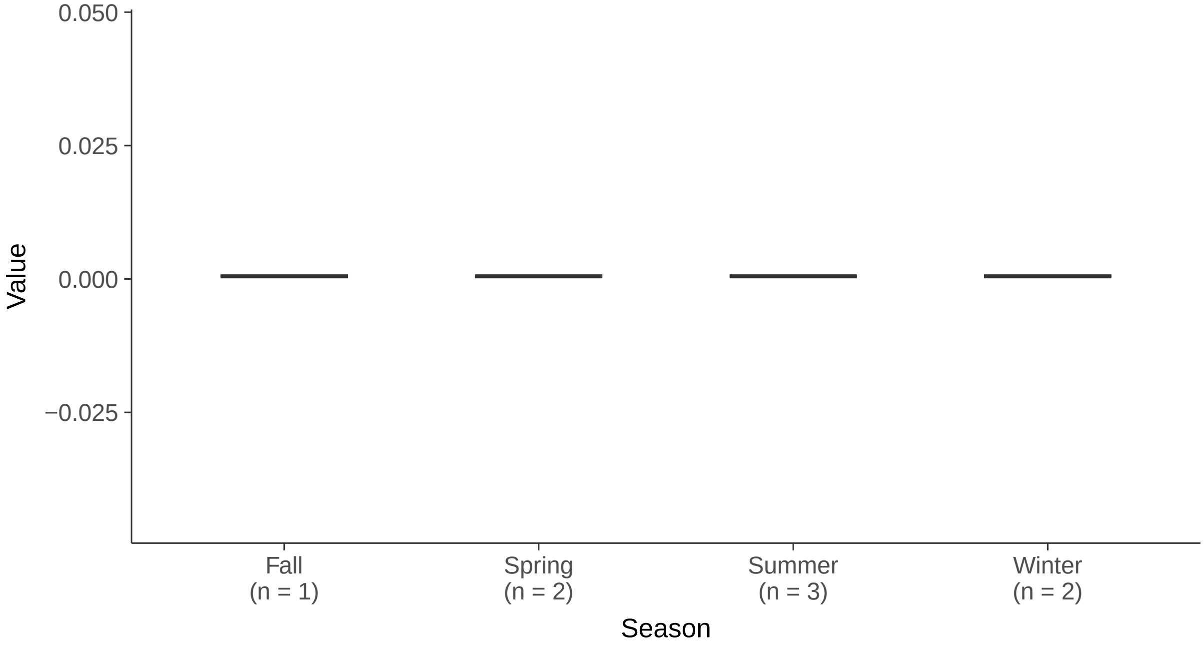
Boxplot

Silver, MW-15 (mg/L)



Boxplot by Season

Silver, MW-15 (mg/L)

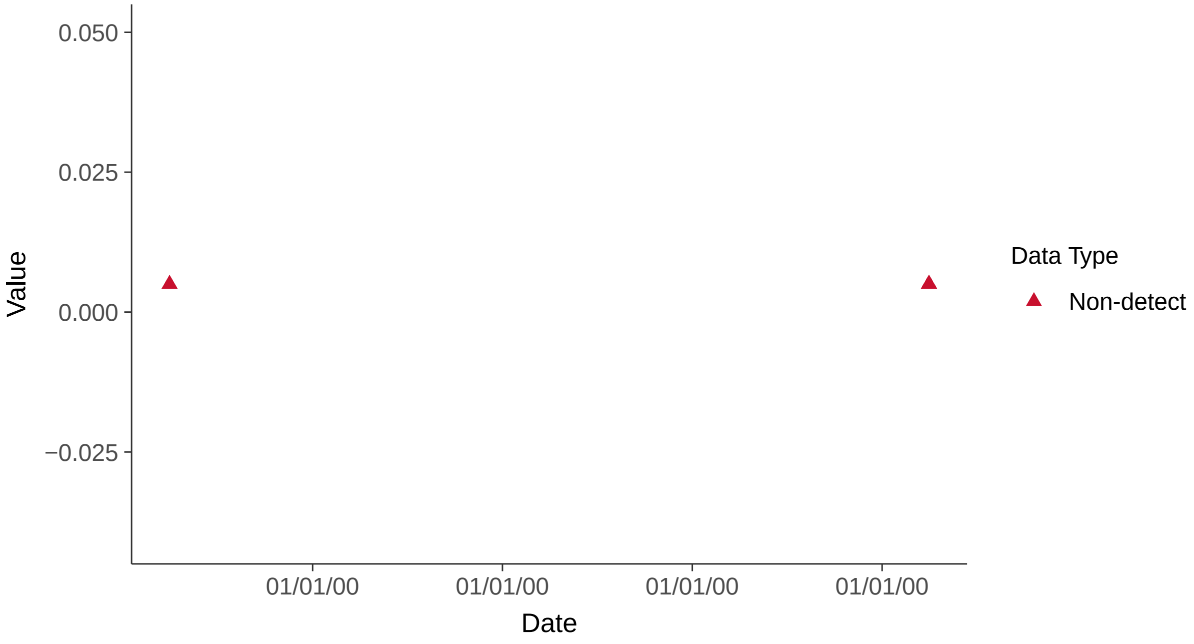


Part 115: Vanadium, MW-15

ID: 15_5_41

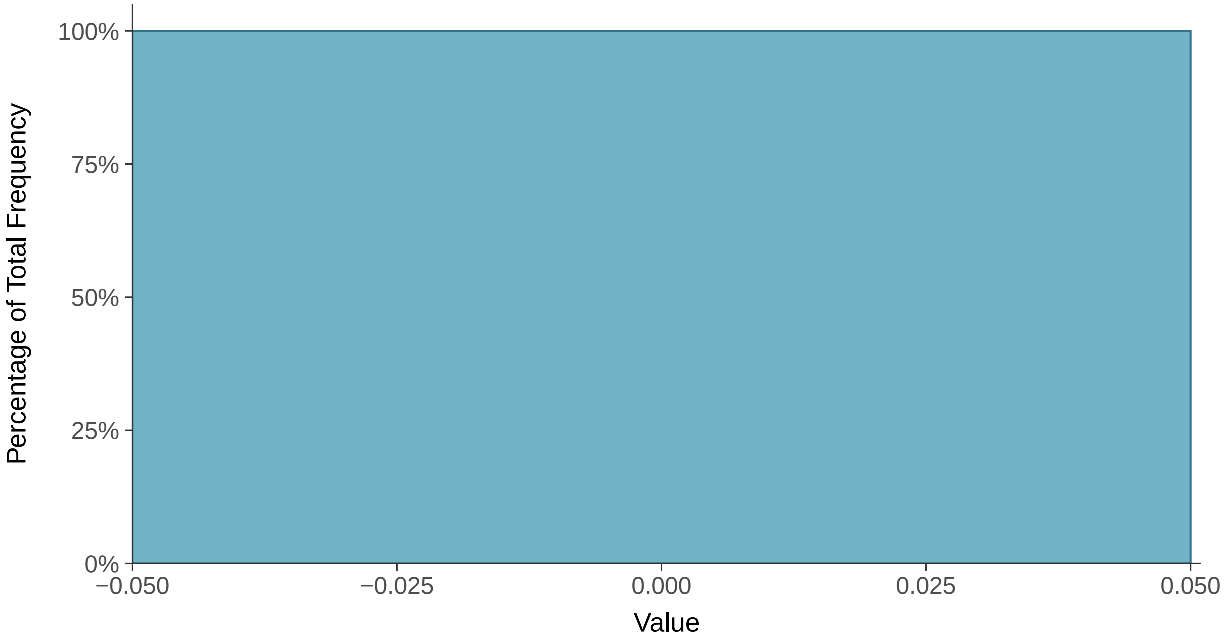
Scatter Plot

Vanadium, MW-15 (mg/L)



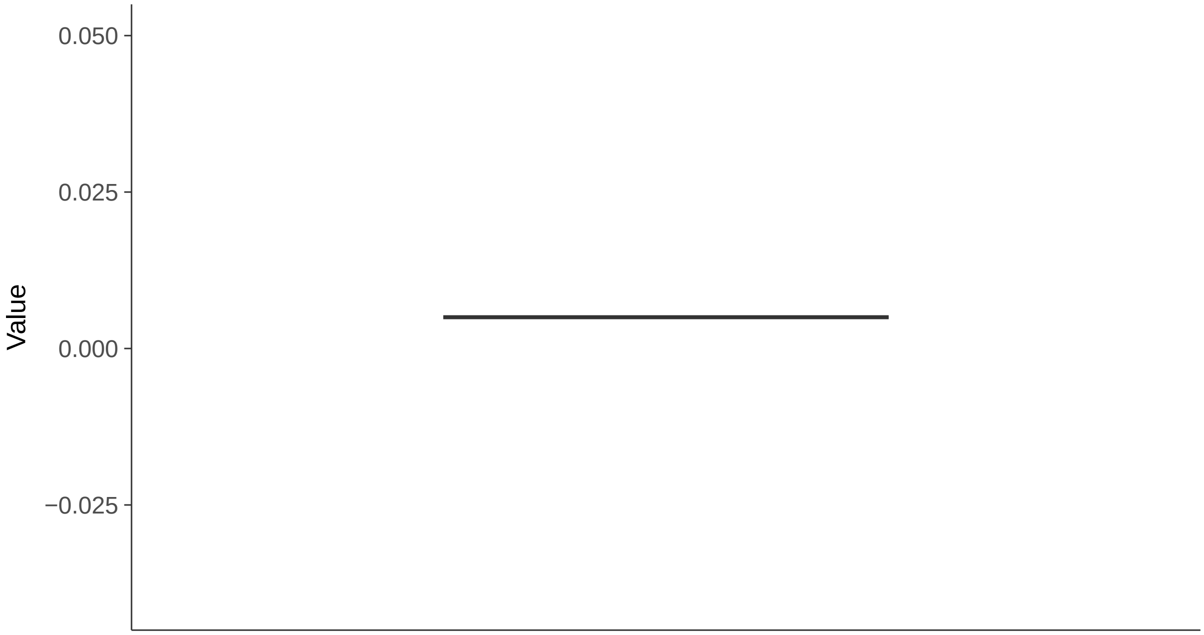
Histogram

Vanadium, MW-15 (mg/L)



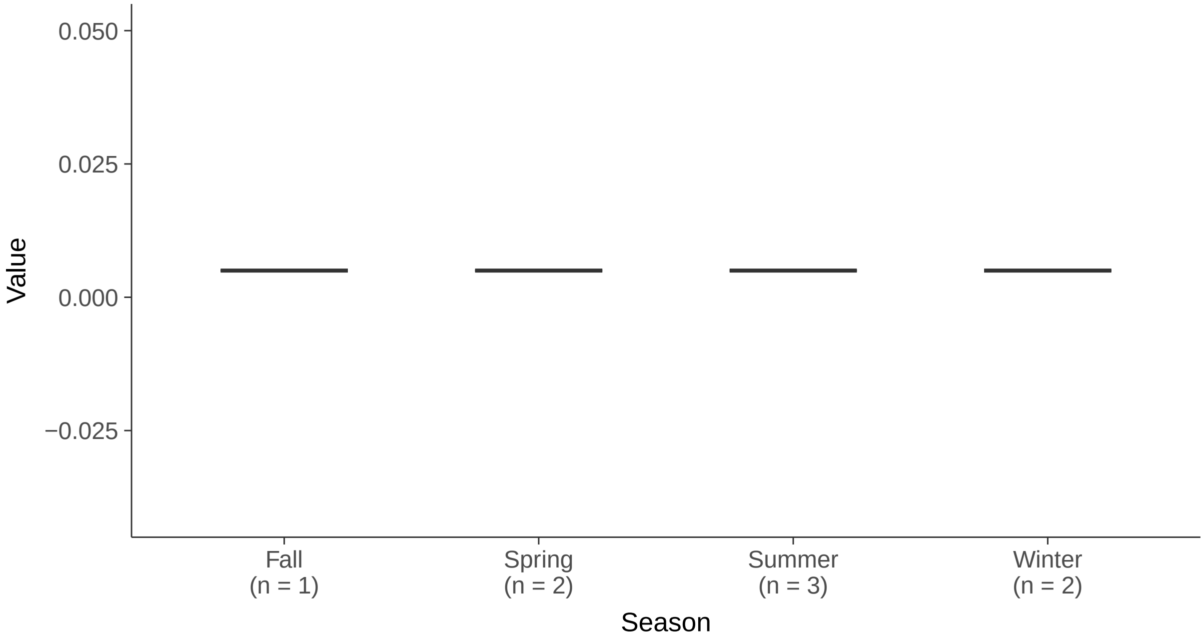
Boxplot

Vanadium, MW-15 (mg/L)



Boxplot by Season

Vanadium, MW-15 (mg/L)

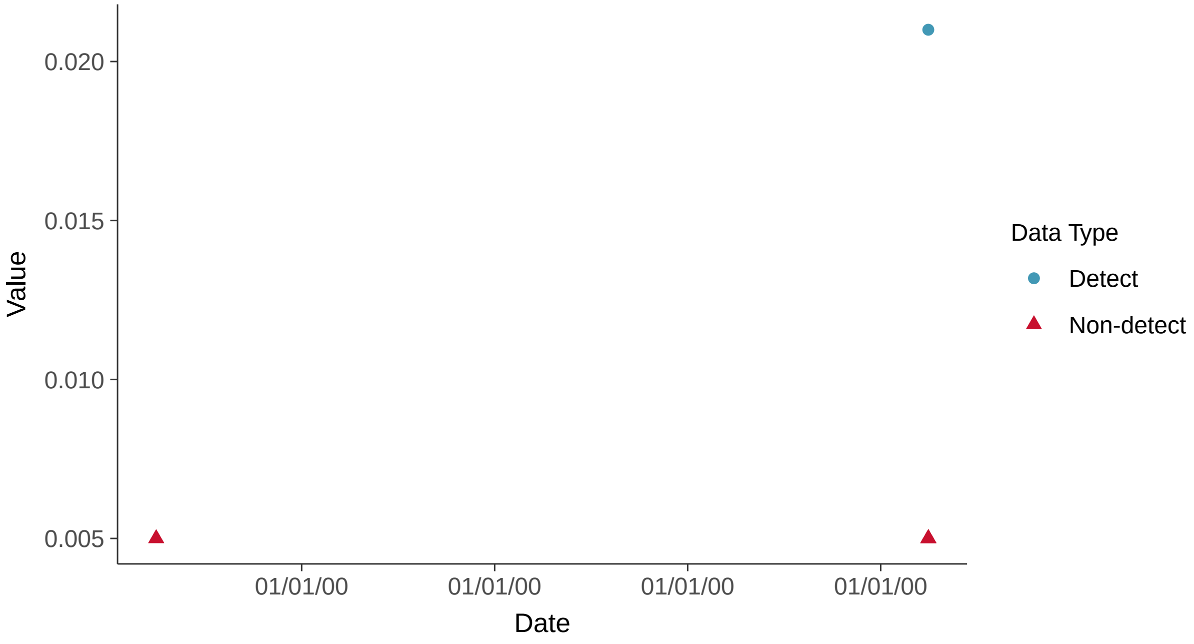


Part 115: Zinc, MW-15

ID: 15_5_42

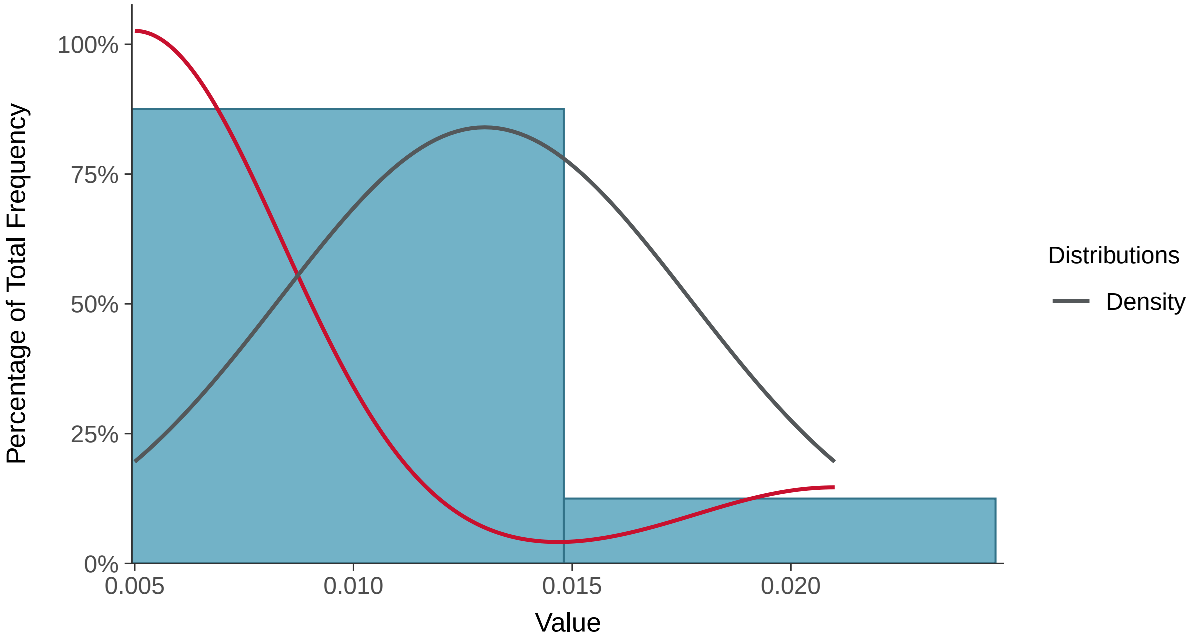
Scatter Plot

Zinc, MW-15 (mg/L)



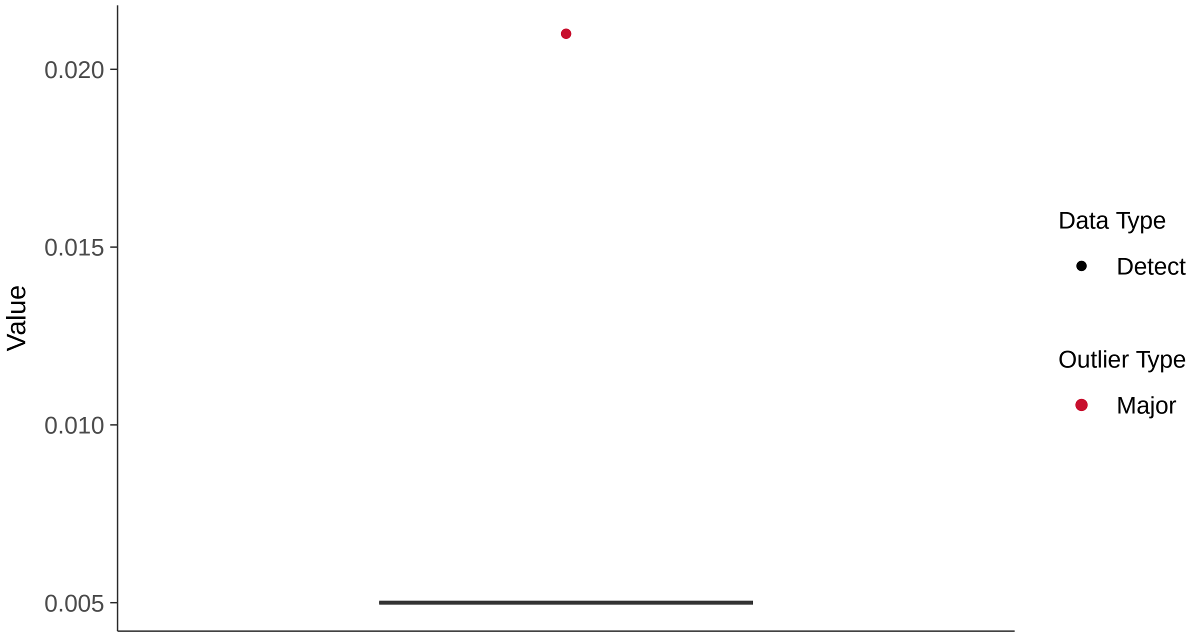
Histogram

Zinc, MW-15 (mg/L)



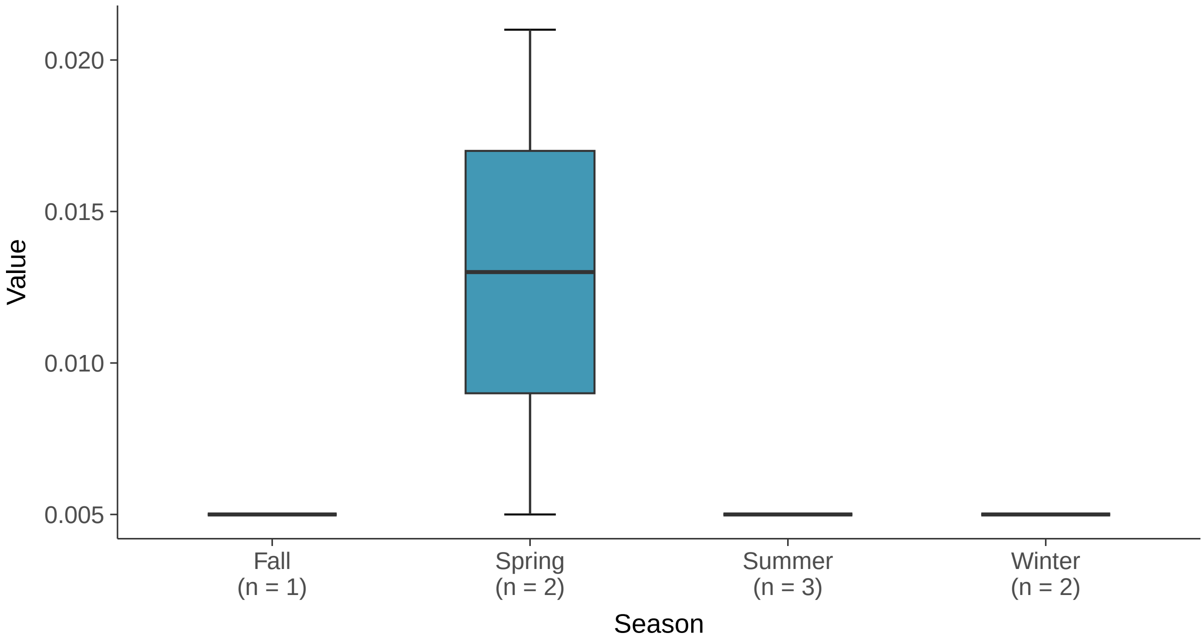
Boxplot

Zinc, MW-15 (mg/L)



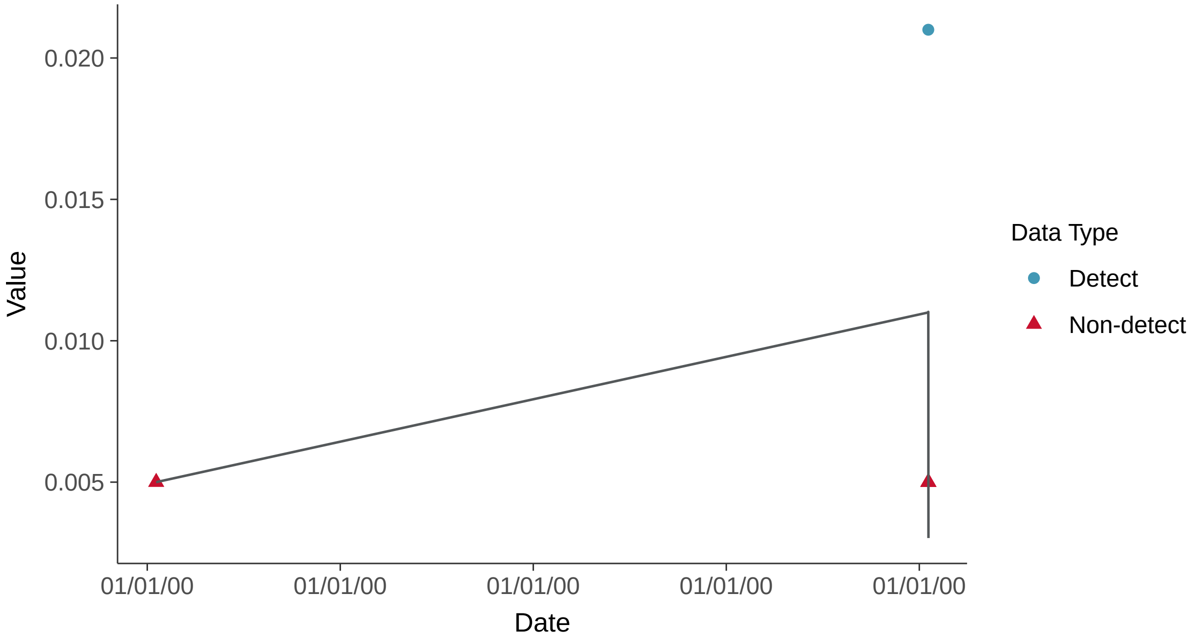
Boxplot by Season

Zinc, MW-15 (mg/L)



Trend Regression: Piecewise Linear-Linear

Zinc, MW-15 (mg/L)

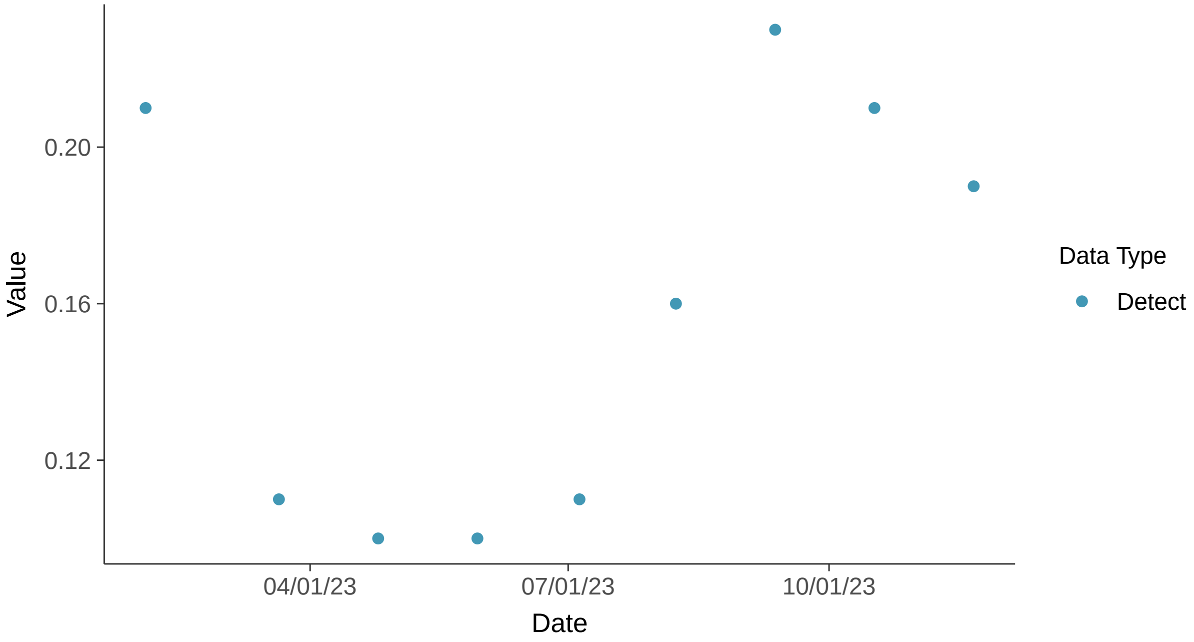


Appendix III: Boron, MW-16A

ID: 16A_1_01

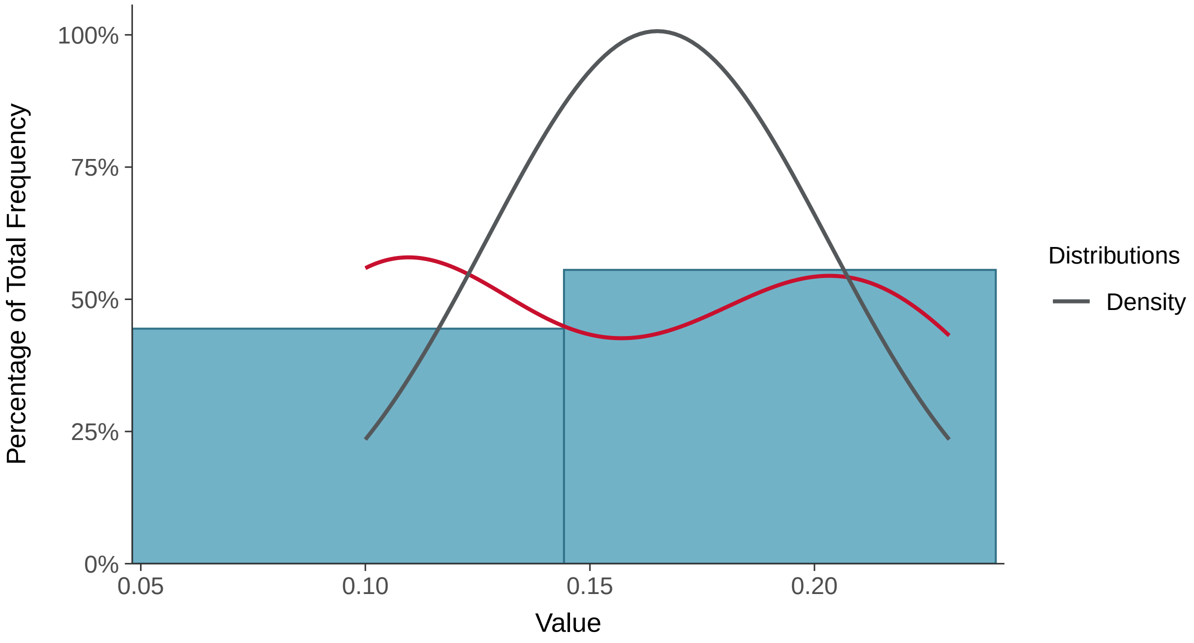
Scatter Plot

Boron, MW-16A (mg/L)



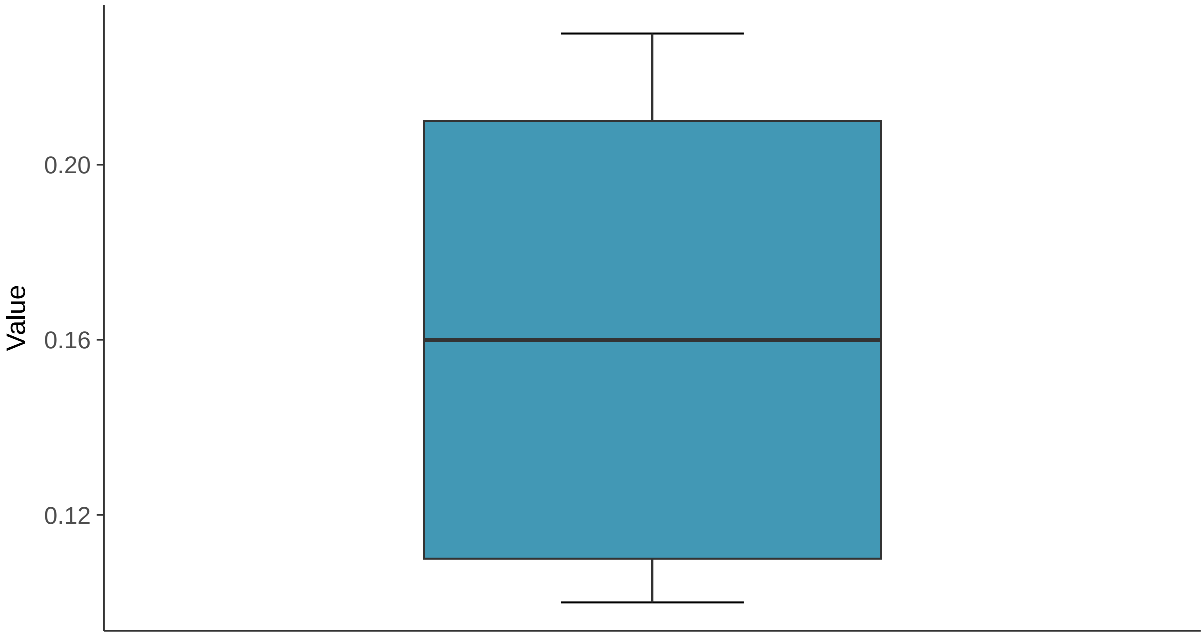
Histogram

Boron, MW-16A (mg/L)



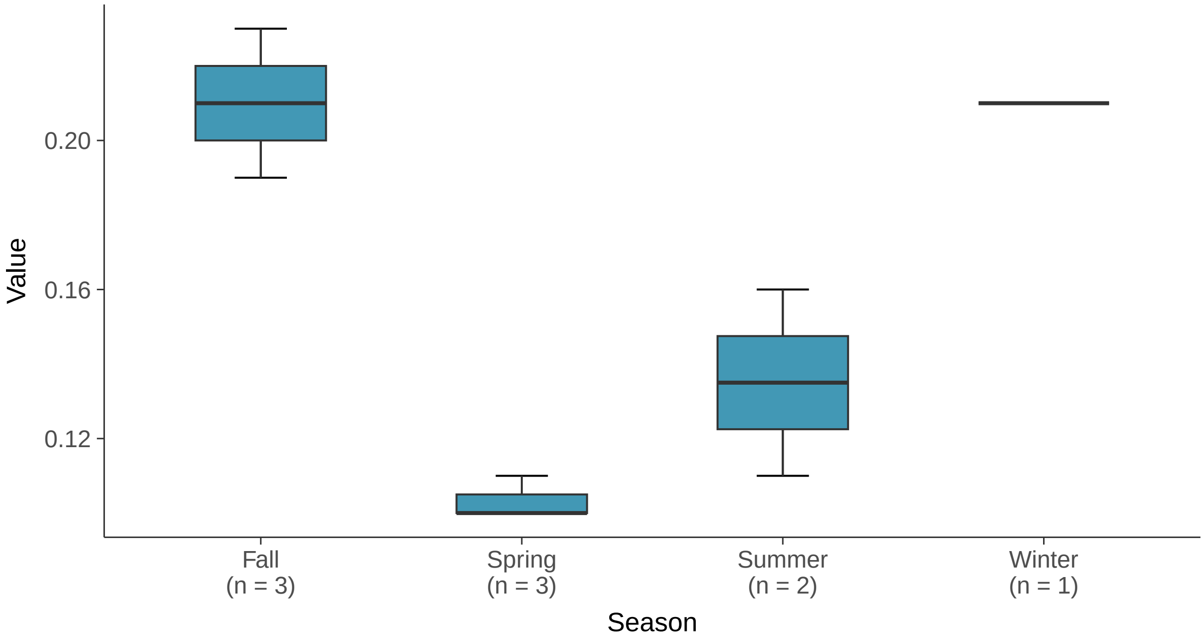
Boxplot

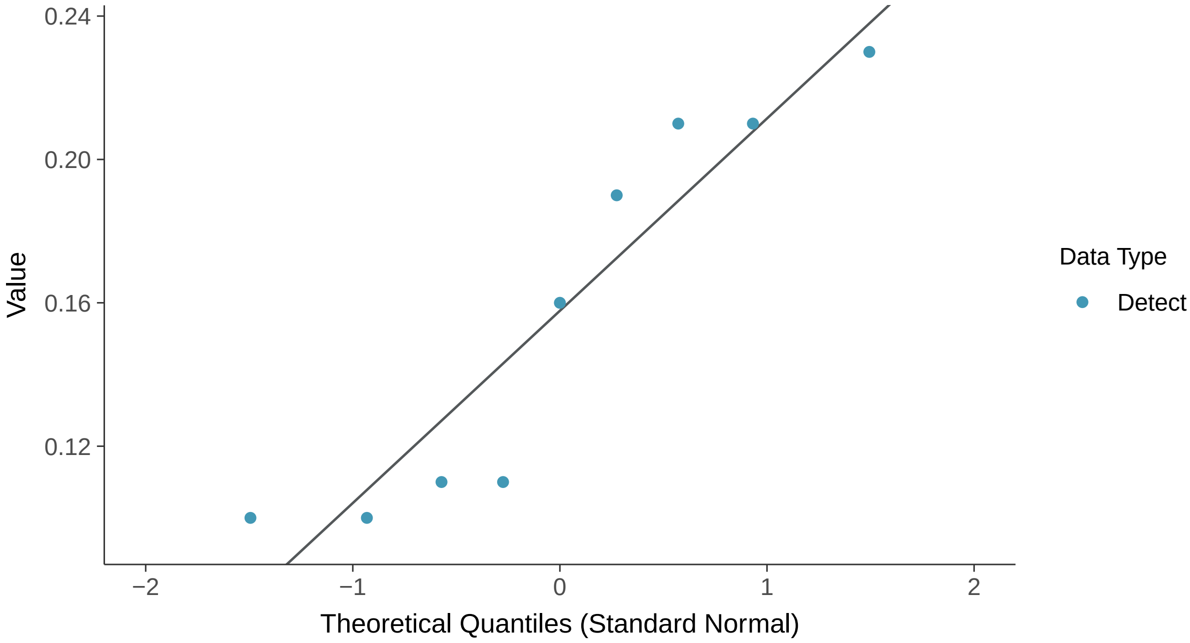
Boron, MW-16A (mg/L)



Boxplot by Season

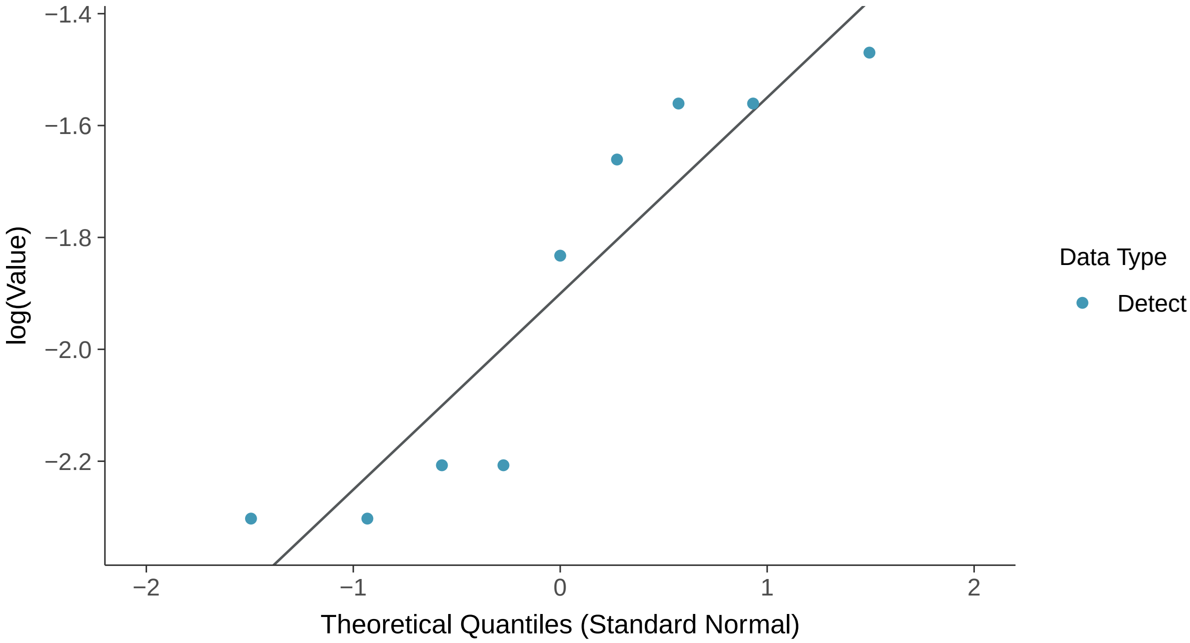
Boron, MW-16A (mg/L)





Normal Q-Q plot

Boron, MW-16A (mg/L)

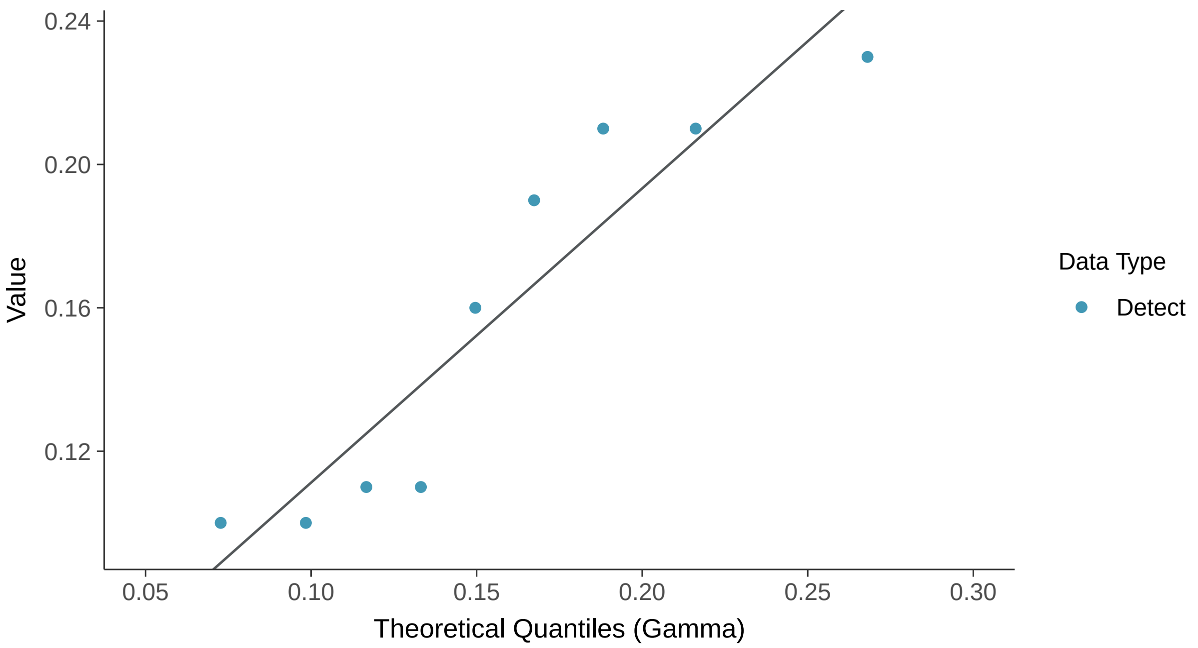


Lognormal Q-Q plot

Boron, MW-16A (mg/L)

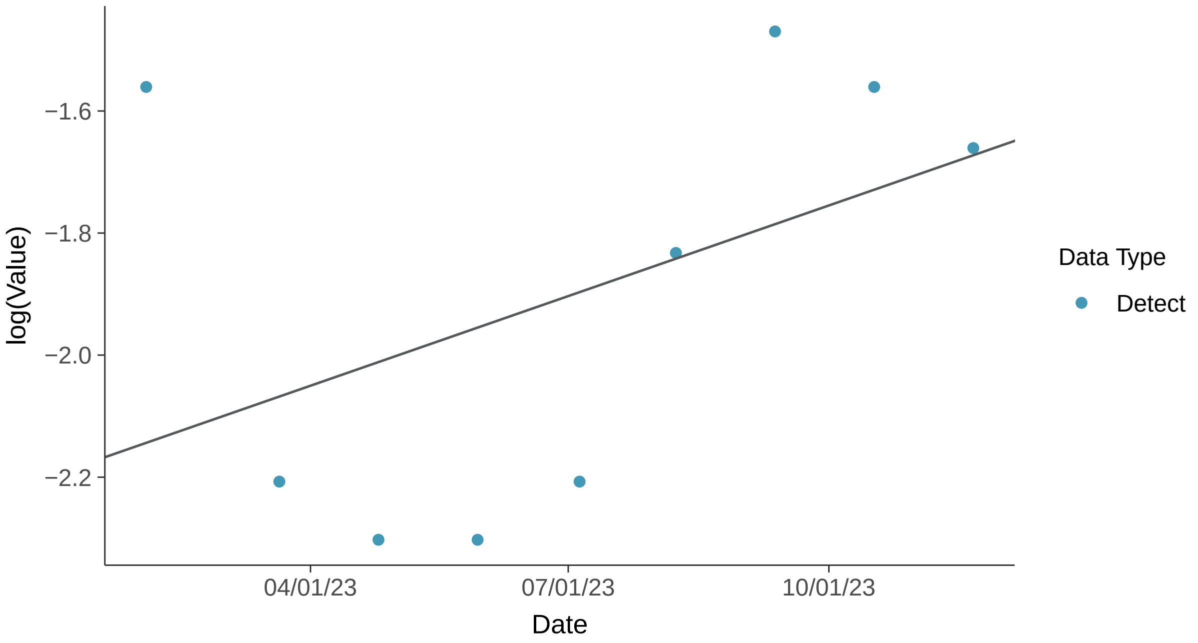
Gamma Q-Q plot

Boron, MW-16A (mg/L)



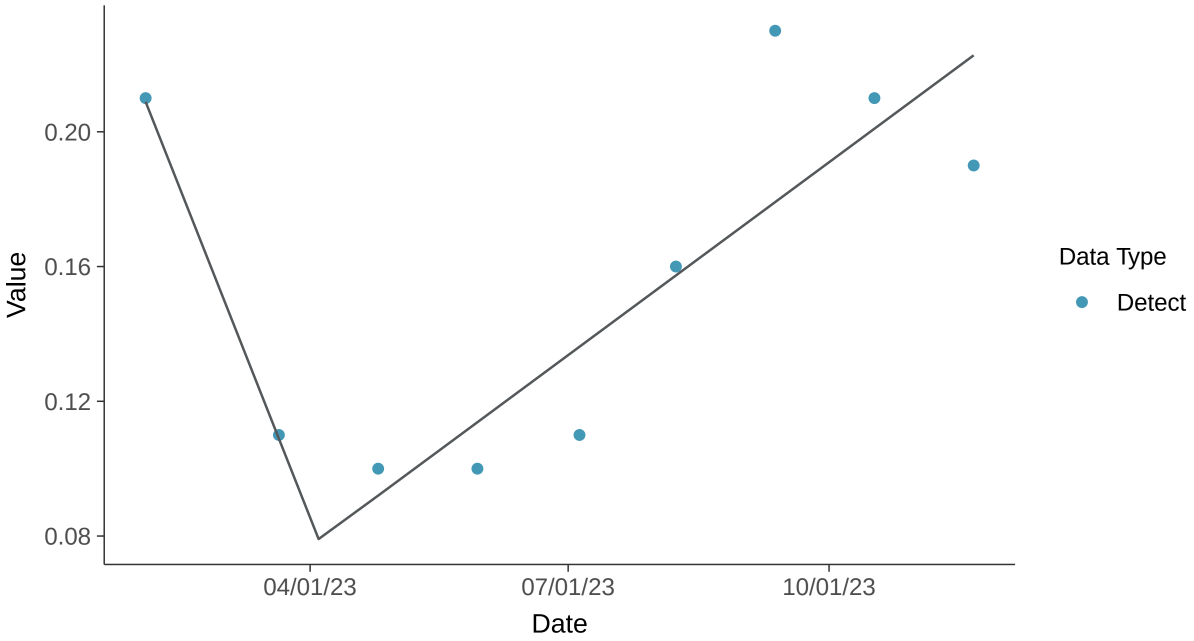
Trend Regression: Lognormal MLE

Boron, MW-16A (mg/L)



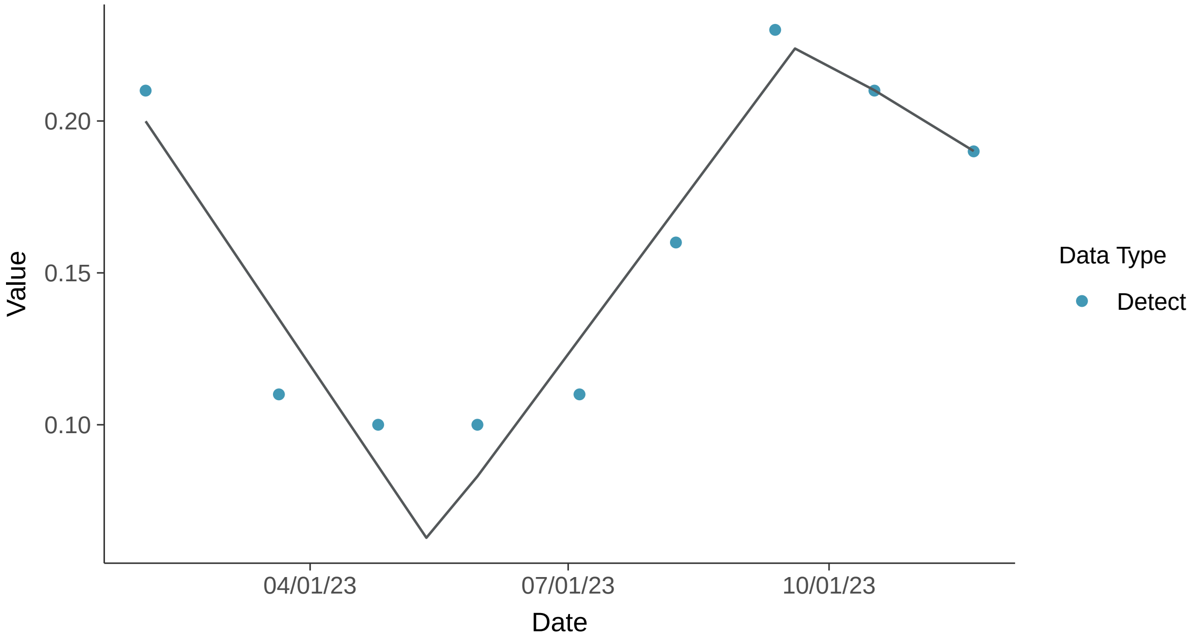
Trend Regression: Piecewise Linear-Linear

Boron, MW-16A (mg/L)



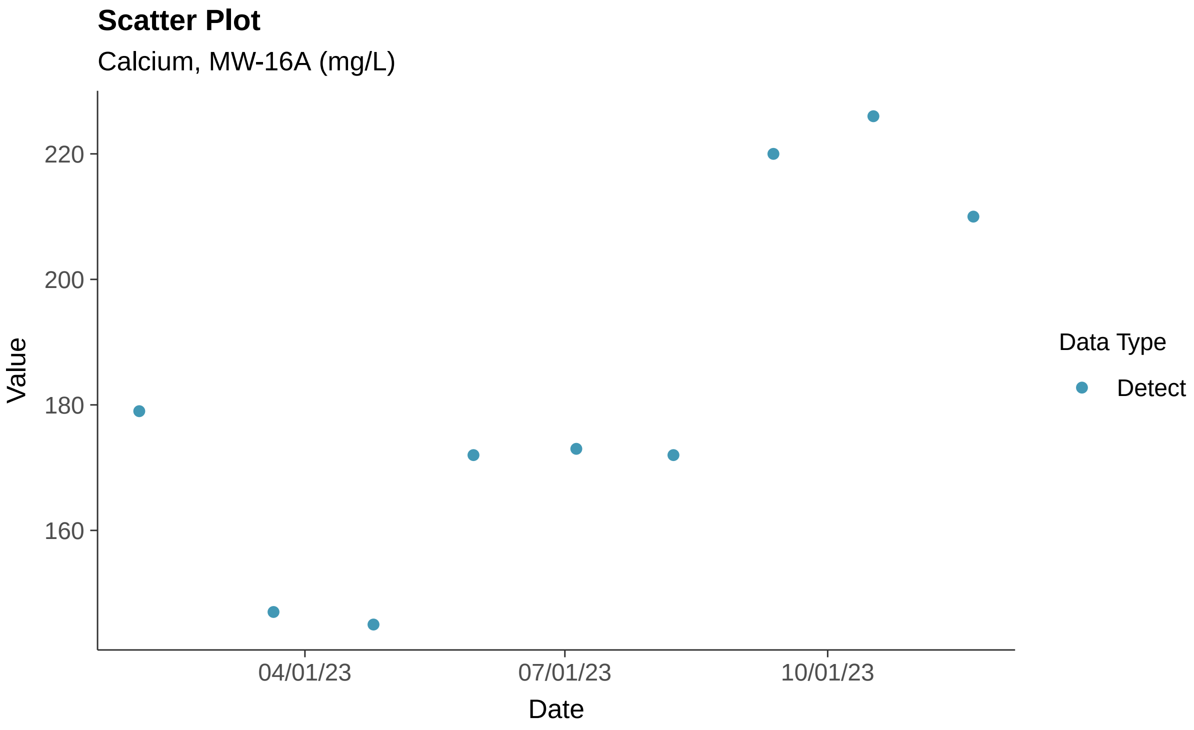
Trend Regression: Piecewise Linear-Linear-Linear

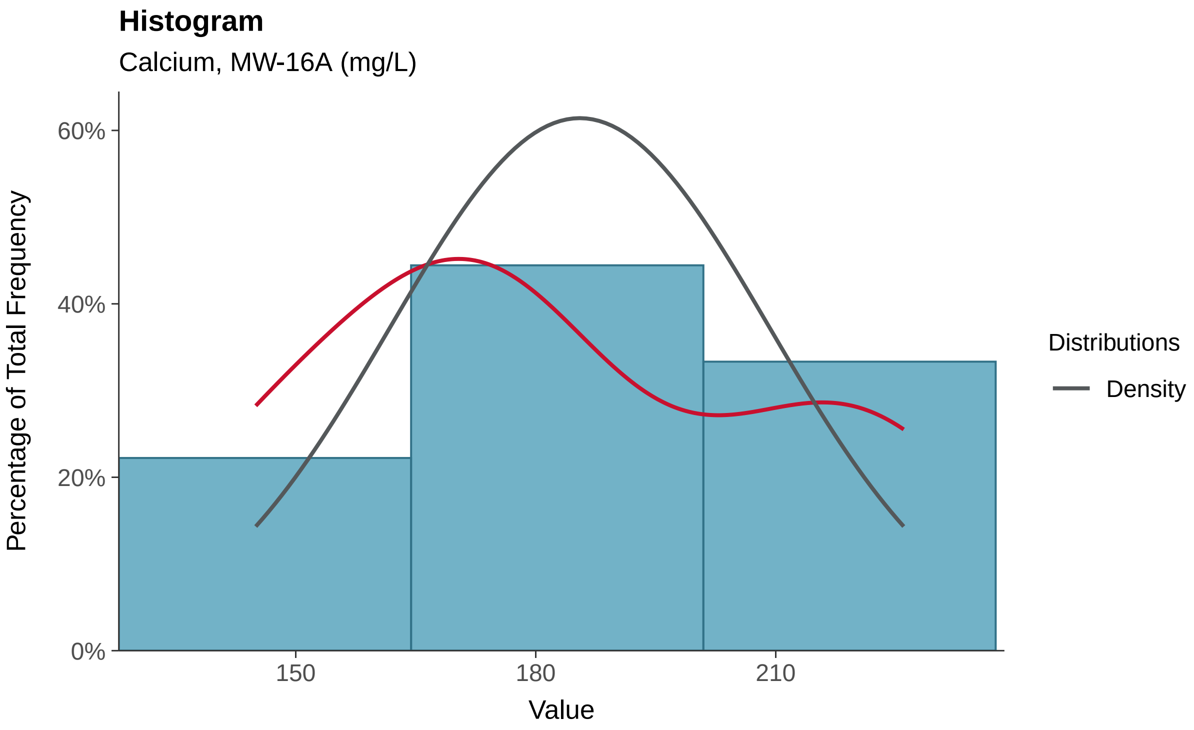
Boron, MW-16A (mg/L)



Appendix III: Calcium, MW-16A

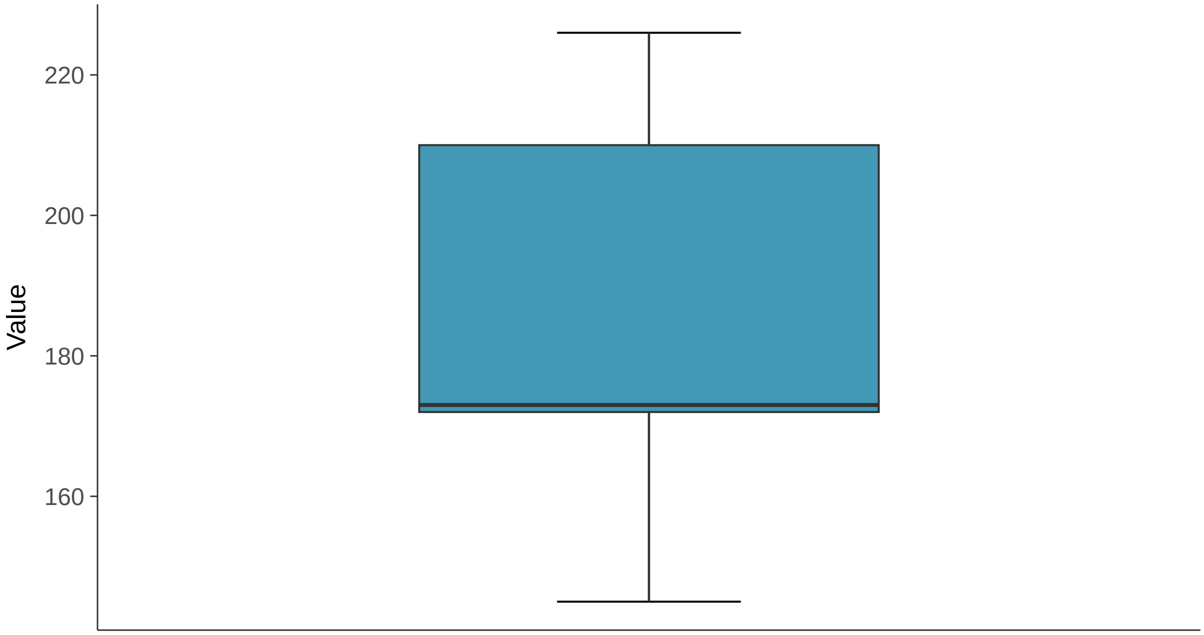
ID: 16A_1_02





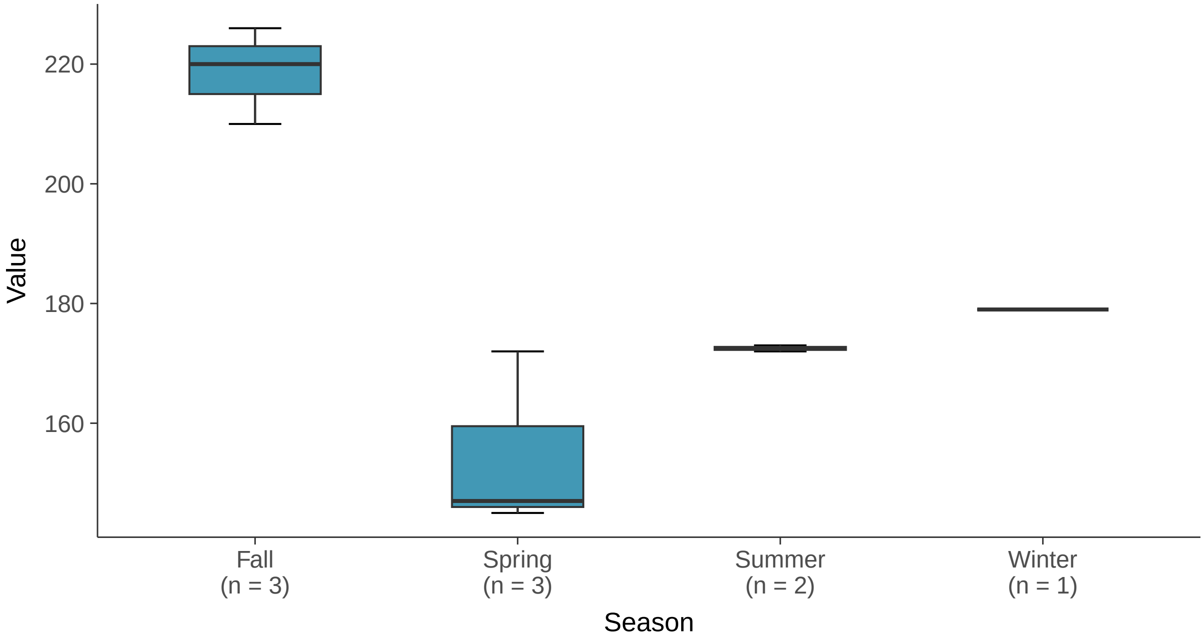
Boxplot

Calcium, MW-16A (mg/L)



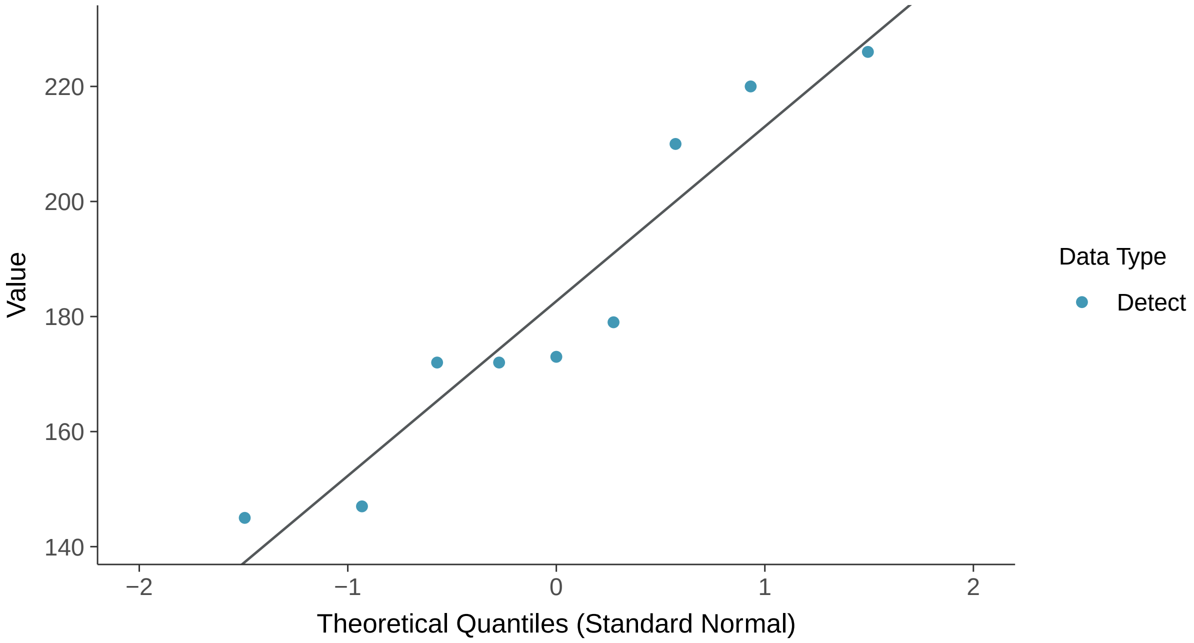
Boxplot by Season

Calcium, MW-16A (mg/L)



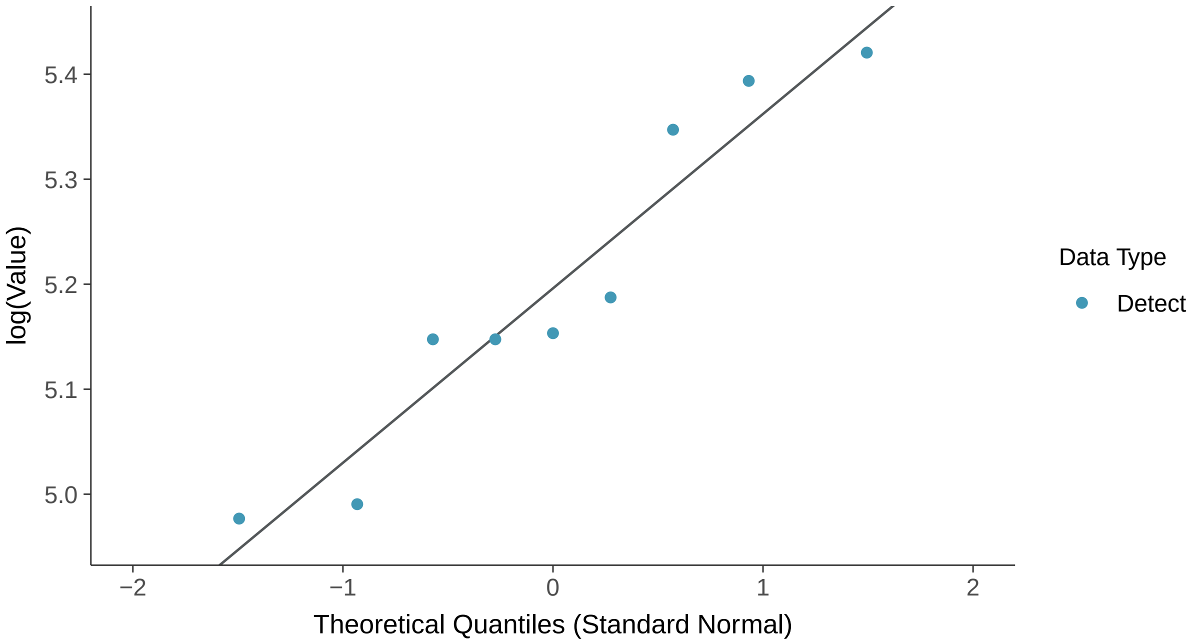
Normal Q-Q plot

Calcium, MW-16A (mg/L)



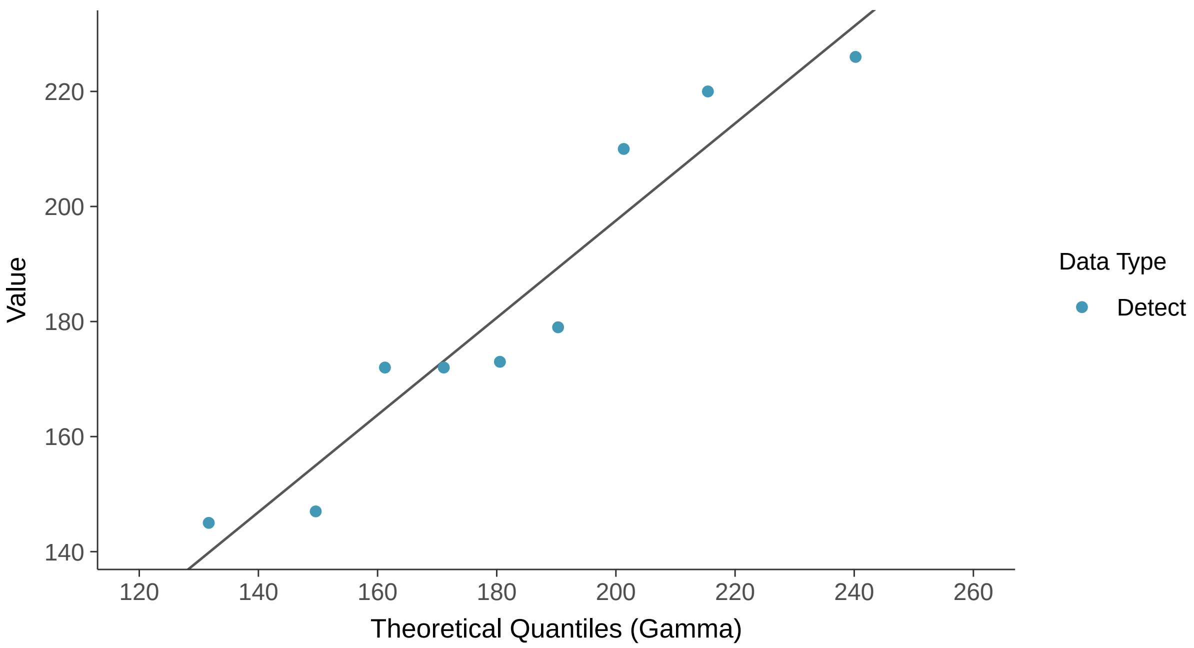
Lognormal Q-Q plot

Calcium, MW-16A (mg/L)



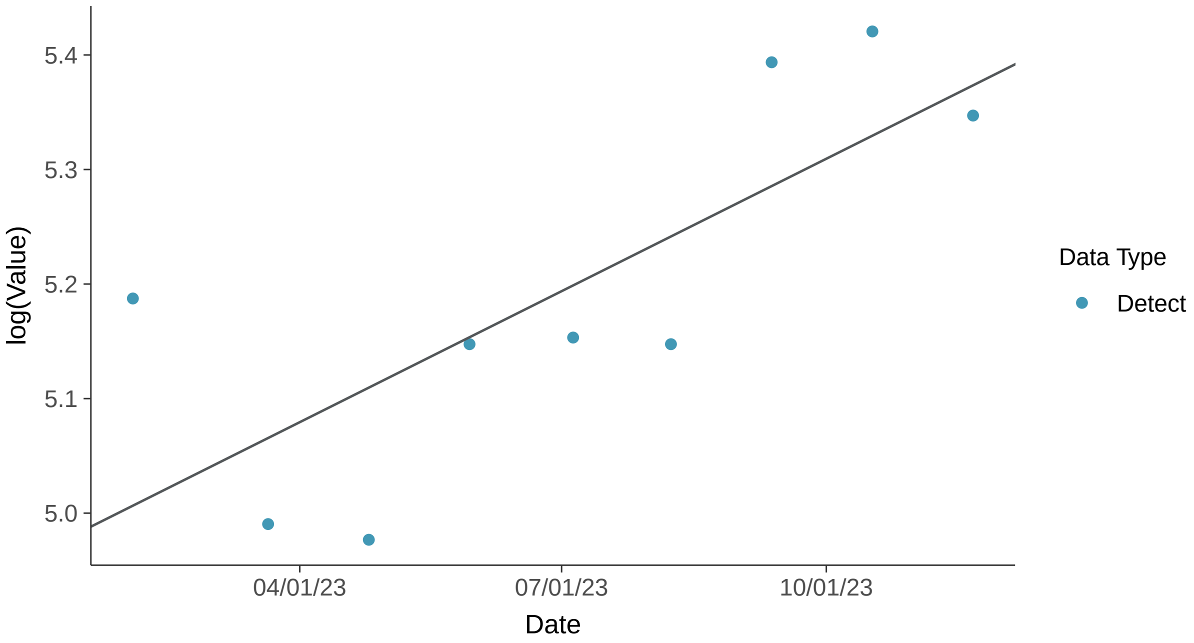
Gamma Q-Q plot

Calcium, MW-16A (mg/L)



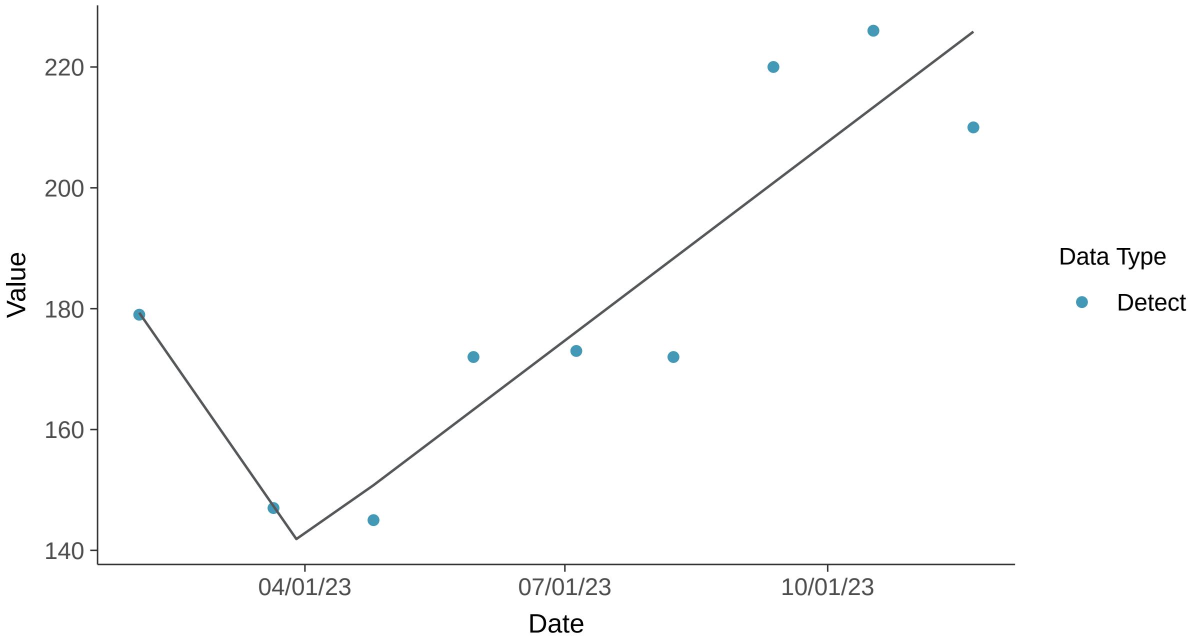
Trend Regression: Lognormal MLE

Calcium, MW-16A (mg/L)



Trend Regression: Piecewise Linear-Linear

Calcium, MW-16A (mg/L)

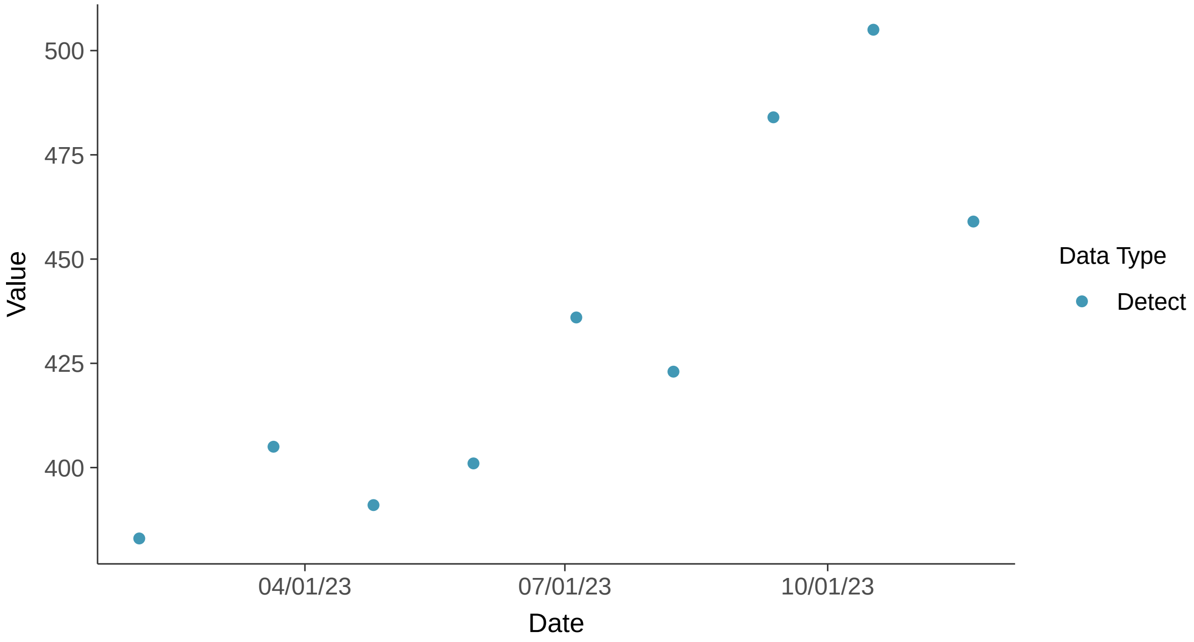


Appendix III: Chloride, MW-16A

ID: 16A_1_03

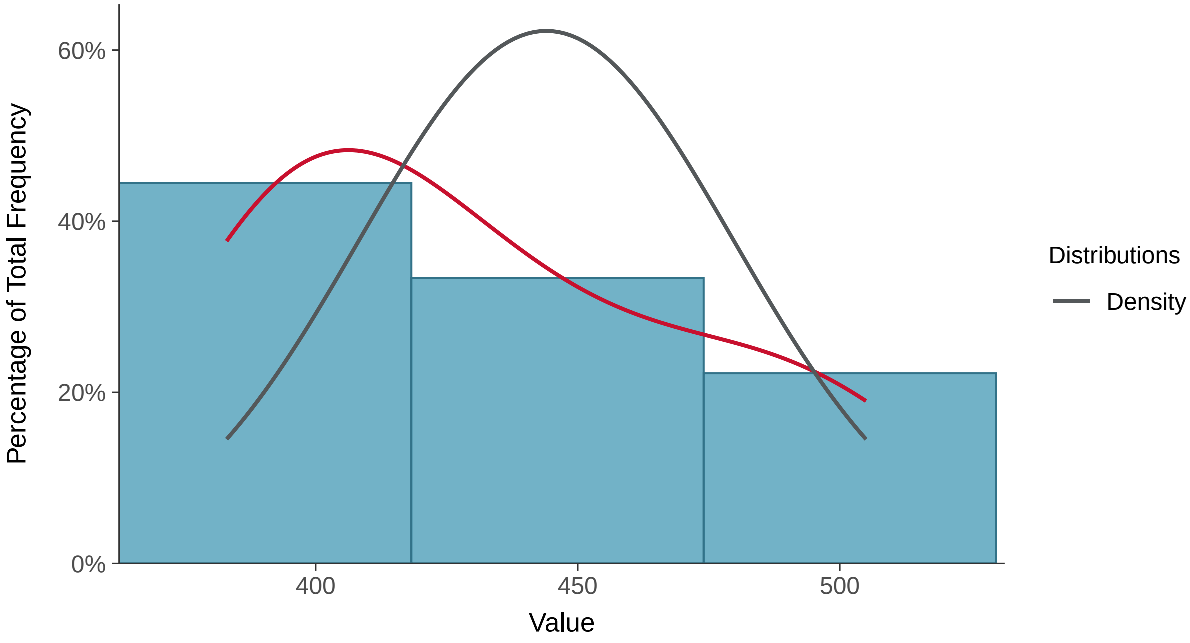
Scatter Plot

Chloride, MW-16A (mg/L)



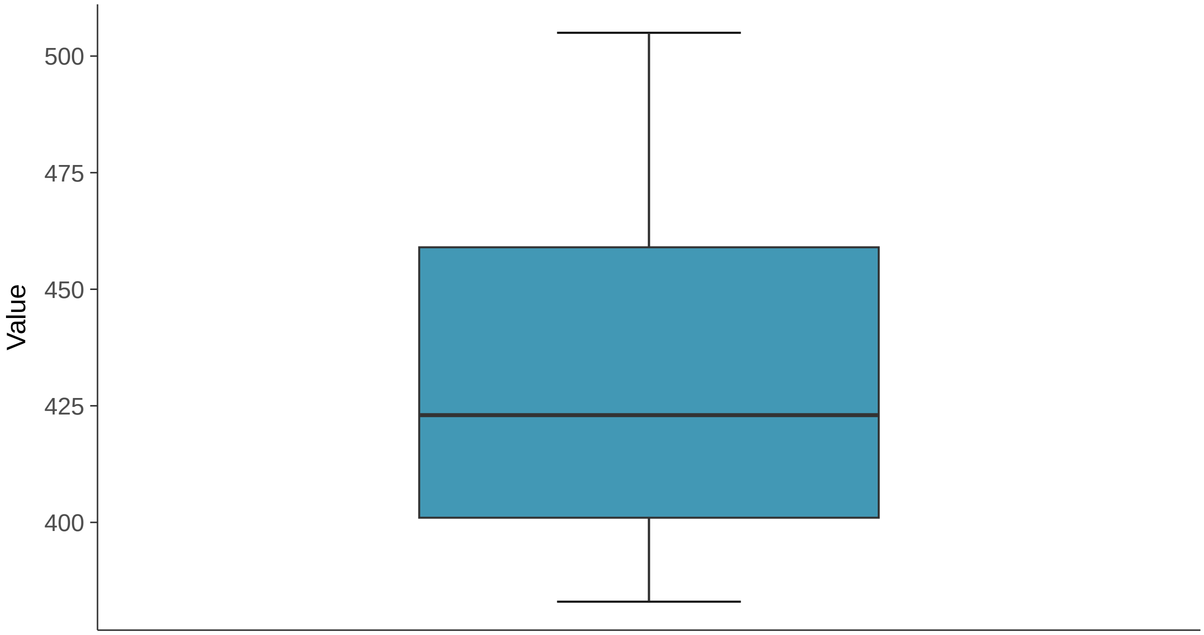
Histogram

Chloride, MW-16A (mg/L)



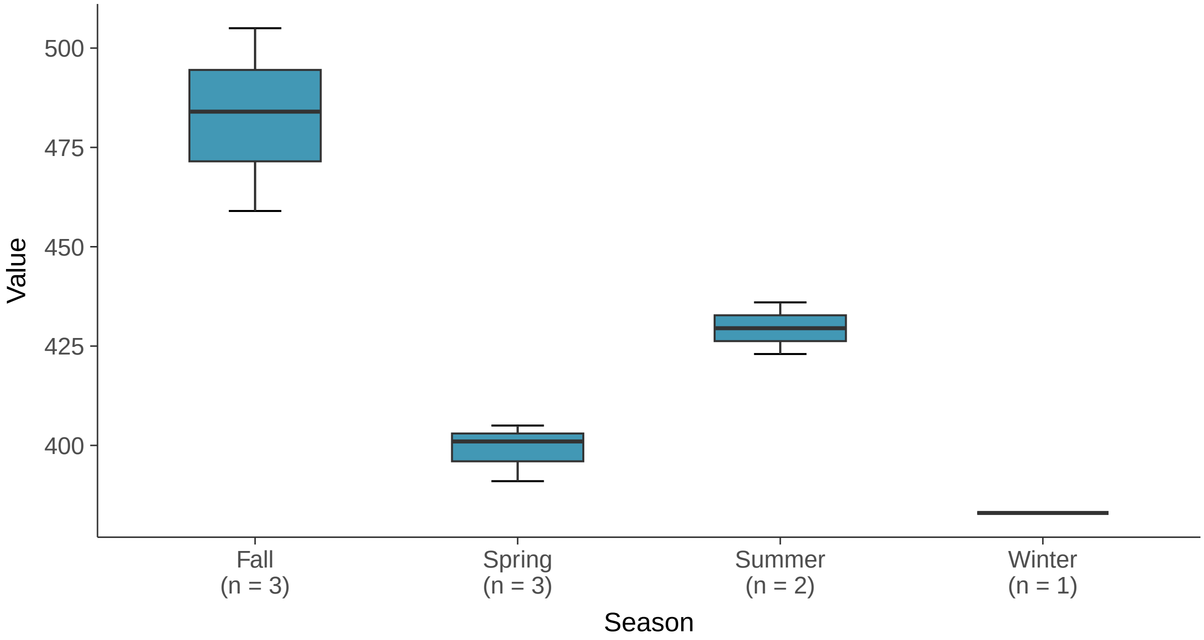
Boxplot

Chloride, MW-16A (mg/L)



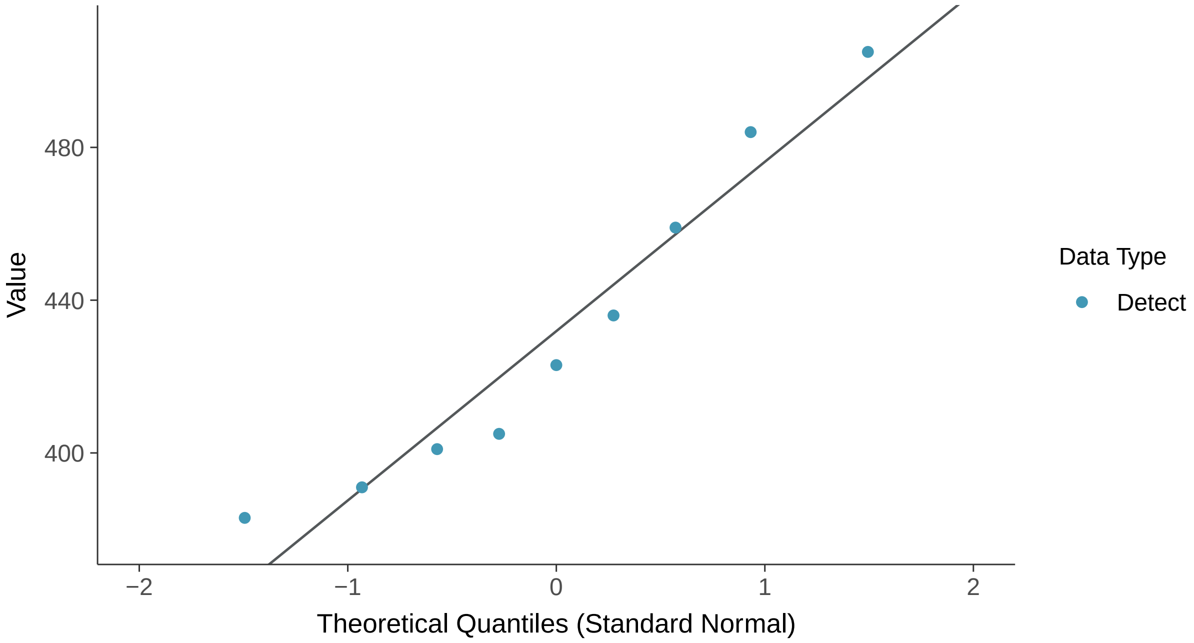
Boxplot by Season

Chloride, MW-16A (mg/L)



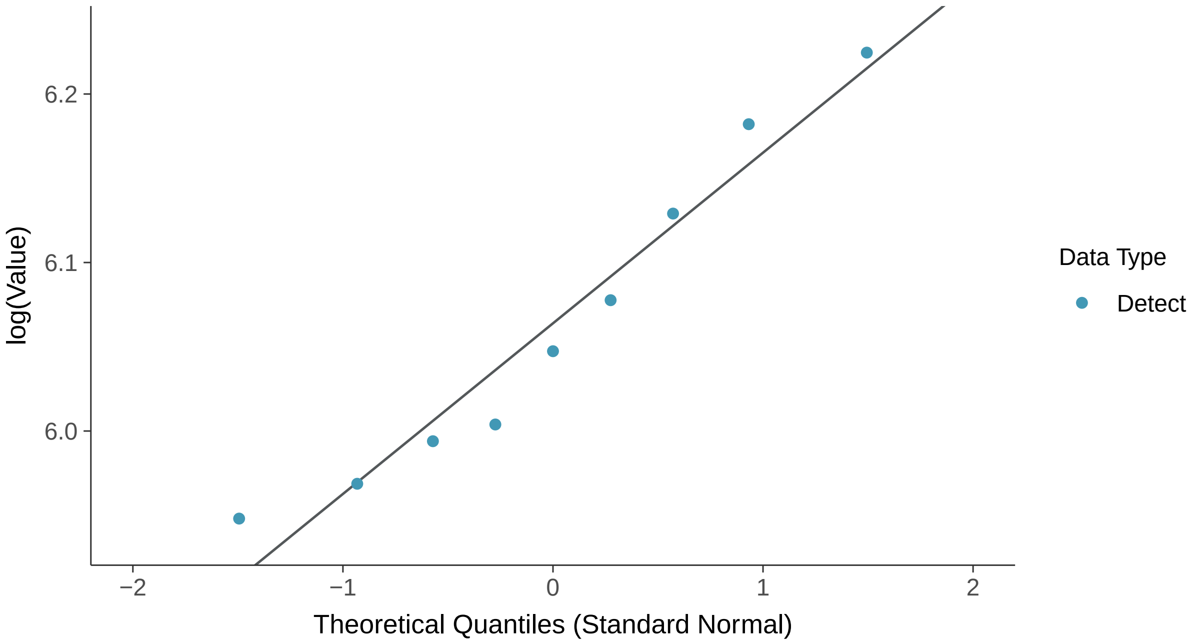
Normal Q-Q plot

Chloride, MW-16A (mg/L)



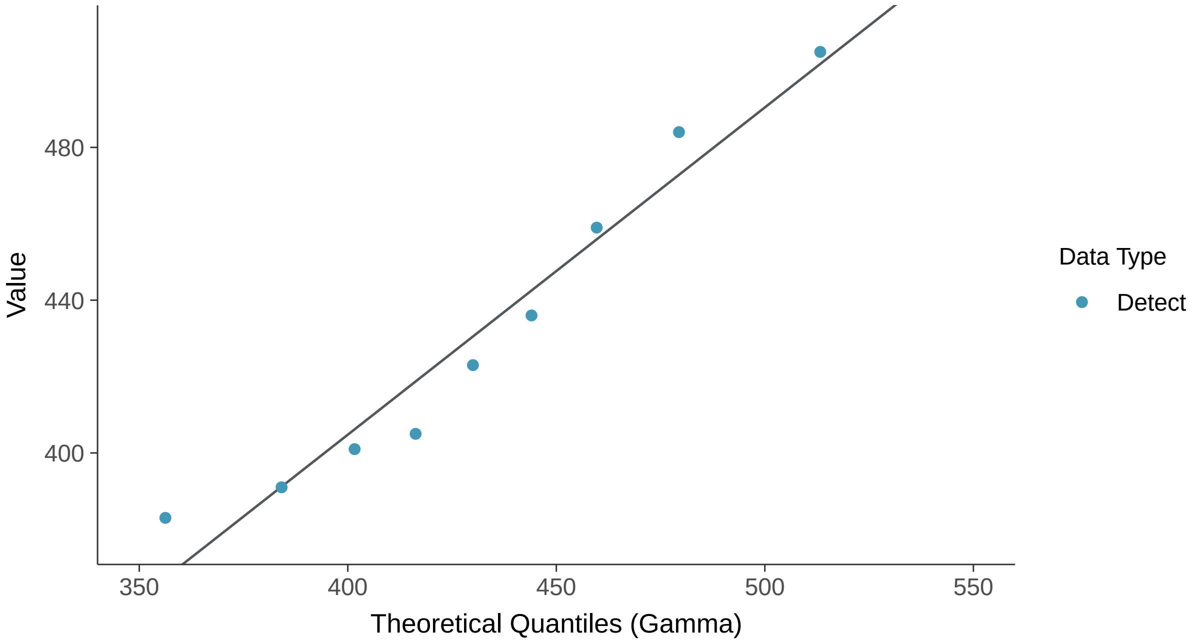
Lognormal Q-Q plot

Chloride, MW-16A (mg/L)



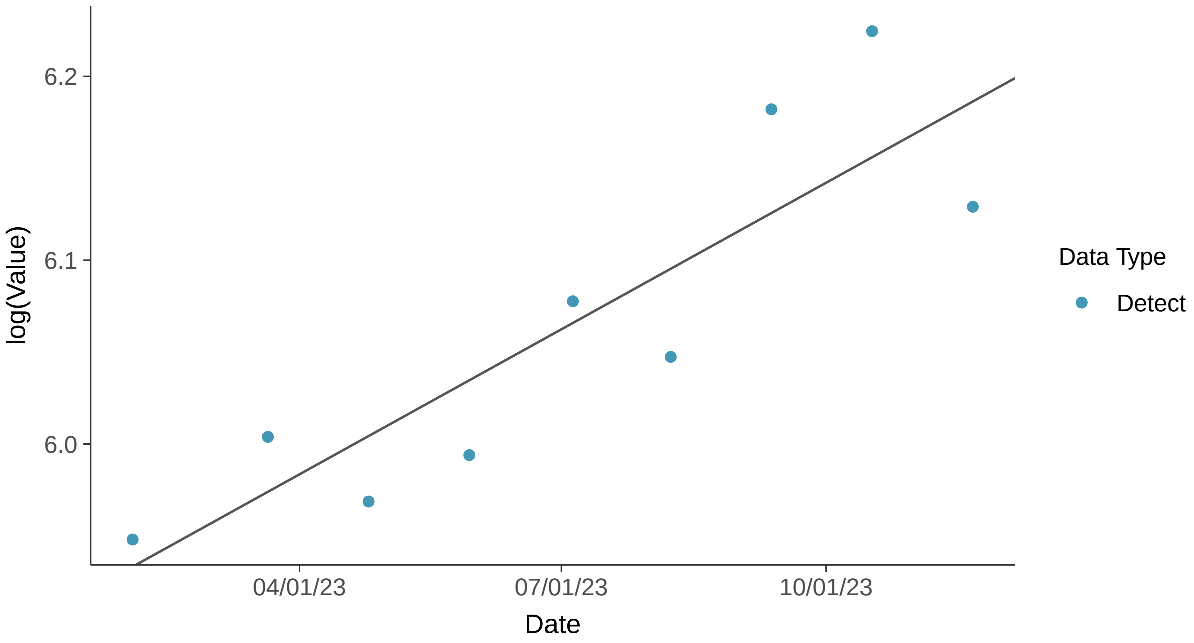
Gamma Q-Q plot

Chloride, MW-16A (mg/L)



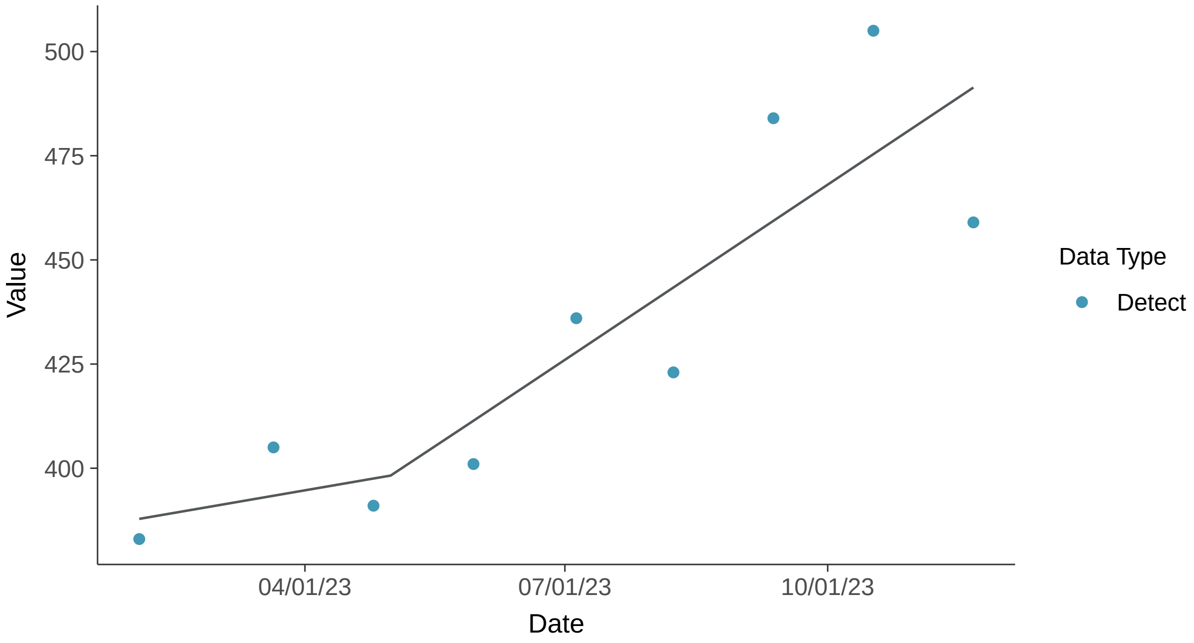
Trend Regression: Lognormal MLE

Chloride, MW-16A (mg/L)



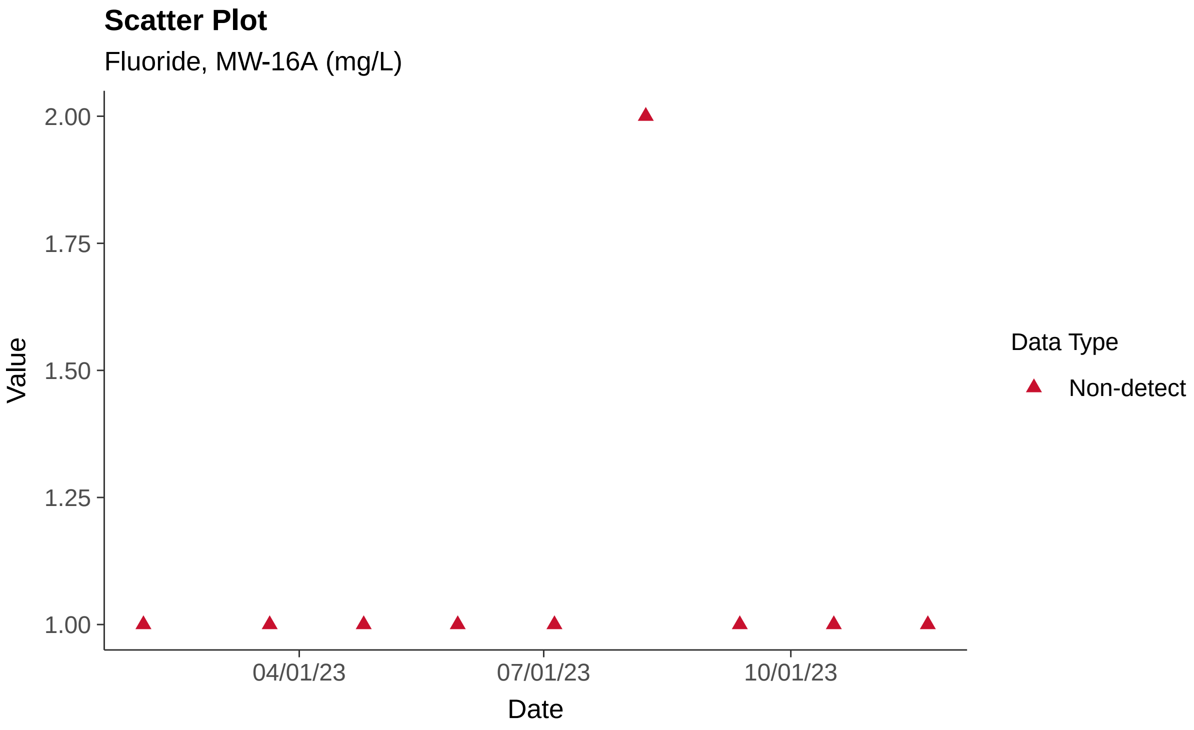
Trend Regression: Piecewise Linear-Linear

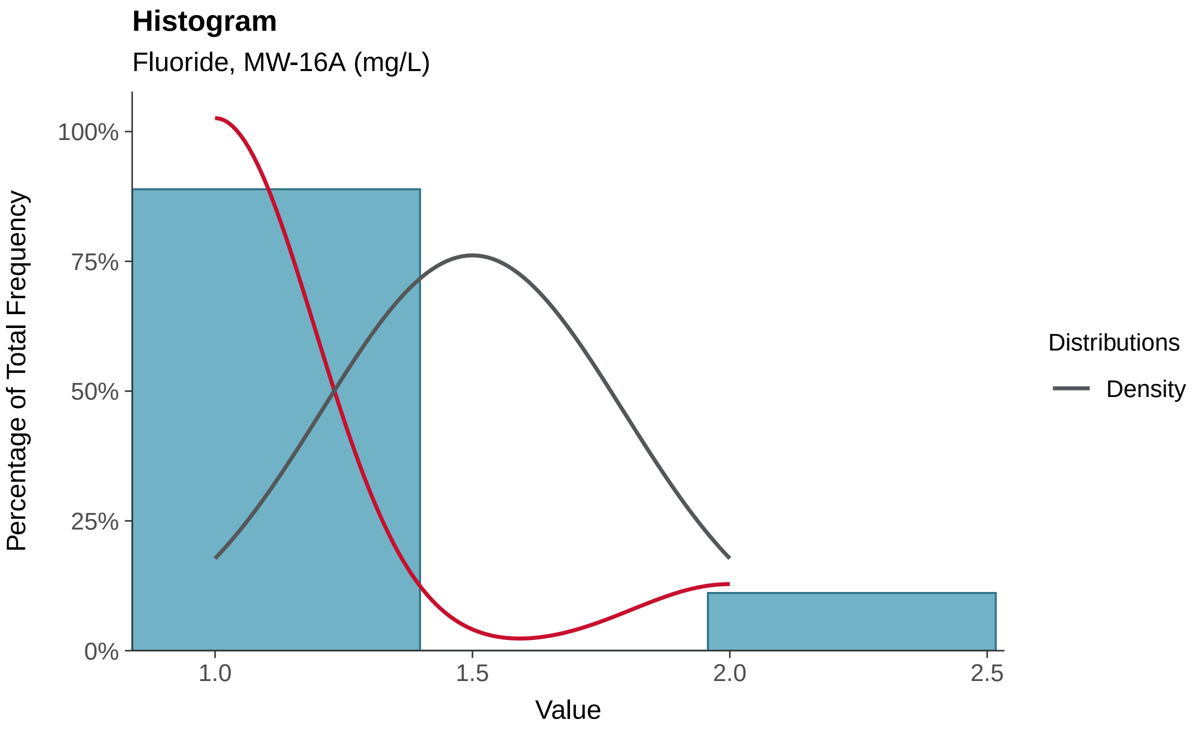
Chloride, MW-16A (mg/L)



Appendix III: Fluoride, MW-16A

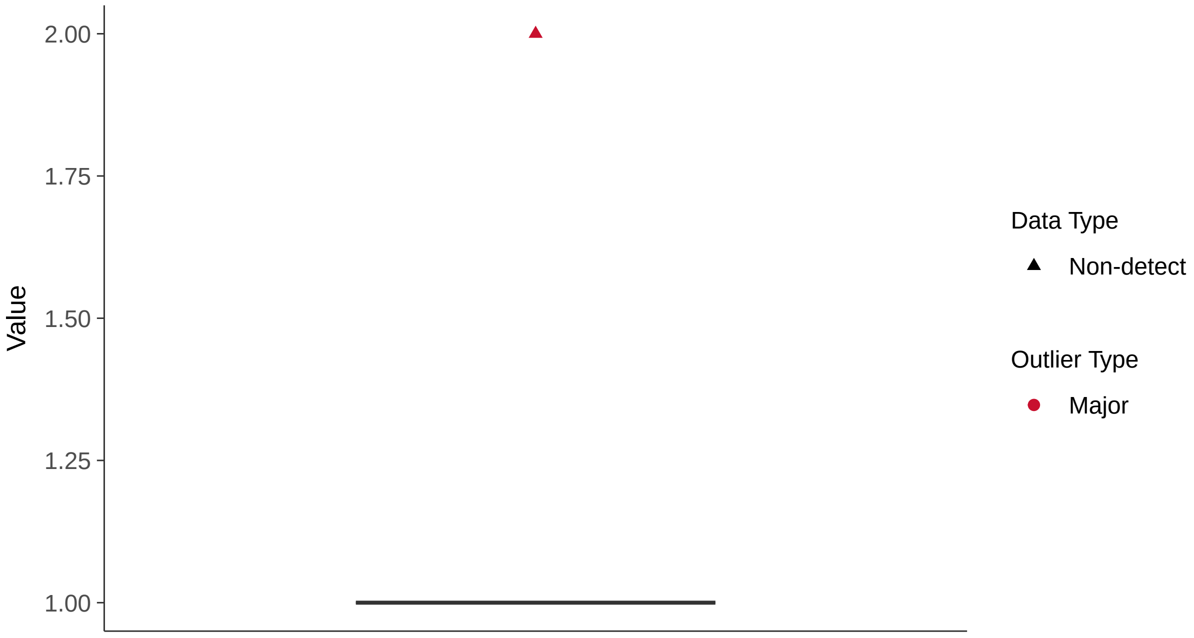
ID: 16A_1_04





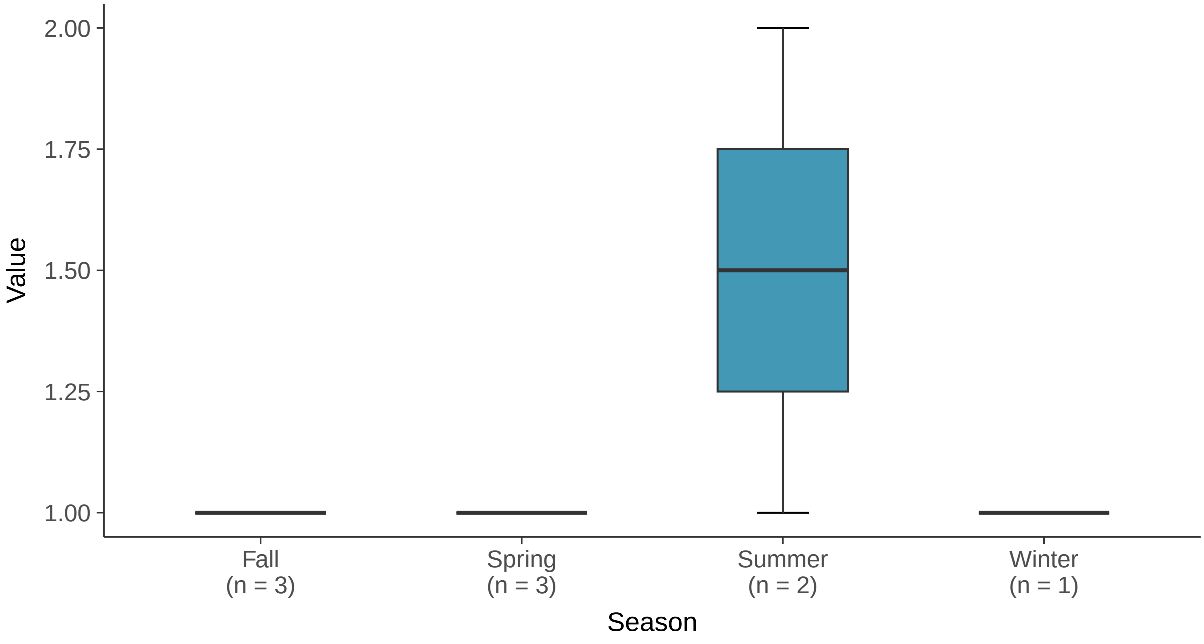
Boxplot

Fluoride, MW-16A (mg/L)



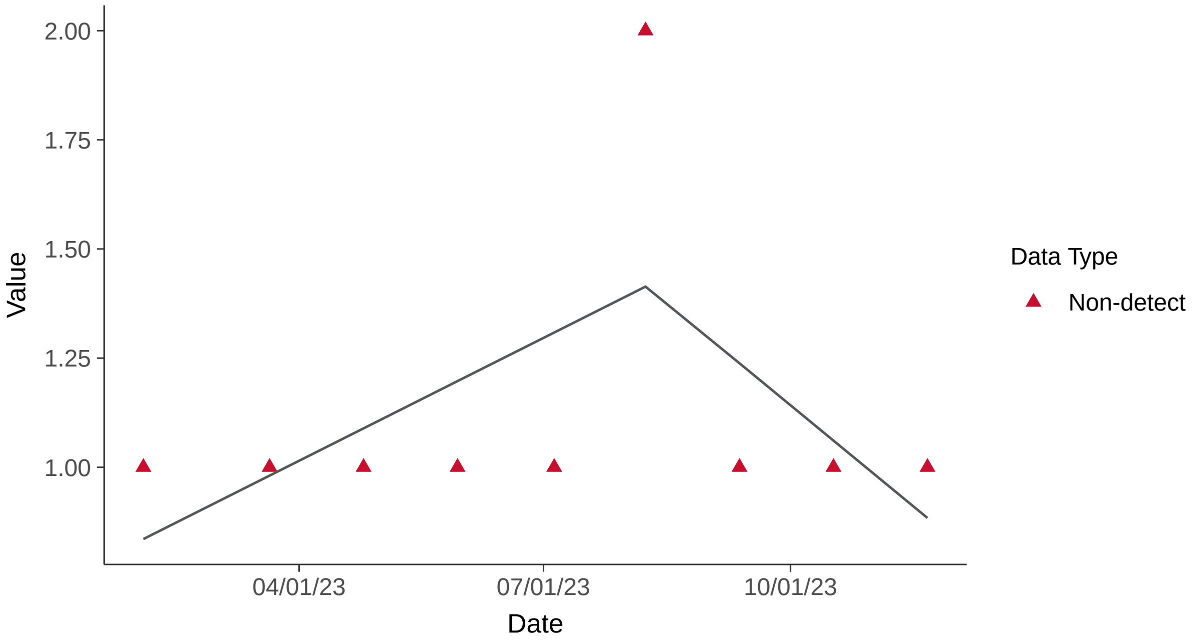
Boxplot by Season

Fluoride, MW-16A (mg/L)



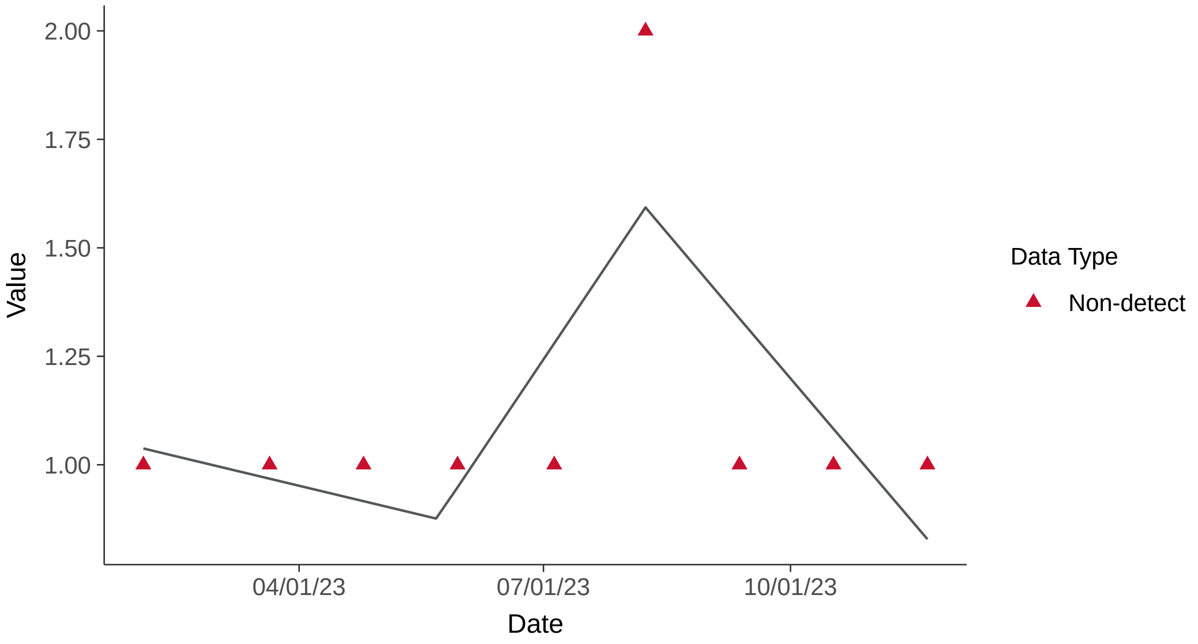
Trend Regression: Piecewise Linear-Linear

Fluoride, MW-16A (mg/L)



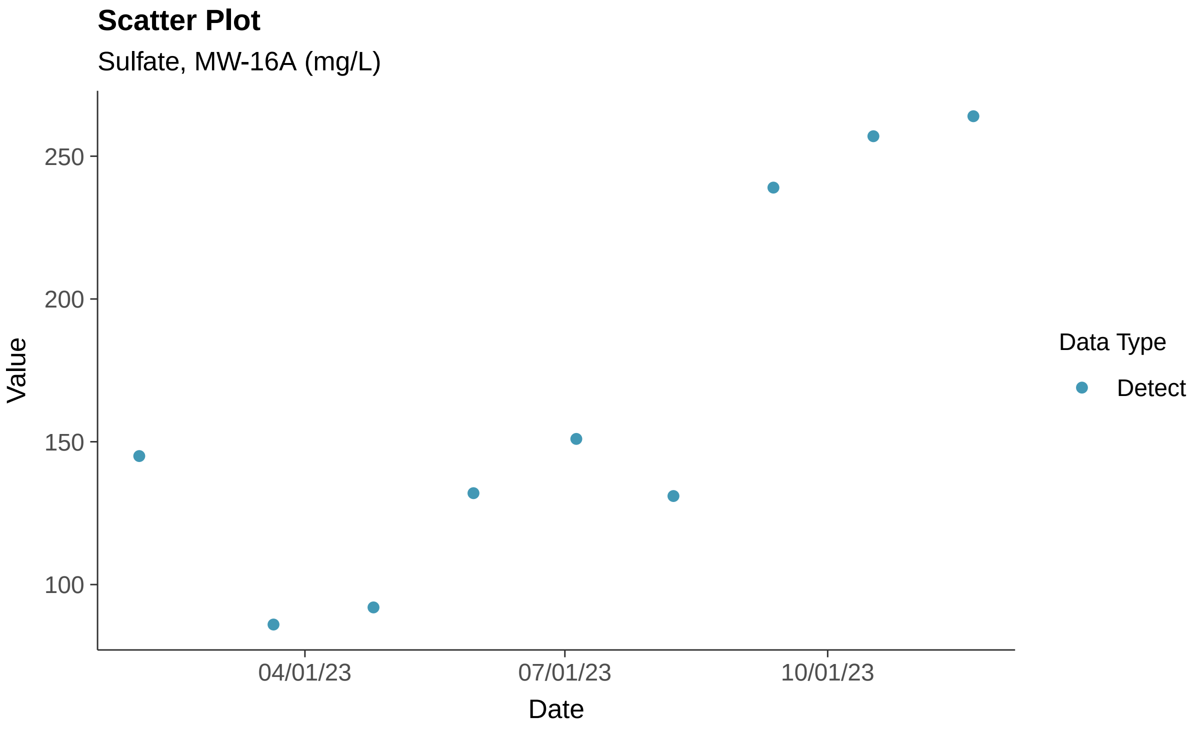
Trend Regression: Piecewise Linear-Linear-Linear

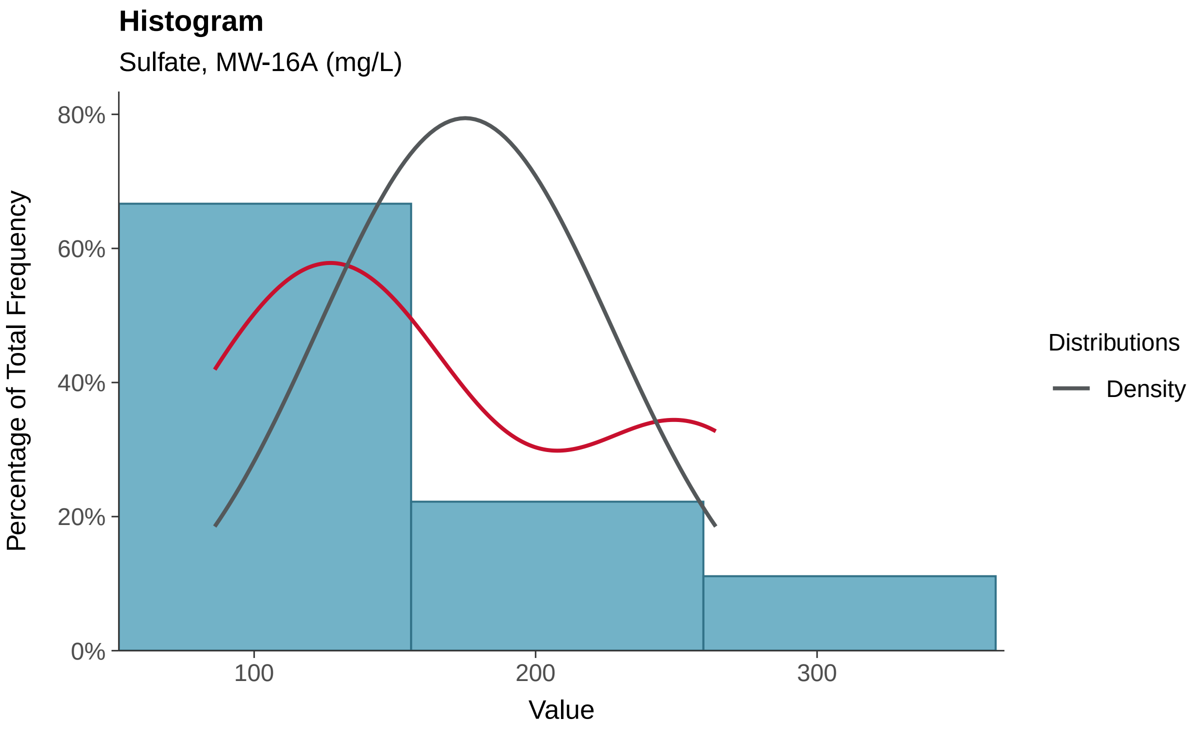
Fluoride, MW-16A (mg/L)



Appendix III: Sulfate, MW-16A

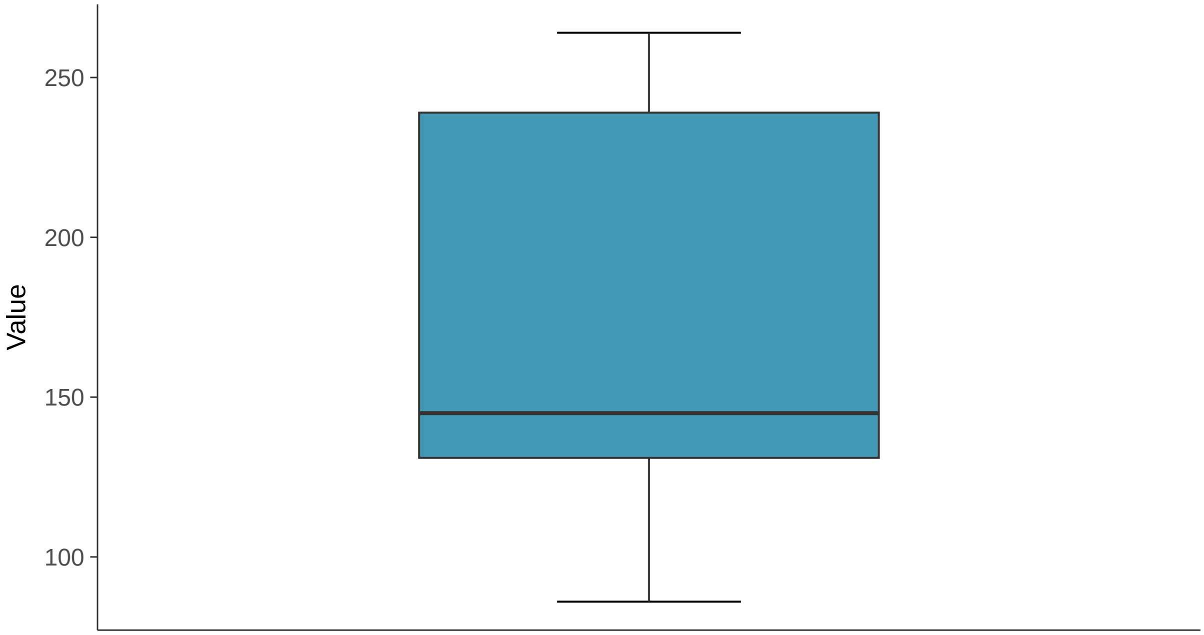
ID: 16A_1_05





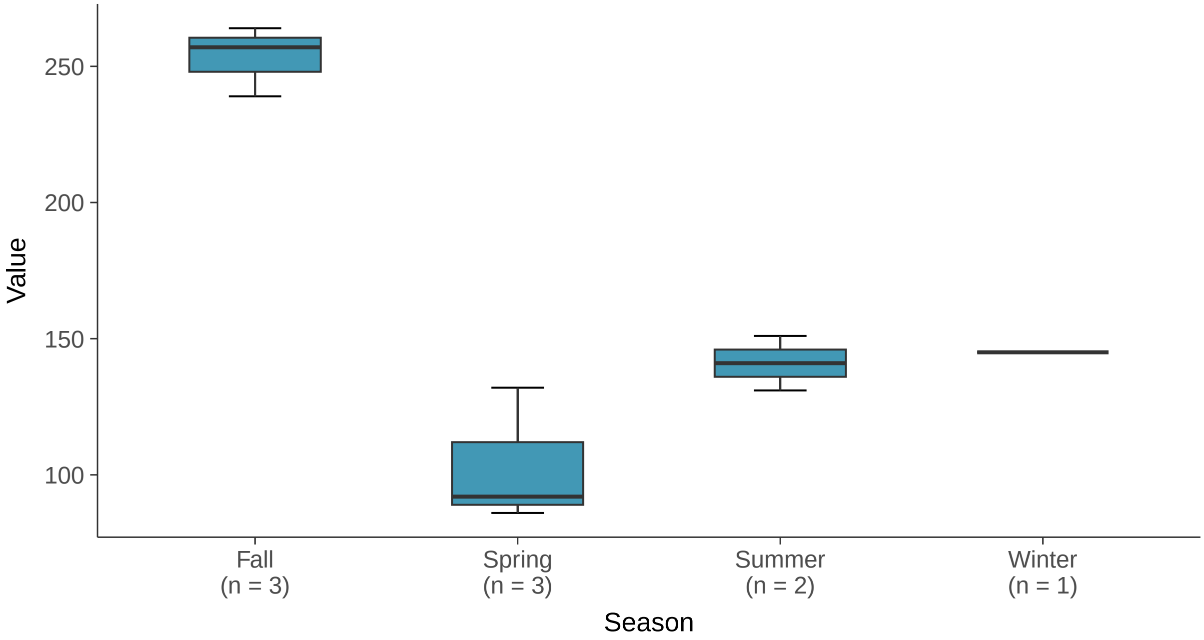
Boxplot

Sulfate, MW-16A (mg/L)



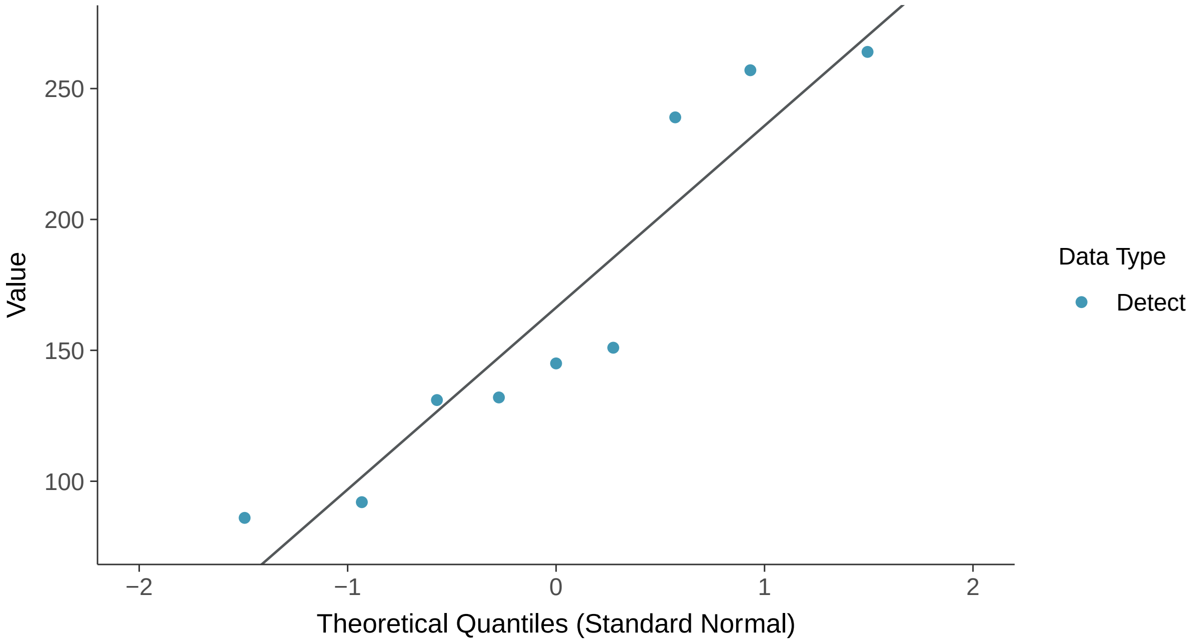
Boxplot by Season

Sulfate, MW-16A (mg/L)



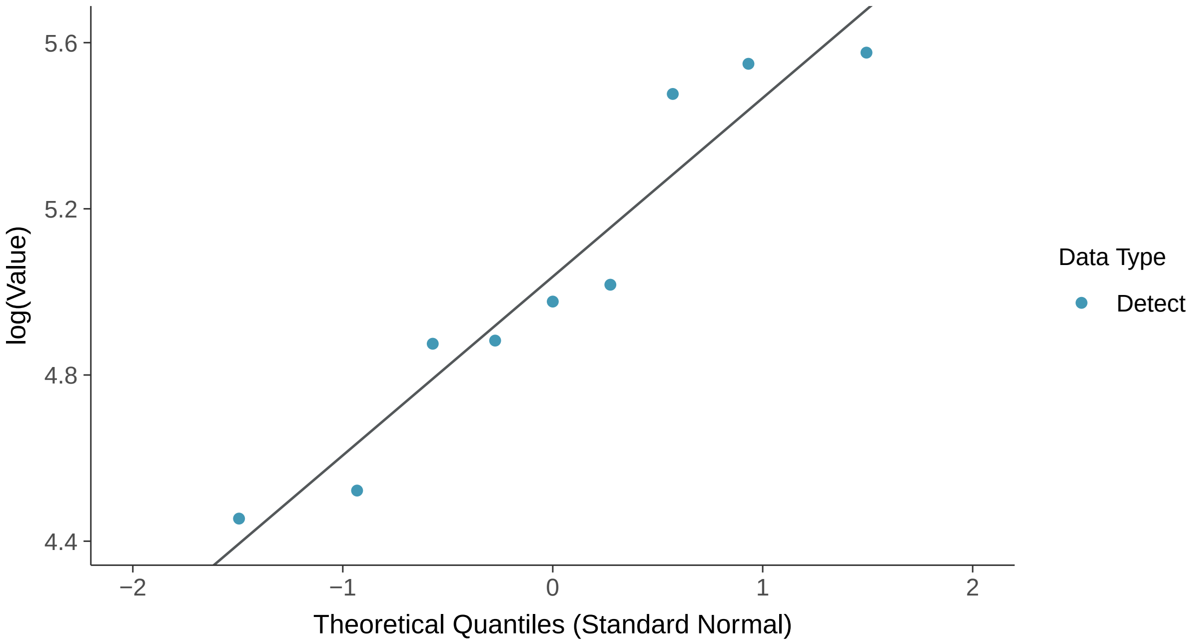
Normal Q-Q plot

Sulfate, MW-16A (mg/L)



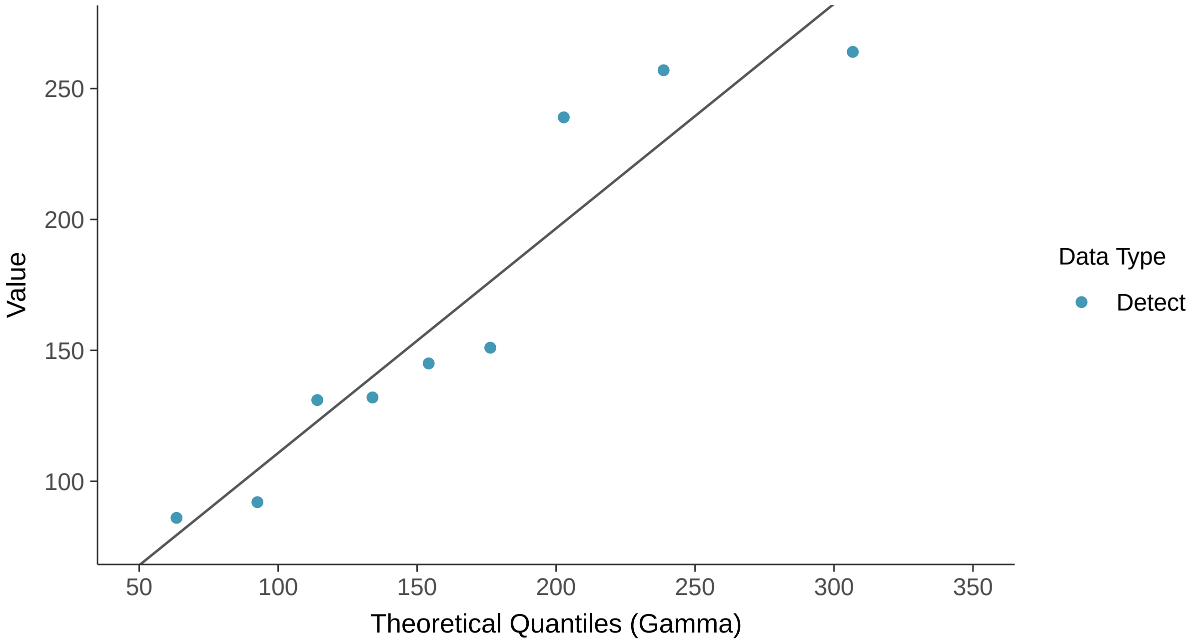
Lognormal Q-Q plot

Sulfate, MW-16A (mg/L)



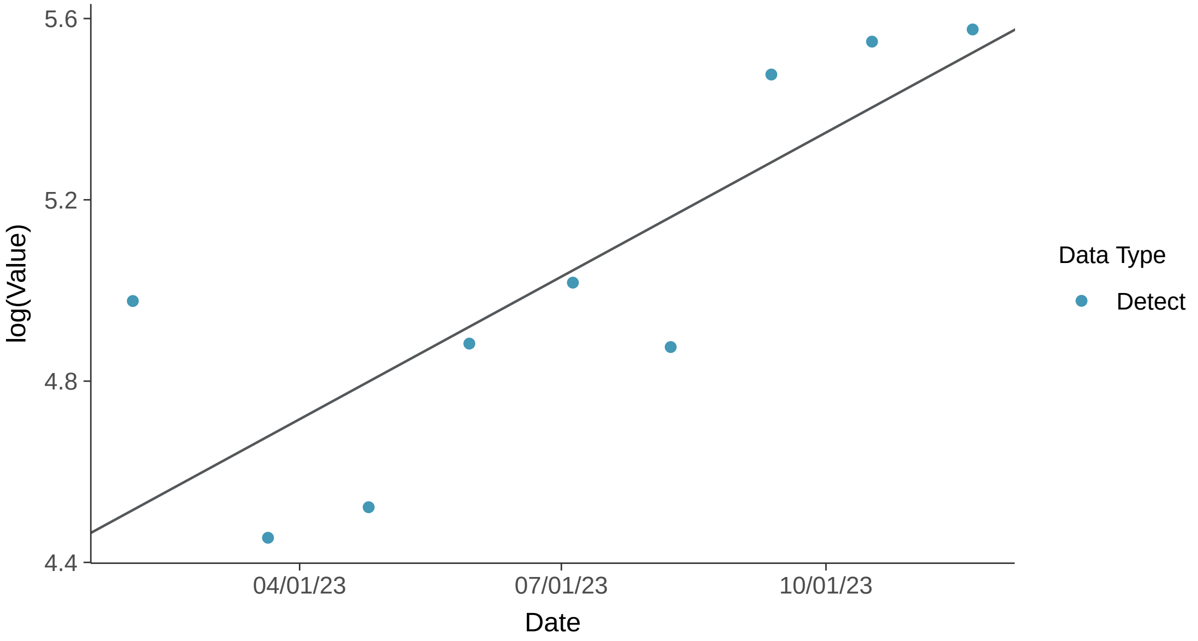
Gamma Q-Q plot

Sulfate, MW-16A (mg/L)



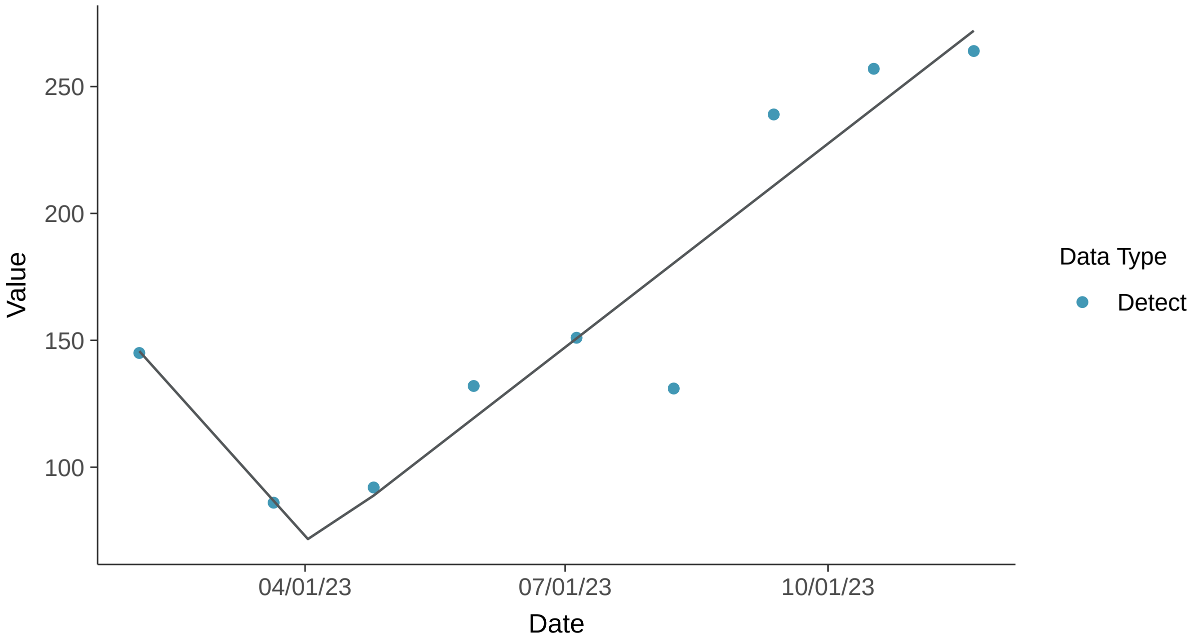
Trend Regression: Lognormal MLE

Sulfate, MW-16A (mg/L)



Trend Regression: Piecewise Linear-Linear

Sulfate, MW-16A (mg/L)

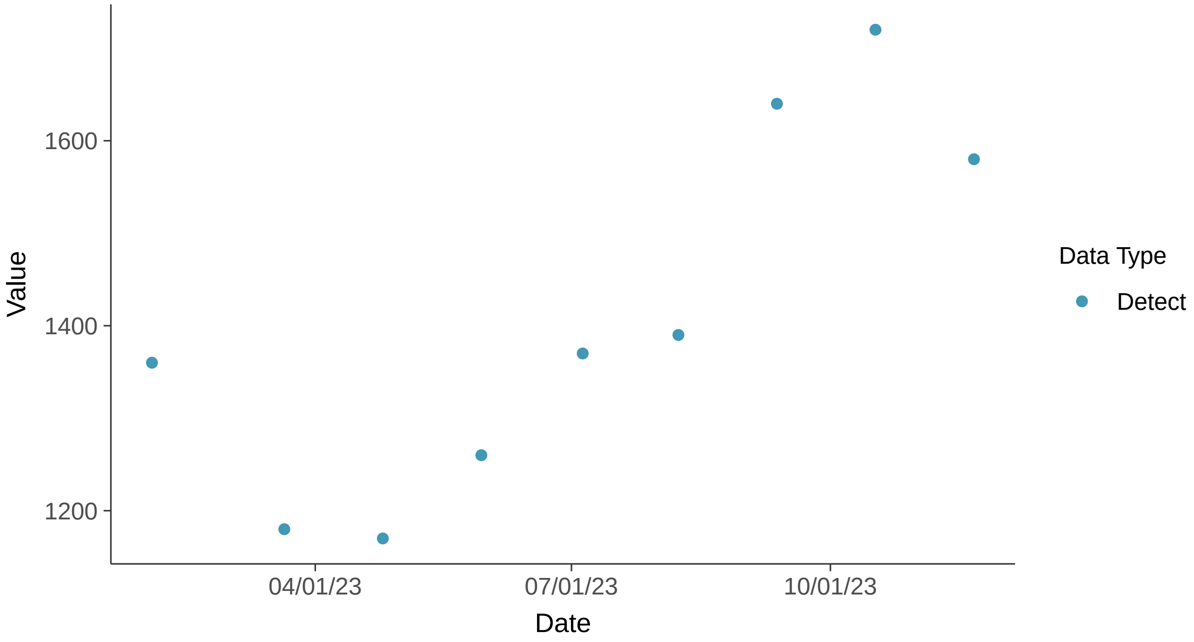


Appendix III: Total Dissolved Solids, MW-16A

ID: 16A_1_06

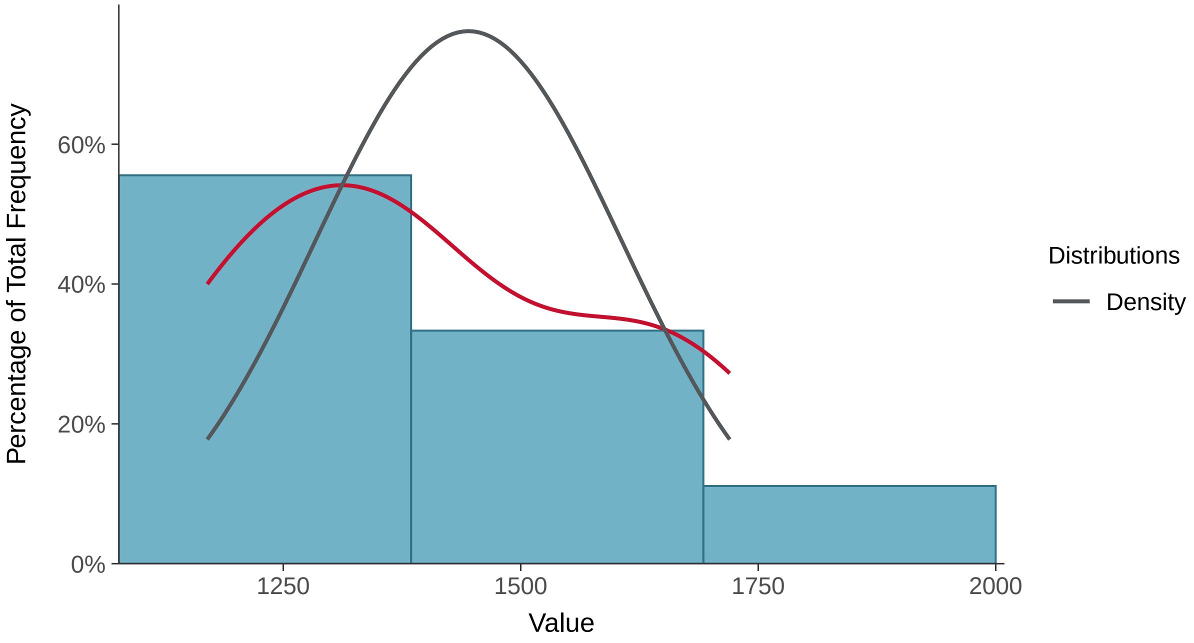
Scatter Plot

Total Dissolved Solids, MW-16A (mg/L)



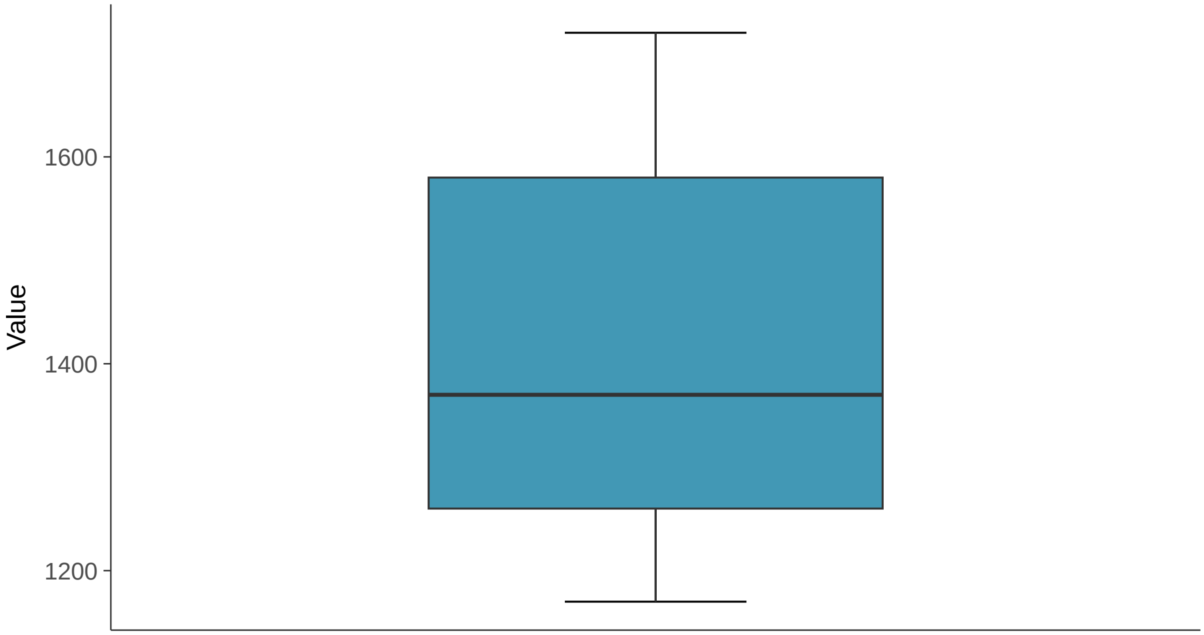
Histogram

Total Dissolved Solids, MW-16A (mg/L)



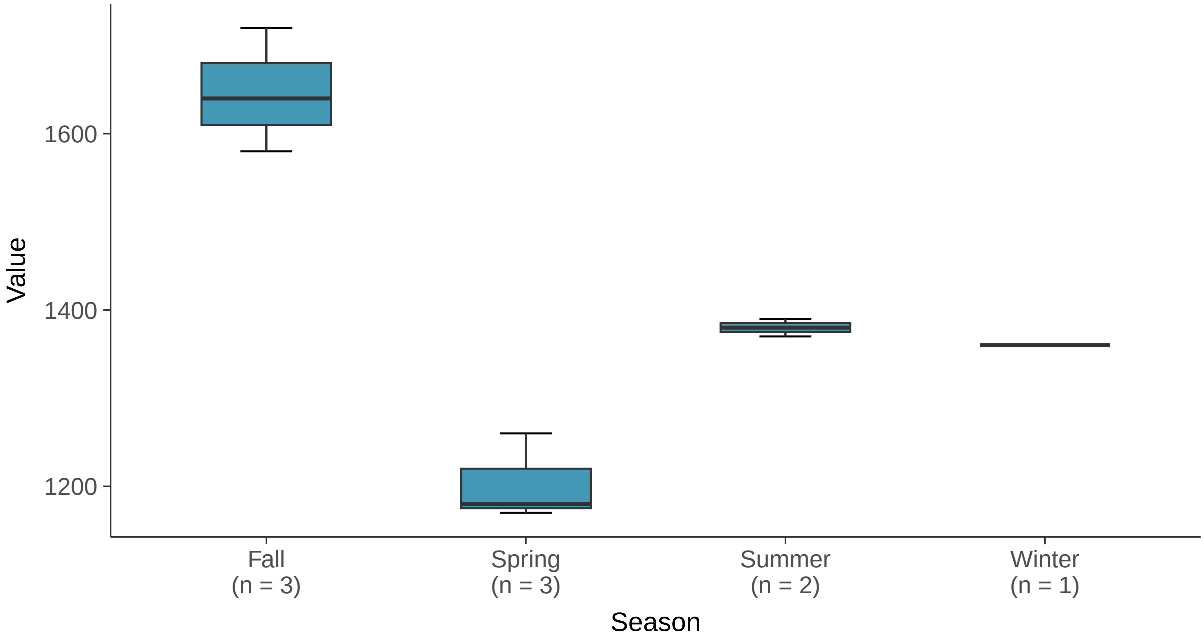
Boxplot

Total Dissolved Solids, MW-16A (mg/L)



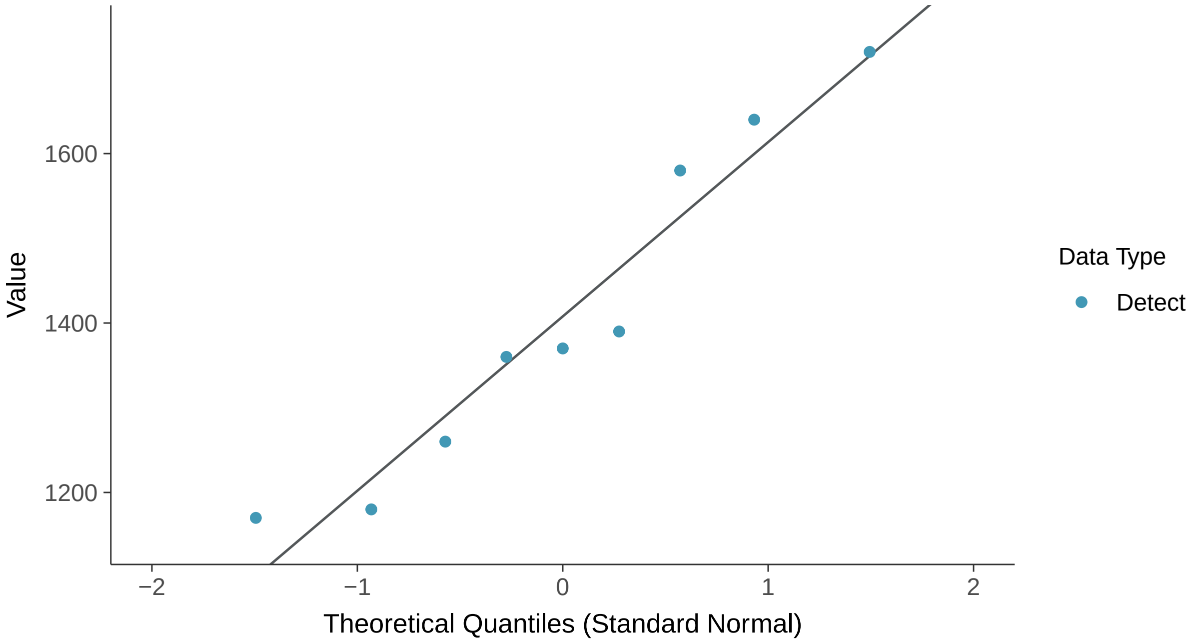
Boxplot by Season

Total Dissolved Solids, MW-16A (mg/L)



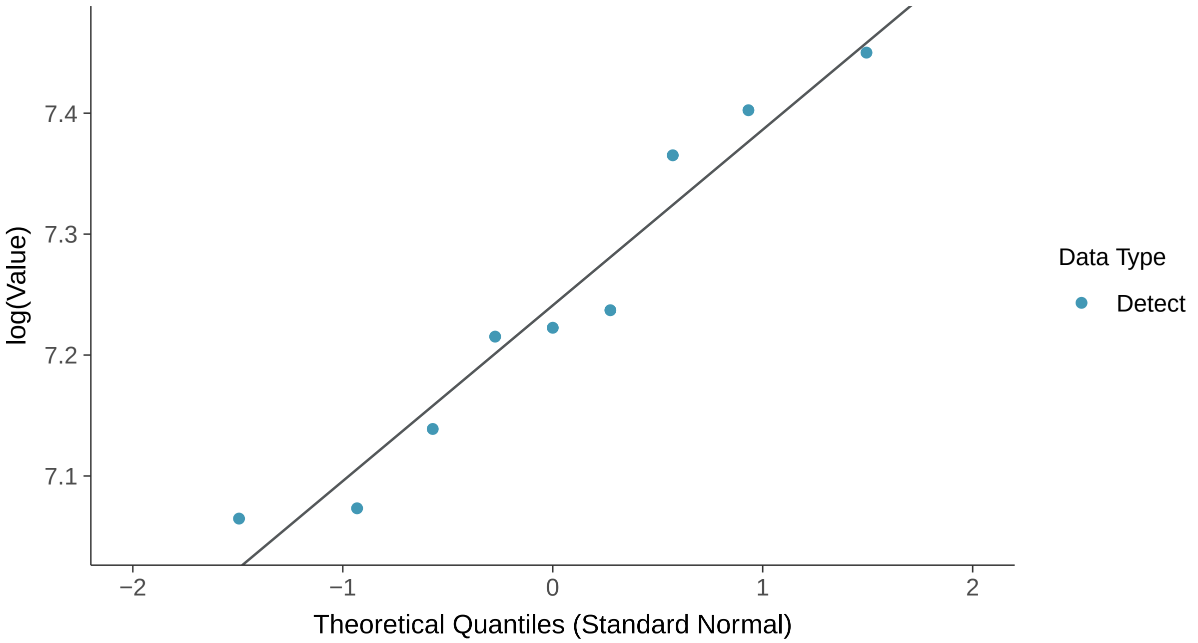
Normal Q-Q plot

Total Dissolved Solids, MW-16A (mg/L)



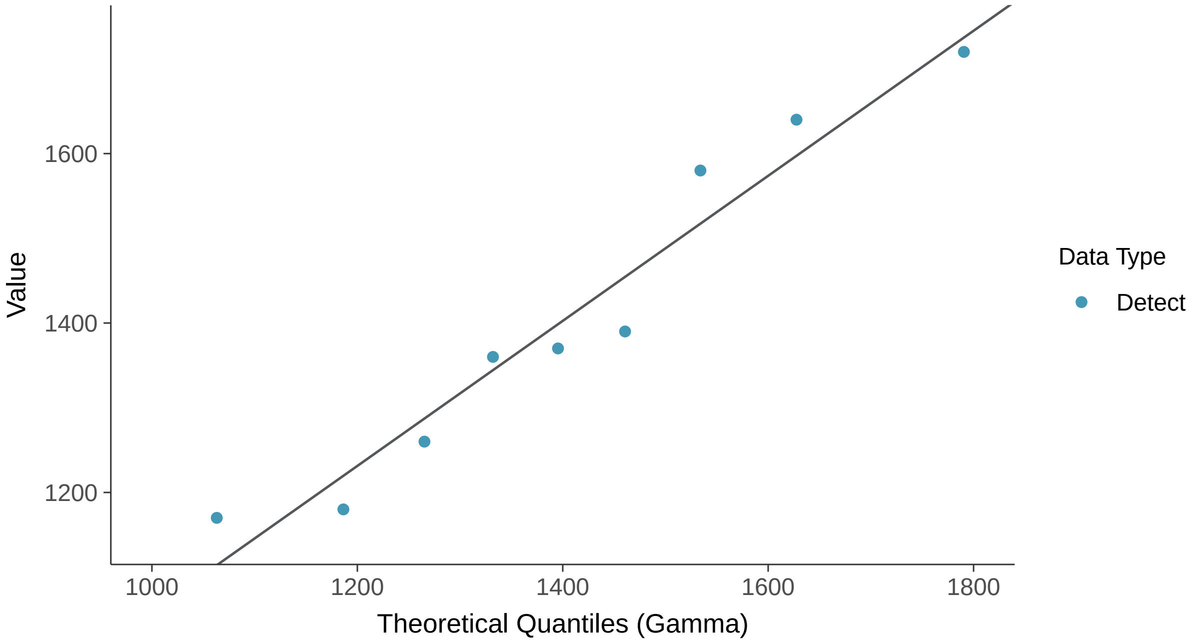
Lognormal Q-Q plot

Total Dissolved Solids, MW-16A (mg/L)



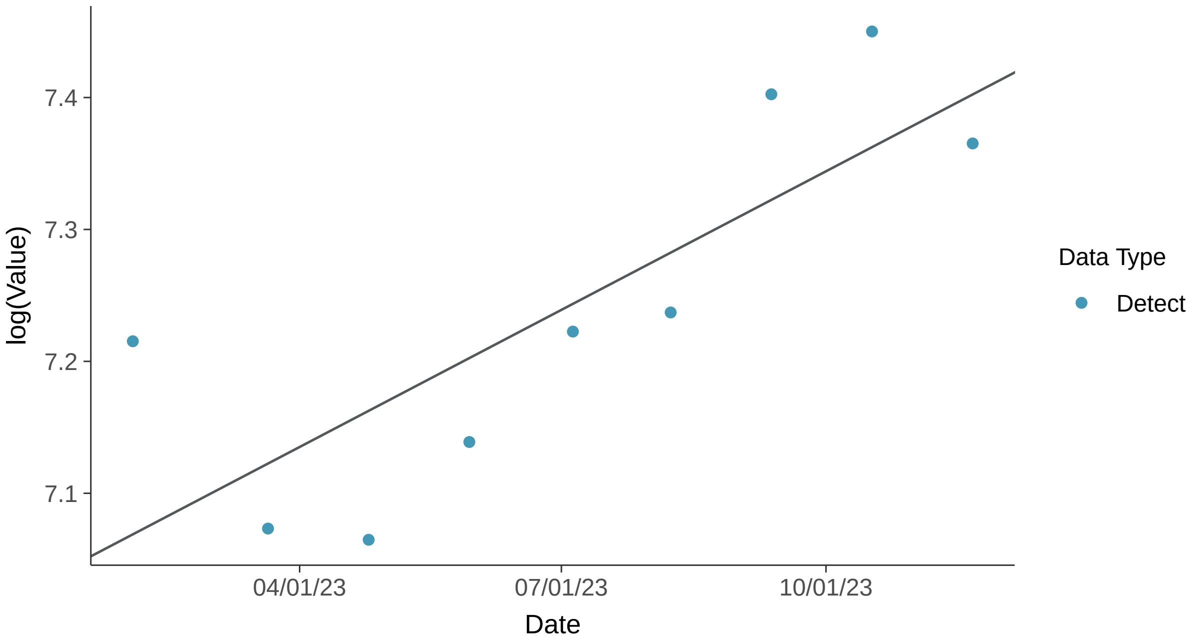
Gamma Q-Q plot

Total Dissolved Solids, MW-16A (mg/L)



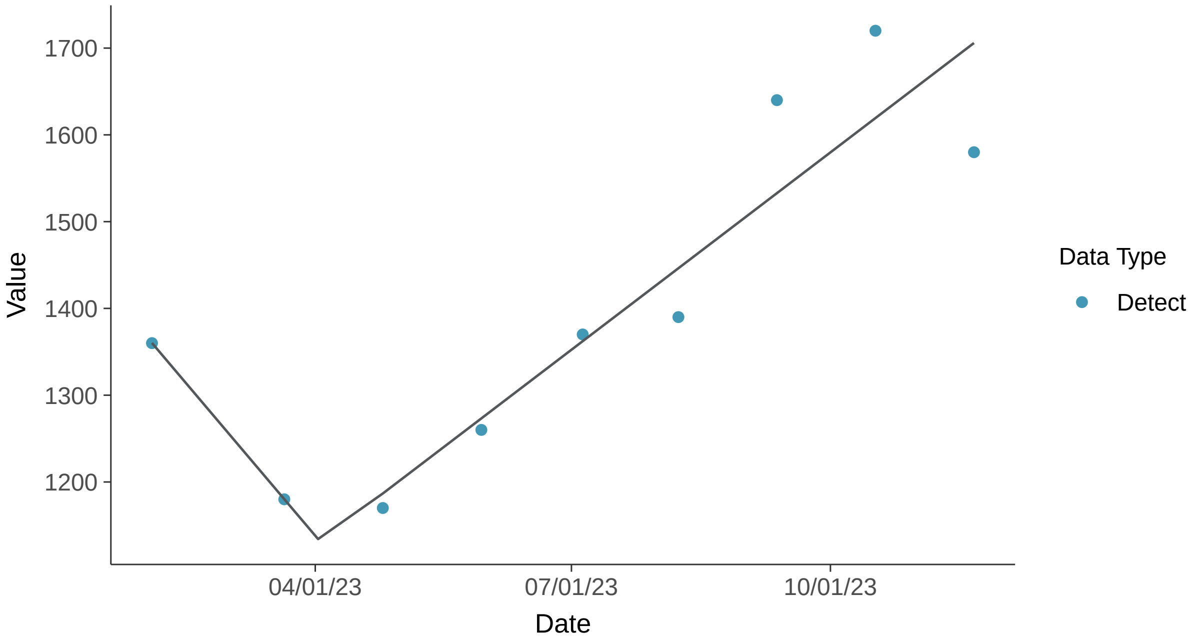
Trend Regression: Lognormal MLE

Total Dissolved Solids, MW-16A (mg/L)



Trend Regression: Piecewise Linear-Linear

Total Dissolved Solids, MW-16A (mg/L)

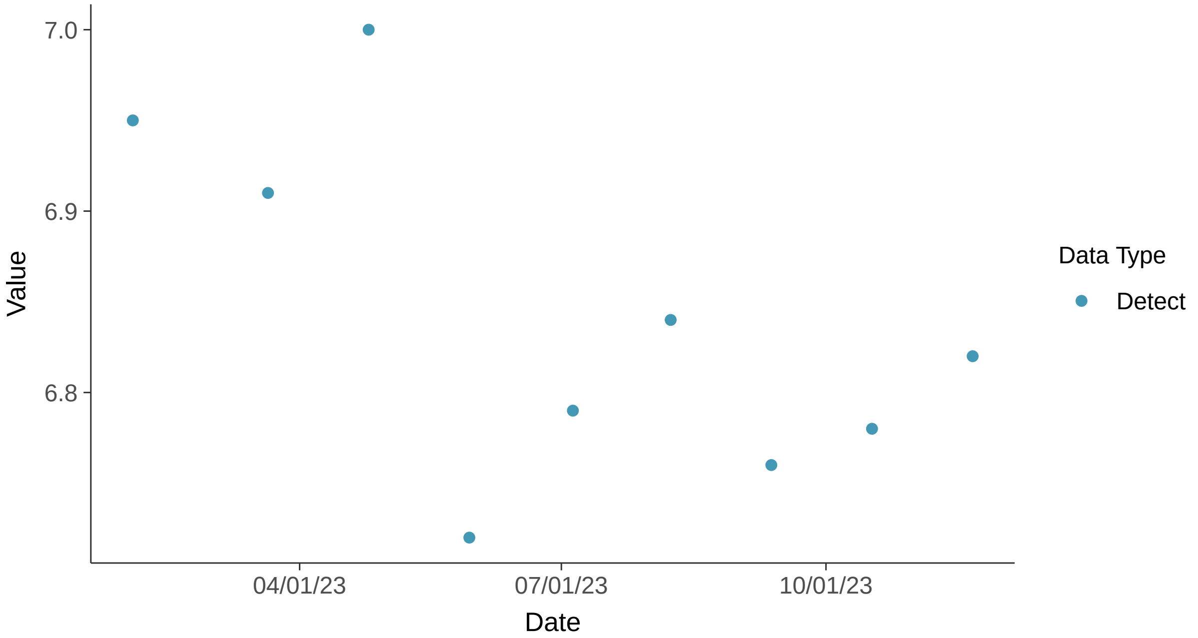


Appendix III: pH, Field, MW-16A

ID: 16A_1_07

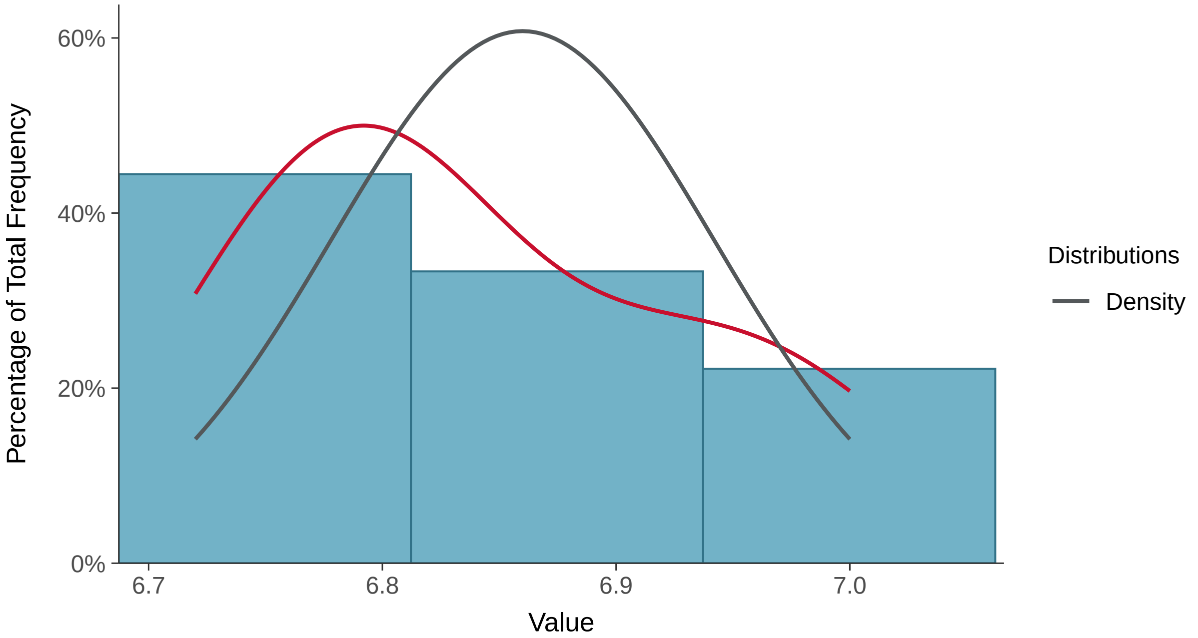
Scatter Plot

pH, Field, MW-16A (su)



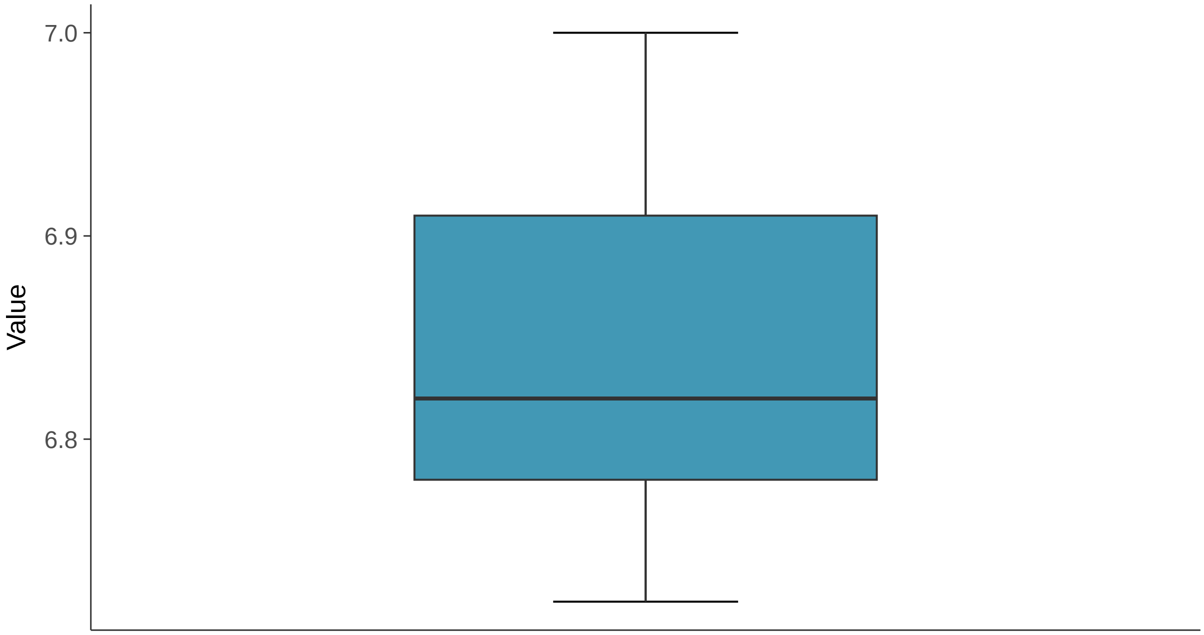
Histogram

pH, Field, MW-16A (su)



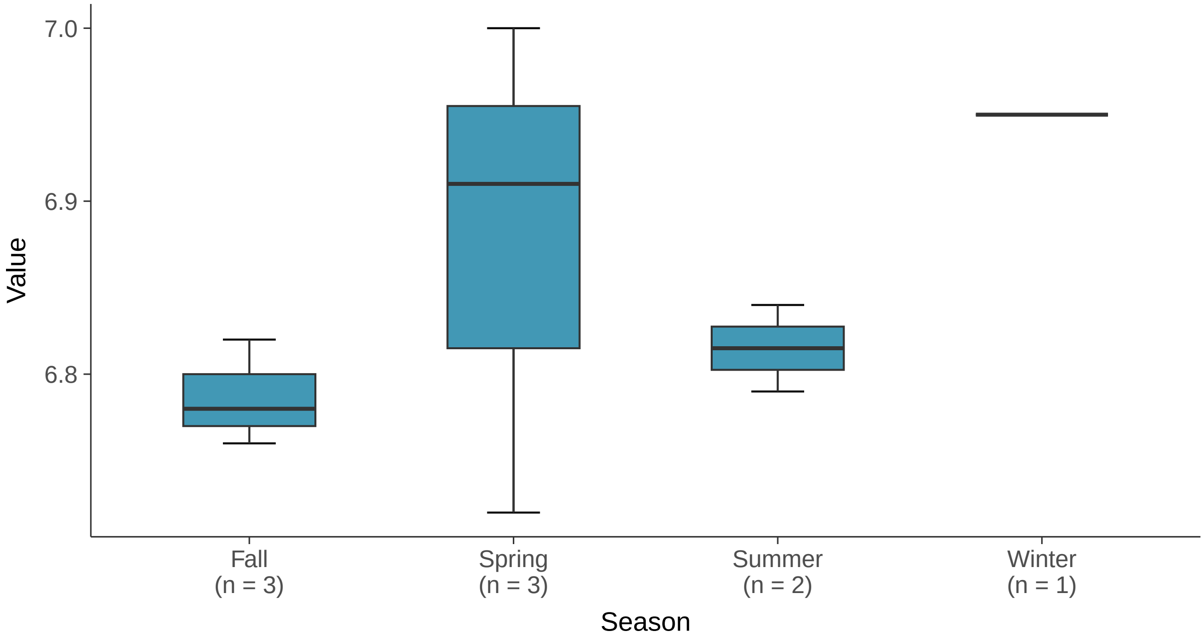
Boxplot

pH, Field, MW-16A (su)



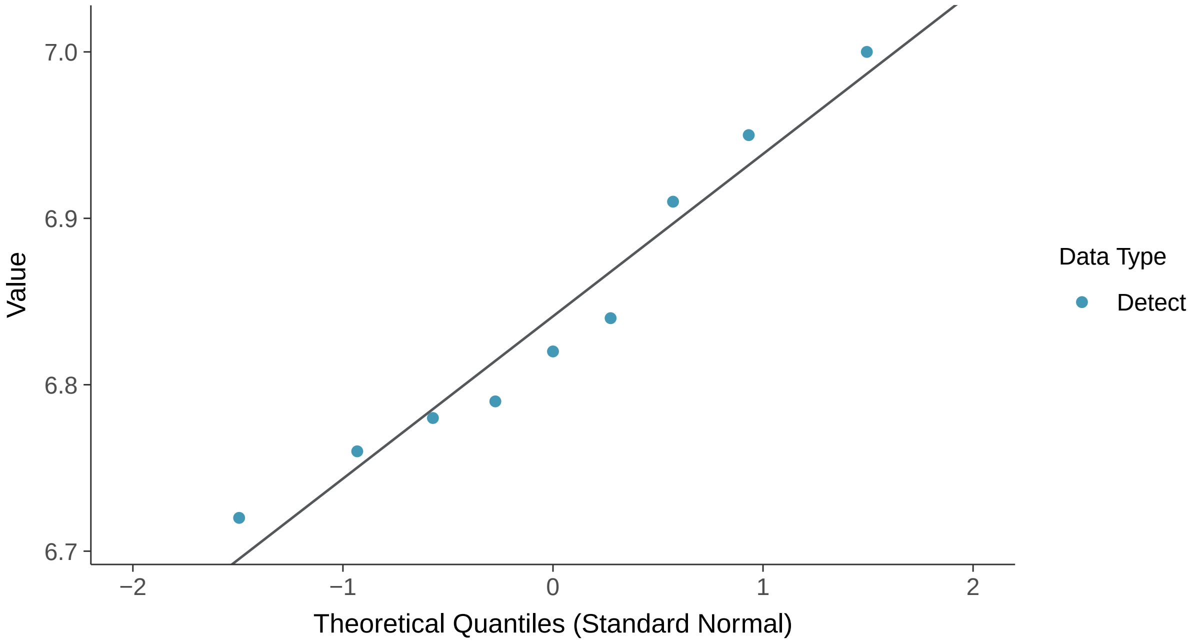
Boxplot by Season

pH, Field, MW-16A (su)



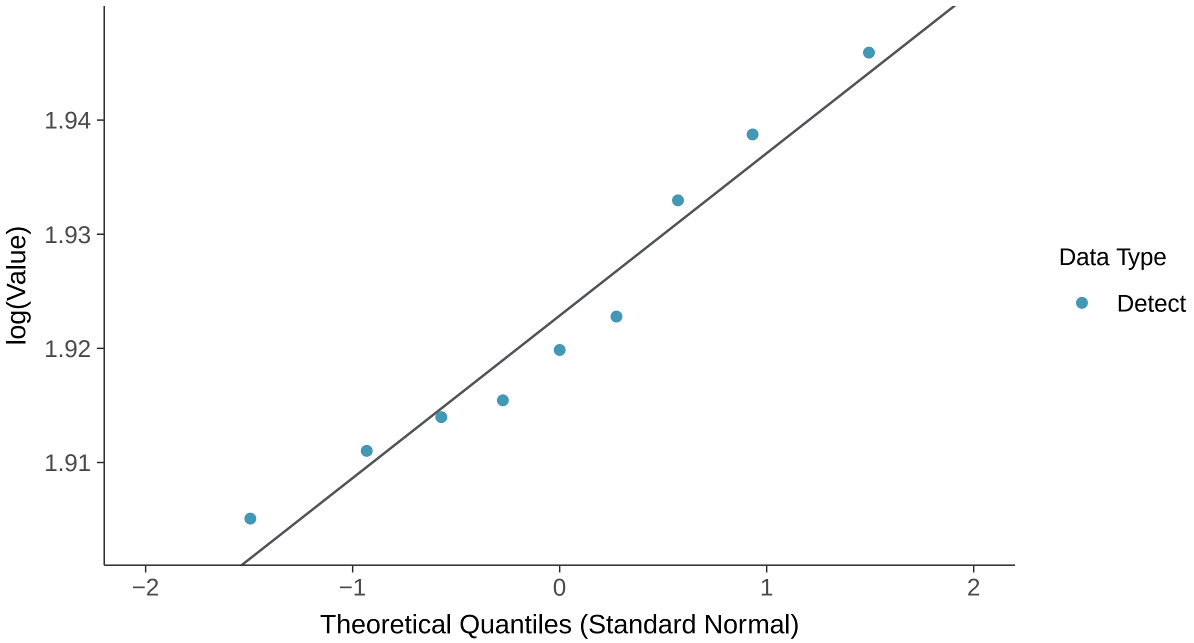
Normal Q-Q plot

pH, Field, MW-16A (su)



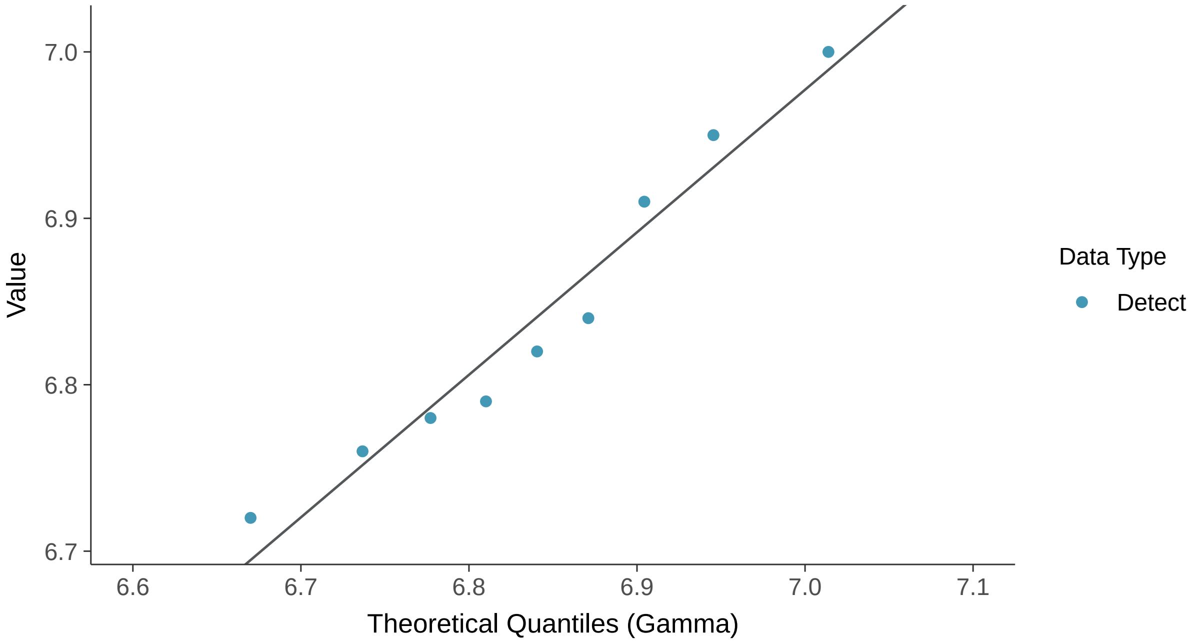
Lognormal Q-Q plot

pH, Field, MW-16A (su)



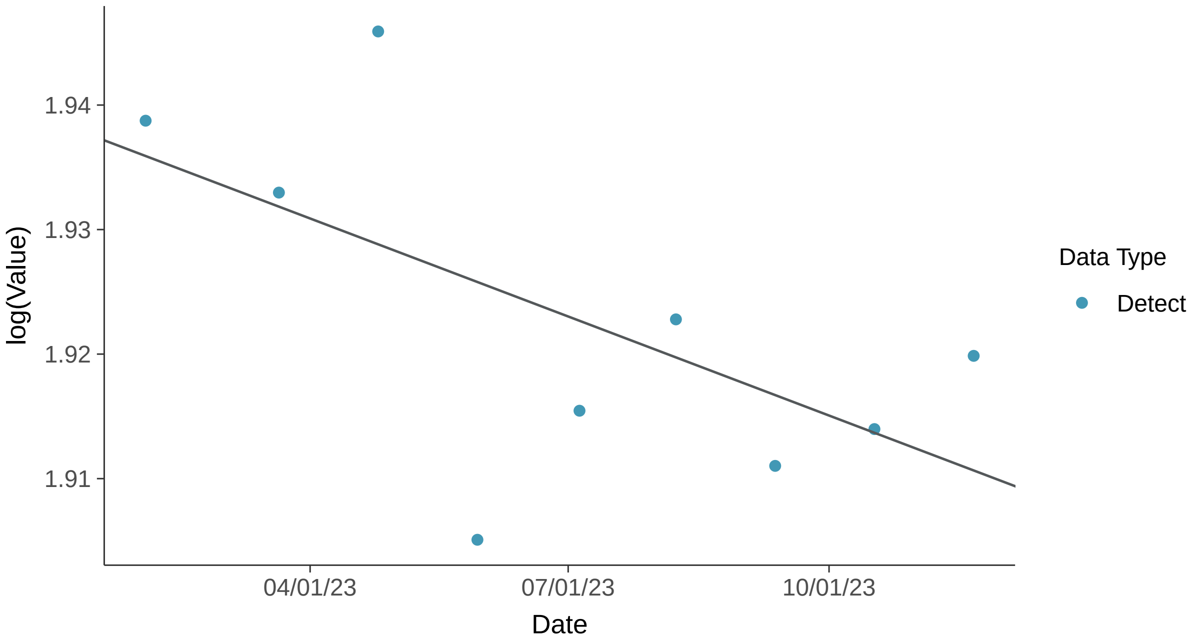
Gamma Q-Q plot

pH, Field, MW-16A (su)



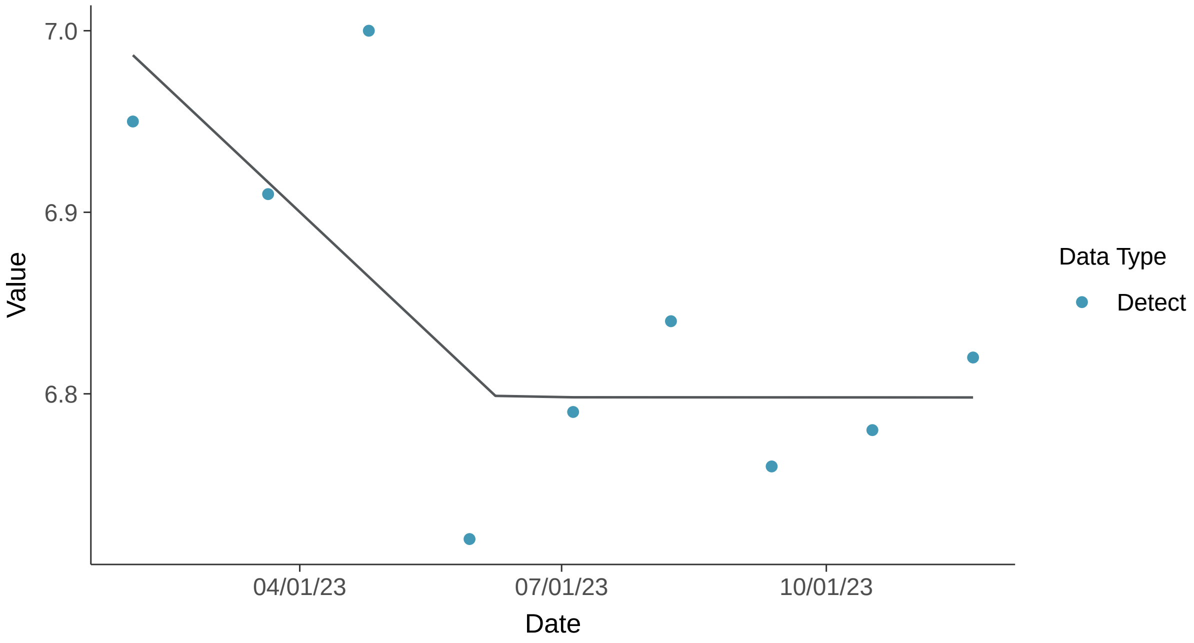
Trend Regression: Lognormal MLE

pH, Field, MW-16A (su)



Trend Regression: Piecewise Linear-Linear

pH, Field, MW-16A (su)

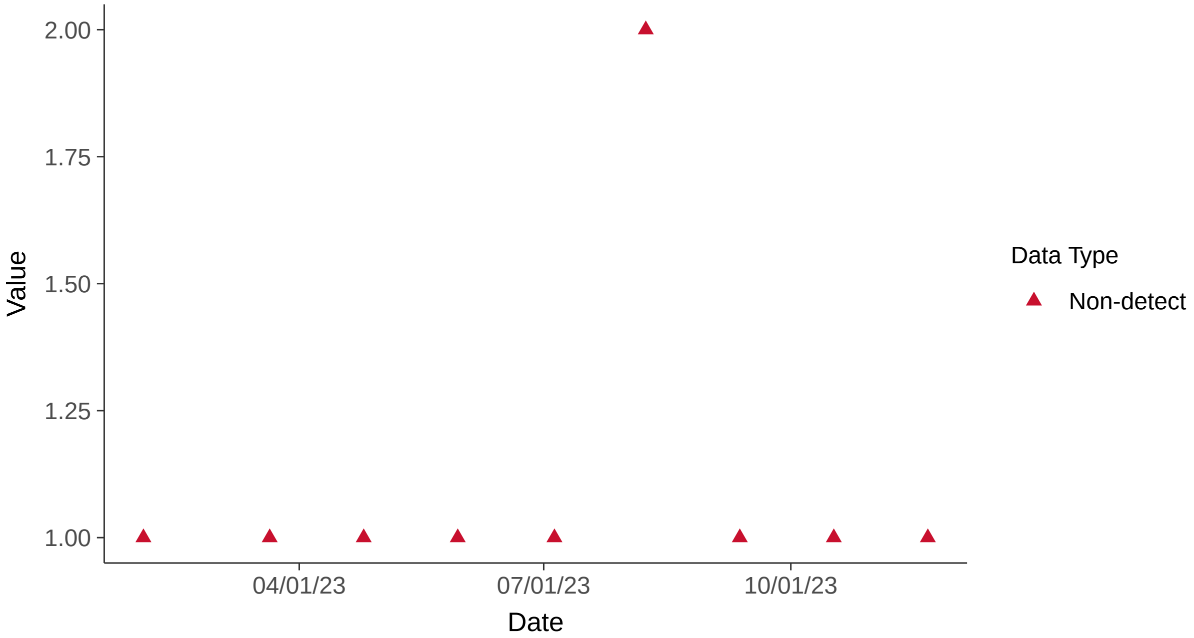


Appendix IV: Fluoride, MW-16A

ID: 16A_2_04

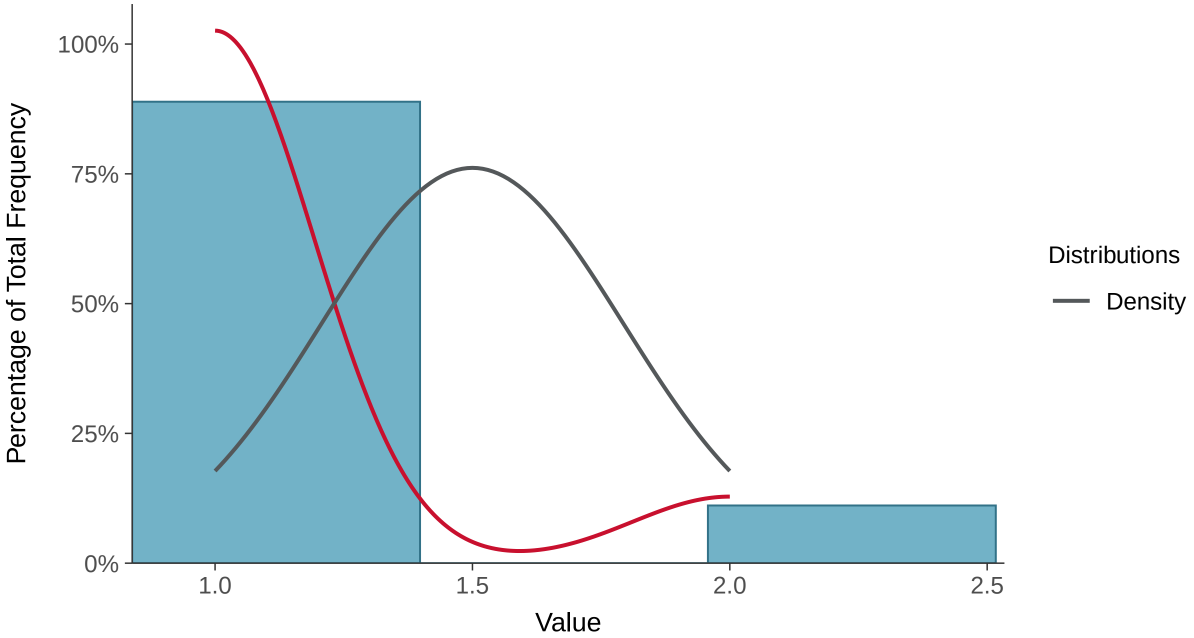
Scatter Plot

Fluoride, MW-16A (mg/L)



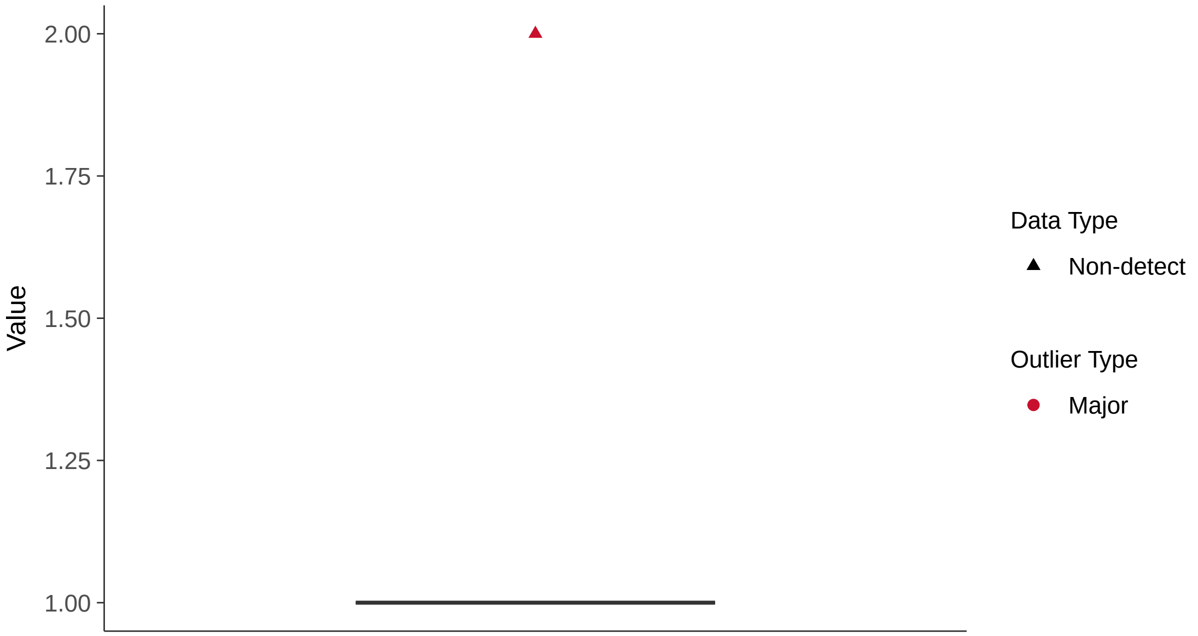
Histogram

Fluoride, MW-16A (mg/L)



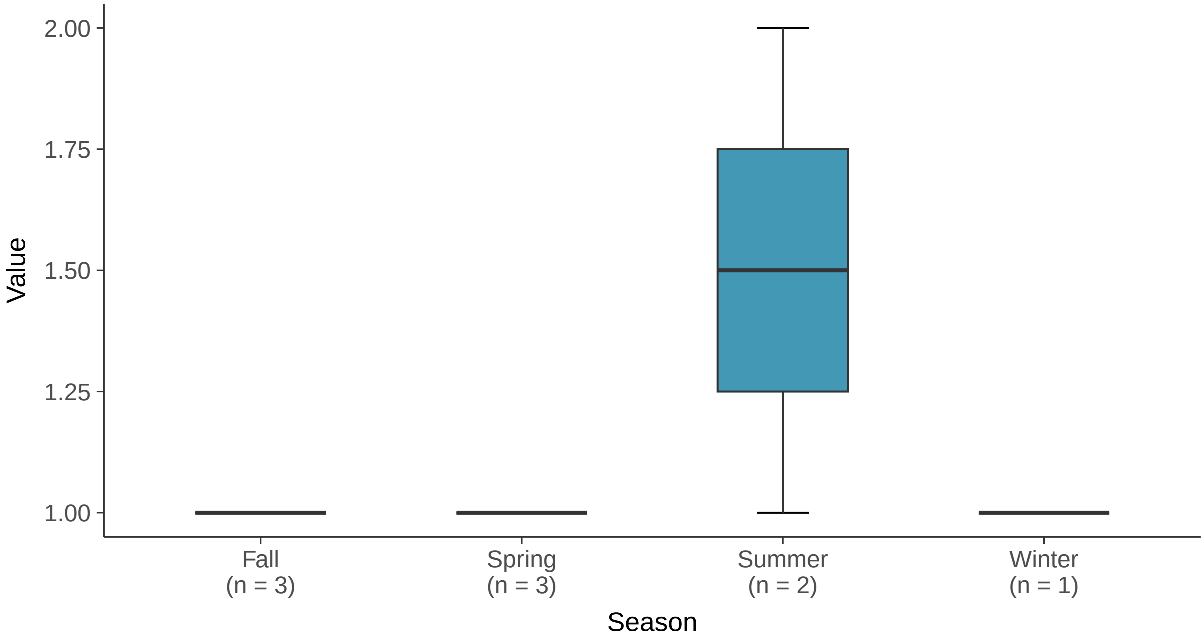
Boxplot

Fluoride, MW-16A (mg/L)



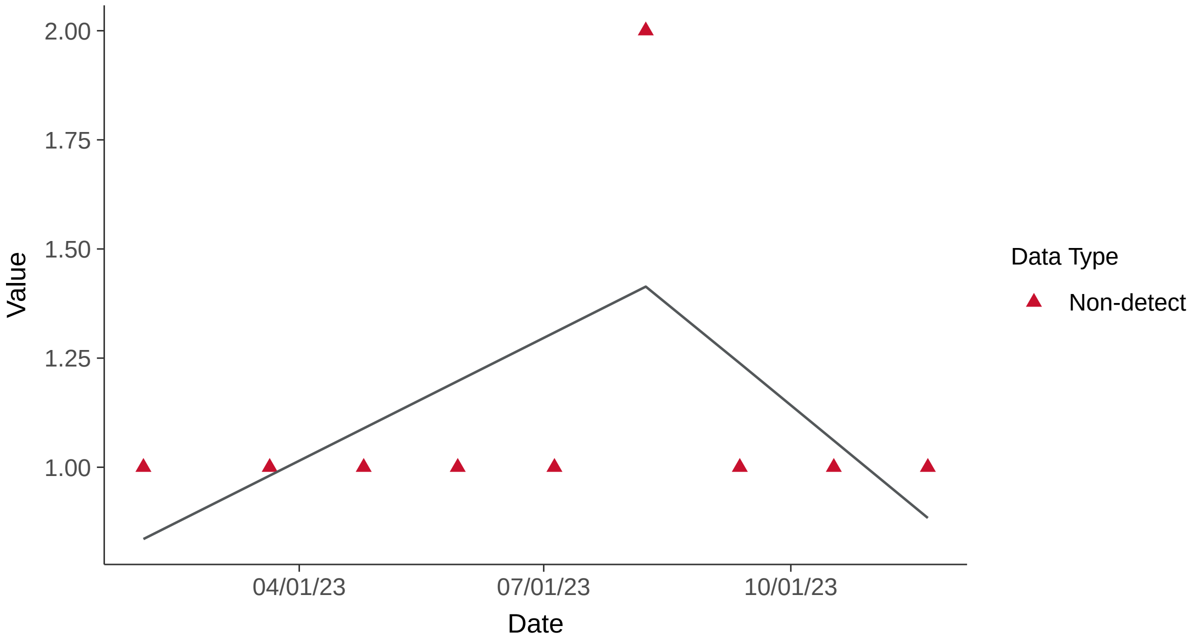
Boxplot by Season

Fluoride, MW-16A (mg/L)



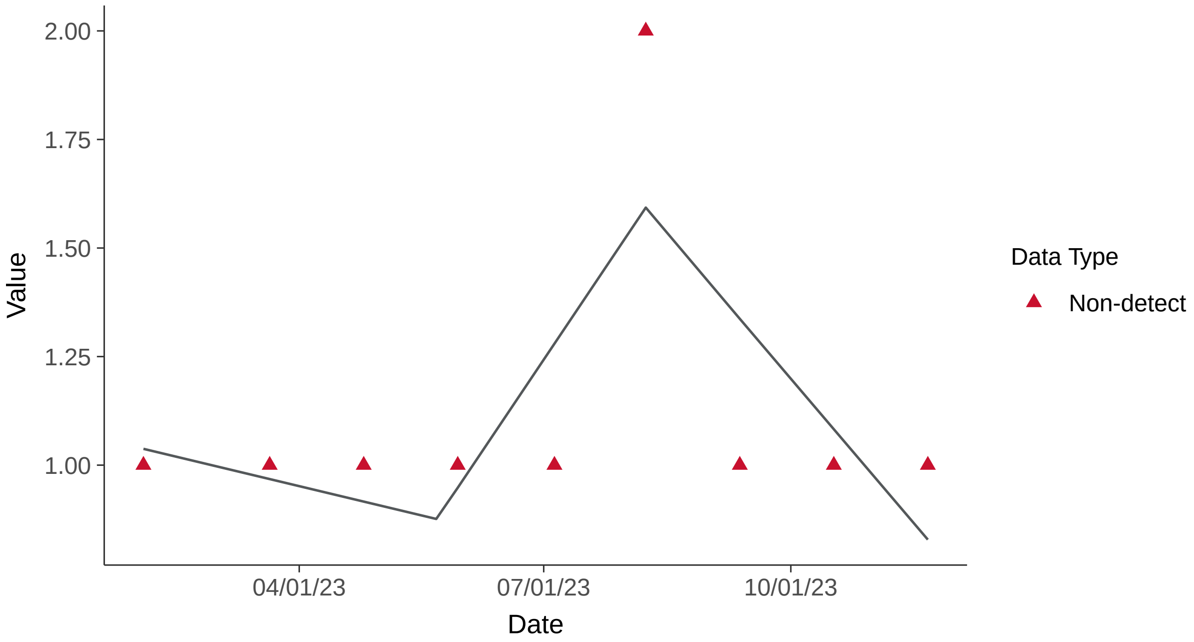
Trend Regression: Piecewise Linear-Linear

Fluoride, MW-16A (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Fluoride, MW-16A (mg/L)

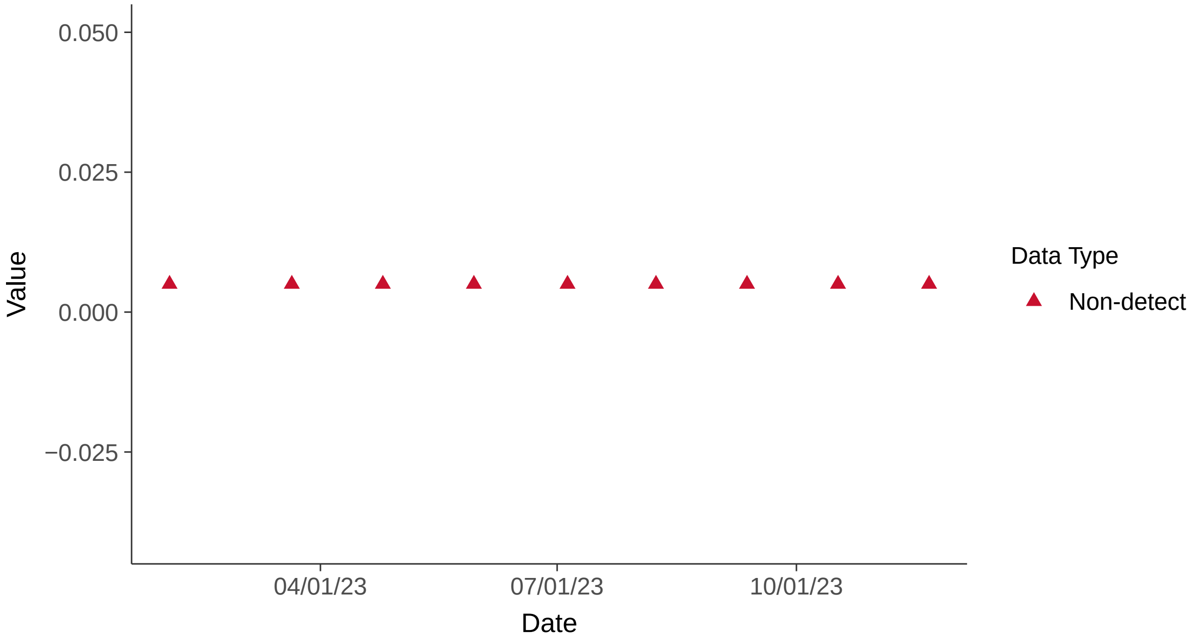


Appendix IV: Antimony, MW-16A

ID: 16A_2_08

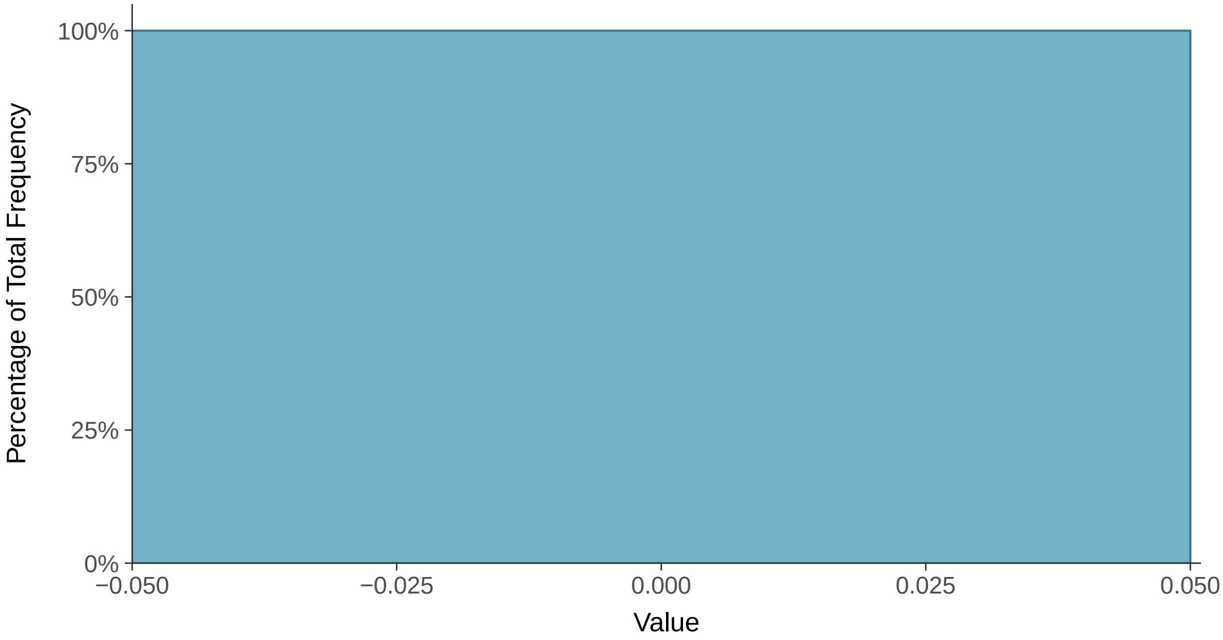
Scatter Plot

Antimony, MW-16A (mg/L)



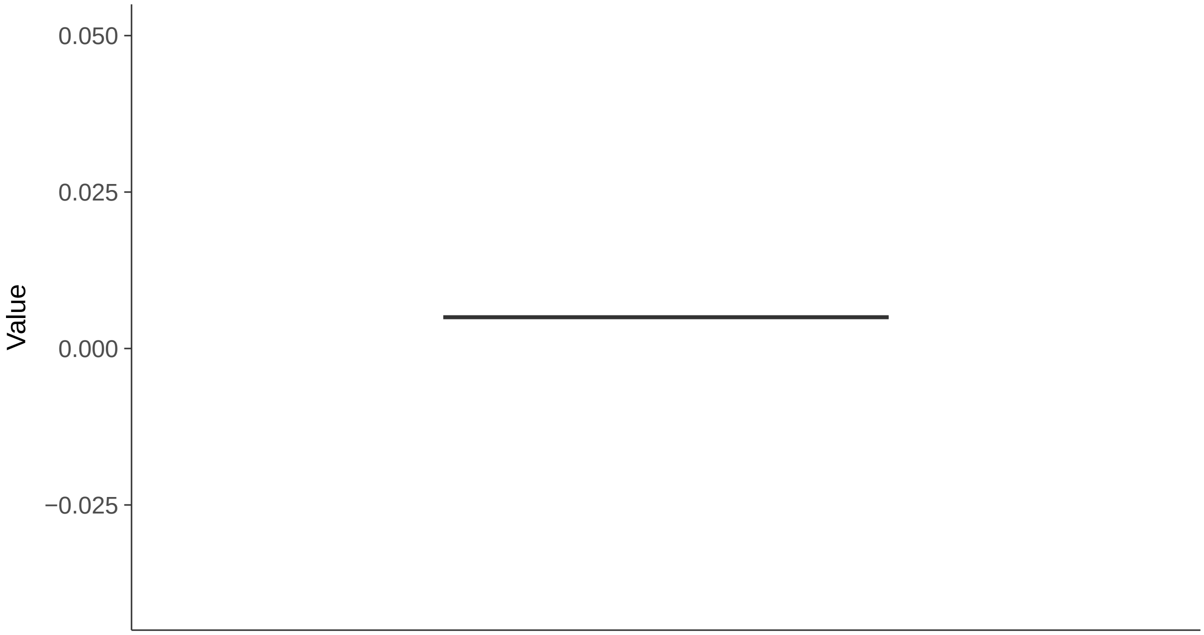
Histogram

Antimony, MW-16A (mg/L)



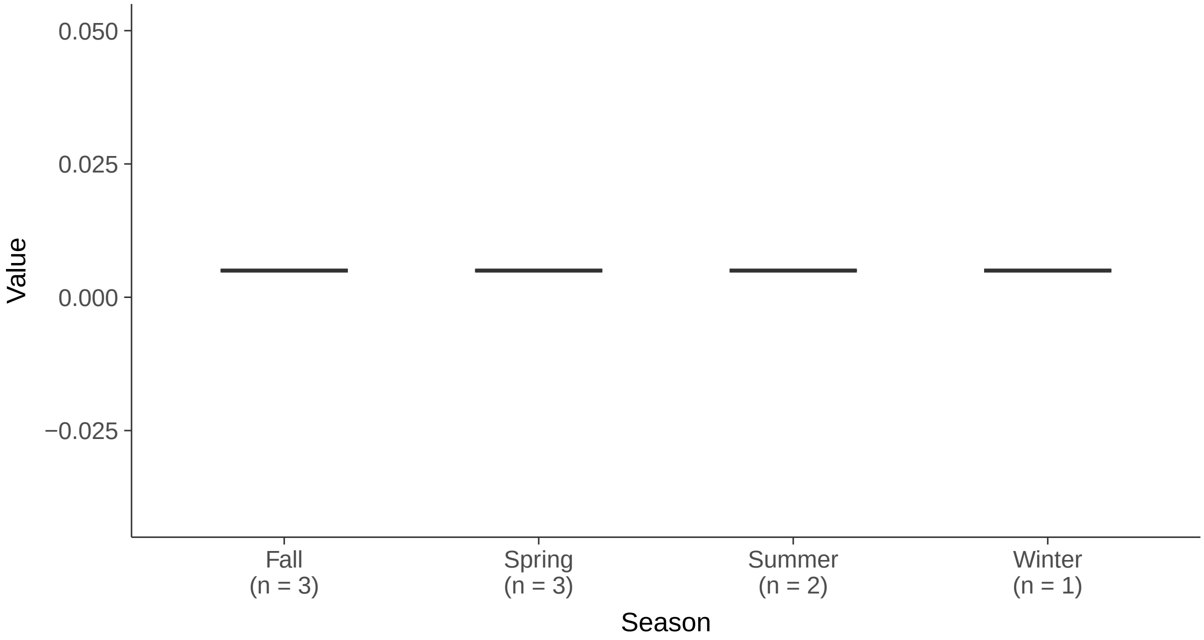
Boxplot

Antimony, MW-16A (mg/L)



Boxplot by Season

Antimony, MW-16A (mg/L)

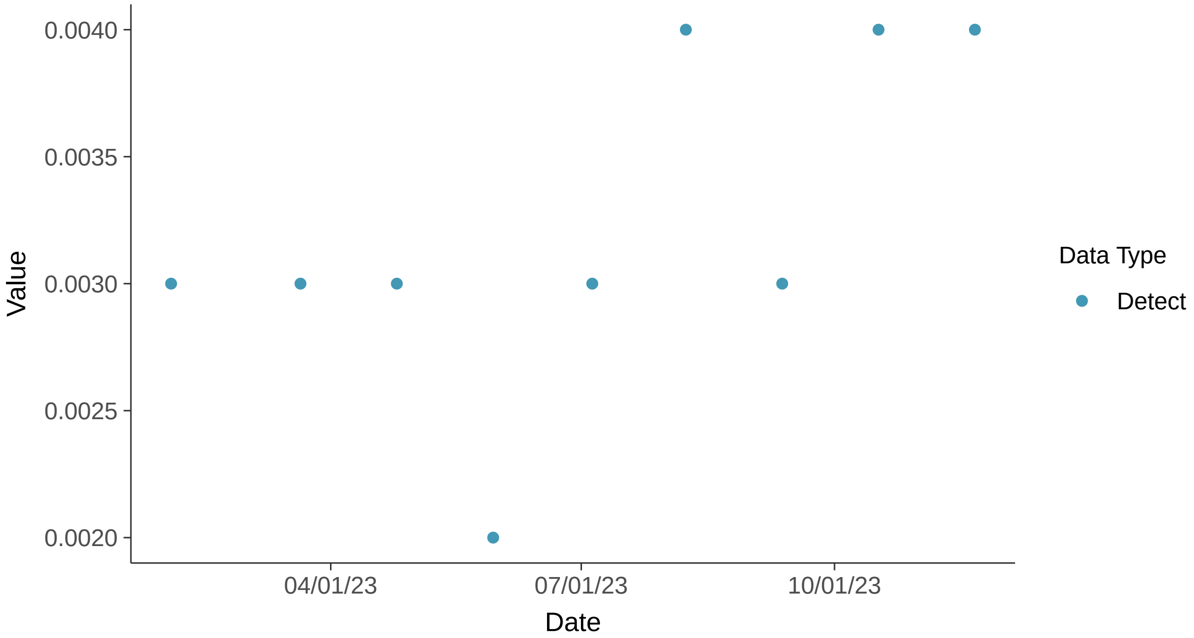


Appendix IV: Arsenic, MW-16A

ID: 16A_2_09

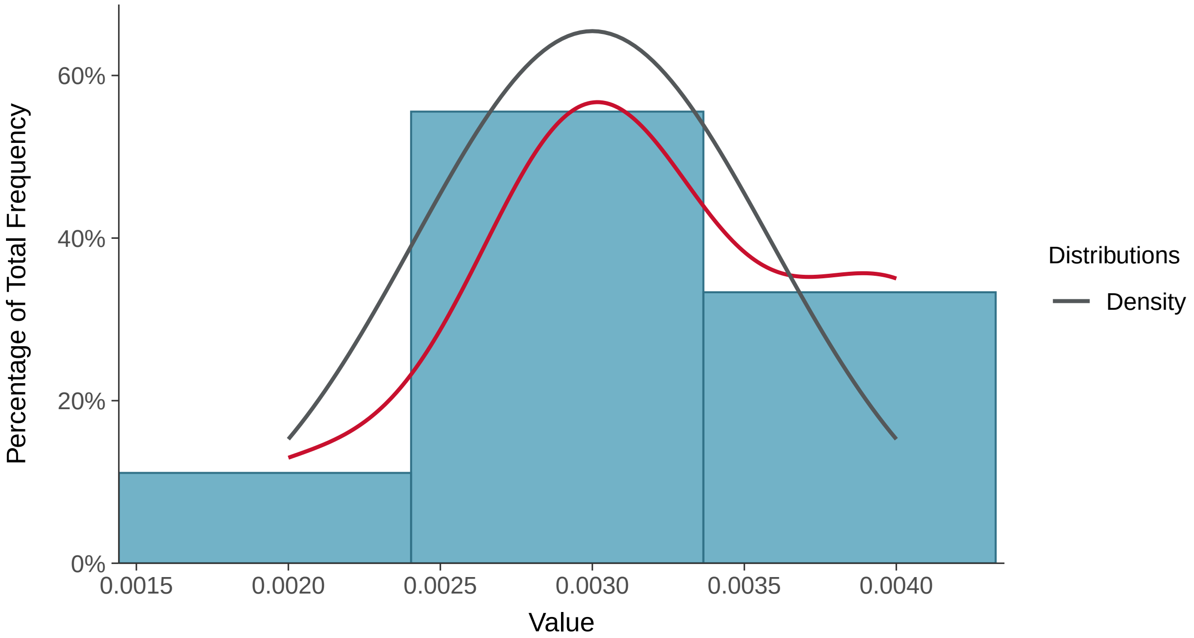
Scatter Plot

Arsenic, MW-16A (mg/L)



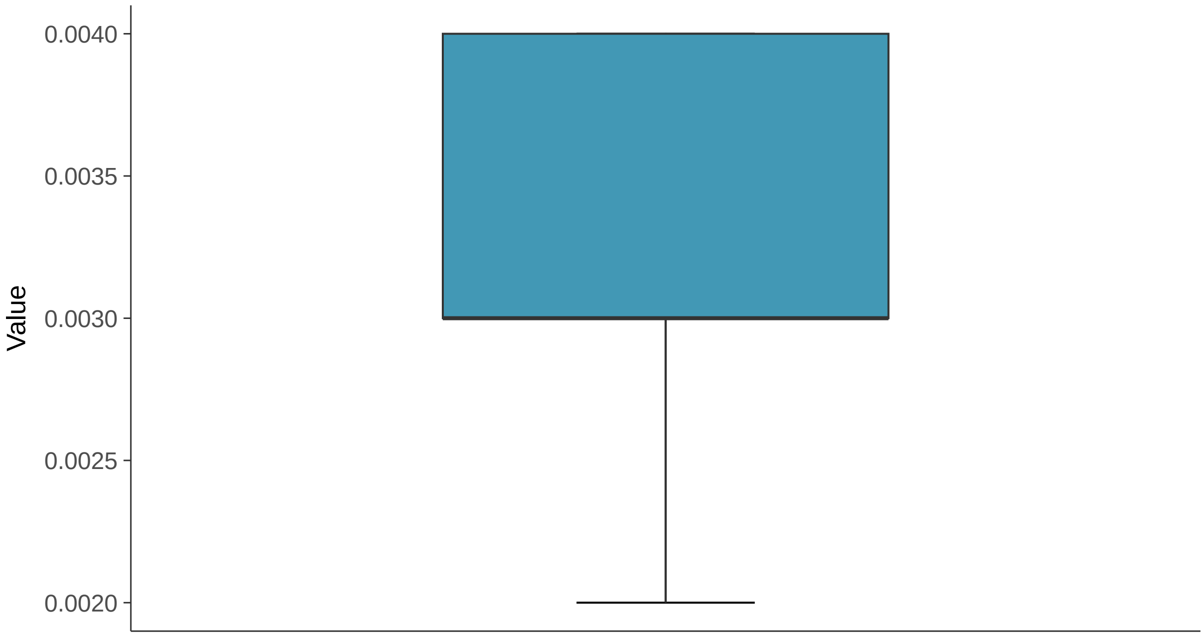
Histogram

Arsenic, MW-16A (mg/L)



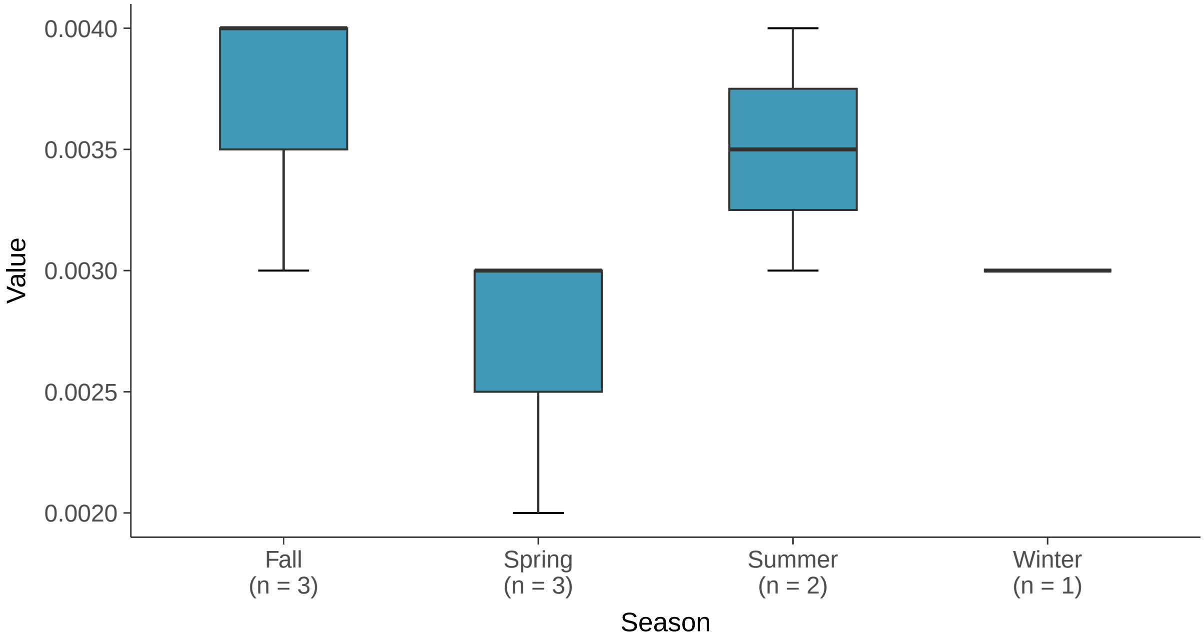
Boxplot

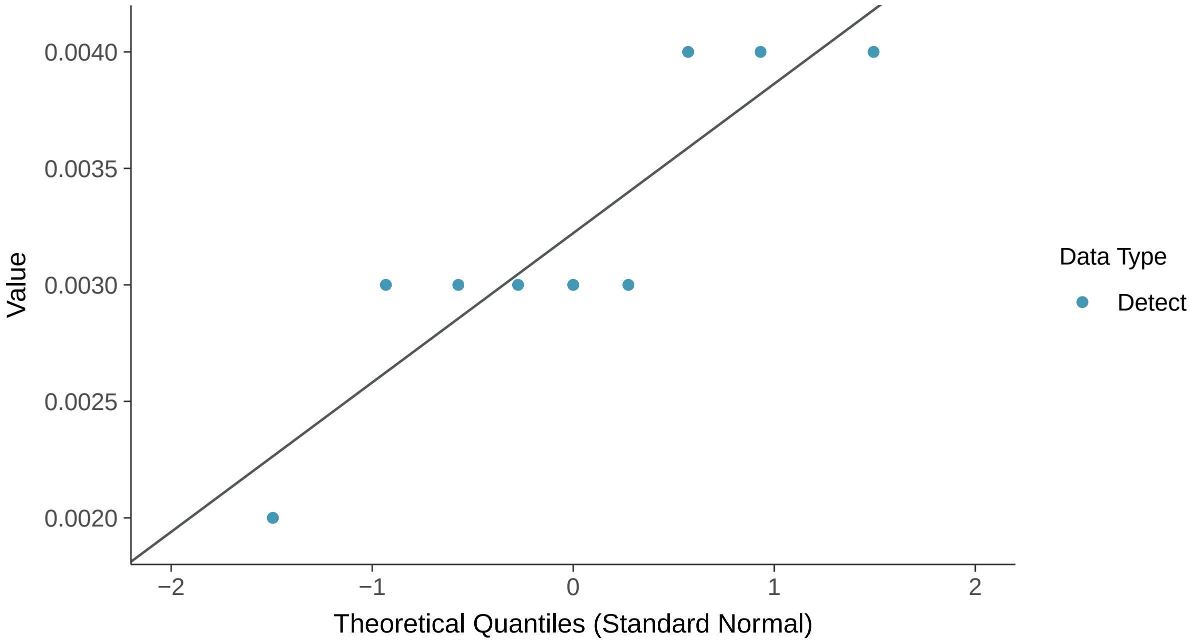
Arsenic, MW-16A (mg/L)



Boxplot by Season

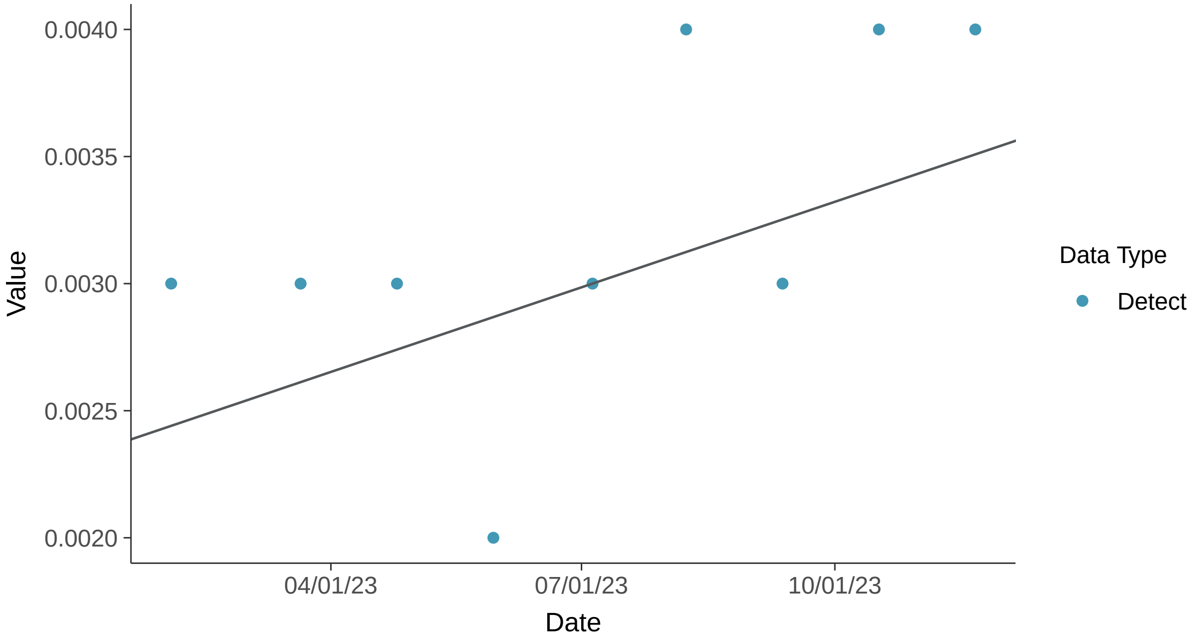
Arsenic, MW-16A (mg/L)





Normal Q-Q plot

Arsenic, MW-16A (mg/L)

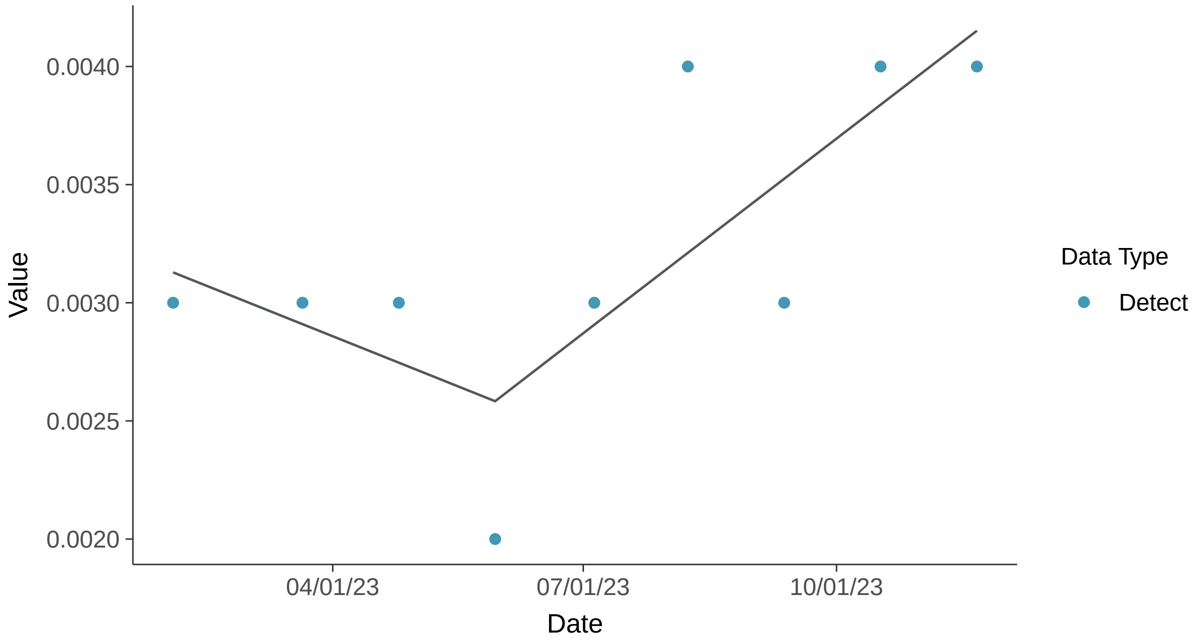


Trend Regression: Mann-Kendall/Theil-Sen Estimate

Arsenic, MW-16A (mg/L)

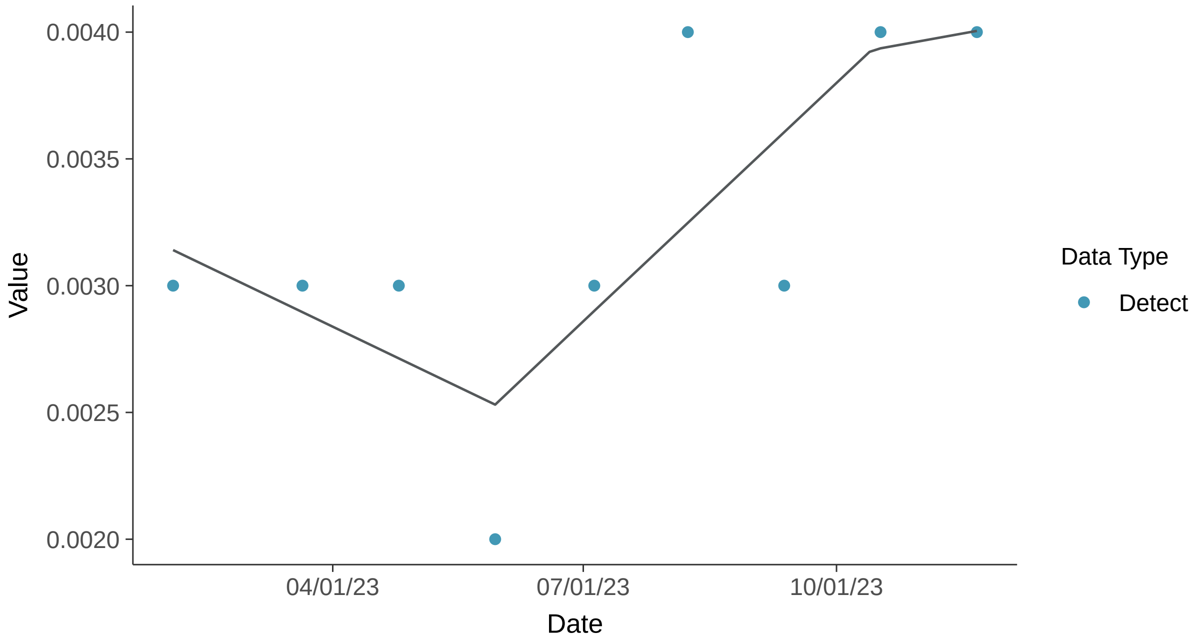
Trend Regression: Piecewise Linear-Linear

Arsenic, MW-16A (mg/L)



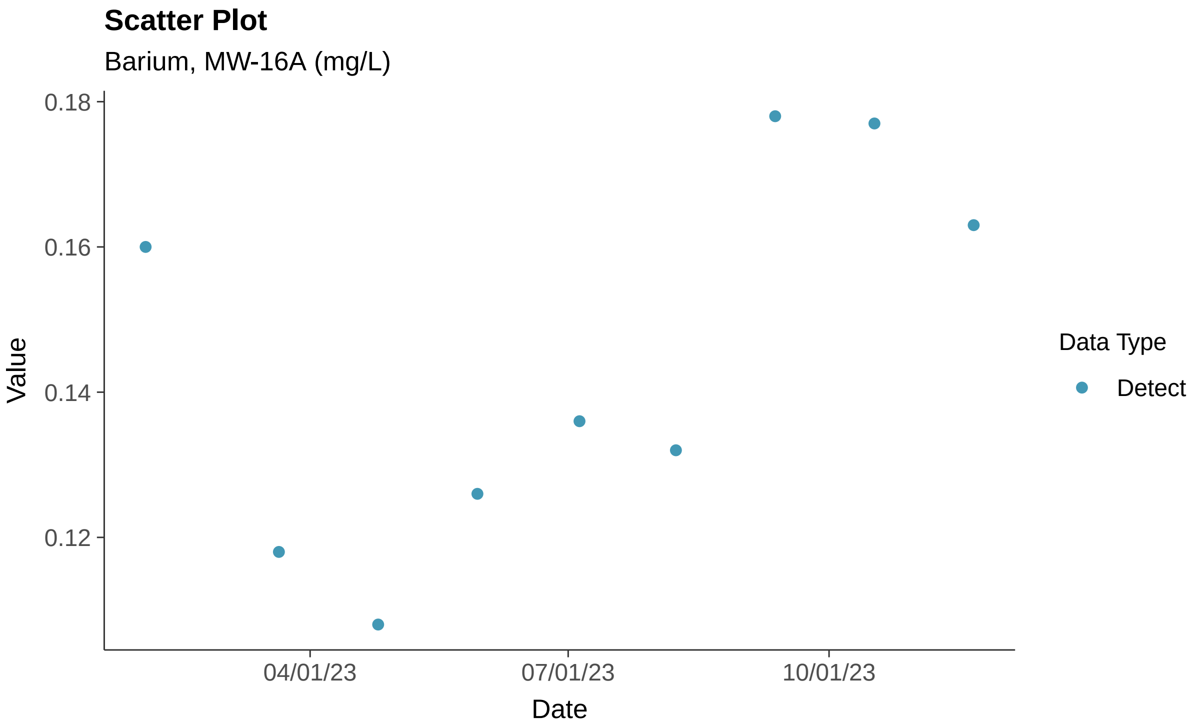
Trend Regression: Piecewise Linear-Linear-Linear

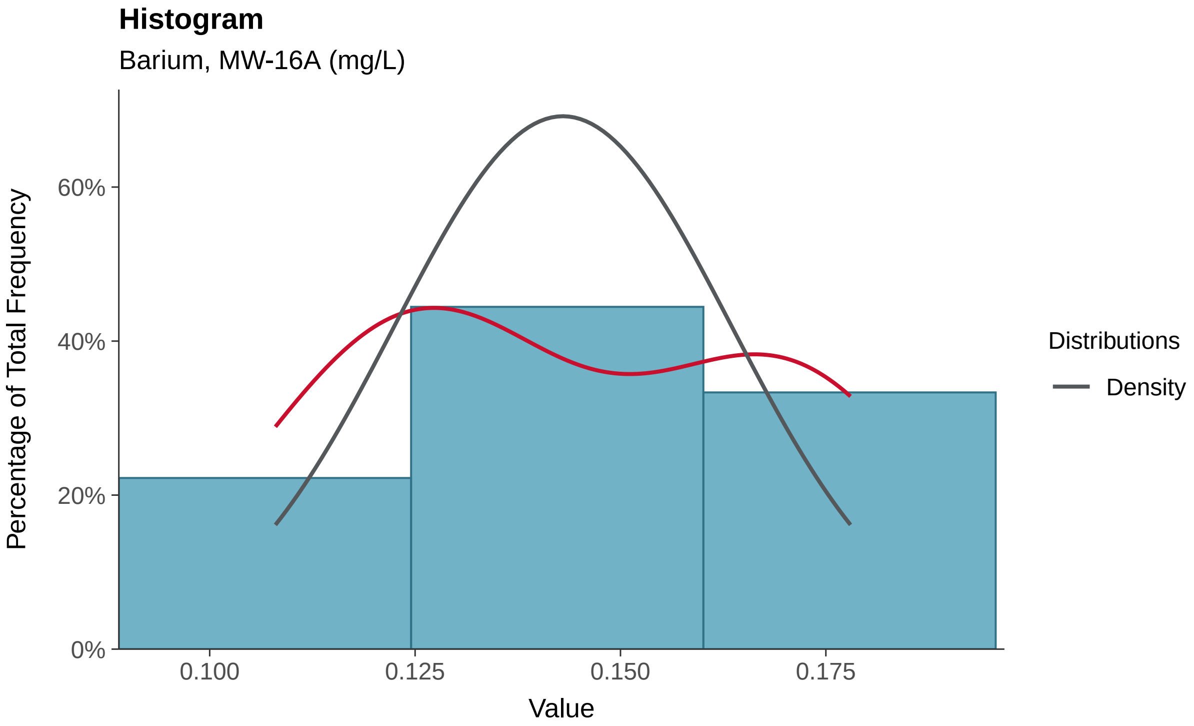
Arsenic, MW-16A (mg/L)



Appendix IV: Barium, MW-16A

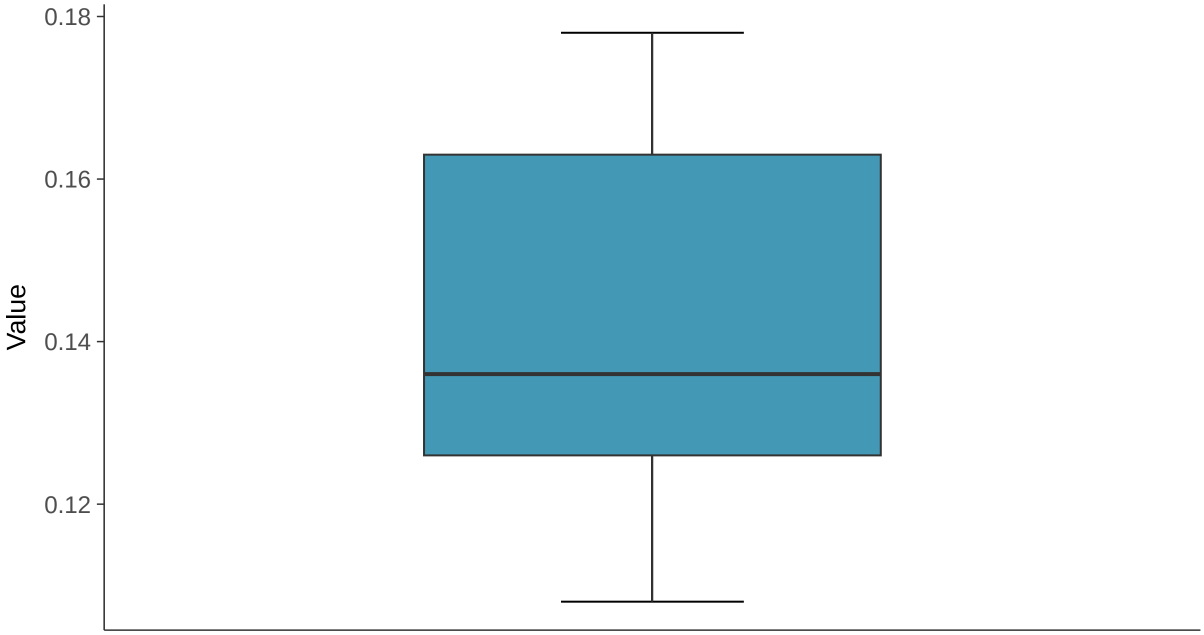
ID: 16A_2_10





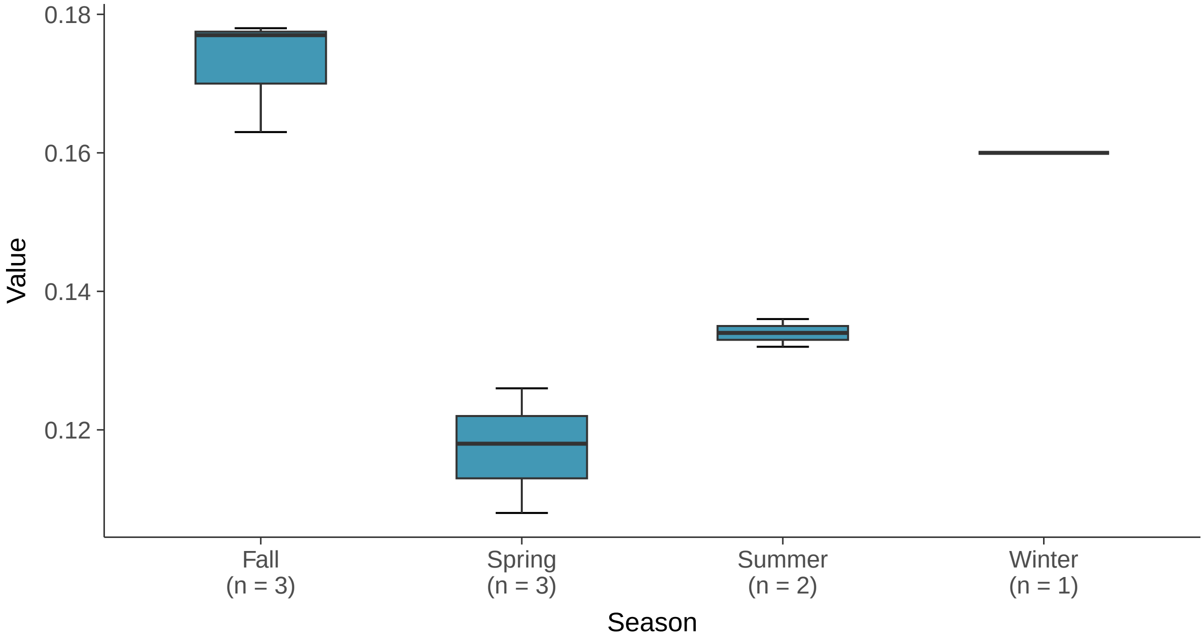
Boxplot

Barium, MW-16A (mg/L)



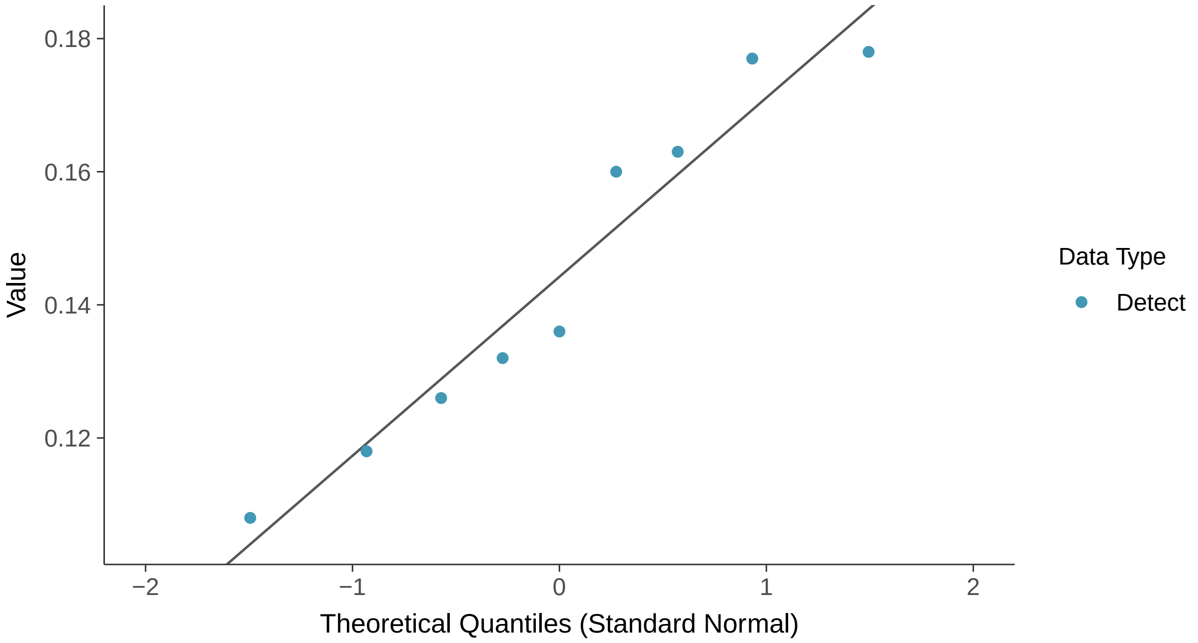
Boxplot by Season

Barium, MW-16A (mg/L)



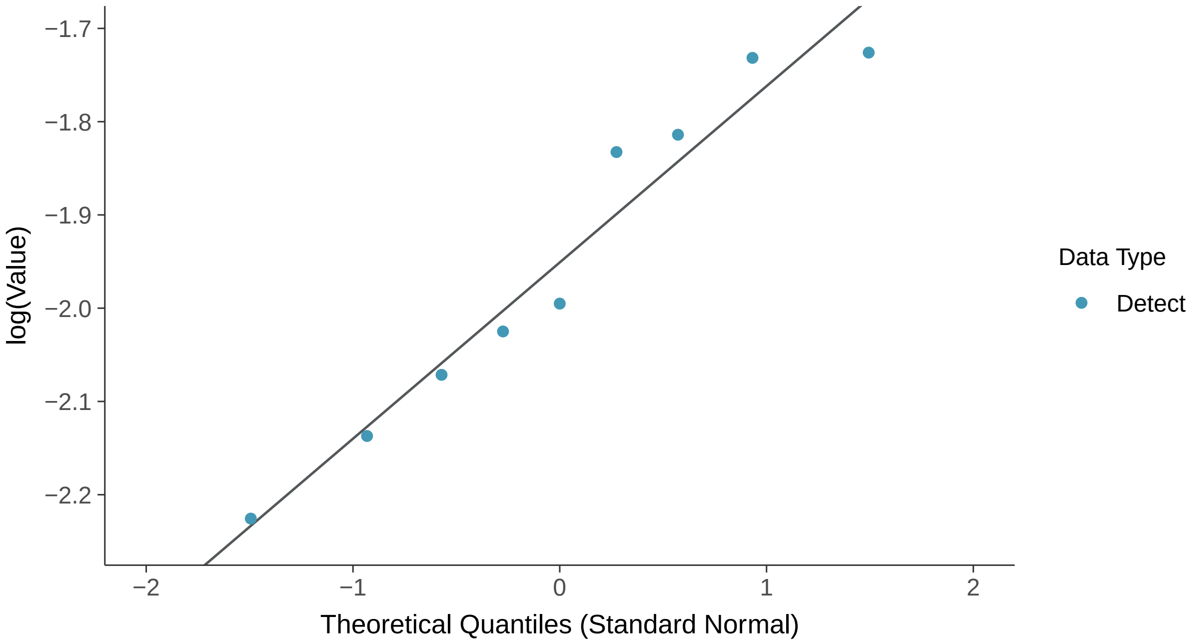
Normal Q-Q plot

Barium, MW-16A (mg/L)



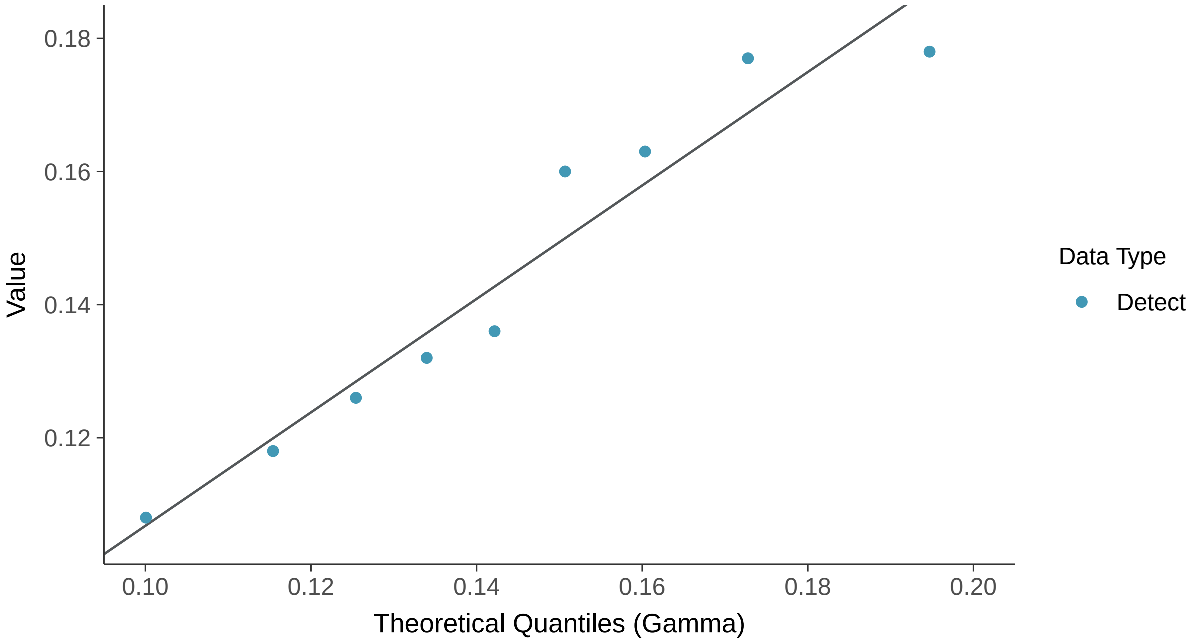
Lognormal Q-Q plot

Barium, MW-16A (mg/L)



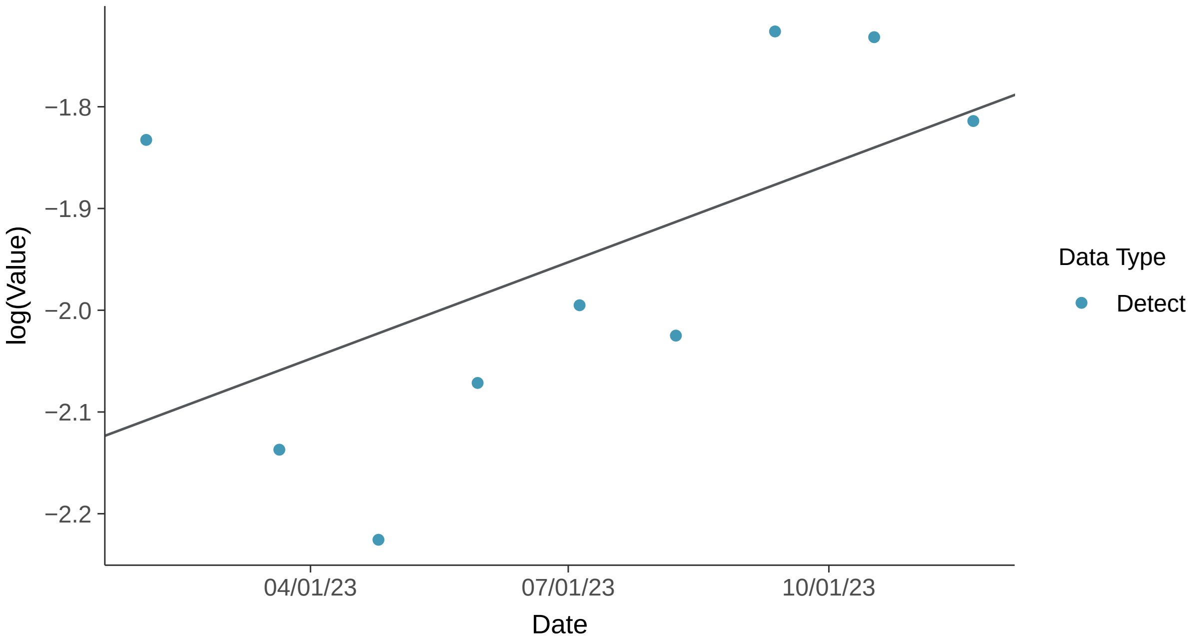
Gamma Q-Q plot

Barium, MW-16A (mg/L)



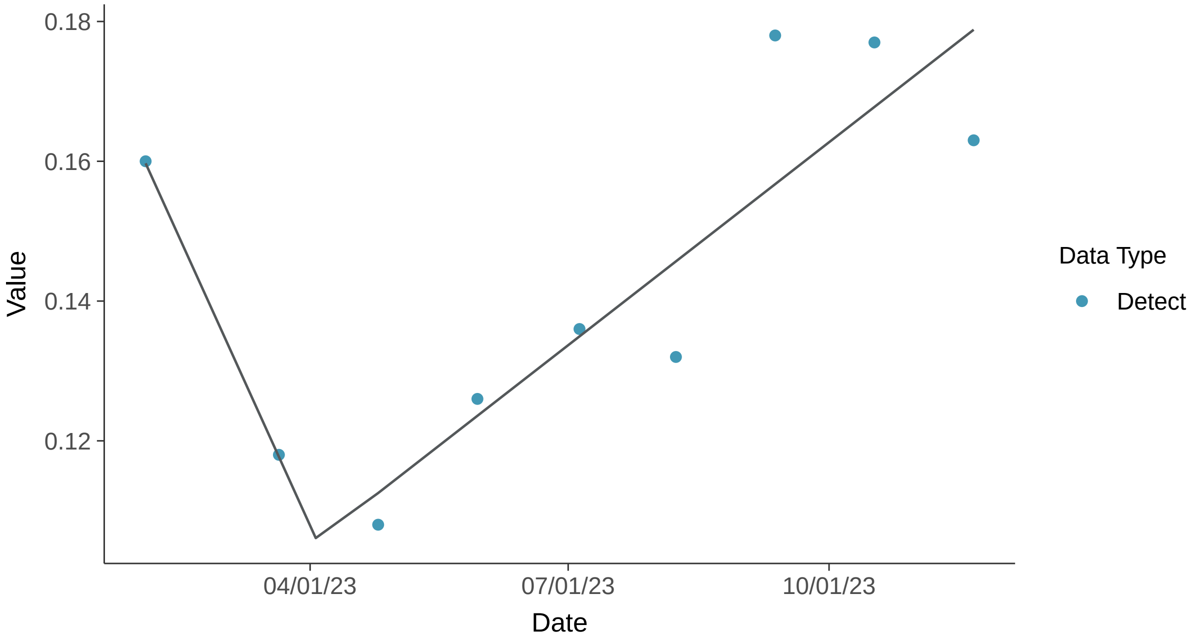
Trend Regression: Lognormal MLE

Barium, MW-16A (mg/L)



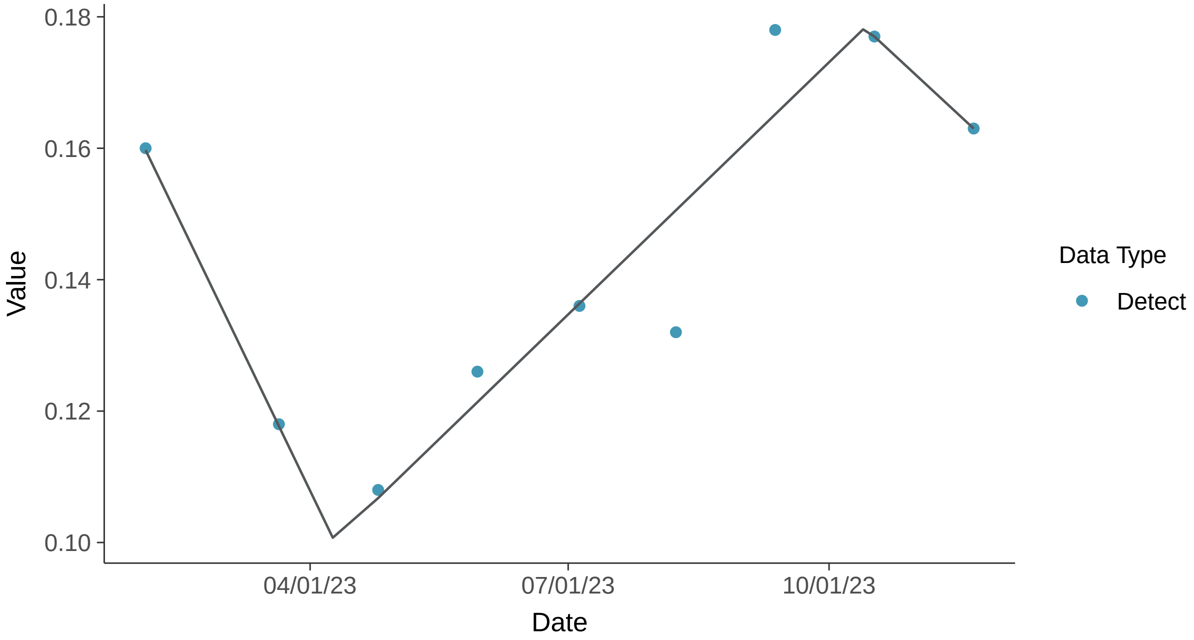
Trend Regression: Piecewise Linear-Linear

Barium, MW-16A (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Barium, MW-16A (mg/L)

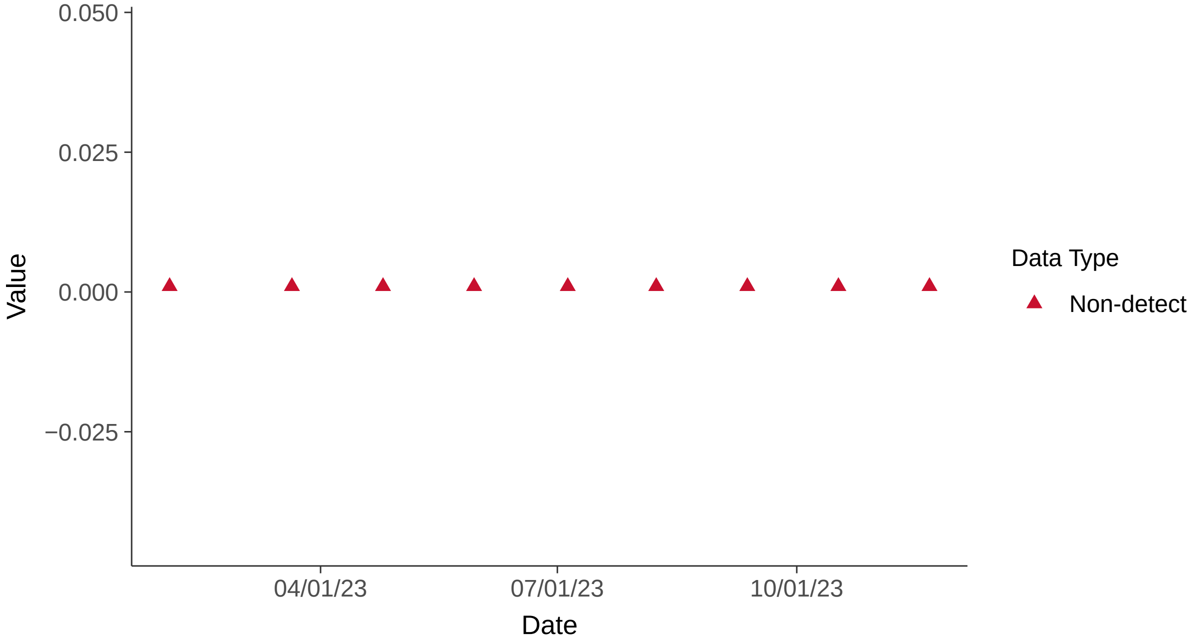


Appendix IV: Beryllium, MW-16A

ID: 16A_2_11

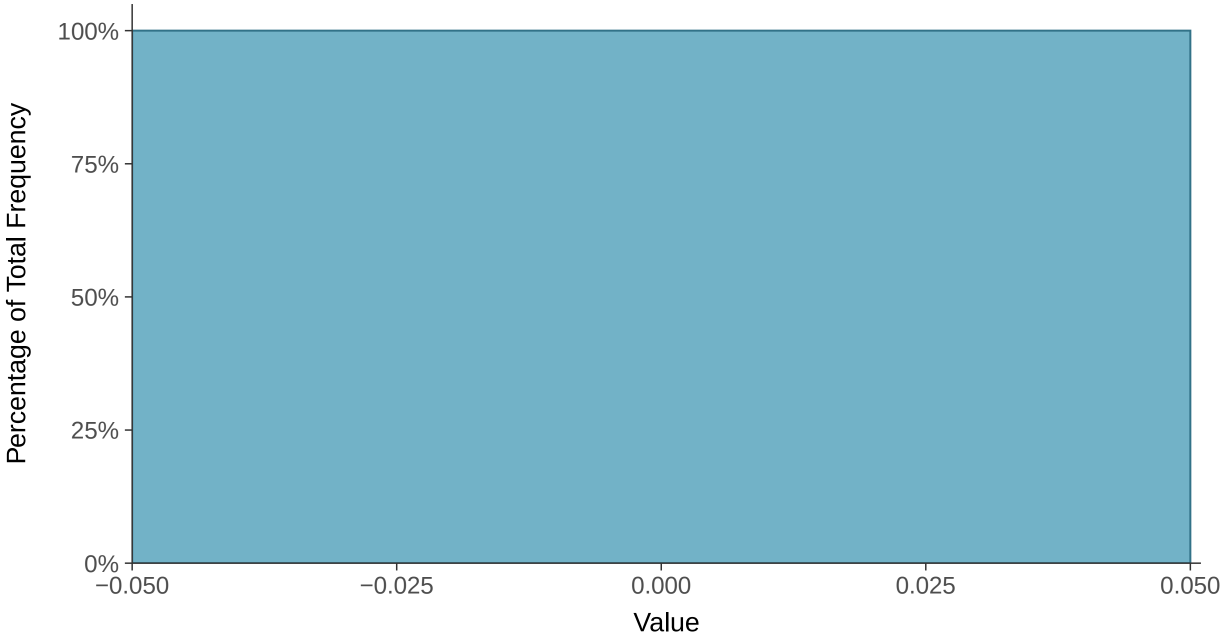
Scatter Plot

Beryllium, MW-16A (mg/L)



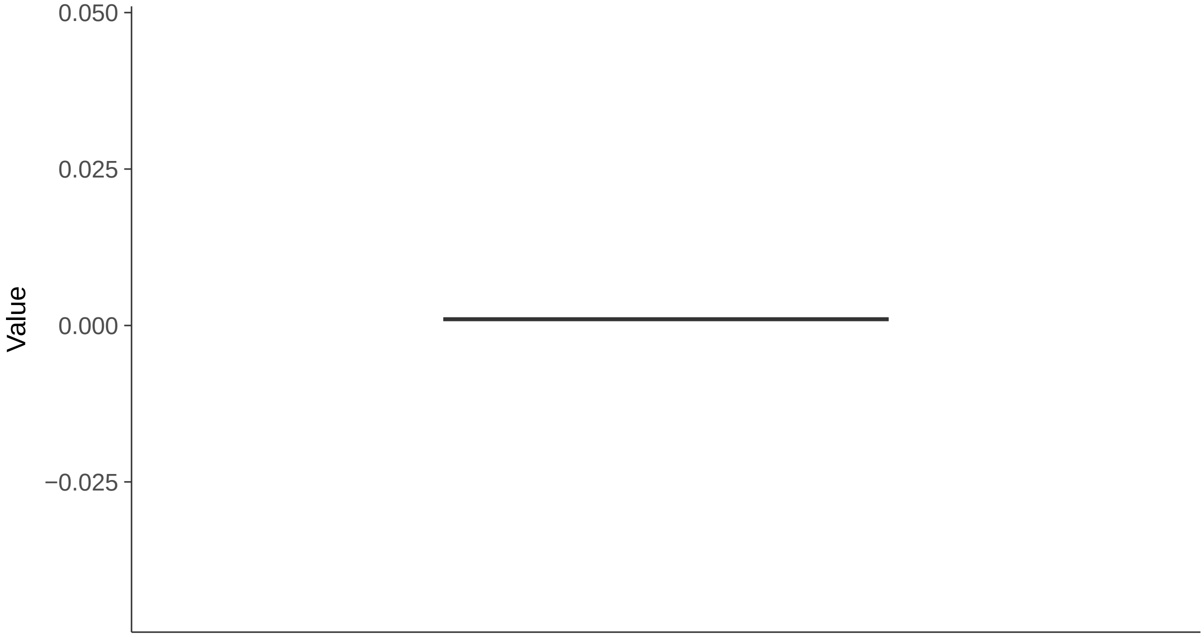
Histogram

Beryllium, MW-16A (mg/L)



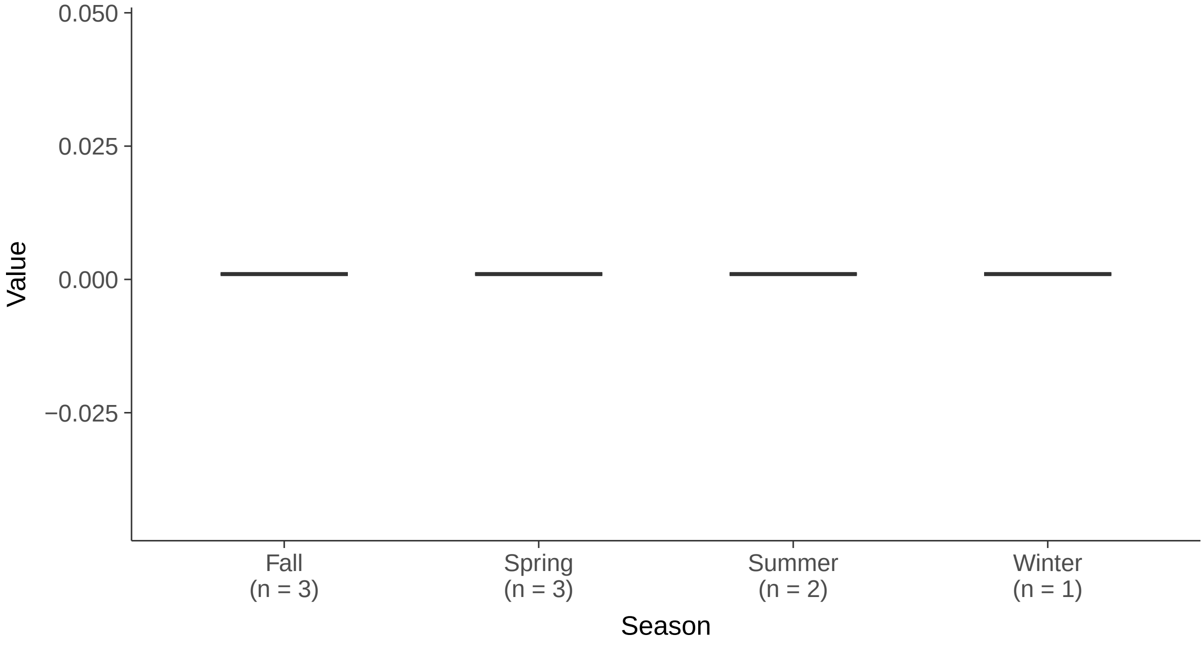
Boxplot

Beryllium, MW-16A (mg/L)



Boxplot by Season

Beryllium, MW-16A (mg/L)

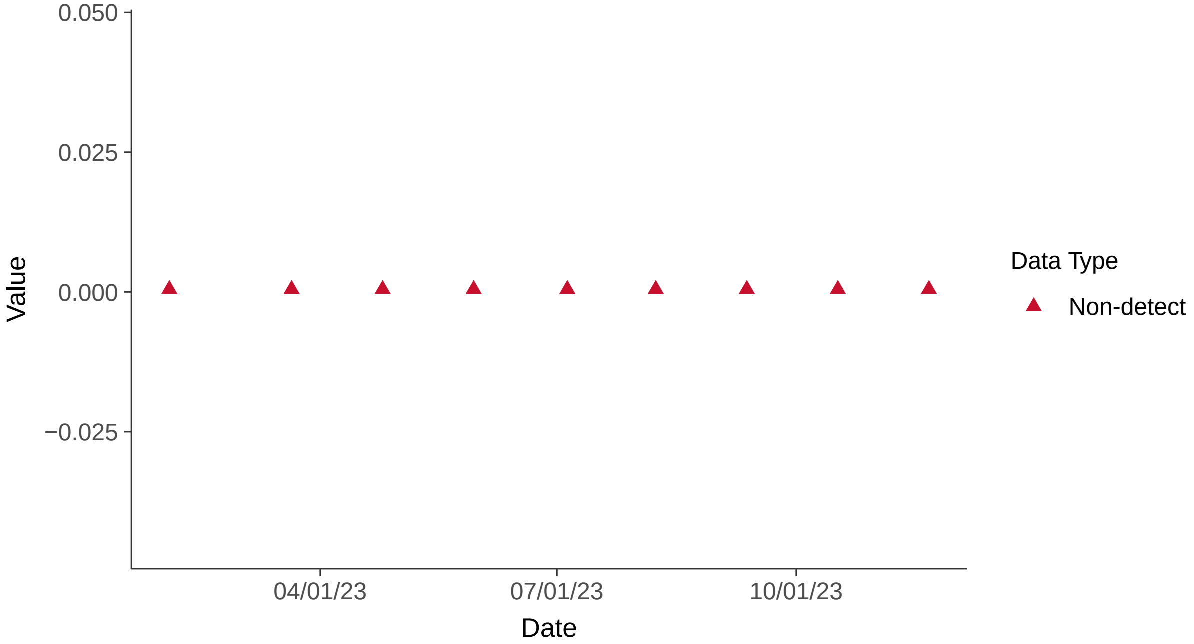


Appendix IV: Cadmium, MW-16A

ID: 16A_2_12

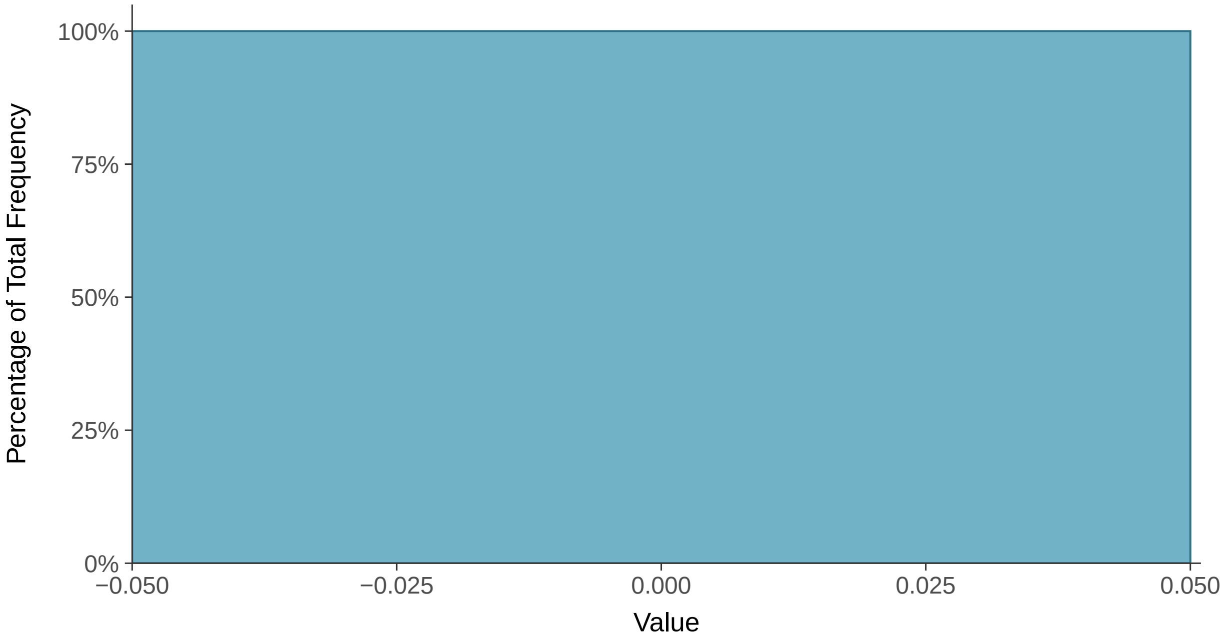
Scatter Plot

Cadmium, MW-16A (mg/L)



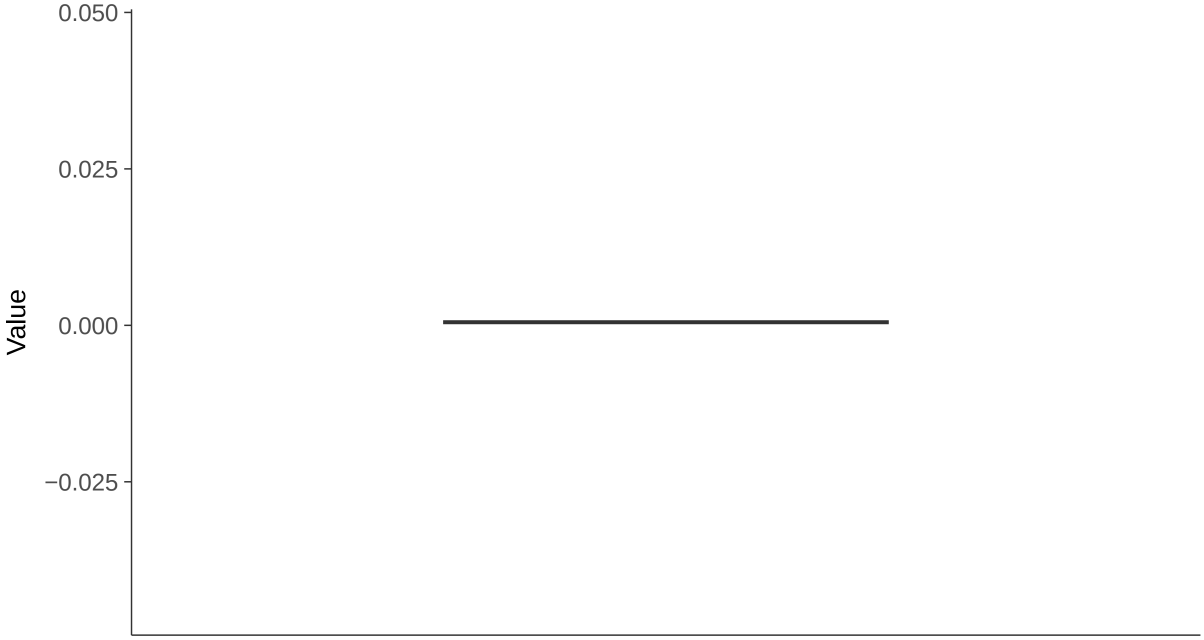
Histogram

Cadmium, MW-16A (mg/L)



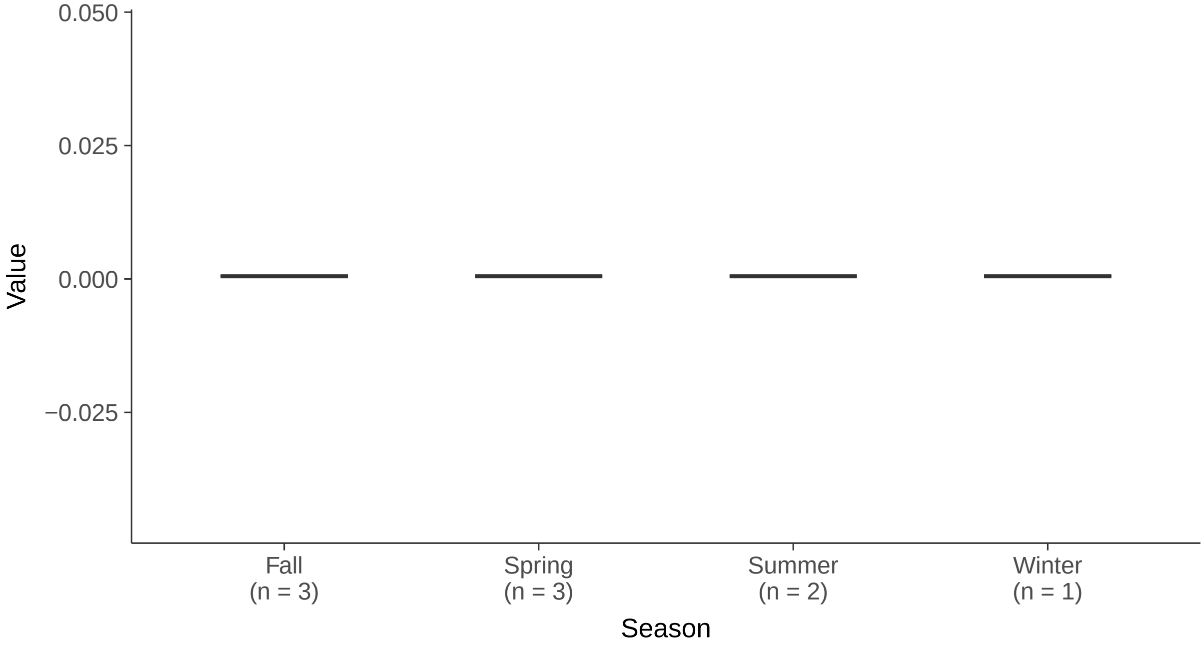
Boxplot

Cadmium, MW-16A (mg/L)



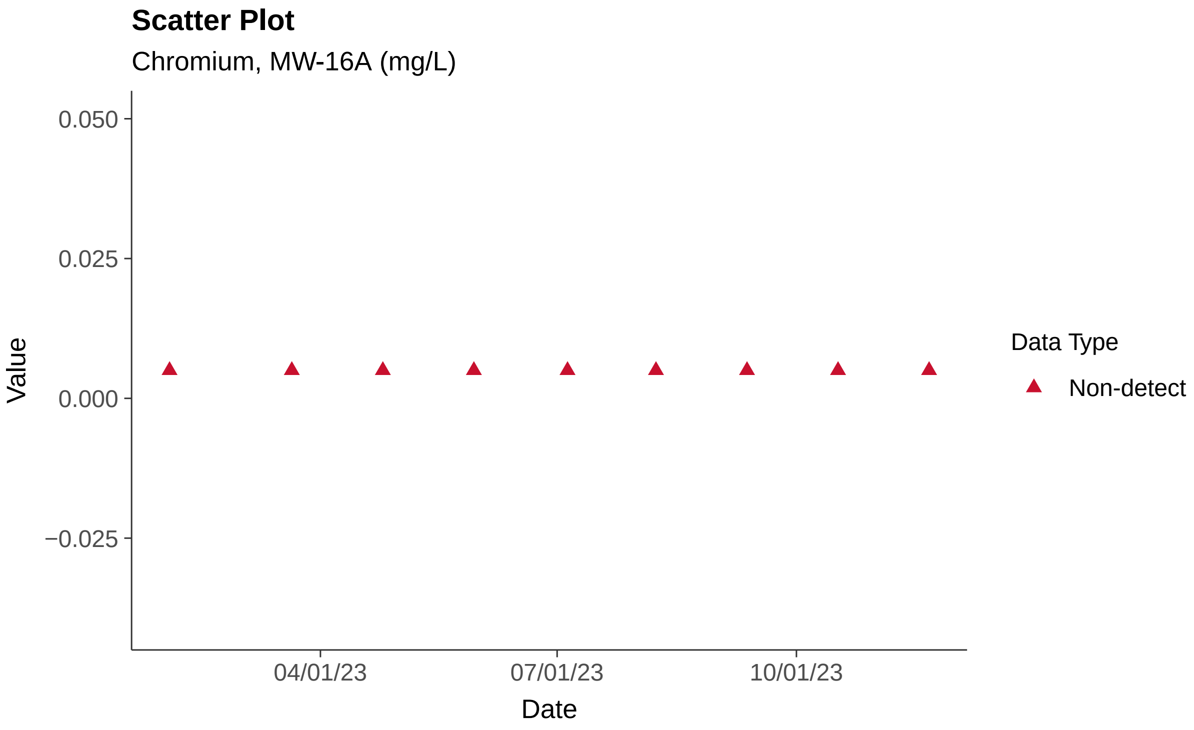
Boxplot by Season

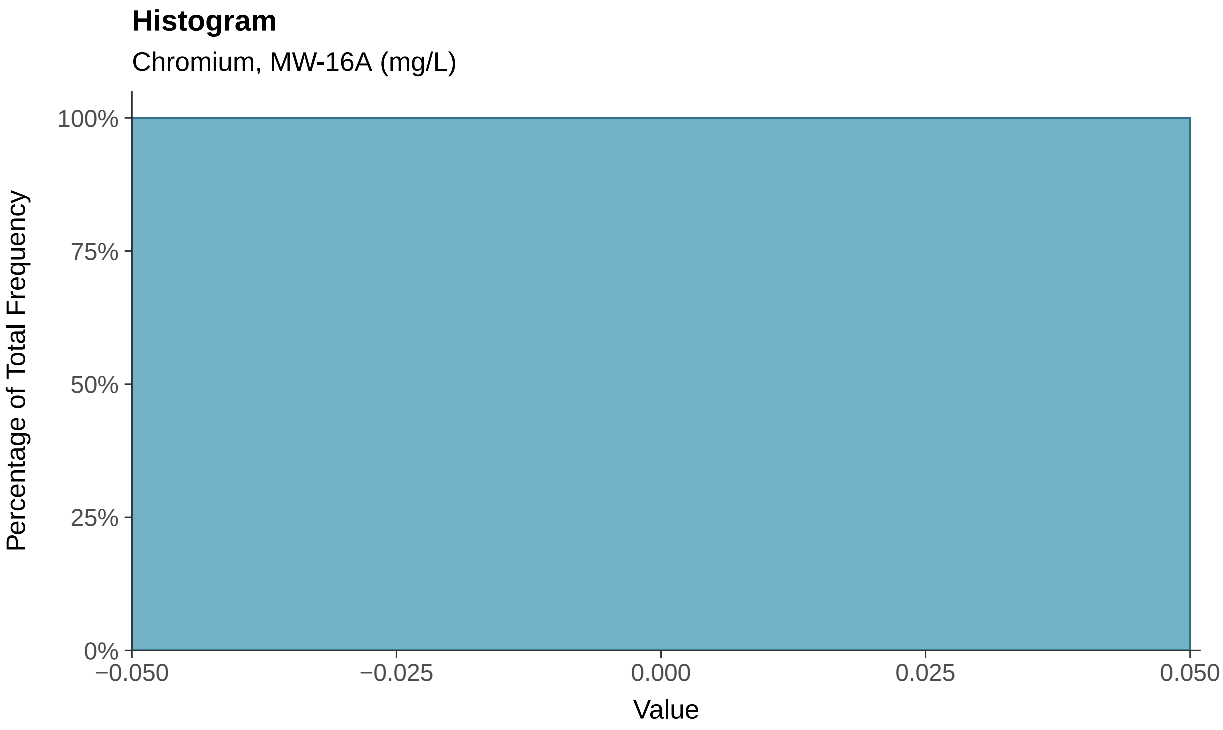
Cadmium, MW-16A (mg/L)



Appendix IV: Chromium, MW-16A

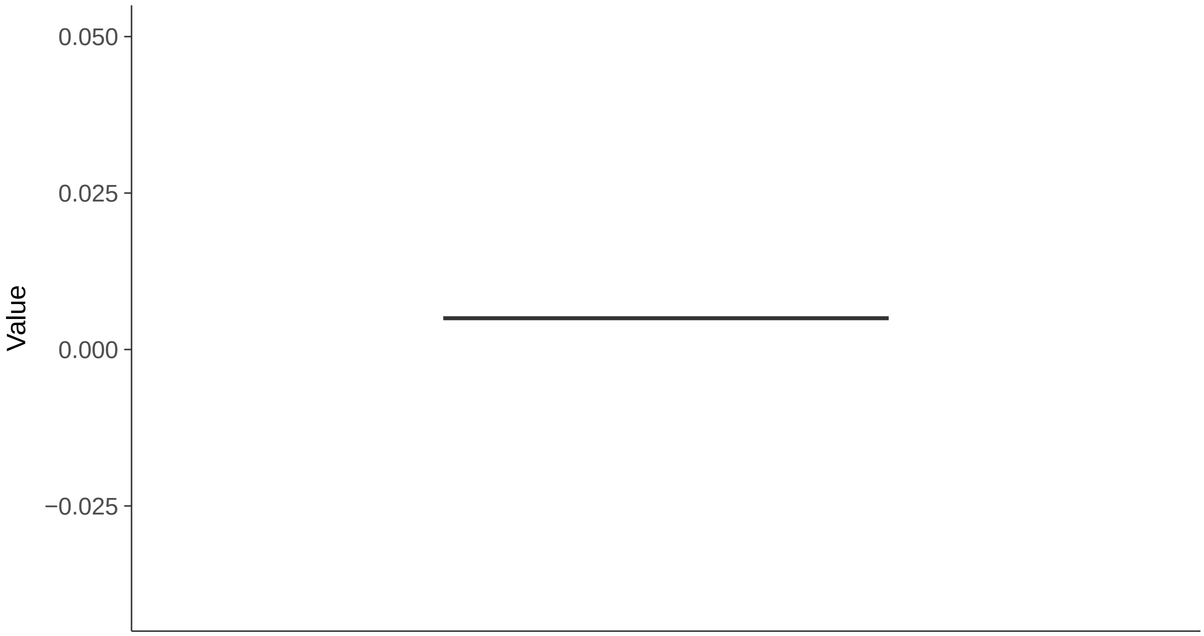
ID: 16A_2_13





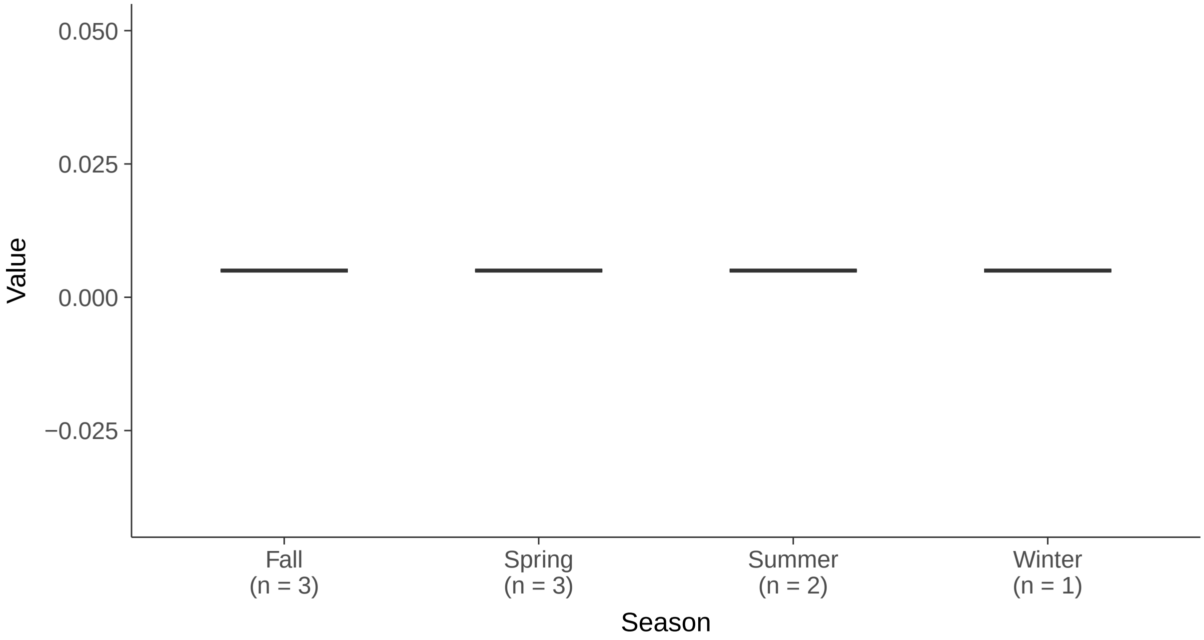
Boxplot

Chromium, MW-16A (mg/L)



Boxplot by Season

Chromium, MW-16A (mg/L)

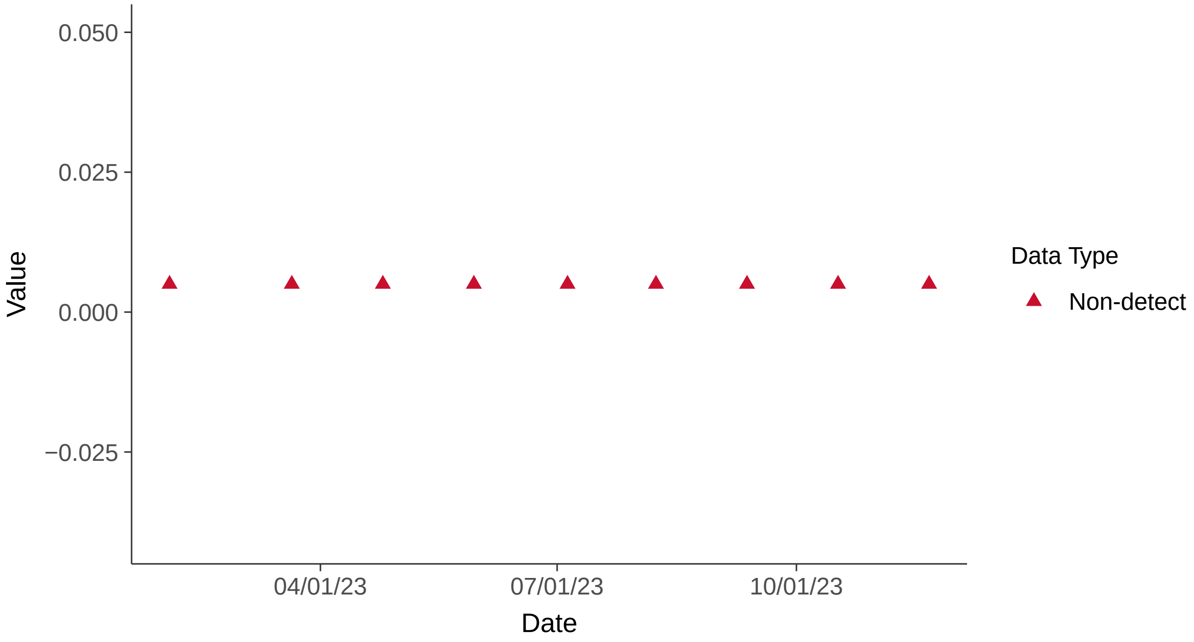


Appendix IV: Cobalt, MW-16A

ID: 16A_2_14

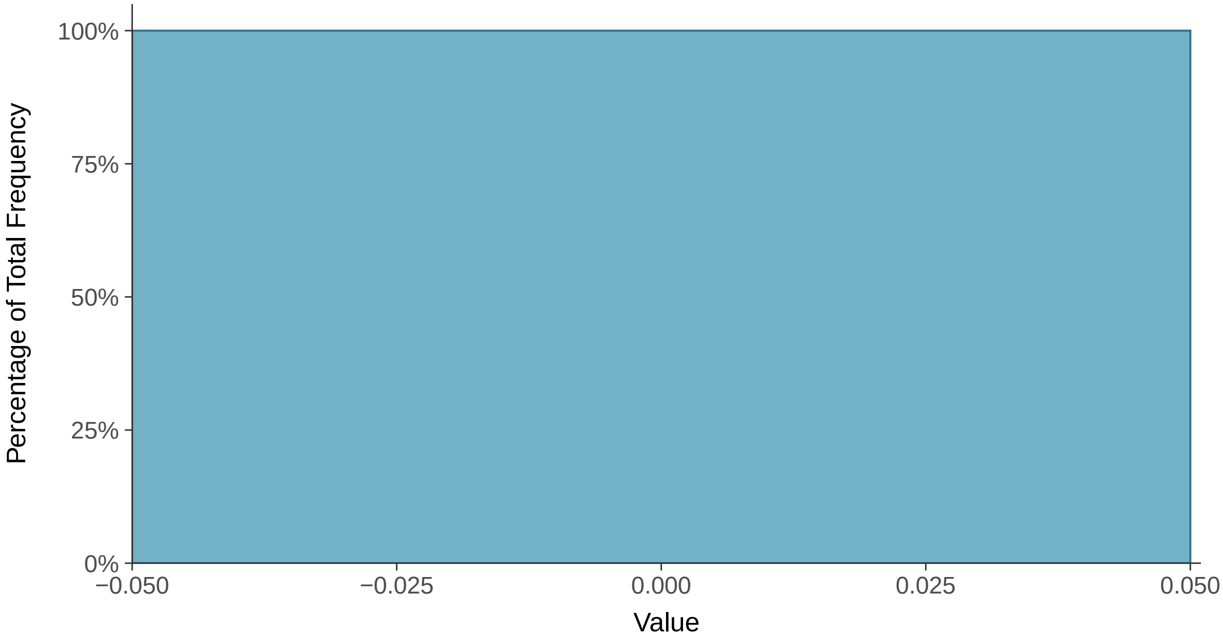
Scatter Plot

Cobalt, MW-16A (mg/L)



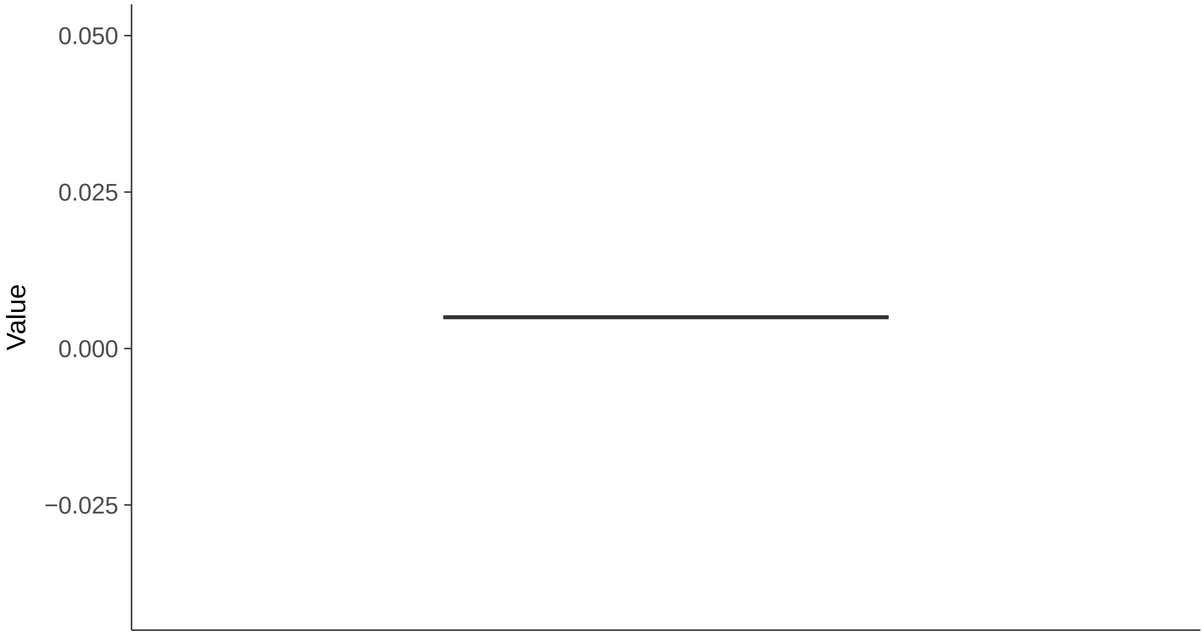
Histogram

Cobalt, MW-16A (mg/L)



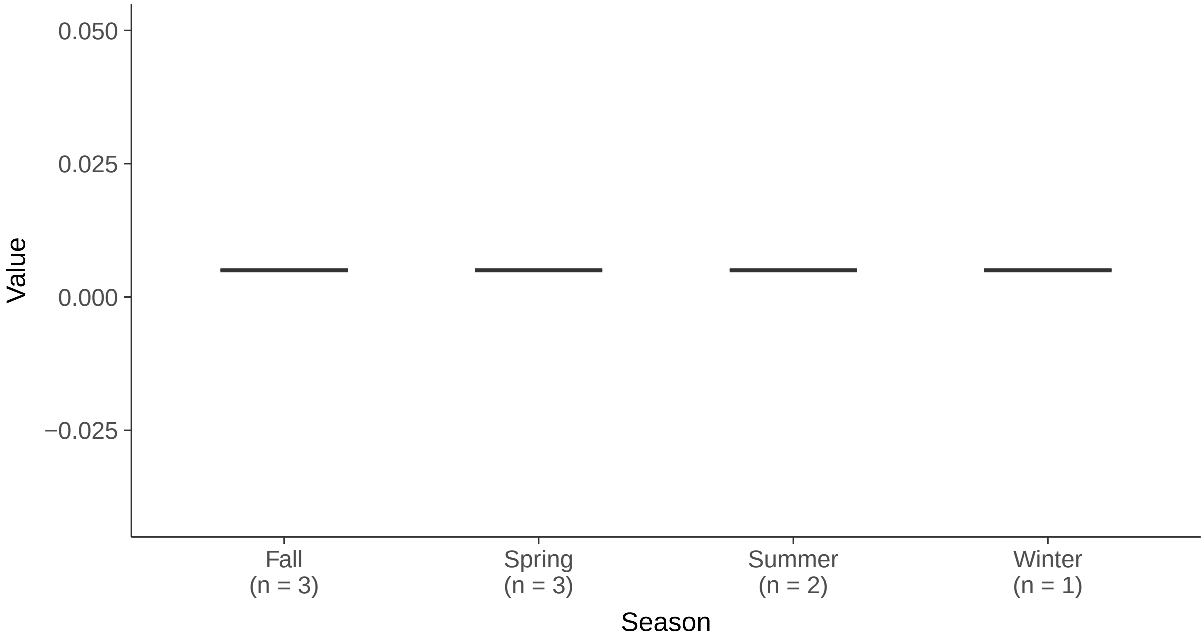
Boxplot

Cobalt, MW-16A (mg/L)



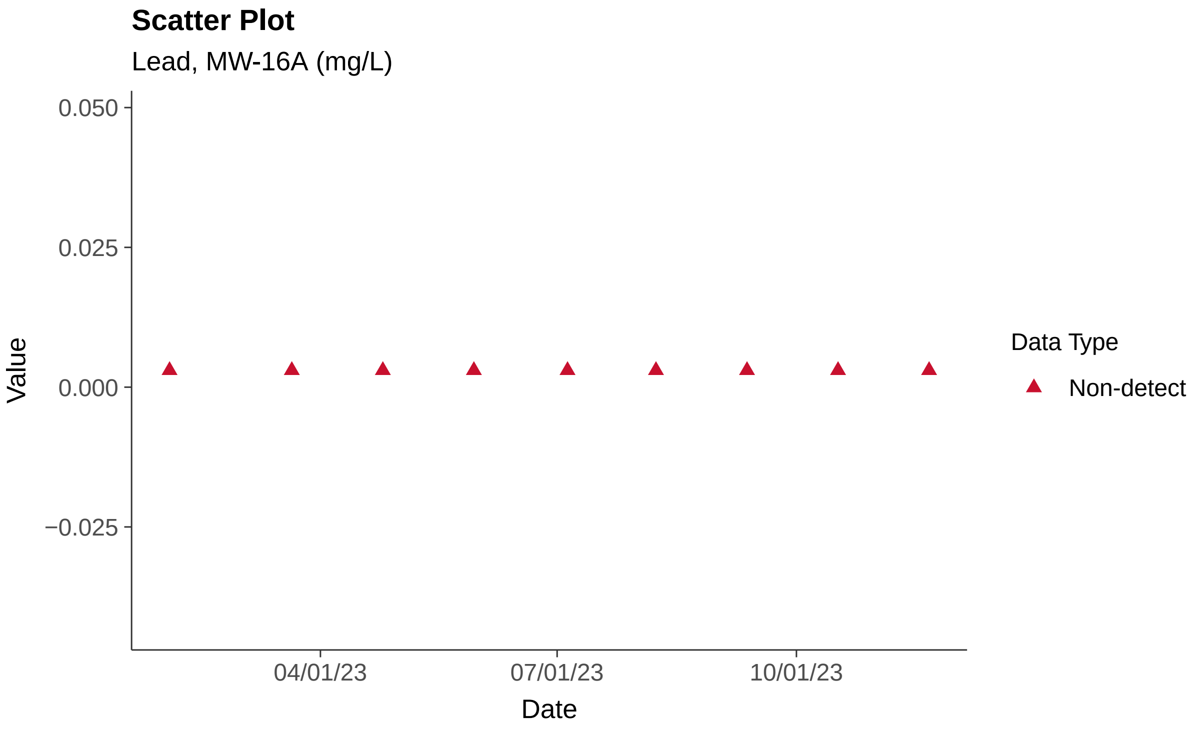
Boxplot by Season

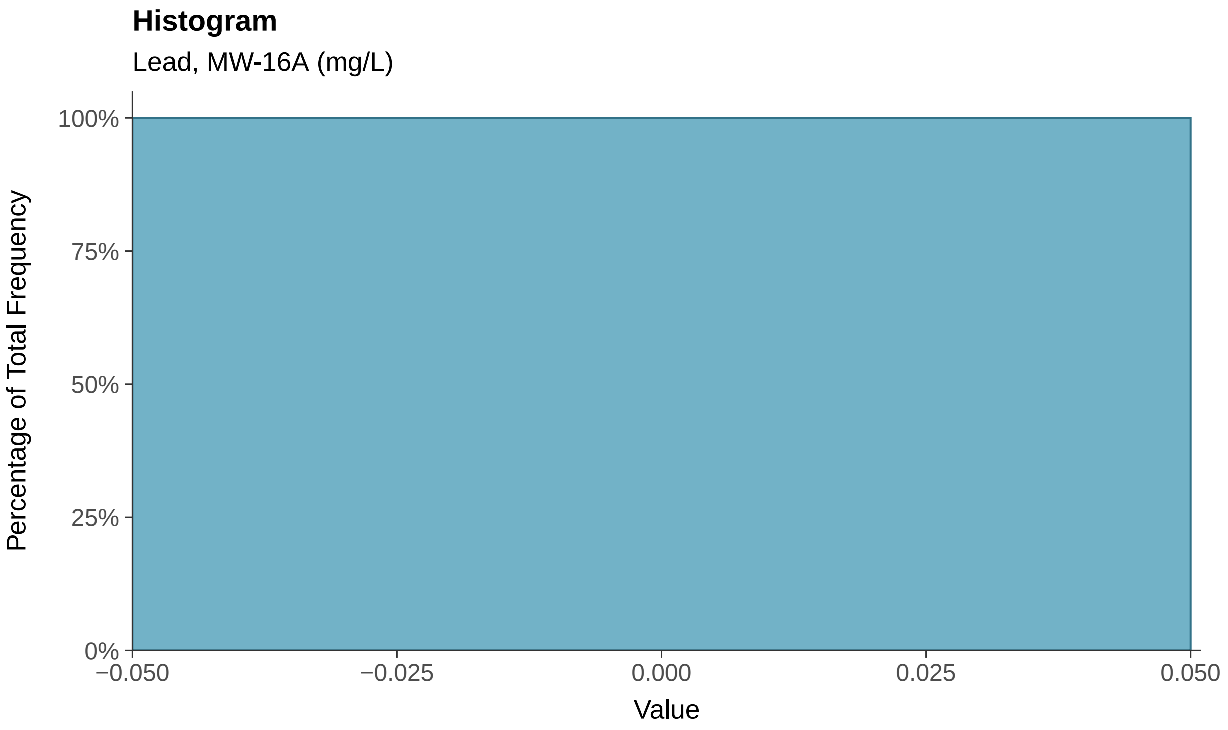
Cobalt, MW-16A (mg/L)



Appendix IV: Lead, MW-16A

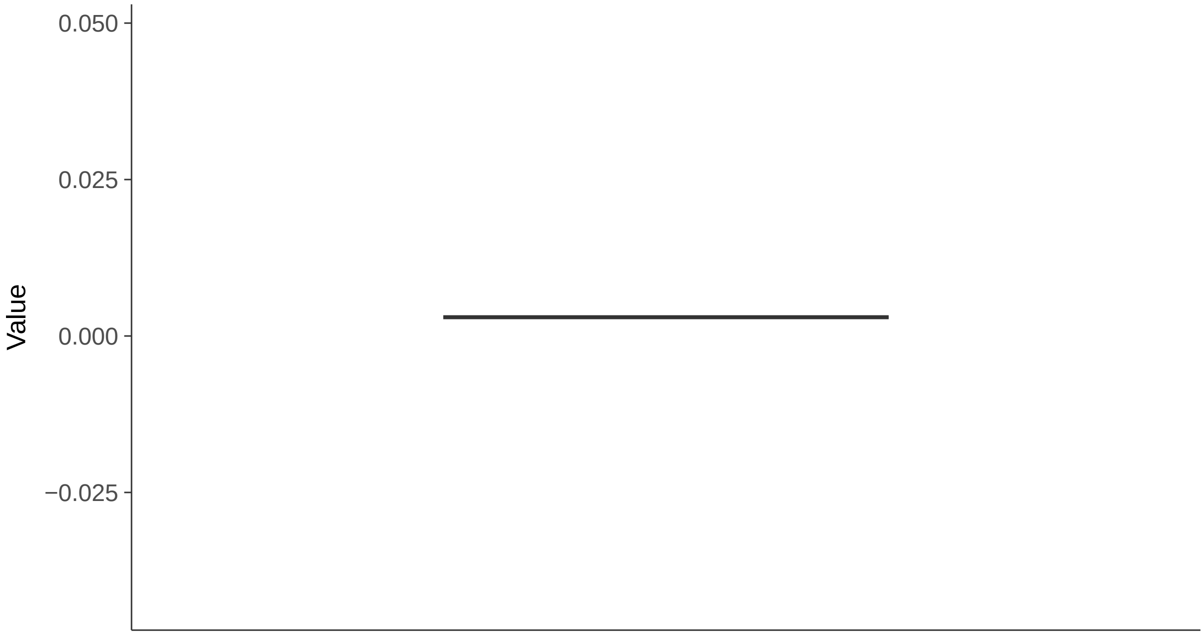
ID: 16A_2_15





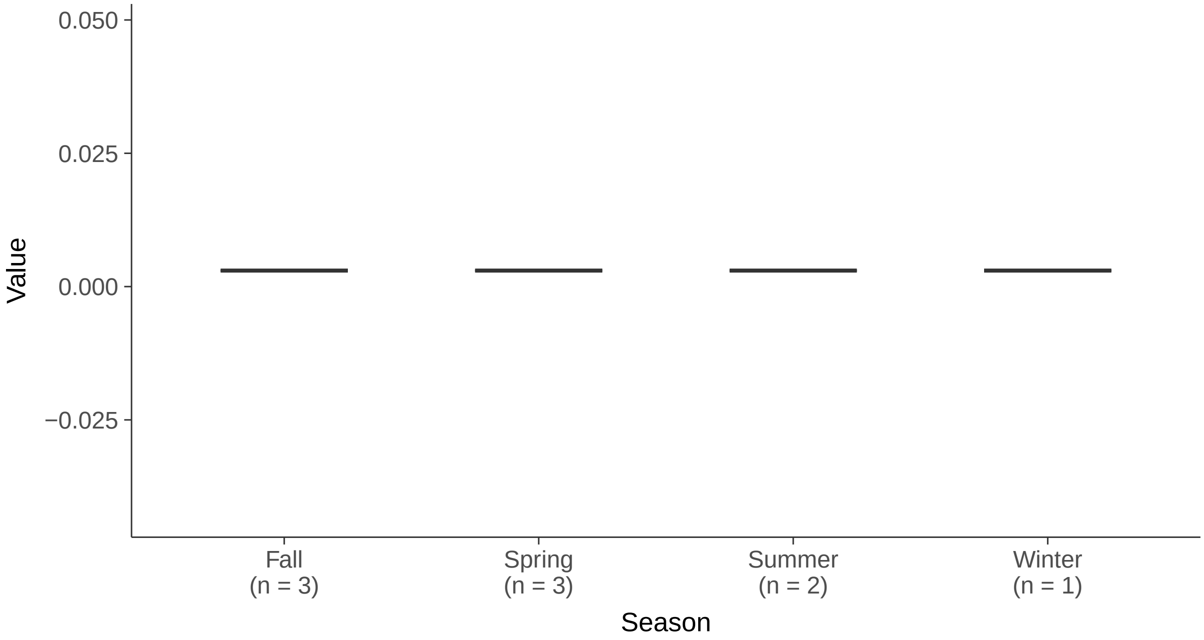
Boxplot

Lead, MW-16A (mg/L)



Boxplot by Season

Lead, MW-16A (mg/L)

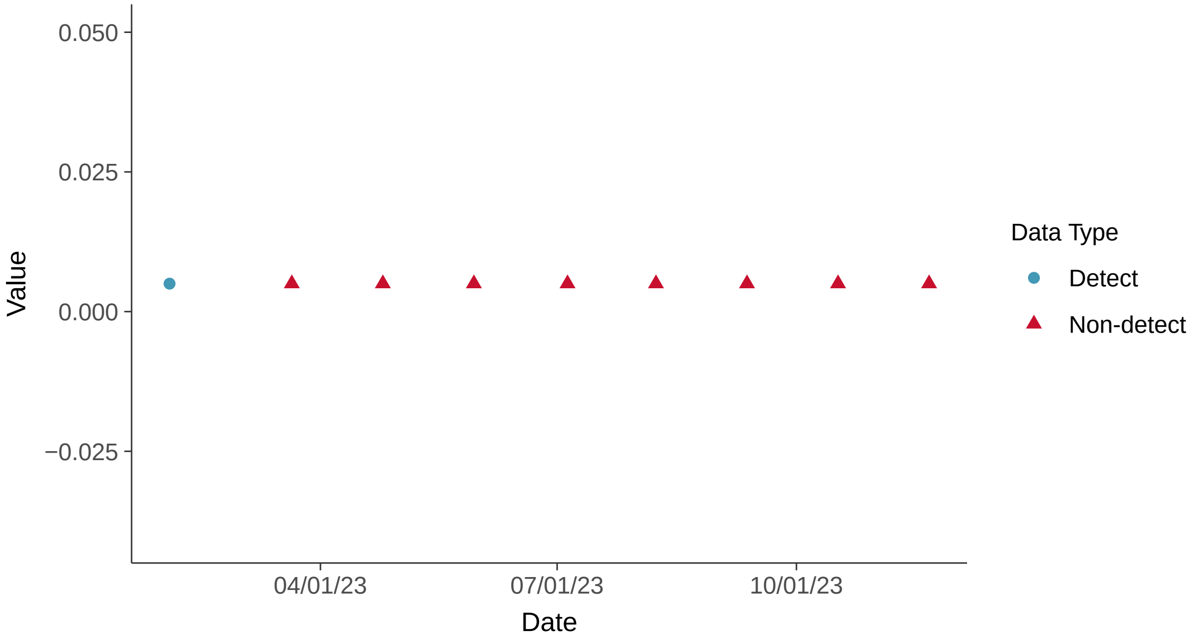


Appendix IV: Lithium, MW-16A

ID: 16A_2_16

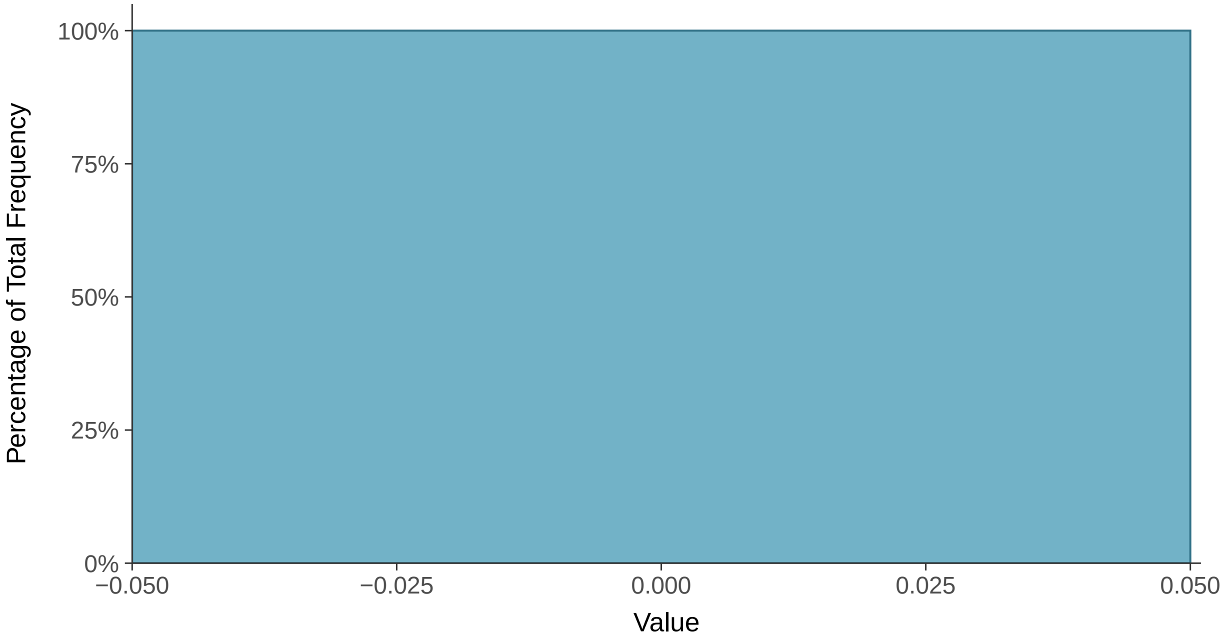
Scatter Plot

Lithium, MW-16A (mg/L)



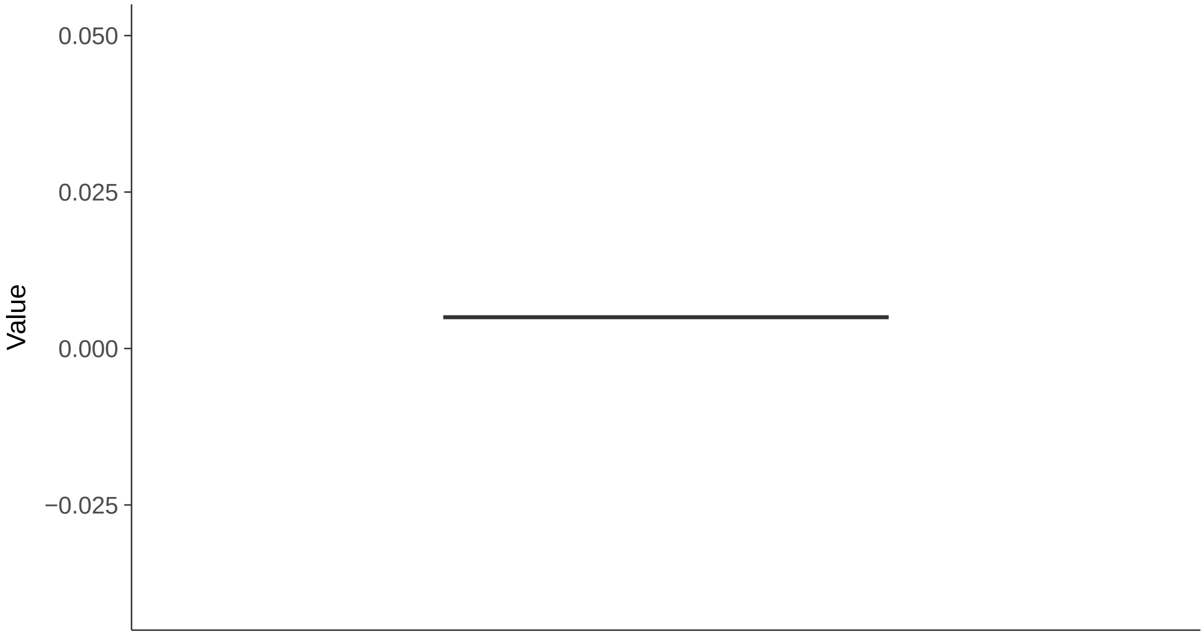
Histogram

Lithium, MW-16A (mg/L)



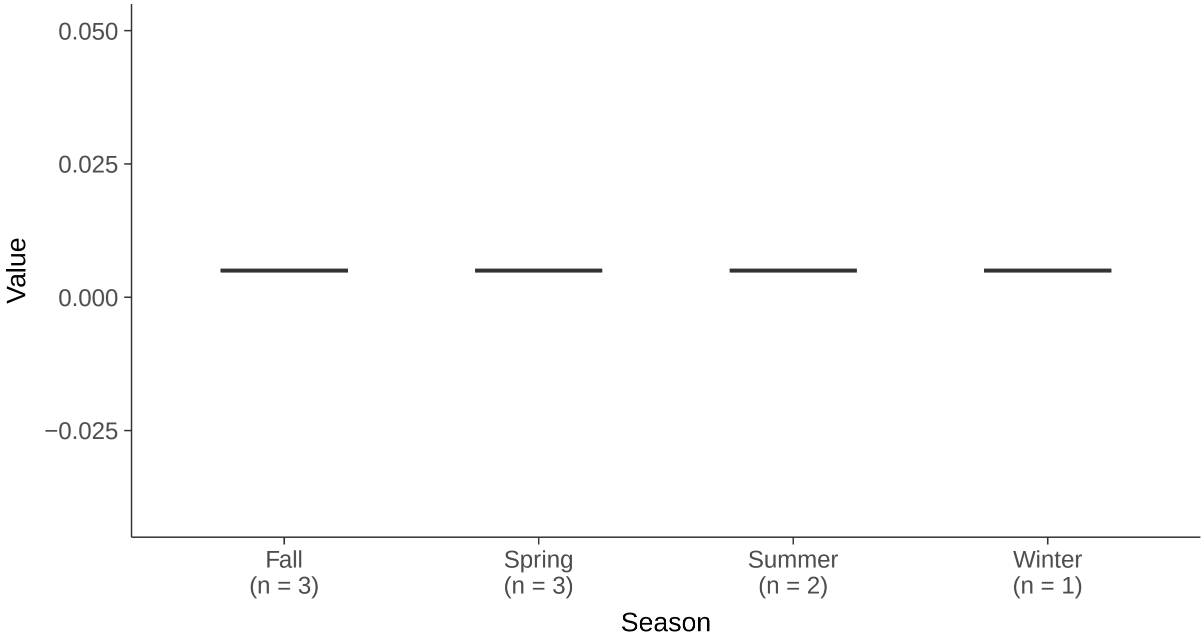
Boxplot

Lithium, MW-16A (mg/L)



Boxplot by Season

Lithium, MW-16A (mg/L)

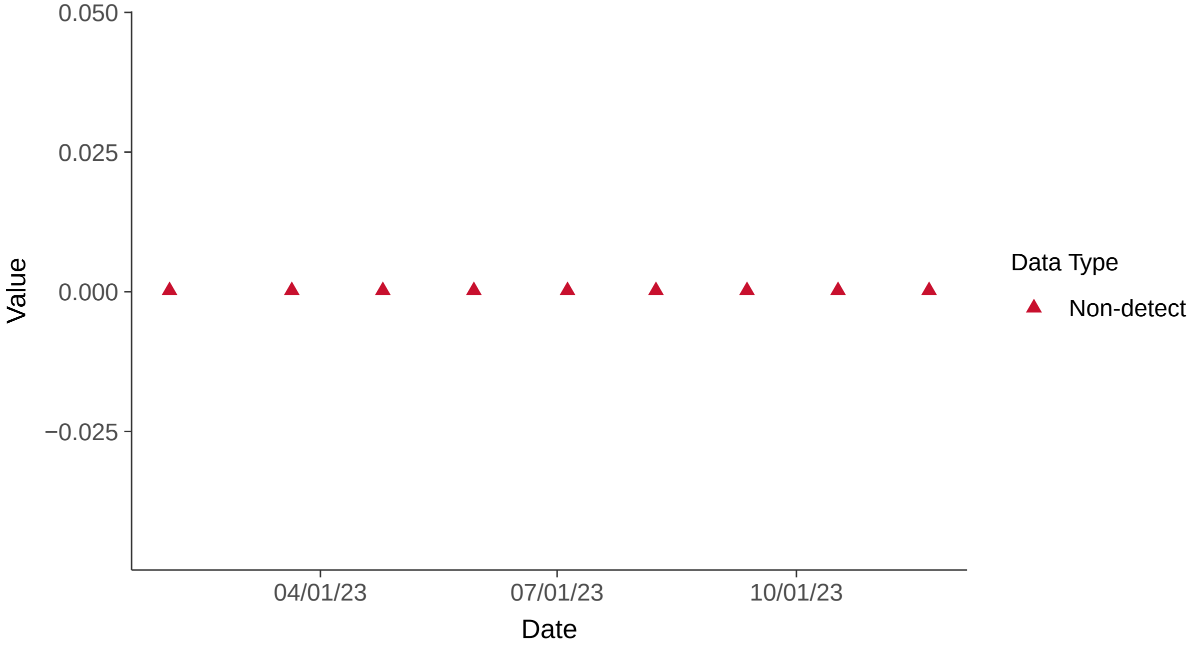


Appendix IV: Mercury, MW-16A

ID: 16A_2_17

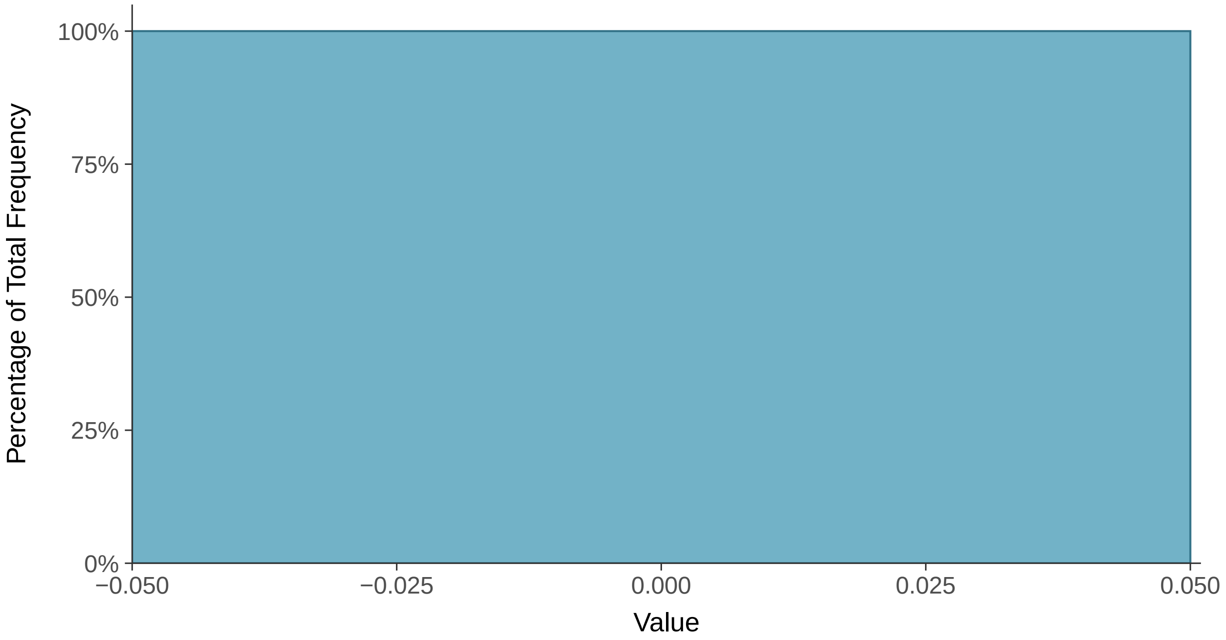
Scatter Plot

Mercury, MW-16A (mg/L)



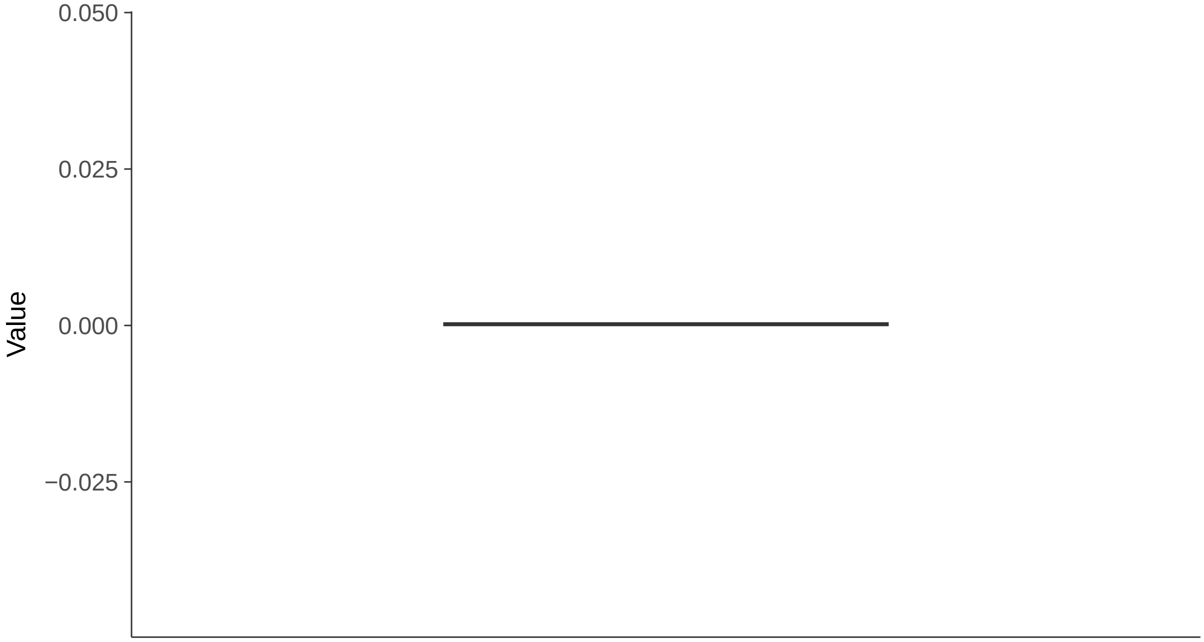
Histogram

Mercury, MW-16A (mg/L)



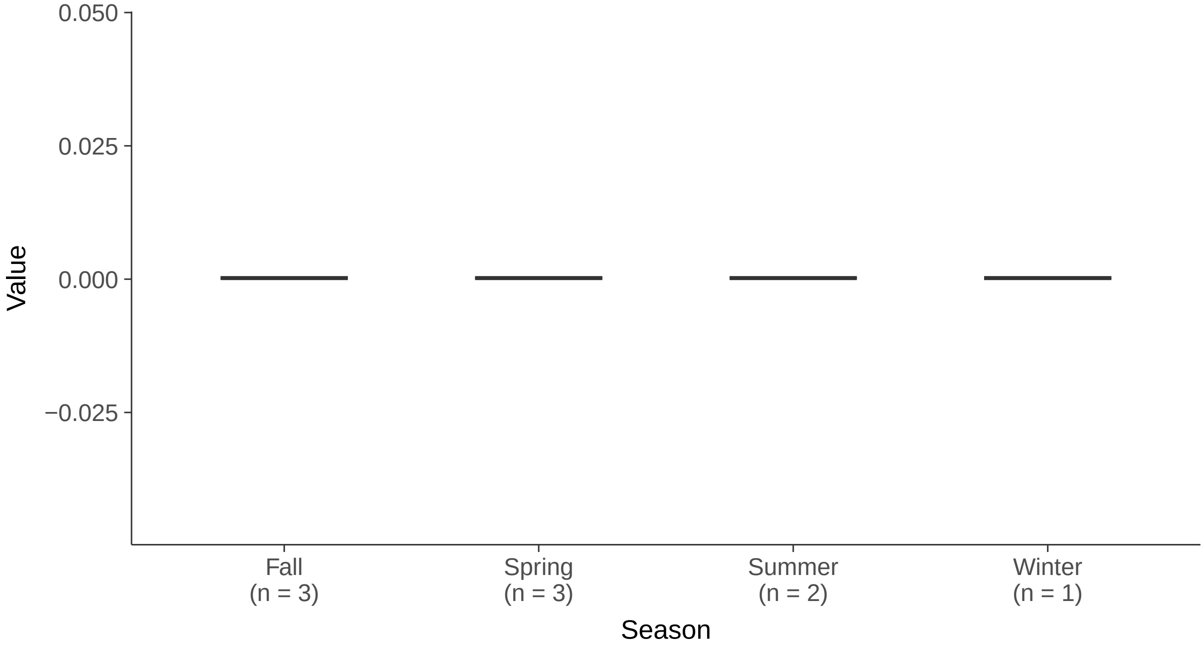
Boxplot

Mercury, MW-16A (mg/L)



Boxplot by Season

Mercury, MW-16A (mg/L)

