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November 30, 2023

Mr. Brian Rath
Land Quality Bureau
Iowa Department of Natural Resources
502 East 9th Street
Des Moines, IA 50319-0034

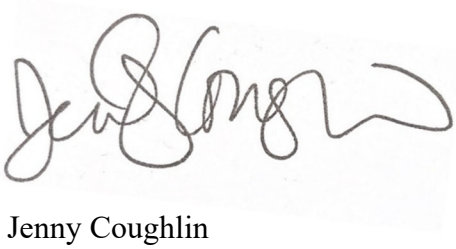
Subject: **2023 Annual Water Quality Report**
Interstate Power and Light Company – Marshalltown East and West Closed Landfills
Permits #64-SDP-05-91C; #64-SDP-03-90C

Dear Mr. Rath:

On behalf of Interstate Power and Light Company (IPL), Alliant Energy is providing the enclosed 2023 Annual Water Quality Report for the closed Marshalltown East and West landfills, as required by Permits #67-SDP-05-91C, #64-SDP-03-90C, and associated amendments.

Please call me at (515) 558-9704 or email me at jennycoughlin@alliantenergy.com with any questions regarding the enclosed report.

Sincerely,



Jenny Coughlin
Sr. Environmental Specialist
Alliant Energy Corporate Services, Inc.

Enclosures

Cc: IDNR Field Office #5
George Kueny – IPL Marshalltown Generating Station
Meghan Blodgett, Thomas Karwoski – SCS Engineers

2023 Annual Water Quality Report

Interstate Power and Light Company Marshalltown East and West Closed Landfills Permit #64-SDP-5-91C and #64-SDP-3-90C

Interstate Power and Light, an Alliant Energy Company
200 First Street SE
Cedar Rapids, Iowa 52401

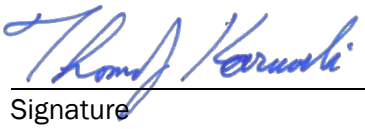
SCS ENGINEERS

25223064.00 | November 30, 2023

2830 Dairy Drive
Madison, WI 53718
608-224-2830

CERTIFICATION

I, Thomas J. Karwoski, hereby certify that this report was prepared by me, or under my direct supervision, and that I am a qualified ground water scientist as defined in Iowa Administrative Code (IAC) SS 113.10(1)d.



Signature

November 30, 2023
Date

Pages or Sheets Covered by this Certification:

2023 Annual Water Quality Report – November 2023, Interstate Power and Light Company, Marshalltown East and West Closed Landfills

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EXECUTIVE SUMMARY

Period of Report Coverage

The period of coverage for this report is from November 2022 through October 2023 and includes the April 2023 water level measurement event and the September 2023 groundwater sampling event conducted at the Marshalltown East and West Closed Landfills (Site), Coal Combustion Residual (CCR) landfills located near Marshalltown, Iowa (**Figure 1**).

Report Priority

Comparison of the September 2023 results to the groundwater protection standards (GWPSs) indicated that there were no new GWPS exceedances in 2023 for parameters that are not new to the sampling program. Lithium and molybdenum were included for the first time in 2023. The GWPS exceedances detected in September 2023 are:

- Lithium at MW-3, MW-10, MW-11AR, MW-13, MW-14, MW-20, MW-21, and MW-23
- Manganese at MW-4
- Molybdenum at MW-20
- Selenium at MW-5

Monitoring well MW-10 is a background well for the East Landfill, and lithium concentrations detected at many of the other wells with GWPS exceedances were similar to the concentration at MW-10. The September 2023 sampling event was the first time samples were tested for lithium and molybdenum at the Site, so the GWPS exceedances for lithium and molybdenum have not been confirmed and cannot be compared to historical data, but these results indicate that lithium concentrations in groundwater at the site may be at least partly attributable to natural conditions.

Most exceedances of the background UPLs were consistent with previous results, with the following exceptions:

- MW-8: New UPL exceedance for lead
- MW-5: Many fewer UPL exceedances, and fewer GWPS exceedances, than in 2021-2022
- MW-18: Many fewer UPL exceedances, and fewer GWPS exceedances, than in 2022

Dedicated pumps were installed in 2023 at MW-4, MW-5, and MW-18 in an attempt to reduce turbidity in samples from these wells. Total suspended solids (TSS) at MW-5 and MW-18 were less than 5 milligrams per liter (mg/L). While TSS data from previous years are not available for comparison, these results and the reduction in UPL and GWPS exceedances at MW-5 and MW-18 indicate that the installation of dedicated pumps did apparently improve sample quality at some wells, and some standards exceedances previously detected at MW-5 and MW-18 may be attributable to suspended sediment in the samples.

Groundwater samples collected in 2023 were unfiltered, in accordance with the variance to IAC 567-103.1(2)f granted on September 16, 2016, and the conditions of the landfill permit renewal dated December 22, 2016. The 2023 sampling event was the eighth round of unfiltered samples collected at the site, and 2023 was the fifth reporting period during which the new statistical approach was applied at the Site.

SCS Engineers (SCS) recommends that the current monitoring program be continued during 2024, with modifications to the parameter list as described in **Section 8.0**.

No additional requests or amendments to the permit are needed at this time.

Site Status and Applicable Rules

The following summarizes the site status and applicable rules associated with groundwater sampling at the Marshalltown East and West Closed Landfills:

- **Landfill Status:** Closed
- **Types of Wastes Accepted:** CCR
- **Applicable IAC Rules:** 567-103 current version, certain provisions of 567-115.26(6) 567-115.21 (referenced for monitoring well maintenance and evaluation requirements, in place of the rescinded 567-110.9).

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Tables

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Appendices

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ACRONYMS/ABBREVIATIONS

AWQR = Annual Water Quality Report
CCR = Coal Combustion Residual
COC = Chain of Custody
DO = Dissolved Oxygen
EPA = Environmental Protection Agency
GWPS = Groundwater Protection Standard
IAC = Illinois Administrative Code
IDNR = Iowa Department of Natural Resources
LCS = Laboratory Control Sample
mg/L = milligrams per liter
MS = Matrix Spike
MSD = Matrix Spike Duplicate
MCL = EPA Maximum Contaminant Level
ORP = Oxidation-Reduction Potential
QA/QC = Quality Assurance/Quality Control
RCRA = Resource Conservation and Recovery Act
Site = Marshalltown East and West Closed Landfills
SMCLs = Secondary Maximum Contaminant Levels
SSI = Statistically Significant Increase above background
SWS = Statewide Standard
TDS = Total Dissolved Solids
TSS = Total Suspended Solids
UPL = Upper Prediction Limits
U.S. EPA = U.S. Environmental Protection Agency
Unified Guidance = Unified Guidance for Statistical Analysis of Groundwater Monitoring Data at Resource Conservation and Recovery Act Facilities

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1.0 SITE BACKGROUND

1.1 SITE HISTORY

The Marshalltown East and West Closed Landfills are closed coal combustion residual (CCR) landfills located near Marshalltown, Iowa (**Figure 1**). The Marshalltown East and West Landfills were used for disposal of CCR. No CCR or other waste has been disposed at the site since 1995, when the East Landfill was capped and closed. The West Landfill was capped and closed in 1993. A site plan is shown on **Figure 2**. A Facility Inspection Report for 2023 is included in **Appendix A**. Erosion features were not noted at the site in 2023.

1.2 SITE HYDROGEOLOGY

1.2.1 Geology

A detailed description of the regional and local geology is provided in the Phase II Hydrogeological Investigation Report prepared by James M. Montgomery, submitted in December 1991 (Montgomery, 1991), and in earlier investigation reports. A summary of the site geology, as described in the December 1991 report, is presented here.

The unconsolidated geology at the site generally consists of loess, glacial till, and alluvium. The loess consists of fine-grained sediment; the till includes material ranging in size from clay to boulders; and the alluvium primarily consists of sand, silt, and clay deposited by the stream on the western border of the site.

The unconsolidated material overlies Mississippian limestone bedrock. The limestone unit at the site is classified as an aquifer. Prior to landfilling, the limestone unit was mined at the site. The bedrock surface at the site is highly variable as a result of erosion and weathering, and depth to bedrock ranges from 6 feet at MW-8 to 69 feet at MW-10.

1.2.2 Hydrogeology/Groundwater Flow Conditions

Groundwater, surface water, and leachate levels were measured during April and September 2023. The groundwater levels during the September event were measured prior to purging the wells for sampling. The groundwater and surface water elevation data are presented in **Table 4A**, and vertical gradients are presented in **Table 4B**. The 2023 water level data were used to create water table and potentiometric surface maps (**Figures 3** through **6**).

Groundwater flow directions in 2023 were consistent with historical data. Shallow groundwater flow at the site is generally to the west and south across the site. Flow in the deeper hydrogeologic unit is generally to the south-southeast. Groundwater elevations in September 2023 were lower than is typical for the site.

Vertical gradients at the Site were consistent with historical data and were generally downward in 2023, with the exceptions of weak upward gradients at MW-4/MW-21 and MW-5/MW-19 in both April and September 2023. Gradients at these two well nests have historically fluctuated between weakly downward and weakly upward.

A biennial evaluation of water level conditions is included in **Section 3.0**. The next biennial evaluation will be completed in 2025.

2.0 SAMPLING STATUS SUMMARY

The Iowa Department of Natural Resources (IDNR) has requested that sampling data be summarized in a series of tables to consistently convey information related to groundwater monitoring at CCR landfills throughout Iowa. These tables are discussed within the text in appropriate sections as noted and included in the Tables section at the end of the text. **Table 1** provides an overview of the sampling status for the Site, including the monitoring points in the program, current monitoring program, comparative statistics findings, and the number of samples collected. **Figure 2** summarizes the monitoring network for Marshalltown.

Field sheets from the 2023 monitoring events are included in **Appendix B**. Sampling completed in 2018 to 2023 and anticipated sampling for 2024 is summarized in **Table 2**. The laboratory analytical report for samples collected in 2023 is included in **Appendix C**. Groundwater chemistry summary tables for historic data collected before 2019 are included in **Appendix D**. Groundwater chemistry tables for all data collected since the transition to unfiltered sampling in 2016 are included in the statistical analysis in **Appendix E**. Sufficient water was not present for sample collection at MW-22 in September 2023.

As requested by IDNR, calcium, lithium, molybdenum, total dissolved solids (TDS), and total suspended solids (TSS) were added to the sampling parameters for all monitoring wells, surface water monitoring points, and leachate sampling points reported in the Annual Water Quality Report (AWQR). Because of the low number of samples for the parameters listed above, UPLs cannot be calculated at this time. UPL calculations for these parameters will be included in the report when a minimum of four samples have been collected at background wells.

Additionally, field parameters dissolved oxygen (DO) and oxidation-reduction potential (ORP) are included in the tables of this AWQR for the first time for evaluation of the potential influences on groundwater chemistry due to reducing groundwater conditions. DO and ORP are required parameters to determine stability during low-flow sampling and have been included in previous AWQRs on field sheets.

Copper and zinc were not included in the analytical parameter list for monitoring wells or surface water points in 2023, as proposed in the June 22, 2023 Assessment Workplan. IDNR's July 14, 2023 response to this submittal approved the recommendation to remove copper and zinc, with the exception that they should be retained for leachate samples in 2023.

3.0 MONITORING WELL MAINTENANCE AND PERFORMANCE SUMMARY

IAC 567-115.21 was referenced for monitoring well maintenance and evaluation, in place of the rescinded 567-110.9. Each requirement is listed below in italics, followed by text describing how the requirement was addressed.

a. *A biennial examination of high and low water levels accompanied by a discussion of the acceptability of well location (vertically and horizontally) and exposure of the screened interval to the atmosphere.*

Water levels are measured twice annually, in April and September. The screened intervals of all water table wells monitoring the shallow hydrogeologic unit intersected the water table during at least one monitoring event in 2023, and the screens of piezometers monitoring the deeper hydrogeologic unit were submerged during both events. Groundwater elevations in September 2023 were lower than is typical for the site. Groundwater flow directions at the site in 2023 were consistent with historical conditions, and the horizontal and vertical well locations remain acceptable.

b. *A biennial evaluation of water level conditions in the monitoring wells to ensure that the effects of waste disposal or well operation have not resulted in changes in the hydrologic setting and resultant flow paths.*

As described in **Section 1.2.2**, comparison of the 2023 groundwater contour map and calculated vertical gradients to previous data indicates that the April and September 2023 groundwater flow conditions are consistent with historical conditions.

c. *Annual measurement of well depths to ensure that wells are physically intact and not filling with sediment.*

Measured well depths are summarized in **Table 4A**. The difference between the previously-measured total depths and the most recent total depths were less than 1 foot in all wells except MW-13 and MW-20. The measured total depth at MW-13 in September 2023 was within 1 foot of the documented total depth. The measured total depth at MW-20 was more than 1 foot deeper than the documented total depth in both April and September 2023. These measurements appear to reflect field error and/or the difficulty of accurately measuring total depth in a deep well using a flexible water level tape. It does not appear siltation is affecting the ability of the monitoring wells to produce representative groundwater samples and groundwater elevation data.

d. *Every five years conduct in-situ permeability tests on monitoring wells to compare test data with those collected originally to determine if well deterioration is occurring.*

A variance to IAC 567-110.9(2)(d) for in situ permeability tests every 5 years was granted by the IDNR in a letter dated May 4, 1999. Although IAC 567-110 has been rescinded since the variance was granted, the same permeability test requirements are now in IAC 567-115.21(2), and our understanding is that the conditions of the variance still apply. The conditions of the variance state that, if a well cannot be sampled or purged because of plugging, the well will be replaced within 6 months of reporting this condition to IDNR in the annual report. The monitoring wells at this site are performing adequately as noted above.

Table 3 provides the years in which each requirement was previously met and for which it is next scheduled.

3.1 DEDICATED PUMP INSTALLATIONS AND NETWORK UPDATES

Dedicated bladder pumps were installed at monitoring wells MW-4, MW-5, and MW-18 in September 2023, to reduce turbidity in samples and assess whether lower-turbidity samples may affect detected metals concentrations.

Removal of the Leachate Tank from the sampling program was proposed in the June 22, 2023 Recommended Assessment Steps submittal, and approved by IDNR on July 14, 2023. Suspension of water level monitoring at LL-1 was approved by IDNR in the 2022 AWQR review letter, dated February 17, 2023.

3.2 WELL MAINTENANCE RECOMMENDATIONS

No well maintenance activities are recommended based on observations during the 2023 monitoring events.

4.0 QUALITY ASSURANCE/QUALITY CONTROL SUMMARY

Data validation quality assurance/quality control (QA/QC) procedures are performed on analytical results for laboratory quality control samples, and a quality assurance assessment of the data is conducted as the data are generated. The QA/QC review procedure provides documentation of the accuracy and precision of the analytical data and confirms that the analyses are sufficiently sensitive to detect constituents at levels below regulatory standards, where such standards exist. QA/QC data validation includes review of sample handling, analytical sensitivity, blanks, accuracy, and precision. The QA/QC and data validation procedures and findings are discussed in more detail below.

4.1 SAMPLE COLLECTION AND HANDLING

Groundwater samples are collected using a dedicated QED Well Wizard bladder pump, or a QED Sample Pro pump with disposable bladders and dedicated tubing. In wells without dedicated pumps, the QED Sample Pro pump is decontaminated between wells and a new bladder is used for each well. Samples are not field filtered. The water level measurement tape is decontaminated between wells. All samples are placed on ice after collection and are transported to the laboratory in sealed coolers under Chain of Custody (COC).

Sample receipt forms were reviewed and checked to verify that samples were received in good condition and within the acceptable temperature range. COC records for each sampling event were reviewed and confirmed that information was complete.

For the September 2023 sampling event, no issues with sample preservation or with sample collection and handling procedures were identified.

4.2 ANALYTICAL SENSITIVITY AND BLANKS

Laboratory QA/QC procedures and post-analysis data validation assist in producing data of acceptable quality and reliability. Eurofins - Cedar Falls is a certified laboratory in Iowa and performed QA/QC procedures, including analyzing laboratory method blanks in association with samples collected for the project to check for contributions to the analytical results possibly attributable to laboratory-based contamination. A field blank was submitted with the groundwater samples to assess whether cross-contamination occurred during sample handling and transport.

There were no detections in the September 2023 field or laboratory method blank samples.

4.3 ACCURACY

Laboratory analytical accuracy can be assessed by evaluating the constituent recoveries from the following laboratory QA/QC samples: laboratory control sample (LCS), and matrix spike/matrix spike duplicate (MS/MSD). LCS samples assess the accuracy of analytical procedures by checking the ability to recover constituents added to clean aqueous matrices. MS/MSD samples assess the accuracy of analytical procedures by checking the ability to recover constituents added to submitted samples. The MS and MSD results for iron exceeded the control limits. A qualifier was applied to the iron result for monitoring well MW-3.

4.4 DATA QUALITY SUMMARY

Based on the above QA/QC procedures and the field sampling standard operating procedures, the samples collected during this reporting period are considered to be representative of site conditions at the locations and times they were obtained. Based on the QA/QC review, no samples were rejected as unusable due to QC failures.

5.0 COMPARISON TO STANDARDS

5.1 STATISTICAL ANALYSIS

Statistical analysis is completed for the Site on an annual basis. The 2023 Annual Statistical Summary Report is included in **Appendix E**, including a summary table of data used for the statistical analysis for each parameter. **Table 5** provides the background and GWPS summary for the Site.

Groundwater samples collected in September 2023 were unfiltered, in accordance with the variance to 567-103.1(2)f granted on September 16, 2016, and the conditions of the landfill permit renewal dated December 22, 2016. The 2023 sampling event was the eighth round of unfiltered samples collected at the Site, and 2023 was the fifth reporting period during which the new statistical approach was applied at the Site.

The selected statistical analysis method uses a prediction interval approach as recommended for detection monitoring in the March 2009 U.S. Environmental Protection Agency (U.S. EPA) Unified Guidance for Statistical Analysis of Groundwater Monitoring Data at Resource Conservation and Recovery Act (RCRA) Facilities (Unified Guidance).

Interwell testing was selected for the prediction interval evaluation. Monitoring results from the downgradient wells were compared to the UPLs to evaluate whether a statistically significant increase (SSI) over background has occurred. UPLs were calculated separately for the East and West Landfills. Consistent with previous sampling events, monitoring wells MW-9 and MW-10 were used as the background wells for the East Landfill and MW-8, MW-13, and MW-14 were used as the background wells for the West Landfill.

Monitoring results from the downgradient wells were compared to the UPLs to evaluate whether an SSI over background has occurred. UPL calculations were completed in 2023 using the eight rounds of unfiltered sample results for metals and a longer data record for anions that are not typically affected by filtration (e.g., chloride, sulfate).

Detection of an SSI at a compliance well indicates that the groundwater quality is different than the background groundwater quality, but does not necessarily indicate an impact to public health or the environment.

To evaluate potential health impacts, the monitoring results were compared to health-based GWPS values. The GWPS values were set at the drinking water Maximum Contaminant Level (MCL) if one exists, otherwise the Iowa Statewide Standard (SWS) for protected groundwater. If the UPL established based on background monitoring was higher than the MCL or SWS, then the GWPS was set at the UPL. Secondary Maximum Contaminant Levels (SMCLs) were not used to establish GWPS values because SMCLs are not health-based standards, but they are shown in Table 5 for comparison with the UPL and GWPS values.

5.2 2023 RESULTS

Table 6 is a summary of monitoring points/detected constituents from the 2023 sampling events that did not exceed a UPL. Table 7 provides a summary of ongoing and newly identified SSIs and compares these concentrations to the GWPS values.

Table 8 provides a visualization of the historic SSIs and regulatory standard exceedances since 2016, the first year during which unfiltered samples were collected at the site. Table 8 does not identify UPL exceedances prior to 2019, as this was the first year UPLs were calculated.

Since the September 2023 sampling event was the eighth sampling event since the site transitioned to unfiltered sampling, trend analyses for wells and parameters with regulatory standard exceedances were performed. The results of the trend analysis are discussed below in Section 8.0.

5.3 STANDARDS HISTORY

The standards for 2019 through 2023 are summarized in Table 9. Graphs of standards history are included in Appendix F.

6.0 SUMMARY OF FINDINGS FOR GROUNDWATER

6.1 COMPARISON TO STANDARDS

Comparison of the September 2023 results to the GWPSs indicated that there were no new GWPS exceedances in 2023 for parameters previously included in the monitoring program. Lithium and molybdenum were included in the sampling event for the first time in 2023, and GWPS exceedances were detected at several wells. The GWPS exceedances detected in September 2023 are:

- Lithium at MW-3, MW-10, MW-11AR, MW-13, MW-14, MW-20, MW-21, and MW-23
- Manganese at MW-4
- Molybdenum at MW-20
- Selenium at MW-5

Monitoring well MW-10 is a background well for the East Landfill, and lithium concentrations detected at many of the other wells with GWPS exceedances were similar to the concentration at MW-10. The September 2023 sampling event was the first time samples were tested for lithium and molybdenum at the Site, so the GWPS exceedances for lithium and molybdenum have not been

confirmed and cannot be compared to historical data. A UPL for lithium cannot yet be calculated, but these results indicate that lithium concentrations in groundwater at the site may be at least partly attributable to natural conditions.

Most exceedances of the background UPLs were consistent with previous results, with the following exceptions:

- MW-8: New UPL exceedance for lead
- MW-5: Many fewer UPL exceedances, and fewer GWPS exceedances, than in 2021-2022
- MW-18: Many fewer UPL exceedances, and fewer GWPS exceedances, than in 2022

Dedicated pumps were installed in 2023 at MW-4, MW-5, and MW-18 to reduce turbidity in samples from these wells. TSS at MW-4 was 6 milligrams per liter (mg/L) in September 2023, and TSS at MW-5 and MW-18 was less than 5 mg/L. Fewer UPL and GPS exceedances were recorded at MW-5 and MW-18 in 2023 as compared to previous years. The same UPL and GWPS exceedances were recorded at MW-4 in 2023 as compared to 2021-2022. While TSS data from previous years are not available for comparison, these results indicate that the installation of dedicated pumps did apparently improve sample quality at some wells and some standards exceedances previously detected at MW-5 and MW-18 may be attributable to suspended sediment in the samples.

6.2 TREND ANALYSIS

Mann-Kendall trend tests were performed in 2023 for the parameters that have health-based standards and were detected at concentrations above the UPL in 2023: arsenic, boron, lead, manganese, and selenium. Trend analysis could not be performed for lithium or molybdenum because not enough data are available. The results are included as **Appendix G** and summarized in **Table 10** for wells/parameters with 2023 UPL exceedances.

The trend tests identified statistically significant trends for the following parameter/well combinations:

- MW-4: Manganese, SSI trend

6.3 TOTAL SUSPENDED SOLIDS EVALUATION

TSS was added to the parameter list in 2023. TSS over 5 mg/L was detected at approximately half of monitoring wells, including one well with a dedicated pump (MW-4, TSS = 6 mg/L). TSS values of 100 mg/L or greater were detected at MW-8, MW-11AR, and MW-21.

Elevated TSS does not appear to be correlated with higher metals concentrations when comparing results between wells, as the three wells with the highest TSS results had relatively few UPL or GWPS exceedances in 2023. As discussed in **Section 6.1**, fewer UPL and GWPS exceedances were recorded at MW-5 and MW-18 in 2023 following the installation of dedicated pumps. TSS data from previous years are not available for comparison, but field turbidity at MW-5 and MW-18 was previously variable and the 2023 results appear to indicate that installation of dedicated pumps at these wells improved sample quality.

7.0 LEACHATE MONITORING SYSTEM

A sample was voluntarily collected from leachate point LW-1. during the September 2023 sampling event. Sampling results for leachate monitoring are included in Table 11.

During the April and September monitoring events, leachate levels are measured at leachate head wells LW-1 through LW-4. LW-1, LW-2, and LW-3 are located in the West Landfill and are generally dry or nearly dry. LW-1 contained 3.35 feet of leachate in April 2023 and 2.75 feet in September 2023. LW-2 and LW-3 were dry during both 2023 sampling events. LW-4 is located in the East Landfill and is not typically dry; it contained 2.25 feet of leachate during the April 2023 sampling event and was dry during the September 2023 sampling event.

Well LL-1, located in the leachate transfer line bedding material between the East Landfill and the leachate collection tank, was dry when measured in April 2023, indicating no leakage into the leachate line bedding material. LL-1 was not measured in September 2023, as discussed in Section 3.1. Leachate depths and elevations measured during 2023 are summarized in Table 12.

8.0 RECOMMENDATIONS

SCS recommends that the current monitoring program be continued during 2024, with the inclusion of calcium, lithium, molybdenum, TDS, TSS, field dissolved oxygen, and field redox potential. Fluoride was only detected at LW-01, at a level below the method detection limit. There were no detections of fluoride in samples collected from monitoring wells at the Site, so annual testing for fluoride is not recommended. Based on communication with IDNR in 2023, fluoride should be included in the sampling program in five years and reevaluated.

In addition, SCS recommends that copper and zinc be removed from the sampling program. These two parameters were retained at leachate wells in 2023 per IDNR's letter dated July 14, 2023, and were detected in the sample from LW-01 at concentrations multiple orders of magnitude lower than GWPSs.

The planned monitoring schedule for 2024 is summarized in Table 2.

9.0 REFERENCES

Montgomery, James M., 1991, Phase II Hydrogeologic Investigation Report and Hydrologic Monitoring System Plan for the Existing Marshalltown CCR Landfill, Iowa Electric Light and Power Company, December 1991.

SCS Engineers, 2018, 2018 Annual Water Quality Report, Interstate Power and Light Company – Marshalltown East and West Closed Landfill, November 28, 2018.

Tables

Table 1
Monitoring Program Summary
2023 Annual Water Quality Report
Marshalltown East and West Closed Landfills
Permit Nos. 64-SDP-5-91C and 64-SDP-3-90C

Monitoring Point	Landfill	Formation	Current Monitoring Program	Change for Next Sampling Event	UPL Exceedances	Total # of Samples in each monitoring program since January 1, 2018
						Routine
Sampled Monitoring Wells						
MW-3	West	Shallow	Routine	NC	Selenium	6
MW-4	West	Shallow	Routine	NC	Arsenic, boron, manganese	6
MW-5	West	Shallow	Routine	NC	Selenium	6
MW-7	West	Shallow	Routine	NC	none	6
MW-8	West	Shallow	Routine	NC	Lead	5**
MW-9	East	Shallow	Routine	NC	none	6
MW-10	East	Shallow	Routine	NC	none	6
MW-11AR	East	Deep	Routine	NC	Magnesium	6
MW-13	East and West*	Shallow	Routine	NC	none	6
MW-14	East and West*	Shallow	Routine	NC	none	6
MW-18	East	Shallow	Routine	NC	none	6
MW-19	West	Deep	Routine	NC	none	6
MW-20	East	Deep	Routine	NC	Boron, selenium, sulfate	6
MW-21	West	Deep	Routine	NC	none	6
MW-22	East	Shallow	Routine	NC	Not Sampled**	3**
MW-23	East	Deep	Routine	NC	none	6
Surface Water Monitoring Points						
SW-1	East and West	N/A	Routine	NC	N/A	5
SW-2	West	N/A	Routine	NC	N/A	4
SW-3	East	N/A	Routine	NC	N/A	0
Leachate Monitoring Points						
LW-1	West	N/A	Routine (Voluntary)^	NC	N/A	5
LW-2	West	N/A	Routine (Voluntary)^	NC	N/A	0
LW-3	West	N/A	Routine (Voluntary)^	NC	N/A	0
LW-4	East	N/A	Routine (Voluntary)^	NC	N/A	3
Leachate Collection Tank	East	N/A	Routine (Voluntary)^	NC	N/A	5
LL-1	East	N/A	Routine	NC	N/A	N/A
Other Monitoring Points						
Groundwater Gradient Control System (GWGCS)	East	N/A	Routine (Voluntary)	NC	N/A	3

*: MW-13, MW-14, and SW-1 are included in the monitoring program for both the East and West landfills. MW-13 and MW-14 are the upgradient wells for the West landfill.
**: Insufficient water was available in MW-8 for sample collection in September 2021, and at MW-22 for sample collection in September 2021, 2022, and 2023.
^: Leachate elevations are required at LW-1 through LW-4. Samples are voluntarily collected for laboratory analysis.

Updated By: RM, 10/31/2023
Checked By: NLB, 11/1/2023

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Table 2
Monitoring Program Implementation Schedule
2023 Annual Water Quality Report
Marshalltown East and West Closed Landfills
Permit Nos. 64-SDP-5-91C and 64-SDP-3-90C

	Recent Sampling Dates and Constituents													Upcoming Sampling Dates and Constituents	
Monitoring Point	**4/9/2018**	**9/11-13/2018**	**4/16-17/2019**	**9/16-17/2019**	**4/16/2020**	**9/1-2/2020**	**4/29/2021**	**9/27-29/2021**	**4/20/2022**	**7/7/2022**	**9/20-22/2022**	**4/13/2023**	**9/18-22/2023**	**April 2024**	**September 2024**
East Landfill Monitoring Wells															
MW-9	Groundwater Elevation	List A	Groundwater Elevation	List A	Groundwater Elevation	List A**	Groundwater Elevation (plus List A at MW-10)	List A^	Groundwater Elevation	--	List A^	Groundwater Elevation	List A^	Groundwater Elevation	List A
MW-10															
MW-11AR															
MW-13*															
MW-14*															
MW-18															
MW-20															
MW-22										Total and dissolved arsenic					
MW-23										--					
West Landfill Monitoring Wells															
MW-3	Groundwater Elevation	List A	Groundwater Elevation	List A	Groundwater Elevation	List A	Groundwater Elevation	List A^	Groundwater Elevation	--	List A	Groundwater Elevation	List A	Groundwater Elevation	List A
MW-4															
MW-5															
MW-7															
MW-8R															
MW-13*															
MW-14*															
MW-19															
MW-21															
Surface Water Monitoring Wells															
SW-1	Surface Water Depth	List A	Surface Water Depth	List A	Surface Water Depth	DRY	Surface Water Depth	List A	Surface Water Depth	--	List A	Surface Water Depth	List A	Surface Water Depth	List A
SW-2						DRY					DRY				
SW-3		DRY		DRY		DRY		DRY			DRY		DRY		
Leachate Monitoring Points[1,#]															
LW-1	Leachate Elevation	List A	Leachate Elevation	Leachate Elevation	Leachate Elevation	List A	Leachate Elevation	List A	Leachate Elevation	--	List A	Leachate Elevation	List A	Leachate Elevation	List A
LW-2		DRY		DRY		DRY		DRY			DRY		DRY		
LW-3		DRY		DRY		DRY		DRY			DRY		DRY		
LW-4		Field Parameters^^		Field Parameters^^		List A		DRY			DRY[#]		DRY		
Leachate Collection Tank	Leachate Depth	List A	Leachate Depth	List A	Leachate Depth	List A	Leachate Depth	List A	Leachate Depth	--	List A	Leachate Depth	List A	Leachate Depth	List A
LL-1		Leachate Depth		Leachate Depth		Leachate Depth		Leachate Depth			Leachate Depth		Leachate Depth		Leachate Depth
Other Monitoring Points															
Groundwater Gradient Control System (GWGCS)	--	List A	--	List A	--	DRY	--	List A	--	--	List A	--	List A	--	List A

Notes:

List A: arsenic, barium, beryllium, boron, cobalt, copper, iron, lead, magnesium, manganese, selenium, zinc, chloride, sulfate, field pH, field specific conductance, field temperature, and groundwater elevation, leachate depth, or surface water depth. Metals are reported as total starting in 2016 (previously reported as dissolved). Calcium, lithium, molybdenum, and TDS were added to the list in 2023.

1) Leachate elevations are required at LW-1 through LW-4. Samples are voluntarily collected for laboratory analysis.

*: MW-13, MW-14, and SW-1 are included in the monitoring program for both the East and West landfills. MW-13 and MW-14 are the upgradient wells for the West landfill.

**: MW-10 was not sampled during the September 2020 event; the well was inaccessible due to downed trees around the well. A strong derecho storm on August 10, 2020 caused significant tree damage in the area.

^: MW-8R and MW-22 did not produce sufficient water for sample collection in September 2021. MW-22 did not produce sufficient water for sample collection in September 2022 or 2023.

^^: The well produced sufficient water for field parameter measurement, but not for sample collection.

#: A depth to liquid measurement was obtained at LW-4 in September 2022, but there was insufficient water to sample for field parameters or List A parameters.

Updated: RM, 10/31/2023
Checked: NLB, 11/1/2023

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Table 3
Monitoring Well Maintenance and Performance Reevaluation Schedule
2023 Annual Water Quality Report
Marshalltown East and West Closed Landfills
Permit Nos. 64-SDP-5-91C and 64-SDP-3-90C

Compliance with:	Monitoring Calendar Years					
	2019	2020	2021	2022	2023	2024
567 IAC 115.21(2)a. high and low water levels (biennial)	Completed		Completed		Completed	
567 IAC 115.21(2)b. changes in the hydrologic setting and flow paths (biennial)	Completed		Completed		Completed	
567 IAC 115.21(2)c. well depths (annual)*	Completed	Completed	Completed	Completed	Completed	Scheduled
567 IAC 115.21(2)d. in-situ permeability tests (every 5 years)**	Not Applicable - Variance granted by IDNR (see comment below)					

Comments:
*: To avoid the potential for cross-contamination and increased sample turbidity associated with removing and re-installing dedicated pumps, well depths are not measured annually at wells with dedicated pumps.
**: A variance to IAC 567-110.9(2)(d) for in situ permeability tests every 5 years was granted by IDNR in a letter dated May 4, 1999. Although IAC 567-110 has been rescinded since the variance was granted, the same permeability test requirements are now in IAC 567-115.21(2), and our understanding is that the conditions of the variance still apply.

Updated By: RM, 10/30/2023
Checked By: NLB, 11/1/2023

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Table 4A
Monitoring Well Maintenance and Performance Summary
2023 Annual Water Quality Report
Marshalltown East and West Closed Landfills
Permit Nos. 64-SDP-5-91C and 64-SDP-3-90C

	Well	Top of Casing (Ft MSL)	Top of Screen^ (Ft MSL)	Total Depth (ft)		Date of Measurements		Depth Discrepancy (ft)
						4/13/2023	9/18-22/2023	
Shallow Hydrogeologic Unit Wells	MW-3	883.88	877.29	21.59	Groundwater Level (ft)	14.82	17.23	-0.31
					Groundwater Elevation (Ft MSL)	869.06	866.65	
					Measured Well Depth (ft)	21.90	21.80	
					Submerged screen	N	N	
	MW-4	880.51	876.49	19.02	Groundwater Level (ft)	8.28	10.61	-0.33
					Groundwater Elevation (Ft MSL)	872.23	869.90	
					Measured Well Depth (ft)	19.35	--*	
					Submerged screen	N	N	
	MW-5	891.41	884.92	21.49	Groundwater Level (ft)	16.85	17.47	-0.15
					Groundwater Elevation (Ft MSL)	874.56	873.94	
					Measured Well Depth (ft)	21.64	--*	
					Submerged screen	N	N	
	MW-7	903.85	876.20	42.65	Groundwater Level (ft)	28.02	29.78	-0.5
					Groundwater Elevation (Ft MSL)	875.83	874.07	
					Measured Well Depth (ft)	43.15	42.35	
					Submerged screen	N	N	
	MW-8	902.53	888.19	29.34	Groundwater Level (ft)	23.24	26.07	-0.44
					Groundwater Elevation (Ft MSL)	879.29	876.46	
					Measured Well Depth (ft)	29.78	29.40	
					Submerged screen	N	N	
	MW-9	918.04	913.00	20.04	Groundwater Level (ft)	5.45	10.85	-0.4
					Groundwater Elevation (Ft MSL)	912.59	907.19	
					Measured Well Depth (ft)	20.44	20.13	
					Submerged screen	N	N	
	MW-10	941.19	936.18	20.01	Groundwater Level (ft)	15.91	16.41	-0.29
					Groundwater Elevation (Ft MSL)	925.28	924.78	
					Measured Well Depth (ft)	20.30	20.10	
					Submerged screen	N	N	
	MW-13	920.75	913.28	22.47	Groundwater Level (ft)	6.80	13.79	-1.38
					Groundwater Elevation (Ft MSL)	913.95	906.96	
					Measured Well Depth (ft)	23.85	22.27	
					Submerged screen	Y	N	
	MW-14	929.48	921.93	22.55	Groundwater Level (ft)	10.42	14.20	-0.48
					Groundwater Elevation (Ft MSL)	919.06	915.28	
					Measured Well Depth (ft)	23.03	22.55	
					Submerged screen	N	N	
	MW-18	921.63	910.13	26.50	Groundwater Level (ft)	18.64	21.40	-0.27
					Groundwater Elevation (Ft MSL)	902.99	900.23	
					Measured Well Depth (ft)	26.77	--*	
					Submerged screen	N	N	
	MW-22	926.63	885.73	55.90	Groundwater Level (ft)	53.20	DRY	-0.76
					Groundwater Elevation (Ft MSL)	873.43	--	
					Measured Well Depth (ft)	56.66	55.70	
					Submerged screen	N	N	

Table 4A
Monitoring Well Maintenance and Performance Summary
2023 Annual Water Quality Report
Marshalltown East and West Closed Landfills
Permit Nos. 64-SDP-5-91C and 64-SDP-3-90C

	Well	Top of Casing (Ft MSL)	Top of Screen^ (Ft MSL)	Total Depth (ft)		Date of Measurements		Depth Discrepancy (ft)
						4/13/2023	9/18-22/2023	
Piezometers (Deep Hydrogeologic Unit)	MW-11AR	922.53	869.84	57.69	Groundwater Level (ft)	49.15	51.60	-0.71
					Groundwater Elevation (Ft MSL)	873.38	870.93	
					Measured Well Depth (ft)	58.40	57.90	
					Submerged screen	Y	Y	
	MW-19	891.46	856.41	40.05	Groundwater Level (ft)	15.85	17.34	-0.26
					Groundwater Elevation (Ft MSL)	875.61	874.12	
					Measured Well Depth (ft)	40.31	39.95	
					Submerged screen	Y	Y	
	MW-20	920.86	846.74	79.12	Groundwater Level (ft)	47.70	50.20	-1.78
					Groundwater Elevation (Ft MSL)	873.16	870.66	
					Measured Well Depth (ft)	80.90	80.40	
					Submerged screen	Y	Y	
	MW-21	880.11	849.09	36.02	Groundwater Level (ft)	7.87	10.12	-0.41
					Groundwater Elevation (Ft MSL)	872.24	869.99	
					Measured Well Depth (ft)	36.43	36.05	
					Submerged screen	Y	Y	
	MW-23	926.64	911.28	20.36	Groundwater Level (ft)	7.75	12.57	0.56
					Groundwater Elevation (Ft MSL)	918.89	914.07	
					Measured Well Depth (ft)	20.43	19.80	
					Submerged screen	Y	Y	
Surface Water Monitoring Points	SW-1	NA	NA	NA	Surface Water Depth	NM	2.00	NA
	SW-2	NA	NA	NA	Surface Water Depth	NM	0.50	NA
	SW-3	NA	NA	NA	Surface Water Depth	NM	DRY	NA

^: Screen lengths of 15 for water table wells and 5 for piezometers and leachate monitoring wells are assumed. Original well construction forms were not available for review at the time this table was prepared.

*: Total depths at monitoring wells MW-4, MW-5, and MW-8 not measured in September 2023 due to dedicated pumps in wells.

NA - Not Applicable NM - Not Measured

Updated By: RM, 10/31/2023
Checked By: NLB, 11/1/2023

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Table 4B
Vertical Gradients
2023 Annual Water Quality Report
Marshalltown East and West Closed Landfills
Permit Nos. 64-SDP-5-91C and 64-SDP-3-90C

Well Pair		Vertical Hydraulic Gradient (feet/foot)[(1)]	
Shallower Well	**Deeper Well**	**April 2023**	**September 2023**
MW-4	MW-21	0.001	0.006
MW-5	MW-19	0.071	0.012
MW-13	MW-20	-0.833	-0.748
MW-18	MW-11AR	-0.992	-0.971

Notes:
(1) A negative value indicates a downward gradient; a positive value indicates an upward gradient.

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Checked: NLB, 11/1/2023

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Table 5
Background and GWPS Summary
2023 Annual Water Quality Report
Marshalltown East and West Closed Landfills
Permit Nos. 64-SDP-5-91C and 64-SDP-3-90C

Interwell Background								
Constituent	**Units**	**Samples***	**Detections**	**UPL**	**Statistical Test**	**Action Level**	**Source**	**Other Standards**
East Landfill - MW-9 and MW-10								
Field pH	SU	16	16	N/A	N/A	none	--	SMCL <6.5 or >8.5
Field Temperature	deg C	16	16	N/A	N/A	none	--	--
Field Specific Conductance	µmhos/cm	16	16	N/A	N/A	none	--	--
Field Dissolved Oxygen	mg/L	2	2	N/A	N/A	none	--	--
Field Oxidation Potential	mV	2	2	N/A	N/A	none	--	--
Arsenic	µg/l	16	6	1.60	PL(NP)	10	MCL	--
Barium	µg/l	16	16	203	PL(P)	2,000	MCL	--
Beryllium	µg/l	16	2	0.330	PL(NP)	4	MCL	--
Boron	µg/l	16	4	815	PL(P)	6,000	SWS	--
Calcium	mg/L	2	2	N/A	N/A	none	--	--
Chloride	mg/L	50	33	46.0	PL(NP)	none	--	SMCL 250
Cobalt	µg/l	16	13	4.95	PL(P)	4.95	Background	SWS 2.1
Iron	µg/l	16	14	3,520	PL(P)	none	--	SMCL 300
Lead	µg/l	16	6	1.90	PL(NP)	15	SWS	--
Lithium	µg/l	2	2	N/A	N/A	14	SWS	--
Magnesium	µg/l	16	16	27,400	PL(P)	none	--	--
Manganese	µg/l	16	15	3,050	PL(NP)	3,050	Background	SWS 300, SMCL 50
Molybdenum	µg/l	2	1	N/A	N/A	40	SWS	--
Selenium	µg/l	16	4	4.00	PL(NP)	50	MCL	--
Sulfate	mg/L	50	50	120	PL(NP)	none	--	SMCL 250
Total Dissolved Solids	mg/L	2	2	N/A	N/A	none	--	SMCL - 500
Total Suspended Solids	mg/L	2	1	N/A	N/A	none	--	--
West Landfill - MW-8, MW-13 and MW-14								
Field pH	SU	23	23	N/A	N/A	none	--	SMCL <6.5 or >8.5
Field Temperature	deg C	23	23	N/A	N/A	none	--	--
Field Specific Conductance	µmhos/cm	23	23	N/A	N/A	none	--	--
Field Dissolved Oxygen	mg/L	2	2	N/A	N/A	none	--	--
Field Oxidation Potential	mV	2	2	N/A	N/A	none	--	--
Arsenic	µg/l	23	10	1.60	PL(NP)	10	MCL	--
Barium	µg/l	23	23	163	PL(P)	2,000	MCL	--
Beryllium	µg/l	23	1	0.330	PL(NP)	4	MCL	--
Boron	µg/l	23	20	1,340	PL(P)	6,000	SWS	--
Calcium	mg/L	3	3	N/A	N/A	none	--	--
Chloride	mg/L	74	44	51.9	PL(NP)	none	--	SMCL 250
Cobalt	µg/l	23	21	3.58	PL(P)	3.58	Background	SWS 2.1
Iron	µg/l	23	22	5,220	PL(P)	none		SMCL 300
Lead	µg/l	23	19	2.55	PL(P)	15	SWS	--
Lithium	µg/l	3	3	N/A	N/A	14	SWS	--
Magnesium	µg/l	23	23	27,600	PL(P)	none	--	--
Manganese	µg/l	23	23	637	PL(P)	637	Background	SWS 300, SMCL 50
Molybdenum	µg/l	3	1	N/A	N/A	40	SWS	--
Selenium	µg/l	23	13	3.49	PL(P)	50	MCL	--
Sulfate	mg/L	74	74	175	PL(P)	none	--	SMCL 250
Total Dissolved Solids	mg/L	3	3	N/A	N/A	none	--	SMCL - 500
Total Suspended Solids	mg/L	3	3	N/A	N/A	none	--	--

PL(NP) - Prediction Limit (Non-Parametric)
PL(P) - Prediction Limit (Parametric)
MCL - Maximum Contaminant Level
SMCL - Secondary Maximum Contaminant Level
SWS - Iowa Statewide Standard for a Protected Groundwater Source (Health-Based)

µg/l - micrograms per liter
mg/L - milligrams per liter
mV - millivolts
µmhos/cm - micromhos per centimeter

*: For all parameters except chloride, sulfate, DO, and ORP, these columns reflect the number of samples since 2016, when unfiltered sample collection for metals analysis began. Additional historical data are included for chloride and sulfate, which were reported as totals prior to 2016. DO and ORP have been sampled as part of low-flow stabilization in the past, but were only required to be reported as part of the AWQR beginning in 2023.

**: Parameters calcium, lithium, molybdenum, TDS, and TSS were added to the sampling program in 2023. Prediction limits will be calculated once the minimum of 4 samples have been obtained.

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Checked: NLB, 11/1/2023

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Table 6
Summary of Well/Detected Constituent Pairs With No Immediately Preceding SSIs
2023 Annual Water Quality Report
Marshalltown East and West Closed Landfills
Permit Nos. 64-SDP-5-91C and 64-SDP-3-90C

	Well	Constituent	Units	Most Recent Result	UPL
East Landfill	MW-9*	Field pH	SU	6.76	N/A
		Field Temperature	deg C	15.3	N/A
		Field Specific Conductance	µmhos/cm	647	N/A
		Field Dissolved Oxygen	mg/L	0.64	N/A
		Field Oxidation Potential	mV	59.7	N/A
		Arsenic	µg/l	ND	1.60
		Barium	µg/l	180	203
		Beryllium	µg/l	ND	0.330
		Boron	µg/l	ND	815
		Calcium	mg/L	96	N/A
		Chloride	mg/L	17	46
		Cobalt	µg/l	0.35 J	4.95
		Iron	µg/l	ND	3520
		Lead	µg/l	ND	1.90
		Lithium	µg/l	9.3 J	N/A
		Magnesium	µg/l	17000	27400
		Manganese	µg/l	220	3050
		Molybdenum	µg/l	ND	N/A
		Selenium	µg/l	ND	4
		Sulfate	mg/L	11	120
		Total Dissolved Solids	mg/L	330	N/A
		Total Suspended Solids	mg/L	1.1 J	N/A
	MW-10*	Field pH	SU	6.93	N/A
		Field Temperature	deg C	12.4	N/A
		Field Specific Conductance	µmhos/cm	629	N/A
		Field Dissolved Oxygen	mg/L	5.33	N/A
		Field Oxidation Potential	mV	96.2	N/A
		Arsenic	µg/l	ND	1.60
		Barium	µg/l	160	203
		Beryllium	µg/l	ND	0.330
		Boron	µg/l	ND	815
		Calcium	mg/L	81	N/A
		Chloride	mg/L	2.3 J	46
		Cobalt	µg/l	ND	4.95
		Iron	µg/l	ND	3520
		Lead	µg/l	ND	1.90
		Lithium	µg/l	18	N/A
		Magnesium	µg/l	23000	27400
		Manganese	µg/l	ND	3050
		Molybdenum	µg/l	1.0 J	N/A
		Selenium	µg/l	ND	4
		Sulfate	mg/L	8.0	120
		Total Dissolved Solids	mg/L	330	N/A
		Total Suspended Solids	mg/L	ND	N/A

Table 6
Summary of Well/Detected Constituent Pairs With No Immediately Preceding SSIs
2023 Annual Water Quality Report
Marshalltown East and West Closed Landfills
Permit Nos. 64-SDP-5-91C and 64-SDP-3-90C

	Well	Constituent	Units	Most Recent Result	UPL
East Landfill (continued)	MW-11AR	Field pH	SU	6.96	N/A
		Field Temperature	deg C	13.7	N/A
		Field Specific Conductance	µmhos/cm	913	N/A
		Field Dissolved Oxygen	mg/L	1.54	N/A
		Field Oxidation Potential	mV	54.7	N/A
		Arsenic	µg/l	0.89 J	1.60
		Barium	µg/l	49	203
		Beryllium	µg/l	ND	0.330
		Boron	µg/l	420	815
		Calcium	mg/L	100	N/A
		Chloride	mg/L	21	46
		Cobalt	µg/l	0.80	4.95
		Iron	µg/l	580	3520
		Lead	µg/l	1.2	1.90
		Lithium	µg/l	15	N/A
		Magnesium	µg/l	34000	27400
		Manganese	µg/l	86	3050
		Molybdenum	µg/l	2.2	N/A
		Selenium	µg/l	2.2 J	4
		Sulfate	mg/L	97	120
		Total Dissolved Solids	mg/L	470	N/A
		Total Suspended Solids	mg/L	100	N/A
	MW-13	Field pH	SU	6.92	N/A
		Field Temperature	deg C	14.9	N/A
		Field Specific Conductance	µmhos/cm	803	N/A
		Field Dissolved Oxygen	mg/L	3.88	N/A
		Field Oxidation Potential	mV	129.3	N/A
		Arsenic	µg/l	ND	1.60
		Barium	µg/l	110	203
		Beryllium	µg/l	ND	0.330
		Boron	µg/l	120	815
		Calcium	mg/L	130	N/A
		Chloride	mg/L	ND	46
		Cobalt	µg/l	0.20 J	4.95
		Iron	µg/l	78 J	3520
		Lead	µg/l	ND	1.90
		Lithium	µg/l	15	N/A
		Magnesium	µg/l	18000	27400
		Manganese	µg/l	21	3050
		Molybdenum	µg/l	ND	N/A
		Selenium	µg/l	ND	4
		Sulfate	mg/L	120	120
		Total Dissolved Solids	mg/L	490	N/A
		Total Suspended Solids	mg/L	6.4	N/A

Table 6
Summary of Well/Detected Constituent Pairs With No Immediately Preceding SSIs
2023 Annual Water Quality Report
Marshalltown East and West Closed Landfills
Permit Nos. 64-SDP-5-91C and 64-SDP-3-90C

	Well	Constituent	Units	Most Recent Result	UPL
East Landfill (continued)	MW-14	Field pH	SU	7.13	N/A
		Field Temperature	deg C	14.3	N/A
		Field Specific Conductance	µmhos/cm	693	N/A
		Field Dissolved Oxygen	mg/L	6.88	N/A
		Field Oxidation Potential	mV	103.7	N/A
		Arsenic	µg/l	ND	1.60
		Barium	µg/l	62	203
		Beryllium	µg/l	ND	0.330
		Boron	µg/l	220	815
		Calcium	mg/L	98	N/A
		Chloride	mg/L	3.6 J	46
		Cobalt	µg/l	0.44 J	4.95
		Iron	µg/l	120	3520
		Lead	µg/l	0.26 J	1.90
		Lithium	µg/l	25	N/A
		Magnesium	µg/l	22000	27400
		Manganese	µg/l	120	3050
		Molybdenum	µg/l	2.2	N/A
		Selenium	µg/l	ND	4
		Sulfate	mg/L	35	120
		Total Dissolved Solids	mg/L	390	N/A
		Total Suspended Solids	mg/L	12	N/A
	MW-18	Field pH	SU	6.73	N/A
		Field Temperature	deg C	12.0	N/A
		Field Specific Conductance	µmhos/cm	819	N/A
		Field Dissolved Oxygen	mg/L	1.47	N/A
		Field Oxidation Potential	mV	111.8	N/A
		Arsenic	µg/l	ND	1.60
		Barium	µg/l	150	203
		Beryllium	µg/l	ND	0.330
		Boron	µg/l	130	815
		Calcium	mg/L	120	N/A
		Chloride	mg/L	4.4 J	46
		Cobalt	µg/l	ND	4.95
		Iron	µg/l	ND	3520
		Lead	µg/l	ND	1.90
		Lithium	µg/l	19	N/A
		Magnesium	µg/l	21,000	27400
		Manganese	µg/l	7.5 J	3050
		Molybdenum	µg/l	0.99 J	N/A
		Selenium	µg/l	ND	4
		Sulfate	mg/L	64	120
		Total Dissolved Solids	mg/L	460	N/A
		Total Suspended Solids	mg/L	ND	N/A

Table 6
Summary of Well/Detected Constituent Pairs With No Immediately Preceding SSIs
2023 Annual Water Quality Report
Marshalltown East and West Closed Landfills
Permit Nos. 64-SDP-5-91C and 64-SDP-3-90C

	Well	Constituent	Units	Most Recent Result	UPL
East Landfill (continued)	MW-20	Field pH	SU	7.10	N/A
		Field Temperature	deg C	14.1	N/A
		Field Specific Conductance	µmhos/cm	867	N/A
		Field Dissolved Oxygen	mg/L	3.68	N/A
		Field Oxidation Potential	mV	76.1	N/A
		Arsenic	µg/l	0.96 J	1.60
		Barium	µg/l	93	203
		Beryllium	µg/l	ND	0.330
		Boron	µg/l	3800	815
		Calcium	mg/L	110	N/A
		Chloride	mg/L	19	46
		Cobalt	µg/l	ND	4.95
		Iron	µg/l	ND	3520
		Lead	µg/l	0.24 J	1.90
		Lithium	µg/l	72	N/A
		Magnesium	µg/l	20000	27400
		Manganese	µg/l	ND	3050
		Molybdenum	µg/l	720	N/A
		Selenium	µg/l	23	4
		Sulfate	mg/L	140	120
		Total Dissolved Solids	mg/L	550	N/A
		Total Suspended Solids	mg/L	2.0	N/A
	MW-22	Field pH	SU	--	N/A
		Field Temperature	deg C	--	N/A
		Field Specific Conductance	µmhos/cm	--	N/A
		Field Dissolved Oxygen	mg/L	--	N/A
		Field Oxidation Potential	mV	--	N/A
		Arsenic	µg/l	--	1.60
		Barium	µg/l	--	203
		Beryllium	µg/l	--	0.330
		Boron	µg/l	--	815
		Calcium	mg/L	--	N/A
		Chloride	mg/L	--	46
		Cobalt	µg/l	--	4.95
		Iron	µg/l	--	3520
		Lead	µg/l	--	1.90
		Lithium	µg/l	--	N/A
		Magnesium	µg/l	--	27400
		Manganese	µg/l	--	3050
		Molybdenum	µg/l	--	N/A
		Selenium	µg/l	--	4
		Sulfate	mg/L	--	120
		Total Dissolved Solids	mg/L	--	N/A
		Total Suspended Solids	mg/L	--	N/A

Table 6
Summary of Well/Detected Constituent Pairs With No Immediately Preceding SSIs
2023 Annual Water Quality Report
Marshalltown East and West Closed Landfills
Permit Nos. 64-SDP-5-91C and 64-SDP-3-90C

	Well	Constituent	Units	Most Recent Result	UPL
East Lanfdill (continued)	MW-23	Field pH	SU	6.85	N/A
		Field Temperature	deg C	16.9	N/A
		Field Specific Conductance	µmhos/cm	725	N/A
		Field Dissolved Oxygen	mg/L	1.06	N/A
		Field Oxidation Potential	mV	69.3	N/A
		Arsenic	µg/l	ND	1.60
		Barium	µg/l	120	203
		Beryllium	µg/l	ND	0.330
		Boron	µg/l	89 J	815
		Calcium	mg/L	110	N/A
		Chloride	mg/L	2.6 J	46
		Cobalt	µg/l	ND	4.95
		Iron	µg/l	ND	3520
		Lead	µg/l	ND	1.90
		Lithium	µg/l	29	N/A
		Magnesium	µg/l	20000	27400
		Manganese	µg/l	5.8 J	3050
		Molybdenum	µg/l	1.5 J	N/A
		Selenium	µg/l	ND	4
		Sulfate	mg/L	65	120
		Total Dissolved Solids	mg/L	440	N/A
		Total Suspended Solids	mg/L	ND	N/A
West Landfill	MW-3	Field pH	SU	7.01	N/A
		Field Temperature	deg C	15.3	N/A
		Field Specific Conductance	µmhos/cm	799	N/A
		Field Dissolved Oxygen	mg/L	3.31	N/A
		Field Oxidation Potential	mV	97.1	N/A
		Arsenic	µg/l	0.65 J	1.60
		Barium	µg/l	150	163
		Beryllium	µg/l	ND	0.330
		Boron	µg/l	1300	1340
		Calcium	mg/L	120	N/A
		Chloride	mg/L	14	52
		Cobalt	µg/l	0.75	3.58
		Iron	µg/l	430 F1 F2	5220
		Lead	µg/l	0.68	2.55
		Lithium	µg/l	23	N/A
		Magnesium	µg/l	18000	27600
		Manganese	µg/l	78	637
		Molybdenum	µg/l	8.6	N/A
		Selenium	µg/l	7.4	3
		Sulfate	mg/L	96	175
		Total Dissolved Solids	mg/L	440	N/A
		Total Suspended Solids	mg/L	10	N/A

Table 6
Summary of Well/Detected Constituent Pairs With No Immediately Preceding SSIs
2023 Annual Water Quality Report
Marshalltown East and West Closed Landfills
Permit Nos. 64-SDP-5-91C and 64-SDP-3-90C

	Well	Constituent	Units	Most Recent Result	UPL
West Landfill (continued)	MW-4	Field pH	SU	6.86	N/A
		Field Temperature	deg C	12.8	N/A
		Field Specific Conductance	µmhos/cm	778	N/A
		Field Dissolved Oxygen	mg/L	0.17	N/A
		Field Oxidation Potential	mV	-65.9	N/A
		Arsenic	µg/l	2.6	1.60
		Barium	µg/l	94	163
		Beryllium	µg/l	ND	0.330
		Boron	µg/l	3400	1340
		Calcium	mg/L	110	N/A
		Chloride	mg/L	12	52
		Cobalt	µg/l	0.90	3.58
		Iron	µg/l	1900	5220
		Lead	µg/l	0.28 J	2.55
		Lithium	µg/l	9.4 J	N/A
		Magnesium	µg/l	17000	27600
		Manganese	µg/l	1,200	637
		Molybdenum	µg/l	15	N/A
		Selenium	µg/l	ND	3
		Sulfate	mg/L	57	175
		Total Dissolved Solids	mg/L	420	N/A
		Total Suspended Solids	mg/L	6.0	N/A
	MW-5	Field pH	SU	6.29	N/A
		Field Temperature	deg C	12.6	N/A
		Field Specific Conductance	µmhos/cm	392.4	N/A
		Field Dissolved Oxygen	mg/L	6.22	N/A
		Field Oxidation Potential	mV	118.4	N/A
		Arsenic	µg/l	0.72 J	1.60
		Barium	µg/l	120	163
		Beryllium	µg/l	ND	0.330
		Boron	µg/l	420	1340
		Calcium	mg/L	48	N/A
		Chloride	mg/L	4.5 J	52
		Cobalt	µg/l	0.53	3.58
		Iron	µg/l	360	5220
		Lead	µg/l	0.60	2.55
		Lithium	µg/l	ND	N/A
		Magnesium	µg/l	13000	27600
		Manganese	µg/l	18	637
		Molybdenum	µg/l	ND	N/A
		Selenium	µg/l	54	3
		Sulfate	mg/L	28	175
		Total Dissolved Solids	mg/L	190	N/A
		Total Suspended Solids	mg/L	4.5	N/A

Table 6
Summary of Well/Detected Constituent Pairs With No Immediately Preceding SSIs
2023 Annual Water Quality Report
Marshalltown East and West Closed Landfills
Permit Nos. 64-SDP-5-91C and 64-SDP-3-90C

	Well	Constituent	Units	Most Recent Result	UPL
West Landfill (continued)	MW-7	Field pH	SU	7.19	N/A
		Field Temperature	deg C	13.3	N/A
		Field Specific Conductance	µmhos/cm	646	N/A
		Field Dissolved Oxygen	mg/L	8.10	N/A
		Field Oxidation Potential	mV	87.5	N/A
		Arsenic	µg/l	ND	1.60
		Barium	µg/l	110	163
		Beryllium	µg/l	ND	0.330
		Boron	µg/l	110	1340
		Calcium	mg/L	87	N/A
		Chloride	mg/L	19	52
		Cobalt	µg/l	0.31 J	3.58
		Iron	µg/l	54 J	5220
		Lead	µg/l	ND	2.55
		Lithium	µg/l	5.9 J	N/A
		Magnesium	µg/l	18000	27600
		Manganese	µg/l	17	637
		Molybdenum	µg/l	ND	N/A
		Selenium	µg/l	2.3 J	3
		Sulfate	mg/L	25	175
		Total Dissolved Solids	mg/L	350	N/A
		Total Suspended Solids	mg/L	8.4	N/A
	MW-8*	Field pH	SU	7.10	N/A
		Field Temperature	deg C	12.3	N/A
		Field Specific Conductance	µmhos/cm	661	N/A
		Field Dissolved Oxygen	mg/L	7.45	N/A
		Field Oxidation Potential	mV	101.9	N/A
		Arsenic	µg/l	0.55 J	1.60
		Barium	µg/l	130	163
		Beryllium	µg/l	ND	0.330
		Boron	µg/l	81 J	1340
		Calcium	mg/L	95	N/A
		Chloride	mg/L	20	52
		Cobalt	µg/l	1.7	3.58
		Iron	µg/l	1,200	5220
		Lead	µg/l	3.5	2.55
		Lithium	µg/l	5.2 J	N/A
		Magnesium	µg/l	17000	27600
		Manganese	µg/l	140	637
		Molybdenum	µg/l	ND	N/A
		Selenium	µg/l	ND	3
		Sulfate	mg/L	16	175
		Total Dissolved Solids	mg/L	360	N/A
		Total Suspended Solids	mg/L	290	N/A

Table 6
Summary of Well/Detected Constituent Pairs With No Immediately Preceding SSIs
2023 Annual Water Quality Report
Marshalltown East and West Closed Landfills
Permit Nos. 64-SDP-5-91C and 64-SDP-3-90C

	Well	Constituent	Units	Most Recent Result	UPL
West Landfill (continued)	MW-19	Field pH	SU	7.03	N/A
		Field Temperature	deg C	18.2	N/A
		Field Specific Conductance	µmhos/cm	652	N/A
		Field Dissolved Oxygen	mg/L	3.95	N/A
		Field Oxidation Potential	mV	91.7	N/A
		Arsenic	µg/l	ND	1.60
		Barium	µg/l	120	163
		Beryllium	µg/l	ND	0.330
		Boron	µg/l	ND	1340
		Calcium	mg/L	80	N/A
		Chloride	mg/L	19	52
		Cobalt	µg/l	ND	3.58
		Iron	µg/l	ND	5220
		Lead	µg/l	ND	2.55
		Lithium	µg/l	5.9 J	N/A
		Magnesium	µg/l	18,000	27600
		Manganese	µg/l	5.0 J	637
		Molybdenum	µg/l	ND	N/A
		Selenium	µg/l	2.4 J	3
		Sulfate	mg/L	25	175
		Total Dissolved Solids	mg/L	370	N/A
		Total Suspended Solids	mg/L	2.1	N/A
	MW-21	Field pH	SU	6.95	N/A
		Field Temperature	deg C	14.0	N/A
		Field Specific Conductance	µmhos/cm	692	N/A
		Field Dissolved Oxygen	mg/L	3.63	N/A
		Field Oxidation Potential	mV	126.3	N/A
		Arsenic	µg/l	0.92 J	1.60
		Barium	µg/l	130	163
		Beryllium	µg/l	ND	0.330
		Boron	µg/l	1300	1340
		Calcium	mg/L	93	N/A
		Chloride	mg/L	18	52
		Cobalt	µg/l	1.0	3.58
		Iron	µg/l	730	5220
		Lead	µg/l	1.4	2.55
		Lithium	µg/l	14	N/A
		Magnesium	µg/l	20000	27600
		Manganese	µg/l	160	637
		Molybdenum	µg/l	34	N/A
		Selenium	µg/l	3.8 J	3
		Sulfate	mg/L	38	175
		Total Dissolved Solids	mg/L	400	N/A
		Total Suspended Solids	mg/L	110	N/A

Table 6
Summary of Well/Detected Constituent Pairs With No Immediately Preceding SSIs
2023 Annual Water Quality Report
Marshalltown East and West Closed Landfills
Permit Nos. 64-SDP-5-91C and 64-SDP-3-90C

Comments:
1. This table includes results for wells/constituents that were below the UPL in 2023.
2. Results below the limit of quantitation (J flags) are estimated values and are not compared to the UPL or GPS. They are included in this table regardless of whether the estimated value is higher or lower than the UPL.
3. MW-9 and MW-10 are background wells for the East Landfill, and UPLs do not apply. MW-8, MW-13, and MW-14 are background wells for the West Landfill.
4. MW-22 was not sampled during the September 2023 monitoring event because the well was dry.

µg/l - micrograms per liter
mV - millivolts
mg/L - milligrams per liter
µmhos/cm - micromhos per centimeter

F1 - MS and/or MSD recovery exceeds control limits
F2 - MS/MSD RPD exceeds control limits

Updated by: RM, 10/31/2023
Checked by: NLB, 11/1/2023

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Table 7
Summary of Ongoing and Newly Identified SSIs
2023 Annual Water Quality Report
Marshalltown East and West Closed Landfills
Permit Nos. 64-SDP-5-91C and 64-SDP-3-90C

	Well	Constituent	Units	Most Recent Result	UPL	Action Level
East Landfill	MW-10	Lithium	µg/l	18	N/A	14
	MW-11AR	Lithium	µg/l	15	N/A	14
		Magnesium	µg/l	34,000	27,400	none
	MW-13	Lithium	µg/l	15	N/A	14
	MW-14	Lithium	µg/l	25	N/A	14
	MW-18	Lithium	µg/l	19	N/A	14
	MW-20	Boron	µg/l	3,800	815	6,000
		Lithium	µg/l	72	N/A	14
		Molybdenum	µg/l	720	N/A	40
		Selenium	µg/l	23	4	50
		Sulfate	mg/l	140	120	none
	MW-21	Lithium	µg/l	14	N/A	14
	MW-23	Lithium	µg/l	29	N/A	14
West Landfill	MW-3	Lithium	µg/l	23	N/A	14
		Selenium	µg/l	7.4	3.49	50
	MW-4	Arsenic	µg/l	2.6	1.60	10
		Boron	µg/l	3,400	1340	6,000
		Manganese	µg/l	1,200	637	637
	MW-5	Selenium	µg/l	54	3.49	50
	MW-8	Lead	µg/l	3.4	2.55	15

Comments:
1. This table includes results for wells/constituents that exceeded the UPL in 2023.
2. Results below the limit of quantitation (J flags) are estimated values and are not compared to the UPL or GPS.

UPL - Upper Prediction Limit
µg/l - micrograms per liter
mV - millivolts
mg/L - milligrams per liter
µmhos/cm - micromhos per centimeter

Updated by: RM, 10/31/2023
Checked by: NLB, 11/1/2023

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Table 8
Historic UPL and Action Level Exceedances
2023 Annual Water Quality Report
Marshalltown East and West Closed Landfills
Permit Nos. 64-SDP-5-91C and 64-SDP-3-90C

Key: gray =UPL exceedance; black =action level exceedance

	Well	Constituent	2016	2017	2018	2019	2020	2021	2022	2023
East Landfill	MW-9	Manganese								
	MW-10	Lithium*								
	MW-11AR	Sulfate								
		Boron								
		Lead								
		Lithium*								
		Magnesium								
	MW-13	Lithium*								
		Sulfate								
	MW-14	Boron								
		Cobalt								
		Lithium*								
		Manganese								
	MW-18	Sulfate								
		Arsenic								
		Barium								
		Cobalt								
		Copper								
		Iron								
		Lead								
		Lithium*								
		Manganese								
	MW-20	Sulfate								
		Boron								
		Lithium*								
		Molybdenum*								
		Selenium								
	MW-21	Lithium*								
	MW-22	Sulfate						Not sampled, insufficient volume	Not sampled, insufficient volume	Not sampled, insufficient volume
		Boron								
		Lead								
		Magnesium								
		Selenium								
	MW-23	Sulfate								
		Boron								
		Lithium*								
West Landfill	MW-3	Lithium*								
		Selenium								
	MW-4	Arsenic								
		Barium								
		Boron								
		Iron								
		Manganese								
	MW-5	Arsenic								
		Barium								
		Cobalt								
		Copper								
		Iron								
		Lead								
		Manganese								
		Selenium								
	MW-8	Lead								
	MW-21	Sulfate								
		Boron								
		Lead								
		Selenium								

Comments:
1. UPLs were calculated annually beginning in 2019 when at least four sampling events with unfiltered (total) data.
2. For results in 2016-2018, prior to calculation of UPLs, the Statewide Standards for cobalt and manganese were used
3. * = Lithium and molybdenum were added to the program in 2023

Updated by: RM, 10/31/2023; NLB, 11/1/2023
Checked by: NLB, 11/1/2023; RM, 11/2/2023

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Table 9
Historic Prediction Limits and Groundwater Protection Standards
2023 Annual Water Quality Report
Marshalltown East and West Closed Landfills
Permit Nos. 64-SDP-5-91C and 64-SDP-3-90C

	Constituent	Units	UPL					GWPS				
			2019	2020	2021	2022	2023	2019	2020	2021	2022	2023
East Landfill	Arsenic	µg/L	1.11	1.31	0.88	0.88	1.60	10	10	10	10	10
	Barium	µg/L	186	185	185	184	203	2,000	2,000	2,000	2,000	2,000
	Beryllium	µg/L	0.27	0.27	0.27	0.27	0.330	4	4	4	4	4
	Boron	µg/L	110	110	110	110	815	6,000	6,000	6,000	6,000	6,000
	Chloride	mg/L	32.20	36.10	33.50	33.60	46.0	none	none	none	none	none
	Cobalt	µg/L	3.65	4.21	3.53	3.24	4.95	3.65	4.21	3.53	3.24	4.95
	Copper[1]	µg/L	3.38	3.45	3.59	3.75	N/A	1,300	1,300	1,300	1,300	N/A
	Iron	µg/L	1,680	1,790	1,480	3,200	3520	none	none	none	none	none
	Lead	µg/L	0.55	0.55	0.55	0.55	1.90	15	15	15	15	15
	Magnesium	mg/L	29,500	29,700	29,000	27,800	27400	none	none	none	none	none
	Manganese	µg/L	2,100	2,100	2,100	2,100	3050	3,050	3,050	2,100	2,100	3,050
	Selenium	µg/L	1.00	1.00	1.60	1.60	4.00	50	50	50	50	50
	Sulfate	mg/L	44.00	44.00	44.00	44.00	120	none	none	none	none	none
	Zinc[1]	µg/L	14.70	16.50	62.10	56.90	N/A	2,000	2,000	2,000	2,000	N/A
West Landfill	Arsenic	µg/L	1.49	1.54	1.47	1.60	1.60	10	10	10	10	10
	Barium	µg/L	169	174	168	163	163	2,000	2,000	2,000	2,000	2,000
	Beryllium	µg/L	0.27	0.33	0.27	0.27	0.330	4	4	4	4	4
	Boron	µg/L	1,890	2,140	1,850	1,630	1340	6,000	6,000	6,000	6,000	6,000
	Chloride	mg/L	51.90	51.90	51.90	51.90	51.90	none	none	none	none	none
	Cobalt	µg/L	5.88	5.41	4.20	3.49	3.58	5.88	5.41	4.20	3.49	3.58
	Copper[1]	µg/L	5.30	6.45	5.68	5.55	N/A	1,300	1,300	1,300	1,300	N/A
	Iron	µg/L	11,800	9,900	8,410	5,940	5220	none	none	none	none	none
	Lead	µg/L	3.30	2.83	2.24	1.89	2.55	15	15	15	15	15
	Magnesium	mg/L	30,200	29,800	29,200	28,200	27600	none	none	none	none	none
	Manganese	µg/L	891	1,040	863	667	637	891	1,040	863	667	637
	Selenium	µg/L	5.03	5.24	4.50	3.71	3.49	50	50	50	50	50
	Sulfate	mg/L	104	109	110	173	175	none	none	none	none	none
	Zinc[1]	µg/L	15.60	16.10	15.80	14.50	N/A	2,000	2,000	2,000	2,000	N/A

(1) Copper and zinc were analyzed only at leachate wells in 2023. Parameters calcium, fluoride, lithium, molybdenum, TDS, and TSS were added in 2023. UPLs will be calculated once the minimum of four samples for each parameter have been collected.

µg/l - micrograms per liter
mV - millivolts
mg/L - milligrams per liter
µmhos/cm - micromhos per centimeter
UPL - Upper Prediction Limit
GWPS - Groundwater Protection Standard

Updated by: RM, 10/31/2023
Checked by: NLB, 11/1/2023

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Table 10
Groundwater Quality Trend Summary
2023 Annual Water Quality Report
Marshalltown East and West Closed Landfills
Permit Nos. 64-SDP-5-91C and 64-SDP-3-90C

Well	Current GWPS Exceedances	Significant Trend
MW-4	Manganese	Increasing
MW-5	Selenium	No significant trend

Comments:
Only well/constituent pairs with GWPS exceedances and with sufficient historical data for trend analysis (8 rounds) are included in this summary. Lithium and molybdenum are not included because only 1 round of data is available.

GWPS = Groundwater Protection Standard

Updated by: MDB, 11/6/2023
Checked by: RM, 11/7/2023

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Table 11
Summary of Leachate Well, Underdrain, and Surface Water Point/Detected Constituent Pairs
2023 Annual Water Quality Report
Marshalltown East and West Closed Landfills
Permit Nos. 64-SDP-5-91C and 64-SDP-3-90C

Monitoring Point	Constituent	Units	September 2023
LW-01	Field pH	SU	7.11
	Field Temperature	deg C	19.5
	Field Specific Conductance	µmhos/cm	846
	Field Dissolved Oxygen	mg/l	5.45
	Field Oxidation Potential	mV	84.8
	Chloride	mg/l	4.1 J
	Fluoride	mg/l	0.38 J
	Sulfate	mg/l	38
	Arsenic	µg/l	23
	Barium	µg/l	130
	Beryllium	µg/l	<0.33
	Boron	µg/l	320
	Calcium	mg/l	140
	Cobalt	µg/l	9.8
	Copper	µg/l	7.9
	Iron	µg/l	2,800
	Lead	µg/l	5.5
	Lithium	µg/l	29
	Magnesium	µg/l	26,000
	Manganese	µg/l	1,100
	Molybdenum	µg/l	4.5
	Selenium	µg/l	<1.4
	Zinc	µg/l	49
	Total Dissolved Solids	mg/l	600
	Total Suspended Solids	mg/l	150

Table 11
Summary of Leachate Well, Underdrain, and Surface Water Point/Detected Constituent Pairs
2023 Annual Water Quality Report
Marshalltown East and West Closed Landfills
Permit Nos. 64-SDP-5-91C and 64-SDP-3-90C

Monitoring Point	Constituent	Units	September 2023
SW-1	Field pH	SU	8.20
	Field Temperature	deg C	25.6
	Field Specific Conductance	µmhos/cm	548
	Field Dissolved Oxygen	mg/l	10.04
	Field Oxidation Potential	mV	51.2
	Chloride	mg/l	18
	Fluoride	mg/l	<0.38
	Sulfate	mg/l	14
	Arsenic	µg/l	4.9
	Barium	µg/l	220
	Beryllium	µg/l	<0.33
	Boron	µg/l	150
	Calcium	mg/l	71
	Cobalt	µg/l	3.2
	Iron	µg/l	1,300
	Lithium	µg/l	5.3 J
	Lead	µg/l	0.81
	Magnesium	µg/l	18,000
	Manganese	µg/l	2,100
	Molybdenum	µg/l	0.95 J
	Selenium	µg/l	<1.4
	Total Dissolved Solids	mg/l	300
	Total Suspended Solids	mg/l	160

Table 11
Summary of Leachate Well, Underdrain, and Surface Water Point/Detected Constituent Pairs
2023 Annual Water Quality Report
Marshalltown East and West Closed Landfills
Permit Nos. 64-SDP-5-91C and 64-SDP-3-90C

Monitoring Point	Constituent	Units	September 2023
SW-2	Field pH	SU	8.00
	Field Temperature	deg C	24.1
	Field Specific Conductance	µmhos/cm	506
	Field Dissolved Oxygen	mg/l	8.53
	Field Oxidation Potential	mV	60.90
	Chloride	mg/l	18
	Fluoride	mg/l	<0.38
	Sulfate	mg/l	24
	Arsenic	µg/l	1.5 J
	Barium	µg/l	170
	Beryllium	µg/l	<0.33
	Boron	µg/l	130
	Calcium	mg/l	83
	Cobalt	µg/l	0.47 J
	Iron	µg/l	430
	Lead	µg/l	0.39 J
	Lithium	µg/l	6.4 J
	Magnesium	µg/l	20,000
	Manganese	µg/l	440
	Molybdenum	µg/l	1.0 J
	Selenium	µg/l	1.5 J
	Total Dissolved Solids	mg/l	290
	Total Suspended Solids	mg/l	160

Notes:
*: Insufficient sample volume was present at LW-2, LW-3, LW-4, SW-3, and GWGCS for sample collection.

µg/l - micrograms per liter
mg/L - milligrams per liter
mV - millivolts
µmhos/cm - micromhos per centimeter

Updated by: RM, 10/31/2023
Checked by: NLB, 11/1/2023

I:\25223064.00\Deliverables\2023 AWQR\Tables\[awqreport_Marshalltown_DRAFT_.xlsx]6- Detection Summary - No SSIs

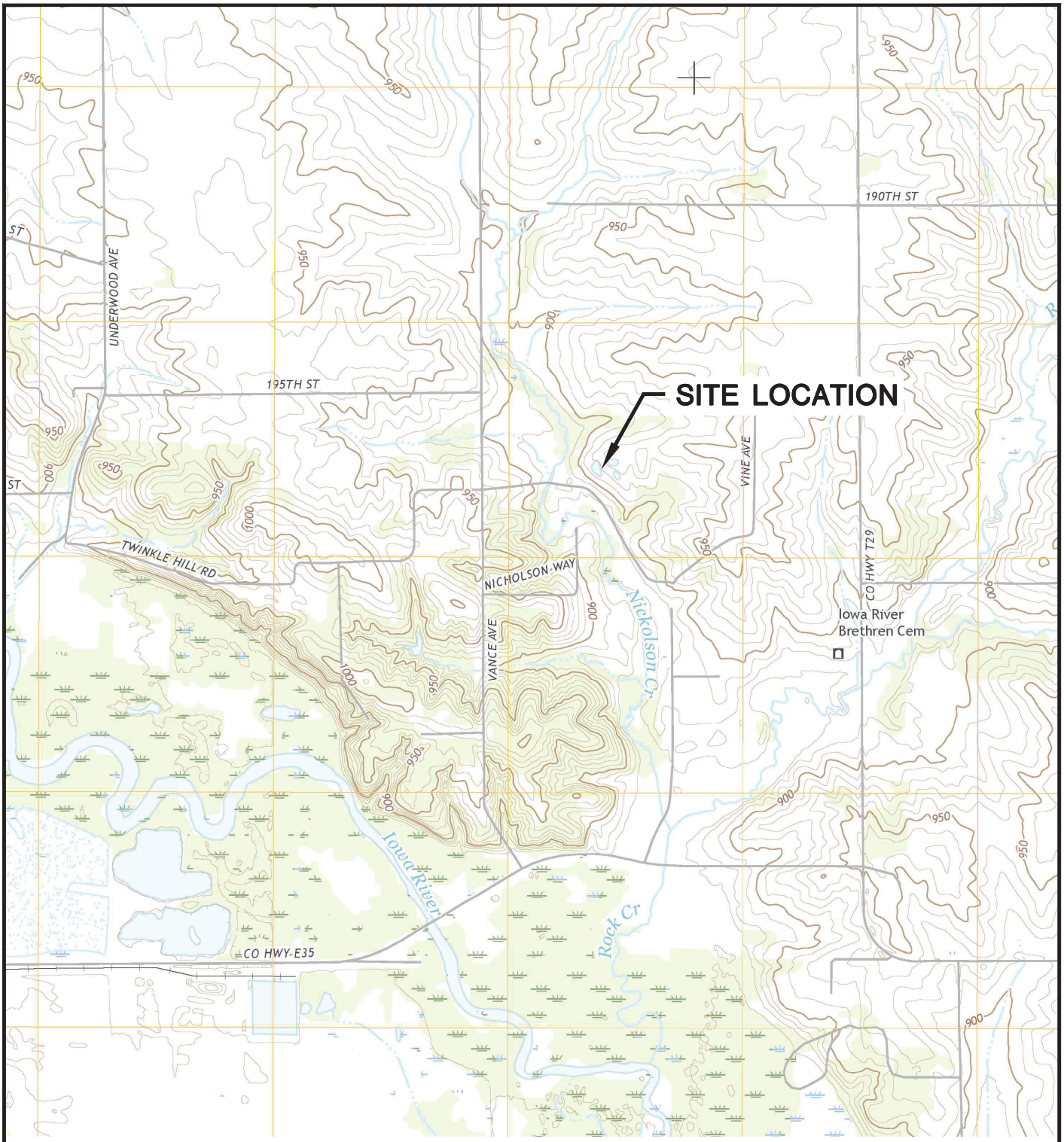
Table 12
Leachate Management Summary
2023 Annual Water Quality Report
Marshalltown East and West Closed Landfills
Permit Nos. 64-SDP-5-91C and 64-SDP-3-90C

	Leachate Depth (ft)				Leachate Elevation (ft amsl)			
Month	**LW-1**	**LW-2**	**LW-3**	**LW-4**	**LW-1**	**LW-2**	**LW-3**	**LW-4**
April 2023	3.35	DRY	DRY	2.25	893.59	DRY	DRY	914.73
September 2023	2.75	DRY	DRY	DRY	892.99	DRY	DRY	DRY

Updated by: RM, 10/31/2023
Checked by: NLB, 11/1/2023

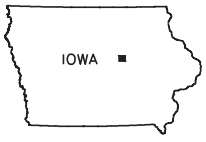
I:\25223064.00\Deliverables\2023 AWQR\Tables\[awqreport_Marshalltown_DRAFT_.xlsx]12 - Leachate Summary

Figures



N

LE GRAND QUADRANGLE
IOWA
7.5 MINUTE SERIES (TOPOGRAPHIC)
2015
SCALE: 1" = 2,000'



CLIENT	ALLIANT ENERGY INTERSTATE POWER AND LIGHT	SITE	MARSHALLTOWN EAST AND WEST CLOSED LANDFILLS MARSHALLTOWN, IOWA
			SITE LOCATION MAP

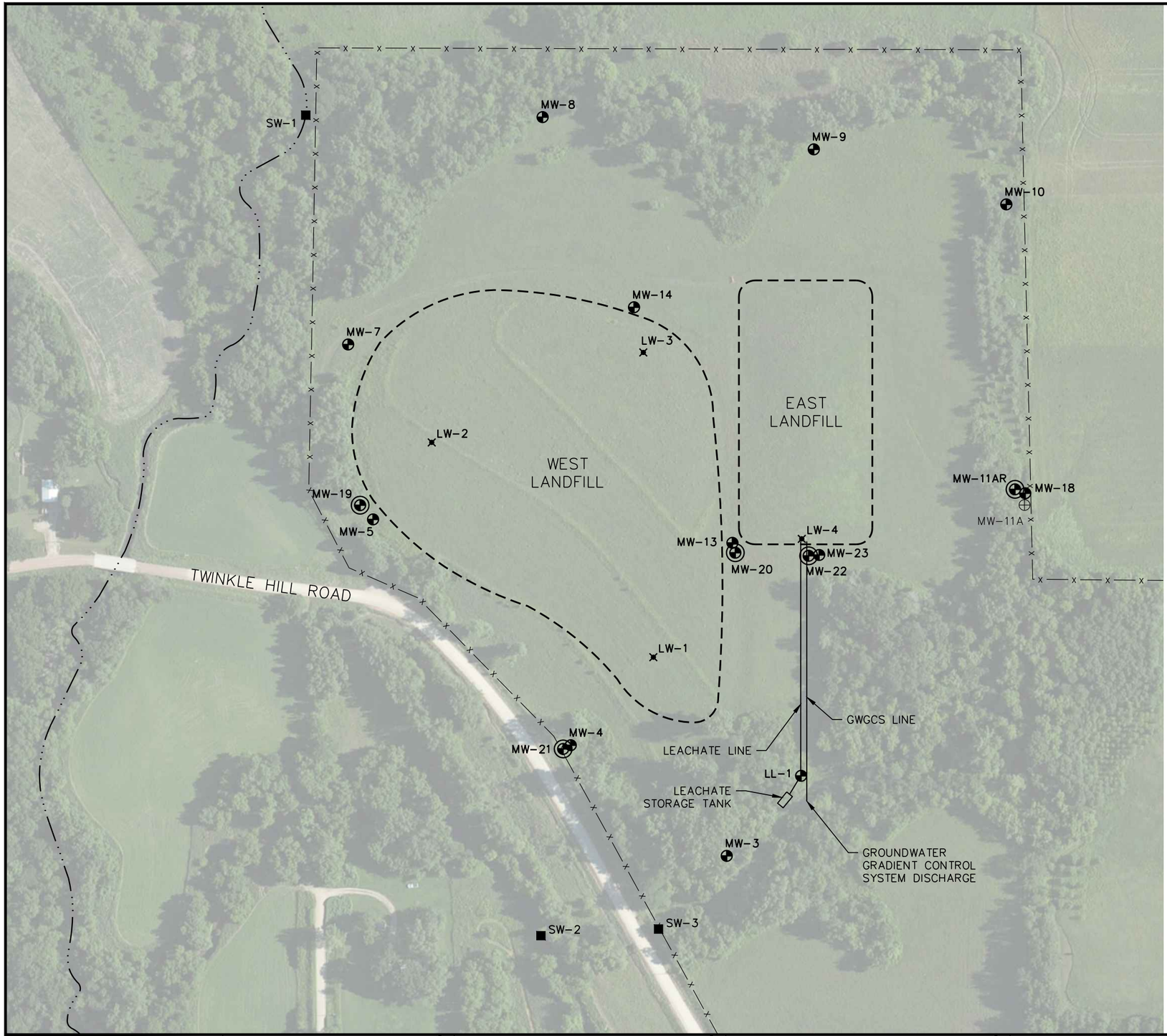
PROJECT NO.	25216064.00	DRAWN BY:	AHB
DRAWN:	10/28/16	CHECKED BY:	MDB
REVISED:	10/28/16	APPROVED BY:	TK 11/20/2017

ENGINEER

SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

FIGURE
1

I:\25216064.00\Drawings\Site Loc.dwg, 11/20/2017 3:23:33 PM



LEGEND

- APPROXIMATE LIMITS OF ASH DISPOSAL
- FENCE
- STREAM
- MONITORING WELL
- DEEP MONITORING WELL
- ABANDONED WELL
- LEACHATE HEAD WELL
- SURFACE WATER SAMPLING POINT

NOTES:

1. MONITORING WELL LOCATIONS ARE APPROXIMATE.

N

200 0 200

SCALE: 1" = 200'

PROJECT NO.	25219064.00	DRAWN BY:	BJM
DRAWN:	10/28/16	CHECKED BY:	KAK
REVISED:	04/16/18	APPROVED BY:	TK 11/26/19

ENGINEER: SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

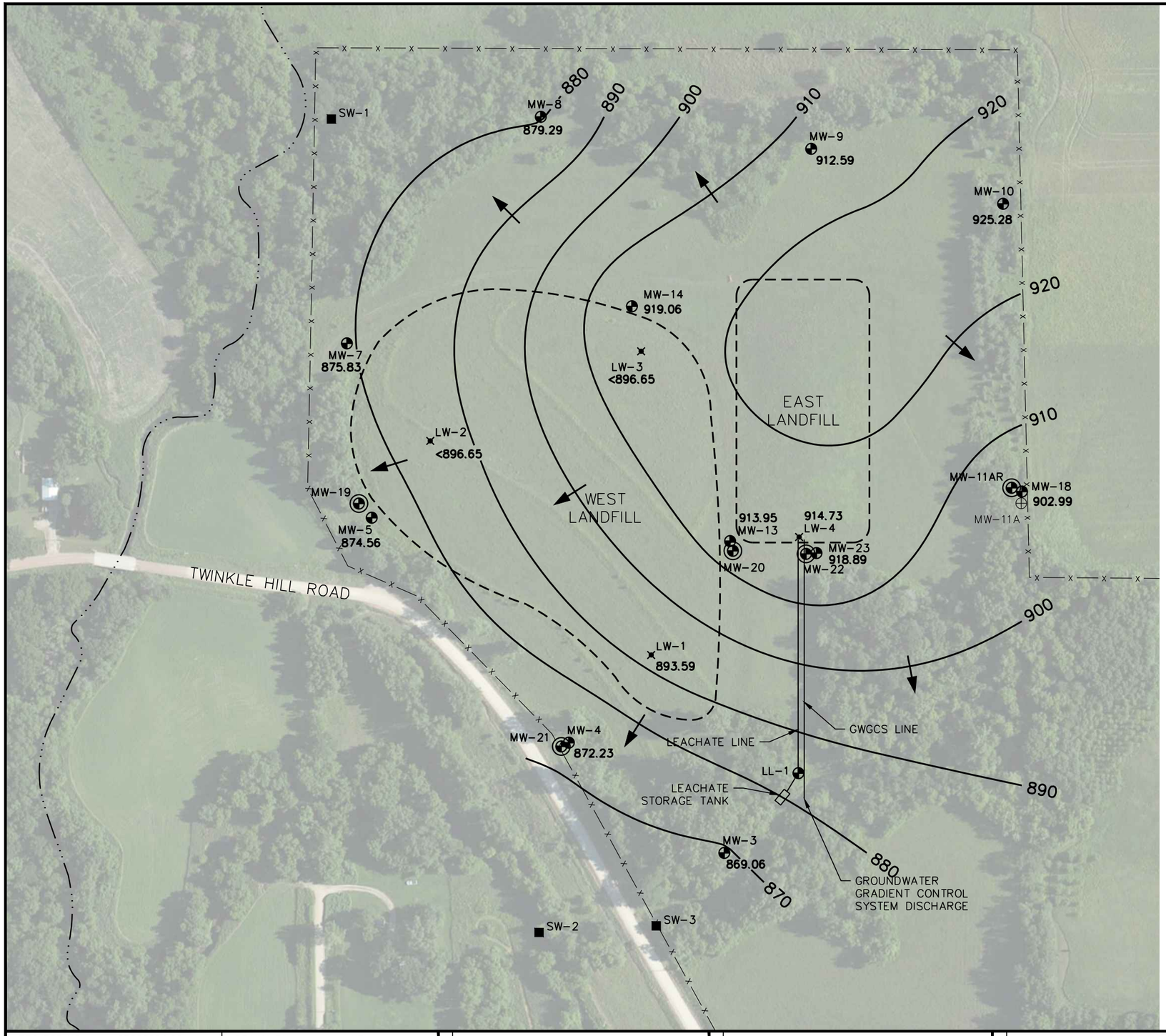
CLIENT: ALLIANT ENERGY INTERSTATE POWER AND LIGHT

SITE: MARSHALLTOWN EAST AND WEST CLOSED LANDFILLS MARSHALLTOWN, IOWA

MONITORING WELL LOCATIONS

FIGURE 2

I:\25219064.00\Drawings\Monitoring Well.dwg, 11/26/2019 9:33:43 AM



LEGEND

— — — —	APPROXIMATE LIMITS OF ASH DISPOSAL
— x — x —	FENCE
—— · · · ——	STREAM
◒	MONITORING WELL
◉	DEEP MONITORING WELL
⊕	ABANDONED WELL
✕	LEACHATE HEAD WELL
■	SURFACE WATER SAMPLING POINT
926.09	WATER TABLE ELEVATION
NM	NOT MEASURED
———	WATER TABLE CONTOUR
→	APPROXIMATE GROUNDWATER FLOW DIRECTION

NOTES:

1. MONITORING WELL LOCATIONS ARE APPROXIMATE.
2. WATER LEVELS MEASURED ON APRIL 13, 2023.
3. LEACHATE WELLS LW-2 AND LW-3 WERE DRY ON APRIL 13, 2023.

N

200 0 200

SCALE: 1" = 200'

PROJECT NO.	25223064.00	DRAWN BY:	KP
DRAWN:	10/30/2023	CHECKED BY:	RM
REVISED:	11/07/2023	APPROVED BY:	TK 11/30/2023

ENGINEER: SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

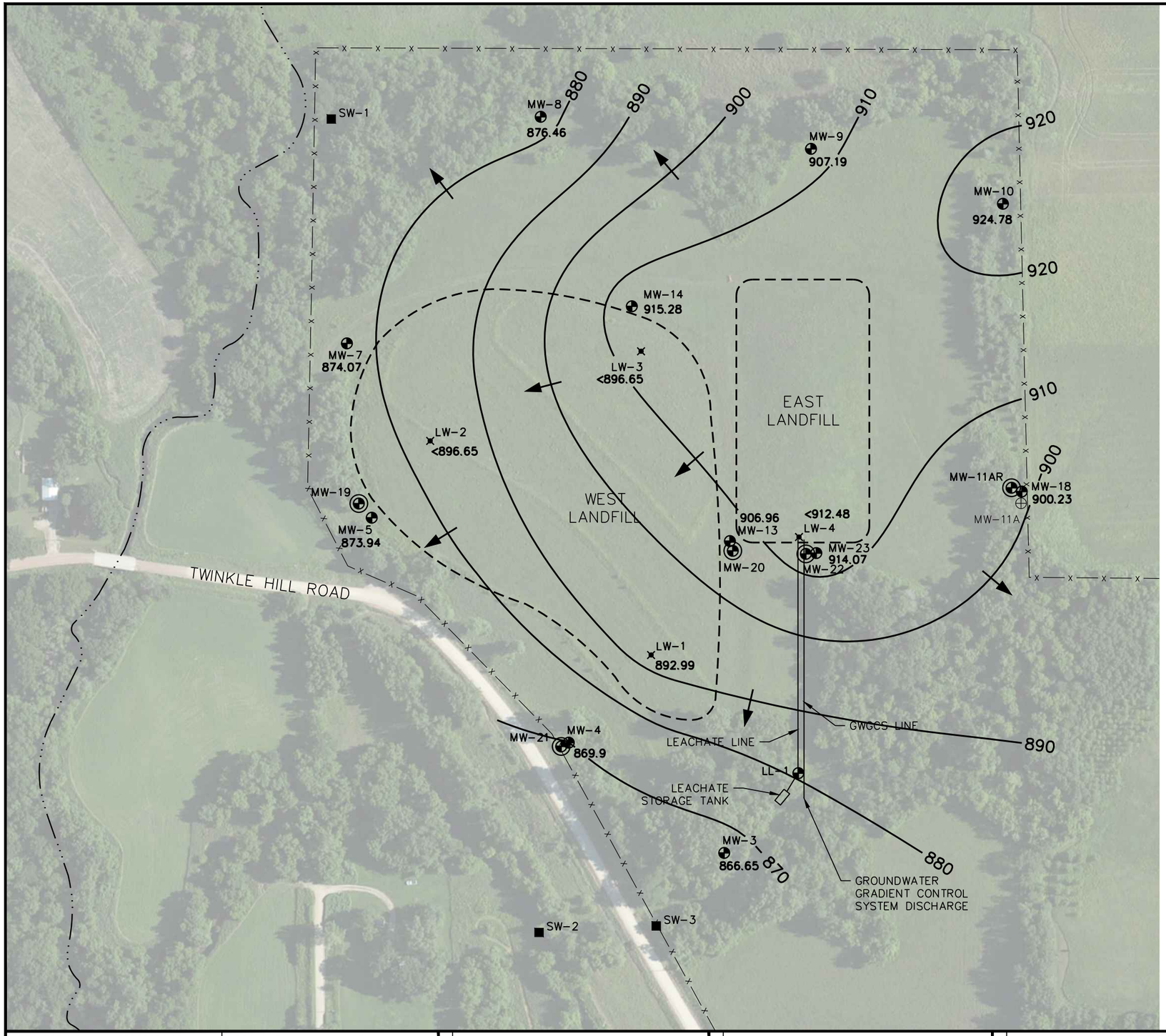
CLIENT: ALLIANT ENERGY INTERSTATE POWER AND LIGHT

SITE: MARSHALLTOWN EAST AND WEST CLOSED LANDFILLS MARSHALLTOWN, IOWA

WATER TABLE MAP
APRIL 2023

FIGURE 3

I:\25223064.00\Drawings\WTBL-2023.dwg, 11/7/2023 11:15:34 AM



LEGEND

- APPROXIMATE LIMITS OF ASH DISPOSAL
- FENCE
- STREAM
- MONITORING WELL
- DEEP MONITORING WELL
- ABANDONED WELL
- LEACHATE HEAD WELL
- SURFACE WATER SAMPLING POINT
- **926.09** WATER TABLE ELEVATION
- WATER TABLE CONTOUR
- APPROXIMATE GROUNDWATER FLOW DIRECTION

NOTES:

1. MONITORING WELL LOCATIONS ARE APPROXIMATE.
2. WATER LEVELS MEASURED ON SEPTEMBER 18–22, 2023.
3. LEACHATE WELLS LW–2, LW–3, AND LW–4 WERE DRY SEPTEMBER 2023.

N

200 0 200

SCALE: 1" = 200'

PROJECT NO.	25223064.00	DRAWN BY:	KP
DRAWN:	10/30/2023	CHECKED BY:	RM
REVISED:	11/07/2023	APPROVED BY:	TK 11/30/2023

ENGINEER: SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718–6751
PHONE: (608) 224–2830

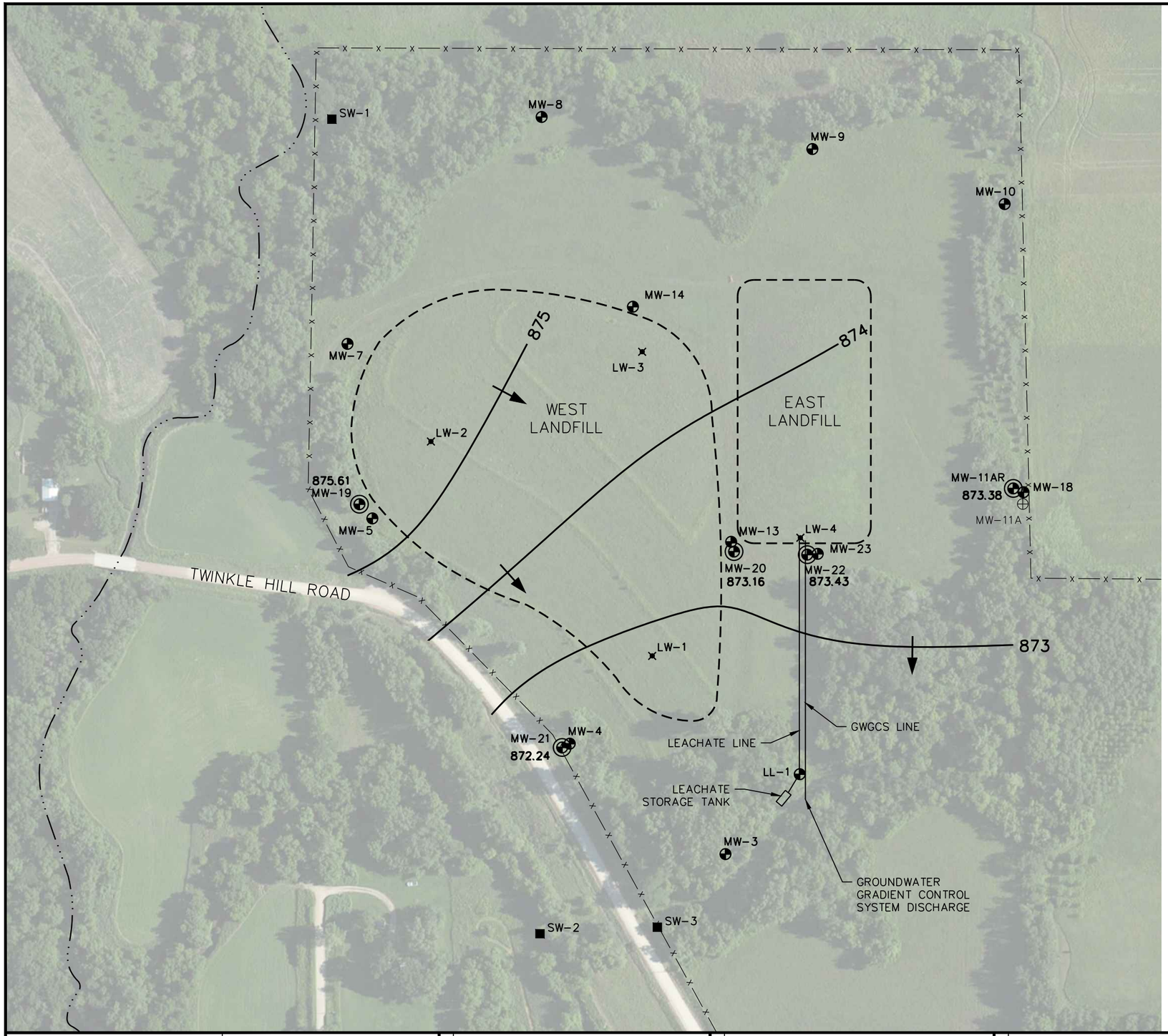
CLIENT: ALLIANT ENERGY INTERSTATE POWER AND LIGHT

SITE: MARSHALLTOWN EAST AND WEST CLOSED LANDFILLS MARSHALLTOWN, IOWA

WATER TABLE MAP
SEPTEMBER 2023

FIGURE 4

I:\25223064.00\Drawings\WTBL-2023.dwg, 11/7/2023 11:15:42 AM



LEGEND

- APPROXIMATE LIMITS OF ASH DISPOSAL
- FENCE
- STREAM
- MONITORING WELL
- DEEP MONITORING WELL
- ABANDONED WELL
- LEACHATE HEAD WELL
- SURFACE WATER SAMPLING POINT
- 872.28 POTENTIOMETRIC SURFACE ELEVATION
- POTENTIOMETRIC SURFACE CONTOUR
- APPROXIMATE GROUNDWATER FLOW DIRECTION

NOTES:

1. MONITORING WELL LOCATIONS ARE APPROXIMATE.
2. WATER LEVELS MEASURED ON APRIL 13, 2023.

N

200 0 200

SCALE: 1" = 200'

PROJECT NO.	25223064.00	DRAWN BY:	KP
DRAWN:	10/30/2023	CHECKED BY:	RM
REVISED:	11/06/2023	APPROVED BY:	TK 11/30/2023

ENGINEER: SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

CLIENT: ALLIANT ENERGY INTERSTATE POWER AND LIGHT

SITE: MARSHALLTOWN EAST AND WEST CLOSED LANDFILLS MARSHALLTOWN, IOWA

POTENTIOMETRIC SURFACE MAP
APRIL 2023

FIGURE 5

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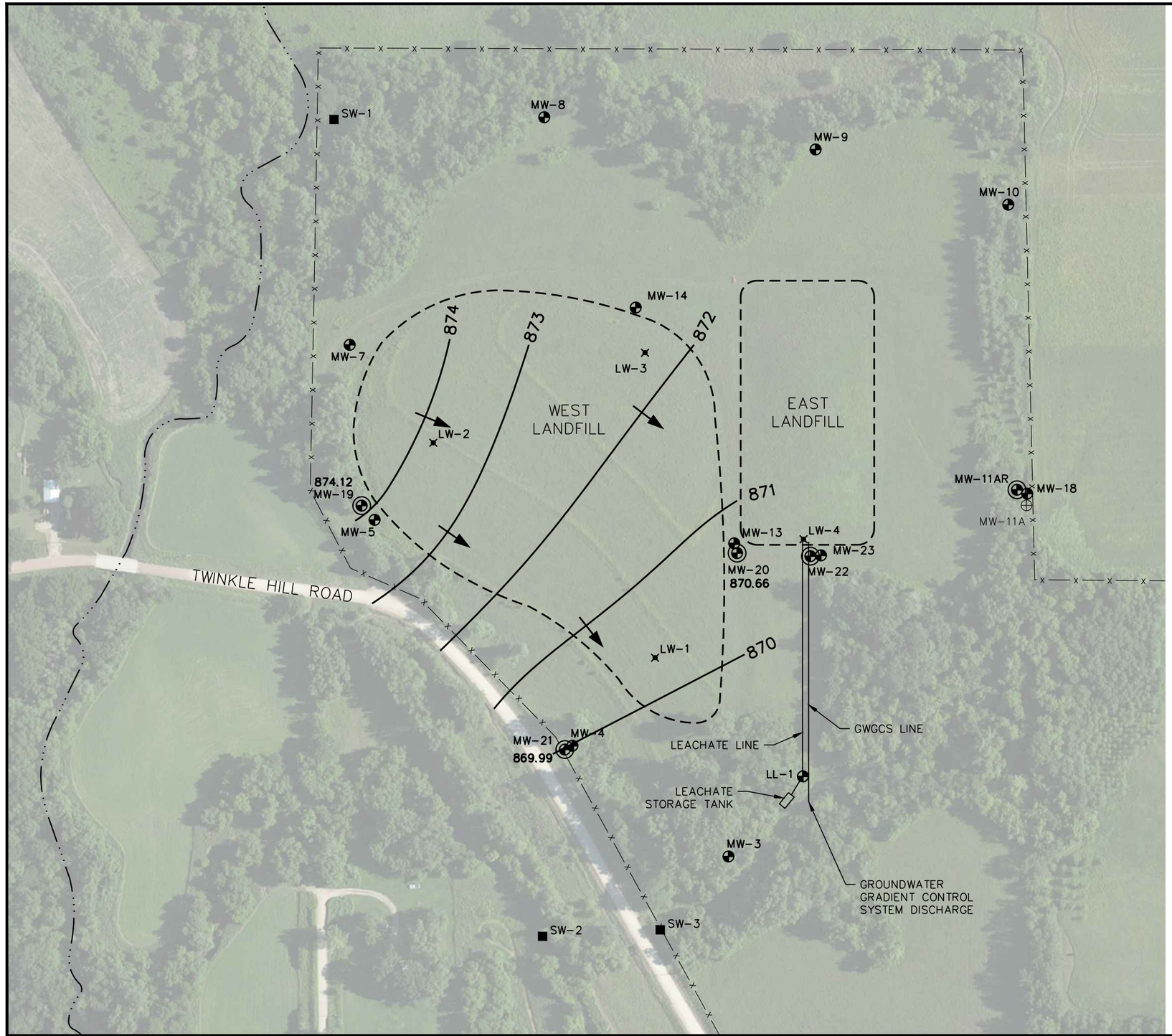

LEGEND

- APPROXIMATE LIMITS OF ASH DISPOSAL
- FENCE
- STREAM
- MONITORING WELL
- DEEP MONITORING WELL
- ABANDONED WELL
- LEACHATE HEAD WELL
- SURFACE WATER SAMPLING POINT
- **872.28** POTENTIOMETRIC SURFACE ELEVATION
- POTENTIOMETRIC SURFACE CONTOUR
- APPROXIMATE GROUNDWATER FLOW DIRECTION

NOTES:

1. MONITORING WELL LOCATIONS ARE APPROXIMATE.
2. WATER LEVELS MEASURED ON SEPTEMBER 18–22, 2023.

N

200 0 200

SCALE: 1" = 200'

PROJECT NO.	25223064.00	DRAWN BY:	KP
DRAWN:	10/30/2023	CHECKED BY:	RM
REVISED:	11/06/2023	APPROVED BY:	TK 11/30/2023

ENGINEER: SCS ENGINEERS, 2830 DAIRY DRIVE MADISON, WI 53718-6751, PHONE: (608) 224-2830

CLIENT: ALLIANT ENERGY INTERSTATE POWER AND LIGHT

SITE: MARSHALLTOWN EAST AND WEST CLOSED LANDFILLS MARSHALLTOWN, IOWA

POTENTIOMETRIC SURFACE MAP SEPTEMBER 2023

FIGURE 6

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Appendix A

Inspections

SEMIANNUAL FACILITY INSPECTION REPORT 2023
INTERSTATE POWER AND LIGHT COMPANY
MARSHALLTOWN EAST AND WEST CLOSED LANDFILL
PERMIT NO. 57-SDP-5-91C AND 57-SDP-3-90C

The semiannual inspections of the Interstate Power and Light Company (IPL) Marshalltown East and West Closed Landfill were conducted on April 13 and September 22, 2023. As required in the general provisions of the permits (Sanitary Disposal Permit No. 57-SDP-5-91C and 57-SDP-3-90C), inspections must be performed by, or under the direct supervision of, an Iowa registered engineer, and a brief report must be submitted to the Iowa Department of Natural Resources (IDNR).

SITE CONDITIONS

The Marshalltown East and West Closed Landfills were used for the disposal of coal combustion residue (CCR). No CCR or other waste has been placed at the site since 1995. The site is in generally good condition. Facility Inspection Reports for April and September 2023 are included in **Attachment A**.

SITE INSPECTIONS

On April 13 and September 22, 2023, staff from SCS Engineers (SCS) conducted site inspections under the supervision of Licensed Professional Engineer Eric Nelson, PE, of SCS. This inspection report discusses the items observed during the inspections.

Access Road and Perimeter Fencing

The access road at the entrance of the property and perimeter fencing were inspected during the site inspections. The access road and perimeter fencing were generally observed to be in good condition. During the September inspection, some tree limbs were observed to have fallen on the perimeter fence to the north of the gate.

Erosion Control

The property was generally well vegetated. No erosional features were noticed on the landfill cover during the inspection.

Groundwater Wells

Groundwater wells were observed to be in generally good condition. The area around some wells was overgrown with shrubs and small trees, but these did not impede well access or appear to threaten well integrity.

IDNR Inspections

The most recent IDNR inspection of the facility was performed on December 14 and 15, 2014.

Attachment A

Site Inspection Forms

SCS ENGINEERS

SITE INSPECTION REPORT

Project: IPL – Marshalltown East & West Closed Landfill Project #: 25223064

Site: Marshalltown East Closed Ash Landfill Permit number: 64-SDP-5-91C

Date: 4-13-23 Prepared by: Meghan Blodgett for Tyler Stirling

Weather: sunny & warm On site/Off site: _____ a.m. _____ p.m.

Personnel: Tyler Stirling

Equipment: Water level tape

Landfill Cover and Erosion Control (Provide description of cover condition, whether grass appears mowed, and any erosional features or other observed issues)
Photos Taken (check)

Notes:

Cover was in good condition

Primary Access Roads and Perimeter Fencing (Provide description of current road and perimeter fencing condition and if improvements are necessary) Photos Taken **D** (check)
Draw/Note location of necessary improvements on the attached figure.

Notes:

Perimeter and access roads were in good condition.

Leachate System Performance (Provide description of leachate system components (head wells, leachate tank) in need of improvements if necessary)
Photos Taken **D** (check)

Notes:
Leachate system components in good condition.

Groundwater (Provide description of current groundwater wells in need of improvements if necessary)
Photos Taken **D** (check)

Notes:
All monitoring wells were in good condition

Miscellaneous Notes: N/A

Communications with Onsite Personnel: N/A.

Signature: Meghan Blodgett for Tyler Stirling

SCS ENGINEERS

SITE INSPECTION REPORT

Project: IPL – Marshalltown East & West Closed Landfill **Project #:** 25216064

Site: Marshalltown East Closed Ash Landfill **Permit number:** 64-SDP-5-91C

Date: 9/22/23 **Prepared by:** Tyler Stirling

Weather: Cloudy - misty **On site/Off site:** 8:30 a.m. 9:00 p.m.

Personnel: TS

Equipment:

Landfill Cover and Erosion Control (Provide description of cover condition, whether grass appears mowed, and any erosional features or other observed issues)
Photos Taken ☑ (check)

Notes: Cover in good condition - no erosion

Wells overgrown w/ shrub + trees - can't be mowed

Primary Access Roads and Perimeter Fencing (Provide description of current road and perimeter fencing condition and if improvements are necessary) Photos Taken ☒ (check)
Draw/Note location of necessary improvements on the attached figure.

Notes: Primary road in okay condition

Tree fell on perimeter fence left of main gate.

Leachate System Performance (Provide description of leachate system components (head wells, leachate tank) in need of improvements if necessary)
Photos Taken ☒ (check)

Notes: Good condition, LW-1 can't fit 2" PVC bailer down

Groundwater (Provide description of current groundwater wells in need of improvements if necessary)
Photos Taken ☒ (check)

Notes: Good condition

SITE INSPECTION REPORT

Miscellaneous Notes: N/a

Communications with Onsite Personnel: N/a

Signature: Tyler S

C:\Users\3510med\Desktop\Site Inspection Form.doc

Appendix B

Groundwater Sampling Field Sheets

Groundwater Sampling Field Sheet

Disposal Site Name: IPL - Marshalltown E/W Closed LF Permit No.: 64-SDP-5-91C, -3-90C

Well/Piezometer: LW-1 Weather: 65°F, Wind Direction: NA, Cloudy, No precipitation

Date: 9/22/2023 Sampler Name: Tyler Stirling

Monitoring Well Details

Construction Data

Borehole Diameter (in): _____ Depth to Tope of Screen (ft): 11.85

Casing Diameter (in): 2.01 Casing Material: PVC

Top of Casing Elevation (ft. MSL): 907.09 Ground Surface Elevation (ft. MSL): _____

Field Observations

Locked: ☒ Yes ☐ No

	Before Purging	After Purging	Before Sampling
Depth to Water Level (ft.):	14.10	--	14.10
Water Elevation (ft. MSL):	892.99	--	892.99

Screen Submerged? (Depth to Water Level < Depth to Top of Screen) ☐ Yes ■ No

	Start	End
Purge Date/Time	--	--

Well Conditions Commentary: --

Sampling Equipment (check one)

☒ Pump ☐ Interval Sampler

☐ Bailer ☐ Other (specify): _____

Equipment Name & Description: Peristaltic pump.

Pump Types (check one)

☐ Submersible ☒ Peristaltic ☐ Bladder ☐ Inertial Lift Pump ☐ Other (specify): _____

Method (check one)

☒ Low Flow ☐ No Purge ☐ Purge

Options (check one)

☐ Dedicated ☒ Disposable ☐ Portable

Decontamination Method: N/A. Disposable peristaltic tubing.

Field Analysis

							Final Reading
Date/Time							9/22, 9:00
Depth to Water (ft)							14.10
Volume Purged (L)							--
Temp (°C)							19.5
Sp. Cond (umhos/cm)							846
pH							7.11
DO (mg/l)							5.45
ORP (mV)							84.8
Turbidity (NTU)							53.18

Equipment Depth: _____ Flow Rate: 150mL/min Volume Removed: _____ Volume Sampled: 1 L

Odor? ☐ Yes ☒ No Color? ☒ Yes ☐ No

Comments: --

Groundwater Sampling Field Sheet

Disposal Site Name: IPL - Marshalltown E/W Closed LF Permit No.: 64-SDP-5-91C, -3-90C

Well/Piezometer: LW-2 Weather: 65°F, Wind Direction: NA, Cloudy, No precipitation

Date: 9/22/2023 Sampler Name: Tyler Stirling

Monitoring Well Details

Construction Data

Borehole Diameter (in): _____ Depth to Tope of Screen (ft): 32.24

Casing Diameter (in): 2.01 Casing Material: PVC

Top of Casing Elevation (ft. MSL): 916.24 Ground Surface Elevation (ft. MSL): _____

Field Observations

Locked: ☒ Yes ☐ No

	Before Purging	After Purging	Before Sampling
Depth to Water Level (ft.):	DRY	--	--
Water Elevation (ft. MSL):	--	--	--

Screen Submerged? (Depth to Water Level < Depth to Top of Screen) ☐ Yes ■ No

	Start	End
Purge Date/Time	--	--

Well Conditions Commentary: DRY

Sampling Equipment (check one)

☐ Pump ☐ Interval Sampler

☐ Bailer ☐ Other (specify): _____

Equipment Name & Description: _____

Pump Types (check one)

☐ Submersible ☐ Peristaltic ☐ Bladder ☐ Inertial Lift Pump ☐ Other (specify): _____

Method (check one)

☐ Low Flow ☐ No Purge ☐ Purge

Options (check one)

☐ Dedicated ☐ Disposable ☐ Portable

Decontamination Method: --

Field Analysis

							Final Reading
Date/Time							--
Depth to Water (ft)							--
Volume Purged (L)							--
Temp (°C)							--
Sp. Cond (umhos/cm)							--
pH							--
DO (mg/l)							--
ORP (mV)							--
Turbidity (NTU)							--

Equipment Depth: _____ Flow Rate: -- Volume Removed: _____ Volume Sampled: --

Odor? ☐ Yes ☒ No Color? ☐ Yes ☒ No

Comments: --

Groundwater Sampling Field Sheet

Disposal Site Name: IPL - Marshalltown E/W Closed LF Permit No.: 64-SDP-5-91C, -3-90C

Well/Piezometer: LW-3 Weather: 65°F, Wind Direction: NA, Cloudy, No precipitation

Date: 9/22/2023 Sampler Name: Tyler Stirling

Monitoring Well Details

Construction Data

Borehole Diameter (in): _____ Depth to Tope of Screen (ft): 40.68

Casing Diameter (in): 2.01 Casing Material: PVC

Top of Casing Elevation (ft. MSL): 942.35 Ground Surface Elevation (ft. MSL): _____

Field Observations

Locked: ☒ Yes ☐ No

	Before Purging	After Purging	Before Sampling
Depth to Water Level (ft.):	DRY	--	--
Water Elevation (ft. MSL):	--	--	--

Screen Submerged? (Depth to Water Level < Depth to Top of Screen) ☐ Yes ■ No

	Start	End
Purge Date/Time	--	--

Well Conditions Commentary: DRY

Sampling Equipment (check one)

☐ Pump ☐ Interval Sampler

☐ Bailer ☐ Other (specify): _____

Equipment Name & Description: _____

Pump Types (check one)

☐ Submersible ☐ Peristaltic ☐ Bladder ☐ Inertial Lift Pump ☐ Other (specify): _____

Method (check one)

☐ Low Flow ☐ No Purge ☐ Purge

Options (check one)

☐ Dedicated ☐ Disposable ☐ Portable

Decontamination Method: --

Field Analysis

							Final Reading
Date/Time							--
Depth to Water (ft)							--
Volume Purged (L)							--
Temp (°C)							--
Sp. Cond (umhos/cm)							--
pH							--
DO (mg/l)							--
ORP (mV)							--
Turbidity (NTU)							--

Equipment Depth: _____ Flow Rate: -- Volume Removed: _____ Volume Sampled: --

Odor? ☐ Yes ☒ No Color? ☐ Yes ☒ No

Comments: --

Groundwater Sampling Field Sheet

Disposal Site Name: IPL - Marshalltown E/W Closed LF Permit No.: 64-SDP-5-91C, -3-90C

Well/Piezometer: LW-4 Weather: 65°F, Wind Direction: NA, Cloudy, No precipitation

Date: 9/22/2023 Sampler Name: Tyler Stirling

Monitoring Well Details

Construction Data

Borehole Diameter (in): _____ Depth to Tope of Screen (ft): 20.4

Casing Diameter (in): 2.01 Casing Material: PVC

Top of Casing Elevation (ft. MSL): 937.88 Ground Surface Elevation (ft. MSL): _____

Field Observations

Locked: ☒ Yes ☐ No

	Before Purging	After Purging	Before Sampling
Depth to Water Level (ft.):	DRY	--	--
Water Elevation (ft. MSL):	--	--	--

Screen Submerged? (Depth to Water Level < Depth to Top of Screen) ☐ Yes ■ No

	Start	End
Purge Date/Time	--	--

Well Conditions Commentary: DRY

Sampling Equipment (check one)

☐ Pump ☐ Interval Sampler

☐ Bailer ☐ Other (specify): _____

Equipment Name & Description: _____

Pump Types (check one)

☐ Submersible ☐ Peristaltic ☐ Bladder ☐ Inertial Lift Pump ☐ Other (specify): _____

Method (check one)

☐ Low Flow ☐ No Purge ☐ Purge

Options (check one)

☐ Dedicated ☐ Disposable ☐ Portable

Decontamination Method: --

Field Analysis

							Final Reading
Date/Time							--
Depth to Water (ft)							--
Volume Purged (L)							--
Temp (°C)							--
Sp. Cond (umhos/cm)							--
pH							--
DO (mg/l)							--
ORP (mV)							--
Turbidity (NTU)							--

Equipment Depth: _____ Flow Rate: -- Volume Removed: _____ Volume Sampled: --

Odor? ☐ Yes ☒ No Color? ☐ Yes ☒ No

Comments: --

Groundwater Sampling Field Sheet

Disposal Site Name: IPL - Marshalltown E/W Closed LF Permit No.: 64-SDP-5-91C, -3-90C

Well/Piezometer: MW-3 Weather: 70°F, Wind Direction: NA, Sunny, No precipitation

Date: 9/21/2023 Sampler Name: Tyler Stirling

Monitoring Well Details

Construction Data

Borehole Diameter (in): _____ Depth to Tope of Screen (ft): 6.59

Casing Diameter (in): 2.01 Casing Material: PVC

Top of Casing Elevation (ft. MSL): 883.88 Ground Surface Elevation (ft. MSL): _____

Field Observations

Locked: ☒ Yes ☐ No

	Before Purging	After Purging	Before Sampling
Depth to Water Level (ft.):	17.23	17.23	17.23
Water Elevation (ft. MSL):	866.65	866.65	866.65

Screen Submerged? (Depth to Water Level < Depth to Top of Screen) ☐ Yes ■ No

	Start	End
Purge Date/Time	9/21, 10:10	9/21, 10:25

Well Conditions Commentary: --

Sampling Equipment (check one)

☒ Pump ☐ Interval Sampler

☐ Bailer ☐ Other (specify): _____

Equipment Name & Description: Well Wizard

Pump Types (check one)

☐ Submersible ☐ Peristaltic ☒ Bladder ☐ Inertial Lift Pump ☐ Other (specify): _____

Method (check one)

☒ Low Flow ☐ No Purge ☐ Purge

Options (check one)

☐ Dedicated ☐ Disposable ☒ Portable

Decontamination Method: Alconox

Field Analysis

							Final Reading
Date/Time				9/21, 10:10	9/21, 10:15	9/21, 10:20	9/21, 10:25
Depth to Water (ft)				17.23	17.23	17.23	17.23
Volume Purged (L)				1	1.5	2	2.5
Temp (°C)				13.3	15.0	15.2	15.3
Sp. Cond (umhos/cm)				780	781	780	799
pH				7.03	7.02	7.02	7.01
DO (mg/l)				5.17	3.57	3.44	3.31
ORP (mV)				98.1	97.8	97.4	97.1
Turbidity (NTU)				51.70	36.86	33.55	34.71

Equipment Depth: _____ Flow Rate: 100mL/min Volume Removed: 3.5L Volume Sampled: 1 L

Odor? ☐ Yes ☒ No Color? ☐ Yes ☒ No

Comments: --

Groundwater Sampling Field Sheet

Disposal Site Name: IPL - Marshalltown E/W Closed LF Permit No.: 64-SDP-5-91C, -3-90C

Well/Piezometer: MW-4 Weather: 74°F, Wind Direction: NA, Sunny, No precipitation

Date: 9/21/2023 Sampler Name: Tyler Stirling

Monitoring Well Details

Construction Data

Borehole Diameter (in): _____ Depth to Tope of Screen (ft): 4.02

Casing Diameter (in): 2.01 Casing Material: PVC

Top of Casing Elevation (ft. MSL): 880.51 Ground Surface Elevation (ft. MSL): _____

Field Observations

Locked: ☒ Yes ☐ No

	Before Purging	After Purging	Before Sampling
Depth to Water Level (ft.):	10.61	10.61	10.61
Water Elevation (ft. MSL):	869.90	869.90	869.90

Screen Submerged? (Depth to Water Level < Depth to Top of Screen) ☐ Yes ■ No

	Start	End
Purge Date/Time	9/21, 14:30	9/21, 14:53

Well Conditions Commentary: --

Sampling Equipment (check one)

☒ Pump ☐ Interval Sampler

☐ Bailer ☐ Other (specify): _____

Equipment Name & Description: Well Wizard

Pump Types (check one)

☐ Submersible ☐ Peristaltic ☒ Bladder ☐ Inertial Lift Pump ☐ Other (specify): _____

Method (check one)

☒ Low Flow ☐ No Purge ☐ Purge

Options (check one)

☒ Dedicated ☐ Disposable ☐ Portable

Decontamination Method: N/A. Dedicated pump.