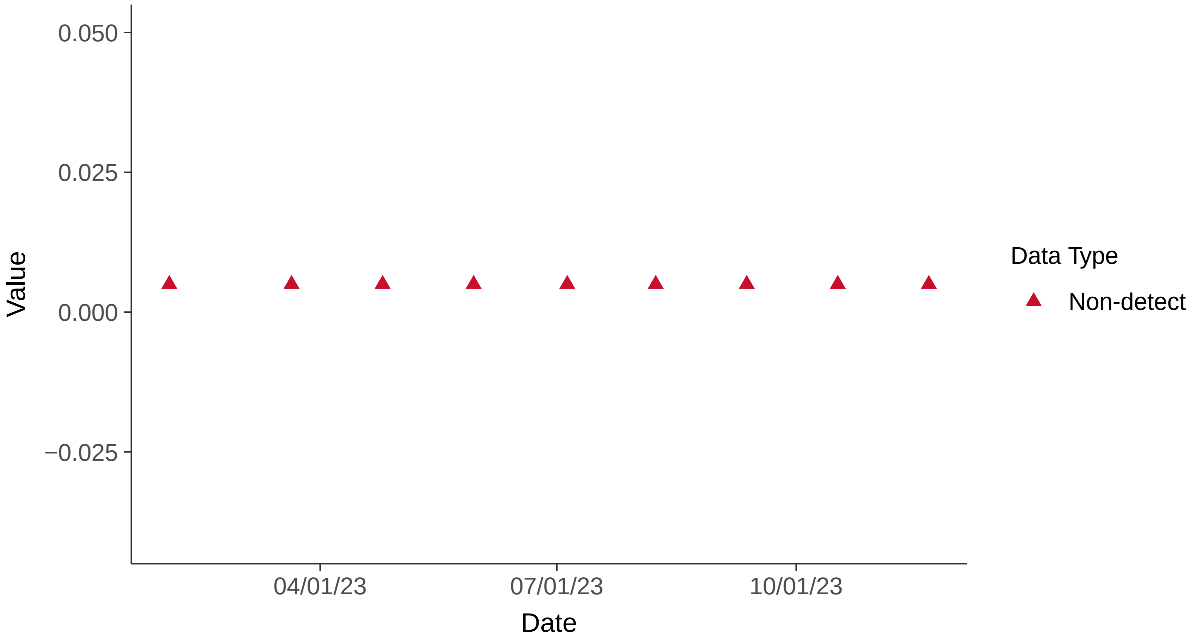


Appendix IV: Molybdenum, MW-16A

ID: 16A_2_18

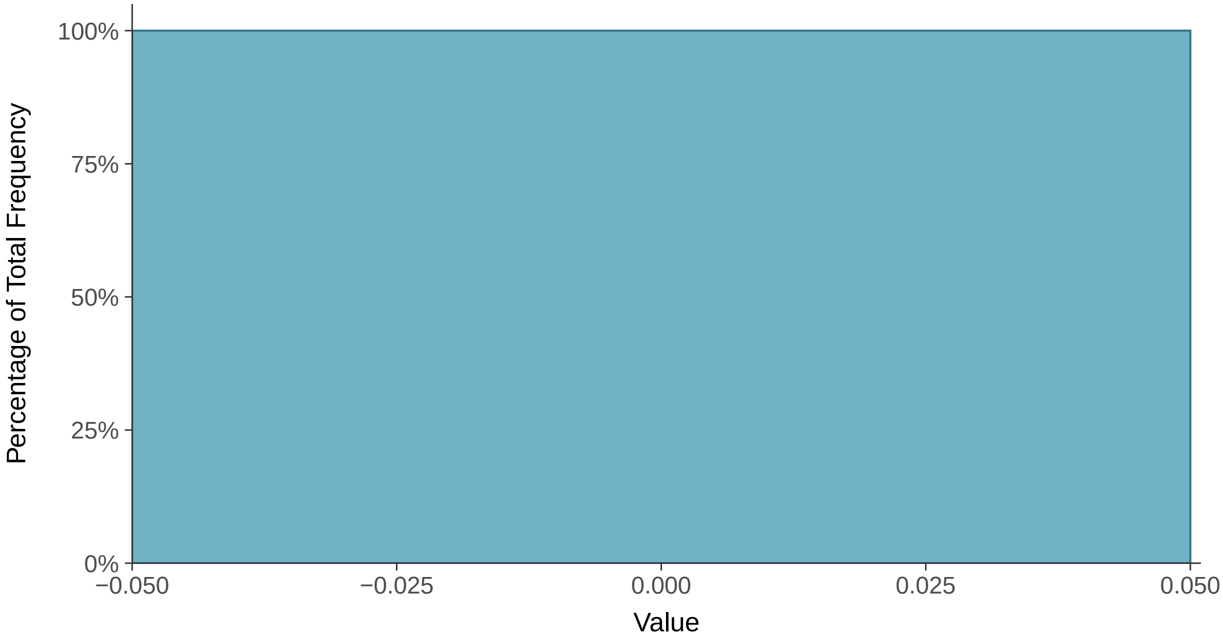
Scatter Plot

Molybdenum, MW-16A (mg/L)



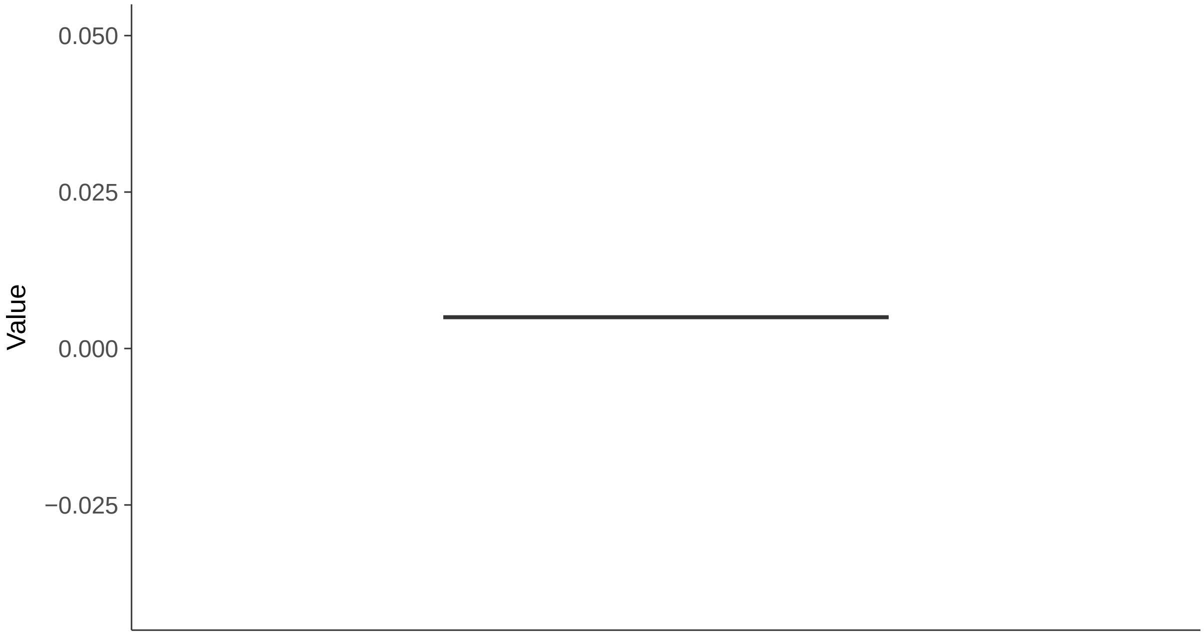
Histogram

Molybdenum, MW-16A (mg/L)



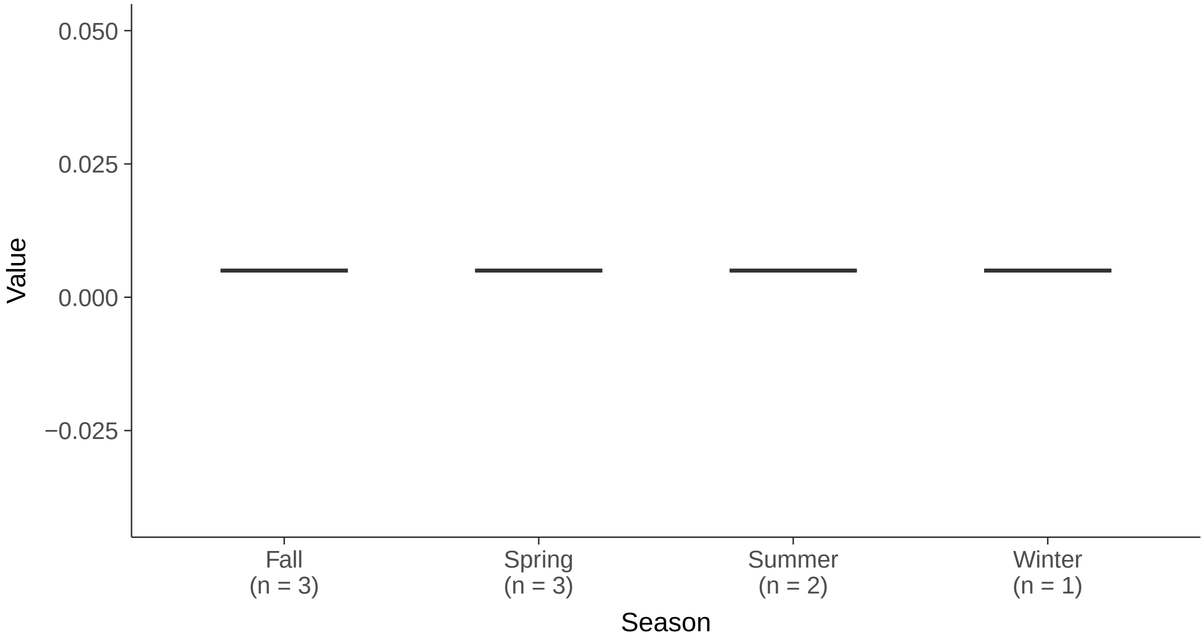
Boxplot

Molybdenum, MW-16A (mg/L)



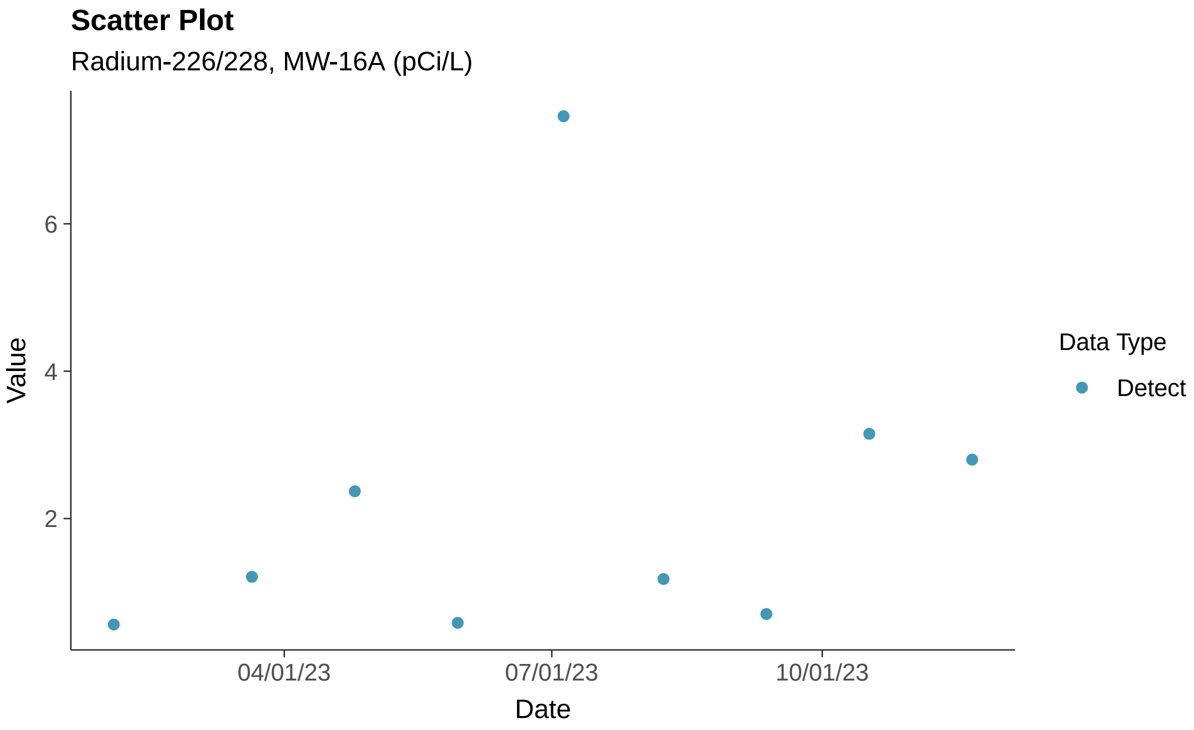
Boxplot by Season

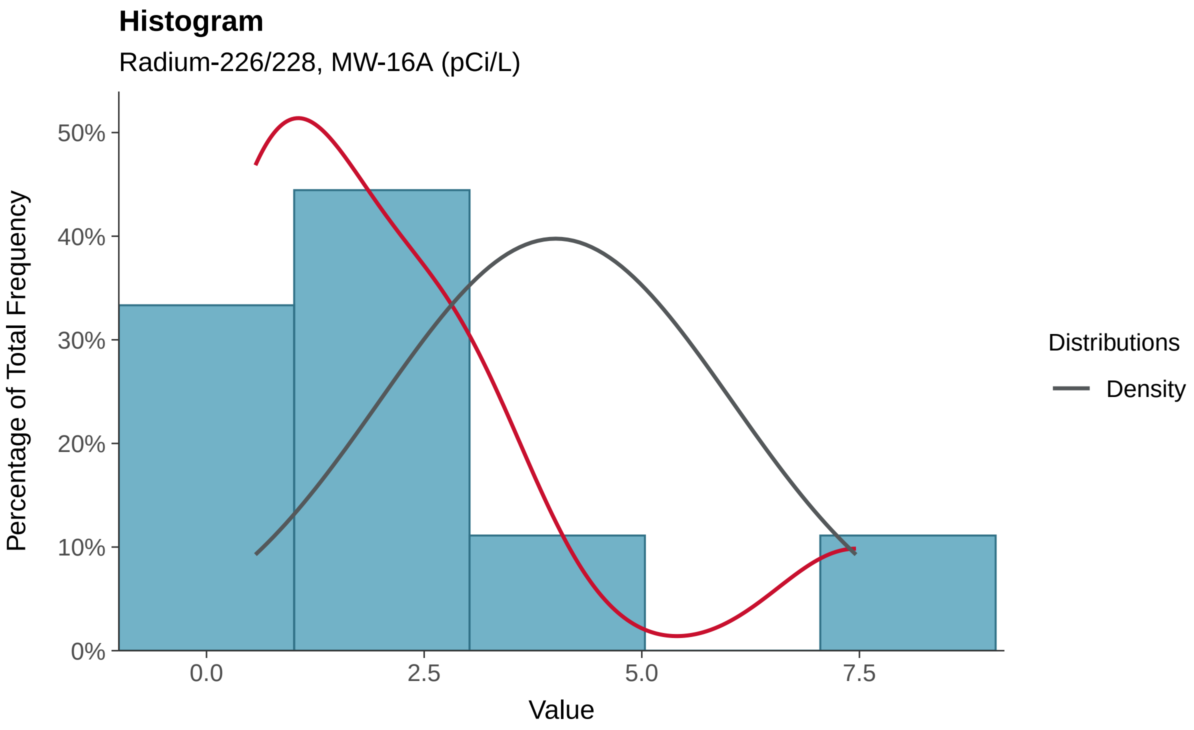
Molybdenum, MW-16A (mg/L)



Appendix IV: Radium-226/228, MW-16A

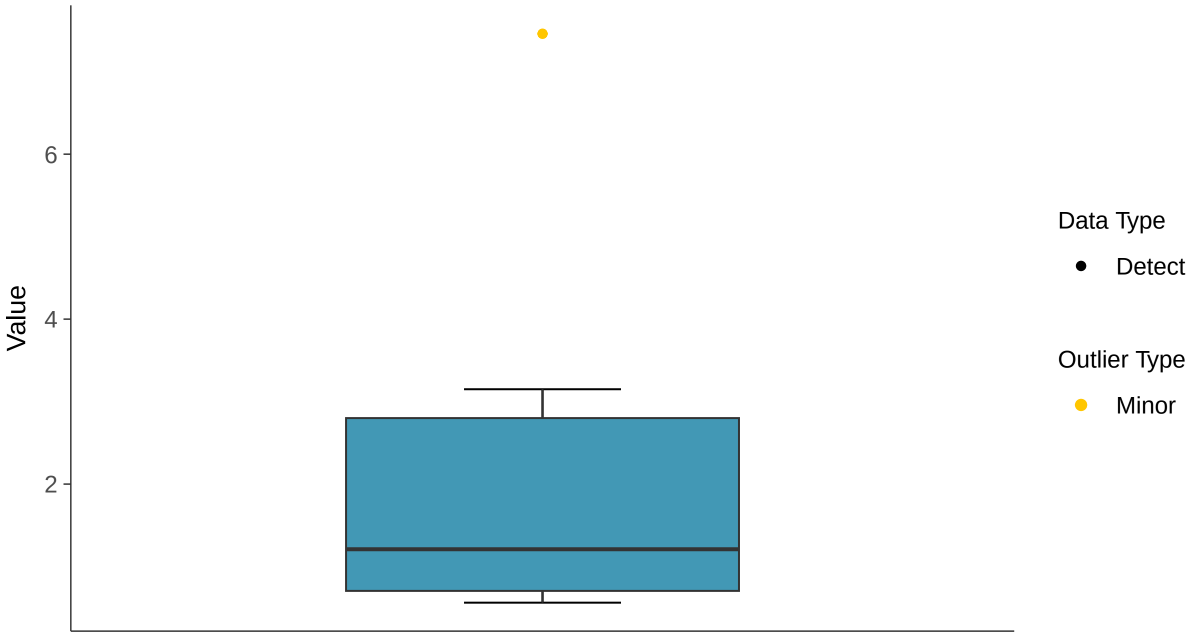
ID: 16A_2_20





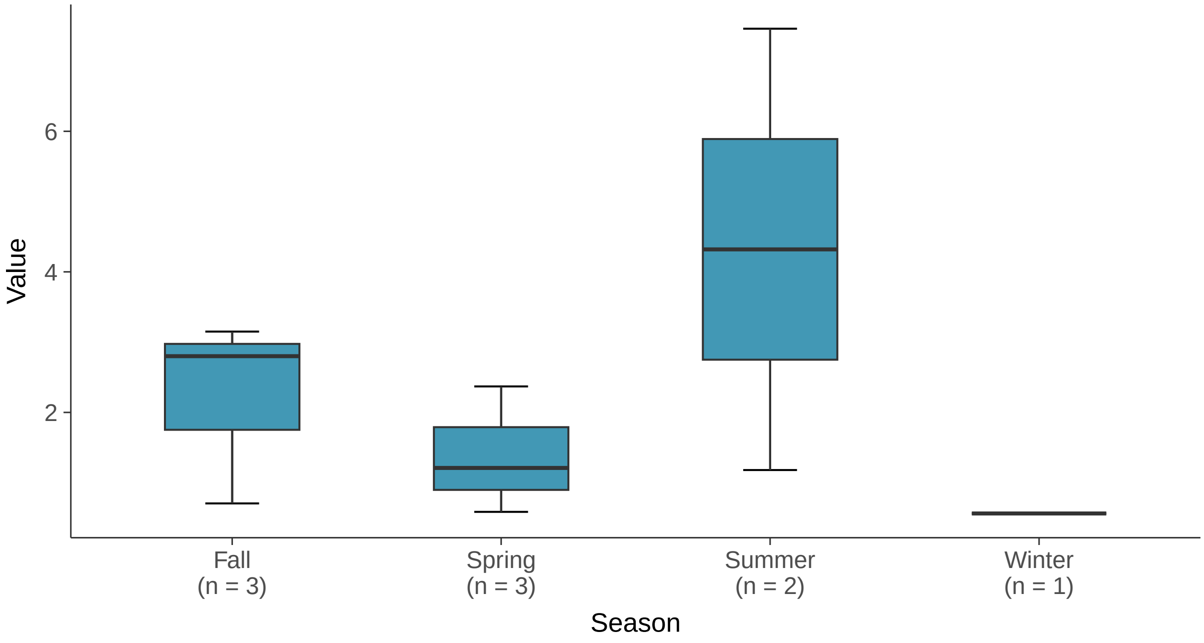
Boxplot

Radium-226/228, MW-16A (pCi/L)



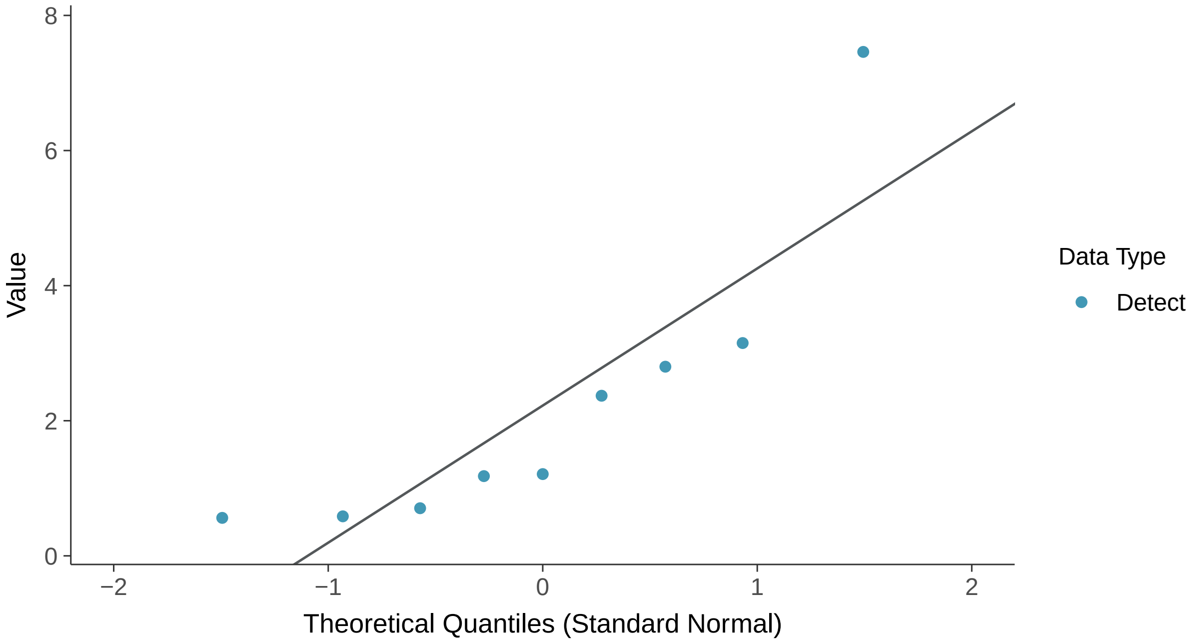
Boxplot by Season

Radium-226/228, MW-16A (pCi/L)



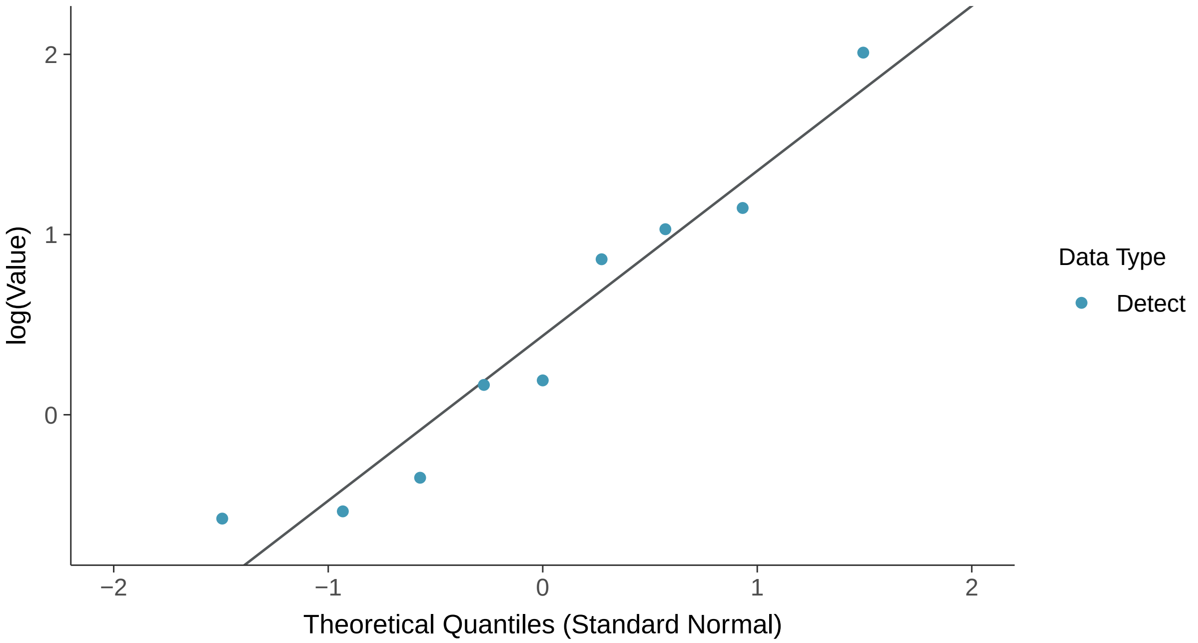
Normal Q-Q plot

Radium-226/228, MW-16A (pCi/L)



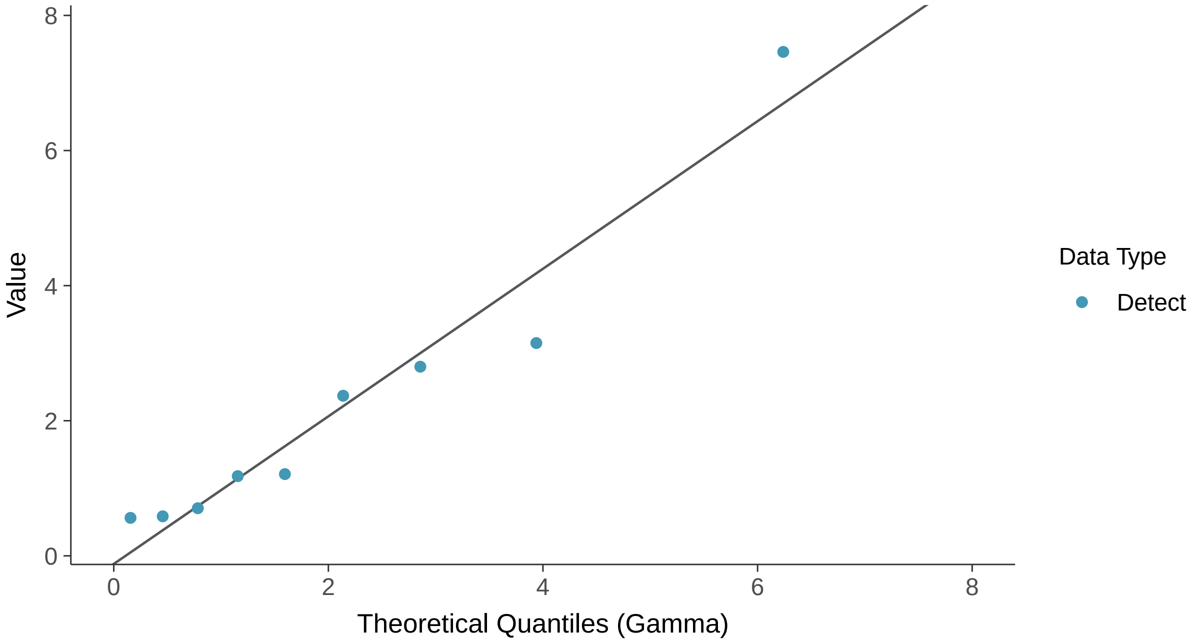
Lognormal Q-Q plot

Radium-226/228, MW-16A (pCi/L)



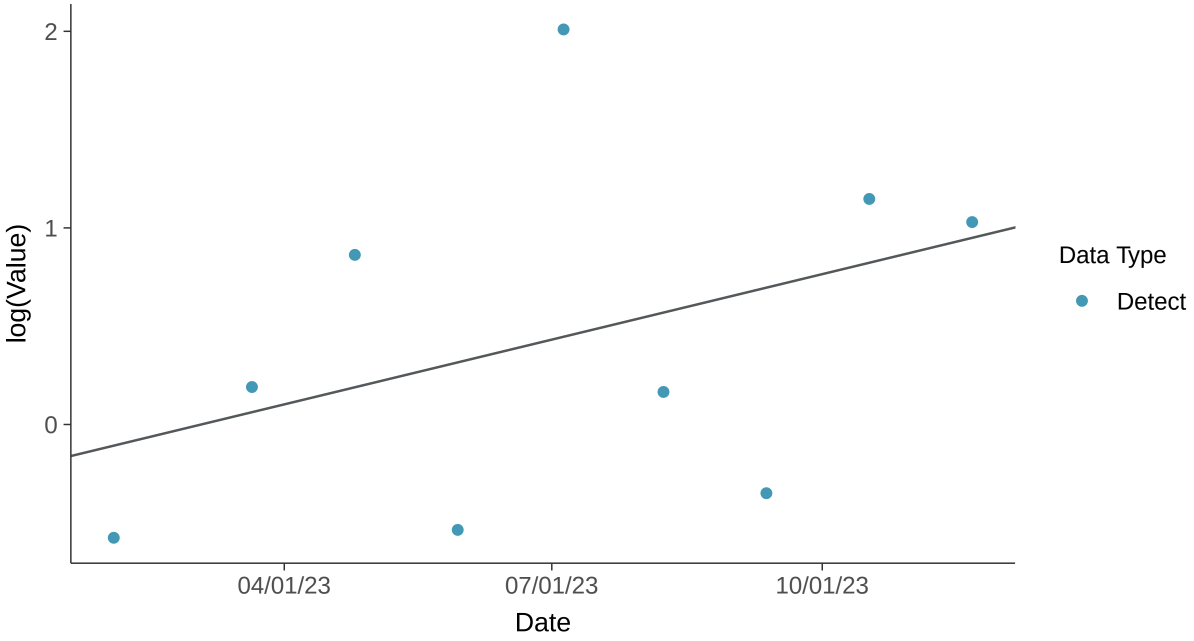
Gamma Q-Q plot

Radium-226/228, MW-16A (pCi/L)



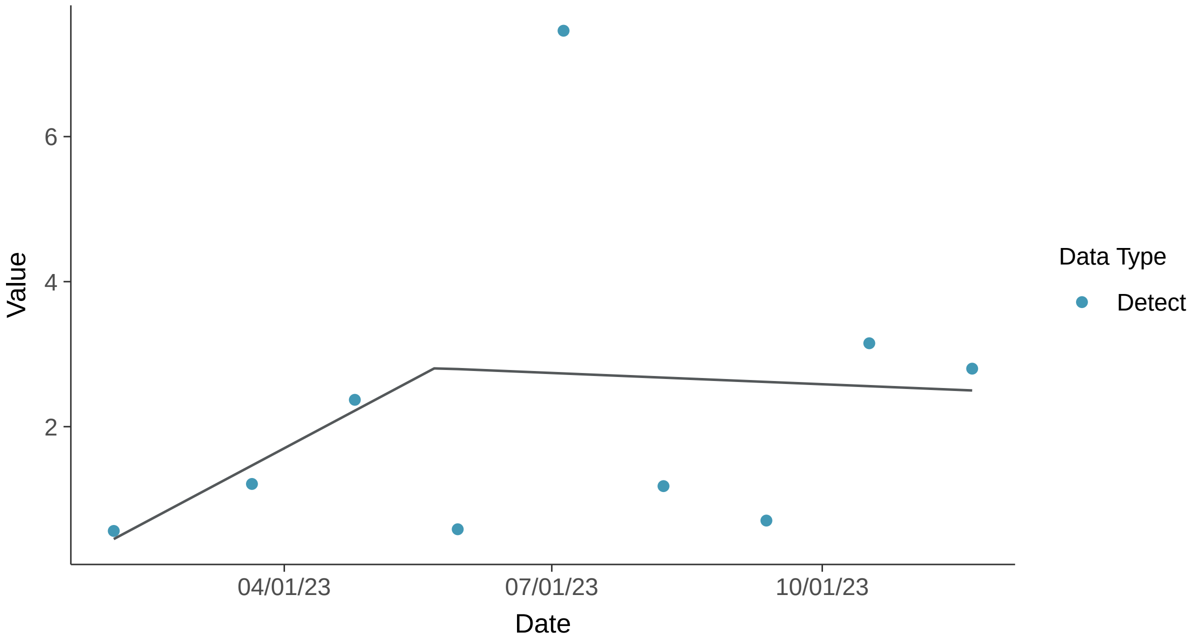
Trend Regression: Lognormal MLE

Radium-226/228, MW-16A (pCi/L)



Trend Regression: Piecewise Linear-Linear

Radium-226/228, MW-16A (pCi/L)

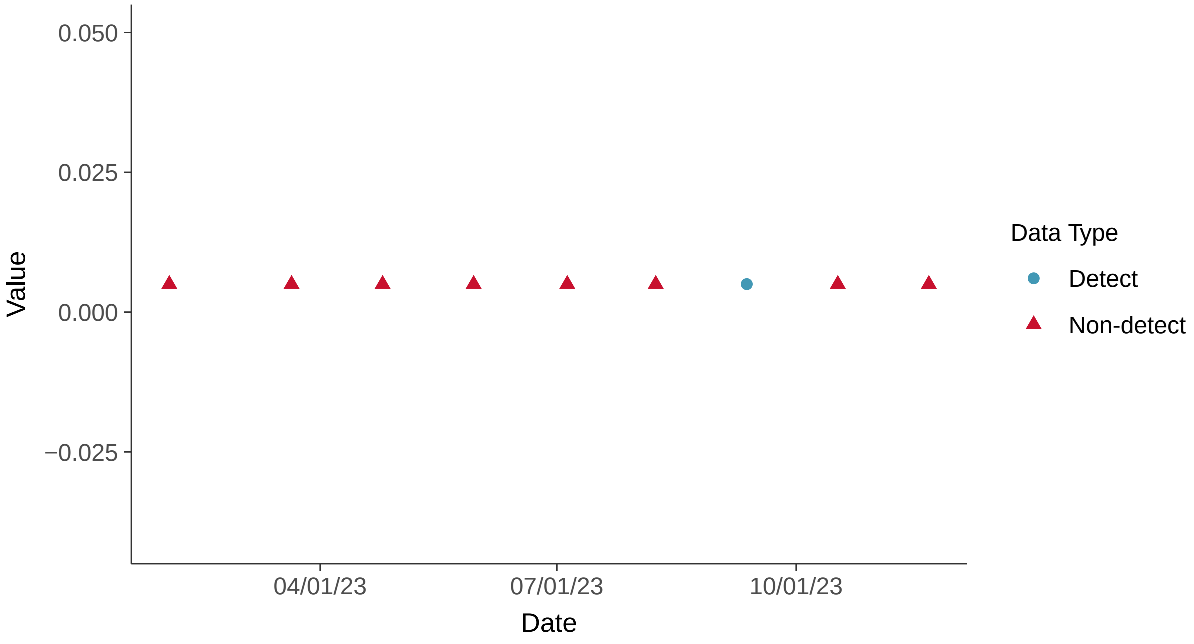


Appendix IV: Selenium, MW-16A

ID: 16A_2_22

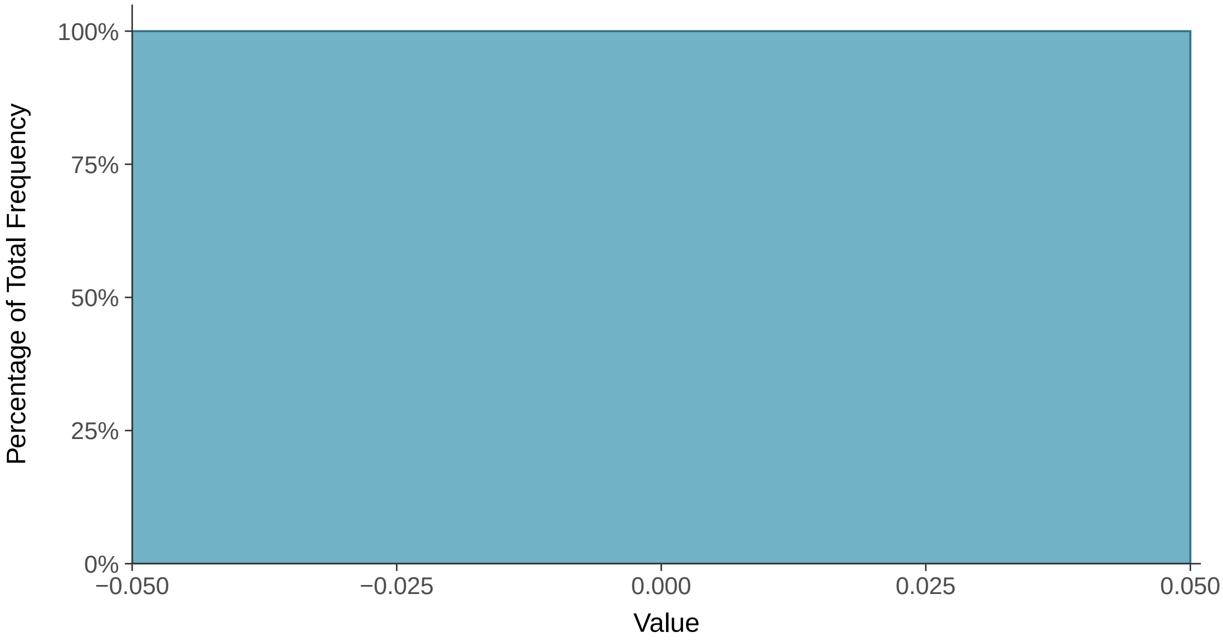
Scatter Plot

Selenium, MW-16A (mg/L)



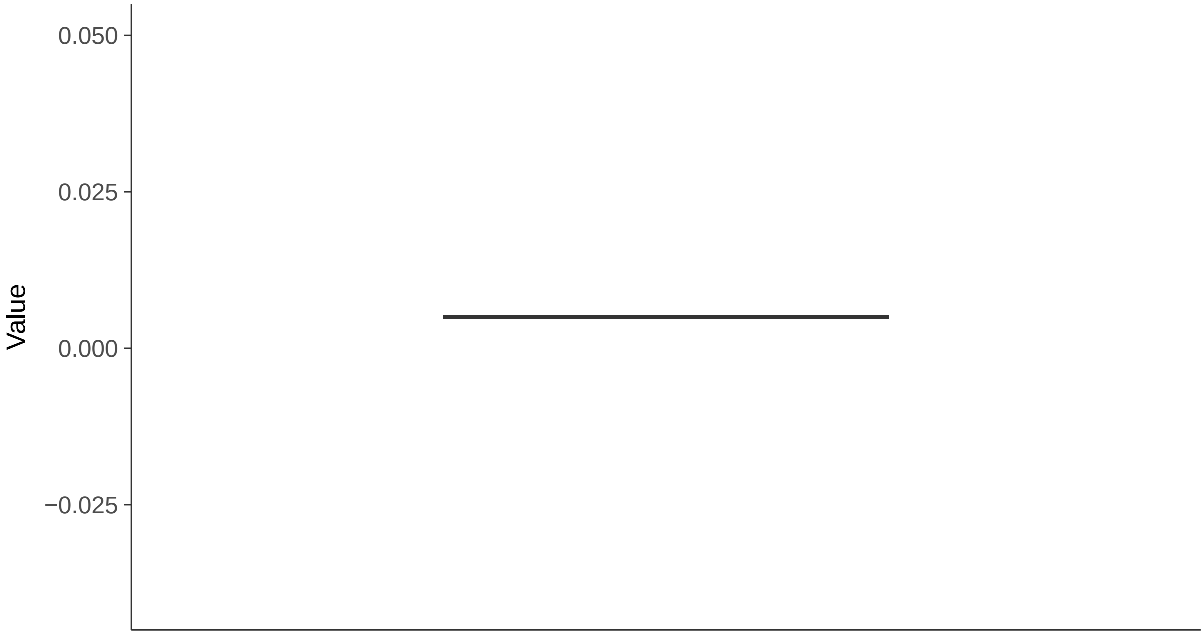
Histogram

Selenium, MW-16A (mg/L)



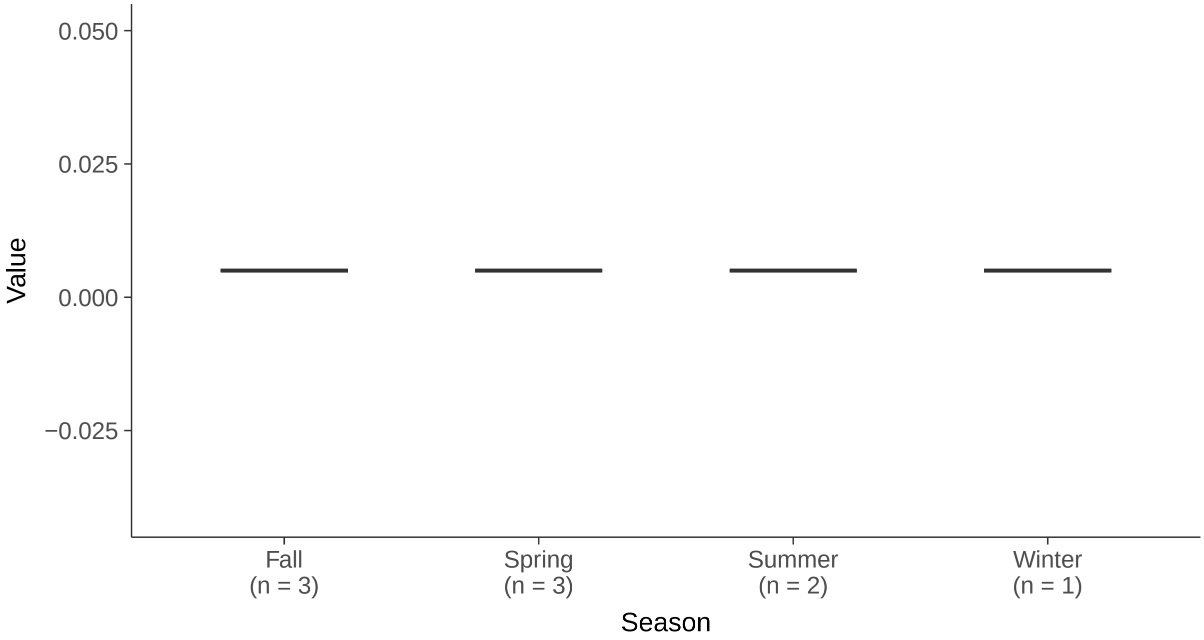
Boxplot

Selenium, MW-16A (mg/L)



Boxplot by Season

Selenium, MW-16A (mg/L)

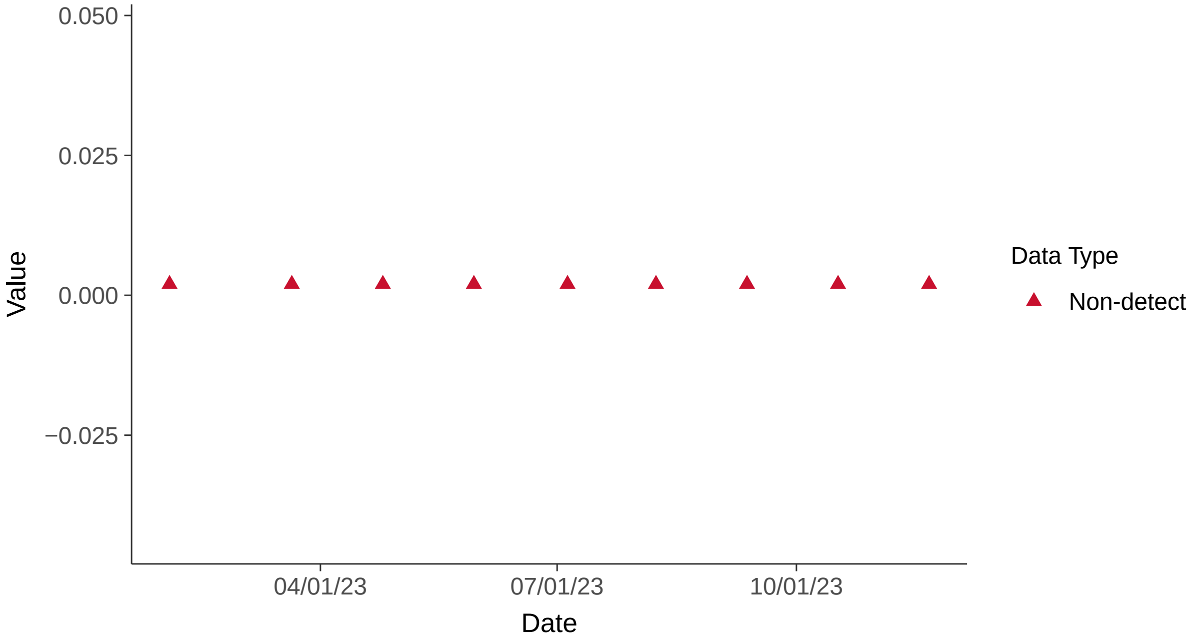


Appendix IV: Thallium, MW-16A

ID: 16A_2_23

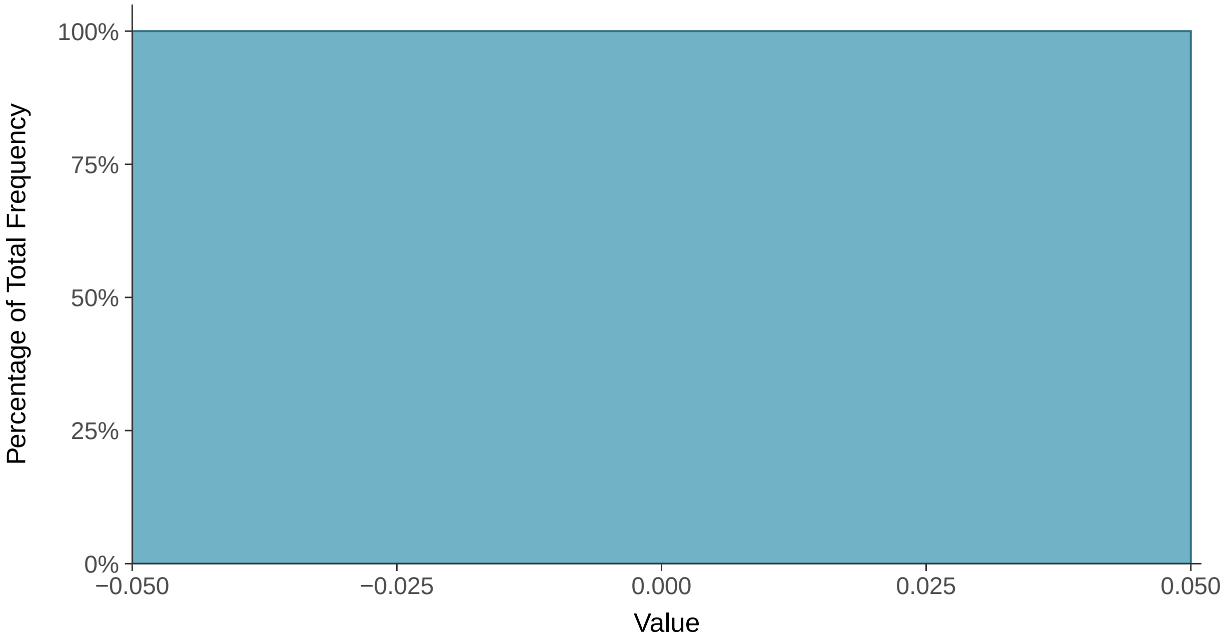
Scatter Plot

Thallium, MW-16A (mg/L)



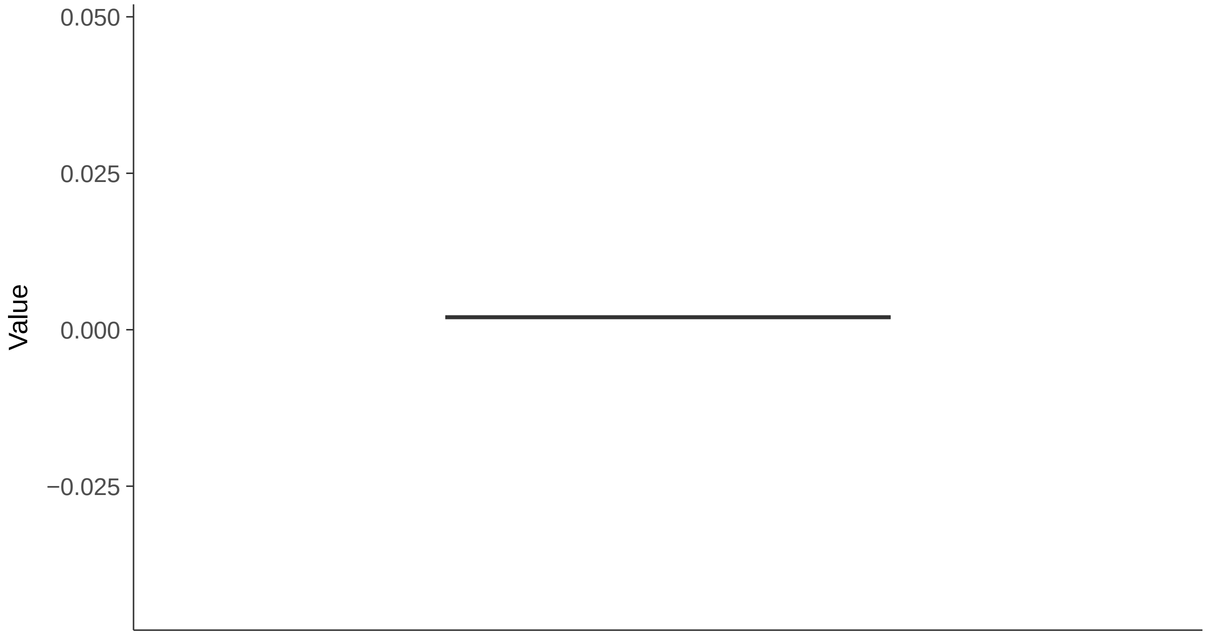
Histogram

Thallium, MW-16A (mg/L)



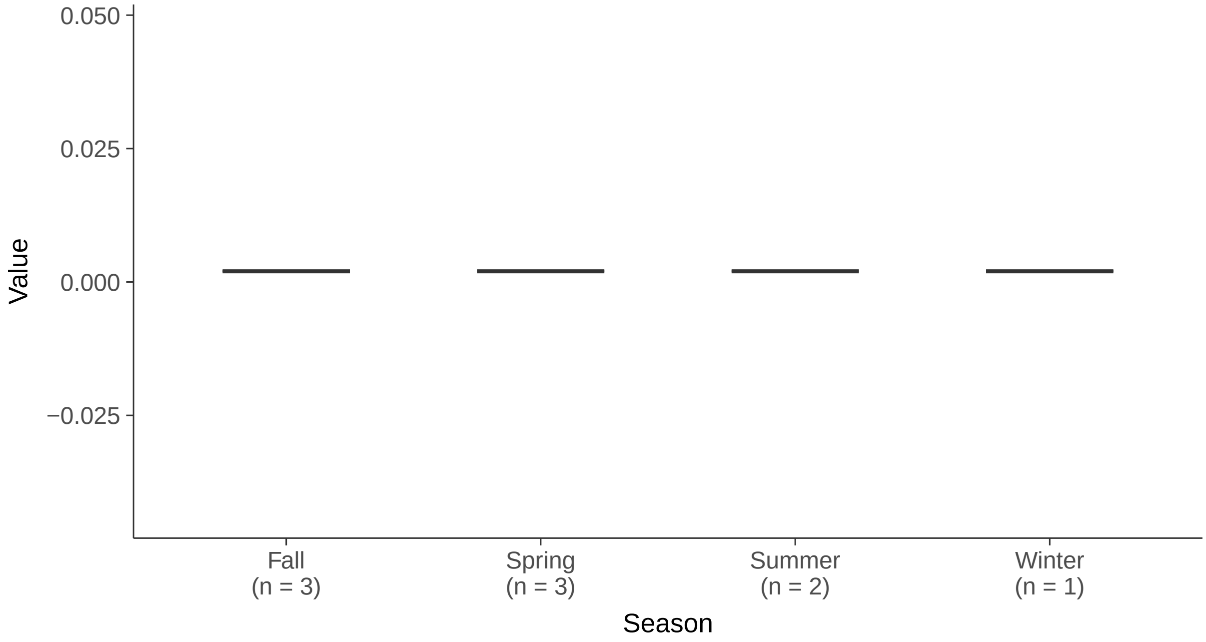
Boxplot

Thallium, MW-16A (mg/L)



Boxplot by Season

Thallium, MW-16A (mg/L)

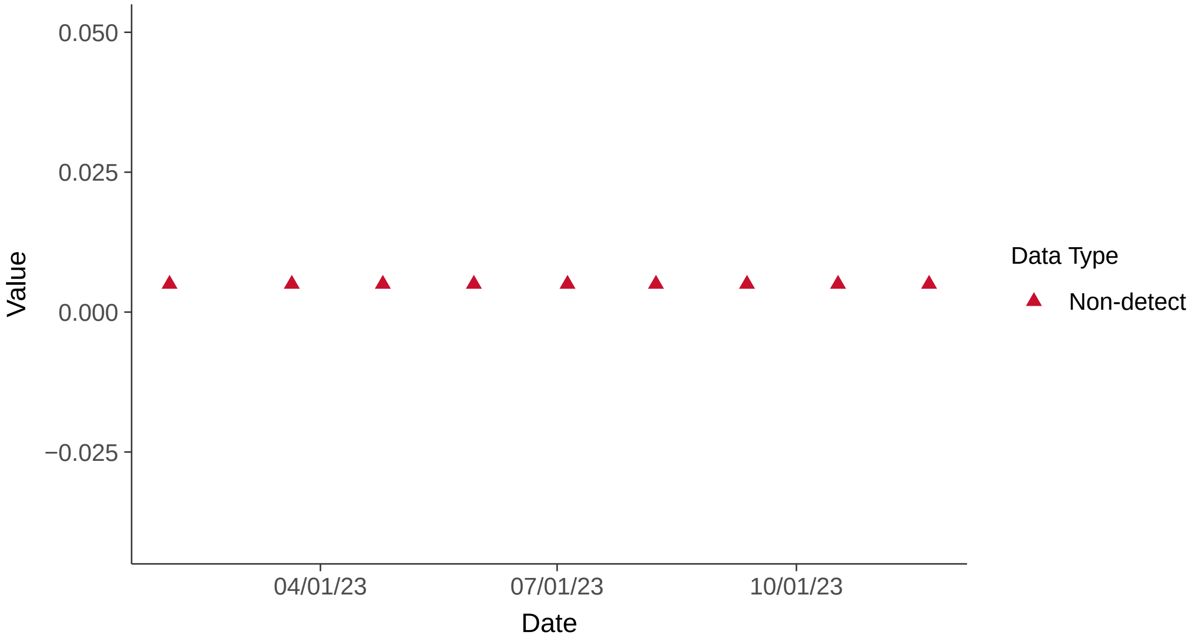


Part 115: Copper, MW-16A

ID: 16A_5_37

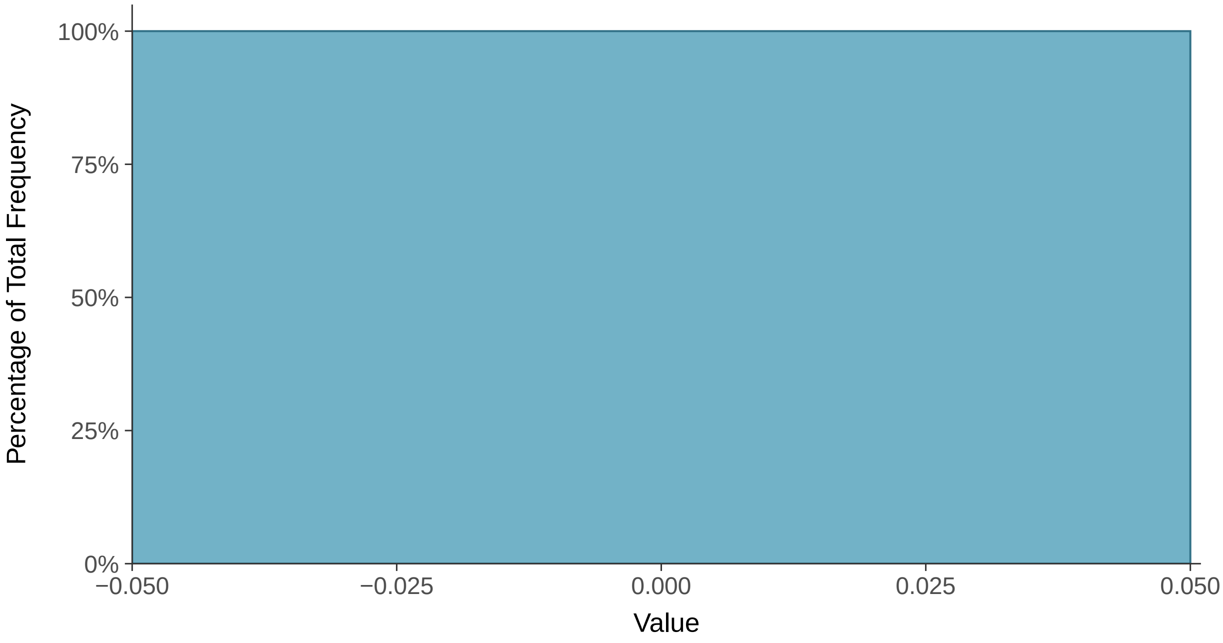
Scatter Plot

Copper, MW-16A (mg/L)



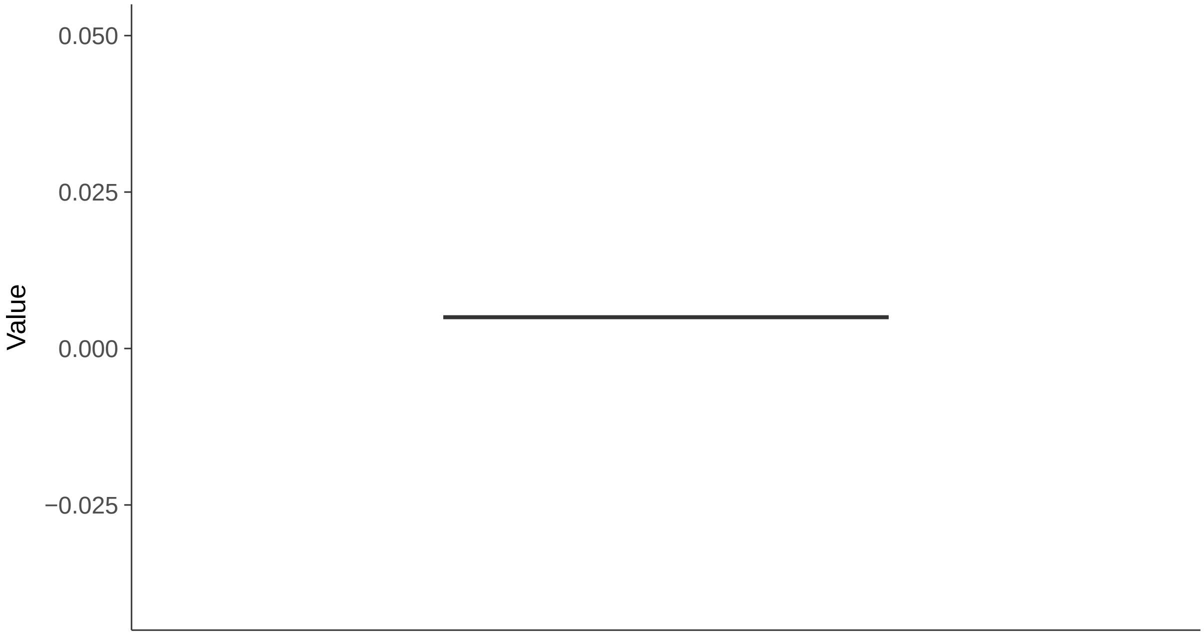
Histogram

Copper, MW-16A (mg/L)



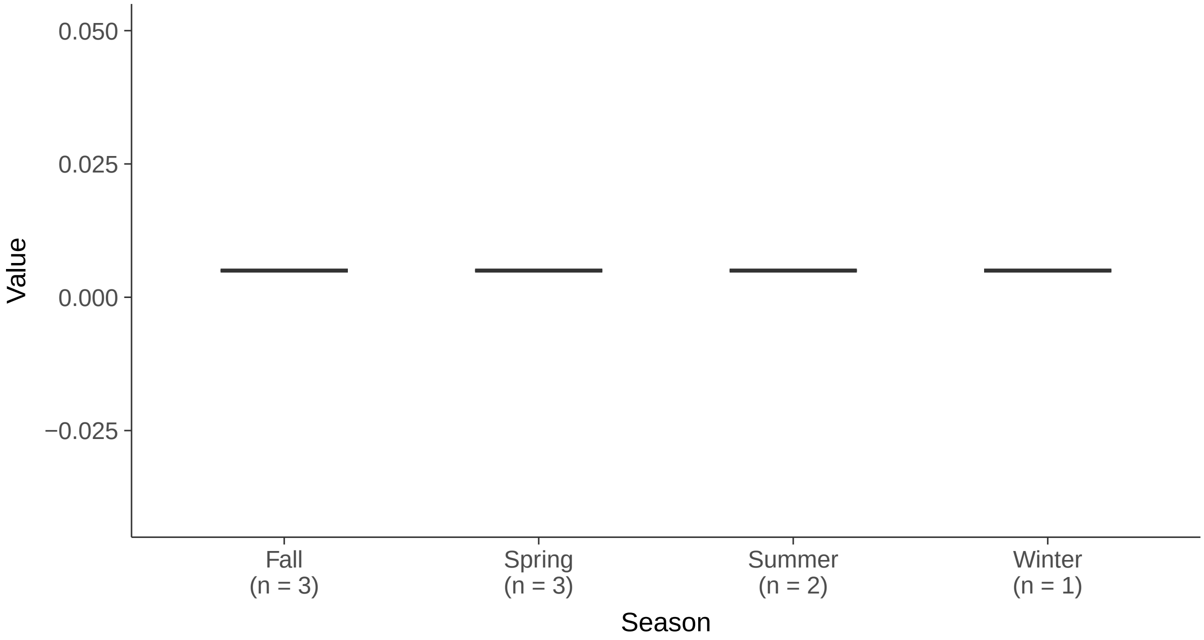
Boxplot

Copper, MW-16A (mg/L)



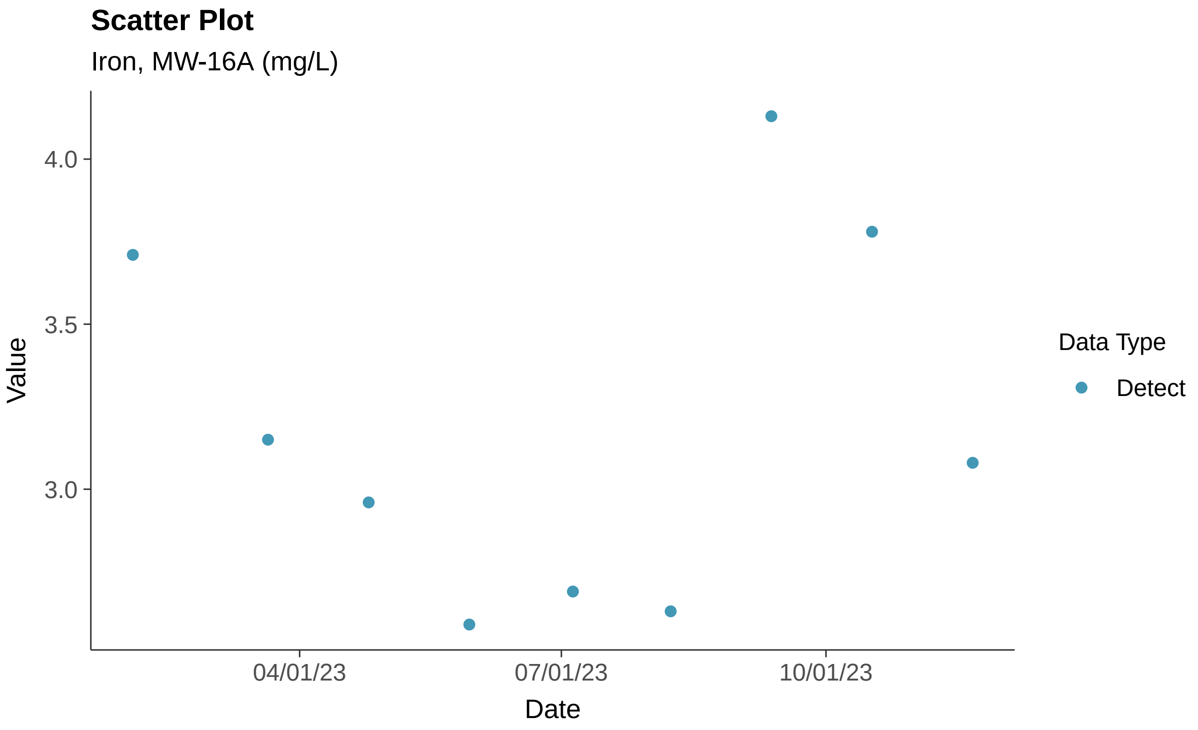
Boxplot by Season

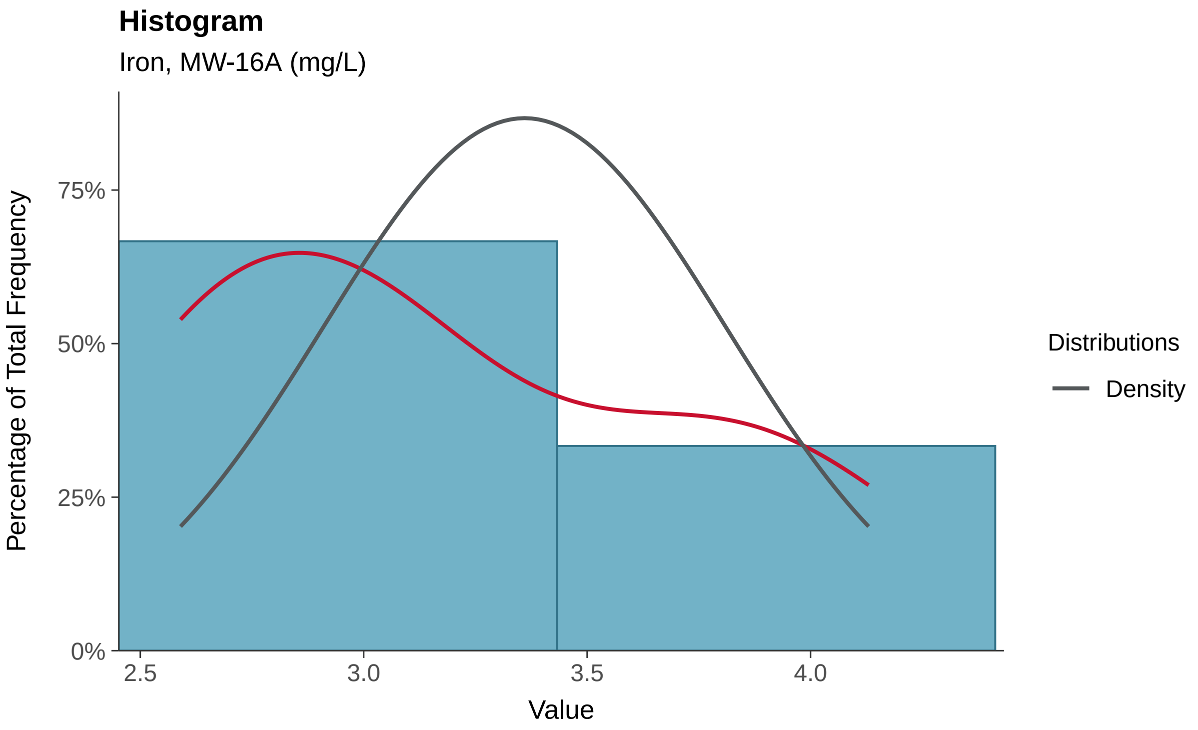
Copper, MW-16A (mg/L)



Part 115: Iron, MW-16A

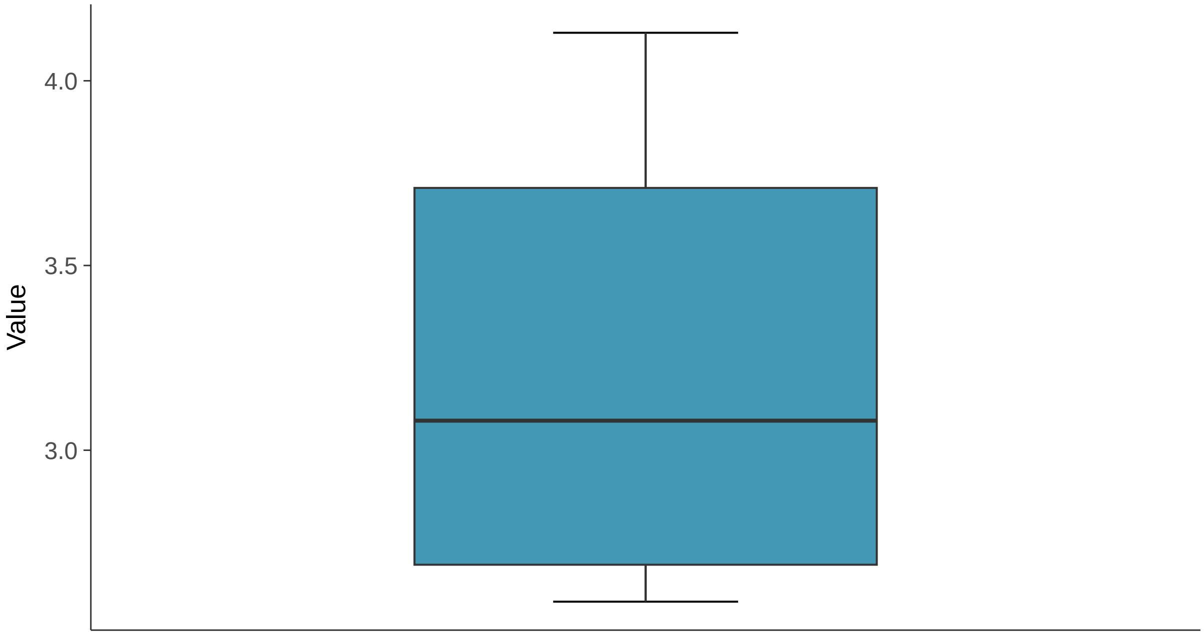
ID: 16A_5_38





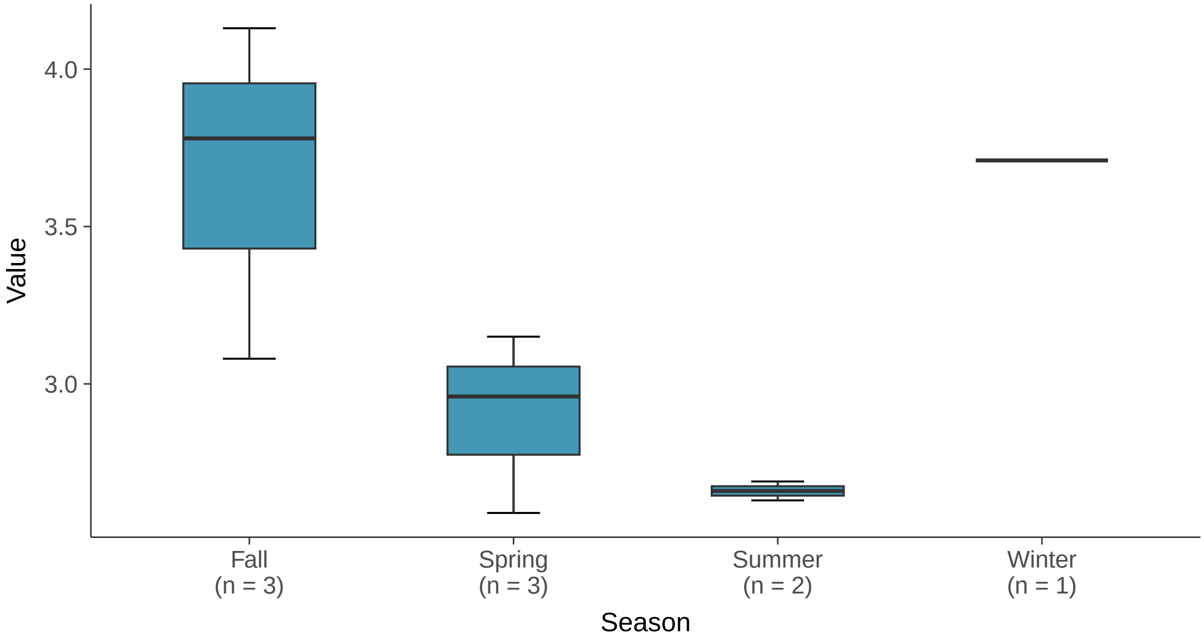
Boxplot

Iron, MW-16A (mg/L)



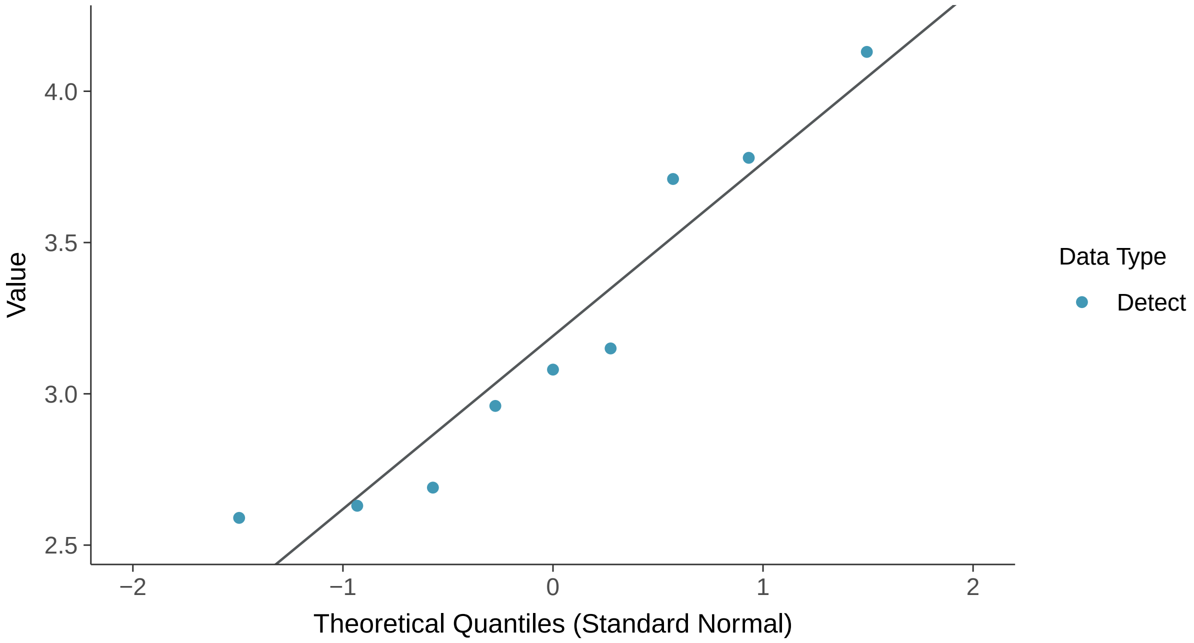
Boxplot by Season

Iron, MW-16A (mg/L)



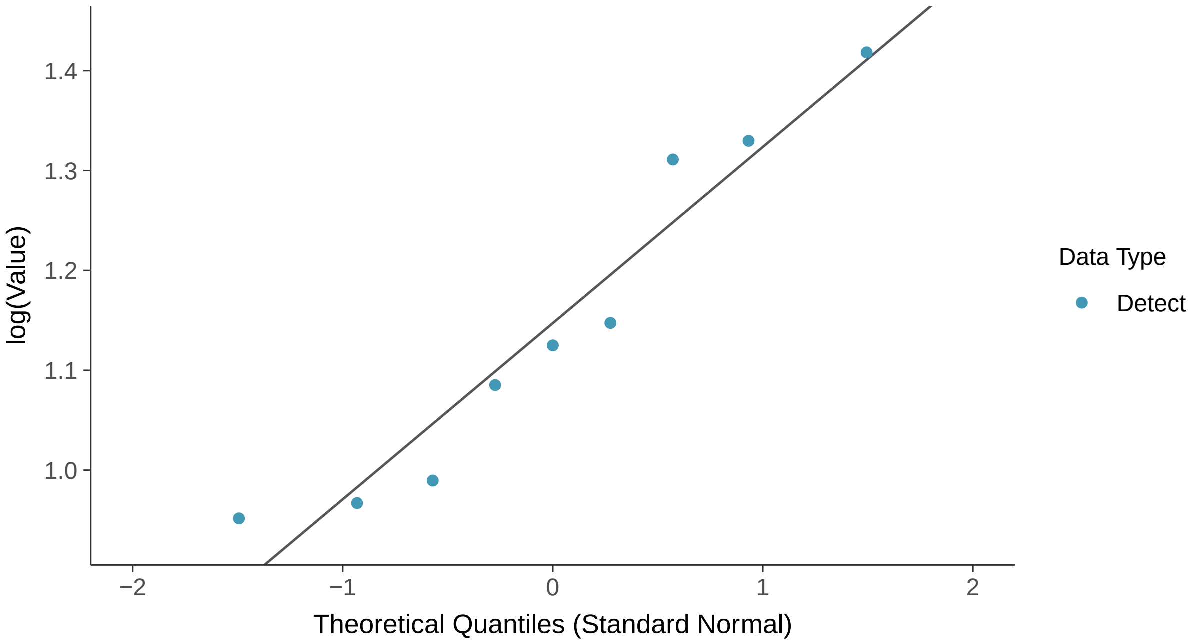
Normal Q-Q plot

Iron, MW-16A (mg/L)



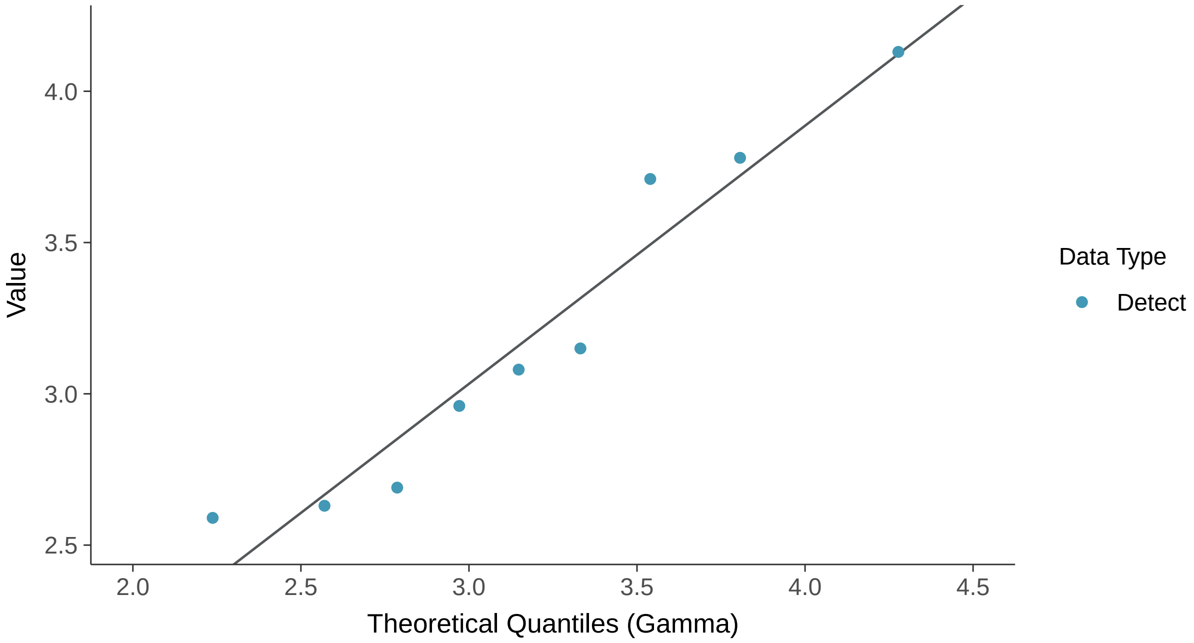
Lognormal Q-Q plot

Iron, MW-16A (mg/L)



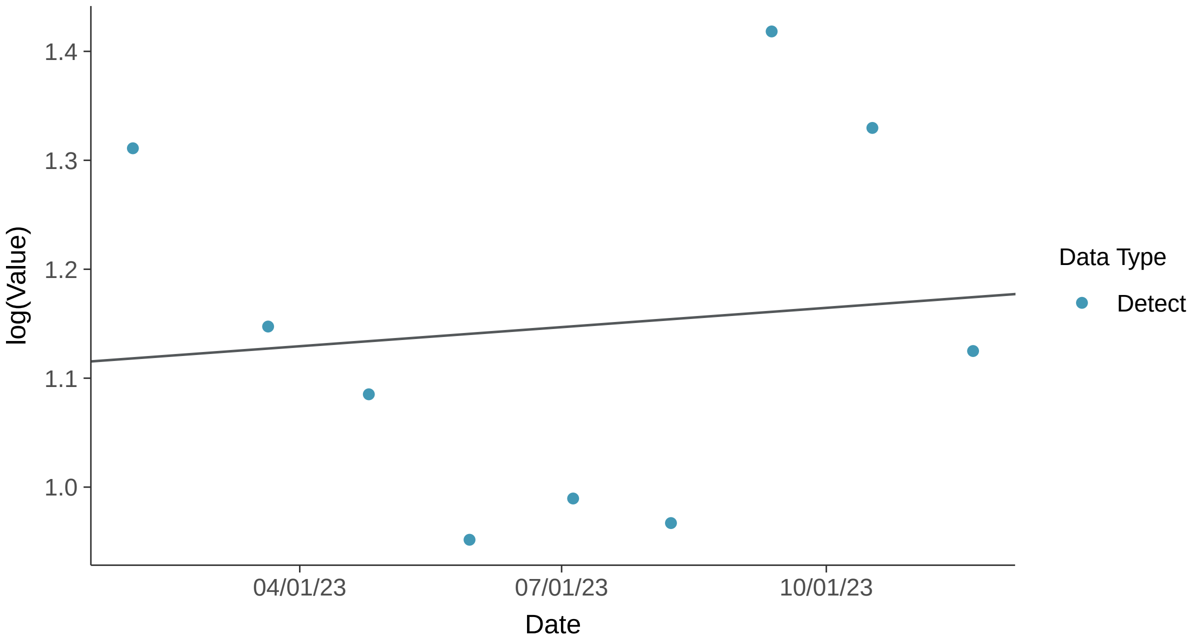
Gamma Q-Q plot

Iron, MW-16A (mg/L)



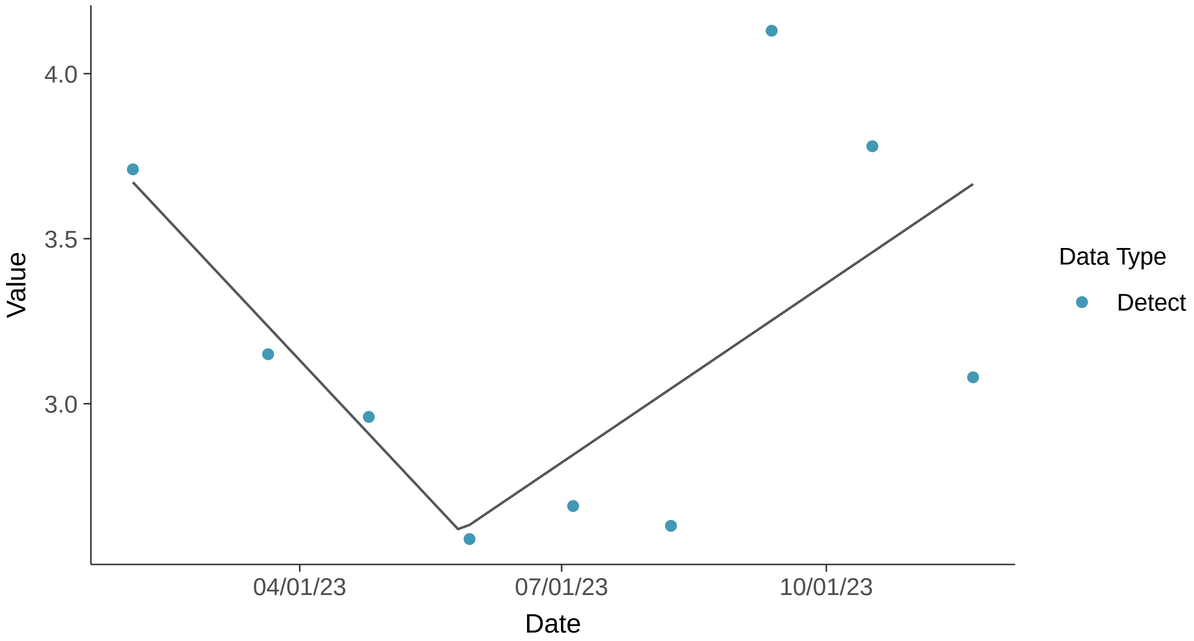
Trend Regression: Lognormal MLE

Iron, MW-16A (mg/L)



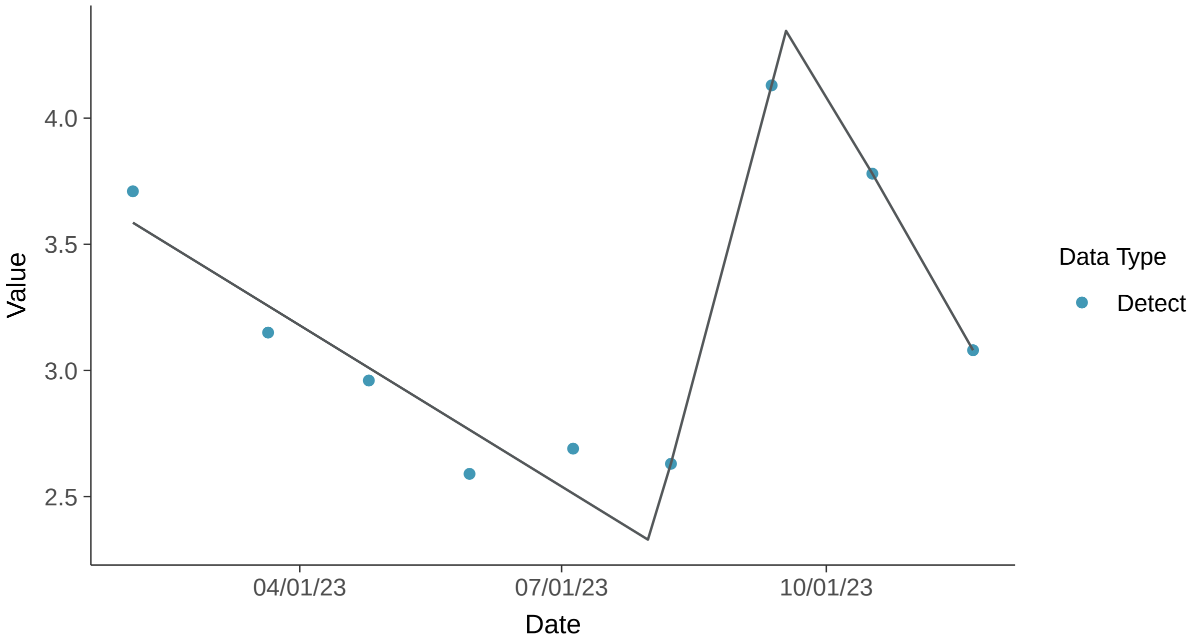
Trend Regression: Piecewise Linear-Linear

Iron, MW-16A (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Iron, MW-16A (mg/L)

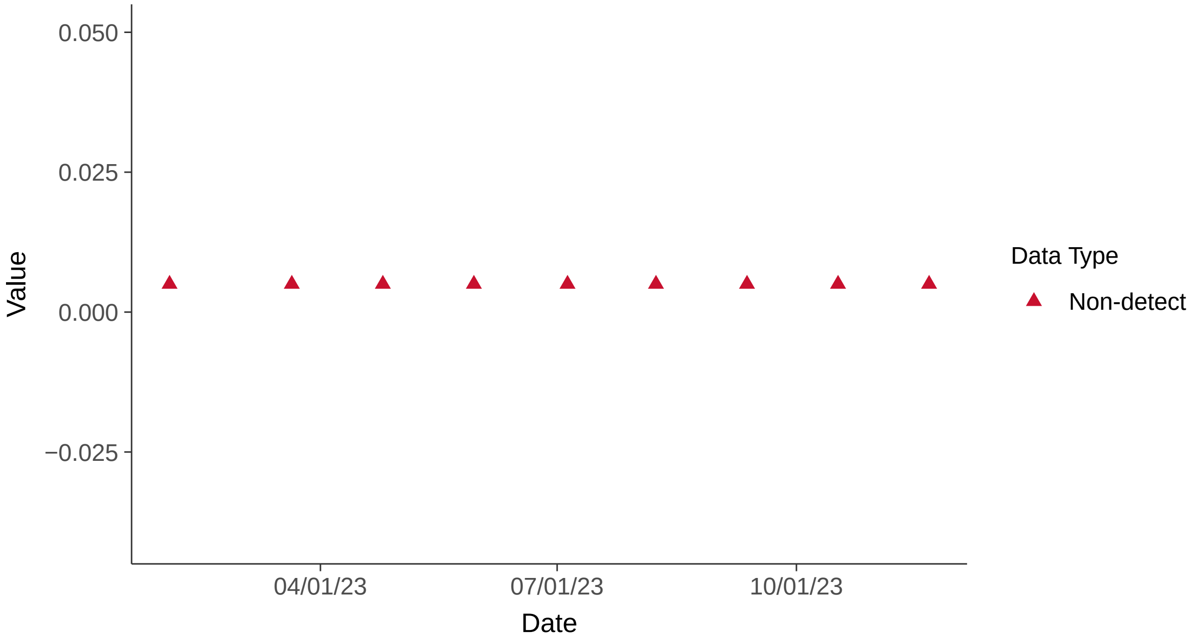


Part 115: Nickel, MW-16A

ID: 16A_5_39

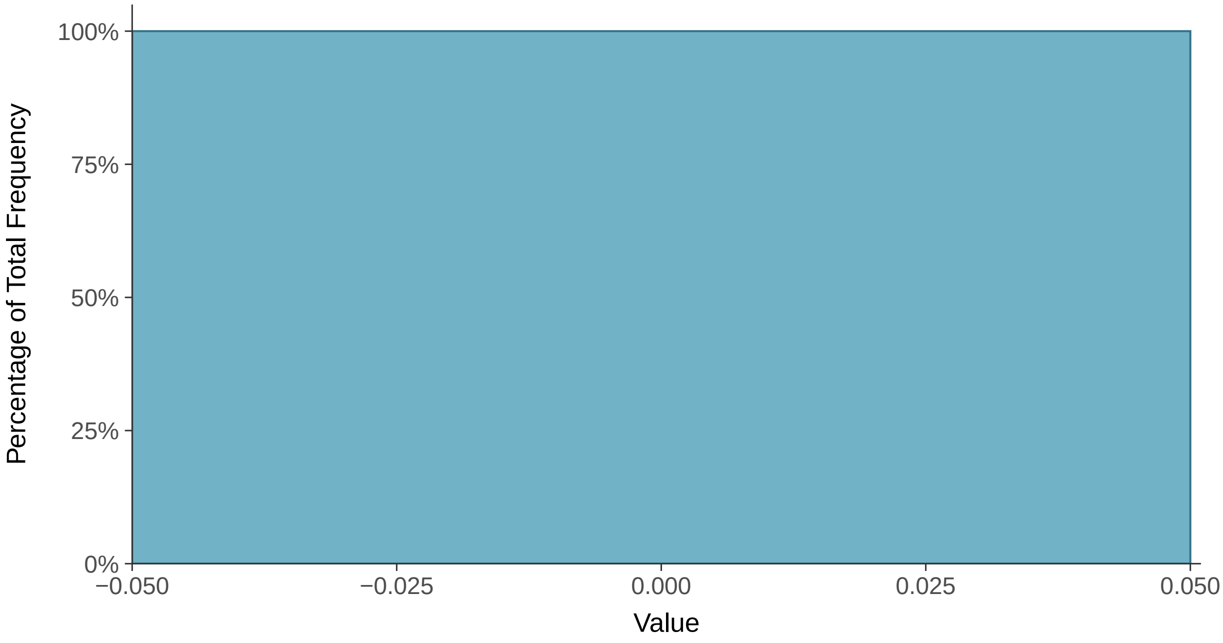
Scatter Plot

Nickel, MW-16A (mg/L)



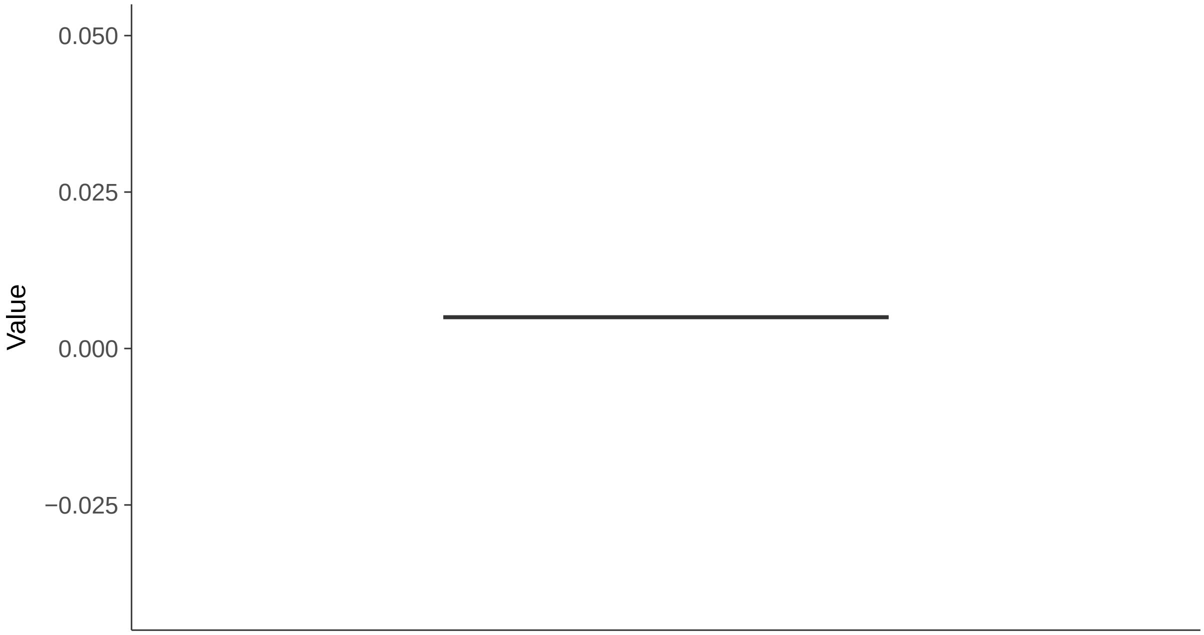
Histogram

Nickel, MW-16A (mg/L)



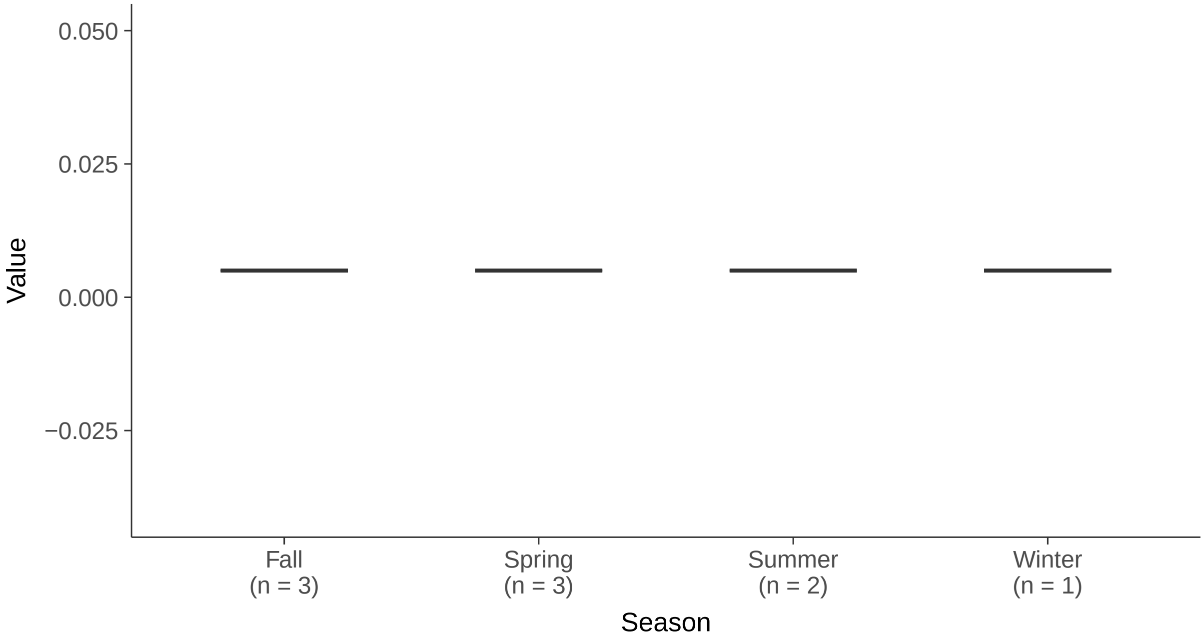
Boxplot

Nickel, MW-16A (mg/L)



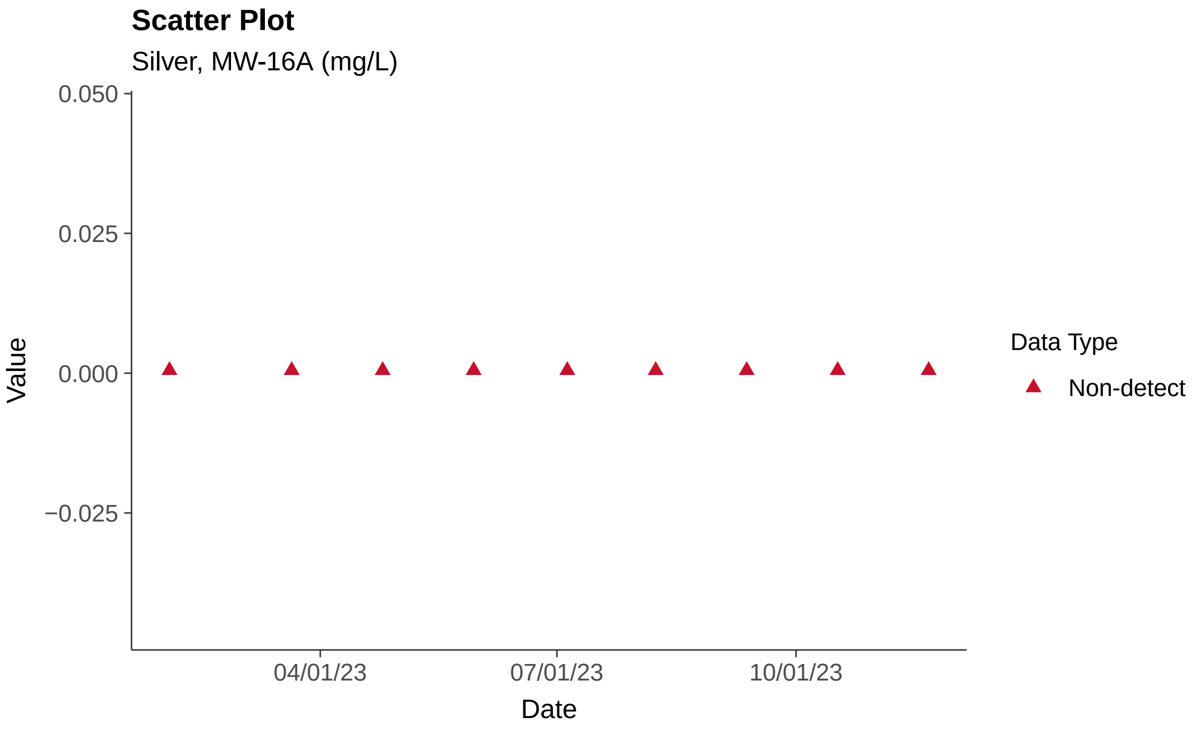
Boxplot by Season

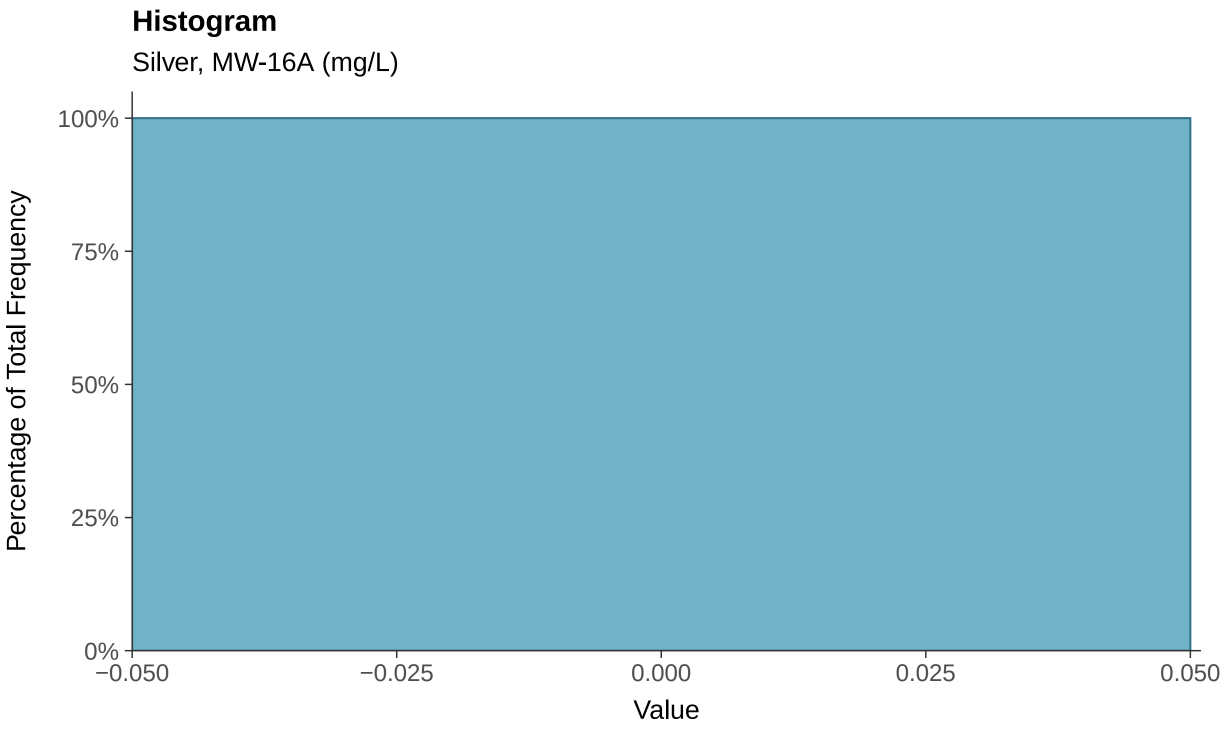
Nickel, MW-16A (mg/L)



Part 115: Silver, MW-16A

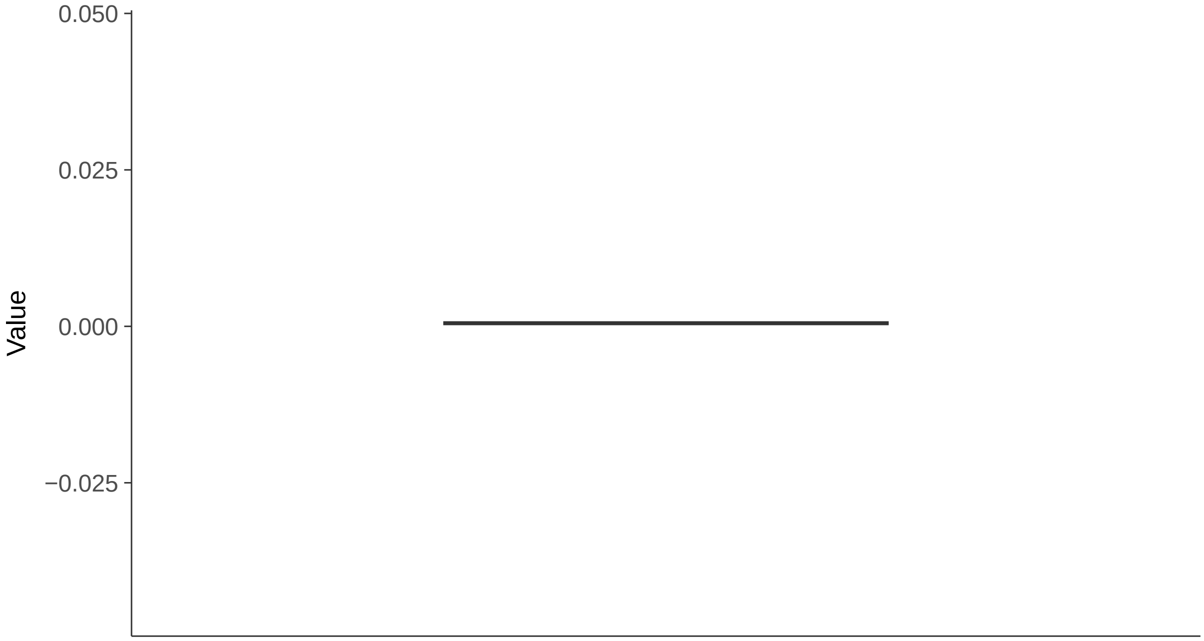
ID: 16A_5_40





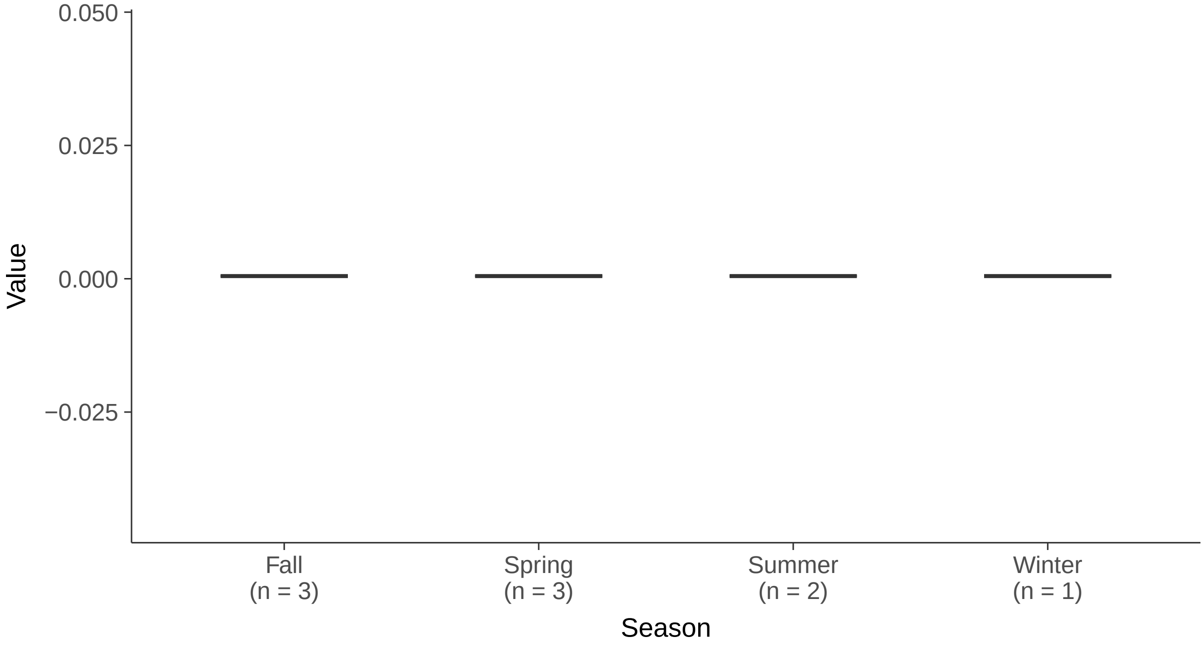
Boxplot

Silver, MW-16A (mg/L)



Boxplot by Season

Silver, MW-16A (mg/L)

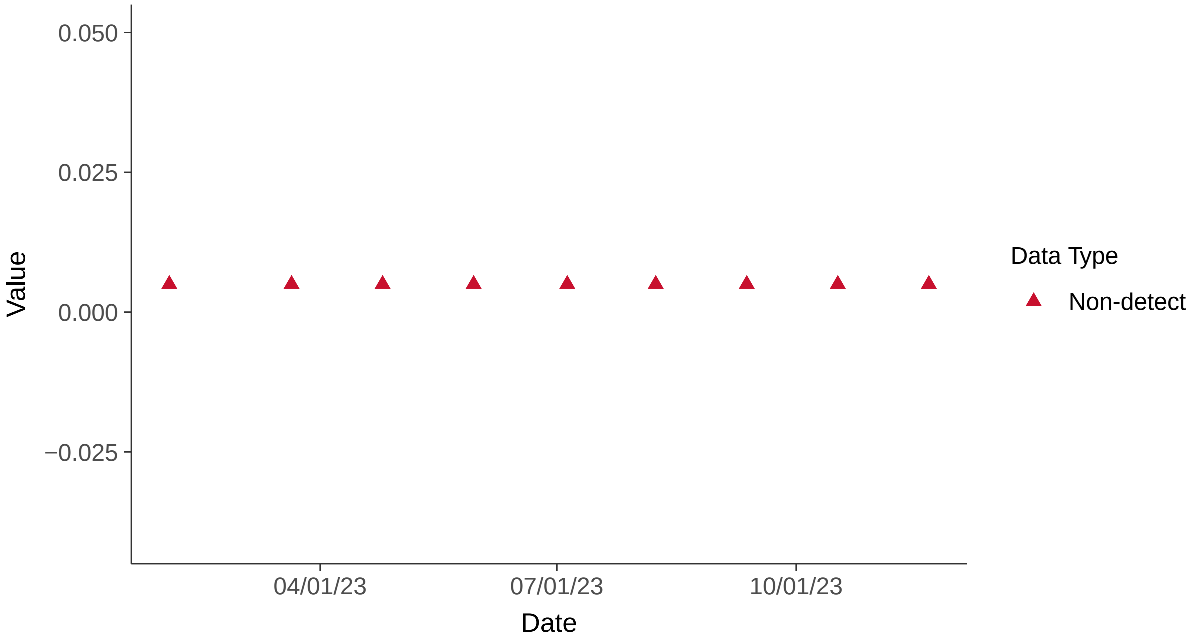


Part 115: Vanadium, MW-16A

ID: 16A_5_41

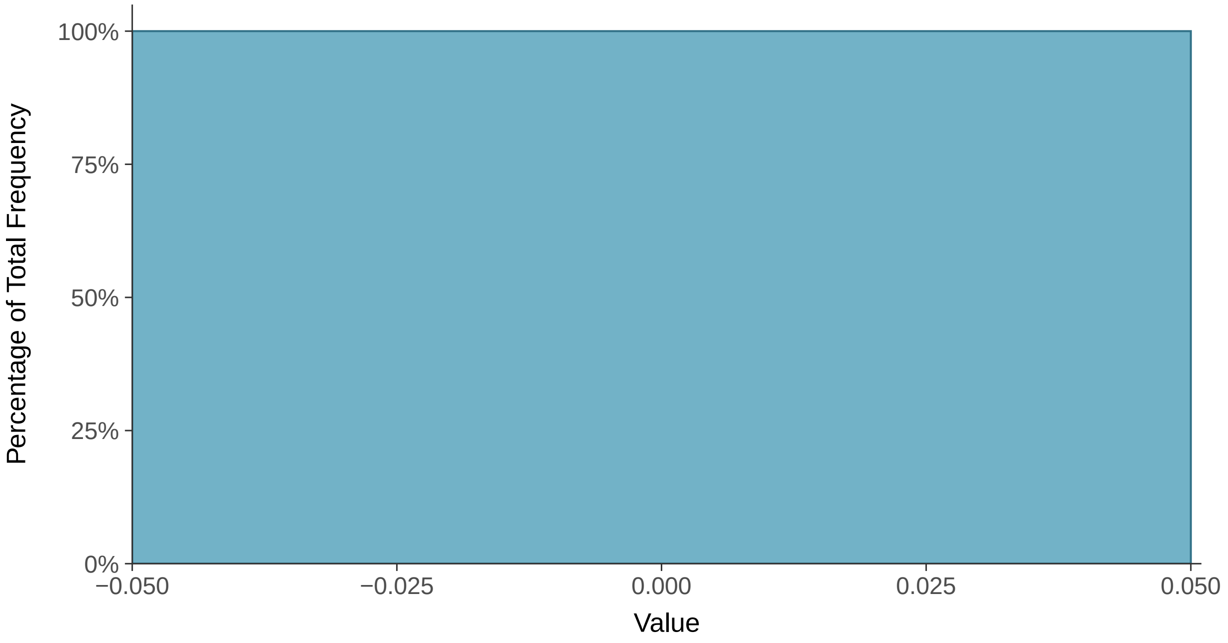
Scatter Plot

Vanadium, MW-16A (mg/L)



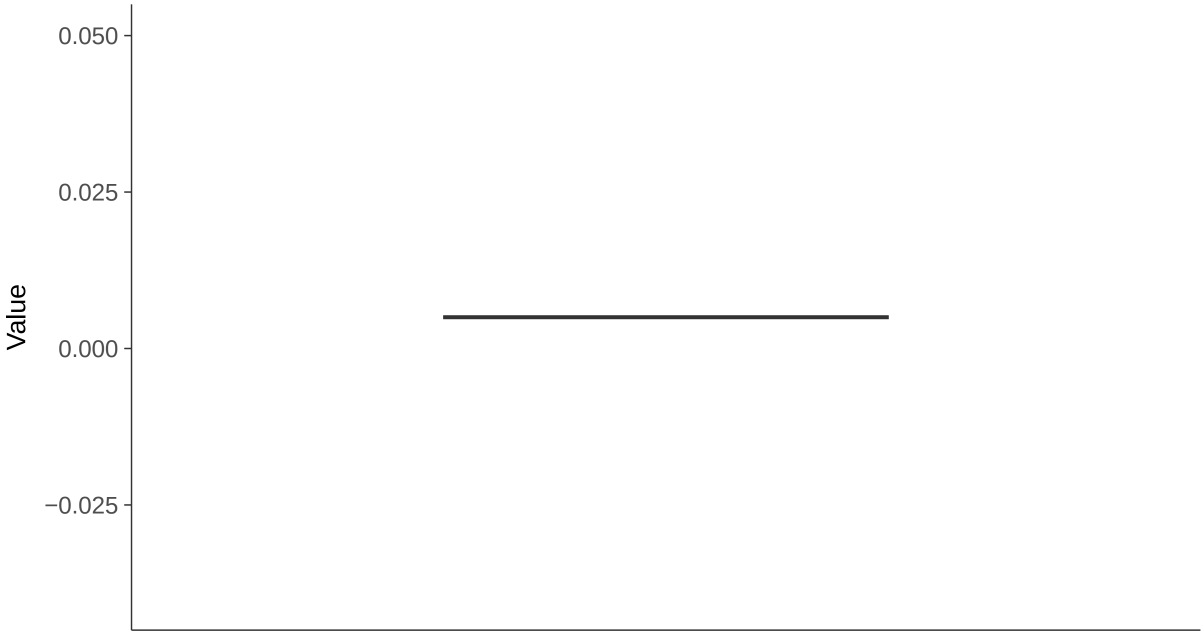
Histogram

Vanadium, MW-16A (mg/L)



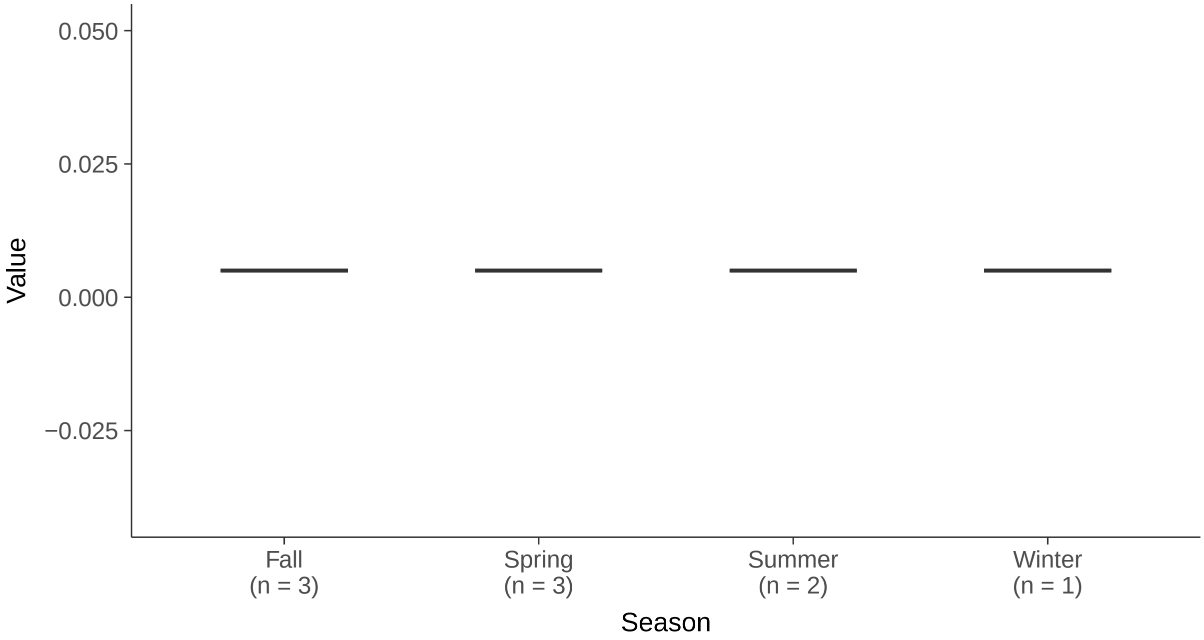
Boxplot

Vanadium, MW-16A (mg/L)



Boxplot by Season

Vanadium, MW-16A (mg/L)

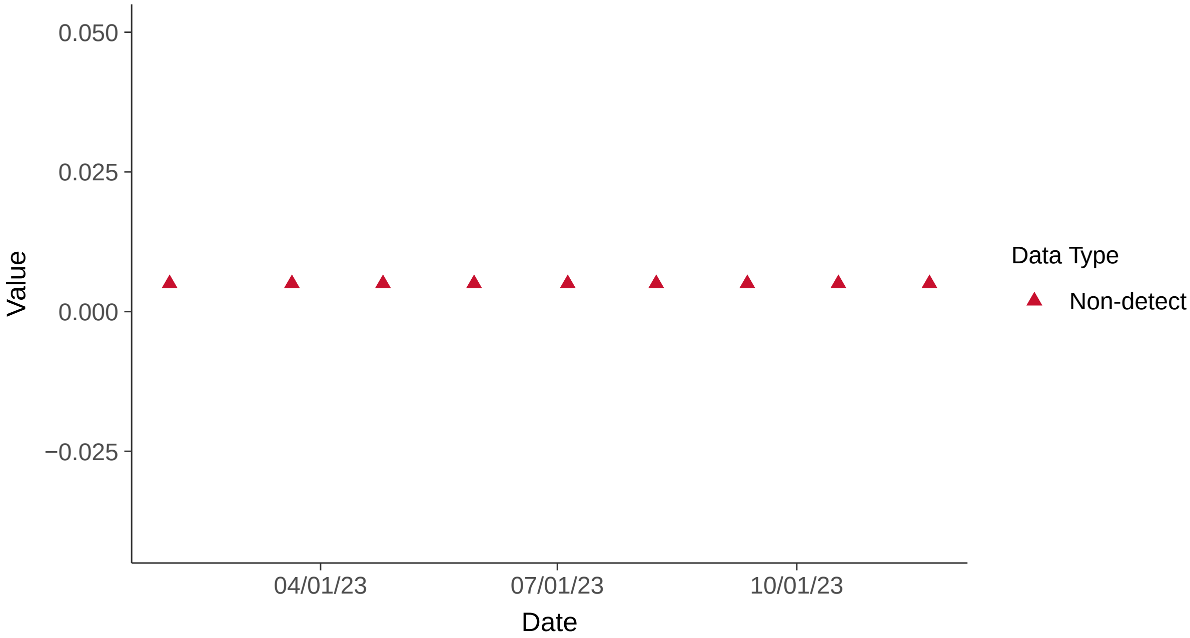


Part 115: Zinc, MW-16A

ID: 16A_5_42

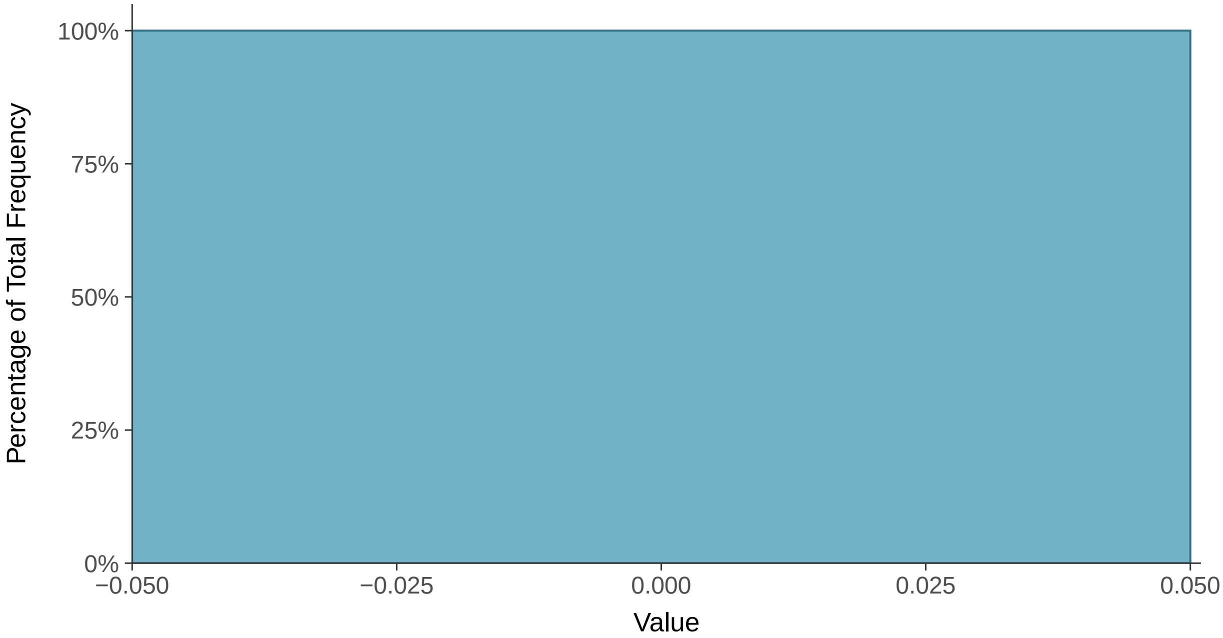
Scatter Plot

Zinc, MW-16A (mg/L)



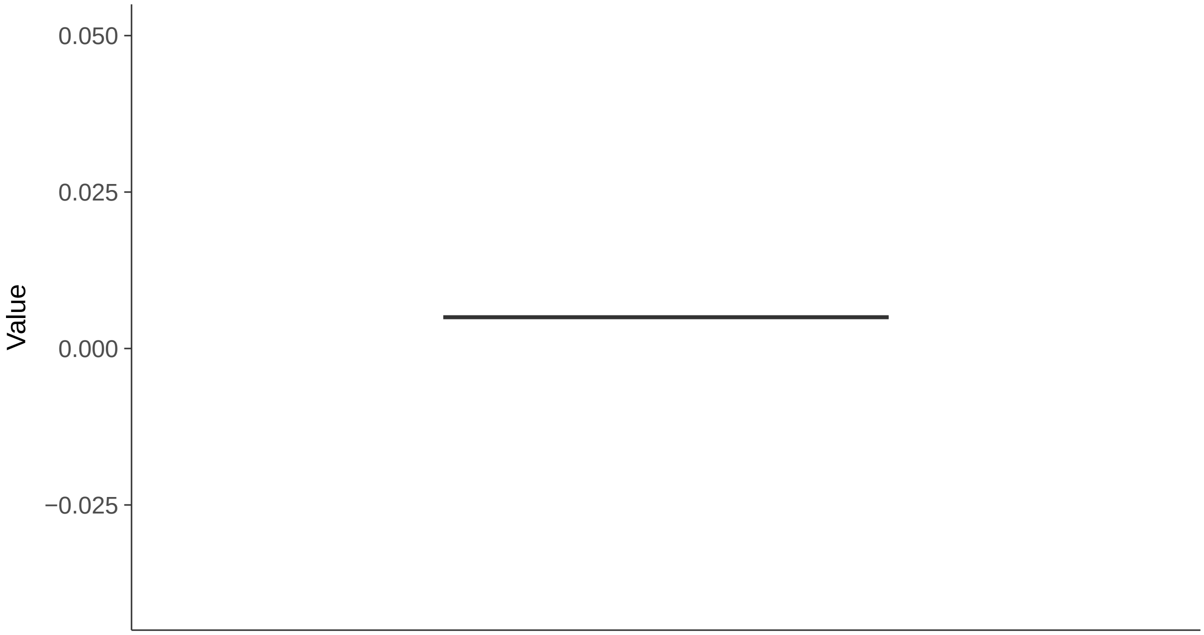
Histogram

Zinc, MW-16A (mg/L)



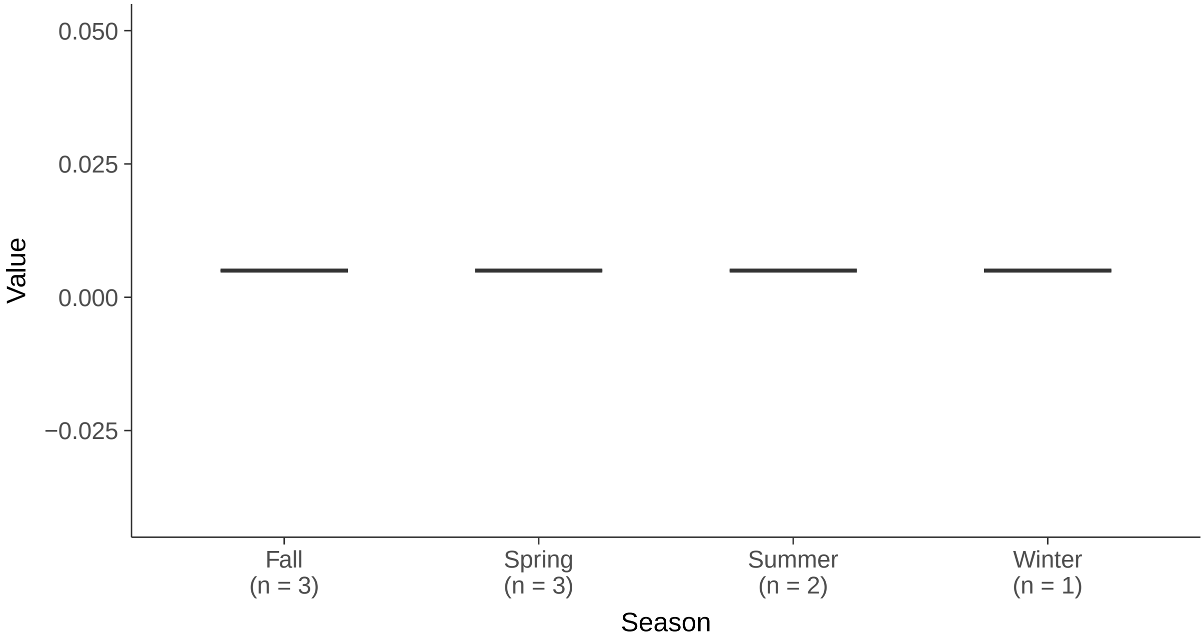
Boxplot

Zinc, MW-16A (mg/L)



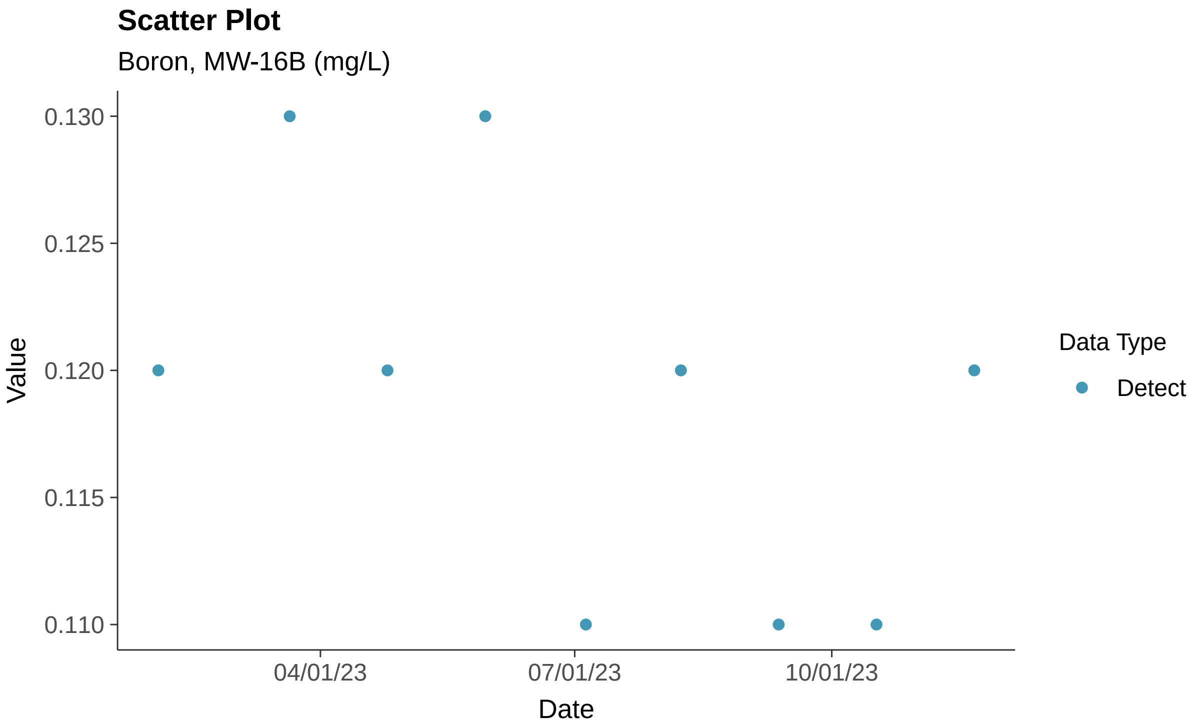
Boxplot by Season

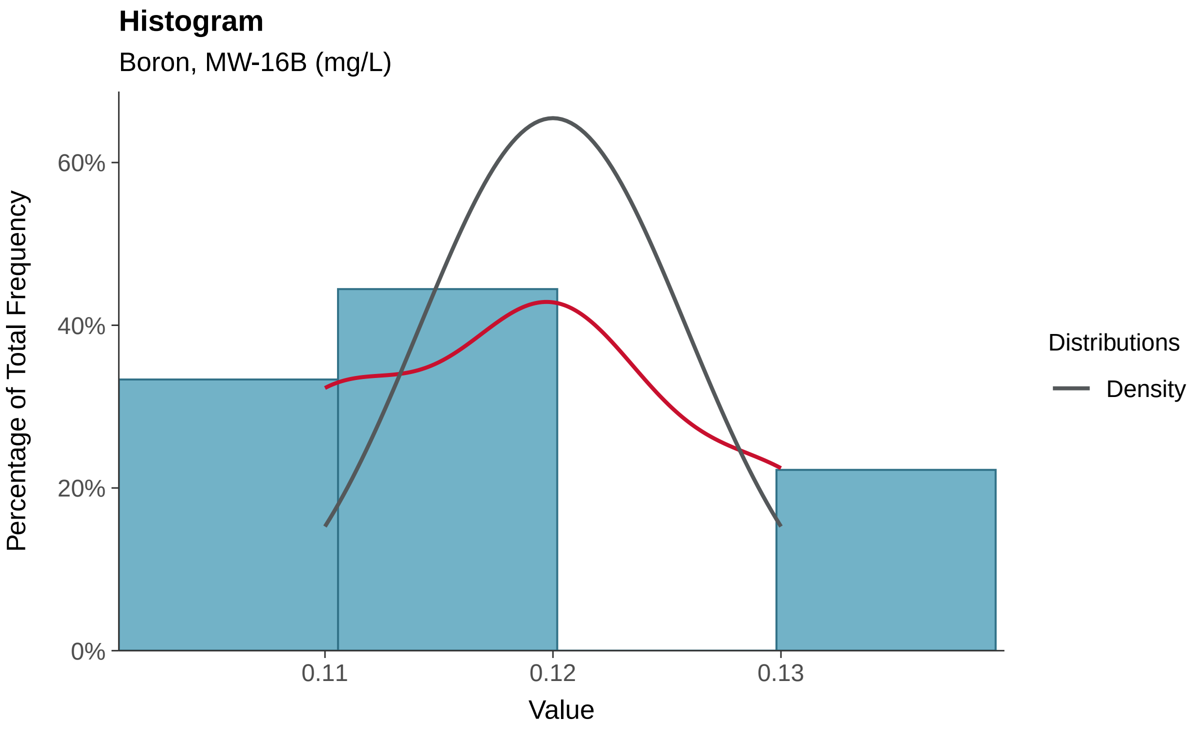
Zinc, MW-16A (mg/L)



Appendix III: Boron, MW-16B

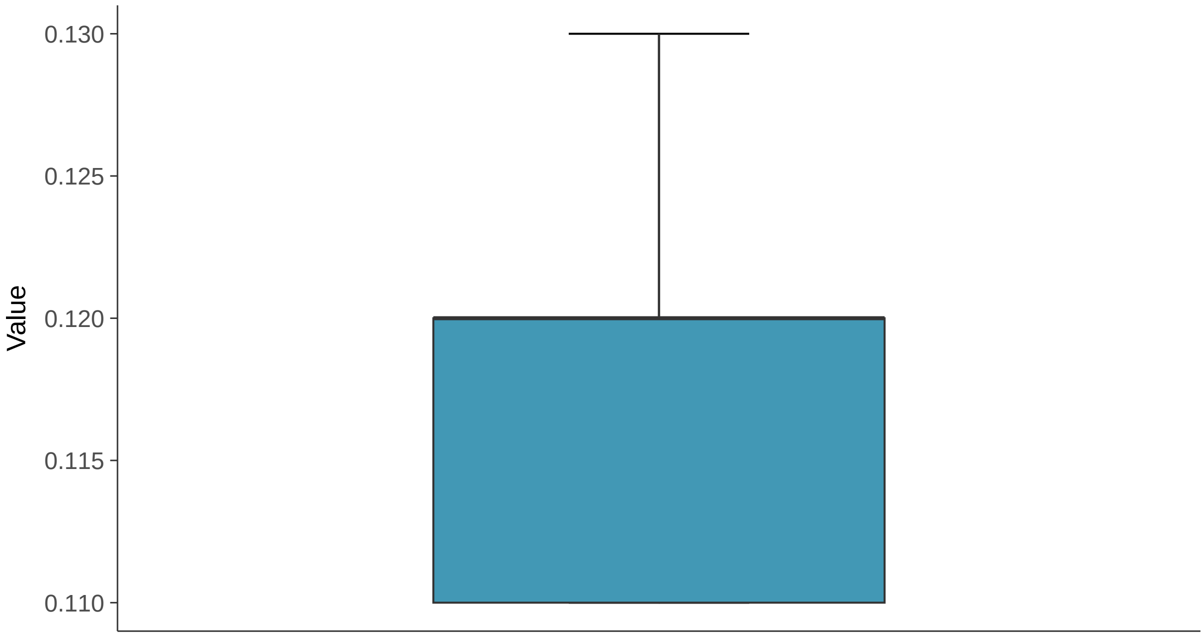
ID: 16B_1_01





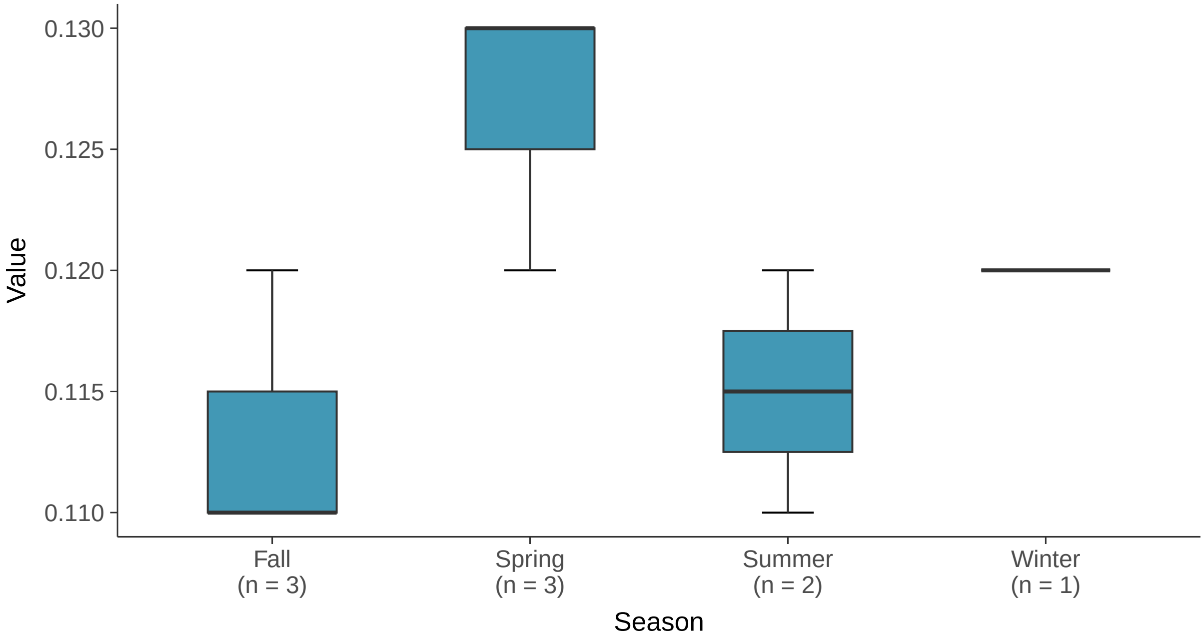
Boxplot

Boron, MW-16B (mg/L)



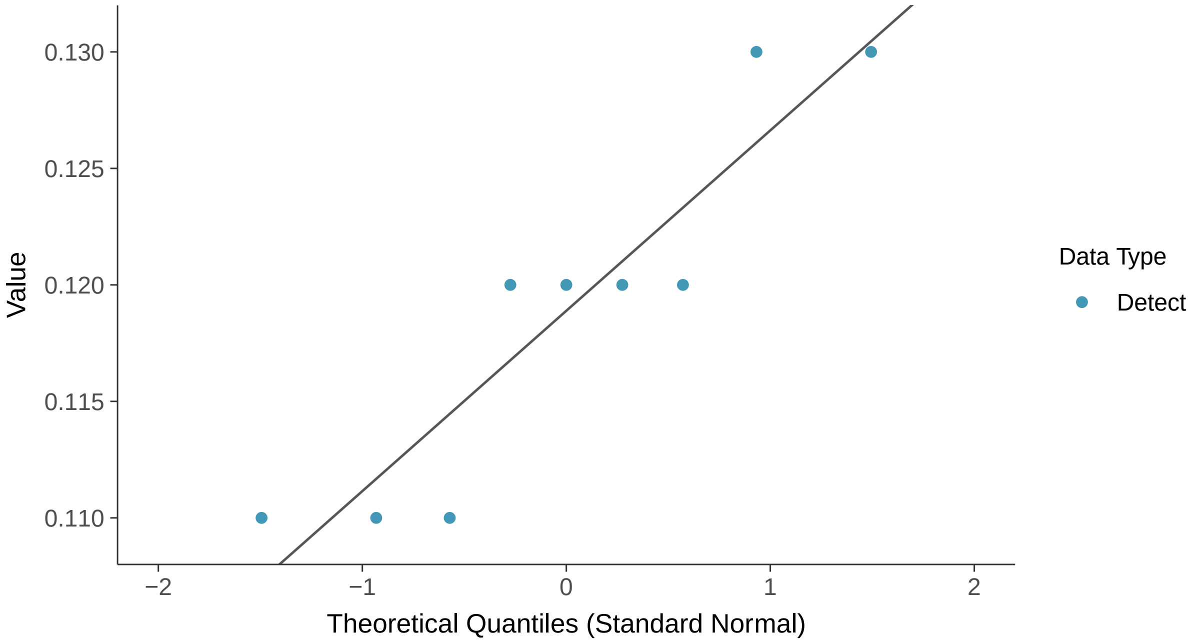
Boxplot by Season

Boron, MW-16B (mg/L)



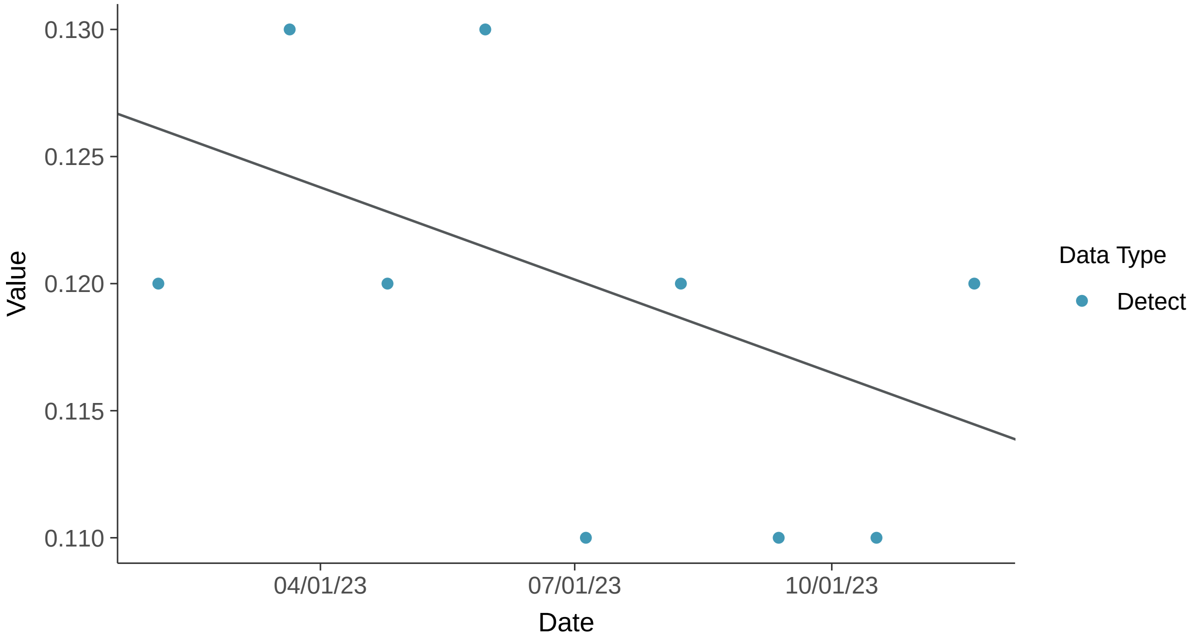
Normal Q-Q plot

Boron, MW-16B (mg/L)



Trend Regression: Mann-Kendall/Theil-Sen Estimate

Boron, MW-16B (mg/L)

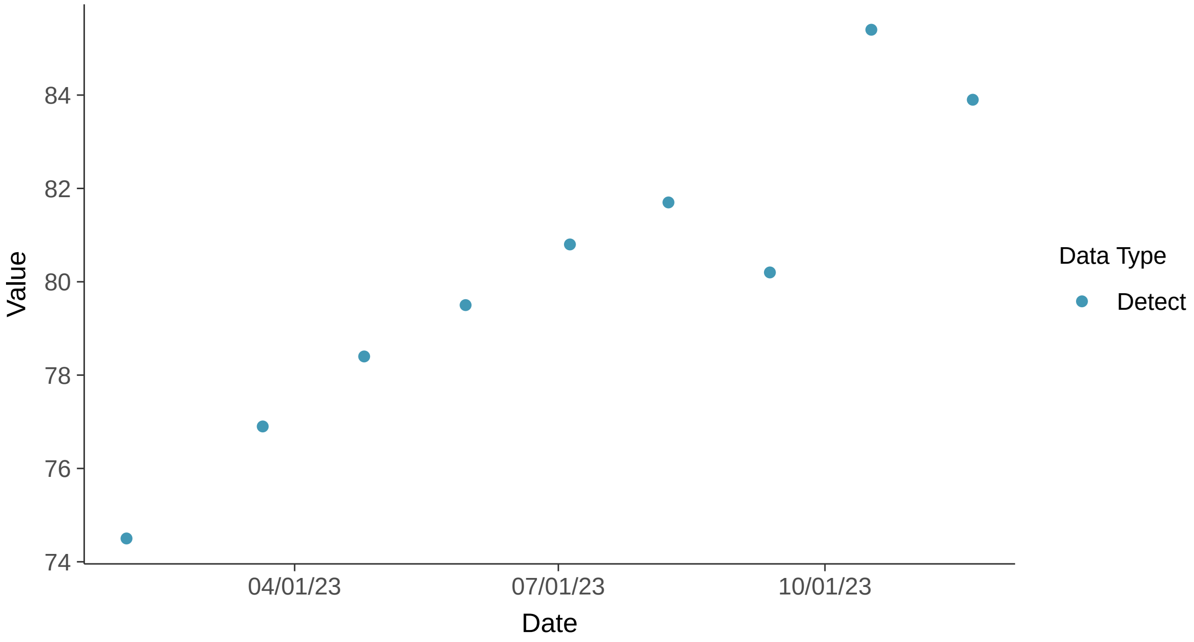


Appendix III: Calcium, MW-16B

ID: 16B_1_02

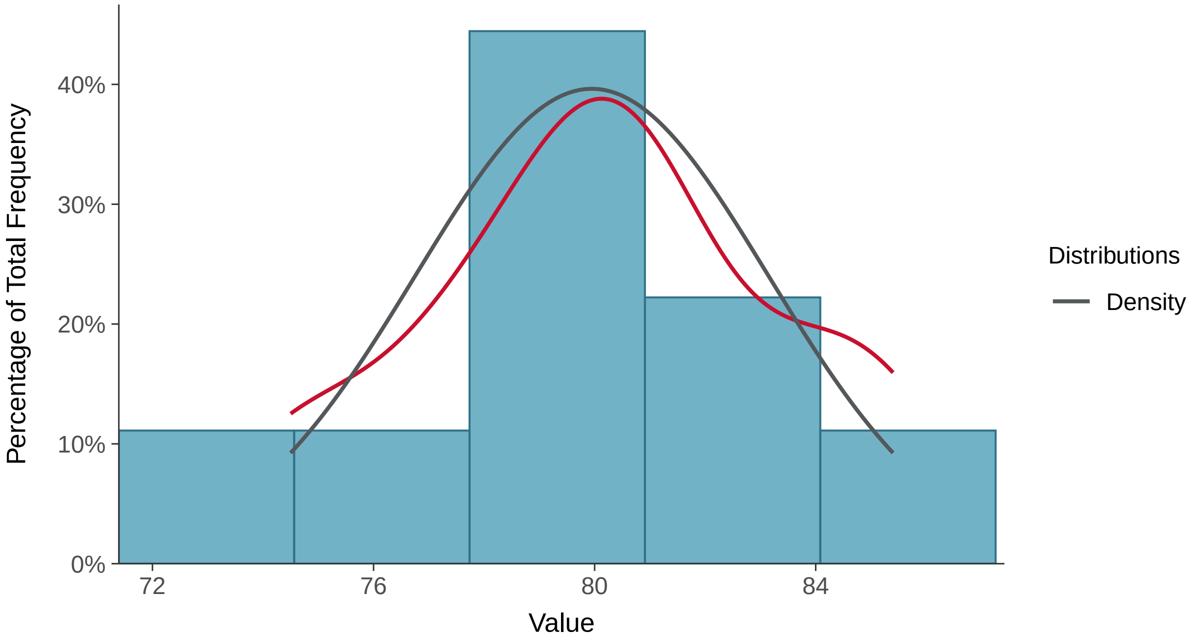
Scatter Plot

Calcium, MW-16B (mg/L)



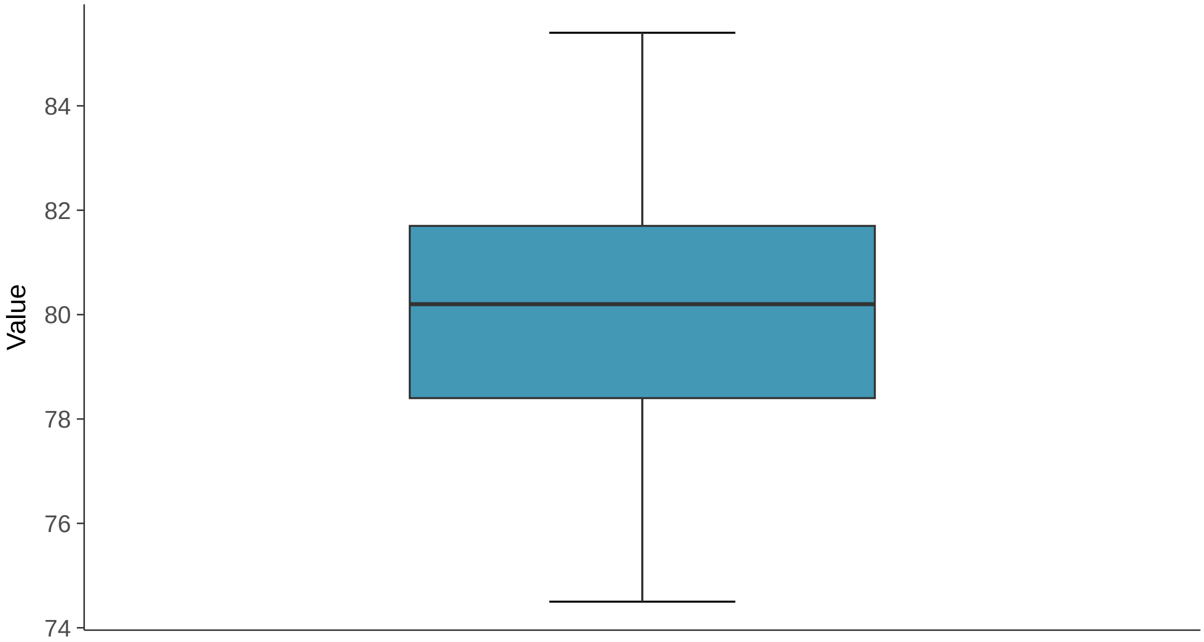
Histogram

Calcium, MW-16B (mg/L)



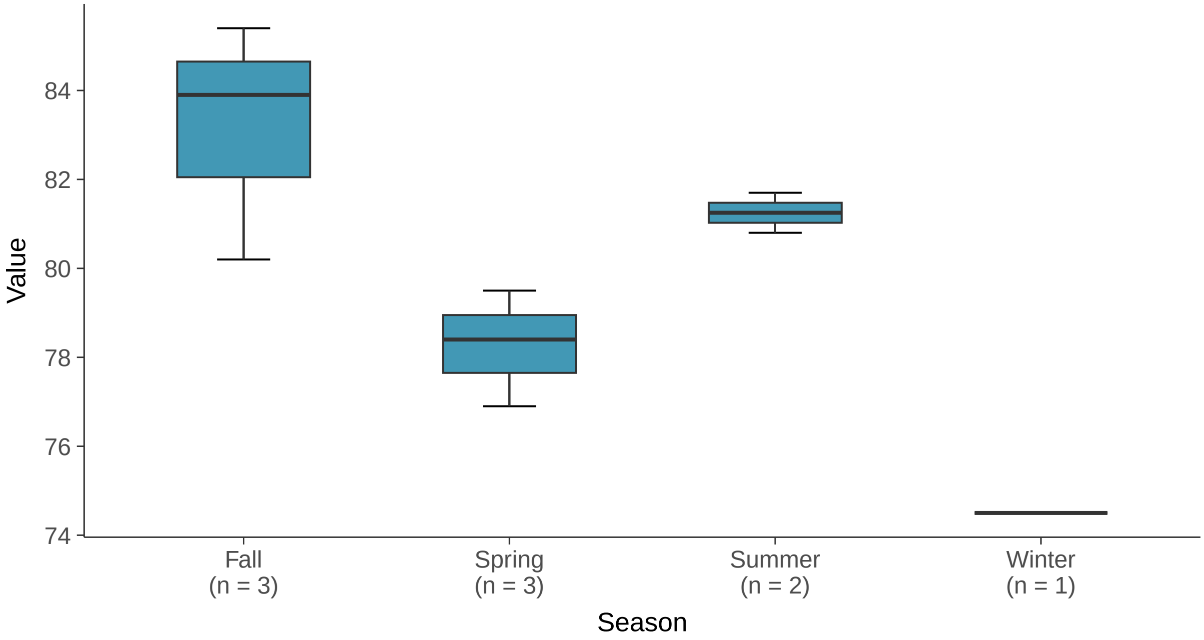
Boxplot

Calcium, MW-16B (mg/L)



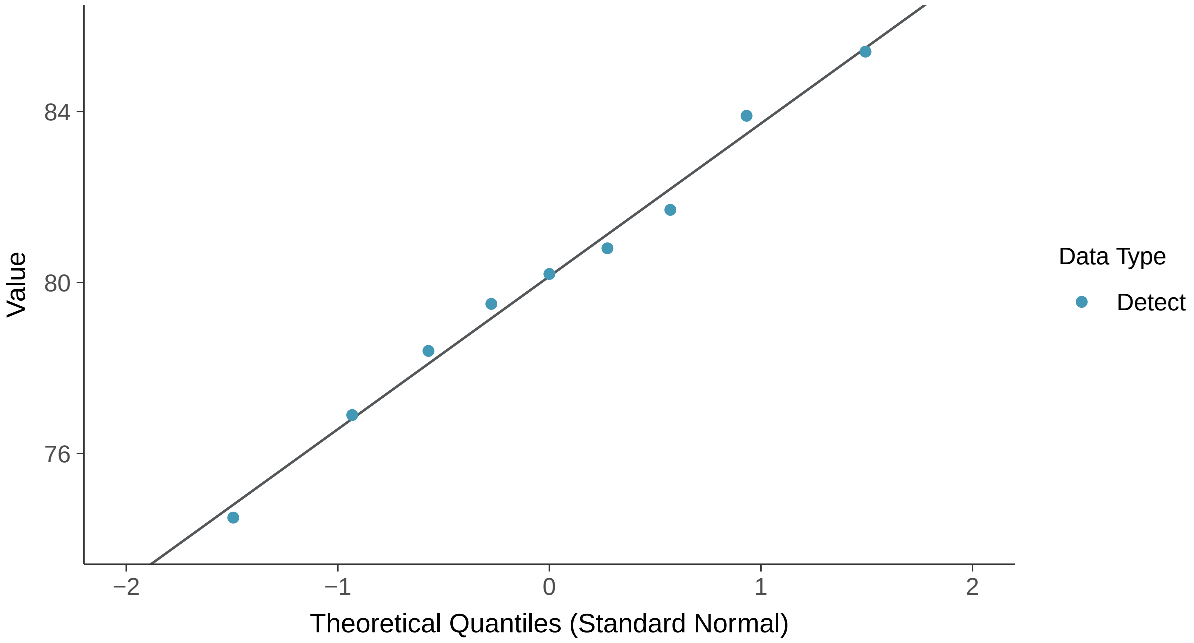
Boxplot by Season

Calcium, MW-16B (mg/L)



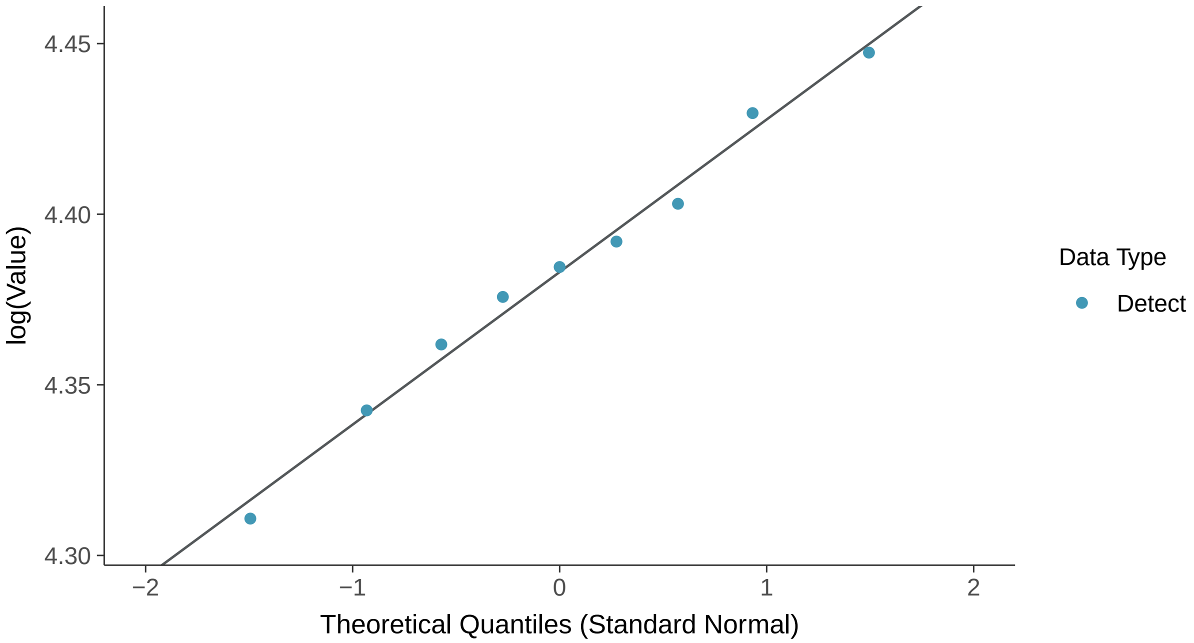
Normal Q-Q plot

Calcium, MW-16B (mg/L)



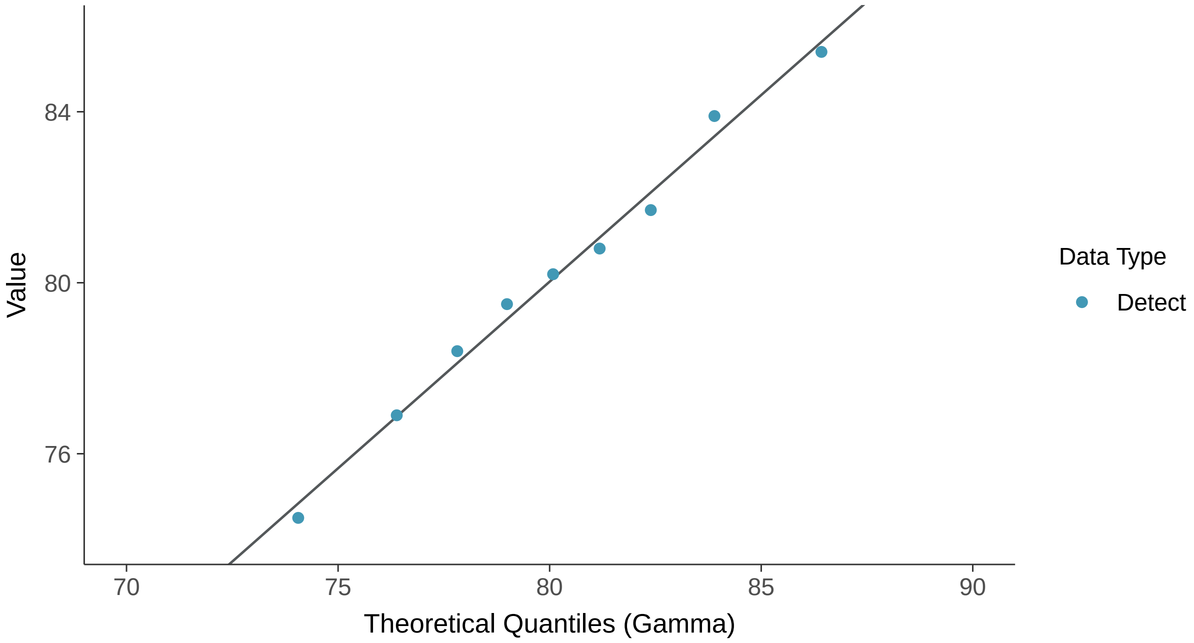
Lognormal Q-Q plot

Calcium, MW-16B (mg/L)



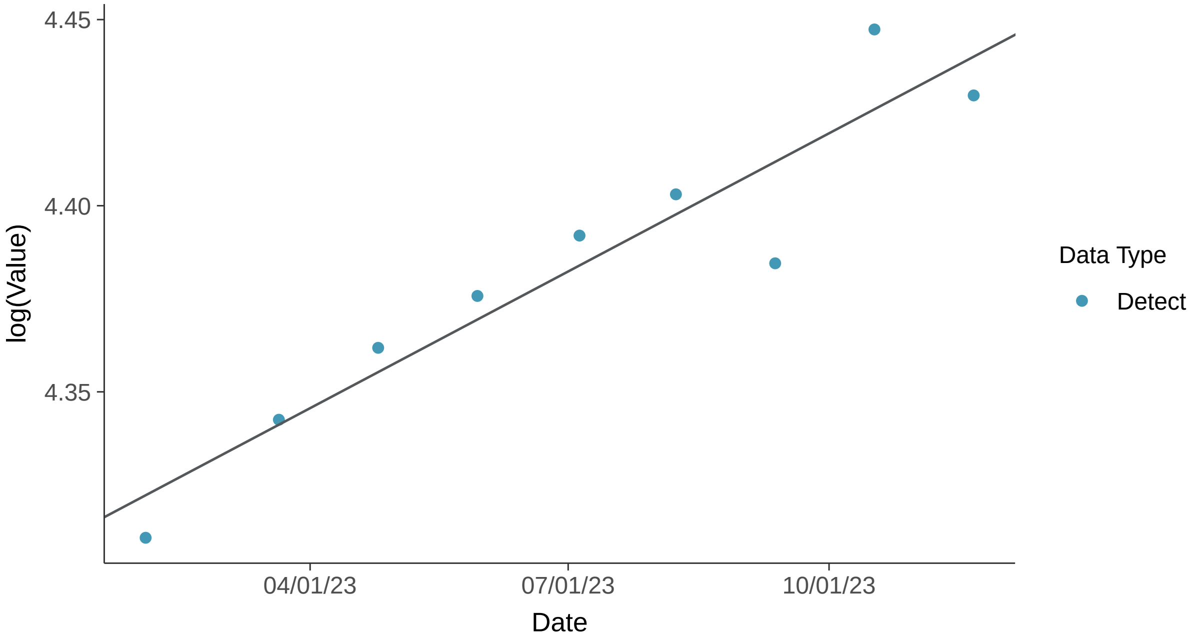
Gamma Q-Q plot

Calcium, MW-16B (mg/L)



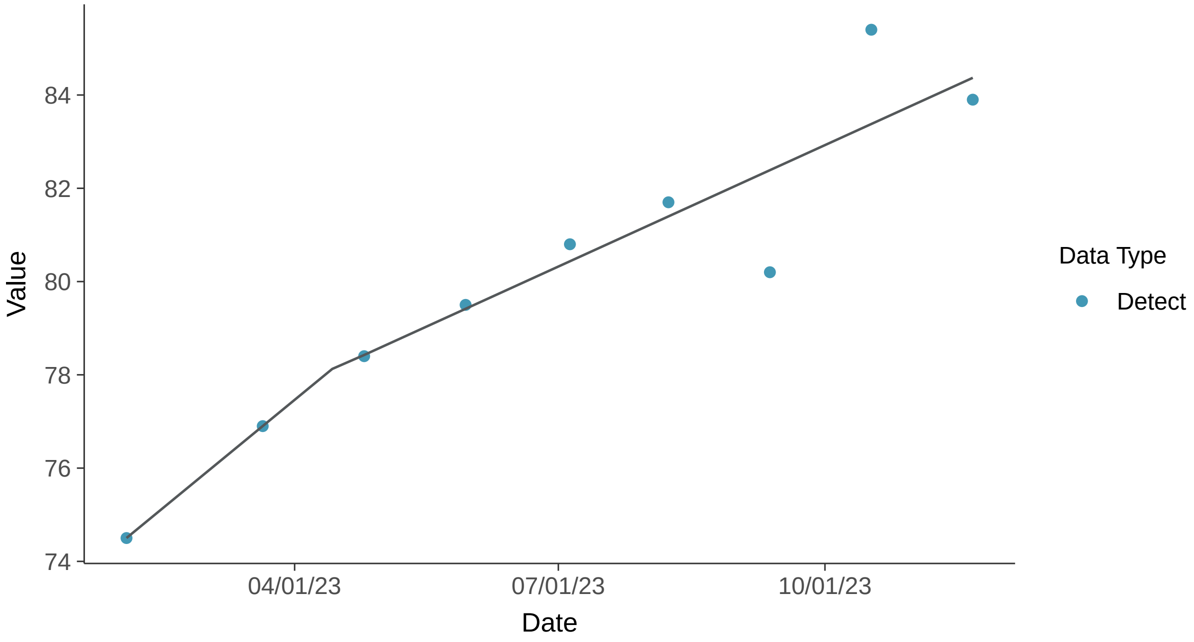
Trend Regression: Lognormal MLE

Calcium, MW-16B (mg/L)



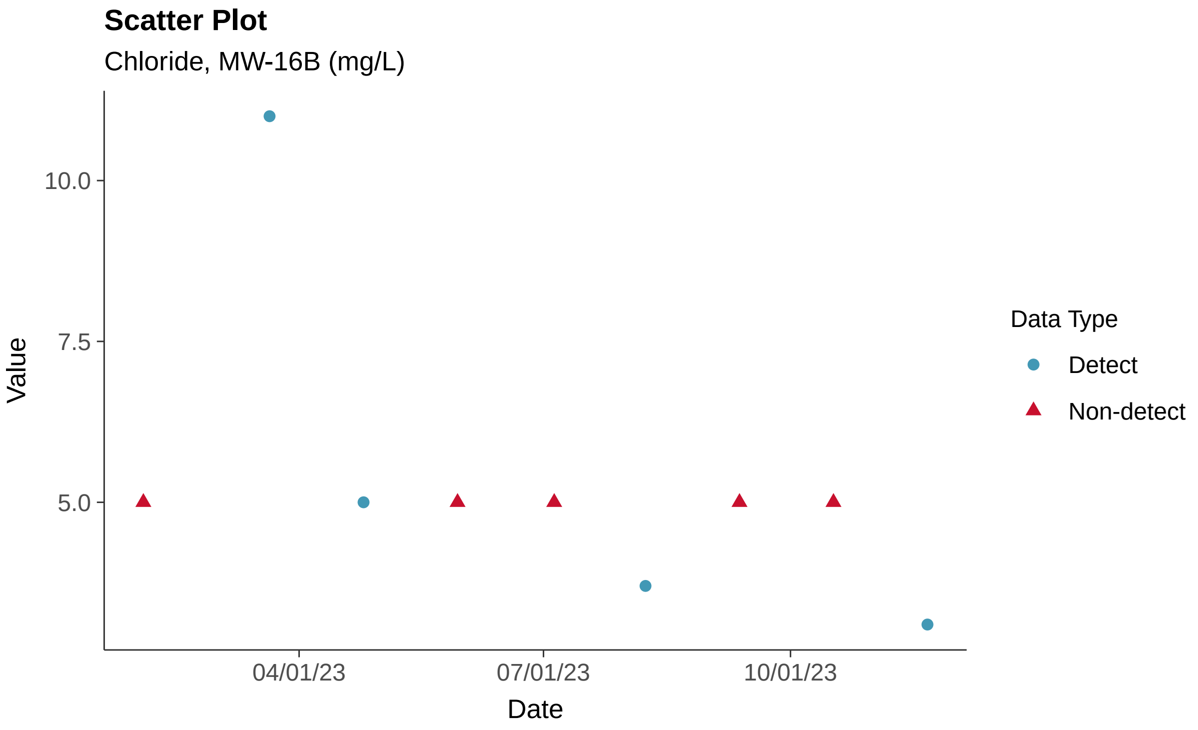
Trend Regression: Piecewise Linear-Linear

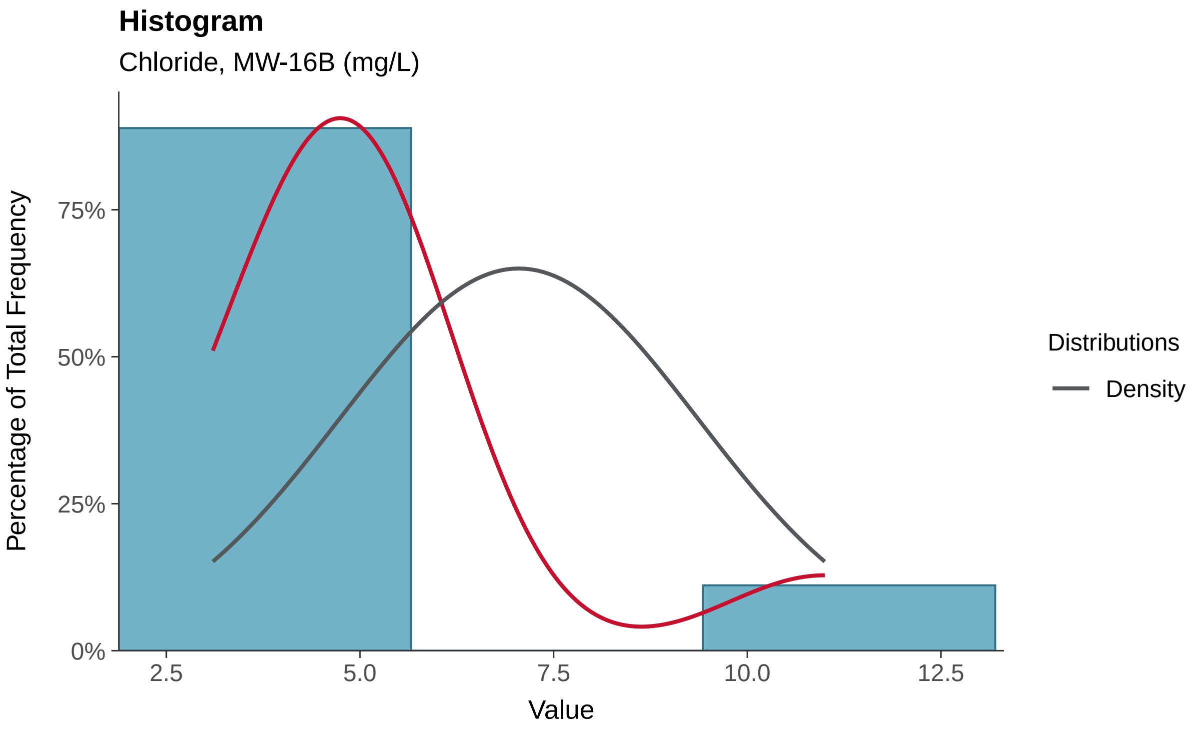
Calcium, MW-16B (mg/L)



Appendix III: Chloride, MW-16B

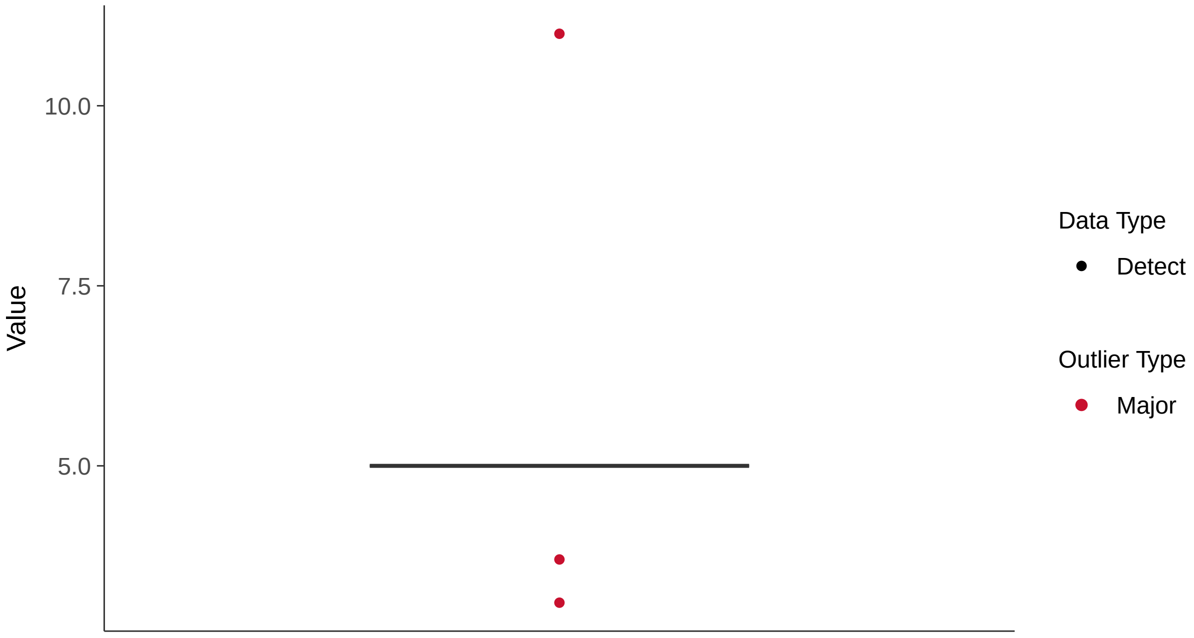
ID: 16B_1_03





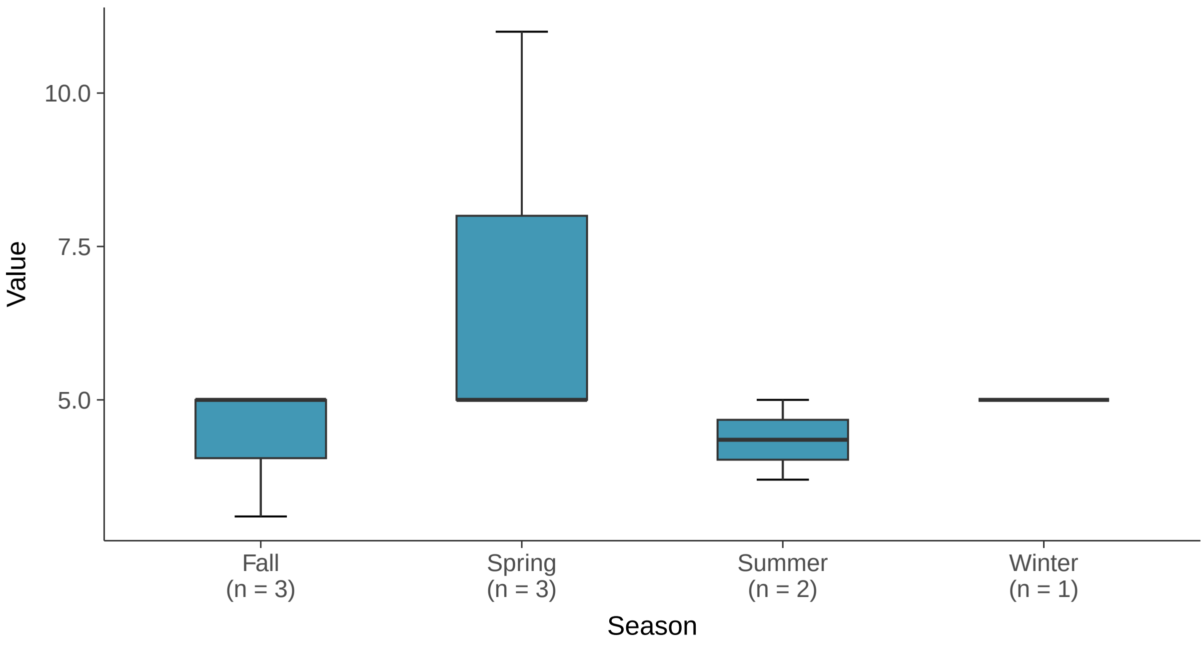
Boxplot

Chloride, MW-16B (mg/L)



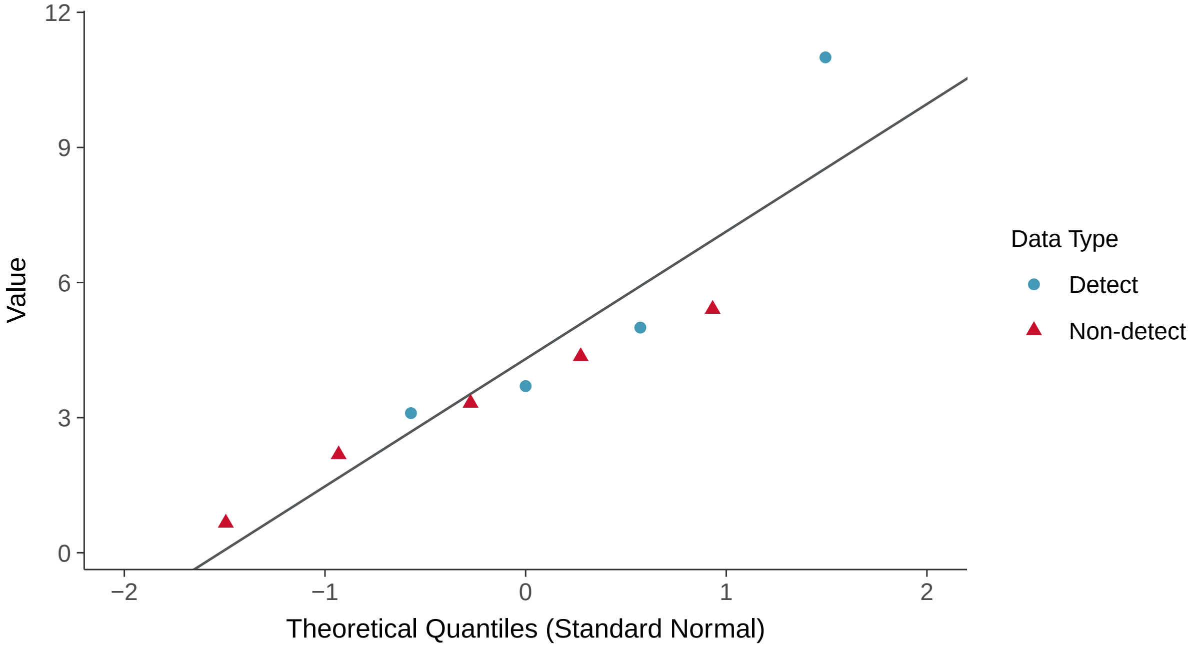
Boxplot by Season

Chloride, MW-16B (mg/L)



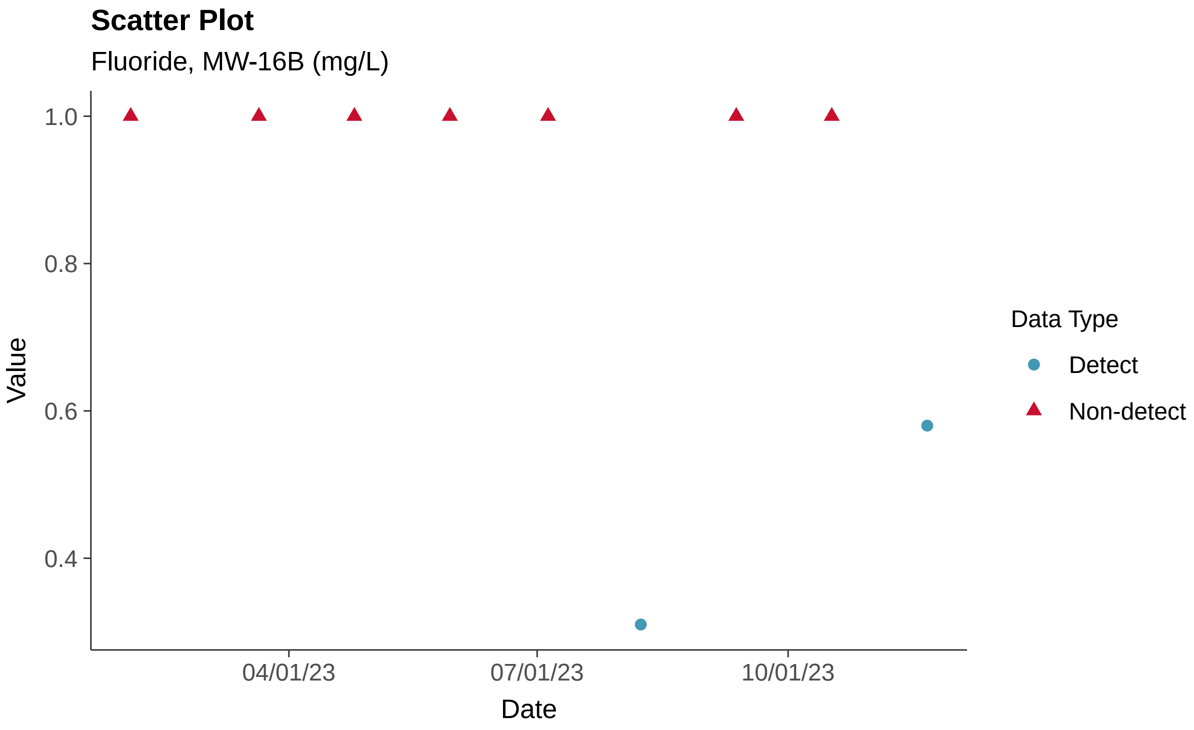
Normal Q-Q plot using ROS Imputed Estimates

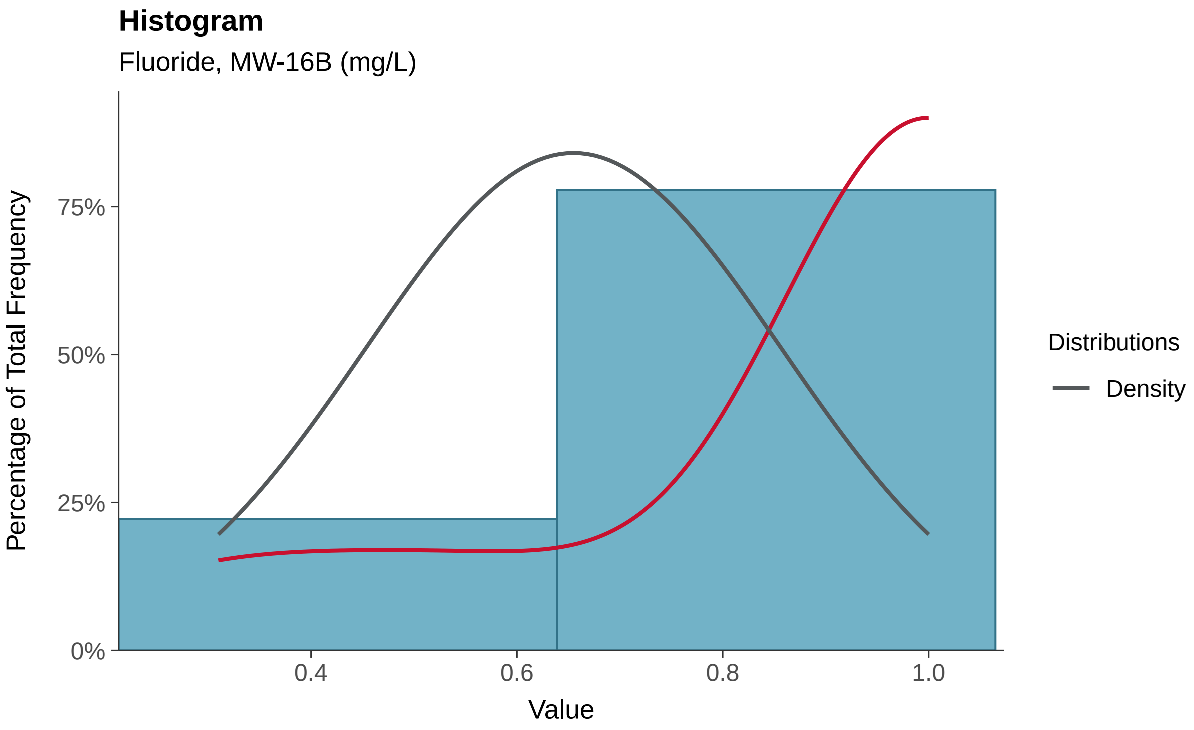
Chloride, MW-16B (mg/L)



Appendix III: Fluoride, MW-16B

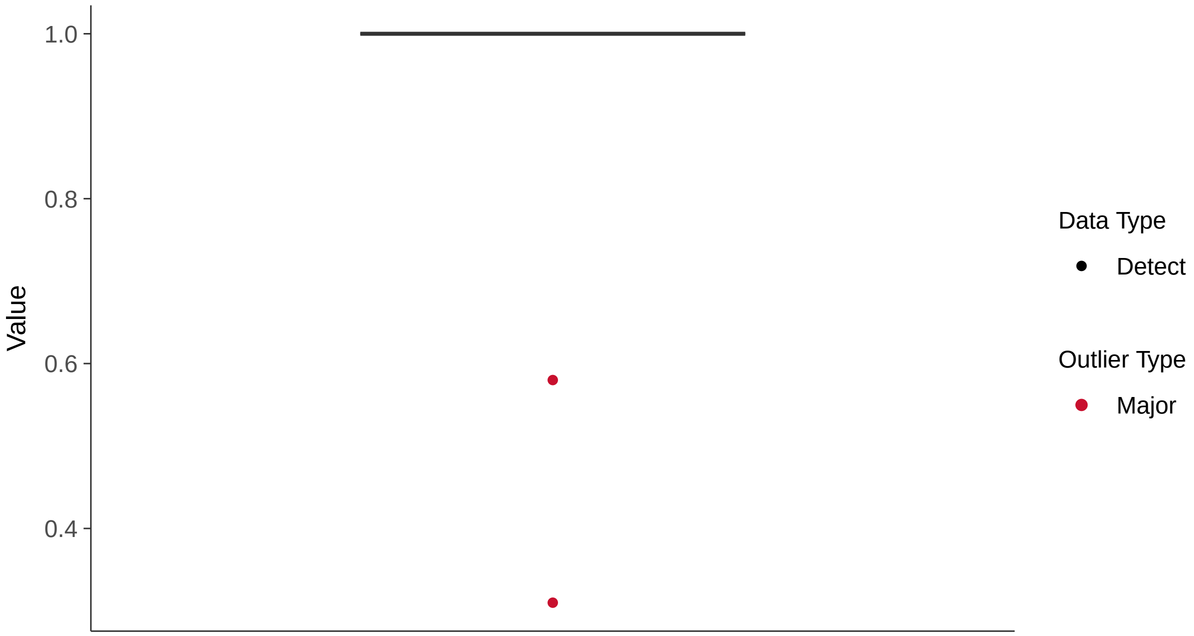
ID: 16B_1_04





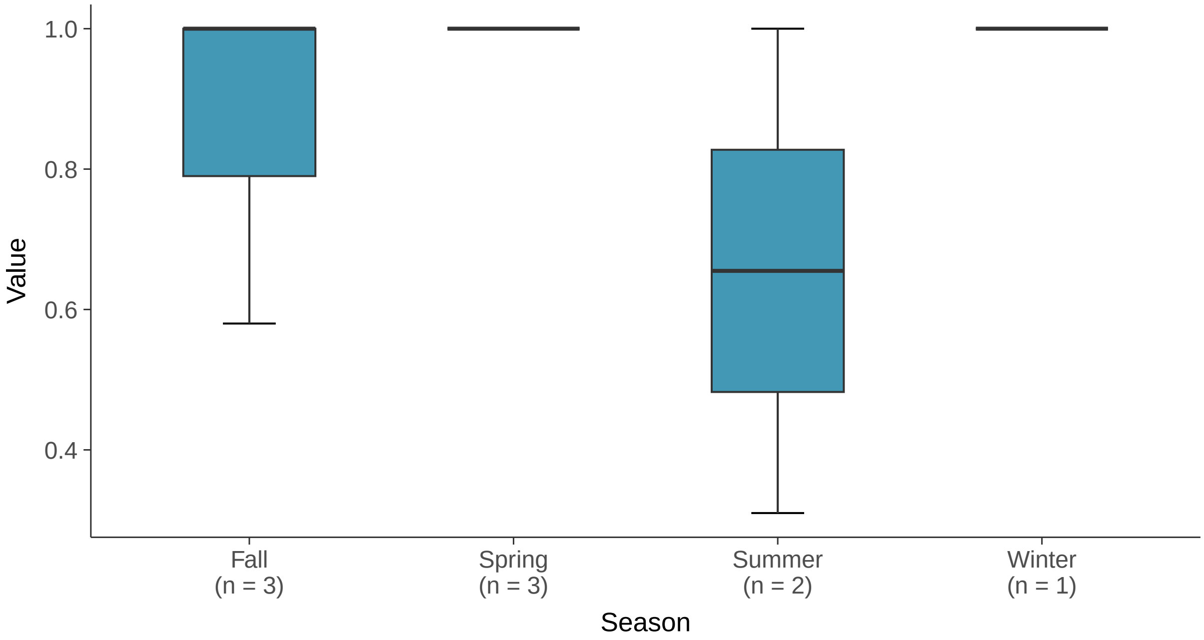
Boxplot

Fluoride, MW-16B (mg/L)



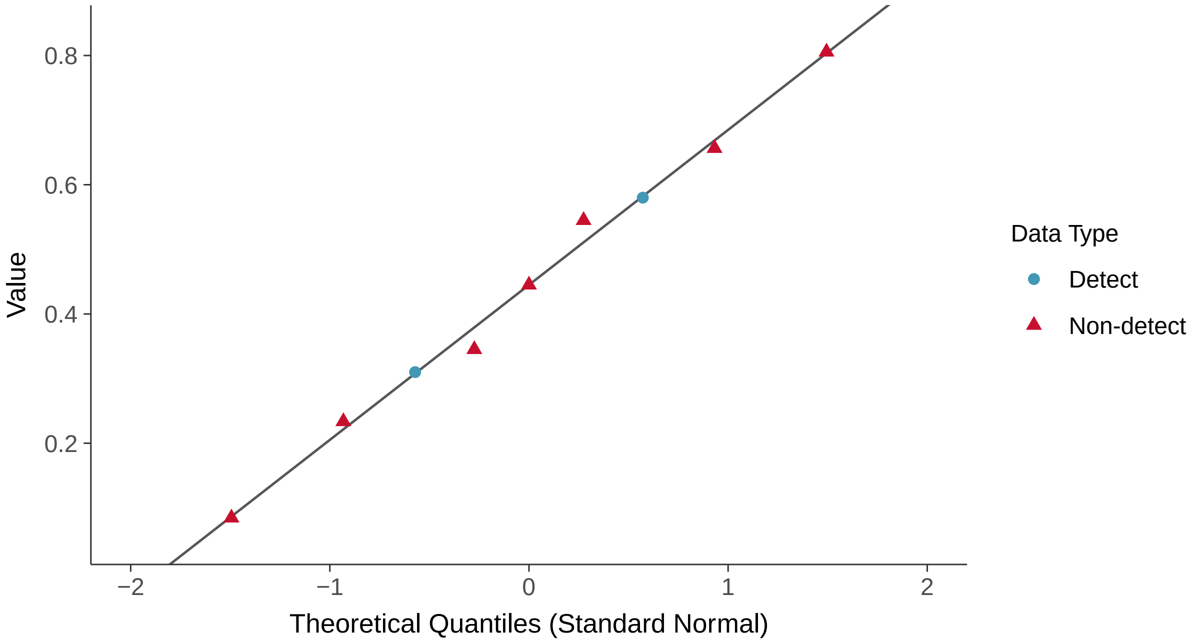
Boxplot by Season

Fluoride, MW-16B (mg/L)



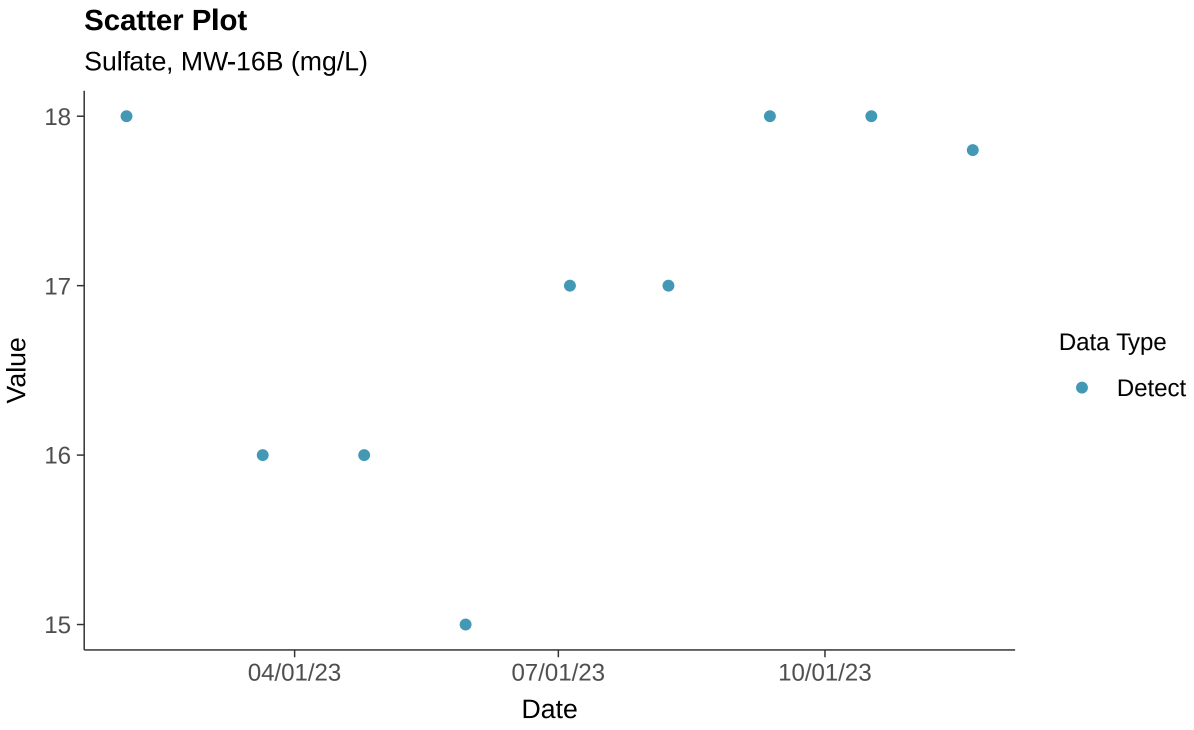
Normal Q-Q plot using ROS Imputed Estimates

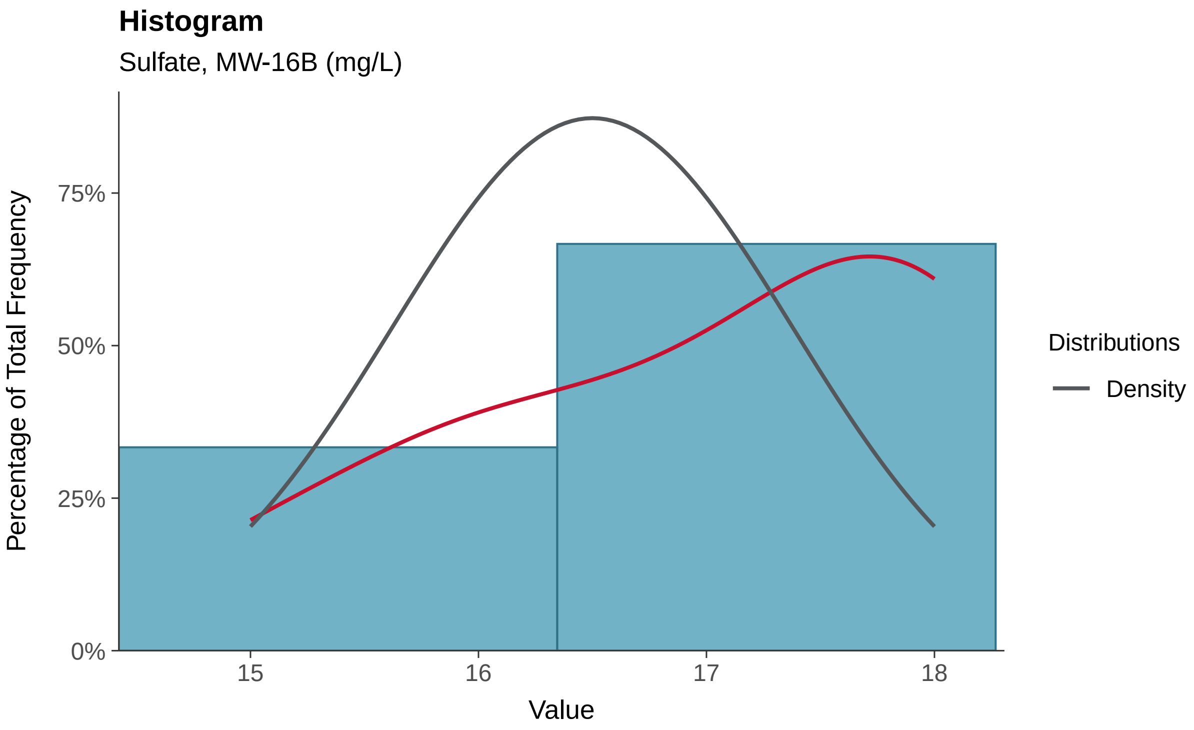
Fluoride, MW-16B (mg/L)



Appendix III: Sulfate, MW-16B

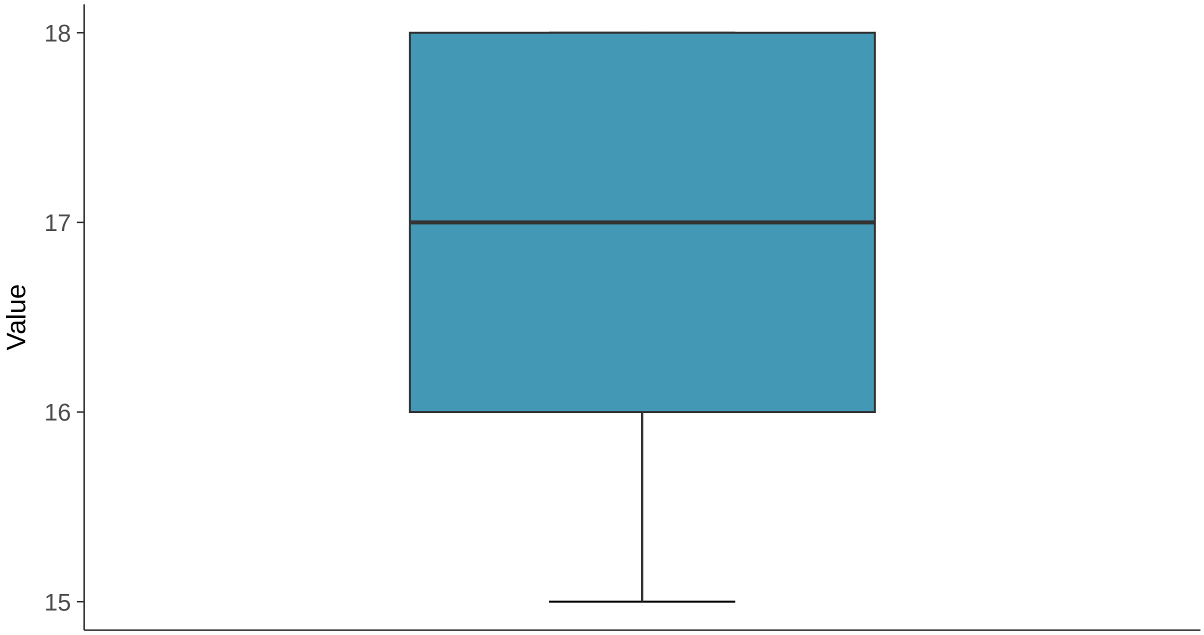
ID: 16B_1_05





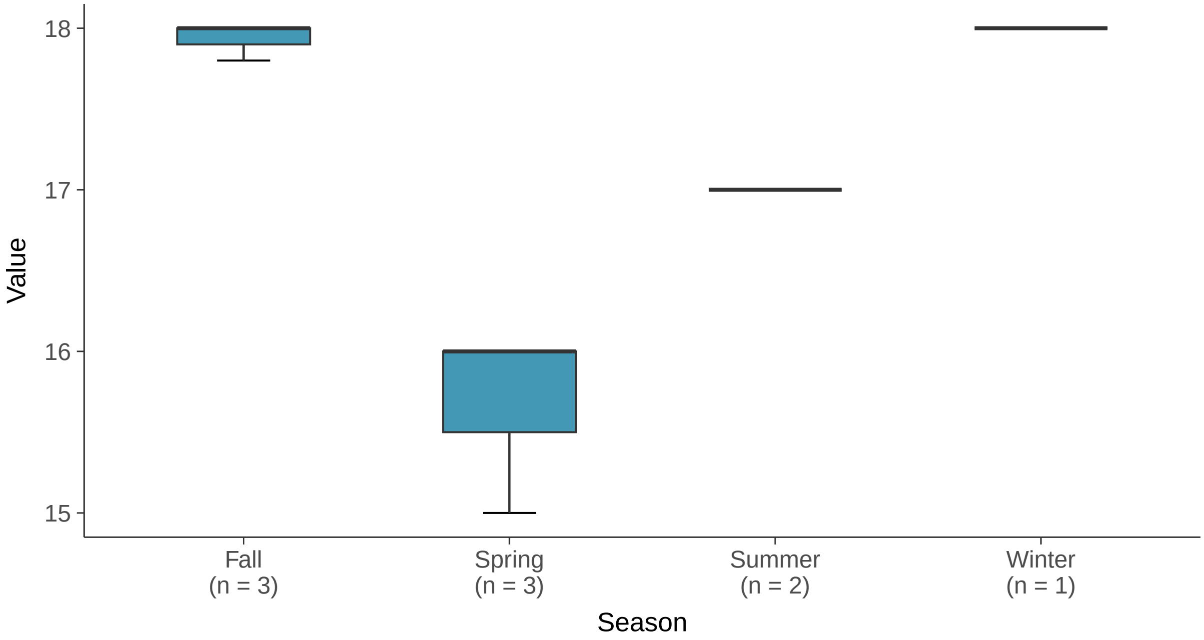
Boxplot

Sulfate, MW-16B (mg/L)



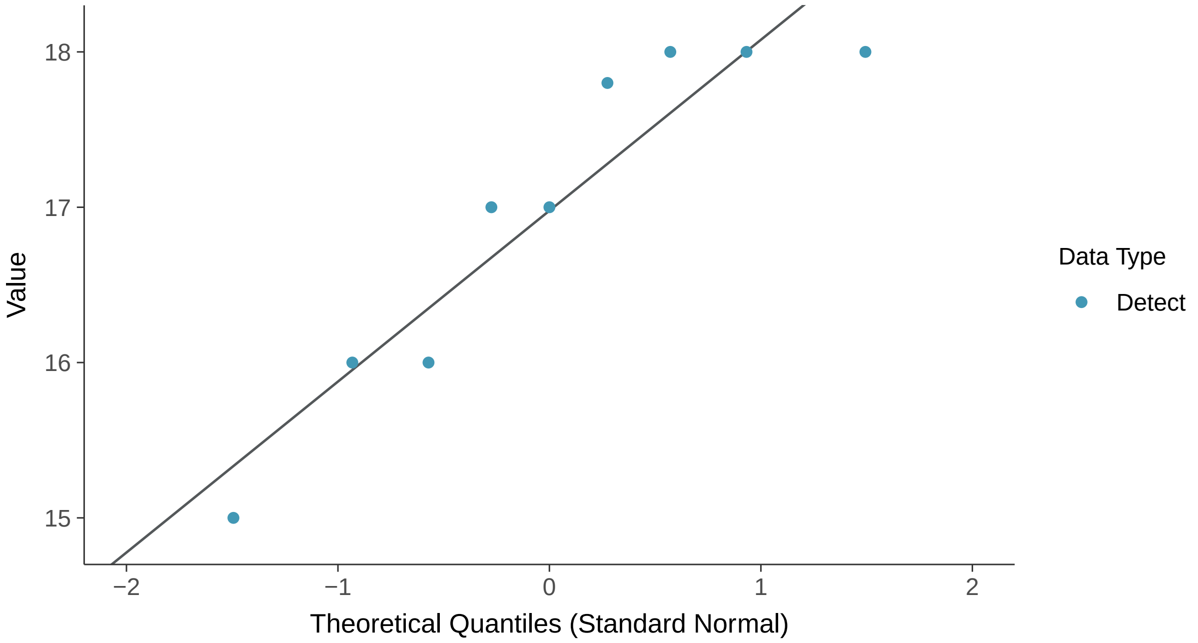
Boxplot by Season

Sulfate, MW-16B (mg/L)



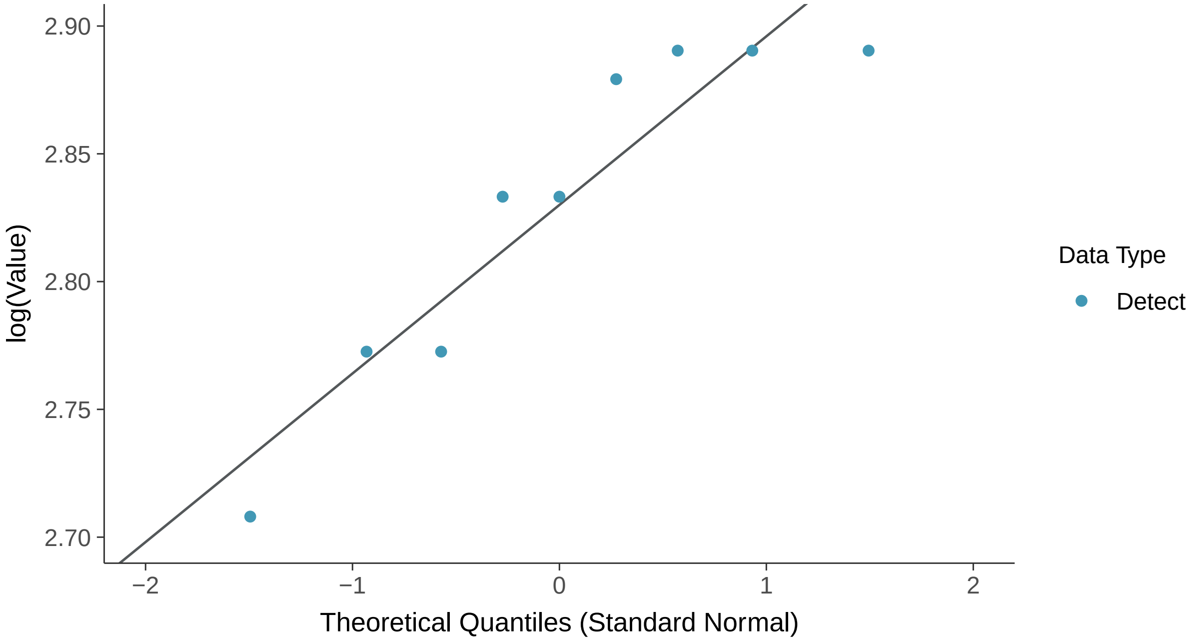
Normal Q-Q plot

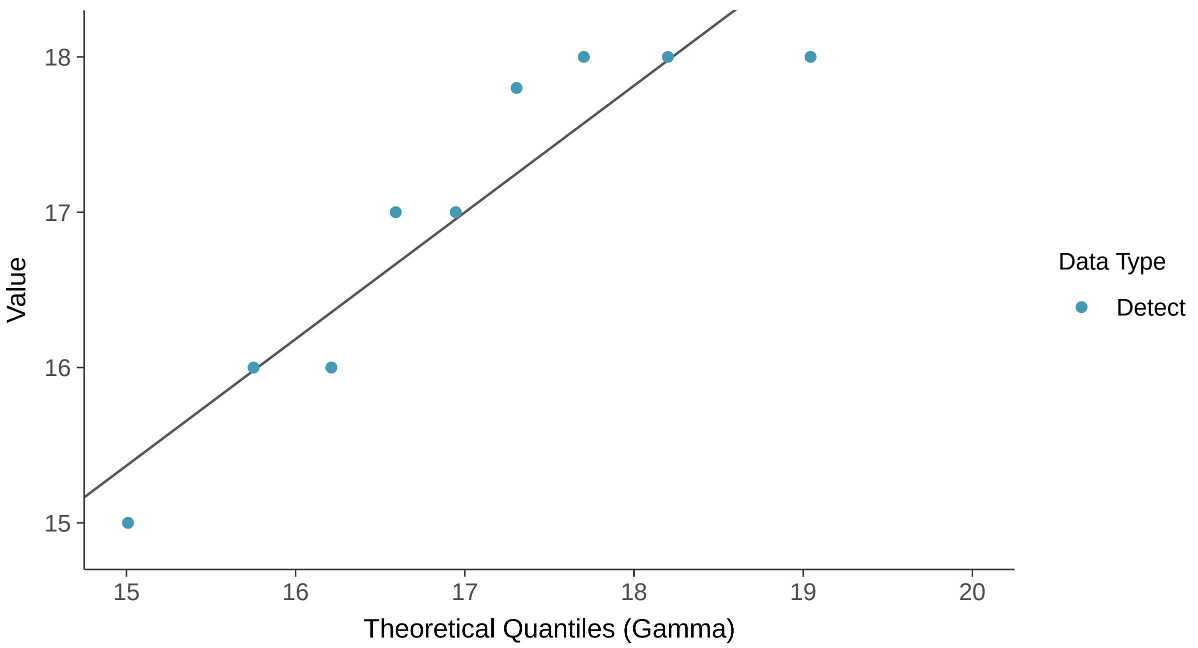
Sulfate, MW-16B (mg/L)



Lognormal Q-Q plot

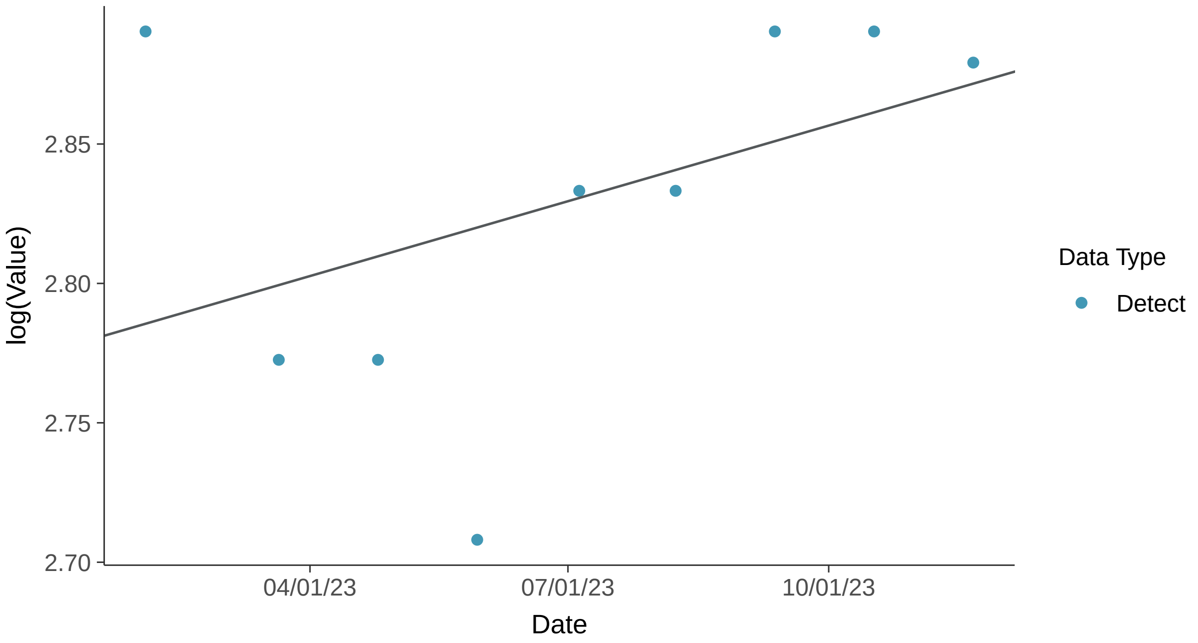
Sulfate, MW-16B (mg/L)





Gamma Q-Q plot

Sulfate, MW-16B (mg/L)

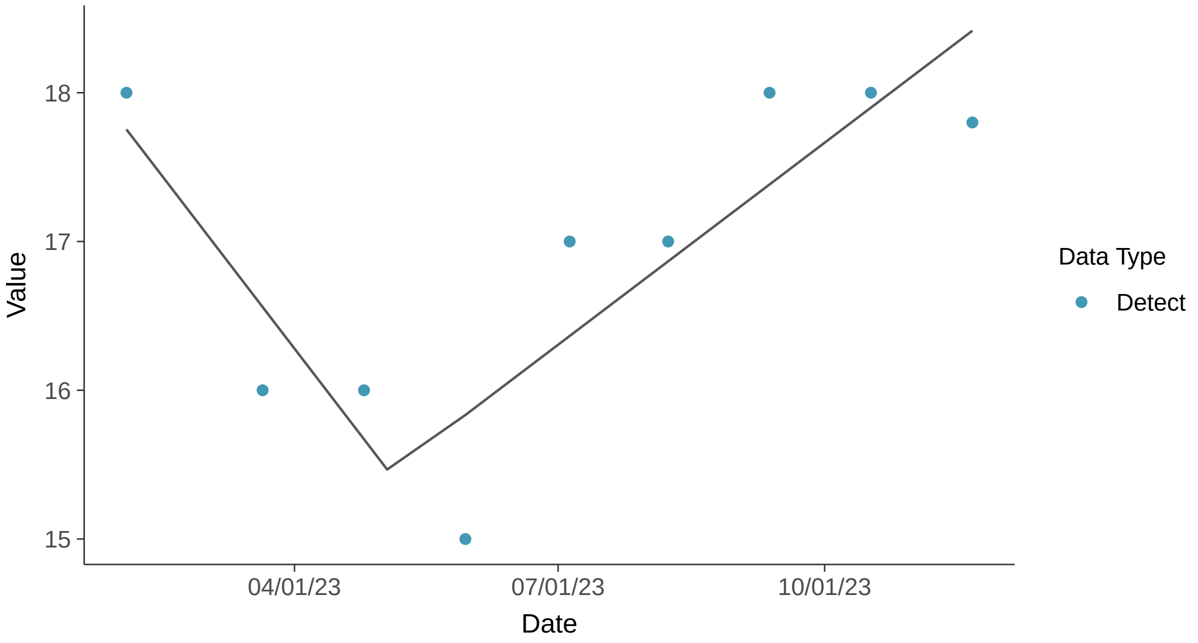


Trend Regression: Lognormal MLE

Sulfate, MW-16B (mg/L)

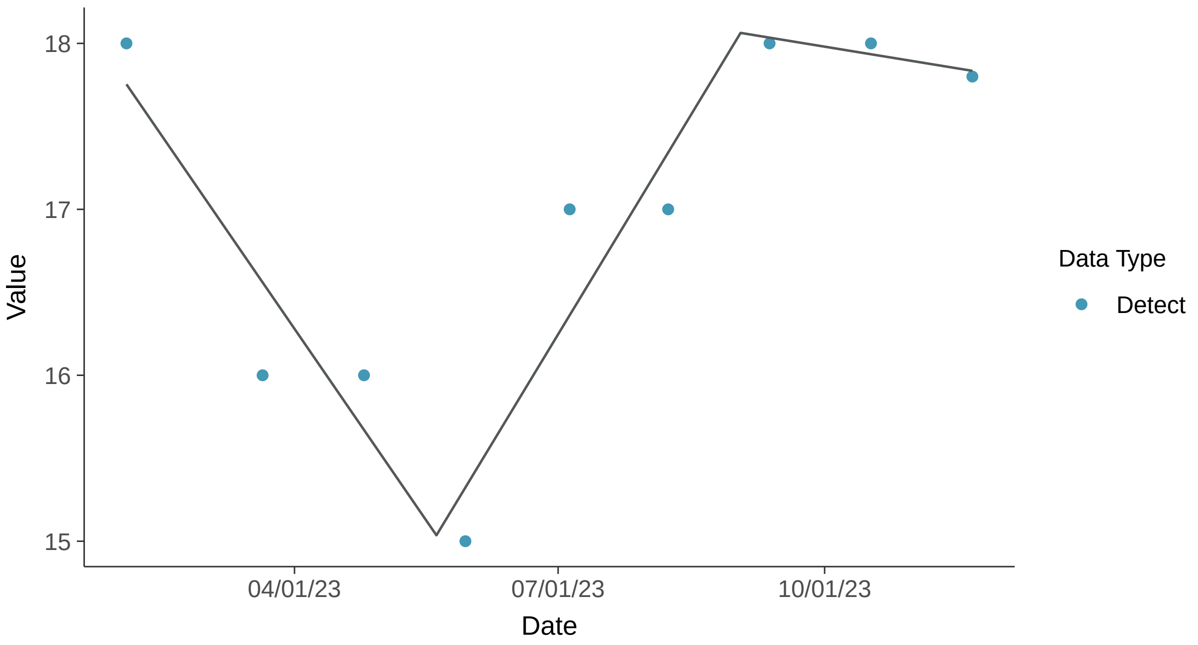
Trend Regression: Piecewise Linear-Linear

Sulfate, MW-16B (mg/L)



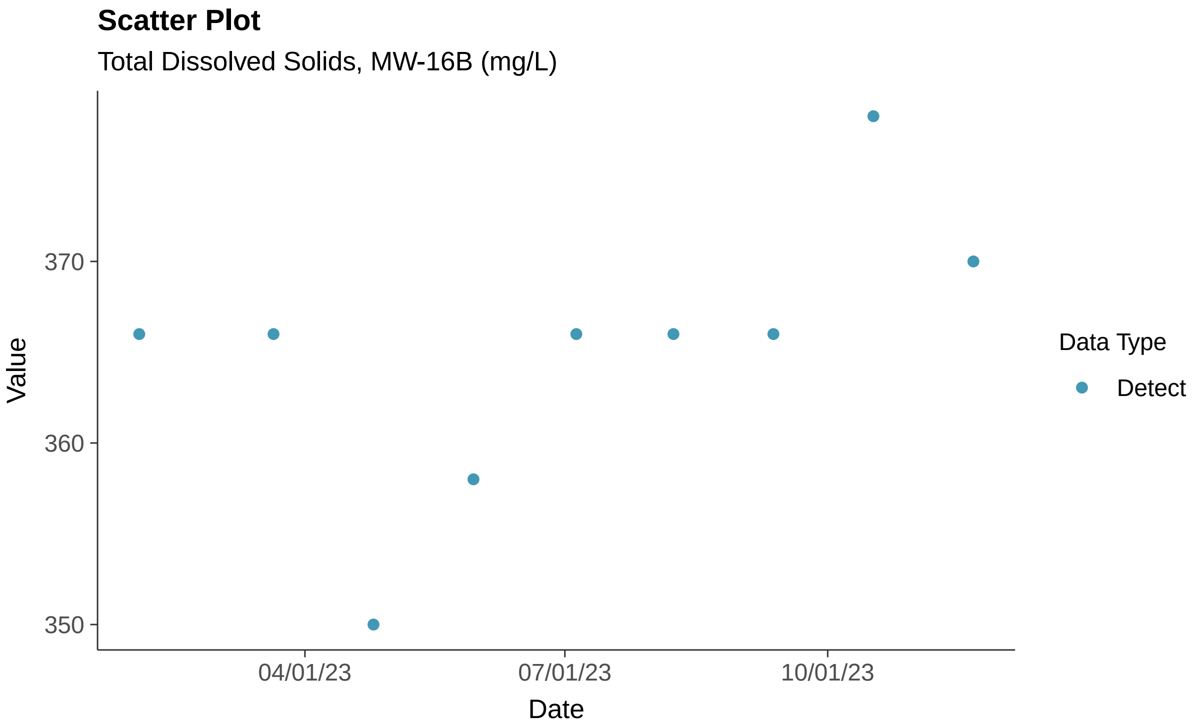
Trend Regression: Piecewise Linear-Linear-Linear

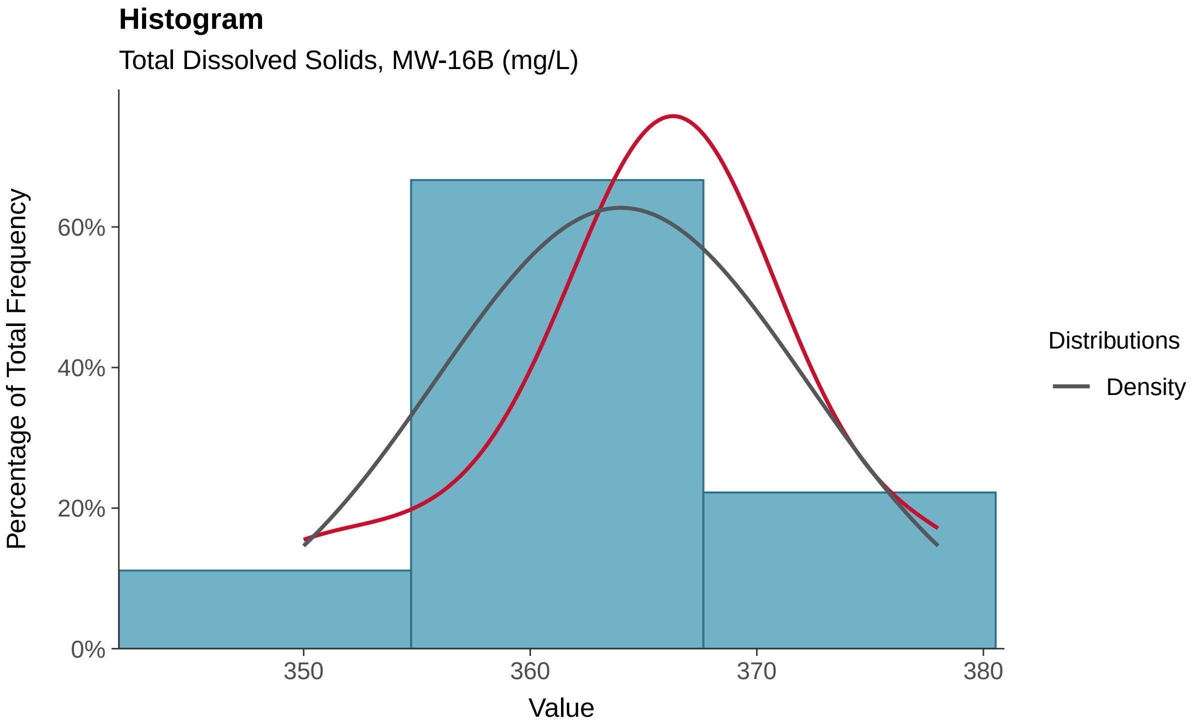
Sulfate, MW-16B (mg/L)



Appendix III: Total Dissolved Solids, MW-16B

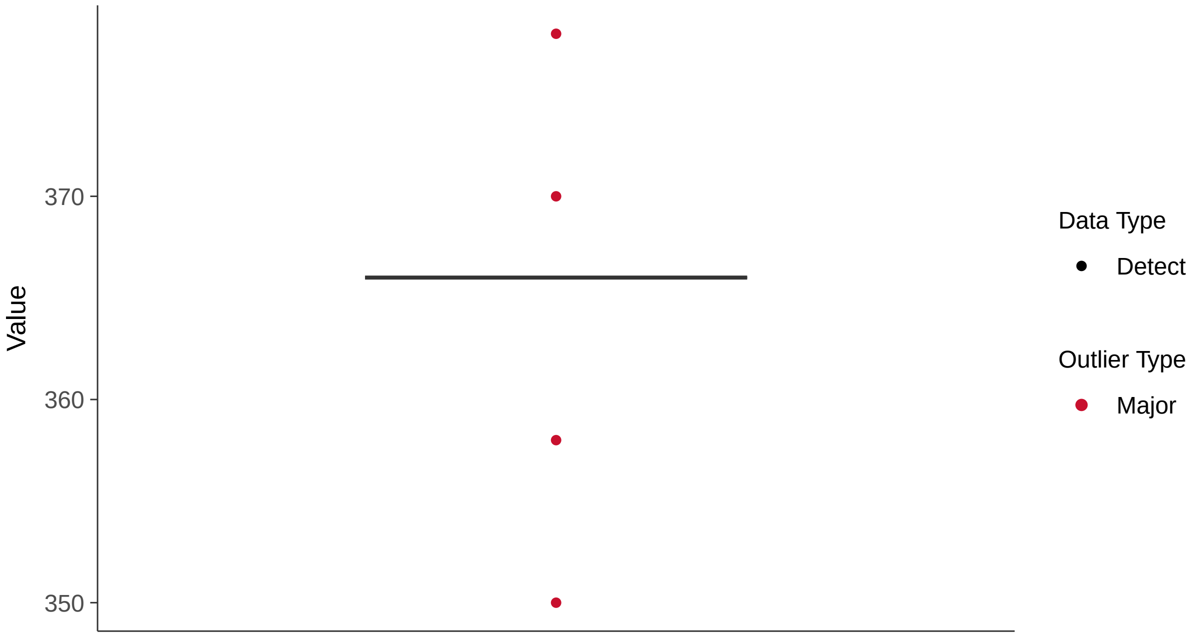
ID: 16B_1_06





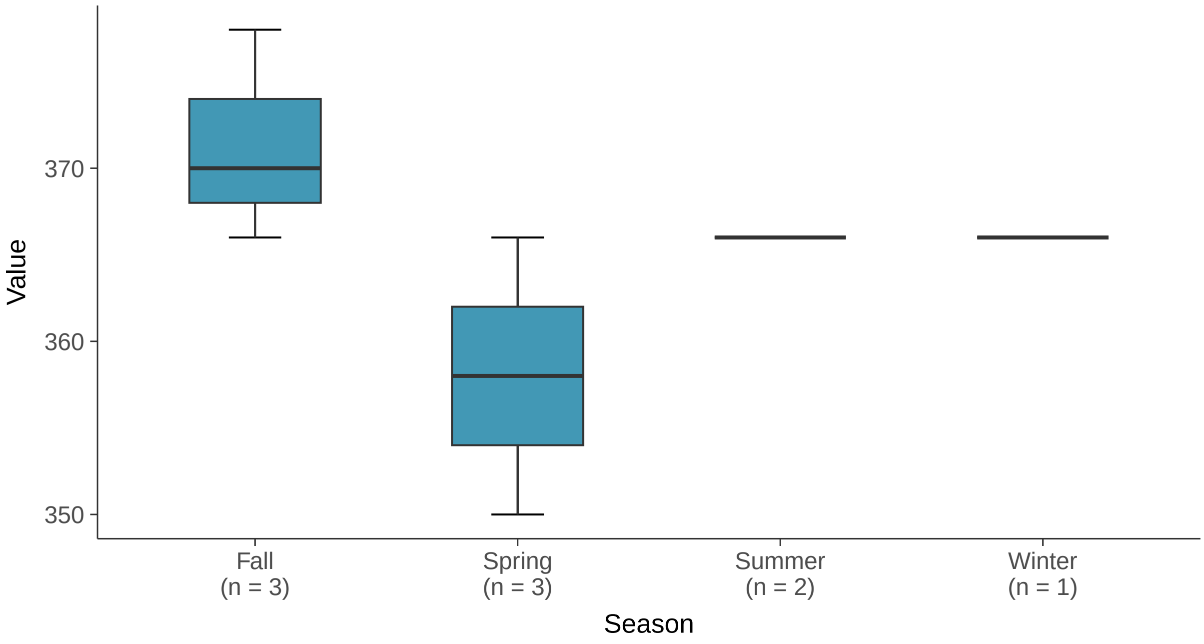
Boxplot

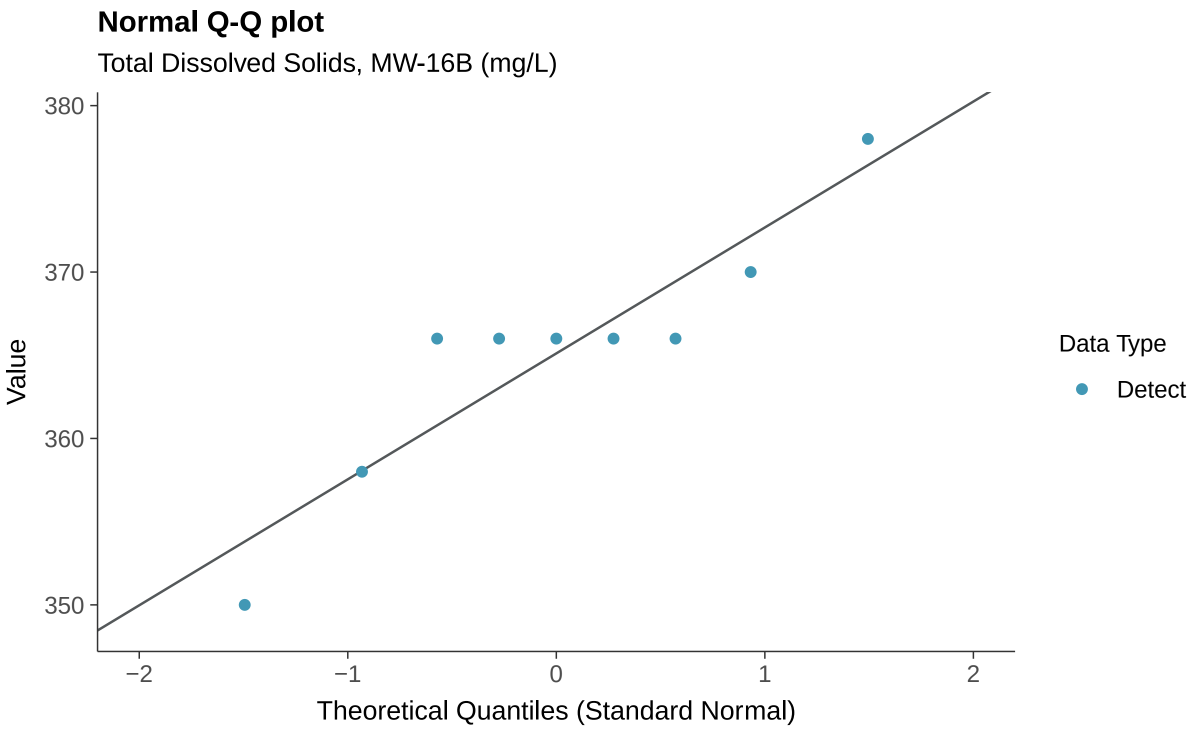
Total Dissolved Solids, MW-16B (mg/L)



Boxplot by Season

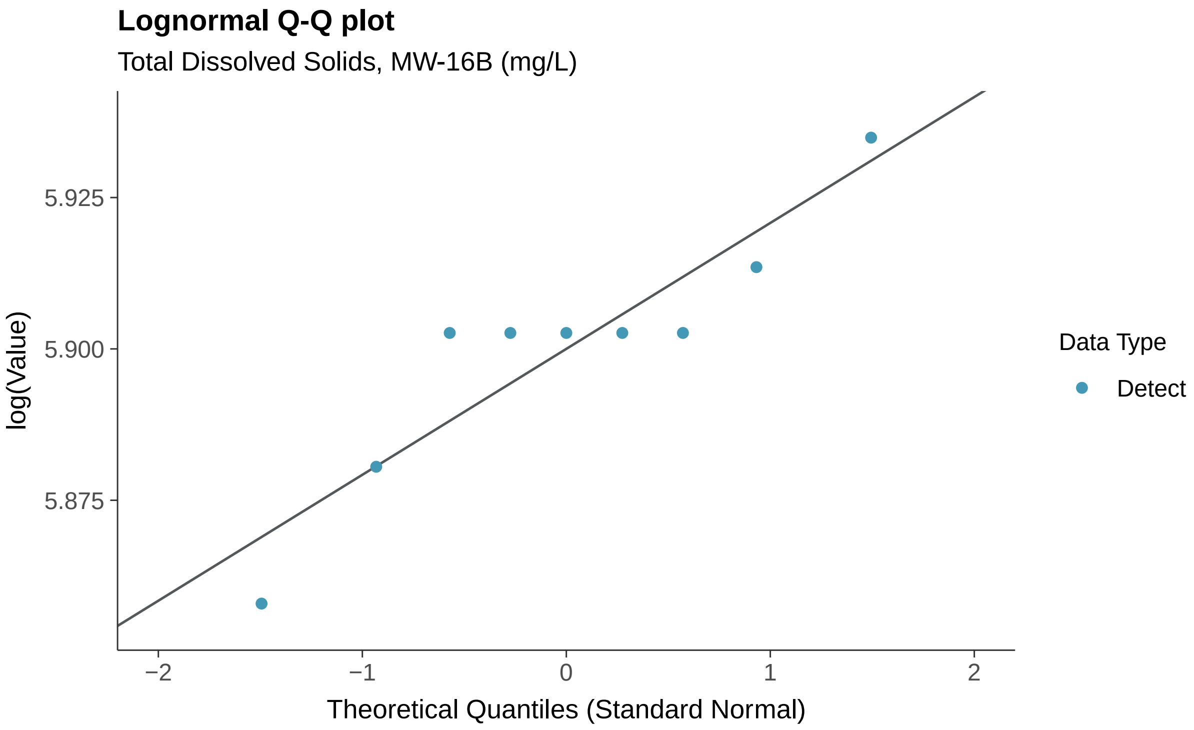
Total Dissolved Solids, MW-16B (mg/L)





Normal Q-Q plot

Total Dissolved Solids, MW-16B (mg/L)

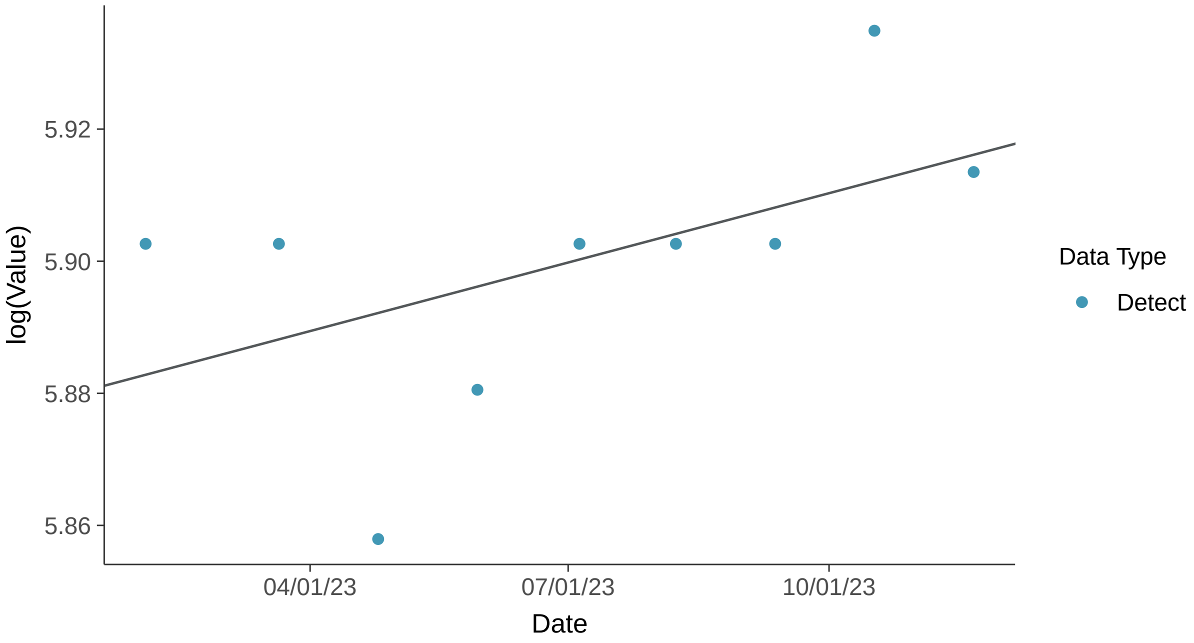


Lognormal Q-Q plot

Total Dissolved Solids, MW-16B (mg/L)

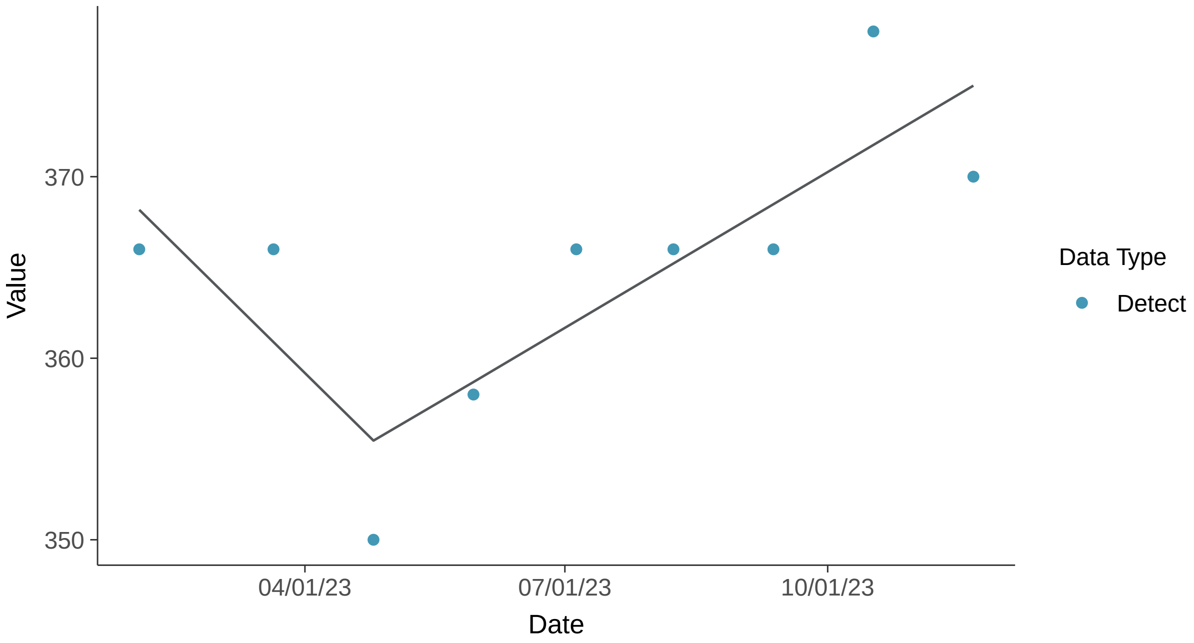
Trend Regression: Lognormal MLE

Total Dissolved Solids, MW-16B (mg/L)



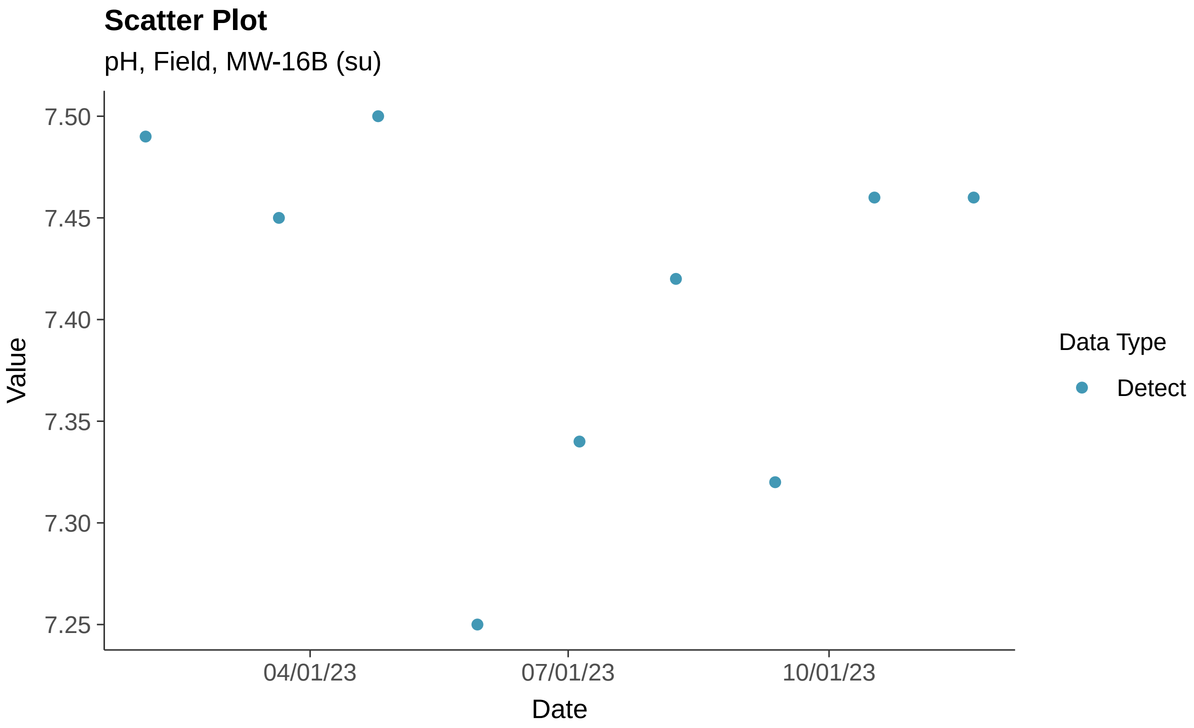
Trend Regression: Piecewise Linear-Linear

Total Dissolved Solids, MW-16B (mg/L)

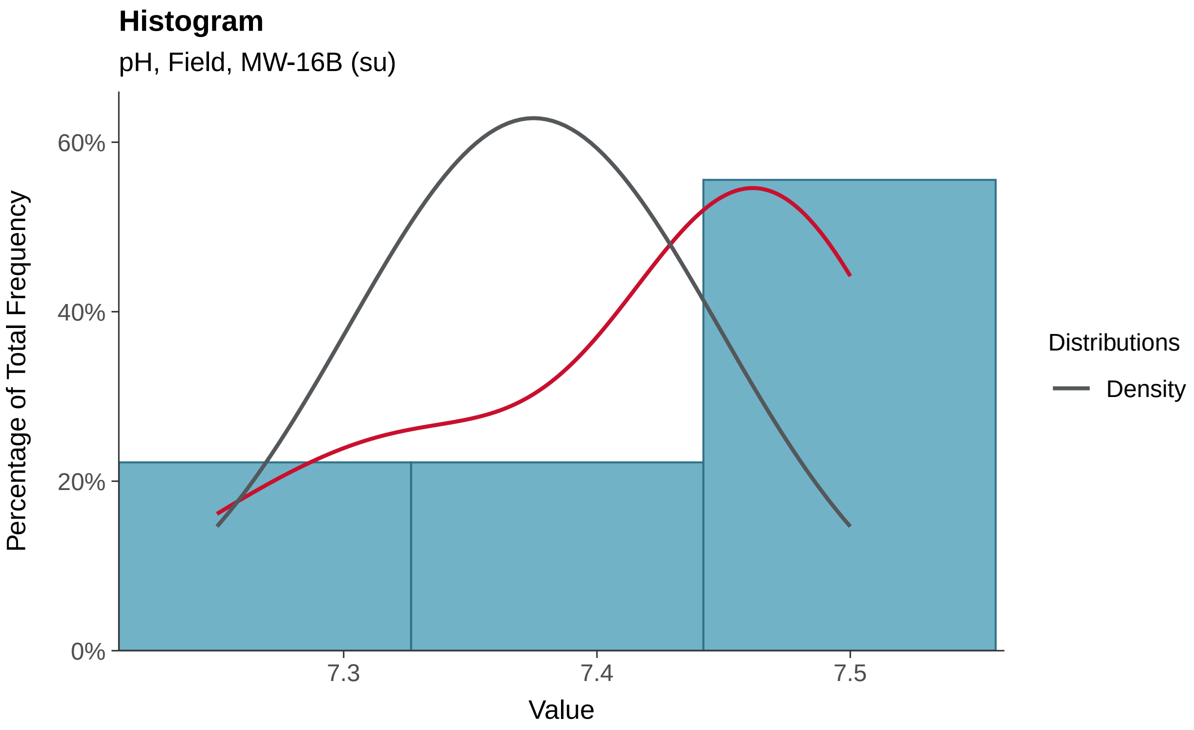


Appendix III: pH, Field, MW-16B

ID: 16B_1_07


Scatter Plot

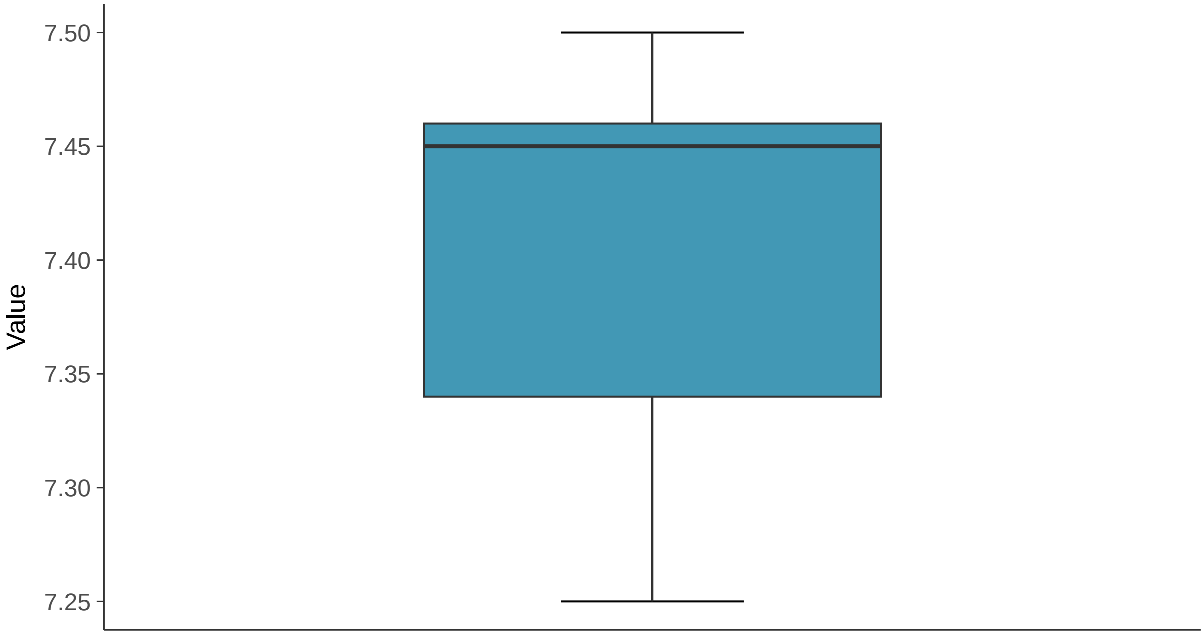
pH, Field, MW-16B (su)


Histogram

pH, Field, MW-16B (su)

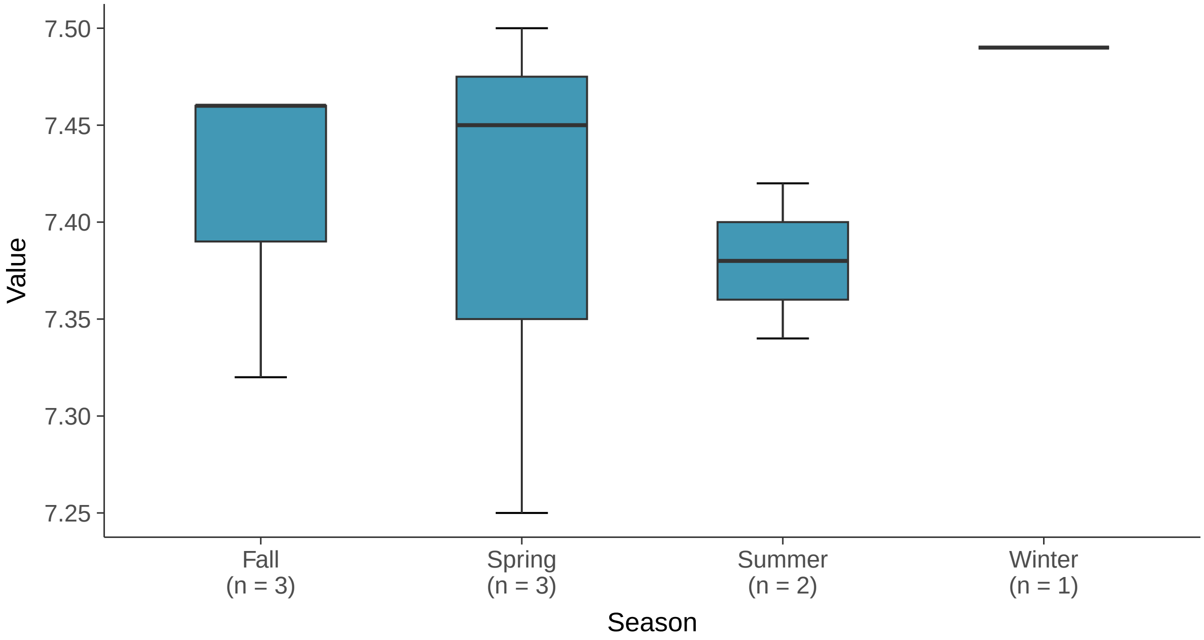
Boxplot

pH, Field, MW-16B (su)



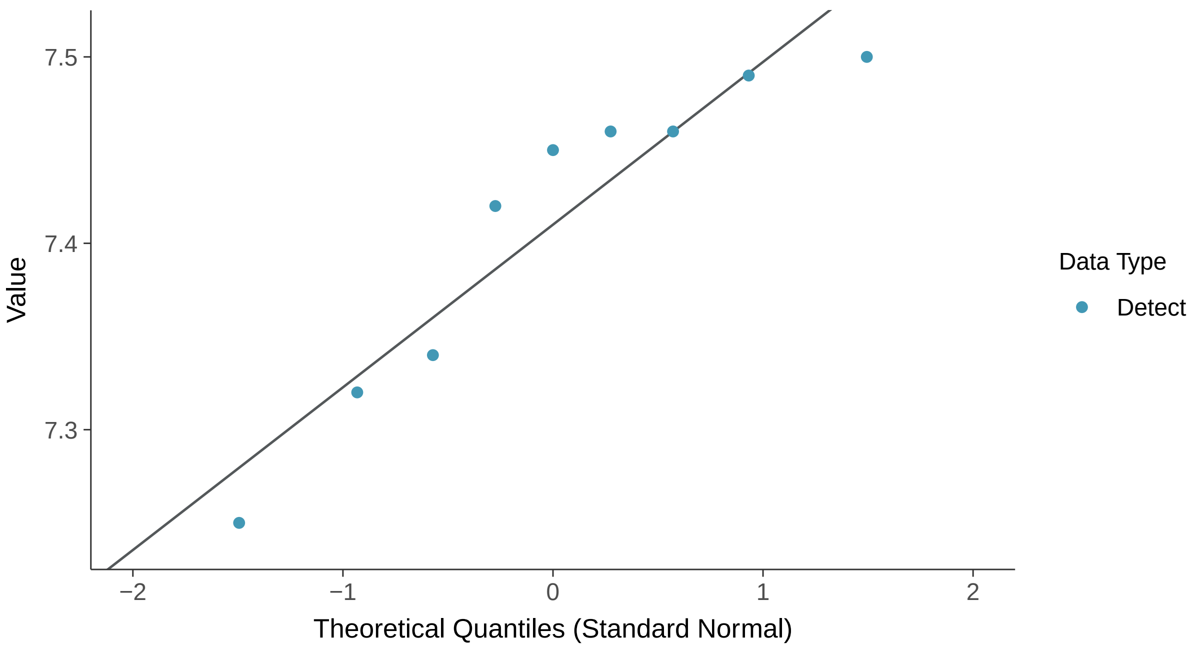
Boxplot by Season

pH, Field, MW-16B (su)



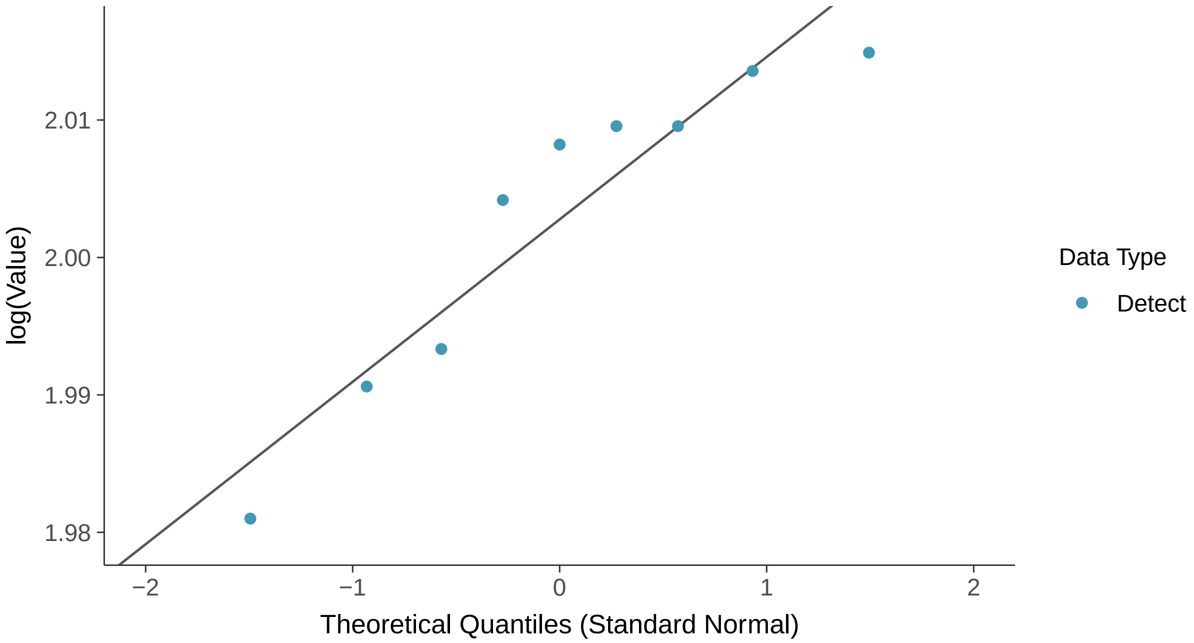
Normal Q-Q plot

pH, Field, MW-16B (su)



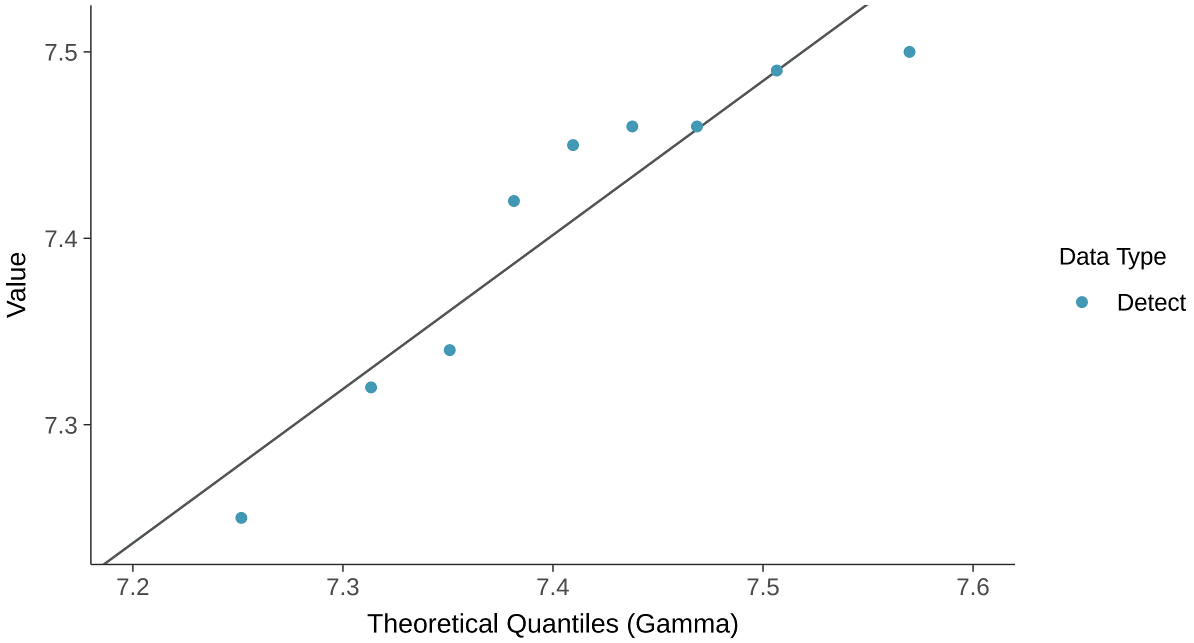
Lognormal Q-Q plot

pH, Field, MW-16B (su)



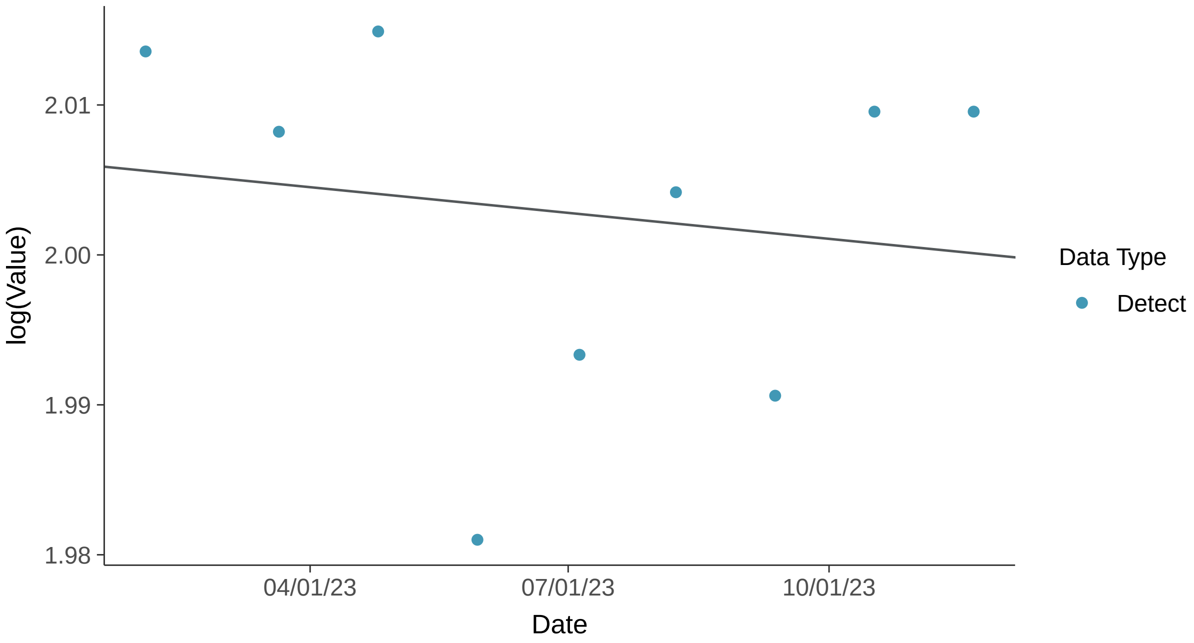
Gamma Q-Q plot

pH, Field, MW-16B (su)



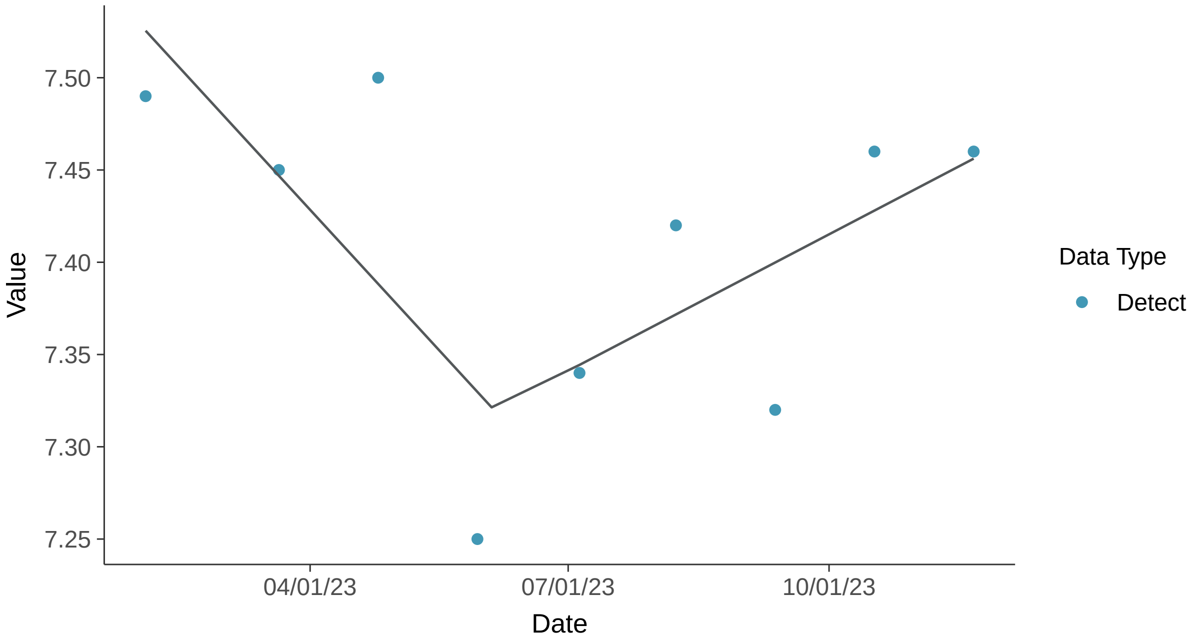
Trend Regression: Lognormal MLE

pH, Field, MW-16B (su)



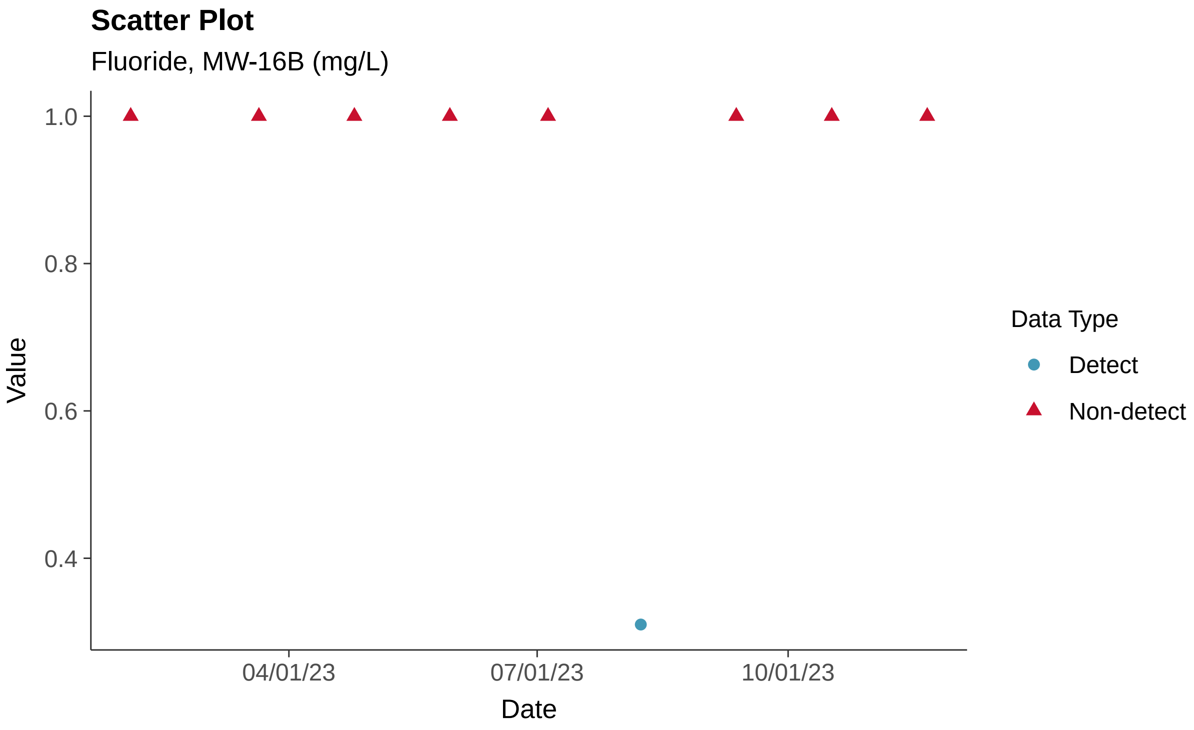
Trend Regression: Piecewise Linear-Linear

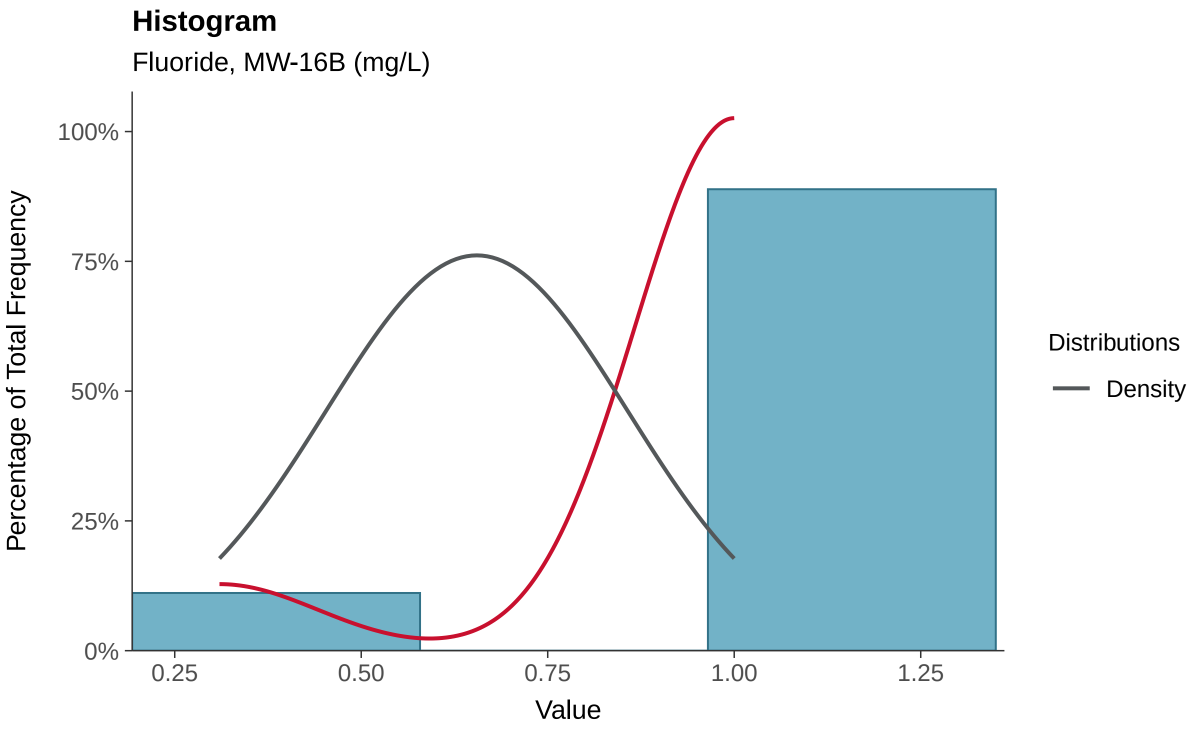
pH, Field, MW-16B (su)



Appendix IV: Fluoride, MW-16B

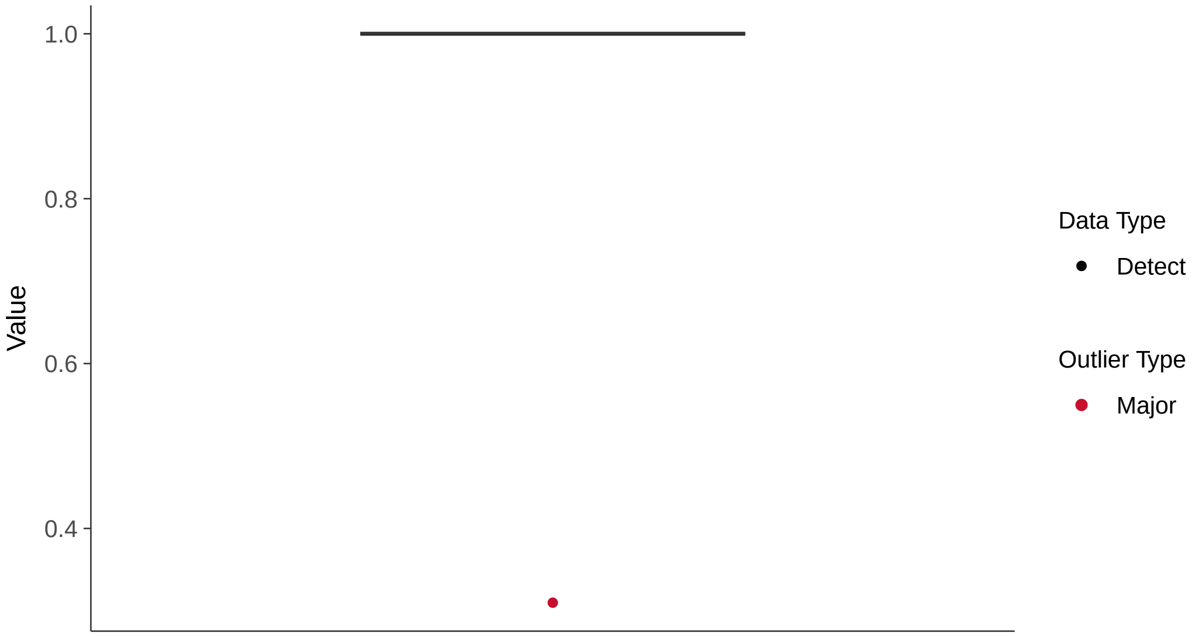
ID: 16B_2_04





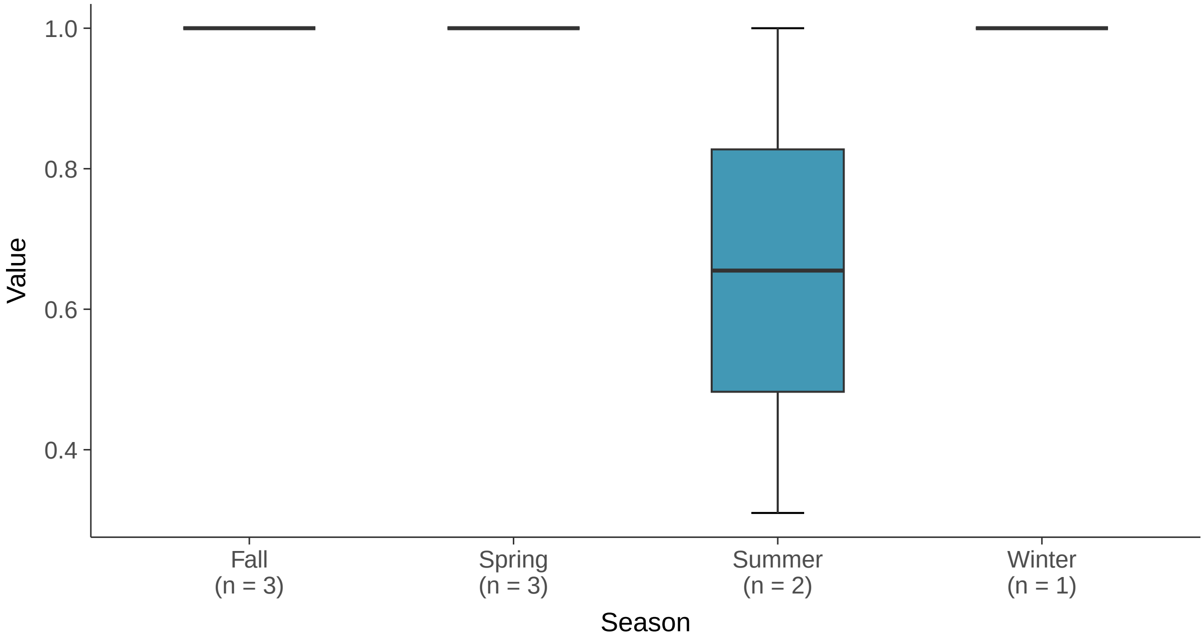
Boxplot

Fluoride, MW-16B (mg/L)



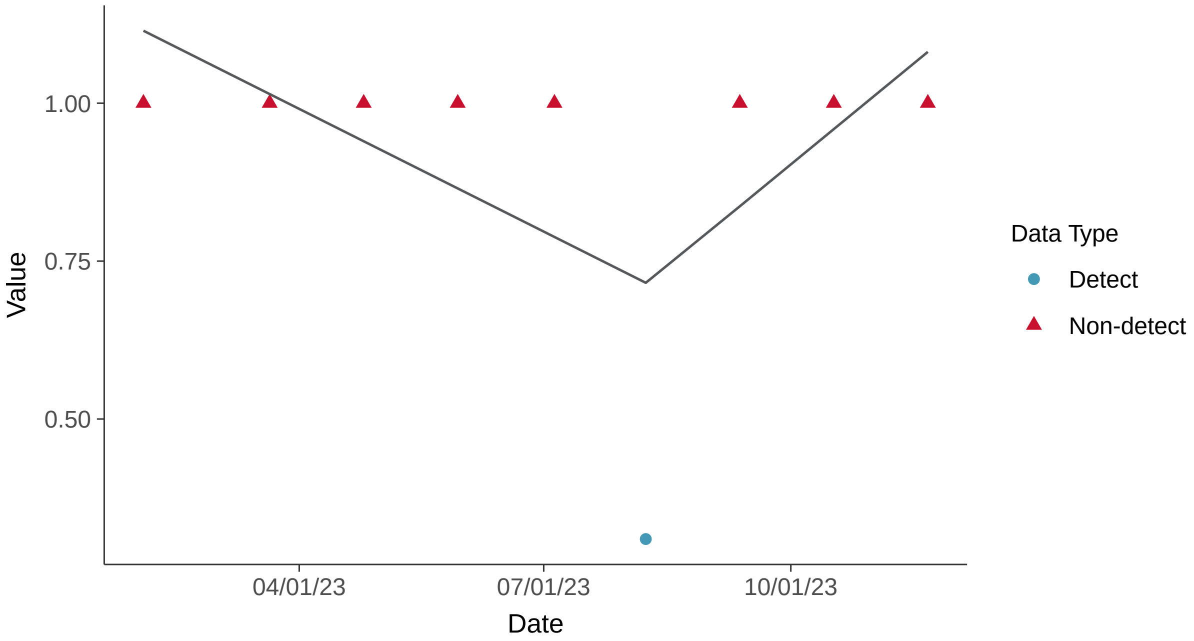
Boxplot by Season

Fluoride, MW-16B (mg/L)



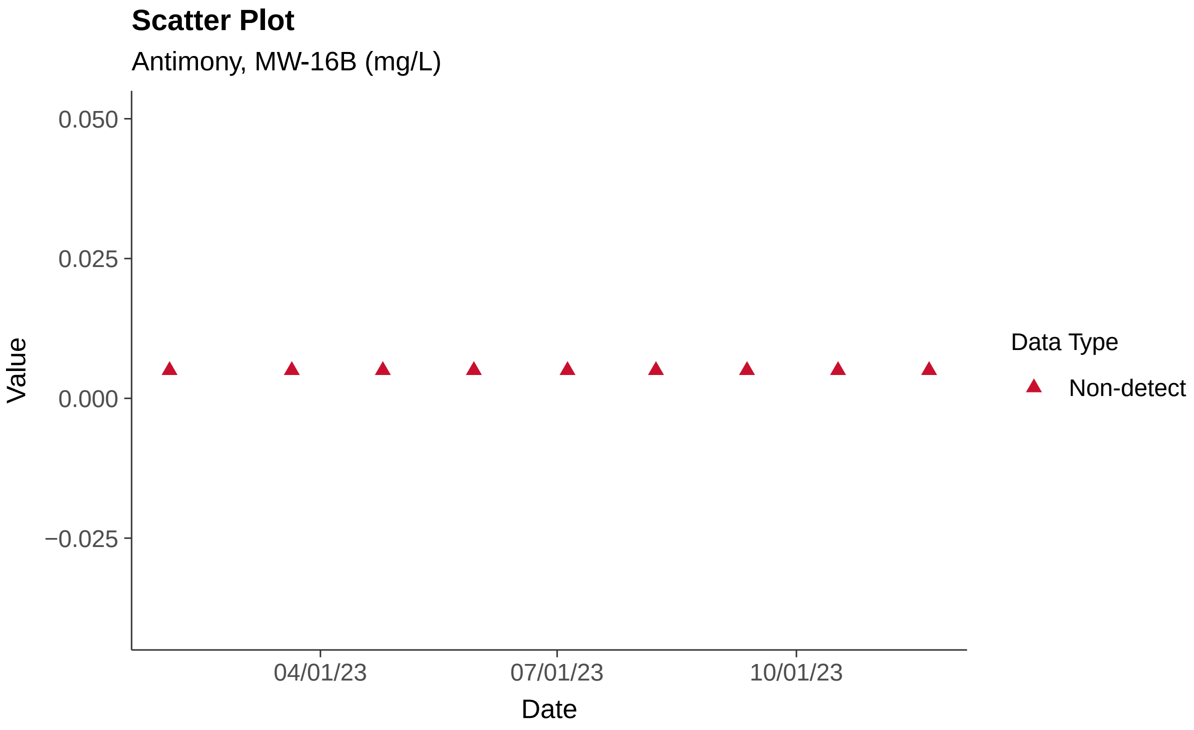
Trend Regression: Piecewise Linear-Linear

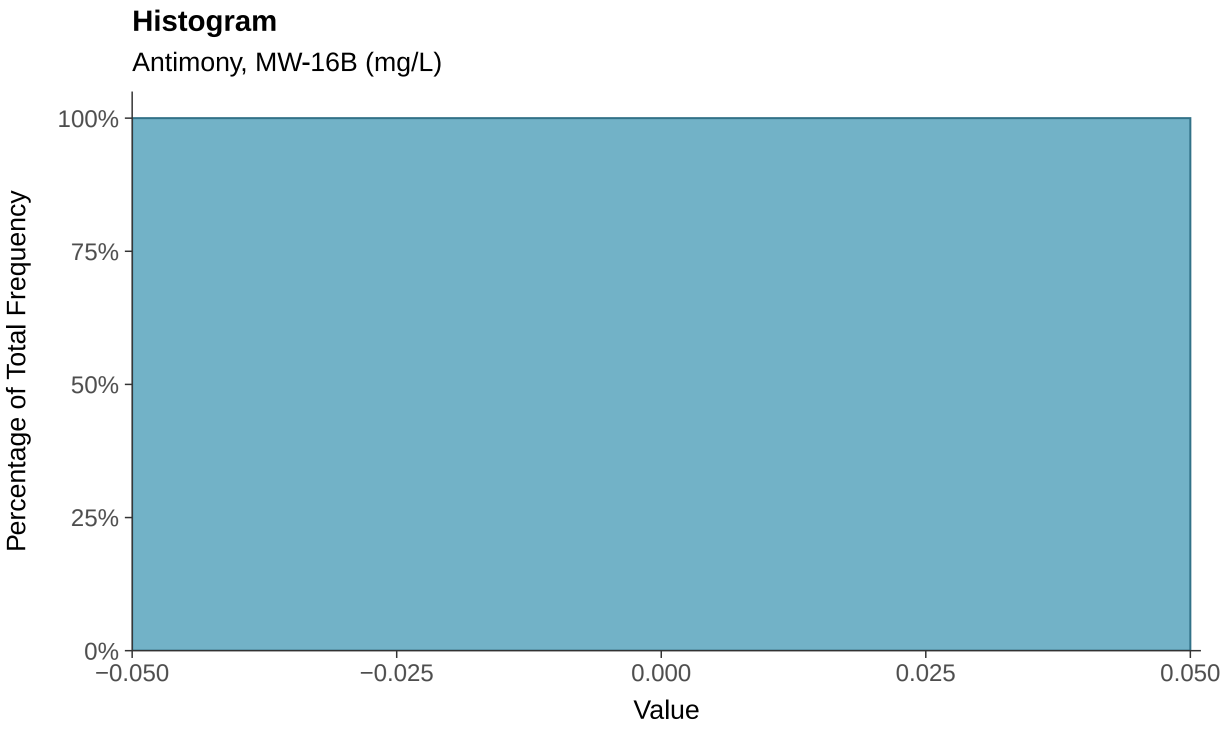
Fluoride, MW-16B (mg/L)



Appendix IV: Antimony, MW-16B

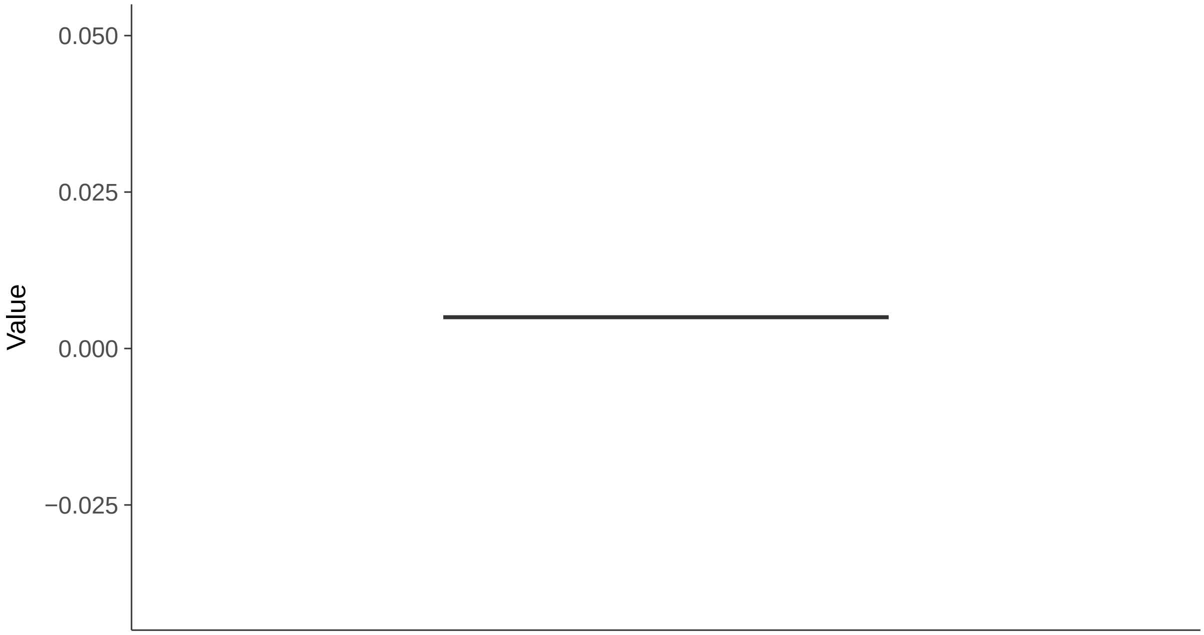
ID: 16B_2_08





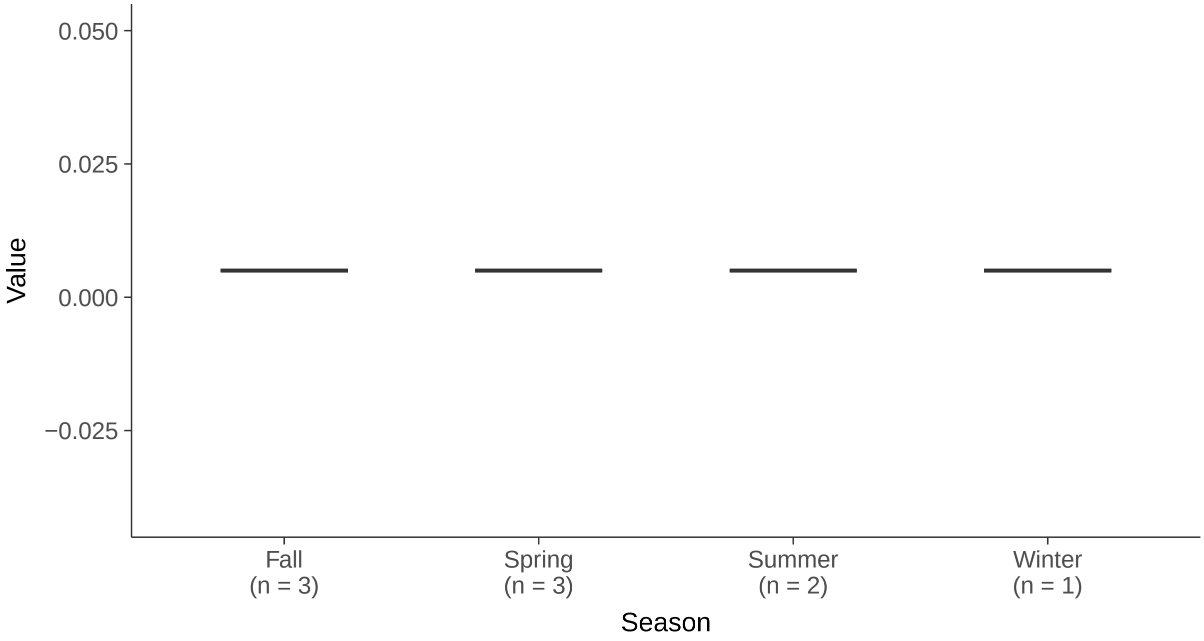
Boxplot

Antimony, MW-16B (mg/L)



Boxplot by Season

Antimony, MW-16B (mg/L)

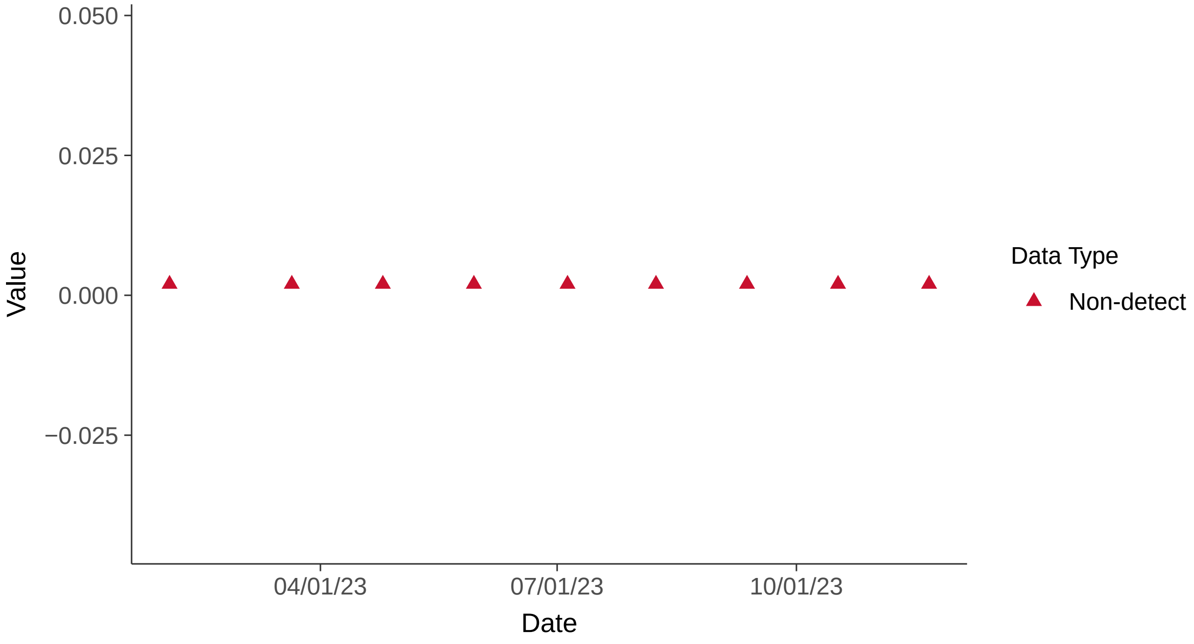


Appendix IV: Arsenic, MW-16B

ID: 16B_2_09

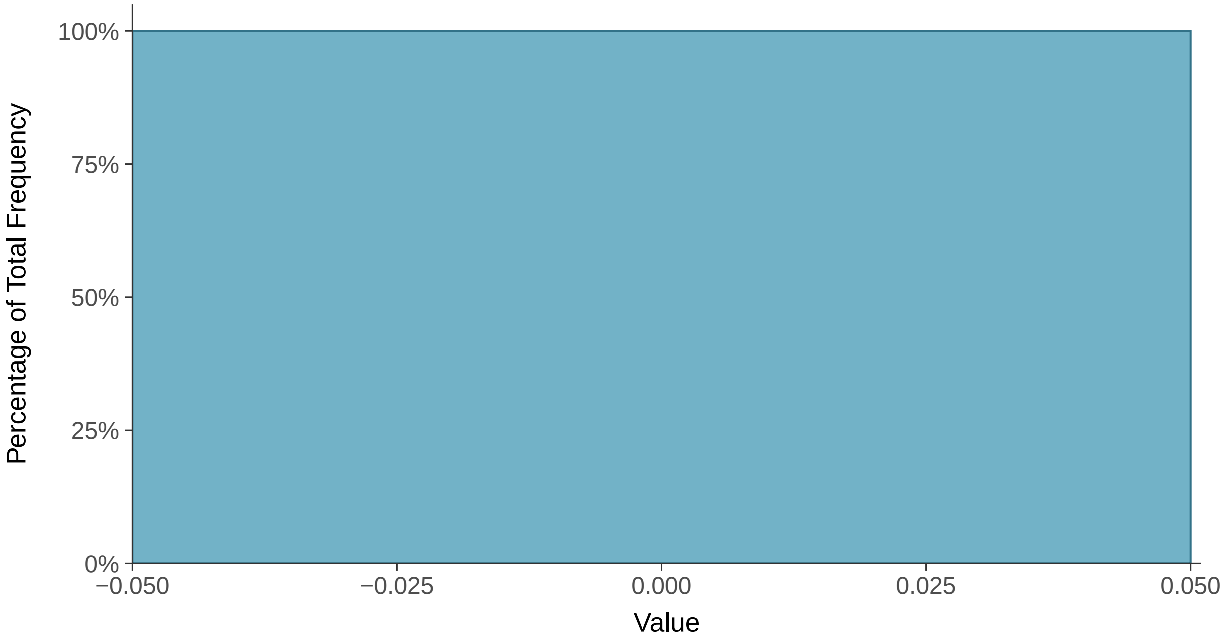
Scatter Plot

Arsenic, MW-16B (mg/L)



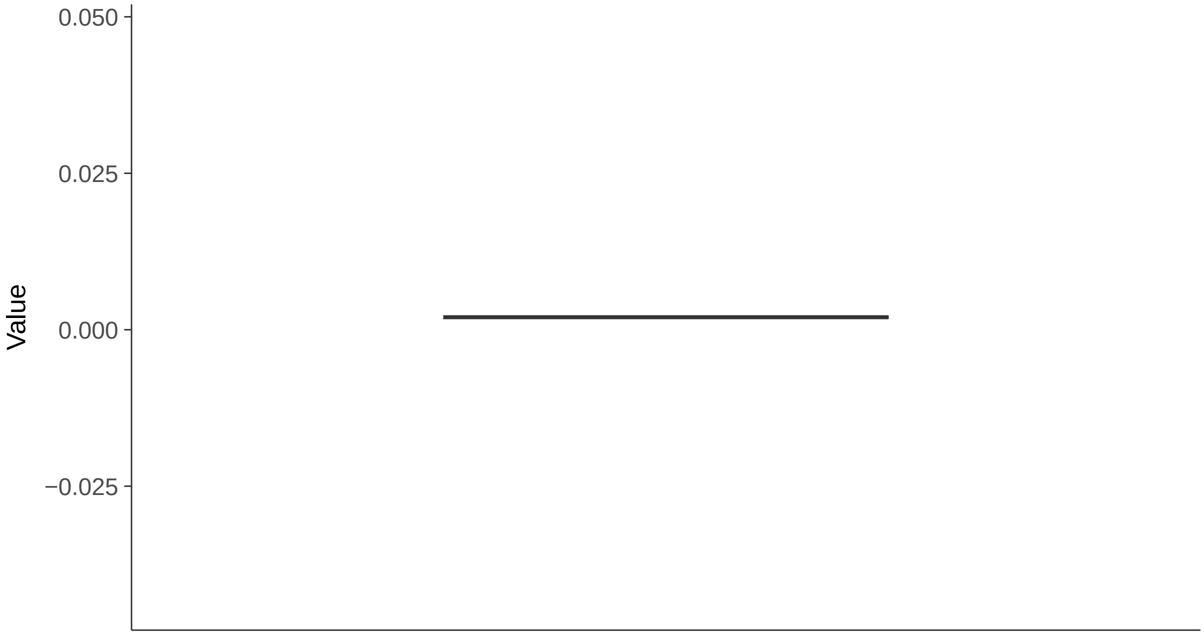
Histogram

Arsenic, MW-16B (mg/L)



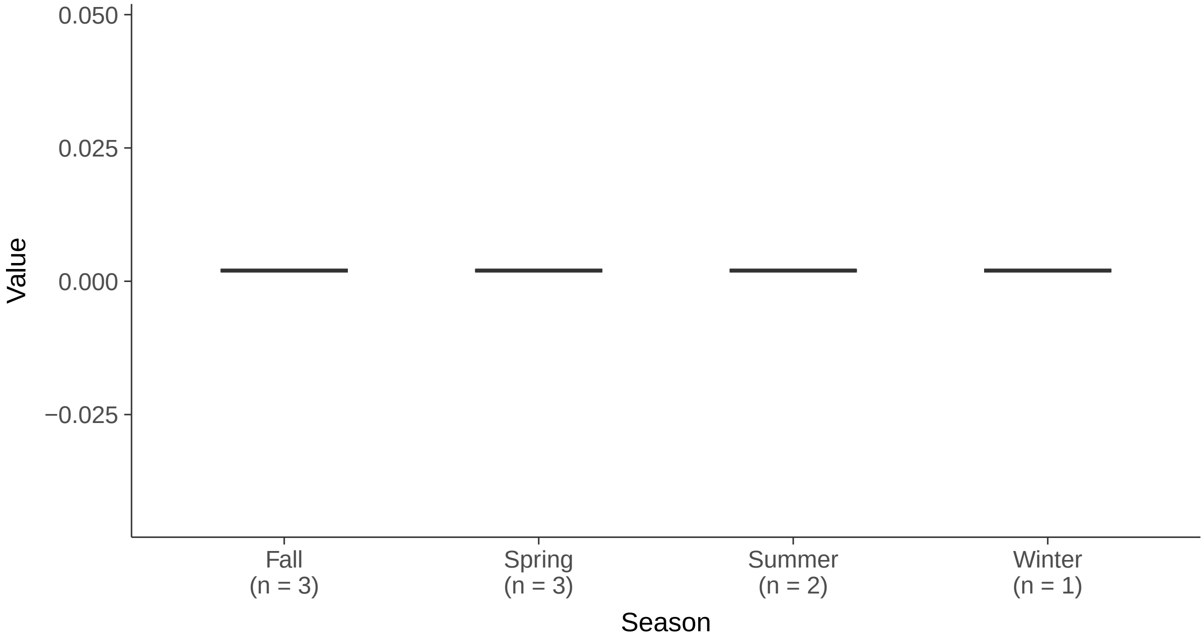
Boxplot

Arsenic, MW-16B (mg/L)



Boxplot by Season

Arsenic, MW-16B (mg/L)

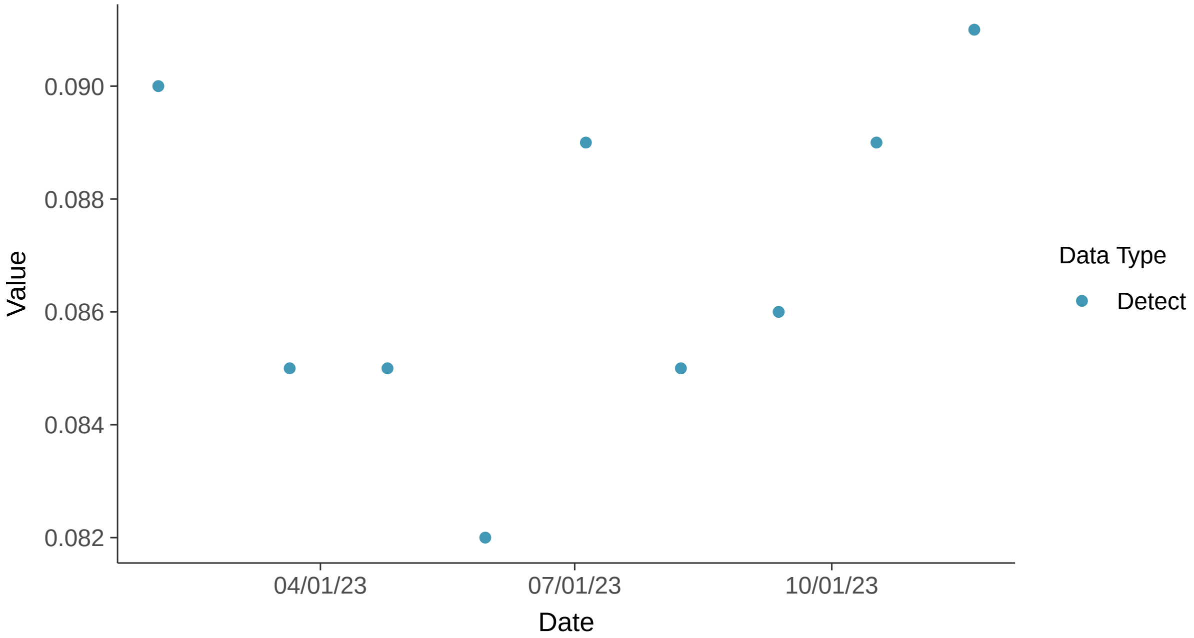


Appendix IV: Barium, MW-16B

ID: 16B_2_10

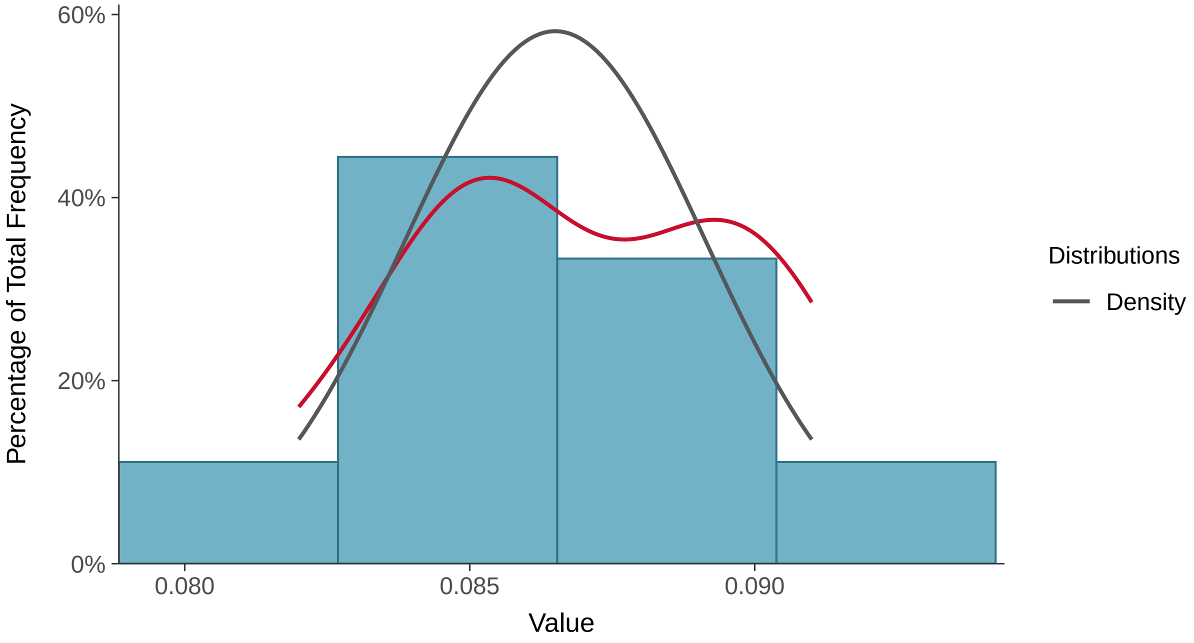
Scatter Plot

Barium, MW-16B (mg/L)



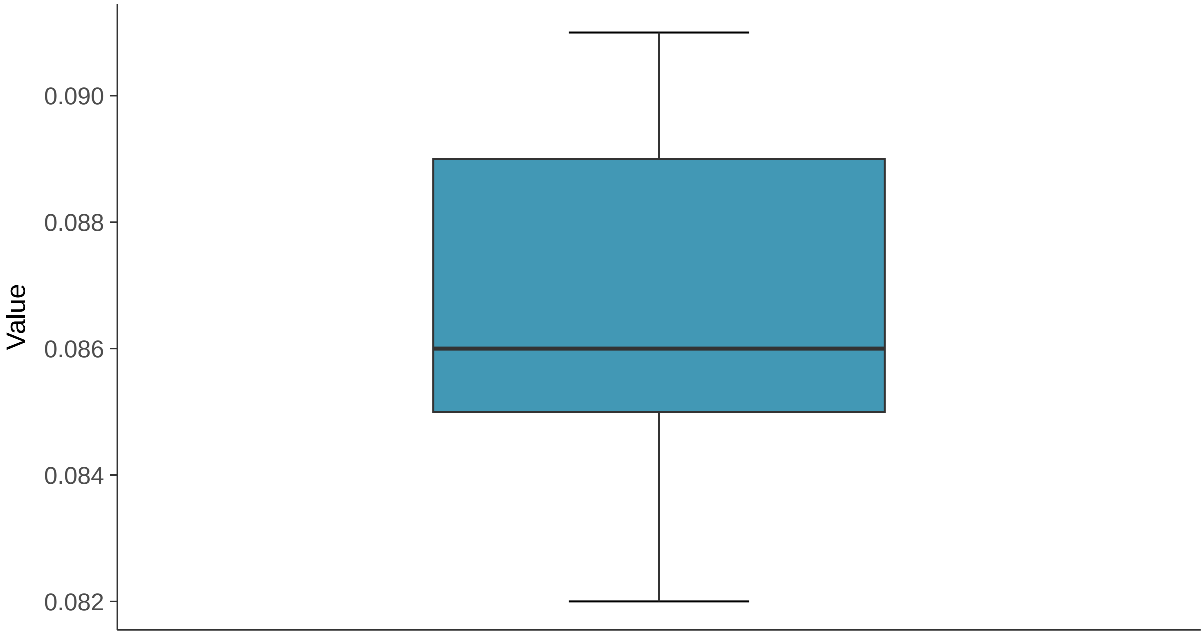
Histogram

Barium, MW-16B (mg/L)



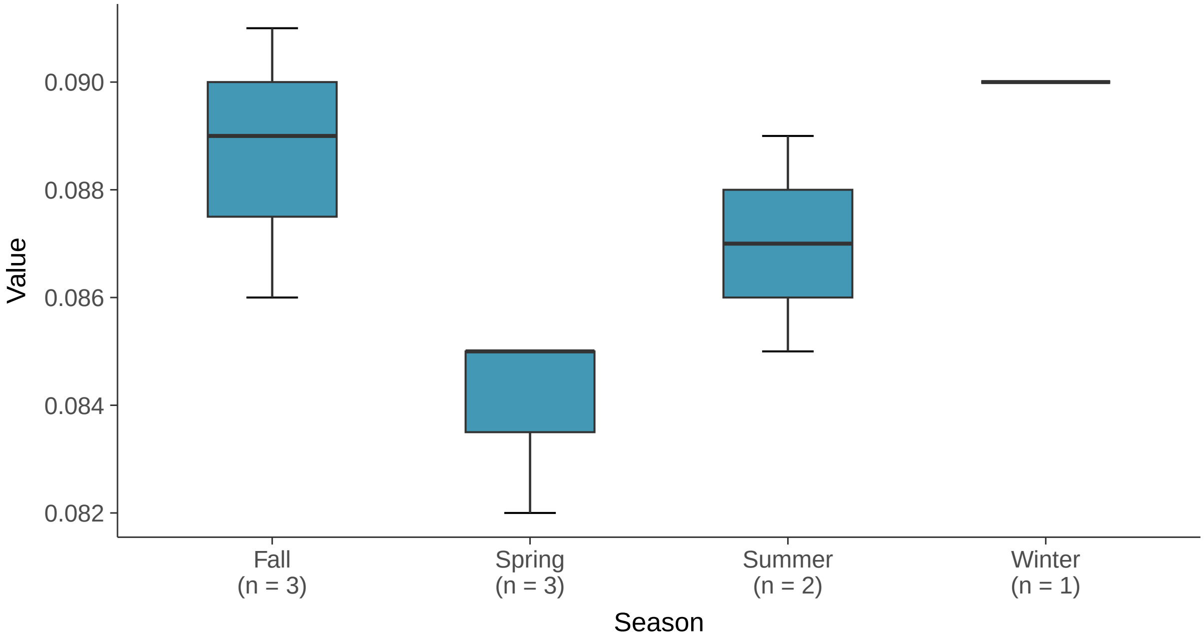
Boxplot

Barium, MW-16B (mg/L)



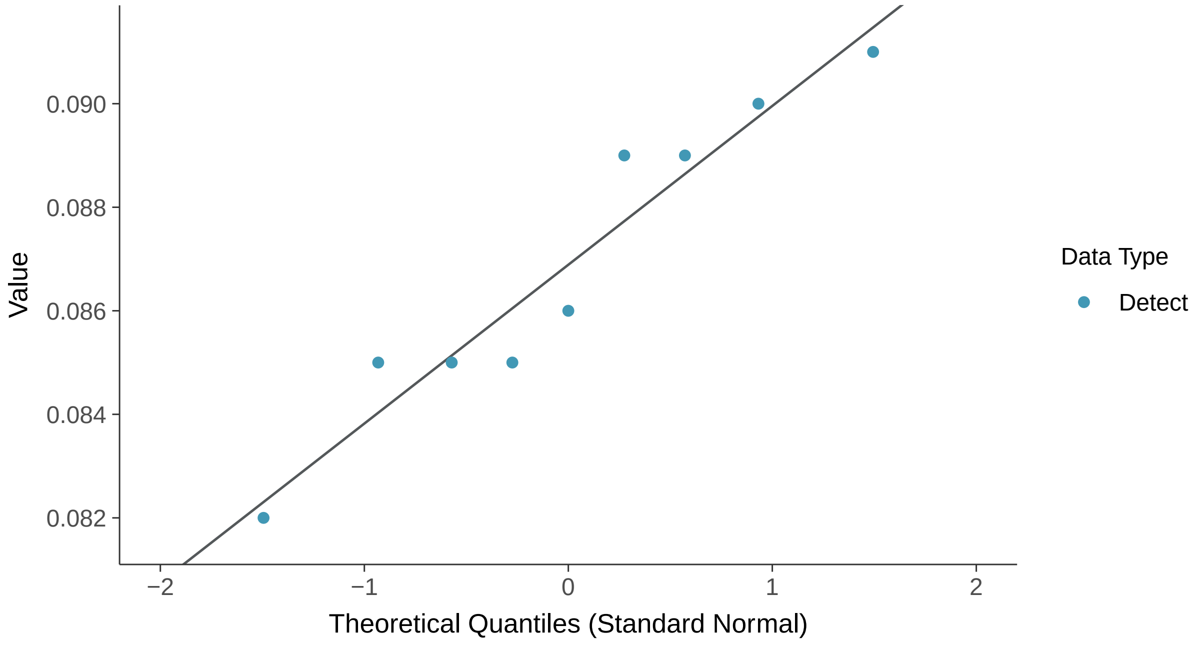
Boxplot by Season

Barium, MW-16B (mg/L)



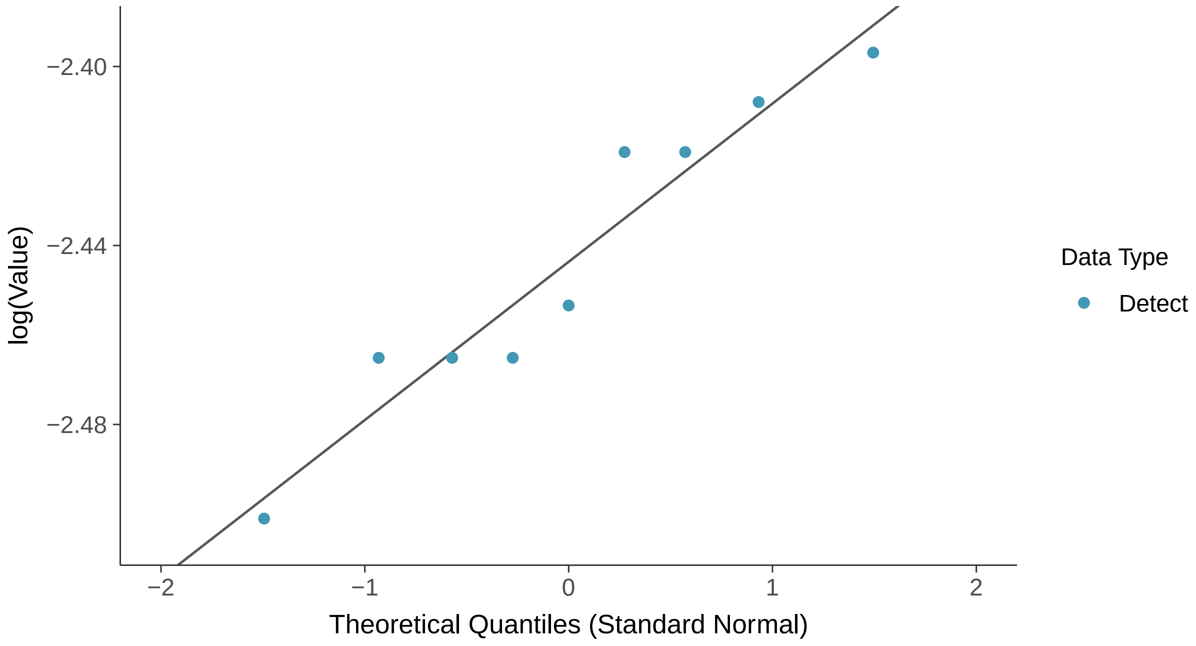
Normal Q-Q plot

Barium, MW-16B (mg/L)



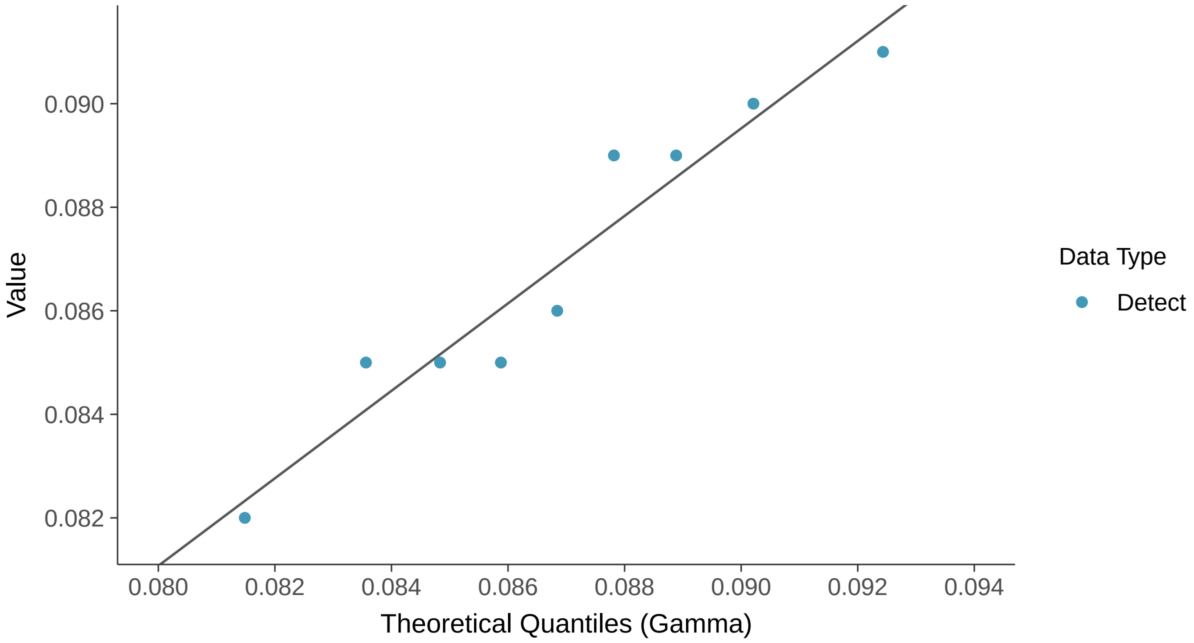
Lognormal Q-Q plot

Barium, MW-16B (mg/L)



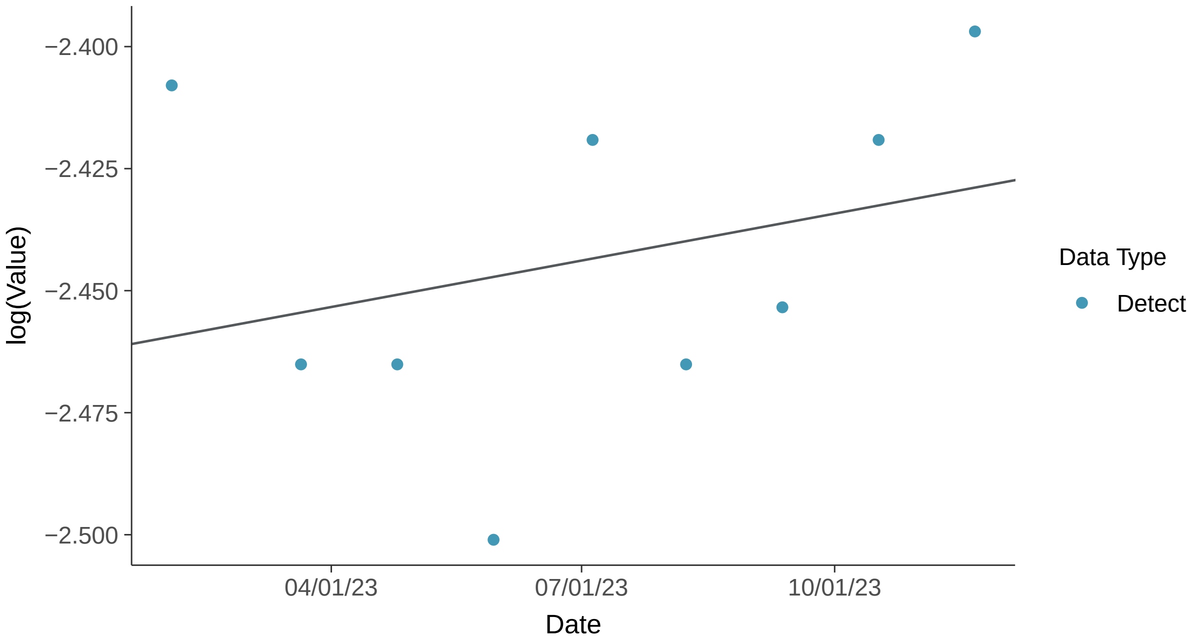
Gamma Q-Q plot

Barium, MW-16B (mg/L)



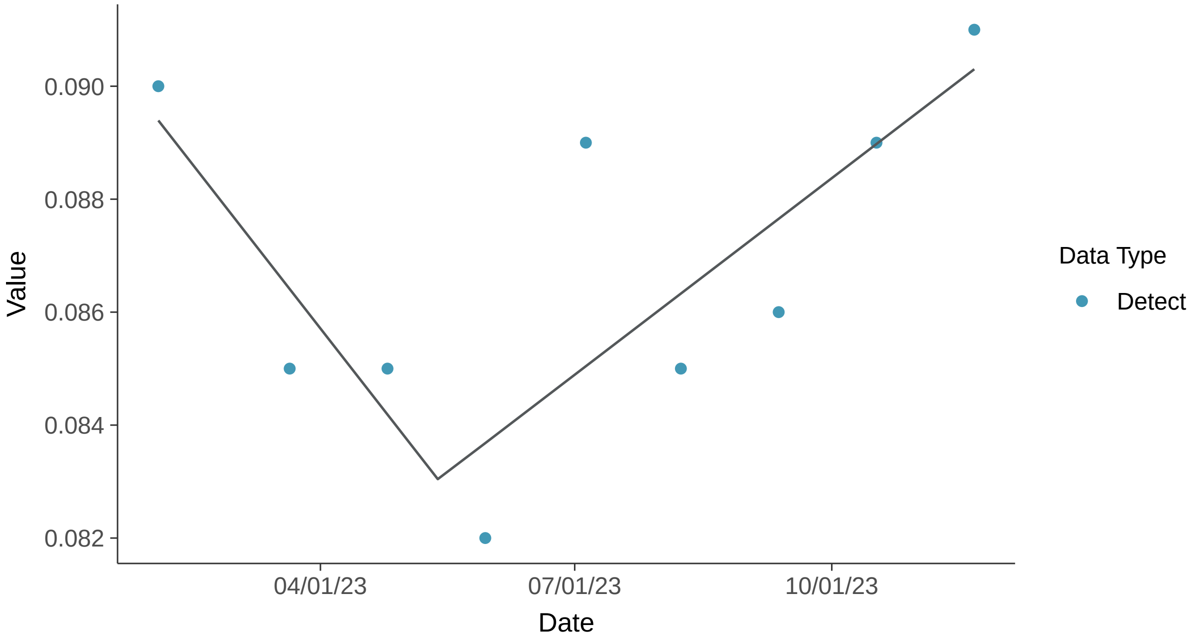
Trend Regression: Lognormal MLE

Barium, MW-16B (mg/L)



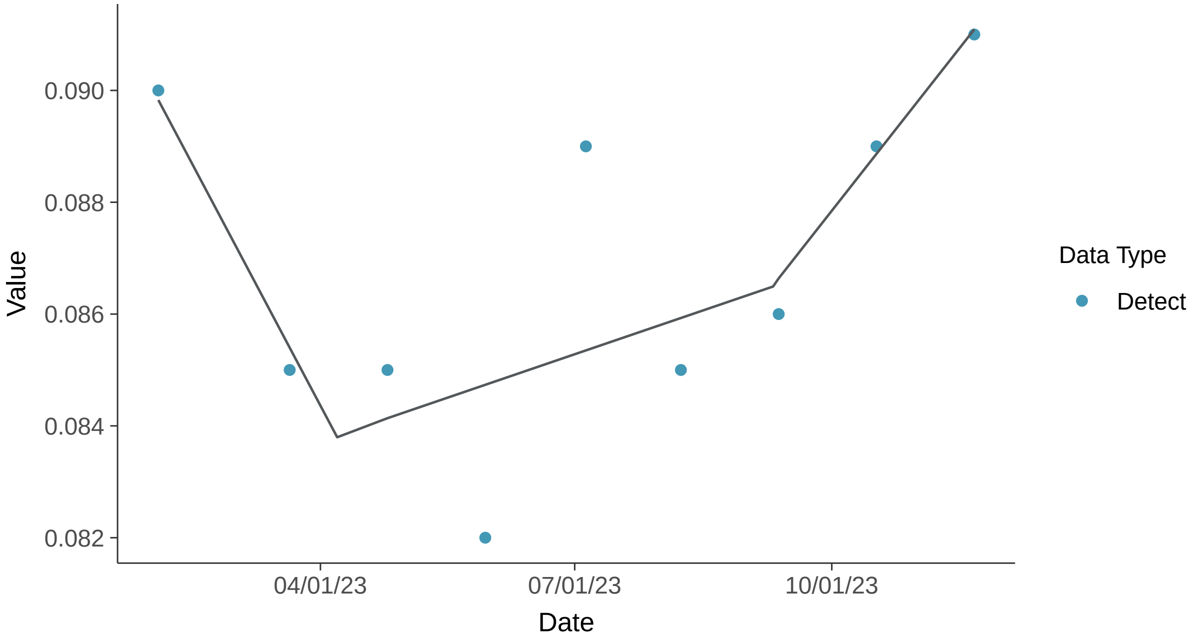
Trend Regression: Piecewise Linear-Linear

Barium, MW-16B (mg/L)



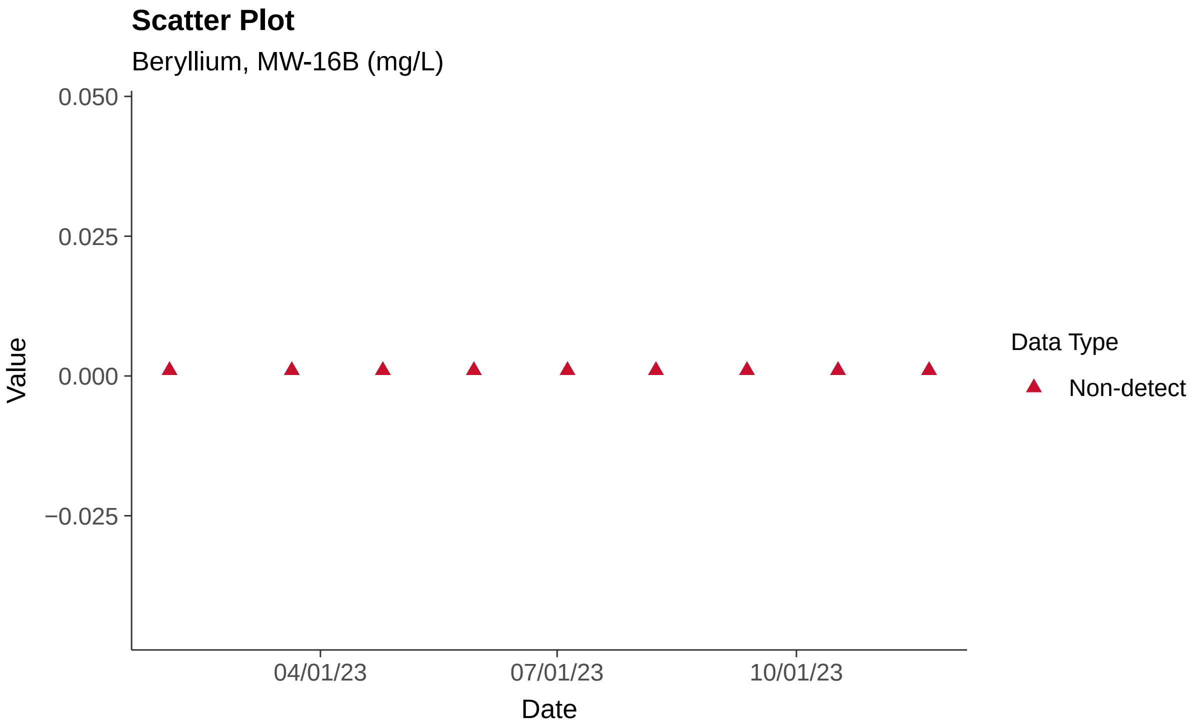
Trend Regression: Piecewise Linear-Linear-Linear

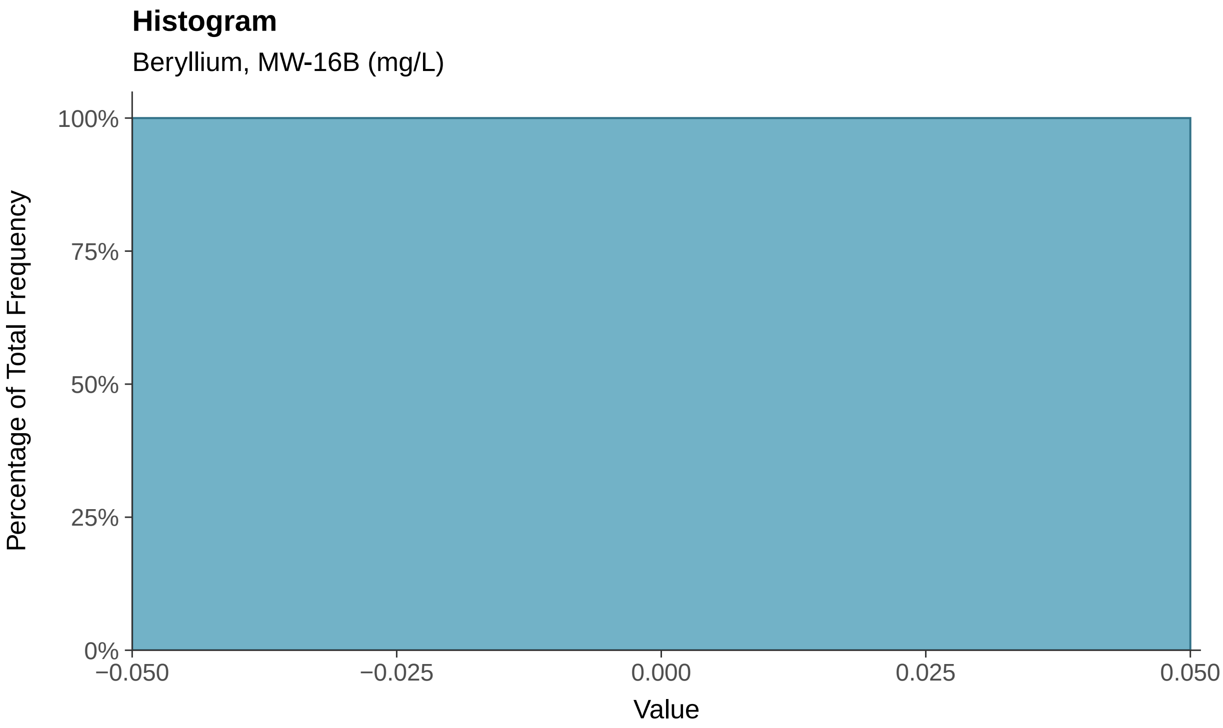
Barium, MW-16B (mg/L)



Appendix IV: Beryllium, MW-16B

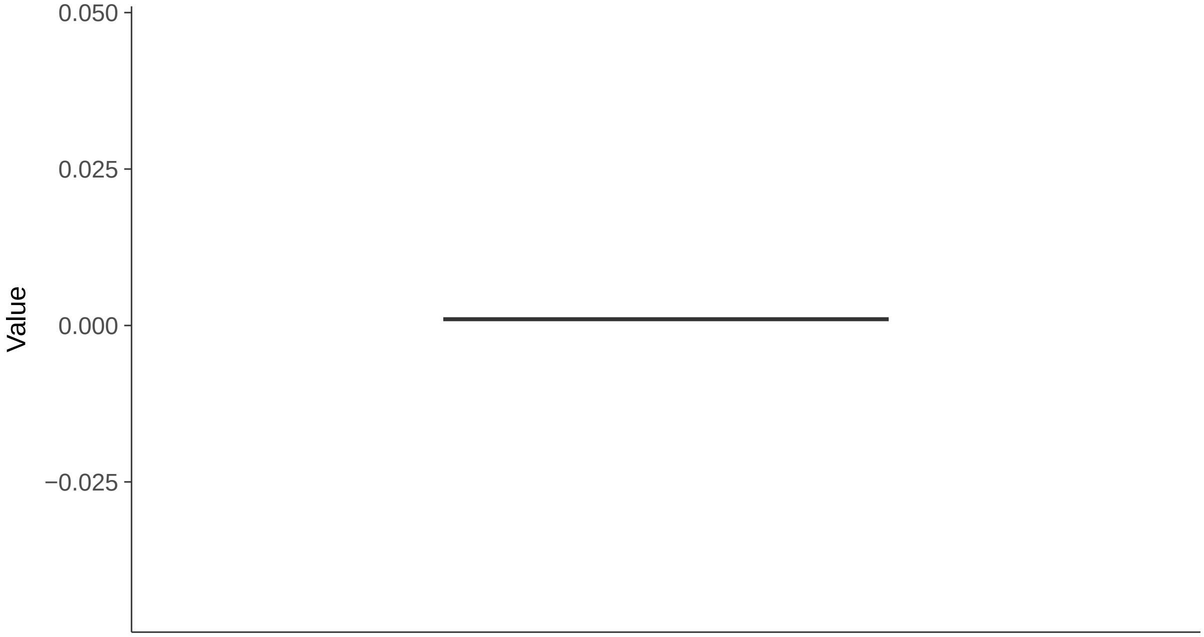
ID: 16B_2_11





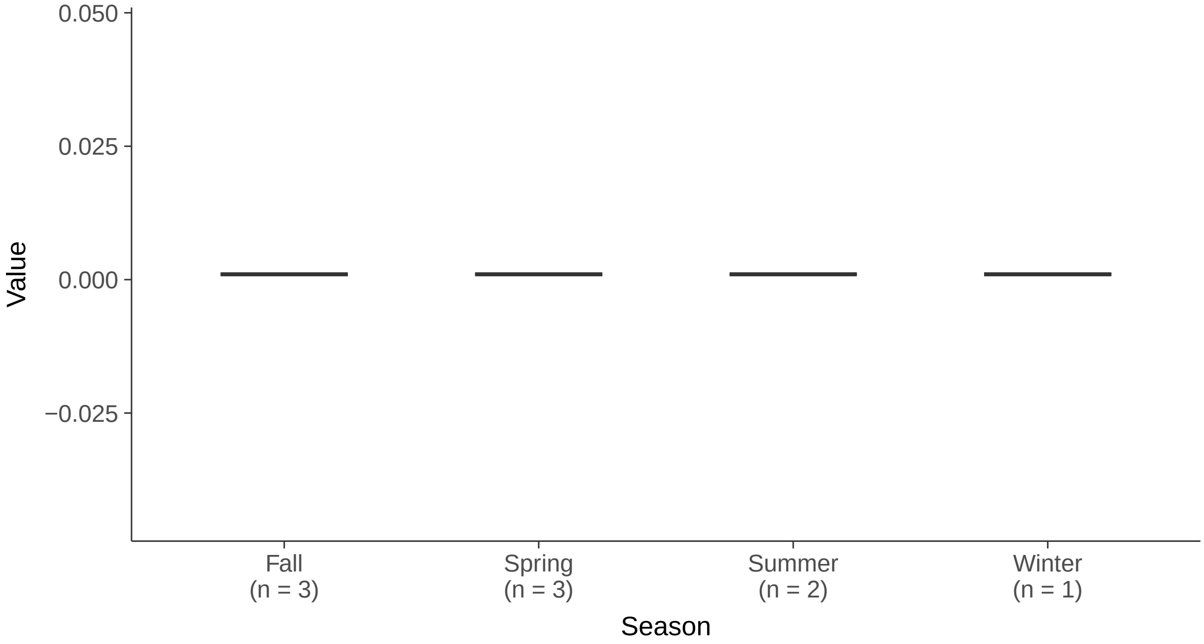
Boxplot

Beryllium, MW-16B (mg/L)



Boxplot by Season

Beryllium, MW-16B (mg/L)

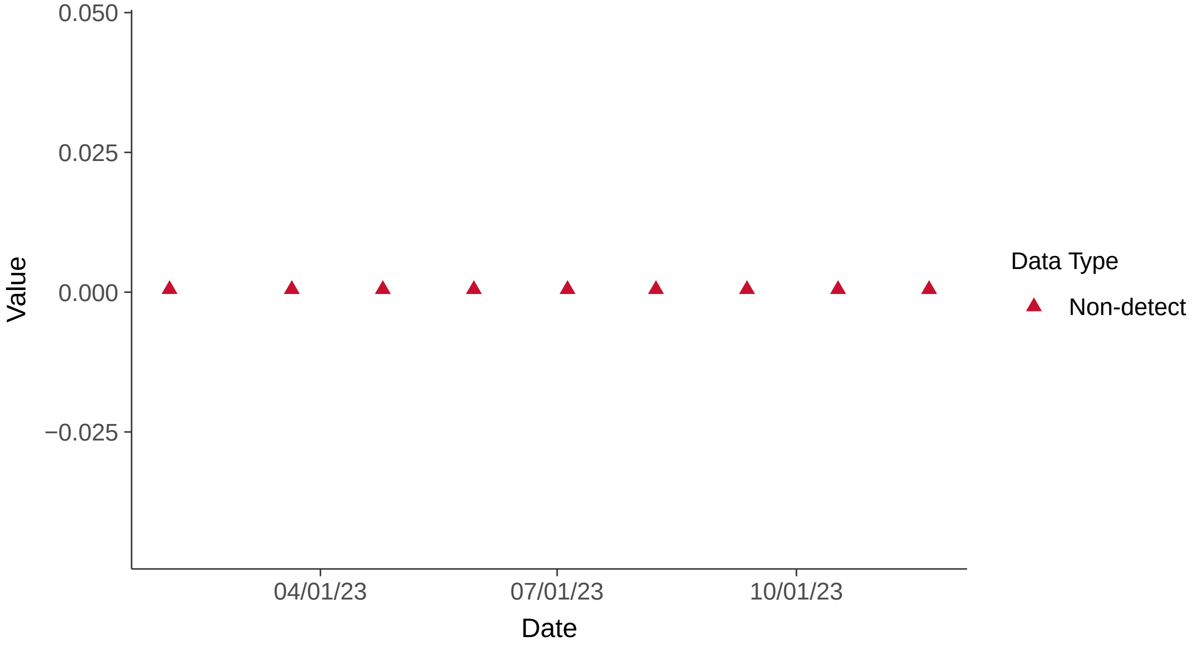


Appendix IV: Cadmium, MW-16B

ID: 16B_2_12

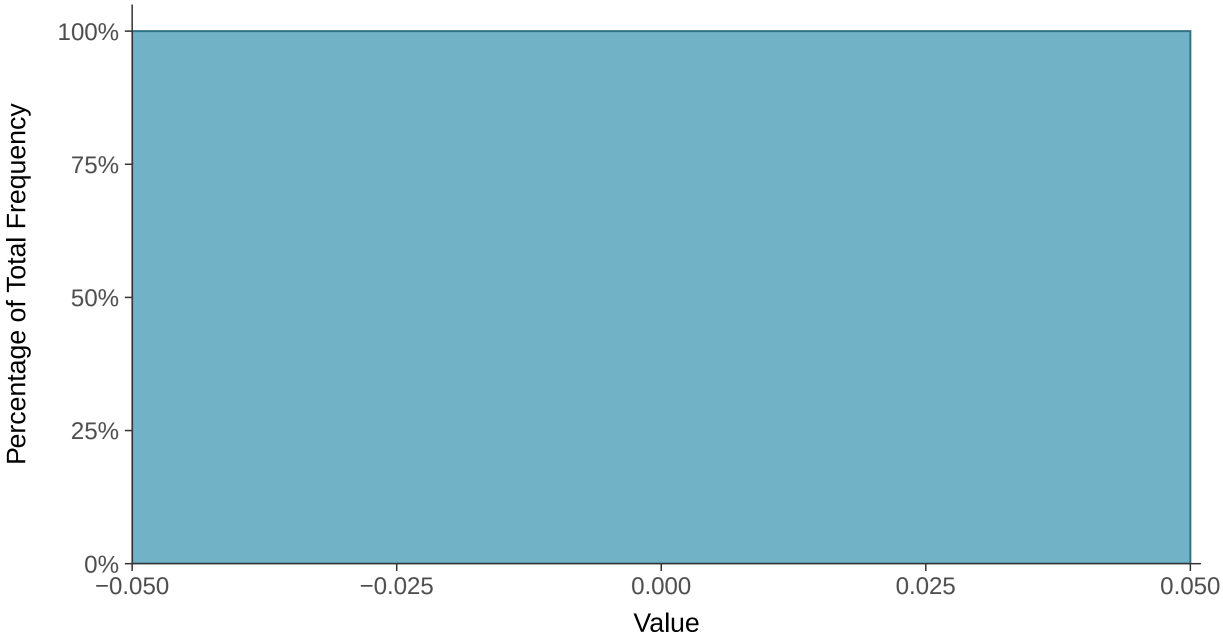
Scatter Plot

Cadmium, MW-16B (mg/L)



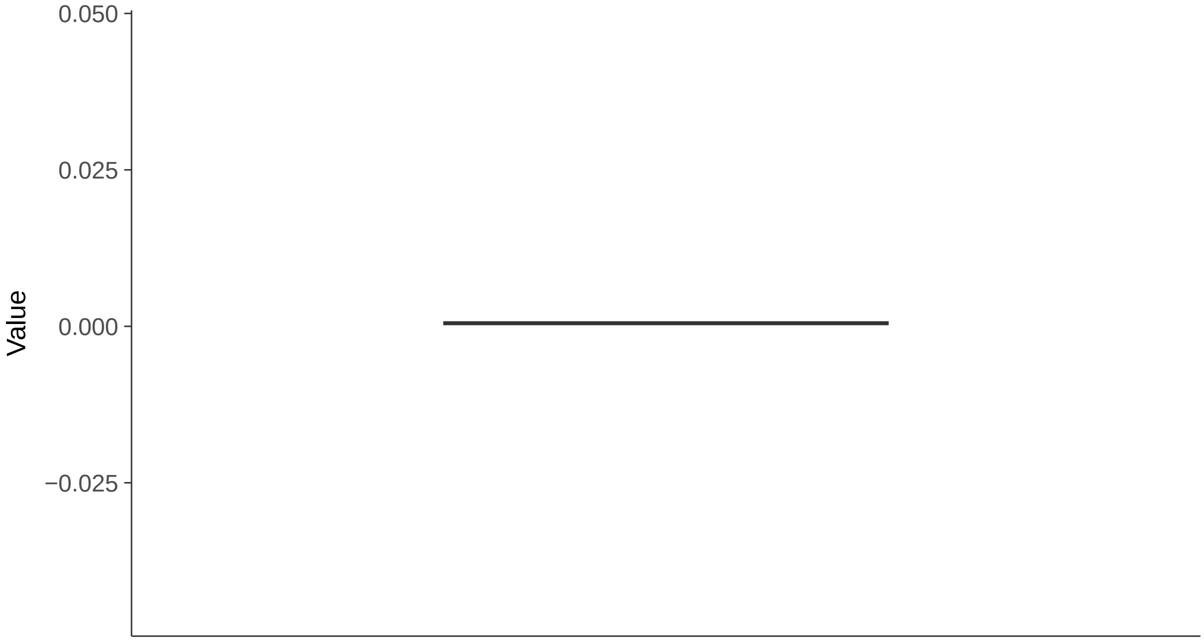
Histogram

Cadmium, MW-16B (mg/L)



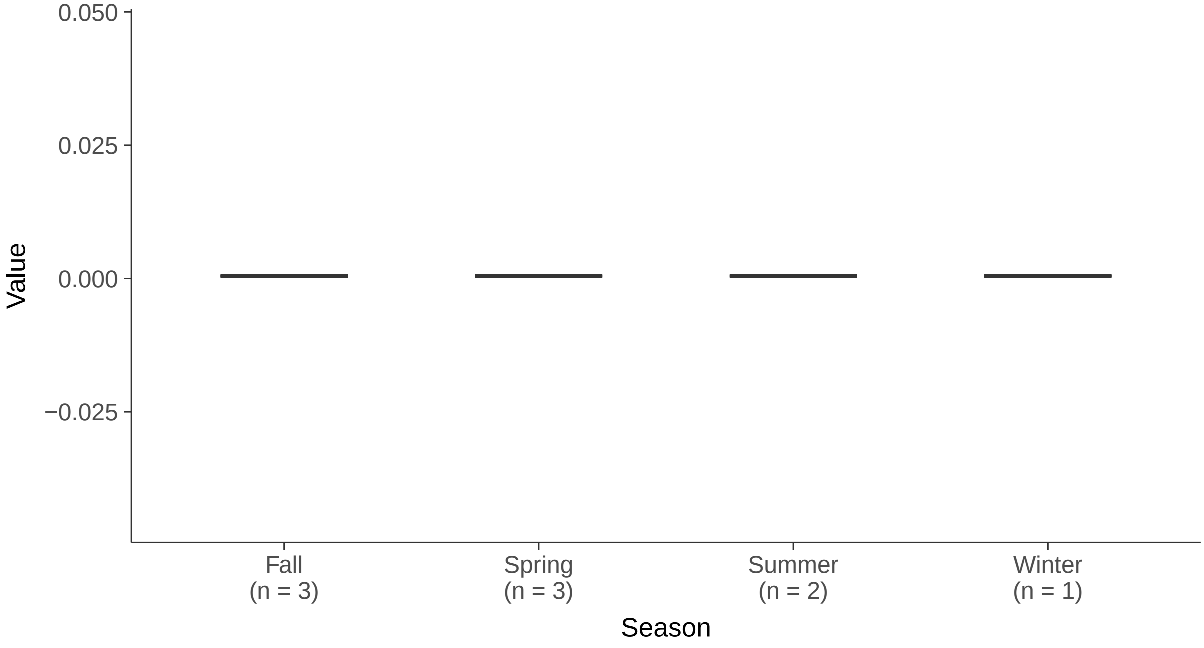
Boxplot

Cadmium, MW-16B (mg/L)



Boxplot by Season

Cadmium, MW-16B (mg/L)

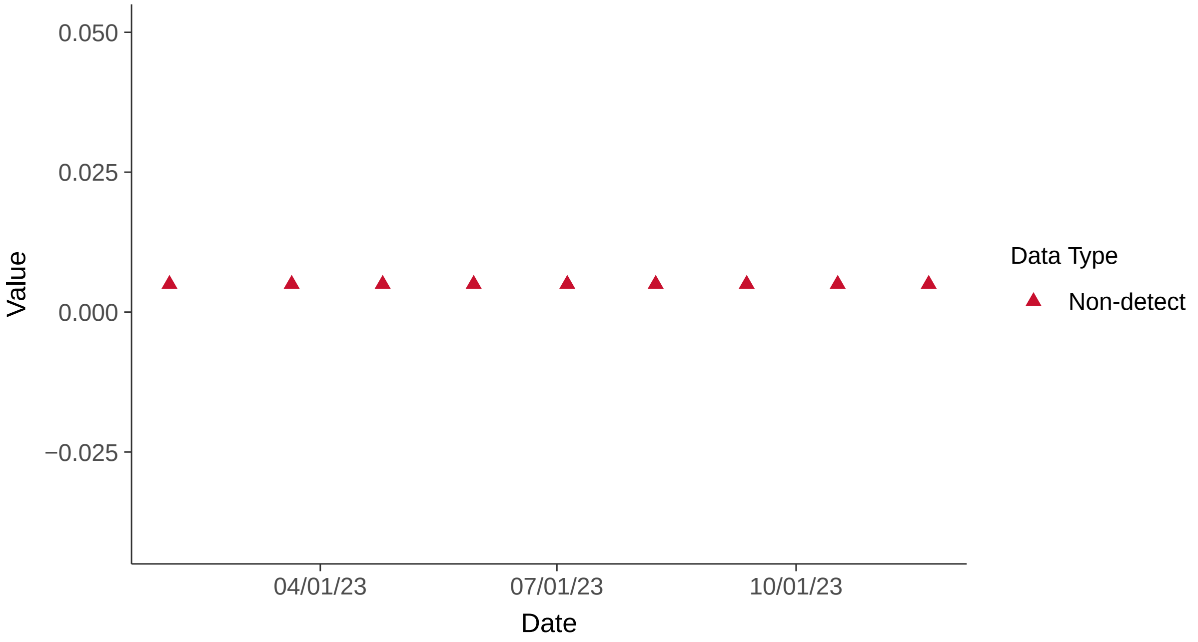


Appendix IV: Chromium, MW-16B

ID: 16B_2_13

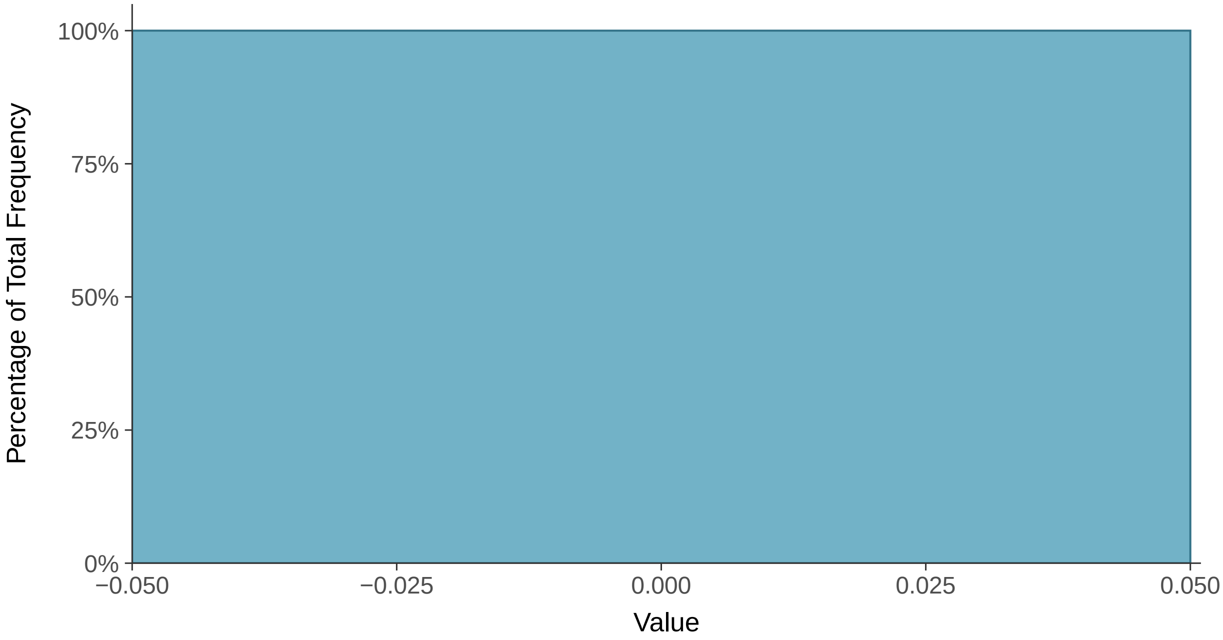
Scatter Plot

Chromium, MW-16B (mg/L)



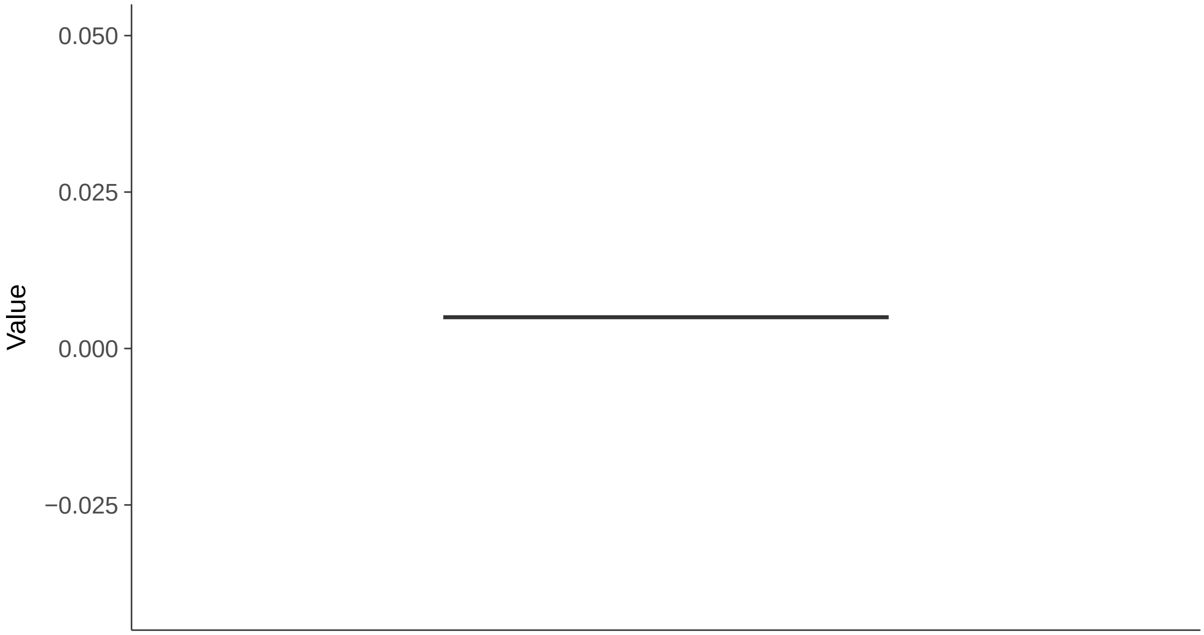
Histogram

Chromium, MW-16B (mg/L)



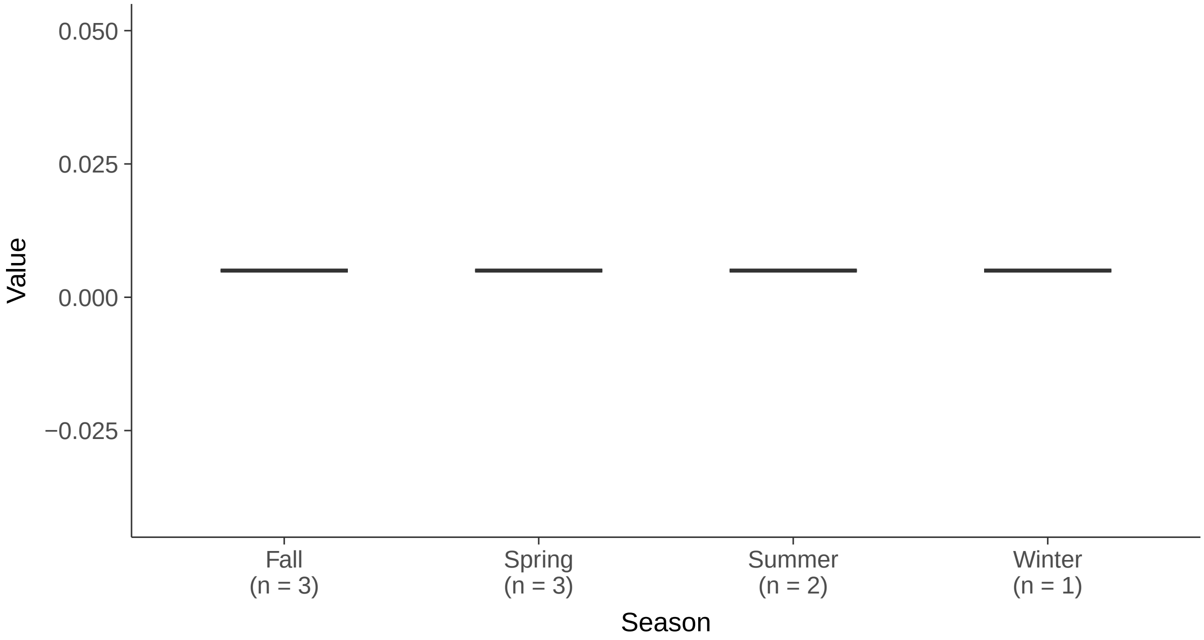
Boxplot

Chromium, MW-16B (mg/L)



Boxplot by Season

Chromium, MW-16B (mg/L)

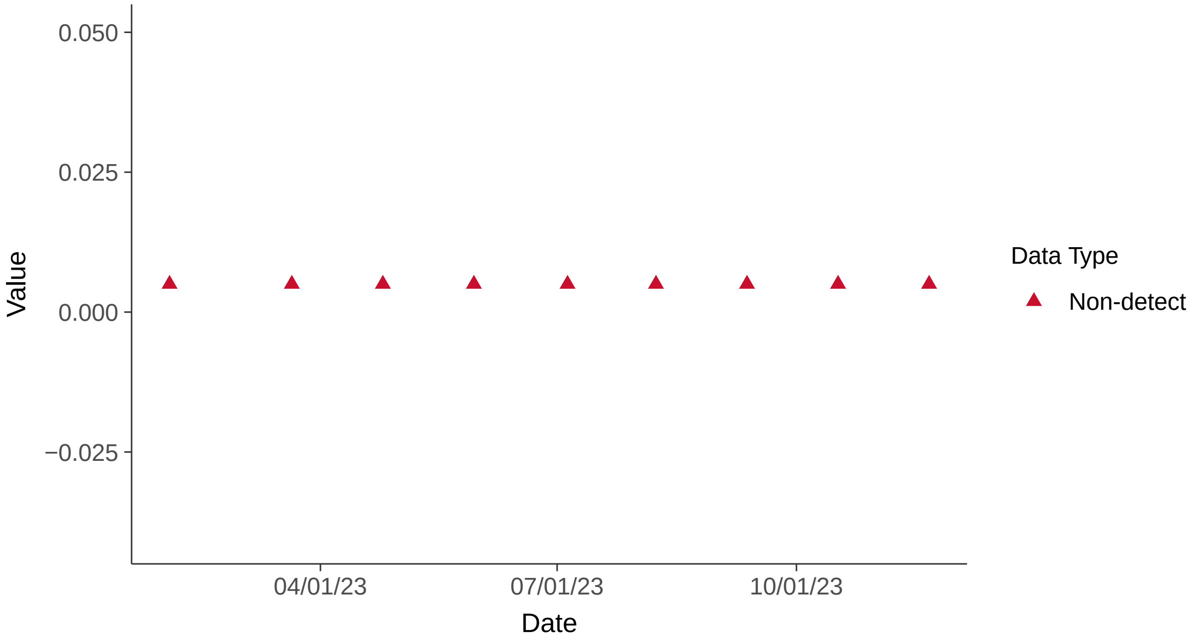


Appendix IV: Cobalt, MW-16B

ID: 16B_2_14

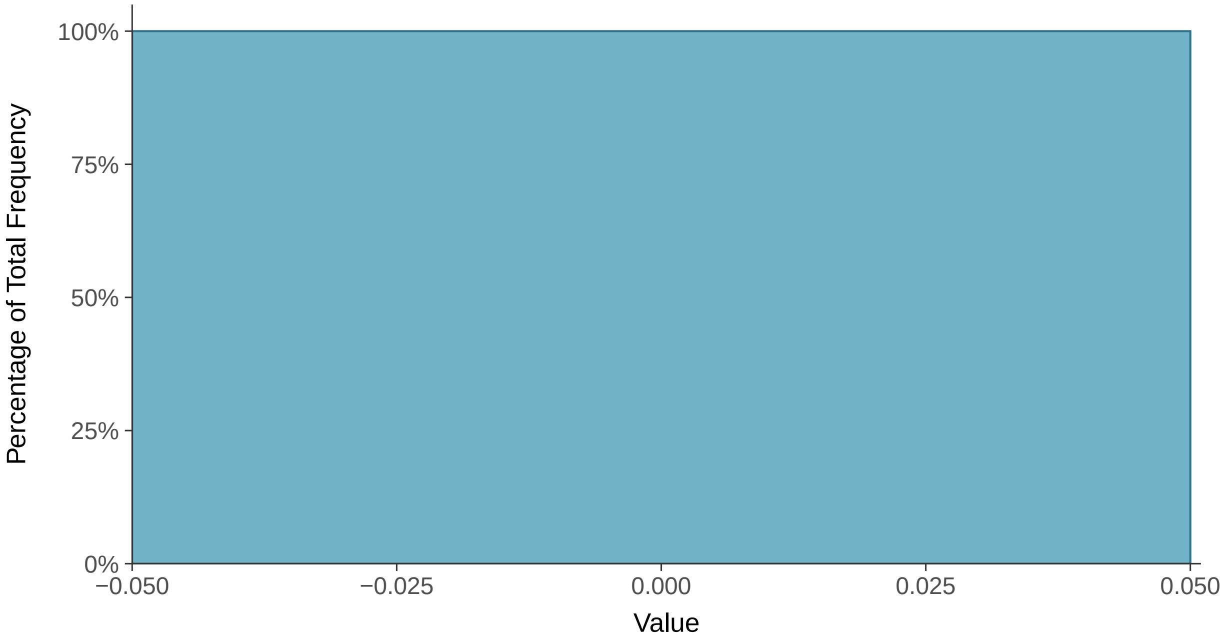
Scatter Plot

Cobalt, MW-16B (mg/L)



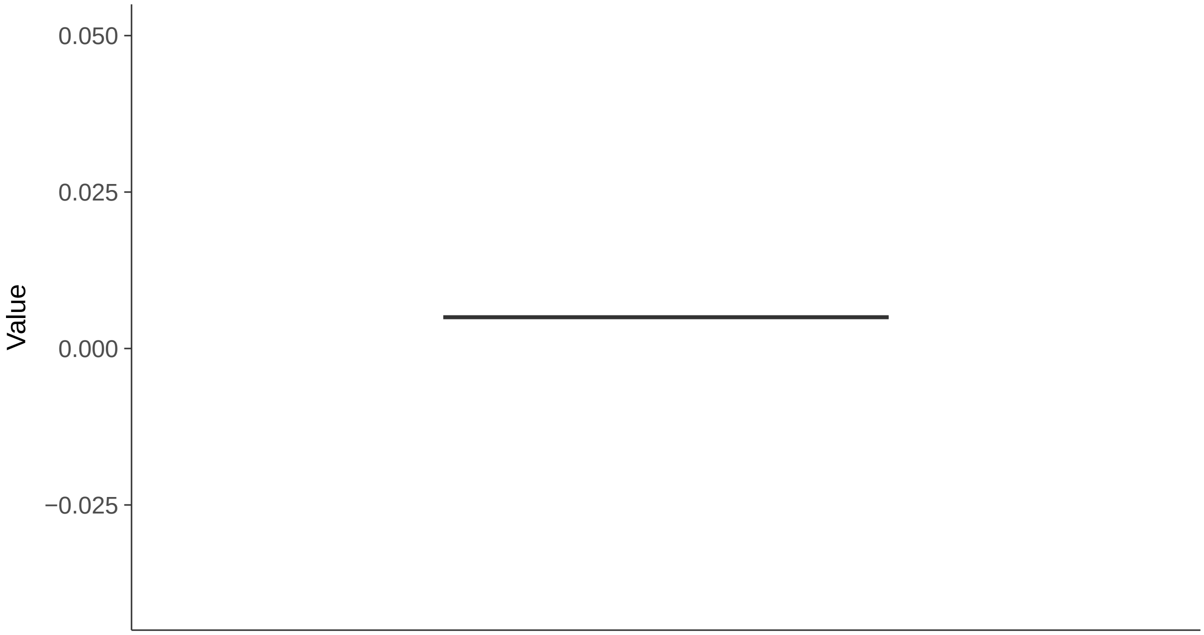
Histogram

Cobalt, MW-16B (mg/L)



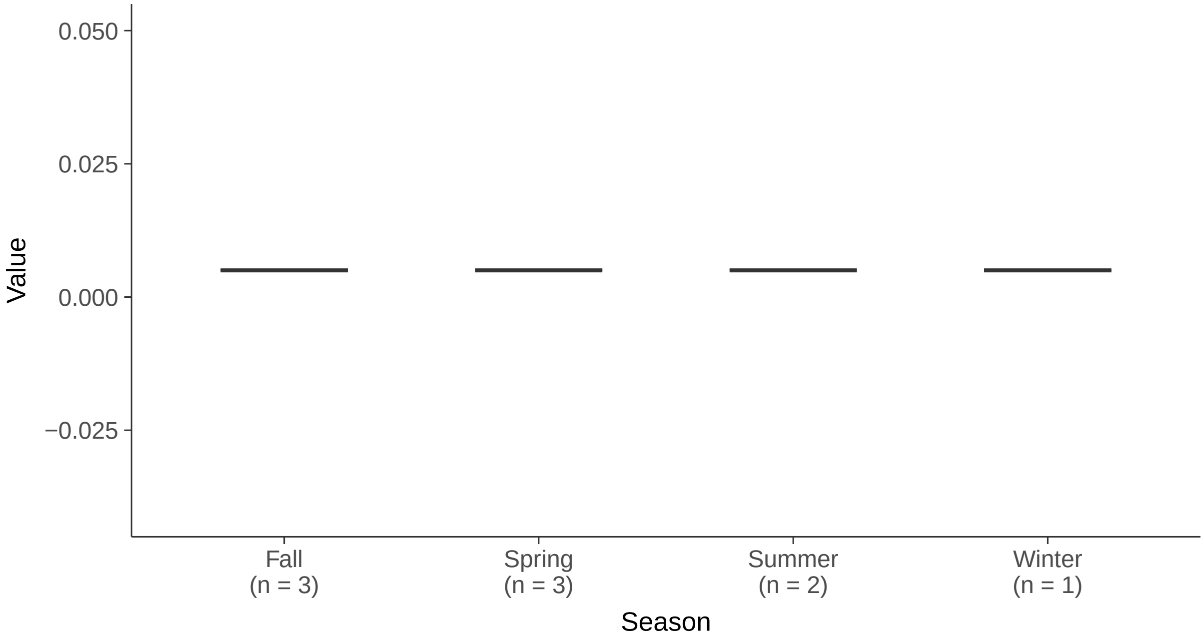
Boxplot

Cobalt, MW-16B (mg/L)



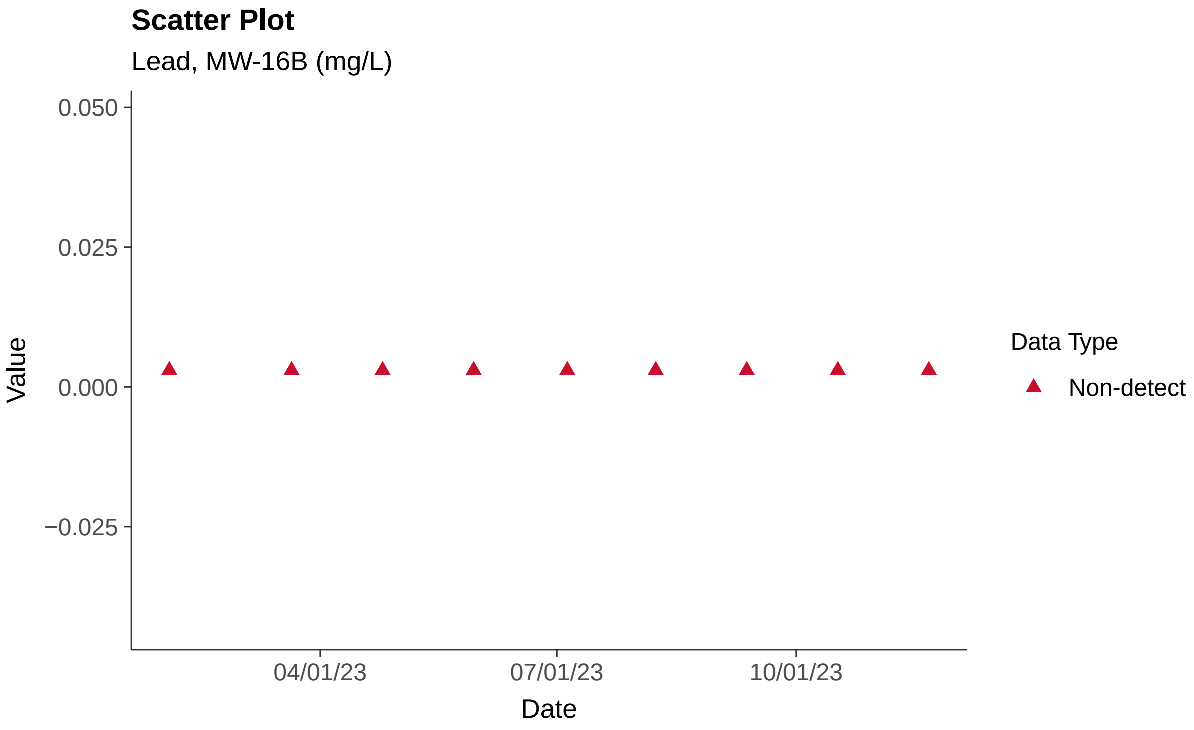
Boxplot by Season

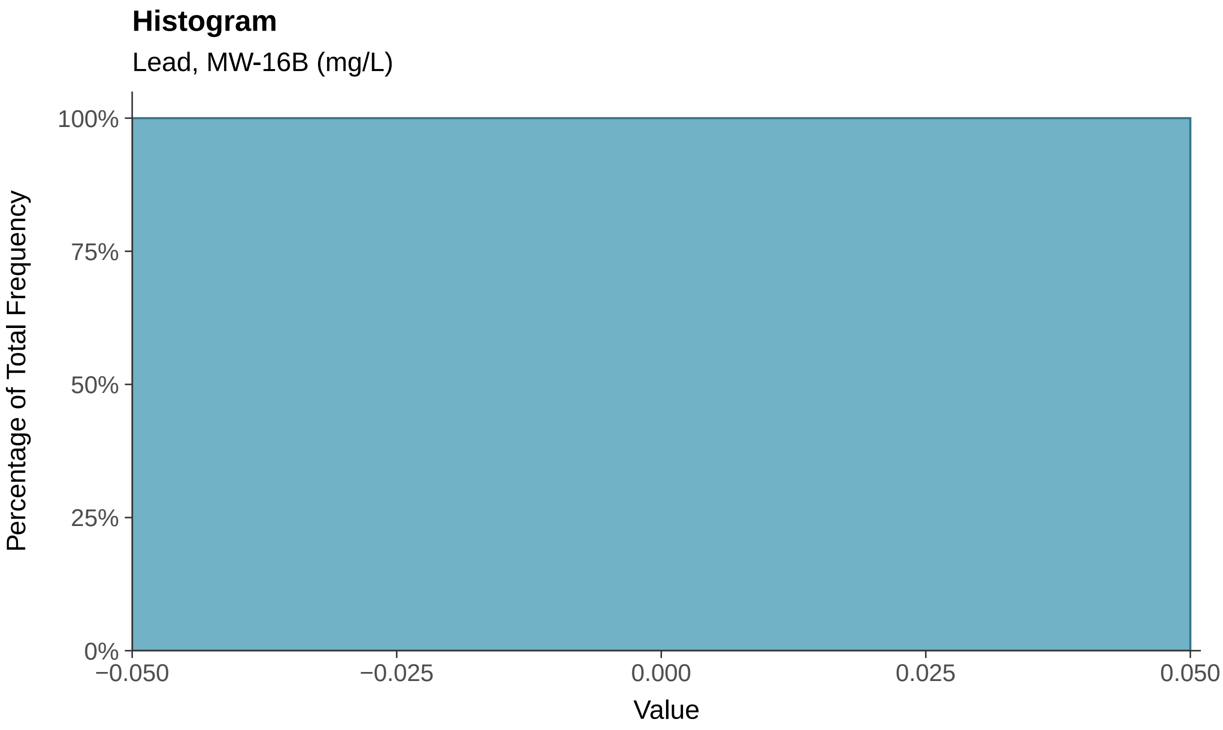
Cobalt, MW-16B (mg/L)



Appendix IV: Lead, MW-16B

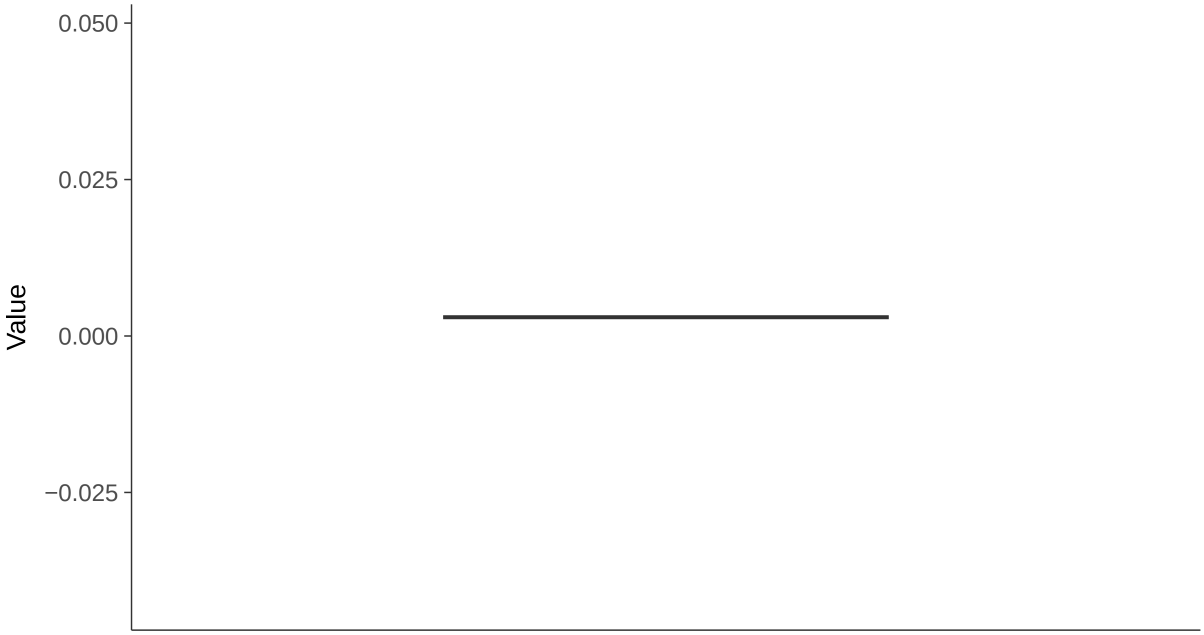
ID: 16B_2_15





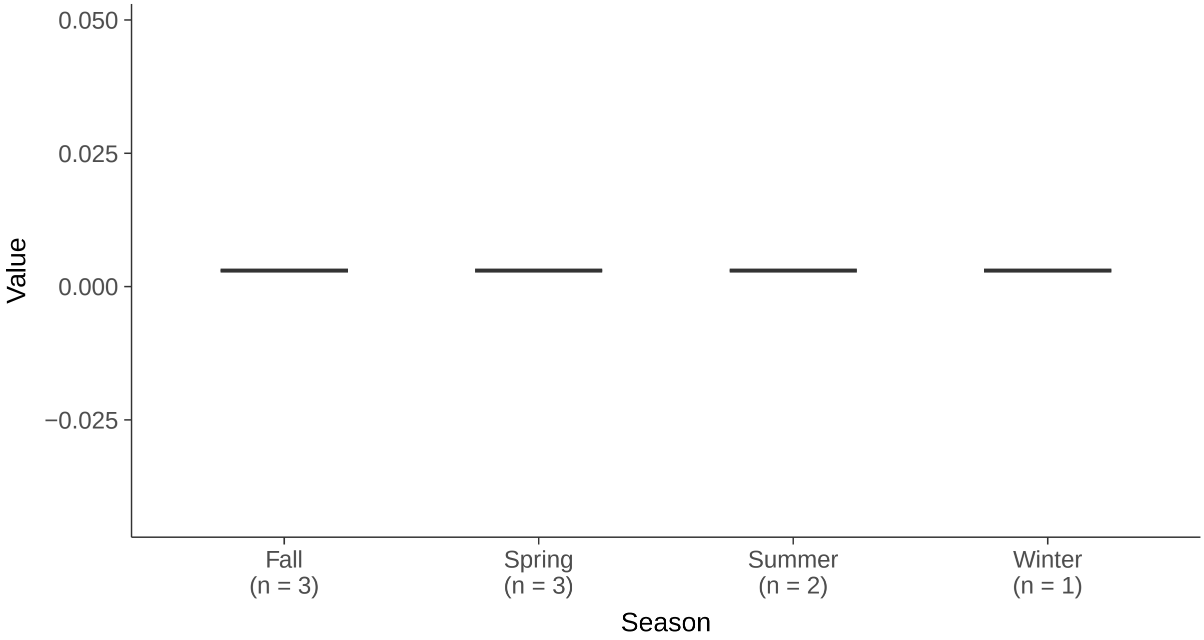
Boxplot

Lead, MW-16B (mg/L)



Boxplot by Season

Lead, MW-16B (mg/L)

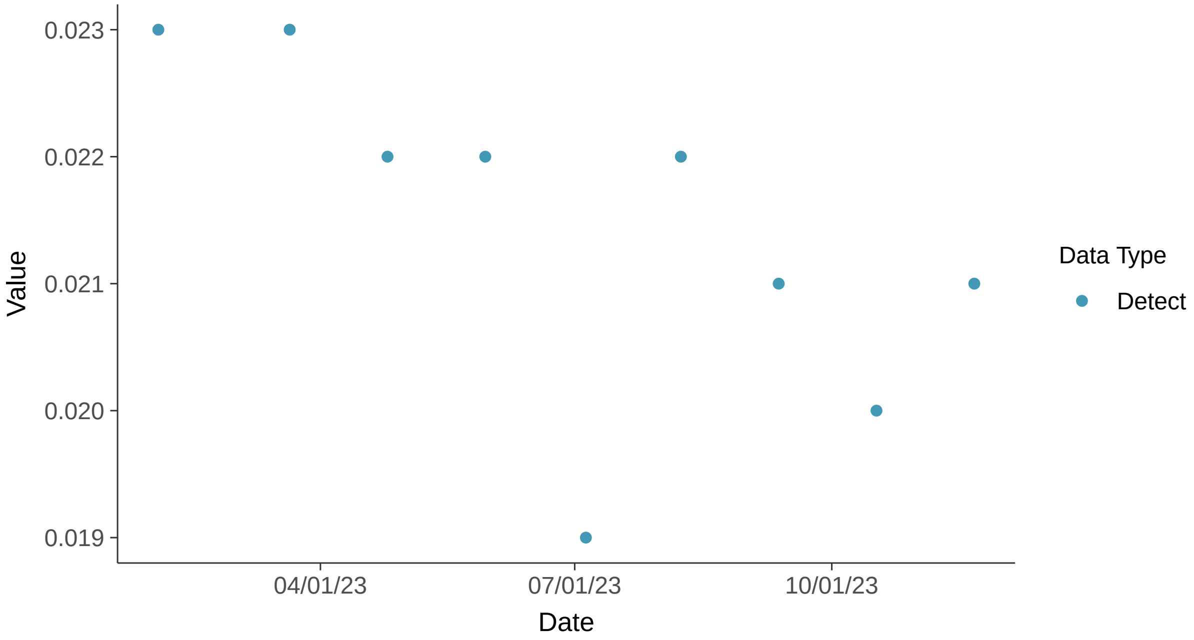


Appendix IV: Lithium, MW-16B

ID: 16B_2_16

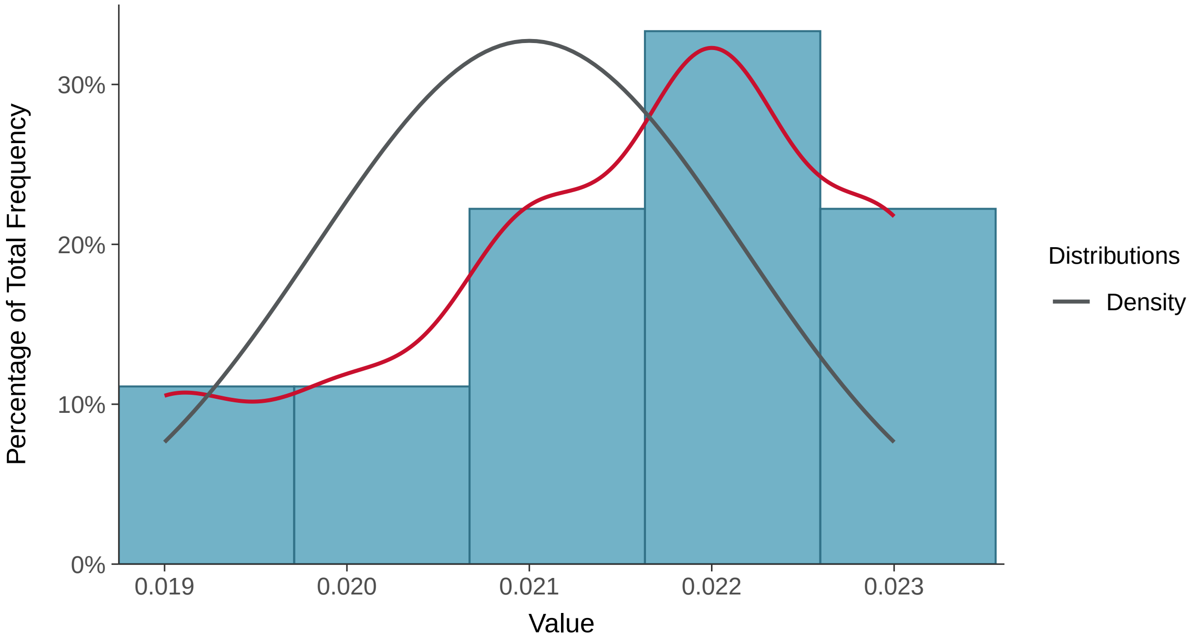
Scatter Plot

Lithium, MW-16B (mg/L)



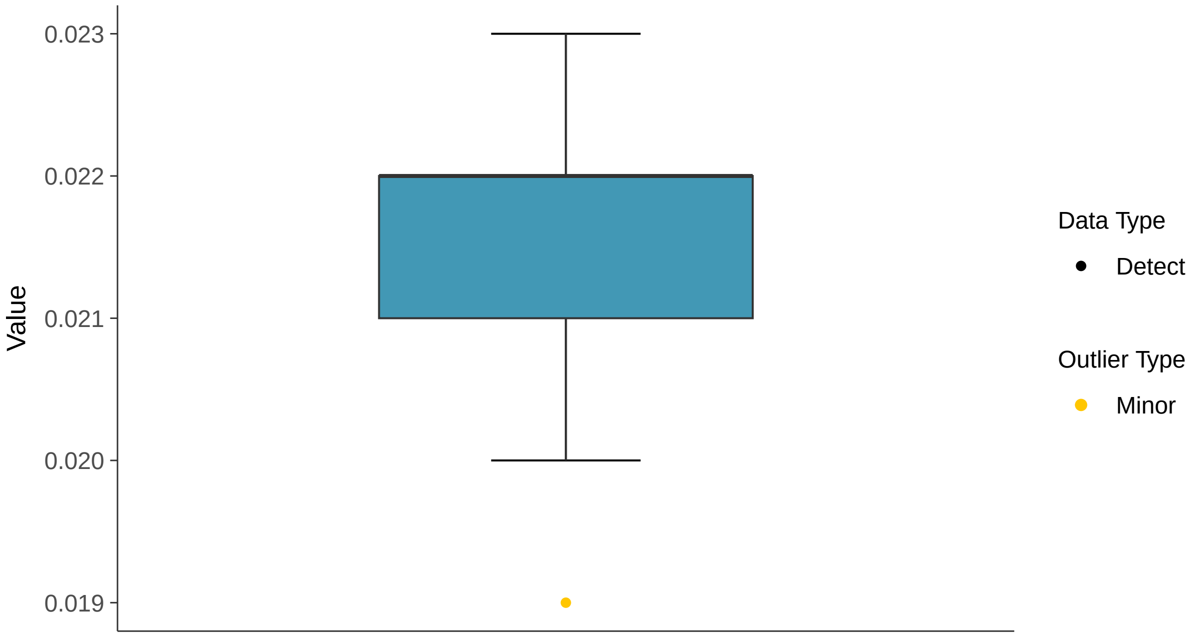
Histogram

Lithium, MW-16B (mg/L)



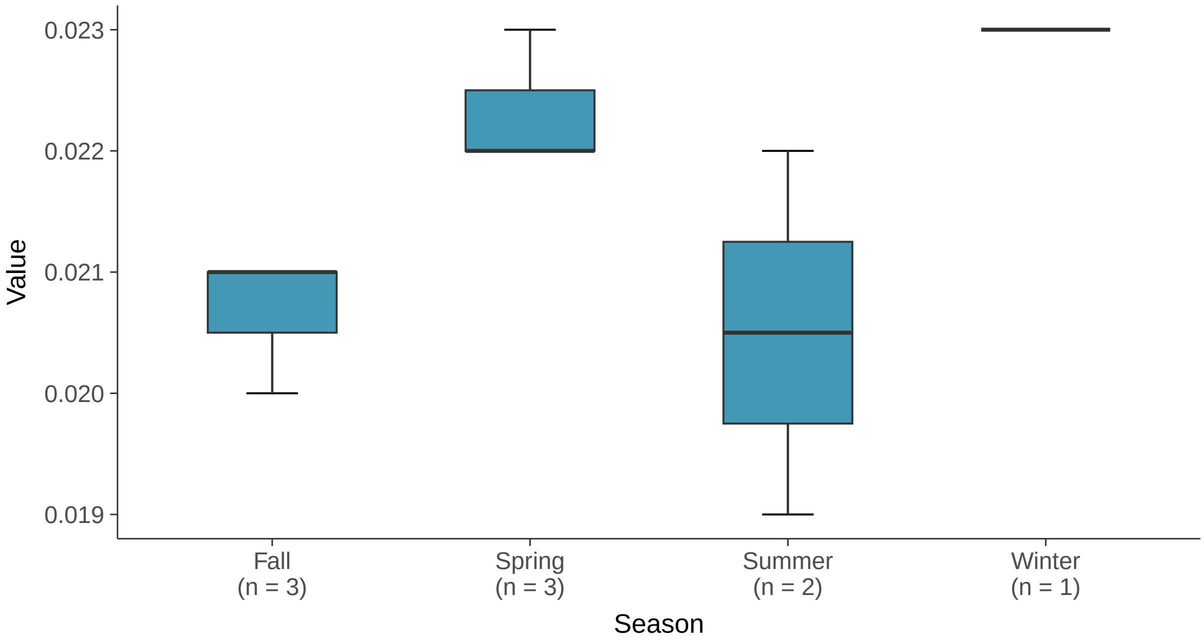
Boxplot

Lithium, MW-16B (mg/L)



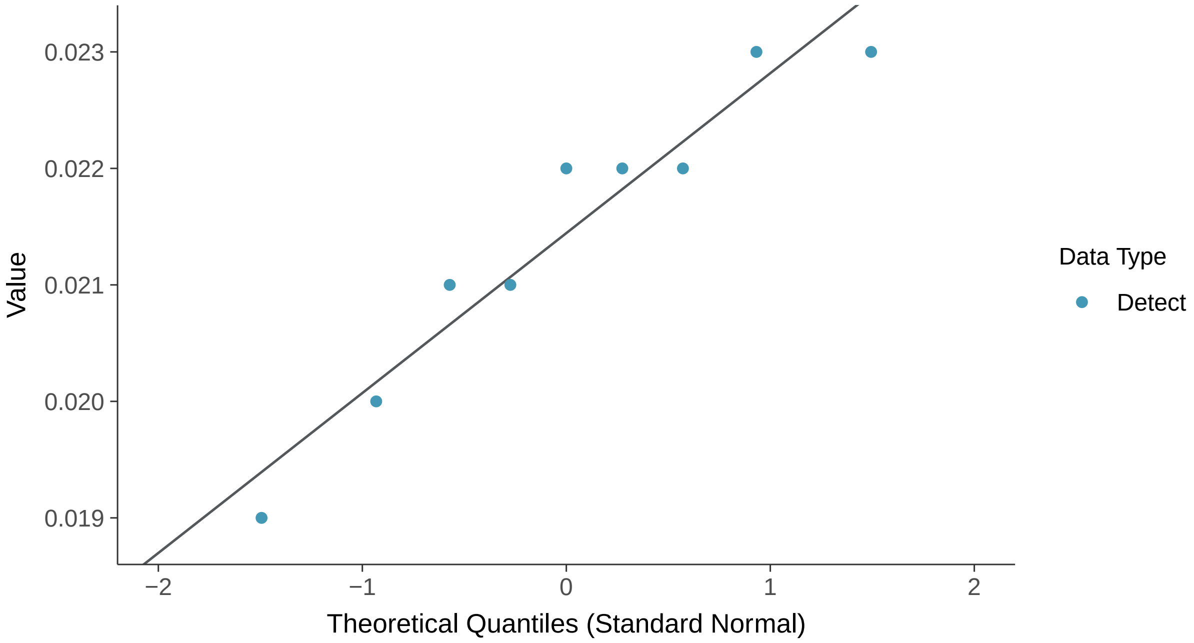
Boxplot by Season

Lithium, MW-16B (mg/L)



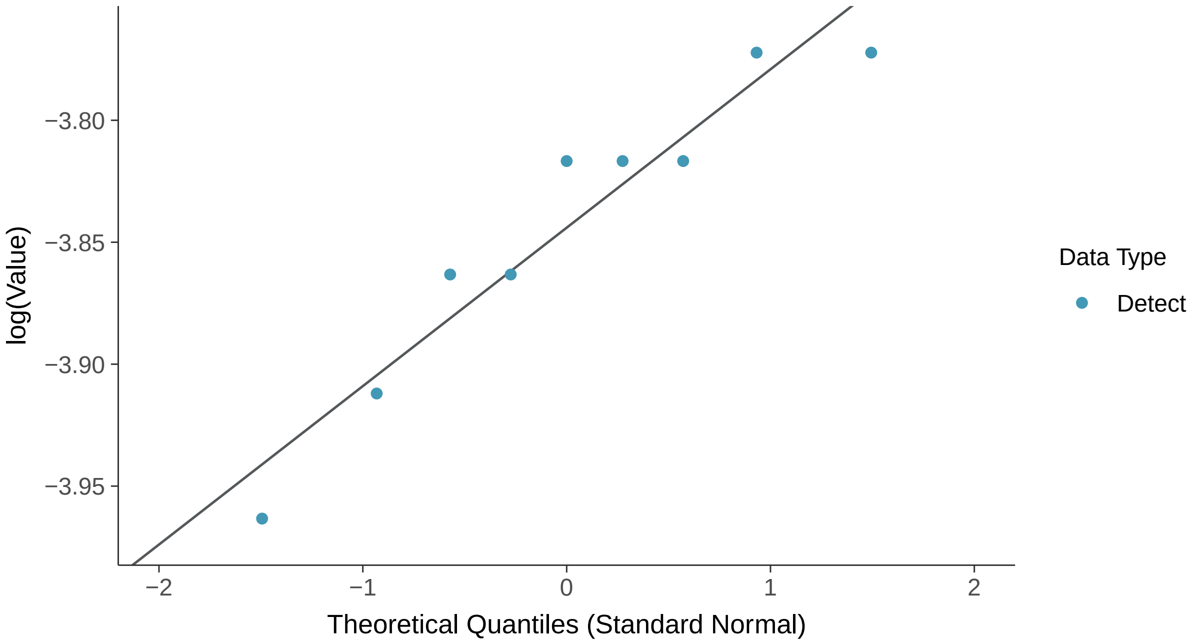
Normal Q-Q plot

Lithium, MW-16B (mg/L)



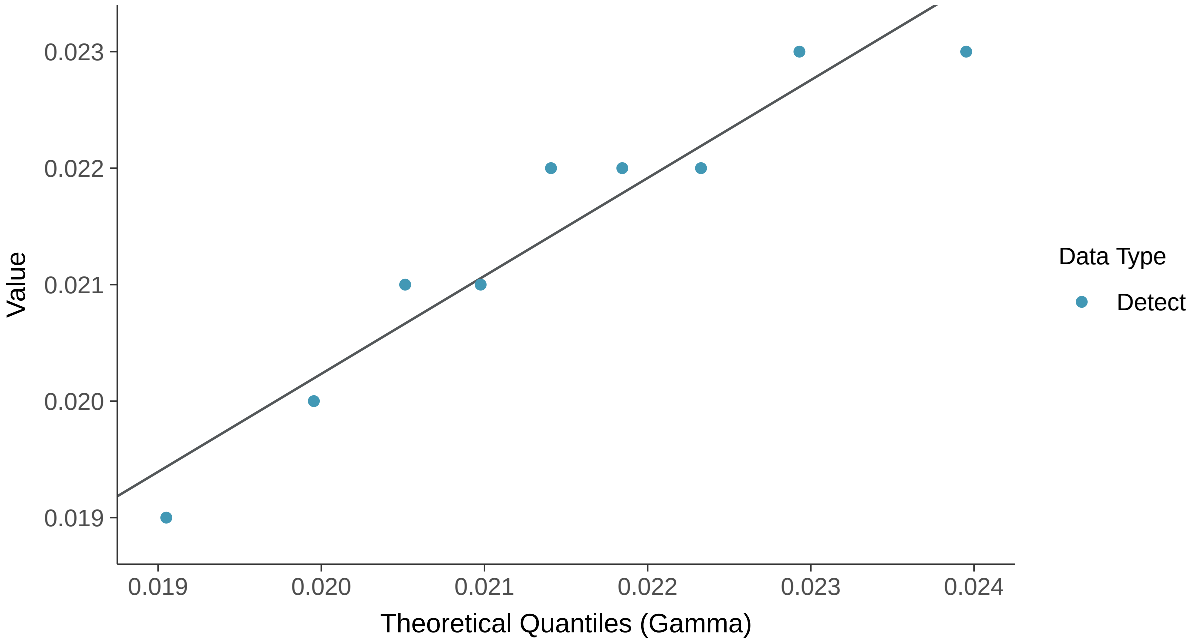
Lognormal Q-Q plot

Lithium, MW-16B (mg/L)



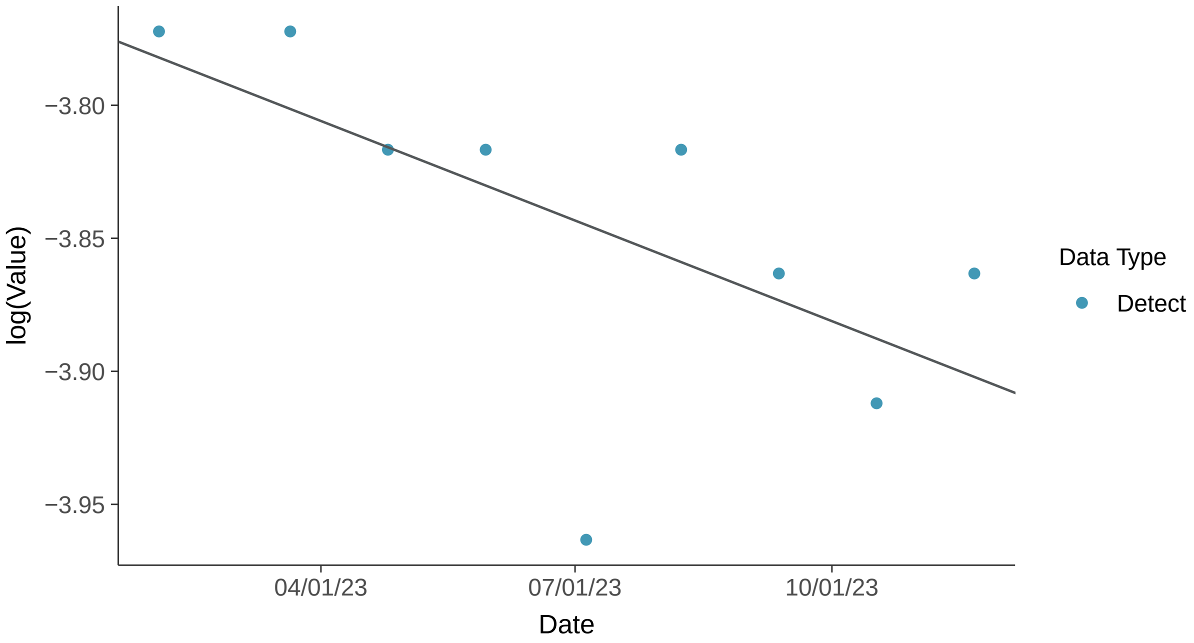
Gamma Q-Q plot

Lithium, MW-16B (mg/L)



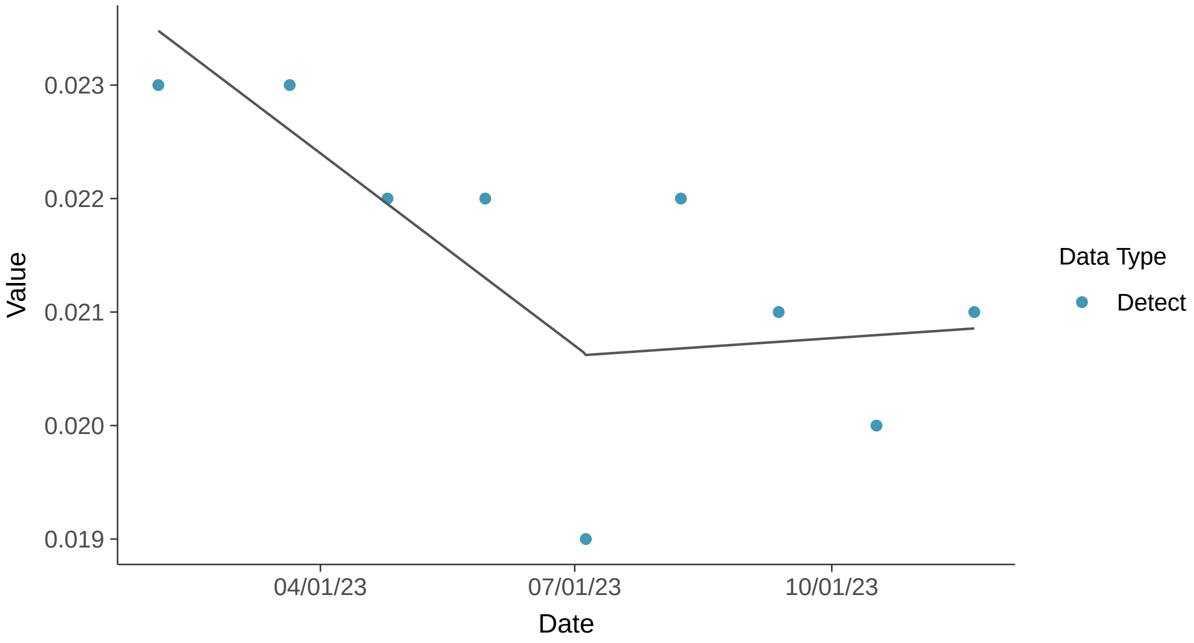
Trend Regression: Lognormal MLE

Lithium, MW-16B (mg/L)



Trend Regression: Piecewise Linear-Linear

Lithium, MW-16B (mg/L)

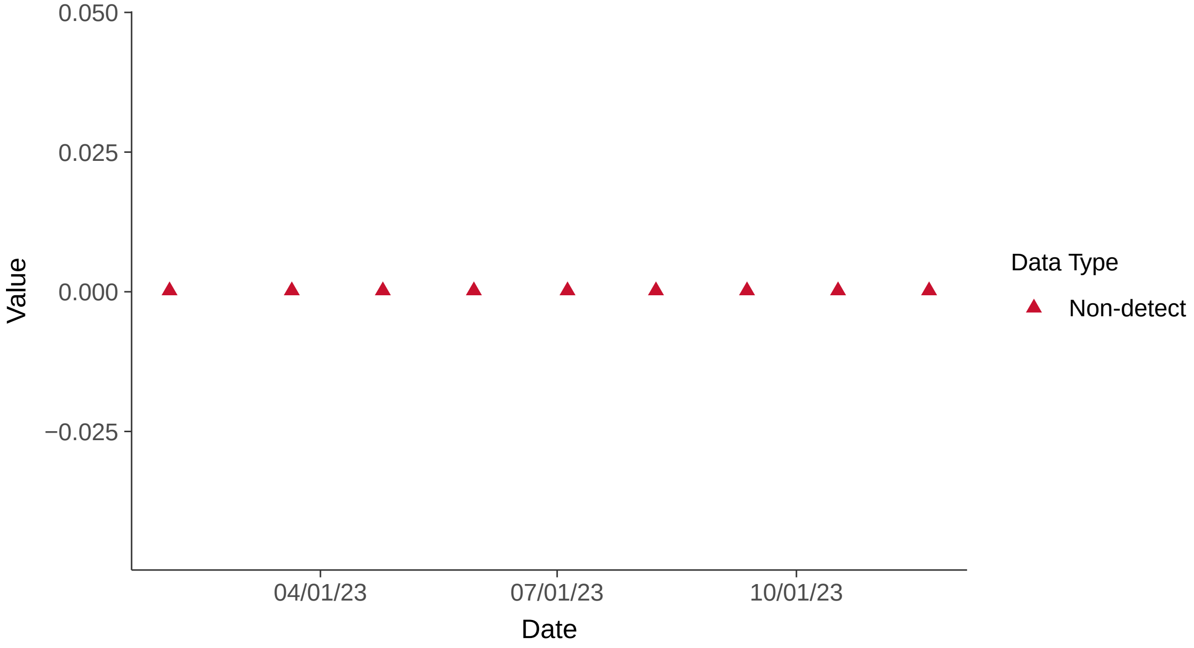


Appendix IV: Mercury, MW-16B

ID: 16B_2_17

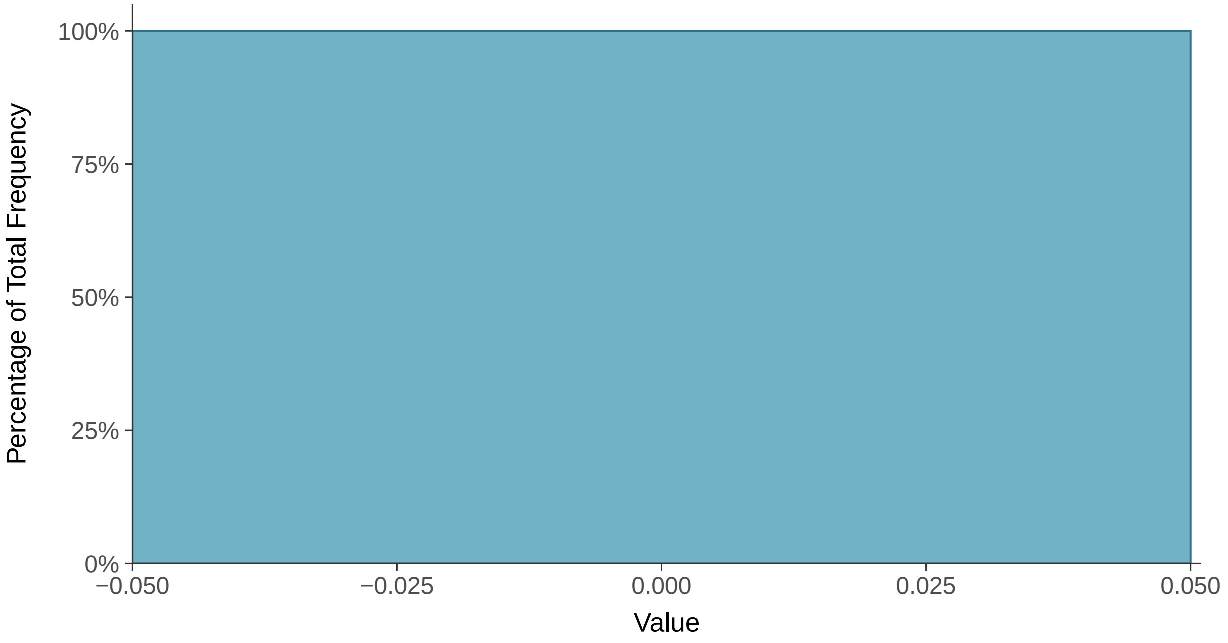
Scatter Plot

Mercury, MW-16B (mg/L)



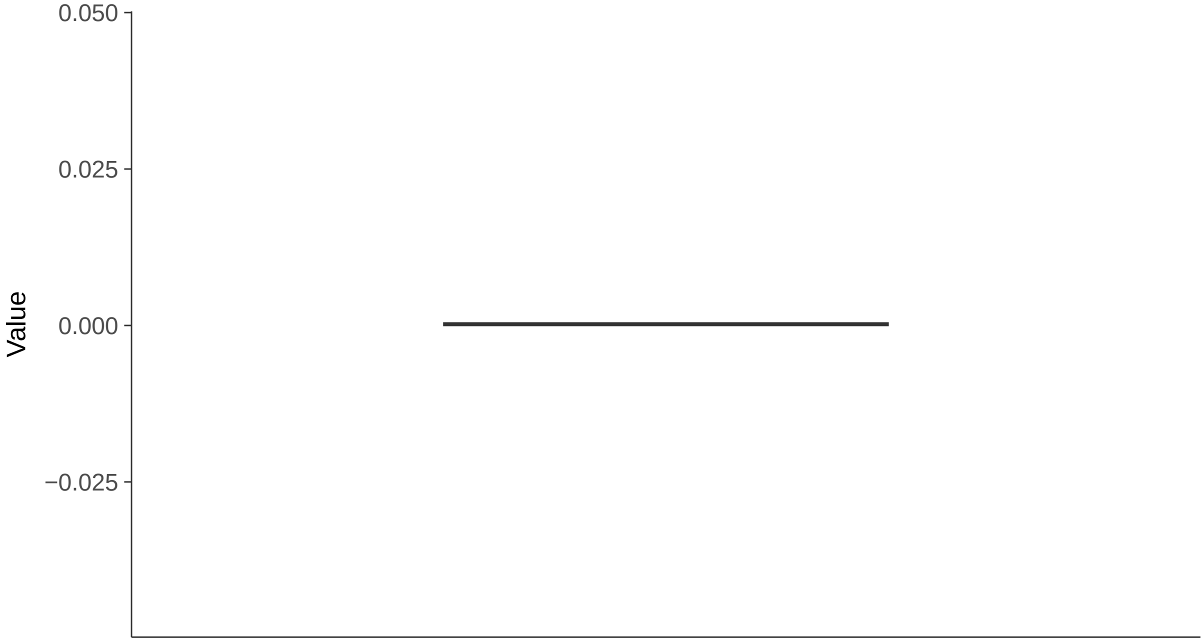
Histogram

Mercury, MW-16B (mg/L)



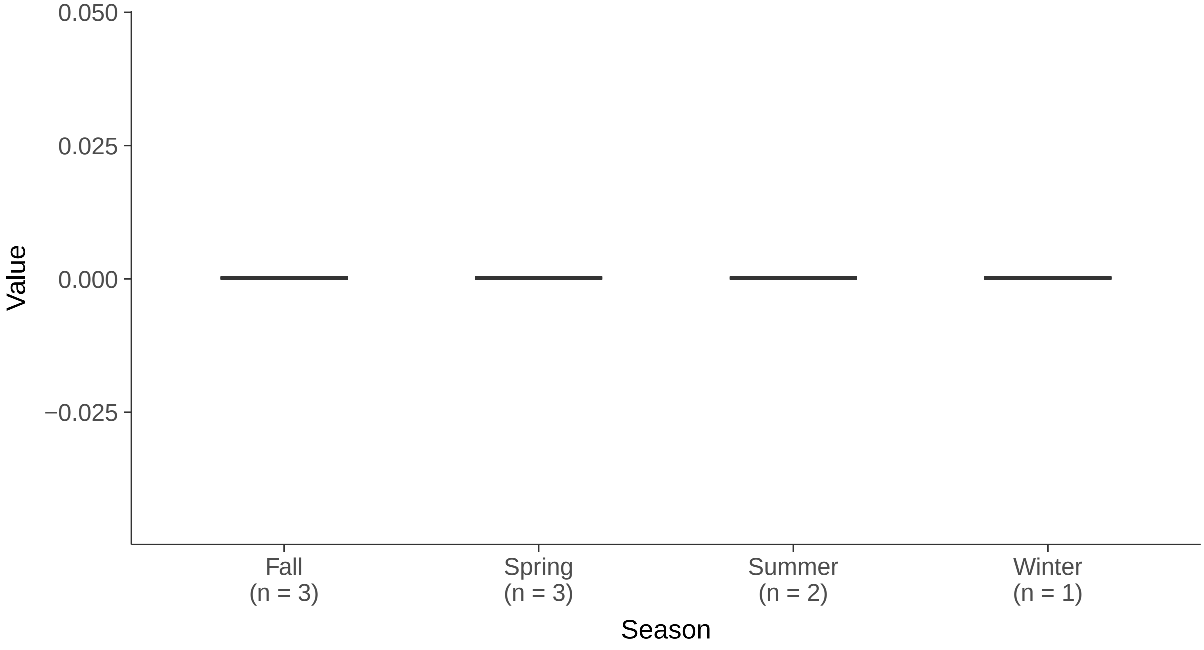
Boxplot

Mercury, MW-16B (mg/L)



Boxplot by Season

Mercury, MW-16B (mg/L)

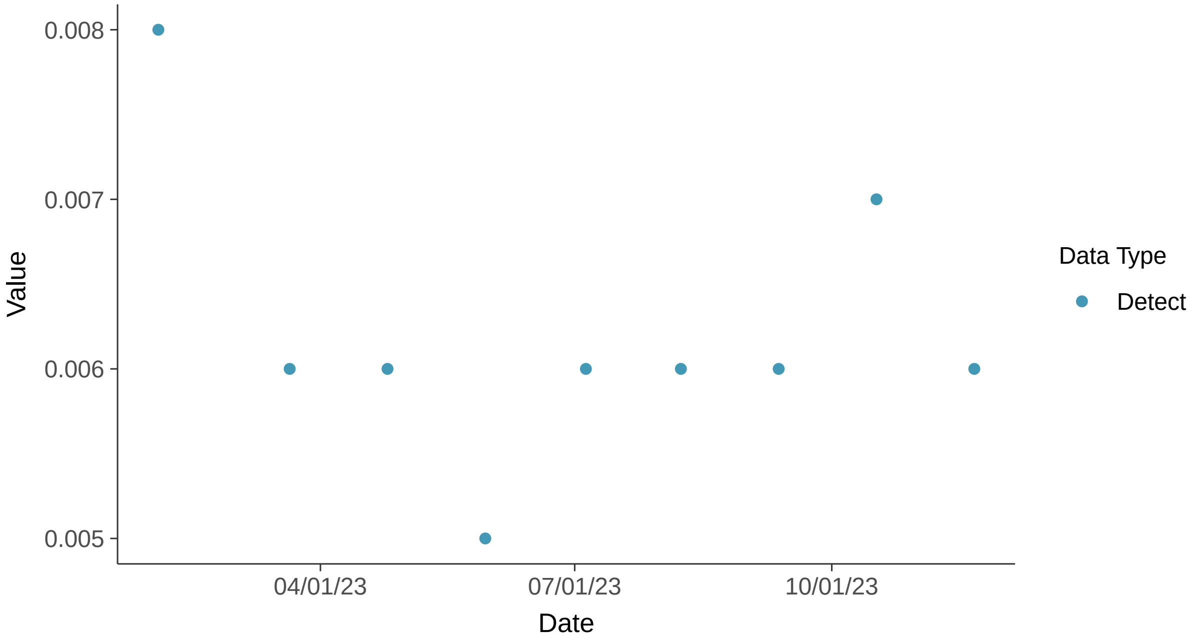


Appendix IV: Molybdenum, MW-16B

ID: 16B_2_18

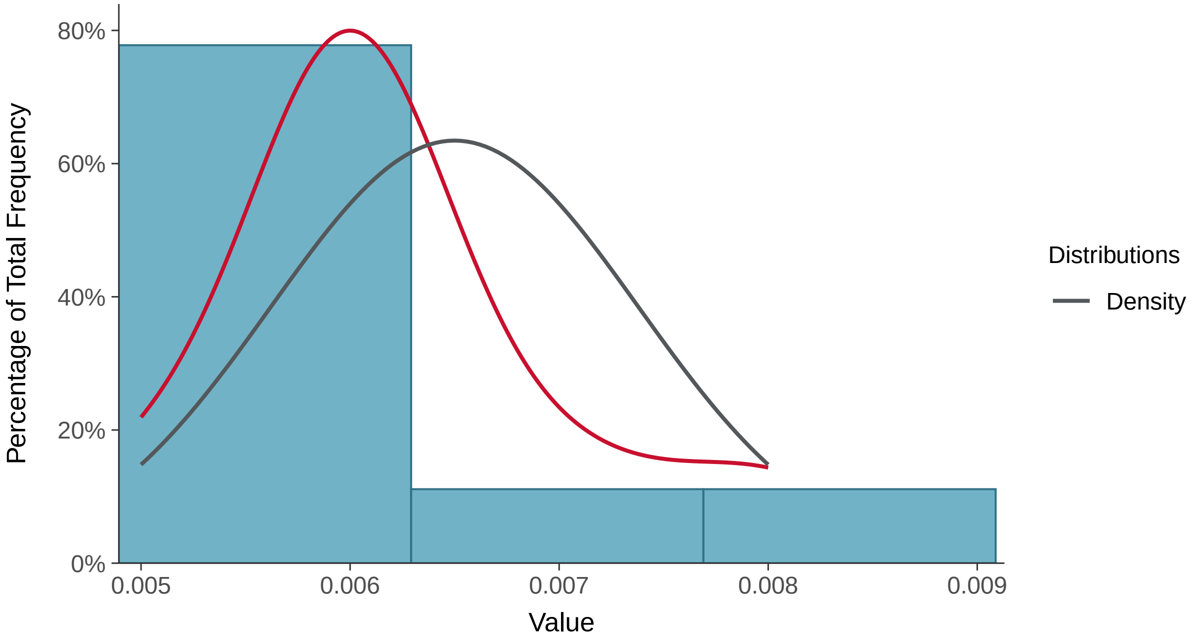
Scatter Plot

Molybdenum, MW-16B (mg/L)



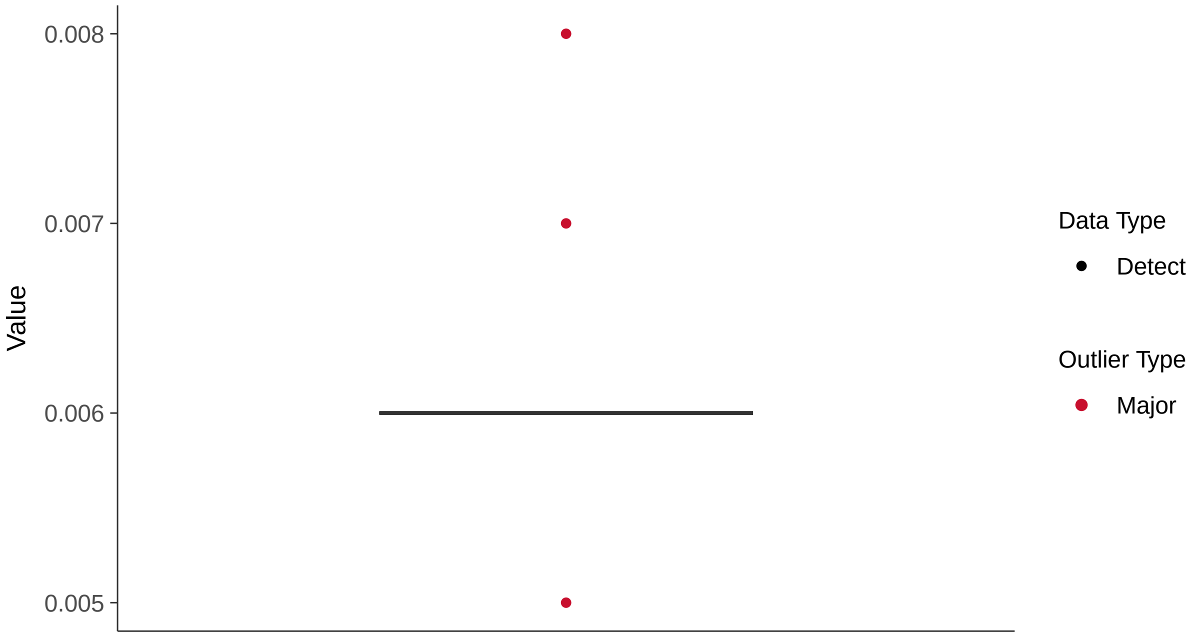
Histogram

Molybdenum, MW-16B (mg/L)



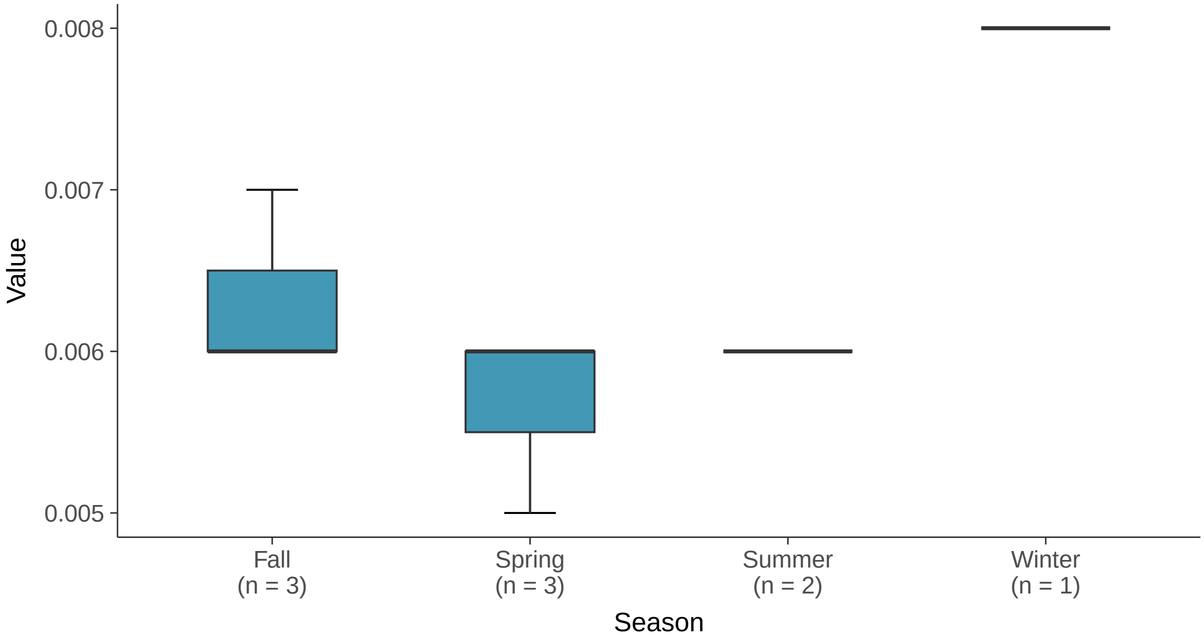
Boxplot

Molybdenum, MW-16B (mg/L)



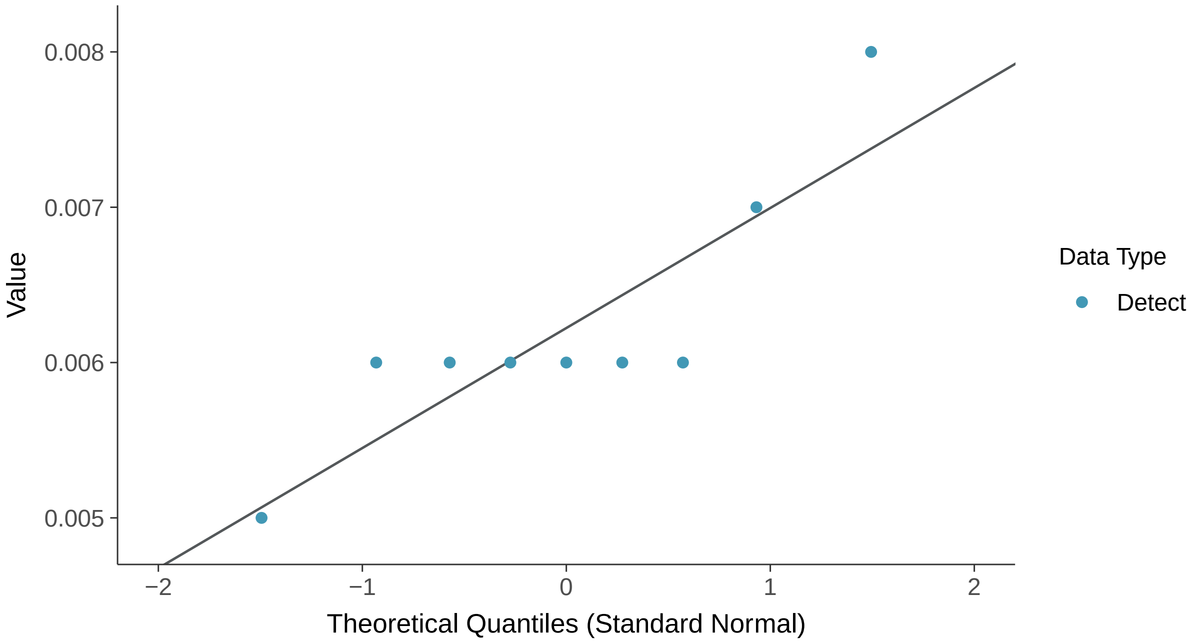
Boxplot by Season

Molybdenum, MW-16B (mg/L)



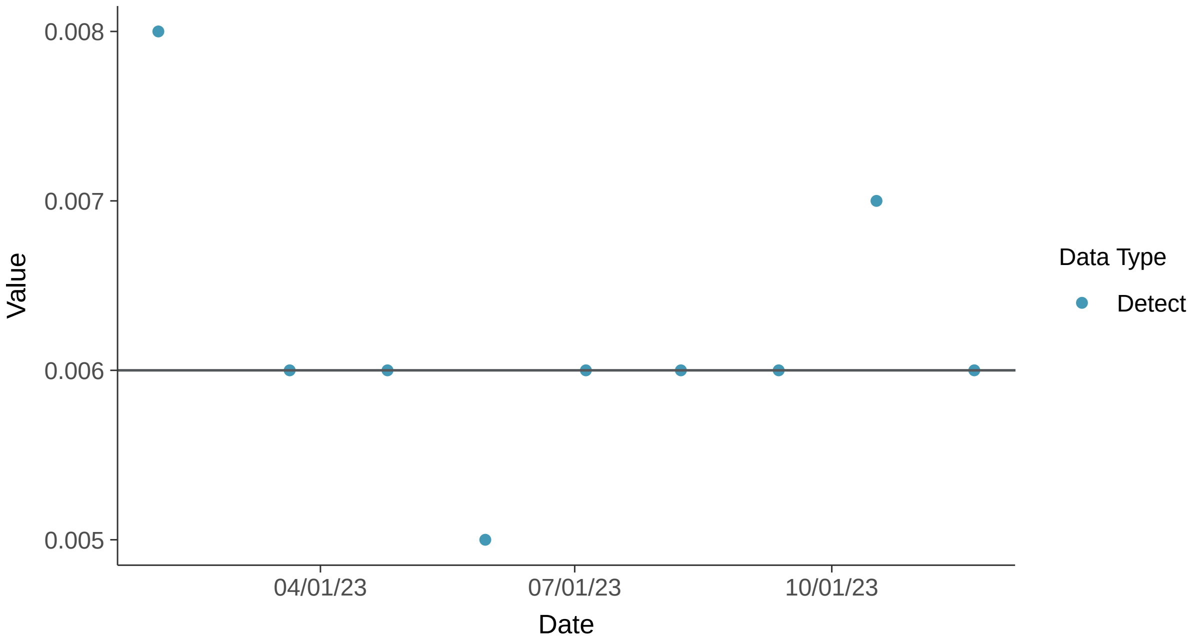
Normal Q-Q plot

Molybdenum, MW-16B (mg/L)



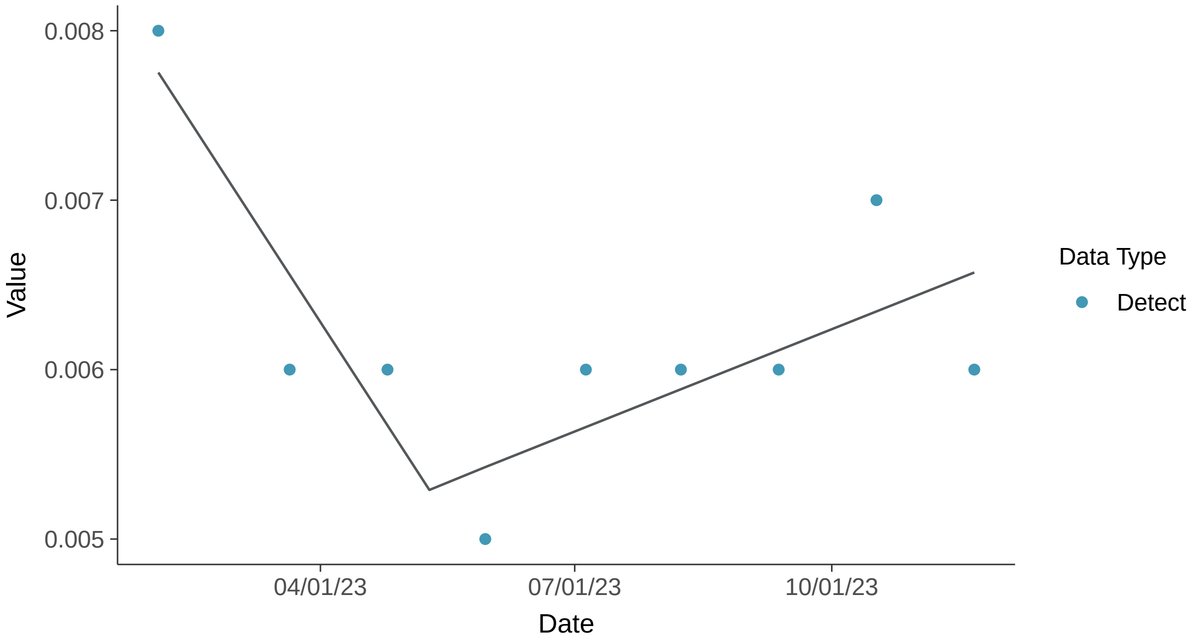
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Molybdenum, MW-16B (mg/L)



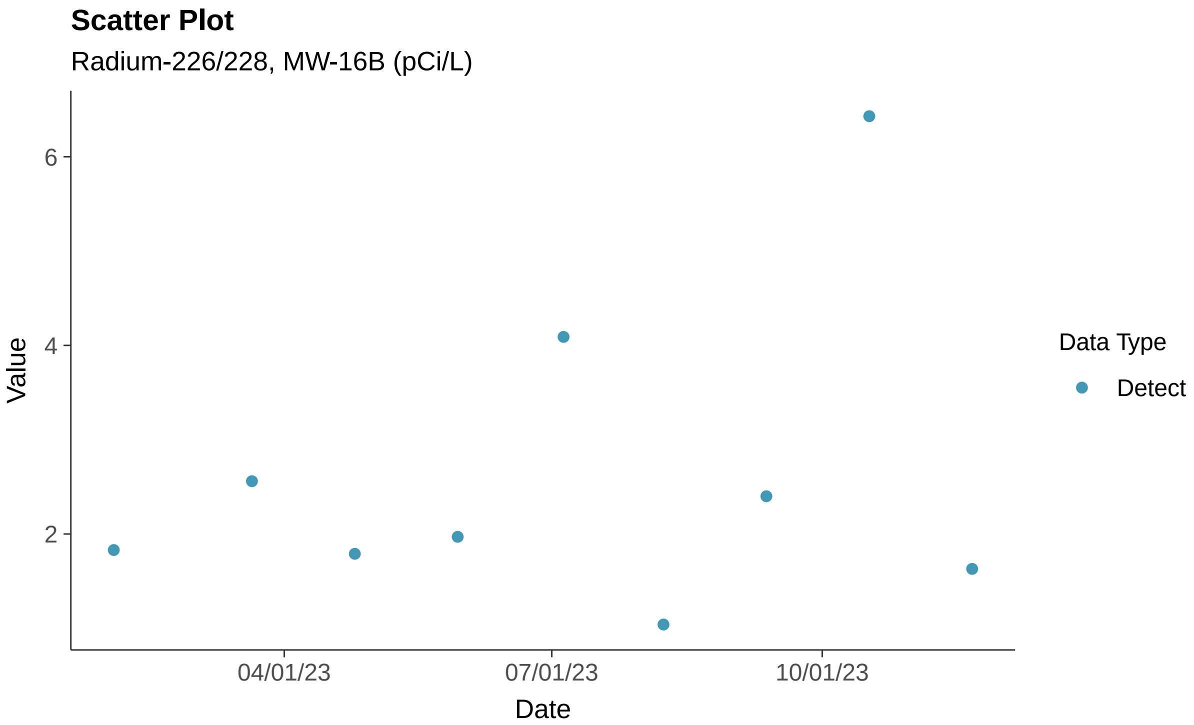
Trend Regression: Piecewise Linear-Linear

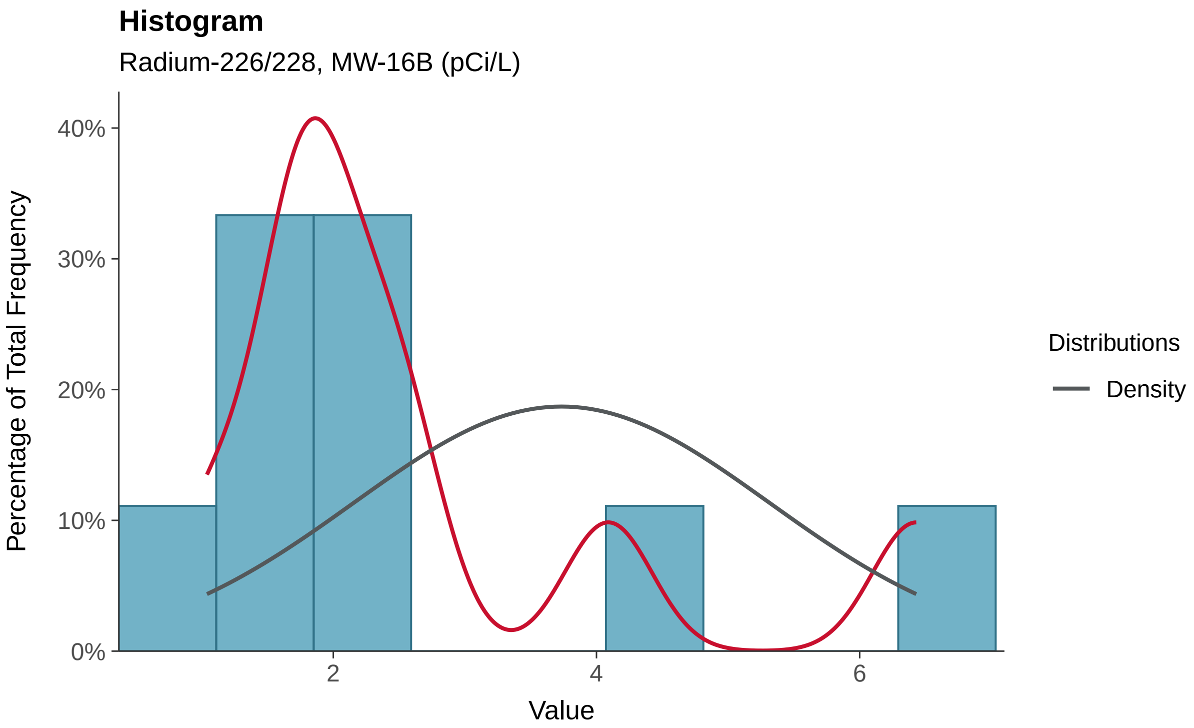
Molybdenum, MW-16B (mg/L)



Appendix IV: Radium-226/228, MW-16B

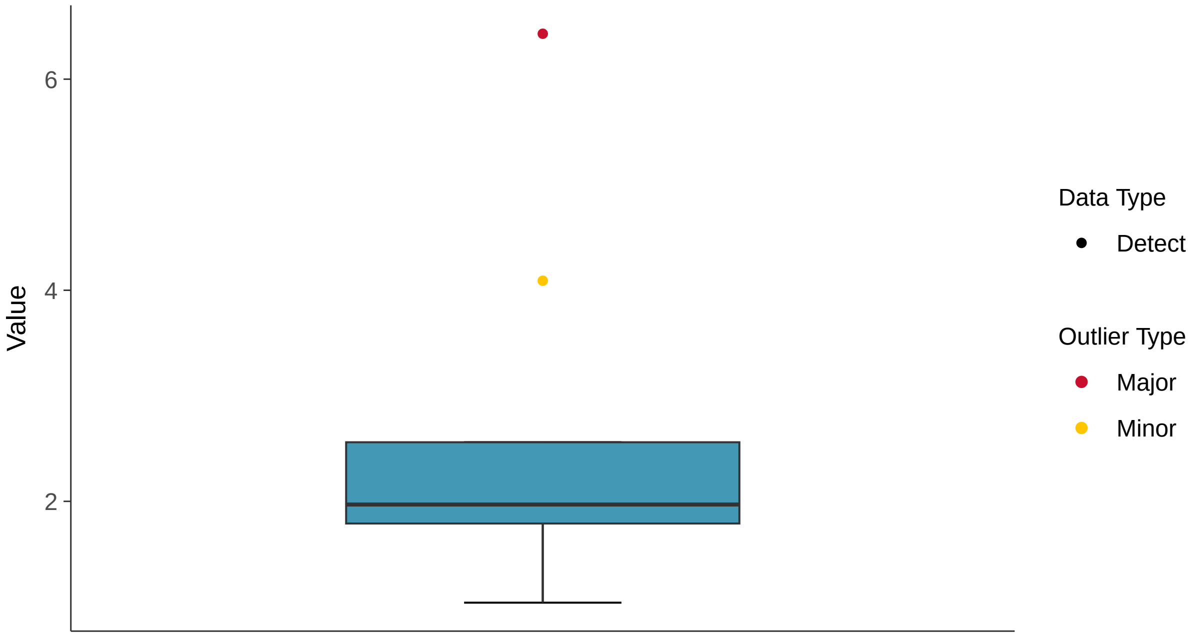
ID: 16B_2_20





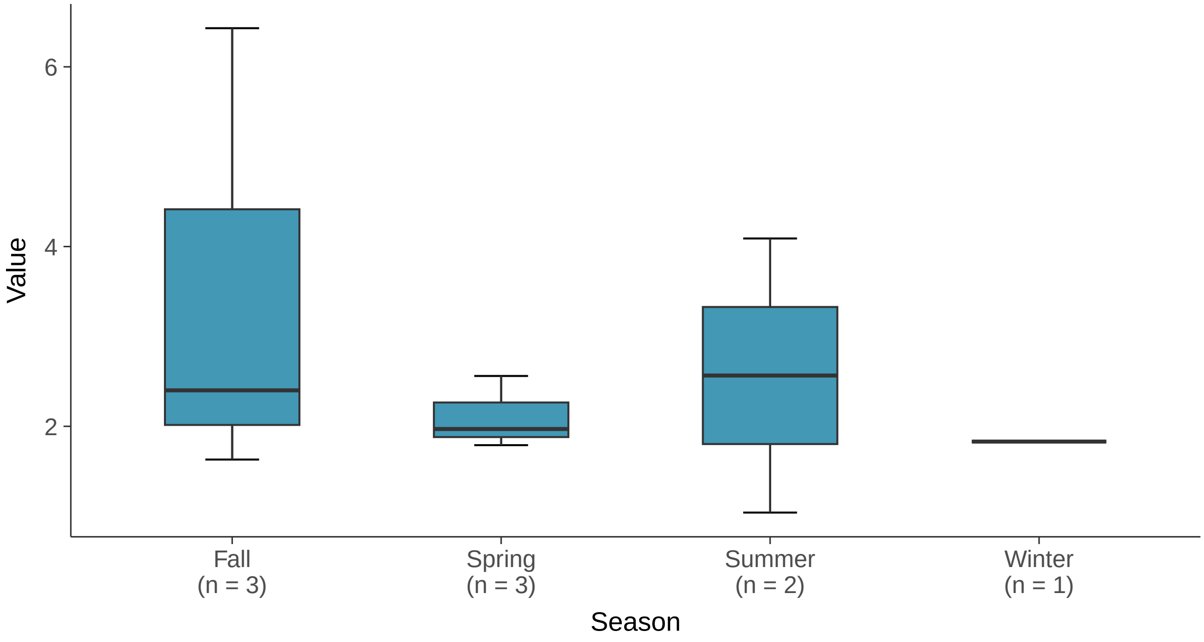
Boxplot

Radium-226/228, MW-16B (pCi/L)



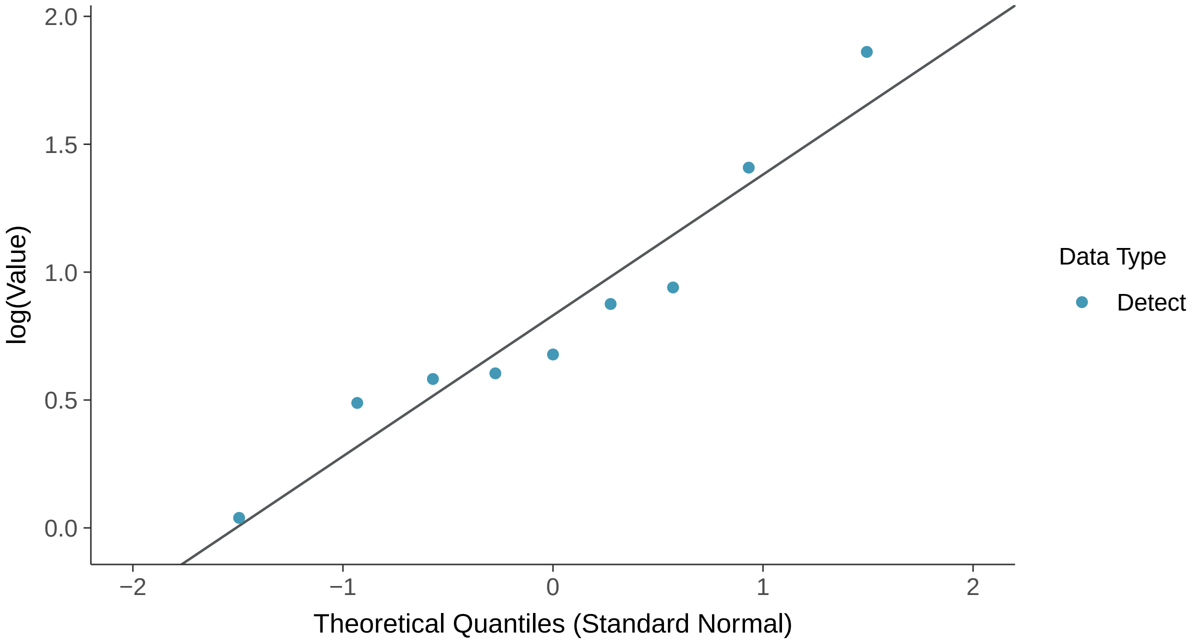
Boxplot by Season

Radium-226/228, MW-16B (pCi/L)



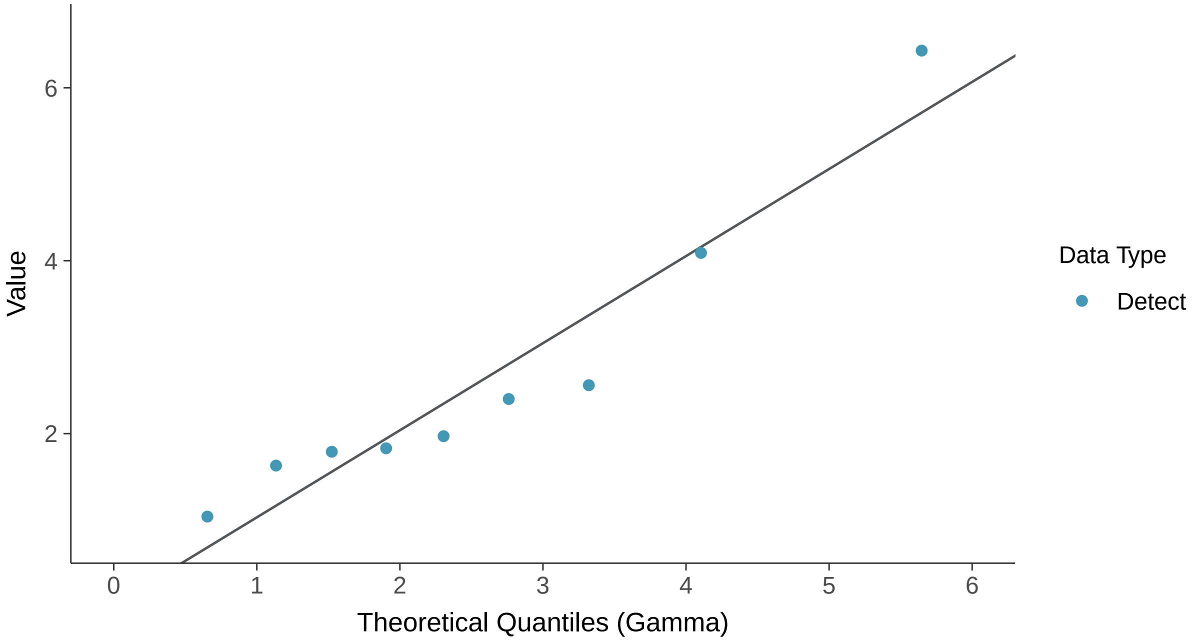
Lognormal Q-Q plot

Radium-226/228, MW-16B (pCi/L)



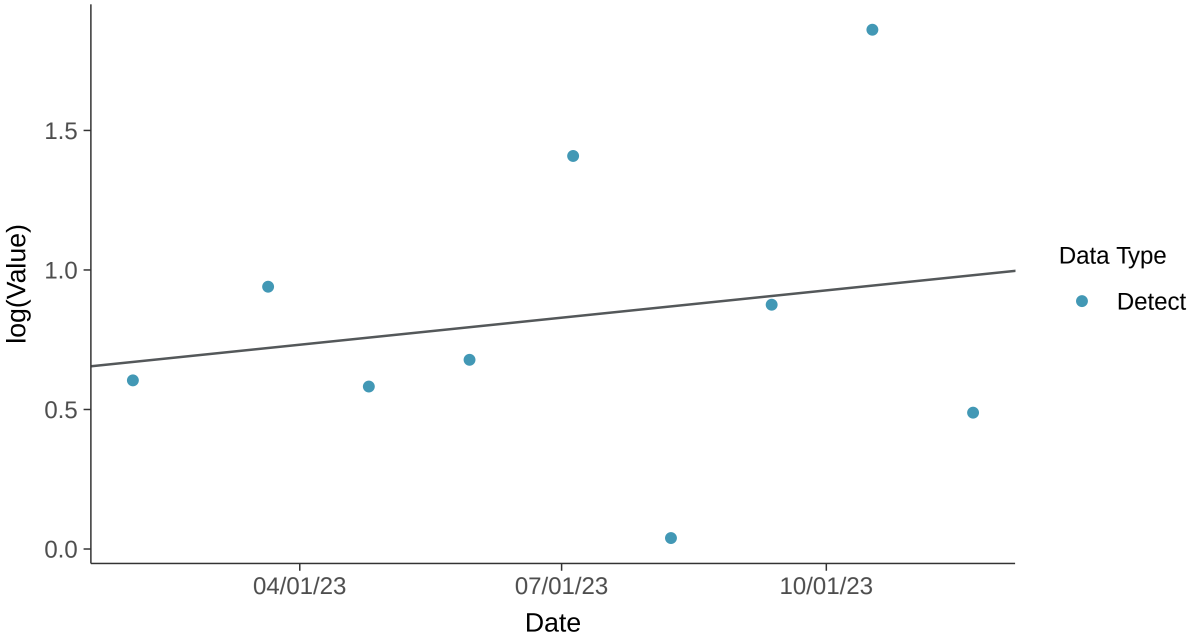
Gamma Q-Q plot

Radium-226/228, MW-16B (pCi/L)



Trend Regression: Lognormal MLE

Radium-226/228, MW-16B (pCi/L)

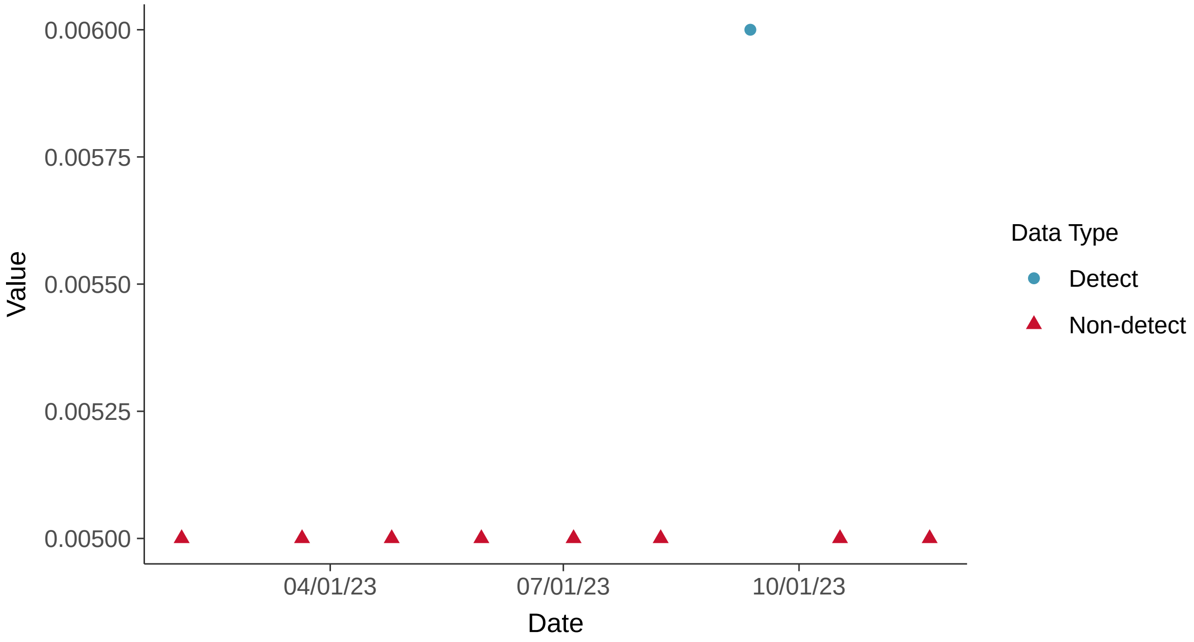


Appendix IV: Selenium, MW-16B

ID: 16B_2_22

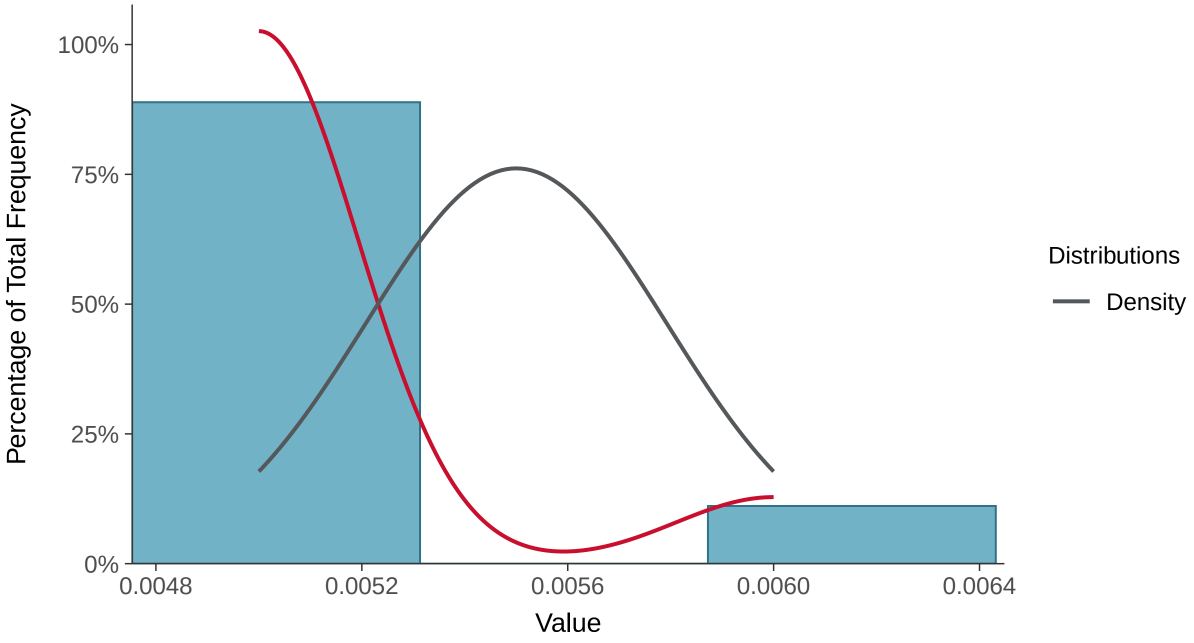
Scatter Plot

Selenium, MW-16B (mg/L)



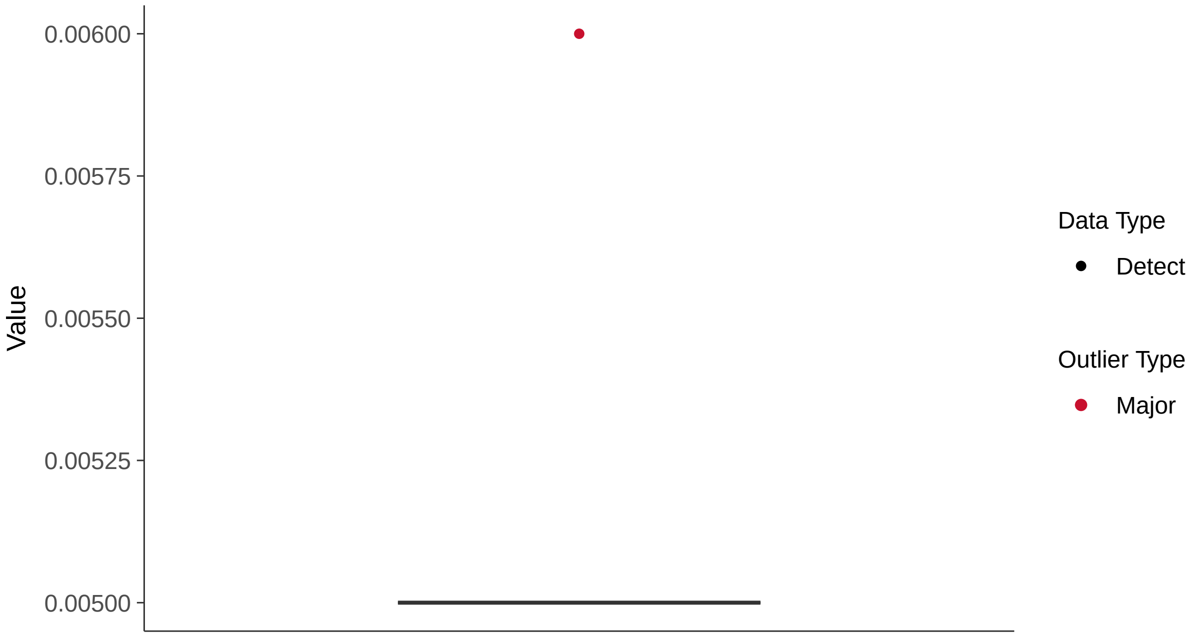
Histogram

Selenium, MW-16B (mg/L)



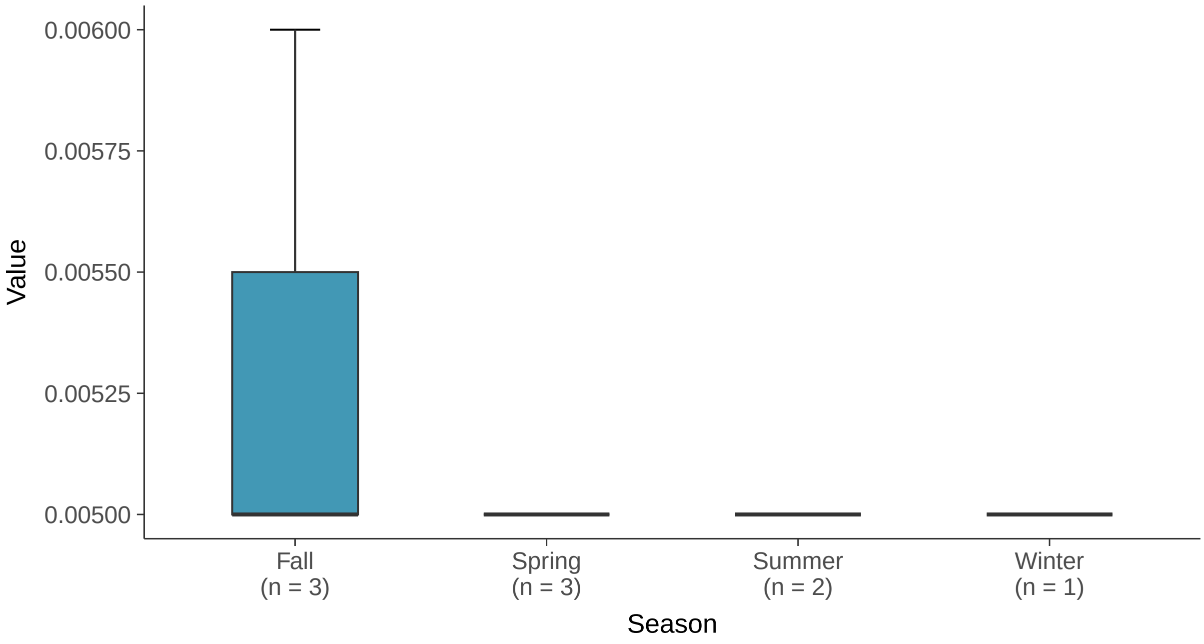
Boxplot

Selenium, MW-16B (mg/L)



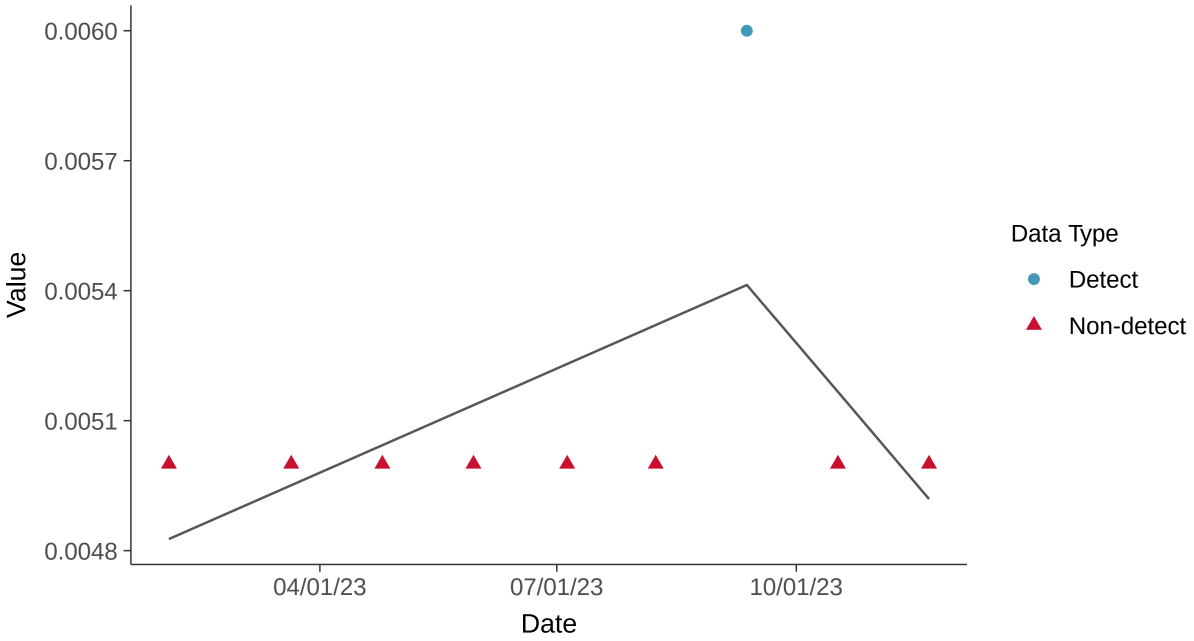
Boxplot by Season

Selenium, MW-16B (mg/L)



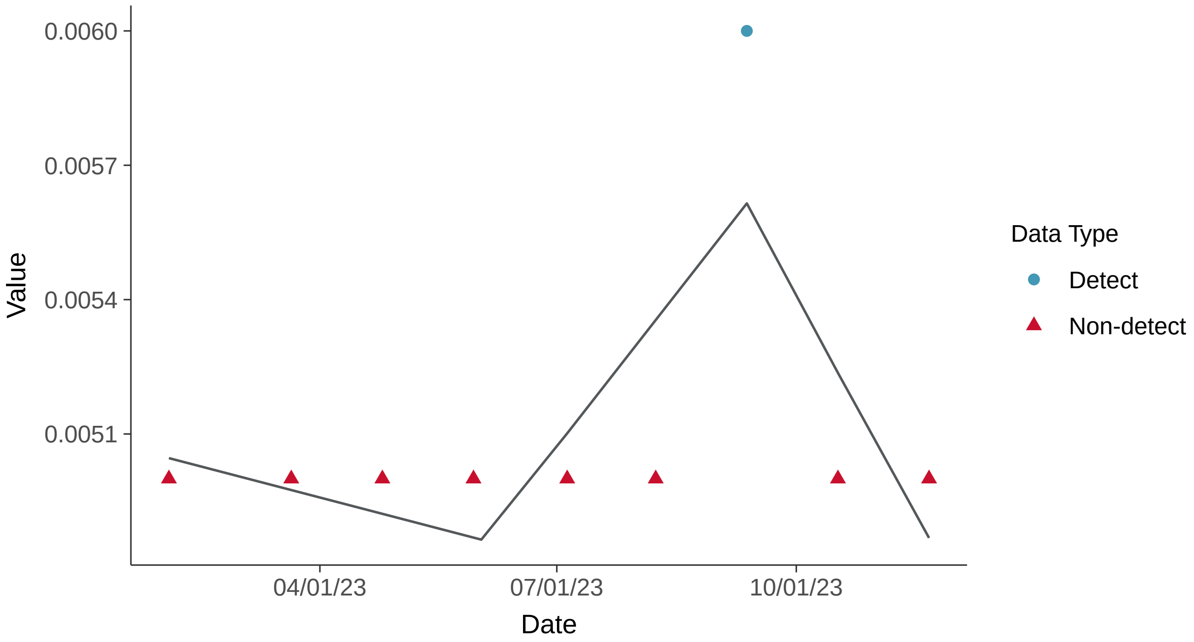
Trend Regression: Piecewise Linear-Linear

Selenium, MW-16B (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Selenium, MW-16B (mg/L)

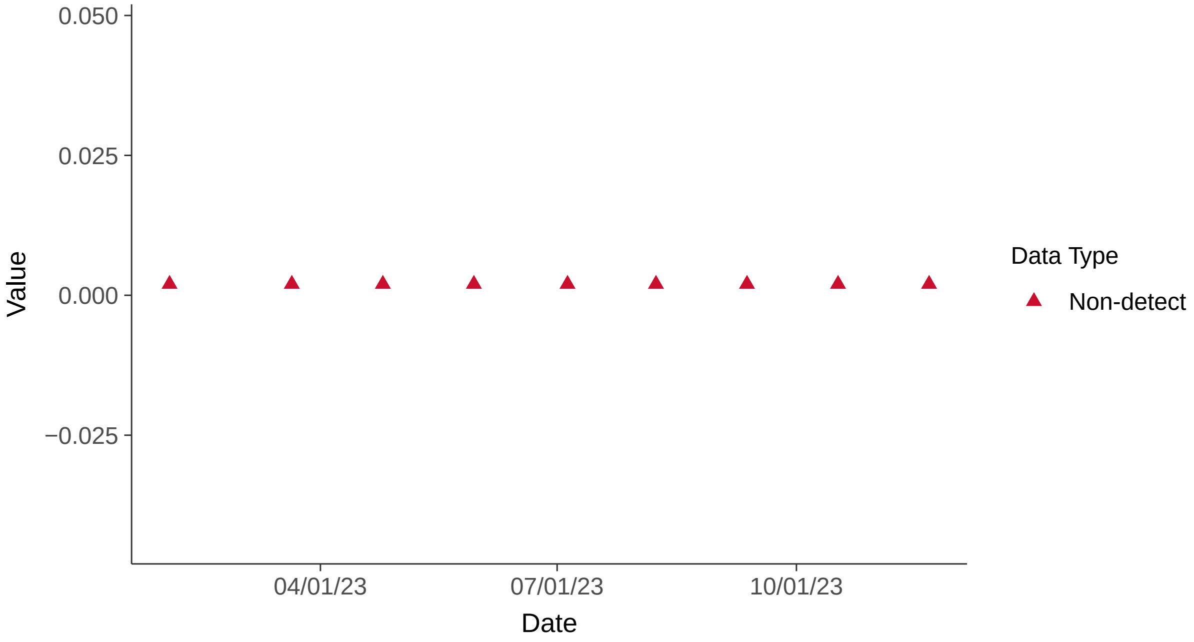


Appendix IV: Thallium, MW-16B

ID: 16B_2_23

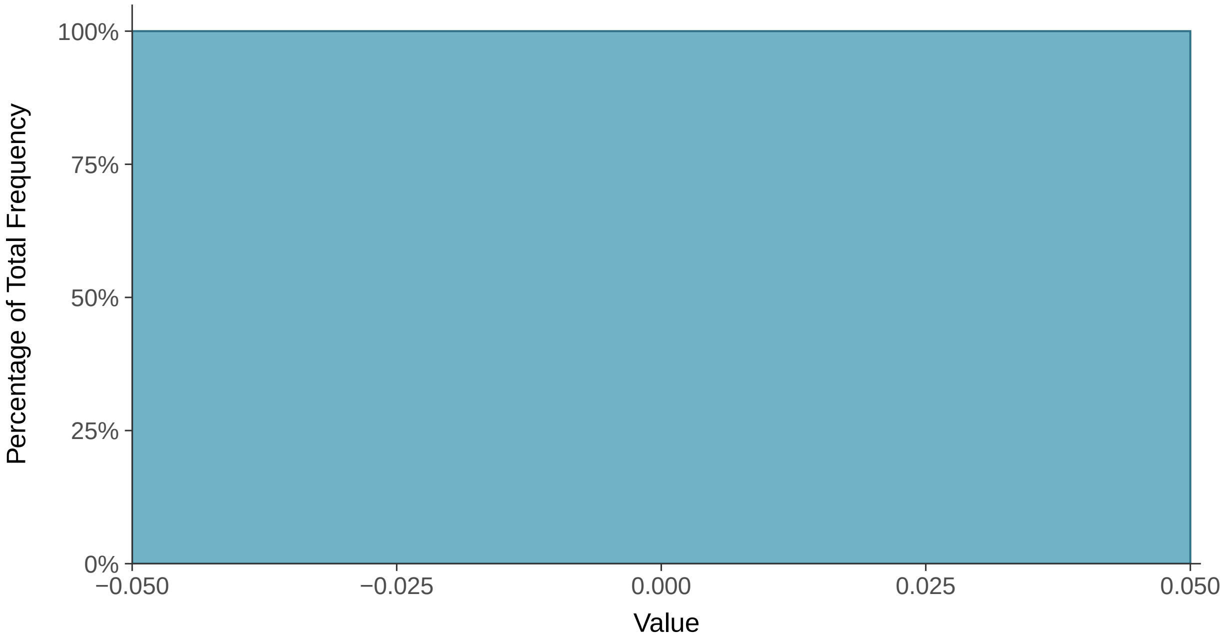
Scatter Plot

Thallium, MW-16B (mg/L)



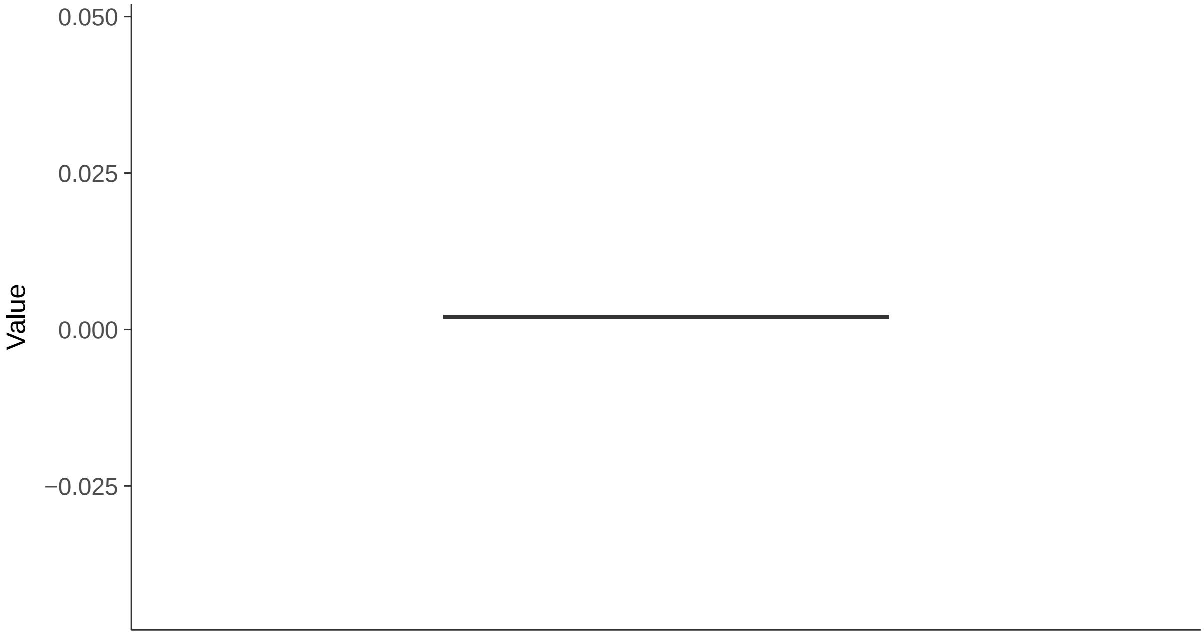
Histogram

Thallium, MW-16B (mg/L)



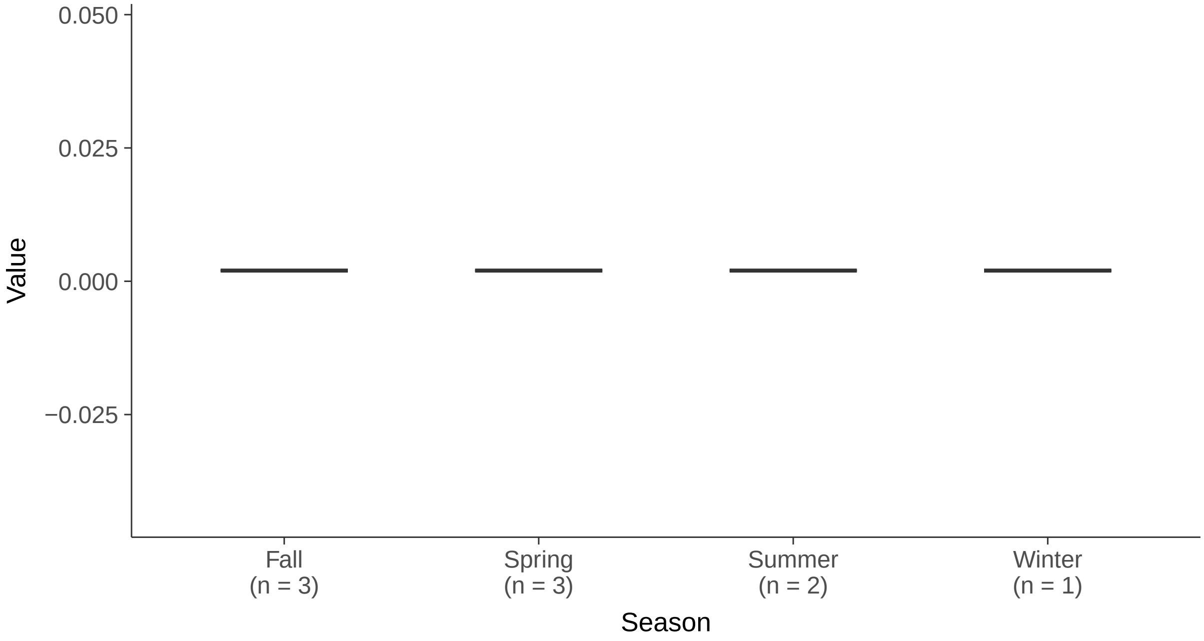
Boxplot

Thallium, MW-16B (mg/L)



Boxplot by Season

Thallium, MW-16B (mg/L)

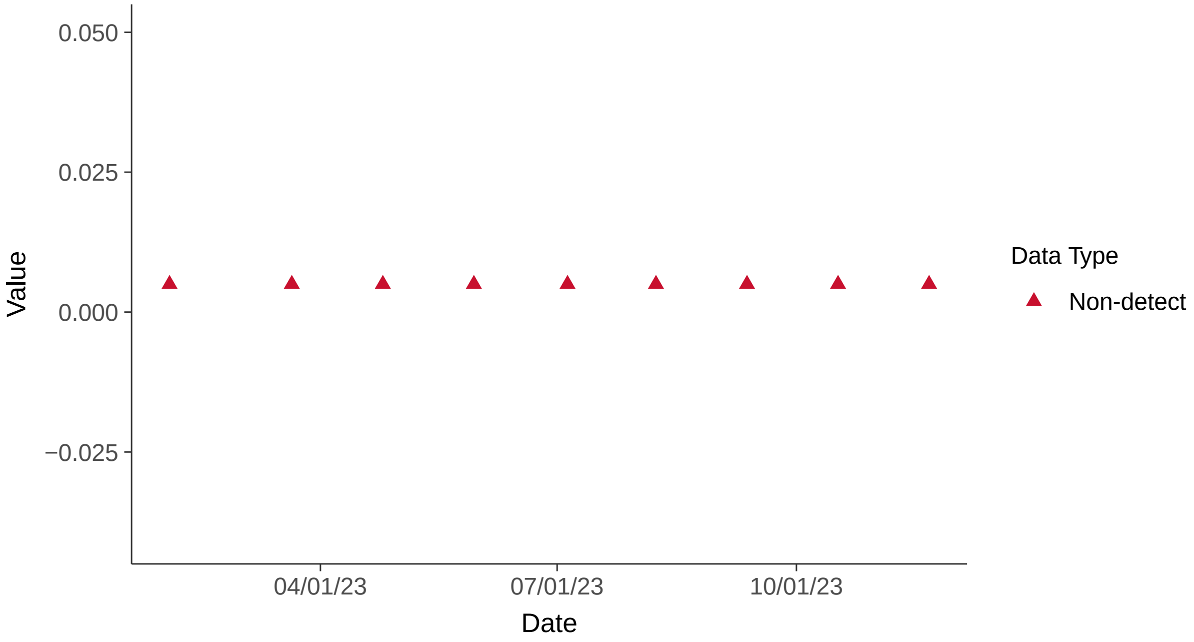


Part 115: Copper, MW-16B

ID: 16B_5_37

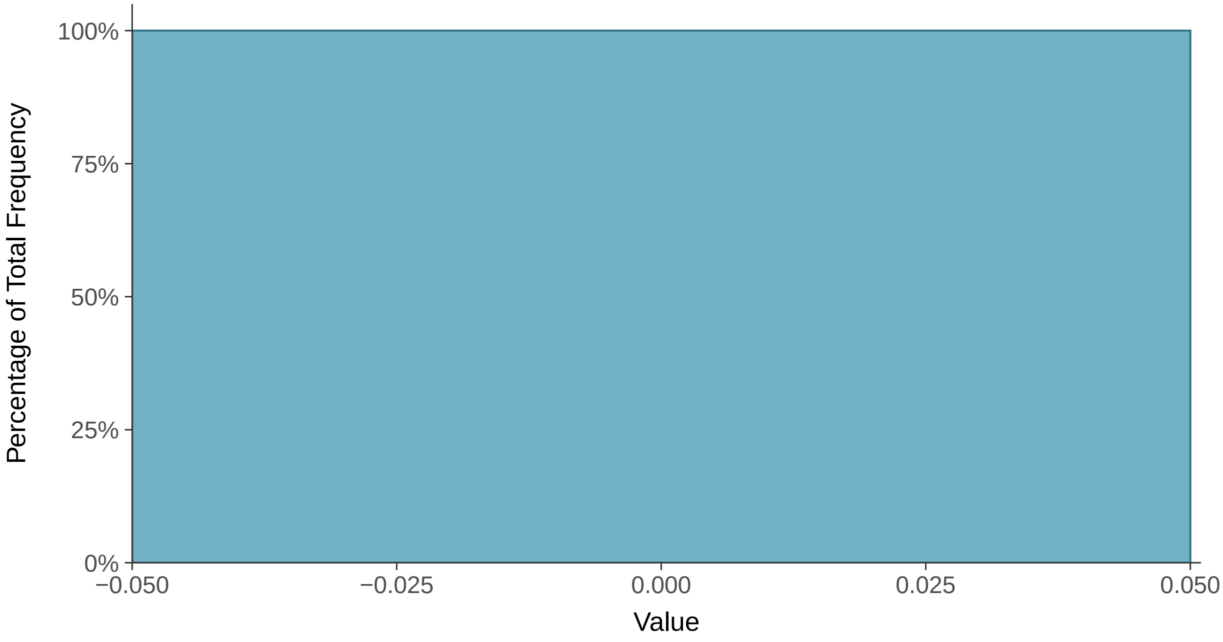
Scatter Plot

Copper, MW-16B (mg/L)



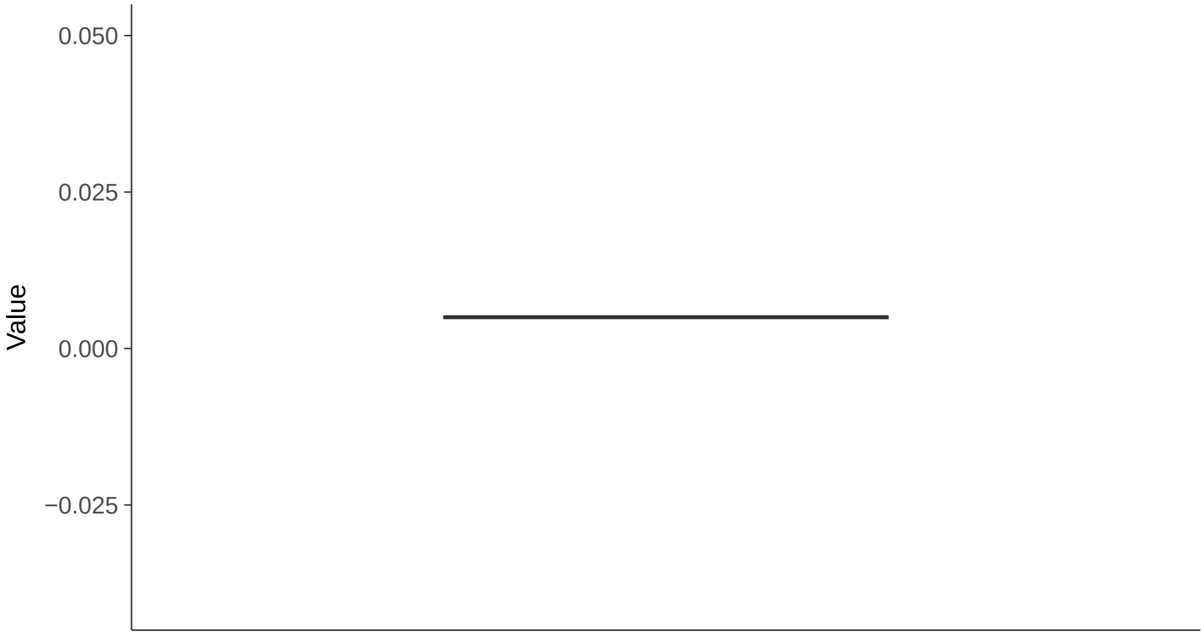
Histogram

Copper, MW-16B (mg/L)



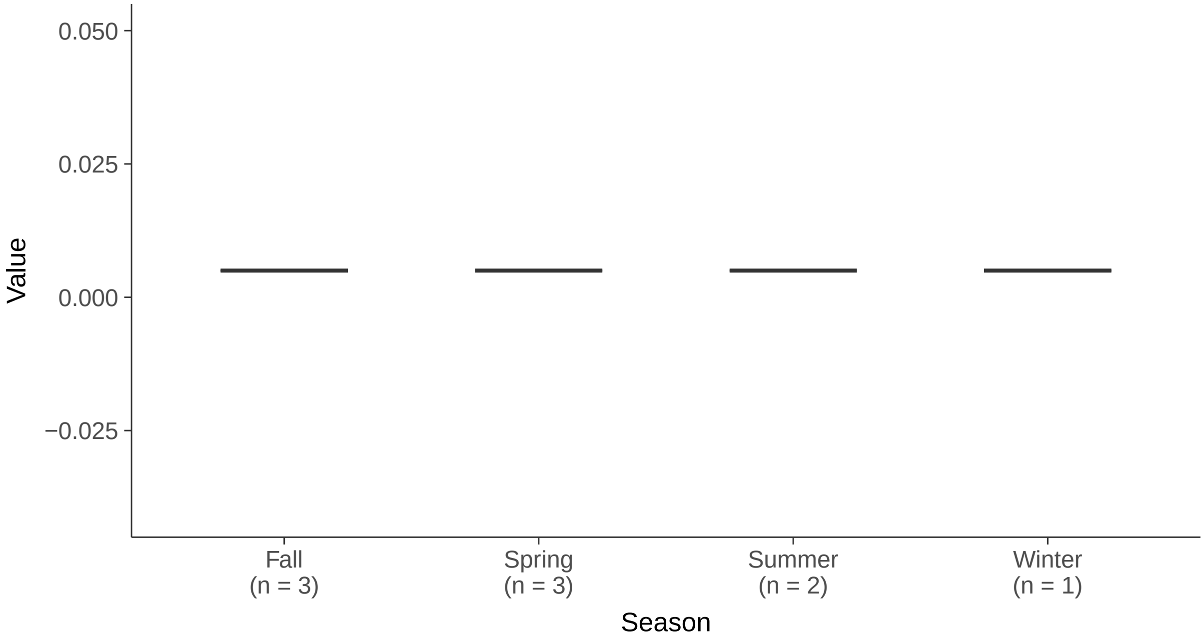
Boxplot

Copper, MW-16B (mg/L)



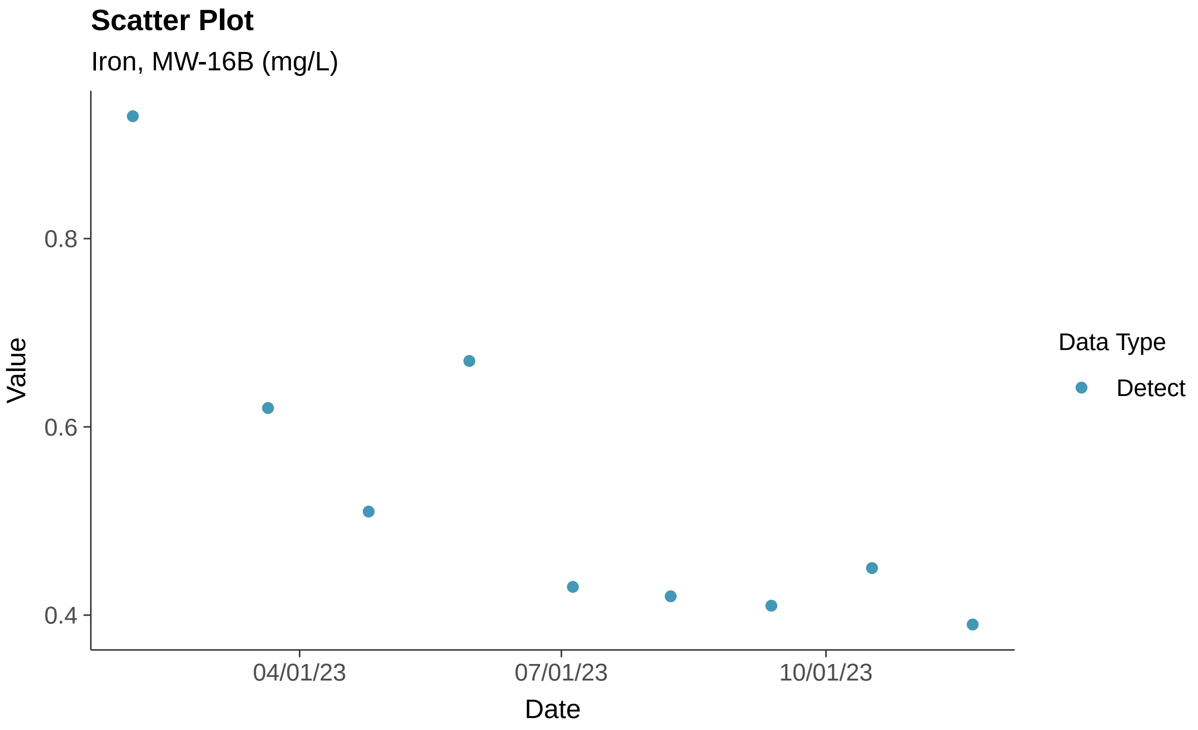
Boxplot by Season

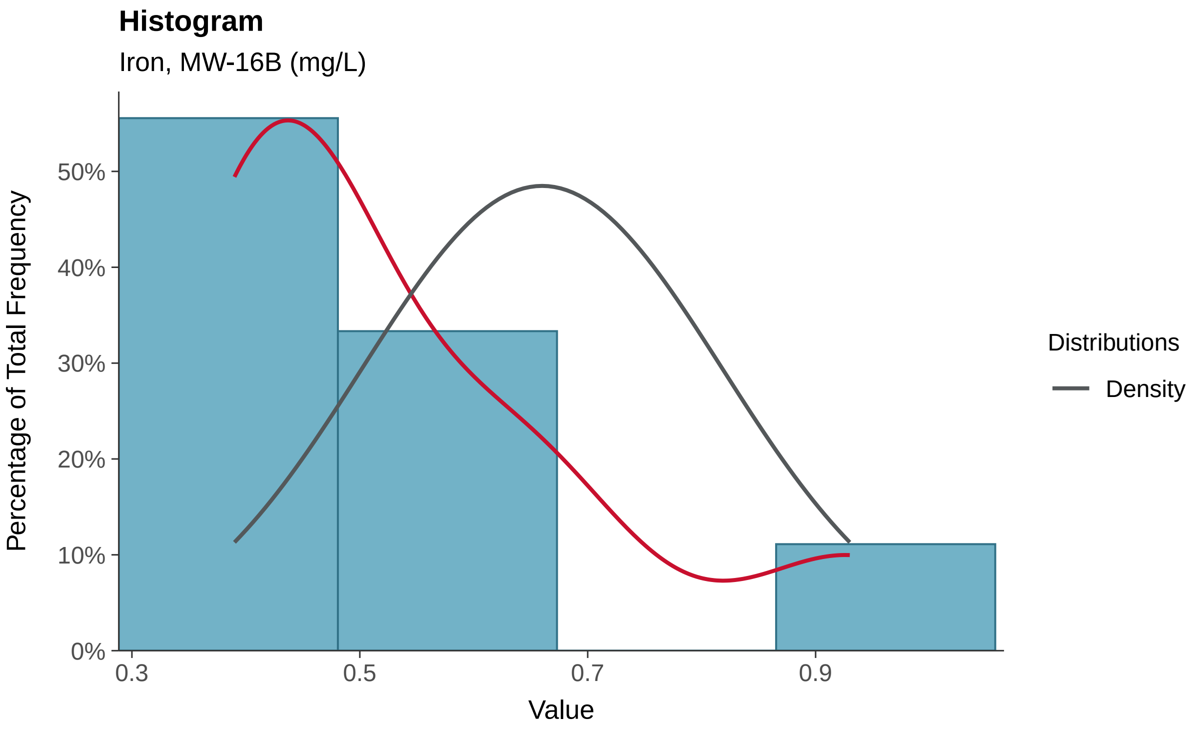
Copper, MW-16B (mg/L)



Part 115: Iron, MW-16B

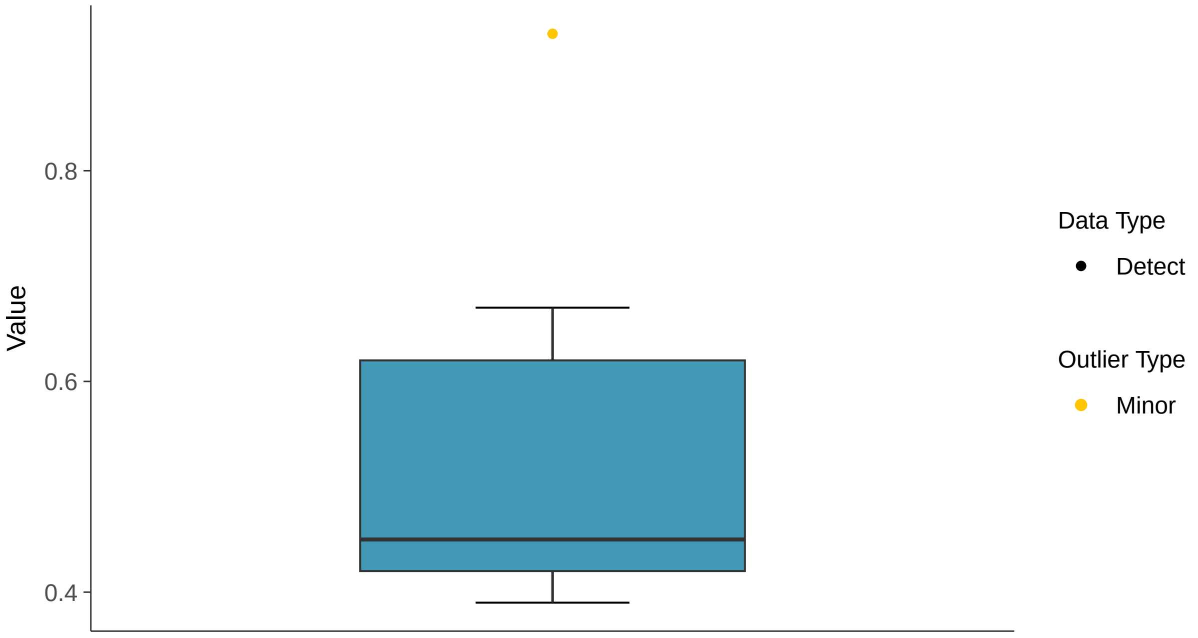
ID: 16B_5_38





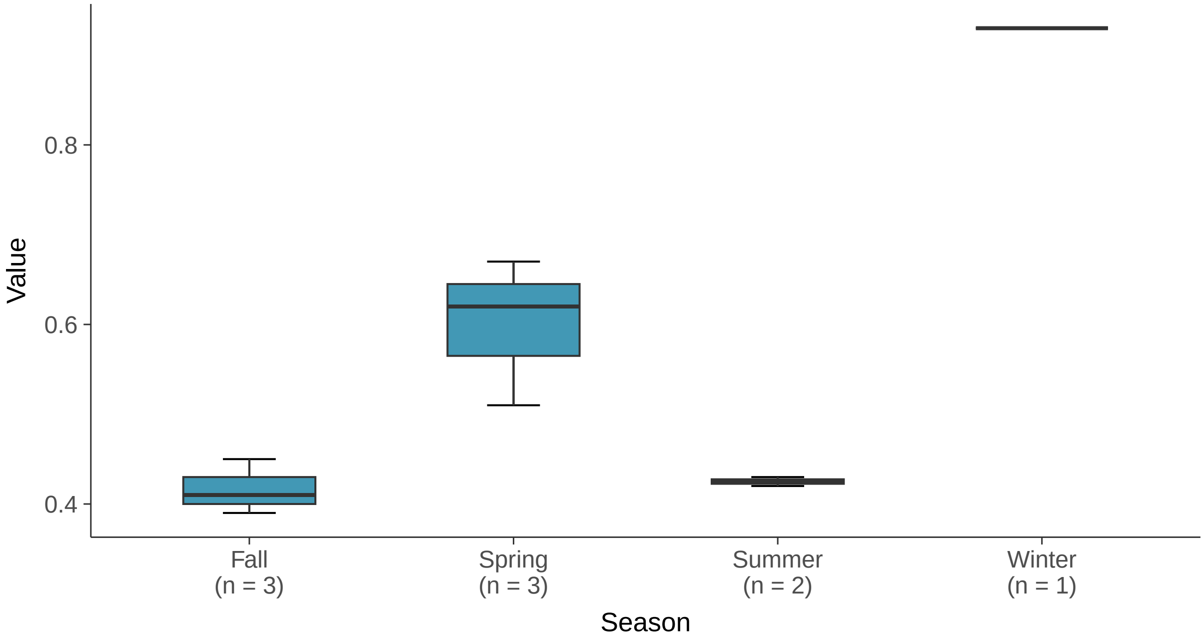
Boxplot

Iron, MW-16B (mg/L)



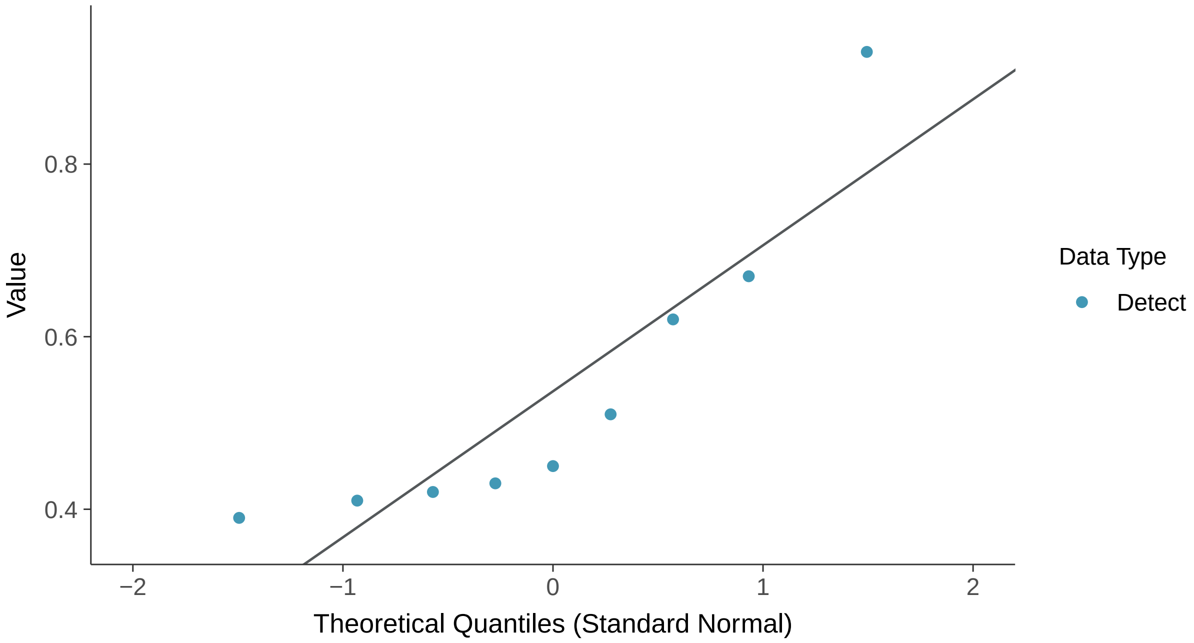
Boxplot by Season

Iron, MW-16B (mg/L)



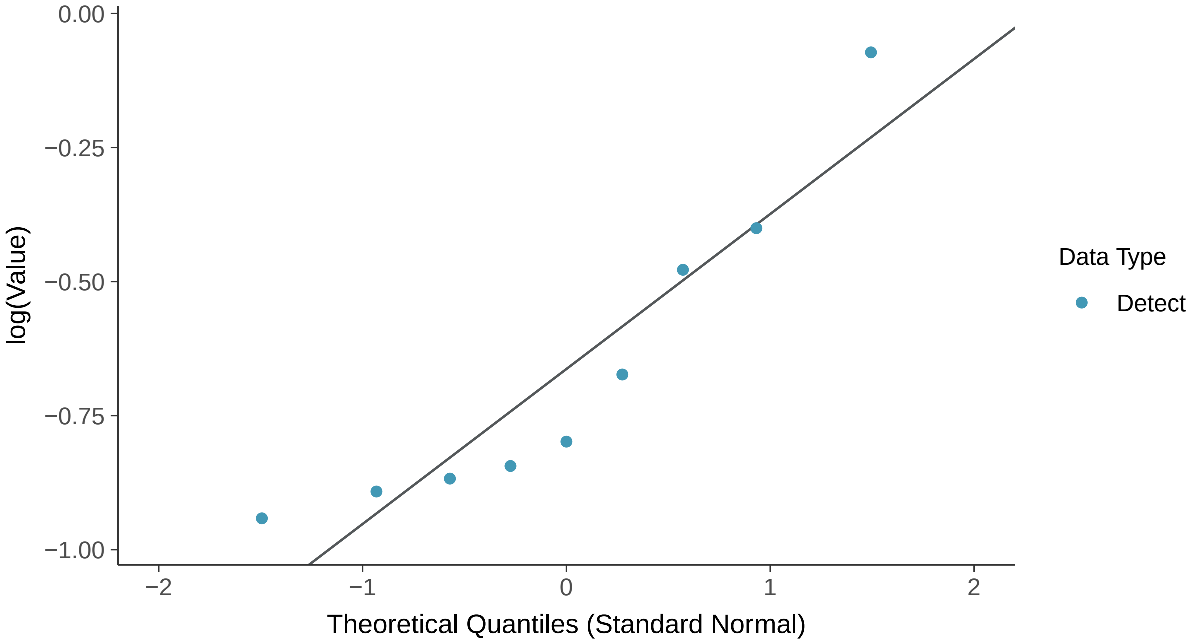
Normal Q-Q plot

Iron, MW-16B (mg/L)



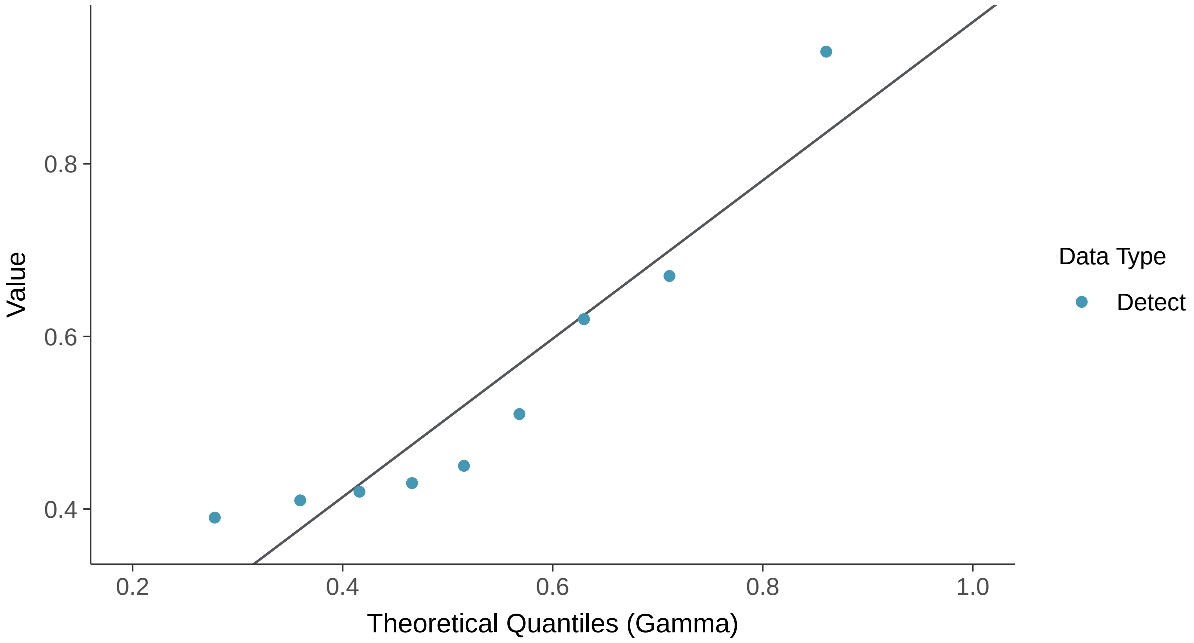
Lognormal Q-Q plot

Iron, MW-16B (mg/L)



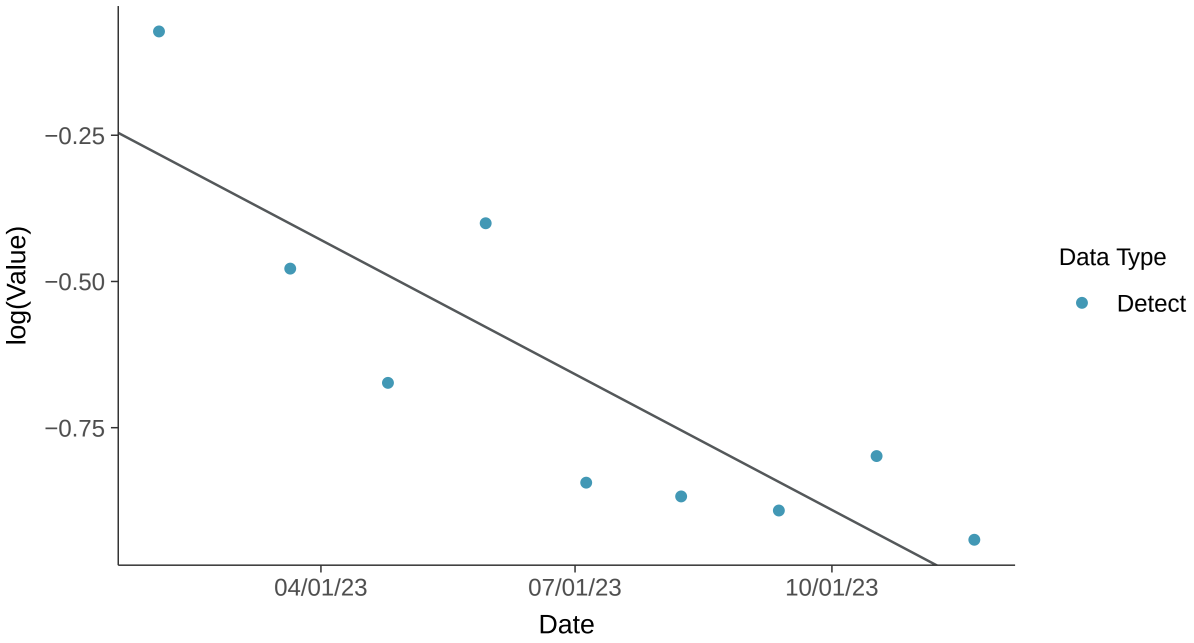
Gamma Q-Q plot

Iron, MW-16B (mg/L)



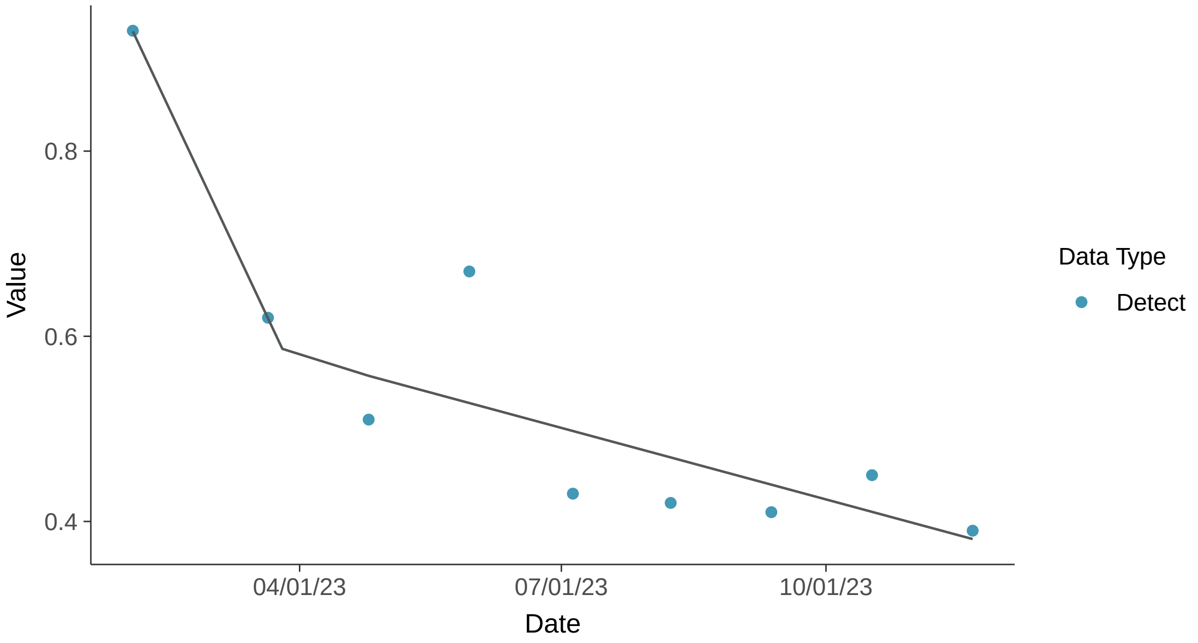
Trend Regression: Lognormal MLE

Iron, MW-16B (mg/L)



Trend Regression: Piecewise Linear-Linear

Iron, MW-16B (mg/L)

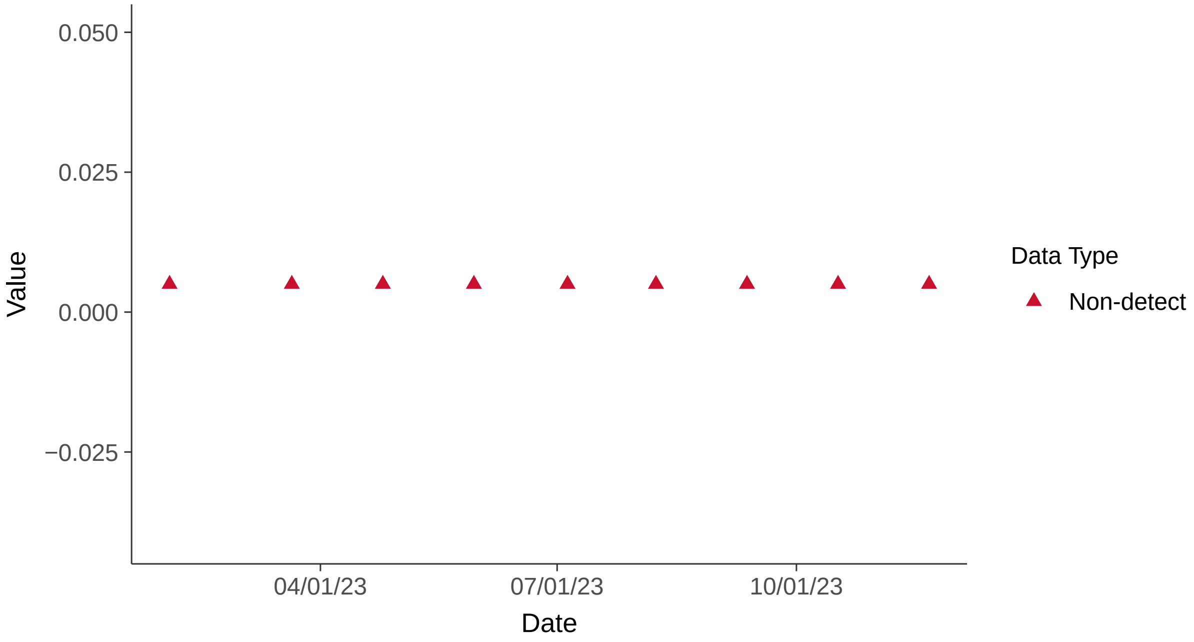


Part 115: Nickel, MW-16B

ID: 16B_5_39

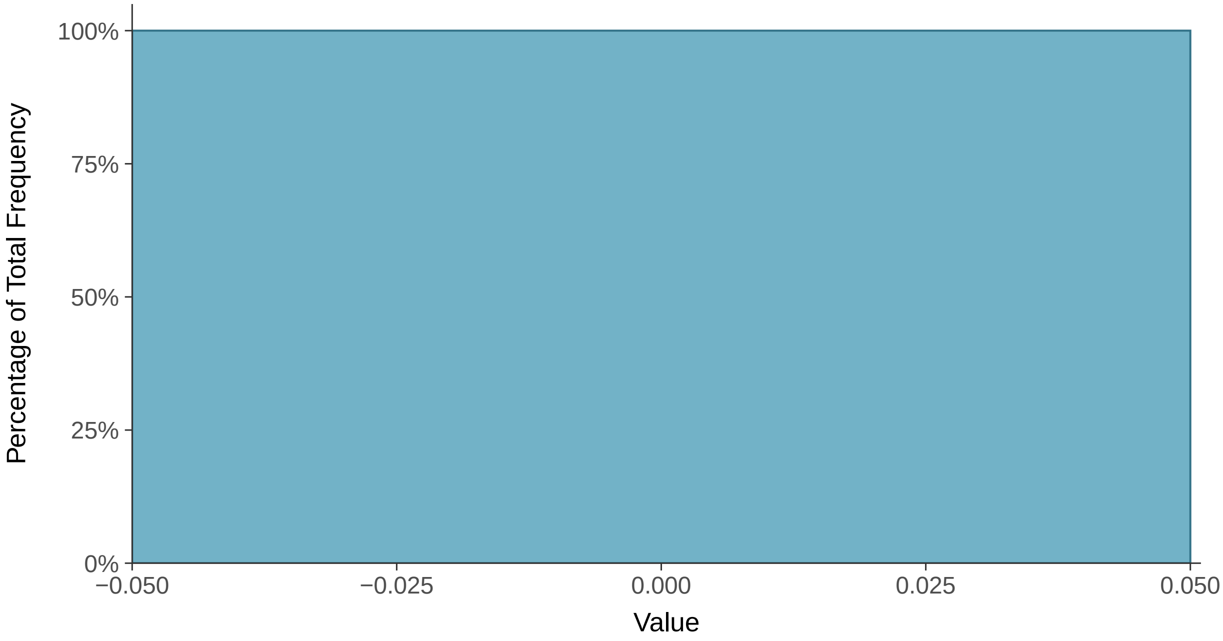
Scatter Plot

Nickel, MW-16B (mg/L)



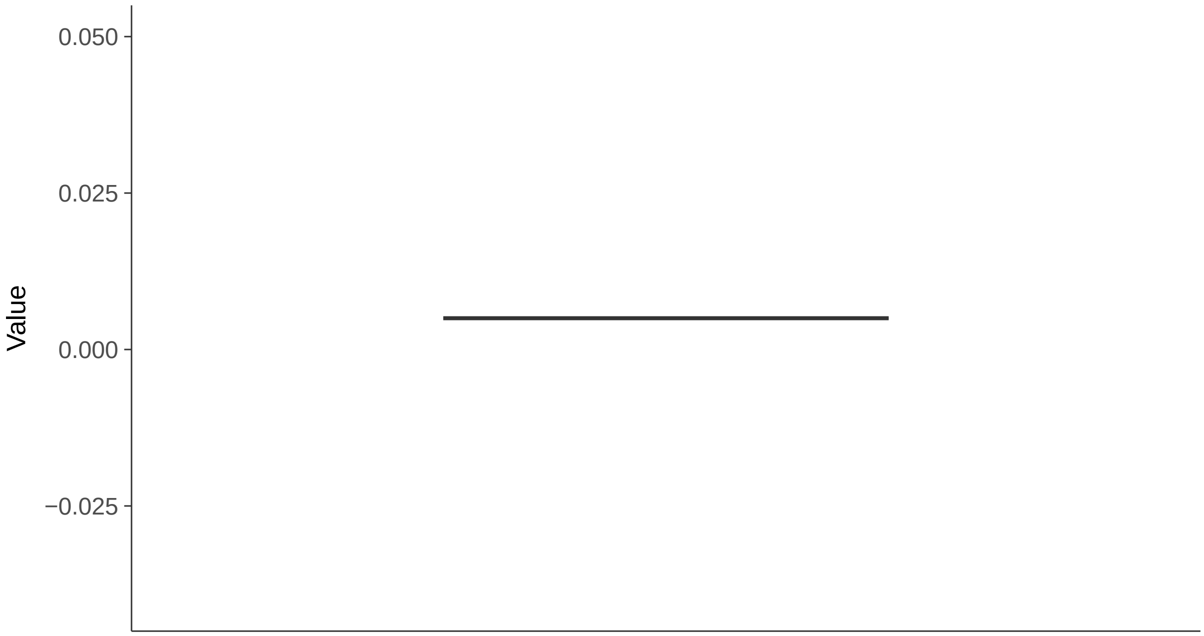
Histogram

Nickel, MW-16B (mg/L)



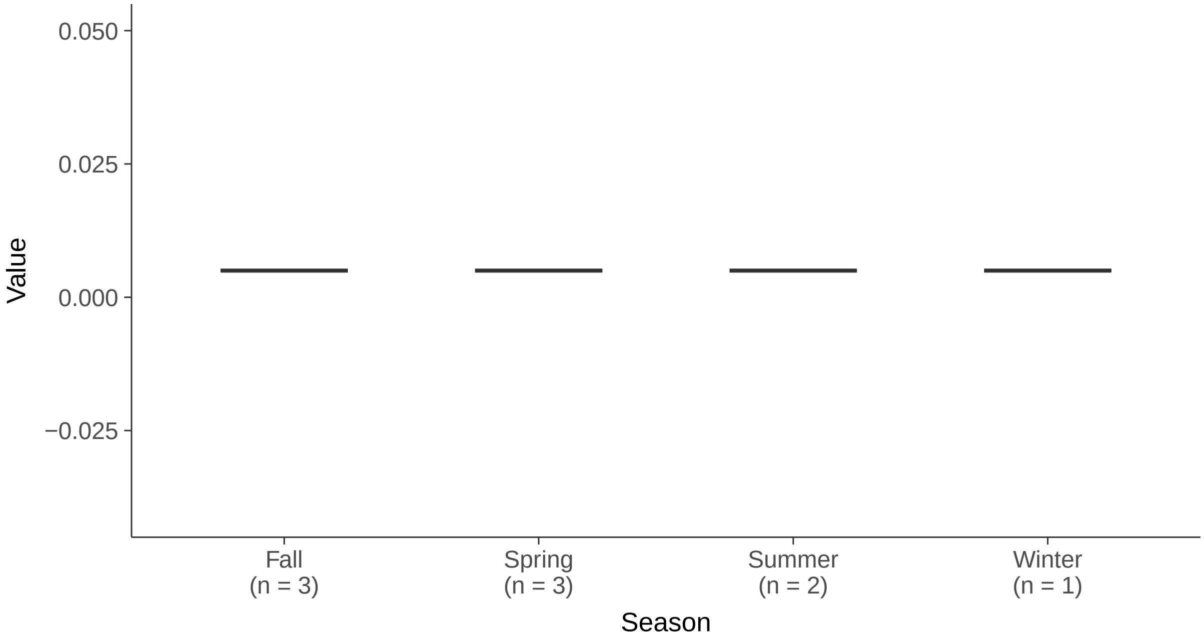
Boxplot

Nickel, MW-16B (mg/L)



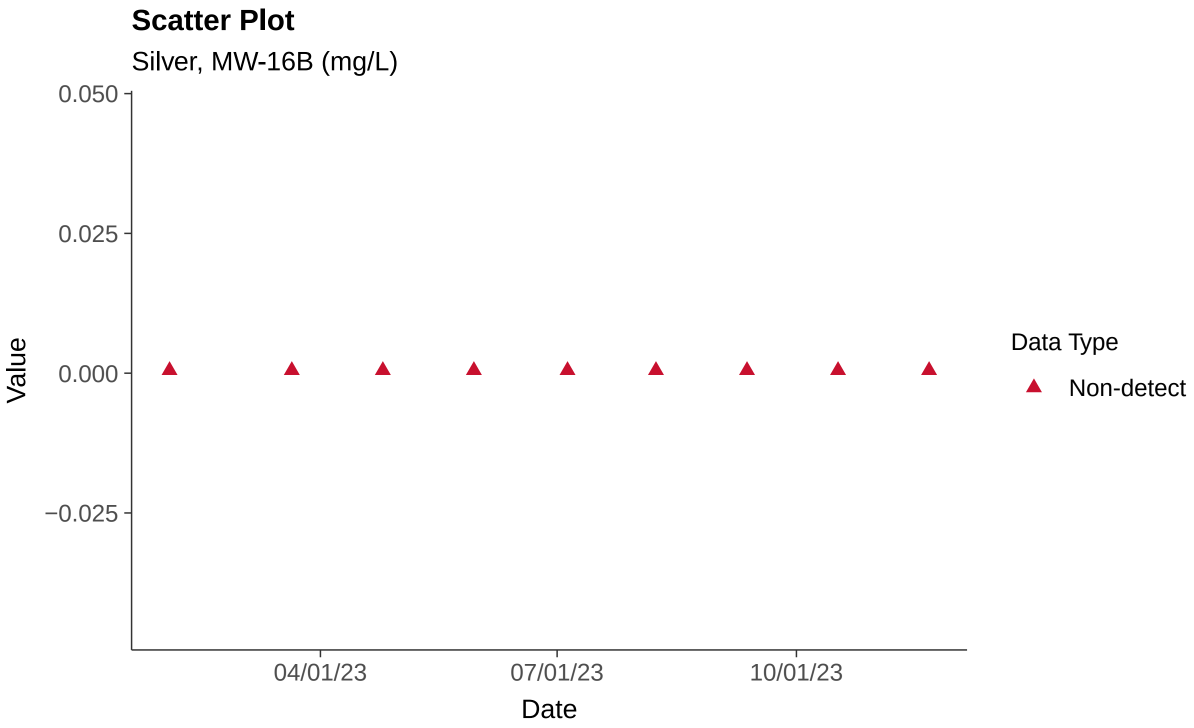
Boxplot by Season

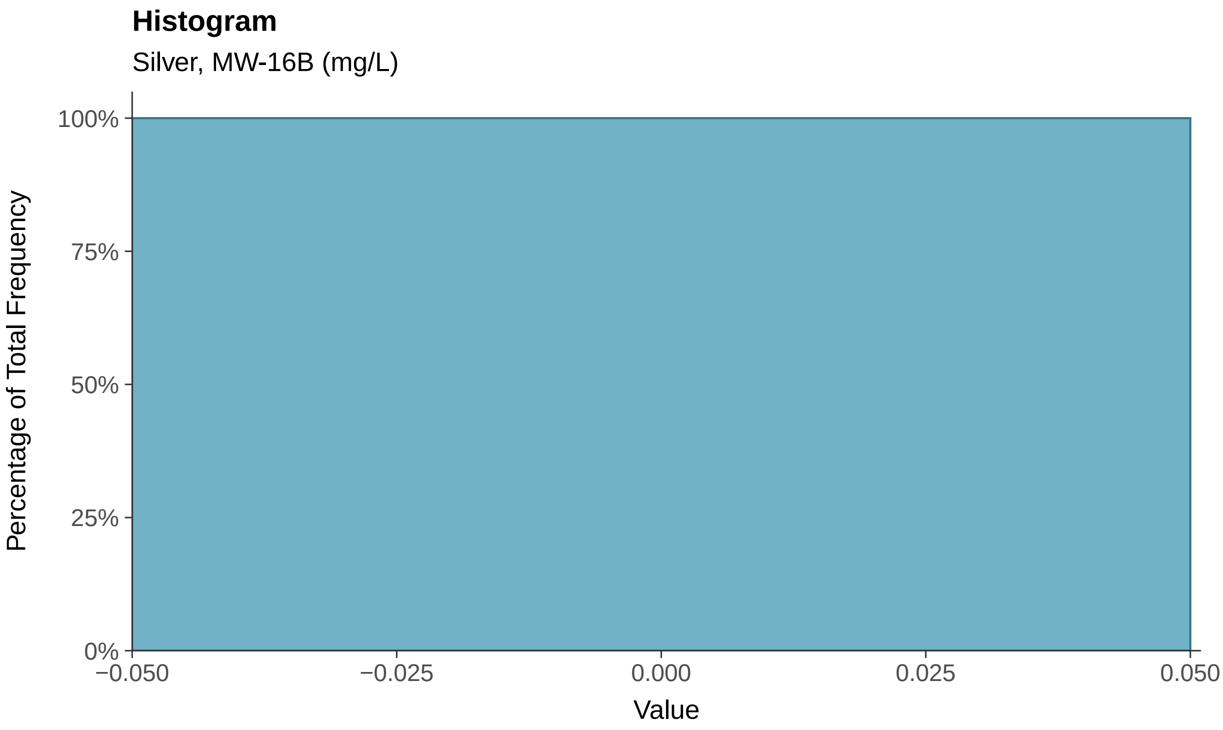
Nickel, MW-16B (mg/L)



Part 115: Silver, MW-16B

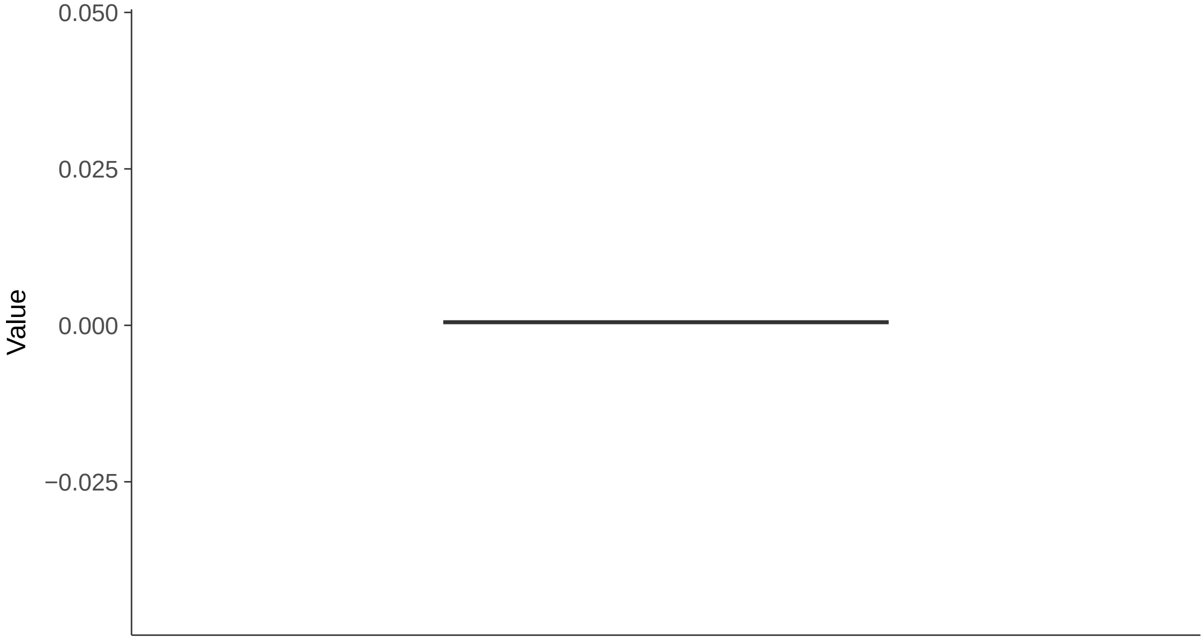
ID: 16B_5_40





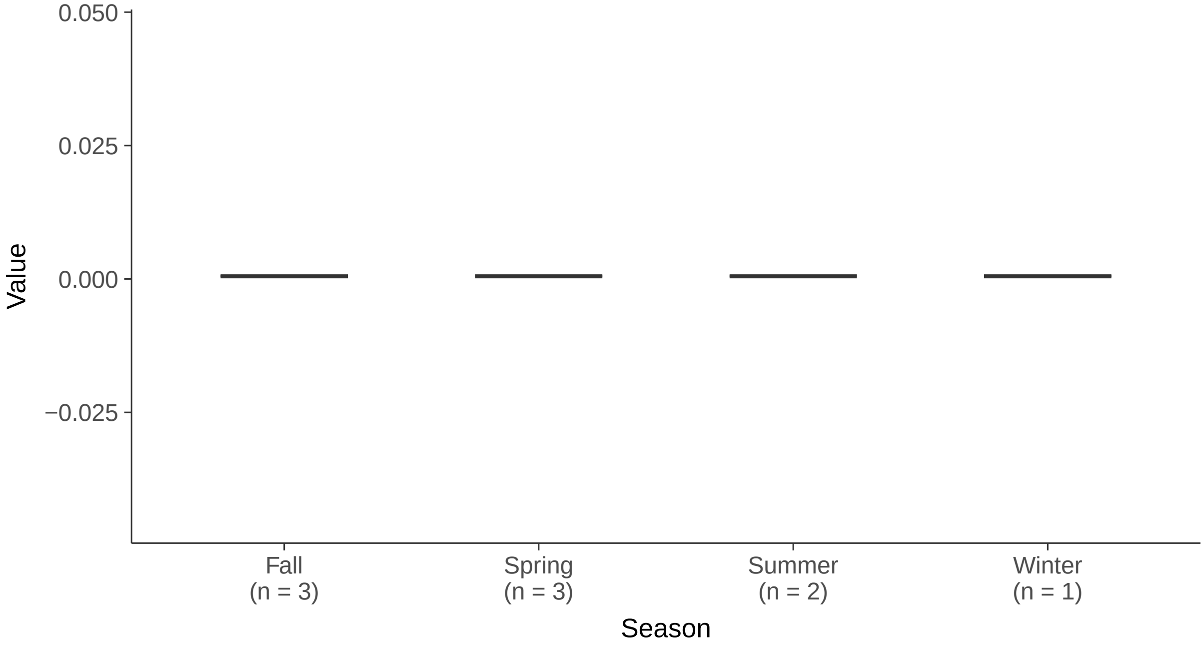
Boxplot

Silver, MW-16B (mg/L)



Boxplot by Season

Silver, MW-16B (mg/L)

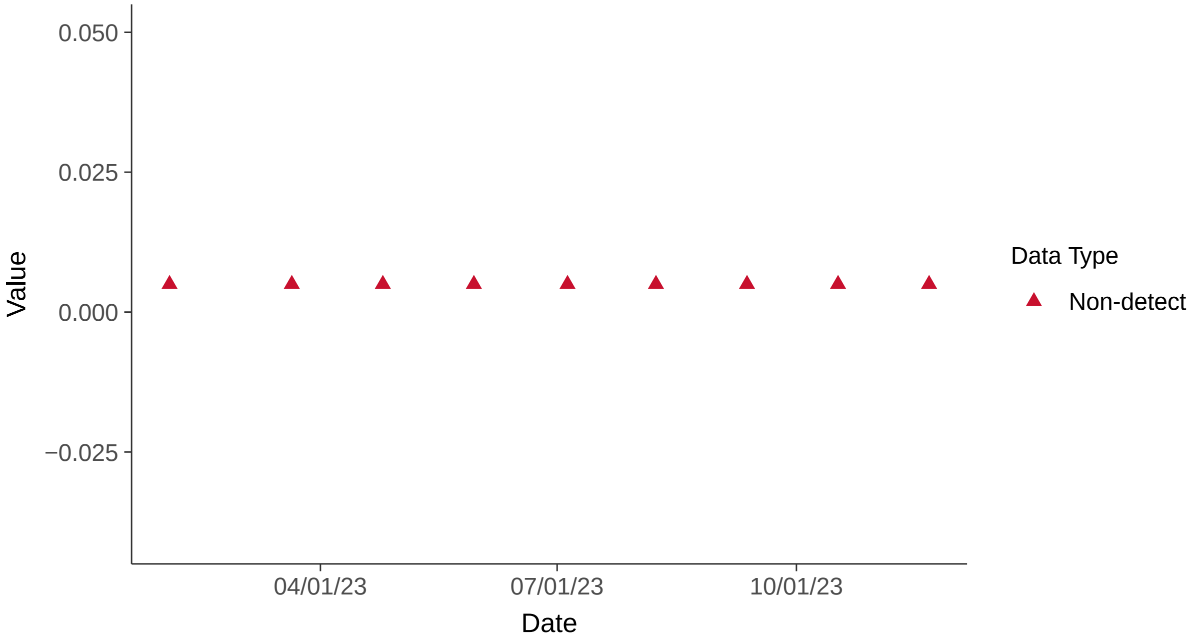


Part 115: Vanadium, MW-16B

ID: 16B_5_41

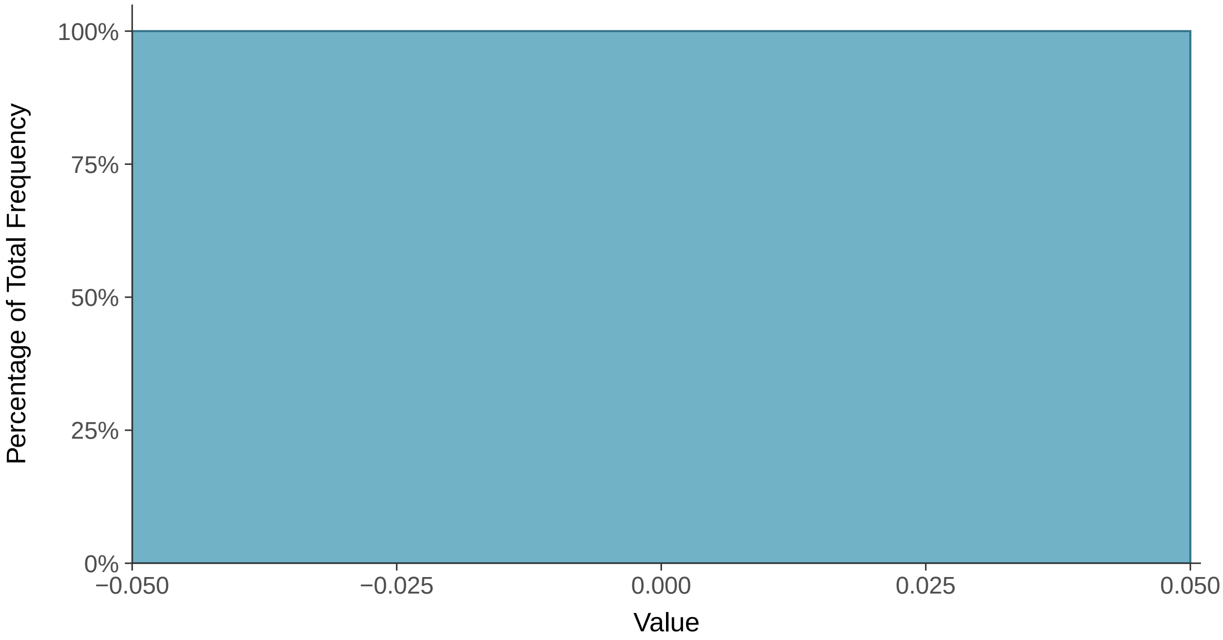
Scatter Plot

Vanadium, MW-16B (mg/L)



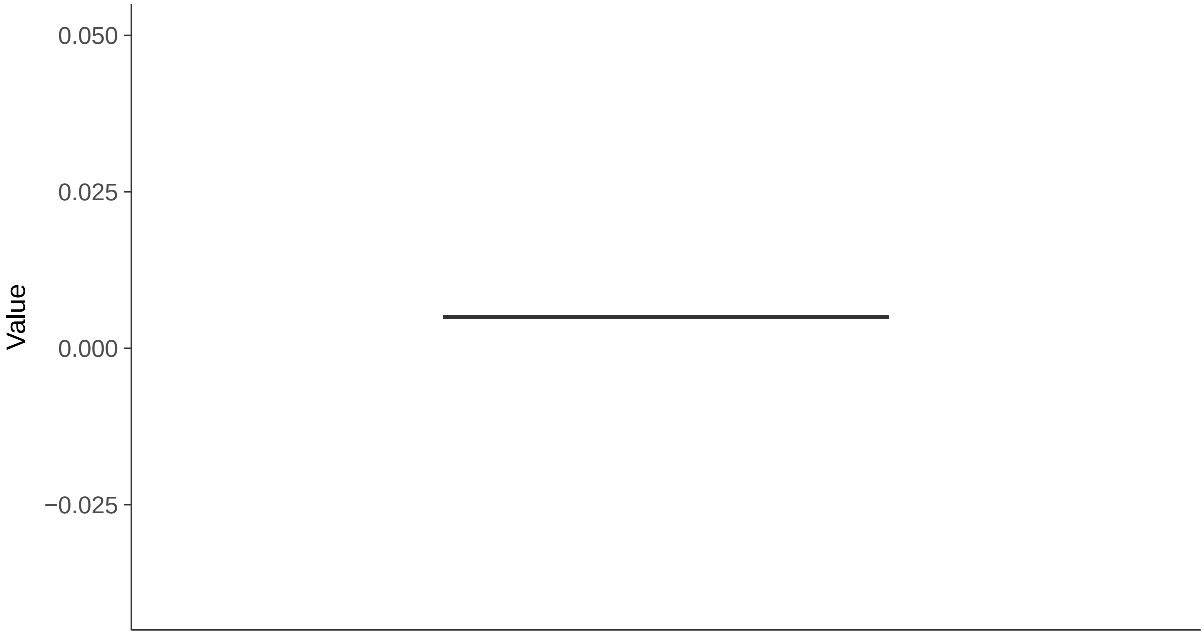
Histogram

Vanadium, MW-16B (mg/L)



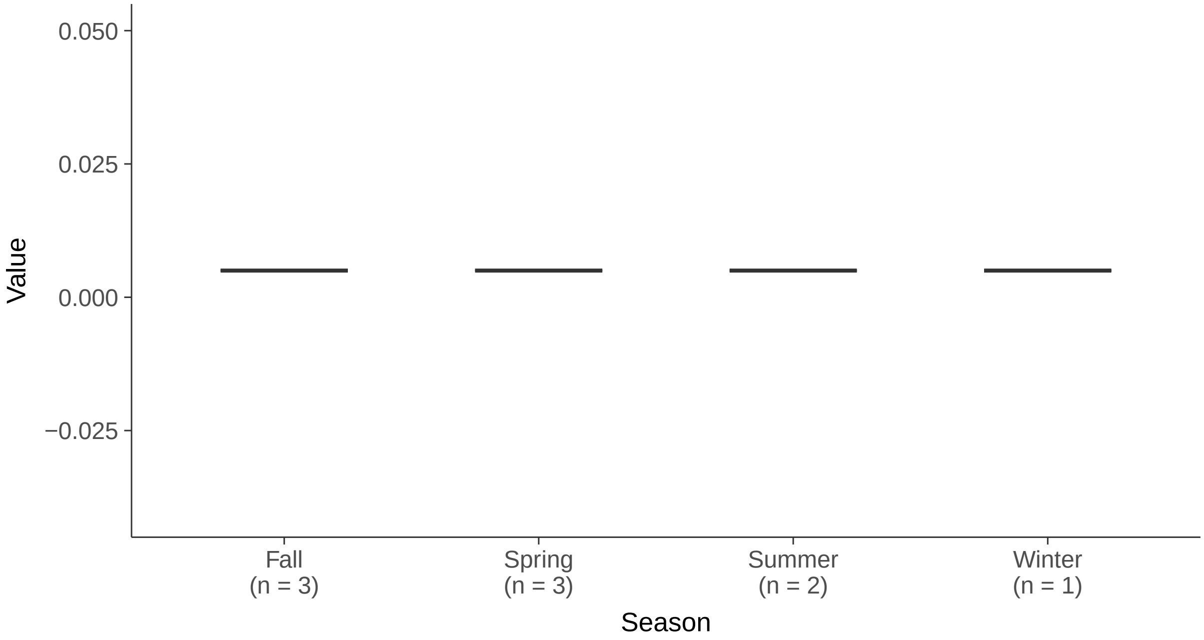
Boxplot

Vanadium, MW-16B (mg/L)



Boxplot by Season

Vanadium, MW-16B (mg/L)

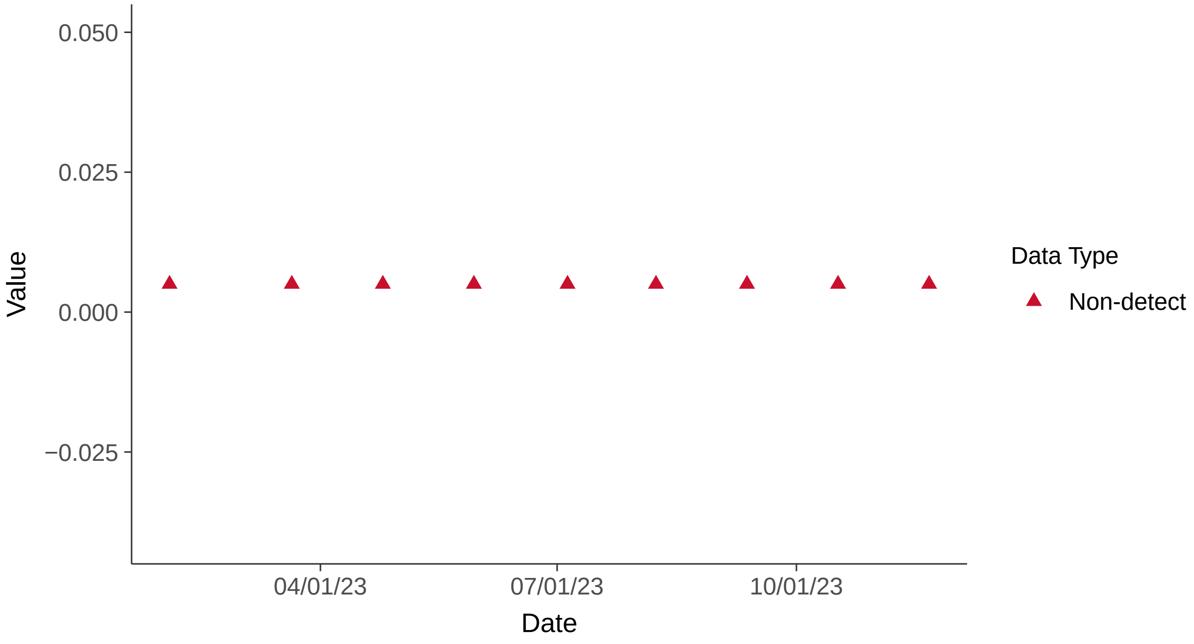


Part 115: Zinc, MW-16B

ID: 16B_5_42

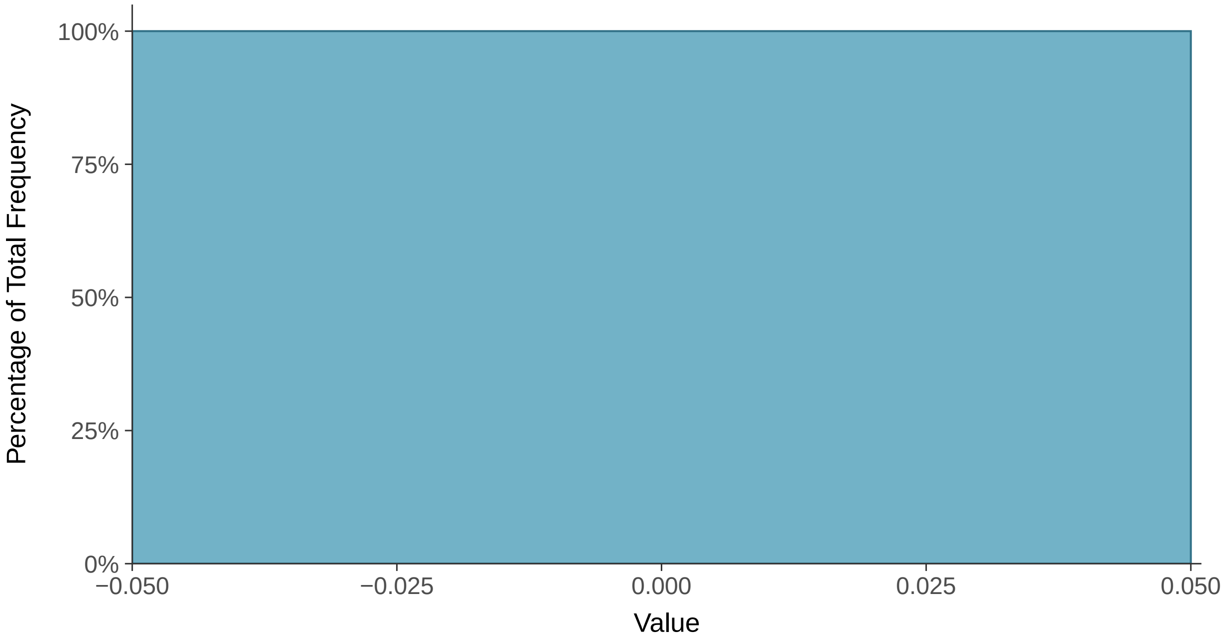
Scatter Plot

Zinc, MW-16B (mg/L)



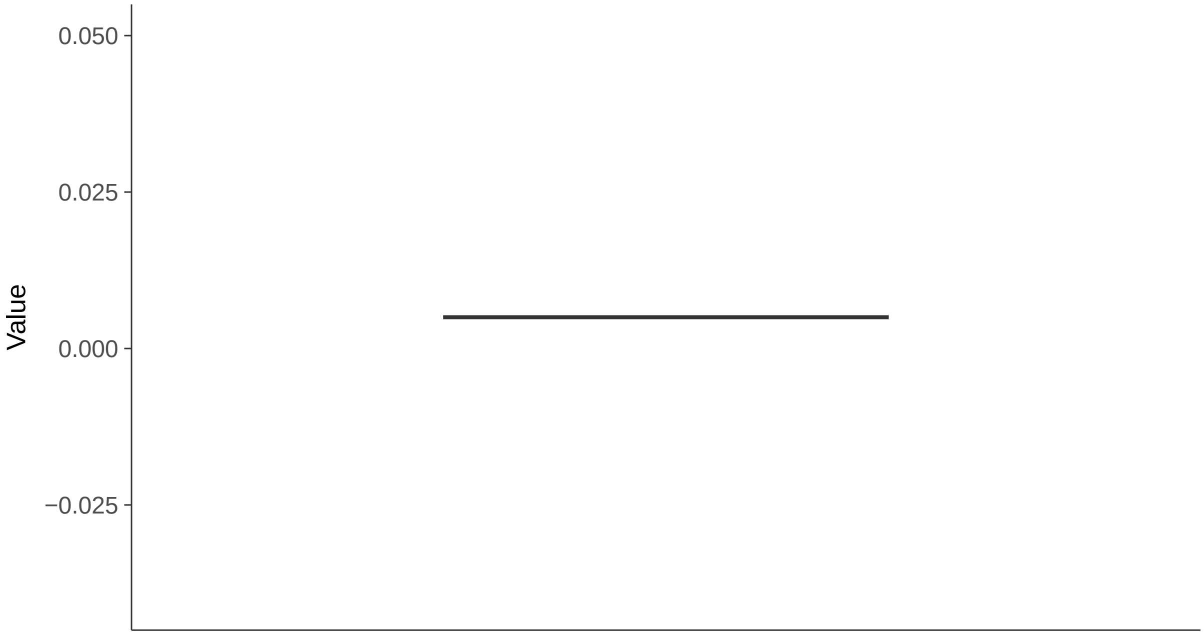
Histogram

Zinc, MW-16B (mg/L)



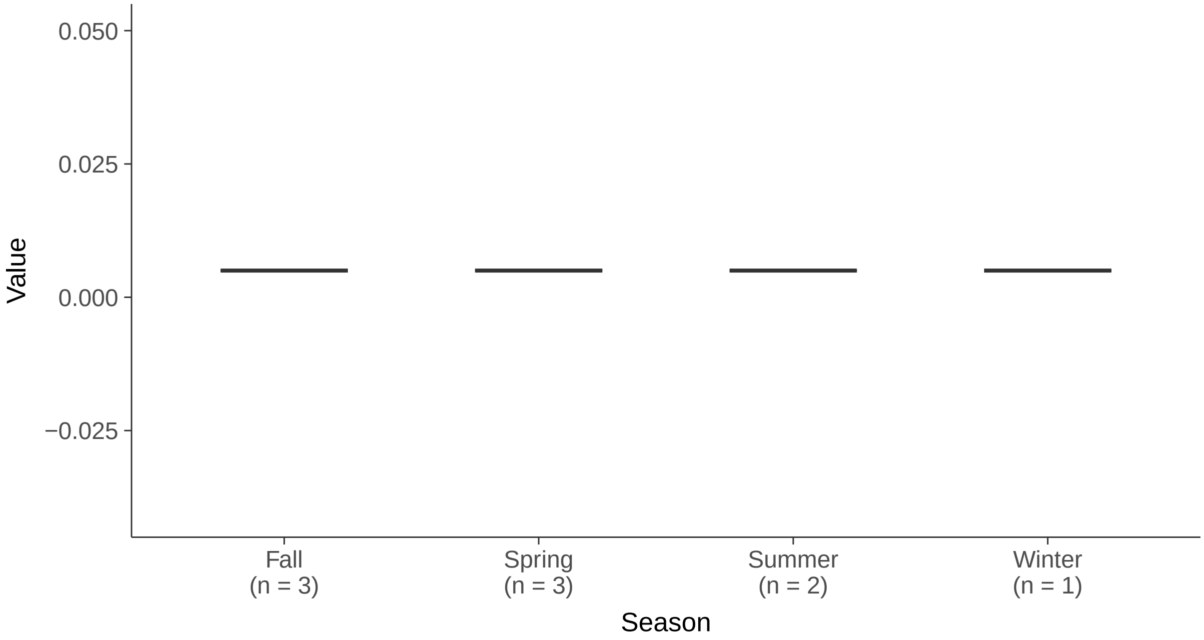
Boxplot

Zinc, MW-16B (mg/L)



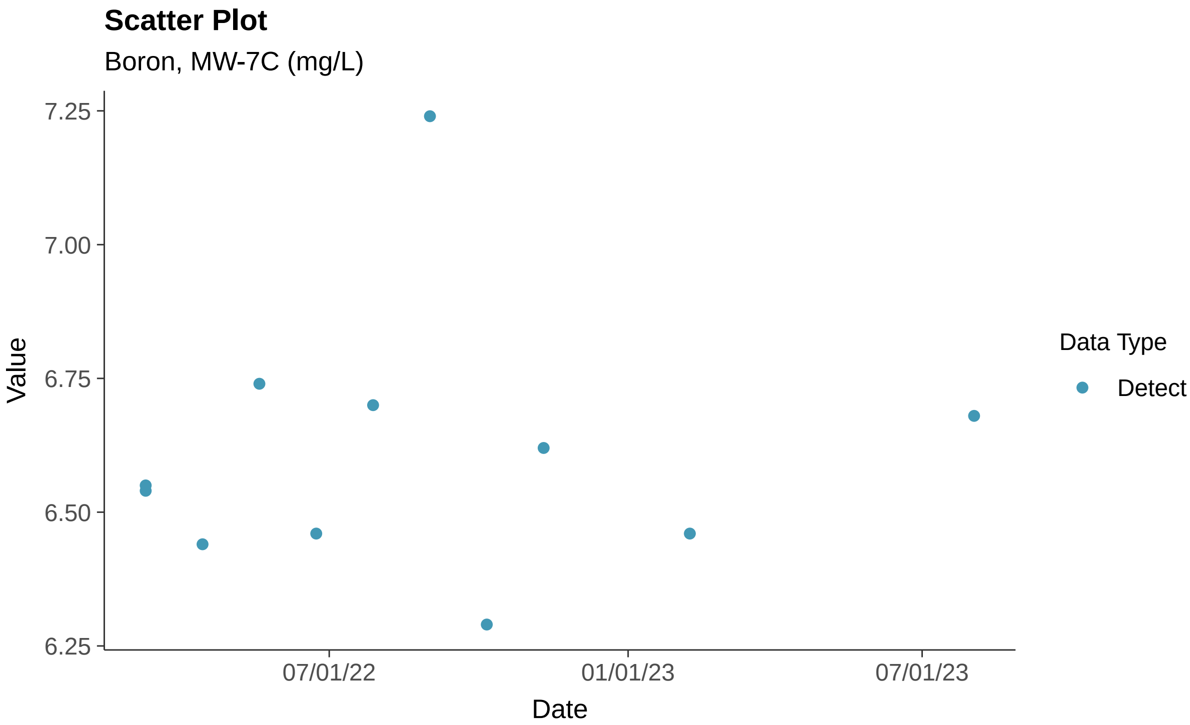
Boxplot by Season

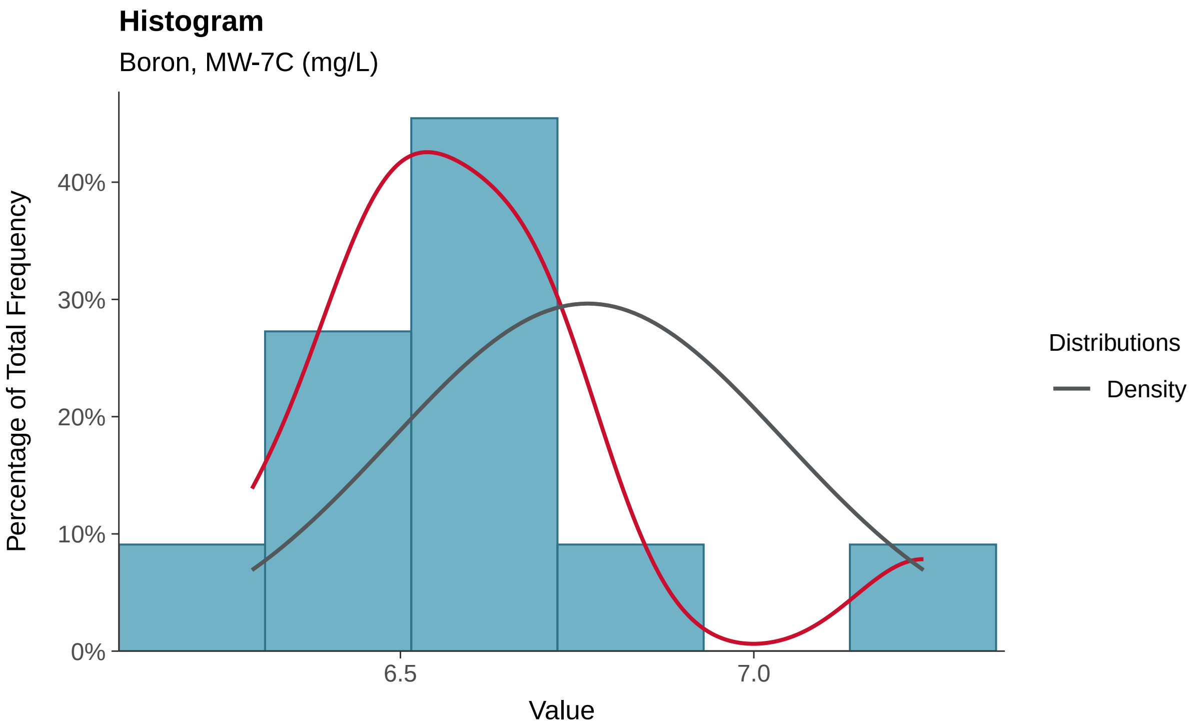
Zinc, MW-16B (mg/L)



Appendix III: Boron, MW-7C

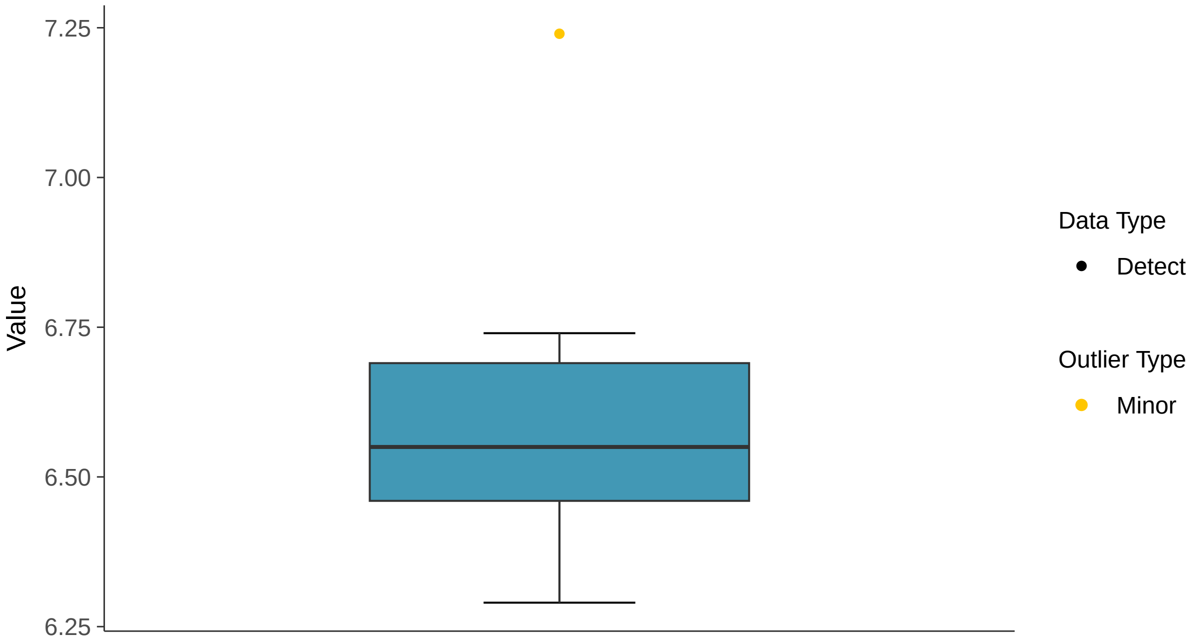
ID: 7C_1_01





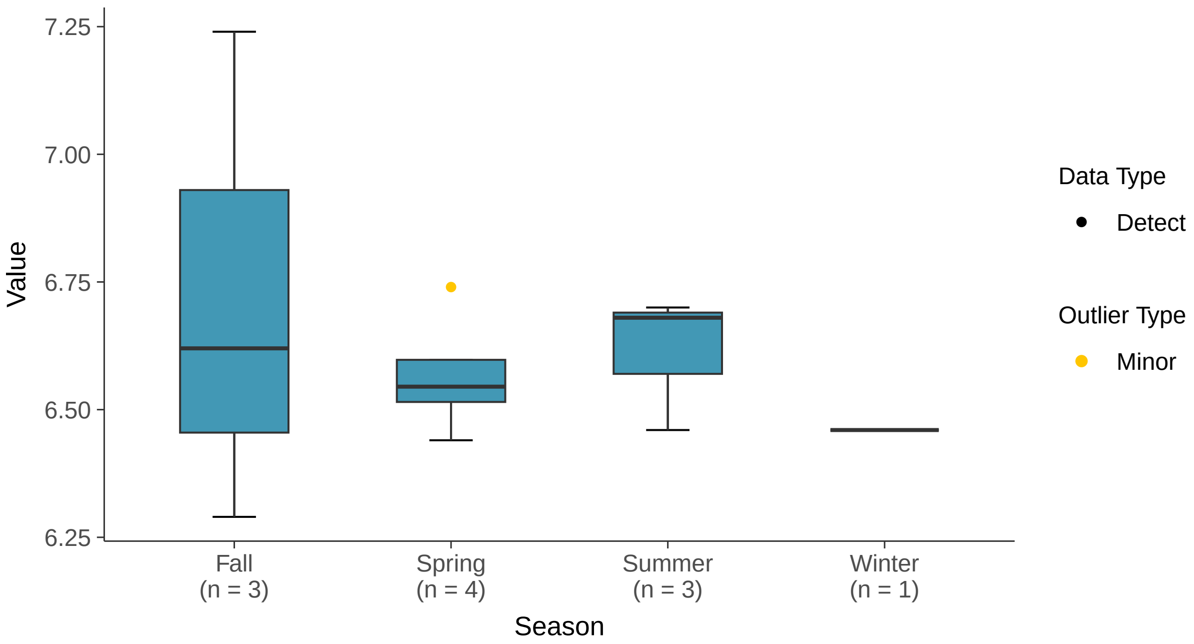
Boxplot

Boron, MW-7C (mg/L)



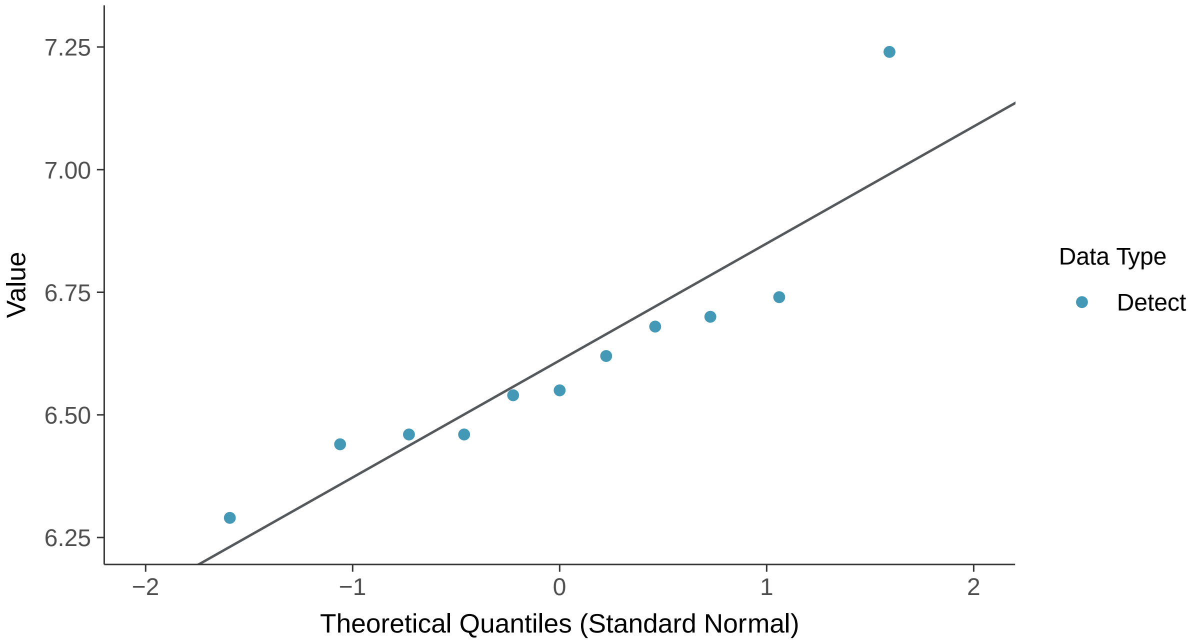
Boxplot by Season

Boron, MW-7C (mg/L)



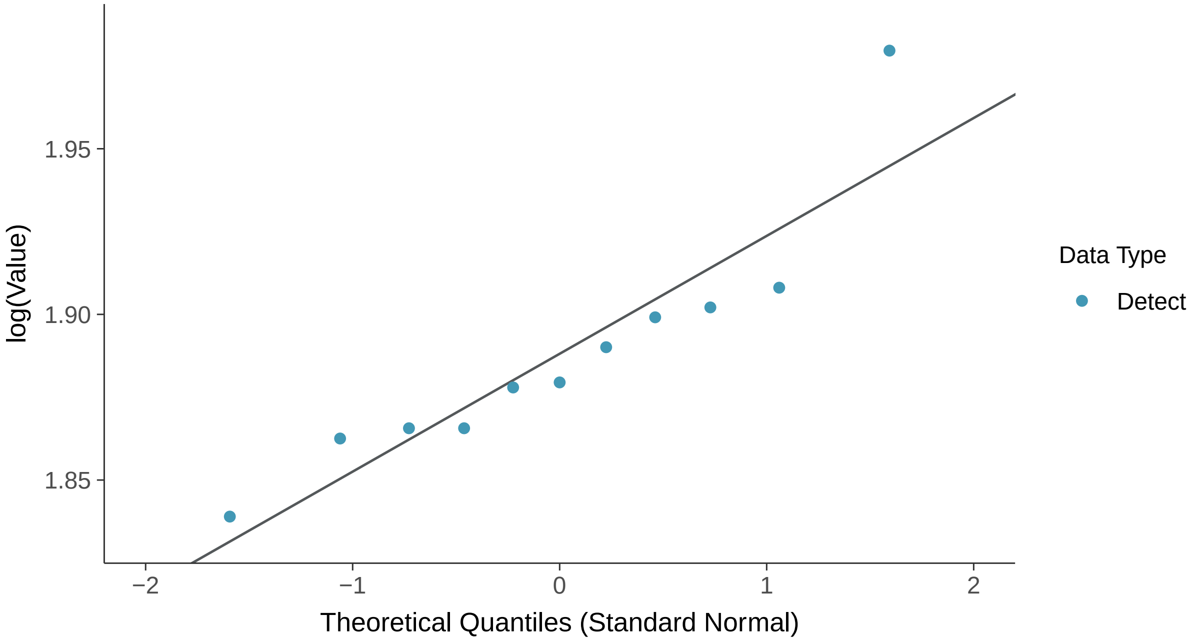
Normal Q-Q plot

Boron, MW-7C (mg/L)



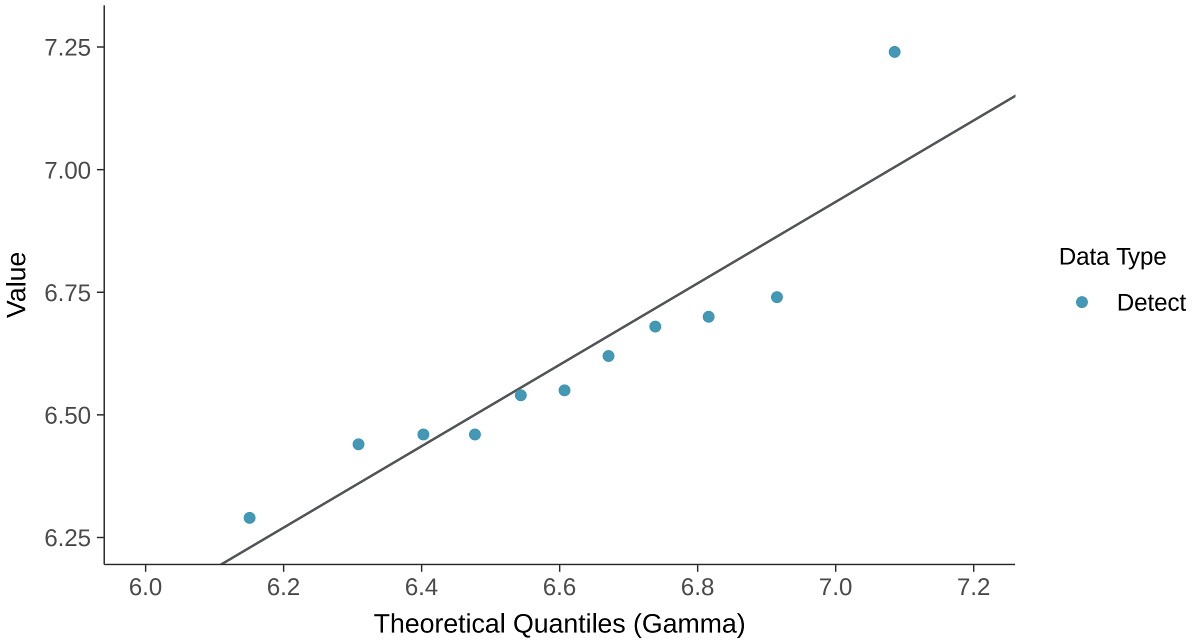
Lognormal Q-Q plot

Boron, MW-7C (mg/L)



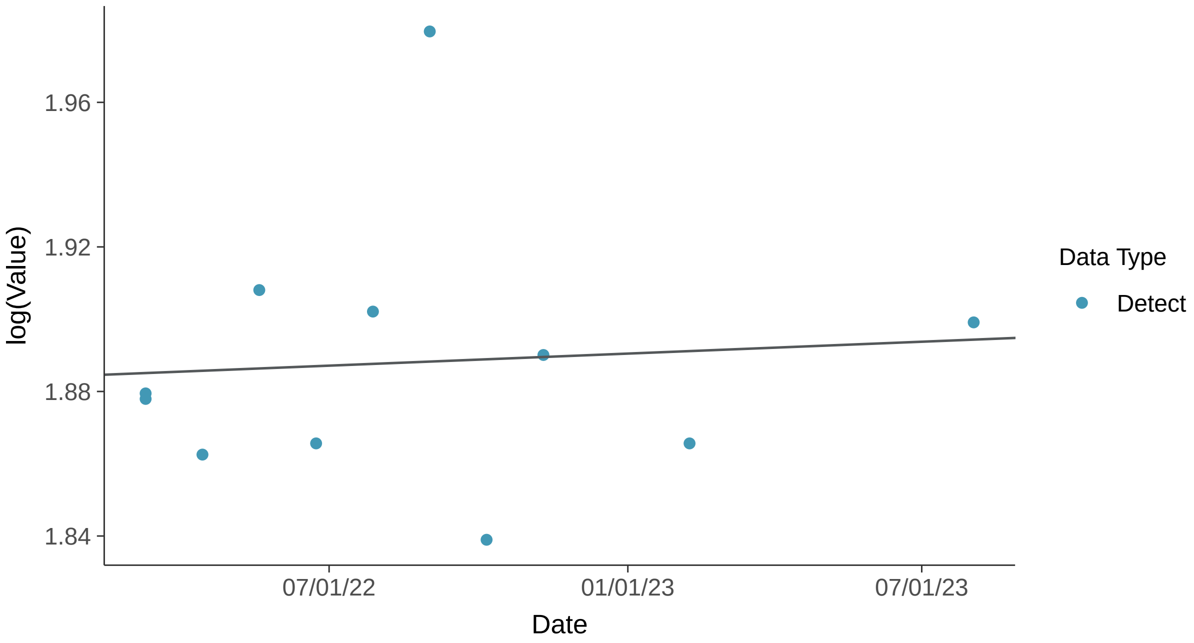
Gamma Q-Q plot

Boron, MW-7C (mg/L)



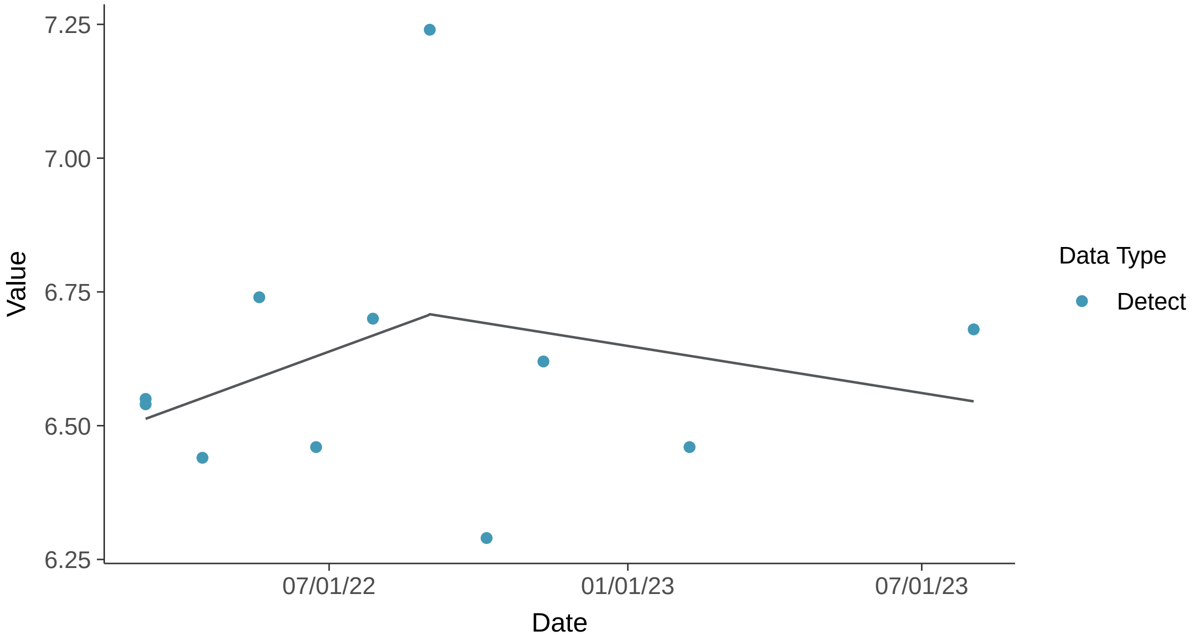
Trend Regression: Lognormal MLE

Boron, MW-7C (mg/L)



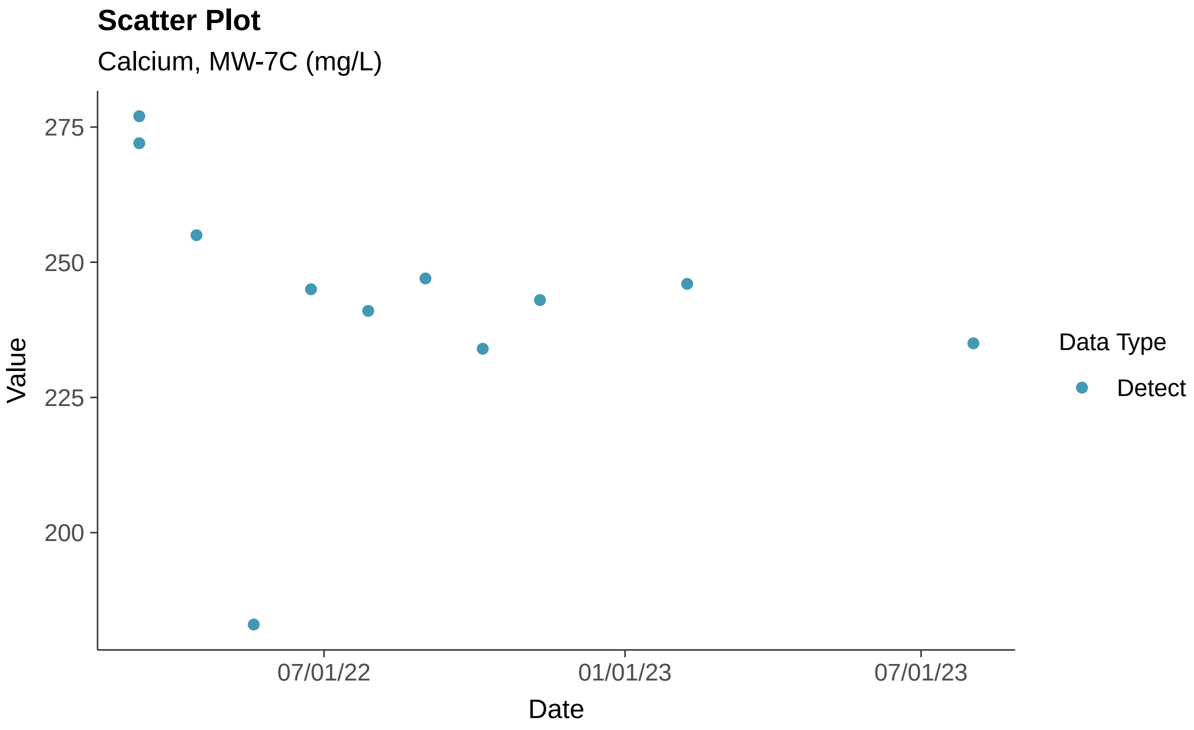
Trend Regression: Piecewise Linear-Linear

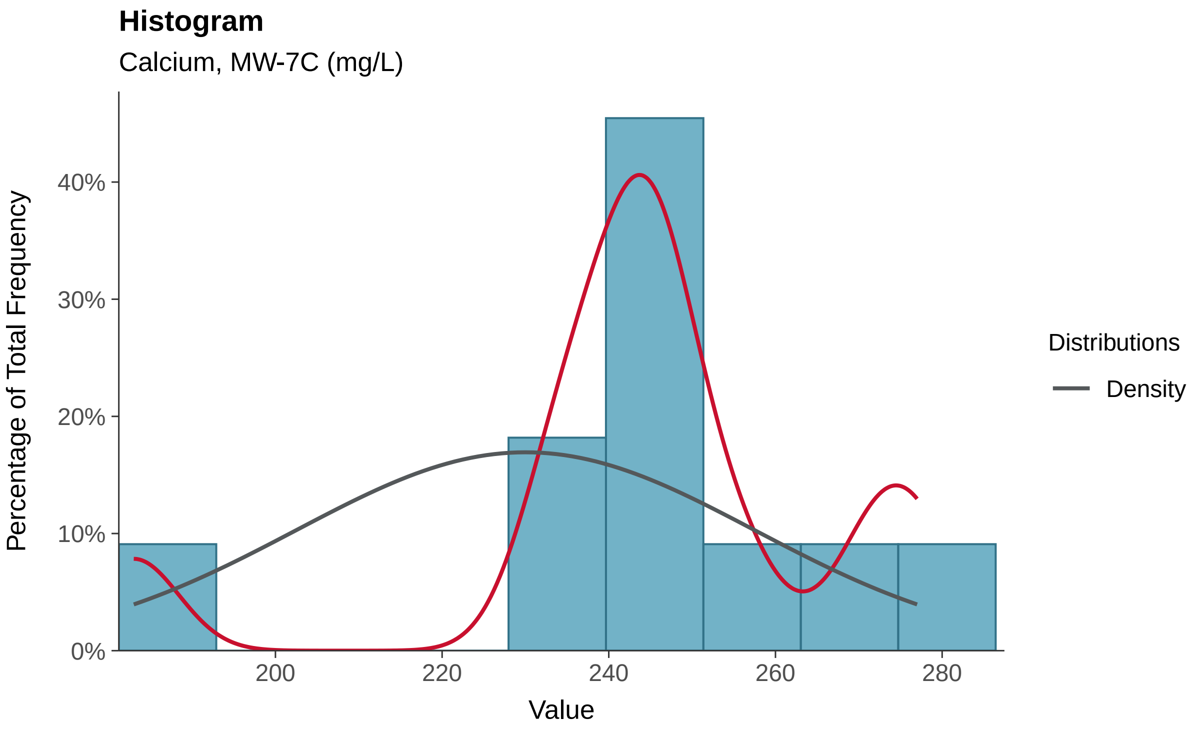
Boron, MW-7C (mg/L)



Appendix III: Calcium, MW-7C

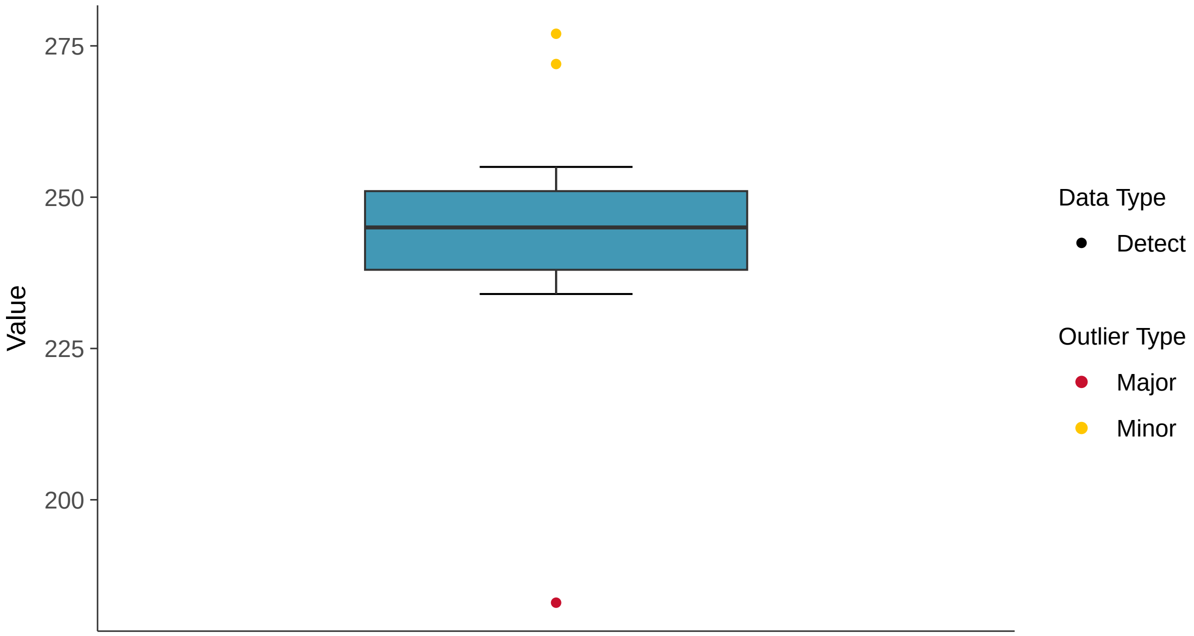
ID: 7C_1_02





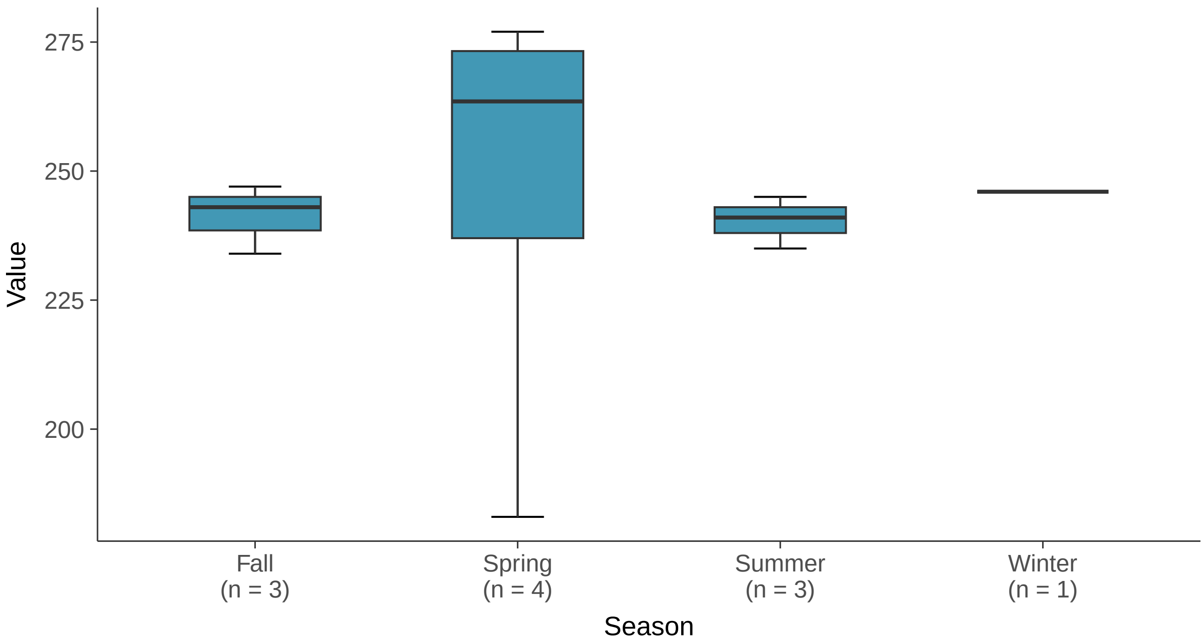
Boxplot

Calcium, MW-7C (mg/L)



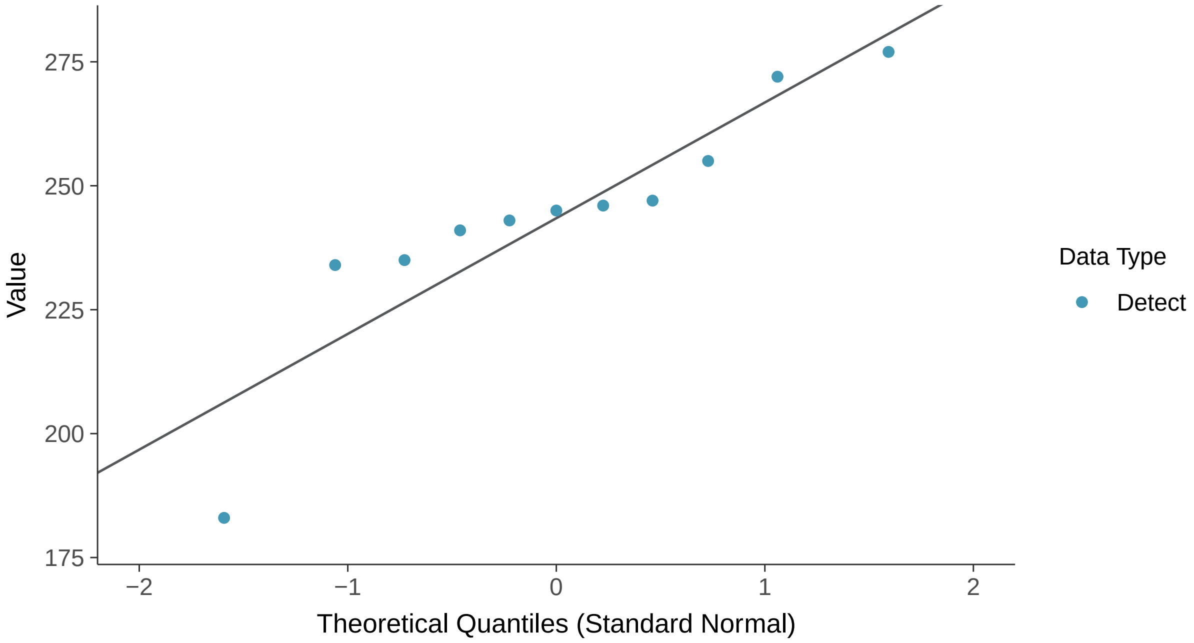
Boxplot by Season

Calcium, MW-7C (mg/L)



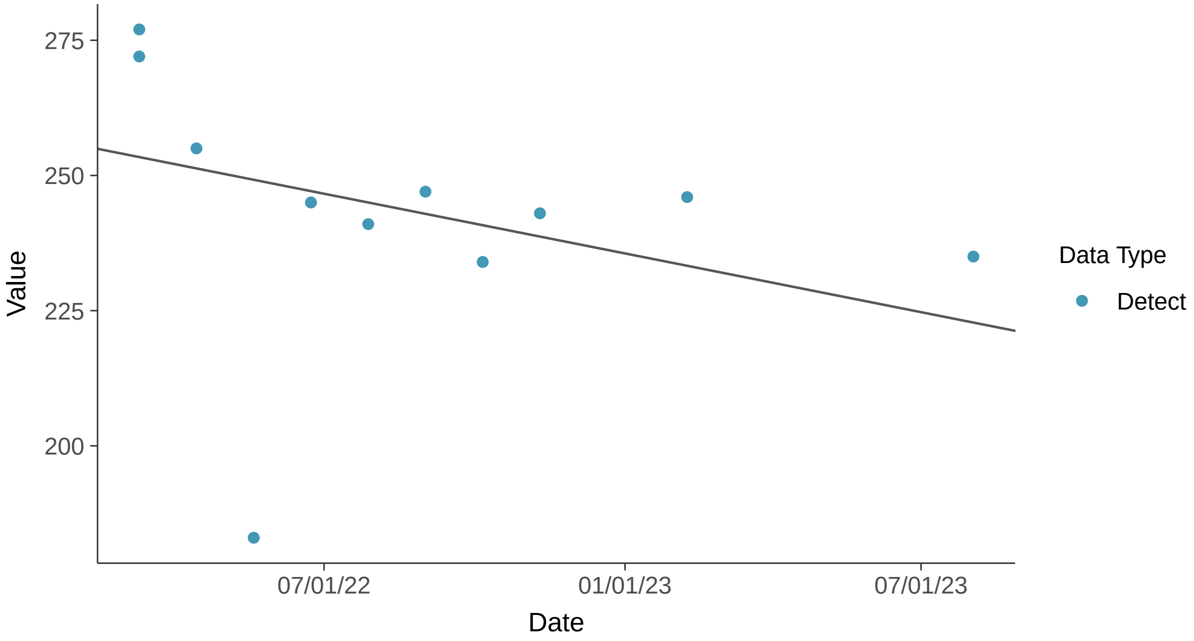
Normal Q-Q plot

Calcium, MW-7C (mg/L)



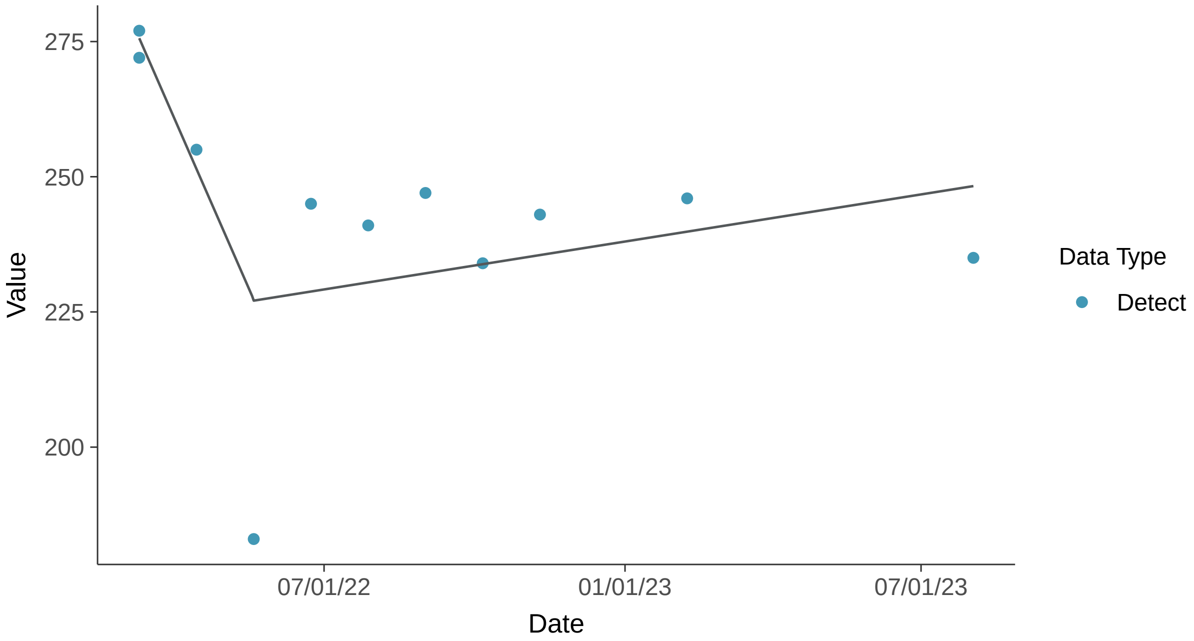
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Calcium, MW-7C (mg/L)



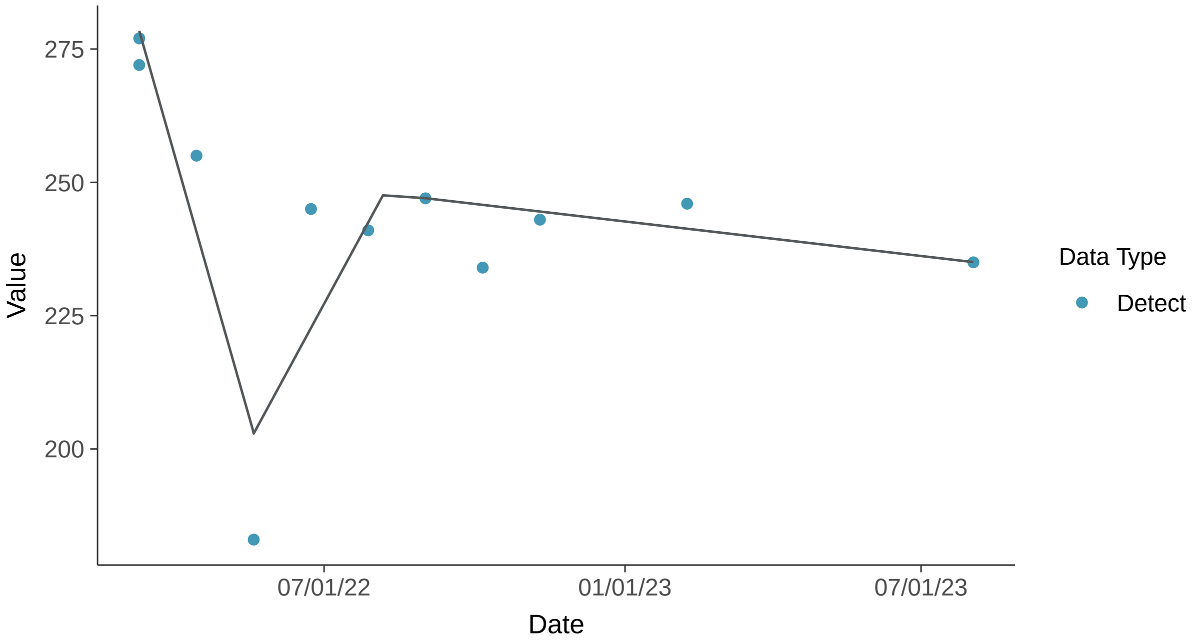
Trend Regression: Piecewise Linear-Linear

Calcium, MW-7C (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Calcium, MW-7C (mg/L)

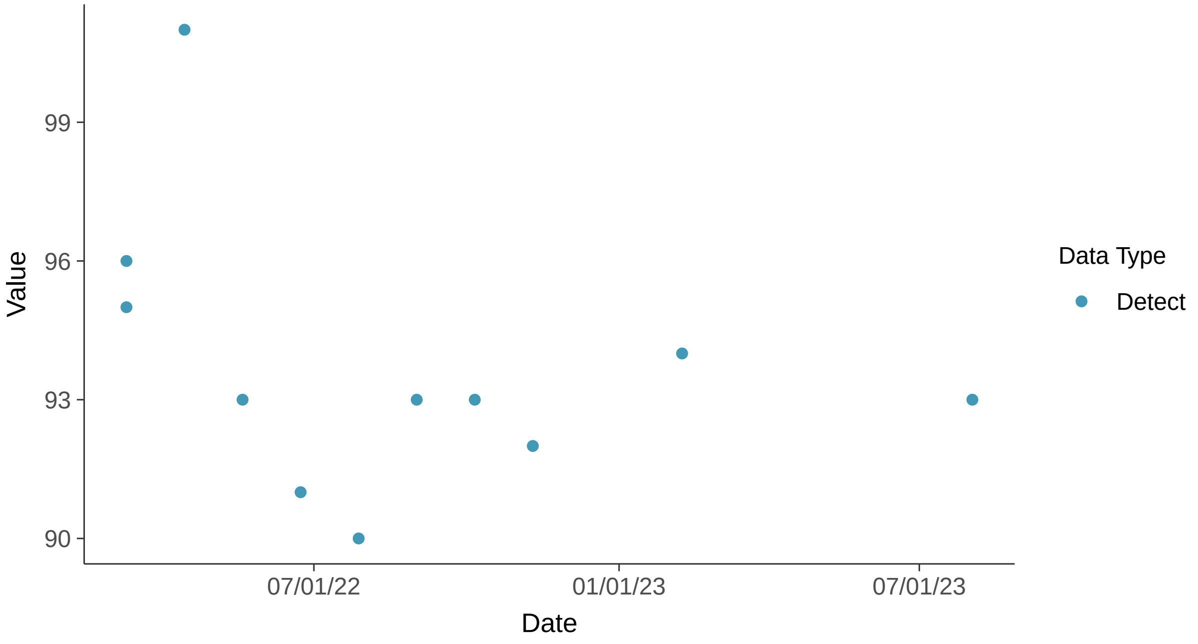


Appendix III: Chloride, MW-7C

ID: 7C_1_03

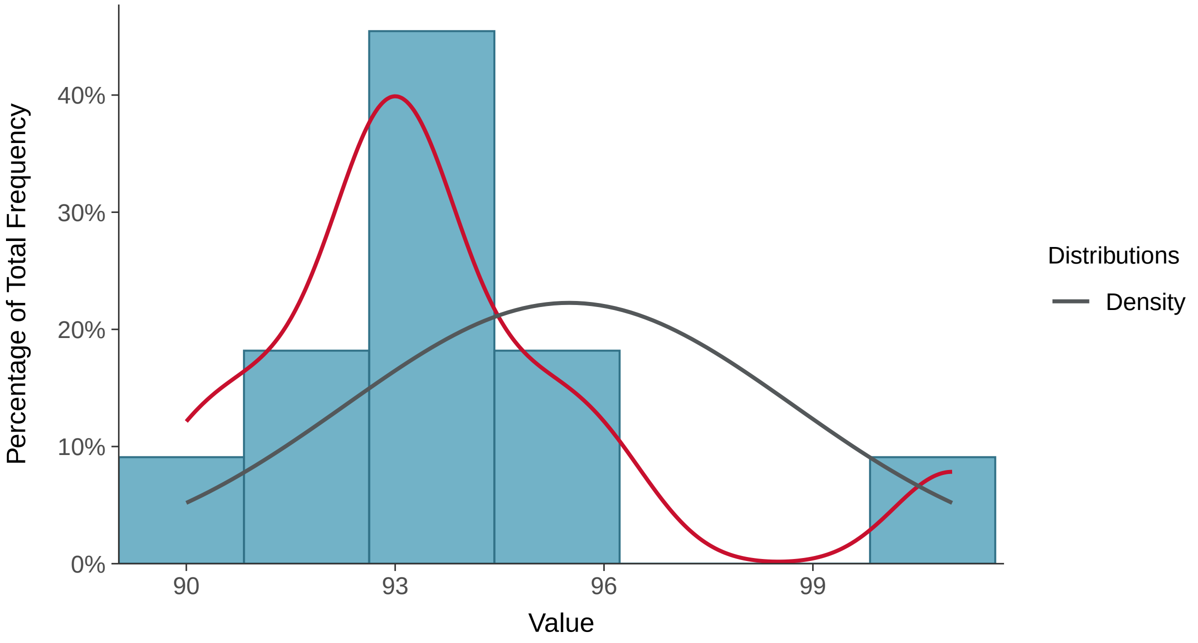
Scatter Plot

Chloride, MW-7C (mg/L)



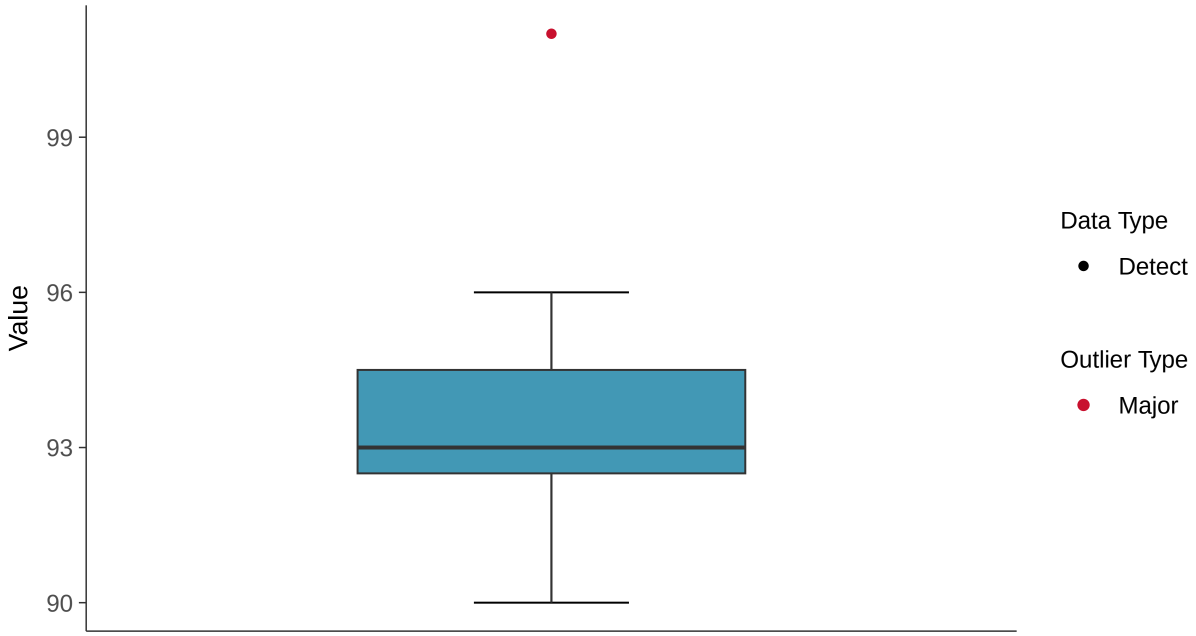
Histogram

Chloride, MW-7C (mg/L)



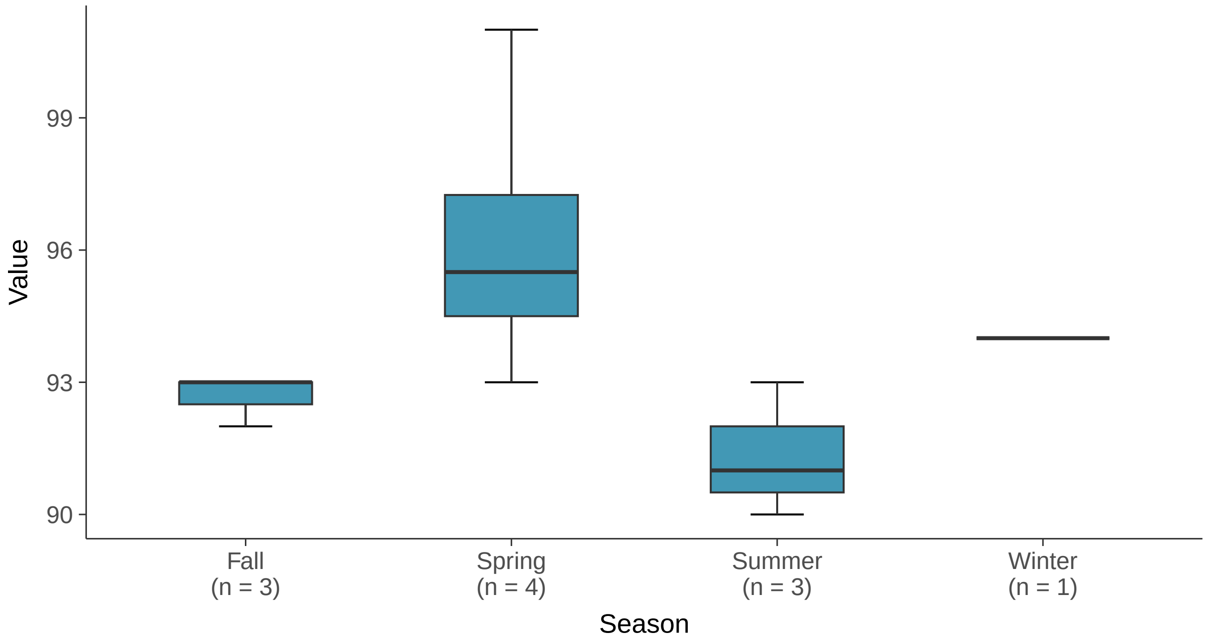
Boxplot

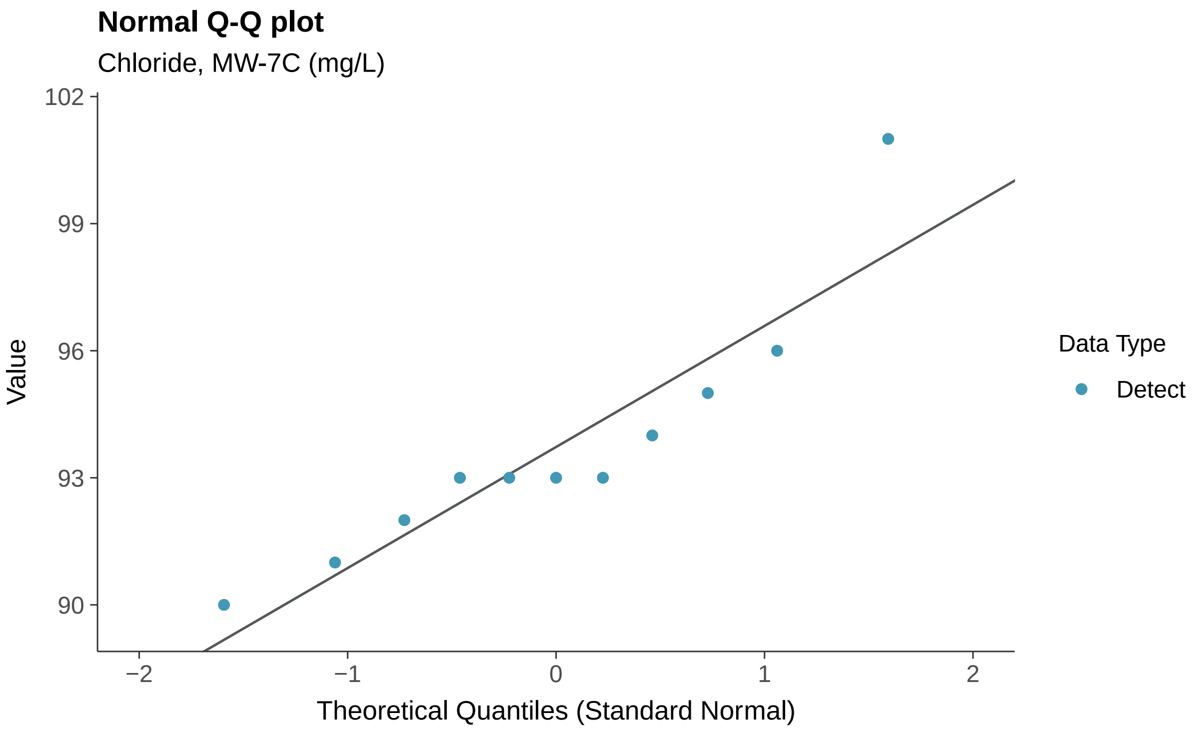
Chloride, MW-7C (mg/L)

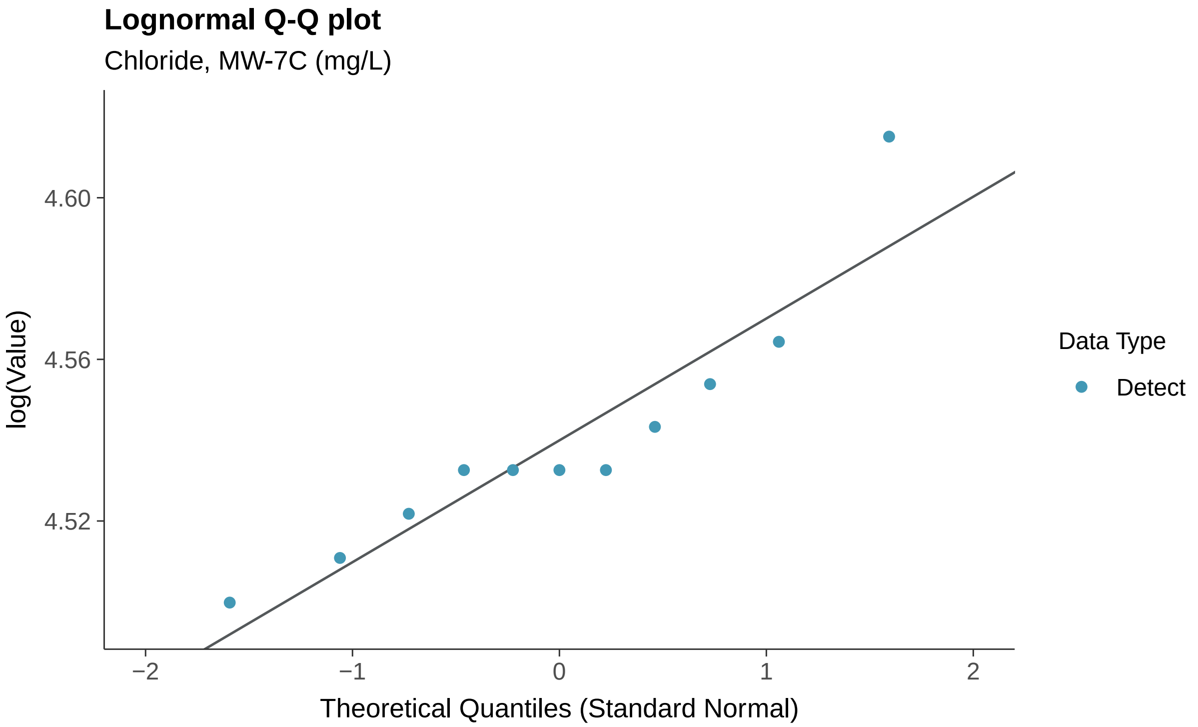


Boxplot by Season

Chloride, MW-7C (mg/L)

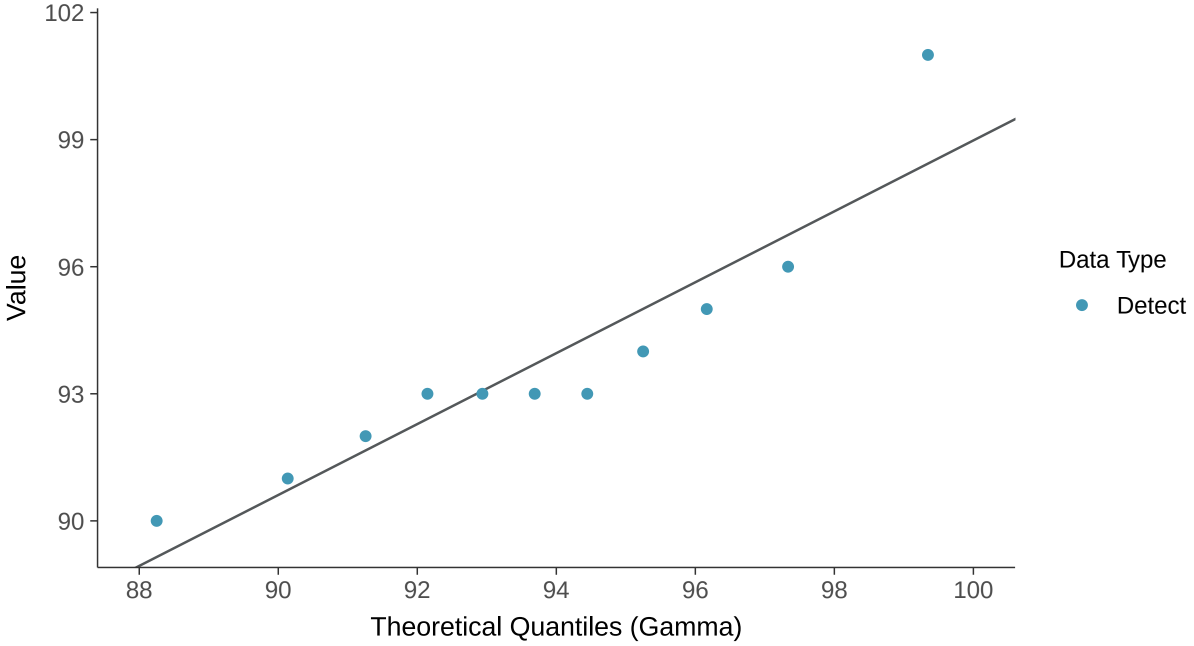



Normal Q-Q plot
Chloride, MW-7C (mg/L)
Value
102
99
96
93
90
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
● Detect


Lognormal Q-Q plot
Chloride, MW-7C (mg/L)
log(Value)
4.60
4.56
4.52
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
● Detect

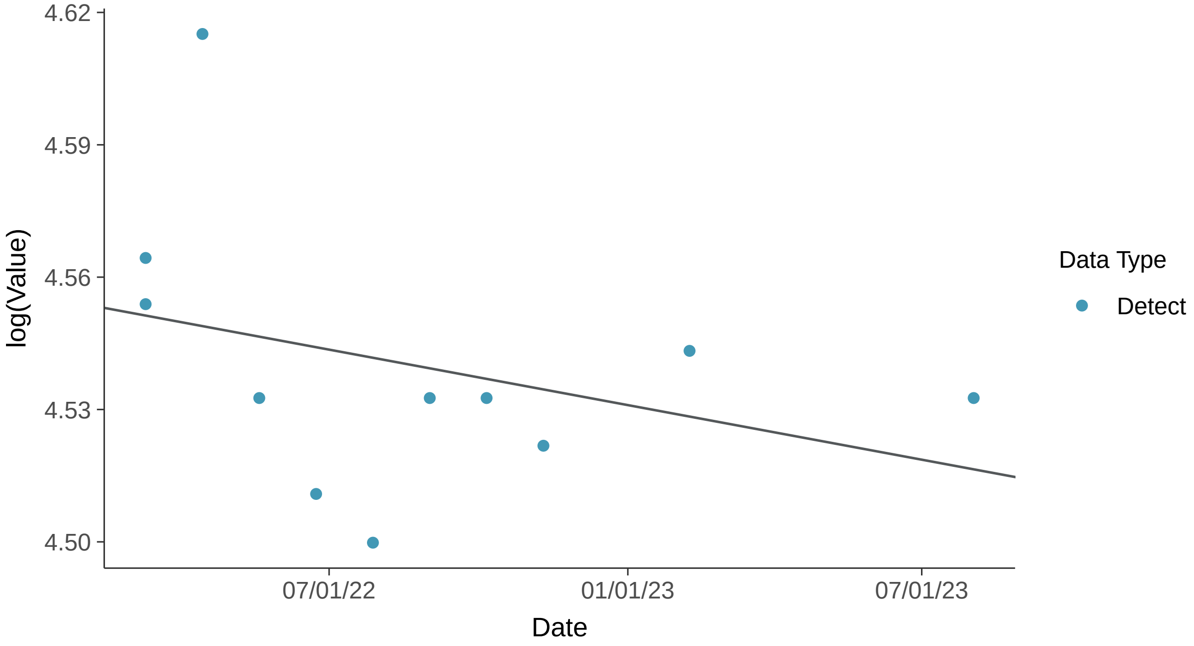
Gamma Q-Q plot

Chloride, MW-7C (mg/L)



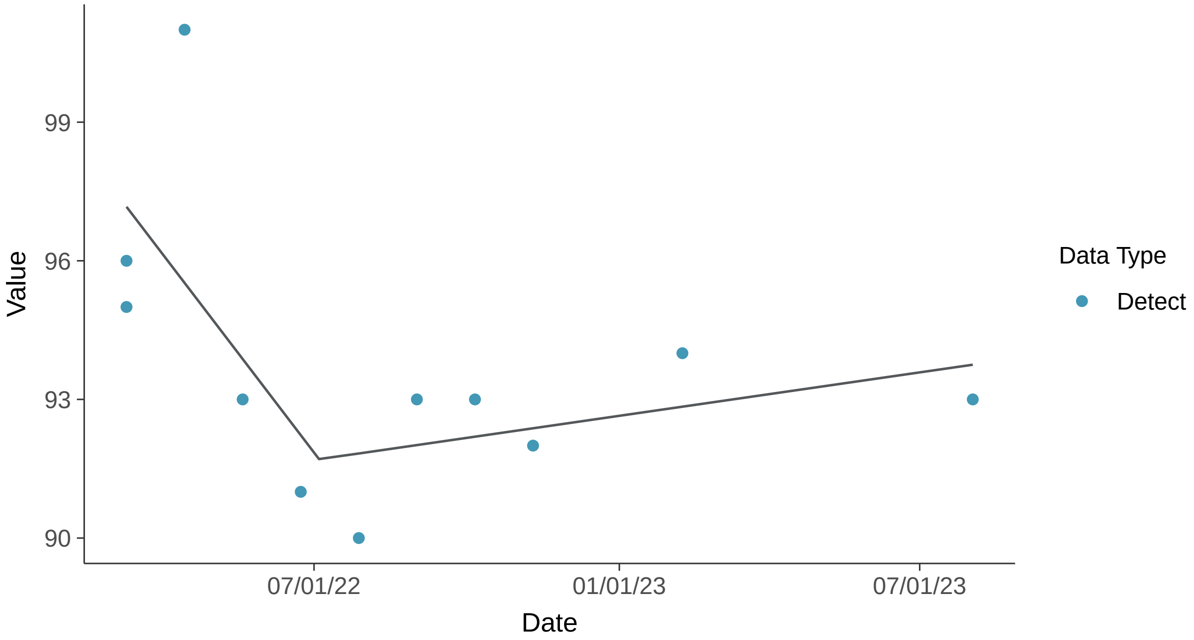
Trend Regression: Lognormal MLE

Chloride, MW-7C (mg/L)



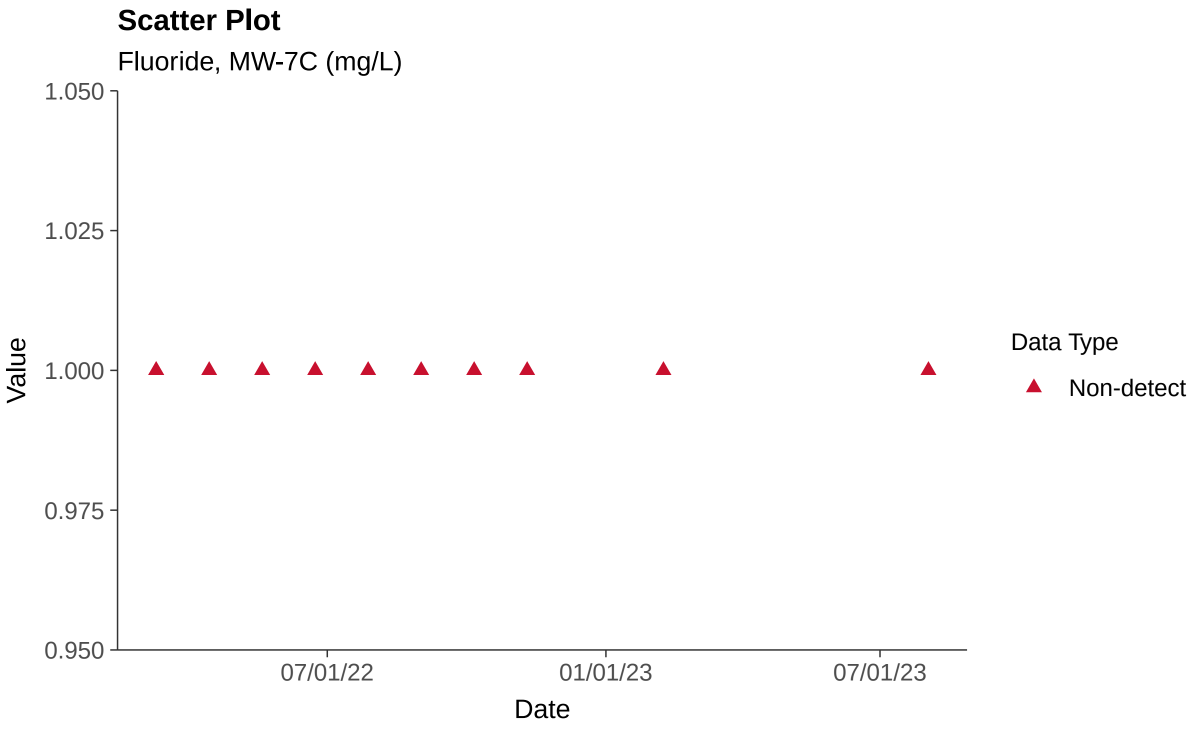
Trend Regression: Piecewise Linear-Linear

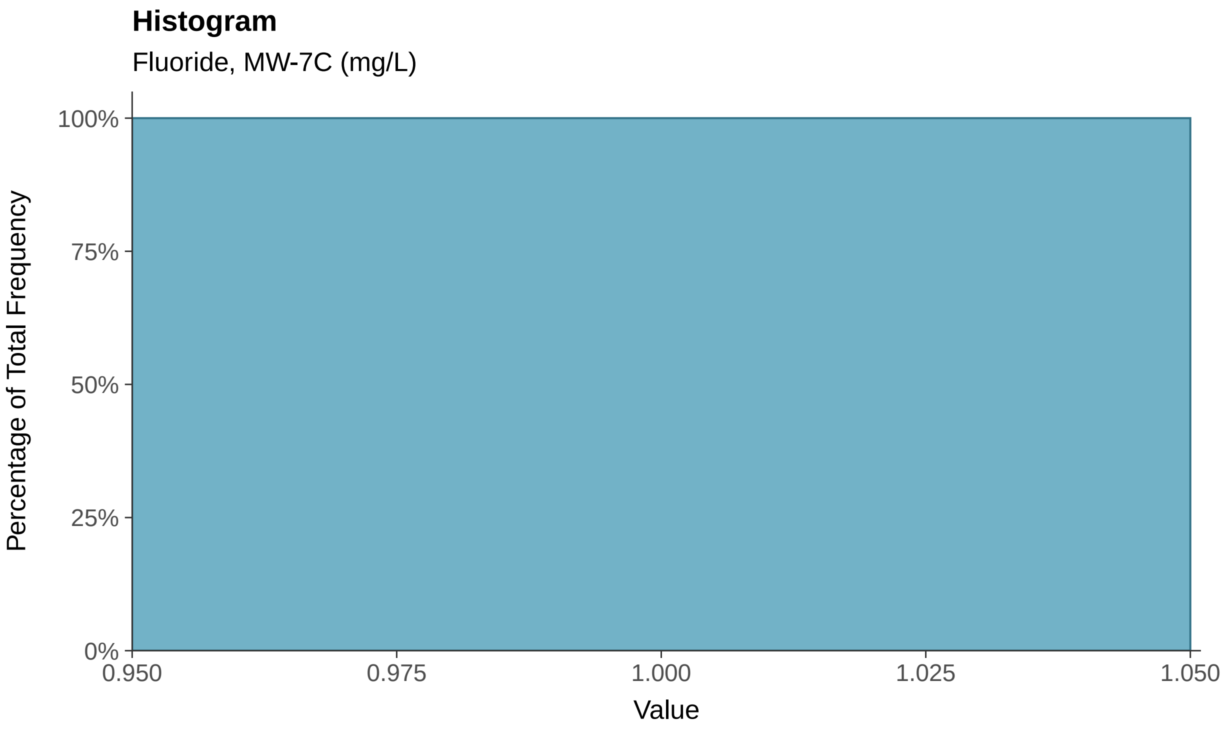
Chloride, MW-7C (mg/L)



Appendix III: Fluoride, MW-7C

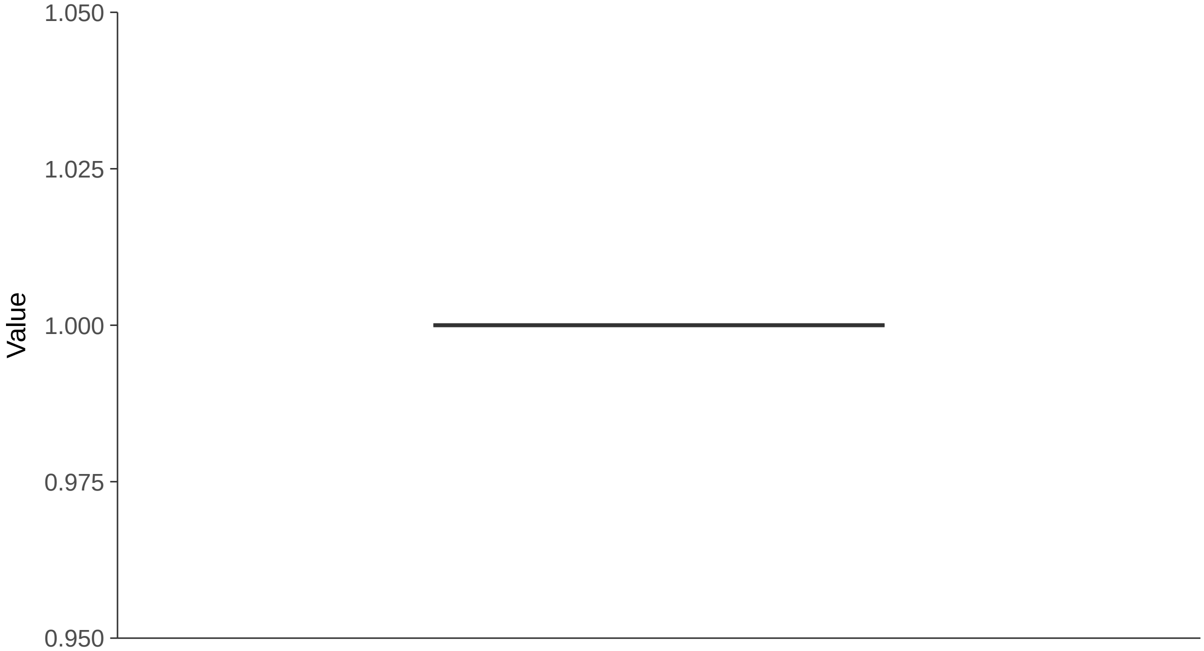
ID: 7C_1_04





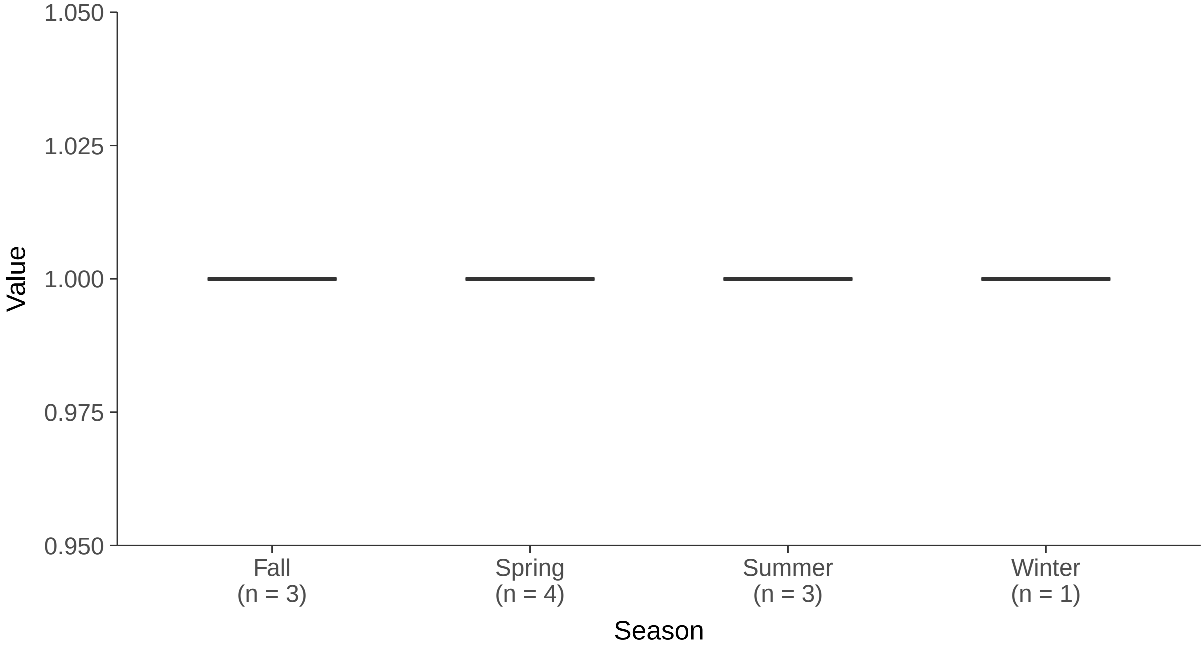
Boxplot

Fluoride, MW-7C (mg/L)



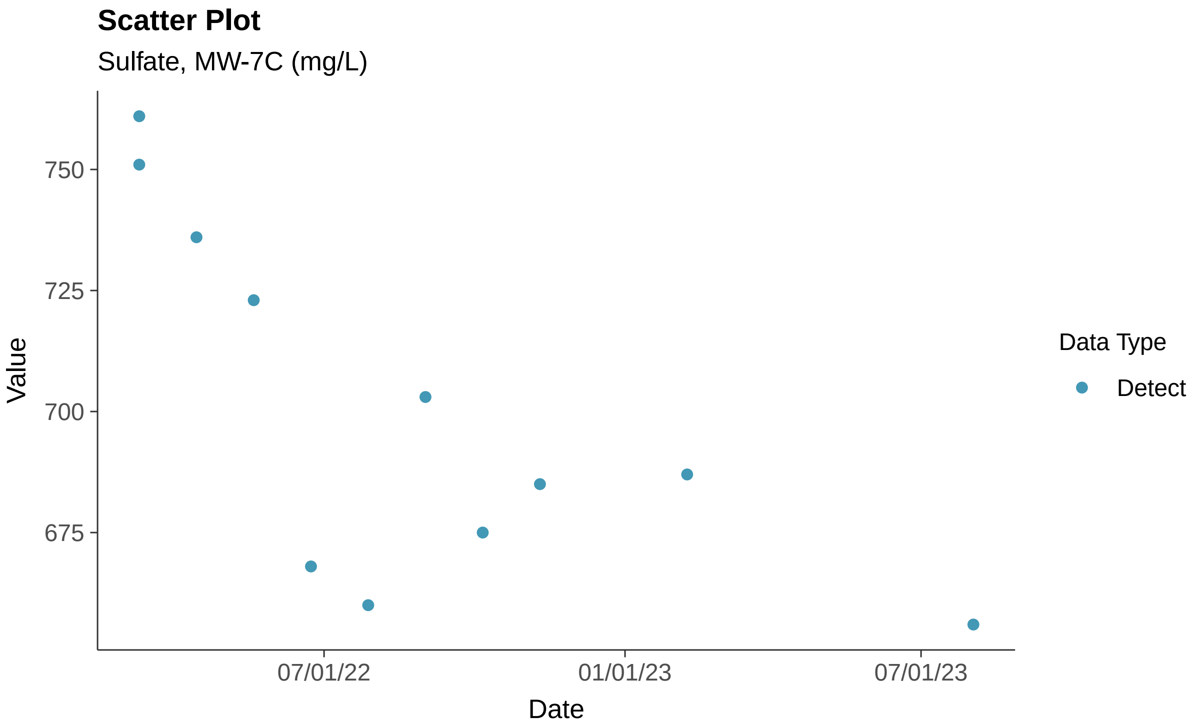
Boxplot by Season

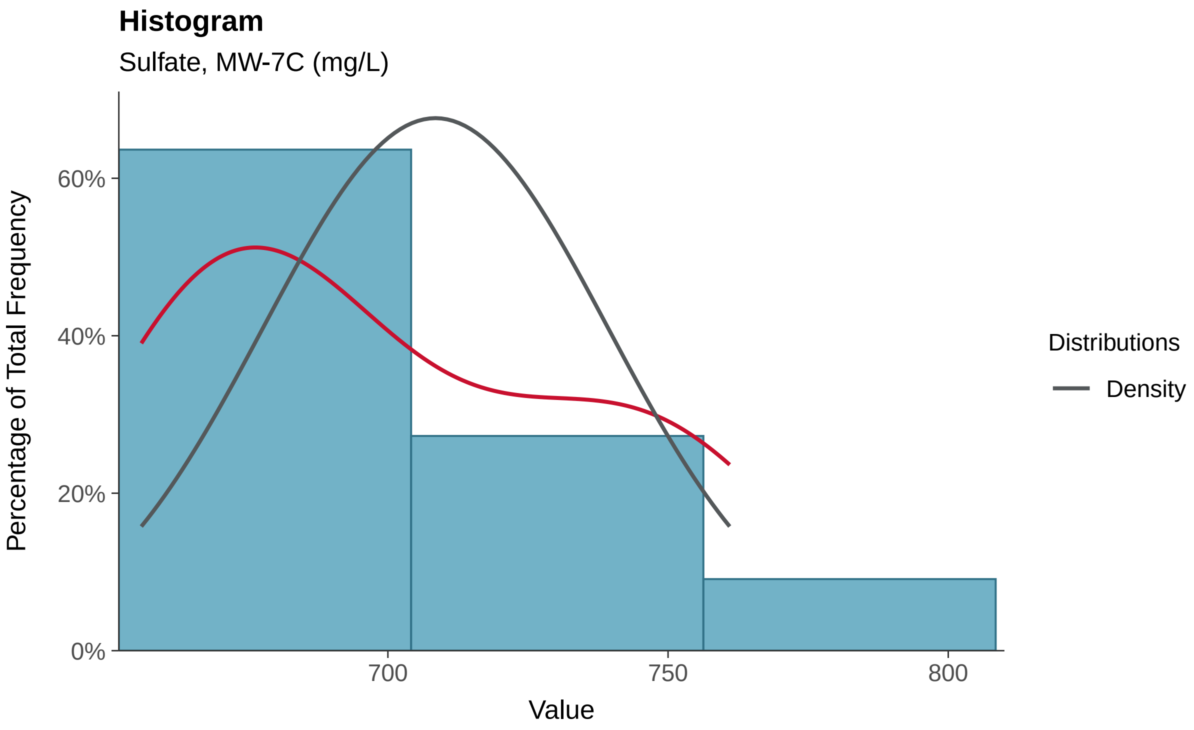
Fluoride, MW-7C (mg/L)



Appendix III: Sulfate, MW-7C

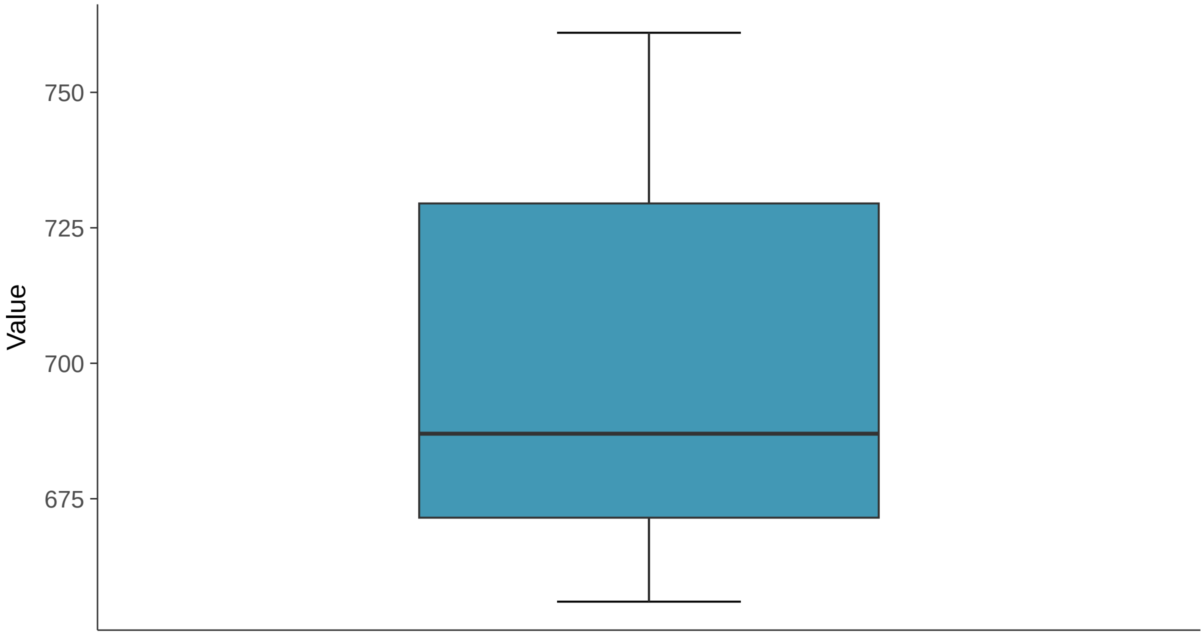
ID: 7C_1_05





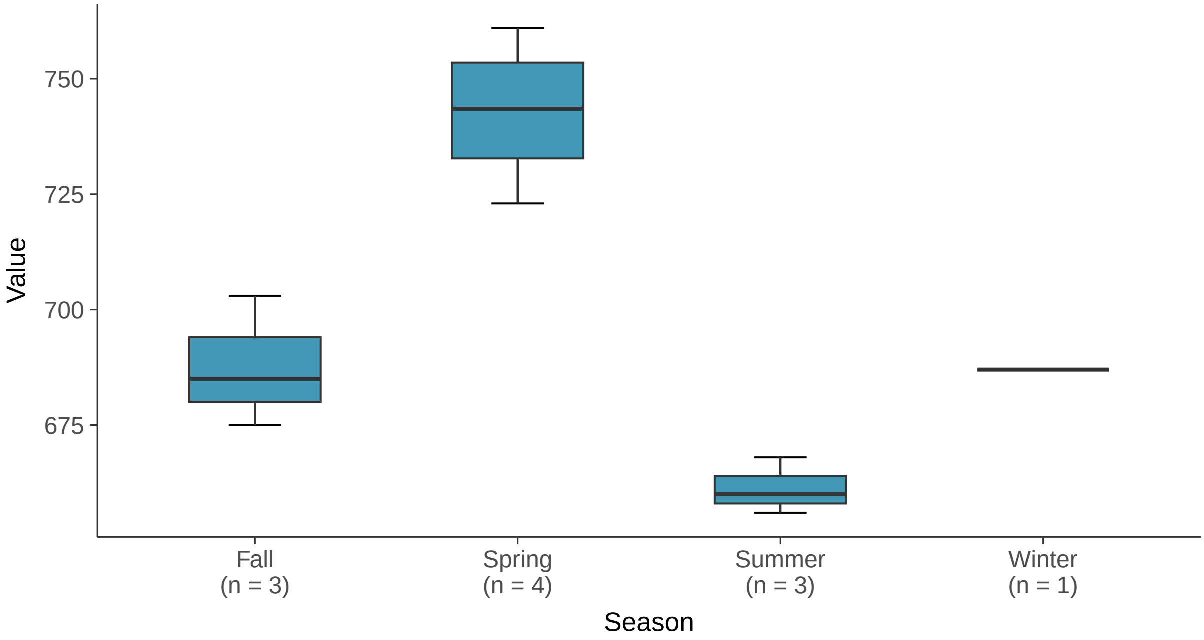
Boxplot

Sulfate, MW-7C (mg/L)



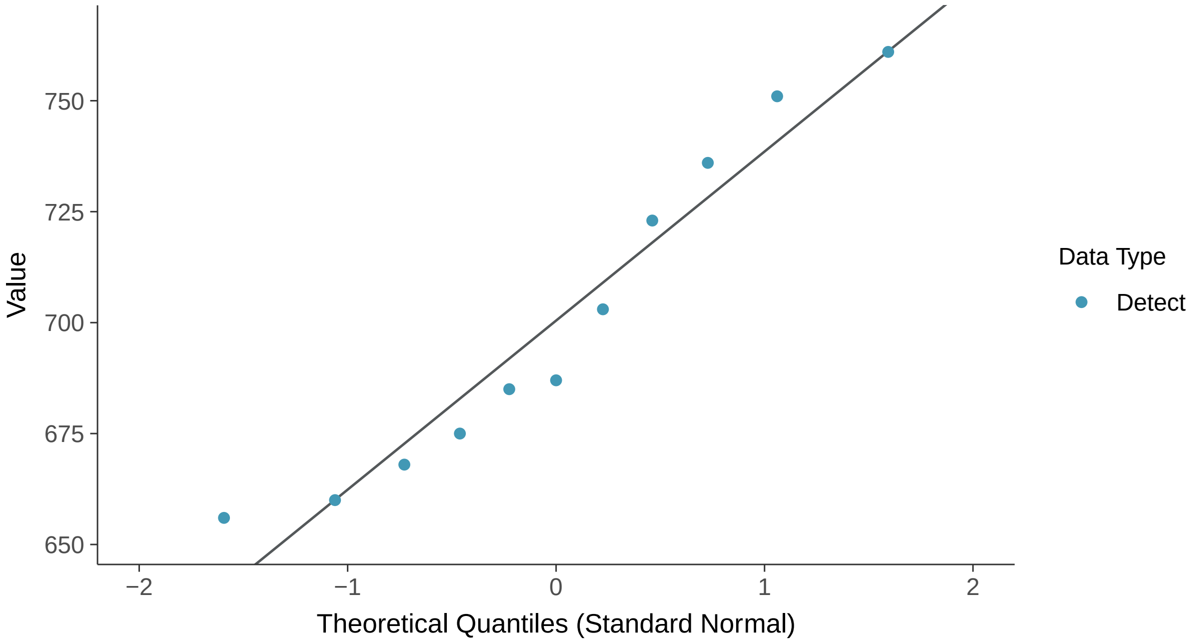
Boxplot by Season

Sulfate, MW-7C (mg/L)



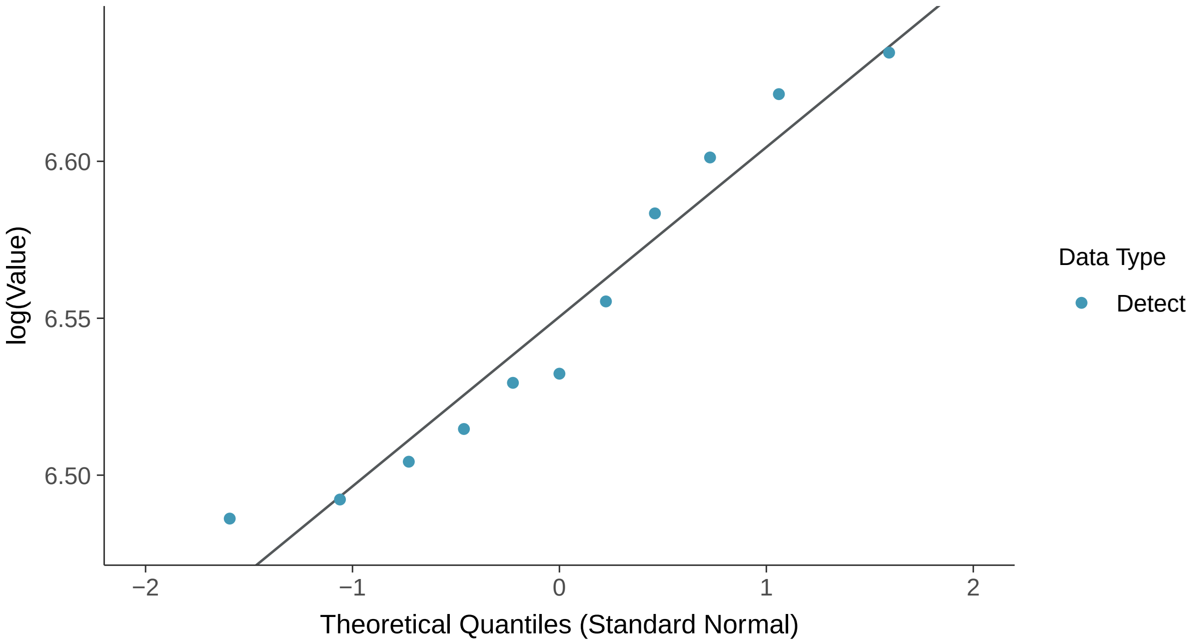
Normal Q-Q plot

Sulfate, MW-7C (mg/L)



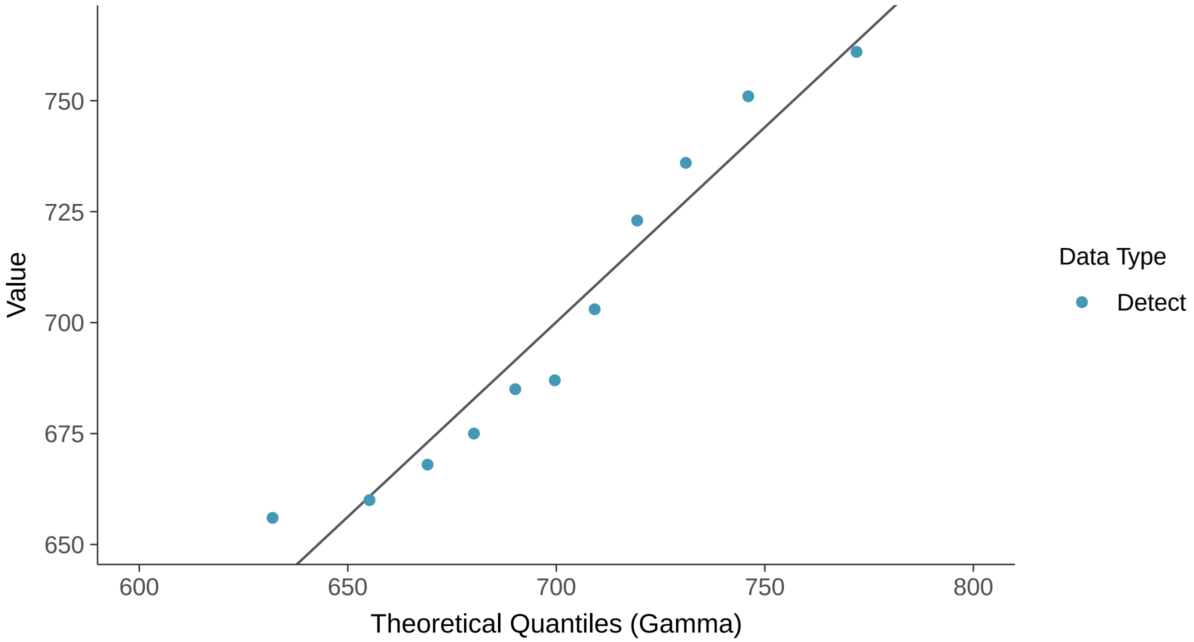
Lognormal Q-Q plot

Sulfate, MW-7C (mg/L)



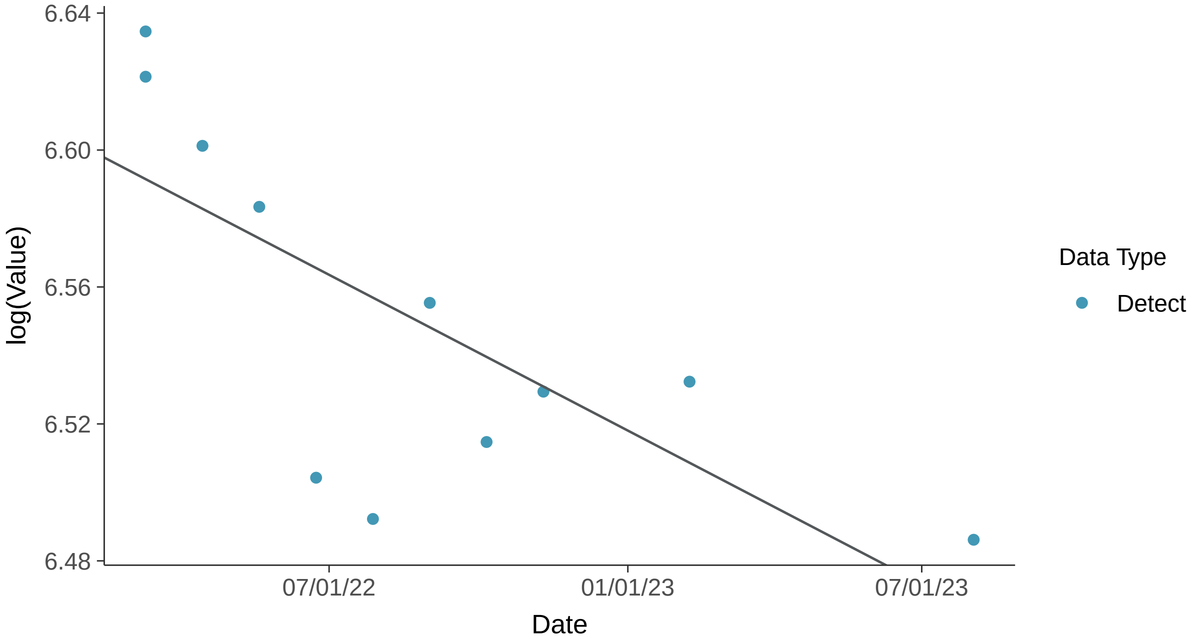
Gamma Q-Q plot

Sulfate, MW-7C (mg/L)



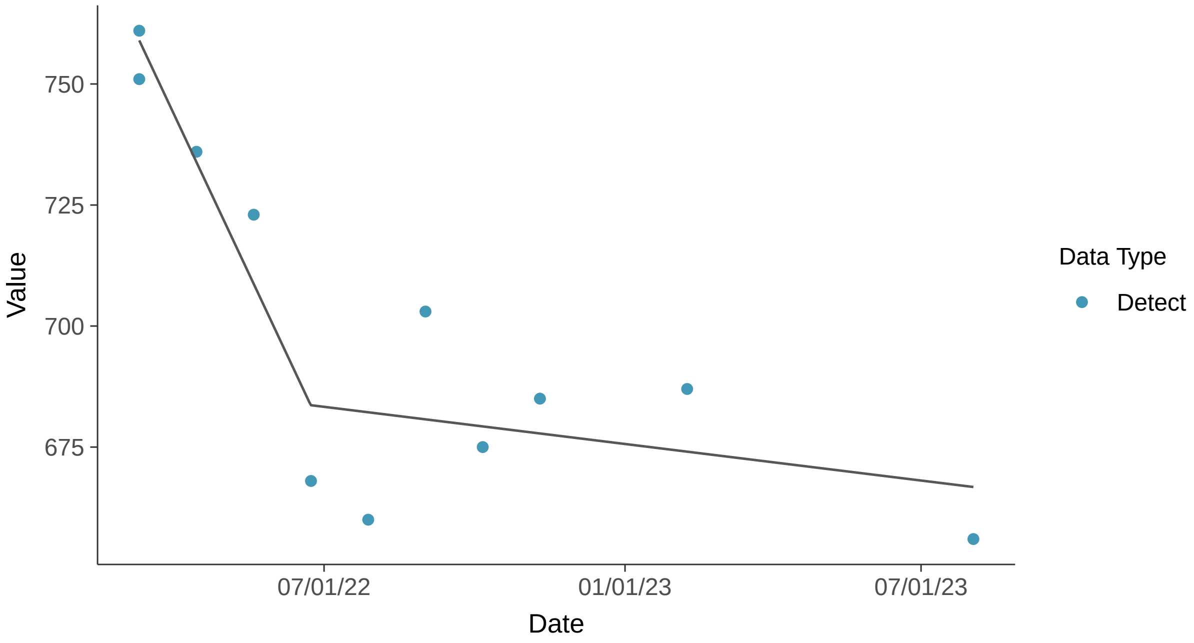
Trend Regression: Lognormal MLE

Sulfate, MW-7C (mg/L)



Trend Regression: Piecewise Linear-Linear

Sulfate, MW-7C (mg/L)

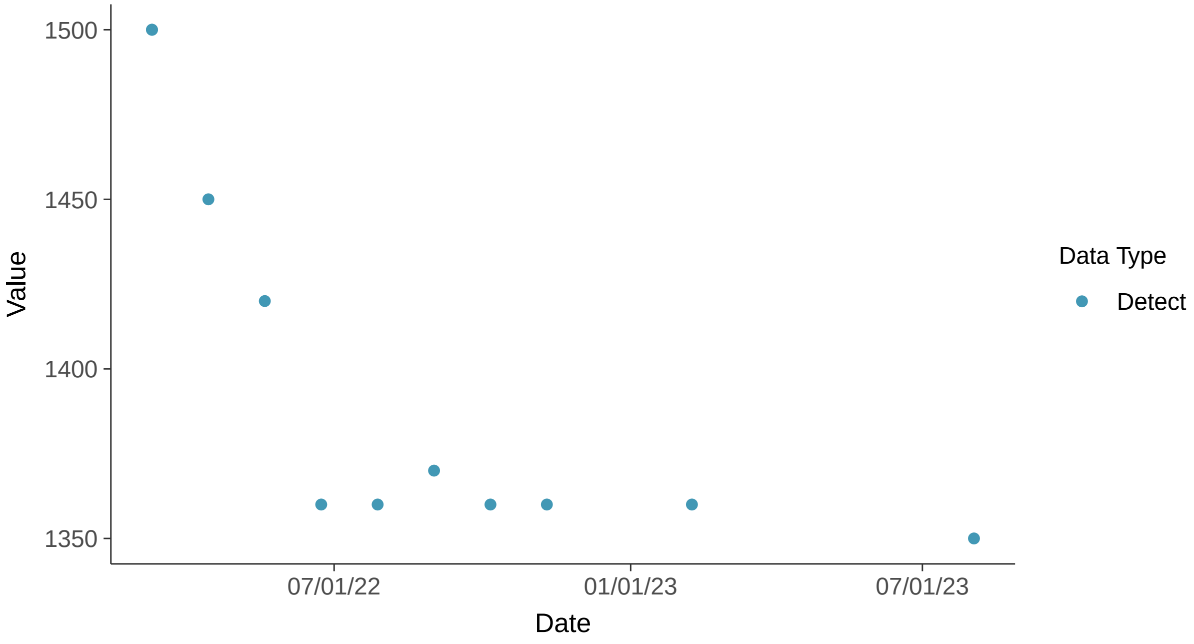


Appendix III: Total Dissolved Solids, MW-7C

ID: 7C_1_06

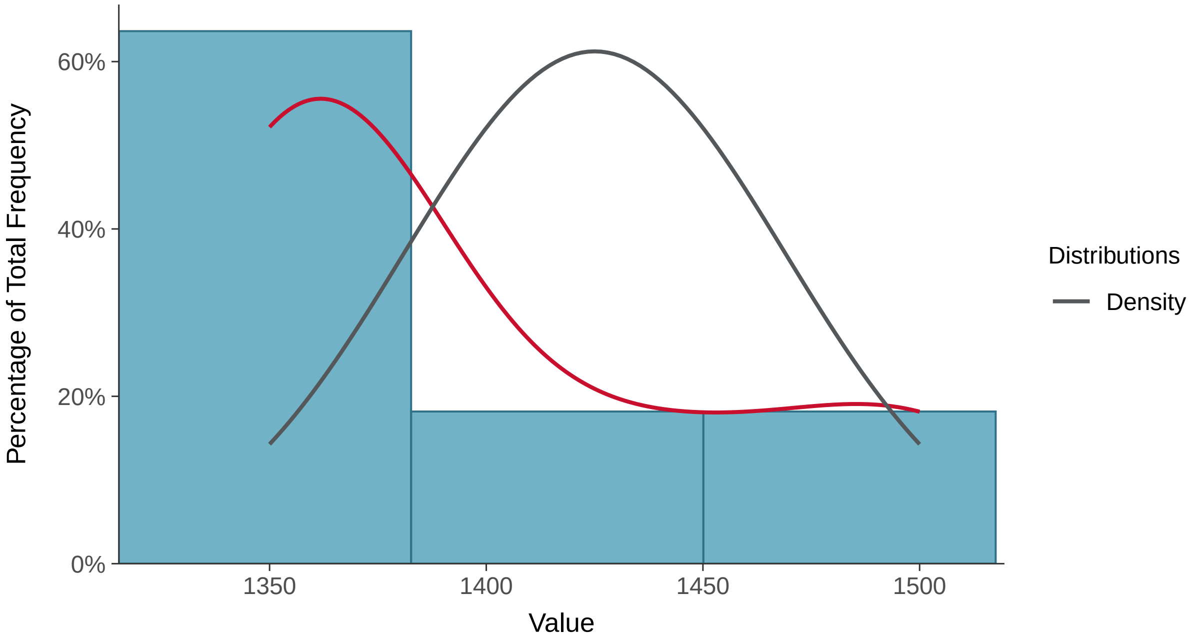
Scatter Plot

Total Dissolved Solids, MW-7C (mg/L)



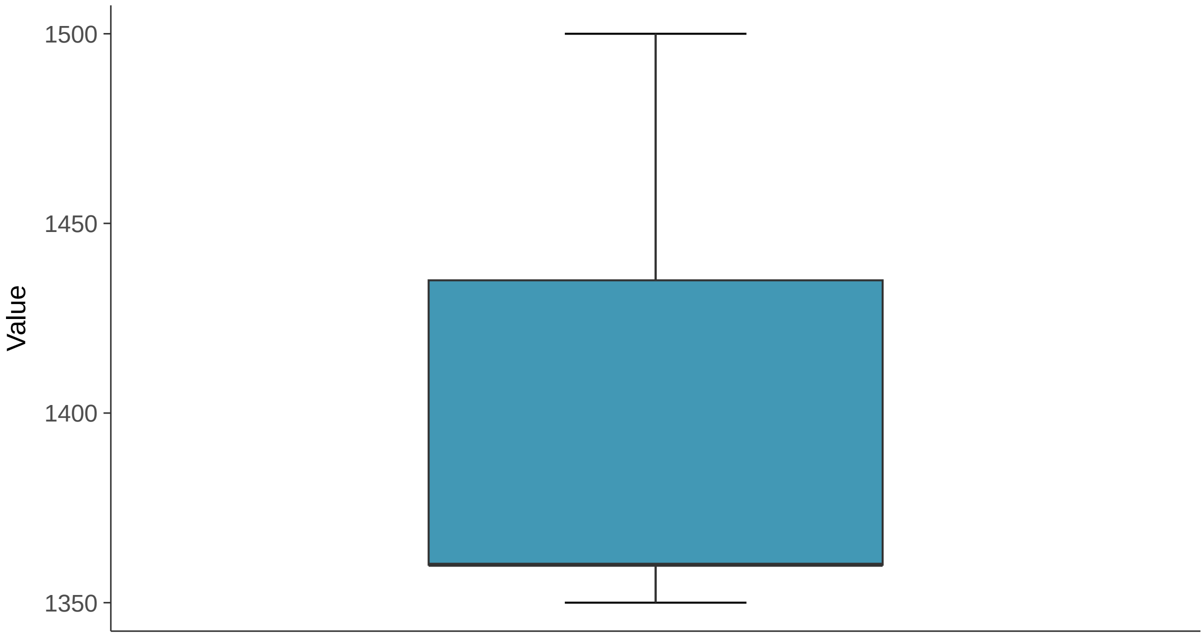
Histogram

Total Dissolved Solids, MW-7C (mg/L)