Field Analysis

							Final Reading
Date/Time			14:33	9/21, 14:38	9/21, 14:43	9/21, 14:48	9/21, 14:53
Depth to Water (ft)			10.61	10.61	10.61	10.61	10.61
Volume Purged (L)			0.6	1.2	1.8	2.4	3.0
Temp (°C)			13.8	12.9	13.0	12.8	12.8
Sp. Cond (umhos/cm)			773	774	770	777	778
pH			6.86	6.86	6.86	6.86	6.86
DO (mg/l)			1.75	0.39	0.35	0.24	0.17
ORP (mV)			-48.2	-63.5	-64.1	-65.2	-65.9
Turbidity (NTU)			13.82	7.78	4.70	4.43	3.95

Equipment Depth: _____ Flow Rate: 200mL/min Volume Removed: 4 L Volume Sampled: 1 L

Odor? ☐ Yes ☒ No Color? ☐ Yes ☒ No

Comments: --

Groundwater Sampling Field Sheet

Disposal Site Name: IPL - Marshalltown E/W Closed LF Permit No.: 64-SDP-5-91C, -3-90C

Well/Piezometer: MW-5 Weather: 72°F, Wind Direction: NA, Sunny, No precipitation

Date: 9/21/2023 Sampler Name: Tyler Stirling

Monitoring Well Details

Construction Data

Borehole Diameter (in): _____ Depth to Tope of Screen (ft): 6.49

Casing Diameter (in): 2.01 Casing Material: PVC

Top of Casing Elevation (ft. MSL): 891.41 Ground Surface Elevation (ft. MSL): _____

Field Observations

Locked: ☒ Yes ☐ No

	Before Purging	After Purging	Before Sampling
Depth to Water Level (ft.):	17.47	17.47	17.47
Water Elevation (ft. MSL):	873.94	873.94	873.94

Screen Submerged? (Depth to Water Level < Depth to Top of Screen) ☐ Yes ■ No

	Start	End
Purge Date/Time	9/21, 13:05	9/21, 13:40

Well Conditions Commentary: --

Sampling Equipment (check one)

☒ Pump ☐ Interval Sampler

☐ Bailer ☐ Other (specify): _____

Equipment Name & Description: Well Wizard

Pump Types (check one)

☐ Submersible ☐ Peristaltic ☒ Bladder ☐ Inertial Lift Pump ☐ Other (specify): _____

Method (check one)

☒ Low Flow ☐ No Purge ☐ Purge

Options (check one)

☒ Dedicated ☐ Disposable ☐ Portable

Decontamination Method: N/A. Dedicated pump.

Field Analysis

							Final Reading
Date/Time				9/21, 13:13	9/21, 13:18	9/21, 13:23	9/21, 13:28
Depth to Water (ft)				17.47	17.47	17.47	17.47
Volume Purged (L)				0.8	1.3	1.8	2.3
Temp (°C)				13.1	12.7	12.7	12.6
Sp. Cond (umhos/cm)				386.6	386.5	389.1	392.4
pH				6.84	6.29	6.29	6.29
DO (mg/l)				6.58	6.43	6.30	6.22
ORP (mV)				116.8	118.2	118.1	118.4
Turbidity (NTU)				4.03	3.72	4.79	3.12

Equipment Depth: _____ Flow Rate: 100mL/min Volume Removed: 3.5 L Volume Sampled: 1 L

Odor? ☐ Yes ☒ No Color? ☐ Yes ☒ No

Comments: --

Groundwater Sampling Field Sheet

Disposal Site Name: IPL - Marshalltown E/W Closed LF Permit No.: 64-SDP-5-91C, -3-90C

Well/Piezometer: MW-7 Weather: 74°F, Wind Direction: NW, Sunny, No precipitation

Date: 9/20/2023 Sampler Name: Tyler Stirling

Monitoring Well Details

Construction Data

Borehole Diameter (in): _____ Depth to Tope of Screen (ft): 27.65

Casing Diameter (in): 2.01 Casing Material: PVC

Top of Casing Elevation (ft. MSL): 903.85 Ground Surface Elevation (ft. MSL): _____

Field Observations

Locked: ☒ Yes ☐ No

	Before Purging	After Purging	Before Sampling
Depth to Water Level (ft.):	29.78	29.78	29.78
Water Elevation (ft. MSL):	874.07	874.07	874.07

Screen Submerged? (Depth to Water Level < Depth to Top of Screen) ☐ Yes ■ No

	Start	End
Purge Date/Time	9/20, 11:40	9/20, 12:40

Well Conditions Commentary: --

Sampling Equipment (check one)

☒ Pump ☐ Interval Sampler

☐ Bailer ☐ Other (specify): _____

Equipment Name & Description: Well Wizard

Pump Types (check one)

☐ Submersible ☐ Peristaltic ☒ Bladder ☐ Inertial Lift Pump ☐ Other (specify): _____

Method (check one)

☒ Low Flow ☐ No Purge ☐ Purge

Options (check one)

☐ Dedicated ☐ Disposable ☒ Portable

Decontamination Method: Alconox

Field Analysis

							Final Reading
Date/Time	9/20, 11:55	9/20, 12:00	9/20, 12:05	9/20, 12:10	9/20, 12:15	9/20, 12:20	9/20, 12:25
Depth to Water (ft)	29.78	29.78	29.78	29.78	29.78	29.78	29.78
Volume Purged (L)	1.5	2	2.5	3	3.5	4	4.5
Temp (°C)	13.9	13.6	13.5	13.8	13.5	13.3	13.3
Sp. Cond (umhos/cm)	650	647	648	647	647	646	646
pH	7.10	7.13	7.16	7.17	7.17	7.18	7.19
DO (mg/l)	5.67	6.60	7.45	7.63	7.78	7.97	8.10
ORP (mV)	90.8	87.5	87.1	87.0	87.5	87.4	87.5
Turbidity (NTU)	9.96	9.81	18.71	18.46	8.15	9.72	8.57

Equipment Depth: _____ Flow Rate: 100mL/min Volume Removed: 6 L Volume Sampled: 1 L

Odor? ☐ Yes ☒ No Color? ☐ Yes ☒ No

Comments: --

Groundwater Sampling Field Sheet

Disposal Site Name: IPL - Marshalltown E/W Closed LF Permit No.: 64-SDP-5-91C, -3-90C

Well/Piezometer: MW-8 Weather:

Date: 9/21/2023 Sampler Name: Tyler Stirling

Monitoring Well Details

Construction Data

Borehole Diameter (in): Depth to Tope of Screen (ft): 14.34

Casing Diameter (in): 2.01 Casing Material: PVC

Top of Casing Elevation (ft. MSL): 902.53 Ground Surface Elevation (ft. MSL):

Field Observations

Locked: ☒ Yes ☐ No

	Before Purging	After Purging	Before Sampling
Depth to Water Level (ft.):	26.07	DRY	26.07
Water Elevation (ft. MSL):	876.46	--	876.46

Screen Submerged? (Depth to Water Level < Depth to Top of Screen) ☐ Yes ■ No

	Start	End
Purge Date/Time	9/21	9/21, 12:45

Well Conditions Commentary: --

Sampling Equipment (check one)

☐ Pump ☐ Interval Sampler

☒ Bailer ☐ Other (specify):

Equipment Name & Description:

Pump Types (check one)

☐ Submersible ☐ Peristaltic ☐ Bladder ☐ Inertial Lift Pump ☐ Other (specify):

Method (check one)

☒ Low Flow ☐ No Purge ☐ Purge

Options (check one)

☐ Dedicated ☐ Disposable ☒ Portable

Decontamination Method: Alconox

Field Analysis

							Final Reading
Date/Time							12:45
Depth to Water (ft)							26.07
Volume Purged ( )							--
Temp (°C)							12.3
Sp. Cond (umhos/cm)							661
pH							7.10
DO (mg/l)							7.45
ORP (mV)							101.9
Turbidity (NTU)							116.9

Equipment Depth: Flow Rate: -- Volume Removed: -- Volume Sampled: 1 L

Odor? ☐ Yes ☒ No Color? ☒ Yes ☐ No

Comments: Purged dry 9/20/23

Groundwater Sampling Field Sheet

Disposal Site Name: IPL - Marshalltown E/W Closed LF Permit No.: 64-SDP-5-91C, -3-90C

Well/Piezometer: MW-9 Weather: 72°F, Wind Direction: NA, Sunny, No precipitation

Date: 9/21/2023 Sampler Name: Tyler Stirling

Monitoring Well Details

Construction Data

Borehole Diameter (in): _____ Depth to Tope of Screen (ft): 5.04

Casing Diameter (in): 2.01 Casing Material: PVC

Top of Casing Elevation (ft. MSL): 918.04 Ground Surface Elevation (ft. MSL): _____

Field Observations

Locked: ☒ Yes ☐ No

	Before Purging	After Purging	Before Sampling
Depth to Water Level (ft.):	10.85	10.85	10.85
Water Elevation (ft. MSL):	907.19	907.19	907.19

Screen Submerged? (Depth to Water Level < Depth to Top of Screen) ☐ Yes ■ No

	Start	End
Purge Date/Time	9/21, 11:30	9/21, 12:40

Well Conditions Commentary: --

Sampling Equipment (check one)

☒ Pump ☐ Interval Sampler

☐ Bailer ☐ Other (specify): _____

Equipment Name & Description: Well Wizard

Pump Types (check one)

☐ Submersible ☐ Peristaltic ☒ Bladder ☐ Inertial Lift Pump ☐ Other (specify): _____

Method (check one)

☒ Low Flow ☐ No Purge ☐ Purge

Options (check one)

☐ Dedicated ☐ Disposable ☒ Portable

Decontamination Method: Alconox

Field Analysis

							Final Reading
Date/Time	9/21, 11:50	9/21, 11:55	9/21, 12:00	9/21, 12:05	9/21, 12:10	9/21, 12:15	9/21, 12:20
Depth to Water (ft)	10.85	10.85	10.85	10.85	10.85	10.85	10.85
Volume Purged (L)	2	2.5	3	3.5	4	4.5	5
Temp (°C)	16.1	15.2	15.1	15.2	15.3	15.2	15.3
Sp. Cond (umhos/cm)	718	714	707	692	679	655	647
pH	6.85	6.85	6.84	6.81	6.79	6.77	6.76
DO (mg/l)	1.56	0.65	0.53	0.63	0.69	0.65	0.64
ORP (mV)	64.7	46.1	30.0	38.3	55.3	58.3	59.7
Turbidity (NTU)	13.06	12.65	12.05	11.00	6.83	5.60	6.20

Equipment Depth: _____ Flow Rate: 100 mL/min Volume Removed: 7 L Volume Sampled: 1 L

Odor? ☐ Yes ☒ No Color? ☐ Yes ☒ No

Comments: --

Groundwater Sampling Field Sheet

Disposal Site Name: IPL - Marshalltown E/W Closed LF Permit No.: 64-SDP-5-91C, -3-90C

Well/Piezometer: MW-10 Weather: 75°F, Wind Direction: N, Sunny, No precipitation

Date: 9/18/2023 Sampler Name: Tyler Stirling

Monitoring Well Details

Construction Data

Borehole Diameter (in): _____ Depth to Tope of Screen (ft): 5.01

Casing Diameter (in): 2.01 Casing Material: PVC

Top of Casing Elevation (ft. MSL): 941.19 Ground Surface Elevation (ft. MSL): _____

Field Observations

Locked: ☒ Yes ☐ No

	Before Purging	After Purging	Before Sampling
Depth to Water Level (ft.):	16.41	16.41	16.41
Water Elevation (ft. MSL):	924.78	924.78	924.78

Screen Submerged? (Depth to Water Level < Depth to Top of Screen) ☐ Yes ☒ No

	Start	End
Purge Date/Time	9/18, 14:30	9/18, 15:40

Well Conditions Commentary: --

Sampling Equipment (check one)

☒ Pump ☐ Interval Sampler

☐ Bailer ☐ Other (specify): _____

Equipment Name & Description: Well Wizard

Pump Types (check one)

☐ Submersible ☐ Peristaltic ☒ Bladder ☐ Inertial Lift Pump ☐ Other (specify): _____

Method (check one)

☒ Low Flow ☐ No Purge ☐ Purge

Options (check one)

☐ Dedicated ☐ Disposable ☒ Portable

Decontamination Method: Alconox

Field Analysis

							Final Reading
Date/Time			9/18, 15:05	9/18, 15:10	9/18, 15:15	9/18, 15:20	9/18, 15:25
Depth to Water (ft)			16.41	16.41	16.41	16.41	16.41
Volume Purged (L)			7	8	9	10	11
Temp (°C)			12.8	12.6	12.5	12.5	12.4
Sp. Cond (umhos/cm)			618	622	626	627	629
pH			6.98	6.95	6.94	6.94	6.93
DO (mg/l)			6.43	5.91	5.26	5.38	5.33
ORP (mV)			97.7	97.4	97.2	96.8	96.2
Turbidity (NTU)			7.60	5.56	3.25	3.10	2.17

Equipment Depth: _____ Flow Rate: 200mL/min Volume Removed: 14 L Volume Sampled: 1 L

Odor? ☐ Yes ☒ No Color? ☐ Yes ☒ No

Comments: --

Groundwater Sampling Field Sheet

Disposal Site Name: IPL - Marshalltown E/W Closed LF Permit No.: 64-SDP-5-91C, -3-90C

Well/Piezometer: MW-11AR Weather: 75°F, Wind Direction: NW, Sunny, No precipitation

Date: 9/20/2023 Sampler Name: Tyler Stirling

Monitoring Well Details

Construction Data

Borehole Diameter (in): _____ Depth to Tope of Screen (ft): 52.69

Casing Diameter (in): 2.01 Casing Material: PVC

Top of Casing Elevation (ft. MSL): 922.53 Ground Surface Elevation (ft. MSL): _____

Field Observations

Locked: ☒ Yes ☐ No

	Before Purging	After Purging	Before Sampling
Depth to Water Level (ft.):	51.60	DRY	DRY
Water Elevation (ft. MSL):	870.93		

Screen Submerged? (Depth to Water Level < Depth to Top of Screen) ■ Yes ☐ No

	Start	End
Purge Date/Time	9/20, 14:45	9/20, 15:30

Well Conditions Commentary: --

Sampling Equipment (check one)

☒ Pump ☐ Interval Sampler

☐ Bailer ☐ Other (specify): _____

Equipment Name & Description: Well Wizard

Pump Types (check one)

☐ Submersible ☐ Peristaltic ☒ Bladder ☐ Inertial Lift Pump ☐ Other (specify): _____

Method (check one)

☒ Low Flow ☐ No Purge ☐ Purge

Options (check one)

☐ Dedicated ☐ Disposable ☒ Portable

Decontamination Method: Alconox

Field Analysis

							Final Reading
Date/Time	9/20, 14:57	9/20, 15:02	9/20, 15:07	9/20, 15:12	9/20, 15:17	9/20, 15:22	9/20, 15:27
Depth to Water (ft)	52.34	52.56	53.11	53.66	54.07	54.45	54.79
Volume Purged (L)	1.2	1.7	2.2	2.7	3.2	3.7	4.2
Temp (°C)	14.1	13.8	13.4	13.7	13.8	13.8	13.7
Sp. Cond (umhos/cm)	923	911	915	915	914	914	913
pH	7.16	7.07	7.03	7.00	6.98	6.98	6.96
DO (mg/l)	2.71	2.02	1.78	1.54	1.50	1.48	1.54
ORP (mV)	107.5	93.4	83.7	74.9	71.1	62.6	54.7
Turbidity (NTU)	35.70	58.10	60.23	95.50	100.40	130.00	104.40

Equipment Depth: _____ Flow Rate: 100mL/min Volume Removed: 5.7 L Volume Sampled: 1 L

Odor? ☐ Yes ☒ No Color? ☐ Yes ☒ No

Comments: Well didn't stabilize, ran dry. Sampled on 9/21/2023 at 4:00 pm.

Groundwater Sampling Field Sheet

Disposal Site Name: IPL - Marshalltown E/W Closed LF Permit No.: 64-SDP-5-91C, -3-90C

Well/Piezometer: MW-13 Weather: 68°F, Wind Direction: NW, Sunny, No precipitation

Date: 9/20/2023 Sampler Name: Tyler Stirling

Monitoring Well Details

Construction Data

Borehole Diameter (in): _____ Depth to Tope of Screen (ft): 7.47

Casing Diameter (in): 2.01 Casing Material: PVC

Top of Casing Elevation (ft. MSL): 920.75 Ground Surface Elevation (ft. MSL): _____

Field Observations

Locked: ☒ Yes ☐ No

	Before Purging	After Purging	Before Sampling
Depth to Water Level (ft.):	13.79	13.79	13.79
Water Elevation (ft. MSL):	906.96	906.96	906.96

Screen Submerged? (Depth to Water Level < Depth to Top of Screen) ☐ Yes ☒ No

	Start	End
Purge Date/Time	9/20, 9:45	9/20, 10:55

Well Conditions Commentary: --

Sampling Equipment (check one)

☒ Pump ☐ Interval Sampler

☐ Bailer ☐ Other (specify): _____

Equipment Name & Description: Well Wizard

Pump Types (check one)

☐ Submersible ☐ Peristaltic ☒ Bladder ☐ Inertial Lift Pump ☐ Other (specify): _____

Method (check one)

☒ Low Flow ☐ No Purge ☐ Purge

Options (check one)

☐ Dedicated ☐ Disposable ☒ Portable

Decontamination Method: Alconox

Field Analysis

							Final Reading
Date/Time	9/20, 10:05	9/20, 10:10	9/20, 10:15	9/20, 10:20	9/20, 10:25	9/20, 10:30	9/20, 10:35
Depth to Water (ft)	13.79	13.79	13.79	13.79	13.79	13.79	13.79
Volume Purged (L)	2	2.5	3	3.5	4	4.5	5.0
Temp (°C)	14.3	15.1	15.0	14.9	14.9	14.9	14.9
Sp. Cond (umhos/cm)	802	801	799	803	801	802	803
pH	6.90	6.90	6.91	6.92	6.92	6.92	6.92
DO (mg/l)	3.38	3.34	3.59	3.72	3.80	3.84	3.88
ORP (mV)	141.5	137.0	133.4	133.0	129.6	129.5	129.3
Turbidity (NTU)	23.25	16.30	12.81	10.54	7.41	8.39	7.61

Equipment Depth: _____ Flow Rate: 100mL/min Volume Removed: 7 L Volume Sampled: 1 L

Odor? ☐ Yes ☒ No Color? ☐ Yes ☒ No

Comments: --

Groundwater Sampling Field Sheet

Disposal Site Name: IPL - Marshalltown E/W Closed LF Permit No.: 64-SDP-5-91C, -3-90C

Well/Piezometer: MW-14 Weather: 75°F, Wind Direction: NW, Sunny, No precipitation

Date: 9/20/2023 Sampler Name: Tyler Stirling

Monitoring Well Details

Construction Data

Borehole Diameter (in): _____ Depth to Tope of Screen (ft): 7.55

Casing Diameter (in): 2.01 Casing Material: PVC

Top of Casing Elevation (ft. MSL): 929.48 Ground Surface Elevation (ft. MSL): _____

Field Observations

Locked: ☒ Yes ☐ No

	Before Purging	After Purging	Before Sampling
Depth to Water Level (ft.):	14.20	14.20	14.20
Water Elevation (ft. MSL):	915.28	915.28	915.28

Screen Submerged? (Depth to Water Level < Depth to Top of Screen) ☐ Yes ■ No

	Start	End
Purge Date/Time	9/20, 13:05	9/20, 14:20

Well Conditions Commentary: --

Sampling Equipment (check one)

☒ Pump ☐ Interval Sampler

☐ Bailer ☐ Other (specify): _____

Equipment Name & Description: Well Wizard

Pump Types (check one)

☐ Submersible ☐ Peristaltic ☒ Bladder ☐ Inertial Lift Pump ☐ Other (specify): _____

Method (check one)

☒ Low Flow ☐ No Purge ☐ Purge

Options (check one)

☐ Dedicated ☐ Disposable ☒ Portable

Decontamination Method: Alconox

Field Analysis

							Final Reading
Date/Time	9/20, 13:30	9/20, 13:35	9/20, 13:40	9/20, 13:45	9/20, 13:50	9/20, 13:55	9/20, 14:00
Depth to Water (ft)	14.20	14.20	14.20	14.20	14.20	14.20	14.20
Volume Purged (L)	2.5	3	3.5	4	4.5	5	5.5
Temp (°C)	14.5	14.3	14.3	14.3	14.3	14.3	14.3
Sp. Cond (umhos/cm)	705	703	700	699	697	695	693
pH	7.03	7.04	7.05	7.07	7.09	7.12	7.13
DO (mg/l)	5.73	5.86	6.09	6.28	6.49	6.75	6.88
ORP (mV)	96.4	98.1	99.7	100.4	101.3	102.5	103.7
Turbidity (NTU)	33.30	27.92	25.46	21.12	19.67	18.45	20.04

Equipment Depth: _____ Flow Rate: 100mL/min Volume Removed: 7.5 L Volume Sampled: 1 L

Odor? ☐ Yes ☒ No Color? ☐ Yes ☒ No

Comments: --

Groundwater Sampling Field Sheet

Disposal Site Name: IPL - Marshalltown E/W Closed LF Permit No.: 64-SDP-5-91C, -3-90C

Well/Piezometer: MW-18 Weather: 75°F, Wind Direction: NW, Sunny, No precipitation

Date: 9/20/2023 Sampler Name: Tyler Stirling

Monitoring Well Details

Construction Data

Borehole Diameter (in): _____ Depth to Tope of Screen (ft): 11.5

Casing Diameter (in): 2.01 Casing Material: PVC

Top of Casing Elevation (ft. MSL): 921.63 Ground Surface Elevation (ft. MSL): _____

Field Observations

Locked: ☒ Yes ☐ No

	Before Purging	After Purging	Before Sampling
Depth to Water Level (ft.):	21.40	21.40	21.40
Water Elevation (ft. MSL):	900.23	900.23	900.23

Screen Submerged? (Depth to Water Level < Depth to Top of Screen) ☐ Yes ■ No

	Start	End
Purge Date/Time	9/20, 14:40	9/20, 15:30

Well Conditions Commentary: --

Sampling Equipment (check one)

☒ Pump ☐ Interval Sampler

☐ Bailer ☐ Other (specify): _____

Equipment Name & Description: Well Wizard

Pump Types (check one)

☐ Submersible ☐ Peristaltic ☒ Bladder ☐ Inertial Lift Pump ☐ Other (specify): _____

Method (check one)

☒ Low Flow ☐ No Purge ☐ Purge

Options (check one)

☒ Dedicated ☐ Disposable ☐ Portable

Decontamination Method: N/A. Dedicated pump.

Field Analysis

							Final Reading
Date/Time		9/20, 14:50	9/20, 14:55	9/20, 15:00	9/20, 15:05	9/20, 15:10	9/20, 15:15
Depth to Water (ft)		21.40	21.40	21.40	21.40	21.40	21.40
Volume Purged (L)		2	3	4	5	6	7
Temp (°C)		12.7	12.0	12.1	12.2	12.0	12.0
Sp. Cond (umhos/cm)		854	843	833	825	822	819
pH		6.72	6.71	6.70	6.71	6.73	6.73
DO (mg/l)		2.78	2.08	1.89	1.36	1.42	1.47
ORP (mV)		131.0	123.9	119.9	117.5	114.1	111.8
Turbidity (NTU)		19.09	6.07	5.23	5.31	6.41	5.82

Equipment Depth: _____ Flow Rate: 200mL/min Volume Removed: 10 L Volume Sampled: 1 L

Odor? ☐ Yes ☒ No Color? ☐ Yes ☒ No

Comments: --

Groundwater Sampling Field Sheet

Disposal Site Name: IPL - Marshalltown E/W Closed LF Permit No.: 64-SDP-5-91C, -3-90C

Well/Piezometer: MW-19 Weather: 72°F, Wind Direction: NA, Sunny, No precipitation

Date: 9/21/2023 Sampler Name: Tyler Stirling

Monitoring Well Details

Construction Data

Borehole Diameter (in): _____ Depth to Tope of Screen (ft): 35.05

Casing Diameter (in): 2.01 Casing Material: PVC

Top of Casing Elevation (ft. MSL): 891.46 Ground Surface Elevation (ft. MSL): _____

Field Observations

Locked: ☒ Yes ☐ No

	Before Purging	After Purging	Before Sampling
Depth to Water Level (ft.):	17.34	17.34	17.34
Water Elevation (ft. MSL):	874.12	874.12	874.12

Screen Submerged? (Depth to Water Level < Depth to Top of Screen) ■ Yes ☐ No

	Start	End
Purge Date/Time	9/21, 13:00	9/21, 13:50

Well Conditions Commentary: --

Sampling Equipment (check one)

☒ Pump ☐ Interval Sampler

☐ Bailer ☐ Other (specify): _____

Equipment Name & Description: Well Wizard

Pump Types (check one)

☐ Submersible ☐ Peristaltic ☒ Bladder ☐ Inertial Lift Pump ☐ Other (specify): _____

Method (check one)

☒ Low Flow ☐ No Purge ☐ Purge

Options (check one)

☐ Dedicated ☐ Disposable ☒ Portable

Decontamination Method: Alconox

Field Analysis

							Final Reading
Date/Time			9/21, 13:15	9/21, 13:20	9/21, 13:25	9/21, 13:30	9/21, 13:35
Depth to Water (ft)			17.34	17.34	17.34	17.34	17.34
Volume Purged (L)			1.5	2	2.5	3	3.5
Temp (°C)			17.8	17.9	18.1	18.2	18.2
Sp. Cond (umhos/cm)			650	645	648	650	652
pH			7.31	7.12	7.06	7.04	7.03
DO (mg/l)			4.98	4.34	4.20	4.02	3.95
ORP (mV)			112.0	102.3	97.7	94.3	91.7
Turbidity (NTU)			6.00	5.86	3.34	4.12	4.44

Equipment Depth: _____ Flow Rate: 100mL/min Volume Removed: 5 L Volume Sampled: 1 L

Odor? ☐ Yes ☒ No Color? ☐ Yes ☒ No

Comments: --

Groundwater Sampling Field Sheet

Disposal Site Name: IPL - Marshalltown E/W Closed LF Permit No.: 64-SDP-5-91C, -3-90C

Well/Piezometer: MW-20 Weather: 68°F, Wind Direction: NW, Sunny, No precipitation

Date: 9/20/2023 Sampler Name: Tyler Stirling

Monitoring Well Details

Construction Data

Borehole Diameter (in): _____ Depth to Tope of Screen (ft): 74.12

Casing Diameter (in): 2.01 Casing Material: PVC

Top of Casing Elevation (ft. MSL): 920.86 Ground Surface Elevation (ft. MSL): _____

Field Observations

Locked: ☒ Yes ☐ No

	Before Purging	After Purging	Before Sampling
Depth to Water Level (ft.):	50.20	50.20	50.20
Water Elevation (ft. MSL):	870.66	870.66	870.66

Screen Submerged? (Depth to Water Level < Depth to Top of Screen) ■ Yes ☐ No

	Start	End
Purge Date/Time	9/20, 9:40	9/20, 10:35

Well Conditions Commentary: --

Sampling Equipment (check one)

☒ Pump ☐ Interval Sampler

☐ Bailer ☐ Other (specify): _____

Equipment Name & Description: Well Wizard

Pump Types (check one)

☐ Submersible ☐ Peristaltic ☒ Bladder ☐ Inertial Lift Pump ☐ Other (specify): _____

Method (check one)

☒ Low Flow ☐ No Purge ☐ Purge

Options (check one)

☐ Dedicated ☐ Disposable ☒ Portable

Decontamination Method: Alconox

Field Analysis

							Final Reading
Date/Time		9/20, 9:57	9/20, 10:02	9/20, 10:07	9/20, 10:12	9/20, 10:17	9/20, 10:22
Depth to Water (ft)		50.20	50.20	50.20	50.20	50.20	50.20
Volume Purged (L)		1.7	2.3	2.8	3.3	3.8	4.3
Temp (°C)		14.9	14.4	14.3	14.2	14.1	14.1
Sp. Cond (umhos/cm)		880	877	872	870	869	867
pH		7.13	7.12	7.11	7.11	7.10	7.10
DO (mg/l)		4.65	4.16	3.96	3.83	3.73	3.68
ORP (mV)		90.0	84.9	80.3	78.5	77.3	76.1
Turbidity (NTU)		7.06	6.02	4.29	4.85	3.32	3.74

Equipment Depth: _____ Flow Rate: 100mL/min Volume Removed: 5.5 L Volume Sampled: 1 L

Odor? ☐ Yes ☒ No Color? ☐ Yes ☒ No

Comments: --

Groundwater Sampling Field Sheet

Disposal Site Name: IPL - Marshalltown E/W Closed LF Permit No.: 64-SDP-5-91C, -3-90C

Well/Piezometer: MW-21 Weather:

Date: 9/21/2023 Sampler Name: Tyler Stirling

Monitoring Well Details

Construction Data

Borehole Diameter (in): Depth to Tope of Screen (ft): 31.02

Casing Diameter (in): 2.01 Casing Material: PVC

Top of Casing Elevation (ft. MSL): 880.11 Ground Surface Elevation (ft. MSL):

Field Observations

Locked: ☒ Yes ☐ No

	Before Purging	After Purging	Before Sampling
Depth to Water Level (ft.):	10.12	10.12	10.12
Water Elevation (ft. MSL):	869.99	869.99	869.99

Screen Submerged? (Depth to Water Level < Depth to Top of Screen) ■ Yes ☐ No

	Start	End
Purge Date/Time	9/21, 14:25	9/21, 14:50

Well Conditions Commentary: --

Sampling Equipment (check one)

☒ Pump ☐ Interval Sampler

☐ Bailer ☐ Other (specify):

Equipment Name & Description: Well Wizard

Pump Types (check one)

☐ Submersible ☐ Peristaltic ☒ Bladder ☐ Inertial Lift Pump ☐ Other (specify):

Method (check one)

☒ Low Flow ☐ No Purge ☐ Purge

Options (check one)

☐ Dedicated ☐ Disposable ☒ Portable

Decontamination Method: Alconox

Field Analysis

							Final Reading
Date/Time				9/21, 14:35	9/21, 14:40	9/21, 14:45	9/21, 14:50
Depth to Water (ft)				10.12	10.12	10.12	10.12
Volume Purged (L)				1	1.5	2	2.5
Temp (°C)				14.9	14.3	14.0	14.0
Sp. Cond (umhos/cm)				696	692	691	692
pH				7.10	7.00	6.97	6.95
DO (mg/l)				4.15	3.87	3.78	3.63
ORP (mV)				119.3	123.5	125.5	126.3
Turbidity (NTU)				44.62	102.7	105.3	98.7

Equipment Depth: Flow Rate: 100 mL/min Volume Removed: 3.5 L Volume Sampled: 1 L

Odor? ☐ Yes ☒ No Color? ☒ Yes ☐ No

Comments: --

Groundwater Sampling Field Sheet

Disposal Site Name: IPL - Marshalltown E/W Closed LF Permit No.: 64-SDP-5-91C, -3-90C

Well/Piezometer: MW-22 Weather: 65°F, Wind Direction: NA, Cloudy, No precipitation

Date: 9/18/2023 Sampler Name: Tyler Stirling

Monitoring Well Details

Construction Data

Borehole Diameter (in): _____ Depth to Tope of Screen (ft): 40.9

Casing Diameter (in): 2.01 Casing Material: PVC

Top of Casing Elevation (ft. MSL): 926.63 Ground Surface Elevation (ft. MSL): _____

Field Observations

Locked: ☒ Yes ☐ No

	Before Purging	After Purging	Before Sampling
Depth to Water Level (ft.):	DRY	--	--
Water Elevation (ft. MSL):	--	--	--

Screen Submerged? (Depth to Water Level < Depth to Top of Screen) ☐ Yes ■ No

	Start	End
Purge Date/Time	--	--

Well Conditions Commentary: DRY

Sampling Equipment (check one)

☐ Pump ☐ Interval Sampler

☐ Bailer ☐ Other (specify): _____

Equipment Name & Description: _____

Pump Types (check one)

☐ Submersible ☐ Peristaltic ☐ Bladder ☐ Inertial Lift Pump ☐ Other (specify): _____

Method (check one)

☐ Low Flow ☐ No Purge ☐ Purge

Options (check one)

☐ Dedicated ☐ Disposable ☐ Portable

Decontamination Method: --

Field Analysis

							Final Reading
Date/Time							--
Depth to Water (ft)							--
Volume Purged (L)							--
Temp (°C)							--
Sp. Cond (umhos/cm)							--
pH							--
DO (mg/l)							--
ORP (mV)							--
Turbidity (NTU)							--

Equipment Depth: _____ Flow Rate: -- Volume Removed: _____ Volume Sampled: --

Odor? ☐ Yes ☒ No Color? ☐ Yes ☒ No

Comments: --

Groundwater Sampling Field Sheet

Disposal Site Name: IPL - Marshalltown E/W Closed LF Permit No.: 64-SDP-5-91C, -3-90C

Well/Piezometer: MW-23 Weather: 75°F, Wind Direction: N, Sunny, No precipitation

Date: 9/18/2023 Sampler Name: Tyler Stirling

Monitoring Well Details

Construction Data

Borehole Diameter (in): _____ Depth to Tope of Screen (ft): 15.36

Casing Diameter (in): 2.01 Casing Material: PVC

Top of Casing Elevation (ft. MSL): 926.64 Ground Surface Elevation (ft. MSL): _____

Field Observations

Locked: ☒ Yes ☐ No

	Before Purging	After Purging	Before Sampling
Depth to Water Level (ft.):	12.57	12.57	14.15
Water Elevation (ft. MSL):	914.07	914.07	912.49

Screen Submerged? (Depth to Water Level < Depth to Top of Screen) ☐ Yes ☐ No

	Start	End
Purge Date/Time	9/18, 13:20	9/18, 14:10

Well Conditions Commentary: --

Sampling Equipment (check one)

☒ Pump ☐ Interval Sampler

☐ Bailer ☐ Other (specify): _____

Equipment Name & Description: Well Wizard

Pump Types (check one)

☐ Submersible ☐ Peristaltic ☒ Bladder ☐ Inertial Lift Pump ☐ Other (specify): _____

Method (check one)

☒ Low Flow ☐ No Purge ☐ Purge

Options (check one)

☐ Dedicated ☐ Disposable ☒ Portable

Decontamination Method: Alconox

Field Analysis

							Final Reading
Date/Time			9/18, 13:30	9/18, 13:35	9/18, 13:40	9/18, 13:45	9/18, 13:50
Depth to Water (ft)			13.15	13.42	13.78	14.00	14.15
Volume Purged (L)			1	1.5	2	2.5	3
Temp (°C)			16.7	16.2	16.7	16.8	16.9
Sp. Cond (umhos/cm)			855	784	723	719	725
pH			6.82	6.86	6.84	6.84	6.85
DO (mg/l)			1.49	1.46	1.16	1.11	1.06
ORP (mV)			66.2	60.1	66.2	68.6	69.3
Turbidity (NTU)			5.56	6.11	3.09	3.22	2.95

Equipment Depth: _____ Flow Rate: 100mL/min Volume Removed: 5 L Volume Sampled: 1 L

Odor? ☐ Yes ☒ No Color? ☐ Yes ☒ No

Comments: --

Appendix C

Laboratory Analytical Report

eurofins | Environment Testing

ANALYTICAL REPORT

PREPARED FOR

Attn: Meghan Blodgett
SCS Engineers
2830 Dairy Drive
Madison, Wisconsin 53718

Generated 10/16/2023 9:39:41 AM Revision 1

JOB DESCRIPTION

Marshalltown E/W Closed LF - 25223064
SDG NUMBER 25223064

JOB NUMBER

310-265481-1

Eurofins Cedar Falls
3019 Venture Way
Cedar Falls IA 50613

See page two for job notes and contact information.

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins Environment Testing North Central, LLC Project Manager.

Authorization

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Revision 1

Authorized for release by
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Table of Contents

Job ID: 310-265481-1

Laboratory: Eurofins Cedar Falls

Narrative

Job Narrative
310-265481-1

Revision
The report being provided is a revision of the original report sent on 10/12/23. The report (revision 1) is being revised due to: Client requested revision with zinc results removed from the MWs. This would include MW3, MW4, MW5, MW7, MW8, and MW9, etc. They still want to include zinc on LW-1 and Field Blank, so no change there.

Receipt
The samples were received on 9/22/2023 4:40 PM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperatures of the 2 coolers at receipt time were 2.6º C and 4.1º C.

Receipt Exceptions
Lab received MW-22 - not MW-23 as listed on the COC; and SW-3 not SW-2 as listed on the COC. MW-23 & SW-2 confirmed with client. MW-23 (310-265481-15) and SW-2 (310-265481-17)

HPLC/IC
Method 9056A: The following samples were diluted due to the nature of the sample matrix: MW-3 (310-265481-1), MW-4 (310-265481-2), MW-5 (310-265481-3), MW-7 (310-265481-4), MW-8 (310-265481-5), MW-9 (310-265481-6), MW-10 (310-265481-7), MW-11AR (310-265481-8), MW-13 (310-265481-9), MW-14 (310-265481-10), MW-18 (310-265481-11), MW-19 (310-265481-12), MW-20 (310-265481-13), MW-21 (310-265481-14), MW-23 (310-265481-15), SW-1 (310-265481-16) and SW-2 (310-265481-17). Elevated reporting limits (RLs) are provided.

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

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

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

Sample Summary

Client: SCS Engineers
Project/Site: Marshalltown E/W Closed LF - 25223064

Job ID: 310-265481-1
SDG: 25223064

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
310-265481-1	MW-3	Water	09/21/23 10:25	09/22/23 16:40
310-265481-2	MW-4	Water	09/21/23 14:53	09/22/23 16:40
310-265481-3	MW-5	Water	09/21/23 13:28	09/22/23 16:40
310-265481-4	MW-7	Water	09/20/23 12:25	09/22/23 16:40
310-265481-5	MW-8	Water	09/21/23 12:45	09/22/23 16:40
310-265481-6	MW-9	Water	09/21/23 12:20	09/22/23 16:40
310-265481-7	MW-10	Water	09/18/23 15:25	09/22/23 16:40
310-265481-8	MW-11AR	Water	09/21/23 16:00	09/22/23 16:40
310-265481-9	MW-13	Water	09/20/23 10:35	09/22/23 16:40
310-265481-10	MW-14	Water	09/20/23 14:00	09/22/23 16:40
310-265481-11	MW-18	Water	09/20/23 15:15	09/22/23 16:40
310-265481-12	MW-19	Water	09/21/23 13:35	09/22/23 16:40
310-265481-13	MW-20	Water	09/20/23 10:22	09/22/23 16:40
310-265481-14	MW-21	Water	09/21/23 14:50	09/22/23 16:40
310-265481-15	MW-23	Water	09/18/23 13:50	09/22/23 16:40
310-265481-16	SW-1	Water	09/20/23 12:45	09/22/23 16:40
310-265481-17	SW-2	Water	09/21/23 10:40	09/22/23 16:40
310-265481-18	LW-01	Water	09/22/23 09:00	09/22/23 16:40
310-265481-19	Field Blank	Water	09/21/23 16:45	09/22/23 16:40

Detection Summary

Client: SCS Engineers
Project/Site: Marshalltown E/W Closed LF - 25223064

Job ID: 310-265481-1
SDG: 25223064

Client Sample ID: MW-3 — Lab Sample ID: 310-265481-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	14		5.0	2.3	mg/L	5		9056A	Total/NA
Sulfate	96		5.0	2.1	mg/L	5		9056A	Total/NA
Arsenic	0.65	J	2.0	0.53	ug/L	1		6020B	Total/NA
Barium	150		2.0	0.64	ug/L	1		6020B	Total/NA
Boron	1300		100	76	ug/L	1		6020B	Total/NA
Calcium	120		0.50	0.19	mg/L	1		6020B	Total/NA
Cobalt	0.75		0.50	0.17	ug/L	1		6020B	Total/NA
Iron	430	F1 F2	100	36	ug/L	1		6020B	Total/NA
Lead	0.68		0.50	0.24	ug/L	1		6020B	Total/NA
Lithium	23		10	2.5	ug/L	1		6020B	Total/NA
Magnesium	18000		500	150	ug/L	1		6020B	Total/NA
Manganese	78		10	3.6	ug/L	1		6020B	Total/NA
Molybdenum	8.6		2.0	0.91	ug/L	1		6020B	Total/NA
Selenium	7.4		5.0	1.4	ug/L	1		6020B	Total/NA
Total Suspended Solids	10		1.9	0.64	mg/L	1		I-3765-85	Total/NA
Total Dissolved Solids	440		50	34	mg/L	1		SM 2540C	Total/NA
Groundwater Elevation	866.65				ft	1		Field Sampling	Total/NA
Field pH	7.01				SU	1		Field Sampling	Total/NA
Field Conductivity	799				umhos/cm	1		Field Sampling	Total/NA
Field Temperature	15.3				Degrees C	1		Field Sampling	Total/NA
Field Turbidity	34.71				NTU	1		Field Sampling	Total/NA

Client Sample ID: MW-4 — Lab Sample ID: 310-265481-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	12		5.0	2.3	mg/L	5		9056A	Total/NA
Sulfate	57		5.0	2.1	mg/L	5		9056A	Total/NA
Arsenic	2.6		2.0	0.53	ug/L	1		6020B	Total/NA
Barium	94		2.0	0.64	ug/L	1		6020B	Total/NA
Boron	3400		100	76	ug/L	1		6020B	Total/NA
Calcium	110		0.50	0.19	mg/L	1		6020B	Total/NA
Cobalt	0.90		0.50	0.17	ug/L	1		6020B	Total/NA
Iron	1900		100	36	ug/L	1		6020B	Total/NA
Lead	0.28	J	0.50	0.24	ug/L	1		6020B	Total/NA
Lithium	9.4	J	10	2.5	ug/L	1		6020B	Total/NA
Magnesium	17000		500	150	ug/L	1		6020B	Total/NA
Manganese	1200		10	3.6	ug/L	1		6020B	Total/NA
Molybdenum	15		2.0	0.91	ug/L	1		6020B	Total/NA
Total Suspended Solids	6.0		1.9	0.64	mg/L	1		I-3765-85	Total/NA
Total Dissolved Solids	420		50	34	mg/L	1		SM 2540C	Total/NA
Groundwater Elevation	869.90				ft	1		Field Sampling	Total/NA
Field pH	6.86				SU	1		Field Sampling	Total/NA
Field Conductivity	778				umhos/cm	1		Field Sampling	Total/NA
Field Temperature	12.8				Degrees C	1		Field Sampling	Total/NA
Field Turbidity	3.95				NTU	1		Field Sampling	Total/NA

Client Sample ID: MW-5 — Lab Sample ID: 310-265481-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	4.5	J	5.0	2.3	mg/L	5		9056A	Total/NA
Sulfate	28		5.0	2.1	mg/L	5		9056A	Total/NA
Arsenic	0.72	J	2.0	0.53	ug/L	1		6020B	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: MW-5 (Continued) — Lab Sample ID: 310-265481-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Barium	120		2.0	0.64	ug/L	1		6020B	Total/NA
Boron	420		100	76	ug/L	1		6020B	Total/NA
Calcium	48		0.50	0.19	mg/L	1		6020B	Total/NA
Cobalt	0.53		0.50	0.17	ug/L	1		6020B	Total/NA
Iron	360		100	36	ug/L	1		6020B	Total/NA
Lead	0.60		0.50	0.24	ug/L	1		6020B	Total/NA
Magnesium	13000		500	150	ug/L	1		6020B	Total/NA
Manganese	18		10	3.6	ug/L	1		6020B	Total/NA
Selenium	54		5.0	1.4	ug/L	1		6020B	Total/NA
Total Suspended Solids	4.5		1.9	0.64	mg/L	1		I-3765-85	Total/NA
Total Dissolved Solids	190		50	34	mg/L	1		SM 2540C	Total/NA
Groundwater Elevation	873.94				ft	1		Field Sampling	Total/NA
Field pH	6.29				SU	1		Field Sampling	Total/NA
Field Conductivity	392.4				umhos/cm	1		Field Sampling	Total/NA
Field Temperature	12.6				Degrees C	1		Field Sampling	Total/NA
Field Turbidity	3.12				NTU	1		Field Sampling	Total/NA

Client Sample ID: MW-7 — Lab Sample ID: 310-265481-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	19		5.0	2.3	mg/L	5		9056A	Total/NA
Sulfate	25		5.0	2.1	mg/L	5		9056A	Total/NA
Barium	110		2.0	0.64	ug/L	1		6020B	Total/NA
Boron	110		100	76	ug/L	1		6020B	Total/NA
Calcium	87		0.50	0.19	mg/L	1		6020B	Total/NA
Cobalt	0.31	J	0.50	0.17	ug/L	1		6020B	Total/NA
Iron	54	J	100	36	ug/L	1		6020B	Total/NA
Lithium	5.9	J	10	2.5	ug/L	1		6020B	Total/NA
Magnesium	18000		500	150	ug/L	1		6020B	Total/NA
Manganese	17		10	3.6	ug/L	1		6020B	Total/NA
Selenium	2.3	J	5.0	1.4	ug/L	1		6020B	Total/NA
Total Suspended Solids	8.4		1.9	0.64	mg/L	1		I-3765-85	Total/NA
Total Dissolved Solids	350		50	34	mg/L	1		SM 2540C	Total/NA
Groundwater Elevation	874.07				ft	1		Field Sampling	Total/NA
Field pH	7.19				SU	1		Field Sampling	Total/NA
Field Conductivity	646				umhos/cm	1		Field Sampling	Total/NA
Field Temperature	13.3				Degrees C	1		Field Sampling	Total/NA
Field Turbidity	8.57				NTU	1		Field Sampling	Total/NA

Client Sample ID: MW-8 — Lab Sample ID: 310-265481-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	20		5.0	2.3	mg/L	5		9056A	Total/NA
Sulfate	16		5.0	2.1	mg/L	5		9056A	Total/NA
Arsenic	0.55	J	2.0	0.53	ug/L	1		6020B	Total/NA
Barium	130		2.0	0.64	ug/L	1		6020B	Total/NA
Boron	81	J	100	76	ug/L	1		6020B	Total/NA
Calcium	95		0.50	0.19	mg/L	1		6020B	Total/NA
Cobalt	1.7		0.50	0.17	ug/L	1		6020B	Total/NA
Iron	1200		100	36	ug/L	1		6020B	Total/NA
Lead	3.5		0.50	0.24	ug/L	1		6020B	Total/NA
Lithium	5.2	J	10	2.5	ug/L	1		6020B	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: MW-8 (Continued) — Lab Sample ID: 310-265481-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Magnesium	17000		500	150	ug/L	1		6020B	Total/NA
Manganese	140		10	3.6	ug/L	1		6020B	Total/NA
Total Suspended Solids	290		15	5.1	mg/L	1		I-3765-85	Total/NA
Total Dissolved Solids	360		50	34	mg/L	1		SM 2540C	Total/NA
Groundwater Elevation	876.46				ft	1		Field Sampling	Total/NA
Field pH	7.10				SU	1		Field Sampling	Total/NA
Field Conductivity	661				umhos/cm	1		Field Sampling	Total/NA
Field Temperature	12.3				Degrees C	1		Field Sampling	Total/NA
Field Turbidity	116.9				NTU	1		Field Sampling	Total/NA

Client Sample ID: MW-9 — Lab Sample ID: 310-265481-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	17		5.0	2.3	mg/L	5		9056A	Total/NA
Sulfate	11		5.0	2.1	mg/L	5		9056A	Total/NA
Barium	180		2.0	0.64	ug/L	1		6020B	Total/NA
Calcium	96		0.50	0.19	mg/L	1		6020B	Total/NA
Cobalt	0.35	J	0.50	0.17	ug/L	1		6020B	Total/NA
Lithium	9.3	J	10	2.5	ug/L	1		6020B	Total/NA
Magnesium	17000		500	150	ug/L	1		6020B	Total/NA
Manganese	220		10	3.6	ug/L	1		6020B	Total/NA
Total Suspended Solids	1.1	J	1.9	0.64	mg/L	1		I-3765-85	Total/NA
Total Dissolved Solids	330		50	34	mg/L	1		SM 2540C	Total/NA
Groundwater Elevation	907.19				ft	1		Field Sampling	Total/NA
Field pH	6.76				SU	1		Field Sampling	Total/NA
Field Conductivity	647				umhos/cm	1		Field Sampling	Total/NA
Field Temperature	15.3				Degrees C	1		Field Sampling	Total/NA
Field Turbidity	6.20				NTU	1		Field Sampling	Total/NA

Client Sample ID: MW-10 — Lab Sample ID: 310-265481-7

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	2.3	J	5.0	2.3	mg/L	5		9056A	Total/NA
Sulfate	8.0		5.0	2.1	mg/L	5		9056A	Total/NA
Barium	160		2.0	0.64	ug/L	1		6020B	Total/NA
Calcium	81		0.50	0.19	mg/L	1		6020B	Total/NA
Lithium	18		10	2.5	ug/L	1		6020B	Total/NA
Magnesium	23000		500	150	ug/L	1		6020B	Total/NA
Molybdenum	1.0	J	2.0	0.91	ug/L	1		6020B	Total/NA
Total Dissolved Solids	330		50	34	mg/L	1		SM 2540C	Total/NA
Groundwater Elevation	924.78				ft	1		Field Sampling	Total/NA
Field pH	6.93				SU	1		Field Sampling	Total/NA
Field Conductivity	629				umhos/cm	1		Field Sampling	Total/NA
Field Temperature	12.4				Degrees C	1		Field Sampling	Total/NA
Field Turbidity	2.17				NTU	1		Field Sampling	Total/NA

Client Sample ID: MW-11AR — Lab Sample ID: 310-265481-8

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	21		5.0	2.3	mg/L	5		9056A	Total/NA
Sulfate	97		5.0	2.1	mg/L	5		9056A	Total/NA
Arsenic	0.89	J	2.0	0.53	ug/L	1		6020B	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: MW-11AR (Continued)

Lab Sample ID: 310-265481-8

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Barium	49		2.0	0.64	ug/L	1		6020B	Total/NA
Boron	420		100	76	ug/L	1		6020B	Total/NA
Calcium	100		0.50	0.19	mg/L	1		6020B	Total/NA
Cobalt	0.80		0.50	0.17	ug/L	1		6020B	Total/NA
Iron	580		100	36	ug/L	1		6020B	Total/NA
Lead	1.2		0.50	0.24	ug/L	1		6020B	Total/NA
Lithium	15		10	2.5	ug/L	1		6020B	Total/NA
Magnesium	34000		500	150	ug/L	1		6020B	Total/NA
Manganese	86		10	3.6	ug/L	1		6020B	Total/NA
Molybdenum	2.2		2.0	0.91	ug/L	1		6020B	Total/NA
Selenium	2.2	J	5.0	1.4	ug/L	1		6020B	Total/NA
Total Suspended Solids	100		5.0	1.7	mg/L	1		I-3765-85	Total/NA
Total Dissolved Solids	470		50	34	mg/L	1		SM 2540C	Total/NA
Groundwater Elevation	870.93				ft	1		Field Sampling	Total/NA
Field pH	Dry				SU	1		Field Sampling	Total/NA
Field Conductivity	Dry				umhos/cm	1		Field Sampling	Total/NA
Field Temperature	Dry				Degrees C	1		Field Sampling	Total/NA
Field Turbidity	Dry				NTU	1		Field Sampling	Total/NA

Client Sample ID: MW-13

Lab Sample ID: 310-265481-9

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	120		5.0	2.1	mg/L	5		9056A	Total/NA
Barium	110		2.0	0.64	ug/L	1		6020B	Total/NA
Boron	120		100	76	ug/L	1		6020B	Total/NA
Calcium	130		0.50	0.19	mg/L	1		6020B	Total/NA
Cobalt	0.20	J	0.50	0.17	ug/L	1		6020B	Total/NA
Iron	78	J	100	36	ug/L	1		6020B	Total/NA
Lithium	15		10	2.5	ug/L	1		6020B	Total/NA
Magnesium	18000		500	150	ug/L	1		6020B	Total/NA
Manganese	21		10	3.6	ug/L	1		6020B	Total/NA
Total Suspended Solids	6.4		1.9	0.64	mg/L	1		I-3765-85	Total/NA
Total Dissolved Solids	490		50	34	mg/L	1		SM 2540C	Total/NA
Groundwater Elevation	906.96				ft	1		Field Sampling	Total/NA
Field pH	6.92				SU	1		Field Sampling	Total/NA
Field Conductivity	803				umhos/cm	1		Field Sampling	Total/NA
Field Temperature	14.9				Degrees C	1		Field Sampling	Total/NA
Field Turbidity	7.61				NTU	1		Field Sampling	Total/NA

Client Sample ID: MW-14

Lab Sample ID: 310-265481-10

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	3.6	J	5.0	2.3	mg/L	5		9056A	Total/NA
Sulfate	35		5.0	2.1	mg/L	5		9056A	Total/NA
Barium	62		2.0	0.64	ug/L	1		6020B	Total/NA
Boron	220		100	76	ug/L	1		6020B	Total/NA
Calcium	98		0.50	0.19	mg/L	1		6020B	Total/NA
Cobalt	0.44	J	0.50	0.17	ug/L	1		6020B	Total/NA
Iron	120		100	36	ug/L	1		6020B	Total/NA
Lead	0.26	J	0.50	0.24	ug/L	1		6020B	Total/NA
Lithium	25		10	2.5	ug/L	1		6020B	Total/NA
Magnesium	22000		500	150	ug/L	1		6020B	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: MW-14 (Continued) — Lab Sample ID: 310-265481-10

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Manganese	120		10	3.6	ug/L	1		6020B	Total/NA
Molybdenum	2.2		2.0	0.91	ug/L	1		6020B	Total/NA
Total Suspended Solids	12		1.9	0.64	mg/L	1		I-3765-85	Total/NA
Total Dissolved Solids	390		50	34	mg/L	1		SM 2540C	Total/NA
Groundwater Elevation	915.28				ft	1		Field Sampling	Total/NA
Field pH	7.13				SU	1		Field Sampling	Total/NA
Field Conductivity	693				umhos/cm	1		Field Sampling	Total/NA
Field Temperature	14.3				Degrees C	1		Field Sampling	Total/NA
Field Turbidity	20.04				NTU	1		Field Sampling	Total/NA

Client Sample ID: MW-18 — Lab Sample ID: 310-265481-11

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	4.4	J	5.0	2.3	mg/L	5		9056A	Total/NA
Sulfate	64		5.0	2.1	mg/L	5		9056A	Total/NA
Barium	150		2.0	0.64	ug/L	1		6020B	Total/NA
Boron	130		100	76	ug/L	1		6020B	Total/NA
Calcium	120		0.50	0.19	mg/L	1		6020B	Total/NA
Lithium	19		10	2.5	ug/L	1		6020B	Total/NA
Magnesium	21000		500	150	ug/L	1		6020B	Total/NA
Manganese	7.5	J	10	3.6	ug/L	1		6020B	Total/NA
Molybdenum	0.99	J	2.0	0.91	ug/L	1		6020B	Total/NA
Total Dissolved Solids	460		50	34	mg/L	1		SM 2540C	Total/NA
Groundwater Elevation	900.23				ft	1		Field Sampling	Total/NA
Field pH	6.73				SU	1		Field Sampling	Total/NA
Field Conductivity	819				umhos/cm	1		Field Sampling	Total/NA
Field Temperature	12.0				Degrees C	1		Field Sampling	Total/NA
Field Turbidity	5.82				NTU	1		Field Sampling	Total/NA

Client Sample ID: MW-19 — Lab Sample ID: 310-265481-12

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	19		5.0	2.3	mg/L	5		9056A	Total/NA
Sulfate	25		5.0	2.1	mg/L	5		9056A	Total/NA
Barium	120		2.0	0.64	ug/L	1		6020B	Total/NA
Calcium	80		0.50	0.19	mg/L	1		6020B	Total/NA
Lithium	5.9	J	10	2.5	ug/L	1		6020B	Total/NA
Magnesium	18000		500	150	ug/L	1		6020B	Total/NA
Manganese	5.0	J	10	3.6	ug/L	1		6020B	Total/NA
Selenium	2.4	J	5.0	1.4	ug/L	1		6020B	Total/NA
Total Suspended Solids	2.1		1.9	0.64	mg/L	1		I-3765-85	Total/NA
Total Dissolved Solids	370		50	34	mg/L	1		SM 2540C	Total/NA
Groundwater Elevation	874.12				ft	1		Field Sampling	Total/NA
Field pH	7.03				SU	1		Field Sampling	Total/NA
Field Conductivity	652				umhos/cm	1		Field Sampling	Total/NA
Field Temperature	18.2				Degrees C	1		Field Sampling	Total/NA
Field Turbidity	4.44				NTU	1		Field Sampling	Total/NA

Client Sample ID: MW-20 — Lab Sample ID: 310-265481-13

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	19		5.0	2.3	mg/L	5		9056A	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: MW-20 (Continued) — Lab Sample ID: 310-265481-13

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	140		5.0	2.1	mg/L	5		9056A	Total/NA
Arsenic	0.96	J	2.0	0.53	ug/L	1		6020B	Total/NA
Barium	93		2.0	0.64	ug/L	1		6020B	Total/NA
Boron	3800		100	76	ug/L	1		6020B	Total/NA
Calcium	110		0.50	0.19	mg/L	1		6020B	Total/NA
Lead	0.24	J	0.50	0.24	ug/L	1		6020B	Total/NA
Lithium	72		10	2.5	ug/L	1		6020B	Total/NA
Magnesium	20000		500	150	ug/L	1		6020B	Total/NA
Molybdenum	720		2.0	0.91	ug/L	1		6020B	Total/NA
Selenium	23		5.0	1.4	ug/L	1		6020B	Total/NA
Total Suspended Solids	2.0		1.9	0.64	mg/L	1		I-3765-85	Total/NA
Total Dissolved Solids	550		50	34	mg/L	1		SM 2540C	Total/NA
Groundwater Elevation	870.66				ft	1		Field Sampling	Total/NA
Field pH	7.10				SU	1		Field Sampling	Total/NA
Field Conductivity	867				umhos/cm	1		Field Sampling	Total/NA
Field Temperature	14.1				Degrees C	1		Field Sampling	Total/NA
Field Turbidity	3.74				NTU	1		Field Sampling	Total/NA

Client Sample ID: MW-21 — Lab Sample ID: 310-265481-14

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	18		5.0	2.3	mg/L	5		9056A	Total/NA
Sulfate	38		5.0	2.1	mg/L	5		9056A	Total/NA
Arsenic	0.92	J	2.0	0.53	ug/L	1		6020B	Total/NA
Barium	130		2.0	0.64	ug/L	1		6020B	Total/NA
Boron	1300		100	76	ug/L	1		6020B	Total/NA
Calcium	93		0.50	0.19	mg/L	1		6020B	Total/NA
Cobalt	1.0		0.50	0.17	ug/L	1		6020B	Total/NA
Iron	730		100	36	ug/L	1		6020B	Total/NA
Lead	1.4		0.50	0.24	ug/L	1		6020B	Total/NA
Lithium	14		10	2.5	ug/L	1		6020B	Total/NA
Magnesium	20000		500	150	ug/L	1		6020B	Total/NA
Manganese	160		10	3.6	ug/L	1		6020B	Total/NA
Molybdenum	34		2.0	0.91	ug/L	1		6020B	Total/NA
Selenium	3.8	J	5.0	1.4	ug/L	1		6020B	Total/NA
Total Suspended Solids	110		15	5.1	mg/L	1		I-3765-85	Total/NA
Total Dissolved Solids	400		50	34	mg/L	1		SM 2540C	Total/NA
Groundwater Elevation	869.99				ft	1		Field Sampling	Total/NA
Field pH	6.95				SU	1		Field Sampling	Total/NA
Field Conductivity	692				umhos/cm	1		Field Sampling	Total/NA
Field Temperature	14.0				Degrees C	1		Field Sampling	Total/NA
Field Turbidity	98.7				NTU	1		Field Sampling	Total/NA

Client Sample ID: MW-23 — Lab Sample ID: 310-265481-15

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	2.6	J	5.0	2.3	mg/L	5		9056A	Total/NA
Sulfate	65		5.0	2.1	mg/L	5		9056A	Total/NA
Barium	120		2.0	0.64	ug/L	1		6020B	Total/NA
Boron	89	J	100	76	ug/L	1		6020B	Total/NA
Calcium	110		0.50	0.19	mg/L	1		6020B	Total/NA
Lithium	29		10	2.5	ug/L	1		6020B	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: MW-23 (Continued) — Lab Sample ID: 310-265481-15

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Magnesium	20000		500	150	ug/L	1		6020B	Total/NA
Manganese	5.8	J	10	3.6	ug/L	1		6020B	Total/NA
Molybdenum	1.5	J	2.0	0.91	ug/L	1		6020B	Total/NA
Total Dissolved Solids	440		50	34	mg/L	1		SM 2540C	Total/NA
Groundwater Elevation	914.07				ft	1		Field Sampling	Total/NA
Field pH	6.85				SU	1		Field Sampling	Total/NA
Field Conductivity	725				umhos/cm	1		Field Sampling	Total/NA
Field Temperature	16.9				Degrees C	1		Field Sampling	Total/NA
Field Turbidity	2.95				NTU	1		Field Sampling	Total/NA

Client Sample ID: SW-1 — Lab Sample ID: 310-265481-16

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	18		5.0	2.3	mg/L	5		9056A	Total/NA
Sulfate	14		5.0	2.1	mg/L	5		9056A	Total/NA
Arsenic	4.9		2.0	0.53	ug/L	1		6020B	Total/NA
Barium	220		2.0	0.64	ug/L	1		6020B	Total/NA
Boron	150		100	76	ug/L	1		6020B	Total/NA
Calcium	71		0.50	0.19	mg/L	1		6020B	Total/NA
Cobalt	3.2		0.50	0.17	ug/L	1		6020B	Total/NA
Iron	1300		100	36	ug/L	1		6020B	Total/NA
Lead	0.81		0.50	0.24	ug/L	1		6020B	Total/NA
Lithium	5.3	J	10	2.5	ug/L	1		6020B	Total/NA
Magnesium	18000		500	150	ug/L	1		6020B	Total/NA
Manganese	2100		10	3.6	ug/L	1		6020B	Total/NA
Molybdenum	0.95	J	2.0	0.91	ug/L	1		6020B	Total/NA
Total Suspended Solids	160		15	5.1	mg/L	1		I-3765-85	Total/NA
Total Dissolved Solids	300		50	34	mg/L	1		SM 2540C	Total/NA
Groundwater Elevation	-				ft	1		Field Sampling	Total/NA
Field pH	8.20				SU	1		Field Sampling	Total/NA
Field Conductivity	548				umhos/cm	1		Field Sampling	Total/NA
Field Temperature	25.6				Degrees C	1		Field Sampling	Total/NA
Field Turbidity	18				NTU	1		Field Sampling	Total/NA

Client Sample ID: SW-2 — Lab Sample ID: 310-265481-17

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	18		5.0	2.3	mg/L	5		9056A	Total/NA
Sulfate	24		5.0	2.1	mg/L	5		9056A	Total/NA
Arsenic	1.5	J	2.0	0.53	ug/L	1		6020B	Total/NA
Barium	170		2.0	0.64	ug/L	1		6020B	Total/NA
Boron	130		100	76	ug/L	1		6020B	Total/NA
Calcium	83		0.50	0.19	mg/L	1		6020B	Total/NA
Cobalt	0.47	J	0.50	0.17	ug/L	1		6020B	Total/NA
Iron	430		100	36	ug/L	1		6020B	Total/NA
Lead	0.39	J	0.50	0.24	ug/L	1		6020B	Total/NA
Lithium	6.4	J	10	2.5	ug/L	1		6020B	Total/NA
Magnesium	20000		500	150	ug/L	1		6020B	Total/NA
Manganese	440		10	3.6	ug/L	1		6020B	Total/NA
Molybdenum	1.0	J	2.0	0.91	ug/L	1		6020B	Total/NA
Selenium	1.5	J	5.0	1.4	ug/L	1		6020B	Total/NA
Total Suspended Solids	160		15	5.1	mg/L	1		I-3765-85	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: SW-2 (Continued) — Lab Sample ID: 310-265481-17

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Total Dissolved Solids	290		50	34	mg/L	1		SM 2540C	Total/NA
Groundwater Elevation	-				ft	1		Field Sampling	Total/NA
Field pH	8.00				SU	1		Field Sampling	Total/NA
Field Conductivity	506				umhos/cm	1		Field Sampling	Total/NA
Field Temperature	24.1				Degrees C	1		Field Sampling	Total/NA
Field Turbidity	17.40				NTU	1		Field Sampling	Total/NA

Client Sample ID: LW-01 — Lab Sample ID: 310-265481-18

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	4.1	J	5.0	2.3	mg/L	5		9056A	Total/NA
Fluoride	0.38	J	1.0	0.38	mg/L	5		9056A	Total/NA
Sulfate	38		5.0	2.1	mg/L	5		9056A	Total/NA
Arsenic	23		2.0	0.53	ug/L	1		6020B	Total/NA
Barium	130		2.0	0.64	ug/L	1		6020B	Total/NA
Boron	320		100	76	ug/L	1		6020B	Total/NA
Calcium	140		0.50	0.19	mg/L	1		6020B	Total/NA
Cobalt	9.8		0.50	0.17	ug/L	1		6020B	Total/NA
Copper	7.9		5.0	1.8	ug/L	1		6020B	Total/NA
Iron	2800		100	36	ug/L	1		6020B	Total/NA
Lead	5.5		0.50	0.24	ug/L	1		6020B	Total/NA
Lithium	29		10	2.5	ug/L	1		6020B	Total/NA
Magnesium	26000		500	150	ug/L	1		6020B	Total/NA
Manganese	1100		10	3.6	ug/L	1		6020B	Total/NA
Molybdenum	4.5		2.0	0.91	ug/L	1		6020B	Total/NA
Zinc	49		20	6.4	ug/L	1		6020B	Total/NA
Total Suspended Solids	150		7.5	2.6	mg/L	1		I-3765-85	Total/NA
Total Dissolved Solids	600		50	34	mg/L	1		SM 2540C	Total/NA
Groundwater Elevation	892.99				ft	1		Field Sampling	Total/NA
Field pH	7.11				SU	1		Field Sampling	Total/NA
Field Conductivity	846				umhos/cm	1		Field Sampling	Total/NA
Field Temperature	19.5				Degrees C	1		Field Sampling	Total/NA
Field Turbidity	53.18				NTU	1		Field Sampling	Total/NA

Client Sample ID: Field Blank — Lab Sample ID: 310-265481-19

No Detections.

This Detection Summary does not include radiochemical test results.

Client Sample Results

Client: SCS Engineers
Project/Site: Marshalltown E/W Closed LF - 25223064

Job ID: 310-265481-1
SDG: 25223064

Client Sample ID: MW-3

Date Collected: 09/21/23 10:25
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-1

Matrix: Water

Method: SW846 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	14		5.0	2.3	mg/L			09/29/23 12:18	5
Fluoride	<0.38		1.0	0.38	mg/L			09/29/23 12:18	5
Sulfate	96		5.0	2.1	mg/L			09/29/23 12:18	5

Method: SW846 6020B - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.65	J	2.0	0.53	ug/L		09/26/23 10:00	10/10/23 12:55	1
Barium	150		2.0	0.64	ug/L		09/26/23 10:00	10/10/23 12:55	1
Beryllium	<0.33		1.0	0.33	ug/L		09/26/23 10:00	10/10/23 12:55	1
Boron	1300		100	76	ug/L		09/26/23 10:00	10/10/23 12:55	1
Calcium	120		0.50	0.19	mg/L		09/26/23 10:00	10/10/23 12:55	1
Cobalt	0.75		0.50	0.17	ug/L		09/26/23 10:00	10/10/23 12:55	1
Iron	430	F1 F2	100	36	ug/L		09/26/23 10:00	10/10/23 12:55	1
Lead	0.68		0.50	0.24	ug/L		09/26/23 10:00	10/10/23 12:55	1
Lithium	23		10	2.5	ug/L		09/26/23 10:00	10/10/23 12:55	1
Magnesium	18000		500	150	ug/L		09/26/23 10:00	10/10/23 12:55	1
Manganese	78		10	3.6	ug/L		09/26/23 10:00	10/10/23 12:55	1
Molybdenum	8.6		2.0	0.91	ug/L		09/26/23 10:00	10/10/23 12:55	1
Selenium	7.4		5.0	1.4	ug/L		09/26/23 10:00	10/10/23 12:55	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids (USGS I-3765-85)	10		1.9	0.64	mg/L			09/27/23 15:23	1
Total Dissolved Solids (SM 2540C)	440		50	34	mg/L			09/25/23 15:45	1

Method: EPA Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Groundwater Elevation	866.65				ft			09/21/23 10:25	1
Field pH	7.01				SU			09/21/23 10:25	1
Field Conductivity	799				umhos/cm			09/21/23 10:25	1
Field Temperature	15.3				Degrees C			09/21/23 10:25	1
Field Turbidity	34.71				NTU			09/21/23 10:25	1

Client: SCS Engineers
Project/Site: Marshalltown E/W Closed LF - 25223064

Job ID: 310-265481-1
SDG: 25223064

Client Sample ID: MW-4

Date Collected: 09/21/23 14:53
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-2

Matrix: Water

Method: SW846 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	12		5.0	2.3	mg/L			09/29/23 12:54	5
Fluoride	<0.38		1.0	0.38	mg/L			09/29/23 12:54	5
Sulfate	57		5.0	2.1	mg/L			09/29/23 12:54	5

Method: SW846 6020B - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	2.6		2.0	0.53	ug/L		09/26/23 10:00	10/10/23 01:31	1
Barium	94		2.0	0.64	ug/L		09/26/23 10:00	10/10/23 01:31	1
Beryllium	<0.33		1.0	0.33	ug/L		09/26/23 10:00	10/10/23 01:31	1
Boron	3400		100	76	ug/L		09/26/23 10:00	10/10/23 01:31	1
Calcium	110		0.50	0.19	mg/L		09/26/23 10:00	10/10/23 01:31	1
Cobalt	0.90		0.50	0.17	ug/L		09/26/23 10:00	10/10/23 01:31	1
Iron	1900		100	36	ug/L		09/26/23 10:00	10/10/23 01:31	1
Lead	0.28	J	0.50	0.24	ug/L		09/26/23 10:00	10/10/23 01:31	1
Lithium	9.4	J	10	2.5	ug/L		09/26/23 10:00	10/10/23 01:31	1
Magnesium	17000		500	150	ug/L		09/26/23 10:00	10/10/23 01:31	1
Manganese	1200		10	3.6	ug/L		09/26/23 10:00	10/10/23 01:31	1
Molybdenum	15		2.0	0.91	ug/L		09/26/23 10:00	10/10/23 01:31	1
Selenium	<1.4		5.0	1.4	ug/L		09/26/23 10:00	10/10/23 01:31	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids (USGS I-3765-85)	6.0		1.9	0.64	mg/L			09/26/23 11:01	1
Total Dissolved Solids (SM 2540C)	420		50	34	mg/L			09/25/23 15:45	1

Method: EPA Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Groundwater Elevation	869.90				ft			09/21/23 14:53	1
Field pH	6.86				SU			09/21/23 14:53	1
Field Conductivity	778				umhos/cm			09/21/23 14:53	1
Field Temperature	12.8				Degrees C			09/21/23 14:53	1
Field Turbidity	3.95				NTU			09/21/23 14:53	1

Client: SCS Engineers
Project/Site: Marshalltown E/W Closed LF - 25223064

Job ID: 310-265481-1
SDG: 25223064

Client Sample ID: MW-5

Date Collected: 09/21/23 13:28
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-3

Matrix: Water

Method: SW846 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	4.5	J	5.0	2.3	mg/L			09/29/23 13:06	5
Fluoride	<0.38		1.0	0.38	mg/L			09/29/23 13:06	5
Sulfate	28		5.0	2.1	mg/L			09/29/23 13:06	5

Method: SW846 6020B - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.72	J	2.0	0.53	ug/L		09/26/23 10:00	10/10/23 01:34	1
Barium	120		2.0	0.64	ug/L		09/26/23 10:00	10/10/23 01:34	1
Beryllium	<0.33		1.0	0.33	ug/L		09/26/23 10:00	10/10/23 01:34	1
Boron	420		100	76	ug/L		09/26/23 10:00	10/10/23 01:34	1
Calcium	48		0.50	0.19	mg/L		09/26/23 10:00	10/10/23 01:34	1
Cobalt	0.53		0.50	0.17	ug/L		09/26/23 10:00	10/10/23 01:34	1
Iron	360		100	36	ug/L		09/26/23 10:00	10/10/23 01:34	1
Lead	0.60		0.50	0.24	ug/L		09/26/23 10:00	10/10/23 01:34	1
Lithium	<2.5		10	2.5	ug/L		09/26/23 10:00	10/10/23 01:34	1
Magnesium	13000		500	150	ug/L		09/26/23 10:00	10/10/23 01:34	1
Manganese	18		10	3.6	ug/L		09/26/23 10:00	10/10/23 01:34	1
Molybdenum	<0.91		2.0	0.91	ug/L		09/26/23 10:00	10/10/23 01:34	1
Selenium	54		5.0	1.4	ug/L		09/26/23 10:00	10/10/23 01:34	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids (USGS I-3765-85)	4.5		1.9	0.64	mg/L			09/26/23 11:01	1
Total Dissolved Solids (SM 2540C)	190		50	34	mg/L			09/25/23 15:45	1

Method: EPA Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Groundwater Elevation	873.94				ft			09/21/23 13:28	1
Field pH	6.29				SU			09/21/23 13:28	1
Field Conductivity	392.4				umhos/cm			09/21/23 13:28	1
Field Temperature	12.6				Degrees C			09/21/23 13:28	1
Field Turbidity	3.12				NTU			09/21/23 13:28	1

Client Sample Results

Client: SCS Engineers
Project/Site: Marshalltown E/W Closed LF - 25223064

Job ID: 310-265481-1
SDG: 25223064

Client Sample ID: MW-7

Date Collected: 09/20/23 12:25
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-4

Matrix: Water

Method: SW846 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	19		5.0	2.3	mg/L			09/29/23 13:18	5
Fluoride	<0.38		1.0	0.38	mg/L			09/29/23 13:18	5
Sulfate	25		5.0	2.1	mg/L			09/29/23 13:18	5

Method: SW846 6020B - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.53		2.0	0.53	ug/L		09/26/23 10:00	10/10/23 01:36	1
Barium	110		2.0	0.64	ug/L		09/26/23 10:00	10/10/23 01:36	1
Beryllium	<0.33		1.0	0.33	ug/L		09/26/23 10:00	10/10/23 01:36	1
Boron	110		100	76	ug/L		09/26/23 10:00	10/10/23 01:36	1
Calcium	87		0.50	0.19	mg/L		09/26/23 10:00	10/10/23 01:36	1
Cobalt	0.31	J	0.50	0.17	ug/L		09/26/23 10:00	10/10/23 01:36	1
Iron	54	J	100	36	ug/L		09/26/23 10:00	10/10/23 01:36	1
Lead	<0.24		0.50	0.24	ug/L		09/26/23 10:00	10/10/23 01:36	1
Lithium	5.9	J	10	2.5	ug/L		09/26/23 10:00	10/10/23 01:36	1
Magnesium	18000		500	150	ug/L		09/26/23 10:00	10/10/23 01:36	1
Manganese	17		10	3.6	ug/L		09/26/23 10:00	10/10/23 01:36	1
Molybdenum	<0.91		2.0	0.91	ug/L		09/26/23 10:00	10/10/23 01:36	1
Selenium	2.3	J	5.0	1.4	ug/L		09/26/23 10:00	10/10/23 01:36	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids (USGS I-3765-85)	8.4		1.9	0.64	mg/L			09/26/23 08:38	1
Total Dissolved Solids (SM 2540C)	350		50	34	mg/L			09/25/23 15:45	1

Method: EPA Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Groundwater Elevation	874.07				ft			09/20/23 12:25	1
Field pH	7.19				SU			09/20/23 12:25	1
Field Conductivity	646				umhos/cm			09/20/23 12:25	1
Field Temperature	13.3				Degrees C			09/20/23 12:25	1
Field Turbidity	8.57				NTU			09/20/23 12:25	1

Client Sample Results

Client: SCS Engineers
Project/Site: Marshalltown E/W Closed LF - 25223064

Job ID: 310-265481-1
SDG: 25223064

Client Sample ID: MW-8

Date Collected: 09/21/23 12:45
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-5

Matrix: Water

Method: SW846 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**20**		5.0	2.3	mg/L			09/29/23 13:30	5
Fluoride	<0.38		1.0	0.38	mg/L			09/29/23 13:30	5
Sulfate	**16**		5.0	2.1	mg/L			09/29/23 13:30	5

Method: SW846 6020B - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**0.55**	**J**	2.0	0.53	ug/L		09/26/23 10:00	10/10/23 01:38	1
Barium	**130**		2.0	0.64	ug/L		09/26/23 10:00	10/10/23 01:38	1
Beryllium	<0.33		1.0	0.33	ug/L		09/26/23 10:00	10/10/23 01:38	1
Boron	**81**	**J**	100	76	ug/L		09/26/23 10:00	10/10/23 01:38	1
Calcium	**95**		0.50	0.19	mg/L		09/26/23 10:00	10/10/23 01:38	1
Cobalt	**1.7**		0.50	0.17	ug/L		09/26/23 10:00	10/10/23 01:38	1
Iron	**1200**		100	36	ug/L		09/26/23 10:00	10/10/23 01:38	1
Lead	**3.5**		0.50	0.24	ug/L		09/26/23 10:00	10/10/23 01:38	1
Lithium	**5.2**	**J**	10	2.5	ug/L		09/26/23 10:00	10/10/23 01:38	1
Magnesium	**17000**		500	150	ug/L		09/26/23 10:00	10/10/23 01:38	1
Manganese	**140**		10	3.6	ug/L		09/26/23 10:00	10/10/23 01:38	1
Molybdenum	<0.91		2.0	0.91	ug/L		09/26/23 10:00	10/10/23 01:38	1
Selenium	<1.4		5.0	1.4	ug/L		09/26/23 10:00	10/10/23 01:38	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids (USGS I-3765-85)	**290**		15	5.1	mg/L			09/26/23 11:01	1
Total Dissolved Solids (SM 2540C)	**360**		50	34	mg/L			09/25/23 15:45	1

Method: EPA Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Groundwater Elevation	**876.46**				ft			09/21/23 12:45	1
Field pH	**7.10**				SU			09/21/23 12:45	1
Field Conductivity	**661**				umhos/cm			09/21/23 12:45	1
Field Temperature	**12.3**				Degrees C			09/21/23 12:45	1
Field Turbidity	**116.9**				NTU			09/21/23 12:45	1

Client: SCS Engineers
Project/Site: Marshalltown E/W Closed LF - 25223064

Job ID: 310-265481-1
SDG: 25223064

Client Sample ID: MW-9

Date Collected: 09/21/23 12:20
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-6

Matrix: Water

Method: SW846 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**17**		5.0	2.3	mg/L			09/29/23 13:43	5
Fluoride	<0.38		1.0	0.38	mg/L			09/29/23 13:43	5
Sulfate	**11**		5.0	2.1	mg/L			09/29/23 13:43	5

Method: SW846 6020B - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.53		2.0	0.53	ug/L		09/26/23 10:00	10/10/23 01:41	1
Barium	**180**		2.0	0.64	ug/L		09/26/23 10:00	10/10/23 01:41	1
Beryllium	<0.33		1.0	0.33	ug/L		09/26/23 10:00	10/10/23 01:41	1
Boron	<76		100	76	ug/L		09/26/23 10:00	10/10/23 01:41	1
Calcium	**96**		0.50	0.19	mg/L		09/26/23 10:00	10/10/23 01:41	1
Cobalt	**0.35**	**J**	0.50	0.17	ug/L		09/26/23 10:00	10/10/23 01:41	1
Iron	<36		100	36	ug/L		09/26/23 10:00	10/10/23 01:41	1
Lead	<0.24		0.50	0.24	ug/L		09/26/23 10:00	10/10/23 01:41	1
Lithium	**9.3**	**J**	10	2.5	ug/L		09/26/23 10:00	10/10/23 01:41	1
Magnesium	**17000**		500	150	ug/L		09/26/23 10:00	10/10/23 01:41	1
Manganese	**220**		10	3.6	ug/L		09/26/23 10:00	10/10/23 01:41	1
Molybdenum	<0.91		2.0	0.91	ug/L		09/26/23 10:00	10/10/23 01:41	1
Selenium	<1.4		5.0	1.4	ug/L		09/26/23 10:00	10/10/23 01:41	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids (USGS I-3765-85)	**1.1**	**J**	1.9	0.64	mg/L			09/26/23 11:01	1
Total Dissolved Solids (SM 2540C)	**330**		50	34	mg/L			09/25/23 15:45	1

Method: EPA Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Groundwater Elevation	**907.19**				ft			09/21/23 12:20	1
Field pH	**6.76**				SU			09/21/23 12:20	1
Field Conductivity	**647**				umhos/cm			09/21/23 12:20	1
Field Temperature	**15.3**				Degrees C			09/21/23 12:20	1
Field Turbidity	**6.20**				NTU			09/21/23 12:20	1

Client Sample Results

Client: SCS Engineers
Project/Site: Marshalltown E/W Closed LF - 25223064

Job ID: 310-265481-1
SDG: 25223064

Client Sample ID: MW-10

Date Collected: 09/18/23 15:25
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-7

Matrix: Water

Method: SW846 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**2.3**	**J**	5.0	2.3	mg/L			09/29/23 13:55	5
Fluoride	<0.38		1.0	0.38	mg/L			09/29/23 13:55	5
Sulfate	**8.0**		5.0	2.1	mg/L			09/29/23 13:55	5

Method: SW846 6020B - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.53		2.0	0.53	ug/L		09/26/23 10:00	10/10/23 01:43	1
Barium	**160**		2.0	0.64	ug/L		09/26/23 10:00	10/10/23 01:43	1
Beryllium	<0.33		1.0	0.33	ug/L		09/26/23 10:00	10/10/23 01:43	1
Boron	<76		100	76	ug/L		09/26/23 10:00	10/10/23 01:43	1
Calcium	**81**		0.50	0.19	mg/L		09/26/23 10:00	10/10/23 01:43	1
Cobalt	<0.17		0.50	0.17	ug/L		09/26/23 10:00	10/10/23 01:43	1
Iron	<36		100	36	ug/L		09/26/23 10:00	10/10/23 01:43	1
Lead	<0.24		0.50	0.24	ug/L		09/26/23 10:00	10/10/23 01:43	1
Lithium	**18**		10	2.5	ug/L		09/26/23 10:00	10/10/23 01:43	1
Magnesium	**23000**		500	150	ug/L		09/26/23 10:00	10/10/23 01:43	1
Manganese	<3.6		10	3.6	ug/L		09/26/23 10:00	10/10/23 01:43	1
Molybdenum	**1.0**	**J**	2.0	0.91	ug/L		09/26/23 10:00	10/10/23 01:43	1
Selenium	<1.4		5.0	1.4	ug/L		09/26/23 10:00	10/10/23 01:43	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids (USGS I-3765-85)	<0.64		1.9	0.64	mg/L			09/25/23 11:20	1
Total Dissolved Solids (SM 2540C)	**330**		50	34	mg/L			09/25/23 15:45	1

Method: EPA Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Groundwater Elevation	**924.78**				ft			09/18/23 15:25	1
Field pH	**6.93**				SU			09/18/23 15:25	1
Field Conductivity	**629**				umhos/cm			09/18/23 15:25	1
Field Temperature	**12.4**				Degrees C			09/18/23 15:25	1
Field Turbidity	**2.17**				NTU			09/18/23 15:25	1

Client Sample Results

Client: SCS Engineers
Project/Site: Marshalltown E/W Closed LF - 25223064

Job ID: 310-265481-1
SDG: 25223064

Client Sample ID: MW-11AR

Date Collected: 09/21/23 16:00
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-8

Matrix: Water

Method: SW846 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	21		5.0	2.3	mg/L			09/30/23 11:21	5
Fluoride	<0.38		1.0	0.38	mg/L			09/30/23 11:21	5
Sulfate	97		5.0	2.1	mg/L			09/30/23 11:21	5

Method: SW846 6020B - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.89	J	2.0	0.53	ug/L		09/26/23 10:00	10/10/23 01:46	1
Barium	49		2.0	0.64	ug/L		09/26/23 10:00	10/10/23 01:46	1
Beryllium	<0.33		1.0	0.33	ug/L		09/26/23 10:00	10/10/23 01:46	1
Boron	420		100	76	ug/L		09/26/23 10:00	10/10/23 01:46	1
Calcium	100		0.50	0.19	mg/L		09/26/23 10:00	10/10/23 01:46	1
Cobalt	0.80		0.50	0.17	ug/L		09/26/23 10:00	10/10/23 01:46	1
Iron	580		100	36	ug/L		09/26/23 10:00	10/10/23 01:46	1
Lead	1.2		0.50	0.24	ug/L		09/26/23 10:00	10/10/23 01:46	1
Lithium	15		10	2.5	ug/L		09/26/23 10:00	10/10/23 01:46	1
Magnesium	34000		500	150	ug/L		09/26/23 10:00	10/10/23 01:46	1
Manganese	86		10	3.6	ug/L		09/26/23 10:00	10/10/23 01:46	1
Molybdenum	2.2		2.0	0.91	ug/L		09/26/23 10:00	10/10/23 01:46	1
Selenium	2.2	J	5.0	1.4	ug/L		09/26/23 10:00	10/10/23 01:46	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids (USGS I-3765-85)	100		5.0	1.7	mg/L			09/26/23 11:01	1
Total Dissolved Solids (SM 2540C)	470		50	34	mg/L			09/25/23 15:45	1

Method: EPA Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Groundwater Elevation	870.93				ft			09/21/23 16:00	1
Field pH	Dry				SU			09/21/23 16:00	1
Field Conductivity	Dry				umhos/cm			09/21/23 16:00	1
Field Temperature	Dry				Degrees C			09/21/23 16:00	1
Field Turbidity	Dry				NTU			09/21/23 16:00	1

Client Sample ID: MW-13

Date Collected: 09/20/23 10:35
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-9

Matrix: Water

Method: SW846 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	<2.3		5.0	2.3	mg/L			09/30/23 11:33	5
Fluoride	<0.38		1.0	0.38	mg/L			09/30/23 11:33	5
Sulfate	**120**		5.0	2.1	mg/L			09/30/23 11:33	5

Method: SW846 6020B - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.53		2.0	0.53	ug/L		09/26/23 10:00	10/10/23 01:48	1
Barium	**110**		2.0	0.64	ug/L		09/26/23 10:00	10/10/23 01:48	1
Beryllium	<0.33		1.0	0.33	ug/L		09/26/23 10:00	10/10/23 01:48	1
Boron	**120**		100	76	ug/L		09/26/23 10:00	10/10/23 01:48	1
Calcium	**130**		0.50	0.19	mg/L		09/26/23 10:00	10/10/23 01:48	1
Cobalt	**0.20**	**J**	0.50	0.17	ug/L		09/26/23 10:00	10/10/23 01:48	1
Iron	**78**	**J**	100	36	ug/L		09/26/23 10:00	10/10/23 01:48	1
Lead	<0.24		0.50	0.24	ug/L		09/26/23 10:00	10/10/23 01:48	1
Lithium	**15**		10	2.5	ug/L		09/26/23 10:00	10/10/23 01:48	1
Magnesium	**18000**		500	150	ug/L		09/26/23 10:00	10/10/23 01:48	1
Manganese	**21**		10	3.6	ug/L		09/26/23 10:00	10/10/23 01:48	1
Molybdenum	<0.91		2.0	0.91	ug/L		09/26/23 10:00	10/10/23 01:48	1
Selenium	<1.4		5.0	1.4	ug/L		09/26/23 10:00	10/10/23 01:48	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids (USGS I-3765-85)	**6.4**		1.9	0.64	mg/L			09/26/23 08:38	1
Total Dissolved Solids (SM 2540C)	**490**		50	34	mg/L			09/25/23 15:45	1

Method: EPA Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Groundwater Elevation	**906.96**				ft			09/20/23 10:35	1
Field pH	**6.92**				SU			09/20/23 10:35	1
Field Conductivity	**803**				umhos/cm			09/20/23 10:35	1
Field Temperature	**14.9**				Degrees C			09/20/23 10:35	1
Field Turbidity	**7.61**				NTU			09/20/23 10:35	1

Client: SCS Engineers
Project/Site: Marshalltown E/W Closed LF - 25223064

Job ID: 310-265481-1
SDG: 25223064

Client Sample ID: MW-14

Date Collected: 09/20/23 14:00
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-10

Matrix: Water

Method: SW846 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	3.6	J	5.0	2.3	mg/L			09/30/23 11:45	5
Fluoride	<0.38		1.0	0.38	mg/L			09/30/23 11:45	5
Sulfate	35		5.0	2.1	mg/L			09/30/23 11:45	5

Method: SW846 6020B - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.53		2.0	0.53	ug/L		09/26/23 10:00	10/10/23 02:02	1
Barium	62		2.0	0.64	ug/L		09/26/23 10:00	10/10/23 02:02	1
Beryllium	<0.33		1.0	0.33	ug/L		09/26/23 10:00	10/10/23 02:02	1
Boron	220		100	76	ug/L		09/26/23 10:00	10/10/23 02:02	1
Calcium	98		0.50	0.19	mg/L		09/26/23 10:00	10/10/23 02:02	1
Cobalt	0.44	J	0.50	0.17	ug/L		09/26/23 10:00	10/10/23 02:02	1
Iron	120		100	36	ug/L		09/26/23 10:00	10/10/23 02:02	1
Lead	0.26	J	0.50	0.24	ug/L		09/26/23 10:00	10/10/23 02:02	1
Lithium	25		10	2.5	ug/L		09/26/23 10:00	10/10/23 02:02	1
Magnesium	22000		500	150	ug/L		09/26/23 10:00	10/10/23 02:02	1
Manganese	120		10	3.6	ug/L		09/26/23 10:00	10/10/23 02:02	1
Molybdenum	2.2		2.0	0.91	ug/L		09/26/23 10:00	10/10/23 02:02	1
Selenium	<1.4		5.0	1.4	ug/L		09/26/23 10:00	10/10/23 02:02	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids (USGS I-3765-85)	12		1.9	0.64	mg/L			09/26/23 08:38	1
Total Dissolved Solids (SM 2540C)	390		50	34	mg/L			09/25/23 15:45	1

Method: EPA Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Groundwater Elevation	915.28				ft			09/20/23 14:00	1
Field pH	7.13				SU			09/20/23 14:00	1
Field Conductivity	693				umhos/cm			09/20/23 14:00	1
Field Temperature	14.3				Degrees C			09/20/23 14:00	1
Field Turbidity	20.04				NTU			09/20/23 14:00	1

Client: SCS Engineers
Project/Site: Marshalltown E/W Closed LF - 25223064

Job ID: 310-265481-1
SDG: 25223064

Client Sample ID: MW-18

Date Collected: 09/20/23 15:15
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-11

Matrix: Water

Method: SW846 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**4.4**	**J**	5.0	2.3	mg/L			09/30/23 11:57	5
Fluoride	<0.38		1.0	0.38	mg/L			09/30/23 11:57	5
Sulfate	**64**		5.0	2.1	mg/L			09/30/23 11:57	5

Method: SW846 6020B - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.53		2.0	0.53	ug/L		09/26/23 10:00	10/10/23 02:05	1
Barium	**150**		2.0	0.64	ug/L		09/26/23 10:00	10/10/23 02:05	1
Beryllium	<0.33		1.0	0.33	ug/L		09/26/23 10:00	10/10/23 02:05	1
Boron	**130**		100	76	ug/L		09/26/23 10:00	10/10/23 02:05	1
Calcium	**120**		0.50	0.19	mg/L		09/26/23 10:00	10/10/23 02:05	1
Cobalt	<0.17		0.50	0.17	ug/L		09/26/23 10:00	10/10/23 02:05	1
Iron	<36		100	36	ug/L		09/26/23 10:00	10/10/23 02:05	1
Lead	<0.24		0.50	0.24	ug/L		09/26/23 10:00	10/10/23 02:05	1
Lithium	**19**		10	2.5	ug/L		09/26/23 10:00	10/10/23 02:05	1
Magnesium	**21000**		500	150	ug/L		09/26/23 10:00	10/10/23 02:05	1
Manganese	**7.5**	**J**	10	3.6	ug/L		09/26/23 10:00	10/10/23 02:05	1
Molybdenum	**0.99**	**J**	2.0	0.91	ug/L		09/26/23 10:00	10/10/23 02:05	1
Selenium	<1.4		5.0	1.4	ug/L		09/26/23 10:00	10/10/23 02:05	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids (USGS I-3765-85)	<0.64		1.9	0.64	mg/L			09/26/23 08:38	1
Total Dissolved Solids (SM 2540C)	**460**		50	34	mg/L			09/25/23 15:45	1

Method: EPA Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Groundwater Elevation	**900.23**				ft			09/20/23 15:15	1
Field pH	**6.73**				SU			09/20/23 15:15	1
Field Conductivity	**819**				umhos/cm			09/20/23 15:15	1
Field Temperature	**12.0**				Degrees C			09/20/23 15:15	1
Field Turbidity	**5.82**				NTU			09/20/23 15:15	1

Client: SCS Engineers
Project/Site: Marshalltown E/W Closed LF - 25223064

Job ID: 310-265481-1
SDG: 25223064

Client Sample ID: MW-19

Date Collected: 09/21/23 13:35
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-12

Matrix: Water

Method: SW846 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**19**		5.0	2.3	mg/L			09/30/23 12:09	5
Fluoride	<0.38		1.0	0.38	mg/L			09/30/23 12:09	5
Sulfate	**25**		5.0	2.1	mg/L			09/30/23 12:09	5

Method: SW846 6020B - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.53		2.0	0.53	ug/L		09/26/23 10:00	10/10/23 02:10	1
Barium	**120**		2.0	0.64	ug/L		09/26/23 10:00	10/10/23 02:10	1
Beryllium	<0.33		1.0	0.33	ug/L		09/26/23 10:00	10/10/23 02:10	1
Boron	<76		100	76	ug/L		09/26/23 10:00	10/10/23 02:10	1
Calcium	**80**		0.50	0.19	mg/L		09/26/23 10:00	10/10/23 02:10	1
Cobalt	<0.17		0.50	0.17	ug/L		09/26/23 10:00	10/10/23 02:10	1
Iron	<36		100	36	ug/L		09/26/23 10:00	10/10/23 02:10	1
Lead	<0.24		0.50	0.24	ug/L		09/26/23 10:00	10/10/23 02:10	1
Lithium	**5.9**	**J**	10	2.5	ug/L		09/26/23 10:00	10/10/23 02:10	1
Magnesium	**18000**		500	150	ug/L		09/26/23 10:00	10/10/23 02:10	1
Manganese	**5.0**	**J**	10	3.6	ug/L		09/26/23 10:00	10/10/23 02:10	1
Molybdenum	<0.91		2.0	0.91	ug/L		09/26/23 10:00	10/10/23 02:10	1
Selenium	**2.4**	**J**	5.0	1.4	ug/L		09/26/23 10:00	10/10/23 02:10	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids (USGS I-3765-85)	**2.1**		1.9	0.64	mg/L			09/26/23 11:01	1
Total Dissolved Solids (SM 2540C)	**370**		50	34	mg/L			09/26/23 17:31	1

Method: EPA Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Groundwater Elevation	**874.12**				ft			09/21/23 13:35	1
Field pH	**7.03**				SU			09/21/23 13:35	1
Field Conductivity	**652**				umhos/cm			09/21/23 13:35	1
Field Temperature	**18.2**				Degrees C			09/21/23 13:35	1
Field Turbidity	**4.44**				NTU			09/21/23 13:35	1

Client Sample Results

Client: SCS Engineers
Project/Site: Marshalltown E/W Closed LF - 25223064

Job ID: 310-265481-1
SDG: 25223064

Client Sample ID: MW-20

Date Collected: 09/20/23 10:22
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-13

Matrix: Water

Method: SW846 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	19		5.0	2.3	mg/L			09/30/23 12:21	5
Fluoride	<0.38		1.0	0.38	mg/L			09/30/23 12:21	5
Sulfate	140		5.0	2.1	mg/L			09/30/23 12:21	5

Method: SW846 6020B - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.96	J	2.0	0.53	ug/L		09/26/23 10:00	10/10/23 02:12	1
Barium	93		2.0	0.64	ug/L		09/26/23 10:00	10/10/23 02:12	1
Beryllium	<0.33		1.0	0.33	ug/L		09/26/23 10:00	10/10/23 02:12	1
Boron	3800		100	76	ug/L		09/26/23 10:00	10/10/23 02:12	1
Calcium	110		0.50	0.19	mg/L		09/26/23 10:00	10/10/23 02:12	1
Cobalt	<0.17		0.50	0.17	ug/L		09/26/23 10:00	10/10/23 02:12	1
Iron	<36		100	36	ug/L		09/26/23 10:00	10/10/23 02:12	1
Lead	0.24	J	0.50	0.24	ug/L		09/26/23 10:00	10/10/23 02:12	1
Lithium	72		10	2.5	ug/L		09/26/23 10:00	10/10/23 02:12	1
Magnesium	20000		500	150	ug/L		09/26/23 10:00	10/10/23 02:12	1
Manganese	<3.6		10	3.6	ug/L		09/26/23 10:00	10/10/23 02:12	1
Molybdenum	720		2.0	0.91	ug/L		09/26/23 10:00	10/10/23 02:12	1
Selenium	23		5.0	1.4	ug/L		09/26/23 10:00	10/10/23 02:12	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids (USGS I-3765-85)	2.0		1.9	0.64	mg/L			09/26/23 08:38	1
Total Dissolved Solids (SM 2540C)	550		50	34	mg/L			09/25/23 15:45	1

Method: EPA Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Groundwater Elevation	870.66				ft			09/20/23 10:22	1
Field pH	7.10				SU			09/20/23 10:22	1
Field Conductivity	867				umhos/cm			09/20/23 10:22	1
Field Temperature	14.1				Degrees C			09/20/23 10:22	1
Field Turbidity	3.74				NTU			09/20/23 10:22	1

Client: SCS Engineers
Project/Site: Marshalltown E/W Closed LF - 25223064

Job ID: 310-265481-1
SDG: 25223064

Client Sample ID: MW-21

Date Collected: 09/21/23 14:50
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-14

Matrix: Water

Method: SW846 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	18		5.0	2.3	mg/L			09/30/23 12:33	5
Fluoride	<0.38		1.0	0.38	mg/L			09/30/23 12:33	5
Sulfate	38		5.0	2.1	mg/L			09/30/23 12:33	5

Method: SW846 6020B - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.92	J	2.0	0.53	ug/L		09/26/23 10:00	10/10/23 02:15	1
Barium	130		2.0	0.64	ug/L		09/26/23 10:00	10/10/23 02:15	1
Beryllium	<0.33		1.0	0.33	ug/L		09/26/23 10:00	10/10/23 02:15	1
Boron	1300		100	76	ug/L		09/26/23 10:00	10/10/23 02:15	1
Calcium	93		0.50	0.19	mg/L		09/26/23 10:00	10/10/23 02:15	1
Cobalt	1.0		0.50	0.17	ug/L		09/26/23 10:00	10/10/23 02:15	1
Iron	730		100	36	ug/L		09/26/23 10:00	10/10/23 02:15	1
Lead	1.4		0.50	0.24	ug/L		09/26/23 10:00	10/10/23 02:15	1
Lithium	14		10	2.5	ug/L		09/26/23 10:00	10/10/23 02:15	1
Magnesium	20000		500	150	ug/L		09/26/23 10:00	10/10/23 02:15	1
Manganese	160		10	3.6	ug/L		09/26/23 10:00	10/10/23 02:15	1
Molybdenum	34		2.0	0.91	ug/L		09/26/23 10:00	10/10/23 02:15	1
Selenium	3.8	J	5.0	1.4	ug/L		09/26/23 10:00	10/10/23 02:15	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids (USGS I-3765-85)	110		15	5.1	mg/L			09/25/23 12:15	1
Total Dissolved Solids (SM 2540C)	400		50	34	mg/L			09/26/23 17:31	1

Method: EPA Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Groundwater Elevation	869.99				ft			09/21/23 14:50	1
Field pH	6.95				SU			09/21/23 14:50	1
Field Conductivity	692				umhos/cm			09/21/23 14:50	1
Field Temperature	14.0				Degrees C			09/21/23 14:50	1
Field Turbidity	98.7				NTU			09/21/23 14:50	1

Client: SCS Engineers
Project/Site: Marshalltown E/W Closed LF - 25223064

Job ID: 310-265481-1
SDG: 25223064

Client Sample ID: MW-23

Date Collected: 09/18/23 13:50
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-15

Matrix: Water

Method: SW846 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**2.6**	**J**	5.0	2.3	mg/L			09/30/23 13:09	5
Fluoride	<0.38		1.0	0.38	mg/L			09/30/23 13:09	5
Sulfate	**65**		5.0	2.1	mg/L			09/30/23 13:09	5

Method: SW846 6020B - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.53		2.0	0.53	ug/L		09/26/23 10:00	10/10/23 02:17	1
Barium	**120**		2.0	0.64	ug/L		09/26/23 10:00	10/10/23 02:17	1
Beryllium	<0.33		1.0	0.33	ug/L		09/26/23 10:00	10/10/23 02:17	1
Boron	**89**	**J**	100	76	ug/L		09/26/23 10:00	10/10/23 02:17	1
Calcium	**110**		0.50	0.19	mg/L		09/26/23 10:00	10/10/23 02:17	1
Cobalt	<0.17		0.50	0.17	ug/L		09/26/23 10:00	10/10/23 02:17	1
Iron	<36		100	36	ug/L		09/26/23 10:00	10/10/23 02:17	1
Lead	<0.24		0.50	0.24	ug/L		09/26/23 10:00	10/10/23 02:17	1
Lithium	**29**		10	2.5	ug/L		09/26/23 10:00	10/10/23 02:17	1
Magnesium	**20000**		500	150	ug/L		09/26/23 10:00	10/10/23 02:17	1
Manganese	**5.8**	**J**	10	3.6	ug/L		09/26/23 10:00	10/10/23 02:17	1
Molybdenum	**1.5**	**J**	2.0	0.91	ug/L		09/26/23 10:00	10/10/23 02:17	1
Selenium	<1.4		5.0	1.4	ug/L		09/26/23 10:00	10/10/23 02:17	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids (USGS I-3765-85)	<0.64		1.9	0.64	mg/L			09/25/23 11:20	1
Total Dissolved Solids (SM 2540C)	**440**		50	34	mg/L			09/25/23 15:45	1

Method: EPA Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Groundwater Elevation	**914.07**				ft			09/18/23 13:50	1
Field pH	**6.85**				SU			09/18/23 13:50	1
Field Conductivity	**725**				umhos/cm			09/18/23 13:50	1
Field Temperature	**16.9**				Degrees C			09/18/23 13:50	1
Field Turbidity	**2.95**				NTU			09/18/23 13:50	1

Client: SCS Engineers
Project/Site: Marshalltown E/W Closed LF - 25223064

Job ID: 310-265481-1
SDG: 25223064

Client Sample ID: SW-1

Date Collected: 09/20/23 12:45
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-16

Matrix: Water

Method: SW846 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	18		5.0	2.3	mg/L			09/30/23 13:22	5
Fluoride	<0.38		1.0	0.38	mg/L			09/30/23 13:22	5
Sulfate	14		5.0	2.1	mg/L			09/30/23 13:22	5

Method: SW846 6020B - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	4.9		2.0	0.53	ug/L		09/26/23 10:00	10/10/23 02:19	1
Barium	220		2.0	0.64	ug/L		09/26/23 10:00	10/10/23 02:19	1
Beryllium	<0.33		1.0	0.33	ug/L		09/26/23 10:00	10/10/23 02:19	1
Boron	150		100	76	ug/L		09/26/23 10:00	10/10/23 02:19	1
Calcium	71		0.50	0.19	mg/L		09/26/23 10:00	10/10/23 02:19	1
Cobalt	3.2		0.50	0.17	ug/L		09/26/23 10:00	10/10/23 02:19	1
Iron	1300		100	36	ug/L		09/26/23 10:00	10/10/23 02:19	1
Lead	0.81		0.50	0.24	ug/L		09/26/23 10:00	10/10/23 02:19	1
Lithium	5.3	J	10	2.5	ug/L		09/26/23 10:00	10/10/23 02:19	1
Magnesium	18000		500	150	ug/L		09/26/23 10:00	10/10/23 02:19	1
Manganese	2100		10	3.6	ug/L		09/26/23 10:00	10/10/23 02:19	1
Molybdenum	0.95	J	2.0	0.91	ug/L		09/26/23 10:00	10/10/23 02:19	1
Selenium	<1.4		5.0	1.4	ug/L		09/26/23 10:00	10/10/23 02:19	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids (USGS I-3765-85)	160		15	5.1	mg/L			09/25/23 12:15	1
Total Dissolved Solids (SM 2540C)	300		50	34	mg/L			09/25/23 15:45	1

Method: EPA Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Groundwater Elevation	-				ft			09/20/23 12:45	1
Field pH	8.20				SU			09/20/23 12:45	1
Field Conductivity	548				umhos/cm			09/20/23 12:45	1
Field Temperature	25.6				Degrees C			09/20/23 12:45	1
Field Turbidity	18				NTU			09/20/23 12:45	1

Client Sample Results

Client: SCS Engineers
Project/Site: Marshalltown E/W Closed LF - 25223064

Job ID: 310-265481-1
SDG: 25223064

Client Sample ID: SW-2

Date Collected: 09/21/23 10:40
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-17

Matrix: Water

Method: SW846 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	18		5.0	2.3	mg/L			09/30/23 13:34	5
Fluoride	<0.38		1.0	0.38	mg/L			09/30/23 13:34	5
Sulfate	24		5.0	2.1	mg/L			09/30/23 13:34	5

Method: SW846 6020B - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	1.5	J	2.0	0.53	ug/L		09/26/23 10:00	10/10/23 02:22	1
Barium	170		2.0	0.64	ug/L		09/26/23 10:00	10/10/23 02:22	1
Beryllium	<0.33		1.0	0.33	ug/L		09/26/23 10:00	10/10/23 02:22	1
Boron	130		100	76	ug/L		09/26/23 10:00	10/10/23 02:22	1
Calcium	83		0.50	0.19	mg/L		09/26/23 10:00	10/10/23 02:22	1
Cobalt	0.47	J	0.50	0.17	ug/L		09/26/23 10:00	10/10/23 02:22	1
Iron	430		100	36	ug/L		09/26/23 10:00	10/10/23 02:22	1
Lead	0.39	J	0.50	0.24	ug/L		09/26/23 10:00	10/10/23 02:22	1
Lithium	6.4	J	10	2.5	ug/L		09/26/23 10:00	10/10/23 02:22	1
Magnesium	20000		500	150	ug/L		09/26/23 10:00	10/10/23 02:22	1
Manganese	440		10	3.6	ug/L		09/26/23 10:00	10/10/23 02:22	1
Molybdenum	1.0	J	2.0	0.91	ug/L		09/26/23 10:00	10/10/23 02:22	1
Selenium	1.5	J	5.0	1.4	ug/L		09/26/23 10:00	10/10/23 02:22	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids (USGS I-3765-85)	160		15	5.1	mg/L			09/25/23 12:15	1
Total Dissolved Solids (SM 2540C)	290		50	34	mg/L			09/26/23 17:31	1

Method: EPA Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Groundwater Elevation	-				ft			09/21/23 10:40	1
Field pH	8.00				SU			09/21/23 10:40	1
Field Conductivity	506				umhos/cm			09/21/23 10:40	1
Field Temperature	24.1				Degrees C			09/21/23 10:40	1
Field Turbidity	17.40				NTU			09/21/23 10:40	1

Client Sample Results

Client: SCS Engineers
Project/Site: Marshalltown E/W Closed LF - 25223064

Job ID: 310-265481-1
SDG: 25223064

Client Sample ID: LW-01

Date Collected: 09/22/23 09:00
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-18

Matrix: Water

Method: SW846 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	4.1	J	5.0	2.3	mg/L			09/30/23 13:46	5
Fluoride	0.38	J	1.0	0.38	mg/L			09/30/23 13:46	5
Sulfate	38		5.0	2.1	mg/L			09/30/23 13:46	5

Method: SW846 6020B - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	23		2.0	0.53	ug/L		09/26/23 10:00	10/10/23 02:24	1
Barium	130		2.0	0.64	ug/L		09/26/23 10:00	10/10/23 02:24	1
Beryllium	<0.33		1.0	0.33	ug/L		09/26/23 10:00	10/10/23 02:24	1
Boron	320		100	76	ug/L		09/26/23 10:00	10/10/23 02:24	1
Calcium	140		0.50	0.19	mg/L		09/26/23 10:00	10/10/23 02:24	1
Cobalt	9.8		0.50	0.17	ug/L		09/26/23 10:00	10/10/23 02:24	1
Copper	7.9		5.0	1.8	ug/L		09/26/23 10:00	10/10/23 02:24	1
Iron	2800		100	36	ug/L		09/26/23 10:00	10/10/23 02:24	1
Lead	5.5		0.50	0.24	ug/L		09/26/23 10:00	10/10/23 02:24	1
Lithium	29		10	2.5	ug/L		09/26/23 10:00	10/10/23 02:24	1
Magnesium	26000		500	150	ug/L		09/26/23 10:00	10/10/23 02:24	1
Manganese	1100		10	3.6	ug/L		09/26/23 10:00	10/10/23 02:24	1
Molybdenum	4.5		2.0	0.91	ug/L		09/26/23 10:00	10/10/23 02:24	1
Selenium	<1.4		5.0	1.4	ug/L		09/26/23 10:00	10/10/23 02:24	1
Zinc	49		20	6.4	ug/L		09/26/23 10:00	10/10/23 02:24	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids (USGS I-3765-85)	150		7.5	2.6	mg/L			09/25/23 12:15	1
Total Dissolved Solids (SM 2540C)	600		50	34	mg/L			09/26/23 17:31	1

Method: EPA Field Sampling - Field Sampling

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Groundwater Elevation	892.99				ft			09/22/23 09:00	1
Field pH	7.11				SU			09/22/23 09:00	1
Field Conductivity	846				umhos/cm			09/22/23 09:00	1
Field Temperature	19.5				Degrees C			09/22/23 09:00	1
Field Turbidity	53.18				NTU			09/22/23 09:00	1

Client: SCS Engineers
Project/Site: Marshalltown E/W Closed LF - 25223064

Job ID: 310-265481-1
SDG: 25223064

Client Sample ID: Field Blank

Date Collected: 09/21/23 16:45
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-19

Matrix: Water

Method: SW846 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	<0.45		1.0	0.45	mg/L			09/30/23 13:58	1
Fluoride	<0.075		0.20	0.075	mg/L			09/30/23 13:58	1
Sulfate	<0.42		1.0	0.42	mg/L			09/30/23 13:58	1

Method: SW846 6020B - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.53		2.0	0.53	ug/L		09/26/23 10:00	10/10/23 02:39	1
Barium	<0.64		2.0	0.64	ug/L		09/26/23 10:00	10/10/23 02:39	1
Beryllium	<0.33		1.0	0.33	ug/L		09/26/23 10:00	10/10/23 02:39	1
Boron	<76		100	76	ug/L		09/26/23 10:00	10/10/23 02:39	1
Calcium	<0.19		0.50	0.19	mg/L		09/26/23 10:00	10/10/23 02:39	1
Cobalt	<0.17		0.50	0.17	ug/L		09/26/23 10:00	10/10/23 02:39	1
Copper	<1.8		5.0	1.8	ug/L		09/26/23 10:00	10/10/23 02:39	1
Iron	<36		100	36	ug/L		09/26/23 10:00	10/10/23 02:39	1
Lead	<0.24		0.50	0.24	ug/L		09/26/23 10:00	10/10/23 02:39	1
Lithium	<2.5		10	2.5	ug/L		09/26/23 10:00	10/10/23 02:39	1
Magnesium	<150		500	150	ug/L		09/26/23 10:00	10/10/23 02:39	1
Manganese	<3.6		10	3.6	ug/L		09/26/23 10:00	10/10/23 02:39	1
Molybdenum	<0.91		2.0	0.91	ug/L		09/26/23 10:00	10/10/23 02:39	1
Selenium	<1.4		5.0	1.4	ug/L		09/26/23 10:00	10/10/23 02:39	1
Zinc	<6.4		20	6.4	ug/L		09/26/23 10:00	10/10/23 02:39	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids (USGS I-3765-85)	<0.64		1.9	0.64	mg/L			09/26/23 10:14	1
Total Dissolved Solids (SM 2540C)	<34		50	34	mg/L			09/26/23 17:31	1

Definitions/Glossary

Client: SCS Engineers
Project/Site: Marshalltown E/W Closed LF - 25223064

Job ID: 310-265481-1
SDG: 25223064

Qualifiers

HPLC/IC

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Metals

Qualifier	Qualifier Description
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.
F1	MS and/or MSD recovery exceeds control limits.
F2	MS/MSD RPD exceeds control limits
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

General Chemistry

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

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

Method: 9056A - Anions, Ion Chromatography

Lab Sample ID: MB 310-401151/3
Matrix: Water
Analysis Batch: 401151

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	<0.45		1.0	0.45	mg/L			09/29/23 11:18	1
Fluoride	<0.075		0.20	0.075	mg/L			09/29/23 11:18	1
Sulfate	<0.42		1.0	0.42	mg/L			09/29/23 11:18	1

Lab Sample ID: LCS 310-401151/4
Matrix: Water
Analysis Batch: 401151

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Chloride	10.0	9.76		mg/L		98	90 - 110
Fluoride	2.00	2.09		mg/L		104	90 - 110
Sulfate	10.0	10.5		mg/L		105	90 - 110

Lab Sample ID: 310-265481-1 MS
Matrix: Water
Analysis Batch: 401151

Client Sample ID: MW-3
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Chloride	14		25.0	36.9		mg/L		91	80 - 120
Fluoride	<0.38		5.00	4.75		mg/L		95	80 - 120
Sulfate	96		25.0	119		mg/L		92	80 - 120

Lab Sample ID: 310-265481-1 MSD
Matrix: Water
Analysis Batch: 401151

Client Sample ID: MW-3
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Chloride	14		25.0	36.9		mg/L		91	80 - 120	0	15
Fluoride	<0.38		5.00	4.66		mg/L		93	80 - 120	2	15
Sulfate	96		25.0	118		mg/L		89	80 - 120	1	15

Method: 6020B - Metals (ICP/MS)

Lab Sample ID: MB 310-400591/1-A
Matrix: Water
Analysis Batch: 402075

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 400591

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.53		2.0	0.53	ug/L		09/26/23 10:00	10/10/23 12:46	1
Barium	<0.64		2.0	0.64	ug/L		09/26/23 10:00	10/10/23 12:46	1
Beryllium	<0.33		1.0	0.33	ug/L		09/26/23 10:00	10/10/23 12:46	1
Boron	<76		100	76	ug/L		09/26/23 10:00	10/10/23 12:46	1
Calcium	<0.19		0.50	0.19	mg/L		09/26/23 10:00	10/10/23 12:46	1
Cobalt	<0.17		0.50	0.17	ug/L		09/26/23 10:00	10/10/23 12:46	1
Copper	<1.8		5.0	1.8	ug/L		09/26/23 10:00	10/10/23 12:46	1
Iron	<36		100	36	ug/L		09/26/23 10:00	10/10/23 12:46	1
Lead	<0.24		0.50	0.24	ug/L		09/26/23 10:00	10/10/23 12:46	1
Lithium	<2.5		10	2.5	ug/L		09/26/23 10:00	10/10/23 12:46	1
Magnesium	<150		500	150	ug/L		09/26/23 10:00	10/10/23 12:46	1
Manganese	<3.6		10	3.6	ug/L		09/26/23 10:00	10/10/23 12:46	1

Method: 6020B - Metals (ICP/MS) (Continued)

Lab Sample ID: MB 310-400591/1-A
Matrix: Water
Analysis Batch: 402075

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 400591

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Molybdenum	<0.91		2.0	0.91	ug/L		09/26/23 10:00	10/10/23 12:46	1
Selenium	<1.4		5.0	1.4	ug/L		09/26/23 10:00	10/10/23 12:46	1
Zinc	<6.4		20	6.4	ug/L		09/26/23 10:00	10/10/23 12:46	1

Lab Sample ID: LCS 310-400591/2-A
Matrix: Water
Analysis Batch: 402075

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 400591

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Arsenic	200	229		ug/L		114	80 - 120
Barium	100	119		ug/L		119	80 - 120
Beryllium	100	118		ug/L		118	80 - 120
Boron	200	225		ug/L		113	80 - 120
Calcium	2.00	1.98		mg/L		99	80 - 120
Cobalt	100	114		ug/L		114	80 - 120
Iron	200	240		ug/L		120	80 - 120
Lead	200	238		ug/L		119	80 - 120
Lithium	200	238		ug/L		119	80 - 120
Magnesium	2000	2140		ug/L		107	80 - 120
Manganese	100	107		ug/L		107	80 - 120
Molybdenum	200	226		ug/L		113	80 - 120
Selenium	400	449		ug/L		112	80 - 120
Zinc	200	227		ug/L		114	80 - 120

Lab Sample ID: LCS 310-400591/2-A
Matrix: Water
Analysis Batch: 402248

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 400591

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Copper	200	235		ug/L		118	80 - 120

Lab Sample ID: 310-265481-1 MS
Matrix: Water
Analysis Batch: 402075

Client Sample ID: MW-3
Prep Type: Total/NA
Prep Batch: 400591

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Arsenic	0.65	J	200	191		ug/L		95	75 - 125
Barium	150		100	236		ug/L		84	75 - 125
Beryllium	<0.33		100	97.7		ug/L		98	75 - 125
Boron	1300		200	1430	4	ug/L		46	75 - 125
Calcium	120		2.00	114	4	mg/L		-444	75 - 125
Cobalt	0.75		100	91.4		ug/L		91	75 - 125
Copper	2.5	J	200	190		ug/L		94	75 - 125
Iron	430	F1 F2	200	709	F1	ug/L		137	75 - 125
Lead	0.68		200	188		ug/L		94	75 - 125
Lithium	23		200	218		ug/L		97	75 - 125
Magnesium	18000		2000	18700	4	ug/L		19	75 - 125
Manganese	78		100	161		ug/L		83	75 - 125
Molybdenum	8.6		200	198		ug/L		95	75 - 125

Method: 6020B - Metals (ICP/MS) (Continued)

Lab Sample ID: 310-265481-1 MS
Matrix: Water
Analysis Batch: 402075

Client Sample ID: MW-3
Prep Type: Total/NA
Prep Batch: 400591

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Selenium	7.4		400	381		ug/L		93	75 - 125
Zinc	16	J	200	200		ug/L		92	75 - 125

Lab Sample ID: 310-265481-1 MSD
Matrix: Water
Analysis Batch: 402075

Client Sample ID: MW-3
Prep Type: Total/NA
Prep Batch: 400591

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Arsenic	0.65	J	200	198		ug/L		99	75 - 125	3	20
Barium	150		100	239		ug/L		88	75 - 125	1	20
Beryllium	<0.33		100	102		ug/L		102	75 - 125	4	20
Boron	1300		200	1450	4	ug/L		56	75 - 125	1	20
Calcium	120		2.00	113	4	mg/L		-491	75 - 125	1	20
Cobalt	0.75		100	95.6		ug/L		95	75 - 125	4	20
Copper	2.5	J	200	196		ug/L		97	75 - 125	3	20
Iron	430	F1 F2	200	920	F1 F2	ug/L		243	75 - 125	26	20
Lead	0.68		200	200		ug/L		100	75 - 125	6	20
Lithium	23		200	227		ug/L		102	75 - 125	4	20
Magnesium	18000		2000	18900	4	ug/L		29	75 - 125	1	20
Manganese	78		100	167		ug/L		89	75 - 125	4	20
Molybdenum	8.6		200	205		ug/L		98	75 - 125	3	20
Selenium	7.4		400	394		ug/L		97	75 - 125	3	20
Zinc	16	J	200	207		ug/L		95	75 - 125	3	20

Lab Sample ID: 310-265481-11 DU
Matrix: Water
Analysis Batch: 402019

Client Sample ID: MW-18
Prep Type: Total/NA
Prep Batch: 400591

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Arsenic	<0.53		<0.53		ug/L		NC	20
Barium	150		144		ug/L		1	20
Beryllium	<0.33		<0.33		ug/L		NC	20
Boron	130		122		ug/L		4	20
Calcium	120		119		mg/L		0.9	20
Cobalt	<0.17		<0.17		ug/L		NC	20
Copper	<1.8		<1.8		ug/L		NC	20
Iron	<36		<36		ug/L		NC	20
Lead	<0.24		<0.24		ug/L		NC	20
Lithium	19		18.4		ug/L		2	20
Magnesium	21000		20800		ug/L		0.3	20
Manganese	7.5	J	7.34	J	ug/L		2	20
Molybdenum	0.99	J	0.948	J	ug/L		4	20
Selenium	<1.4		<1.4		ug/L		NC	20
Zinc	<6.4		<6.4		ug/L		NC	20

Method: I-3765-85 - Residue, Non-filterable (TSS)

Lab Sample ID: MB 310-400553/1
Matrix: Water
Analysis Batch: 400553

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids	<1.7		5.0	1.7	mg/L			09/25/23 11:20	1

Lab Sample ID: LCS 310-400553/2
Matrix: Water
Analysis Batch: 400553

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Total Suspended Solids	100	98.0		mg/L		98	75 - 116

Lab Sample ID: MB 310-400556/1
Matrix: Water
Analysis Batch: 400556

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids	<1.7		5.0	1.7	mg/L			09/25/23 12:15	1

Lab Sample ID: LCS 310-400556/2
Matrix: Water
Analysis Batch: 400556

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Total Suspended Solids	100	93.0		mg/L		93	75 - 116

Lab Sample ID: 310-265481-17 DU
Matrix: Water
Analysis Batch: 400556

Client Sample ID: SW-2
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Total Suspended Solids	160		145		mg/L		7	35

Lab Sample ID: MB 310-400627/1
Matrix: Water
Analysis Batch: 400627

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids	<1.7		5.0	1.7	mg/L			09/26/23 08:38	1

Lab Sample ID: LCS 310-400627/2
Matrix: Water
Analysis Batch: 400627

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Total Suspended Solids	100	102		mg/L		102	75 - 116

Lab Sample ID: MB 310-400666/1
Matrix: Water
Analysis Batch: 400666

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids	<1.7		5.0	1.7	mg/L			09/26/23 10:14	1

Method: I-3765-85 - Residue, Non-filterable (TSS)

Lab Sample ID: LCS 310-400666/2
Matrix: Water
Analysis Batch: 400666

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Total Suspended Solids	100	101		mg/L		101	75 - 116

Lab Sample ID: MB 310-400681/1
Matrix: Water
Analysis Batch: 400681

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids	<1.7		5.0	1.7	mg/L			09/26/23 11:01	1

Lab Sample ID: LCS 310-400681/2
Matrix: Water
Analysis Batch: 400681

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Total Suspended Solids	100	100		mg/L		100	75 - 116

Lab Sample ID: MB 310-400829/1
Matrix: Water
Analysis Batch: 400829

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids	<1.7		5.0	1.7	mg/L			09/27/23 15:23	1

Lab Sample ID: LCS 310-400829/2
Matrix: Water
Analysis Batch: 400829

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Total Suspended Solids	100	93.0		mg/L		93	75 - 116

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 310-400583/1
Matrix: Water
Analysis Batch: 400583

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	<34		50	34	mg/L			09/25/23 15:45	1

Lab Sample ID: LCS 310-400583/2
Matrix: Water
Analysis Batch: 400583

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Total Dissolved Solids	1000	984		mg/L		98	90 - 110

Method: SM 2540C - Solids, Total Dissolved (TDS) (Continued)

Lab Sample ID: 310-265481-5 DU
Matrix: Water
Analysis Batch: 400583

Client Sample ID: MW-8
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Total Dissolved Solids	360			354		mg/L				2	20

Lab Sample ID: MB 310-400711/1
Matrix: Water
Analysis Batch: 400711

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	<34		50	34	mg/L			09/26/23 17:31	1

Lab Sample ID: LCS 310-400711/2
Matrix: Water
Analysis Batch: 400711

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

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Total Dissolved Solids			1000	988		mg/L		99	90 - 110		

HPLC/IC

Analysis Batch: 401151

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-265481-1	MW-3	Total/NA	Water	9056A	
310-265481-2	MW-4	Total/NA	Water	9056A	
310-265481-3	MW-5	Total/NA	Water	9056A	
310-265481-4	MW-7	Total/NA	Water	9056A	
310-265481-5	MW-8	Total/NA	Water	9056A	
310-265481-6	MW-9	Total/NA	Water	9056A	
310-265481-7	MW-10	Total/NA	Water	9056A	
310-265481-8	MW-11AR	Total/NA	Water	9056A	
310-265481-9	MW-13	Total/NA	Water	9056A	
310-265481-10	MW-14	Total/NA	Water	9056A	
310-265481-11	MW-18	Total/NA	Water	9056A	
310-265481-12	MW-19	Total/NA	Water	9056A	
310-265481-13	MW-20	Total/NA	Water	9056A	
310-265481-14	MW-21	Total/NA	Water	9056A	
310-265481-15	MW-23	Total/NA	Water	9056A	
310-265481-16	SW-1	Total/NA	Water	9056A	
310-265481-17	SW-2	Total/NA	Water	9056A	
310-265481-18	LW-01	Total/NA	Water	9056A	
310-265481-19	Field Blank	Total/NA	Water	9056A	
MB 310-401151/3	Method Blank	Total/NA	Water	9056A	
LCS 310-401151/4	Lab Control Sample	Total/NA	Water	9056A	
310-265481-1 MS	MW-3	Total/NA	Water	9056A	
310-265481-1 MSD	MW-3	Total/NA	Water	9056A	

Metals

Prep Batch: 400591

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-265481-1	MW-3	Total/NA	Water	3005A	
310-265481-2	MW-4	Total/NA	Water	3005A	
310-265481-3	MW-5	Total/NA	Water	3005A	
310-265481-4	MW-7	Total/NA	Water	3005A	
310-265481-5	MW-8	Total/NA	Water	3005A	
310-265481-6	MW-9	Total/NA	Water	3005A	
310-265481-7	MW-10	Total/NA	Water	3005A	
310-265481-8	MW-11AR	Total/NA	Water	3005A	
310-265481-9	MW-13	Total/NA	Water	3005A	
310-265481-10	MW-14	Total/NA	Water	3005A	
310-265481-11	MW-18	Total/NA	Water	3005A	
310-265481-12	MW-19	Total/NA	Water	3005A	
310-265481-13	MW-20	Total/NA	Water	3005A	
310-265481-14	MW-21	Total/NA	Water	3005A	
310-265481-15	MW-23	Total/NA	Water	3005A	
310-265481-16	SW-1	Total/NA	Water	3005A	
310-265481-17	SW-2	Total/NA	Water	3005A	
310-265481-18	LW-01	Total/NA	Water	3005A	
310-265481-19	Field Blank	Total/NA	Water	3005A	
MB 310-400591/1-A	Method Blank	Total/NA	Water	3005A	
LCS 310-400591/2-A	Lab Control Sample	Total/NA	Water	3005A	
310-265481-1 MS	MW-3	Total/NA	Water	3005A	
310-265481-1 MSD	MW-3	Total/NA	Water	3005A	

Metals (Continued)

Prep Batch: 400591 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-265481-11 DU	MW-18	Total/NA	Water	3005A	

Analysis Batch: 402019

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-265481-2	MW-4	Total/NA	Water	6020B	400591
310-265481-3	MW-5	Total/NA	Water	6020B	400591
310-265481-4	MW-7	Total/NA	Water	6020B	400591
310-265481-5	MW-8	Total/NA	Water	6020B	400591
310-265481-6	MW-9	Total/NA	Water	6020B	400591
310-265481-7	MW-10	Total/NA	Water	6020B	400591
310-265481-8	MW-11AR	Total/NA	Water	6020B	400591
310-265481-9	MW-13	Total/NA	Water	6020B	400591
310-265481-10	MW-14	Total/NA	Water	6020B	400591
310-265481-11	MW-18	Total/NA	Water	6020B	400591
310-265481-12	MW-19	Total/NA	Water	6020B	400591
310-265481-13	MW-20	Total/NA	Water	6020B	400591
310-265481-14	MW-21	Total/NA	Water	6020B	400591
310-265481-15	MW-23	Total/NA	Water	6020B	400591
310-265481-16	SW-1	Total/NA	Water	6020B	400591
310-265481-17	SW-2	Total/NA	Water	6020B	400591
310-265481-18	LW-01	Total/NA	Water	6020B	400591
310-265481-19	Field Blank	Total/NA	Water	6020B	400591
310-265481-11 DU	MW-18	Total/NA	Water	6020B	400591

Analysis Batch: 402075

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-265481-1	MW-3	Total/NA	Water	6020B	400591
MB 310-400591/1-A	Method Blank	Total/NA	Water	6020B	400591
LCS 310-400591/2-A	Lab Control Sample	Total/NA	Water	6020B	400591
310-265481-1 MS	MW-3	Total/NA	Water	6020B	400591
310-265481-1 MSD	MW-3	Total/NA	Water	6020B	400591

Analysis Batch: 402248

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LCS 310-400591/2-A	Lab Control Sample	Total/NA	Water	6020B	400591

General Chemistry

Analysis Batch: 400553

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-265481-7	MW-10	Total/NA	Water	I-3765-85	
310-265481-15	MW-23	Total/NA	Water	I-3765-85	
MB 310-400553/1	Method Blank	Total/NA	Water	I-3765-85	
LCS 310-400553/2	Lab Control Sample	Total/NA	Water	I-3765-85	

Analysis Batch: 400556

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-265481-14	MW-21	Total/NA	Water	I-3765-85	
310-265481-16	SW-1	Total/NA	Water	I-3765-85	
310-265481-17	SW-2	Total/NA	Water	I-3765-85	
310-265481-18	LW-01	Total/NA	Water	I-3765-85	

General Chemistry (Continued)

Analysis Batch: 400556 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 310-400556/1	Method Blank	Total/NA	Water	I-3765-85	
LCS 310-400556/2	Lab Control Sample	Total/NA	Water	I-3765-85	
310-265481-17 DU	SW-2	Total/NA	Water	I-3765-85	

Analysis Batch: 400583

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-265481-1	MW-3	Total/NA	Water	SM 2540C	
310-265481-2	MW-4	Total/NA	Water	SM 2540C	
310-265481-3	MW-5	Total/NA	Water	SM 2540C	
310-265481-4	MW-7	Total/NA	Water	SM 2540C	
310-265481-5	MW-8	Total/NA	Water	SM 2540C	
310-265481-6	MW-9	Total/NA	Water	SM 2540C	
310-265481-7	MW-10	Total/NA	Water	SM 2540C	
310-265481-8	MW-11AR	Total/NA	Water	SM 2540C	
310-265481-9	MW-13	Total/NA	Water	SM 2540C	
310-265481-10	MW-14	Total/NA	Water	SM 2540C	
310-265481-11	MW-18	Total/NA	Water	SM 2540C	
310-265481-13	MW-20	Total/NA	Water	SM 2540C	
310-265481-15	MW-23	Total/NA	Water	SM 2540C	
310-265481-16	SW-1	Total/NA	Water	SM 2540C	
MB 310-400583/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 310-400583/2	Lab Control Sample	Total/NA	Water	SM 2540C	
310-265481-5 DU	MW-8	Total/NA	Water	SM 2540C	

Analysis Batch: 400627

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-265481-4	MW-7	Total/NA	Water	I-3765-85	
310-265481-9	MW-13	Total/NA	Water	I-3765-85	
310-265481-10	MW-14	Total/NA	Water	I-3765-85	
310-265481-11	MW-18	Total/NA	Water	I-3765-85	
310-265481-13	MW-20	Total/NA	Water	I-3765-85	
MB 310-400627/1	Method Blank	Total/NA	Water	I-3765-85	
LCS 310-400627/2	Lab Control Sample	Total/NA	Water	I-3765-85	

Analysis Batch: 400666

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-265481-19	Field Blank	Total/NA	Water	I-3765-85	
MB 310-400666/1	Method Blank	Total/NA	Water	I-3765-85	
LCS 310-400666/2	Lab Control Sample	Total/NA	Water	I-3765-85	

Analysis Batch: 400681

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-265481-2	MW-4	Total/NA	Water	I-3765-85	
310-265481-3	MW-5	Total/NA	Water	I-3765-85	
310-265481-5	MW-8	Total/NA	Water	I-3765-85	
310-265481-6	MW-9	Total/NA	Water	I-3765-85	
310-265481-8	MW-11AR	Total/NA	Water	I-3765-85	
310-265481-12	MW-19	Total/NA	Water	I-3765-85	
MB 310-400681/1	Method Blank	Total/NA	Water	I-3765-85	
LCS 310-400681/2	Lab Control Sample	Total/NA	Water	I-3765-85	

QC Association Summary

Client: SCS Engineers
Project/Site: Marshalltown E/W Closed LF - 25223064

Job ID: 310-265481-1
SDG: 25223064

General Chemistry

Analysis Batch: 400711

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-265481-12	MW-19	Total/NA	Water	SM 2540C	
310-265481-14	MW-21	Total/NA	Water	SM 2540C	
310-265481-17	SW-2	Total/NA	Water	SM 2540C	
310-265481-18	LW-01	Total/NA	Water	SM 2540C	
310-265481-19	Field Blank	Total/NA	Water	SM 2540C	
MB 310-400711/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 310-400711/2	Lab Control Sample	Total/NA	Water	SM 2540C	

Analysis Batch: 400829

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-265481-1	MW-3	Total/NA	Water	I-3765-85	
MB 310-400829/1	Method Blank	Total/NA	Water	I-3765-85	
LCS 310-400829/2	Lab Control Sample	Total/NA	Water	I-3765-85	

Field Service / Mobile Lab

Analysis Batch: 401185

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-265481-1	MW-3	Total/NA	Water	Field Sampling	
310-265481-2	MW-4	Total/NA	Water	Field Sampling	
310-265481-3	MW-5	Total/NA	Water	Field Sampling	
310-265481-4	MW-7	Total/NA	Water	Field Sampling	
310-265481-5	MW-8	Total/NA	Water	Field Sampling	
310-265481-6	MW-9	Total/NA	Water	Field Sampling	
310-265481-7	MW-10	Total/NA	Water	Field Sampling	
310-265481-8	MW-11AR	Total/NA	Water	Field Sampling	
310-265481-9	MW-13	Total/NA	Water	Field Sampling	
310-265481-10	MW-14	Total/NA	Water	Field Sampling	
310-265481-11	MW-18	Total/NA	Water	Field Sampling	
310-265481-12	MW-19	Total/NA	Water	Field Sampling	
310-265481-13	MW-20	Total/NA	Water	Field Sampling	
310-265481-14	MW-21	Total/NA	Water	Field Sampling	
310-265481-15	MW-23	Total/NA	Water	Field Sampling	
310-265481-16	SW-1	Total/NA	Water	Field Sampling	
310-265481-17	SW-2	Total/NA	Water	Field Sampling	
310-265481-18	LW-01	Total/NA	Water	Field Sampling	

Lab Chronicle

Client: SCS Engineers
Project/Site: Marshalltown E/W Closed LF - 25223064

Job ID: 310-265481-1
SDG: 25223064

Client Sample ID: MW-3
Date Collected: 09/21/23 10:25
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-1
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	9056A		5	401151	QTZ5	EET CF	09/29/23 12:18
Total/NA	Prep	3005A			400591	KCK5	EET CF	09/26/23 10:00
Total/NA	Analysis	6020B		1	402075	A6US	EET CF	10/10/23 12:55
Total/NA	Analysis	I-3765-85		1	400829	A4XP	EET CF	09/27/23 15:23
Total/NA	Analysis	SM 2540C		1	400583	ENB7	EET CF	09/25/23 15:45
Total/NA	Analysis	Field Sampling		1	401185	BJ0R	EET CF	09/21/23 10:25

Client Sample ID: MW-4
Date Collected: 09/21/23 14:53
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-2
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	9056A		5	401151	QTZ5	EET CF	09/29/23 12:54
Total/NA	Prep	3005A			400591	KCK5	EET CF	09/26/23 10:00
Total/NA	Analysis	6020B		1	402019	A6US	EET CF	10/10/23 01:31
Total/NA	Analysis	I-3765-85		1	400681	DGU1	EET CF	09/26/23 11:01
Total/NA	Analysis	SM 2540C		1	400583	ENB7	EET CF	09/25/23 15:45
Total/NA	Analysis	Field Sampling		1	401185	BJ0R	EET CF	09/21/23 14:53

Client Sample ID: MW-5
Date Collected: 09/21/23 13:28
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-3
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	9056A		5	401151	QTZ5	EET CF	09/29/23 13:06
Total/NA	Prep	3005A			400591	KCK5	EET CF	09/26/23 10:00
Total/NA	Analysis	6020B		1	402019	A6US	EET CF	10/10/23 01:34
Total/NA	Analysis	I-3765-85		1	400681	DGU1	EET CF	09/26/23 11:01
Total/NA	Analysis	SM 2540C		1	400583	ENB7	EET CF	09/25/23 15:45
Total/NA	Analysis	Field Sampling		1	401185	BJ0R	EET CF	09/21/23 13:28

Client Sample ID: MW-7
Date Collected: 09/20/23 12:25
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-4
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	9056A		5	401151	QTZ5	EET CF	09/29/23 13:18
Total/NA	Prep	3005A			400591	KCK5	EET CF	09/26/23 10:00
Total/NA	Analysis	6020B		1	402019	A6US	EET CF	10/10/23 01:36
Total/NA	Analysis	I-3765-85		1	400627	DGU1	EET CF	09/26/23 08:38
Total/NA	Analysis	SM 2540C		1	400583	ENB7	EET CF	09/25/23 15:45
Total/NA	Analysis	Field Sampling		1	401185	BJ0R	EET CF	09/20/23 12:25

Lab Chronicle

Client: SCS Engineers
Project/Site: Marshalltown E/W Closed LF - 25223064

Job ID: 310-265481-1
SDG: 25223064

Client Sample ID: MW-8
Date Collected: 09/21/23 12:45
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-5
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	9056A		5	401151	QTZ5	EET CF	09/29/23 13:30
Total/NA	Prep	3005A			400591	KCK5	EET CF	09/26/23 10:00
Total/NA	Analysis	6020B		1	402019	A6US	EET CF	10/10/23 01:38
Total/NA	Analysis	I-3765-85		1	400681	DGU1	EET CF	09/26/23 11:01
Total/NA	Analysis	SM 2540C		1	400583	ENB7	EET CF	09/25/23 15:45
Total/NA	Analysis	Field Sampling		1	401185	BJ0R	EET CF	09/21/23 12:45

Client Sample ID: MW-9
Date Collected: 09/21/23 12:20
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-6
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	9056A		5	401151	QTZ5	EET CF	09/29/23 13:43
Total/NA	Prep	3005A			400591	KCK5	EET CF	09/26/23 10:00
Total/NA	Analysis	6020B		1	402019	A6US	EET CF	10/10/23 01:41
Total/NA	Analysis	I-3765-85		1	400681	DGU1	EET CF	09/26/23 11:01
Total/NA	Analysis	SM 2540C		1	400583	ENB7	EET CF	09/25/23 15:45
Total/NA	Analysis	Field Sampling		1	401185	BJ0R	EET CF	09/21/23 12:20

Client Sample ID: MW-10
Date Collected: 09/18/23 15:25
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-7
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	9056A		5	401151	QTZ5	EET CF	09/29/23 13:55
Total/NA	Prep	3005A			400591	KCK5	EET CF	09/26/23 10:00
Total/NA	Analysis	6020B		1	402019	A6US	EET CF	10/10/23 01:43
Total/NA	Analysis	I-3765-85		1	400553	DGU1	EET CF	09/25/23 11:20
Total/NA	Analysis	SM 2540C		1	400583	ENB7	EET CF	09/25/23 15:45
Total/NA	Analysis	Field Sampling		1	401185	BJ0R	EET CF	09/18/23 15:25

Client Sample ID: MW-11AR
Date Collected: 09/21/23 16:00
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-8
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	9056A		5	401151	QTZ5	EET CF	09/30/23 11:21
Total/NA	Prep	3005A			400591	KCK5	EET CF	09/26/23 10:00
Total/NA	Analysis	6020B		1	402019	A6US	EET CF	10/10/23 01:46
Total/NA	Analysis	I-3765-85		1	400681	DGU1	EET CF	09/26/23 11:01
Total/NA	Analysis	SM 2540C		1	400583	ENB7	EET CF	09/25/23 15:45
Total/NA	Analysis	Field Sampling		1	401185	BJ0R	EET CF	09/21/23 16:00

Lab Chronicle

Client: SCS Engineers
Project/Site: Marshalltown E/W Closed LF - 25223064

Job ID: 310-265481-1
SDG: 25223064

Client Sample ID: MW-13
Date Collected: 09/20/23 10:35
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-9
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	9056A		5	401151	QTZ5	EET CF	09/30/23 11:33
Total/NA	Prep	3005A			400591	KCK5	EET CF	09/26/23 10:00
Total/NA	Analysis	6020B		1	402019	A6US	EET CF	10/10/23 01:48
Total/NA	Analysis	I-3765-85		1	400627	DGU1	EET CF	09/26/23 08:38
Total/NA	Analysis	SM 2540C		1	400583	ENB7	EET CF	09/25/23 15:45
Total/NA	Analysis	Field Sampling		1	401185	BJ0R	EET CF	09/20/23 10:35

Client Sample ID: MW-14
Date Collected: 09/20/23 14:00
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-10
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	9056A		5	401151	QTZ5	EET CF	09/30/23 11:45
Total/NA	Prep	3005A			400591	KCK5	EET CF	09/26/23 10:00
Total/NA	Analysis	6020B		1	402019	A6US	EET CF	10/10/23 02:02
Total/NA	Analysis	I-3765-85		1	400627	DGU1	EET CF	09/26/23 08:38
Total/NA	Analysis	SM 2540C		1	400583	ENB7	EET CF	09/25/23 15:45
Total/NA	Analysis	Field Sampling		1	401185	BJ0R	EET CF	09/20/23 14:00

Client Sample ID: MW-18
Date Collected: 09/20/23 15:15
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-11
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	9056A		5	401151	QTZ5	EET CF	09/30/23 11:57
Total/NA	Prep	3005A			400591	KCK5	EET CF	09/26/23 10:00
Total/NA	Analysis	6020B		1	402019	A6US	EET CF	10/10/23 02:05
Total/NA	Analysis	I-3765-85		1	400627	DGU1	EET CF	09/26/23 08:38
Total/NA	Analysis	SM 2540C		1	400583	ENB7	EET CF	09/25/23 15:45
Total/NA	Analysis	Field Sampling		1	401185	BJ0R	EET CF	09/20/23 15:15

Client Sample ID: MW-19
Date Collected: 09/21/23 13:35
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-12
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	9056A		5	401151	QTZ5	EET CF	09/30/23 12:09
Total/NA	Prep	3005A			400591	KCK5	EET CF	09/26/23 10:00
Total/NA	Analysis	6020B		1	402019	A6US	EET CF	10/10/23 02:10
Total/NA	Analysis	I-3765-85		1	400681	DGU1	EET CF	09/26/23 11:01
Total/NA	Analysis	SM 2540C		1	400711	D7CP	EET CF	09/26/23 17:31
Total/NA	Analysis	Field Sampling		1	401185	BJ0R	EET CF	09/21/23 13:35

Lab Chronicle

Client: SCS Engineers
Project/Site: Marshalltown E/W Closed LF - 25223064

Job ID: 310-265481-1
SDG: 25223064

Client Sample ID: MW-20
Date Collected: 09/20/23 10:22
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-13
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	9056A		5	401151	QTZ5	EET CF	09/30/23 12:21
Total/NA	Prep	3005A			400591	KCK5	EET CF	09/26/23 10:00
Total/NA	Analysis	6020B		1	402019	A6US	EET CF	10/10/23 02:12
Total/NA	Analysis	I-3765-85		1	400627	DGU1	EET CF	09/26/23 08:38
Total/NA	Analysis	SM 2540C		1	400583	ENB7	EET CF	09/25/23 15:45
Total/NA	Analysis	Field Sampling		1	401185	BJ0R	EET CF	09/20/23 10:22

Client Sample ID: MW-21
Date Collected: 09/21/23 14:50
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-14
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	9056A		5	401151	QTZ5	EET CF	09/30/23 12:33
Total/NA	Prep	3005A			400591	KCK5	EET CF	09/26/23 10:00
Total/NA	Analysis	6020B		1	402019	A6US	EET CF	10/10/23 02:15
Total/NA	Analysis	I-3765-85		1	400556	DGU1	EET CF	09/25/23 12:15
Total/NA	Analysis	SM 2540C		1	400711	D7CP	EET CF	09/26/23 17:31
Total/NA	Analysis	Field Sampling		1	401185	BJ0R	EET CF	09/21/23 14:50

Client Sample ID: MW-23
Date Collected: 09/18/23 13:50
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-15
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	9056A		5	401151	QTZ5	EET CF	09/30/23 13:09
Total/NA	Prep	3005A			400591	KCK5	EET CF	09/26/23 10:00
Total/NA	Analysis	6020B		1	402019	A6US	EET CF	10/10/23 02:17
Total/NA	Analysis	I-3765-85		1	400553	DGU1	EET CF	09/25/23 11:20
Total/NA	Analysis	SM 2540C		1	400583	ENB7	EET CF	09/25/23 15:45
Total/NA	Analysis	Field Sampling		1	401185	BJ0R	EET CF	09/18/23 13:50

Client Sample ID: SW-1
Date Collected: 09/20/23 12:45
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-16
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	9056A		5	401151	QTZ5	EET CF	09/30/23 13:22
Total/NA	Prep	3005A			400591	KCK5	EET CF	09/26/23 10:00
Total/NA	Analysis	6020B		1	402019	A6US	EET CF	10/10/23 02:19
Total/NA	Analysis	I-3765-85		1	400556	DGU1	EET CF	09/25/23 12:15
Total/NA	Analysis	SM 2540C		1	400583	ENB7	EET CF	09/25/23 15:45
Total/NA	Analysis	Field Sampling		1	401185	BJ0R	EET CF	09/20/23 12:45

Lab Chronicle

Client: SCS Engineers
Project/Site: Marshalltown E/W Closed LF - 25223064

Job ID: 310-265481-1
SDG: 25223064

Client Sample ID: SW-2
Date Collected: 09/21/23 10:40
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-17
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	9056A		5	401151	QTZ5	EET CF	09/30/23 13:34
Total/NA	Prep	3005A			400591	KCK5	EET CF	09/26/23 10:00
Total/NA	Analysis	6020B		1	402019	A6US	EET CF	10/10/23 02:22
Total/NA	Analysis	I-3765-85		1	400556	DGU1	EET CF	09/25/23 12:15
Total/NA	Analysis	SM 2540C		1	400711	D7CP	EET CF	09/26/23 17:31
Total/NA	Analysis	Field Sampling		1	401185	BJ0R	EET CF	09/21/23 10:40

Client Sample ID: LW-01
Date Collected: 09/22/23 09:00
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-18
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	9056A		5	401151	QTZ5	EET CF	09/30/23 13:46
Total/NA	Prep	3005A			400591	KCK5	EET CF	09/26/23 10:00
Total/NA	Analysis	6020B		1	402019	A6US	EET CF	10/10/23 02:24
Total/NA	Analysis	I-3765-85		1	400556	DGU1	EET CF	09/25/23 12:15
Total/NA	Analysis	SM 2540C		1	400711	D7CP	EET CF	09/26/23 17:31
Total/NA	Analysis	Field Sampling		1	401185	BJ0R	EET CF	09/22/23 09:00

Client Sample ID: Field Blank
Date Collected: 09/21/23 16:45
Date Received: 09/22/23 16:40

Lab Sample ID: 310-265481-19
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	9056A		1	401151	QTZ5	EET CF	09/30/23 13:58
Total/NA	Prep	3005A			400591	KCK5	EET CF	09/26/23 10:00
Total/NA	Analysis	6020B		1	402019	A6US	EET CF	10/10/23 02:39
Total/NA	Analysis	I-3765-85		1	400666	DGU1	EET CF	09/26/23 10:14
Total/NA	Analysis	SM 2540C		1	400711	D7CP	EET CF	09/26/23 17:31

Laboratory References:
EET CF = Eurofins Cedar Falls, 3019 Venture Way, Cedar Falls, IA 50613, TEL (319)277-2401

Accreditation/Certification Summary

Client: SCS Engineers
Project/Site: Marshalltown E/W Closed LF - 25223064

Job ID: 310-265481-1
SDG: 25223064

Laboratory: Eurofins Cedar Falls

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Iowa	State	007	12-01-23

Method Summary

Client: SCS Engineers
Project/Site: Marshalltown E/W Closed LF - 25223064

Job ID: 310-265481-1
SDG: 25223064

Method	Method Description	Protocol	Laboratory
9056A	Anions, Ion Chromatography	SW846	EET CF
6020B	Metals (ICP/MS)	SW846	EET CF
I-3765-85	Residue, Non-filterable (TSS)	USGS	EET CF
SM 2540C	Solids, Total Dissolved (TDS)	SM	EET CF
Field Sampling	Field Sampling	EPA	EET CF
3005A	Preparation, Total Metals	SW846	EET CF

Protocol References:

EPA = US Environmental Protection Agency

SM = "Standard Methods For The Examination Of Water And Wastewater"

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

USGS = "Methods For Analysis Of Water And Fluvial Sediments", USGS, 1989

Laboratory References:

EET CF = Eurofins Cedar Falls, 3019 Venture Way, Cedar Falls, IA 50613, TEL (319)277-2401

eurofins | Environment Testing America

310-265481 Chain of Custody

Cooler/Sample Receipt and Temperature Log Form

Client Information

Client: SCS

City/State: CITY | STATE FA | Project:

Receipt Information

Date/Time Received: DATE 9/22/23 | TIME 1640 | Received By: SL

Delivery Type: ☐ UPS ☐ FedEx ☐ FedEx Ground ☐ US Mail ☐ Spee-Dee
☑ Lab Courier ☐ Lab Field Services ☐ Client Drop-off ☐ Other:_____

Condition of Cooler/Containers

Sample(s) received in Cooler? ☑ Yes ☐ No *If yes:* Cooler ID:

Multiple Coolers? ☑ Yes ☐ No *If yes:* Cooler # 1 of 2

Cooler Custody Seals Present? ☐ Yes ☑ No *If yes:* Cooler custody seals intact? ☐ Yes ☐ No

Sample Custody Seals Present? ☐ Yes ☑ No *If yes:* Sample custody seals intact? ☐ Yes ☐ No

Trip Blank Present? ☐ Yes ☑ No *If yes:* Which VOA samples are in cooler? ↓

Temperature Record

Coolant: ☑ Wet ice ☐ Blue ice ☐ Dry ice ☐ Other:_____ ☐ NONE

Thermometer ID: P | Correction Factor (°C): 0

• **Temp Blank Temperature** – If no temp blank, or temp blank temperature above criteria, proceed to Sample Container Temperature

Uncorrected Temp (°C): 4.1 | Corrected Temp (°C): 4.1

• **Sample Container Temperature**

	CONTAINER 1	CONTAINER 2
Container(s) used:		
Uncorrected Temp (°C):		
Corrected Temp (°C):		

Exceptions Noted

1) If temperature exceeds criteria, was sample(s) received same day of sampling? ☐ Yes ☐ No
   a) *If yes:* Is there evidence that the chilling process began? ☐ Yes ☐ No

2) If temperature is <0°C, are there obvious signs that the integrity of sample containers is compromised? (e.g., bulging septa, broken/cracked bottles, frozen solid?) ☐ Yes ☐ No

NOTE. If yes, contact PM before proceeding. If no, proceed with login

Additional Comments

eurofins | Environment Testing America

Place COC scanning label here

Cooler/Sample Receipt and Temperature Log Form

Client Information

Client: SCS

City/State: CITY | STATE FA | Project:

Receipt Information

Date/Time Received: DATE 9/22/23 | TIME 1040 | Received By: SL

Delivery Type: ☐ UPS ☐ FedEx ☐ FedEx Ground ☐ US Mail ☐ Spee-Dee
☑ Lab Courier ☐ Lab Field Services ☐ Client Drop-off ☐ Other:_____

Condition of Cooler/Containers

Sample(s) received in Cooler? ☑ Yes ☐ No *If yes:* Cooler ID:

Multiple Coolers? ☑ Yes ☐ No *If yes:* Cooler # 2 of 2

Cooler Custody Seals Present? ☐ Yes ☑ No *If yes:* Cooler custody seals intact? ☐ Yes ☐ No

Sample Custody Seals Present? ☐ Yes ☑ No *If yes:* Sample custody seals intact? ☐ Yes ☐ No

Trip Blank Present? ☐ Yes ☑ No *If yes:* Which VOA samples are in cooler? ↓

Temperature Record

Coolant: ☑ Wet ice ☐ Blue ice ☐ Dry ice ☐ Other:_____ ☐ NONE

Thermometer ID: P | Correction Factor (°C): 0

• **Temp Blank Temperature** – If no temp blank, or temp blank temperature above criteria, proceed to Sample Container Temperature

Uncorrected Temp (°C): 2.6 | Corrected Temp (°C): 2.6

• **Sample Container Temperature**

	CONTAINER 1	CONTAINER 2
Container(s) used:		
Uncorrected Temp (°C):		
Corrected Temp (°C):		

Exceptions Noted

1) If temperature exceeds criteria, was sample(s) received same day of sampling? ☐ Yes ☐ No
   a) *If yes:* Is there evidence that the chilling process began? ☐ Yes ☐ No

2) If temperature is <0°C, are there obvious signs that the integrity of sample containers is compromised? (e.g., bulging septa, broken/cracked bottles, frozen solid?) ☐ Yes ☐ No

NOTE: If yes, contact PM before proceeding. If no, proceed with login

Additional Comments

★Received MW-22 instead of MW-23 with all of MW-23 info written on MW-22, have SW-3 instead of SW-2 also

Eurofins Cedar Falls
3019 Venture Way
Cedar Falls, IA 50613
Phone 319-277-2401 Fax: 319-277-2425

Chain of Custody Record

TestAmerica Des Moines SC
214

eurofins | Environment Testing

Client Information	Sampler: Tyler Stirling	Lab PM: Fredrick, Sandie	Carrier Tracking No(s):	COC No: 310-84937-23686 1
Client Contact: Meghan Blodgett	Phone: 515-509-2716	E-Mail: Sandra Fredrick@et.eurofinsus.com	State of Origin: IA	Page: Page 1 of 3
Company: SCS Engineers	PWSID:			Job #: 25223064

Address: 2830 Dairy Drive	Due Date Requested:	
City: Madison	TAT Requested (days):	
State, Zip: WI, 53718	Compliance Project: Δ Yes Δ No	
Phone:	PO #: Purchase Order Requested	
Email: mblodgett@scsengineers.com	WO #:	
Project Name: Marshalltown E/W Closed LF	Project #: 31011020	
Site:	SSOW#:	

Analysis Requested

Preservation Codes

A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Y - Trizma
Z - other (specify)
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	9056A_ORGFM_28D - Chloride, Fluoride & Sulfate	6020B - Metals (16)	2540C_Calcd, I_3766_85	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N	D	N		
MW-3	9/21/23	10 25	G	Water			X	X	X		
MW-4	9/21/23	2 53	G	Water			X	X	X		
MW-5	9/21/23	1 28	G	Water			X	X	X		
MW-7	9/20/23	12 25	G	Water			X	X	X		
MW-8	9/21/23	12 45	G	Water			X	X	X		
MW-9	9/21/23	12 20	G	Water			X	X	X		
MW-10	9/19/23	3 25	G	Water			X	X	X		
MW-11AR	9/21/23	4 00	G	Water			X	X	X		
MW-13	9/20/23	10 35	G	Water			X	X	X		
MW-14	9/20/23	2 00	G	Water			X	X	X		
MW-18	9/20/23	3 15	G	Water			X	X	X		

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested I II III IV Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:			
Relinquished by: Tyler S	Date/Time: 9/22/23 2.30	Company: SCS	Received by: ST	Date/Time: 9/22/23 1640	Company	
Relinquished by:	Date/Time	Company	Received by:	Date/Time:	Company	
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company	

Custody Seals Intact: Δ Yes Δ No	Custody Seal No	Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021

Eurofins Cedar Falls
3019 Venture Way
Cedar Falls, IA 50613
Phone 319-277-2401 Fax: 319-277-2425

Chain of Custody Record

TestAmerica Des Moines SC
214

eurofins | Environment Testing

Client Information	Sampler: Tyler Stirling	Lab PM: Fredrick, Sandie	Carrier Tracking No(s):	COC No: 310-84937-23686.2
Client Contact: Meghan Blodgett	Phone: 515-508-2716	E-Mail: Sandra.Fredrick@et.eurofinsus.com	State of Origin: IA	Page: Page 2 of 3
Company: SCS Engineers	PWSID:			Job #: 25223064

Address: 2830 Dairy Drive	Due Date Requested:	
City: Madison	TAT Requested (days):	
State, Zip: WI, 53718	Compliance Project: Δ Yes Δ No	
Phone:	PO #: Purchase Order Requested	
Email: mblodgett@scsengineers.com	WO #:	
Project Name: Marshalltown E/W Closed LF	Project #: 31011020	
Site:	SSOW#:	

Analysis Requested

Preservation Codes.

A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Y - Trizma
Z - other (specify)
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	9056A_ORGFM_28D - Chloride, Fluoride & Sulfate	6020B - Metals (15)	2540C_Calcd, I_3765_85	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N	D	N		
MW-19	9/21/23	1 35	G	Water			X	X	X		
MW-20	9/20/23	10 22	G	Water			X	X	X		
MW-21	9/21/23	2 50	G	Water			X	X	X		
~~MW-22~~				Water							
MW-23	9/19/23	1 00	G	Water			X	X	X		
~~GWGCS~~				Water							
SW-1	9/20/23	12 45	G	Water			X	X	X		
SW-2	9/21/23	10 40	G	Water			X	X	X		
~~SW-3~~				Water			~~X~~	~~X~~			
LW-01	9/22/23	9 00	G	Water	X		X	X	X		
~~LW-02~~				Water							

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested I, II, III, IV Other (specify)

Special Instructions/QC Requirements.

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by: Tyler S	9/22/23 2 30	SCS	ST	9/22/23 1640	
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No	Cooler Temperature(s) °C and Other Remarks

Ver: 06/08/2021

Eurofins Cedar Falls
3019 Venture Way
Cedar Falls, IA 50613
Phone. 319-277-2401 Fax: 319-277-2425

Chain of Custody Record

TestAmerica Des Moines SC
214

eurofins
Environment Testing

Client Information	Sampler: Tyler Sterling	Lab PM: Fredrick, Sandie	Carrier Tracking No(s).	COC No: 310-84937-23686 3
Client Contact: Meghan Blodgett	Phone: 515 - 305-2718	E-Mail: Sandra Fredrick@et.eurofinsus.com	State of Origin: IA	Page: Page 3 of 3
Company: SCS Engineers	PWSID:			Job #: 25223064
Address: 2830 Dairy Drive	Due Date Requested			
City: Madison	TAT Requested (days):			
State, Zip: WI, 53718	Compliance Project: Δ Yes Δ No			
Phone:	PO #: Purchase Order Requested			
Email: mblodgett@scsengineers.com	WO #:			
Project Name: Marshalltown E/W Closed LF	Project #: 31011020			
Site:	SSOW#:			

Analysis Requested

Preservation Codes

A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Y - Trizma
Z - other (specify)
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	9056A_ORGFM_28D - Chloride, Fluoride & Sulfate	6020B - Metals (15)	2540C_Calcd, I_3765_86	Total Number of containers	Special Instructions/Note:
			Preservation Code		X	X	N	D	N	X	
~~LW-03~~				Water							
~~LW-04~~				Water							
FIELDBLANK	9/21/23	4 45	G	Water			X	X	X		

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested I, II, III, IV, Other (specify)

Special Instructions/QC Requirements.

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

	Relinquished by	Date/Time	Company	Received by	Date/Time	Company
1	Tyler S	9/22/23 2-30	SCS	ST	9/22/23 1640	
2						
3						

Custody Seals Intact: Δ Yes Δ No	Custody Seal No	Cooler Temperature(s) °C and Other Remarks

Ver: 06/08/2021

Page 55 of 58

10/16/2023 (Rev. 1)

Table 1 Sampling Points and Parameters State Sampling Program
Groundwater Monitoring Marshalltown East and West Closed Landfills / SCS Engineers Project #25223064

	GROUNDWATER																	SURFACE WATER			LEACHATE							
Parameter*	MW-3	MW-4	MW-5	MW-7	MW-8	MW-9	MW-10	MW-11AR	MW-13	MW-14	MW-18	MW-19	MW-20	MW-21	MW-22	MW-23	Groundwater Gradient Control system (GWGCS)	SW-1	SW-2	SW-3	LL-1	LW-01	LW-02	LW-03	LW-04	Leachate Collection Tank	Field Blank	TOTAL
Arsenic	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x		x	25
Barium	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x		x	25
Beryllium	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x		x	25
Boron	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x		x	25
Calcium	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x		x	25
Cobalt	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x		x	25
Copper																						x	x	x	x		x	5
Iron	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x		x	25
Lead	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x		x	25
Lithium	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x		x	25
Magnesium	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x		x	25
Manganese	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x		x	25
Molybdenum	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x		x	25
Selenium	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x		x	25
Zinc																						x	x	x	x		x	5
Chloride	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x		x	25
Fluoride	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x		x	25
Sulfate	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x		x	25
TDS	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x		x	25
TSS	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x		x	25
Field Parameters																												
pH	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x			24
Conductance	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x			24
Dissolved Oxygen	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x			24
Temperature	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x			24
ORP	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x			24
Groundwater or Leachate Elevation	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x			24
Leachate or Surface Water Depth																		x	x	x		x	x	x	x			7
Well Depth	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x			24
Turbidity	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x			24
Color	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x			24
Odor	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x			24

Notes X = Monitoring point is sampled for this parameter

I \25223064.00\Data and Calculations\Field Work Requests\September 2023\[Marshalltown Sampling Detail_September 2023 xls]Sheet1

Login Sample Receipt Checklist

Client: SCS Engineers

Job Number: 310-265481-1
SDG Number: 25223064

Login Number: 265481
List Number: 1
Creator: Muehling, Angela C

List Source: Eurofins Cedar Falls

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	False	Rec'd MW-22, not MW-23, & SW-3, not SW-2
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Groundwater Monitoring Results - Field Parameters
Marshalltown Closed Landfill / SCS Engineers Project #25223064.00
September 2023

Sample	Sample Date	GW Elevation (feet amsl)	Leachate Elevation (ft amsl)	Surface Water Depth (ft)	Temperature (Deg. C)	pH (Std. Units)	Specific Conductivity (µs/cm)	Turbidity (NTU)
MW-3	9/21/2023	866.65	--	--	15.3	7.01	799	34.71
MW-4	9/21/2023	869.90	--	--	12.8	6.86	778	3.95
MW-5	9/21/2023	873.94	--	--	12.6	6.29	392.4	3.12
MW-7	9/20/2023	874.07	--	--	13.3	7.19	646	8.57
MW-8	9/21/2023	876.46	--	--	12.3	7.10	661	116.9
MW-9	9/21/2023	907.19	--	--	15.3	6.76	647	6.20
MW-10	9/18/2023	924.78	--	--	12.4	6.93	629	2.17
MW-11AR	9/20/2023	DRY	--	--	--	--	--	--
MW-13	9/20/2023	906.96	--	--	14.9	6.92	803	7.61
MW-14	9/20/2023	915.28	--	--	14.3	7.13	693	20.04
MW-18	9/20/2023	900.23	--	--	12.0	6.73	819	5.82
MW-19	9/21/2023	874.12	--	--	18.2	7.03	652	4.44
MW-20	9/20/2023	870.66	--	--	14.1	7.10	867	3.74
MW-21	9/21/2023	869.99	--	--	14.0	6.95	692	98.7
MW-22	9/18/2023	DRY	--	--	--	--	--	--
MW-23	9/18/2023	914.07	--	--	16.9	6.85	725	2.95
Leachate Collection Tank	--	--	DRY	--	--	--	--	--
SW-1	9/20/2023	--	--	2.00	25.6	8.20	548	18
SW-2	9/21/2023	--	--	0.50	24.1	8.00	506	17.40
SW-3	--	--	--	DRY	--	--	--	--
LW-1	9/22/2023	--	892.99	--	19.5	7.11	846	53.18
LW-2	--	--	DRY	--	--	--	--	--
LW-3	--	--	DRY	--	--	--	--	--
LW-4	--	--	DRY	--	--	--	--	--
GWGCS	--	--	DRY	--	--	--	--	--

Abbreviations:
mg/L = milligrams per liter
mV = millivolts
amsl = above mean sea level
-- = not measured

Notes:
None

Created by: NDK Date: 10/6/2021
Last revision by: RM Date: 9/29/2023
Checked by: NLB Date: 10/2/2023

C:\Users\hld0\AppData\Local\Microsoft\Windows\INetCache\Content.Outlook\USG3GGGC\[2309_Marshalltown_Field.xlsx]GW Field Parameters

Appendix D

Summary of Groundwater Chemistry – Pre-2019

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

ARSENIC
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	MW-03	MW-04	MW-05	MW-07	MW-08	MW-09	MW-10	MW-11AR	MW-13	MW-14	MW-18	MW-19	MW-20
ARSENIC, DISSOLVED	1993-Sep						<5	<5		<5	<5	<5		<5
ARSENIC, DISSOLVED	1994-Feb	<5	<5	<5	<5	<5	<5	<5		<5	<5	<5	<5	11
ARSENIC, DISSOLVED	1994-Apr	<5	<5	<5	<5	<5	<5	<5		<5	<5	<5	<5	<5
ARSENIC, DISSOLVED	1994-Jul	<5	<5	<5	<5	<5	<5	<5		<5	<5	<5	<5	<5
ARSENIC, DISSOLVED	1994-Oct	<5	<5	<5	<5	<5	<5	<5		<5	<5	<5	<5	<5
ARSENIC, DISSOLVED	1995-Apr													<5
ARSENIC, DISSOLVED	1996-Apr													1.4
ARSENIC, DISSOLVED	1996-Oct													<5
ARSENIC, DISSOLVED	1997-Apr													1
ARSENIC, DISSOLVED	1997-Oct													1.9
ARSENIC, DISSOLVED	1998-Apr													<1
ARSENIC, DISSOLVED	1998-Oct													<1
ARSENIC, DISSOLVED	1999-Sep													<1
ARSENIC, DISSOLVED	2000-Sep	<1	4.2	<1	<1	<1	<1	<1		<1	<1	<1	<1	<1
ARSENIC, DISSOLVED	2001-Sep	<1	3.6	<1	<1	<1	<1	<1		<1	<1	<1	<1	<1
ARSENIC, DISSOLVED	2002-Sep	<1	3.1	<1	<1	<1	<1	<1		<1	<1	<1	<1	<1
ARSENIC, DISSOLVED	2003-Sep	<1	2.9	<1	<1	<1	<1	<1		<1	<1	<1	<1	<1
ARSENIC, DISSOLVED	2004-Sep	<1	3.5	2.2	<1	<1	<1	<1		<1	<1	1.7	<1	<1
ARSENIC, DISSOLVED	2005-Sep	<1	3	<1	<1	<1	<1	<1	<1	1.9	1.5	<1	1.6	<1
ARSENIC, DISSOLVED	2006-Sep	<1	2.12	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ARSENIC, DISSOLVED	2007-Sep	<1	2.99	3.24	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ARSENIC, DISSOLVED	2008-Sep	<1	3.15	4.29	<1	<1	1.41	<1	<1	<1	<1	<1	<1	<1
ARSENIC, DISSOLVED	2009-Sep	<1	4.27	3.06	<1	<1	1.33	<1	<1	<1	<1	1.08	<1	<1
ARSENIC, DISSOLVED	2010-Sep	<1	2.32	1.35	<1	<1	<1	<1	<1	<1	<1	1.87	<1	<1
ARSENIC, DISSOLVED	2011-Sep	<2	3.72	<1	<1	<1	<2	<2	<2	<2	<2	<2	<1	<2
ARSENIC, DISSOLVED	2012-Sep	<2	1.44	1.33	<2	<1	<2	<2	<1	<2	<2	<2	<2	<1
ARSENIC, DISSOLVED	2013-Apr													
ARSENIC, DISSOLVED	2013-Sep	<1	2.6	1.2	<1	<1	<1	<1	<1	<1	<1	<1	<1	2.9
ARSENIC, DISSOLVED	2014-Sep	<1	2.4	7.3	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.1
ARSENIC, DISSOLVED	2015-Sep	1.3	3.1	2.7	<1	<1	1.1	<1	1.1	<1	<1	1.3	<1	5.3
ARSENIC, DISSOLVED	2016-Sep			0.24		0.4		0.13						1
ARSENIC	2013-Sep													
ARSENIC	2014-Sep													
ARSENIC	2015-Sep													
ARSENIC	2016-Sep	0.52	6	4.2	0.25	0.63	0.55	0.14	0.94	0.38	0.64	1.2	0.26	1.3
ARSENIC	2017-Sep	0.68	5.9	1.2	0.32	0.29	0.26	0.17	<0.052	0.16	1.6	0.32	0.41	1.4
ARSENIC	2018-Sep	0.35	18.7	2.1	0.38	0.55	0.3	0.36	1.7	0.33	0.38	4.4	0.41	1.2

GW Standard:
MCL = 10

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

ARSENIC
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	MW-21	MW-22	MW-23	GWGCS	SW-01	SW-02	SW-03	LW-01	LW-02	LW-03	LW-04	LEACHATE TANK
ARSENIC, DISSOLVED	1993-Sep		<5	<5									
ARSENIC, DISSOLVED	1994-Feb	5	7	<5									
ARSENIC, DISSOLVED	1994-Apr	<5	<5	<5									
ARSENIC, DISSOLVED	1994-Jul	<5	<5	<5									
ARSENIC, DISSOLVED	1994-Oct	<5	<5	<5									
ARSENIC, DISSOLVED	1995-Apr		<5										
ARSENIC, DISSOLVED	1996-Apr		<1										
ARSENIC, DISSOLVED	1996-Oct	<5	<5										
ARSENIC, DISSOLVED	1997-Apr												
ARSENIC, DISSOLVED	1997-Oct												
ARSENIC, DISSOLVED	1998-Apr												
ARSENIC, DISSOLVED	1998-Oct												
ARSENIC, DISSOLVED	1999-Sep	1.1	1.2										
ARSENIC, DISSOLVED	2000-Sep	<1	<1	<1									
ARSENIC, DISSOLVED	2001-Sep	<1	<1	<1									
ARSENIC, DISSOLVED	2002-Sep	<1	<1	<1									
ARSENIC, DISSOLVED	2003-Sep	<1	<1	<1									
ARSENIC, DISSOLVED	2004-Sep	<1	<1	<1									
ARSENIC, DISSOLVED	2005-Sep	<1	<1	<1									
ARSENIC, DISSOLVED	2006-Sep	<1	<1	<2									
ARSENIC, DISSOLVED	2007-Sep	<1	<1	<1									
ARSENIC, DISSOLVED	2008-Sep	<1	<1	<1									
ARSENIC, DISSOLVED	2009-Sep	<1	<1	<1									
ARSENIC, DISSOLVED	2010-Sep	<1	<1	<2									
ARSENIC, DISSOLVED	2011-Sep	<2	<2	<6									
ARSENIC, DISSOLVED	2012-Sep	<2		<1	<1	1.95	<1						1.94
ARSENIC, DISSOLVED	2013-Apr				<1							39.3	5.48
ARSENIC, DISSOLVED	2013-Sep	<1	1	<1		1	<1						
ARSENIC, DISSOLVED	2014-Sep	<1	<1	<1	<1	<1	<1						
ARSENIC, DISSOLVED	2015-Sep	1.5	2	<1	1.1	1.8	1.6						
ARSENIC, DISSOLVED	2016-Sep												
ARSENIC	2013-Sep				<1								4.9
ARSENIC	2014-Sep								3.2				2.6
ARSENIC	2015-Sep								5.4				2.2
ARSENIC	2016-Sep	0.8	0.41	0.32		0.57	0.76		45.2				8.9
ARSENIC	2017-Sep	0.58	0.58	0.29	0.22	1.4	3.2		6.8				52
ARSENIC	2018-Sep	0.57	0.49	0.25	0.27	0.76	0.86		2.6				72.7

GW Standard:
MCL = 10

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

BARIUM
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	MW-03	MW-04	MW-05	MW-07	MW-08	MW-09	MW-10	MW-11AR	MW-13	MW-14	MW-18	MW-19	MW-20
BARIUM, DISSOLVED	1993-Sep						<500	<500		<500	<500	<500		<500
BARIUM, DISSOLVED	1994-Apr	<500	<500	<500	<500	<500	<500	<500		<500	<500	<500	<500	<500
BARIUM, DISSOLVED	1994-Feb	<500	<500	<500	<500	<500	<500	<500		<500	<500	<500	<500	<500
BARIUM, DISSOLVED	1994-Jul	123	107	142	118	154	118	150		131	97	94	139	76
BARIUM, DISSOLVED	1994-Oct	106	104	116	121	160	106	152		128	96	87	140	74
BARIUM, DISSOLVED	1999-Sep	93	88	109	107	145	108	157		122	85	81	118	97
BARIUM, DISSOLVED	2000-Sep	89	79	68	102	128	128	150		110	56	99	117	80
BARIUM, DISSOLVED	2001-Sep	106	94	63	105	137	125	130		119	60	152	118	93
BARIUM, DISSOLVED	2002-Sep	98	84	74	110	126	136	154		104	70	157	121	79
BARIUM, DISSOLVED	2003-Sep	98	82	69	108	128	147	143		111	73	74	122	90
BARIUM, DISSOLVED	2004-Sep	115	96	78	105	129	146	129		106	72	265	116	95
BARIUM, DISSOLVED	2005-Sep	116	96	72	104	128	133	155	44	98	57	150	148	95
BARIUM, DISSOLVED	2006-Sep	110	93.1	86.2	116	126	164	169	26.8	72.6	67.5	81.5	117	91
BARIUM, DISSOLVED	2007-Sep	117	107	74.5	113	137	173	134	25.8	92.9	68.5	119	116	104
BARIUM, DISSOLVED	2008-Sep	114	112	104	113	167	176	143	28.4	94.5	70.7	167	118	109
BARIUM, DISSOLVED	2009-Sep	123	103	102	107	149	160	143	24.8	95.4	65.1	182	117	105
BARIUM, DISSOLVED	2010-Sep	124	92.6	113	108	150	170	136	22.4	72.1	63.7	173	110	92.2
BARIUM, DISSOLVED	2011-Sep	117	106	125	107	158	159	143	24.7	104	64.6	208	118	239
BARIUM, DISSOLVED	2012-Sep	124	95.1	161	119	154	168	171	31.4	100	70.2	117	135	96
BARIUM, DISSOLVED	2013-Apr													
BARIUM, DISSOLVED	2013-Sep	147	100	113	109	150	201	135	31.5	89.4	58.8	171	121	114
BARIUM, DISSOLVED	2014-Sep	105	104	197	104	133	181	132	23.2	55.3	66.4	<10	119	85.5
BARIUM, DISSOLVED	2015-Sep	113	110	110	116	126	174	121	28.6	78.7	59.5	154	118	117
BARIUM, DISSOLVED	2016-Sep			170		110		150						96
BARIUM	2013-Sep													
BARIUM	2014-Sep													
BARIUM	2015-Sep													
BARIUM	2016-Sep	123	114	183	106	114	158	151	30.1	91.2	62.1	176	123	96.5
BARIUM	2017-Sep	112	102	118	110	135	138	149	<0.095	101	108	200	124	99.1
BARIUM	2018-Sep	123	187	143	98.9	118	157	131	35.6	90.4	55.1	242	122	87.3

GW Standard:
MCL = 2000

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

BARIUM
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	MW-21	MW-22	MW-23	GWGCS	SW-01	SW-02	SW-03	LW-01	LW-02	LW-03	LW-04	LEACHATE TANK
BARIUM, DISSOLVED	1993-Sep		<500	<500									
BARIUM, DISSOLVED	1994-Apr	<500	<500	<500									
BARIUM, DISSOLVED	1994-Feb	<500	<500	<500									
BARIUM, DISSOLVED	1994-Jul	108	87	<50									
BARIUM, DISSOLVED	1994-Oct	108	61	20									
BARIUM, DISSOLVED	1999-Sep	89	46	17									
BARIUM, DISSOLVED	2000-Sep	71	47	38									
BARIUM, DISSOLVED	2001-Sep	80	39	26									
BARIUM, DISSOLVED	2002-Sep	88	41	27									
BARIUM, DISSOLVED	2003-Sep	87	36	26									
BARIUM, DISSOLVED	2004-Sep	82	46	37									
BARIUM, DISSOLVED	2005-Sep	77	47	28									
BARIUM, DISSOLVED	2006-Sep	93.8	50	15.8									
BARIUM, DISSOLVED	2007-Sep	97.1	55	57.3									
BARIUM, DISSOLVED	2008-Sep	113	52.9	31.1									
BARIUM, DISSOLVED	2009-Sep	104	52.2	77									
BARIUM, DISSOLVED	2010-Sep	86.8	66.2	55.1									
BARIUM, DISSOLVED	2011-Sep	97.3	46.1	25.1									
BARIUM, DISSOLVED	2012-Sep	94.5		12.4	27.1	54.7	108						31.4
BARIUM, DISSOLVED	2013-Apr				54.2							13300	21.5
BARIUM, DISSOLVED	2013-Sep	91	41	77.6		139	148						
BARIUM, DISSOLVED	2014-Sep	81.5	80	51.4	55.8	183	163						
BARIUM, DISSOLVED	2015-Sep	103	60.8	91.8	52	178	157						
BARIUM, DISSOLVED	2016-Sep												
BARIUM	2013-Sep				43.1								30.2
BARIUM	2014-Sep								112				29.7
BARIUM	2015-Sep								143				42.4
BARIUM	2016-Sep	104	93.8	94.2		180	198		859				151
BARIUM	2017-Sep	91.3	40.9	57	38.4	116	441		181				951 M1
BARIUM	2018-Sep	89.8	79.6	60	55	174	180		134				952

GW Standard:
MCL = 2000

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

BERYLLIUM
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	MW-03	MW-04	MW-05	MW-07	MW-08	MW-09	MW-10	MW-11AR	MW-13	MW-14
BERYLLIUM, DISSOLVED	1999-Sep	<10	<10	<10	<10	<10	<10	<10		<10	<10
BERYLLIUM, DISSOLVED	2000-Sep	<10	<10	<10	<10	<10	<10	<10		<10	<10
BERYLLIUM, DISSOLVED	2001-Sep	<10	<10	<10	<10	<10	<10	<10		<10	<10
BERYLLIUM, DISSOLVED	2002-Sep	<10	<10	<10	<10	<10	<10	<10		<10	<10
BERYLLIUM, DISSOLVED	2003-Sep	<10	<10	<10	<10	<10	<10	<10		<10	<10
BERYLLIUM, DISSOLVED	2004-Sep	<10	<10	<10	<10	<10	<10	<10		<10	<10
BERYLLIUM, DISSOLVED	2005-Sep	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
BERYLLIUM, DISSOLVED	2006-Sep	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
BERYLLIUM, DISSOLVED	2007-Sep	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
BERYLLIUM, DISSOLVED	2008-Sep	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
BERYLLIUM, DISSOLVED	2009-Sep	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
BERYLLIUM, DISSOLVED	2010-Sep	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
BERYLLIUM, DISSOLVED	2011-Sep	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
BERYLLIUM, DISSOLVED	2012-Sep	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BERYLLIUM, DISSOLVED	2013-Apr										
BERYLLIUM, DISSOLVED	2013-Sep	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
BERYLLIUM, DISSOLVED	2014-Sep	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
BERYLLIUM, DISSOLVED	2015-Sep	<0.4	<0.4	0.48	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
BERYLLIUM, DISSOLVED	2016-Sep			<0.08		<0.08		<0.08			
BERYLLIUM	2013-Sep										
BERYLLIUM	2014-Sep										
BERYLLIUM	2015-Sep										
BERYLLIUM	2016-Sep	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
BERYLLIUM	2017-Sep	0.018	0.012	<0.012	<0.012	<0.012	0.02	<0.012	<0.012	<0.012	0.15
BERYLLIUM	2018-Sep	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	0.17	<0.12	<0.12	<0.12

GW Standard:
MCL = 4

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

BERYLLIUM
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	MW-18	MW-19	MW-20	MW-21	MW-22	MW-23	GWGCS	SW-01	SW-02	SW-03
BERYLLIUM, DISSOLVED	1999-Sep	<10	<10	<10	<10	<10	<10				
BERYLLIUM, DISSOLVED	2000-Sep	<10	<10	<10	<10	<10	<10				
BERYLLIUM, DISSOLVED	2001-Sep	<10	<10	<10	<10	<10	<10				
BERYLLIUM, DISSOLVED	2002-Sep	<10	<10	<10	<10	<10	<10				
BERYLLIUM, DISSOLVED	2003-Sep	<10	<10	<10	<10	<10	<10				
BERYLLIUM, DISSOLVED	2004-Sep	<10	<10	<10	<10	<10	<10				
BERYLLIUM, DISSOLVED	2005-Sep	<10	<10	<10	<10	<10	<10				
BERYLLIUM, DISSOLVED	2006-Sep	<10	<10	<10	<10	<10	<10				
BERYLLIUM, DISSOLVED	2007-Sep	<10	<10	<10	<10	<10	<10				
BERYLLIUM, DISSOLVED	2008-Sep	<10	<10	<10	<10	<10	<10				
BERYLLIUM, DISSOLVED	2009-Sep	<10	<10	<10	<10	<10	<10				
BERYLLIUM, DISSOLVED	2010-Sep	<10	<10	<10	<10	<10	11.7				
BERYLLIUM, DISSOLVED	2011-Sep	<10	<10	<10	<10	<10	<10				
BERYLLIUM, DISSOLVED	2012-Sep	<1	<1	<1	<1		<1	<1	<1	<1	
BERYLLIUM, DISSOLVED	2013-Apr							<1			
BERYLLIUM, DISSOLVED	2013-Sep	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4		<0.4	<0.4	
BERYLLIUM, DISSOLVED	2014-Sep	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	
BERYLLIUM, DISSOLVED	2015-Sep	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	
BERYLLIUM, DISSOLVED	2016-Sep			<0.08							
BERYLLIUM	2013-Sep							<0.4			
BERYLLIUM	2014-Sep										
BERYLLIUM	2015-Sep										
BERYLLIUM	2016-Sep	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08		<0.08	<0.08	
BERYLLIUM	2017-Sep	<0.012	<0.012	<0.012	0.015	<0.012	<0.012	<0.012	0.021	0.21	
BERYLLIUM	2018-Sep	0.13	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	

GW Standard:
MCL = 4

IPL Marshalltown East and West Closed Landfills
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BERYLLIUM
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	LW-01	LW-02	LW-03	LW-04	LEACHATE TANK
BERYLLIUM, DISSOLVED	1999-Sep					
BERYLLIUM, DISSOLVED	2000-Sep					
BERYLLIUM, DISSOLVED	2001-Sep					
BERYLLIUM, DISSOLVED	2002-Sep					
BERYLLIUM, DISSOLVED	2003-Sep					
BERYLLIUM, DISSOLVED	2004-Sep					
BERYLLIUM, DISSOLVED	2005-Sep					
BERYLLIUM, DISSOLVED	2006-Sep					
BERYLLIUM, DISSOLVED	2007-Sep					
BERYLLIUM, DISSOLVED	2008-Sep					
BERYLLIUM, DISSOLVED	2009-Sep					
BERYLLIUM, DISSOLVED	2010-Sep					
BERYLLIUM, DISSOLVED	2011-Sep					
BERYLLIUM, DISSOLVED	2012-Sep					<1
BERYLLIUM, DISSOLVED	2013-Apr				<5	<1
BERYLLIUM, DISSOLVED	2013-Sep					
BERYLLIUM, DISSOLVED	2014-Sep					
BERYLLIUM, DISSOLVED	2015-Sep					
BERYLLIUM, DISSOLVED	2016-Sep					
BERYLLIUM	2013-Sep					<0.4
BERYLLIUM	2014-Sep	<0.4				<0.4
BERYLLIUM	2015-Sep	<0.4				<0.4
BERYLLIUM	2016-Sep	2.6				0.6
BERYLLIUM	2017-Sep	0.26				6.4 M1
BERYLLIUM	2018-Sep	<0.12				5.6

GW Standard:
MCL = 4

IPL Marshalltown East and West Closed Landfills
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BORON
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	MW-03	MW-04	MW-05	MW-07	MW-08	MW-09	MW-10	MW-11AR	MW-13	MW-14
BORON, DISSOLVED	2009-Sep	535	3980	717	<100	<100	<100	<100	493	<100	400
BORON, DISSOLVED	2010-Sep	584	2940	858	120	<100	<100	<100	1140	113	414
BORON, DISSOLVED	2011-Sep	432	4920	687	<100	<100	<100	<100	801	<100	143
BORON, DISSOLVED	2012-Sep	539	4070	599	<100	<100	<100	<100	605	<100	222
BORON, DISSOLVED	2013-Apr										
BORON, DISSOLVED	2013-Sep	1020	3290	521	<100	<100	<100	<100	388	<100	400
BORON, DISSOLVED	2014-Sep	505	3020	458	125	<100	<100	<100	628	428	535
BORON, DISSOLVED	2015-Sep	687	3890	499	<100	<100	<100	<100	686	<100	232
BORON, DISSOLVED	2016-Sep			460		<50		<50			
BORON	2013-Sep										
BORON	2014-Sep										
BORON	2015-Sep										
BORON	2016-Sep	740	3940	444	126	<50	<50	<50	650	50.2	282
BORON	2017-Sep	700	4810	440	49	37.6	17.2	14.1	755	48.6	169
BORON	2018-Sep	616	3710	490	228	<12.5	<12.5	<12.5	443	41.4	651

GW Standard:
None

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

BORON
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	MW-18	MW-19	MW-20	MW-21	MW-22	MW-23	GWGCS	SW-01	SW-02	SW-03
BORON, DISSOLVED	2009-Sep	<100	<100	5180	4640	2000	<100				
BORON, DISSOLVED	2010-Sep	118	225	5590	1840	1850	<100				
BORON, DISSOLVED	2011-Sep	121	<100	4960	4060	1940	<100				
BORON, DISSOLVED	2012-Sep	539	<100	3820	1000		<100	<100	<100	<100	
BORON, DISSOLVED	2013-Apr							126			
BORON, DISSOLVED	2013-Sep	<100	<100	4920	2630	1380	<100		<100	<100	
BORON, DISSOLVED	2014-Sep	<100	566	3070	974	1230	<100	128	<100	549	
BORON, DISSOLVED	2015-Sep	<100	111	5020	3430	1720	<100	119	<100	373	
BORON, DISSOLVED	2016-Sep			3900							
BORON	2013-Sep							<100			
BORON	2014-Sep										
BORON	2015-Sep										
BORON	2016-Sep	53.8	226	3870	1870	2450	70.1		<50	289	
BORON	2017-Sep	57	44.7	4860	3580	1600	47	91.2	46.6	67.4	
BORON	2018-Sep	21.6	645	3310	1270	1330	42.9	70.5	<12.5	<12.5	

GW Standard:
None

IPL Marshalltown East and West Closed Landfills
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BORON
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	LW-01	LW-02	LW-03	LW-04	LEACHATE TANK
BORON, DISSOLVED	2009-Sep					
BORON, DISSOLVED	2010-Sep					
BORON, DISSOLVED	2011-Sep					
BORON, DISSOLVED	2012-Sep					378
BORON, DISSOLVED	2013-Apr				1360	393
BORON, DISSOLVED	2013-Sep					
BORON, DISSOLVED	2014-Sep					
BORON, DISSOLVED	2015-Sep					
BORON, DISSOLVED	2016-Sep					
BORON	2013-Sep					333
BORON	2014-Sep	1030				305
BORON	2015-Sep	272				272
BORON	2016-Sep	378				216
BORON	2017-Sep	309				266
BORON	2018-Sep	1390				295

GW Standard:
None

IPL Marshalltown East and West Closed Landfills
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COBALT
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	MW-03	MW-04	MW-05	MW-07	MW-08	MW-09	MW-10	MW-11AR	MW-13	MW-14
COBALT, DISSOLVED	1999-Sep	<20	<20	<20	<20	<20	<20	<20		<20	<20
COBALT, DISSOLVED	2000-Sep	<20	<20	<20	<20	<20	<20	<20		<20	<20
COBALT, DISSOLVED	2001-Sep	<20	<20	<20	<20	<20	<20	<20		<20	<20
COBALT, DISSOLVED	2002-Sep	<20	<20	<20	<20	<20	<20	<20		<20	<20
COBALT, DISSOLVED	2003-Sep	<20	<20	<20	<20	<20	<20	<20		<20	<20
COBALT, DISSOLVED	2004-Sep	<20	<20	<20	<20	<20	<20	<20		<20	<20
COBALT, DISSOLVED	2005-Sep	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
COBALT, DISSOLVED	2006-Sep	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
COBALT, DISSOLVED	2007-Sep	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
COBALT, DISSOLVED	2008-Sep	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
COBALT, DISSOLVED	2009-Sep	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
COBALT, DISSOLVED	2010-Sep	<1.55	6.25 J	7.07 J	<1.55	3.62 J	6.61 J	4.44 J	3.82 J	3.42 J	3.56 J
COBALT, DISSOLVED	2011-Sep	<1.55	<1.55	<1.55	<1.55	<1.55	<1.55	<1.55	1.75 J	<1.55	<1.55
COBALT, DISSOLVED	2012-Sep	<1.55	<1.55	1.93 J	<1.55	3.63 J	<1.55	<1.55	<1.55	<1.55	<1.55
COBALT, DISSOLVED	2013-Apr										
COBALT, DISSOLVED	2013-Sep	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
COBALT, DISSOLVED	2014-Sep	<5	<5	27.3	<5	<5	<5	<5	<5	<5	<5
COBALT, DISSOLVED	2015-Sep	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
COBALT, DISSOLVED	2016-Sep			<0.5		<0.5		<0.5			
COBALT	2013-Sep										
COBALT	2014-Sep										
COBALT	2015-Sep										
COBALT	2016-Sep	<0.5	<0.5	1	<0.5	<0.5	2	<0.5	1.7	1.2	1.3
COBALT	2017-Sep	0.22	0.42	4.1	0.027	0.051	0.43	0.05	<0.014	0.15	3
COBALT	2018-Sep	<0.15	0.56	4.3	<0.15	0.15	1.4	0.76	1	0.52	0.5

GW Standard:
None

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

COBALT
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	MW-18	MW-19	MW-20	MW-21	MW-22	MW-23	GWGCS	SW-01	SW-02	SW-03
COBALT, DISSOLVED	1999-Sep	<20	<20	<20	<20	<20	<20				
COBALT, DISSOLVED	2000-Sep	<20	<20	<20	<20	<20	<20				
COBALT, DISSOLVED	2001-Sep	<20	<20	<20	<20	<20	<20				
COBALT, DISSOLVED	2002-Sep	<20	<20	<20	<20	<20	<20				
COBALT, DISSOLVED	2003-Sep	<20	<20	<20	<20	<20	<20				
COBALT, DISSOLVED	2004-Sep	<20	<20	<20	<20	<20	<20				
COBALT, DISSOLVED	2005-Sep	<20	<20	<20	<20	<20	<20				
COBALT, DISSOLVED	2006-Sep	<20	<20	<20	<20	<20	<20				
COBALT, DISSOLVED	2007-Sep	<20	<20	<20	<20	<20	<20				
COBALT, DISSOLVED	2008-Sep	<20	<20	<20	<20	<20	<20				
COBALT, DISSOLVED	2009-Sep	<20	<20	<20	<20	<20	<20				
COBALT, DISSOLVED	2010-Sep	4.67 J	7.21 J	4.6 J	3.95 J	2.41 J	<1.55				
COBALT, DISSOLVED	2011-Sep	3.35 J	<1.55	<1.55	<1.55	<1.55	<1.55				
COBALT, DISSOLVED	2012-Sep	1.97 J	<1.55	<1.55	<1.55		3.24 J	<1.55	<1.55	<1.55	
COBALT, DISSOLVED	2013-Apr							<7			
COBALT, DISSOLVED	2013-Sep	5.3	<5	<5	<5	<5	<5		<5	<5	
COBALT, DISSOLVED	2014-Sep	<5	<5	<5	<5	<5	<5	<5	<5	<5	
COBALT, DISSOLVED	2015-Sep	<5	<5	<5	<5	<5	<5	<5	<5	<5	
COBALT, DISSOLVED	2016-Sep			<0.5							
COBALT	2013-Sep							<5			
COBALT	2014-Sep										
COBALT	2015-Sep										
COBALT	2016-Sep	3.1	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	
COBALT	2017-Sep	1	0.22	0.09	0.16	0.19	0.036	0.1	0.45	3.4	
COBALT	2018-Sep	20.4	0.21	0.16	0.21	<0.15	<0.15	0.16	0.49	0.4	

GW Standard:
None

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

COBALT
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	LW-01	LW-02	LW-03	LW-04	LEACHATE TANK
COBALT, DISSOLVED	1999-Sep					
COBALT, DISSOLVED	2000-Sep					
COBALT, DISSOLVED	2001-Sep					
COBALT, DISSOLVED	2002-Sep					
COBALT, DISSOLVED	2003-Sep					
COBALT, DISSOLVED	2004-Sep					
COBALT, DISSOLVED	2005-Sep					
COBALT, DISSOLVED	2006-Sep					
COBALT, DISSOLVED	2007-Sep					
COBALT, DISSOLVED	2008-Sep					
COBALT, DISSOLVED	2009-Sep					
COBALT, DISSOLVED	2010-Sep					
COBALT, DISSOLVED	2011-Sep					
COBALT, DISSOLVED	2012-Sep					<1.55
COBALT, DISSOLVED	2013-Apr				164	<7
COBALT, DISSOLVED	2013-Sep					
COBALT, DISSOLVED	2014-Sep					
COBALT, DISSOLVED	2015-Sep					
COBALT, DISSOLVED	2016-Sep					
COBALT	2013-Sep					<5
COBALT	2014-Sep	<5				<5
COBALT	2015-Sep	12.1				<5
COBALT	2016-Sep	140				5.8
COBALT	2017-Sep	13.3				71.2
COBALT	2018-Sep	6.3				54.5

GW Standard:
None

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

COPPER
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	MW-03	MW-04	MW-05	MW-07	MW-08	MW-09	MW-10	MW-11AR	MW-13	MW-14
COPPER, DISSOLVED	1993-Sep						<50	<50		<50	<50
COPPER, DISSOLVED	1994-Feb	<50	<50	<50	<50	<50	<50	<50		<50	<50
COPPER, DISSOLVED	1994-Apr	<50	<50	<50	<50	<50	<50	<50		<50	<50
COPPER, DISSOLVED	1994-Jul	<20	<20	<20	<20	<20	<20	<20		<20	<20
COPPER, DISSOLVED	1994-Oct	<20	<20	<20	<20	<20	<20	<20		<20	<20
COPPER, DISSOLVED	1999-Sep										
COPPER, DISSOLVED	2000-Sep										
COPPER, DISSOLVED	2001-Sep										
COPPER, DISSOLVED	2002-Sep										
COPPER, DISSOLVED	2004-Sep	<20	<20	<20	<20	<20	<20	<20		<20	<20
COPPER, DISSOLVED	2005-Sep	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
COPPER, DISSOLVED	2006-Sep	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
COPPER, DISSOLVED	2007-Sep	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
COPPER, DISSOLVED	2008-Sep	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
COPPER, DISSOLVED	2009-Sep	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
COPPER, DISSOLVED	2010-Sep	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
COPPER, DISSOLVED	2011-Sep	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
COPPER, DISSOLVED	2012-Sep	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
COPPER, DISSOLVED	2013-Apr										
COPPER, DISSOLVED	2013-Sep	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
COPPER, DISSOLVED	2014-Sep	<10	<10	14.4	<10	<10	<10	<10	<10	<10	<10
COPPER, DISSOLVED	2015-Sep	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
COPPER, DISSOLVED	2016-Sep			0.66		1.1		0.44			
COPPER	2013-Sep										
COPPER	2014-Sep										
COPPER	2015-Sep										
COPPER	2016-Sep	0.69	0.3	2.7	0.94	2	0.42	0.72	2.4	2.7	3.6
COPPER	2017-Sep	2.9	0.98	0.83	0.41	0.8	1.3	0.58	<0.045	0.99	5.5
COPPER	2018-Sep	<0.48	3.3	0.62	0.77	1.1	0.95	2.3	5.9	1.9	2.5

GW Standard:
SMCL = 1000

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

COPPER
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	MW-18	MW-19	MW-20	MW-21	MW-22	MW-23	GWGCS	SW-01	SW-02	SW-03
COPPER, DISSOLVED	1993-Sep	<50		<50		<50	<50				
COPPER, DISSOLVED	1994-Feb	<50	<50	<50	<50	<50	<50				
COPPER, DISSOLVED	1994-Apr	<50	<50	<50	<50	<50	<50				
COPPER, DISSOLVED	1994-Jul	<20	<20	<20	<20	<20	<20				
COPPER, DISSOLVED	1994-Oct	<20	<20	<20	<20	<20	<20				
COPPER, DISSOLVED	1999-Sep										
COPPER, DISSOLVED	2000-Sep										
COPPER, DISSOLVED	2001-Sep										
COPPER, DISSOLVED	2002-Sep										
COPPER, DISSOLVED	2004-Sep	<20	<20	<20	<20	<20	<20				
COPPER, DISSOLVED	2005-Sep	<20	<20	<20	<20	<20	<20				
COPPER, DISSOLVED	2006-Sep	<20	<20	<20	<20	<20	<20				
COPPER, DISSOLVED	2007-Sep	<20	<20	<20	<20	<20	<20				
COPPER, DISSOLVED	2008-Sep	<20	<20	<20	<20	<20	<20				
COPPER, DISSOLVED	2009-Sep	<20	<20	<20	<20	<20	<20				
COPPER, DISSOLVED	2010-Sep	<20	<20	<20	<20	<20	<20				
COPPER, DISSOLVED	2011-Sep	<20	<20	<20	<20	<20	<20				
COPPER, DISSOLVED	2012-Sep	<20	<20	<20	<20		<20	<20	<20	<20	
COPPER, DISSOLVED	2013-Apr							<20			
COPPER, DISSOLVED	2013-Sep	<10	<10	<10	<10	<10	<10		<10	<10	
COPPER, DISSOLVED	2014-Sep	<10	<10	<10	<10	<10	<10	<10	<10	<10	
COPPER, DISSOLVED	2015-Sep	<10	<10	<10	<10	<10	<10	<10	<10	<10	
COPPER, DISSOLVED	2016-Sep			1							
COPPER	2013-Sep							<10			
COPPER	2014-Sep										
COPPER	2015-Sep										
COPPER	2016-Sep	1.3	0.34	2	1.4	1.1	1.9		0.86	1.1	
COPPER	2017-Sep	1	0.46	1.5	0.74	2.6	1	0.78	0.85	5.6	
COPPER	2018-Sep	13.3	0.59	1.1	0.77	0.59	1.2	<0.48	1	0.79	

GW Standard:
SMCL = 1000

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

COPPER
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	LW-01	LW-02	LW-03	LW-04	LEACHATE TANK
COPPER, DISSOLVED	1993-Sep					
COPPER, DISSOLVED	1994-Feb					
COPPER, DISSOLVED	1994-Apr					
COPPER, DISSOLVED	1994-Jul					
COPPER, DISSOLVED	1994-Oct					
COPPER, DISSOLVED	1999-Sep					
COPPER, DISSOLVED	2000-Sep					
COPPER, DISSOLVED	2001-Sep					
COPPER, DISSOLVED	2002-Sep					
COPPER, DISSOLVED	2004-Sep					
COPPER, DISSOLVED	2005-Sep					
COPPER, DISSOLVED	2006-Sep					
COPPER, DISSOLVED	2007-Sep					
COPPER, DISSOLVED	2008-Sep					
COPPER, DISSOLVED	2009-Sep					
COPPER, DISSOLVED	2010-Sep					
COPPER, DISSOLVED	2011-Sep					
COPPER, DISSOLVED	2012-Sep					<20
COPPER, DISSOLVED	2013-Apr				884	<20
COPPER, DISSOLVED	2013-Sep					
COPPER, DISSOLVED	2014-Sep					
COPPER, DISSOLVED	2015-Sep					
COPPER, DISSOLVED	2016-Sep					
COPPER	2013-Sep					<10
COPPER	2014-Sep	<10				<10
COPPER	2015-Sep	<10				<10
COPPER	2016-Sep	72.4				22.4
COPPER	2017-Sep	9.6				174
COPPER	2018-Sep	4.3				128

GW Standard:
SMCL = 1000

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

IRON
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	MW-03	MW-04	MW-05	MW-07	MW-08	MW-09	MW-10	MW-11AR	MW-13	MW-14	MW-18	MW-19	MW-20	MW-21
IRON, DISSOLVED	1993-Sep						90	<50		50	50	70		<50	
IRON, DISSOLVED	1994-Feb	60	<50	6600	50	60	380	60		500	110	70	<50	60	60
IRON, DISSOLVED	1994-Apr	80	6300	80	50	50	70	80		290	70	250	90	70	90
IRON, DISSOLVED	1994-Jul	<100	4200	<100	<100	<100	<100	<100		<100	<100	<100	<100	<100	<100
IRON, DISSOLVED	1994-Oct	<100	4900	<100	<100	<100	<100	<100		<100	<100	<100	<100	<100	<100
IRON, DISSOLVED	1995-Apr	<100	6400	<100	<100	<100	<100	<100		<100	<100	<100	<100	<100	<100
IRON, DISSOLVED	1995-Oct	<100	3800	<100	<100	<100	<100	<100		<100	<100	<100	<100	<100	<100
IRON, DISSOLVED	1996-Apr	<30	4420	<30	<30	<30	<30	438		<30	<30	<30	<30	74	<30
IRON, DISSOLVED	1996-Oct	54	5350	45	<30	<30	<30	<30		<30	<30	<30	<30	<30	<30
IRON, DISSOLVED	1997-Apr	<100	5500	170	<100	<100	<100	<100		<100	<100	<100	<100	<100	<100
IRON, DISSOLVED	1997-Oct	<100	4900	<100	<100	<100	<100	<100		<100	<100	<100	<100	<100	<100
IRON, DISSOLVED	1998-Apr	<100	6300	250	<100	<100	<100	<100		<100	130	<100	<100	120	<100
IRON, DISSOLVED	1998-Oct	230	5500	1400	160	<100	<100	160		<100	<100	<100	<100	<100	<100
IRON, DISSOLVED	1999-Sep	<100	5600	110	<100	<100	<100	<100		<100	<100	<100	<100	<100	<100
IRON, DISSOLVED	2000-Sep	<100	4700	590	<100	<100	<100	<100		<100	<100	100	<100	<100	<100
IRON, DISSOLVED	2001-Sep	<100	5130	<100	<100	<100	<100	<100		<100	<100	<100	<100	<100	<100
IRON, DISSOLVED	2002-Sep	370	5000	540	110	<100	<100	<100		<100	<100	<100	<100	<100	<100
IRON, DISSOLVED	2003-Sep	<100	3780	130	<100	<100	120	<100		<100	170	<100	<100	<100	<100
IRON, DISSOLVED	2004-Sep	180	4200	700	<100	<100	<100	520		<100	<100	1700	<100	<100	<100
IRON, DISSOLVED	2005-Sep	<100	4900	130	<100	<100	<100	140	<100	<100	<100	110	2700	<100	<100
IRON, DISSOLVED	2006-Sep	<100	4650	701	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
IRON, DISSOLVED	2007-Sep	<100	2970	3840	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
IRON, DISSOLVED	2008-Sep	<100	5370	7310	<100	<100	365	<100	<100	<100	<100	1470	<100	<100	<100
IRON, DISSOLVED	2009-Sep	<100	5000	5570	<100	165	251	108	<100	314	<100	511	<100	<100	<100
IRON, DISSOLVED	2010-Sep	437	3450	4310	115	<100	<100	115	<100	<100	<100	863	<100	118	<100
IRON, DISSOLVED	2011-Sep	<100	4200	1310	<100	<100	157	<100	101	1160	<100	423	<100	<100	<100
IRON, DISSOLVED	2012-Sep	<100	2580	1620	<100	413	<100	<100	<100	432	<100	<100	<100	<100	<100
IRON, DISSOLVED	2013-Apr														
IRON, DISSOLVED	2013-Sep	<50	2710	<50	<50	<50	<50	<50	<50	<50	<50	127	<50	<50	<50
IRON, DISSOLVED	2014-Sep	<50	3500	9870	<50	<50	179	302	78.8	<50	<50	<50	<50	176	<50
IRON, DISSOLVED	2015-Sep	<50	2460	1520	<50	<50	<50	<50	<50	<50	<50	899	<50	<50	<50
IRON, DISSOLVED	2016-Sep			<13		<13		34						<13	
IRON	2013-Sep														
IRON	2014-Sep														
IRON	2015-Sep														
IRON	2016-Sep	362	4640	3530	51.9	820	55.7	126	1080	1240	1770	1170	<12.8	140	1010
IRON	2017-Sep	475	4500	2850	11.9	18.7	357	93.1	<9.6	162	4440	128	162	135	297
IRON	2018-Sep	42.2	12600	1100	41.7	45.2	624	344	993	289	267	6270	101	82.8	195

GW Standard:
SMCL = 300

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

IRON
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	MW-22	MW-23	GWGCS	SW-01	SW-02	SW-03	LW-01	LW-02	LW-03	LW-04	LEACHATE TANK
IRON, DISSOLVED	1993-Sep	120	90									
IRON, DISSOLVED	1994-Feb	1570	<50									
IRON, DISSOLVED	1994-Apr	<50	80									
IRON, DISSOLVED	1994-Jul	<100	<100									
IRON, DISSOLVED	1994-Oct	<100	<100									
IRON, DISSOLVED	1995-Apr	<100	<100									
IRON, DISSOLVED	1995-Oct	<100	<100									
IRON, DISSOLVED	1996-Apr	<30	<30									
IRON, DISSOLVED	1996-Oct	32	<30									
IRON, DISSOLVED	1997-Apr	<100	<100									
IRON, DISSOLVED	1997-Oct	<100	<100									
IRON, DISSOLVED	1998-Apr	<100	<100									
IRON, DISSOLVED	1998-Oct	<100	<100									
IRON, DISSOLVED	1999-Sep	<100	<100									
IRON, DISSOLVED	2000-Sep	120	<100									
IRON, DISSOLVED	2001-Sep	<100	<100									
IRON, DISSOLVED	2002-Sep	<100	<100									
IRON, DISSOLVED	2003-Sep	200	<100									
IRON, DISSOLVED	2004-Sep	<100	<100									
IRON, DISSOLVED	2005-Sep	100	<100									
IRON, DISSOLVED	2006-Sep	<100	<100									
IRON, DISSOLVED	2007-Sep	<100	<100									
IRON, DISSOLVED	2008-Sep	<100	<100									
IRON, DISSOLVED	2009-Sep	<100	<100									
IRON, DISSOLVED	2010-Sep	<100	<100									
IRON, DISSOLVED	2011-Sep	<100	178									
IRON, DISSOLVED	2012-Sep		893	<100	<100	<100						<100
IRON, DISSOLVED	2013-Apr			<100							696	402
IRON, DISSOLVED	2013-Sep	<50	<50		<50	<50						
IRON, DISSOLVED	2014-Sep	<50	77.8	<50	<50	<50						
IRON, DISSOLVED	2015-Sep	<50	<50	<50	<50	<50						
IRON, DISSOLVED	2016-Sep											
IRON	2013-Sep			<50								143
IRON	2014-Sep							248				<50
IRON	2015-Sep							1820				<50
IRON	2016-Sep	54.6	518		471	578		46100				25400
IRON	2017-Sep	139	30.3	68.1	516	4500		3960				140000 M1
IRON	2018-Sep	23.9	34.3	23.5	295	213		819				224000

GW Standard:
SMCL = 300

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

LEAD
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	MW-03	MW-04	MW-05	MW-07	MW-08	MW-09	MW-10	MW-11AR	MW-13	MW-14
LEAD, DISSOLVED	1993-Sep						<5	<5		<5	<5
LEAD, DISSOLVED	1994-Feb	<5	<5	<5	<5	<5	<5	<5		<5	<5
LEAD, DISSOLVED	1994-Apr	<5	<5	<5	<5	<5	<5	<5		<5	<5
LEAD, DISSOLVED	1994-Jul	<5	<5	<5	<5	<5	<5	<5		<5	<5
LEAD, DISSOLVED	1994-Oct	<5	<5	<5	<5	<5	<5	<5		<5	<5
LEAD, DISSOLVED	2004-Sep	<4	<4	<4	<4	<4	<4	<4		<4	<4
LEAD, DISSOLVED	2005-Sep	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
LEAD, DISSOLVED	2006-Sep	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
LEAD, DISSOLVED	2007-Sep	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
LEAD, DISSOLVED	2008-Sep	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
LEAD, DISSOLVED	2009-Sep	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
LEAD, DISSOLVED	2010-Sep	<4	<4	<4	<4	<4	11.4	<4	<4	<4	<4
LEAD, DISSOLVED	2011-Sep	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
LEAD, DISSOLVED	2012-Sep	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
LEAD, DISSOLVED	2013-Apr										
LEAD, DISSOLVED	2013-Sep	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
LEAD, DISSOLVED	2014-Sep	<1	<1	13.8	<1	<1	<1	<1	<1	<1	<1
LEAD, DISSOLVED	2015-Sep	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
LEAD, DISSOLVED	2016-Sep			<0.19		<0.19		<0.19			
LEAD	2013-Sep										
LEAD	2014-Sep										
LEAD	2015-Sep										
LEAD	2016-Sep	0.24	<0.19	1.9	<0.19	0.42	<0.19	<0.19	1	0.71	0.98
LEAD	2017-Sep	0.36	0.18	0.08	0.056	0.053	0.25	0.12	<0.033	0.13	1.9
LEAD	2018-Sep	0.4	1.9	0.38	<0.12	0.14	<0.12	0.55	0.64	0.39	0.42

GW Standard:
MCL = 15

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

LEAD
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	MW-18	MW-19	MW-20	MW-21	MW-22	MW-23	GWGCS	SW-01	SW-02	SW-03
LEAD, DISSOLVED	1993-Sep	<5		<5		5	<5				
LEAD, DISSOLVED	1994-Feb	<5	<5	<5	<5	<5	<5				
LEAD, DISSOLVED	1994-Apr	<5	<5	<5	<5	<5	<5				
LEAD, DISSOLVED	1994-Jul	<5	<5	<5	<5	<5	<5				
LEAD, DISSOLVED	1994-Oct	<5	<5	<5	<5	<5	<5				
LEAD, DISSOLVED	2004-Sep	<4	<4	<4	<4	<4	<4				
LEAD, DISSOLVED	2005-Sep	<4	<4	<4	<4	<4	<4				
LEAD, DISSOLVED	2006-Sep	<4	<4	<4	<4	<4	<4				
LEAD, DISSOLVED	2007-Sep	<4	<4	<4	<4	<4	<4				
LEAD, DISSOLVED	2008-Sep	<4	<4	<4	<4	<4	<4				
LEAD, DISSOLVED	2009-Sep	<4	<4	<4	<4	<4	<4				
LEAD, DISSOLVED	2010-Sep	<4	<4	<4	<4	<4	<4				
LEAD, DISSOLVED	2011-Sep	<4	<4	<4	<4	<4	<4				
LEAD, DISSOLVED	2012-Sep	<4	<4	<4	<4		<4	<4	<4	<4	
LEAD, DISSOLVED	2013-Apr							<4			
LEAD, DISSOLVED	2013-Sep	<1	<1	<1	<1	<1	<1		<1	<1	
LEAD, DISSOLVED	2014-Sep	<1	<1	<1	<1	<1	<1	<1	<1	<1	
LEAD, DISSOLVED	2015-Sep	<1	<1	<1	<1	<1	<1	<1	<1	<1	
LEAD, DISSOLVED	2016-Sep			<0.19							
LEAD	2013-Sep							<1			
LEAD	2014-Sep										
LEAD	2015-Sep										
LEAD	2016-Sep	0.31	<0.19	<0.19	0.77	0.64	0.5		0.34	0.42	
LEAD	2017-Sep	0.1	0.22	0.14	0.23	0.7	0.076	0.14	0.38	4.7	
LEAD	2018-Sep	5.7	0.29	0.22	0.34	<0.12	<0.12	<0.12	0.68	0.43	

GW Standard:
MCL = 15

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

LEAD
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	LW-01	LW-02	LW-03	LW-04	LEACHATE TANK
LEAD, DISSOLVED	1993-Sep					
LEAD, DISSOLVED	1994-Feb					
LEAD, DISSOLVED	1994-Apr					
LEAD, DISSOLVED	1994-Jul					
LEAD, DISSOLVED	1994-Oct					
LEAD, DISSOLVED	2004-Sep					
LEAD, DISSOLVED	2005-Sep					
LEAD, DISSOLVED	2006-Sep					
LEAD, DISSOLVED	2007-Sep					
LEAD, DISSOLVED	2008-Sep					
LEAD, DISSOLVED	2009-Sep					
LEAD, DISSOLVED	2010-Sep					
LEAD, DISSOLVED	2011-Sep					
LEAD, DISSOLVED	2012-Sep					<4
LEAD, DISSOLVED	2013-Apr				23.5	<4
LEAD, DISSOLVED	2013-Sep					
LEAD, DISSOLVED	2014-Sep					
LEAD, DISSOLVED	2015-Sep					
LEAD, DISSOLVED	2016-Sep					
LEAD	2013-Sep					<1
LEAD	2014-Sep	<1				<1
LEAD	2015-Sep	1.9				<1
LEAD	2016-Sep	61.9				8.3
LEAD	2017-Sep	6.3				63.8
LEAD	2018-Sep	0.97				74.4

GW Standard:
MCL = 15

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

MAGNESIUM
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	MW-03	MW-04	MW-05	MW-07	MW-08	MW-09	MW-10	MW-11AR	MW-13	MW-14	MW-18	MW-19	MW-20	MW-21
MAGNESIUM, DISSOLVED	1993-Sep						11000	26000		14000	31000	27000		27000	
MAGNESIUM, DISSOLVED	1994-Feb	18000	30000	32000	21000	25000	19000	32000		22000	29000	24000	24000	27000	27000
MAGNESIUM, DISSOLVED	1994-Apr	24000	56000	38000	36000	42000	22000	30000		36000	37000	27000	32000	39000	27000
MAGNESIUM, DISSOLVED	1994-Jul	20000	35000	36000	22000	25000	17000	30000		23000	26000	22000	23000	24000	24000
MAGNESIUM, DISSOLVED	1994-Oct	17000	32000	20000	22000	24000	15000	29000		21000	24000	22000	24000	24000	27000
MAGNESIUM, DISSOLVED	1995-Apr		36000			20000									
MAGNESIUM, DISSOLVED	1995-Oct		29000												
MAGNESIUM, DISSOLVED	1996-Apr		24000												23000
MAGNESIUM, DISSOLVED	1996-Oct		27400			27100									
MAGNESIUM, DISSOLVED	1997-Apr		28000			23000									20000
MAGNESIUM, DISSOLVED	1997-Oct		24000			26000									23000
MAGNESIUM, DISSOLVED	1998-Apr		22000			18000									16000
MAGNESIUM, DISSOLVED	1998-Oct		25000			25000									23000
MAGNESIUM, DISSOLVED	1999-Sep	14000	24000	23000	19000	24000	14000	26000		22000	26000	18000	20000	24000	23000
MAGNESIUM, DISSOLVED	2000-Sep	15000	23000	18000	20000	25000	17000	27000		21000	26000	20000	22000	23000	22000
MAGNESIUM, DISSOLVED	2001-Sep	16400	23900	14600	19900	24700	14900	23600		22700	27600	28100	20500	21700	21700
MAGNESIUM, DISSOLVED	2002-Sep	15000	22000	15000	20000	23000	17000	28000		23000	25000	31000	21000	22000	22000
MAGNESIUM, DISSOLVED	2003-Sep	15600	22000	18300	20800	23500	16700	26500		23700	26900	36200	21800	22400	22100
MAGNESIUM, DISSOLVED	2004-Sep	17000	23000	16000	20000	22000	19000	23000		22000	27000	31000	21000	23000	23000
MAGNESIUM, DISSOLVED	2005-Sep	18000	23000	13000	20000	23000	16000	27000	43000	21000	28000	27000	22000	22000	23000
MAGNESIUM, DISSOLVED	2006-Sep	17000	20500	16600	21700	21800	19900	29700	72900	12800	25800	31400	20200	22500	21800
MAGNESIUM, DISSOLVED	2007-Sep	17300	22000	14700	19800	21300	19100	22900	64200	21500	25900	29800	20500	23900	24500
MAGNESIUM, DISSOLVED	2008-Sep	17700	23700	18600	21000	25900	19900	24500	55200	22700	28300	19700	21500	26600	27400
MAGNESIUM, DISSOLVED	2009-Sep	19000	22400	17400	20300	25000	19100	25900	49200	22100	27000	24200	21700	24600	25800
MAGNESIUM, DISSOLVED	2010-Sep	17500	19300	19100	19400	23900	18500	24700	37700	15200	26600	17100	19600	25200	20300
MAGNESIUM, DISSOLVED	2011-Sep	16900	21700	19000	20100	27700	18000	23500	41000	20700	25600	23400	21100	22400	24600
MAGNESIUM, DISSOLVED	2012-Sep	16600	20800	22100	20700	24900	19700	27200	51000	22900	26300	26900	21600	21900	21700
MAGNESIUM, DISSOLVED	2013-Apr														
MAGNESIUM, DISSOLVED	2013-Sep	19500	18900	16600	19000	21900	18700	20600	43800	19900	24400	27400	20500	21200	21800
MAGNESIUM, DISSOLVED	2014-Sep	13500	17000	23200	16400	16400	18600	21100	31300	8420	21700	<50	17700	18800	16100
MAGNESIUM, DISSOLVED	2015-Sep	15100	20400	14600	19800	19800	19200	18400	36400	20200	25400	14800	19900	22600	22700
MAGNESIUM, DISSOLVED	2016-Sep			27000		20200		23700						21400	
MAGNESIUM	2013-Sep														
MAGNESIUM	2014-Sep														
MAGNESIUM	2015-Sep														
MAGNESIUM	2016-Sep	15900	18900	26500	18400	19600	16000	23400	35200	19000	25000	16600	19900	21100	20100
MAGNESIUM	2017-Sep	14900	18800	13600	19000	22400	14600	23900	42900	17900	29800	20100	20000	22200	21700
MAGNESIUM	2018-Sep	15400	19700	27300	17400	17400	16000	21200	39300	17600	21600	16400	20200	21500	18100

GW Standard:
None

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

MAGNESIUM
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	MW-22	MW-23	GWGCS	SW-01	SW-02	SW-03	LW-01	LW-02	LW-03	LW-04	LEACHATE TANK
MAGNESIUM, DISSOLVED	1993-Sep	33000	41000									
MAGNESIUM, DISSOLVED	1994-Feb	82000	57000									
MAGNESIUM, DISSOLVED	1994-Apr	64000	44000									
MAGNESIUM, DISSOLVED	1994-Jul	26000	85000									
MAGNESIUM, DISSOLVED	1994-Oct	33000	63000									
MAGNESIUM, DISSOLVED	1995-Apr	26000	44000									
MAGNESIUM, DISSOLVED	1995-Oct											
MAGNESIUM, DISSOLVED	1996-Apr	34000	33000									
MAGNESIUM, DISSOLVED	1996-Oct	35600	25900									
MAGNESIUM, DISSOLVED	1997-Apr	23000	19000									
MAGNESIUM, DISSOLVED	1997-Oct	28000	36000									
MAGNESIUM, DISSOLVED	1998-Apr	21000	7300									
MAGNESIUM, DISSOLVED	1998-Oct	33000	36000									
MAGNESIUM, DISSOLVED	1999-Sep	35000	44000									
MAGNESIUM, DISSOLVED	2000-Sep	37000	37000									
MAGNESIUM, DISSOLVED	2001-Sep	33600	42300									
MAGNESIUM, DISSOLVED	2002-Sep	32000	30000									
MAGNESIUM, DISSOLVED	2003-Sep	37900	34600									
MAGNESIUM, DISSOLVED	2004-Sep	31000	38000									
MAGNESIUM, DISSOLVED	2005-Sep	32000	36000									
MAGNESIUM, DISSOLVED	2006-Sep	29100	33400									
MAGNESIUM, DISSOLVED	2007-Sep	31100	26800									
MAGNESIUM, DISSOLVED	2008-Sep	39900	40800									
MAGNESIUM, DISSOLVED	2009-Sep	35000	20300									
MAGNESIUM, DISSOLVED	2010-Sep	25800	29100									
MAGNESIUM, DISSOLVED	2011-Sep	33800	38100									
MAGNESIUM, DISSOLVED	2012-Sep		56100	42500	20200	22900						20600
MAGNESIUM, DISSOLVED	2013-Apr			421							14500	12200
MAGNESIUM, DISSOLVED	2013-Sep	36900	25400		21800	21400						
MAGNESIUM, DISSOLVED	2014-Sep	19900	13500	34200	24100	23500						
MAGNESIUM, DISSOLVED	2015-Sep	23800	12100	39800	24600	24200						
MAGNESIUM, DISSOLVED	2016-Sep											
MAGNESIUM	2013-Sep			34500								12600
MAGNESIUM	2014-Sep							28500				16600
MAGNESIUM	2015-Sep							29400				15700
MAGNESIUM	2016-Sep	24000	13000		24700	27300		37000				15600
MAGNESIUM	2017-Sep	31200	28900	37900	18000	20600		30100				46600
MAGNESIUM	2018-Sep	22500	7320	36600	25700	23500		22500				23000

GW Standard:
None

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

MANGANESE
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	MW-03	MW-04	MW-05	MW-07	MW-08	MW-09	MW-10	MW-11AR	MW-13	MW-14
MANGANESE, DISSOLVED	1999-Sep	<10	850	215	<10	<10	<10	<10		357	54
MANGANESE, DISSOLVED	2000-Sep	<10	799	324	<10	<10	49	29		69	51
MANGANESE, DISSOLVED	2001-Sep	<10	875	<10	<10	<10	<10	<10		380	42
MANGANESE, DISSOLVED	2002-Sep	<10	826	541	<10	<10	58	34		162	43
MANGANESE, DISSOLVED	2003-Sep	<10	1160	29	<10	<10	134	22		200	90
MANGANESE, DISSOLVED	2004-Sep	15	839	1700	<10	<10	275	67		173	24
MANGANESE, DISSOLVED	2005-Sep	<10	832	809	10	14	45	32	85	73	47
MANGANESE, DISSOLVED	2006-Sep	13.2	727	952	13	10.2	113	78	155	35.7	23
MANGANESE, DISSOLVED	2007-Sep	10	696	1050	<10	<10	147	<10	120	194	20.1
MANGANESE, DISSOLVED	2008-Sep	20.9	618	1030	<10	152	417	15.4	103	68.9	25.1
MANGANESE, DISSOLVED	2009-Sep	14.8	745	502	<10	551	199	13.1	99	160	78.3
MANGANESE, DISSOLVED	2010-Sep	15.5	543	419	<10	15.8	34.5	14.5	110	17.9	21.5
MANGANESE, DISSOLVED	2011-Sep	<10	642	209	<10	<10	27.1	<10	128	335	37.5
MANGANESE, DISSOLVED	2012-Sep	<10	1320	171	<10	583	13.1	<10	93.4	279	161
MANGANESE, DISSOLVED	2013-Apr										
MANGANESE, DISSOLVED	2013-Sep	<5	858	52.3	<5	125	<5	60.5	60.9	75.9	<5
MANGANESE, DISSOLVED	2014-Sep	<5	522	946	<5	<5	55.8	10.3	68.3	<5	<5
MANGANESE, DISSOLVED	2015-Sep	<5	701	230	<5	52.5	96.3	<5	60.1	52.4	24.3
MANGANESE, DISSOLVED	2016-Sep			1		0.31		2.7			
MANGANESE	2013-Sep										
MANGANESE	2014-Sep										
MANGANESE	2015-Sep										
MANGANESE	2016-Sep	13.7	454	26.6	2.6	51.6	515	6.1	144	148	118
MANGANESE	2017-Sep	35.8	585	422	0.78 B	4.3	49.8	3.2	<0.07	14.6	407
MANGANESE	2018-Sep	5.2	602	466 M1	2.9	6.6	722	54.9	114	59.8	64.9

GW Standard:
SMCL = 50

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

MANGANESE
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	MW-18	MW-19	MW-20	MW-21	MW-22	MW-23	GWGCS	SW-01	SW-02	SW-03
MANGANESE, DISSOLVED	1999-Sep	12	<10	<10	<10	15	478				
MANGANESE, DISSOLVED	2000-Sep	<10	<10	<10	<10	25	370				
MANGANESE, DISSOLVED	2001-Sep	86	<10	<10	<10	<10	409				
MANGANESE, DISSOLVED	2002-Sep	688	<10	<10	<10	<10	340				
MANGANESE, DISSOLVED	2003-Sep	1150	<10	<10	<10	118	497				
MANGANESE, DISSOLVED	2004-Sep	10000	<10	<10	<10	30	432				
MANGANESE, DISSOLVED	2005-Sep	2500	192	13	<10	89	433				
MANGANESE, DISSOLVED	2006-Sep	1240	10.8	11.4	<10	<10	359				
MANGANESE, DISSOLVED	2007-Sep	820	<10	<10	<10	22.8	234				
MANGANESE, DISSOLVED	2008-Sep	2100	13.7	<10	<10	<10	513				
MANGANESE, DISSOLVED	2009-Sep	2220	18.2	25.7	15.4	21.9	33.8				
MANGANESE, DISSOLVED	2010-Sep	1070	13	11.5	<10	<10	307				
MANGANESE, DISSOLVED	2011-Sep	1070	<10	<10	<10	40.7	475				
MANGANESE, DISSOLVED	2012-Sep	327	<10	<10	<10		1220	<10	118	72.3	
MANGANESE, DISSOLVED	2013-Apr							74			
MANGANESE, DISSOLVED	2013-Sep	1240	<5	<5	<5	<5	84		103	173	
MANGANESE, DISSOLVED	2014-Sep	<5	<5	<5	<5	<5	36.8	91.4	44.5	65.7	
MANGANESE, DISSOLVED	2015-Sep	379	<5	<5	<5	<5	9.9	21.6	98.3	262	
MANGANESE, DISSOLVED	2016-Sep			0.68							
MANGANESE	2013-Sep							21.6			
MANGANESE	2014-Sep										
MANGANESE	2015-Sep										
MANGANESE	2016-Sep	395	0.3	4.2	90.3	2.5	70		49	102	
MANGANESE	2017-Sep	85.3	39.1	6.3	36.1	17.2	2.2	16.1	231	706	
MANGANESE	2018-Sep	1120	40.9	15.7	53.6	2.9	2	166	114	106	

GW Standard:
SMCL = 50

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

MANGANESE
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	LW-01	LW-02	LW-03	LW-04	LEACHATE TANK
MANGANESE, DISSOLVED	1999-Sep					
MANGANESE, DISSOLVED	2000-Sep					
MANGANESE, DISSOLVED	2001-Sep					
MANGANESE, DISSOLVED	2002-Sep					
MANGANESE, DISSOLVED	2003-Sep					
MANGANESE, DISSOLVED	2004-Sep					
MANGANESE, DISSOLVED	2005-Sep					
MANGANESE, DISSOLVED	2006-Sep					
MANGANESE, DISSOLVED	2007-Sep					
MANGANESE, DISSOLVED	2008-Sep					
MANGANESE, DISSOLVED	2009-Sep					
MANGANESE, DISSOLVED	2010-Sep					
MANGANESE, DISSOLVED	2011-Sep					
MANGANESE, DISSOLVED	2012-Sep					<10
MANGANESE, DISSOLVED	2013-Apr				123	18.5
MANGANESE, DISSOLVED	2013-Sep					
MANGANESE, DISSOLVED	2014-Sep					
MANGANESE, DISSOLVED	2015-Sep					
MANGANESE, DISSOLVED	2016-Sep					
MANGANESE	2013-Sep					<5
MANGANESE	2014-Sep	1420				<5
MANGANESE	2015-Sep	1840				<5
MANGANESE	2016-Sep	8480				382
MANGANESE	2017-Sep	1180				17000 M1
MANGANESE	2018-Sep	1050 M1				4330

GW Standard:
SMCL = 50

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

SELENIUM
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	MW-03	MW-04	MW-05	MW-07	MW-08	MW-09	MW-10	MW-11AR	MW-13	MW-14	MW-18	MW-19	MW-20	MW-21
SELENIUM, DISSOLVED	1993-Sep						<5	<5		<5	<5	<5		18	
SELENIUM, DISSOLVED	1994-Feb	<5	<5	<5	7	<5	<5	<5		<5	<5	<5	<5	28	18
SELENIUM, DISSOLVED	1994-Apr	15	<5	15	<5	<5	<5	<5		<5	<5	<5	<5	53	25
SELENIUM, DISSOLVED	1994-Jul	5	<5	5.4	<5	<5	<5	<5		<5	<5	<5	<5	23.4	7.2
SELENIUM, DISSOLVED	1994-Oct	5.4	<5	<5	<5	<5	<5	<5		<5	<5	<5	<5	21.7	20.1
SELENIUM, DISSOLVED	1995-Apr	<5		<5										13.9	<5
SELENIUM, DISSOLVED	1995-Oct	<5		10.7	<5									26.7	8.6
SELENIUM, DISSOLVED	1996-Apr	<5		7	<5									11	6
SELENIUM, DISSOLVED	1996-Oct	6		9	<5									21	14
SELENIUM, DISSOLVED	1997-Apr													17.5	<5
SELENIUM, DISSOLVED	1997-Oct			12.3										27	<5
SELENIUM, DISSOLVED	1998-Apr			20.5										11.4	<5
SELENIUM, DISSOLVED	1998-Oct			<5										23	8.6
SELENIUM, DISSOLVED	1999-Sep	<5		9.3										37.6	10
SELENIUM, DISSOLVED	2000-Sep	<5	<5	7.7	<5	<5	<5	<5		<5	<5	<5	<5	14.8	5
SELENIUM, DISSOLVED	2001-Sep	<5	<5	6.9	<5	<5	<5	<5		<5	<5	<5	<5	22.5	<5
SELENIUM, DISSOLVED	2002-Sep	<5	<5	6	<5	<5	<5	<5		<5	<5	<5	<5	13.2	<5
SELENIUM, DISSOLVED	2003-Sep	5.3	<5	5.4	<5	<5	<5	<5		<5	<5	<5	<5	16.3	<5
SELENIUM, DISSOLVED	2004-Sep	<5	<5	<5	<5	<5	<5	<5		<5	<5	<5	<5	15.8	<5
SELENIUM, DISSOLVED	2005-Sep	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	15.7	<5
SELENIUM, DISSOLVED	2006-Sep	6.5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	14.1	<5
SELENIUM, DISSOLVED	2007-Sep	5.29	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	15	5.66
SELENIUM, DISSOLVED	2008-Sep	7.24	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	36.4	10.8
SELENIUM, DISSOLVED	2009-Sep	5.37	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	18.4	5.47
SELENIUM, DISSOLVED	2010-Sep	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	23.3	<5
SELENIUM, DISSOLVED	2011-Sep	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	38.1	8.95
SELENIUM, DISSOLVED	2012-Sep	<5	<5	23.8	12.9	<5	<5	<5	<5	<5	<5	<5	<5	27.9	<5
SELENIUM, DISSOLVED	2013-Apr														
SELENIUM, DISSOLVED	2013-Sep	7.5	<1	30.9	1.8	1.1	<1	<1	2.2	<1	2.3	<1	2.5	40	7
SELENIUM, DISSOLVED	2014-Sep	4.8	<1	28.6	<1	<1	<1	<1	2.2	<1	4.2	<1	3.2	14	3.4
SELENIUM, DISSOLVED	2015-Sep	4.8	<1	<1	<1	<1	<1	<1	1.7	<1	<1	<1	1.5	36.4	6.6
SELENIUM, DISSOLVED	2016-Sep			3		0.21		0.54						19	
SELENIUM	2013-Sep														
SELENIUM	2014-Sep														
SELENIUM	2015-Sep														
SELENIUM	2016-Sep	5.8	0.27	6.8	0.8	0.41	<0.18	0.68	1.5	1.1	1.7	0.52	1.9	19.9	7.1
SELENIUM	2017-Sep	5.6	0.17	0.69	1.4	1	<0.086	0.66	<0.086	1	0.63	0.094	1.6	33.7	6.6
SELENIUM	2018-Sep	5.6	1.4	2.3	1.2	0.34	<0.16	0.71	0.22	1.3	4	0.87	3.8	13.5	3.4

GW Standard:
MCL = 50

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

SELENIUM
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	MW-22	MW-23	GWGCS	SW-01	SW-02	SW-03	LW-01	LW-02	LW-03	LW-04	LEACHATE TANK
SELENIUM, DISSOLVED	1993-Sep	<5	<5									
SELENIUM, DISSOLVED	1994-Feb	<5	10									
SELENIUM, DISSOLVED	1994-Apr	26	53									
SELENIUM, DISSOLVED	1994-Jul	9.5	<5									
SELENIUM, DISSOLVED	1994-Oct	16.1	<5									
SELENIUM, DISSOLVED	1995-Apr	<5	<5									
SELENIUM, DISSOLVED	1995-Oct	13.4	<5									
SELENIUM, DISSOLVED	1996-Apr	21	<5									
SELENIUM, DISSOLVED	1996-Oct	8	<5									
SELENIUM, DISSOLVED	1997-Apr	6.7										
SELENIUM, DISSOLVED	1997-Oct	17.5										
SELENIUM, DISSOLVED	1998-Apr	<5										
SELENIUM, DISSOLVED	1998-Oct											
SELENIUM, DISSOLVED	1999-Sep	17.3	<5									
SELENIUM, DISSOLVED	2000-Sep	15.3	<5									
SELENIUM, DISSOLVED	2001-Sep	13.4	<5									
SELENIUM, DISSOLVED	2002-Sep	16.9	<5									
SELENIUM, DISSOLVED	2003-Sep	12.1	<5									
SELENIUM, DISSOLVED	2004-Sep	7.2	<5									
SELENIUM, DISSOLVED	2005-Sep	5.8	<5									
SELENIUM, DISSOLVED	2006-Sep	14.9	<5									
SELENIUM, DISSOLVED	2007-Sep	5.98	<5									
SELENIUM, DISSOLVED	2008-Sep	10.6	<5									
SELENIUM, DISSOLVED	2009-Sep	6.65	<5									
SELENIUM, DISSOLVED	2010-Sep	<5	<5									
SELENIUM, DISSOLVED	2011-Sep	11.8	<5									
SELENIUM, DISSOLVED	2012-Sep		<5	<5	<5	<5						11.4
SELENIUM, DISSOLVED	2013-Apr			<5							<5	<5
SELENIUM, DISSOLVED	2013-Sep	12.4	2.1		1.5	1.4						
SELENIUM, DISSOLVED	2014-Sep	4.2	1.4	<1	1.3	2						
SELENIUM, DISSOLVED	2015-Sep	7.5	<1	<1	1.7	1.4						
SELENIUM, DISSOLVED	2016-Sep											
SELENIUM	2013-Sep			1								8.3
SELENIUM	2014-Sep							<1				12.8
SELENIUM	2015-Sep							<1				6.3
SELENIUM	2016-Sep	8.2	0.36		0.83	1.2		4.8				7.6
SELENIUM	2017-Sep	9.2	6.1	0.21	1.4	1.4		0.54				13.2
SELENIUM	2018-Sep	3.6	0.47	1.3	1	1.3		1.3				28

GW Standard:
MCL = 50

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

ZINC
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	MW-03	MW-04	MW-05	MW-07	MW-08	MW-09	MW-10	MW-11AR	MW-13	MW-14
ZINC, DISSOLVED	1993-Sep						<50	<50		<50	<50
ZINC, DISSOLVED	1994-Feb	<50	<50	<50	<50	<50	<50	<50		<50	<50
ZINC, DISSOLVED	1994-Apr	<50	<50	<50	<50	<50	<50	<50		<50	<50
ZINC, DISSOLVED	1994-Jul	<20	<20	<20	<20	<20	<20	<20		<20	<72
ZINC, DISSOLVED	1994-Oct	<20	<20	<20	<20	<20	<20	<20		<20	<20
ZINC, DISSOLVED	2004-Sep	<20	<20	<20	<20	<20	<20	<20		<20	<20
ZINC, DISSOLVED	2005-Sep	<20	23	<20	<20	20	<20	<20	<20	<20	<20
ZINC, DISSOLVED	2006-Sep	25.9	35.6	20.4	28.6	31.5	24.4	20.4	21	43.8	49.7
ZINC, DISSOLVED	2007-Sep	38.4	48.3	<20	29.1	29.2	42.9	25.2	46.9	38.3	32.8
ZINC, DISSOLVED	2008-Sep	22.6	25.8	<20	21.2	21.2	23.6	<20	27.2	27.7	22.8
ZINC, DISSOLVED	2009-Sep	44.2	53.4	23.8	35.4	42.1	37	28.9	36.8	45.4	37.1
ZINC, DISSOLVED	2010-Sep	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
ZINC, DISSOLVED	2011-Sep	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
ZINC, DISSOLVED	2012-Sep	<20	<20	<20	<20	20.7	<20	<20	<20	<20	<20
ZINC, DISSOLVED	2013-Apr										
ZINC, DISSOLVED	2013-Sep	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
ZINC, DISSOLVED	2014-Sep	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
ZINC, DISSOLVED	2015-Sep	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
ZINC, DISSOLVED	2016-Sep			1.5		1.6		1.5			
ZINC	2013-Sep										
ZINC	2014-Sep										
ZINC	2015-Sep										
ZINC	2016-Sep	2.7 B	1.5 B	10.3	3.5 B	3 B	1.6 B	1.8 B	8.8 B	8.4 B	6.9 B
ZINC	2017-Sep	8.1	2.4 B	2.4 B	2.6 B	4.9 B	3.7 B	2.1 B	<0.53	2.7 B	14.5
ZINC	2018-Sep	<3.7	5.9	<3.7	<3.7	4.4	4.7	5.4	9.6	4.8	7.2

GW Standard:
SMCL = 5000

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

ZINC
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	MW-18	MW-19	MW-20	MW-21	MW-22	MW-23	GWGCS	SW-01	SW-02	SW-03
ZINC, DISSOLVED	1993-Sep	<50		<50		<50	<50				
ZINC, DISSOLVED	1994-Feb	<50	<50	<50	<50	<50	<50				
ZINC, DISSOLVED	1994-Apr	<50	<50	<50	<50	<50	<50				
ZINC, DISSOLVED	1994-Jul	<20	<20	<20	<20	<20	<20				
ZINC, DISSOLVED	1994-Oct	<20	<20	<20	<20	<20	<20				
ZINC, DISSOLVED	2004-Sep	<20	<20	<20	<20	<20	<20				
ZINC, DISSOLVED	2005-Sep	22	22	<20	<20	<20	27				
ZINC, DISSOLVED	2006-Sep	36.5	26.4	31	24.1	24.4	37.9				
ZINC, DISSOLVED	2007-Sep	59.6	25.9	32	34.5	43.7	63				
ZINC, DISSOLVED	2008-Sep	32.5	20.8	<20	24.5	31.6	52.7				
ZINC, DISSOLVED	2009-Sep	65.1	34.2	48.6	44.1	43.7	46.3				
ZINC, DISSOLVED	2010-Sep	<20	<20	<20	<20	<20	<20				
ZINC, DISSOLVED	2011-Sep	<20	<20	<20	<20	<20	<20				
ZINC, DISSOLVED	2012-Sep	<20	<20	<20	<20		<20	<20	<20	<20	
ZINC, DISSOLVED	2013-Apr							79.1			
ZINC, DISSOLVED	2013-Sep	<50	<50	<50	<50	<50	<50		<50	<50	
ZINC, DISSOLVED	2014-Sep	<50	<50	<50	<50	<50	<50	<50	<50	<50	
ZINC, DISSOLVED	2015-Sep	<50	<50	<50	<50	<50	<50	<50	<50	<50	
ZINC, DISSOLVED	2016-Sep			4.7							
ZINC	2013-Sep							<50			
ZINC	2014-Sep										
ZINC	2015-Sep										
ZINC	2016-Sep	22.3	1.3 B	39.2	5.6 B	23.5	4.9 B		3.2	4.1	
ZINC	2017-Sep	1.4 B	2.6 B	4.9 B	3.7 B	11.4	4.5 B	2.1 B,M1,R1	2.7 B	22.4	
ZINC	2018-Sep	16.5	3.7	4.3	4.2	<3.7	6.1	<3.7	7.6	4.7	

GW Standard:
SMCL = 5000

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

ZINC
UNITS: UG/L

CHEMICAL PARAMETER	EVENT	LW-01	LW-02	LW-03	LW-04	LEACHATE TANK
ZINC, DISSOLVED	1993-Sep					
ZINC, DISSOLVED	1994-Feb					
ZINC, DISSOLVED	1994-Apr					
ZINC, DISSOLVED	1994-Jul					
ZINC, DISSOLVED	1994-Oct					
ZINC, DISSOLVED	2004-Sep					
ZINC, DISSOLVED	2005-Sep					
ZINC, DISSOLVED	2006-Sep					
ZINC, DISSOLVED	2007-Sep					
ZINC, DISSOLVED	2008-Sep					
ZINC, DISSOLVED	2009-Sep					
ZINC, DISSOLVED	2010-Sep					
ZINC, DISSOLVED	2011-Sep					
ZINC, DISSOLVED	2012-Sep					<20
ZINC, DISSOLVED	2013-Apr				123	<20
ZINC, DISSOLVED	2013-Sep					
ZINC, DISSOLVED	2014-Sep					
ZINC, DISSOLVED	2015-Sep					
ZINC, DISSOLVED	2016-Sep					
ZINC	2013-Sep					<50
ZINC	2014-Sep	<50				<50
ZINC	2015-Sep	<50				<50
ZINC	2016-Sep	291				55.1
ZINC	2017-Sep	35.2				517
ZINC	2018-Sep	10.9				398

GW Standard:
SMCL = 5000

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

CHLORIDE
UNITS: MG/L

CHEMICAL PARAMETER	EVENT	MW-03	MW-04	MW-05	MW-07	MW-08	MW-09	MW-10	MW-11AR	MW-13	MW-14	MW-18	MW-19	MW-20
CHLORIDE	1993-Sep						54	92		14	87	37		53
CHLORIDE	1994-Feb	15	2	25	17	54	7	11		2	2	3	11	33
CHLORIDE	1994-Apr	15	21	4	25	52	3	13		36	3	3	13	40
CHLORIDE	1994-Jul	13	18	5.4	23	47	<5	12		<5	<5	<5	16	33
CHLORIDE	1994-Oct	13	17	<5	19	46	<5	12		<5	<5	5	12	29
CHLORIDE	1995-Apr	14	12	<5	26	46	<5	11		<5	<5	5.6	28	36
CHLORIDE	1995-Oct	14	20	<5	15	54	<5	10		<5	<5	<5	11	31
CHLORIDE	1996-Apr	15	11	3.6	19	56	3	10		4.9	4.8	7.1	10	32
CHLORIDE	1996-Oct	28	26	10	33	54	10	18		13	10	15	20	36
CHLORIDE	1997-Apr	15	9.4	<5	<5	47	<5	7.8		<5	<5	<5	18	37
CHLORIDE	1997-Oct	15	16	<5	25	48	<5	9.4		<5	<5	6.4	13	31
CHLORIDE	1998-Apr	12	22	5.1	33	46	<5	9.4		<5	5	6	31	38
CHLORIDE	1998-Oct	13	20	<5	26	52	<5	11		<5	<5	5.1	14	37
CHLORIDE	1999-Sep	14	21	<5	25	46	<5	12		<5	<5	5.5	14	31
CHLORIDE	2000-Sep	13.8	14.9	<5	19.6	19.5	<5	12		<5	<5	9	13.2	24.4
CHLORIDE	2001-Sep	13.3	16.3	<5	18.4	18.3	<5	13.8		5.9	5.9	15.3	14.5	20.5
CHLORIDE	2002-Sep	14.8	15.9	<5	21.9	11.9	<5	12.8		<5	<5	13.6	13.7	20.1
CHLORIDE	2003-Sep	16	14	<5	23.5	14.5	<5	14.8		<5	<5	14.5	15.2	19.8
CHLORIDE	2004-Sep	20.1	17.4	<5	19.4	27.1	<5	18.9		<5	<5	22	14.8	26.1
CHLORIDE	2005-Sep	22.9	15.3	<5	19.1	18.5	<5	18.7	35.6	<5	<5	13.6	15.3	22
CHLORIDE	2006-Sep	26.1	10.8	<5	22.1	14.6	<5	20.5	26.7	<5	<5	16.5	16.7	21.8
CHLORIDE	2007-Sep	26.3	15	<5	20.3	40.6	<5	16.4	21.1	<5	<5	16.4	17.1	33.6
CHLORIDE	2008-Sep	23	16.5	<5	21.5	51.9	<5	7.31	16.9	<5	<5	9.03	15.7	33.8
CHLORIDE	2009-Sep	21.9	15.6	<5	20	43.4	<5	8.21	18.8	<5	<5	11.1	15.2	33.4
CHLORIDE	2010-Sep	12.8	15.2	1.2	23.6	44.5	1.25	2.76	19.8	<1	<2	4.09	16.9	31
CHLORIDE	2011-Sep	11	15.5	<2	17.8	30	<2	3.81	20.7	<2	<2	7.37	13.1	26.1
CHLORIDE	2012-Sep	11.9	15.3	<5	15.9	33	<5	<5	19.4	<5	<5	7.91	13.1	17.2
CHLORIDE	2013-Apr													
CHLORIDE	2013-Sep	14.3	11.7	2	17.3	19.7	29.9	3.1	22.2	1.4	1.6	7.2	14.2	19.3
CHLORIDE	2014-Sep	8.1	12.4	5.7	28.5	41.3	46	2.5	23.3	<1	<1	1.8	26.1	33.3
CHLORIDE	2015-Sep	11.6	13.4	1.3	15.9	26.1	18.9	1.3	14.7	1.1	<1	4.3	15.3	25.3
CHLORIDE	2016-Sep	11.8	10	8.8	21.5	30.1	2.6	1.9	18.6	2.8	1.3	3.2	17.9	24.3
CHLORIDE	2017-Sep	11.8	14.6	3	14.8	19.8	4	2.4	14.2	4	1.7	4.2	13.8	19.8
CHLORIDE	2018-Sep	9.5	10.3	11.8	18.6	27.4	3	1.5	21.5	3.2	2.2	1.8	19.9	24

GW Standard:
SMCL = 250

IPL Marshalltown East and West Closed Landfills
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CHLORIDE
UNITS: MG/L

CHEMICAL PARAMETER	MW-21	MW-22	MW-23	GWGCS	SW-01	SW-02	SW-03	LW-01	LW-02	LW-03	LW-04	LEACHATE TANK
CHLORIDE		62	23									
CHLORIDE	32	3	38									
CHLORIDE	39	43	38									
CHLORIDE	33	38	<5									
CHLORIDE	32	36	<5									
CHLORIDE	37	40	<5									
CHLORIDE	26	37	<5									
CHLORIDE	32	37	4.2									
CHLORIDE	38	51	13									
CHLORIDE	41	43	<5									
CHLORIDE	22	41	5.3									
CHLORIDE	31	40	<5									
CHLORIDE	30	39	<5									
CHLORIDE	27	35	<5									
CHLORIDE	22.2	34.1	<5									
CHLORIDE	18.8	30.6	5.5									
CHLORIDE	13.8	31.9	<5									
CHLORIDE	16.8	30.9	<5									
CHLORIDE	23	35.5	<5									
CHLORIDE	19.6	33.9	<5									
CHLORIDE	17.3	28.6	<5									
CHLORIDE	29	35.8	<5									
CHLORIDE	26.4	30.8	<5									
CHLORIDE	27.9	34.8	<5									
CHLORIDE	18.6	32.7	<2									
CHLORIDE	20.9	30.5	<5									
CHLORIDE	14.1		<5	<5	12.8	13.8						<5
CHLORIDE				<5							<100	<5
CHLORIDE	16.7	29.1	1.1	1.3	13.1	15.2						<1
CHLORIDE	18.3	34.9	<1	<1	19.7	20.1		1.6				<1
CHLORIDE	19.7	28.8	1.1	3.9	17.8	18		2.3			6.6	1.2
CHLORIDE	17.7	26	6		16.5	16.7		2.4				1.2
CHLORIDE	16.5	26.4	3.1	3.4	18.2	17		3.3				11.7
CHLORIDE	13	25.6	4.5	3.1	16.6	16		1.9				9.9