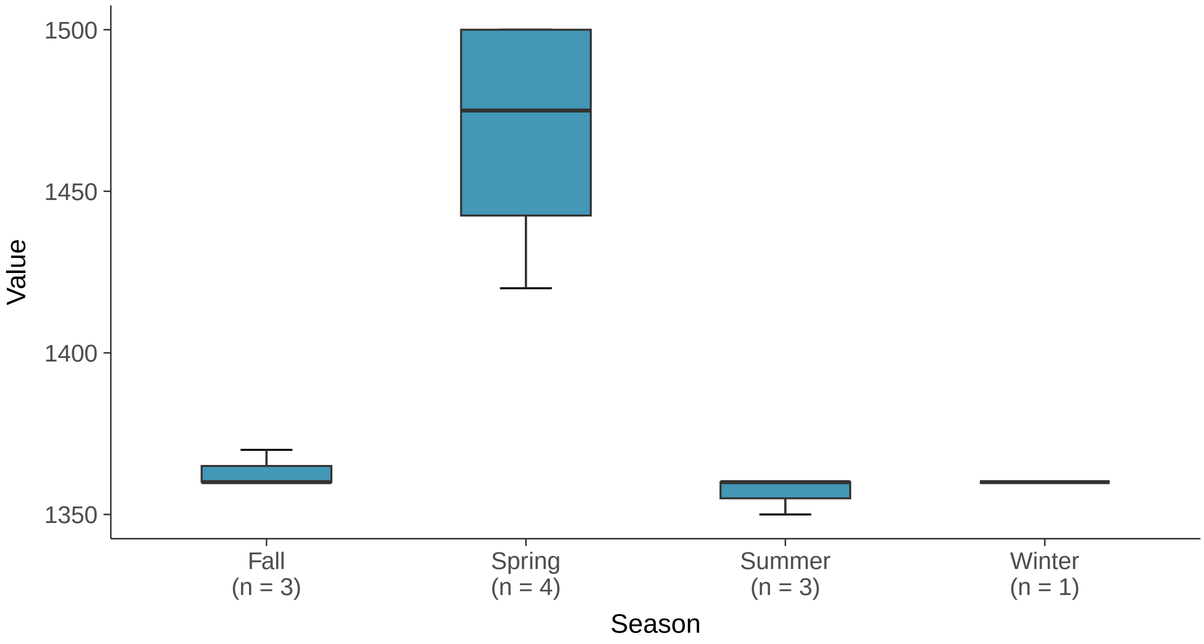
Boxplot

Total Dissolved Solids, MW-7C (mg/L)



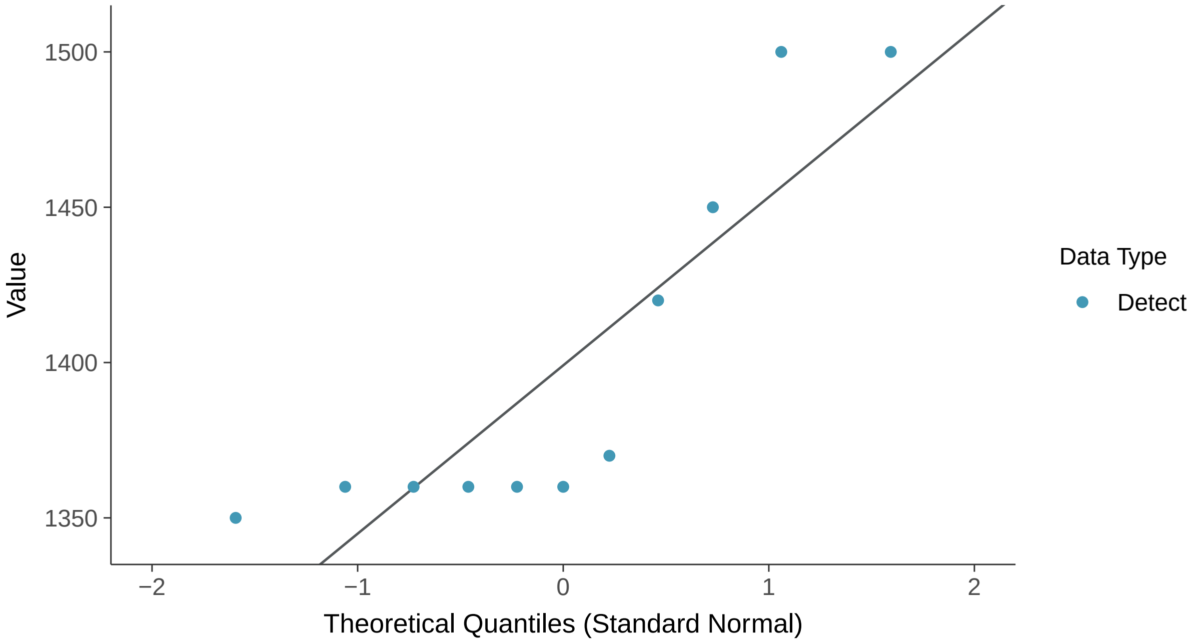
Boxplot by Season

Total Dissolved Solids, MW-7C (mg/L)



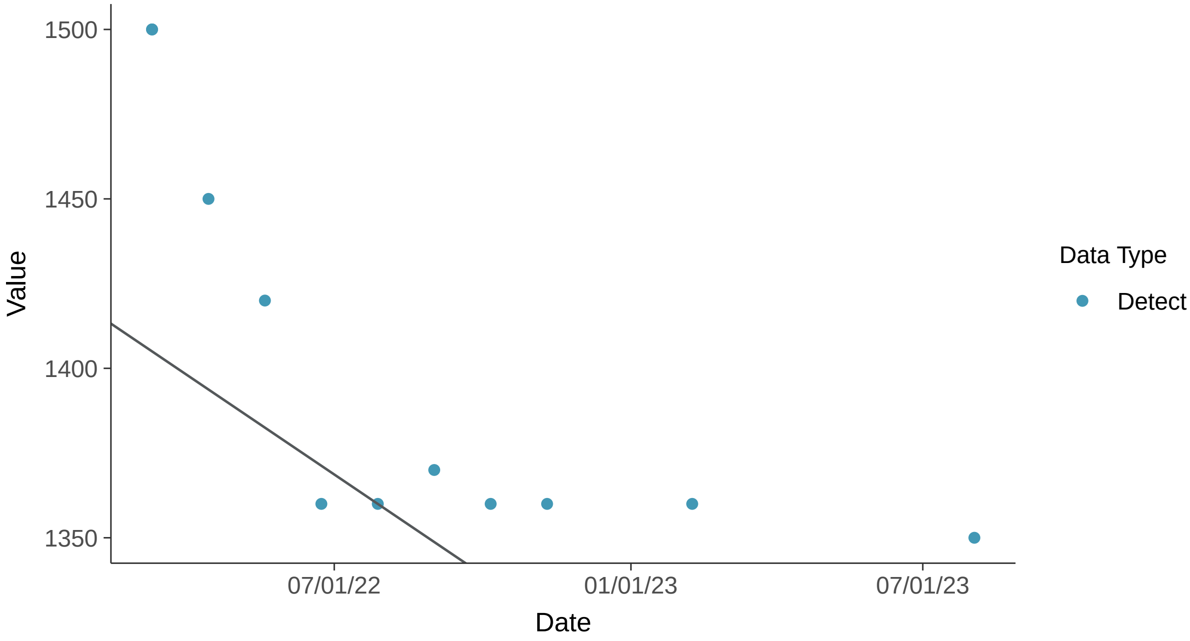
Normal Q-Q plot

Total Dissolved Solids, MW-7C (mg/L)



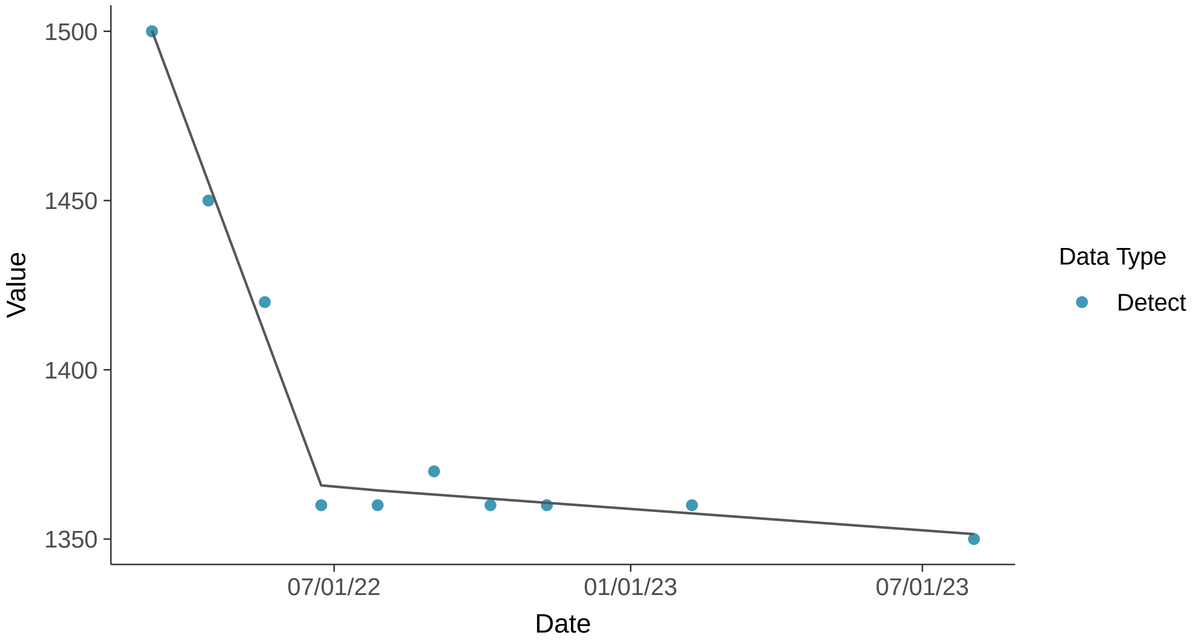
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Total Dissolved Solids, MW-7C (mg/L)



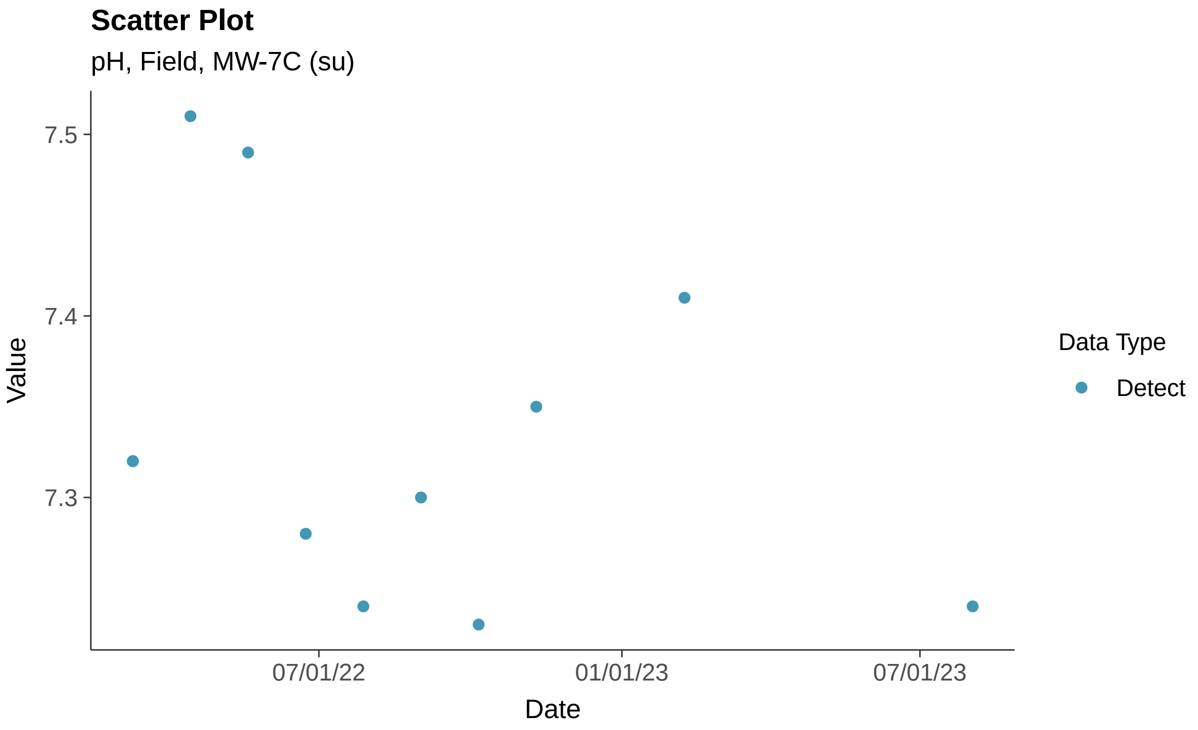
Trend Regression: Piecewise Linear-Linear

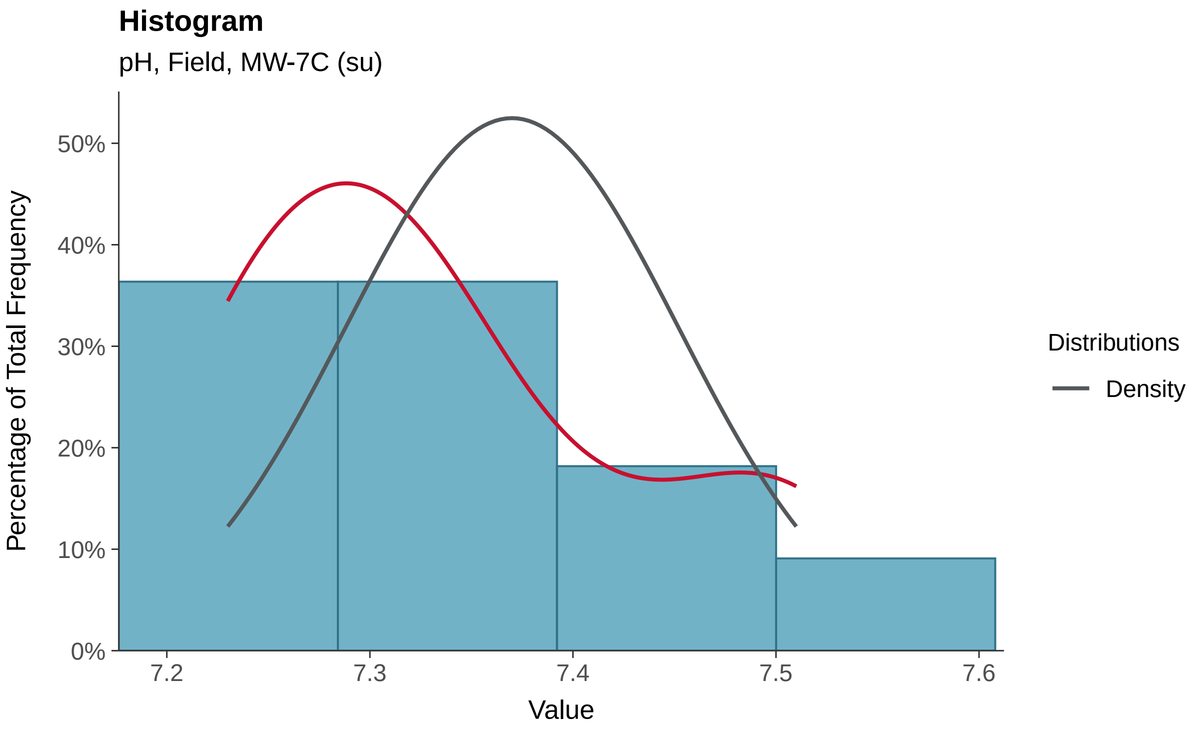
Total Dissolved Solids, MW-7C (mg/L)



Appendix III: pH, Field, MW-7C

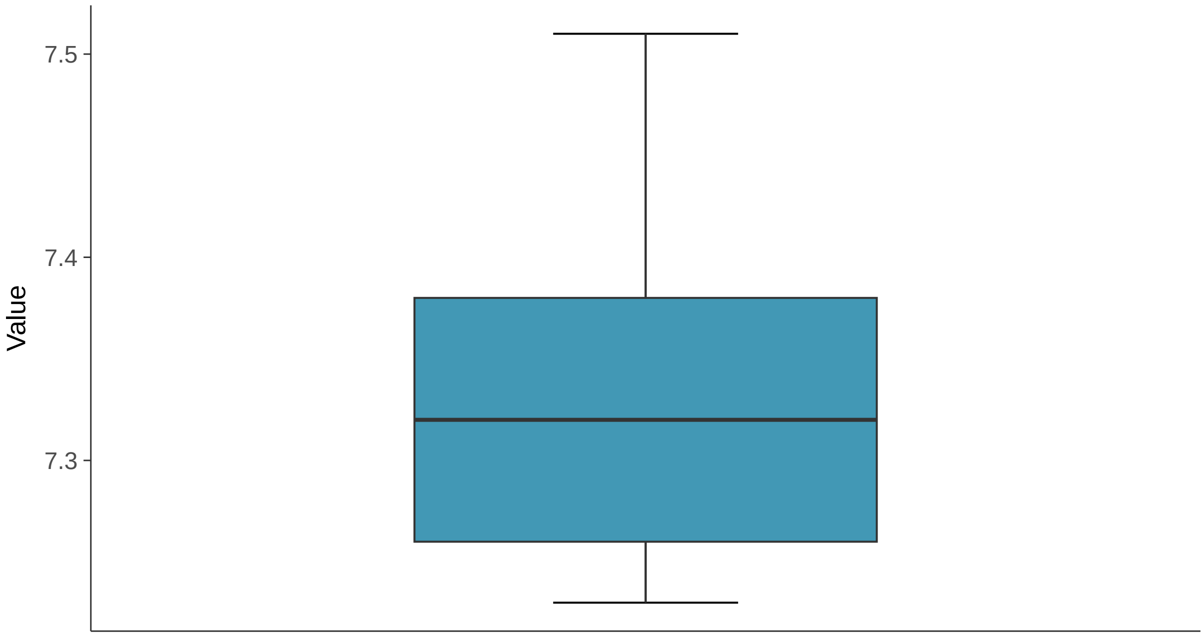
ID: 7C_1_07





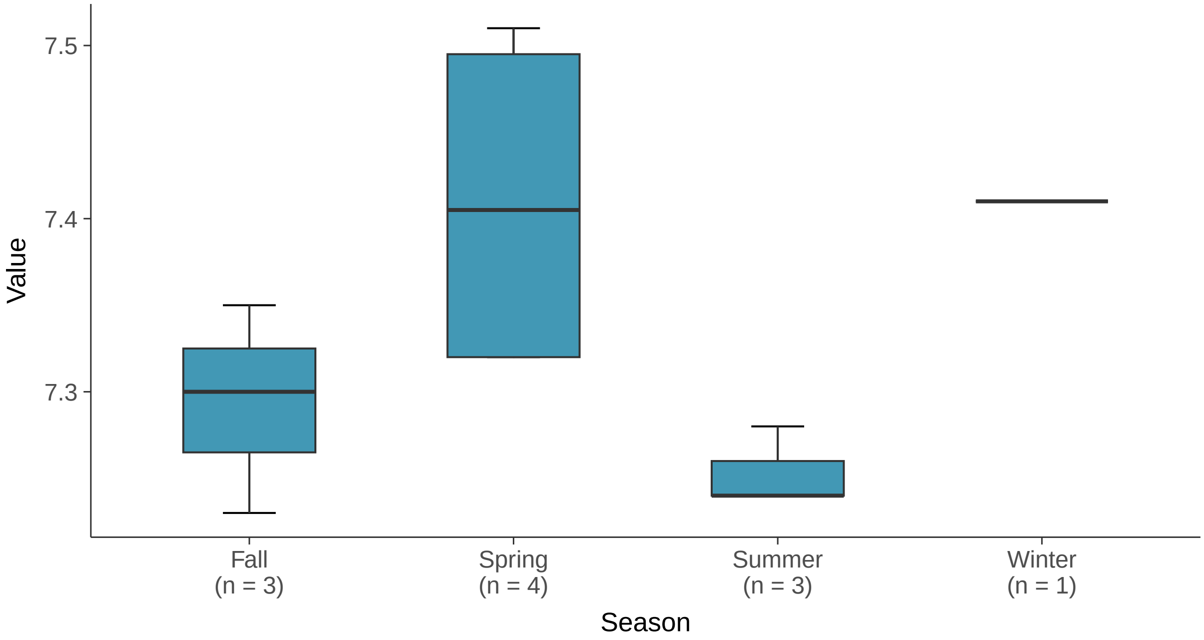
Boxplot

pH, Field, MW-7C (su)



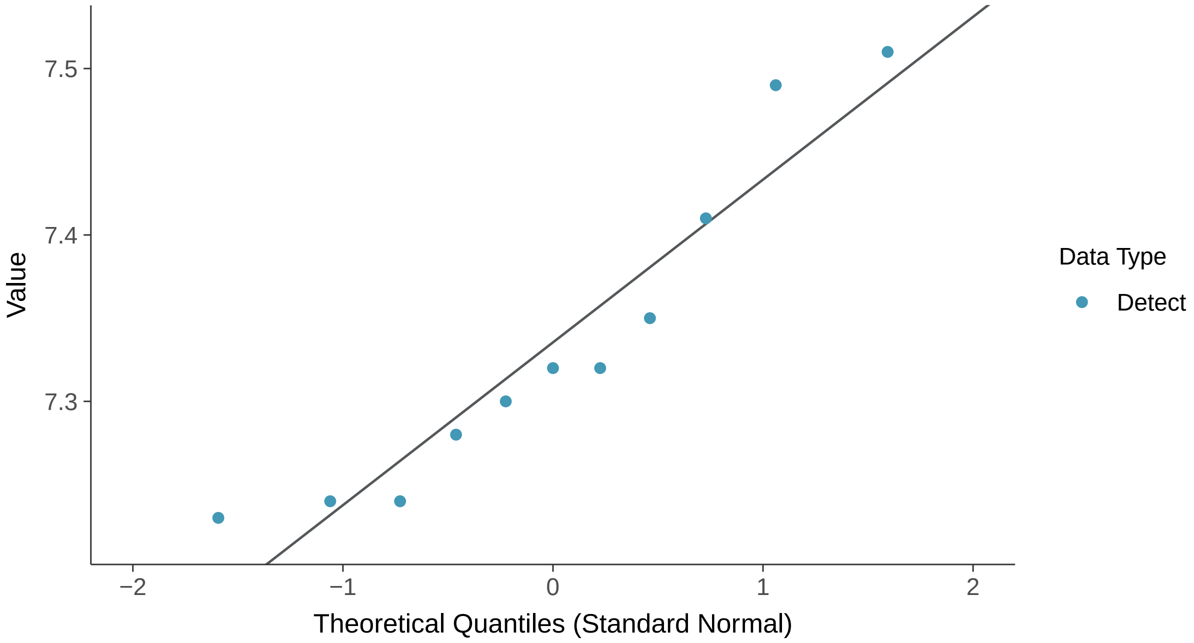
Boxplot by Season

pH, Field, MW-7C (su)



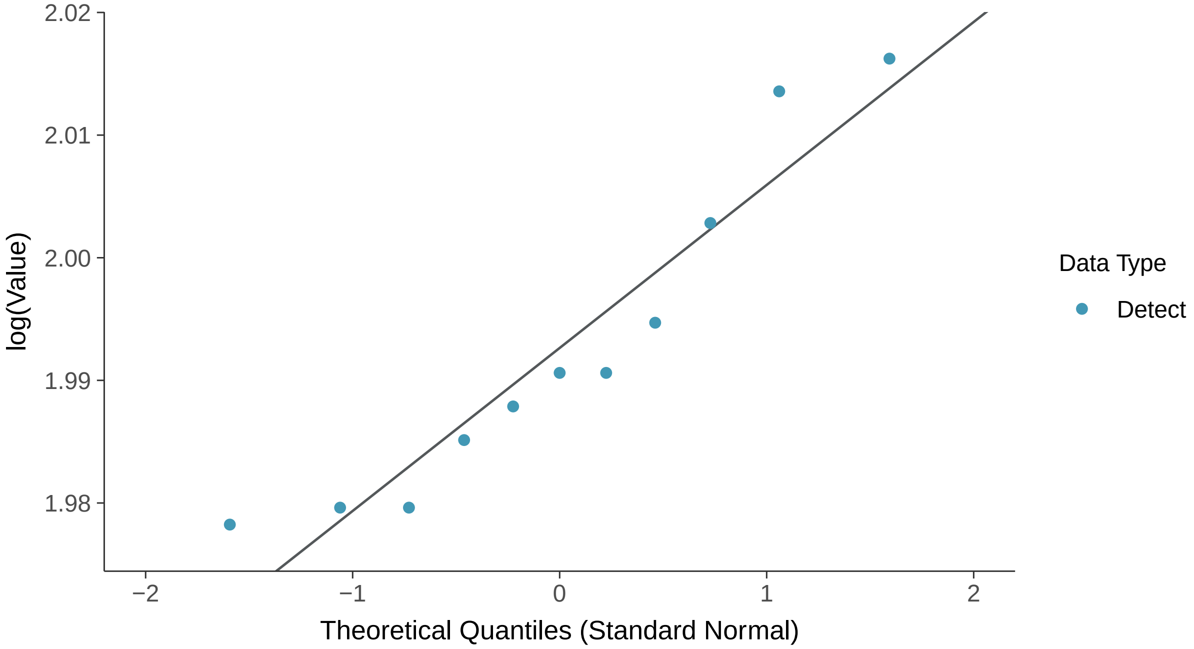
Normal Q-Q plot

pH, Field, MW-7C (su)



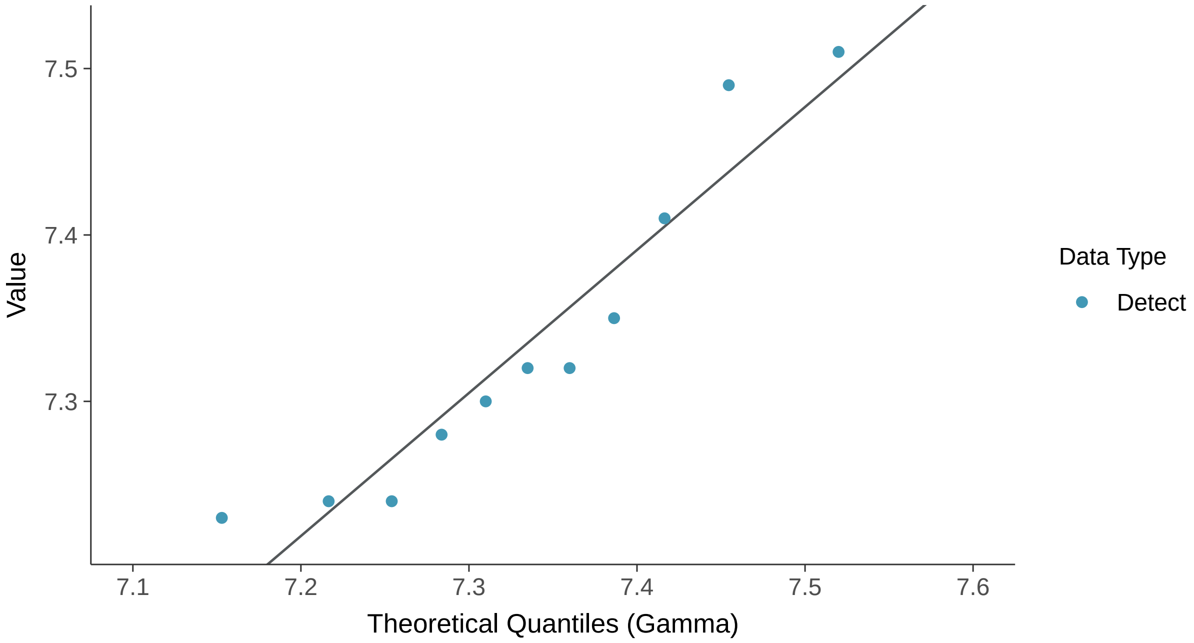
Lognormal Q-Q plot

pH, Field, MW-7C (su)



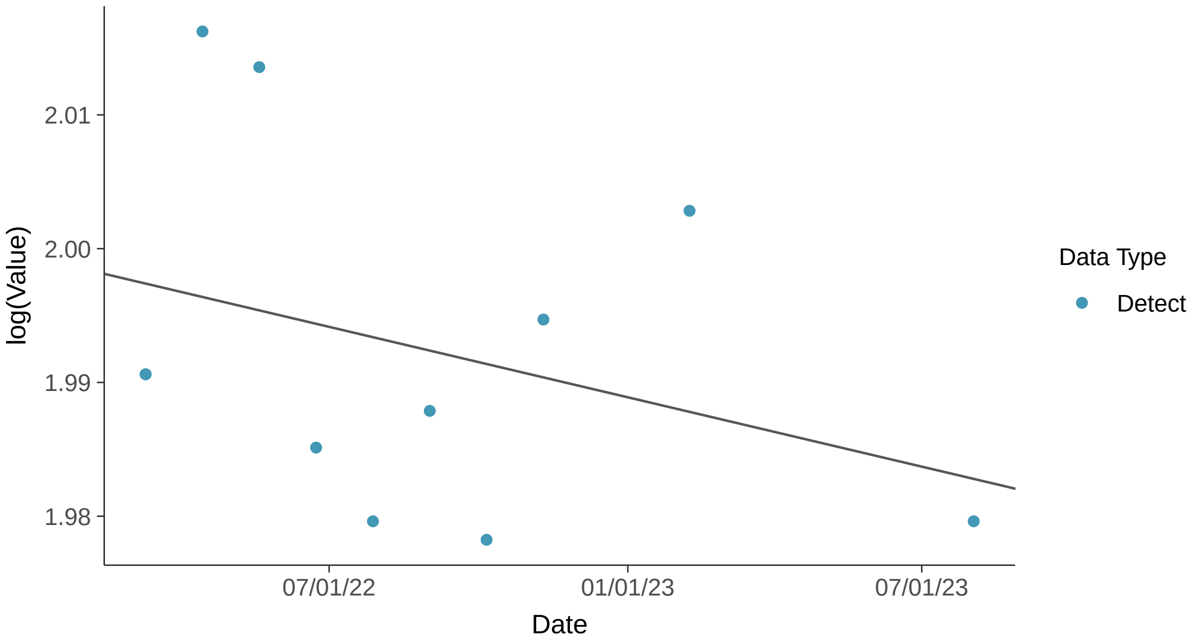
Gamma Q-Q plot

pH, Field, MW-7C (su)



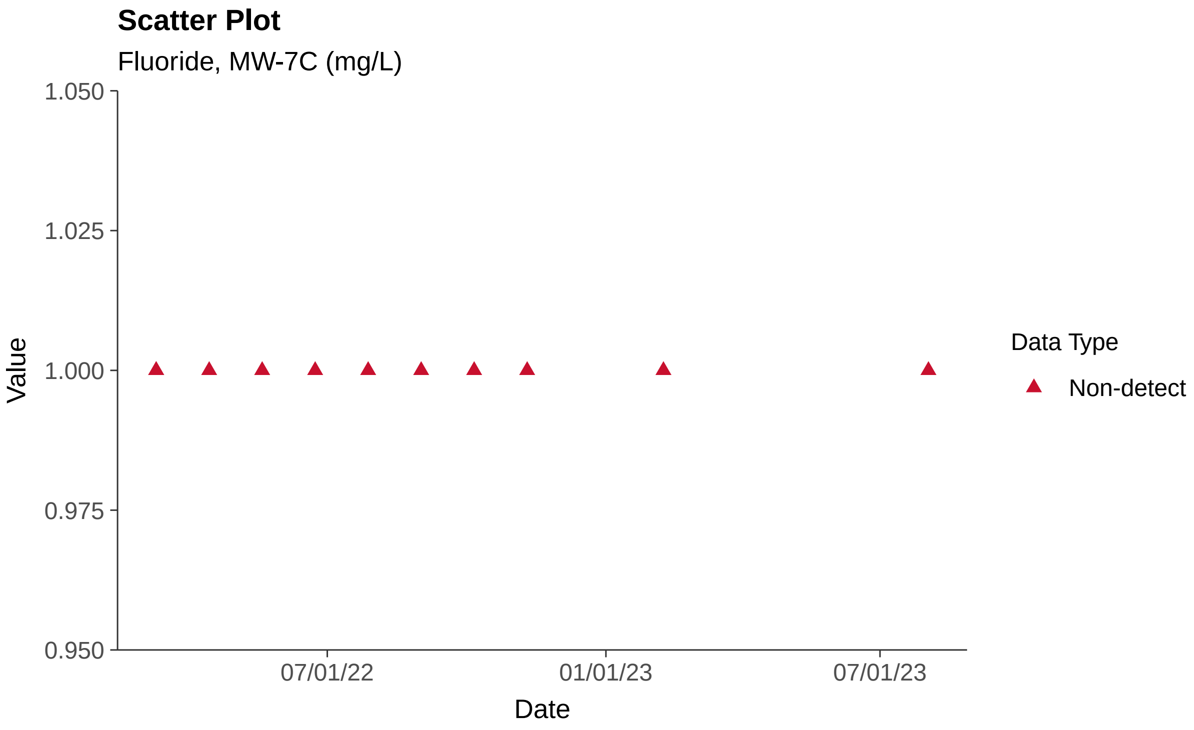
Trend Regression: Lognormal MLE

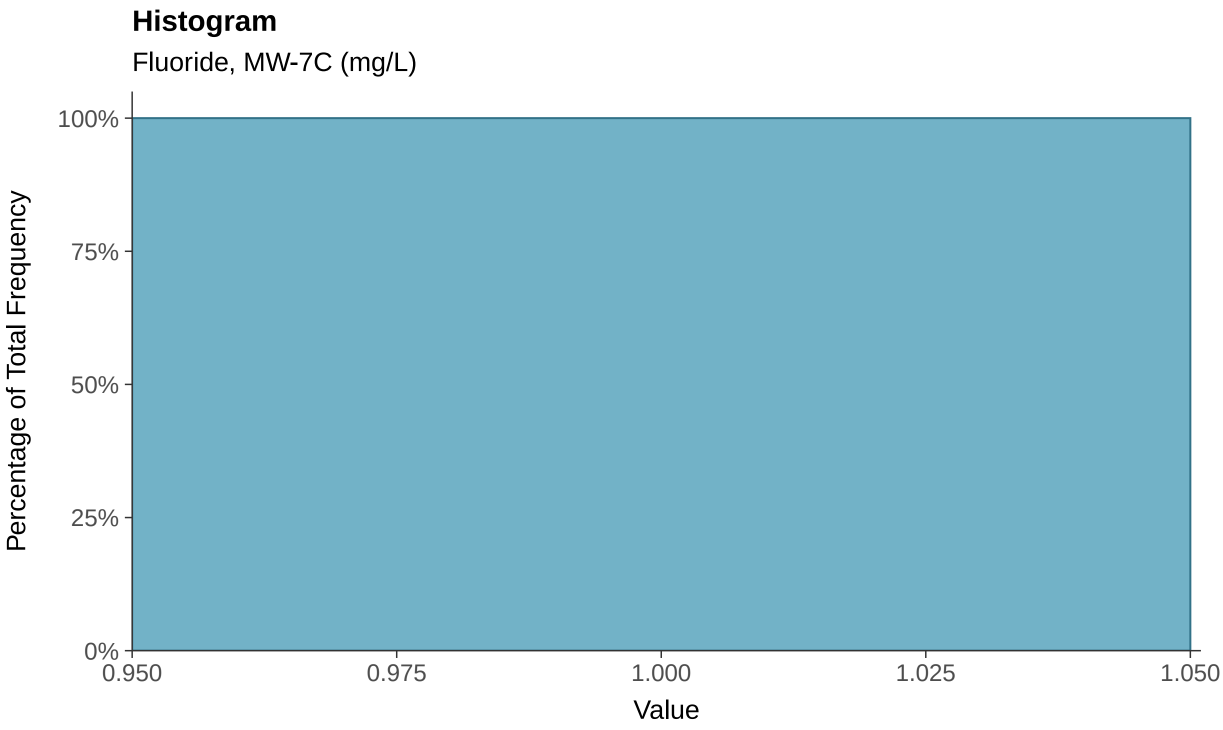
pH, Field, MW-7C (su)



Appendix IV: Fluoride, MW-7C

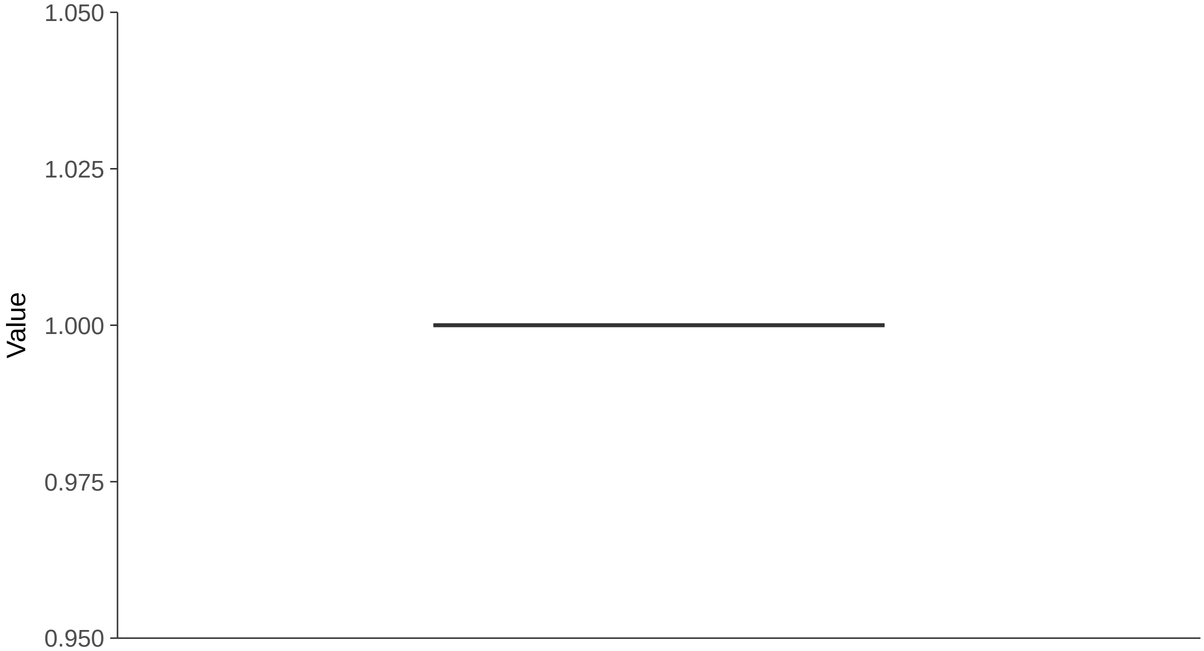
ID: 7C_2_04





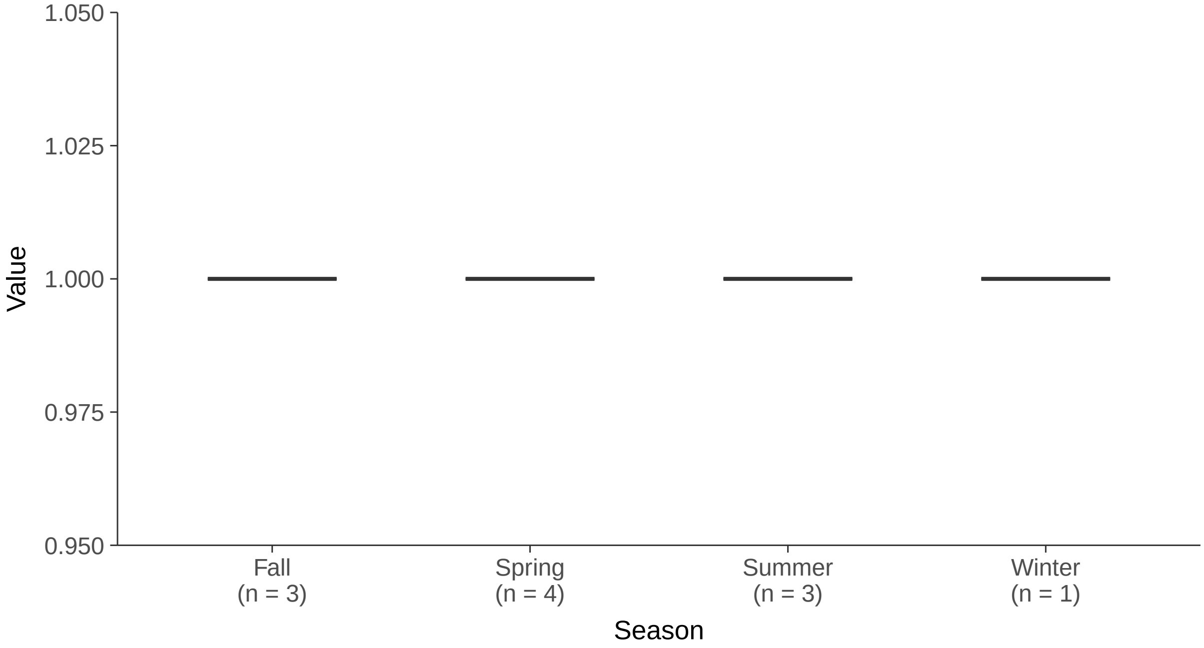
Boxplot

Fluoride, MW-7C (mg/L)



Boxplot by Season

Fluoride, MW-7C (mg/L)

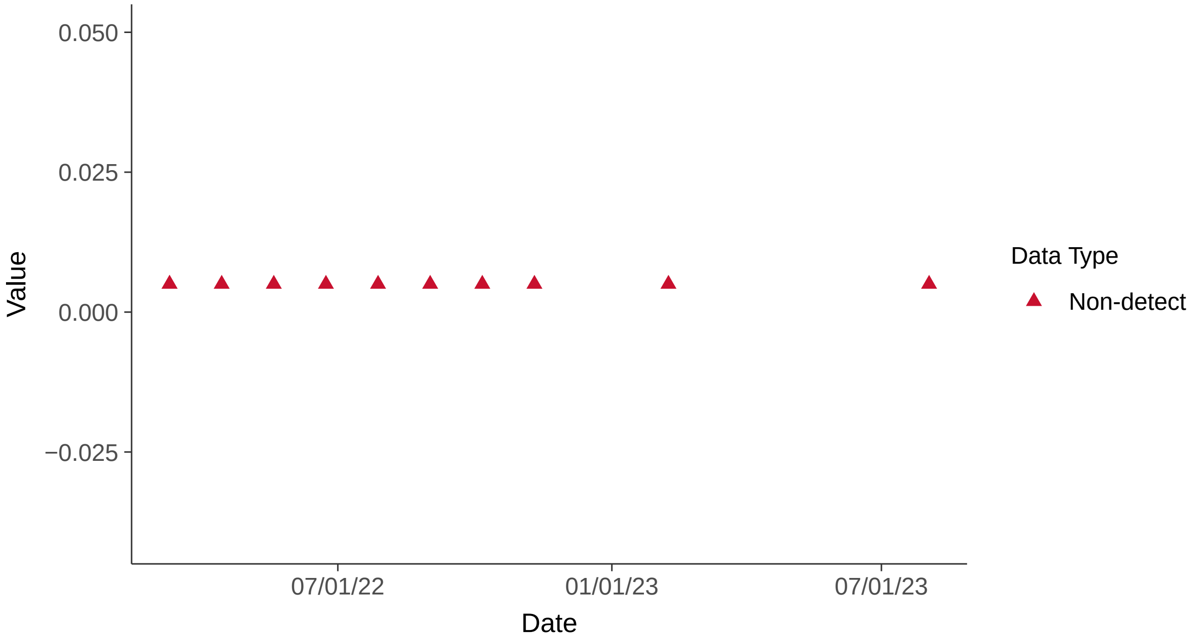


Appendix IV: Antimony, MW-7C

ID: 7C_2_08

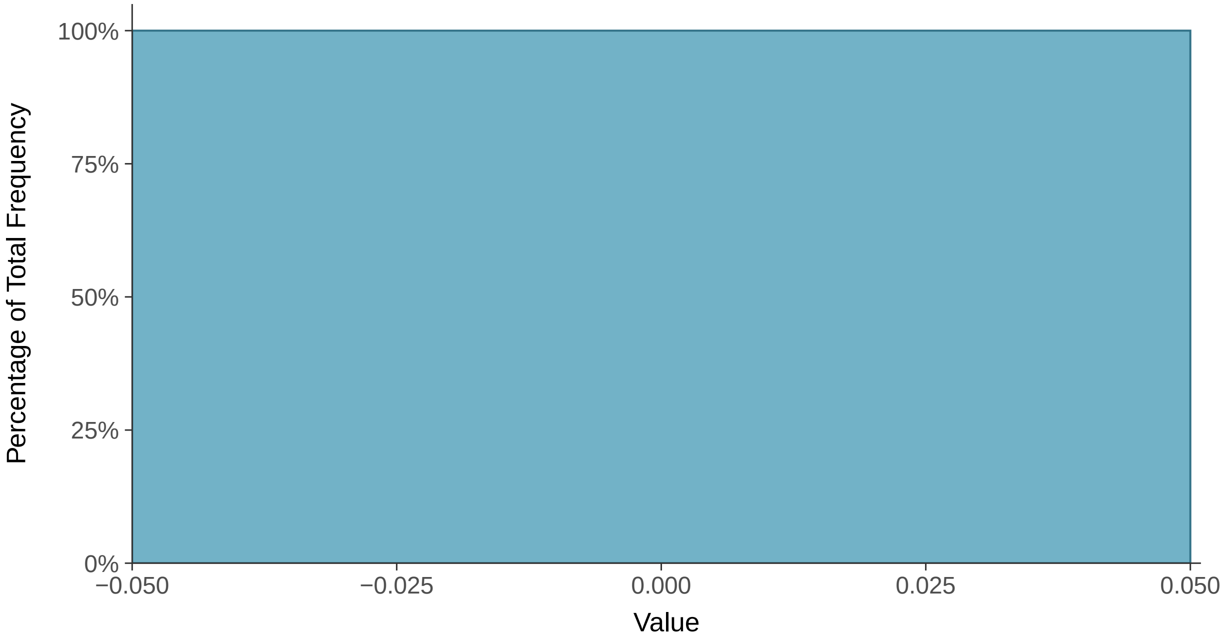
Scatter Plot

Antimony, MW-7C (mg/L)



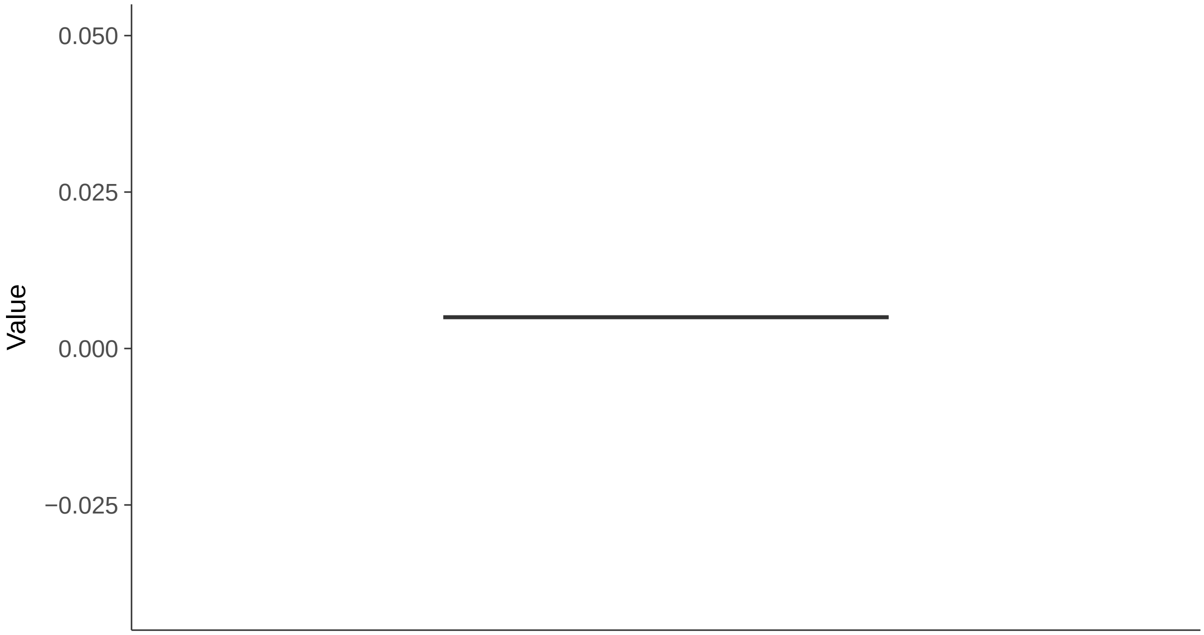
Histogram

Antimony, MW-7C (mg/L)



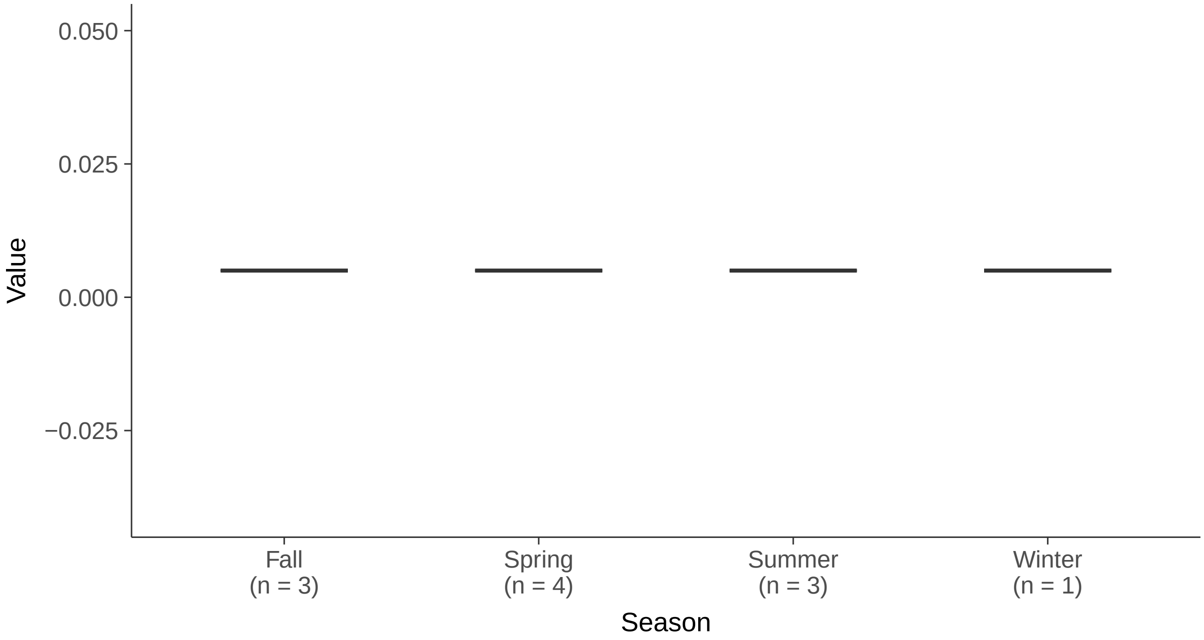
Boxplot

Antimony, MW-7C (mg/L)



Boxplot by Season

Antimony, MW-7C (mg/L)

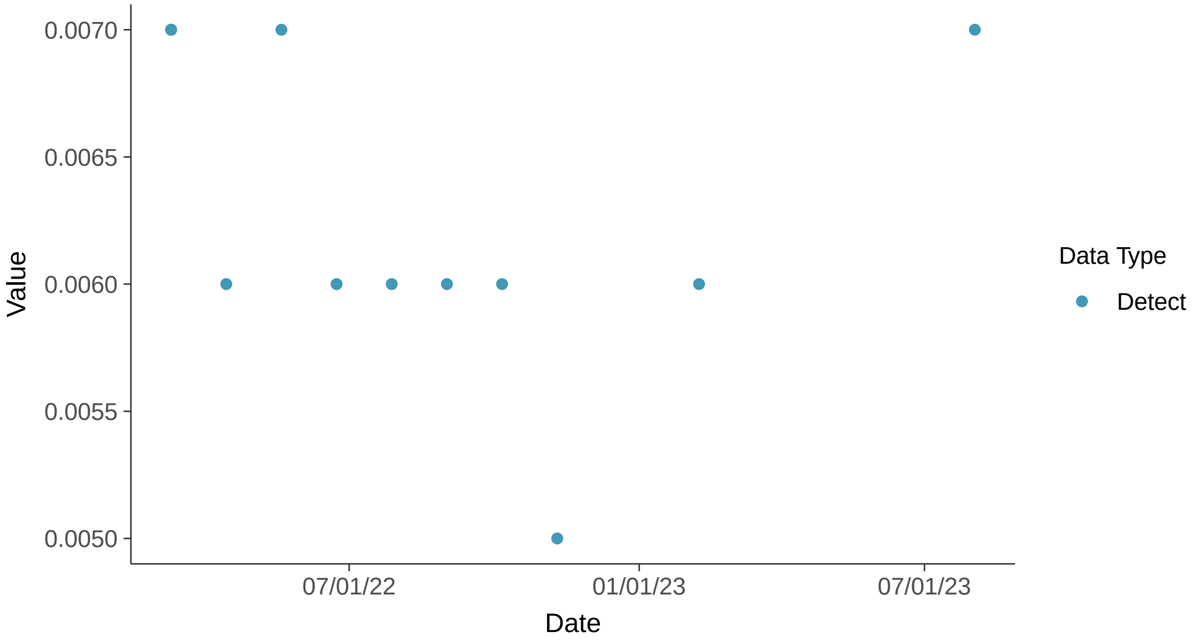


Appendix IV: Arsenic, MW-7C

ID: 7C_2_09

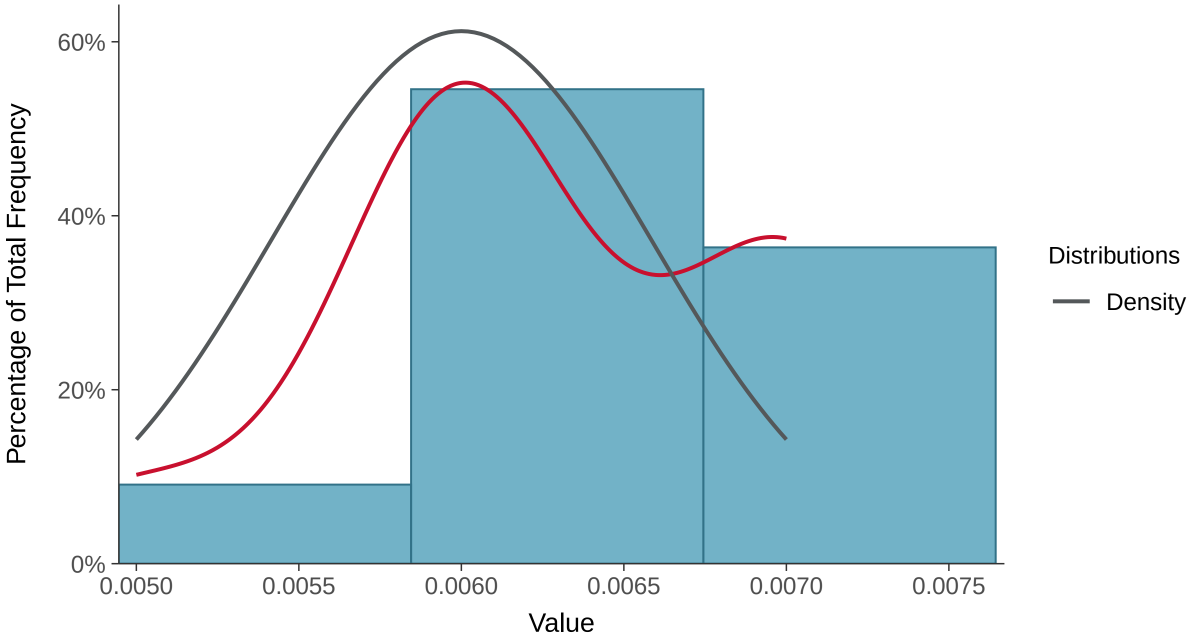
Scatter Plot

Arsenic, MW-7C (mg/L)



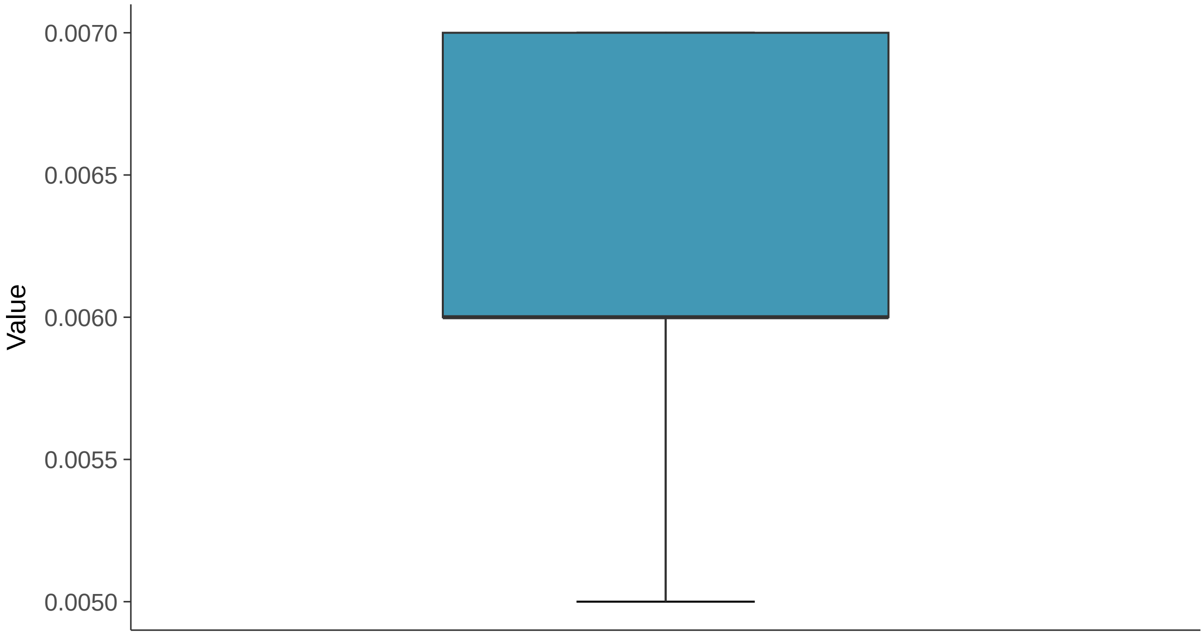
Histogram

Arsenic, MW-7C (mg/L)



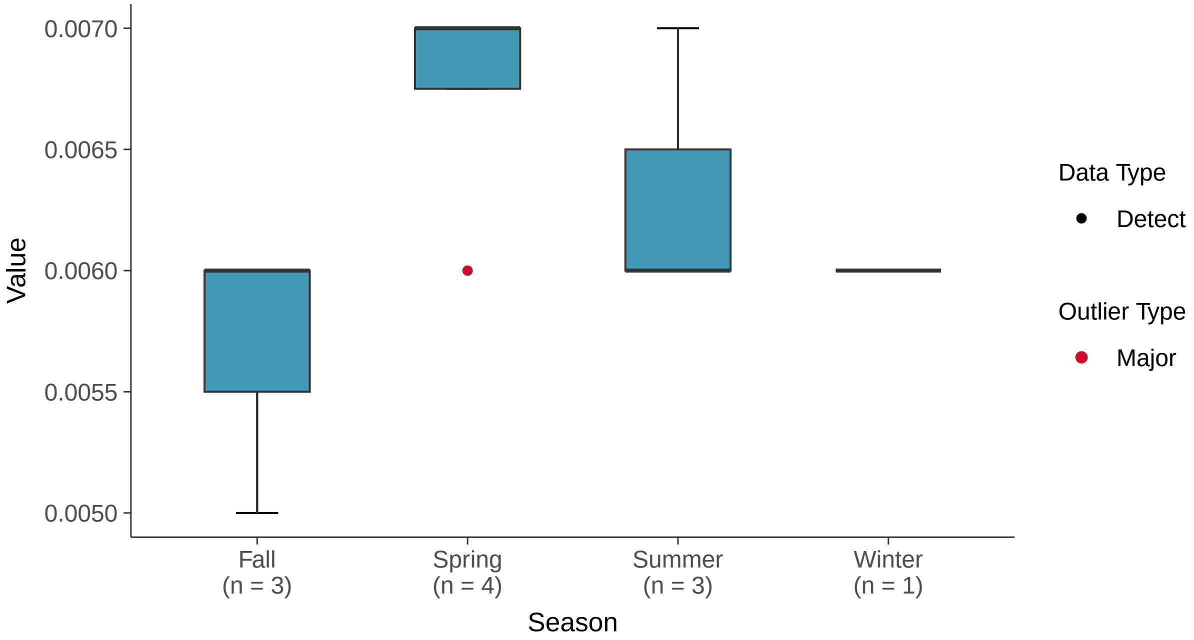
Boxplot

Arsenic, MW-7C (mg/L)



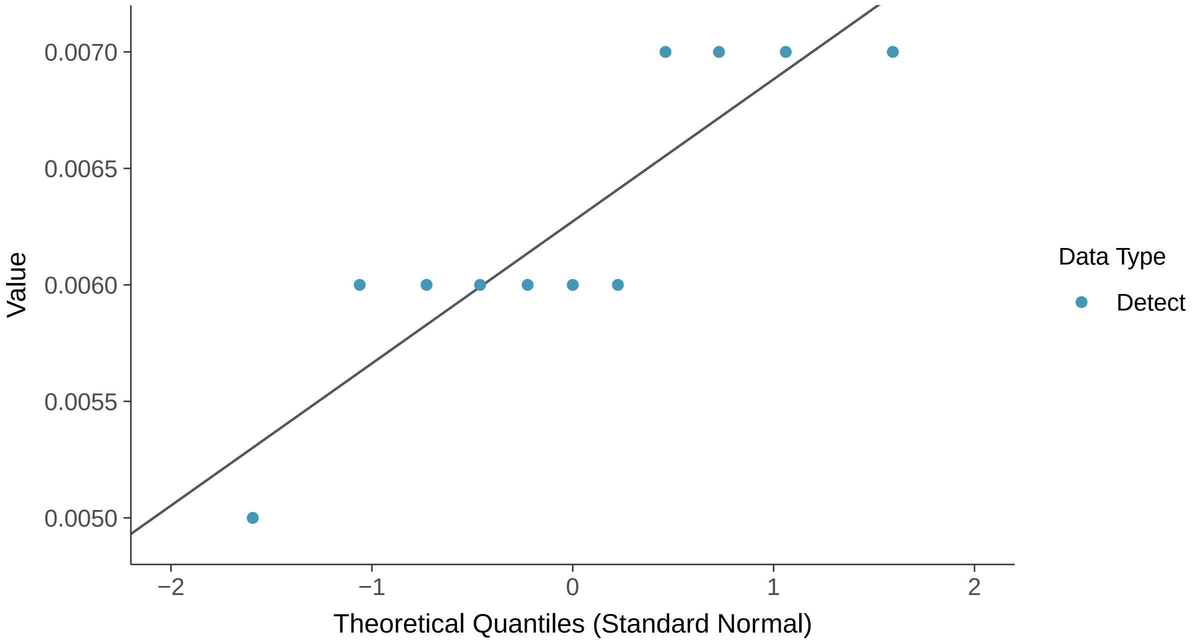
Boxplot by Season

Arsenic, MW-7C (mg/L)



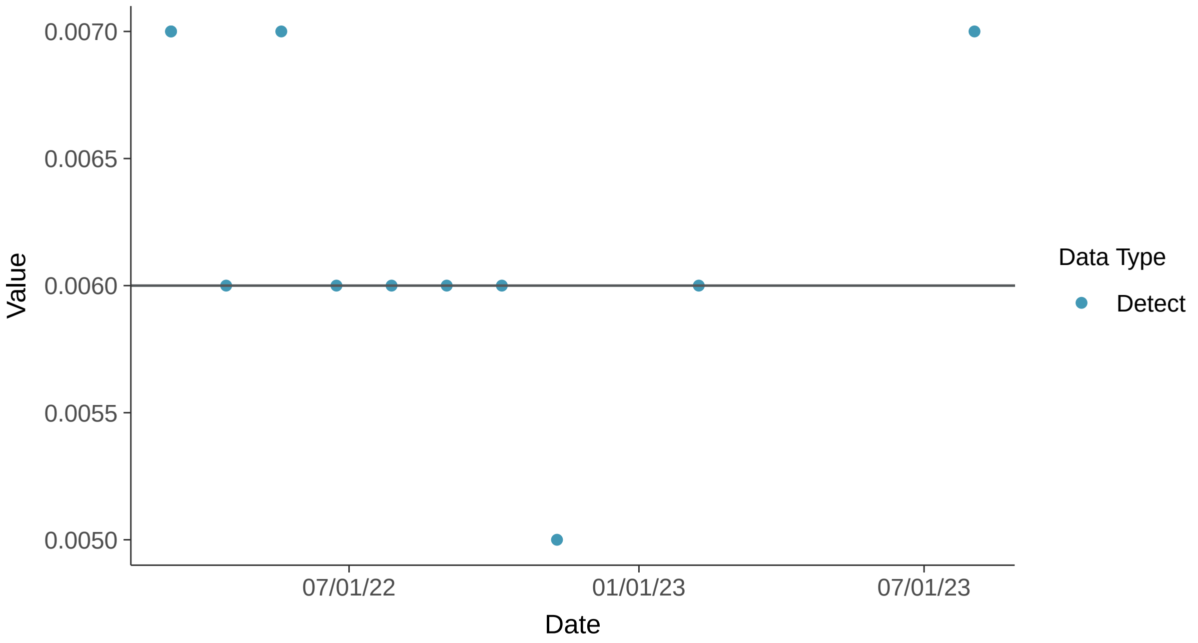
Normal Q-Q plot

Arsenic, MW-7C (mg/L)



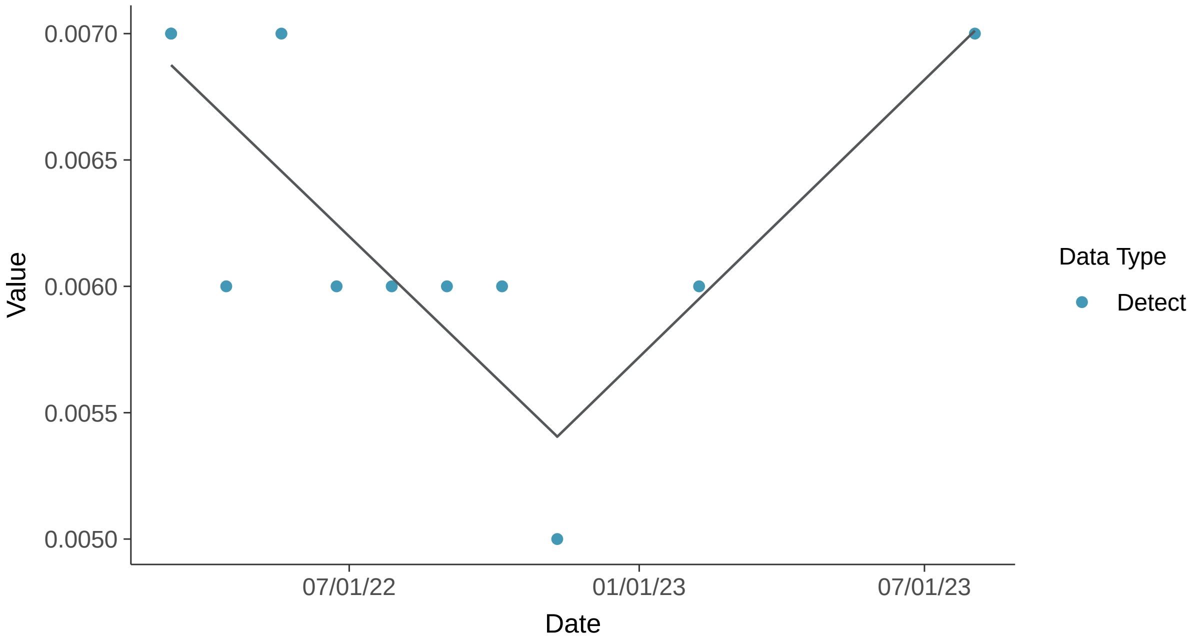
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Arsenic, MW-7C (mg/L)



Trend Regression: Piecewise Linear-Linear

Arsenic, MW-7C (mg/L)

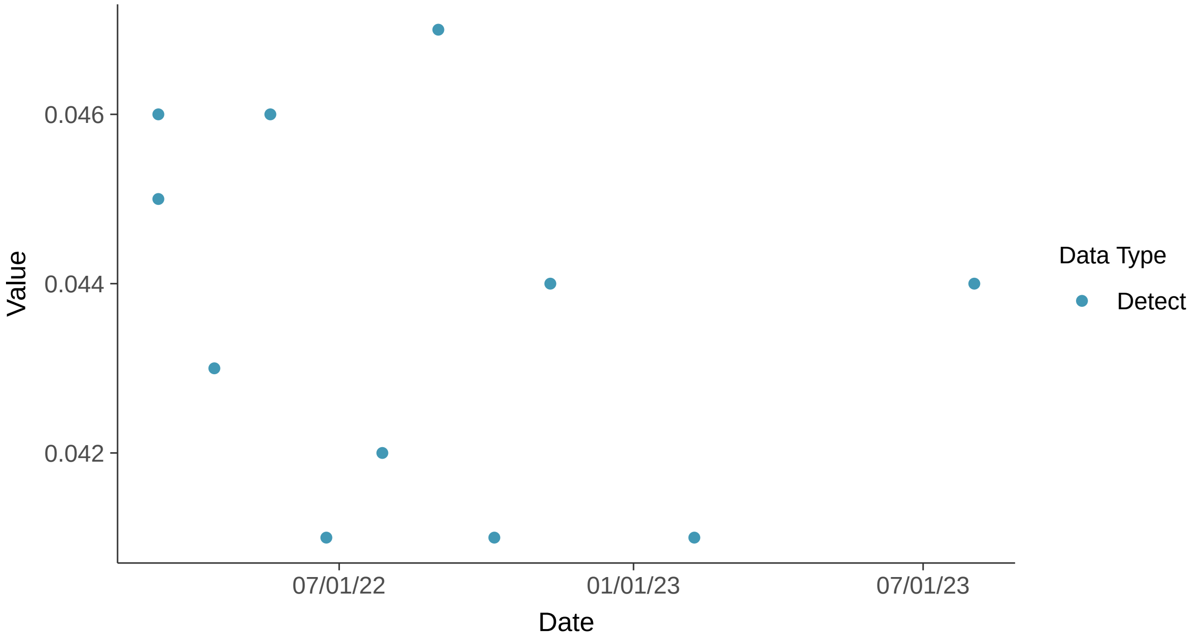


Appendix IV: Barium, MW-7C

ID: 7C_2_10

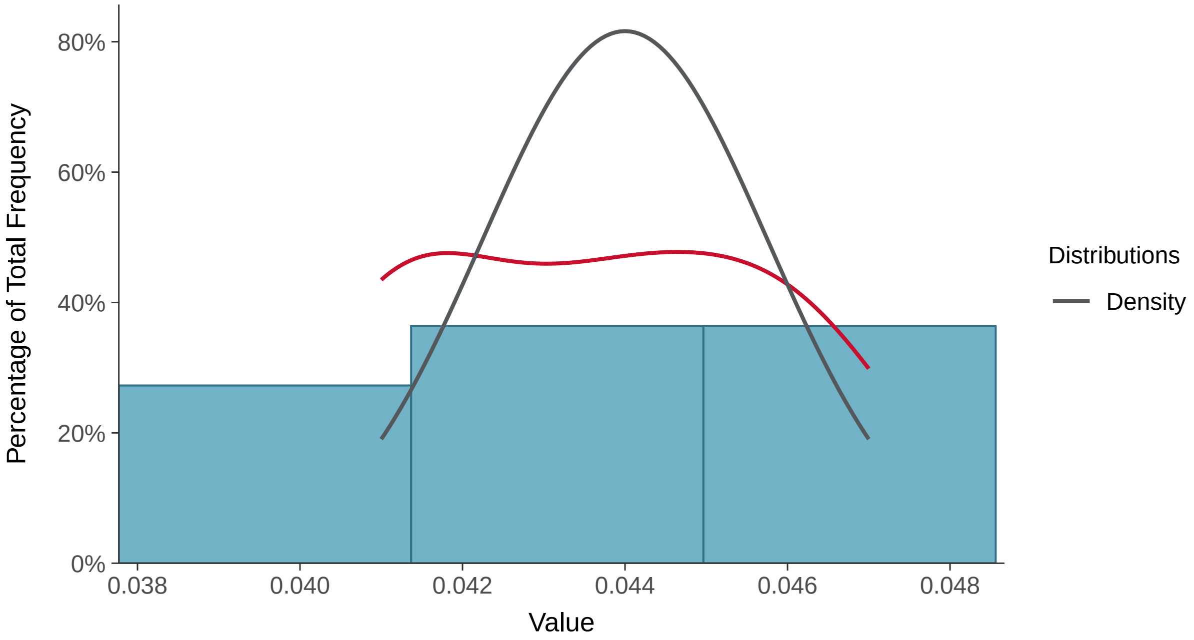
Scatter Plot

Barium, MW-7C (mg/L)



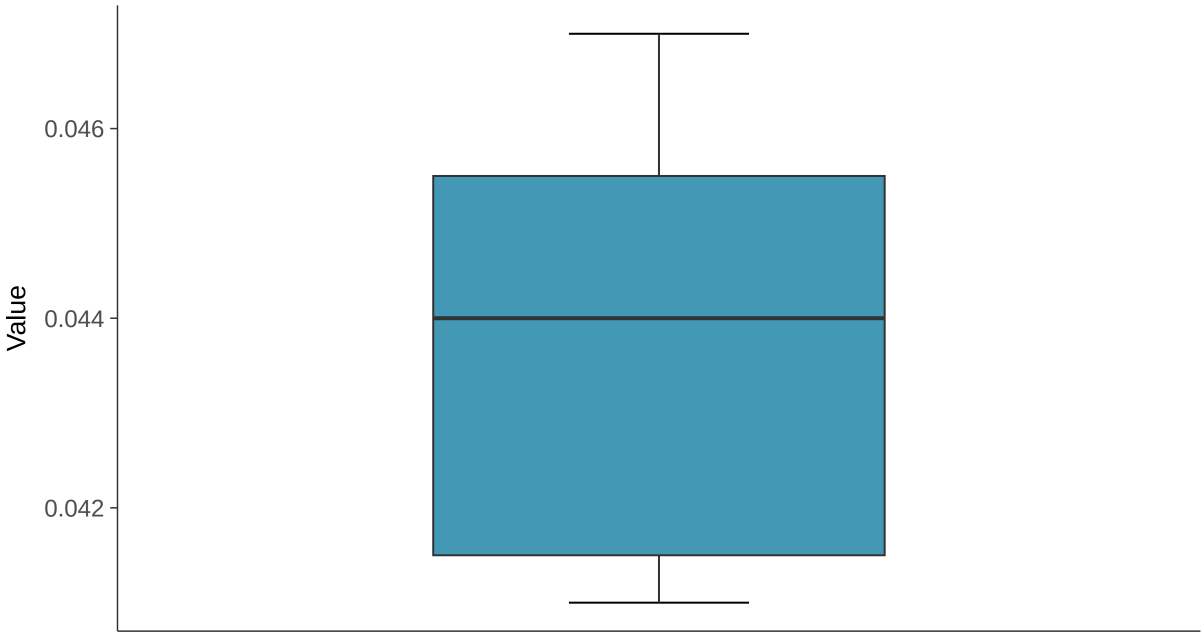
Histogram

Barium, MW-7C (mg/L)



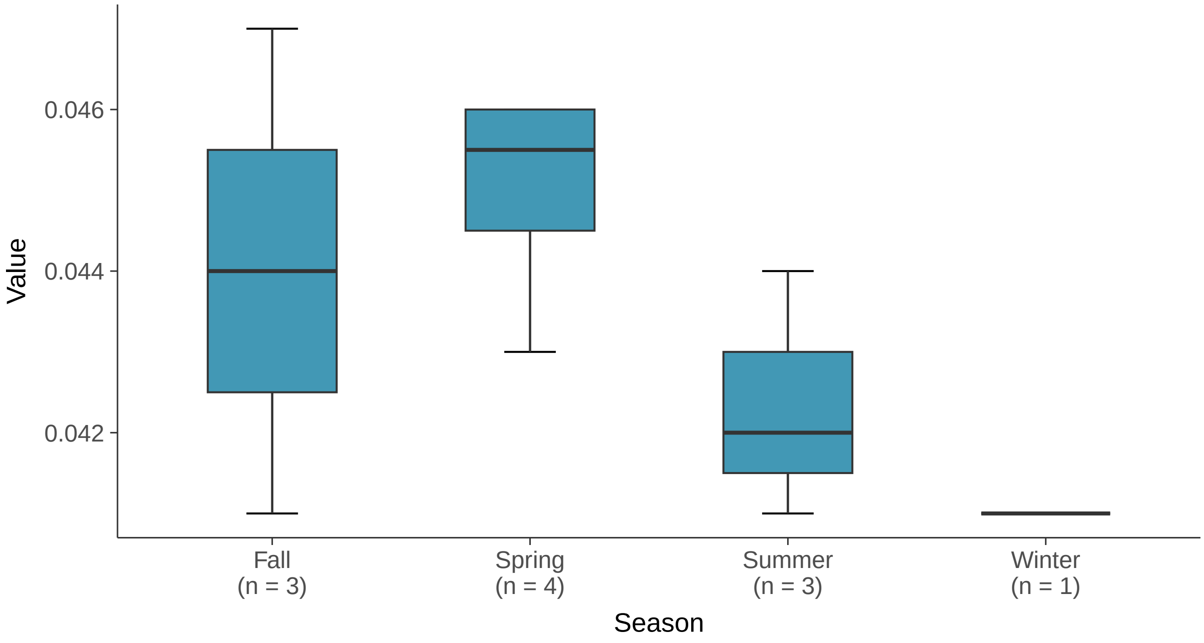
Boxplot

Barium, MW-7C (mg/L)



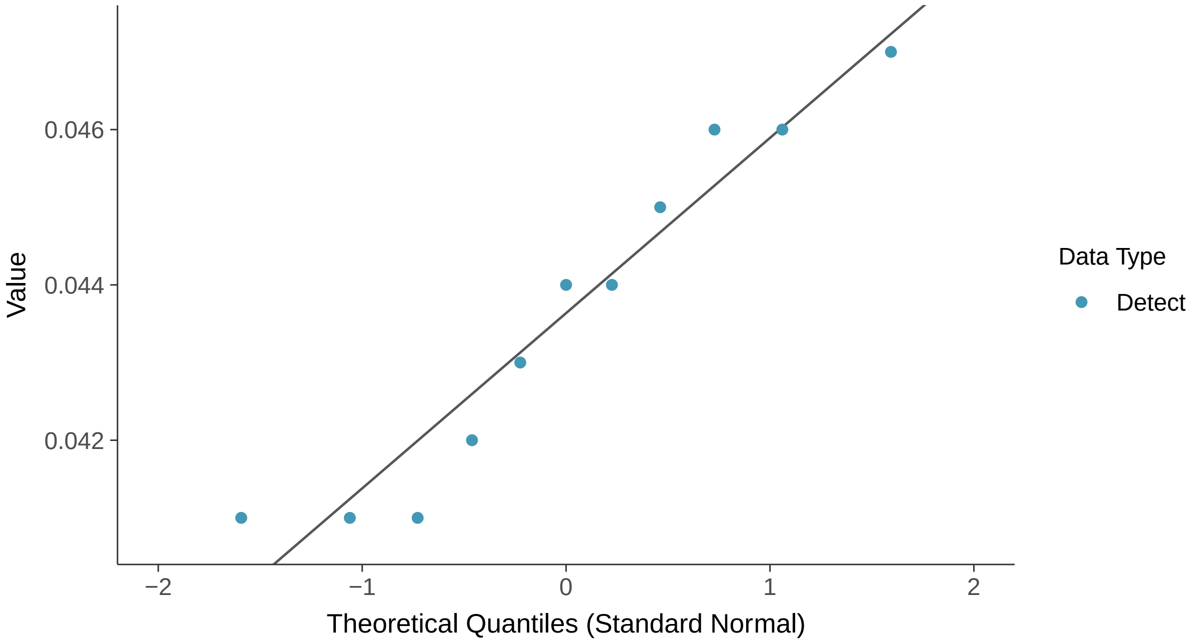
Boxplot by Season

Barium, MW-7C (mg/L)



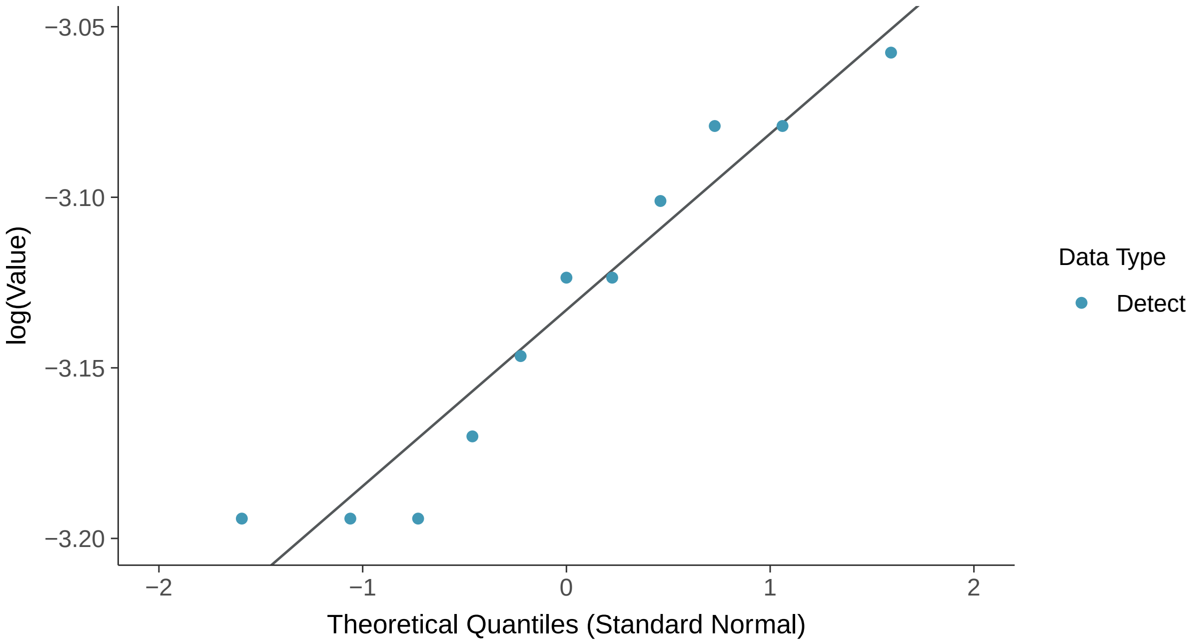
Normal Q-Q plot

Barium, MW-7C (mg/L)



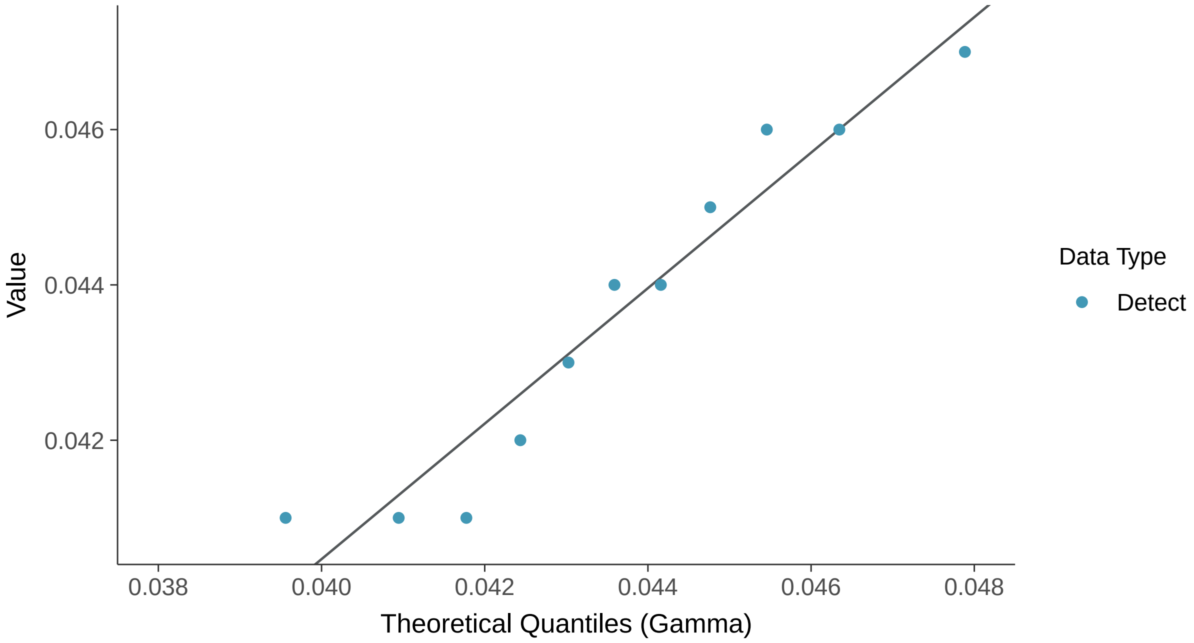
Lognormal Q-Q plot

Barium, MW-7C (mg/L)



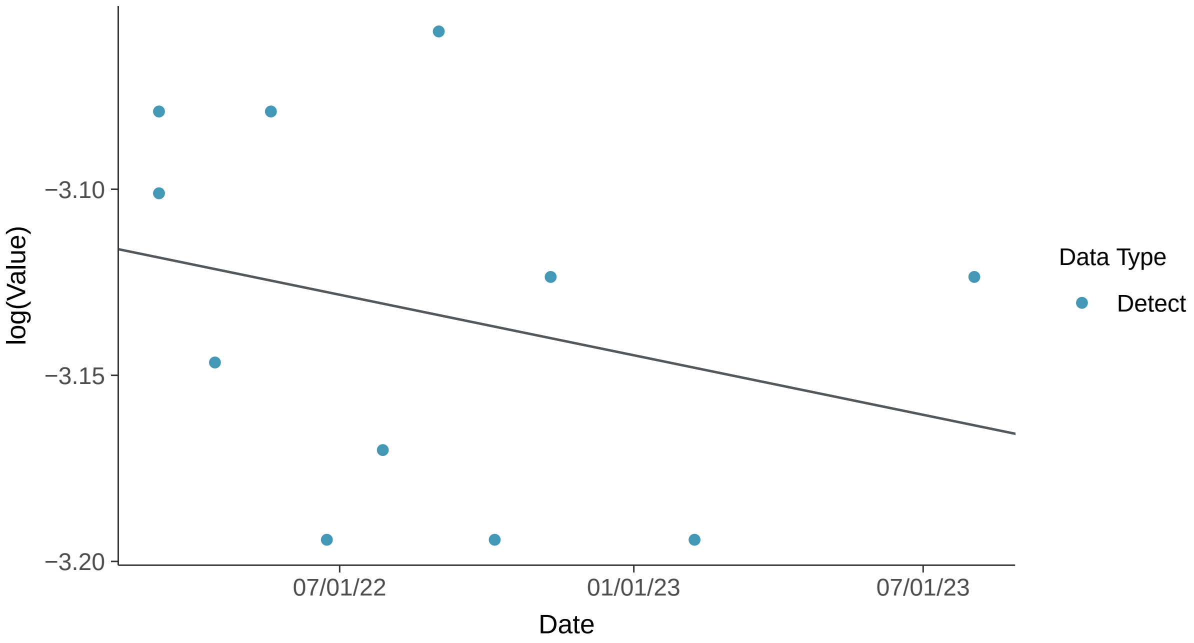
Gamma Q-Q plot

Barium, MW-7C (mg/L)



Trend Regression: Lognormal MLE

Barium, MW-7C (mg/L)

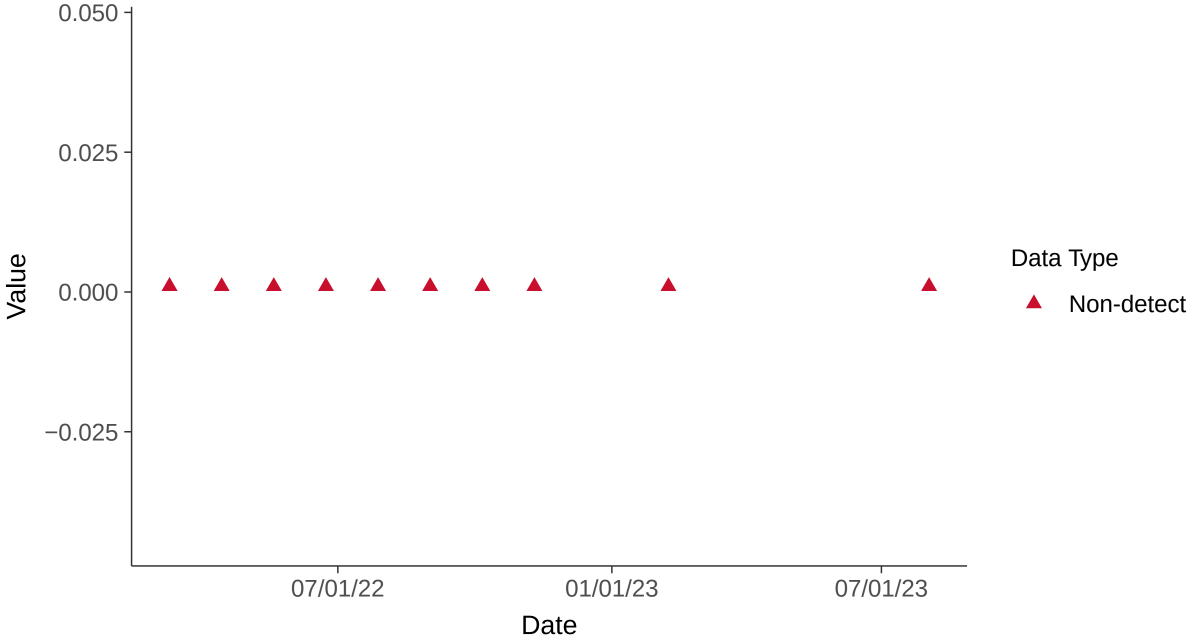


Appendix IV: Beryllium, MW-7C

ID: 7C_2_11

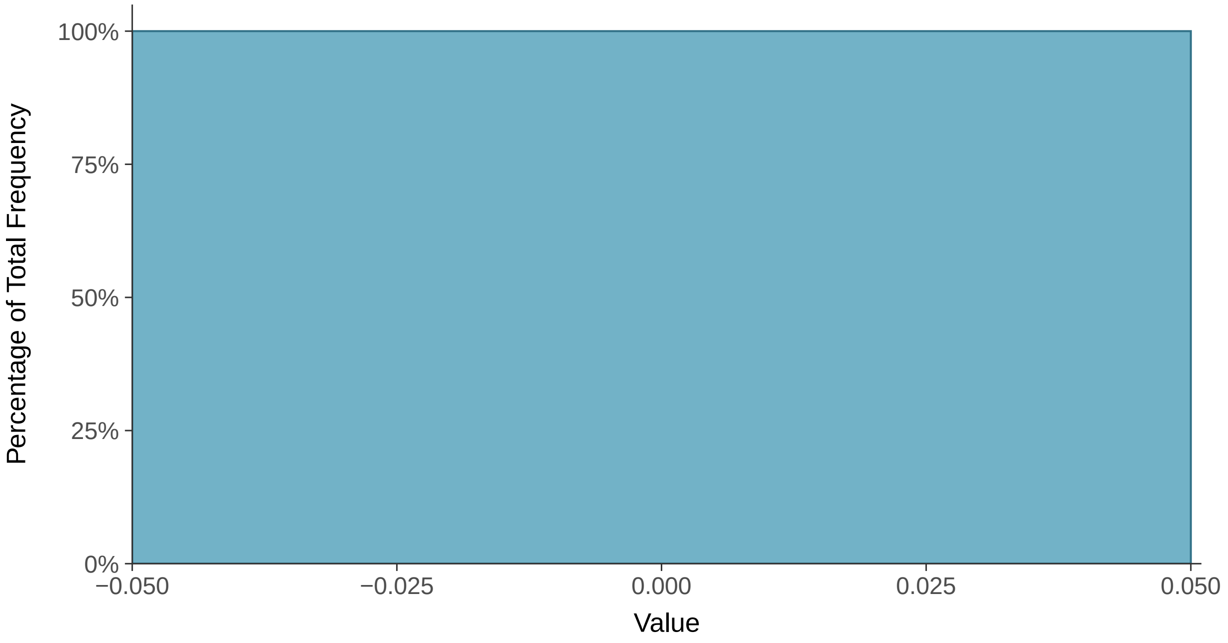
Scatter Plot

Beryllium, MW-7C (mg/L)



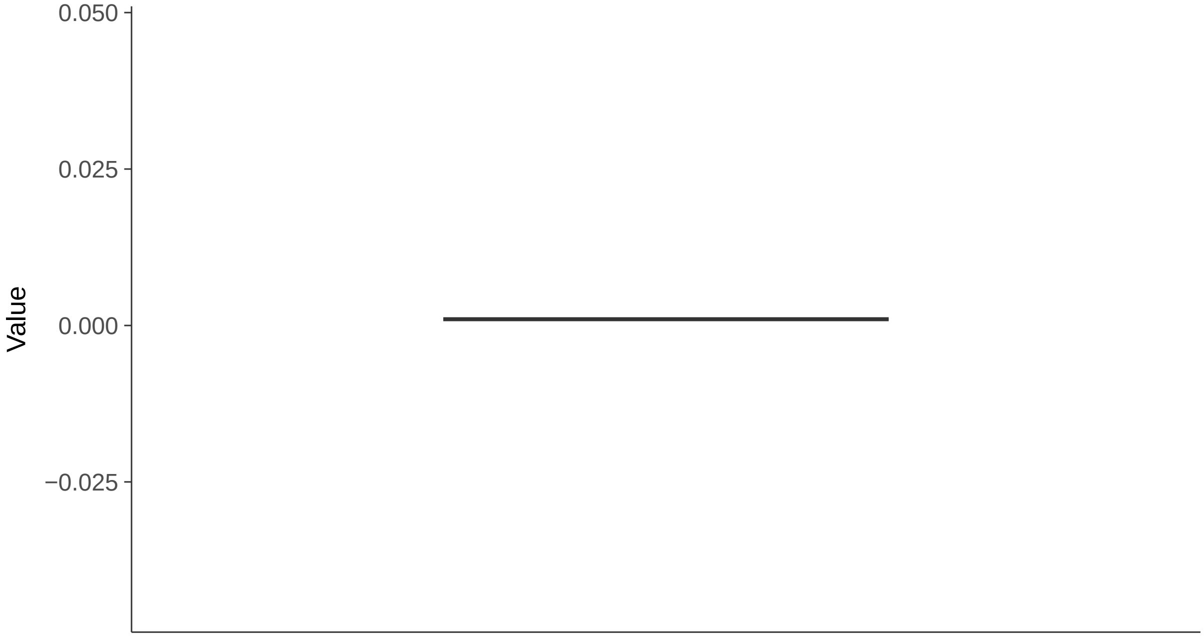
Histogram

Beryllium, MW-7C (mg/L)



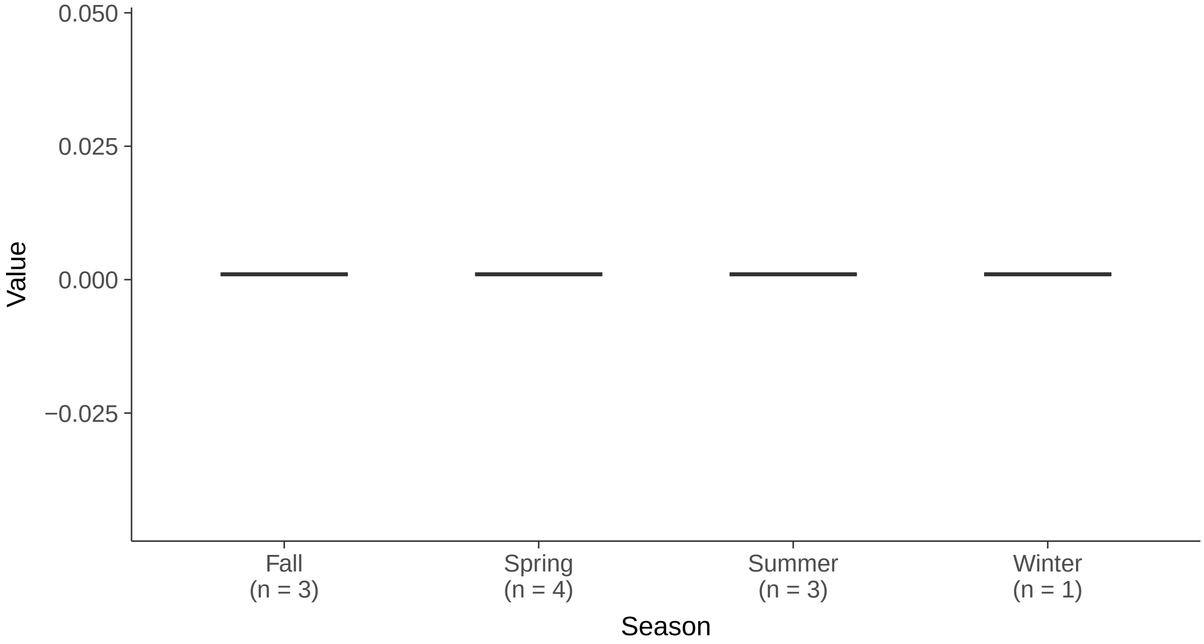
Boxplot

Beryllium, MW-7C (mg/L)



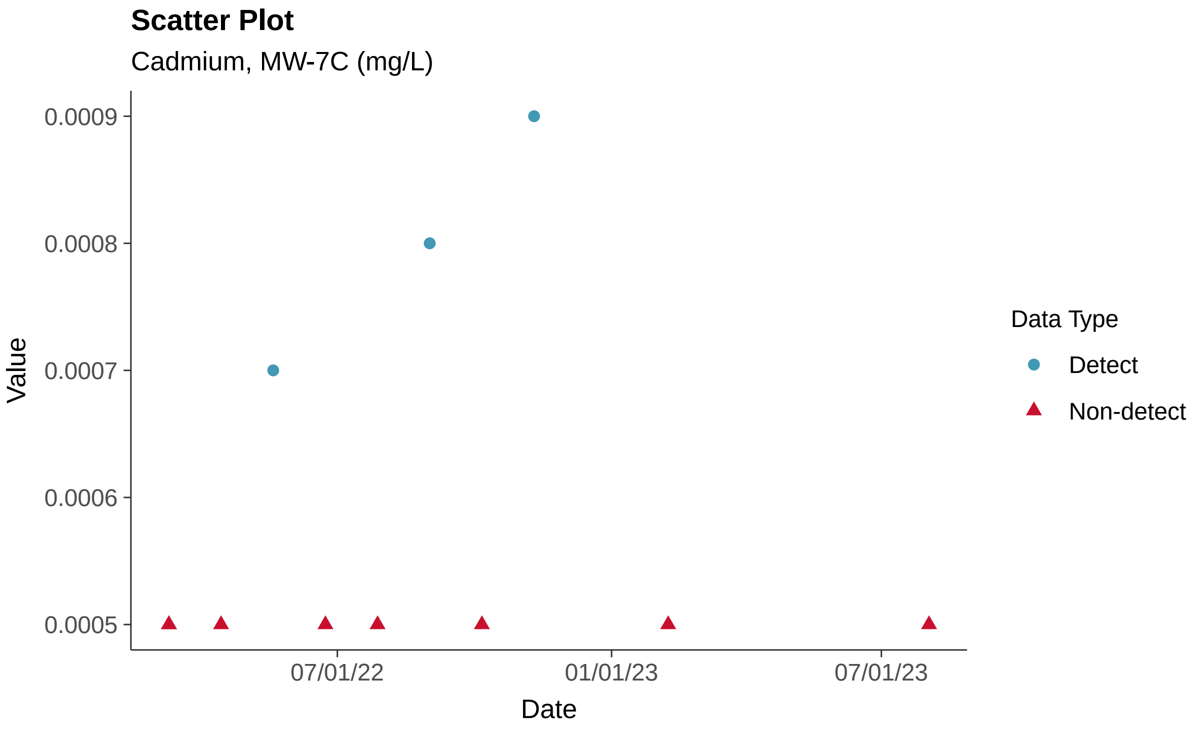
Boxplot by Season

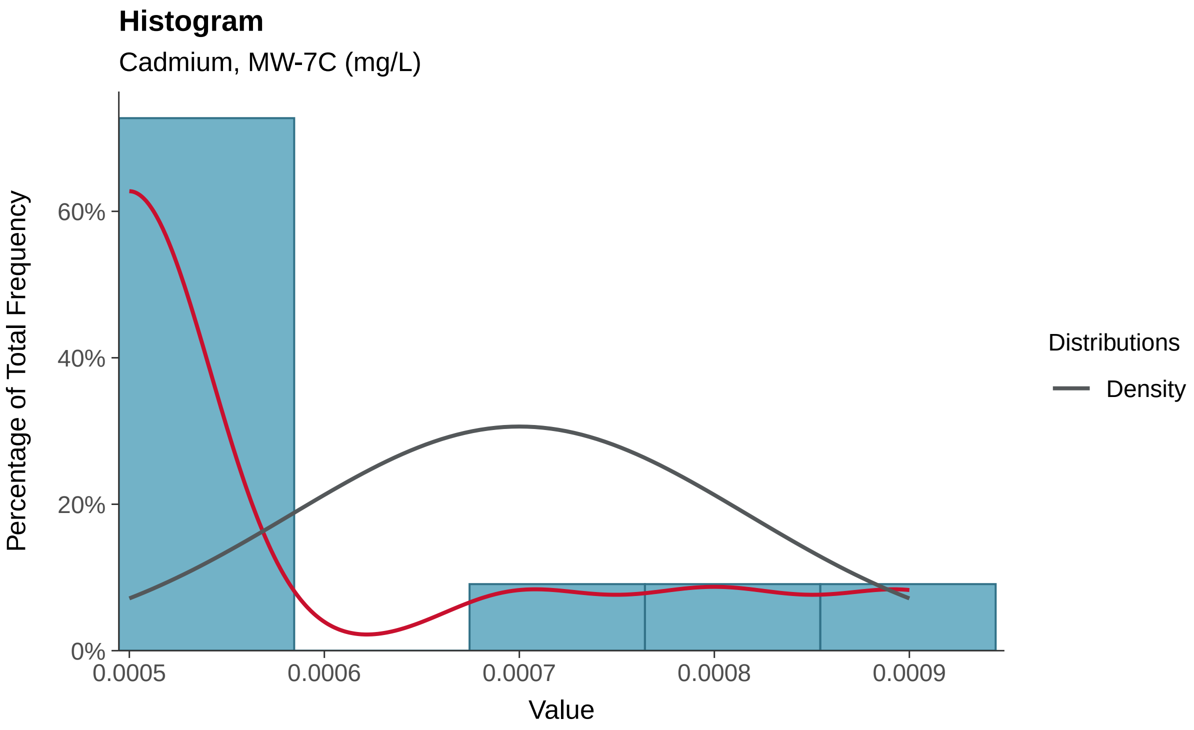
Beryllium, MW-7C (mg/L)



Appendix IV: Cadmium, MW-7C

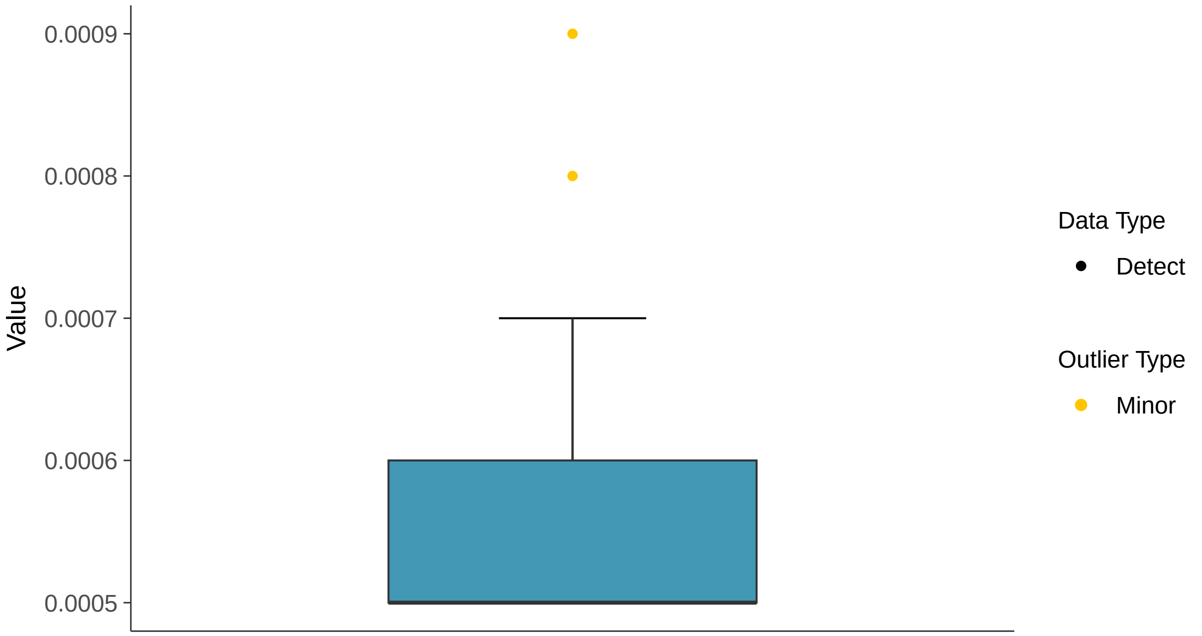
ID: 7C_2_12





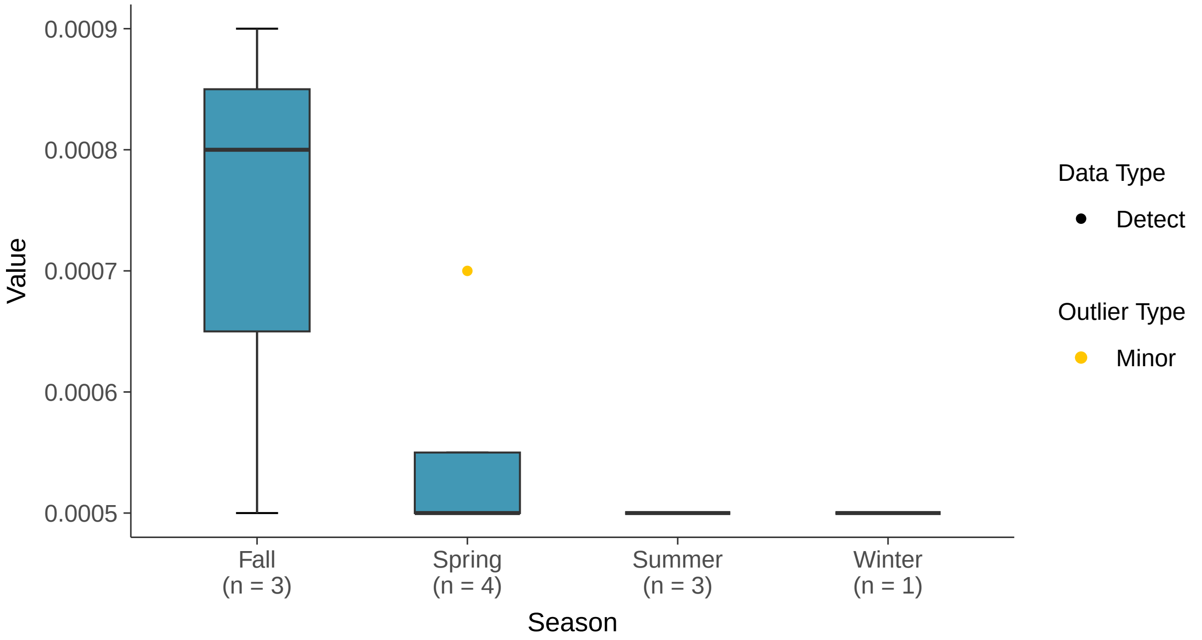
Boxplot

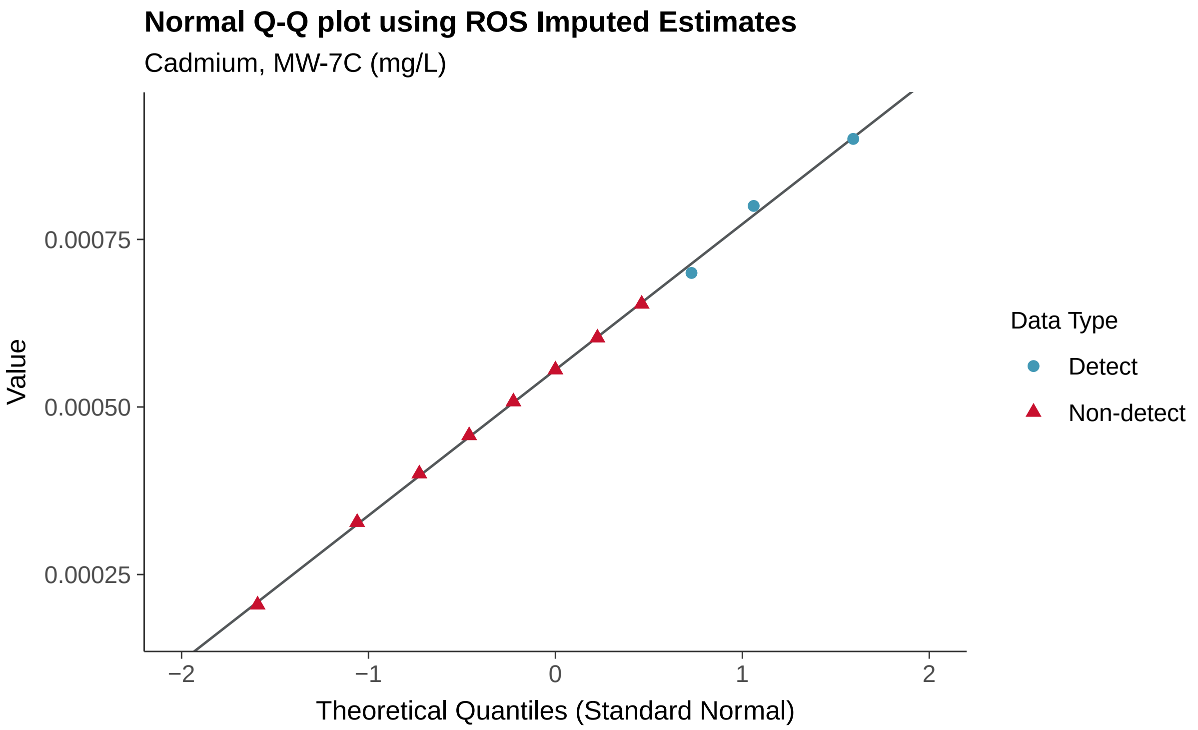
Cadmium, MW-7C (mg/L)

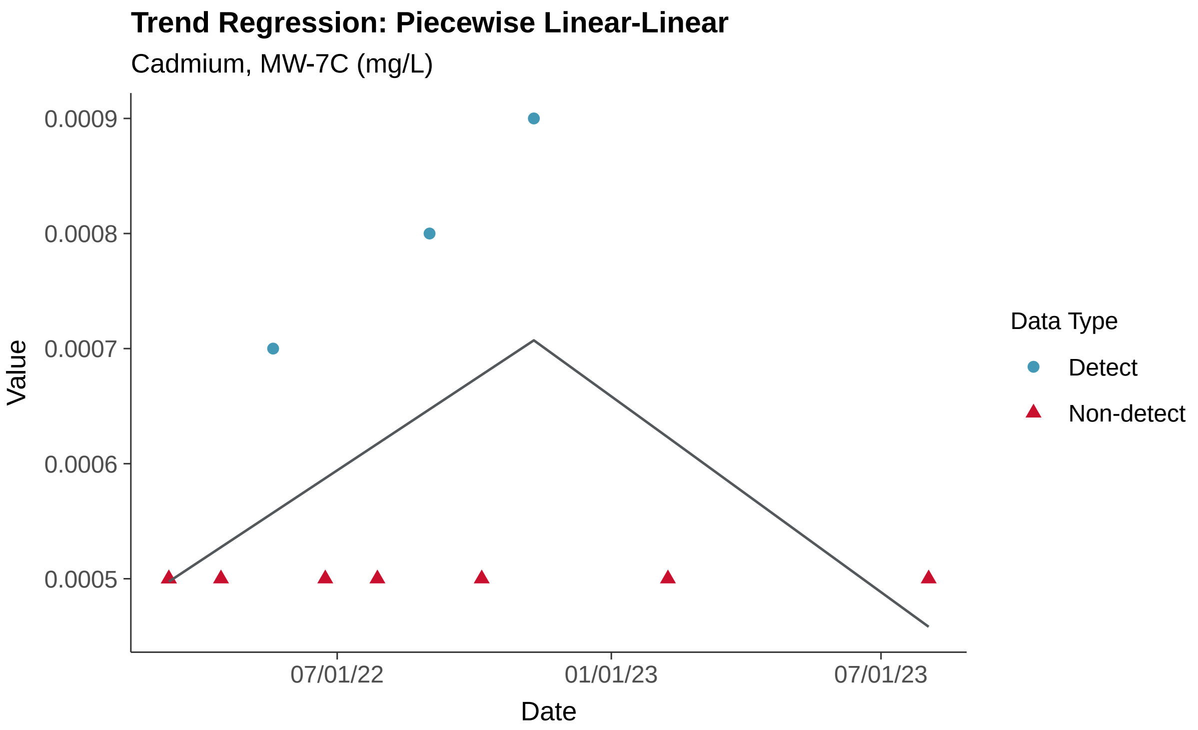


Boxplot by Season

Cadmium, MW-7C (mg/L)

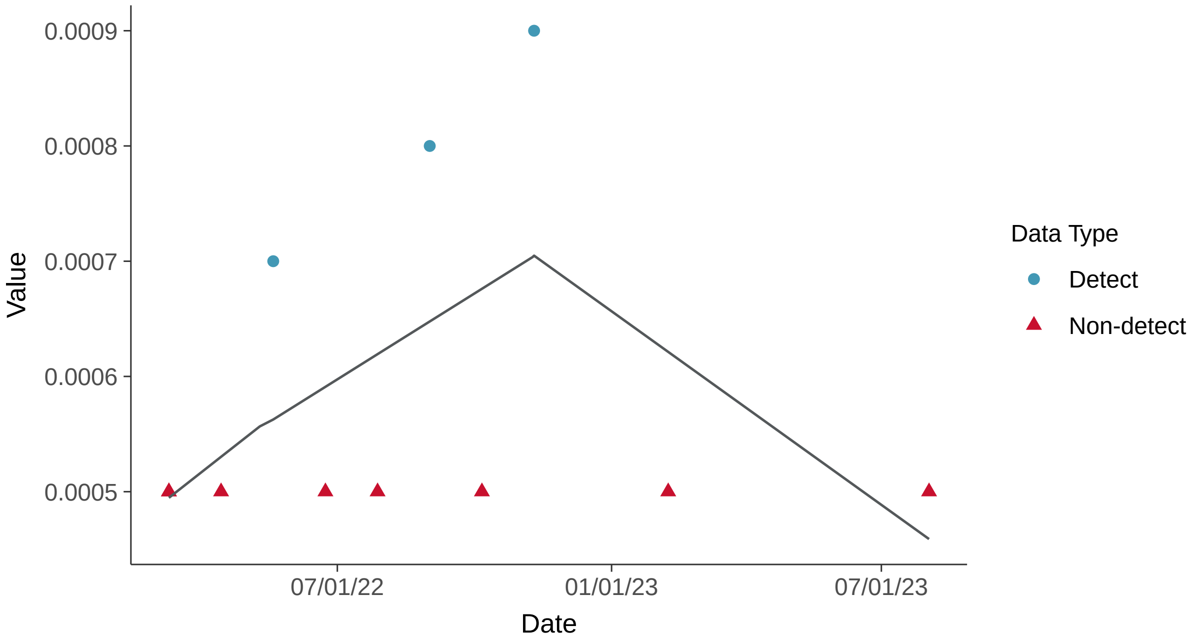



Normal Q-Q plot using ROS Imputed Estimates
Cadmium, MW-7C (mg/L)
Value
0.00075
0.00050
0.00025
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear
Cadmium, MW-7C (mg/L)
Value
0.0009
0.0008
0.0007
0.0006
0.0005
07/01/22
01/01/23
07/01/23
Date
Data Type
Detect
Non-detect

Trend Regression: Piecewise Linear-Linear-Linear

Cadmium, MW-7C (mg/L)

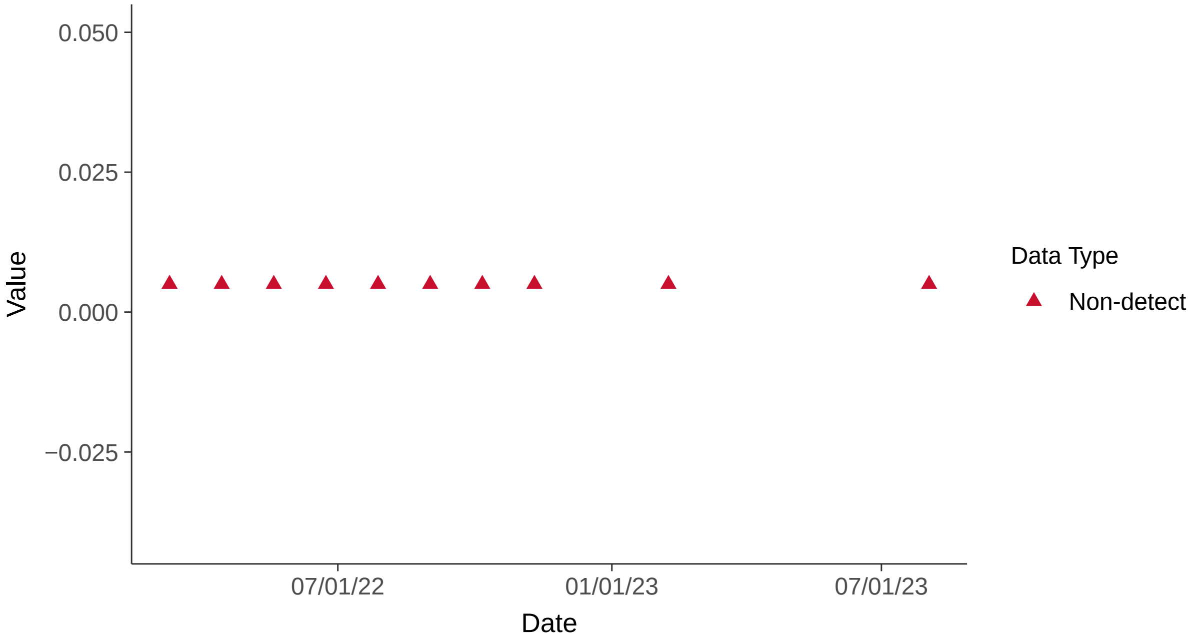


Appendix IV: Chromium, MW-7C

ID: 7C_2_13

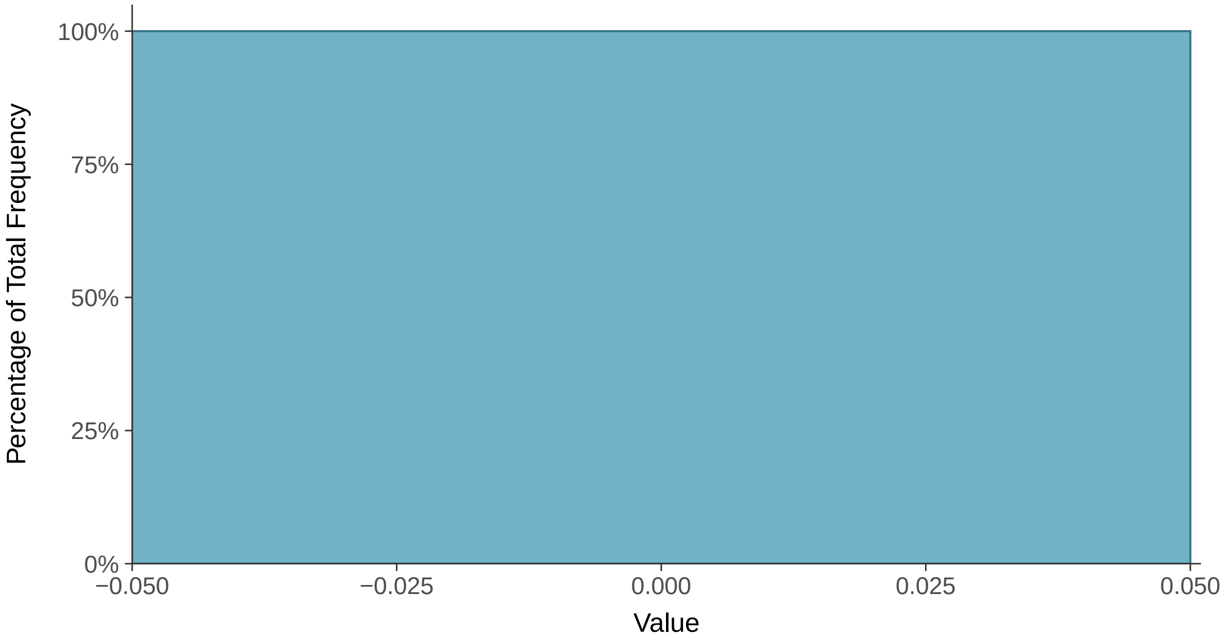
Scatter Plot

Chromium, MW-7C (mg/L)



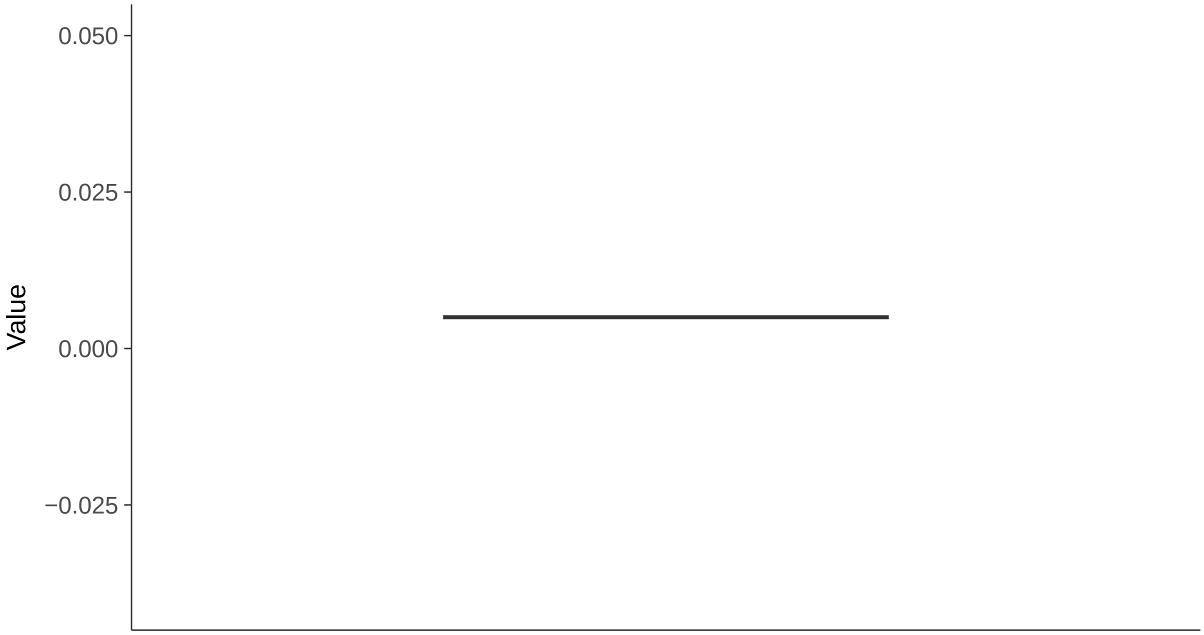
Histogram

Chromium, MW-7C (mg/L)



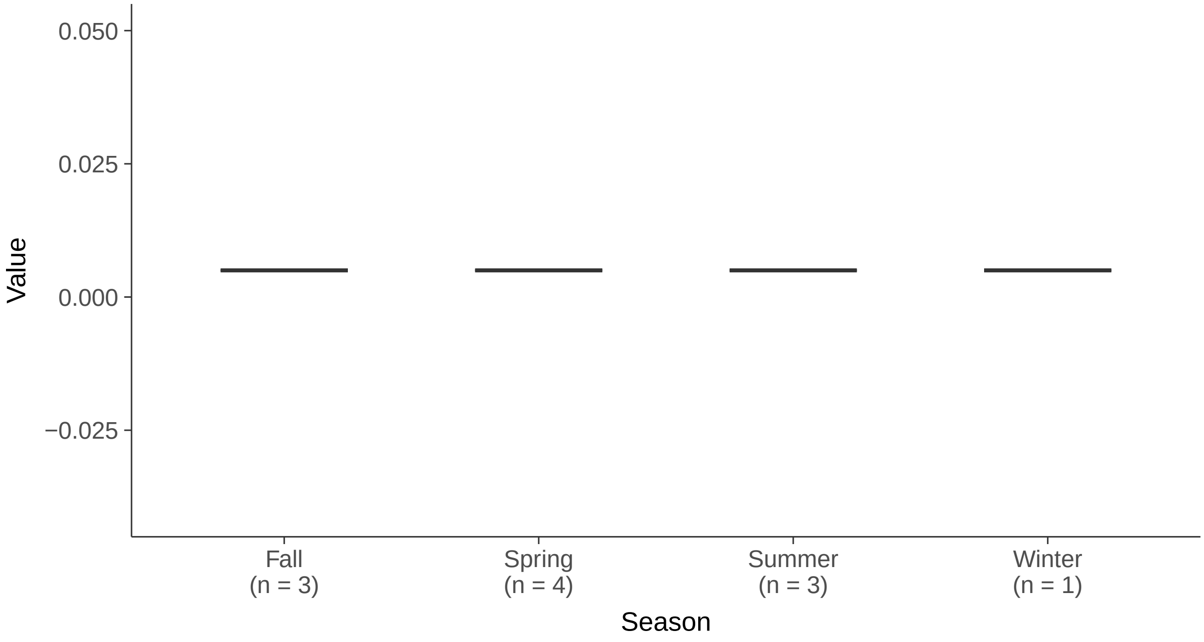
Boxplot

Chromium, MW-7C (mg/L)



Boxplot by Season

Chromium, MW-7C (mg/L)

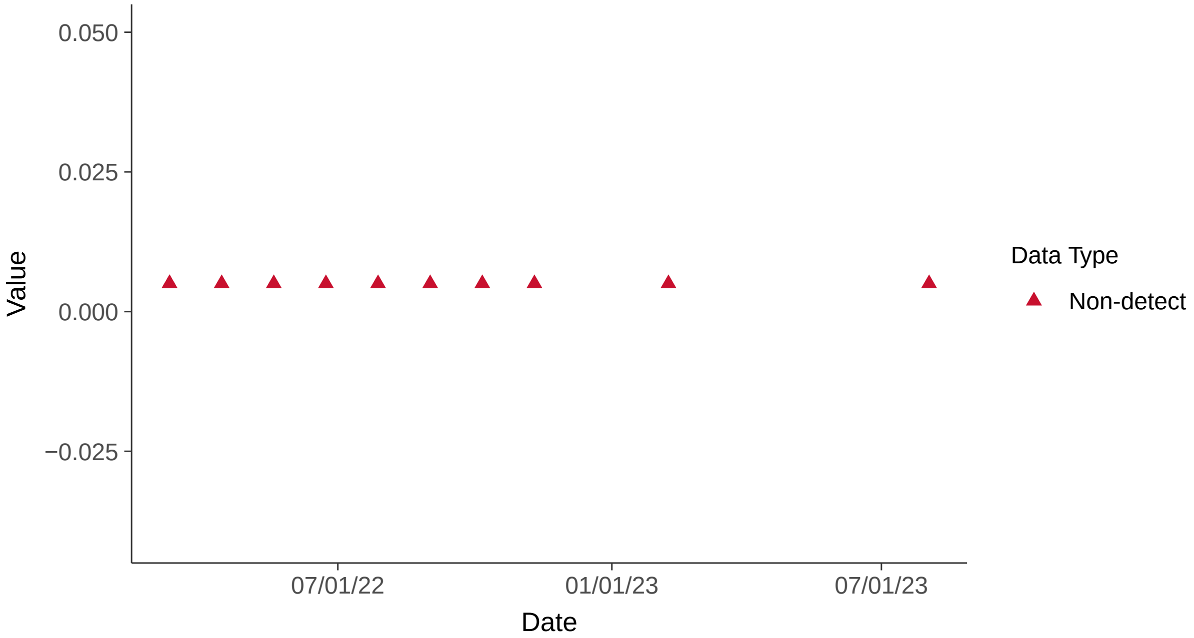


Appendix IV: Cobalt, MW-7C

ID: 7C_2_14

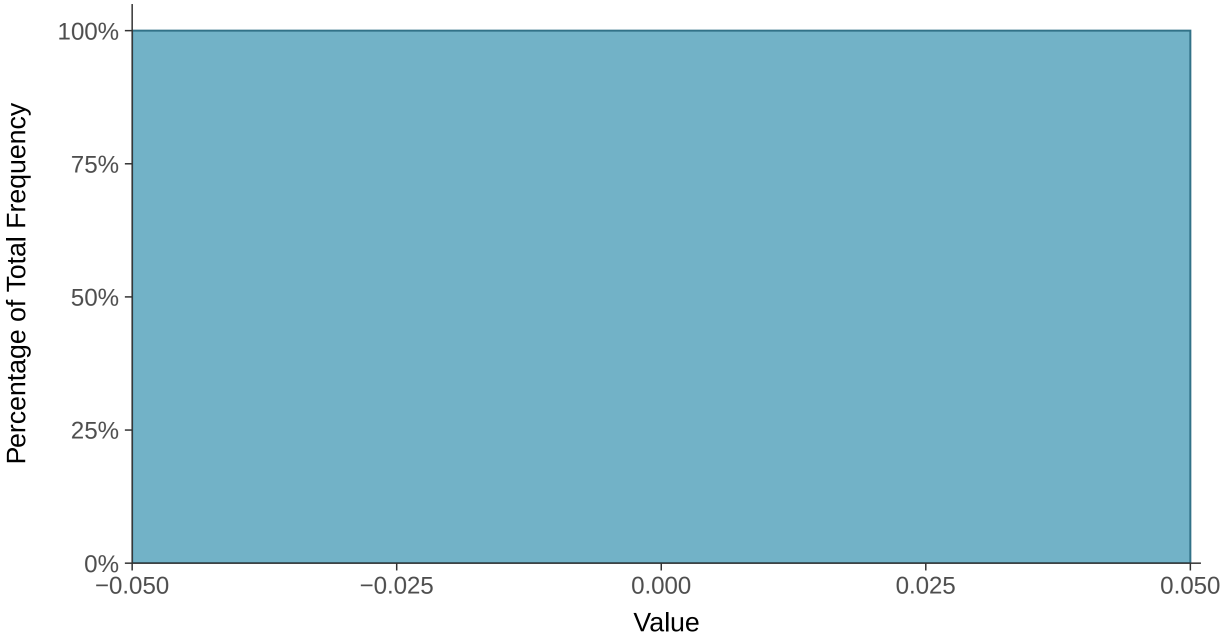
Scatter Plot

Cobalt, MW-7C (mg/L)



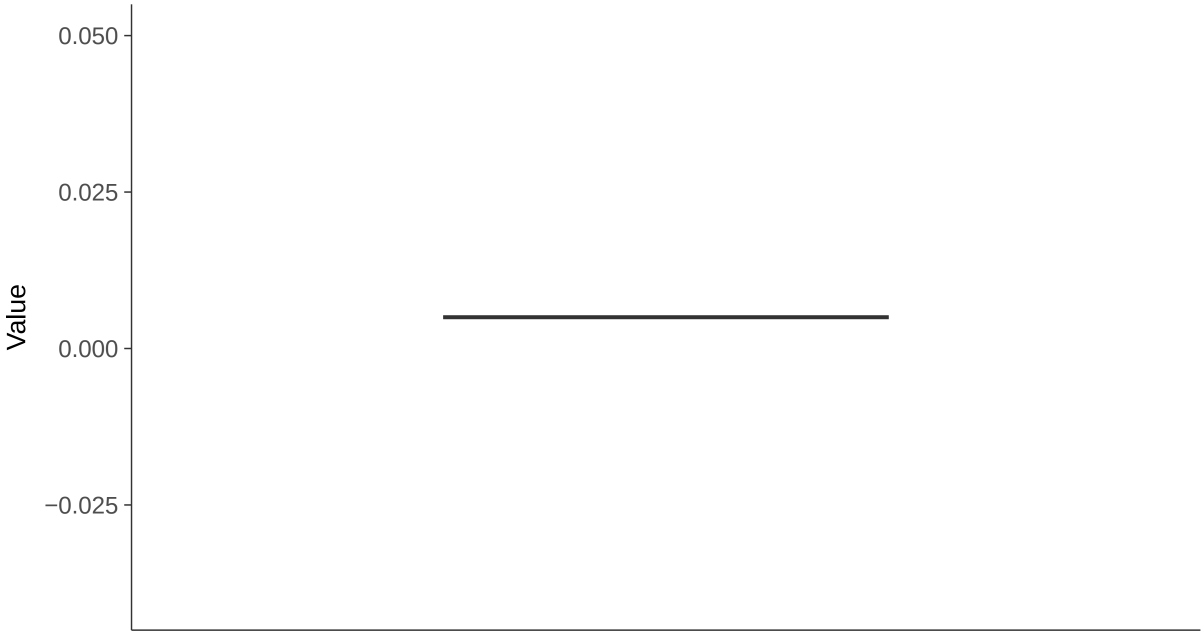
Histogram

Cobalt, MW-7C (mg/L)



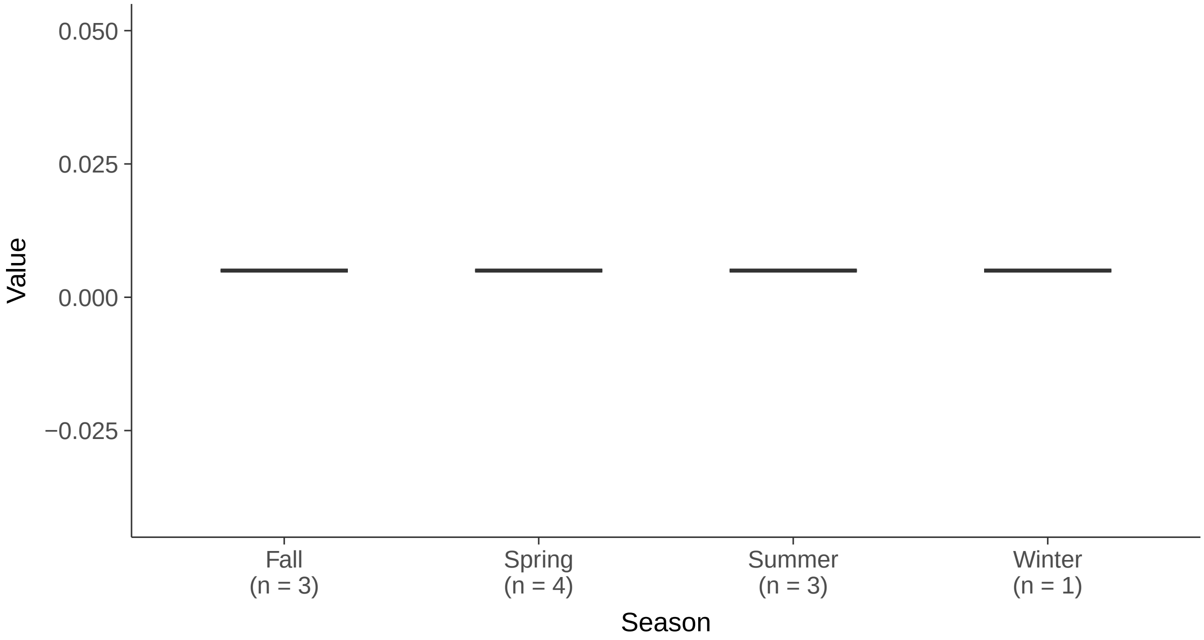
Boxplot

Cobalt, MW-7C (mg/L)



Boxplot by Season

Cobalt, MW-7C (mg/L)

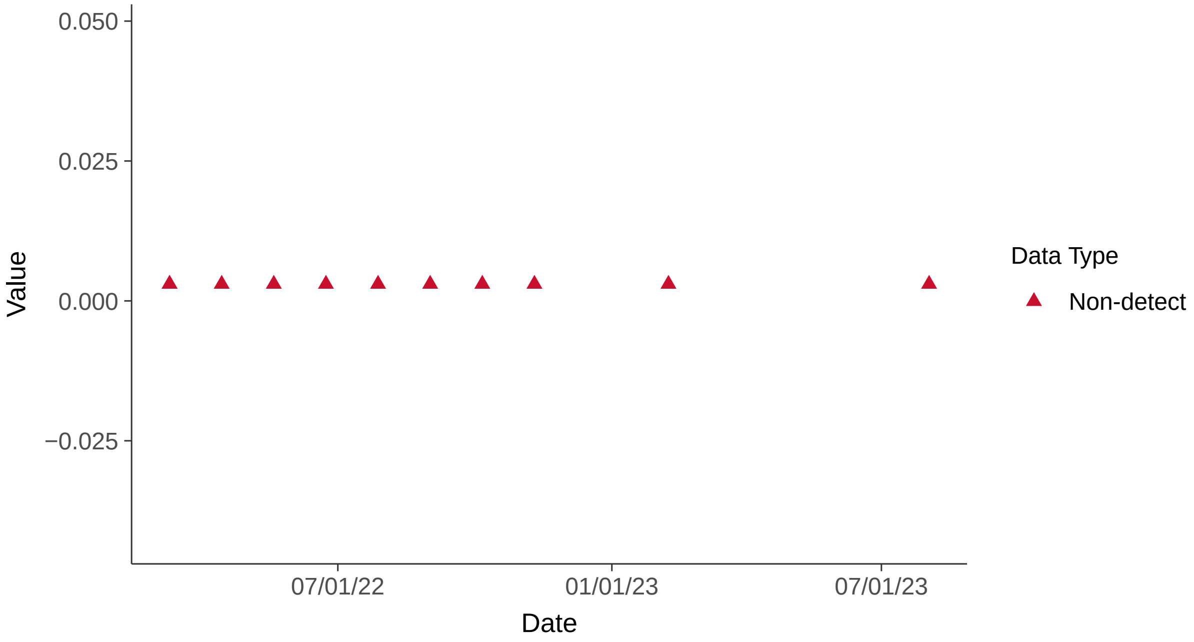


Appendix IV: Lead, MW-7C

ID: 7C_2_15

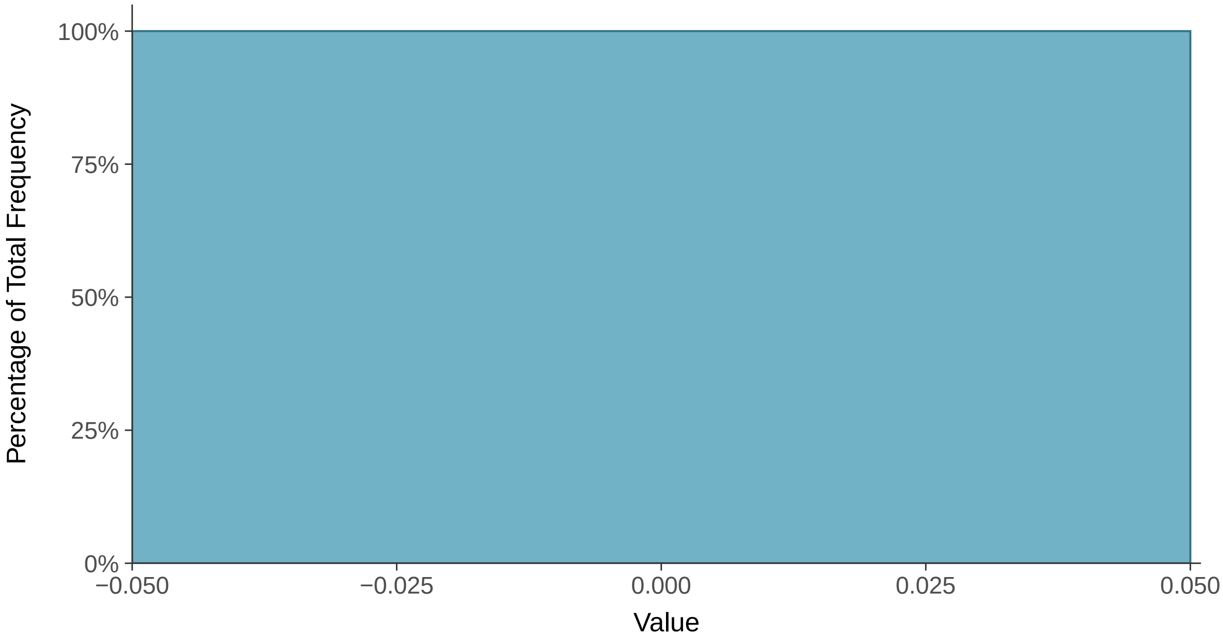
Scatter Plot

Lead, MW-7C (mg/L)



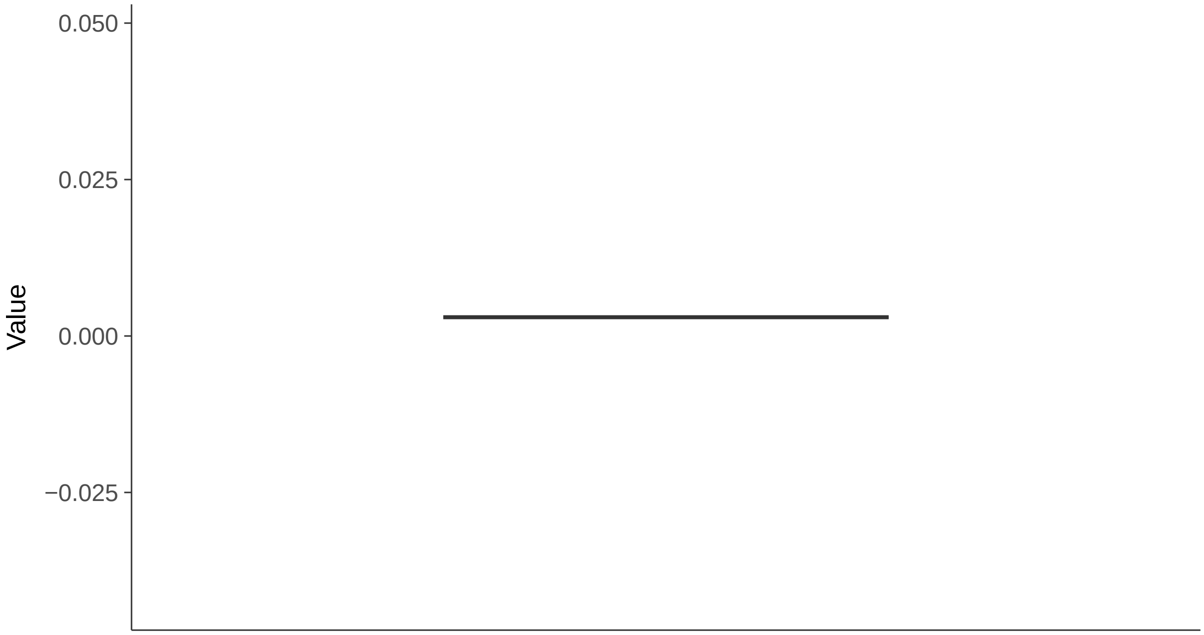
Histogram

Lead, MW-7C (mg/L)



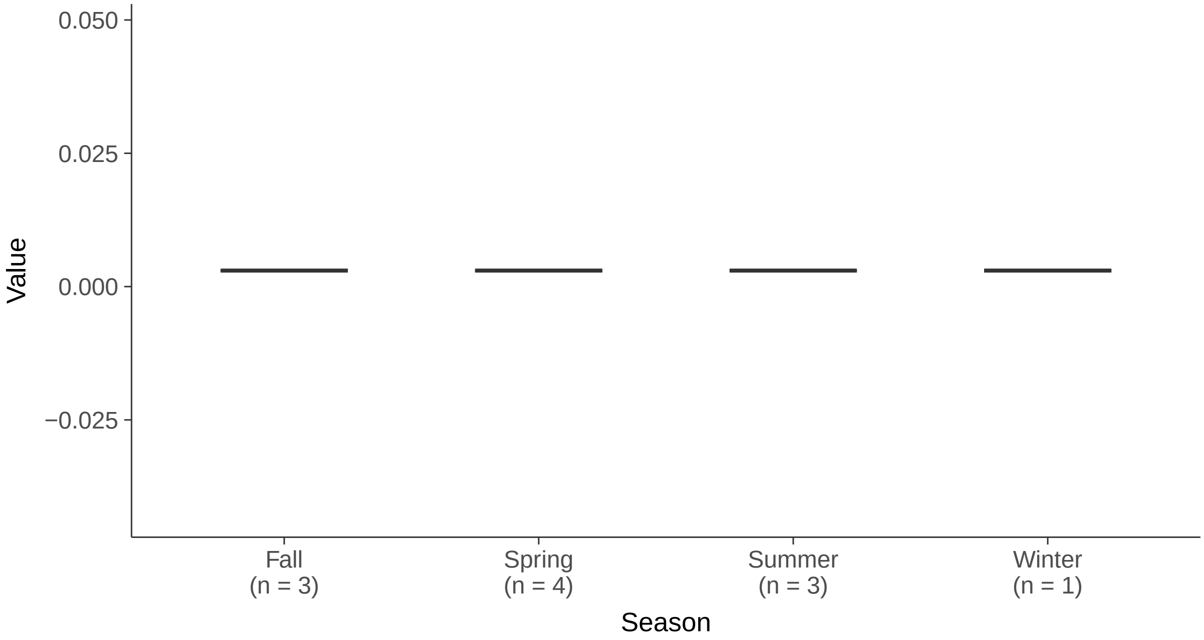
Boxplot

Lead, MW-7C (mg/L)



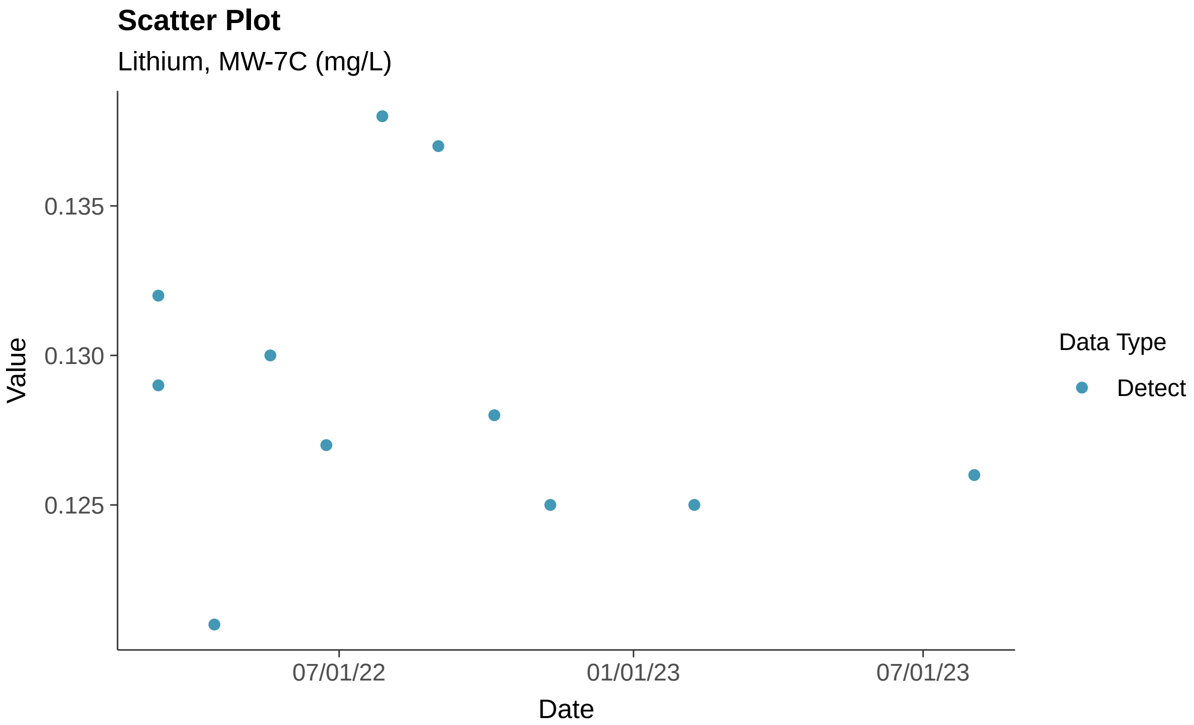
Boxplot by Season

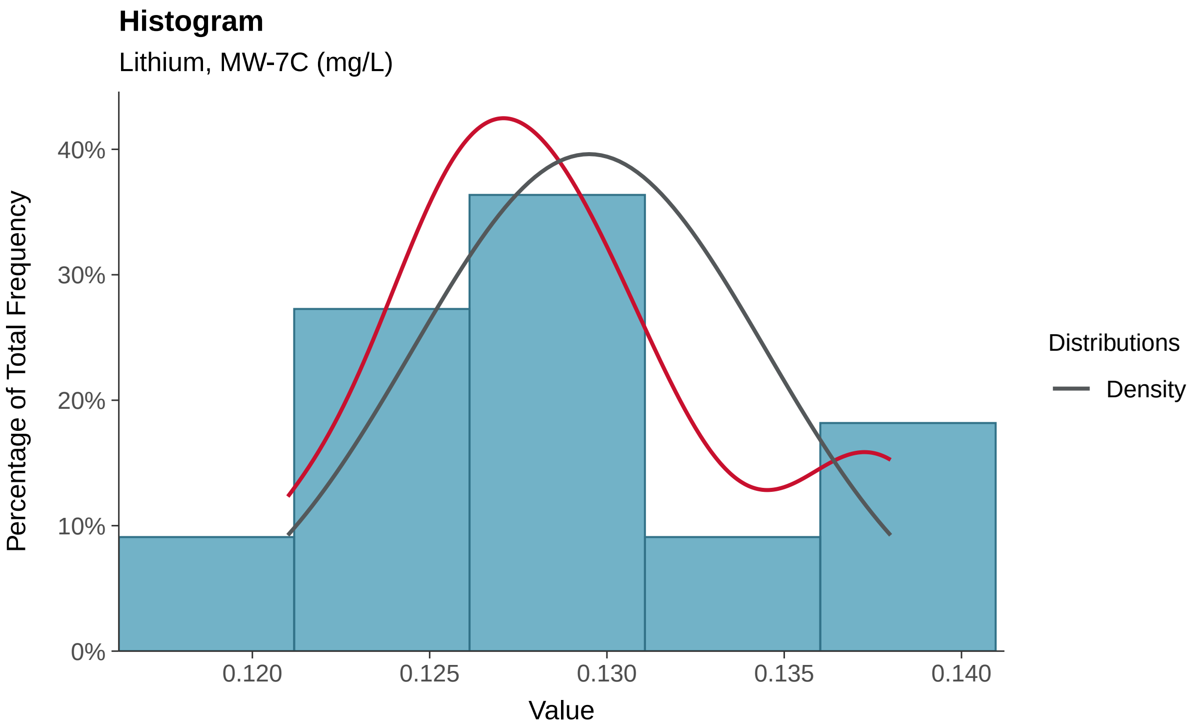
Lead, MW-7C (mg/L)



Appendix IV: Lithium, MW-7C

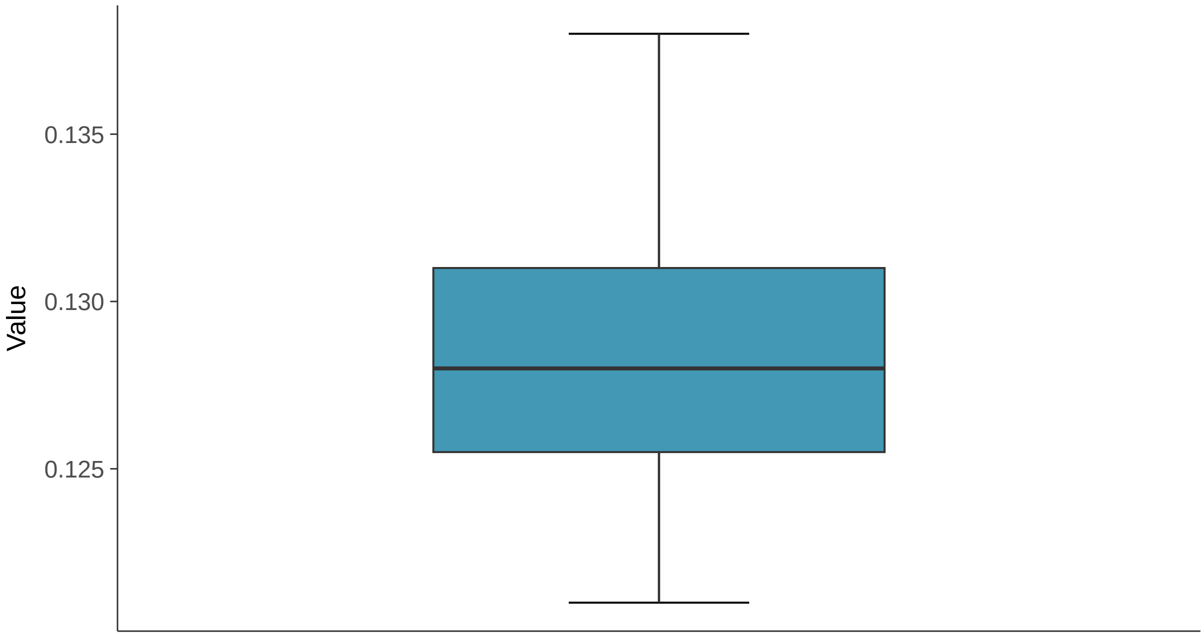
ID: 7C_2_16





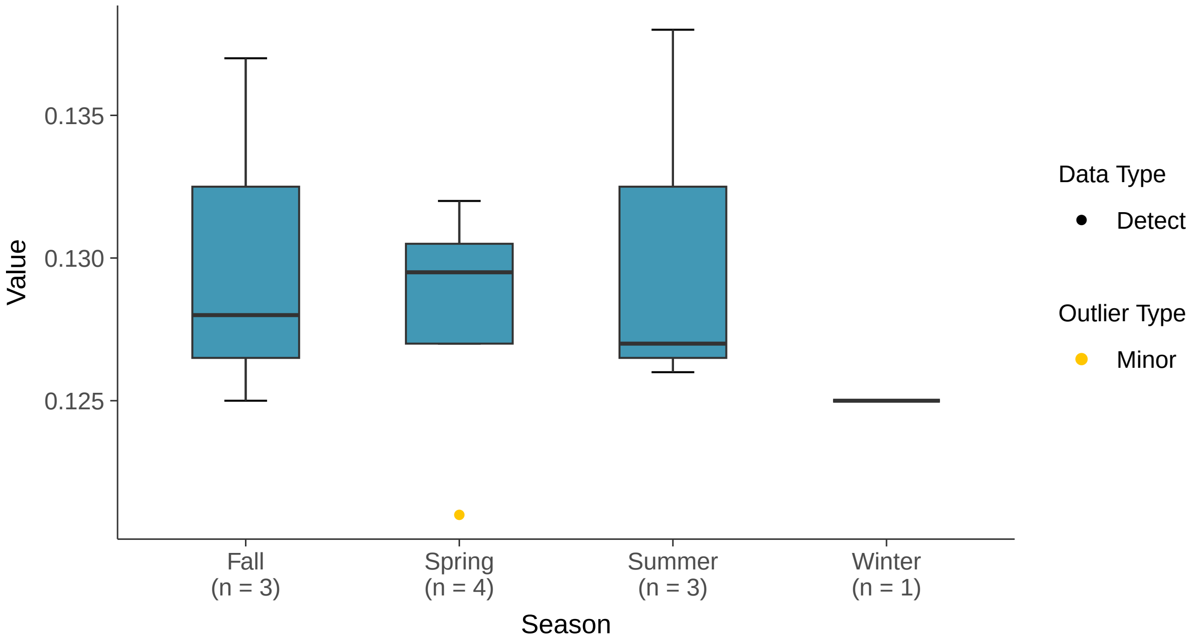
Boxplot

Lithium, MW-7C (mg/L)



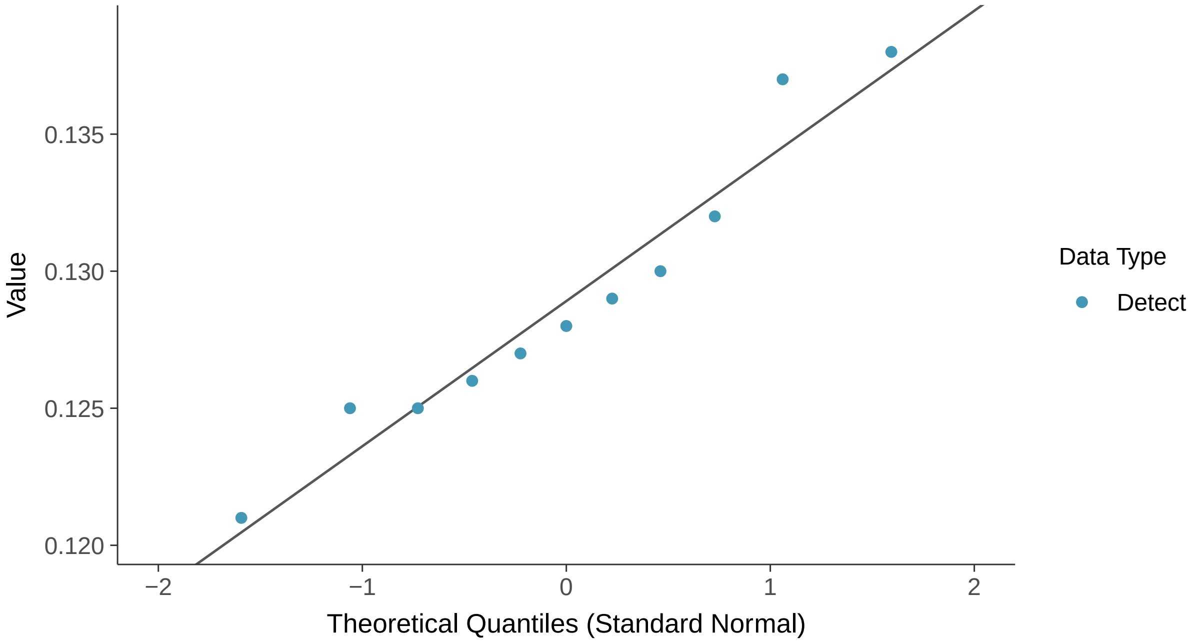
Boxplot by Season

Lithium, MW-7C (mg/L)



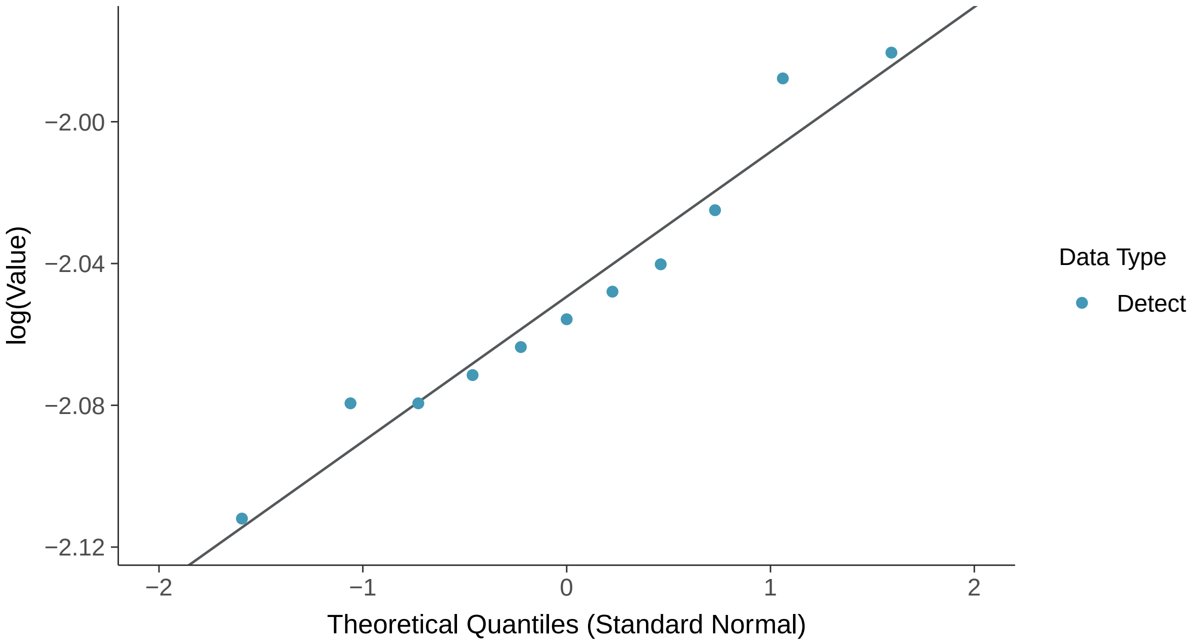
Normal Q-Q plot

Lithium, MW-7C (mg/L)



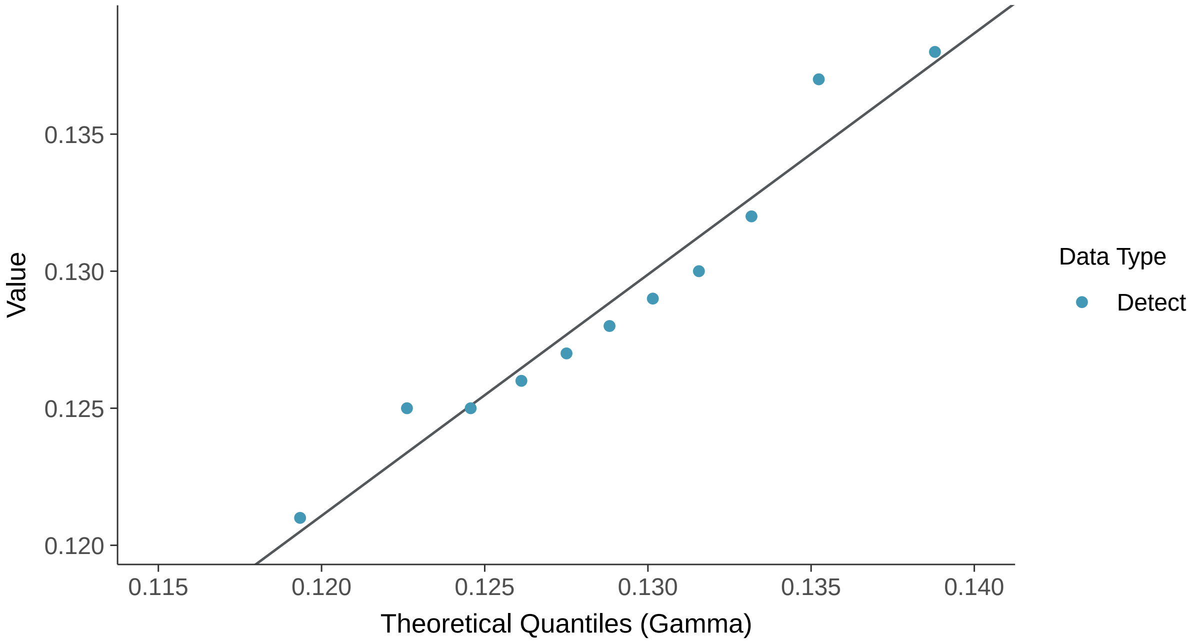
Lognormal Q-Q plot

Lithium, MW-7C (mg/L)



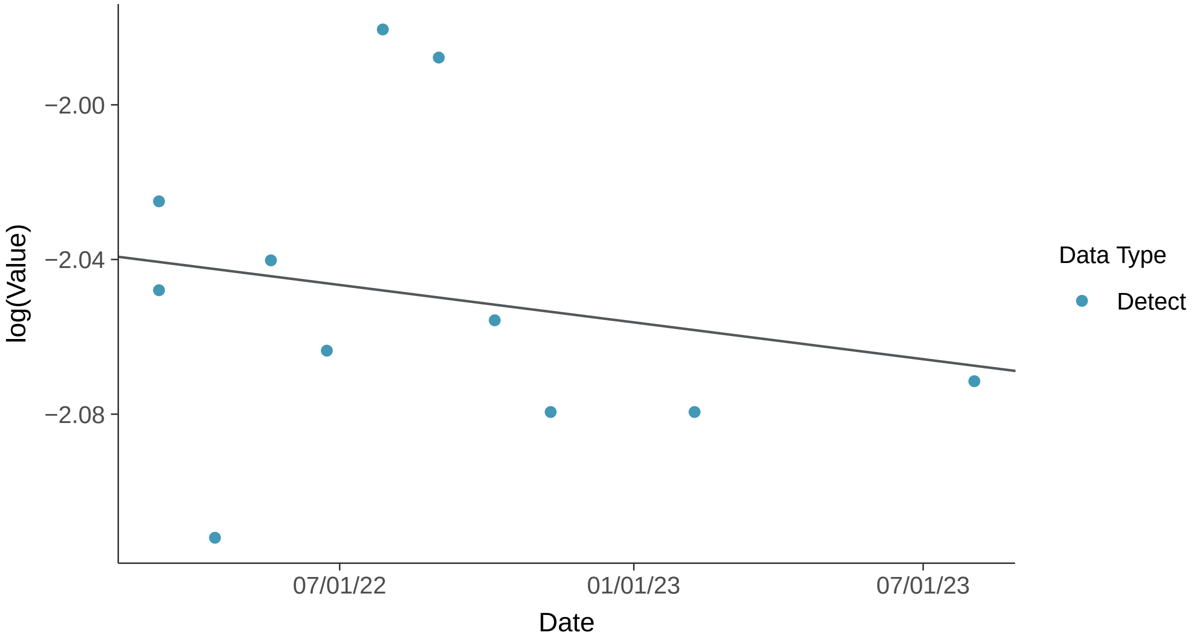
Gamma Q-Q plot

Lithium, MW-7C (mg/L)



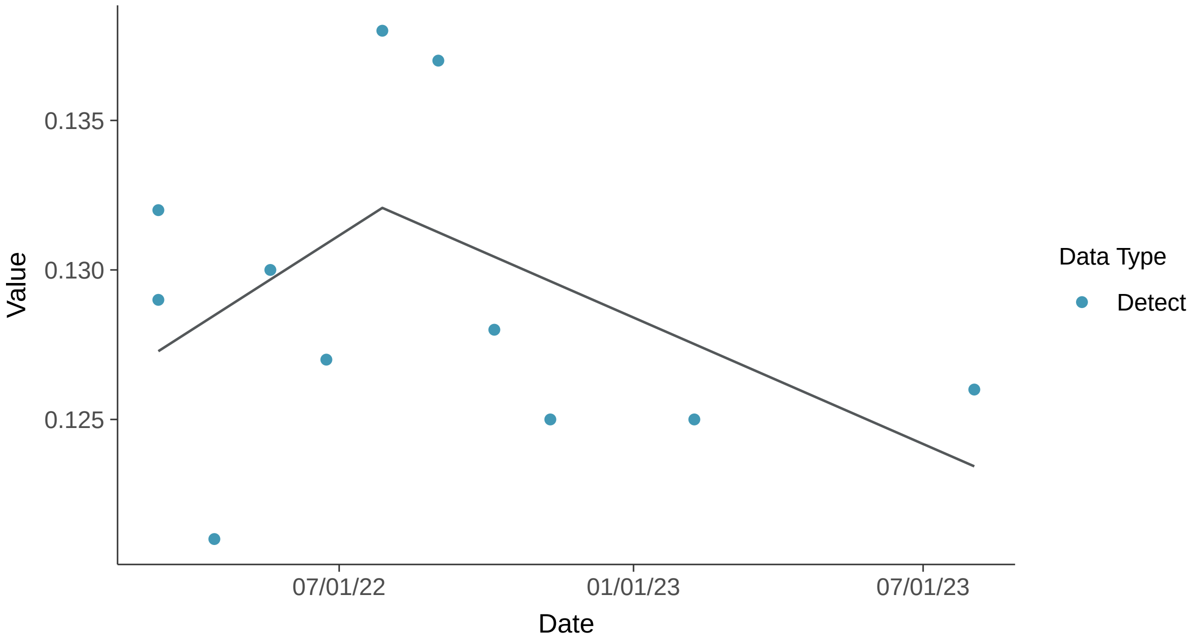
Trend Regression: Lognormal MLE

Lithium, MW-7C (mg/L)



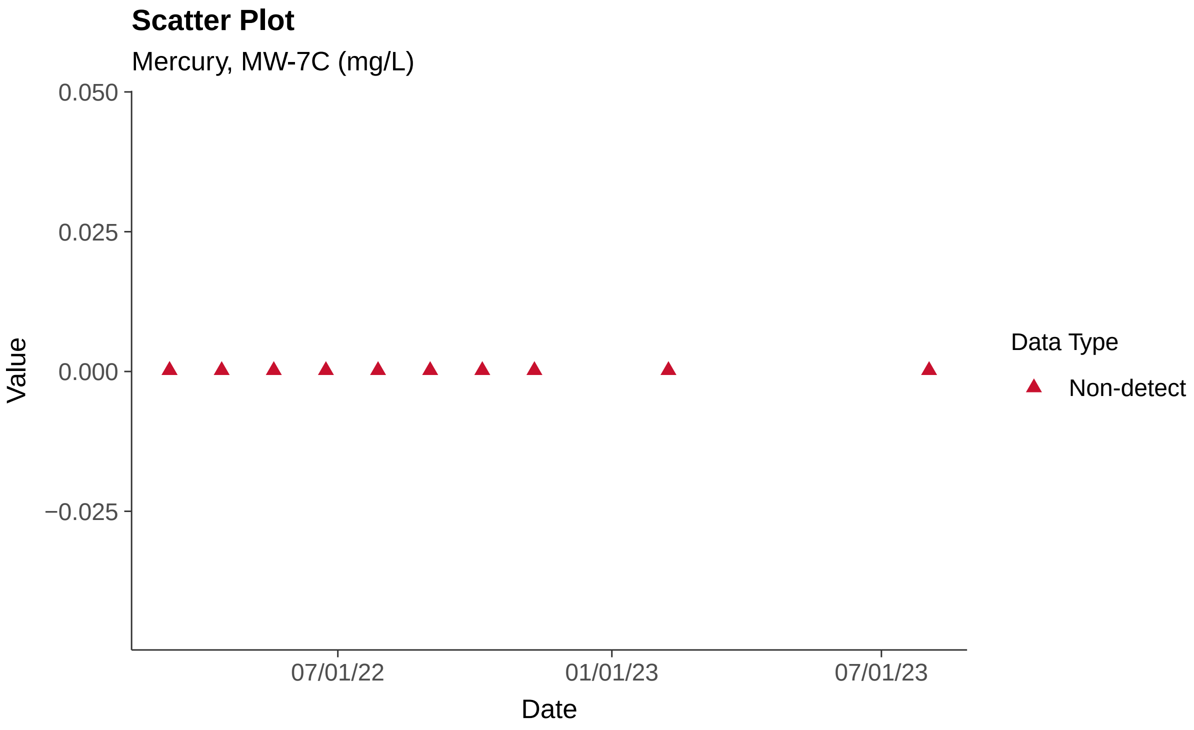
Trend Regression: Piecewise Linear-Linear

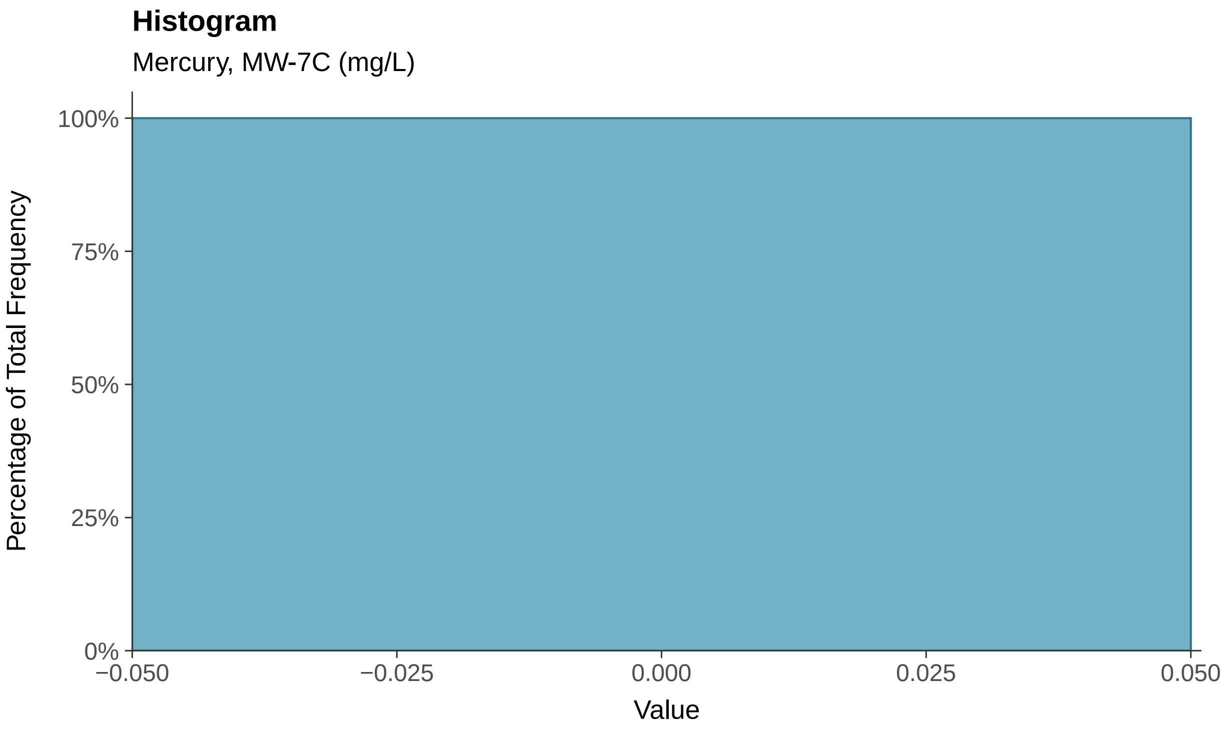
Lithium, MW-7C (mg/L)



Appendix IV: Mercury, MW-7C

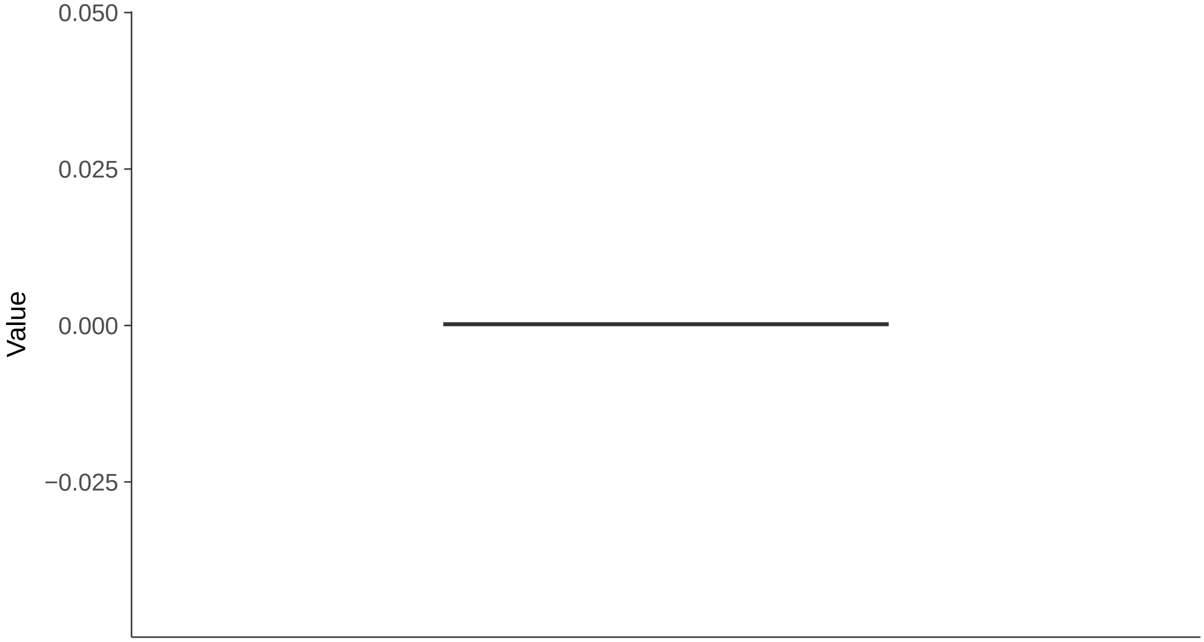
ID: 7C_2_17





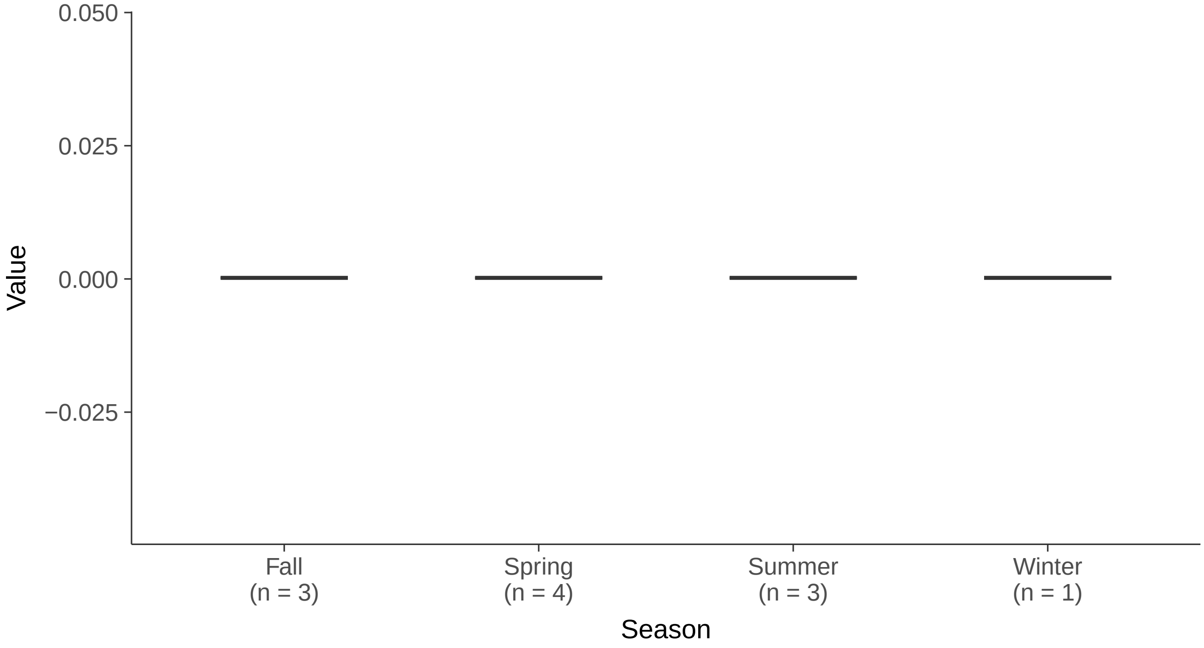
Boxplot

Mercury, MW-7C (mg/L)



Boxplot by Season

Mercury, MW-7C (mg/L)

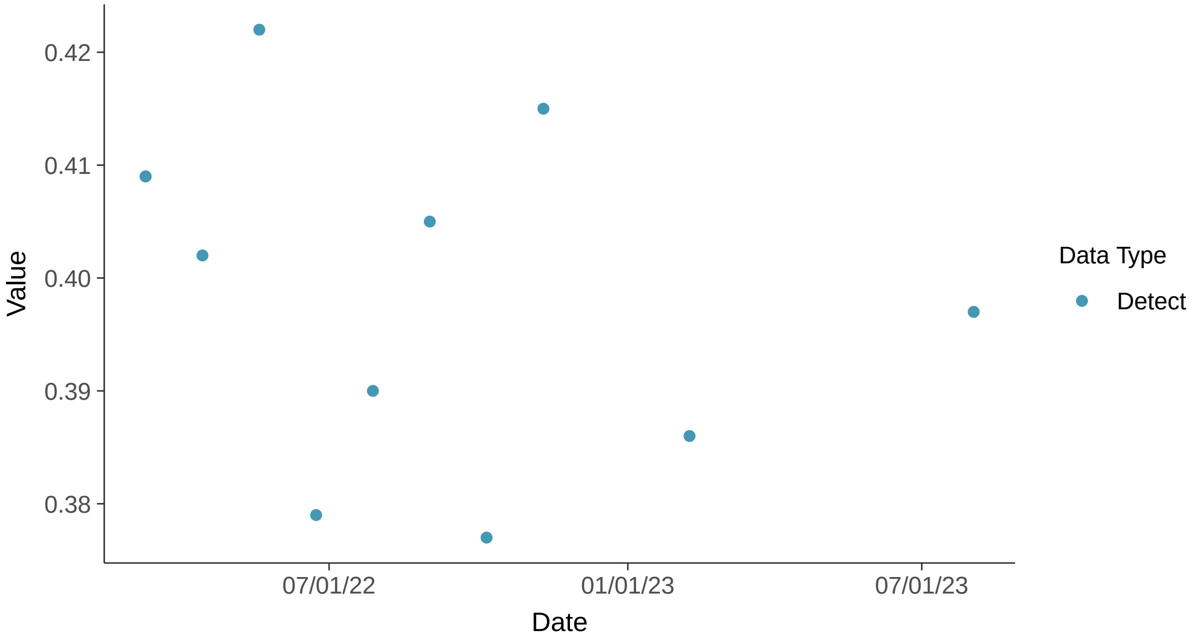


Appendix IV: Molybdenum, MW-7C

ID: 7C_2_18

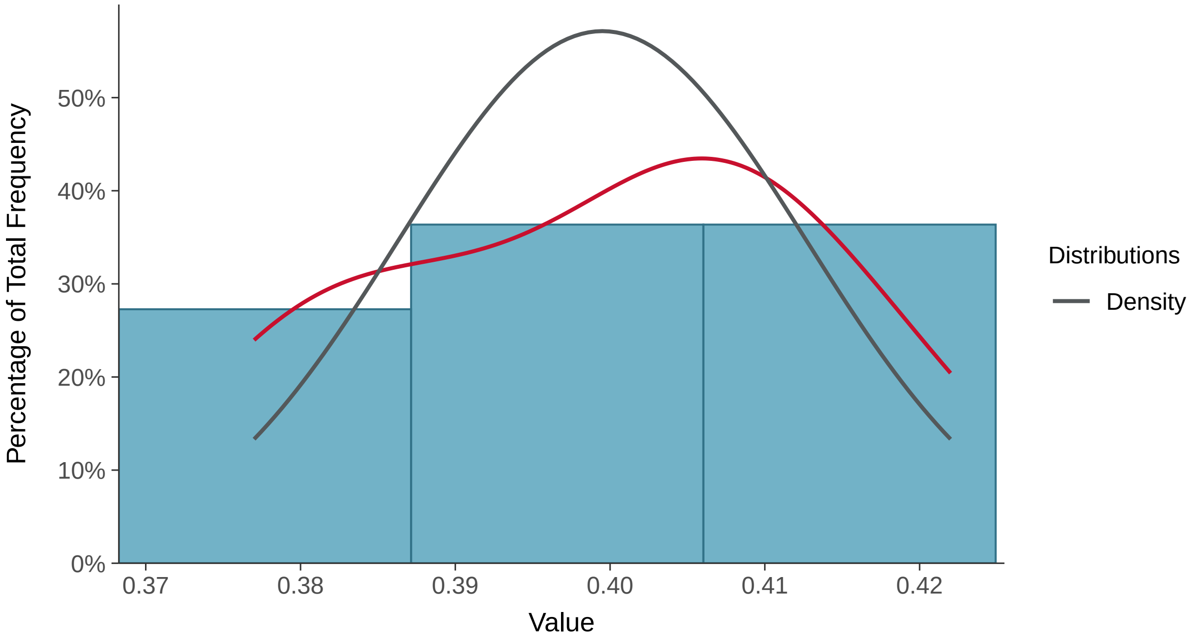
Scatter Plot

Molybdenum, MW-7C (mg/L)



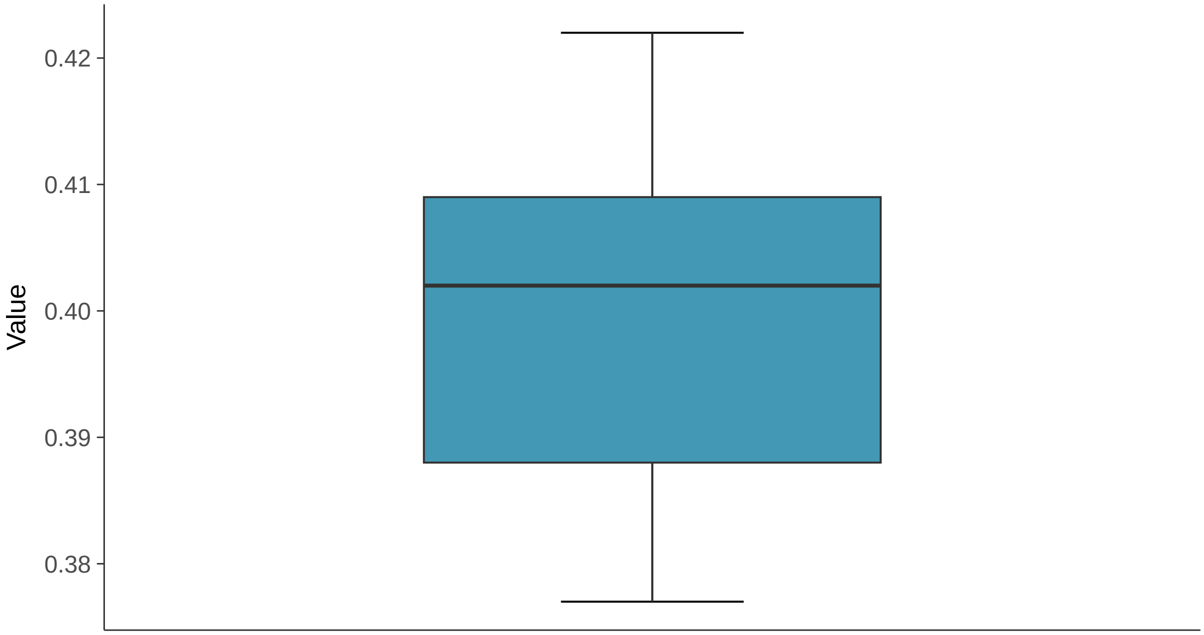
Histogram

Molybdenum, MW-7C (mg/L)



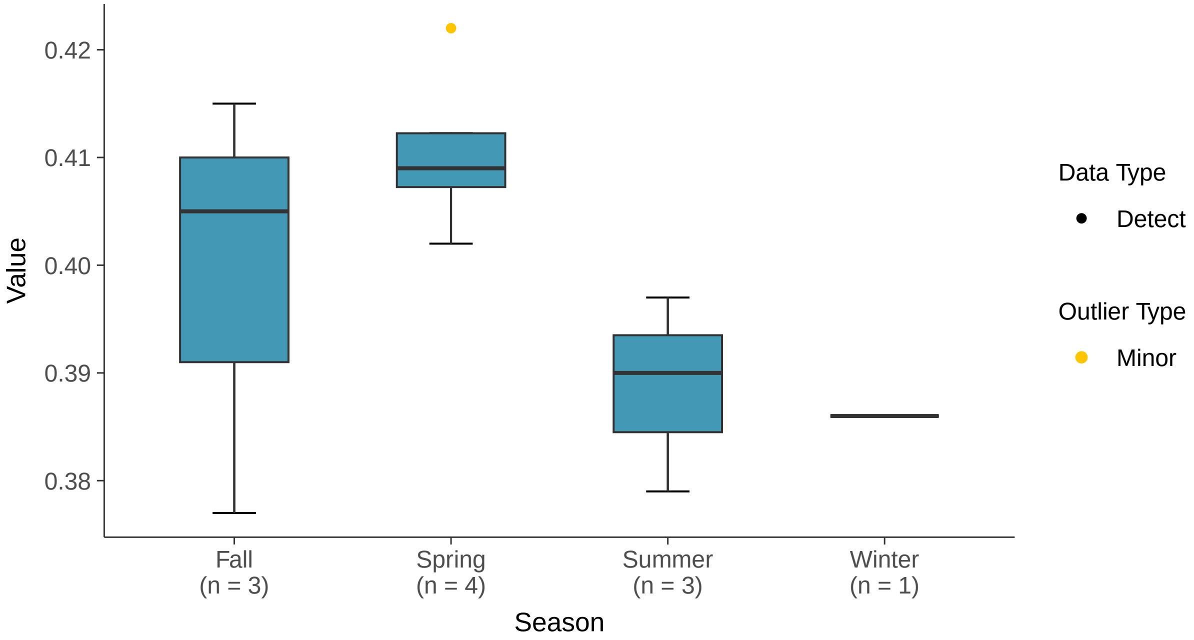
Boxplot

Molybdenum, MW-7C (mg/L)



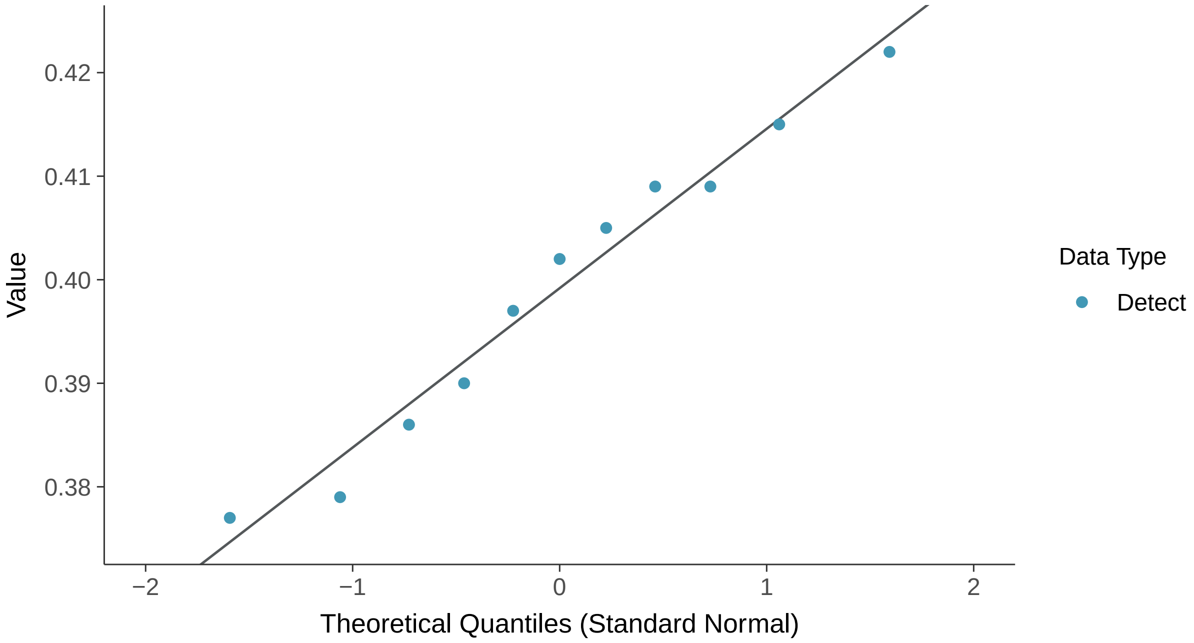
Boxplot by Season

Molybdenum, MW-7C (mg/L)



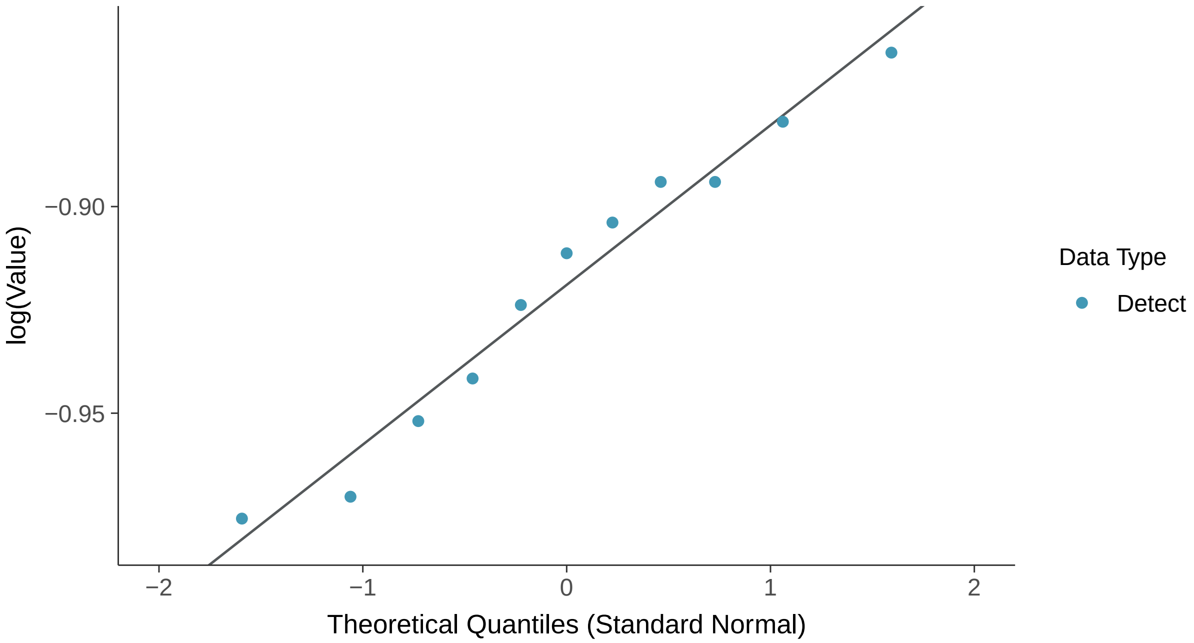
Normal Q-Q plot

Molybdenum, MW-7C (mg/L)



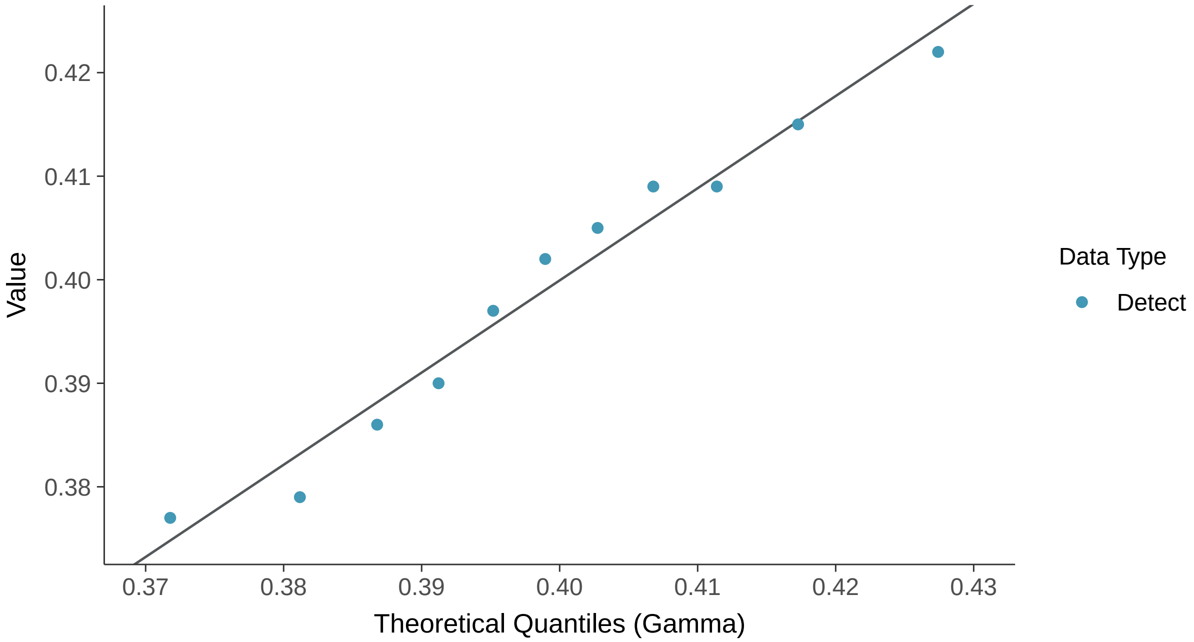
Lognormal Q-Q plot

Molybdenum, MW-7C (mg/L)



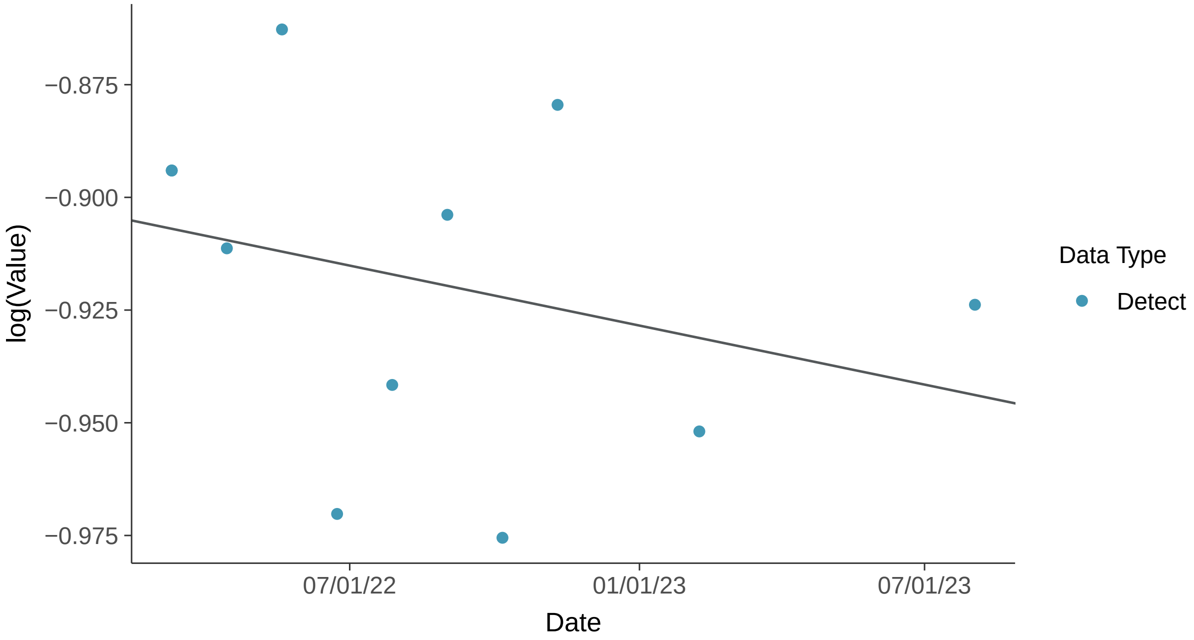
Gamma Q-Q plot

Molybdenum, MW-7C (mg/L)



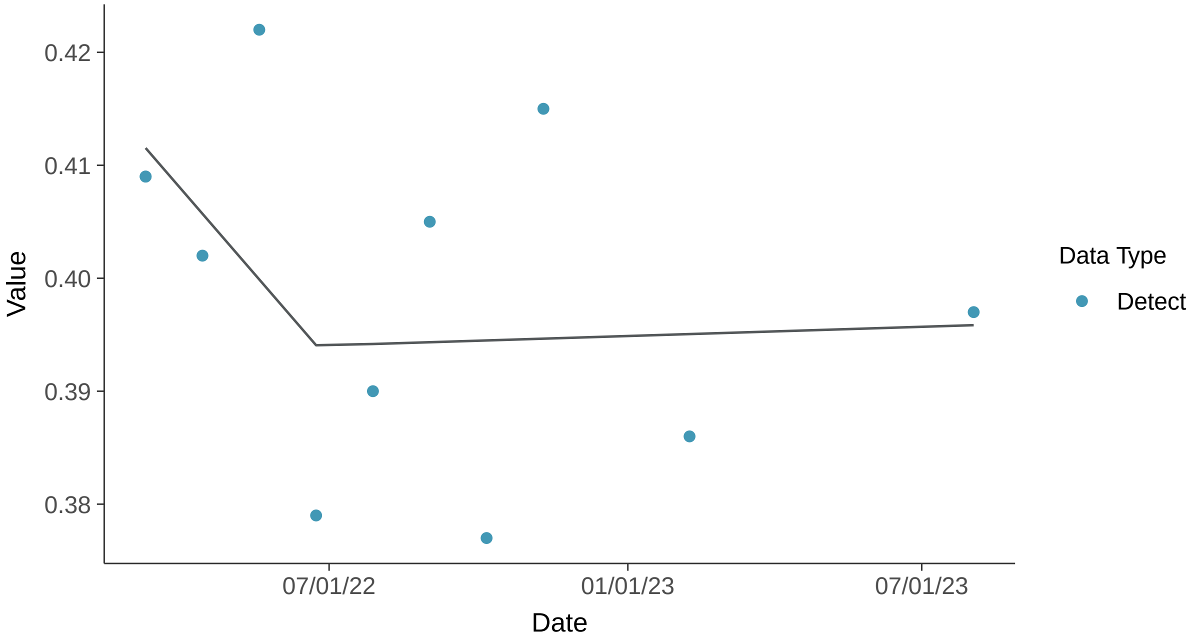
Trend Regression: Lognormal MLE

Molybdenum, MW-7C (mg/L)



Trend Regression: Piecewise Linear-Linear

Molybdenum, MW-7C (mg/L)

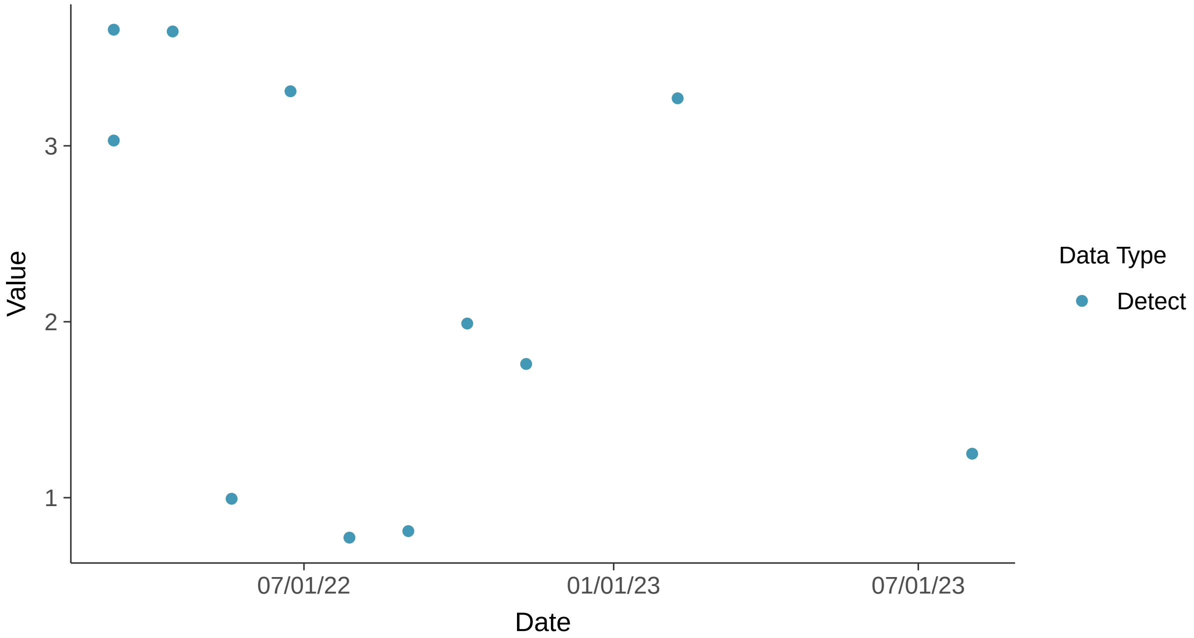


Appendix IV: Radium-226/228, MW-7C

ID: 7C_2_20

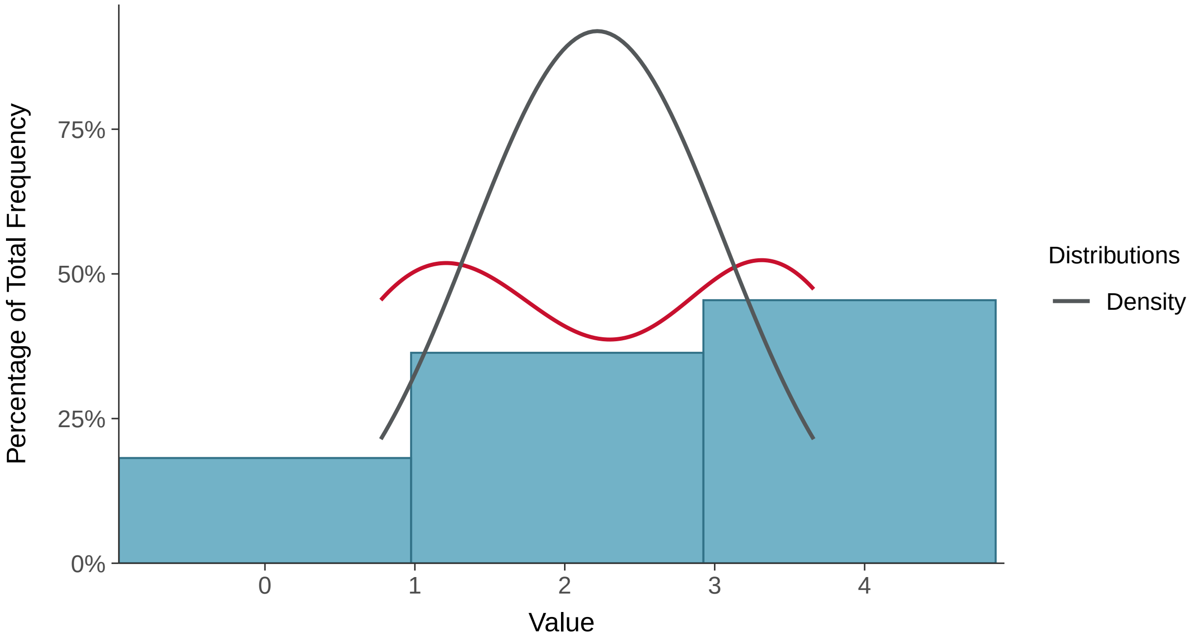
Scatter Plot

Radium-226/228, MW-7C (pCi/L)



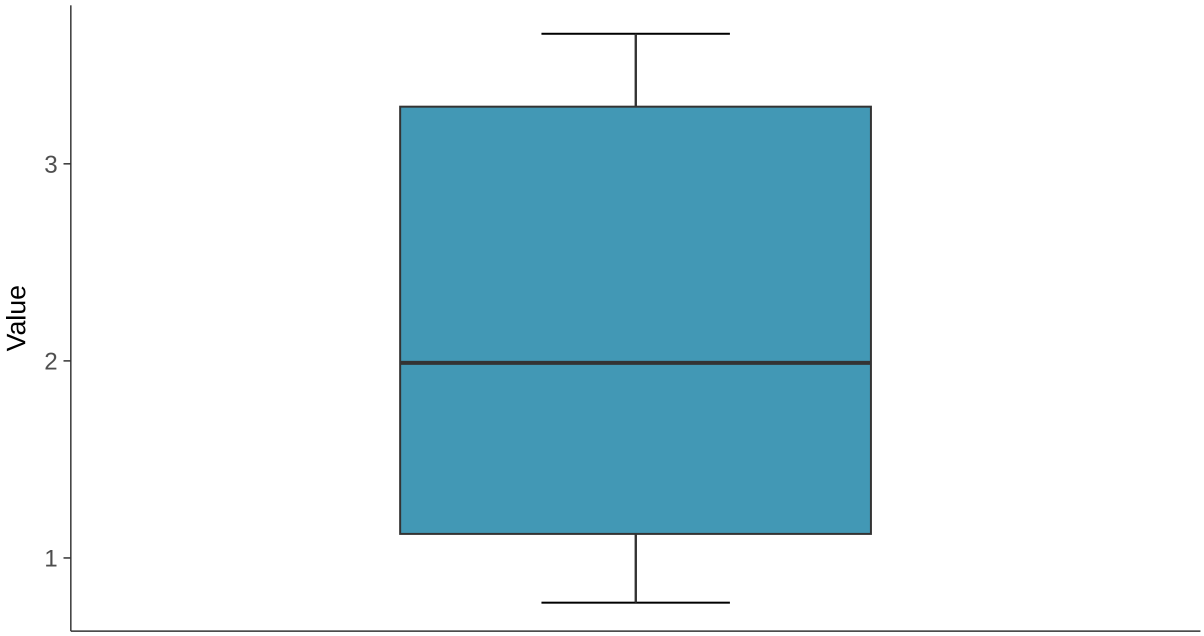
Histogram

Radium-226/228, MW-7C (pCi/L)



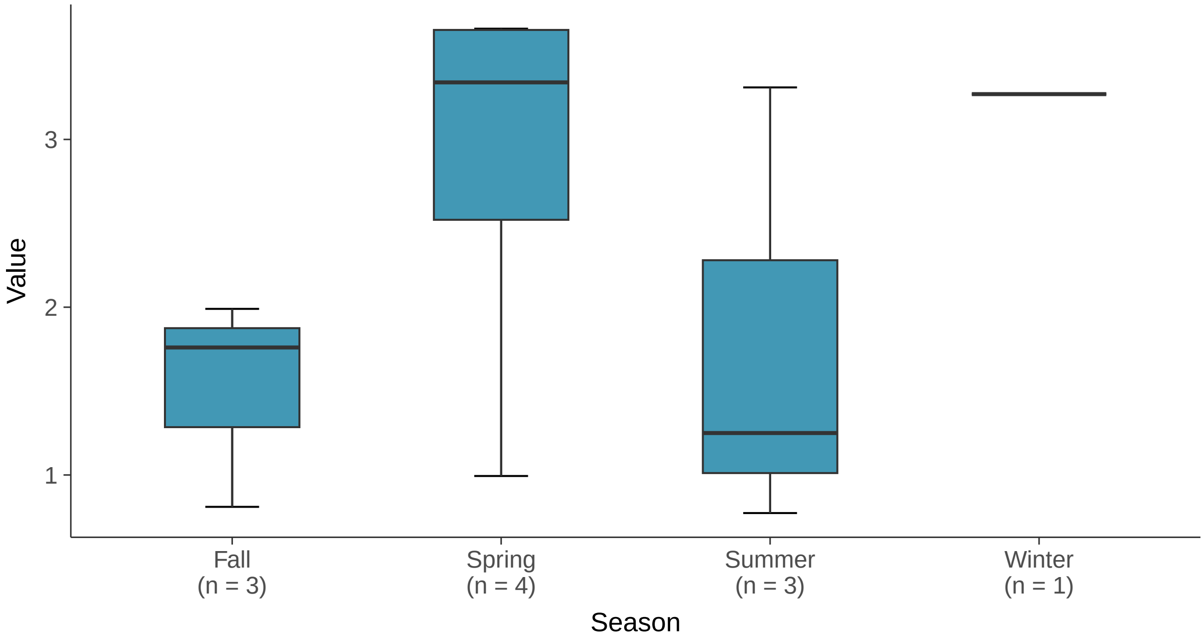
Boxplot

Radium-226/228, MW-7C (pCi/L)



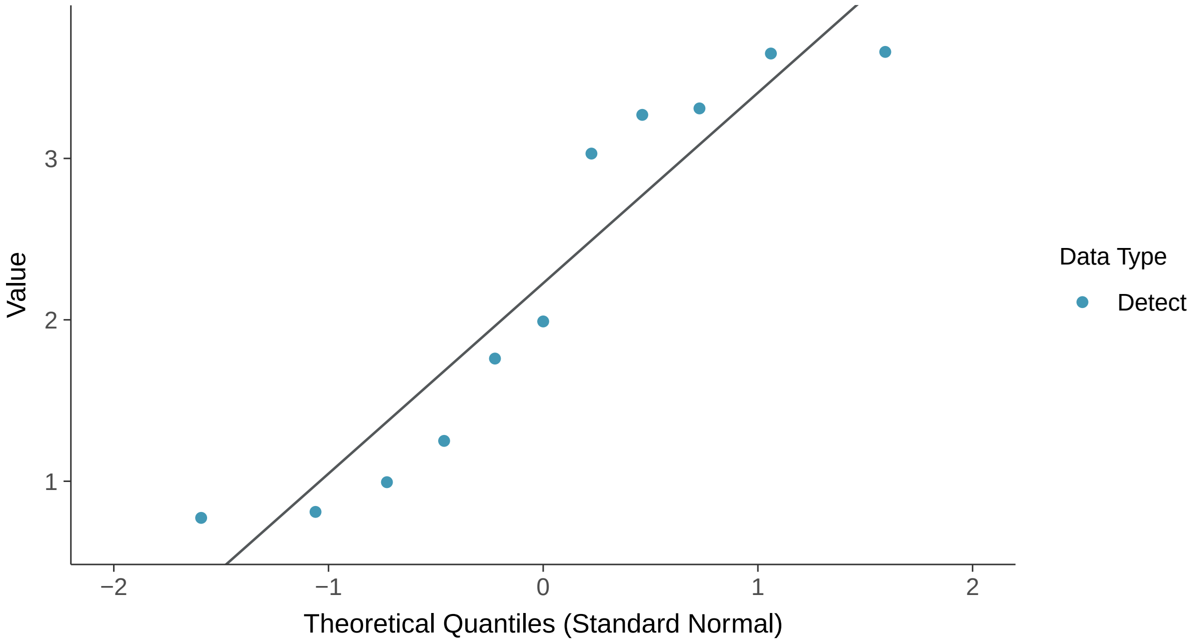
Boxplot by Season

Radium-226/228, MW-7C (pCi/L)



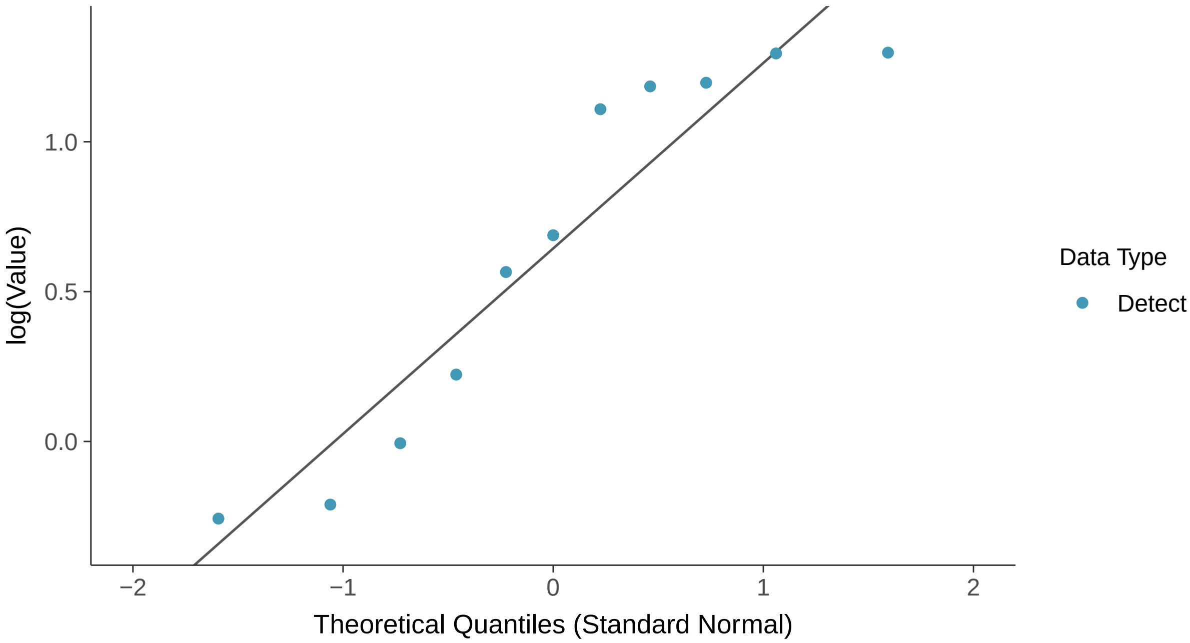
Normal Q-Q plot

Radium-226/228, MW-7C (pCi/L)



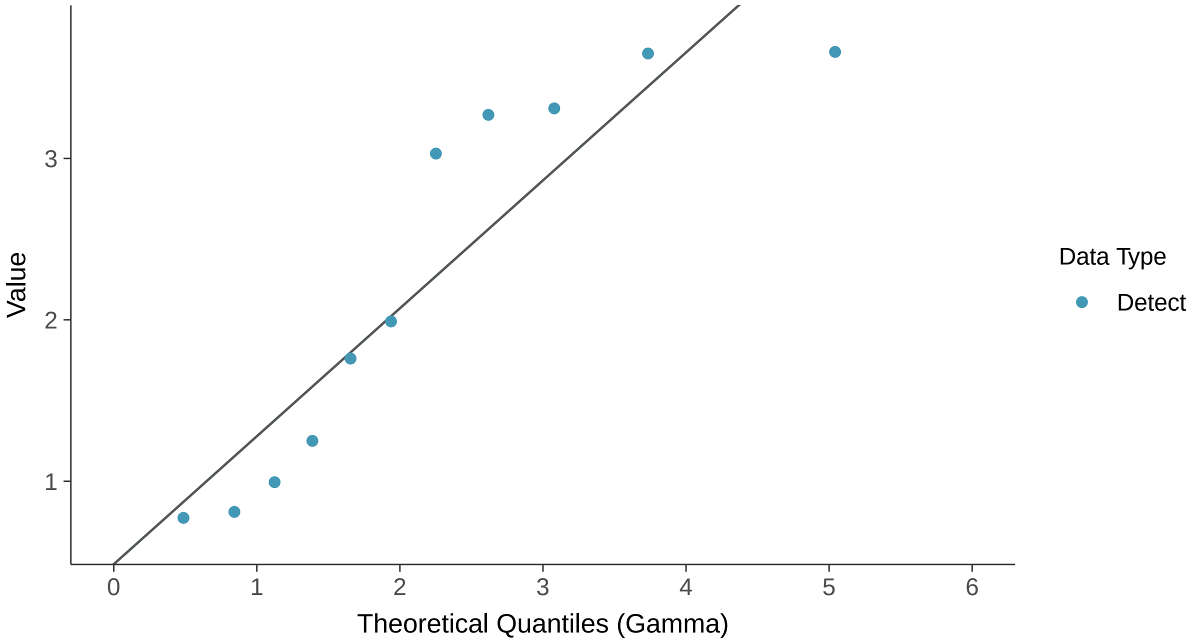
Lognormal Q-Q plot

Radium-226/228, MW-7C (pCi/L)



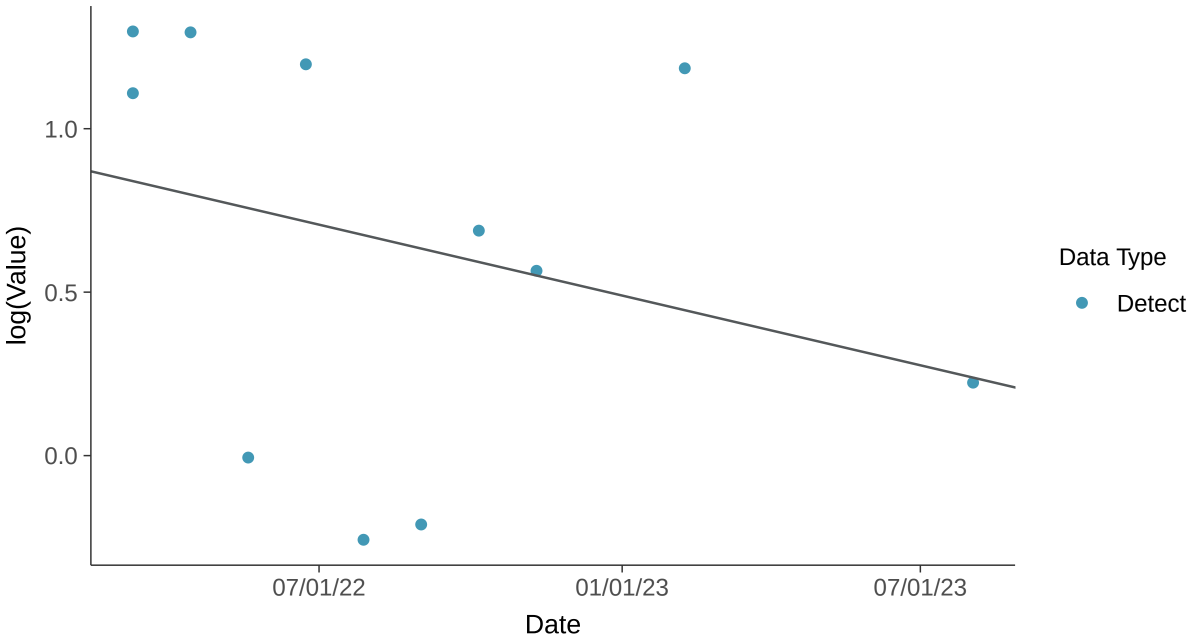
Gamma Q-Q plot

Radium-226/228, MW-7C (pCi/L)



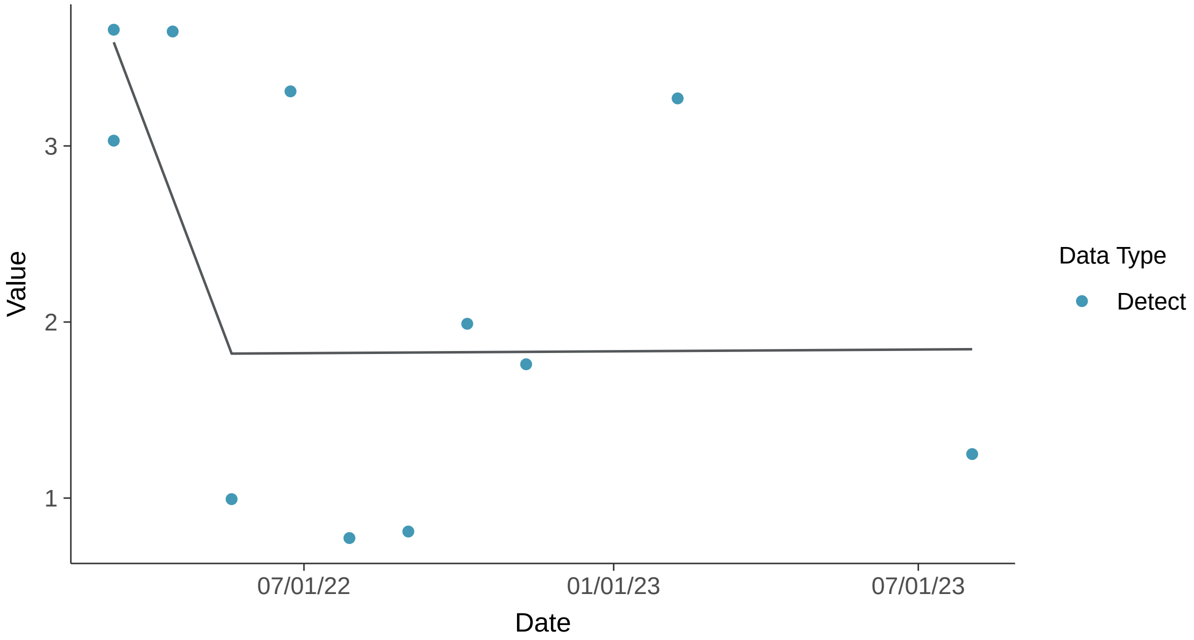
Trend Regression: Lognormal MLE

Radium-226/228, MW-7C (pCi/L)



Trend Regression: Piecewise Linear-Linear

Radium-226/228, MW-7C (pCi/L)

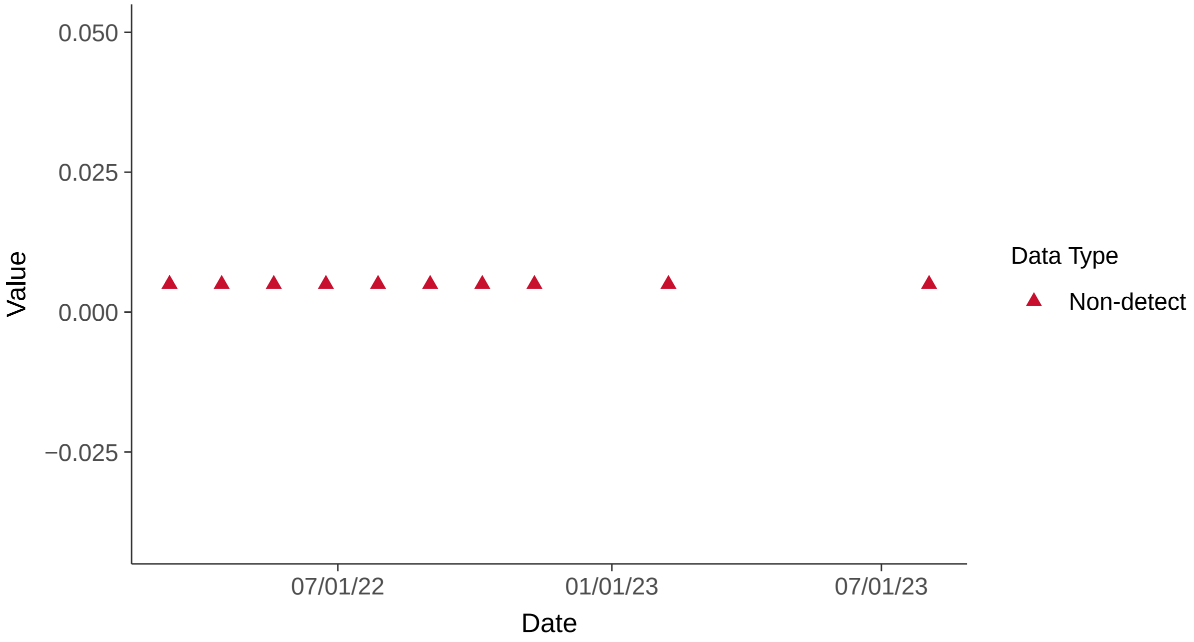


Appendix IV: Selenium, MW-7C

ID: 7C_2_22

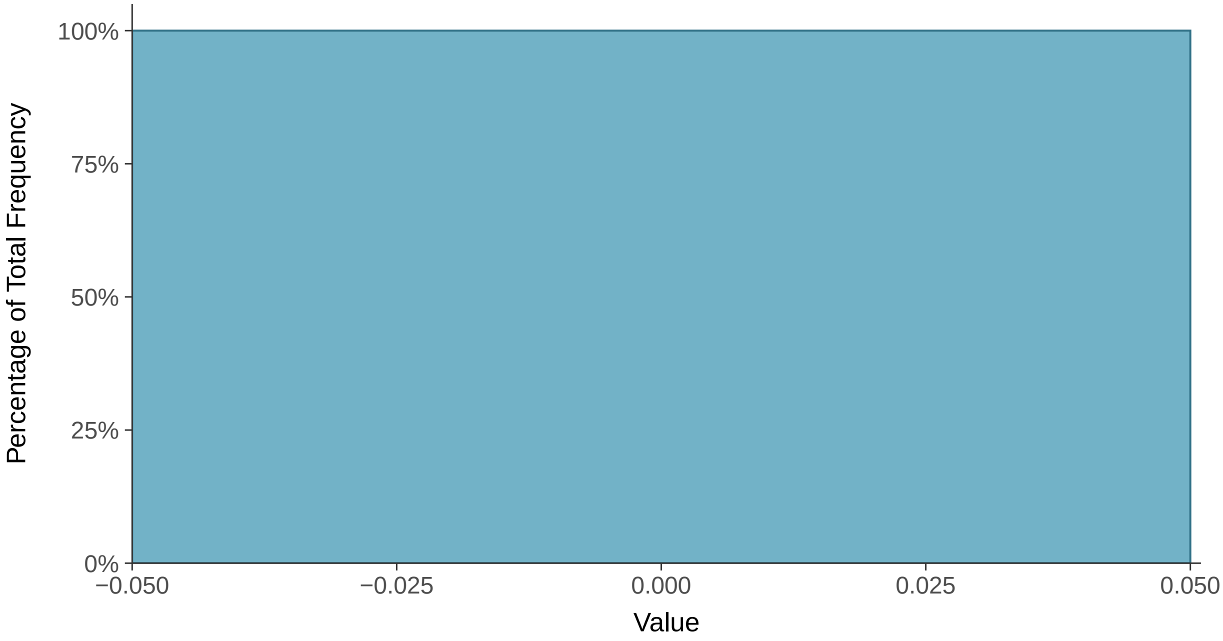
Scatter Plot

Selenium, MW-7C (mg/L)



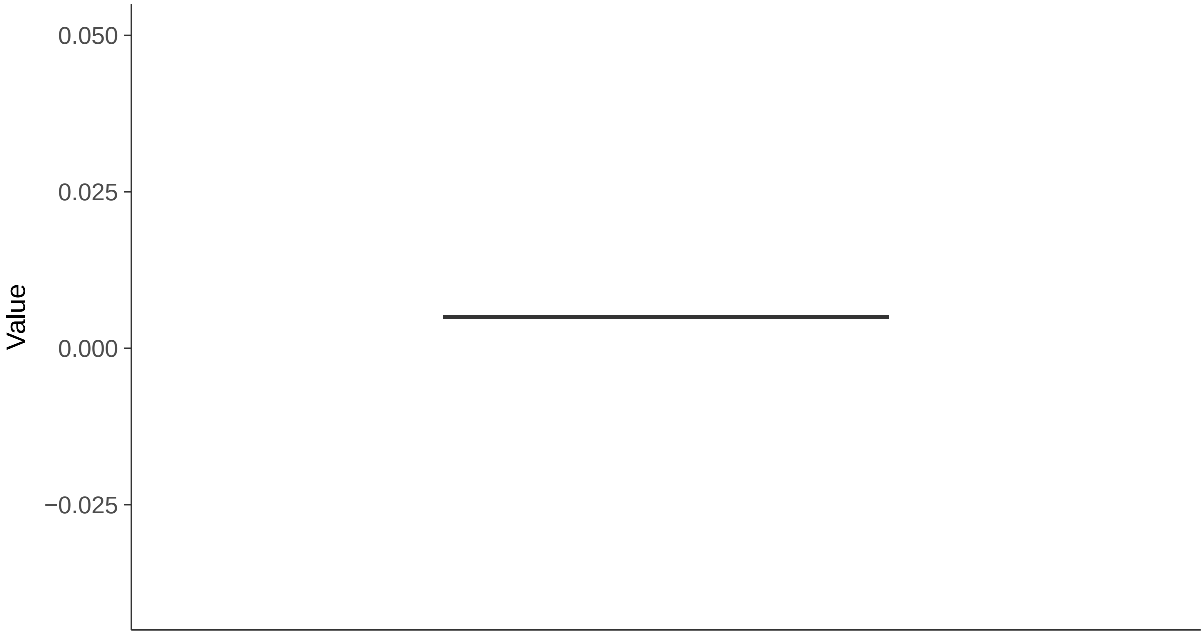
Histogram

Selenium, MW-7C (mg/L)



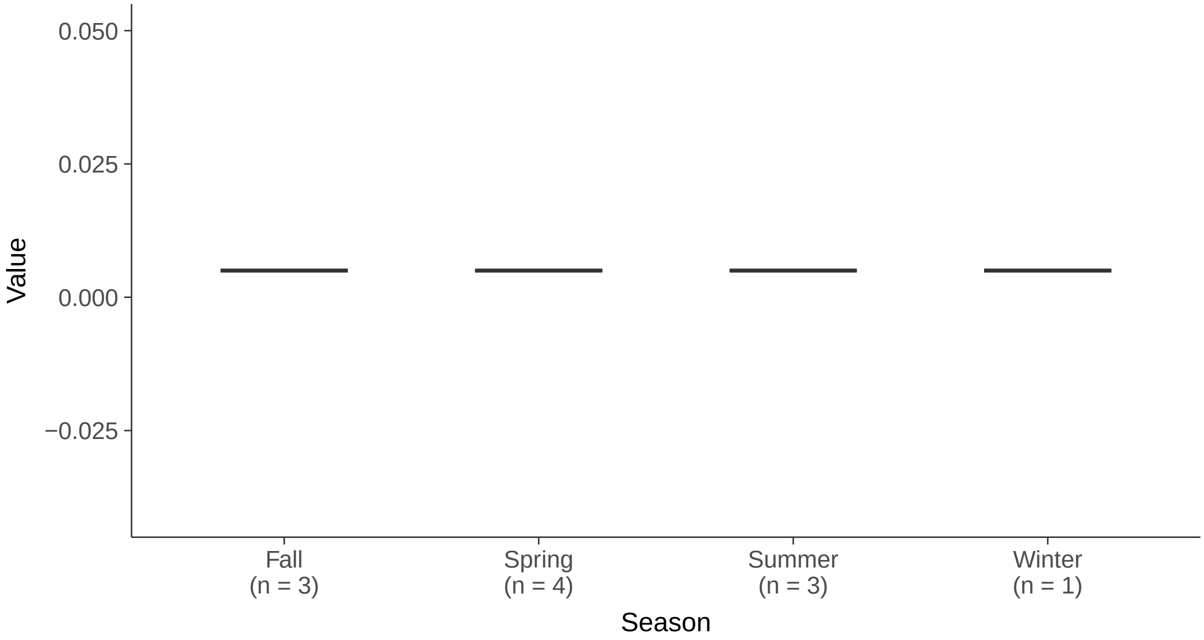
Boxplot

Selenium, MW-7C (mg/L)



Boxplot by Season

Selenium, MW-7C (mg/L)

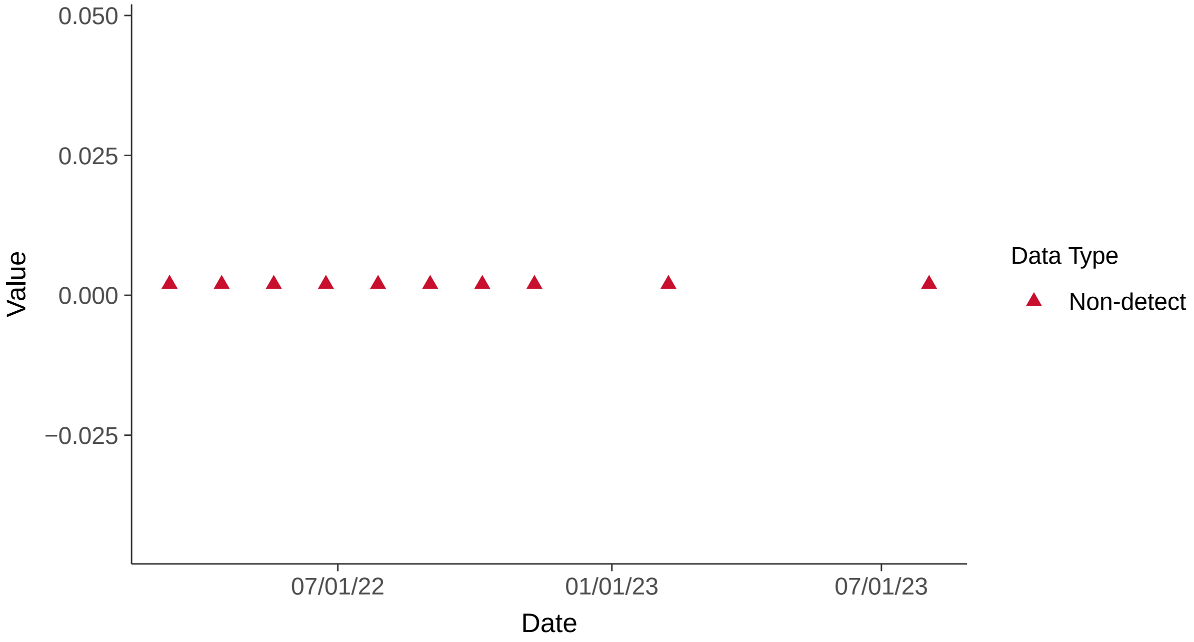


Appendix IV: Thallium, MW-7C

ID: 7C_2_23

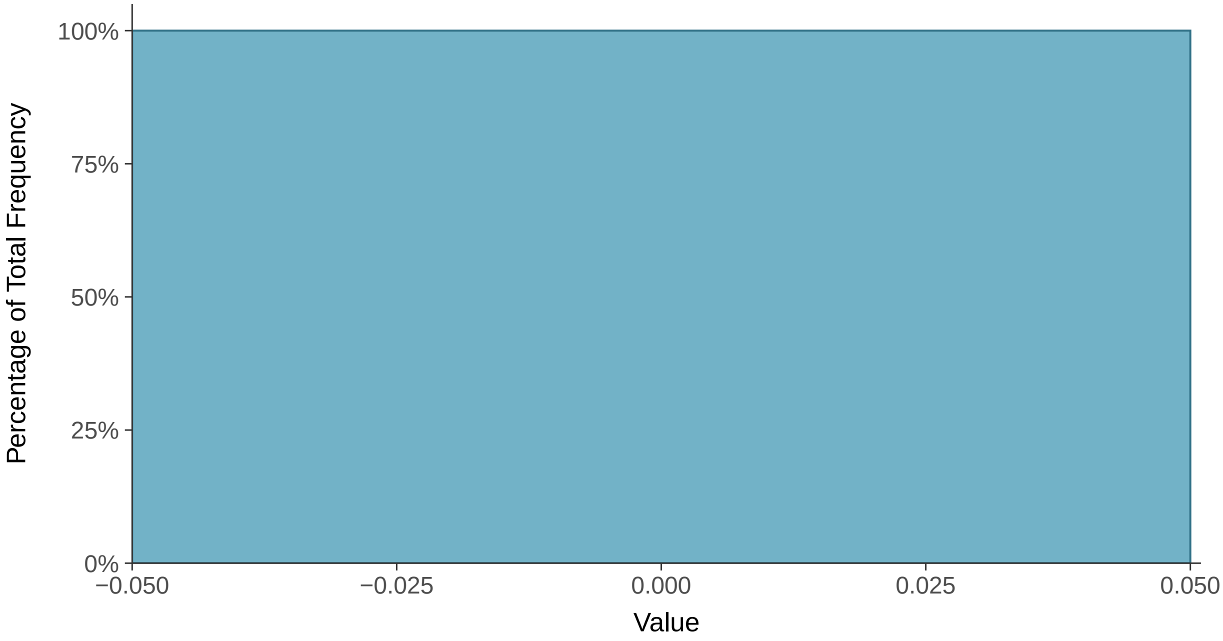
Scatter Plot

Thallium, MW-7C (mg/L)



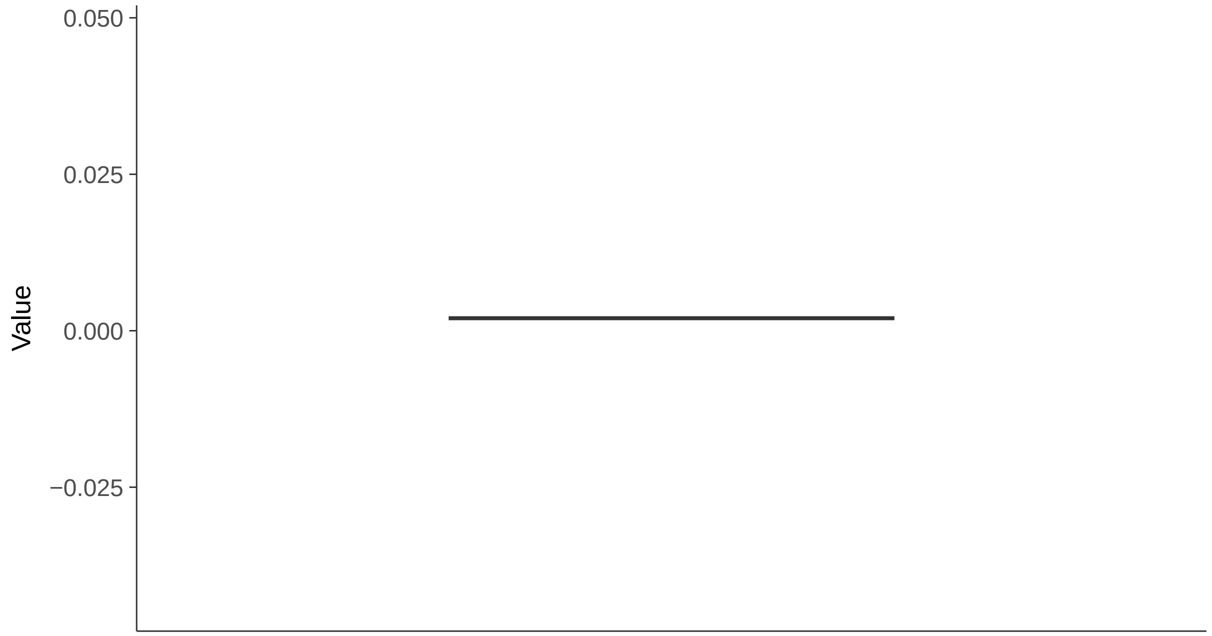
Histogram

Thallium, MW-7C (mg/L)



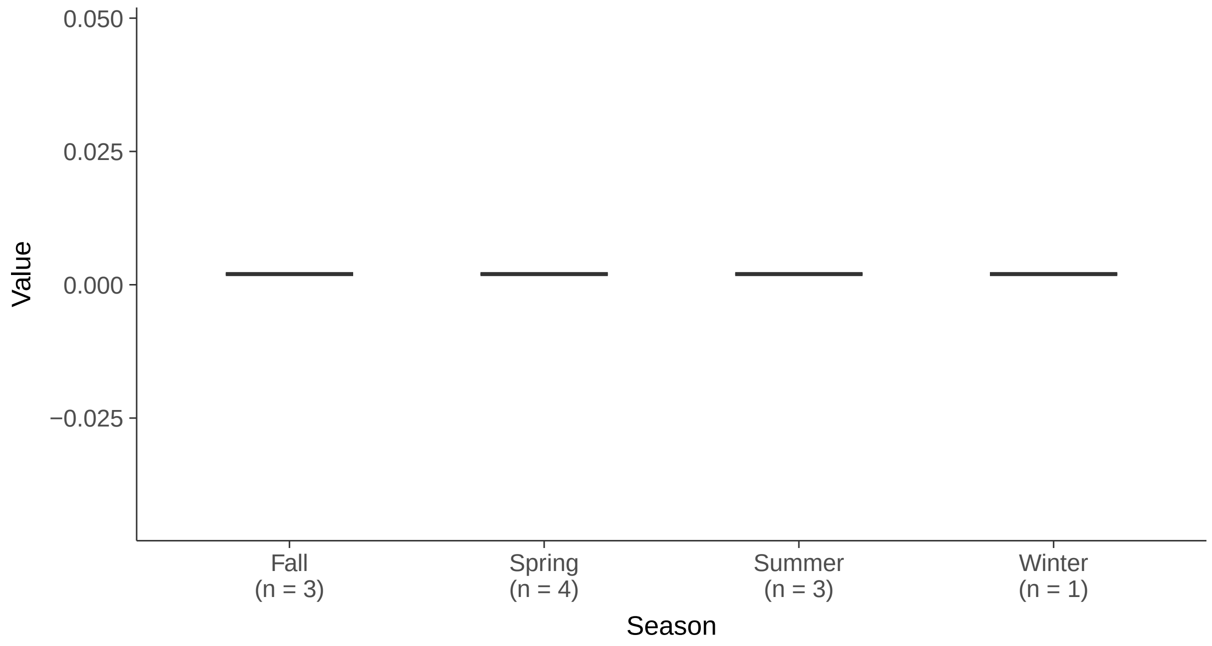
Boxplot

Thallium, MW-7C (mg/L)



Boxplot by Season

Thallium, MW-7C (mg/L)

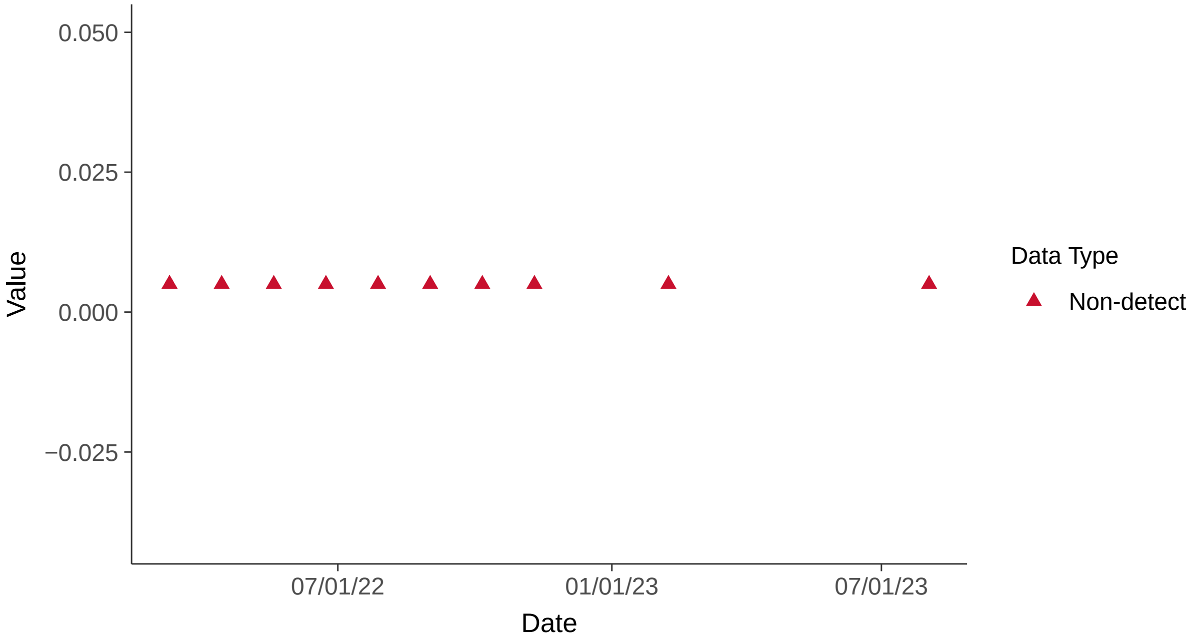


Part 115: Copper, MW-7C

ID: 7C_5_37

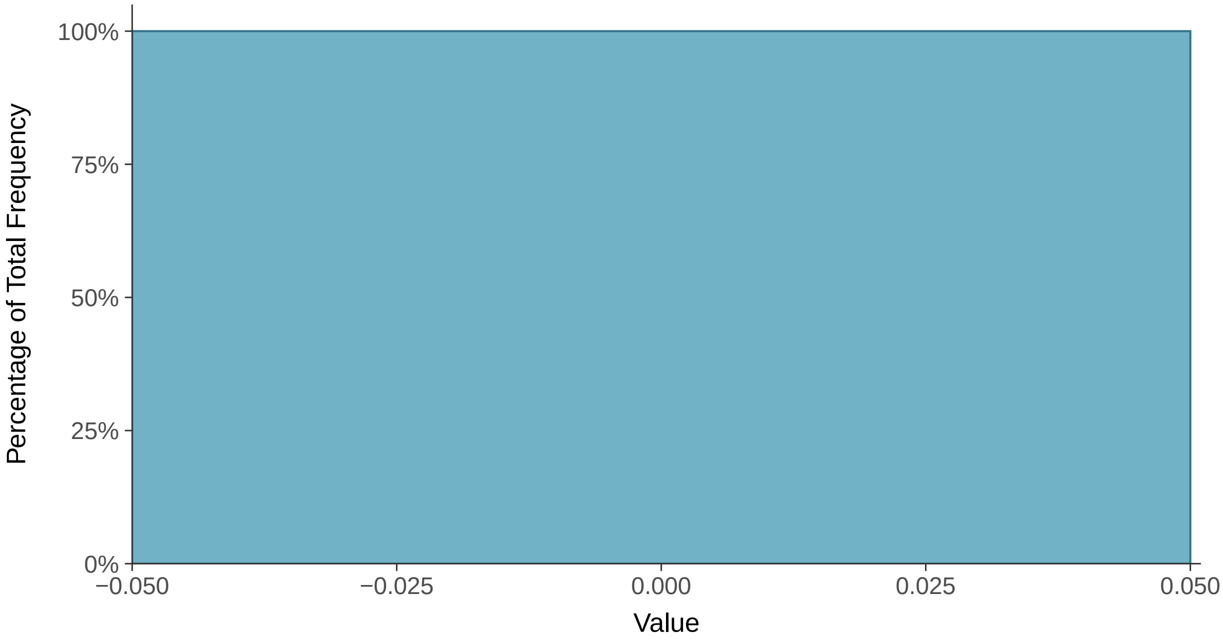
Scatter Plot

Copper, MW-7C (mg/L)



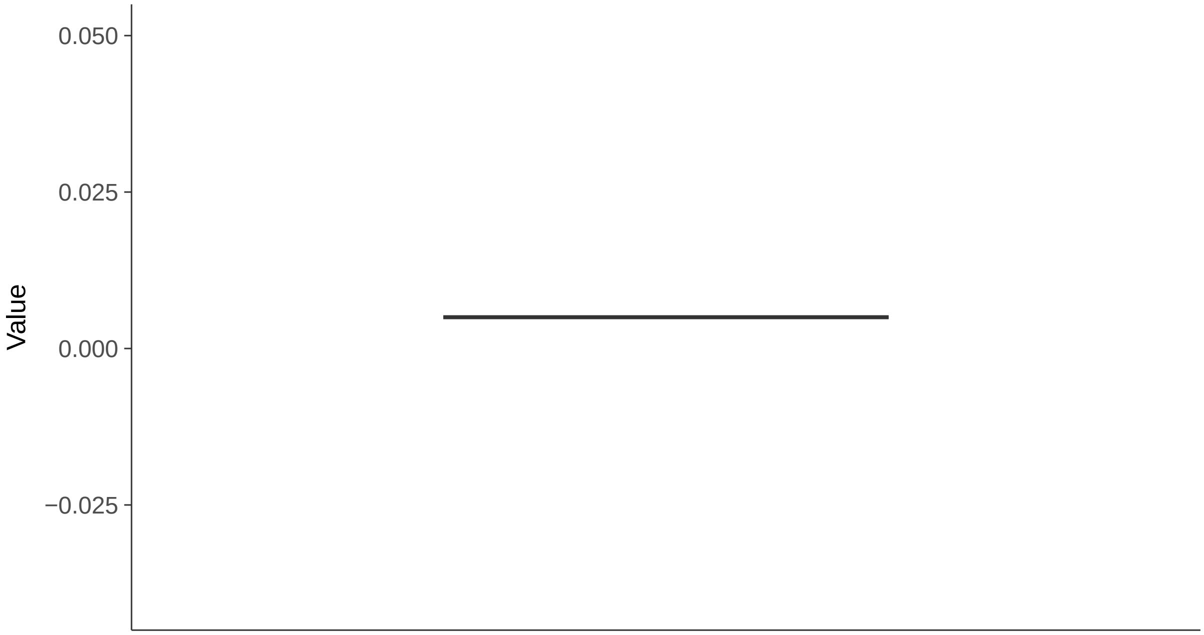
Histogram

Copper, MW-7C (mg/L)



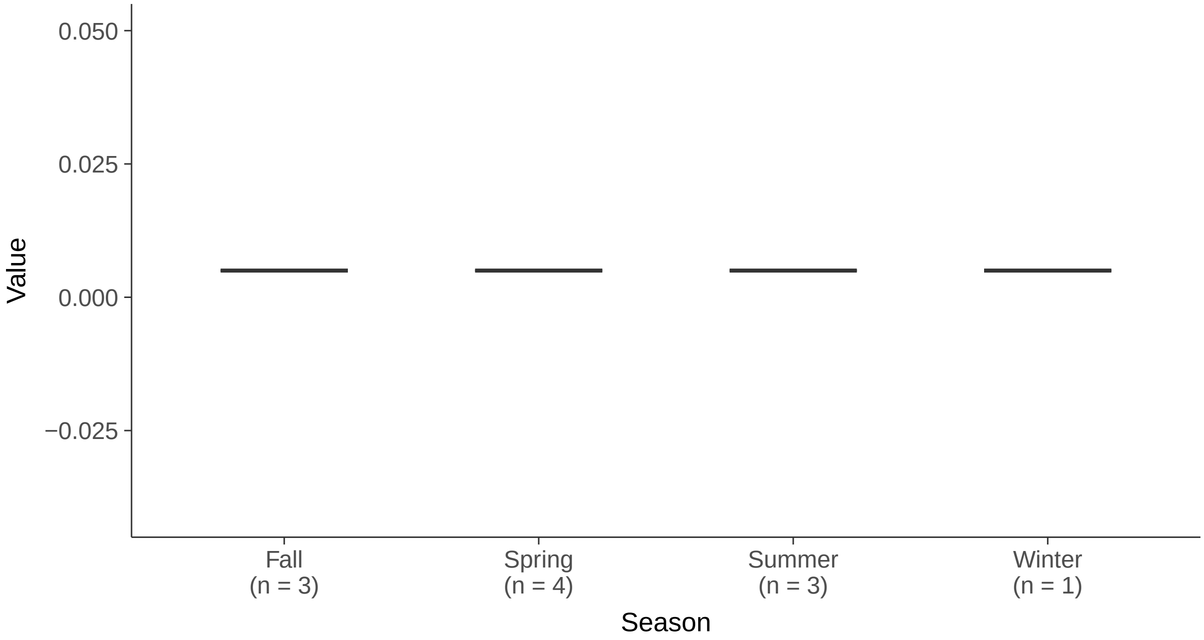
Boxplot

Copper, MW-7C (mg/L)



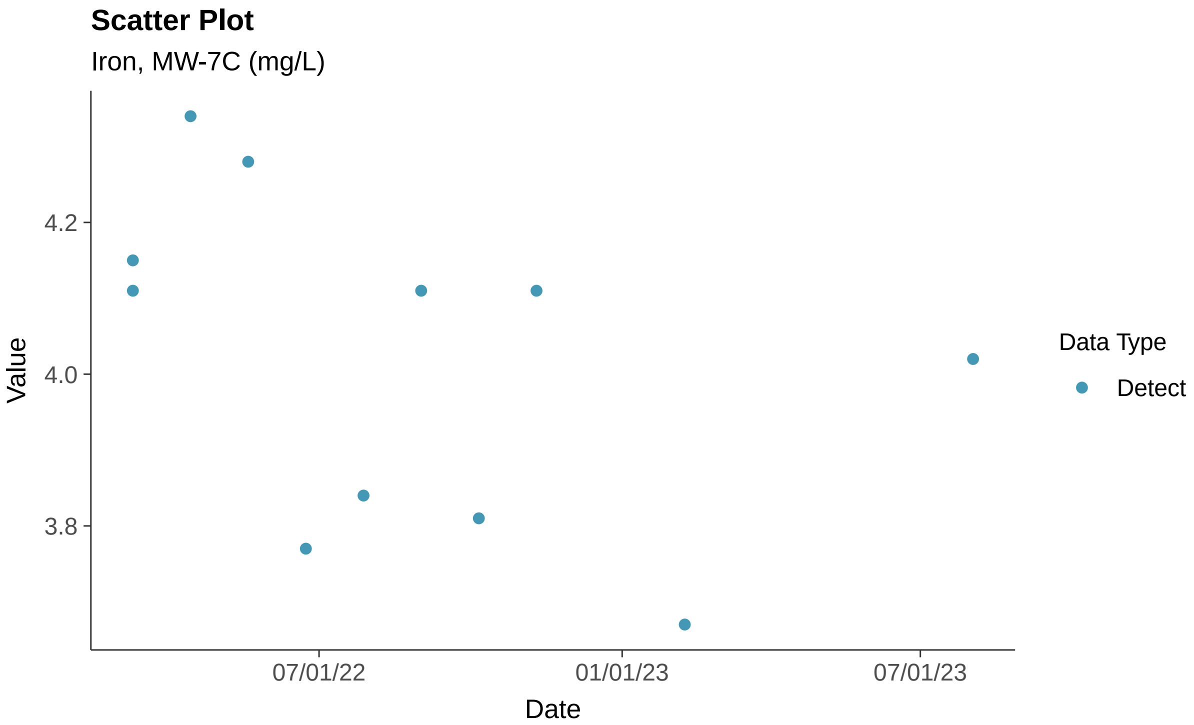
Boxplot by Season

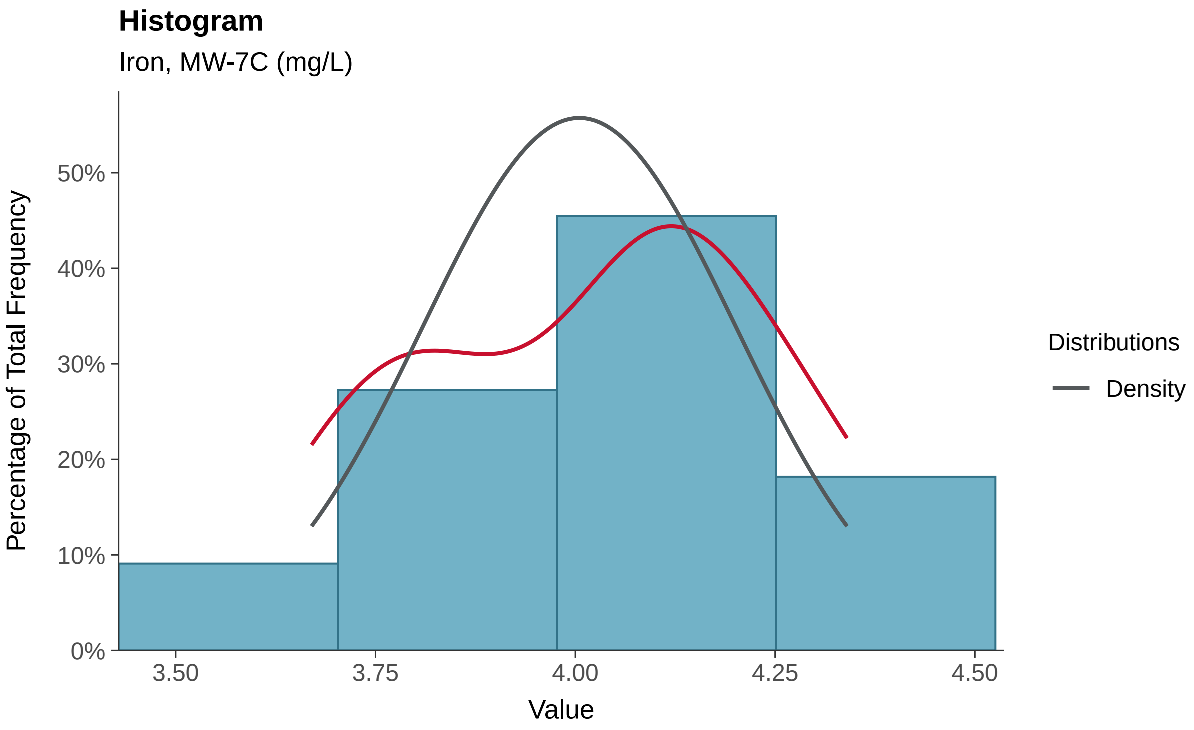
Copper, MW-7C (mg/L)



Part 115: Iron, MW-7C

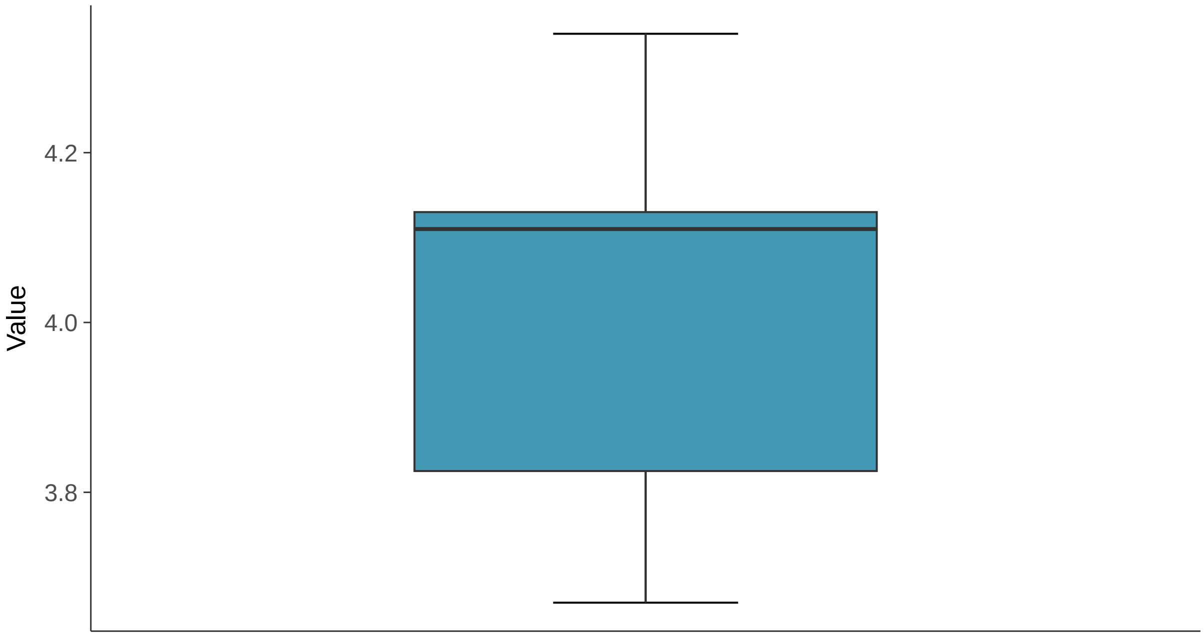
ID: 7C_5_38





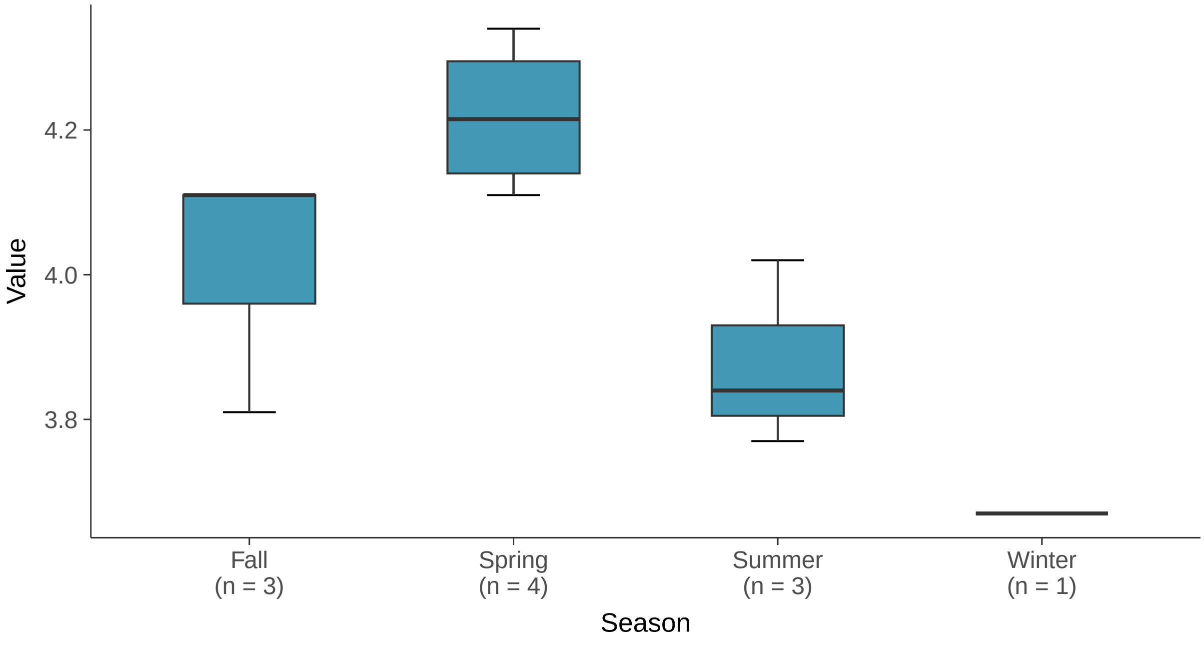
Boxplot

Iron, MW-7C (mg/L)



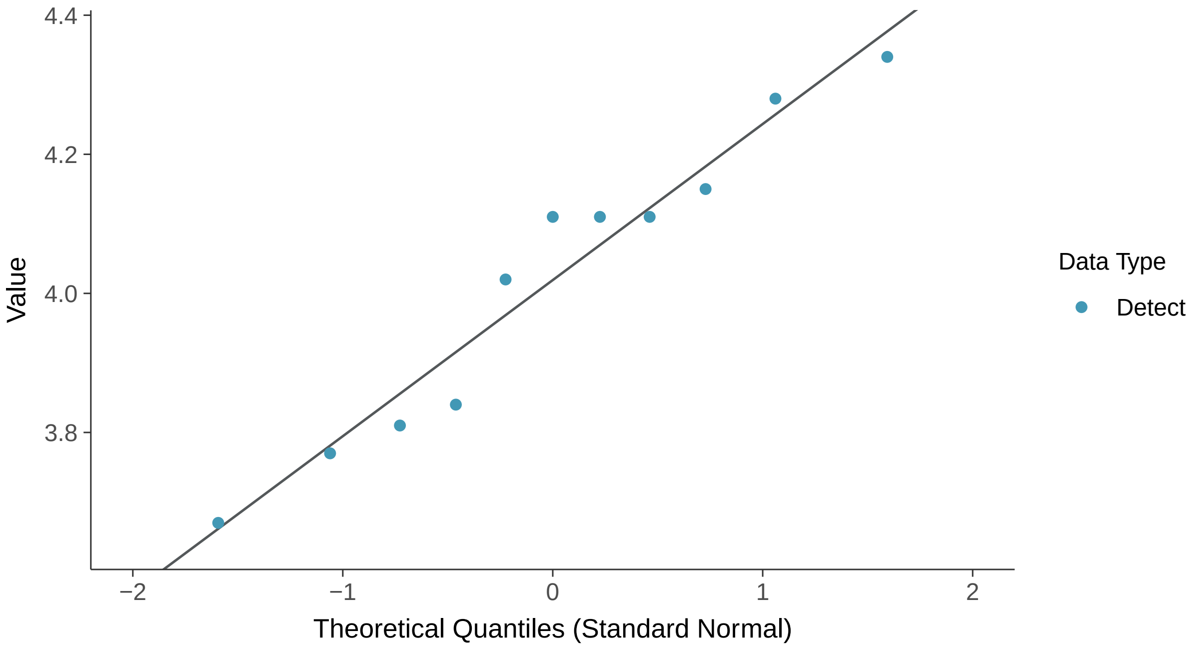
Boxplot by Season

Iron, MW-7C (mg/L)



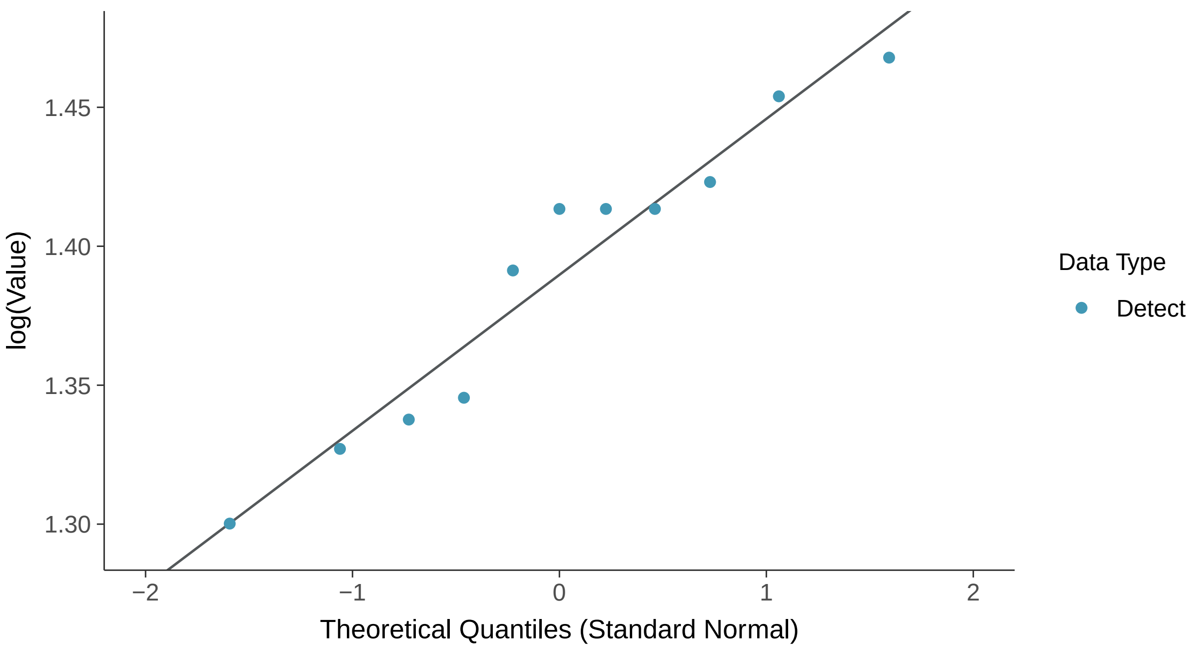
Normal Q-Q plot

Iron, MW-7C (mg/L)



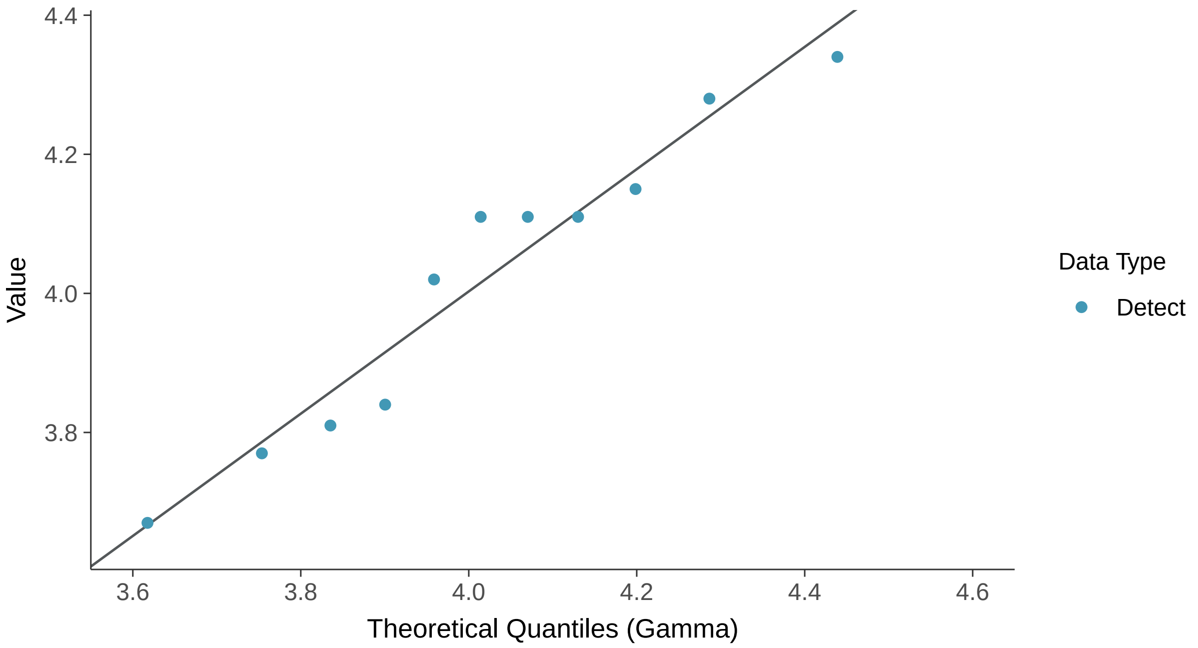
Lognormal Q-Q plot

Iron, MW-7C (mg/L)



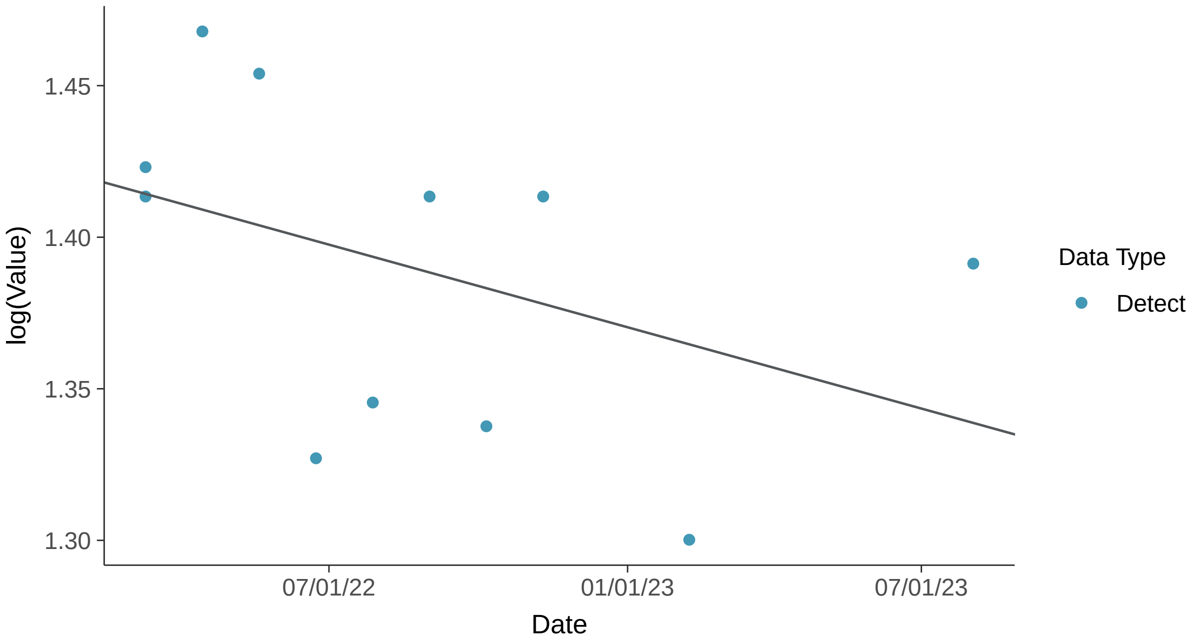
Gamma Q-Q plot

Iron, MW-7C (mg/L)



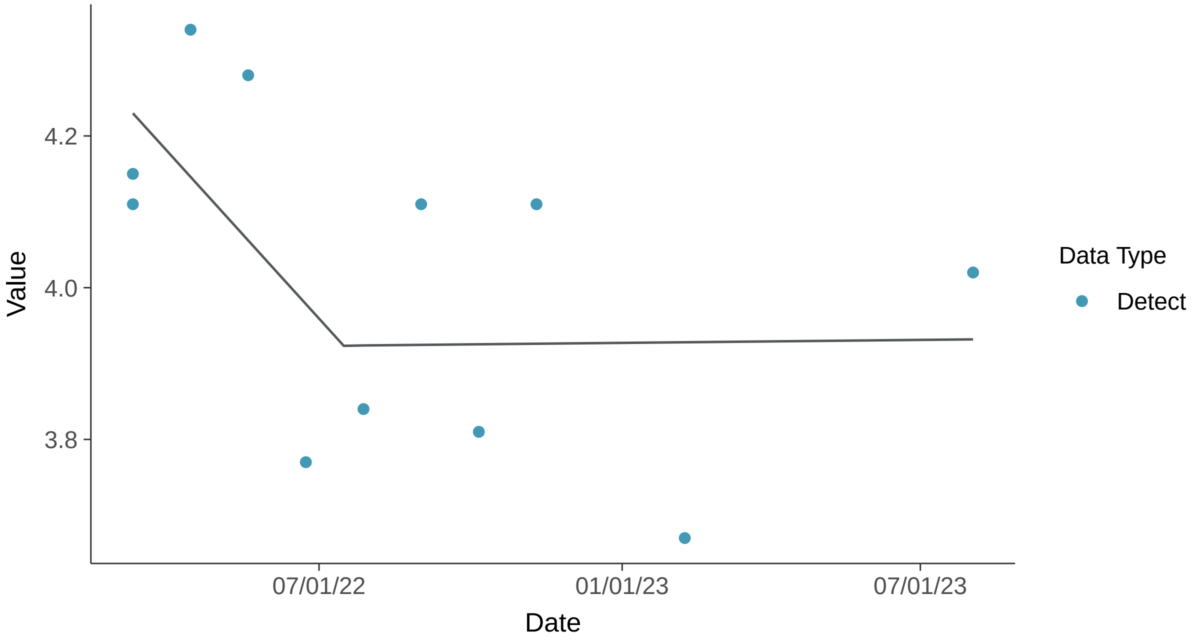
Trend Regression: Lognormal MLE

Iron, MW-7C (mg/L)



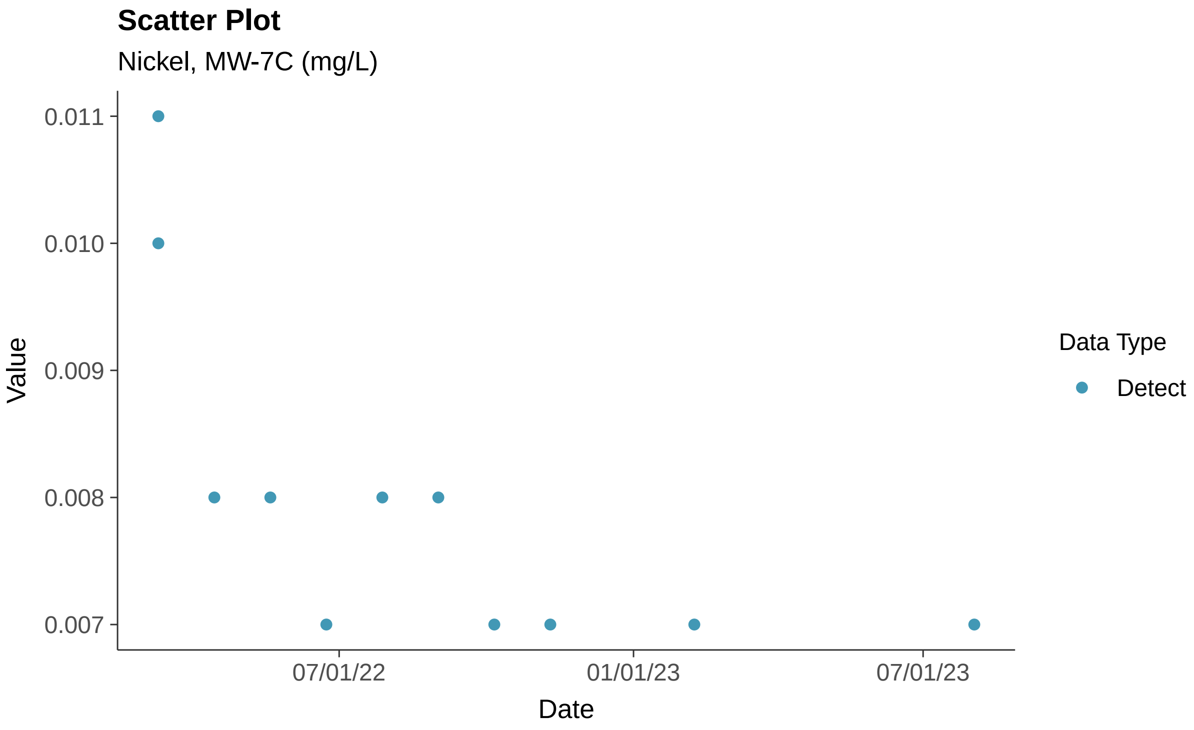
Trend Regression: Piecewise Linear-Linear

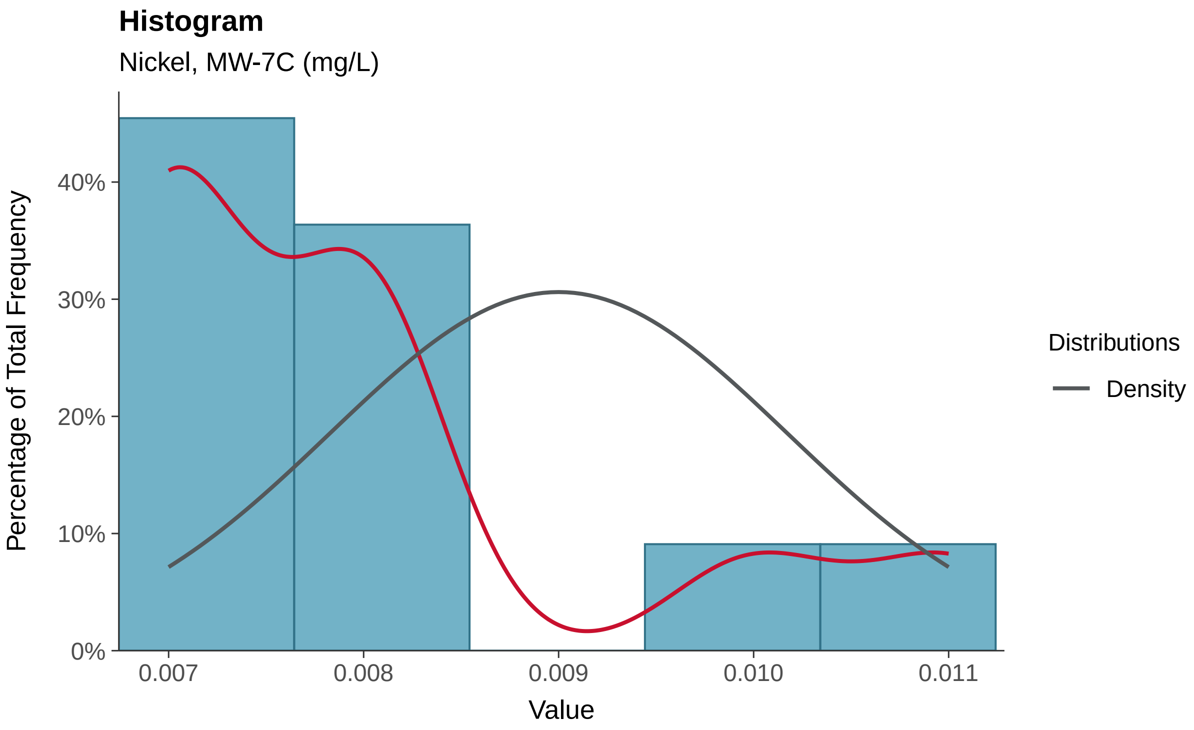
Iron, MW-7C (mg/L)



Part 115: Nickel, MW-7C

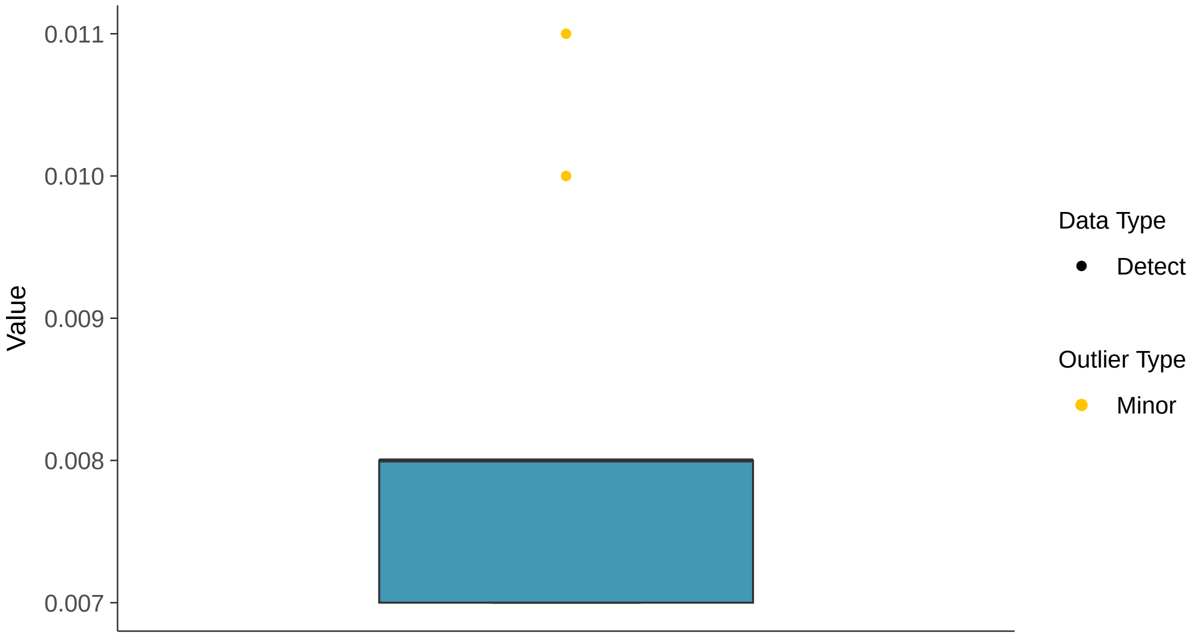
ID: 7C_5_39





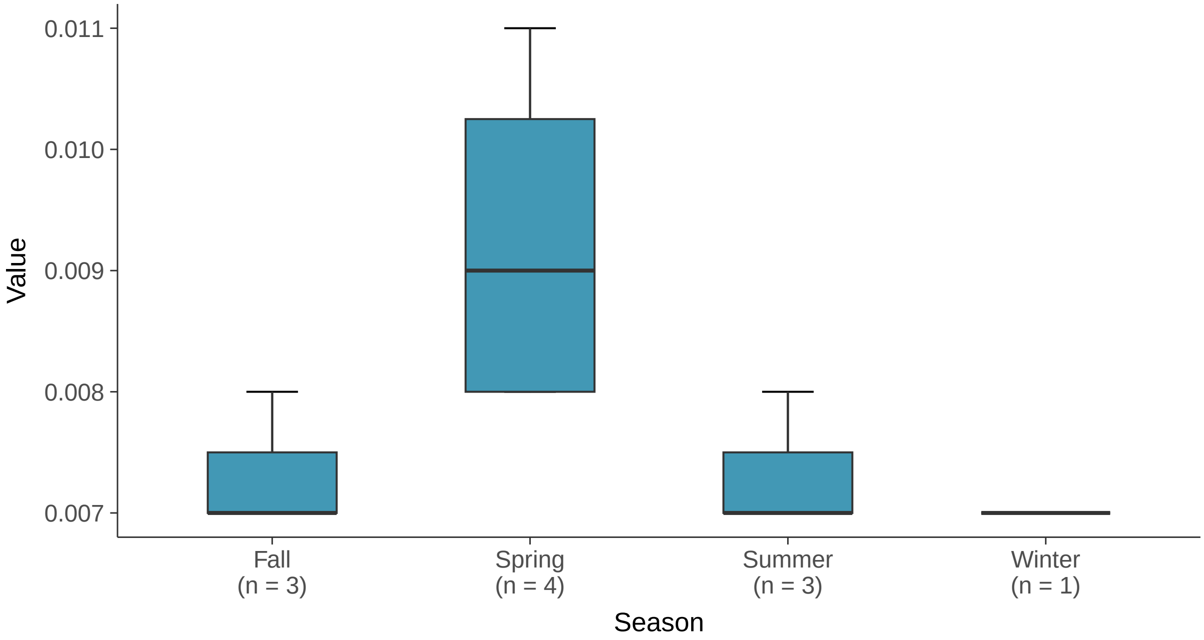
Boxplot

Nickel, MW-7C (mg/L)



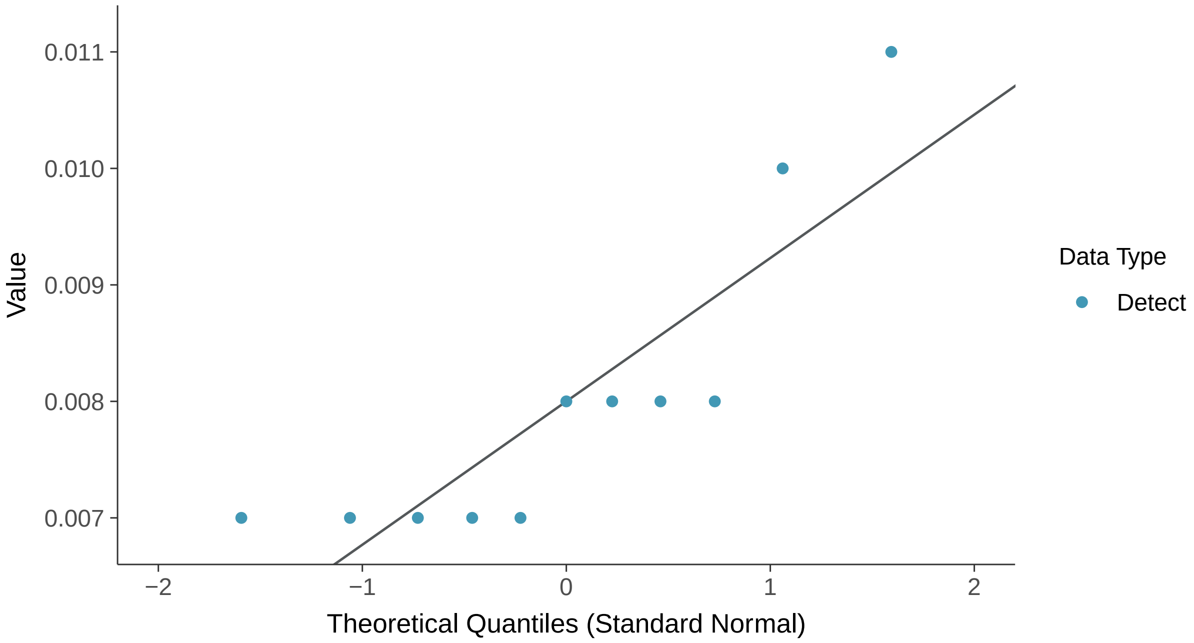
Boxplot by Season

Nickel, MW-7C (mg/L)



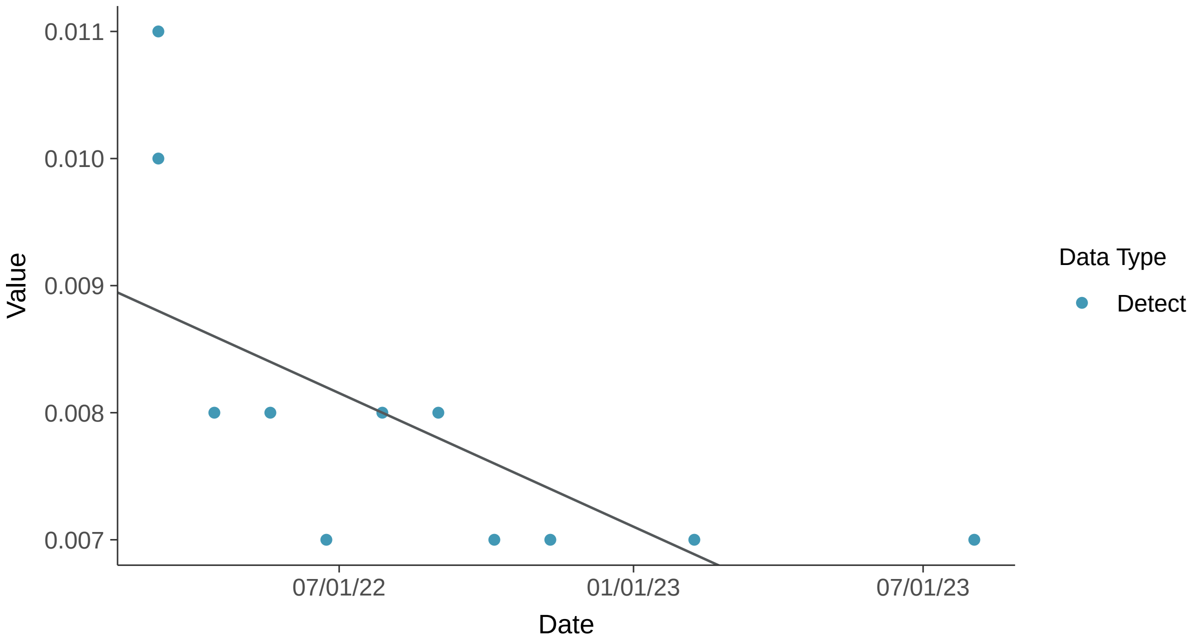
Normal Q-Q plot

Nickel, MW-7C (mg/L)



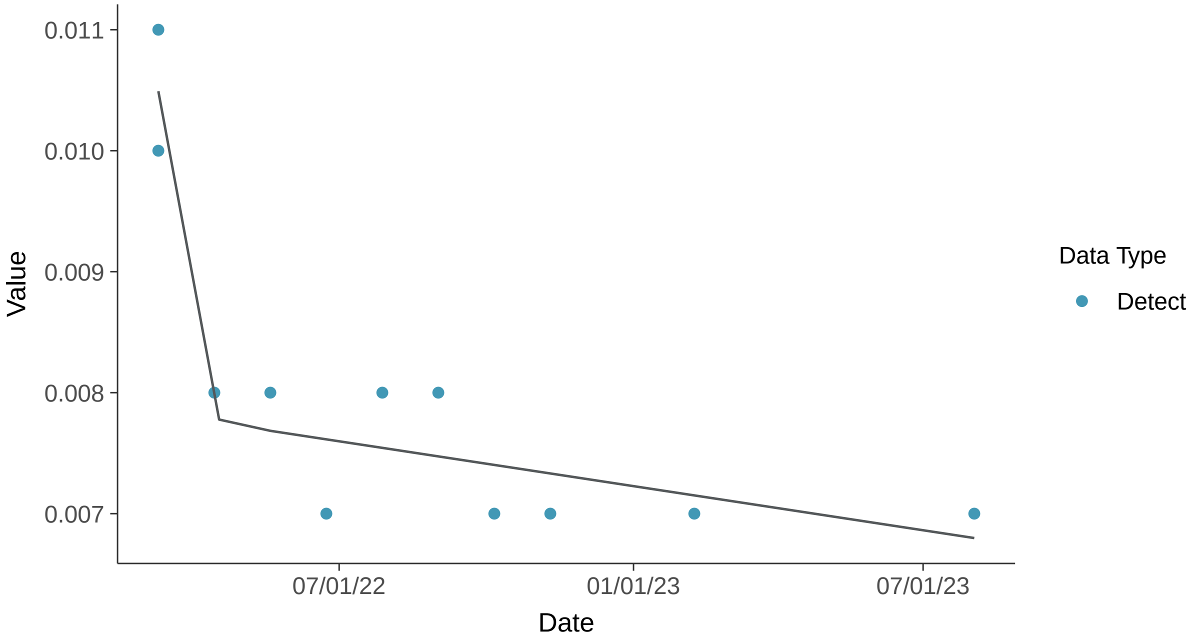
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Nickel, MW-7C (mg/L)



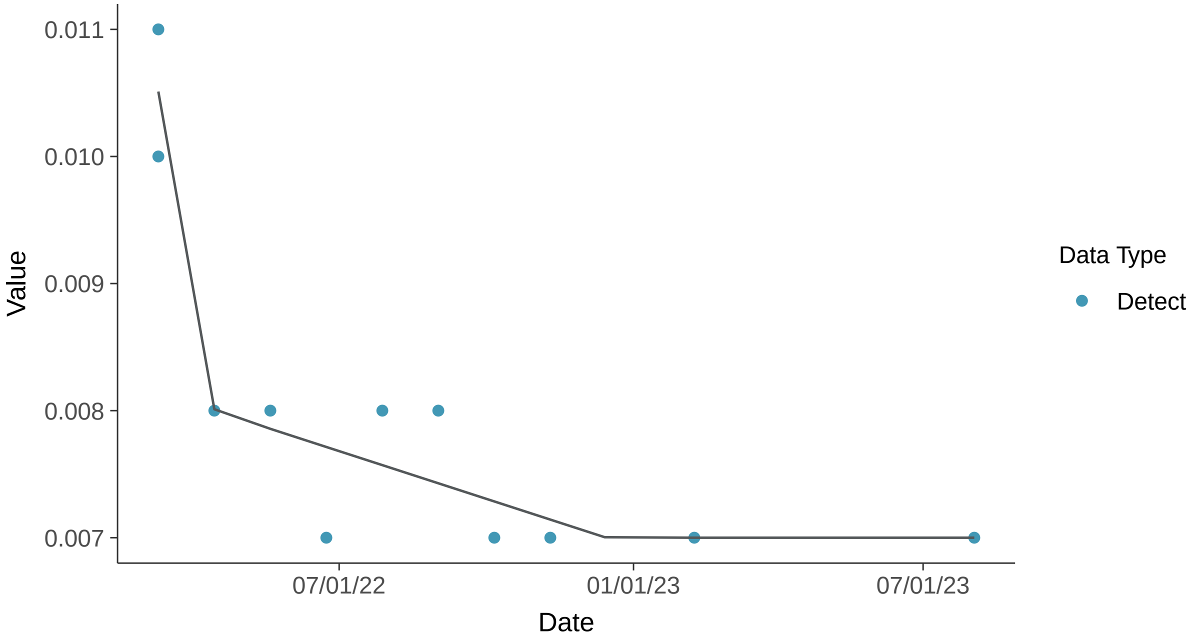
Trend Regression: Piecewise Linear-Linear

Nickel, MW-7C (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Nickel, MW-7C (mg/L)

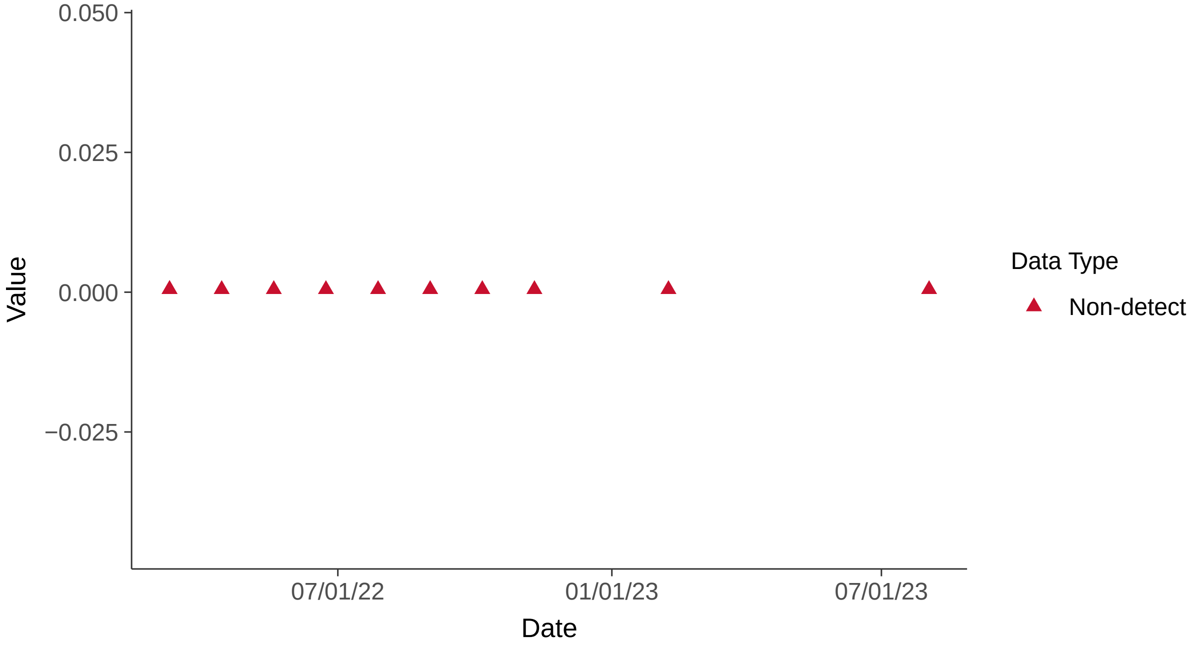


Part 115: Silver, MW-7C

ID: 7C_5_40

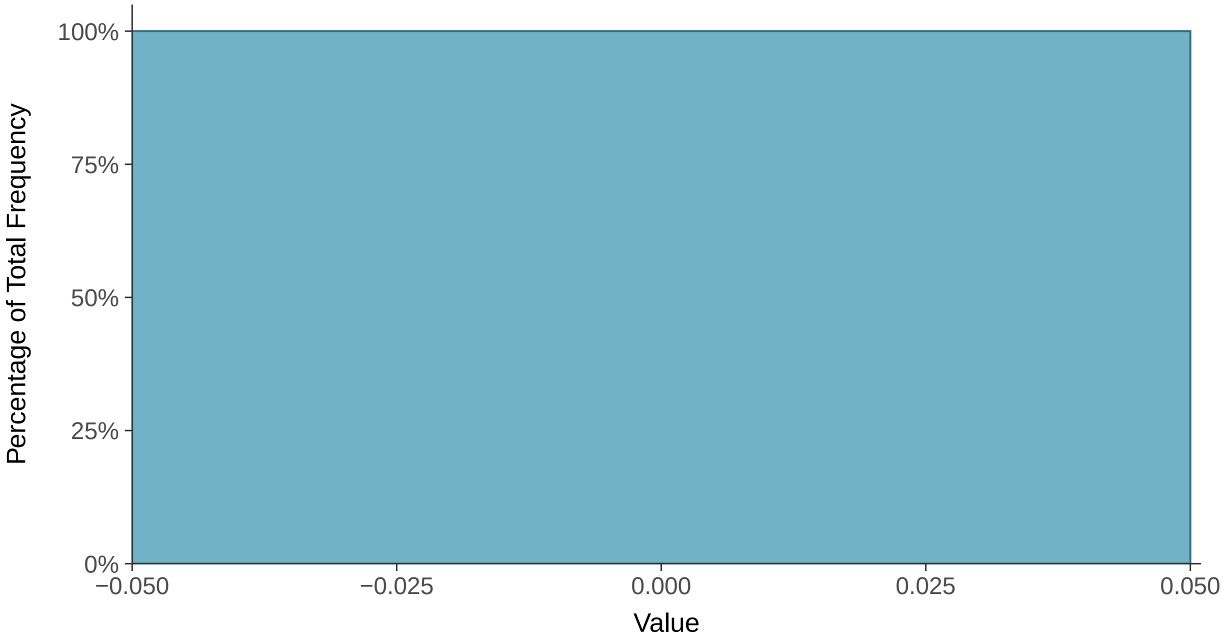
Scatter Plot

Silver, MW-7C (mg/L)



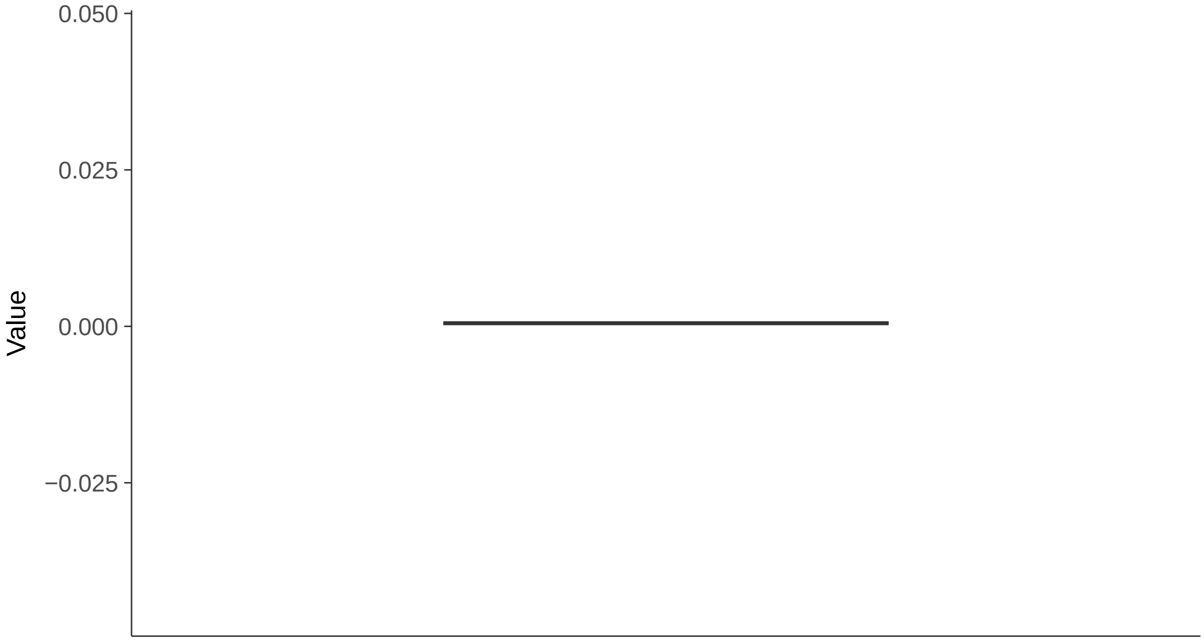
Histogram

Silver, MW-7C (mg/L)



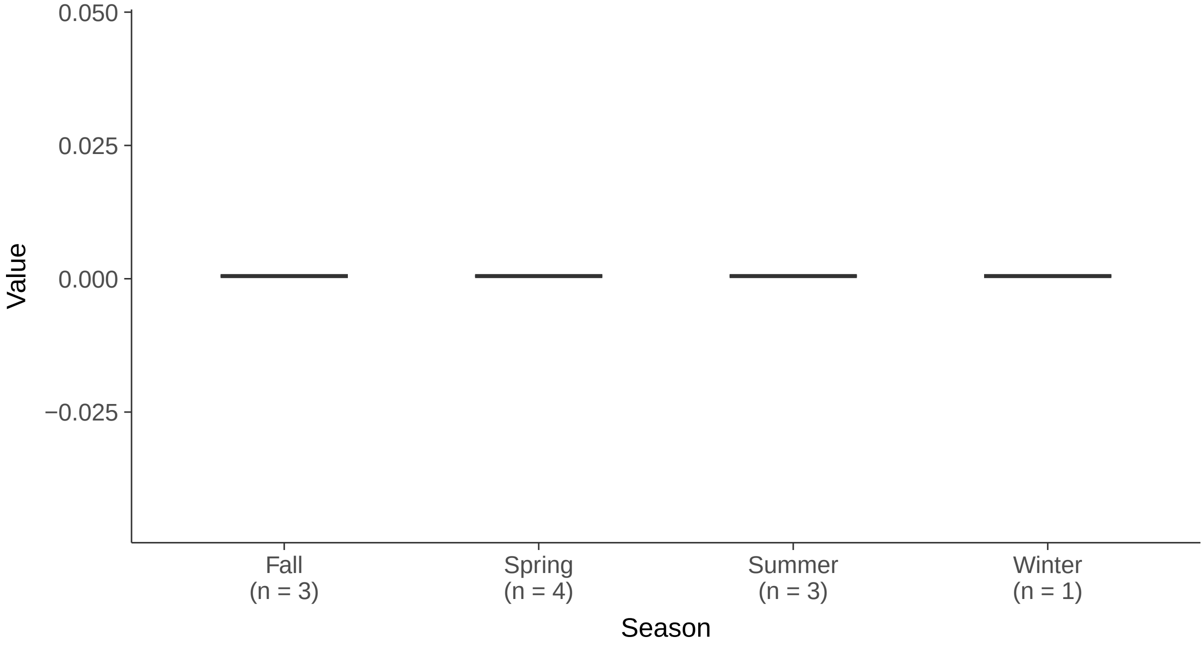
Boxplot

Silver, MW-7C (mg/L)



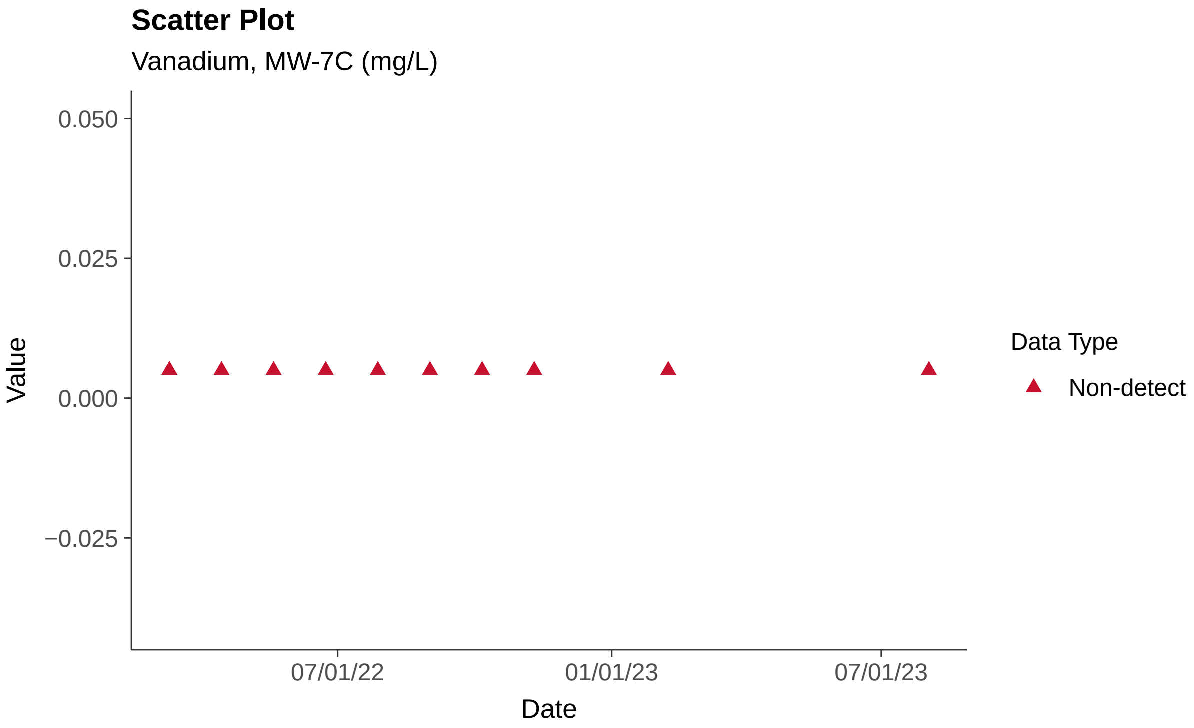
Boxplot by Season

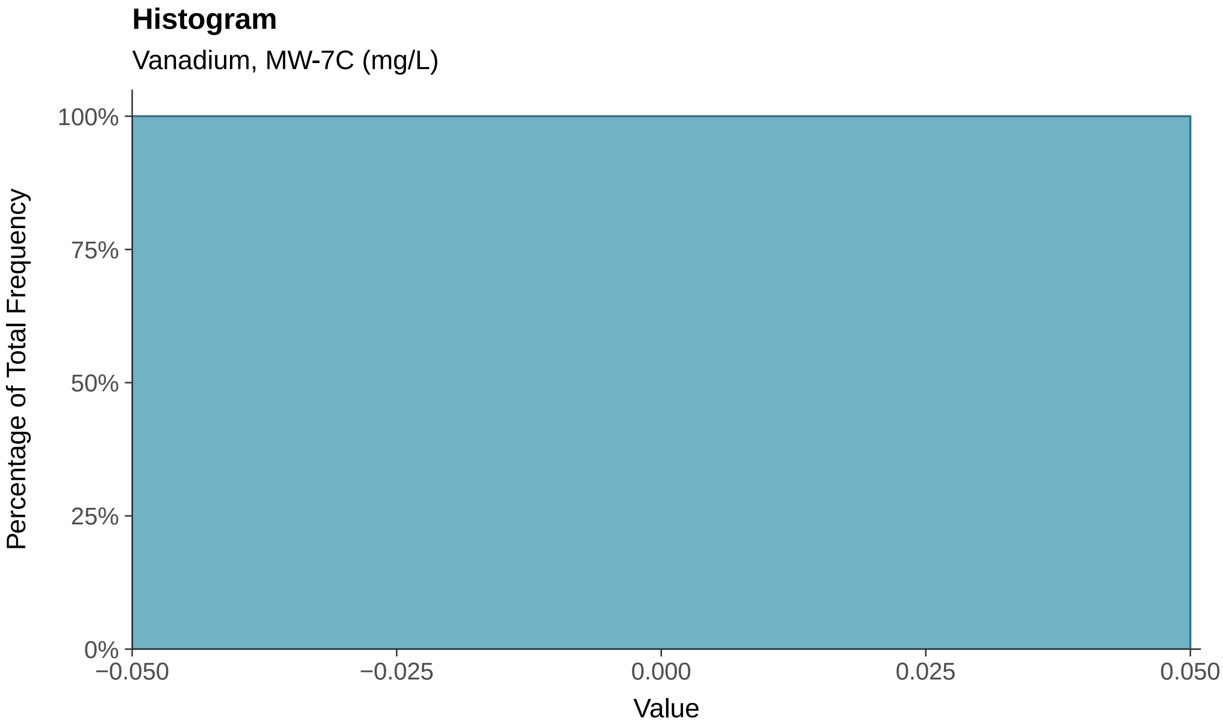
Silver, MW-7C (mg/L)



Part 115: Vanadium, MW-7C

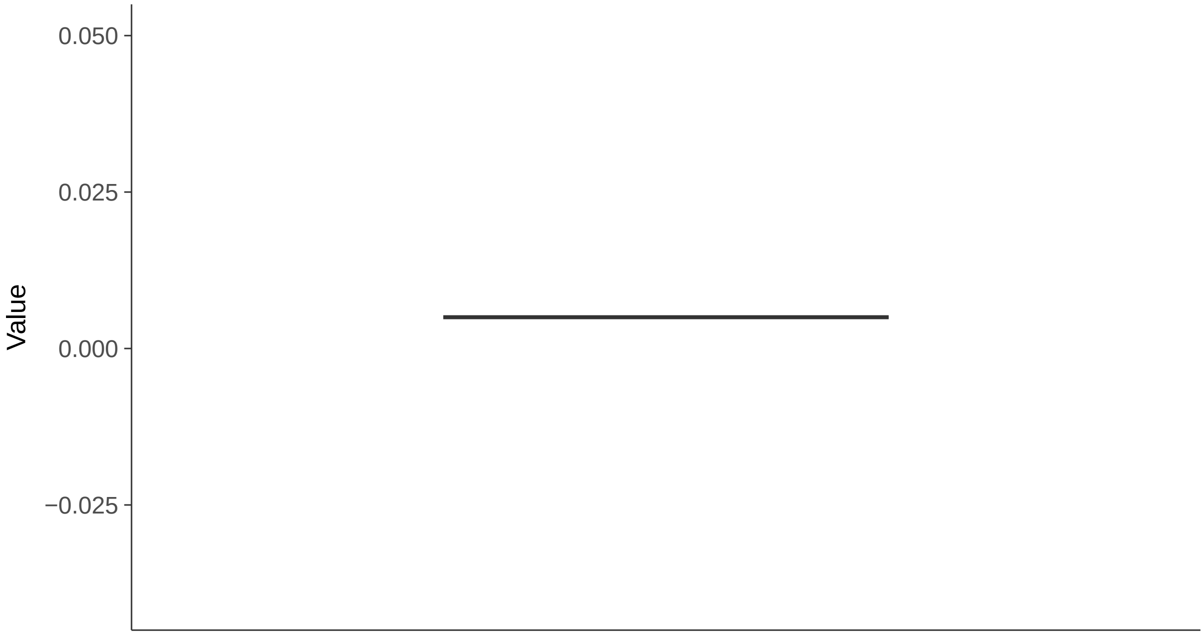
ID: 7C_5_41





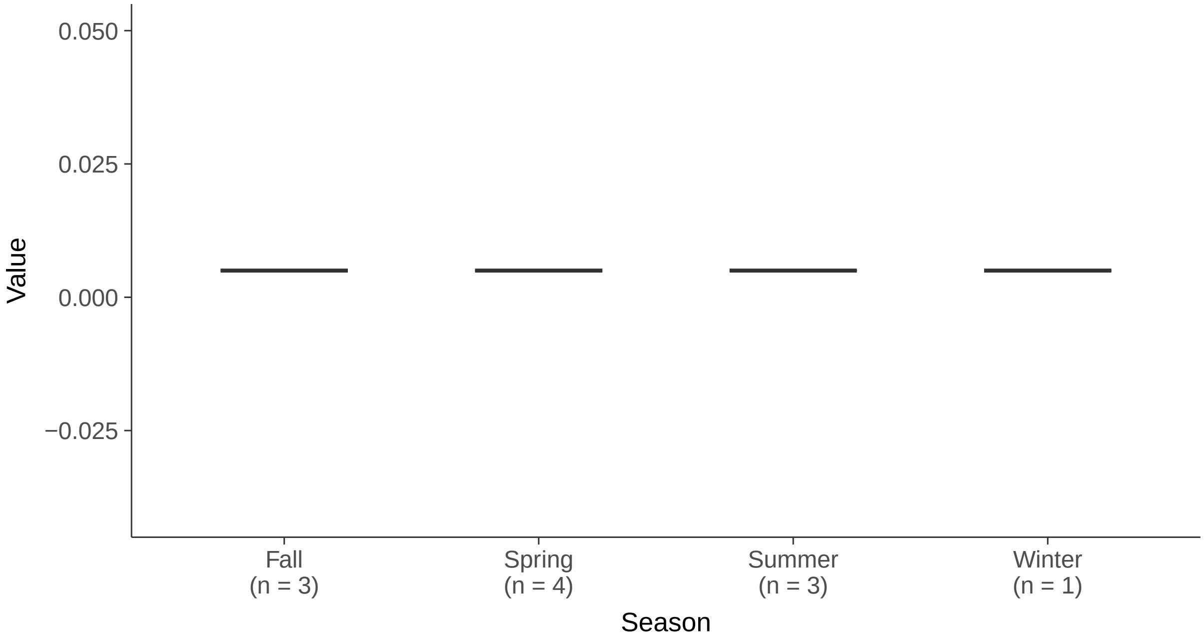
Boxplot

Vanadium, MW-7C (mg/L)



Boxplot by Season

Vanadium, MW-7C (mg/L)