GW Standard:
SMCL = 250

IPL Marshalltown East and West Closed Landfills
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SULFATE
UNITS: MG/L

CHEMICAL PARAMETER	EVENT	MW-03	MW-04	MW-05	MW-07	MW-08	MW-09	MW-10	MW-11AR	MW-13	MW-14
SULFATE	1999-Sep	68	160	65	31	25	30	43		56	64
SULFATE	2000-Sep	78	120	43	36	33	35	28		110	48
SULFATE	2001-Sep	70	100	37	29	23	38	14		76	56
SULFATE	2002-Sep	78	47	62	30	21	36	19		110	60
SULFATE	2003-Sep	77	90	70	32	27	35	17		100	32
SULFATE	2004-Sep	84	110	57	34	29	39	31		100	64
SULFATE	2005-Sep	90	100	36	32	28	44	17	130	120	80
SULFATE	2006-Sep	79	52	63.6	29.9	22.4	42.7	14.7	372	60.5	81.2
SULFATE	2007-Sep	107	118	47.4	35	23.5	28.7	13.8	370	106	86.9
SULFATE	2008-Sep	81.8	109	41.7	25.4	10.9	35.2	8.48	219	86.5	60
SULFATE	2009-Sep	91.5	108	32.7	27.1	10.5	35.6	10.1	197	80.2	56.5
SULFATE	2010-Sep	84.5	80.3	32.2	17.1	5.7	25.6	7.17	121	69.2	54.5
SULFATE	2011-Sep	83.2	100	30.9	25.2	14.3	26	9.16	163	70.5	51.8
SULFATE	2012-Sep	88.3	90.1	78.2	30.8	22.5	27.5	11.6	220	72.6	54.2
SULFATE	2013-Apr										
SULFATE	2013-Sep	94.5	73.1	50	27.7	26.5	19.7	11.1	158	69.3	50
SULFATE	2014-Sep	63.4	82.1	27.6	18.8	14	24.1	10.5	110	33.6	38.7
SULFATE	2015-Sep	74.5	96.7	18.8	21.1	11.1	27.2	6.2	116	68.9	49
SULFATE	2016-Sep	80.5 M1	69.8	31.3	14.1	9.9	6.3	7.8	99	59.7	40
SULFATE	2017-Sep	80	88.7	20.9	23.7	21.3	12	8.4	116	67.6	45.1
SULFATE	2018-Sep	74.5	63.6	29.2	18.6	13.6	9.1	7.8	127	51.6	30.7

GW Standard:
SMCL = 250

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SULFATE
UNITS: MG/L

CHEMICAL PARAMETER	EVENT	MW-18	MW-19	MW-20	MW-21	MW-22	MW-23	GWGCS	SW-01	SW-02	SW-03
SULFATE	1999-Sep	40	33	240	110	180	360				
SULFATE	2000-Sep	28	25	140	76	170	400				
SULFATE	2001-Sep	55	30	150	59	130	410				
SULFATE	2002-Sep	92	33	100	81	120	100				
SULFATE	2003-Sep	180	34	110	44	140	390				
SULFATE	2004-Sep	100	16	160	85	130	410				
SULFATE	2005-Sep	90	34	160	79	140	360				
SULFATE	2006-Sep	107	32.8	101	45.8	113	318				
SULFATE	2007-Sep	67.1	36	149	153	120	324				
SULFATE	2008-Sep	30.6	26.5	333	199	196	446				
SULFATE	2009-Sep	42.4	25.5	241	169	175	95.7				
SULFATE	2010-Sep	16.4	22.7	285	89.8	125	153				
SULFATE	2011-Sep	29.8	23.2	241	127	160	462				
SULFATE	2012-Sep	104	30	169	43.8		774	275	21.5	29.4	
SULFATE	2013-Apr							357			
SULFATE	2013-Sep	91	26.9	223	77.5	159	189	183	24.5	26	
SULFATE	2014-Sep	22.6	32	118	53.4	80	73.4	188	15.2	24.7	
SULFATE	2015-Sep	19.6	21.6	209	118	107	29.8	254	16.6	20.8	
SULFATE	2016-Sep	19.8	21.1	132	86.9	123	31.8		11.2	16.1	
SULFATE	2017-Sep	48.4	20.4	209	92.2	117	157	222	34.4	29	
SULFATE	2018-Sep	24.3	32.2	123	55.2	77.4	13.5	218	10.9	12	

GW Standard:
SMCL = 250

IPL Marshalltown East and West Closed Landfills
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SULFATE
UNITS: MG/L

CHEMICAL PARAMETER	EVENT	LW-01	LW-02	LW-03	LW-04	LEACHATE TANK
SULFATE	1999-Sep					
SULFATE	2000-Sep					
SULFATE	2001-Sep					
SULFATE	2002-Sep					
SULFATE	2003-Sep					
SULFATE	2004-Sep					
SULFATE	2005-Sep					
SULFATE	2006-Sep					
SULFATE	2007-Sep					
SULFATE	2008-Sep					
SULFATE	2009-Sep					
SULFATE	2010-Sep					
SULFATE	2011-Sep					
SULFATE	2012-Sep					277
SULFATE	2013-Apr				153	105
SULFATE	2013-Sep					131
SULFATE	2014-Sep	72.9				210
SULFATE	2015-Sep	58			74.9	196
SULFATE	2016-Sep	73.3				168
SULFATE	2017-Sep	80.5				178
SULFATE	2018-Sep	50.3				202

GW Standard:
SMCL = 250

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

PH, FIELD
UNITS: SU

CHEMICAL PARAMETER	EVENT	MW-03	MW-04	MW-05	MW-07	MW-08	MW-09	MW-10	MW-11AR	MW-13	MW-14	MW-18	MW-19
PH, FIELD	1993-Sep						7.25	7.49		6.72	7.2	7.16	
PH, FIELD	1994-Feb	7.74	7.14	6.95	6.51	7.47	7.23	7.58		7.49	7.69	7.3	7.15
PH, FIELD	1994-Apr	7.19	6.9	6.46	7.28	7.02	7.05	7.15		6.94	7.34	7.3	7.32
PH, FIELD	1994-Jul	7.2	6.93	6.88	7.11	6.98	6.86	7.24		6.82	7.29	7.06	7.07
PH, FIELD	1994-Oct	7.31	6.9	6.96	7.36	7.27	6.9	7.12		7.11	7.34	7.3	7.12
PH, FIELD	1995-Apr	7.23	6.88	6.44	7.08	7.34	7.11	7.23		6.77	7.12	7.51	7.13
PH, FIELD	1995-Oct	7.49	7.41	7.95	7.19	7.98	6.84	7.07		7.36	6.99	6.68	7.16
PH, FIELD	1996-Apr	7.9	7.7	7.2	7.7	8.4	8.2	7.9		7.7	8.5	7.9	7.9
PH, FIELD	1996-Oct	7.3	7.1	6.9	7.6	7.4	7.1	7.4		7.2	7.5	7.4	7.6
PH, FIELD	1997-Apr	7.5	7.1	6.4	7.4	7.4	7.2	7.3		7.5	7.3	7.4	7.4
PH, FIELD	1997-Oct	7.8	7.5	7	7.7	7.8	7.7	7.7		7.2	7.6	7.7	7.8
PH, FIELD	1998-Apr	7.22	7.06	6.14	6.85	7.17	7.12	7.07		6.27	6.97	7.04	7.11
PH, FIELD	1998-Oct	6.9	6.7	6.34	7	7	7.2	6.8		6.3	7	6.1	7.1
PH, FIELD	1999-Sep	6.7	6.6	5.6	6.5	6.5	6.6	6.6		6.9	6.9	5.8	6.8
PH, FIELD	2000-Sep	6.8	6.6	6.32	7.21	7.02	6.98	7.25		7.12	7.28	6.9	6.96
PH, FIELD	2001-Sep	6.9	6.86	6.7	7.4	7.13	7.2	7.3		6.45	7.33	6.82	9.4
PH, FIELD	2002-Sep	6.86	6.98	6.54	7.06	6.98	7.18	7.06		6.75	6.96	6.64	6.84
PH, FIELD	2003-Sep	7.45	7.13	6.33	6.88	7.06	7.13	7.16		7.04	7.15	7.27	6.42
PH, FIELD	2004-Sep	7.36	6.88	6.71	7.31	7.17	7.21	7.2		7.05	7.22	6.79	7.08
PH, FIELD	2005-Sep	7.3	6.46	5.71	6.47	6.59	6.67	6.83	6.68	6.73	6.91	6.77	6.58
PH, FIELD	2006-Sep	7.2	6.69	6.11	7.05	7.1	7.25	7.04	7.34	6.64	7.01	6.76	6.42
PH, FIELD	2007-Sep	7.13	6.88	5.76	6.82	6.9	7.22	7.21	7.32	6.96	6.95	6.83	6.53
PH, FIELD	2008-Sep	7.1	6.86	6.43	6.85	6.94	7.1	7.01	7.19	7.01	7.12	7.19	6.67
PH, FIELD	2009-Sep	7.41	6.18	6.89	7.35	7.16	7.45	7.16	7.2	7.18	7.35	6.94	7.18
PH, FIELD	2010-Sep	7.29	7.11	6.92	7.34	7.16	7.3	7.34	7.15	7.09	7.25	6.94	7.38
PH, FIELD	2011-Sep	7.82	7.5	7.68	7.58	7.03	7.5	7.24	6.89	7.58	7.7	6.7	7.55
PH, FIELD	2012-Sep	7.4	7.07	7.14	7.23	5.67	7.27	7.19	8.65	7.02	7.24	6.74	7.62
PH, FIELD	2013-Sep	7.36	7	6.57	7.3	7.15	7.08	7.25	7.29	7.13	7.23	6.87	7.1
PH, FIELD	2014-Sep	6.96	7.12	7.27	7.47	7.26	7.19	7.27	7.29	6.72	7.31	7.36	7.68
PH, FIELD	2015-Sep	6.81	6.67	7.24	6.79	6.76	6.71	6.57	7.51	7.26	7.27	7.23	7.23
PH, FIELD	2016-Sep	7.51	7.48	7.39	8.33	8.32	7.09	7.57	7.96	7.5	7.66	7.54	7.8
PH, FIELD	2017-Sep	7.5	6.86	6.35	7.12	7.29	8.12	7.05	6.64	7.08	7.39	5.55	7.34
PH, FIELD	2018-Sep	7.12	7.06	7.03	7.25	7.17	6.87	7.33	7.29	7.03	7.25	7.19	7.24

GW Standard:
SMCL = 8.5

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

PH, FIELD
UNITS: SU

CHEMICAL PARAMETER	EVENT	MW-20	MW-21	MW-22	MW-23	GWGCS	SW-01	SW-02	SW-03
PH, FIELD	1993-Sep	7.15		8.29	7.47				
PH, FIELD	1994-Feb	7.46	6.7	6.97	5.44				
PH, FIELD	1994-Apr	7.39	7.29	7.44	7.54				
PH, FIELD	1994-Jul	7.28	7.1	7.23	7.04				
PH, FIELD	1994-Oct	7.33	7.42	7.75	7.04				
PH, FIELD	1995-Apr	7.45	7.27	7.18	6.73				
PH, FIELD	1995-Oct	7.07	7.13	6.54	8.15				
PH, FIELD	1996-Apr	7.9	7.9	7.8	7.7				
PH, FIELD	1996-Oct	7.8	7.3	7.6	7.4				
PH, FIELD	1997-Apr	7.4	7.3	7.4	7.2				
PH, FIELD	1997-Oct	7.8	7.7	8	7.4				
PH, FIELD	1998-Apr	7.06	6.98	7.02	6.62				
PH, FIELD	1998-Oct	6.5	6.7	6.6	6.6				
PH, FIELD	1999-Sep	7	6.7	7	6.6				
PH, FIELD	2000-Sep	7.15	6.7	7.38	6.99				
PH, FIELD	2001-Sep	6.72	7.25	7.19	6.92				
PH, FIELD	2002-Sep	6.83	7.2	7.33	7.19				
PH, FIELD	2003-Sep	7.4	7.28	7.3	7.26				
PH, FIELD	2004-Sep	7.26	7.22	7.24	6.98				
PH, FIELD	2005-Sep	7.03	7.27	7.05	6.84				
PH, FIELD	2006-Sep	7.1	6.89	7.39	7.07				
PH, FIELD	2007-Sep	7.36	7.12	7.35	7.33				
PH, FIELD	2008-Sep	7.18	7.07	7.28	7.07				
PH, FIELD	2009-Sep	7.24	6.12	7.09	7.3				
PH, FIELD	2010-Sep	7.23	7.15	7.15	7.3				
PH, FIELD	2011-Sep	7.45	7.48	7.26	7.17				
PH, FIELD	2012-Sep	7.18	7.29		7.15	7.62	7.66	7.97	
PH, FIELD	2013-Sep	7.35	7.21	7.33	7.12	7.1	7.62	7.86	
PH, FIELD	2014-Sep	7.17	7.45	6.95	6.26	7.27	7.96	7.95	
PH, FIELD	2015-Sep	7.23	6.93	7.17	7.29	6.7	7.85	7.14	
PH, FIELD	2016-Sep	8.2	7.52	7.66	8.02		8.67	8.53	
PH, FIELD	2017-Sep	7.07	7.46		6.88	9.01	8.12	8.13	
PH, FIELD	2018-Sep	7.26	7.05	7.75	6.7	7.01	7.69	7.9	

GW Standard:
SMCL = 8.5

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

PH, FIELD
UNITS: SU

CHEMICAL PARAMETER	EVENT	LW-01	LW-02	LW-03	LW-04	LEACHATE TANK
PH, FIELD	1993-Sep					
PH, FIELD	1994-Feb					
PH, FIELD	1994-Apr					
PH, FIELD	1994-Jul					
PH, FIELD	1994-Oct					
PH, FIELD	1995-Apr					
PH, FIELD	1995-Oct					
PH, FIELD	1996-Apr					
PH, FIELD	1996-Oct					
PH, FIELD	1997-Apr					
PH, FIELD	1997-Oct					
PH, FIELD	1998-Apr					
PH, FIELD	1998-Oct					
PH, FIELD	1999-Sep					
PH, FIELD	2000-Sep					
PH, FIELD	2001-Sep					
PH, FIELD	2002-Sep					
PH, FIELD	2003-Sep					
PH, FIELD	2004-Sep					
PH, FIELD	2005-Sep					
PH, FIELD	2006-Sep					
PH, FIELD	2007-Sep					
PH, FIELD	2008-Sep					
PH, FIELD	2009-Sep					
PH, FIELD	2010-Sep					
PH, FIELD	2011-Sep					
PH, FIELD	2012-Sep					7.78
PH, FIELD	2013-Sep					7.83
PH, FIELD	2014-Sep	7.23				8.29
PH, FIELD	2015-Sep	7.16				7.02
PH, FIELD	2016-Sep	8.19				8.66
PH, FIELD	2017-Sep	9.06				7.98
PH, FIELD	2018-Sep	7.39			8.32	8

GW Standard:
SMCL = 8.5

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

TEMPERATURE
UNITS: DEG C

CHEMICAL PARAMETER	EVENT	MW-03	MW-04	MW-05	MW-07	MW-08	MW-09	MW-10	MW-11AR	MW-13	MW-14	MW-18	MW-19
TEMPERATURE	1993-Sep						16.3	14.1		16.1	15.6	12.8	
TEMPERATURE	1994-Feb	10.1	10.1	10.1	11.6	9	8.6	9.8		11.1	10.2	9.5	10.6
TEMPERATURE	1994-Apr	9.8	9	9.4	13.2	13	11.7	13.3		11.3	13.7	14.3	10
TEMPERATURE	1994-Jul	14	13.6	13.9	14.8	17.3	13.8	16		17.9	15.2	15.8	14.8
TEMPERATURE	1994-Oct	16.3	16.8	15.5	14.2	15.5	16.5	15.1		15.2	15.6	16.5	13.8
TEMPERATURE	1995-Apr	24.4	23.9	23.5	24.1	20	20.8	22.7		23.9	22.3	22	22.9
TEMPERATURE	1995-Oct	12.5	11.4	12.1	9.8	12.2	9.6	9.4		11.7	10.5	10.6	11.3
TEMPERATURE	1996-Apr	8.6	7	8	9.5	11.5	6.5	11		7.5	8	10.5	9.8
TEMPERATURE	1996-Oct	10.6	11.7	11.1	8.9	11.7	12.2	11.7		11.1	10.6	12.2	9.4
TEMPERATURE	1997-Apr	7	6	6	6	5	5	6		11	7	9	7
TEMPERATURE	1997-Oct	11	12	11	10	16	13	11		13	12	12	10
TEMPERATURE	1998-Apr	10	12.5	9	12.5	10	10	10.5		10.5	11	13.5	10
TEMPERATURE	1998-Oct	14	14.5	14	12	16	15.5	13		13.9	13	11.4	13.5
TEMPERATURE	1999-Sep	15	14.2	15.6	13	13.3	15.3	14		15	18.6	10.6	12.7
TEMPERATURE	2000-Sep	19.2	20.7	12.4	11.8	13.7	17.6	12.1		15.5	14.4	13.1	11
TEMPERATURE	2001-Sep	15.9	18.5	15.1	14.1	15.6	14.2	14.9		16.1	13.5	13	14.1
TEMPERATURE	2002-Sep	14.2	14.4	15.3	13.1	14.5	13.6	14.9		15.9	14.5	13.6	13.7
TEMPERATURE	2003-Sep	13.9	16	14.5	11.8	15.9	14.3	13.1		15.8	13.2	12.7	11.7
TEMPERATURE	2004-Sep	13.6	11.9	11.9	11.2	13.3	13.8	12.6		13.5	12.3	12.3	11.1
TEMPERATURE	2005-Sep	15.6	14.6	13	10.8	12.4	14	12.6	12.7	14	13.3	12.3	11.7
TEMPERATURE	2006-Sep	17.2	13.5	12.2	12.3	14.7	15.7	13.7	15.2	16	14.7	12.8	11.6
TEMPERATURE	2007-Sep	14.4	13.6	12.6	10.9	14.3	15.8	13.8	15.3	15	12.7	14	11.4
TEMPERATURE	2008-Sep	12.4	14.2	11.7	10.6	13.7	13.7	12.1	11.1	17.7	16.1	12.1	11.3
TEMPERATURE	2009-Sep	13.4	12.6	12.2	10.9	14.9	16.1	12.6	11.5	15.6	13.5	11.5	12.2
TEMPERATURE	2010-Sep	13.1	14.5	14.6	11.1	18	15.8	12.8	16.7	15.4	15	14.9	12
TEMPERATURE	2011-Sep	12.9	13.1	12.4	11.1	10.8	14.1	12.5	9.5	12.9	12.5	9.3	12.3
TEMPERATURE	2012-Sep	14.17	15.05	13.88	12.19	11.03	15.3	13.47	10.45	11.99	13.91	10.66	13.9
TEMPERATURE	2013-Sep	14.2	14.3	13.5	11.6	11.4		12.7	10.7	17.7	12.8	11.1	11.5
TEMPERATURE	2014-Sep	18.52	16.85	18.69	18.44	20.7	18.71	17.8	20.22	20.22	17.38	22.37	13.48
TEMPERATURE	2015-Sep	13.01	14.83	14.29	11.36	17.96	14.33	17.05	13.45	14.99	15.46	13.45	13.21
TEMPERATURE	2016-Sep	12.5	14.6	12.5	11	13	14.2	13.7	11.6	16.6	17.6	14	11.7
TEMPERATURE	2017-Sep	13	12.9	15.2	10.7	15.1	13.4	13.1	13.6	16.1	11.9	13	13.5
TEMPERATURE	2018-Sep	12.2	13.7	11.7	10.9	16.8	16.3	14	13.8	15.9	14.3	12.7	12.9

GW Standard:
None

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

TEMPERATURE
UNITS: DEG C

CHEMICAL PARAMETER	EVENT	MW-20	MW-21	MW-22	MW-23	GWGCS	SW-01	SW-02	SW-03
TEMPERATURE	1993-Sep	14.4		12.2	16.6				
TEMPERATURE	1994-Feb	11.1	11.4	8.4	8.7				
TEMPERATURE	1994-Apr	14.6	10.5	14.6	15.9				
TEMPERATURE	1994-Jul	14.9	13.4	15.8	17.5				
TEMPERATURE	1994-Oct	13.6	16.9	13.6	14.5				
TEMPERATURE	1995-Apr	24.6	24.6	24.2	22.1				
TEMPERATURE	1995-Oct	9.8	10.6	9.1	14				
TEMPERATURE	1996-Apr	10	9.8	15	8.9				
TEMPERATURE	1996-Oct	10.6	9.4	9.4	12.8				
TEMPERATURE	1997-Apr	10	9	11	9				
TEMPERATURE	1997-Oct	11	10	10	12				
TEMPERATURE	1998-Apr	12	11	12	10.5				
TEMPERATURE	1998-Oct	13.7	13.1	11	13				
TEMPERATURE	1999-Sep	14	14.1	10	10.5				
TEMPERATURE	2000-Sep	14.5	15.8	14.8	15.3				
TEMPERATURE	2001-Sep	16	14.8	13.9	15.2				
TEMPERATURE	2002-Sep	14.9	13.3	15.2	15.8				
TEMPERATURE	2003-Sep	14.7	15.5	20.1	15.6				
TEMPERATURE	2004-Sep	15.5	10.6	14.2	13.8				
TEMPERATURE	2005-Sep	13.2	13.3	12.9	14.5				
TEMPERATURE	2006-Sep	13	12.4	17.9	14.7				
TEMPERATURE	2007-Sep	13.7	12.5	14	14.6				
TEMPERATURE	2008-Sep	13.1	13.1	14.1	15.3				
TEMPERATURE	2009-Sep	12.7	10.1	11.3	14				
TEMPERATURE	2010-Sep	14.7	14.2	13	15.1				
TEMPERATURE	2011-Sep	12.2	11.6	8.8	11				
TEMPERATURE	2012-Sep	11.06	14.29		16.7	17.94	20.36	21.62	
TEMPERATURE	2013-Sep	12.8	13.3	13.6	14.1	17.1	19.8	18.7	
TEMPERATURE	2014-Sep	17.37	18.37	12.4	15.62	21.21	24.02	28.69	
TEMPERATURE	2015-Sep	14.1	13.38	14.69	16.83	14.22	21.01	18.43	
TEMPERATURE	2016-Sep	12.2	11.6	13.4	13.8		15.5	15.6	
TEMPERATURE	2017-Sep	15.1	13.5		17.4	15.6	18.6	21.5	
TEMPERATURE	2018-Sep	12.6	14.1	14.2	16.8	16.4	19.2	16.4	

GW Standard:
None

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

TEMPERATURE
UNITS: DEG C

CHEMICAL PARAMETER	EVENT	LW-01	LW-02	LW-03	LW-04	LEACHATE TANK
TEMPERATURE	1993-Sep					
TEMPERATURE	1994-Feb					
TEMPERATURE	1994-Apr					
TEMPERATURE	1994-Jul					
TEMPERATURE	1994-Oct					
TEMPERATURE	1995-Apr					
TEMPERATURE	1995-Oct					
TEMPERATURE	1996-Apr					
TEMPERATURE	1996-Oct					
TEMPERATURE	1997-Apr					
TEMPERATURE	1997-Oct					
TEMPERATURE	1998-Apr					
TEMPERATURE	1998-Oct					
TEMPERATURE	1999-Sep					
TEMPERATURE	2000-Sep					
TEMPERATURE	2001-Sep					
TEMPERATURE	2002-Sep					
TEMPERATURE	2003-Sep					
TEMPERATURE	2004-Sep					
TEMPERATURE	2005-Sep					
TEMPERATURE	2006-Sep					
TEMPERATURE	2007-Sep					
TEMPERATURE	2008-Sep					
TEMPERATURE	2009-Sep					
TEMPERATURE	2010-Sep					
TEMPERATURE	2011-Sep					
TEMPERATURE	2012-Sep					16.9
TEMPERATURE	2013-Sep					14.4
TEMPERATURE	2014-Sep	17.93				21.95
TEMPERATURE	2015-Sep	14.7				14.79
TEMPERATURE	2016-Sep	13.4				14.6
TEMPERATURE	2017-Sep	13.9				15.8
TEMPERATURE	2018-Sep	17.6			17.2	17.2

GW Standard:
None

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

CONDUCTANCE, SPECIFIC
UNITS: UMHOS/CM

CHEMICAL PARAMETER	EVENT	MW-03	MW-04	MW-05	MW-07	MW-08	MW-09	MW-10	MW-11AR	MW-13	MW-14	MW-18	MW-19
CONDUCTANCE, SPECIFIC	1993-Sep						394	634		490	691	677	
CONDUCTANCE, SPECIFIC	1994-Feb	746	1100	679	701	762	651	742		716	785	713	658
CONDUCTANCE, SPECIFIC	1994-Apr	740	1150	682	658	731	455	687		680	673	690	662
CONDUCTANCE, SPECIFIC	1994-Jul	696	1190	904	670	627	476	610		720	675	580	636
CONDUCTANCE, SPECIFIC	1994-Oct	785	1280	544	712	736	494	699		751	741	707	674
CONDUCTANCE, SPECIFIC	1995-Apr	666	1203	491	641	561	444	608		497	659	567	585
CONDUCTANCE, SPECIFIC	1995-Oct	1000	1545	864	967	1010	812	1080		1113	1123	886	954
CONDUCTANCE, SPECIFIC	1996-Apr	720	1000	570	860	680	410	790		810	740	550	660
CONDUCTANCE, SPECIFIC	1996-Oct	760	1370	640	760	860	470	560		900	880	600	760
CONDUCTANCE, SPECIFIC	1997-Apr	760	1280	360	680	640	430	520		720	810	630	700
CONDUCTANCE, SPECIFIC	1997-Oct	810	1310	770	720	930	540	630		620	560	680	690
CONDUCTANCE, SPECIFIC	1998-Apr	540	850	640	490	490	430	540		370	610	510	530
CONDUCTANCE, SPECIFIC	1998-Oct	520	940	550	540	660	510	510		630	550	490	510
CONDUCTANCE, SPECIFIC	1999-Sep	610	940	520	620	640	580	620		740	630	550	590
CONDUCTANCE, SPECIFIC	2000-Sep	643	952	419	629	697	392	643		831	686	616	628
CONDUCTANCE, SPECIFIC	2001-Sep	640	930	370	610	698	510	562		793	675	901	600
CONDUCTANCE, SPECIFIC	2002-Sep	667	871	377	621	645	467	627		819	695	989	595
CONDUCTANCE, SPECIFIC	2003-Sep	677	861	463	656	671	606	627		804	692	1207	624
CONDUCTANCE, SPECIFIC	2004-Sep	689	931	440	593	635	577	554		721	638	1018	575
CONDUCTANCE, SPECIFIC	2005-Sep	704	889	370	630	678	502	647	732	758	677	959	611
CONDUCTANCE, SPECIFIC	2006-Sep	719	823	375	689	668	633	695	1120	481	690	1070	632
CONDUCTANCE, SPECIFIC	2007-Sep	723	907	403	644	677	625	593	1134	674	671	1031	624
CONDUCTANCE, SPECIFIC	2008-Sep	719	879	449	623	699	599	560	970	744	678	767	604
CONDUCTANCE, SPECIFIC	2009-Sep	723	892	421	620	681	602	587	903	720	678	934	602
CONDUCTANCE, SPECIFIC	2010-Sep	661	741	449	581	620	586	555	857	687	665	644	579
CONDUCTANCE, SPECIFIC	2011-Sep	663	861	430	610	735	597	567	918	737	682	808	555
CONDUCTANCE, SPECIFIC	2012-Sep	690	803	536	605	774	339	611	955	712	688	937	739
CONDUCTANCE, SPECIFIC	2013-Sep	727	740	450	596	653	693	516	872	732	666	935	585
CONDUCTANCE, SPECIFIC	2014-Sep	611	782	583	571	572	754	528	784	383	606	504	600
CONDUCTANCE, SPECIFIC	2015-Sep	675	780	353	692	549	655	513	723	625	596	579	554
CONDUCTANCE, SPECIFIC	2016-Sep	1105	1352	1192	523.1	493.8	822	922	1329	1162	1099	1002	1011
CONDUCTANCE, SPECIFIC	2017-Sep	585	802	339.7	562.3	695	493.8	527.7	763	660	715	721	554.2
CONDUCTANCE, SPECIFIC	2018-Sep	631	809	685	589	534	526	484	828	667	588	571	611

GW Standard:
None

IPL Marshalltown East and West Closed Landfills
Historic Monitoring Results

CONDUCTANCE, SPECIFIC
UNITS: UMHOS/CM

CHEMICAL PARAMETER	MW-20	MW-21	MW-22	MW-23	GWGCS	SW-01	SW-02	SW-03	LW-01	LW-02	LW-03	LW-04	LEACHATE TANK
CONDUCTANCE, SPECIFIC	964		814	1164									
CONDUCTANCE, SPECIFIC	1130	810	2050	200									
CONDUCTANCE, SPECIFIC	990	927	860	1124									
CONDUCTANCE, SPECIFIC	987	812	827	1520									
CONDUCTANCE, SPECIFIC	860	890	924	1520									
CONDUCTANCE, SPECIFIC	835	679	784	1190									
CONDUCTANCE, SPECIFIC	1488	1196	1190	2160									
CONDUCTANCE, SPECIFIC	1120	840	990	1800									
CONDUCTANCE, SPECIFIC	1070	1100	1150	960									
CONDUCTANCE, SPECIFIC	960	860	940	1650									
CONDUCTANCE, SPECIFIC	1160	1050	1060	1800									
CONDUCTANCE, SPECIFIC	800	590	730	2630									
CONDUCTANCE, SPECIFIC	890	780	820	1100									
CONDUCTANCE, SPECIFIC	1650	760	770	1310									
CONDUCTANCE, SPECIFIC	825	755	895	1167									
CONDUCTANCE, SPECIFIC	850	700	850	1328									
CONDUCTANCE, SPECIFIC	764	657	817	970									
CONDUCTANCE, SPECIFIC	844	672	938	1152									
CONDUCTANCE, SPECIFIC	873	759	755	1211									
CONDUCTANCE, SPECIFIC	794	724	817	1127									
CONDUCTANCE, SPECIFIC	776	689	804	1066									
CONDUCTANCE, SPECIFIC	869	849	830	828									
CONDUCTANCE, SPECIFIC	1157	922	913	1252									
CONDUCTANCE, SPECIFIC	1038	919	903	671									
CONDUCTANCE, SPECIFIC	1058	695	768	952									
CONDUCTANCE, SPECIFIC	1015	812	849	1242									
CONDUCTANCE, SPECIFIC	832	664		1668	842	437	547						736
CONDUCTANCE, SPECIFIC	928	712	848	824	991	530	531						514
CONDUCTANCE, SPECIFIC	789	627	717	455	991	581	592		876				624
CONDUCTANCE, SPECIFIC	856	706	687	431	991	525	539		788				538
CONDUCTANCE, SPECIFIC	1334	1184	1344	1193		998	1015		1425				884
CONDUCTANCE, SPECIFIC	887	707		1449	95.3	446.1	283.1		789				528.7
CONDUCTANCE, SPECIFIC	811	644	719	271.2	1044	576	576		771			1193	632

GW Standard:
None

Appendix E

Statistical Evaluation of Groundwater Monitoring Results

November 30, 2023
File No. 25223064.00

TECHNICAL MEMORANDUM

SUBJECT: Statistical Evaluation of Groundwater Monitoring Results
Marshalltown East and West Closed CCR Landfills, September 2023 Sampling Event

PREPARED BY: Ryan Matzuk

CHECKED BY: Charles Hostetler

STATISTICAL METHOD

The statistical analysis uses a prediction interval approach, as recommended for detection monitoring in the March 2009 U.S. Environmental Protection Agency (U.S. EPA) Unified Guidance for Statistical Analysis of Groundwater Monitoring Data at Resource Conservation and Recovery Act (RCRA) Facilities. For the prediction interval evaluation, interwell testing was selected based on the considerations outlined in Chapter 6 of the Unified Guidance. The statistical program used to calculate the interwell prediction interval is Sanitas™ (Version 9.6.37).

The Marshalltown monitoring data are evaluated in two well groups, representing the East and West Landfills. For the East Landfill, monitoring wells MW-9 and MW-10 are used as the background wells. For the West Landfill, monitoring wells MW-8, MW-13, and MW-14 are used as the background wells. For each group, the background data are pooled for calculation of the prediction limits.

TIME SERIES PLOTS

Time series plots are prepared for the required monitoring parameters to show the concentration variations over time. Time series graphs are included in **Attachments E1** (West) and **E2** (East). For metals, the time series plots only show monitoring results since 2016, when the monitoring program transitioned from dissolved metals to total metals analysis. For chloride and sulfate, which are not typically affected by filtering, older historical results for the background wells are included in the time series plots and are used in the determination of background for the statistical evaluation.

OUTLIER ANALYSIS

An outlier analysis is performed for background monitoring results at the upgradient wells. A statistical outlier is a value that is extremely different from the other values in the data set. The Sanitas outlier tests identify data points that do not appear to fit the distribution of the rest of the data set and determine if they differ significantly from the rest of the data. The outlier analysis was performed for each background well individually, rather than for the pooled background data.

The outlier analysis performed in Sanitas includes the following steps:

1) Run normality test (Shapiro Wilk/Francia).

2) If normally distributed, run U.S. EPA's 1989 Outlier Test to identify suspected outliers.
   a) If number of background samples is less than or equal to 22, run Dixon's test for suspected outliers.
   b) If number of background samples is more than 22, run Rosner's test for suspected outliers.

3) If not normally distributed, run Tukey's test for outliers.

4) Review data flagged as possible outliers to evaluate whether they should be removed from the background data set. Also review time series plots for possible outliers that were not picked up in the statistical evaluation (e.g., outlier test may not identify outliers when two values are similar to each other, but very different from all other data).

Results identified as statistical outliers are checked for possible lab instrument failure, field collection problems, or data entry errors; however, outliers may exist naturally in the data if there is an extremely wide inherent or temporal variability in the data. The Unified Guidance states that unless a likely error can be identified, the outlier should not be removed.

For the September 2023 sampling event, the following background values were identified as potential outliers and handled as described:

West Landfill

- **Barium (MW-14).** One high result from the September 2017 event was flagged by Sanitas as a statistical outlier. This result was kept in the dataset because there was no known explanation for the higher result, and it appeared to be within the range of potential natural variation relative to the other observed barium concentrations (approximately 2 times the typical values at MW-14, similar to levels at other background wells).

- **Iron (MW-14).** One high result from the September 2017 event was flagged by Sanitas as a statistical outlier. This result was kept in the dataset because there was no known explanation for the higher result, and it appeared to be within the range of potential natural variation relative to the other observed iron concentrations.

East Landfill

- **Chloride (MW-9).** Four high results from the September 2013, September 2014, September 2015, and September 2022 events were flagged by Sanitas as statistical outliers. These results were kept in the dataset because there was no known explanation for the higher results, and the higher chloride levels persisted for at least 2 years, so it did not appear to reflect a sampling or laboratory error.

Outlier analysis results are included in **Attachments E3** (West) and **E4** (East).

INTERWELL PREDICTION LIMITS

Interwell upper prediction limits (UPLs) are calculated for the shallow and deep groundwater systems using data from the background wells for each monitored constituent, with outliers removed as noted above. The prediction limit analysis performed in Sanitas includes the following steps:

1) If 50 percent or more of results are non-detect, apply a non-parametric UPL. For small background sample sizes, the non-parametric UPL is the highest background value. For a parameter with 100 percent non-detects in the background values, the Double Quanitification rule applies, which says that a statistically significant increase (SSI) occurs when two results exceeding the quantification limit are reported for a compliance well.

2) If fewer than 50 percent of the results are non-detect, run normality test (Shapiro Wilk/Francia) to assess whether the data fit a normal distribution or can be transformed to fit a normal distribution (e.g., lognormal).

3) If normal or transformed normal, calculate parametric UPL.

4) If not normal or transformed normal, calculate non-parametric UPL.

For evaluation of parameters with less than 100 percent non-detects in the background sampling, the non-detects were replaced with the detection limit, unless the non-detects represented less than 15 percent of the total samples, in which case one-half of the detection limit was used.

Consistent with the Unified Guidance, parametric prediction limits are calculated based on a 1-of-2 retesting protocol and a target 10 percent annual site-wide false positive rate. Sanitas establishes the per-test significance level based on user inputs of the number of events per year, number of constituents being evaluated, and number of compliance wells. For the 2023 event, the following values were used:

Parameter	Value	Comments
Evaluations per year	1	September event
Constituents analyzed	12	Total of 18 constituents analyzed. Calcium, fluoride, lithium, molybdenum, total dissolved solids (TDS), and total suspended solids (TSS) not included because they were added to the program in 2023 and do not meet the minimum sample number requirements needed to produce prediciton limits.
Compliance wells	13	6 West, 7 East

Non-parametric prediction limits are also based on a 1-of-2 retesting protocol. The non-parametric limit is the highest value in the background dataset. Due to the small sample size, the false positive rate for the non-parametric tests is higher than for the parametric tests, but will go down as more background data are obtained.

Although the limits are based on a 1-of-2 retesting approach, retesting is not required. Because the site is closed and has been monitored for many years, retesting will typically not be performed unless

a new potential SSI is identified. If retesting is not performed, a result above the UPL is presumed to represent an SSI above the interwell background level. Only results that exceed the laboratory's limit of quantititation or reporting limit are compared to the UPL; therefore, a J-flagged value above the UPL is not an SSI.

Interwell prediction limit analysis results for 2023 are included in **Attachments E5** (West) and **E6** (East).

RM/lmh/CJH

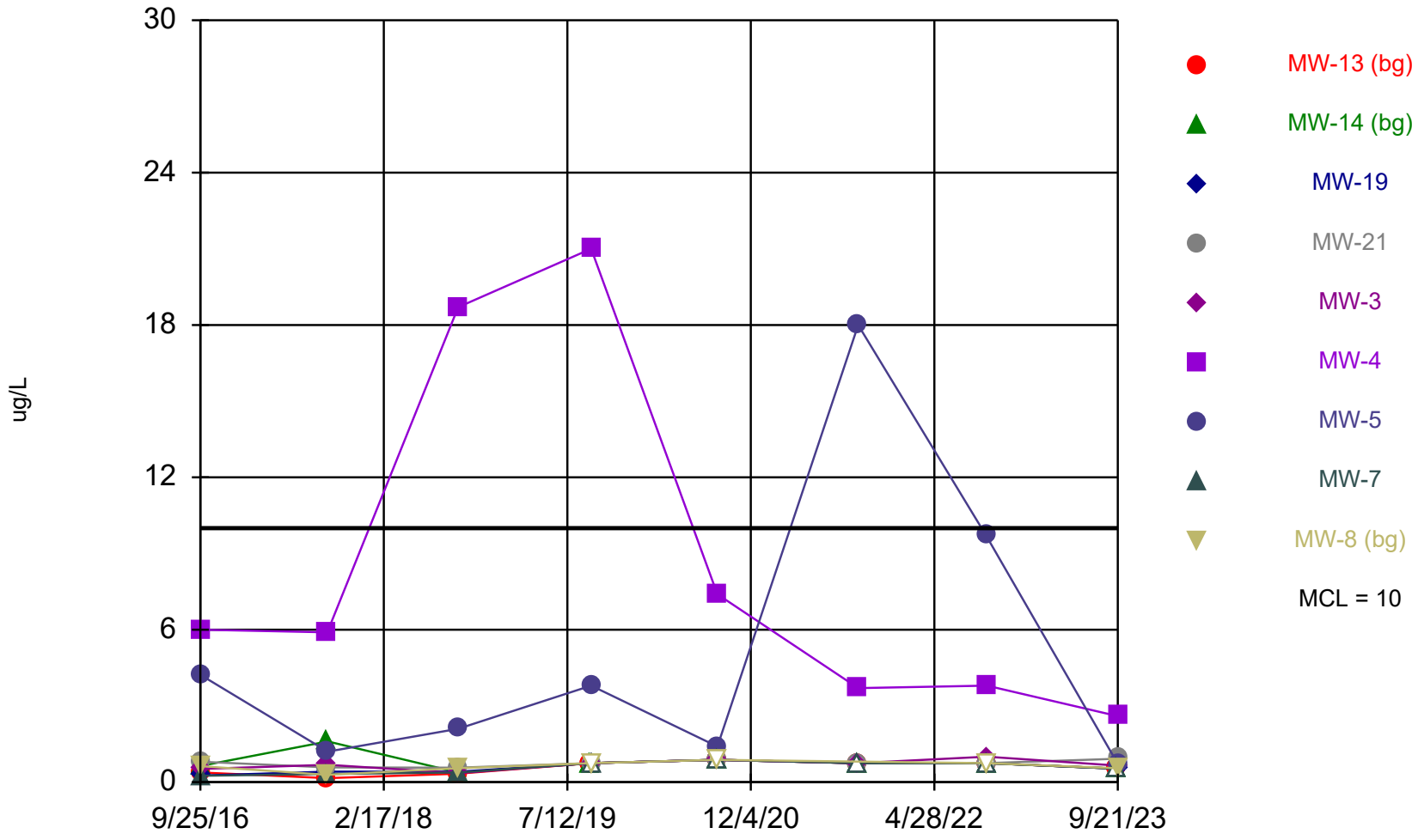
I:\25223064.00\Deliverables\2023 AWQR\Appendix E - Stats\Appendix E_Stats Memo_MT_2023.docx

Attachment E1

Times Series Graphs – West

Hollow symbols indicate censored values.

Arsenic



Time Series Analysis Run 10/30/2023 11:16 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Time Series

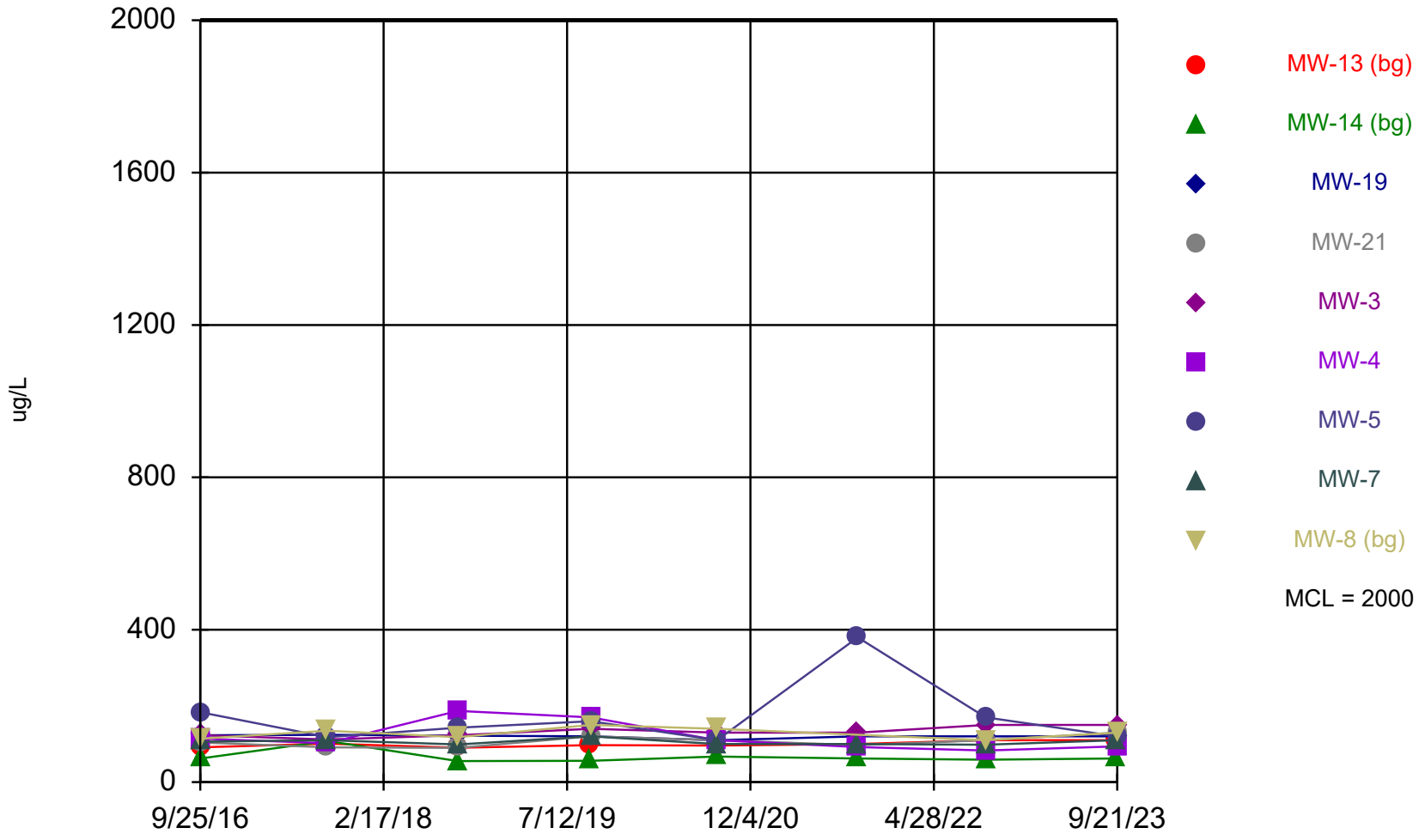
Constituent: Arsenic (ug/L) Analysis Run 10/30/2023 11:17 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)	MW-14 (bg)	MW-19	MW-21	MW-3	MW-4	MW-5	MW-7	MW-8 (bg)
9/25/2016	0.38 (J)								
9/26/2016		0.64 (J)							0.63 (J)
9/27/2016			0.26 (J)			6		0.25 (J)	
9/28/2016				0.8 (J)	0.52 (J)		4.2		
9/13/2017	0.16 (J)					5.9		0.32 (J)	0.29 (J)
9/14/2017		1.6	0.41 (J)	0.58 (J)	0.68 (J)		1.2		
9/11/2018	0.33 (J)			0.57 (J)					
9/12/2018		0.38 (J)	0.41 (J)			18.7	2.1		0.55 (J)
9/13/2018					0.35 (J)			0.38 (J)	
9/16/2019	<0.75	<0.75							
9/17/2019			<0.75	0.75 (J)	<0.75	21	3.8	<0.75	<0.75
9/1/2020		<0.88						<0.88	<0.88
9/2/2020	<0.88		<0.88	<0.88	<0.88	7.4	1.4 (J)		
9/27/2021	<0.75	<0.75							
9/28/2021								<0.75	
9/29/2021			<0.75	<0.75	<0.75	3.7	18		
9/20/2022		<0.75	<0.75				9.7	<0.75	<0.75
9/21/2022	<0.75				1 (J)				
9/22/2022				<0.75		3.8			
9/20/2023	<0.53 (U)	<0.53 (U)						<0.53 (U)	
9/21/2023			<0.53 (U)	0.92 (J)	0.65 (J)	2.6	0.72 (J)		0.55 (J)

ND substitution: RL or RL/2 if <15% NDs.

Barium



Time Series Analysis Run 10/30/2023 11:16 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

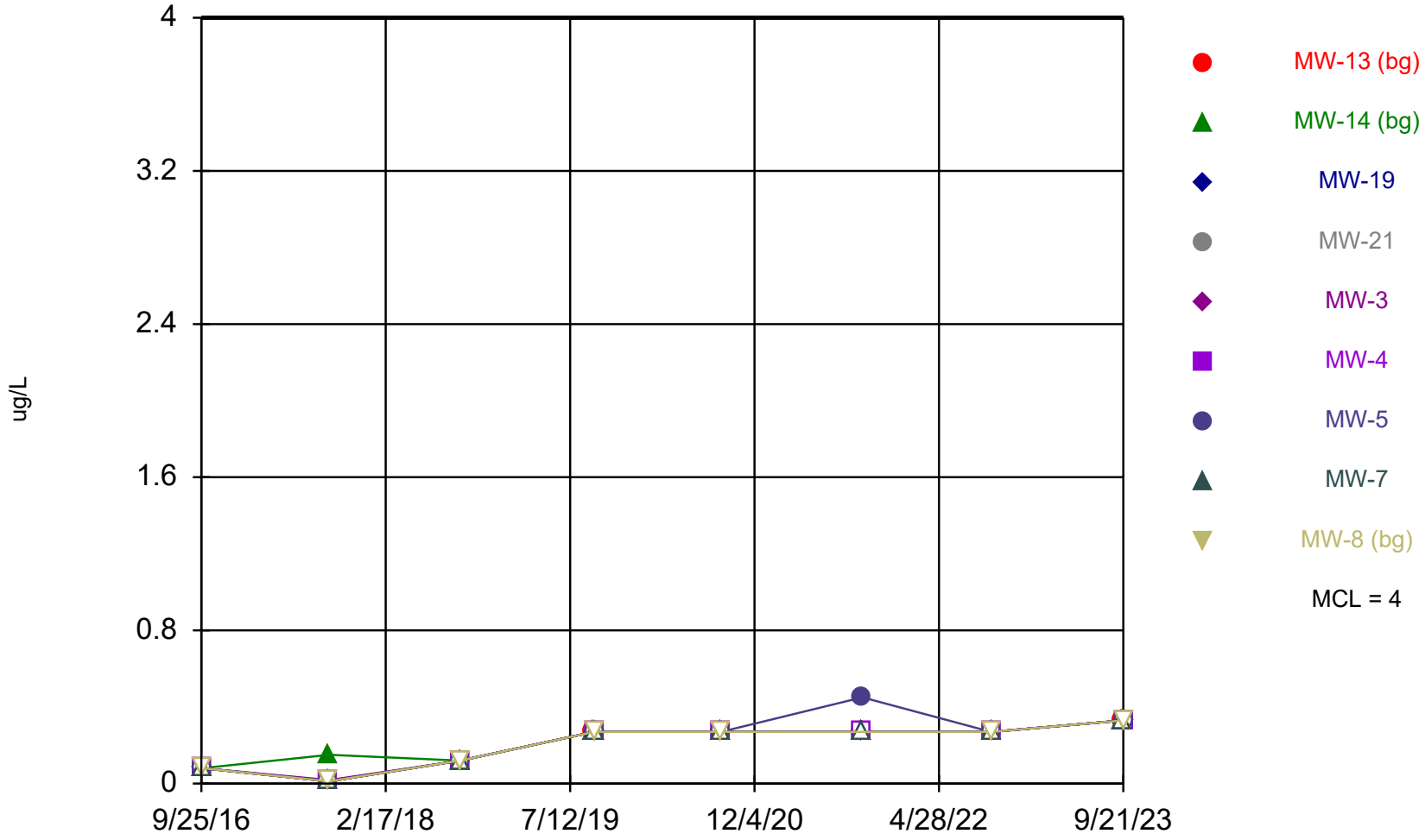
Time Series

Constituent: Barium (ug/L) Analysis Run 10/30/2023 11:17 AM View: West Closed LF
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)	MW-14 (bg)	MW-19	MW-21	MW-3	MW-4	MW-5	MW-7	MW-8 (bg)
9/25/2016	91.2								
9/26/2016		62.1							114
9/27/2016			123			114		106	
9/28/2016				104	123		183		
9/13/2017	101					102		110	135
9/14/2017		108	124	91.3	112		118		
9/11/2018	90.4			89.8					
9/12/2018		55.1	122			187	143		118
9/13/2018					123			98.9	
9/16/2019	97	56							
9/17/2019			120	120	140	170	160	120	150
9/1/2020		67						100	140
9/2/2020	96		110	110	130	110	110		
9/27/2021	100	62							
9/28/2021								100	
9/29/2021			120	97	130	92	380		
9/20/2022		59	120				170	98	110
9/21/2022	110				150				
9/22/2022				110		83			
9/20/2023	110	62						110	
9/21/2023			120	130	150	94	120		130

Hollow symbols indicate censored values.

Beryllium



Time Series Analysis Run 10/30/2023 11:16 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Time Series

Constituent: Beryllium (ug/L) Analysis Run 10/30/2023 11:17 AM View: West Closed LF

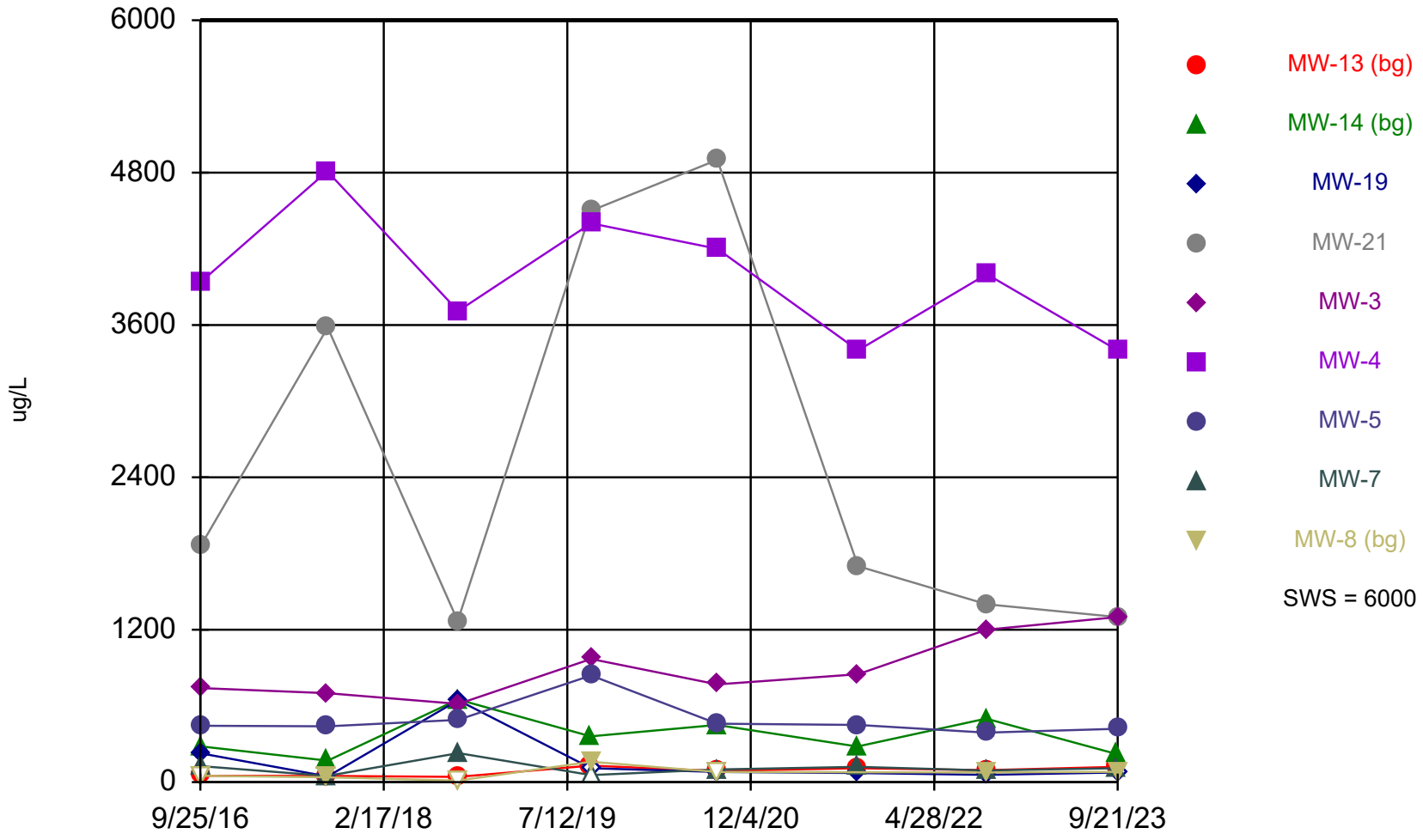
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)	MW-14 (bg)	MW-19	MW-21	MW-3	MW-4	MW-5	MW-7	MW-8 (bg)
9/25/2016	<0.08								
9/26/2016		<0.08							<0.08
9/27/2016			<0.08			<0.08		<0.08	
9/28/2016				<0.08	<0.08		<0.08		
9/13/2017	<0.012					0.012 (J)		<0.012	<0.012
9/14/2017		0.15 (J)	<0.012	0.015 (J)	0.018 (J)		<0.012		
9/11/2018	<0.12			<0.12					
9/12/2018		<0.12	<0.12			<0.12	<0.12		<0.12
9/13/2018					<0.12			<0.12	
9/16/2019	<0.27	<0.27							
9/17/2019			<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27
9/1/2020		<0.27						<0.27	<0.27
9/2/2020	<0.27		<0.27	<0.27	<0.27	<0.27	<0.27		
9/27/2021	<0.27	<0.27							
9/28/2021								<0.27	
9/29/2021			<0.27	<0.27	<0.27	<0.27	0.45 (J)		
9/20/2022		<0.27	<0.27				<0.27	<0.27	<0.27
9/21/2022	<0.27				<0.27				
9/22/2022				<0.27		<0.27			
9/20/2023	<0.33 (U)	<0.33 (U)						<0.33 (U)	
9/21/2023			<0.33 (U)	<0.33 (U)	<0.33 (U)	<0.33 (U)	<0.33 (U)		<0.33 (U)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Boron



Time Series Analysis Run 10/30/2023 11:16 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

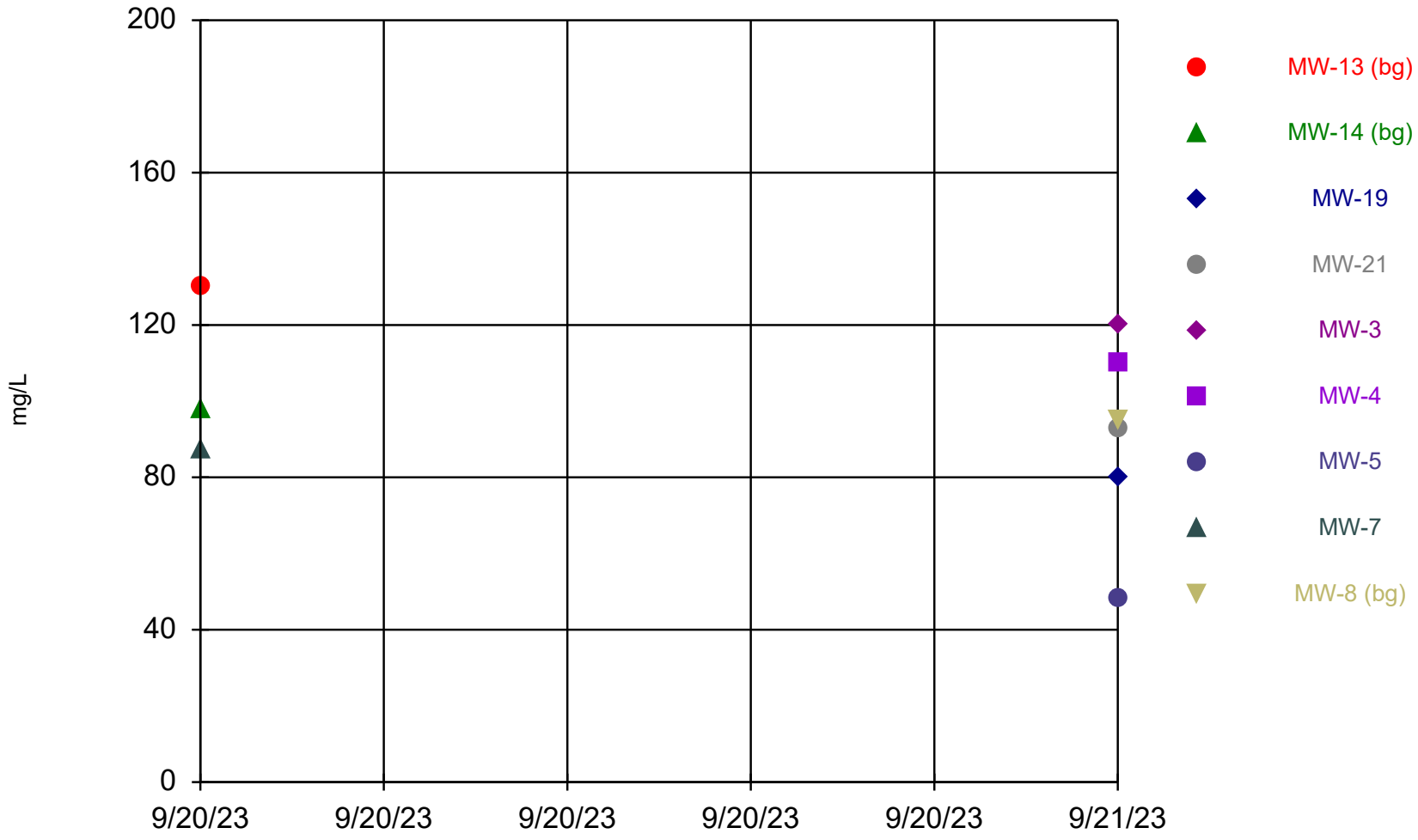
Time Series

Constituent: Boron (ug/L) Analysis Run 10/30/2023 11:17 AM View: West Closed LF
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)	MW-14 (bg)	MW-19	MW-21	MW-3	MW-4	MW-5	MW-7	MW-8 (bg)
9/25/2016	50.2 (J)								
9/26/2016		282							<50
9/27/2016			226			3940		126	
9/28/2016				1870	740		444		
9/13/2017	48.6 (J)					4810		49 (J)	37.6 (J)
9/14/2017		169	44.7 (J)	3580	700		440		
9/11/2018	41.4 (J)			1270					
9/12/2018		651	645			3710	490		<12.5
9/13/2018					616			228	
9/16/2019	130 (J)	360							
9/17/2019			<110	4500	970	4400	840	<110	160 (J)
9/1/2020		450						100	<80
9/2/2020	88 (J)		<80	4900	770	4200	460		
9/27/2021	110	280							
9/28/2021								120	
9/29/2021			72 (J)	1700	850	3400	450		
9/20/2022		500	<58				390	92 (J)	76 (J)
9/21/2022	94 (J)				1200				
9/22/2022				1400		4000			
9/20/2023	120	220						110	
9/21/2023			<76 (U)	1300	1300	3400	420		81 (J)

ND substitution: RL or RL/2 if <15% NDs.

Calcium



Time Series Analysis Run 10/30/2023 11:16 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Time Series

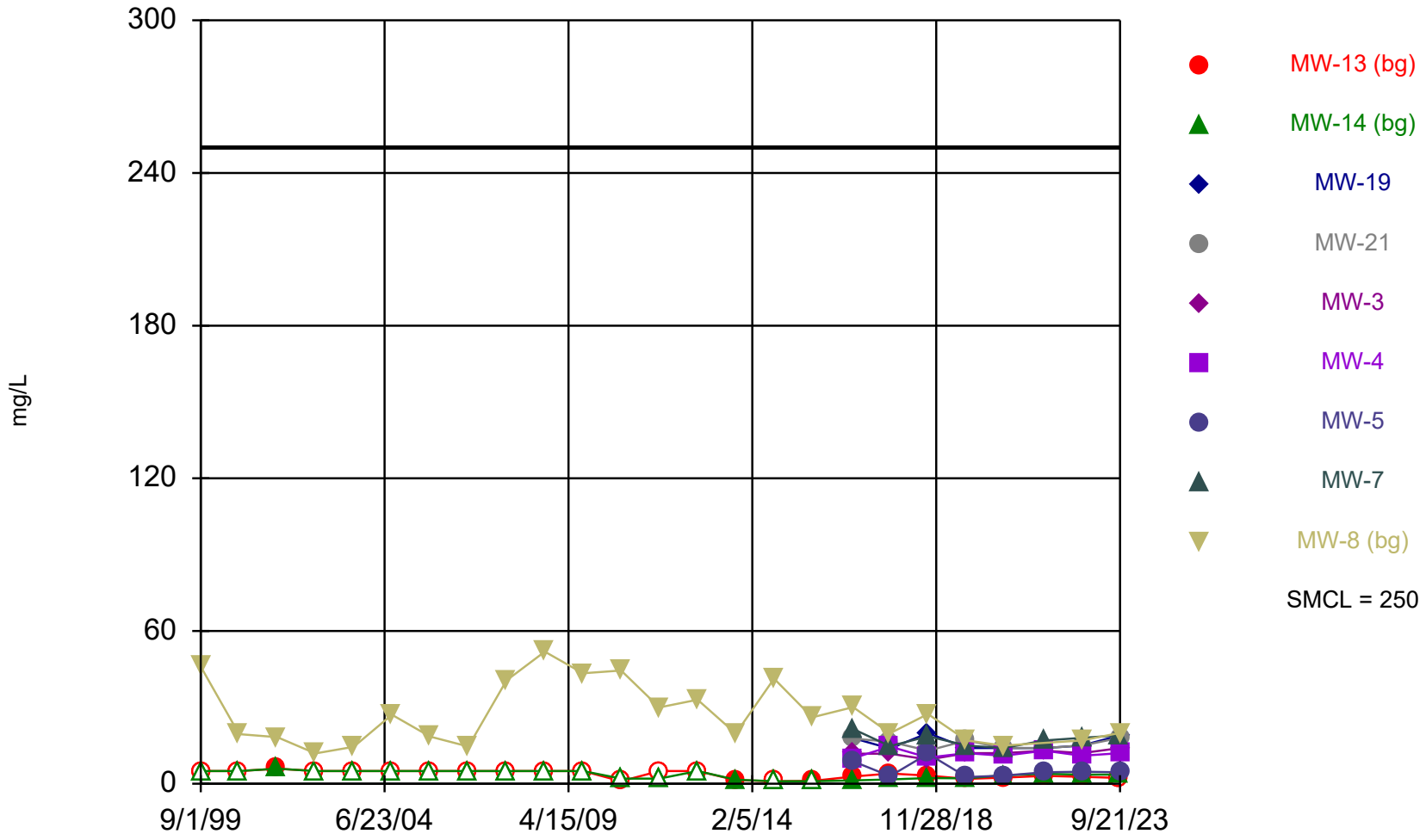
Constituent: Calcium (mg/L) Analysis Run 10/30/2023 11:17 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)	MW-14 (bg)	MW-19	MW-21	MW-3	MW-4	MW-5	MW-7	MW-8 (bg)
9/20/2023	130	98						87	
9/21/2023			80	93	120	110	48		95

Hollow symbols indicate censored values.

Chloride



Time Series Analysis Run 10/30/2023 11:16 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Time Series

Constituent: Chloride (mg/L) Analysis Run 10/30/2023 11:17 AM View: West Closed LF

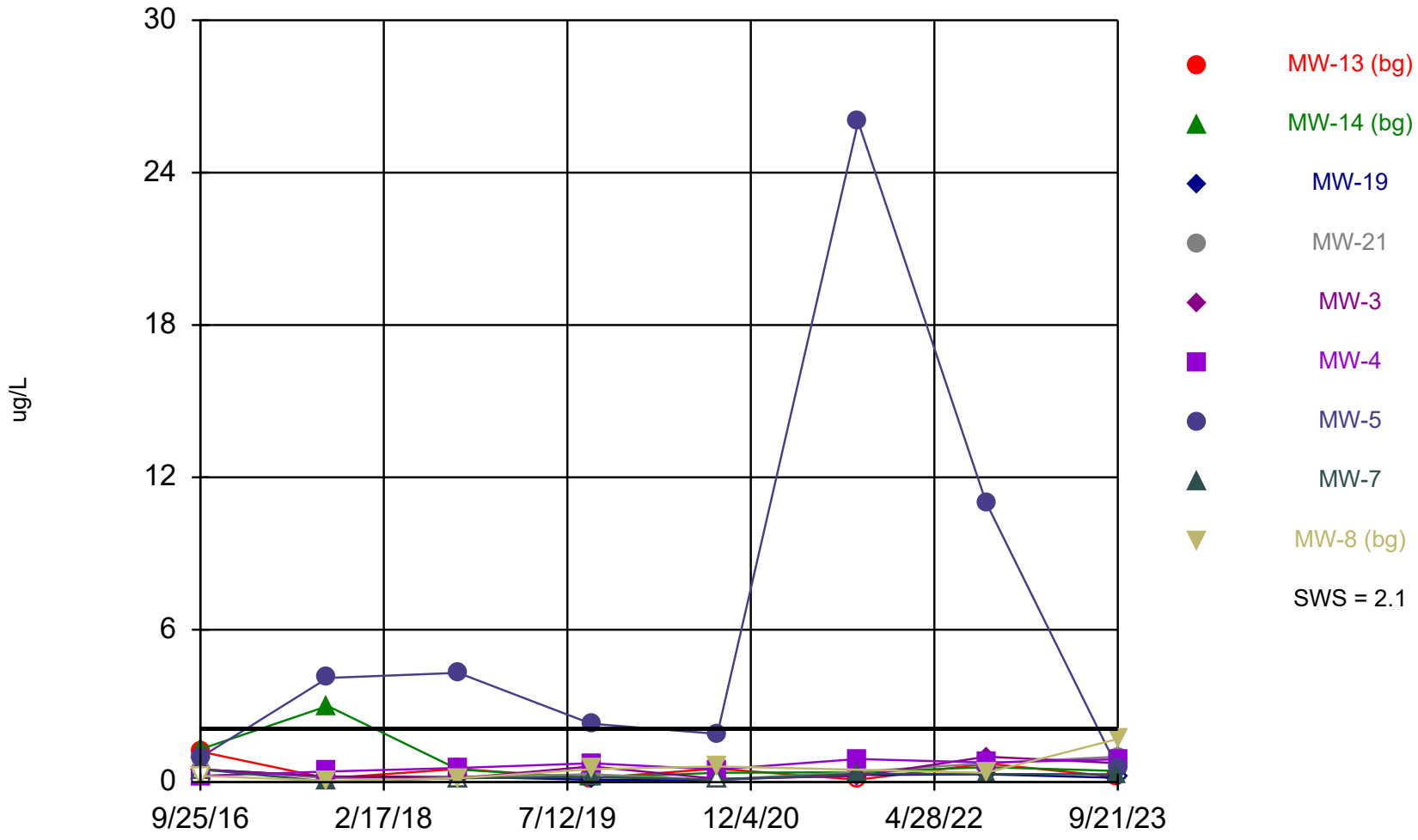
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)	MW-14 (bg)	MW-19	MW-21	MW-3	MW-4	MW-5	MW-7	MW-8 (bg)
9/1/1999	<5	<5							46
9/1/2000	<5	<5							19.5
9/1/2001	5.9	5.9							18.3
9/1/2002	<5	<5							11.9
9/1/2003	<5	<5							14.5
9/1/2004	<5	<5							27.1
9/1/2005	<5	<5							18.5
9/1/2006	<5	<5							14.6
9/1/2007	<5	<5							40.6
9/1/2008	<5	<5							51.9
9/1/2009	<5	<5							43.4
9/1/2010	<1	<2							44.5
9/1/2011	<5	<2							30
9/1/2012	<5	<5							33
9/1/2013	1.4	1.6							19.7
9/1/2014	<1	<1							41.3
9/1/2015	1.1	<1							26.1
9/25/2016	2.8								
9/26/2016		1.3							30.1
9/27/2016			17.9			10		21.5	
9/28/2016				17.7	11.8		8.8		
9/13/2017	4					14.6		14.8	19.8
9/14/2017		1.7	13.8	16.5	11.8		3		
9/11/2018	3.2			13					
9/12/2018		2.2	19.9			10.3	11.8		27.4
9/13/2018					9.5			18.6	
9/16/2019	1.9 (J,B)	2.1 (J,B)							
9/17/2019			14 (B)	17 (B)	12 (B)	12 (B)	2.6 (J,B)	15 (B)	17 (B)
9/1/2020		3.3 (J,B)						14 (B)	15 (B)
9/2/2020	2.4 (J,B)		14 (B)	14 (B)	12 (B)	11 (B)	3.2 (J,B)		
9/27/2021	3.1 (J)	3.9 (J)							
9/28/2021								17	
9/29/2021			14	14	13	13	4.5 (J)		
9/20/2022		3.6 (J)	15				4.7 (J)	18	17
9/21/2022	2.7 (J)				12				
9/22/2022				15		11			
9/20/2023	<2.3 (U)	3.6 (J)						19	
9/21/2023			19	18	14	12	4.5 (J)		20

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Cobalt



Time Series Analysis Run 10/30/2023 11:16 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Time Series

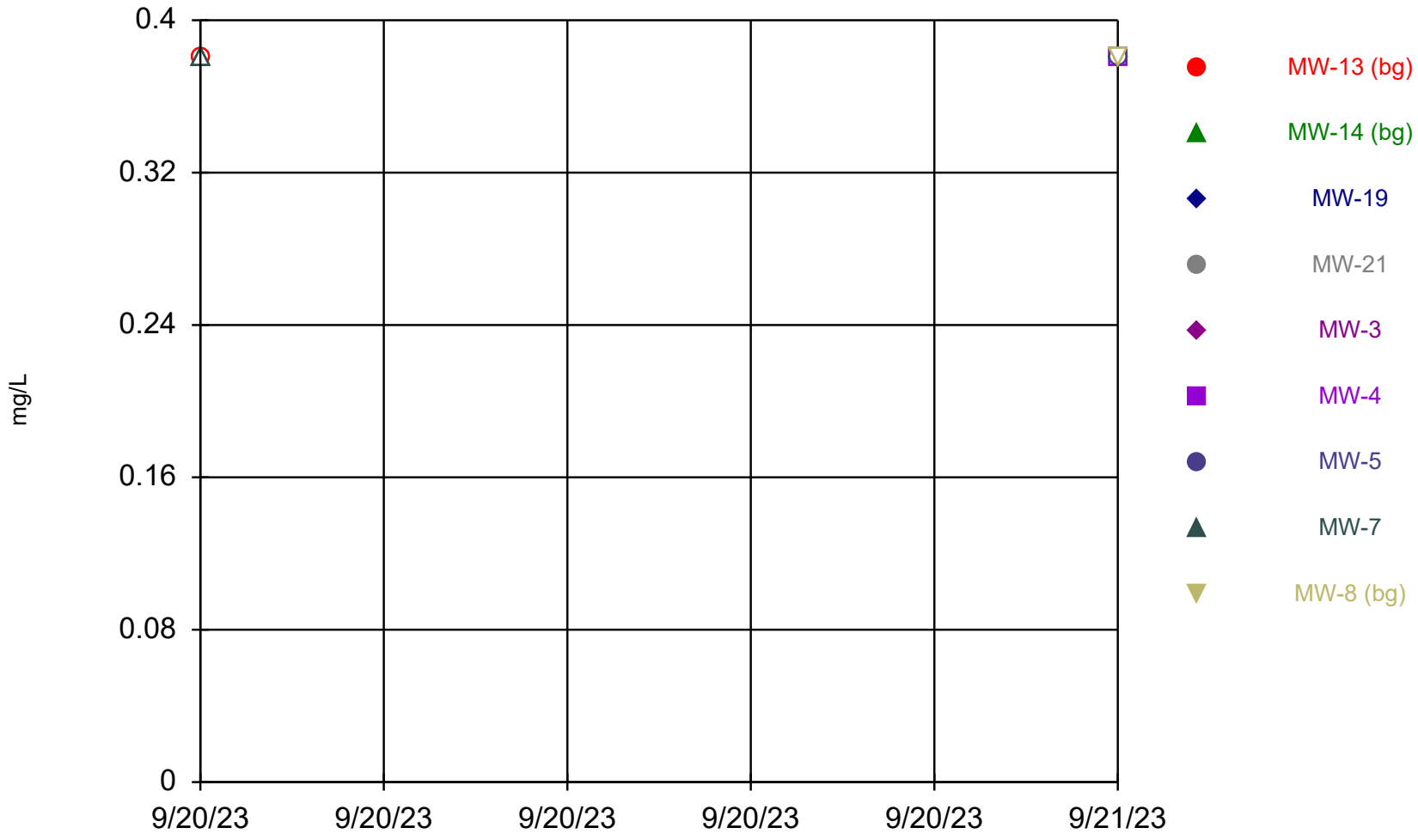
Constituent: Cobalt (ug/L) Analysis Run 10/30/2023 11:17 AM View: West Closed LF
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)	MW-14 (bg)	MW-19	MW-21	MW-3	MW-4	MW-5	MW-7	MW-8 (bg)
9/25/2016	1.2								
9/26/2016		1.3							<0.5
9/27/2016			<0.5			<0.5		<0.5	
9/28/2016				<0.5	<0.5		1		
9/13/2017	0.15 (J)					0.42 (J)		0.027 (J)	0.051 (J)
9/14/2017		3	0.22 (J)	0.16 (J)	0.22 (J)		4.1		
9/11/2018	0.52 (J)			0.21 (J)					
9/12/2018		0.5 (J)	0.21 (J)			0.56 (J)	4.3		0.15 (J)
9/13/2018					<0.15			<0.15	
9/16/2019	0.16 (J)	0.17 (J)							
9/17/2019			<0.091	0.31 (J)	0.62	0.74	2.3	0.2 (J)	0.51
9/1/2020		0.37 (J)						<0.091	0.62
9/2/2020	0.53		0.094 (J)	<0.091	0.13 (J)	0.5	1.9		
9/27/2021	<0.19	0.39 (J)							
9/28/2021								0.33 (J)	
9/29/2021			0.28 (J)	0.41 (J)	0.24 (J)	0.91	26		
9/20/2022		0.59	0.31 (J)				11	0.32 (J)	0.37 (J)
9/21/2022	0.73				1				
9/22/2022				0.75		0.77			
9/20/2023	0.2 (J)	0.44 (J)						0.31 (J)	
9/21/2023			<0.17 (U)	1	0.75	0.9	0.53		1.7

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Fluoride



Time Series Analysis Run 10/30/2023 11:16 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Time Series

Constituent: Fluoride (mg/L) Analysis Run 10/30/2023 11:17 AM View: West Closed LF

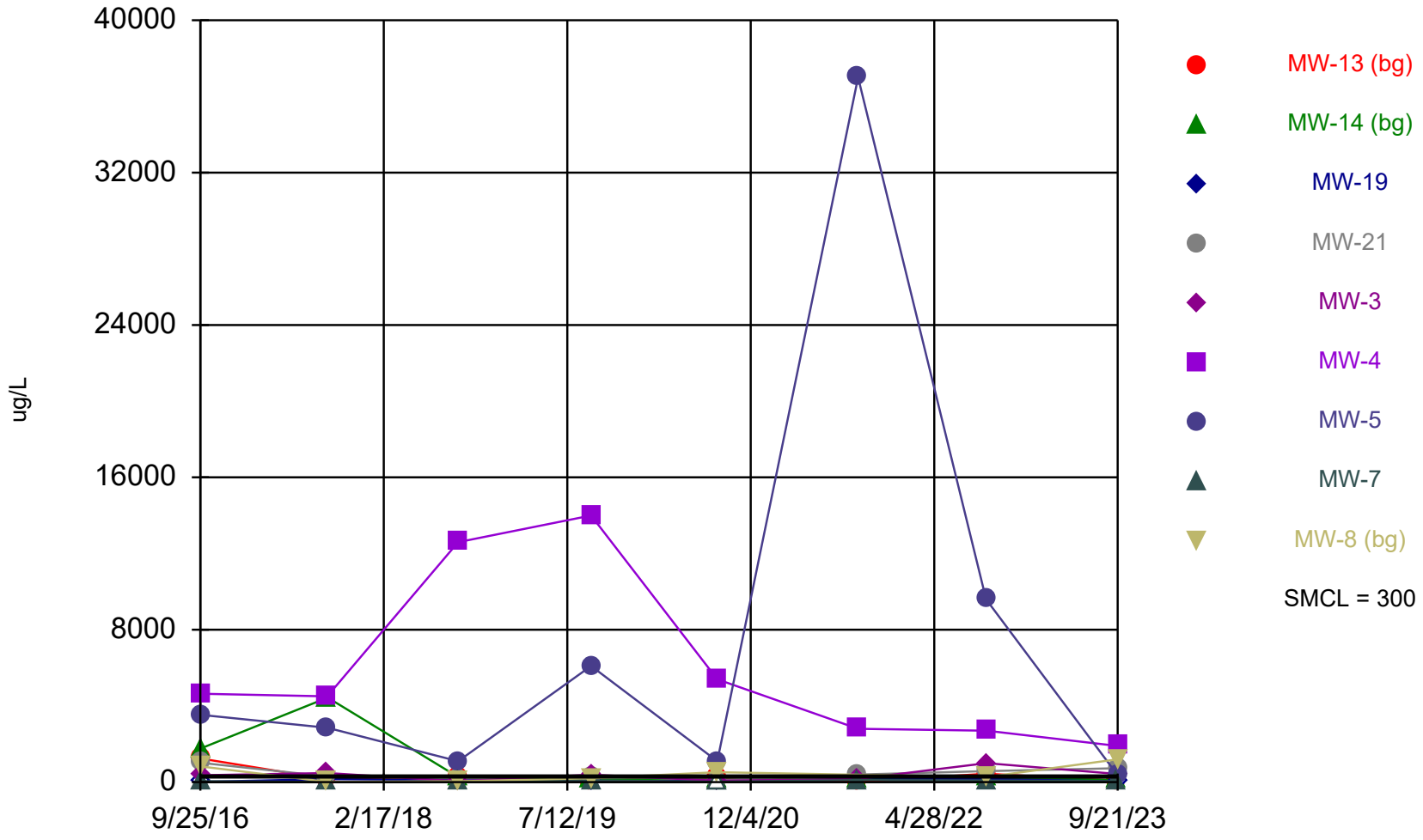
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)	MW-14 (bg)	MW-19	MW-21	MW-3	MW-4	MW-5	MW-7	MW-8 (bg)
9/20/2023	<0.38 (U)	<0.38 (U)						<0.38 (U)	
9/21/2023			<0.38 (U)	<0.38 (U)	<0.38 (U)	<0.38 (U)	<0.38 (U)		<0.38 (U)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Iron



Time Series Analysis Run 10/30/2023 11:16 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Time Series

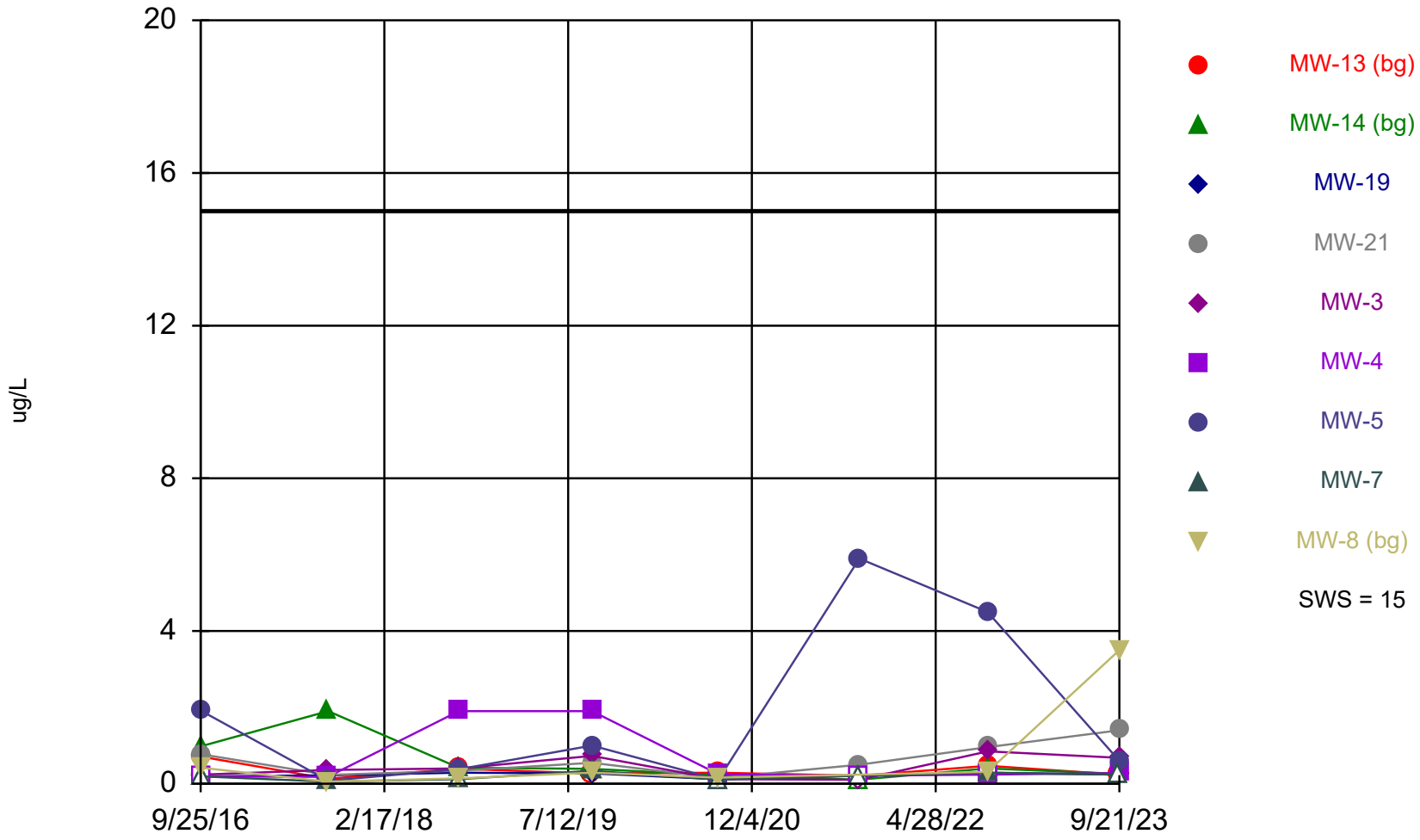
Constituent: Iron (ug/L) Analysis Run 10/30/2023 11:17 AM View: West Closed LF
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)	MW-14 (bg)	MW-19	MW-21	MW-3	MW-4	MW-5	MW-7	MW-8 (bg)
9/25/2016	1240								
9/26/2016		1770							820
9/27/2016			<12.8			4640		51.9	
9/28/2016				1010	362		3530		
9/13/2017	162					4500		11.9 (J)	18.7 (J)
9/14/2017		4440	162	297	475		2850		
9/11/2018	289			195					
9/12/2018		267	101			12600	1100		45.2 (J)
9/13/2018					42.2 (J)			41.7 (J)	
9/16/2019	76 (J)	130							
9/17/2019			<66	320	390	14000	6100	95 (J)	200
9/1/2020		130						<50	520
9/2/2020	230		<50	110	72 (J)	5400	1100		
9/27/2021	<36	140							
9/28/2021								110	
9/29/2021			130	400	170	2800	37000		
9/20/2022		240	170				9600	90 (J)	270
9/21/2022	440				1000				
9/22/2022				580		2700			
9/20/2023	78 (J)	120						54 (J)	
9/21/2023			<36 (U)	730	430	1900	360		1200

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Lead



Time Series Analysis Run 10/30/2023 11:16 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Time Series

Constituent: Lead (ug/L) Analysis Run 10/30/2023 11:17 AM View: West Closed LF

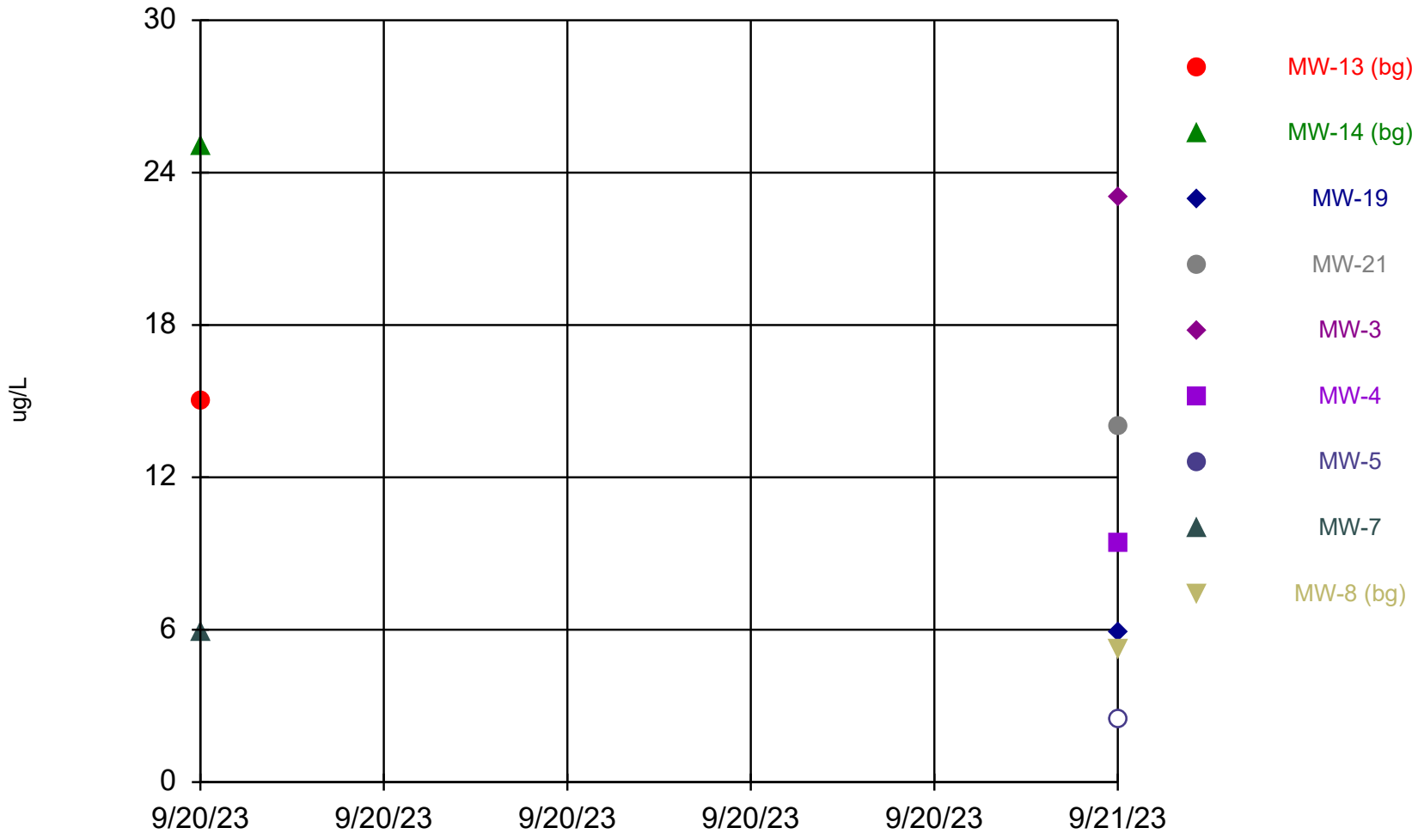
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)	MW-14 (bg)	MW-19	MW-21	MW-3	MW-4	MW-5	MW-7	MW-8 (bg)
9/25/2016	0.71 (J)								
9/26/2016		0.98 (J)							0.42 (J)
9/27/2016			<0.19			<0.19		<0.19	
9/28/2016				0.77 (J)	0.24 (J)		1.9		
9/13/2017	0.13 (J)					0.18 (J)		0.056 (J)	0.053 (J)
9/14/2017		1.9	0.22 (J)	0.23 (J)	0.36 (J)		0.08 (J)		
9/11/2018	0.39 (J)			0.34 (J)					
9/12/2018		0.42 (J)	0.29 (J)			1.9	0.38 (J)		0.14 (J)
9/13/2018					0.4 (J)			<0.12	
9/16/2019	<0.27	0.39 (J)							
9/17/2019			<0.27	0.55	0.73	1.9	1	0.34 (J)	0.29 (J)
9/1/2020		0.22 (J)						<0.11	0.16 (J)
9/2/2020	0.29 (J)		0.12 (J)	0.15 (J)	0.12 (J)	0.25 (J)	0.11 (J)		
9/27/2021	<0.21	<0.21							
9/28/2021								<0.21	
9/29/2021			<0.21	0.5	<0.21	<0.21	5.9		
9/20/2022		0.4 (J)	0.29 (J)				4.5	0.29 (J)	0.31 (J)
9/21/2022	0.47 (J)				0.85				
9/22/2022				0.96		<0.24			
9/20/2023	<0.24 (U)	0.26 (J)						<0.24 (U)	
9/21/2023			<0.24 (U)	1.4	0.68	0.28 (J)	0.6		3.5

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Lithium



Time Series Analysis Run 10/30/2023 11:16 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Time Series

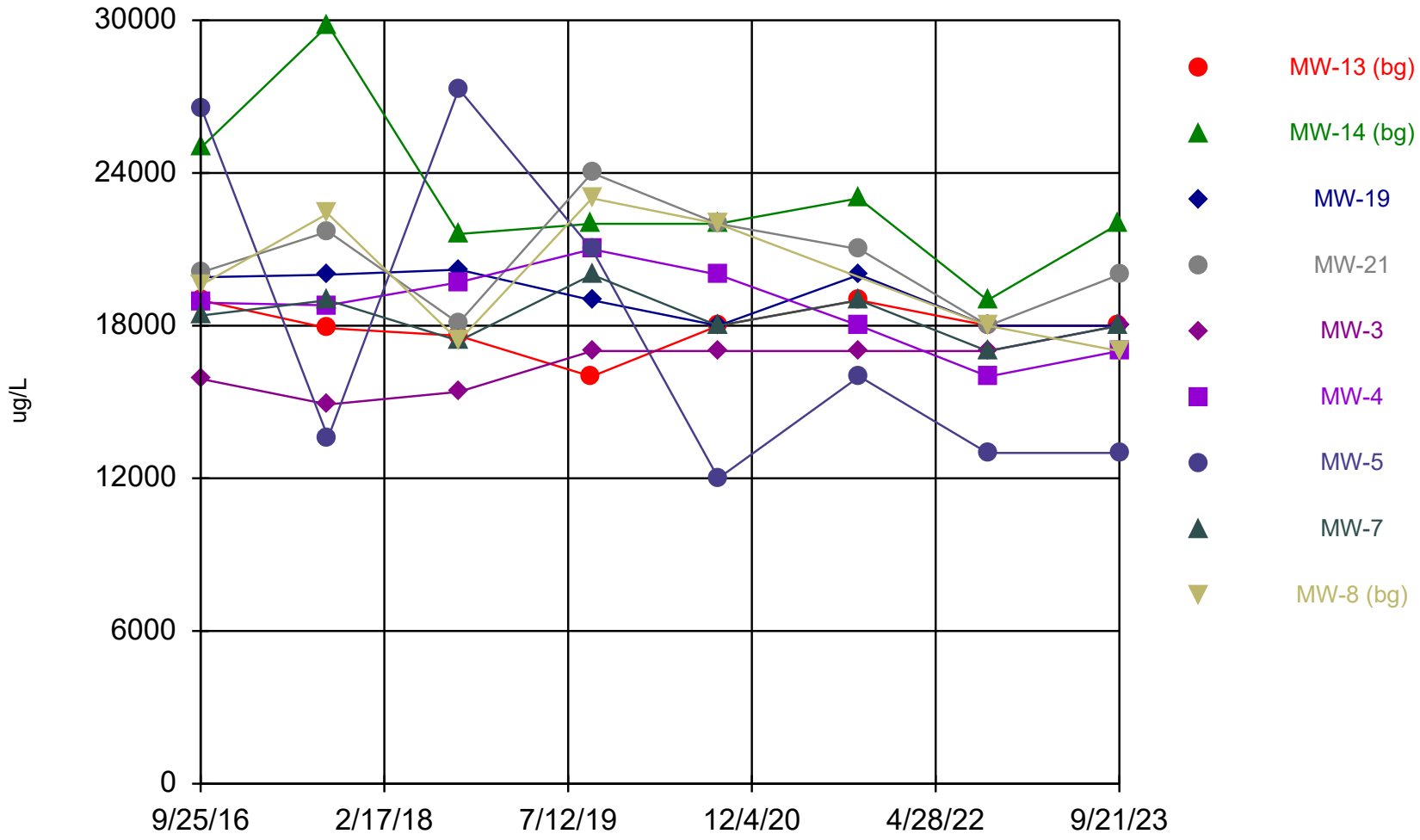
Constituent: Lithium (ug/L) Analysis Run 10/30/2023 11:17 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)	MW-14 (bg)	MW-19	MW-21	MW-3	MW-4	MW-5	MW-7	MW-8 (bg)
9/20/2023	15	25						5.9 (J)	
9/21/2023			5.9 (J)	14	23	9.4 (J)	<2.5 (U)		5.2 (J)

ND substitution: RL or RL/2 if <15% NDs.

Magnesium



Time Series Analysis Run 10/30/2023 11:17 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Time Series

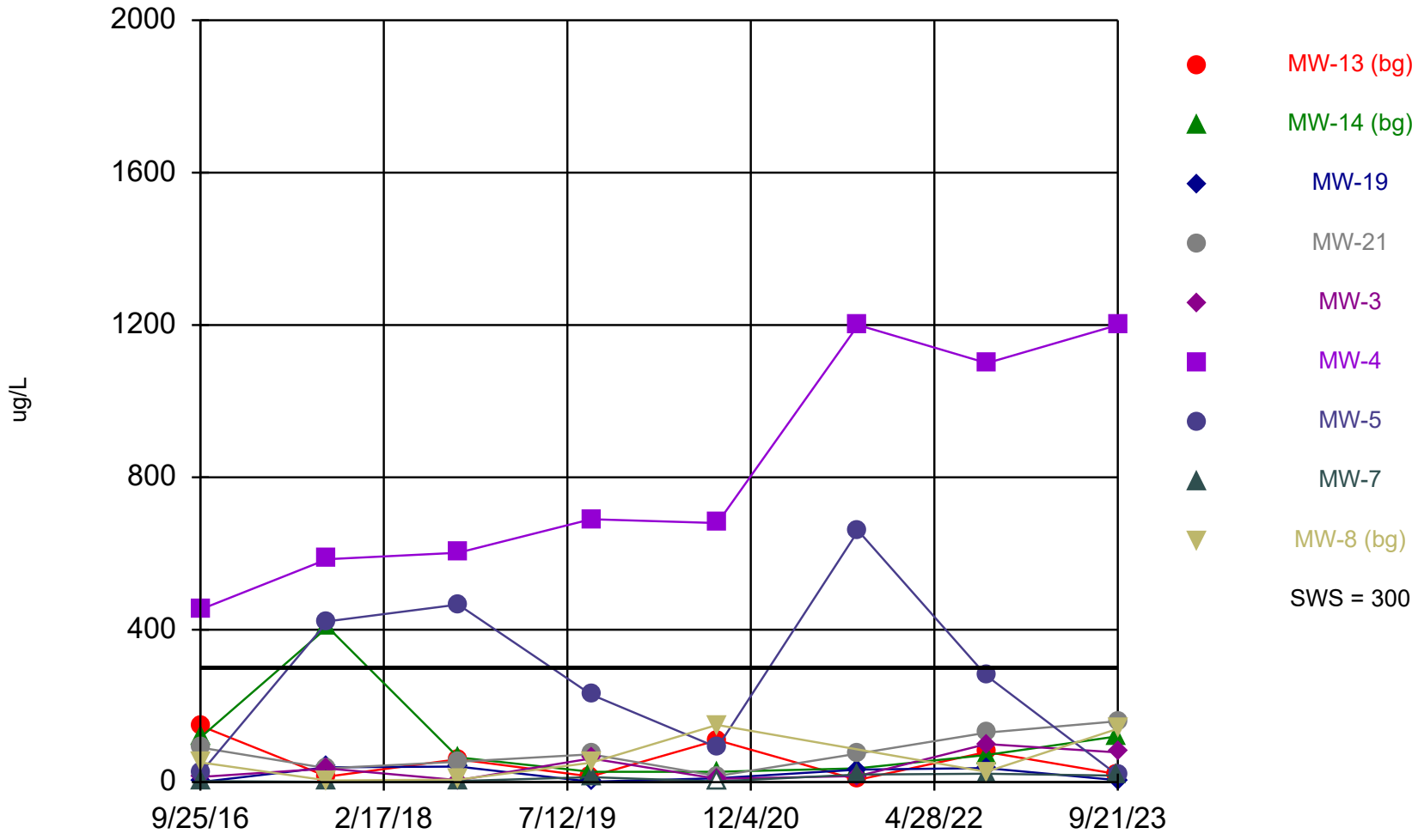
Constituent: Magnesium (ug/L) Analysis Run 10/30/2023 11:17 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)	MW-14 (bg)	MW-19	MW-21	MW-3	MW-4	MW-5	MW-7	MW-8 (bg)
9/25/2016	19000								
9/26/2016		25000							19600
9/27/2016			19900			18900		18400	
9/28/2016				20100	15900		26500		
9/13/2017	17900					18800		19000	22400
9/14/2017		29800	20000	21700	14900		13600		
9/11/2018	17600			18100					
9/12/2018		21600	20200			19700	27300		17400
9/13/2018					15400			17400	
9/16/2019	16000	22000							
9/17/2019			19000	24000	17000	21000	21000	20000	23000
9/1/2020		22000						18000	22000
9/2/2020	18000		18000	22000	17000	20000	12000		
9/27/2021	19000	23000							
9/28/2021								19000	
9/29/2021			20000	21000	17000	18000	16000		
9/20/2022		19000	18000				13000	17000	18000
9/21/2022	18000				17000				
9/22/2022				18000		16000			
9/20/2023	18000	22000						18000	
9/21/2023			18000	20000	18000	17000	13000		17000

Hollow symbols indicate censored values.

Manganese



Time Series Analysis Run 10/30/2023 11:17 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Time Series

Constituent: Manganese (ug/L) Analysis Run 10/30/2023 11:17 AM View: West Closed LF

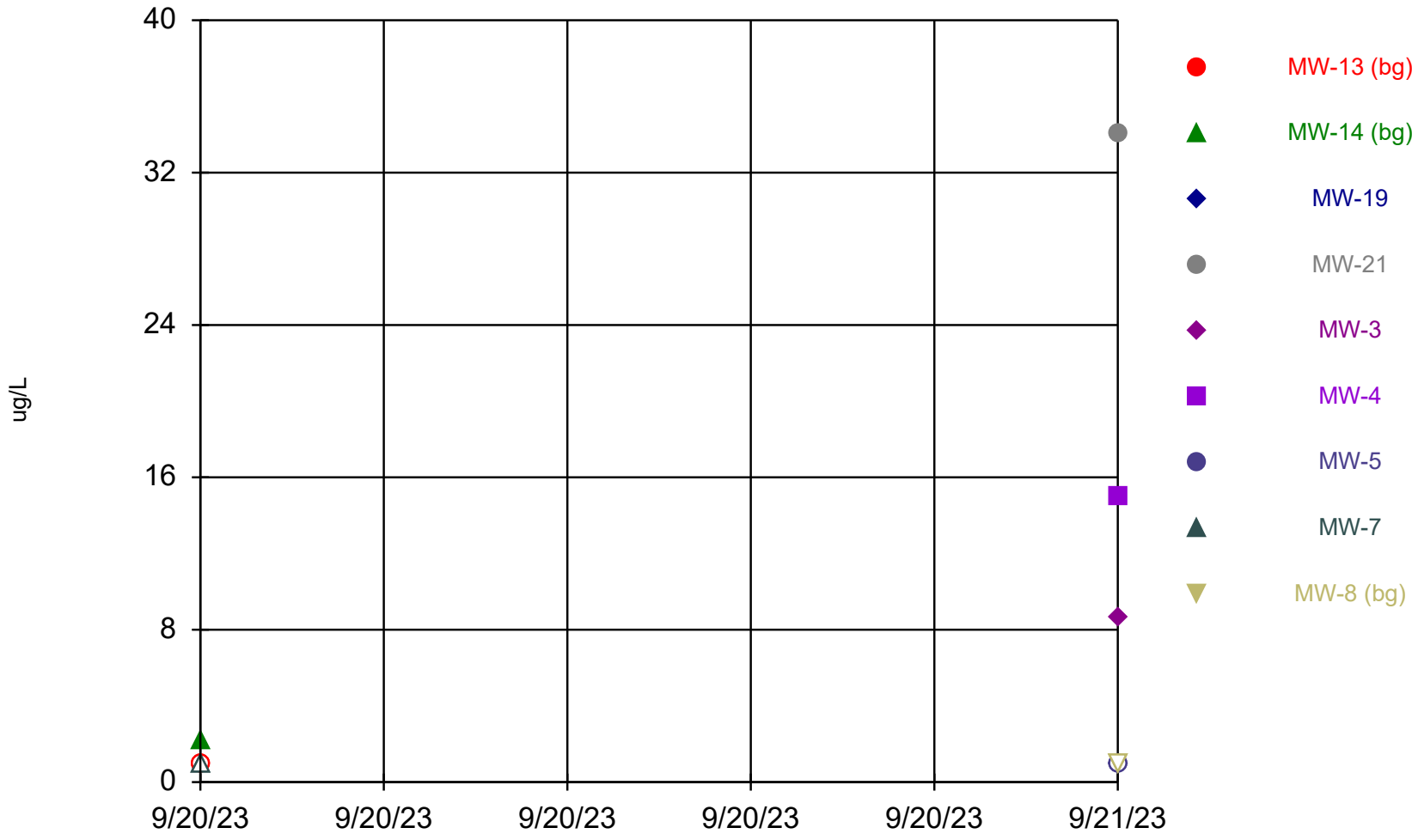
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)	MW-14 (bg)	MW-19	MW-21	MW-3	MW-4	MW-5	MW-7	MW-8 (bg)
9/25/2016	148								
9/26/2016		118							51.6
9/27/2016			0.3 (J)			454		2.6	
9/28/2016				90.3	13.7		26.6		
9/13/2017	14.6					585		0.78 (J)	4.3
9/14/2017		407	39.1	36.1	35.8		422		
9/11/2018	59.8			53.6					
9/12/2018		64.9	40.9			602	466		6.6
9/13/2018					5.2			2.9	
9/16/2019	15	27							
9/17/2019			<2.5	73	62	690	230	13	51
9/1/2020		27						<4	150
9/2/2020	110		10	16	8.6 (J)	680	91		
9/27/2021	5.7 (J)	36							
9/28/2021								20	
9/29/2021			33	75	16	1200	660		
9/20/2022		71	37				280	22	27
9/21/2022	79				100				
9/22/2022				130		1100			
9/20/2023	21	120						17	
9/21/2023			5 (J)	160	78	1200	18		140

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Molybdenum



Time Series Analysis Run 10/30/2023 11:17 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Time Series

Constituent: Molybdenum (ug/L) Analysis Run 10/30/2023 11:17 AM View: West Closed LF

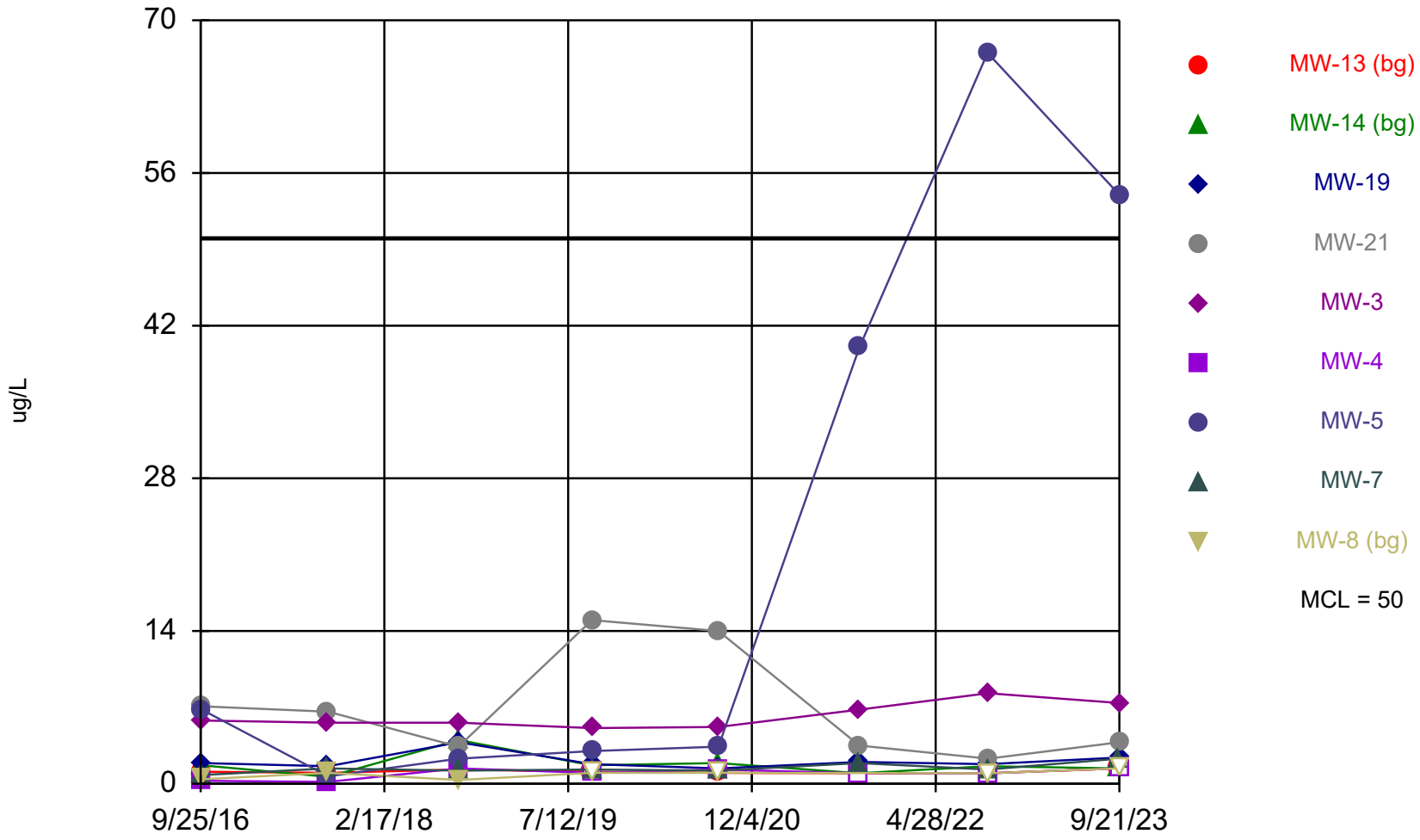
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)	MW-14 (bg)	MW-19	MW-21	MW-3	MW-4	MW-5	MW-7	MW-8 (bg)
9/20/2023	<0.91 (U)	2.2						<0.91 (U)	
9/21/2023			<0.91 (U)	34	8.6	15	<0.91 (U)		<0.91 (U)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Selenium



Time Series Analysis Run 10/30/2023 11:17 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Time Series

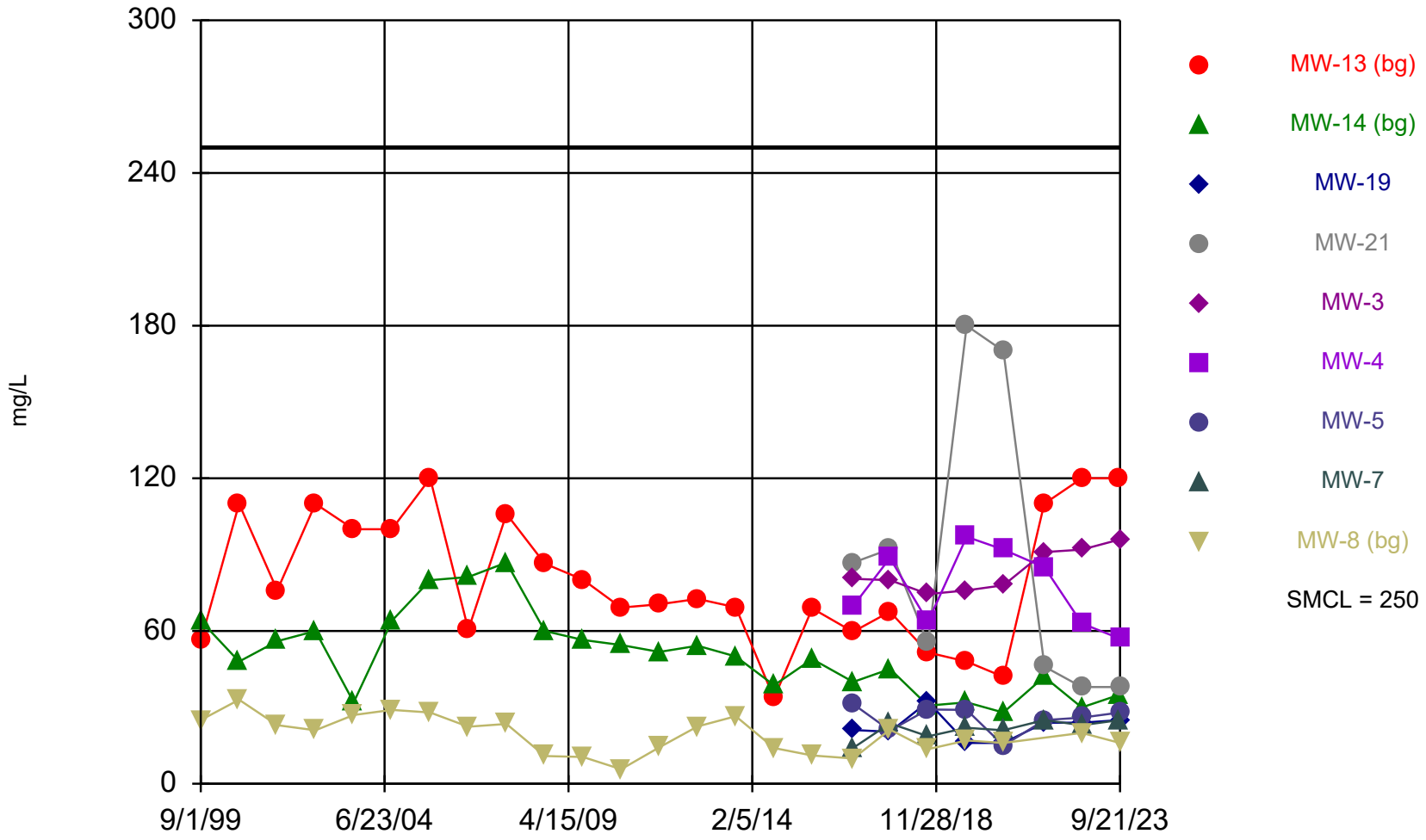
Constituent: Selenium (ug/L) Analysis Run 10/30/2023 11:17 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)	MW-14 (bg)	MW-19	MW-21	MW-3	MW-4	MW-5	MW-7	MW-8 (bg)
9/25/2016	1.1								
9/26/2016		1.7							0.41 (J)
9/27/2016			1.9			0.27 (J)		0.8 (J)	
9/28/2016				7.1	5.8		6.8		
9/13/2017	1					0.17 (J)		1.4	1
9/14/2017		0.63 (J)	1.6	6.6	5.6		0.69 (J)		
9/11/2018	1.3			3.4					
9/12/2018		4	3.8			1.4	2.3		0.34 (J)
9/13/2018					5.6			1.2	
9/16/2019	1.1 (J)	1.7 (J)							
9/17/2019			1.8 (J)	15	5.1	<1	3 (J)	1.3 (J)	<1
9/1/2020		1.9 (J)						1.2 (J)	<1
9/2/2020	<1		1.4 (J)	14	5.2	1.3 (J)	3.4 (J)		
9/27/2021	<0.96	<0.96							
9/28/2021								1.9 (J)	
9/29/2021			2 (J)	3.5 (J)	6.8	<0.96	40		
9/20/2022		1.6 (J)	1.8 (J)				67	1.3 (J)	<0.96
9/21/2022	<0.96				8.3				
9/22/2022				2.3 (J)		<0.96			
9/20/2023	<1.4 (U)	<1.4 (U)						2.3 (J)	
9/21/2023			2.4 (J)	3.8 (J)	7.4	<1.4 (U)	54		<1.4 (U)

ND substitution: RL or RL/2 if <15% NDs.

Sulfate



Time Series Analysis Run 10/30/2023 11:17 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

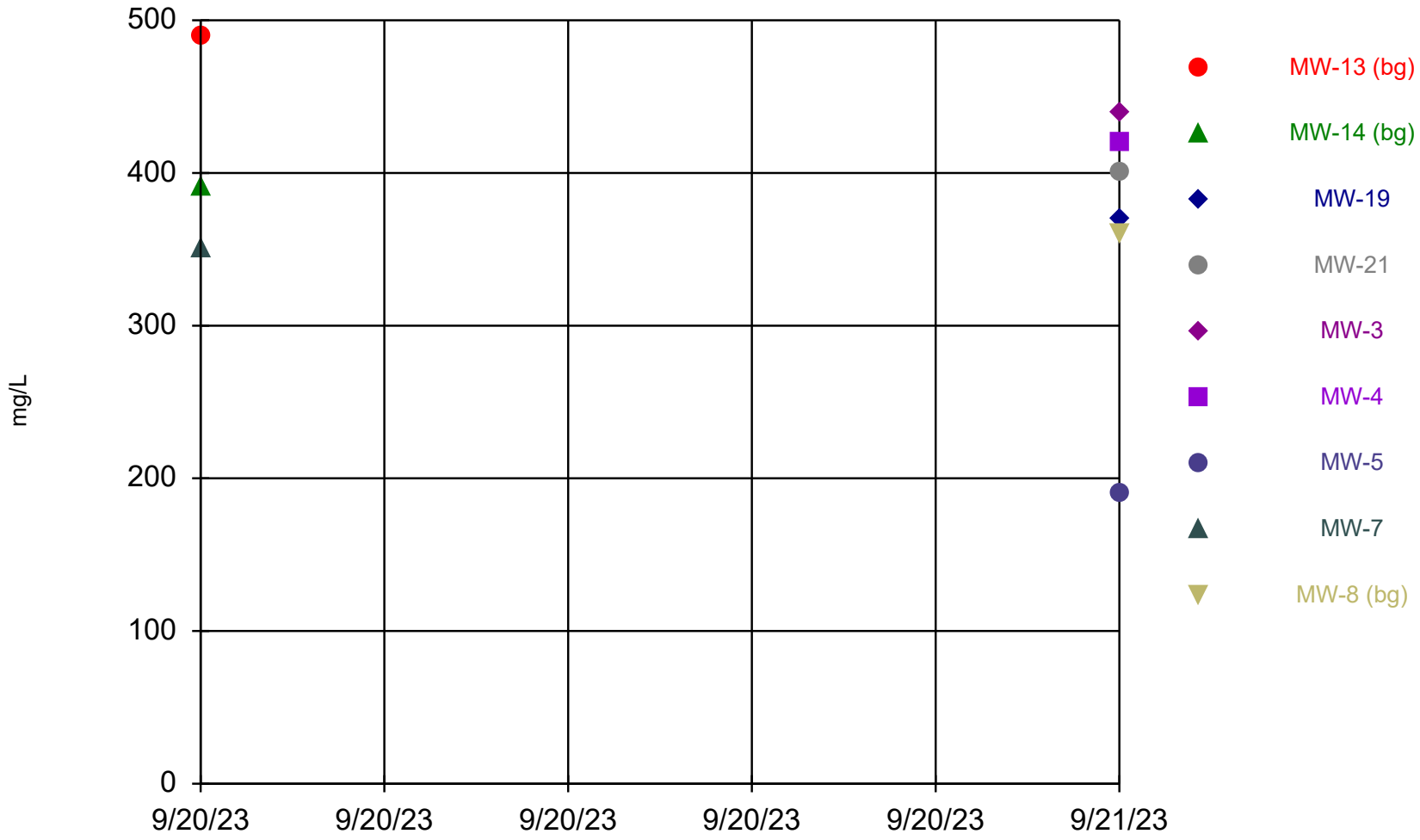
Time Series

Constituent: Sulfate (mg/L) Analysis Run 10/30/2023 11:17 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)	MW-14 (bg)	MW-19	MW-21	MW-3	MW-4	MW-5	MW-7	MW-8 (bg)
9/1/1999	56	64							25
9/1/2000	110	48							33
9/1/2001	76	56							23
9/1/2002	110	60							21
9/1/2003	100	32							27
9/1/2004	100	64							29
9/1/2005	120	80							28
9/1/2006	60.5	81.2							22.4
9/1/2007	106	86.9							23.5
9/1/2008	86.5	60							10.9
9/1/2009	80.2	56.5							10.5
9/1/2010	69.2	54.5							5.7
9/1/2011	70.5	51.8							14.3
9/1/2012	72.6	54.2							22.5
9/1/2013	69.3	50							26.5
9/1/2014	33.6	38.7							14
9/1/2015	68.9	49							11.1
9/25/2016	59.7								
9/26/2016		40							9.9
9/27/2016			21.1			69.8		14.1	
9/28/2016				86.9	80.5		31.3		
9/13/2017	67.6					88.7		23.7	21.3
9/14/2017		45.1	20.4	92.2	80		20.9		
9/11/2018	51.6			55.2					
9/12/2018		30.7	32.2			63.6	29.2		13.6
9/13/2018					74.5			18.6	
9/16/2019	48	32							
9/17/2019			16	180	76	97	29	22	17
9/1/2020		28						21	16
9/2/2020	42		16	170	78	92	15		
9/27/2021	110	42							
9/28/2021								25	
9/29/2021			24	46	91	85	25		
9/20/2022		30	24				26	23	20
9/21/2022	120				92				
9/22/2022				38		63			
9/20/2023	120	35						25	
9/21/2023			25	38	96	57	28		16

Total Dissolved Solids



Time Series Analysis Run 10/30/2023 11:17 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

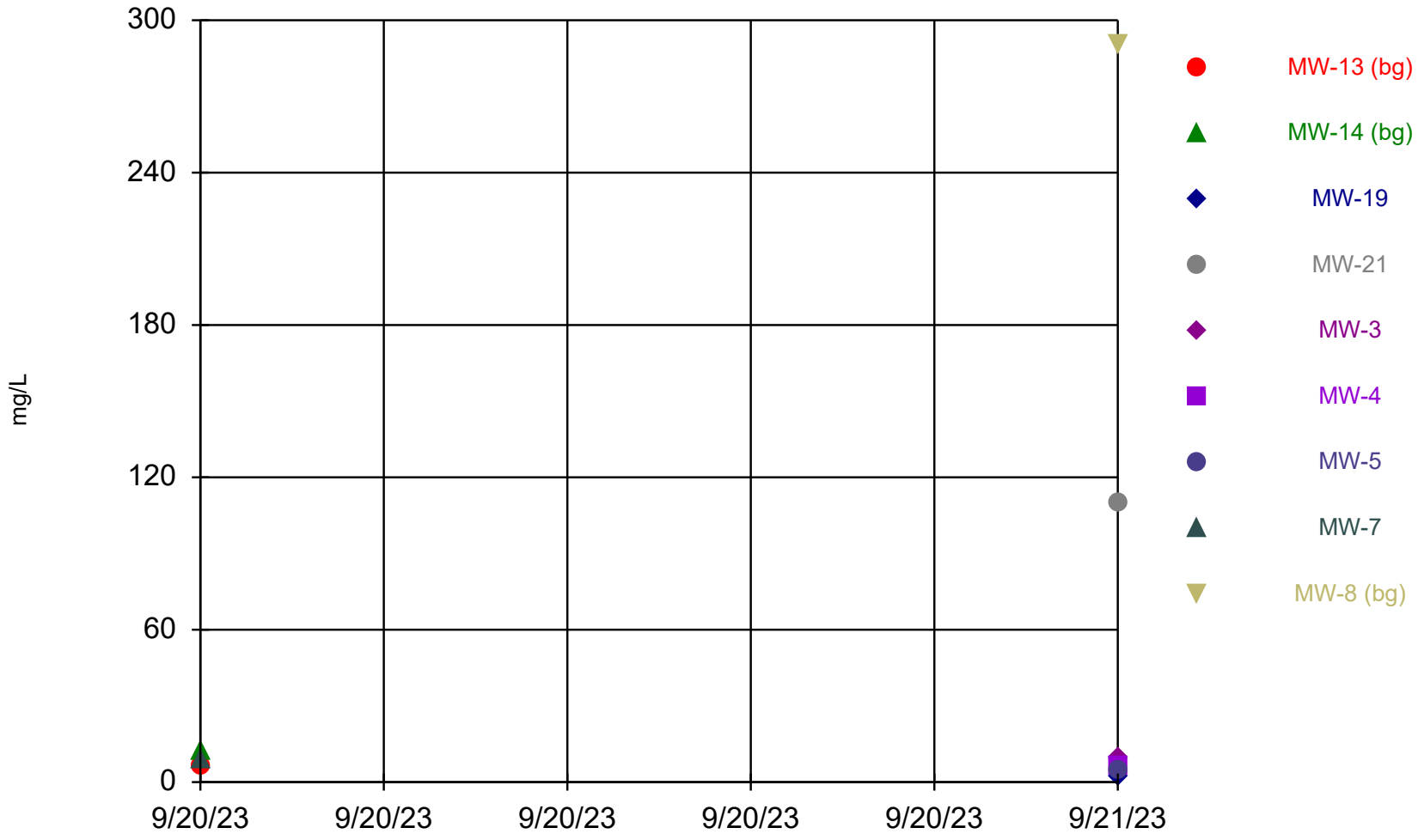
Time Series

Constituent: Total Dissolved Solids (mg/L) Analysis Run 10/30/2023 11:17 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)	MW-14 (bg)	MW-19	MW-21	MW-3	MW-4	MW-5	MW-7	MW-8 (bg)
9/20/2023	490	390						350	
9/21/2023			370	400	440	420	190		360

Total Suspended Solids



Time Series Analysis Run 10/30/2023 11:17 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Time Series

Constituent: Total Suspended Solids (mg/L) Analysis Run 10/30/2023 11:17 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

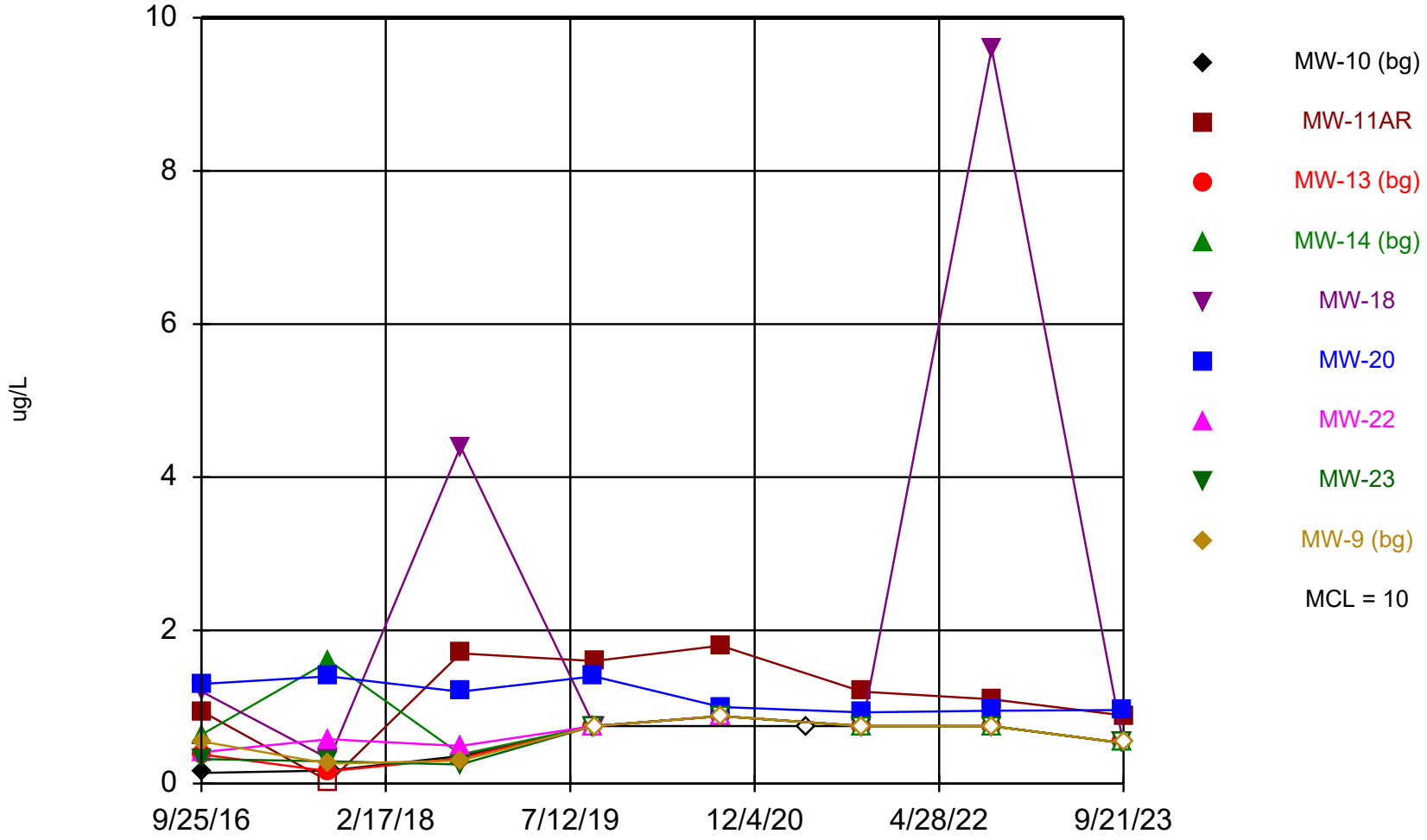
	MW-13 (bg)	MW-14 (bg)	MW-19	MW-21	MW-3	MW-4	MW-5	MW-7	MW-8 (bg)
9/20/2023	6.4	12						8.4	
9/21/2023			2.1	110	10	6	4.5		290

Attachment E2

Times Series Graphs – East

Hollow symbols indicate censored values.

Arsenic



Time Series Analysis Run 10/30/2023 12:12 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Time Series

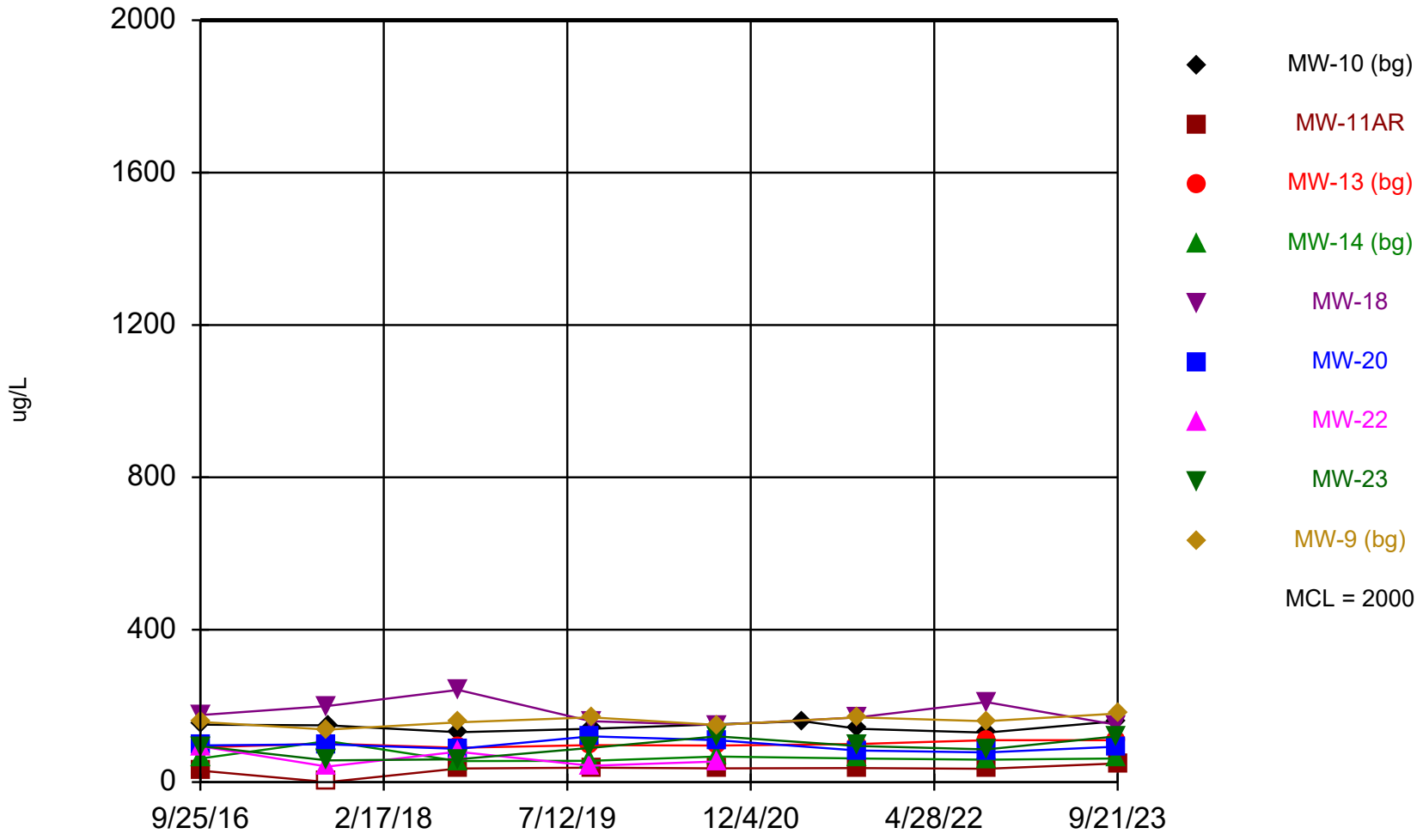
Constituent: Arsenic (ug/L) Analysis Run 10/30/2023 12:17 PM View: East Closed LF
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)	MW-11AR	MW-13 (bg)	MW-14 (bg)	MW-18	MW-20	MW-22	MW-23	MW-9 (bg)
9/25/2016			0.38 (J)						0.55 (J)
9/26/2016				0.64 (J)	1.2	1.3	0.41 (J)		
9/27/2016	0.14 (J)	0.94 (J)							
9/28/2016								0.32 (J)	
9/13/2017			0.16 (J)			1.4	0.58 (J)	0.29 (J)	
9/14/2017		<0.052		1.6	0.32 (J)				0.26 (J)
9/15/2017	0.17 (J)								
9/11/2018			0.33 (J)			1.2	0.49 (J)	0.25 (J)	
9/12/2018	0.36 (J)	1.7		0.38 (J)	4.4				0.3 (J)
9/16/2019			<0.75	<0.75		1.4 (J)	<0.75	<0.75	
9/17/2019	<0.75	1.6 (J)			<0.75				<0.75
9/1/2020		1.8 (J)		<0.88	<0.88			<0.88	<0.88
9/2/2020			<0.88			1 (J)	<0.88		
4/29/2021	<0.75								
9/27/2021			<0.75	<0.75		0.93 (J)		<0.75	
9/28/2021	<0.75	1.2 (J)			<0.75				<0.75
9/20/2022	<0.75			<0.75					<0.75
9/21/2022		1.1 (J)	<0.75		9.6	0.95 (J)		<0.75	
9/18/2023	<0.53 (U)							<0.53 (U)	
9/20/2023			<0.53 (U)	<0.53 (U)	<0.53 (U)	0.96 (J)			
9/21/2023		0.89 (J)							<0.53 (U)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Barium



Time Series Analysis Run 10/30/2023 12:12 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Time Series

Constituent: Barium (ug/L) Analysis Run 10/30/2023 12:17 PM View: East Closed LF

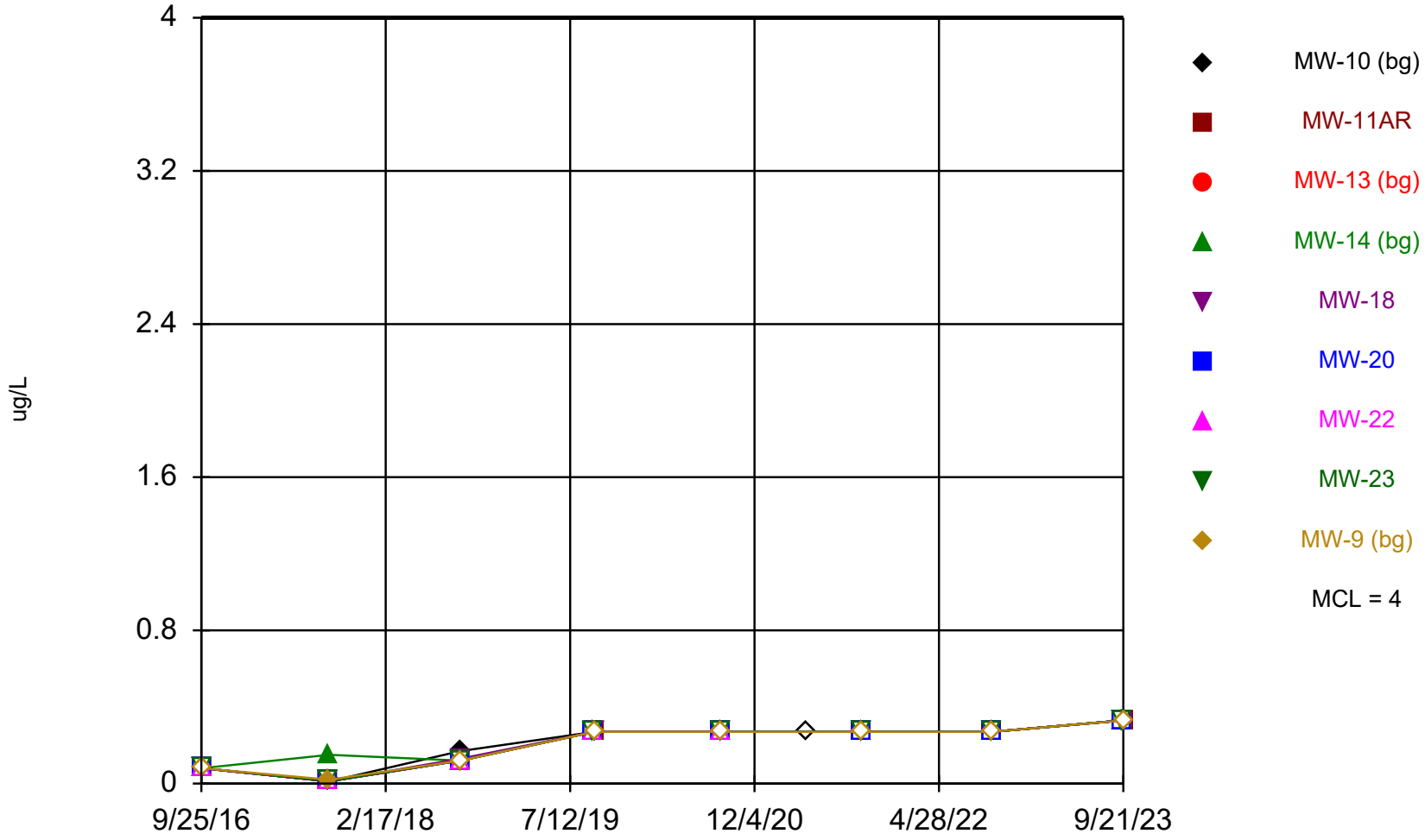
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)	MW-11AR	MW-13 (bg)	MW-14 (bg)	MW-18	MW-20	MW-22	MW-23	MW-9 (bg)
9/25/2016			91.2						158
9/26/2016				62.1	176	96.5	93.8		
9/27/2016	151	30.1							
9/28/2016								94.2	
9/13/2017			101			99.1	40.9	57	
9/14/2017		<0.095		108	200				138
9/15/2017	149								
9/11/2018			90.4			87.3	79.6	60	
9/12/2018	131	35.6		55.1	242				157
9/16/2019			97	56		120	43	90	
9/17/2019	140	38			160				170
9/1/2020		36		67	150			120	150
9/2/2020			96			110	54		
4/29/2021	160								
9/27/2021			100	62		83		95	
9/28/2021	140	37			170				170
9/20/2022	130			59					160
9/21/2022		35	110		210	78		86	
9/18/2023	160							120	
9/20/2023			110	62	150	93			
9/21/2023		49							180

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Beryllium



Time Series Analysis Run 10/30/2023 12:12 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Time Series

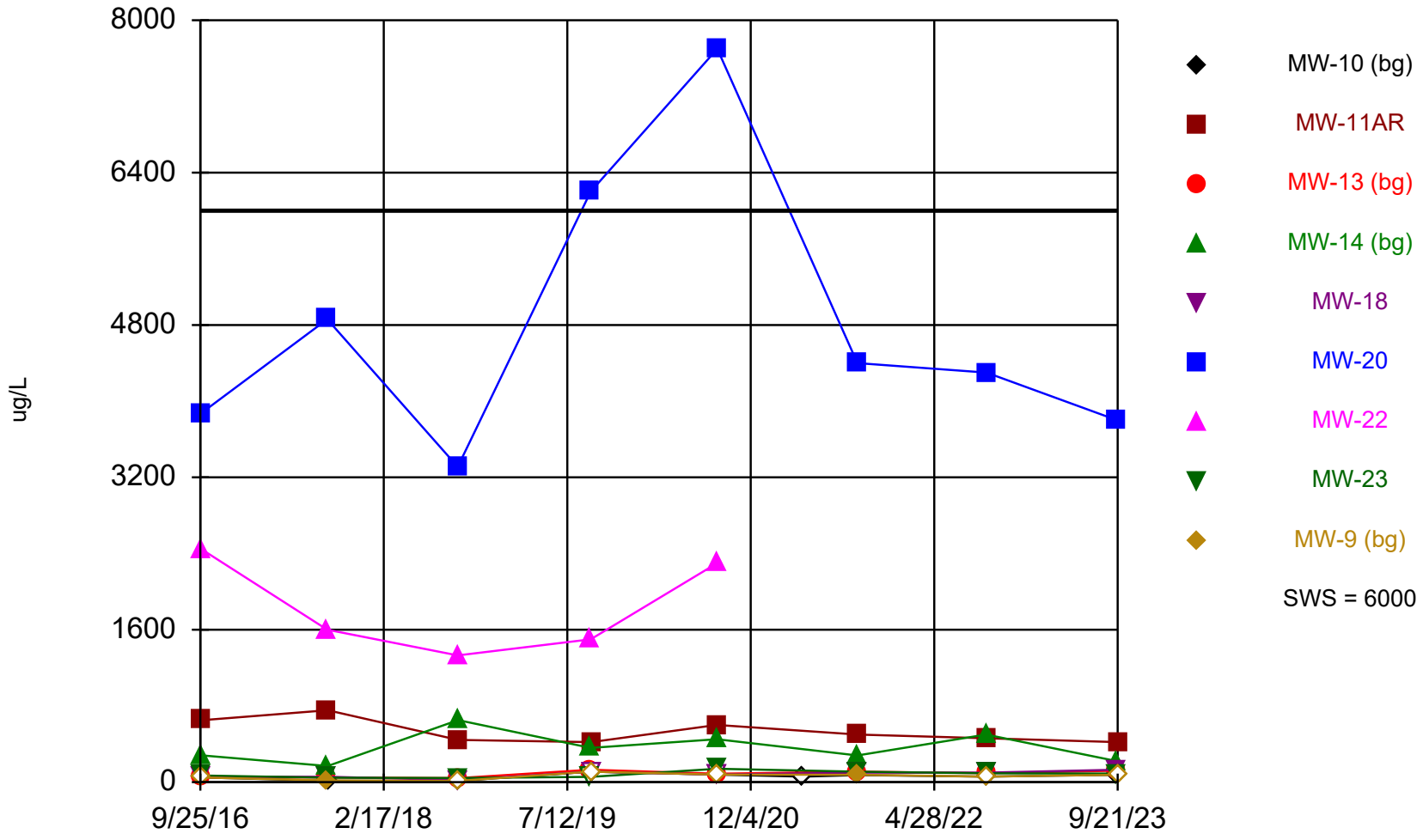
Constituent: Beryllium (ug/L) Analysis Run 10/30/2023 12:17 PM View: East Closed LF
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)	MW-11AR	MW-13 (bg)	MW-14 (bg)	MW-18	MW-20	MW-22	MW-23	MW-9 (bg)
9/25/2016			<0.08						<0.08
9/26/2016				<0.08	<0.08	<0.08	<0.08		
9/27/2016	<0.08	<0.08							
9/28/2016								<0.08	
9/13/2017			<0.012			<0.012	<0.012	<0.012	
9/14/2017		<0.012		0.15 (J)	<0.012				0.02 (J)
9/15/2017	<0.012								
9/11/2018			<0.12			<0.12	<0.12	<0.12	
9/12/2018	0.17 (J)	<0.12		<0.12	0.13 (J)				<0.12
9/16/2019			<0.27	<0.27		<0.27	<0.27	<0.27	
9/17/2019	<0.27	<0.27			<0.27				<0.27
9/1/2020		<0.27		<0.27	<0.27			<0.27	<0.27
9/2/2020			<0.27			<0.27	<0.27		
4/29/2021	<0.27								
9/27/2021			<0.27	<0.27		<0.27		<0.27	
9/28/2021	<0.27	<0.27			<0.27				<0.27
9/20/2022	<0.27			<0.27					<0.27
9/21/2022		<0.27	<0.27		<0.27	<0.27		<0.27	
9/18/2023	<0.33 (U)							<0.33 (U)	
9/20/2023			<0.33 (U)	<0.33 (U)	<0.33 (U)	<0.33 (U)			
9/21/2023		<0.33 (U)							<0.33 (U)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Boron



Time Series Analysis Run 10/30/2023 12:12 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Time Series

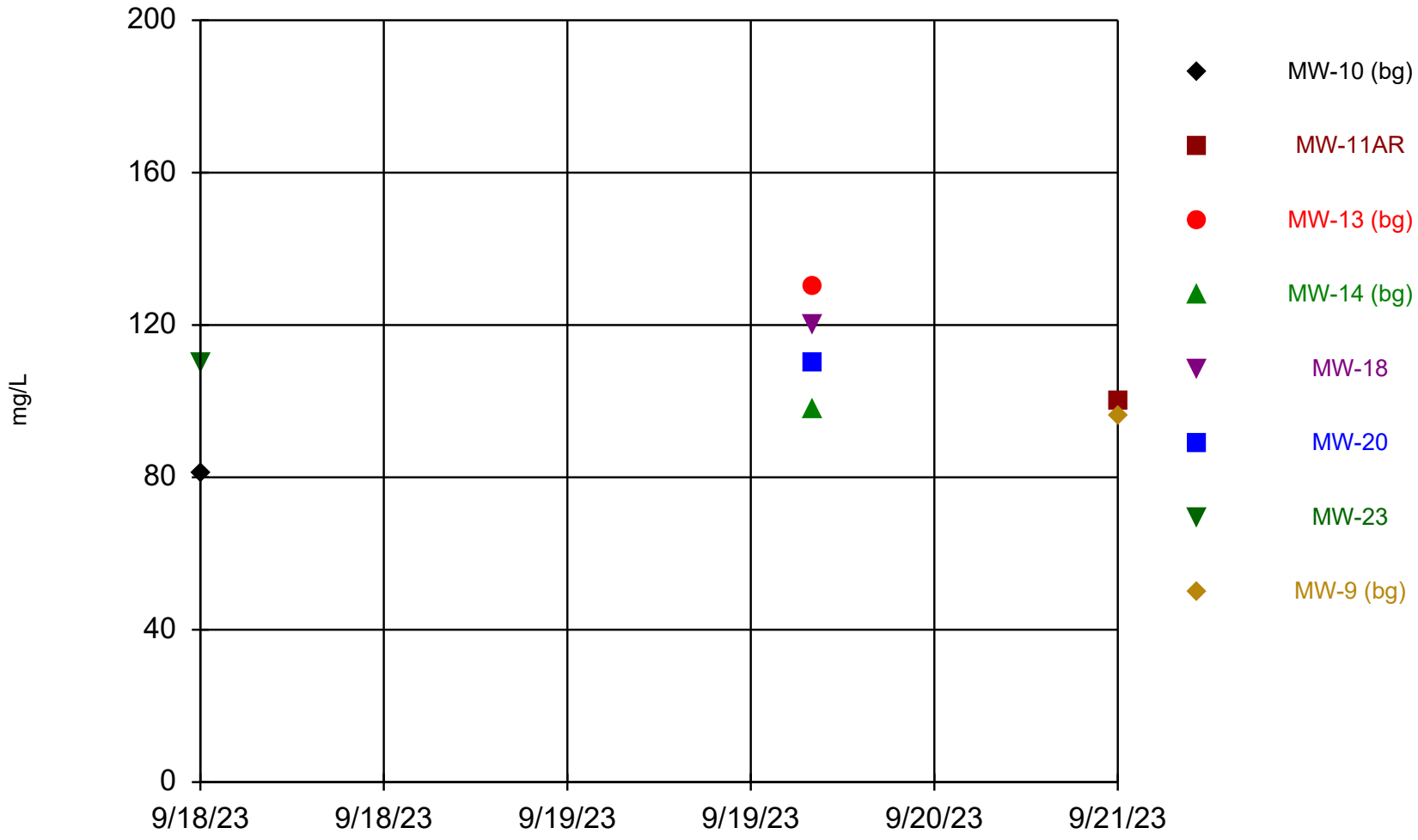
Constituent: Boron (ug/L) Analysis Run 10/30/2023 12:17 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)	MW-11AR	MW-13 (bg)	MW-14 (bg)	MW-18	MW-20	MW-22	MW-23	MW-9 (bg)
9/25/2016			50.2 (J)						<50
9/26/2016				282	53.8 (J)	3870	2450		
9/27/2016	<50	650							
9/28/2016								70.1 (J)	
9/13/2017			48.6 (J)			4860	1600	47 (J)	
9/14/2017		755		169	57 (J)				17.2 (J)
9/15/2017	14.1 (J)								
9/11/2018			41.4 (J)			3310	1330	42.9 (J)	
9/12/2018	<12.5	443		651	21.6 (J)				<12.5
9/16/2019			130 (J)	360		6200	1500	<110	
9/17/2019	<110	420			<110				<110
9/1/2020		600		450	<80			140	<80
9/2/2020			88 (J)			7700	2300		
4/29/2021	<58								
9/27/2021			110	280		4400		110	
9/28/2021	74 (J)	500			100				77 (J)
9/20/2022	<58			500					<58
9/21/2022		460	94 (J)		100	4300		92 (J)	
9/18/2023	<76 (U)							89 (J)	
9/20/2023			120	220	130	3800			
9/21/2023		420							<76 (U)

ND substitution: RL or RL/2 if <15% NDs.

Calcium



Time Series Analysis Run 10/30/2023 12:12 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

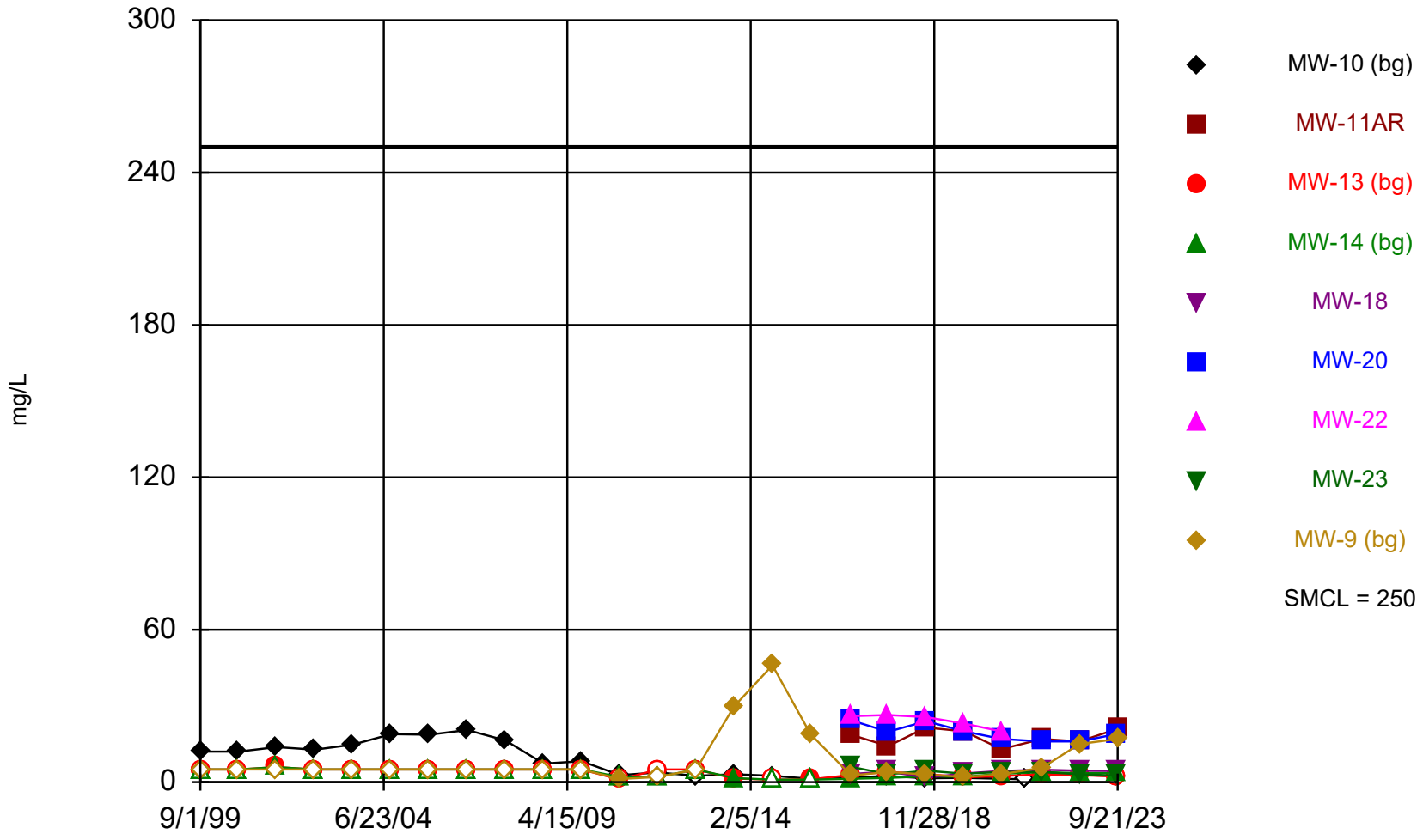
Time Series

Constituent: Calcium (mg/L) Analysis Run 10/30/2023 12:17 PM View: East Closed LF
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)	MW-11AR	MW-13 (bg)	MW-14 (bg)	MW-18	MW-20	MW-23	MW-9 (bg)
9/18/2023	81						110	
9/20/2023			130	98	120	110		
9/21/2023		100						96

Hollow symbols indicate censored values.

Chloride



Time Series Analysis Run 10/30/2023 12:12 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Time Series

Constituent: Chloride (mg/L) Analysis Run 10/30/2023 12:17 PM View: East Closed LF

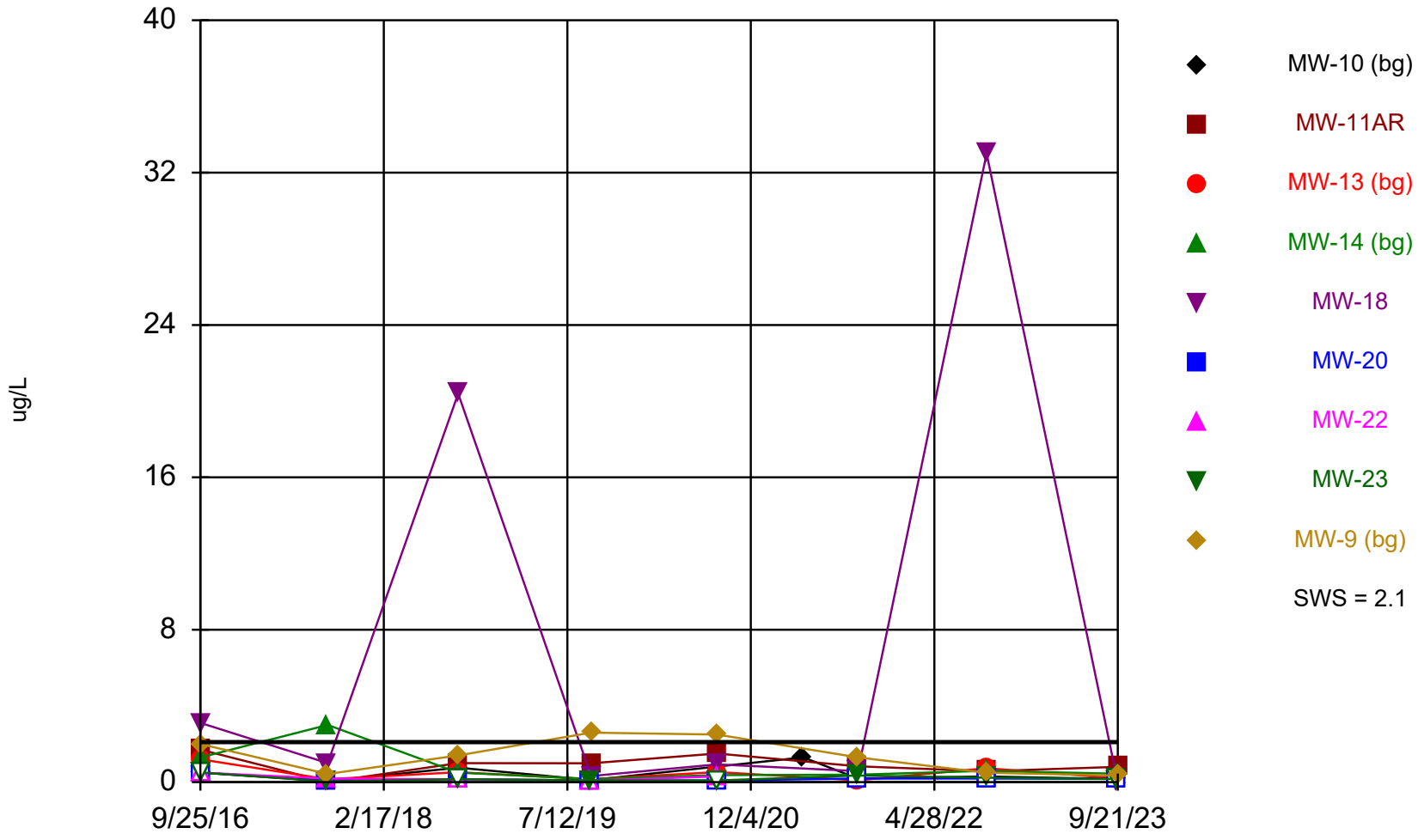
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)	MW-11AR	MW-13 (bg)	MW-14 (bg)	MW-18	MW-20	MW-22	MW-23	MW-9 (bg)
9/1/1999	12		<5	<5					<5
9/1/2000	12		<5	<5					<5
9/1/2001	13.8		5.9	5.9					<5
9/1/2002	12.8		<5	<5					<5
9/1/2003	14.8		<5	<5					<5
9/1/2004	18.9		<5	<5					<5
9/1/2005	18.7		<5	<5					<5
9/1/2006	20.5		<5	<5					<5
9/1/2007	16.4		<5	<5					<5
9/1/2008	7.31		<5	<5					<5
9/1/2009	8.21		<5	<5					<5
9/1/2010	2.76		<1	<2					1.25
9/1/2011	3.81		<5	<2					<2
9/1/2012	<5		<5	<5					<5
9/1/2013	3.1		1.4	1.6					29.9
9/1/2014	2.5		<1	<1					46
9/1/2015	1.3		1.1	<1					18.9
9/25/2016			2.8						2.6
9/26/2016				1.3	3.2	24.3	26		
9/27/2016	1.9	18.6							
9/28/2016								6	
9/13/2017			4			19.8	26.4	3.1	
9/14/2017		14.2		1.7	4.2				4
9/15/2017	2.4								
9/11/2018			3.2			24	25.6	4.5	
9/12/2018	1.5	21.5		2.2	1.8				3
9/16/2019			1.9 (J,B)	2.1 (J,B)		20 (B)	23 (B)	3.3 (J,B)	
9/17/2019	1.7 (J,B)	20 (B)			3.4 (J,B)				2 (J,B)
9/1/2020		13 (B)		3.3 (J,B)	4.4 (J,B)			4 (J,B)	3.1 (J,B)
9/2/2020			2.4 (J,B)			17 (B)	20 (B)		
4/29/2021	<2.2								
9/27/2021			3.1 (J)	3.9 (J)		16		4 (J)	
9/28/2021	4 (J)	17			4.9 (J)				5.7
9/20/2022	2.9 (J)			3.6 (J)					15
9/21/2022		16	2.7 (J)		4.5 (J)	16		3.1 (J)	
9/18/2023	2.3 (J)							2.6 (J)	
9/20/2023			<2.3 (U)	3.6 (J)	4.4 (J)	19			
9/21/2023		21							17

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Cobalt



Time Series Analysis Run 10/30/2023 12:12 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Time Series

Constituent: Cobalt (ug/L) Analysis Run 10/30/2023 12:17 PM View: East Closed LF

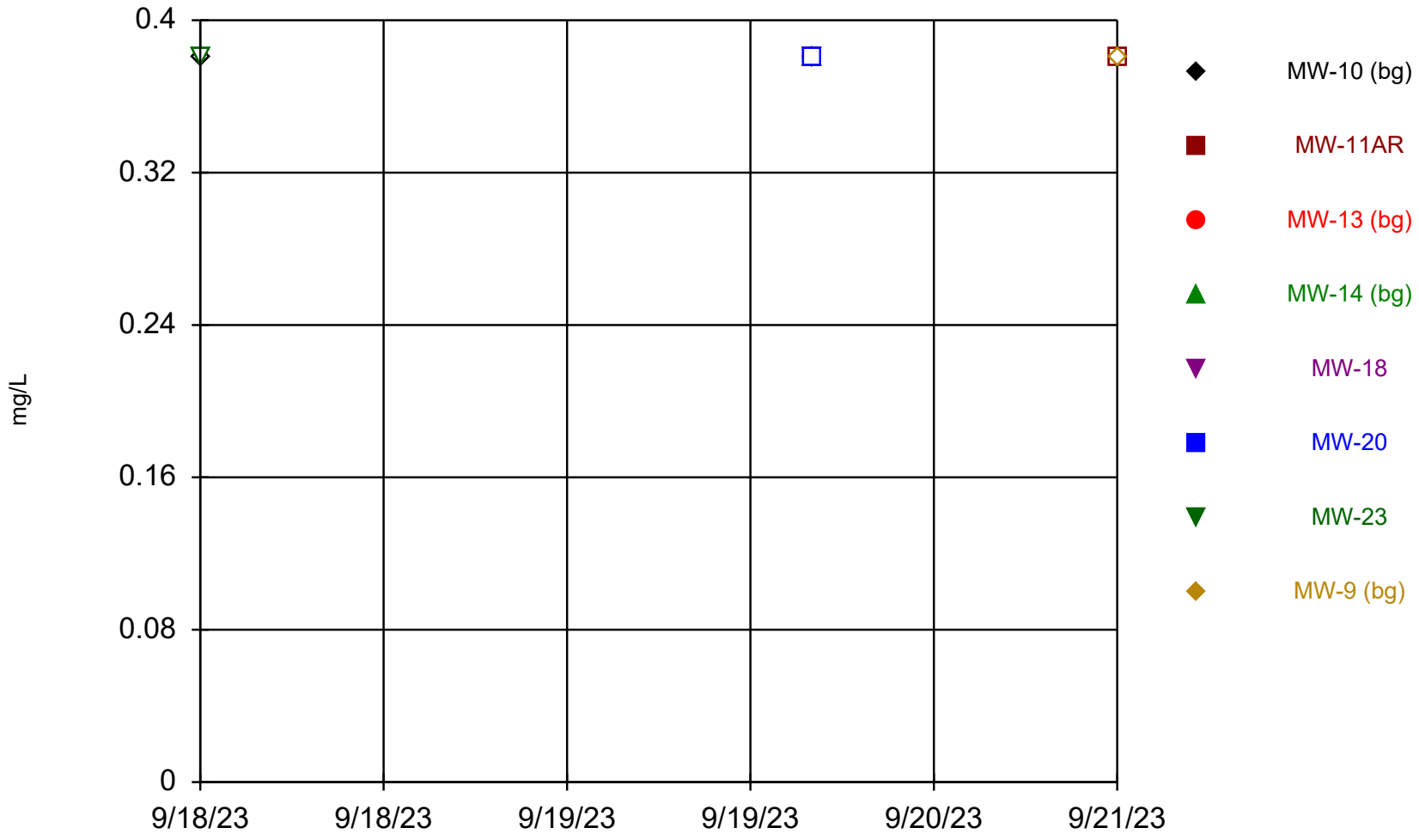
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)	MW-11AR	MW-13 (bg)	MW-14 (bg)	MW-18	MW-20	MW-22	MW-23	MW-9 (bg)
9/25/2016			1.2						2
9/26/2016				1.3	3.1	<0.5	<0.5		
9/27/2016	<0.5	1.7							
9/28/2016								<0.5	
9/13/2017			0.15 (J)			0.09 (J)	0.19 (J)	0.036 (J)	
9/14/2017		<0.014		3	1				0.43 (J)
9/15/2017	0.05 (J)								
9/11/2018			0.52 (J)			0.16 (J)	<0.15	<0.15	
9/12/2018	0.76 (J)	1		0.5 (J)	20.4				1.4
9/16/2019			0.16 (J)	0.17 (J)		<0.091	<0.091	0.094 (J)	
9/17/2019	0.11 (J)	0.99			0.32 (J)				2.6
9/1/2020		1.5		0.37 (J)	0.93			<0.091	2.5
9/2/2020			0.53			<0.091	0.3 (J)		
4/29/2021	1.3								
9/27/2021			<0.19	0.39 (J)		<0.19		0.35 (J)	
9/28/2021	<0.19	0.83			0.58				1.3
9/20/2022	0.3 (J)			0.59					0.49 (J)
9/21/2022		0.57	0.73		33	<0.19		0.23 (J)	
9/18/2023	<0.17 (U)							<0.17 (U)	
9/20/2023			0.2 (J)	0.44 (J)	<0.17 (U)	<0.17 (U)			
9/21/2023		0.8							0.35 (J)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Fluoride



Time Series Analysis Run 10/30/2023 12:12 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Time Series

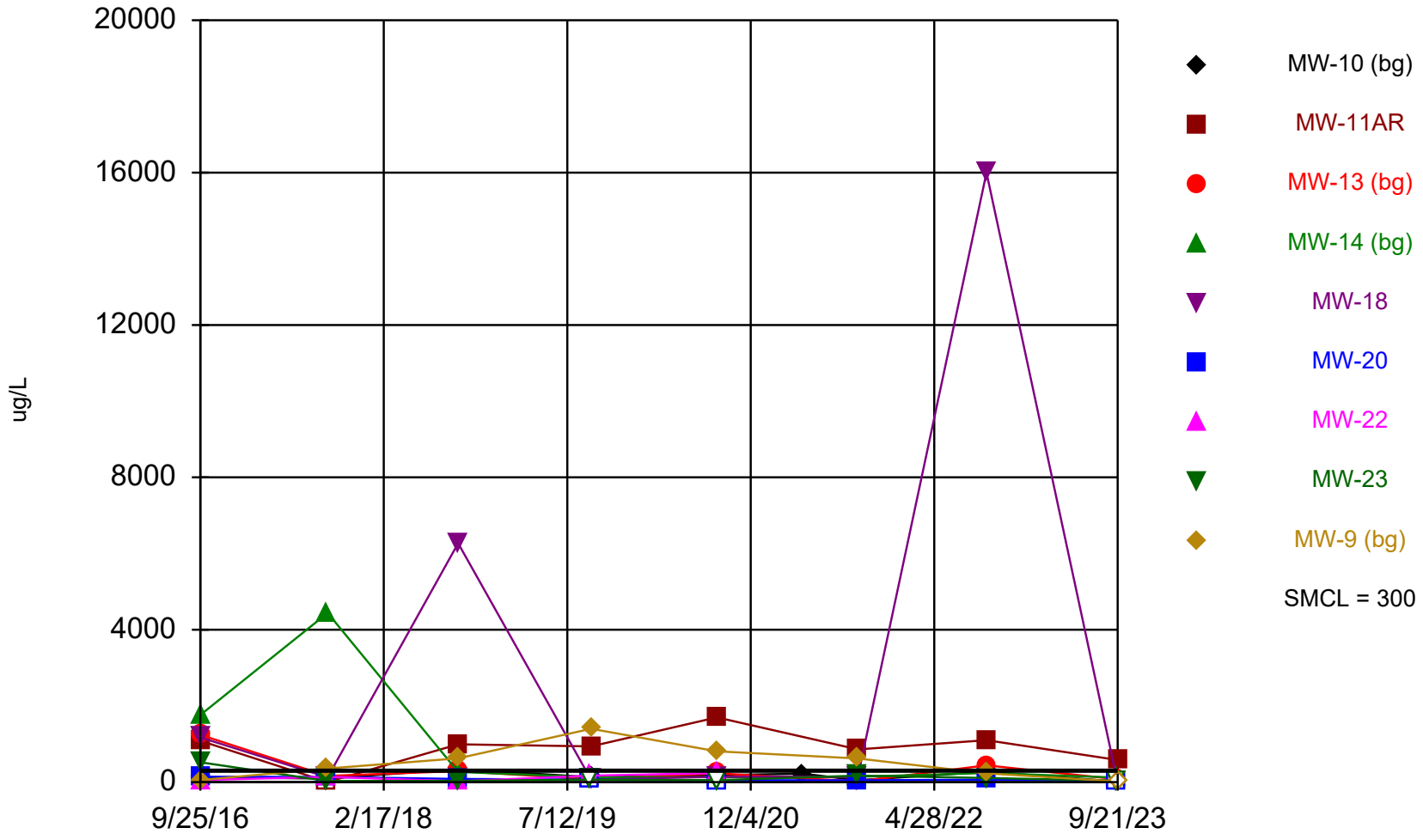
Constituent: Fluoride (mg/L) Analysis Run 10/30/2023 12:17 PM View: East Closed LF
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)	MW-11AR	MW-13 (bg)	MW-14 (bg)	MW-18	MW-20	MW-23	MW-9 (bg)
9/18/2023	<0.38 (U)						<0.38 (U)	
9/20/2023			<0.38 (U)	<0.38 (U)	<0.38 (U)	<0.38 (U)		
9/21/2023		<0.38 (U)						<0.38 (U)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Iron



Time Series Analysis Run 10/30/2023 12:12 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Time Series

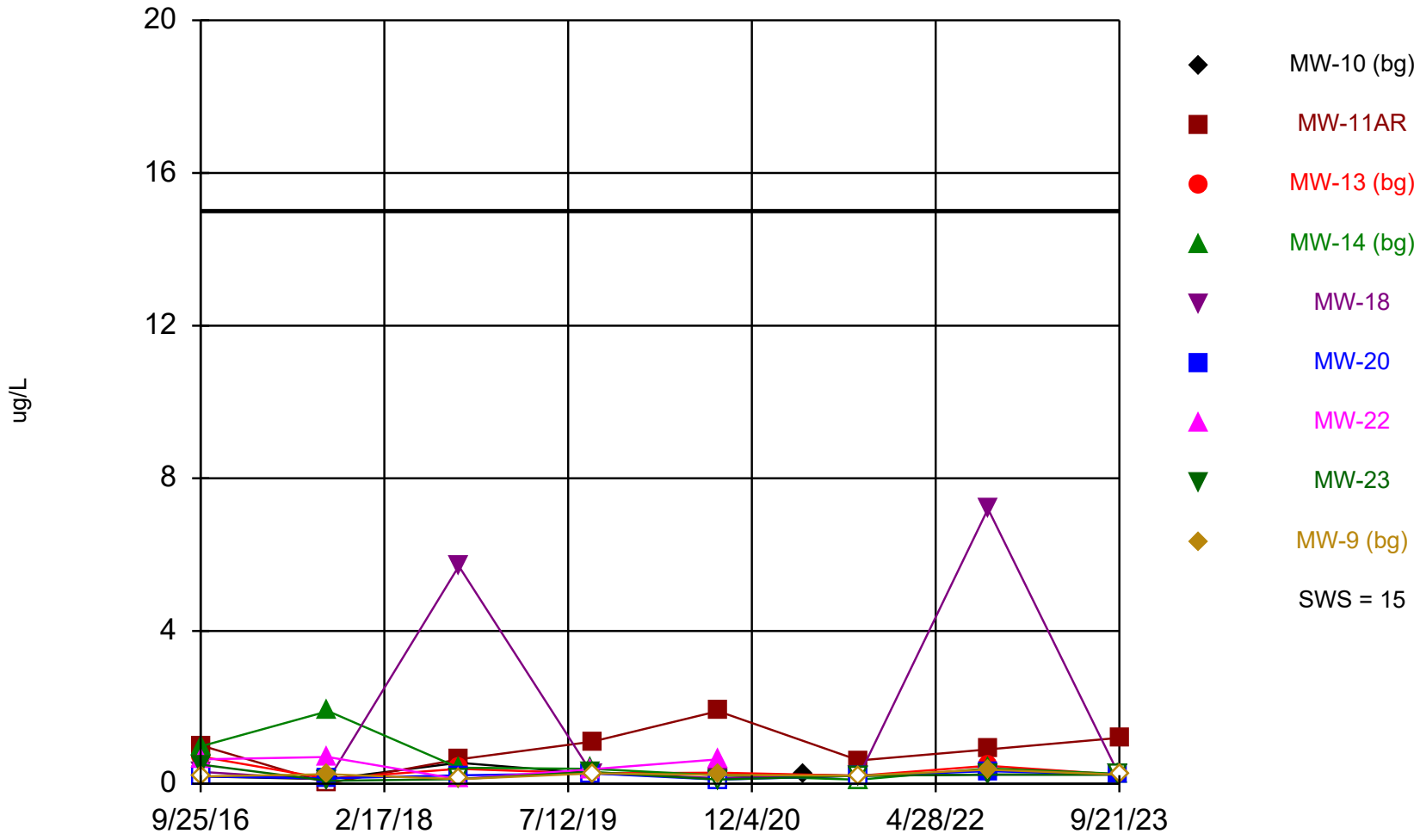
Constituent: Iron (ug/L) Analysis Run 10/30/2023 12:17 PM View: East Closed LF
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)	MW-11AR	MW-13 (bg)	MW-14 (bg)	MW-18	MW-20	MW-22	MW-23	MW-9 (bg)
9/25/2016			1240						55.7
9/26/2016				1770	1170	140	54.6		
9/27/2016	126	1080							
9/28/2016								518	
9/13/2017			162			135	139	30.3 (J)	
9/14/2017		<9.6		4440	128				357
9/15/2017	93.1								
9/11/2018			289			82.8	23.9 (J)	34.3 (J)	
9/12/2018	344	993		267	6270				624
9/16/2019			76 (J)	130		<66	170	<66	
9/17/2019	130	940			<66				1400
9/1/2020		1700		130	140			<50	810
9/2/2020			230			<50	240		
4/29/2021	220								
9/27/2021			<36	140		49 (J)		170	
9/28/2021	52 (J)	860			140				620
9/20/2022	270			240					230
9/21/2022		1100	440		16000	67 (J)		110	
9/18/2023	<36 (U)							<36 (U)	
9/20/2023			78 (J)	120	<36 (U)	<36 (U)			
9/21/2023		580							<36 (U)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Lead



Time Series Analysis Run 10/30/2023 12:12 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Time Series

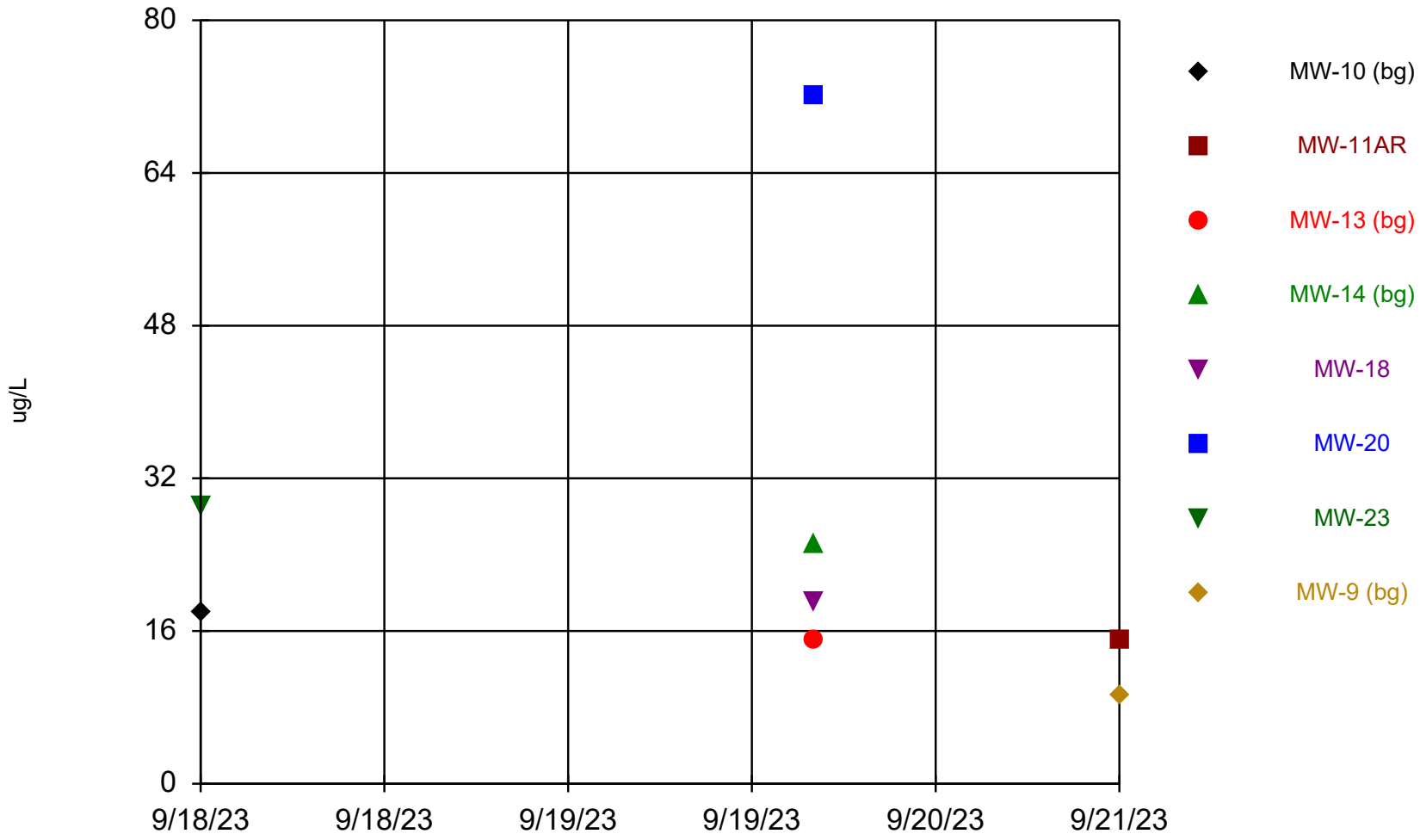
Constituent: Lead (ug/L) Analysis Run 10/30/2023 12:17 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)	MW-11AR	MW-13 (bg)	MW-14 (bg)	MW-18	MW-20	MW-22	MW-23	MW-9 (bg)
9/25/2016			0.71 (J)						<0.19
9/26/2016				0.98 (J)	0.31 (J)	<0.19	0.64 (J)		
9/27/2016	<0.19	1							
9/28/2016								0.5 (J)	
9/13/2017			0.13 (J)			0.14 (J)	0.7 (J)	0.076 (J)	
9/14/2017		<0.033		1.9	0.1 (J)				0.25 (J)
9/15/2017	0.12 (J)								
9/11/2018			0.39 (J)			0.22 (J)	<0.12	<0.12	
9/12/2018	0.55 (J)	0.64 (J)		0.42 (J)	5.7				<0.12
9/16/2019			<0.27	0.39 (J)		<0.27	0.38 (J)	0.31 (J)	
9/17/2019	<0.27	1.1			<0.27				<0.27
9/1/2020		1.9		0.22 (J)	0.15 (J)			<0.11	0.23 (J)
9/2/2020			0.29 (J)			<0.11	0.64		
4/29/2021	0.23 (J)								
9/27/2021			<0.21	<0.21		<0.21		<0.21	
9/28/2021	<0.21	0.61			<0.21				<0.21
9/20/2022	<0.24			0.4 (J)					0.37 (J)
9/21/2022		0.9	0.47 (J)		7.2	0.33 (J)		<0.24	
9/18/2023	<0.24 (U)							<0.24 (U)	
9/20/2023			<0.24 (U)	0.26 (J)	<0.24 (U)	0.24 (J)			
9/21/2023		1.2							<0.24 (U)

ND substitution: RL or RL/2 if <15% NDs.

Lithium



Time Series Analysis Run 10/30/2023 12:12 PM View: East Closed LF

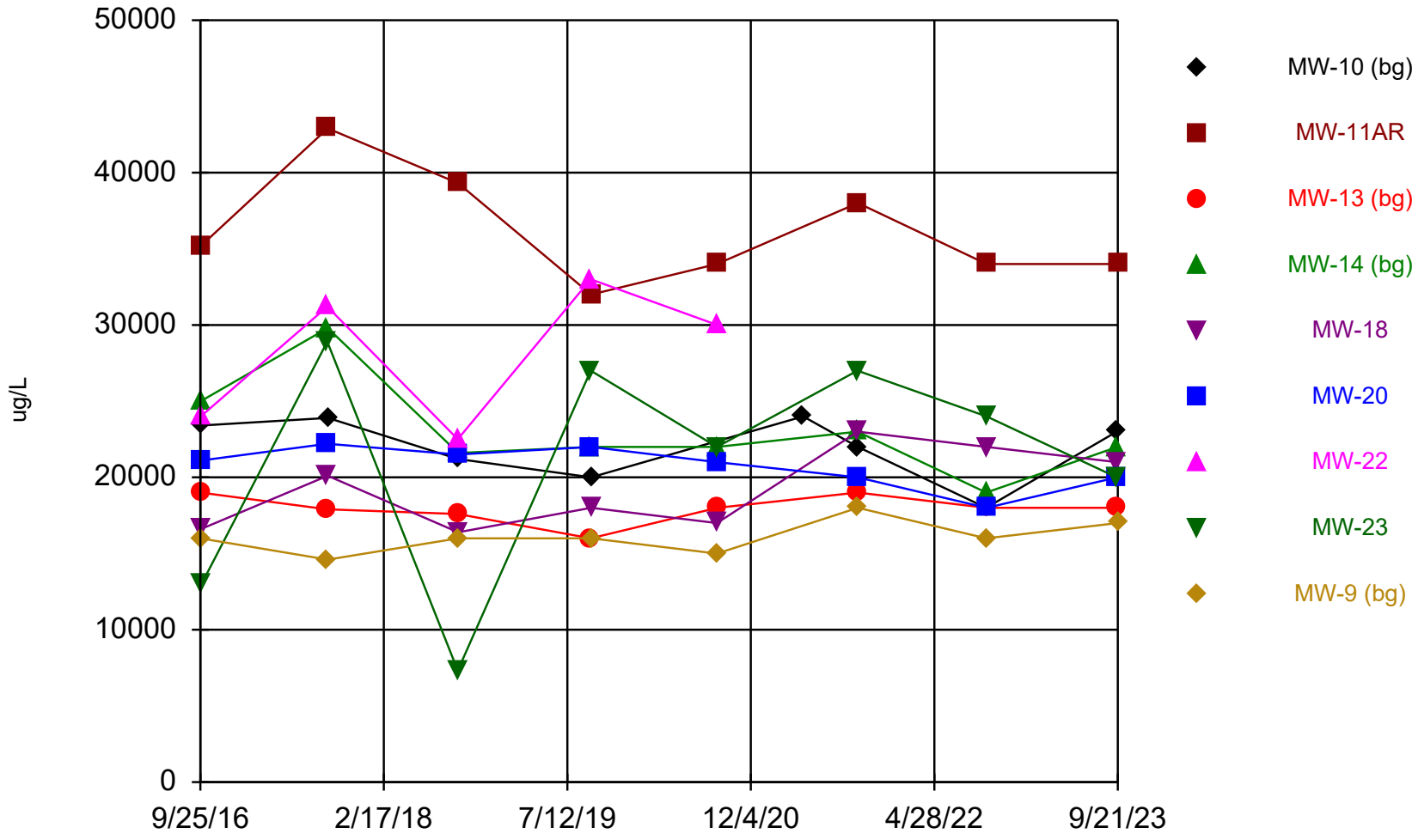
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Time Series

Constituent: Lithium (ug/L) Analysis Run 10/30/2023 12:17 PM View: East Closed LF
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)	MW-11AR	MW-13 (bg)	MW-14 (bg)	MW-18	MW-20	MW-23	MW-9 (bg)
9/18/2023	18						29	
9/20/2023			15	25	19	72		
9/21/2023		15						9.3 (J)

Magnesium



Time Series Analysis Run 10/30/2023 12:12 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Time Series

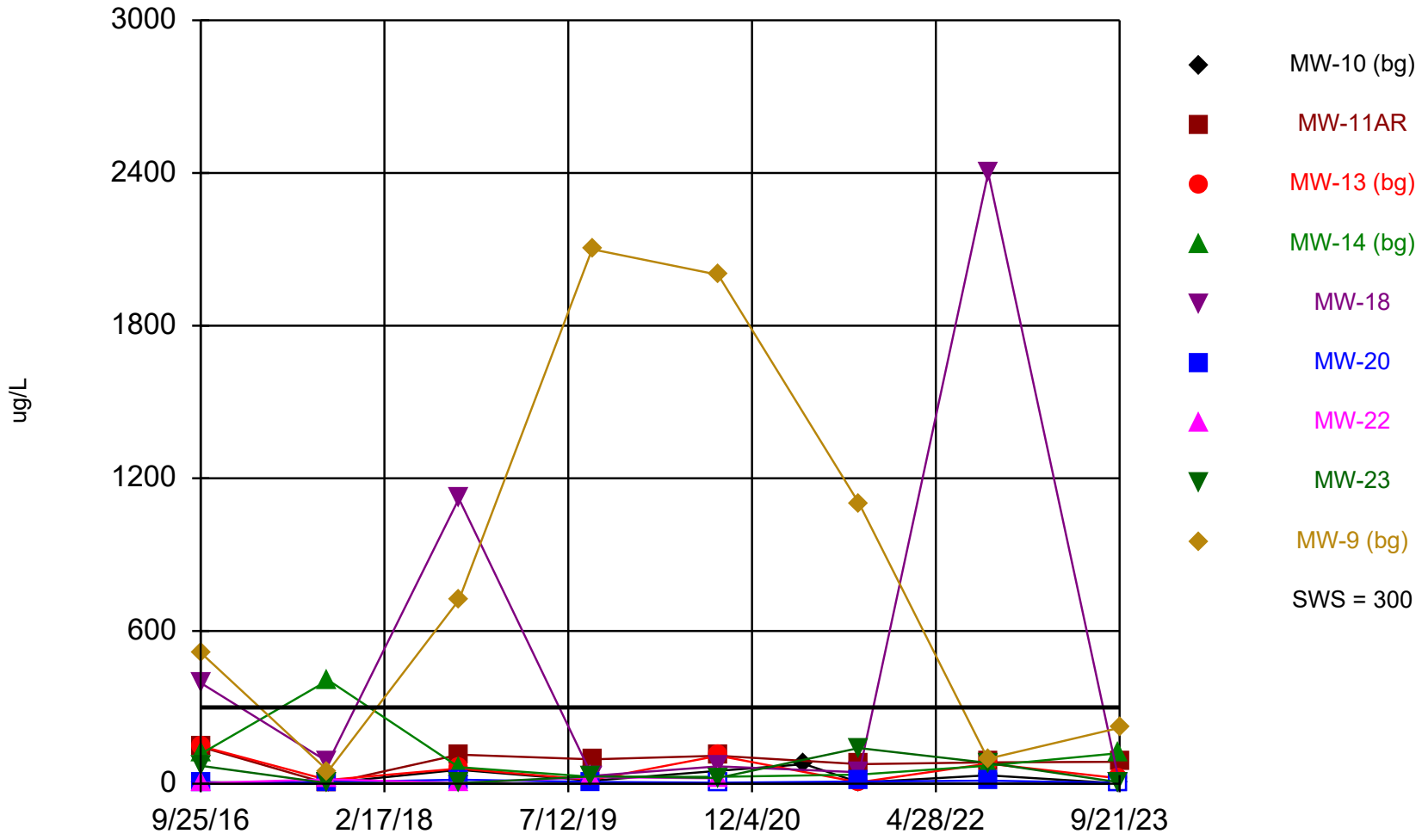
Constituent: Magnesium (ug/L) Analysis Run 10/30/2023 12:17 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)	MW-11AR	MW-13 (bg)	MW-14 (bg)	MW-18	MW-20	MW-22	MW-23	MW-9 (bg)
9/25/2016			19000						16000
9/26/2016				25000	16600	21100	24000		
9/27/2016	23400	35200							
9/28/2016								13000	
9/13/2017			17900			22200	31200	28900	
9/14/2017		42900		29800	20100				14600
9/15/2017	23900								
9/11/2018			17600			21500	22500	7320	
9/12/2018	21200	39300		21600	16400				16000
9/16/2019			16000	22000		22000	33000	27000	
9/17/2019	20000	32000			18000				16000
9/1/2020		34000		22000	17000			22000	15000
9/2/2020			18000			21000	30000		
4/29/2021	24000								
9/27/2021			19000	23000		20000		27000	
9/28/2021	22000	38000			23000				18000
9/20/2022	18000			19000					16000
9/21/2022		34000	18000		22000	18000		24000	
9/18/2023	23000							20000	
9/20/2023			18000	22000	21000	20000			
9/21/2023		34000							17000

Hollow symbols indicate censored values.

Manganese



Time Series Analysis Run 10/30/2023 12:12 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Time Series

Constituent: Manganese (ug/L) Analysis Run 10/30/2023 12:17 PM View: East Closed LF

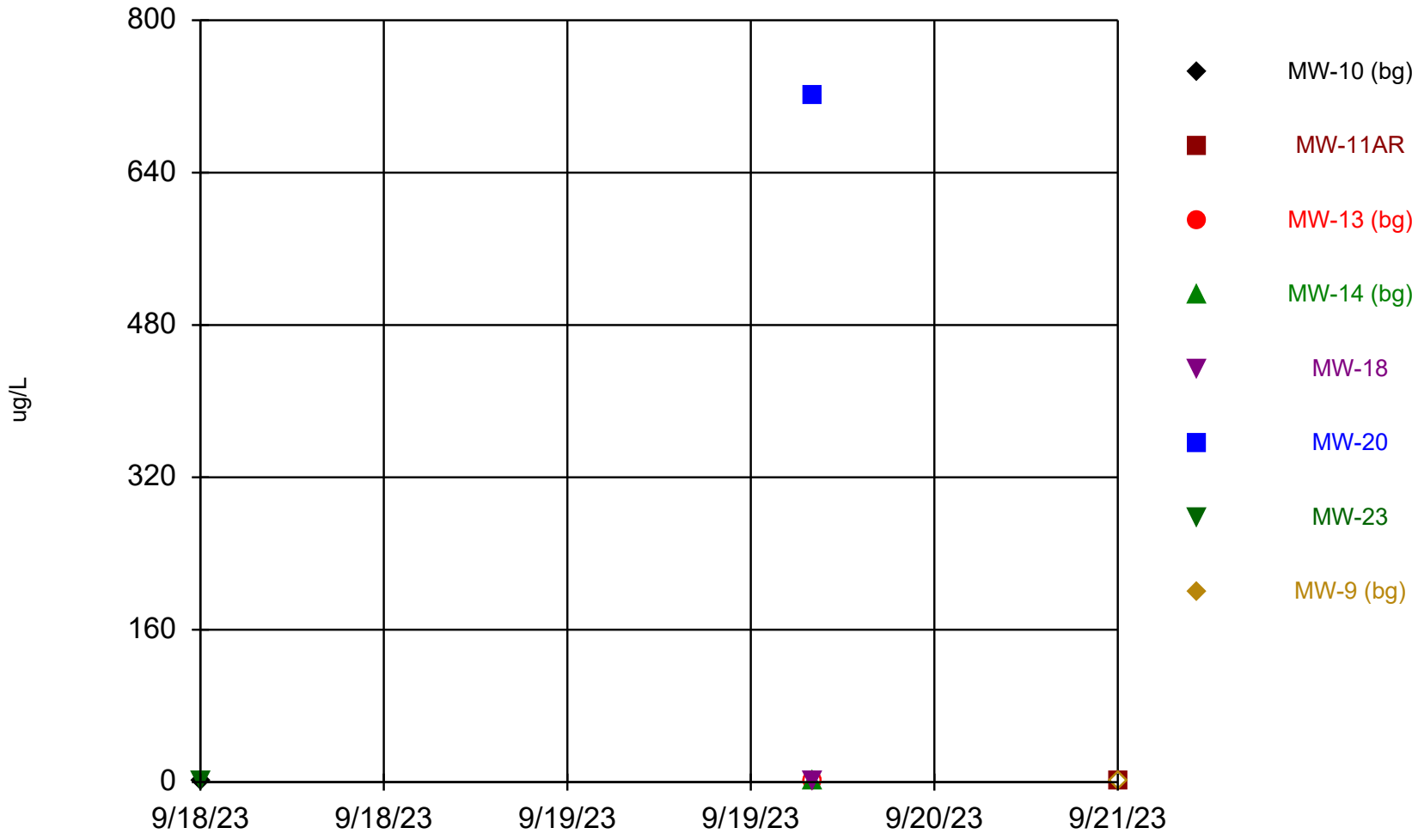
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)	MW-11AR	MW-13 (bg)	MW-14 (bg)	MW-18	MW-20	MW-22	MW-23	MW-9 (bg)
9/25/2016			148						515
9/26/2016				118	395	4.2	2.5		
9/27/2016	6.1	144							
9/28/2016								70	
9/13/2017			14.6			6.3	17.2	2.2	
9/14/2017		<0.07		407	85.3				49.8
9/15/2017	3.2								
9/11/2018			59.8			15.7	2.9	2	
9/12/2018	54.9	114		64.9	1120				722
9/16/2019			15	27		7.3 (J)	26	29	
9/17/2019	12	96			31				2100
9/1/2020		110		27	68			23	2000
9/2/2020			110			<4	21		
4/29/2021	77								
9/27/2021			5.7 (J)	36		8.8 (J)		140	
9/28/2021	4.9 (J)	77			45				1100
9/20/2022	33			71					98
9/21/2022		84	79		2400	12		82	
9/18/2023	<3.6 (U)							5.8 (J)	
9/20/2023			21	120	7.5 (J)	<3.6 (U)			
9/21/2023		86							220

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Molybdenum



Time Series Analysis Run 10/30/2023 12:12 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Time Series

Constituent: Molybdenum (ug/L) Analysis Run 10/30/2023 12:17 PM View: East Closed LF

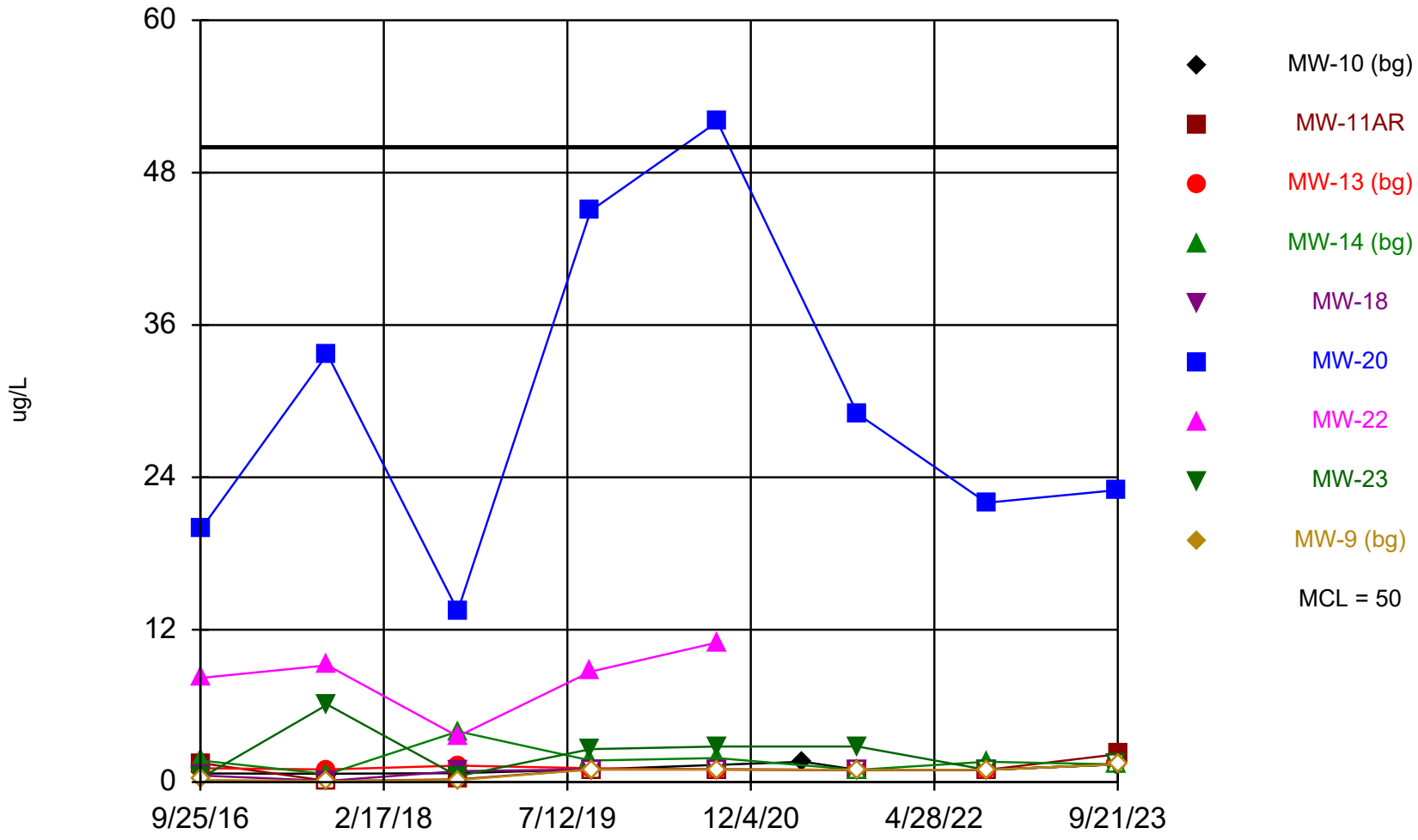
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)	MW-11AR	MW-13 (bg)	MW-14 (bg)	MW-18	MW-20	MW-23	MW-9 (bg)
9/18/2023	1 (J)						1.5 (J)	
9/20/2023			<0.91 (U)	2.2	0.99 (J)	720		
9/21/2023		2.2						<0.91 (U)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Selenium



Time Series Analysis Run 10/30/2023 12:12 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Time Series

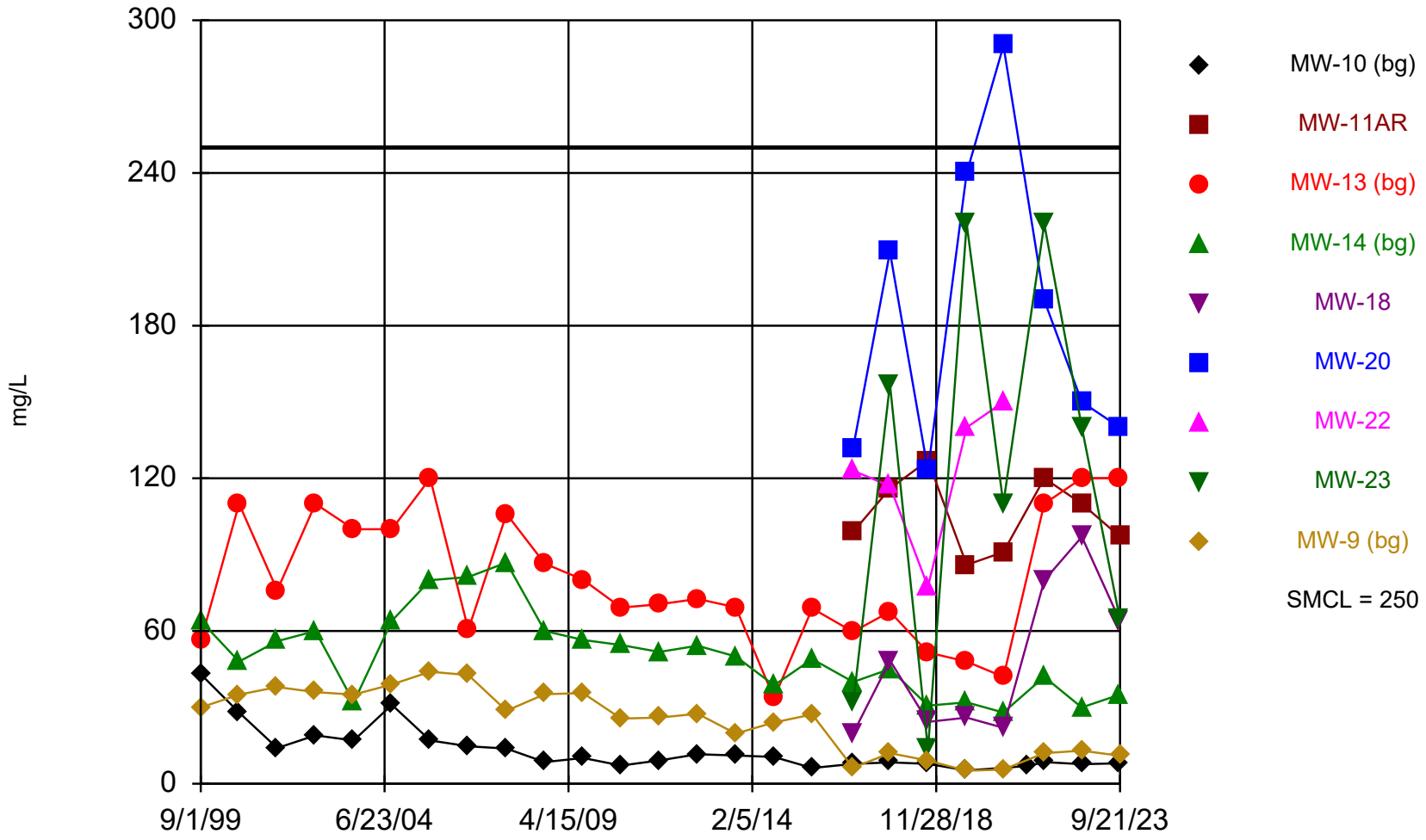
Constituent: Selenium (ug/L) Analysis Run 10/30/2023 12:17 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)	MW-11AR	MW-13 (bg)	MW-14 (bg)	MW-18	MW-20	MW-22	MW-23	MW-9 (bg)
9/25/2016			1.1						<0.18
9/26/2016				1.7	0.52 (J)	19.9	8.2		
9/27/2016	0.68 (J)	1.5							
9/28/2016								0.36 (J)	
9/13/2017			1			33.7	9.2	6.1	
9/14/2017		<0.086		0.63 (J)	0.094 (J)				<0.086
9/15/2017	0.66 (J)								
9/11/2018			1.3			13.5	3.6	0.47 (J)	
9/12/2018	0.71 (J)	0.22 (J)		4	0.87 (J)				<0.16
9/16/2019			1.1 (J)	1.7 (J)		45	8.7	2.6 (J)	
9/17/2019	<1	<1			<1				<1
9/1/2020		<1		1.9 (J)	<1			2.8 (J)	<1
9/2/2020			<1			52	11		
4/29/2021	1.6 (J)								
9/27/2021			<0.96	<0.96		29		2.8 (J)	
9/28/2021	<0.96	<0.96			<0.96				<0.96
9/20/2022	<0.96			1.6 (J)					<0.96
9/21/2022		<0.96	<0.96		<0.96	22		<0.96	
9/18/2023	<1.4 (U)							<1.4 (U)	
9/20/2023			<1.4 (U)	<1.4 (U)	<1.4 (U)	23			
9/21/2023		2.2 (J)							<1.4 (U)

ND substitution: RL or RL/2 if <15% NDs.

Sulfate



Time Series Analysis Run 10/30/2023 12:12 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

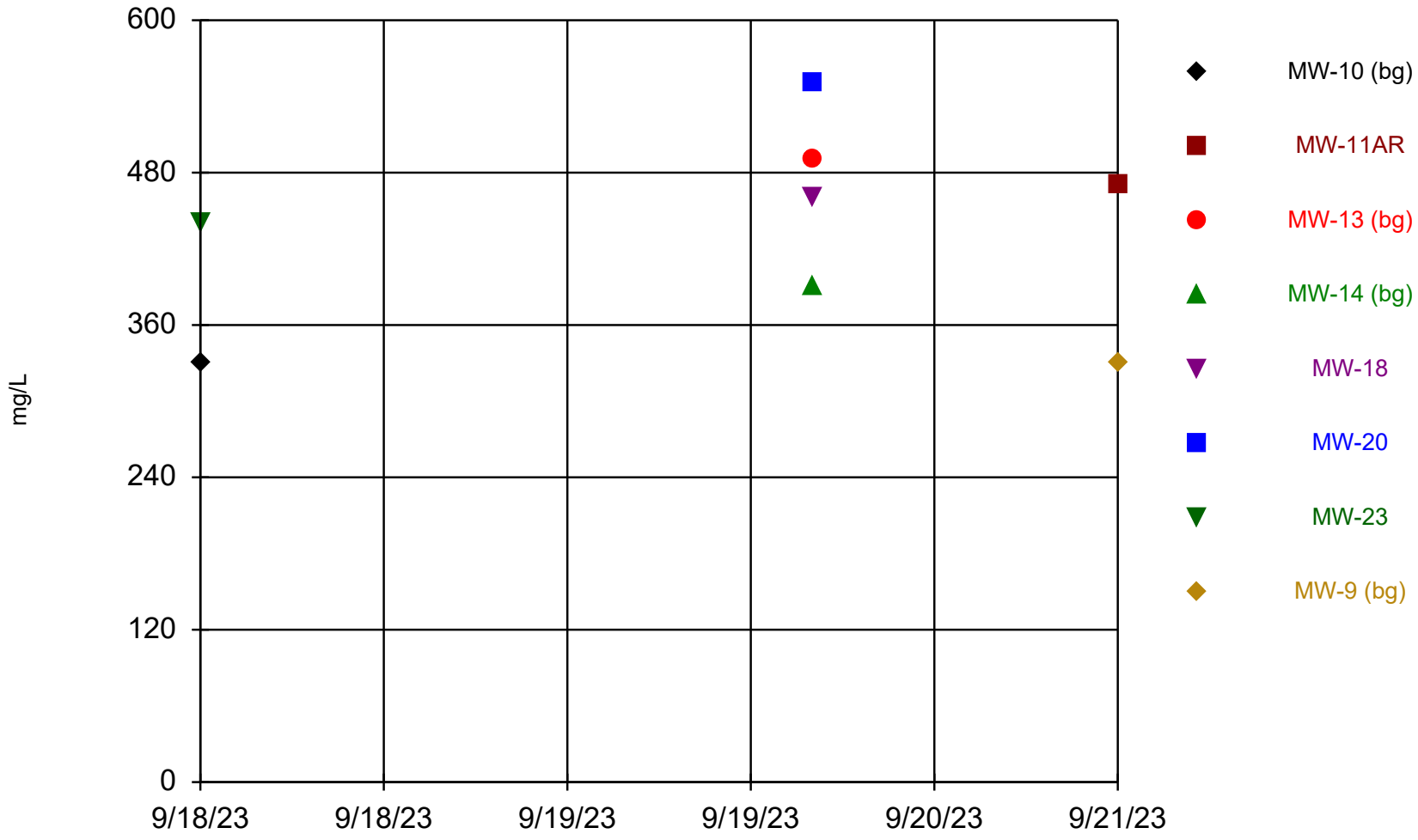
Time Series

Constituent: Sulfate (mg/L) Analysis Run 10/30/2023 12:17 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)	MW-11AR	MW-13 (bg)	MW-14 (bg)	MW-18	MW-20	MW-22	MW-23	MW-9 (bg)
9/1/1999	43		56	64					30
9/1/2000	28		110	48					35
9/1/2001	14		76	56					38
9/1/2002	19		110	60					36
9/1/2003	17		100	32					35
9/1/2004	31		100	64					39
9/1/2005	17		120	80					44
9/1/2006	14.7		60.5	81.2					42.7
9/1/2007	13.8		106	86.9					28.7
9/1/2008	8.48		86.5	60					35.2
9/1/2009	10.1		80.2	56.5					35.6
9/1/2010	7.17		69.2	54.5					25.6
9/1/2011	9.16		70.5	51.8					26
9/1/2012	11.6		72.6	54.2					27.5
9/1/2013	11.1		69.3	50					19.7
9/1/2014	10.5		33.6	38.7					24.1
9/1/2015	6.2		68.9	49					27.2
9/25/2016			59.7						6.3
9/26/2016				40	19.8	132	123		
9/27/2016	7.8	99							
9/28/2016								31.8	
9/13/2017			67.6			209	117	157	
9/14/2017		116		45.1	48.4				12
9/15/2017	8.4								
9/11/2018			51.6			123	77.4	13.5	
9/12/2018	7.8	127		30.7	24.3				9.1
9/16/2019			48	32		240	140	220	
9/17/2019	5.2	86			26				5.1
9/1/2020		91		28	22			110	5.6
9/2/2020			42			290	150		
4/29/2021	7								
9/27/2021			110	42		190		220	
9/28/2021	8.5	120			80				12
9/20/2022	7.7			30					13
9/21/2022		110	120		97	150		140	
9/18/2023	8							65	
9/20/2023			120	35	64	140			
9/21/2023		97							11

Total Dissolved Solids



Time Series Analysis Run 10/30/2023 12:12 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Time Series

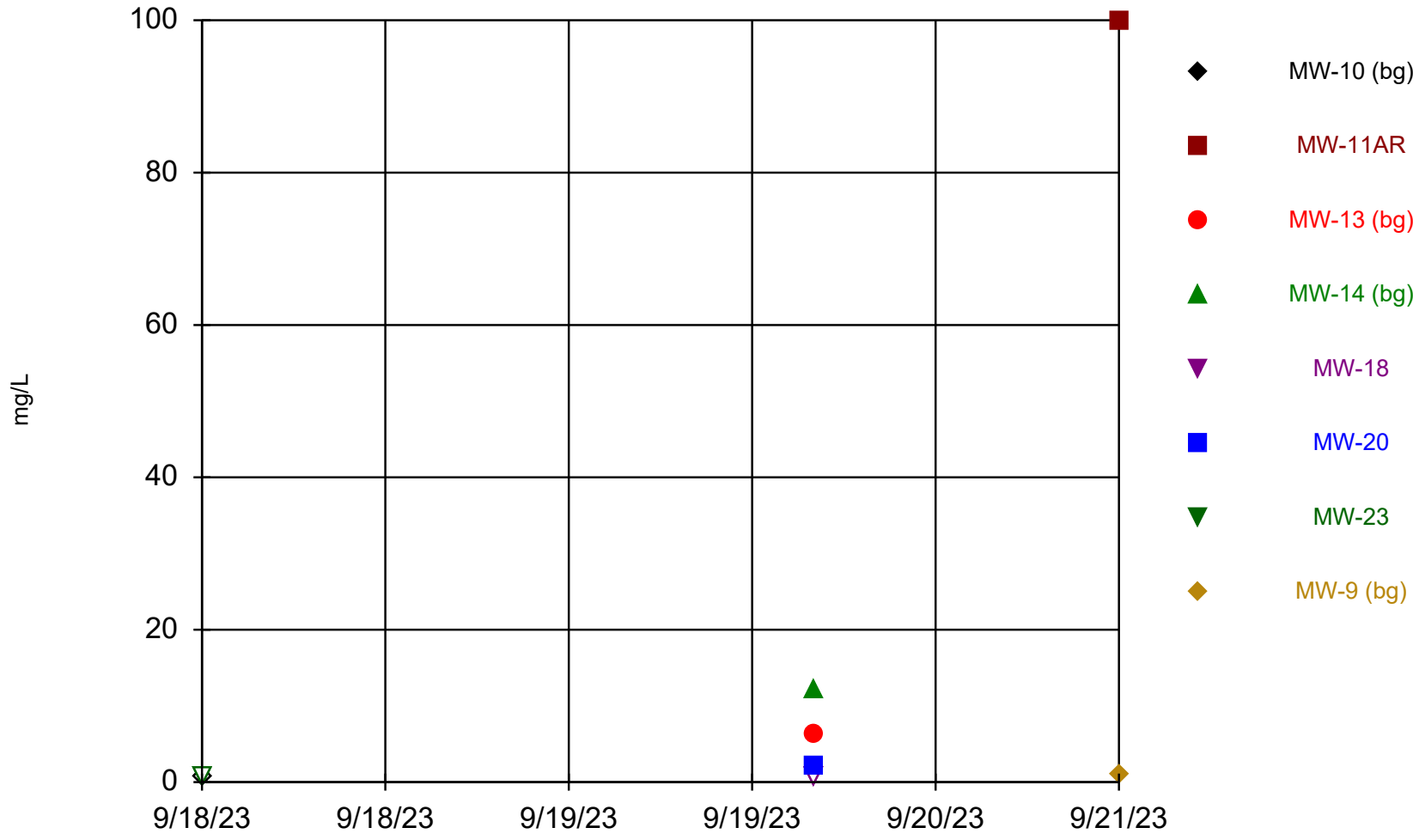
Constituent: Total Dissolved Solids (mg/L) Analysis Run 10/30/2023 12:17 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)	MW-11AR	MW-13 (bg)	MW-14 (bg)	MW-18	MW-20	MW-23	MW-9 (bg)
9/18/2023	330						440	
9/20/2023			490	390	460	550		
9/21/2023		470						330

Hollow symbols indicate censored values.

Total Suspended Solids



Time Series Analysis Run 10/30/2023 12:12 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Time Series

Constituent: Total Suspended Solids (mg/L) Analysis Run 10/30/2023 12:17 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)	MW-11AR	MW-13 (bg)	MW-14 (bg)	MW-18	MW-20	MW-23	MW-9 (bg)
9/18/2023	<0.64 (U)						<0.64 (U)	
9/20/2023			6.4	12	<0.64 (U)	2		
9/21/2023		100						1.1 (J)

ND substitution: RL or RL/2 if <15% NDs.

Attachment E3

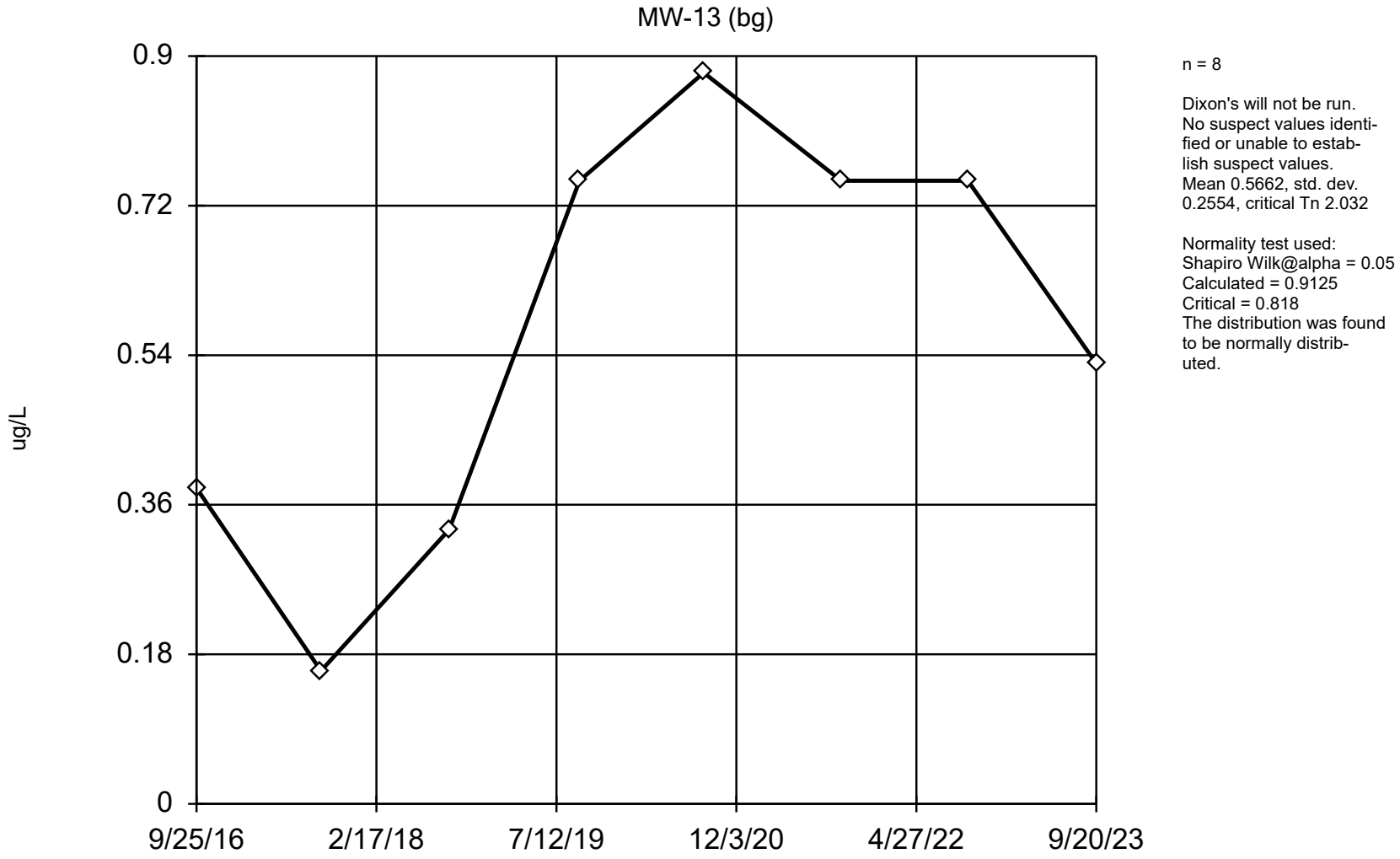
Outlier Analysis Results – West

Outlier Analysis

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input Printed 10/30/2023, 11:24 AM

Constituent	Well	Outlier	Value(s)	Date(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Arsenic (ug/L)	MW-13 (bg)	No	n/a	n/a	EPA 1989	0.05	8	0.5662	0.2554	normal	ShapiroWilk
Arsenic (ug/L)	MW-14 (bg)	No	n/a	n/a	EPA 1989	0.05	8	0.785	0.3639	ln(x)	ShapiroWilk
Arsenic (ug/L)	MW-8 (bg)	No	n/a	n/a	Dixon`s	0.05	7	0.6286	0.1913	normal	ShapiroWilk
Barium (ug/L)	MW-13 (bg)	No	n/a	n/a	EPA 1989	0.05	8	99.45	7.495	normal	ShapiroWilk
Barium (ug/L)	**MW-14 (bg)**	**Yes**	**108**	**9/14/2017**	**Dixon`s**	**0.05**	**8**	**66.4**	**17.23**	**normal**	**ShapiroWilk**
Barium (ug/L)	MW-8 (bg)	No	n/a	n/a	EPA 1989	0.05	7	128.1	14.72	normal	ShapiroWilk
Beryllium (ug/L)	MW-13 (bg)	No	n/a	n/a	NP (nrm)	NaN	8	0.2028	0.115	unknown	ShapiroWilk
Beryllium (ug/L)	MW-14 (bg)	No	n/a	n/a	EPA 1989	0.05	8	0.22	0.08992	normal	ShapiroWilk
Beryllium (ug/L)	MW-8 (bg)	No	n/a	n/a	Dixon`s	0.05	7	0.1931	0.1207	normal	ShapiroWilk
Boron (ug/L)	MW-13 (bg)	No	n/a	n/a	EPA 1989	0.05	8	85.28	34.64	normal	ShapiroWilk
Boron (ug/L)	MW-14 (bg)	No	n/a	n/a	EPA 1989	0.05	8	364	160.7	normal	ShapiroWilk
Boron (ug/L)	MW-8 (bg)	No	n/a	n/a	EPA 1989	0.05	7	71.01	46.74	normal	ShapiroWilk
Chloride (mg/L)	MW-13 (bg)	No	n/a	n/a	NP (nrm)	NaN	25	3.712	1.596	unknown	ShapiroWilk
Chloride (mg/L)	MW-14 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	25	3.608	1.617	unknown	ShapiroWilk
Chloride (mg/L)	MW-8 (bg)	No	n/a	n/a	EPA 1989	0.05	24	26.97	11.87	ln(x)	ShapiroWilk
Cobalt (ug/L)	MW-13 (bg)	No	n/a	n/a	EPA 1989	0.05	8	0.4481	0.3808	normal	ShapiroWilk
Cobalt (ug/L)	MW-14 (bg)	No	n/a	n/a	EPA 1989	0.05	8	0.845	0.9325	ln(x)	ShapiroWilk
Cobalt (ug/L)	MW-8 (bg)	No	n/a	n/a	EPA 1989	0.05	7	0.5216	0.556	ln(x)	ShapiroWilk
Iron (ug/L)	MW-13 (bg)	No	n/a	n/a	EPA 1989	0.05	8	316.6	397.1	ln(x)	ShapiroWilk
Iron (ug/L)	**MW-14 (bg)**	**Yes**	**4440**	**9/14/2017**	**NP (nrm)**	**NaN**	**8**	**904.6**	**1535**	**unknown**	**ShapiroWilk**
Iron (ug/L)	MW-8 (bg)	No	n/a	n/a	EPA 1989	0.05	7	439.1	437.5	normal	ShapiroWilk
Lead (ug/L)	MW-13 (bg)	No	n/a	n/a	EPA 1989	0.05	8	0.3387	0.1831	normal	ShapiroWilk
Lead (ug/L)	MW-14 (bg)	No	n/a	n/a	EPA 1989	0.05	8	0.5844	0.5921	ln(x)	ShapiroWilk
Lead (ug/L)	MW-8 (bg)	No	n/a	n/a	EPA 1989	0.05	7	0.6961	1.242	ln(x)	ShapiroWilk
Magnesium (ug/L)	MW-13 (bg)	No	n/a	n/a	NP (nrm)	NaN	8	17938	936.5	unknown	ShapiroWilk
Magnesium (ug/L)	MW-14 (bg)	No	n/a	n/a	EPA 1989	0.05	8	23050	3189	normal	ShapiroWilk
Magnesium (ug/L)	MW-8 (bg)	No	n/a	n/a	EPA 1989	0.05	7	19914	2537	normal	ShapiroWilk
Manganese (ug/L)	MW-13 (bg)	No	n/a	n/a	EPA 1989	0.05	8	56.64	52.2	normal	ShapiroWilk
Manganese (ug/L)	MW-14 (bg)	No	n/a	n/a	EPA 1989	0.05	8	108.9	126	ln(x)	ShapiroWilk
Manganese (ug/L)	MW-8 (bg)	No	n/a	n/a	EPA 1989	0.05	7	61.5	60.11	normal	ShapiroWilk
Selenium (ug/L)	MW-13 (bg)	No	n/a	n/a	EPA 1989	0.05	8	1.102	0.1644	normal	ShapiroWilk
Selenium (ug/L)	MW-14 (bg)	No	n/a	n/a	EPA 1989	0.05	8	1.736	1.008	ln(x)	ShapiroWilk
Selenium (ug/L)	MW-8 (bg)	No	n/a	n/a	EPA 1989	0.05	7	0.8729	0.3724	normal	ShapiroWilk
Sulfate (mg/L)	MW-13 (bg)	No	n/a	n/a	EPA 1989	0.05	25	80.33	26.2	normal	ShapiroWilk
Sulfate (mg/L)	MW-14 (bg)	No	n/a	n/a	EPA 1989	0.05	25	50.78	16.31	normal	ShapiroWilk
Sulfate (mg/L)	MW-8 (bg)	No	n/a	n/a	Rosner`s	0.01	24	19.22	7.104	normal	ShapiroWilk

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 0.5662, std. dev. 0.2554, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9125
Critical = 0.818
The distribution was found to be normally distributed.

Constituent: Arsenic Analysis Run 10/30/2023 11:22 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

EPA 1989 Outlier Screening

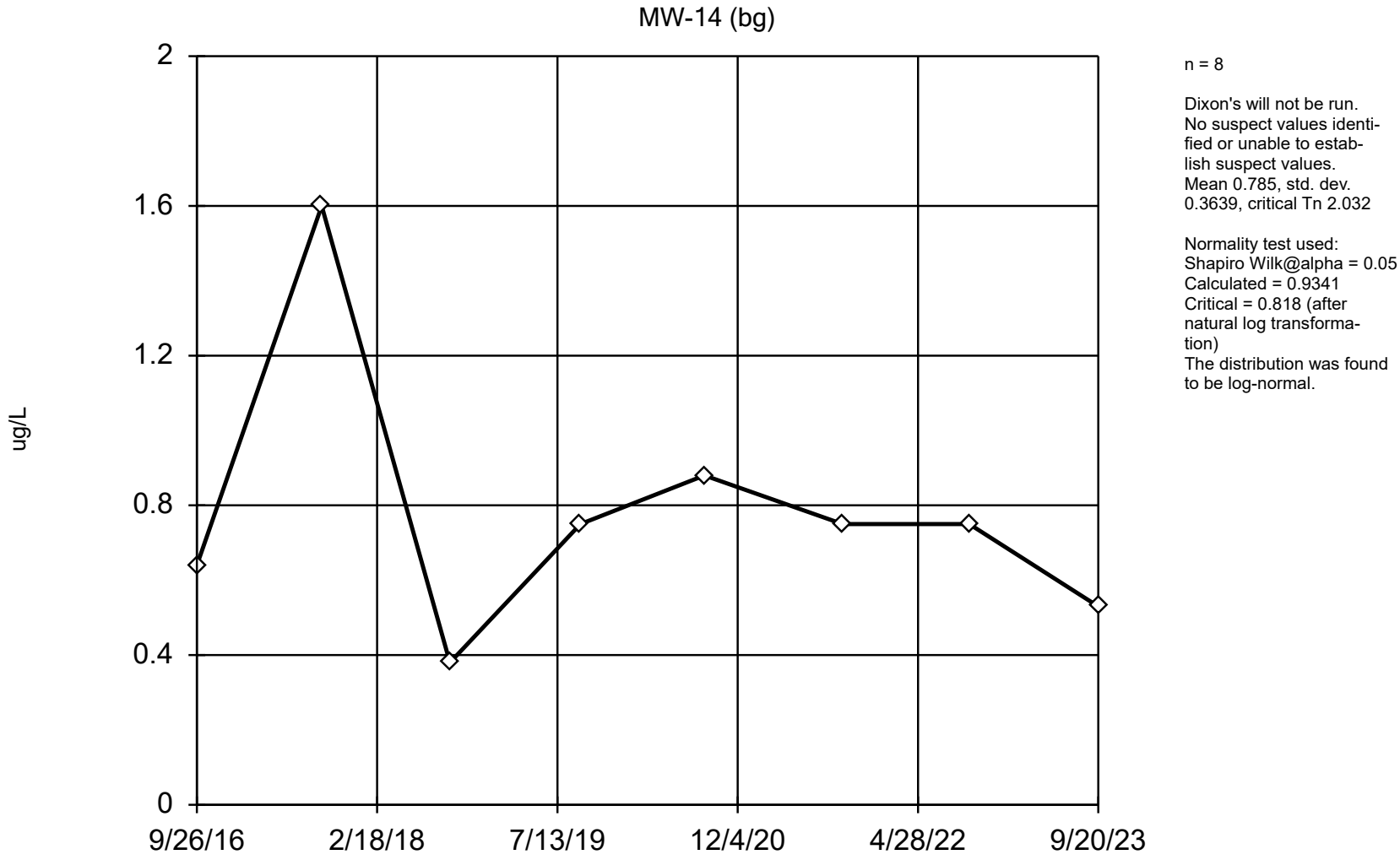
Constituent: Arsenic (ug/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)
9/25/2016	0.38 (J)
9/13/2017	0.16 (J)
9/11/2018	0.33 (J)
9/16/2019	<0.75
9/2/2020	<0.88
9/27/2021	<0.75
9/21/2022	<0.75
9/20/2023	<0.53 (U)

ND substitution: RL or RL/2 if <15% NDs.

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 0.785, std. dev. 0.3639, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9341
Critical = 0.818 (after natural log transformation)
The distribution was found to be log-normal.

Constituent: Arsenic Analysis Run 10/30/2023 11:22 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

EPA 1989 Outlier Screening

Constituent: Arsenic (ug/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

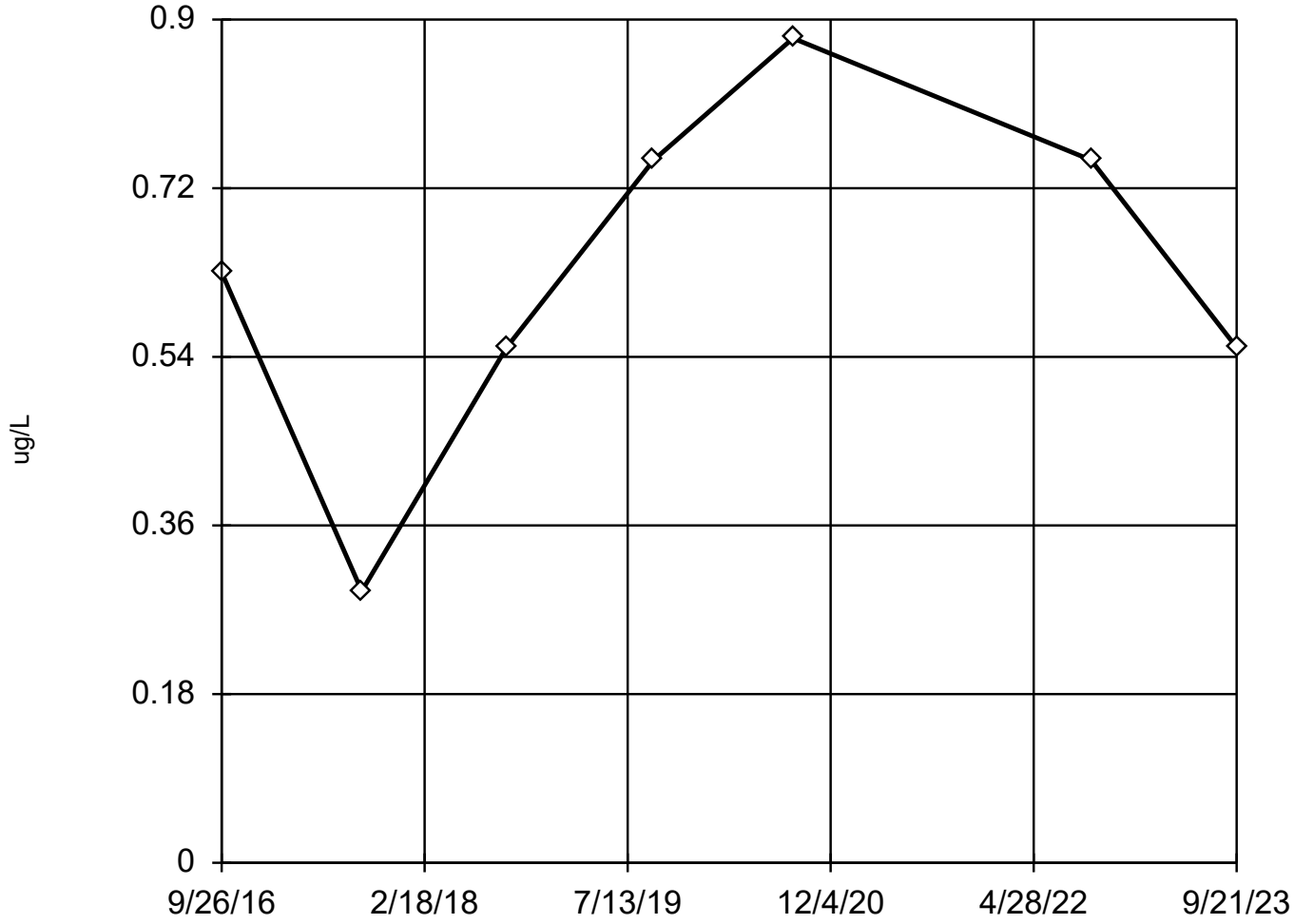
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-14 (bg)
9/26/2016	0.64 (J)
9/14/2017	1.6
9/12/2018	0.38 (J)
9/16/2019	<0.75
9/1/2020	<0.88
9/27/2021	<0.75
9/20/2022	<0.75
9/20/2023	<0.53 (U)

ND substitution: RL or RL/2 if <15% NDs.

Dixon's Outlier Test

MW-8 (bg)



n = 7

No statistical outliers.
Testing for 1 low outlier.
Mean = 0.6286.
Std. Dev. = 0.1913.
0.29 (J): c = 0.4407
tabl = 0.507.
Alpha = 0.05.

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9046
Critical = 0.788
The distribution was found to be normally distrib-uted.

Constituent: Arsenic Analysis Run 10/30/2023 11:22 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Dixon's Outlier Test

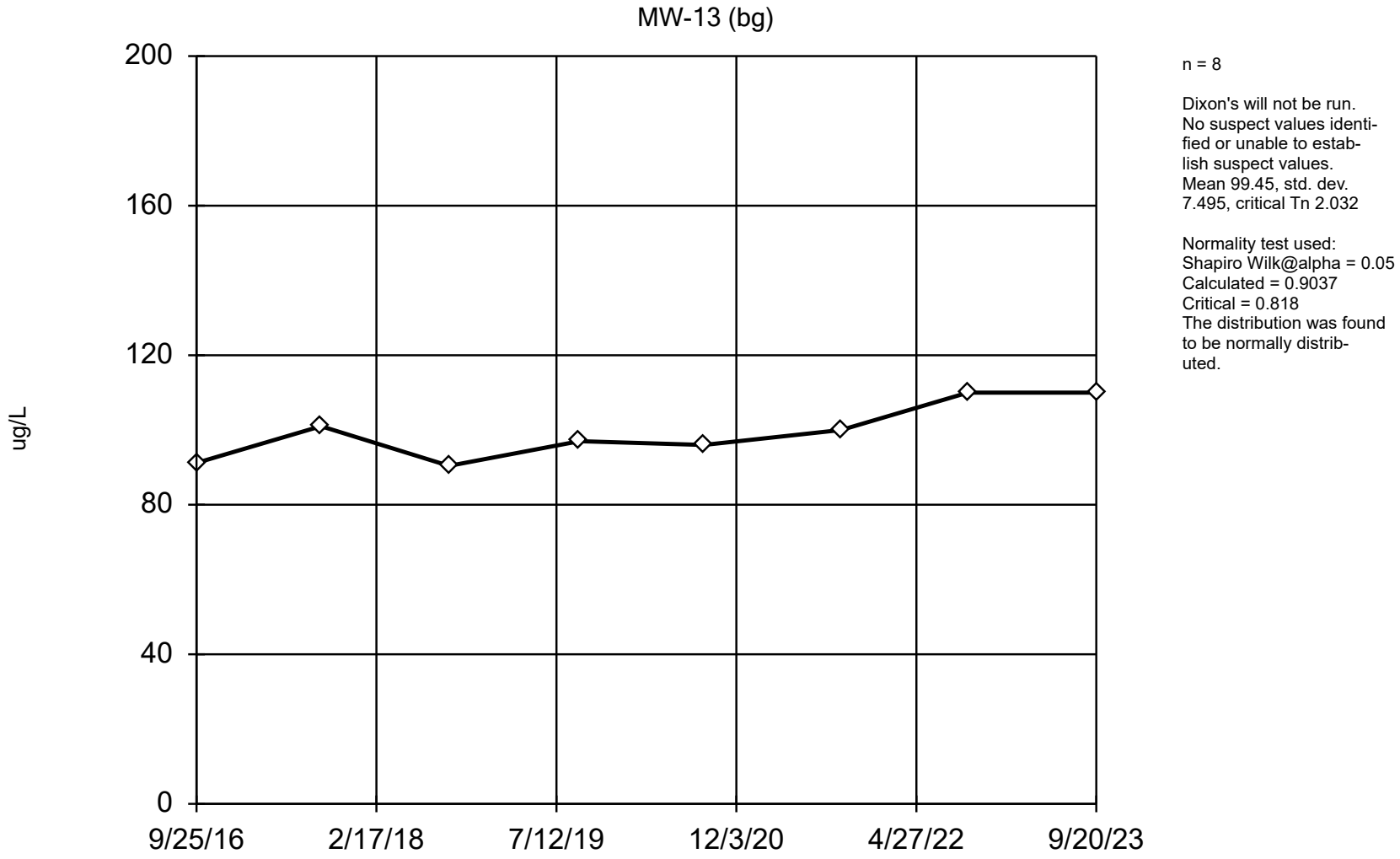
Constituent: Arsenic (ug/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-8 (bg)
9/26/2016	0.63 (J)
9/13/2017	0.29 (J)
9/12/2018	0.55 (J)
9/17/2019	<0.75
9/1/2020	<0.88
9/20/2022	<0.75
9/21/2023	0.55 (J)

ND substitution: RL or RL/2 if <15% NDs.

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 99.45, std. dev. 7.495, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9037
Critical = 0.818
The distribution was found to be normally distributed.

Constituent: Barium Analysis Run 10/30/2023 11:22 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

EPA 1989 Outlier Screening

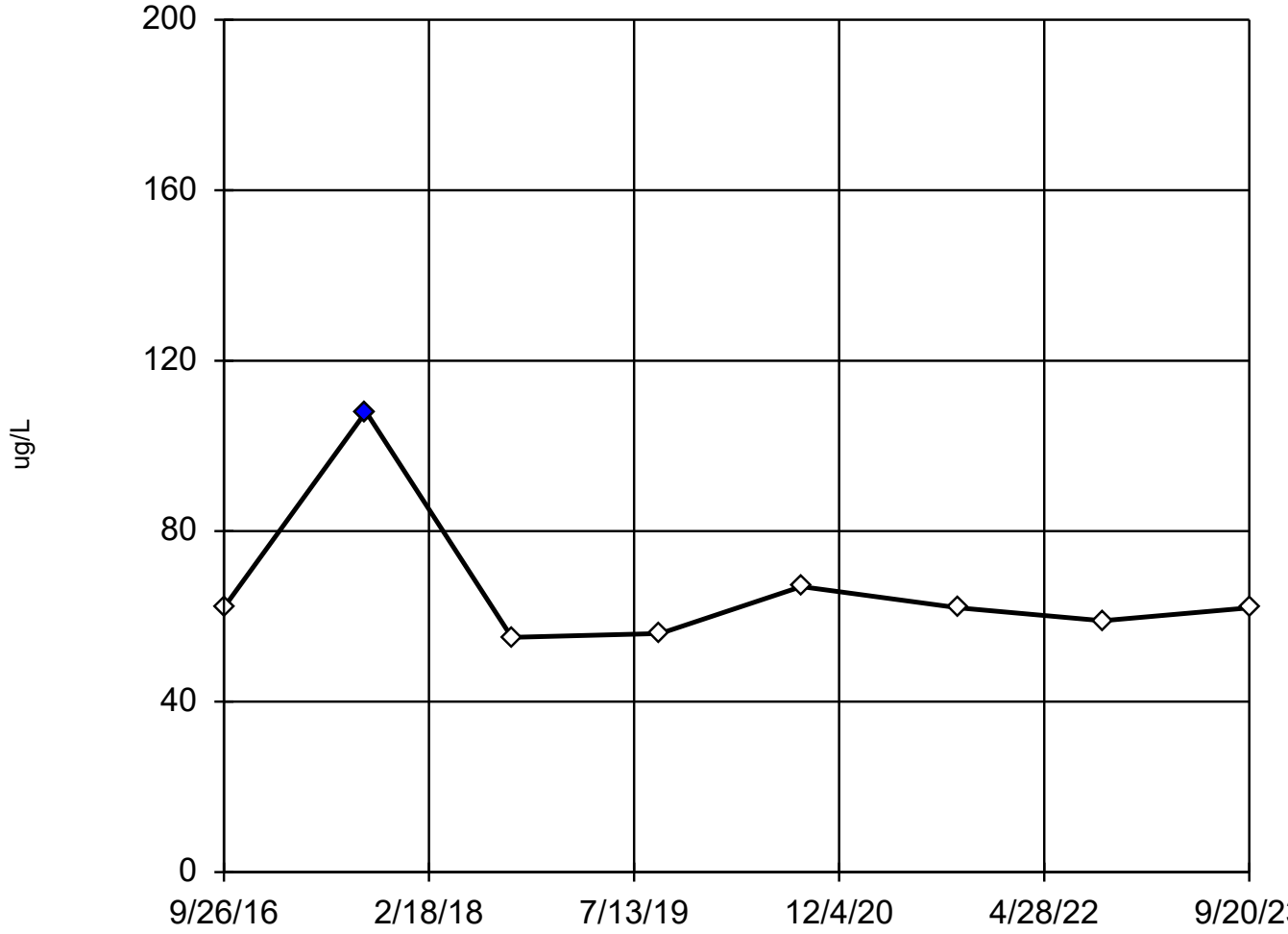
Constituent: Barium (ug/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)
9/25/2016	91.2
9/13/2017	101
9/11/2018	90.4
9/16/2019	97
9/2/2020	96
9/27/2021	100
9/21/2022	110
9/20/2023	110

Dixon's Outlier Test

MW-14 (bg)



n = 8

Statistical outlier is drawn as solid.
Testing for 1 high outlier.
Mean = 66.4.
Std. Dev. = 17.23.
108: c = 0.7885
tabl = 0.554.
Alpha = 0.05.

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9294
Critical = 0.803
The distribution, after removal of suspect value, was found to be normally distributed.

Constituent: Barium Analysis Run 10/30/2023 11:22 AM View: West Closed LF

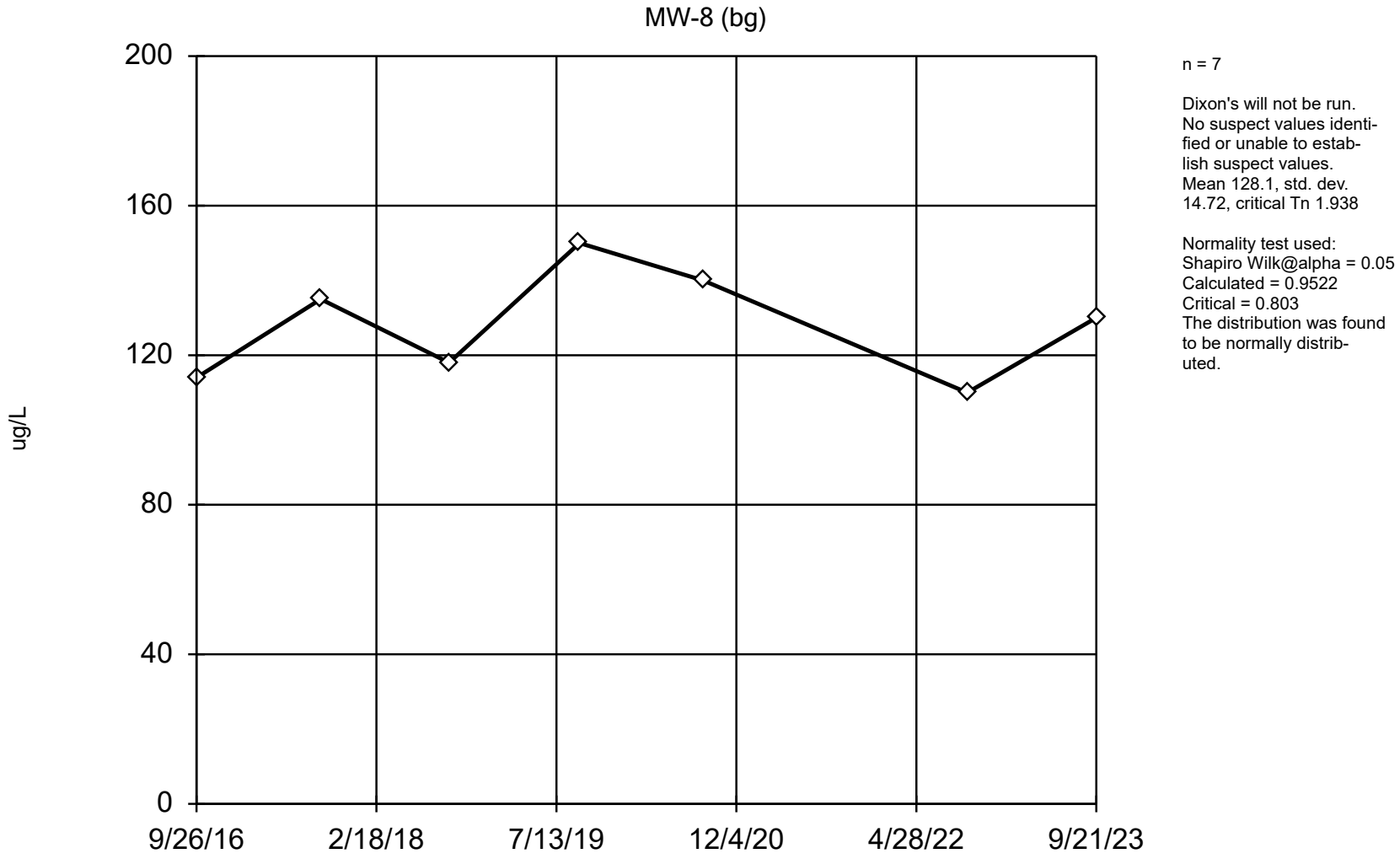
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Dixon's Outlier Test

Constituent: Barium (ug/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-14 (bg)
9/26/2016	62.1
9/14/2017	108 (O)
9/12/2018	55.1
9/16/2019	56
9/1/2020	67
9/27/2021	62
9/20/2022	59
9/20/2023	62

EPA Screening (suspected outliers for Dixon's Test)



n = 7

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 128.1, std. dev. 14.72, critical Tn 1.938

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9522
Critical = 0.803
The distribution was found to be normally distributed.

Constituent: Barium Analysis Run 10/30/2023 11:22 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

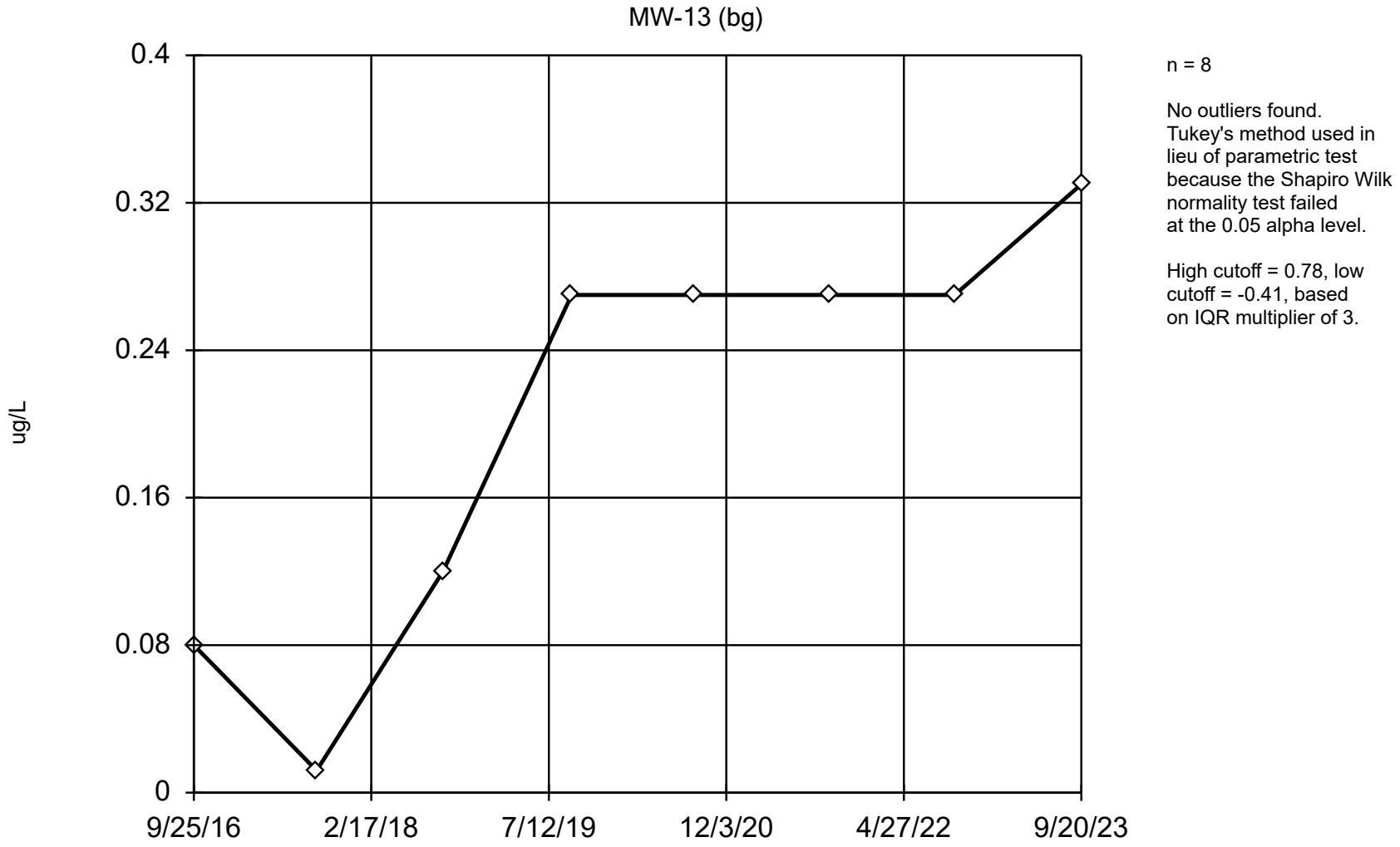
EPA 1989 Outlier Screening

Constituent: Barium (ug/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-8 (bg)
9/26/2016	114
9/13/2017	135
9/12/2018	118
9/17/2019	150
9/1/2020	140
9/20/2022	110
9/21/2023	130

Tukey's Outlier Screening



n = 8

No outliers found.
Tukey's method used in lieu of parametric test because the Shapiro Wilk normality test failed at the 0.05 alpha level.