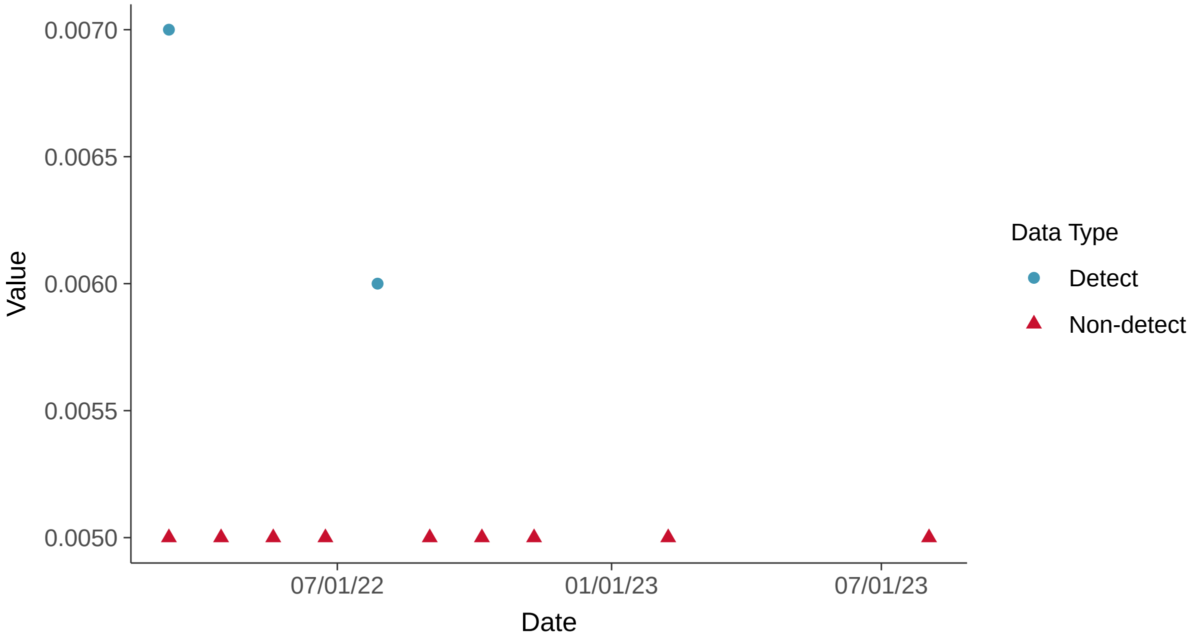


Part 115: Zinc, MW-7C

ID: 7C_5_42

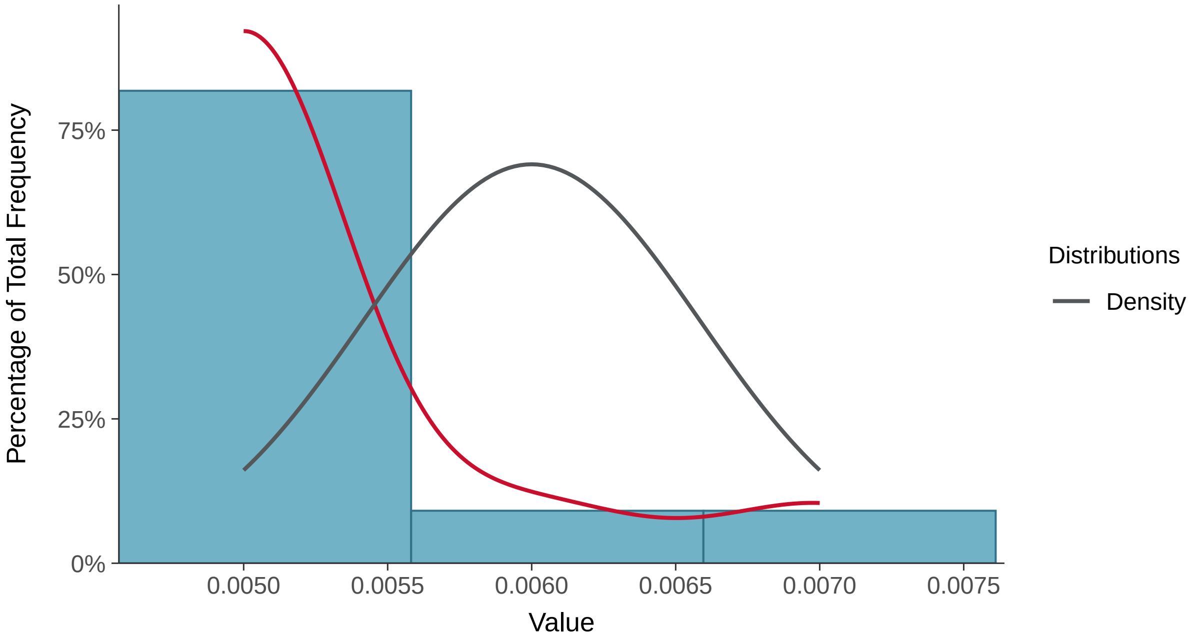
Scatter Plot

Zinc, MW-7C (mg/L)



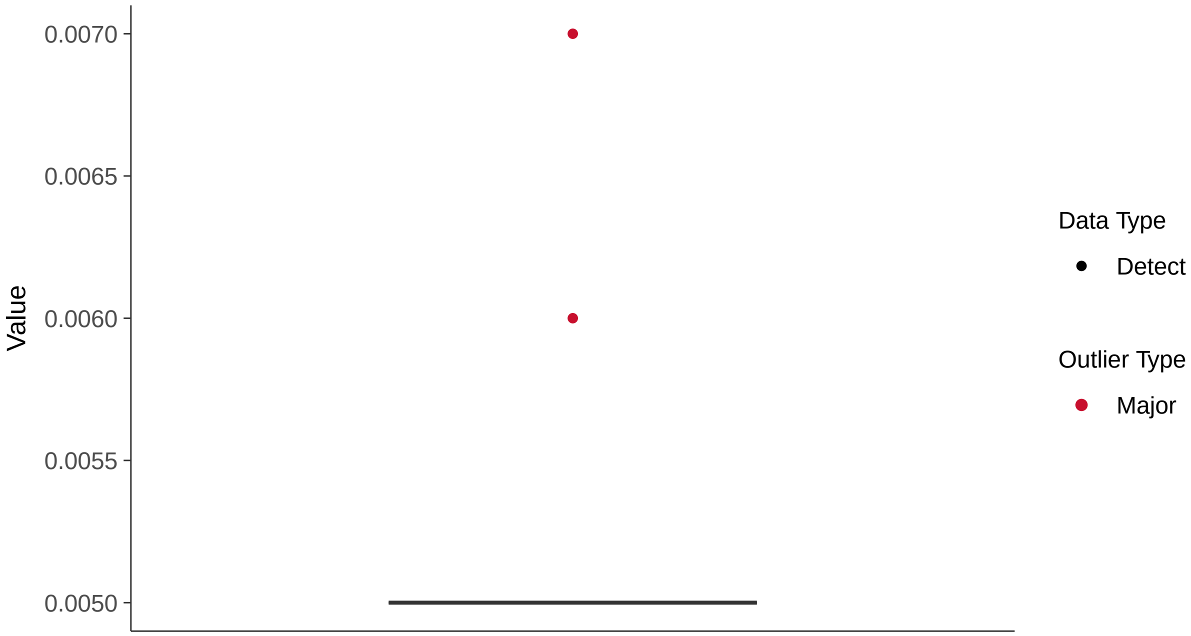
Histogram

Zinc, MW-7C (mg/L)



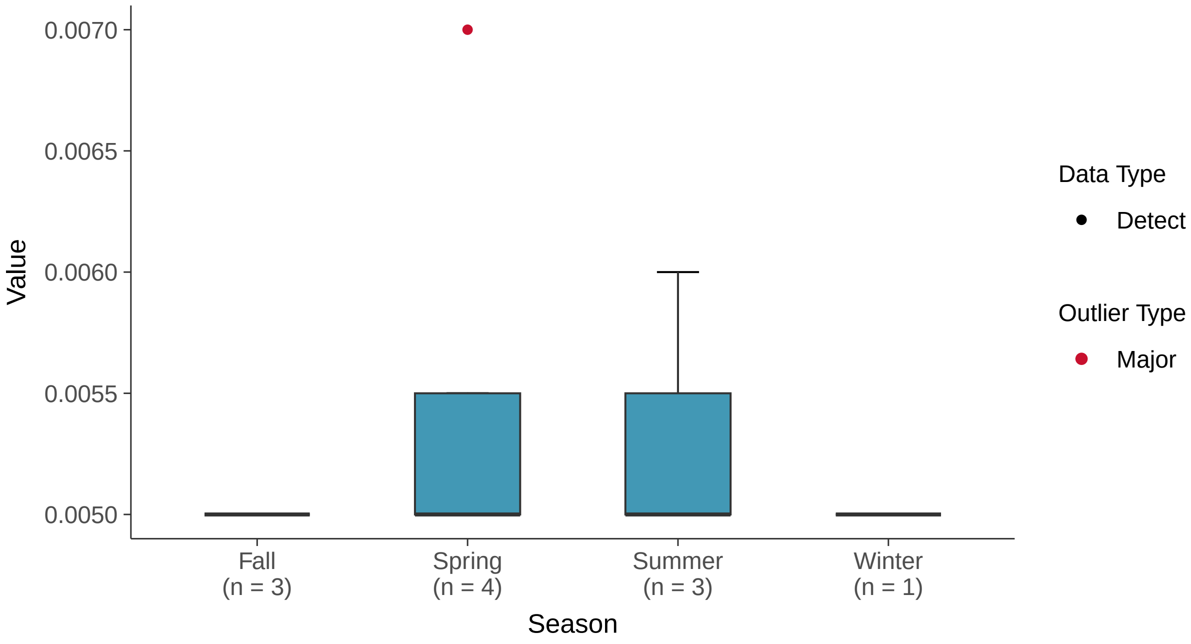
Boxplot

Zinc, MW-7C (mg/L)



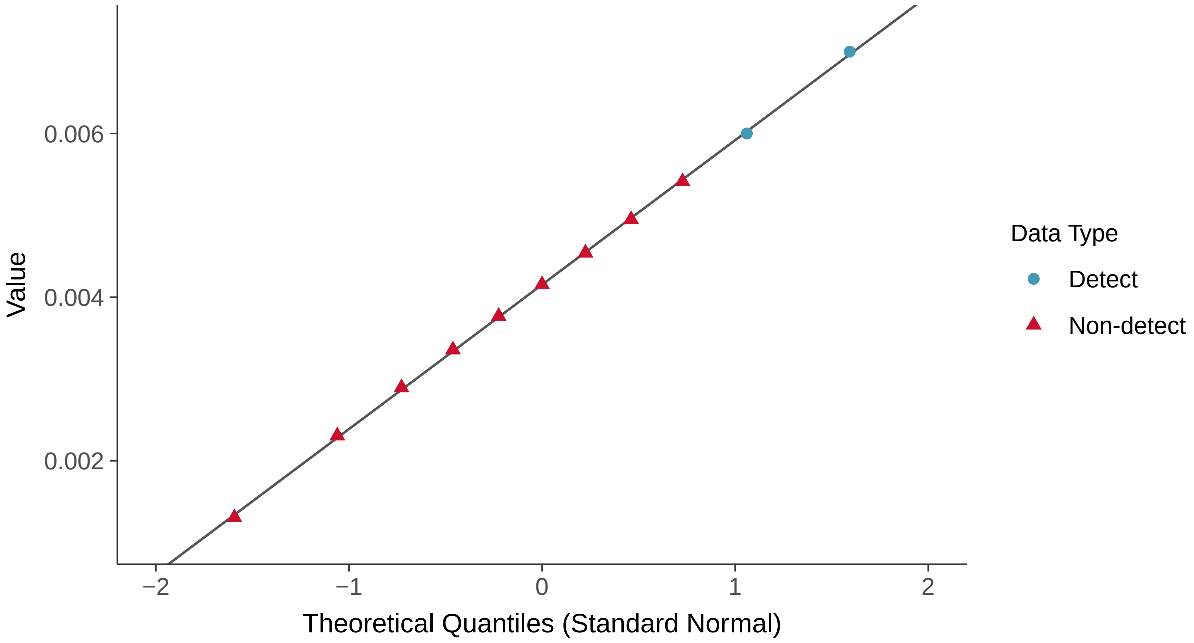
Boxplot by Season

Zinc, MW-7C (mg/L)



Normal Q-Q plot using ROS Imputed Estimates

Zinc, MW-7C (mg/L)



BWL Bedrock (State Program) - 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-7B	Appendix III	Boron	mg/L	10	0%	2022-03-09 to 2023-08-02	Normal LCL	2.96
MW-7B	Appendix III	Calcium	mg/L	10	0%	2022-03-09 to 2023-08-02	Normal LCL	8.87
MW-7B	Appendix III	Chloride	mg/L	10	100%	2022-03-09 to 2023-08-02	Nonparametric LCL around the Median	5.00
MW-7B	Appendix III	Fluoride	mg/L	10	100%	2022-03-09 to 2023-08-02	Nonparametric LCL around the Median	1.00
MW-7B	Appendix III	pH, Field	su	10	0%	2022-03-09 to 2023-08-02	Normal LCL	7.85
MW-7B	Appendix III	Sulfate	mg/L	10	100%	2022-03-09 to 2023-08-02	Nonparametric LCL around the Median	5.00
MW-7B	Appendix III	Total Dissolved Solids	mg/L	10	0%	2022-03-09 to 2023-08-02	Normal LCL	361
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	Fluoride	mg/L	10	100%	2022-03-09 to 2023-08-02	Nonparametric LCL around the Median	1.00
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
MW-7B	Part 115	Copper	mg/L	10	100%	2022-03-09 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-7B	Part 115	Iron	mg/L	10	0%	2022-03-09 to 2023-08-02	Normal LCL	0.0443
MW-7B	Part 115	Nickel	mg/L	10	100%	2022-03-09 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-7B	Part 115	Silver	mg/L	10	100%	2022-03-09 to 2023-08-02	Nonparametric LCL around the Median	0.000500
MW-7B	Part 115	Vanadium	mg/L	10	100%	2022-03-09 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-7B	Part 115	Zinc	mg/L	10	100%	2022-03-09 to 2023-08-02	Nonparametric LCL around the Median	0.00500
MW-16C	Appendix III	Boron	mg/L	9	0%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.390
MW-16C	Appendix III	Calcium	mg/L	9	0%	2023-02-02 to 2023-11-21	Normal LCL	67.2
MW-16C	Appendix III	Chloride	mg/L	9	67%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	2.50
MW-16C	Appendix III	Fluoride	mg/L	9	89%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.500
MW-16C	Appendix III	pH, Field	su	9	0%	2023-02-02 to 2023-11-21	Normal LCL	7.25
MW-16C	Appendix III	Sulfate	mg/L	9	0%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	7.00
MW-16C	Appendix III	Total Dissolved Solids	mg/L	9	0%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	322
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	Fluoride	mg/L	9	89%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.500
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-16C	Part 115	Copper	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16C	Part 115	Iron	mg/L	9	0%	2023-02-02 to 2023-11-21	Normal LCL	0.481
MW-16C	Part 115	Nickel	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16C	Part 115	Silver	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.000500
MW-16C	Part 115	Vanadium	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500

MW-16C	Part 115	Zinc	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16D	Appendix III	Boron	mg/L	9	0%	2023-02-02 to 2023-11-21	Normal LCL	4.57
MW-16D	Appendix III	Calcium	mg/L	9	0%	2023-02-02 to 2023-11-21	Normal LCL	28.9
MW-16D	Appendix III	Chloride	mg/L	9	0%	2023-02-02 to 2023-11-21	Normal LCL	6.81
MW-16D	Appendix III	Fluoride	mg/L	9	89%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.500
MW-16D	Appendix III	pH, Field	su	9	0%	2023-02-02 to 2023-11-21	Normal LCL	7.48
MW-16D	Appendix III	Sulfate	mg/L	9	11%	2023-02-02 to 2023-11-21	Normal MLE LCL	5.07
MW-16D	Appendix III	Total Dissolved Solids	mg/L	9	0%	2023-02-02 to 2023-11-21	Normal LCL	370
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	Fluoride	mg/L	9	89%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.500
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-16D	Part 115	Copper	mg/L	9	89%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16D	Part 115	Iron	mg/L	9	0%	2023-02-02 to 2023-11-21	Normal LCL	0.171
MW-16D	Part 115	Nickel	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16D	Part 115	Silver	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.000500
MW-16D	Part 115	Vanadium	mg/L	9	100%	2023-02-02 to 2023-11-21	Nonparametric LCL around the Median	0.00500
MW-16D	Part 115	Zinc	mg/L	9	0%	2023-02-02 to 2023-11-21	Adjusted Gamma LCL	0.0379

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_1_01	MW-16C	Appendix III	Boron	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Nonparametric	Nonparametric	0.402	0.400	0.390	0.430	0.0120	0.0299	0	1.68	3.69
16C_1_02	MW-16C	Appendix III	Calcium	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	70.6	71.7	62.1	77.1	5.53	0.0783	7.56	-0.476	-1.16
16C_1_03	MW-16C	Appendix III	Chloride	mg/L	9	6	67%	2023-02-02 to 2023-11-21		Nonparametric	4.74	5.00	2.20	8.00	1.68	0.353	0	0.233	1.51
16C_1_04	MW-16C	Appendix III	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_1_05	MW-16C	Appendix III	Sulfate	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Nonparametric	Nonparametric	8.90	8.00	7.00	19.0	3.81	0.429	0.148	2.92	8.65
16C_1_06	MW-16C	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Nonparametric	Nonparametric	346	334	320	418	30.9	0.0895	14.8	1.94	3.86
16C_1_07	MW-16C	Appendix III	pH, Field	su	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	7.32	7.36	7.17	7.46	0.110	0.0151	0.148	-0.177	-1.67
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
16C_5_37	MW-16C	Part 115	Copper	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_5_38	MW-16C	Part 115	Iron	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	0.611	0.510	0.450	1.10	0.210	0.343	0.0889	1.87	3.62
16C_5_39	MW-16C	Part 115	Nickel	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_5_40	MW-16C	Part 115	Silver	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_5_41	MW-16C	Part 115	Vanadium	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_5_42	MW-16C	Part 115	Zinc	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_1_01	MW-16D	Appendix III	Boron	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	4.64	4.65	4.39	4.85	0.123	0.0266	0.0741	-0.589	2.31
16D_1_02	MW-16D	Appendix III	Calcium	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	29.3	29.3	28.5	30.5	0.611	0.0209	0.593	0.919	0.653
16D_1_03	MW-16D	Appendix III	Chloride	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	7.23	7.00	6.00	8.00	0.674	0.0933	0.370	-0.306	-0.187
16D_1_04	MW-16D	Appendix III	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_1_05	MW-16D	Appendix III	Sulfate	mg/L	9	1	11%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	6.96	6.20	4.47	13.0	2.65	0.380	1.78	1.70	3.15
16D_1_06	MW-16D	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	376	376	364	396	9.33	0.0248	5.93	1.06	2.21
16D_1_07	MW-16D	Appendix III	pH, Field	su	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	7.54	7.52	7.44	7.73	0.0959	0.0127	0.0593	1.18	0.494
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

(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
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
16D_5_37	MW-16D	Part 115	Copper	mg/L	9	8	89%	2023-02-02 to 2023-11-21		Nonparametric	0.00556	0.00500	0.00500	0.0100	0.00167	0.300	0	3.00	9.00
16D_5_38	MW-16D	Part 115	Iron	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	0.253	0.280	0.0600	0.450	0.132	0.522	0.148	-0.203	-0.899
16D_5_39	MW-16D	Part 115	Nickel	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_5_40	MW-16D	Part 115	Silver	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_5_41	MW-16D	Part 115	Vanadium	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_5_42	MW-16D	Part 115	Zinc	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal	Gamma	0.0757	0.0250	0.00800	0.271	0.0938	1.24	0.0207	1.48	1.18
7B_1_01	MW-7B	Appendix III	Boron	mg/L	10	0	0%	2022-03-09 to 2023-08-02	Gamma; Lognormal; Normal	Normal	3.01	3.01	2.90	3.17	0.0821	0.0273	0.0815	0.488	0.240
7B_1_02	MW-7B	Appendix III	Calcium	mg/L	10	0	0%	2022-03-09 to 2023-08-02	Gamma; Lognormal; Normal	Normal	9.17	9.23	8.24	10.2	0.528	0.0575	0.363	0.181	1.19
7B_1_03	MW-7B	Appendix III	Chloride	mg/L	10	10	100%	2022-03-09 to 2023-08-02		Nonparametric	5.00	5.00	5.00	5.00	0	0	0	NA	NA
7B_1_04	MW-7B	Appendix III	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_1_05	MW-7B	Appendix III	Sulfate	mg/L	10	10	100%	2022-03-09 to 2023-08-02		Nonparametric	5.00	5.00	5.00	5.00	0	0	0	NA	NA
7B_1_06	MW-7B	Appendix III	Total Dissolved Solids	mg/L	10	0	0%	2022-03-09 to 2023-08-02	Gamma; Lognormal; Normal	Normal	365	364	356	376	7.01	0.0192	4.44	0.465	-0.473
7B_1_07	MW-7B	Appendix III	pH, Field	su	10	0	0%	2022-03-09 to 2023-08-02	Gamma; Lognormal; Normal	Normal	7.94	7.88	7.73	8.15	0.151	0.0191	0.178	0.304	-1.53
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
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
7B_5_37	MW-7B	Part 115	Copper	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_5_38	MW-7B	Part 115	Iron	mg/L	10	0	0%	2022-03-09 to 2023-08-02	Gamma; Lognormal; Normal	Normal	0.0560	0.0550	0.0300	0.0900	0.0201	0.359	0.0222	0.279	-0.751
7B_5_39	MW-7B	Part 115	Nickel	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_5_40	MW-7B	Part 115	Silver	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_5_41	MW-7B	Part 115	Vanadium	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_5_42	MW-7B	Part 115	Zinc	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

[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_1_01	MW-16C	Appendix III	Boron	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Nonparametric	Nonparametric	0.402	0.400	0.390	0.430	0.0120	0.0299	0	1.68	3.69
16C_1_02	MW-16C	Appendix III	Calcium	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	70.6	71.7	62.1	77.1	5.53	0.0783	7.56	-0.476	-1.16
16C_1_03	MW-16C	Appendix III	Chloride	mg/L	9	6	67%	2023-02-02 to 2023-11-21		Nonparametric	4.23	2.50	2.20	8.00	3.27	0.771	0.444	1.72	NA
16C_1_04	MW-16C	Appendix III	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_1_05	MW-16C	Appendix III	Sulfate	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Nonparametric	Nonparametric	8.90	8.00	7.00	19.0	3.81	0.429	0.148	2.92	8.65
16C_1_06	MW-16C	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Nonparametric	Nonparametric	346	334	320	418	30.9	0.0895	14.8	1.94	3.86
16C_1_07	MW-16C	Appendix III	pH, Field	su	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	7.32	7.36	7.17	7.46	0.110	0.0151	0.148	-0.177	-1.67
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
16C_5_38	MW-16C	Part 115	Iron	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	0.611	0.510	0.450	1.10	0.210	0.343	0.0889	1.87	3.62
16D_1_01	MW-16D	Appendix III	Boron	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	4.64	4.65	4.39	4.85	0.123	0.0266	0.0741	-0.589	2.31
16D_1_02	MW-16D	Appendix III	Calcium	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	29.3	29.3	28.5	30.5	0.611	0.0209	0.593	0.919	0.653
16D_1_03	MW-16D	Appendix III	Chloride	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	7.23	7.00	6.00	8.00	0.674	0.0933	0.370	-0.306	-0.187
16D_1_04	MW-16D	Appendix III	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_1_05	MW-16D	Appendix III	Sulfate	mg/L	9	1	11%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	7.21	6.60	4.47	13.0	2.72	0.377	1.63	1.57	2.76
16D_1_06	MW-16D	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	376	376	364	396	9.33	0.0248	5.93	1.06	2.21
16D_1_07	MW-16D	Appendix III	pH, Field	su	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	7.54	7.52	7.44	7.73	0.0959	0.0127	0.0593	1.18	0.494
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	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
16D_5_37	MW-16D	Part 115	Copper	mg/L	9	8	89%	2023-02-02 to 2023-11-21		Nonparametric	0.0100	0.0100	0.0100	0.0100	NA	NA	0	NA	NA
16D_5_38	MW-16D	Part 115	Iron	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal; Normal	Normal	0.253	0.280	0.0600	0.450	0.132	0.522	0.148	-0.203	-0.899
16D_5_42	MW-16D	Part 115	Zinc	mg/L	9	0	0%	2023-02-02 to 2023-11-21	Gamma; Lognormal	Gamma	0.0757	0.0250	0.00800	0.271	0.0938	1.24	0.0207	1.48	1.18
7B_1_01	MW-7B	Appendix III	Boron	mg/L	10	0	0%	2022-03-09 to 2023-08-02	Gamma; Lognormal; Normal	Normal	3.01	3.01	2.90	3.17	0.0821	0.0273	0.0815	0.488	0.240
7B_1_02	MW-7B	Appendix III	Calcium	mg/L	10	0	0%	2022-03-09 to 2023-08-02	Gamma; Lognormal; Normal	Normal	9.17	9.23	8.24	10.2	0.528	0.0575	0.363	0.181	1.19
7B_1_06	MW-7B	Appendix III	Total Dissolved Solids	mg/L	10	0	0%	2022-03-09 to 2023-08-02	Gamma; Lognormal; Normal	Normal	365	364	356	376	7.01	0.0192	4.44	0.465	-0.473
7B_1_07	MW-7B	Appendix III	pH, Field	su	10	0	0%	2022-03-09 to 2023-08-02	Gamma; Lognormal; Normal	Normal	7.94	7.88	7.73	8.15	0.151	0.0191	0.178	0.304	-1.53
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	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
7B_5_38	MW-7B	Part 115	Iron	mg/L	10	0	0%	2022-03-09 to 2023-08-02	Gamma; Lognormal; Normal	Normal	0.0560	0.0550	0.0300	0.0900	0.0201	0.359	0.0222	0.279	-0.751

Table 3: Goodness-of-Fit Tests, Non-Detects Excluded

								Normal				Lognormal				Gamma						
								S-W		Lilliefors		S-W		Lilliefors		K-S		A-D				
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution
16C_1_01	MW-16C	Appendix III	Boron	mg/L	9	0	0%	0.781	0.012	0.351	0.002	0.789	0.015	0.348	0.002	0.352	< 0.01	0.941	0.01 <= p < 0.05	0.029	Nonparametric	Nonparametric
16C_1_02	MW-16C	Appendix III	Calcium	mg/L	9	0	0%	0.918	0.378	0.161	0.719	0.911	0.322	0.175	0.591	0.171	>= 0.10	0.390	>= 0.10	0.080	Gamma; Lognormal; Normal	Normal
16C_1_03	MW-16C	Appendix III	Chloride	mg/L	9	6	67%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.711		Nonparametric
16C_1_04	MW-16C	Appendix III	Fluoride	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
16C_1_05	MW-16C	Appendix III	Sulfate	mg/L	9	0	0%	0.491	0.000	0.482	0.000	0.554	0.000	0.457	0.000	0.474	< 0.01	2.014	< 0.01	0.310	Nonparametric	Nonparametric
16C_1_06	MW-16C	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.771	0.010	0.298	0.021	0.797	0.019	0.284	0.036	0.288	0.01 <= p < 0.05	0.824	0.01 <= p < 0.05	0.084	Nonparametric	Nonparametric
16C_1_07	MW-16C	Appendix III	pH, Field	su	9	0	0%	0.909	0.307	0.197	0.398	0.908	0.303	0.199	0.382	0.207	>= 0.10	0.422	>= 0.10	0.015	Gamma; Lognormal; Normal	Normal
16C_2_04	MW-16C	Appendix IV	Fluoride	mg/L	9	8	89%	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		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		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		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		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		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		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		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		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		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		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		Nonparametric
16C_5_37	MW-16C	Part 115	Copper	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
16C_5_38	MW-16C	Part 115	Iron	mg/L	9	0	0%	0.769	0.009	0.241	0.140	0.840	0.058	0.237	0.155	0.250	>= 0.10	0.716	0.05 <= p < 0.10	0.294	Gamma; Lognormal; Normal	Normal
16C_5_39	MW-16C	Part 115	Nickel	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
16C_5_40	MW-16C	Part 115	Silver	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
16C_5_41	MW-16C	Part 115	Vanadium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
16C_5_42	MW-16C	Part 115	Zinc	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
16D_1_01	MW-16D	Appendix III	Boron	mg/L	9	0	0%	0.921	0.403	0.225	0.210	0.916	0.364	0.229	0.187	0.218	>= 0.10	0.439	>= 0.10	0.027	Gamma; Lognormal; Normal	Normal
16D_1_02	MW-16D	Appendix III	Calcium	mg/L	9	0	0%	0.924	0.425	0.220	0.238	0.928	0.462	0.216	0.262	0.214	>= 0.10	0.395	>= 0.10	0.021	Gamma; Lognormal; Normal	Normal
16D_1_03	MW-16D	Appendix III	Chloride	mg/L	9	0	0%	0.880	0.156	0.207	0.321	0.878	0.150	0.200	0.377	0.216	>= 0.10	0.560	>= 0.10	0.095	Gamma; Lognormal; Normal	Normal
16D_1_04	MW-16D	Appendix III	Fluoride	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
16D_1_05	MW-16D	Appendix III	Sulfate	mg/L	9	1	11%	0.855	0.106	0.281	0.063	0.943	0.641	0.222	0.292	0.243	>= 0.10	0.362	>= 0.10	0.337	Gamma; Lognormal; Normal	Normal
16D_1_06	MW-16D	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.909	0.309	0.223	0.221	0.915	0.355	0.218	0.248	0.211	>= 0.10	0.386	>= 0.10	0.025	Gamma; Lognormal; Normal	Normal
16D_1_07	MW-16D	Appendix III	pH, Field	su	9	0	0%	0.871	0.126	0.227	0.202	0.874	0.135	0.225	0.212	0.229	>= 0.10	0.586	>= 0.10	0.013	Gamma; Lognormal; Normal	Normal
16D_2_04	MW-16D	Appendix IV	Fluoride	mg/L	9	8	89%	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		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		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

(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)*

								Normal				Lognormal				Gamma						
								S-W		Lilliefors		S-W		Lilliefors		K-S		A-D				
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution
16D_2_11	MW-16D	Appendix IV	Beryllium	mg/L	9	9	100%	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		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		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		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		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		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		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		Nonparametric
16D_5_37	MW-16D	Part 115	Copper	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
16D_5_38	MW-16D	Part 115	Iron	mg/L	9	0	0%	0.955	0.745	0.157	0.757	0.871	0.127	0.259	0.083	0.235	>= 0.10	0.452	>= 0.10	0.701	Gamma; Lognormal; Normal	Normal
16D_5_39	MW-16D	Part 115	Nickel	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
16D_5_40	MW-16D	Part 115	Silver	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
16D_5_41	MW-16D	Part 115	Vanadium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
16D_5_42	MW-16D	Part 115	Zinc	mg/L	9	0	0%	0.758	0.007	0.331	0.005	0.919	0.385	0.179	0.553	0.253	>= 0.10	0.570	>= 0.10	1.267	Gamma; Lognormal	Gamma
7B_1_01	MW-7B	Appendix III	Boron	mg/L	10	0	0%	0.960	0.791	0.129	0.909	0.963	0.819	0.126	0.923	0.116	>= 0.10	0.196	>= 0.10	0.027	Gamma; Lognormal; Normal	Normal
7B_1_02	MW-7B	Appendix III	Calcium	mg/L	10	0	0%	0.956	0.743	0.174	0.527	0.958	0.761	0.185	0.434	0.180	>= 0.10	0.331	>= 0.10	0.058	Gamma; Lognormal; Normal	Normal
7B_1_03	MW-7B	Appendix III	Chloride	mg/L	10	10	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
7B_1_04	MW-7B	Appendix III	Fluoride	mg/L	10	10	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
7B_1_05	MW-7B	Appendix III	Sulfate	mg/L	10	10	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
7B_1_06	MW-7B	Appendix III	Total Dissolved Solids	mg/L	10	0	0%	0.904	0.243	0.166	0.609	0.906	0.256	0.164	0.628	0.172	>= 0.10	0.433	>= 0.10	0.019	Gamma; Lognormal; Normal	Normal
7B_1_07	MW-7B	Appendix III	pH, Field	su	10	0	0%	0.910	0.283	0.194	0.354	0.912	0.293	0.191	0.378	0.197	>= 0.10	0.461	>= 0.10	0.019	Gamma; Lognormal; Normal	Normal
7B_2_04	MW-7B	Appendix IV	Fluoride	mg/L	10	10	100%	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		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		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		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		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		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		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		Nonparametric
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		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		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		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		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)*

								Normal				Lognormal				Gamma						
								S-W		Lilliefors		S-W		Lilliefors		K-S		A-D				
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution
7B_5_37	MW-7B	Part 115	Copper	mg/L	10	10	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
7B_5_38	MW-7B	Part 115	Iron	mg/L	10	0	0%	0.954	0.717	0.121	0.946	0.941	0.569	0.146	0.789	0.133	>= 0.10	0.241	>= 0.10	0.379	Gamma; Lognormal; Normal	Normal
7B_5_39	MW-7B	Part 115	Nickel	mg/L	10	10	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
7B_5_40	MW-7B	Part 115	Silver	mg/L	10	10	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
7B_5_41	MW-7B	Part 115	Vanadium	mg/L	10	10	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
7B_5_42	MW-7B	Part 115	Zinc	mg/L	10	10	100%	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.
16C_1_01	MW-16C	Appendix III	Boron	mg/L	9	0	0%	-0.072	0.801	
16C_1_02	MW-16C	Appendix III	Calcium	mg/L	9	0	0%	0.647	0.023	*
16C_1_03	MW-16C	Appendix III	Chloride	mg/L	9	6	67%	-0.141	0.700	
16C_1_04	MW-16C	Appendix III	Fluoride	mg/L	9	8	89%	NA	NA	
16C_1_05	MW-16C	Appendix III	Sulfate	mg/L	9	0	0%	0.023	0.935	
16C_1_06	MW-16C	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.335	0.239	
16C_1_07	MW-16C	Appendix III	pH, Field	su	9	0	0%	0.519	0.068	
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	
16C_5_38	MW-16C	Part 115	Iron	mg/L	9	0	0%	0.450	0.113	
16D_1_01	MW-16D	Appendix III	Boron	mg/L	9	0	0%	-0.269	0.344	
16D_1_02	MW-16D	Appendix III	Calcium	mg/L	9	0	0%	0.524	0.065	
16D_1_03	MW-16D	Appendix III	Chloride	mg/L	9	0	0%	0.305	0.283	
16D_1_04	MW-16D	Appendix III	Fluoride	mg/L	9	8	89%	NA	NA	
16D_1_05	MW-16D	Appendix III	Sulfate	mg/L	9	1	11%	0.374	0.206	
16D_1_06	MW-16D	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.138	0.628	
16D_1_07	MW-16D	Appendix III	pH, Field	su	9	0	0%	-0.048	0.866	
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	
16D_5_37	MW-16D	Part 115	Copper	mg/L	9	8	89%	NA	NA	
16D_5_38	MW-16D	Part 115	Iron	mg/L	9	0	0%	0.384	0.177	
16D_5_42	MW-16D	Part 115	Zinc	mg/L	9	0	0%	0.567	0.046	*
7B_1_01	MW-7B	Appendix III	Boron	mg/L	10	0	0%	-0.363	0.185	
7B_1_02	MW-7B	Appendix III	Calcium	mg/L	10	0	0%	-0.048	0.861	
7B_1_06	MW-7B	Appendix III	Total Dissolved Solids	mg/L	10	0	0%	-0.428	0.118	
7B_1_07	MW-7B	Appendix III	pH, Field	su	10	0	0%	0.107	0.695	
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	*
7B_5_38	MW-7B	Part 115	Iron	mg/L	10	0	0%	0.578	0.035	*

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Table 5: Outlier Counts by Date

Date	Count
2022-04-13	1
2023-02-02	2
2023-07-05	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
16C_1_05	MW-16C	Appendix III	Sulfate	mg/L	9	0	0%	9	2023-02-02	19.0
16D_1_01	MW-16D	Appendix III	Boron	mg/L	9	0	0%	9	2023-07-05	4.39
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

						Full										Without Non-Detects										
						Sample Size					p-Value					Sample Size					p-Value					
ID	Well	Constituent Type	Constituent	Unit	% NDs	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA		Log ANOVA		Winter	Spring	Summer	Fall	Total	Kruskal-Wallis		ANOVA		Log ANOVA	
16C_1_01	MW-16C	Appendix III	Boron	mg/L	0%	1	3	2	3	9	0.673	0.667		0.667		1	3	2	3	9	0.673	NA	0.667		0.667	
16C_1_02	MW-16C	Appendix III	Calcium	mg/L	0%	1	3	2	3	9	0.104	0.043	*	0.045	*	1	3	2	3	9	0.104	NA	0.043	*	0.045	*
16C_1_03	MW-16C	Appendix III	Chloride	mg/L	67%	1	3	2	3	9	0.230	0.146		0.354		1	0	1	1	3	0.368	NA	NA		NA	
16C_1_04	MW-16C	Appendix III	Fluoride	mg/L	89%	1	3	2	3	9	0.608	0.725		0.737		0	0	0	1	1	NA	NA	NA		NA	
16C_1_05	MW-16C	Appendix III	Sulfate	mg/L	0%	1	3	2	3	9	0.257	0.000	***	0.000	***	1	3	2	3	9	0.257	NA	0.000	***	0.000	***
16C_1_06	MW-16C	Appendix III	Total Dissolved Solids	mg/L	0%	1	3	2	3	9	0.122	0.008	**	0.010	*	1	3	2	3	9	0.122	NA	0.008	**	0.010	*
16C_1_07	MW-16C	Appendix III	pH, Field	su	0%	1	3	2	3	9	0.426	0.431		0.433		1	3	2	3	9	0.426	NA	0.431		0.433	
16C_2_04	MW-16C	Appendix IV	Fluoride	mg/L	89%	1	3	2	3	9	0.608	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		0.000	***	NA	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	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	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	0.000	***	0.000	***	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	0.000	***	0.000	***	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		0.000	***	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		0.000	***	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	0.000	***	0.000	***	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	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	0.000	***	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	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	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		0.000	***	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	0.000	***	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA		NA	
16C_5_37	MW-16C	Part 115	Copper	mg/L	100%	1	3	2	3	9	NA	NA		0.000	***	NA	NA	NA	NA	NA	NA	NA	NA		NA	
16C_5_38	MW-16C	Part 115	Iron	mg/L	0%	1	3	2	3	9	0.079	0.206		0.101		1	3	2	3	9	0.079	NA	0.206		0.101	
16C_5_39	MW-16C	Part 115	Nickel	mg/L	100%	1	3	2	3	9	NA	NA		0.000	***	NA	NA	NA	NA	NA	NA	NA	NA		NA	
16C_5_40	MW-16C	Part 115	Silver	mg/L	100%	1	3	2	3	9	NA	0.000	***	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA		NA	
16C_5_41	MW-16C	Part 115	Vanadium	mg/L	100%	1	3	2	3	9	NA	NA		0.000	***	NA	NA	NA	NA	NA	NA	NA	NA		NA	
16C_5_42	MW-16C	Part 115	Zinc	mg/L	100%	1	3	2	3	9	NA	NA		0.000	***	NA	NA	NA	NA	NA	NA	NA	NA		NA	
16D_1_01	MW-16D	Appendix III	Boron	mg/L	0%	1	3	2	3	9	0.763	0.567		0.564		1	3	2	3	9	0.763	NA	0.567		0.564	
16D_1_02	MW-16D	Appendix III	Calcium	mg/L	0%	1	3	2	3	9	0.104	0.098		0.097		1	3	2	3	9	0.104	NA	0.098		0.097	
16D_1_03	MW-16D	Appendix III	Chloride	mg/L	0%	1	3	2	3	9	0.318	0.167		0.135		1	3	2	3	9	0.318	NA	0.167		0.135	
16D_1_04	MW-16D	Appendix III	Fluoride	mg/L	89%	1	3	2	3	9	0.608	0.704		0.719		0	0	0	1	1	NA	NA	NA		NA	
16D_1_05	MW-16D	Appendix III	Sulfate	mg/L	11%	1	3	2	3	9	0.078	0.137		0.074		0	3	2	3	8	0.051	NA	0.095		0.053	
16D_1_06	MW-16D	Appendix III	Total Dissolved Solids	mg/L	0%	1	3	2	3	9	0.667	0.724		0.724		1	3	2	3	9	0.667	NA	0.724		0.724	
16D_1_07	MW-16D	Appendix III	pH, Field	su	0%	1	3	2	3	9	0.381	0.399		0.399		1	3	2	3	9	0.381	NA	0.399		0.399	
16D_2_04	MW-16D	Appendix IV	Fluoride	mg/L	89%	1	3	2	3	9	0.608	0.704		0.719		0	0	0	1	1	NA	NA	NA		NA	
16D_2_08	MW-16D	Appendix IV	Antimony	mg/L	100%	1	3	2	3	9	NA	NA		0.000	***	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	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	0.163		0.165		1	3	2	3	9	0.161	NA	0.163		0.165	

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 7: Seasonality Tests *(continued)*

						Full											Without Non-Detects										
						Sample Size					p-Value						Sample Size					p-Value					
ID	Well	Constituent Type	Constituent	Unit	% NDs	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis		ANOVA		Log ANOVA		Winter	Spring	Summer	Fall	Total	Kruskal-Wallis		ANOVA		Log ANOVA	
16D_2_11	MW-16D	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	
16D_2_12	MW-16D	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	
16D_2_13	MW-16D	Appendix IV	Chromium	mg/L	100%	1	3	2	3	9	NA		NA		0.000	***	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		0.000	***	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		0.000	***	0.000	***	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		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		0.000	***	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		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		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		0.667		0.667		0	0	0	1	1	NA	NA	NA		NA	
16D_2_23	MW-16D	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	
16D_5_37	MW-16D	Part 115	Copper	mg/L	89%	1	3	2	3	9	0.046	*	0.000	***	0.000	***	1	0	0	0	1	NA	NA	NA		NA	
16D_5_38	MW-16D	Part 115	Iron	mg/L	0%	1	3	2	3	9	0.367		0.382		0.330		1	3	2	3	9	0.367	NA	0.382		0.330	
16D_5_39	MW-16D	Part 115	Nickel	mg/L	100%	1	3	2	3	9	NA		NA		0.000	***	NA	NA	NA	NA	NA	NA	NA	NA		NA	
16D_5_40	MW-16D	Part 115	Silver	mg/L	100%	1	3	2	3	9	NA		0.000	***	0.000	***	NA	NA	NA	NA	NA	NA	NA	NA		NA	
16D_5_41	MW-16D	Part 115	Vanadium	mg/L	100%	1	3	2	3	9	NA		NA		0.000	***	NA	NA	NA	NA	NA	NA	NA	NA		NA	
16D_5_42	MW-16D	Part 115	Zinc	mg/L	0%	1	3	2	3	9	0.104		0.178		0.057		1	3	2	3	9	0.104	NA	0.178		0.057	
7B_1_01	MW-7B	Appendix III	Boron	mg/L	0%	1	3	3	3	10	0.951		0.984		0.982		1	3	3	3	10	0.951	NA	0.984		0.982	
7B_1_02	MW-7B	Appendix III	Calcium	mg/L	0%	1	3	3	3	10	0.511		0.817		0.835		1	3	3	3	10	0.511	NA	0.817		0.835	
7B_1_03	MW-7B	Appendix III	Chloride	mg/L	100%	1	3	3	3	10	NA		0.586		NA		NA	NA	NA	NA	NA	NA	NA	NA		NA	
7B_1_04	MW-7B	Appendix III	Fluoride	mg/L	100%	1	3	3	3	10	NA		NA		NA		NA	NA	NA	NA	NA	NA	NA	NA		NA	
7B_1_05	MW-7B	Appendix III	Sulfate	mg/L	100%	1	3	3	3	10	NA		0.586		NA		NA	NA	NA	NA	NA	NA	NA	NA		NA	
7B_1_06	MW-7B	Appendix III	Total Dissolved Solids	mg/L	0%	1	3	3	3	10	0.899		0.966		0.967		1	3	3	3	10	0.899	NA	0.966		0.967	
7B_1_07	MW-7B	Appendix III	pH, Field	su	0%	1	3	3	3	10	0.071		0.002	**	0.002	**	1	3	3	3	10	0.071	NA	0.002	**	0.002	**
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	
7B_2_08	MW-7B	Appendix IV	Antimony	mg/L	100%	1	3	3	3	10	NA		0.586		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		0.586		0.586		0	1	0	0	1	NA	NA	NA		NA	
7B_2_10	MW-7B	Appendix IV	Barium	mg/L	0%	1	3	3	3	10	0.144		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		0.586		0.586		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		0.586		0.586		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		0.586		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		0.586		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		0.586		0.586		0	0	1	0	1	NA	NA	NA		NA	
7B_2_16	MW-7B	Appendix IV	Lithium	mg/L	0%	1	3	3	3	10	0.586		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		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		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		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		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		0.586		0.586		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)*

						Full								Without Non-Detects								
						Sample Size					p-Value			Sample Size					p-Value			
ID	Well	Constituent Type	Constituent	Unit	% NDs	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis		ANOVA	Log ANOVA
7B_5_37	MW-7B	Part 115	Copper	mg/L	100%	1	3	3	3	10	NA	0.586	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7B_5_38	MW-7B	Part 115	Iron	mg/L	0%	1	3	3	3	10	0.328	0.355	0.297	1	3	3	3	10	0.328	NA	0.355	0.297
7B_5_39	MW-7B	Part 115	Nickel	mg/L	100%	1	3	3	3	10	NA	0.586	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7B_5_40	MW-7B	Part 115	Silver	mg/L	100%	1	3	3	3	10	NA	0.586	0.586	NA	NA	NA	NA	NA	NA	NA	NA	NA
7B_5_41	MW-7B	Part 115	Vanadium	mg/L	100%	1	3	3	3	10	NA	0.586	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7B_5_42	MW-7B	Part 115	Zinc	mg/L	100%	1	3	3	3	10	NA	0.586	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
16C_1_01	MW-16C	Appendix III	Boron	mg/L	9	0	0%	Nonparametric	MK	0.0000267	0.246	↔
16C_1_02	MW-16C	Appendix III	Calcium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.000757	0.000	↑
16C_1_05	MW-16C	Appendix III	Sulfate	mg/L	9	0	0%	Nonparametric	MK	0	0.826	↔
16C_1_06	MW-16C	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	Nonparametric	MK	-0.109	0.348	↔
16C_1_07	MW-16C	Appendix III	pH, Field	su	9	0	0%	Parametric	Lognormal MLE	-0.0000557	0.244	↔
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	↔
16C_5_38	MW-16C	Part 115	Iron	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00253	0.000	↓
16D_1_01	MW-16D	Appendix III	Boron	mg/L	9	0	0%	Parametric	Lognormal MLE	0.000104	0.216	↔
16D_1_02	MW-16D	Appendix III	Calcium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.000133	0.015	↔
16D_1_03	MW-16D	Appendix III	Chloride	mg/L	9	0	0%	Parametric	Lognormal MLE	0.000179	0.574	↔
16D_1_05	MW-16D	Appendix III	Sulfate	mg/L	9	1	11%	Parametric	Lognormal MLE	-0.00147	0.186	↔
16D_1_06	MW-16D	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0000591	0.466	↔
16D_1_07	MW-16D	Appendix III	pH, Field	su	9	0	0%	Parametric	Lognormal MLE	-0.0000841	0.010	↓
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	↔
16D_5_38	MW-16D	Part 115	Iron	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00499	0.003	↑
16D_5_42	MW-16D	Part 115	Zinc	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0107	0.000	↓
7B_1_01	MW-7B	Appendix III	Boron	mg/L	10	0	0%	Parametric	Lognormal MLE	0.0000156	0.781	↔
7B_1_02	MW-7B	Appendix III	Calcium	mg/L	10	0	0%	Parametric	Lognormal MLE	-0.0000751	0.518	↔
7B_1_06	MW-7B	Appendix III	Total Dissolved Solids	mg/L	10	0	0%	Parametric	Lognormal MLE	-0.0000384	0.306	↔
7B_1_07	MW-7B	Appendix III	pH, Field	su	10	0	0%	Parametric	Lognormal MLE	-0.0000263	0.493	↔
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	↔
7B_5_38	MW-7B	Part 115	Iron	mg/L	10	0	0%	Parametric	Lognormal MLE	0.00189	0.000	↑

Table 9: Trend Tests: Piecewise Linear-Linear

								Line 1			Line 2					
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	R-Squared	Overall Trend
16C_1_01	MW-16C	Appendix III	Boron	mg/L	9	0	0%	-0.0000454	0.613	↔	0.000193	0.194	↔	2023-07-05	0.563	↔
16C_1_02	MW-16C	Appendix III	Calcium	mg/L	9	0	0%	0.0717	0.010	↔	0.0318	0.297	↔	2023-07-05	0.906	↔
16C_1_04	MW-16C	Appendix III	Fluoride	mg/L	9	8	89%	0.0000000000323	1.000	↔	-0.00316	0.290	↔	2023-06-21	0.386	↔
16C_1_05	MW-16C	Appendix III	Sulfate	mg/L	9	0	0%	-0.234	0.000	↓	0.00482	0.057	↔	2023-03-25	0.994	↔
16C_1_06	MW-16C	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	-1.07	0.001	↓	0.0224	0.744	↔	2023-04-26	0.941	↔
16C_1_07	MW-16C	Appendix III	pH, Field	su	9	0	0%	-0.00212	0.044	↔	0.00135	0.082	↔	2023-07-01	0.759	↔

(Table continues on next page)

Table 9: Trend Tests: Piecewise Linear-Linear *(continued)*

								Line 1			Line 2					
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	R-Squared	Overall 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	↔	0.00000000000400	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	↔
16C_5_38	MW-16C	Part 115	Iron	mg/L	9	0	0%	-0.00249	0.115	↔	-0.000286	0.891	↔	2023-07-26	0.657	↔
16D_1_01	MW-16D	Appendix III	Boron	mg/L	9	0	0%	-0.000788	0.452	↔	0.00189	0.256	↔	2023-07-05	0.455	↔
16D_1_02	MW-16D	Appendix III	Calcium	mg/L	9	0	0%	-0.00348	0.405	↔	0.0120	0.010	↔	2023-07-04	0.816	↔
16D_1_03	MW-16D	Appendix III	Chloride	mg/L	9	0	0%	0.0242	0.017	↔	-0.00534	0.110	↔	2023-04-26	0.778	↔
16D_1_04	MW-16D	Appendix III	Fluoride	mg/L	9	8	89%	-0.00000000000423	1.000	↔	-0.00224	0.388	↔	2023-06-02	0.342	↔
16D_1_05	MW-16D	Appendix III	Sulfate	mg/L	9	1	11%	0.0851	0.158	↔	-0.0313	0.019	↔	2023-04-10	0.740	↔
16D_1_06	MW-16D	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.199	0.079	↔	-0.0763	0.333	↔	2023-05-30	0.559	↔
16D_1_07	MW-16D	Appendix III	pH, Field	su	9	0	0%	-0.00131	0.246	↔	-0.000268	0.746	↔	2023-05-30	0.494	↔
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	↔
16D_5_37	MW-16D	Part 115	Copper	mg/L	9	8	89%	-0.000106	0.000	↓	0.000000000000000154	0.253	↔	2023-03-21	1.000	↔
16D_5_42	MW-16D	Part 115	Zinc	mg/L	9	0	0%	-0.00102	0.093	↔	0.0000857	0.958	↔	2023-08-13	0.588	↔
7B_1_02	MW-7B	Appendix III	Calcium	mg/L	10	0	0%	-0.0195	0.251	↔	0.00102	0.349	↔	2022-05-18	0.654	↔
7B_1_06	MW-7B	Appendix III	Total Dissolved Solids	mg/L	10	0	0%	0.0272	0.505	↔	-0.0454	0.271	↔	2022-10-06	0.308	↔
7B_1_07	MW-7B	Appendix III	pH, Field	su	10	0	0%	-0.00316	0.106	↔	0.000352	0.447	↔	2022-06-23	0.498	↔
7B_2_09	MW-7B	Appendix IV	Arsenic	mg/L	10	9	90%	-0.00000287	0.530	↔	-0.000000000000163	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

								Line 1			Line 2			Line 3						
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	Break 2	R-Squared	Overall Trend
16C_1_05	MW-16C	Appendix III	Sulfate	mg/L	9	0	0%	-0.234	0.000	↓	0.00633	0.210	↔	-0.00286	0.883	↔	2023-03-26	2023-10-05	0.995	↔
16C_1_06	MW-16C	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	-1.02	0.038	↔	-0.143	0.504	↔	0.149	0.309	↔	2023-04-22	2023-07-29	0.964	↔
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_1_03	MW-16D	Appendix III	Chloride	mg/L	9	0	0%	0.0242	0.019	↔	-0.0170	0.070	↔	0.00357	0.602	↔	2023-05-15	2023-08-16	0.923	↔
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	↔
16D_5_42	MW-16D	Part 115	Zinc	mg/L	9	0	0%	0.00343	0.001	↑	-0.00420	0.001	↓	-0.0000282	0.737	↔	2023-03-28	2023-06-03	0.997	↔

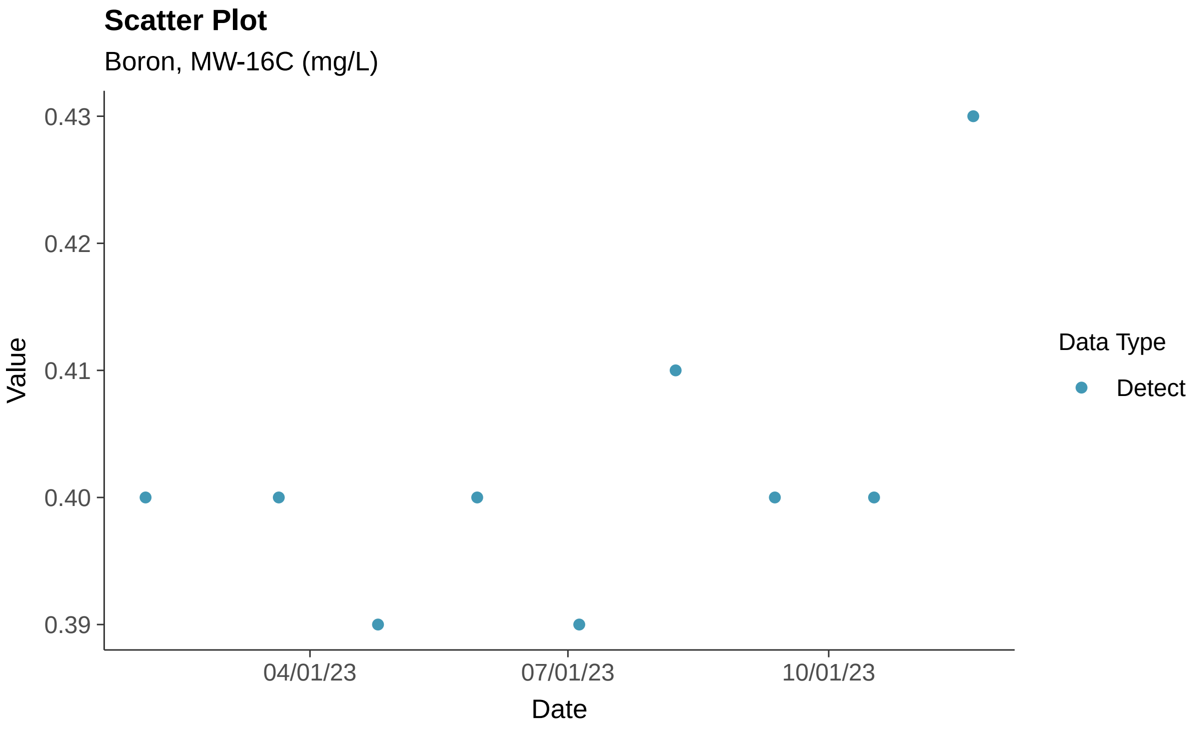
(Table continues on next page)

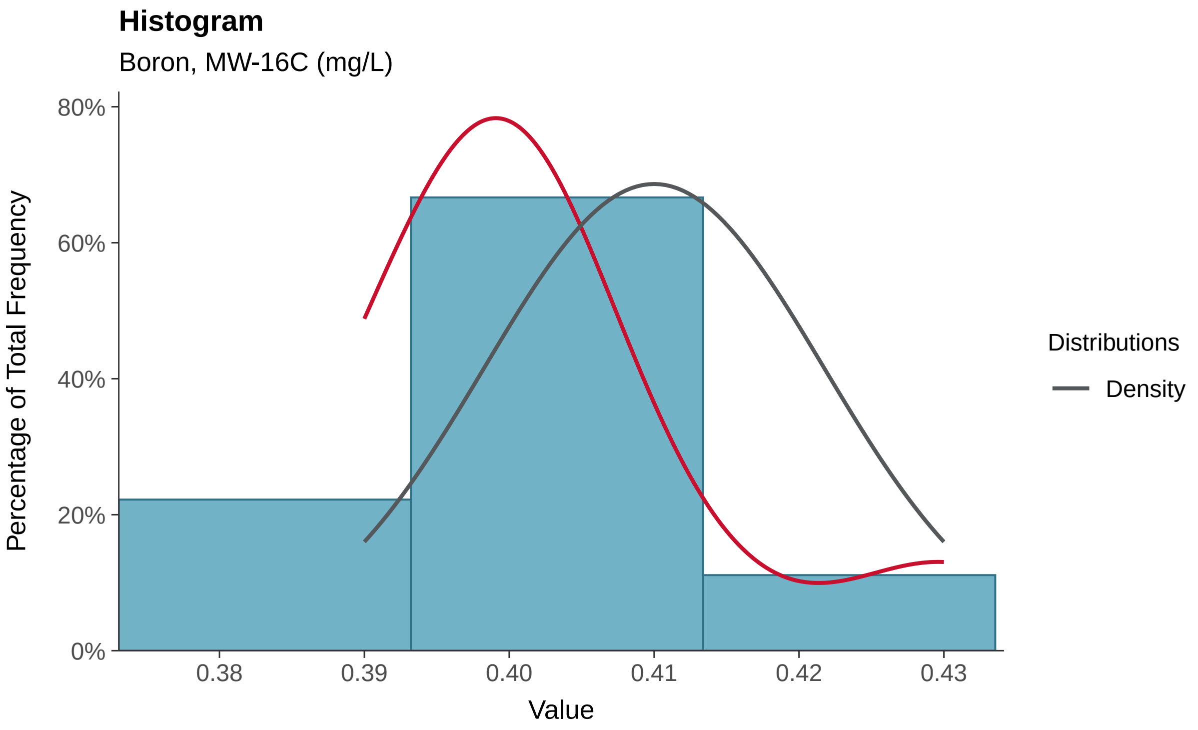
Table 10: Trend Tests: Piecewise Linear-Linear-Linear *(continued)*

								Line 1			Line 2			Line 3						
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	Break 2	R-Squared	Overall 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	↔
7B_5_38	MW-7B	Part 115	Iron	mg/L	10	0	0%	-0.000857	0.033	↔	0.000196	0.013	↔	0.0000571	0.348	↔	2022-04-16	2023-01-04	0.951	↔

Appendix III: Boron, MW-16C

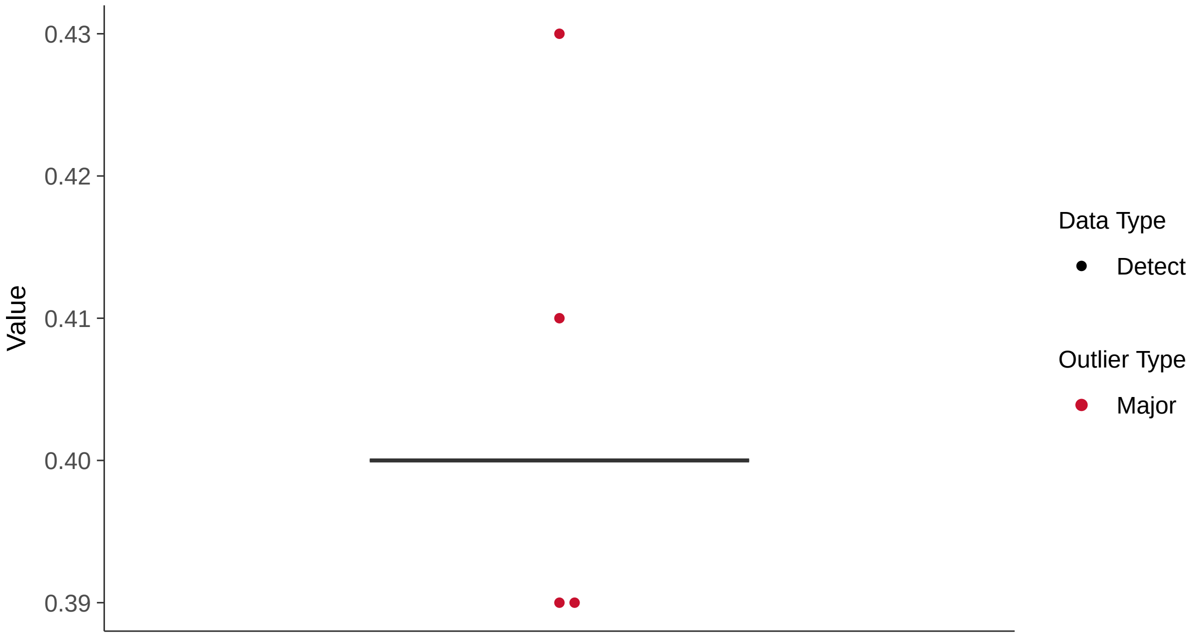
ID: 16C_1_01





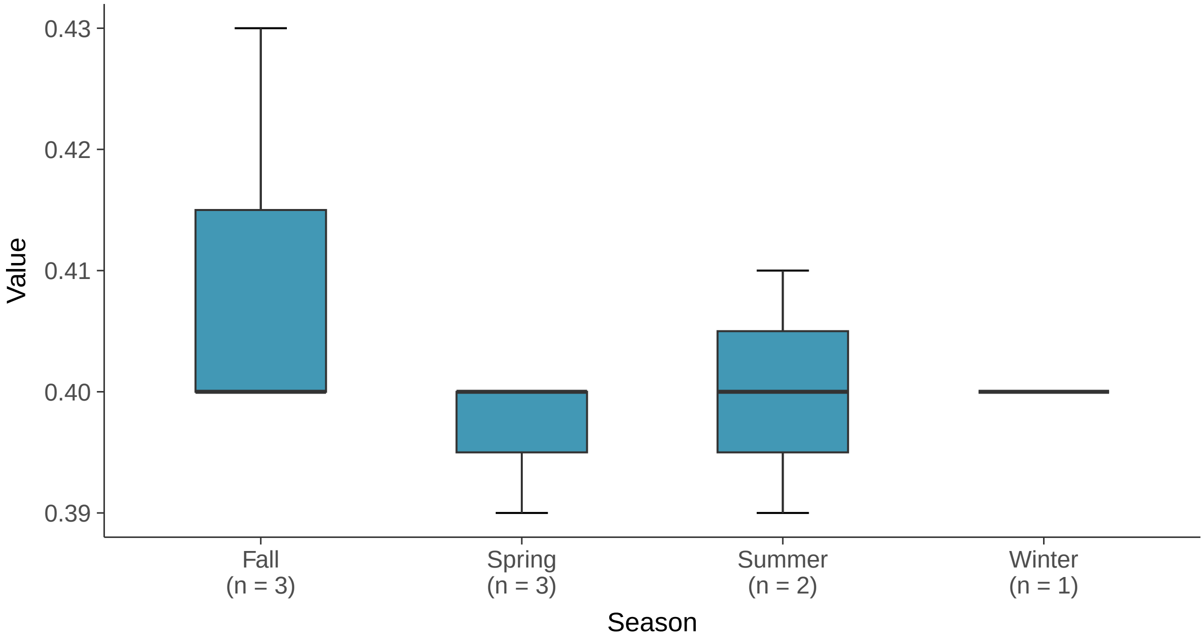
Boxplot

Boron, MW-16C (mg/L)



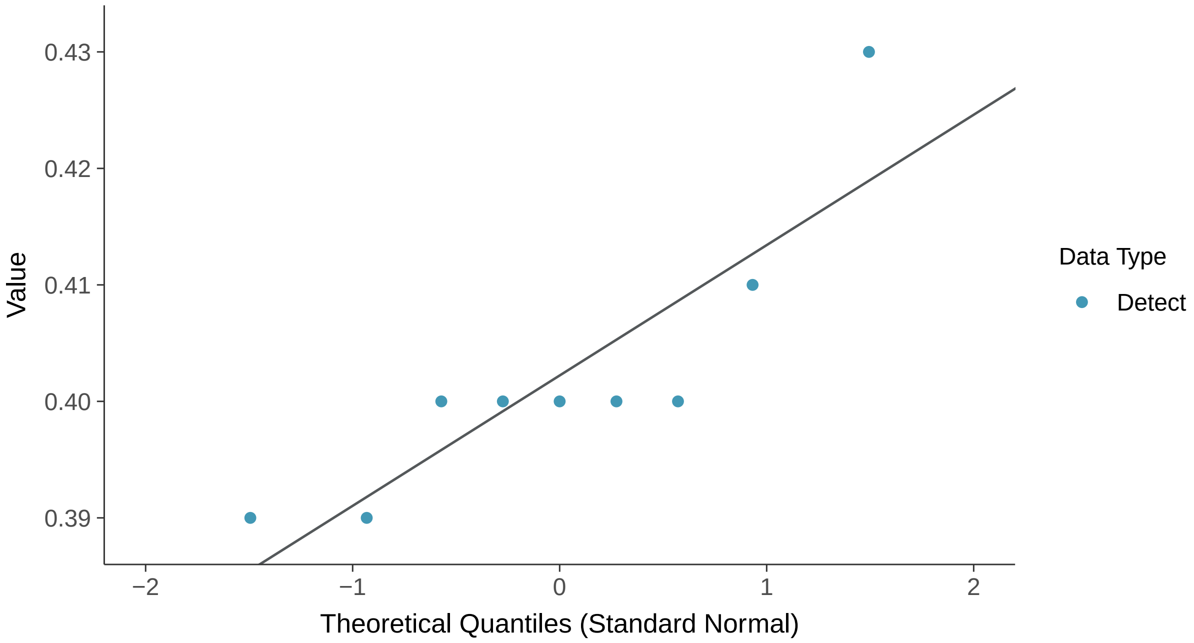
Boxplot by Season

Boron, MW-16C (mg/L)



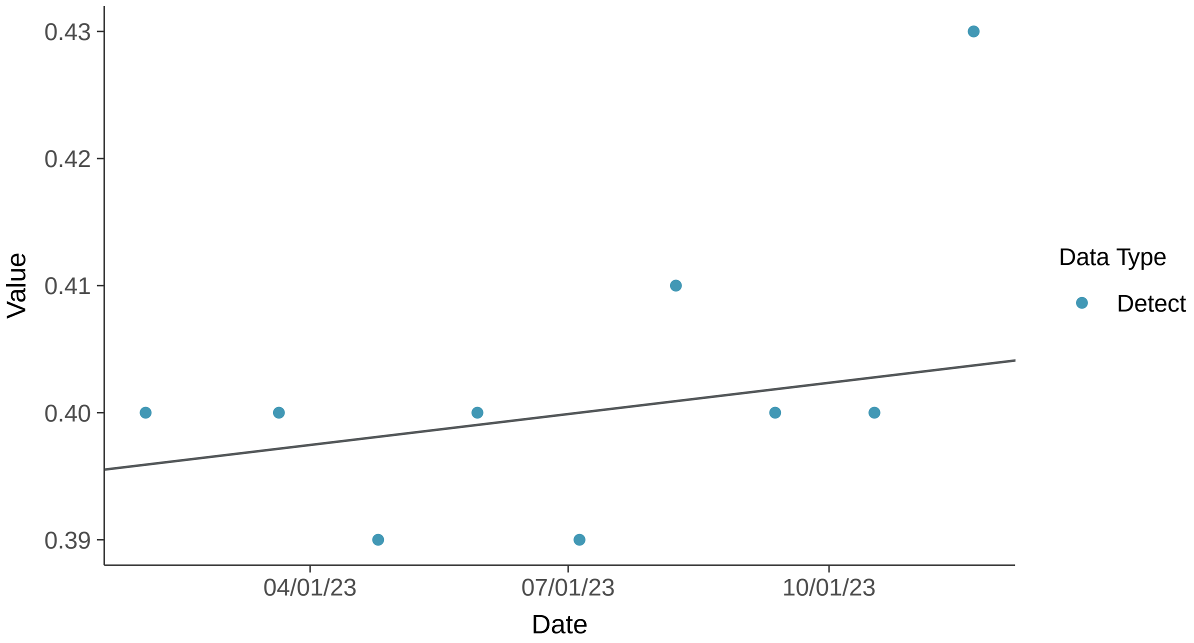
Normal Q-Q plot

Boron, MW-16C (mg/L)



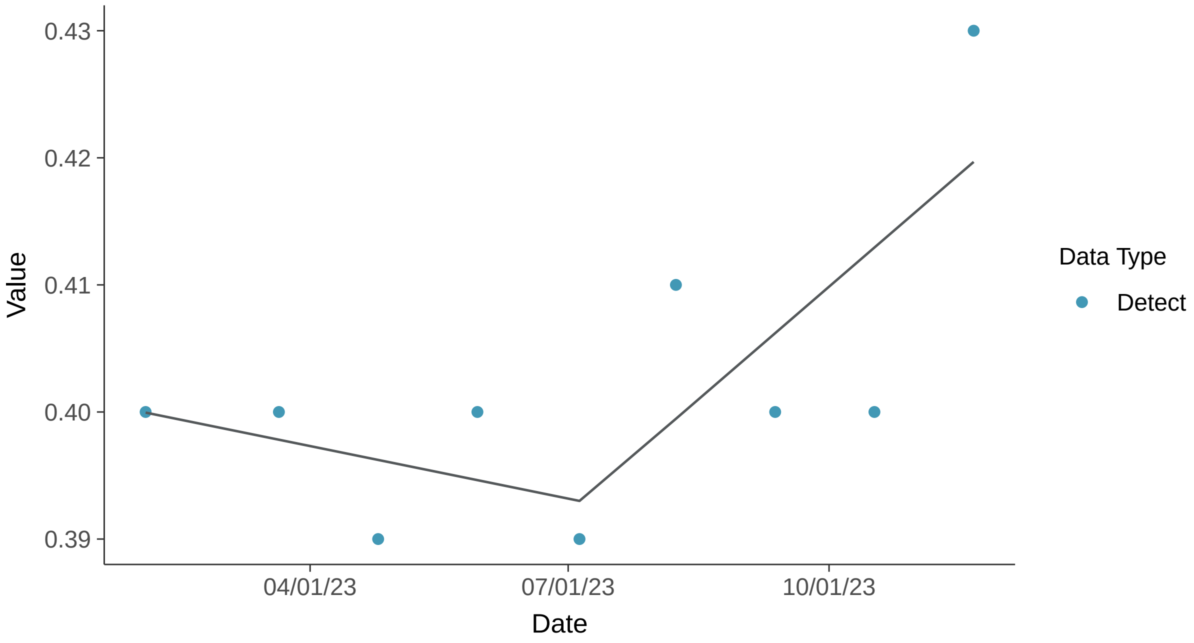
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Boron, MW-16C (mg/L)



Trend Regression: Piecewise Linear-Linear

Boron, MW-16C (mg/L)

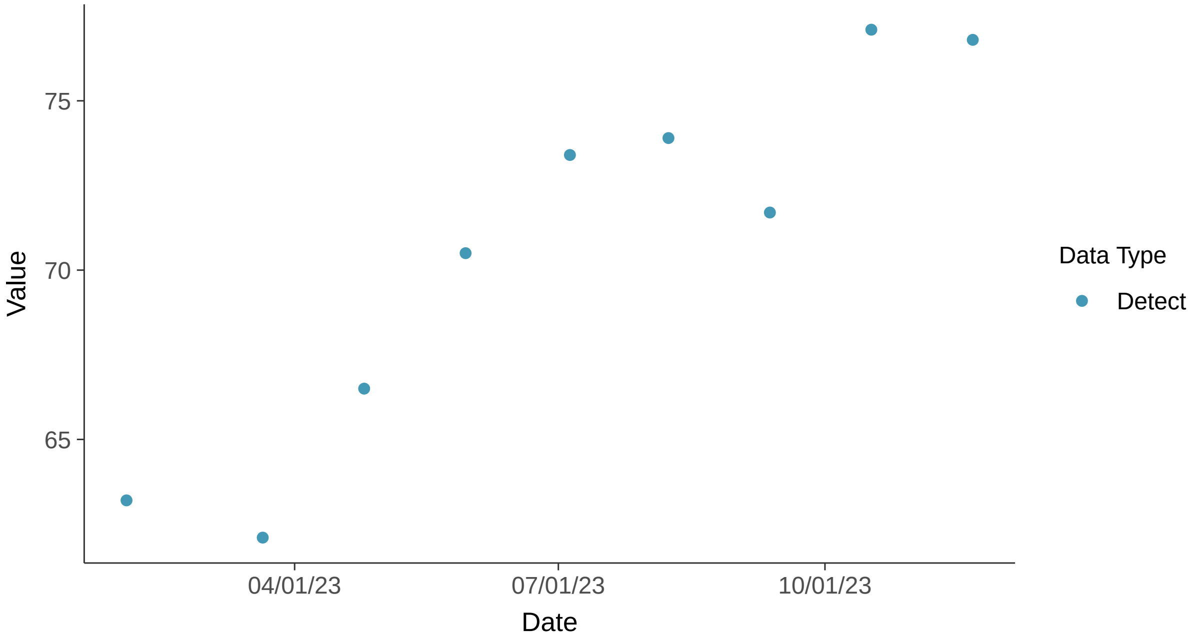


Appendix III: Calcium, MW-16C

ID: 16C_1_02

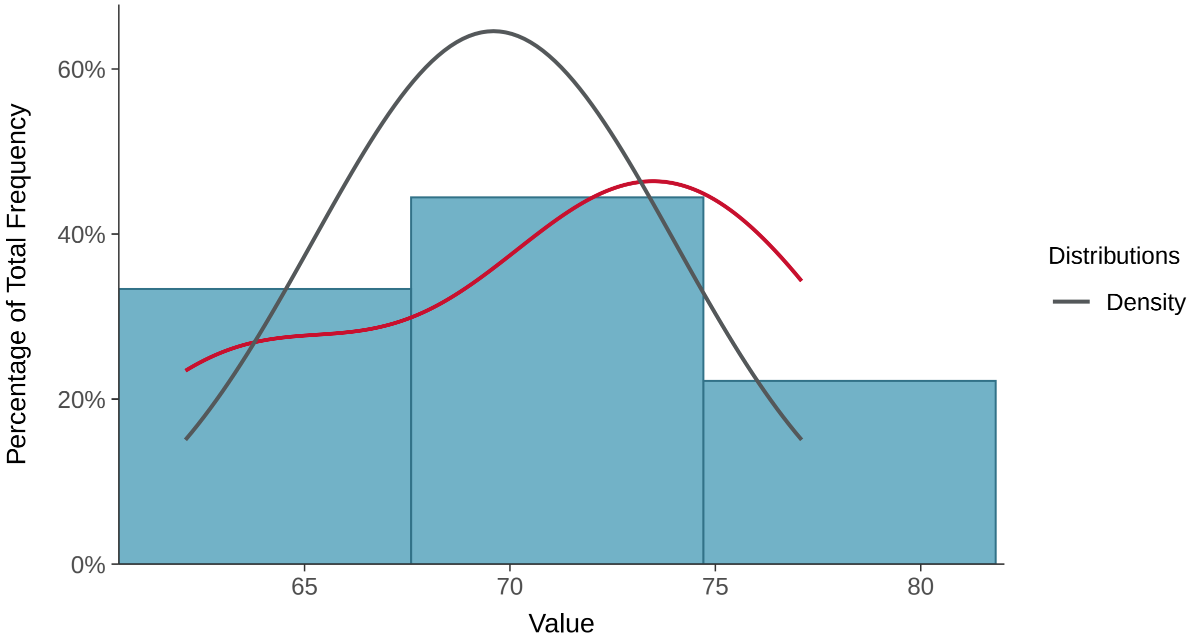
Scatter Plot

Calcium, MW-16C (mg/L)



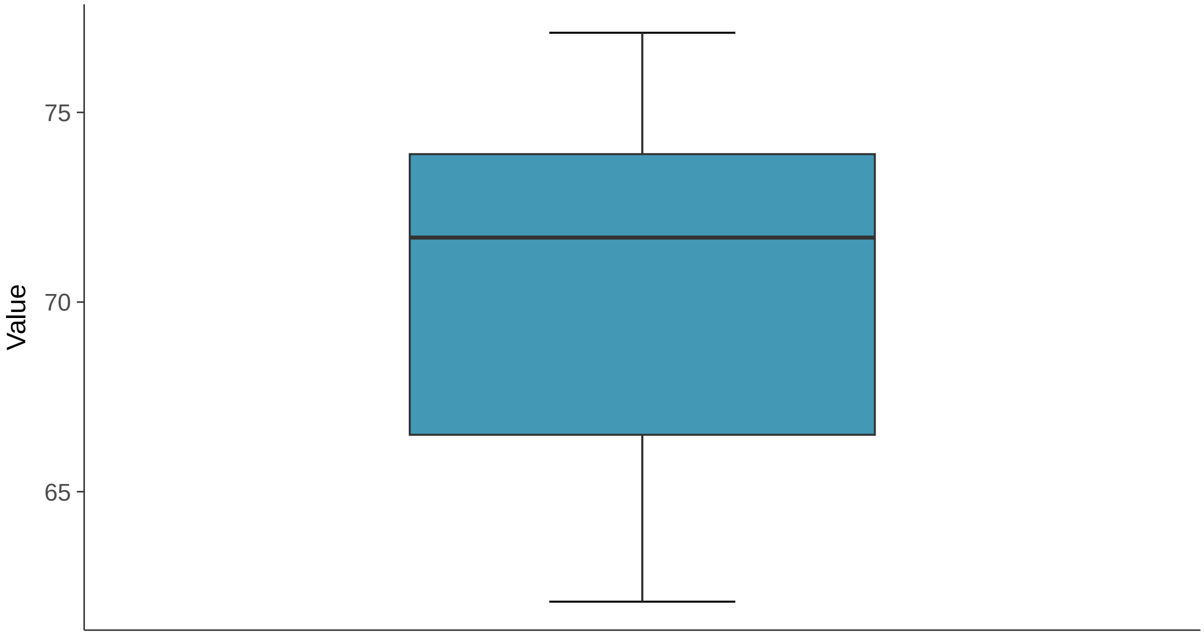
Histogram

Calcium, MW-16C (mg/L)



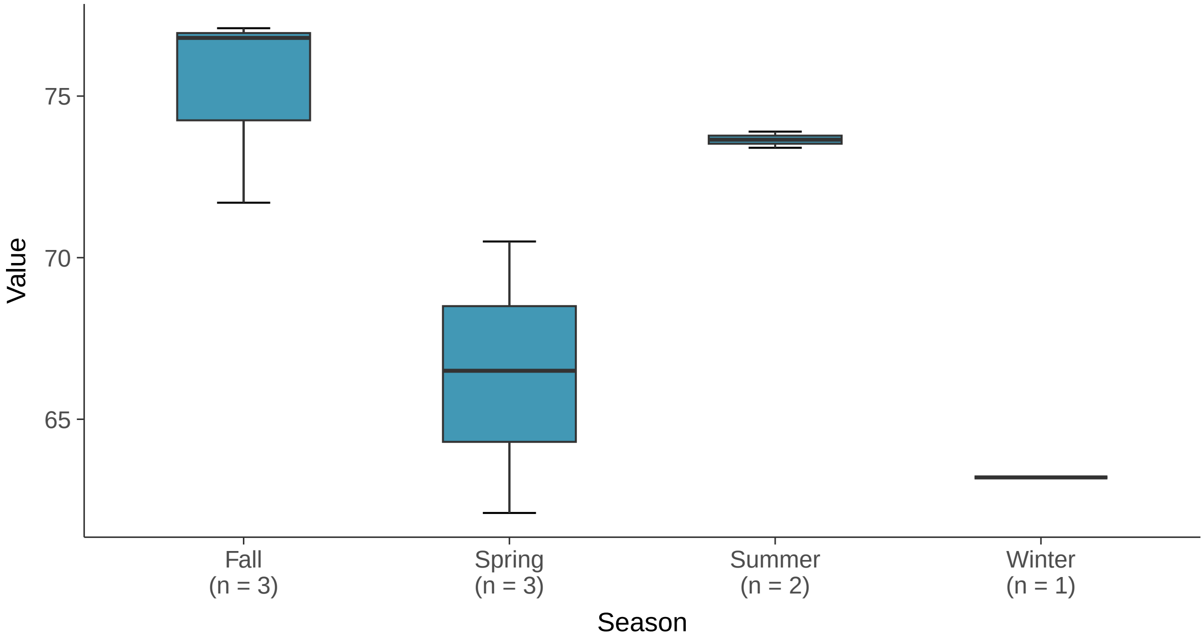
Boxplot

Calcium, MW-16C (mg/L)



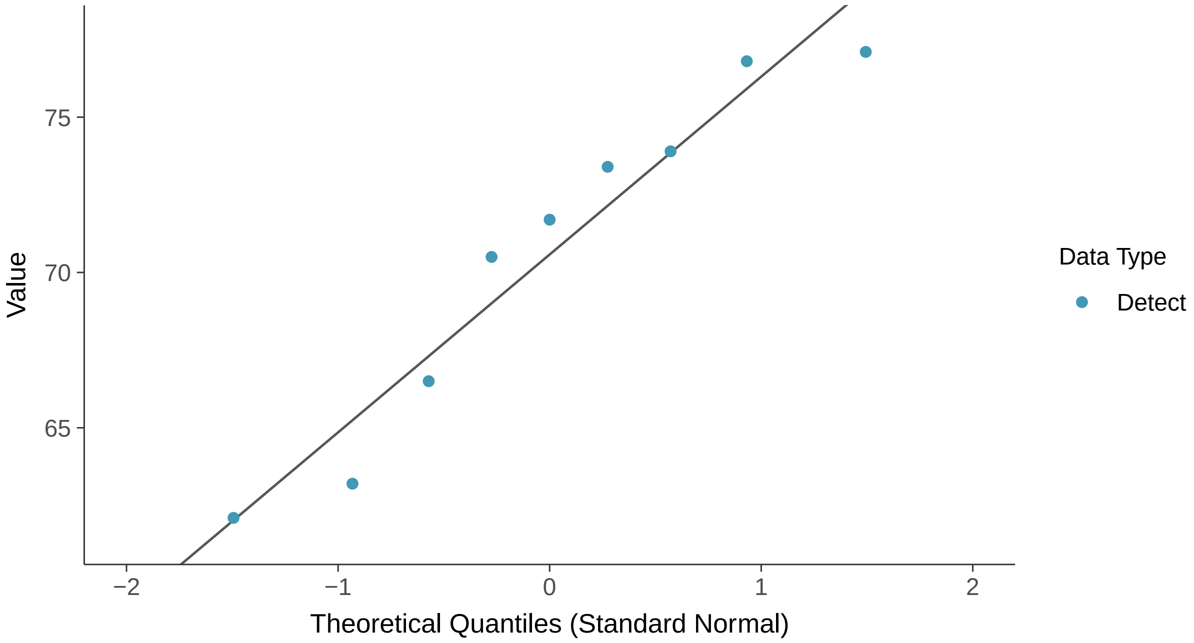
Boxplot by Season

Calcium, MW-16C (mg/L)



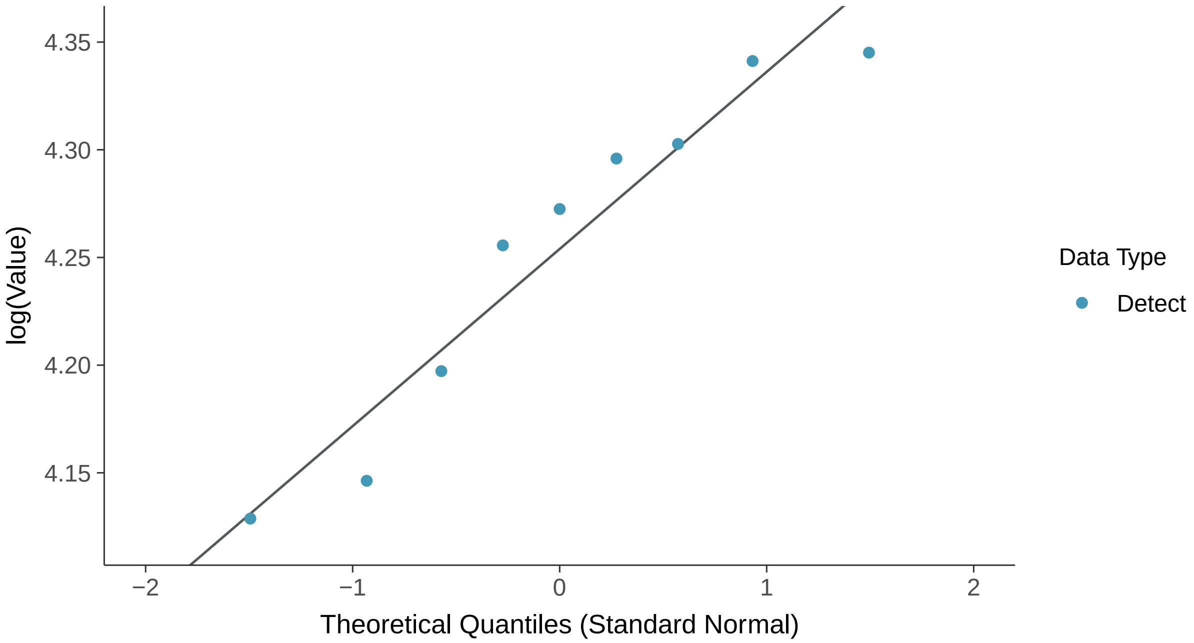
Normal Q-Q plot

Calcium, MW-16C (mg/L)



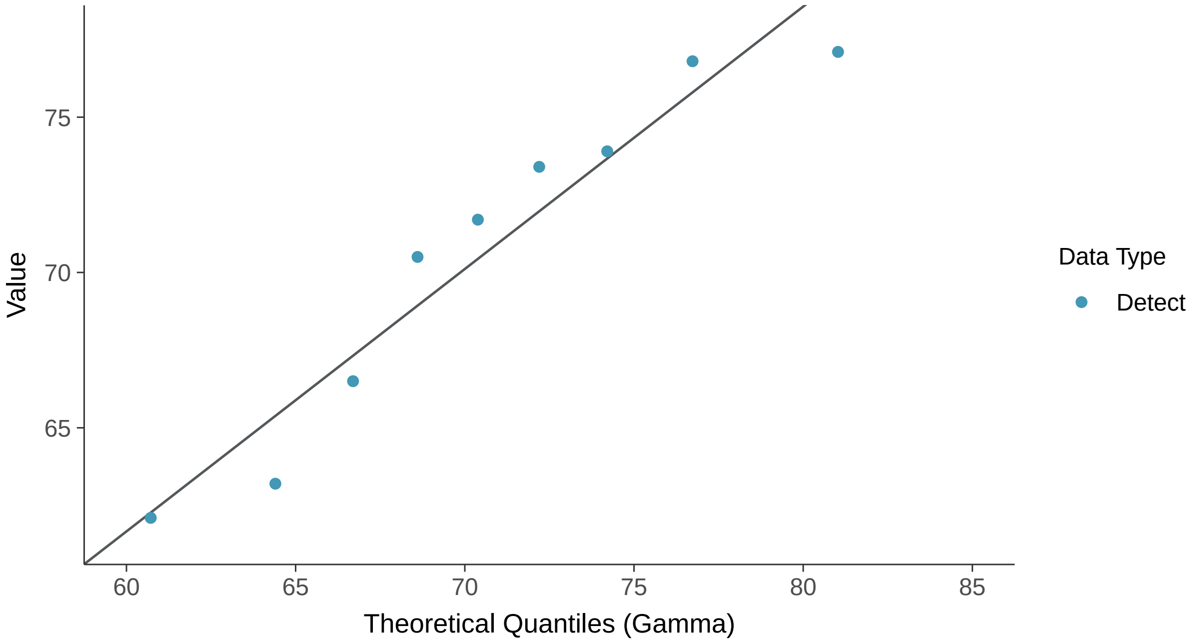
Lognormal Q-Q plot

Calcium, MW-16C (mg/L)



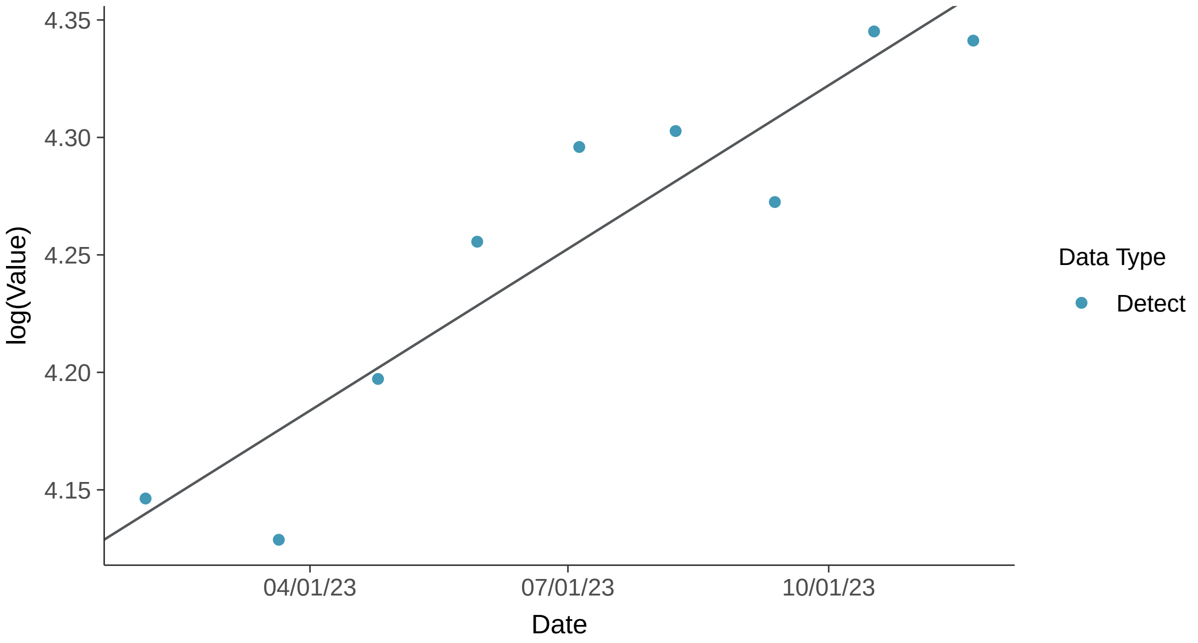
Gamma Q-Q plot

Calcium, MW-16C (mg/L)



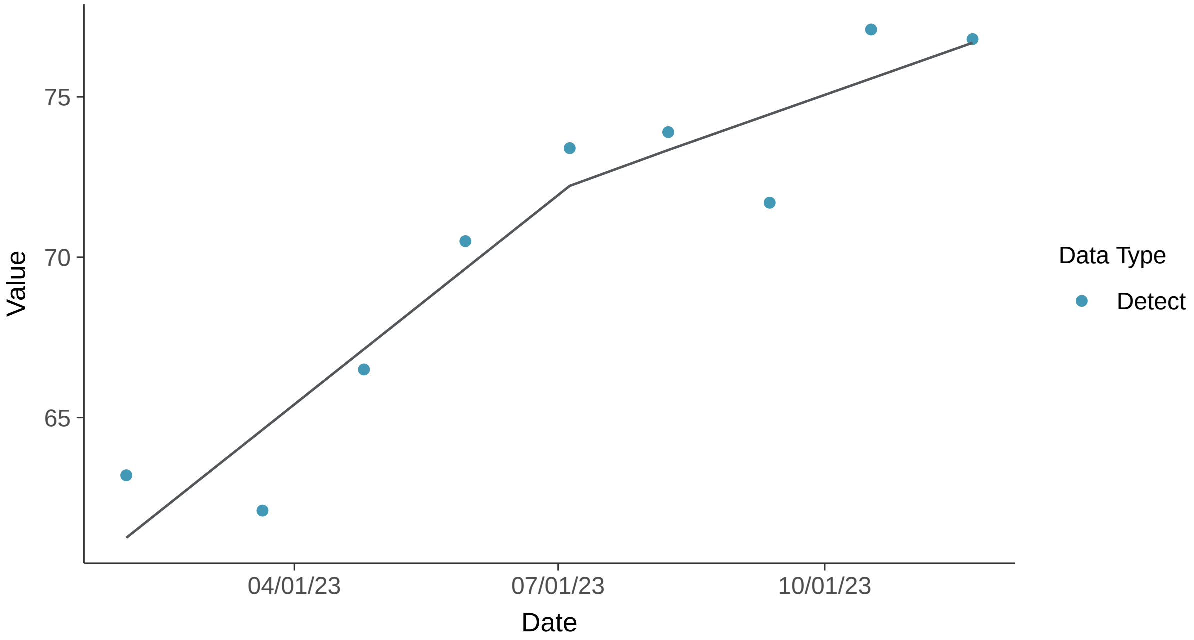
Trend Regression: Lognormal MLE

Calcium, MW-16C (mg/L)



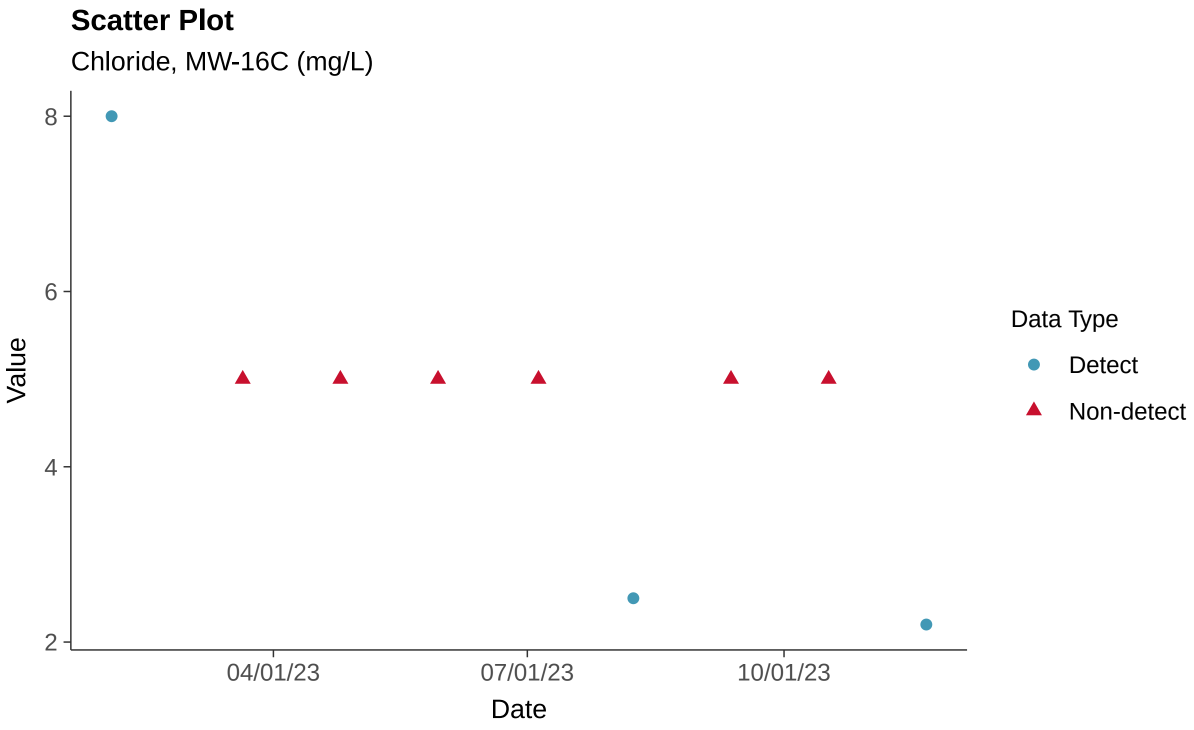
Trend Regression: Piecewise Linear-Linear

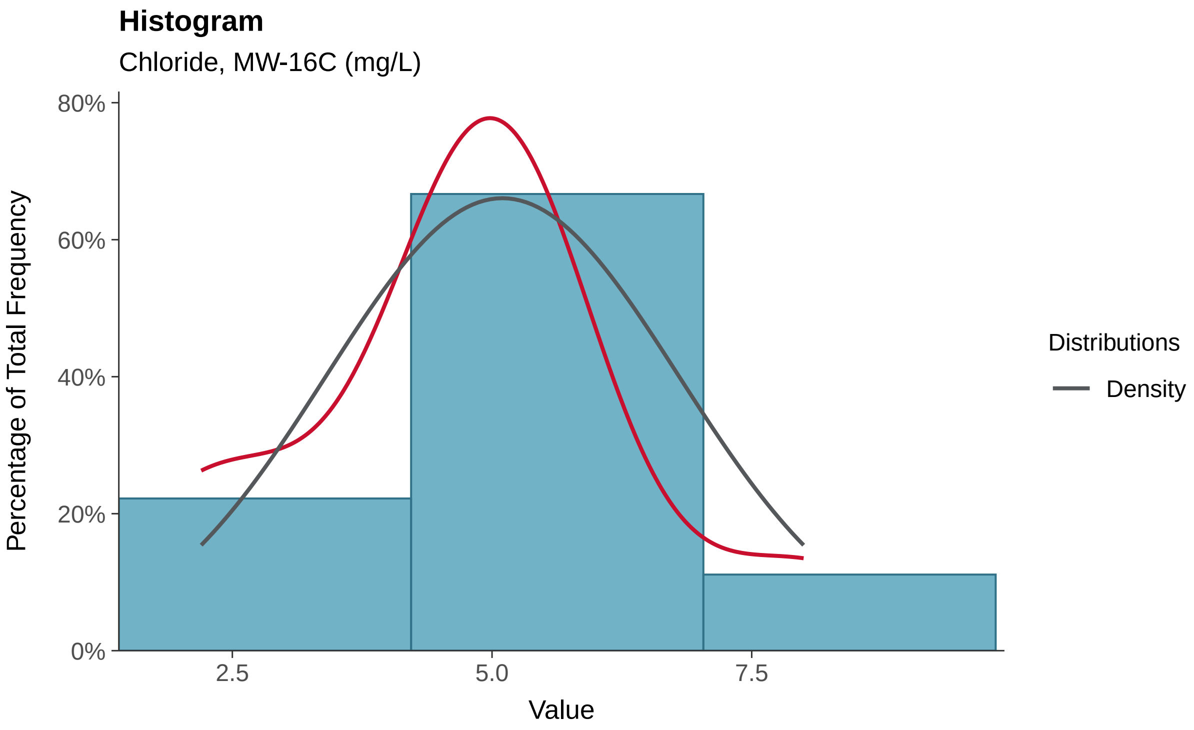
Calcium, MW-16C (mg/L)



Appendix III: Chloride, MW-16C

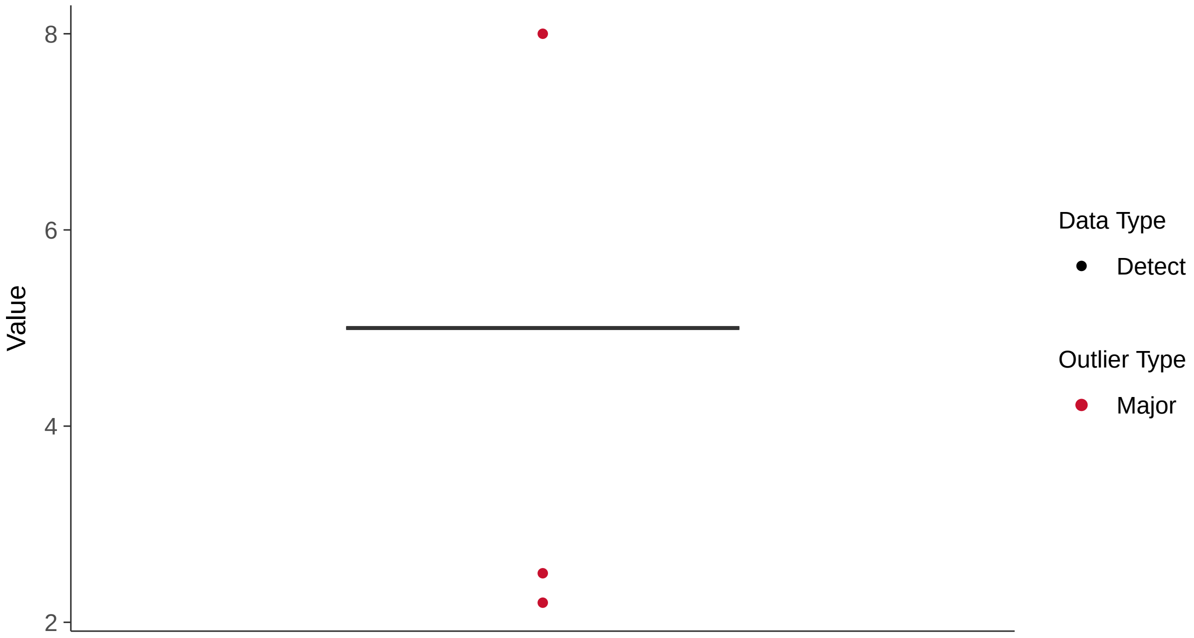
ID: 16C_1_03





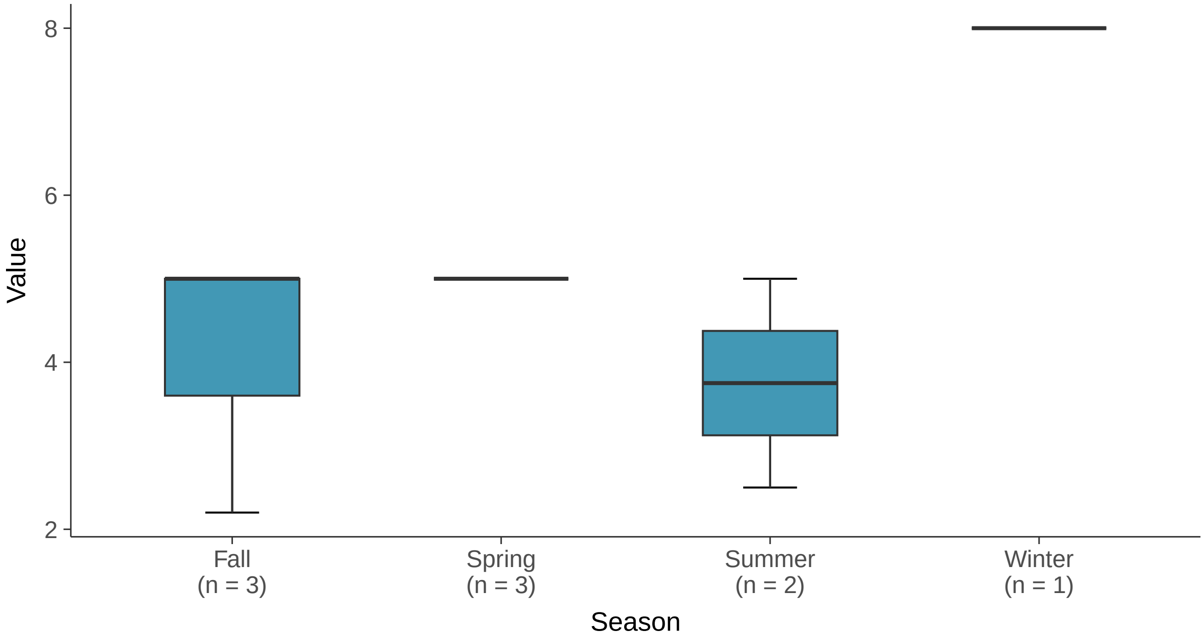
Boxplot

Chloride, MW-16C (mg/L)



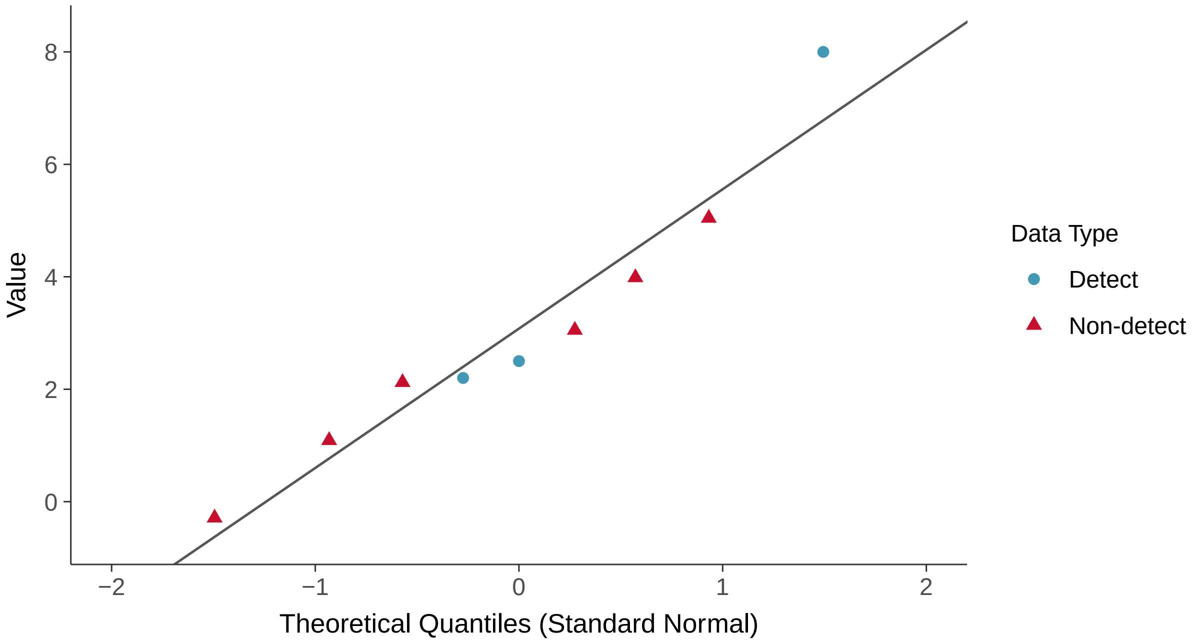
Boxplot by Season

Chloride, MW-16C (mg/L)



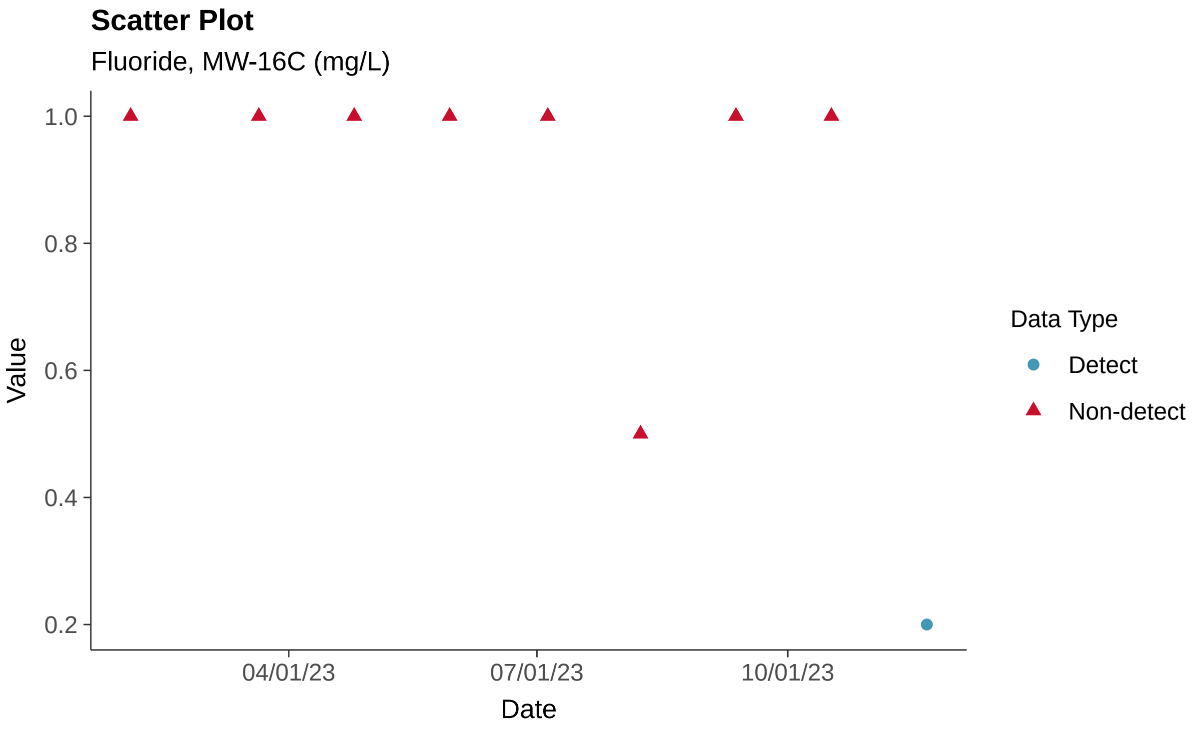
Normal Q-Q plot using ROS Imputed Estimates

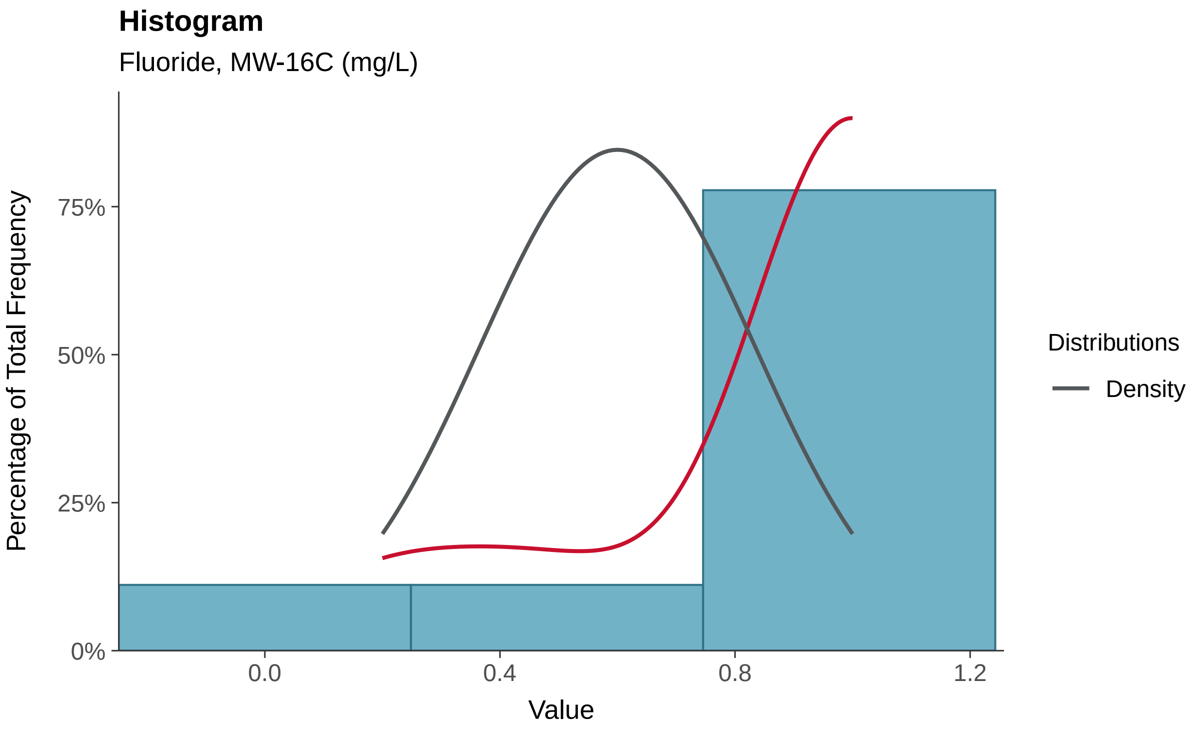
Chloride, MW-16C (mg/L)



Appendix III: Fluoride, MW-16C

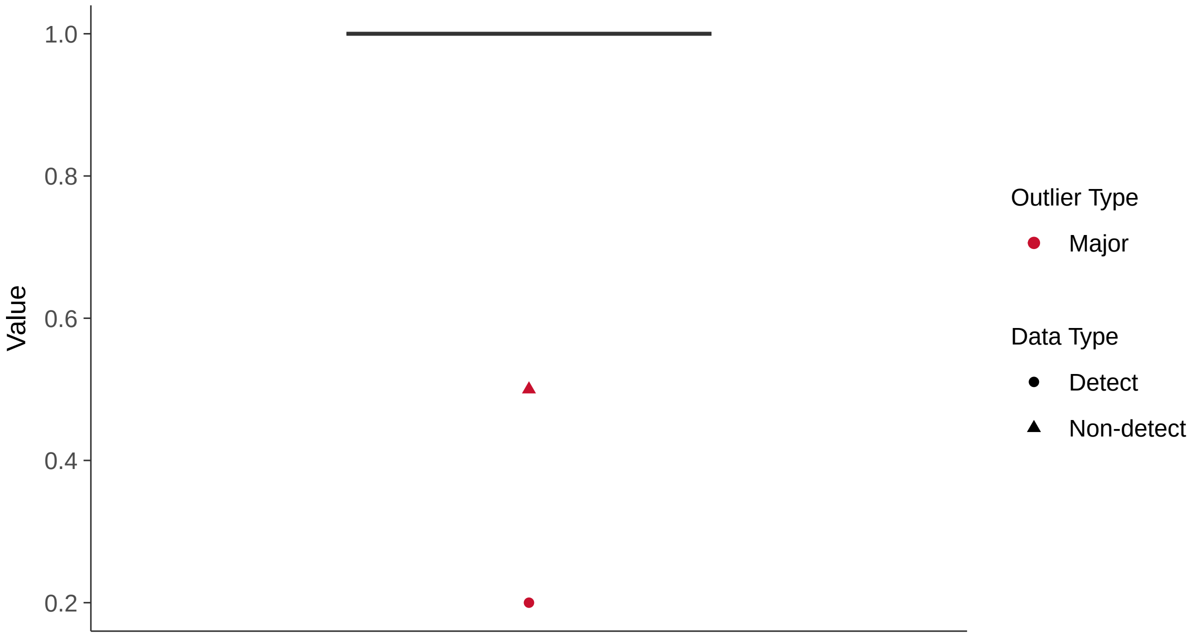
ID: 16C_1_04





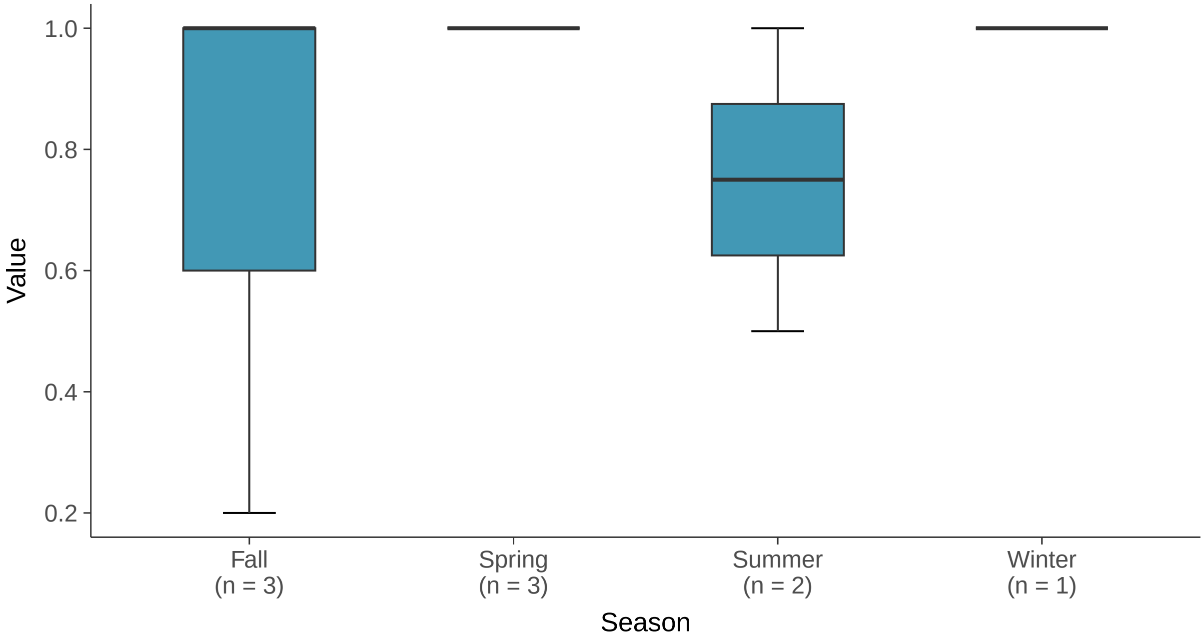
Boxplot

Fluoride, MW-16C (mg/L)



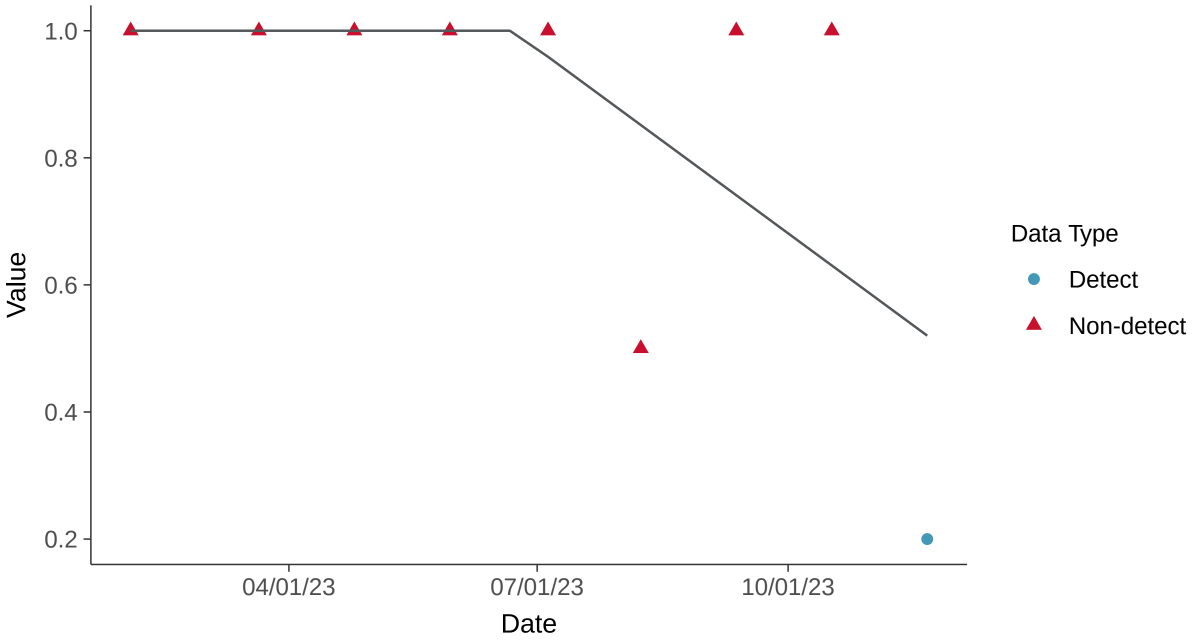
Boxplot by Season

Fluoride, MW-16C (mg/L)



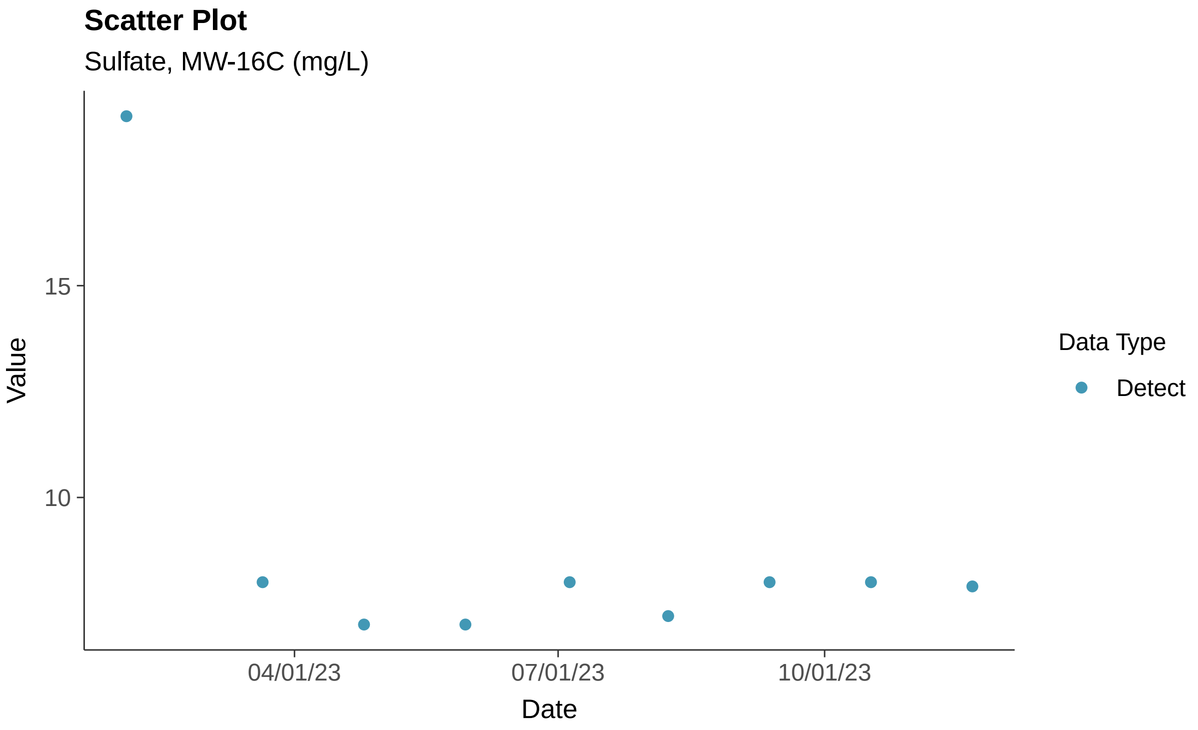
Trend Regression: Piecewise Linear-Linear

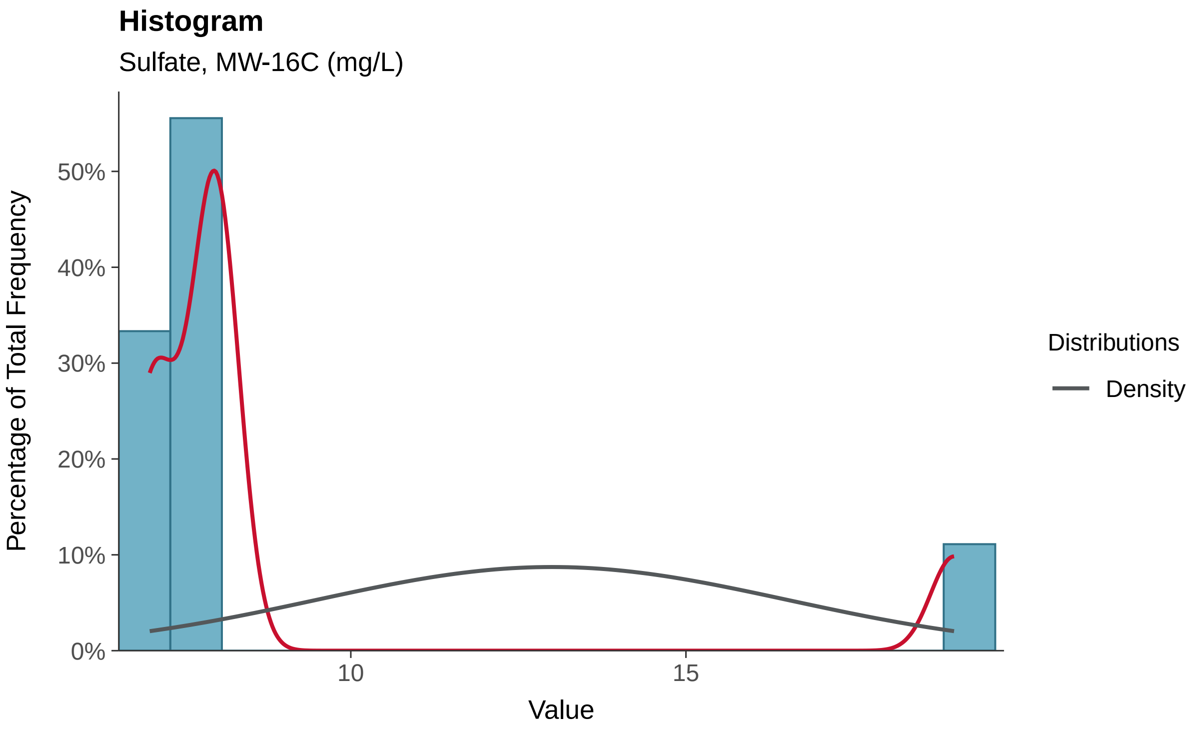
Fluoride, MW-16C (mg/L)



Appendix III: Sulfate, MW-16C

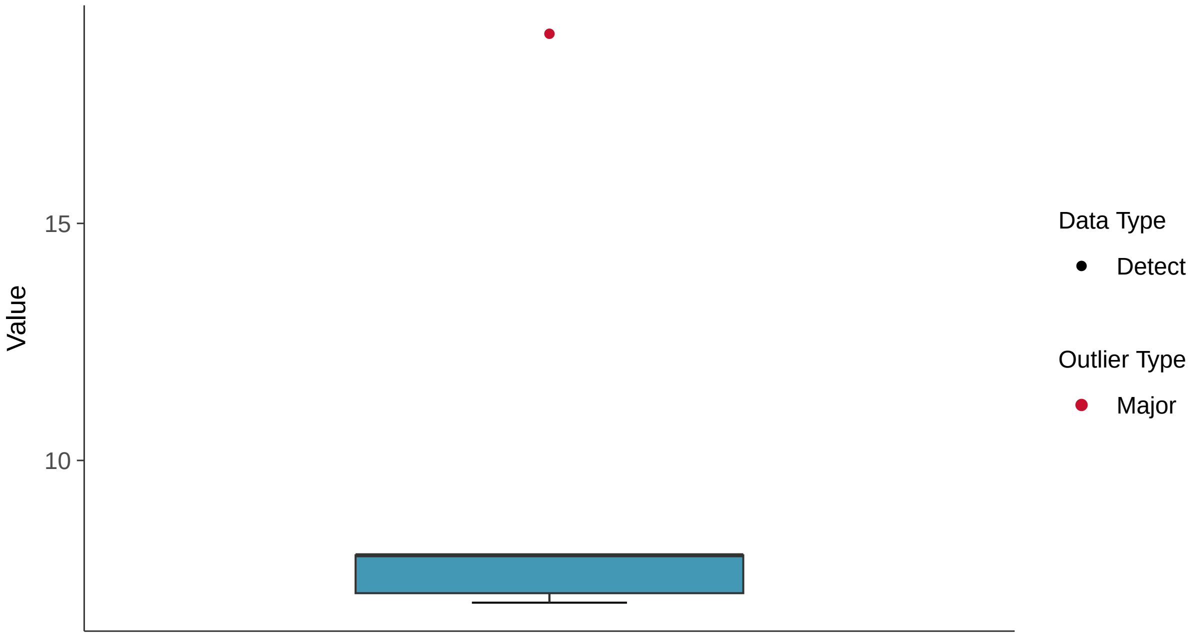
ID: 16C_1_05





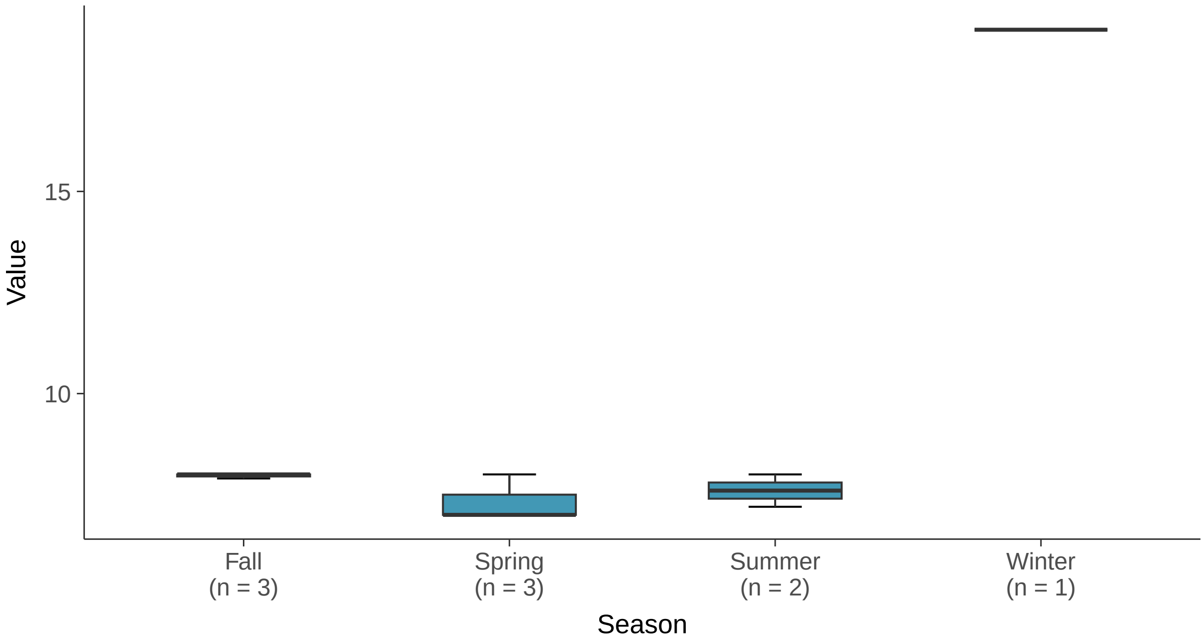
Boxplot

Sulfate, MW-16C (mg/L)



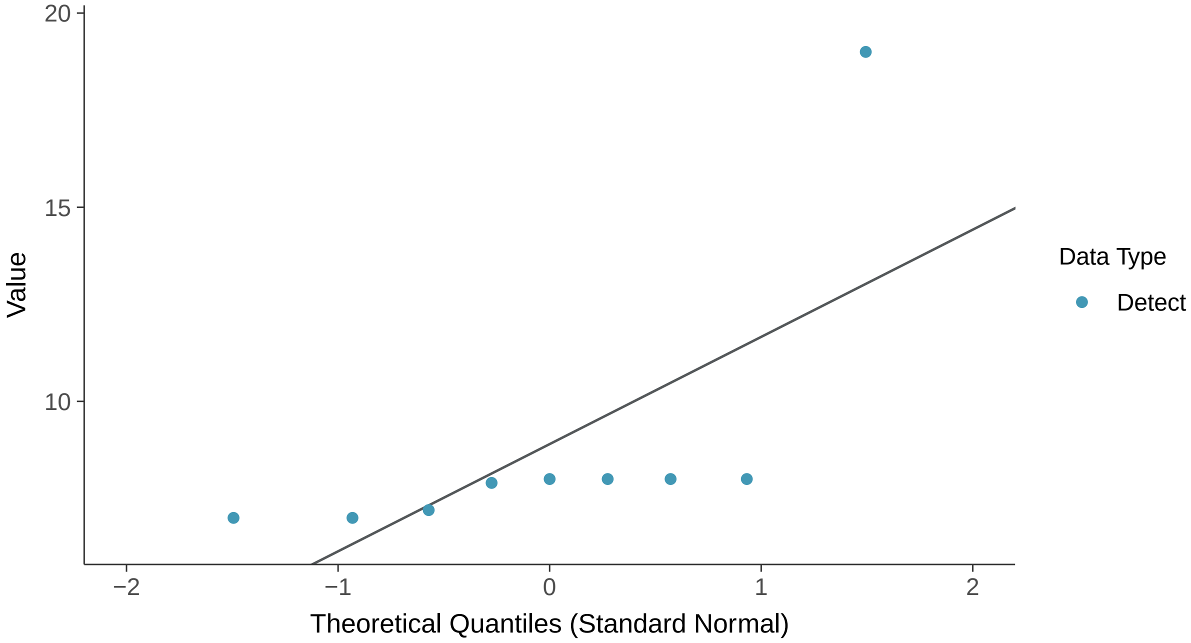
Boxplot by Season

Sulfate, MW-16C (mg/L)



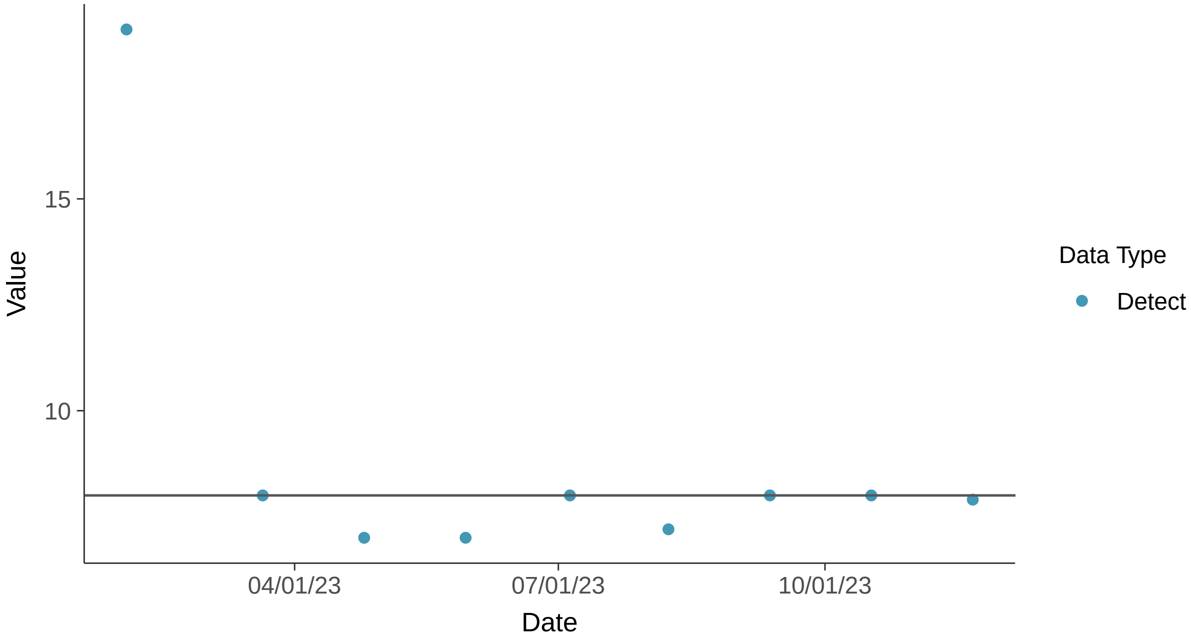
Normal Q-Q plot

Sulfate, MW-16C (mg/L)



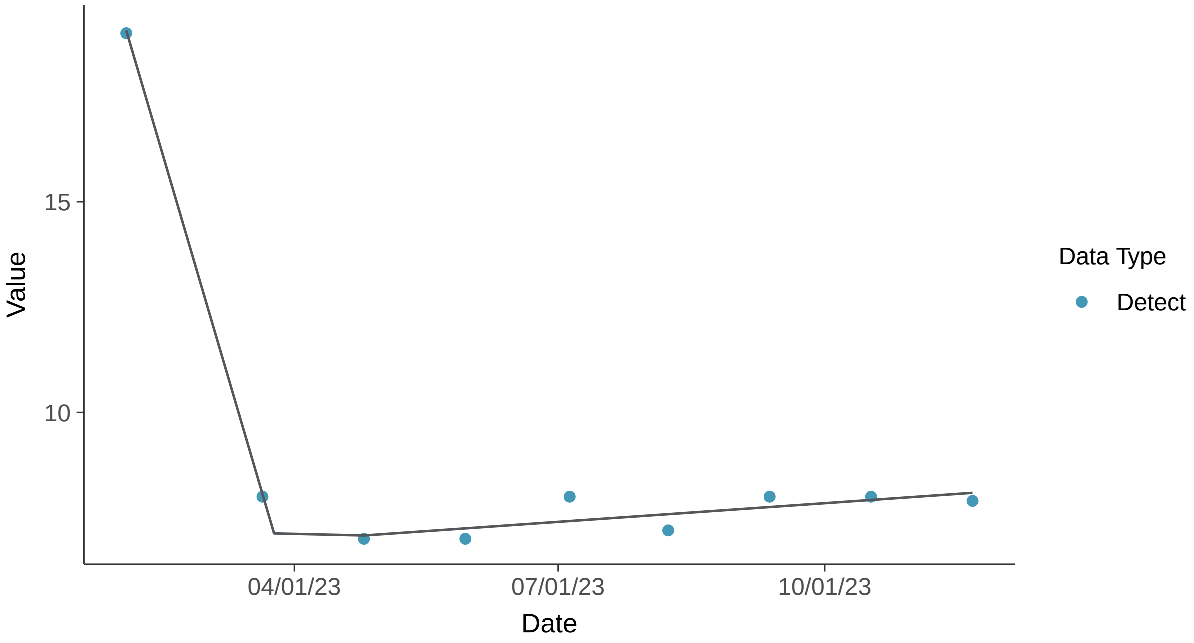
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Sulfate, MW-16C (mg/L)



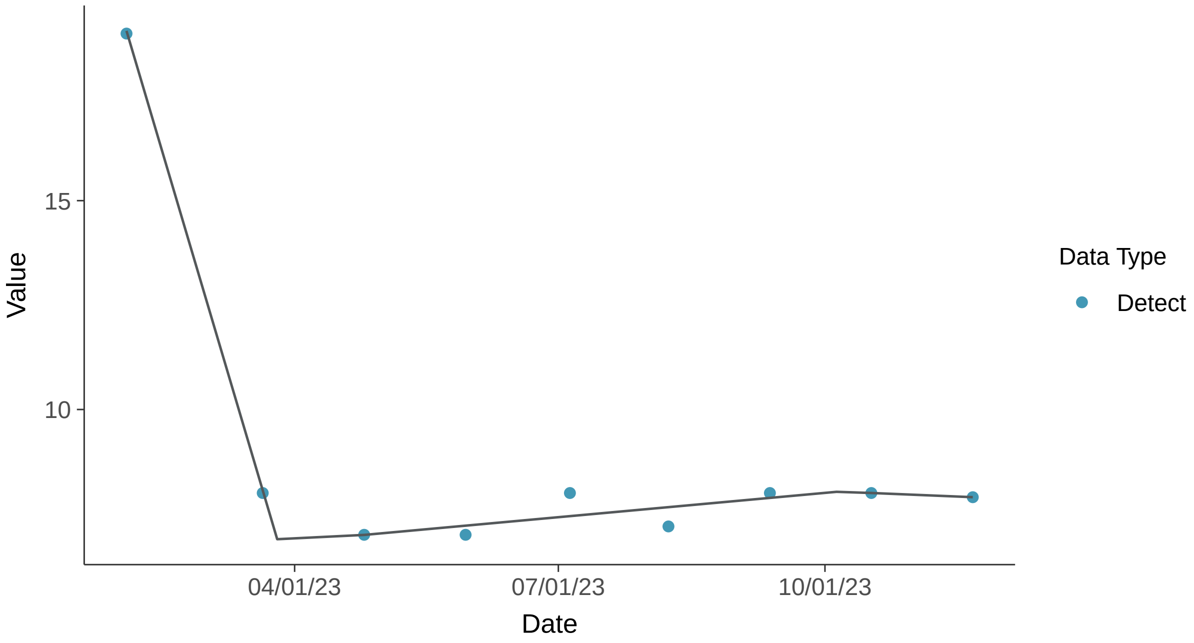
Trend Regression: Piecewise Linear-Linear

Sulfate, MW-16C (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Sulfate, MW-16C (mg/L)

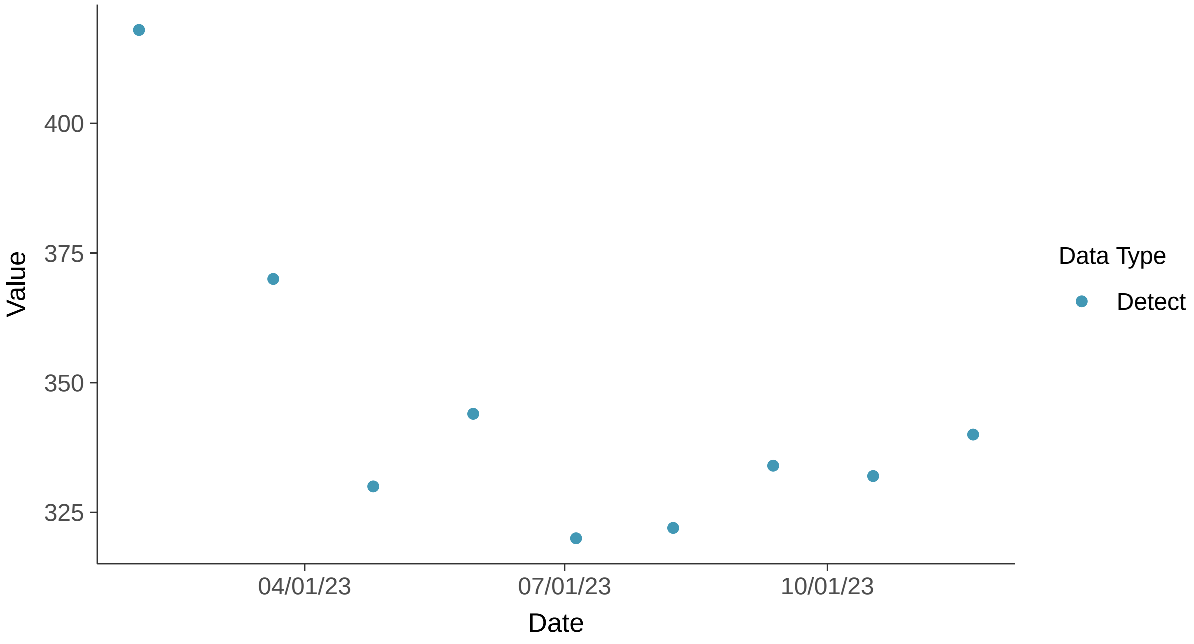


Appendix III: Total Dissolved Solids, MW-16C

ID: 16C_1_06

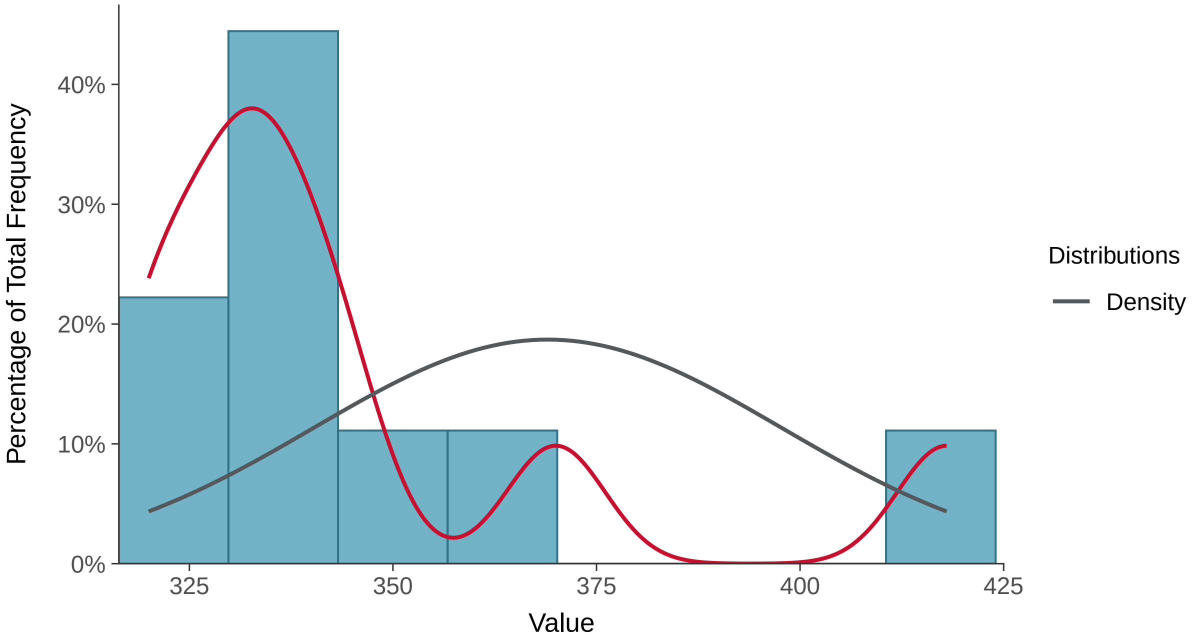
Scatter Plot

Total Dissolved Solids, MW-16C (mg/L)



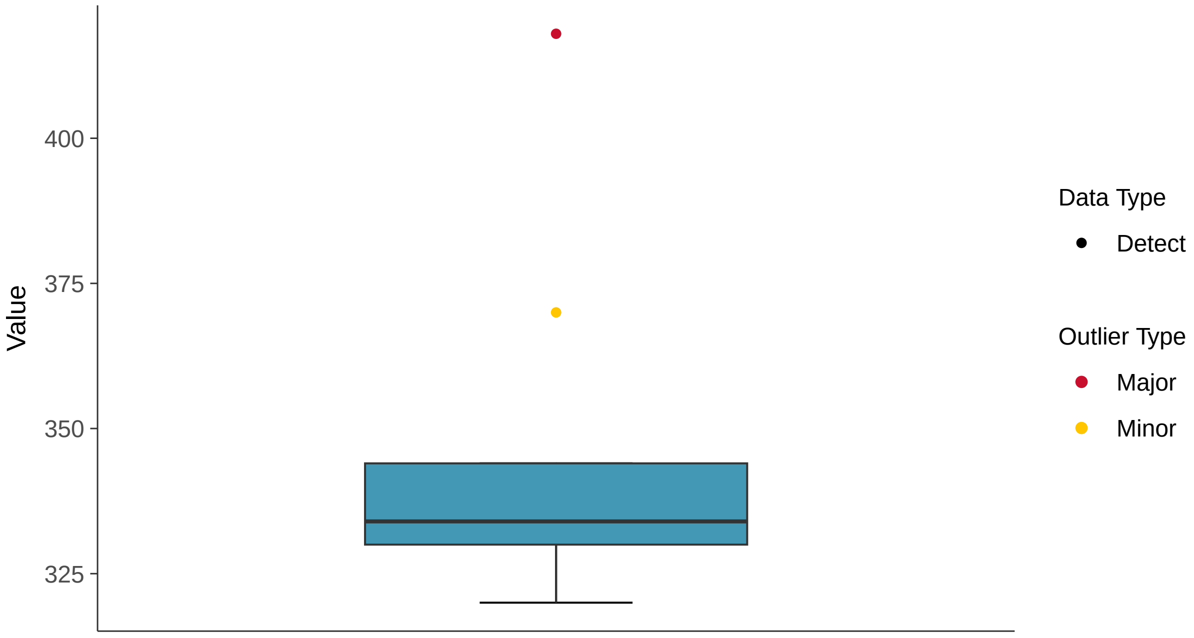
Histogram

Total Dissolved Solids, MW-16C (mg/L)



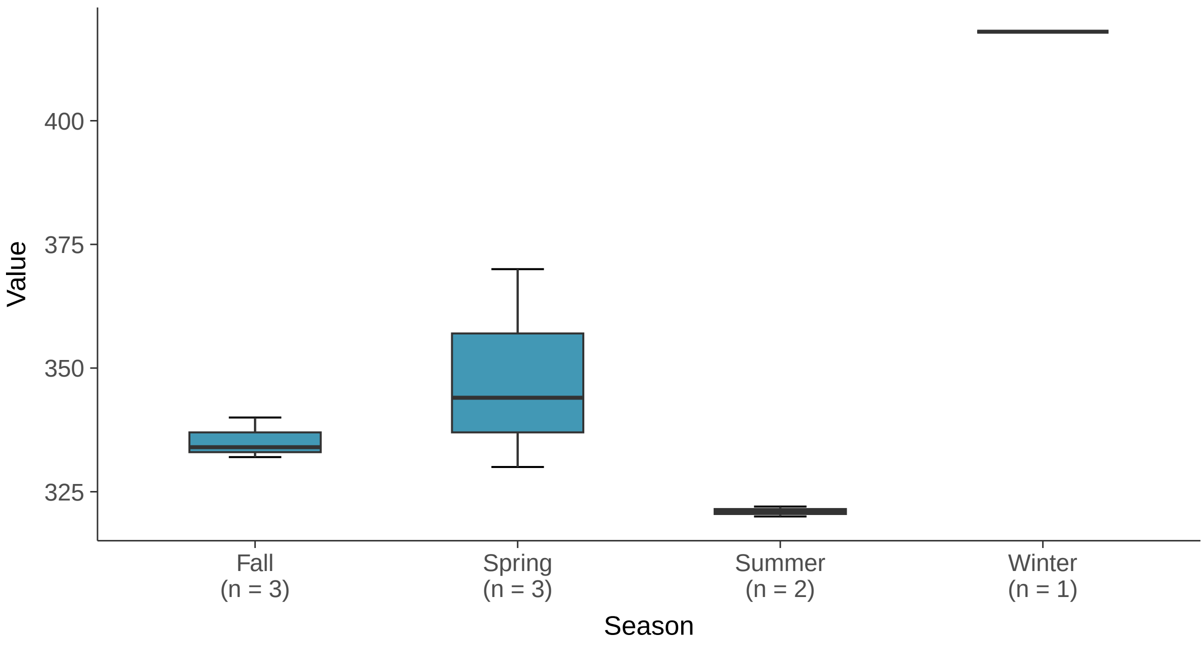
Boxplot

Total Dissolved Solids, MW-16C (mg/L)



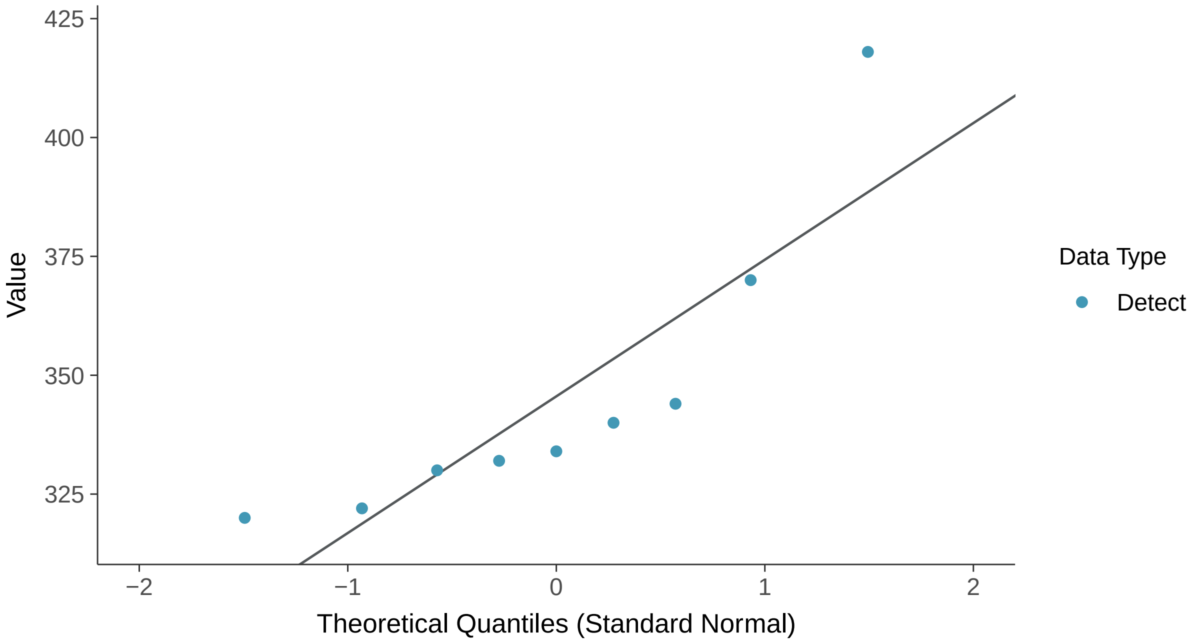
Boxplot by Season

Total Dissolved Solids, MW-16C (mg/L)



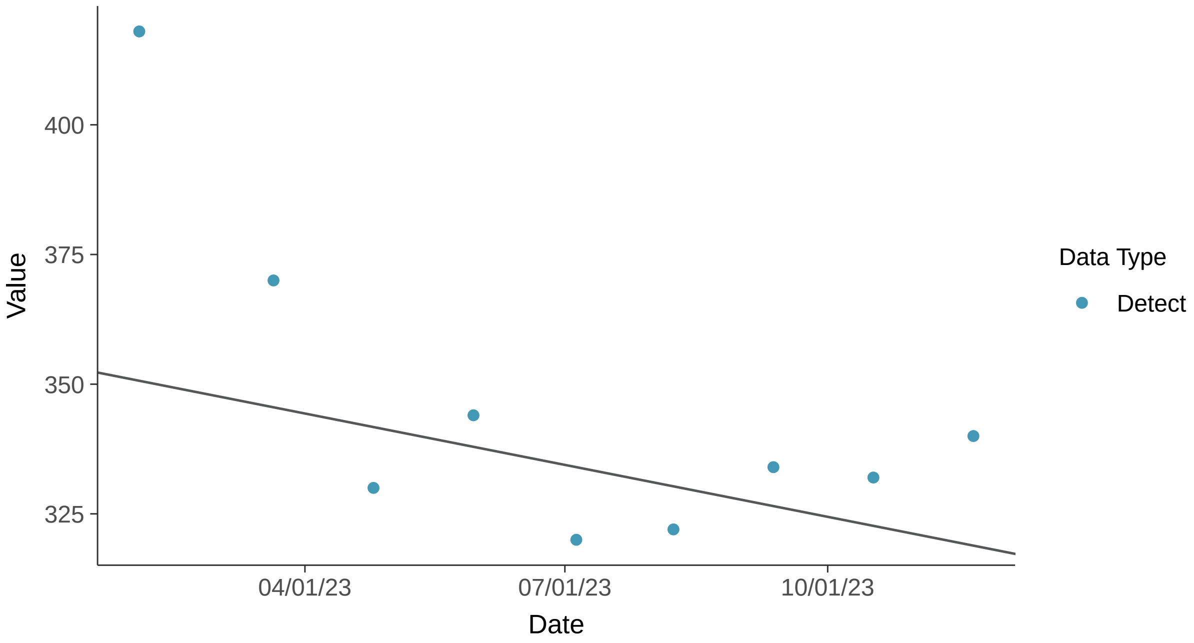
Normal Q-Q plot

Total Dissolved Solids, MW-16C (mg/L)



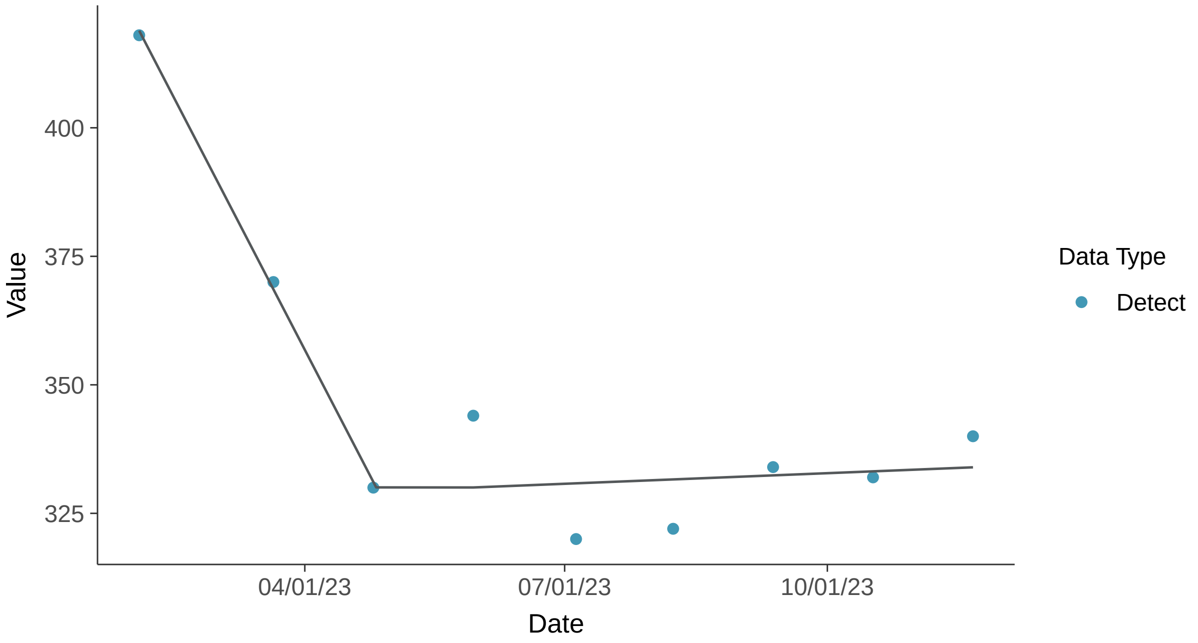
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Total Dissolved Solids, MW-16C (mg/L)



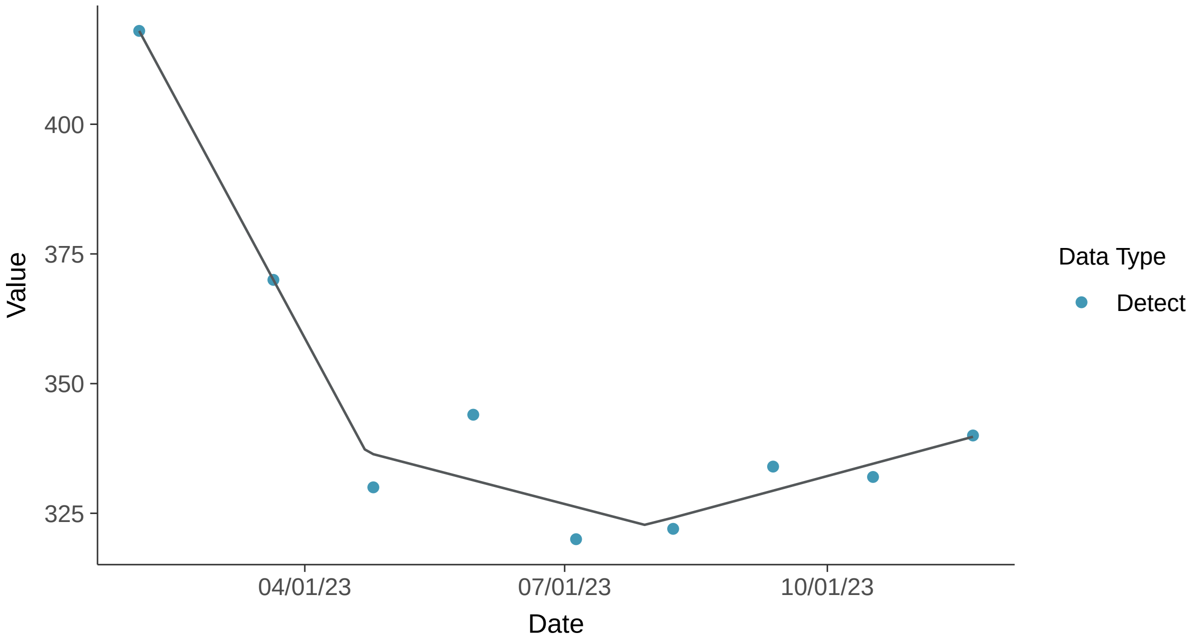
Trend Regression: Piecewise Linear-Linear

Total Dissolved Solids, MW-16C (mg/L)



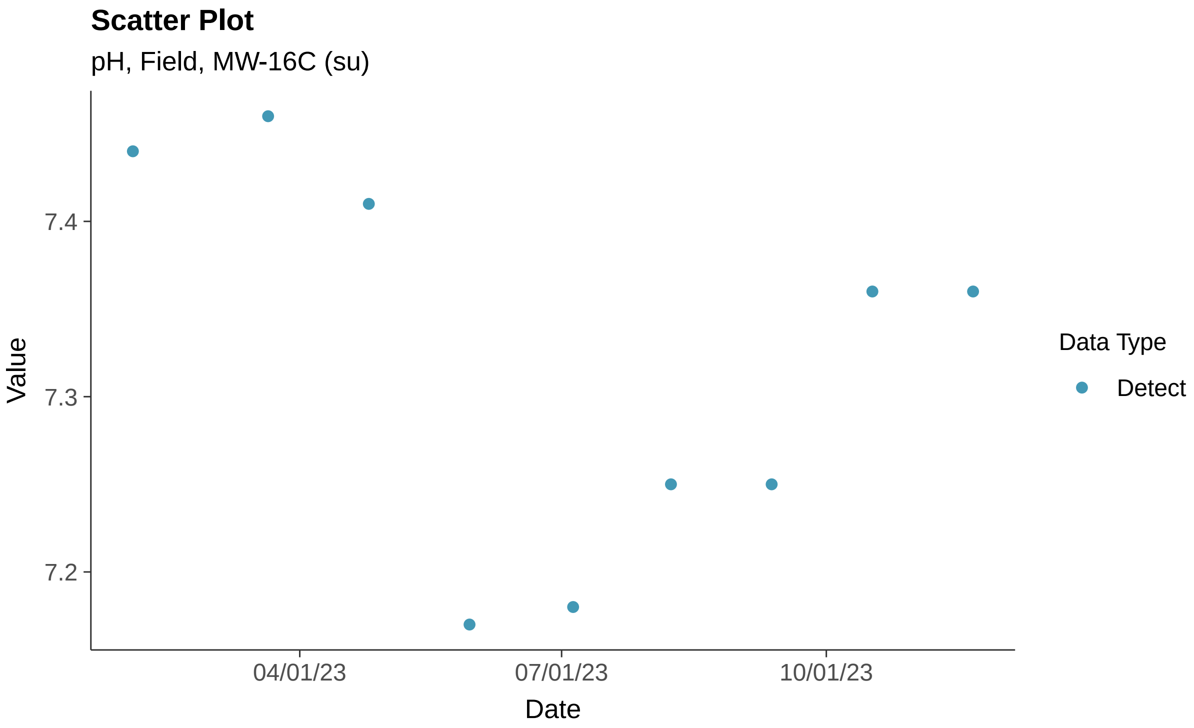
Trend Regression: Piecewise Linear-Linear-Linear

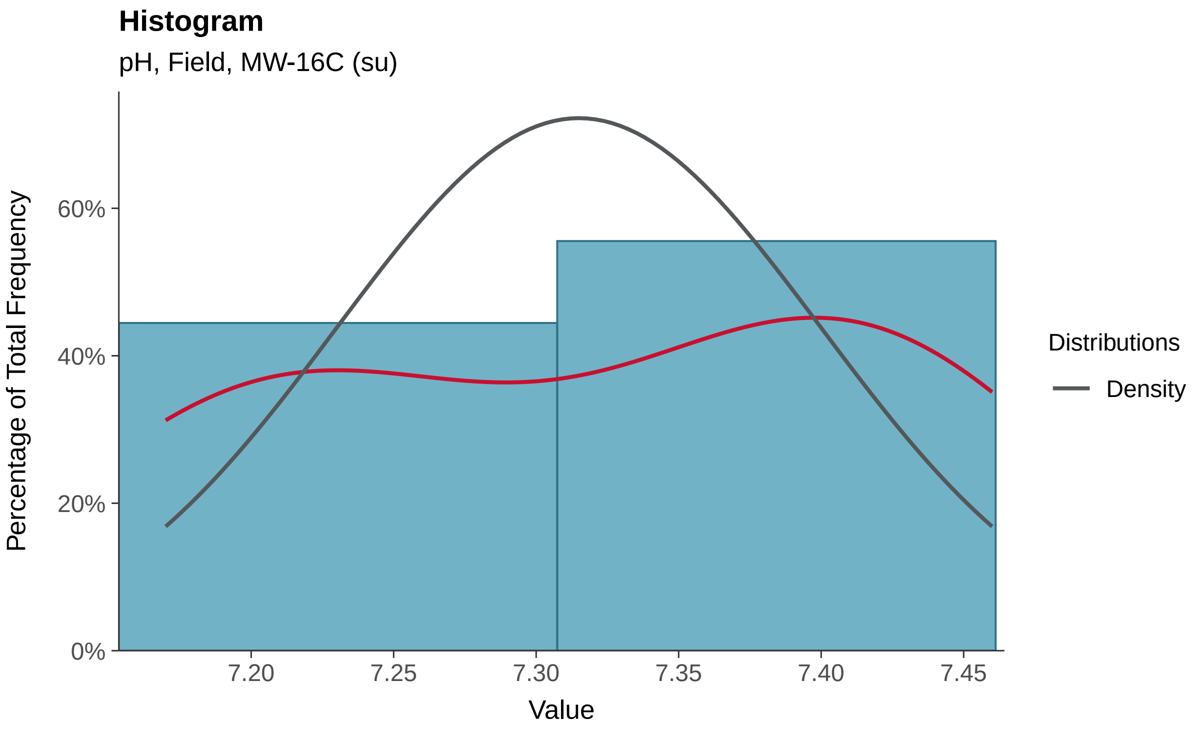
Total Dissolved Solids, MW-16C (mg/L)



Appendix III: pH, Field, MW-16C

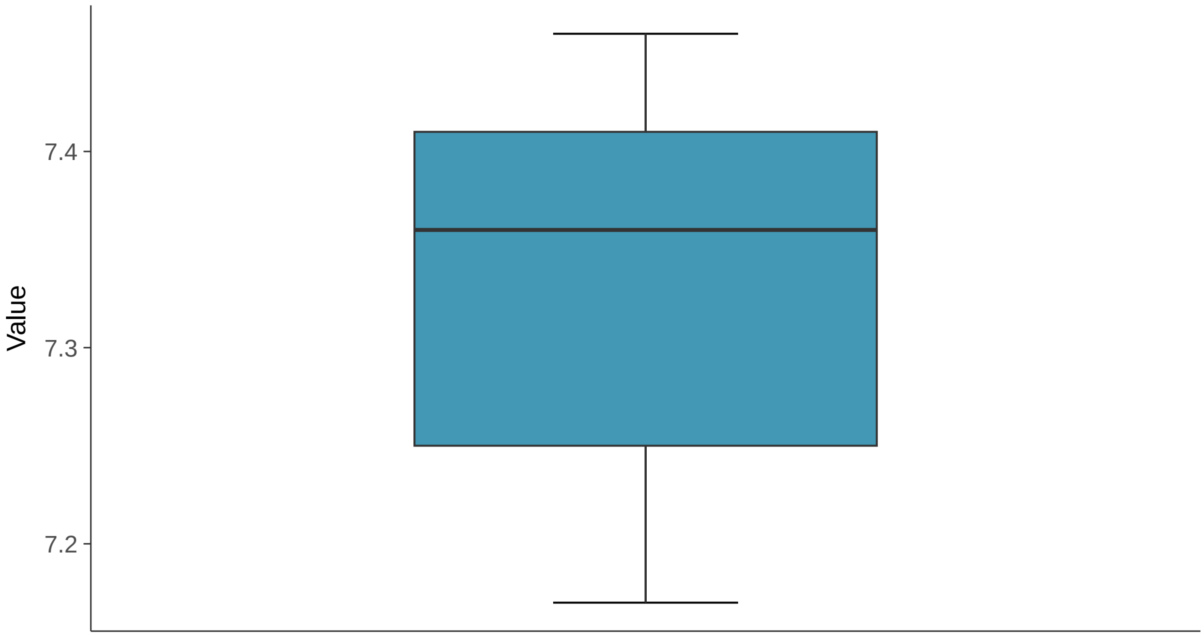
ID: 16C_1_07





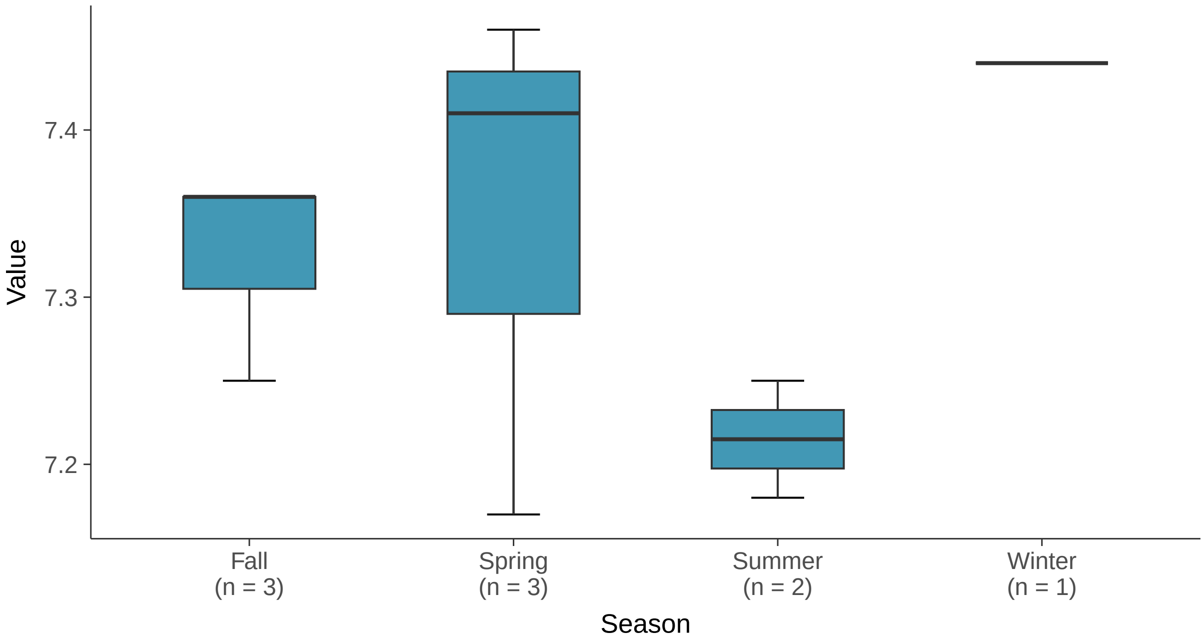
Boxplot

pH, Field, MW-16C (su)



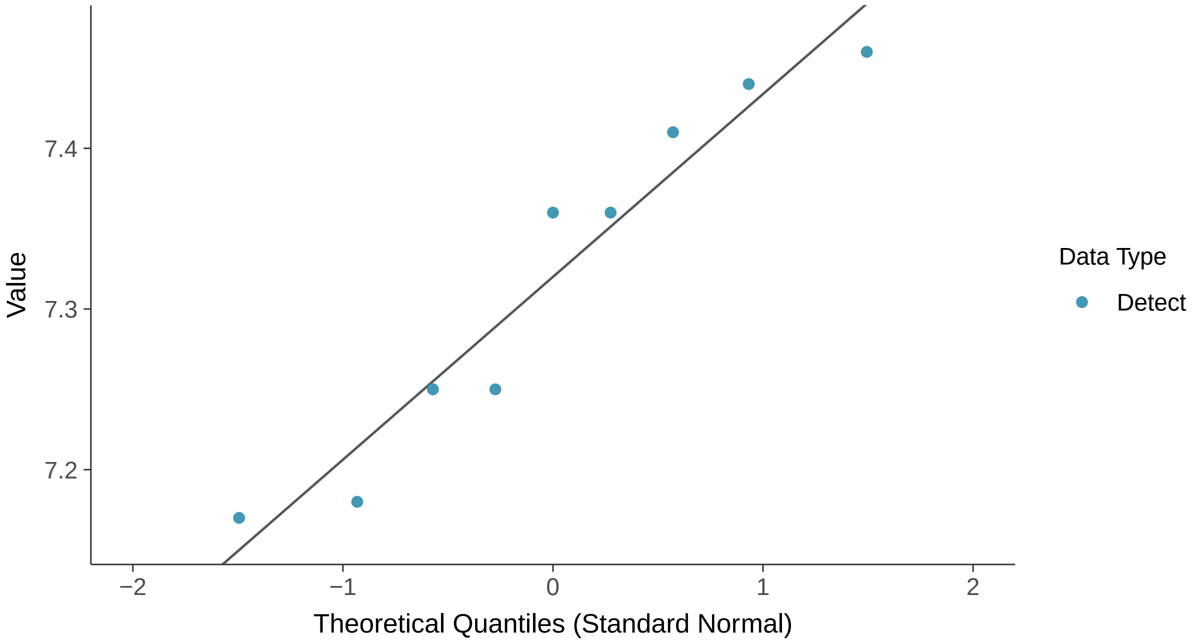
Boxplot by Season

pH, Field, MW-16C (su)



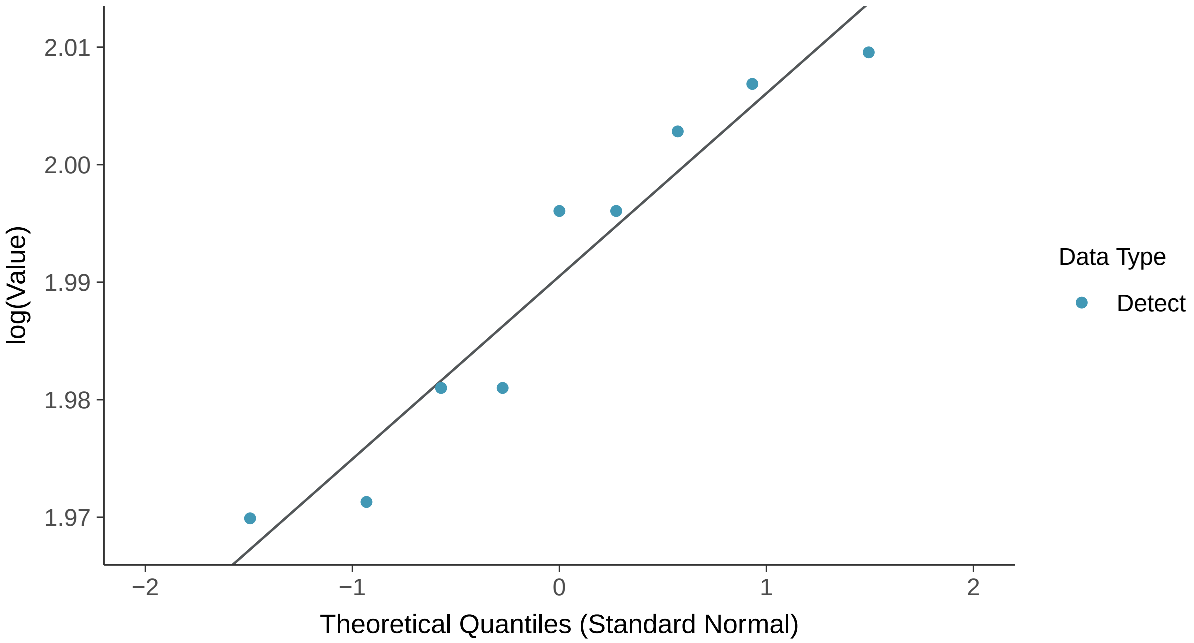
Normal Q-Q plot

pH, Field, MW-16C (su)



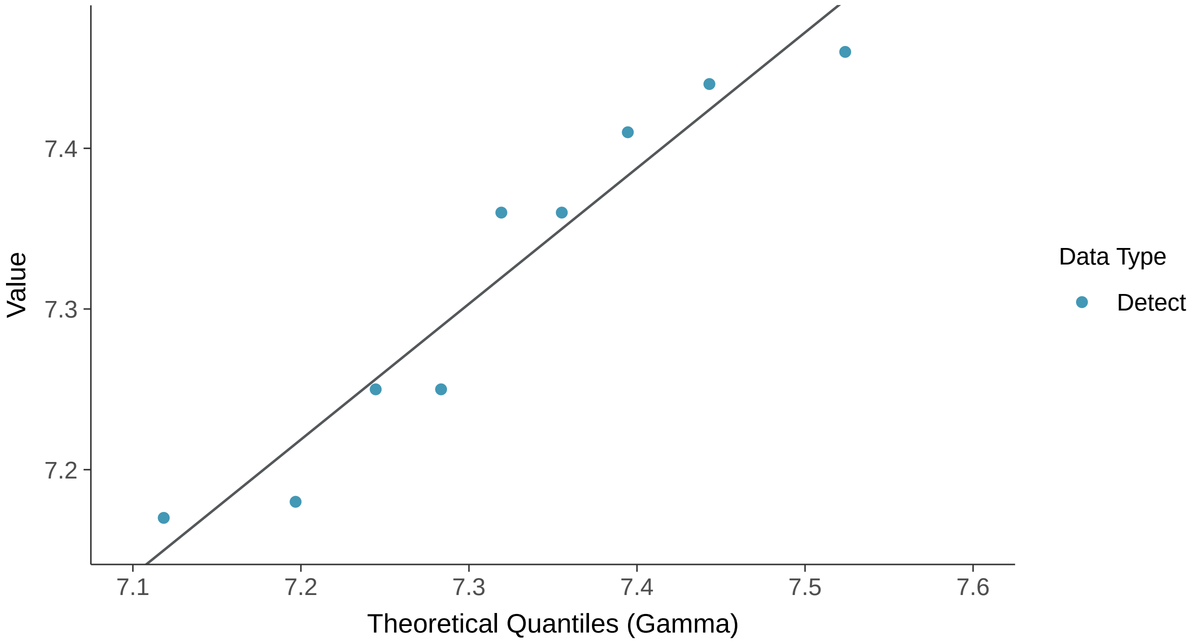
Lognormal Q-Q plot

pH, Field, MW-16C (su)



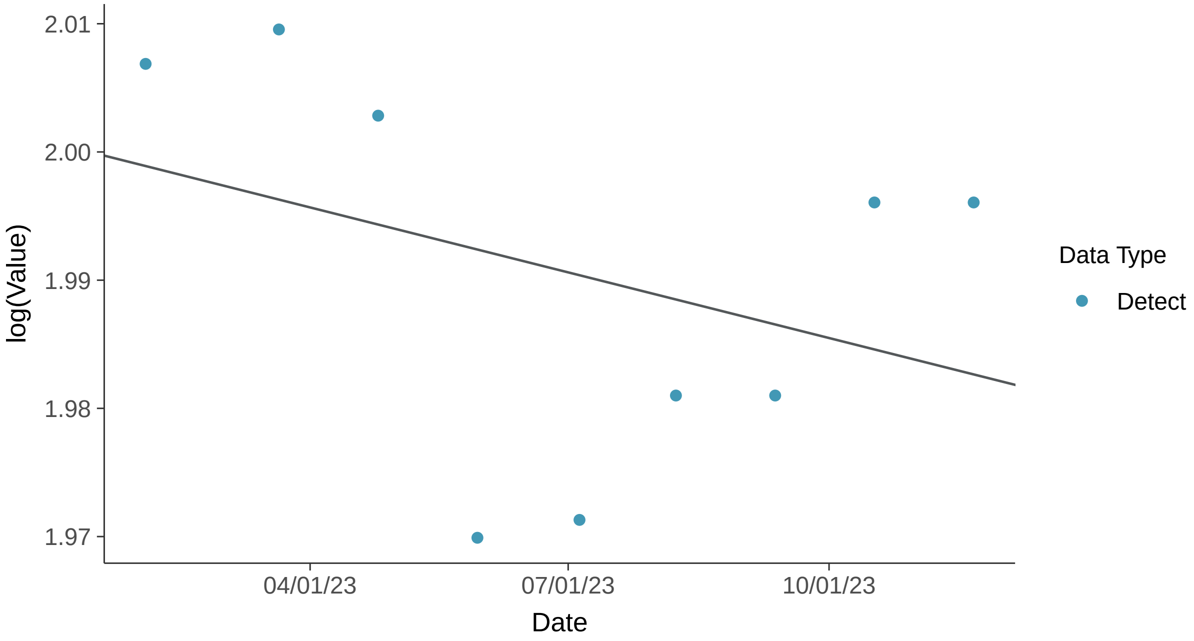
Gamma Q-Q plot

pH, Field, MW-16C (su)



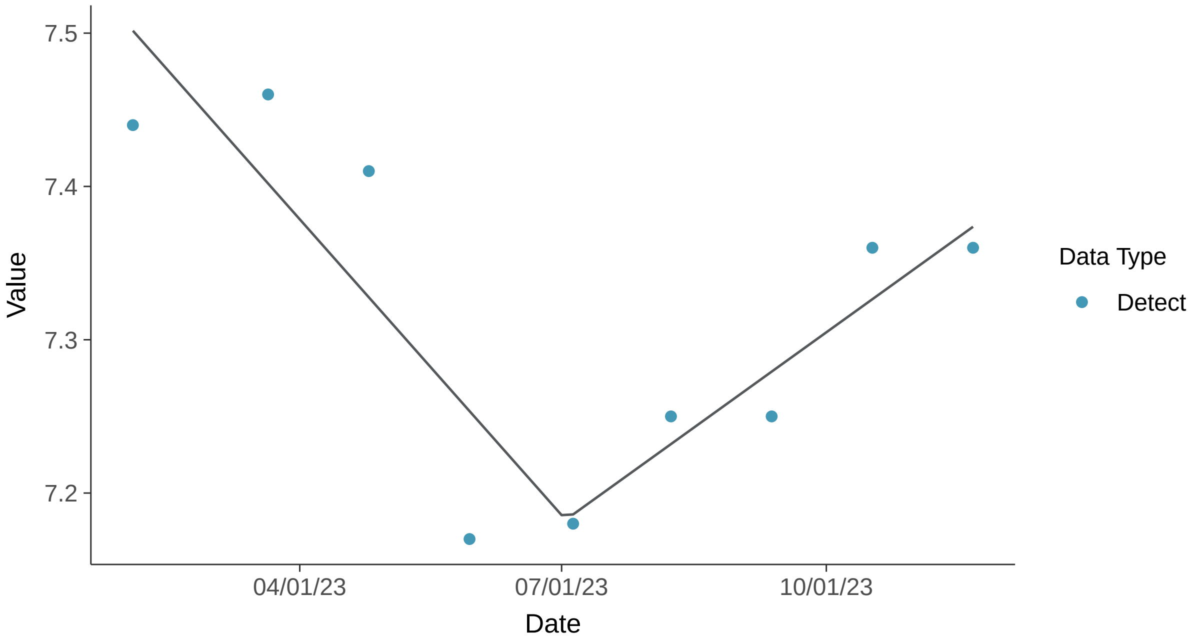
Trend Regression: Lognormal MLE

pH, Field, MW-16C (su)



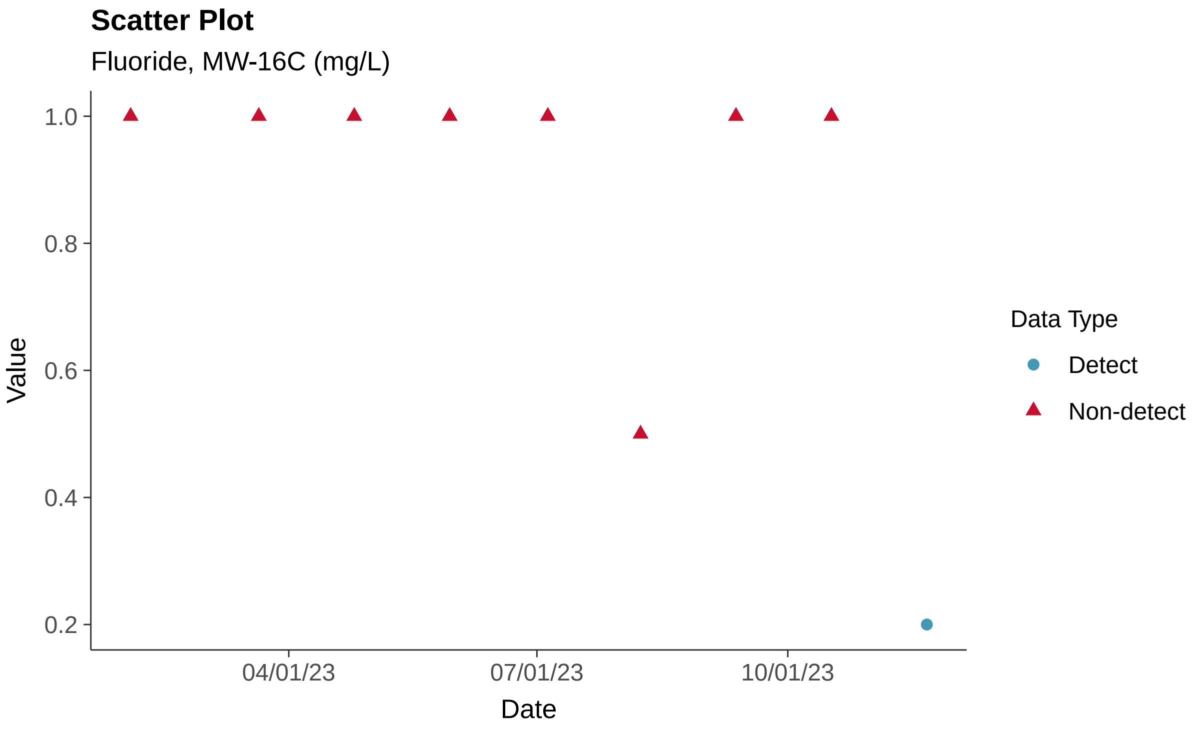
Trend Regression: Piecewise Linear-Linear

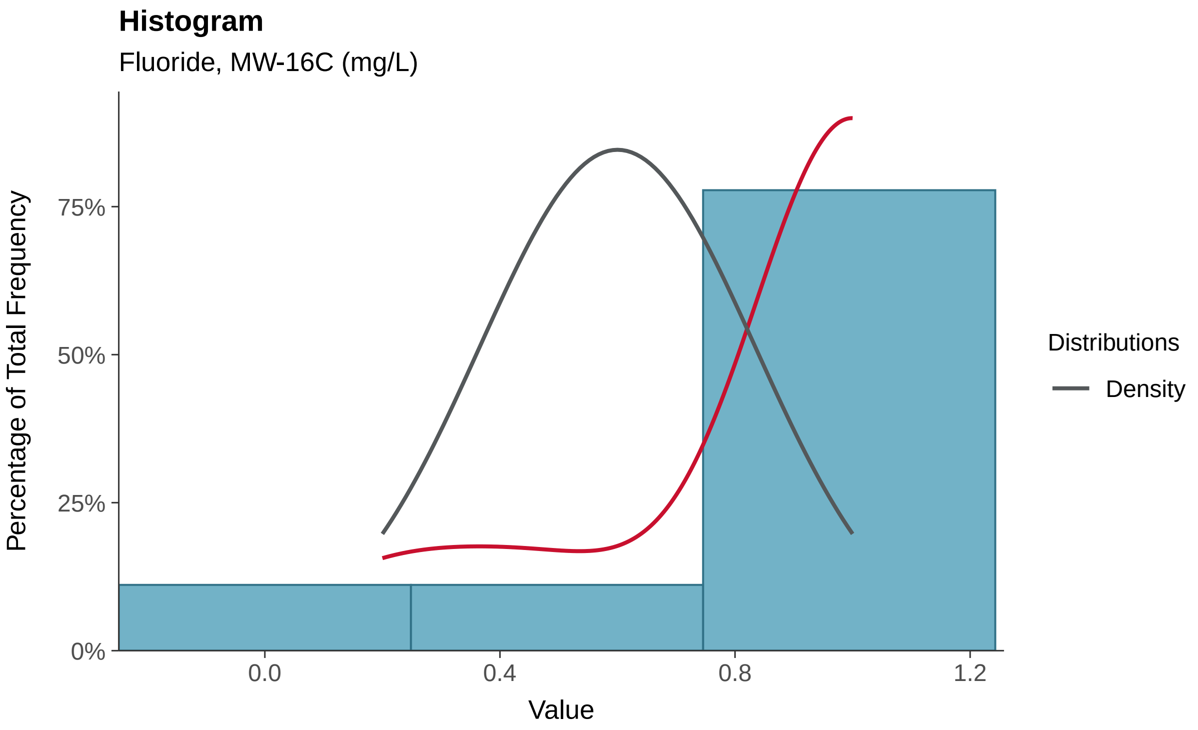
pH, Field, MW-16C (su)



Appendix IV: Fluoride, MW-16C

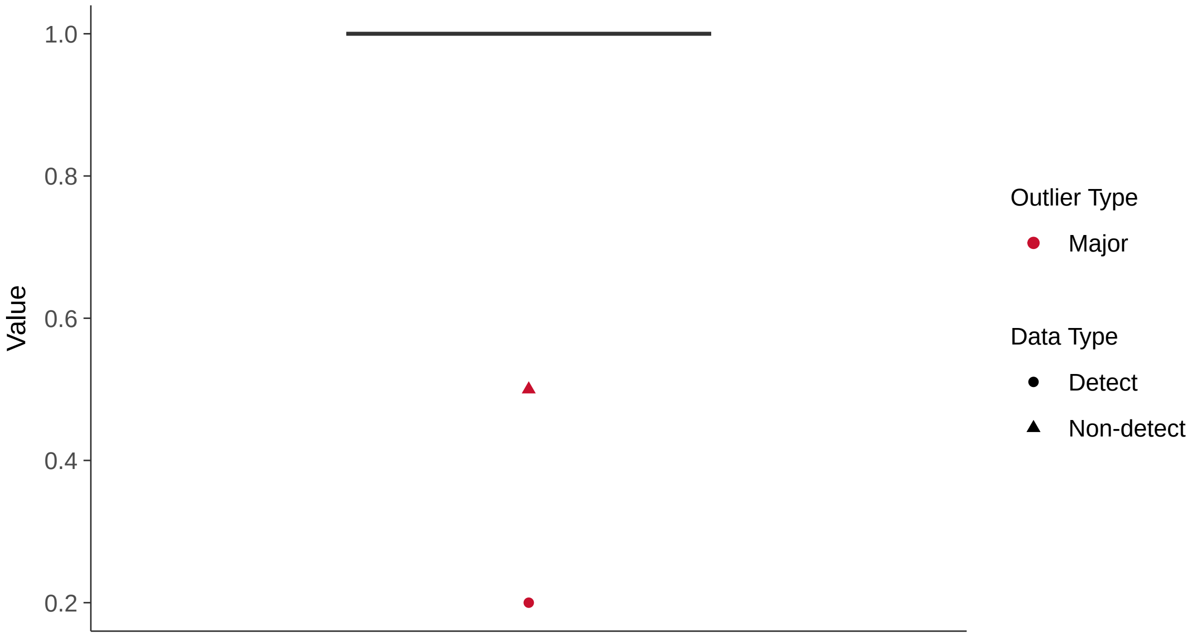
ID: 16C_2_04





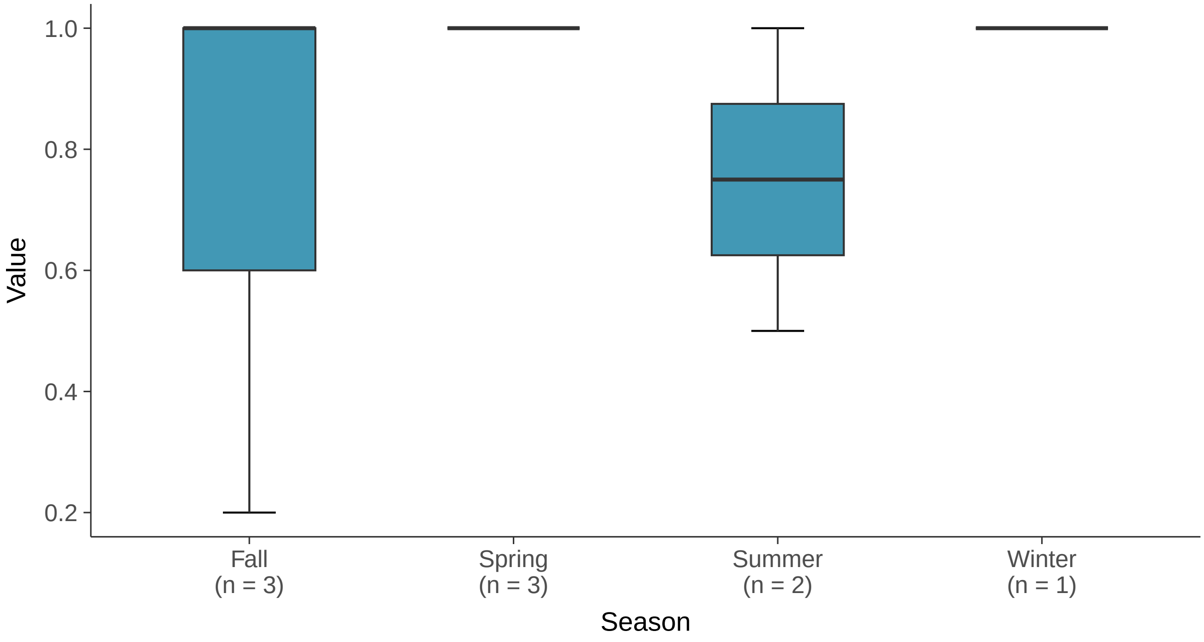
Boxplot

Fluoride, MW-16C (mg/L)



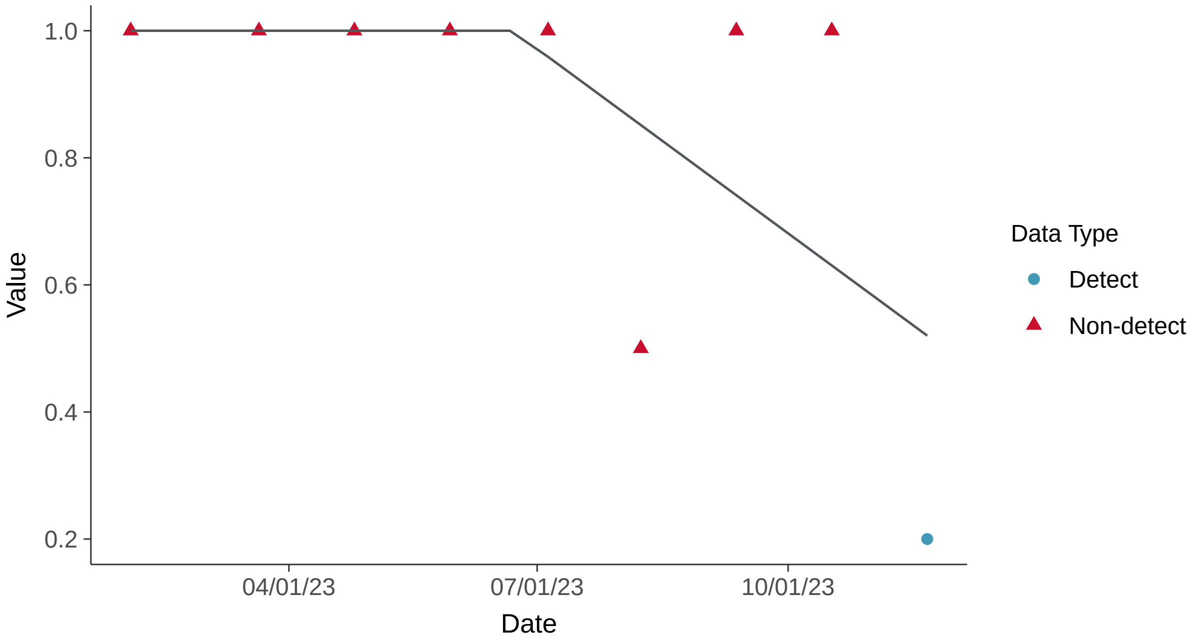
Boxplot by Season

Fluoride, MW-16C (mg/L)



Trend Regression: Piecewise Linear-Linear

Fluoride, MW-16C (mg/L)

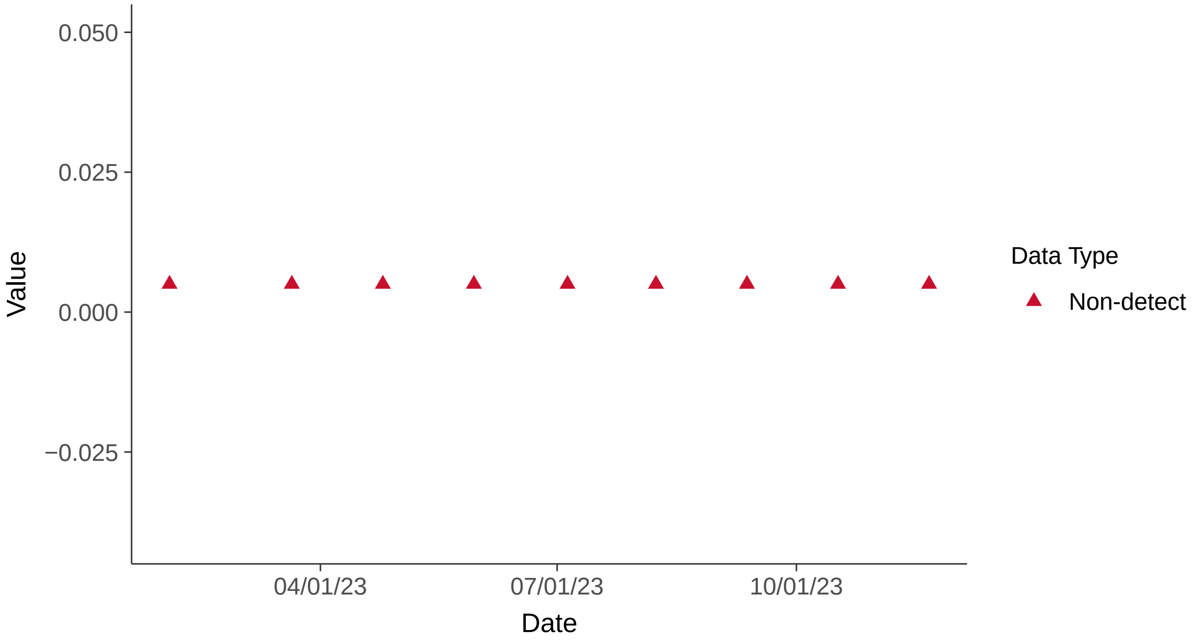


Appendix IV: Antimony, MW-16C

ID: 16C_2_08

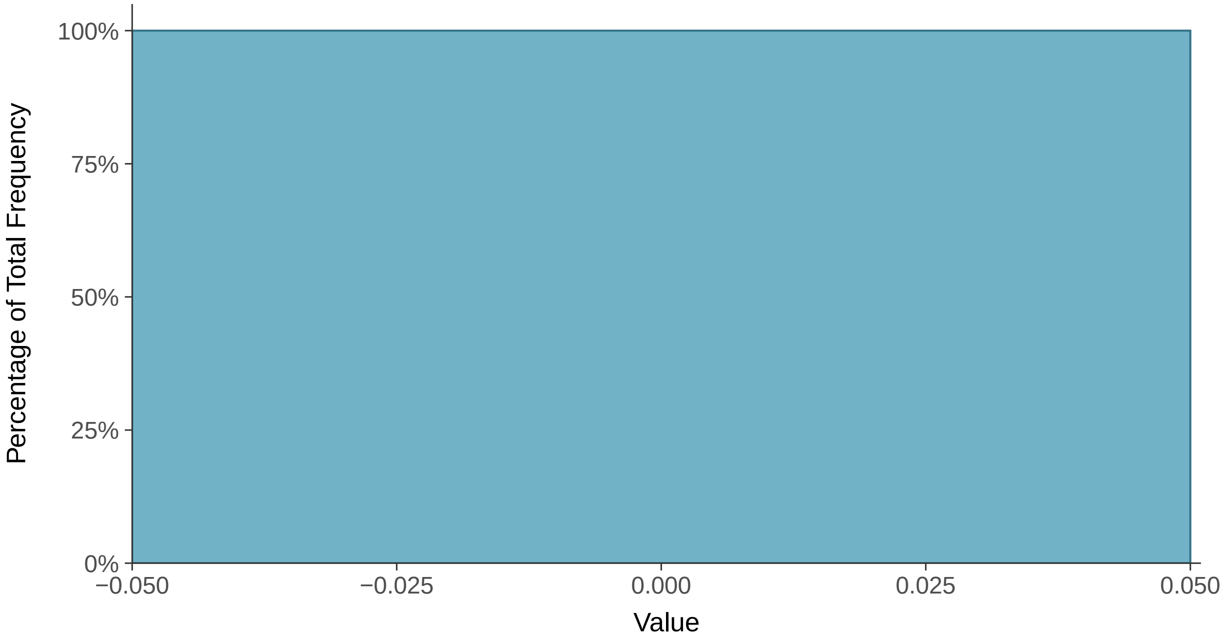
Scatter Plot

Antimony, MW-16C (mg/L)



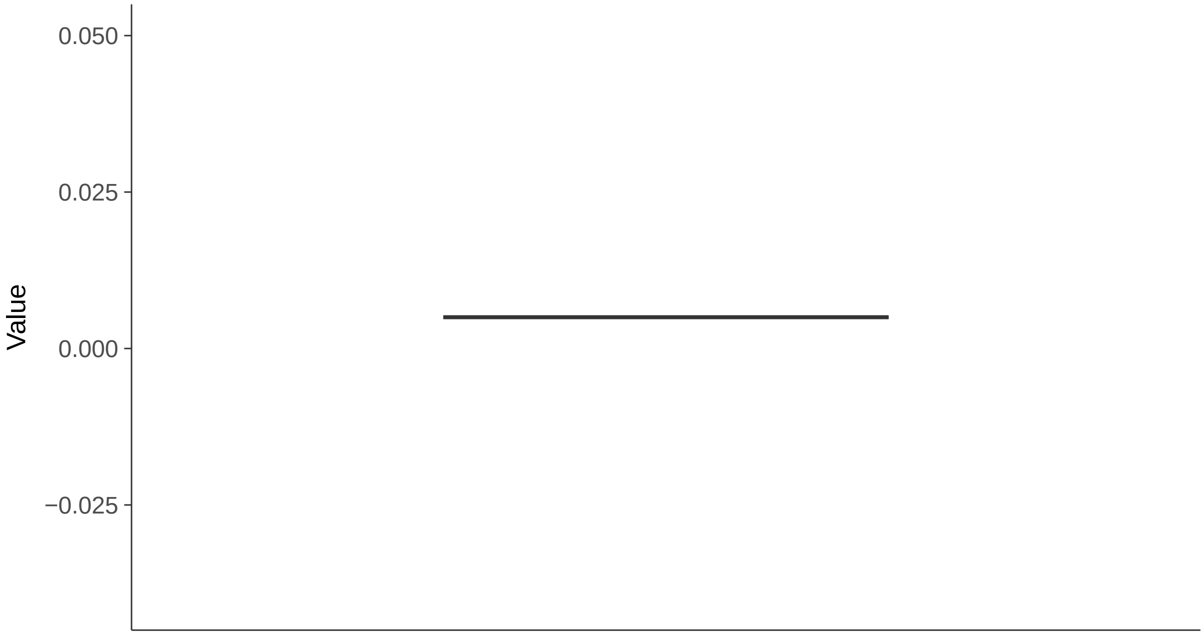
Histogram

Antimony, MW-16C (mg/L)



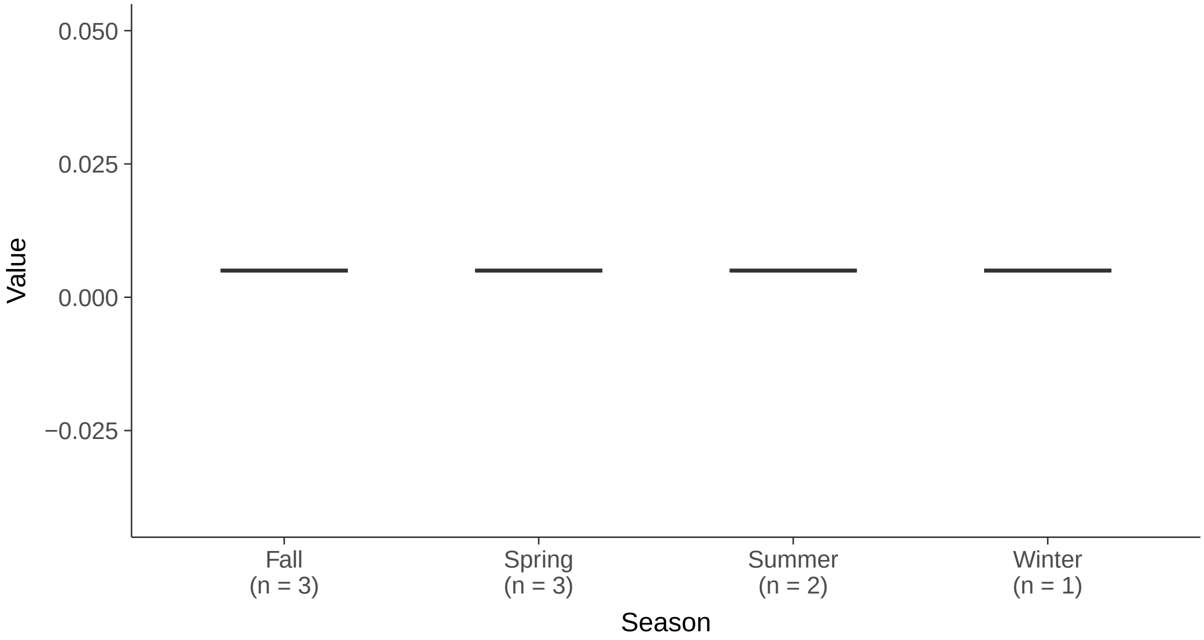
Boxplot

Antimony, MW-16C (mg/L)



Boxplot by Season

Antimony, MW-16C (mg/L)

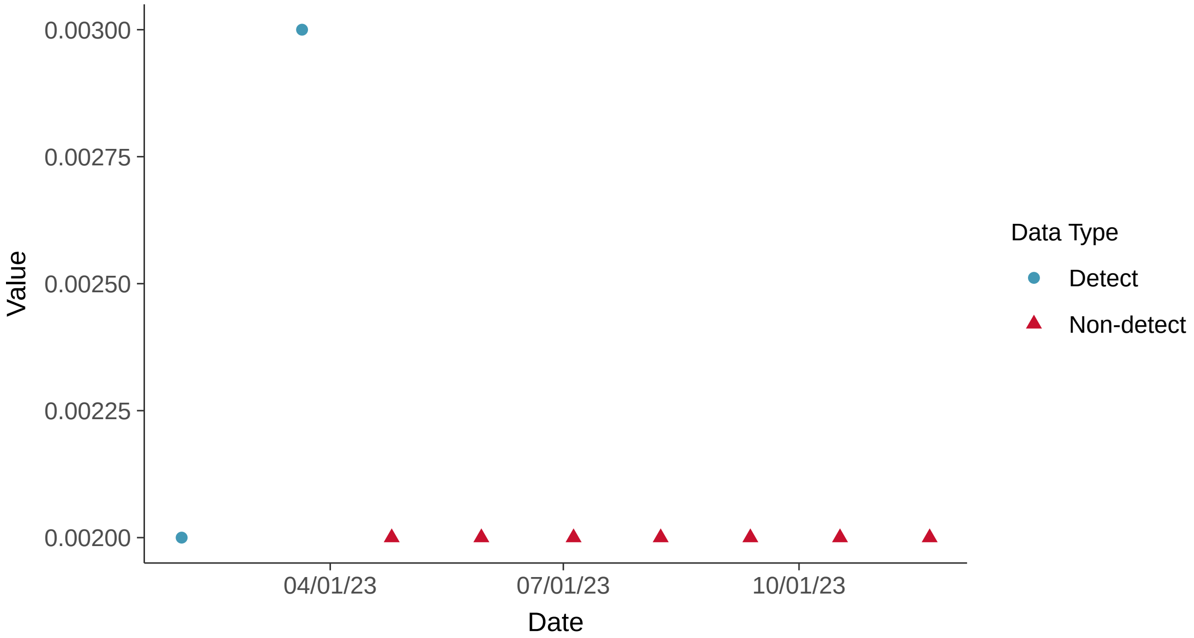


Appendix IV: Arsenic, MW-16C

ID: 16C_2_09

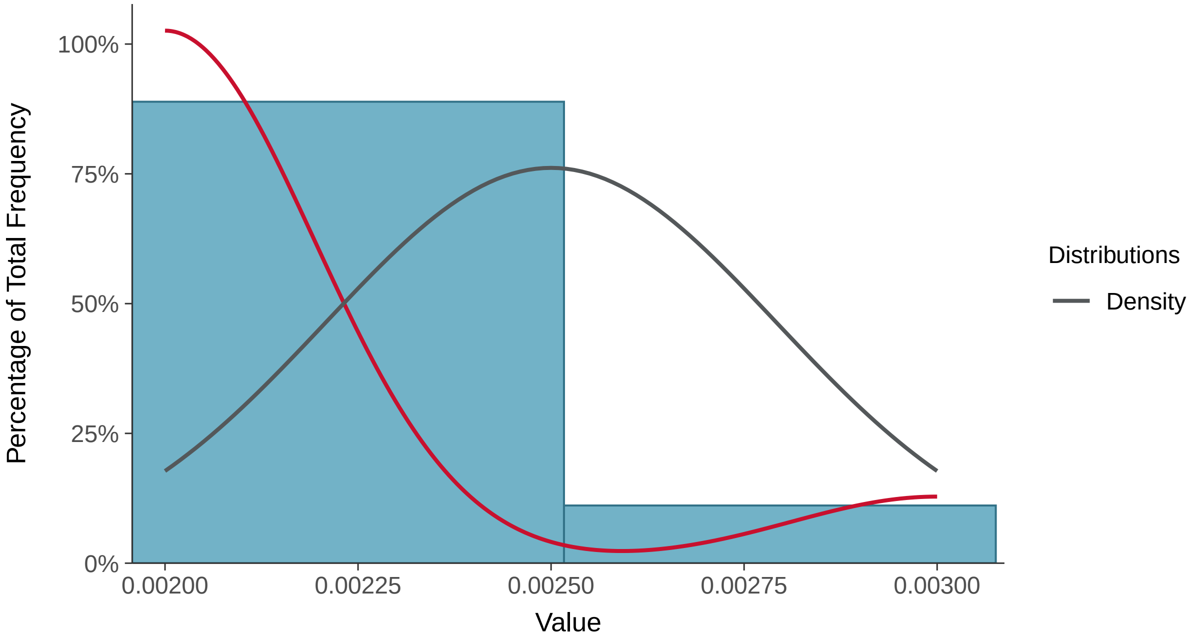
Scatter Plot

Arsenic, MW-16C (mg/L)



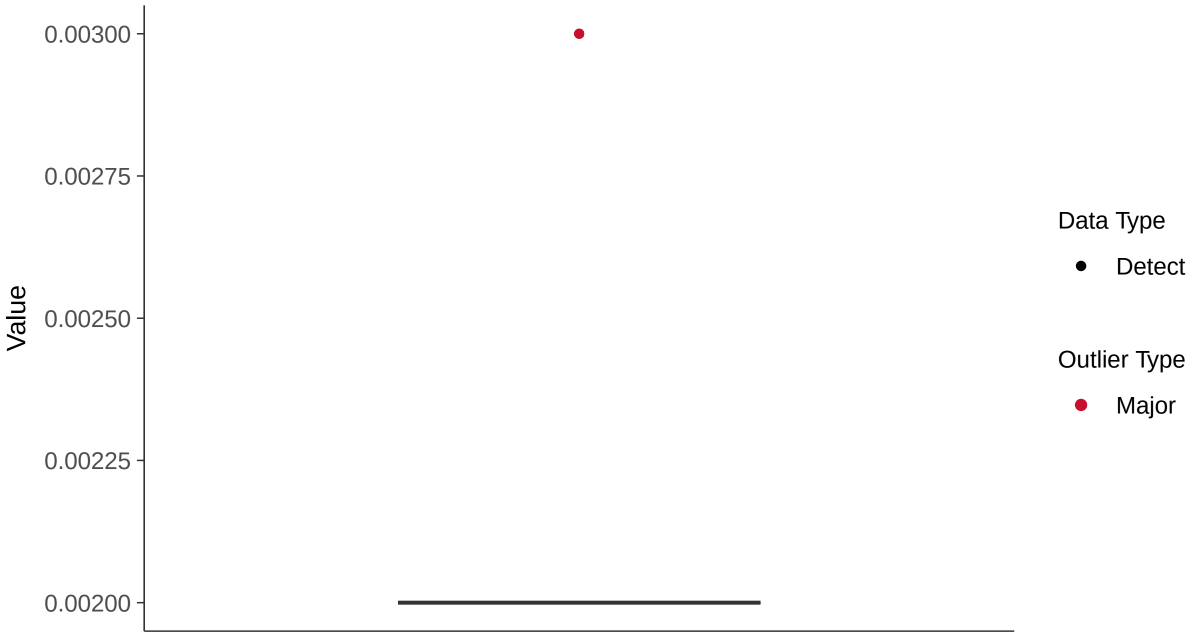
Histogram

Arsenic, MW-16C (mg/L)



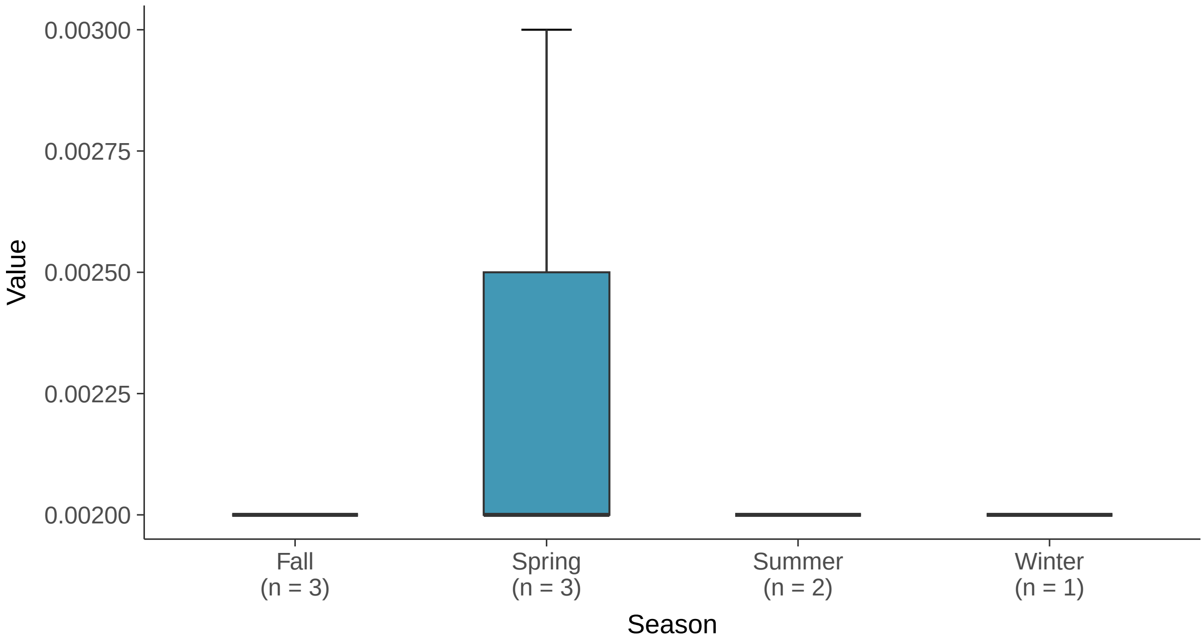
Boxplot

Arsenic, MW-16C (mg/L)



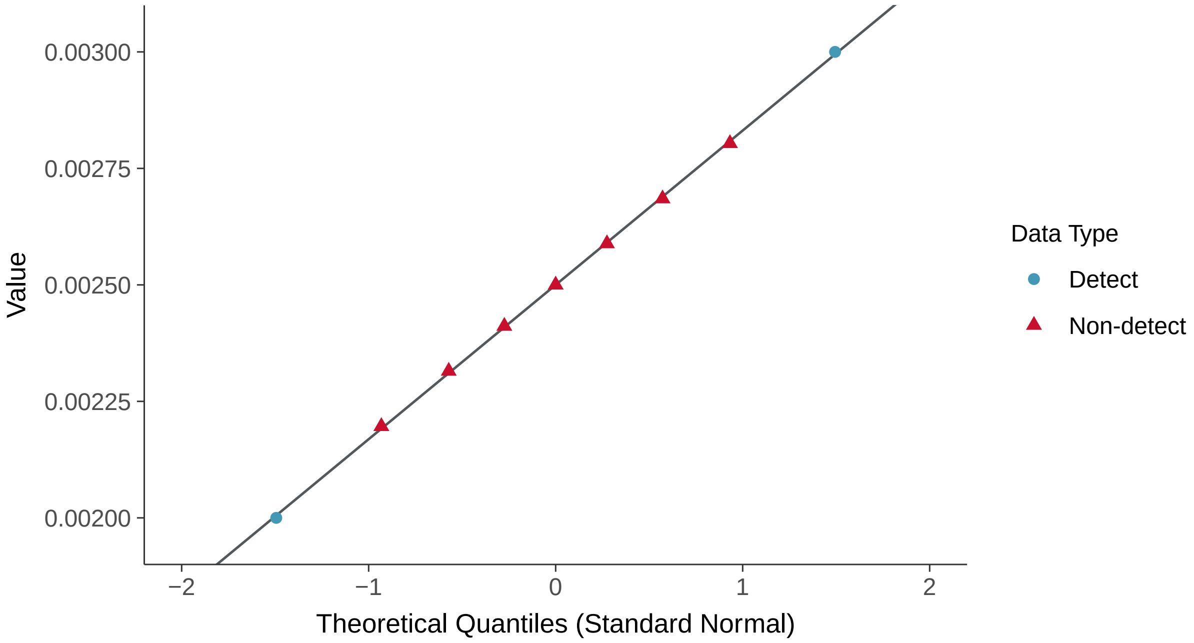
Boxplot by Season

Arsenic, MW-16C (mg/L)



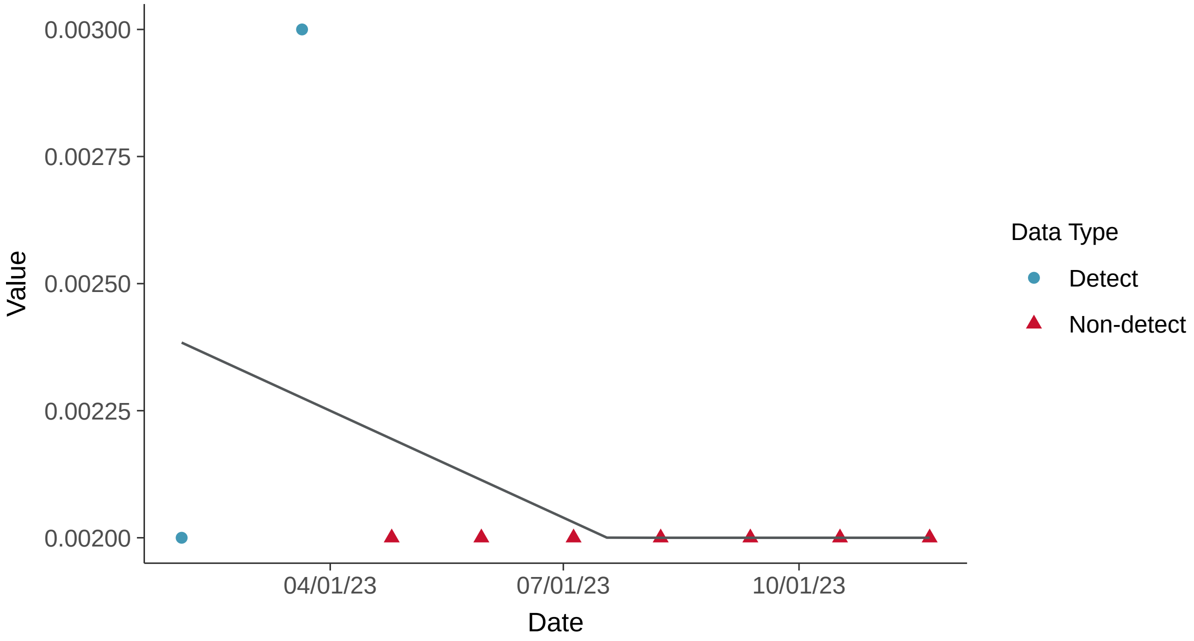
Normal Q-Q plot using ROS Imputed Estimates

Arsenic, MW-16C (mg/L)



Trend Regression: Piecewise Linear-Linear

Arsenic, MW-16C (mg/L)

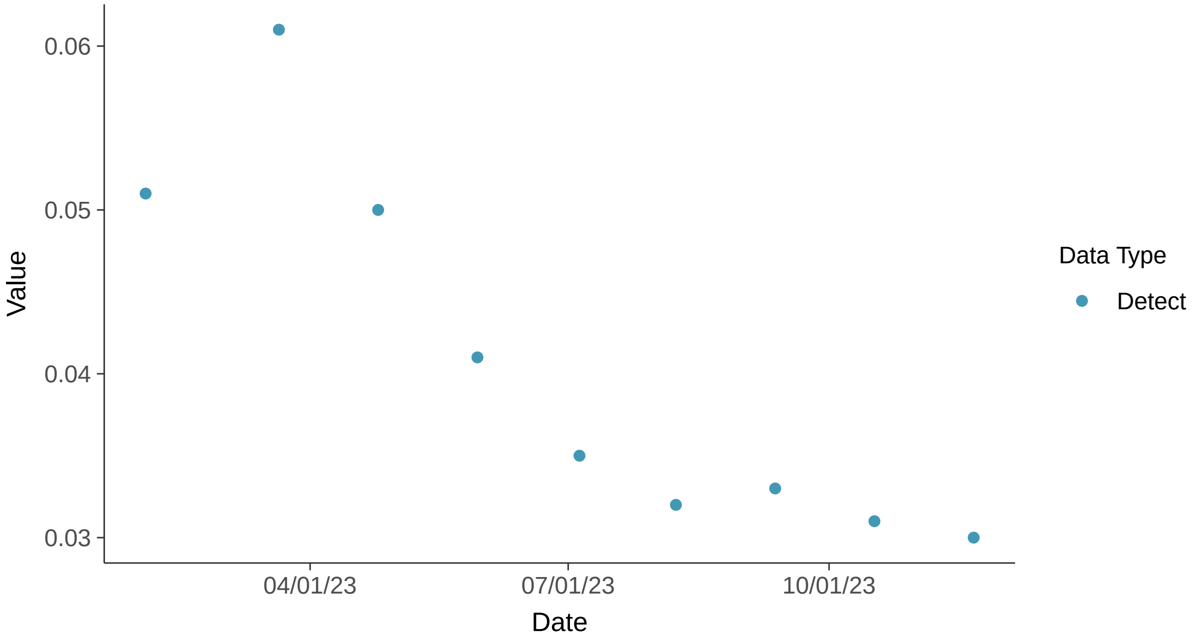


Appendix IV: Barium, MW-16C

ID: 16C_2_10

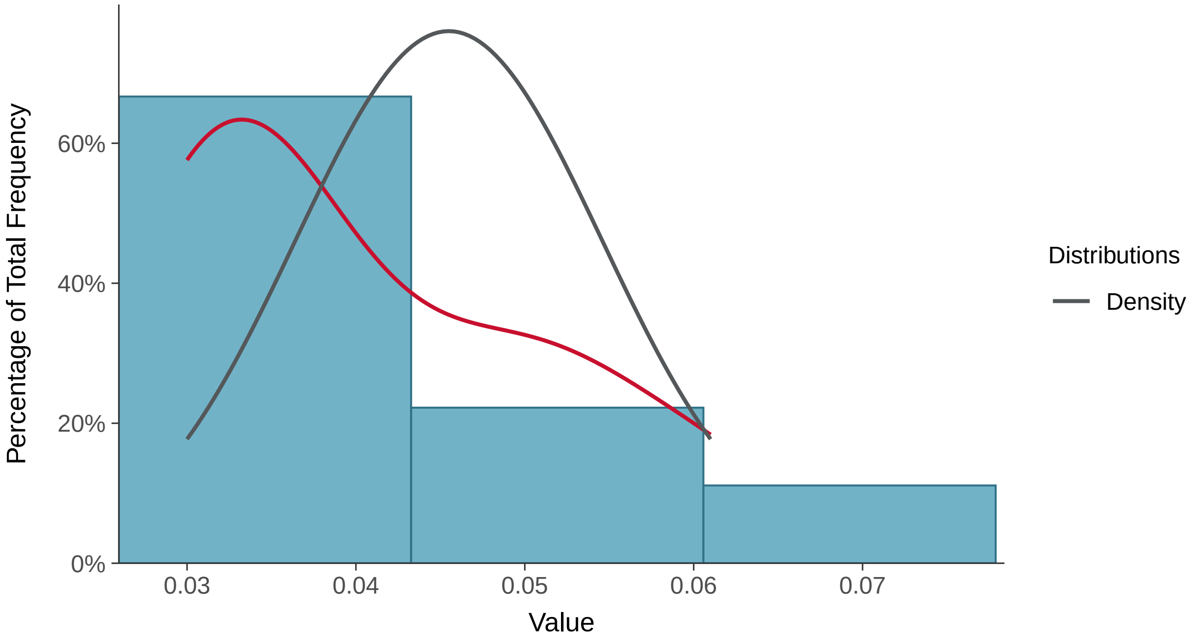
Scatter Plot

Barium, MW-16C (mg/L)



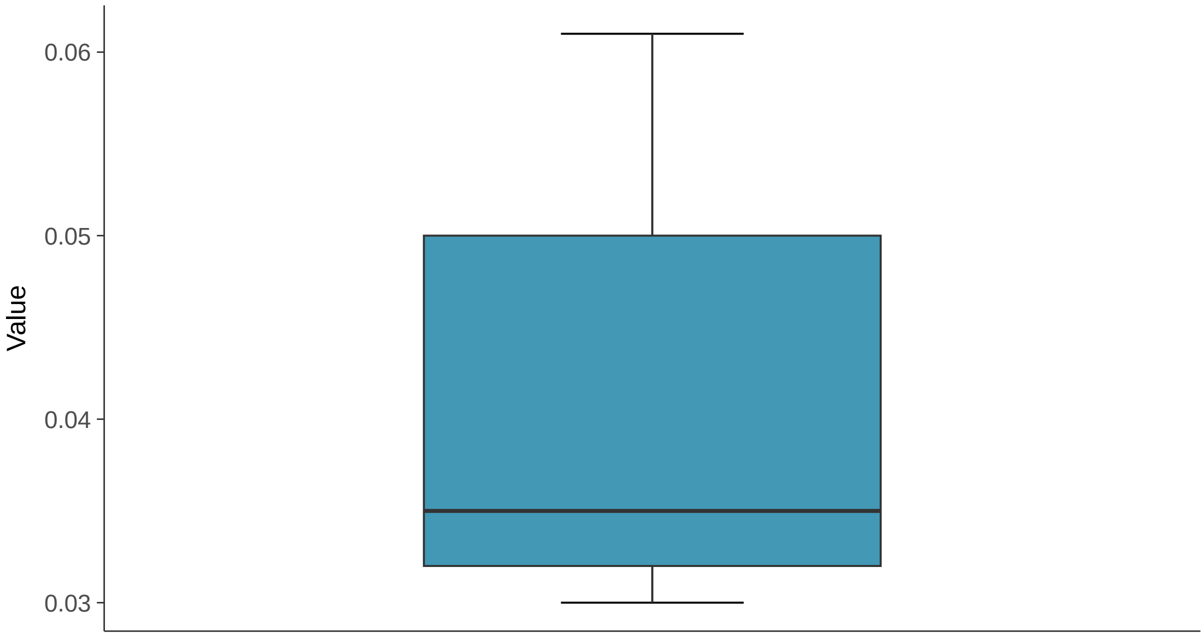
Histogram

Barium, MW-16C (mg/L)



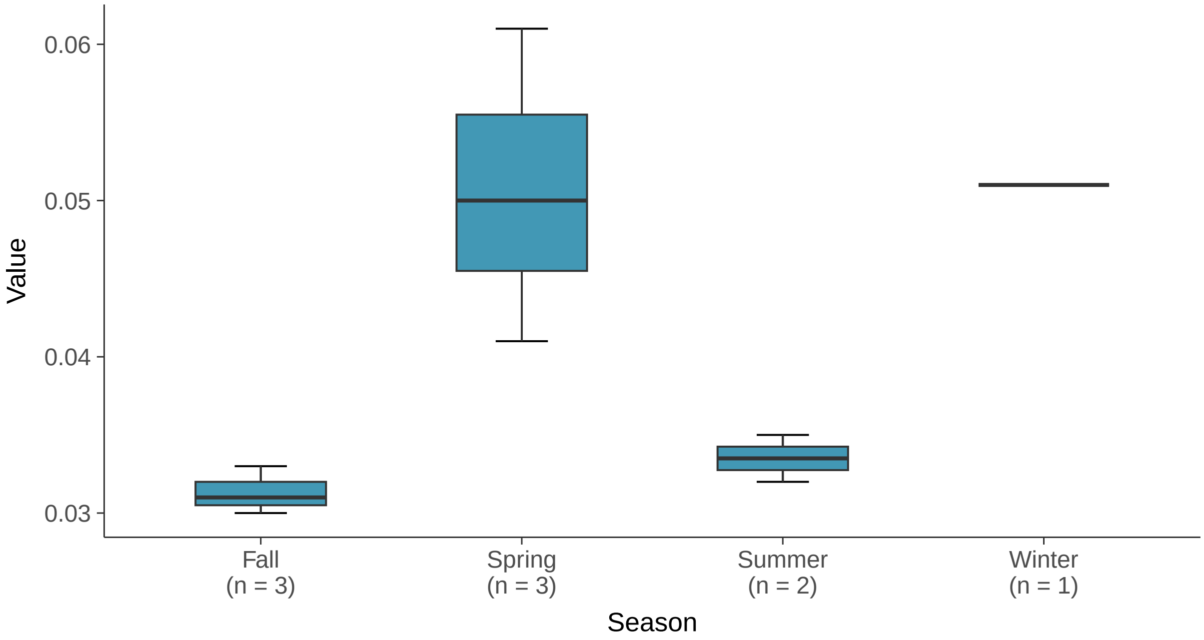
Boxplot

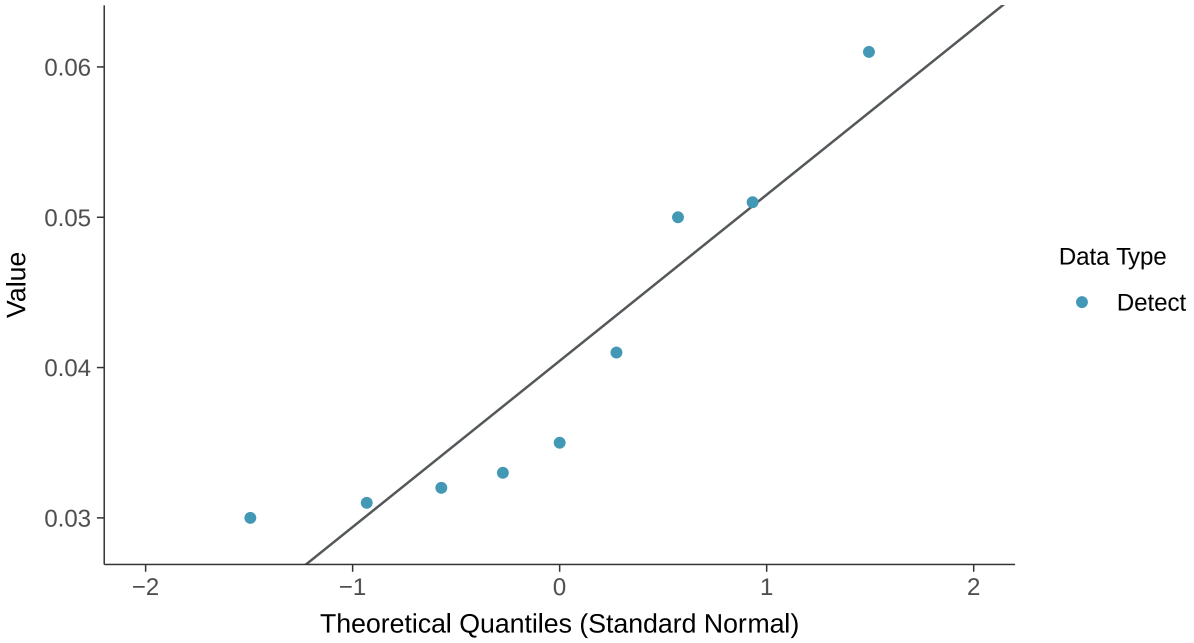
Barium, MW-16C (mg/L)



Boxplot by Season

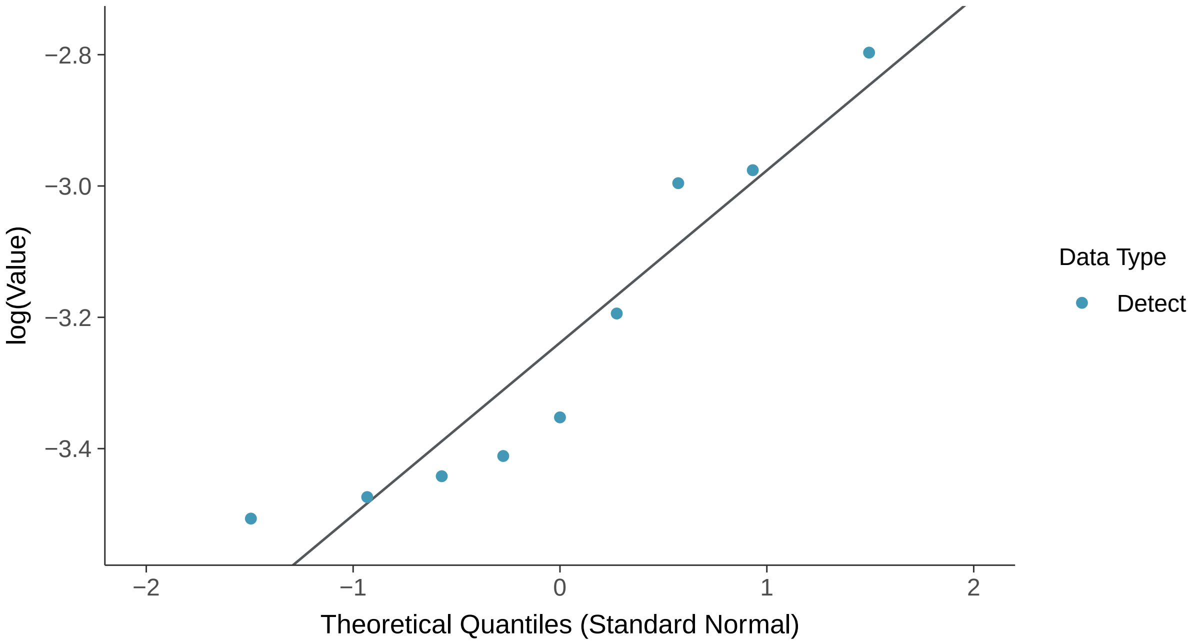
Barium, MW-16C (mg/L)





Normal Q-Q plot

Barium, MW-16C (mg/L)

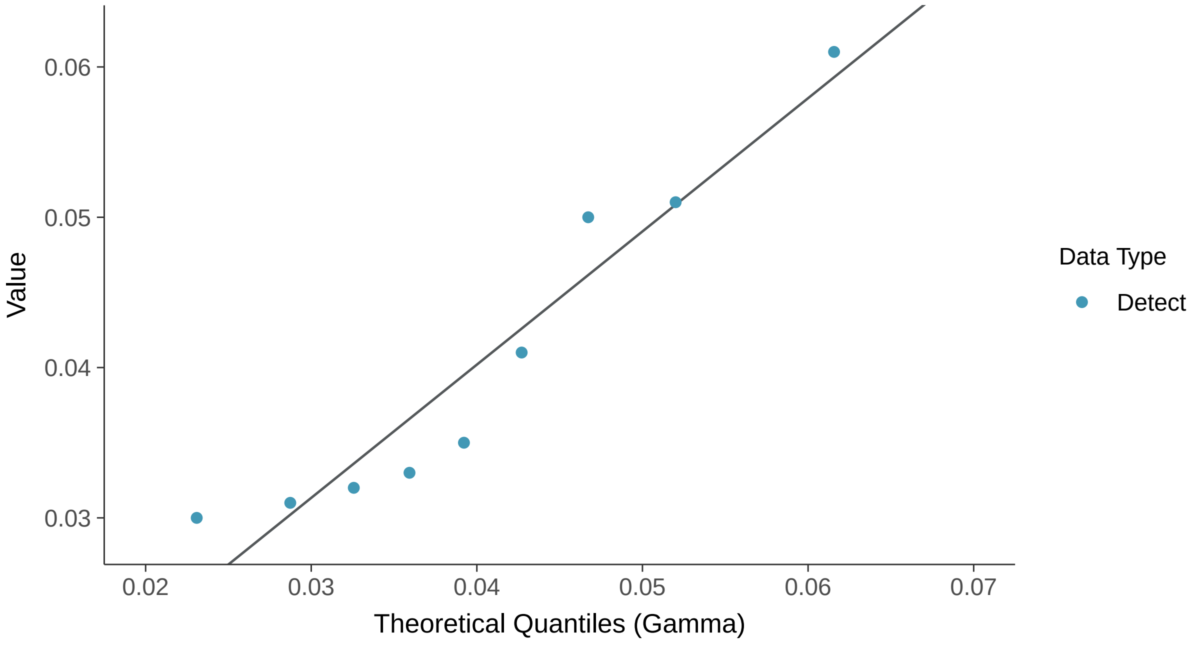


Lognormal Q-Q plot

Barium, MW-16C (mg/L)

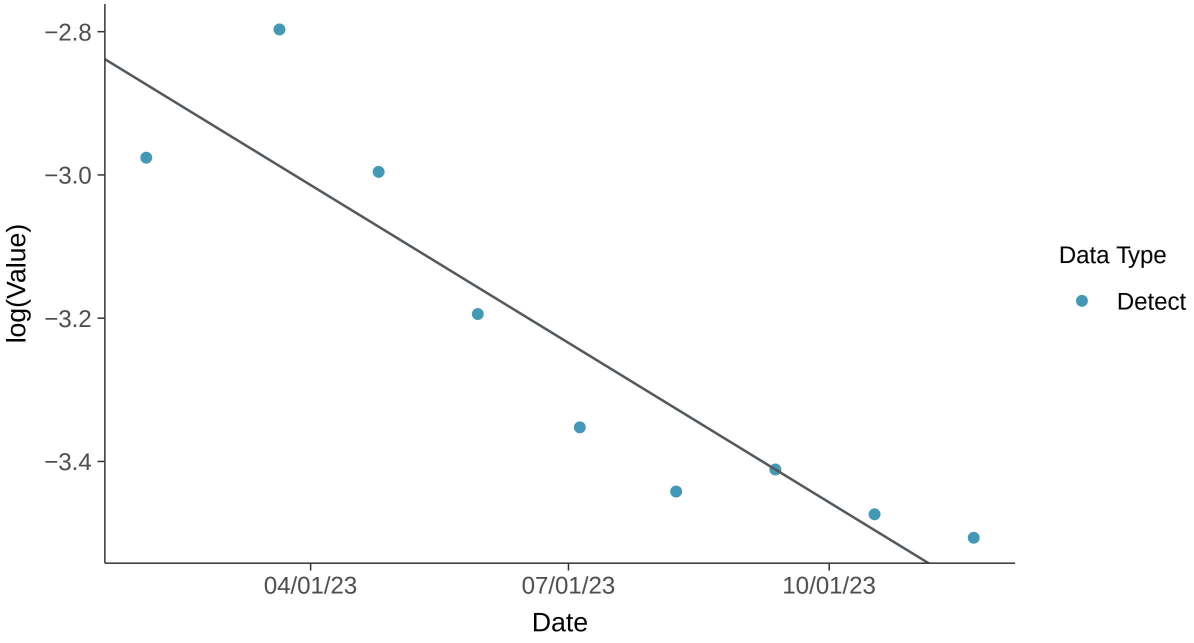
Gamma Q-Q plot

Barium, MW-16C (mg/L)



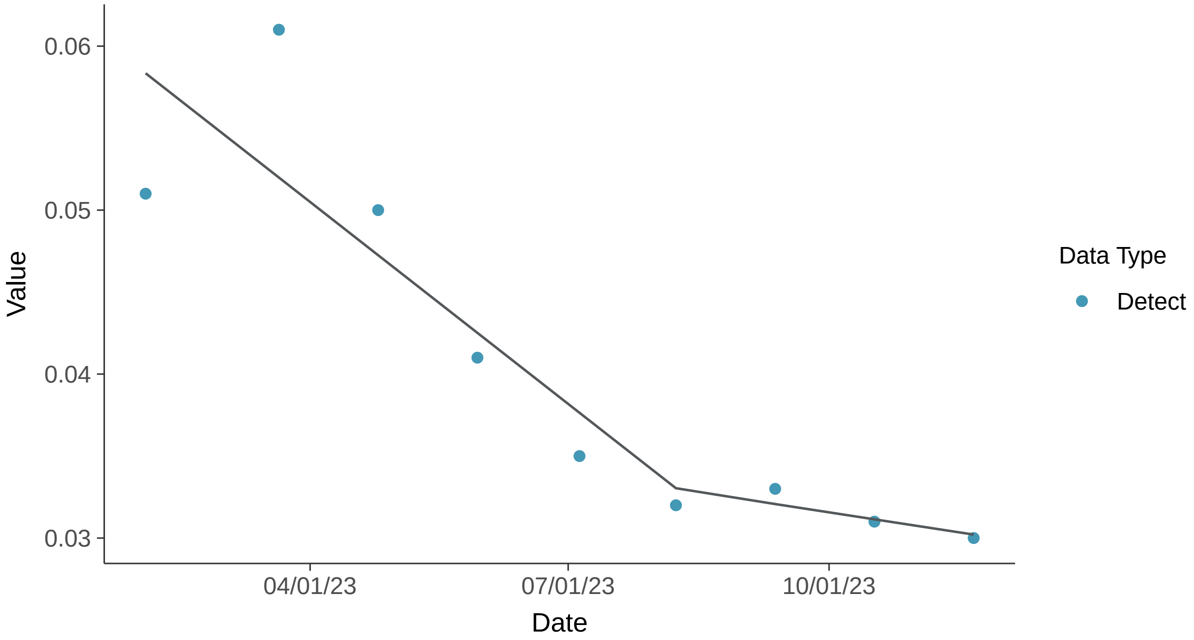
Trend Regression: Lognormal MLE

Barium, MW-16C (mg/L)



Trend Regression: Piecewise Linear-Linear

Barium, MW-16C (mg/L)

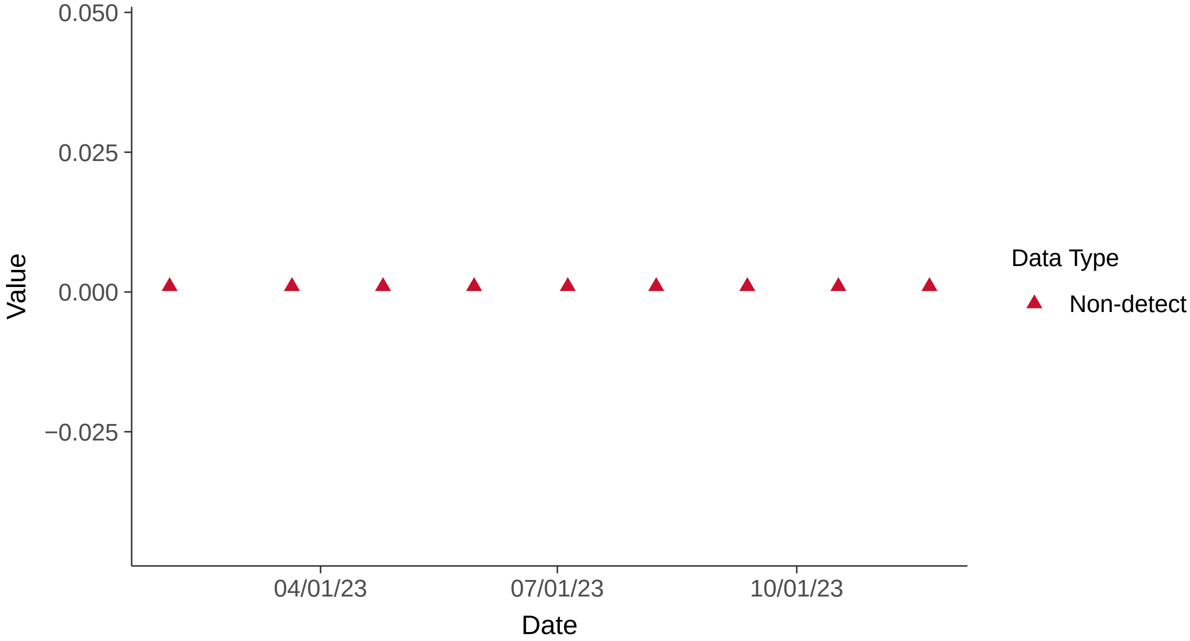


Appendix IV: Beryllium, MW-16C

ID: 16C_2_11

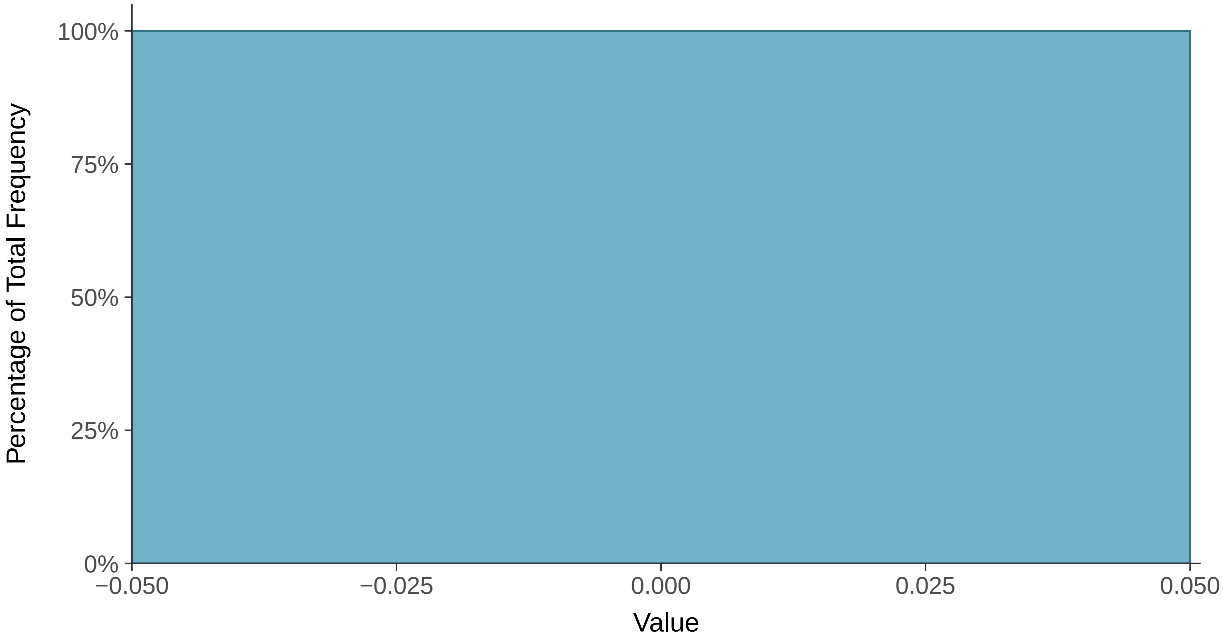
Scatter Plot

Beryllium, MW-16C (mg/L)



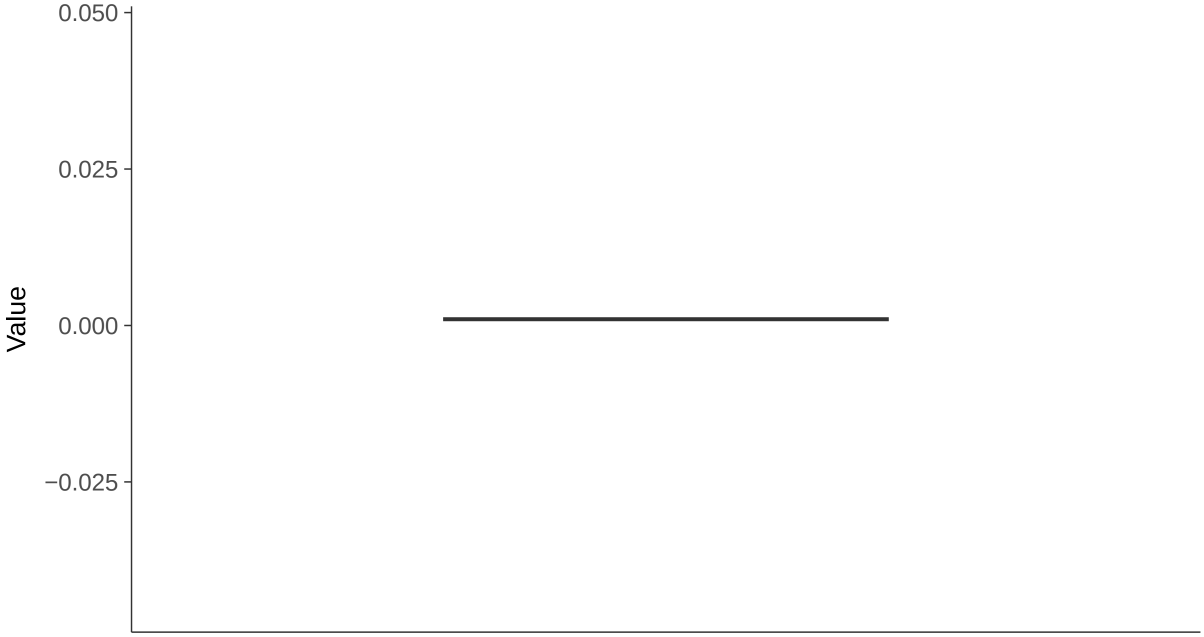
Histogram

Beryllium, MW-16C (mg/L)



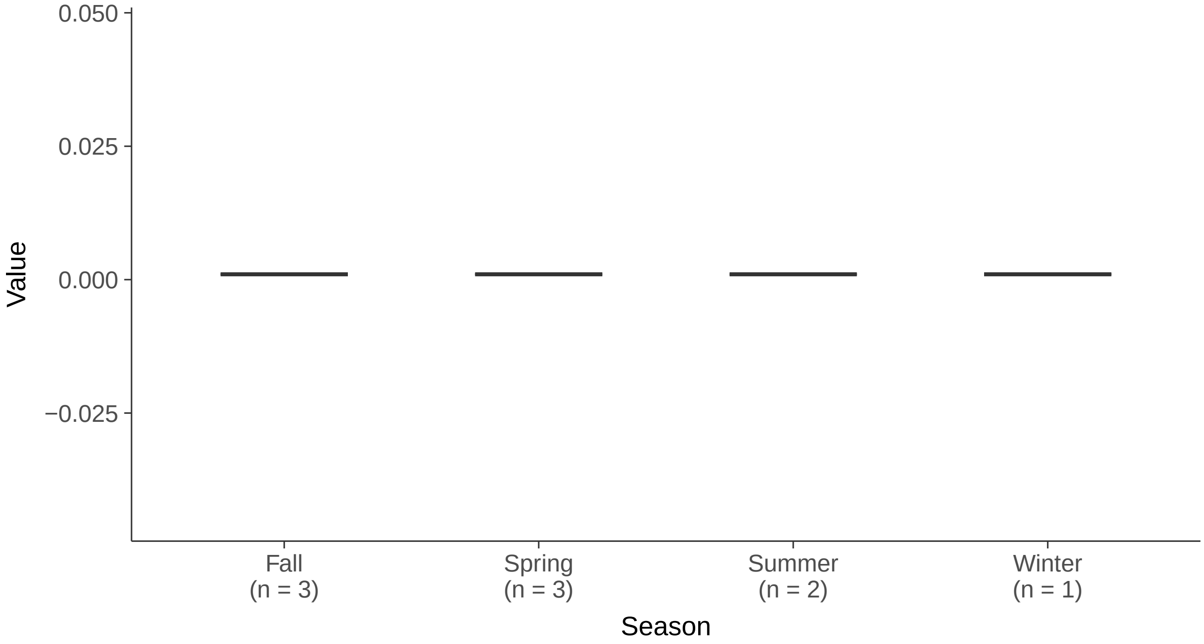
Boxplot

Beryllium, MW-16C (mg/L)



Boxplot by Season

Beryllium, MW-16C (mg/L)

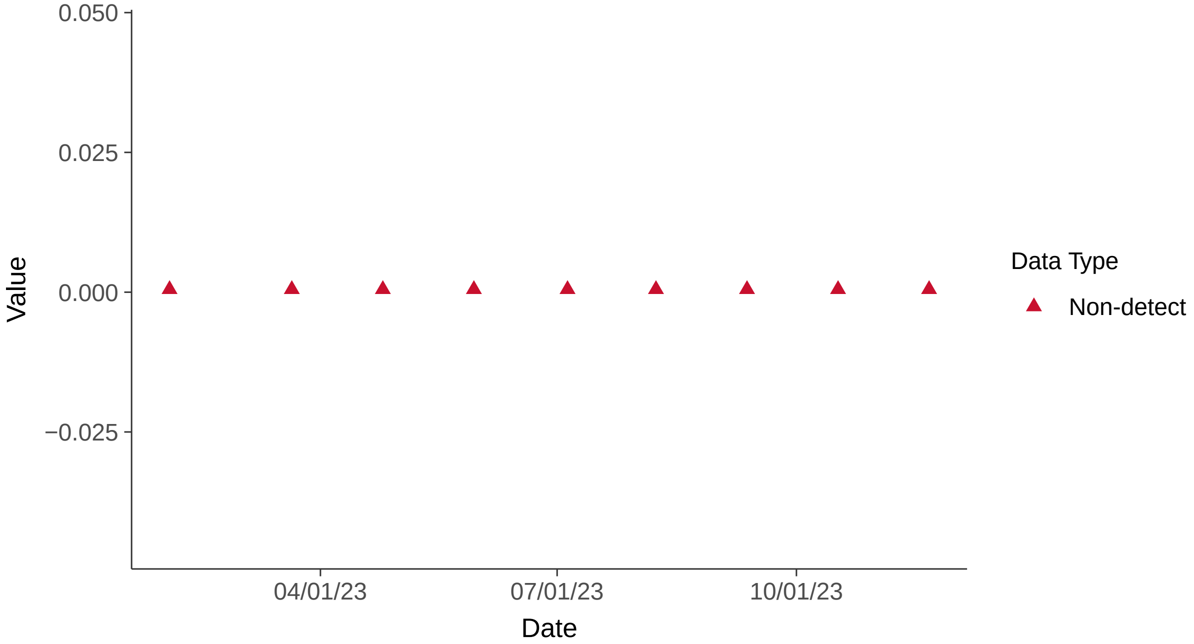


Appendix IV: Cadmium, MW-16C

ID: 16C_2_12

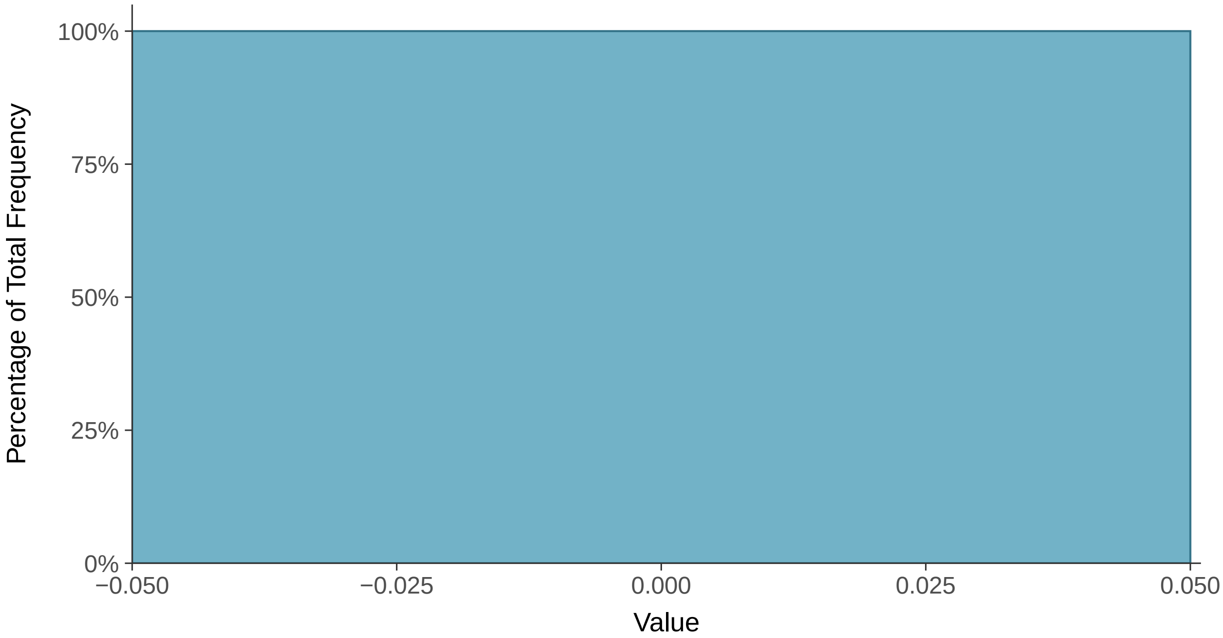
Scatter Plot

Cadmium, MW-16C (mg/L)



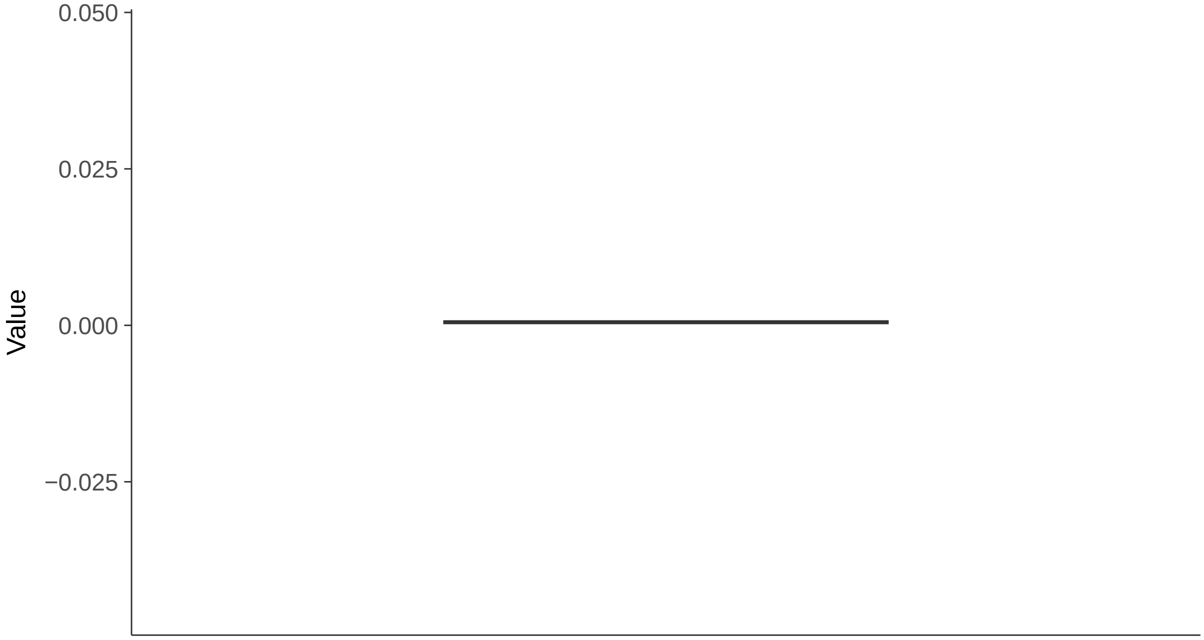
Histogram

Cadmium, MW-16C (mg/L)



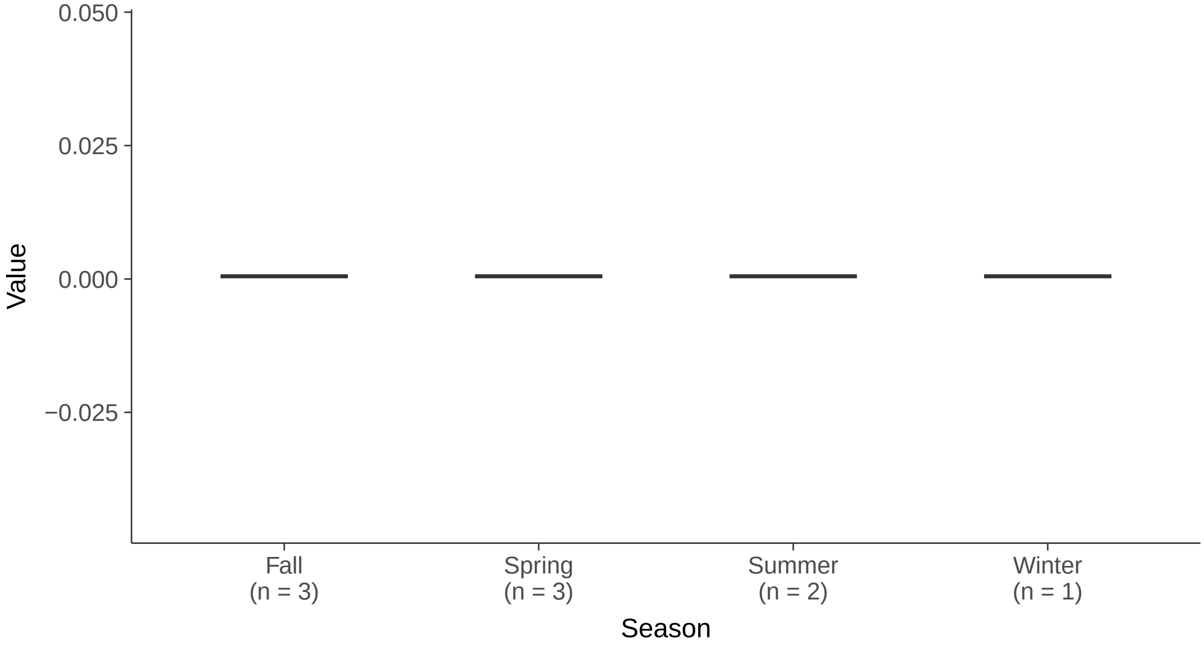
Boxplot

Cadmium, MW-16C (mg/L)



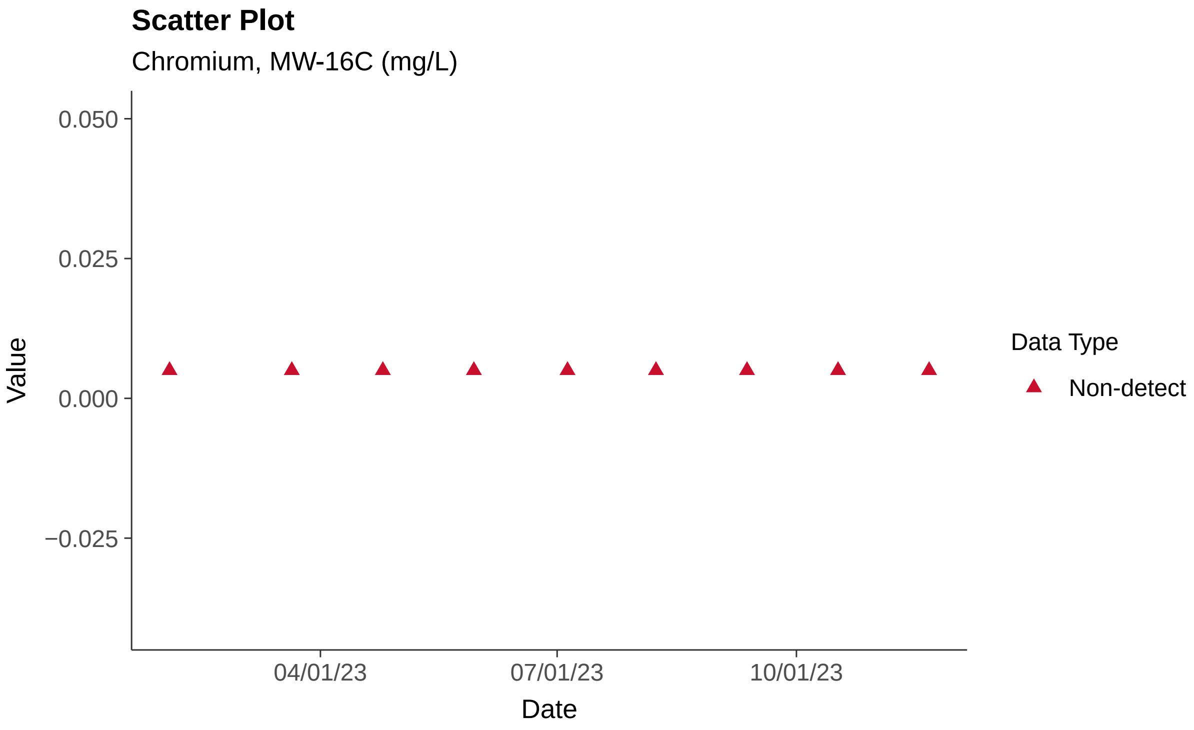
Boxplot by Season

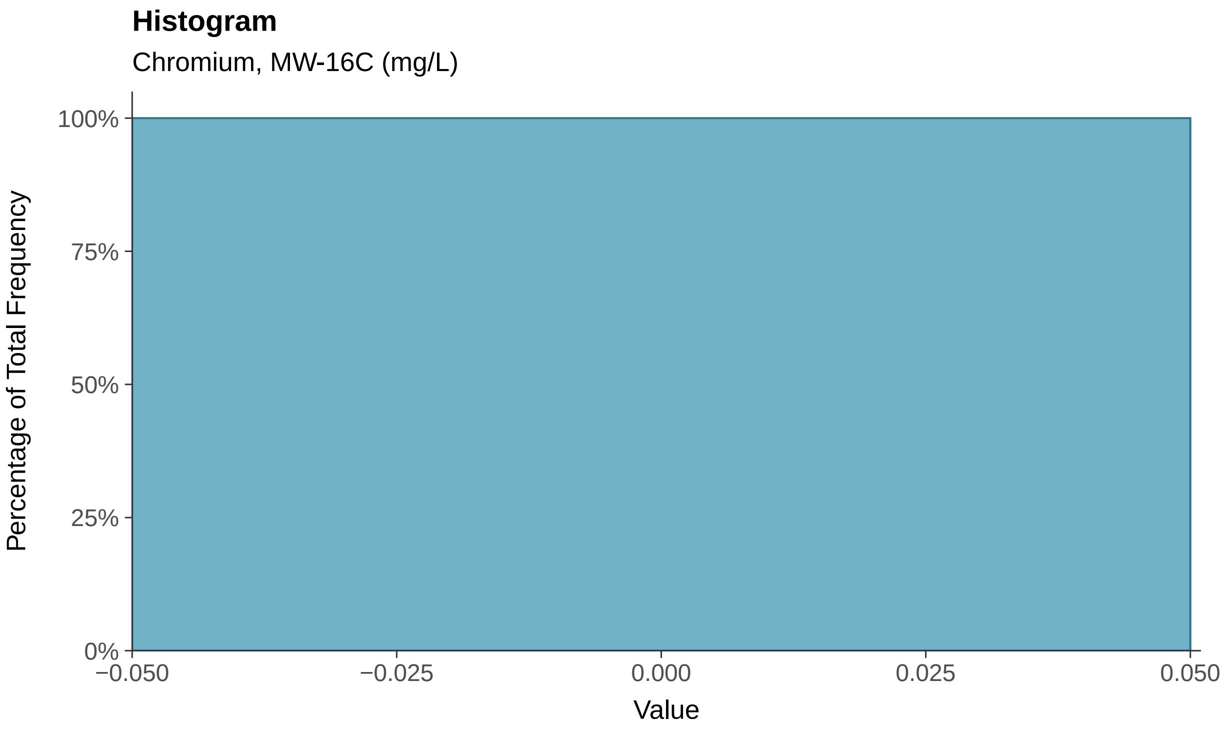
Cadmium, MW-16C (mg/L)



Appendix IV: Chromium, MW-16C

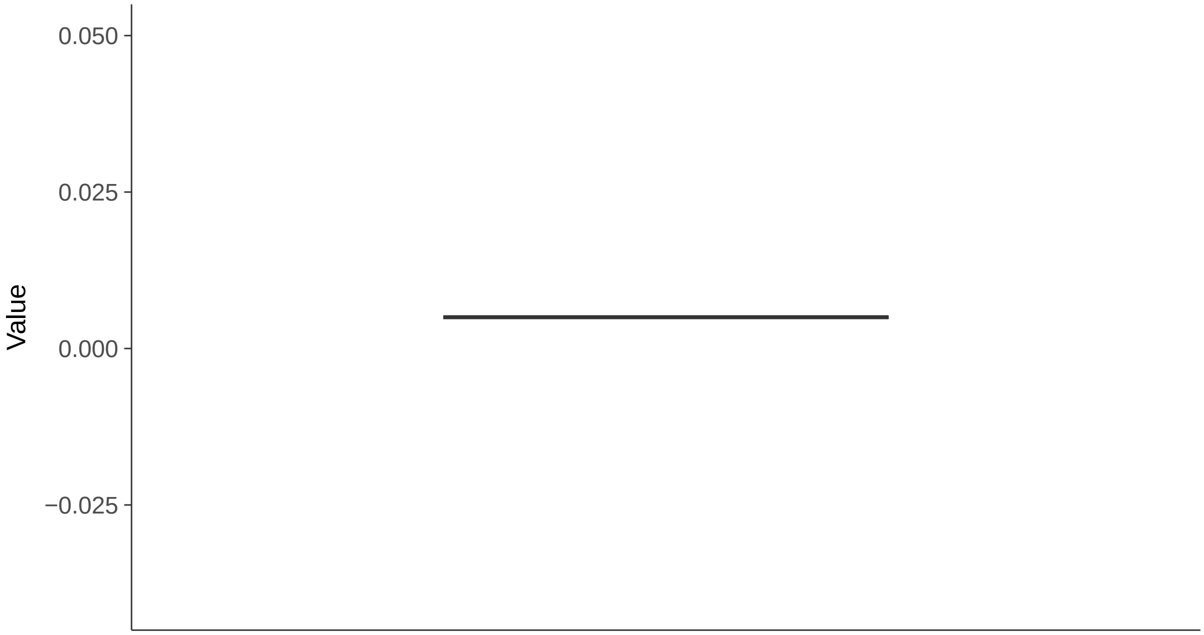
ID: 16C_2_13





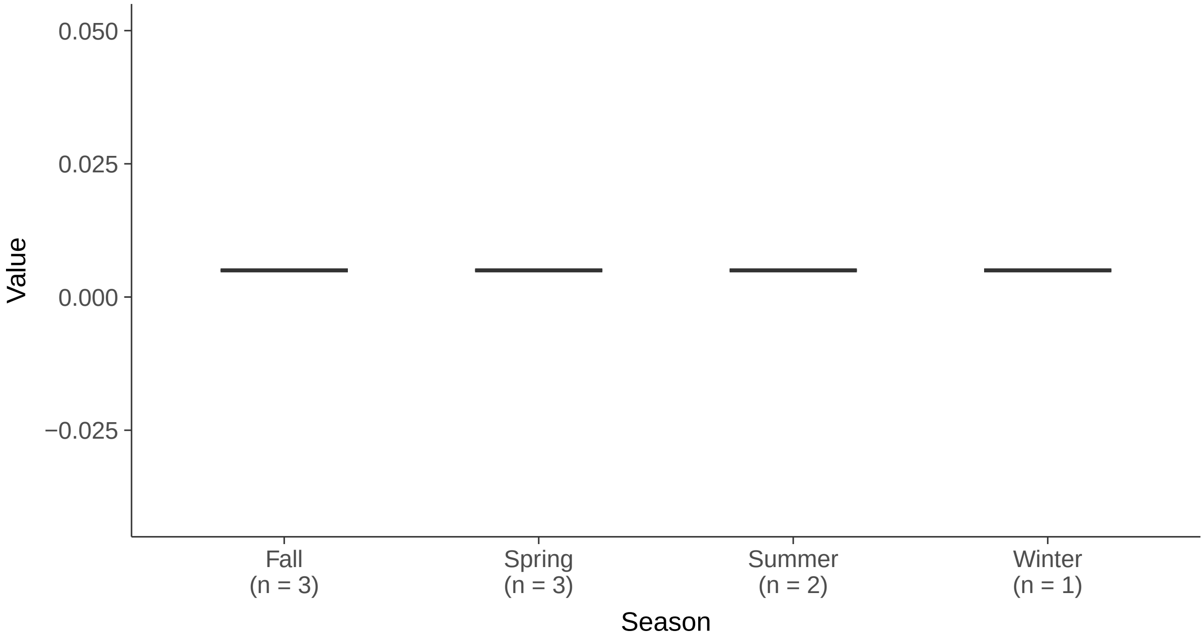
Boxplot

Chromium, MW-16C (mg/L)



Boxplot by Season

Chromium, MW-16C (mg/L)

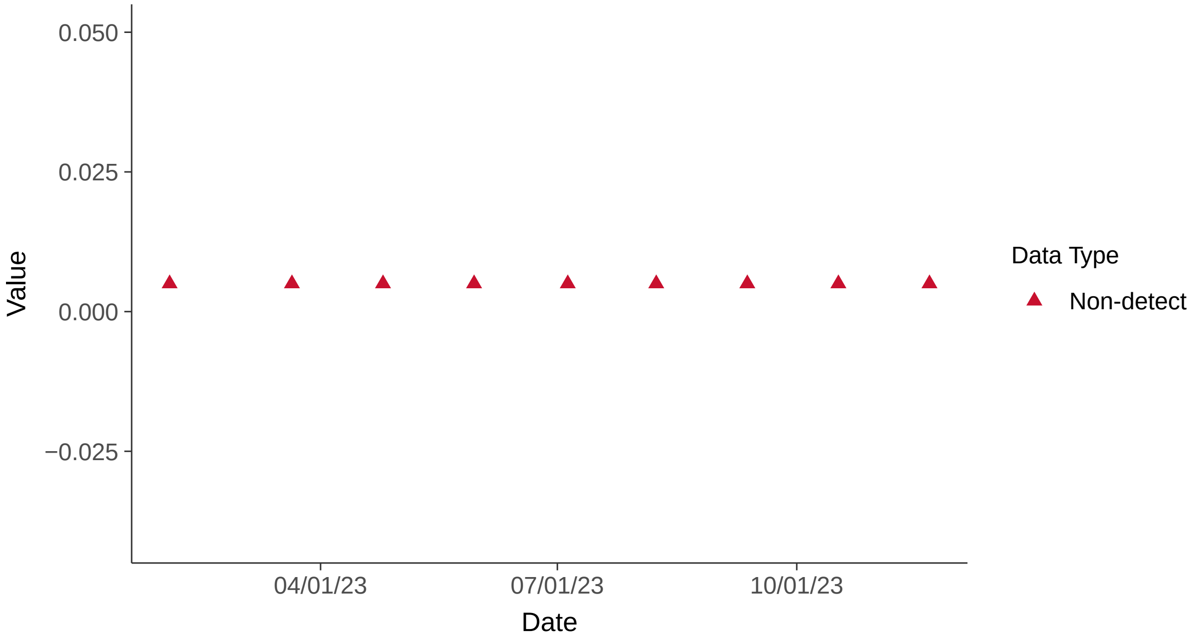


Appendix IV: Cobalt, MW-16C

ID: 16C_2_14

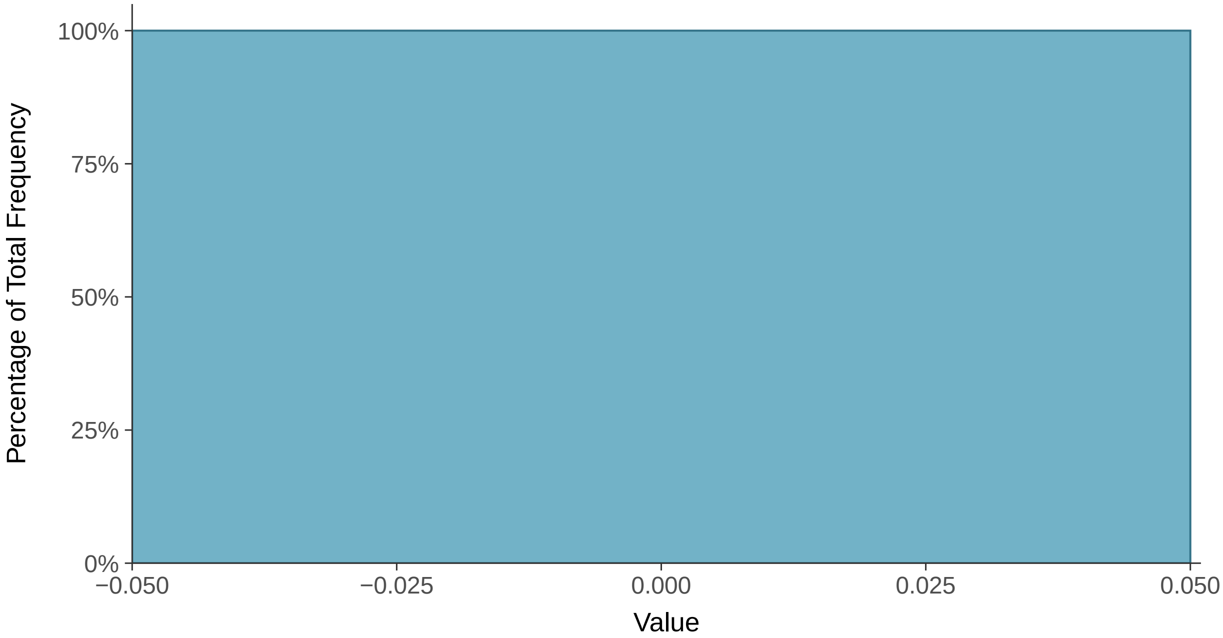
Scatter Plot

Cobalt, MW-16C (mg/L)



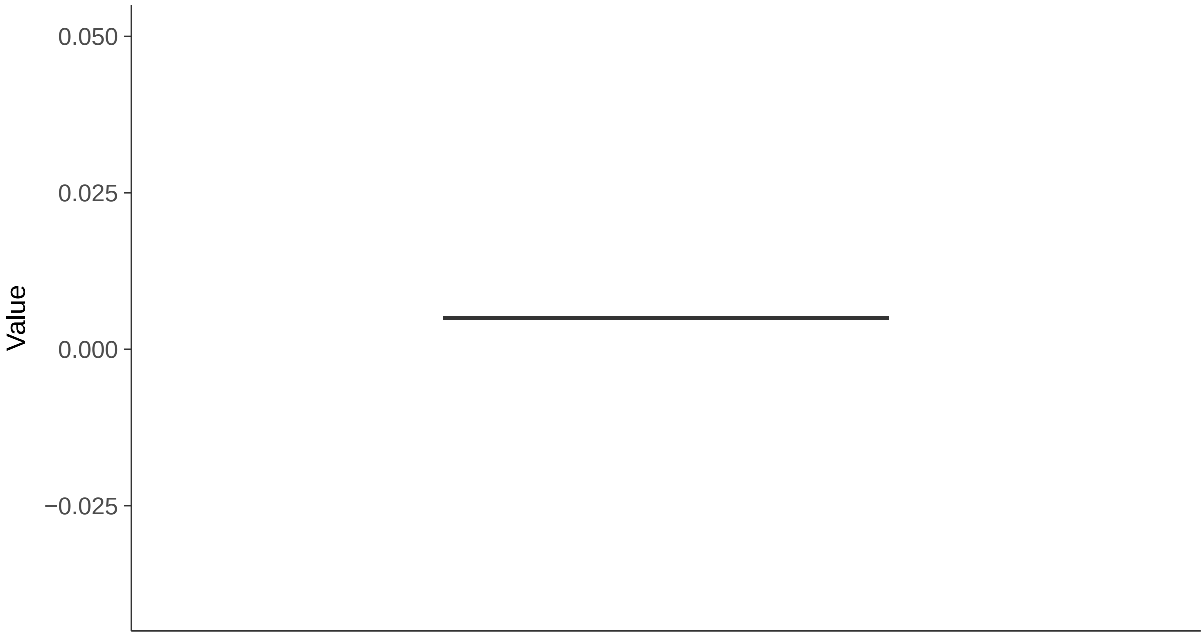
Histogram

Cobalt, MW-16C (mg/L)



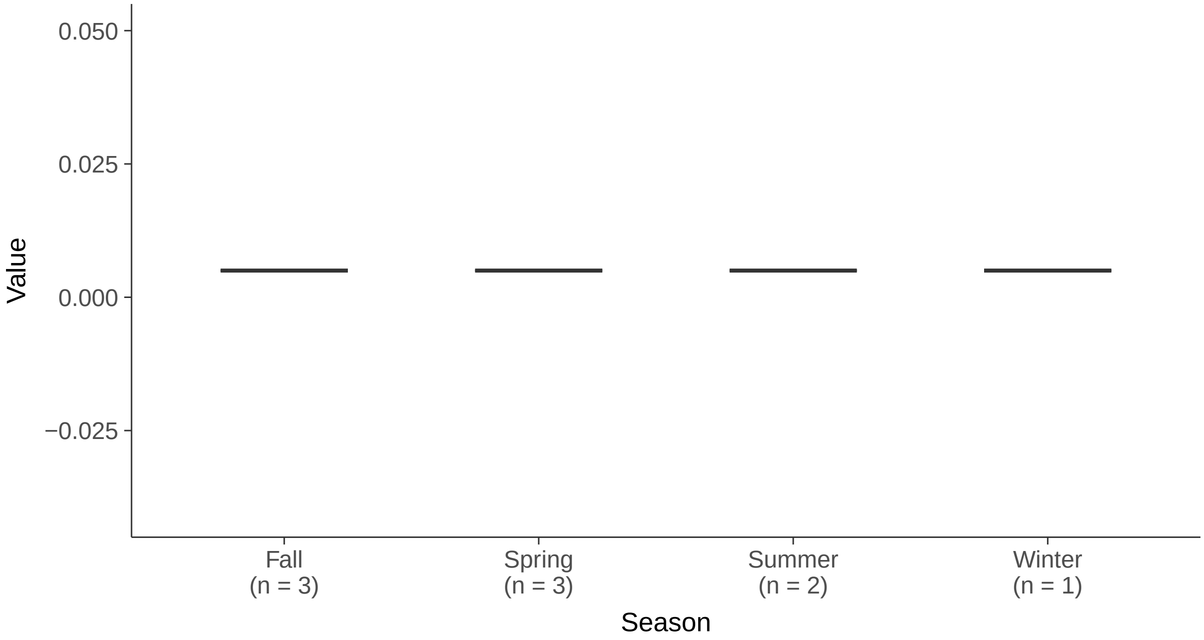
Boxplot

Cobalt, MW-16C (mg/L)



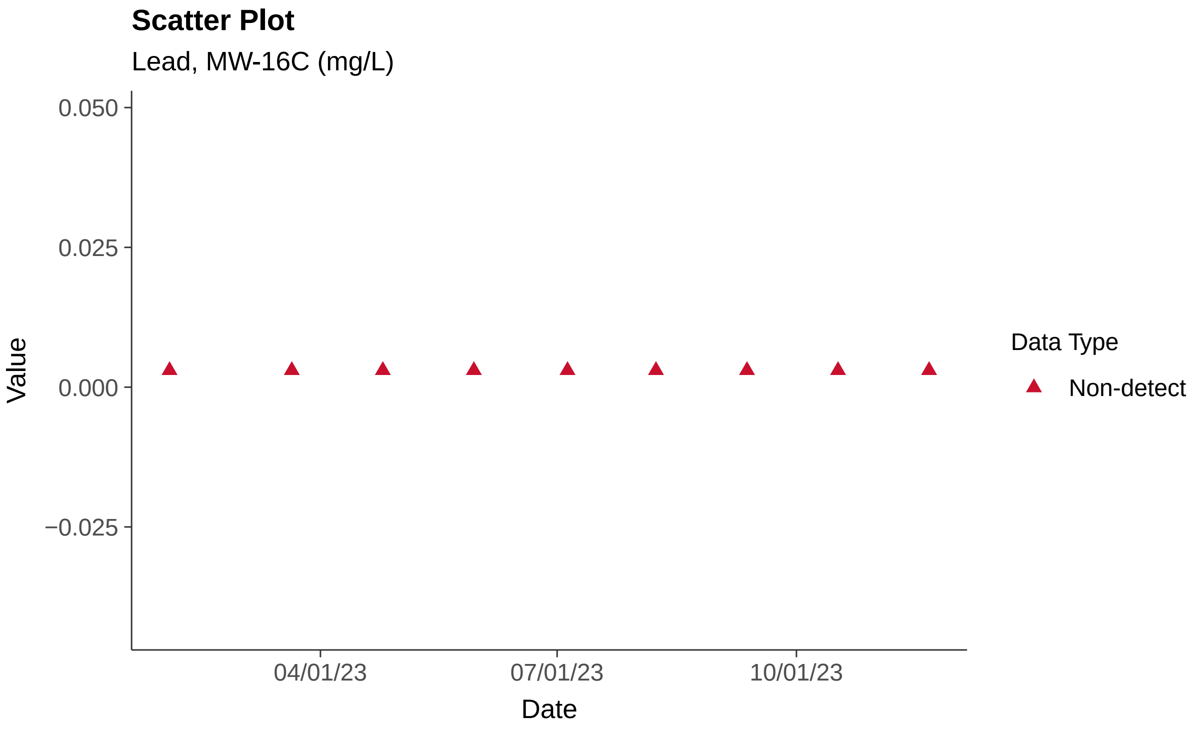
Boxplot by Season

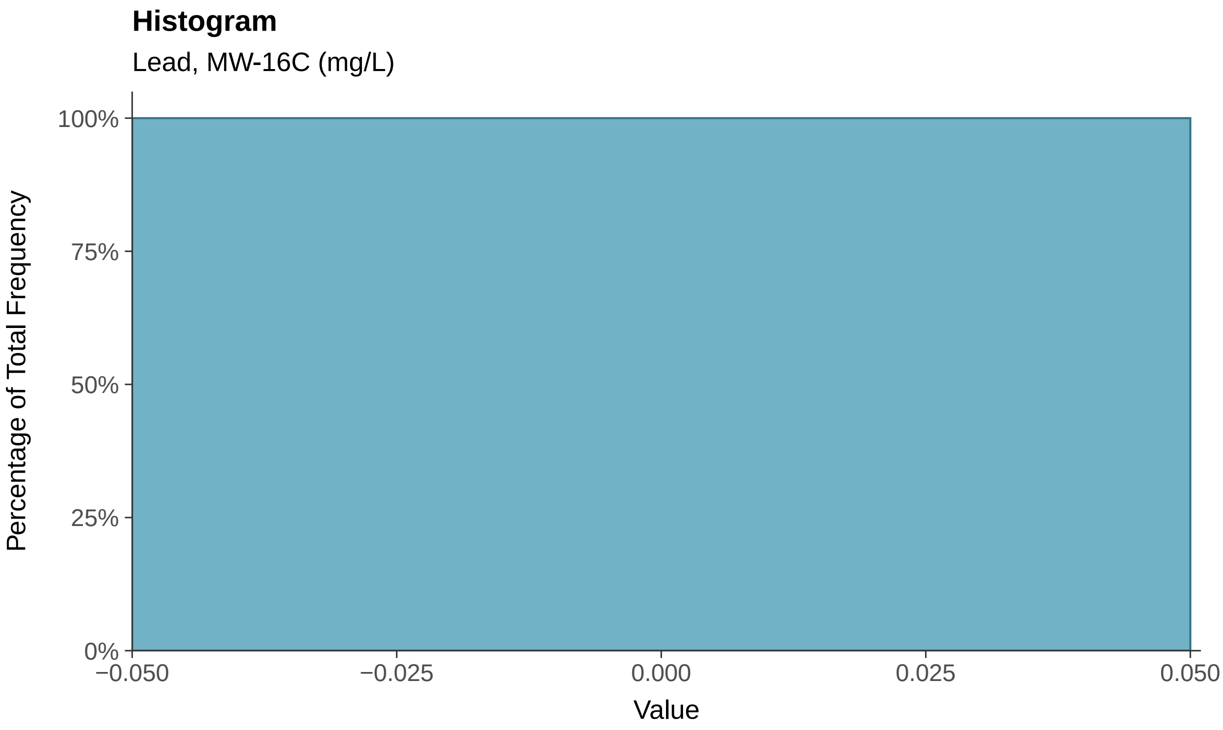
Cobalt, MW-16C (mg/L)



Appendix IV: Lead, MW-16C

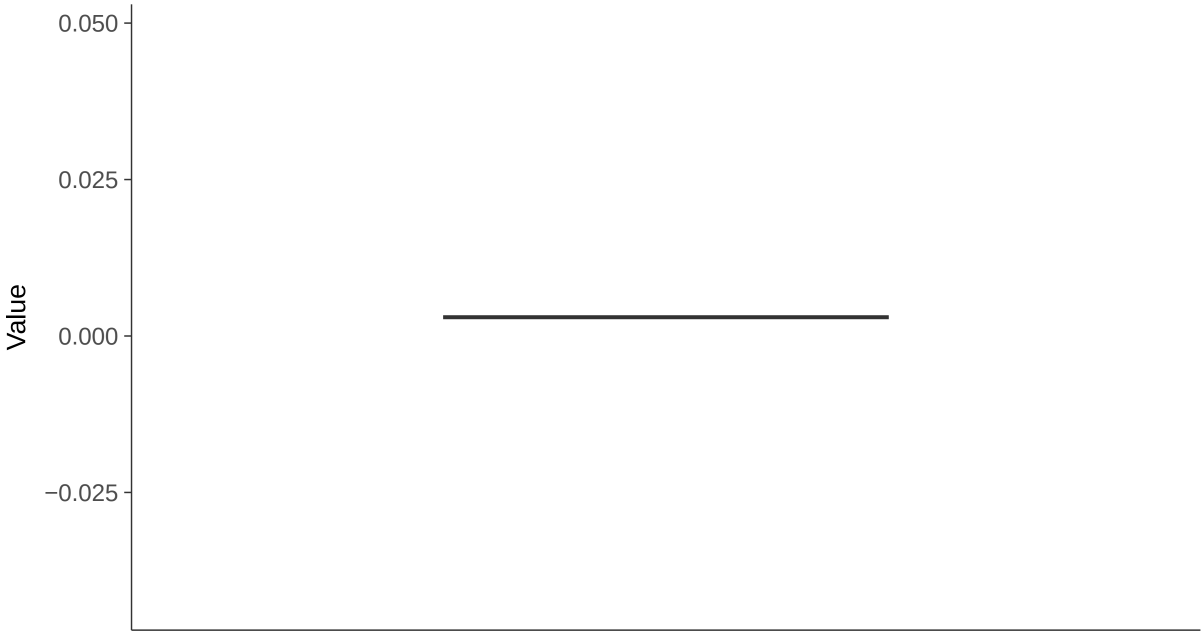
ID: 16C_2_15





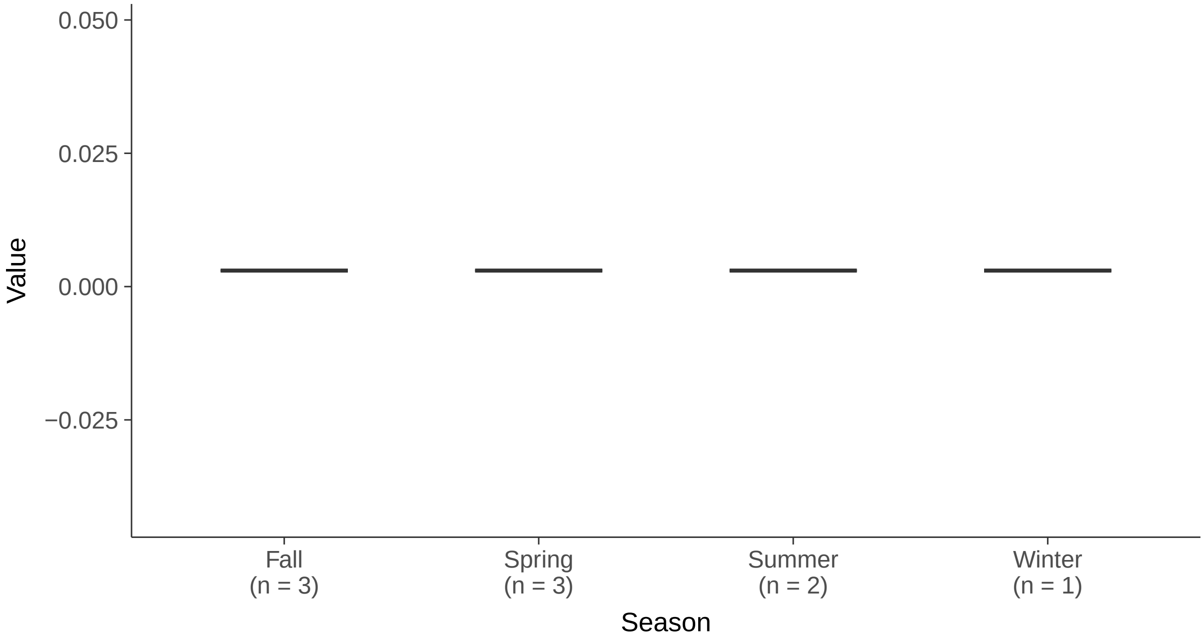
Boxplot

Lead, MW-16C (mg/L)



Boxplot by Season

Lead, MW-16C (mg/L)

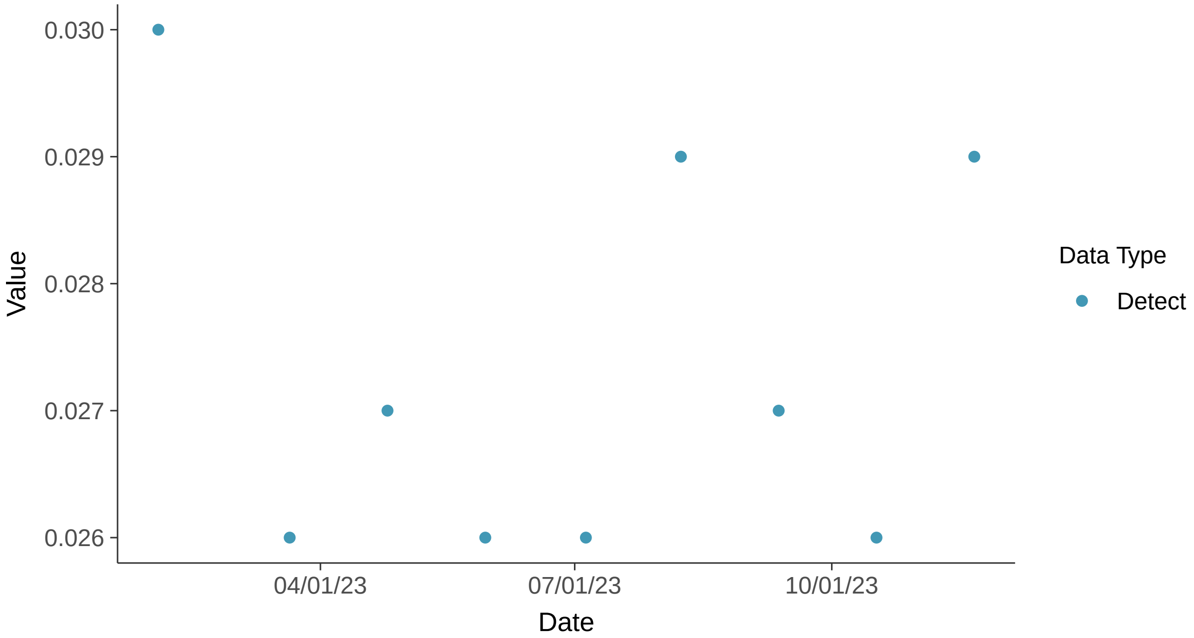


Appendix IV: Lithium, MW-16C

ID: 16C_2_16

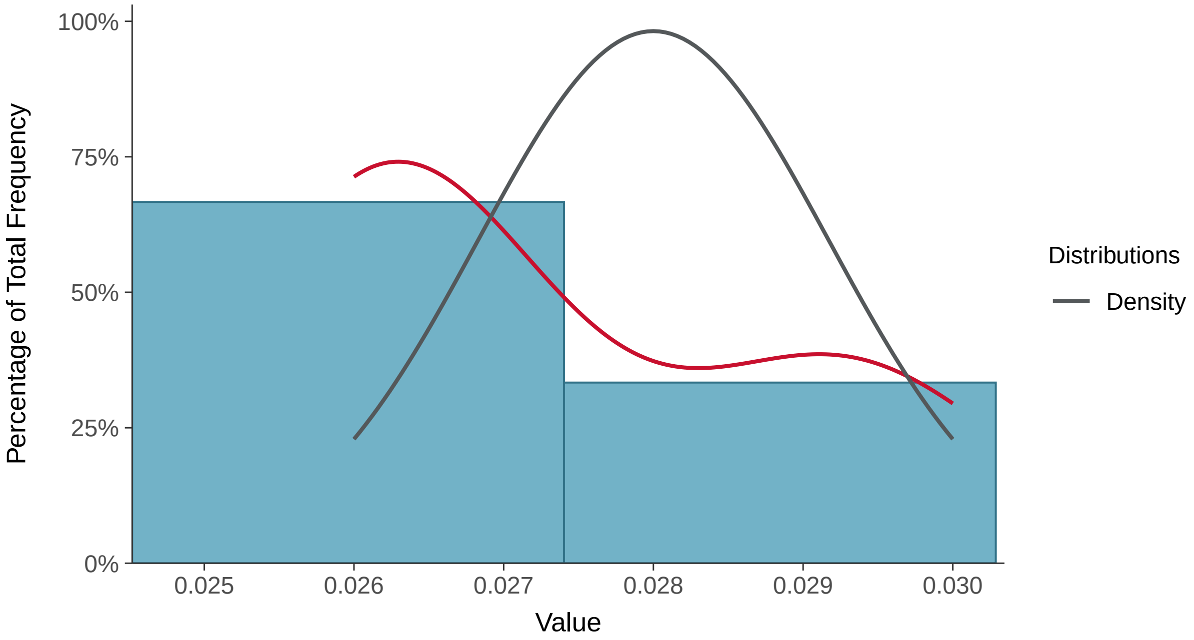
Scatter Plot

Lithium, MW-16C (mg/L)



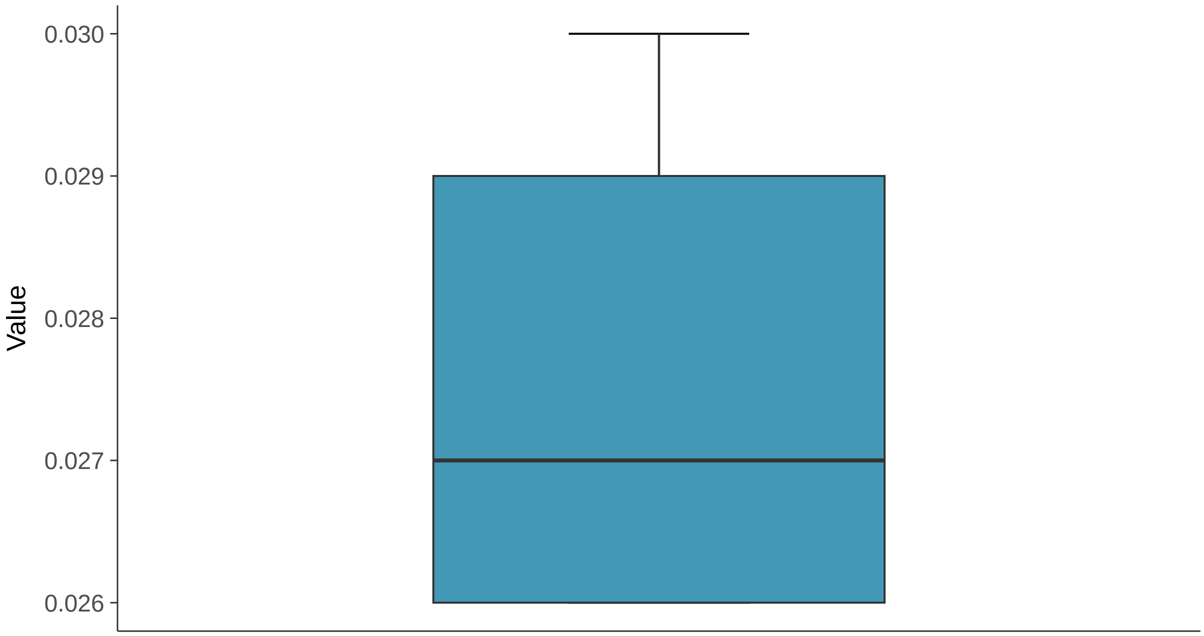
Histogram

Lithium, MW-16C (mg/L)



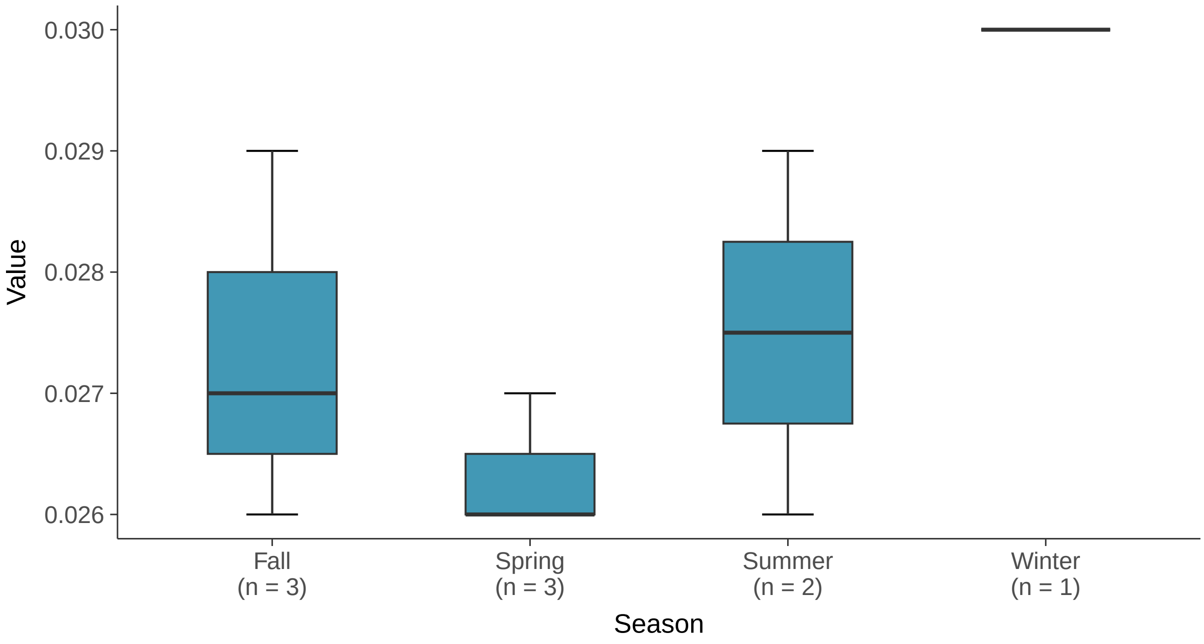
Boxplot

Lithium, MW-16C (mg/L)



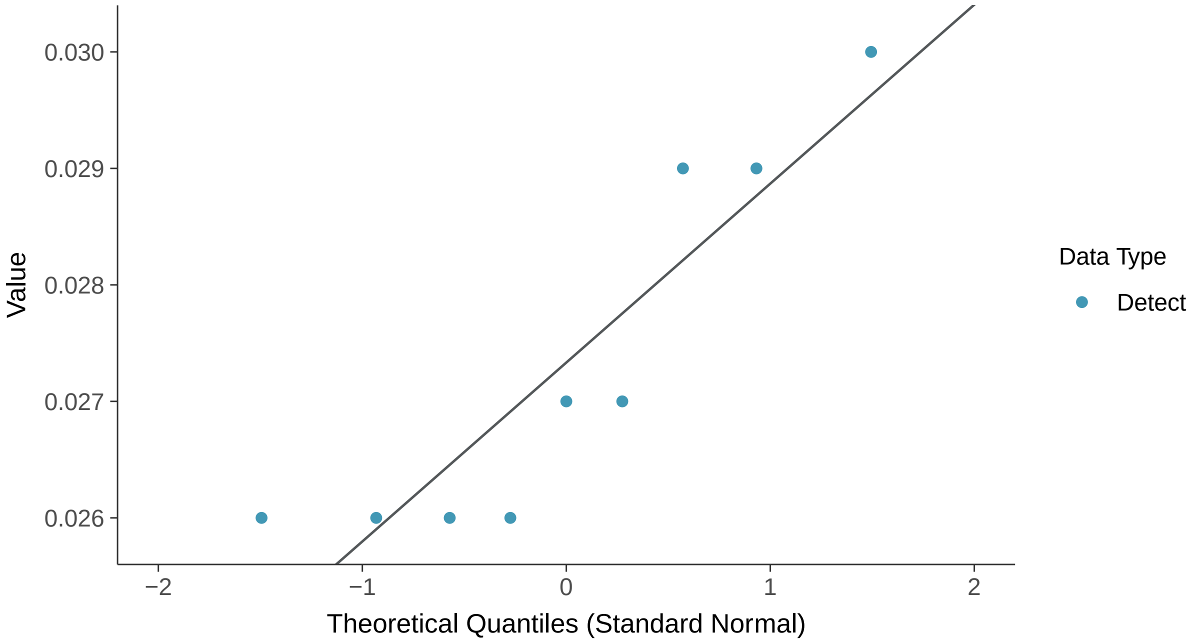
Boxplot by Season

Lithium, MW-16C (mg/L)



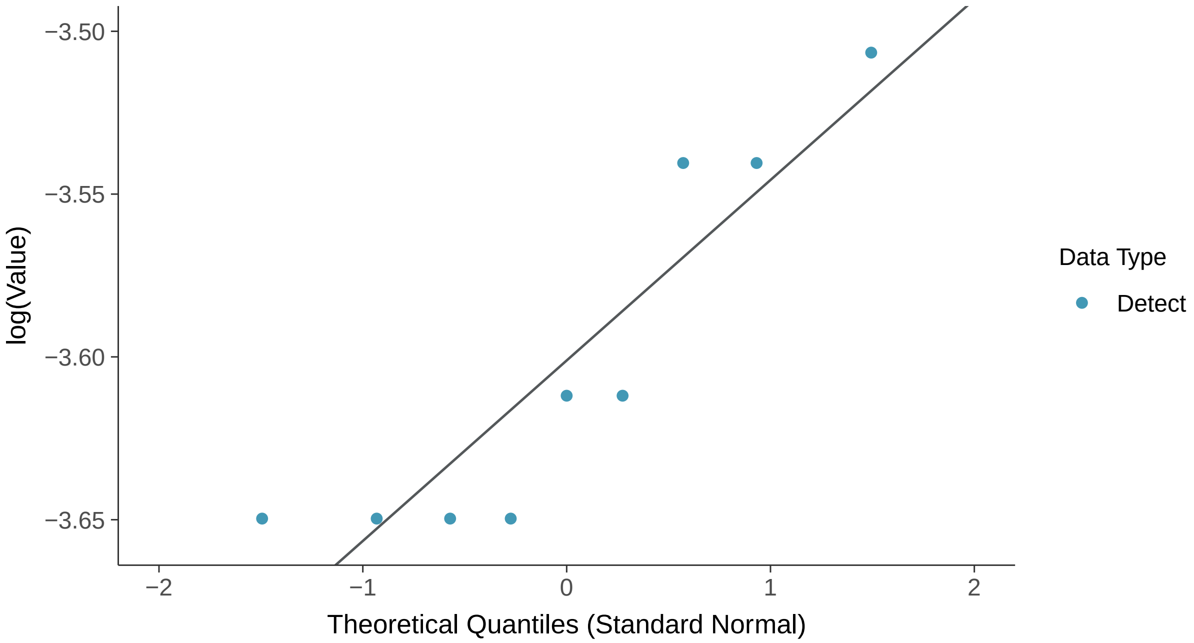
Normal Q-Q plot

Lithium, MW-16C (mg/L)



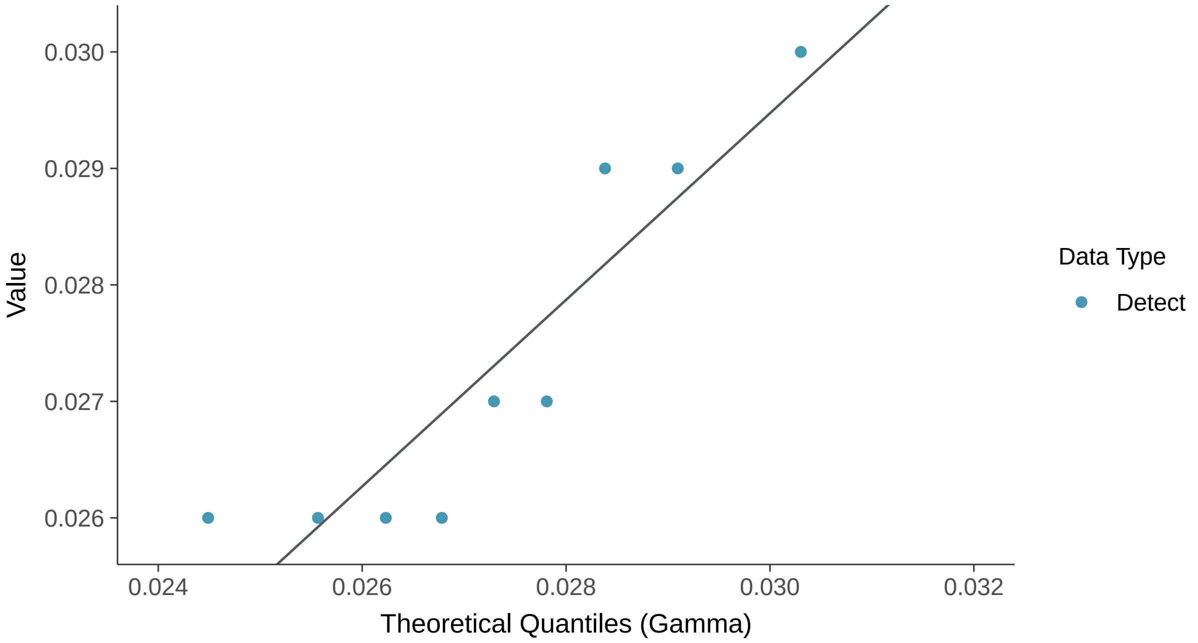
Lognormal Q-Q plot

Lithium, MW-16C (mg/L)



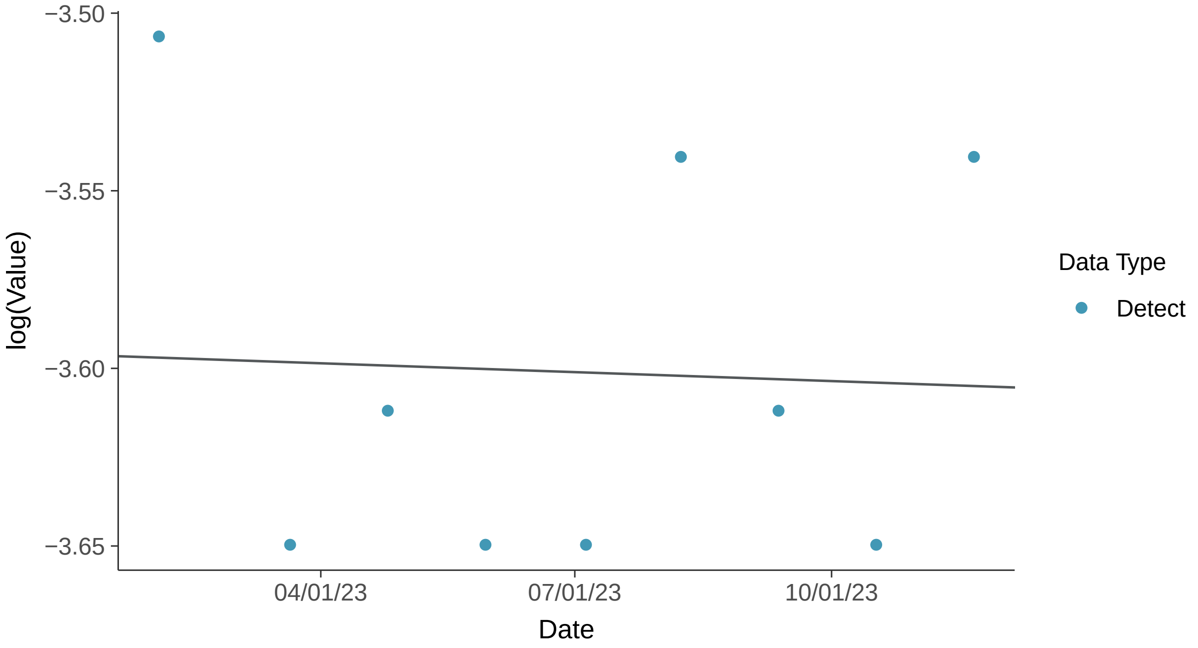
Gamma Q-Q plot

Lithium, MW-16C (mg/L)



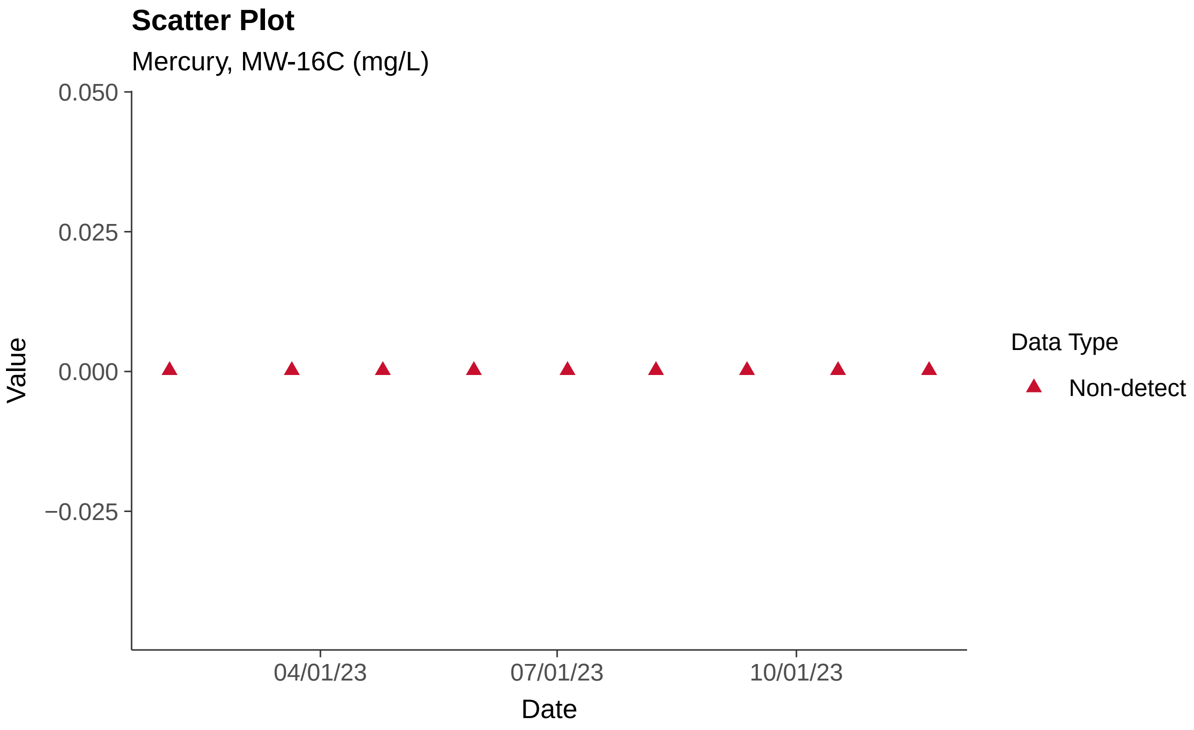
Trend Regression: Lognormal MLE

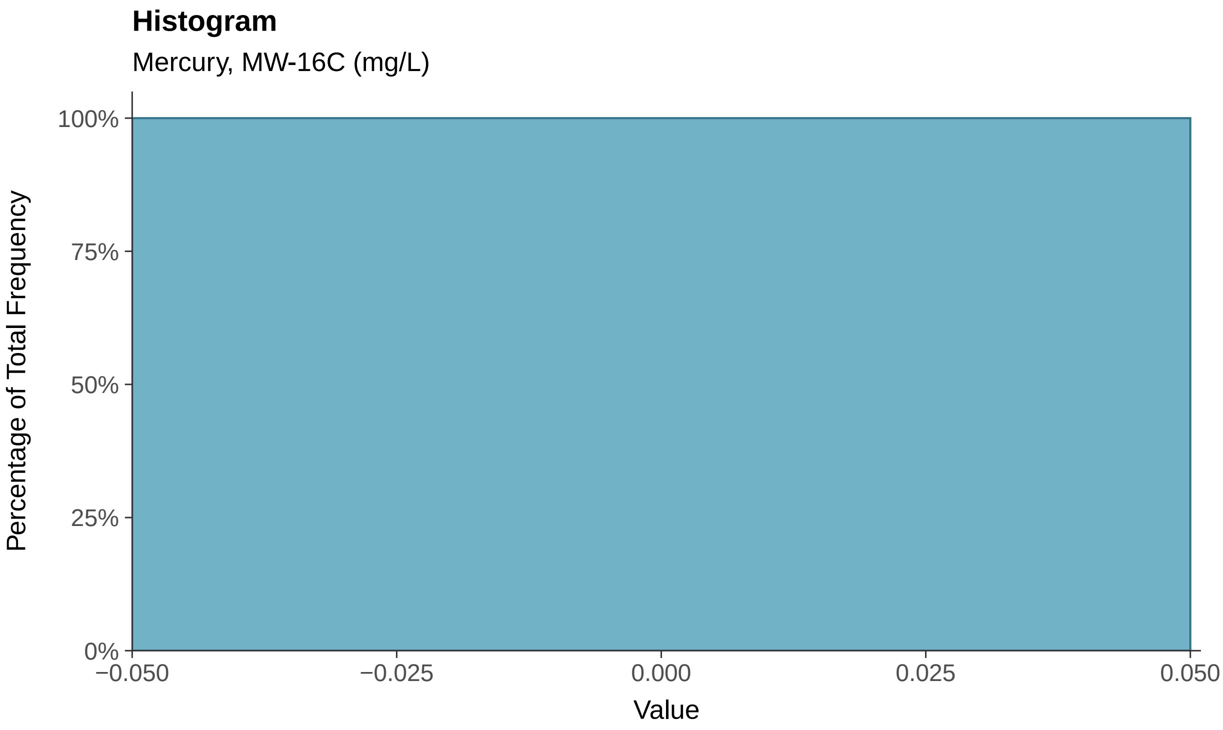
Lithium, MW-16C (mg/L)