High cutoff = 0.78, low cutoff = -0.41, based on IQR multiplier of 3.

Constituent: Beryllium Analysis Run 10/30/2023 11:22 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Tukey's Outlier Screening

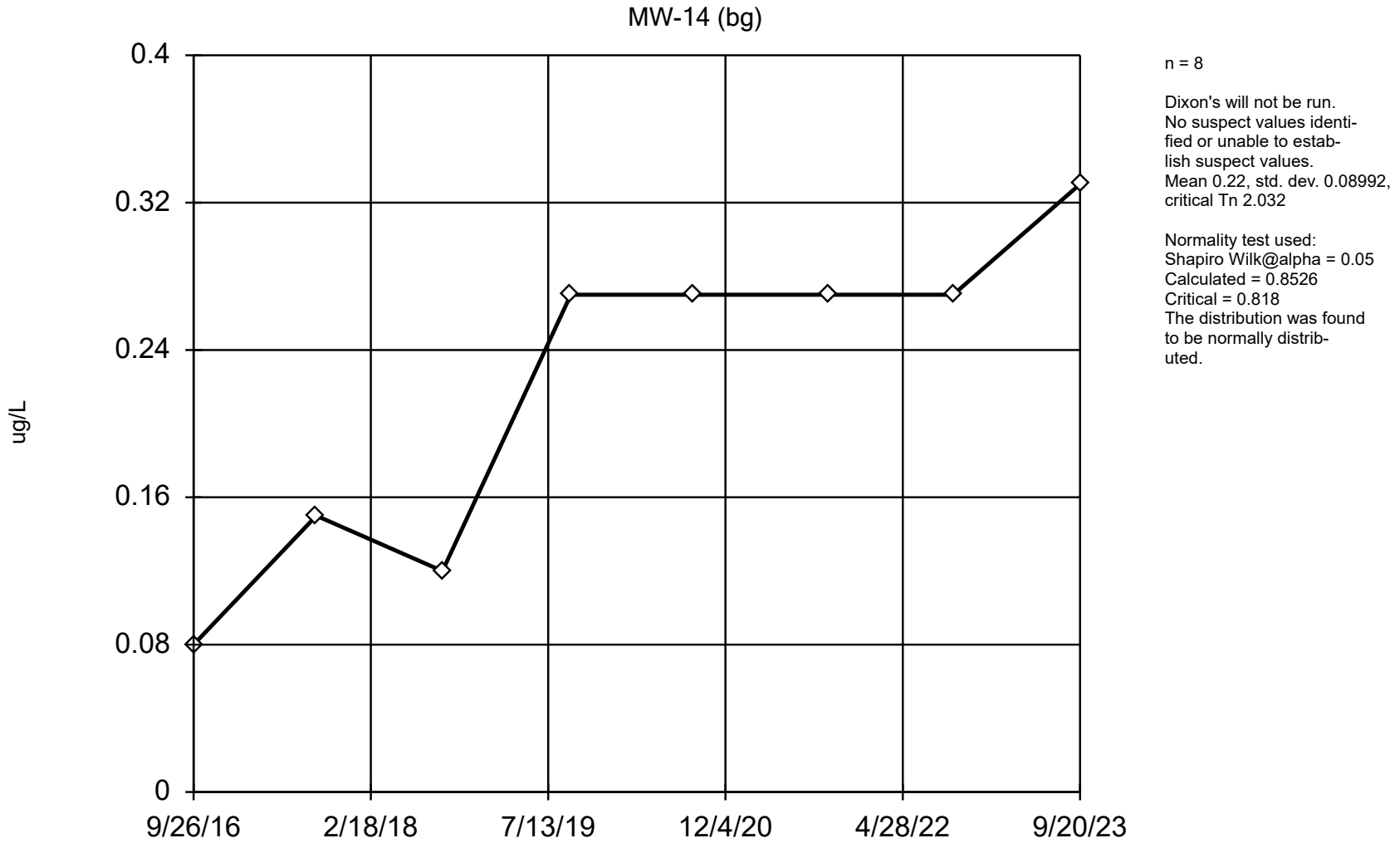
Constituent: Beryllium (ug/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)
9/25/2016	<0.08
9/13/2017	<0.012
9/11/2018	<0.12
9/16/2019	<0.27
9/2/2020	<0.27
9/27/2021	<0.27
9/21/2022	<0.27
9/20/2023	<0.33 (U)

ND substitution: RL or RL/2 if <15% NDs.

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 0.22, std. dev. 0.08992, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.8526
Critical = 0.818
The distribution was found to be normally distributed.

Constituent: Beryllium Analysis Run 10/30/2023 11:22 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

EPA 1989 Outlier Screening

Constituent: Beryllium (ug/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

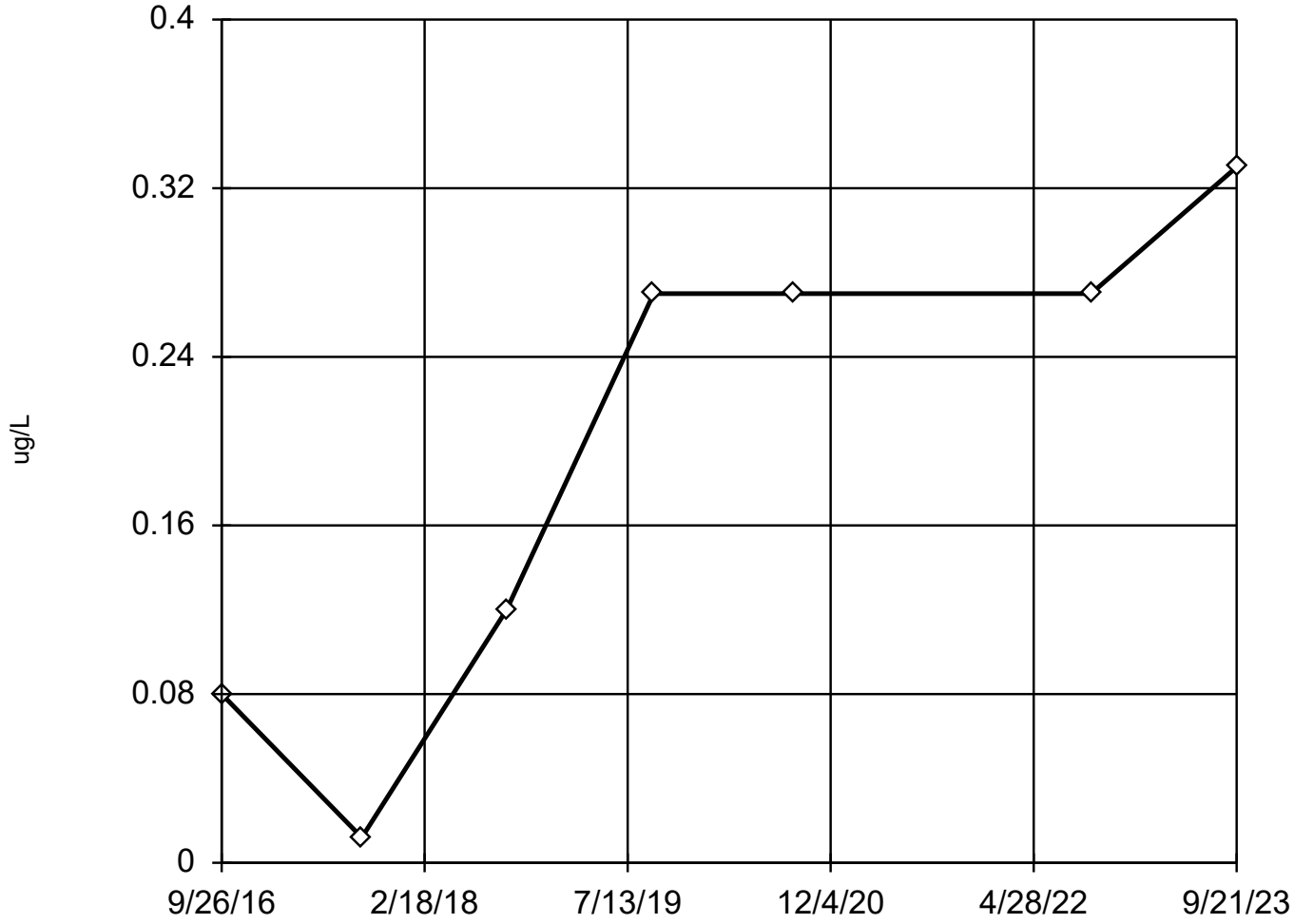
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-14 (bg)
9/26/2016	<0.08
9/14/2017	0.15 (J)
9/12/2018	<0.12
9/16/2019	<0.27
9/1/2020	<0.27
9/27/2021	<0.27
9/20/2022	<0.27
9/20/2023	<0.33 (U)

ND substitution: RL or RL/2 if <15% NDs.

Dixon's Outlier Test

MW-8 (bg)



n = 7

No statistical outliers.
Testing for 1 low outlier.
Mean = 0.1931.
Std. Dev. = 0.1207.
<0.012: c = 0.2138
tabl = 0.507.
Alpha = 0.05.

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.8376
Critical = 0.788
The distribution was found to be normally distrib-uted.

Constituent: Beryllium Analysis Run 10/30/2023 11:22 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Dixon's Outlier Test

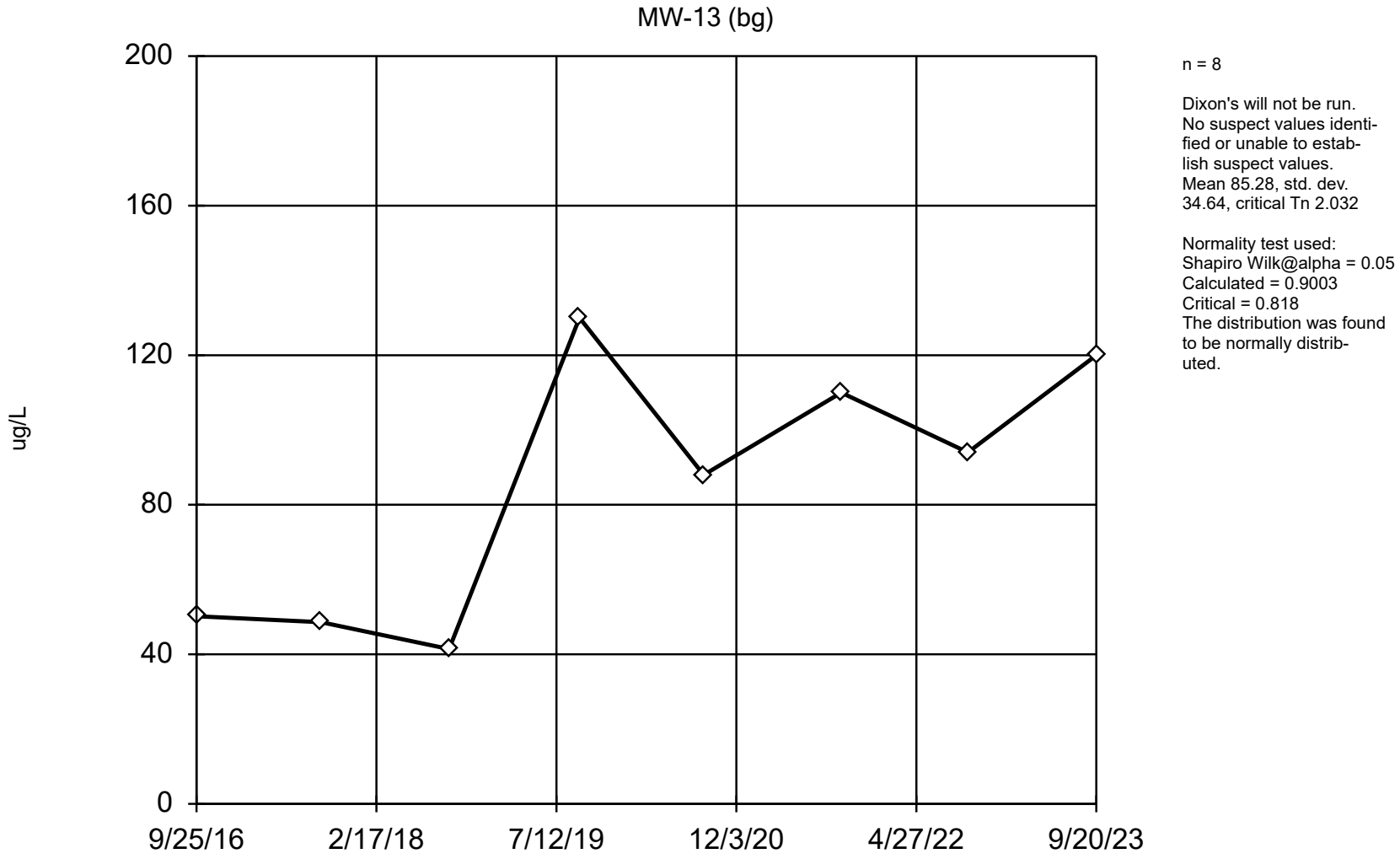
Constituent: Beryllium (ug/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-8 (bg)
9/26/2016	<0.08
9/13/2017	<0.012
9/12/2018	<0.12
9/17/2019	<0.27
9/1/2020	<0.27
9/20/2022	<0.27
9/21/2023	<0.33 (U)

ND substitution: RL or RL/2 if <15% NDs.

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 85.28, std. dev. 34.64, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9003
Critical = 0.818
The distribution was found to be normally distributed.

Constituent: Boron Analysis Run 10/30/2023 11:22 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

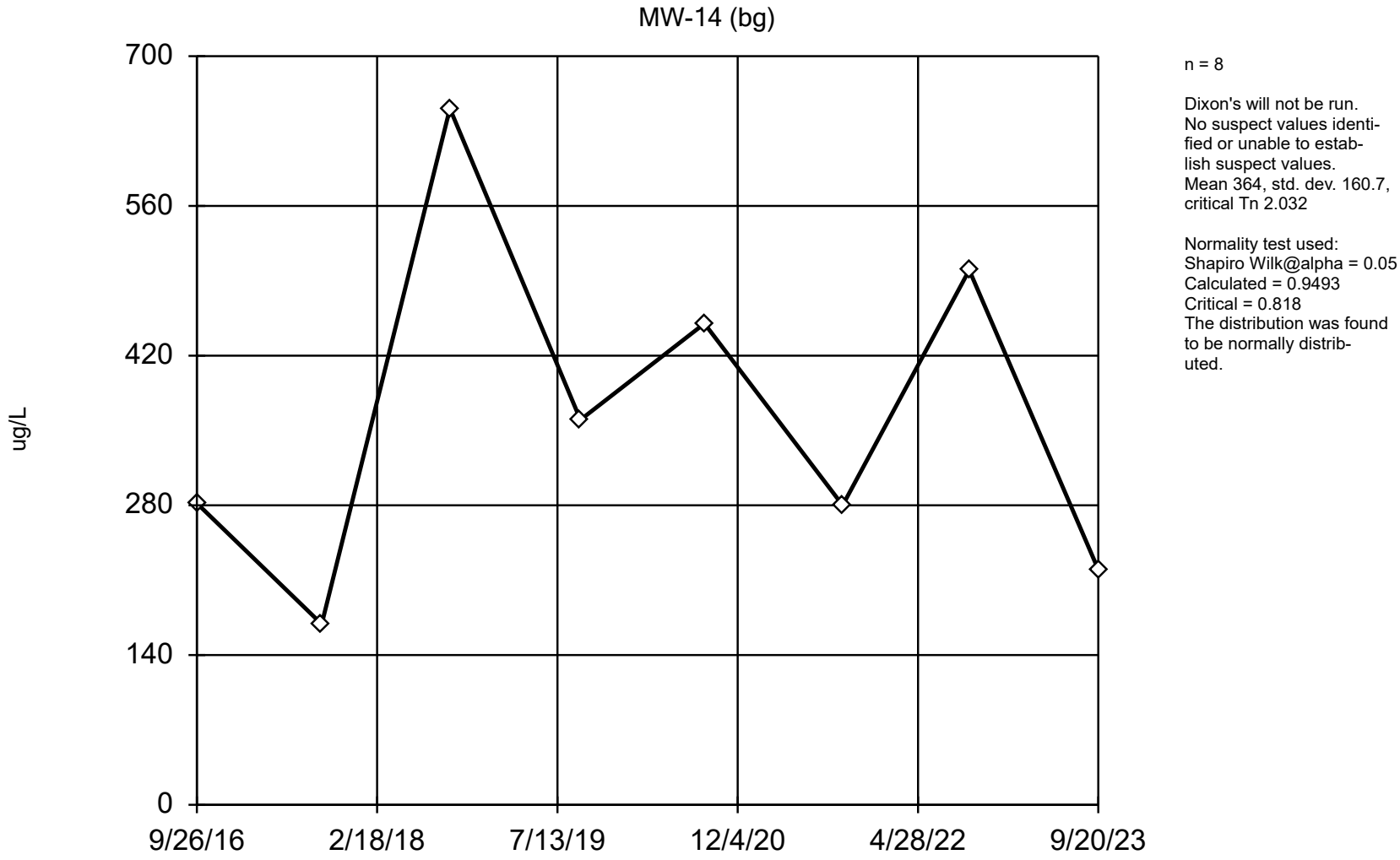
EPA 1989 Outlier Screening

Constituent: Boron (ug/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)
9/25/2016	50.2 (J)
9/13/2017	48.6 (J)
9/11/2018	41.4 (J)
9/16/2019	130 (J)
9/2/2020	88 (J)
9/27/2021	110
9/21/2022	94 (J)
9/20/2023	120

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 364, std. dev. 160.7, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9493
Critical = 0.818
The distribution was found to be normally distributed.

Constituent: Boron Analysis Run 10/30/2023 11:22 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

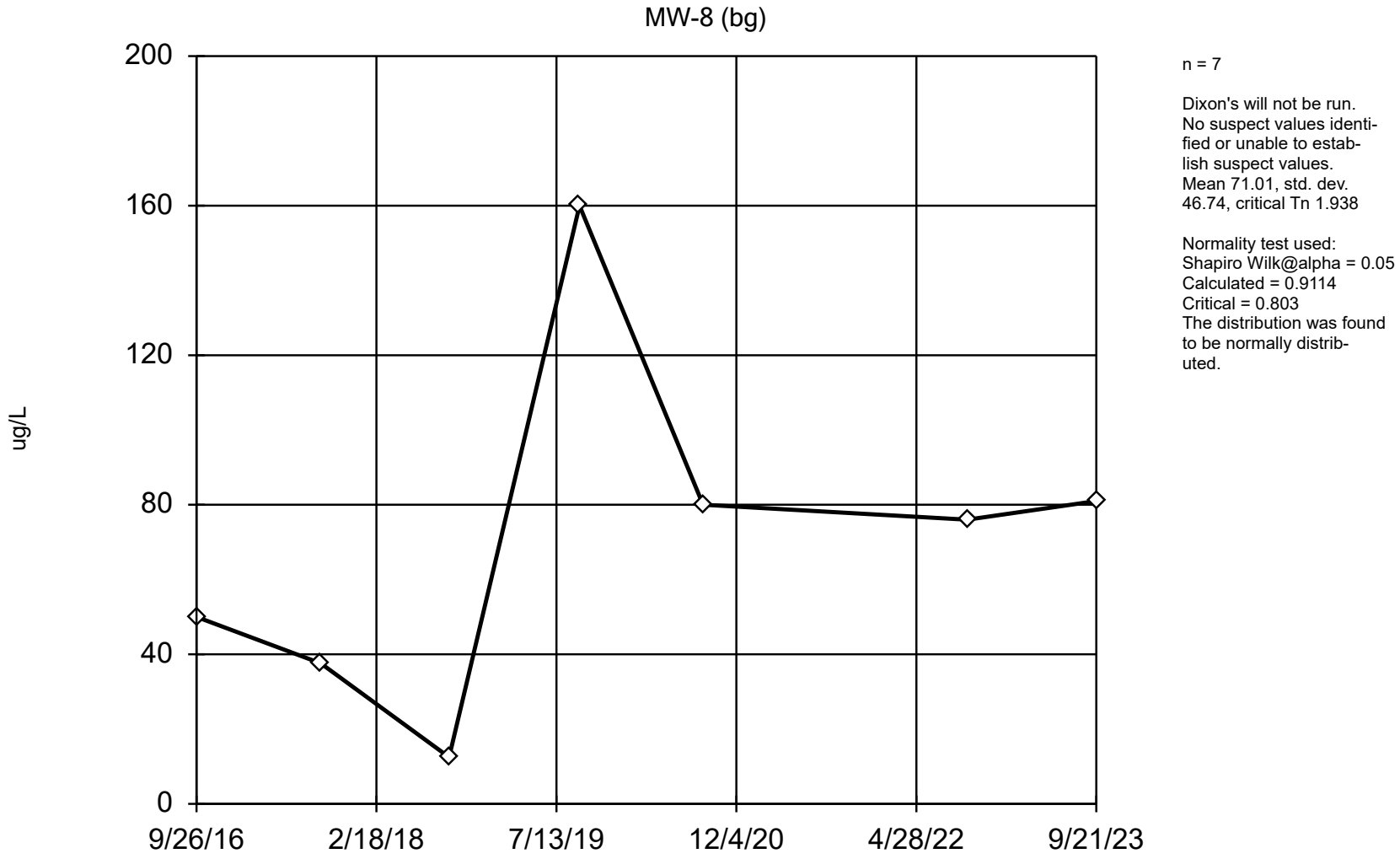
EPA 1989 Outlier Screening

Constituent: Boron (ug/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-14 (bg)
9/26/2016	282
9/14/2017	169
9/12/2018	651
9/16/2019	360
9/1/2020	450
9/27/2021	280
9/20/2022	500
9/20/2023	220

EPA Screening (suspected outliers for Dixon's Test)



n = 7

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 71.01, std. dev. 46.74, critical Tn 1.938

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9114
Critical = 0.803
The distribution was found to be normally distributed.

Constituent: Boron Analysis Run 10/30/2023 11:22 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

EPA 1989 Outlier Screening

Constituent: Boron (ug/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

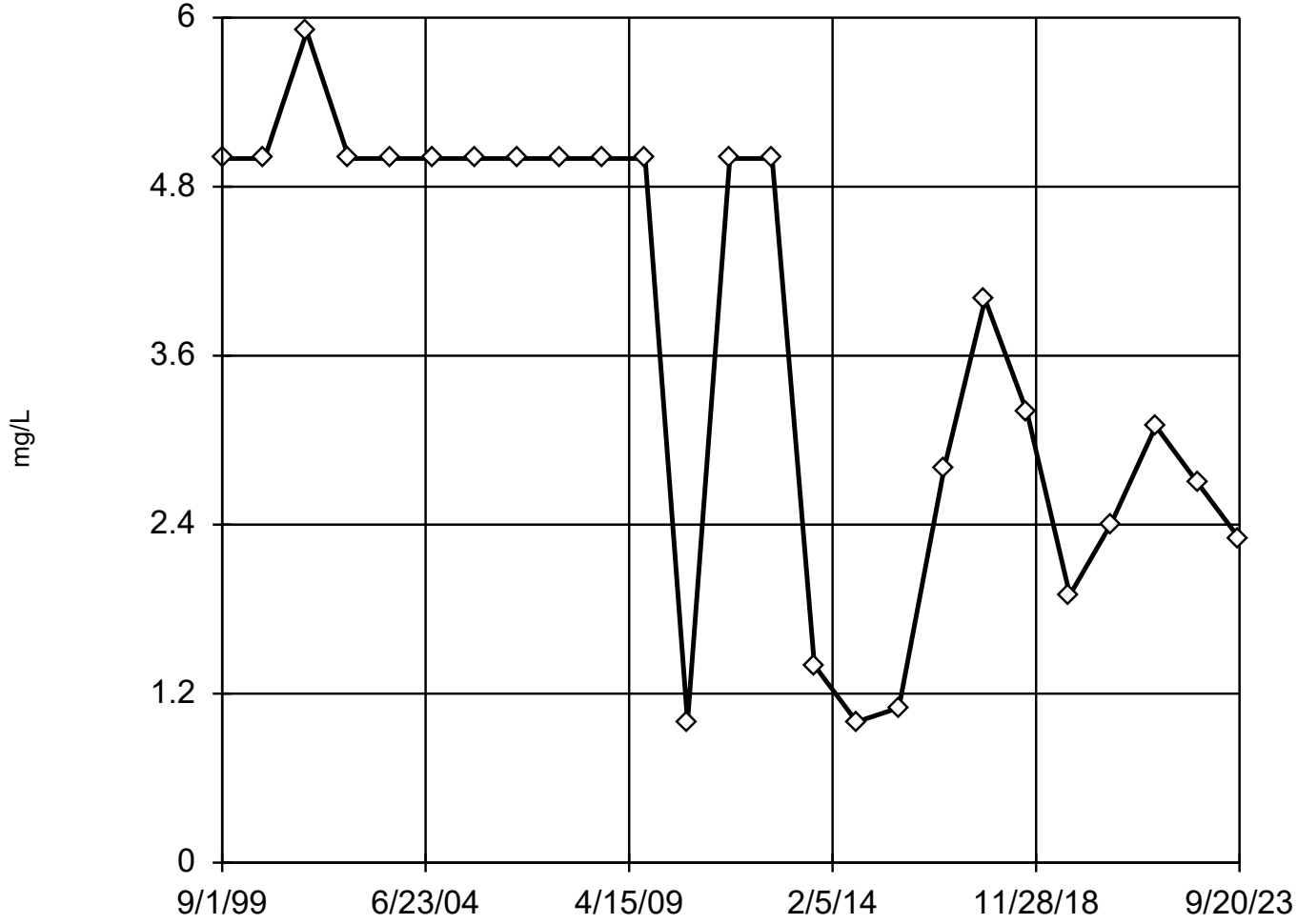
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-8 (bg)
9/26/2016	<50
9/13/2017	37.6 (J)
9/12/2018	<12.5
9/17/2019	160 (J)
9/1/2020	<80
9/20/2022	76 (J)
9/21/2023	81 (J)

ND substitution: RL or RL/2 if <15% NDs.

Tukey's Outlier Screening

MW-13 (bg)



n = 25

No outliers found.
Tukey's method used in lieu of parametric test because the Shapiro Wilk normality test failed at the 0.05 alpha level.

High cutoff = 12.95, low cutoff = -5.6, based on IQR multiplier of 3.

Constituent: Chloride Analysis Run 10/30/2023 11:22 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Tukey's Outlier Screening

Constituent: Chloride (mg/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

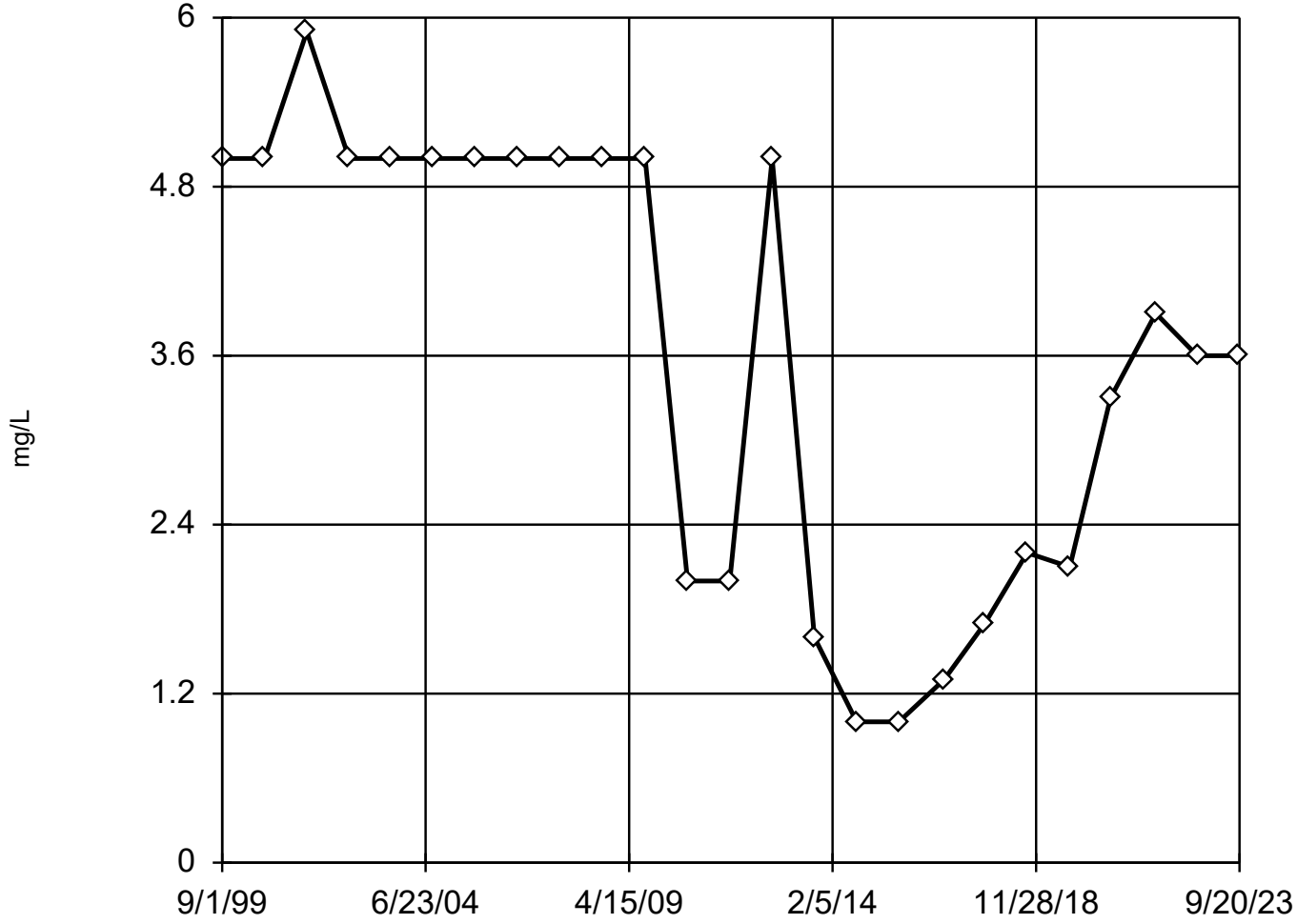
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)
9/1/1999	<5
9/1/2000	<5
9/1/2001	5.9
9/1/2002	<5
9/1/2003	<5
9/1/2004	<5
9/1/2005	<5
9/1/2006	<5
9/1/2007	<5
9/1/2008	<5
9/1/2009	<5
9/1/2010	<1
9/1/2011	<5
9/1/2012	<5
9/1/2013	1.4
9/1/2014	<1
9/1/2015	1.1
9/25/2016	2.8
9/13/2017	4
9/11/2018	3.2
9/16/2019	1.9 (J,B)
9/2/2020	2.4 (J,B)
9/27/2021	3.1 (J)
9/21/2022	2.7 (J)
9/20/2023	<2.3 (U)

ND substitution: RL or RL/2 if <15% NDs.

Tukey's Outlier Screening

MW-14 (bg)



n = 25

No outliers found.
Tukey's method used in lieu of parametric test because the Shapiro Wilk normality test failed at the 0.05 alpha level.

The results were invalidated, because both the lower and upper quartiles represent reporting limits.

Constituent: Chloride Analysis Run 10/30/2023 11:22 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Tukey's Outlier Screening

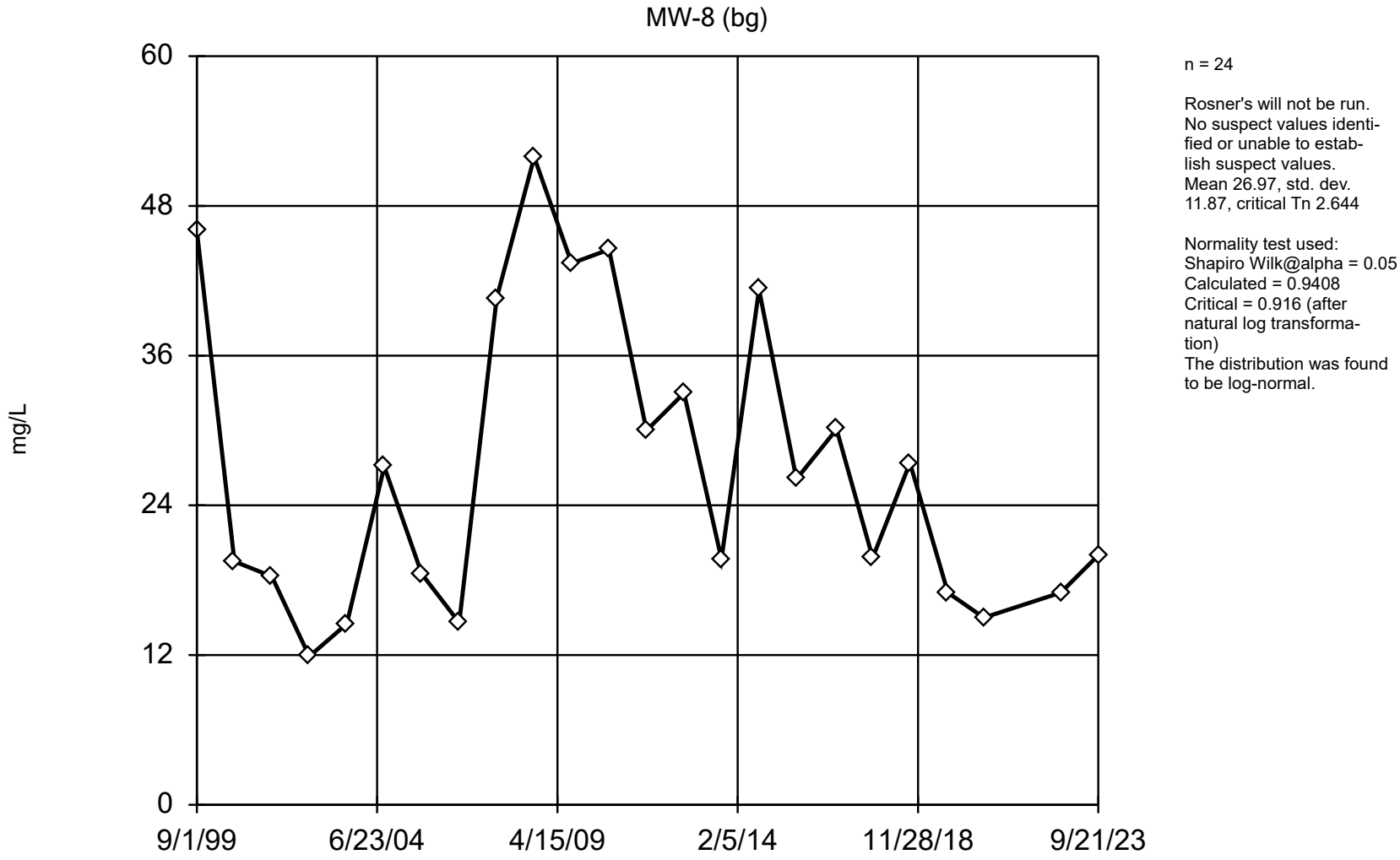
Constituent: Chloride (mg/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-14 (bg)
9/1/1999	<5
9/1/2000	<5
9/1/2001	5.9
9/1/2002	<5
9/1/2003	<5
9/1/2004	<5
9/1/2005	<5
9/1/2006	<5
9/1/2007	<5
9/1/2008	<5
9/1/2009	<5
9/1/2010	<2
9/1/2011	<2
9/1/2012	<5
9/1/2013	1.6
9/1/2014	<1
9/1/2015	<1
9/26/2016	1.3
9/14/2017	1.7
9/12/2018	2.2
9/16/2019	2.1 (J,B)
9/1/2020	3.3 (J,B)
9/27/2021	3.9 (J)
9/20/2022	3.6 (J)
9/20/2023	3.6 (J)

ND substitution: RL or RL/2 if <15% NDs.

EPA Screening (suspected outliers for Rosner's Test)



n = 24

Rosner's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 26.97, std. dev. 11.87, critical Tn 2.644

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9408
Critical = 0.916 (after natural log transformation)
The distribution was found to be log-normal.

Constituent: Chloride Analysis Run 10/30/2023 11:22 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

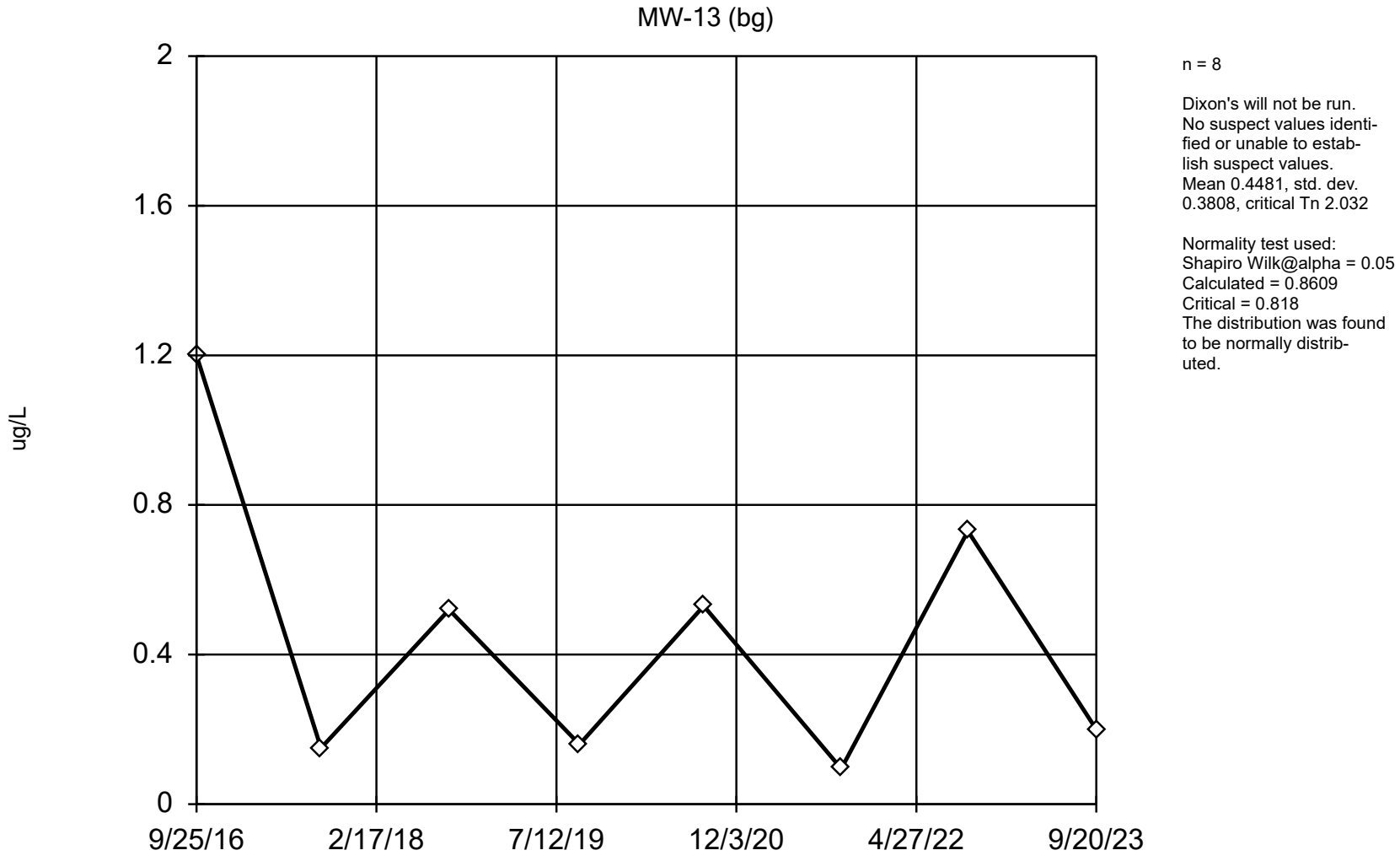
EPA 1989 Outlier Screening

Constituent: Chloride (mg/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-8 (bg)
9/1/1999	46
9/1/2000	19.5
9/1/2001	18.3
9/1/2002	11.9
9/1/2003	14.5
9/1/2004	27.1
9/1/2005	18.5
9/1/2006	14.6
9/1/2007	40.6
9/1/2008	51.9
9/1/2009	43.4
9/1/2010	44.5
9/1/2011	30
9/1/2012	33
9/1/2013	19.7
9/1/2014	41.3
9/1/2015	26.1
9/26/2016	30.1
9/13/2017	19.8
9/12/2018	27.4
9/17/2019	17 (B)
9/1/2020	15 (B)
9/20/2022	17
9/21/2023	20

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 0.4481, std. dev. 0.3808, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.8609
Critical = 0.818
The distribution was found to be normally distributed.

Constituent: Cobalt Analysis Run 10/30/2023 11:22 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

EPA 1989 Outlier Screening

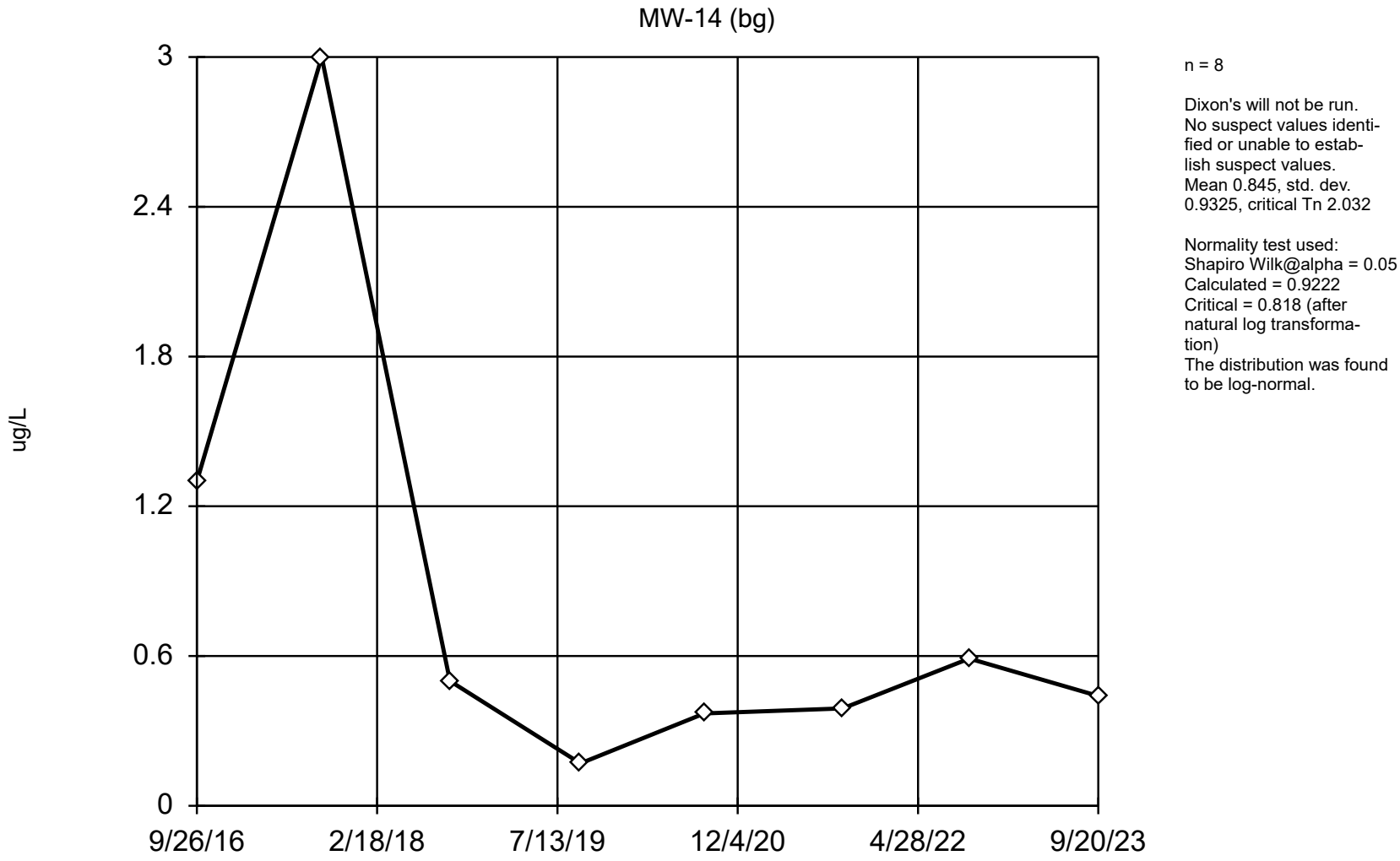
Constituent: Cobalt (ug/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)
9/25/2016	1.2
9/13/2017	0.15 (J)
9/11/2018	0.52 (J)
9/16/2019	0.16 (J)
9/2/2020	0.53
9/27/2021	<0.19
9/21/2022	0.73
9/20/2023	0.2 (J)

ND substitution: RL or RL/2 if <15% NDs.

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 0.845, std. dev. 0.9325, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9222
Critical = 0.818 (after natural log transformation)
The distribution was found to be log-normal.

Constituent: Cobalt Analysis Run 10/30/2023 11:22 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

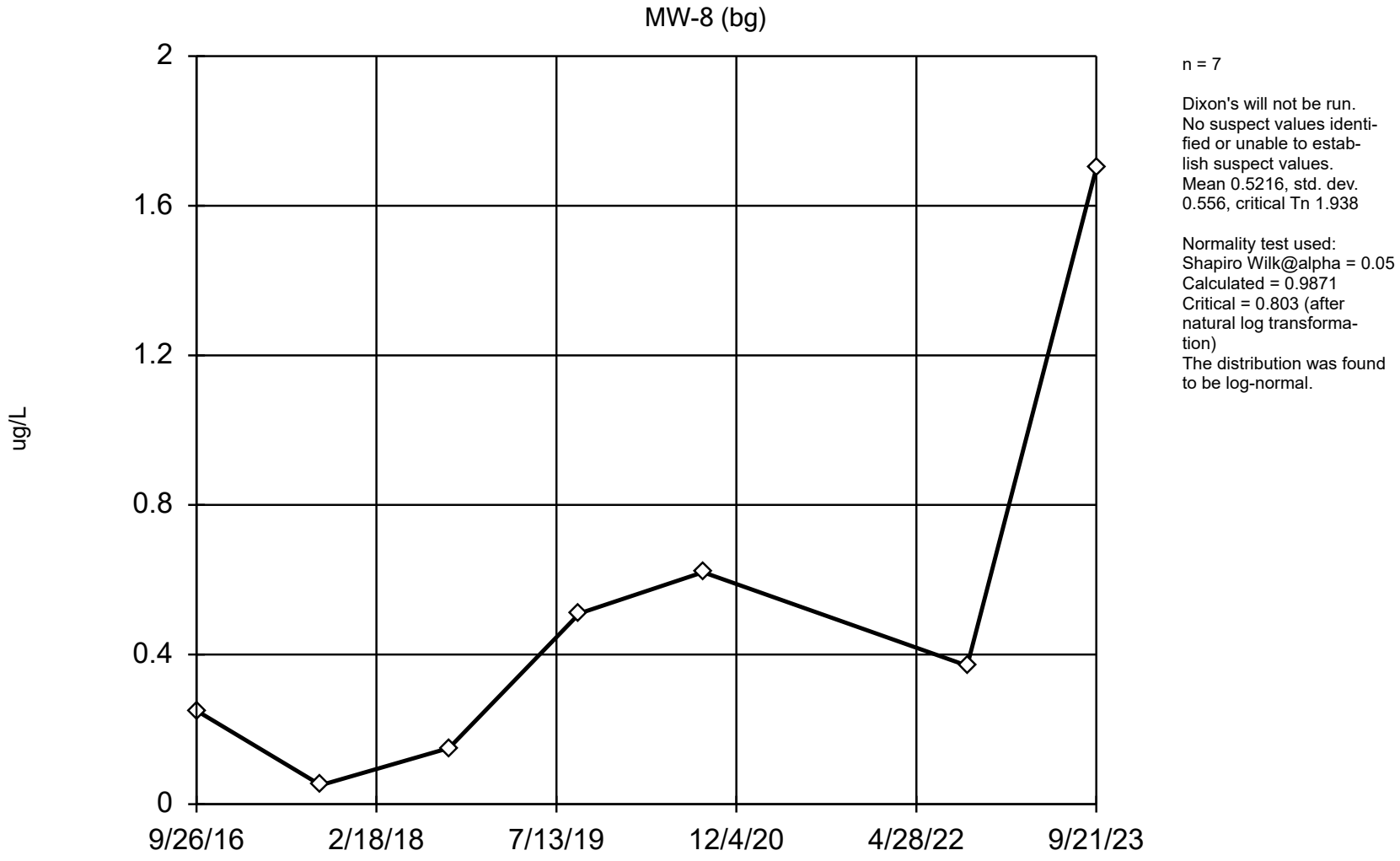
EPA 1989 Outlier Screening

Constituent: Cobalt (ug/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-14 (bg)
9/26/2016	1.3
9/14/2017	3
9/12/2018	0.5 (J)
9/16/2019	0.17 (J)
9/1/2020	0.37 (J)
9/27/2021	0.39 (J)
9/20/2022	0.59
9/20/2023	0.44 (J)

EPA Screening (suspected outliers for Dixon's Test)



Constituent: Cobalt Analysis Run 10/30/2023 11:22 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

EPA 1989 Outlier Screening

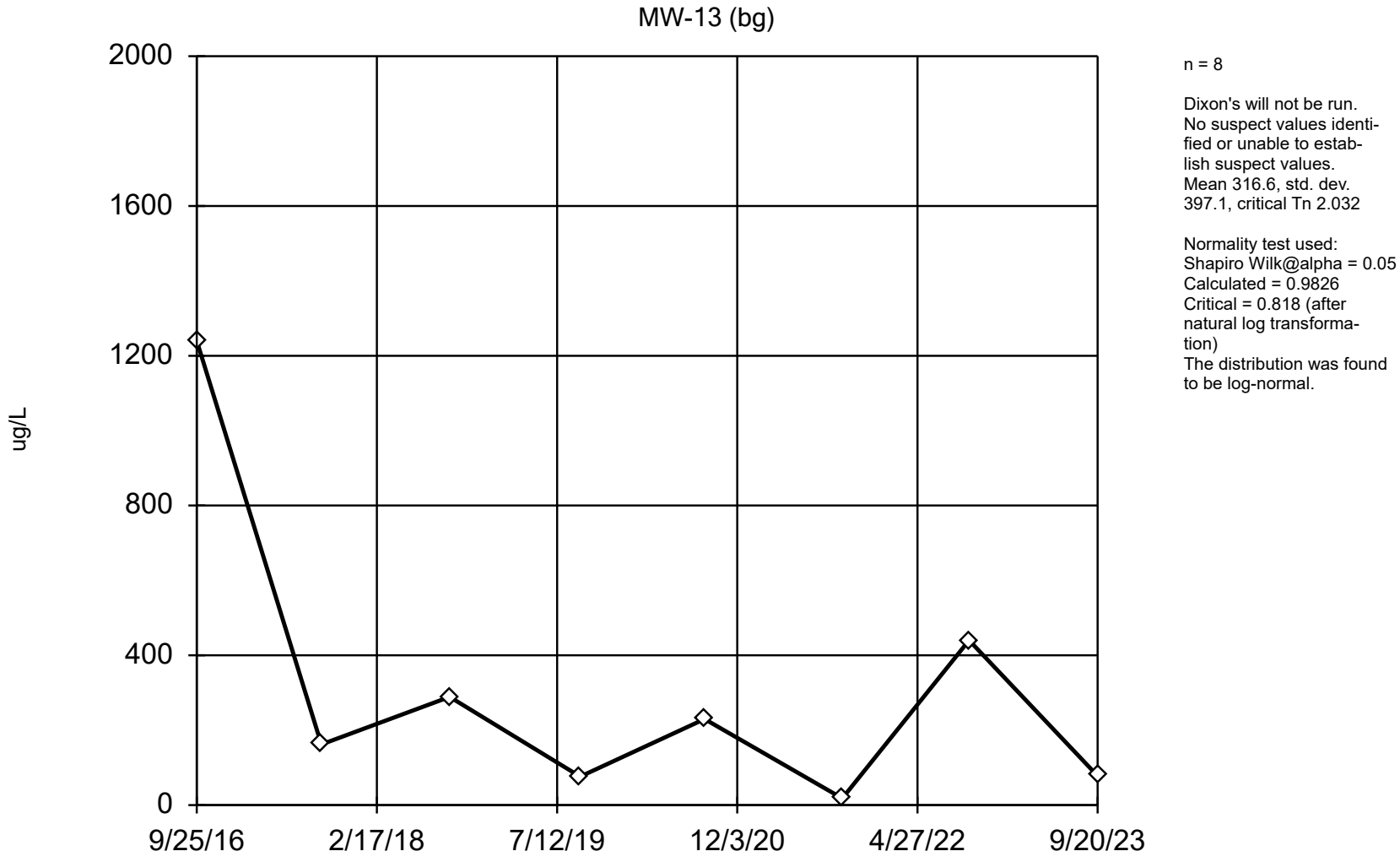
Constituent: Cobalt (ug/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-8 (bg)
9/26/2016	<0.5
9/13/2017	0.051 (J)
9/12/2018	0.15 (J)
9/17/2019	0.51
9/1/2020	0.62
9/20/2022	0.37 (J)
9/21/2023	1.7

ND substitution: RL or RL/2 if <15% NDs.

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 316.6, std. dev. 397.1, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9826
Critical = 0.818 (after natural log transformation)
The distribution was found to be log-normal.

Constituent: Iron Analysis Run 10/30/2023 11:22 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

EPA 1989 Outlier Screening

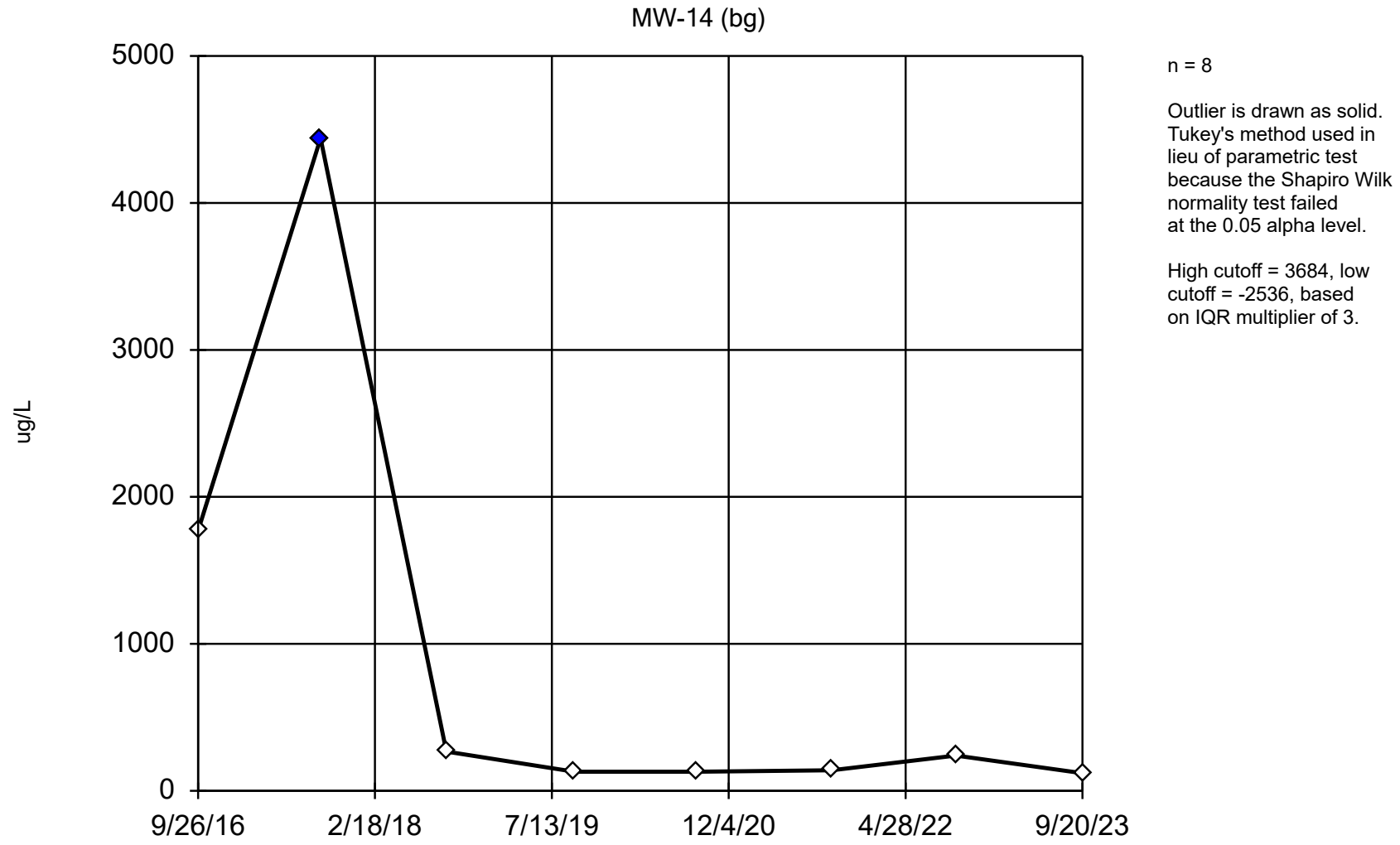
Constituent: Iron (ug/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)
9/25/2016	1240
9/13/2017	162
9/11/2018	289
9/16/2019	76 (J)
9/2/2020	230
9/27/2021	<36
9/21/2022	440
9/20/2023	78 (J)

ND substitution: RL or RL/2 if <15% NDs.

Tukey's Outlier Screening



Constituent: Iron Analysis Run 10/30/2023 11:22 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

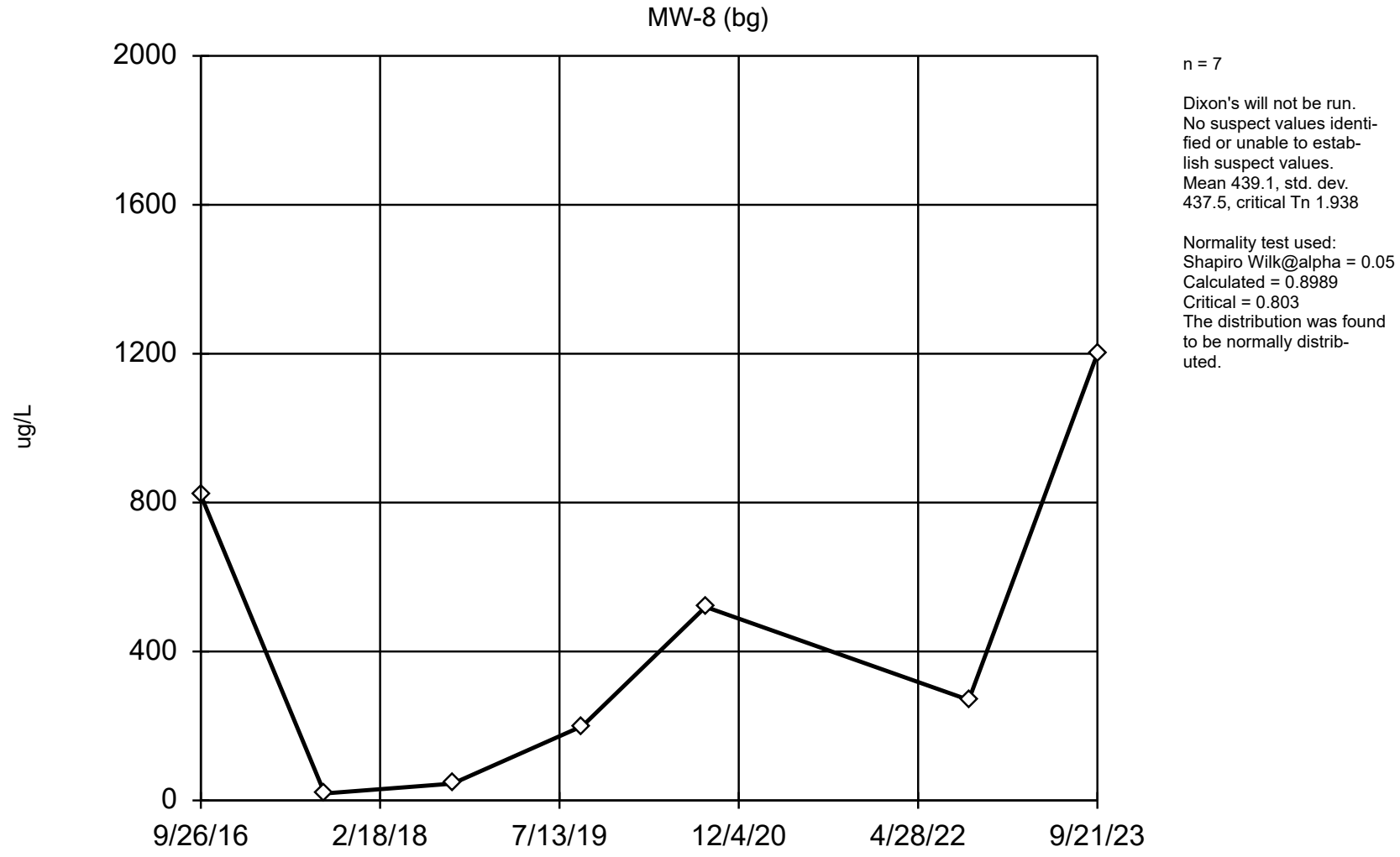
Tukey's Outlier Screening

Constituent: Iron (ug/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-14 (bg)
9/26/2016	1770
9/14/2017	4440 (O)
9/12/2018	267
9/16/2019	130
9/1/2020	130
9/27/2021	140
9/20/2022	240
9/20/2023	120

EPA Screening (suspected outliers for Dixon's Test)



n = 7

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 439.1, std. dev. 437.5, critical Tn 1.938

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.8989
Critical = 0.803
The distribution was found to be normally distributed.

Constituent: Iron Analysis Run 10/30/2023 11:22 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

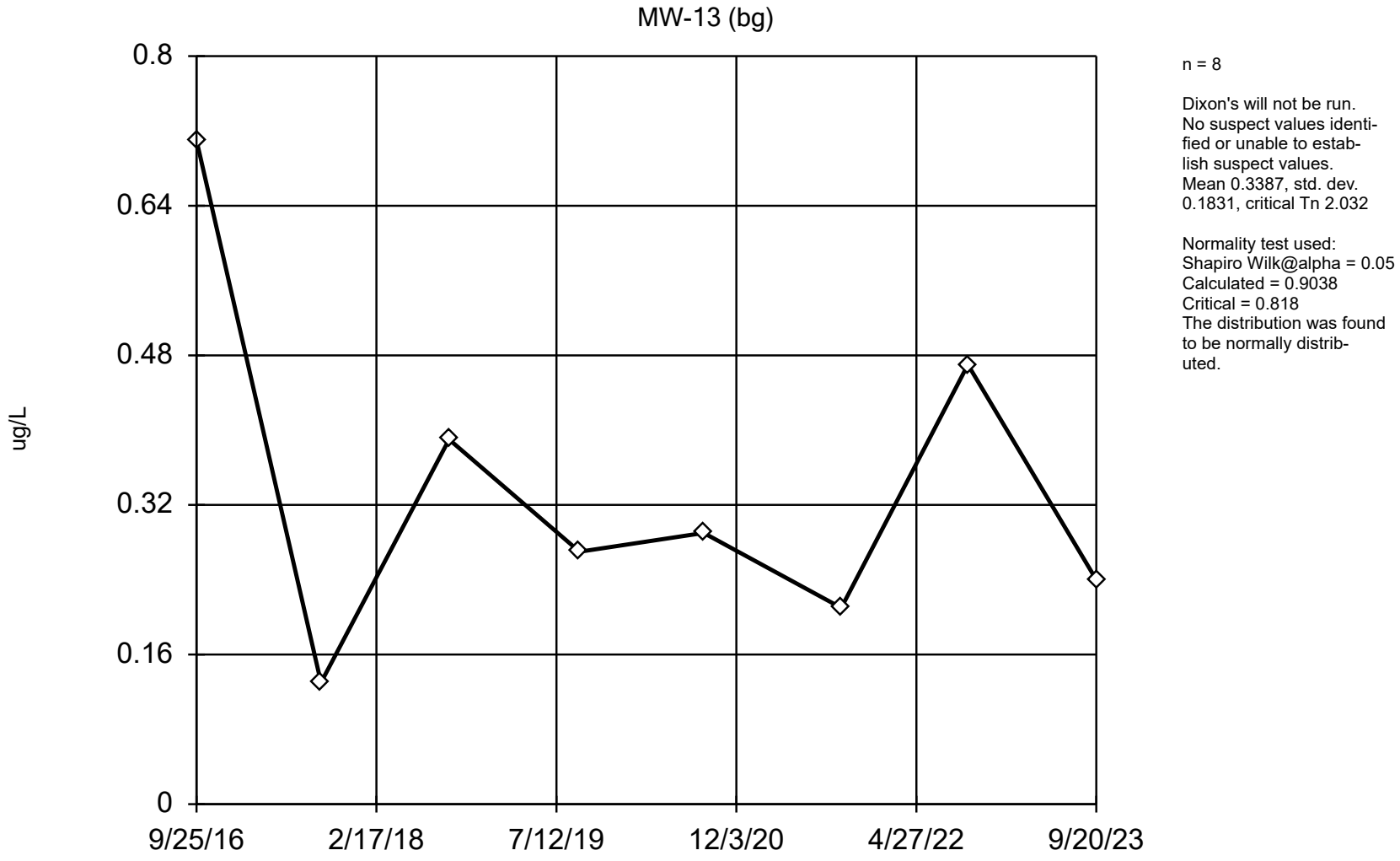
EPA 1989 Outlier Screening

Constituent: Iron (ug/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-8 (bg)
9/26/2016	820
9/13/2017	18.7 (J)
9/12/2018	45.2 (J)
9/17/2019	200
9/1/2020	520
9/20/2022	270
9/21/2023	1200

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 0.3387, std. dev. 0.1831, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9038
Critical = 0.818
The distribution was found to be normally distributed.

Constituent: Lead Analysis Run 10/30/2023 11:22 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

EPA 1989 Outlier Screening

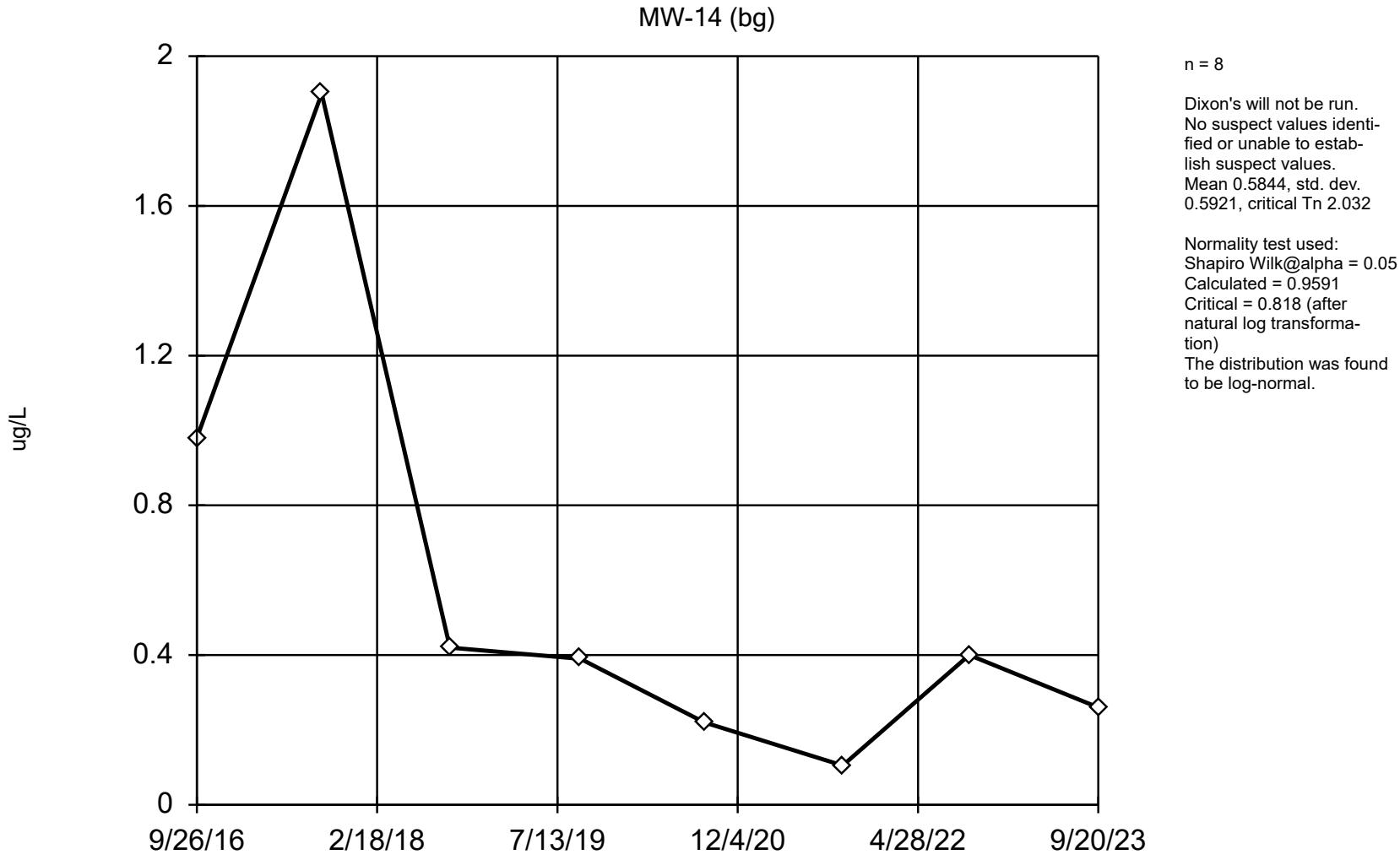
Constituent: Lead (ug/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)
9/25/2016	0.71 (J)
9/13/2017	0.13 (J)
9/11/2018	0.39 (J)
9/16/2019	<0.27
9/2/2020	0.29 (J)
9/27/2021	<0.21
9/21/2022	0.47 (J)
9/20/2023	<0.24 (U)

ND substitution: RL or RL/2 if <15% NDs.

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 0.5844, std. dev. 0.5921, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9591
Critical = 0.818 (after natural log transformation)
The distribution was found to be log-normal.

Constituent: Lead Analysis Run 10/30/2023 11:23 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

EPA 1989 Outlier Screening

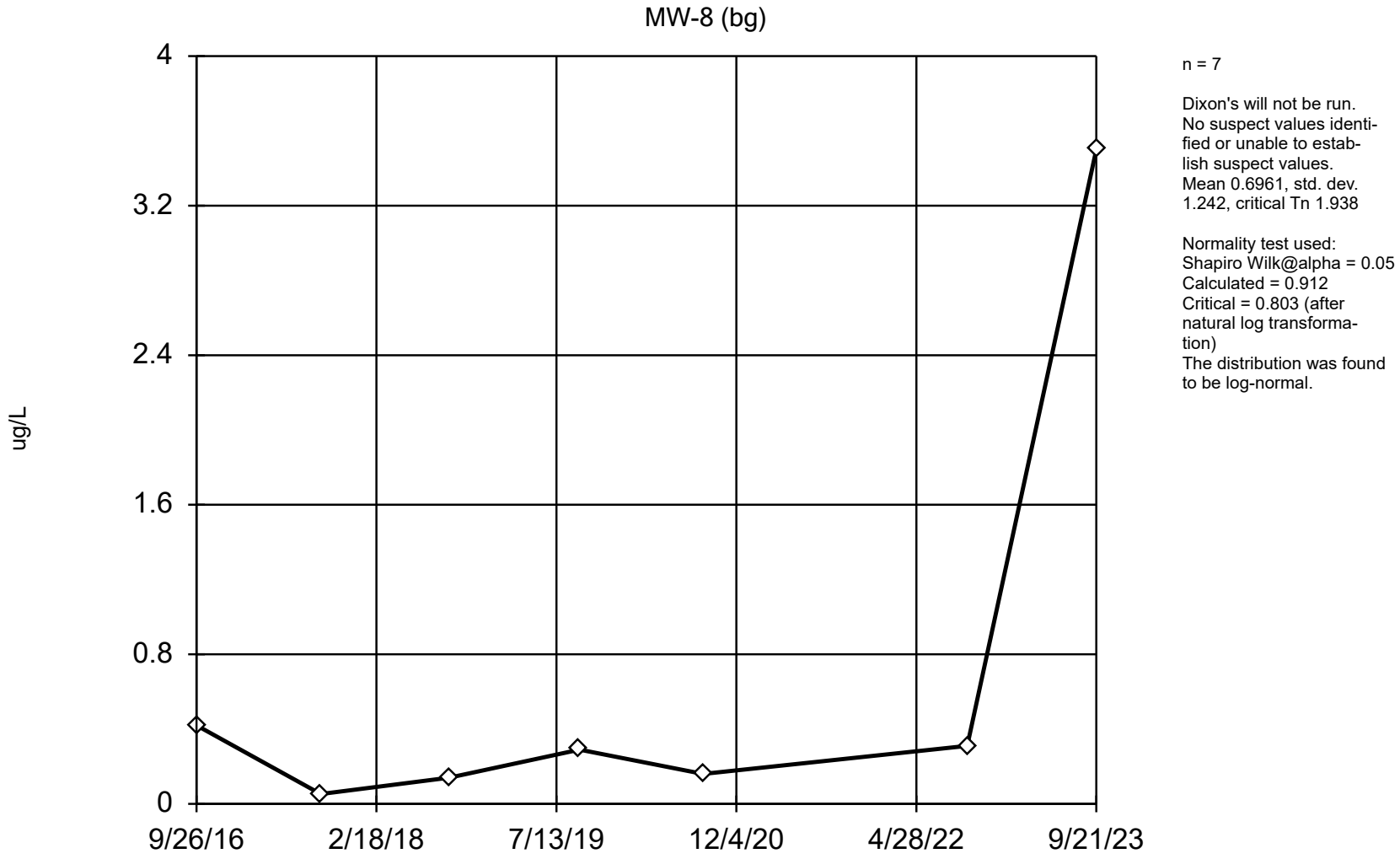
Constituent: Lead (ug/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-14 (bg)
9/26/2016	0.98 (J)
9/14/2017	1.9
9/12/2018	0.42 (J)
9/16/2019	0.39 (J)
9/1/2020	0.22 (J)
9/27/2021	<0.21
9/20/2022	0.4 (J)
9/20/2023	0.26 (J)

ND substitution: RL or RL/2 if <15% NDs.

EPA Screening (suspected outliers for Dixon's Test)



Constituent: Lead Analysis Run 10/30/2023 11:23 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

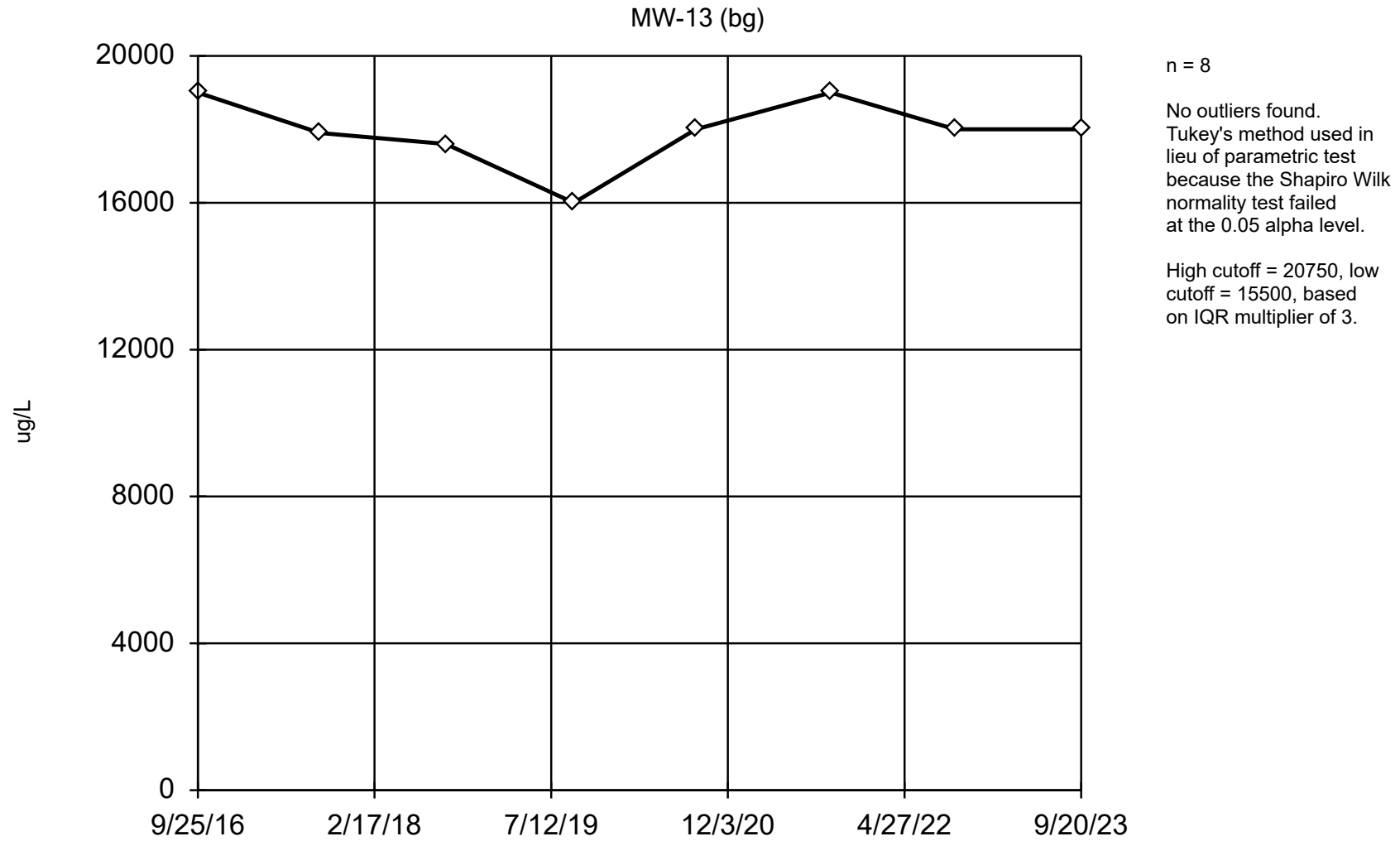
EPA 1989 Outlier Screening

Constituent: Lead (ug/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-8 (bg)
9/26/2016	0.42 (J)
9/13/2017	0.053 (J)
9/12/2018	0.14 (J)
9/17/2019	0.29 (J)
9/1/2020	0.16 (J)
9/20/2022	0.31 (J)
9/21/2023	3.5

Tukey's Outlier Screening



n = 8

No outliers found.
Tukey's method used in lieu of parametric test because the Shapiro Wilk normality test failed at the 0.05 alpha level.

High cutoff = 20750, low cutoff = 15500, based on IQR multiplier of 3.

Constituent: Magnesium Analysis Run 10/30/2023 11:23 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

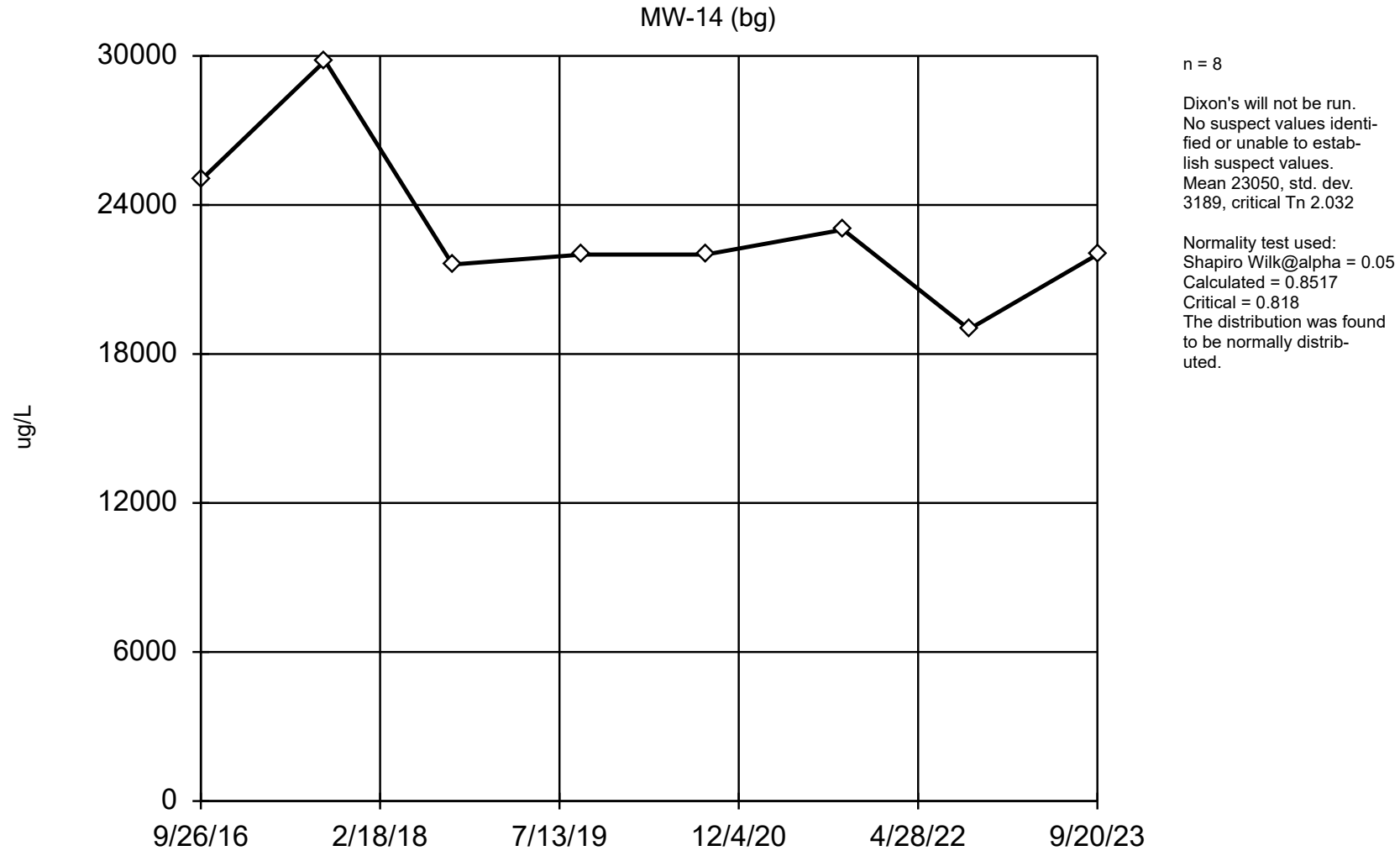
Tukey's Outlier Screening

Constituent: Magnesium (ug/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)
9/25/2016	19000
9/13/2017	17900
9/11/2018	17600
9/16/2019	16000
9/2/2020	18000
9/27/2021	19000
9/21/2022	18000
9/20/2023	18000

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 23050, std. dev. 3189, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.8517
Critical = 0.818
The distribution was found to be normally distributed.

Constituent: Magnesium Analysis Run 10/30/2023 11:23 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

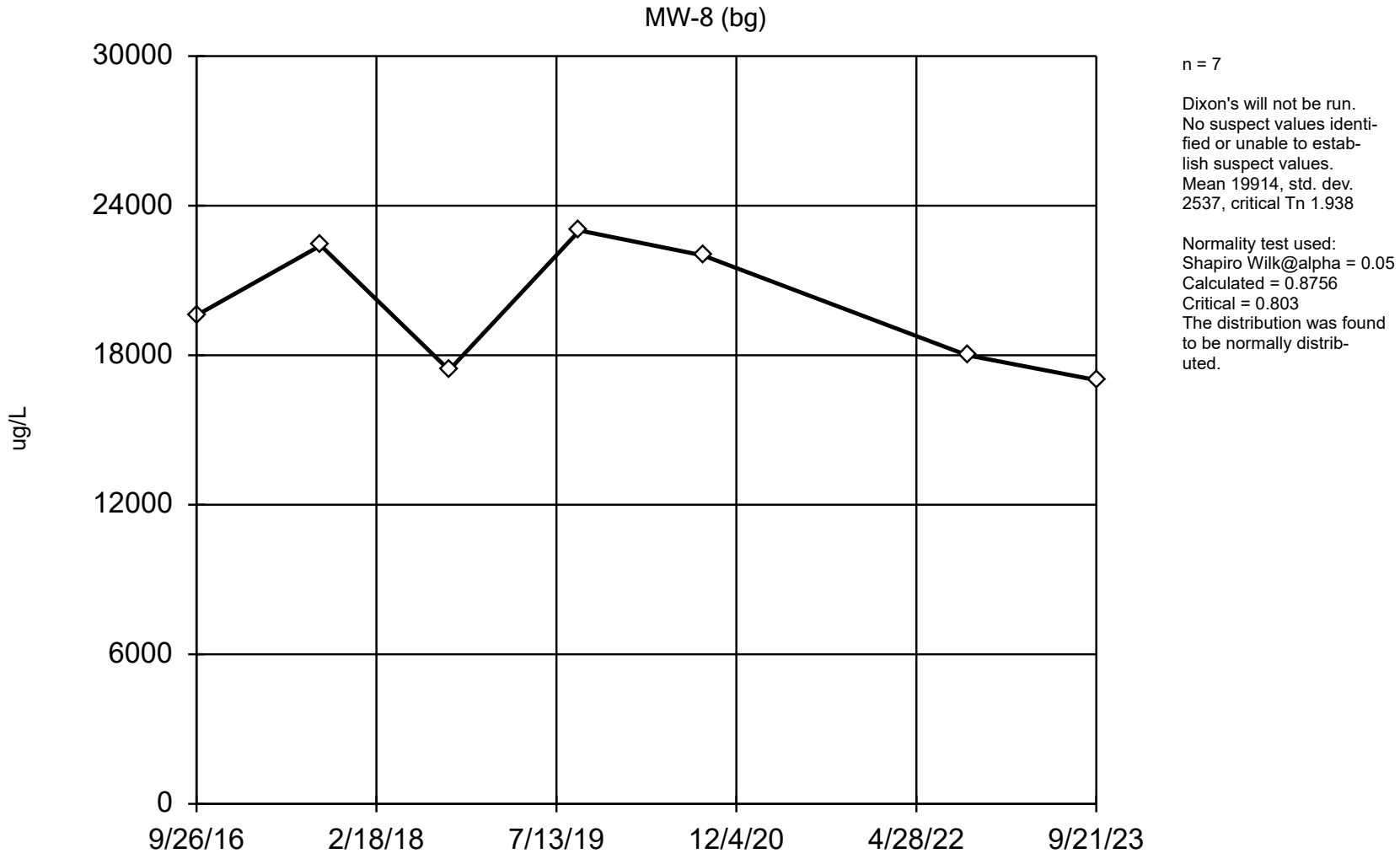
EPA 1989 Outlier Screening

Constituent: Magnesium (ug/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-14 (bg)
9/26/2016	25000
9/14/2017	29800
9/12/2018	21600
9/16/2019	22000
9/1/2020	22000
9/27/2021	23000
9/20/2022	19000
9/20/2023	22000

EPA Screening (suspected outliers for Dixon's Test)



n = 7

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 19914, std. dev. 2537, critical Tn 1.938

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.8756
Critical = 0.803
The distribution was found to be normally distributed.

Constituent: Magnesium Analysis Run 10/30/2023 11:23 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

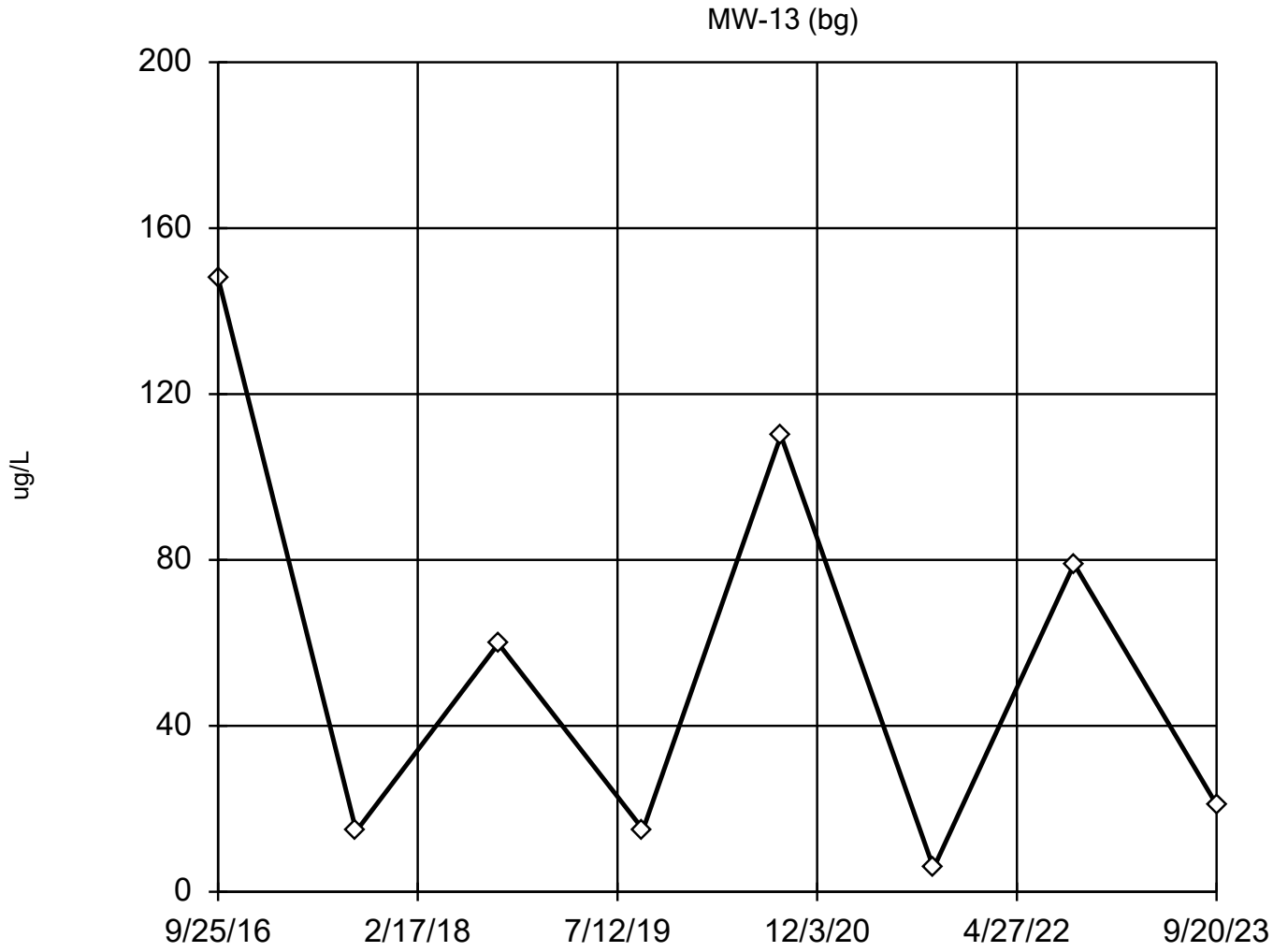
EPA 1989 Outlier Screening

Constituent: Magnesium (ug/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-8 (bg)
9/26/2016	19600
9/13/2017	22400
9/12/2018	17400
9/17/2019	23000
9/1/2020	22000
9/20/2022	18000
9/21/2023	17000

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 56.64, std. dev. 52.2, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.8812
Critical = 0.818
The distribution was found to be normally distributed.

Constituent: Manganese Analysis Run 10/30/2023 11:23 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

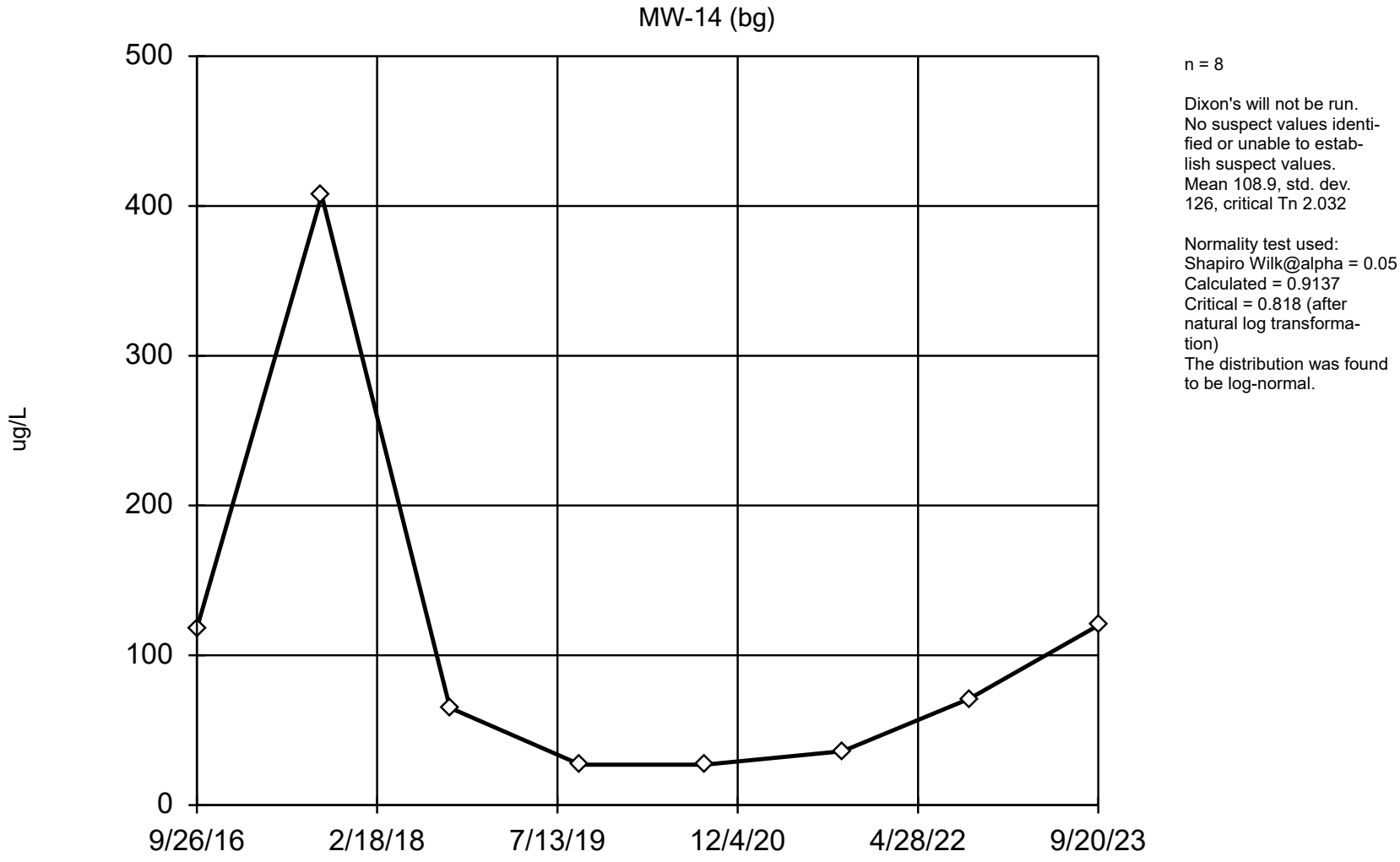
EPA 1989 Outlier Screening

Constituent: Manganese (ug/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)
9/25/2016	148
9/13/2017	14.6
9/11/2018	59.8
9/16/2019	15
9/2/2020	110
9/27/2021	5.7 (J)
9/21/2022	79
9/20/2023	21

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 108.9, std. dev. 126, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9137
Critical = 0.818 (after natural log transformation)
The distribution was found to be log-normal.

Constituent: Manganese Analysis Run 10/30/2023 11:23 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

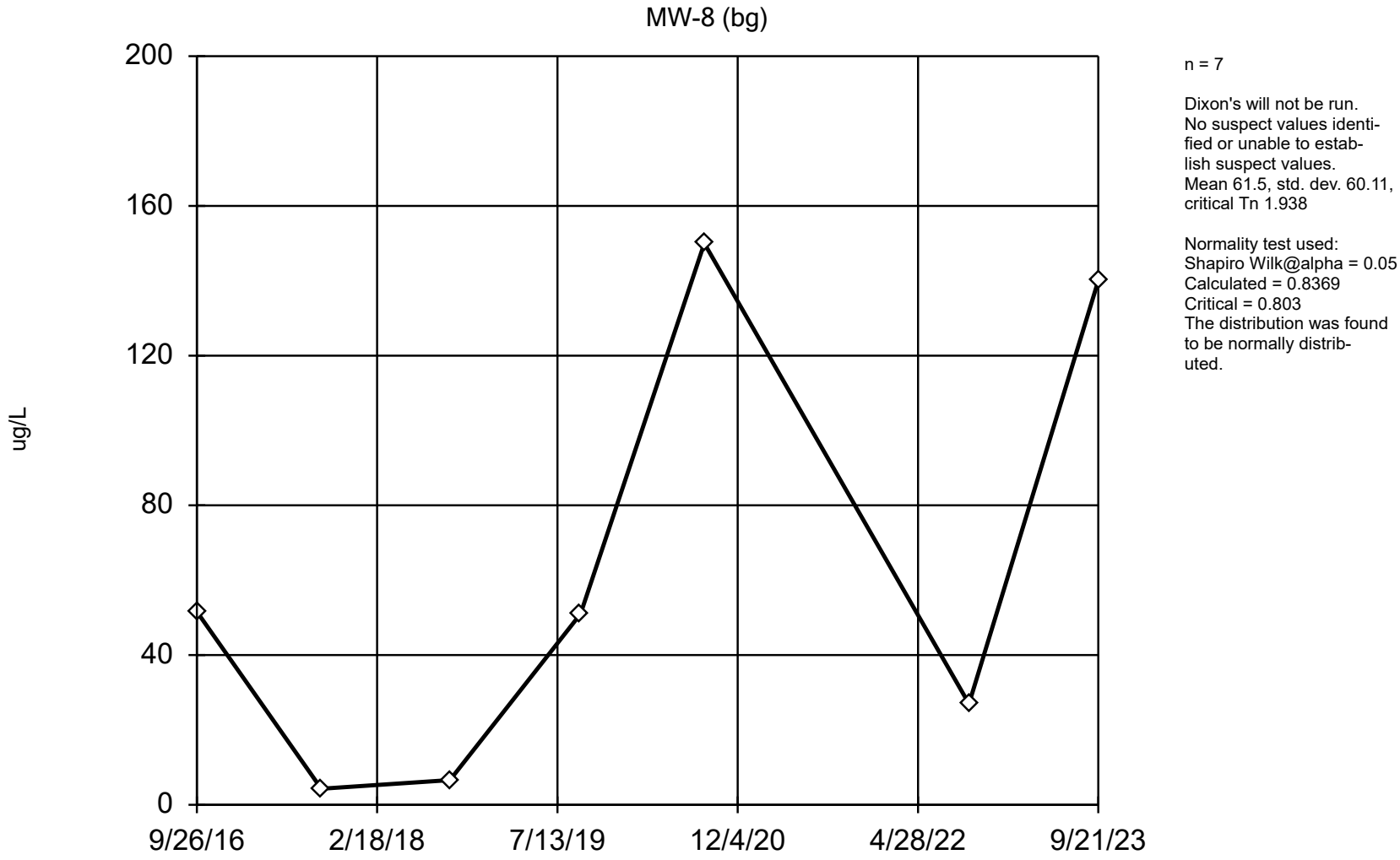
EPA 1989 Outlier Screening

Constituent: Manganese (ug/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-14 (bg)
9/26/2016	118
9/14/2017	407
9/12/2018	64.9
9/16/2019	27
9/1/2020	27
9/27/2021	36
9/20/2022	71
9/20/2023	120

EPA Screening (suspected outliers for Dixon's Test)



n = 7

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 61.5, std. dev. 60.11, critical Tn 1.938

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.8369
Critical = 0.803
The distribution was found to be normally distributed.

Constituent: Manganese Analysis Run 10/30/2023 11:23 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

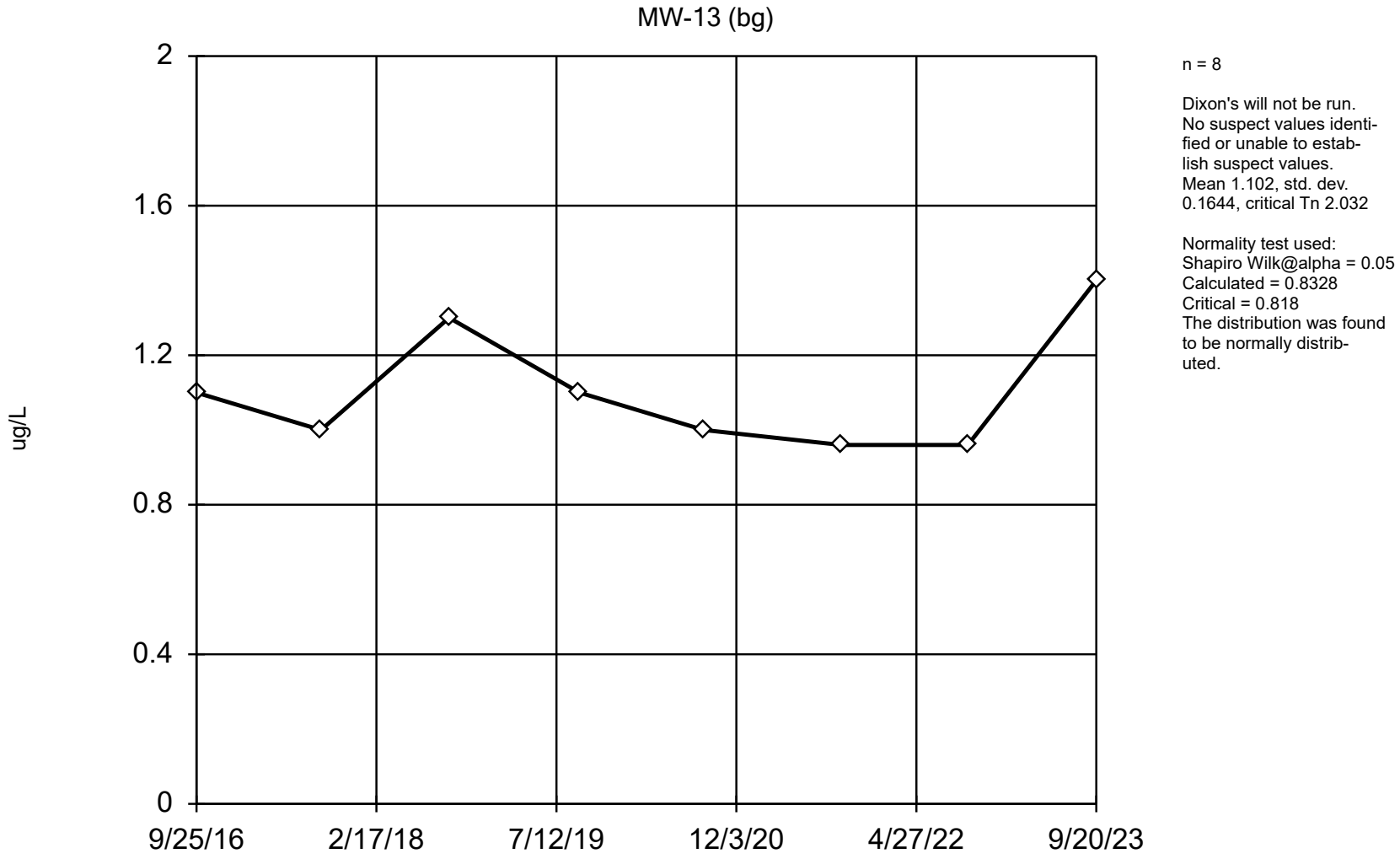
EPA 1989 Outlier Screening

Constituent: Manganese (ug/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-8 (bg)
9/26/2016	51.6
9/13/2017	4.3
9/12/2018	6.6
9/17/2019	51
9/1/2020	150
9/20/2022	27
9/21/2023	140

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 1.102, std. dev. 0.1644, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.8328
Critical = 0.818
The distribution was found to be normally distributed.

Constituent: Selenium Analysis Run 10/30/2023 11:23 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

EPA 1989 Outlier Screening

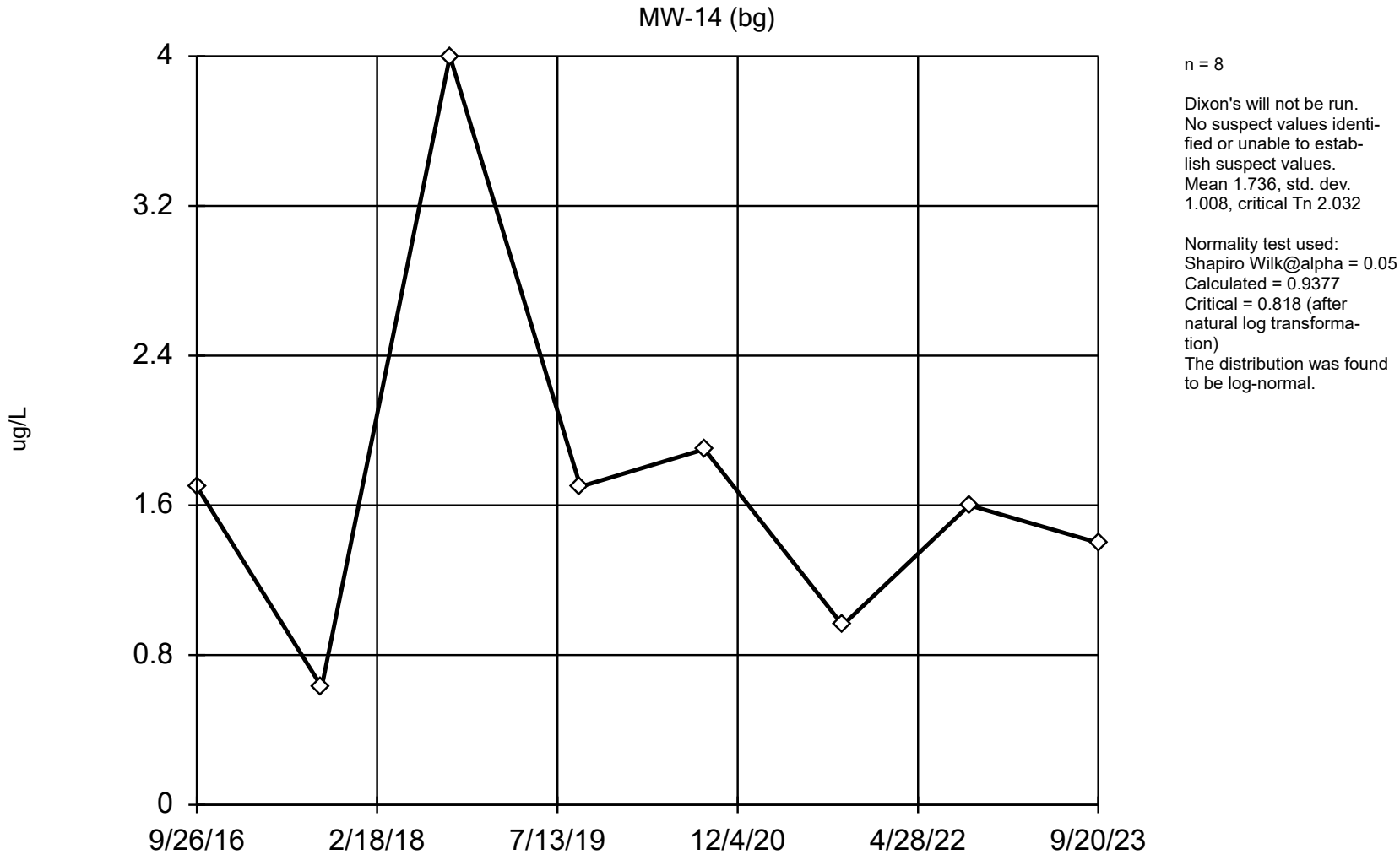
Constituent: Selenium (ug/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)
9/25/2016	1.1
9/13/2017	1
9/11/2018	1.3
9/16/2019	1.1 (J)
9/2/2020	<1
9/27/2021	<0.96
9/21/2022	<0.96
9/20/2023	<1.4 (U)

ND substitution: RL or RL/2 if <15% NDs.

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 1.736, std. dev. 1.008, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9377
Critical = 0.818 (after natural log transformation)
The distribution was found to be log-normal.

Constituent: Selenium Analysis Run 10/30/2023 11:23 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

EPA 1989 Outlier Screening

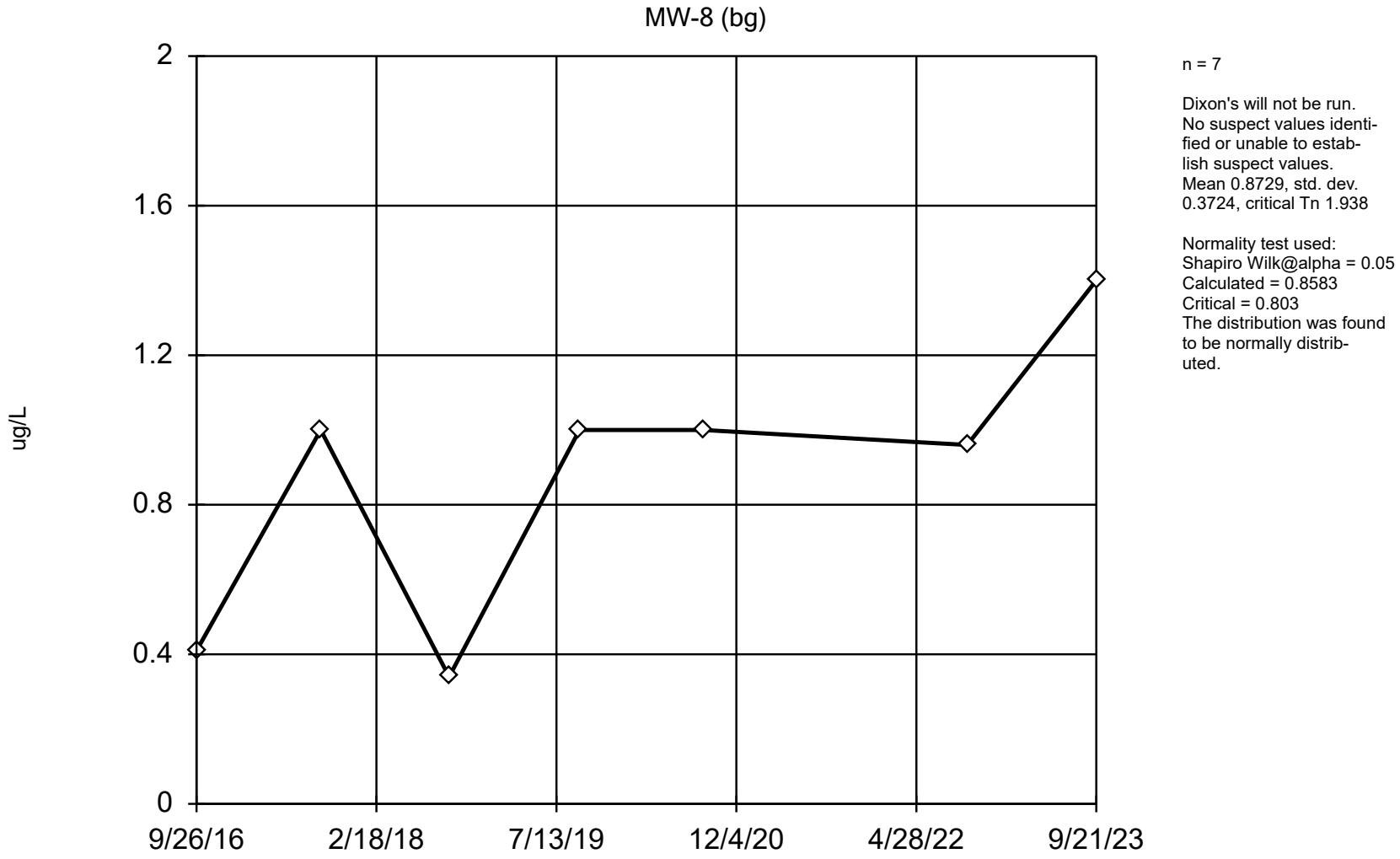
Constituent: Selenium (ug/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-14 (bg)
9/26/2016	1.7
9/14/2017	0.63 (J)
9/12/2018	4
9/16/2019	1.7 (J)
9/1/2020	1.9 (J)
9/27/2021	<0.96
9/20/2022	1.6 (J)
9/20/2023	<1.4 (U)

ND substitution: RL or RL/2 if <15% NDs.

EPA Screening (suspected outliers for Dixon's Test)



n = 7

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 0.8729, std. dev. 0.3724, critical Tn 1.938

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.8583
Critical = 0.803
The distribution was found to be normally distributed.

Constituent: Selenium Analysis Run 10/30/2023 11:23 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

EPA 1989 Outlier Screening

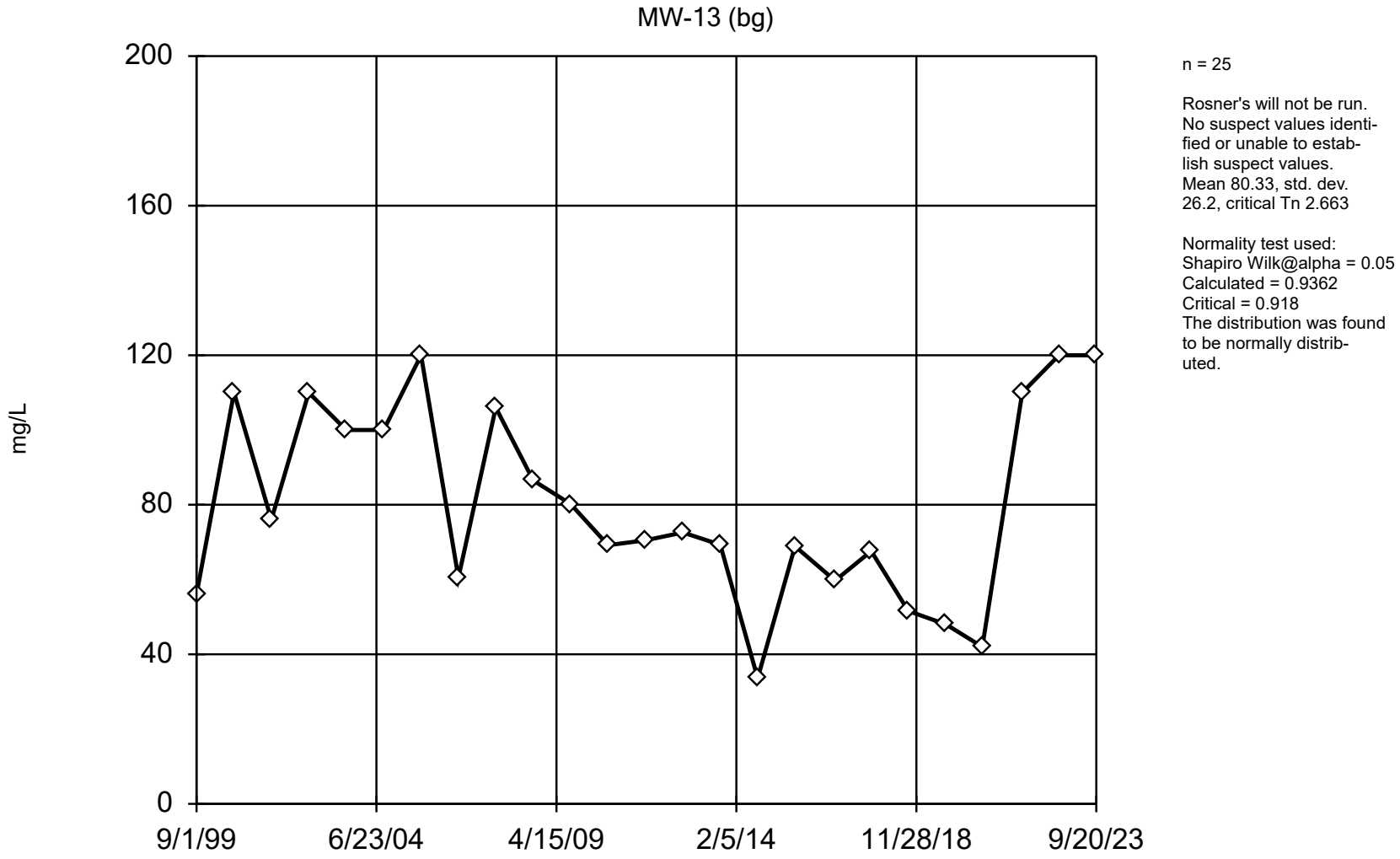
Constituent: Selenium (ug/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-8 (bg)
9/26/2016	0.41 (J)
9/13/2017	1
9/12/2018	0.34 (J)
9/17/2019	<1
9/1/2020	<1
9/20/2022	<0.96
9/21/2023	<1.4 (U)

ND substitution: RL or RL/2 if <15% NDs.

EPA Screening (suspected outliers for Rosner's Test)



n = 25

Rosner's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 80.33, std. dev. 26.2, critical Tn 2.663

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9362
Critical = 0.918
The distribution was found to be normally distributed.

Constituent: Sulfate Analysis Run 10/30/2023 11:23 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

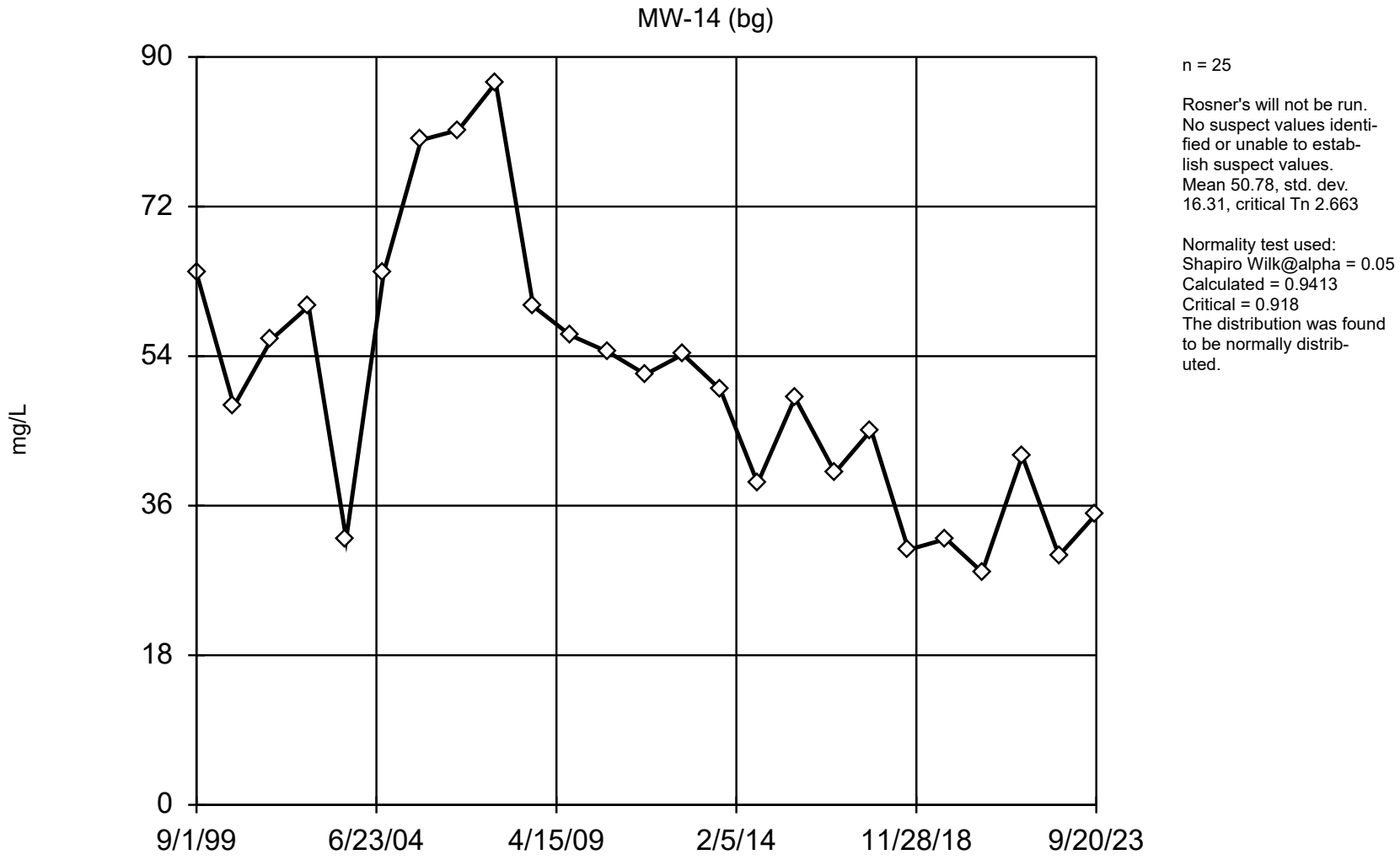
EPA 1989 Outlier Screening

Constituent: Sulfate (mg/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)
9/1/1999	56
9/1/2000	110
9/1/2001	76
9/1/2002	110
9/1/2003	100
9/1/2004	100
9/1/2005	120
9/1/2006	60.5
9/1/2007	106
9/1/2008	86.5
9/1/2009	80.2
9/1/2010	69.2
9/1/2011	70.5
9/1/2012	72.6
9/1/2013	69.3
9/1/2014	33.6
9/1/2015	68.9
9/25/2016	59.7
9/13/2017	67.6
9/11/2018	51.6
9/16/2019	48
9/2/2020	42
9/27/2021	110
9/21/2022	120
9/20/2023	120

EPA Screening (suspected outliers for Rosner's Test)



n = 25

Rosner's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 50.78, std. dev. 16.31, critical Tn 2.663

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9413
Critical = 0.918
The distribution was found to be normally distributed.

Constituent: Sulfate Analysis Run 10/30/2023 11:23 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

EPA 1989 Outlier Screening

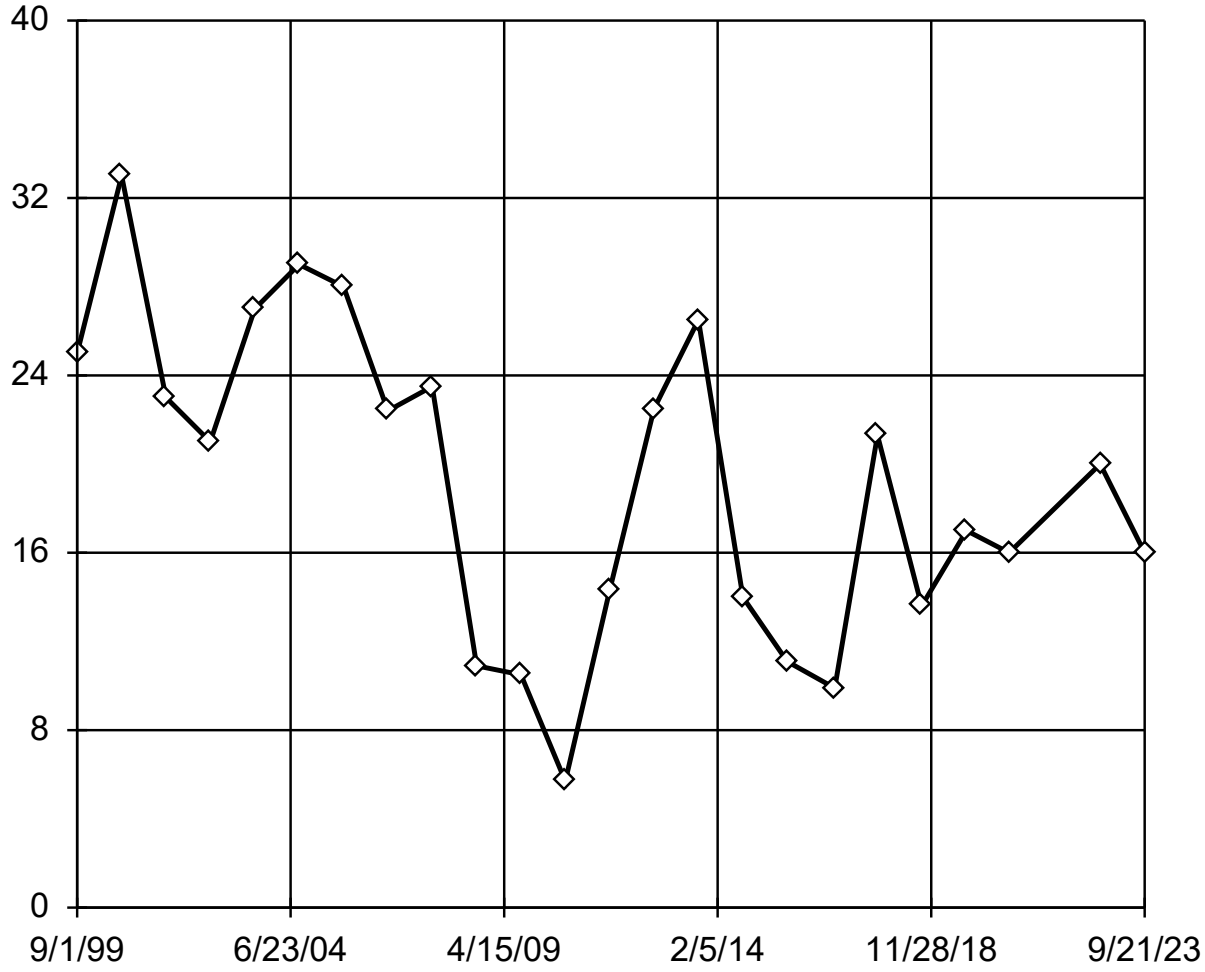
Constituent: Sulfate (mg/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-14 (bg)
9/1/1999	64
9/1/2000	48
9/1/2001	56
9/1/2002	60
9/1/2003	32
9/1/2004	64
9/1/2005	80
9/1/2006	81.2
9/1/2007	86.9
9/1/2008	60
9/1/2009	56.5
9/1/2010	54.5
9/1/2011	51.8
9/1/2012	54.2
9/1/2013	50
9/1/2014	38.7
9/1/2015	49
9/26/2016	40
9/14/2017	45.1
9/12/2018	30.7
9/16/2019	32
9/1/2020	28
9/27/2021	42
9/20/2022	30
9/20/2023	35

Rosner's Outlier Test

MW-8 (bg)



n = 24

No statistical outliers.

k = 1
r = 1.94
Tabulated value = 2.824
Alpha = 0.01

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9595
Critical = 0.914
The distribution was found to be normally distrib-uted.

Constituent: Sulfate Analysis Run 10/30/2023 11:23 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Rosner's Outlier Test

Constituent: Sulfate (mg/L) Analysis Run 10/30/2023 11:24 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-8 (bg)
9/1/1999	25
9/1/2000	33
9/1/2001	23
9/1/2002	21
9/1/2003	27
9/1/2004	29
9/1/2005	28
9/1/2006	22.4
9/1/2007	23.5
9/1/2008	10.9
9/1/2009	10.5
9/1/2010	5.7
9/1/2011	14.3
9/1/2012	22.5
9/1/2013	26.5
9/1/2014	14
9/1/2015	11.1
9/26/2016	9.9
9/13/2017	21.3
9/12/2018	13.6
9/17/2019	17
9/1/2020	16
9/20/2022	20
9/21/2023	16

Attachment E4

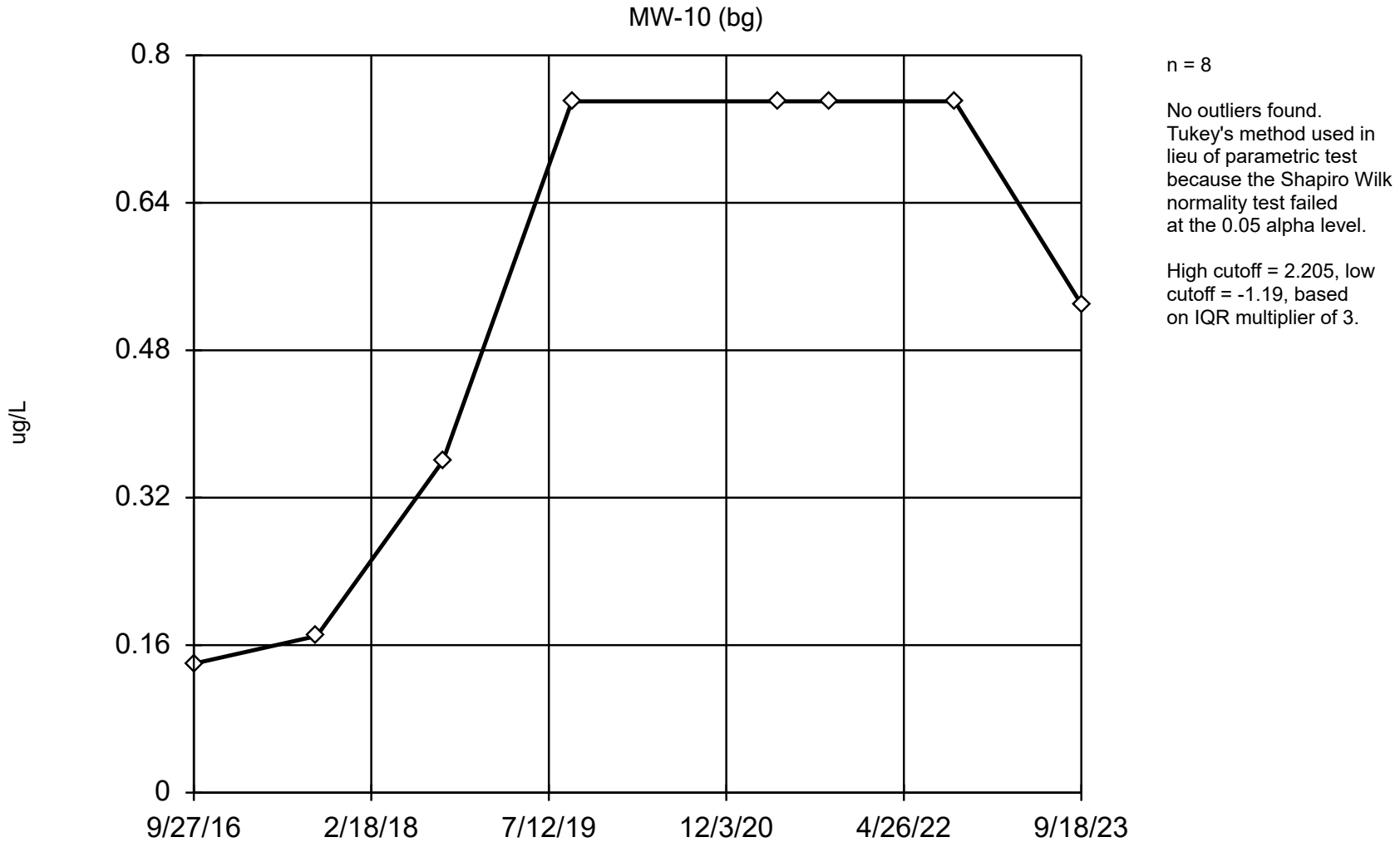
Outlier Analysis Results - East

Outlier Analysis

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input Printed 10/30/2023, 12:20 PM

Constituent	Well	Outlier	Value(s)	Date(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Arsenic (ug/L)	MW-10 (bg)	No	n/a	n/a	NP (nrm)	NaN	8	0.525	0.2683	unknown	ShapiroWilk
Arsenic (ug/L)	MW-9 (bg)	No	n/a	n/a	EPA 1989	0.05	8	0.5962	0.2264	normal	ShapiroWilk
Barium (ug/L)	MW-10 (bg)	No	n/a	n/a	EPA 1989	0.05	8	145.1	11.79	normal	ShapiroWilk
Barium (ug/L)	MW-9 (bg)	No	n/a	n/a	EPA 1989	0.05	8	160.4	13.07	normal	ShapiroWilk
Beryllium (ug/L)	MW-10 (bg)	n/a	n/a	n/a	EPA 1989	0.05	8	0.209	0.1112	unknown	ShapiroWilk
Beryllium (ug/L)	MW-9 (bg)	No	n/a	n/a	NP (nrm)	NaN	8	0.2038	0.1131	unknown	ShapiroWilk
Boron (ug/L)	MW-10 (bg)	No	n/a	n/a	EPA 1989	0.05	8	56.58	32.36	normal	ShapiroWilk
Boron (ug/L)	MW-9 (bg)	No	n/a	n/a	EPA 1989	0.05	8	60.09	33.03	normal	ShapiroWilk
Chloride (mg/L)	MW-10 (bg)	No	n/a	n/a	NP (nrm)	NaN	25	7.568	6.576	unknown	ShapiroWilk
Chloride (mg/L)	**MW-9 (bg)**	**Yes**	**29.9,46,1...**	**9/1/2013,...**	**NP (nrm)**	**NaN**	**25**	**8.418**	**10.19**	**unknown**	**ShapiroWilk**
Cobalt (ug/L)	MW-10 (bg)	No	n/a	n/a	EPA 1989	0.05	8	0.4225	0.4241	normal	ShapiroWilk
Cobalt (ug/L)	MW-9 (bg)	No	n/a	n/a	EPA 1989	0.05	8	1.384	0.9172	normal	ShapiroWilk
Iron (ug/L)	MW-10 (bg)	No	n/a	n/a	EPA 1989	0.05	8	156.6	112	normal	ShapiroWilk
Iron (ug/L)	MW-9 (bg)	No	n/a	n/a	EPA 1989	0.05	8	514.3	456.3	normal	ShapiroWilk
Lead (ug/L)	MW-10 (bg)	No	n/a	n/a	EPA 1989	0.05	8	0.2562	0.1269	ln(x)	ShapiroWilk
Lead (ug/L)	MW-9 (bg)	No	n/a	n/a	EPA 1989	0.05	8	0.235	0.07131	normal	ShapiroWilk
Magnesium (ug/L)	MW-10 (bg)	No	n/a	n/a	EPA 1989	0.05	8	21938	2110	normal	ShapiroWilk
Magnesium (ug/L)	MW-9 (bg)	No	n/a	n/a	EPA 1989	0.05	8	16075	1063	normal	ShapiroWilk
Manganese (ug/L)	MW-10 (bg)	No	n/a	n/a	EPA 1989	0.05	8	24.11	28.28	ln(x)	ShapiroWilk
Manganese (ug/L)	MW-9 (bg)	No	n/a	n/a	EPA 1989	0.05	8	850.6	817.6	normal	ShapiroWilk
Selenium (ug/L)	MW-10 (bg)	No	n/a	n/a	EPA 1989	0.05	8	0.9962	0.3433	normal	ShapiroWilk
Selenium (ug/L)	MW-9 (bg)	No	n/a	n/a	EPA 1989	0.05	8	0.7182	0.4988	normal	ShapiroWilk
Sulfate (mg/L)	MW-10 (bg)	No	n/a	n/a	EPA 1989	0.05	25	13.29	8.899	ln(x)	ShapiroWilk
Sulfate (mg/L)	MW-9 (bg)	No	n/a	n/a	EPA 1989	0.05	25	24.94	12.43	normal	ShapiroWilk

Tukey's Outlier Screening



Constituent: Arsenic Analysis Run 10/30/2023 12:19 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Tukey's Outlier Screening

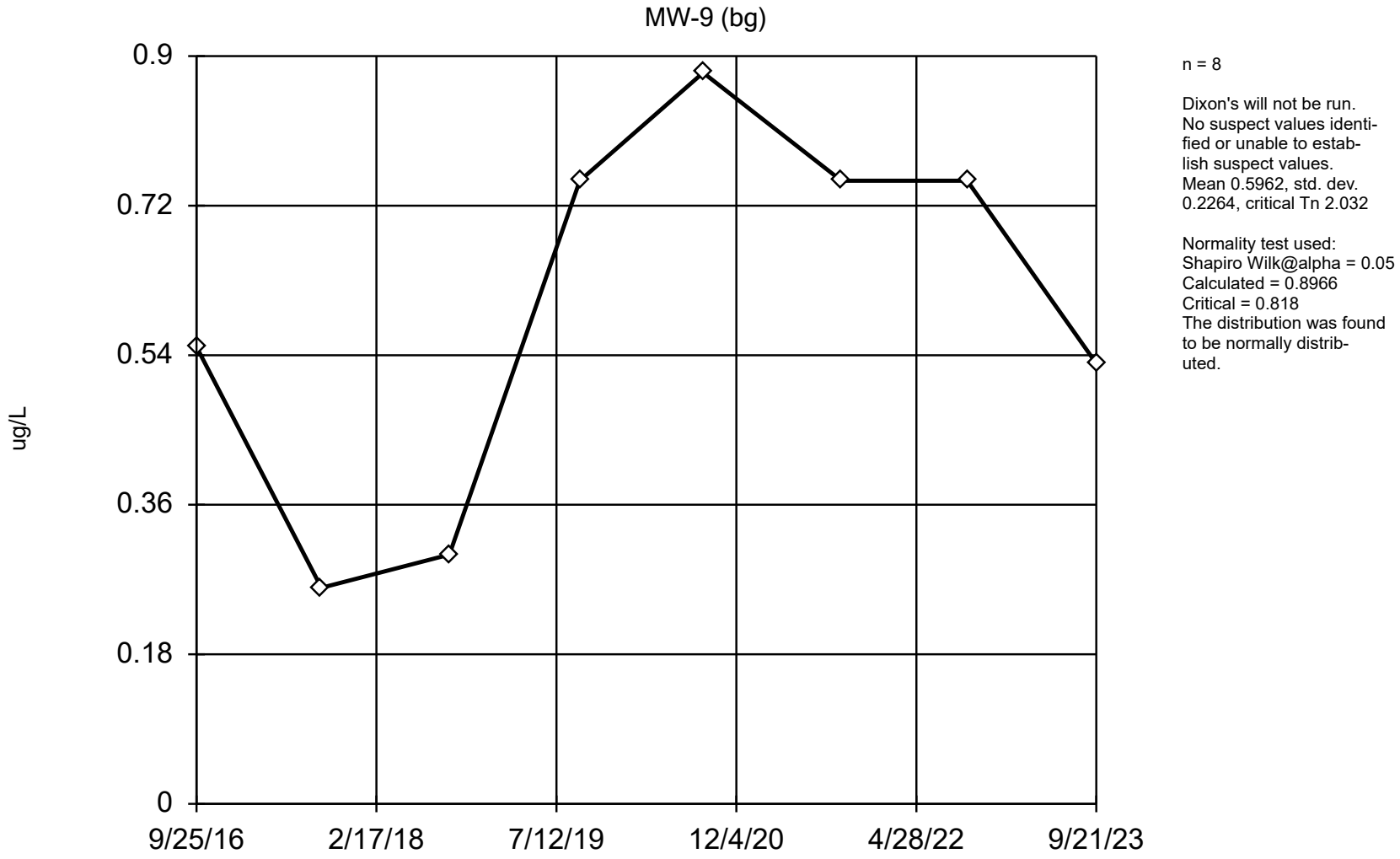
Constituent: Arsenic (ug/L) Analysis Run 10/30/2023 12:20 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)
9/27/2016	0.14 (J)
9/15/2017	0.17 (J)
9/12/2018	0.36 (J)
9/17/2019	<0.75
4/29/2021	<0.75
9/28/2021	<0.75
9/20/2022	<0.75
9/18/2023	<0.53 (U)

ND substitution: RL or RL/2 if <15% NDs.

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 0.5962, std. dev. 0.2264, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.8966
Critical = 0.818
The distribution was found to be normally distributed.

Constituent: Arsenic Analysis Run 10/30/2023 12:19 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

EPA 1989 Outlier Screening

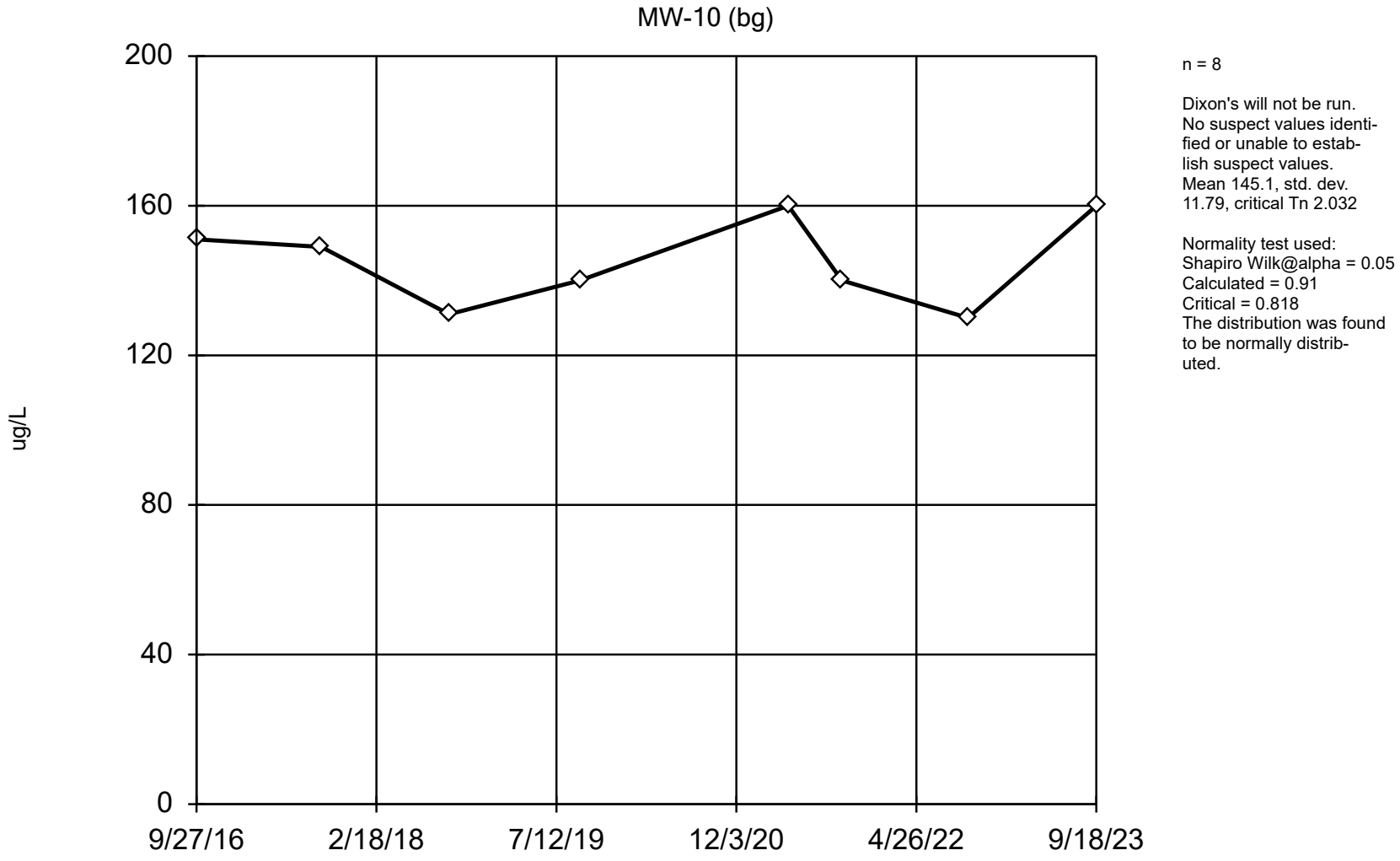
Constituent: Arsenic (ug/L) Analysis Run 10/30/2023 12:20 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-9 (bg)
9/25/2016	0.55 (J)
9/14/2017	0.26 (J)
9/12/2018	0.3 (J)
9/17/2019	<0.75
9/1/2020	<0.88
9/28/2021	<0.75
9/20/2022	<0.75
9/21/2023	<0.53 (U)

ND substitution: RL or RL/2 if <15% NDs.

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 145.1, std. dev. 11.79, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.91
Critical = 0.818
The distribution was found to be normally distributed.

Constituent: Barium Analysis Run 10/30/2023 12:19 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

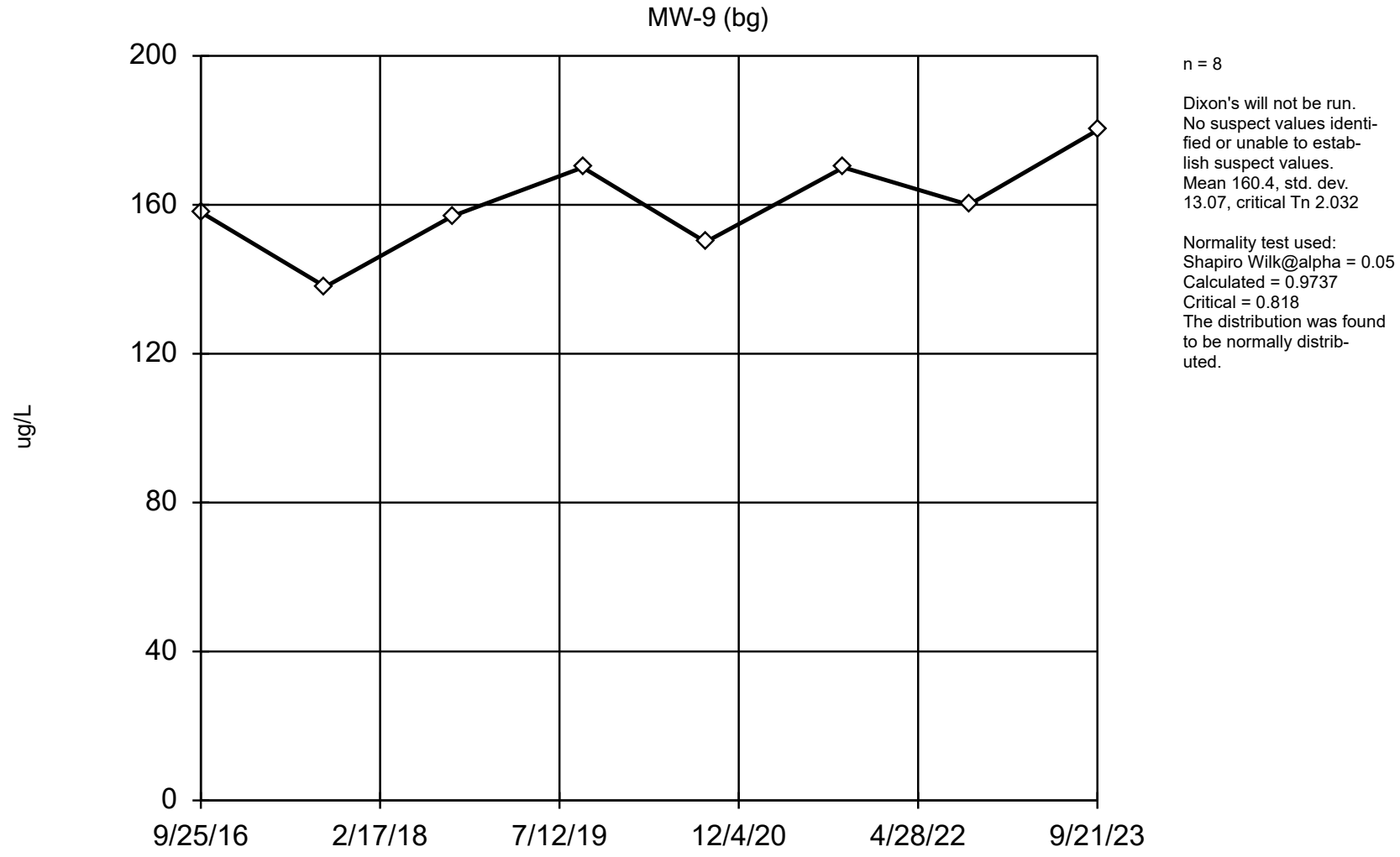
EPA 1989 Outlier Screening

Constituent: Barium (ug/L) Analysis Run 10/30/2023 12:20 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)
9/27/2016	151
9/15/2017	149
9/12/2018	131
9/17/2019	140
4/29/2021	160
9/28/2021	140
9/20/2022	130
9/18/2023	160

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 160.4, std. dev. 13.07, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9737
Critical = 0.818
The distribution was found to be normally distributed.

Constituent: Barium Analysis Run 10/30/2023 12:19 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

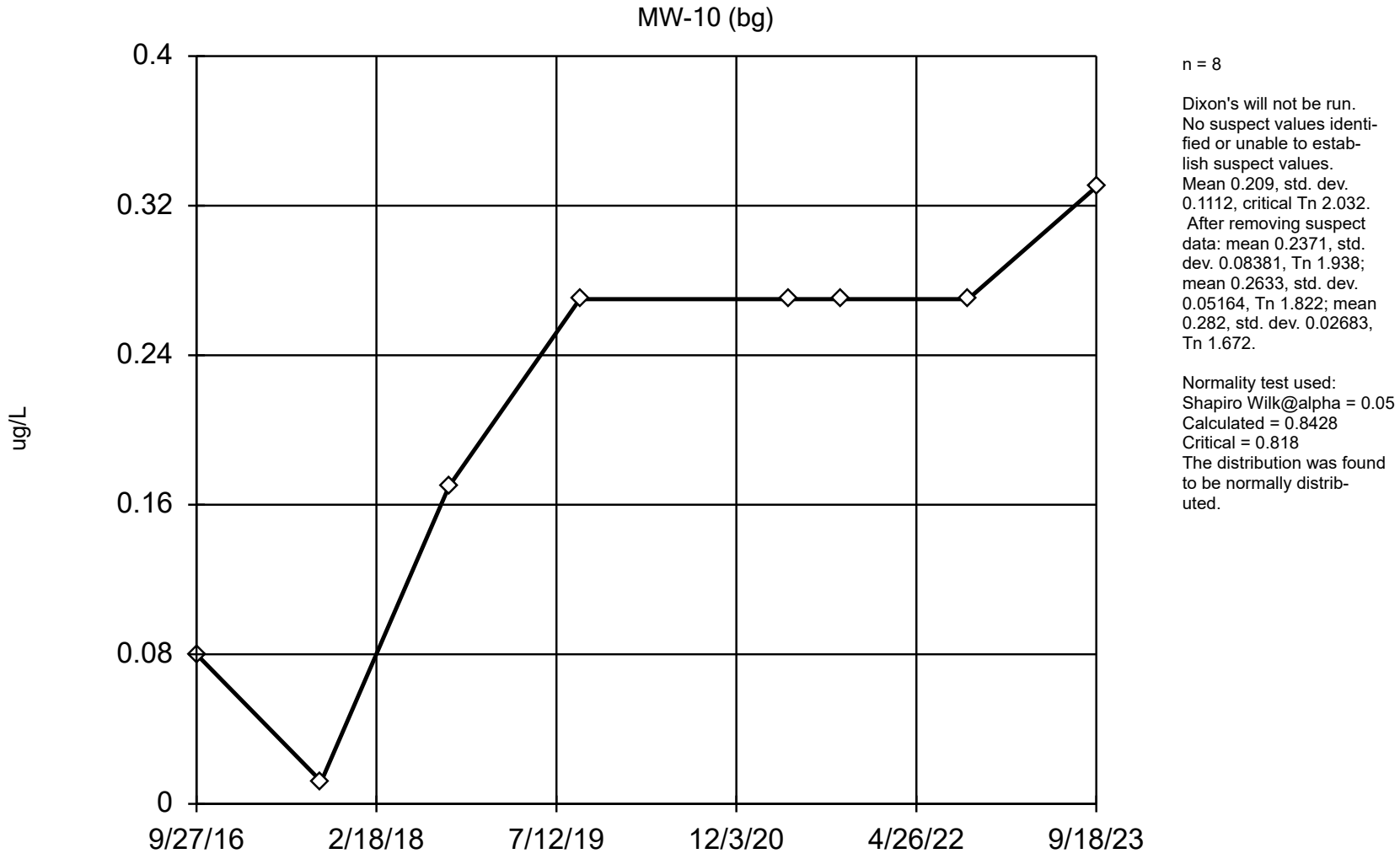
EPA 1989 Outlier Screening

Constituent: Barium (ug/L) Analysis Run 10/30/2023 12:20 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-9 (bg)
9/25/2016	158
9/14/2017	138
9/12/2018	157
9/17/2019	170
9/1/2020	150
9/28/2021	170
9/20/2022	160
9/21/2023	180

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 0.209, std. dev. 0.1112, critical Tn 2.032.
After removing suspect data: mean 0.2371, std. dev. 0.08381, Tn 1.938; mean 0.2633, std. dev. 0.05164, Tn 1.822; mean 0.282, std. dev. 0.02683, Tn 1.672.

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.8428
Critical = 0.818
The distribution was found to be normally distributed.

Constituent: Beryllium Analysis Run 10/30/2023 12:19 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

EPA 1989 Outlier Screening

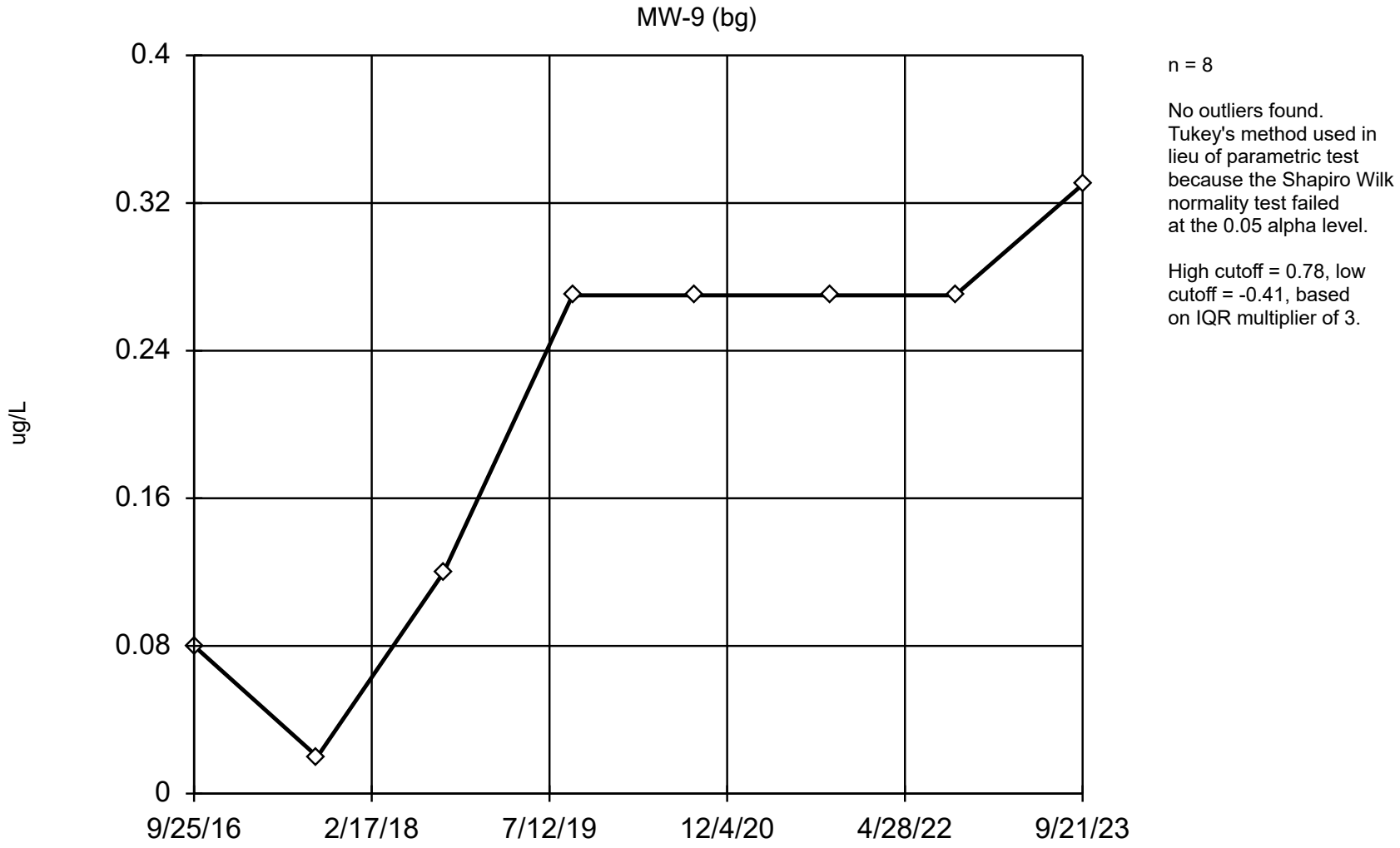
Constituent: Beryllium (ug/L) Analysis Run 10/30/2023 12:20 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)
9/27/2016	<0.08
9/15/2017	<0.012
9/12/2018	0.17 (J)
9/17/2019	<0.27
4/29/2021	<0.27
9/28/2021	<0.27
9/20/2022	<0.27
9/18/2023	<0.33 (U)

ND substitution: RL or RL/2 if <15% NDs.

Tukey's Outlier Screening



n = 8

No outliers found.
Tukey's method used in lieu of parametric test because the Shapiro Wilk normality test failed at the 0.05 alpha level.

High cutoff = 0.78, low cutoff = -0.41, based on IQR multiplier of 3.

Constituent: Beryllium Analysis Run 10/30/2023 12:19 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Tukey's Outlier Screening

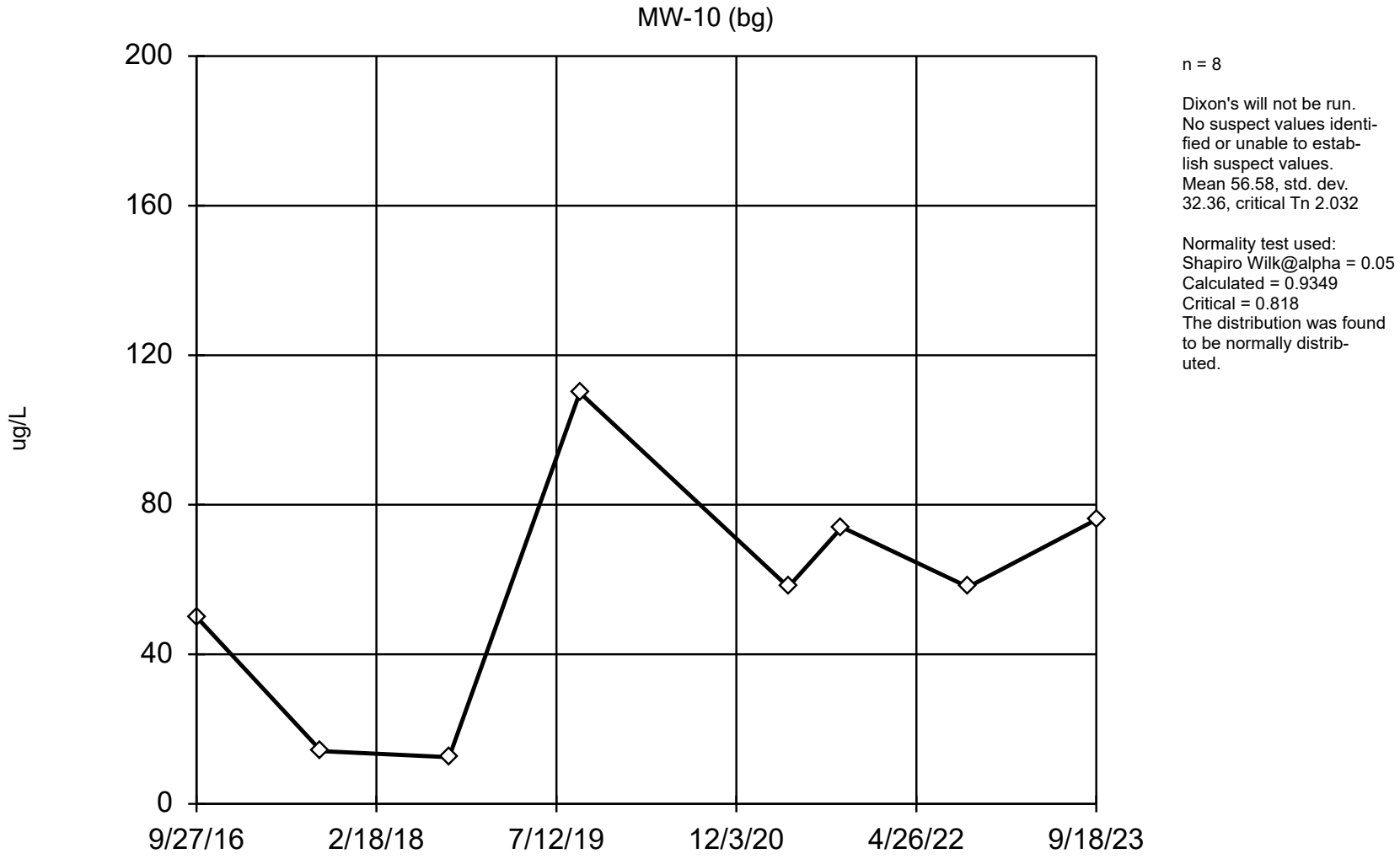
Constituent: Beryllium (ug/L) Analysis Run 10/30/2023 12:20 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-9 (bg)
9/25/2016	<0.08
9/14/2017	0.02 (J)
9/12/2018	<0.12
9/17/2019	<0.27
9/1/2020	<0.27
9/28/2021	<0.27
9/20/2022	<0.27
9/21/2023	<0.33 (U)

ND substitution: RL or RL/2 if <15% NDs.

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 56.58, std. dev. 32.36, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9349
Critical = 0.818
The distribution was found to be normally distributed.

Constituent: Boron Analysis Run 10/30/2023 12:19 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

EPA 1989 Outlier Screening

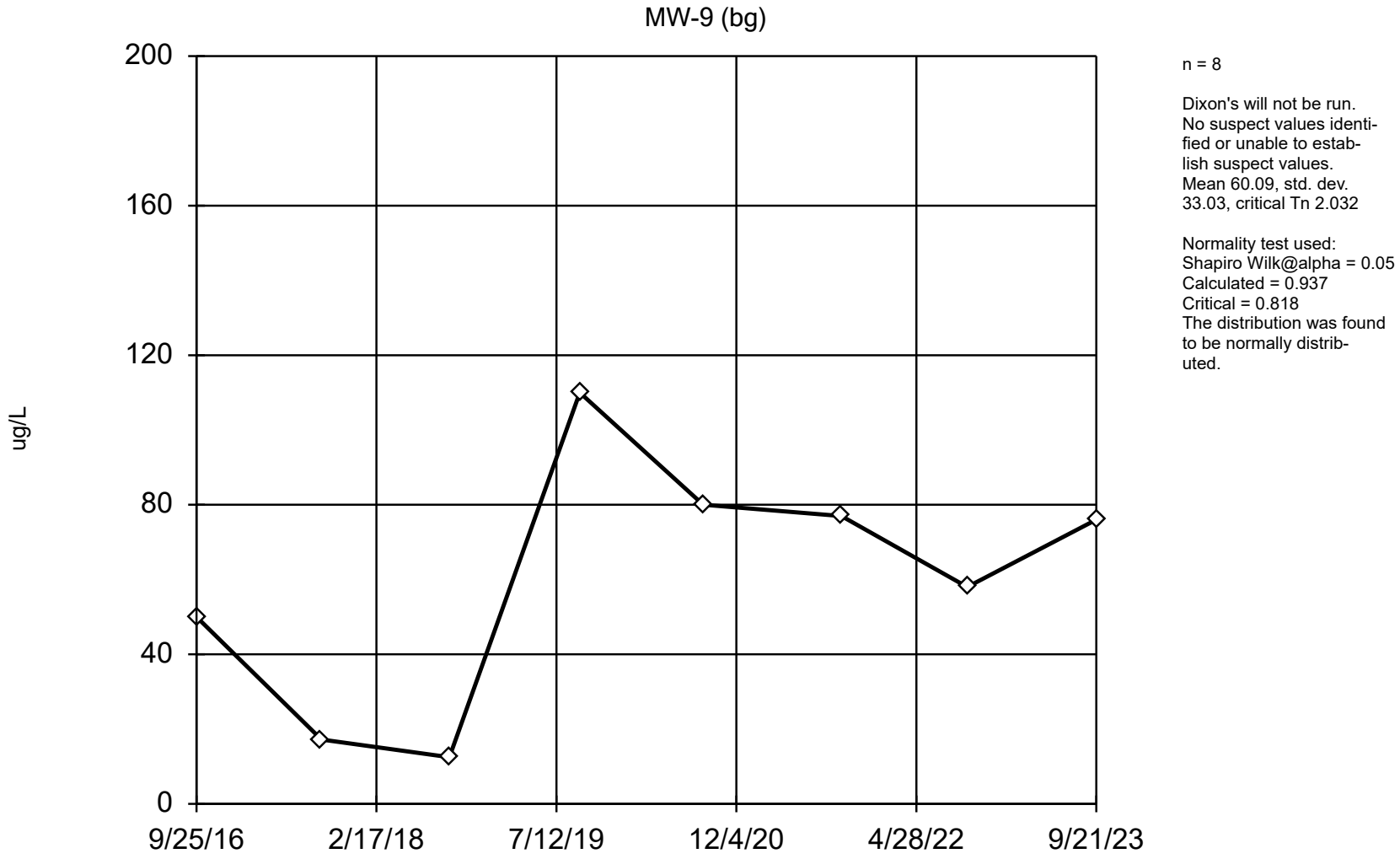
Constituent: Boron (ug/L) Analysis Run 10/30/2023 12:20 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)
9/27/2016	<50
9/15/2017	14.1 (J)
9/12/2018	<12.5
9/17/2019	<110
4/29/2021	<58
9/28/2021	74 (J)
9/20/2022	<58
9/18/2023	<76 (U)

ND substitution: RL or RL/2 if <15% NDs.

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 60.09, std. dev. 33.03, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.937
Critical = 0.818
The distribution was found to be normally distributed.

Constituent: Boron Analysis Run 10/30/2023 12:19 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

EPA 1989 Outlier Screening

Constituent: Boron (ug/L) Analysis Run 10/30/2023 12:20 PM View: East Closed LF

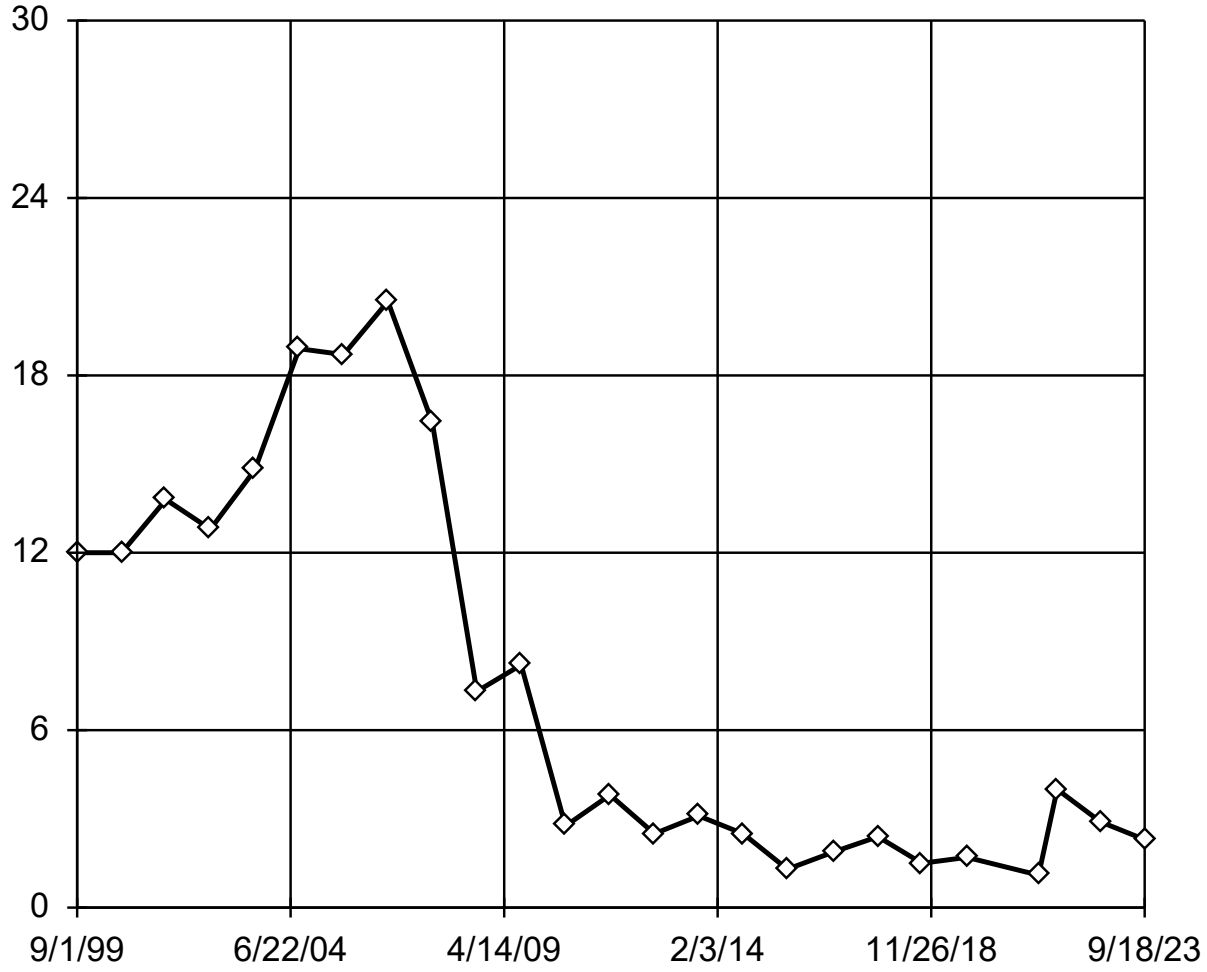
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-9 (bg)
9/25/2016	<50
9/14/2017	17.2 (J)
9/12/2018	<12.5
9/17/2019	<110
9/1/2020	<80
9/28/2021	77 (J)
9/20/2022	<58
9/21/2023	<76 (U)

ND substitution: RL or RL/2 if <15% NDs.

Tukey's Outlier Screening

MW-10 (bg)



n = 25

No outliers found.
Tukey's method used in lieu of parametric test because the Shapiro Wilk normality test failed at the 0.05 alpha level.

High cutoff = 46.15, low cutoff = -30.5, based on IQR multiplier of 3.

Constituent: Chloride Analysis Run 10/30/2023 12:19 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Tukey's Outlier Screening

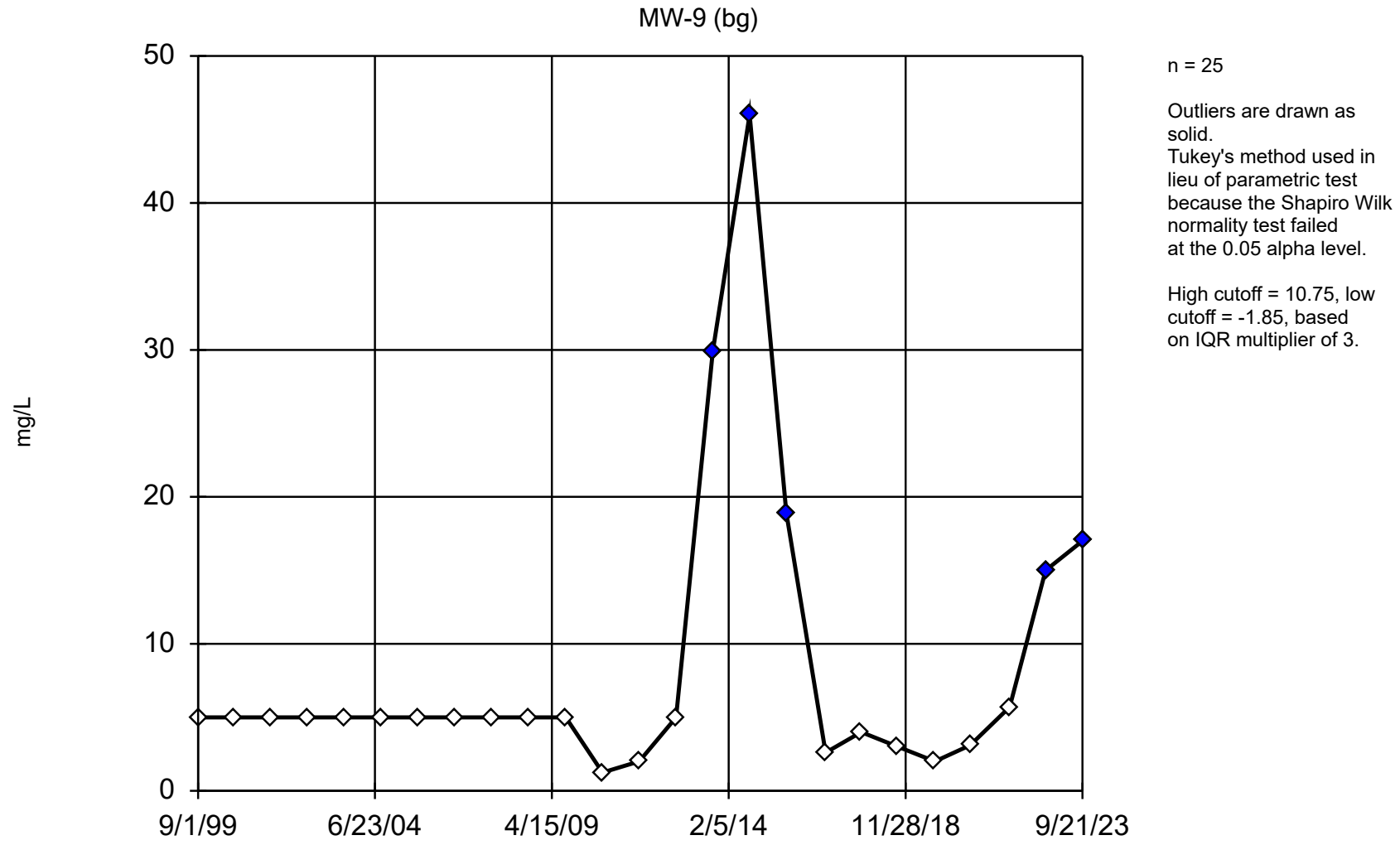
Constituent: Chloride (mg/L) Analysis Run 10/30/2023 12:20 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)
9/1/1999	12
9/1/2000	12
9/1/2001	13.8
9/1/2002	12.8
9/1/2003	14.8
9/1/2004	18.9
9/1/2005	18.7
9/1/2006	20.5
9/1/2007	16.4
9/1/2008	7.31
9/1/2009	8.21
9/1/2010	2.76
9/1/2011	3.81
9/1/2012	<5
9/1/2013	3.1
9/1/2014	2.5
9/1/2015	1.3
9/27/2016	1.9
9/15/2017	2.4
9/12/2018	1.5
9/17/2019	1.7 (J,B)
4/29/2021	<2.2
9/28/2021	4 (J)
9/20/2022	2.9 (J)
9/18/2023	2.3 (J)

ND substitution: RL or RL/2 if <15% NDs.

Tukey's Outlier Screening



n = 25

Outliers are drawn as solid.
Tukey's method used in lieu of parametric test because the Shapiro Wilk normality test failed at the 0.05 alpha level.

High cutoff = 10.75, low cutoff = -1.85, based on IQR multiplier of 3.

Constituent: Chloride Analysis Run 10/30/2023 12:19 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Tukey's Outlier Screening

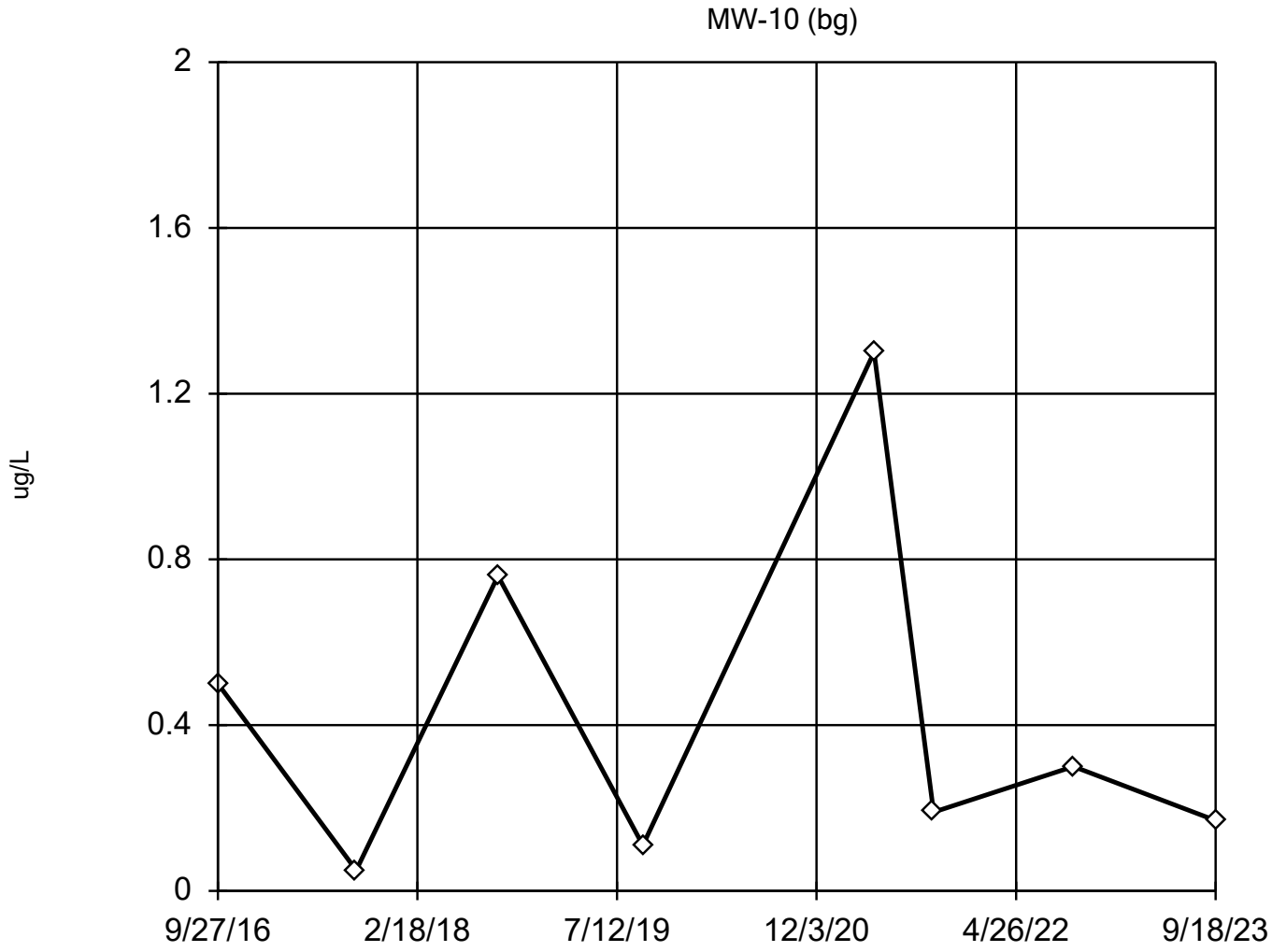
Constituent: Chloride (mg/L) Analysis Run 10/30/2023 12:20 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-9 (bg)
9/1/1999	<5
9/1/2000	<5
9/1/2001	<5
9/1/2002	<5
9/1/2003	<5
9/1/2004	<5
9/1/2005	<5
9/1/2006	<5
9/1/2007	<5
9/1/2008	<5
9/1/2009	<5
9/1/2010	1.25
9/1/2011	<2
9/1/2012	<5
9/1/2013	29.9 (O)
9/1/2014	46 (O)
9/1/2015	18.9 (O)
9/25/2016	2.6
9/14/2017	4
9/12/2018	3
9/17/2019	2 (J,B)
9/1/2020	3.1 (J,B)
9/28/2021	5.7
9/20/2022	15 (O)
9/21/2023	17 (O)

ND substitution: RL or RL/2 if <15% NDs.

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 0.4225, std. dev. 0.4241, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.8358
Critical = 0.818
The distribution was found to be normally distributed.

Constituent: Cobalt Analysis Run 10/30/2023 12:19 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

EPA 1989 Outlier Screening

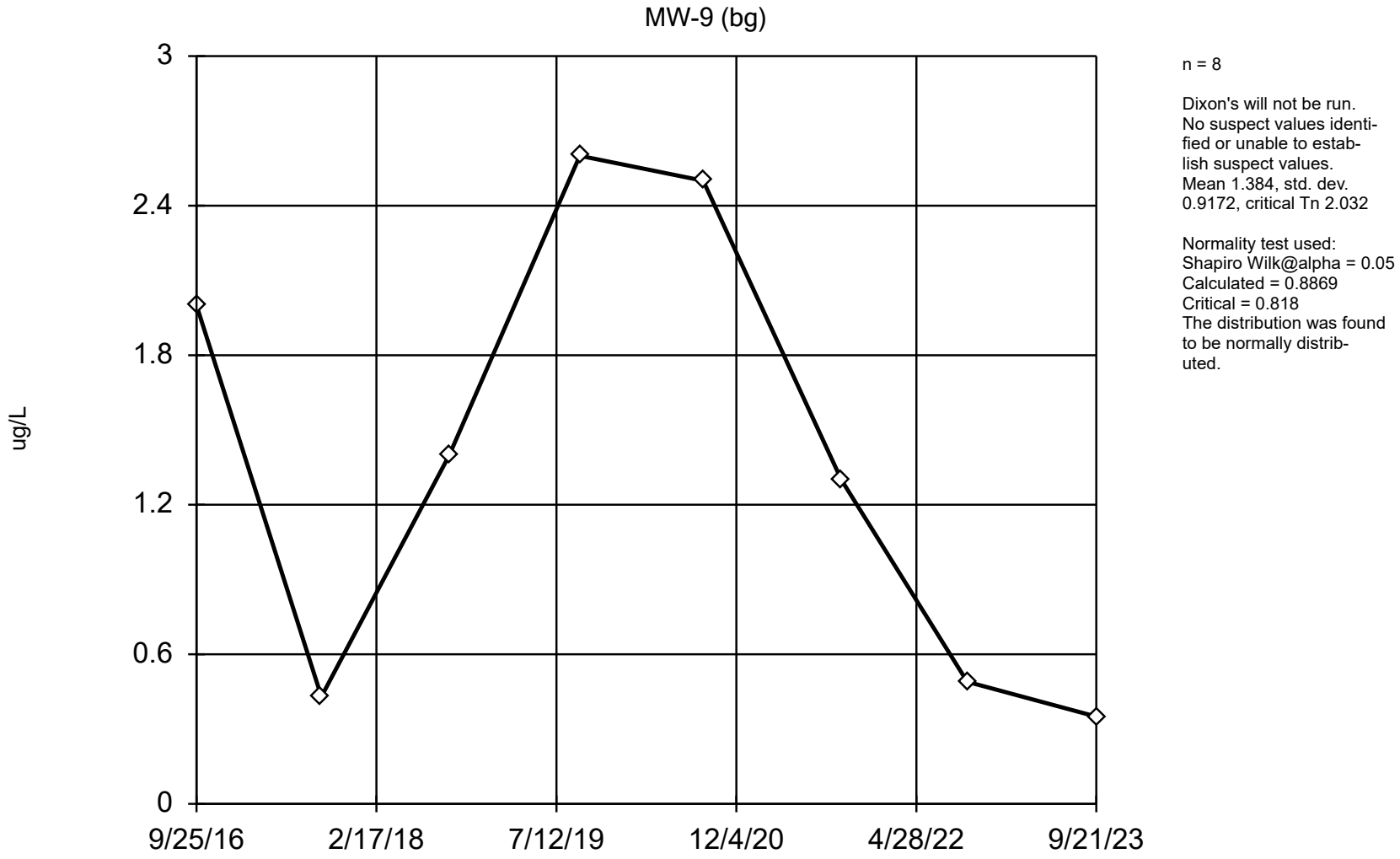
Constituent: Cobalt (ug/L) Analysis Run 10/30/2023 12:20 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)
9/27/2016	<0.5
9/15/2017	0.05 (J)
9/12/2018	0.76 (J)
9/17/2019	0.11 (J)
4/29/2021	1.3
9/28/2021	<0.19
9/20/2022	0.3 (J)
9/18/2023	<0.17 (U)

ND substitution: RL or RL/2 if <15% NDs.

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 1.384, std. dev. 0.9172, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.8869
Critical = 0.818
The distribution was found to be normally distributed.

Constituent: Cobalt Analysis Run 10/30/2023 12:19 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

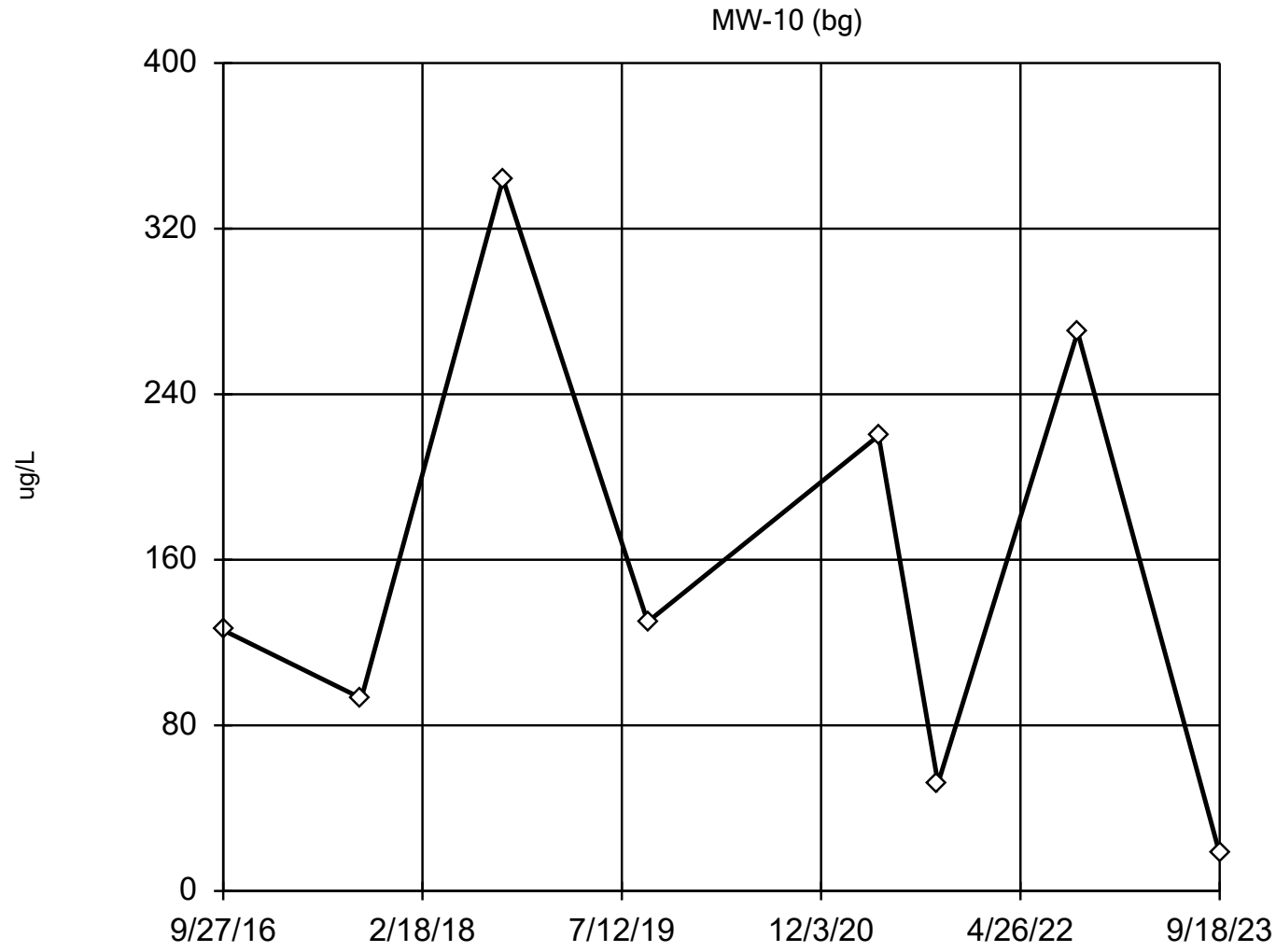
EPA 1989 Outlier Screening

Constituent: Cobalt (ug/L) Analysis Run 10/30/2023 12:20 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-9 (bg)
9/25/2016	2
9/14/2017	0.43 (J)
9/12/2018	1.4
9/17/2019	2.6
9/1/2020	2.5
9/28/2021	1.3
9/20/2022	0.49 (J)
9/21/2023	0.35 (J)

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 156.6, std. dev. 112, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9484
Critical = 0.818
The distribution was found to be normally distributed.

Constituent: Iron Analysis Run 10/30/2023 12:19 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

EPA 1989 Outlier Screening

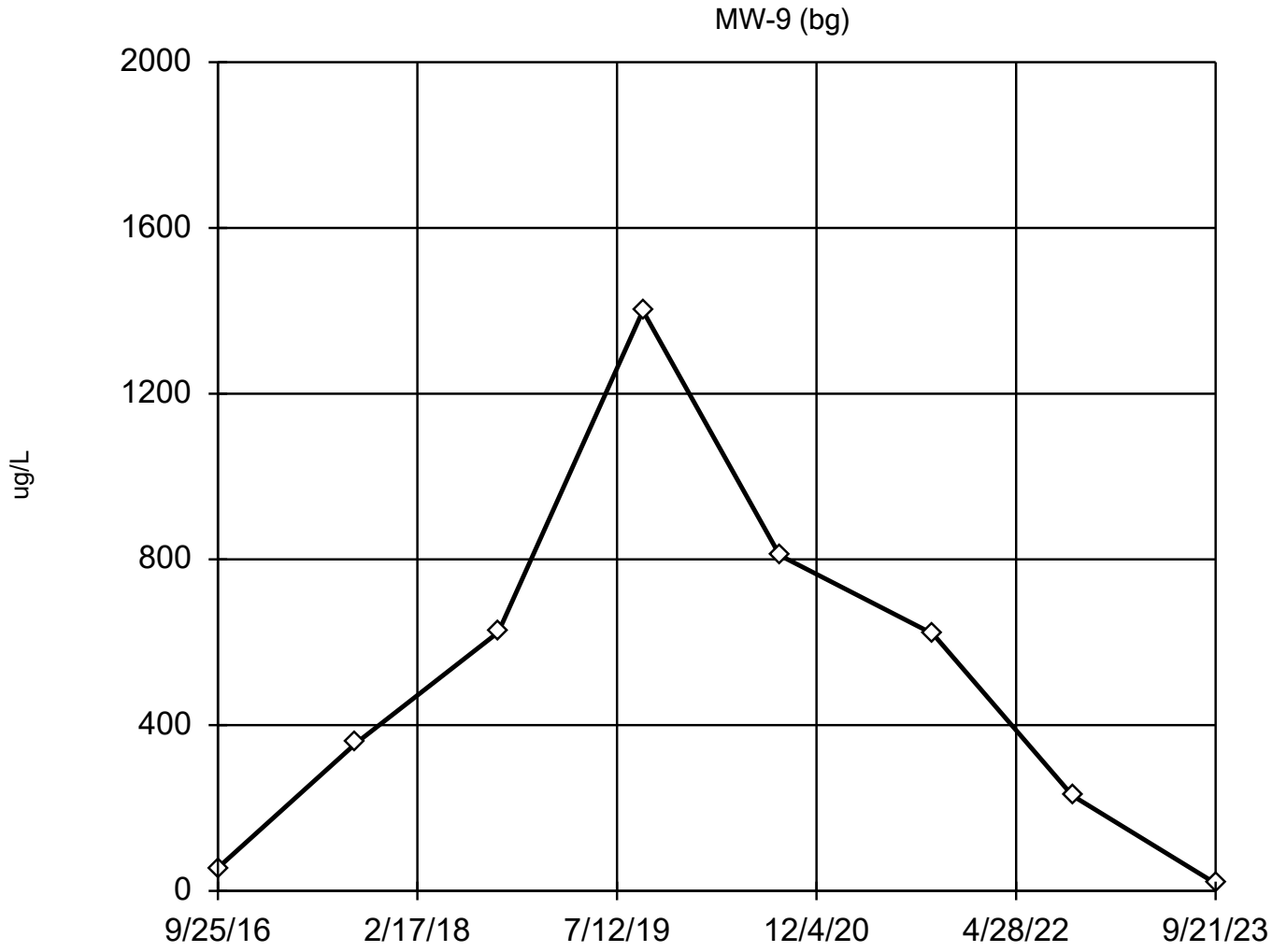
Constituent: Iron (ug/L) Analysis Run 10/30/2023 12:20 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)
9/27/2016	126
9/15/2017	93.1
9/12/2018	344
9/17/2019	130
4/29/2021	220
9/28/2021	52 (J)
9/20/2022	270
9/18/2023	<36 (U)

ND substitution: RL or RL/2 if <15% NDs.

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 514.3, std. dev. 456.3, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9209
Critical = 0.818
The distribution was found to be normally distributed.

Constituent: Iron Analysis Run 10/30/2023 12:19 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

EPA 1989 Outlier Screening

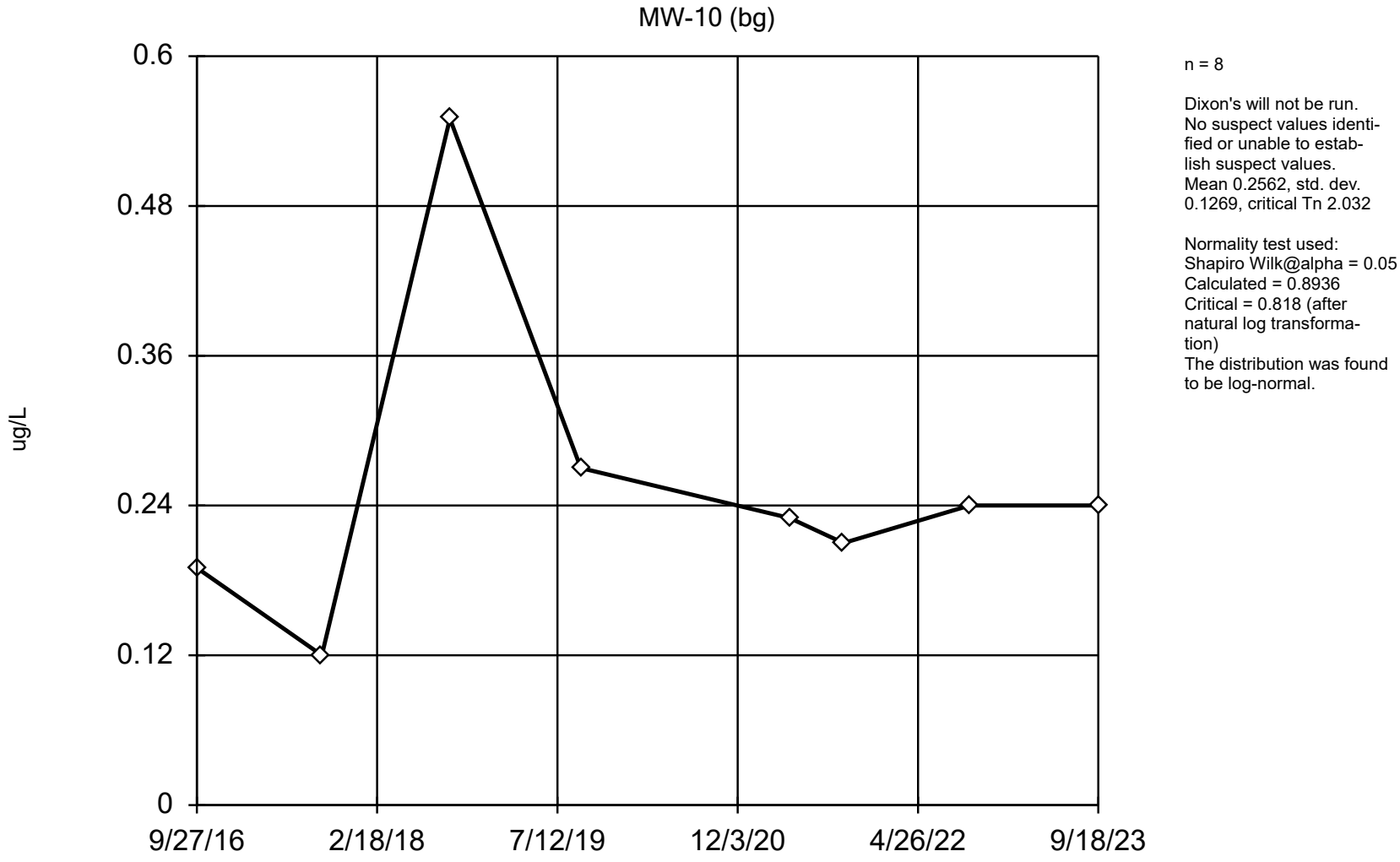
Constituent: Iron (ug/L) Analysis Run 10/30/2023 12:20 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-9 (bg)
9/25/2016	55.7
9/14/2017	357
9/12/2018	624
9/17/2019	1400
9/1/2020	810
9/28/2021	620
9/20/2022	230
9/21/2023	<36 (U)

ND substitution: RL or RL/2 if <15% NDs.

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 0.2562, std. dev. 0.1269, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.8936
Critical = 0.818 (after natural log transformation)
The distribution was found to be log-normal.

Constituent: Lead Analysis Run 10/30/2023 12:19 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

EPA 1989 Outlier Screening

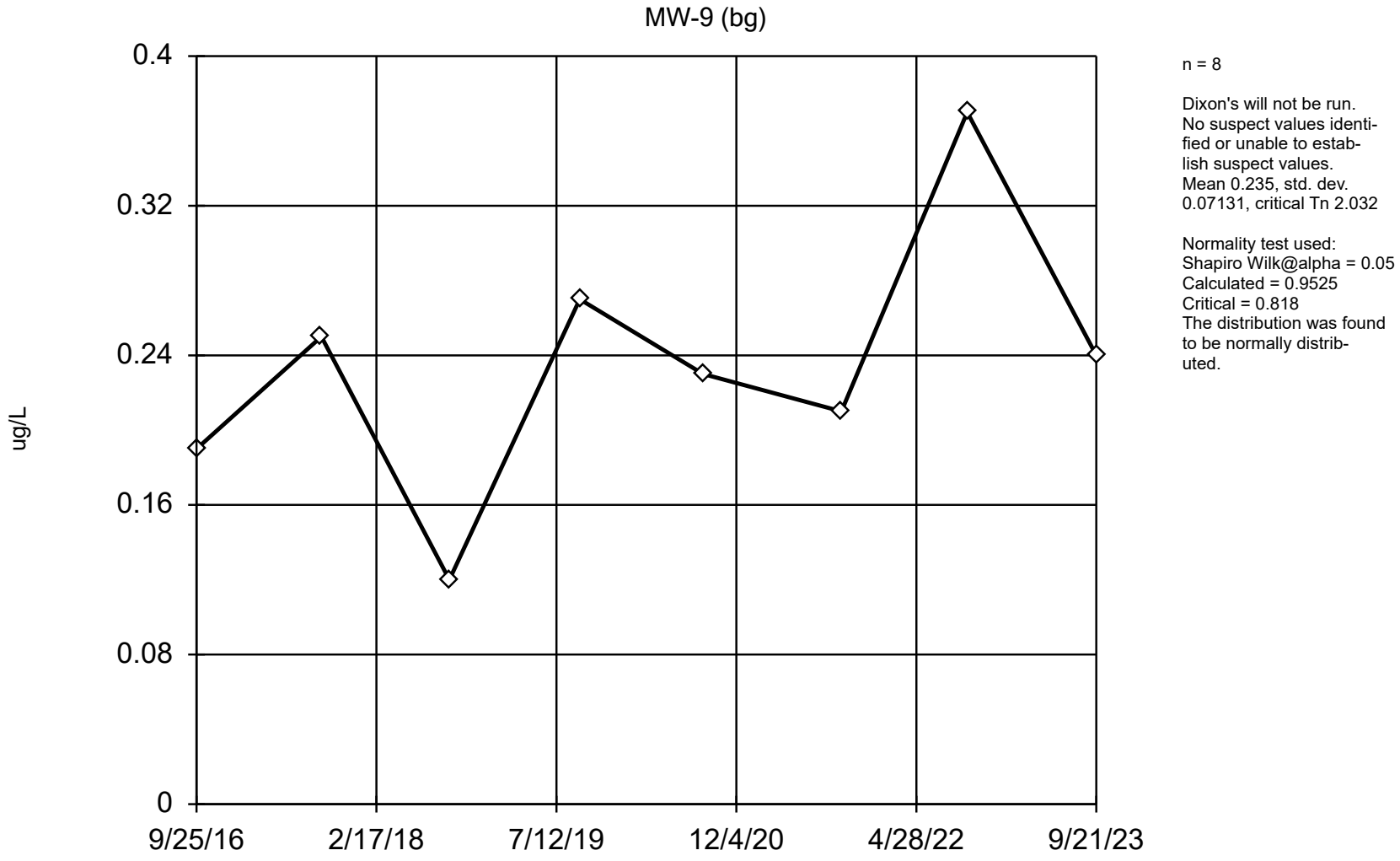
Constituent: Lead (ug/L) Analysis Run 10/30/2023 12:20 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)
9/27/2016	<0.19
9/15/2017	0.12 (J)
9/12/2018	0.55 (J)
9/17/2019	<0.27
4/29/2021	0.23 (J)
9/28/2021	<0.21
9/20/2022	<0.24
9/18/2023	<0.24 (U)

ND substitution: RL or RL/2 if <15% NDs.

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 0.235, std. dev. 0.07131, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9525
Critical = 0.818
The distribution was found to be normally distributed.

Constituent: Lead Analysis Run 10/30/2023 12:19 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

EPA 1989 Outlier Screening

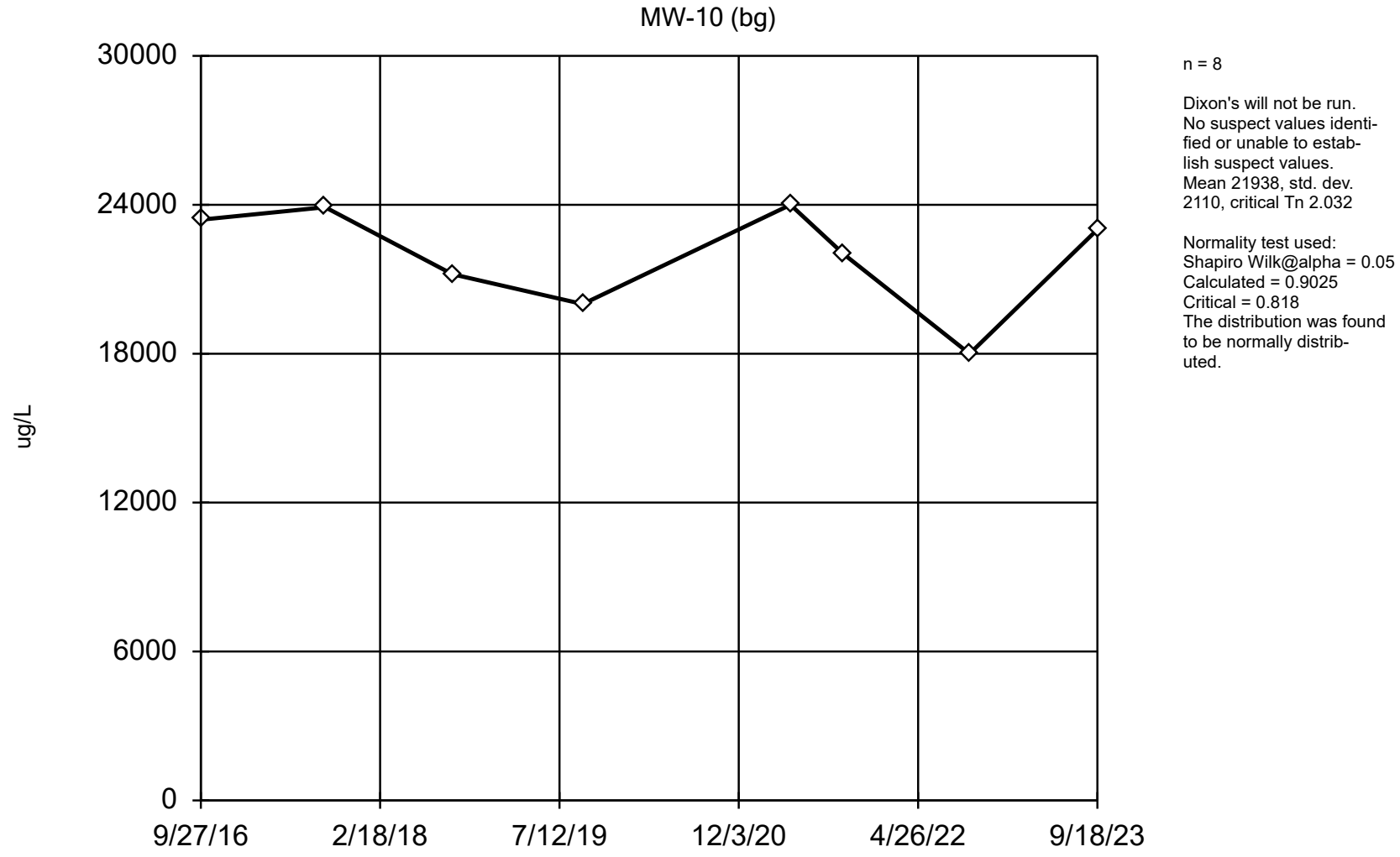
Constituent: Lead (ug/L) Analysis Run 10/30/2023 12:20 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-9 (bg)
9/25/2016	<0.19
9/14/2017	0.25 (J)
9/12/2018	<0.12
9/17/2019	<0.27
9/1/2020	0.23 (J)
9/28/2021	<0.21
9/20/2022	0.37 (J)
9/21/2023	<0.24 (U)

ND substitution: RL or RL/2 if <15% NDs.

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 21938, std. dev. 2110, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9025
Critical = 0.818
The distribution was found to be normally distributed.

Constituent: Magnesium Analysis Run 10/30/2023 12:19 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

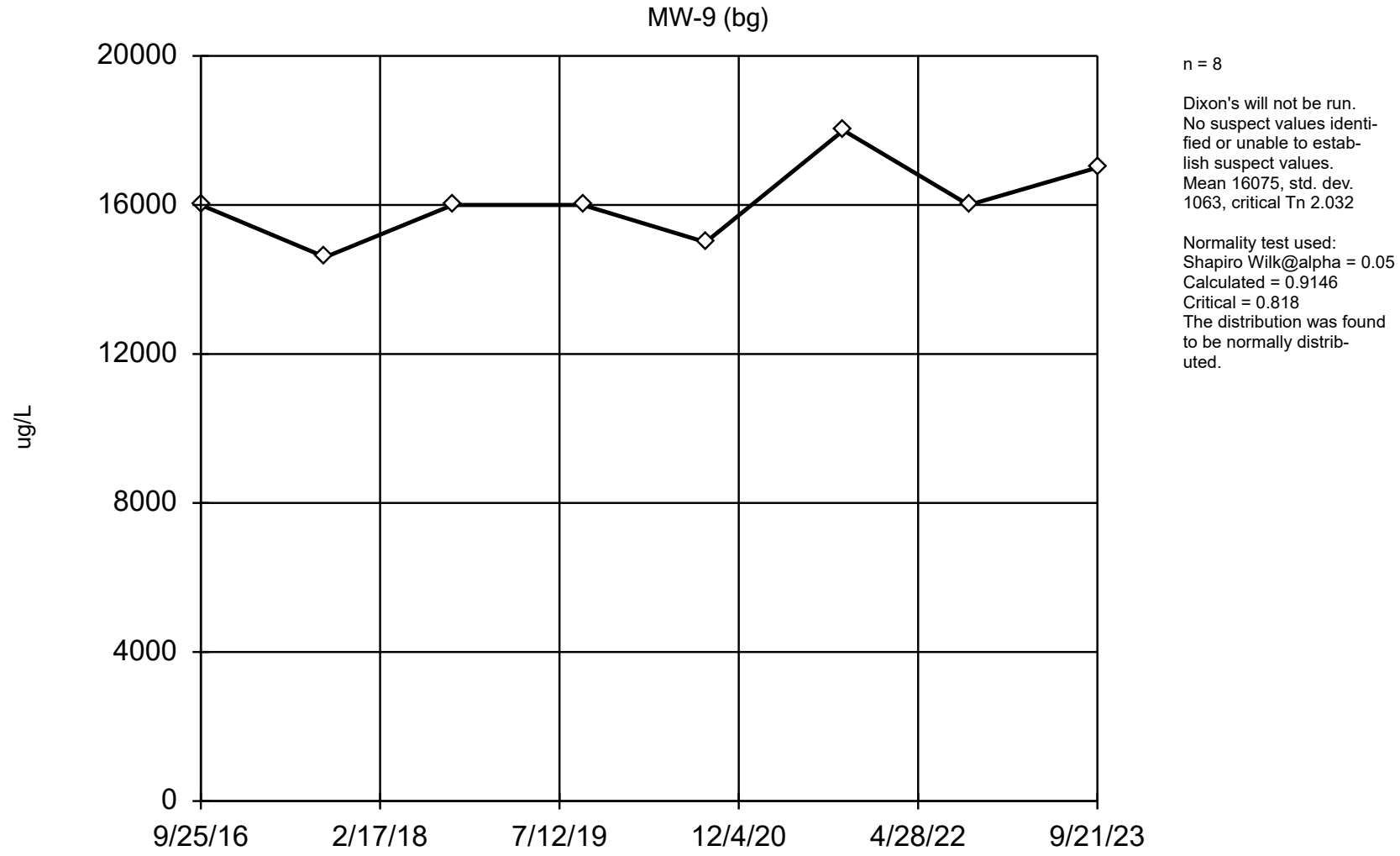
EPA 1989 Outlier Screening

Constituent: Magnesium (ug/L) Analysis Run 10/30/2023 12:20 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)
9/27/2016	23400
9/15/2017	23900
9/12/2018	21200
9/17/2019	20000
4/29/2021	24000
9/28/2021	22000
9/20/2022	18000
9/18/2023	23000

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 16075, std. dev. 1063, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9146
Critical = 0.818
The distribution was found to be normally distributed.

Constituent: Magnesium Analysis Run 10/30/2023 12:19 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

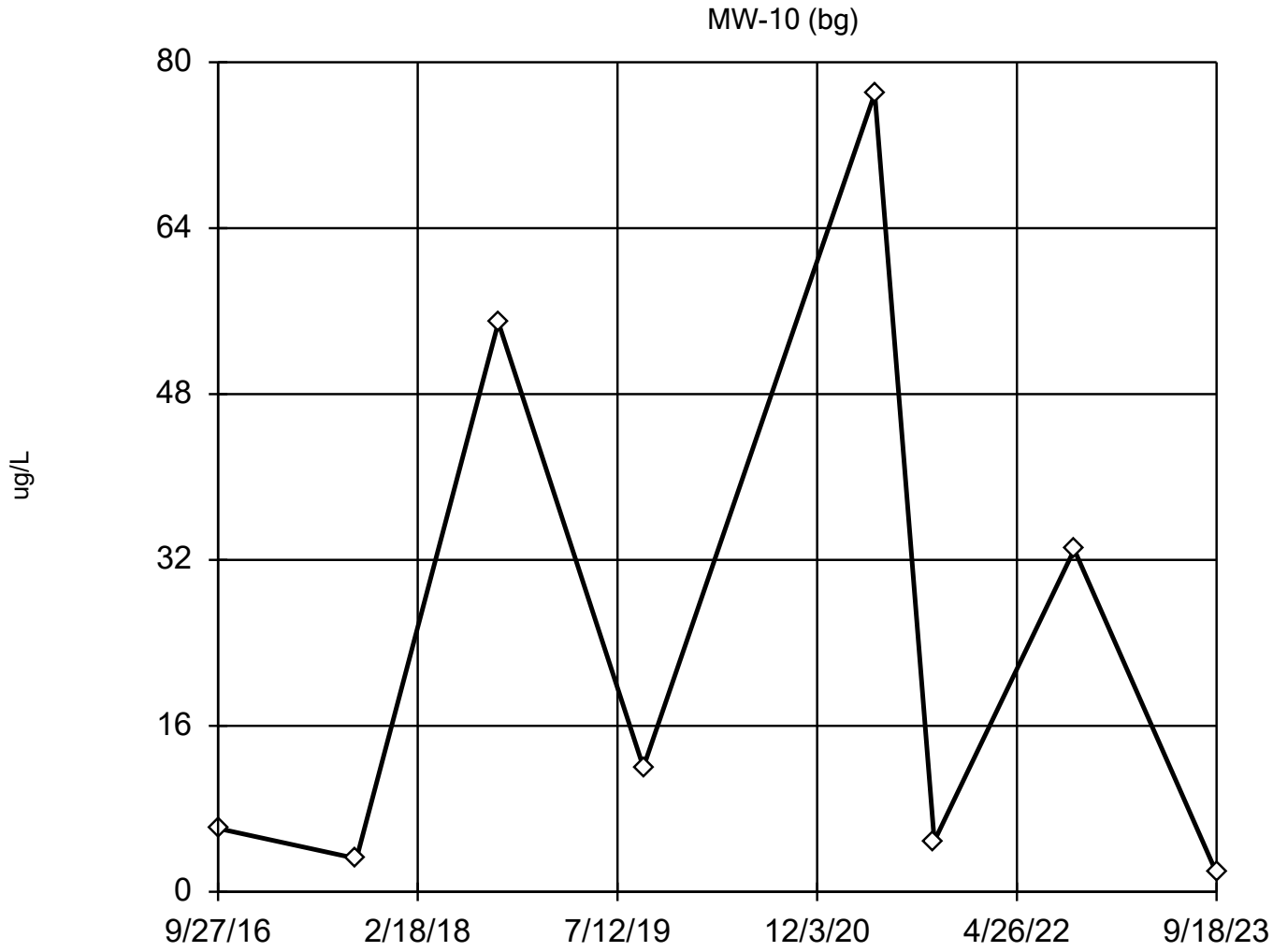
EPA 1989 Outlier Screening

Constituent: Magnesium (ug/L) Analysis Run 10/30/2023 12:20 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-9 (bg)
9/25/2016	16000
9/14/2017	14600
9/12/2018	16000
9/17/2019	16000
9/1/2020	15000
9/28/2021	18000
9/20/2022	16000
9/21/2023	17000

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 24.11, std. dev. 28.28, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9383
Critical = 0.818 (after natural log transformation)
The distribution was found to be log-normal.

Constituent: Manganese Analysis Run 10/30/2023 12:19 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

EPA 1989 Outlier Screening

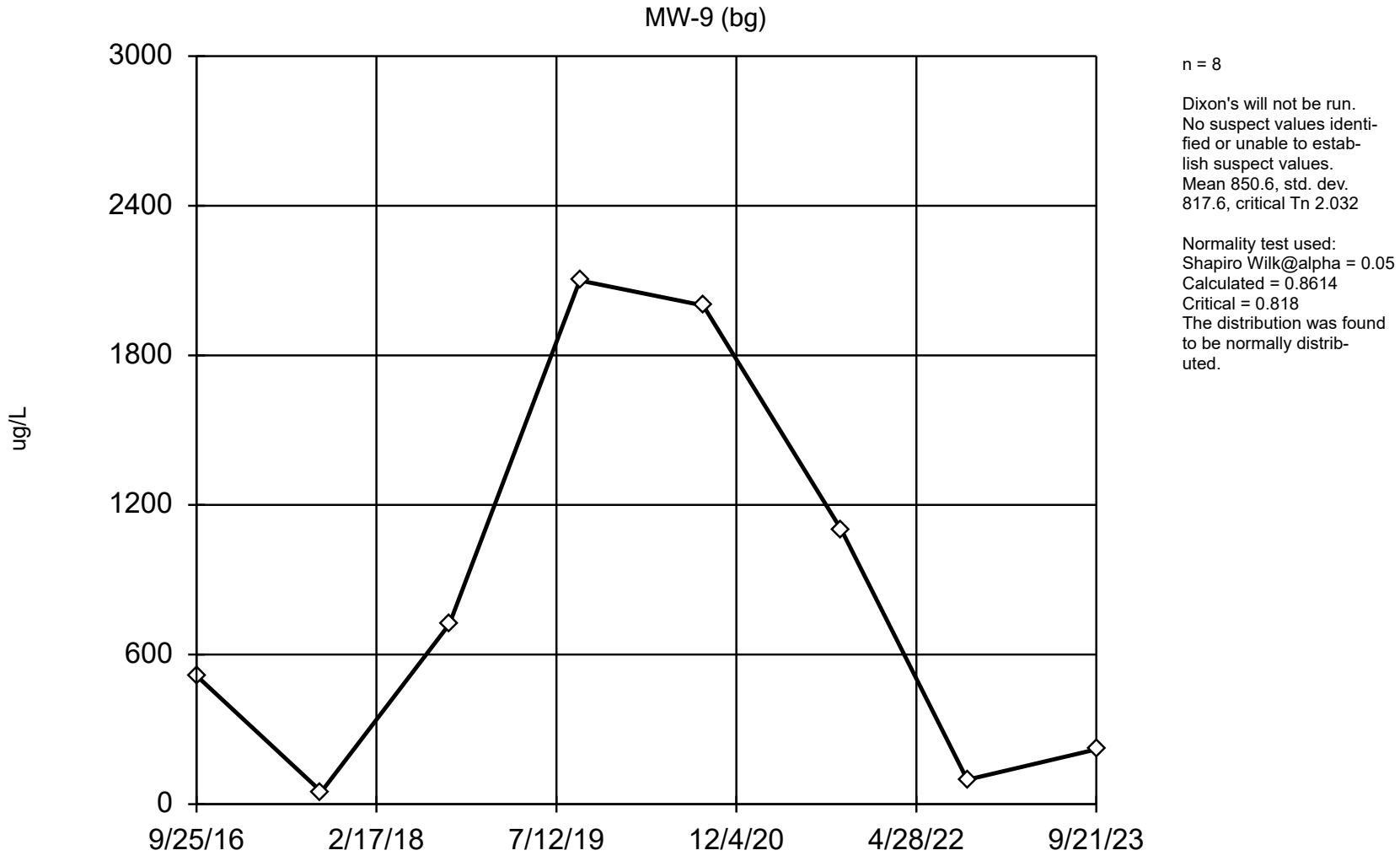
Constituent: Manganese (ug/L) Analysis Run 10/30/2023 12:20 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)
9/27/2016	6.1
9/15/2017	3.2
9/12/2018	54.9
9/17/2019	12
4/29/2021	77
9/28/2021	4.9 (J)
9/20/2022	33
9/18/2023	<3.6 (U)

ND substitution: RL or RL/2 if <15% NDs.

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 850.6, std. dev. 817.6, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.8614
Critical = 0.818
The distribution was found to be normally distributed.

Constituent: Manganese Analysis Run 10/30/2023 12:19 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

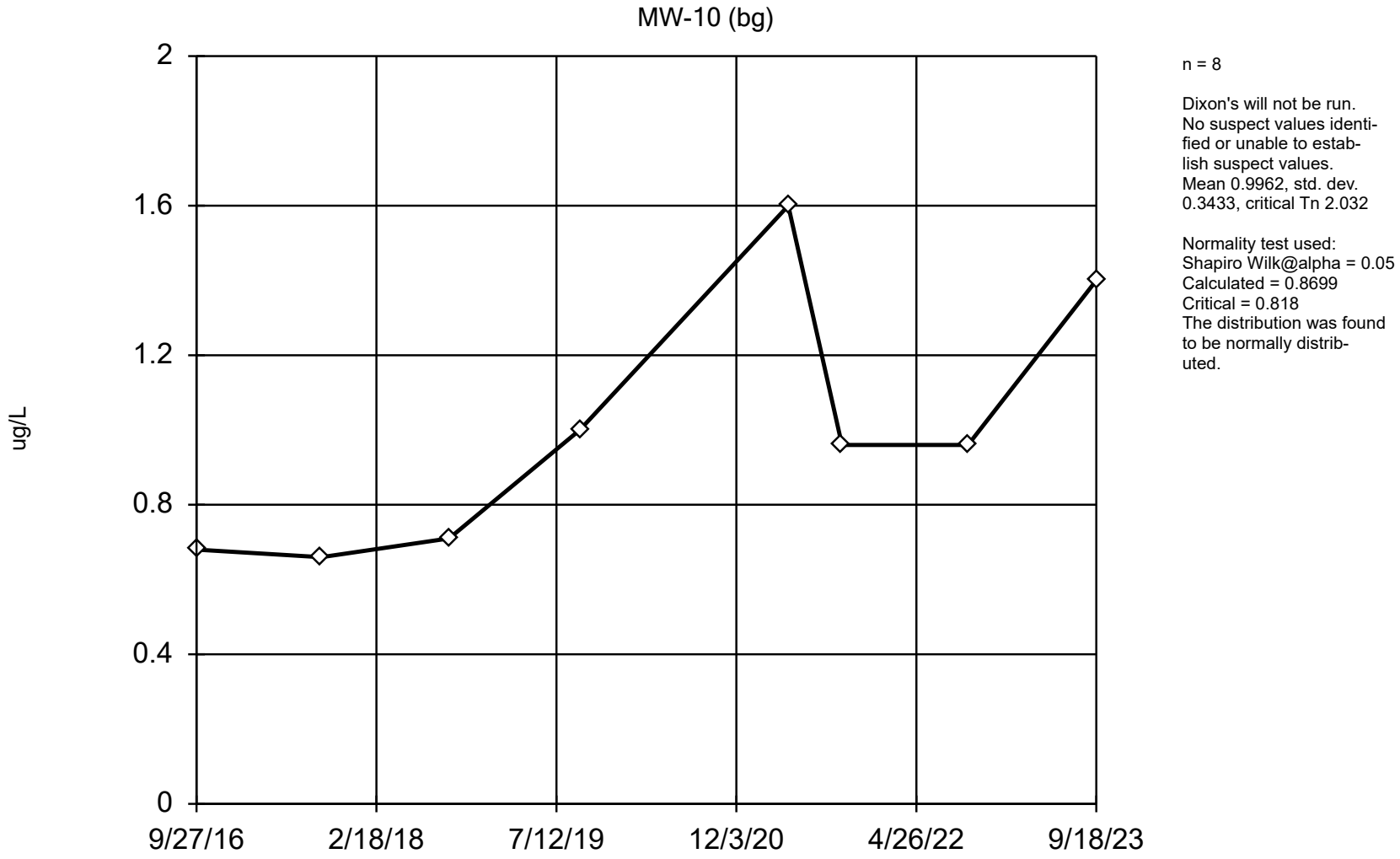
EPA 1989 Outlier Screening

Constituent: Manganese (ug/L) Analysis Run 10/30/2023 12:20 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-9 (bg)
9/25/2016	515
9/14/2017	49.8
9/12/2018	722
9/17/2019	2100
9/1/2020	2000
9/28/2021	1100
9/20/2022	98
9/21/2023	220

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 0.9962, std. dev. 0.3433, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.8699
Critical = 0.818
The distribution was found to be normally distributed.

Constituent: Selenium Analysis Run 10/30/2023 12:19 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

EPA 1989 Outlier Screening

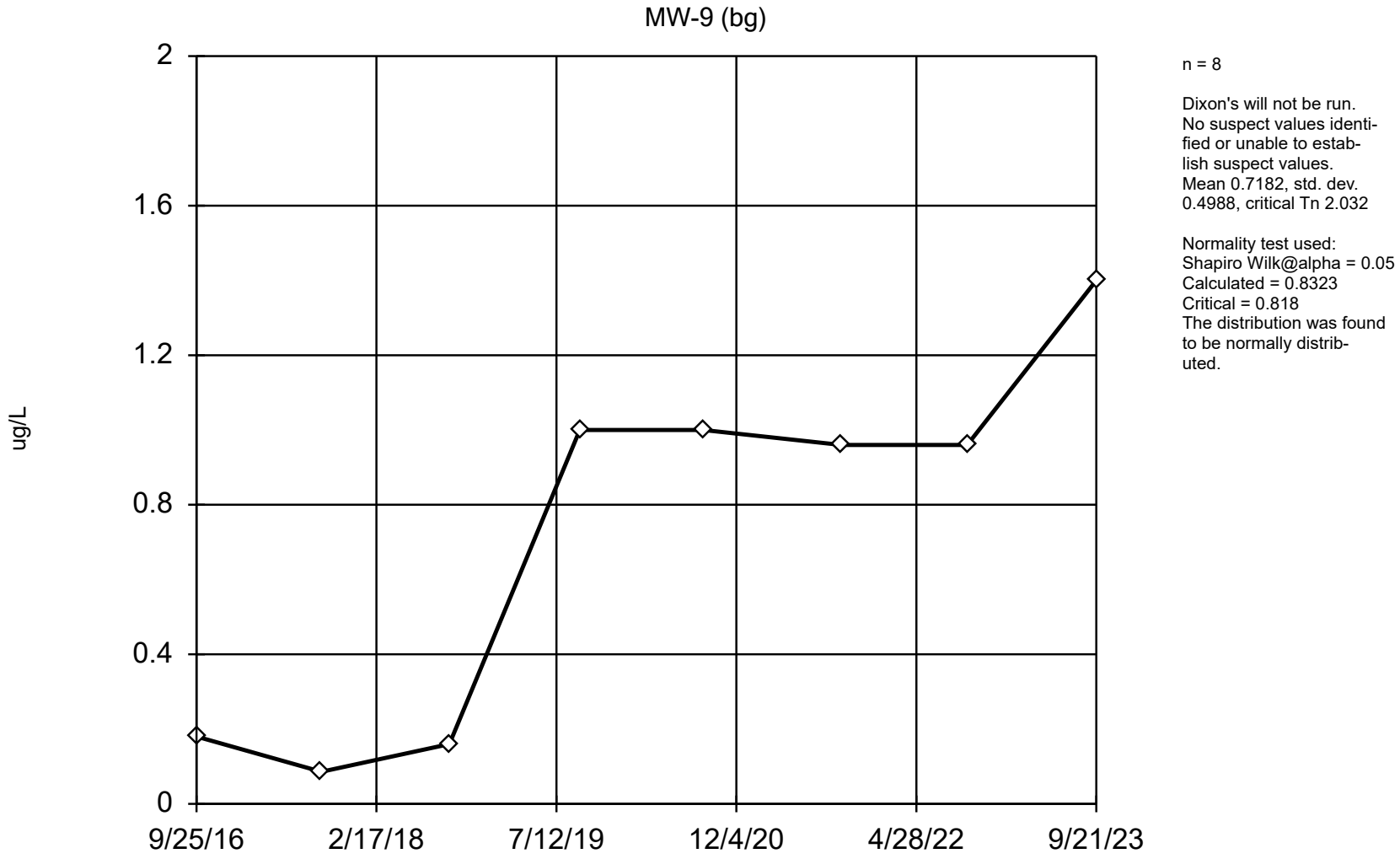
Constituent: Selenium (ug/L) Analysis Run 10/30/2023 12:20 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)
9/27/2016	0.68 (J)
9/15/2017	0.66 (J)
9/12/2018	0.71 (J)
9/17/2019	<1
4/29/2021	1.6 (J)
9/28/2021	<0.96
9/20/2022	<0.96
9/18/2023	<1.4 (U)

ND substitution: RL or RL/2 if <15% NDs.

EPA Screening (suspected outliers for Dixon's Test)



n = 8

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 0.7182, std. dev. 0.4988, critical Tn 2.032

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.8323
Critical = 0.818
The distribution was found to be normally distributed.

Constituent: Selenium Analysis Run 10/30/2023 12:19 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

EPA 1989 Outlier Screening

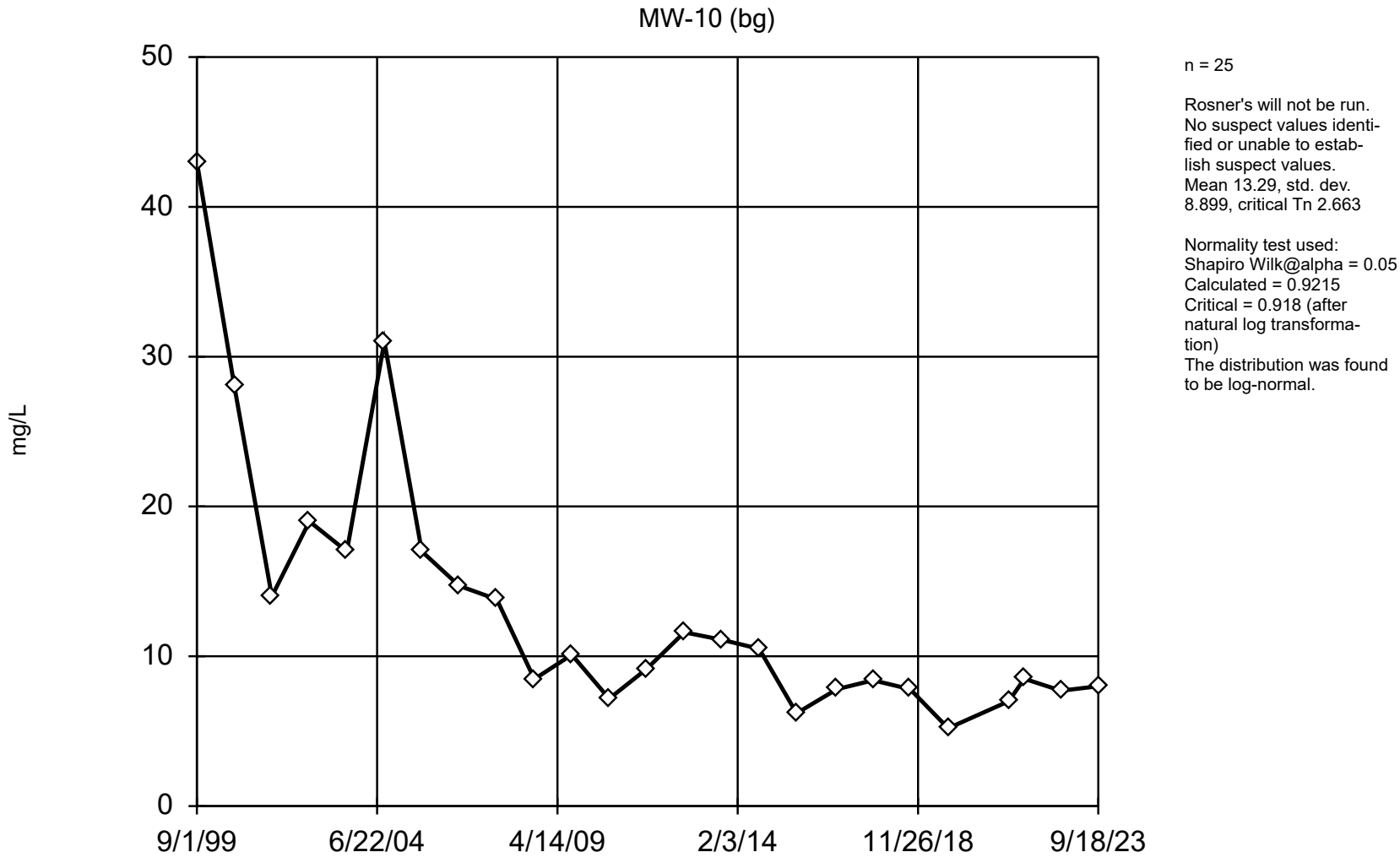
Constituent: Selenium (ug/L) Analysis Run 10/30/2023 12:20 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-9 (bg)
9/25/2016	<0.18
9/14/2017	<0.086
9/12/2018	<0.16
9/17/2019	<1
9/1/2020	<1
9/28/2021	<0.96
9/20/2022	<0.96
9/21/2023	<1.4 (U)

ND substitution: RL or RL/2 if <15% NDs.

EPA Screening (suspected outliers for Rosner's Test)



n = 25

Rosner's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 13.29, std. dev. 8.899, critical Tn 2.663

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9215
Critical = 0.918 (after natural log transformation)
The distribution was found to be log-normal.

Constituent: Sulfate Analysis Run 10/30/2023 12:19 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

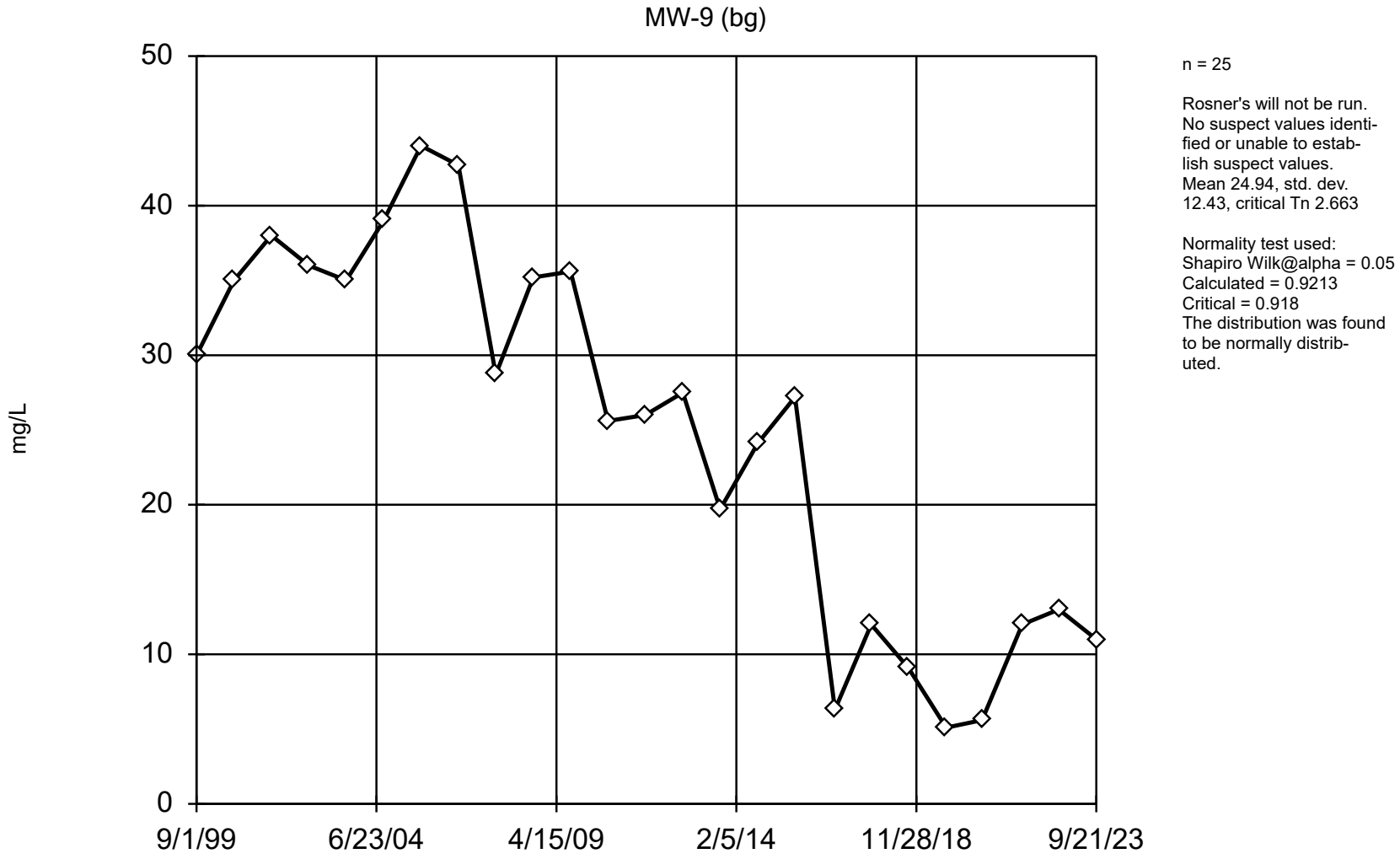
EPA 1989 Outlier Screening

Constituent: Sulfate (mg/L) Analysis Run 10/30/2023 12:20 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)
9/1/1999	43
9/1/2000	28
9/1/2001	14
9/1/2002	19
9/1/2003	17
9/1/2004	31
9/1/2005	17
9/1/2006	14.7
9/1/2007	13.8
9/1/2008	8.48
9/1/2009	10.1
9/1/2010	7.17
9/1/2011	9.16
9/1/2012	11.6
9/1/2013	11.1
9/1/2014	10.5
9/1/2015	6.2
9/27/2016	7.8
9/15/2017	8.4
9/12/2018	7.8
9/17/2019	5.2
4/29/2021	7
9/28/2021	8.5
9/20/2022	7.7
9/18/2023	8

EPA Screening (suspected outliers for Rosner's Test)



n = 25

Rosner's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 24.94, std. dev. 12.43, critical Tn 2.663

Normality test used:
Shapiro Wilk@alpha = 0.05
Calculated = 0.9213
Critical = 0.918
The distribution was found to be normally distributed.

Constituent: Sulfate Analysis Run 10/30/2023 12:19 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

EPA 1989 Outlier Screening

Constituent: Sulfate (mg/L) Analysis Run 10/30/2023 12:20 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-9 (bg)
9/1/1999	30
9/1/2000	35
9/1/2001	38
9/1/2002	36
9/1/2003	35
9/1/2004	39
9/1/2005	44
9/1/2006	42.7
9/1/2007	28.7
9/1/2008	35.2
9/1/2009	35.6
9/1/2010	25.6
9/1/2011	26
9/1/2012	27.5
9/1/2013	19.7
9/1/2014	24.1
9/1/2015	27.2
9/25/2016	6.3
9/14/2017	12
9/12/2018	9.1
9/17/2019	5.1
9/1/2020	5.6
9/28/2021	12
9/20/2022	13
9/21/2023	11

Attachment E5

Interwell Prediction Limit Analysis Results – West

Prediction Limit

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input Printed 10/30/2023, 11:49 AM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Wells	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Arsenic (ug/L)	MW-19	1.60	n/a	9/21/2023	0.53ND	No	23	MW-13,MW-8,MW-14	n/a	n/a	56.52	n/a	n/a	0.003168	NP Inter (NDs) 1 of 2
Arsenic (ug/L)	MW-21	1.60	n/a	9/21/2023	0.92J	No	23	MW-13,MW-8,MW-14	n/a	n/a	56.52	n/a	n/a	0.003168	NP Inter (NDs) 1 of 2
Arsenic (ug/L)	MW-3	1.60	n/a	9/21/2023	0.65J	No	23	MW-13,MW-8,MW-14	n/a	n/a	56.52	n/a	n/a	0.003168	NP Inter (NDs) 1 of 2
Arsenic (ug/L)	**MW-4**	**1.60**	**n/a**	**9/21/2023**	**2.6**	**Yes**	**23**	**MW-13,MW-8,MW-14**	**n/a**	**n/a**	**56.52**	**n/a**	**n/a**	**0.003168**	**NP Inter (NDs) 1 of 2**
Arsenic (ug/L)	MW-5	1.60	n/a	9/21/2023	0.72J	No	23	MW-13,MW-8,MW-14	n/a	n/a	56.52	n/a	n/a	0.003168	NP Inter (NDs) 1 of 2
Arsenic (ug/L)	MW-7	1.60	n/a	9/20/2023	0.53ND	No	23	MW-13,MW-8,MW-14	n/a	n/a	56.52	n/a	n/a	0.003168	NP Inter (NDs) 1 of 2
Barium (ug/L)	MW-19	163	n/a	9/21/2023	120	No	23	MW-13,MW-14,MW-8	96.69	28.68	0	None	No	0.0005787	Param Inter 1 of 2
Barium (ug/L)	MW-21	163	n/a	9/21/2023	130	No	23	MW-13,MW-14,MW-8	96.69	28.68	0	None	No	0.0005787	Param Inter 1 of 2
Barium (ug/L)	MW-3	163	n/a	9/21/2023	150	No	23	MW-13,MW-14,MW-8	96.69	28.68	0	None	No	0.0005787	Param Inter 1 of 2
Barium (ug/L)	MW-4	163	n/a	9/21/2023	94	No	23	MW-13,MW-14,MW-8	96.69	28.68	0	None	No	0.0005787	Param Inter 1 of 2
Barium (ug/L)	MW-5	163	n/a	9/21/2023	120	No	23	MW-13,MW-14,MW-8	96.69	28.68	0	None	No	0.0005787	Param Inter 1 of 2
Barium (ug/L)	MW-7	163	n/a	9/20/2023	110	No	23	MW-13,MW-14,MW-8	96.69	28.68	0	None	No	0.0005787	Param Inter 1 of 2
Beryllium (ug/L)	MW-19	0.330	n/a	9/21/2023	0.33ND	No	23	MW-13,MW-8,MW-14	n/a	n/a	95.65	n/a	n/a	0.003168	NP Inter (NDs) 1 of 2
Beryllium (ug/L)	MW-21	0.330	n/a	9/21/2023	0.33ND	No	23	MW-13,MW-8,MW-14	n/a	n/a	95.65	n/a	n/a	0.003168	NP Inter (NDs) 1 of 2
Beryllium (ug/L)	MW-3	0.330	n/a	9/21/2023	0.33ND	No	23	MW-13,MW-8,MW-14	n/a	n/a	95.65	n/a	n/a	0.003168	NP Inter (NDs) 1 of 2
Beryllium (ug/L)	MW-4	0.330	n/a	9/21/2023	0.33ND	No	23	MW-13,MW-8,MW-14	n/a	n/a	95.65	n/a	n/a	0.003168	NP Inter (NDs) 1 of 2
Beryllium (ug/L)	MW-5	0.330	n/a	9/21/2023	0.33ND	No	23	MW-13,MW-8,MW-14	n/a	n/a	95.65	n/a	n/a	0.003168	NP Inter (NDs) 1 of 2
Beryllium (ug/L)	MW-7	0.330	n/a	9/20/2023	0.33ND	No	23	MW-13,MW-8,MW-14	n/a	n/a	95.65	n/a	n/a	0.003168	NP Inter (NDs) 1 of 2
Boron (ug/L)	MW-19	1340	n/a	9/21/2023	38ND	No	23	MW-13,MW-14,MW-8	4.676	1.099	13.04	None	ln(x)	0.0005787	Param Inter 1 of 2
Boron (ug/L)	MW-21	1340	n/a	9/21/2023	1300	No	23	MW-13,MW-14,MW-8	4.676	1.099	13.04	None	ln(x)	0.0005787	Param Inter 1 of 2
Boron (ug/L)	MW-3	1340	n/a	9/21/2023	1300	No	23	MW-13,MW-14,MW-8	4.676	1.099	13.04	None	ln(x)	0.0005787	Param Inter 1 of 2
Boron (ug/L)	**MW-4**	**1340**	**n/a**	**9/21/2023**	**3400**	**Yes**	**23**	**MW-13,MW-14,MW-8**	**4.676**	**1.099**	**13.04**	**None**	**ln(x)**	**0.0005787**	**Param Inter 1 of 2**
Boron (ug/L)	MW-5	1340	n/a	9/21/2023	420	No	23	MW-13,MW-14,MW-8	4.676	1.099	13.04	None	ln(x)	0.0005787	Param Inter 1 of 2
Boron (ug/L)	MW-7	1340	n/a	9/20/2023	110	No	23	MW-13,MW-14,MW-8	4.676	1.099	13.04	None	ln(x)	0.0005787	Param Inter 1 of 2
Chloride (mg/L)	MW-19	51.9	n/a	9/21/2023	19	No	74	MW-13,MW-14,MW-8	n/a	n/a	40.54	n/a	n/a	0.0003516	NP Inter (normality) ...
Chloride (mg/L)	MW-21	51.9	n/a	9/21/2023	18	No	74	MW-13,MW-14,MW-8	n/a	n/a	40.54	n/a	n/a	0.0003516	NP Inter (normality) ...
Chloride (mg/L)	MW-3	51.9	n/a	9/21/2023	14	No	74	MW-13,MW-14,MW-8	n/a	n/a	40.54	n/a	n/a	0.0003516	NP Inter (normality) ...
Chloride (mg/L)	MW-4	51.9	n/a	9/21/2023	12	No	74	MW-13,MW-14,MW-8	n/a	n/a	40.54	n/a	n/a	0.0003516	NP Inter (normality) ...
Chloride (mg/L)	MW-5	51.9	n/a	9/21/2023	4.5J	No	74	MW-13,MW-14,MW-8	n/a	n/a	40.54	n/a	n/a	0.0003516	NP Inter (normality) ...
Chloride (mg/L)	MW-7	51.9	n/a	9/20/2023	19	No	74	MW-13,MW-14,MW-8	n/a	n/a	40.54	n/a	n/a	0.0003516	NP Inter (normality) ...
Cobalt (ug/L)	MW-19	3.58	n/a	9/21/2023	0.085ND	No	23	MW-13,MW-14,MW-8	-0.9294	0.9591	8.696	None	ln(x)	0.0005787	Param Inter 1 of 2
Cobalt (ug/L)	MW-21	3.58	n/a	9/21/2023	1	No	23	MW-13,MW-14,MW-8	-0.9294	0.9591	8.696	None	ln(x)	0.0005787	Param Inter 1 of 2
Cobalt (ug/L)	MW-3	3.58	n/a	9/21/2023	0.75	No	23	MW-13,MW-14,MW-8	-0.9294	0.9591	8.696	None	ln(x)	0.0005787	Param Inter 1 of 2
Cobalt (ug/L)	MW-4	3.58	n/a	9/21/2023	0.9	No	23	MW-13,MW-14,MW-8	-0.9294	0.9591	8.696	None	ln(x)	0.0005787	Param Inter 1 of 2
Cobalt (ug/L)	MW-5	3.58	n/a	9/21/2023	0.53	No	23	MW-13,MW-14,MW-8	-0.9294	0.9591	8.696	None	ln(x)	0.0005787	Param Inter 1 of 2
Cobalt (ug/L)	MW-7	3.58	n/a	9/20/2023	0.31J	No	23	MW-13,MW-14,MW-8	-0.9294	0.9591	8.696	None	ln(x)	0.0005787	Param Inter 1 of 2
Iron (ug/L)	MW-19	5220	n/a	9/21/2023	18ND	No	23	MW-13,MW-14,MW-8	5.438	1.358	4.348	None	ln(x)	0.0005787	Param Inter 1 of 2
Iron (ug/L)	MW-21	5220	n/a	9/21/2023	730	No	23	MW-13,MW-14,MW-8	5.438	1.358	4.348	None	ln(x)	0.0005787	Param Inter 1 of 2
Iron (ug/L)	MW-3	5220	n/a	9/21/2023	430	No	23	MW-13,MW-14,MW-8	5.438	1.358	4.348	None	ln(x)	0.0005787	Param Inter 1 of 2
Iron (ug/L)	MW-4	5220	n/a	9/21/2023	1900	No	23	MW-13,MW-14,MW-8	5.438	1.358	4.348	None	ln(x)	0.0005787	Param Inter 1 of 2
Iron (ug/L)	MW-5	5220	n/a	9/21/2023	360	No	23	MW-13,MW-14,MW-8	5.438	1.358	4.348	None	ln(x)	0.0005787	Param Inter 1 of 2
Iron (ug/L)	MW-7	5220	n/a	9/20/2023	54J	No	23	MW-13,MW-14,MW-8	5.438	1.358	4.348	None	ln(x)	0.0005787	Param Inter 1 of 2
Lead (ug/L)	MW-19	2.55	n/a	9/21/2023	0.24ND	No	23	MW-13,MW-14,MW-8	-1.083	0.8793	17.39	None	ln(x)	0.0005787	Param Inter 1 of 2
Lead (ug/L)	MW-21	2.55	n/a	9/21/2023	1.4	No	23	MW-13,MW-14,MW-8	-1.083	0.8793	17.39	None	ln(x)	0.0005787	Param Inter 1 of 2
Lead (ug/L)	MW-3	2.55	n/a	9/21/2023	0.68	No	23	MW-13,MW-14,MW-8	-1.083	0.8793	17.39	None	ln(x)	0.0005787	Param Inter 1 of 2
Lead (ug/L)	MW-4	2.55	n/a	9/21/2023	0.28J	No	23	MW-13,MW-14,MW-8	-1.083	0.8793	17.39	None	ln(x)	0.0005787	Param Inter 1 of 2
Lead (ug/L)	MW-5	2.55	n/a	9/21/2023	0.6	No	23	MW-13,MW-14,MW-8	-1.083	0.8793	17.39	None	ln(x)	0.0005787	Param Inter 1 of 2
Lead (ug/L)	MW-7	2.55	n/a	9/20/2023	0.24ND	No	23	MW-13,MW-14,MW-8	-1.083	0.8793	17.39	None	ln(x)	0.0005787	Param Inter 1 of 2
Magnesium (ug/L)	MW-19	27600	n/a	9/21/2023	18000	No	23	MW-13,MW-14,MW-8	20317	3178	0	None	No	0.0005787	Param Inter 1 of 2
Magnesium (ug/L)	MW-21	27600	n/a	9/21/2023	20000	No	23	MW-13,MW-14,MW-8	20317	3178	0	None	No	0.0005787	Param Inter 1 of 2

Prediction Limit

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input Printed 10/30/2023, 11:49 AM

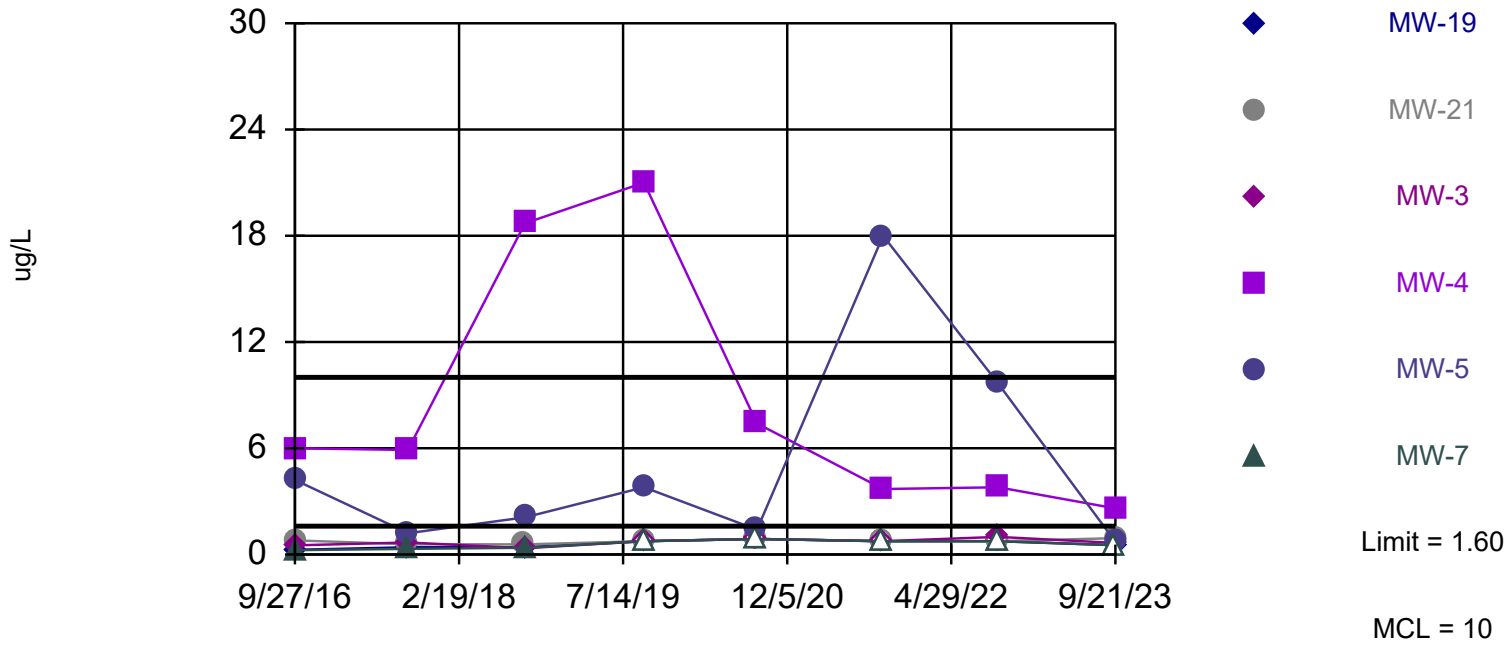
Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Wells	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Magnesium (ug/L)	MW-3	27600	n/a	9/21/2023	18000	No	23	MW-13,MW-14,MW-8	20317	3178	0	None	No	0.0005787	Param Inter 1 of 2
Magnesium (ug/L)	MW-4	27600	n/a	9/21/2023	17000	No	23	MW-13,MW-14,MW-8	20317	3178	0	None	No	0.0005787	Param Inter 1 of 2
Magnesium (ug/L)	MW-5	27600	n/a	9/21/2023	13000	No	23	MW-13,MW-14,MW-8	20317	3178	0	None	No	0.0005787	Param Inter 1 of 2
Magnesium (ug/L)	MW-7	27600	n/a	9/20/2023	18000	No	23	MW-13,MW-14,MW-8	20317	3178	0	None	No	0.0005787	Param Inter 1 of 2
Manganese (ug/L)	MW-19	637	n/a	9/21/2023	5J	No	23	MW-13,MW-14,MW-8	3.782	1.164	0	None	ln(x)	0.0005787	Param Inter 1 of 2
Manganese (ug/L)	MW-21	637	n/a	9/21/2023	160	No	23	MW-13,MW-14,MW-8	3.782	1.164	0	None	ln(x)	0.0005787	Param Inter 1 of 2
Manganese (ug/L)	MW-3	637	n/a	9/21/2023	78	No	23	MW-13,MW-14,MW-8	3.782	1.164	0	None	ln(x)	0.0005787	Param Inter 1 of 2
Manganese (ug/L)	**MW-4**	**637**	**n/a**	**9/21/2023**	**1200**	**Yes**	**23**	**MW-13,MW-14,MW-8**	**3.782**	**1.164**	**0**	**None**	**ln(x)**	**0.0005787**	**Param Inter 1 of 2**
Manganese (ug/L)	MW-5	637	n/a	9/21/2023	18	No	23	MW-13,MW-14,MW-8	3.782	1.164	0	None	ln(x)	0.0005787	Param Inter 1 of 2
Manganese (ug/L)	MW-7	637	n/a	9/20/2023	17	No	23	MW-13,MW-14,MW-8	3.782	1.164	0	None	ln(x)	0.0005787	Param Inter 1 of 2
Selenium (ug/L)	MW-19	3.49	n/a	9/21/2023	2.4J	No	23	MW-13,MW-14,MW-8	0.1055	0.4985	43.48	None	ln(x)	0.0005787	Param Inter 1 of 2
Selenium (ug/L)	MW-21	3.49	n/a	9/21/2023	3.8J	No	23	MW-13,MW-14,MW-8	0.1055	0.4985	43.48	None	ln(x)	0.0005787	Param Inter 1 of 2
Selenium (ug/L)	**MW-3**	**3.49**	**n/a**	**9/21/2023**	**7.4**	**Yes**	**23**	**MW-13,MW-14,MW-8**	**0.1055**	**0.4985**	**43.48**	**None**	**ln(x)**	**0.0005787**	**Param Inter 1 of 2**
Selenium (ug/L)	MW-4	3.49	n/a	9/21/2023	1.4ND	No	23	MW-13,MW-14,MW-8	0.1055	0.4985	43.48	None	ln(x)	0.0005787	Param Inter 1 of 2
Selenium (ug/L)	**MW-5**	**3.49**	**n/a**	**9/21/2023**	**54**	**Yes**	**23**	**MW-13,MW-14,MW-8**	**0.1055**	**0.4985**	**43.48**	**None**	**ln(x)**	**0.0005787**	**Param Inter 1 of 2**
Selenium (ug/L)	MW-7	3.49	n/a	9/20/2023	2.3J	No	23	MW-13,MW-14,MW-8	0.1055	0.4985	43.48	None	ln(x)	0.0005787	Param Inter 1 of 2
Sulfate (mg/L)	MW-19	175	n/a	9/21/2023	25	No	74	MW-13,MW-14,MW-8	3.707	0.7077	0	None	ln(x)	0.0005787	Param Inter 1 of 2
Sulfate (mg/L)	MW-21	175	n/a	9/21/2023	38	No	74	MW-13,MW-14,MW-8	3.707	0.7077	0	None	ln(x)	0.0005787	Param Inter 1 of 2
Sulfate (mg/L)	MW-3	175	n/a	9/21/2023	96	No	74	MW-13,MW-14,MW-8	3.707	0.7077	0	None	ln(x)	0.0005787	Param Inter 1 of 2
Sulfate (mg/L)	MW-4	175	n/a	9/21/2023	57	No	74	MW-13,MW-14,MW-8	3.707	0.7077	0	None	ln(x)	0.0005787	Param Inter 1 of 2
Sulfate (mg/L)	MW-5	175	n/a	9/21/2023	28	No	74	MW-13,MW-14,MW-8	3.707	0.7077	0	None	ln(x)	0.0005787	Param Inter 1 of 2
Sulfate (mg/L)	MW-7	175	n/a	9/20/2023	25	No	74	MW-13,MW-14,MW-8	3.707	0.7077	0	None	ln(x)	0.0005787	Param Inter 1 of 2

Hollow symbols indicate censored values.