Appendix IV: Mercury, MW-16C

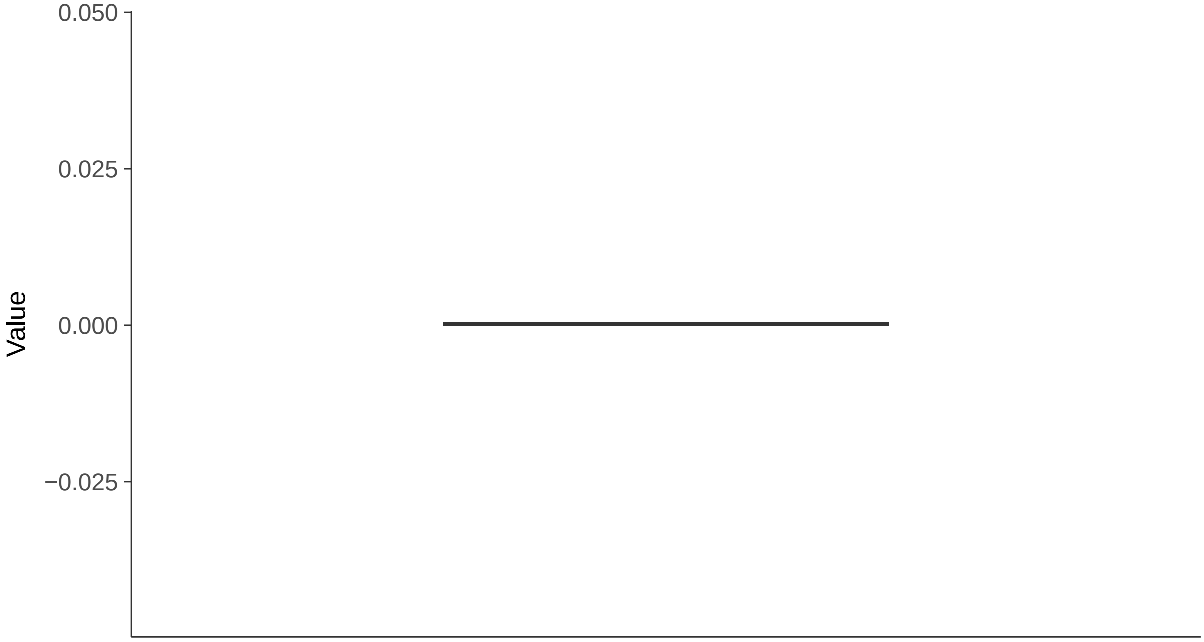
ID: 16C_2_17





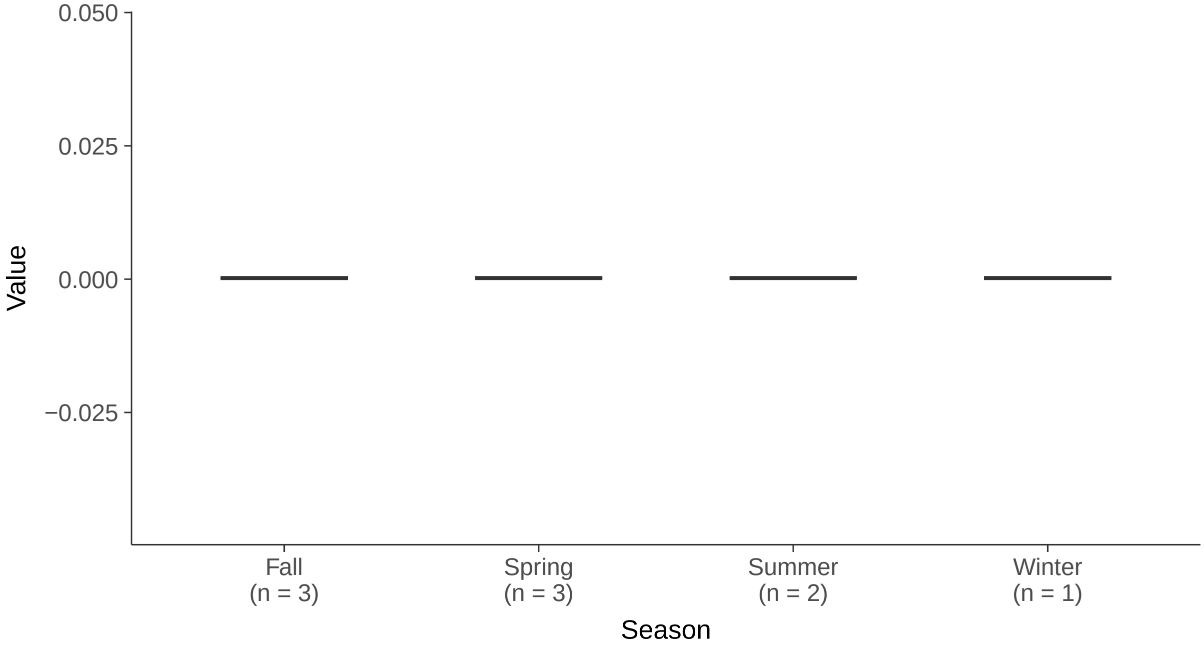
Boxplot

Mercury, MW-16C (mg/L)



Boxplot by Season

Mercury, MW-16C (mg/L)

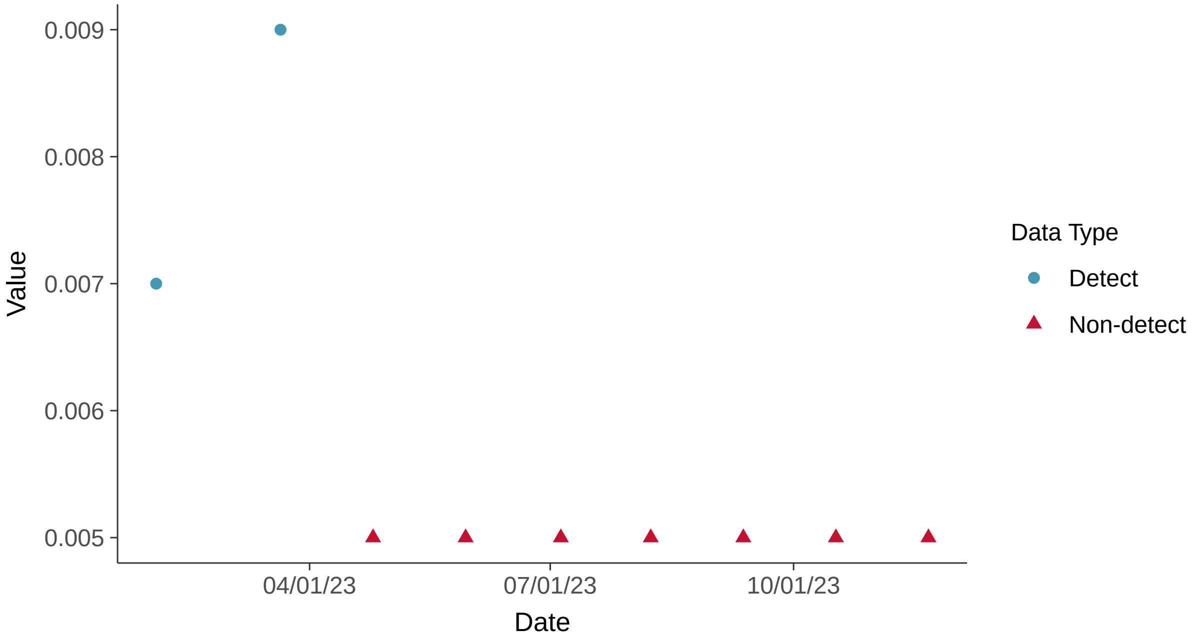


Appendix IV: Molybdenum, MW-16C

ID: 16C_2_18

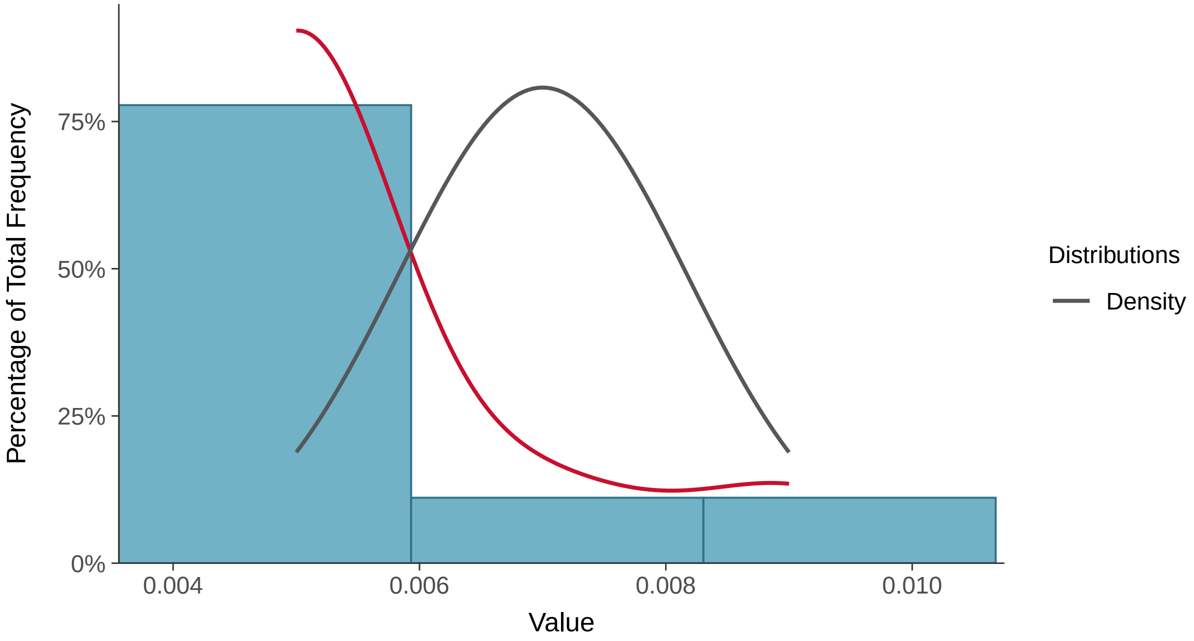
Scatter Plot

Molybdenum, MW-16C (mg/L)



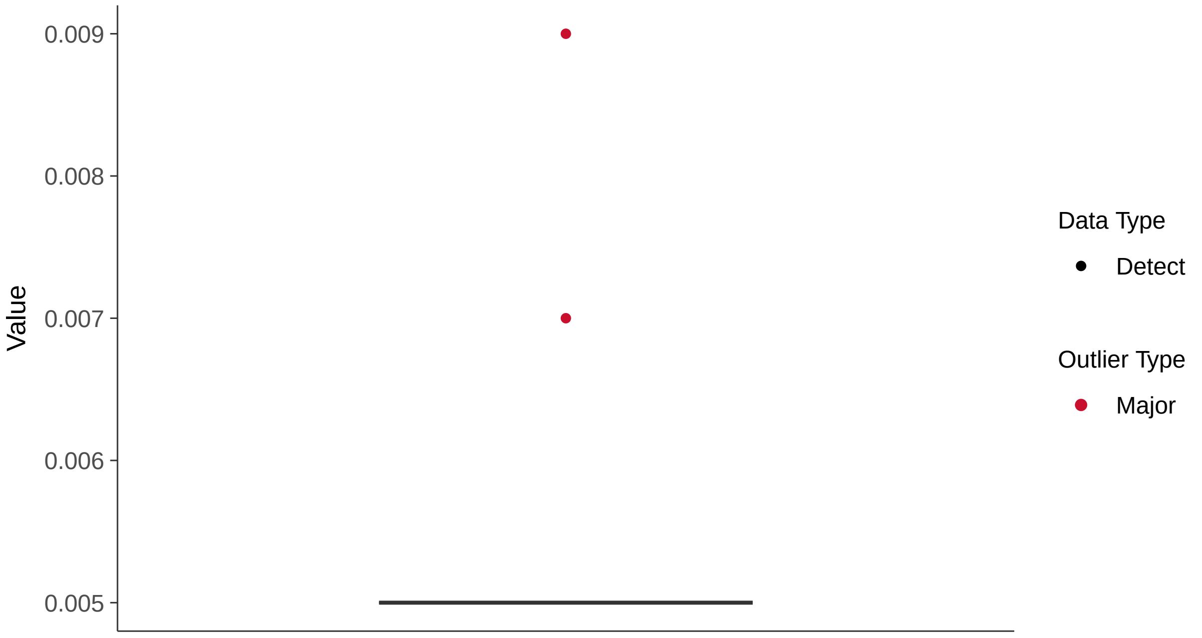
Histogram

Molybdenum, MW-16C (mg/L)



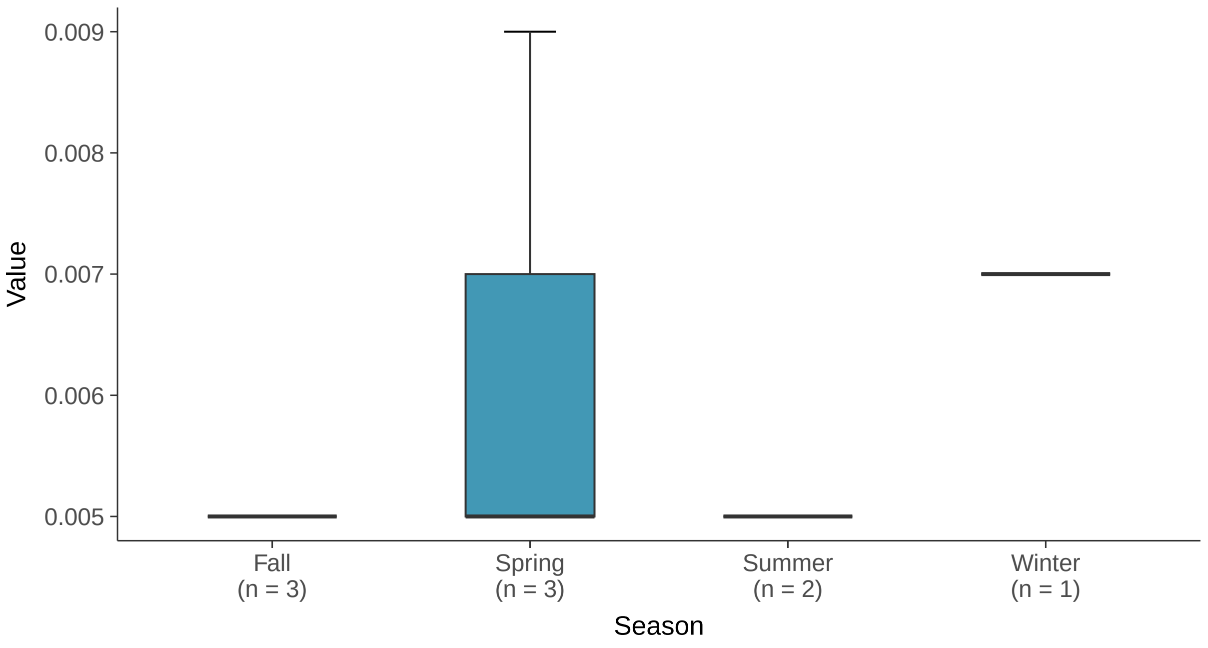
Boxplot

Molybdenum, MW-16C (mg/L)



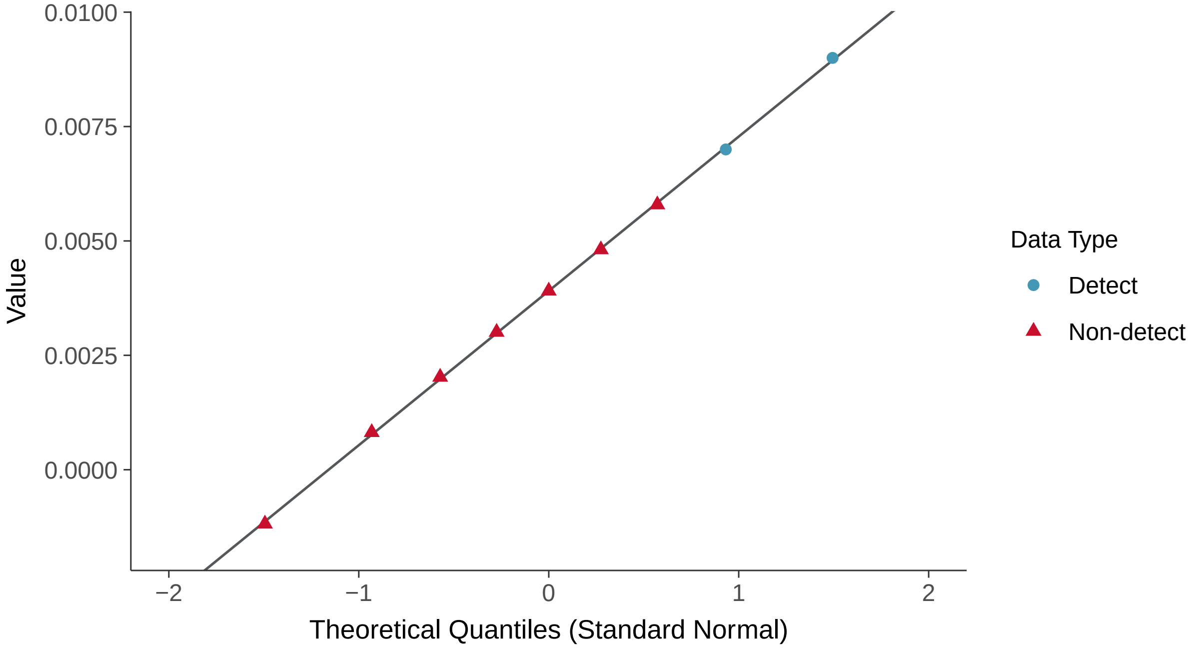
Boxplot by Season

Molybdenum, MW-16C (mg/L)



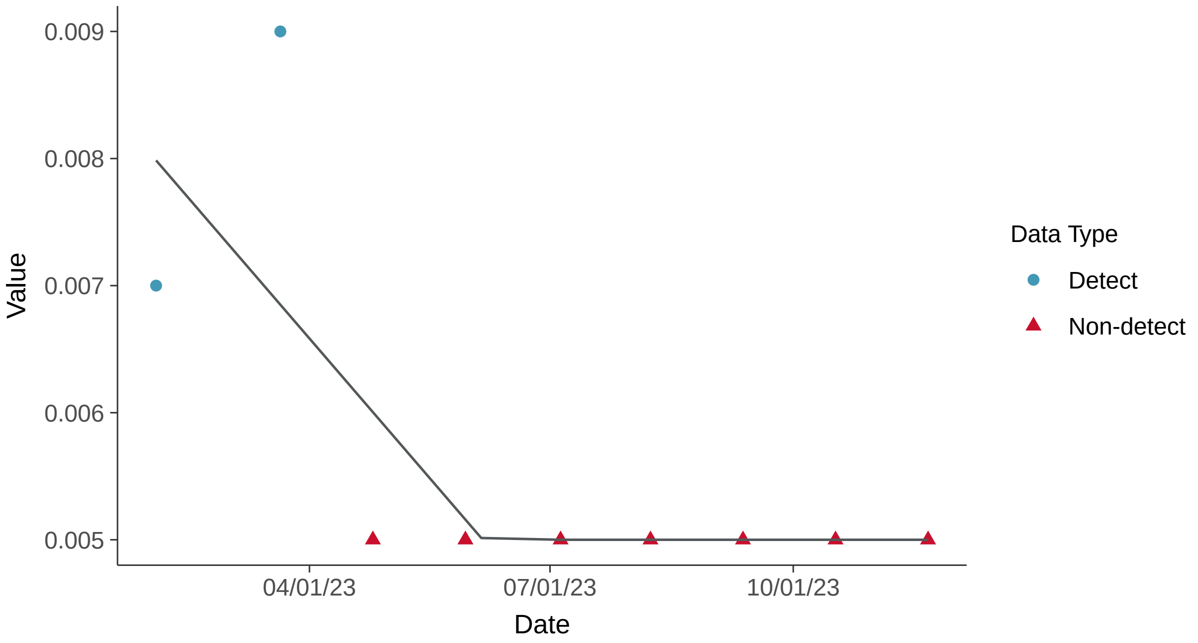
Normal Q-Q plot using ROS Imputed Estimates

Molybdenum, MW-16C (mg/L)



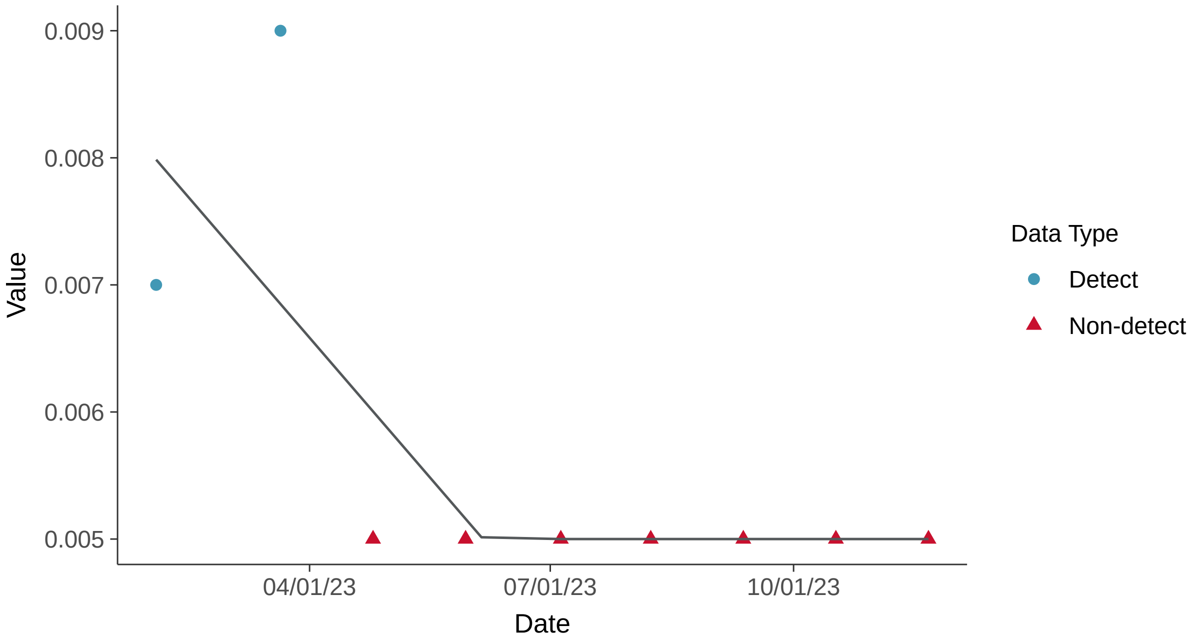
Trend Regression: Piecewise Linear-Linear

Molybdenum, MW-16C (mg/L)



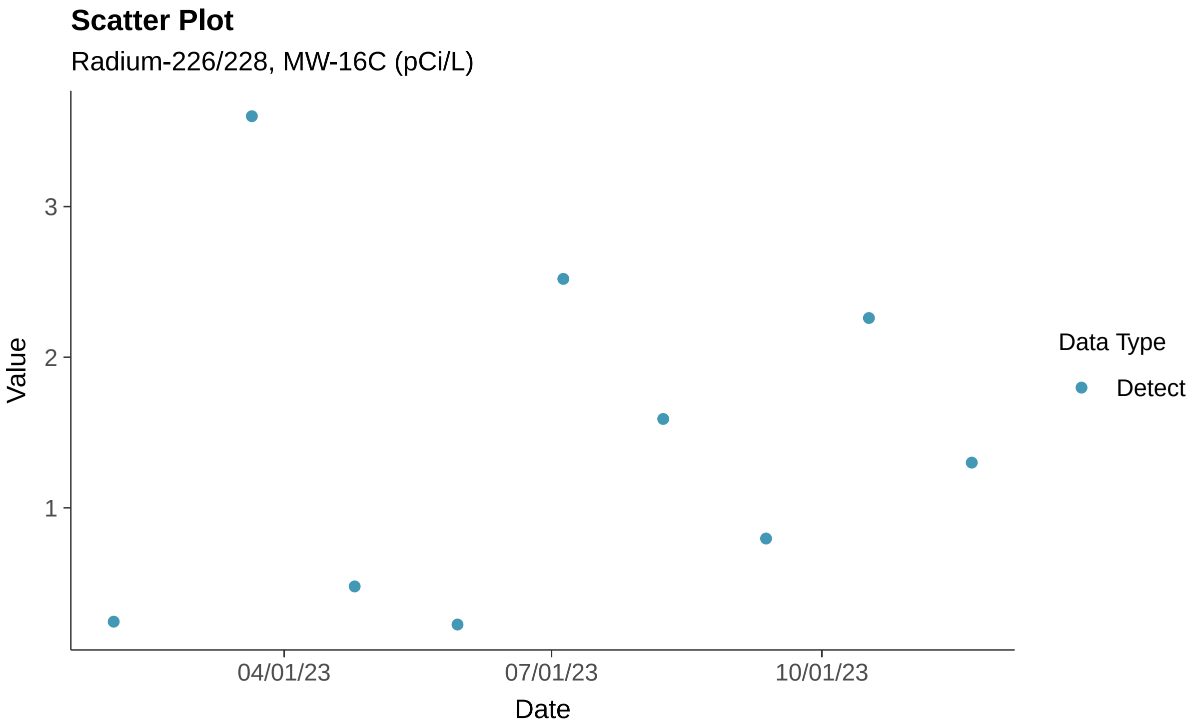
Trend Regression: Piecewise Linear-Linear-Linear

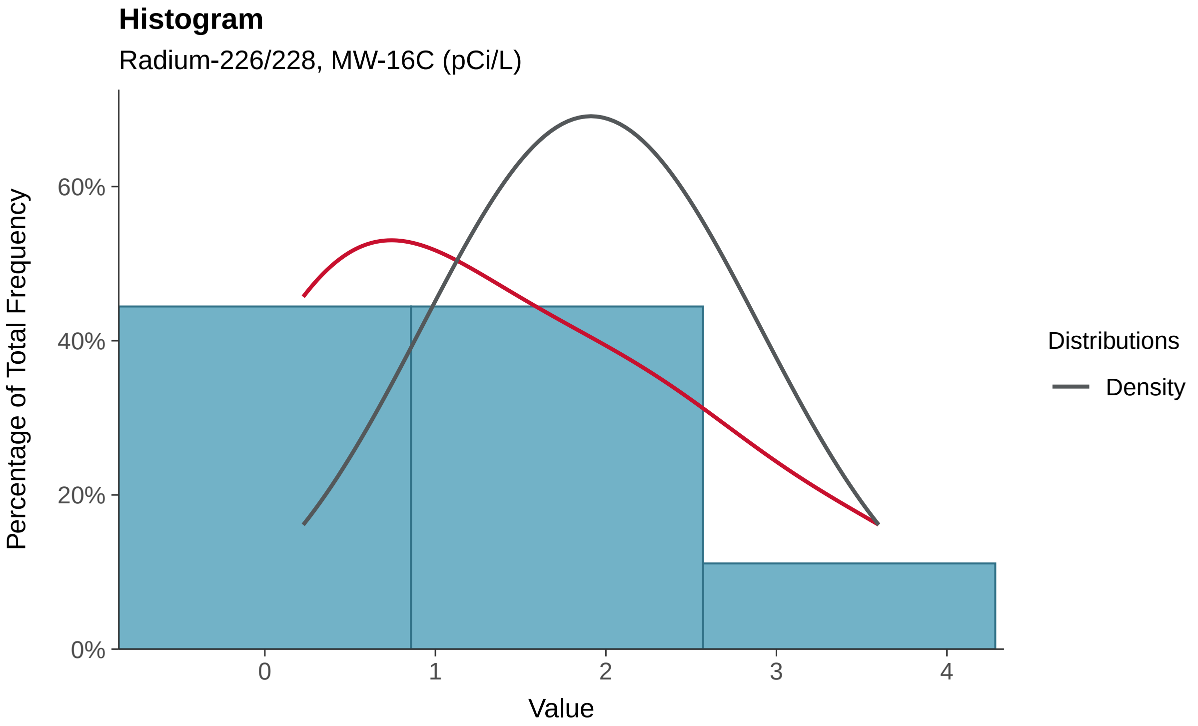
Molybdenum, MW-16C (mg/L)



Appendix IV: Radium-226/228, MW-16C

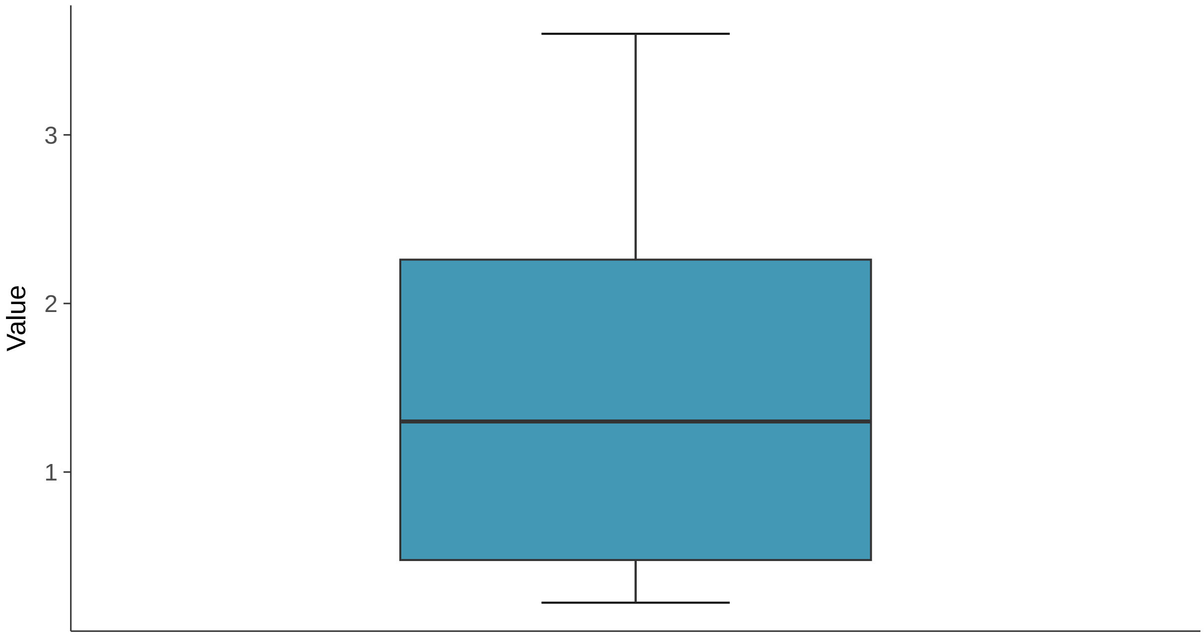
ID: 16C_2_20





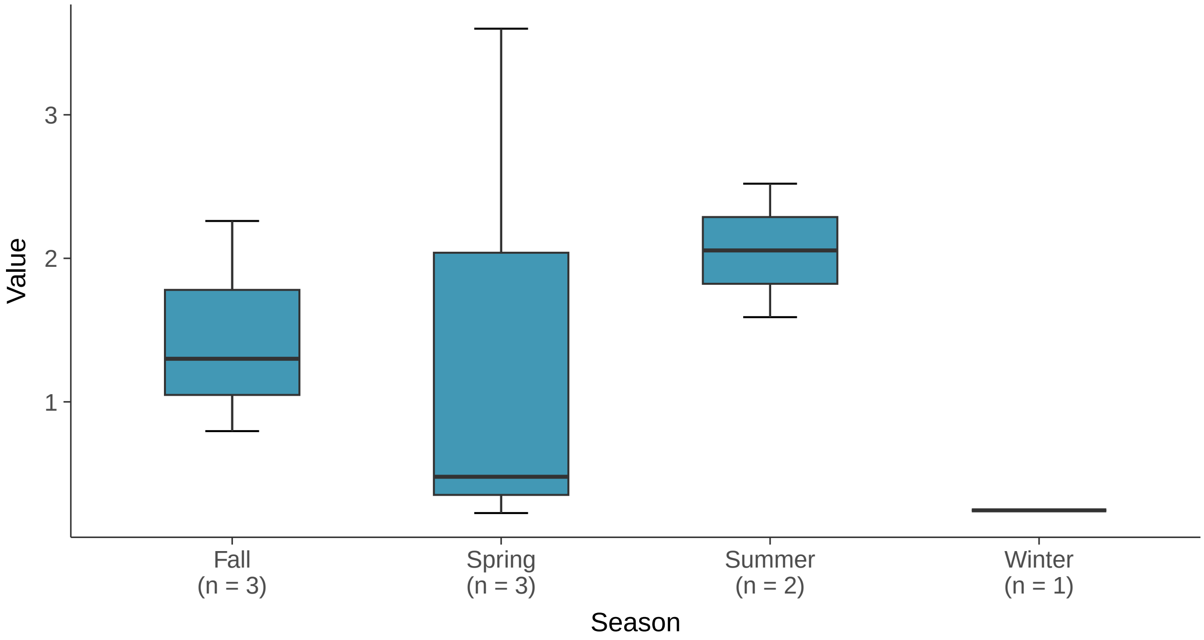
Boxplot

Radium-226/228, MW-16C (pCi/L)



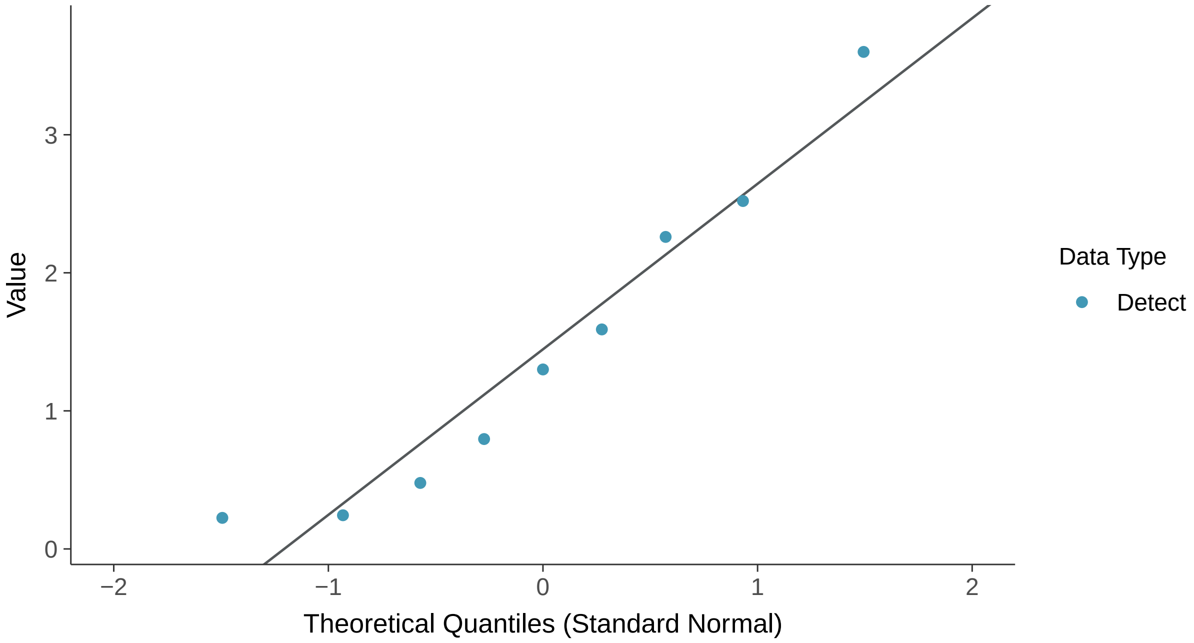
Boxplot by Season

Radium-226/228, MW-16C (pCi/L)



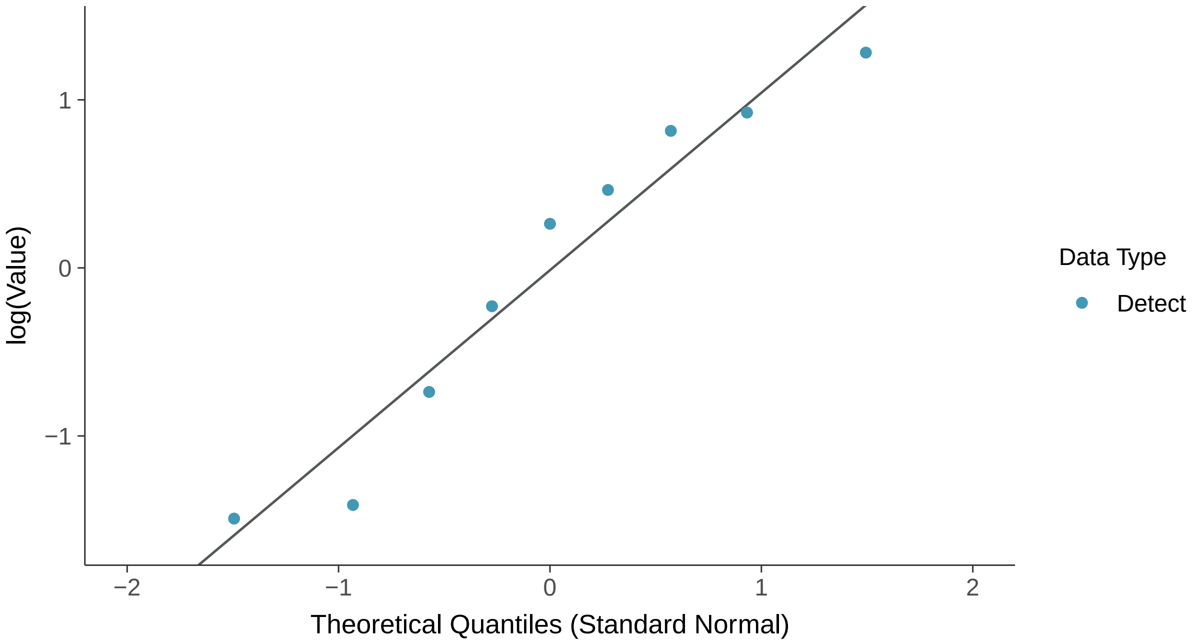
Normal Q-Q plot

Radium-226/228, MW-16C (pCi/L)



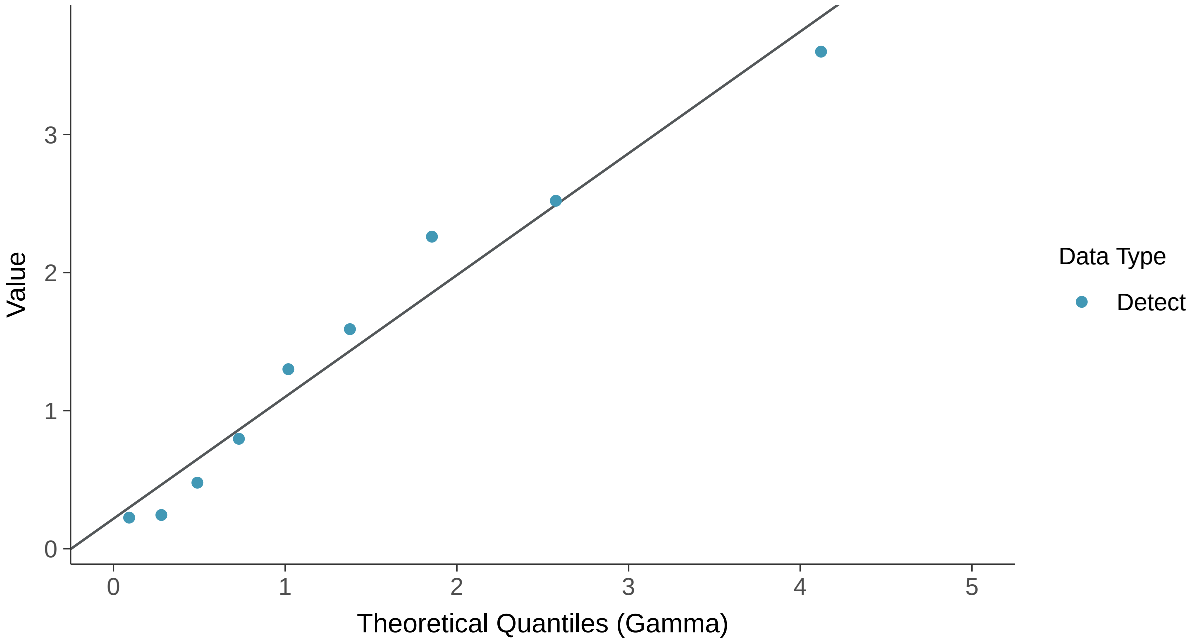
Lognormal Q-Q plot

Radium-226/228, MW-16C (pCi/L)



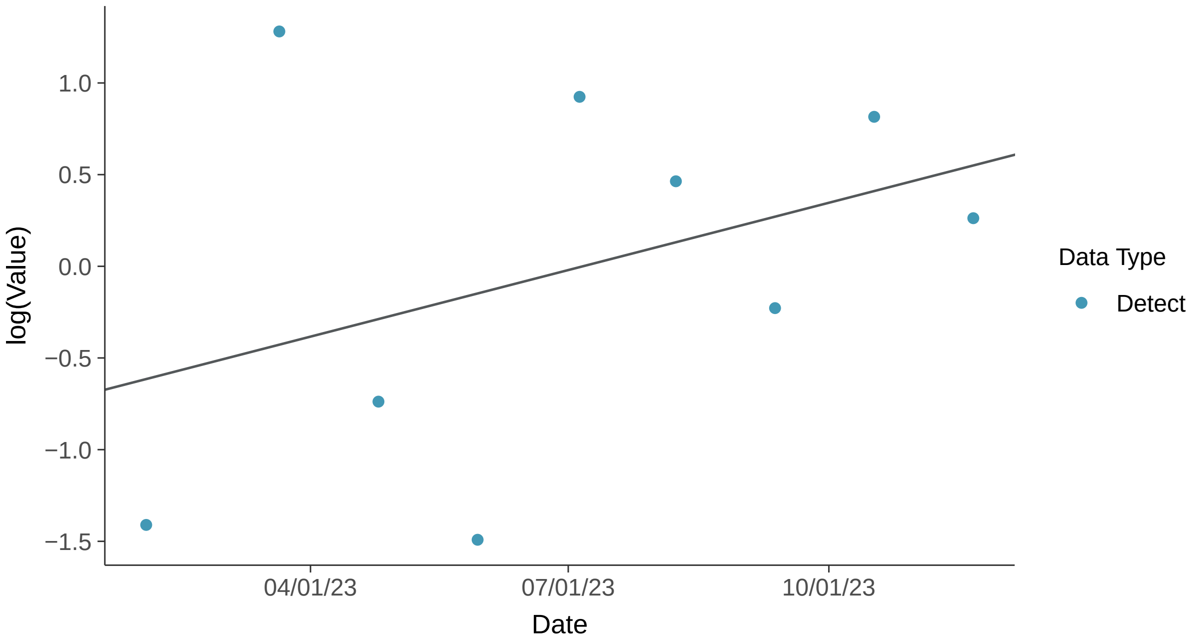
Gamma Q-Q plot

Radium-226/228, MW-16C (pCi/L)



Trend Regression: Lognormal MLE

Radium-226/228, MW-16C (pCi/L)

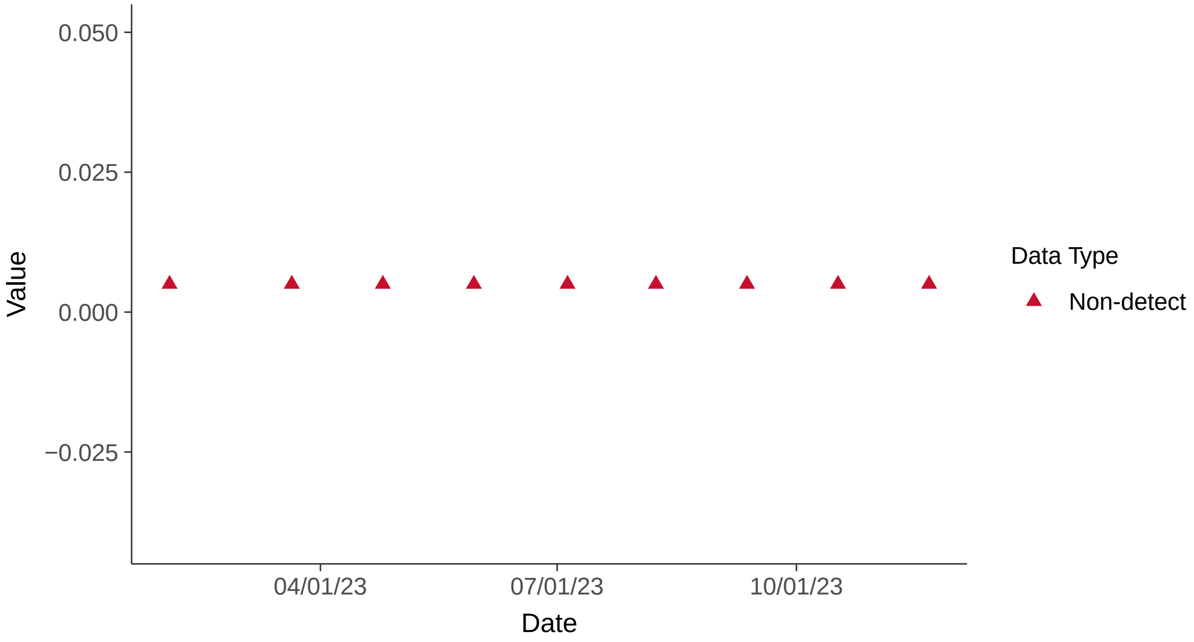


Appendix IV: Selenium, MW-16C

ID: 16C_2_22

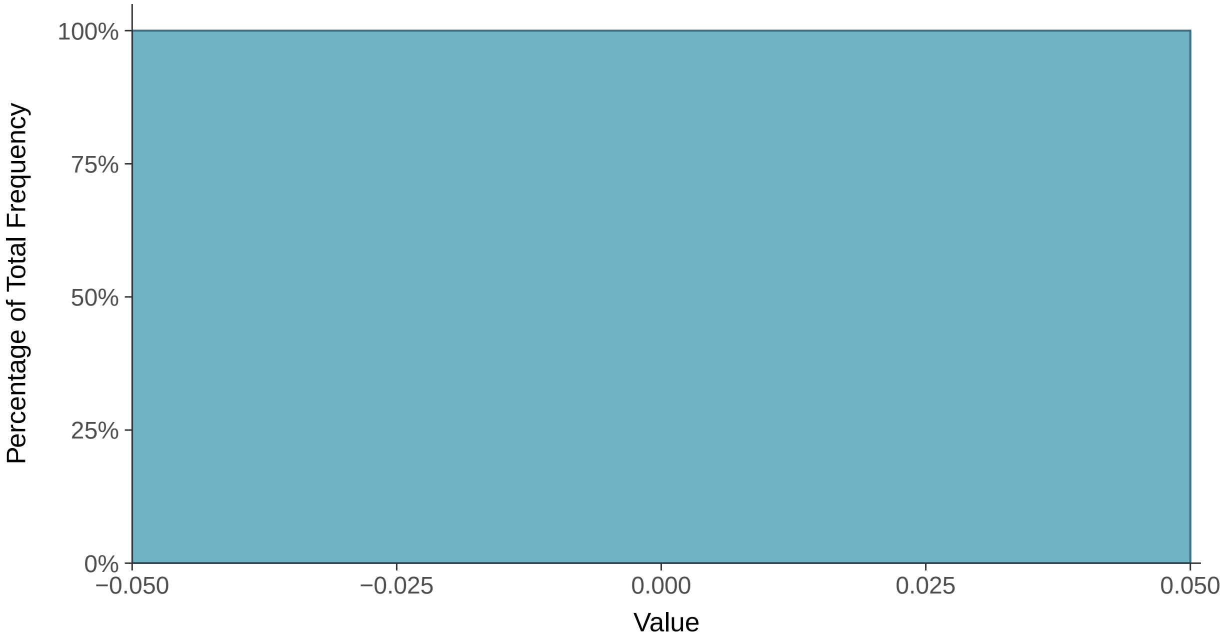
Scatter Plot

Selenium, MW-16C (mg/L)



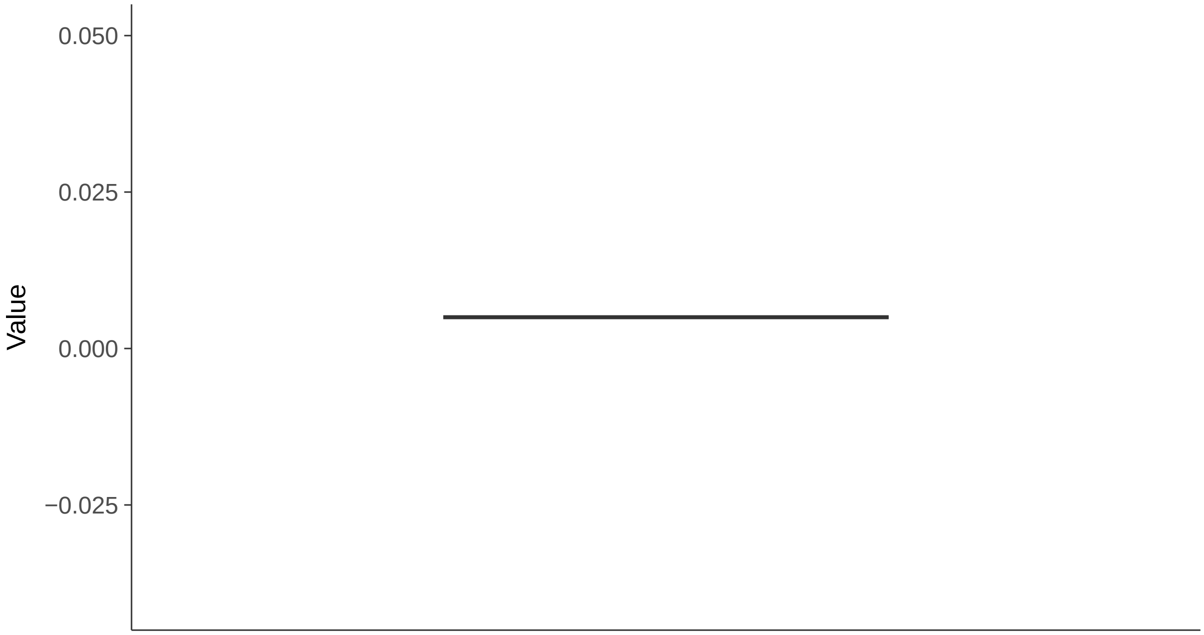
Histogram

Selenium, MW-16C (mg/L)



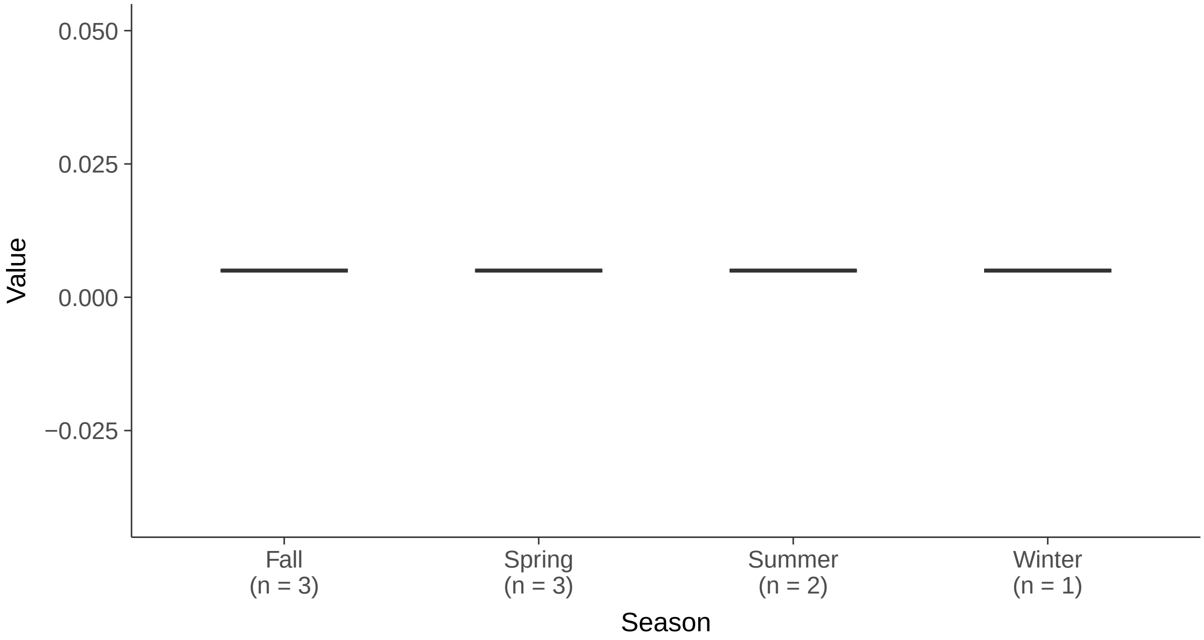
Boxplot

Selenium, MW-16C (mg/L)



Boxplot by Season

Selenium, MW-16C (mg/L)

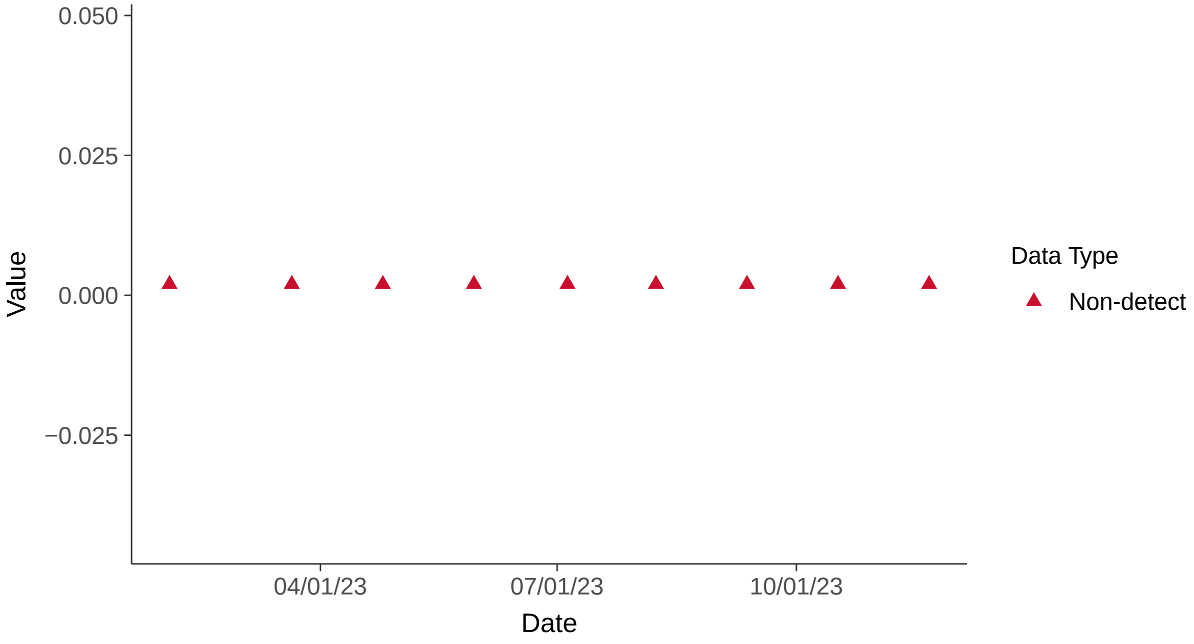


Appendix IV: Thallium, MW-16C

ID: 16C_2_23

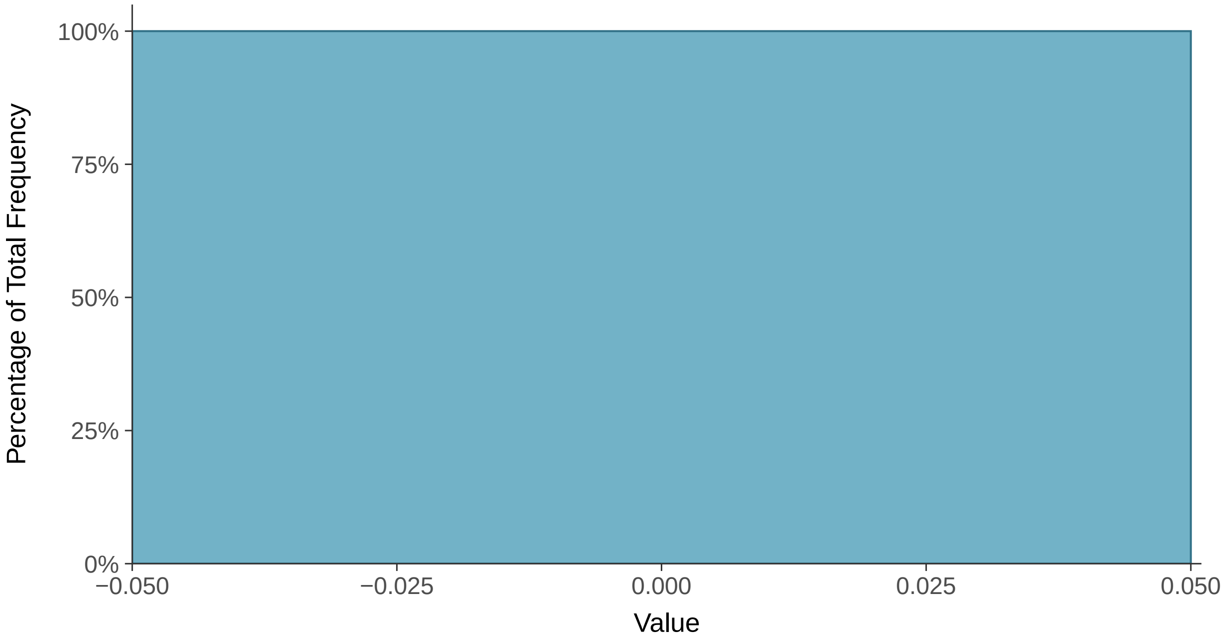
Scatter Plot

Thallium, MW-16C (mg/L)



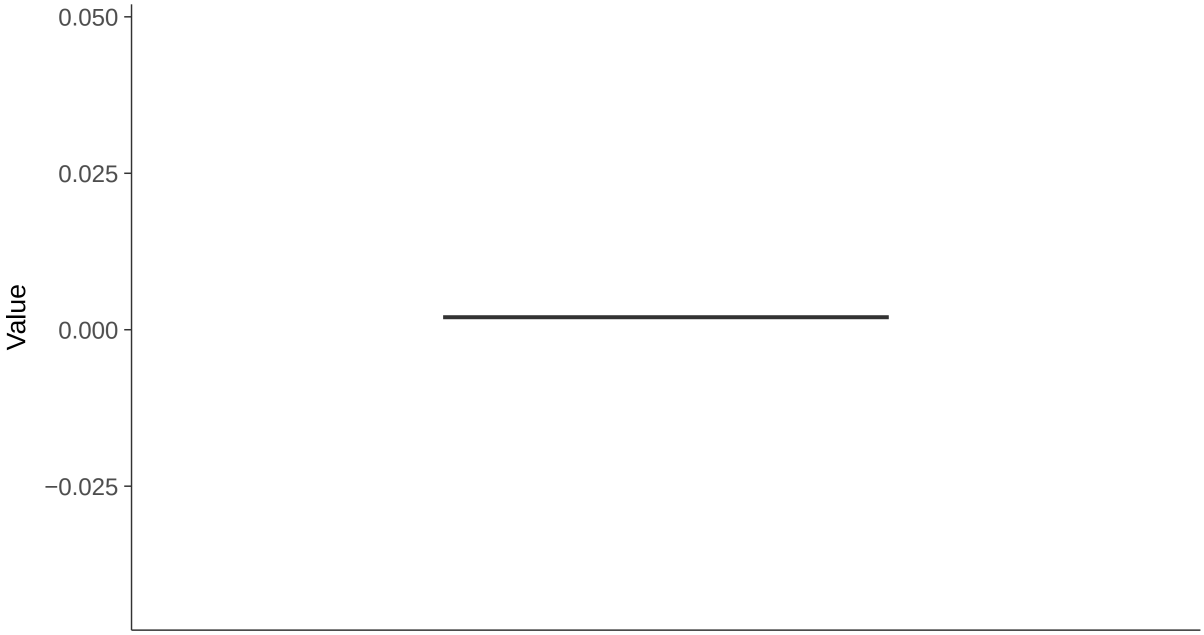
Histogram

Thallium, MW-16C (mg/L)



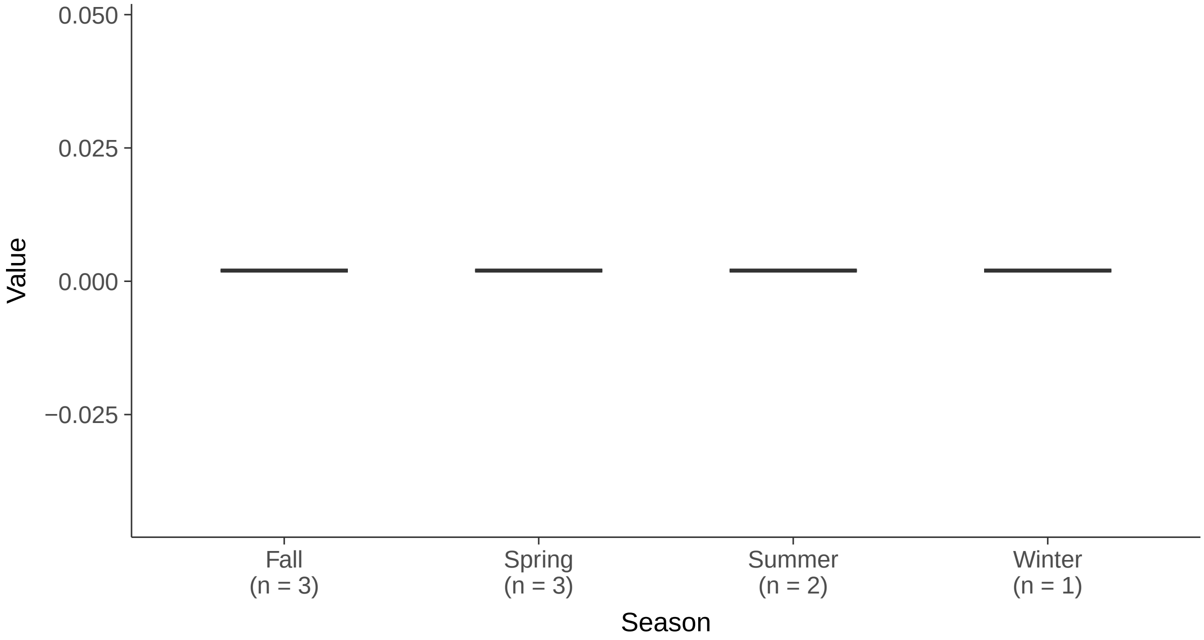
Boxplot

Thallium, MW-16C (mg/L)



Boxplot by Season

Thallium, MW-16C (mg/L)

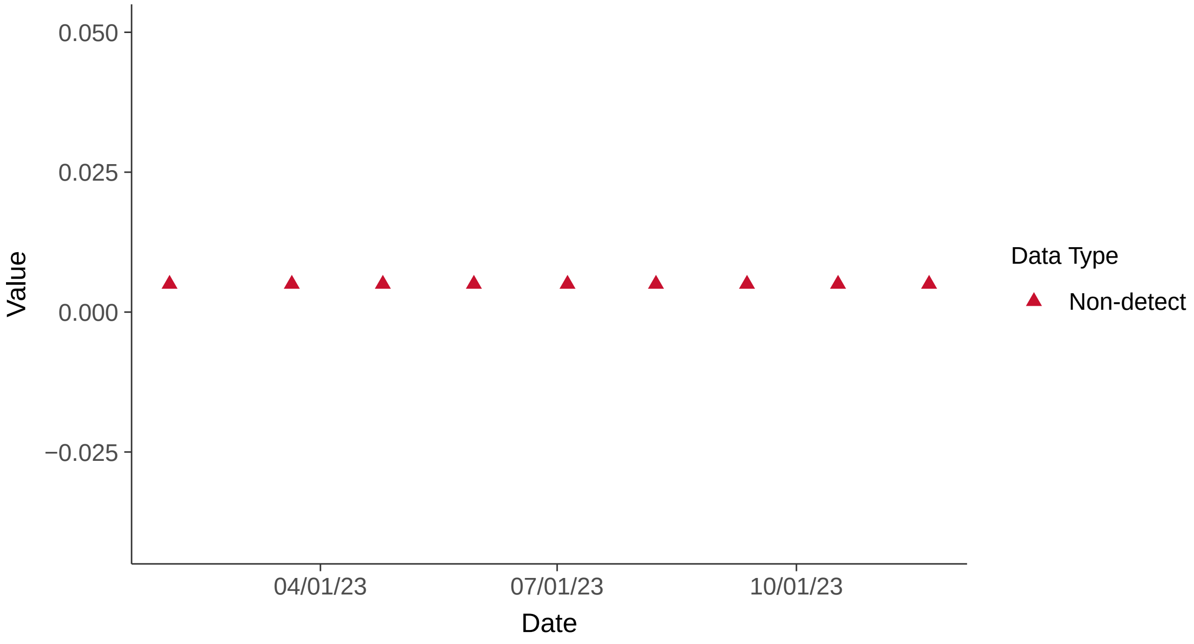


Part 115: Copper, MW-16C

ID: 16C_5_37

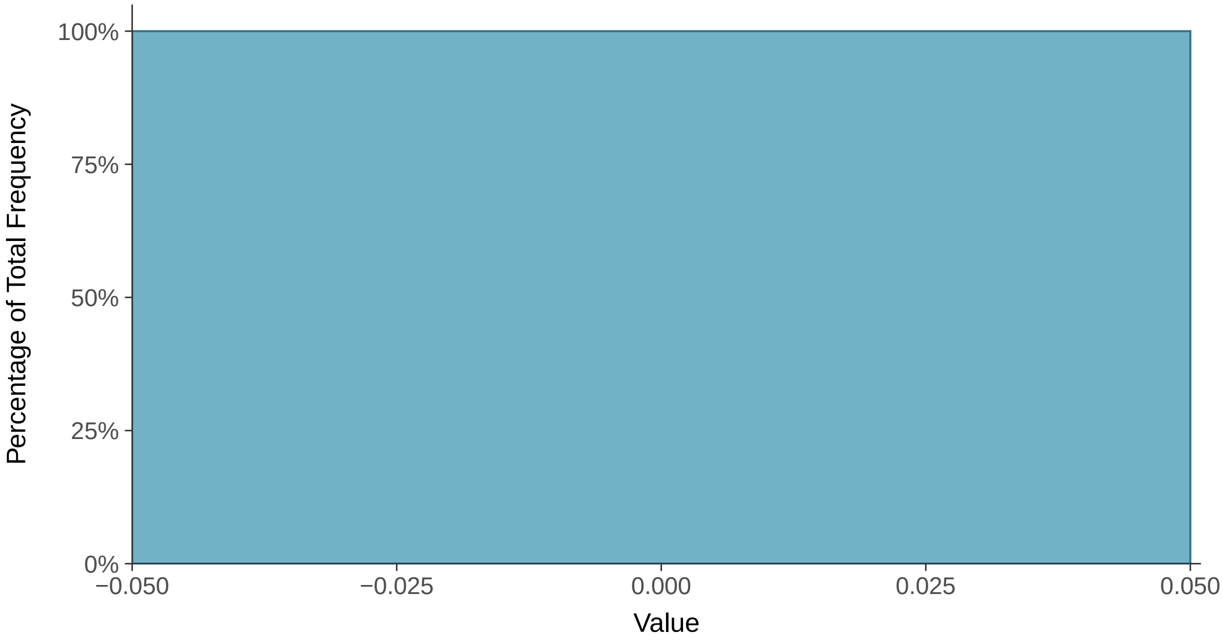
Scatter Plot

Copper, MW-16C (mg/L)



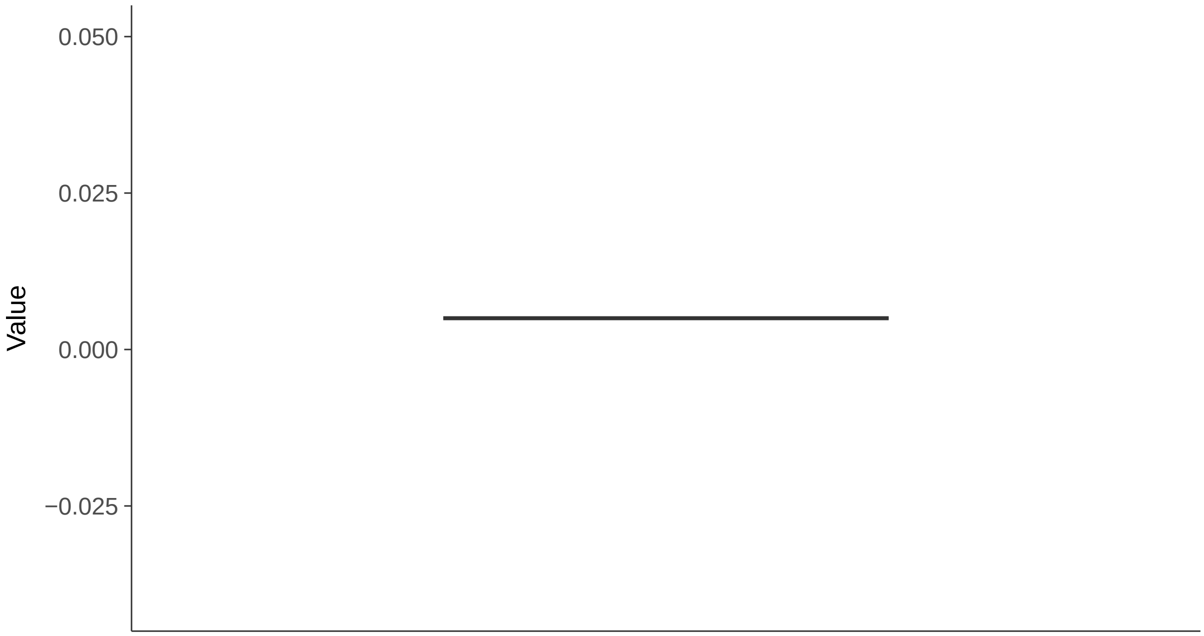
Histogram

Copper, MW-16C (mg/L)



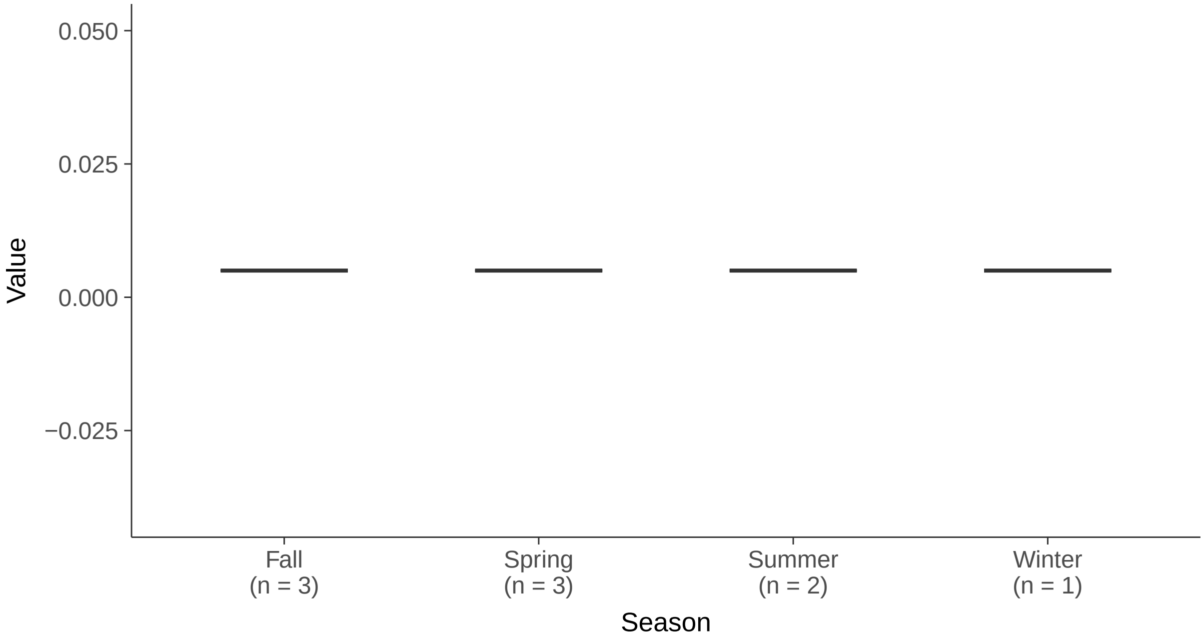
Boxplot

Copper, MW-16C (mg/L)



Boxplot by Season

Copper, MW-16C (mg/L)

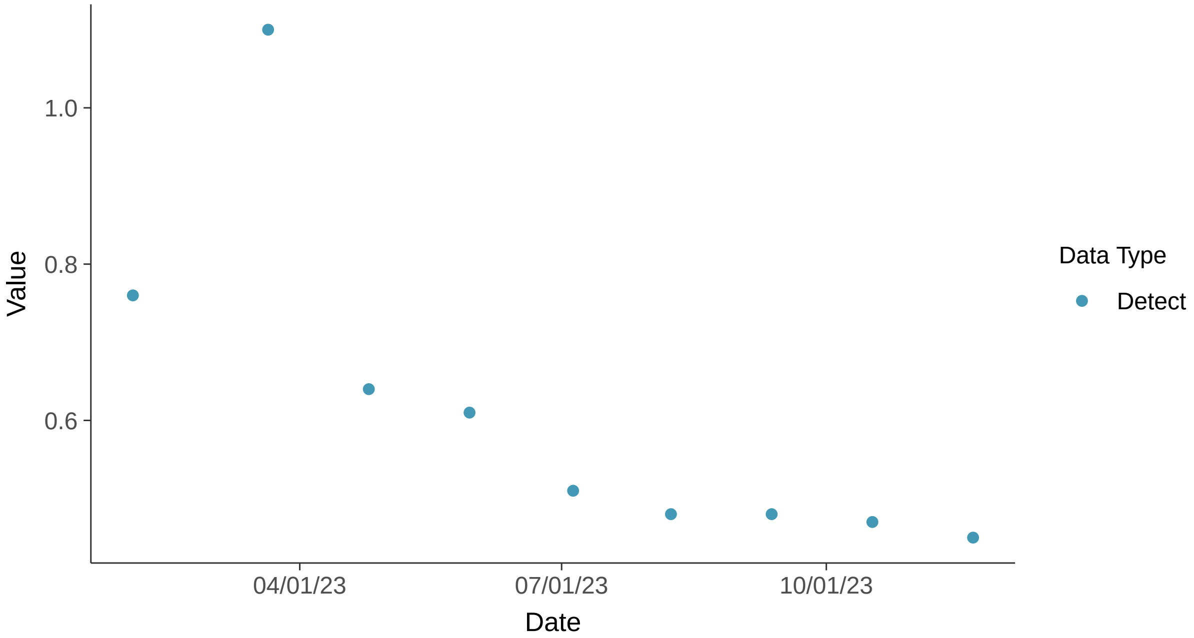


Part 115: Iron, MW-16C

ID: 16C_5_38

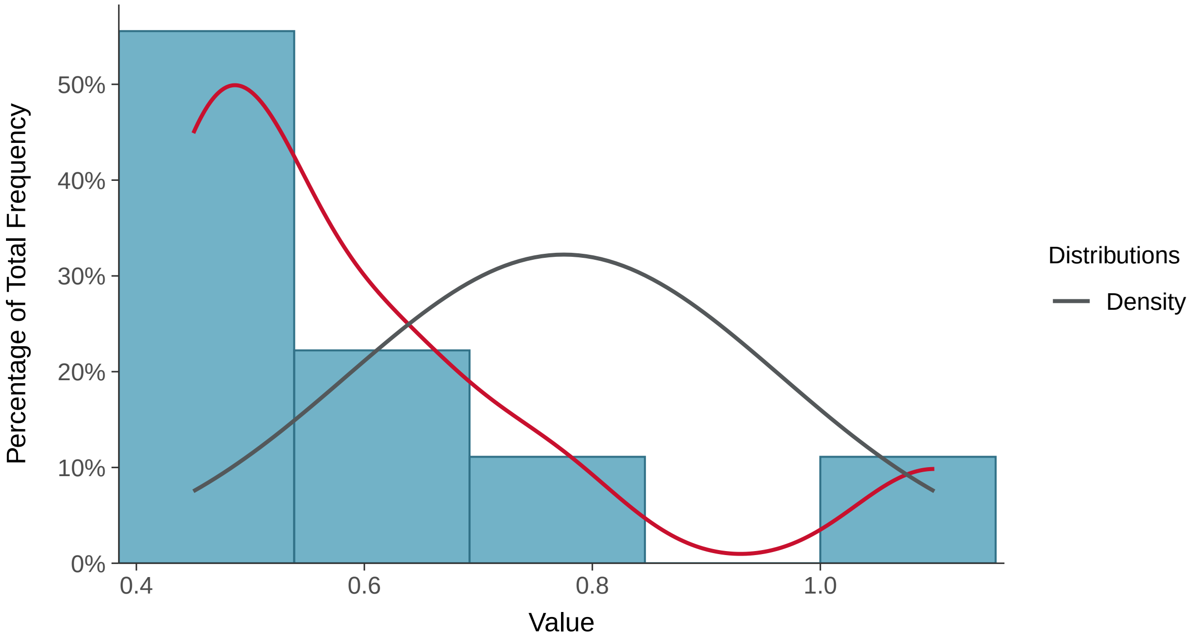
Scatter Plot

Iron, MW-16C (mg/L)



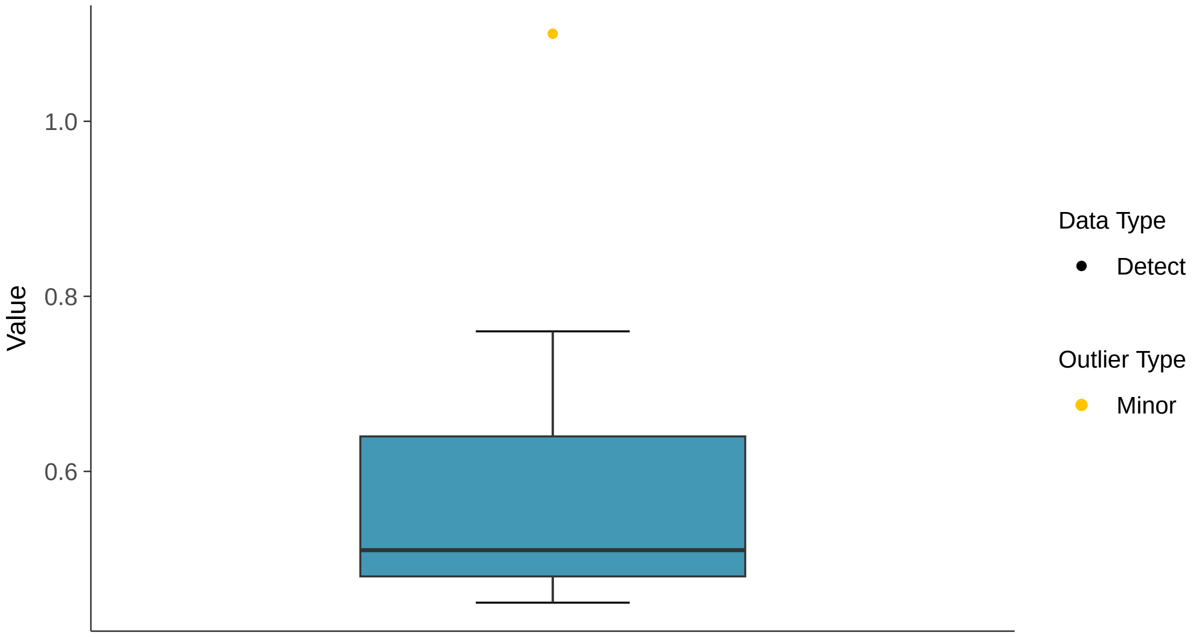
Histogram

Iron, MW-16C (mg/L)



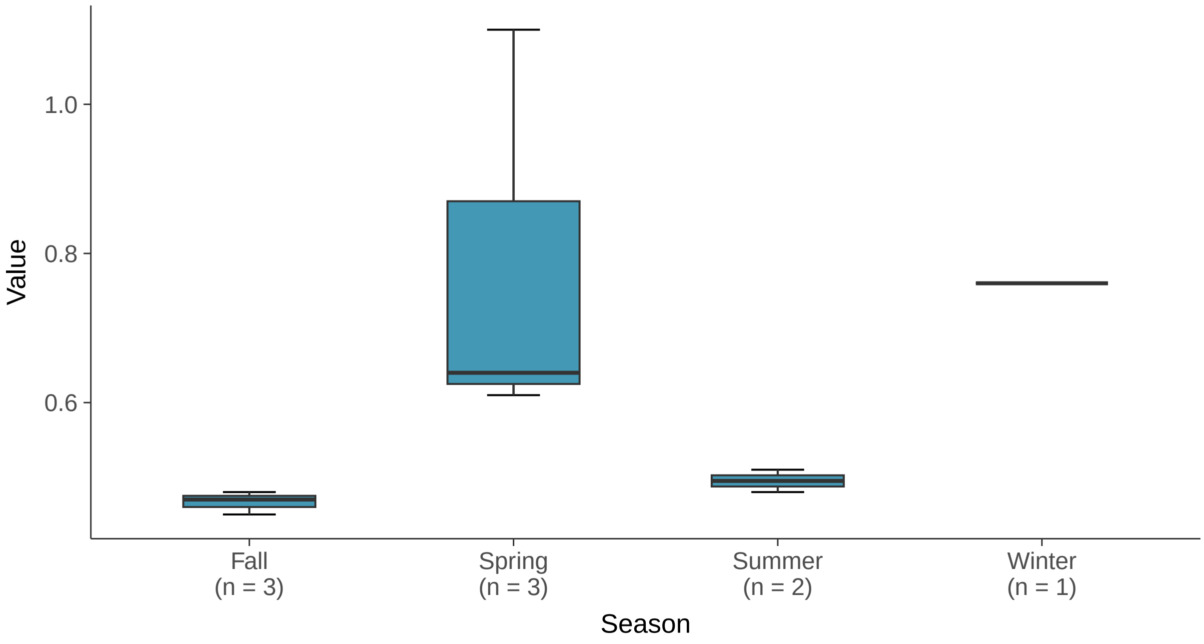
Boxplot

Iron, MW-16C (mg/L)



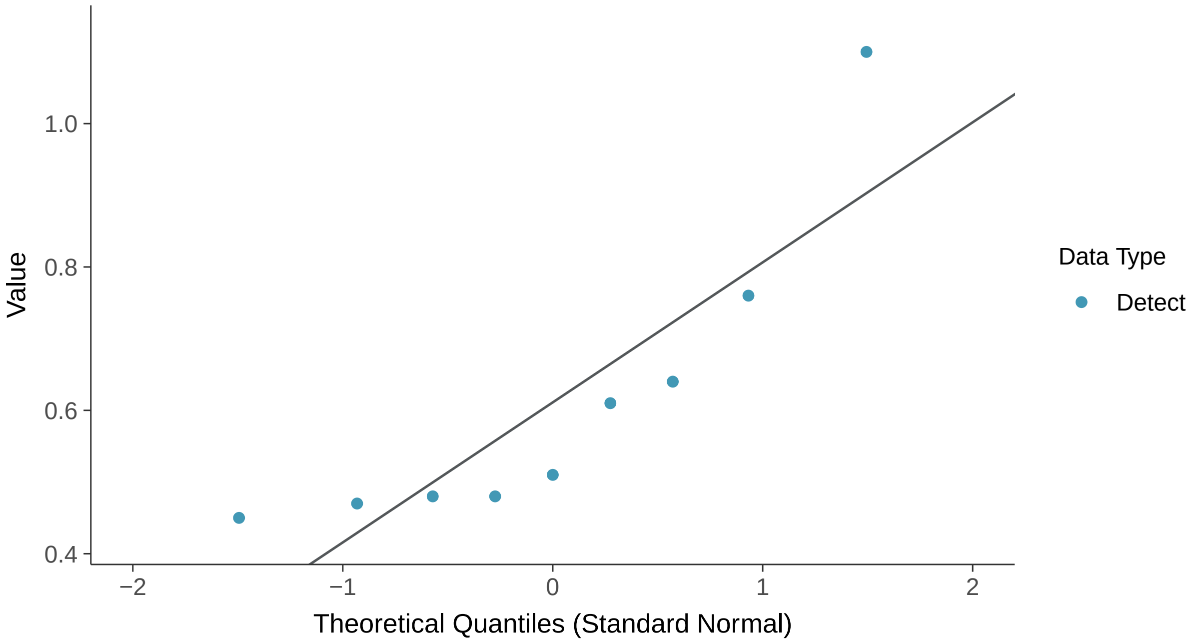
Boxplot by Season

Iron, MW-16C (mg/L)



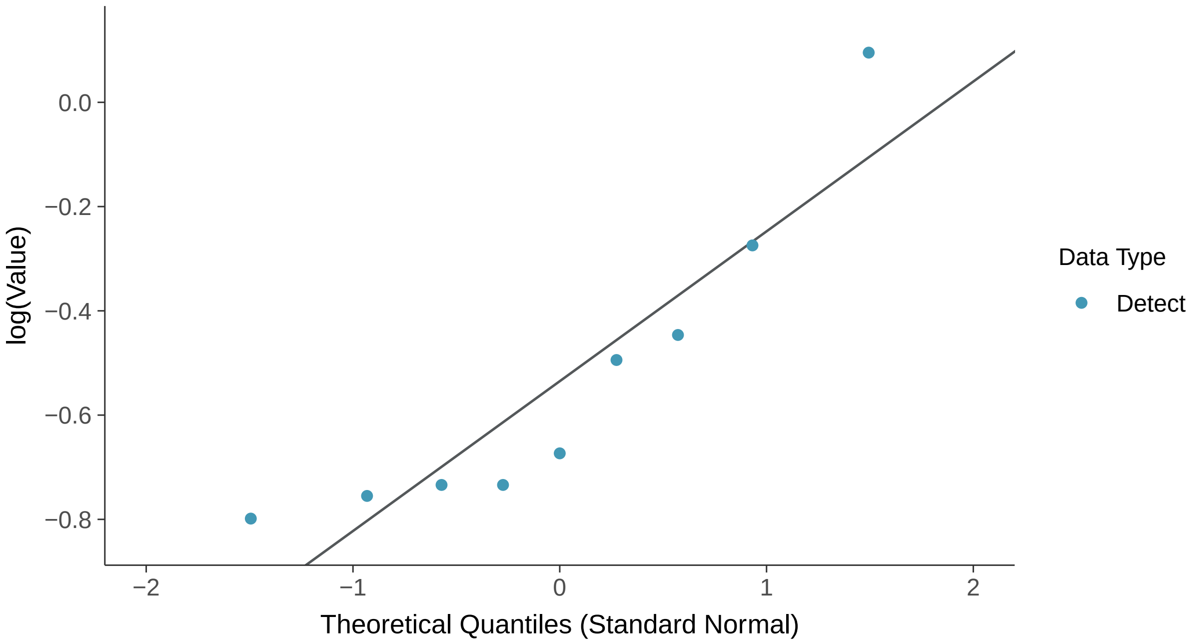
Normal Q-Q plot

Iron, MW-16C (mg/L)



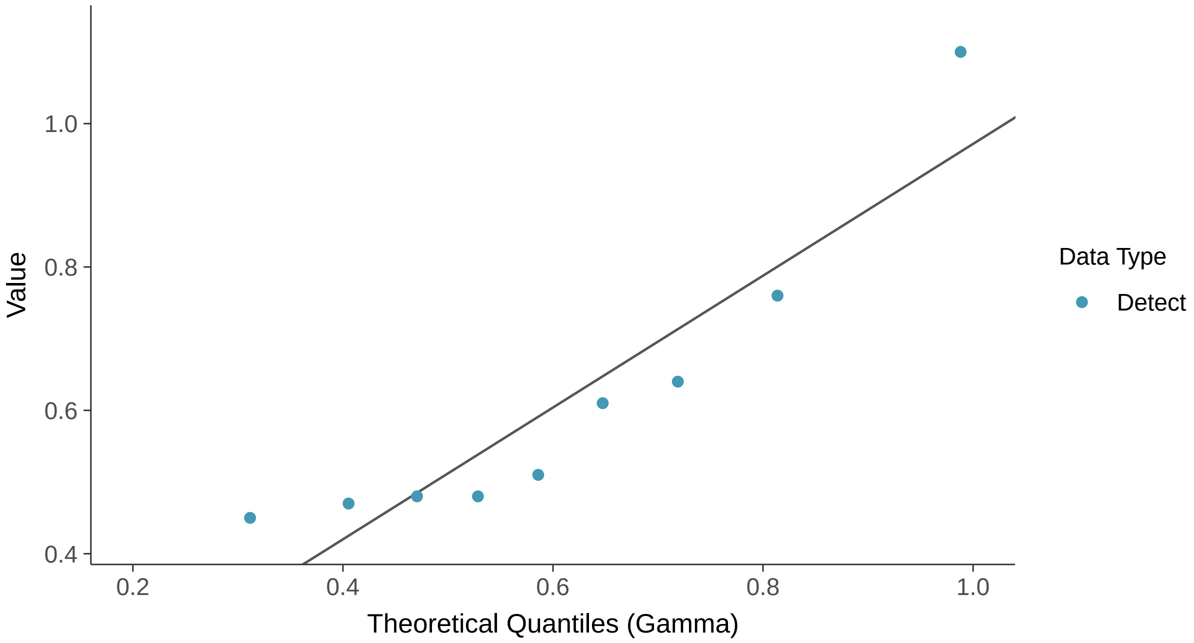
Lognormal Q-Q plot

Iron, MW-16C (mg/L)



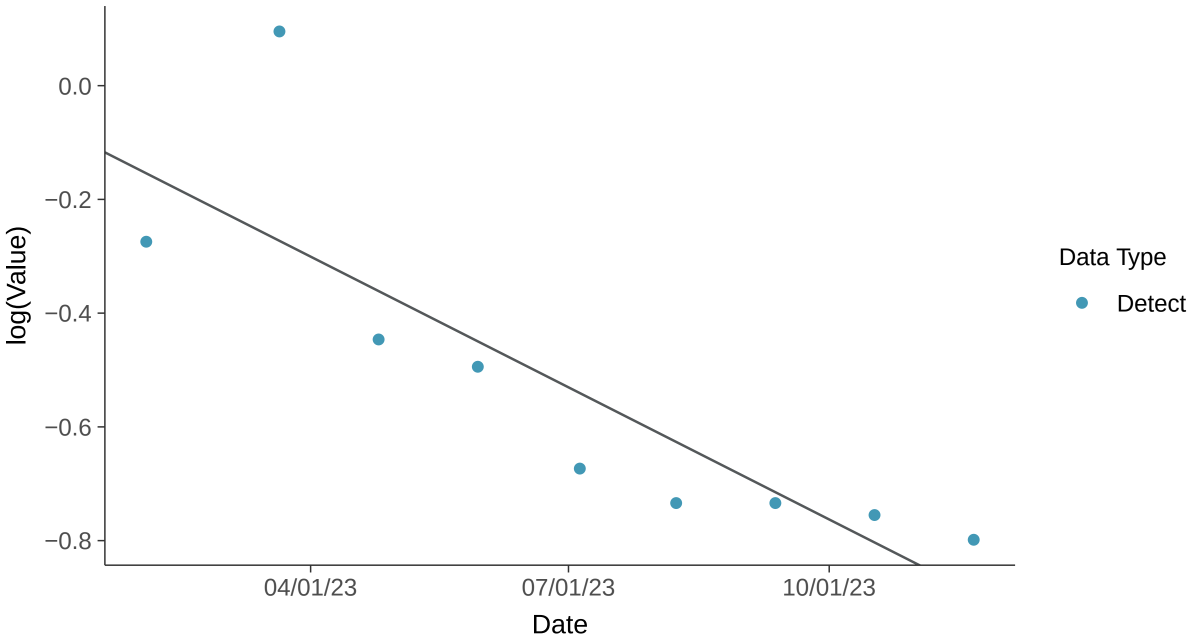
Gamma Q-Q plot

Iron, MW-16C (mg/L)



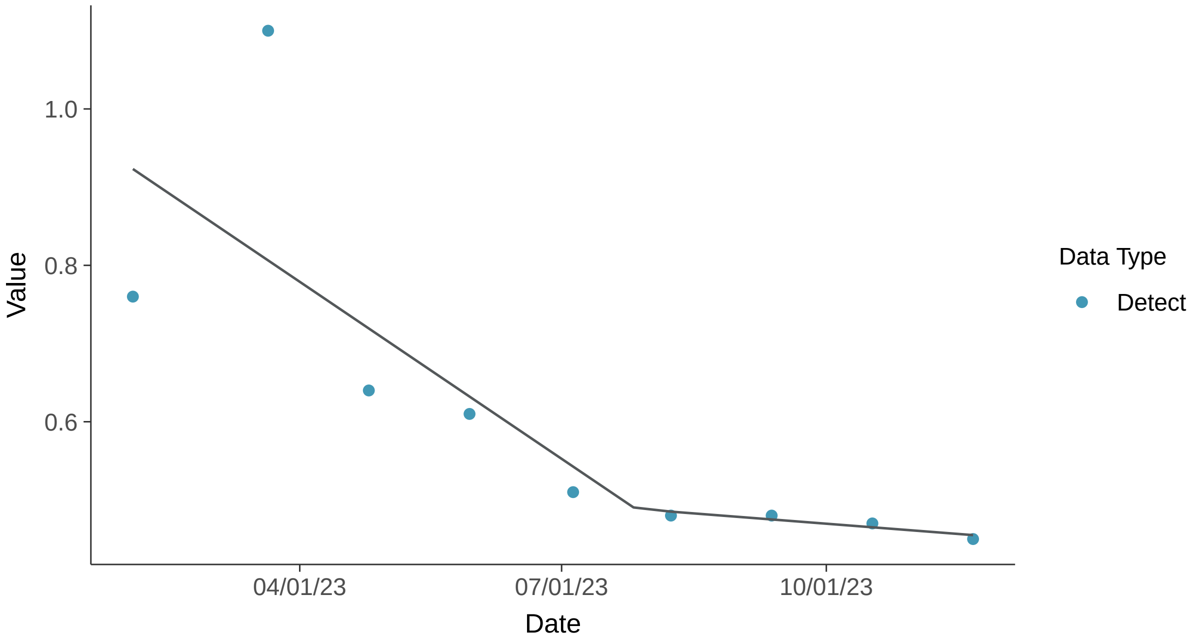
Trend Regression: Lognormal MLE

Iron, MW-16C (mg/L)



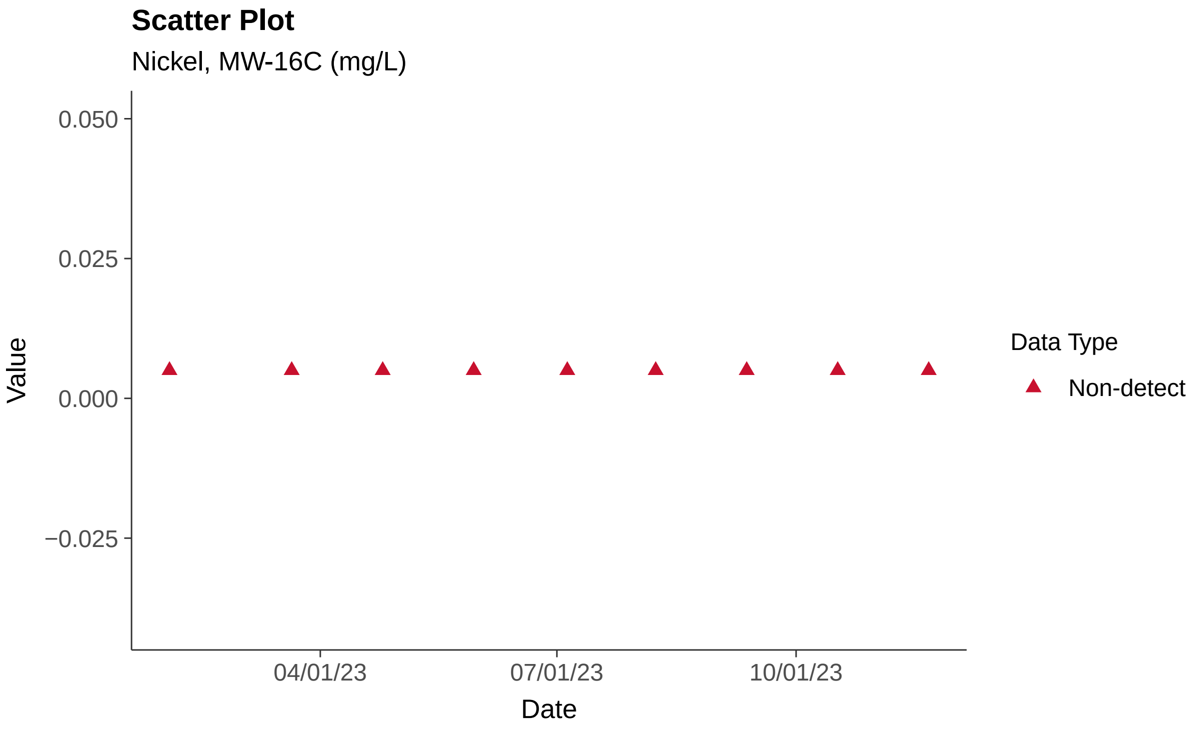
Trend Regression: Piecewise Linear-Linear

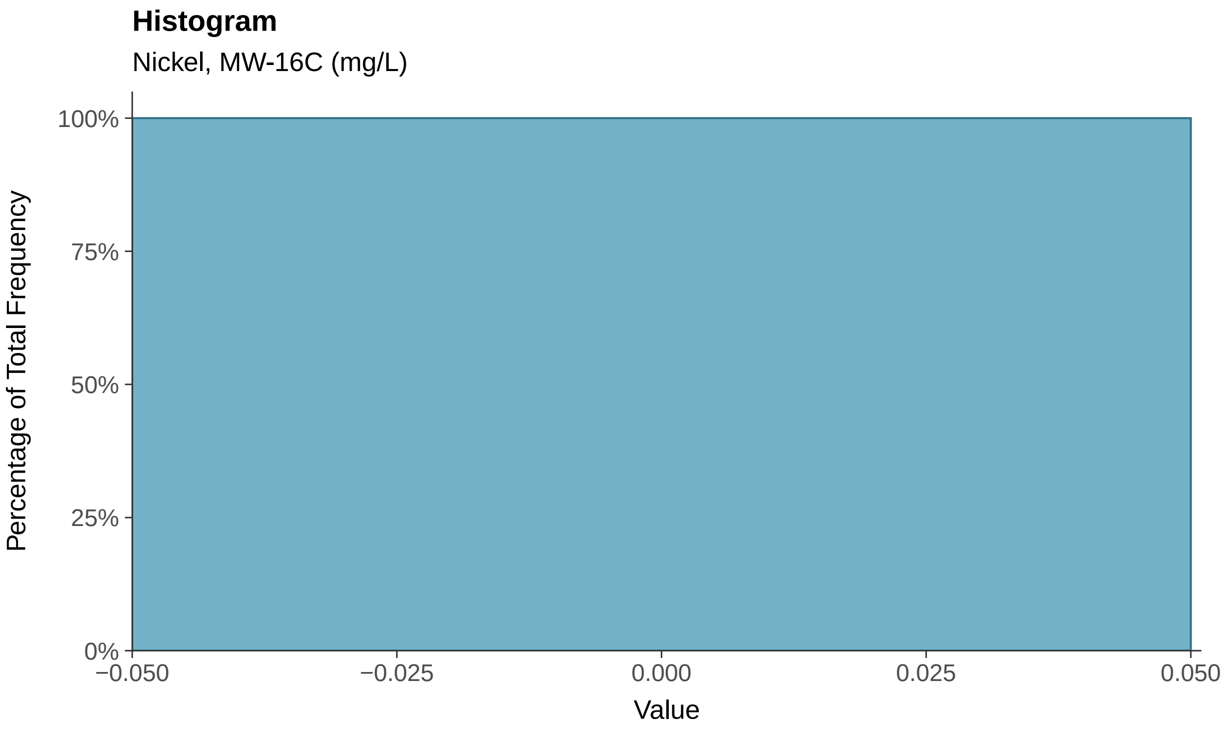
Iron, MW-16C (mg/L)



Part 115: Nickel, MW-16C

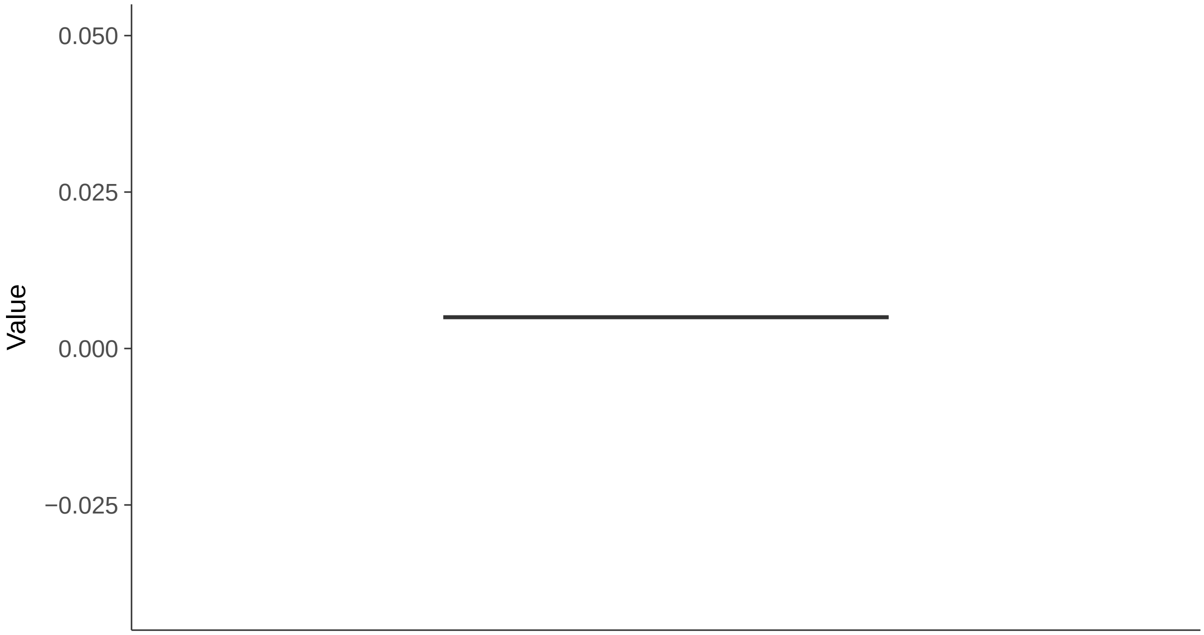
ID: 16C_5_39





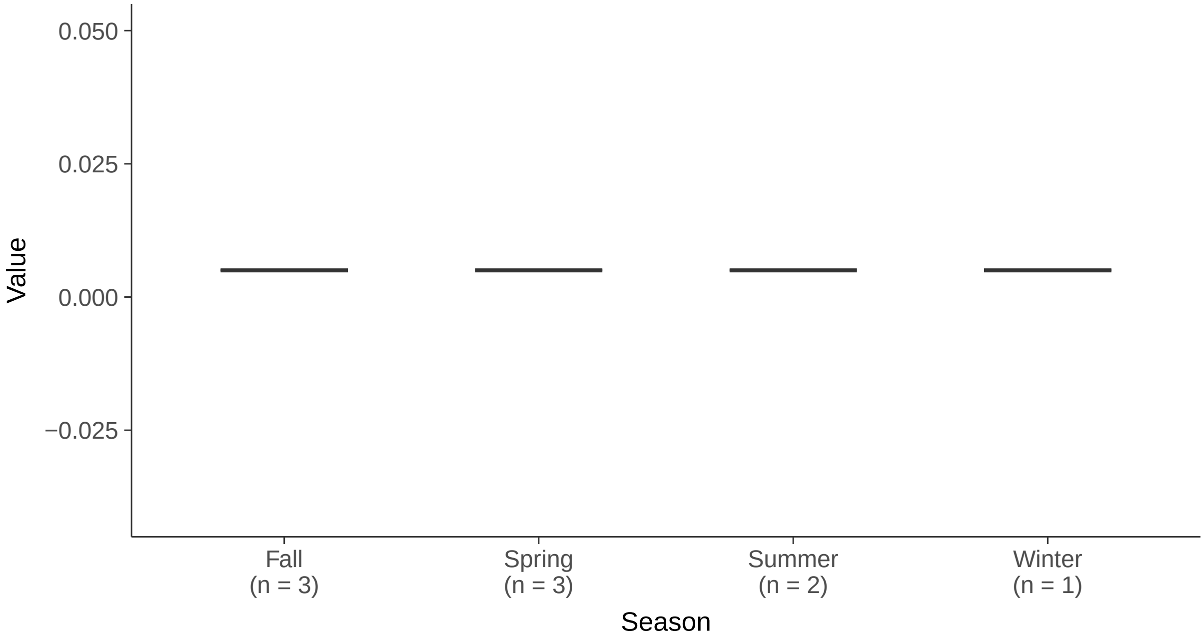
Boxplot

Nickel, MW-16C (mg/L)



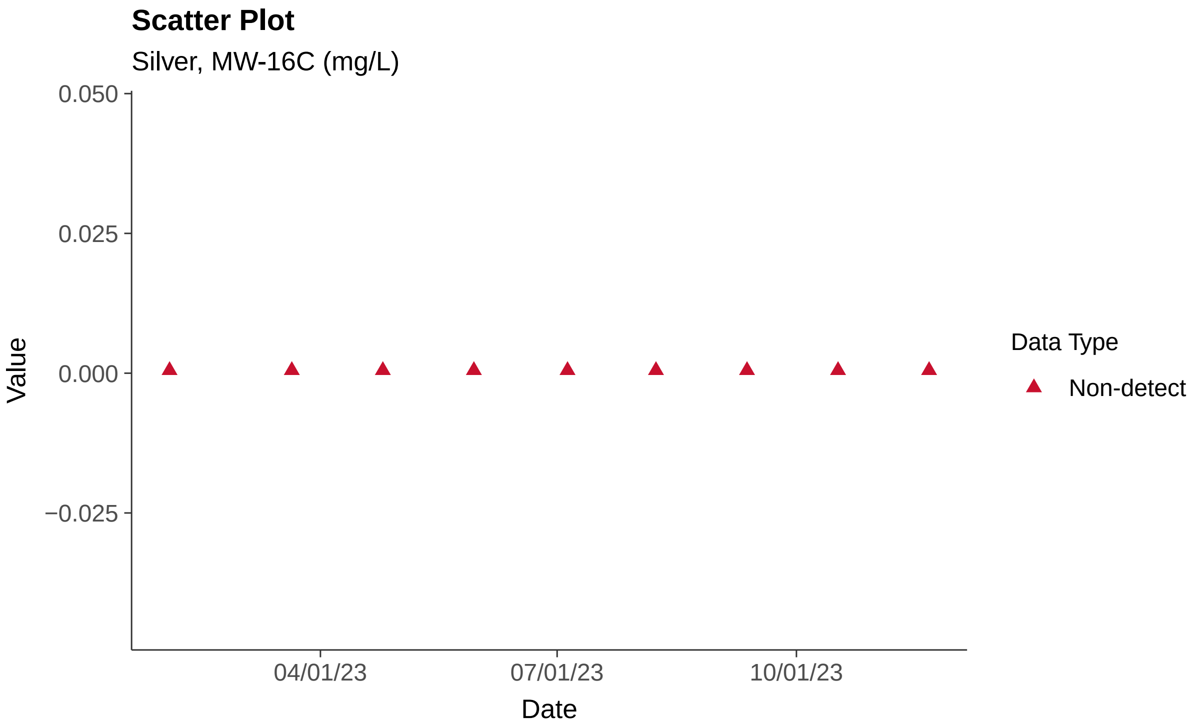
Boxplot by Season

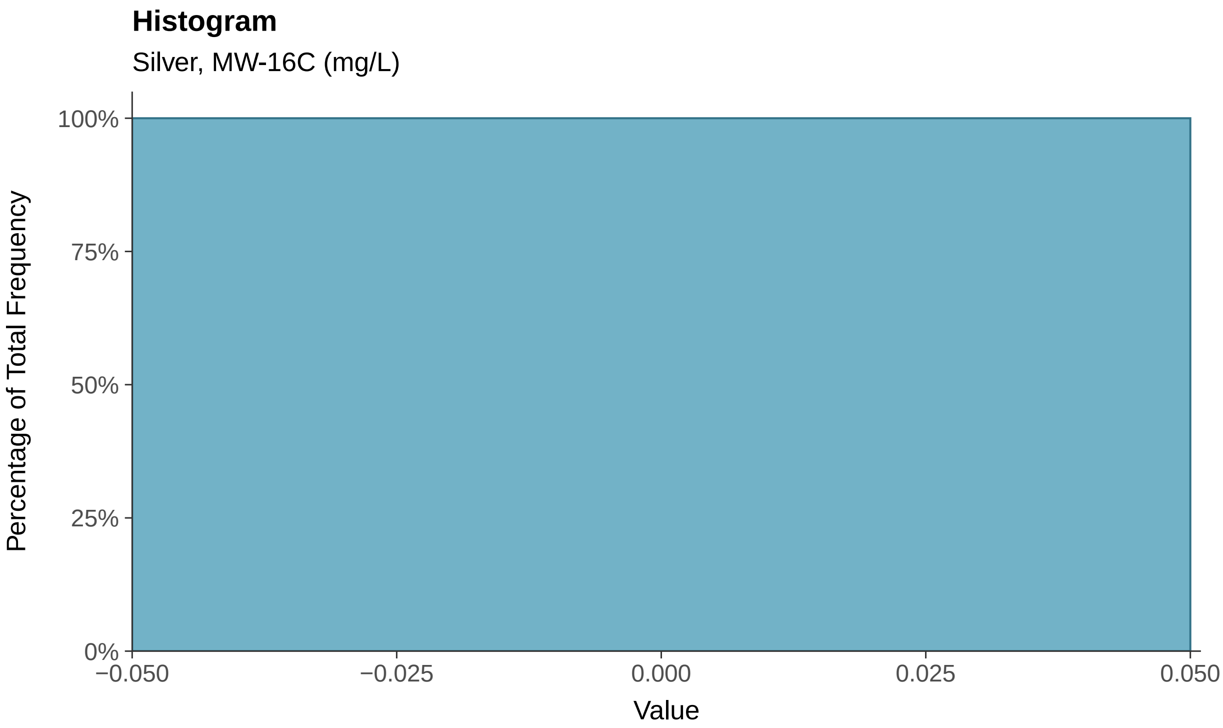
Nickel, MW-16C (mg/L)



Part 115: Silver, MW-16C

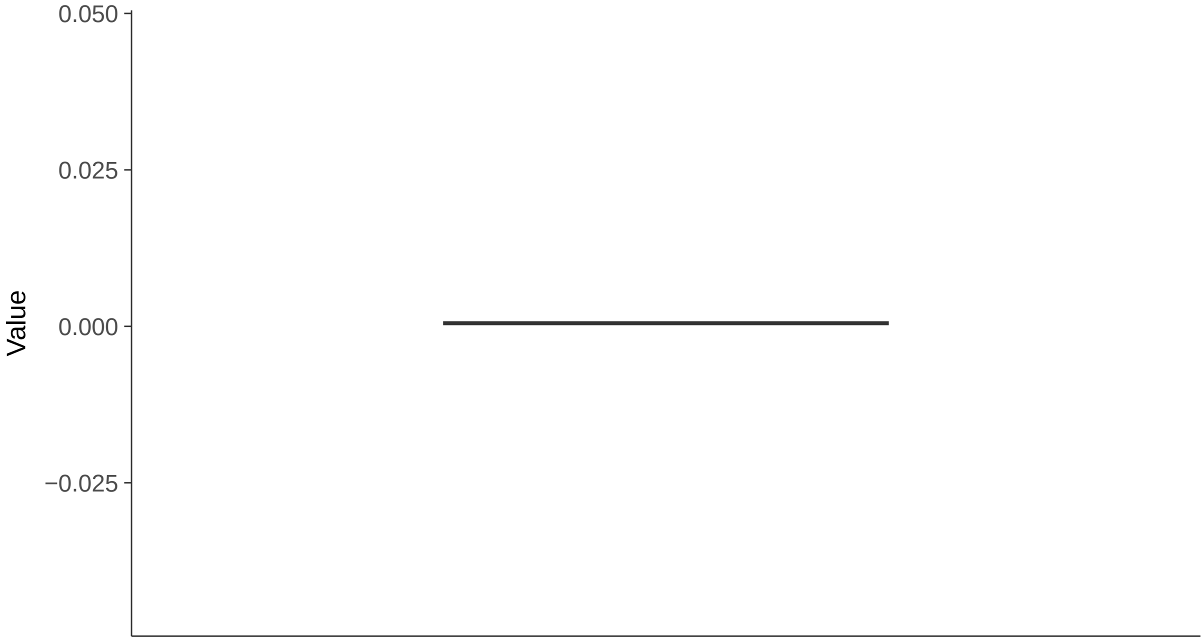
ID: 16C_5_40





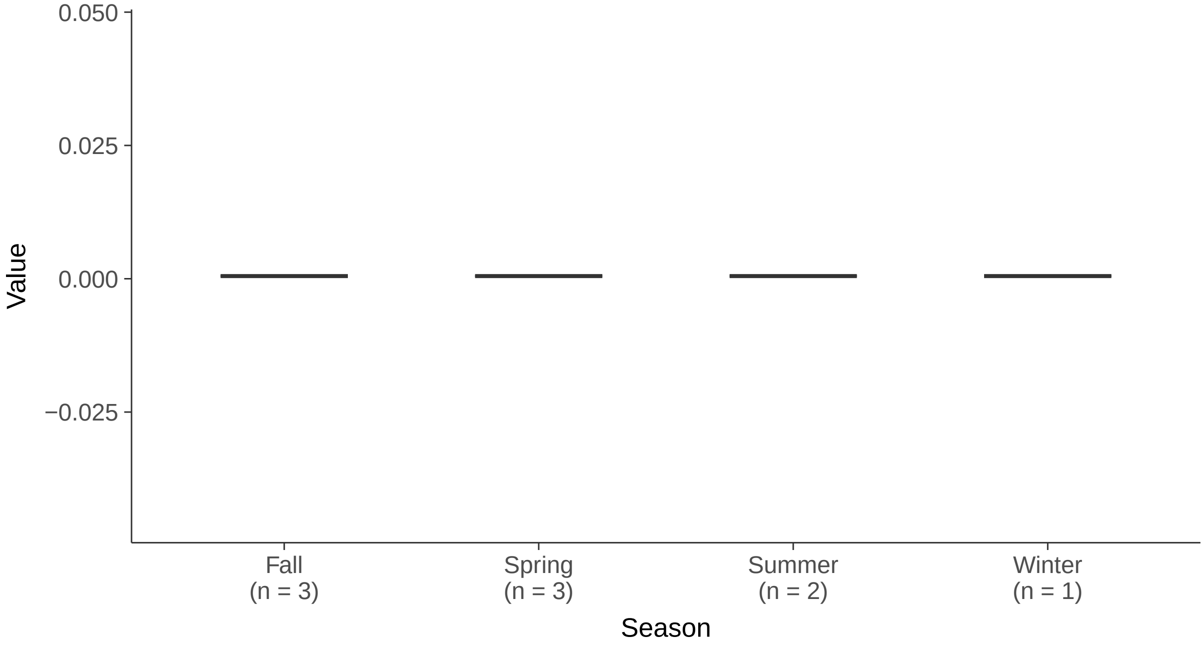
Boxplot

Silver, MW-16C (mg/L)



Boxplot by Season

Silver, MW-16C (mg/L)

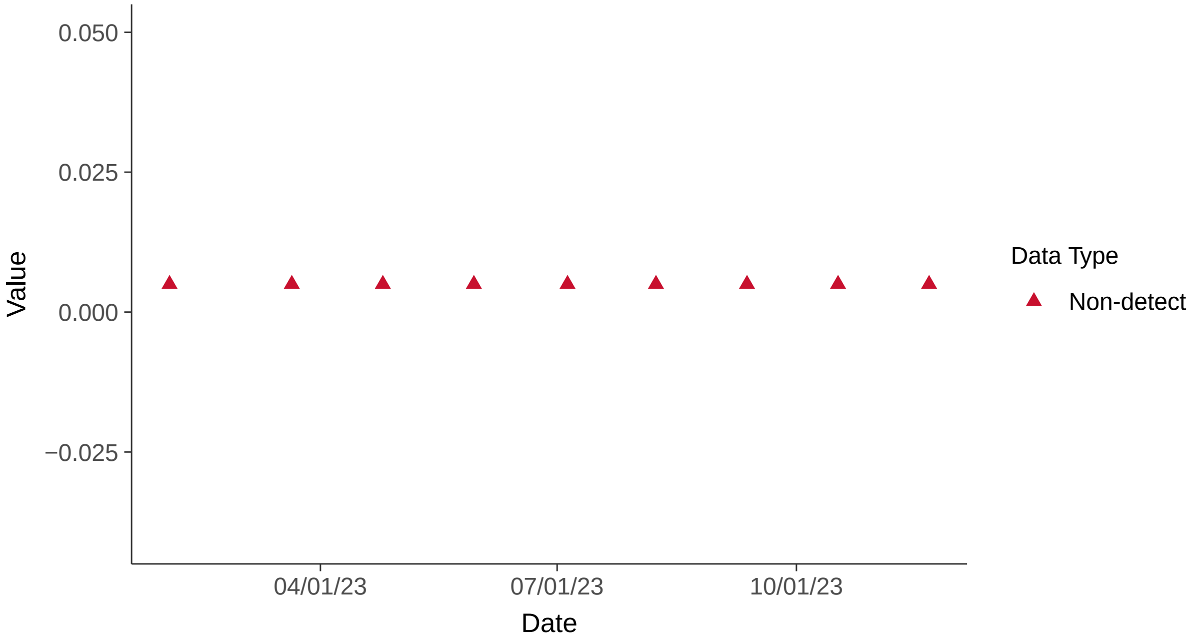


Part 115: Vanadium, MW-16C

ID: 16C_5_41

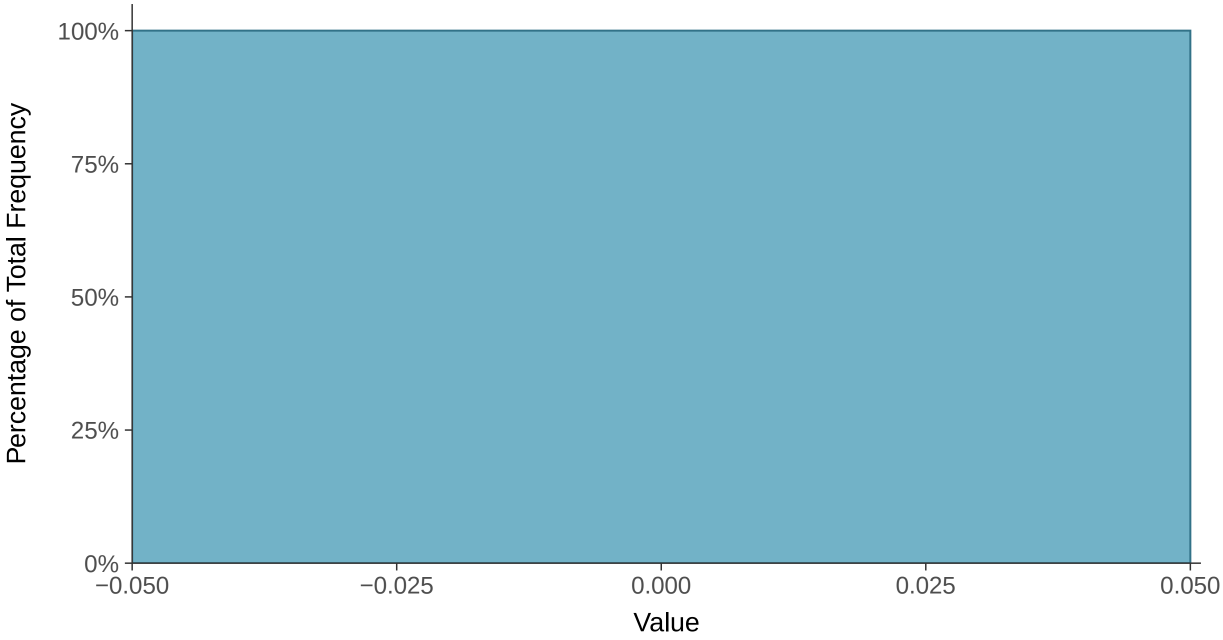
Scatter Plot

Vanadium, MW-16C (mg/L)



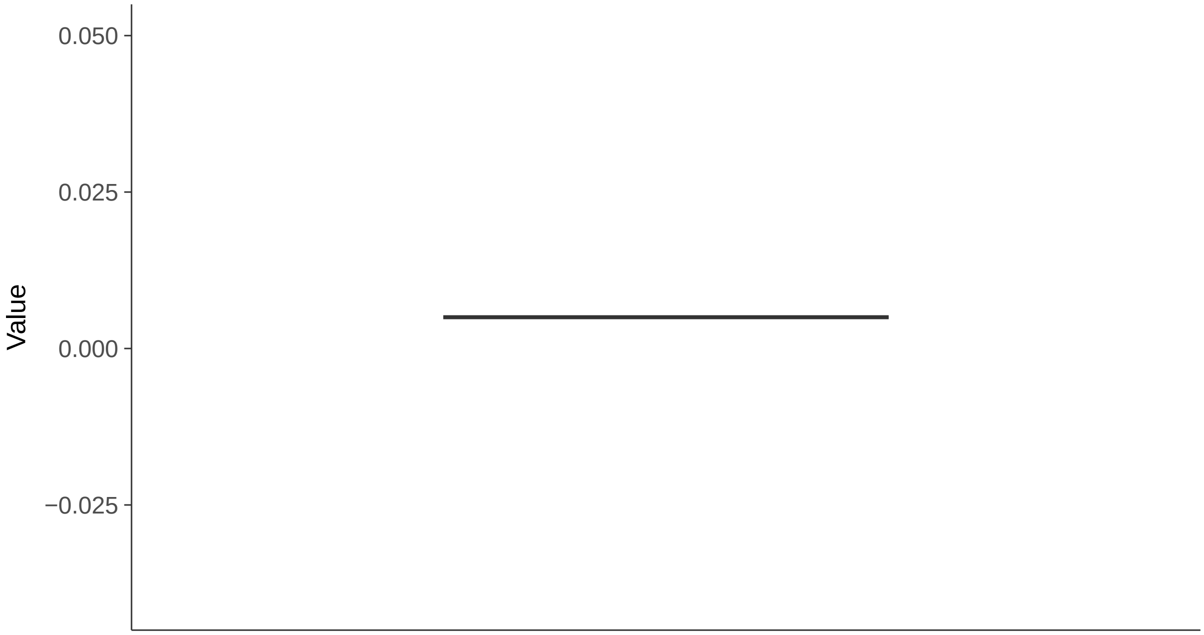
Histogram

Vanadium, MW-16C (mg/L)



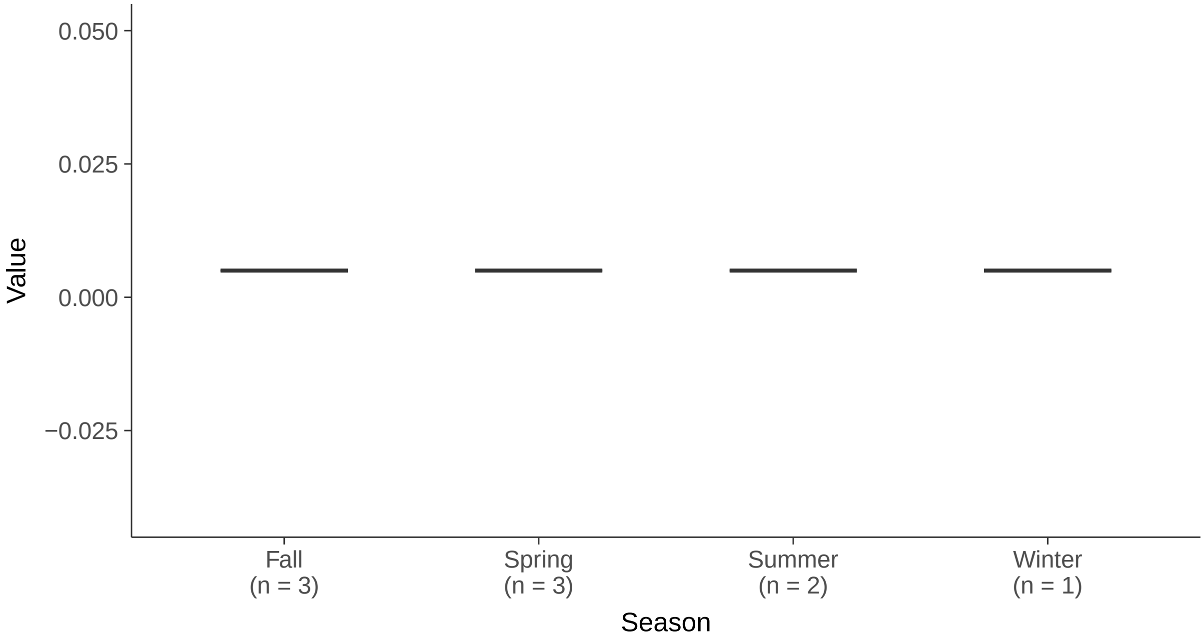
Boxplot

Vanadium, MW-16C (mg/L)



Boxplot by Season

Vanadium, MW-16C (mg/L)

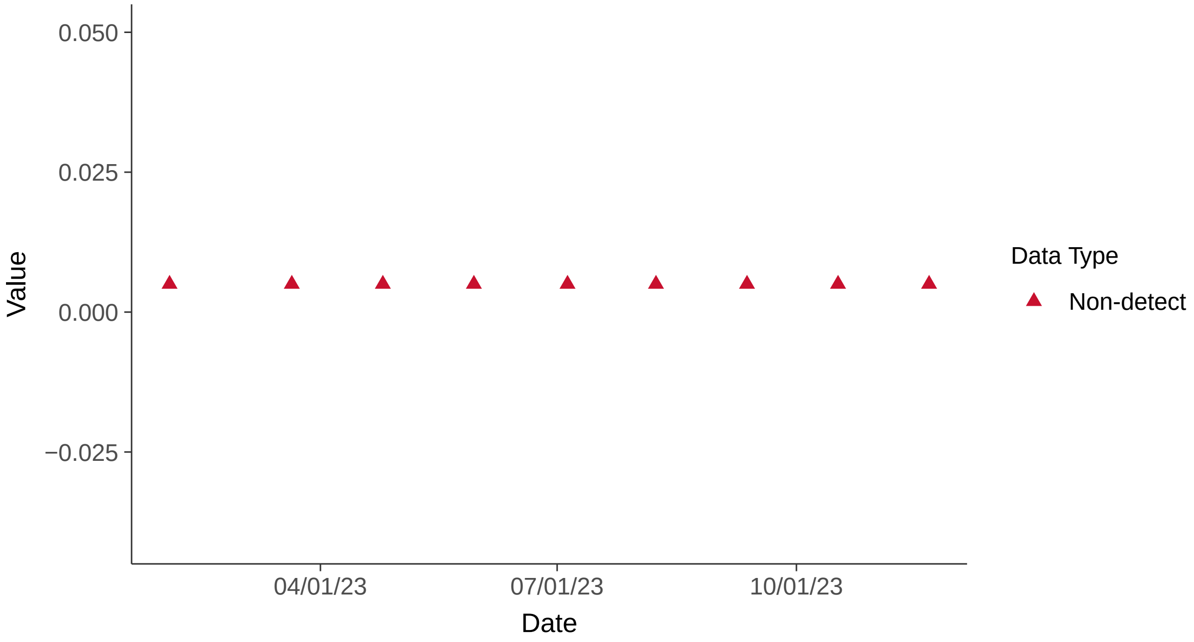


Part 115: Zinc, MW-16C

ID: 16C_5_42

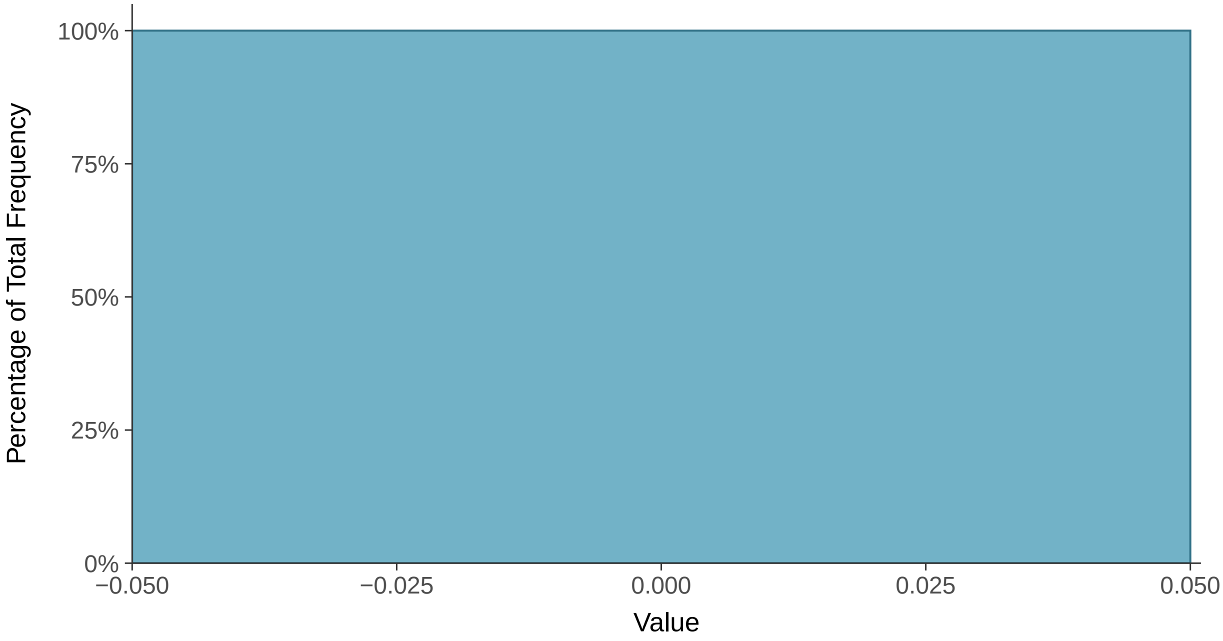
Scatter Plot

Zinc, MW-16C (mg/L)



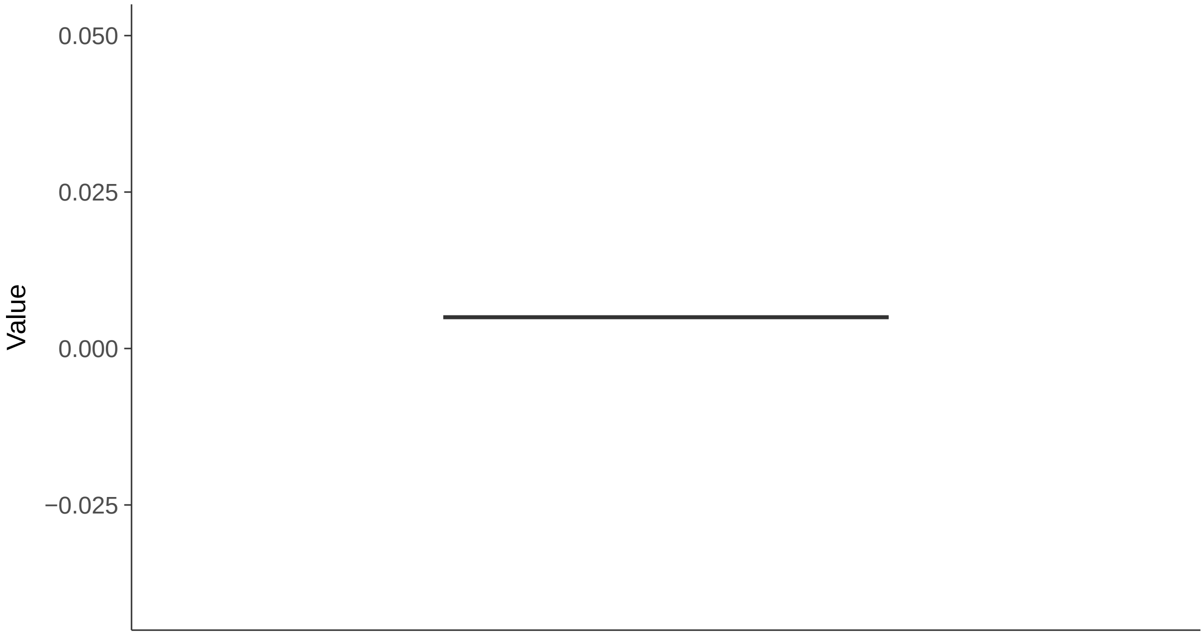
Histogram

Zinc, MW-16C (mg/L)



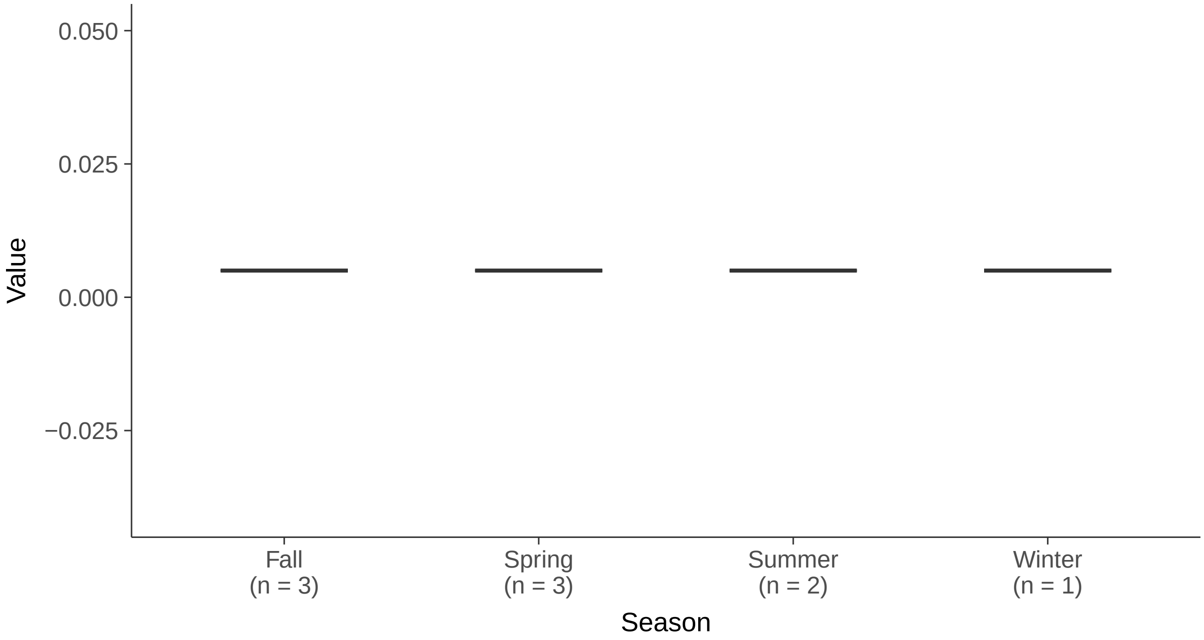
Boxplot

Zinc, MW-16C (mg/L)



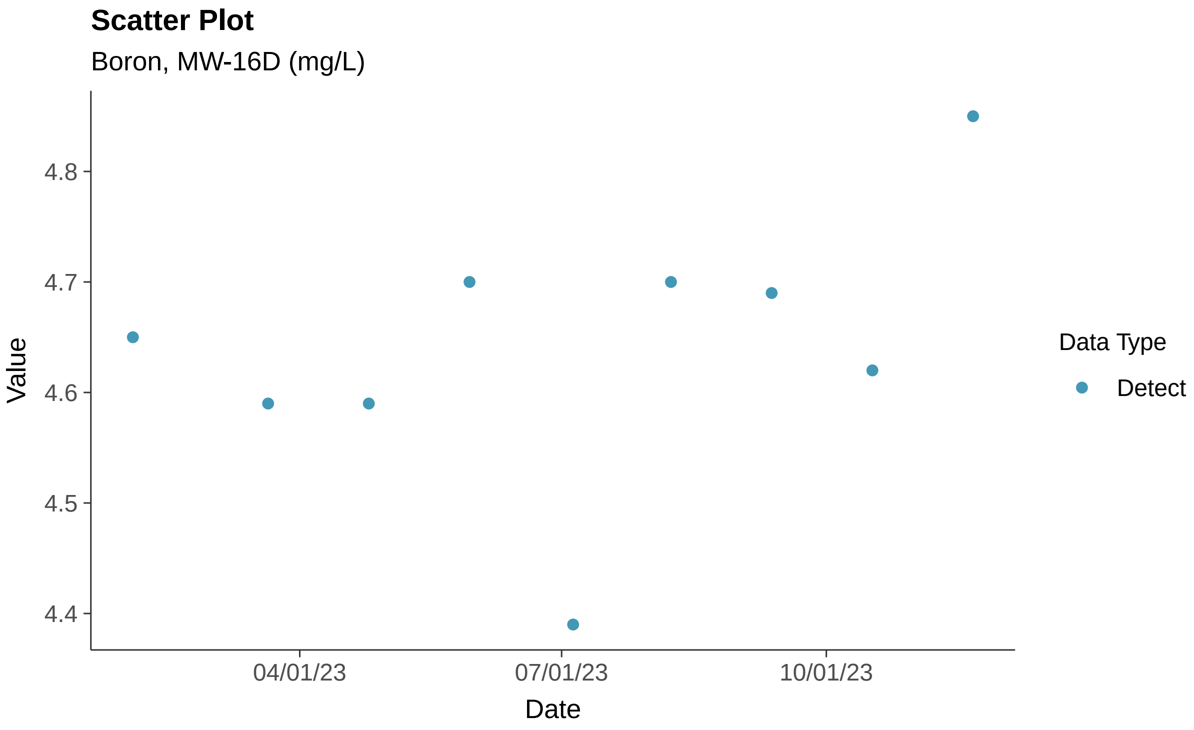
Boxplot by Season

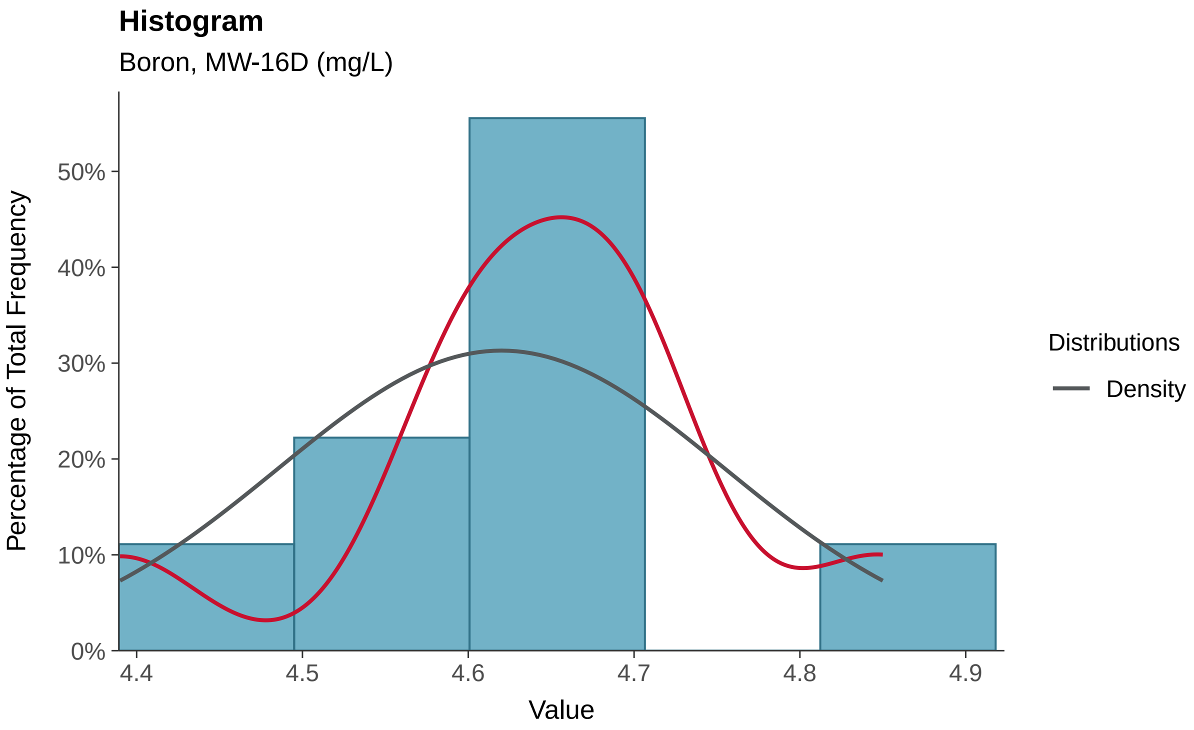
Zinc, MW-16C (mg/L)



Appendix III: Boron, MW-16D

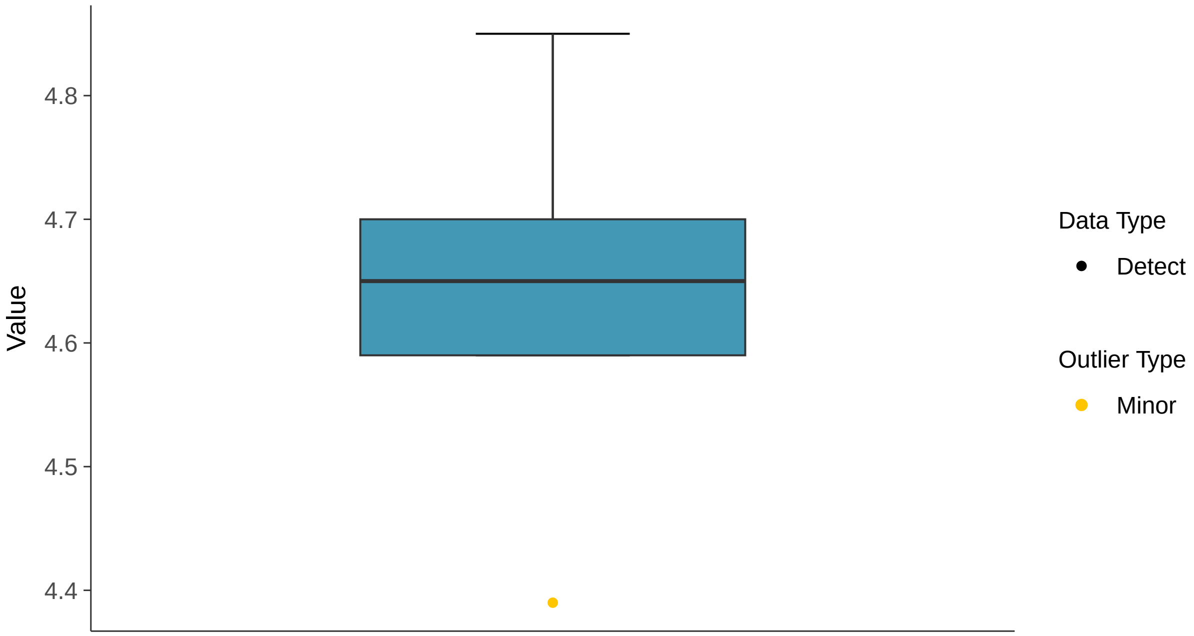
ID: 16D_1_01





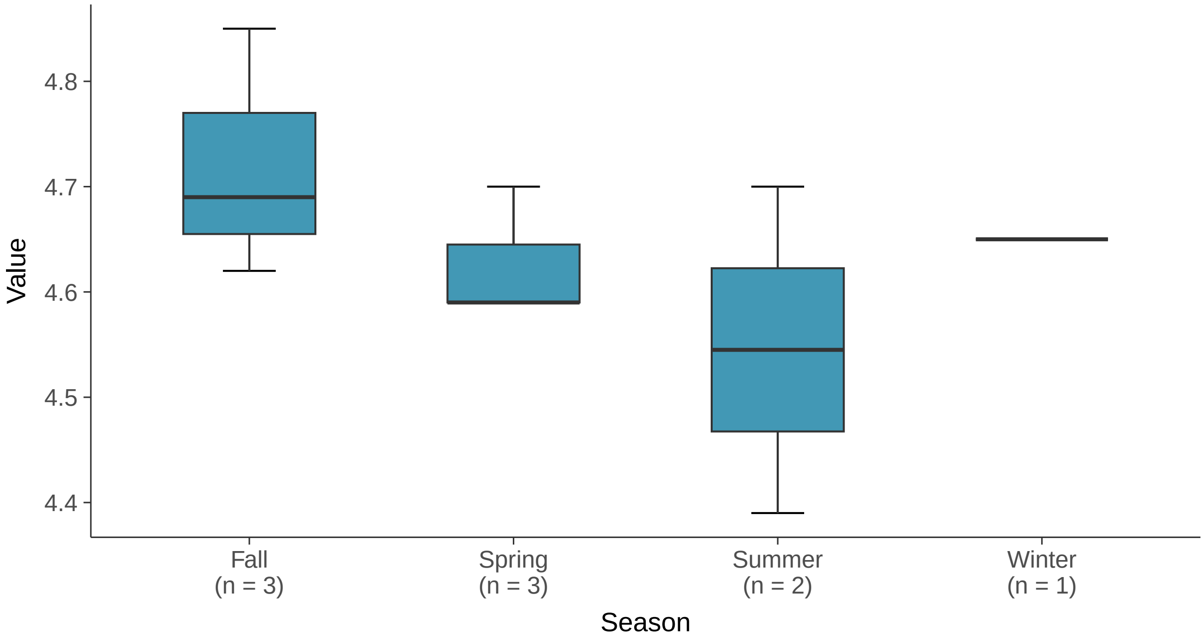
Boxplot

Boron, MW-16D (mg/L)



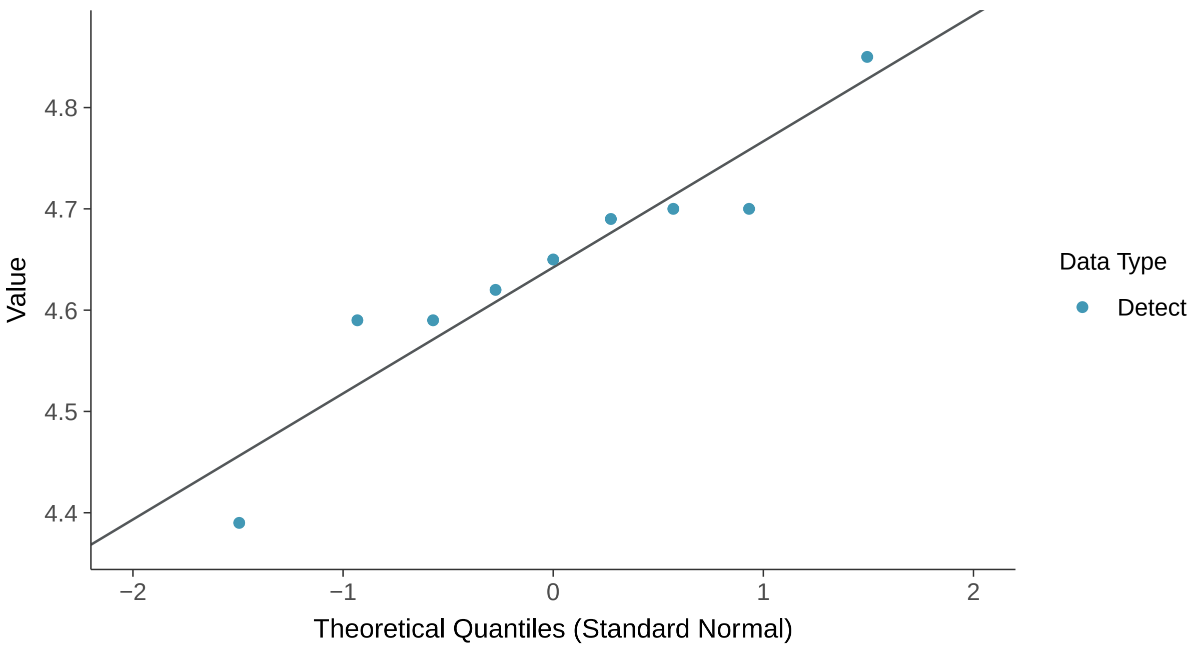
Boxplot by Season

Boron, MW-16D (mg/L)



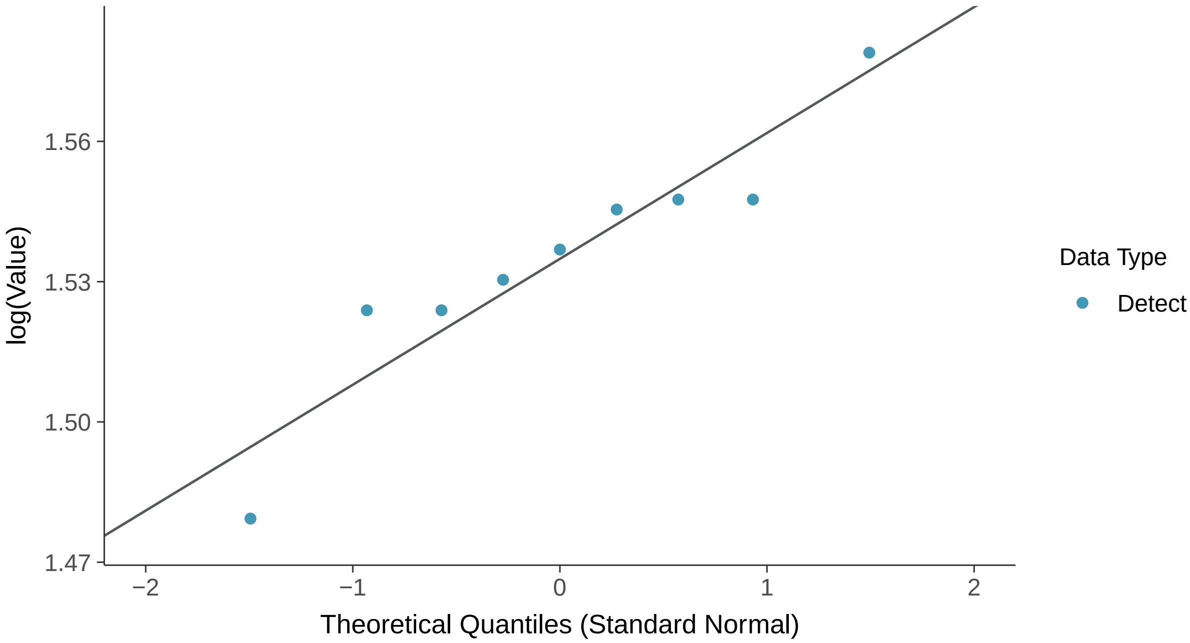
Normal Q-Q plot

Boron, MW-16D (mg/L)



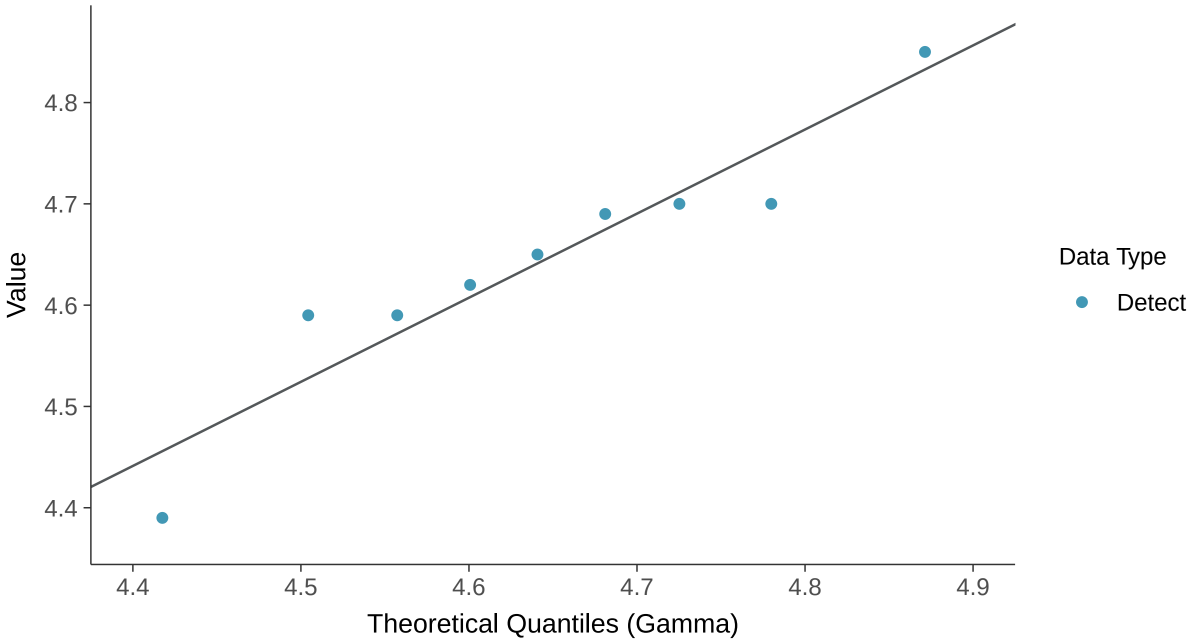
Lognormal Q-Q plot

Boron, MW-16D (mg/L)



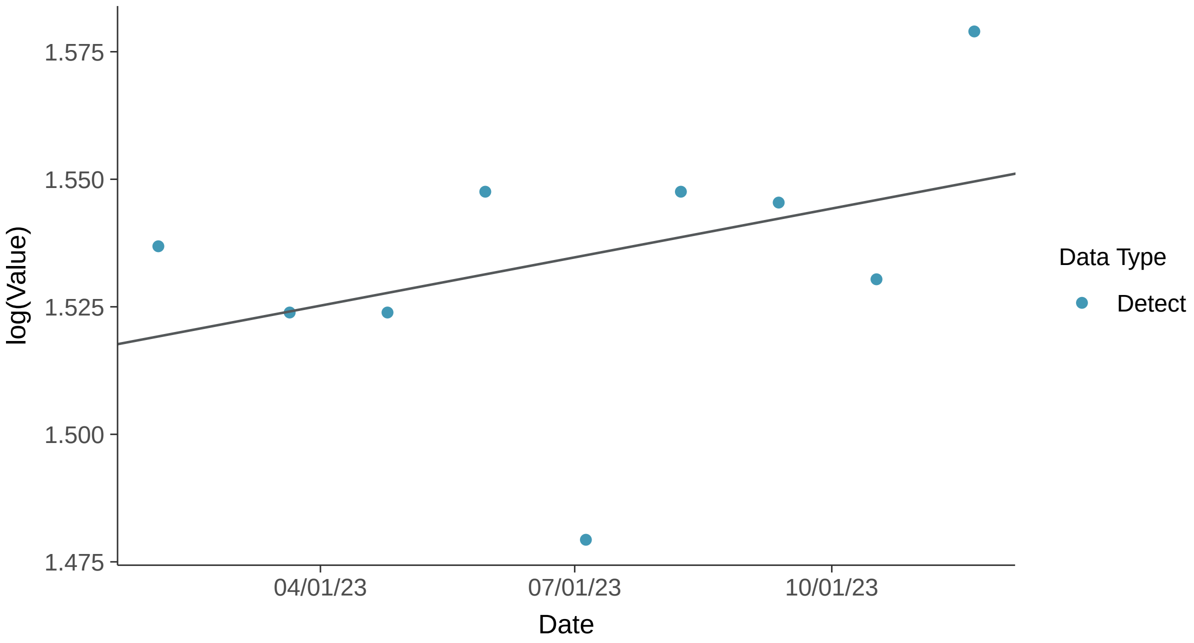
Gamma Q-Q plot

Boron, MW-16D (mg/L)



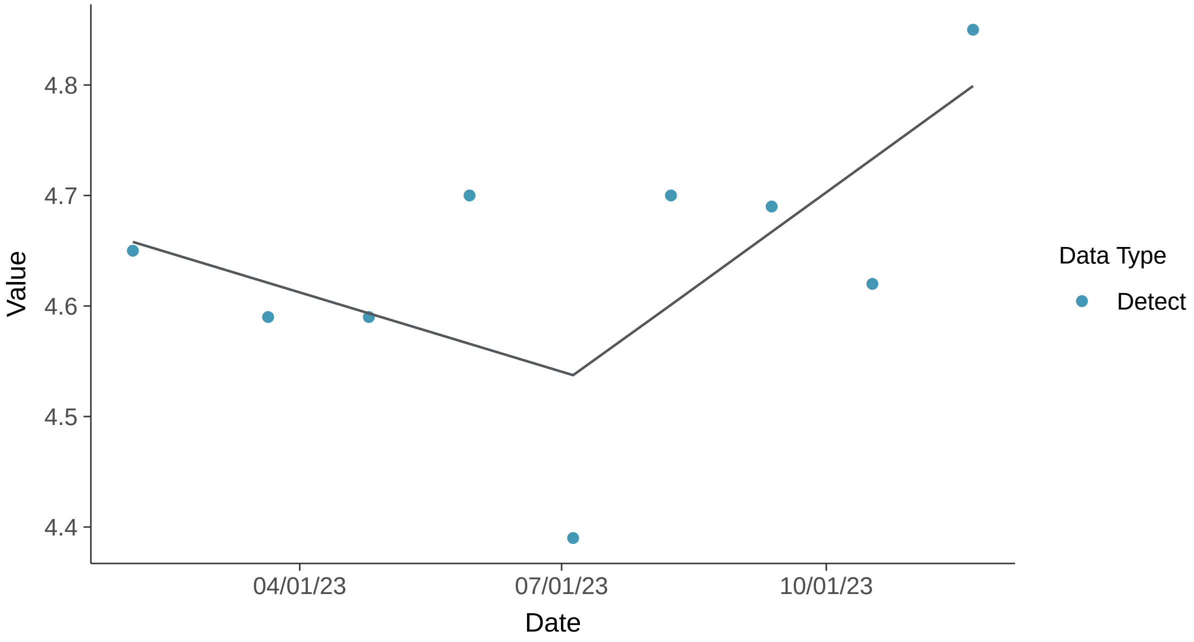
Trend Regression: Lognormal MLE

Boron, MW-16D (mg/L)



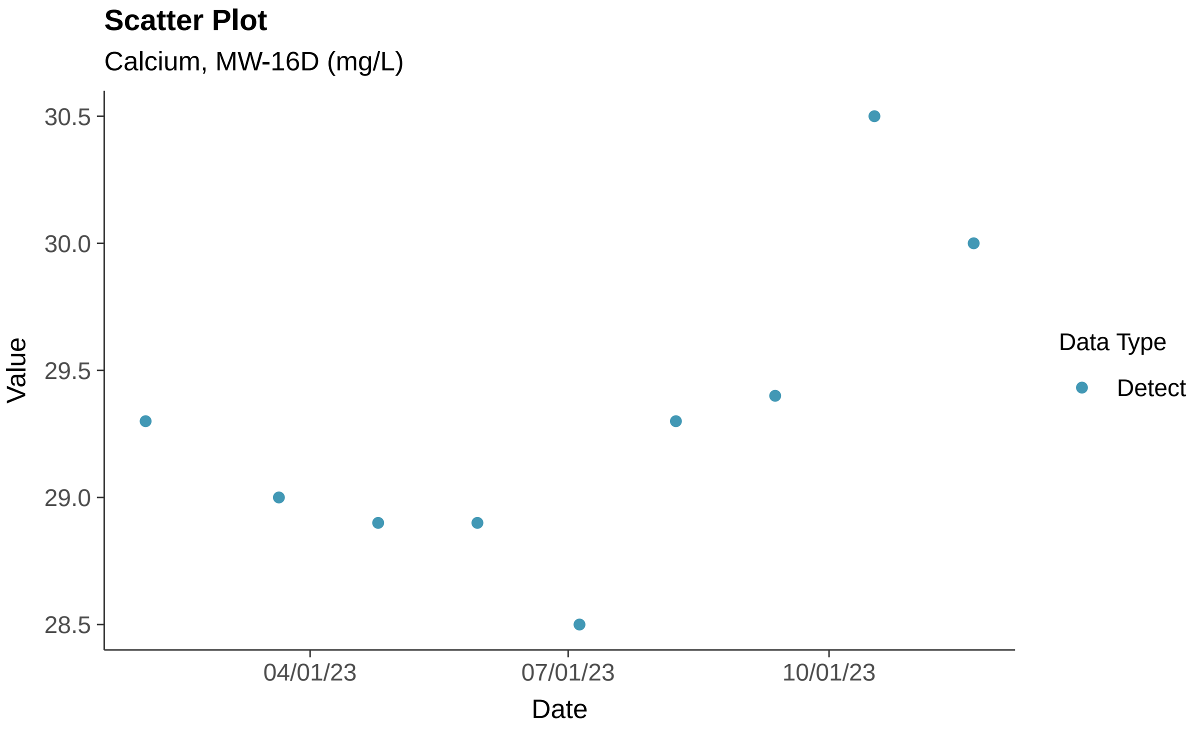
Trend Regression: Piecewise Linear-Linear

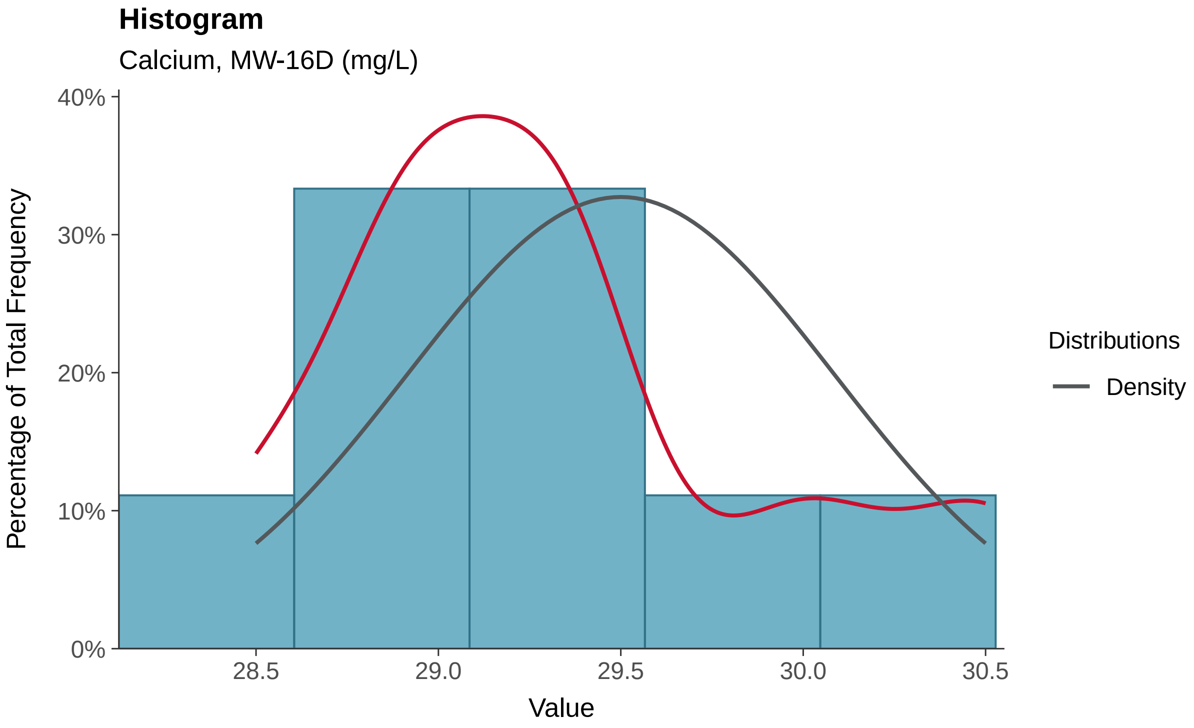
Boron, MW-16D (mg/L)



Appendix III: Calcium, MW-16D

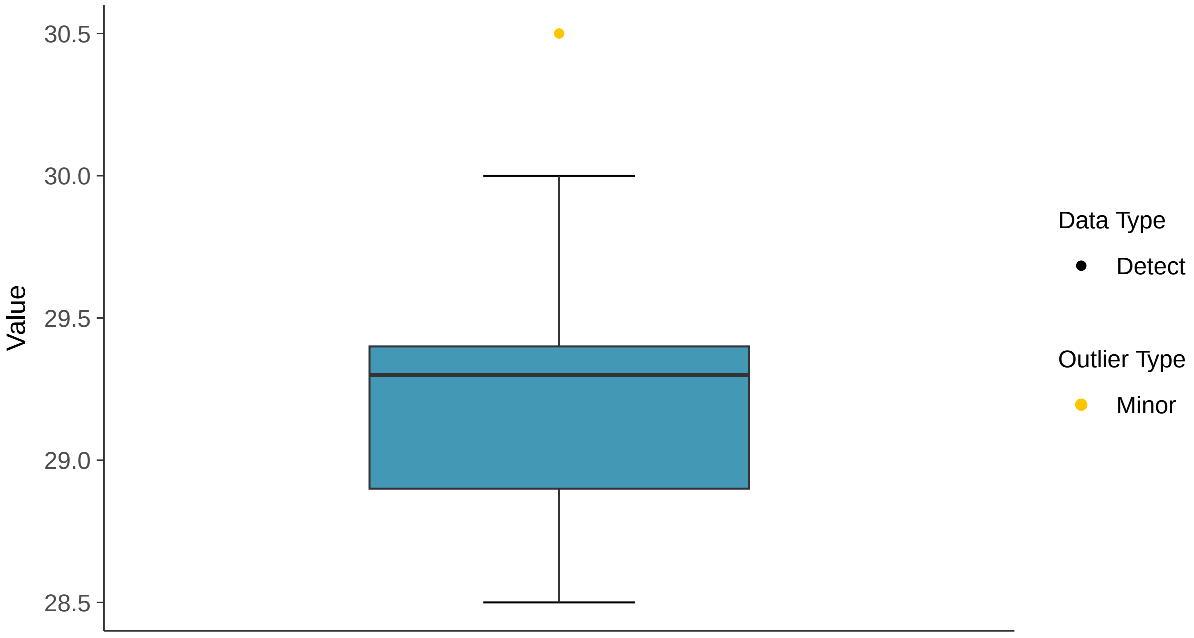
ID: 16D_1_02





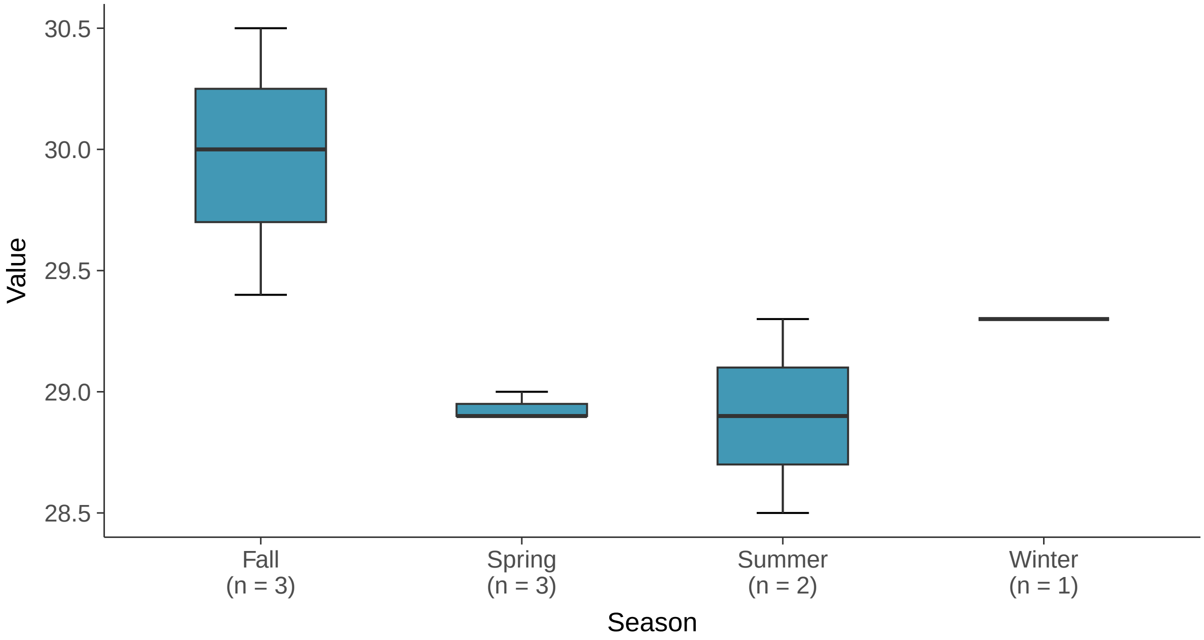
Boxplot

Calcium, MW-16D (mg/L)



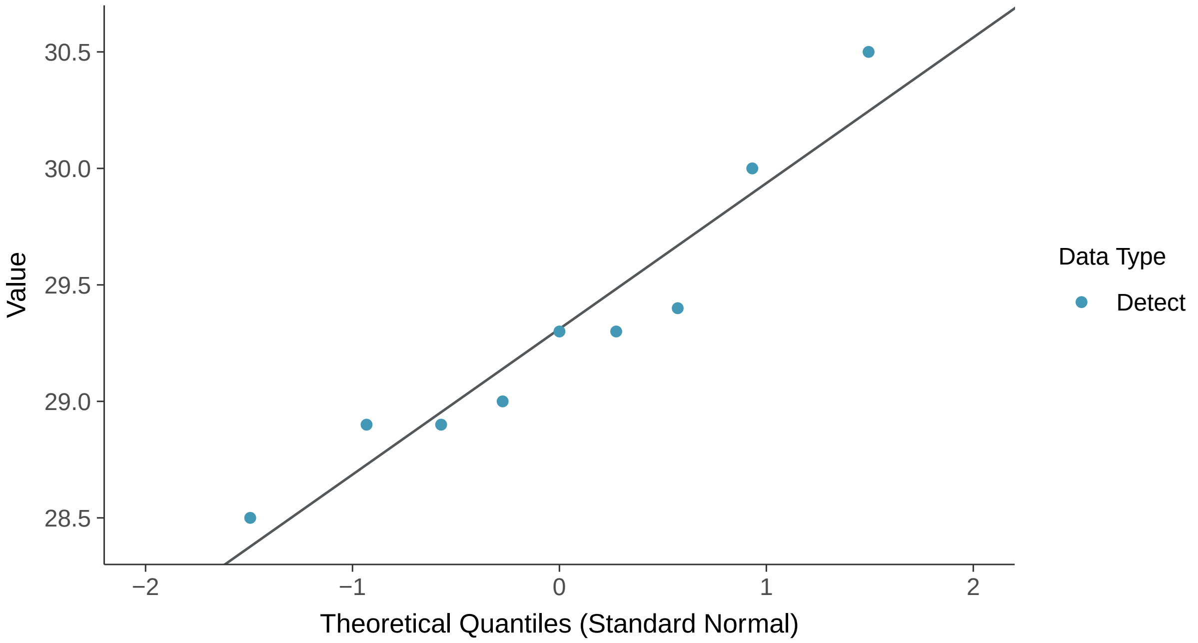
Boxplot by Season

Calcium, MW-16D (mg/L)



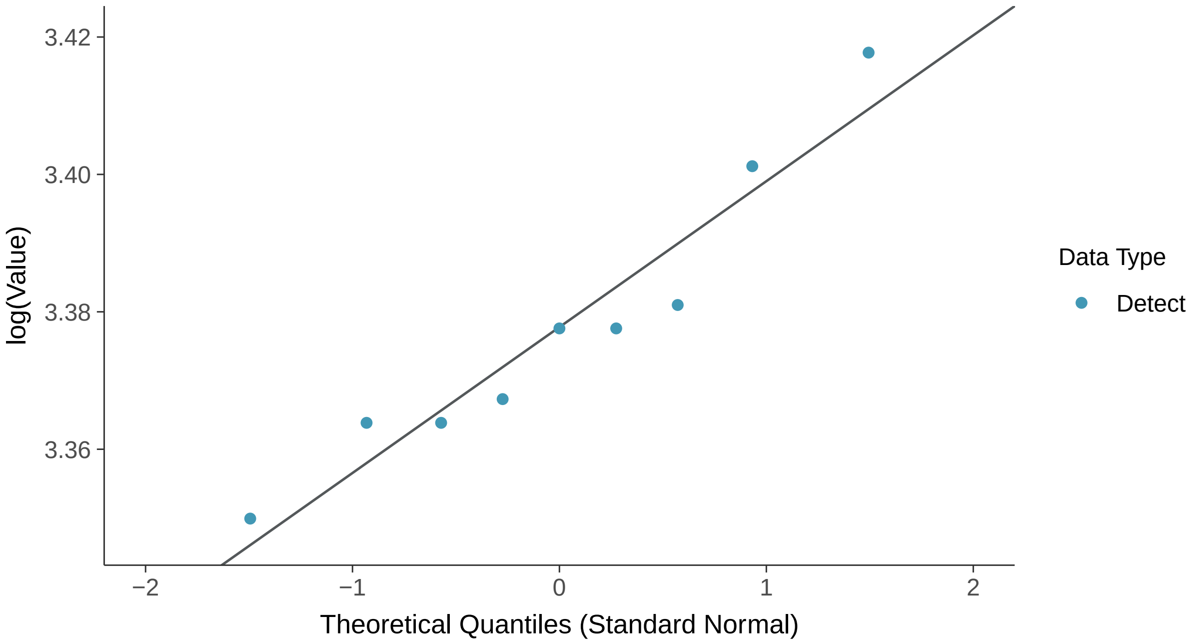
Normal Q-Q plot

Calcium, MW-16D (mg/L)



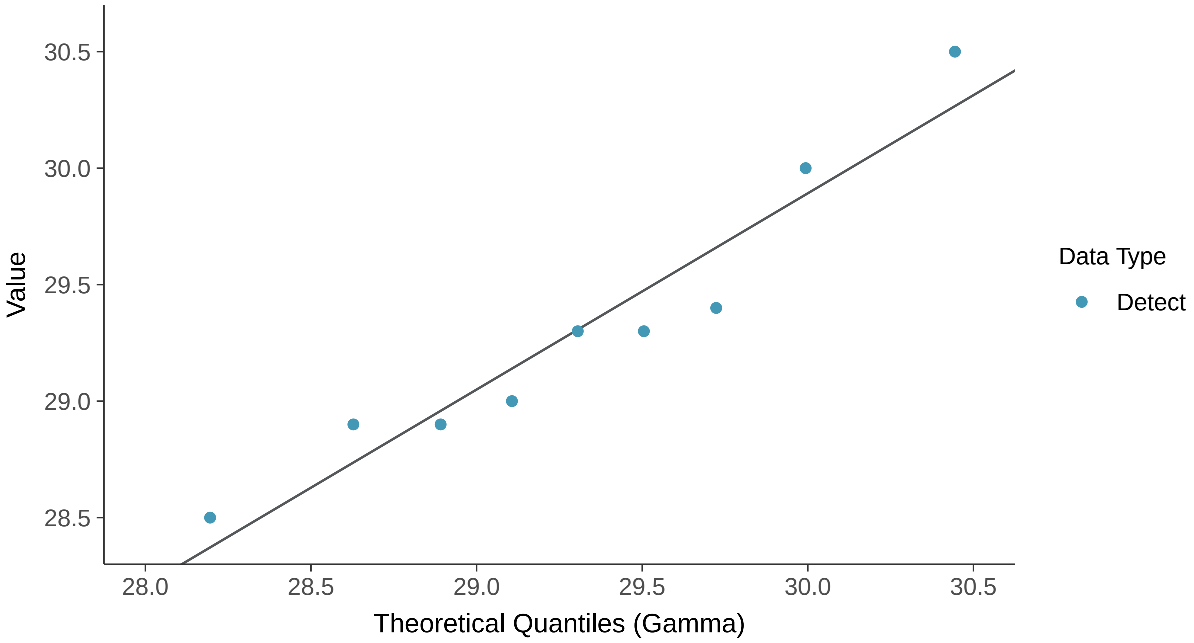
Lognormal Q-Q plot

Calcium, MW-16D (mg/L)



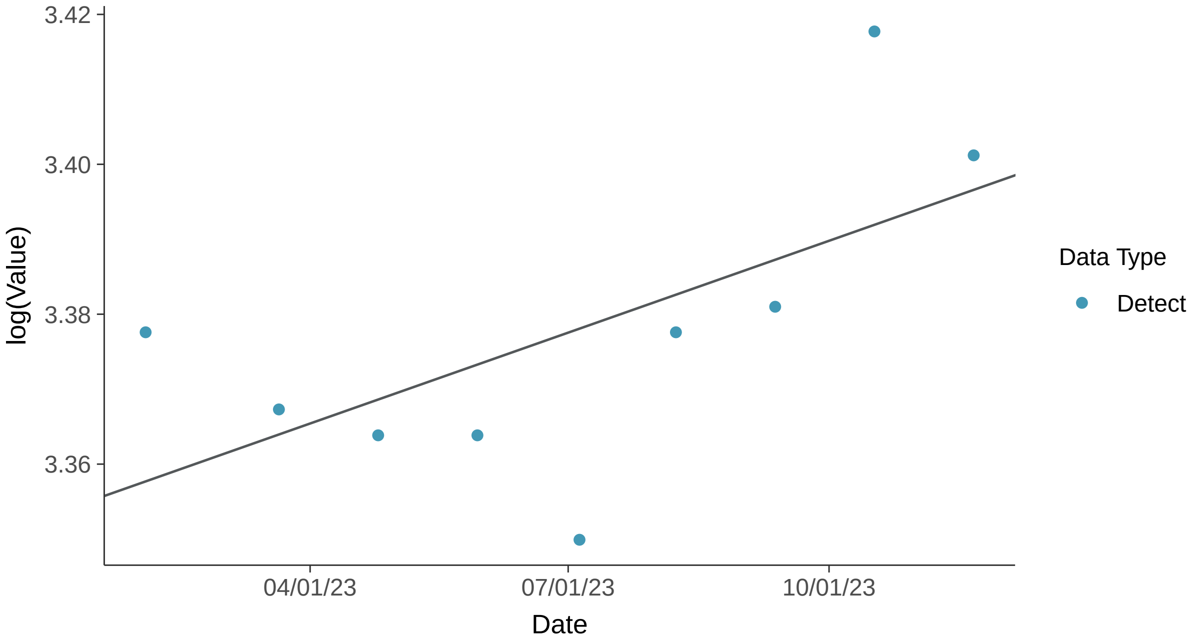
Gamma Q-Q plot

Calcium, MW-16D (mg/L)



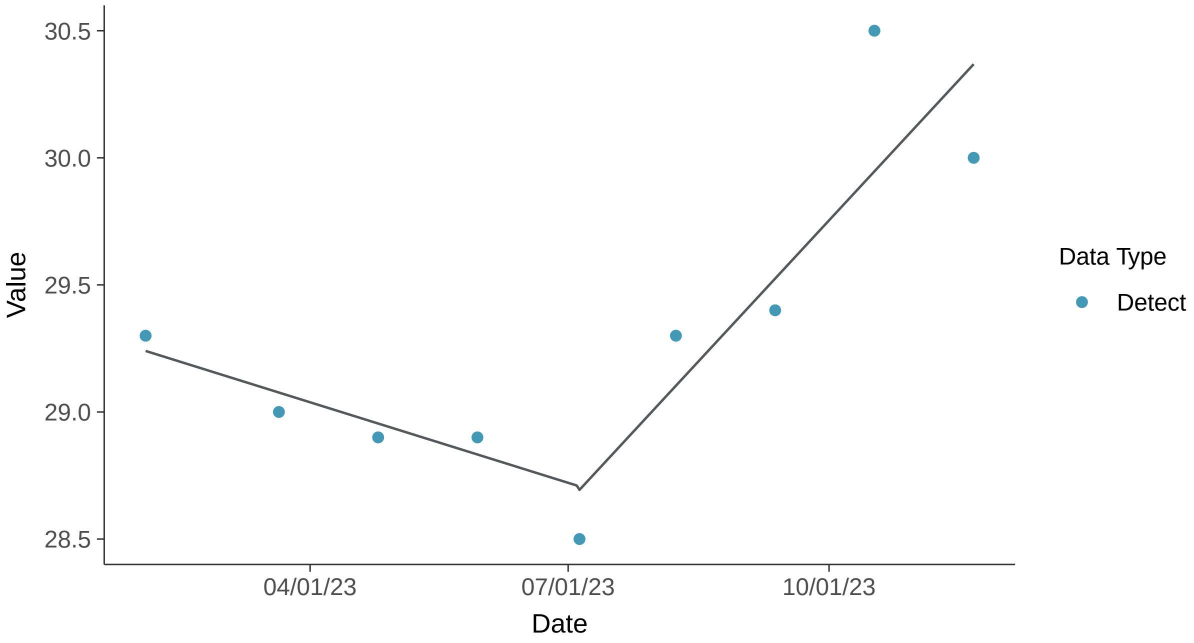
Trend Regression: Lognormal MLE

Calcium, MW-16D (mg/L)



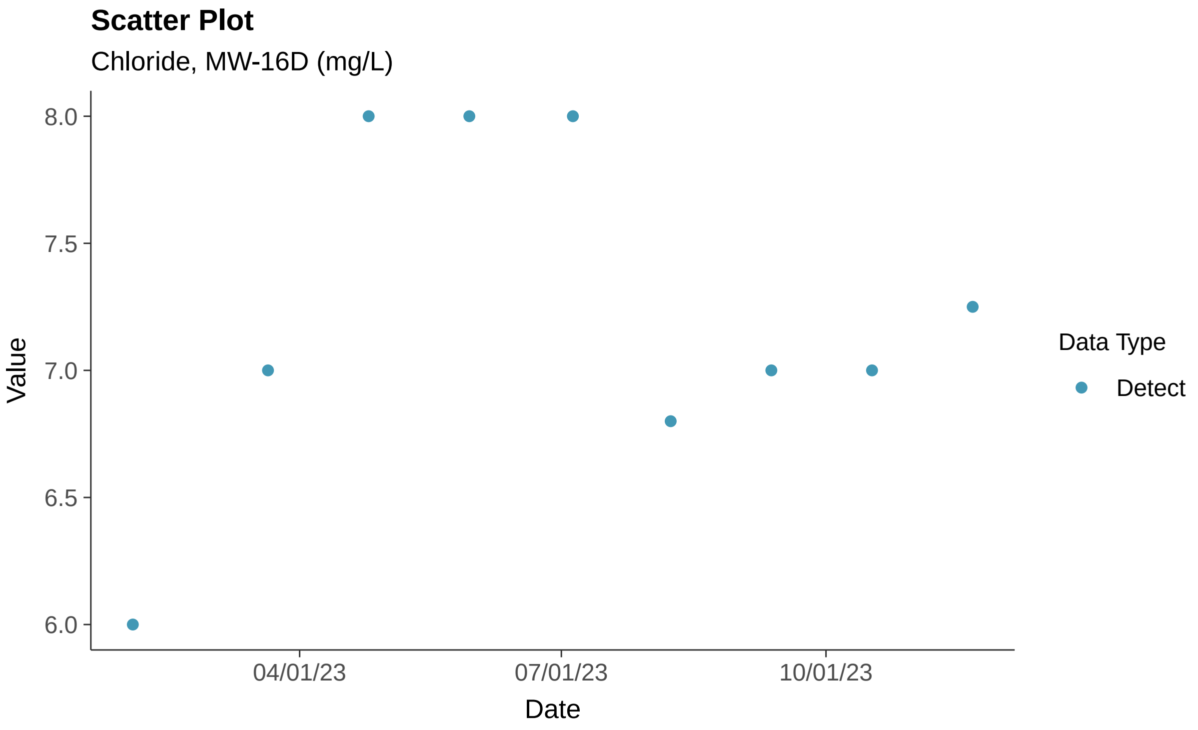
Trend Regression: Piecewise Linear-Linear

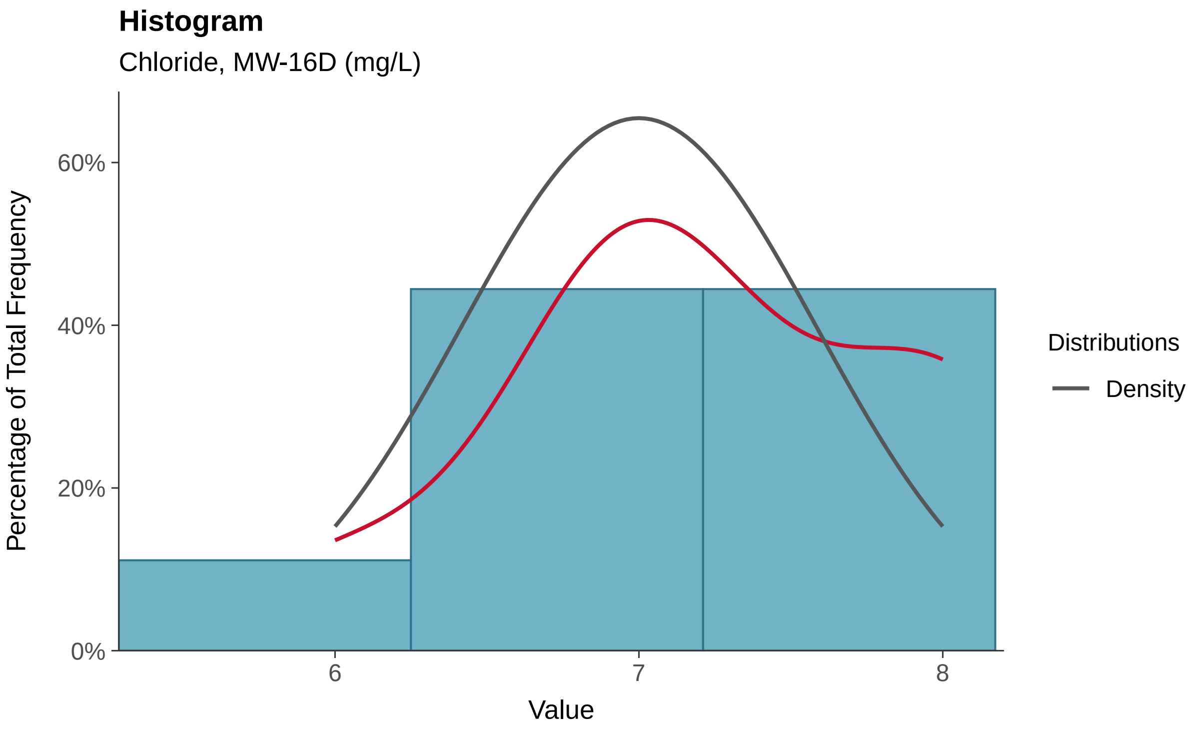
Calcium, MW-16D (mg/L)



Appendix III: Chloride, MW-16D

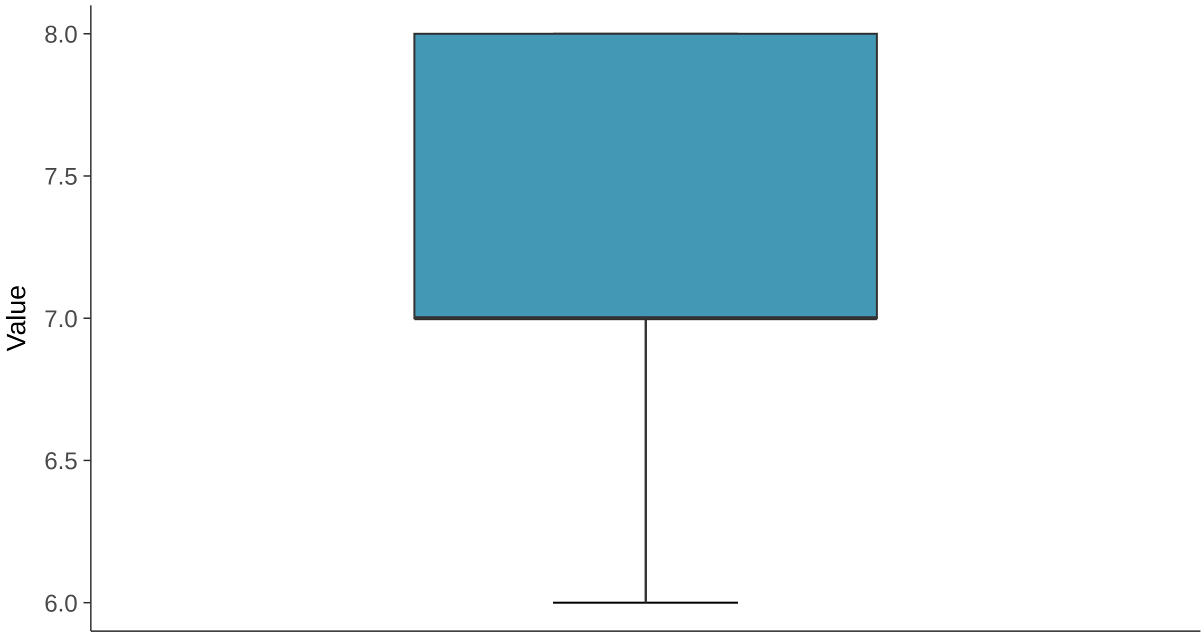
ID: 16D_1_03





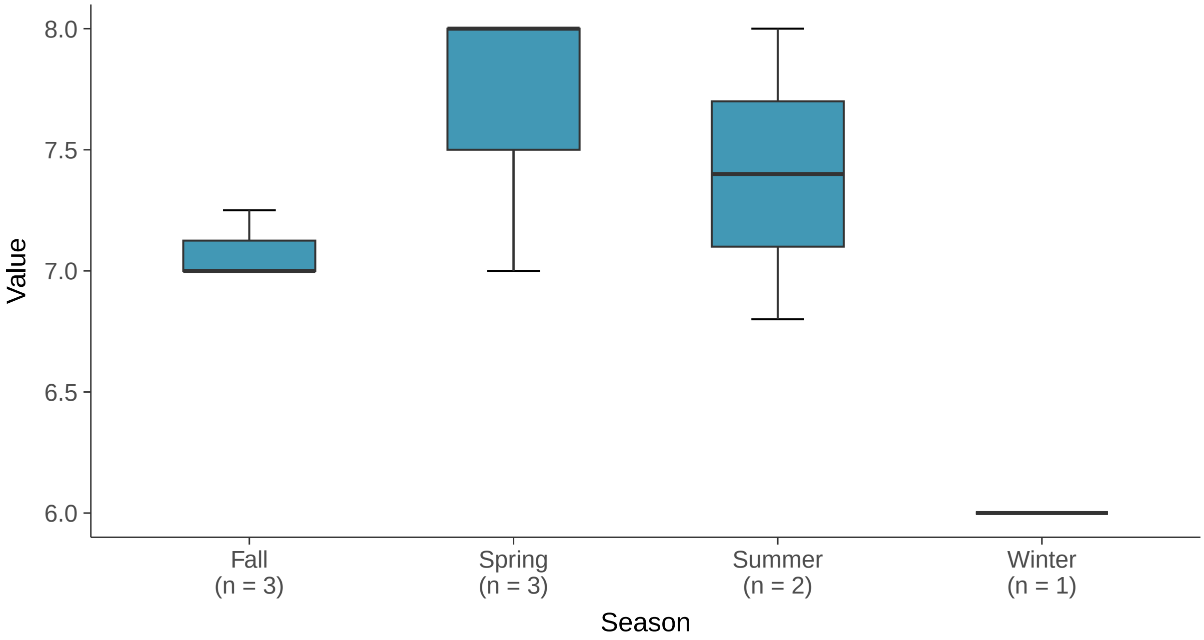
Boxplot

Chloride, MW-16D (mg/L)



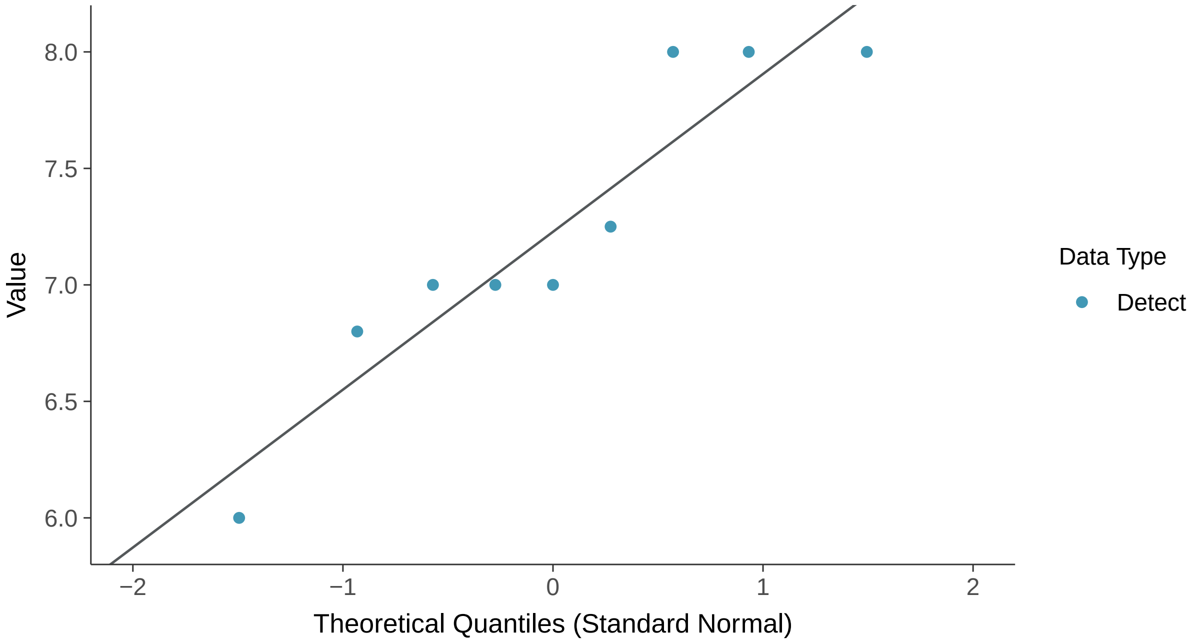
Boxplot by Season

Chloride, MW-16D (mg/L)



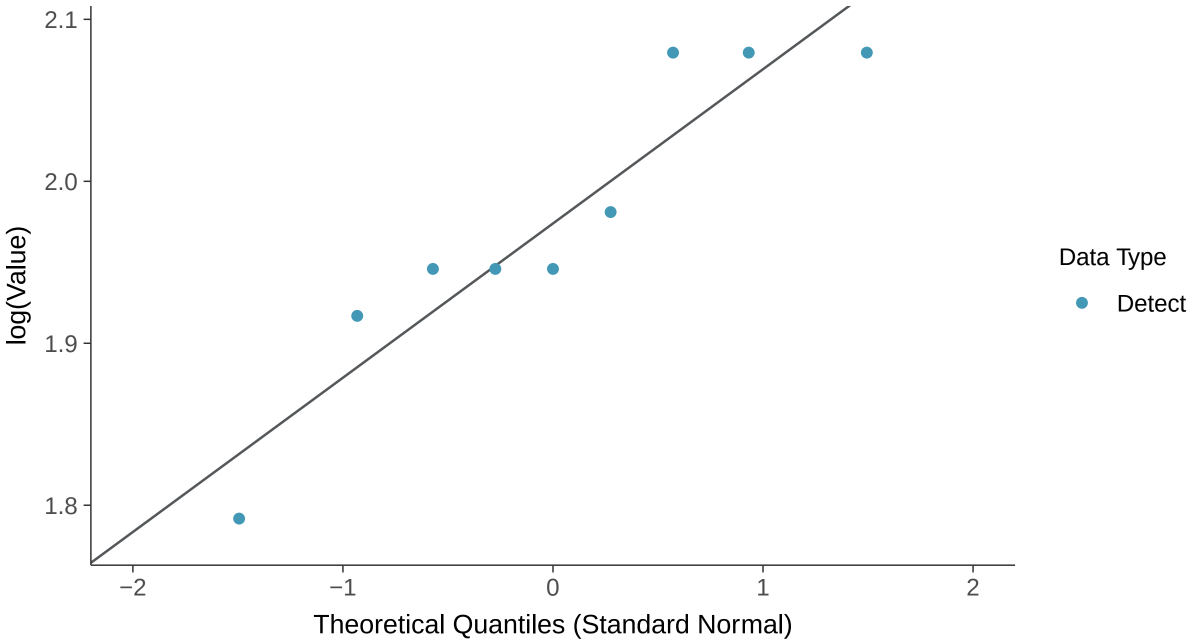
Normal Q-Q plot

Chloride, MW-16D (mg/L)



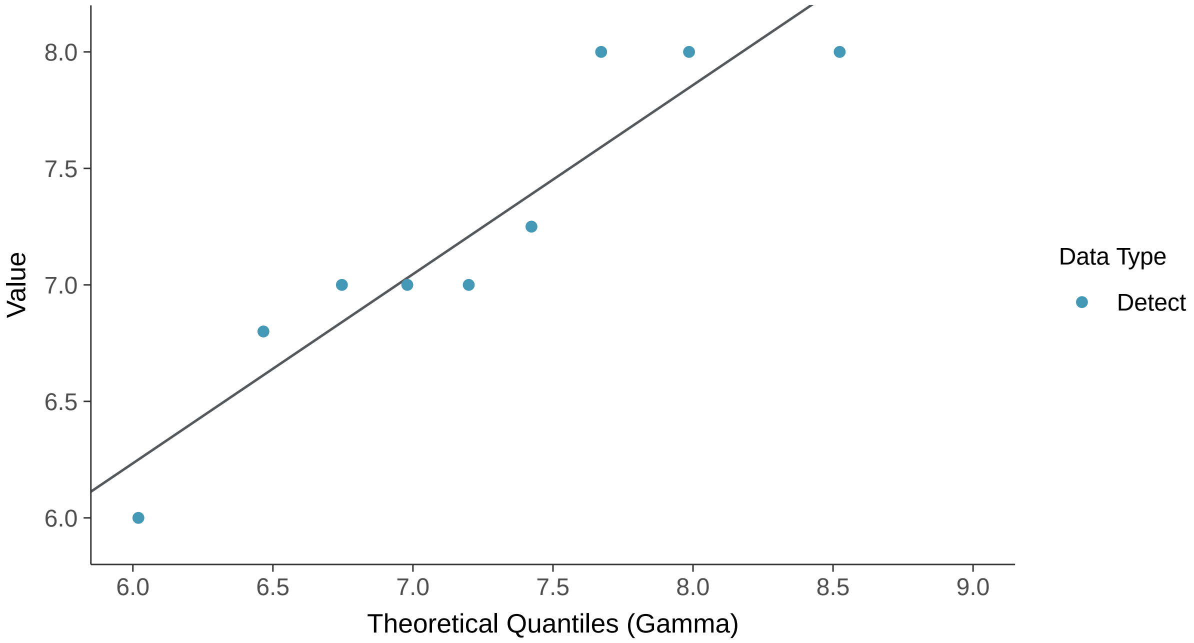
Lognormal Q-Q plot

Chloride, MW-16D (mg/L)



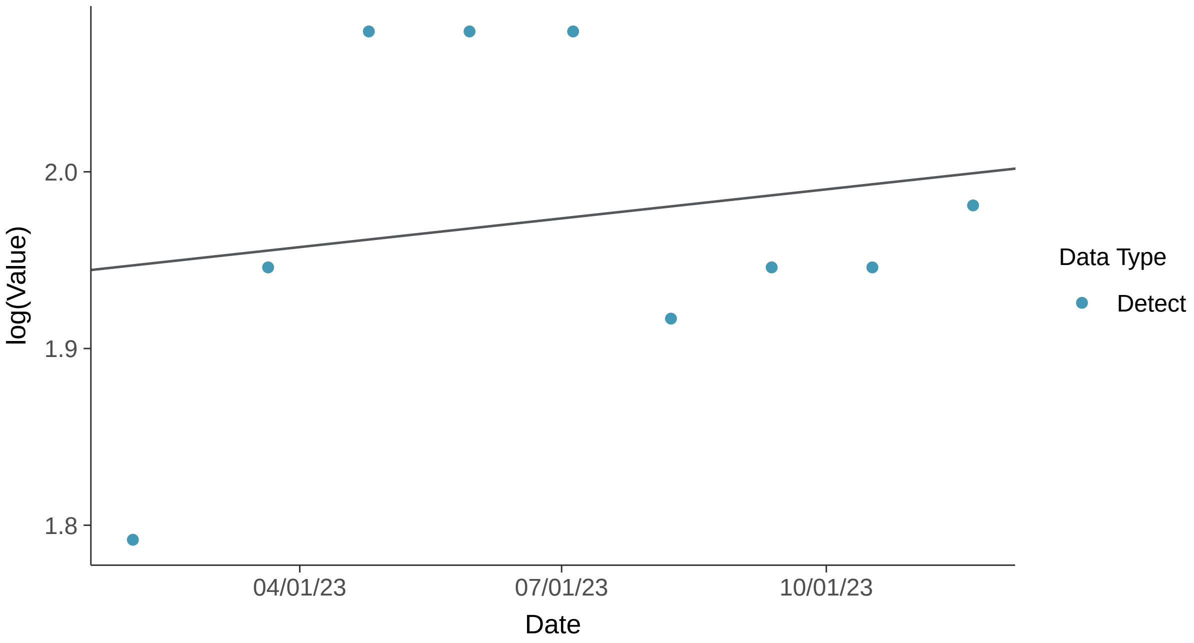
Gamma Q-Q plot

Chloride, MW-16D (mg/L)



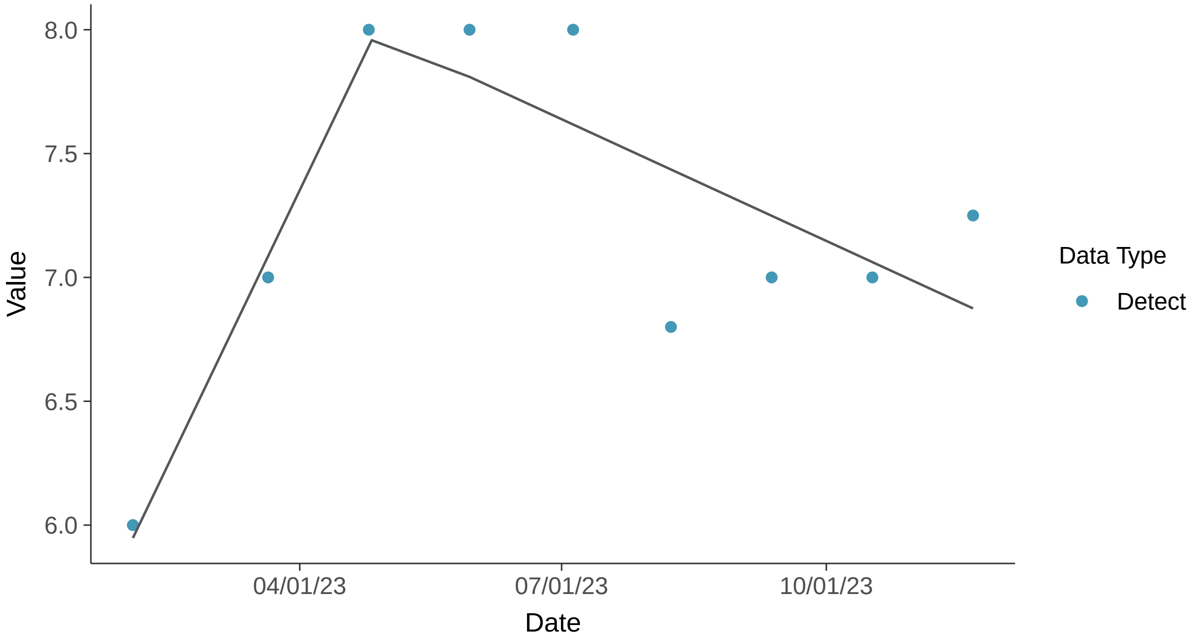
Trend Regression: Lognormal MLE

Chloride, MW-16D (mg/L)



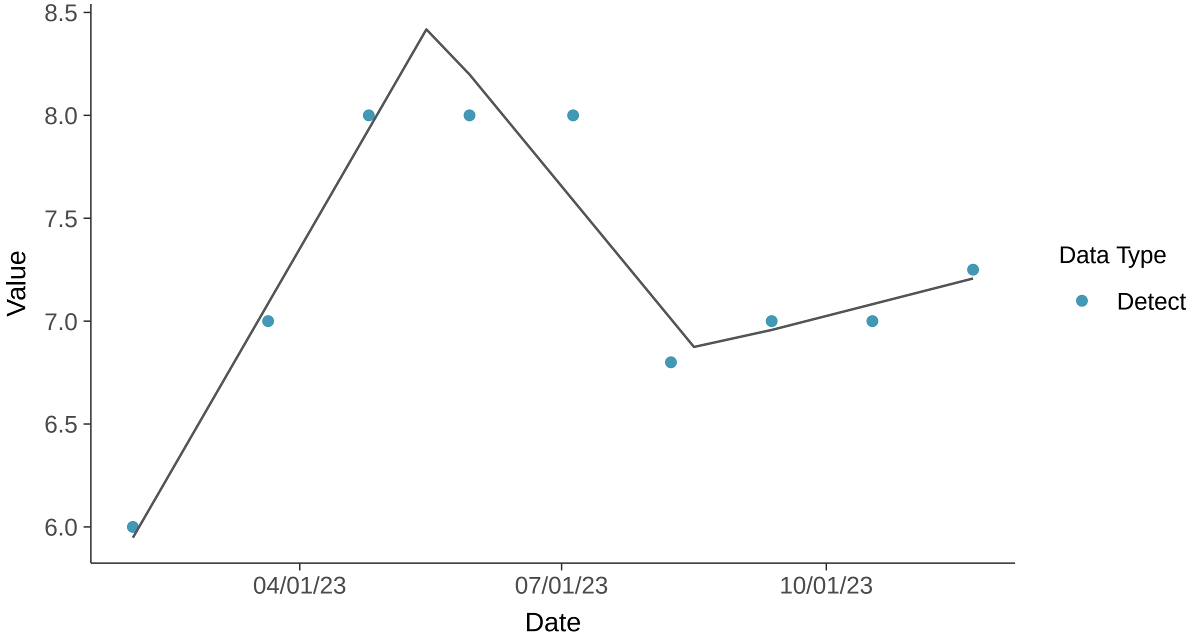
Trend Regression: Piecewise Linear-Linear

Chloride, MW-16D (mg/L)



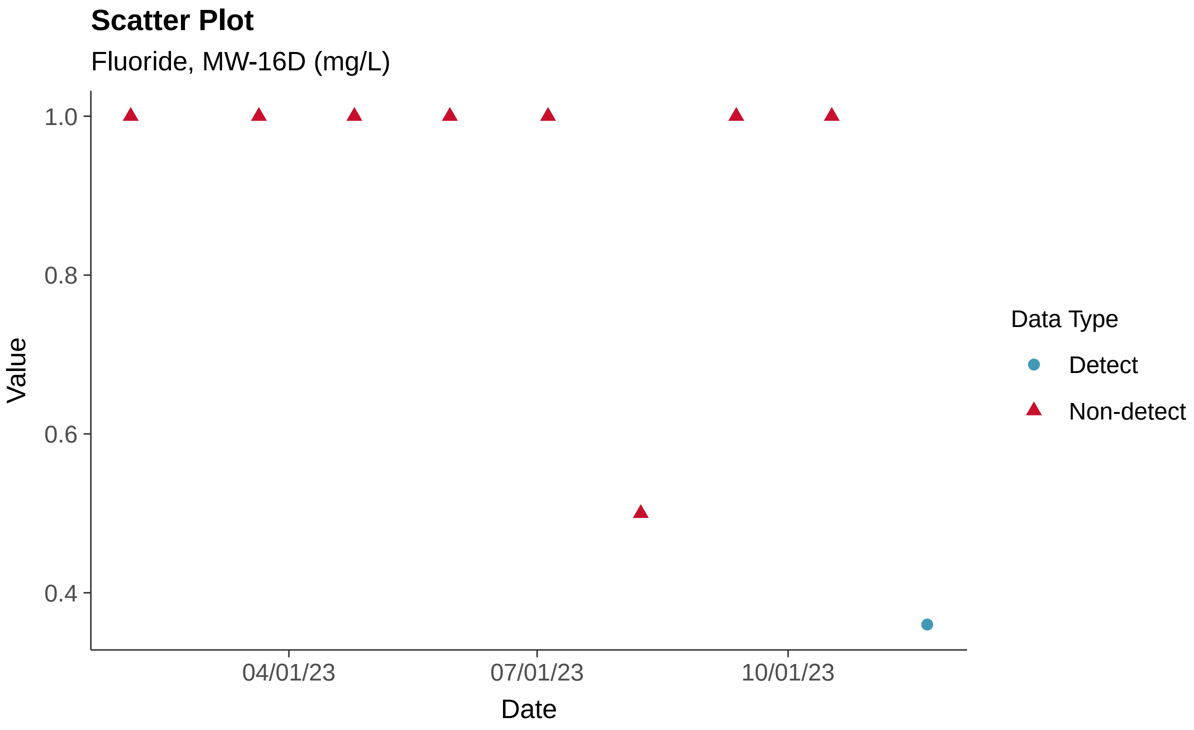
Trend Regression: Piecewise Linear-Linear-Linear

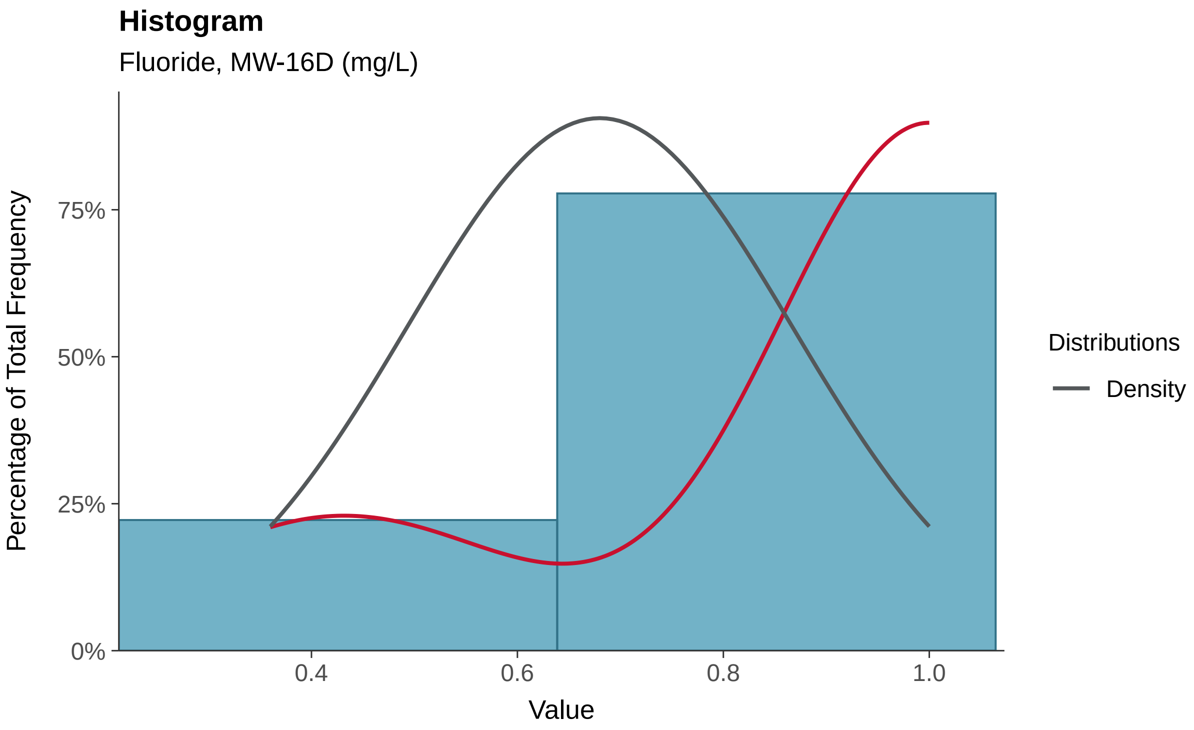
Chloride, MW-16D (mg/L)



Appendix III: Fluoride, MW-16D

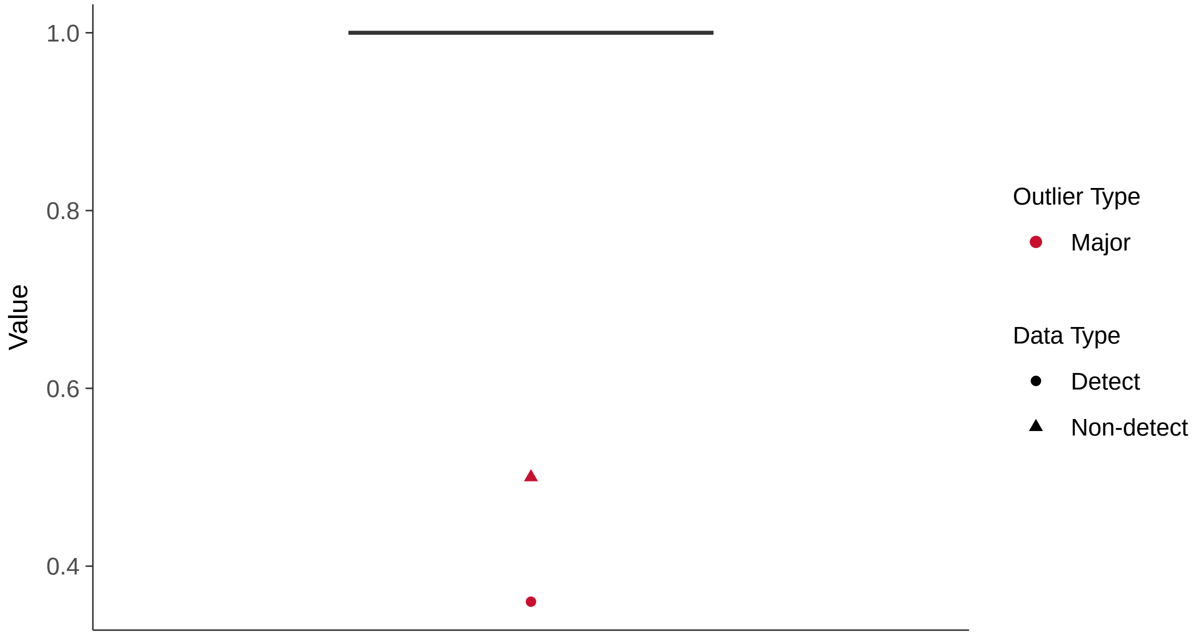
ID: 16D_1_04





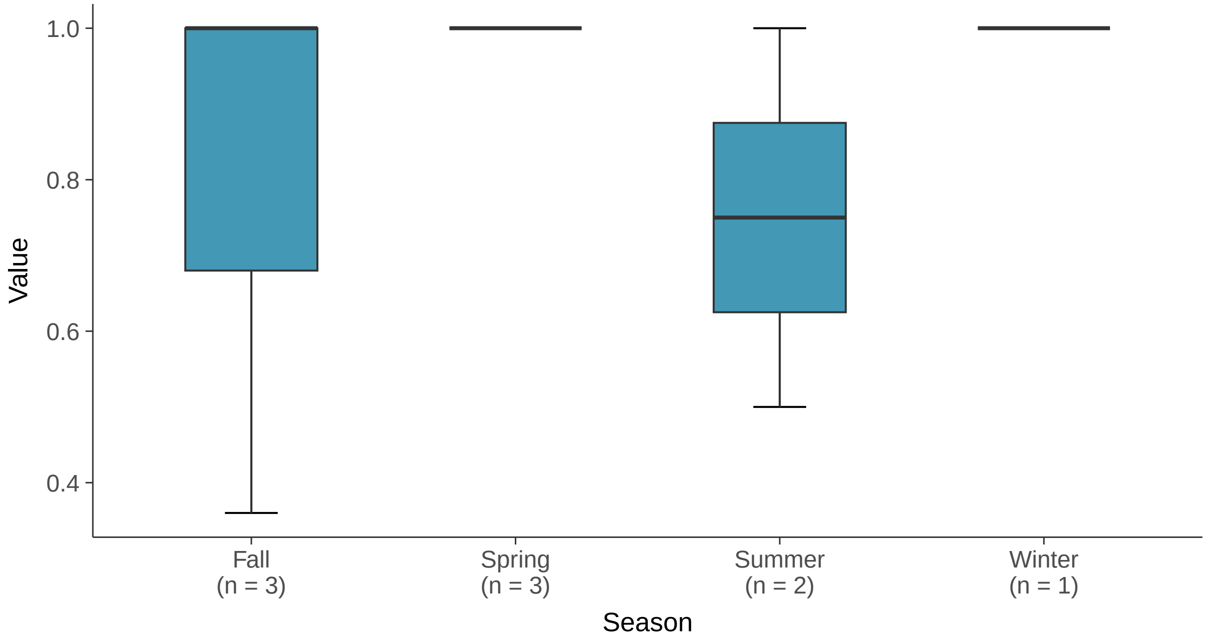
Boxplot

Fluoride, MW-16D (mg/L)



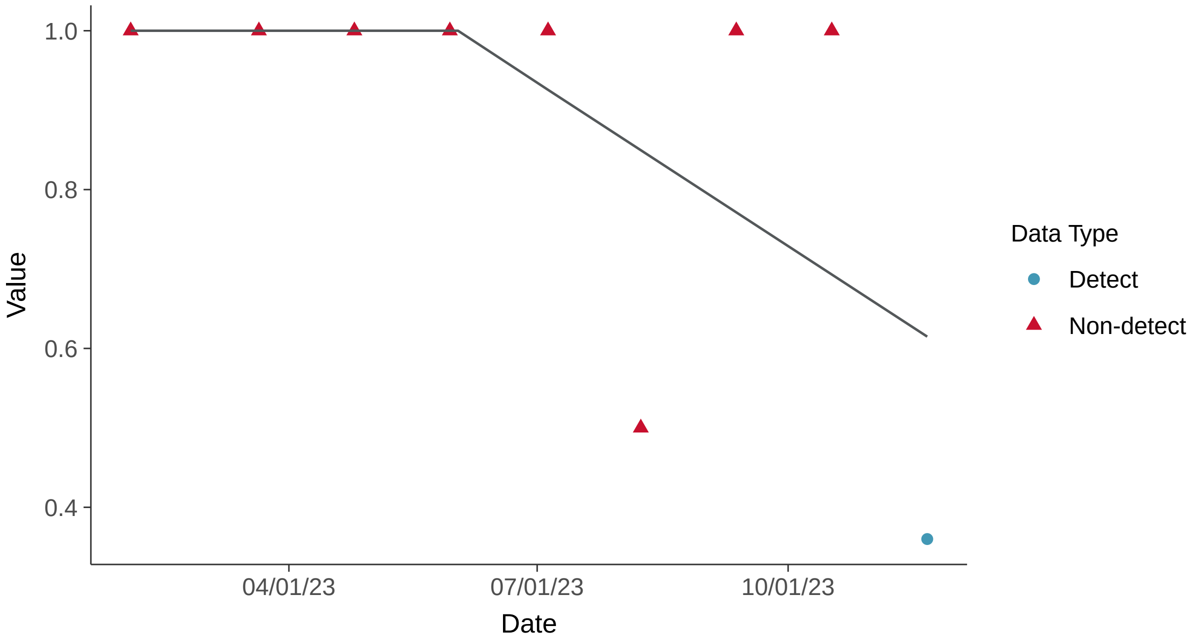
Boxplot by Season

Fluoride, MW-16D (mg/L)



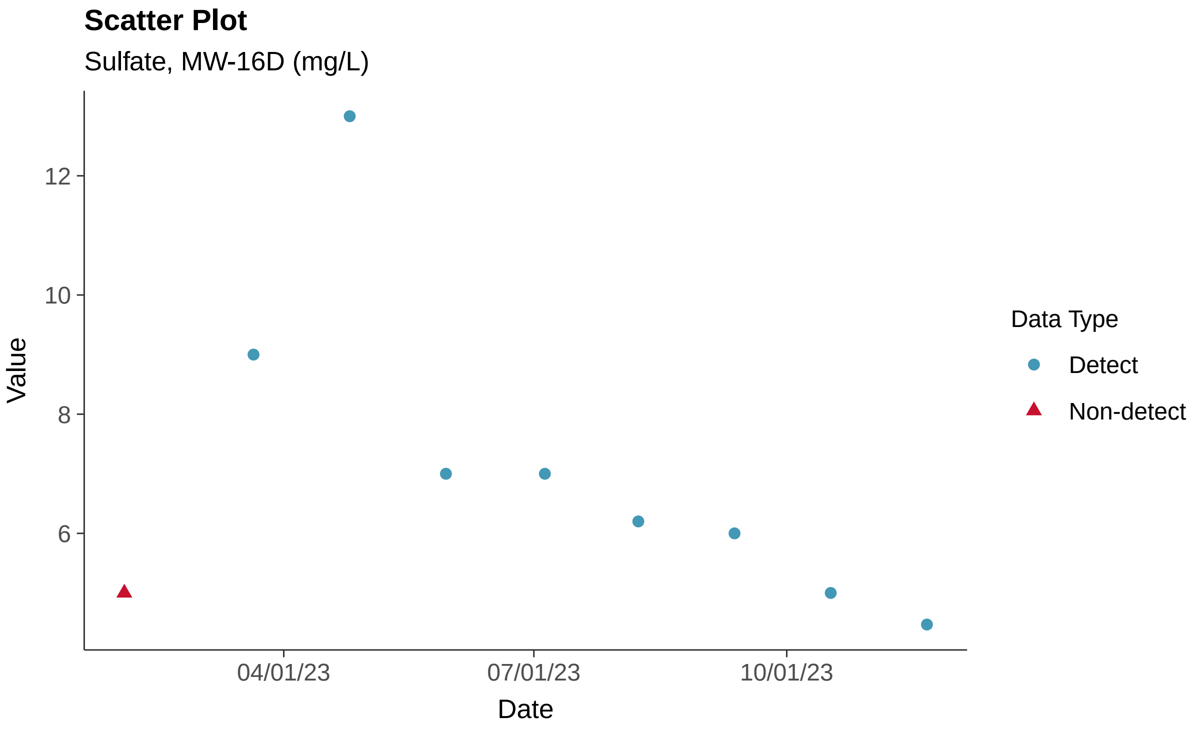
Trend Regression: Piecewise Linear-Linear

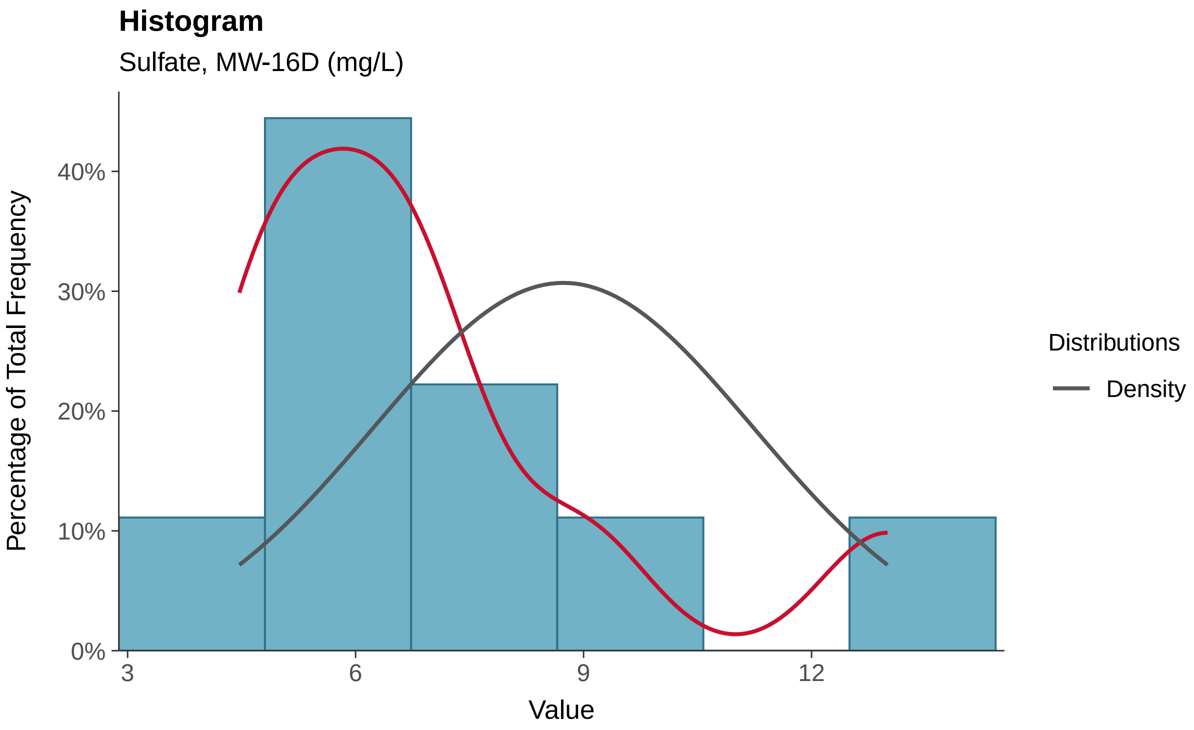
Fluoride, MW-16D (mg/L)



Appendix III: Sulfate, MW-16D

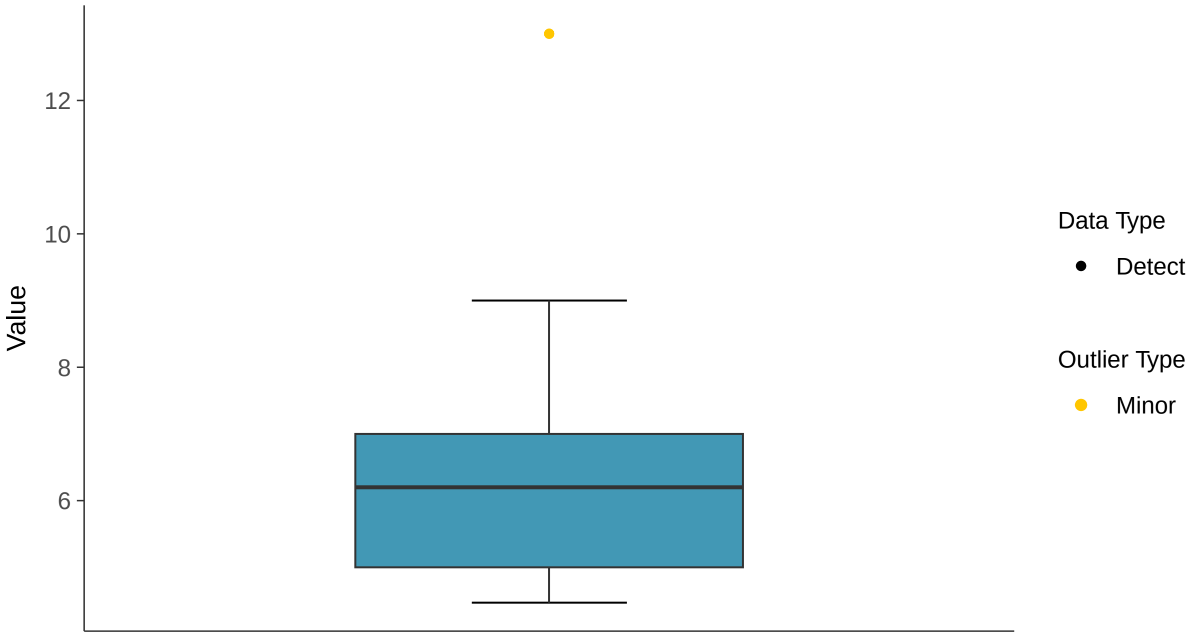
ID: 16D_1_05





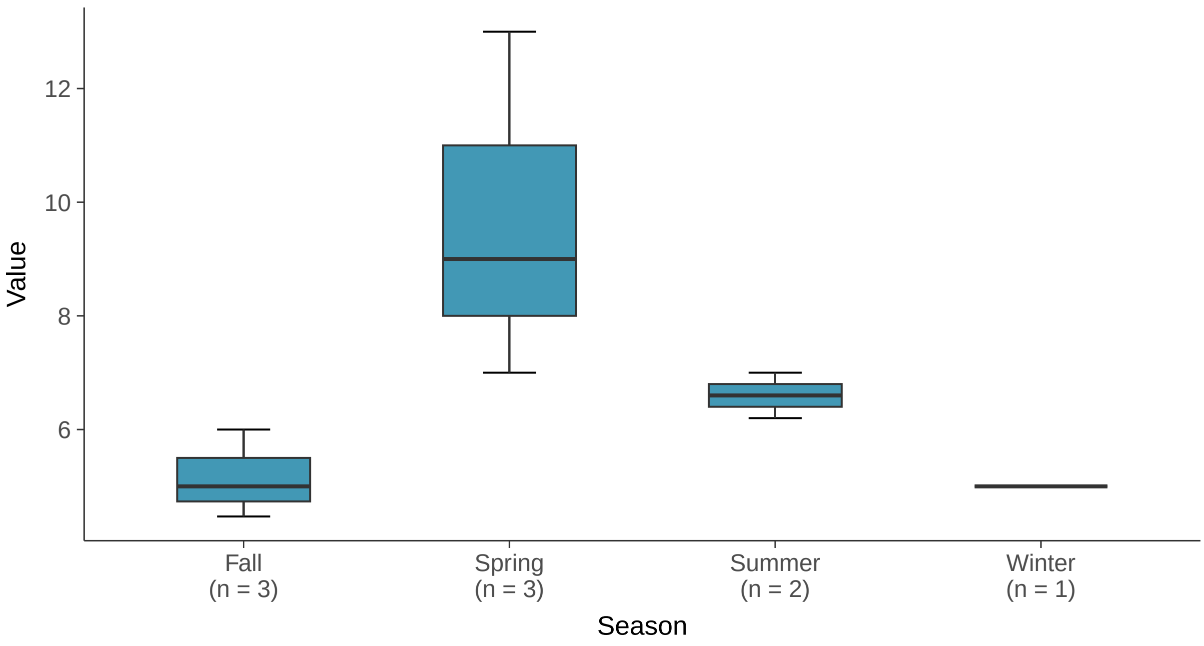
Boxplot

Sulfate, MW-16D (mg/L)



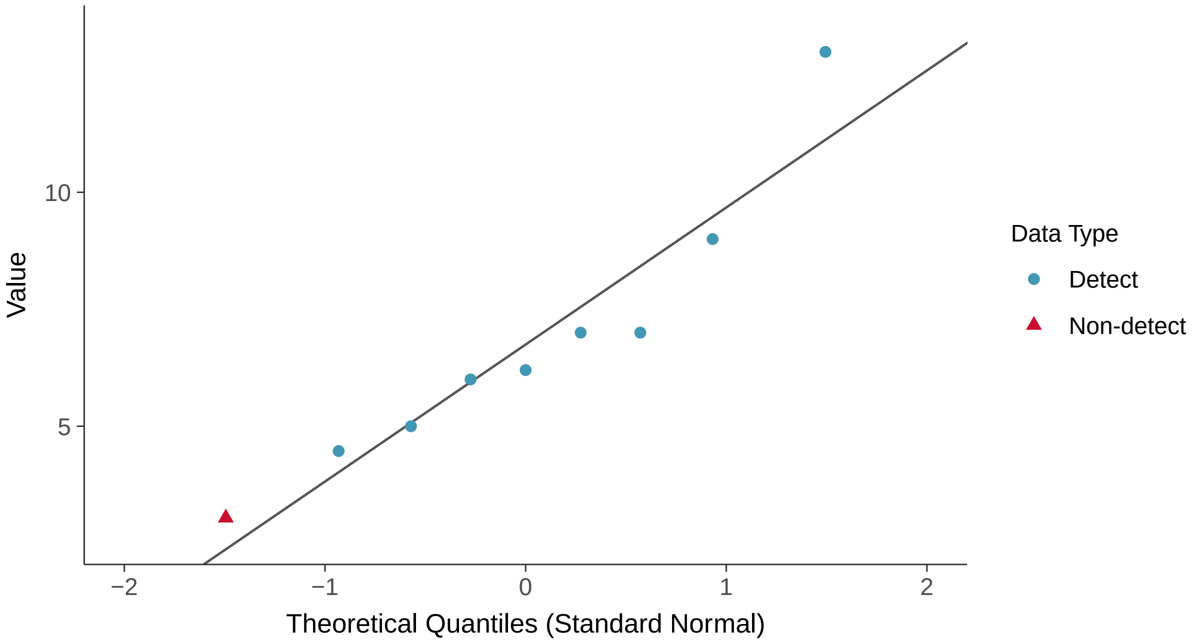
Boxplot by Season

Sulfate, MW-16D (mg/L)



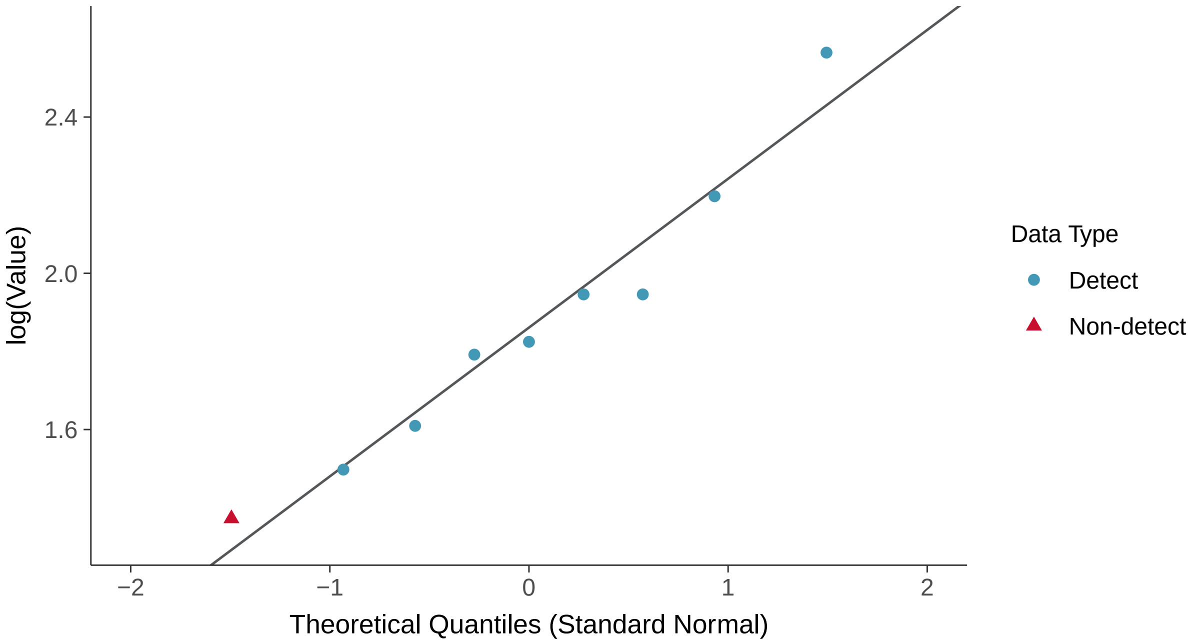
Normal Q-Q plot using ROS Imputed Estimates

Sulfate, MW-16D (mg/L)



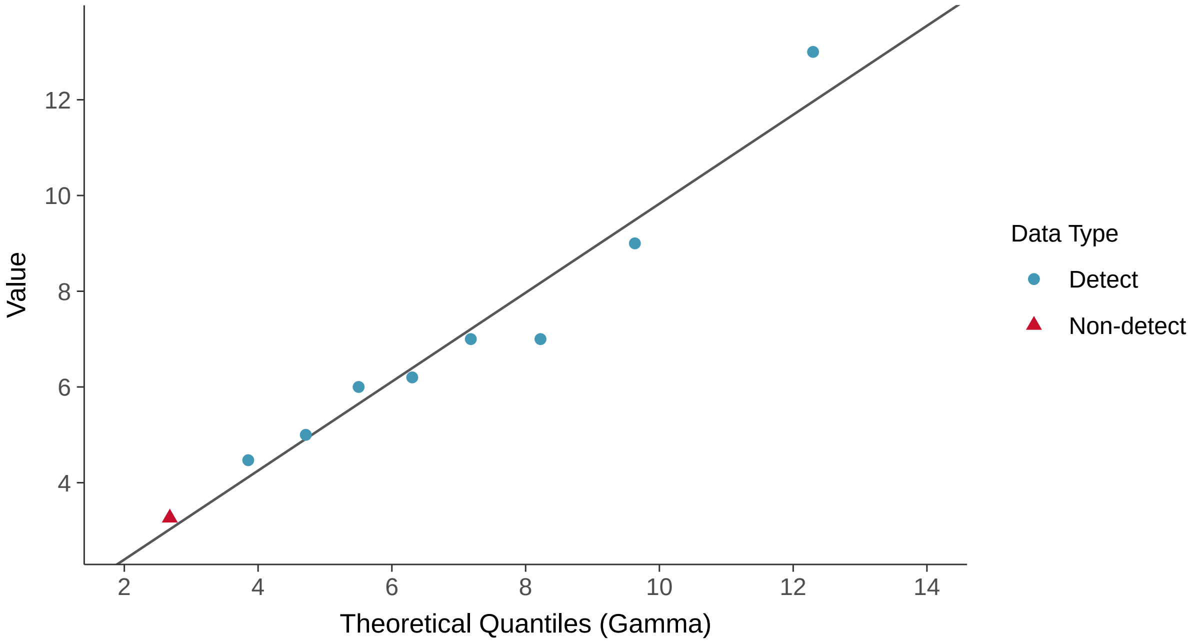
Lognormal Q-Q plot using ROS Imputed Estimates

Sulfate, MW-16D (mg/L)



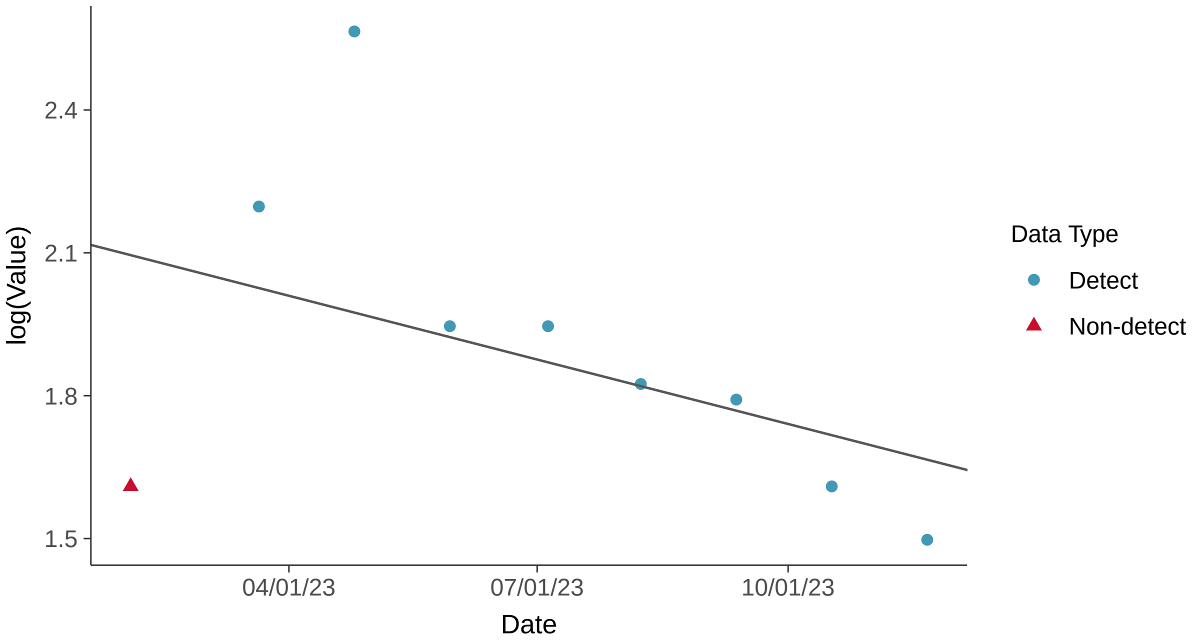
Gamma Q-Q plot using ROS Imputed Estimates

Sulfate, MW-16D (mg/L)



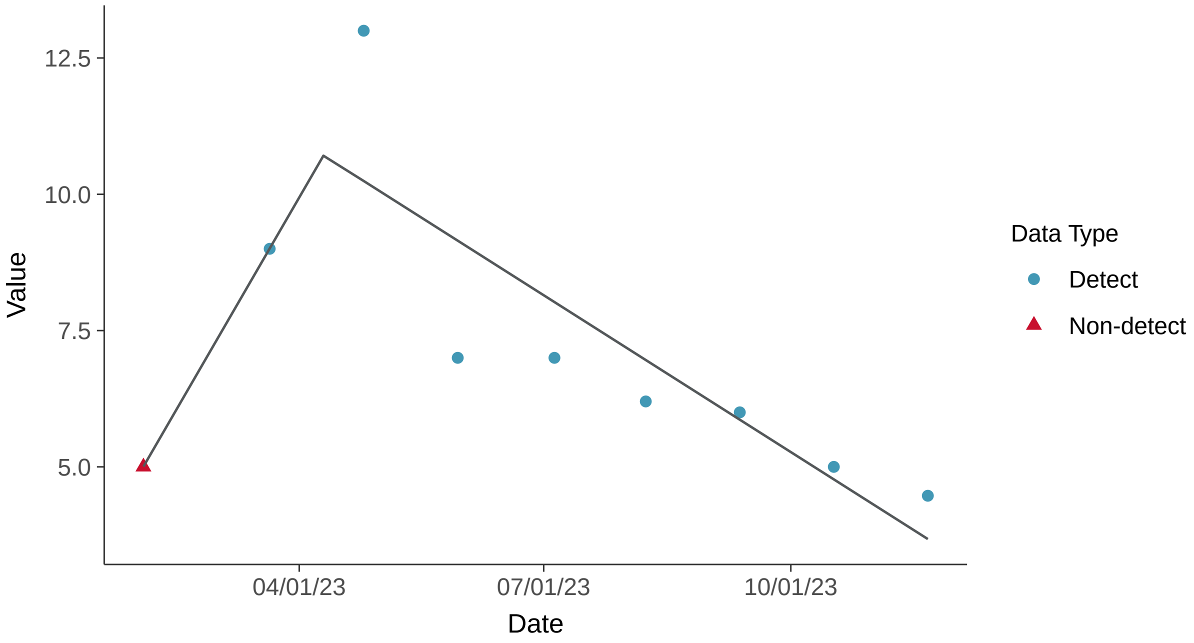
Trend Regression: Lognormal MLE

Sulfate, MW-16D (mg/L)



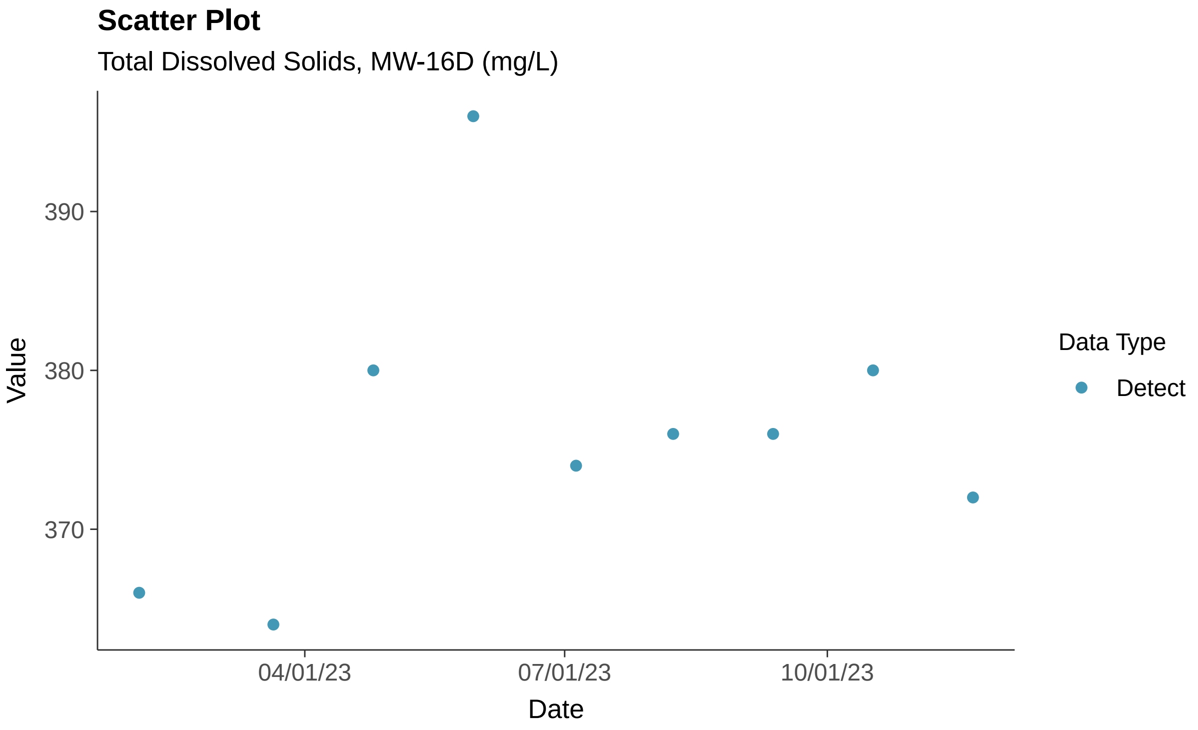
Trend Regression: Piecewise Linear-Linear

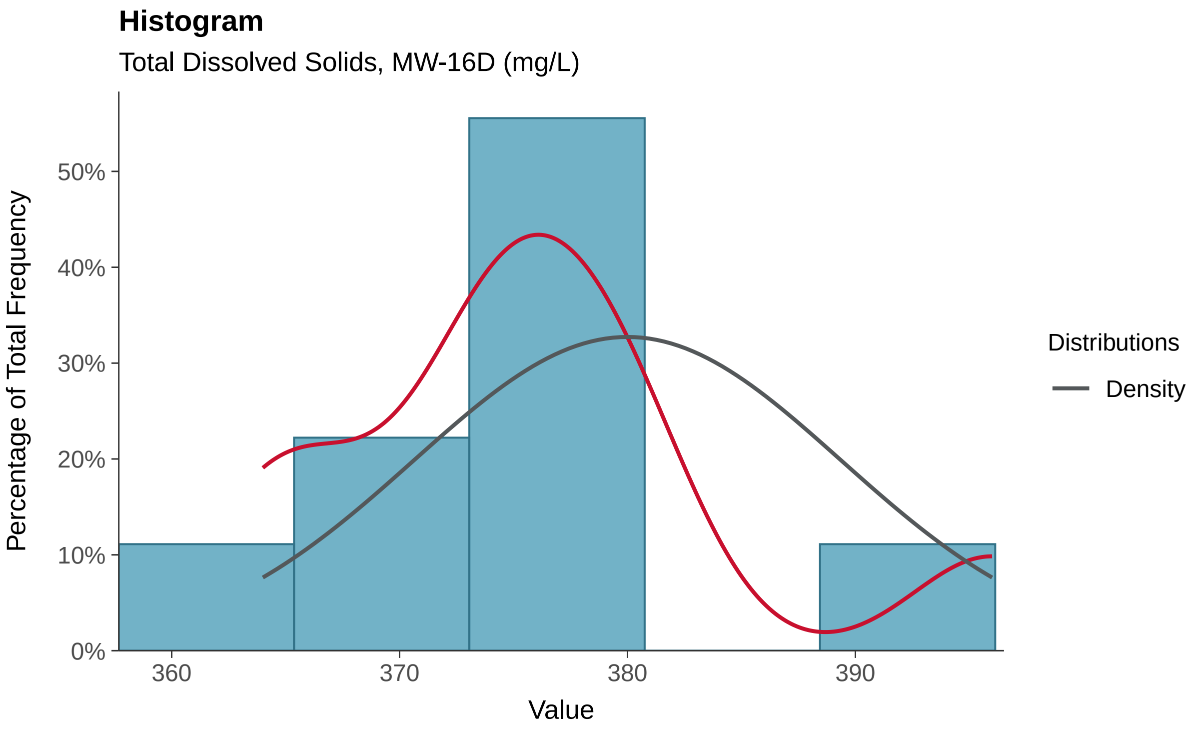
Sulfate, MW-16D (mg/L)



Appendix III: Total Dissolved Solids, MW-16D

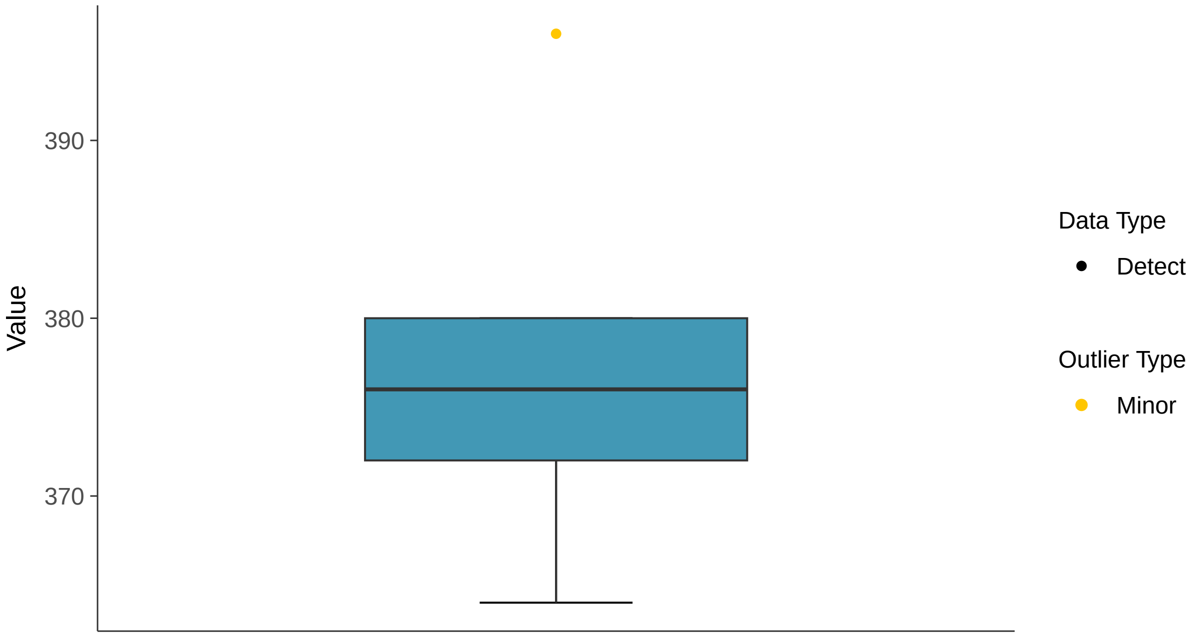
ID: 16D_1_06





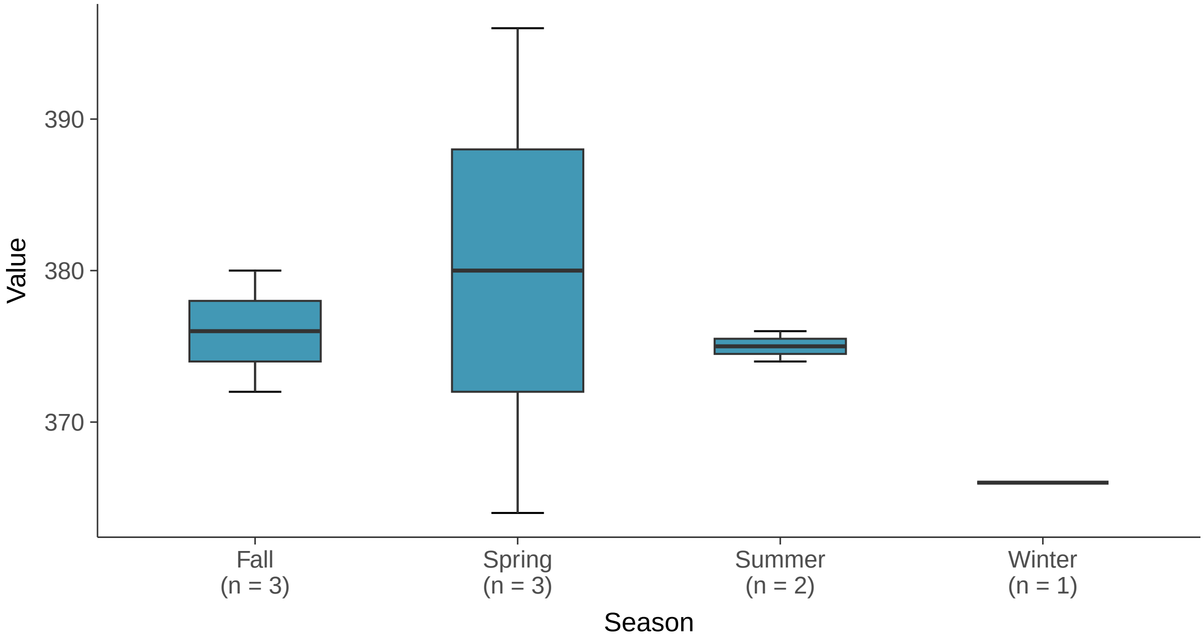
Boxplot

Total Dissolved Solids, MW-16D (mg/L)



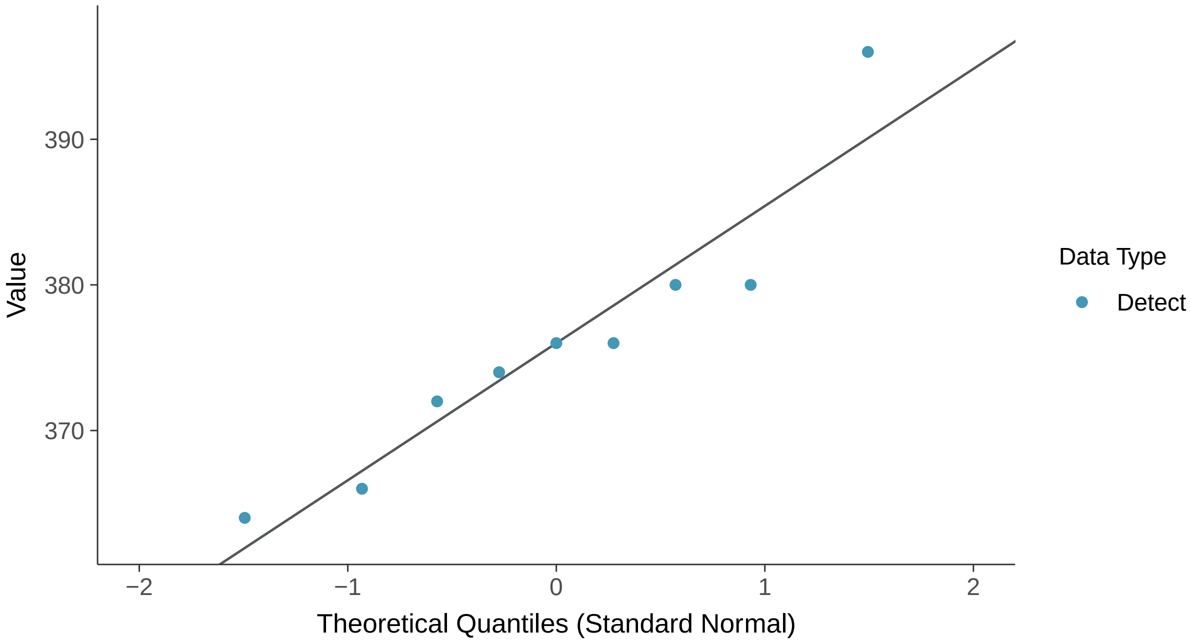
Boxplot by Season

Total Dissolved Solids, MW-16D (mg/L)



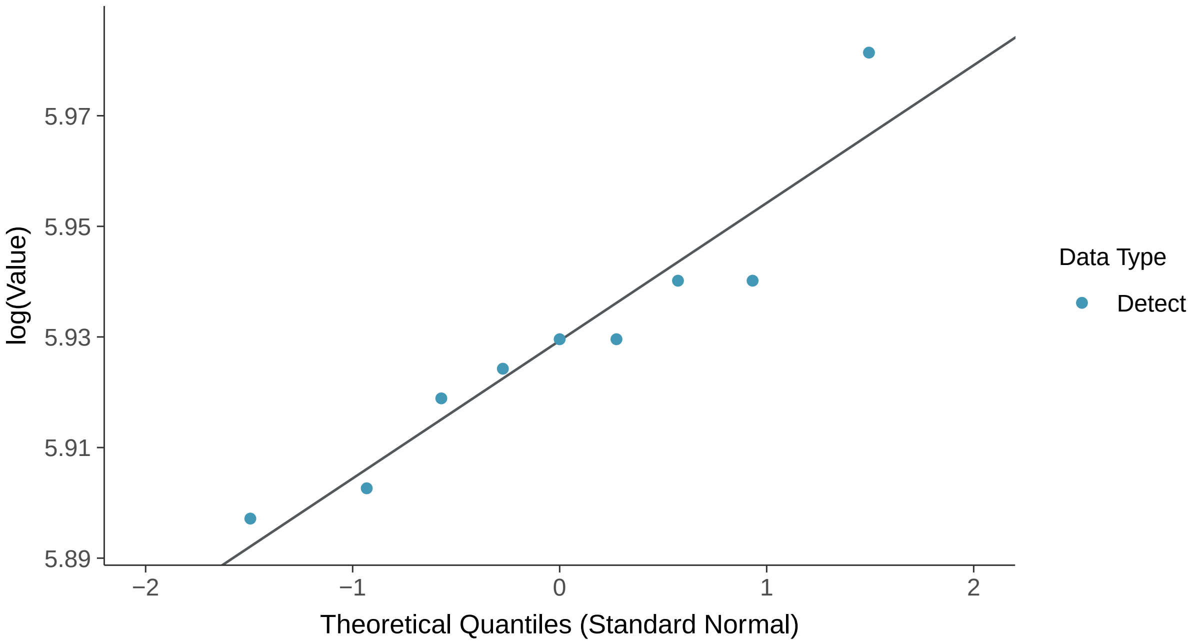
Normal Q-Q plot

Total Dissolved Solids, MW-16D (mg/L)



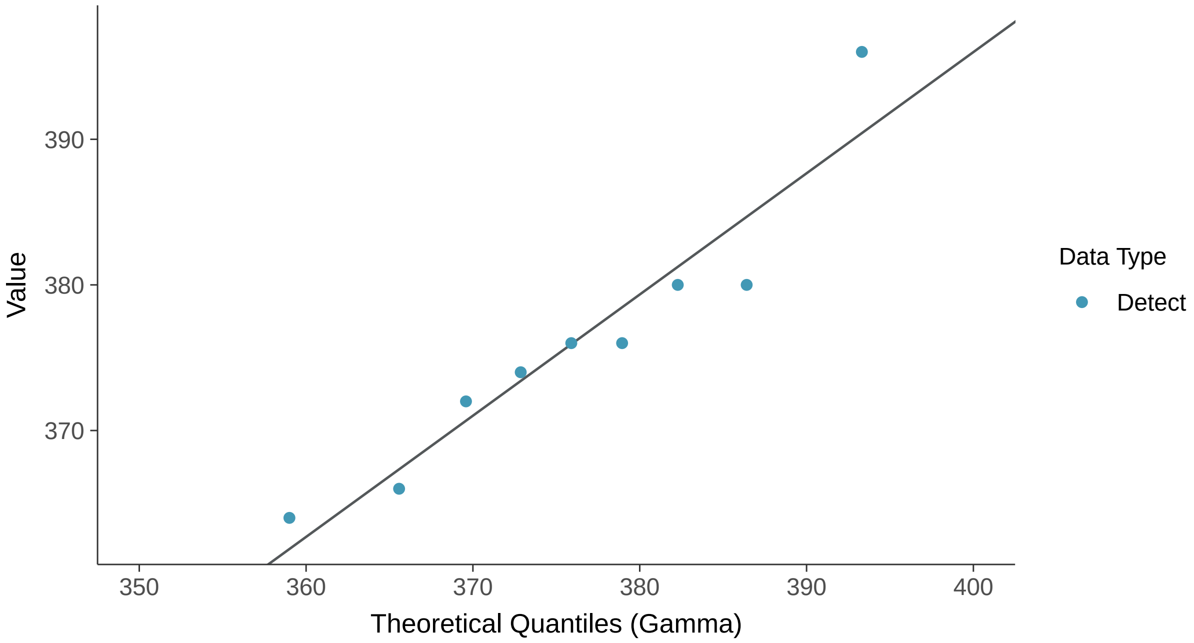
Lognormal Q-Q plot

Total Dissolved Solids, MW-16D (mg/L)



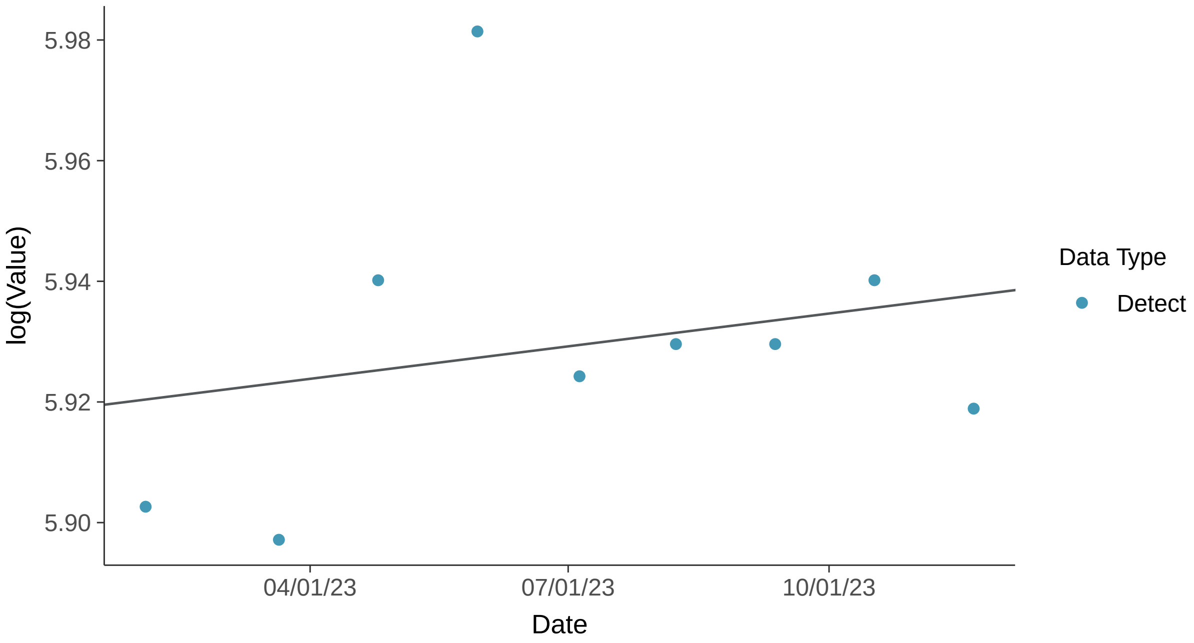
Gamma Q-Q plot

Total Dissolved Solids, MW-16D (mg/L)



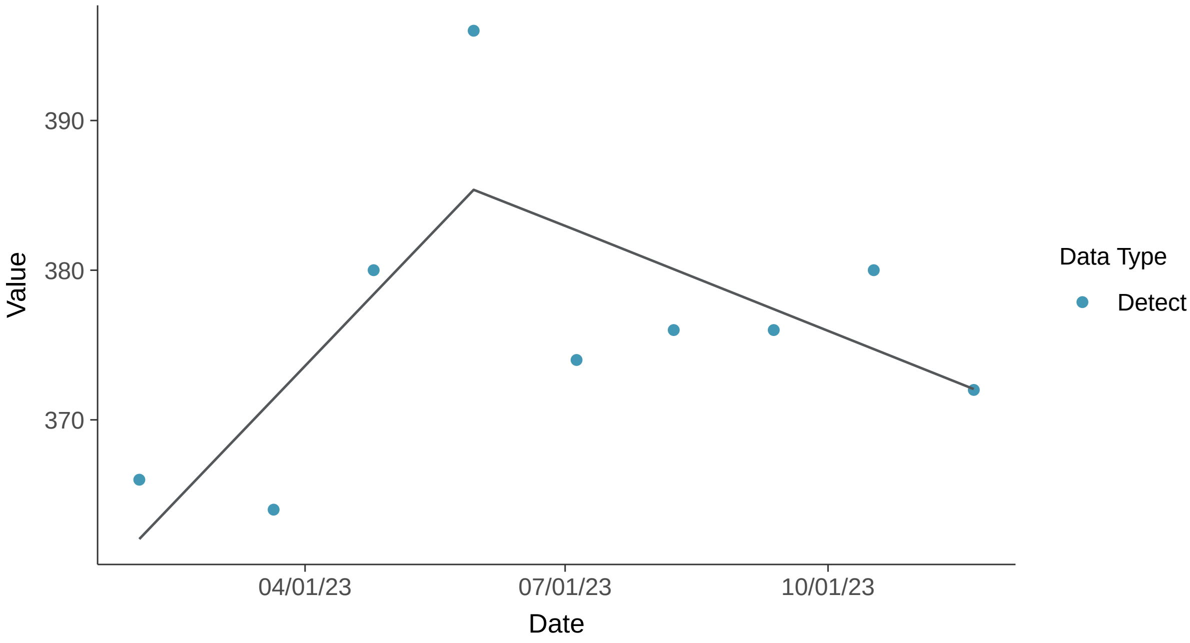
Trend Regression: Lognormal MLE

Total Dissolved Solids, MW-16D (mg/L)



Trend Regression: Piecewise Linear-Linear

Total Dissolved Solids, MW-16D (mg/L)

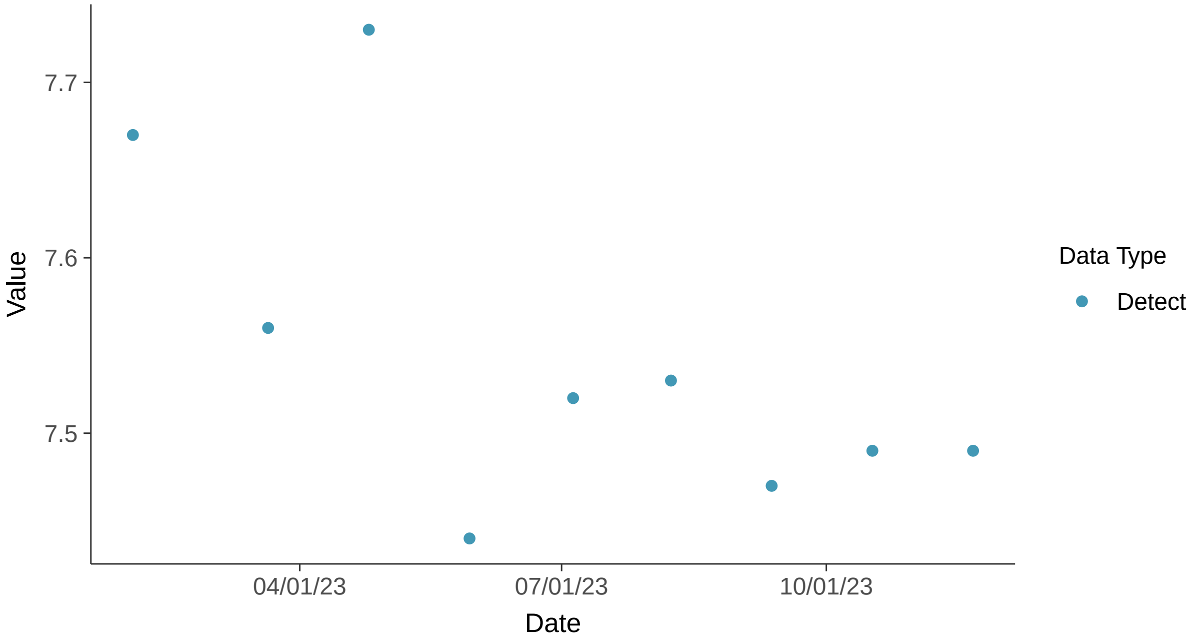


Appendix III: pH, Field, MW-16D

ID: 16D_1_07

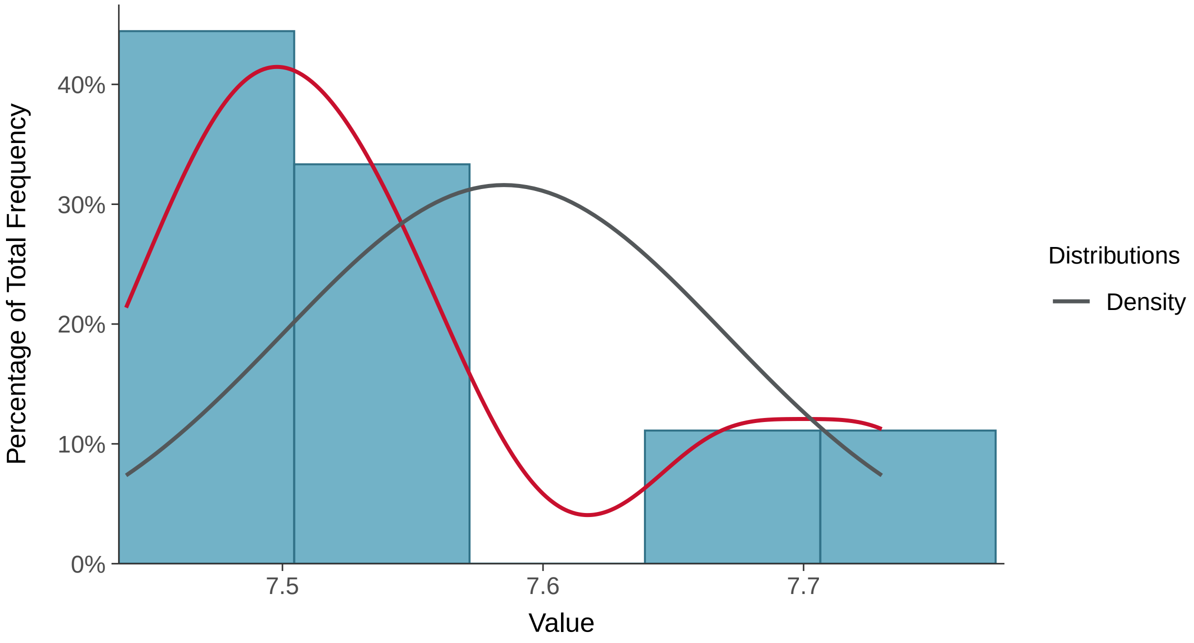
Scatter Plot

pH, Field, MW-16D (su)



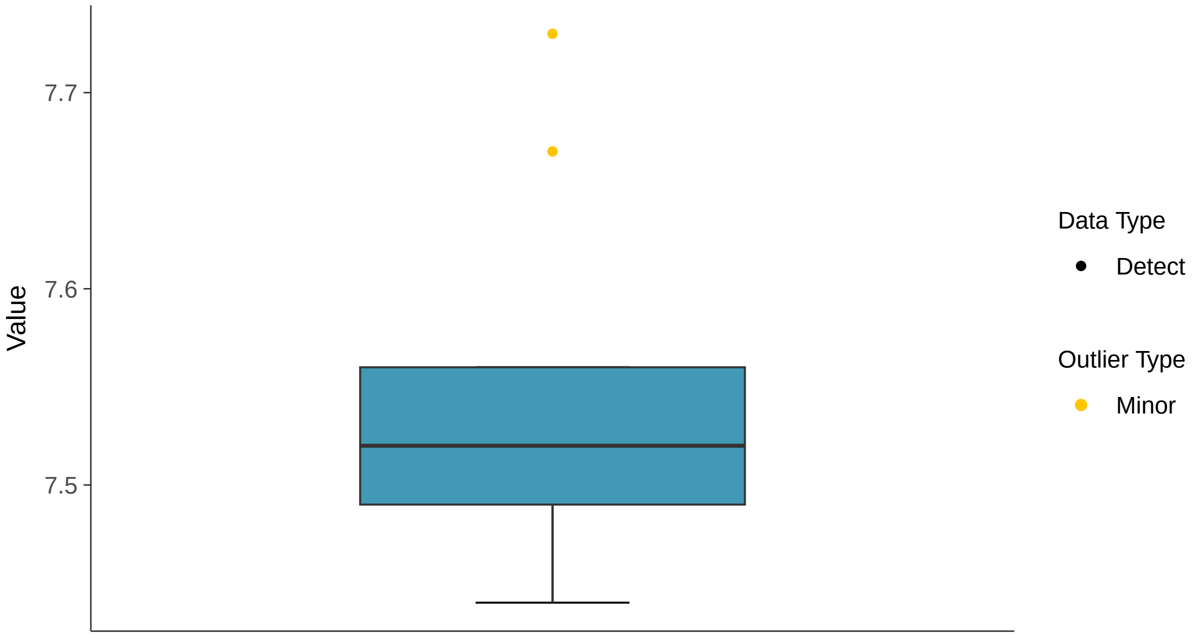
Histogram

pH, Field, MW-16D (su)



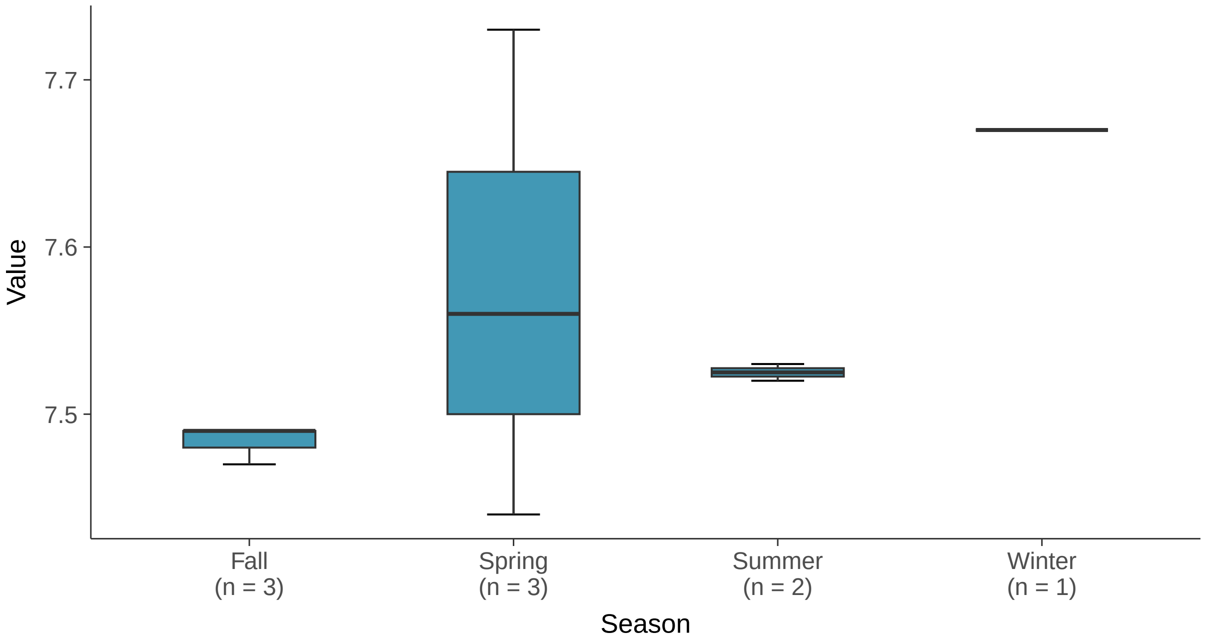
Boxplot

pH, Field, MW-16D (su)



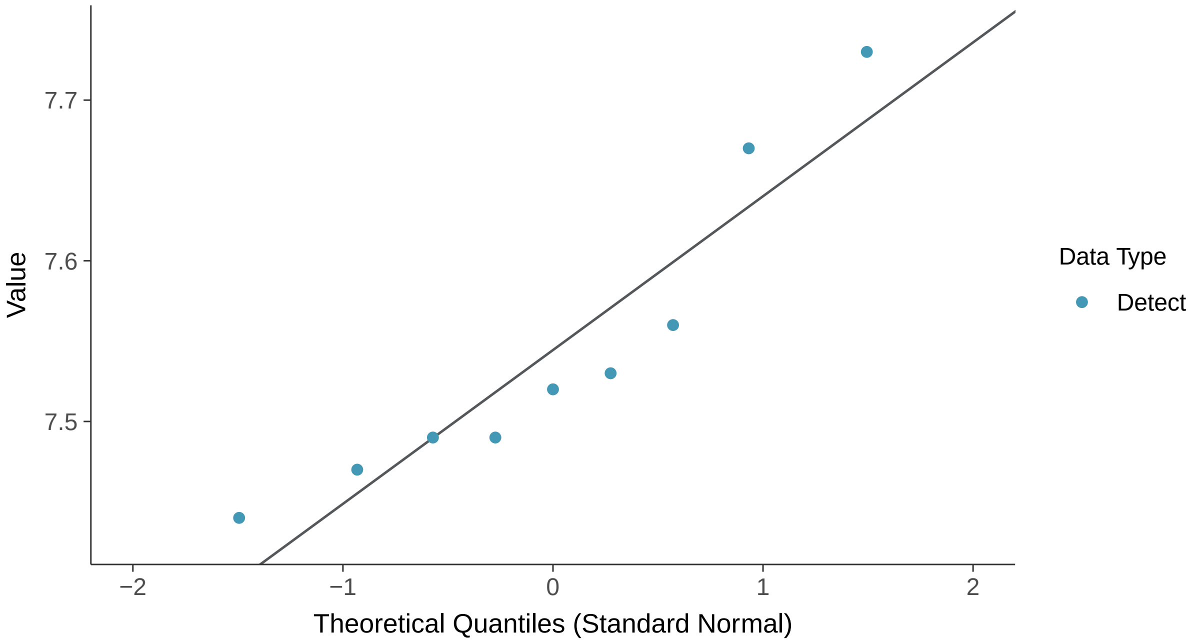
Boxplot by Season

pH, Field, MW-16D (su)



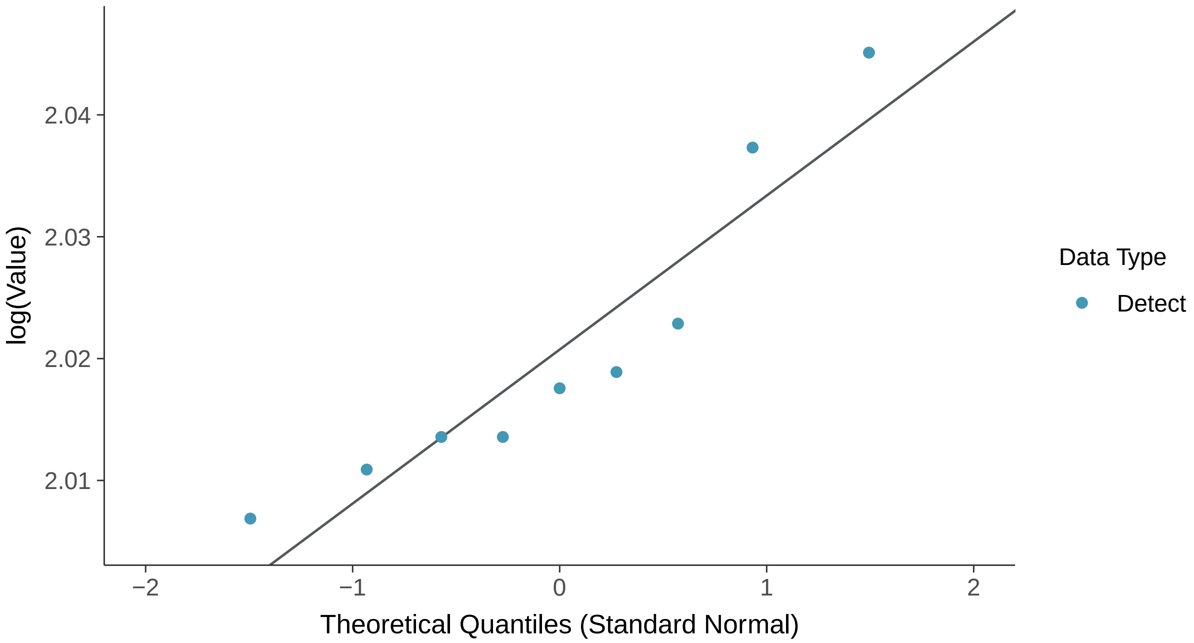
Normal Q-Q plot

pH, Field, MW-16D (su)



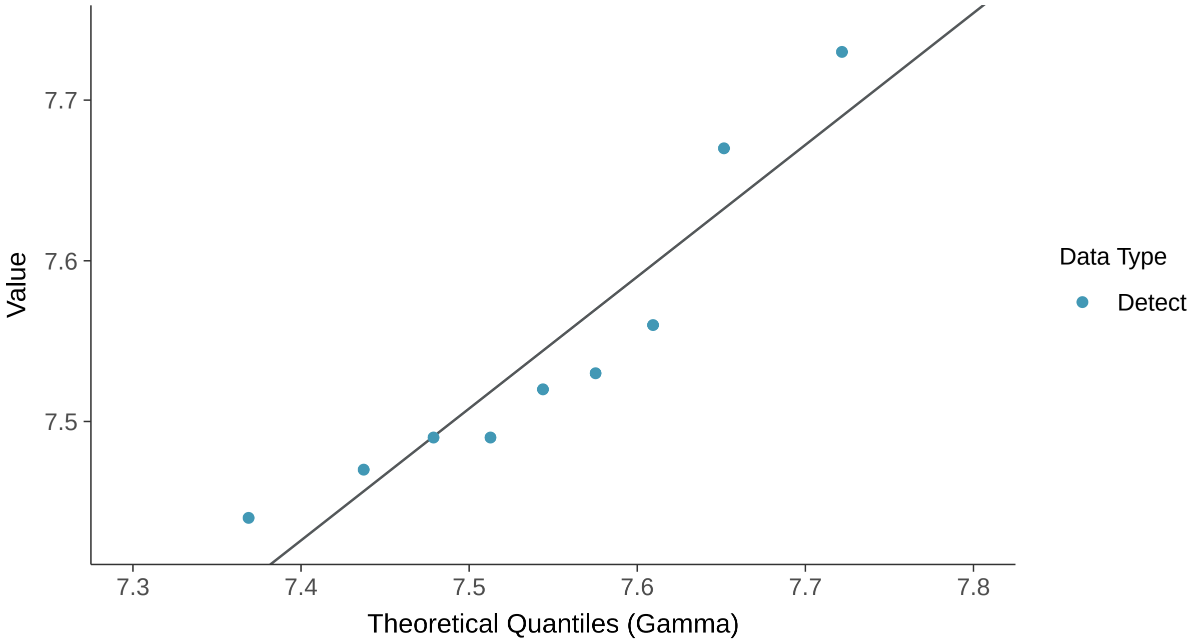
Lognormal Q-Q plot

pH, Field, MW-16D (su)



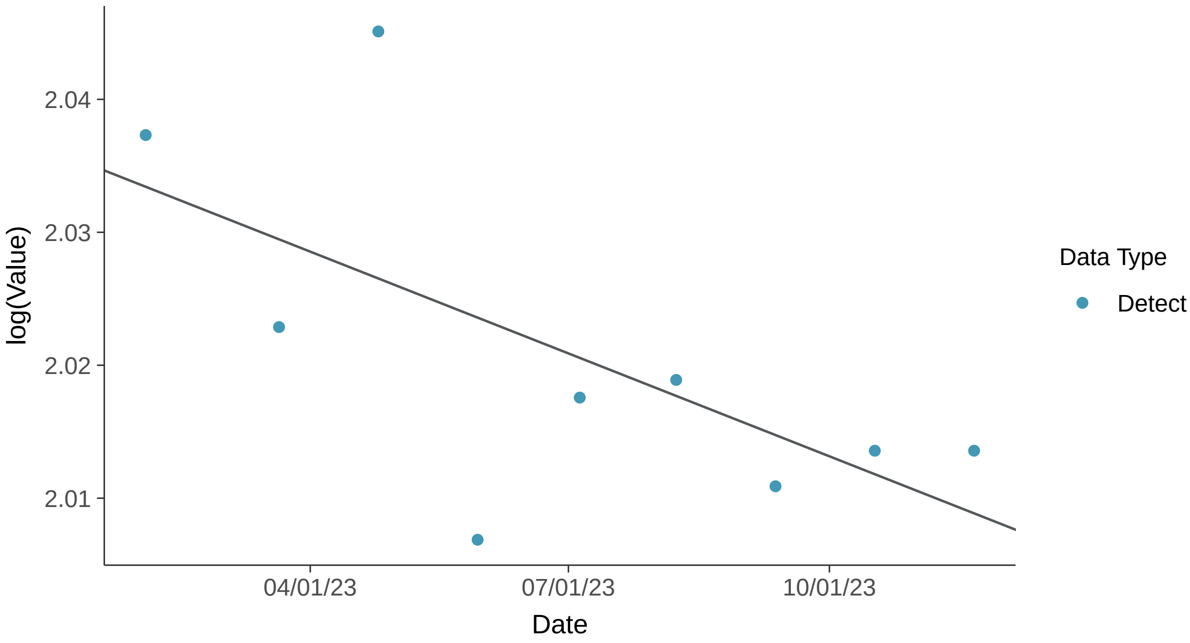
Gamma Q-Q plot

pH, Field, MW-16D (su)



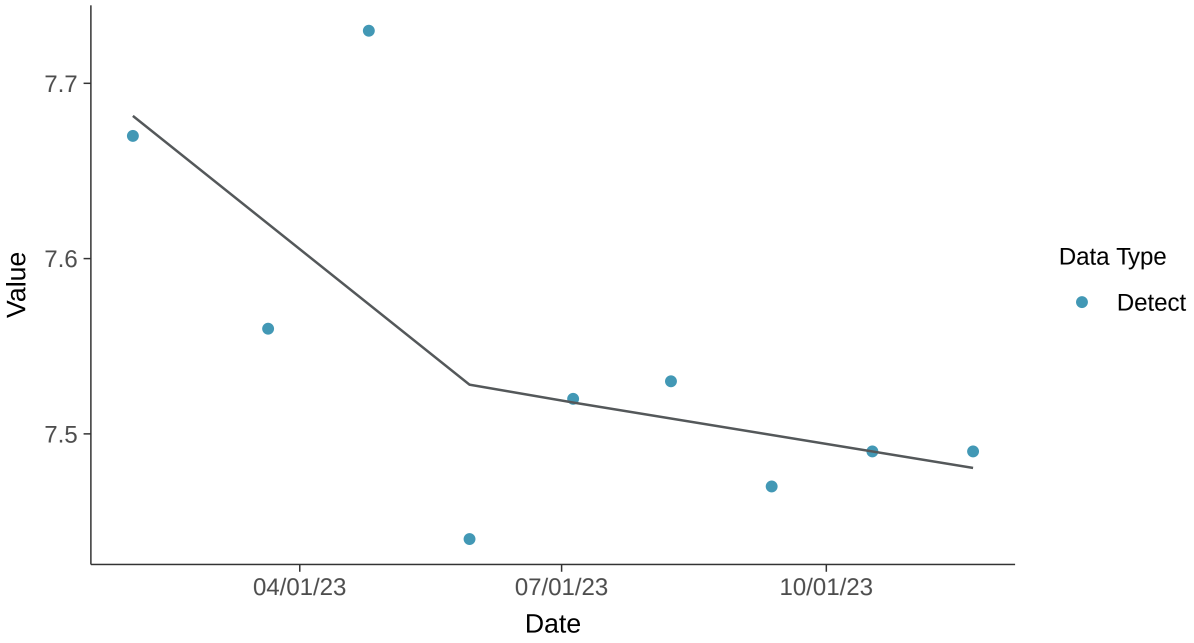
Trend Regression: Lognormal MLE

pH, Field, MW-16D (su)



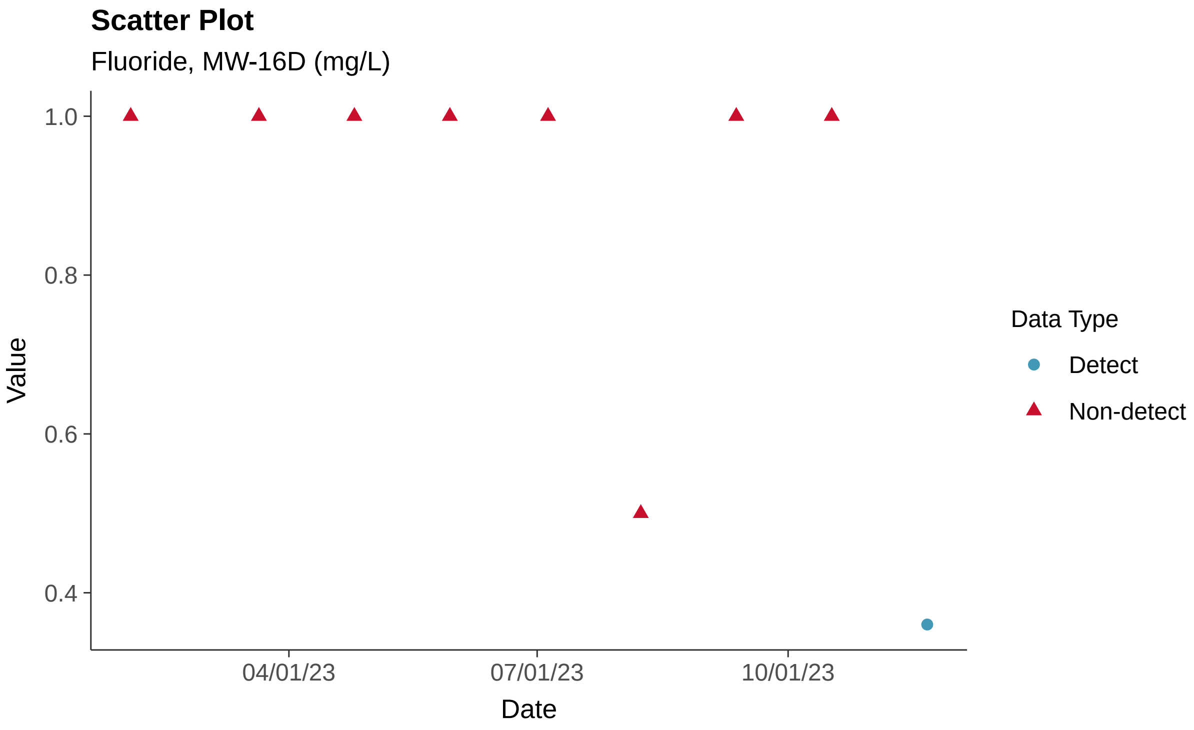
Trend Regression: Piecewise Linear-Linear

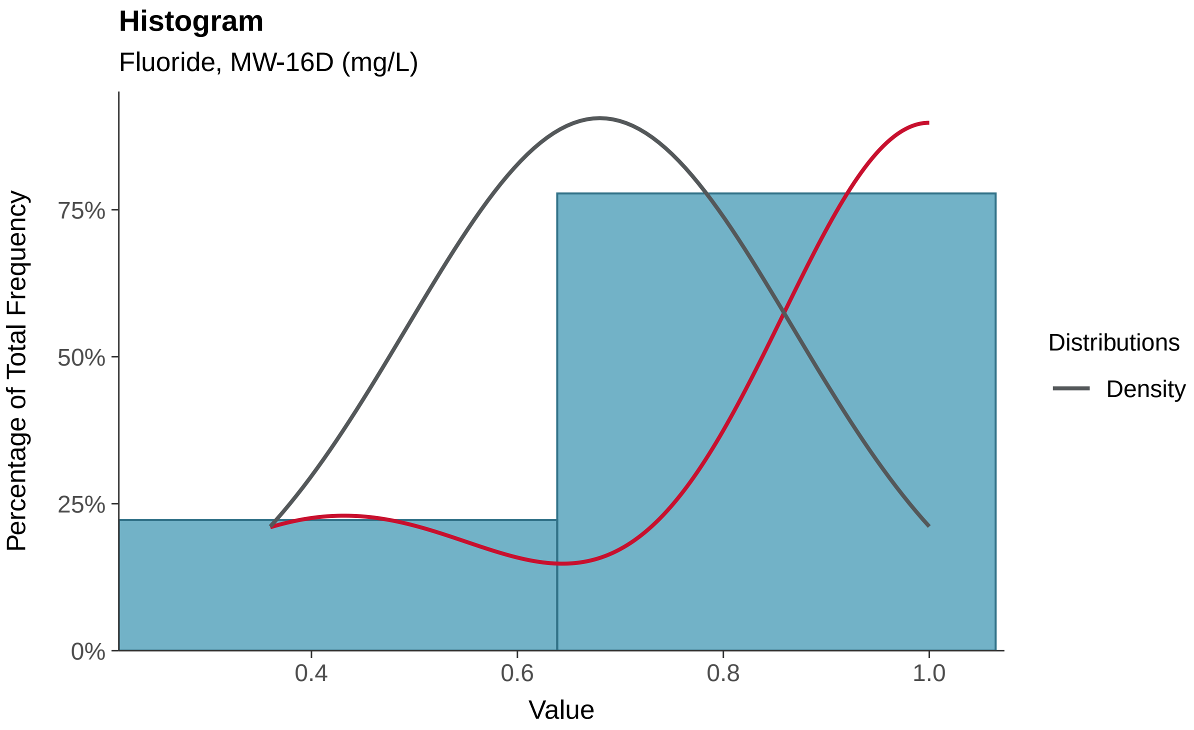
pH, Field, MW-16D (su)



Appendix IV: Fluoride, MW-16D

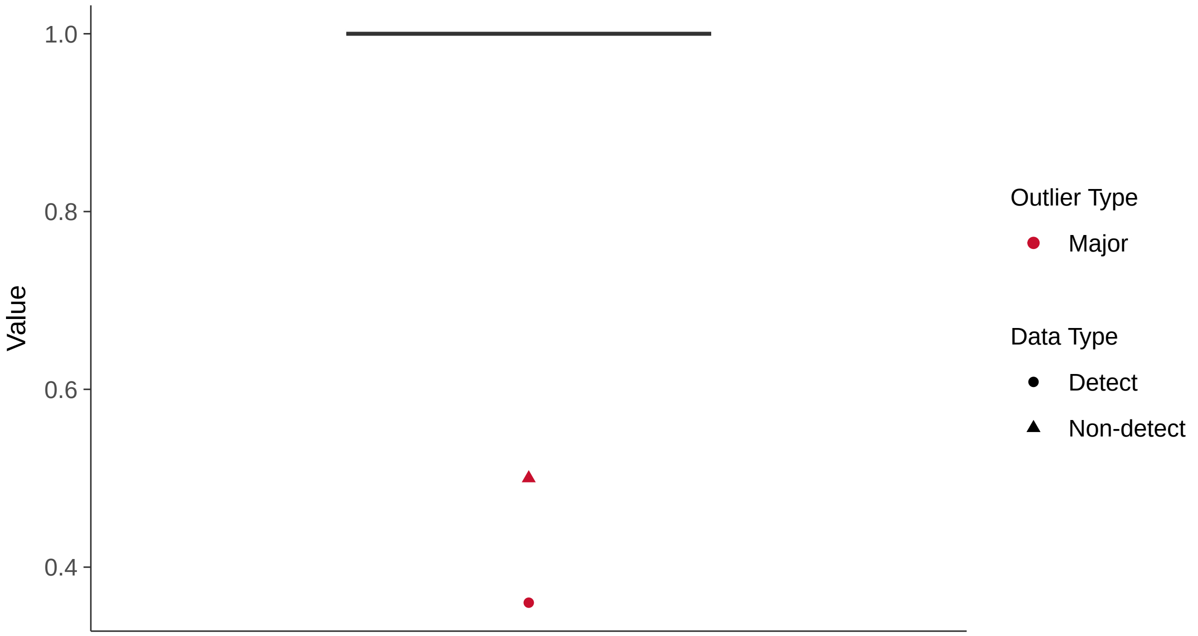
ID: 16D_2_04





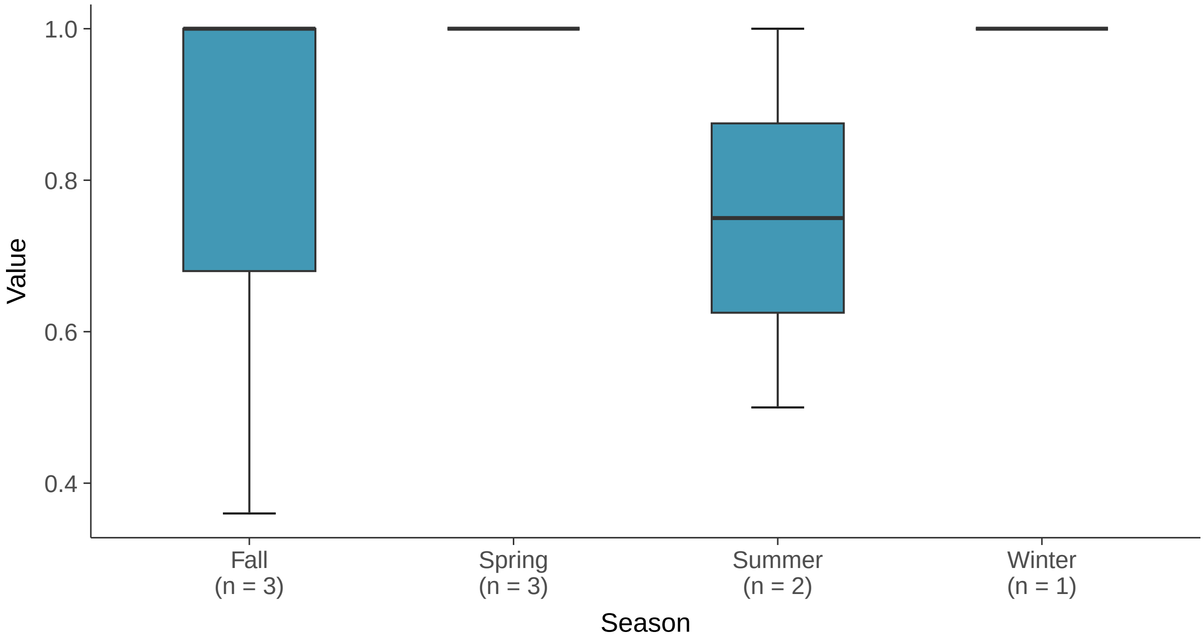
Boxplot

Fluoride, MW-16D (mg/L)



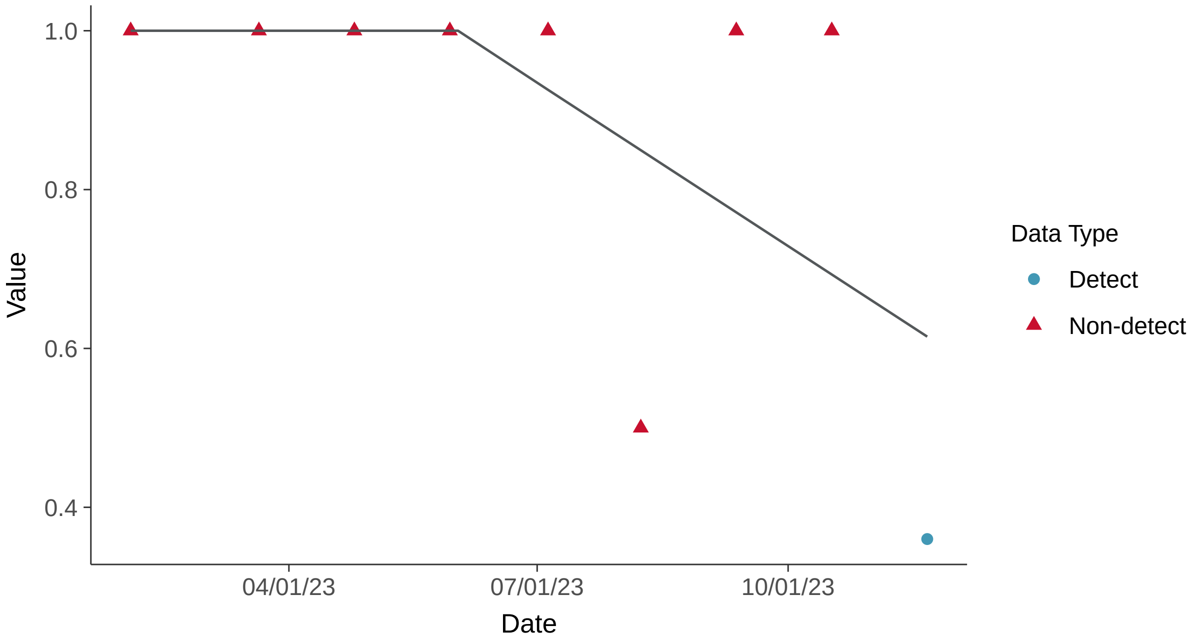
Boxplot by Season

Fluoride, MW-16D (mg/L)



Trend Regression: Piecewise Linear-Linear

Fluoride, MW-16D (mg/L)

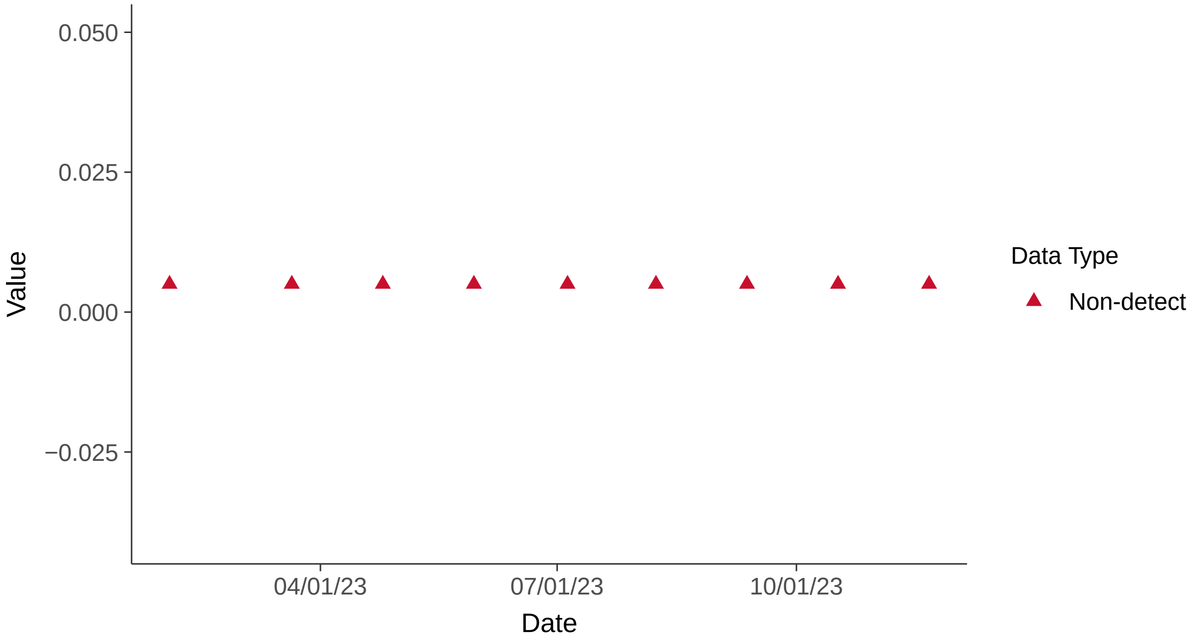


Appendix IV: Antimony, MW-16D

ID: 16D_2_08

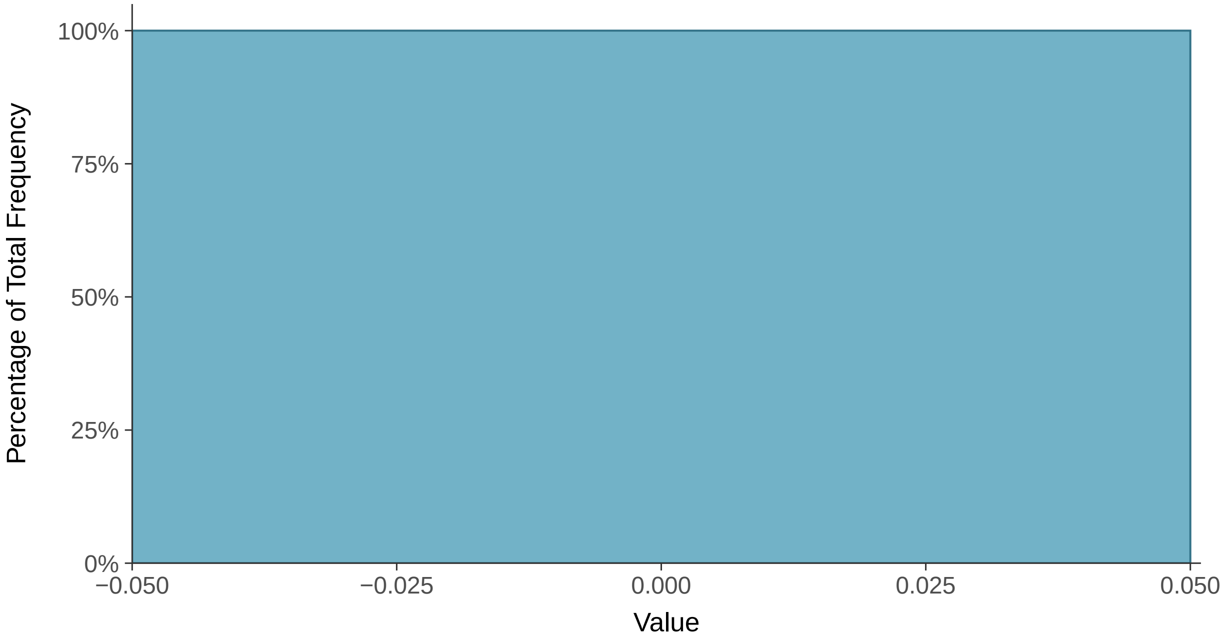
Scatter Plot

Antimony, MW-16D (mg/L)



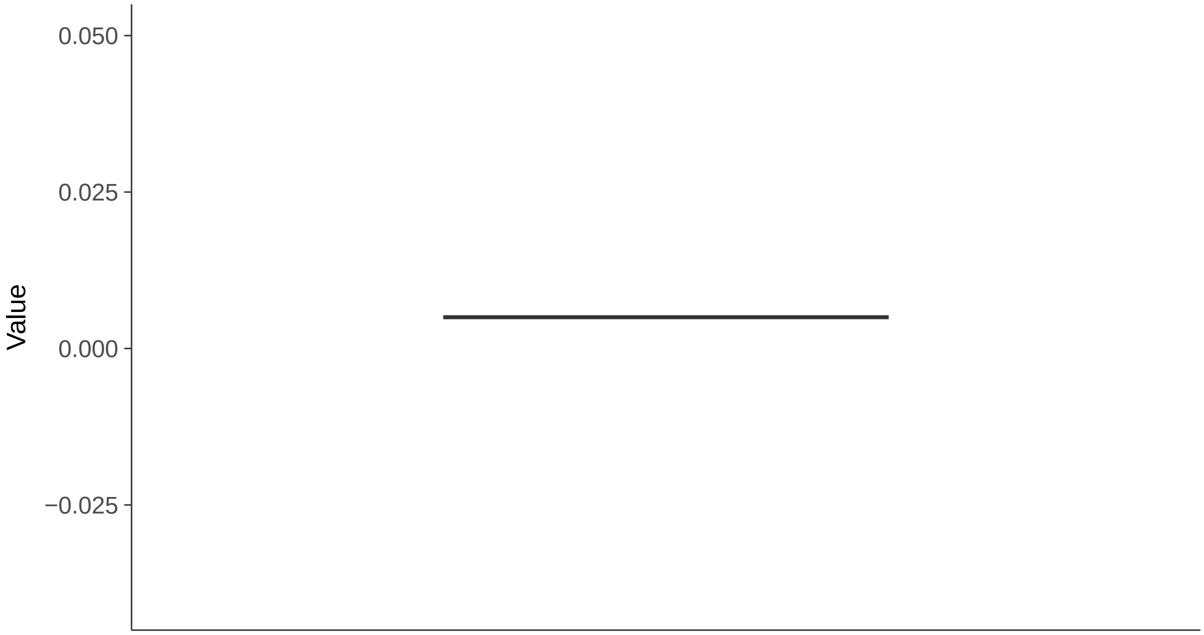
Histogram

Antimony, MW-16D (mg/L)



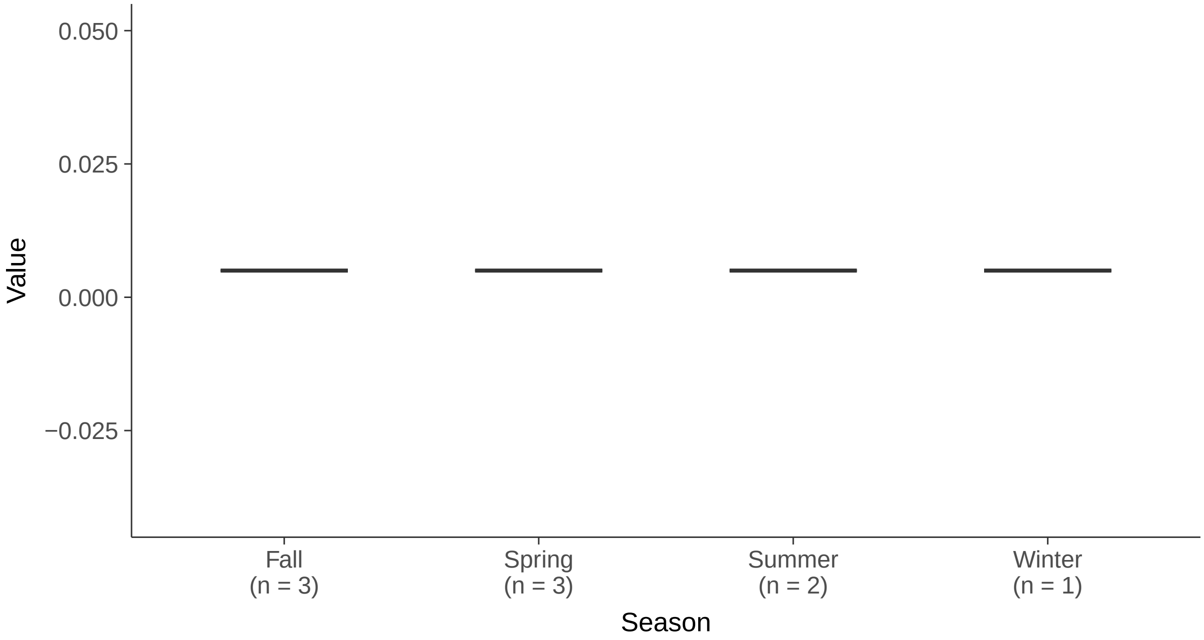
Boxplot

Antimony, MW-16D (mg/L)



Boxplot by Season

Antimony, MW-16D (mg/L)

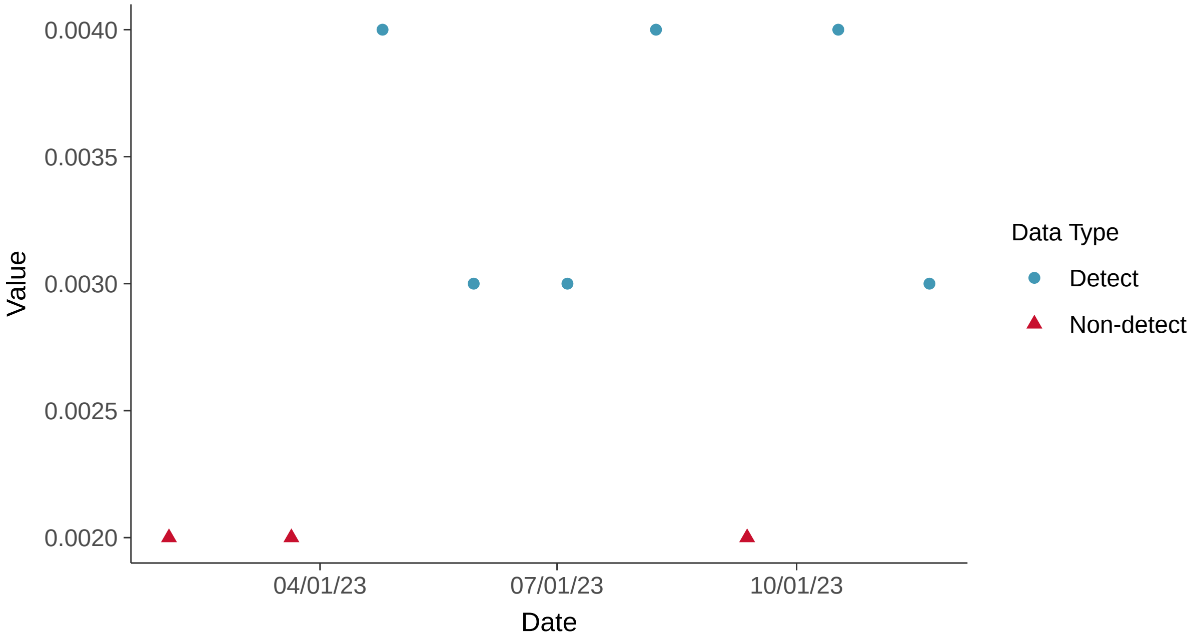


Appendix IV: Arsenic, MW-16D

ID: 16D_2_09

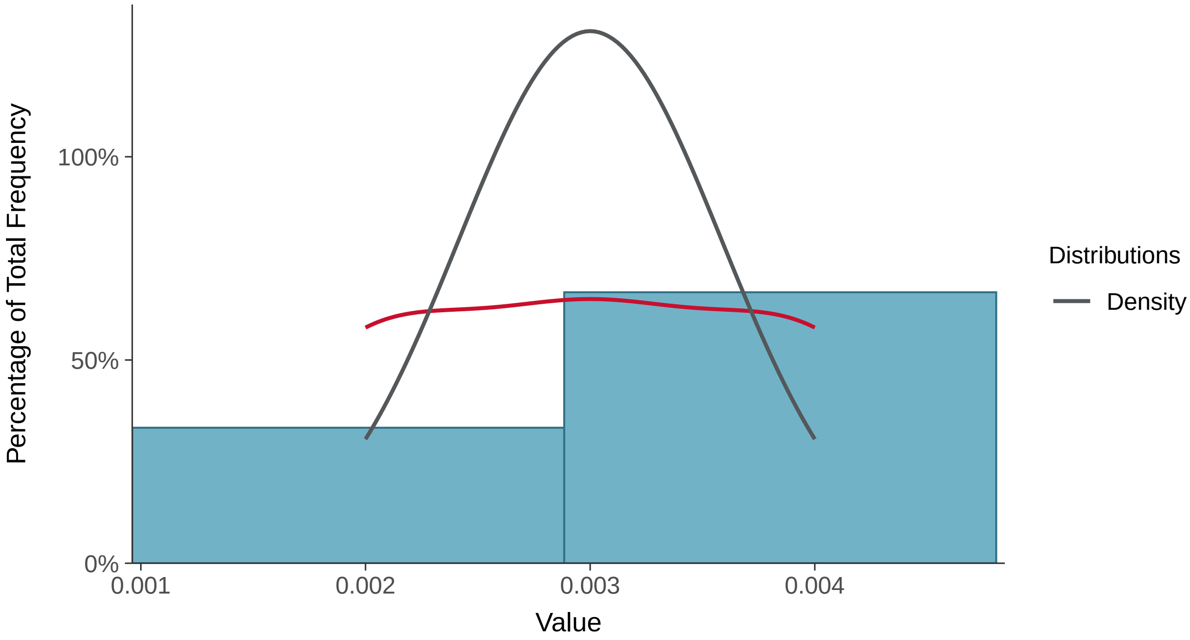
Scatter Plot

Arsenic, MW-16D (mg/L)



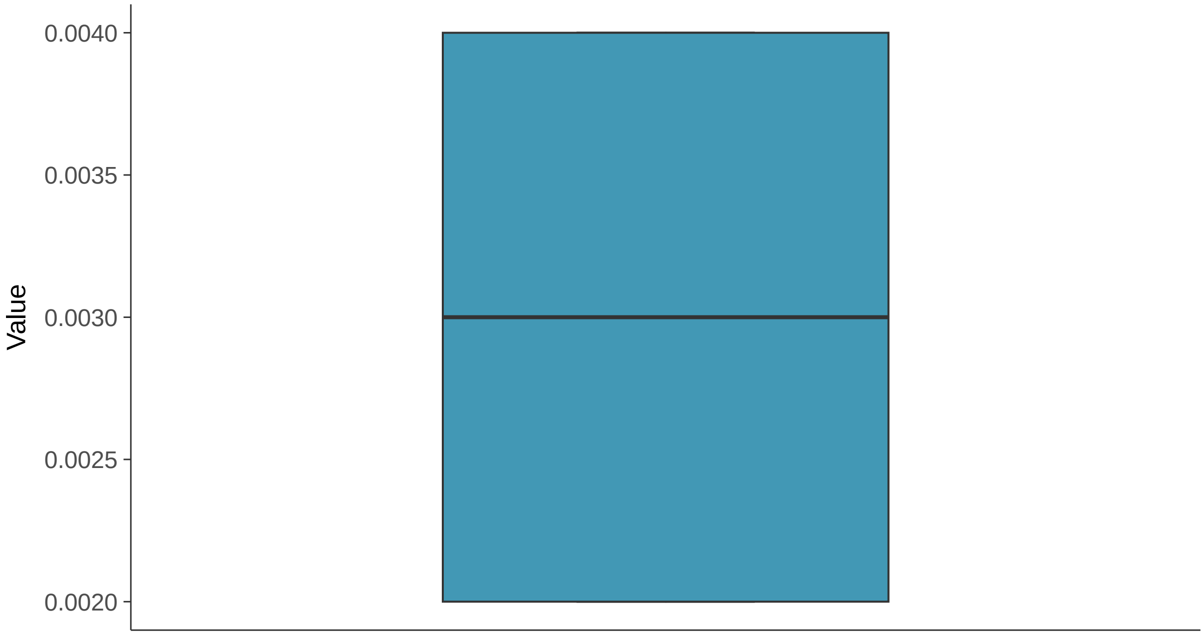
Histogram

Arsenic, MW-16D (mg/L)



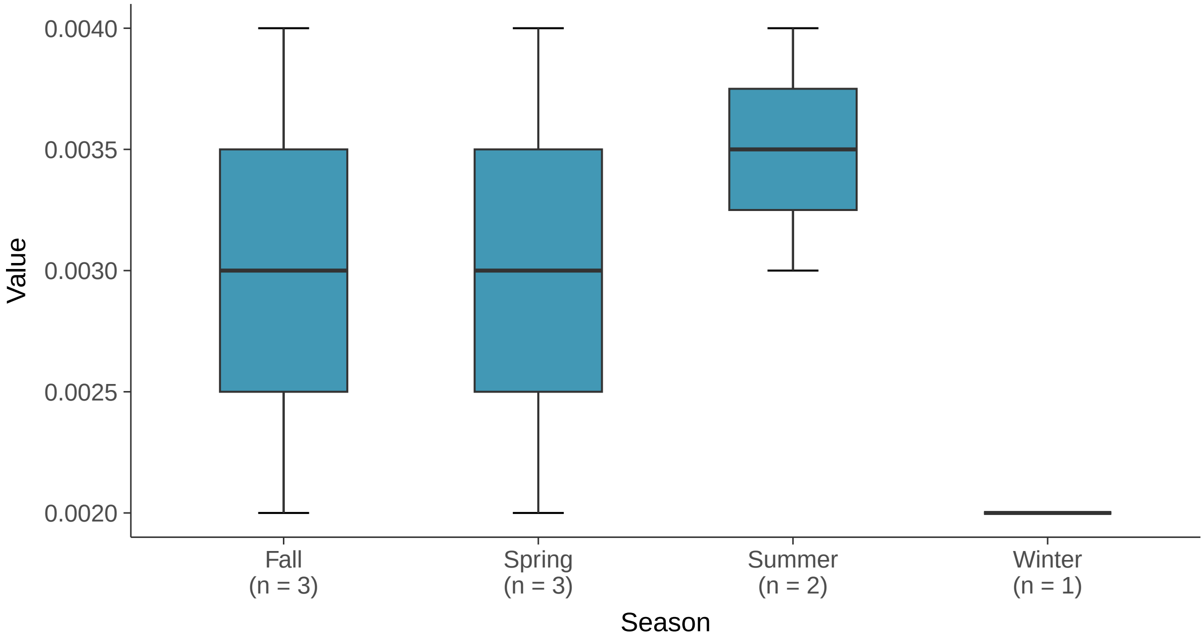
Boxplot

Arsenic, MW-16D (mg/L)



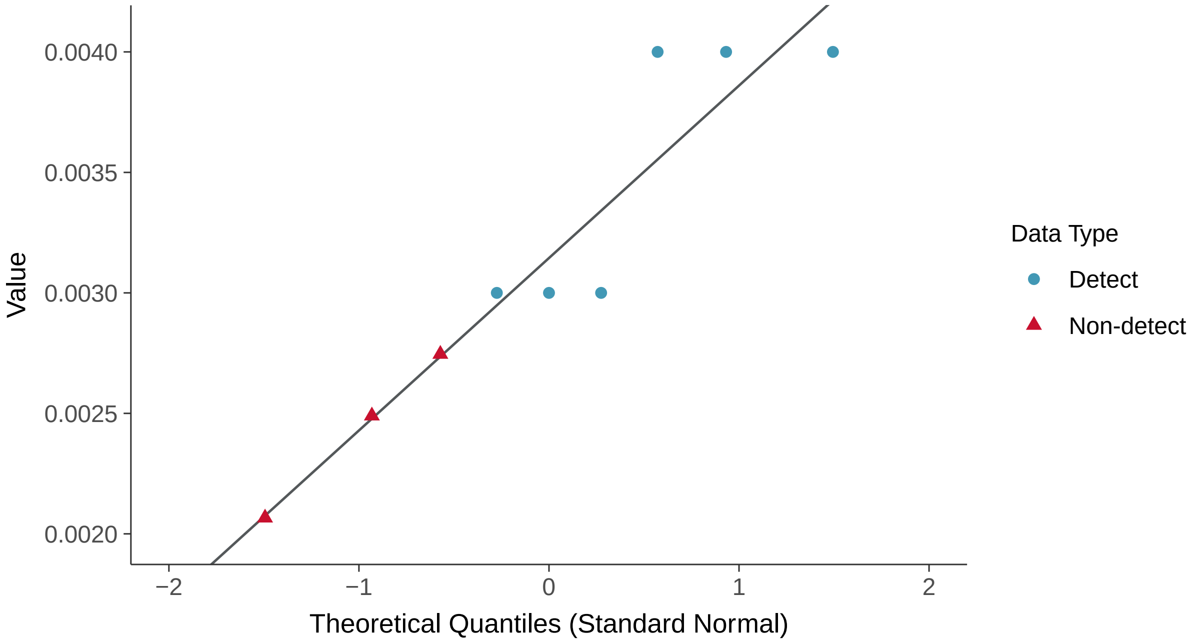
Boxplot by Season

Arsenic, MW-16D (mg/L)



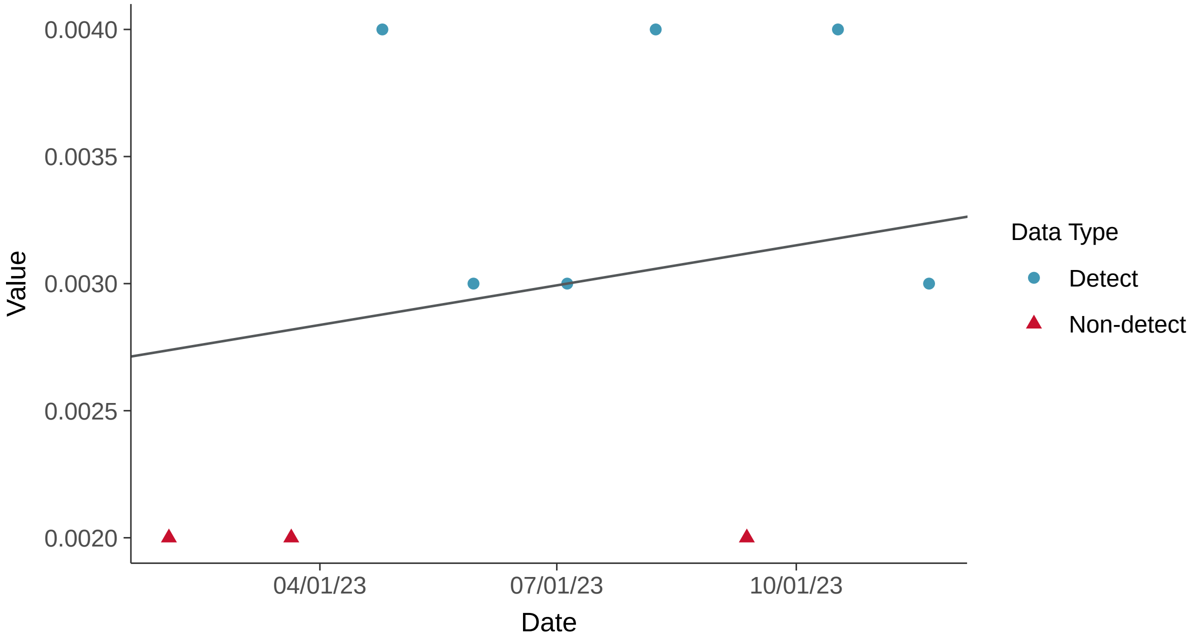
Normal Q-Q plot using ROS Imputed Estimates

Arsenic, MW-16D (mg/L)



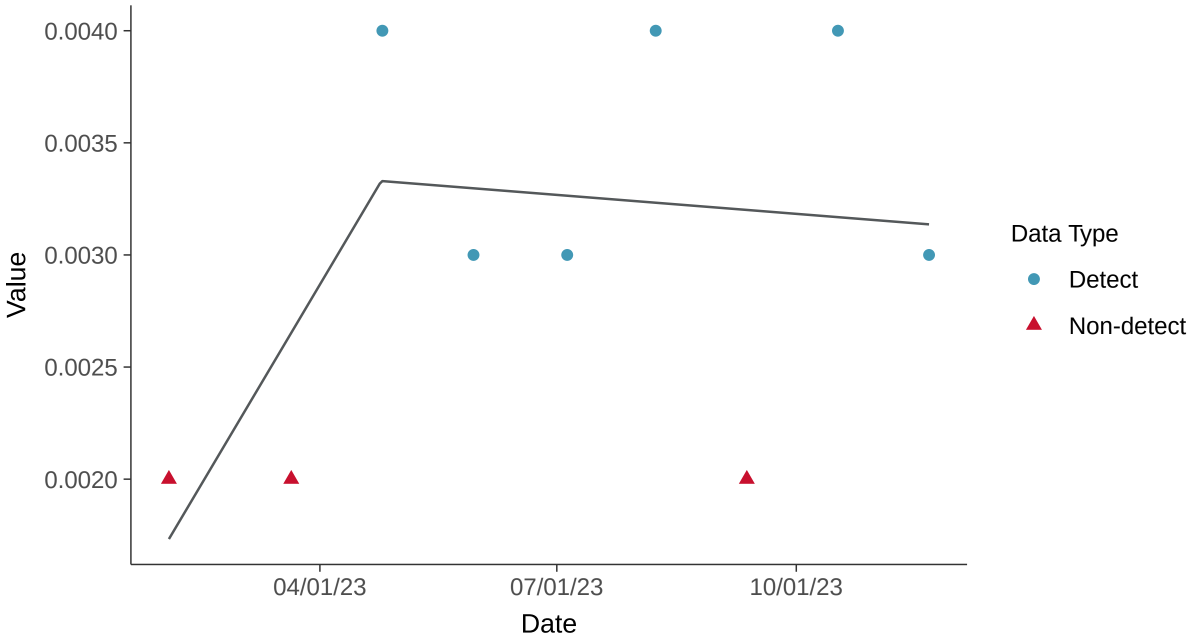
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Arsenic, MW-16D (mg/L)



Trend Regression: Piecewise Linear-Linear

Arsenic, MW-16D (mg/L)

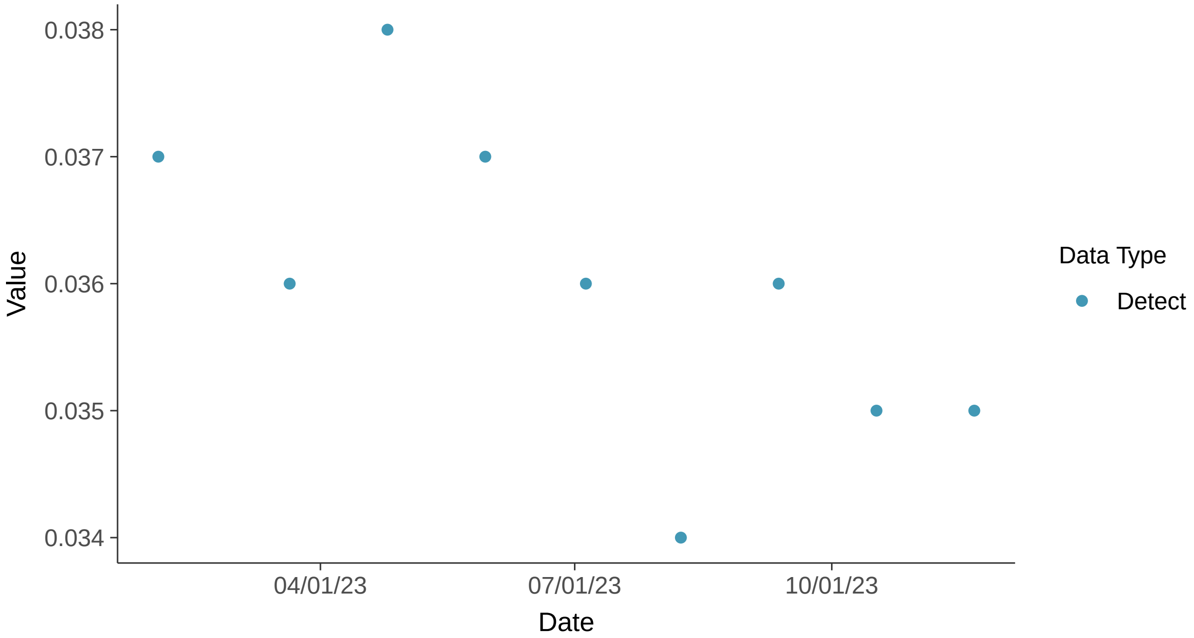


Appendix IV: Barium, MW-16D

ID: 16D_2_10

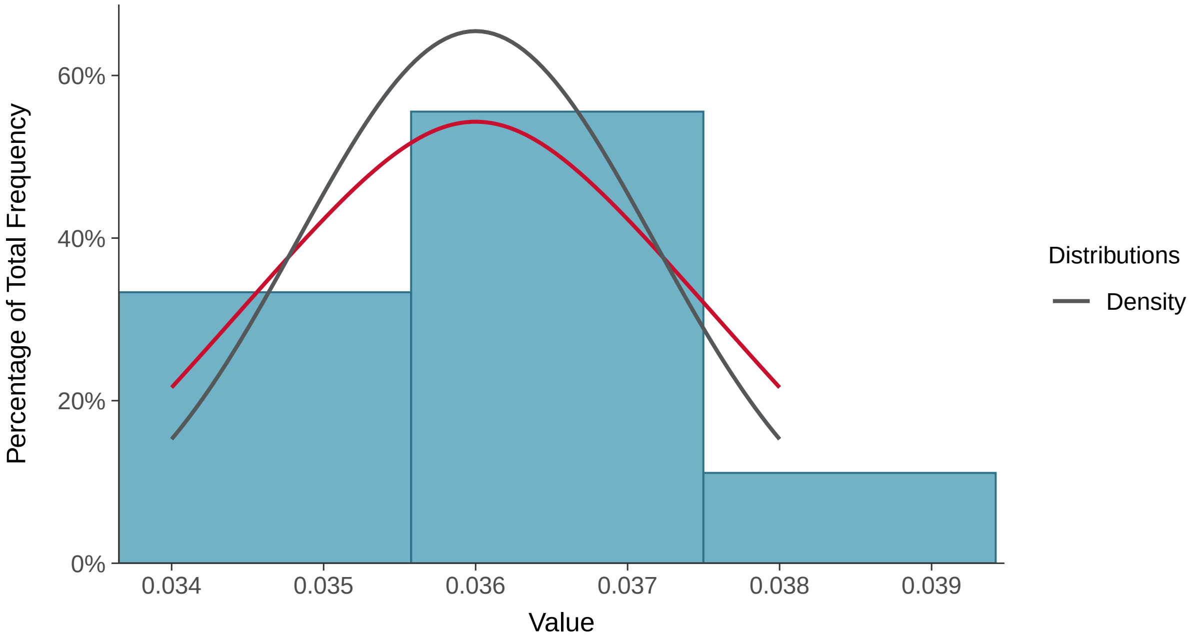
Scatter Plot

Barium, MW-16D (mg/L)



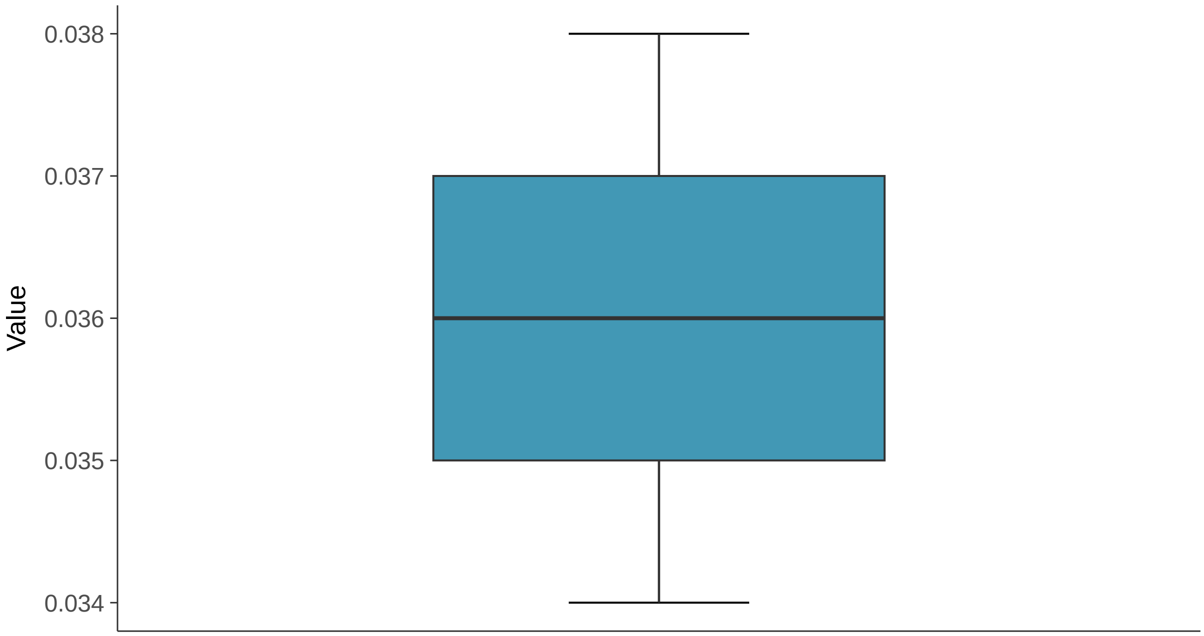
Histogram

Barium, MW-16D (mg/L)



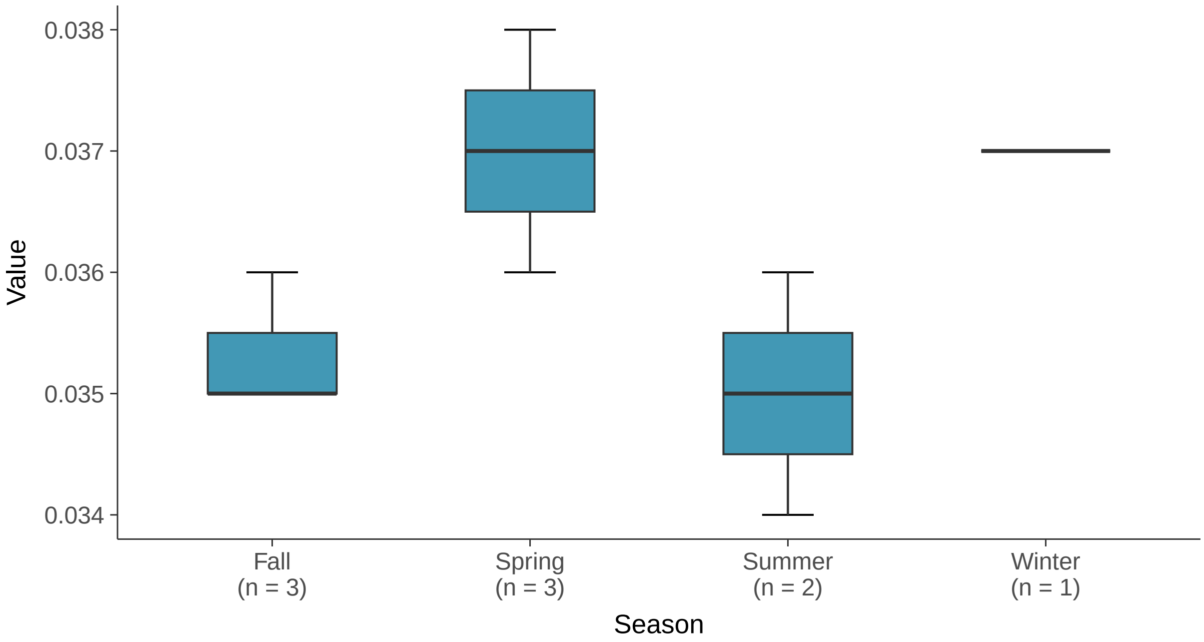
Boxplot

Barium, MW-16D (mg/L)



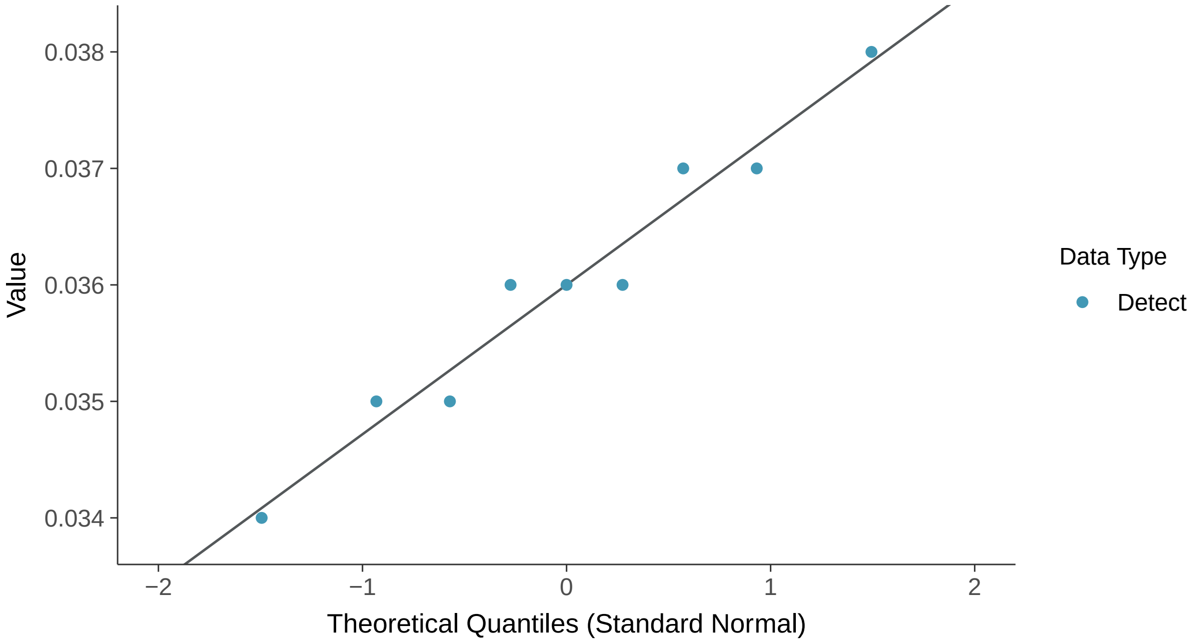
Boxplot by Season

Barium, MW-16D (mg/L)



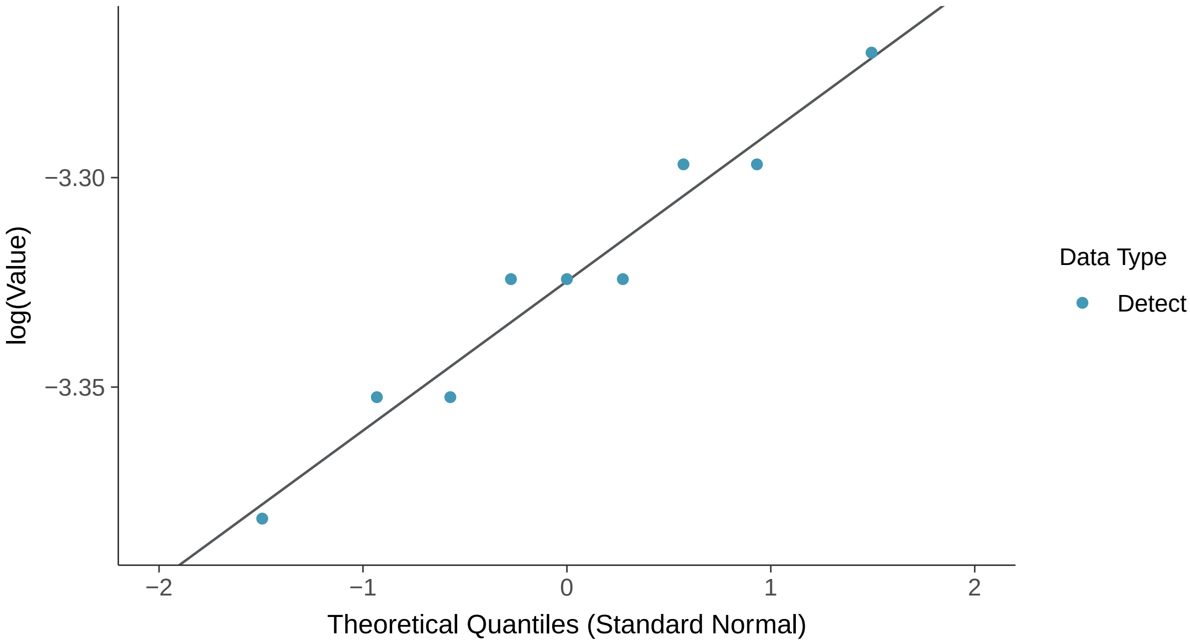
Normal Q-Q plot

Barium, MW-16D (mg/L)



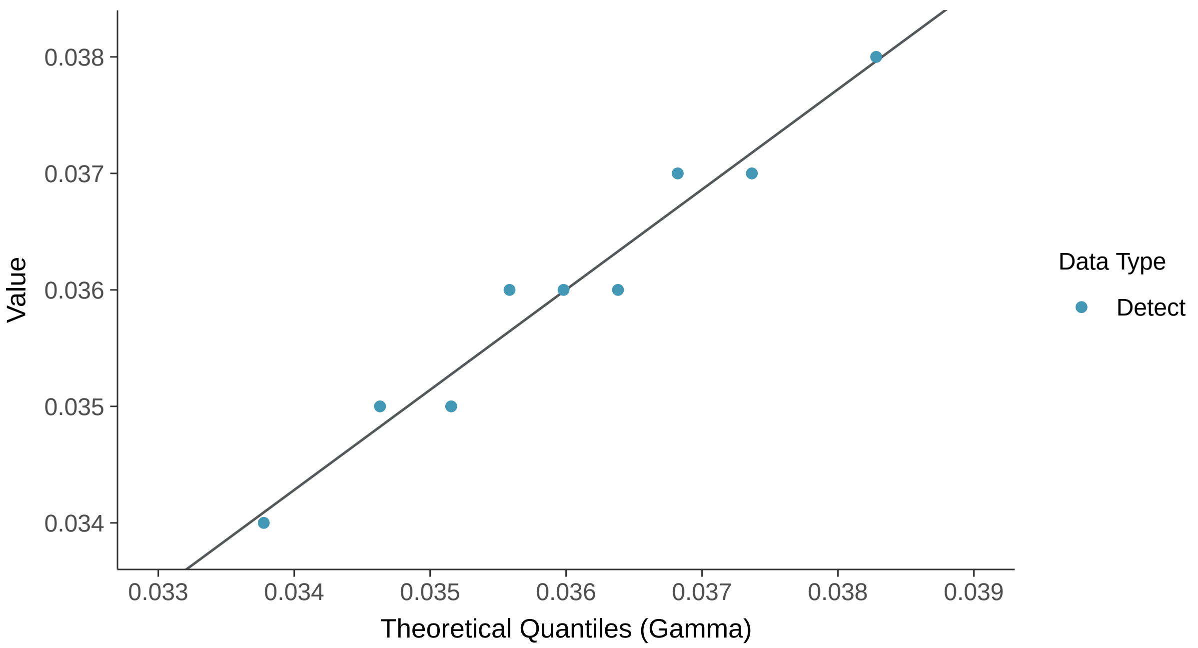
Lognormal Q-Q plot

Barium, MW-16D (mg/L)



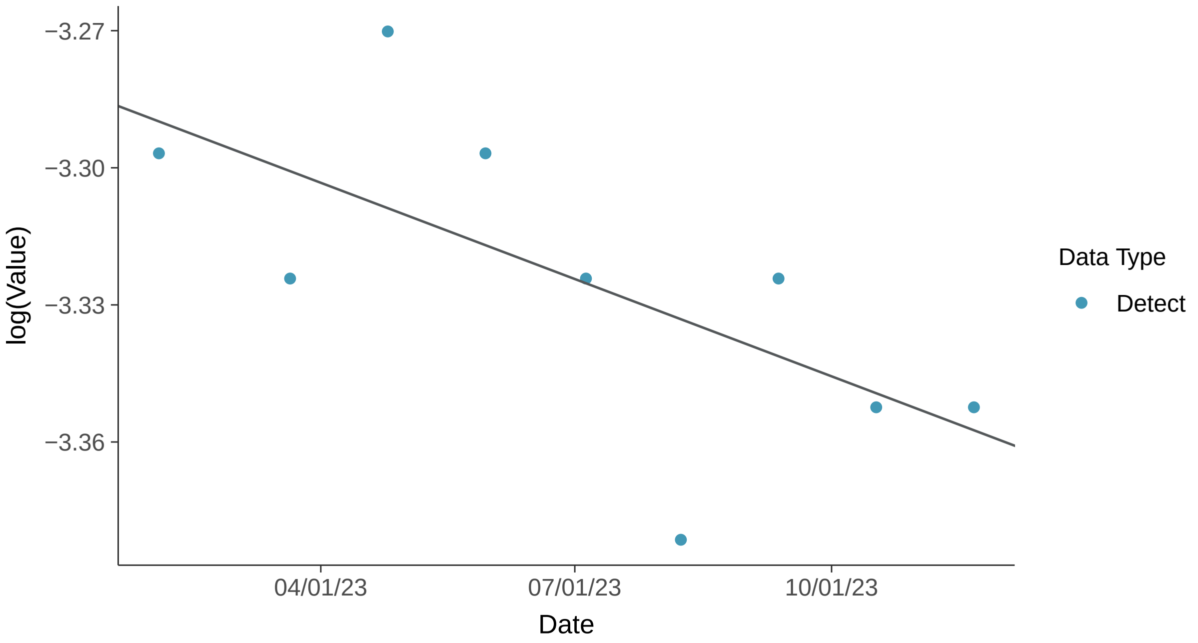
Gamma Q-Q plot

Barium, MW-16D (mg/L)



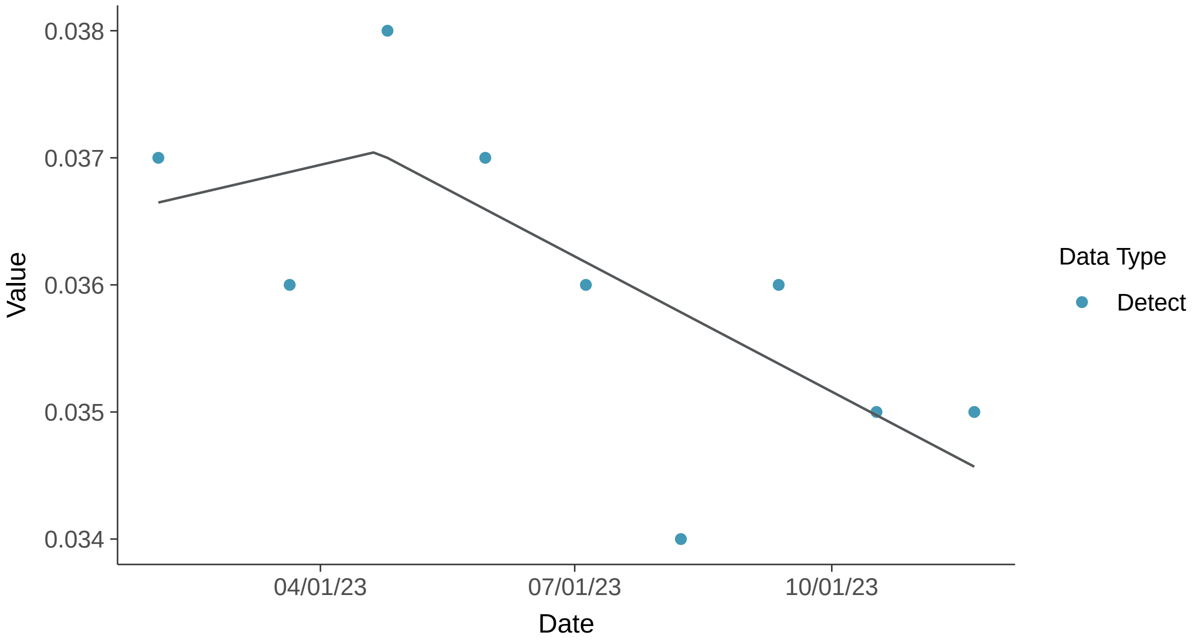
Trend Regression: Lognormal MLE

Barium, MW-16D (mg/L)



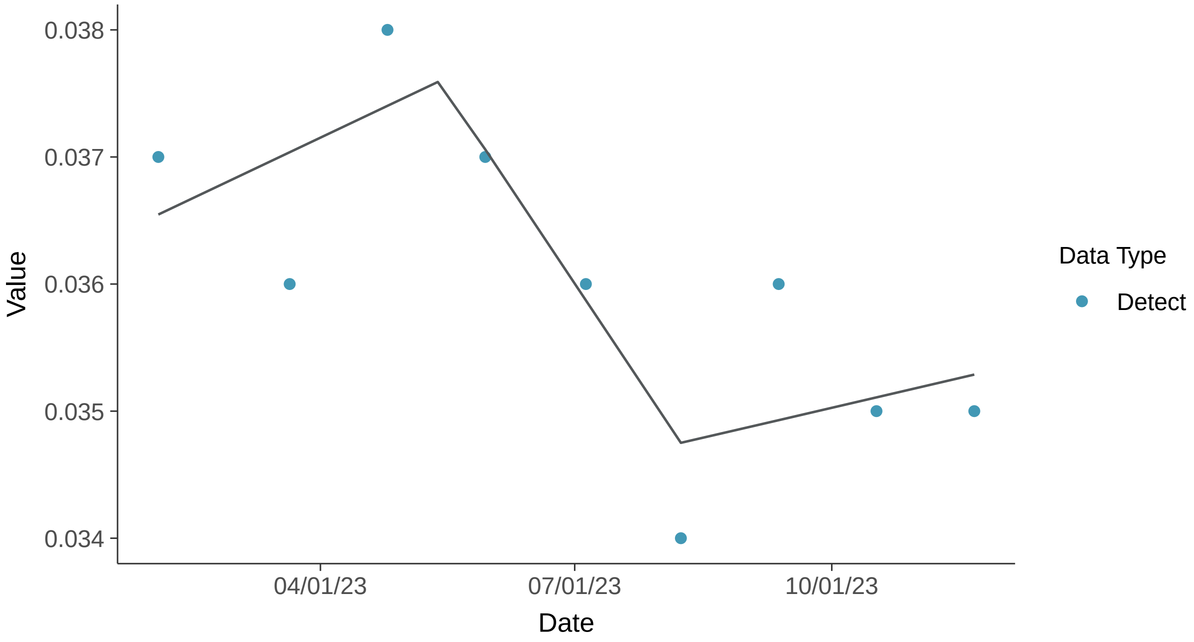
Trend Regression: Piecewise Linear-Linear

Barium, MW-16D (mg/L)



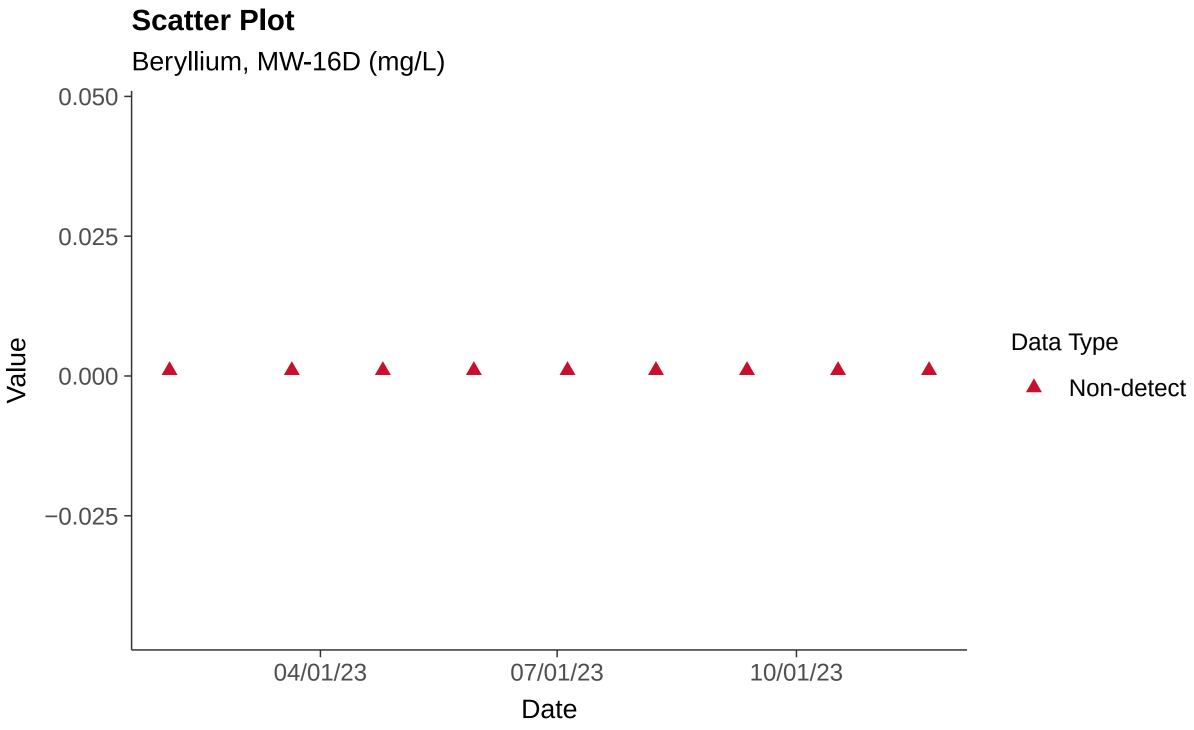
Trend Regression: Piecewise Linear-Linear-Linear

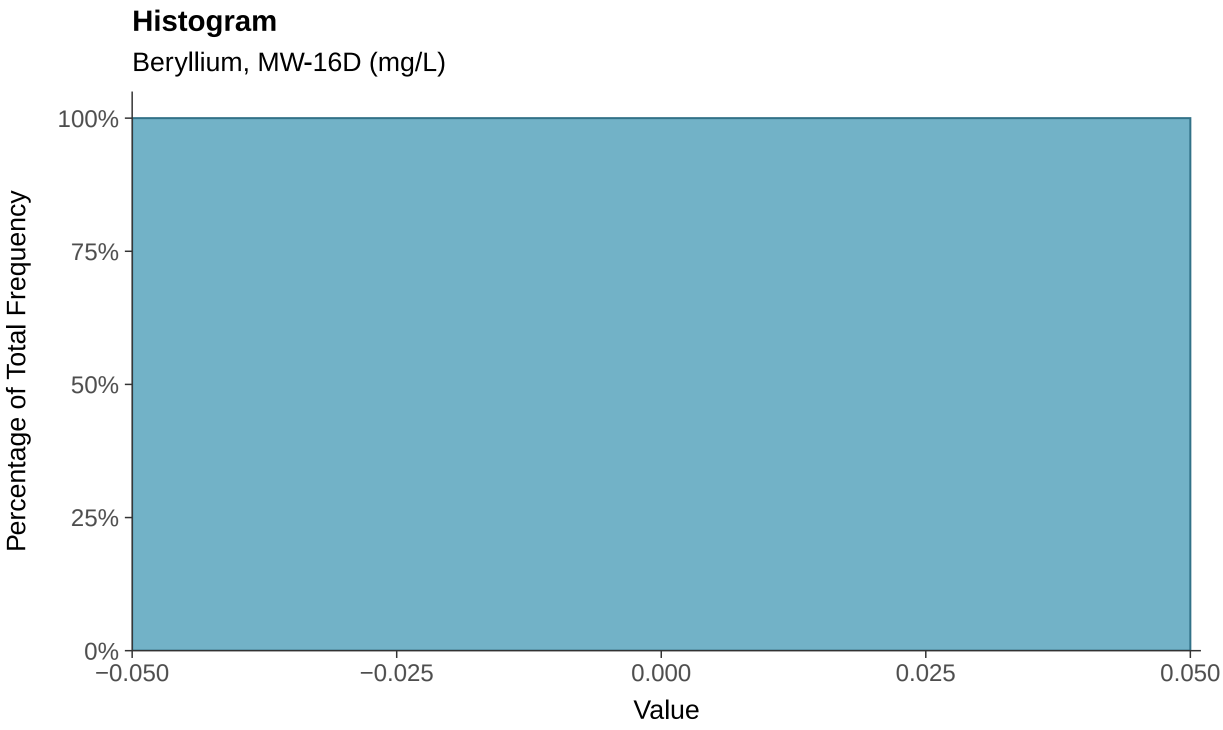
Barium, MW-16D (mg/L)



Appendix IV: Beryllium, MW-16D

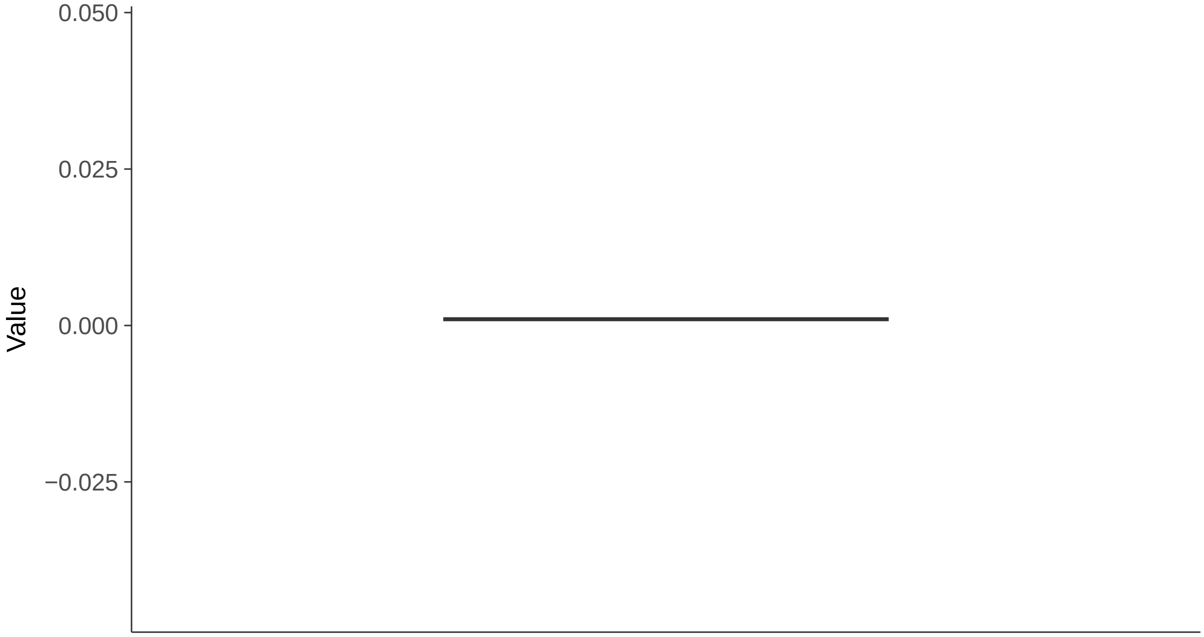
ID: 16D_2_11





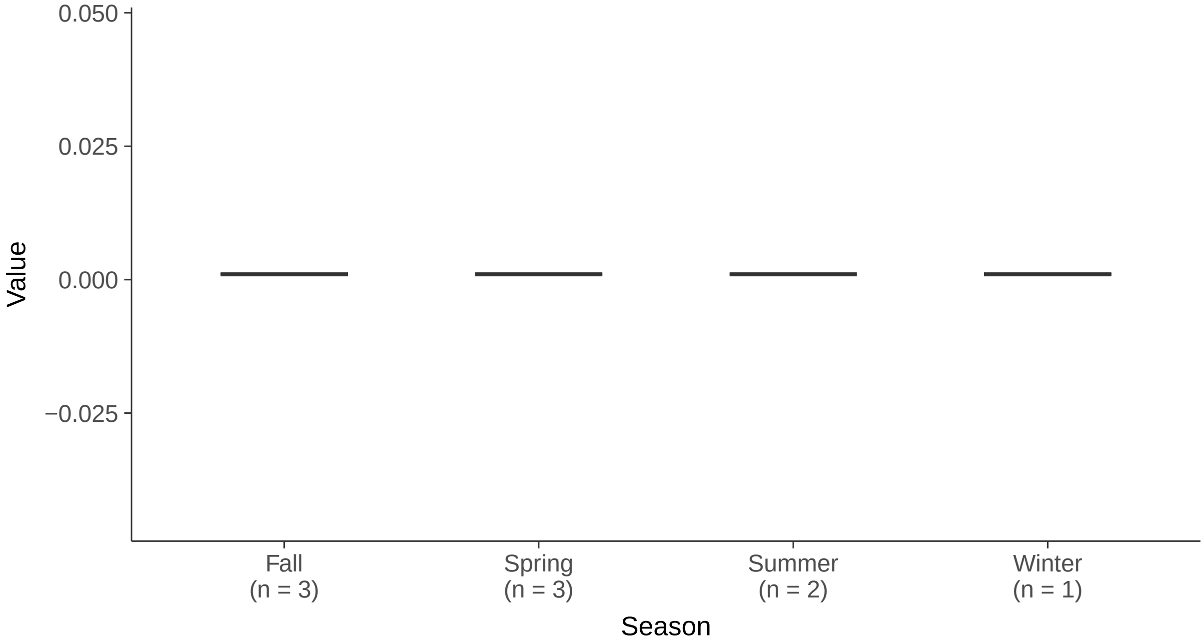
Boxplot

Beryllium, MW-16D (mg/L)



Boxplot by Season

Beryllium, MW-16D (mg/L)

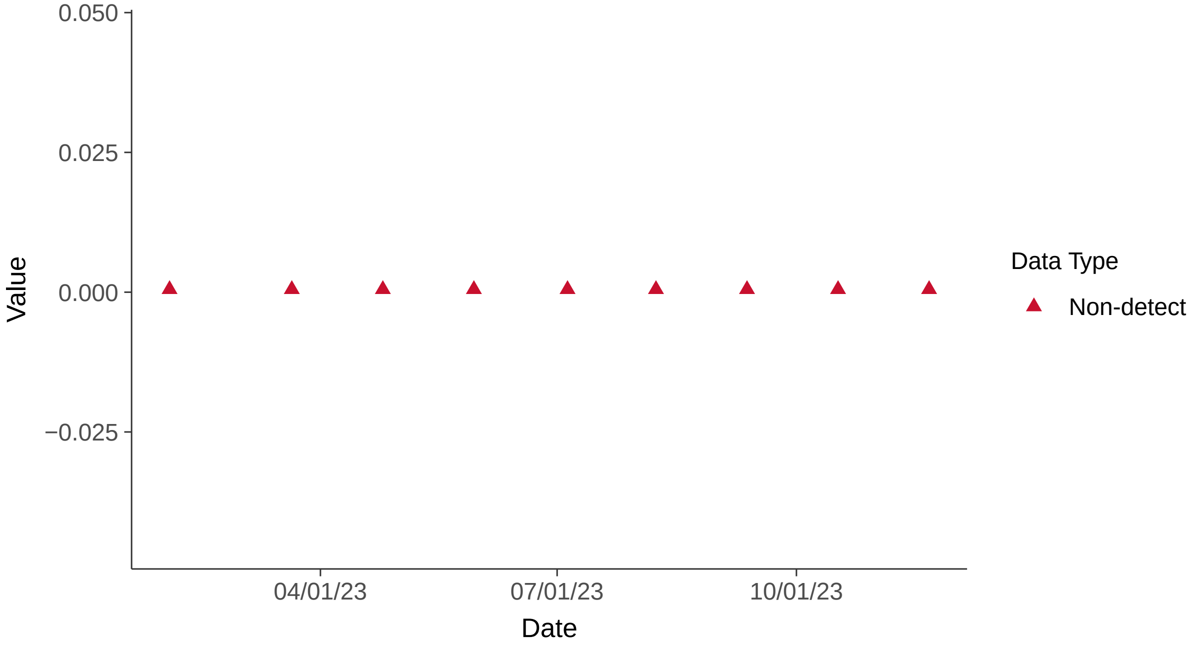


Appendix IV: Cadmium, MW-16D

ID: 16D_2_12

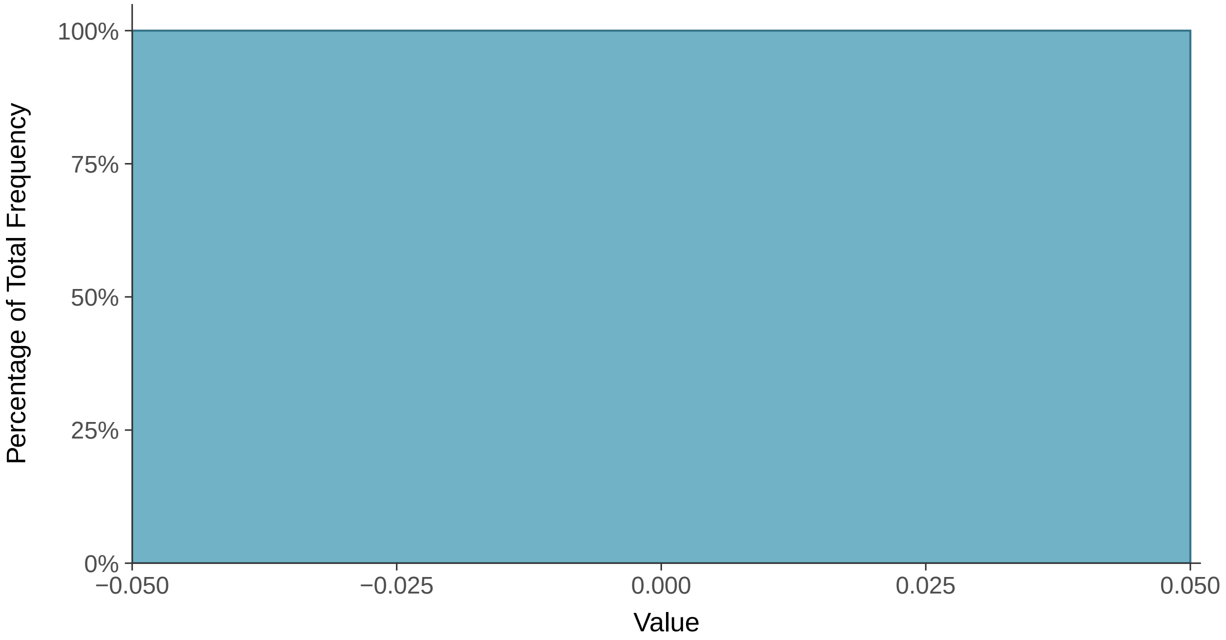
Scatter Plot

Cadmium, MW-16D (mg/L)



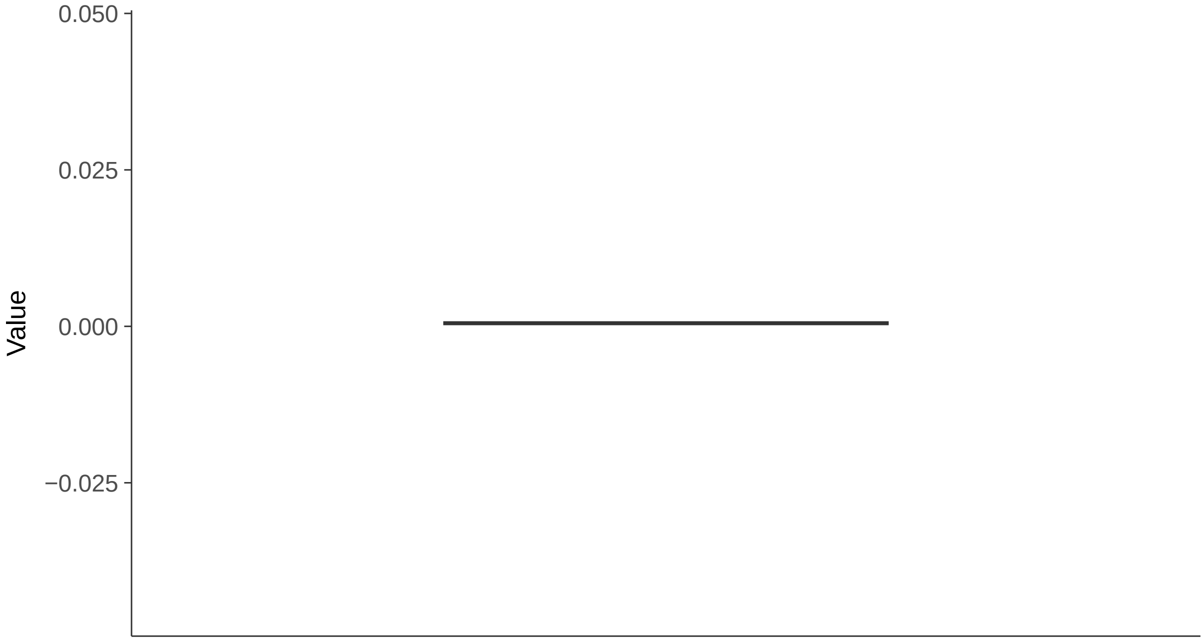
Histogram

Cadmium, MW-16D (mg/L)



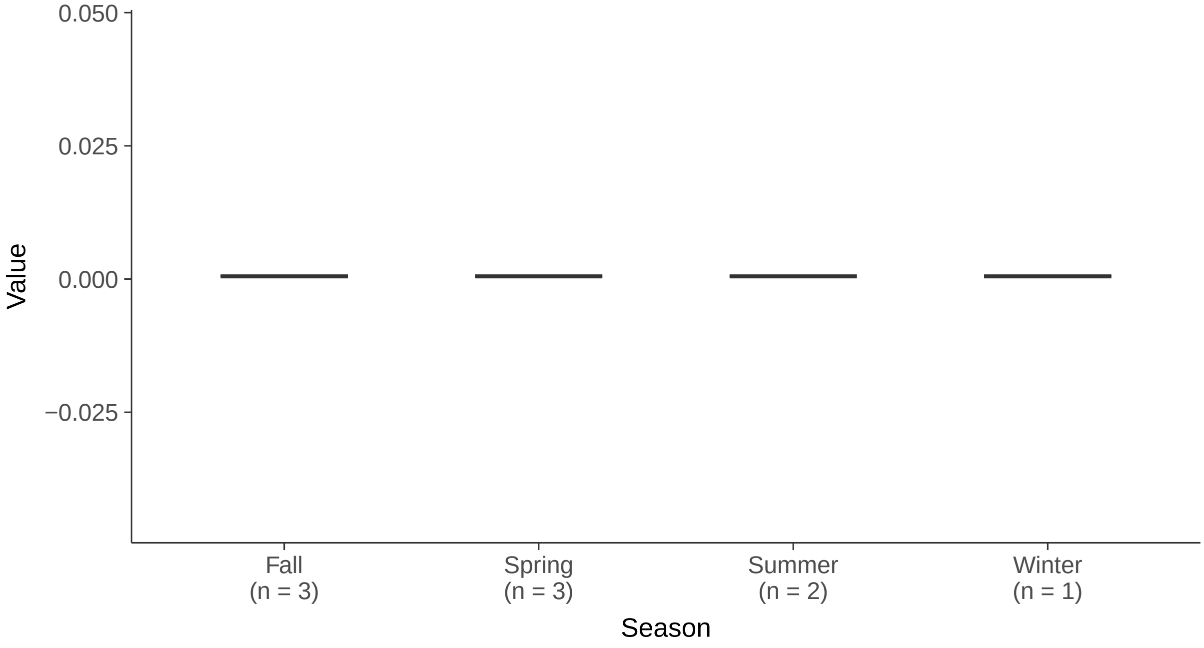
Boxplot

Cadmium, MW-16D (mg/L)



Boxplot by Season

Cadmium, MW-16D (mg/L)

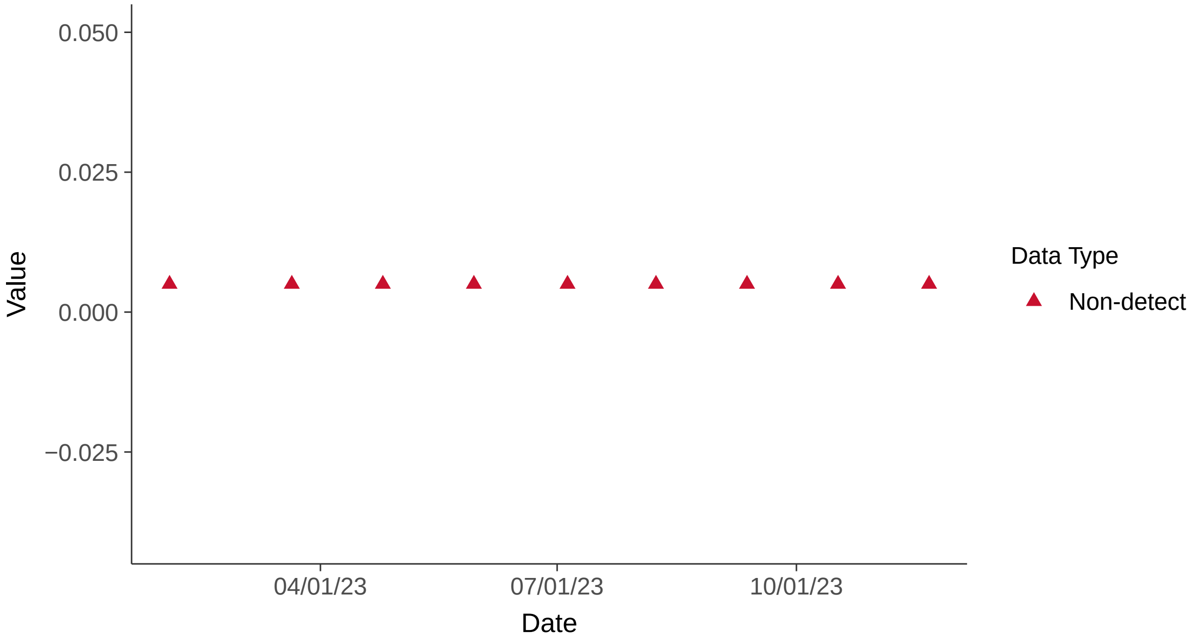


Appendix IV: Chromium, MW-16D

ID: 16D_2_13

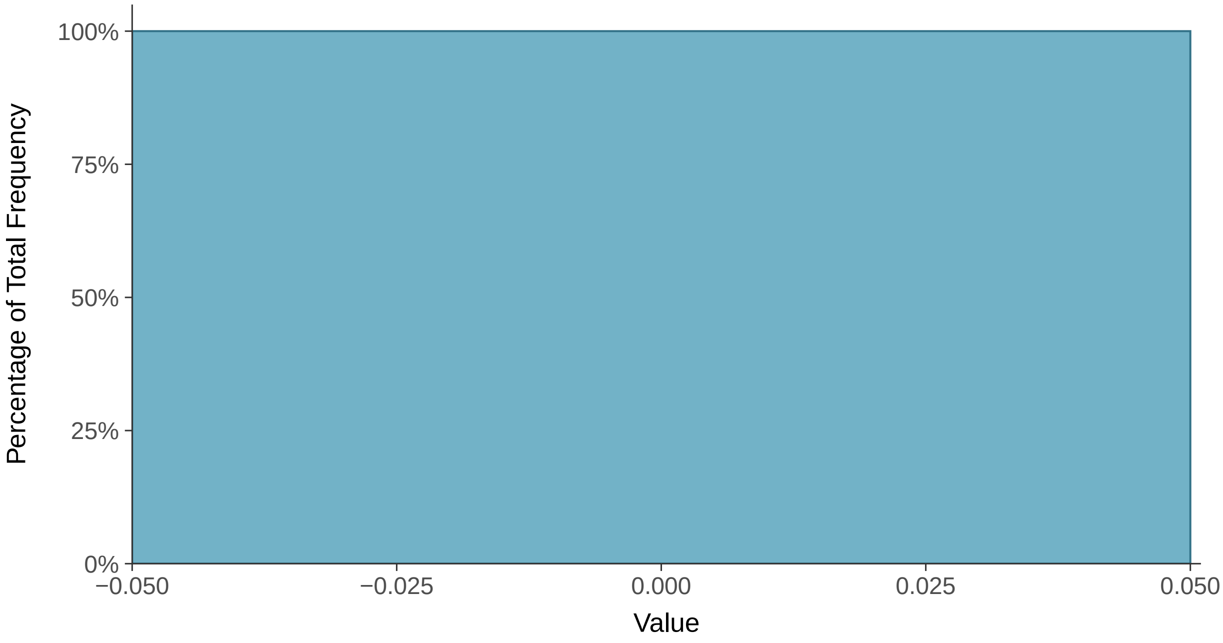
Scatter Plot

Chromium, MW-16D (mg/L)



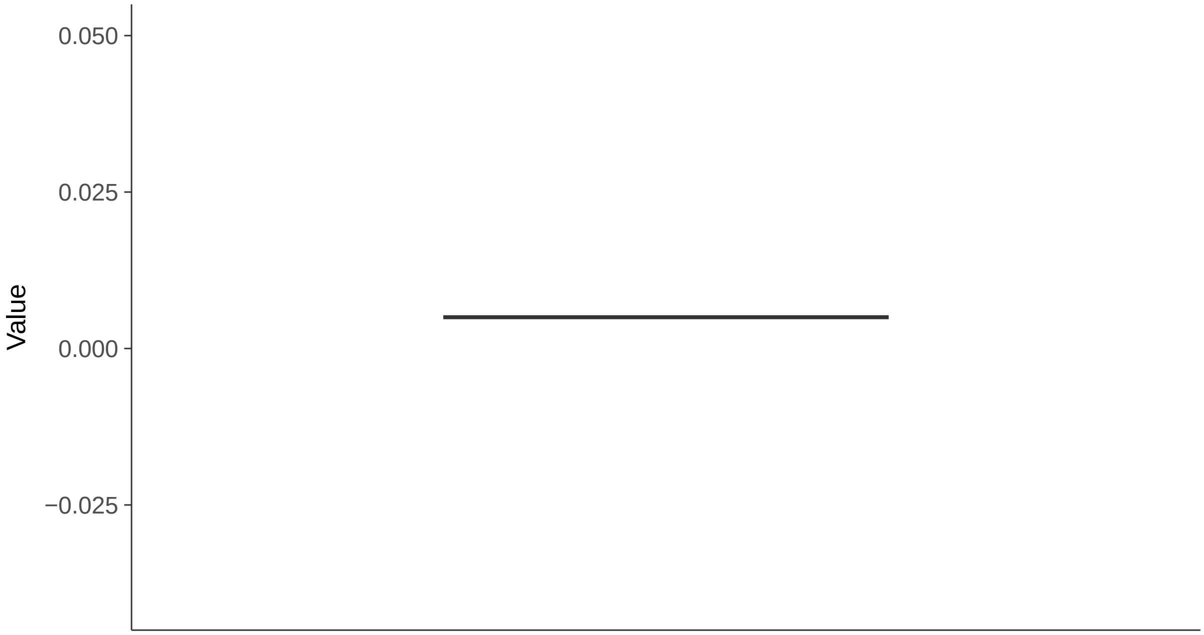
Histogram

Chromium, MW-16D (mg/L)



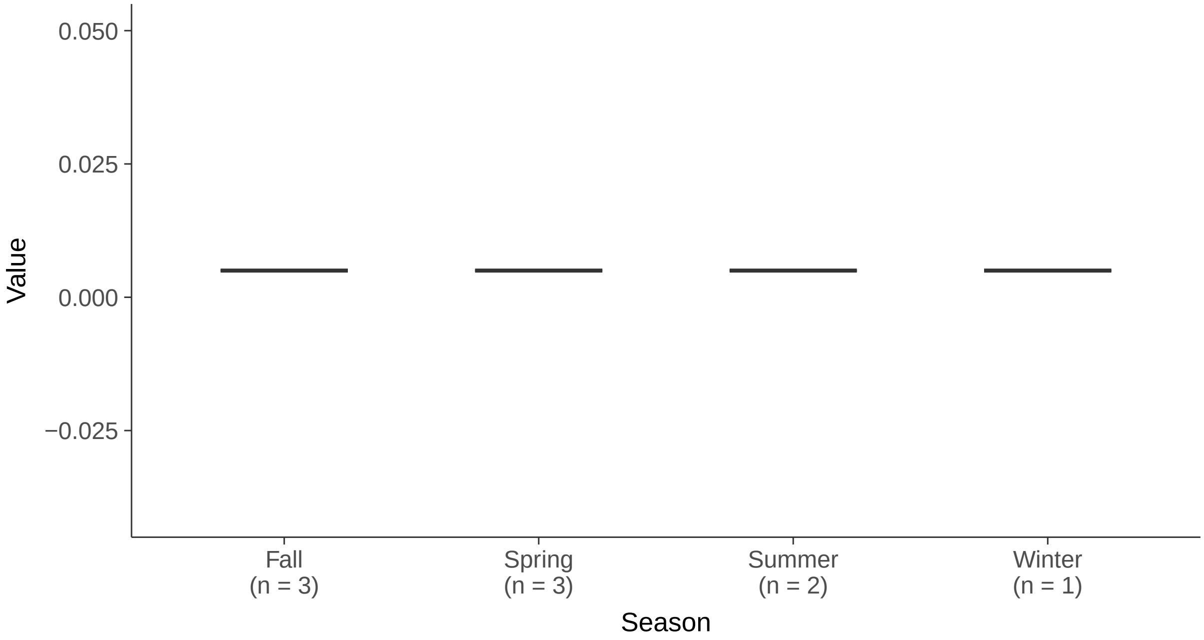
Boxplot

Chromium, MW-16D (mg/L)



Boxplot by Season

Chromium, MW-16D (mg/L)

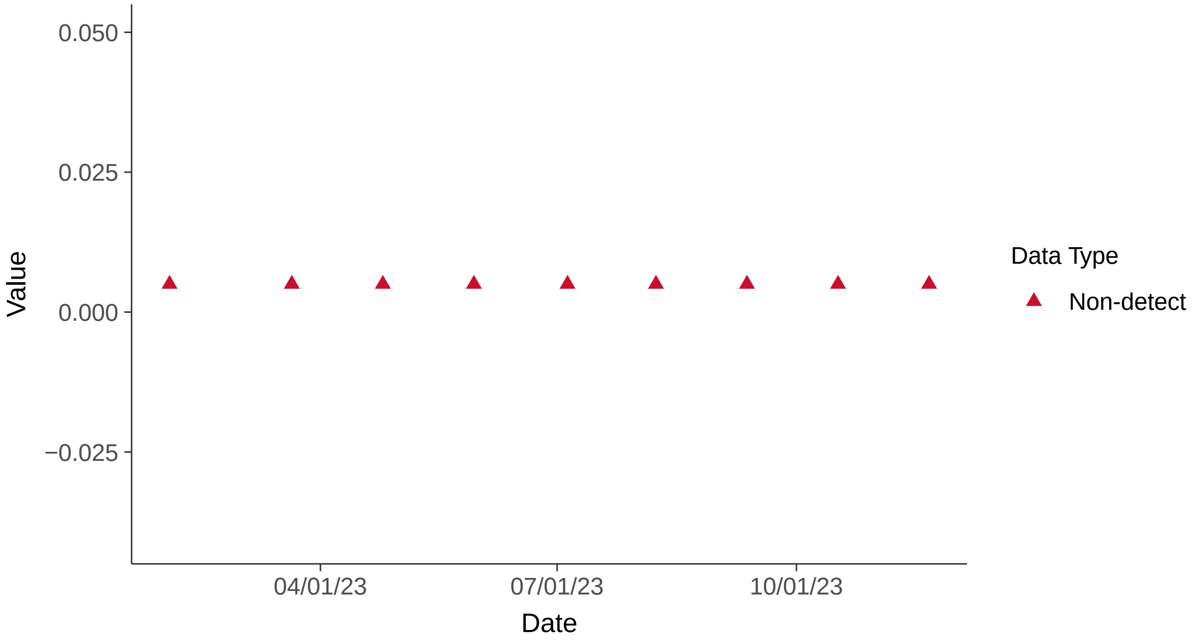


Appendix IV: Cobalt, MW-16D

ID: 16D_2_14

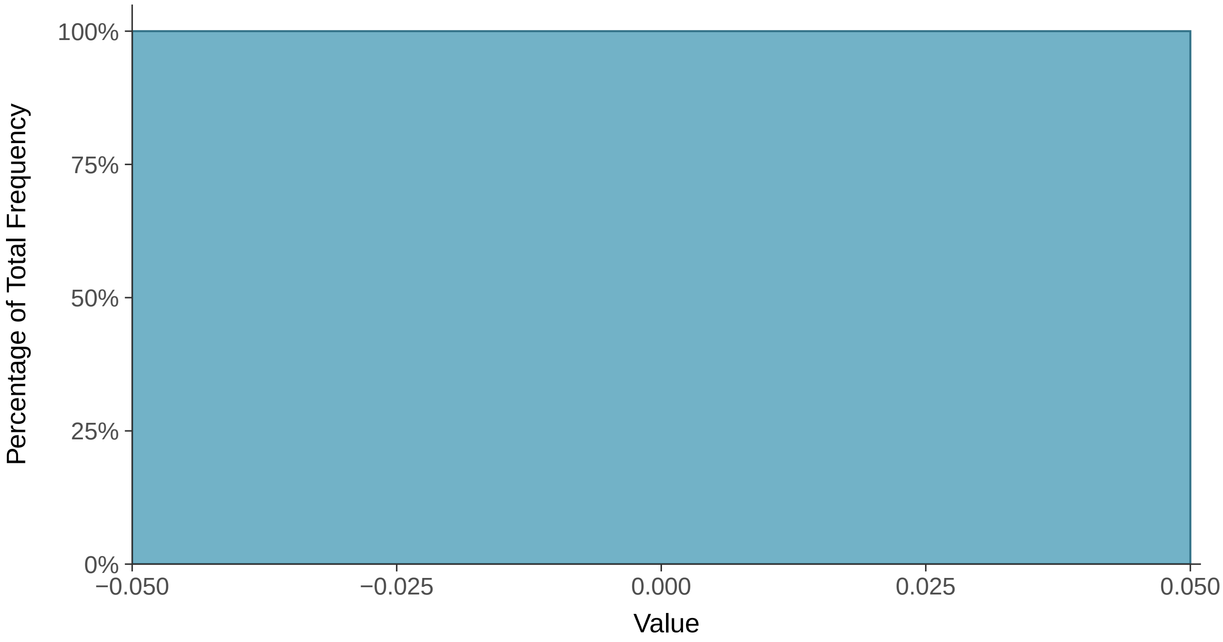
Scatter Plot

Cobalt, MW-16D (mg/L)



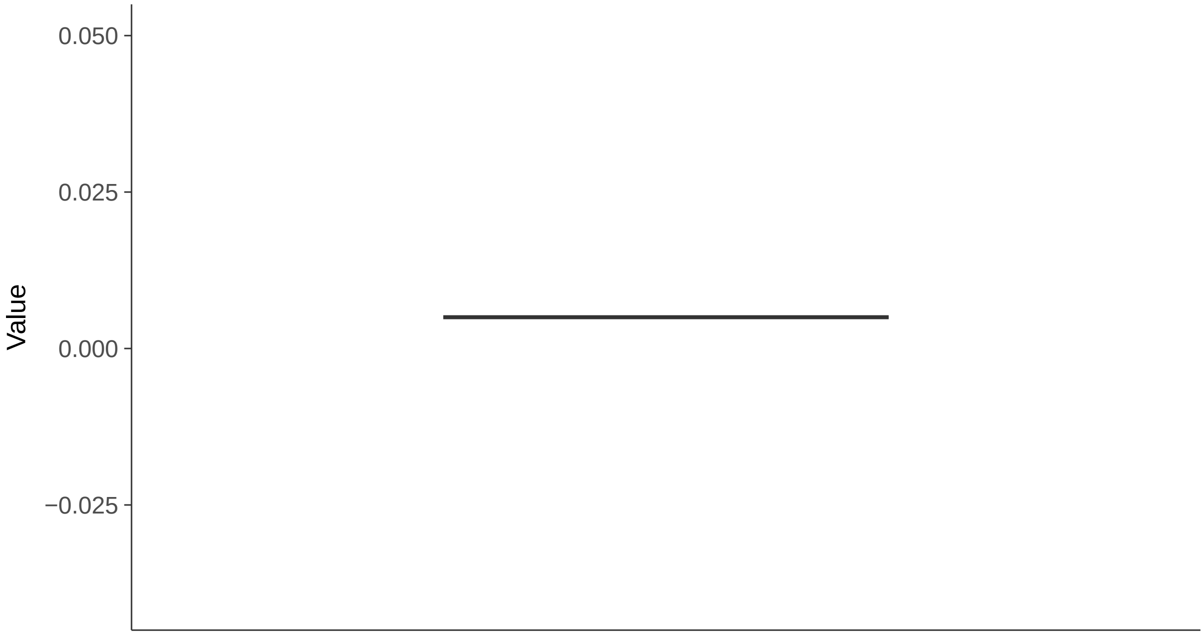
Histogram

Cobalt, MW-16D (mg/L)



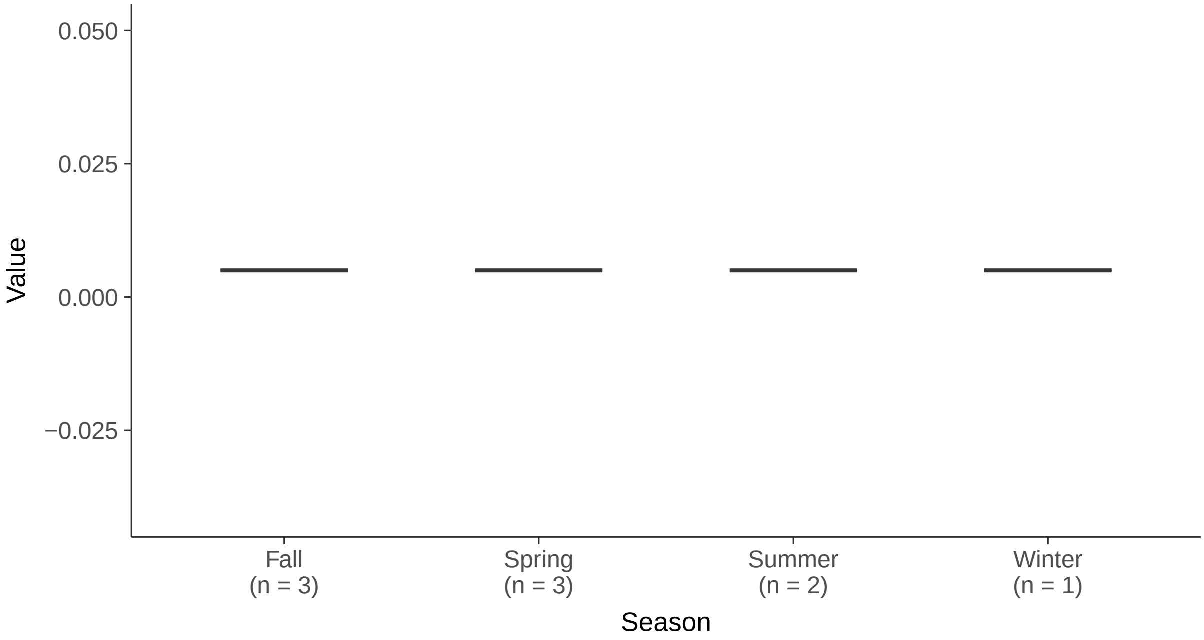
Boxplot

Cobalt, MW-16D (mg/L)



Boxplot by Season

Cobalt, MW-16D (mg/L)

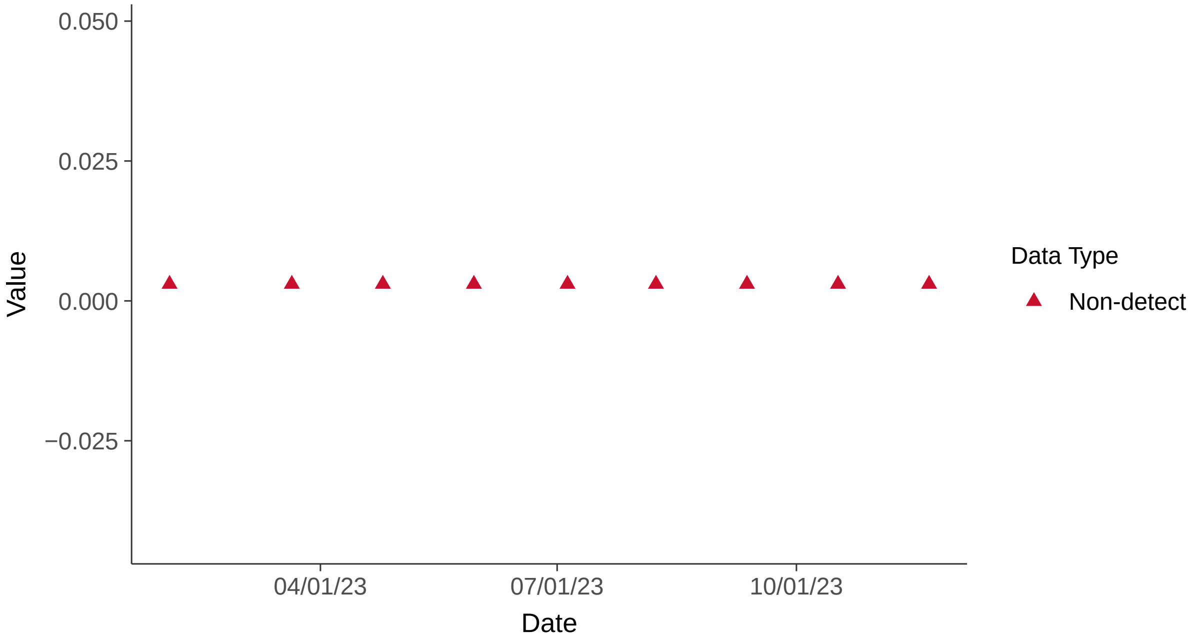


Appendix IV: Lead, MW-16D

ID: 16D_2_15

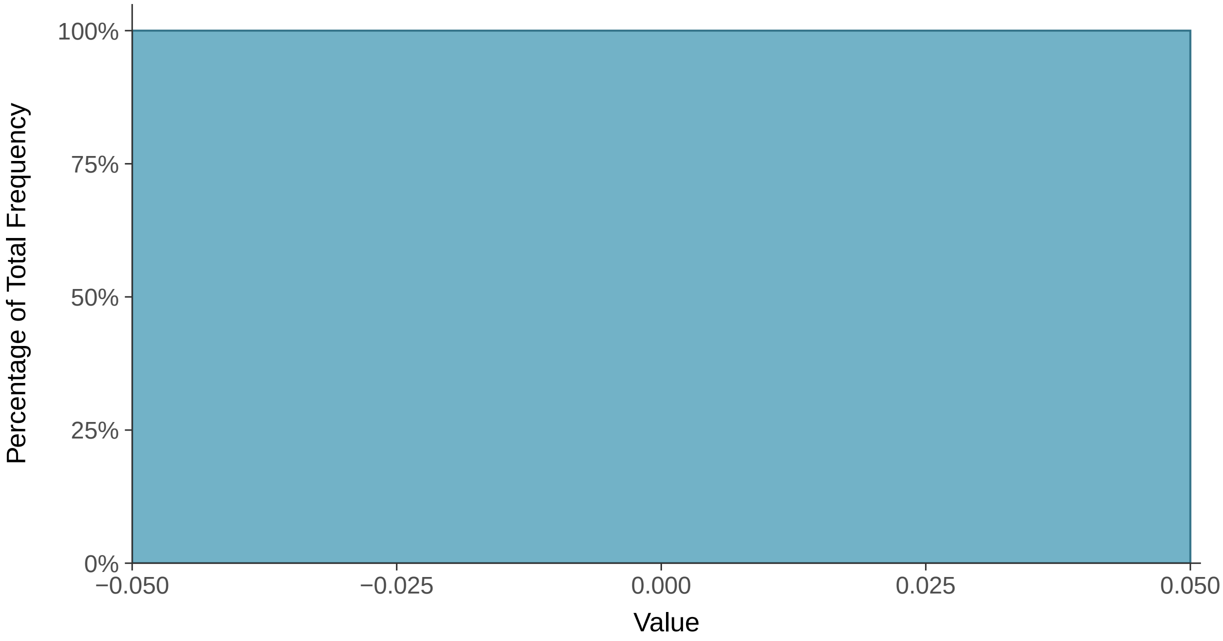
Scatter Plot

Lead, MW-16D (mg/L)



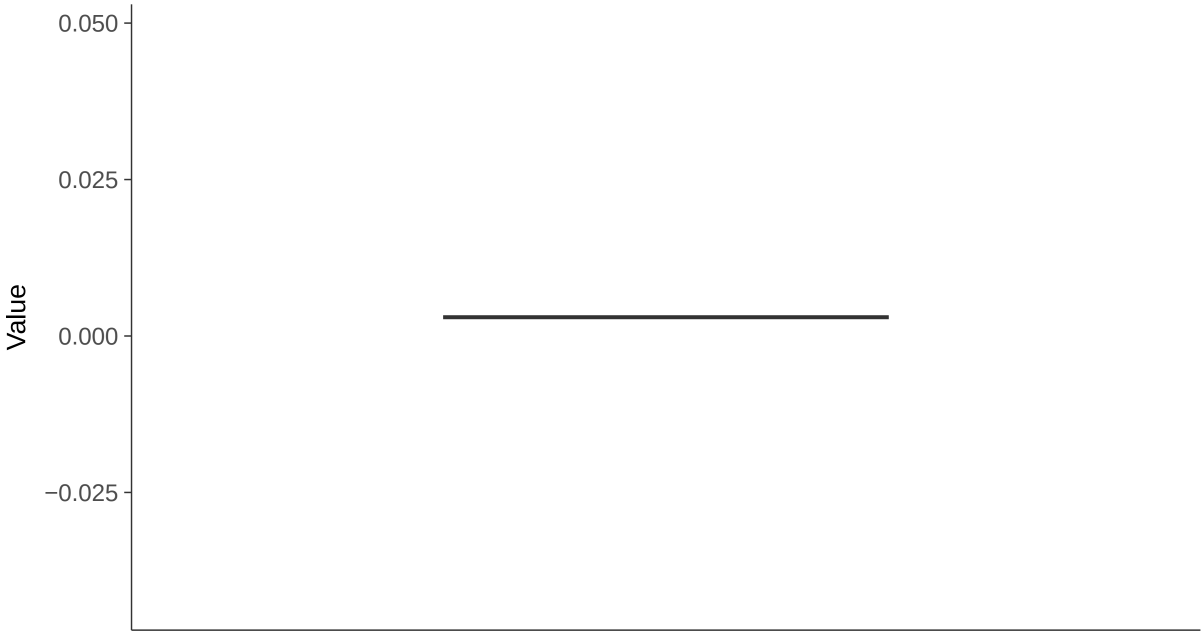
Histogram

Lead, MW-16D (mg/L)



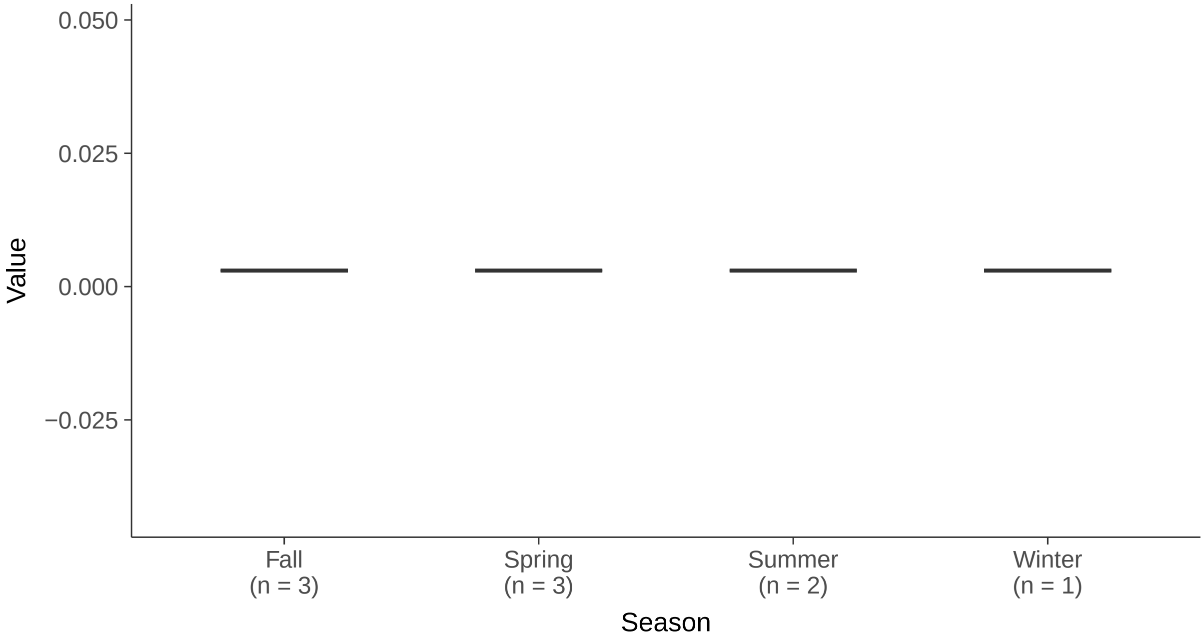
Boxplot

Lead, MW-16D (mg/L)



Boxplot by Season

Lead, MW-16D (mg/L)

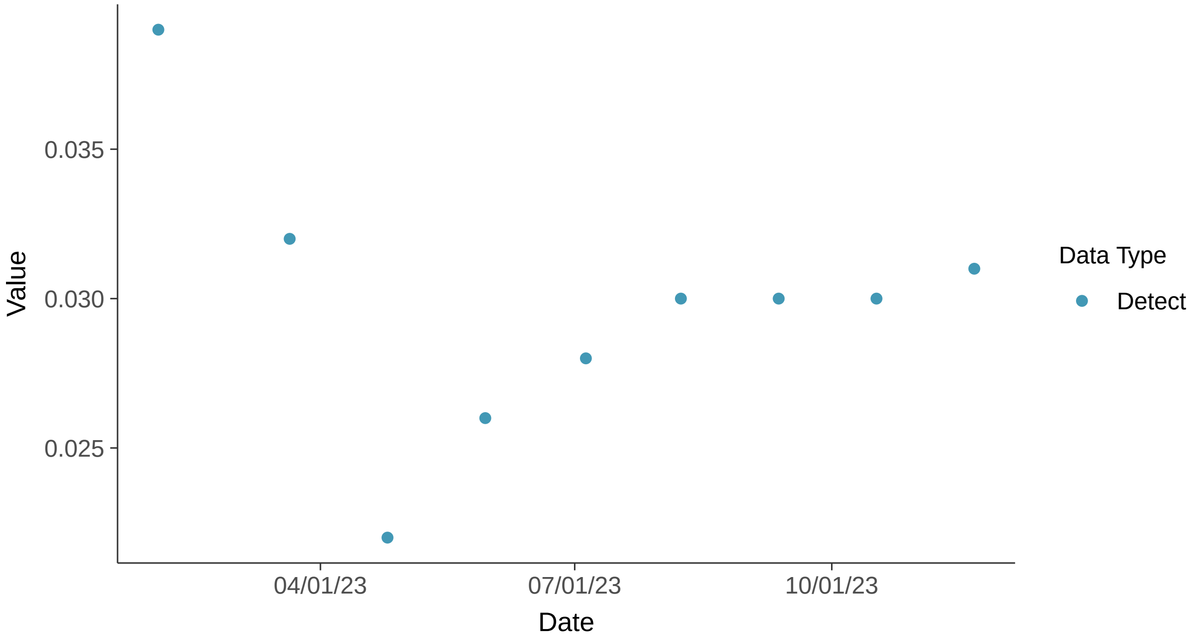


Appendix IV: Lithium, MW-16D

ID: 16D_2_16

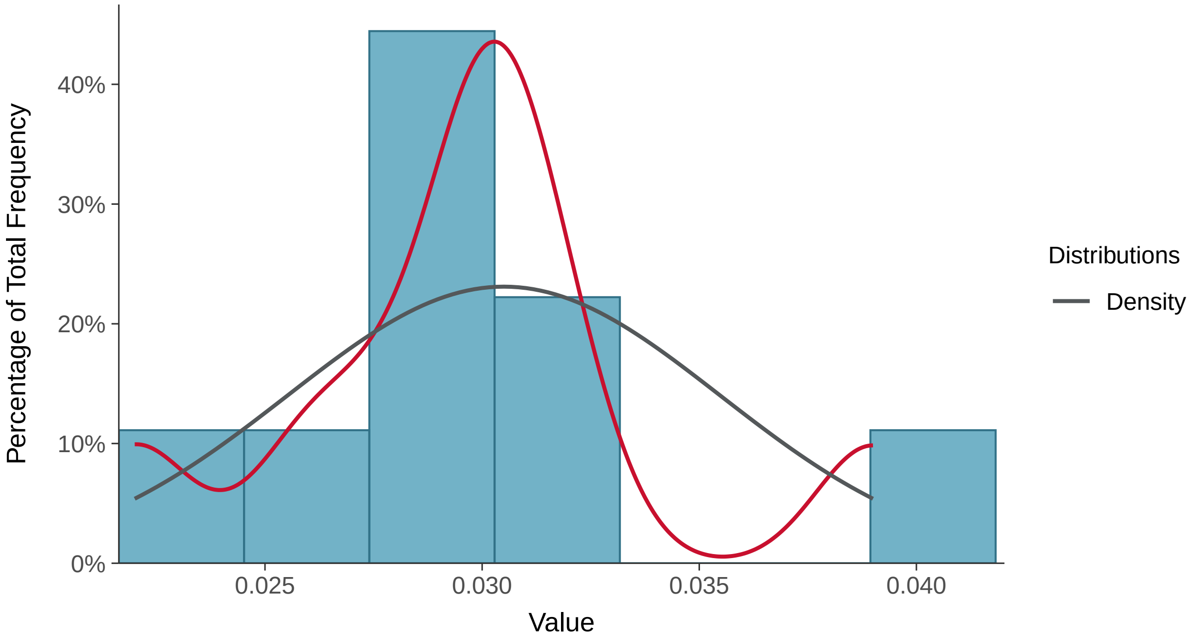
Scatter Plot

Lithium, MW-16D (mg/L)



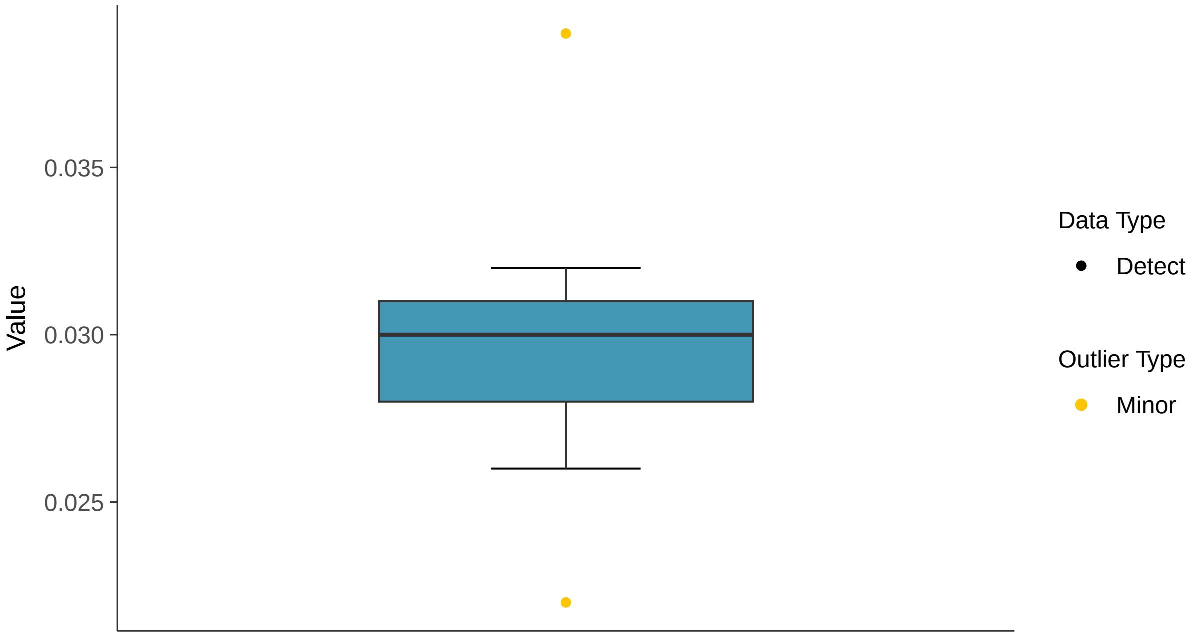
Histogram

Lithium, MW-16D (mg/L)



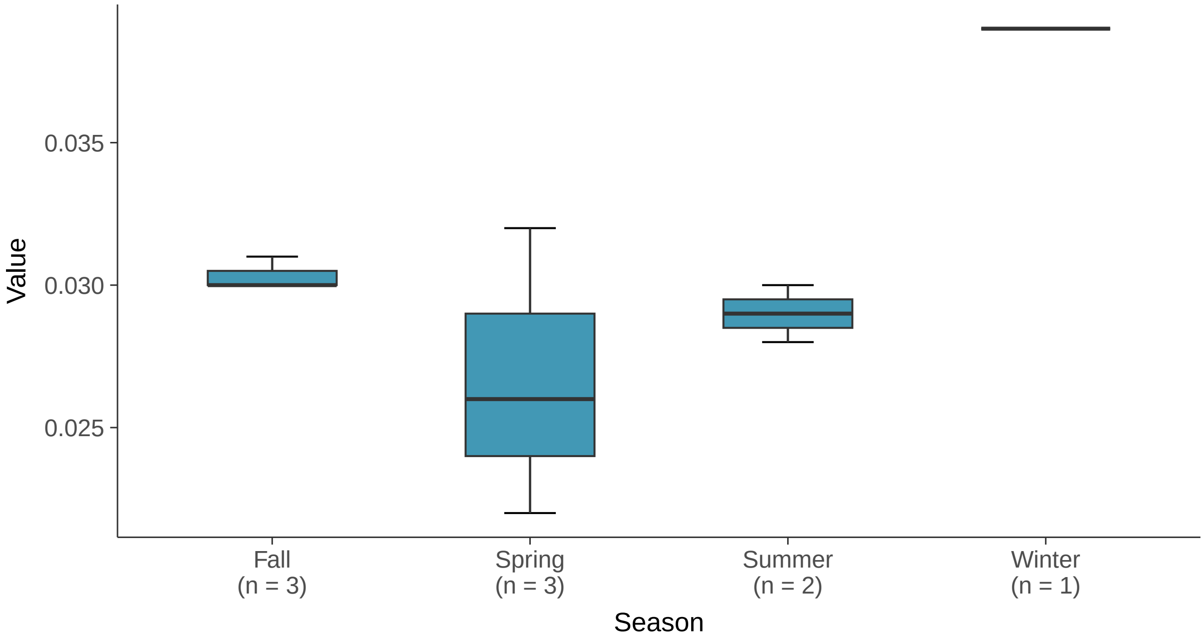
Boxplot

Lithium, MW-16D (mg/L)



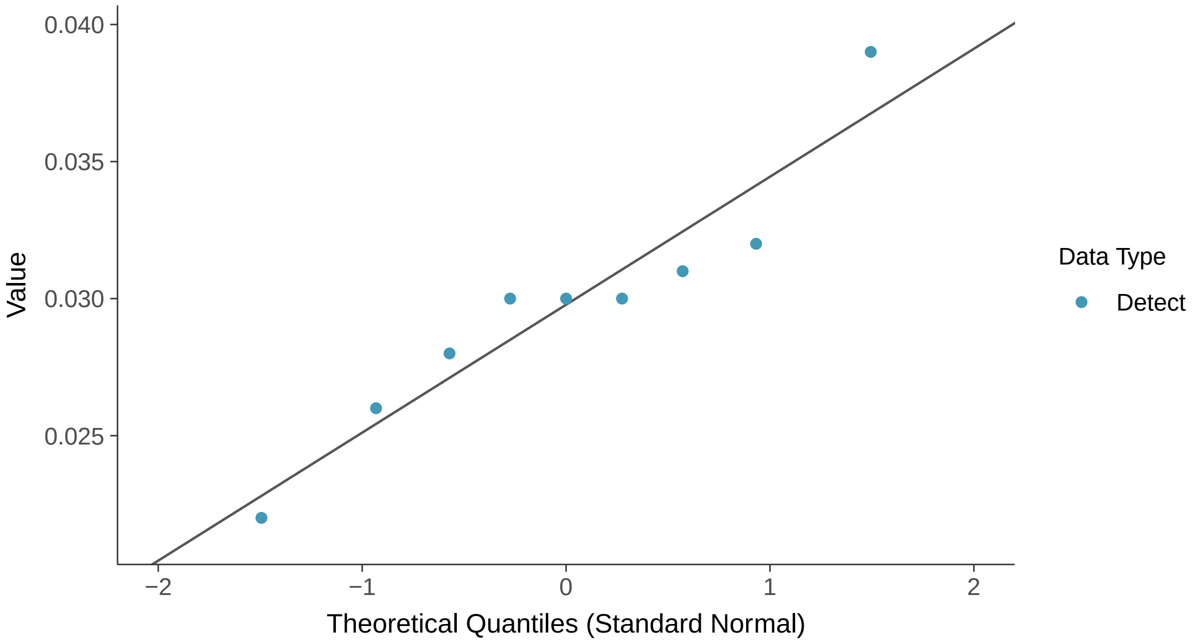
Boxplot by Season

Lithium, MW-16D (mg/L)



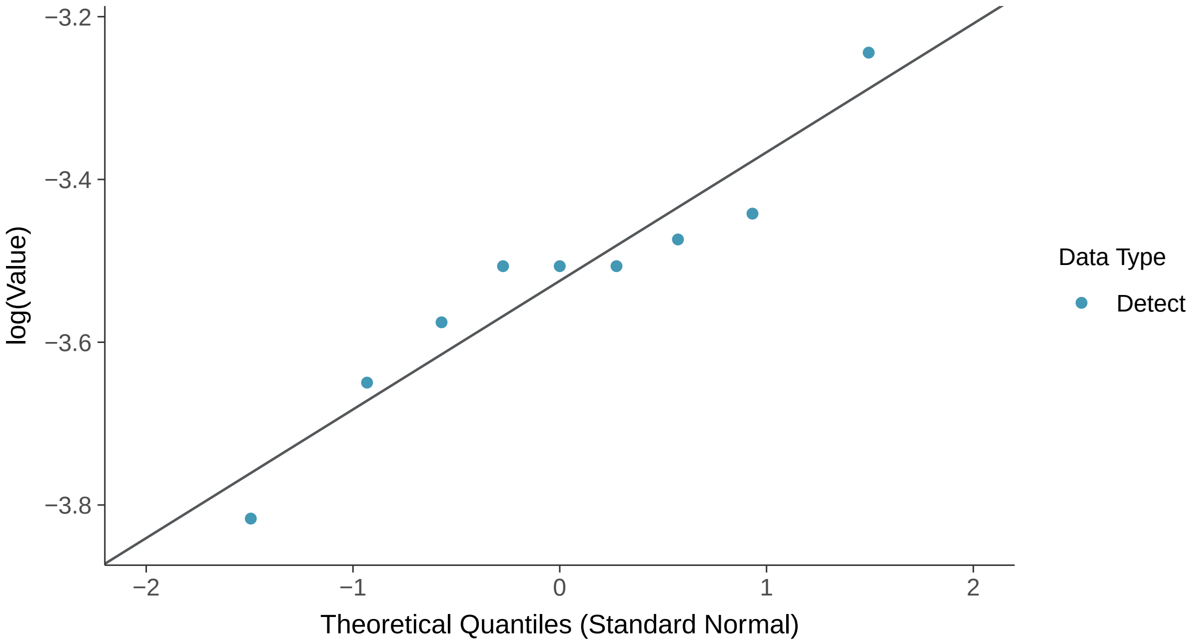
Normal Q-Q plot

Lithium, MW-16D (mg/L)



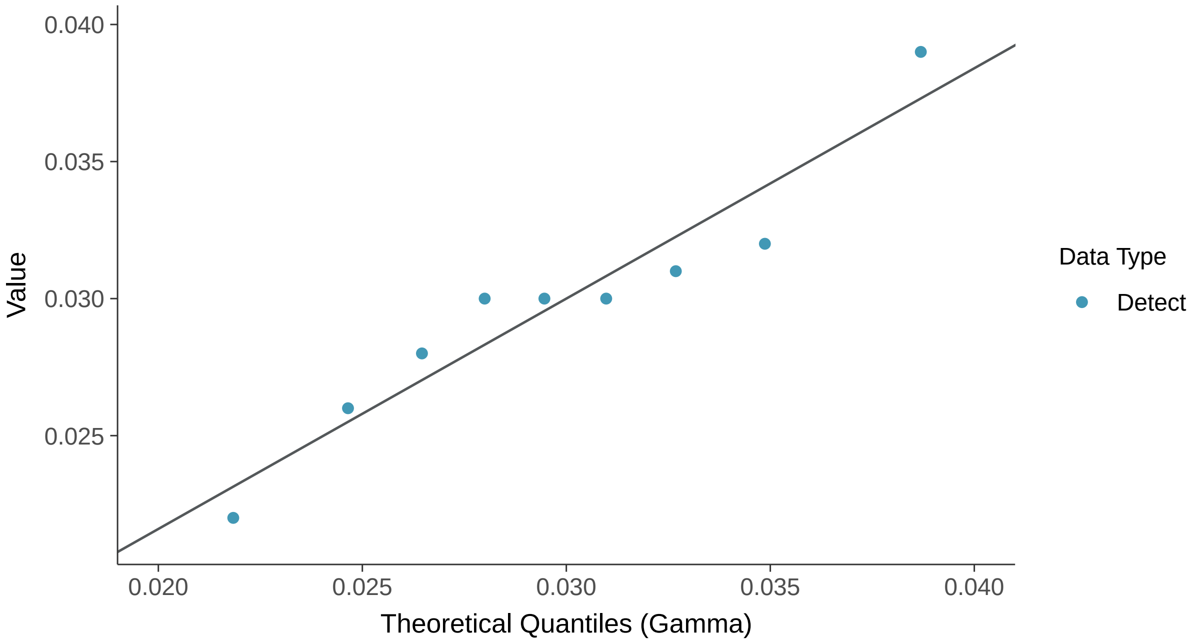
Lognormal Q-Q plot

Lithium, MW-16D (mg/L)



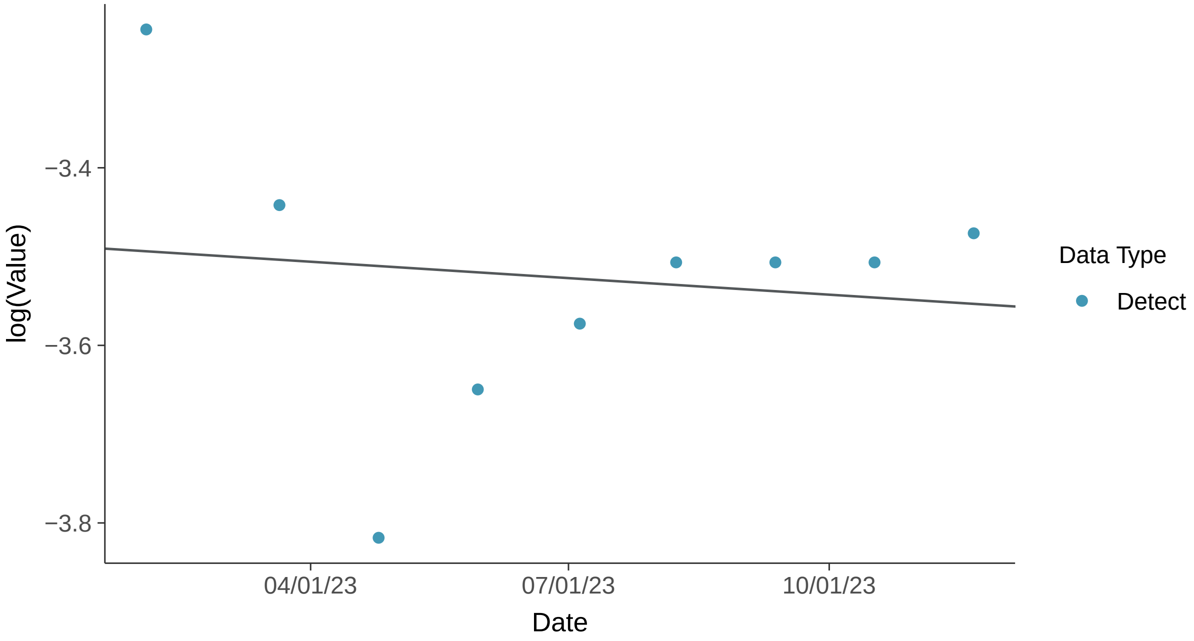
Gamma Q-Q plot

Lithium, MW-16D (mg/L)



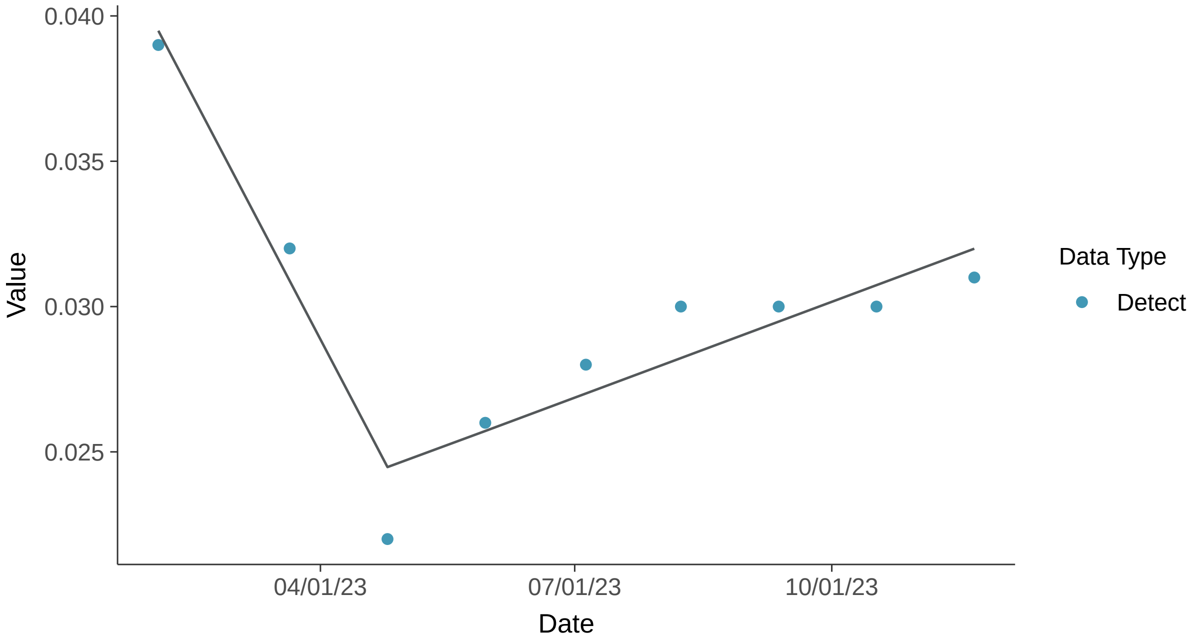
Trend Regression: Lognormal MLE

Lithium, MW-16D (mg/L)



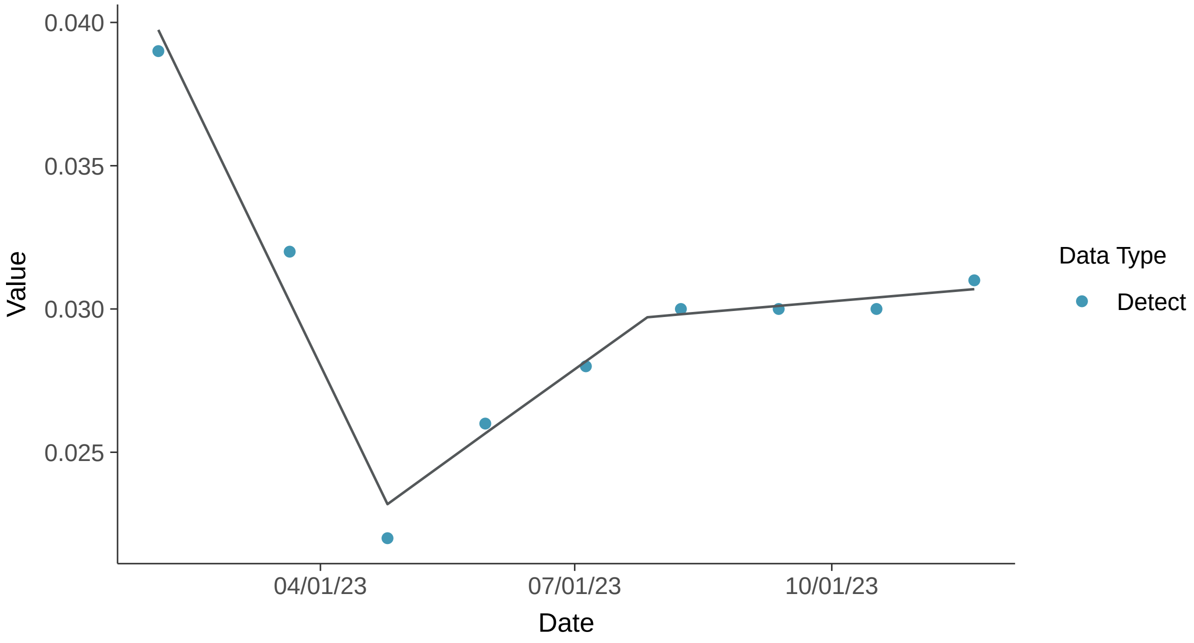
Trend Regression: Piecewise Linear-Linear

Lithium, MW-16D (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Lithium, MW-16D (mg/L)

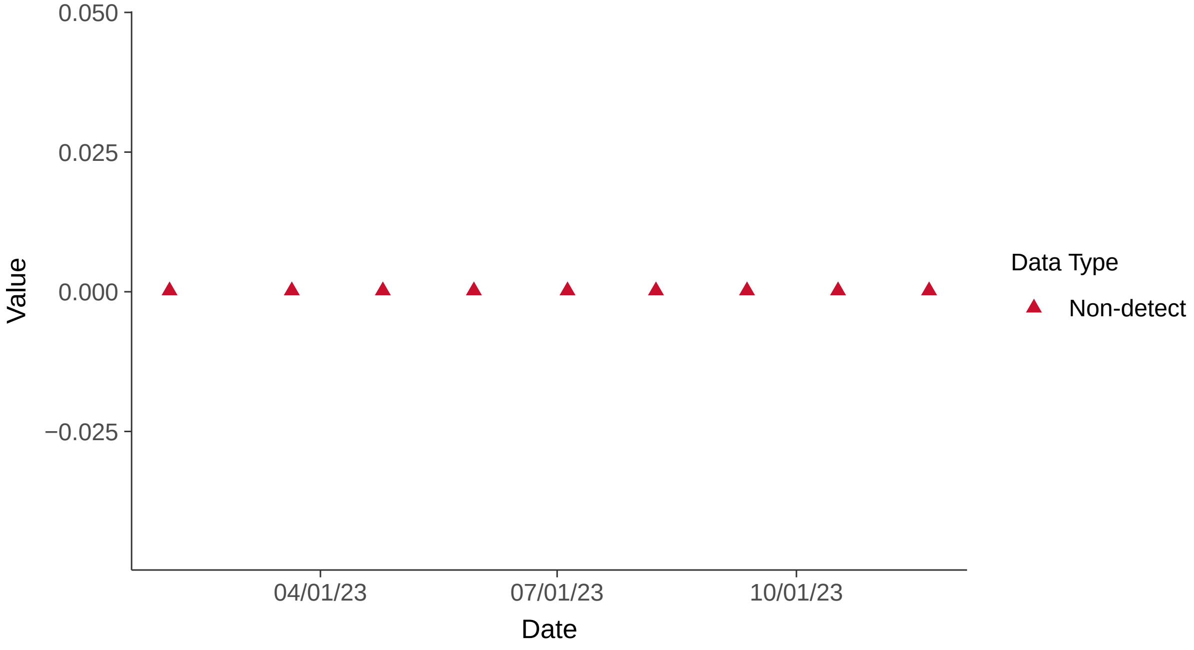


Appendix IV: Mercury, MW-16D

ID: 16D_2_17

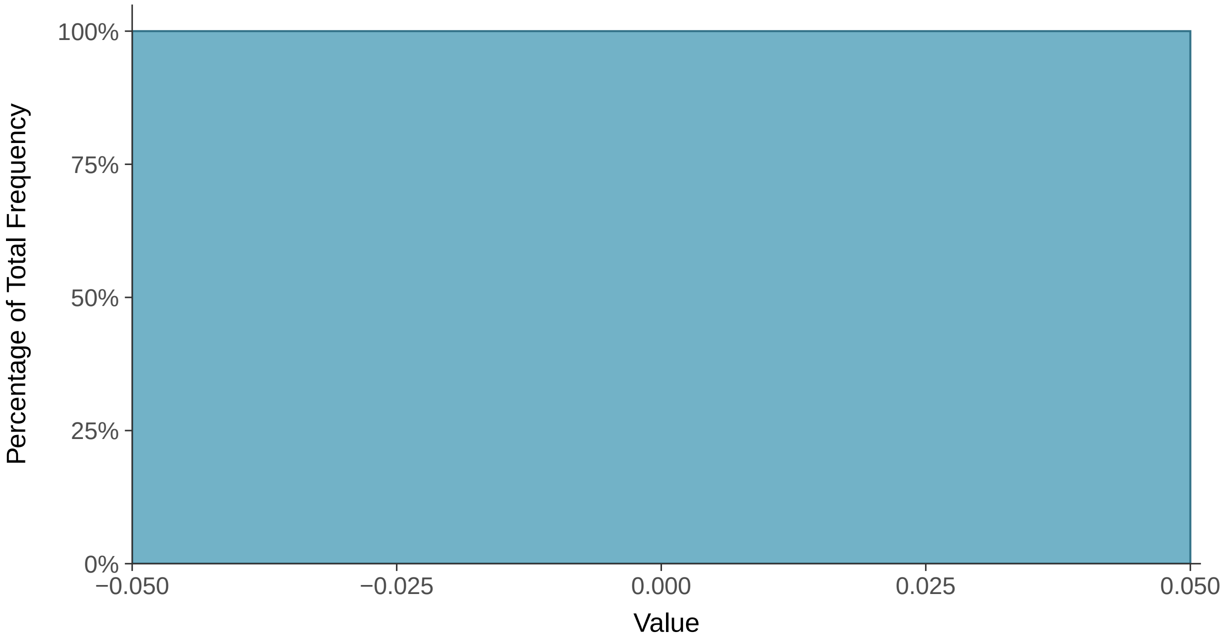
Scatter Plot

Mercury, MW-16D (mg/L)



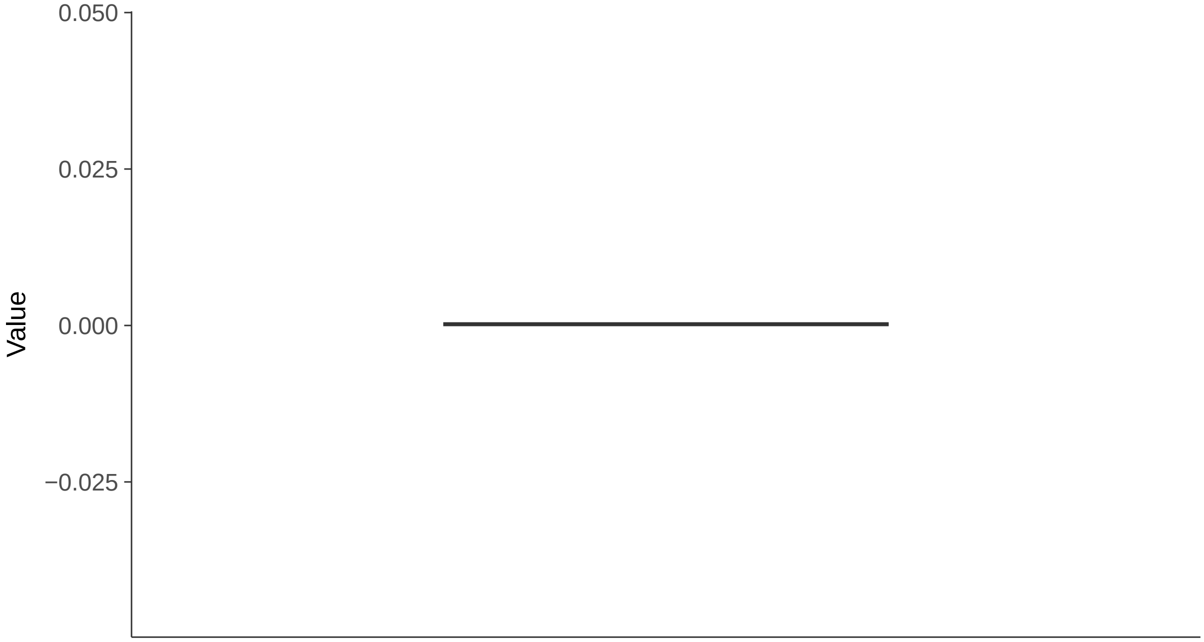
Histogram

Mercury, MW-16D (mg/L)



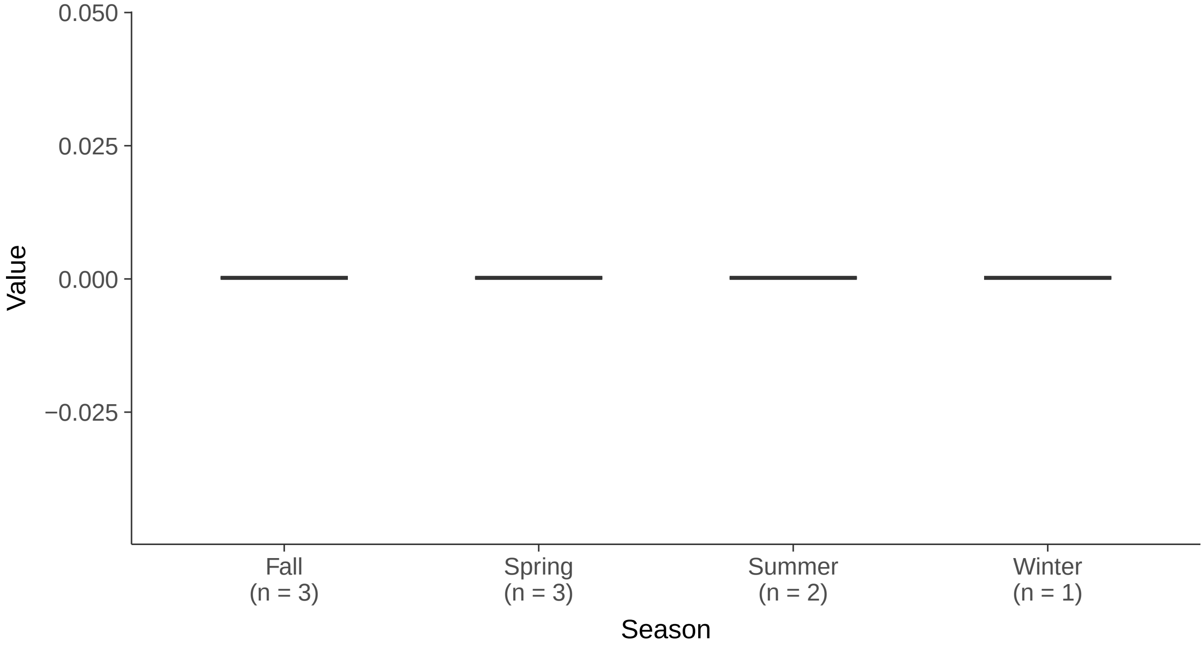
Boxplot

Mercury, MW-16D (mg/L)



Boxplot by Season

Mercury, MW-16D (mg/L)

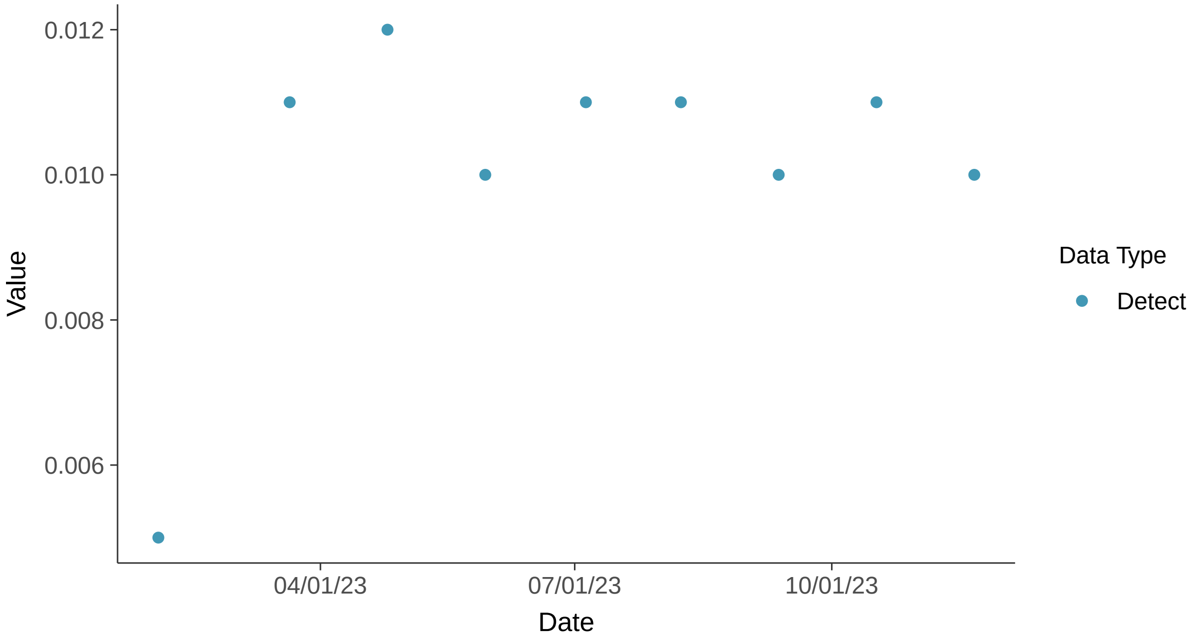


Appendix IV: Molybdenum, MW-16D

ID: 16D_2_18

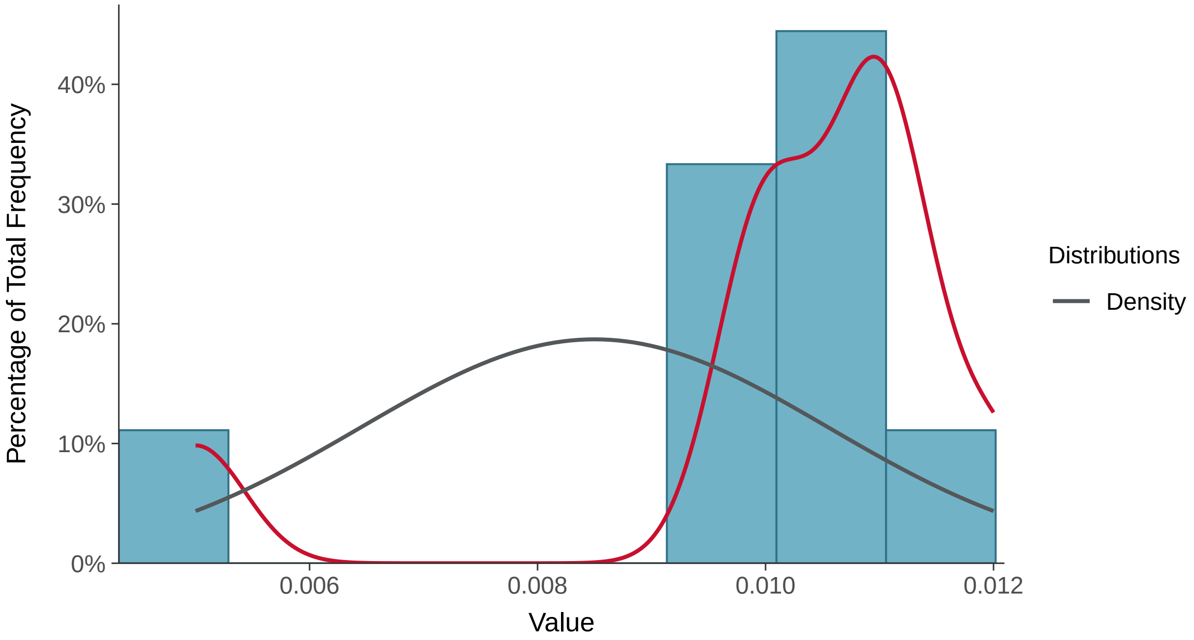
Scatter Plot

Molybdenum, MW-16D (mg/L)



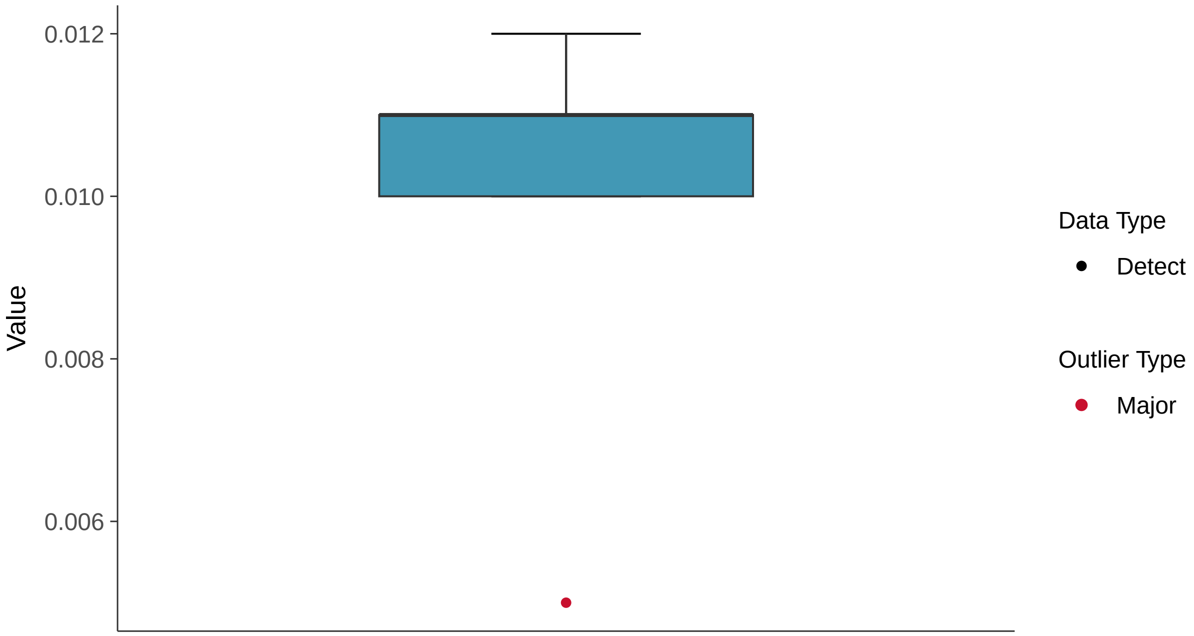
Histogram

Molybdenum, MW-16D (mg/L)



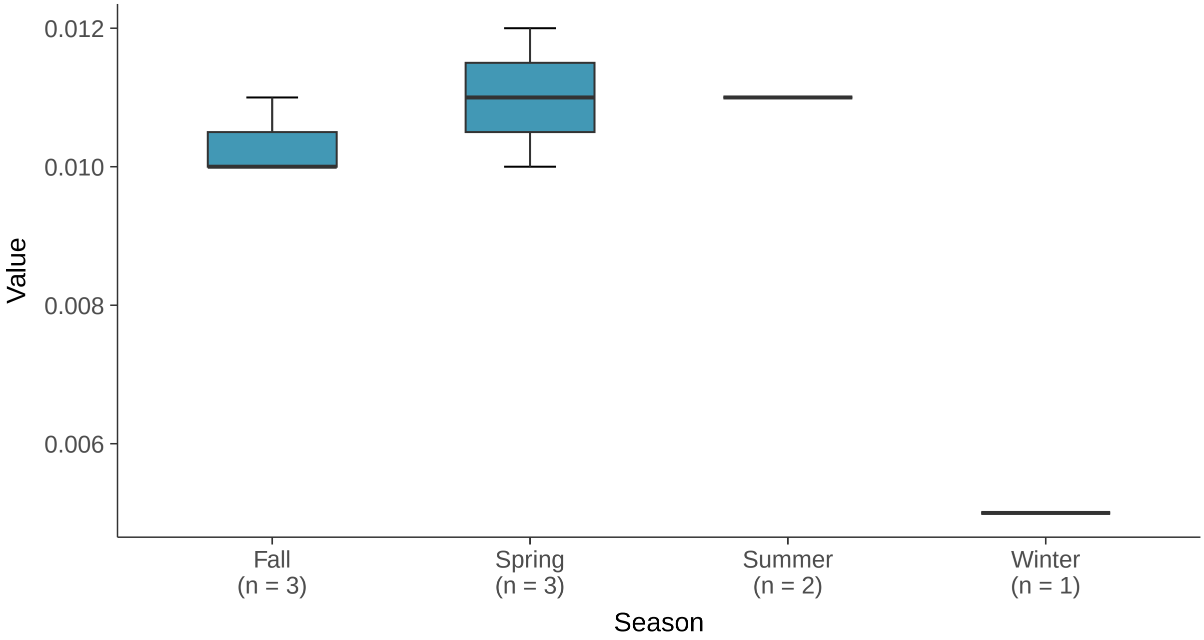
Boxplot

Molybdenum, MW-16D (mg/L)



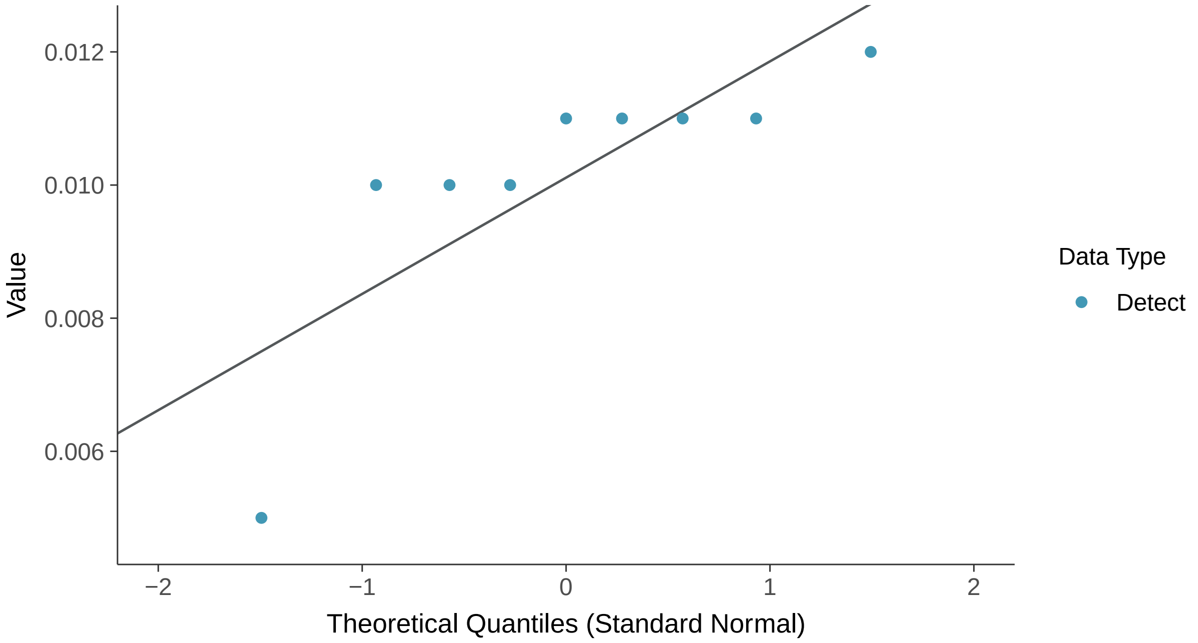
Boxplot by Season

Molybdenum, MW-16D (mg/L)



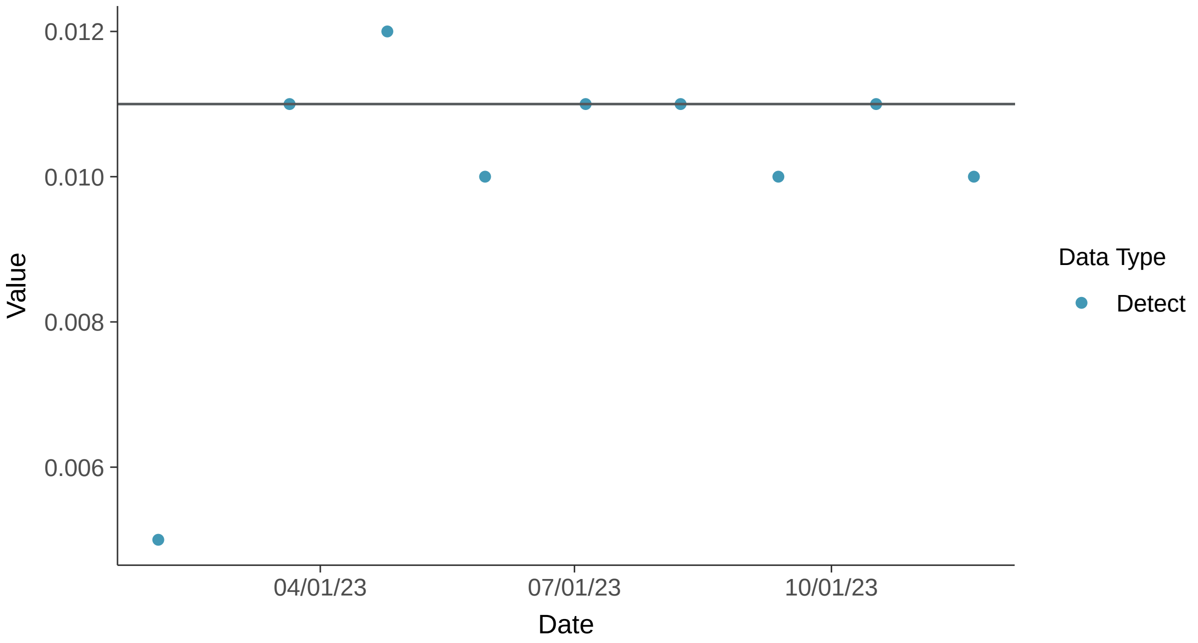
Normal Q-Q plot

Molybdenum, MW-16D (mg/L)



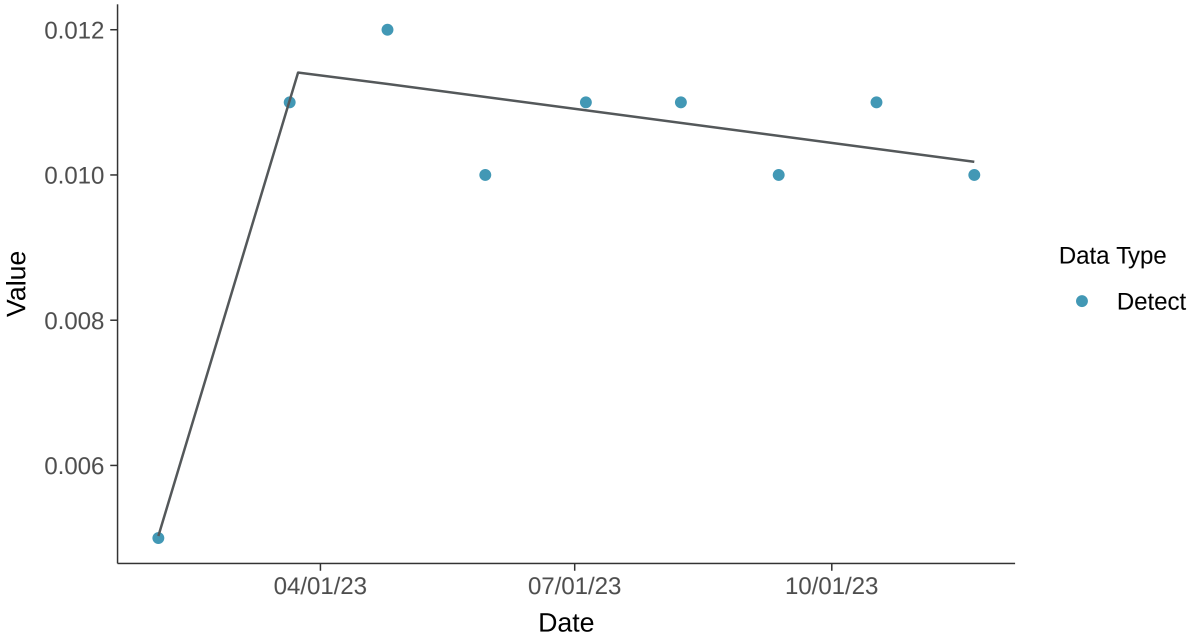
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Molybdenum, MW-16D (mg/L)



Trend Regression: Piecewise Linear-Linear

Molybdenum, MW-16D (mg/L)

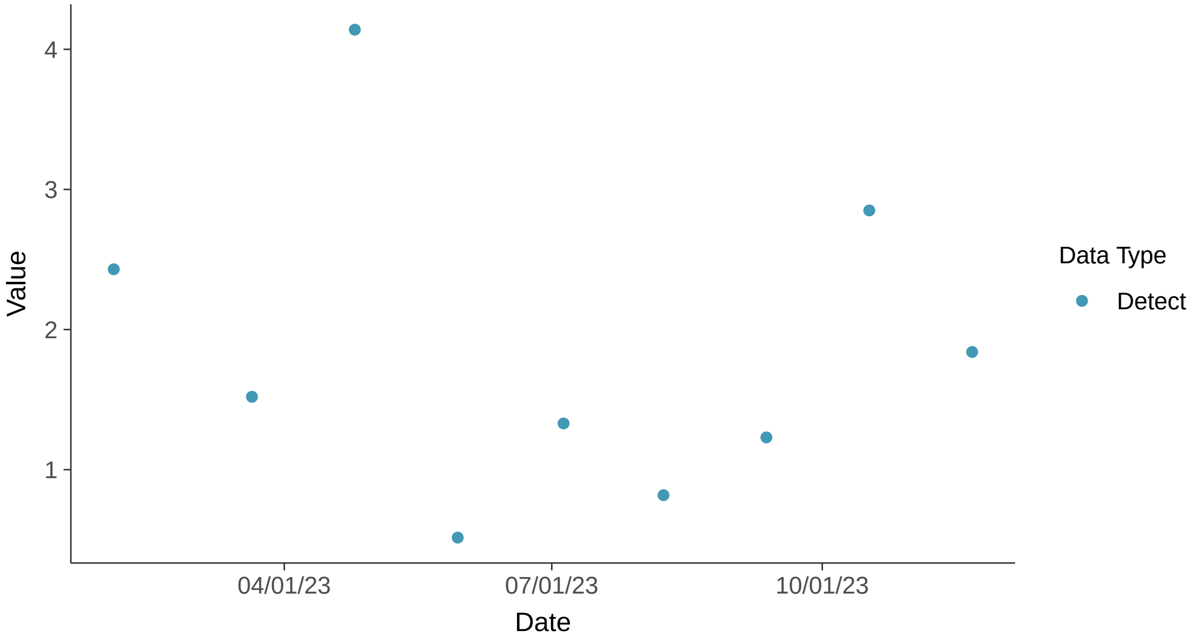


Appendix IV: Radium-226/228, MW-16D

ID: 16D_2_20

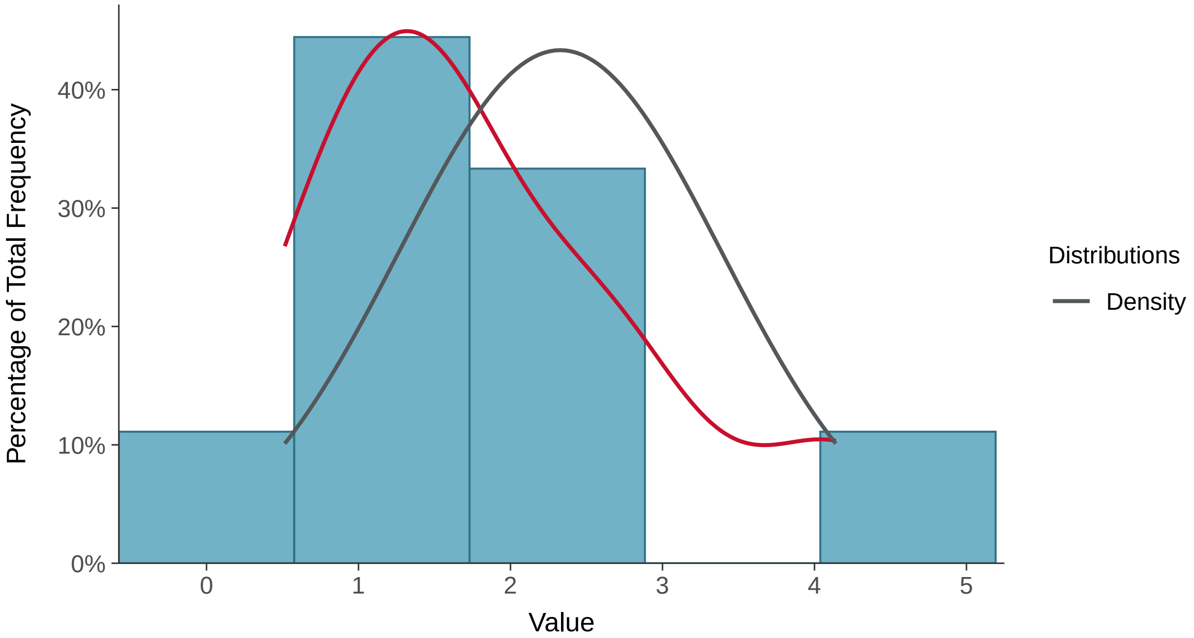
Scatter Plot

Radium-226/228, MW-16D (pCi/L)



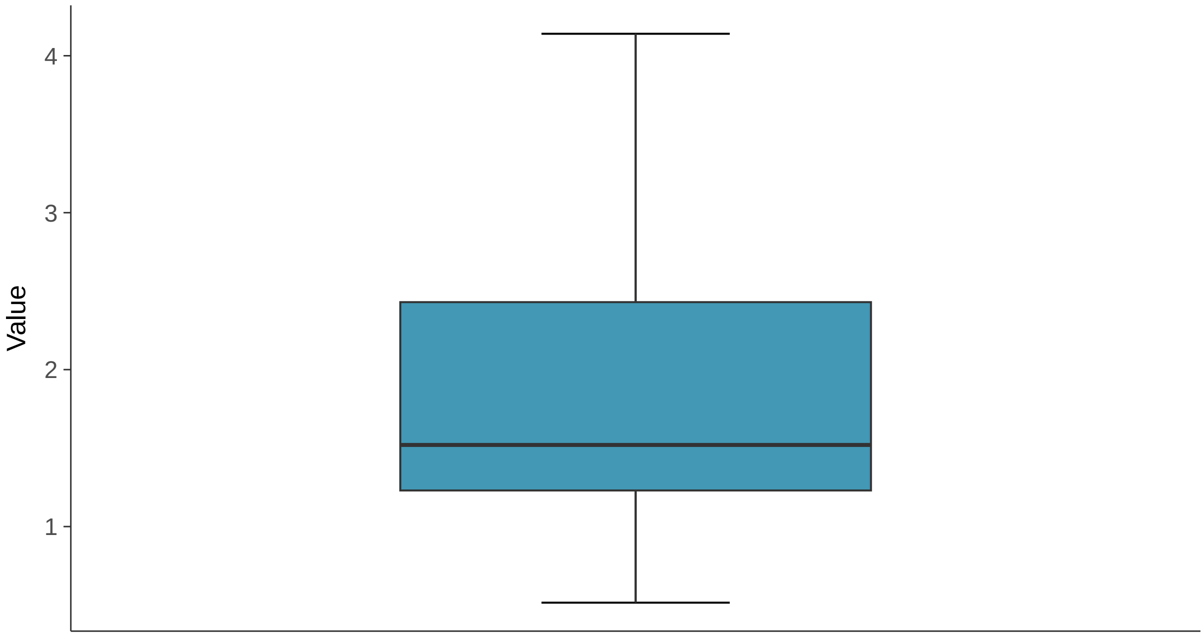
Histogram

Radium-226/228, MW-16D (pCi/L)



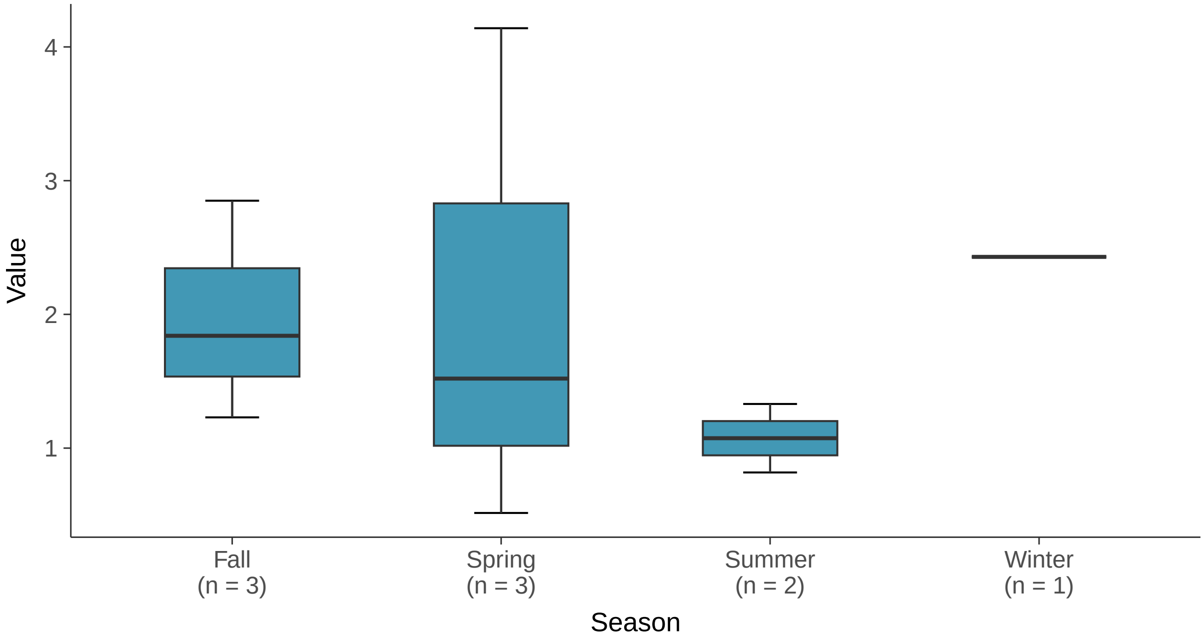
Boxplot

Radium-226/228, MW-16D (pCi/L)



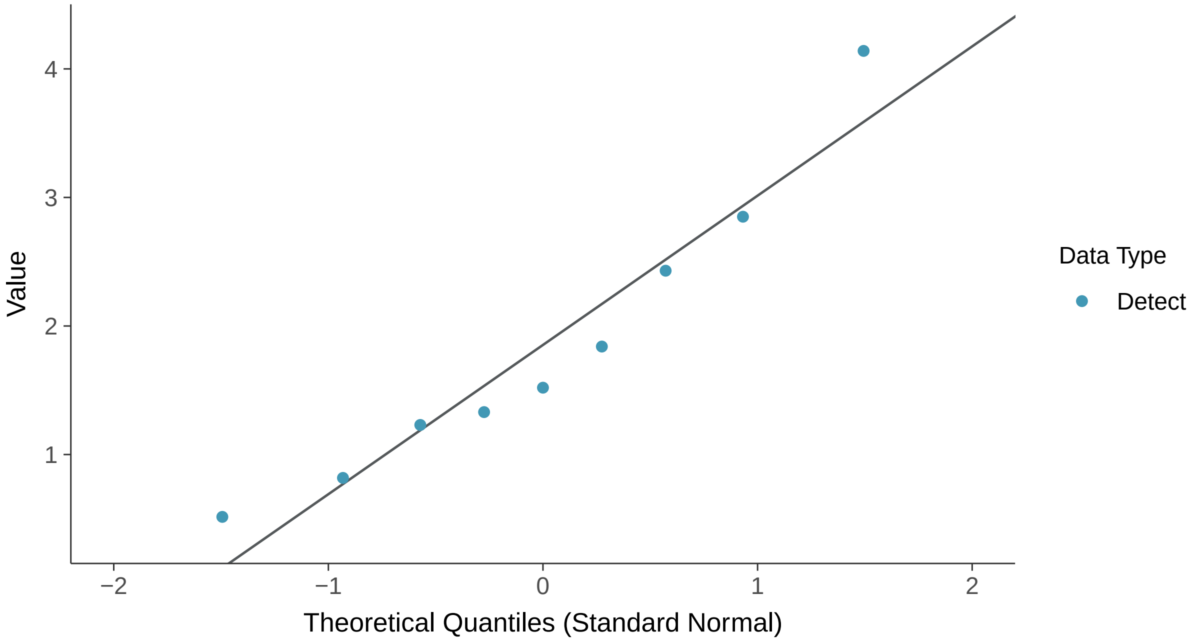
Boxplot by Season

Radium-226/228, MW-16D (pCi/L)



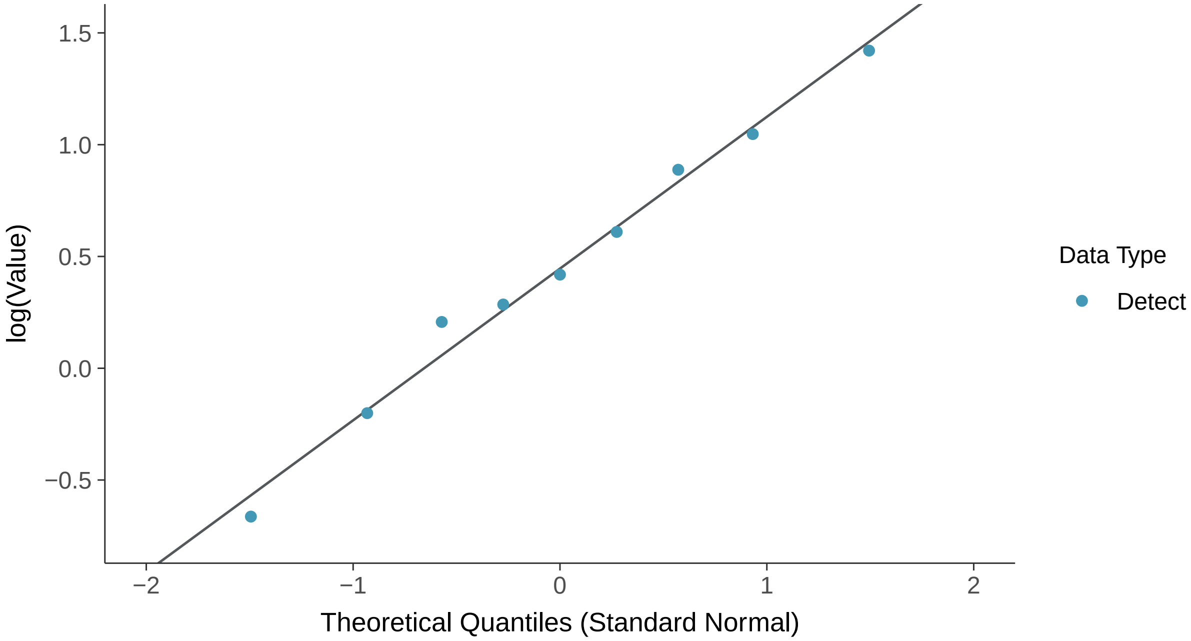
Normal Q-Q plot

Radium-226/228, MW-16D (pCi/L)



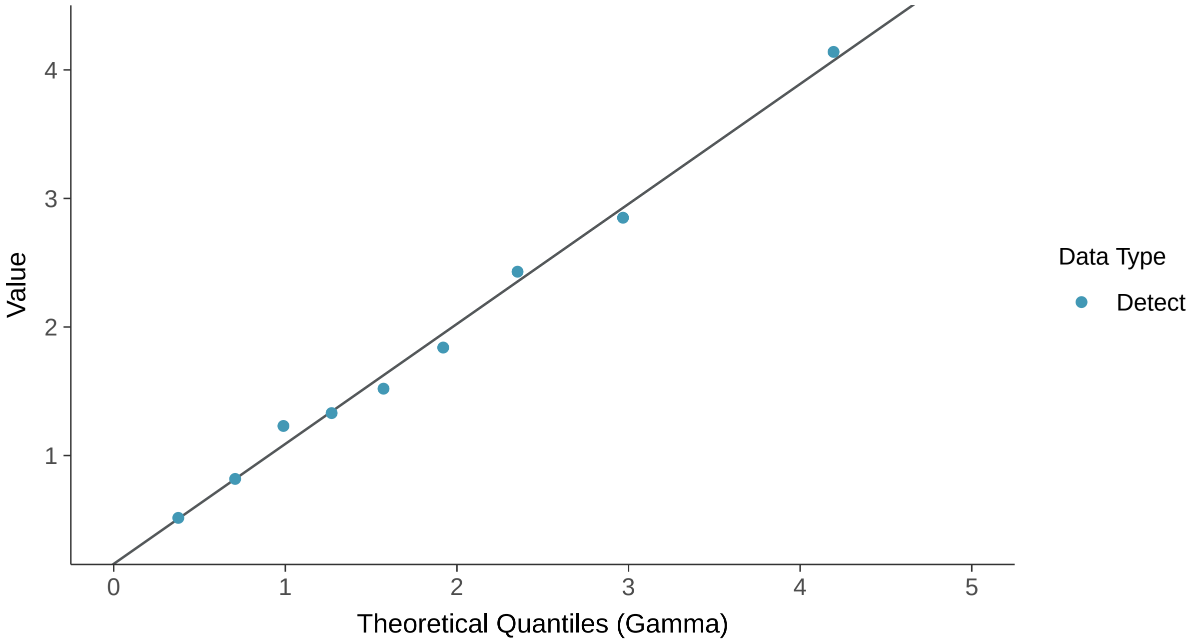
Lognormal Q-Q plot

Radium-226/228, MW-16D (pCi/L)



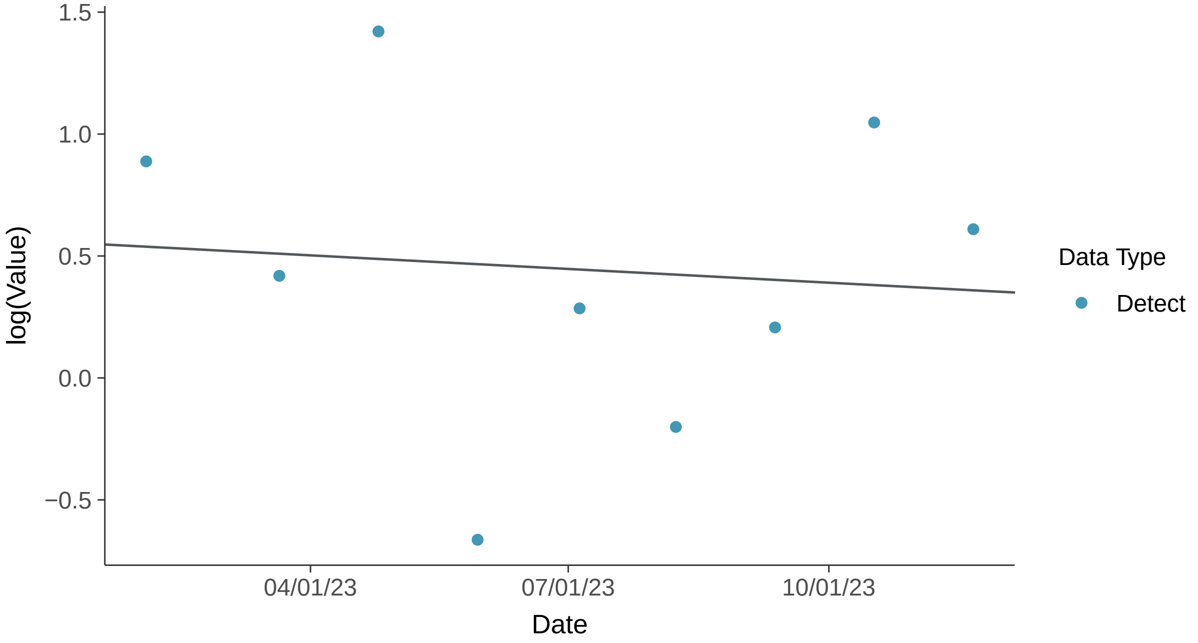
Gamma Q-Q plot

Radium-226/228, MW-16D (pCi/L)



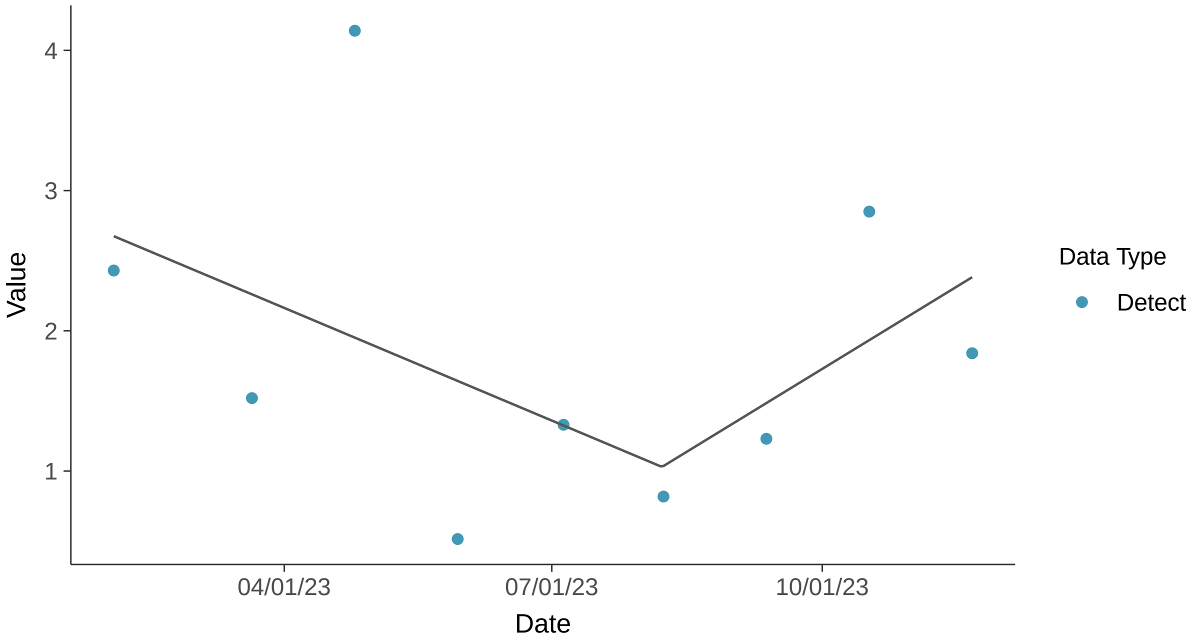
Trend Regression: Lognormal MLE

Radium-226/228, MW-16D (pCi/L)



Trend Regression: Piecewise Linear-Linear

Radium-226/228, MW-16D (pCi/L)

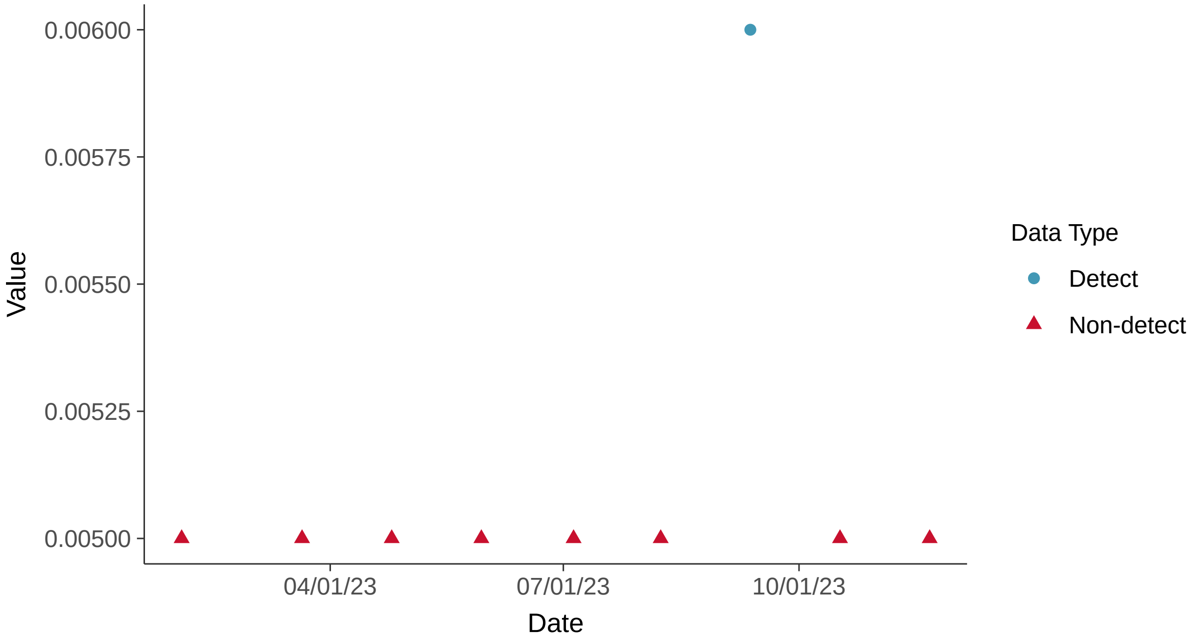


Appendix IV: Selenium, MW-16D

ID: 16D_2_22

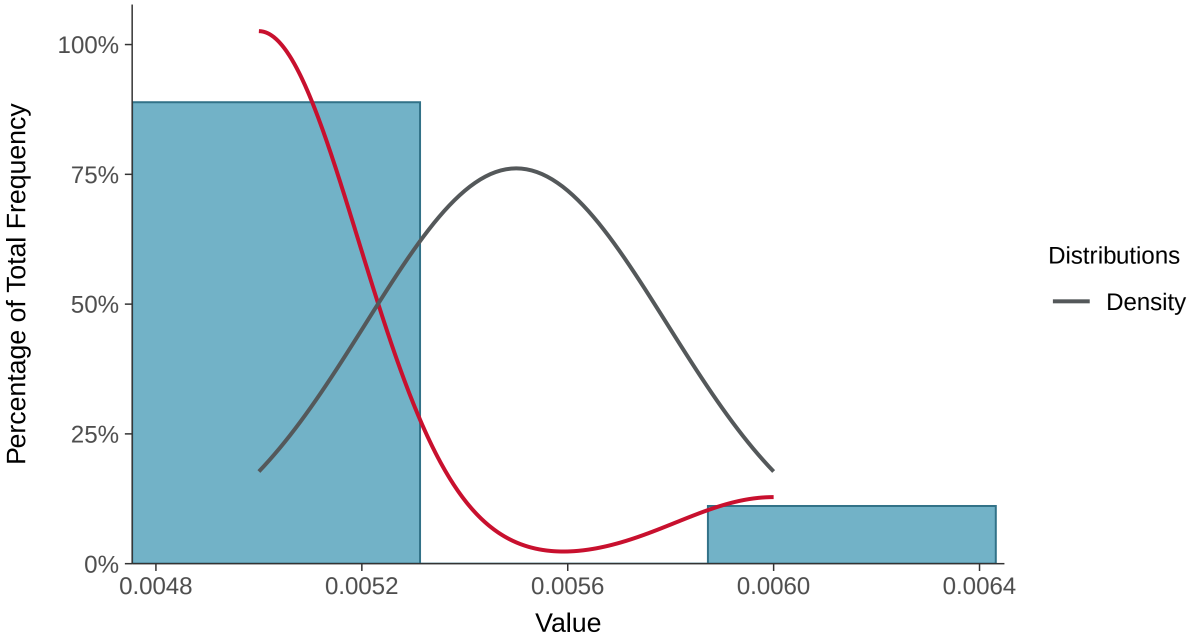
Scatter Plot

Selenium, MW-16D (mg/L)



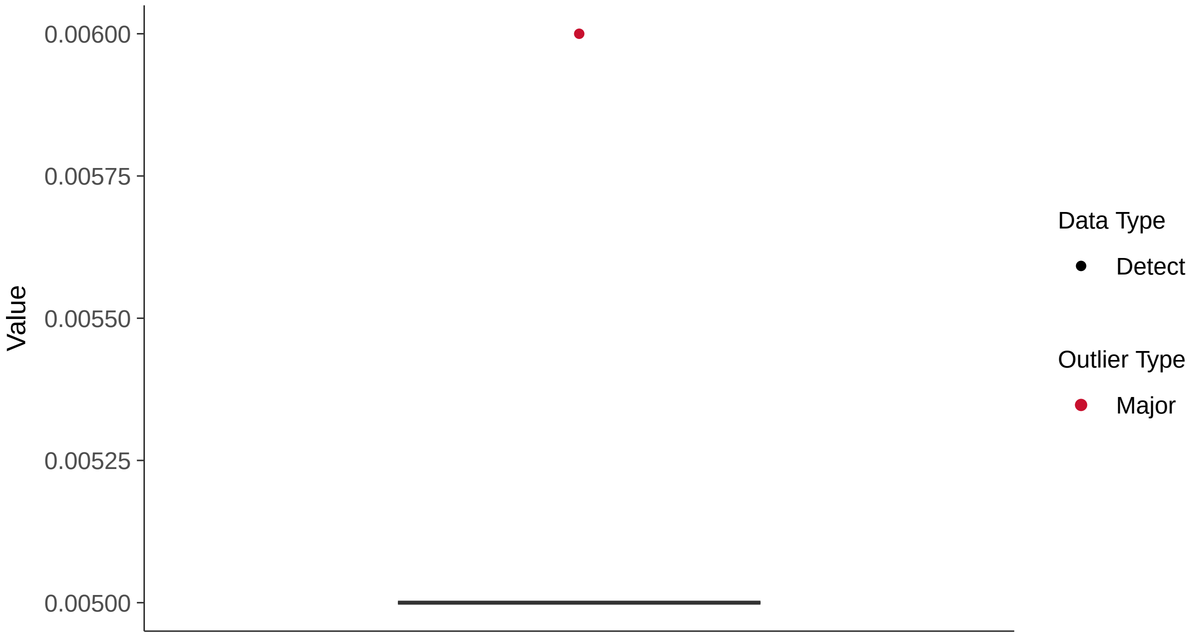
Histogram

Selenium, MW-16D (mg/L)



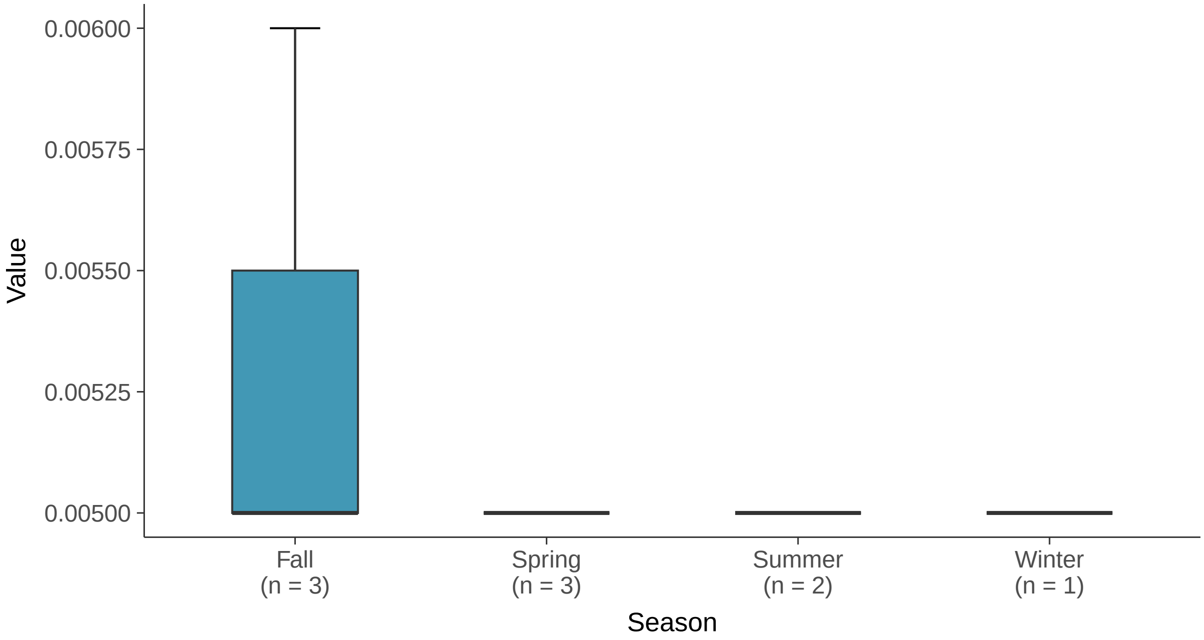
Boxplot

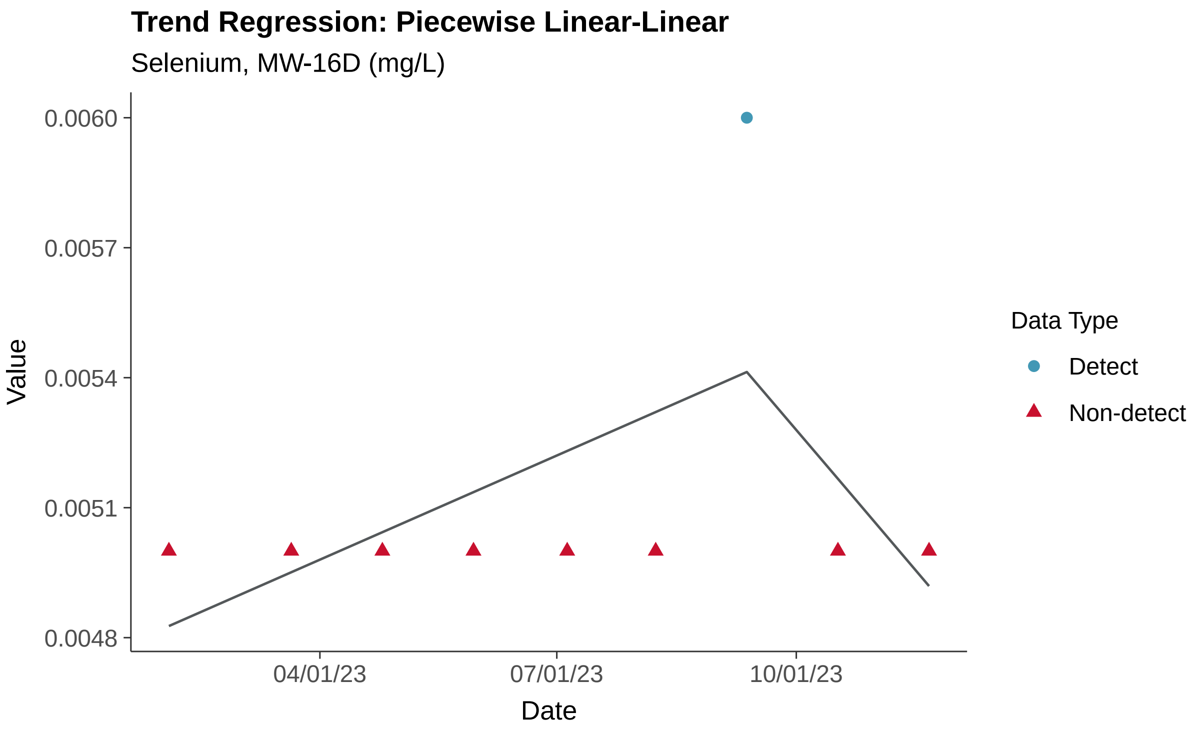
Selenium, MW-16D (mg/L)

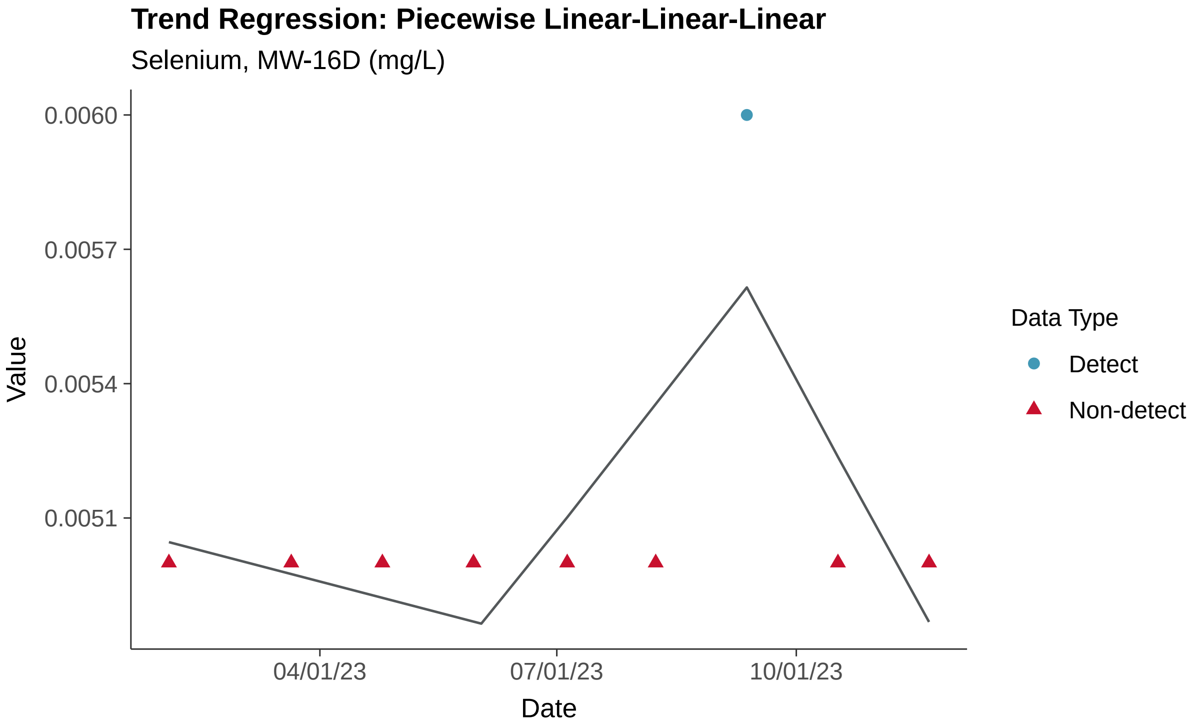


Boxplot by Season

Selenium, MW-16D (mg/L)




Trend Regression: Piecewise Linear-Linear
Selenium, MW-16D (mg/L)
Value
0.0060
0.0057
0.0054
0.0051
0.0048
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

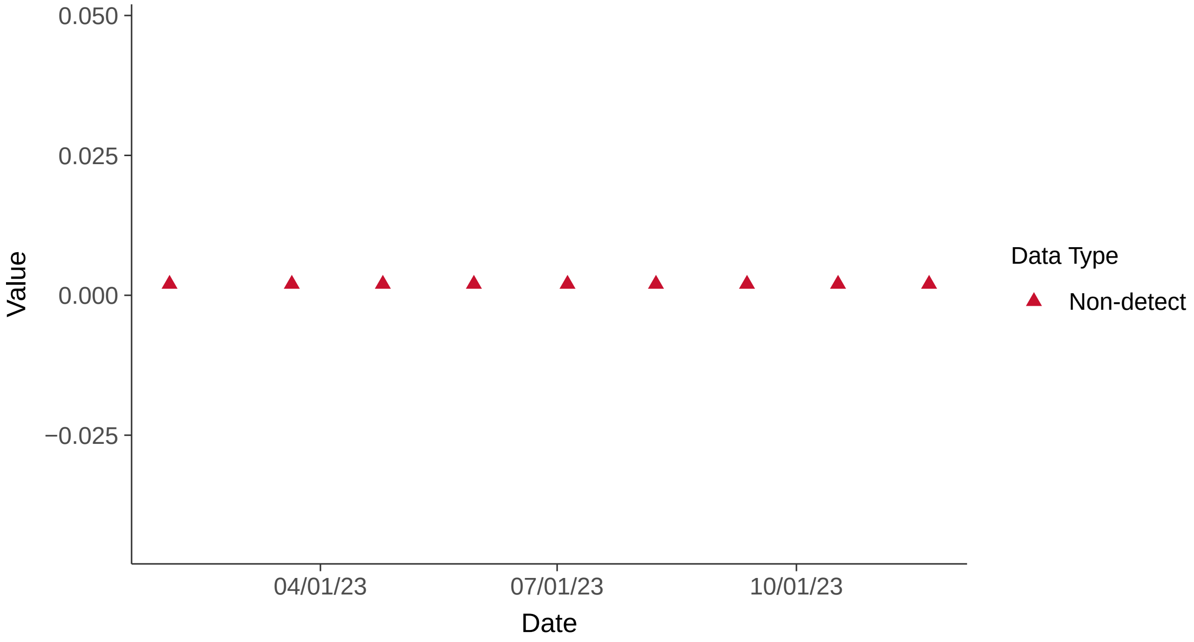

Trend Regression: Piecewise Linear-Linear-Linear
Selenium, MW-16D (mg/L)
Value
0.0060
0.0057
0.0054
0.0051
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Thallium, MW-16D

ID: 16D_2_23

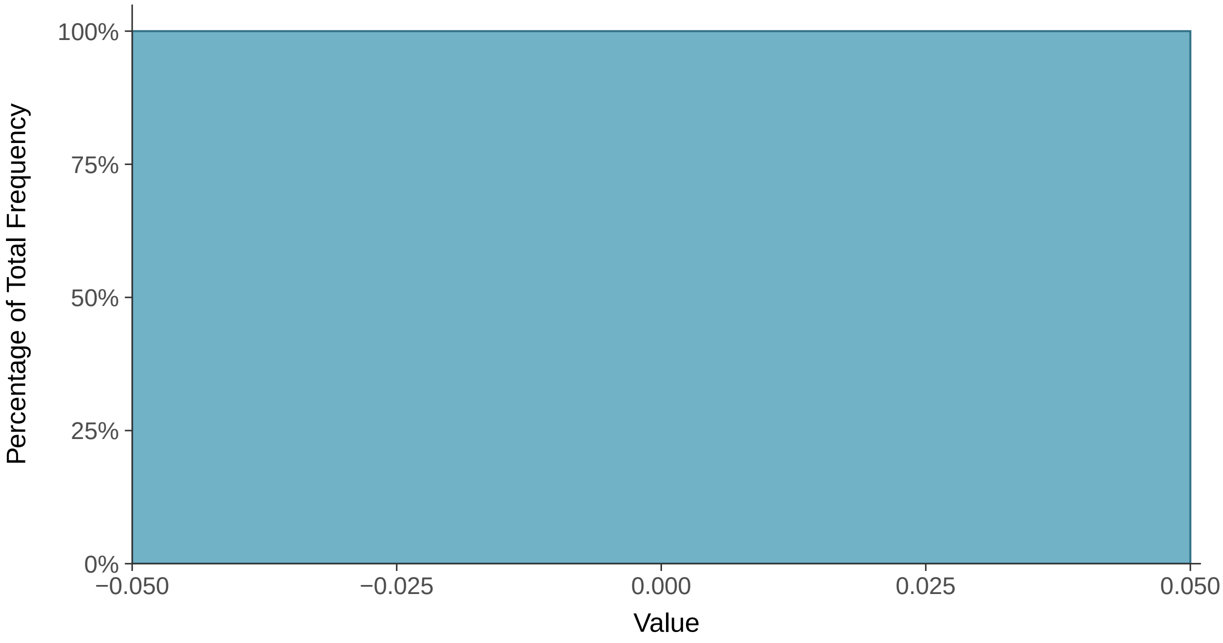
Scatter Plot

Thallium, MW-16D (mg/L)



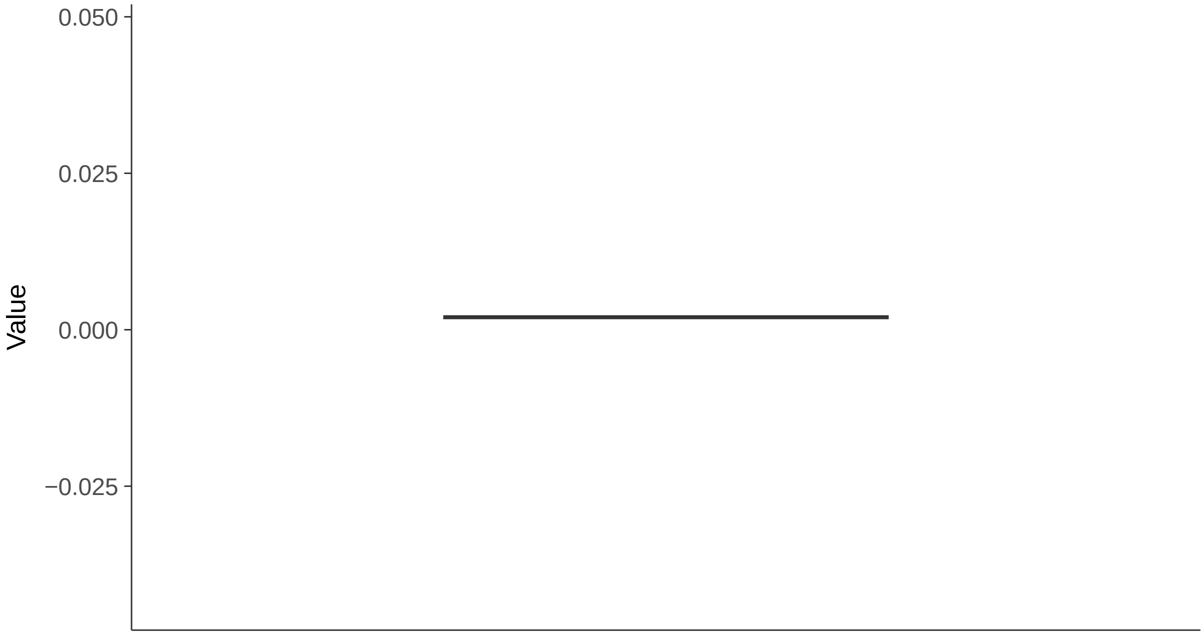
Histogram

Thallium, MW-16D (mg/L)



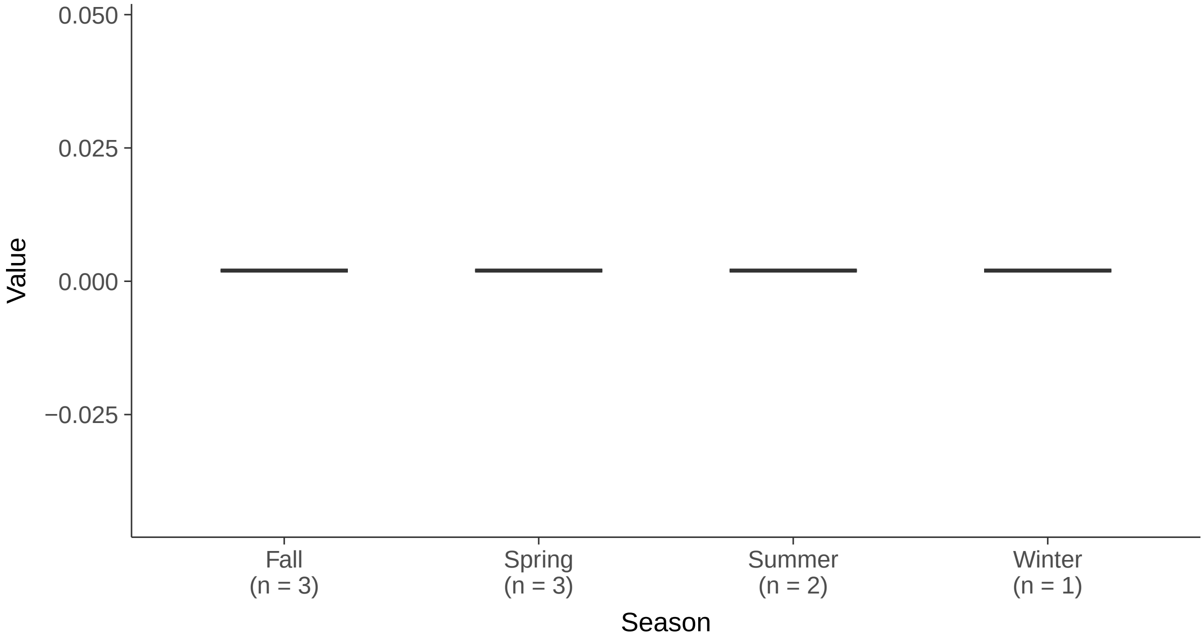
Boxplot

Thallium, MW-16D (mg/L)



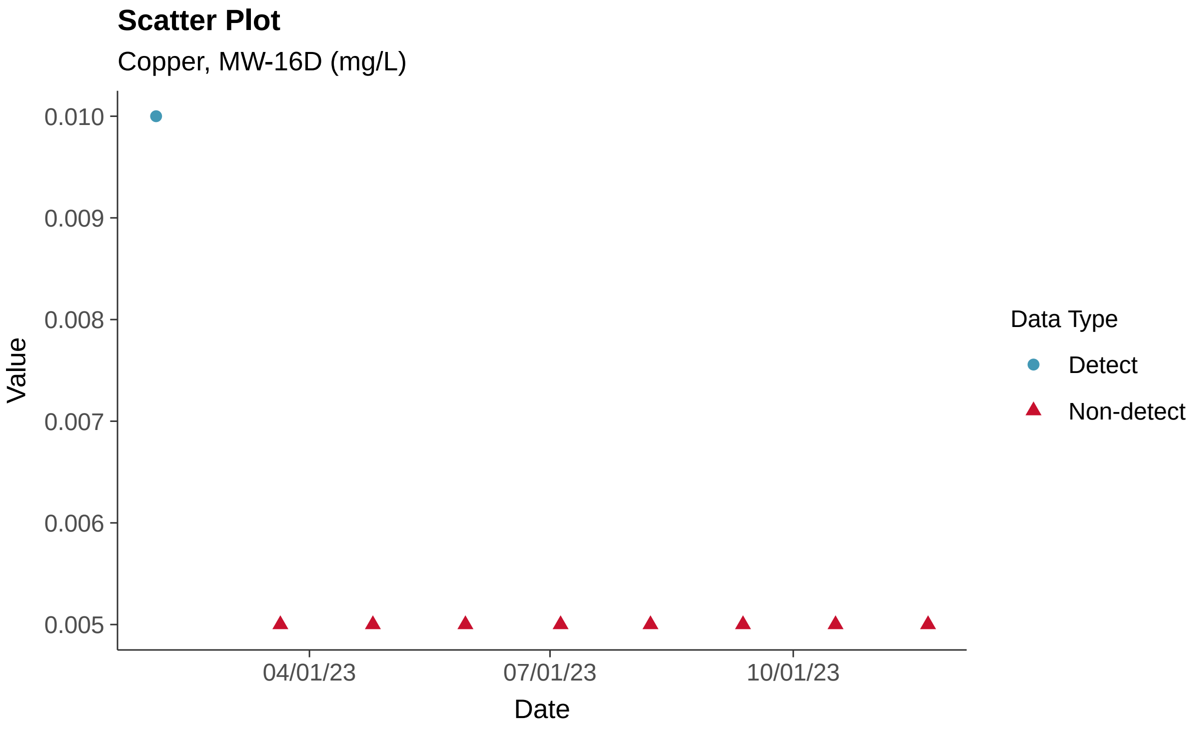
Boxplot by Season

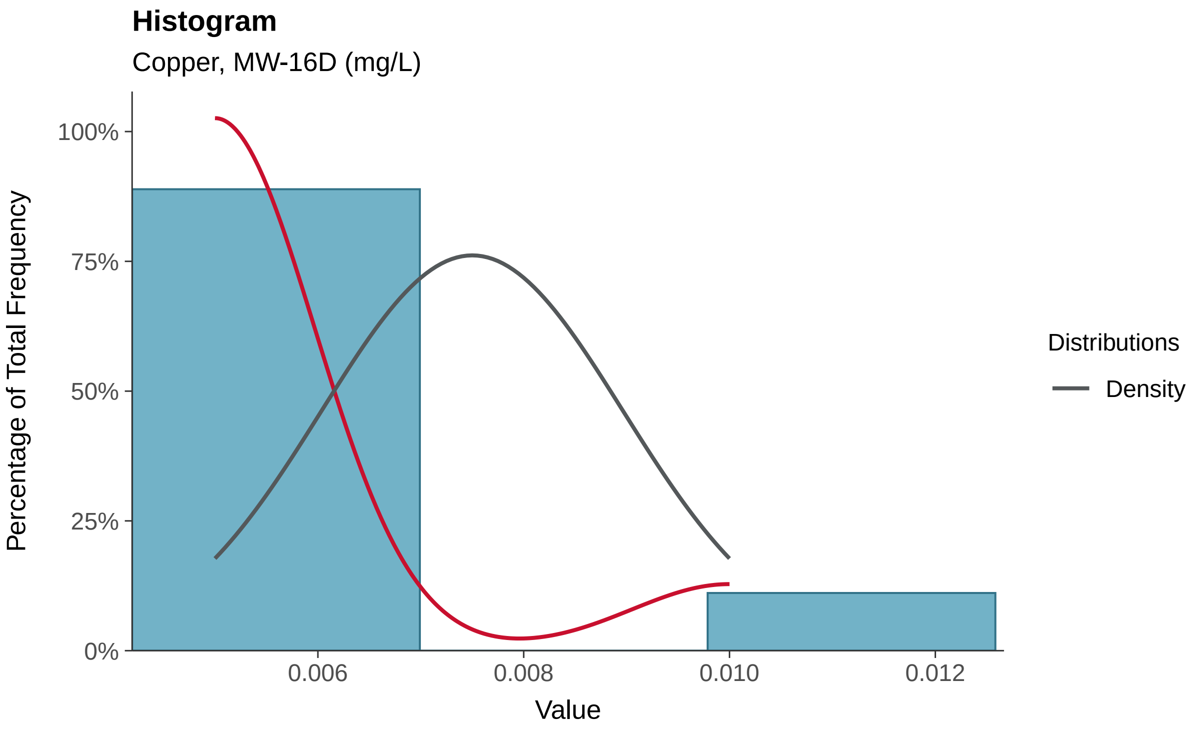
Thallium, MW-16D (mg/L)



Part 115: Copper, MW-16D

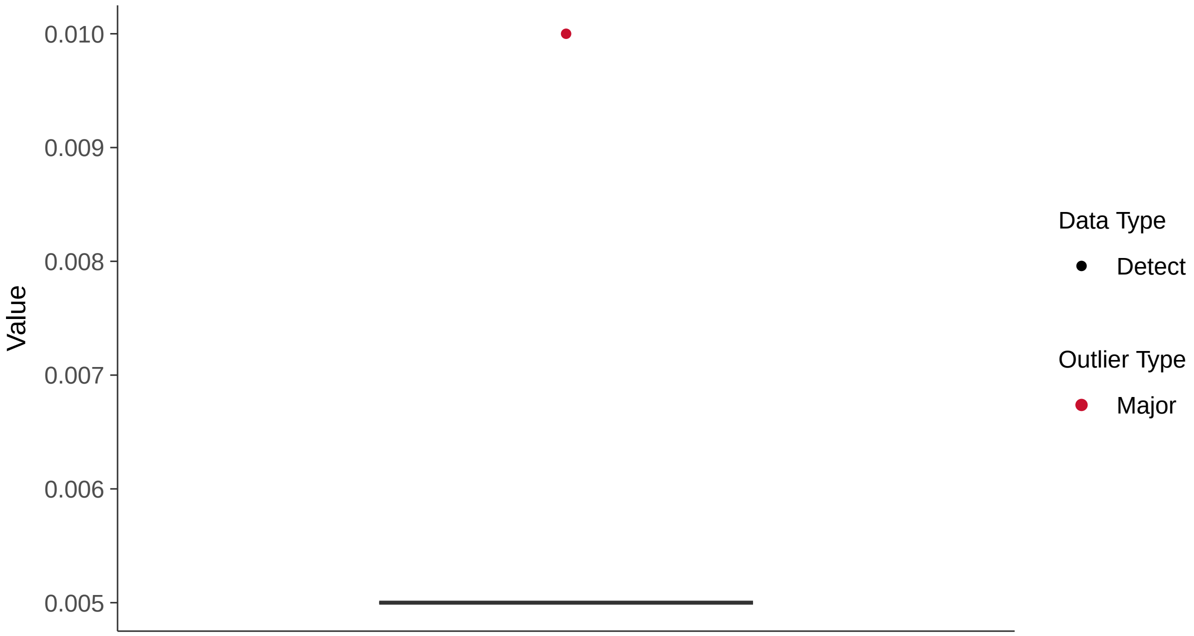
ID: 16D_5_37





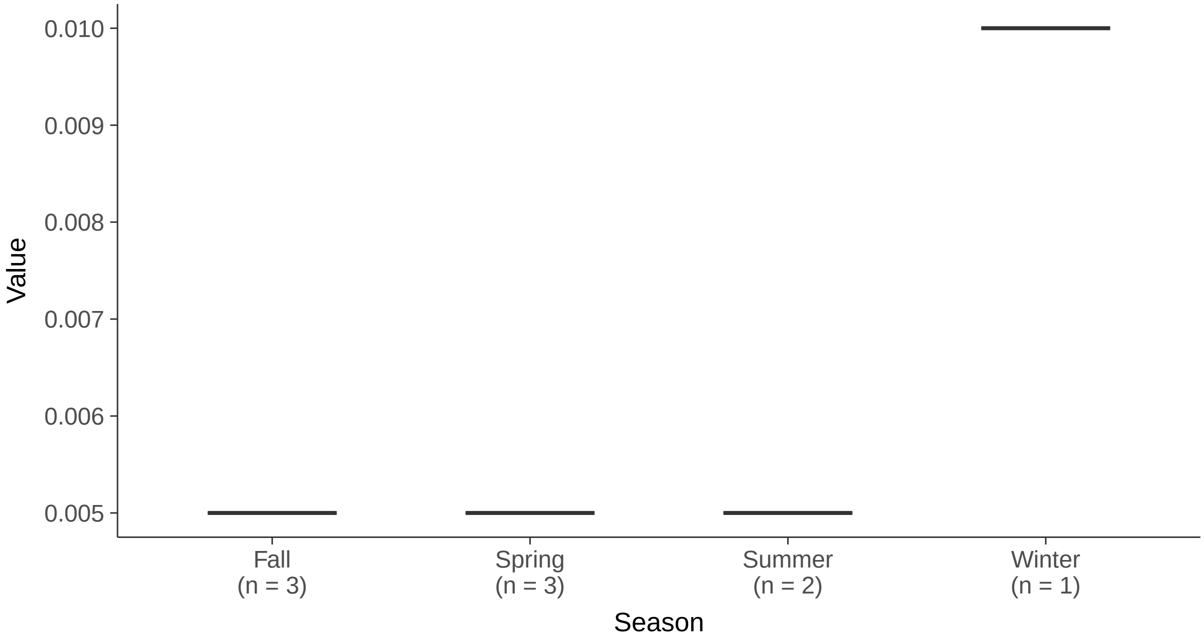
Boxplot

Copper, MW-16D (mg/L)



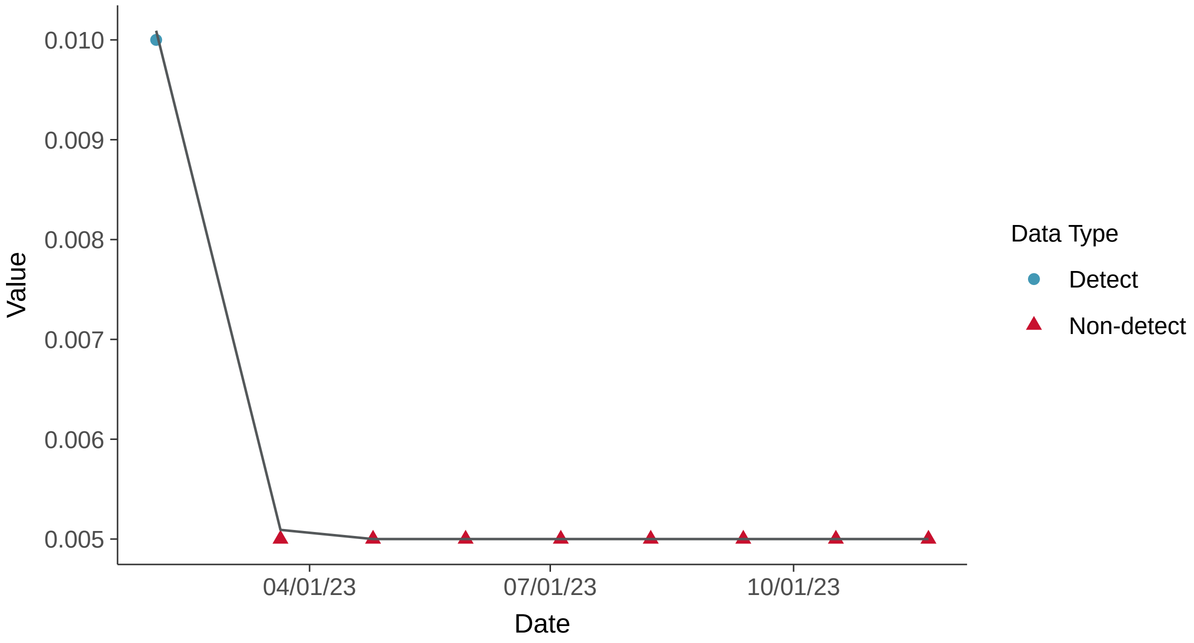
Boxplot by Season

Copper, MW-16D (mg/L)



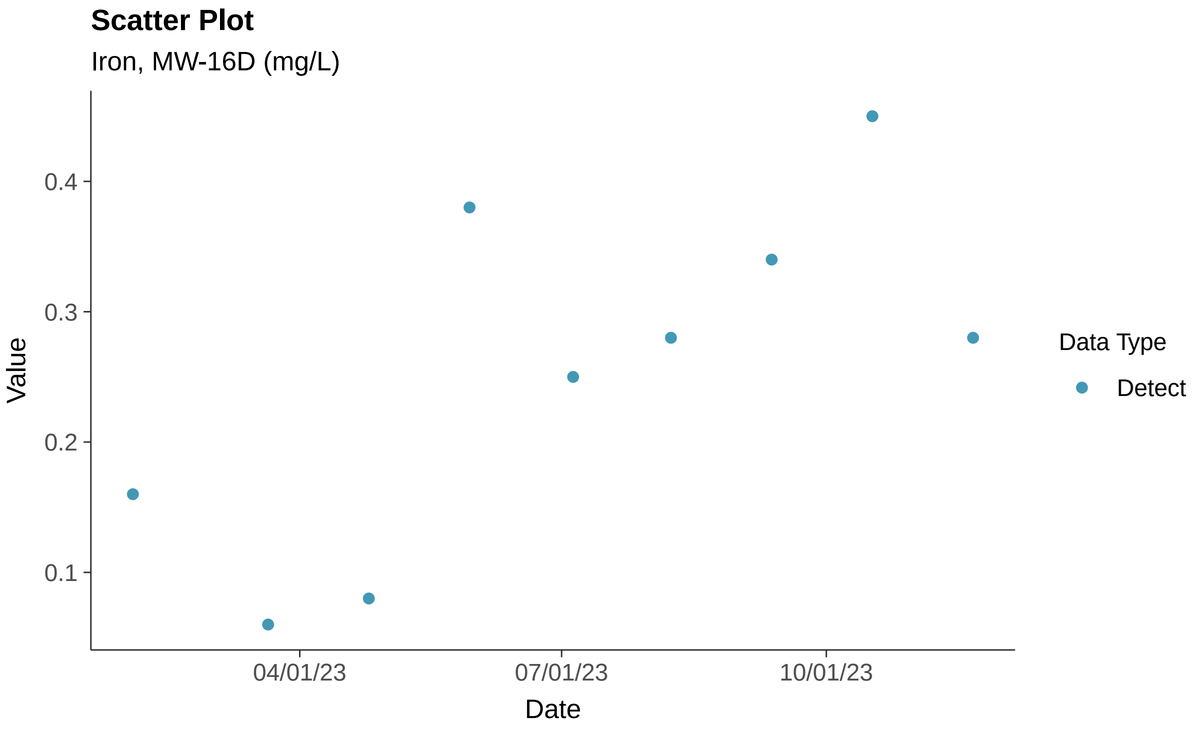
Trend Regression: Piecewise Linear-Linear

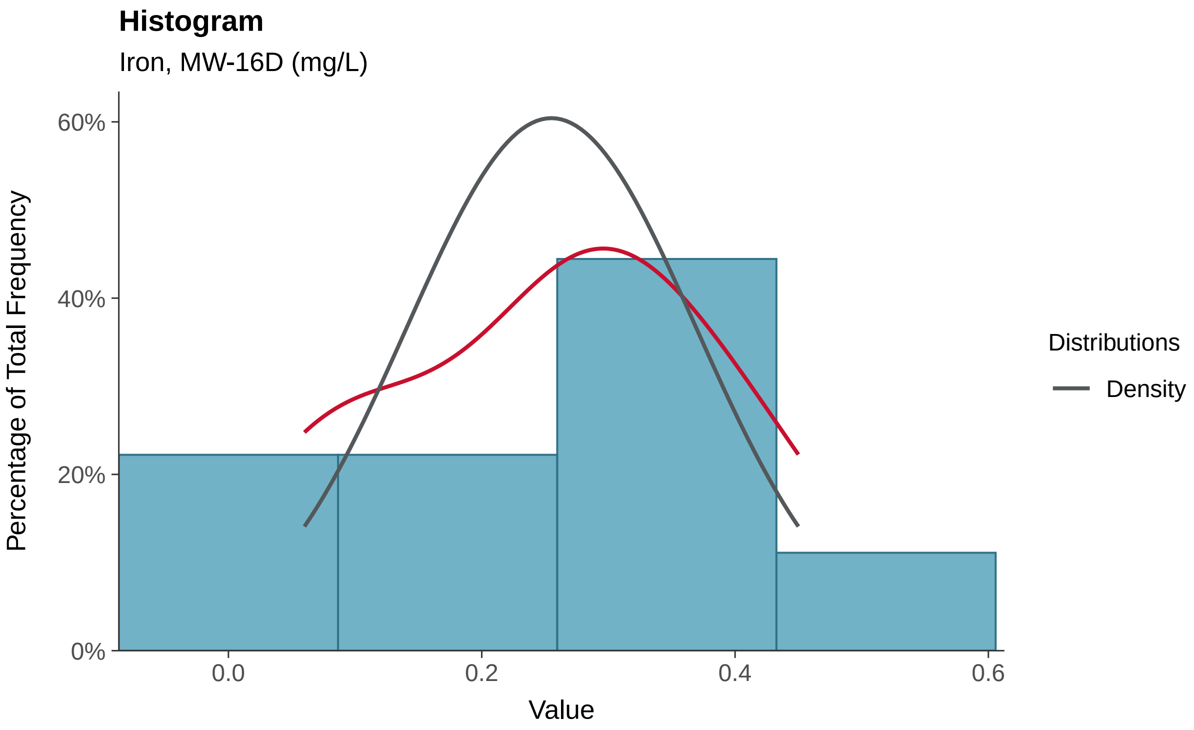
Copper, MW-16D (mg/L)



Part 115: Iron, MW-16D

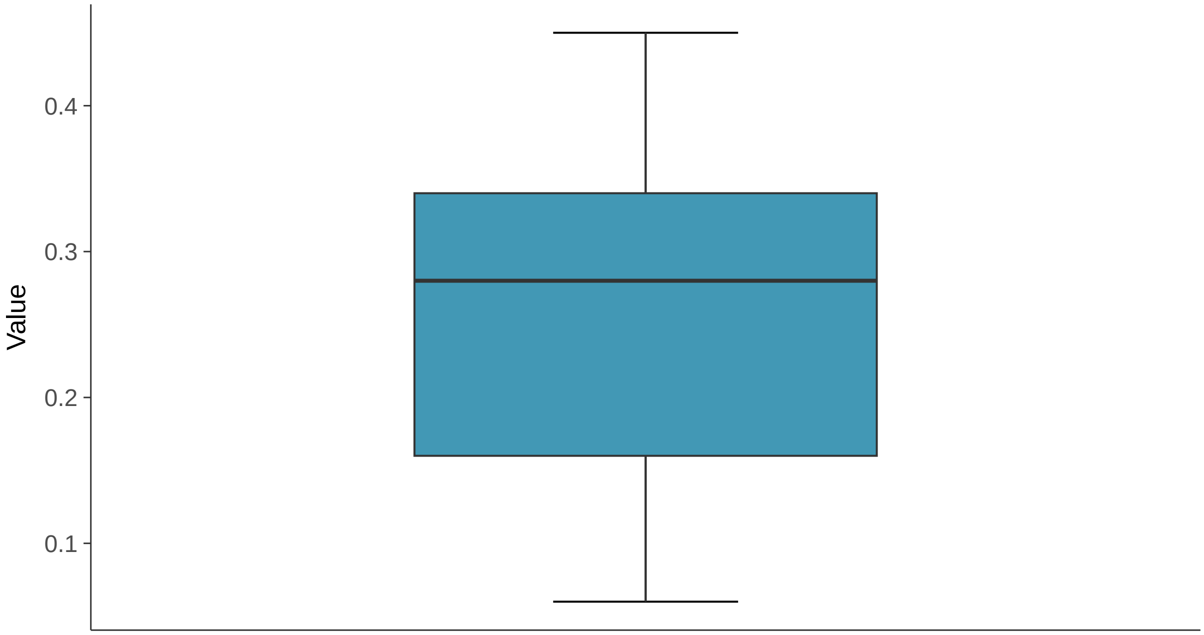
ID: 16D_5_38





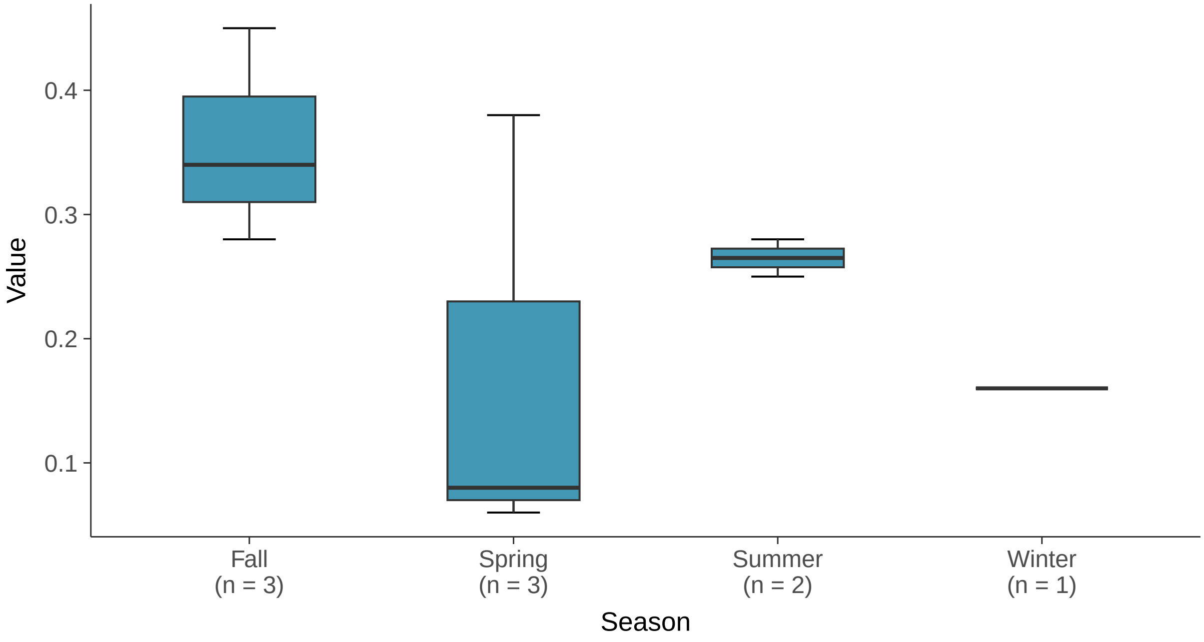
Boxplot

Iron, MW-16D (mg/L)



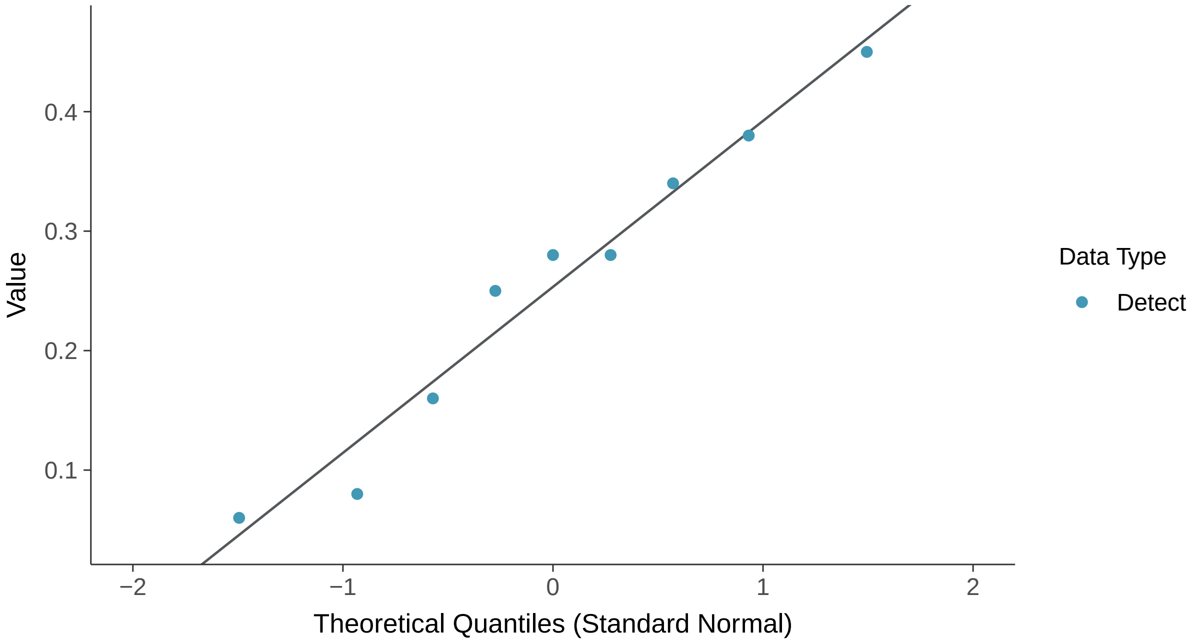
Boxplot by Season

Iron, MW-16D (mg/L)



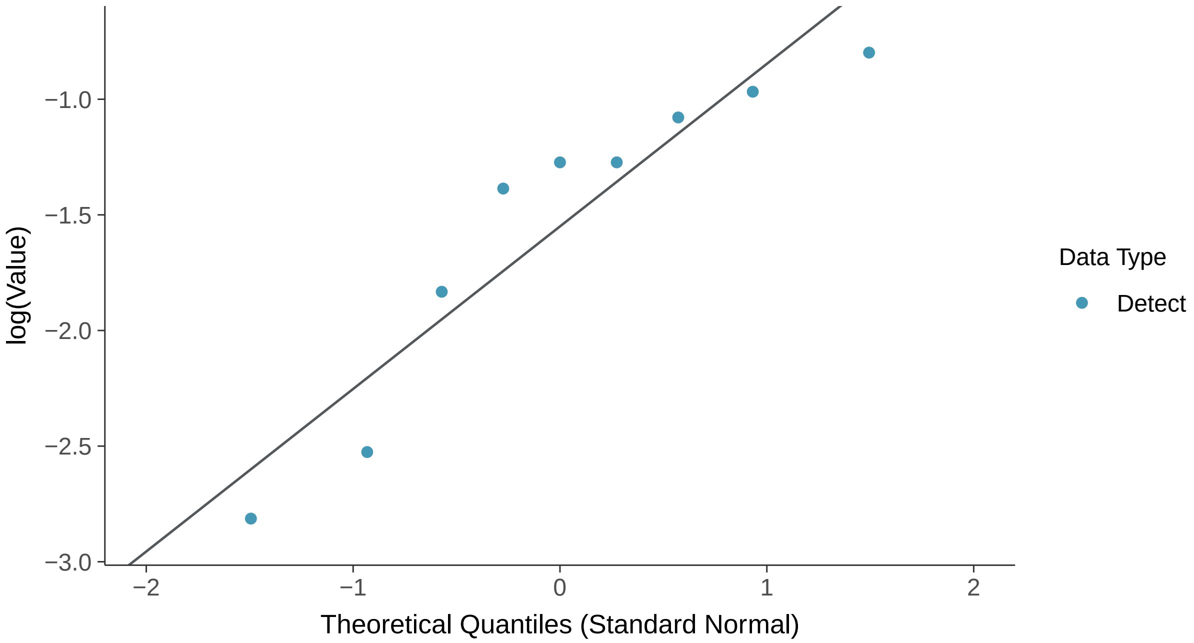
Normal Q-Q plot

Iron, MW-16D (mg/L)



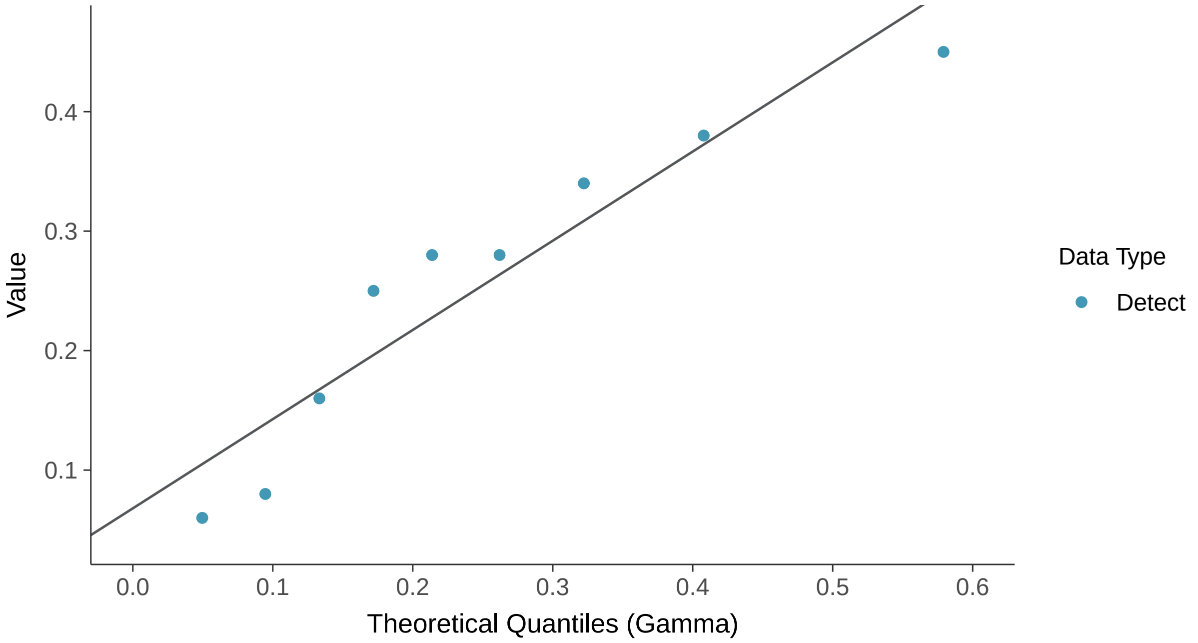
Lognormal Q-Q plot

Iron, MW-16D (mg/L)



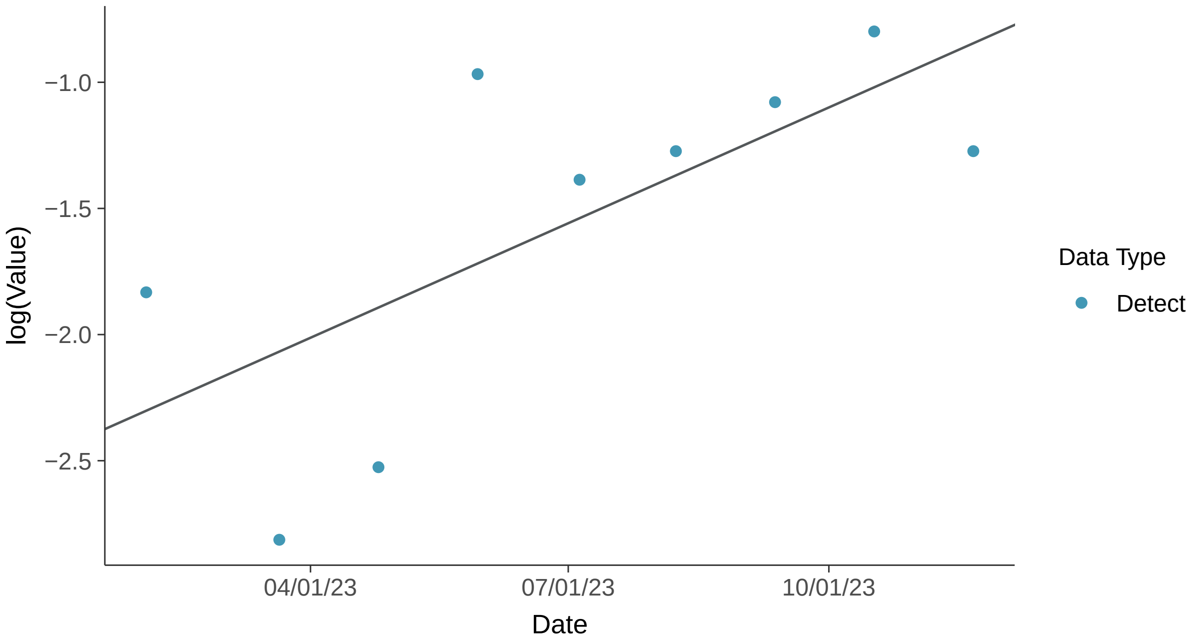
Gamma Q-Q plot

Iron, MW-16D (mg/L)



Trend Regression: Lognormal MLE

Iron, MW-16D (mg/L)

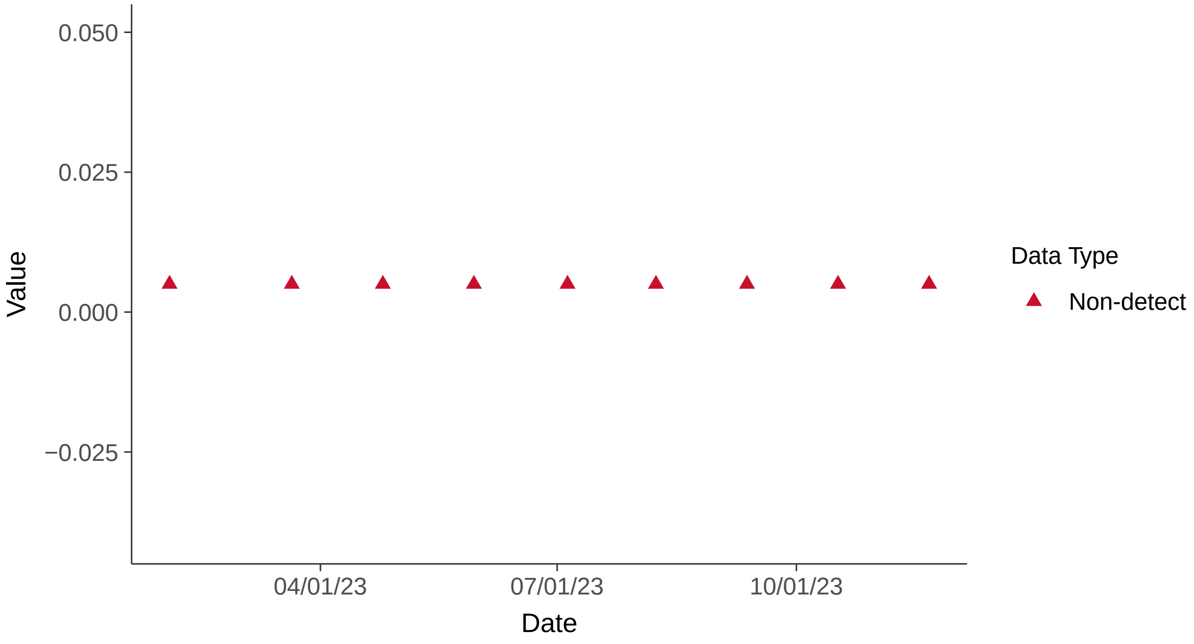


Part 115: Nickel, MW-16D

ID: 16D_5_39

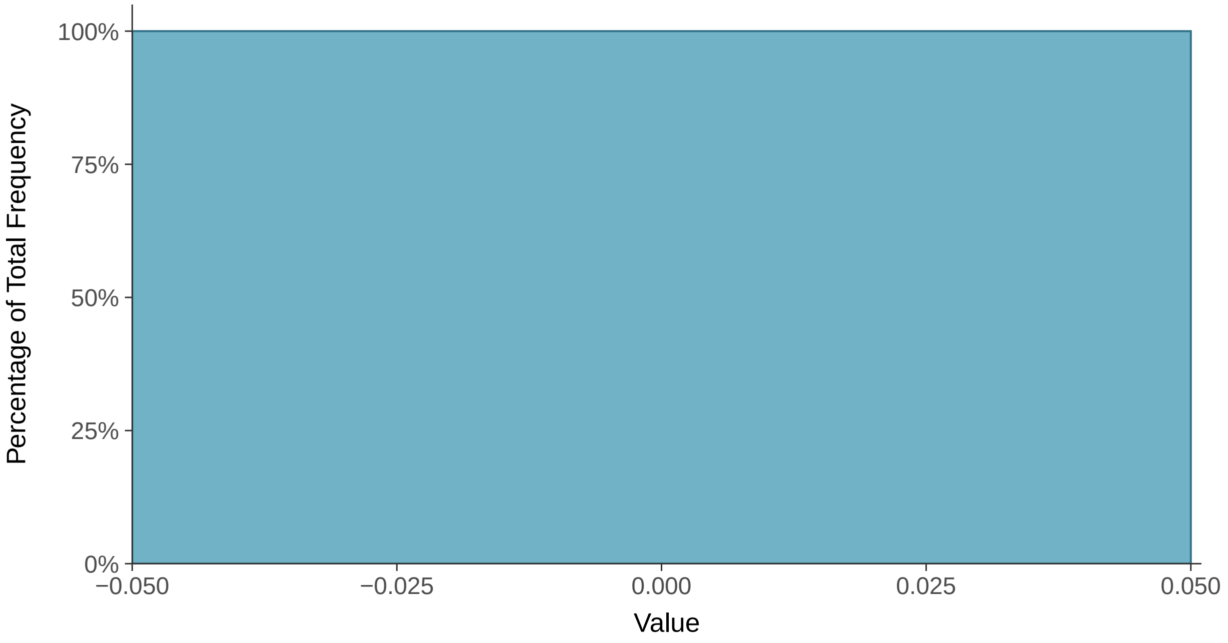
Scatter Plot

Nickel, MW-16D (mg/L)



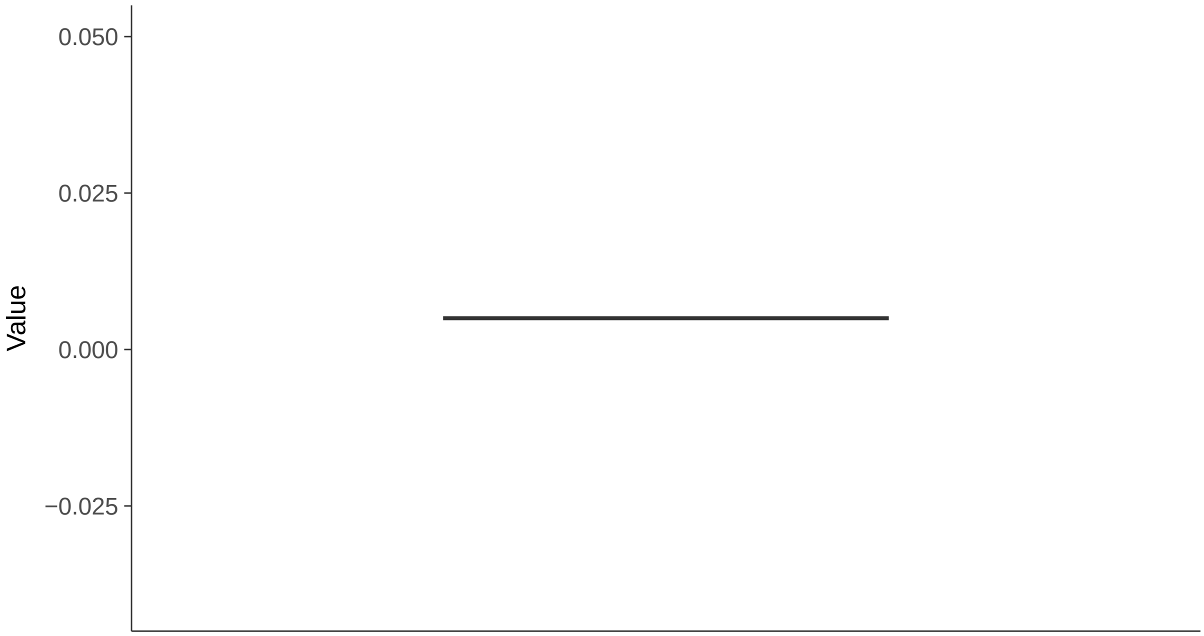
Histogram

Nickel, MW-16D (mg/L)



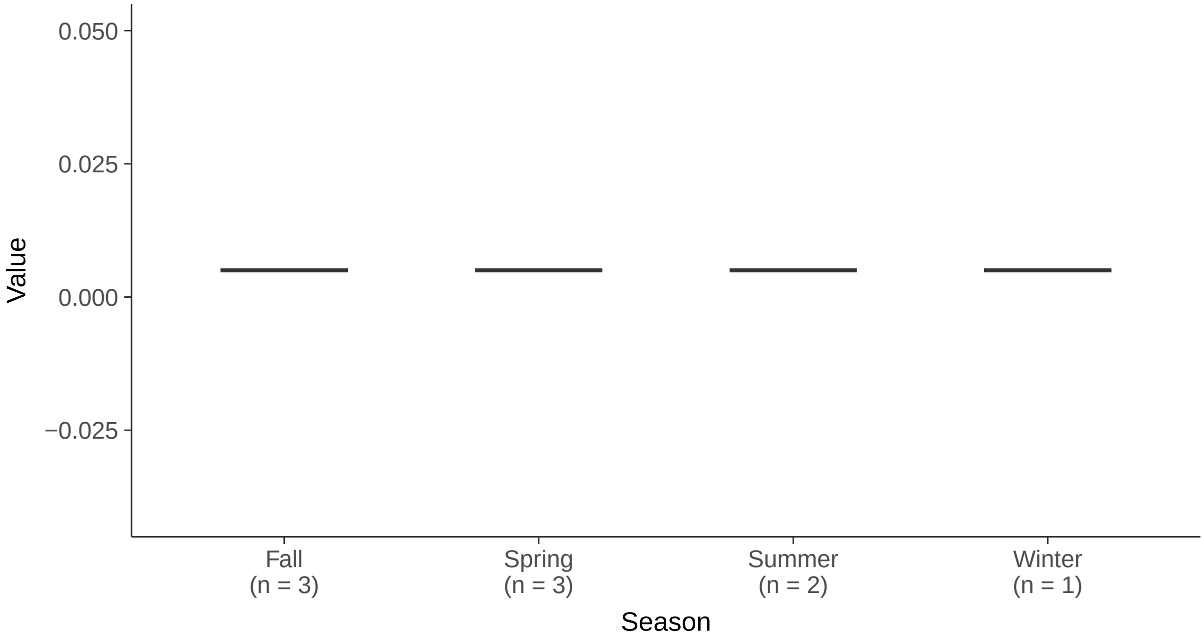
Boxplot

Nickel, MW-16D (mg/L)



Boxplot by Season

Nickel, MW-16D (mg/L)

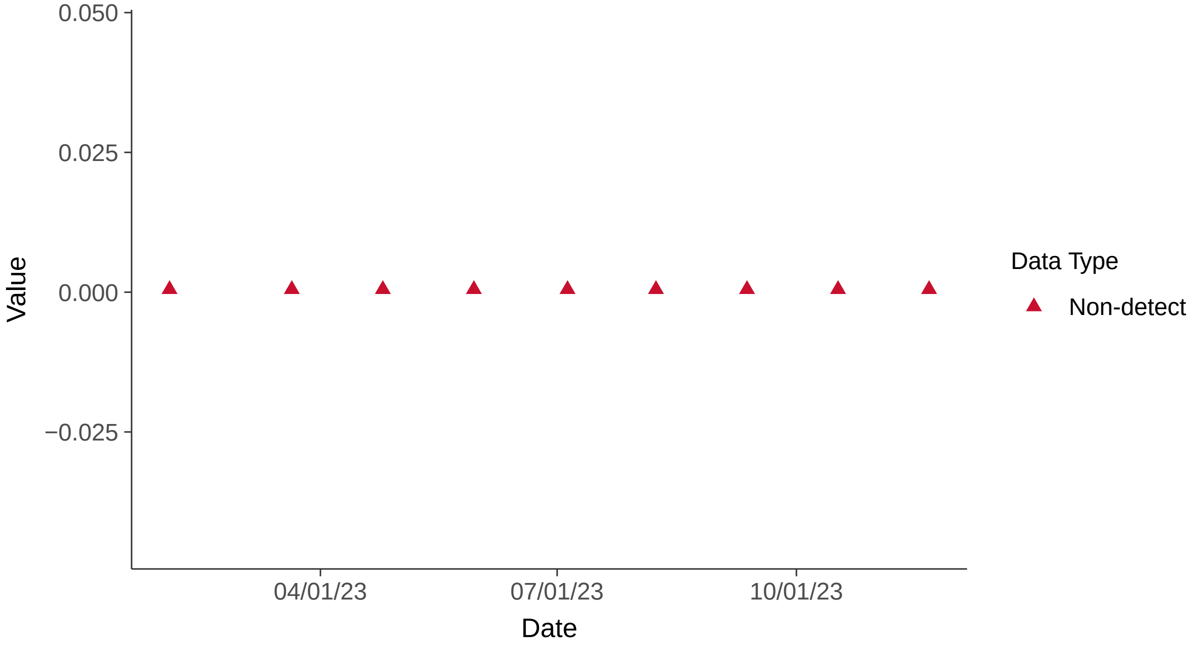


Part 115: Silver, MW-16D

ID: 16D_5_40

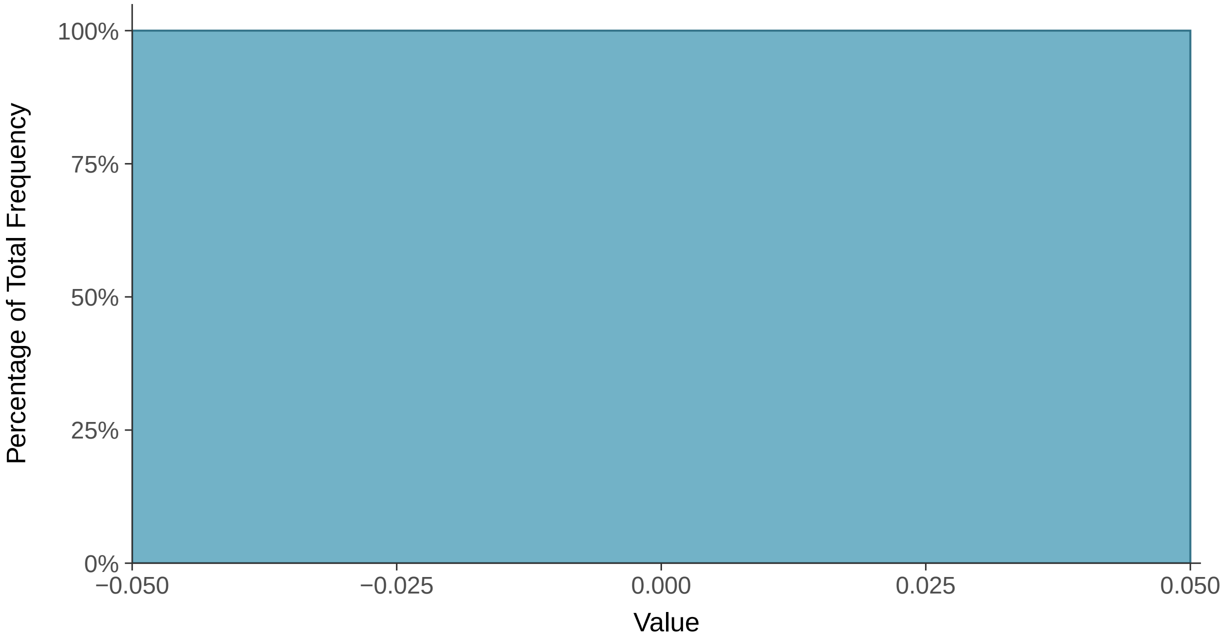
Scatter Plot

Silver, MW-16D (mg/L)



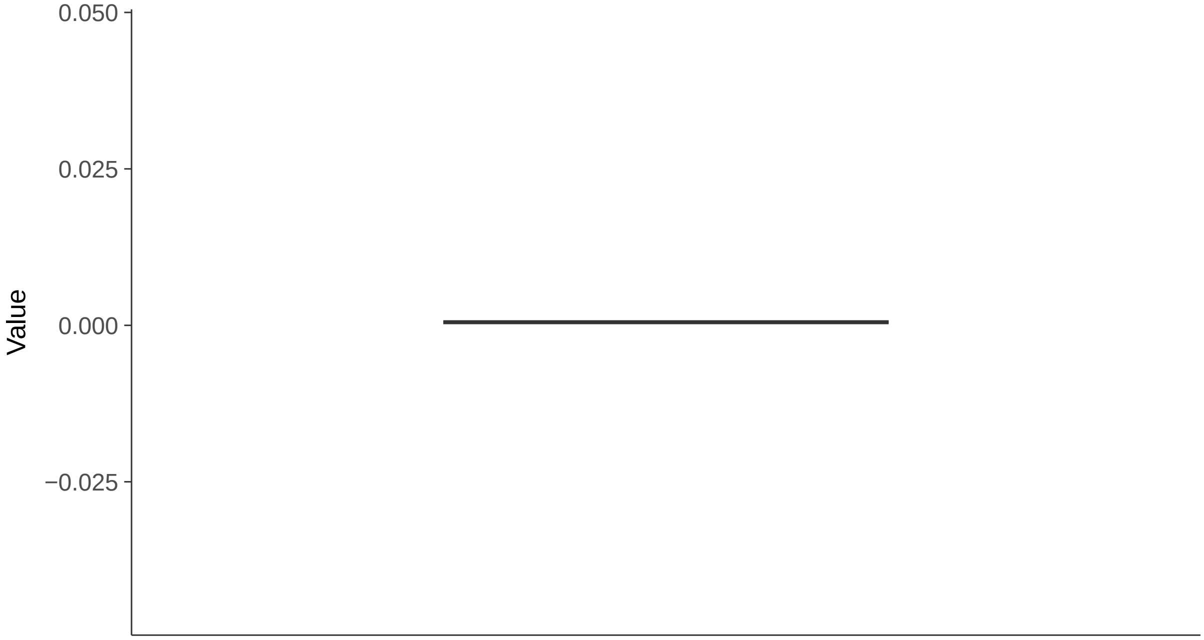
Histogram

Silver, MW-16D (mg/L)



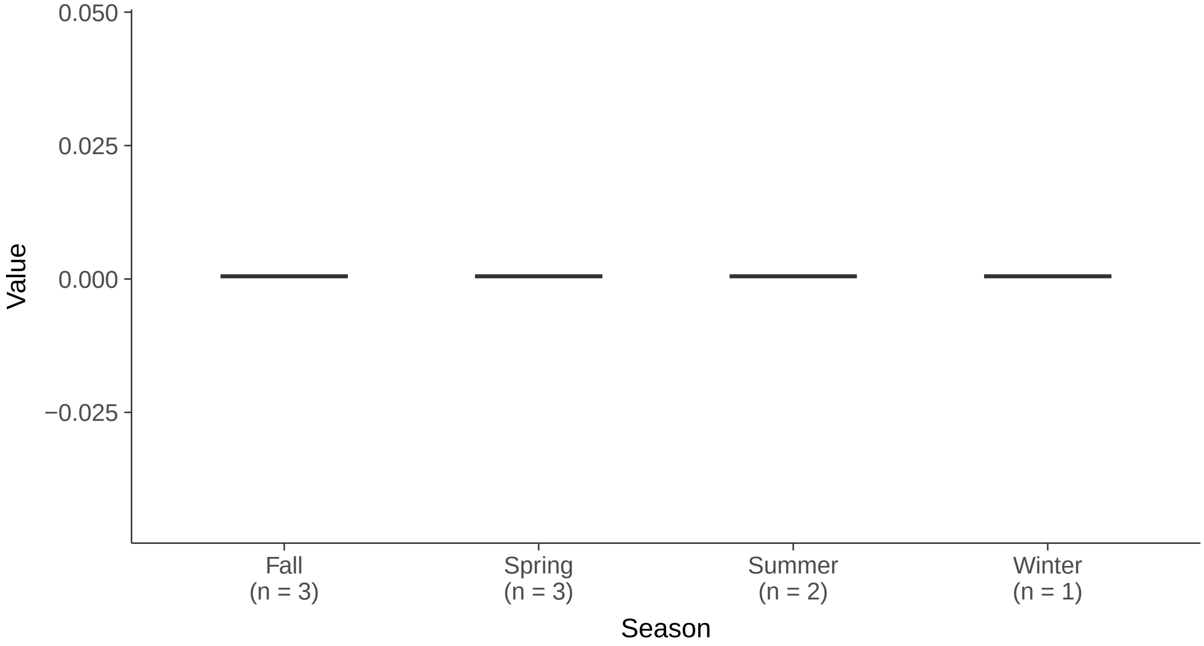
Boxplot

Silver, MW-16D (mg/L)



Boxplot by Season

Silver, MW-16D (mg/L)

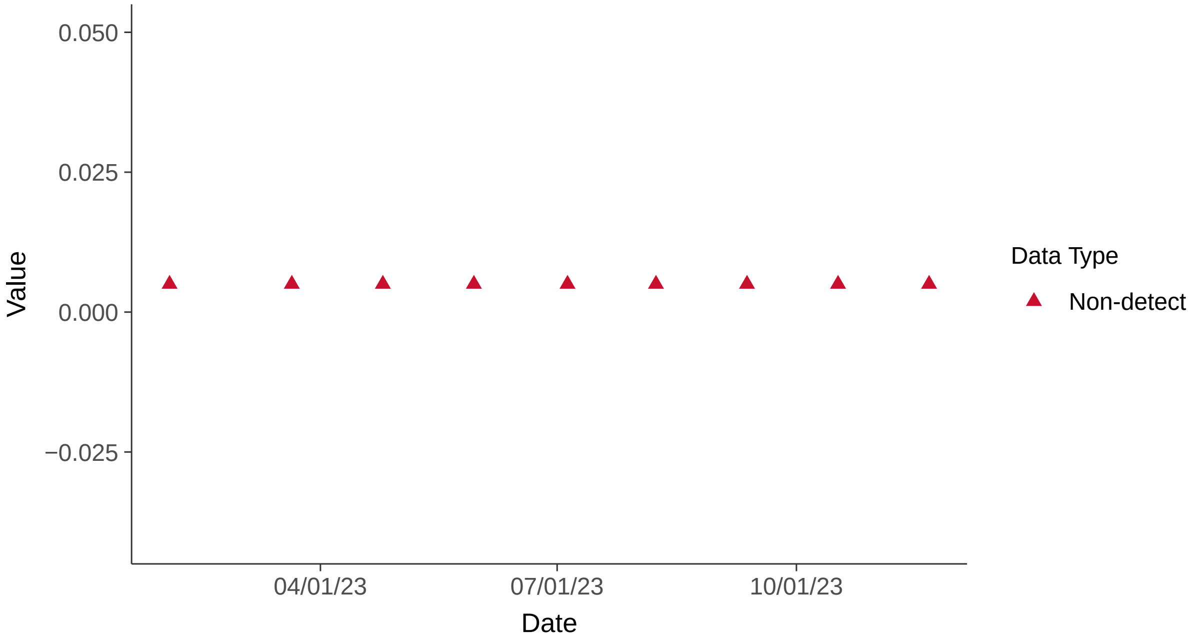


Part 115: Vanadium, MW-16D

ID: 16D_5_41

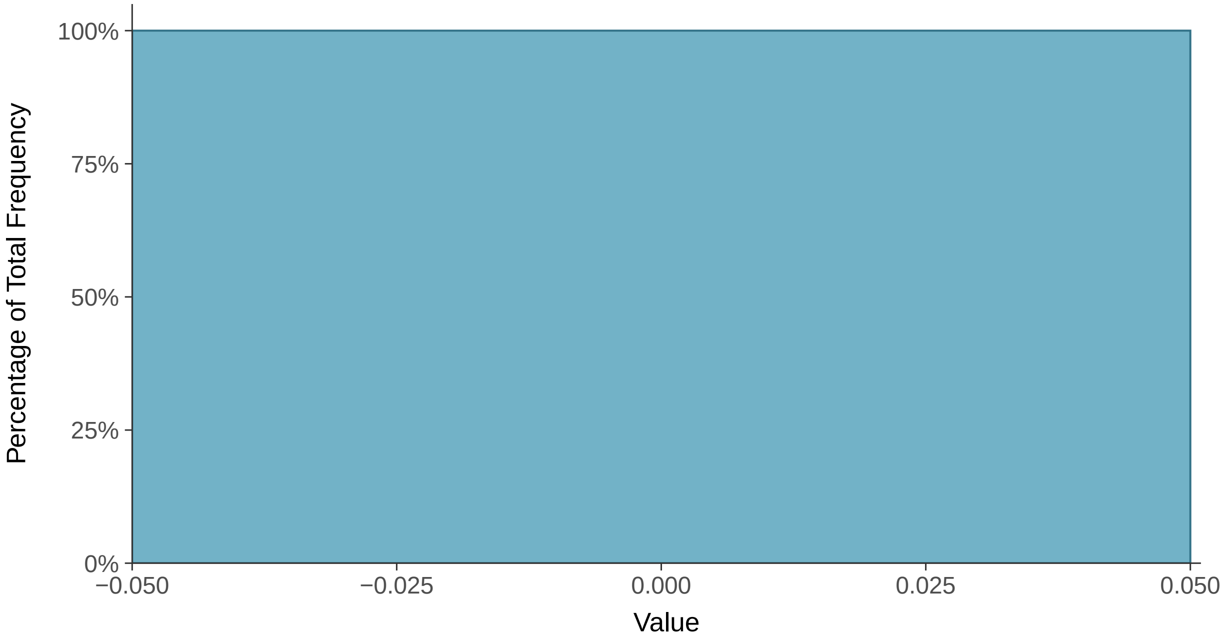
Scatter Plot

Vanadium, MW-16D (mg/L)



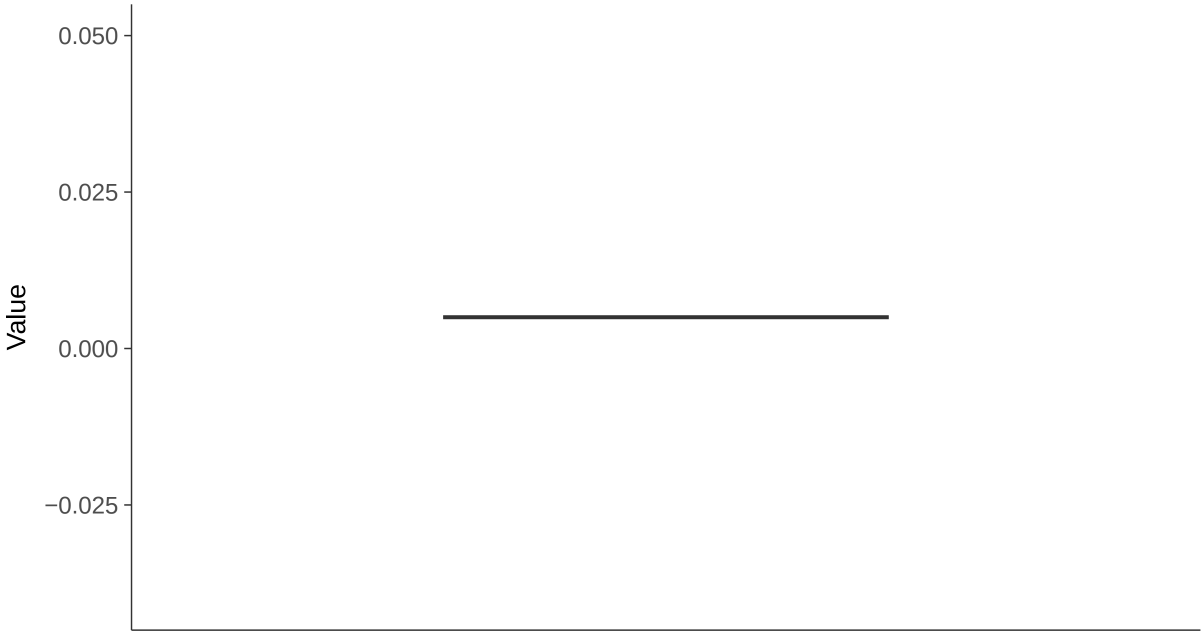
Histogram

Vanadium, MW-16D (mg/L)



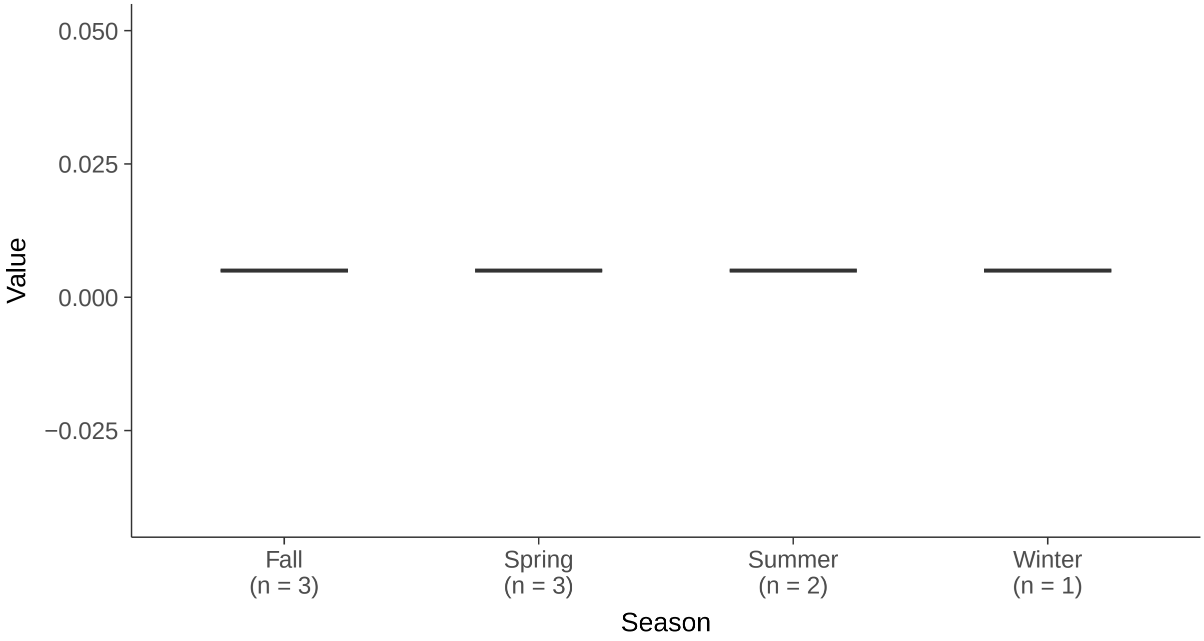
Boxplot

Vanadium, MW-16D (mg/L)



Boxplot by Season

Vanadium, MW-16D (mg/L)

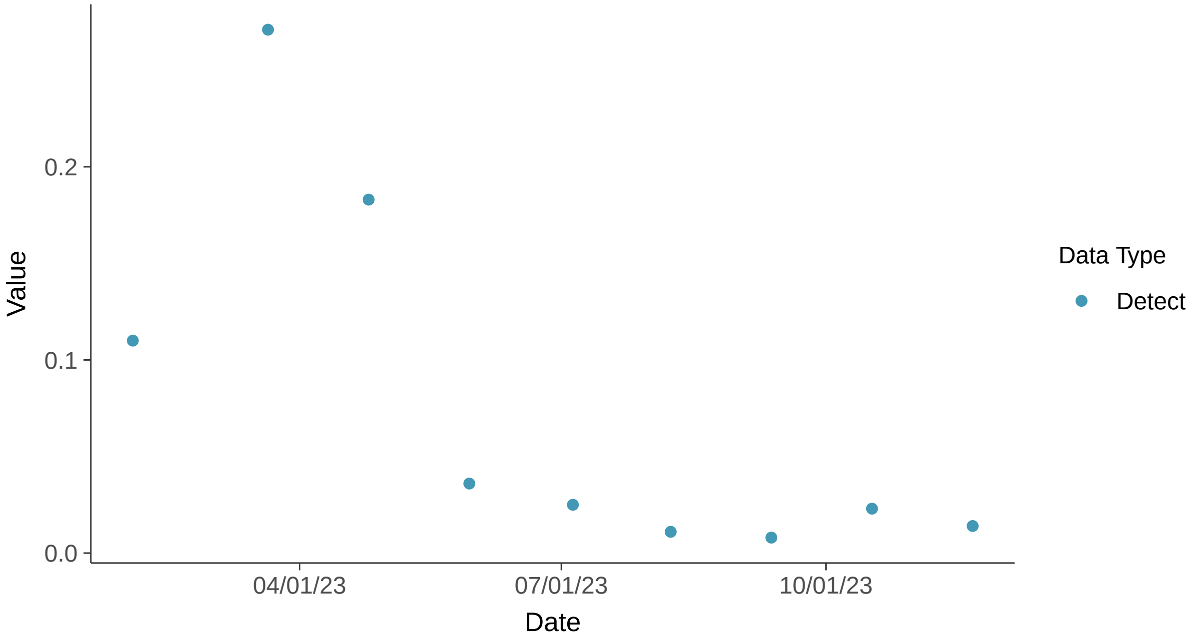


Part 115: Zinc, MW-16D

ID: 16D_5_42

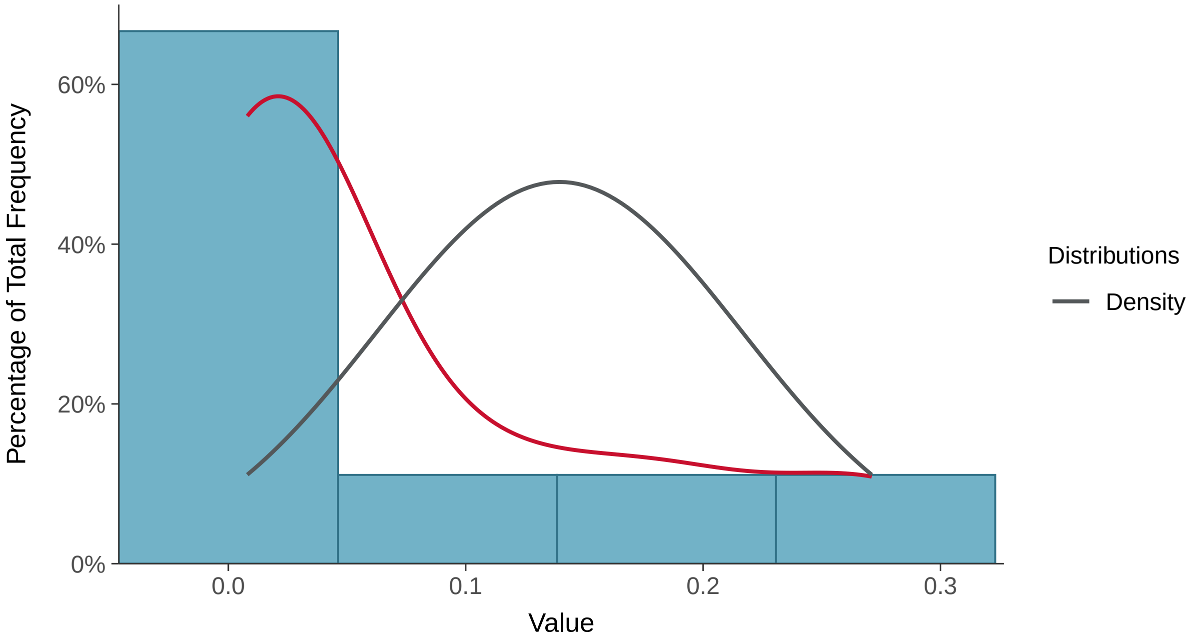
Scatter Plot

Zinc, MW-16D (mg/L)



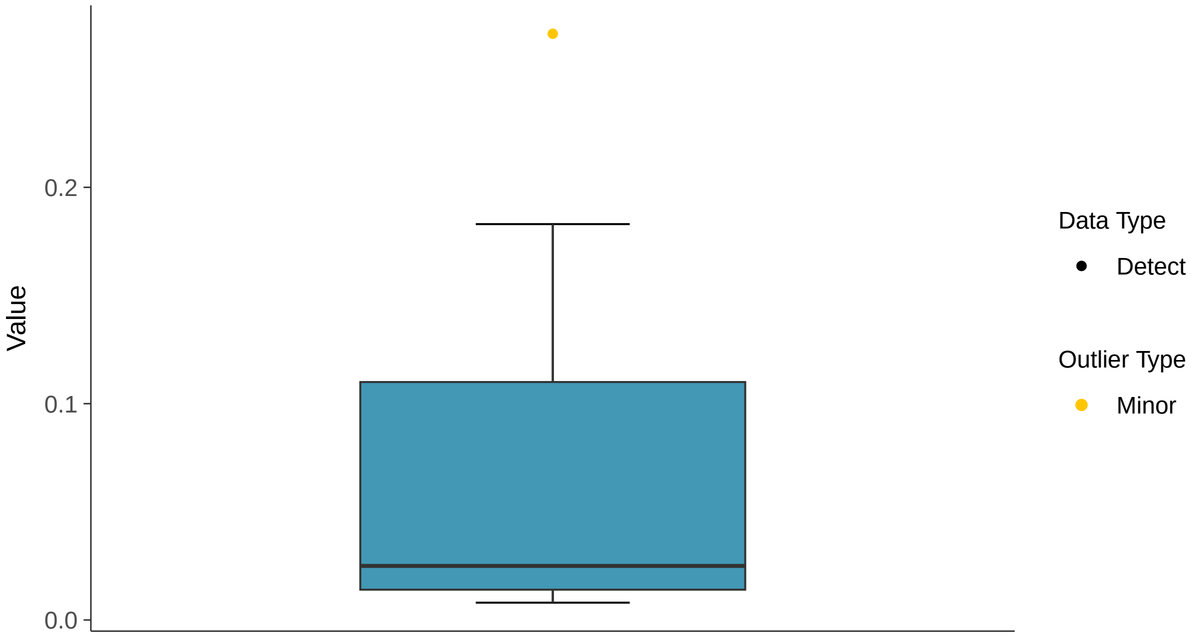
Histogram

Zinc, MW-16D (mg/L)



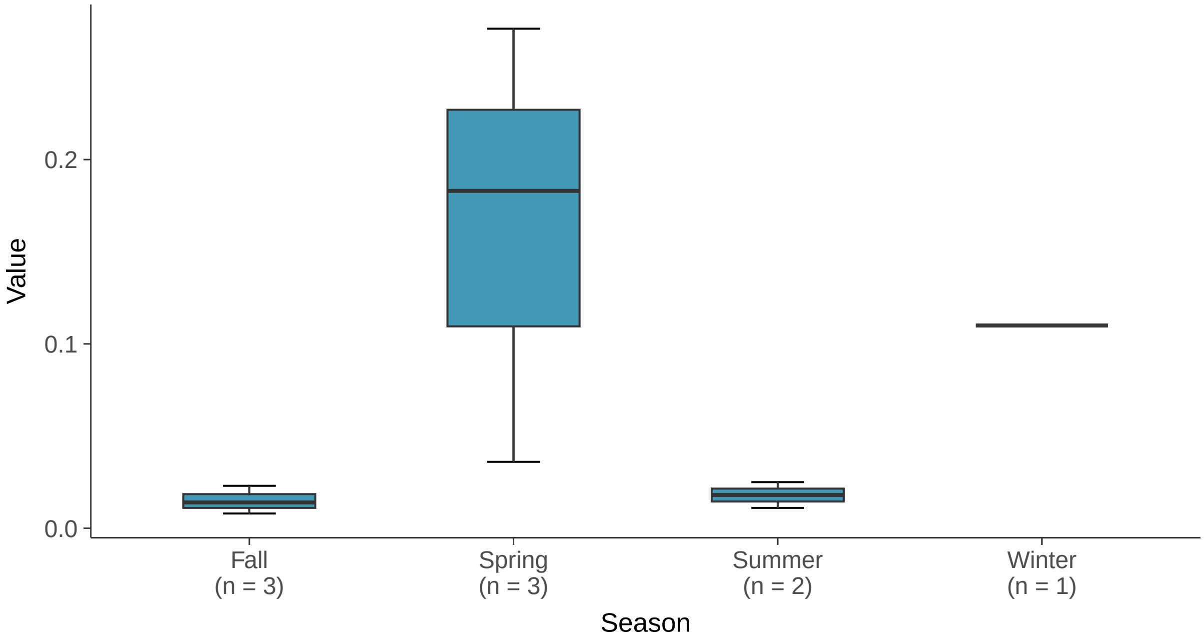
Boxplot

Zinc, MW-16D (mg/L)



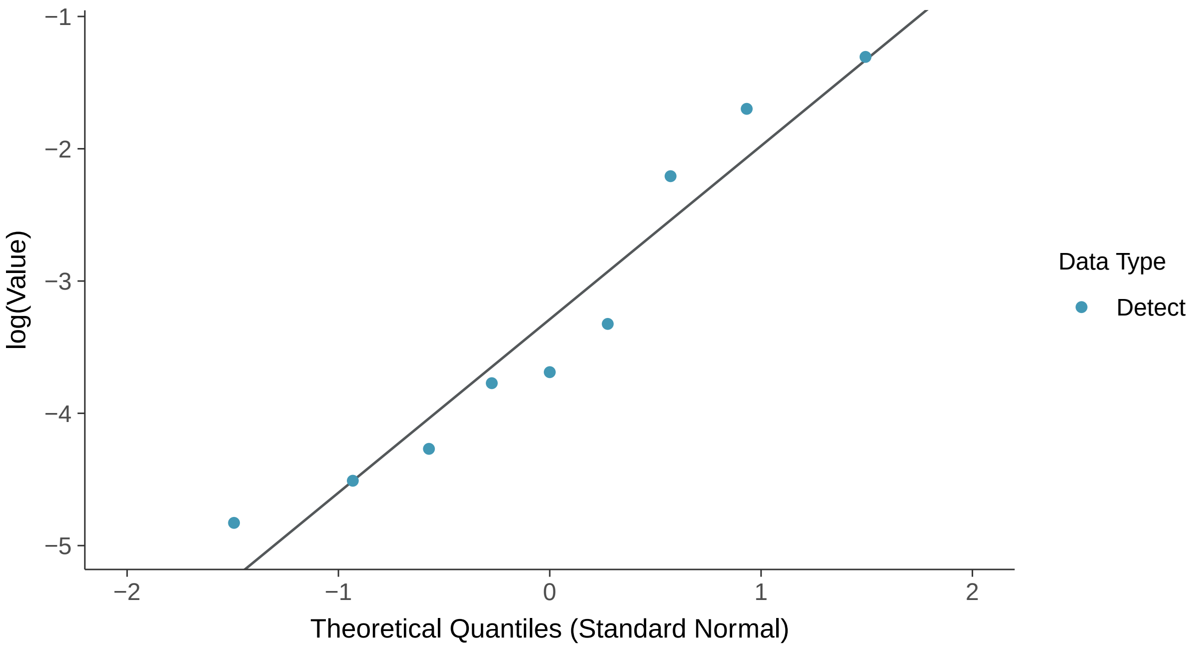
Boxplot by Season

Zinc, MW-16D (mg/L)



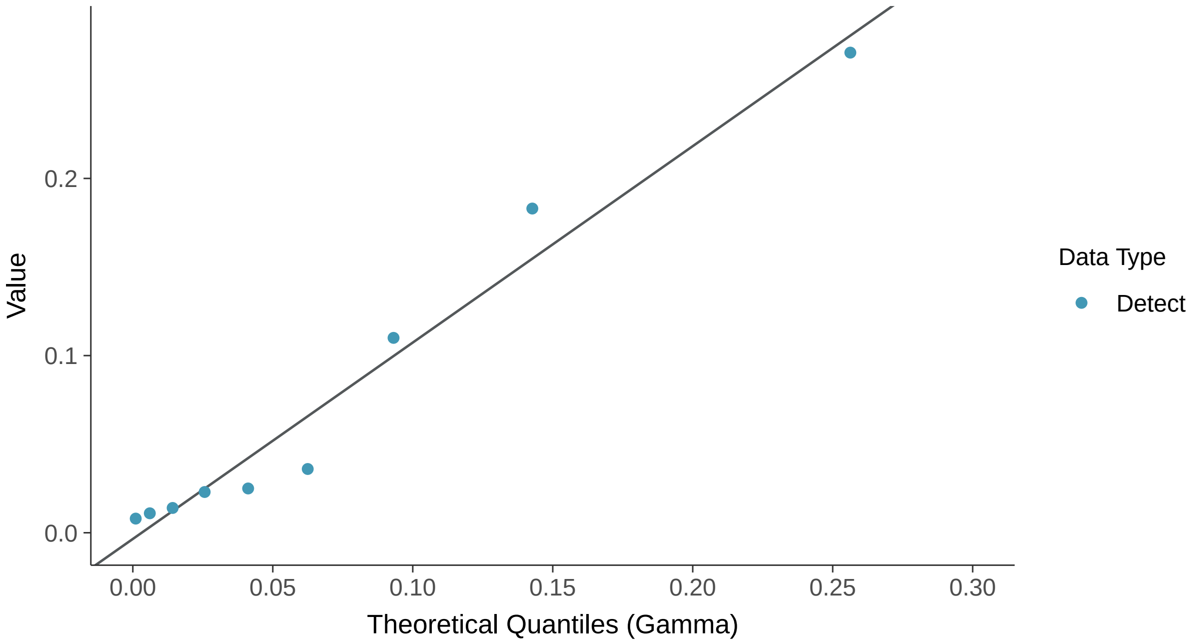
Lognormal Q-Q plot

Zinc, MW-16D (mg/L)



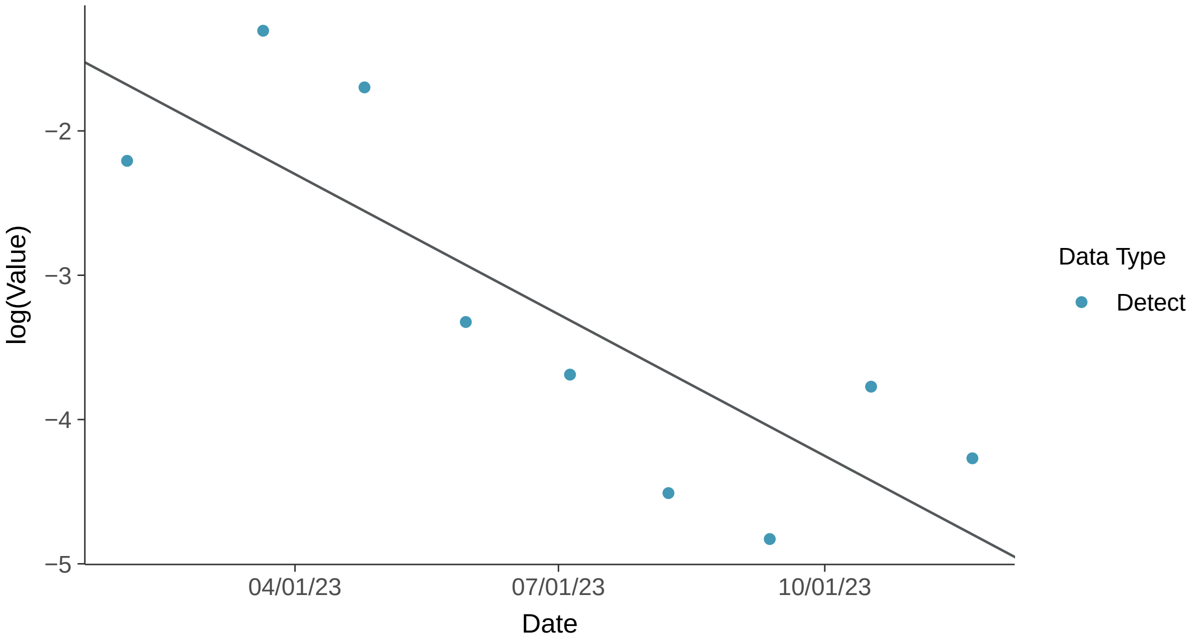
Gamma Q-Q plot

Zinc, MW-16D (mg/L)



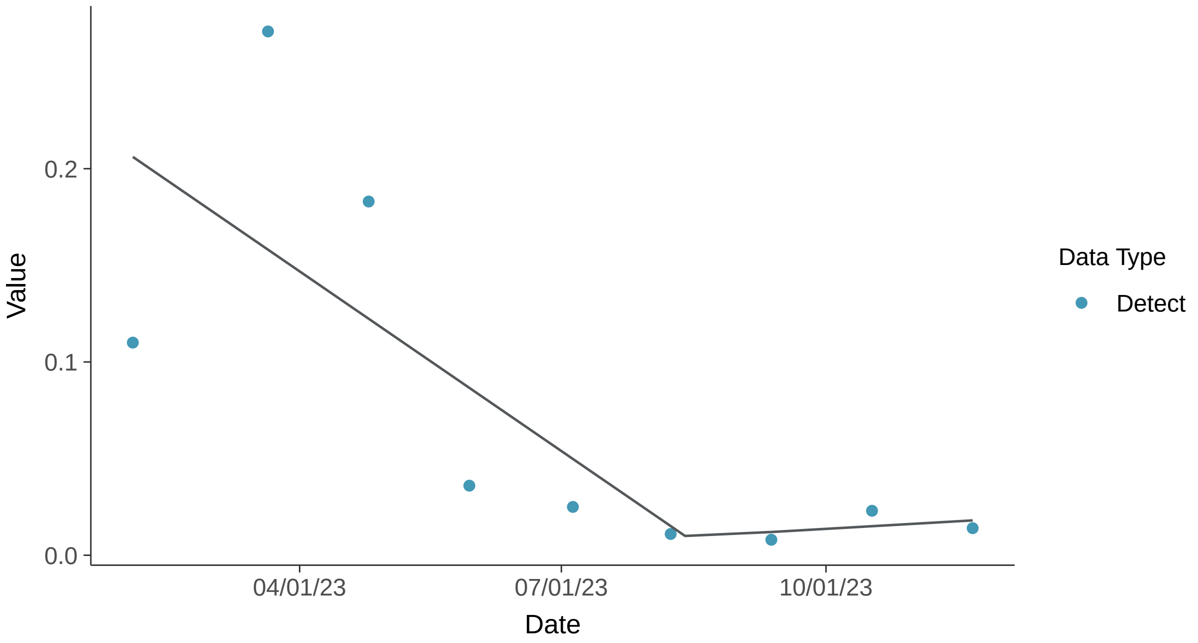
Trend Regression: Lognormal MLE

Zinc, MW-16D (mg/L)



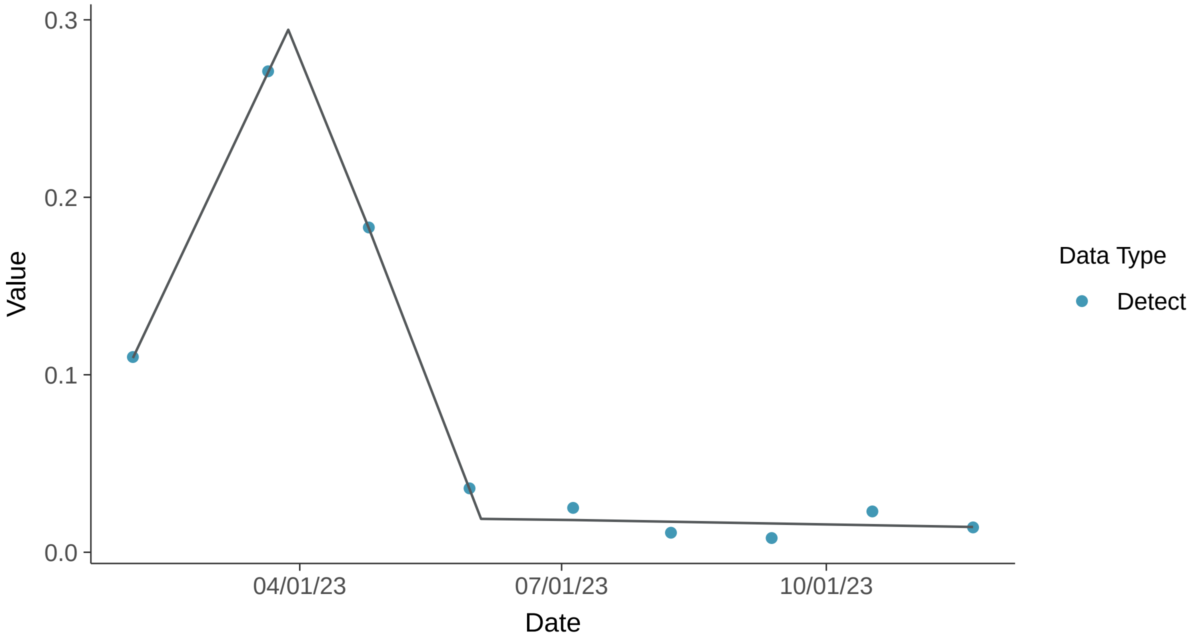
Trend Regression: Piecewise Linear-Linear

Zinc, MW-16D (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Zinc, MW-16D (mg/L)

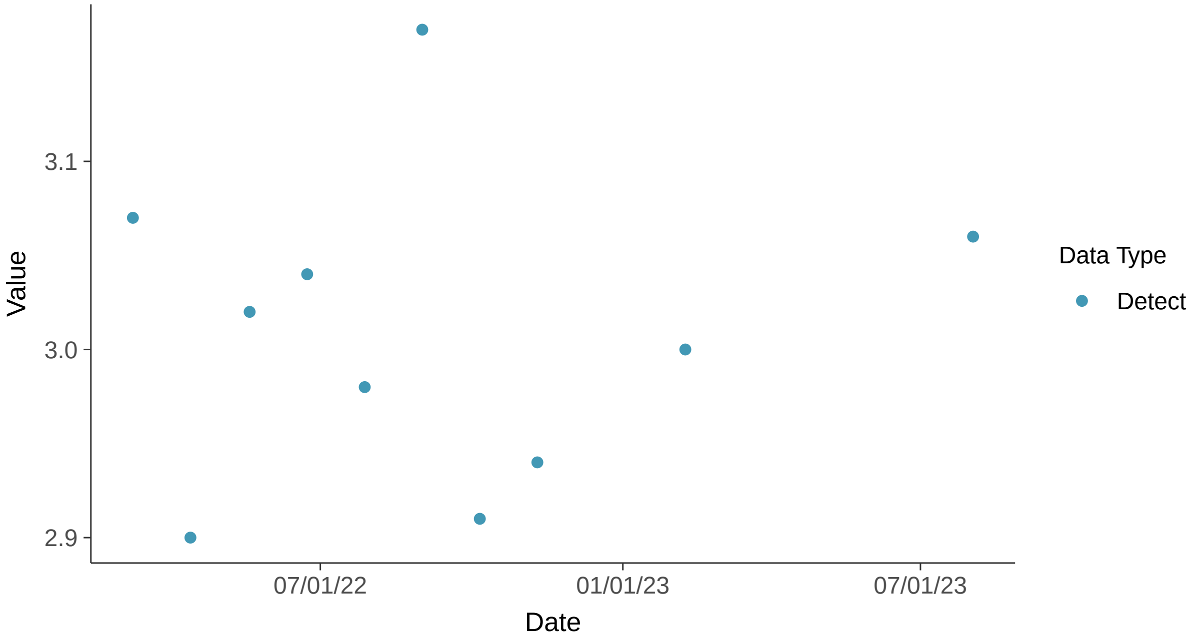


Appendix III: Boron, MW-7B

ID: 7B_1_01

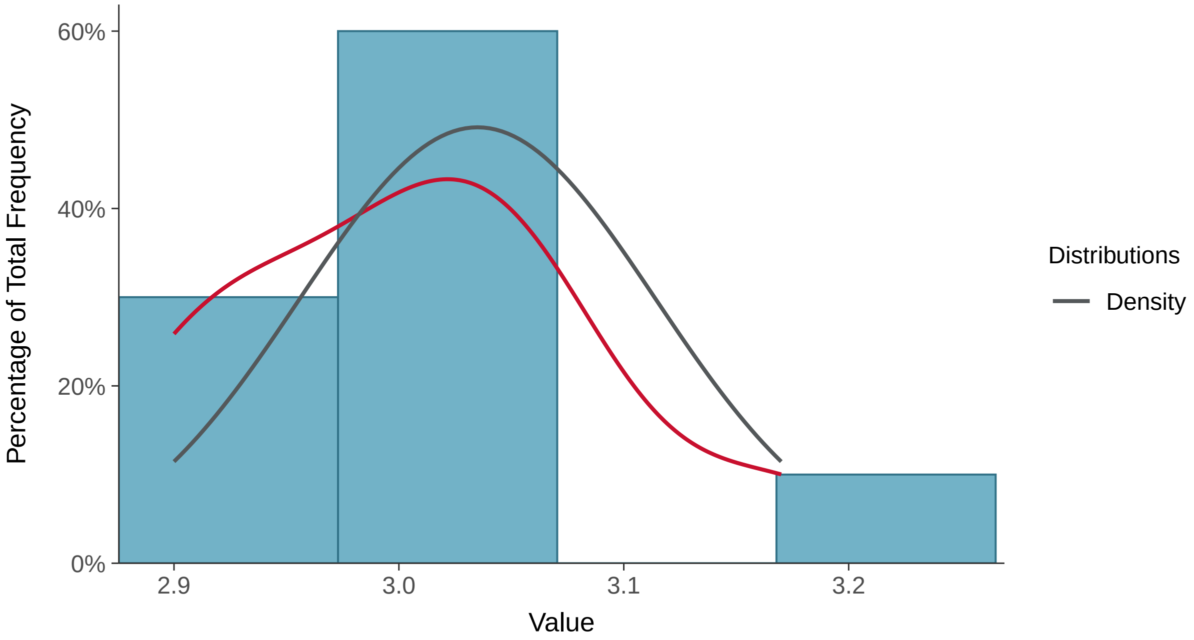
Scatter Plot

Boron, MW-7B (mg/L)



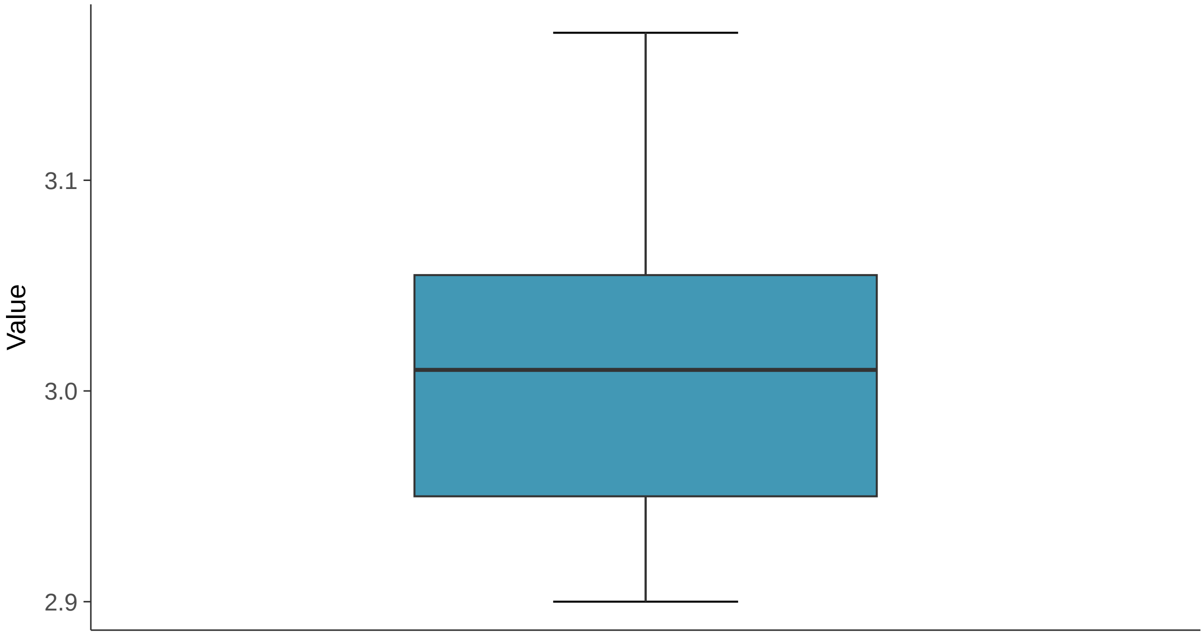
Histogram

Boron, MW-7B (mg/L)



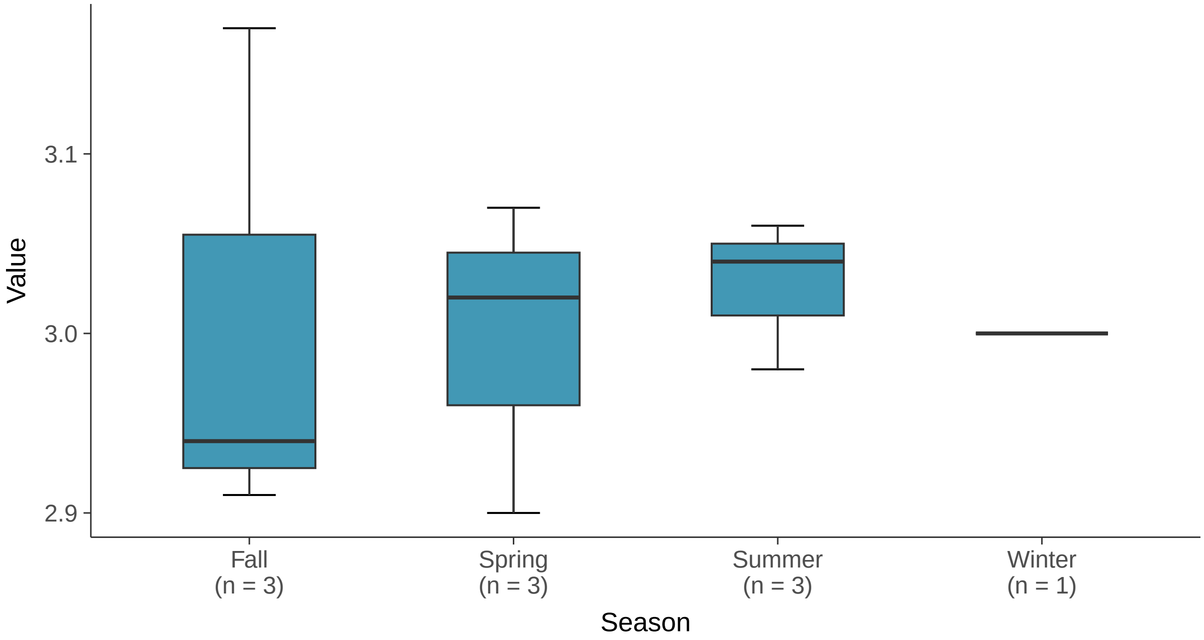
Boxplot

Boron, MW-7B (mg/L)



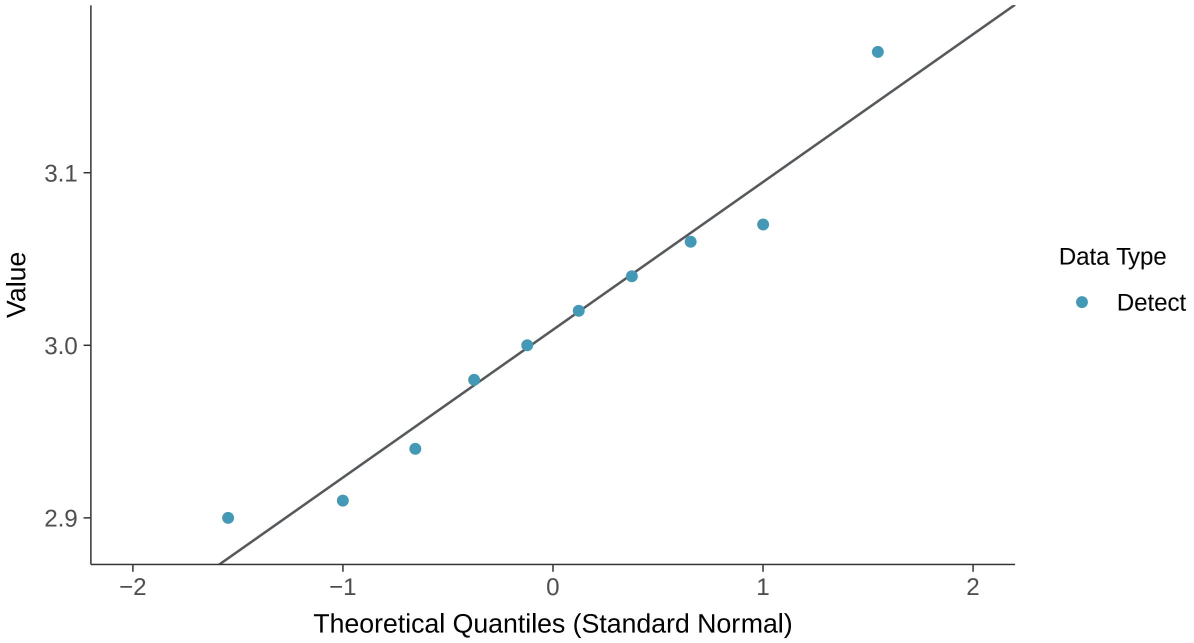
Boxplot by Season

Boron, MW-7B (mg/L)



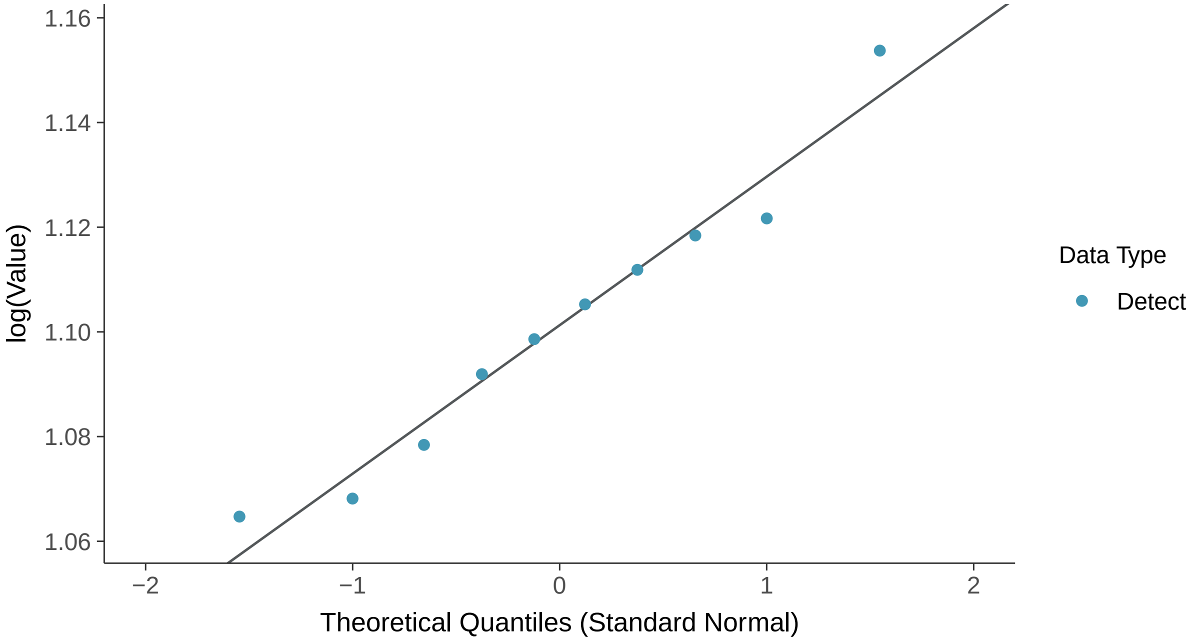
Normal Q-Q plot

Boron, MW-7B (mg/L)



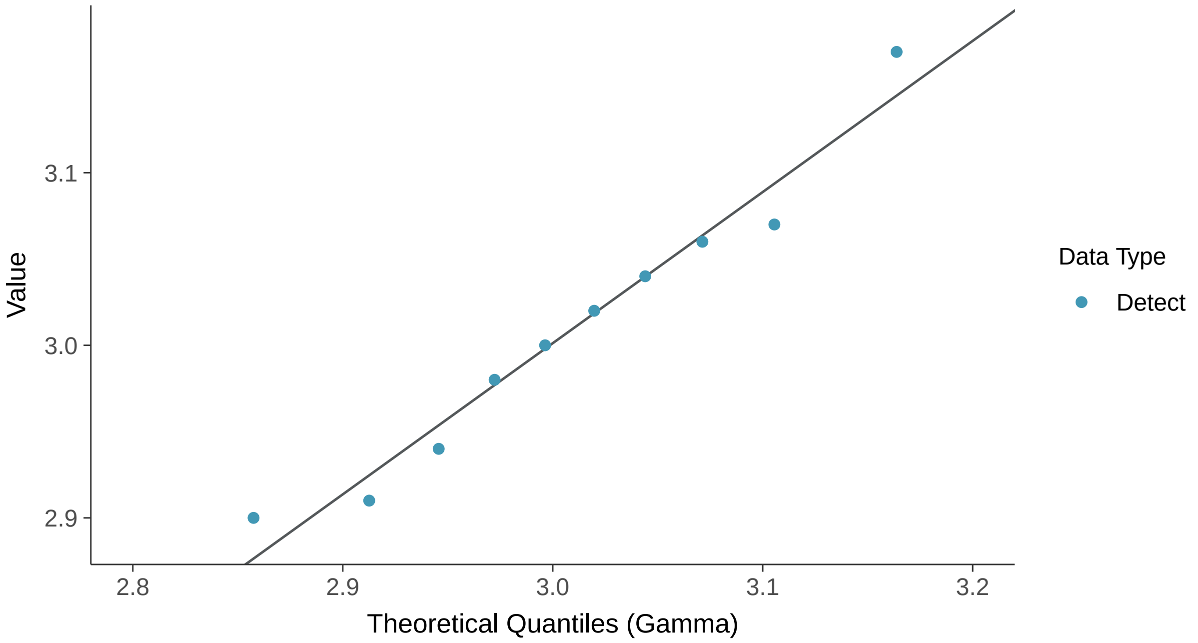
Lognormal Q-Q plot

Boron, MW-7B (mg/L)



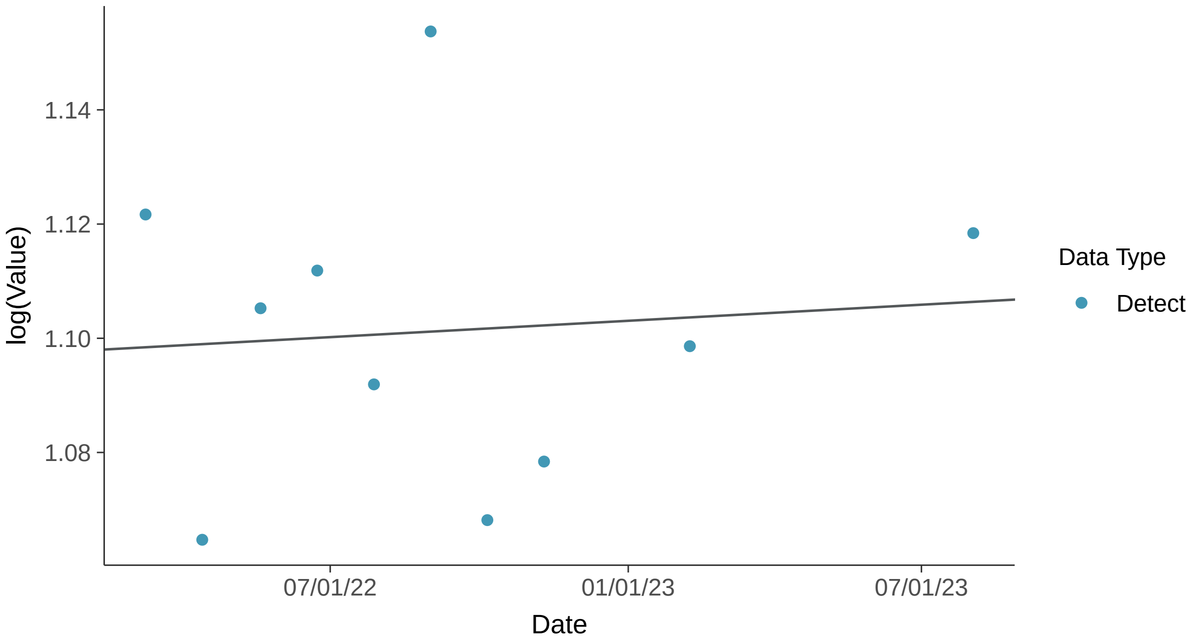
Gamma Q-Q plot

Boron, MW-7B (mg/L)



Trend Regression: Lognormal MLE

Boron, MW-7B (mg/L)

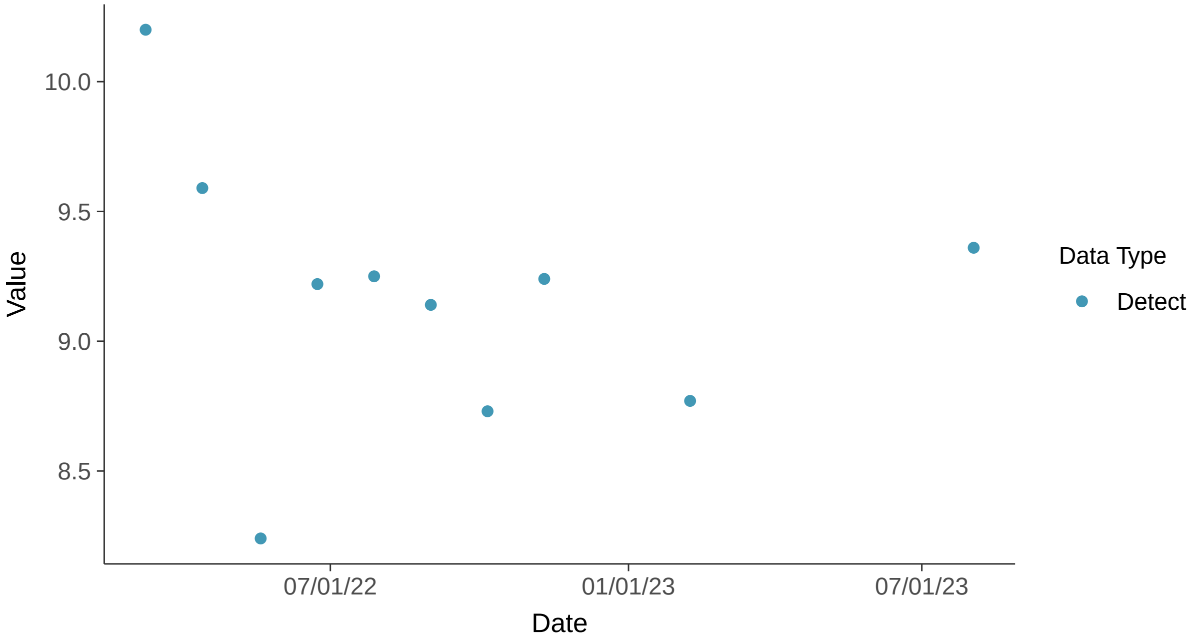


Appendix III: Calcium, MW-7B

ID: 7B_1_02

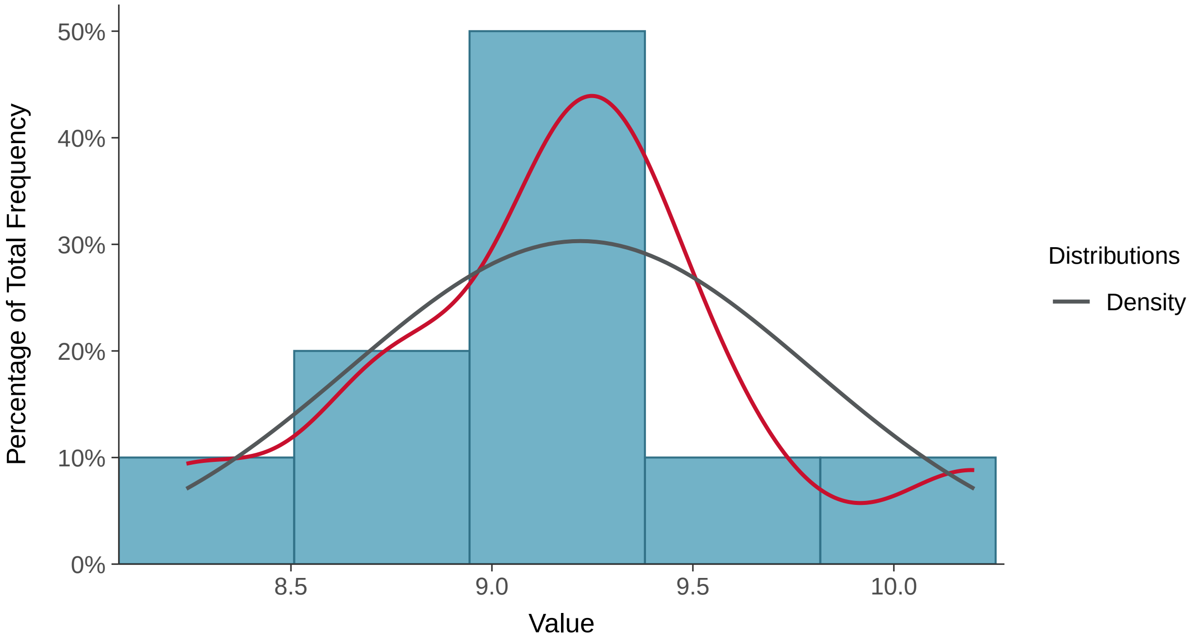
Scatter Plot

Calcium, MW-7B (mg/L)



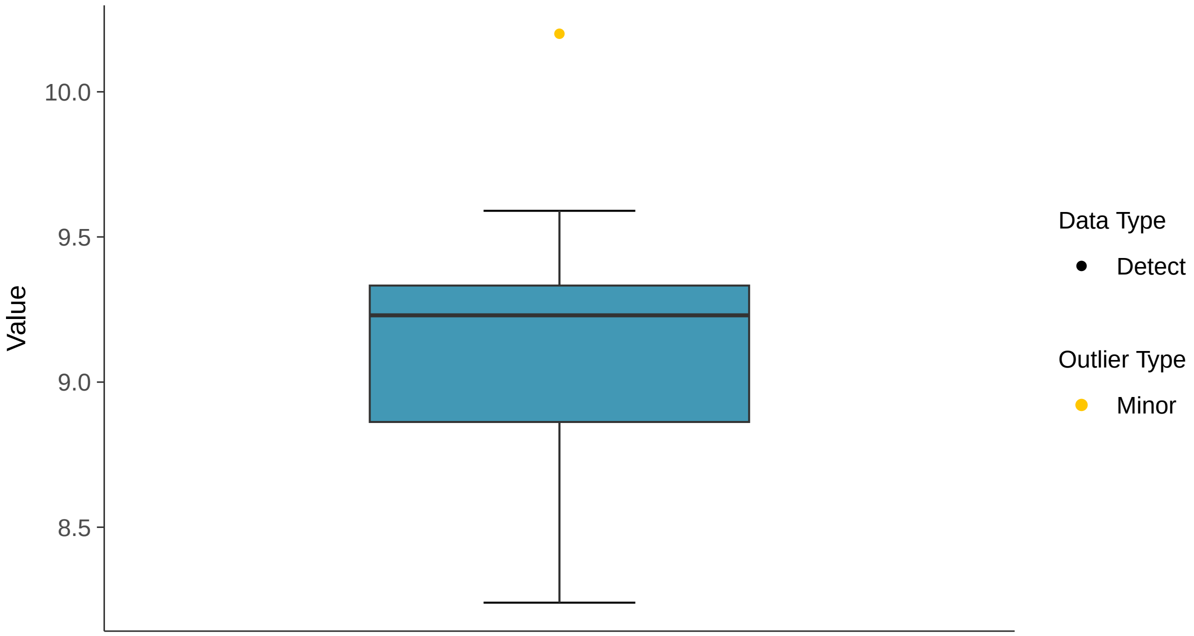
Histogram

Calcium, MW-7B (mg/L)



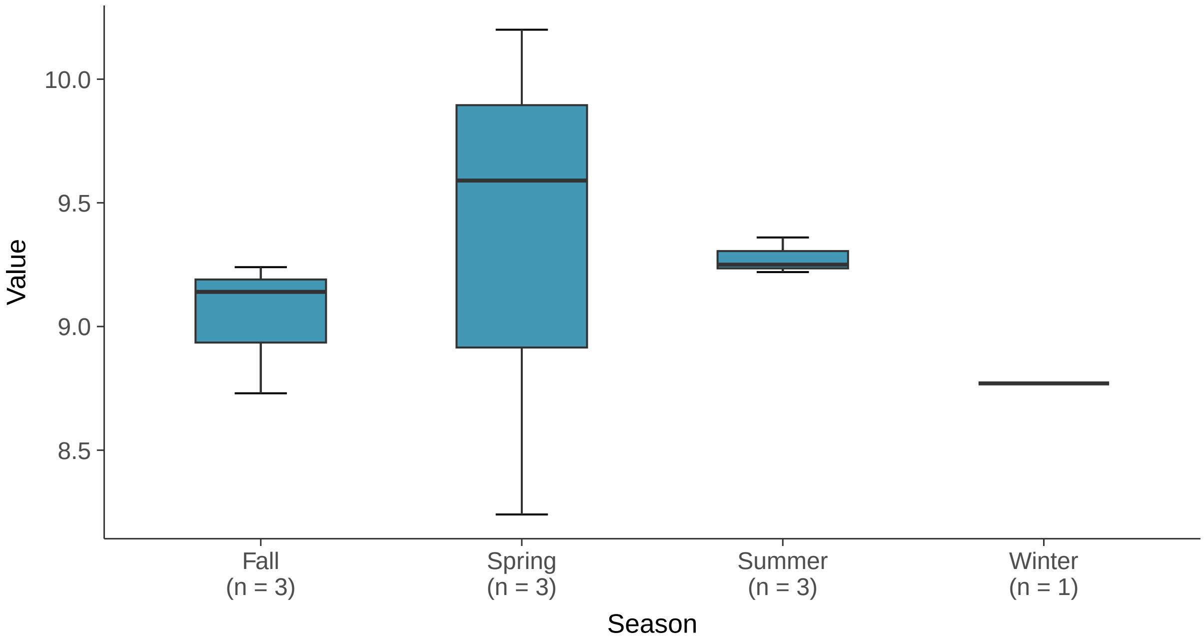
Boxplot

Calcium, MW-7B (mg/L)



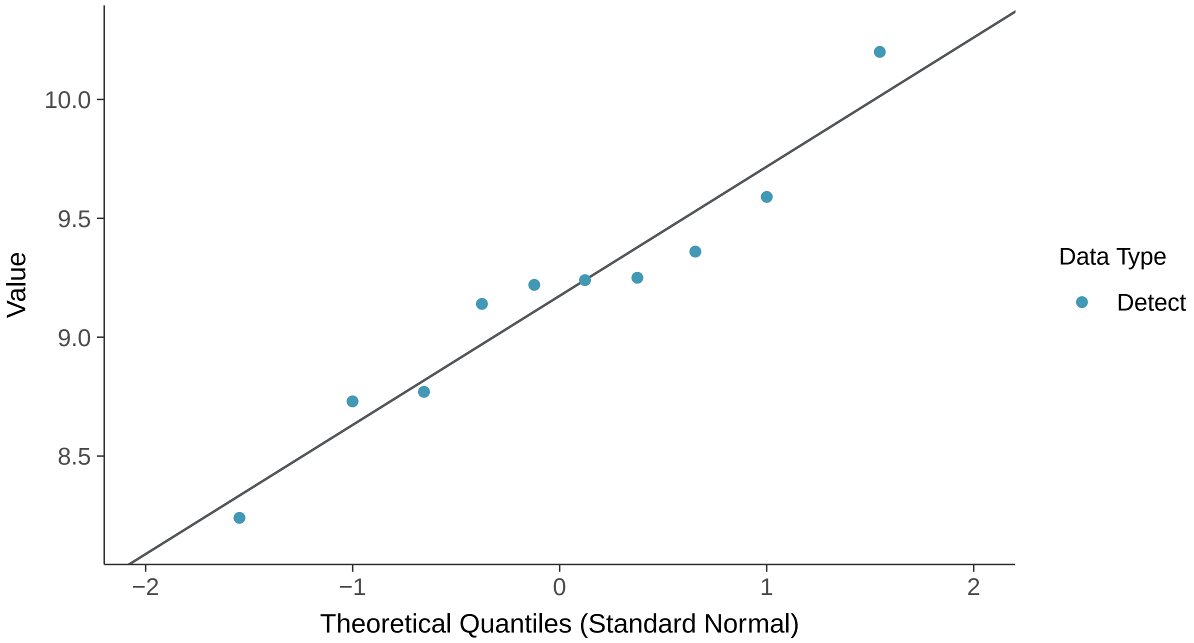
Boxplot by Season

Calcium, MW-7B (mg/L)



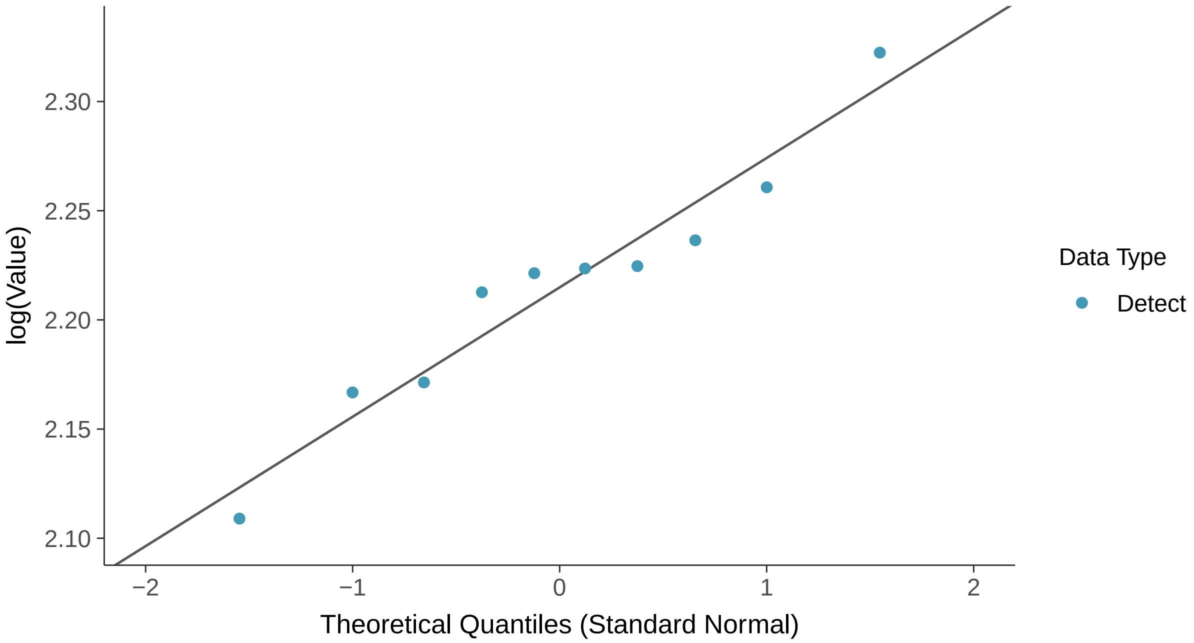
Normal Q-Q plot

Calcium, MW-7B (mg/L)



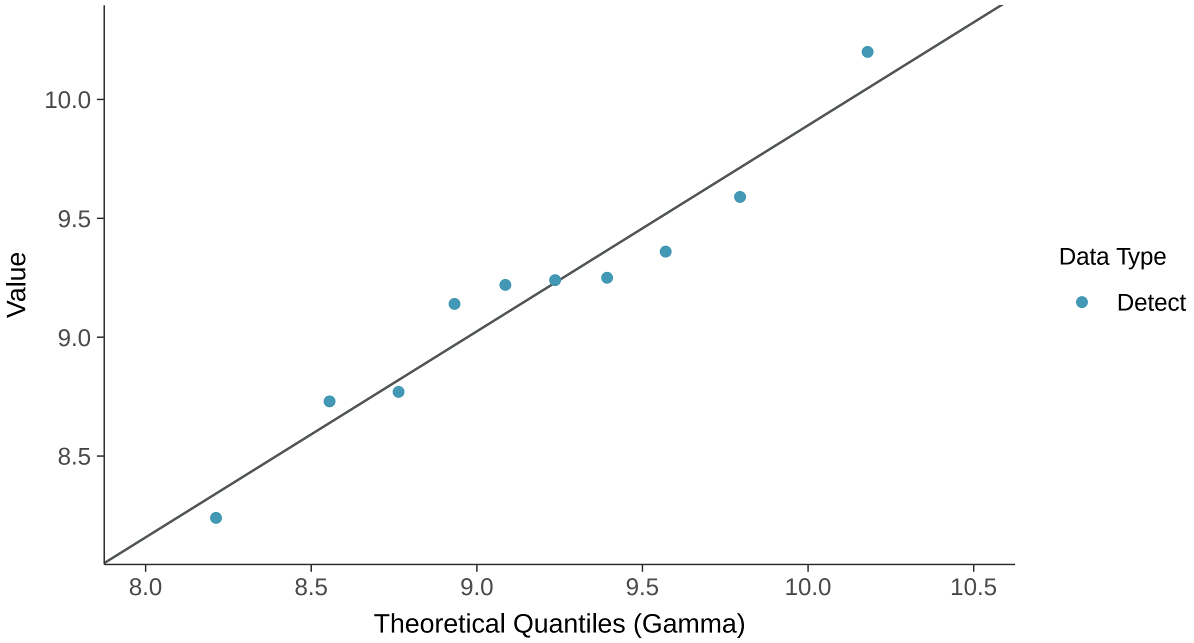
Lognormal Q-Q plot

Calcium, MW-7B (mg/L)



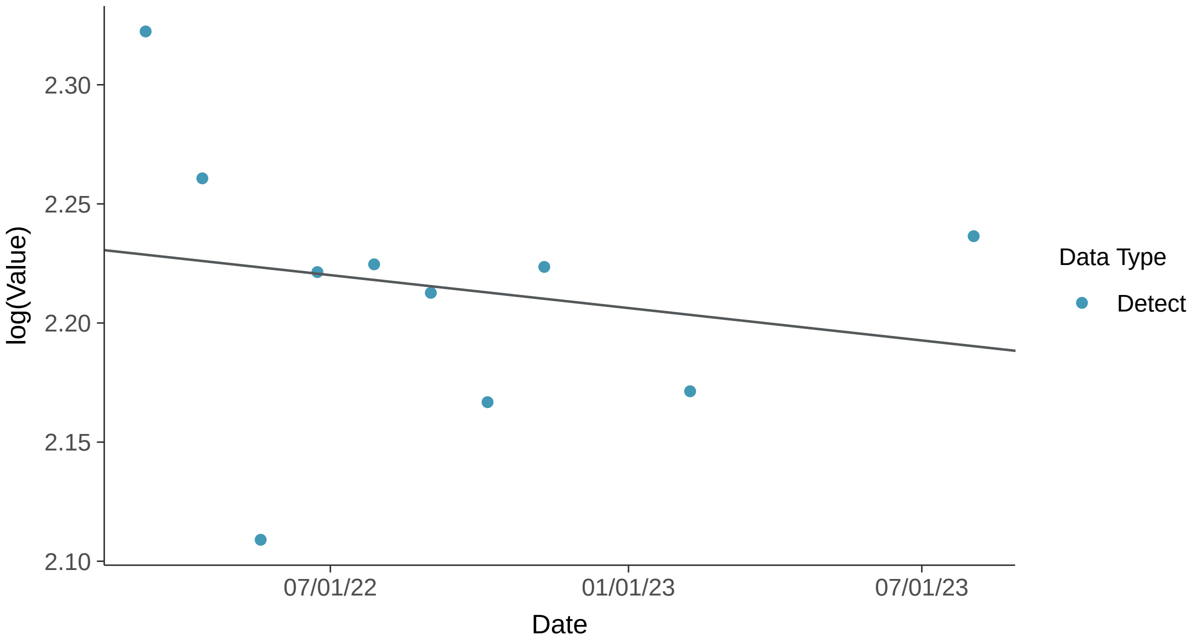
Gamma Q-Q plot

Calcium, MW-7B (mg/L)



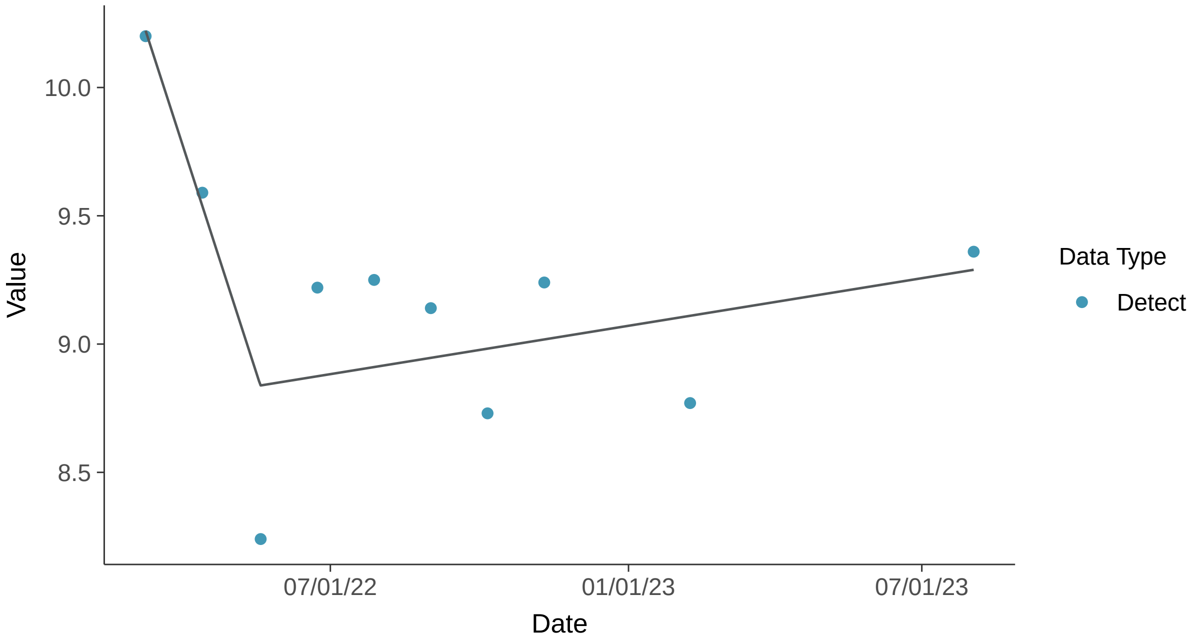
Trend Regression: Lognormal MLE

Calcium, MW-7B (mg/L)



Trend Regression: Piecewise Linear-Linear

Calcium, MW-7B (mg/L)

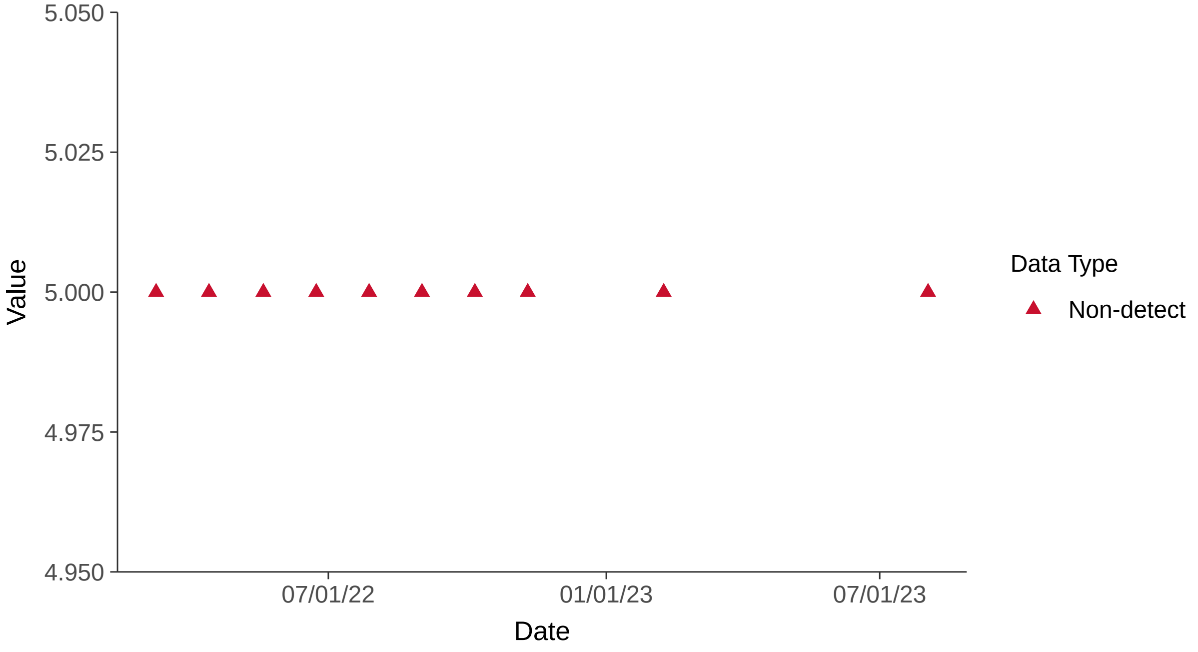


Appendix III: Chloride, MW-7B

ID: 7B_1_03

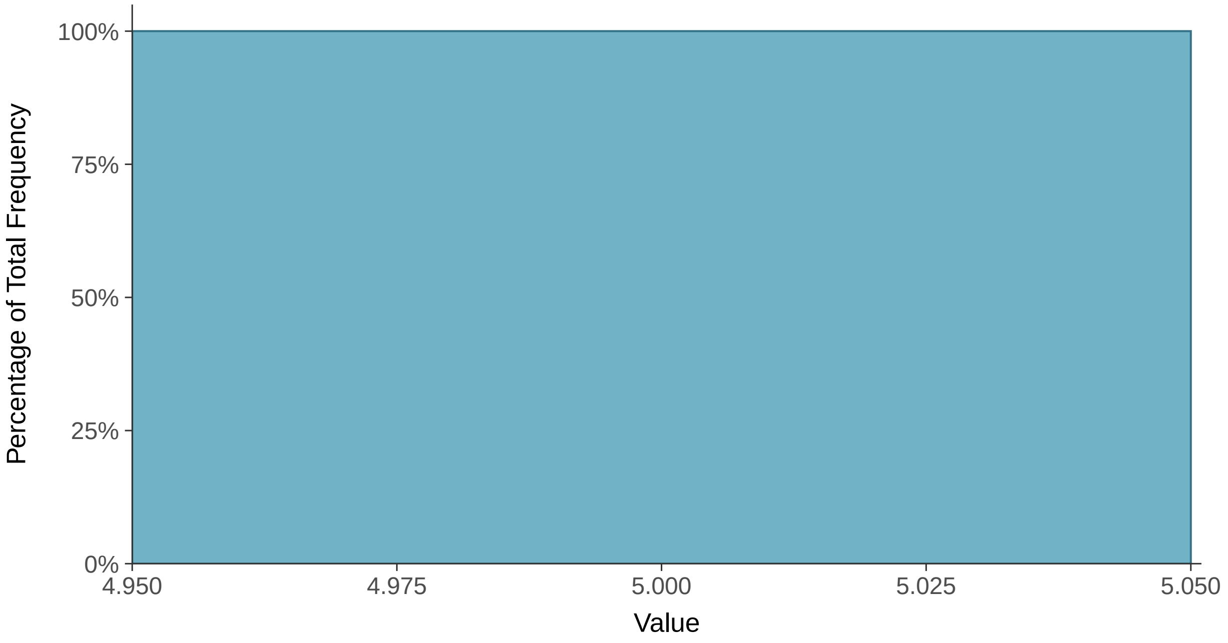
Scatter Plot

Chloride, MW-7B (mg/L)



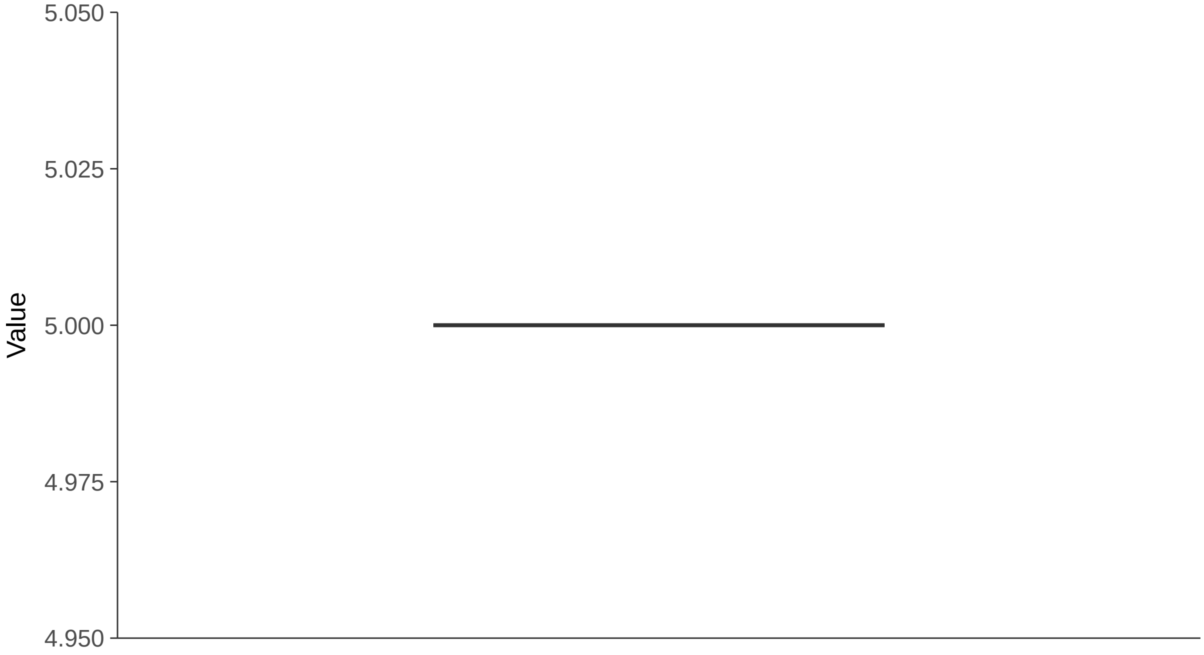
Histogram

Chloride, MW-7B (mg/L)



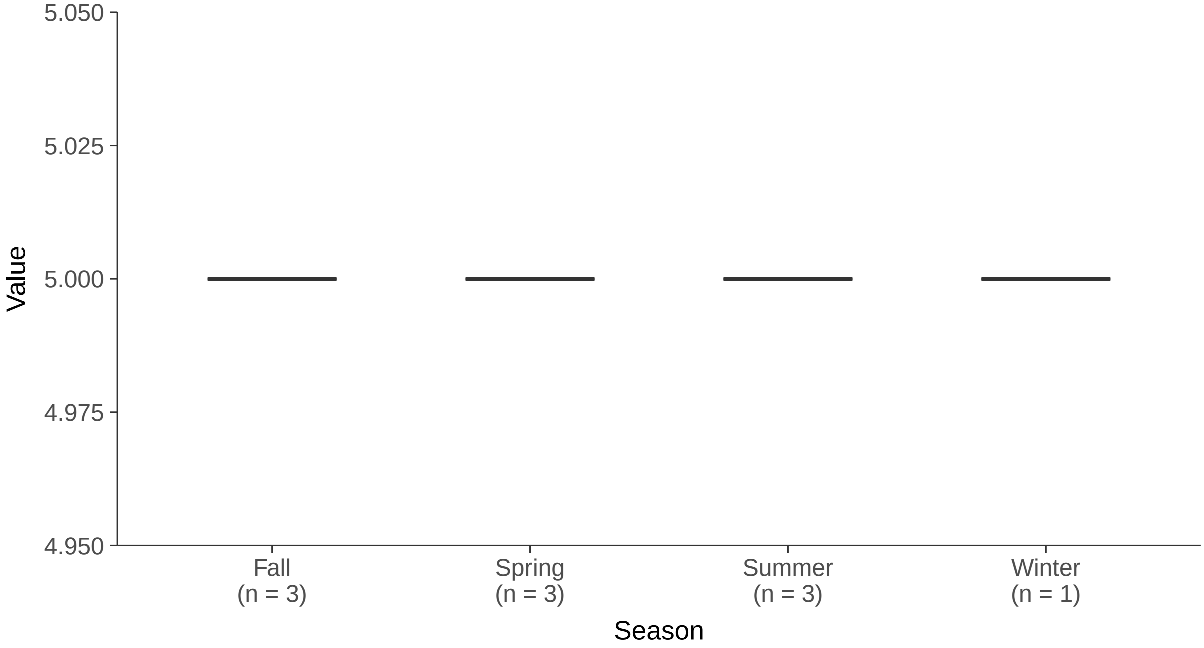
Boxplot

Chloride, MW-7B (mg/L)



Boxplot by Season

Chloride, MW-7B (mg/L)

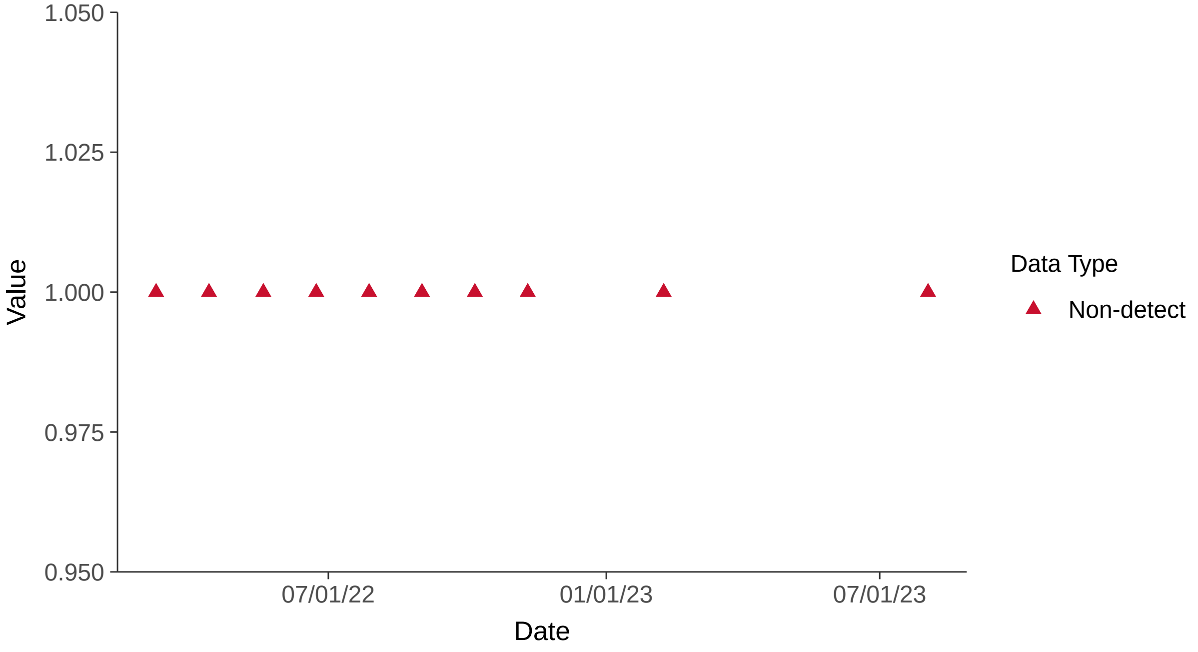


Appendix III: Fluoride, MW-7B

ID: 7B_1_04

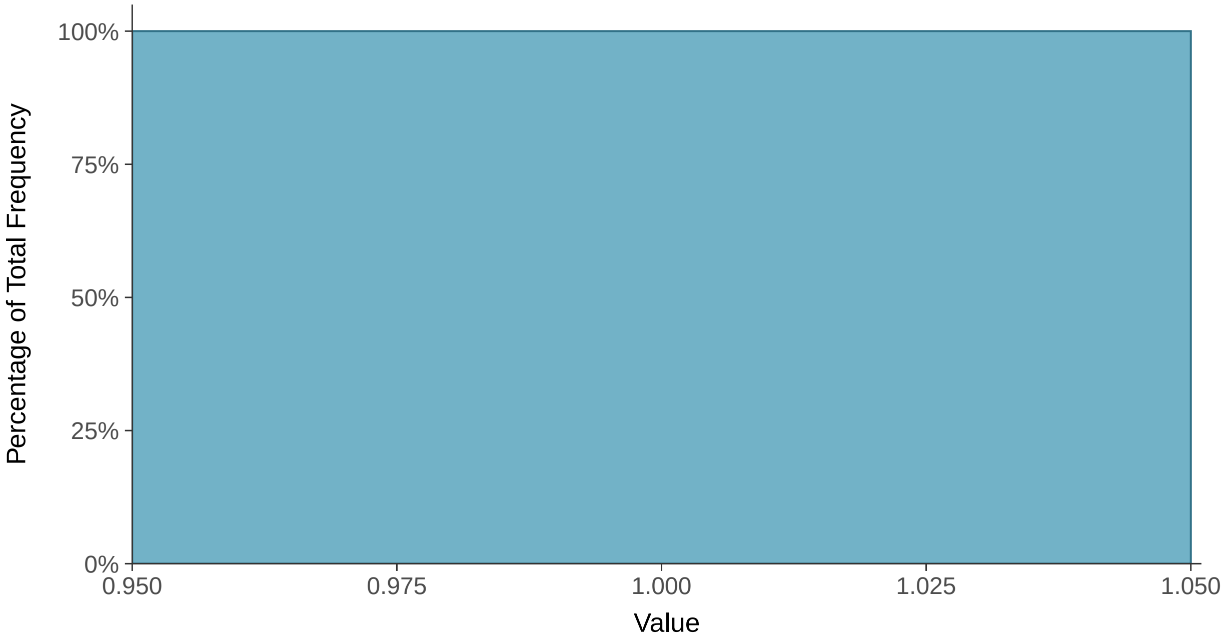
Scatter Plot

Fluoride, MW-7B (mg/L)



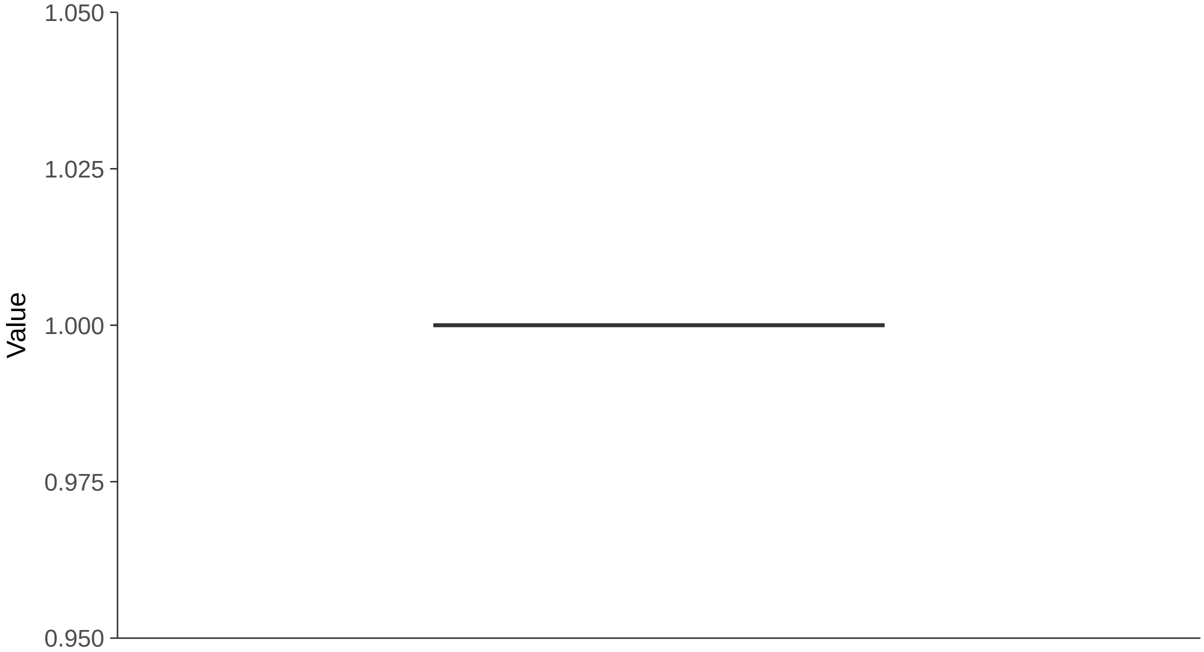
Histogram

Fluoride, MW-7B (mg/L)



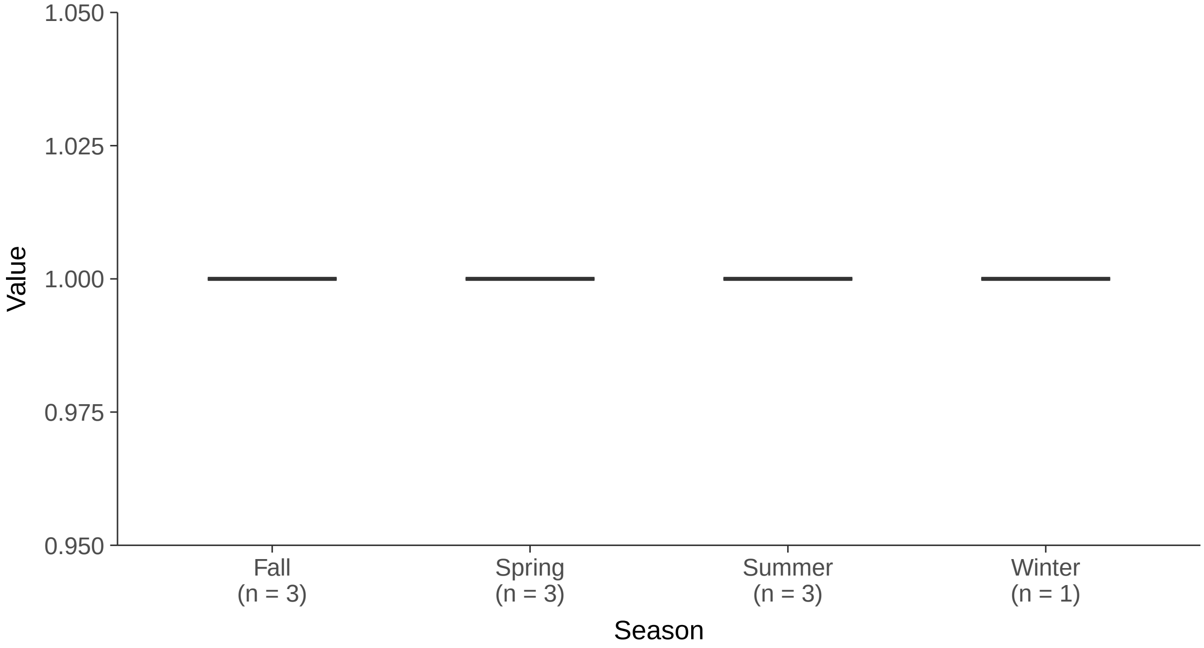
Boxplot

Fluoride, MW-7B (mg/L)



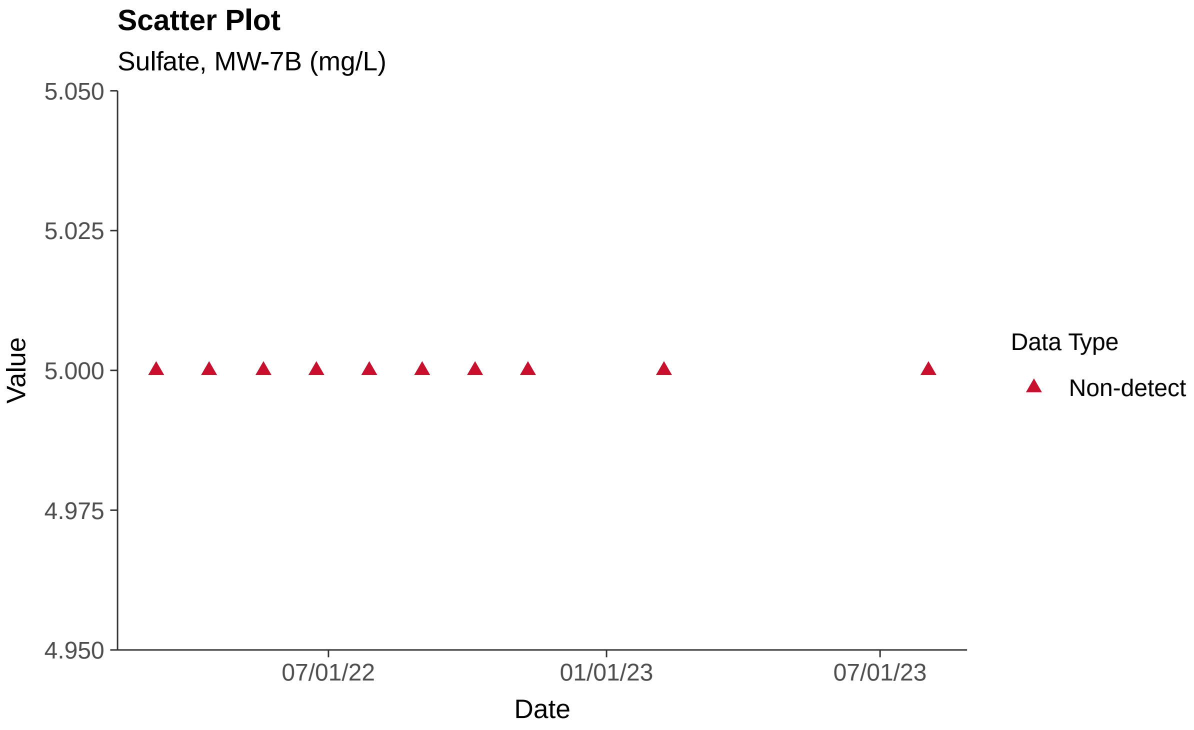
Boxplot by Season

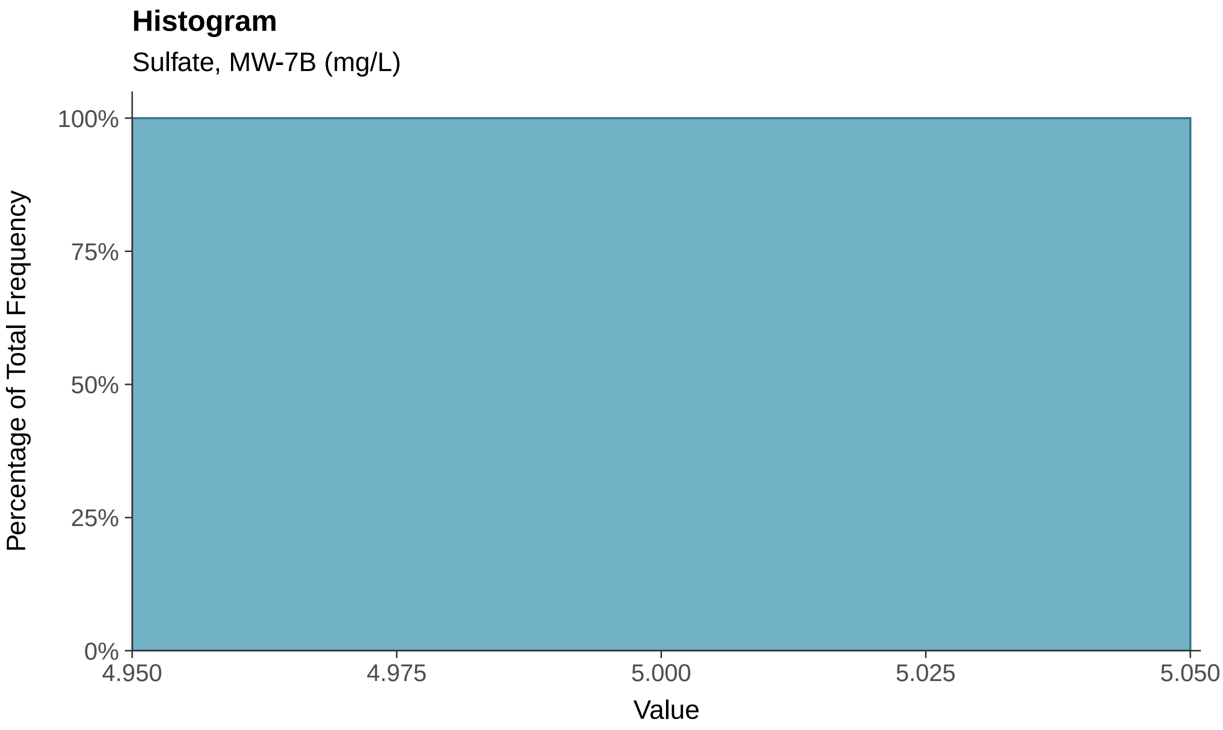
Fluoride, MW-7B (mg/L)



Appendix III: Sulfate, MW-7B

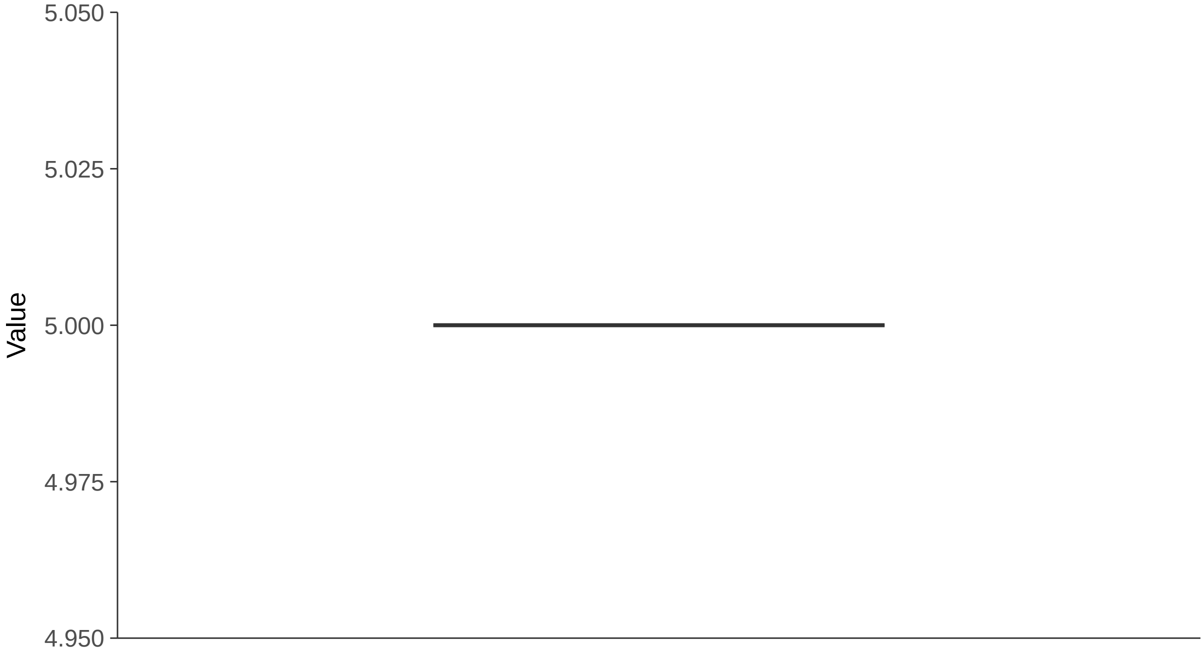
ID: 7B_1_05





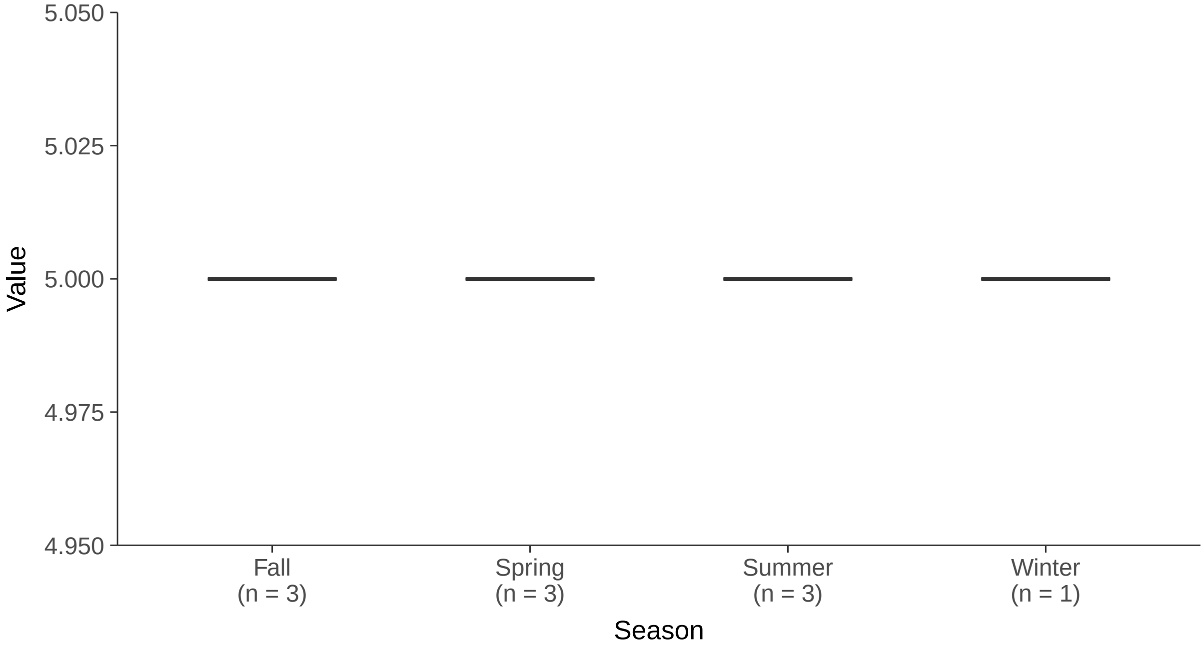
Boxplot

Sulfate, MW-7B (mg/L)



Boxplot by Season

Sulfate, MW-7B (mg/L)

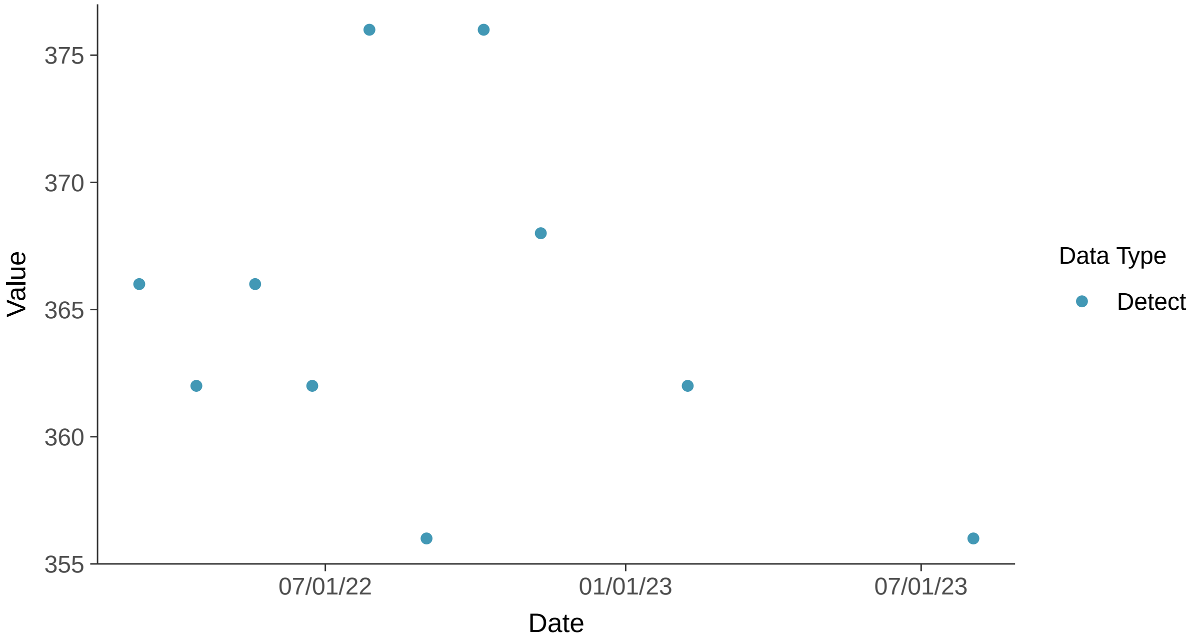


Appendix III: Total Dissolved Solids, MW-7B

ID: 7B_1_06

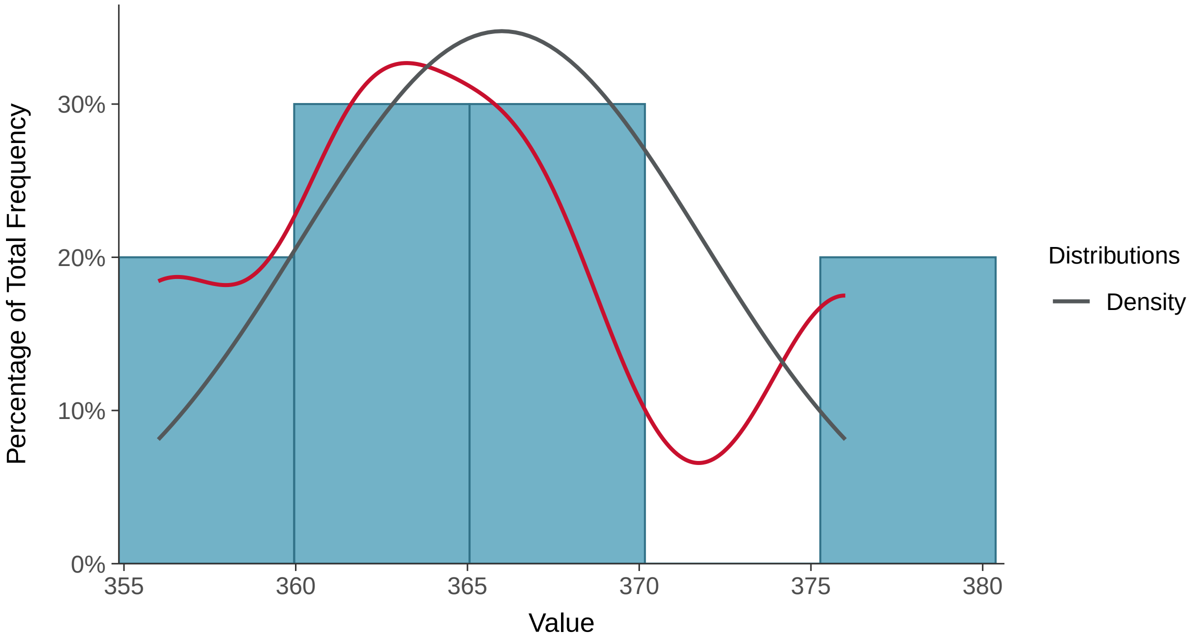
Scatter Plot

Total Dissolved Solids, MW-7B (mg/L)



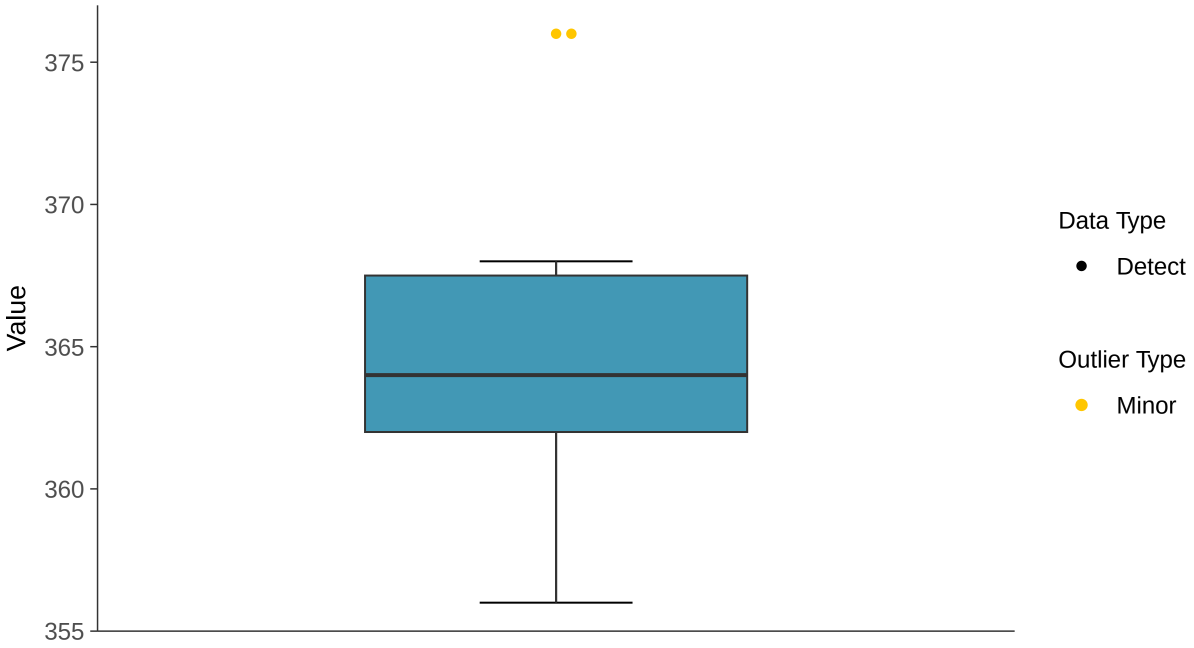
Histogram

Total Dissolved Solids, MW-7B (mg/L)



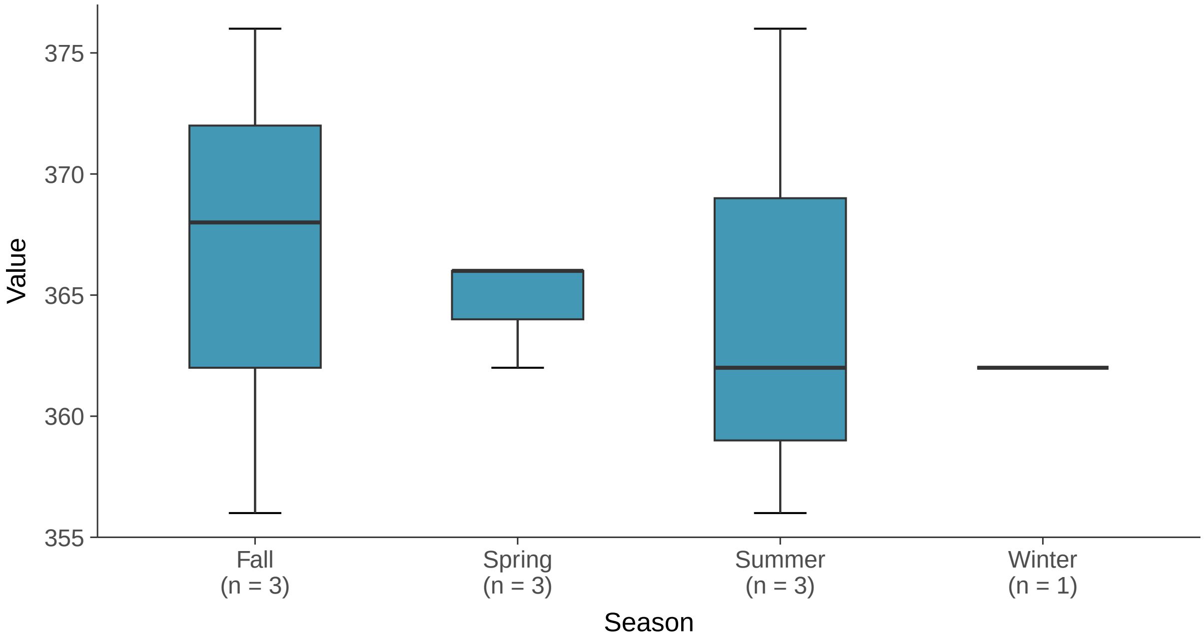
Boxplot

Total Dissolved Solids, MW-7B (mg/L)



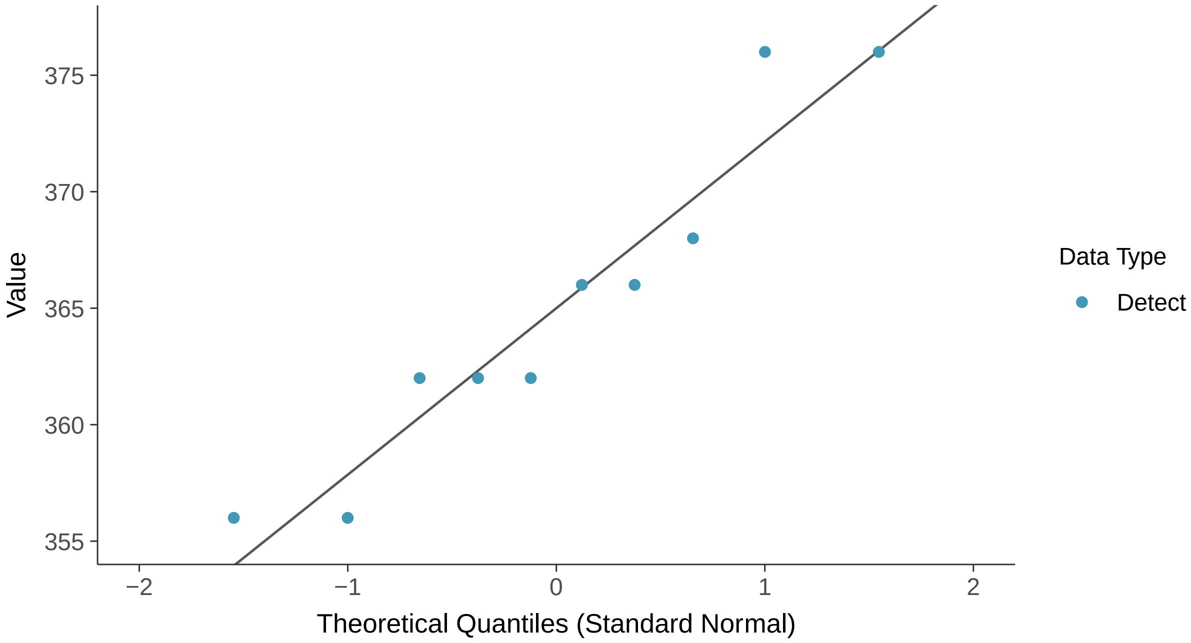
Boxplot by Season

Total Dissolved Solids, MW-7B (mg/L)



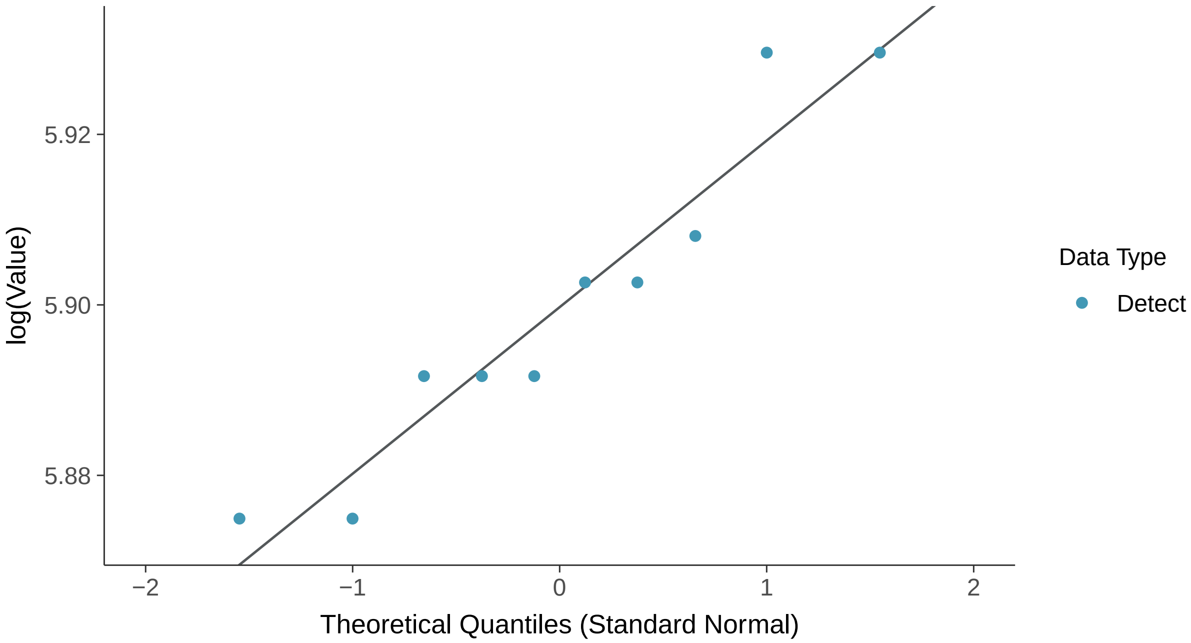
Normal Q-Q plot

Total Dissolved Solids, MW-7B (mg/L)



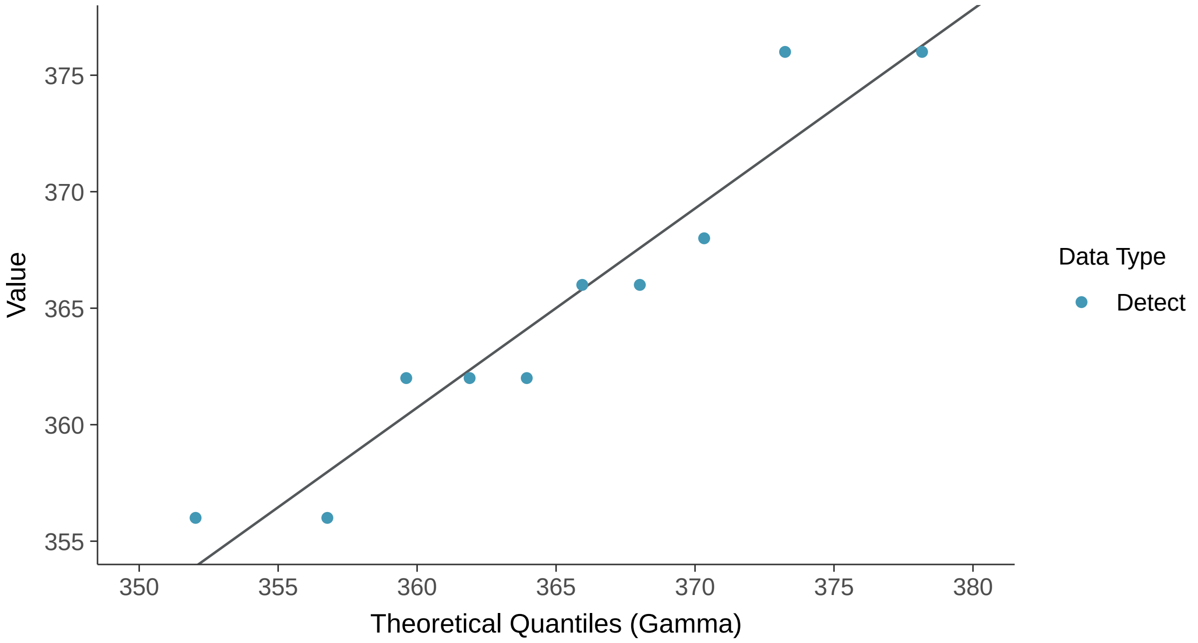
Lognormal Q-Q plot

Total Dissolved Solids, MW-7B (mg/L)



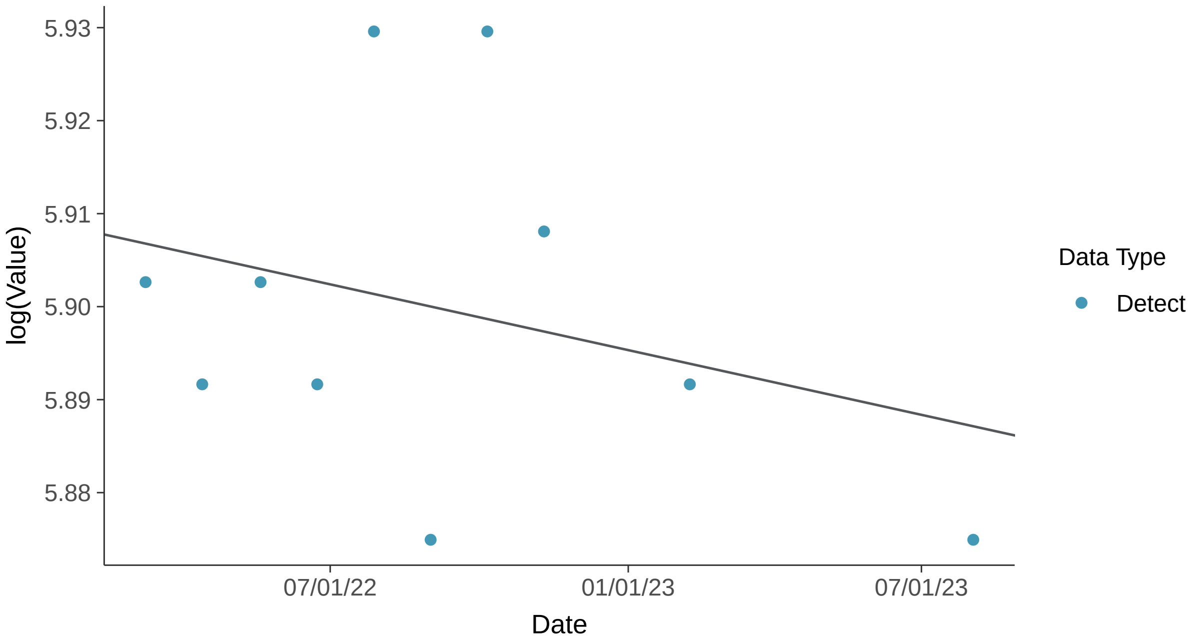
Gamma Q-Q plot

Total Dissolved Solids, MW-7B (mg/L)



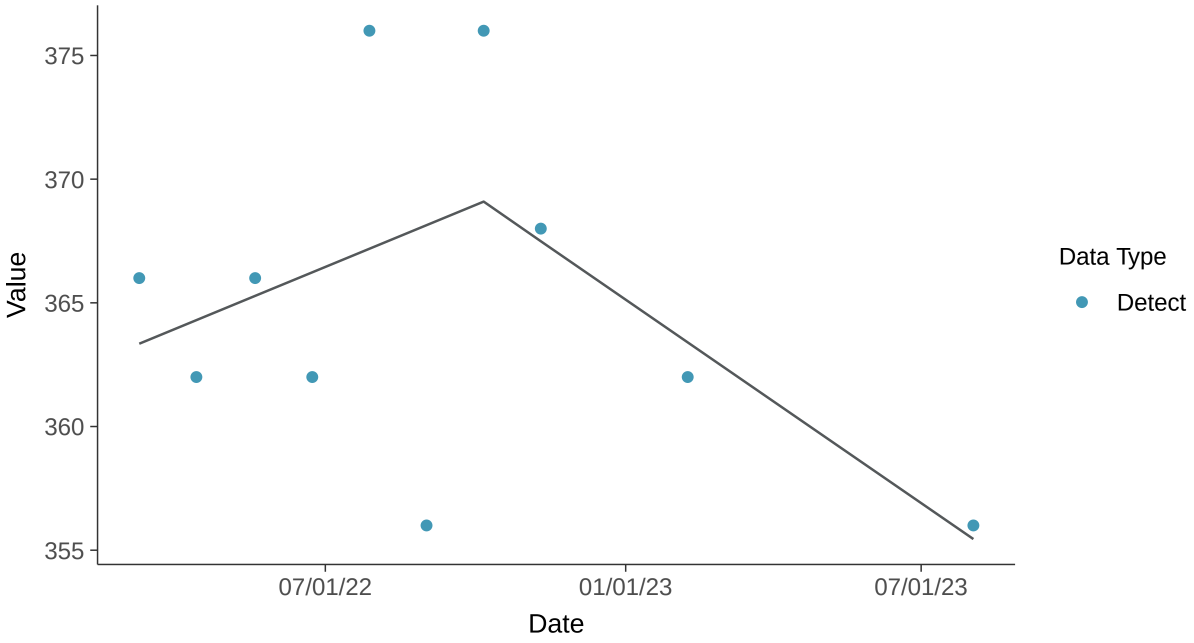
Trend Regression: Lognormal MLE

Total Dissolved Solids, MW-7B (mg/L)



Trend Regression: Piecewise Linear-Linear

Total Dissolved Solids, MW-7B (mg/L)

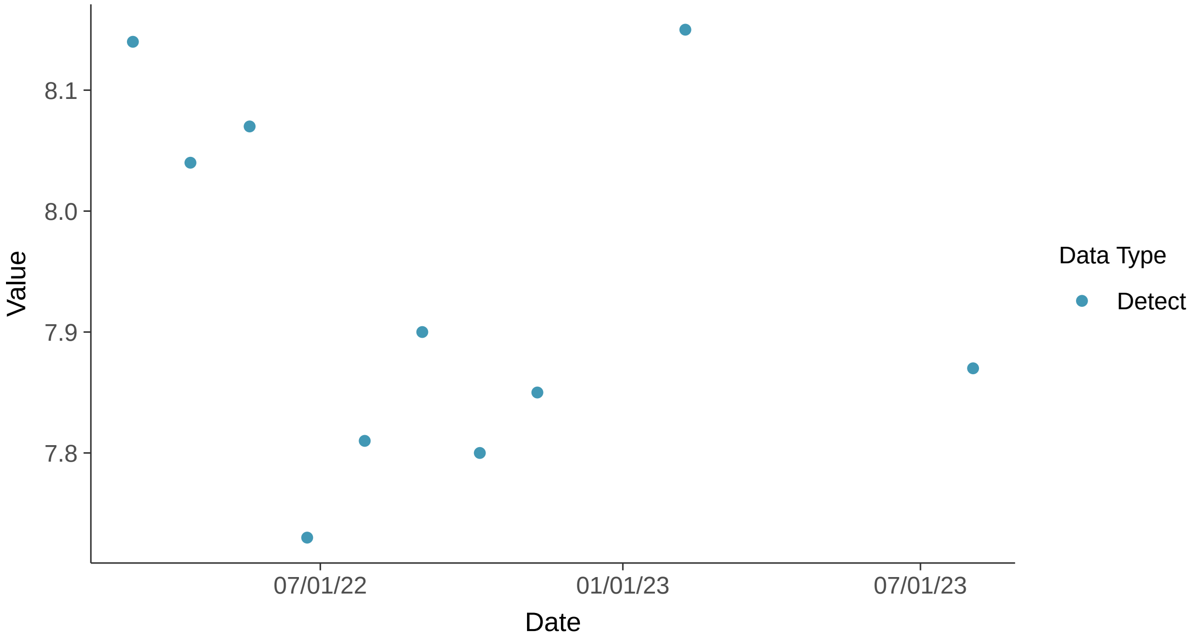


Appendix III: pH, Field, MW-7B

ID: 7B_1_07

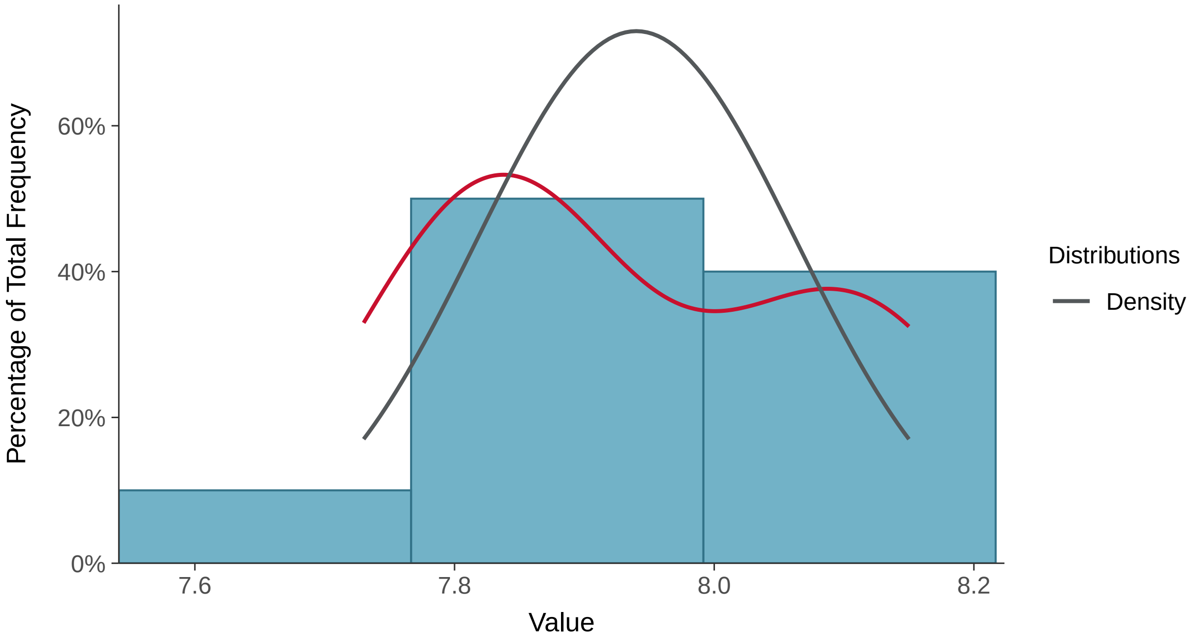
Scatter Plot

pH, Field, MW-7B (su)



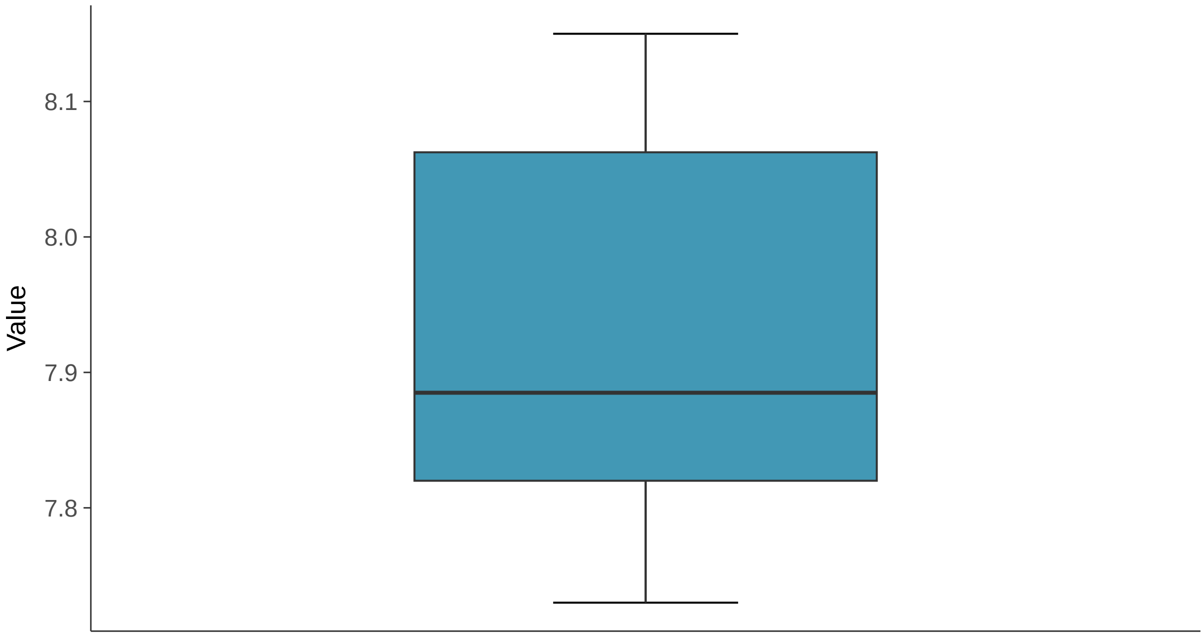
Histogram

pH, Field, MW-7B (su)



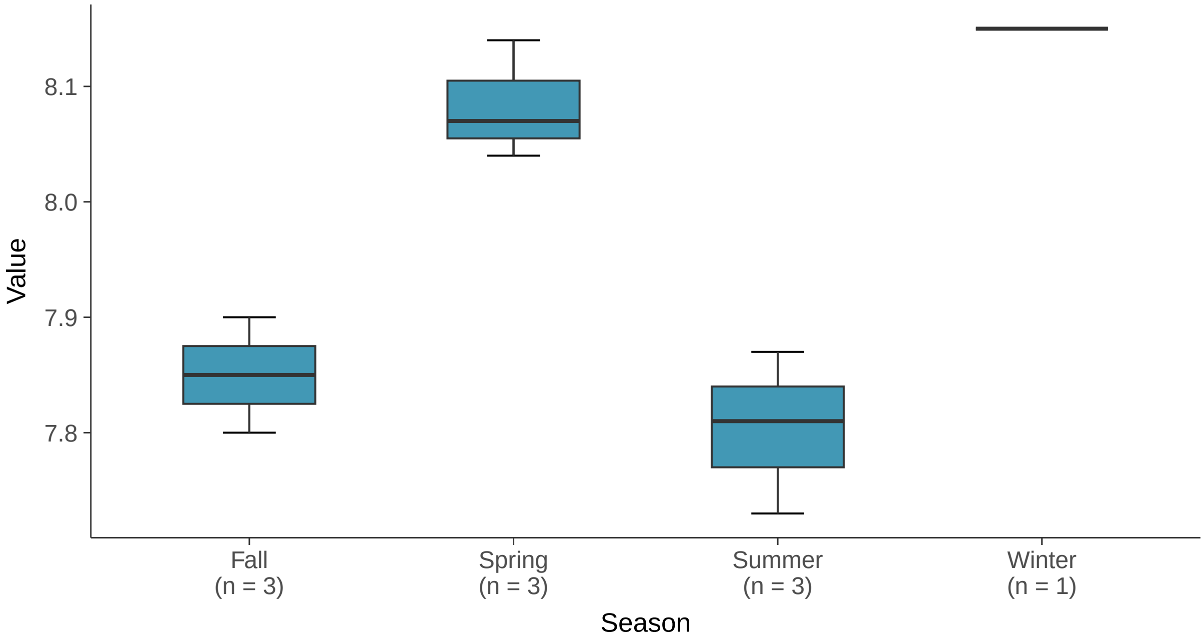
Boxplot

pH, Field, MW-7B (su)



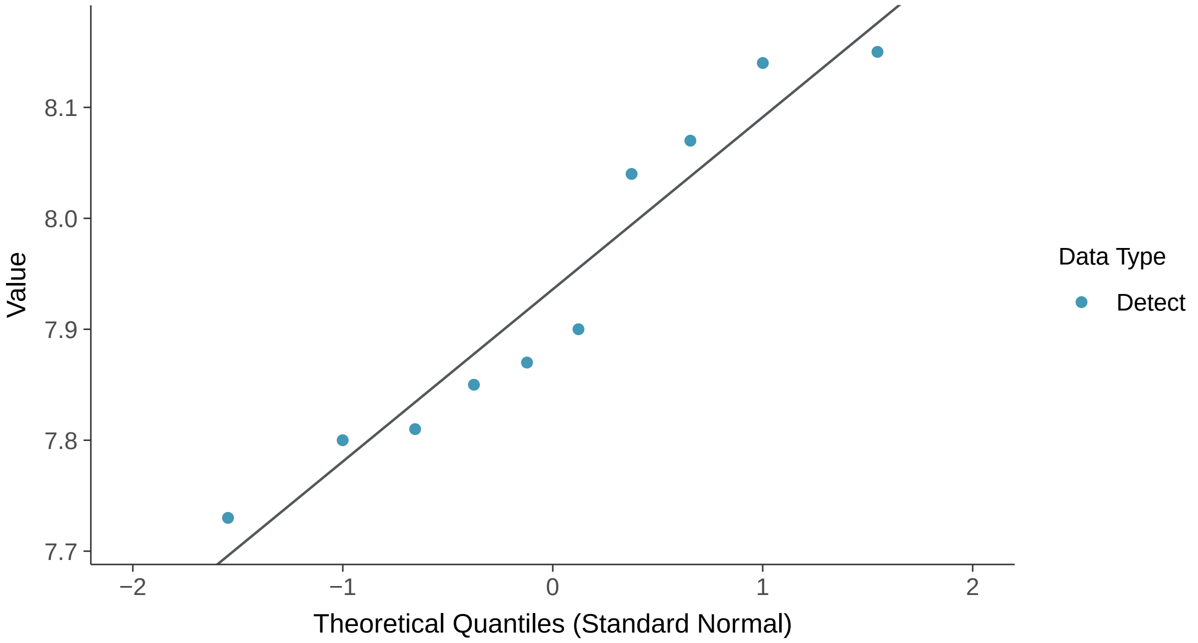
Boxplot by Season

pH, Field, MW-7B (su)



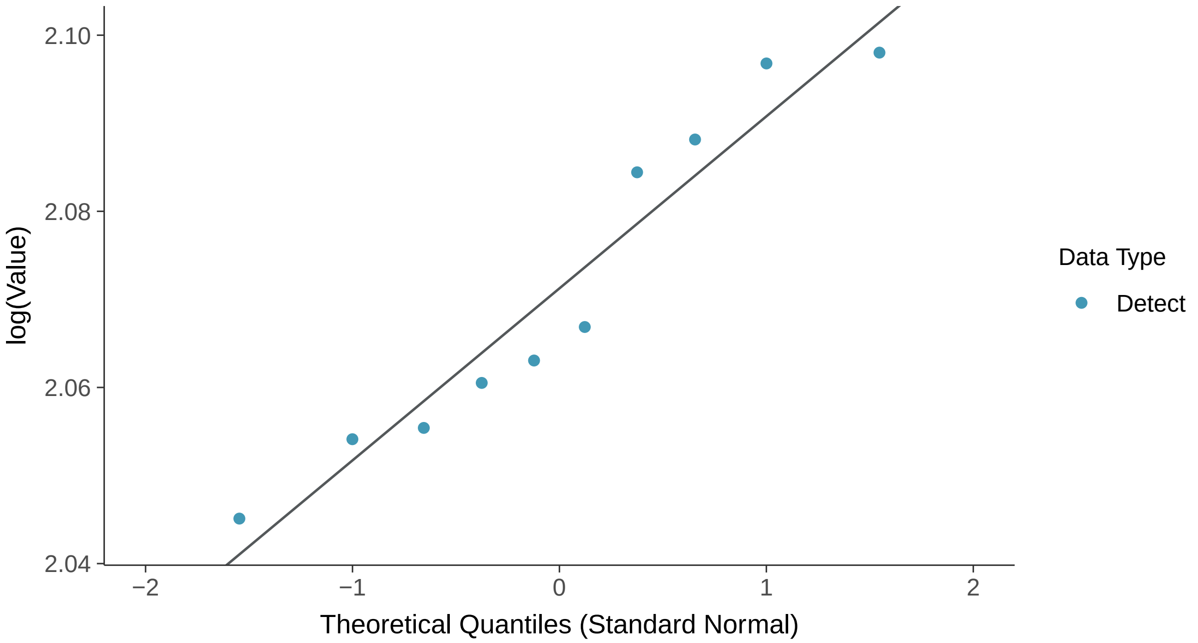
Normal Q-Q plot

pH, Field, MW-7B (su)



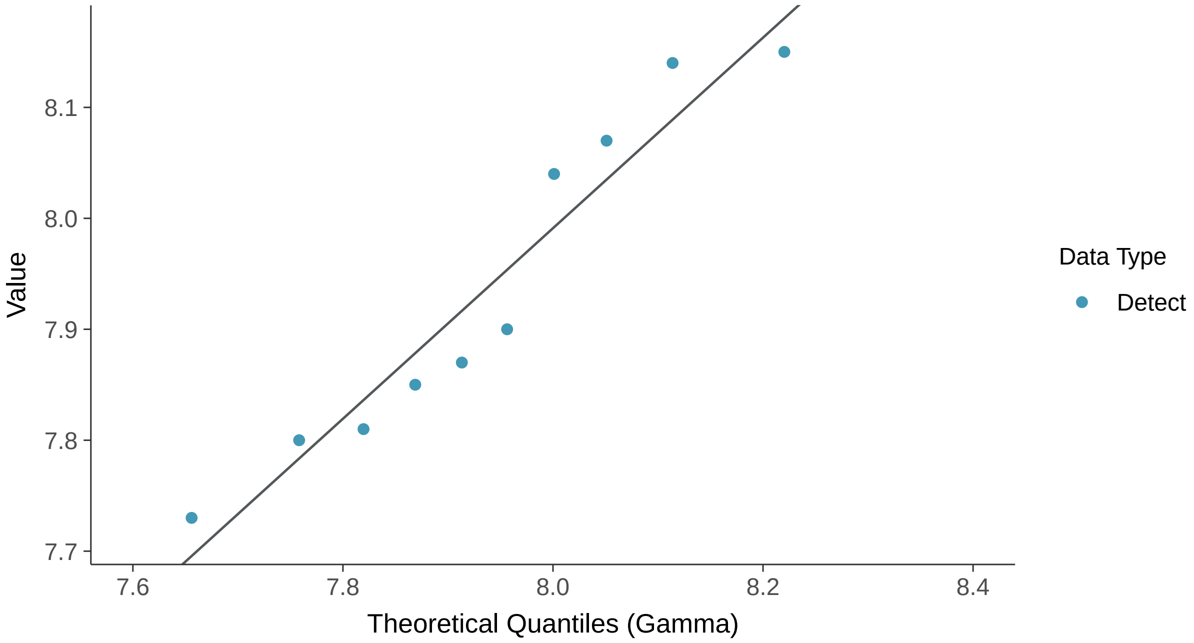
Lognormal Q-Q plot

pH, Field, MW-7B (su)



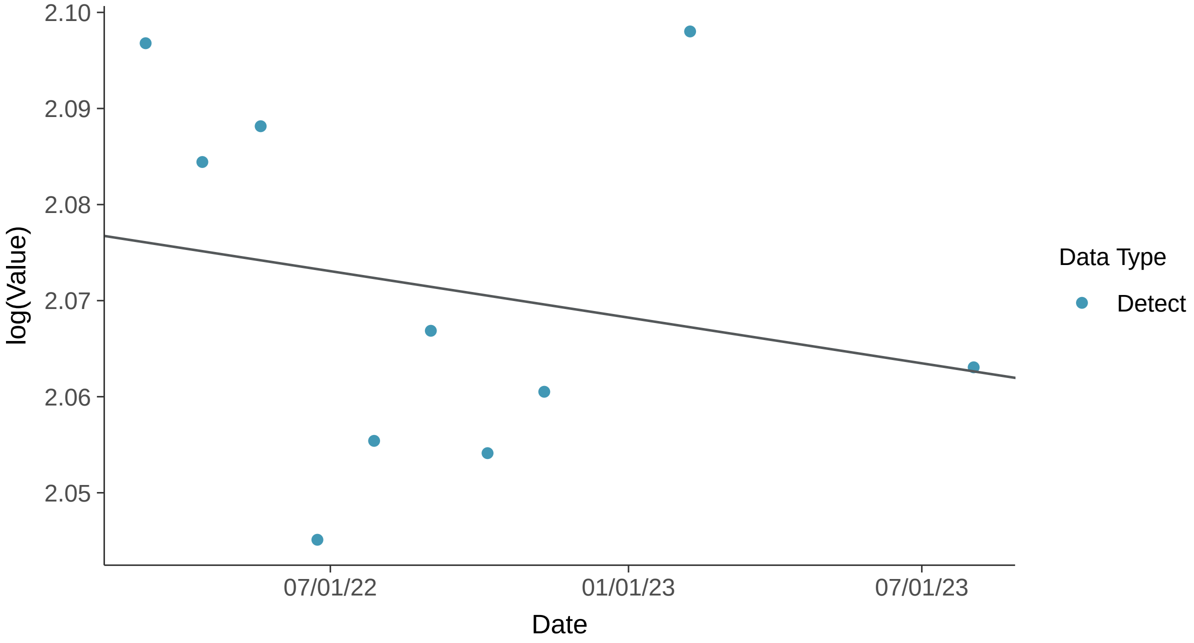
Gamma Q-Q plot

pH, Field, MW-7B (su)



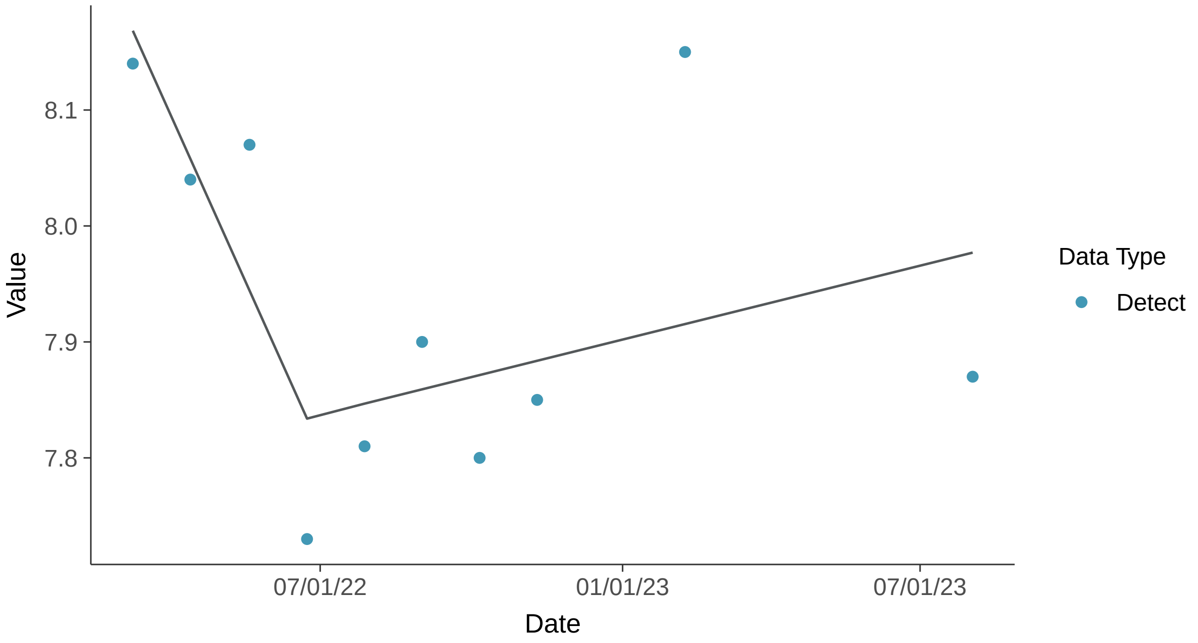
Trend Regression: Lognormal MLE

pH, Field, MW-7B (su)



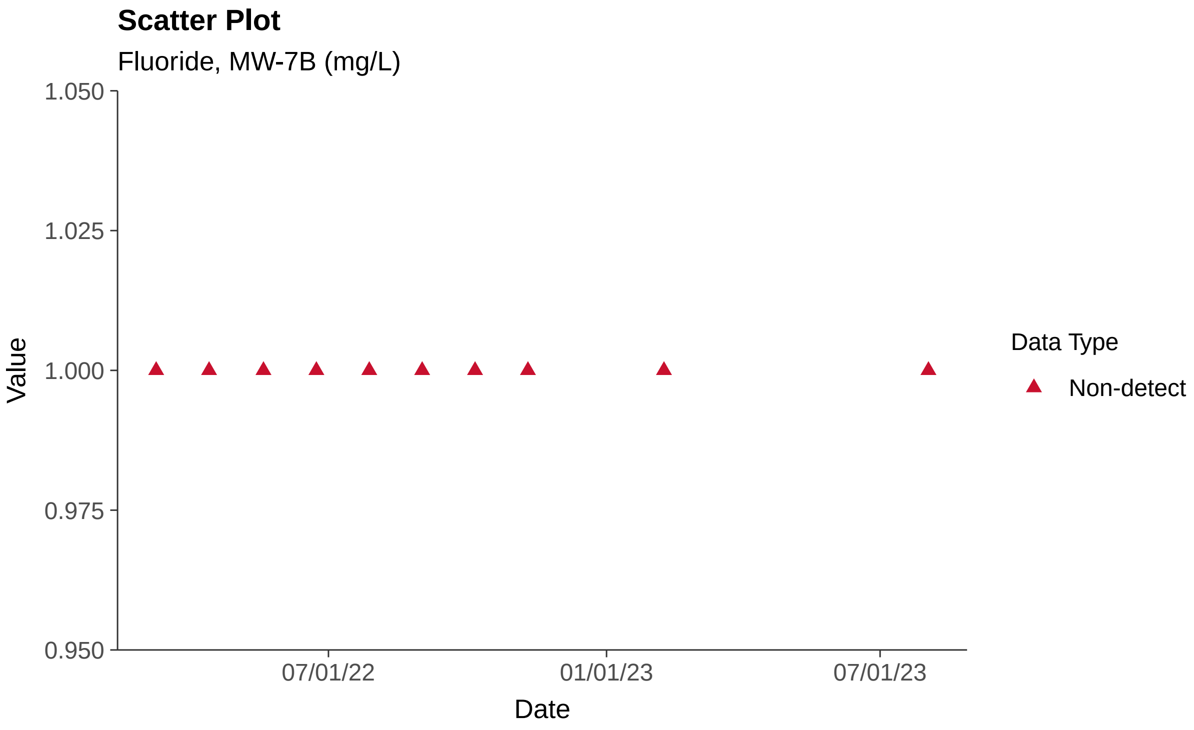
Trend Regression: Piecewise Linear-Linear

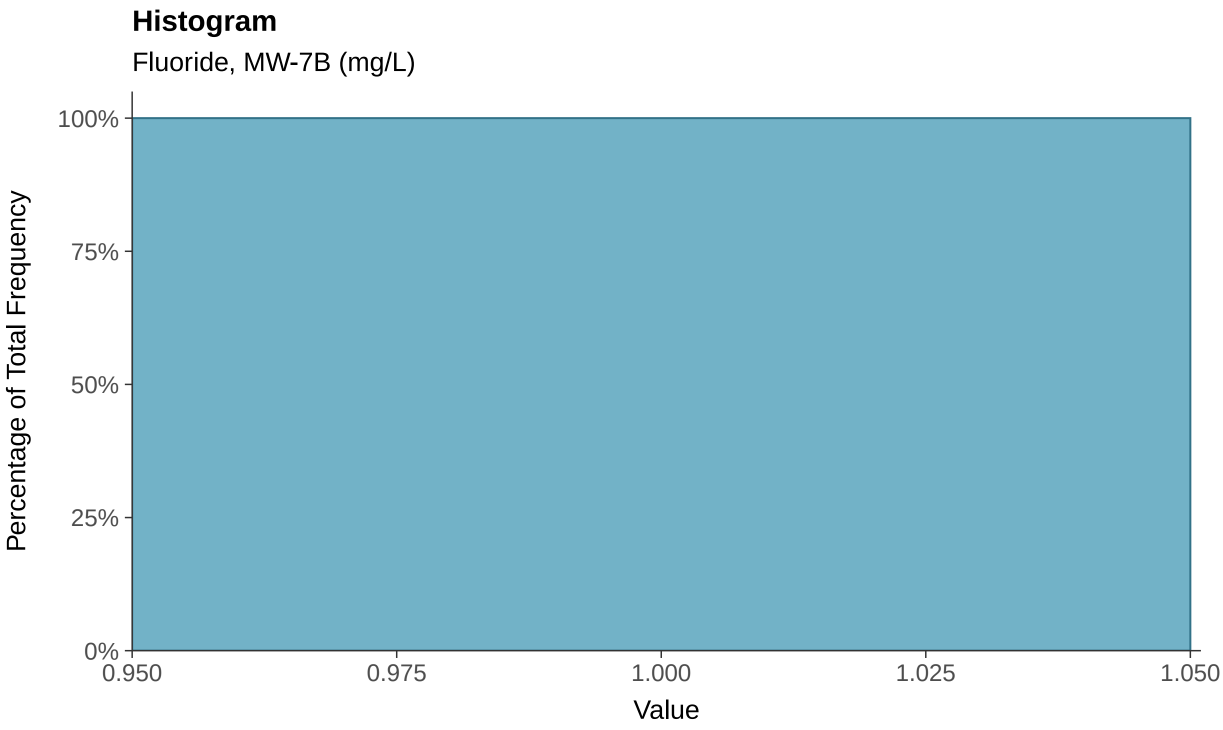
pH, Field, MW-7B (su)



Appendix IV: Fluoride, MW-7B

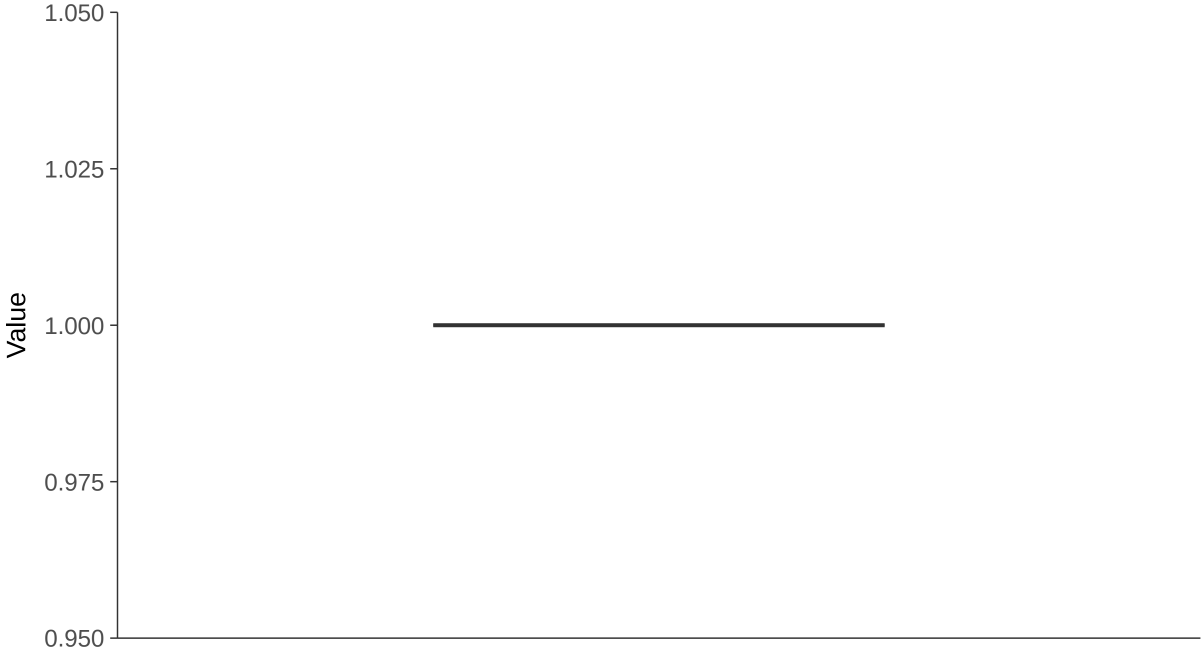
ID: 7B_2_04





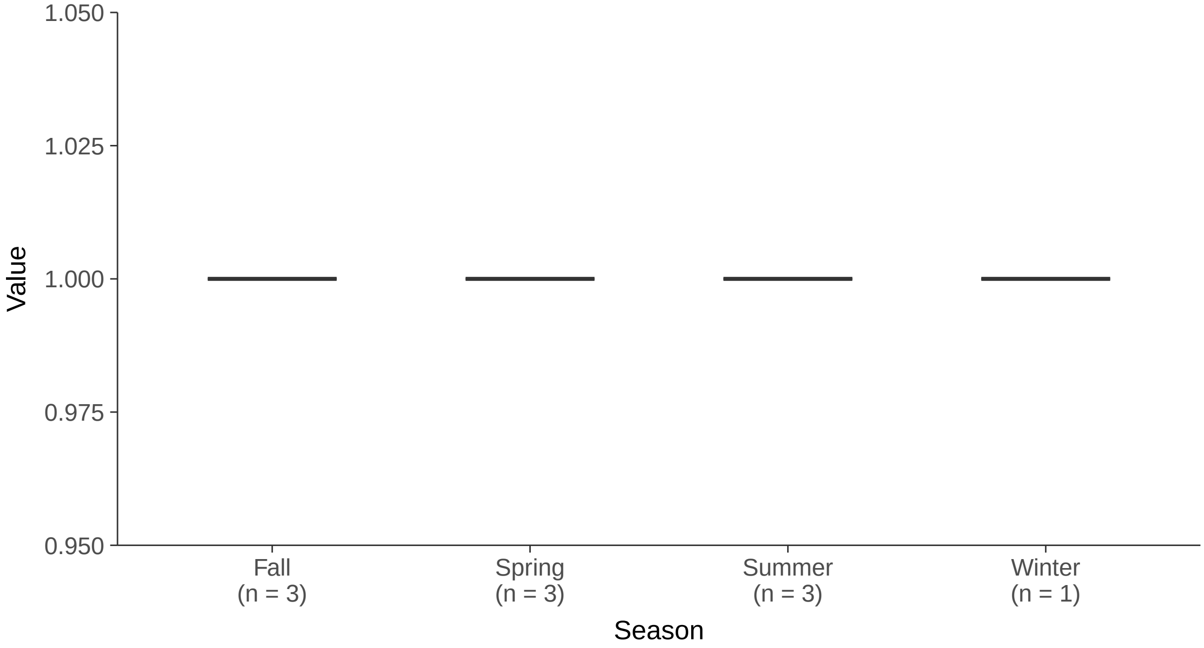
Boxplot

Fluoride, MW-7B (mg/L)



Boxplot by Season

Fluoride, MW-7B (mg/L)

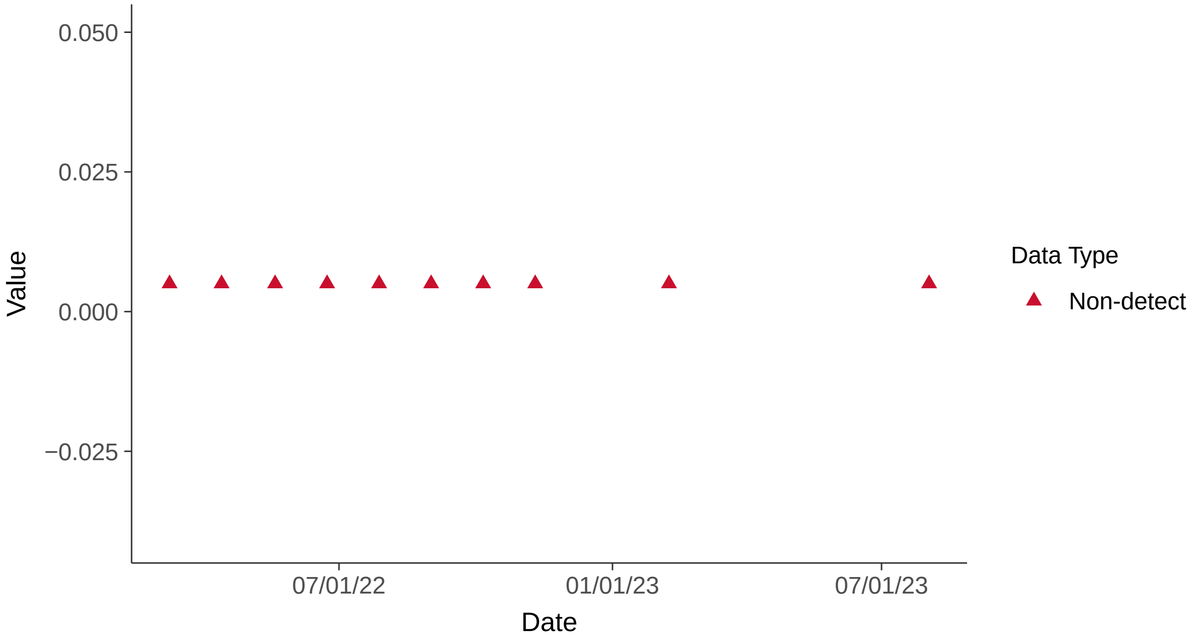


Appendix IV: Antimony, MW-7B

ID: 7B_2_08

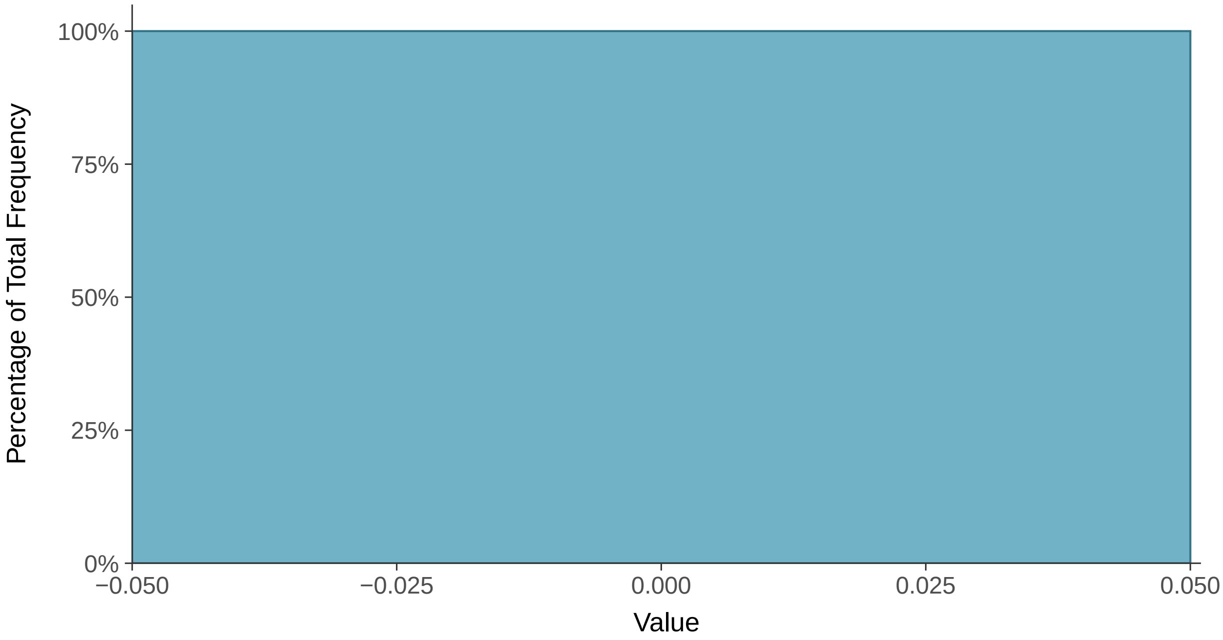
Scatter Plot

Antimony, MW-7B (mg/L)



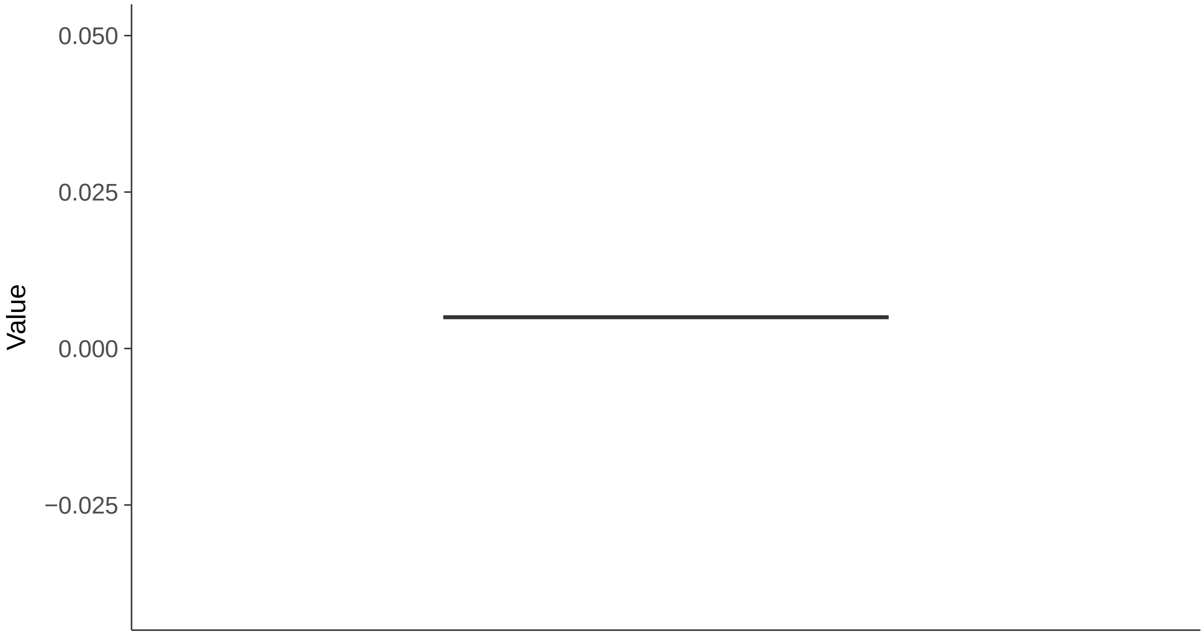
Histogram

Antimony, MW-7B (mg/L)



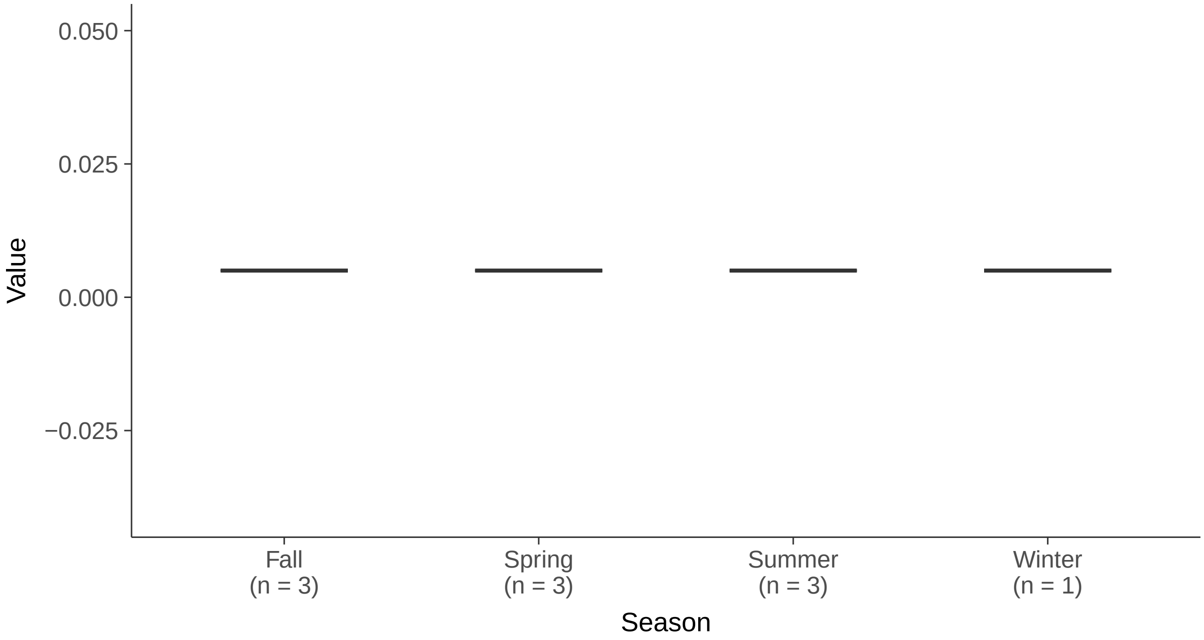
Boxplot

Antimony, MW-7B (mg/L)



Boxplot by Season

Antimony, MW-7B (mg/L)

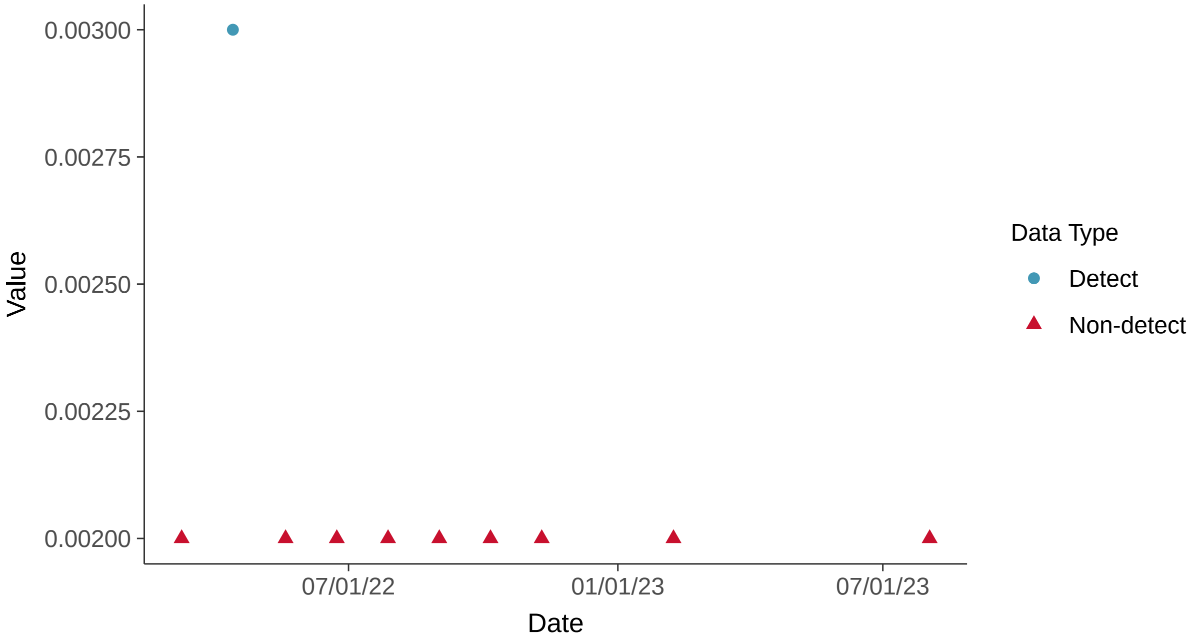


Appendix IV: Arsenic, MW-7B

ID: 7B_2_09

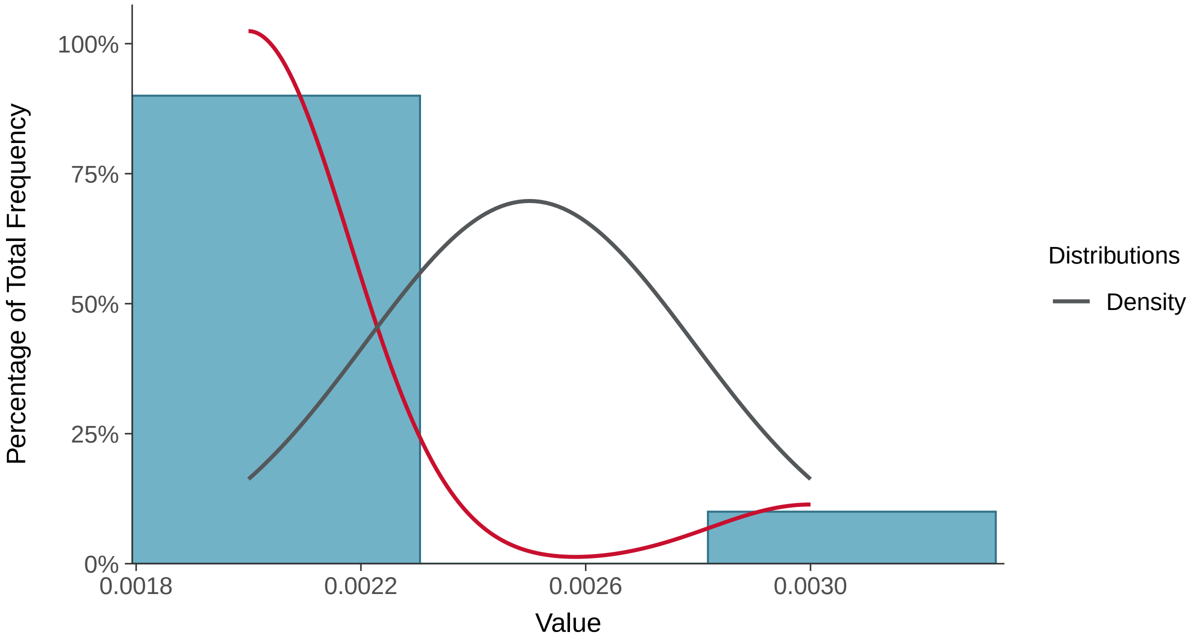
Scatter Plot

Arsenic, MW-7B (mg/L)



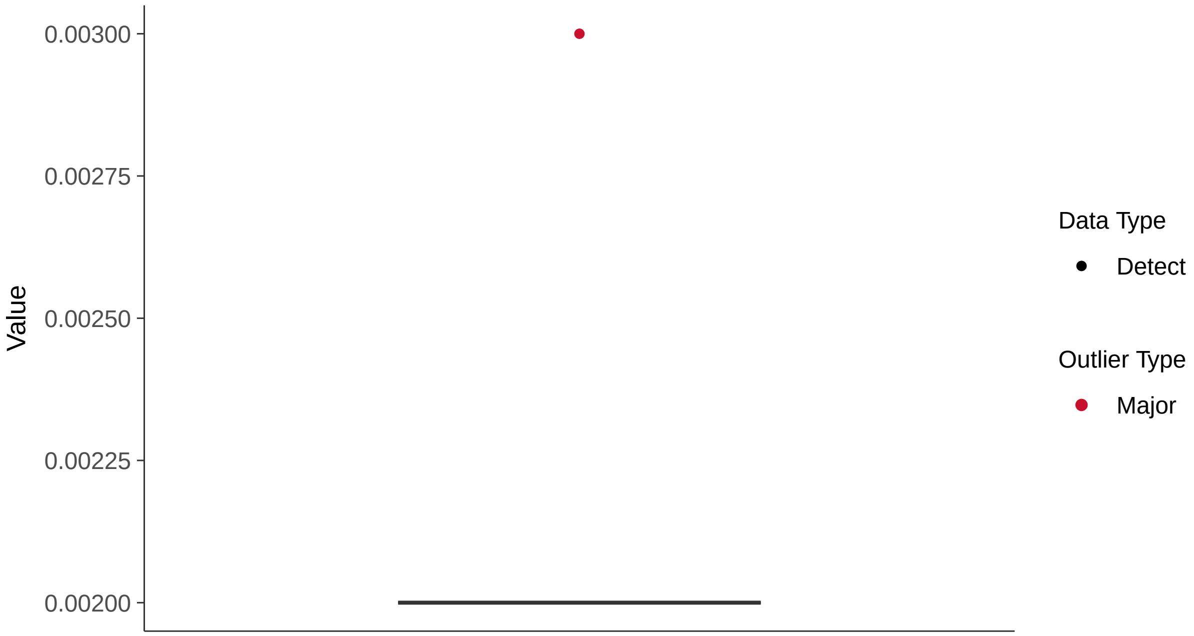
Histogram

Arsenic, MW-7B (mg/L)



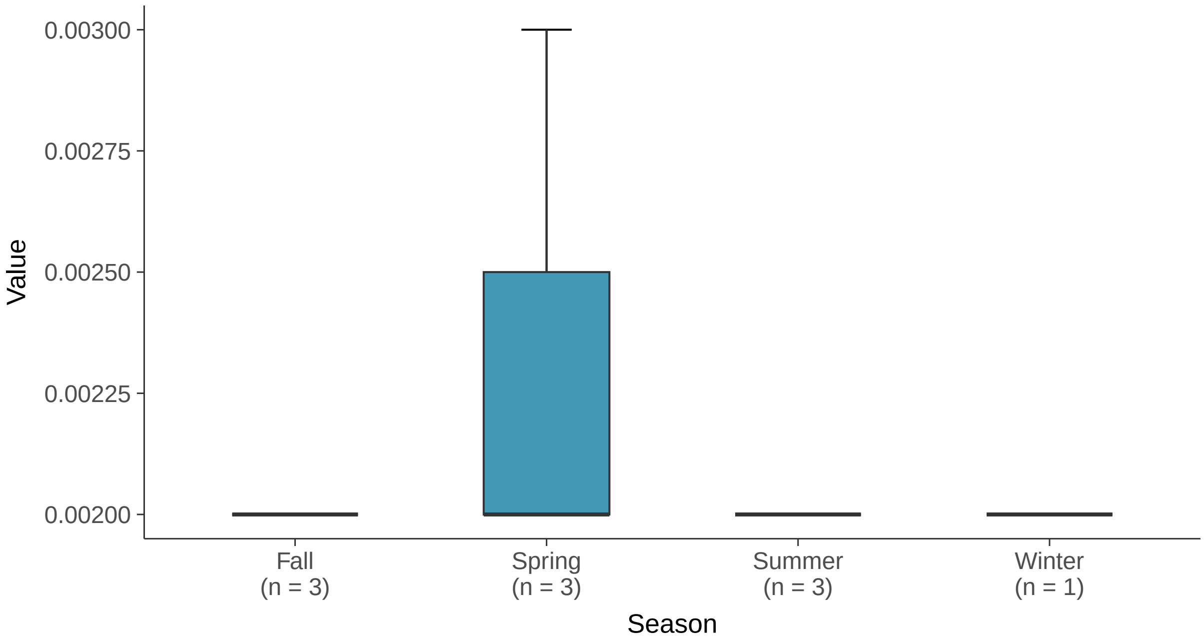
Boxplot

Arsenic, MW-7B (mg/L)



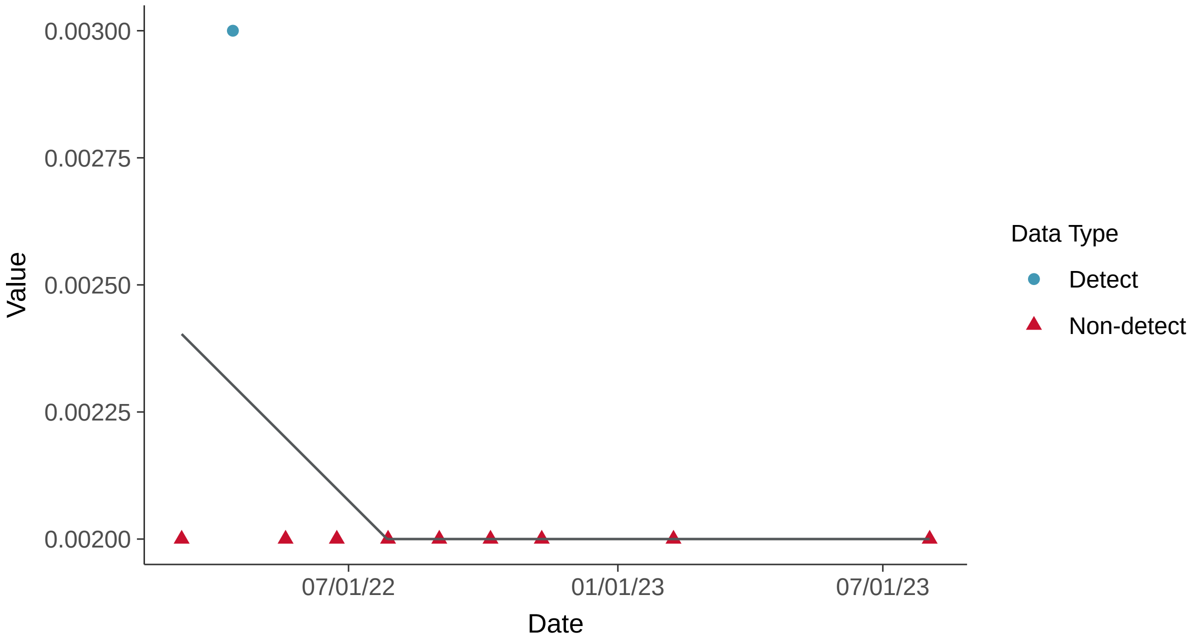
Boxplot by Season

Arsenic, MW-7B (mg/L)



Trend Regression: Piecewise Linear-Linear

Arsenic, MW-7B (mg/L)

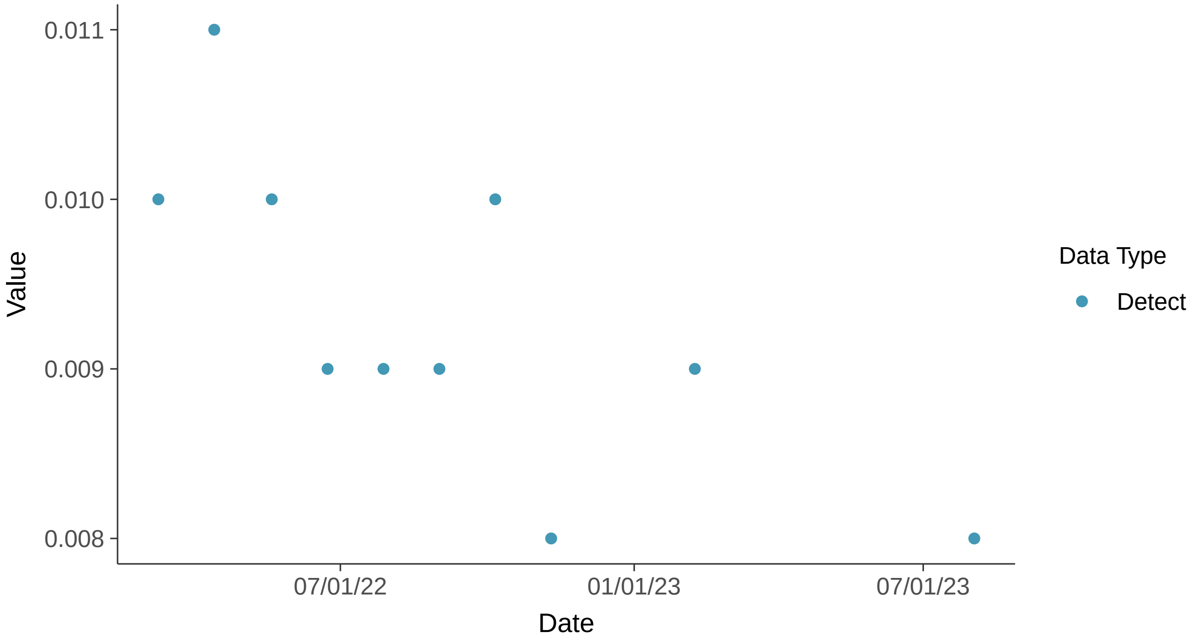


Appendix IV: Barium, MW-7B

ID: 7B_2_10

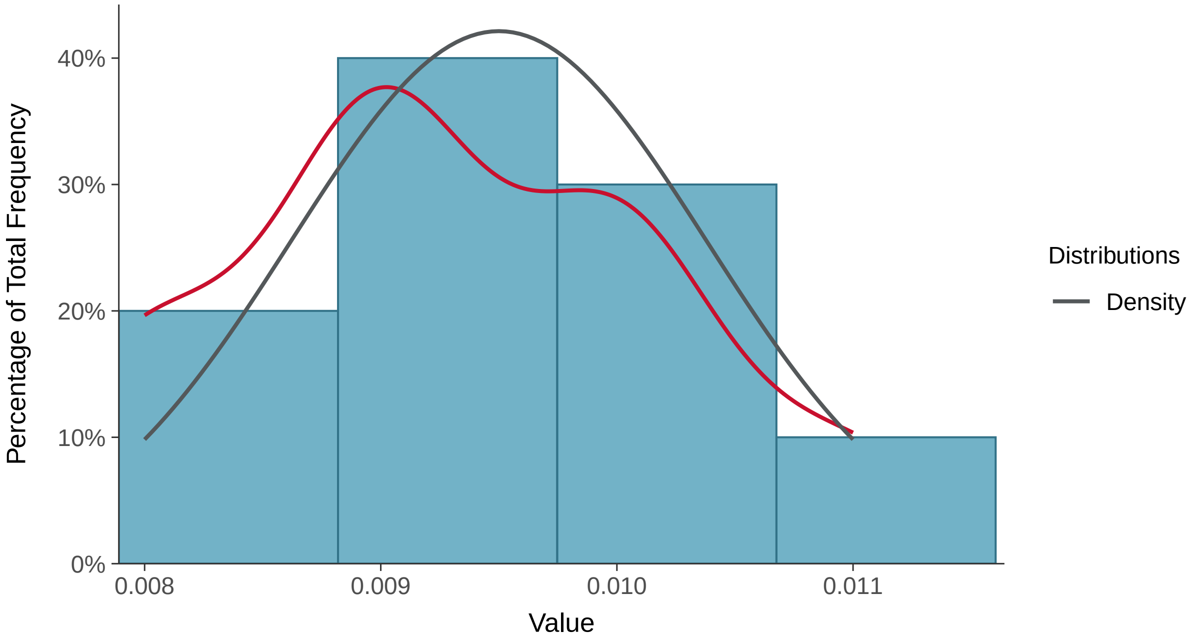
Scatter Plot

Barium, MW-7B (mg/L)



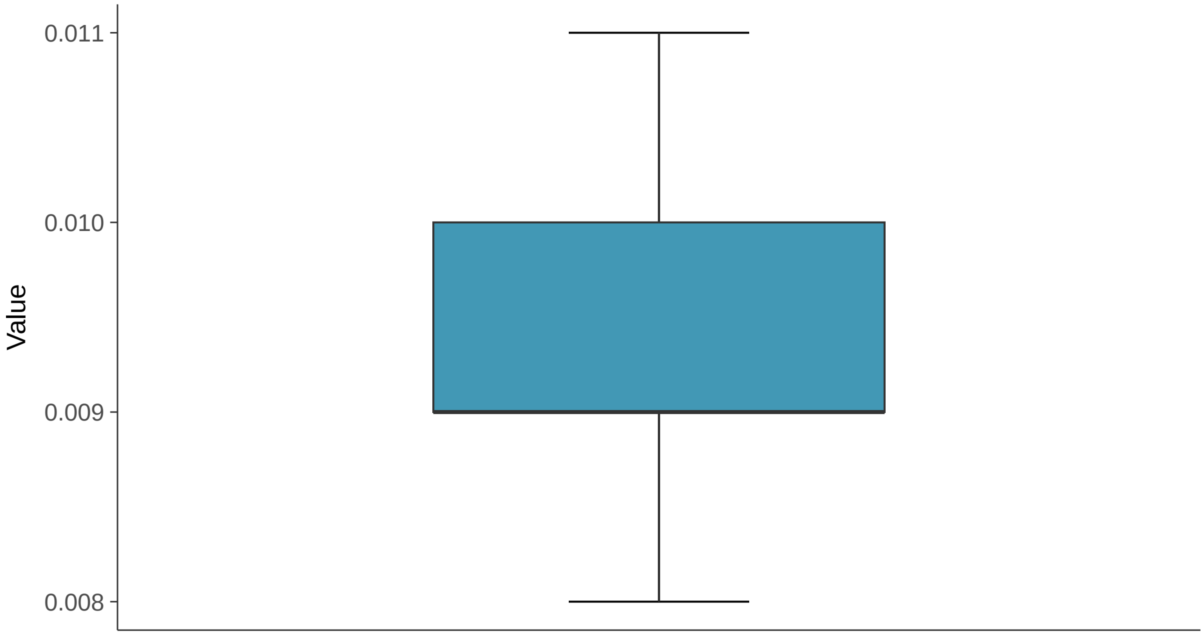
Histogram

Barium, MW-7B (mg/L)



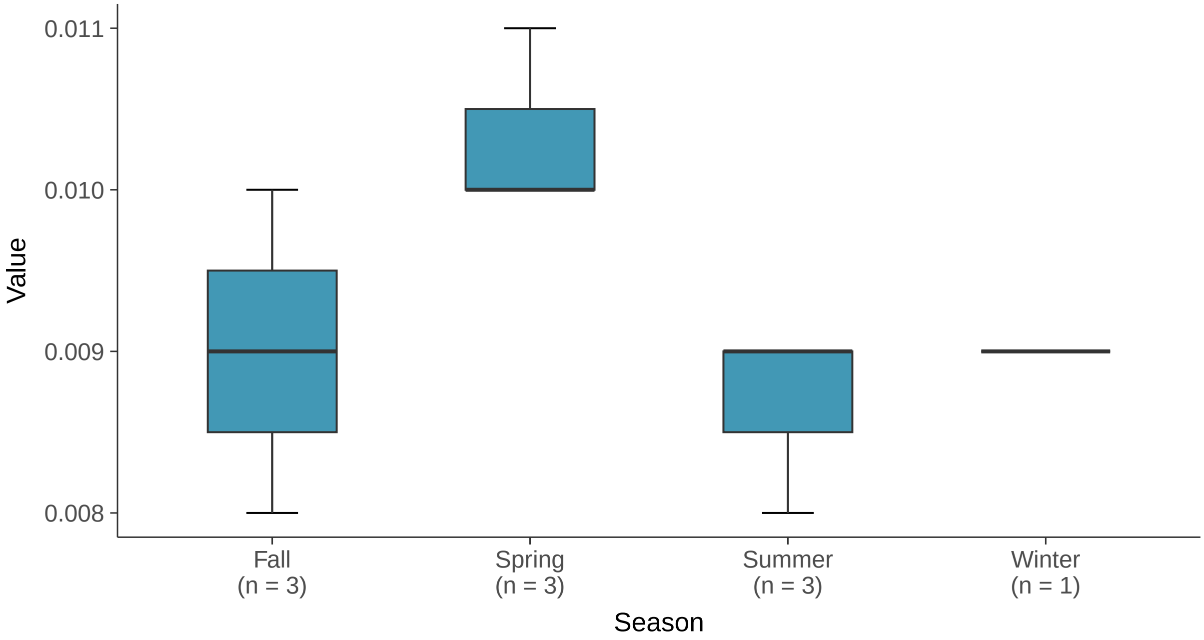
Boxplot

Barium, MW-7B (mg/L)



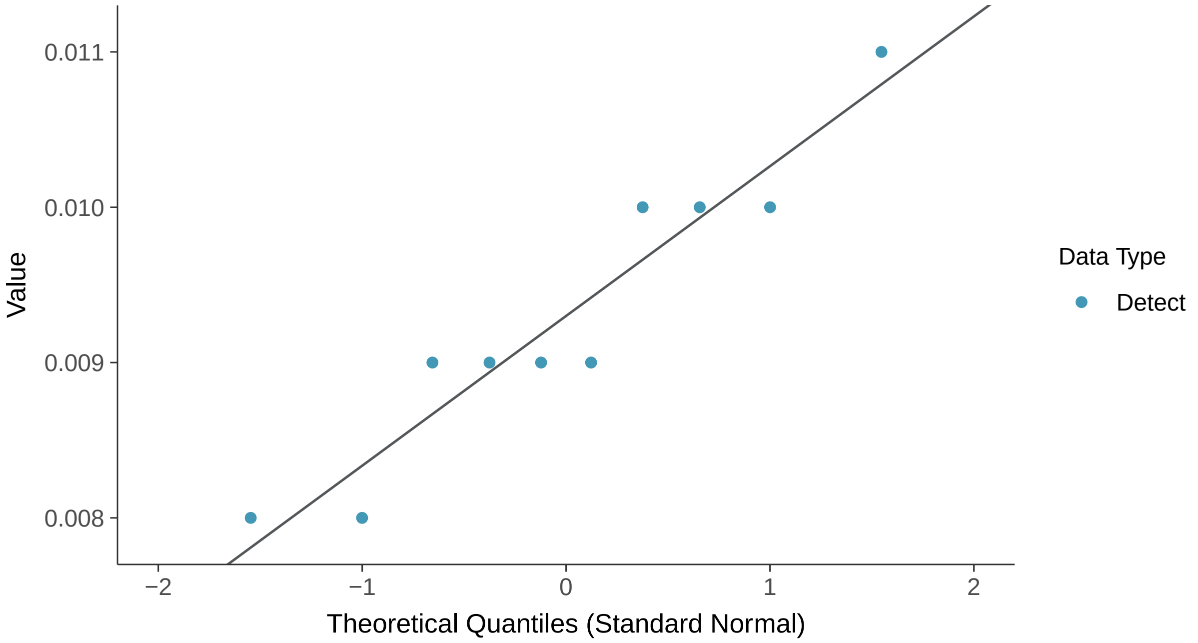
Boxplot by Season

Barium, MW-7B (mg/L)



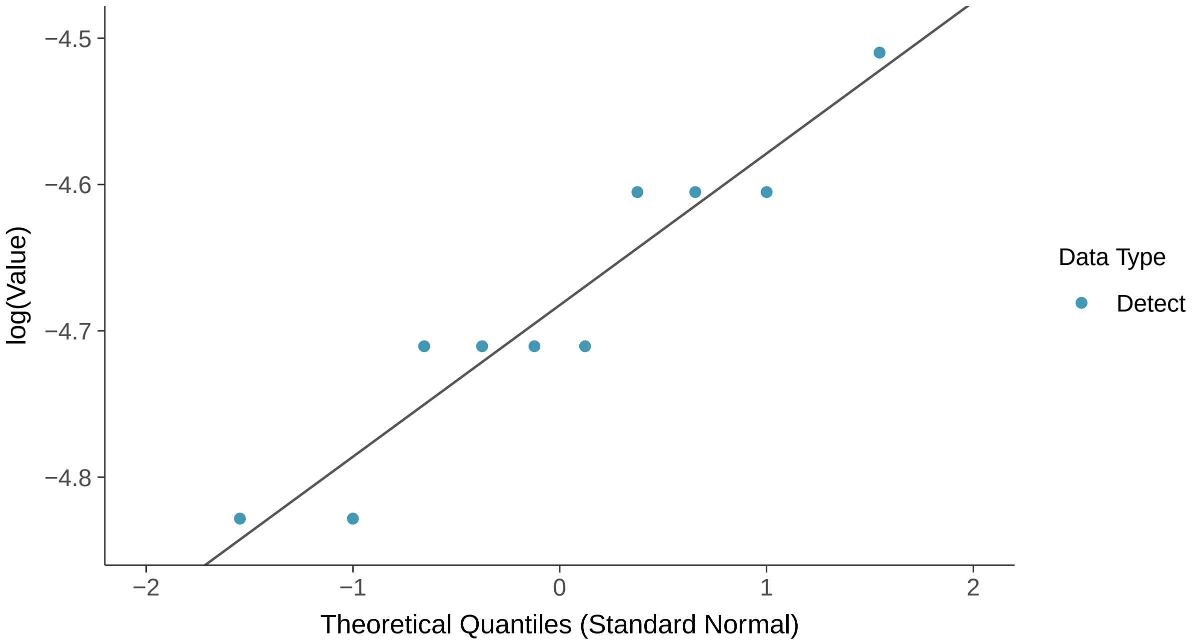
Normal Q-Q plot

Barium, MW-7B (mg/L)



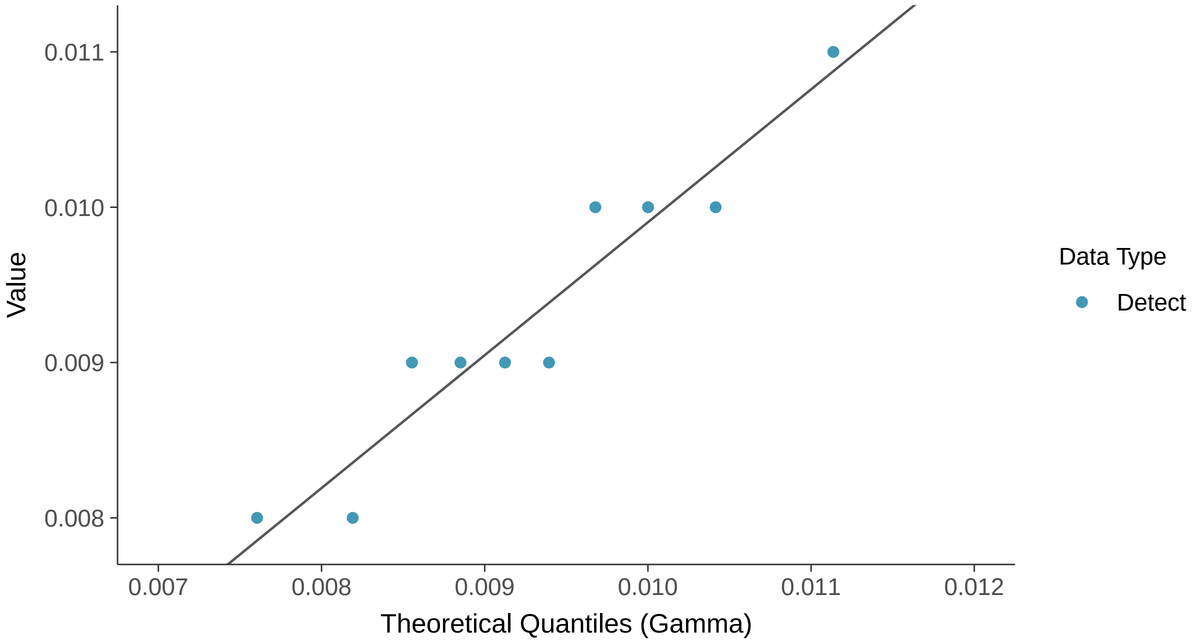
Lognormal Q-Q plot

Barium, MW-7B (mg/L)



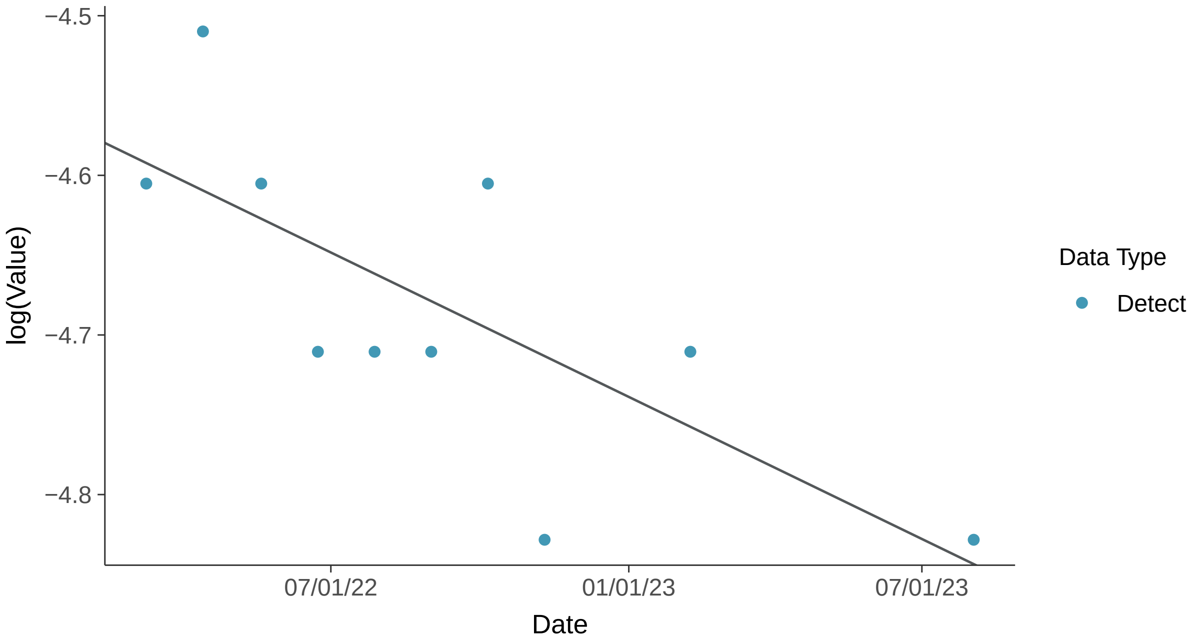
Gamma Q-Q plot

Barium, MW-7B (mg/L)



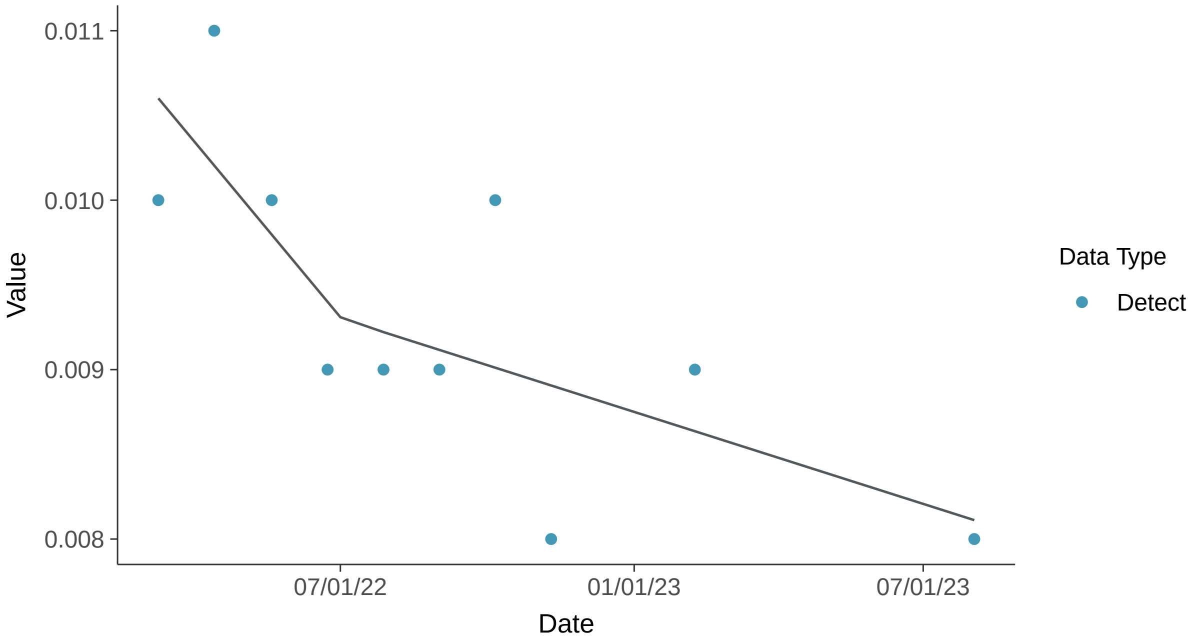
Trend Regression: Lognormal MLE

Barium, MW-7B (mg/L)



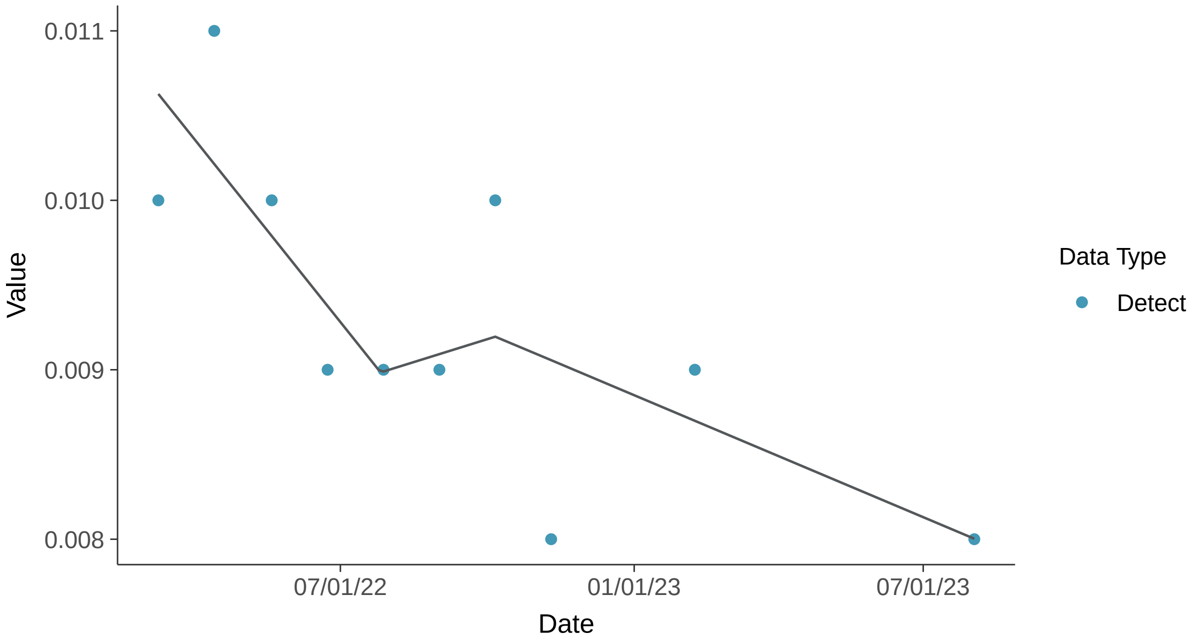
Trend Regression: Piecewise Linear-Linear

Barium, MW-7B (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Barium, MW-7B (mg/L)

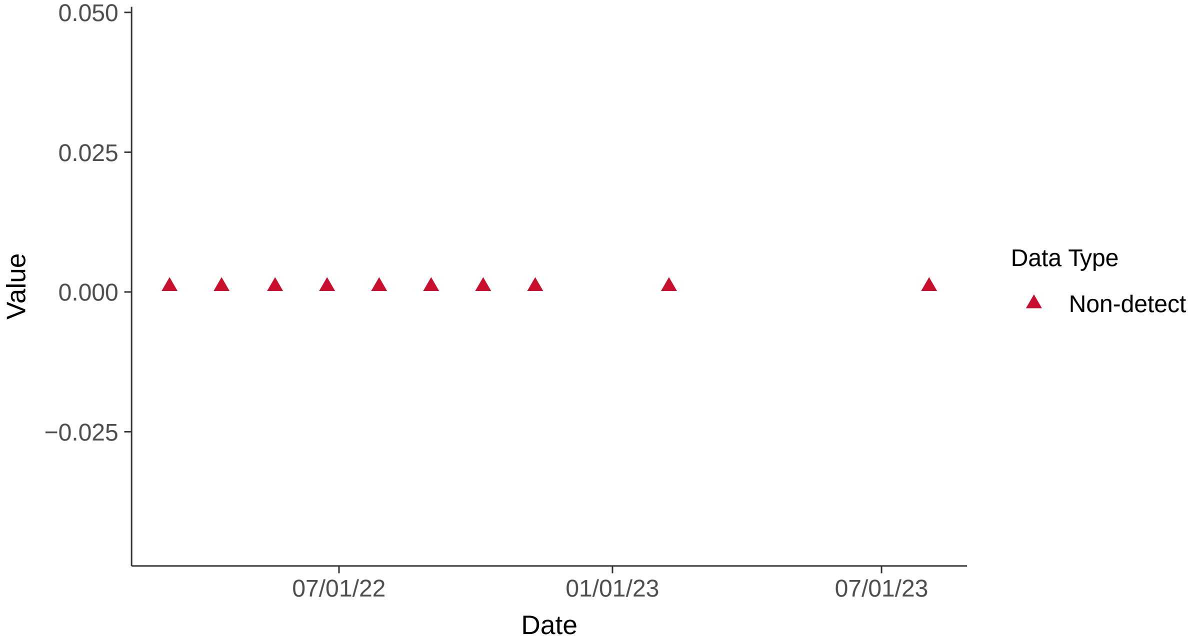


Appendix IV: Beryllium, MW-7B

ID: 7B_2_11

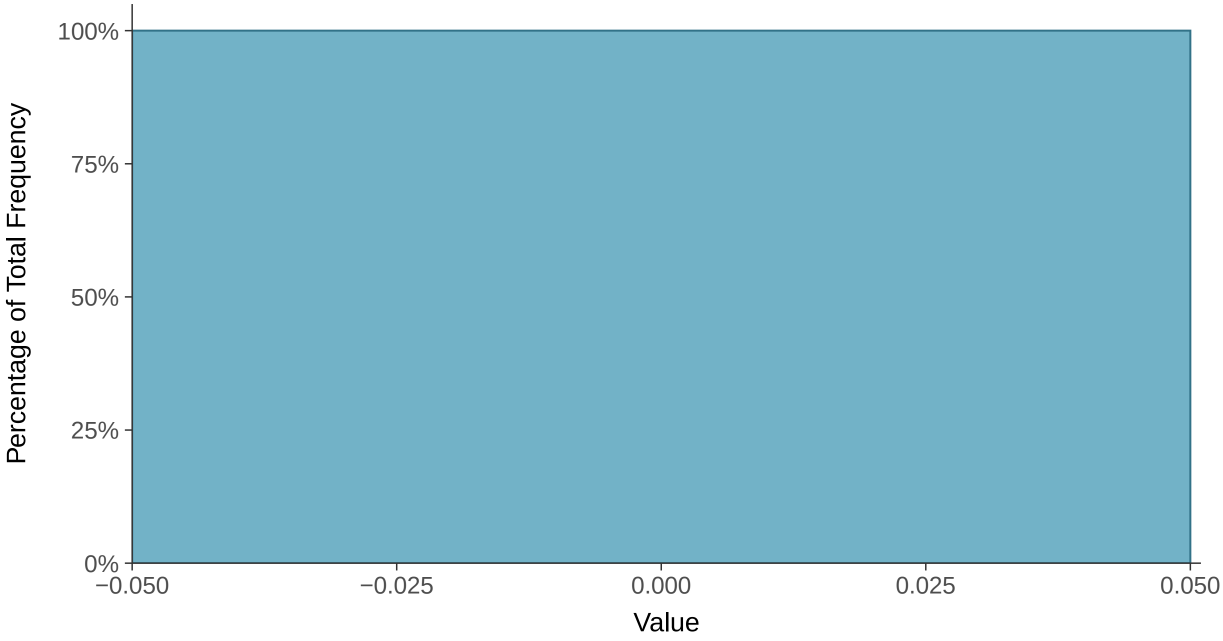
Scatter Plot

Beryllium, MW-7B (mg/L)



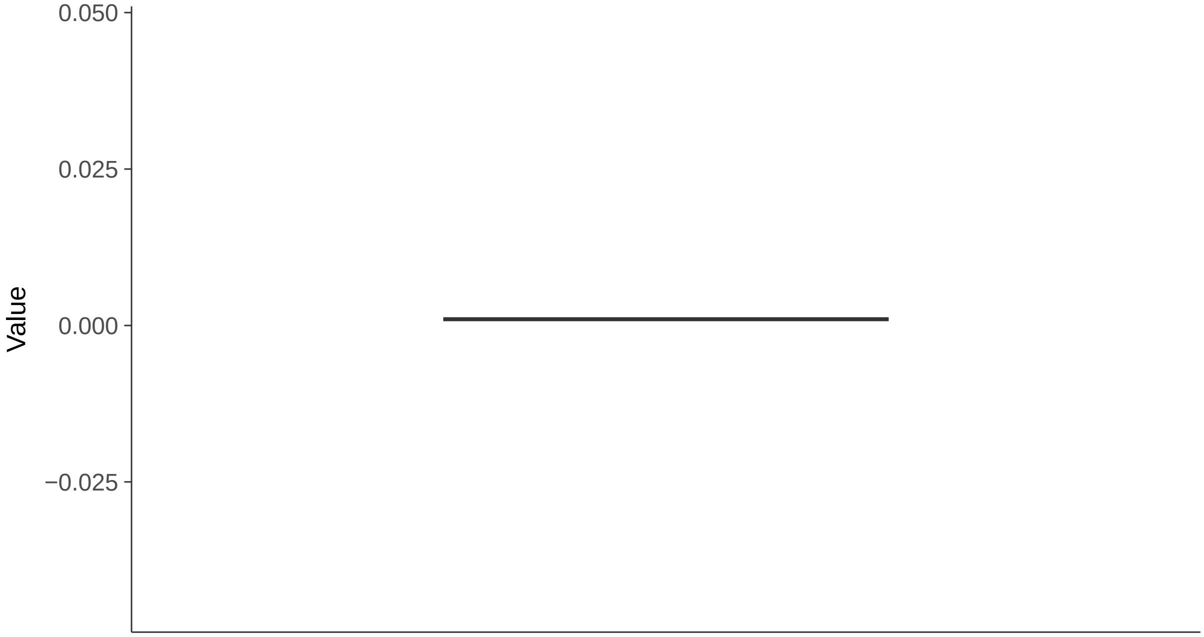
Histogram

Beryllium, MW-7B (mg/L)



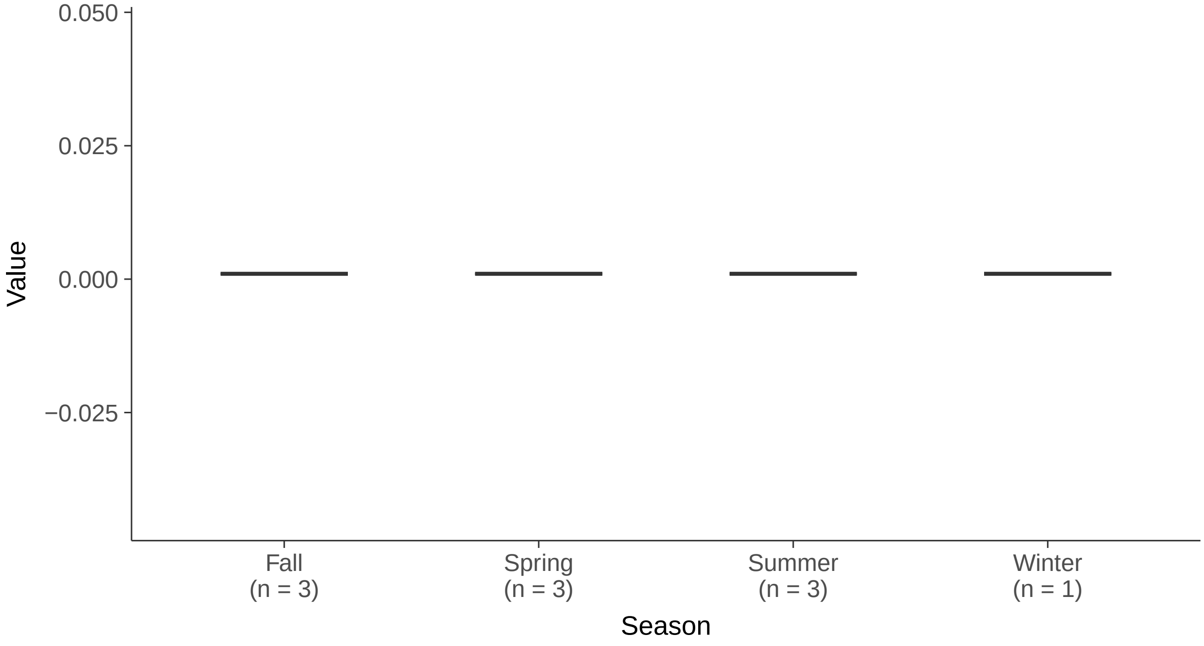
Boxplot

Beryllium, MW-7B (mg/L)



Boxplot by Season

Beryllium, MW-7B (mg/L)

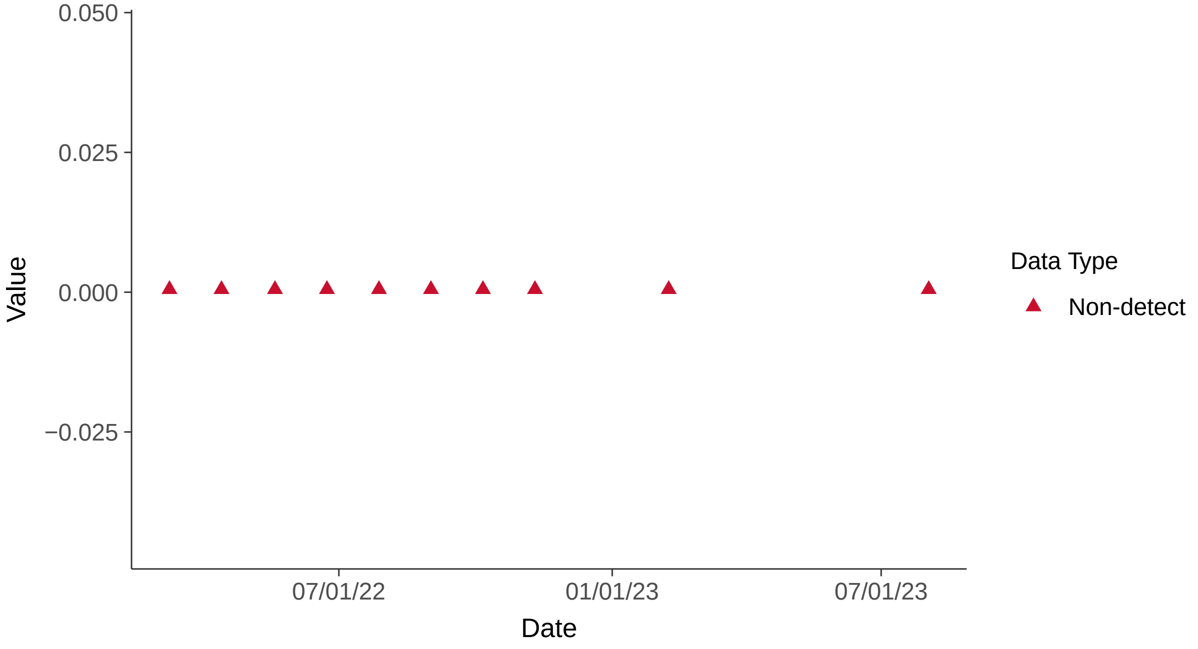


Appendix IV: Cadmium, MW-7B

ID: 7B_2_12

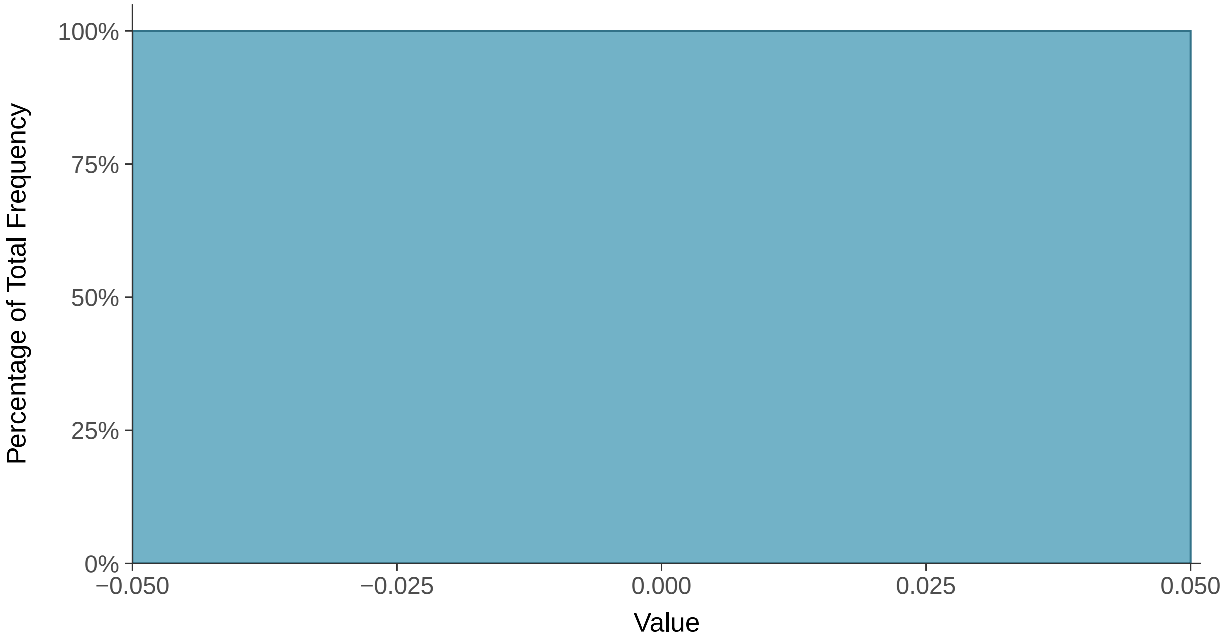
Scatter Plot

Cadmium, MW-7B (mg/L)



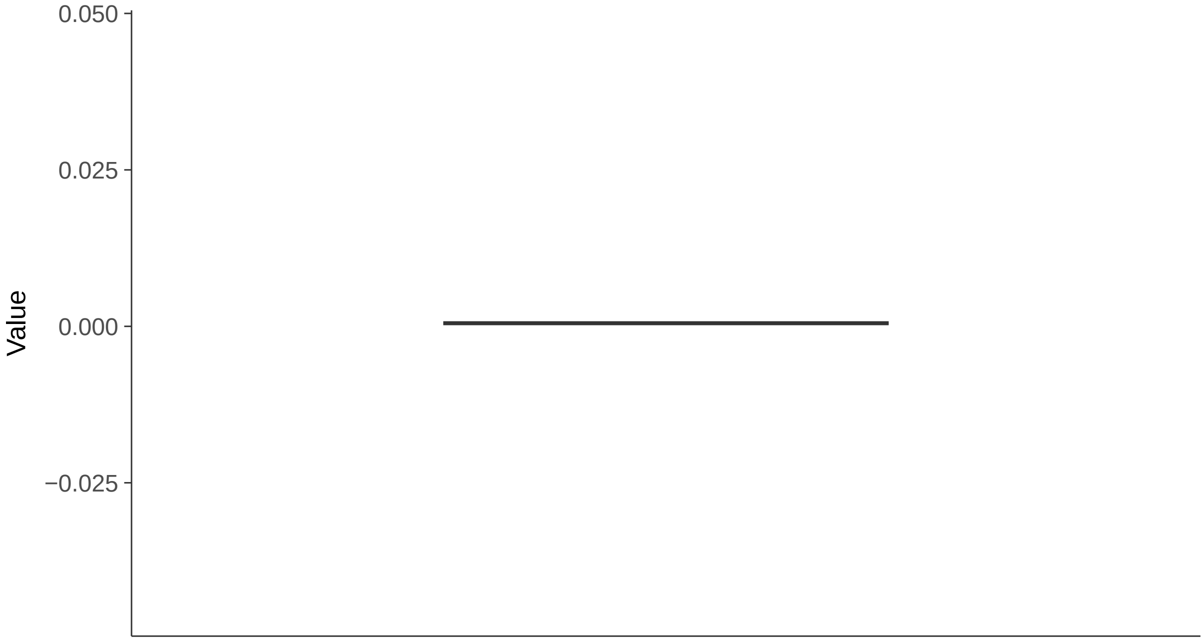
Histogram

Cadmium, MW-7B (mg/L)



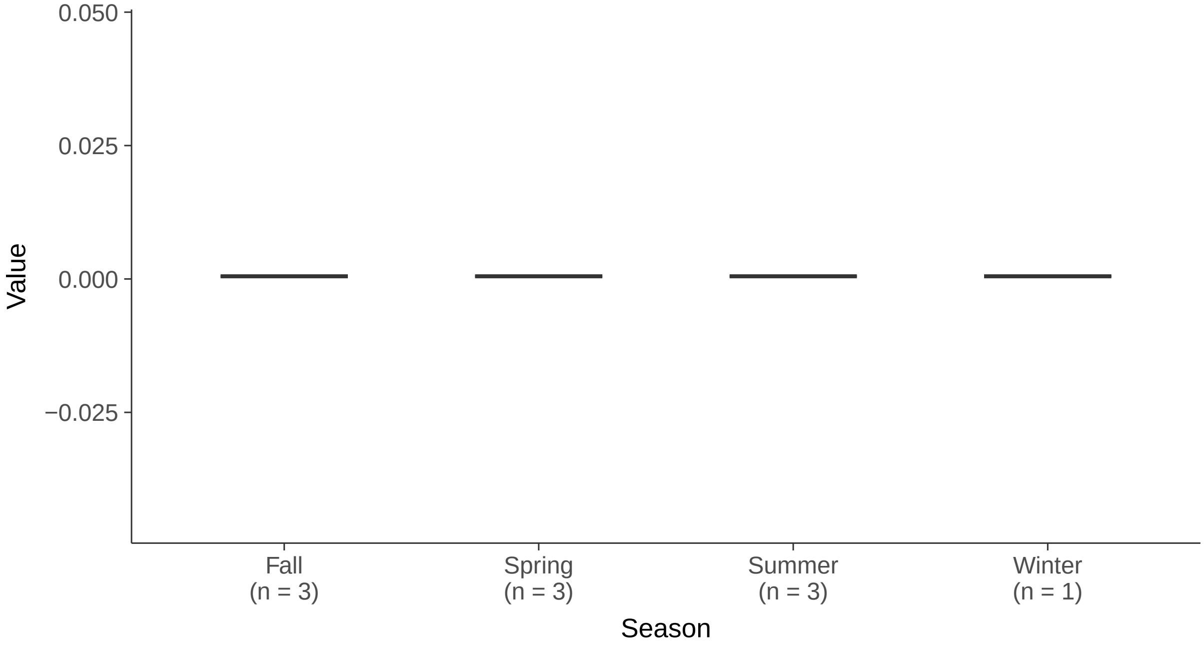
Boxplot

Cadmium, MW-7B (mg/L)



Boxplot by Season

Cadmium, MW-7B (mg/L)

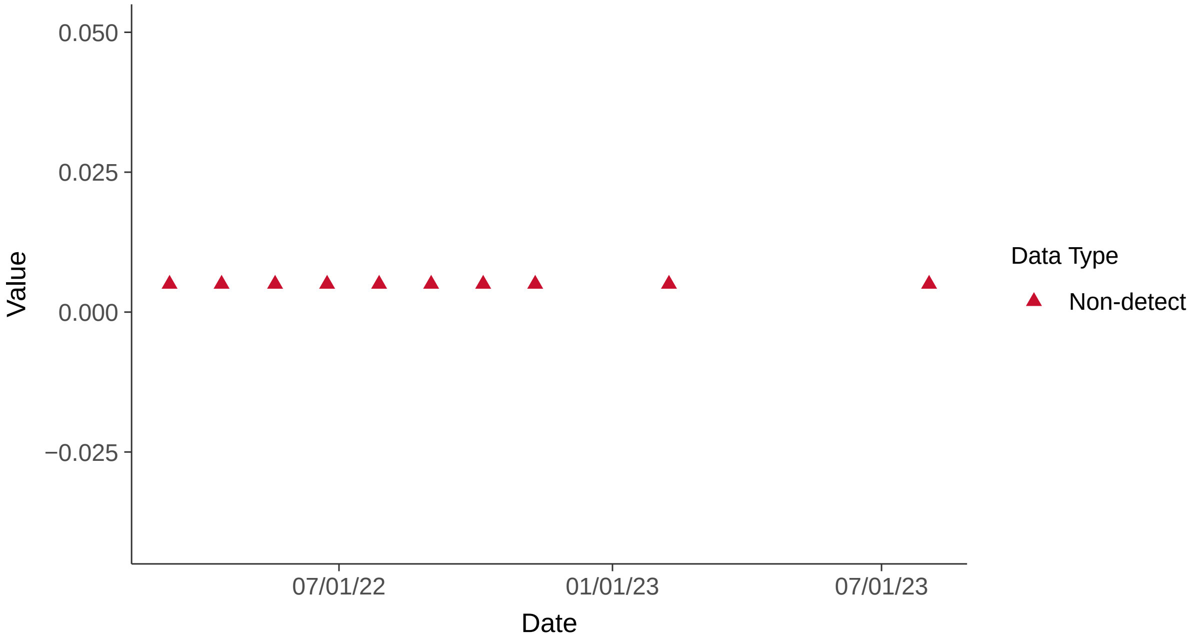


Appendix IV: Chromium, MW-7B

ID: 7B_2_13

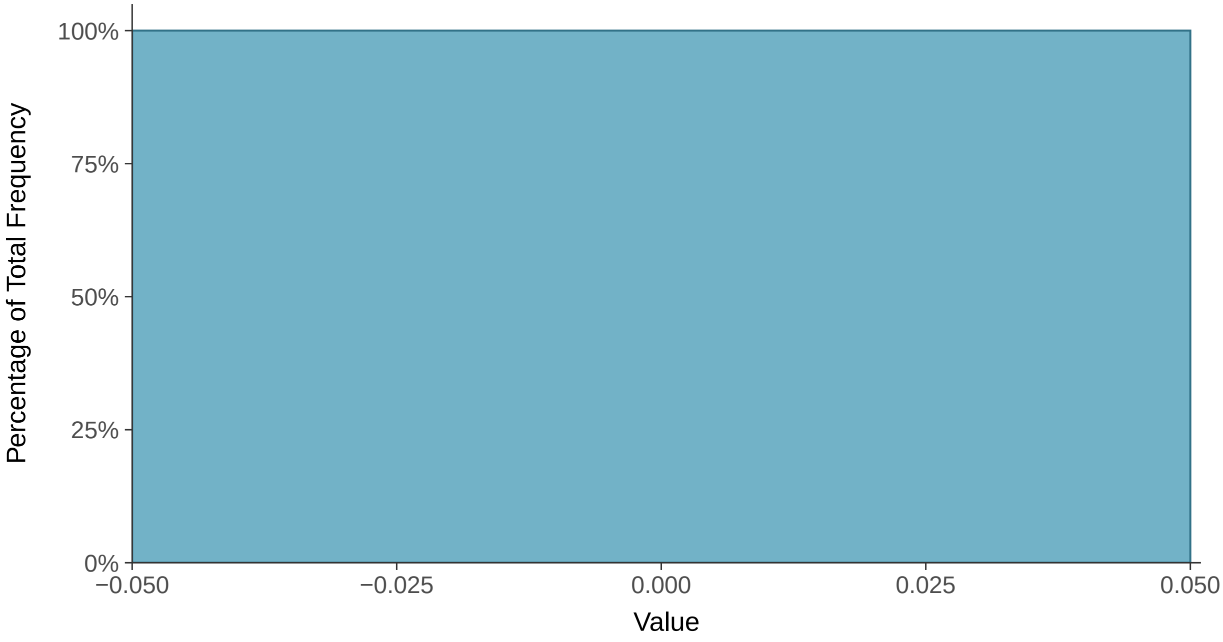
Scatter Plot

Chromium, MW-7B (mg/L)



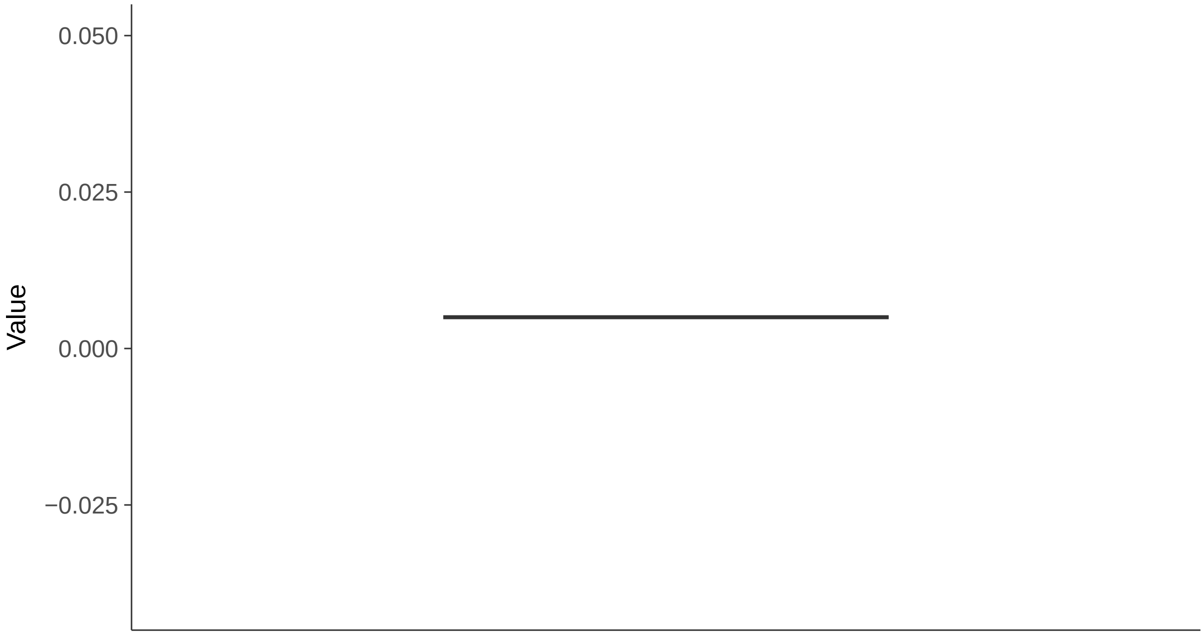
Histogram

Chromium, MW-7B (mg/L)



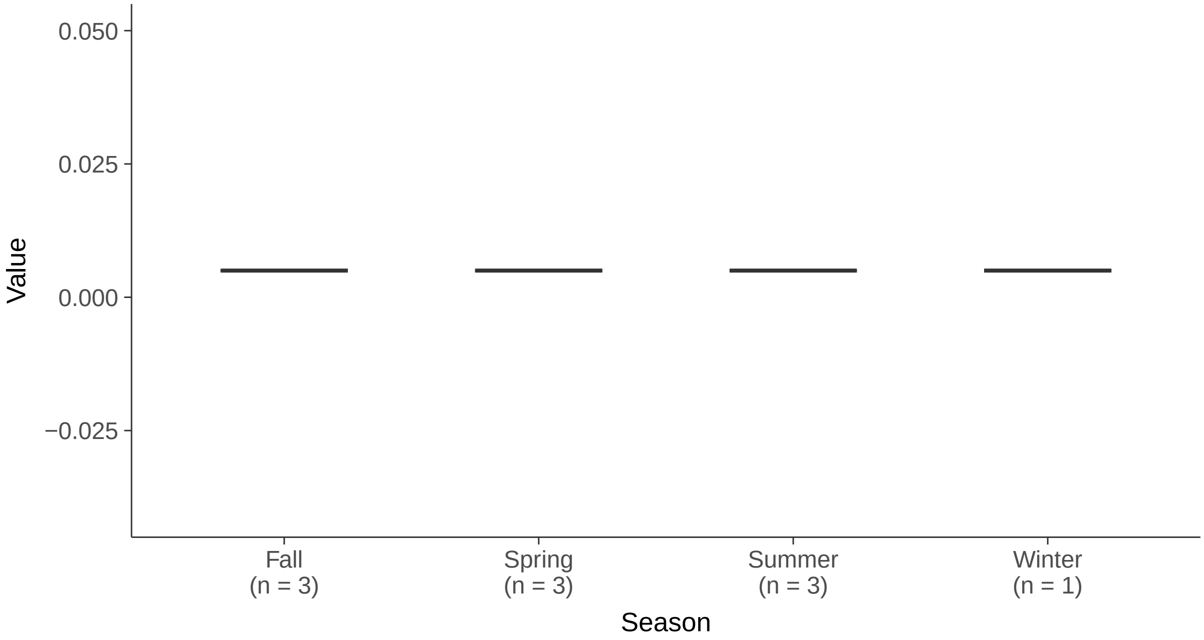
Boxplot

Chromium, MW-7B (mg/L)



Boxplot by Season

Chromium, MW-7B (mg/L)

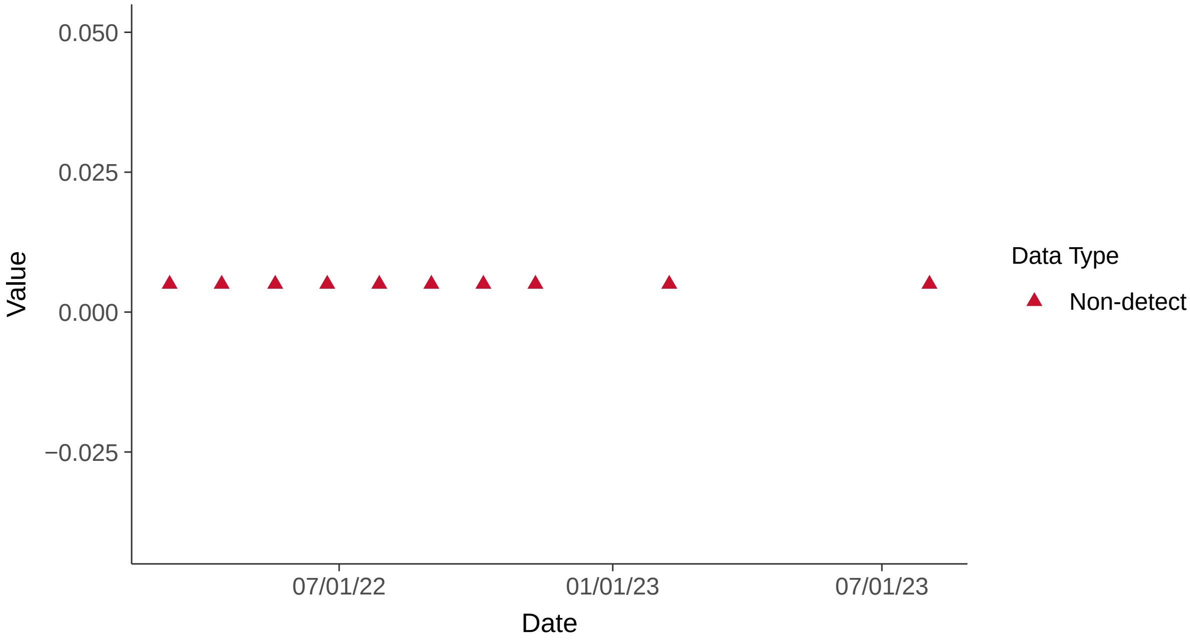


Appendix IV: Cobalt, MW-7B

ID: 7B_2_14

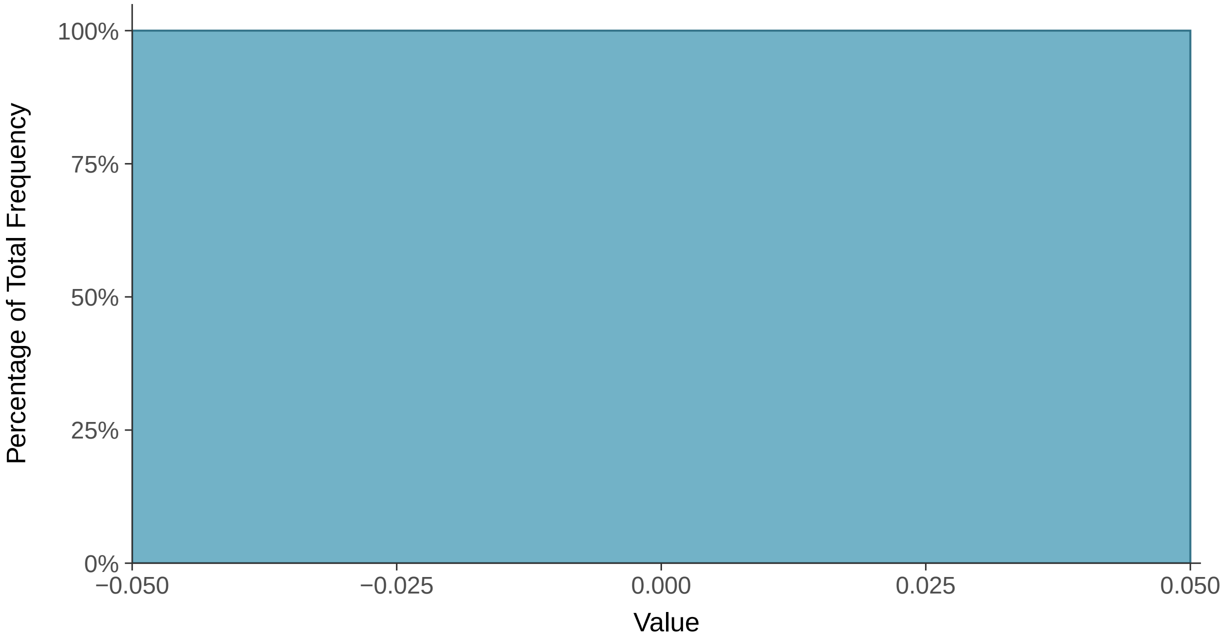
Scatter Plot

Cobalt, MW-7B (mg/L)



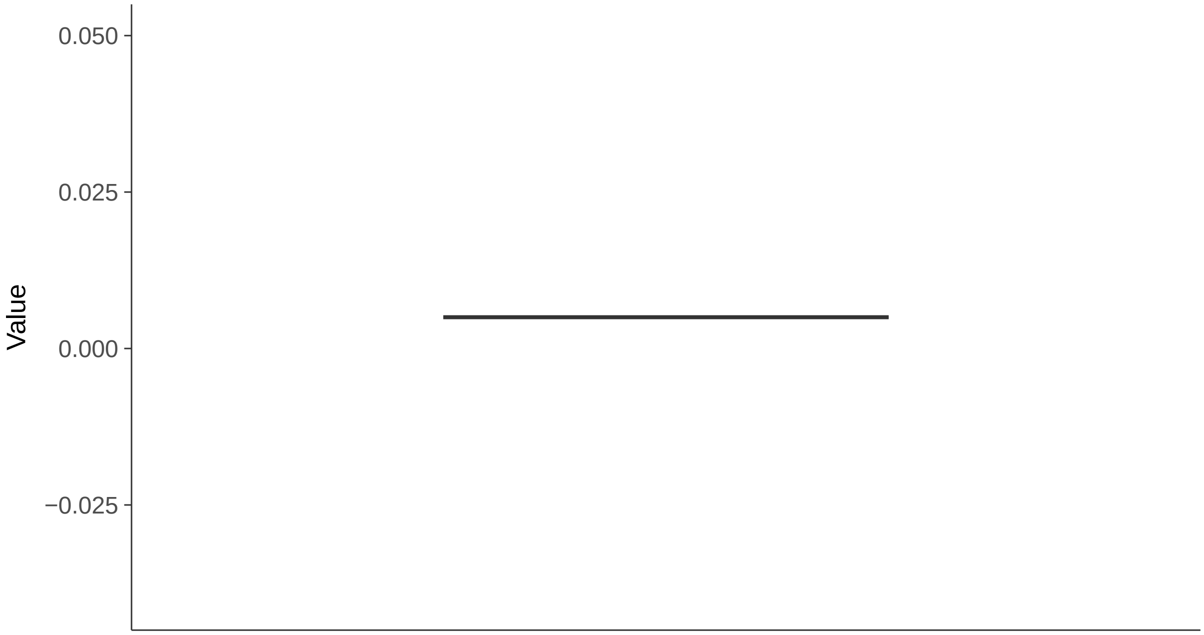
Histogram

Cobalt, MW-7B (mg/L)



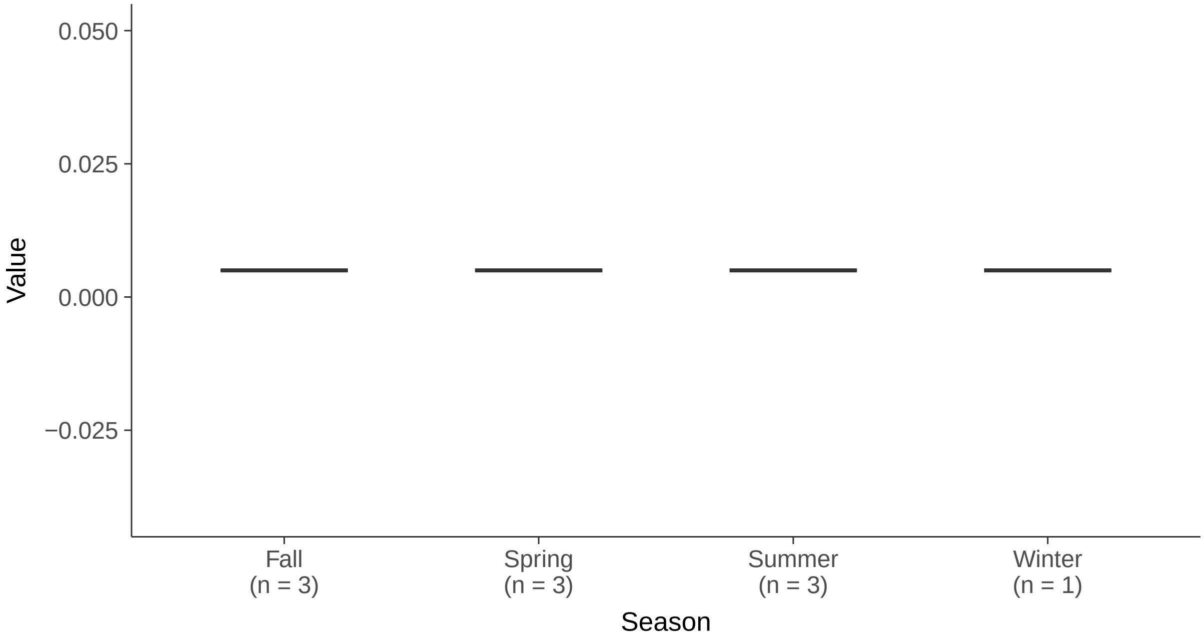
Boxplot

Cobalt, MW-7B (mg/L)



Boxplot by Season

Cobalt, MW-7B (mg/L)

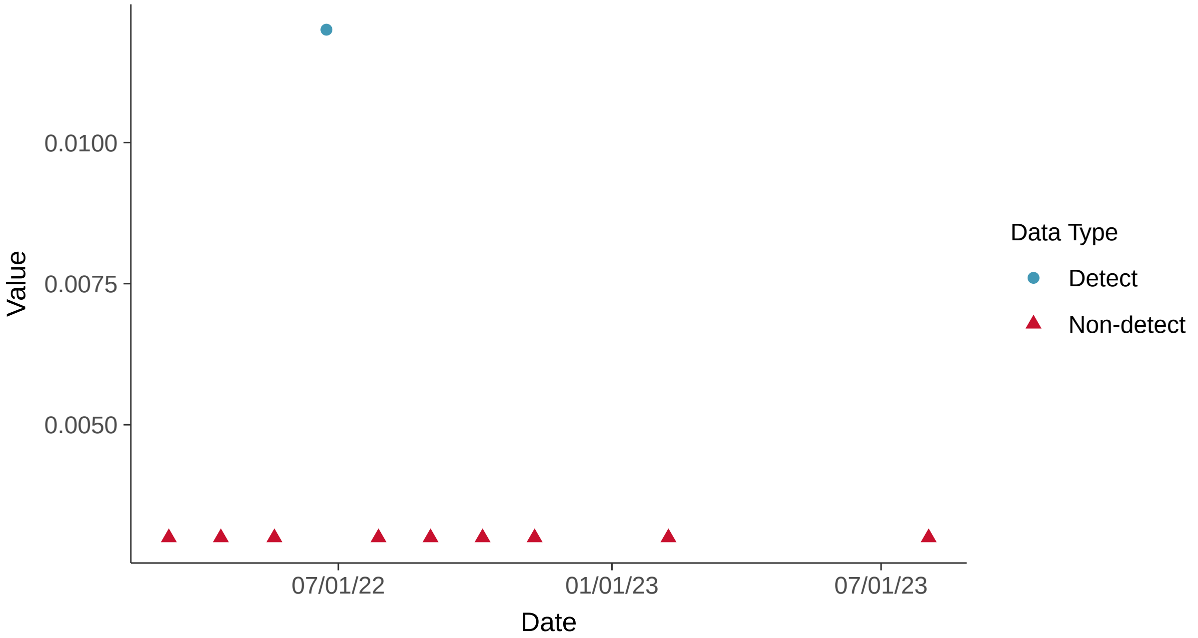


Appendix IV: Lead, MW-7B

ID: 7B_2_15

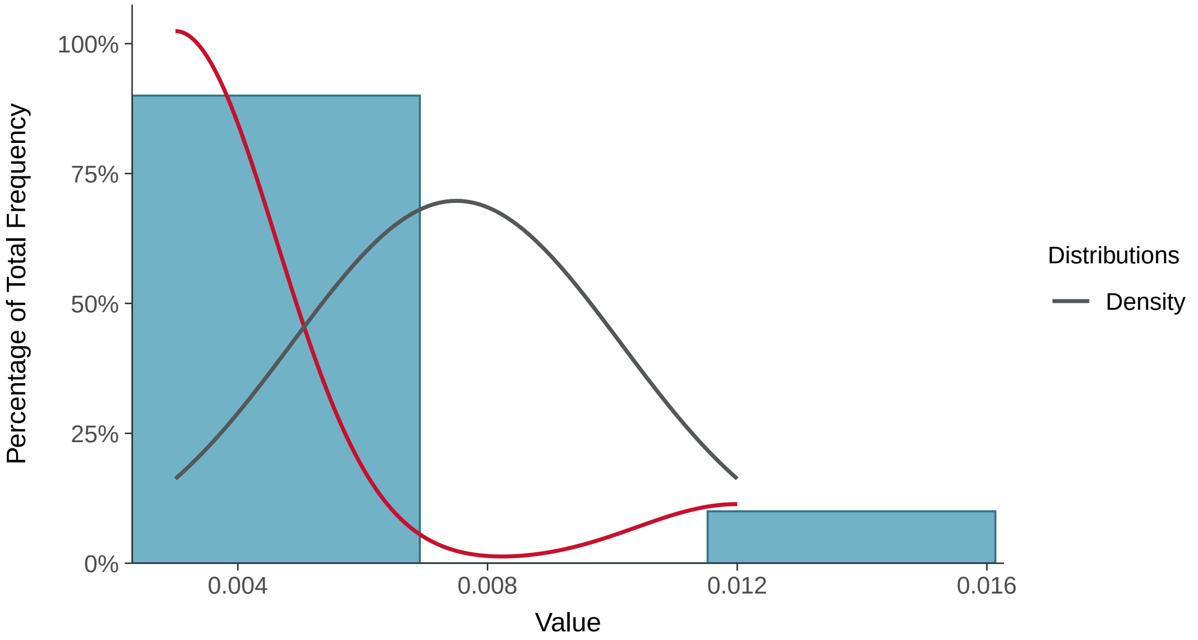
Scatter Plot

Lead, MW-7B (mg/L)



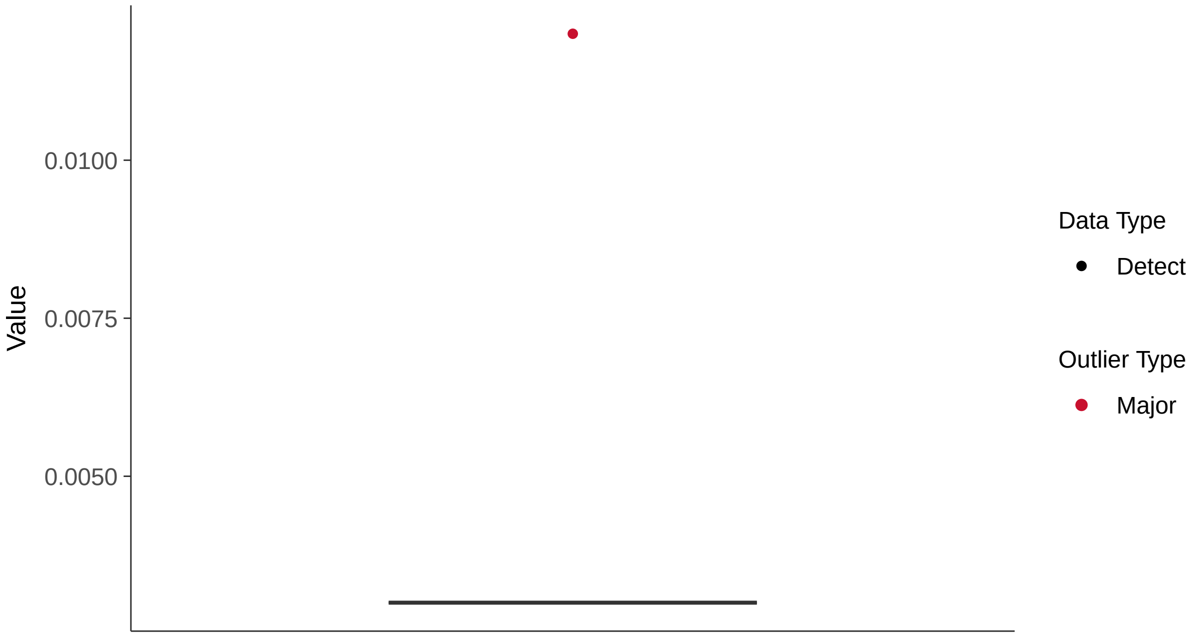
Histogram

Lead, MW-7B (mg/L)



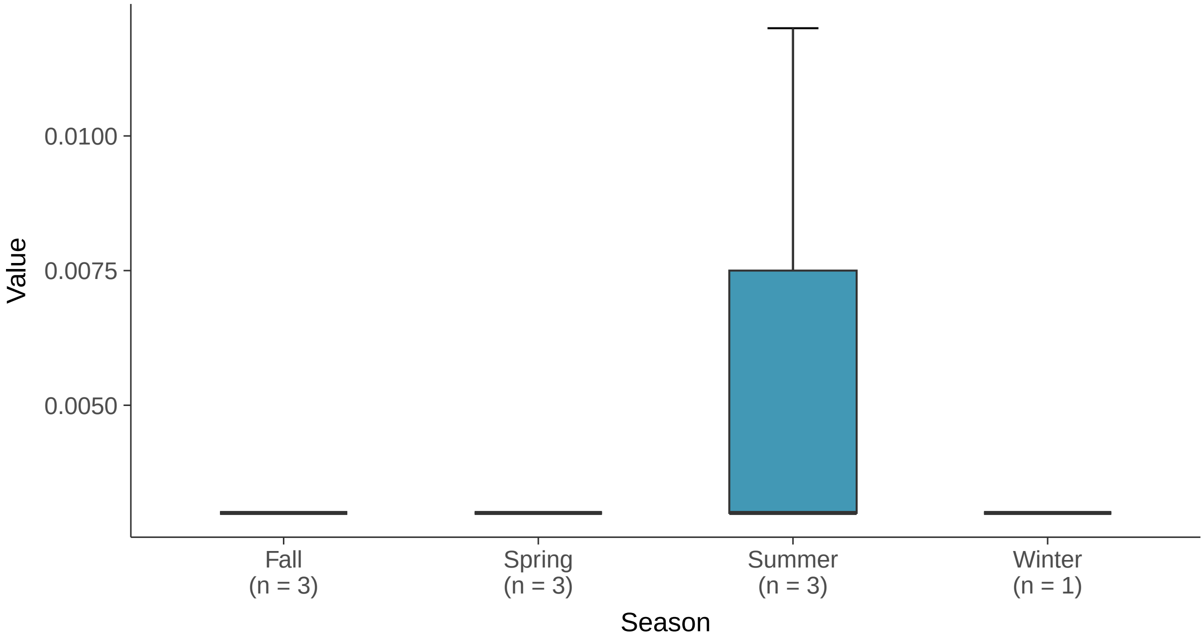
Boxplot

Lead, MW-7B (mg/L)



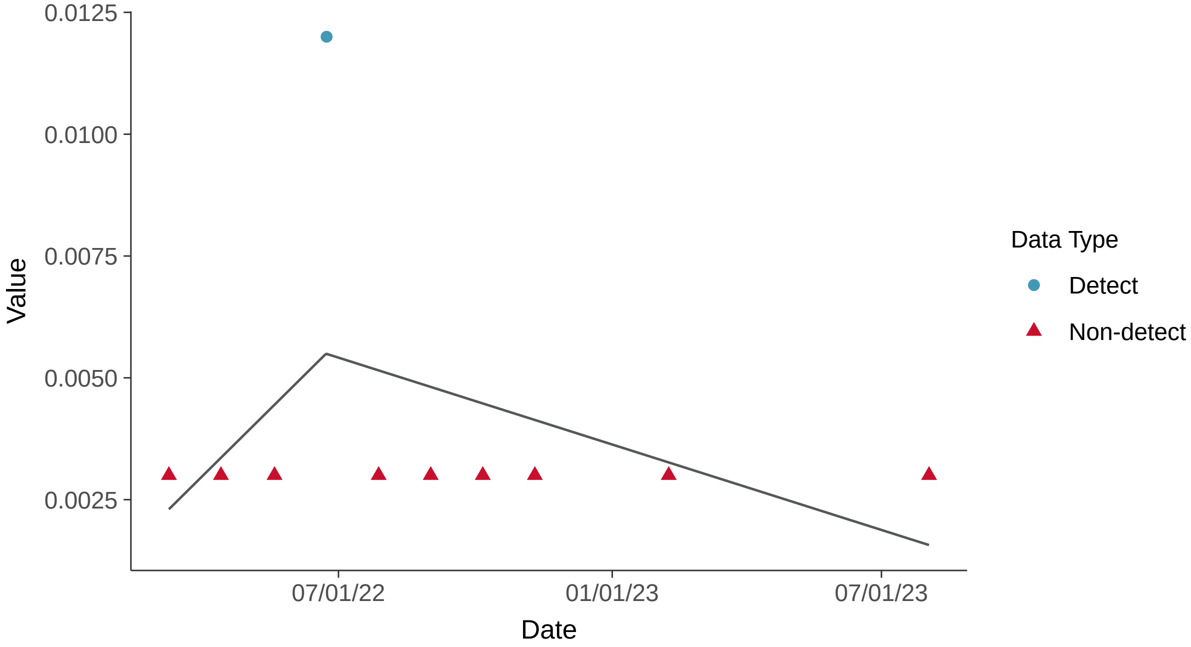
Boxplot by Season

Lead, MW-7B (mg/L)



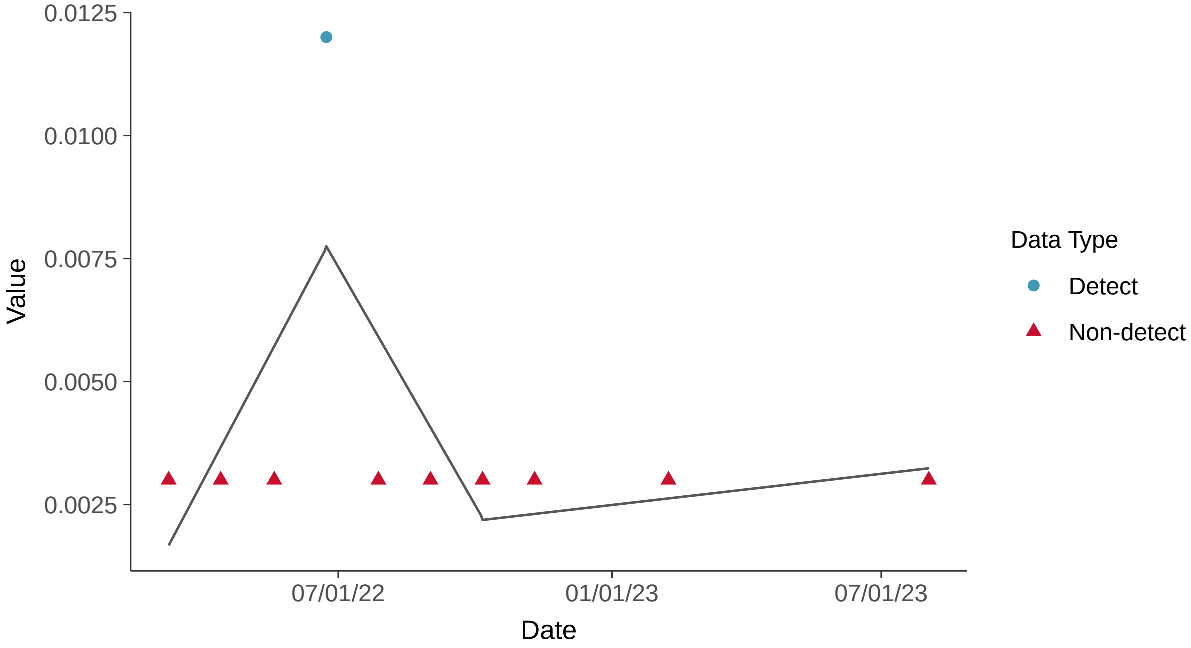
Trend Regression: Piecewise Linear-Linear

Lead, MW-7B (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Lead, MW-7B (mg/L)

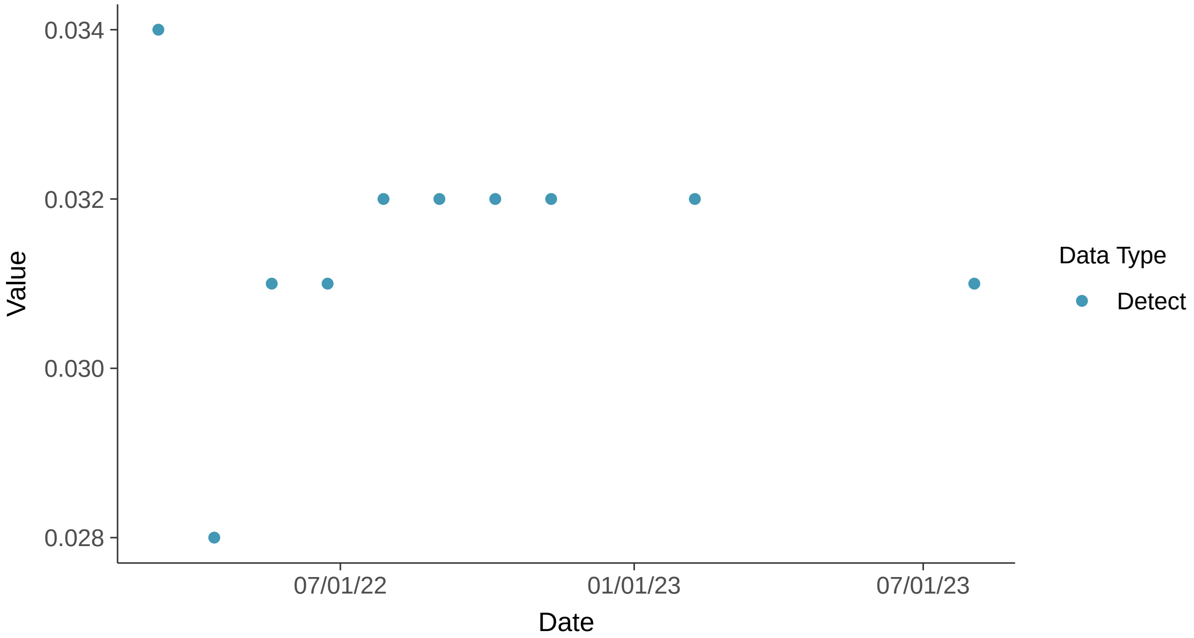


Appendix IV: Lithium, MW-7B

ID: 7B_2_16

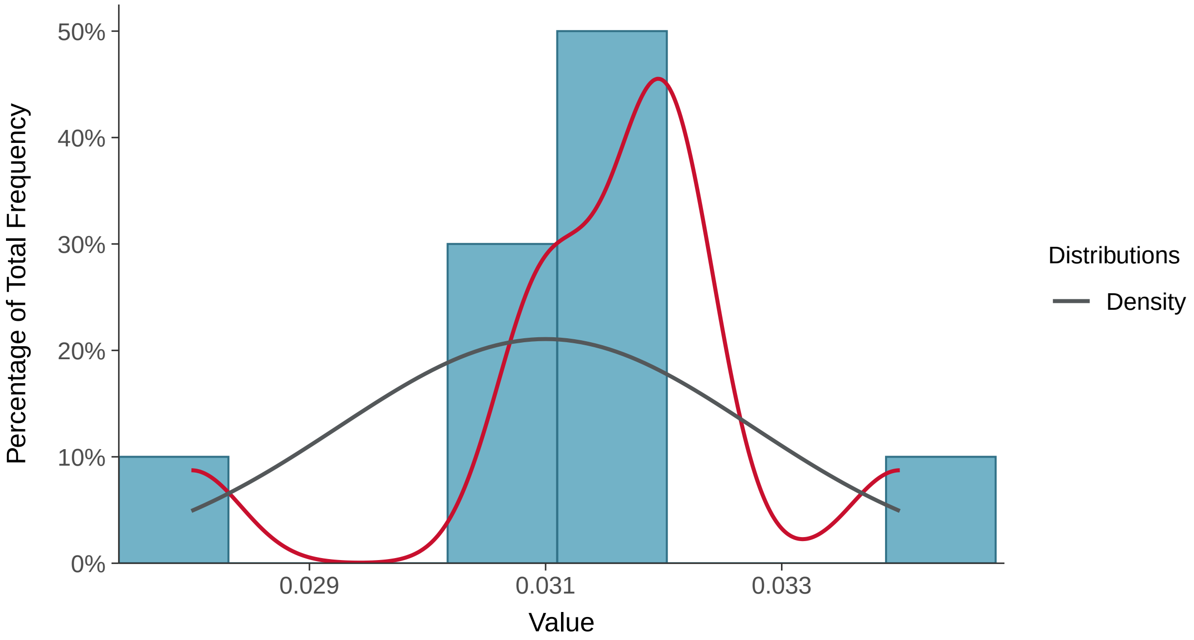
Scatter Plot

Lithium, MW-7B (mg/L)



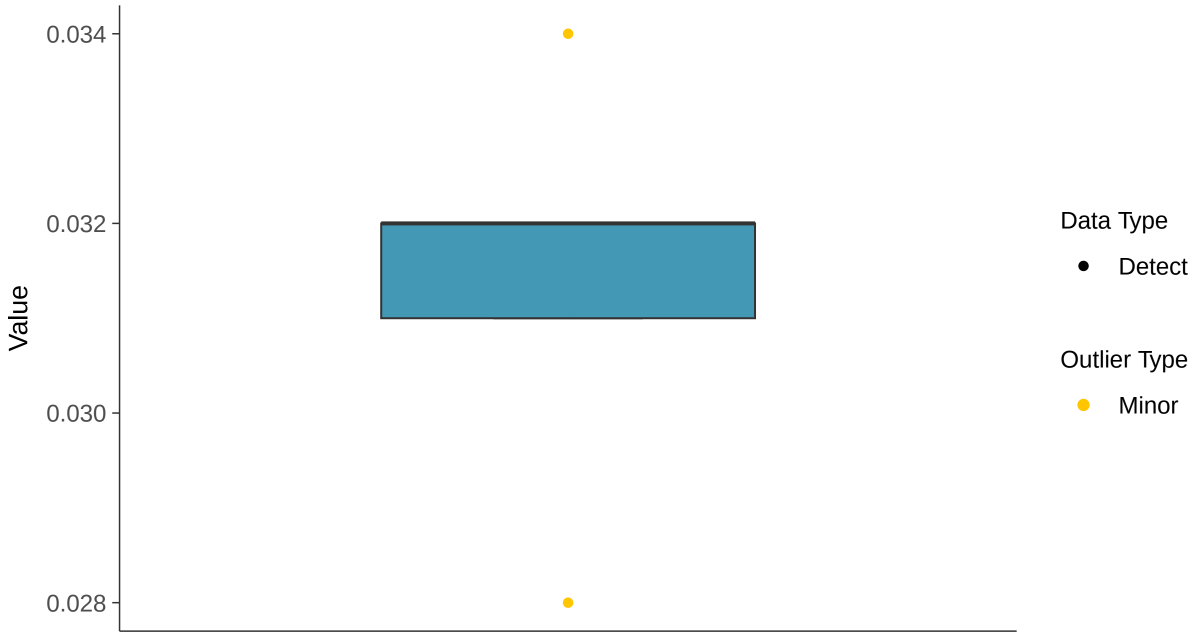
Histogram

Lithium, MW-7B (mg/L)



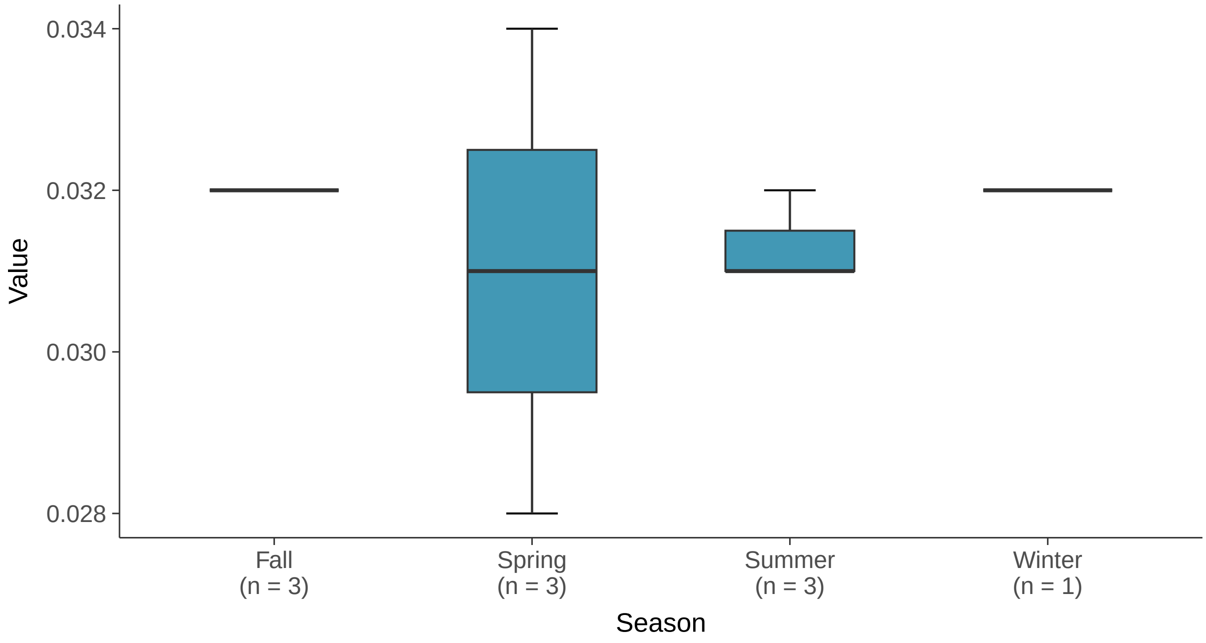
Boxplot

Lithium, MW-7B (mg/L)



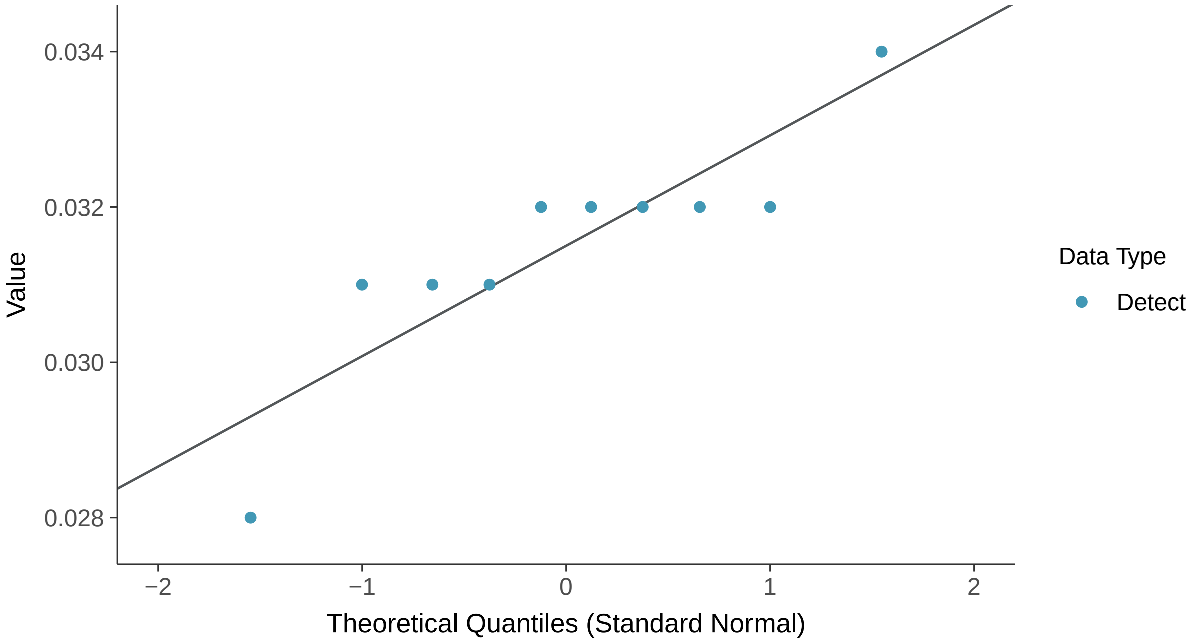
Boxplot by Season

Lithium, MW-7B (mg/L)



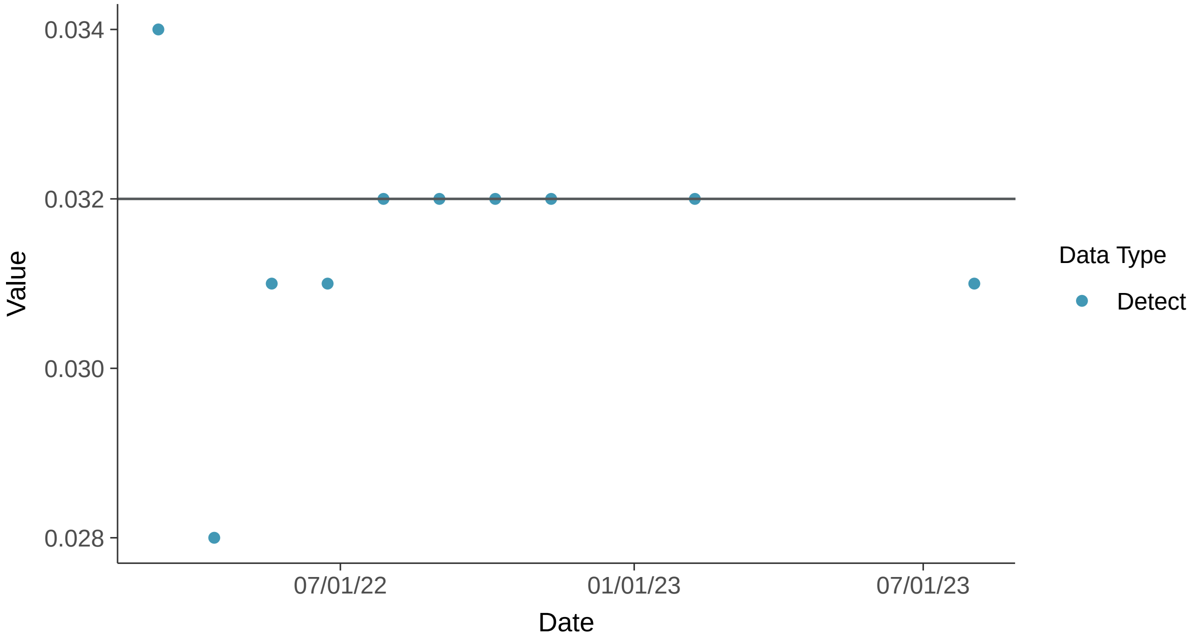
Normal Q-Q plot

Lithium, MW-7B (mg/L)



Trend Regression: Mann-Kendall/Theil-Sen Estimate

Lithium, MW-7B (mg/L)

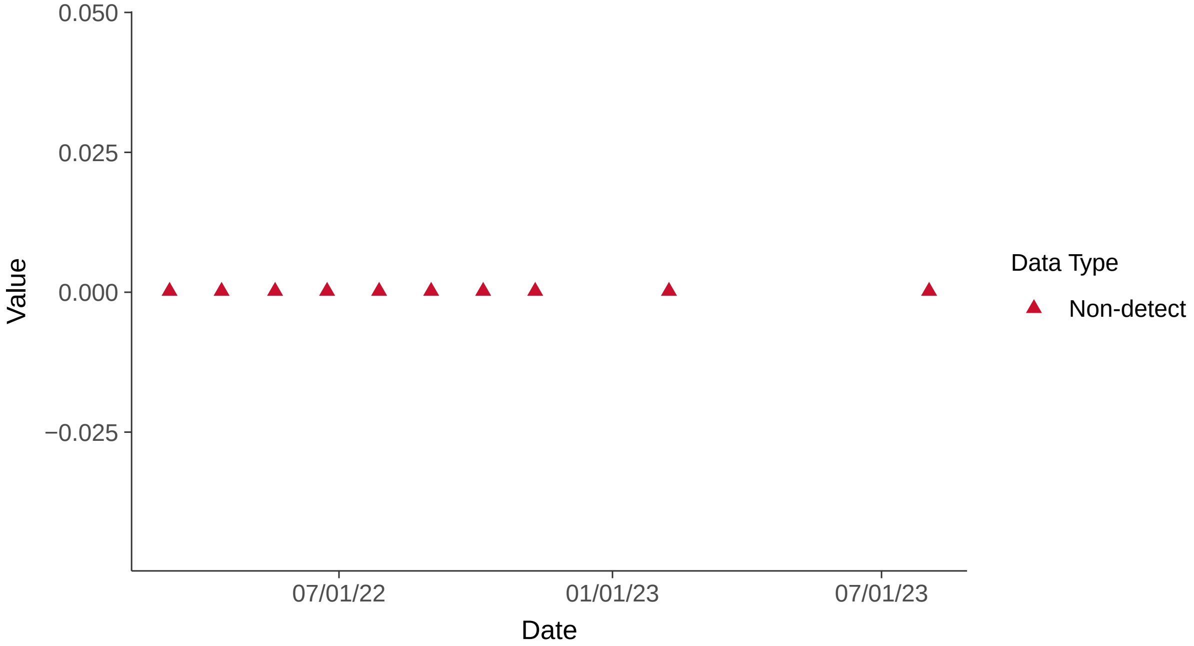


Appendix IV: Mercury, MW-7B

ID: 7B_2_17

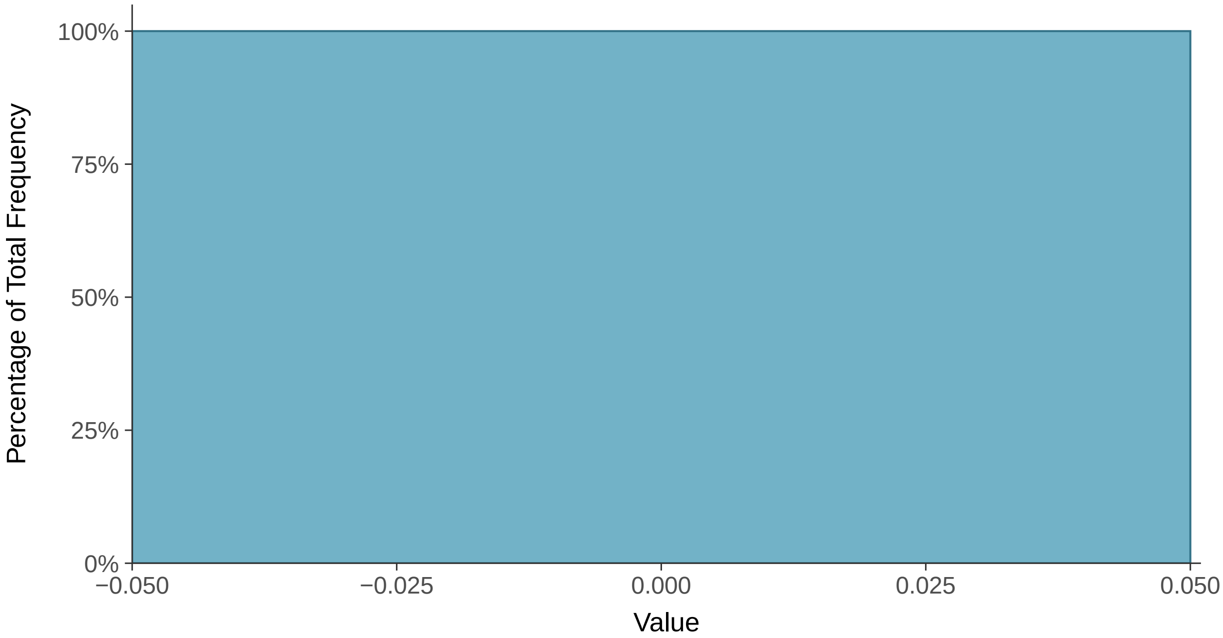
Scatter Plot

Mercury, MW-7B (mg/L)



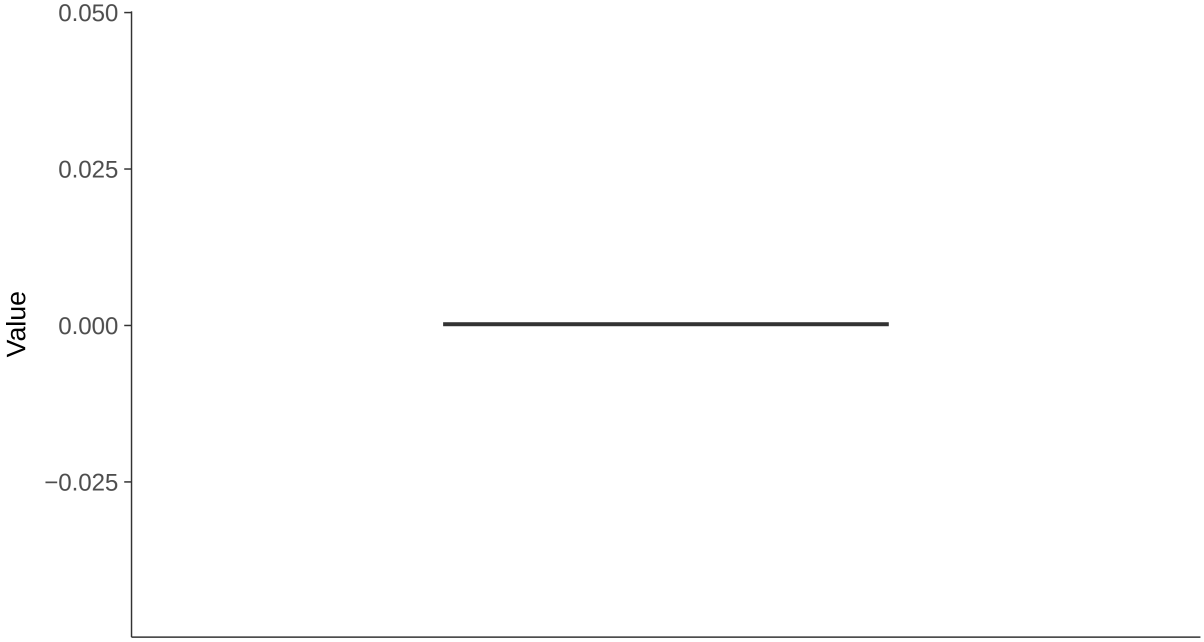
Histogram

Mercury, MW-7B (mg/L)



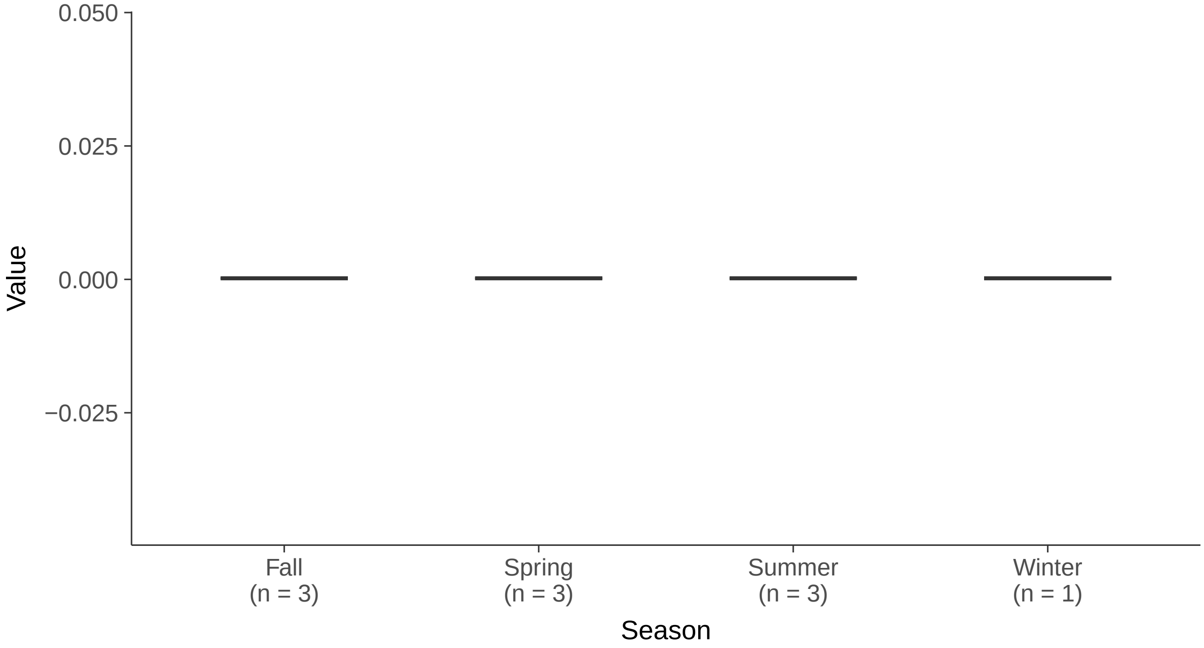
Boxplot

Mercury, MW-7B (mg/L)



Boxplot by Season

Mercury, MW-7B (mg/L)

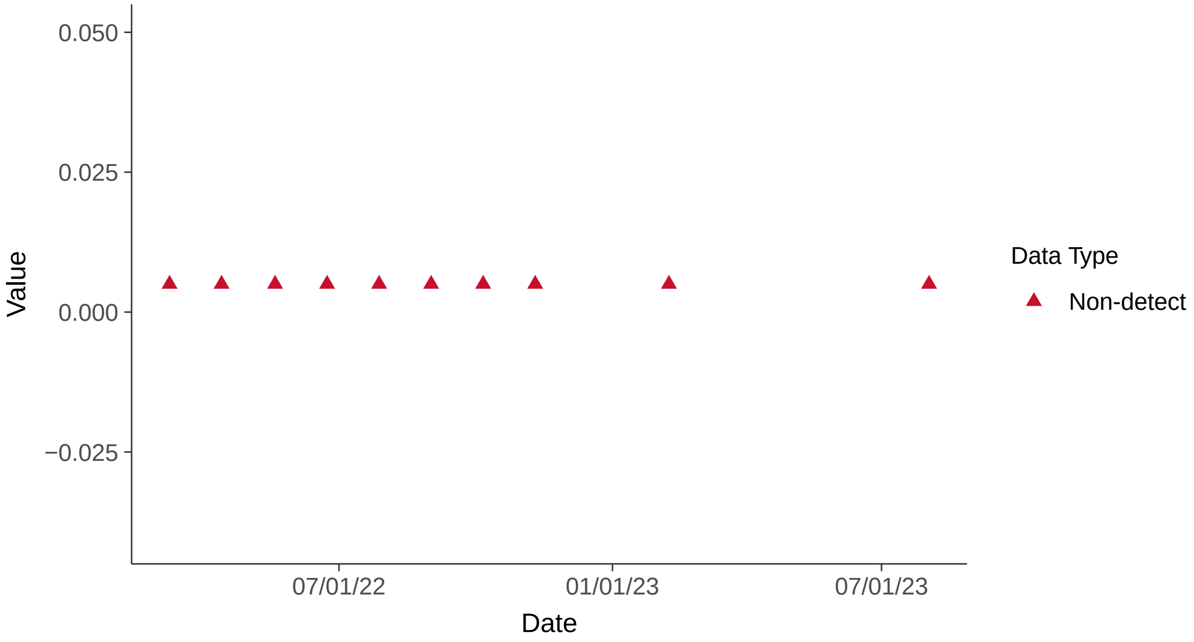


Appendix IV: Molybdenum, MW-7B

ID: 7B_2_18

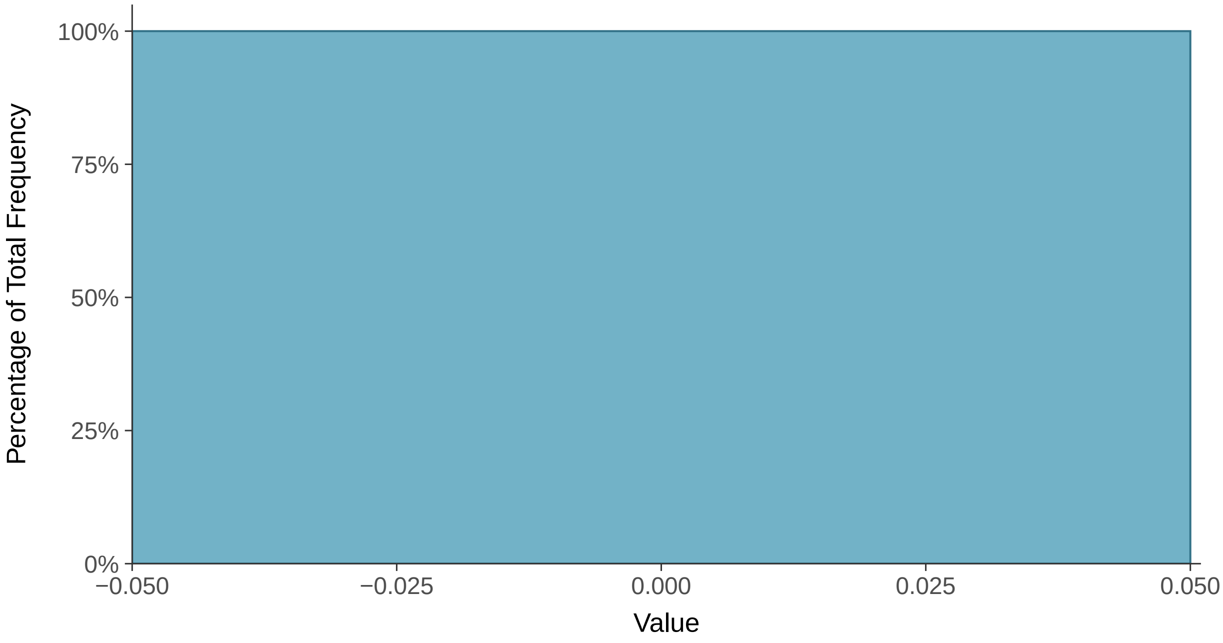
Scatter Plot

Molybdenum, MW-7B (mg/L)



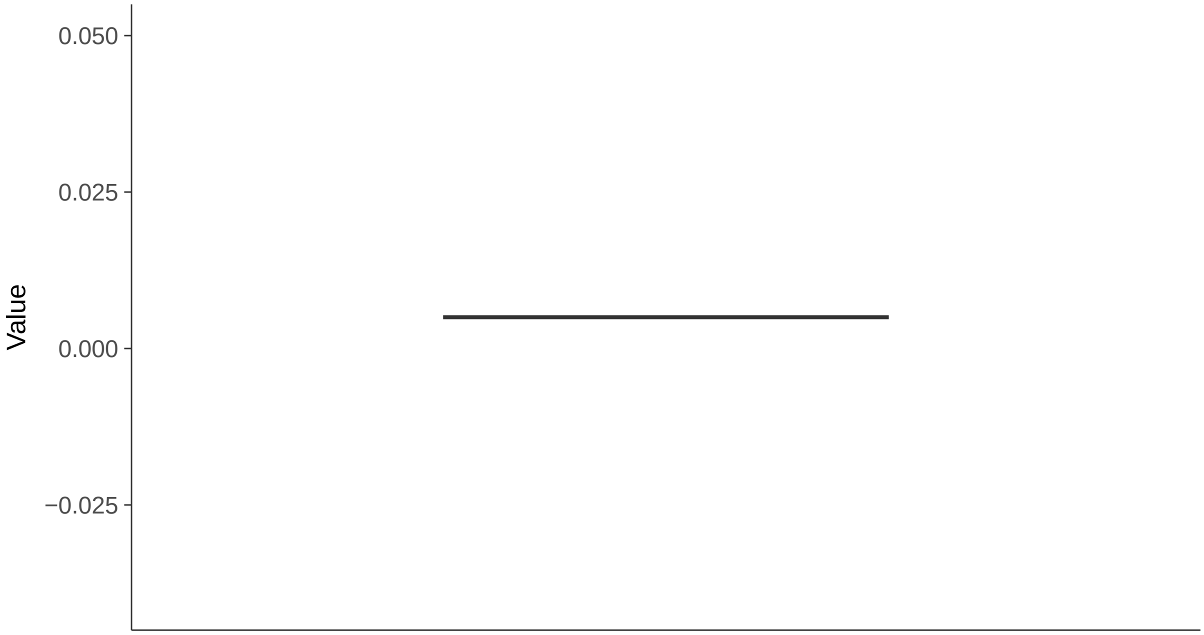
Histogram

Molybdenum, MW-7B (mg/L)



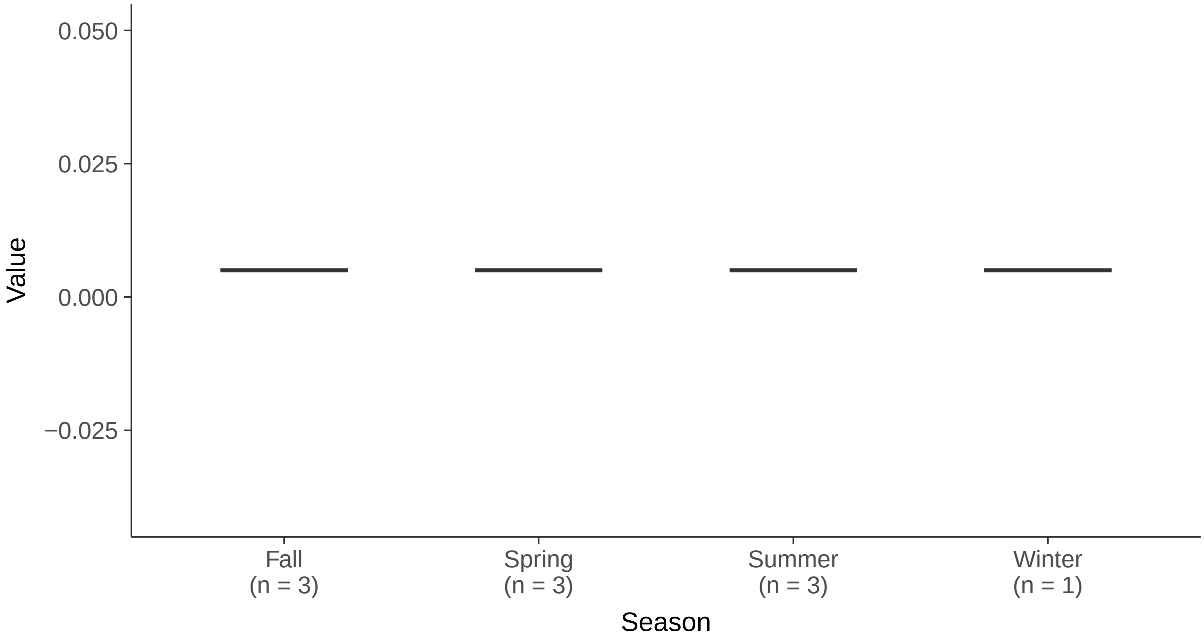
Boxplot

Molybdenum, MW-7B (mg/L)



Boxplot by Season

Molybdenum, MW-7B (mg/L)

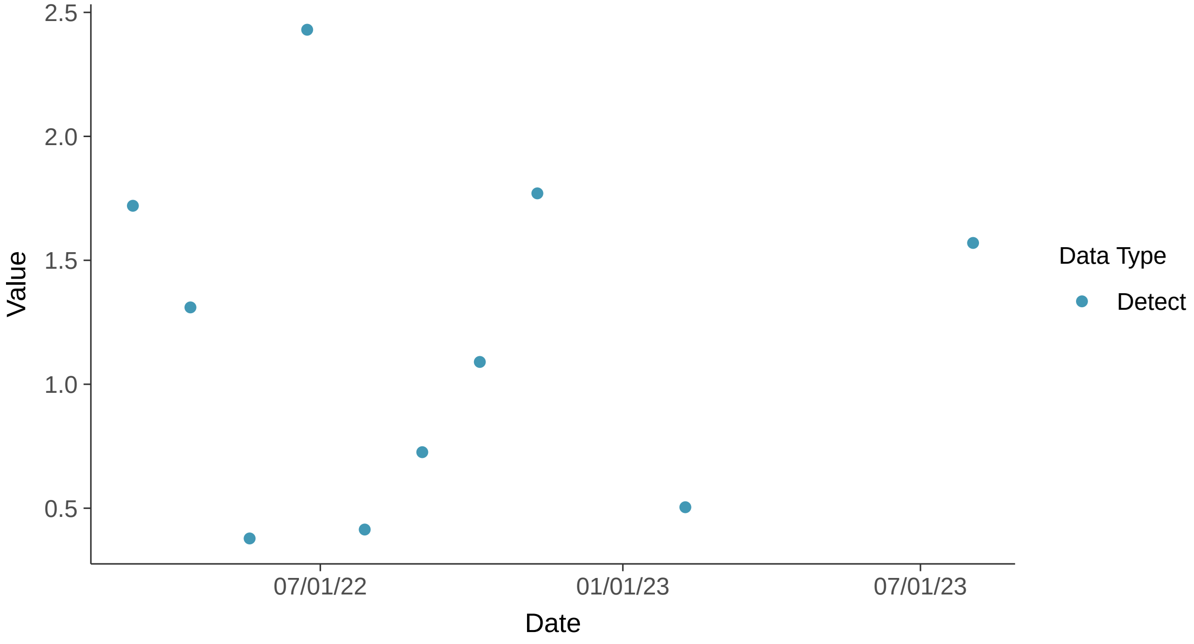


Appendix IV: Radium-226/228, MW-7B

ID: 7B_2_20

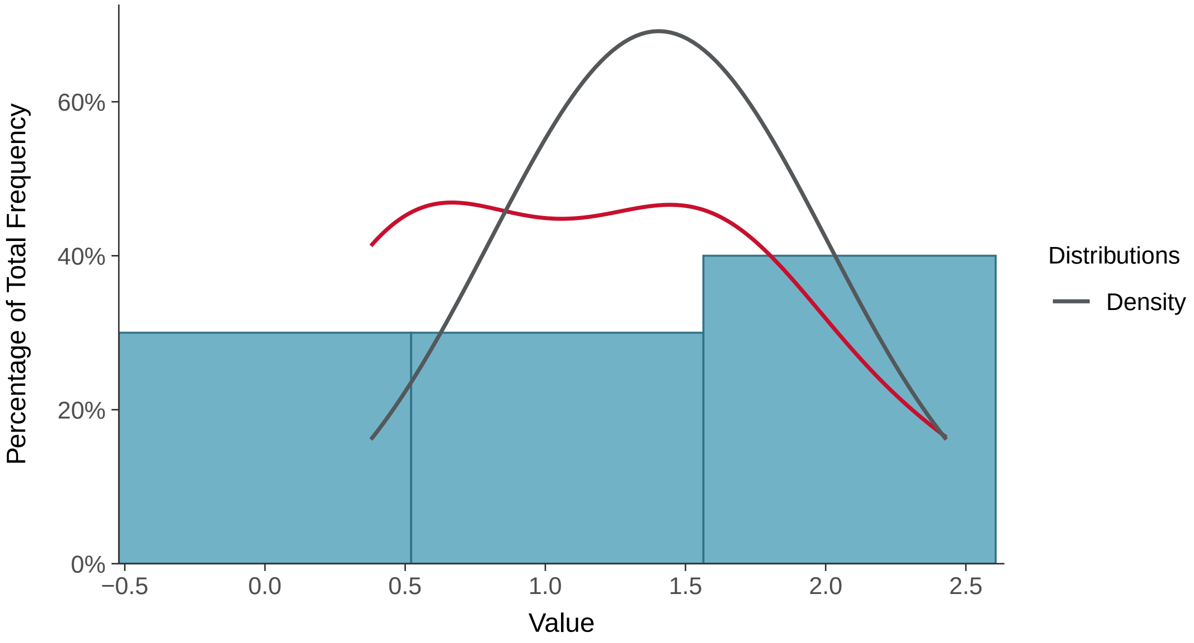
Scatter Plot

Radium-226/228, MW-7B (pCi/L)



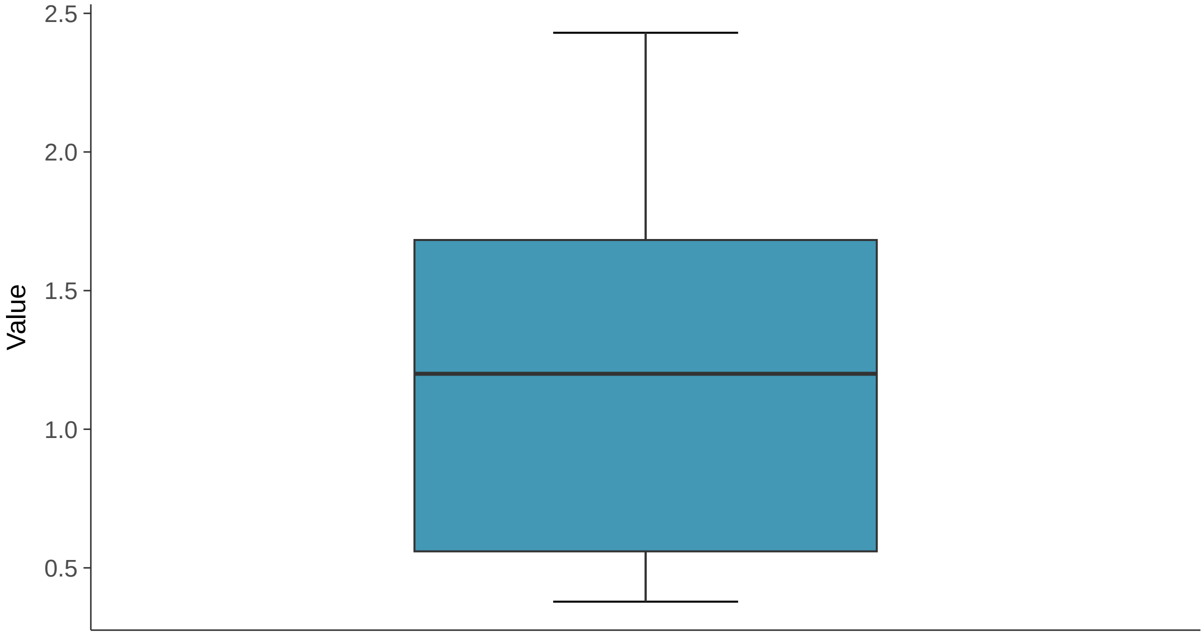
Histogram

Radium-226/228, MW-7B (pCi/L)



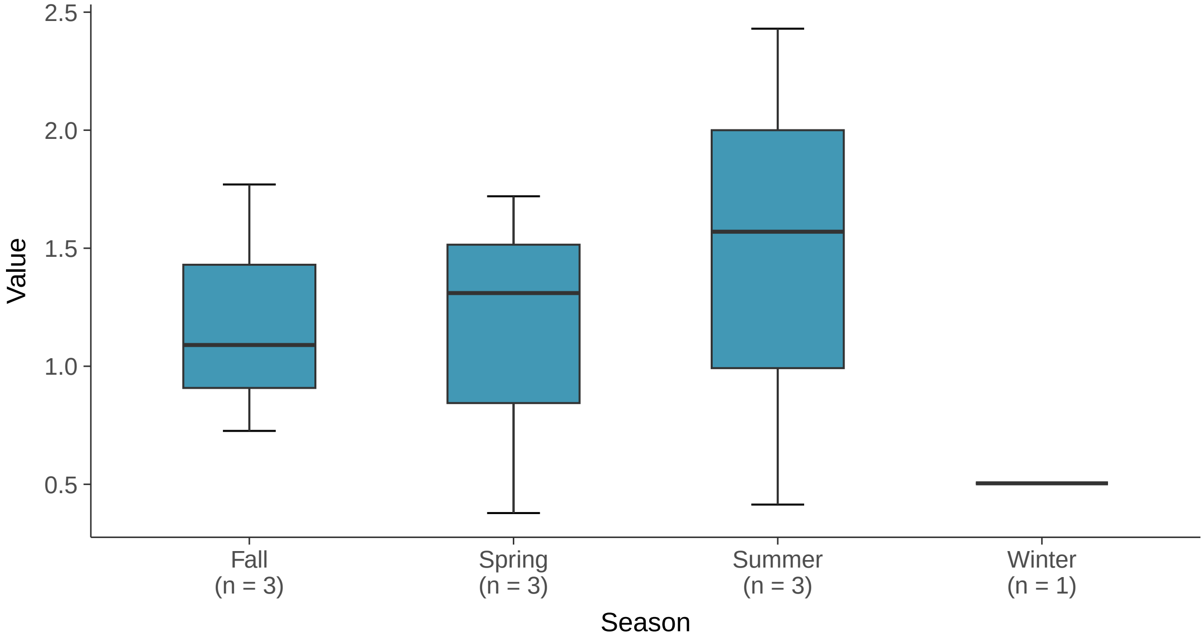
Boxplot

Radium-226/228, MW-7B (pCi/L)



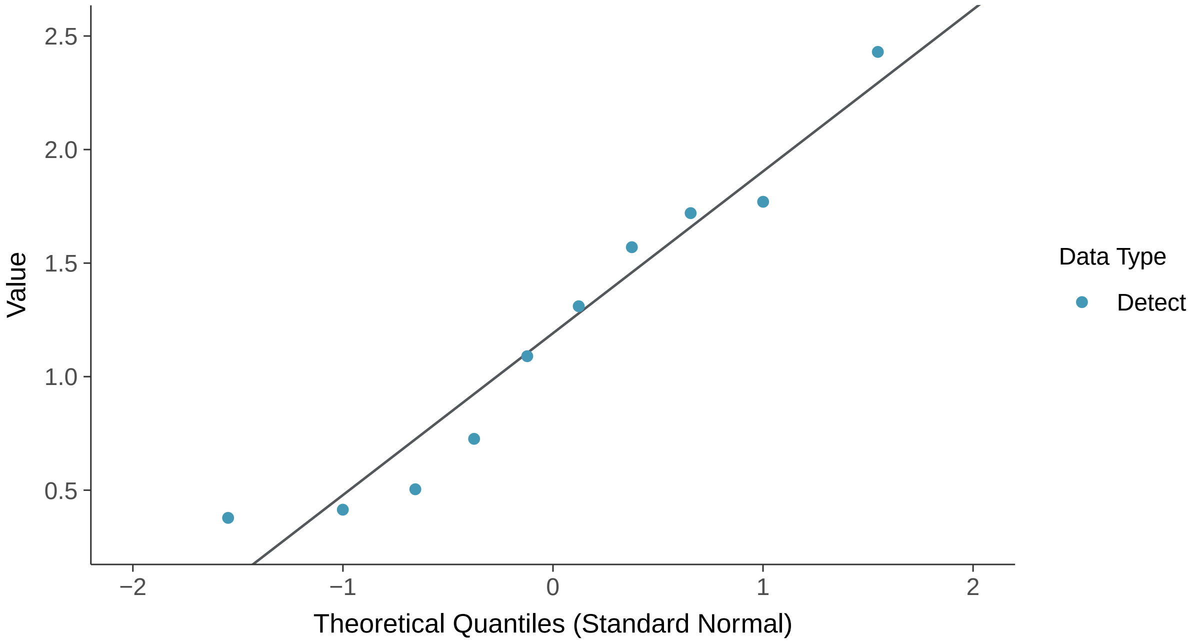
Boxplot by Season

Radium-226/228, MW-7B (pCi/L)



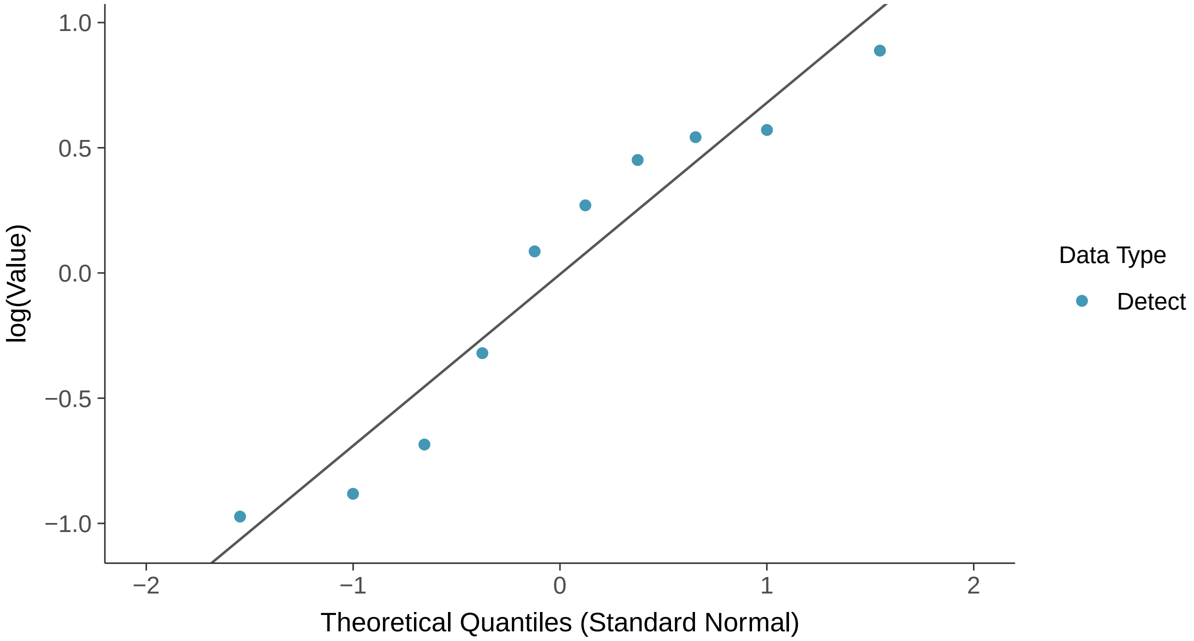
Normal Q-Q plot

Radium-226/228, MW-7B (pCi/L)



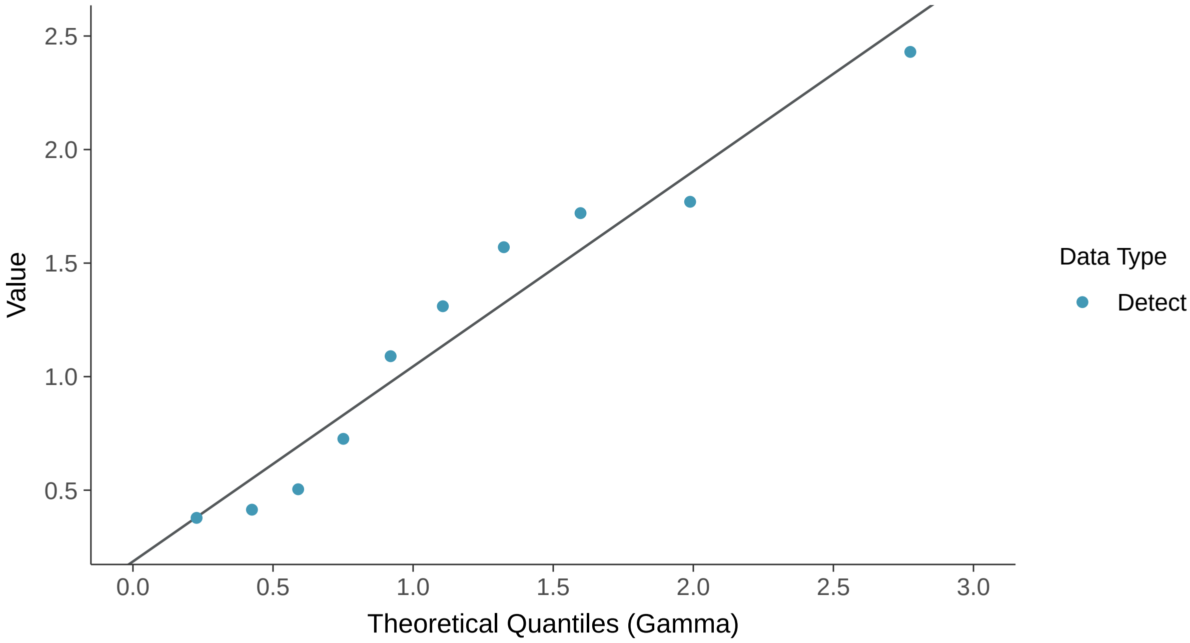
Lognormal Q-Q plot

Radium-226/228, MW-7B (pCi/L)



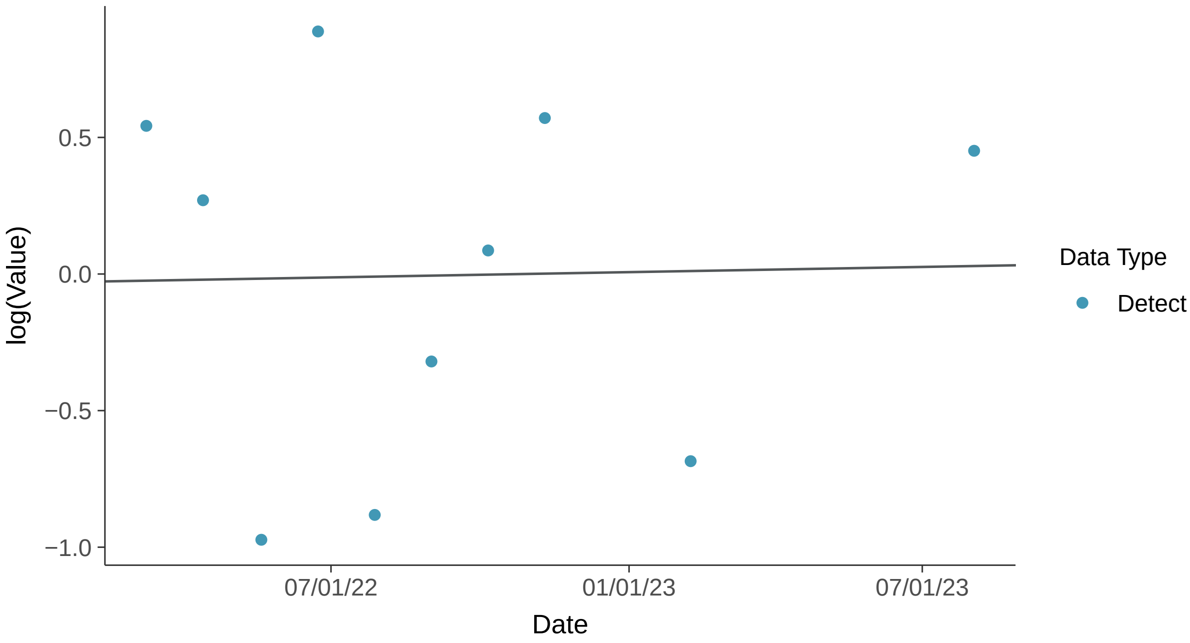
Gamma Q-Q plot

Radium-226/228, MW-7B (pCi/L)



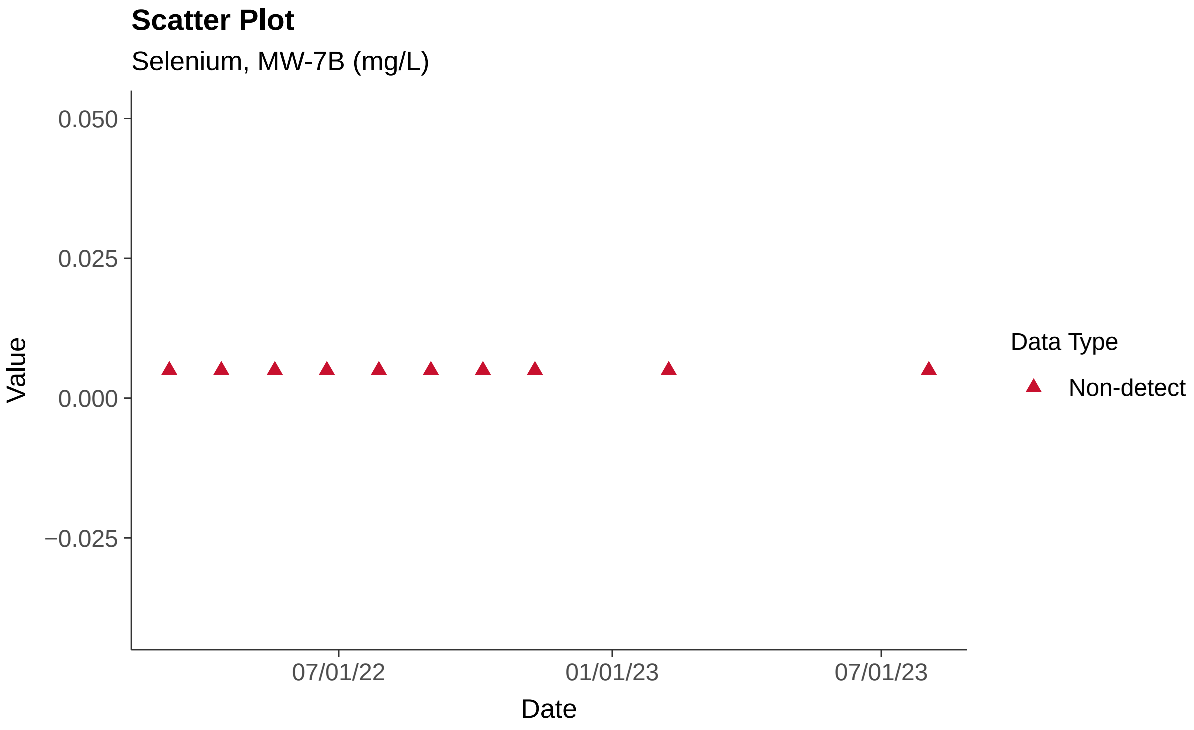
Trend Regression: Lognormal MLE

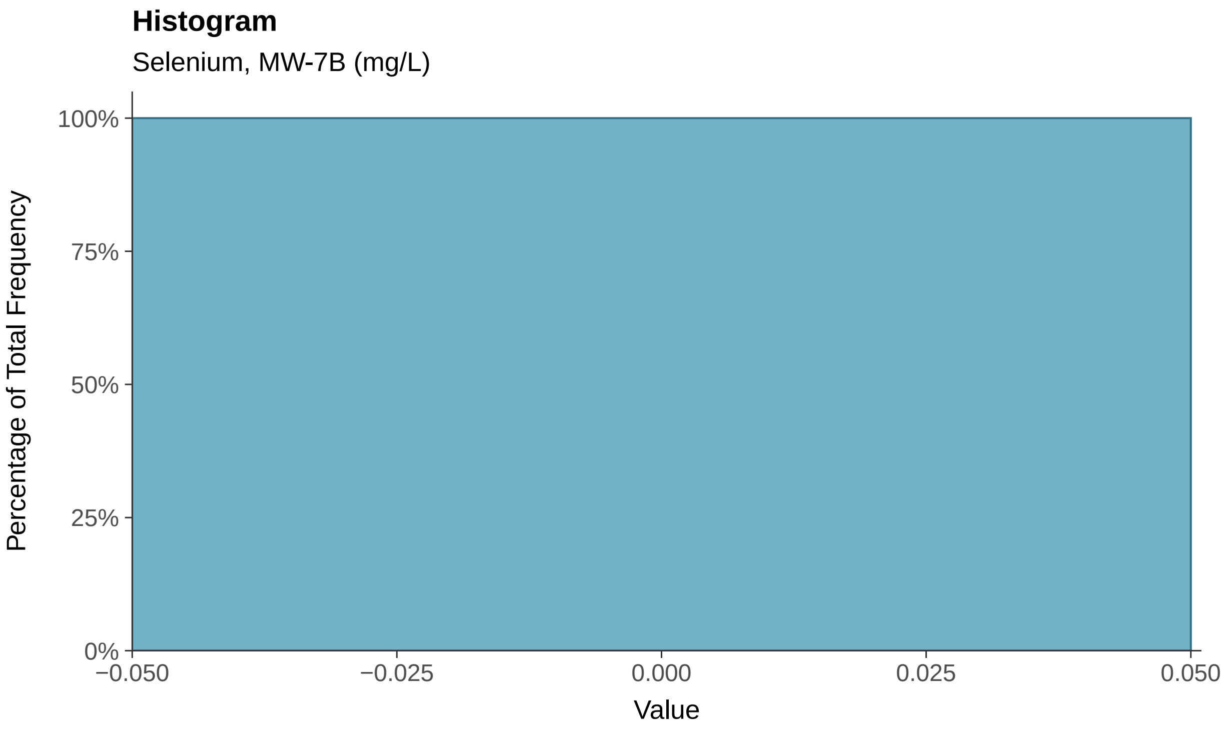
Radium-226/228, MW-7B (pCi/L)



Appendix IV: Selenium, MW-7B

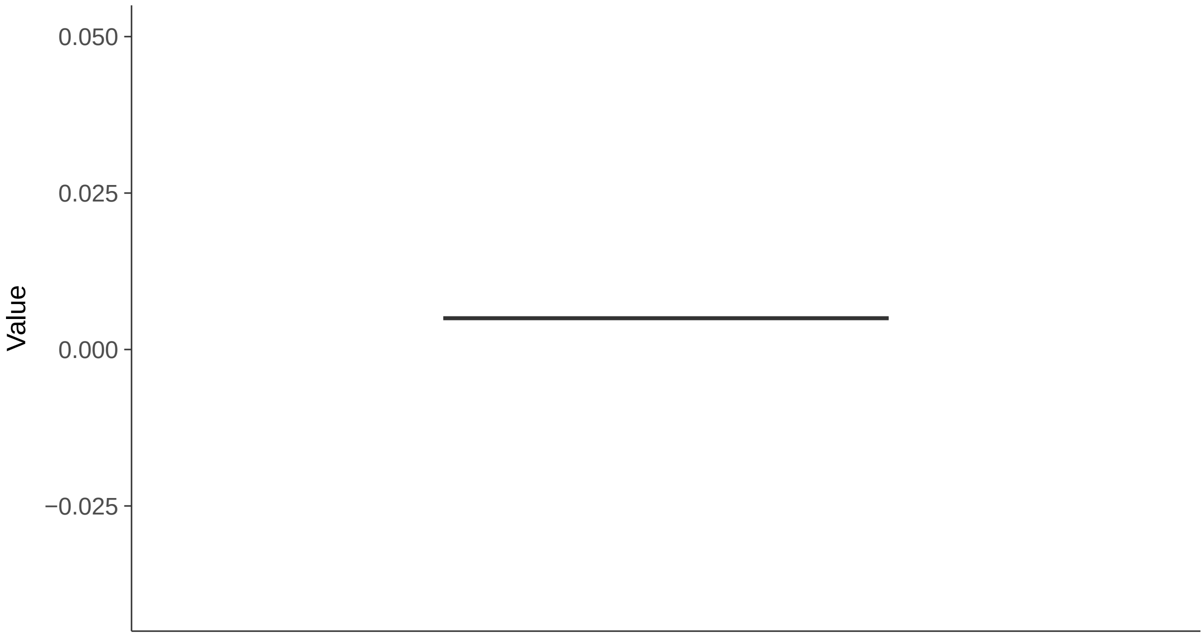
ID: 7B_2_22





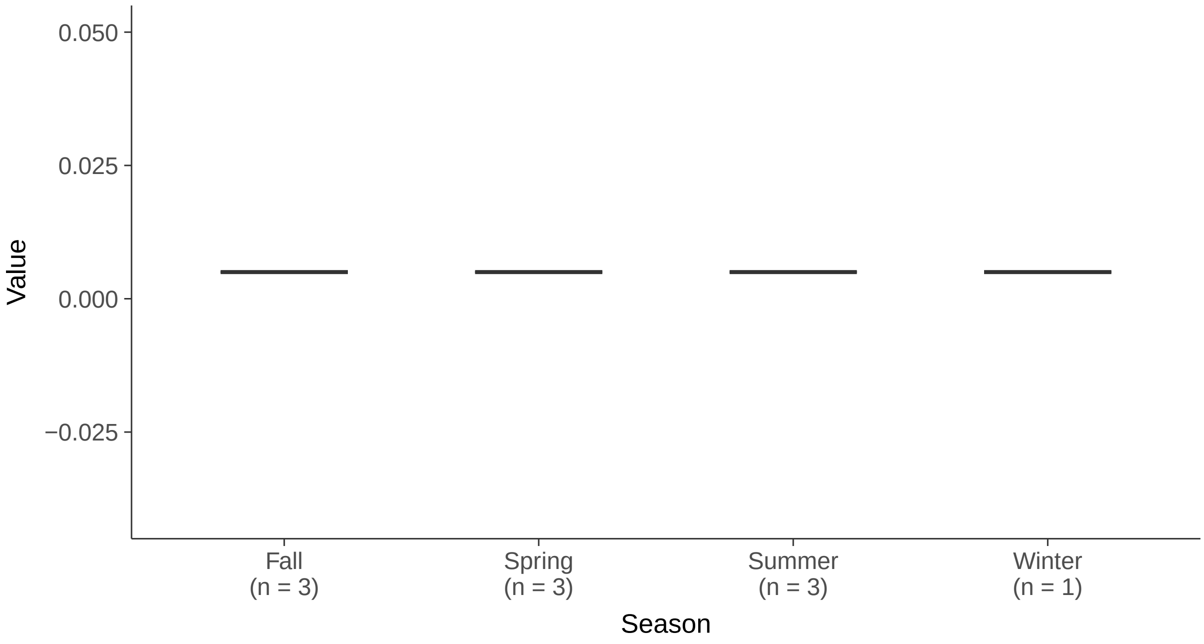
Boxplot

Selenium, MW-7B (mg/L)



Boxplot by Season

Selenium, MW-7B (mg/L)

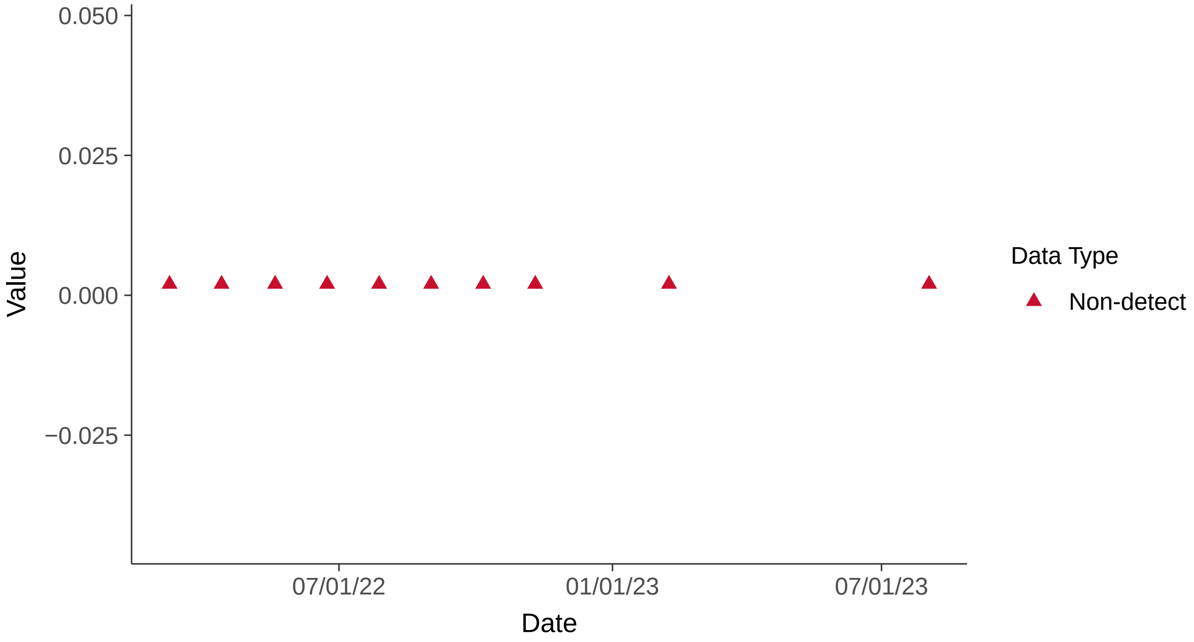


Appendix IV: Thallium, MW-7B

ID: 7B_2_23

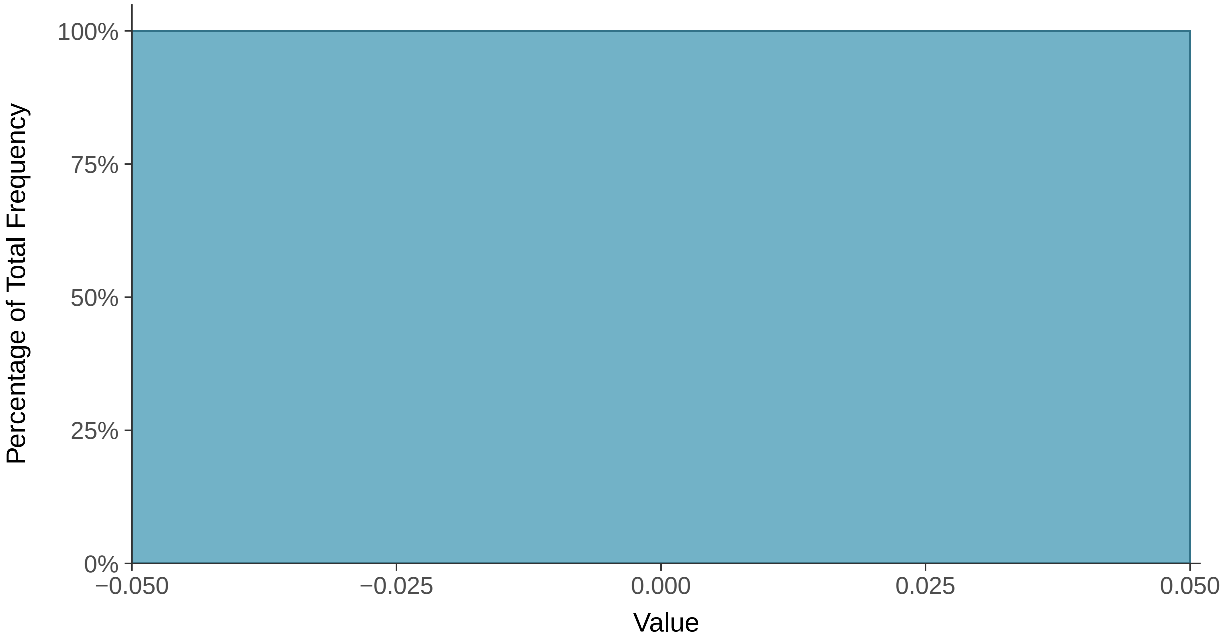
Scatter Plot

Thallium, MW-7B (mg/L)



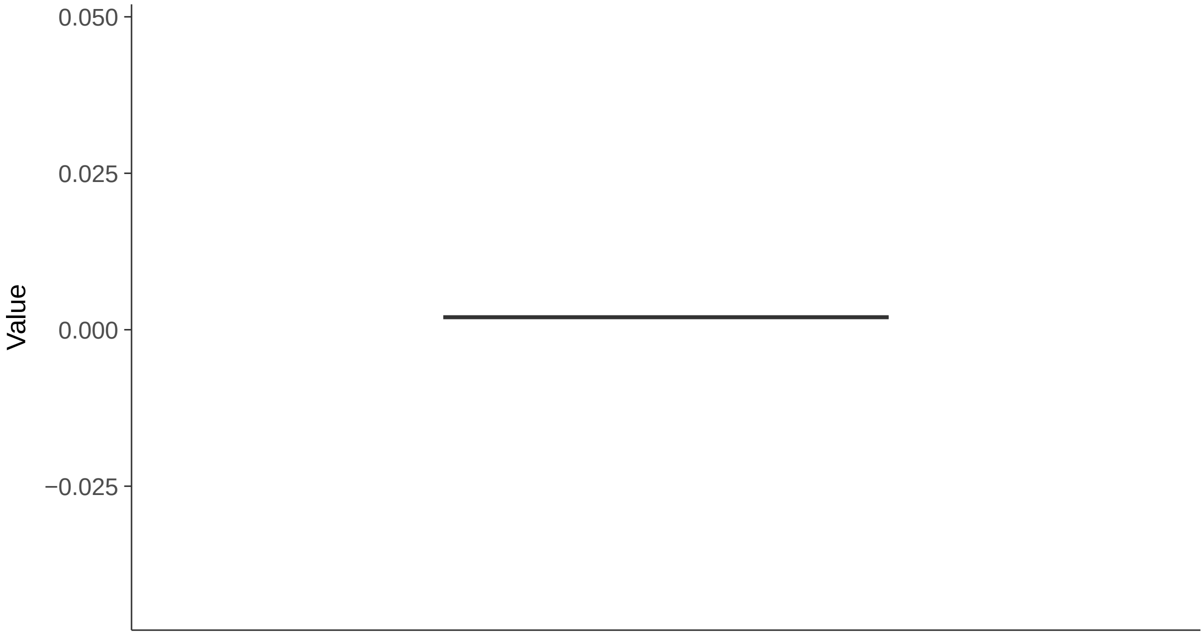
Histogram

Thallium, MW-7B (mg/L)



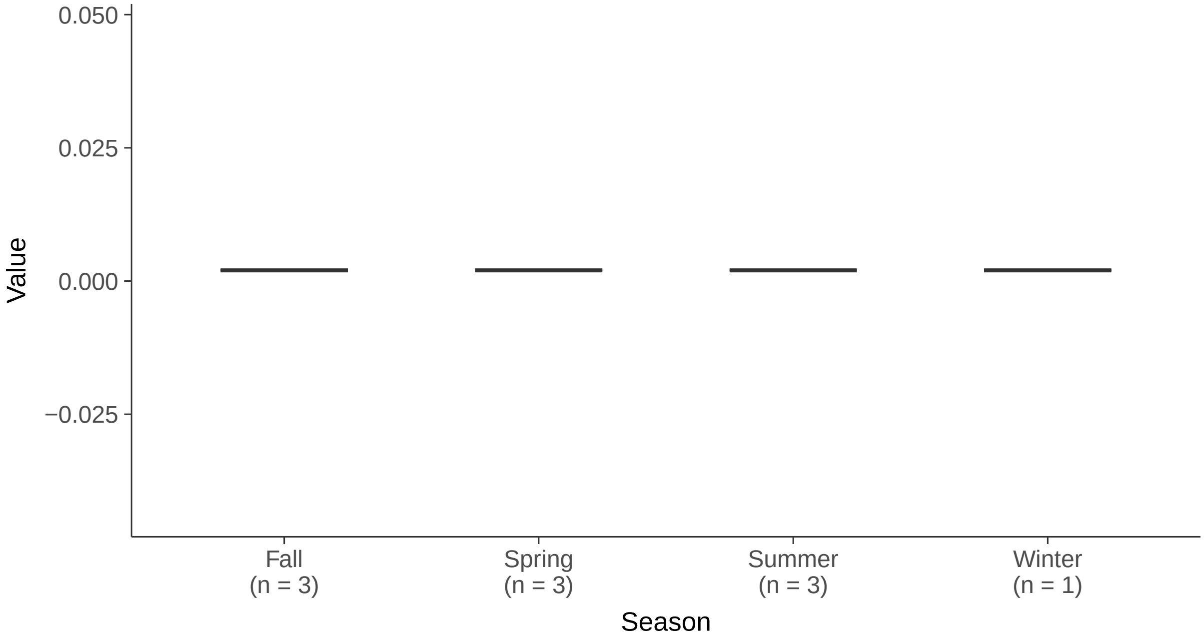
Boxplot

Thallium, MW-7B (mg/L)



Boxplot by Season

Thallium, MW-7B (mg/L)

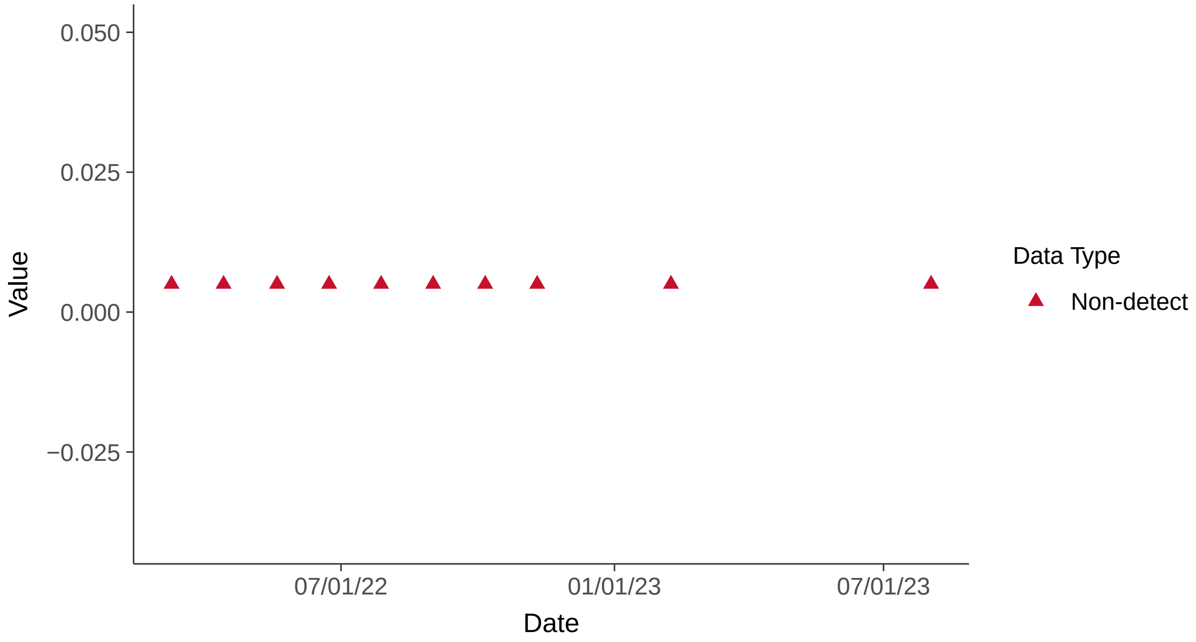


Part 115: Copper, MW-7B

ID: 7B_5_37

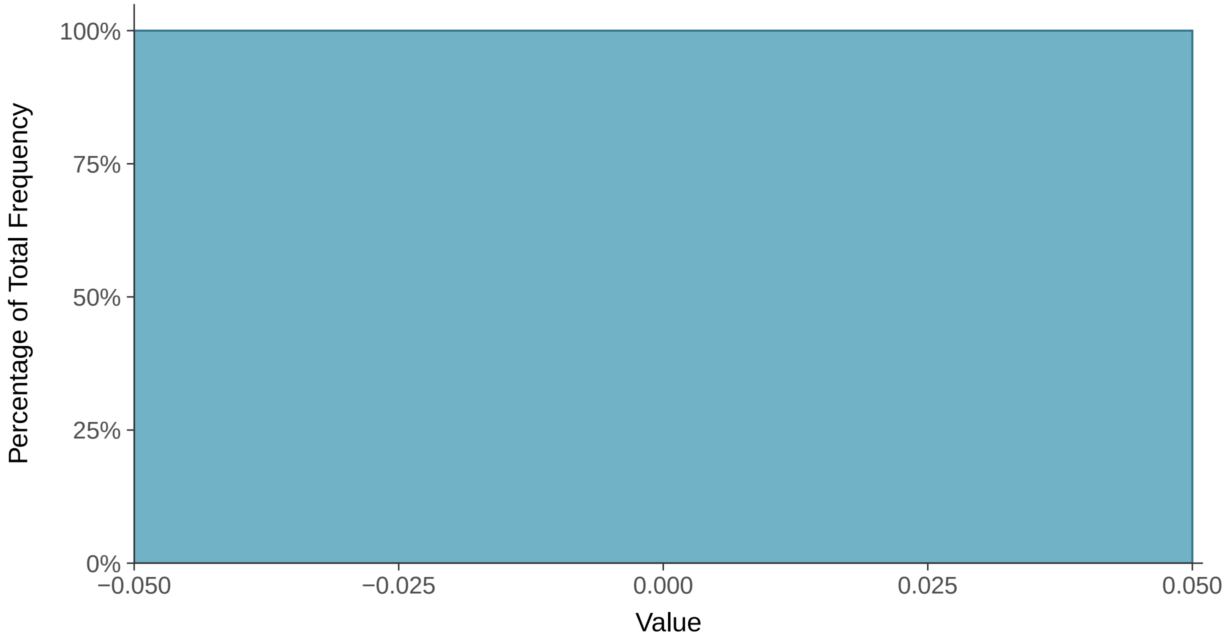
Scatter Plot

Copper, MW-7B (mg/L)



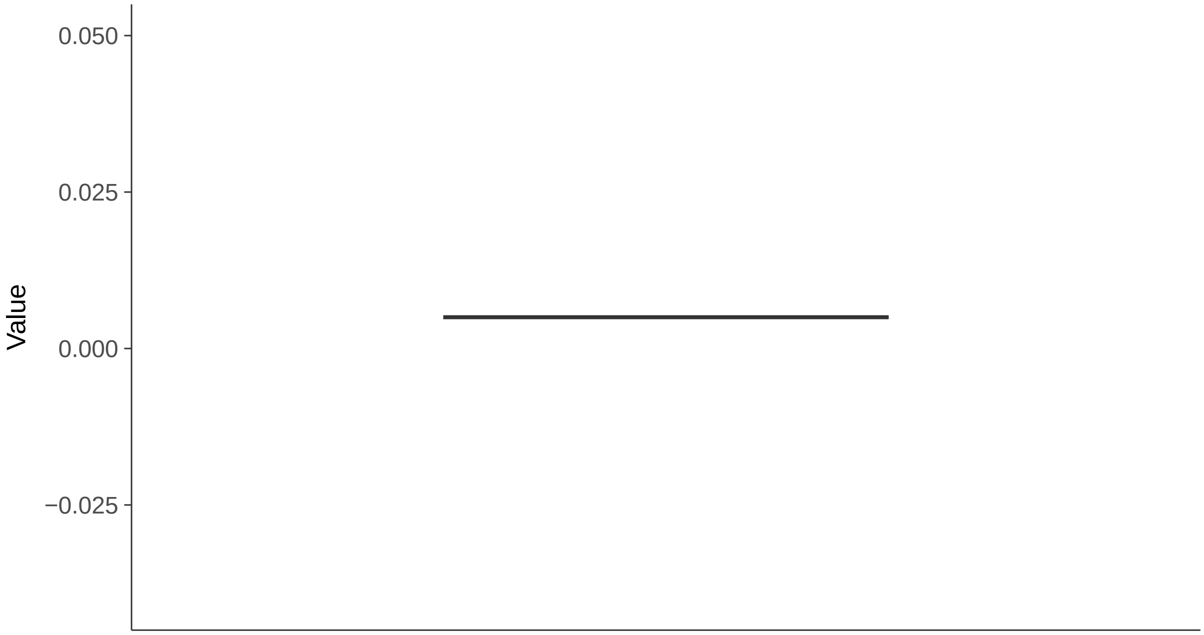
Histogram

Copper, MW-7B (mg/L)



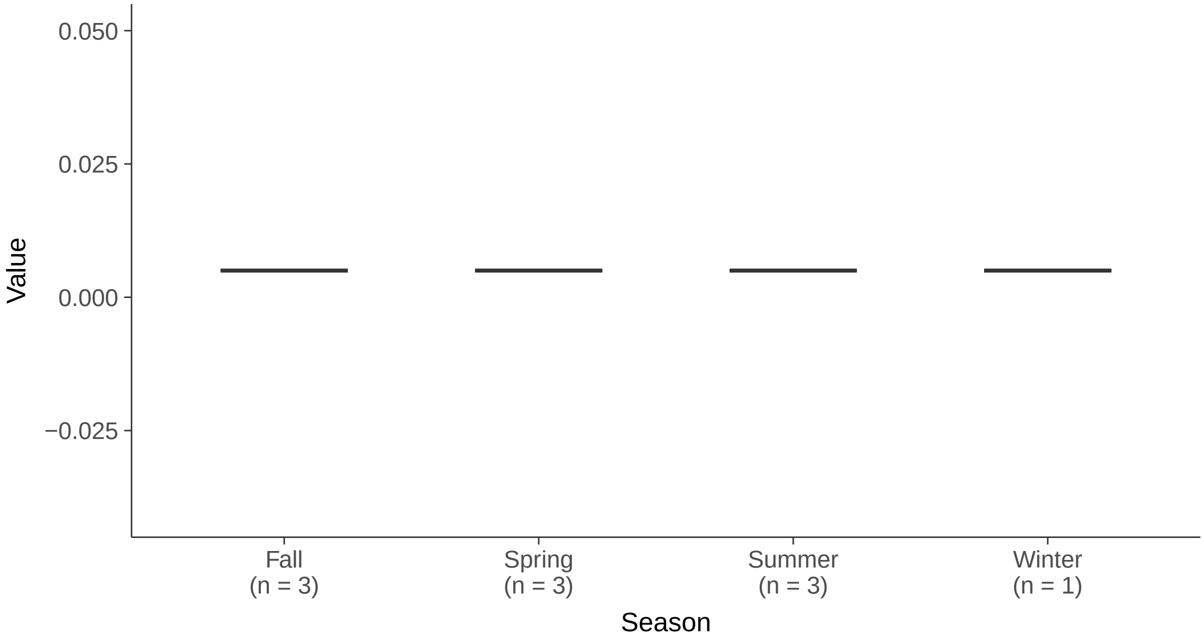
Boxplot

Copper, MW-7B (mg/L)



Boxplot by Season

Copper, MW-7B (mg/L)

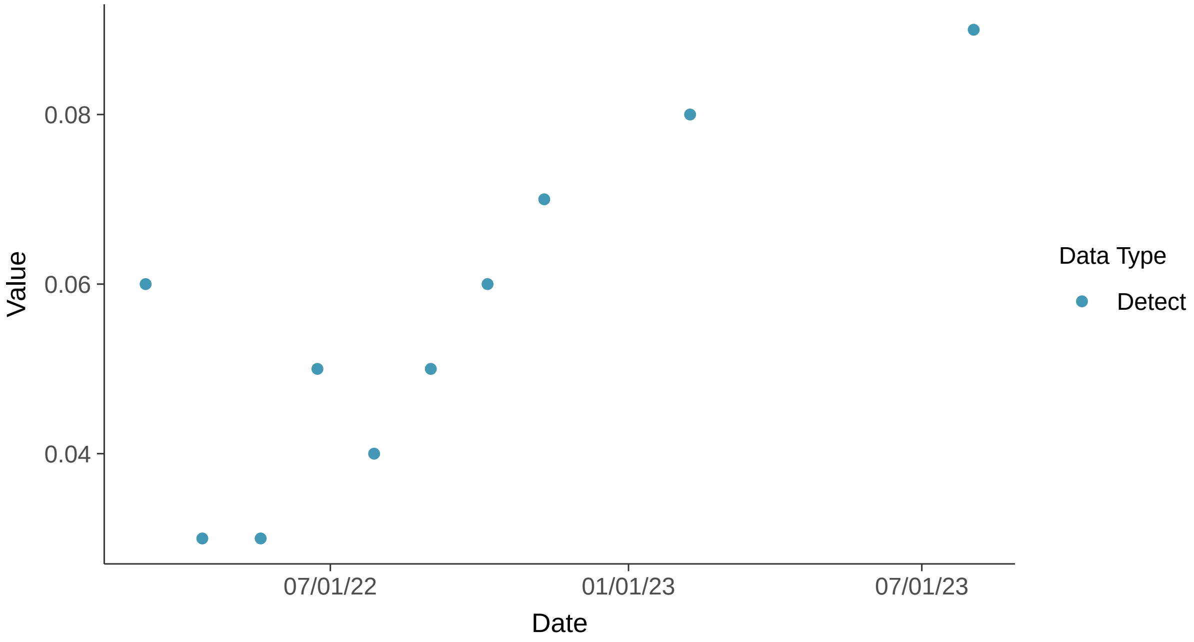


Part 115: Iron, MW-7B

ID: 7B_5_38

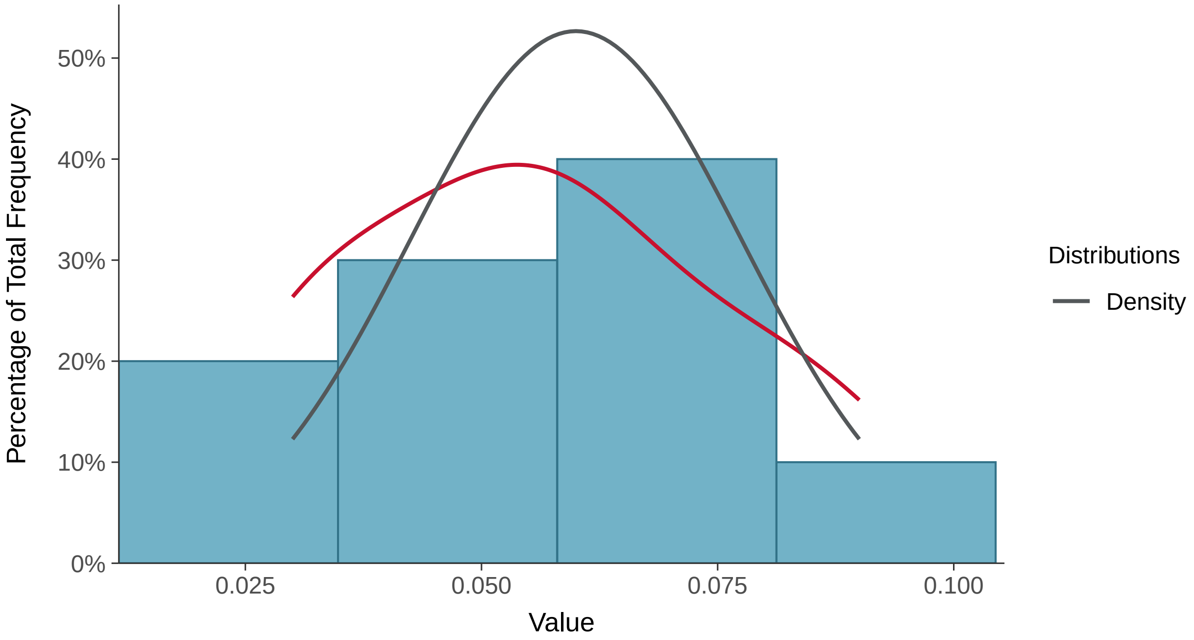
Scatter Plot

Iron, MW-7B (mg/L)



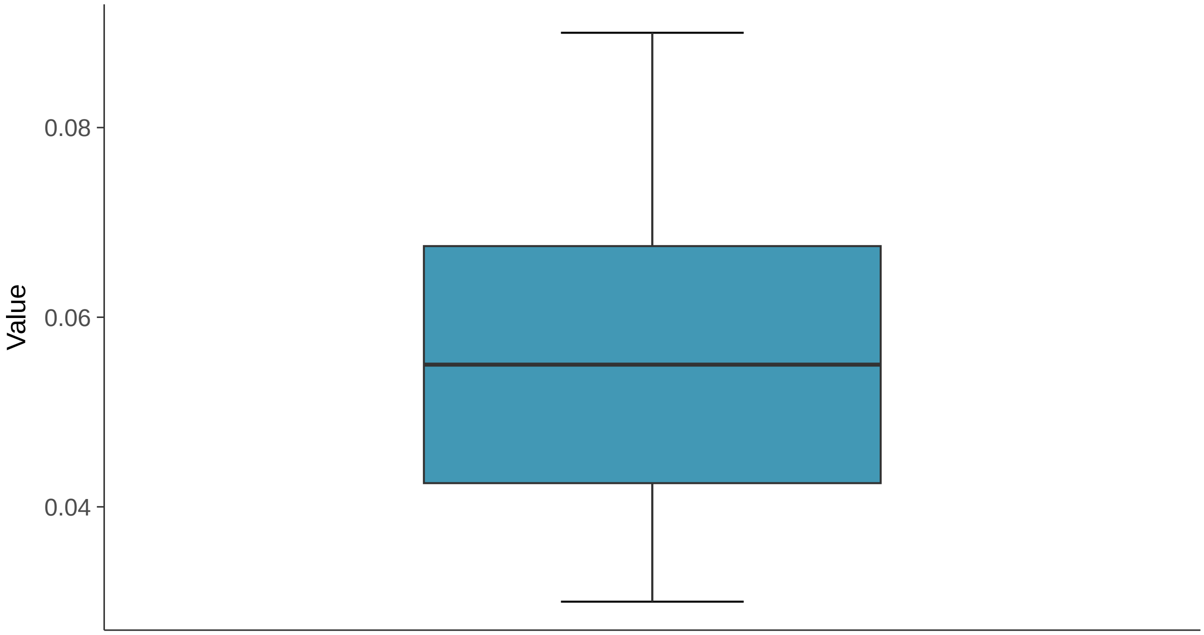
Histogram

Iron, MW-7B (mg/L)



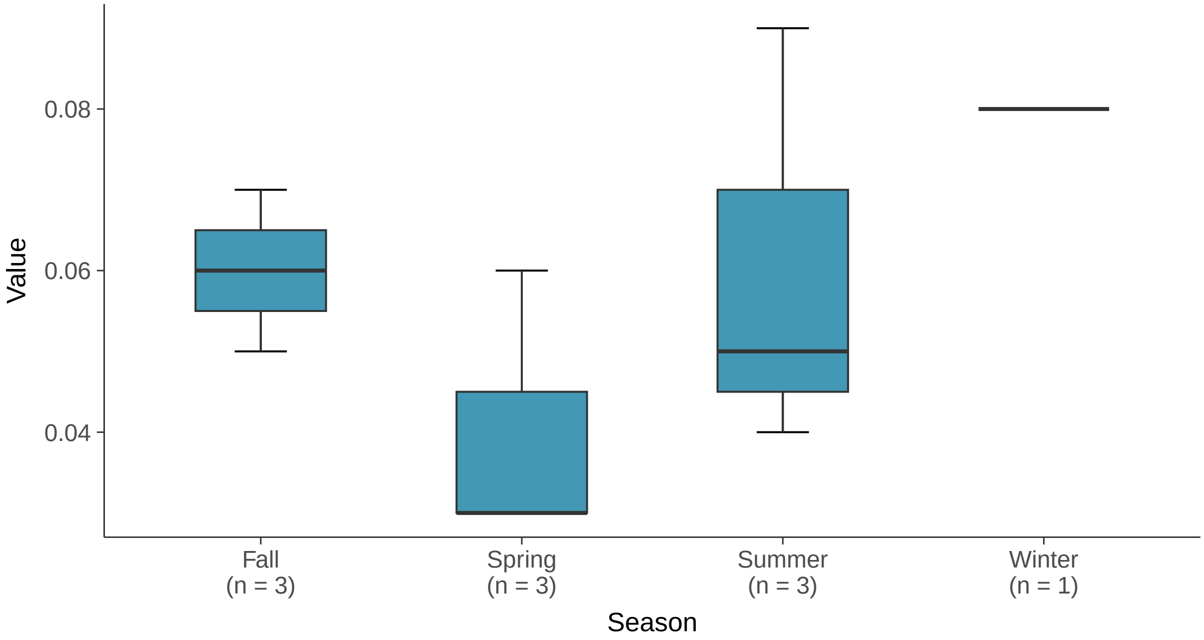
Boxplot

Iron, MW-7B (mg/L)



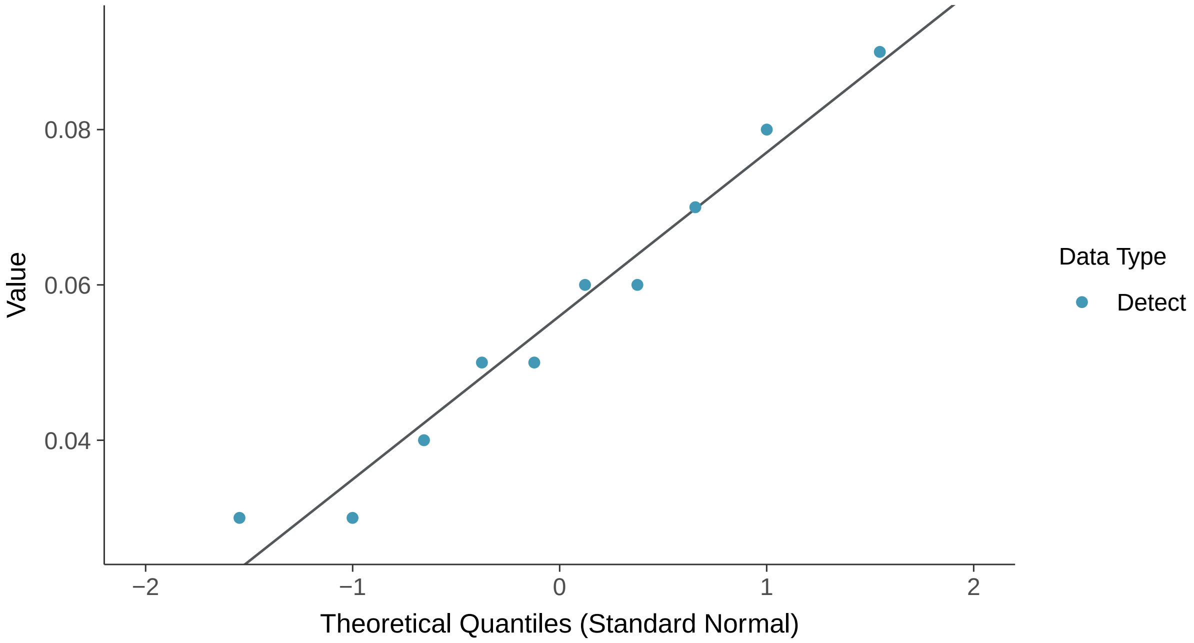
Boxplot by Season

Iron, MW-7B (mg/L)



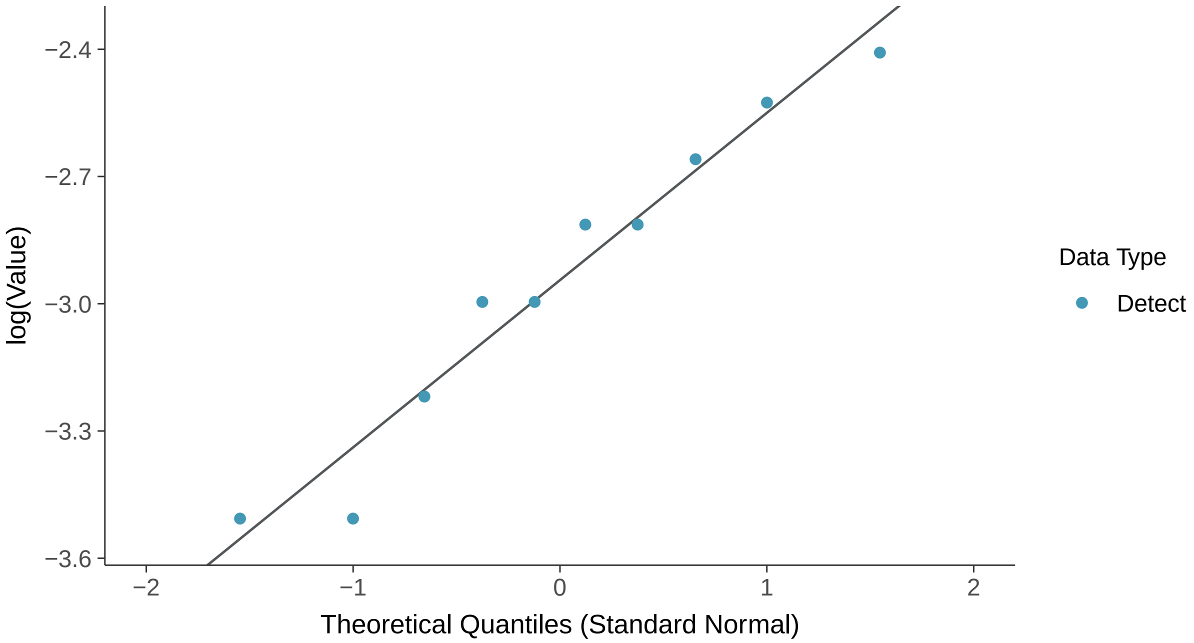
Normal Q-Q plot

Iron, MW-7B (mg/L)



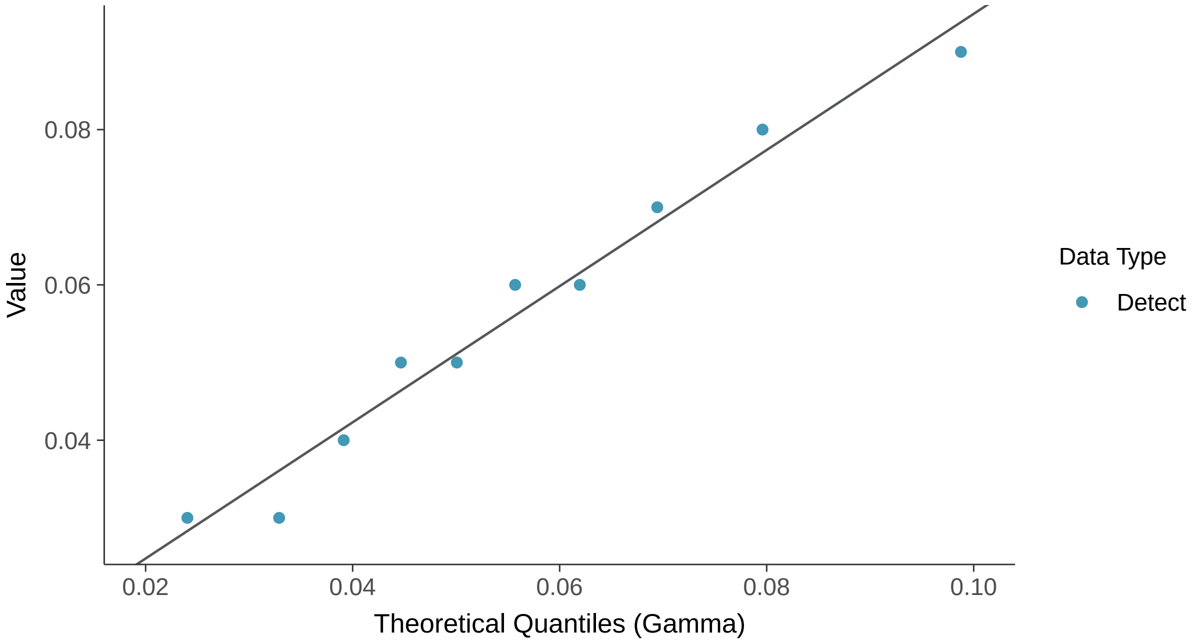
Lognormal Q-Q plot

Iron, MW-7B (mg/L)



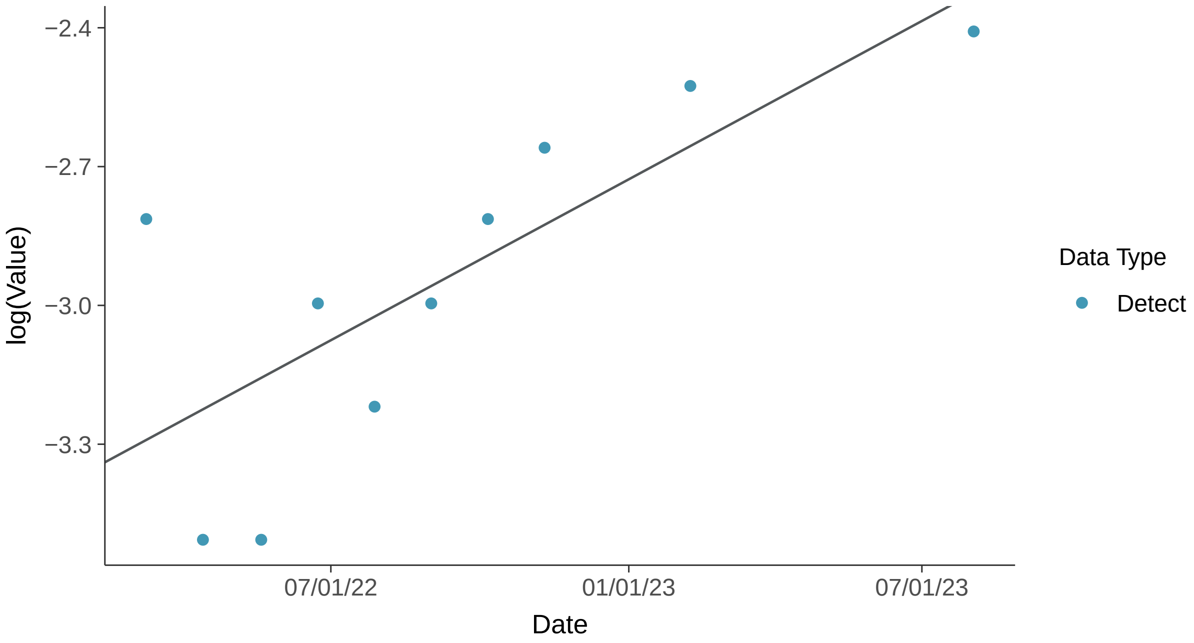
Gamma Q-Q plot

Iron, MW-7B (mg/L)



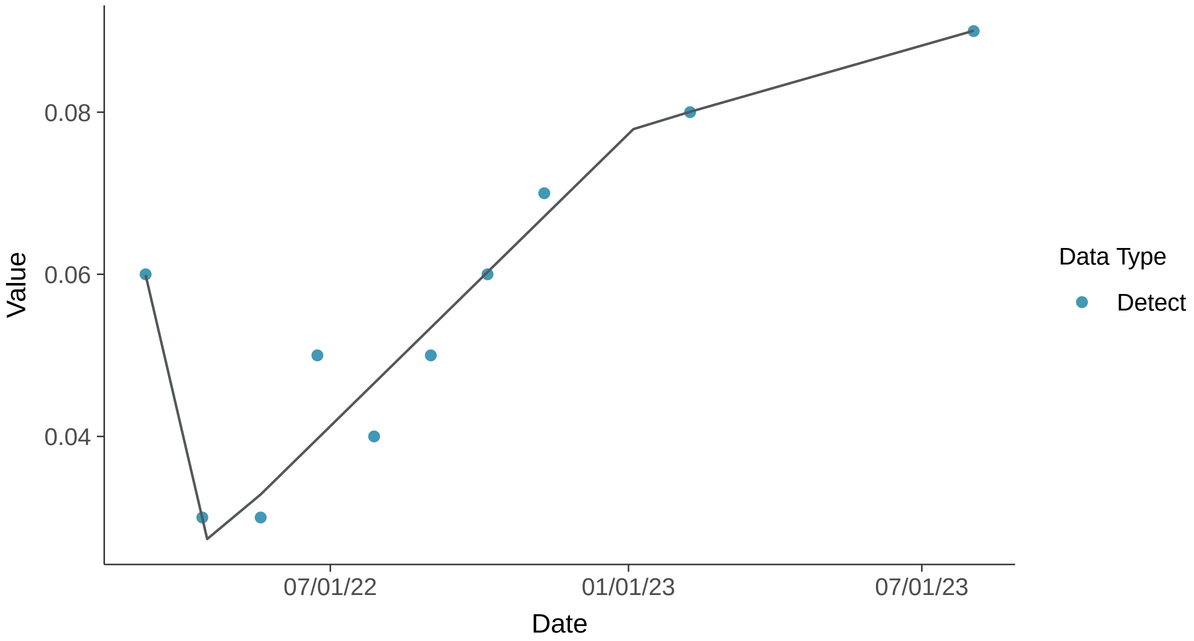
Trend Regression: Lognormal MLE

Iron, MW-7B (mg/L)



Trend Regression: Piecewise Linear-Linear-Linear

Iron, MW-7B (mg/L)

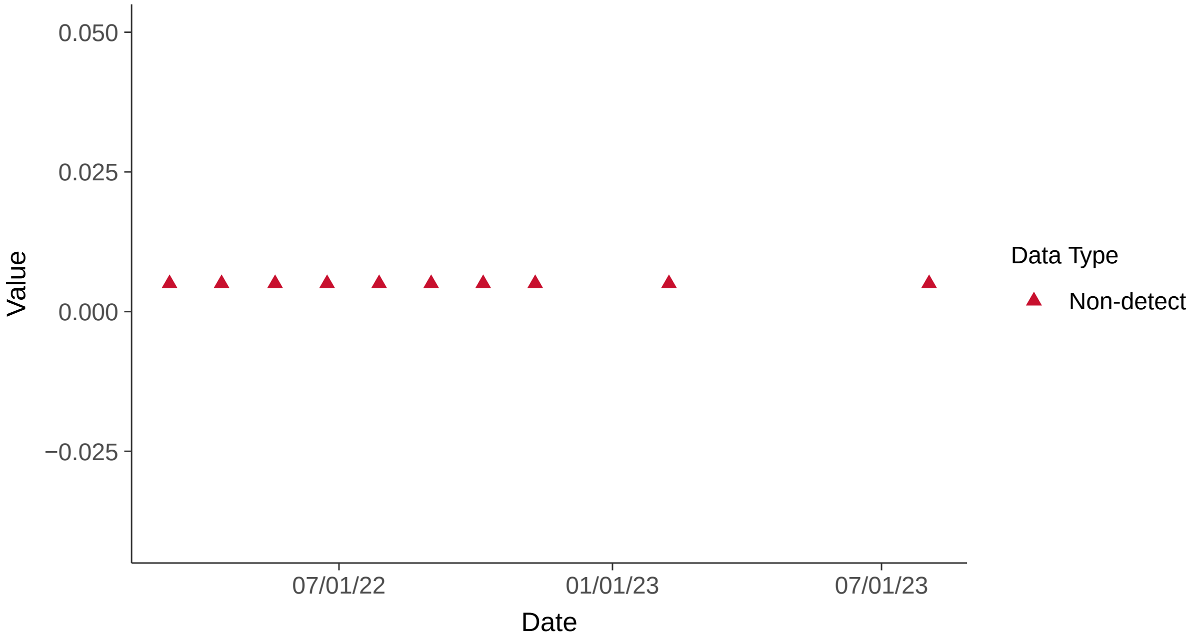


Part 115: Nickel, MW-7B

ID: 7B_5_39

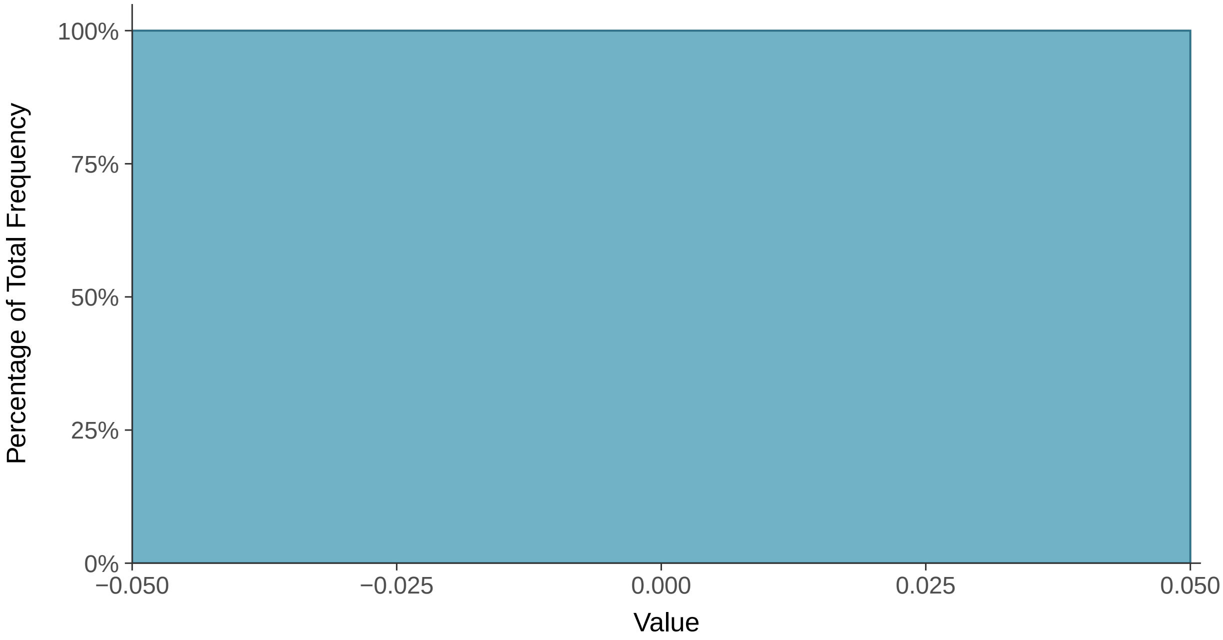
Scatter Plot

Nickel, MW-7B (mg/L)



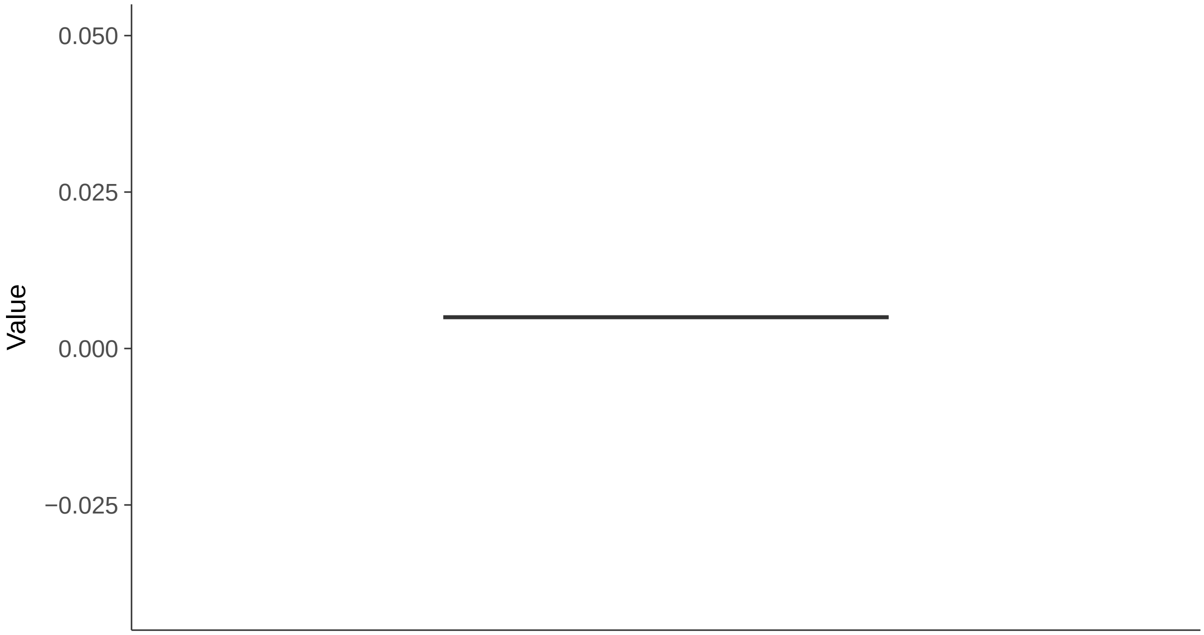
Histogram

Nickel, MW-7B (mg/L)



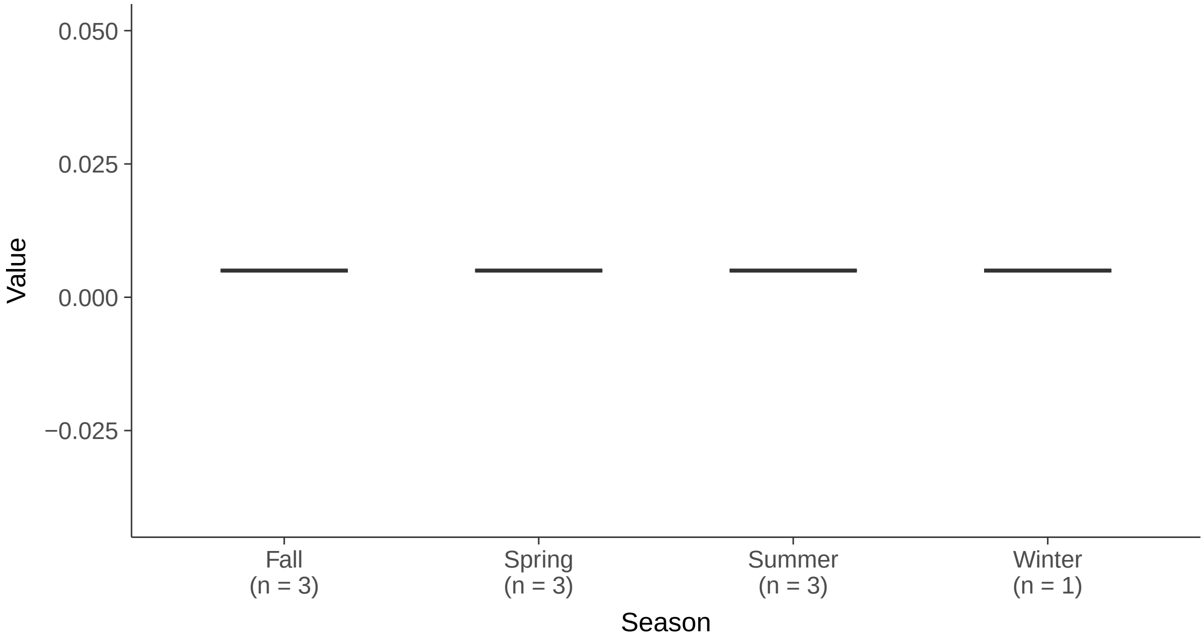
Boxplot

Nickel, MW-7B (mg/L)



Boxplot by Season

Nickel, MW-7B (mg/L)

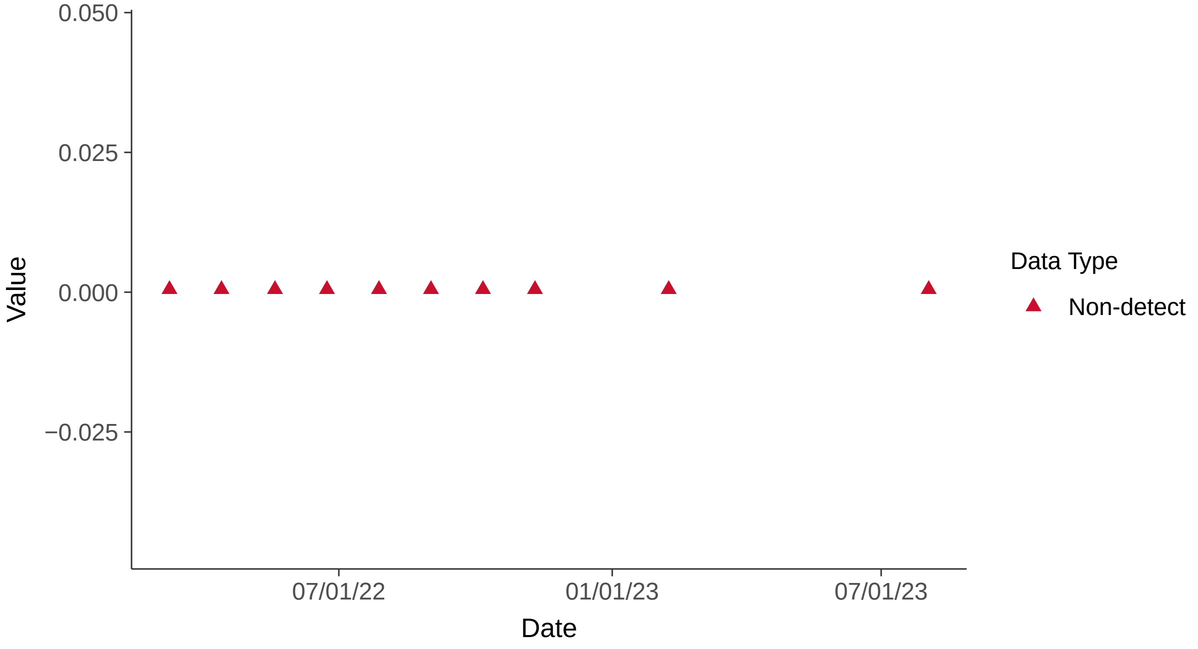


Part 115: Silver, MW-7B

ID: 7B_5_40

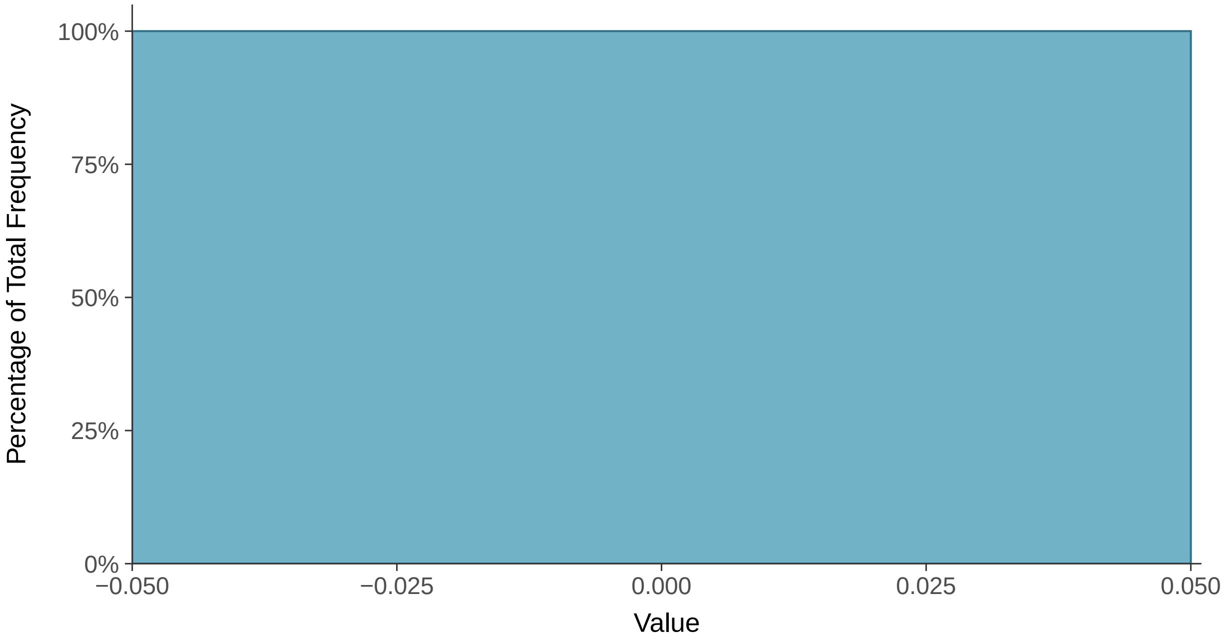
Scatter Plot

Silver, MW-7B (mg/L)



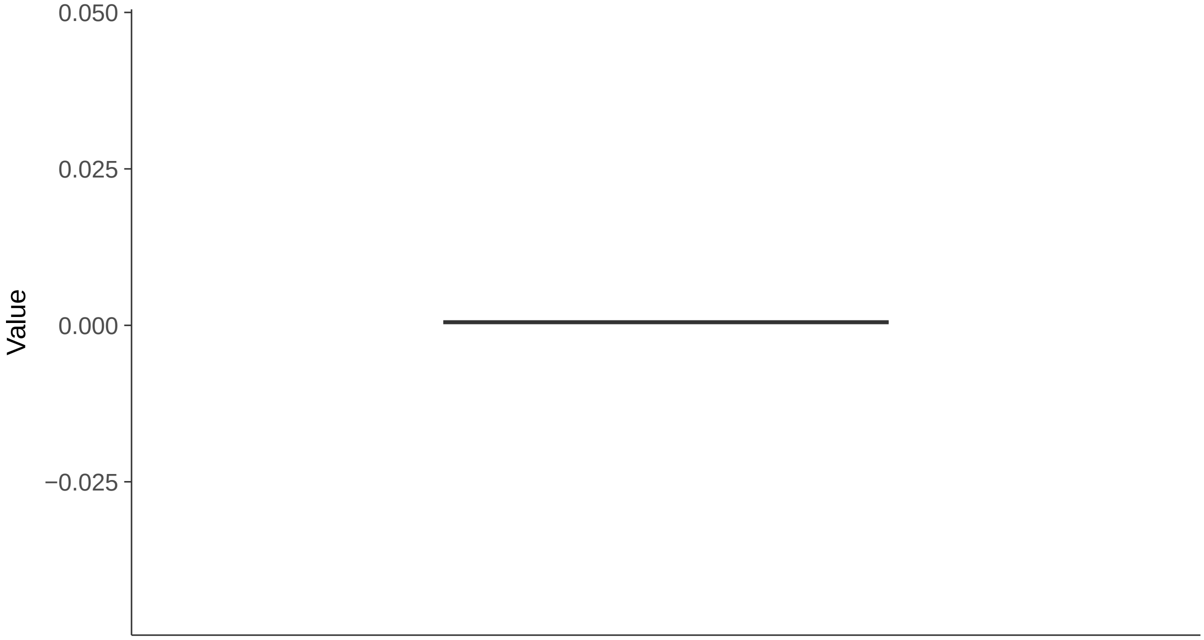
Histogram

Silver, MW-7B (mg/L)



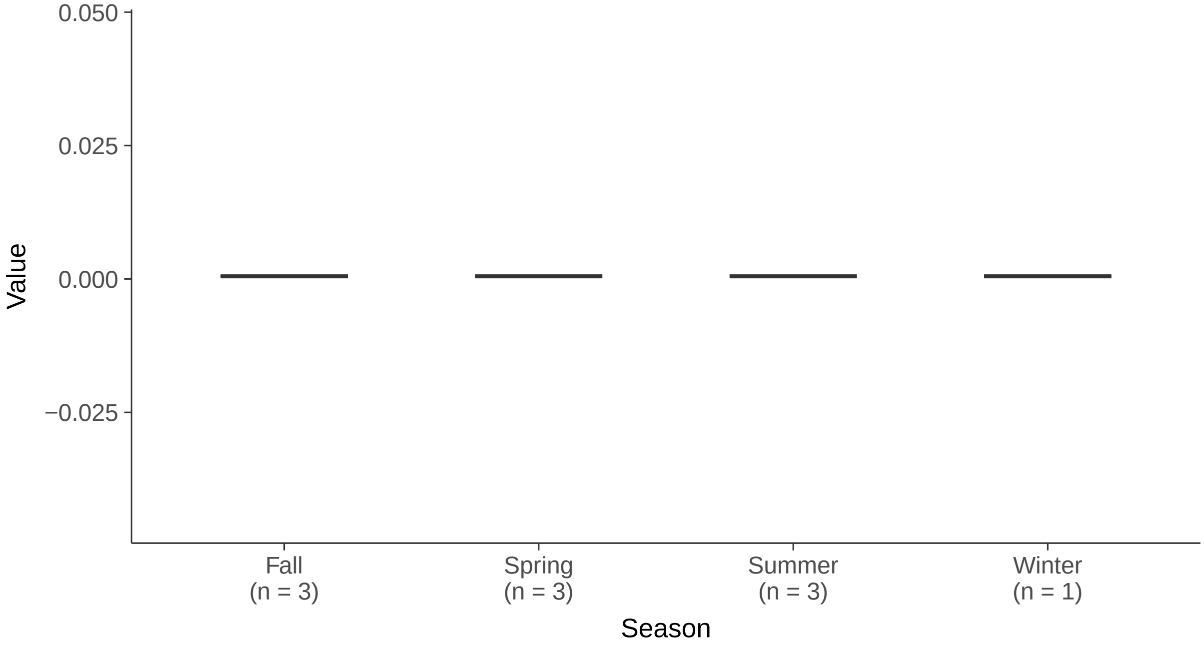
Boxplot

Silver, MW-7B (mg/L)



Boxplot by Season

Silver, MW-7B (mg/L)

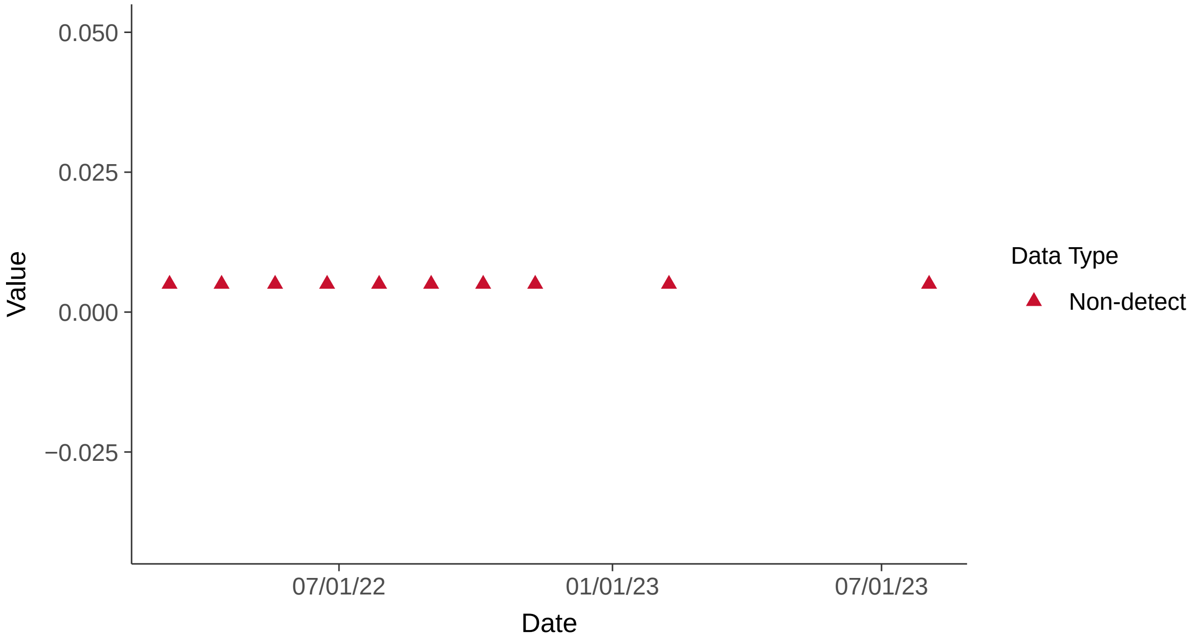


Part 115: Vanadium, MW-7B

ID: 7B_5_41

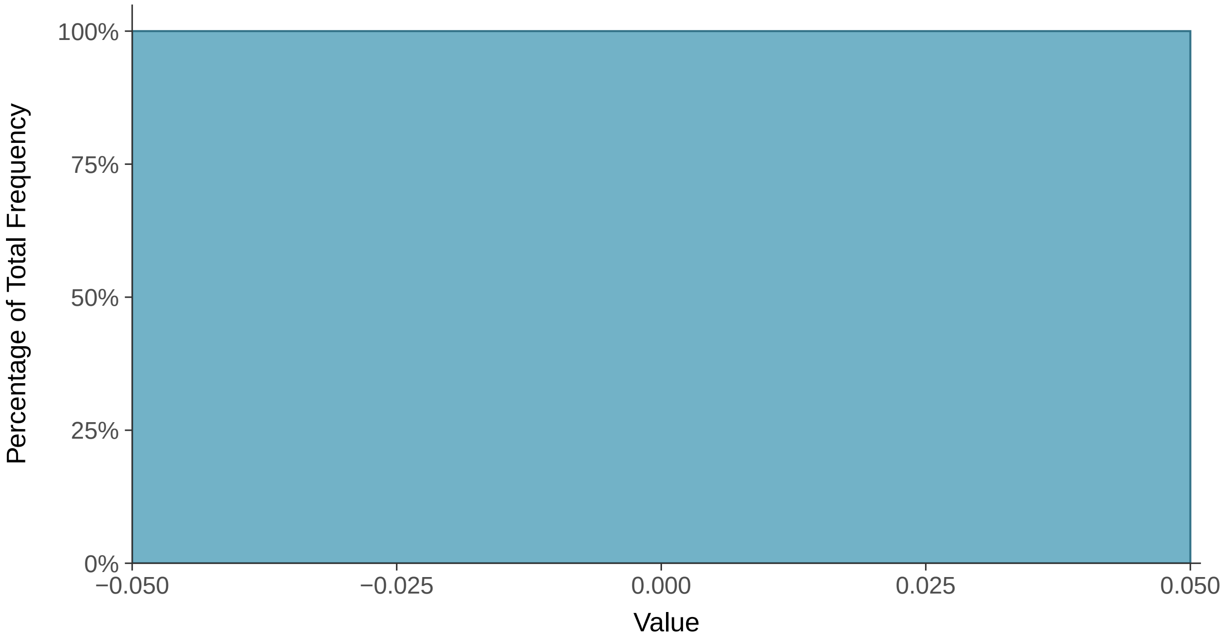
Scatter Plot

Vanadium, MW-7B (mg/L)



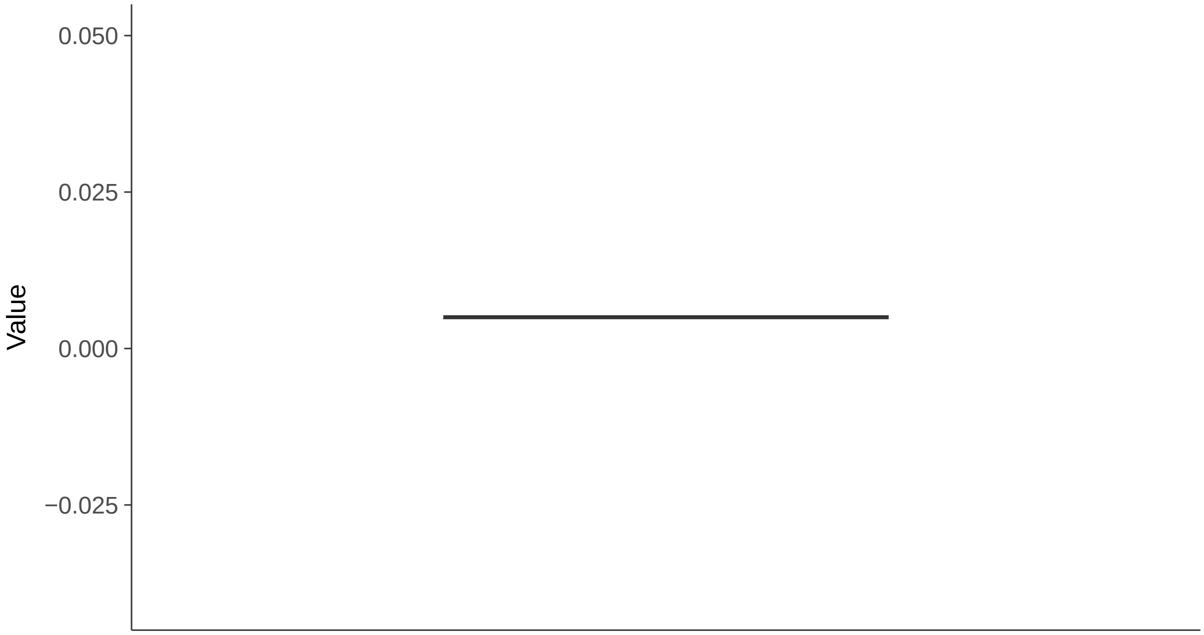
Histogram

Vanadium, MW-7B (mg/L)



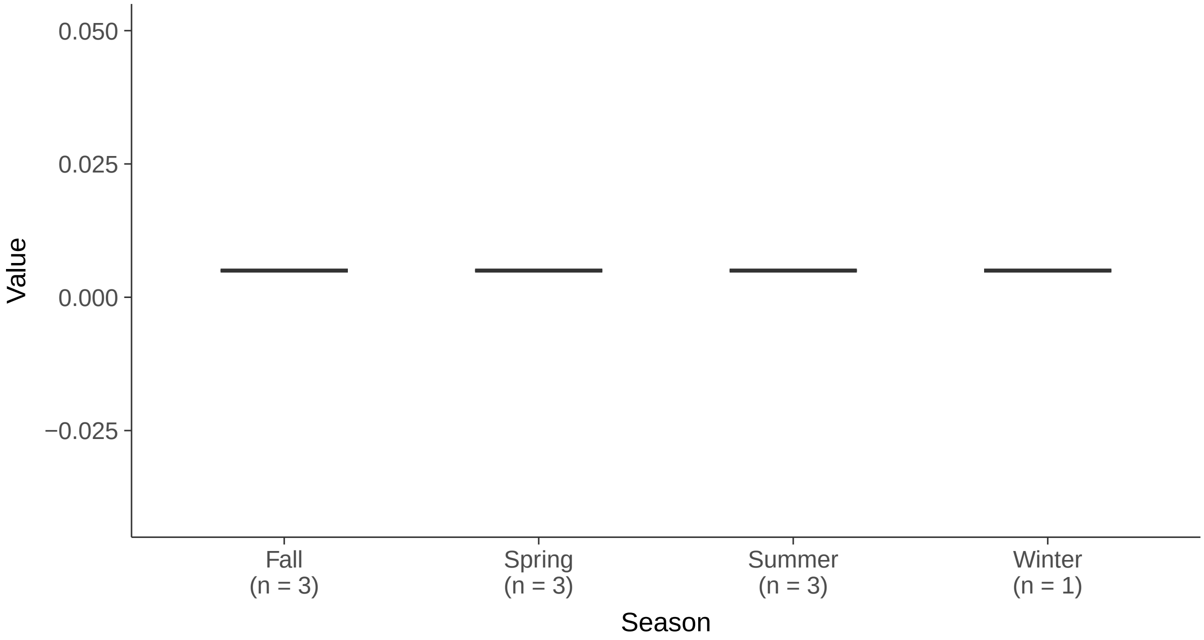
Boxplot

Vanadium, MW-7B (mg/L)



Boxplot by Season

Vanadium, MW-7B (mg/L)

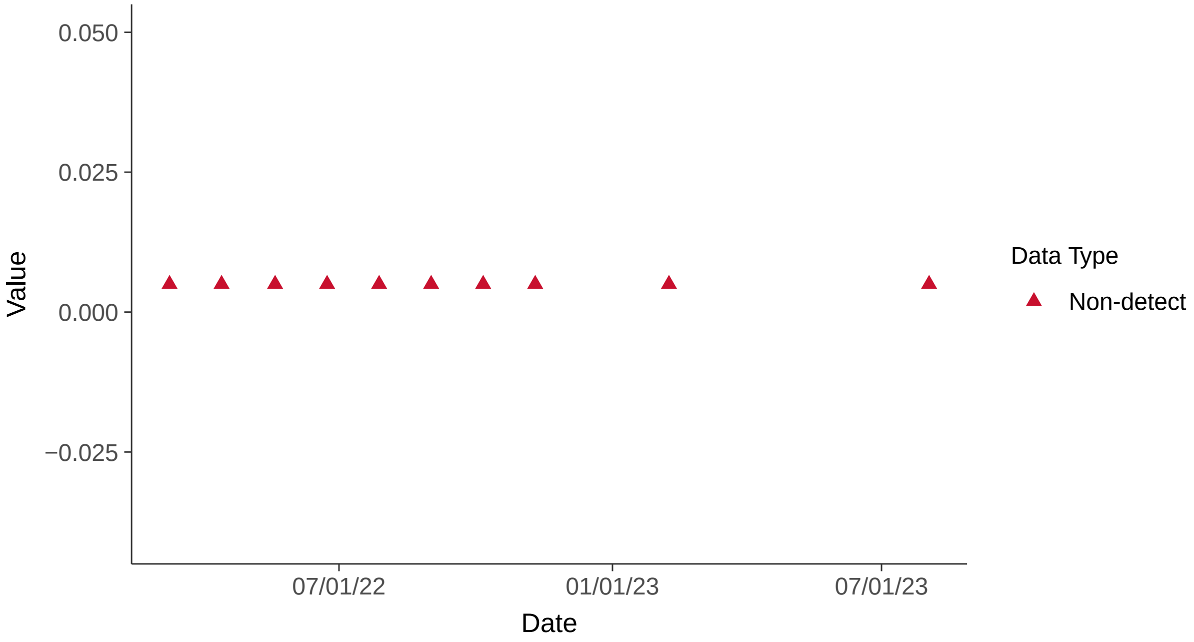


Part 115: Zinc, MW-7B

ID: 7B_5_42

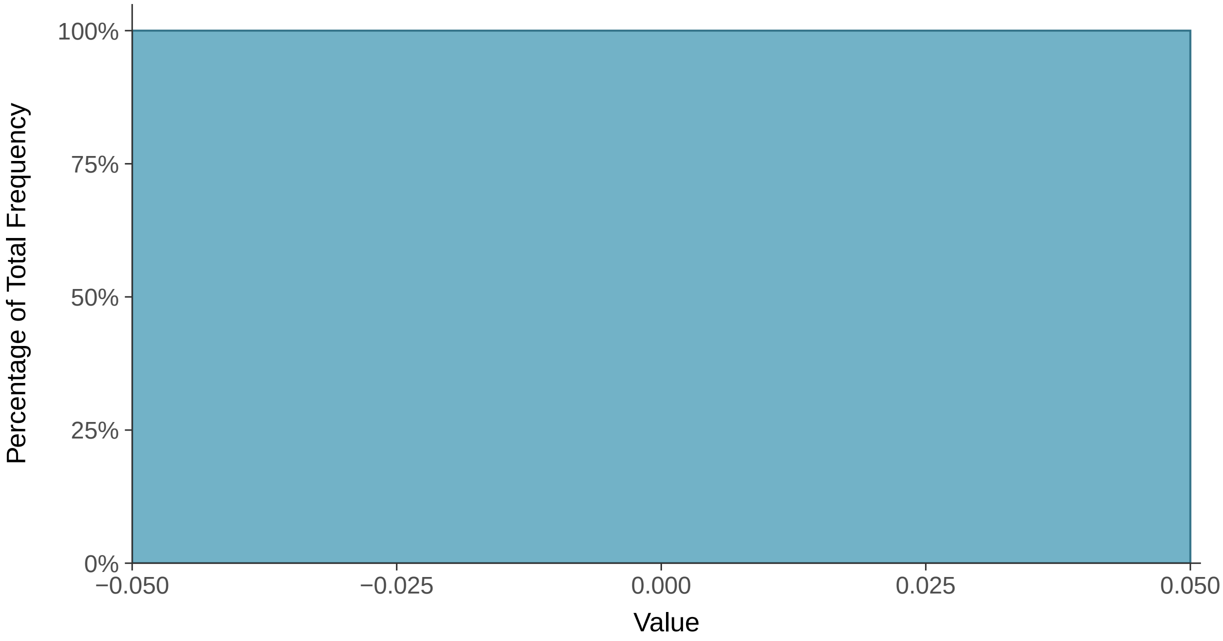
Scatter Plot

Zinc, MW-7B (mg/L)



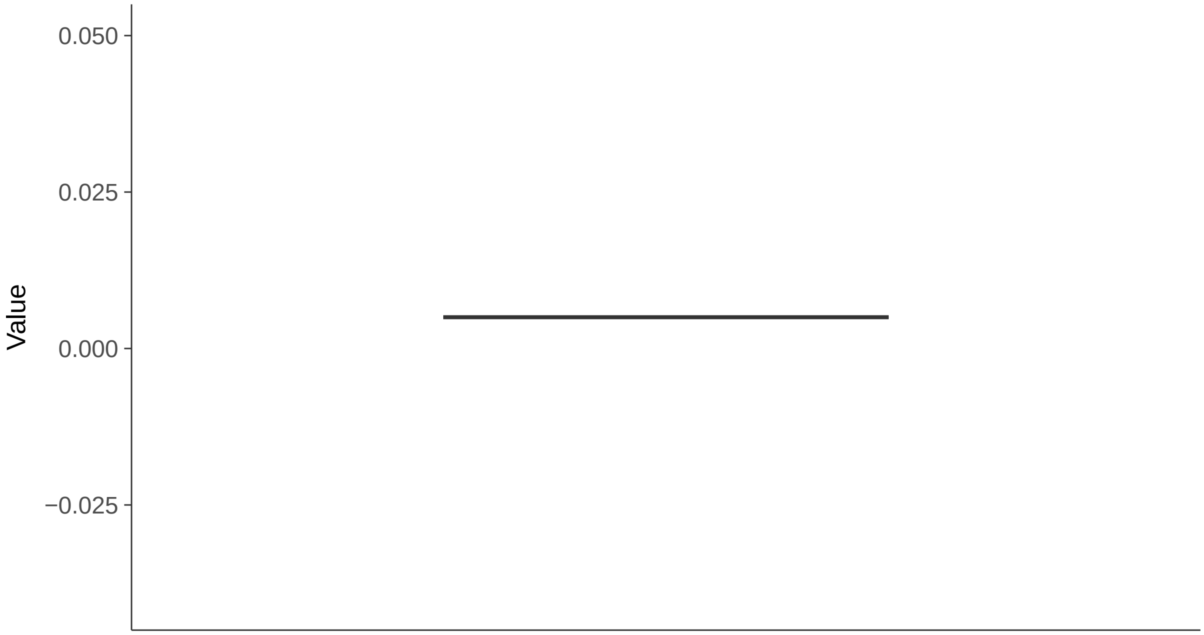
Histogram

Zinc, MW-7B (mg/L)



Boxplot

Zinc, MW-7B (mg/L)



Boxplot by Season

Zinc, MW-7B (mg/L)