Exceeds Limit: MW-4

Arsenic

Interwell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because censored data exceeded 49%. Limit is highest of 23 background values. 56.52% NDs. Annual per-constituent alpha = 0.04041. Individual comparison alpha = 0.003168 (1 of 2). Comparing 6 points to limit. Assumes 7 future values. Insufficient data to test for seasonality; data will not be deseasonalized.

Prediction Limit

Constituent: Arsenic (ug/L) Analysis Run 10/30/2023 11:49 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

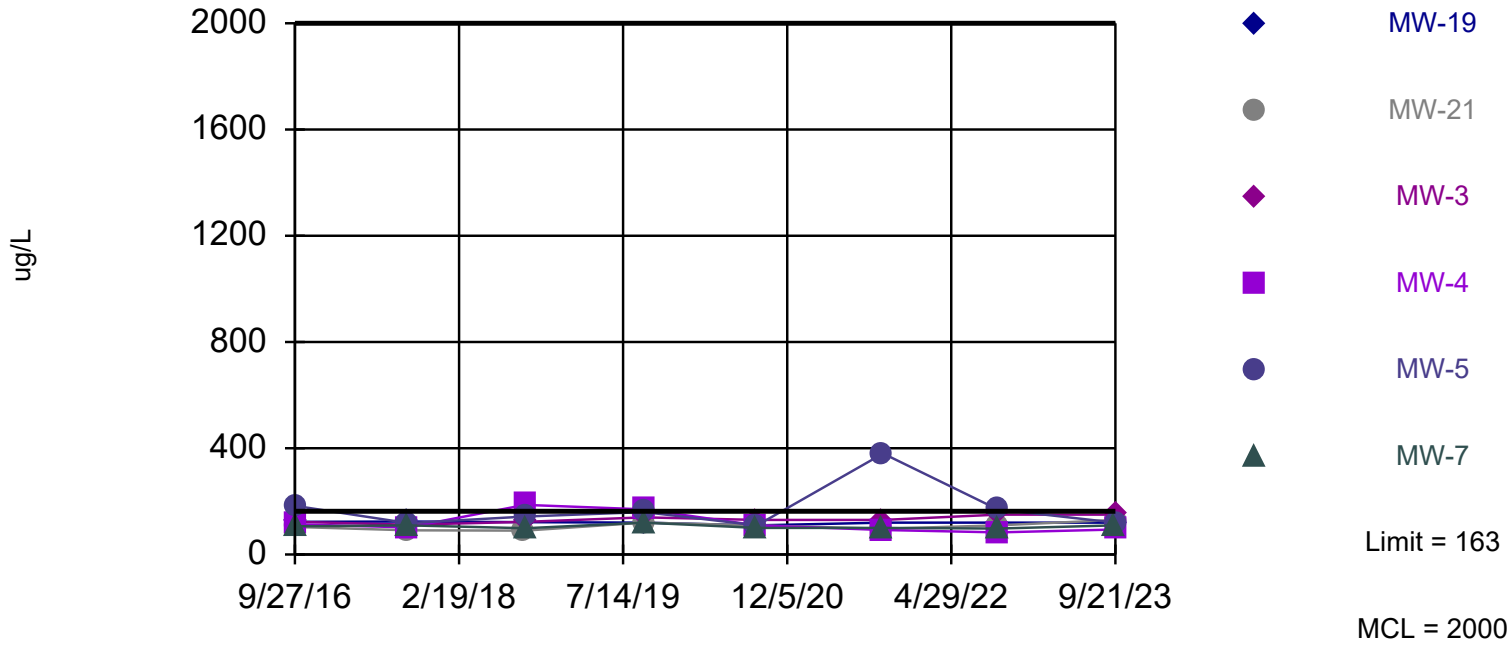
	MW-13 (bg)	MW-14 (bg)	MW-8 (bg)	MW-4	MW-7	MW-19	MW-3	MW-21	MW-5
9/25/2016	0.38 (J)								
9/26/2016		0.64 (J)	0.63 (J)						
9/27/2016				6	0.25 (J)	0.26 (J)			
9/28/2016							0.52 (J)	0.8 (J)	4.2
9/13/2017	0.16 (J)		0.29 (J)	5.9	0.32 (J)				
9/14/2017		1.6				0.41 (J)	0.68 (J)	0.58 (J)	1.2
9/11/2018	0.33 (J)							0.57 (J)	
9/12/2018		0.38 (J)	0.55 (J)	18.7		0.41 (J)			2.1
9/13/2018					0.38 (J)		0.35 (J)		
9/16/2019	<0.75	<0.75							
9/17/2019			<0.75	21	<0.75	<0.75	<0.75	0.75 (J)	3.8
9/1/2020		<0.88	<0.88		<0.88				
9/2/2020	<0.88			7.4		<0.88	<0.88	<0.88	1.4 (J)
9/27/2021	<0.75	<0.75							
9/28/2021					<0.75				
9/29/2021				3.7		<0.75	<0.75	<0.75	18
9/20/2022		<0.75	<0.75		<0.75	<0.75			9.7
9/21/2022	<0.75						1 (J)		
9/22/2022				3.8				<0.75	
9/20/2023	<0.53 (U)	<0.53 (U)			<0.53 (U)				
9/21/2023			0.55 (J)	2.6		<0.53 (U)	0.65 (J)	0.92 (J)	0.72 (J)

ND substitution: RL or RL/2 if <15% NDs.

Within Limit

Barium

Interwell Parametric



Background Data Summary: Mean=96.69, Std. Dev.=28.68, n=23. Insufficient data to test for seasonality; not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9343, critical = 0.881. Kappa = 2.298 (c=14, w=13, 1 of 2, event alpha = 0.1). Report alpha = 0.007498. Individual comparison alpha = 0.0005787. Comparing 6 points to limit. Assumes 7 future values.

Prediction Limit Analysis Run 10/30/2023 11:36 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Prediction Limit

Constituent: Barium (ug/L) Analysis Run 10/30/2023 11:50 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

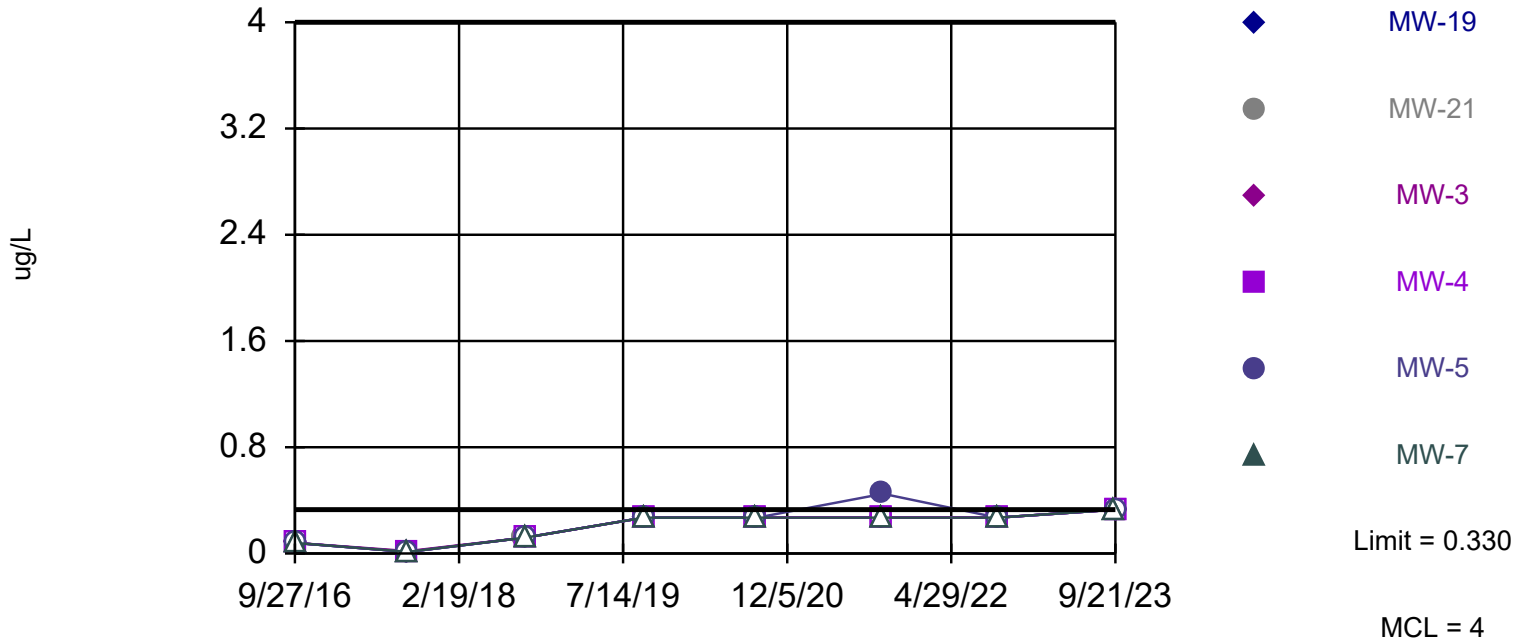
	MW-13 (bg)	MW-14 (bg)	MW-19	MW-21	MW-3	MW-4	MW-5	MW-7	MW-8 (bg)
9/25/2016	91.2								
9/26/2016		62.1							114
9/27/2016			123			114		106	
9/28/2016				104	123		183		
9/13/2017	101					102		110	135
9/14/2017		108	124	91.3	112		118		
9/11/2018	90.4			89.8					
9/12/2018		55.1	122			187	143		118
9/13/2018					123			98.9	
9/16/2019	97	56							
9/17/2019			120	120	140	170	160	120	150
9/1/2020		67						100	140
9/2/2020	96		110	110	130	110	110		
9/27/2021	100	62							
9/28/2021								100	
9/29/2021			120	97	130	92	380		
9/20/2022		59	120				170	98	110
9/21/2022	110				150				
9/22/2022				110		83			
9/20/2023	110	62						110	
9/21/2023			120	130	150	94	120		130

Hollow symbols indicate censored values.

Within Limit

Beryllium

Interwell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because censored data exceeded 49%. Limit is highest of 23 background values. 95.65% NDs. Annual per-constituent alpha = 0.04041. Individual comparison alpha = 0.003168 (1 of 2). Comparing 6 points to limit. Assumes 7 future values. Insufficient data to test for seasonality; data will not be deseasonalized.

Prediction Limit Analysis Run 10/30/2023 11:36 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Prediction Limit

Constituent: Beryllium (ug/L) Analysis Run 10/30/2023 11:50 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)	MW-14 (bg)	MW-8 (bg)	MW-4	MW-7	MW-19	MW-3	MW-21	MW-5
9/25/2016	<0.08								
9/26/2016		<0.08	<0.08						
9/27/2016				<0.08	<0.08	<0.08			
9/28/2016							<0.08	<0.08	<0.08
9/13/2017	<0.012		<0.012	0.012 (J)	<0.012				
9/14/2017		0.15 (J)				<0.012	0.018 (J)	0.015 (J)	<0.012
9/11/2018	<0.12							<0.12	
9/12/2018		<0.12	<0.12	<0.12		<0.12			<0.12
9/13/2018					<0.12		<0.12		
9/16/2019	<0.27	<0.27							
9/17/2019			<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27
9/1/2020		<0.27	<0.27		<0.27				
9/2/2020	<0.27			<0.27		<0.27	<0.27	<0.27	<0.27
9/27/2021	<0.27	<0.27							
9/28/2021					<0.27				
9/29/2021				<0.27		<0.27	<0.27	<0.27	0.45 (J)
9/20/2022		<0.27	<0.27		<0.27	<0.27			<0.27
9/21/2022	<0.27						<0.27		
9/22/2022				<0.27				<0.27	
9/20/2023	<0.33 (U)	<0.33 (U)			<0.33 (U)				
9/21/2023			<0.33 (U)	<0.33 (U)		<0.33 (U)	<0.33 (U)	<0.33 (U)	<0.33 (U)

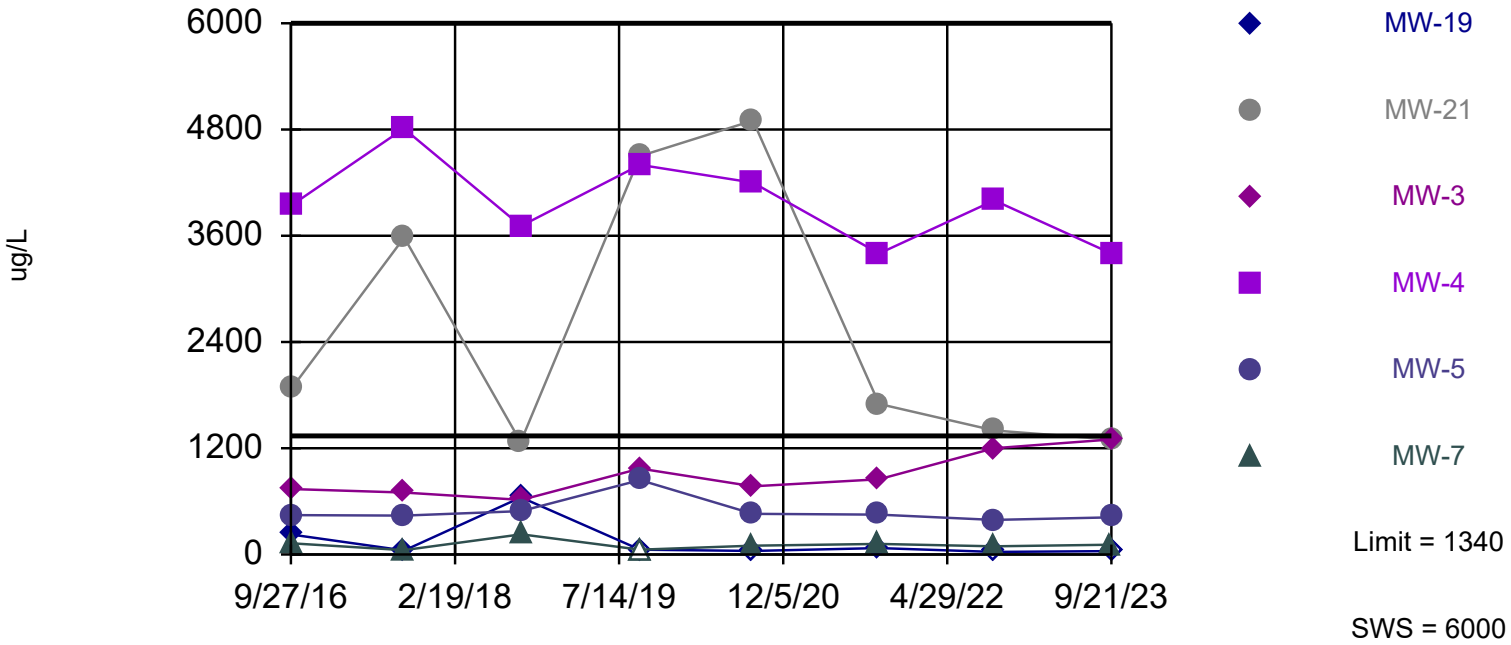
ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Exceeds Limit: MW-4

Boron

Interwell Parametric



Background Data Summary (based on natural log transformation): Mean=4.676, Std. Dev.=1.099, n=23, 13.04% NDs. Insufficient data to test for seasonality; not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9707, critical = 0.881. Kappa = 2.298 (c=14, w=13, 1 of 2, event alpha = 0.1). Report alpha = 0.007498. Individual comparison alpha = 0.0005787. Comparing 6 points to limit. Assumes 7 future values.

Prediction Limit Analysis Run 10/30/2023 11:36 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Prediction Limit

Constituent: Boron (ug/L) Analysis Run 10/30/2023 11:50 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

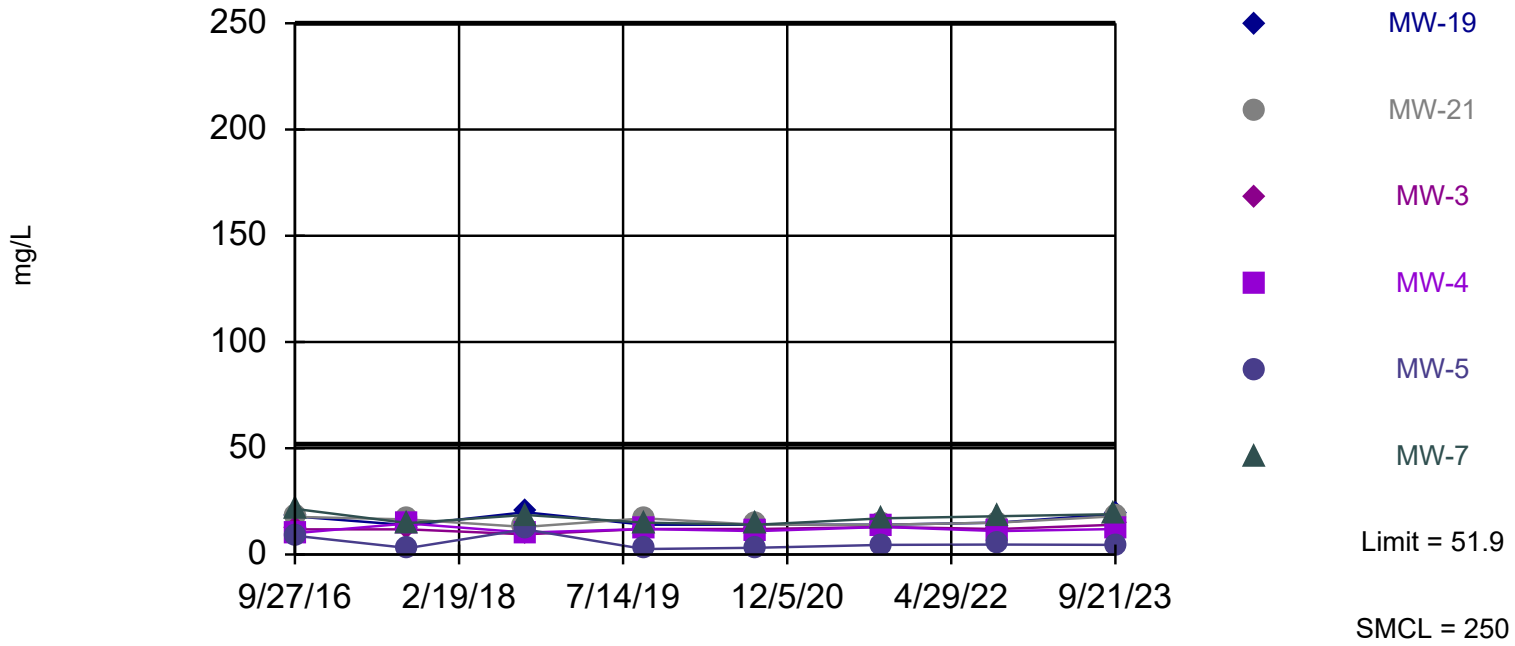
	MW-13 (bg)	MW-14 (bg)	MW-19	MW-21	MW-3	MW-4	MW-5	MW-7	MW-8 (bg)
9/25/2016	50.2 (J)								
9/26/2016		282							<50
9/27/2016			226			3940		126	
9/28/2016				1870	740		444		
9/13/2017	48.6 (J)					4810		49 (J)	37.6 (J)
9/14/2017		169	44.7 (J)	3580	700		440		
9/11/2018	41.4 (J)			1270					
9/12/2018		651	645			3710	490		<12.5
9/13/2018					616			228	
9/16/2019	130 (J)	360							
9/17/2019			<110	4500	970	4400	840	<110	160 (J)
9/1/2020		450						100	<80
9/2/2020	88 (J)		<80	4900	770	4200	460		
9/27/2021	110	280							
9/28/2021								120	
9/29/2021			72 (J)	1700	850	3400	450		
9/20/2022		500	<58				390	92 (J)	76 (J)
9/21/2022	94 (J)				1200				
9/22/2022				1400		4000			
9/20/2023	120	220						110	
9/21/2023			<76 (U)	1300	1300	3400	420		81 (J)

ND substitution: RL or RL/2 if <15% NDs.

Within Limit

Chloride

Interwell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 74 background values. 40.54% NDs. Annual per-constituent alpha = 0.004561. Individual comparison alpha = 0.0003516 (1 of 2). Comparing 6 points to limit. Assumes 7 future values. Insufficient data to test for seasonality; data will not be deseasonalized.

Prediction Limit Analysis Run 10/30/2023 11:36 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Prediction Limit

Constituent: Chloride (mg/L) Analysis Run 10/30/2023 11:50 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)	MW-14 (bg)	MW-8 (bg)	MW-7	MW-19	MW-4	MW-21	MW-5	MW-3
9/1/1999	<5	<5	46						
9/1/2000	<5	<5	19.5						
9/1/2001	5.9	5.9	18.3						
9/1/2002	<5	<5	11.9						
9/1/2003	<5	<5	14.5						
9/1/2004	<5	<5	27.1						
9/1/2005	<5	<5	18.5						
9/1/2006	<5	<5	14.6						
9/1/2007	<5	<5	40.6						
9/1/2008	<5	<5	51.9						
9/1/2009	<5	<5	43.4						
9/1/2010	<1	<2	44.5						
9/1/2011	<5	<2	30						
9/1/2012	<5	<5	33						
9/1/2013	1.4	1.6	19.7						
9/1/2014	<1	<1	41.3						
9/1/2015	1.1	<1	26.1						
9/25/2016	2.8								
9/26/2016		1.3	30.1						
9/27/2016				21.5	17.9	10			
9/28/2016							17.7	8.8	11.8
9/13/2017	4		19.8	14.8		14.6			
9/14/2017		1.7			13.8		16.5	3	11.8
9/11/2018	3.2						13		
9/12/2018		2.2	27.4		19.9	10.3		11.8	
9/13/2018				18.6					9.5
9/16/2019	1.9 (J,B)	2.1 (J,B)							
9/17/2019			17 (B)	15 (B)	14 (B)	12 (B)	17 (B)	2.6 (J,B)	12 (B)
9/1/2020		3.3 (J,B)	15 (B)	14 (B)					
9/2/2020	2.4 (J,B)				14 (B)	11 (B)	14 (B)	3.2 (J,B)	12 (B)
9/27/2021	3.1 (J)	3.9 (J)							
9/28/2021				17					
9/29/2021					14	13	14	4.5 (J)	13
9/20/2022		3.6 (J)	17	18	15			4.7 (J)	
9/21/2022	2.7 (J)								12
9/22/2022						11	15		
9/20/2023	<2.3 (U)	3.6 (J)		19					
9/21/2023			20		19	12	18	4.5 (J)	14

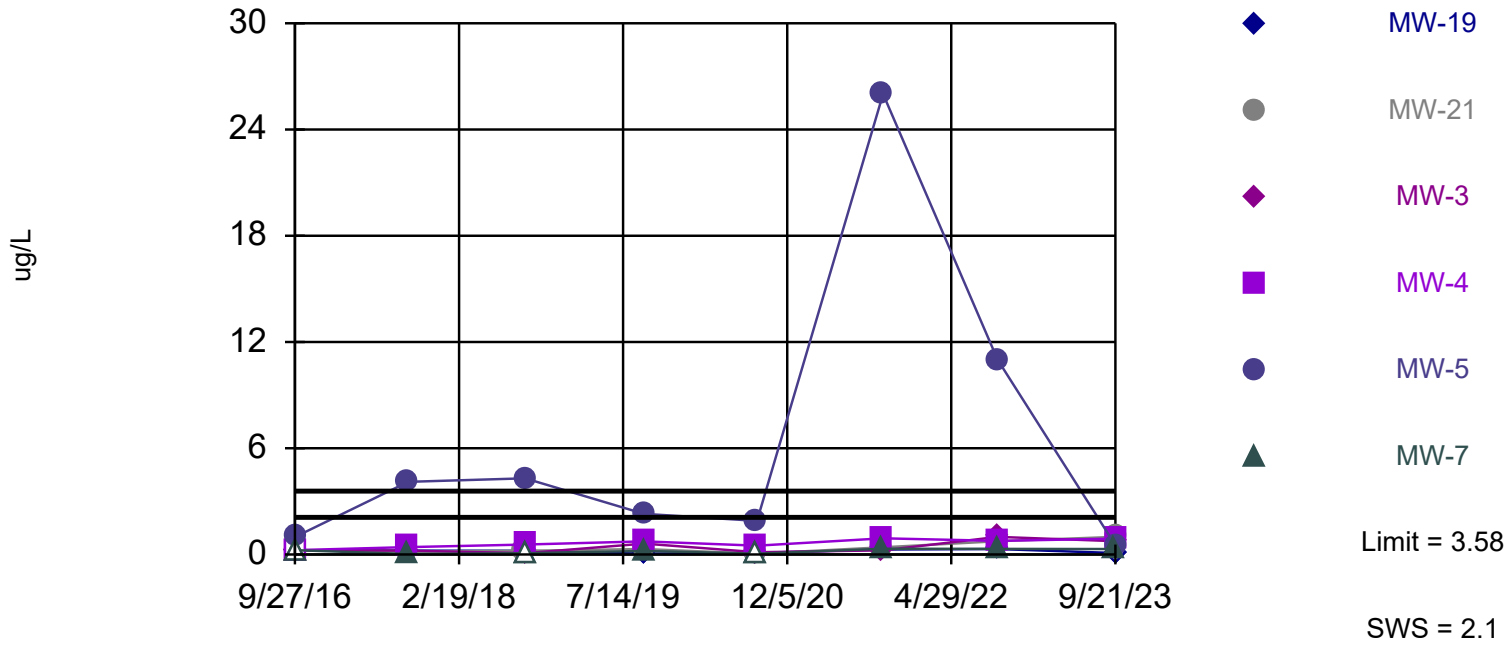
ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Within Limit

Cobalt

Interwell Parametric



Background Data Summary (based on natural log transformation): Mean=-0.9294, Std. Dev.=0.9591, n=23, 8.696% NDs. Insufficient data to test for seasonality; not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9822, critical = 0.881. Kappa = 2.298 (c=14, w=13, 1 of 2, event alpha = 0.1). Report alpha = 0.007498. Individual comparison alpha = 0.0005787. Comparing 6 points to limit. Assumes 7 future values.

Prediction Limit Analysis Run 10/30/2023 11:36 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Prediction Limit

Constituent: Cobalt (ug/L) Analysis Run 10/30/2023 11:50 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)	MW-14 (bg)	MW-19	MW-21	MW-3	MW-4	MW-5	MW-7	MW-8 (bg)
9/25/2016	1.2								
9/26/2016		1.3							<0.5
9/27/2016			<0.5			<0.5		<0.5	
9/28/2016				<0.5	<0.5		1		
9/13/2017	0.15 (J)					0.42 (J)		0.027 (J)	0.051 (J)
9/14/2017		3	0.22 (J)	0.16 (J)	0.22 (J)		4.1		
9/11/2018	0.52 (J)			0.21 (J)					
9/12/2018		0.5 (J)	0.21 (J)			0.56 (J)	4.3		0.15 (J)
9/13/2018					<0.15			<0.15	
9/16/2019	0.16 (J)	0.17 (J)							
9/17/2019			<0.091	0.31 (J)	0.62	0.74	2.3	0.2 (J)	0.51
9/1/2020		0.37 (J)						<0.091	0.62
9/2/2020	0.53		0.094 (J)	<0.091	0.13 (J)	0.5	1.9		
9/27/2021	<0.19	0.39 (J)							
9/28/2021								0.33 (J)	
9/29/2021			0.28 (J)	0.41 (J)	0.24 (J)	0.91	26		
9/20/2022		0.59	0.31 (J)				11	0.32 (J)	0.37 (J)
9/21/2022	0.73				1				
9/22/2022				0.75		0.77			
9/20/2023	0.2 (J)	0.44 (J)						0.31 (J)	
9/21/2023			<0.17 (U)	1	0.75	0.9	0.53		1.7

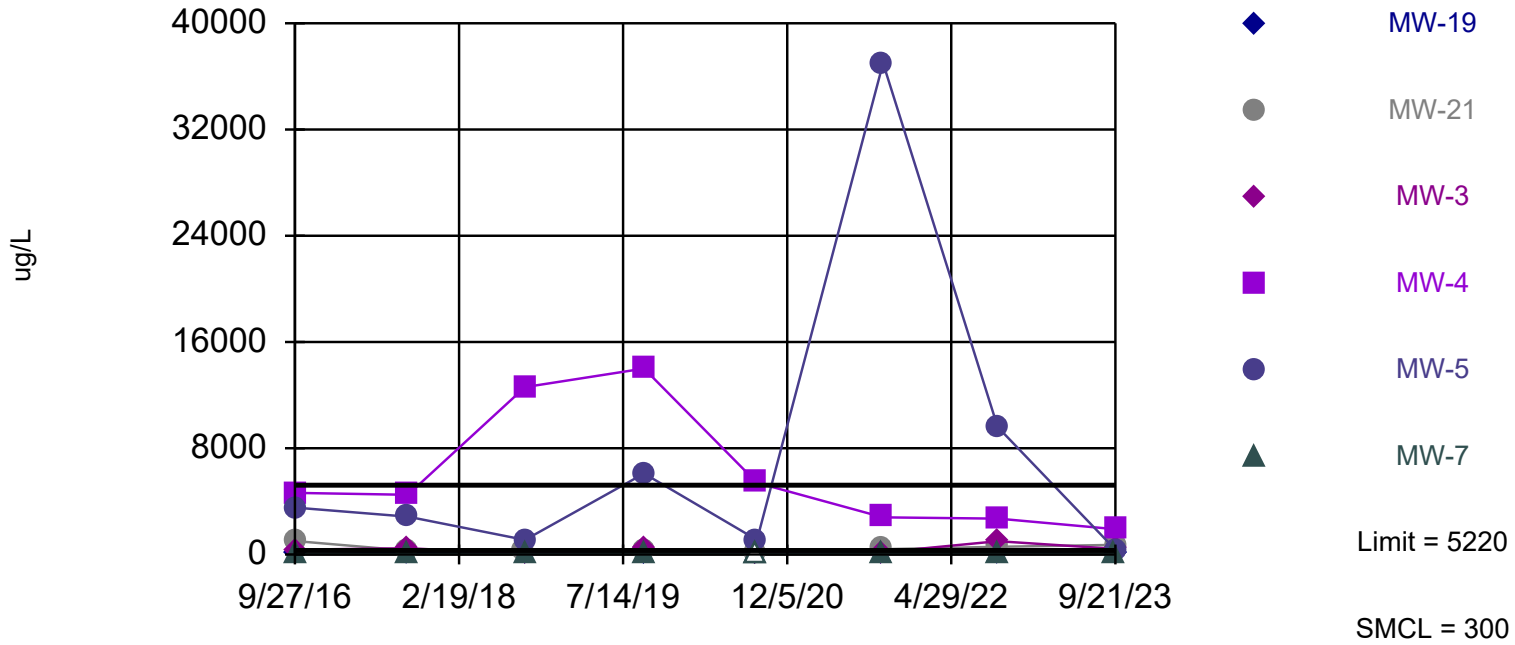
ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Within Limit

Iron

Interwell Parametric



Background Data Summary (based on natural log transformation): Mean=5.438, Std. Dev.=1.358, n=23, 4.348% NDs. Insufficient data to test for seasonality; not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9762, critical = 0.881. Kappa = 2.298 (c=14, w=13, 1 of 2, event alpha = 0.1). Report alpha = 0.007498. Individual comparison alpha = 0.0005787. Comparing 6 points to limit. Assumes 7 future values.

Prediction Limit Analysis Run 10/30/2023 11:36 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Prediction Limit

Constituent: Iron (ug/L) Analysis Run 10/30/2023 11:50 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)	MW-14 (bg)	MW-19	MW-21	MW-3	MW-4	MW-5	MW-7	MW-8 (bg)
9/25/2016	1240								
9/26/2016		1770							820
9/27/2016			<12.8			4640		51.9	
9/28/2016				1010	362		3530		
9/13/2017	162					4500		11.9 (J)	18.7 (J)
9/14/2017		4440	162	297	475		2850		
9/11/2018	289			195					
9/12/2018		267	101			12600	1100		45.2 (J)
9/13/2018					42.2 (J)			41.7 (J)	
9/16/2019	76 (J)	130							
9/17/2019			<66	320	390	14000	6100	95 (J)	200
9/1/2020		130						<50	520
9/2/2020	230		<50	110	72 (J)	5400	1100		
9/27/2021	<36	140							
9/28/2021								110	
9/29/2021			130	400	170	2800	37000		
9/20/2022		240	170				9600	90 (J)	270
9/21/2022	440				1000				
9/22/2022				580		2700			
9/20/2023	78 (J)	120						54 (J)	
9/21/2023			<36 (U)	730	430	1900	360		1200

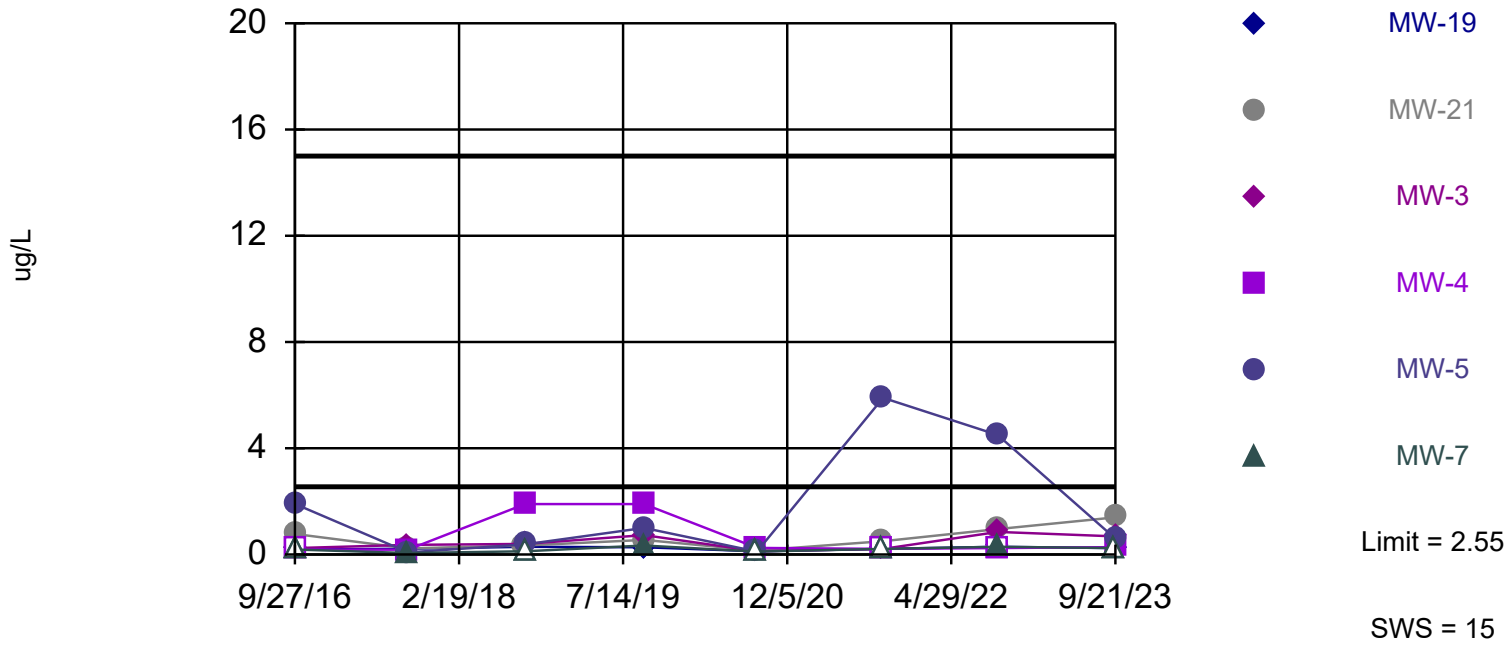
ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Within Limit

Lead

Interwell Parametric



Background Data Summary (based on natural log transformation): Mean=-1.083, Std. Dev.=0.8793, n=23, 17.39% NDs. Insufficient data to test for seasonality; not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9302, critical = 0.881. Kappa = 2.298 (c=14, w=13, 1 of 2, event alpha = 0.1). Report alpha = 0.007498. Individual comparison alpha = 0.0005787. Comparing 6 points to limit. Assumes 7 future values.

Prediction Limit

Constituent: Lead (ug/L) Analysis Run 10/30/2023 11:50 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

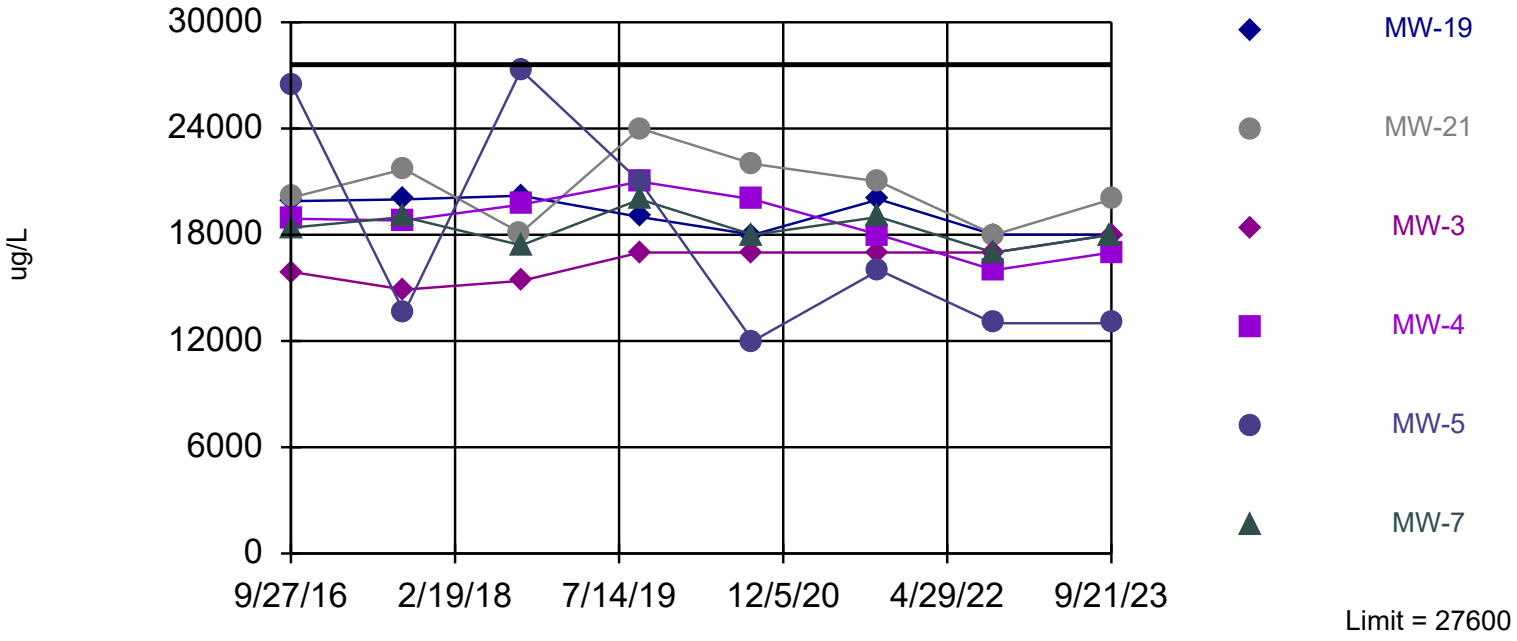
	MW-13 (bg)	MW-14 (bg)	MW-19	MW-21	MW-3	MW-4	MW-5	MW-7	MW-8 (bg)
9/25/2016	0.71 (J)								
9/26/2016		0.98 (J)							0.42 (J)
9/27/2016			<0.19			<0.19		<0.19	
9/28/2016				0.77 (J)	0.24 (J)		1.9		
9/13/2017	0.13 (J)					0.18 (J)		0.056 (J)	0.053 (J)
9/14/2017		1.9	0.22 (J)	0.23 (J)	0.36 (J)		0.08 (J)		
9/11/2018	0.39 (J)			0.34 (J)					
9/12/2018		0.42 (J)	0.29 (J)			1.9	0.38 (J)		0.14 (J)
9/13/2018					0.4 (J)			<0.12	
9/16/2019	<0.27	0.39 (J)							
9/17/2019			<0.27	0.55	0.73	1.9	1	0.34 (J)	0.29 (J)
9/1/2020		0.22 (J)						<0.11	0.16 (J)
9/2/2020	0.29 (J)		0.12 (J)	0.15 (J)	0.12 (J)	0.25 (J)	0.11 (J)		
9/27/2021	<0.21	<0.21							
9/28/2021								<0.21	
9/29/2021			<0.21	0.5	<0.21	<0.21	5.9		
9/20/2022		0.4 (J)	0.29 (J)				4.5	0.29 (J)	0.31 (J)
9/21/2022	0.47 (J)				0.85				
9/22/2022				0.96		<0.24			
9/20/2023	<0.24 (U)	0.26 (J)						<0.24 (U)	
9/21/2023			<0.24 (U)	1.4	0.68	0.28 (J)	0.6		3.5

ND substitution: RL or RL/2 if <15% NDs.

Within Limit

Magnesium

Interwell Parametric



Background Data Summary: Mean=20317, Std. Dev.=3178, n=23. Insufficient data to test for seasonality; not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8853, critical = 0.881. Kappa = 2.298 (c=14, w=13, 1 of 2, event alpha = 0.1). Report alpha = 0.007498. Individual comparison alpha = 0.0005787. Comparing 6 points to limit. Assumes 7 future values.

Prediction Limit

Constituent: Magnesium (ug/L) Analysis Run 10/30/2023 11:50 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

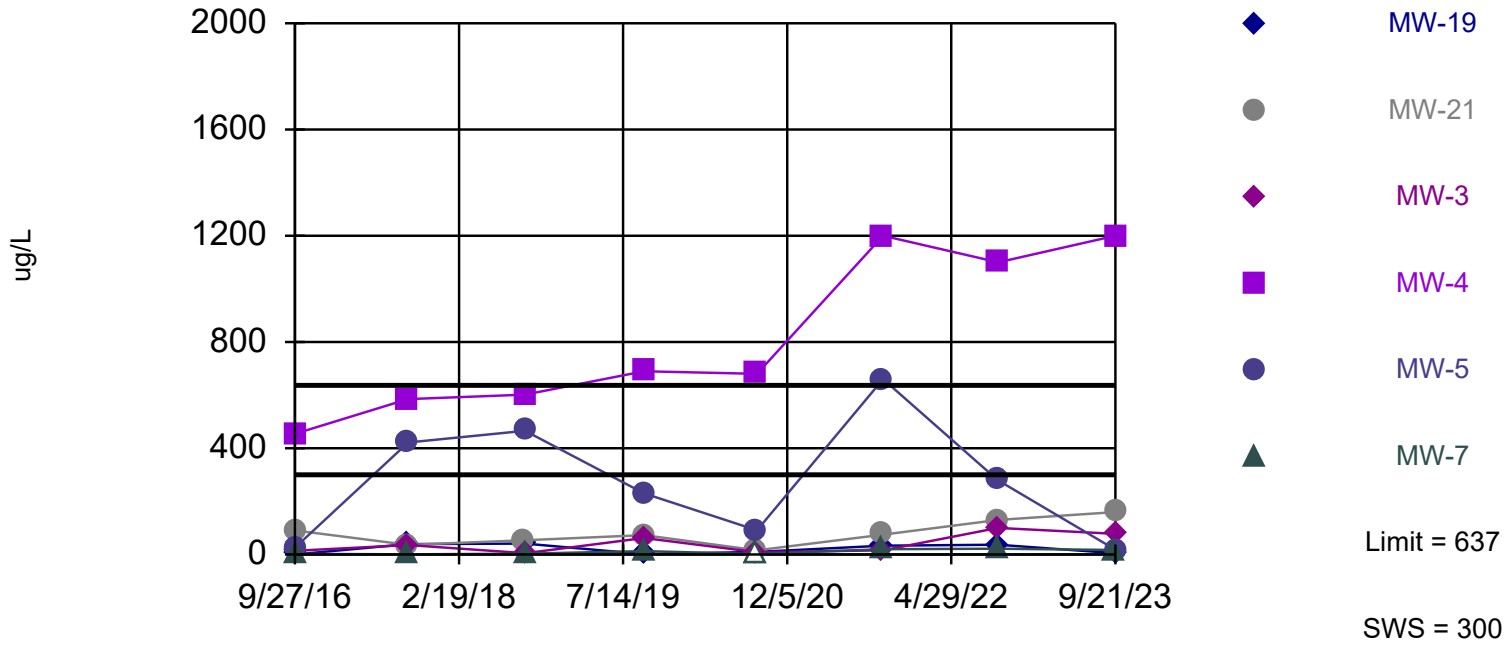
	MW-13 (bg)	MW-14 (bg)	MW-19	MW-21	MW-3	MW-4	MW-5	MW-7	MW-8 (bg)
9/25/2016	19000								
9/26/2016		25000							19600
9/27/2016			19900			18900		18400	
9/28/2016				20100	15900		26500		
9/13/2017	17900					18800		19000	22400
9/14/2017		29800	20000	21700	14900		13600		
9/11/2018	17600			18100					
9/12/2018		21600	20200			19700	27300		17400
9/13/2018					15400			17400	
9/16/2019	16000	22000							
9/17/2019			19000	24000	17000	21000	21000	20000	23000
9/1/2020		22000						18000	22000
9/2/2020	18000		18000	22000	17000	20000	12000		
9/27/2021	19000	23000							
9/28/2021								19000	
9/29/2021			20000	21000	17000	18000	16000		
9/20/2022		19000	18000				13000	17000	18000
9/21/2022	18000				17000				
9/22/2022				18000		16000			
9/20/2023	18000	22000						18000	
9/21/2023			18000	20000	18000	17000	13000		17000

Hollow symbols indicate censored values.

Exceeds Limit: MW-4

Manganese

Interwell Parametric



Background Data Summary (based on natural log transformation): Mean=3.782, Std. Dev.=1.164, n=23. Insufficient data to test for seasonality; not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9654, critical = 0.881. Kappa = 2.298 (c=14, w=13, 1 of 2, event alpha = 0.1). Report alpha = 0.007498. Individual comparison alpha = 0.0005787. Comparing 6 points to limit. Assumes 7 future values.

Prediction Limit

Constituent: Manganese (ug/L) Analysis Run 10/30/2023 11:50 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)	MW-14 (bg)	MW-19	MW-21	MW-3	MW-4	MW-5	MW-7	MW-8 (bg)
9/25/2016	148								
9/26/2016		118							51.6
9/27/2016			0.3 (J)			454		2.6	
9/28/2016				90.3	13.7		26.6		
9/13/2017	14.6					585		0.78 (J)	4.3
9/14/2017		407	39.1	36.1	35.8		422		
9/11/2018	59.8			53.6					
9/12/2018		64.9	40.9			602	466		6.6
9/13/2018					5.2			2.9	
9/16/2019	15	27							
9/17/2019			<2.5	73	62	690	230	13	51
9/1/2020		27						<4	150
9/2/2020	110		10	16	8.6 (J)	680	91		
9/27/2021	5.7 (J)	36							
9/28/2021								20	
9/29/2021			33	75	16	1200	660		
9/20/2022		71	37				280	22	27
9/21/2022	79				100				
9/22/2022				130		1100			
9/20/2023	21	120						17	
9/21/2023			5 (J)	160	78	1200	18		140

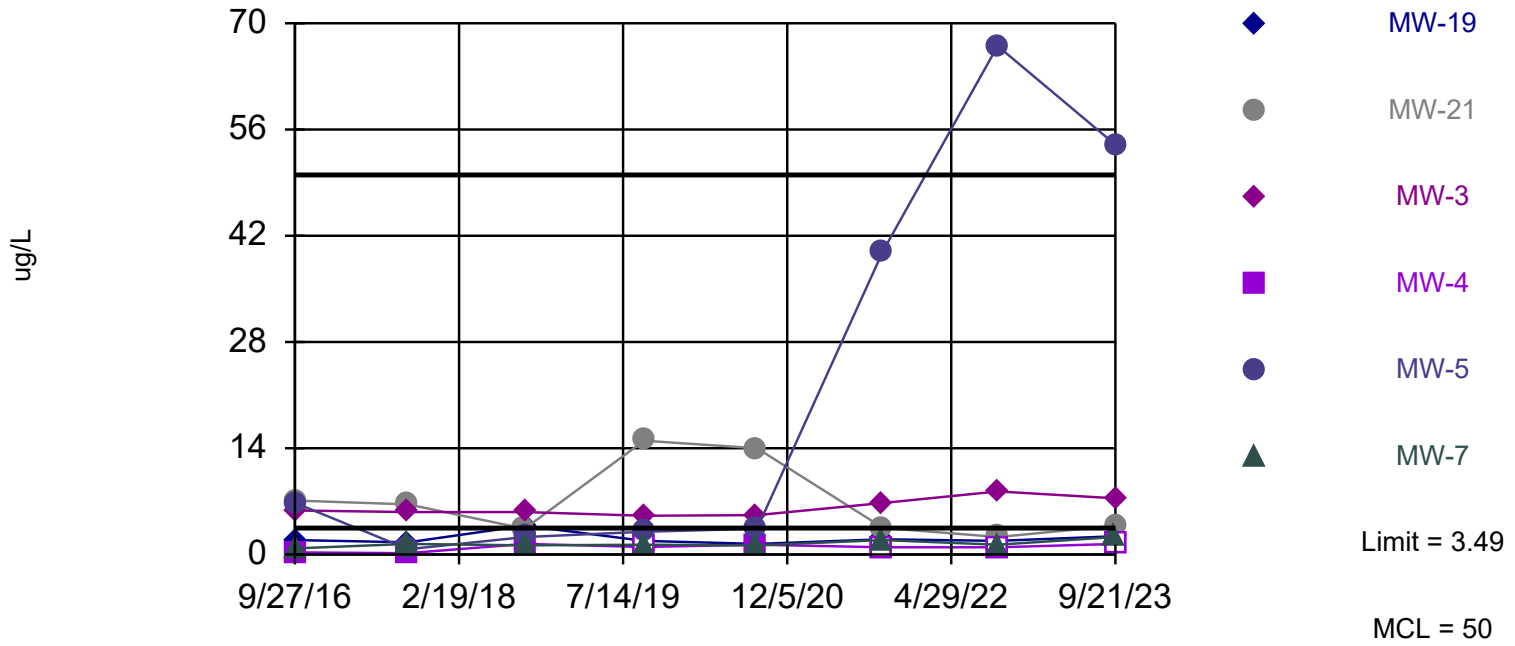
ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Exceeds Limit: MW-3, MW-5

Selenium

Interwell Parametric



Background Data Summary (based on natural log transformation): Mean=0.1055, Std. Dev.=0.4985, n=23, 43.48% NDs. Insufficient data to test for seasonality; not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9051, critical = 0.881. Kappa = 2.298 (c=14, w=13, 1 of 2, event alpha = 0.1). Report alpha = 0.007498. Individual comparison alpha = 0.0005787. Comparing 6 points to limit. Assumes 7 future values.

Prediction Limit Analysis Run 10/30/2023 11:36 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Prediction Limit

Constituent: Selenium (ug/L) Analysis Run 10/30/2023 11:50 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

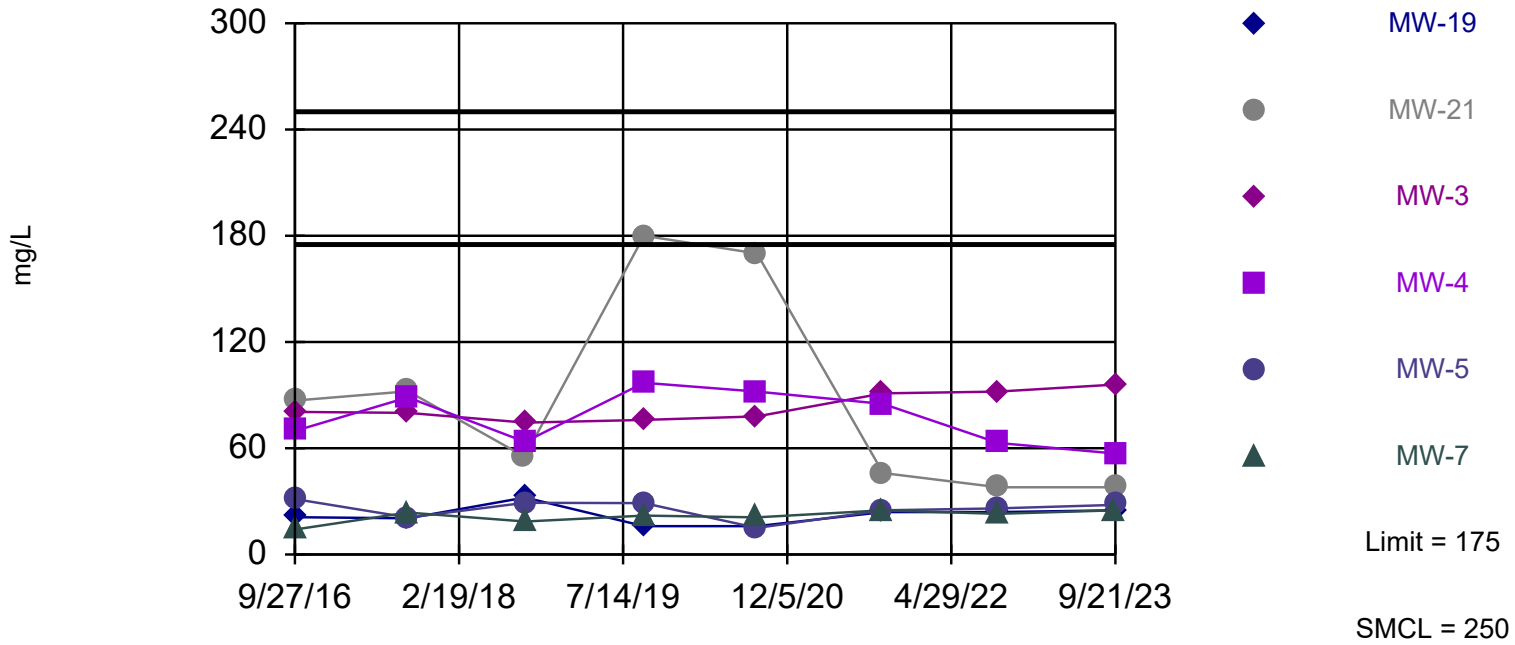
	MW-13 (bg)	MW-14 (bg)	MW-19	MW-21	MW-3	MW-4	MW-5	MW-7	MW-8 (bg)
9/25/2016	1.1								
9/26/2016		1.7							0.41 (J)
9/27/2016			1.9			0.27 (J)		0.8 (J)	
9/28/2016				7.1	5.8		6.8		
9/13/2017	1					0.17 (J)		1.4	1
9/14/2017		0.63 (J)	1.6	6.6	5.6		0.69 (J)		
9/11/2018	1.3			3.4					
9/12/2018		4	3.8			1.4	2.3		0.34 (J)
9/13/2018					5.6			1.2	
9/16/2019	1.1 (J)	1.7 (J)							
9/17/2019			1.8 (J)	15	5.1	<1	3 (J)	1.3 (J)	<1
9/1/2020		1.9 (J)						1.2 (J)	<1
9/2/2020	<1		1.4 (J)	14	5.2	1.3 (J)	3.4 (J)		
9/27/2021	<0.96	<0.96							
9/28/2021								1.9 (J)	
9/29/2021			2 (J)	3.5 (J)	6.8	<0.96	40		
9/20/2022		1.6 (J)	1.8 (J)				67	1.3 (J)	<0.96
9/21/2022	<0.96				8.3				
9/22/2022				2.3 (J)		<0.96			
9/20/2023	<1.4 (U)	<1.4 (U)						2.3 (J)	
9/21/2023			2.4 (J)	3.8 (J)	7.4	<1.4 (U)	54		<1.4 (U)

ND substitution: RL or RL/2 if <15% NDs.

Within Limit

Sulfate

Interwell Parametric



Background Data Summary (based on natural log transformation): Mean=3.707, Std. Dev.=0.7077, n=74. Insufficient data to test for seasonality; not deseasonalized. Normality test: Shapiro Francia @alpha = 0.01, calculated = 0.9703, critical = 0.956. Kappa = 2.057 (c=14, w=13, 1 of 2, event alpha = 0.1). Report alpha = 0.007498. Individual comparison alpha = 0.0005787. Comparing 6 points to limit. Assumes 7 future values.

Prediction Limit Analysis Run 10/30/2023 11:36 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Prediction Limit

Constituent: Sulfate (mg/L) Analysis Run 10/30/2023 11:50 AM View: West Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)	MW-14 (bg)	MW-19	MW-21	MW-3	MW-4	MW-5	MW-7	MW-8 (bg)
9/1/1999	56	64							25
9/1/2000	110	48							33
9/1/2001	76	56							23
9/1/2002	110	60							21
9/1/2003	100	32							27
9/1/2004	100	64							29
9/1/2005	120	80							28
9/1/2006	60.5	81.2							22.4
9/1/2007	106	86.9							23.5
9/1/2008	86.5	60							10.9
9/1/2009	80.2	56.5							10.5
9/1/2010	69.2	54.5							5.7
9/1/2011	70.5	51.8							14.3
9/1/2012	72.6	54.2							22.5
9/1/2013	69.3	50							26.5
9/1/2014	33.6	38.7							14
9/1/2015	68.9	49							11.1
9/25/2016	59.7								
9/26/2016		40							9.9
9/27/2016			21.1			69.8		14.1	
9/28/2016				86.9	80.5		31.3		
9/13/2017	67.6					88.7		23.7	21.3
9/14/2017		45.1	20.4	92.2	80		20.9		
9/11/2018	51.6			55.2					
9/12/2018		30.7	32.2			63.6	29.2		13.6
9/13/2018					74.5			18.6	
9/16/2019	48	32							
9/17/2019			16	180	76	97	29	22	17
9/1/2020		28						21	16
9/2/2020	42		16	170	78	92	15		
9/27/2021	110	42							
9/28/2021								25	
9/29/2021			24	46	91	85	25		
9/20/2022		30	24				26	23	20
9/21/2022	120				92				
9/22/2022				38		63			
9/20/2023	120	35						25	
9/21/2023			25	38	96	57	28		16

Attachment E6

Interwell Prediction Limit Analysis Results - East

Prediction Limit

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input Printed 10/30/2023, 2:58 PM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Wells	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Arsenic (ug/L)	MW-11AR	1.60	n/a	9/21/2023	0.89J	No	32	MW-10,MW-13,MW-9,n/a	n/a	n/a	62.5	n/a	n/a	0.001728	NP Inter (NDs) 1 of 2
Arsenic (ug/L)	MW-18	1.60	n/a	9/20/2023	0.53ND	No	32	MW-10,MW-13,MW-9,n/a	n/a	n/a	62.5	n/a	n/a	0.001728	NP Inter (NDs) 1 of 2
Arsenic (ug/L)	MW-20	1.60	n/a	9/20/2023	0.96J	No	32	MW-10,MW-13,MW-9,n/a	n/a	n/a	62.5	n/a	n/a	0.001728	NP Inter (NDs) 1 of 2
Arsenic (ug/L)	MW-22	1.60	n/a	9/2/2020	0.88ND	No	32	MW-10,MW-13,MW-9,n/a	n/a	n/a	62.5	n/a	n/a	0.001728	NP Inter (NDs) 1 of 2
Arsenic (ug/L)	MW-23	1.60	n/a	9/18/2023	0.53ND	No	32	MW-10,MW-13,MW-9,n/a	n/a	n/a	62.5	n/a	n/a	0.001728	NP Inter (NDs) 1 of 2
Barium (ug/L)	MW-11AR	205	n/a	9/21/2023	49	No	32	MW-10,MW-13,MW-14	117.8	39.73	0	None	No	0.0005787	Param Inter 1 of 2
Barium (ug/L)	MW-18	205	n/a	9/20/2023	150	No	32	MW-10,MW-13,MW-14	117.8	39.73	0	None	No	0.0005787	Param Inter 1 of 2
Barium (ug/L)	MW-20	205	n/a	9/20/2023	93	No	32	MW-10,MW-13,MW-14	117.8	39.73	0	None	No	0.0005787	Param Inter 1 of 2
Barium (ug/L)	MW-22	205	n/a	9/2/2020	54	No	32	MW-10,MW-13,MW-14	117.8	39.73	0	None	No	0.0005787	Param Inter 1 of 2
Barium (ug/L)	MW-23	205	n/a	9/18/2023	120	No	32	MW-10,MW-13,MW-14	117.8	39.73	0	None	No	0.0005787	Param Inter 1 of 2
Beryllium (ug/L)	MW-11AR	0.330	n/a	9/21/2023	0.33ND	No	32	MW-10,MW-13,MW-9,n/a	n/a	n/a	90.63	n/a	n/a	0.001728	NP Inter (NDs) 1 of 2
Beryllium (ug/L)	MW-18	0.330	n/a	9/20/2023	0.33ND	No	32	MW-10,MW-13,MW-9,n/a	n/a	n/a	90.63	n/a	n/a	0.001728	NP Inter (NDs) 1 of 2
Beryllium (ug/L)	MW-20	0.330	n/a	9/20/2023	0.33ND	No	32	MW-10,MW-13,MW-9,n/a	n/a	n/a	90.63	n/a	n/a	0.001728	NP Inter (NDs) 1 of 2
Beryllium (ug/L)	MW-22	0.330	n/a	9/2/2020	0.27ND	No	32	MW-10,MW-13,MW-9,n/a	n/a	n/a	90.63	n/a	n/a	0.001728	NP Inter (NDs) 1 of 2
Beryllium (ug/L)	MW-23	0.330	n/a	9/18/2023	0.33ND	No	32	MW-10,MW-13,MW-9,n/a	n/a	n/a	90.63	n/a	n/a	0.001728	NP Inter (NDs) 1 of 2
Boron (ug/L)	MW-11AR	815	n/a	9/21/2023	420	No	32	MW-10,MW-13,MW-14	4.47	1.019	37.5	None	ln(x)	0.0005787	Param Inter 1 of 2
Boron (ug/L)	MW-18	815	n/a	9/20/2023	130	No	32	MW-10,MW-13,MW-14	4.47	1.019	37.5	None	ln(x)	0.0005787	Param Inter 1 of 2
Boron (ug/L)	**MW-20**	**815**	**n/a**	**9/20/2023**	**3800**	**Yes**	**32**	**MW-10,MW-13,MW-14**	**4.47**	**1.019**	**37.5**	**None**	**ln(x)**	**0.0005787**	**Param Inter 1 of 2**
Boron (ug/L)	**MW-22**	**815**	**n/a**	**9/2/2020**	**2300**	**Yes**	**32**	**MW-10,MW-13,MW-14**	**4.47**	**1.019**	**37.5**	**None**	**ln(x)**	**0.0005787**	**Param Inter 1 of 2**
Boron (ug/L)	MW-23	815	n/a	9/18/2023	89J	No	32	MW-10,MW-13,MW-14	4.47	1.019	37.5	None	ln(x)	0.0005787	Param Inter 1 of 2
Chloride (mg/L)	MW-11AR	46.0	n/a	9/21/2023	21	No	100	MW-13,MW-14,MW-9,n/a	n/a	n/a	45	n/a	n/a	0.000193	NP Inter (normality) ...
Chloride (mg/L)	MW-18	46.0	n/a	9/20/2023	4.4J	No	100	MW-13,MW-14,MW-9,n/a	n/a	n/a	45	n/a	n/a	0.000193	NP Inter (normality) ...
Chloride (mg/L)	MW-20	46.0	n/a	9/20/2023	19	No	100	MW-13,MW-14,MW-9,n/a	n/a	n/a	45	n/a	n/a	0.000193	NP Inter (normality) ...
Chloride (mg/L)	MW-22	46.0	n/a	9/2/2020	20	No	100	MW-13,MW-14,MW-9,n/a	n/a	n/a	45	n/a	n/a	0.000193	NP Inter (normality) ...
Chloride (mg/L)	MW-23	46.0	n/a	9/18/2023	2.6J	No	100	MW-13,MW-14,MW-9,n/a	n/a	n/a	45	n/a	n/a	0.000193	NP Inter (normality) ...
Cobalt (ug/L)	MW-11AR	4.95	n/a	9/21/2023	0.8	No	32	MW-10,MW-13,MW-14	0.7991	1.093	12.5	None	ln(x)	0.0005787	Param Inter 1 of 2
Cobalt (ug/L)	MW-18	4.95	n/a	9/20/2023	0.085ND	No	32	MW-10,MW-13,MW-14	0.7991	1.093	12.5	None	ln(x)	0.0005787	Param Inter 1 of 2
Cobalt (ug/L)	MW-20	4.95	n/a	9/20/2023	0.085ND	No	32	MW-10,MW-13,MW-14	0.7991	1.093	12.5	None	ln(x)	0.0005787	Param Inter 1 of 2
Cobalt (ug/L)	MW-22	4.95	n/a	9/2/2020	0.3J	No	32	MW-10,MW-13,MW-14	0.7991	1.093	12.5	None	ln(x)	0.0005787	Param Inter 1 of 2
Cobalt (ug/L)	MW-23	4.95	n/a	9/18/2023	0.085ND	No	32	MW-10,MW-13,MW-14	0.7991	1.093	12.5	None	ln(x)	0.0005787	Param Inter 1 of 2
Iron (ug/L)	MW-11AR	3520	n/a	9/21/2023	580	No	32	MW-10,MW-13,MW-14	5.323	1.296	9.375	None	ln(x)	0.0005787	Param Inter 1 of 2
Iron (ug/L)	MW-18	3520	n/a	9/20/2023	18ND	No	32	MW-10,MW-13,MW-14	5.323	1.296	9.375	None	ln(x)	0.0005787	Param Inter 1 of 2
Iron (ug/L)	MW-20	3520	n/a	9/20/2023	18ND	No	32	MW-10,MW-13,MW-14	5.323	1.296	9.375	None	ln(x)	0.0005787	Param Inter 1 of 2
Iron (ug/L)	MW-22	3520	n/a	9/2/2020	240	No	32	MW-10,MW-13,MW-14	5.323	1.296	9.375	None	ln(x)	0.0005787	Param Inter 1 of 2
Iron (ug/L)	MW-23	3520	n/a	9/18/2023	18ND	No	32	MW-10,MW-13,MW-14	5.323	1.296	9.375	None	ln(x)	0.0005787	Param Inter 1 of 2
Lead (ug/L)	MW-11AR	1.90	n/a	9/21/2023	1.2	No	32	MW-9,MW-10,MW-13,n/a	n/a	n/a	43.75	n/a	n/a	0.001728	NP Inter (normality) ...
Lead (ug/L)	MW-18	1.90	n/a	9/20/2023	0.24ND	No	32	MW-9,MW-10,MW-13,n/a	n/a	n/a	43.75	n/a	n/a	0.001728	NP Inter (normality) ...
Lead (ug/L)	MW-20	1.90	n/a	9/20/2023	0.24J	No	32	MW-9,MW-10,MW-13,n/a	n/a	n/a	43.75	n/a	n/a	0.001728	NP Inter (normality) ...
Lead (ug/L)	MW-22	1.90	n/a	9/2/2020	0.64	No	32	MW-9,MW-10,MW-13,n/a	n/a	n/a	43.75	n/a	n/a	0.001728	NP Inter (normality) ...
Lead (ug/L)	MW-23	1.90	n/a	9/18/2023	0.24ND	No	32	MW-9,MW-10,MW-13,n/a	n/a	n/a	43.75	n/a	n/a	0.001728	NP Inter (normality) ...
Magnesium (ug/L)	**MW-11AR**	**27400**	**n/a**	**9/21/2023**	**34000**	**Yes**	**32**	**MW-10,MW-13,MW-14**	**19750**	**3483**	**0**	**None**	**No**	**0.0005787**	**Param Inter 1 of 2**
Magnesium (ug/L)	MW-18	27400	n/a	9/20/2023	21000	No	32	MW-10,MW-13,MW-14	19750	3483	0	None	No	0.0005787	Param Inter 1 of 2
Magnesium (ug/L)	MW-20	27400	n/a	9/20/2023	20000	No	32	MW-10,MW-13,MW-14	19750	3483	0	None	No	0.0005787	Param Inter 1 of 2
Magnesium (ug/L)	**MW-22**	**27400**	**n/a**	**9/2/2020**	**30000**	**Yes**	**32**	**MW-10,MW-13,MW-14**	**19750**	**3483**	**0**	**None**	**No**	**0.0005787**	**Param Inter 1 of 2**
Magnesium (ug/L)	MW-23	27400	n/a	9/18/2023	20000	No	32	MW-10,MW-13,MW-14	19750	3483	0	None	No	0.0005787	Param Inter 1 of 2
Manganese (ug/L)	MW-11AR	3050	n/a	9/21/2023	86	No	32	MW-10,MW-13,MW-14	4.092	1.792	3.125	None	ln(x)	0.0005787	Param Inter 1 of 2
Manganese (ug/L)	MW-18	3050	n/a	9/20/2023	7.5J	No	32	MW-10,MW-13,MW-14	4.092	1.792	3.125	None	ln(x)	0.0005787	Param Inter 1 of 2
Manganese (ug/L)	MW-20	3050	n/a	9/20/2023	1.8ND	No	32	MW-10,MW-13,MW-14	4.092	1.792	3.125	None	ln(x)	0.0005787	Param Inter 1 of 2
Manganese (ug/L)	MW-22	3050	n/a	9/2/2020	21	No	32	MW-10,MW-13,MW-14	4.092	1.792	3.125	None	ln(x)	0.0005787	Param Inter 1 of 2
Manganese (ug/L)	MW-23	3050	n/a	9/18/2023	5.8J	No	32	MW-10,MW-13,MW-14	4.092	1.792	3.125	None	ln(x)	0.0005787	Param Inter 1 of 2

Prediction Limit

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input Printed 10/30/2023, 2:58 PM

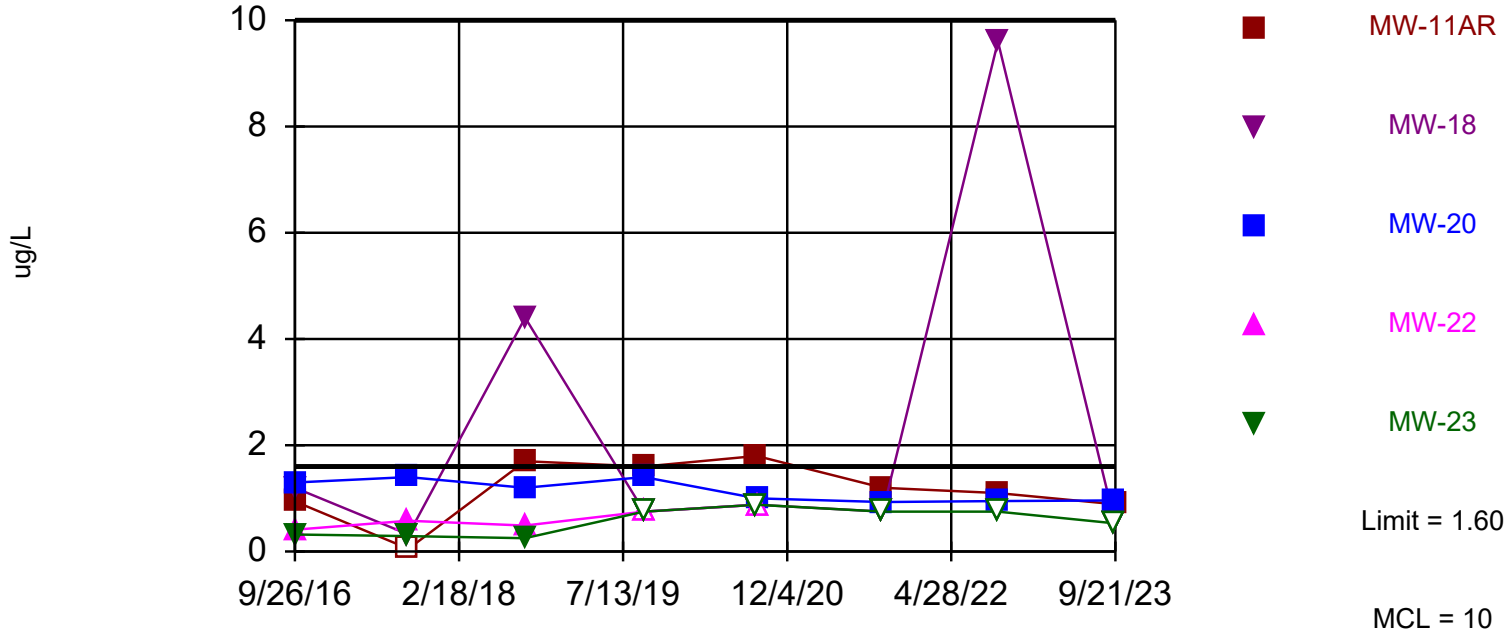
Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Wells	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Selenium (ug/L)	MW-11AR	4.00	n/a	9/21/2023	2.2J	No	32	MW-9,MW-14,MW-10,n/a	n/a	n/a	56.25	n/a	n/a	0.001728	NP Inter (NDs) 1 of 2
Selenium (ug/L)	MW-18	4.00	n/a	9/20/2023	1.4ND	No	32	MW-9,MW-14,MW-10,n/a	n/a	n/a	56.25	n/a	n/a	0.001728	NP Inter (NDs) 1 of 2
Selenium (ug/L)	**MW-20**	**4.00**	**n/a**	**9/20/2023**	**23**	**Yes**	**32**	**MW-9,MW-14,MW-10,n/a**	**n/a**	**n/a**	**56.25**	**n/a**	**n/a**	**0.001728**	**NP Inter (NDs) 1 of 2**
Selenium (ug/L)	**MW-22**	**4.00**	**n/a**	**9/2/2020**	**11**	**Yes**	**32**	**MW-9,MW-14,MW-10,n/a**	**n/a**	**n/a**	**56.25**	**n/a**	**n/a**	**0.001728**	**NP Inter (NDs) 1 of 2**
Selenium (ug/L)	MW-23	4.00	n/a	9/18/2023	1.4ND	No	32	MW-9,MW-14,MW-10,n/a	n/a	n/a	56.25	n/a	n/a	0.001728	NP Inter (NDs) 1 of 2
Sulfate (mg/L)	MW-11AR	120	n/a	9/21/2023	97	No	100	MW-9,MW-10,MW-14,n/a	n/a	n/a	0	n/a	n/a	0.000193	NP Inter (normality) ...
Sulfate (mg/L)	MW-18	120	n/a	9/20/2023	64	No	100	MW-9,MW-10,MW-14,n/a	n/a	n/a	0	n/a	n/a	0.000193	NP Inter (normality) ...
Sulfate (mg/L)	**MW-20**	**120**	**n/a**	**9/20/2023**	**140**	**Yes**	**100**	**MW-9,MW-10,MW-14,n/a**	**n/a**	**n/a**	**0**	**n/a**	**n/a**	**0.000193**	**NP Inter (normality) ...**
Sulfate (mg/L)	**MW-22**	**120**	**n/a**	**9/2/2020**	**150**	**Yes**	**100**	**MW-9,MW-10,MW-14,n/a**	**n/a**	**n/a**	**0**	**n/a**	**n/a**	**0.000193**	**NP Inter (normality) ...**
Sulfate (mg/L)	MW-23	120	n/a	9/18/2023	65	No	100	MW-9,MW-10,MW-14,n/a	n/a	n/a	0	n/a	n/a	0.000193	NP Inter (normality) ...

Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Interwell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because censored data exceeded 49%. Limit is highest of 32 background values. 62.5% NDs. Annual per-constituent alpha = 0.02223. Individual comparison alpha = 0.001728 (1 of 2). Comparing 5 points to limit. Assumes 8 future values. Insufficient data to test for seasonality; data will not be deseasonalized.

Constituent: Arsenic Analysis Run 10/30/2023 2:57 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Prediction Limit

Constituent: Arsenic (ug/L) Analysis Run 10/30/2023 2:58 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)	MW-9 (bg)	MW-14 (bg)	MW-18	MW-20	MW-22	MW-11AR	MW-10 (bg)	MW-23
9/25/2016	0.38 (J)	0.55 (J)							
9/26/2016			0.64 (J)	1.2	1.3	0.41 (J)			
9/27/2016							0.94 (J)	0.14 (J)	
9/28/2016									0.32 (J)
9/13/2017	0.16 (J)				1.4	0.58 (J)			0.29 (J)
9/14/2017		0.26 (J)	1.6	0.32 (J)			<0.052		
9/15/2017								0.17 (J)	
9/11/2018	0.33 (J)				1.2	0.49 (J)			0.25 (J)
9/12/2018		0.3 (J)	0.38 (J)	4.4			1.7	0.36 (J)	
9/16/2019	<0.75		<0.75		1.4 (J)	<0.75			<0.75
9/17/2019		<0.75		<0.75			1.6 (J)	<0.75	
9/1/2020		<0.88	<0.88	<0.88			1.8 (J)		<0.88
9/2/2020	<0.88				1 (J)	<0.88			
4/29/2021								<0.75	
9/27/2021	<0.75		<0.75		0.93 (J)				<0.75
9/28/2021		<0.75		<0.75			1.2 (J)	<0.75	
9/20/2022		<0.75	<0.75					<0.75	
9/21/2022	<0.75			9.6	0.95 (J)		1.1 (J)		<0.75
9/18/2023								<0.53 (U)	<0.53 (U)
9/20/2023	<0.53 (U)		<0.53 (U)	<0.53 (U)	0.96 (J)				
9/21/2023		<0.53 (U)					0.89 (J)		

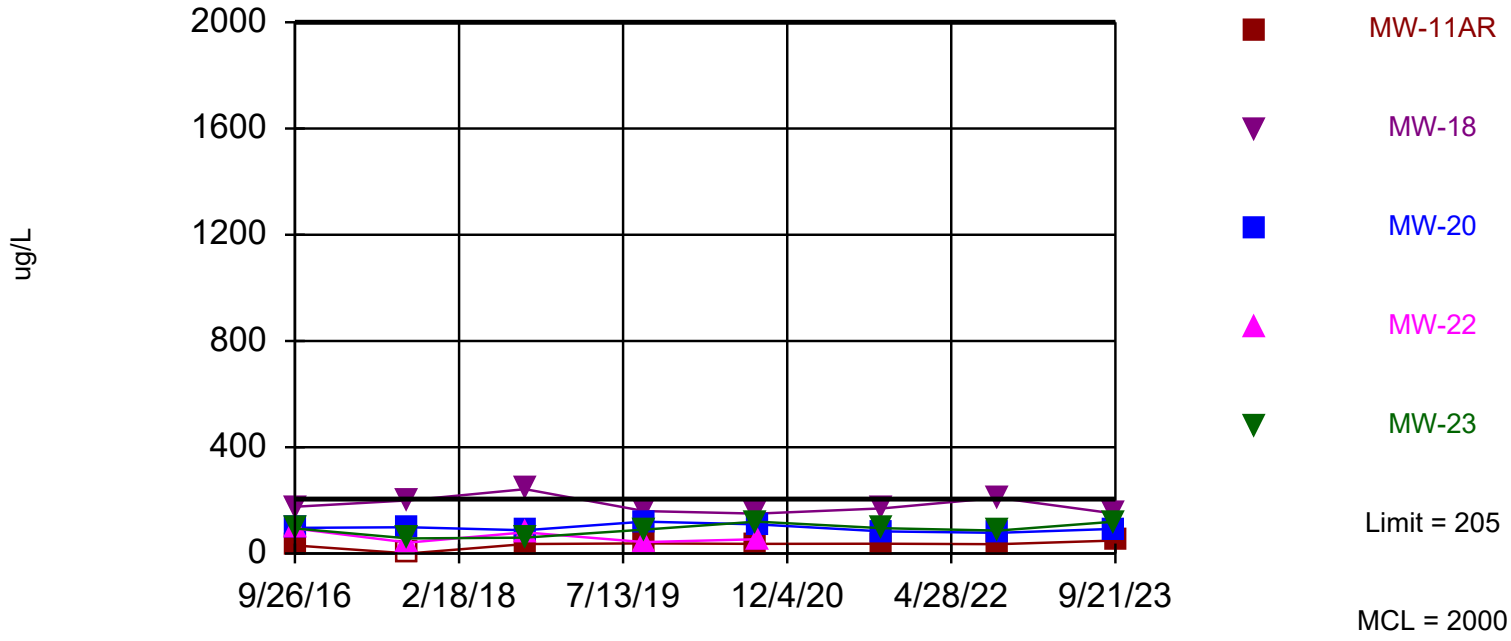
ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Interwell Parametric



Background Data Summary: Mean=117.8, Std. Dev.=39.73, n=32. Insufficient data to test for seasonality; not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9135, critical = 0.904. Kappa = 2.193 (c=14, w=13, 1 of 2, event alpha = 0.1). Report alpha = 0.007498. Individual comparison alpha = 0.0005787. Comparing 5 points to limit. Assumes 8 future values.

Constituent: Barium Analysis Run 10/30/2023 2:57 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Prediction Limit

Constituent: Barium (ug/L) Analysis Run 10/30/2023 2:58 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)	MW-11AR	MW-13 (bg)	MW-14 (bg)	MW-18	MW-20	MW-22	MW-23	MW-9 (bg)
9/25/2016			91.2						158
9/26/2016				62.1	176	96.5	93.8		
9/27/2016	151	30.1							
9/28/2016								94.2	
9/13/2017			101			99.1	40.9	57	
9/14/2017		<0.095		108	200				138
9/15/2017	149								
9/11/2018			90.4			87.3	79.6	60	
9/12/2018	131	35.6		55.1	242				157
9/16/2019			97	56		120	43	90	
9/17/2019	140	38			160				170
9/1/2020		36		67	150			120	150
9/2/2020			96			110	54		
4/29/2021	160								
9/27/2021			100	62		83		95	
9/28/2021	140	37			170				170
9/20/2022	130			59					160
9/21/2022		35	110		210	78		86	
9/18/2023	160							120	
9/20/2023			110	62	150	93			
9/21/2023		49							180

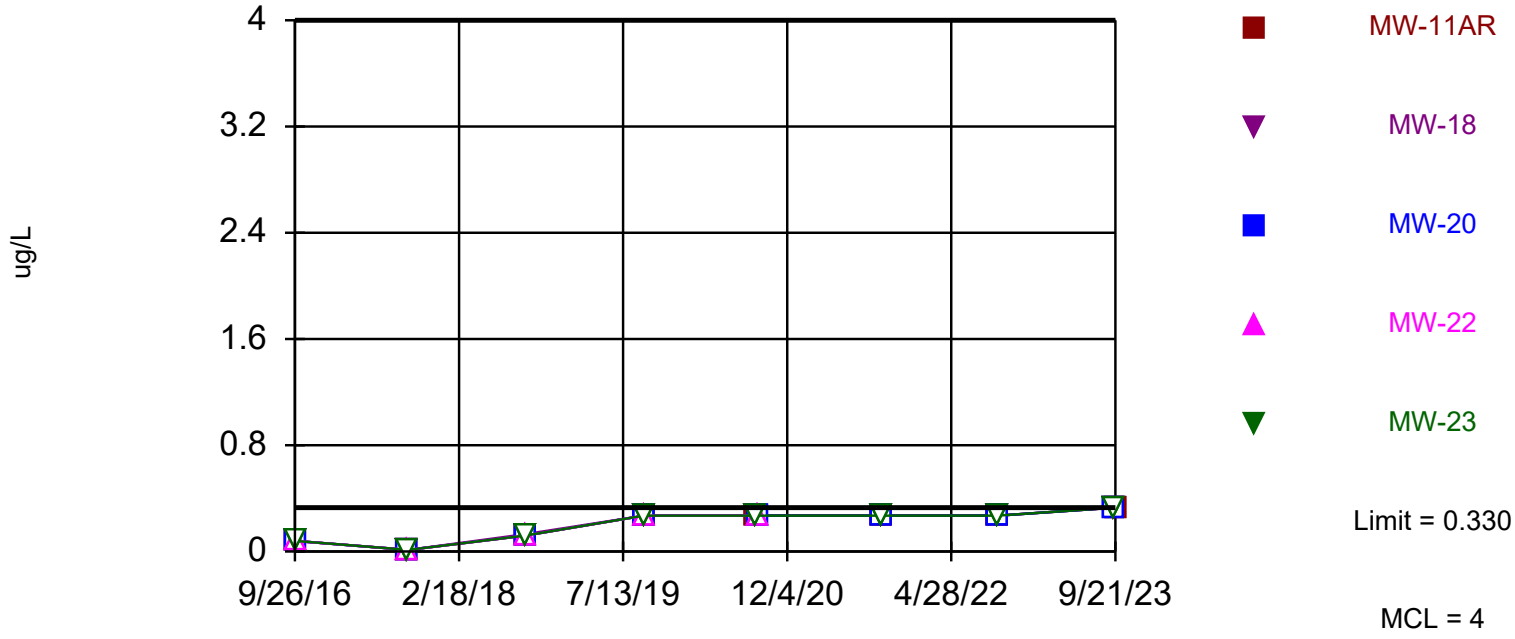
ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Interwell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because censored data exceeded 49%. Limit is highest of 32 background values. 90.63% NDs. Annual per-constituent alpha = 0.02223. Individual comparison alpha = 0.001728 (1 of 2). Comparing 5 points to limit. Assumes 8 future values. Insufficient data to test for seasonality; data will not be deseasonalized.

Constituent: Beryllium Analysis Run 10/30/2023 2:57 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Prediction Limit

Constituent: Beryllium (ug/L) Analysis Run 10/30/2023 2:58 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)	MW-9 (bg)	MW-14 (bg)	MW-18	MW-20	MW-22	MW-11AR	MW-10 (bg)	MW-23
9/25/2016	<0.08	<0.08							
9/26/2016			<0.08	<0.08	<0.08	<0.08			
9/27/2016							<0.08	<0.08	
9/28/2016									<0.08
9/13/2017	<0.012				<0.012	<0.012			<0.012
9/14/2017		0.02 (J)	0.15 (J)	<0.012			<0.012		
9/15/2017								<0.012	
9/11/2018	<0.12				<0.12	<0.12			<0.12
9/12/2018		<0.12	<0.12	0.13 (J)			<0.12	0.17 (J)	
9/16/2019	<0.27		<0.27		<0.27	<0.27			<0.27
9/17/2019		<0.27		<0.27			<0.27	<0.27	
9/1/2020		<0.27	<0.27	<0.27			<0.27		<0.27
9/2/2020	<0.27				<0.27	<0.27			
4/29/2021								<0.27	
9/27/2021	<0.27		<0.27		<0.27				<0.27
9/28/2021		<0.27		<0.27			<0.27	<0.27	
9/20/2022		<0.27	<0.27					<0.27	
9/21/2022	<0.27			<0.27	<0.27		<0.27		<0.27
9/18/2023								<0.33 (U)	<0.33 (U)
9/20/2023	<0.33 (U)		<0.33 (U)	<0.33 (U)	<0.33 (U)				
9/21/2023		<0.33 (U)					<0.33 (U)		

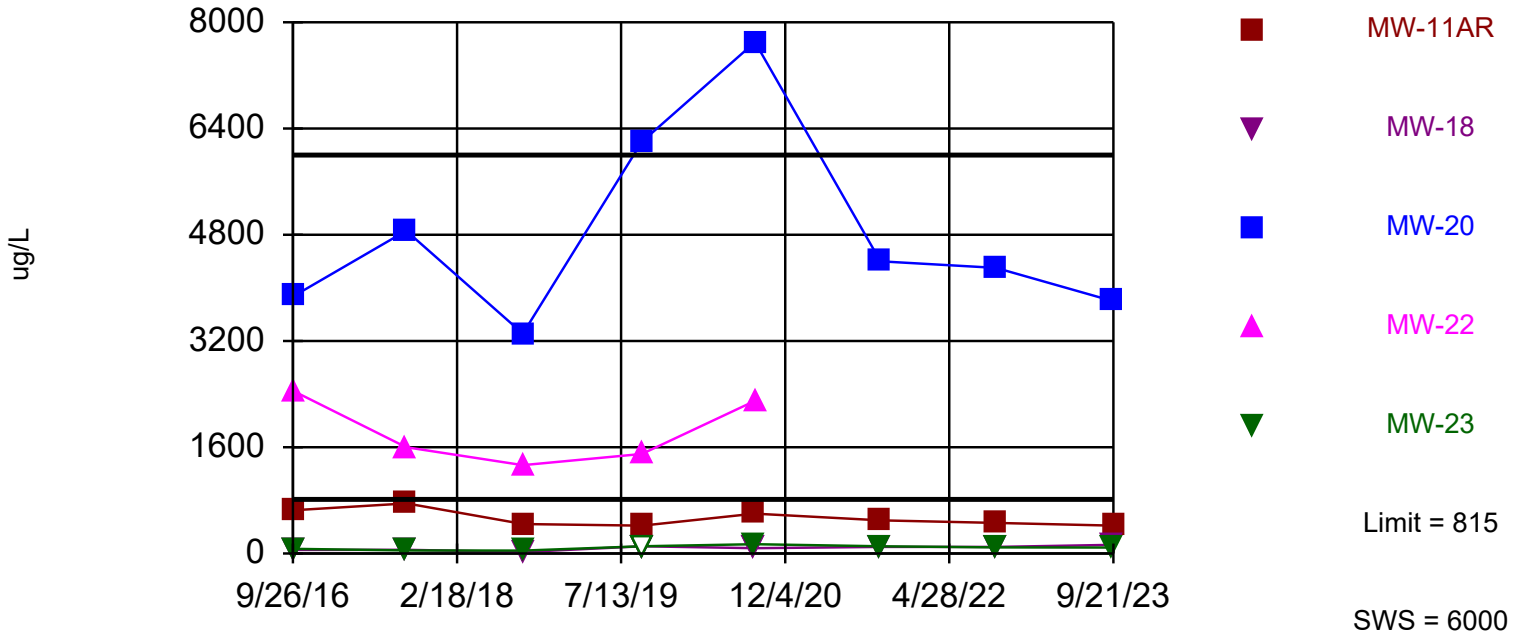
ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Exceeds Limit: MW-20, MW-22

Prediction Limit

Interwell Parametric



Background Data Summary (based on natural log transformation): Mean=4.47, Std. Dev.=1.019, n=32, 37.5% NDs. Insufficient data to test for seasonality; not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9535, critical = 0.904. Kappa = 2.193 (c=14, w=13, 1 of 2, event alpha = 0.1). Report alpha = 0.007498. Individual comparison alpha = 0.0005787. Comparing 5 points to limit. Assumes 8 future values.

Constituent: Boron Analysis Run 10/30/2023 2:57 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Prediction Limit

Constituent: Boron (ug/L) Analysis Run 10/30/2023 2:58 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

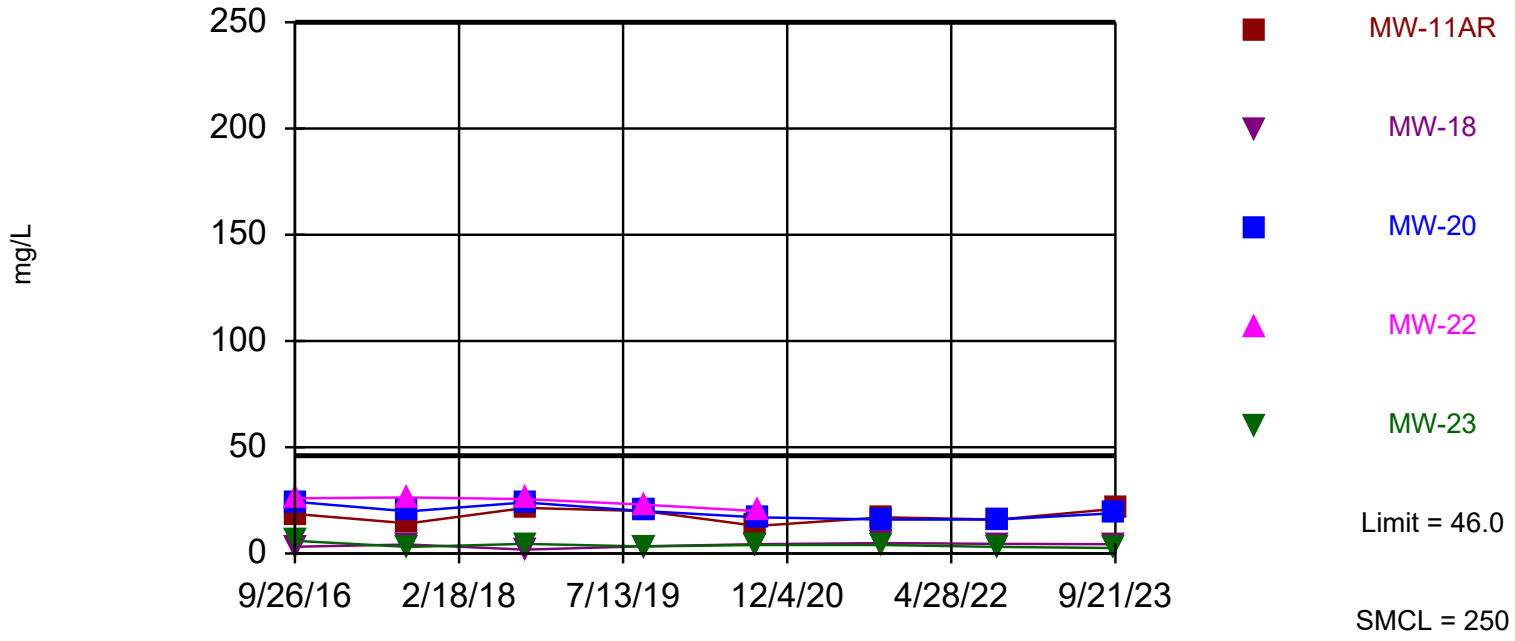
	MW-10 (bg)	MW-11AR	MW-13 (bg)	MW-14 (bg)	MW-18	MW-20	MW-22	MW-23	MW-9 (bg)
9/25/2016			50.2 (J)						<50
9/26/2016				282	53.8 (J)	3870	2450		
9/27/2016	<50	650							
9/28/2016								70.1 (J)	
9/13/2017			48.6 (J)			4860	1600	47 (J)	
9/14/2017		755		169	57 (J)				17.2 (J)
9/15/2017	14.1 (J)								
9/11/2018			41.4 (J)			3310	1330	42.9 (J)	
9/12/2018	<12.5	443		651	21.6 (J)				<12.5
9/16/2019			130 (J)	360		6200	1500	<110	
9/17/2019	<110	420			<110				<110
9/1/2020		600		450	<80			140	<80
9/2/2020			88 (J)			7700	2300		
4/29/2021	<58								
9/27/2021			110	280		4400		110	
9/28/2021	74 (J)	500			100				77 (J)
9/20/2022	<58			500					<58
9/21/2022		460	94 (J)		100	4300		92 (J)	
9/18/2023	<76 (U)							89 (J)	
9/20/2023			120	220	130	3800			
9/21/2023		420							<76 (U)

ND substitution: RL or RL/2 if <15% NDs.

Within Limit

Prediction Limit

Interwell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because the Chi Squared normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 100 background values. 45% NDs. Annual per-constituent alpha = 0.002506. Individual comparison alpha = 0.000193 (1 of 2). Comparing 5 points to limit. Assumes 8 future values. Insufficient data to test for seasonality; data will not be deseasonalized.

Constituent: Chloride Analysis Run 10/30/2023 2:57 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Prediction Limit

Constituent: Chloride (mg/L) Analysis Run 10/30/2023 2:58 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)	MW-13 (bg)	MW-14 (bg)	MW-9 (bg)	MW-22	MW-20	MW-18	MW-11AR	MW-23
9/1/1999	12	<5	<5	<5					
9/1/2000	12	<5	<5	<5					
9/1/2001	13.8	5.9	5.9	<5					
9/1/2002	12.8	<5	<5	<5					
9/1/2003	14.8	<5	<5	<5					
9/1/2004	18.9	<5	<5	<5					
9/1/2005	18.7	<5	<5	<5					
9/1/2006	20.5	<5	<5	<5					
9/1/2007	16.4	<5	<5	<5					
9/1/2008	7.31	<5	<5	<5					
9/1/2009	8.21	<5	<5	<5					
9/1/2010	2.76	<1	<2	1.25					
9/1/2011	3.81	<5	<2	<2					
9/1/2012	<5	<5	<5	<5					
9/1/2013	3.1	1.4	1.6	29.9					
9/1/2014	2.5	<1	<1	46					
9/1/2015	1.3	1.1	<1	18.9					
9/25/2016		2.8		2.6					
9/26/2016			1.3		26	24.3	3.2		
9/27/2016	1.9							18.6	
9/28/2016									6
9/13/2017		4			26.4	19.8			3.1
9/14/2017			1.7	4			4.2	14.2	
9/15/2017	2.4								
9/11/2018		3.2			25.6	24			4.5
9/12/2018	1.5		2.2	3			1.8	21.5	
9/16/2019		1.9 (J,B)	2.1 (J,B)		23 (B)	20 (B)			3.3 (J,B)
9/17/2019	1.7 (J,B)			2 (J,B)			3.4 (J,B)	20 (B)	
9/1/2020			3.3 (J,B)	3.1 (J,B)			4.4 (J,B)	13 (B)	4 (J,B)
9/2/2020		2.4 (J,B)			20 (B)	17 (B)			
4/29/2021	<2.2								
9/27/2021		3.1 (J)	3.9 (J)			16			4 (J)
9/28/2021	4 (J)			5.7			4.9 (J)	17	
9/20/2022	2.9 (J)		3.6 (J)	15					
9/21/2022		2.7 (J)				16	4.5 (J)	16	3.1 (J)
9/18/2023	2.3 (J)								2.6 (J)
9/20/2023		<2.3 (U)	3.6 (J)			19	4.4 (J)		
9/21/2023				17				21	

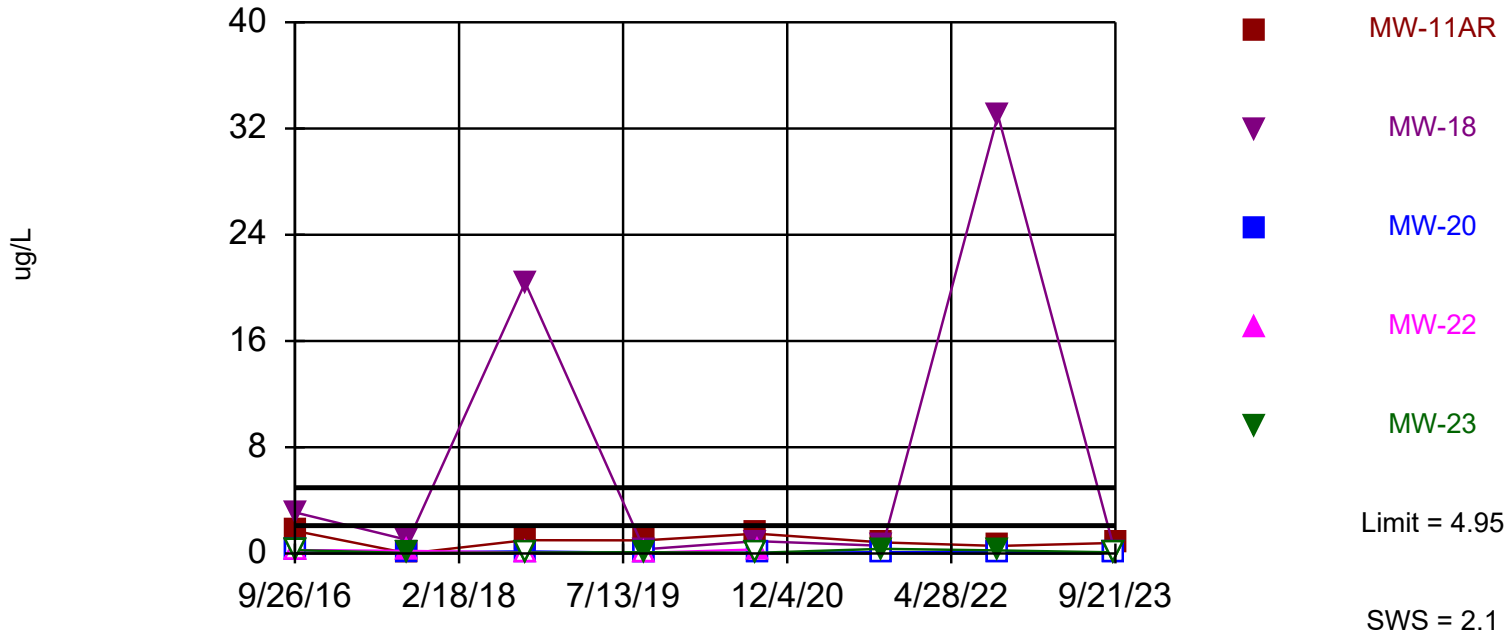
ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Interwell Parametric



Background Data Summary (based on natural log transformation): Mean=-0.7991, Std. Dev.=1.093, n=32, 12.5% NDs. Insufficient data to test for seasonality; not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9685, critical = 0.904. Kappa = 2.193 (c=14, w=13, 1 of 2, event alpha = 0.1). Report alpha = 0.007498. Individual comparison alpha = 0.0005787. Comparing 5 points to limit. Assumes 8 future values.

Constituent: Cobalt Analysis Run 10/30/2023 2:57 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Prediction Limit

Constituent: Cobalt (ug/L) Analysis Run 10/30/2023 2:58 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)	MW-11AR	MW-13 (bg)	MW-14 (bg)	MW-18	MW-20	MW-22	MW-23	MW-9 (bg)
9/25/2016			1.2						2
9/26/2016				1.3	3.1	<0.5	<0.5		
9/27/2016	<0.5	1.7							
9/28/2016								<0.5	
9/13/2017			0.15 (J)			0.09 (J)	0.19 (J)	0.036 (J)	
9/14/2017		<0.014		3	1				0.43 (J)
9/15/2017	0.05 (J)								
9/11/2018			0.52 (J)			0.16 (J)	<0.15	<0.15	
9/12/2018	0.76 (J)	1		0.5 (J)	20.4				1.4
9/16/2019			0.16 (J)	0.17 (J)		<0.091	<0.091	0.094 (J)	
9/17/2019	0.11 (J)	0.99			0.32 (J)				2.6
9/1/2020		1.5		0.37 (J)	0.93			<0.091	2.5
9/2/2020			0.53			<0.091	0.3 (J)		
4/29/2021	1.3								
9/27/2021			<0.19	0.39 (J)		<0.19		0.35 (J)	
9/28/2021	<0.19	0.83			0.58				1.3
9/20/2022	0.3 (J)			0.59					0.49 (J)
9/21/2022		0.57	0.73		33	<0.19		0.23 (J)	
9/18/2023	<0.17 (U)							<0.17 (U)	
9/20/2023			0.2 (J)	0.44 (J)	<0.17 (U)	<0.17 (U)			
9/21/2023		0.8							0.35 (J)

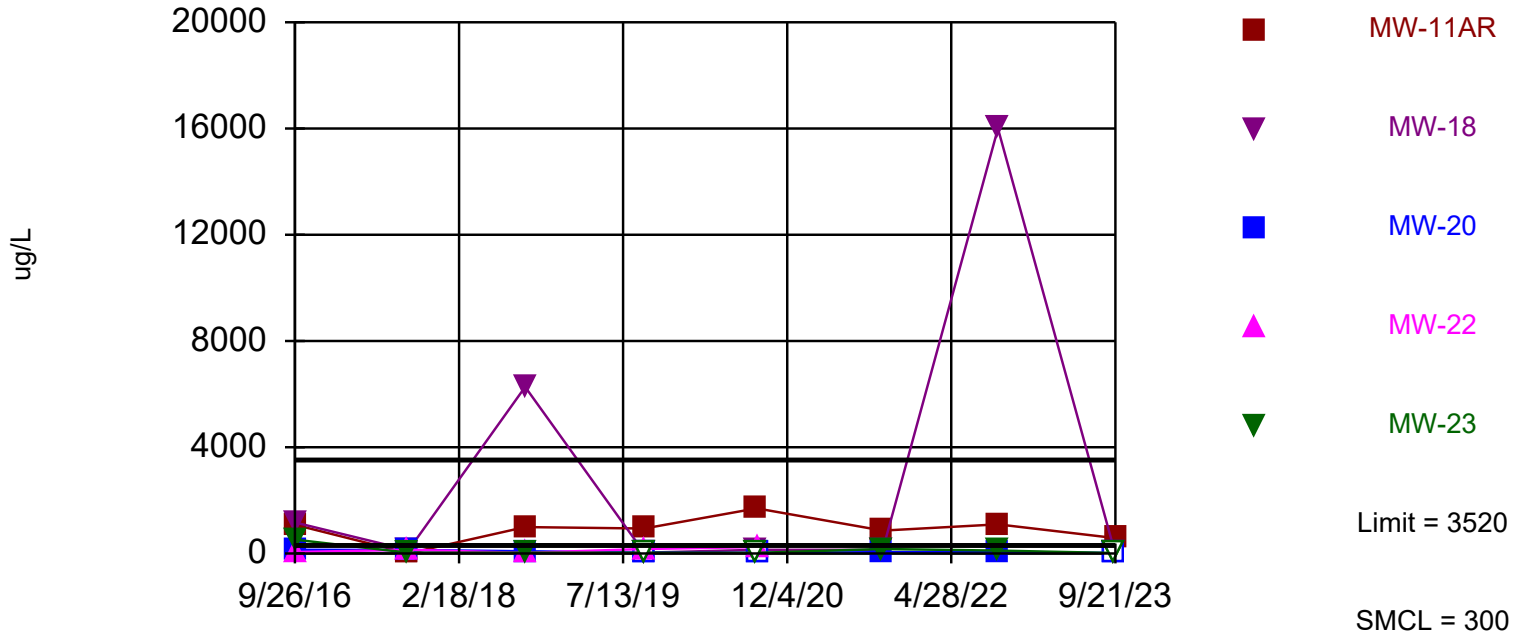
ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Interwell Parametric



Background Data Summary (based on natural log transformation): Mean=5.323, Std. Dev.=1.296, n=32, 9.375% NDs. Insufficient data to test for seasonality; not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9722, critical = 0.904. Kappa = 2.193 (c=14, w=13, 1 of 2, event alpha = 0.1). Report alpha = 0.007498. Individual comparison alpha = 0.0005787. Comparing 5 points to limit. Assumes 8 future values.

Constituent: Iron Analysis Run 10/30/2023 2:57 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Prediction Limit

Constituent: Iron (ug/L) Analysis Run 10/30/2023 2:58 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)	MW-11AR	MW-13 (bg)	MW-14 (bg)	MW-18	MW-20	MW-22	MW-23	MW-9 (bg)
9/25/2016			1240						55.7
9/26/2016				1770	1170	140	54.6		
9/27/2016	126	1080							
9/28/2016								518	
9/13/2017			162			135	139	30.3 (J)	
9/14/2017		<9.6		4440	128				357
9/15/2017	93.1								
9/11/2018			289			82.8	23.9 (J)	34.3 (J)	
9/12/2018	344	993		267	6270				624
9/16/2019			76 (J)	130		<66	170	<66	
9/17/2019	130	940			<66				1400
9/1/2020		1700		130	140			<50	810
9/2/2020			230			<50	240		
4/29/2021	220								
9/27/2021			<36	140		49 (J)		170	
9/28/2021	52 (J)	860			140				620
9/20/2022	270			240					230
9/21/2022		1100	440		16000	67 (J)		110	
9/18/2023	<36 (U)							<36 (U)	
9/20/2023			78 (J)	120	<36 (U)	<36 (U)			
9/21/2023		580							<36 (U)

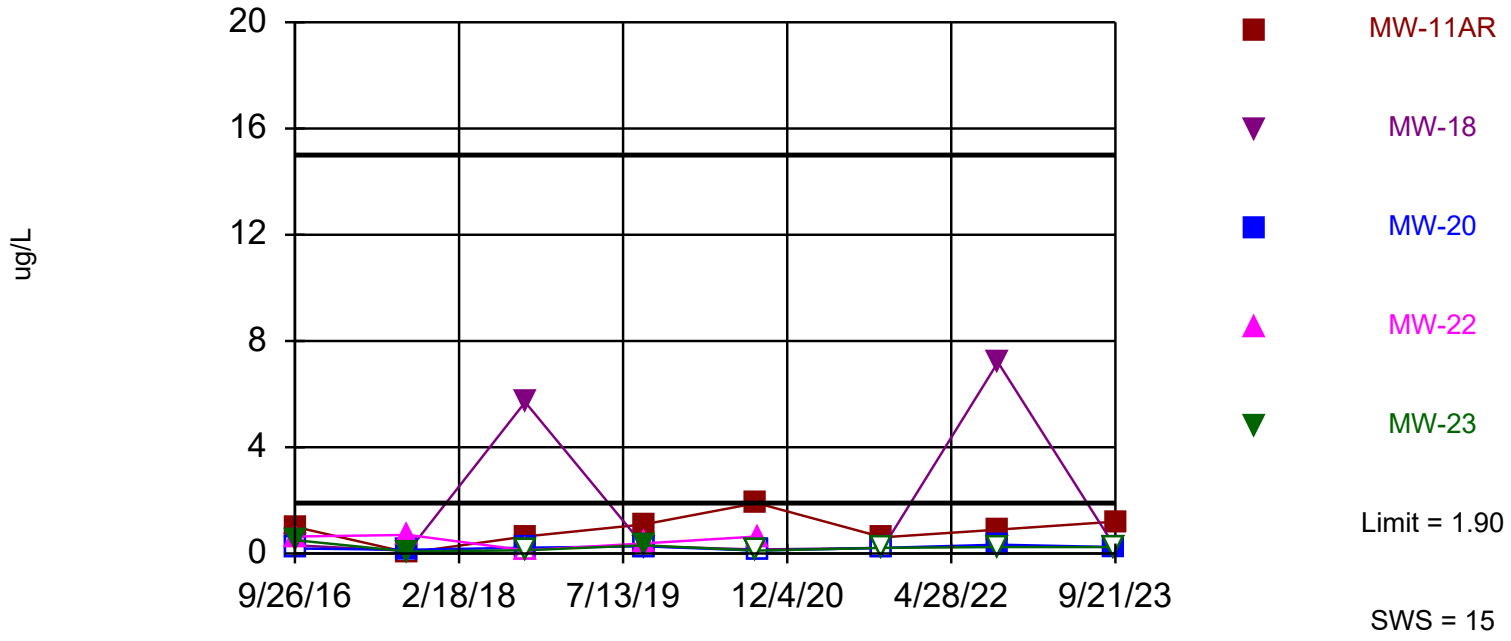
ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Interwell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 32 background values. 43.75% NDs. Annual per-constituent alpha = 0.02223. Individual comparison alpha = 0.001728 (1 of 2). Comparing 5 points to limit. Assumes 8 future values. Insufficient data to test for seasonality; data will not be deseasonalized.

Constituent: Lead Analysis Run 10/30/2023 2:57 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Prediction Limit

Constituent: Lead (ug/L) Analysis Run 10/30/2023 2:58 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

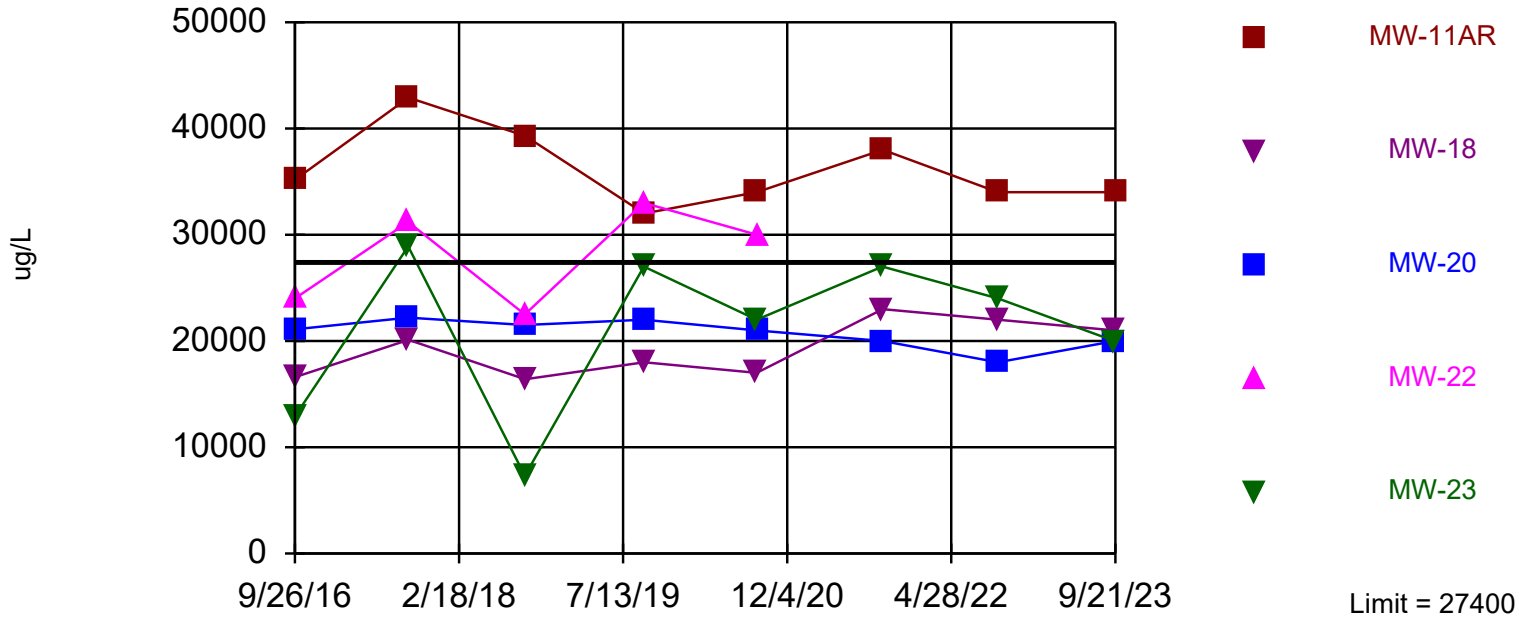
	MW-13 (bg)	MW-9 (bg)	MW-14 (bg)	MW-18	MW-20	MW-22	MW-11AR	MW-10 (bg)	MW-23
9/25/2016	0.71 (J)	<0.19							
9/26/2016			0.98 (J)	0.31 (J)	<0.19	0.64 (J)			
9/27/2016							1	<0.19	
9/28/2016									0.5 (J)
9/13/2017	0.13 (J)				0.14 (J)	0.7 (J)			0.076 (J)
9/14/2017		0.25 (J)	1.9	0.1 (J)			<0.033		
9/15/2017								0.12 (J)	
9/11/2018	0.39 (J)				0.22 (J)	<0.12			<0.12
9/12/2018		<0.12	0.42 (J)	5.7			0.64 (J)	0.55 (J)	
9/16/2019	<0.27		0.39 (J)		<0.27	0.38 (J)			0.31 (J)
9/17/2019		<0.27		<0.27			1.1	<0.27	
9/1/2020		0.23 (J)	0.22 (J)	0.15 (J)			1.9		<0.11
9/2/2020	0.29 (J)				<0.11	0.64			
4/29/2021								0.23 (J)	
9/27/2021	<0.21		<0.21		<0.21				<0.21
9/28/2021		<0.21		<0.21			0.61	<0.21	
9/20/2022		0.37 (J)	0.4 (J)					<0.24	
9/21/2022	0.47 (J)			7.2	0.33 (J)		0.9		<0.24
9/18/2023								<0.24 (U)	<0.24 (U)
9/20/2023	<0.24 (U)		0.26 (J)	<0.24 (U)	0.24 (J)				
9/21/2023		<0.24 (U)					1.2		

ND substitution: RL or RL/2 if <15% NDs.

Exceeds Limit: MW-11AR, MW-22

Prediction Limit

Interwell Parametric



Background Data Summary: Mean=19750, Std. Dev.=3483, n=32. Insufficient data to test for seasonality; not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9358, critical = 0.904. Kappa = 2.193 (c=14, w=13, 1 of 2, event alpha = 0.1). Report alpha = 0.007498. Individual comparison alpha = 0.0005787. Comparing 5 points to limit. Assumes 8 future values.

Constituent: Magnesium Analysis Run 10/30/2023 2:57 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Prediction Limit

Constituent: Magnesium (ug/L) Analysis Run 10/30/2023 2:58 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

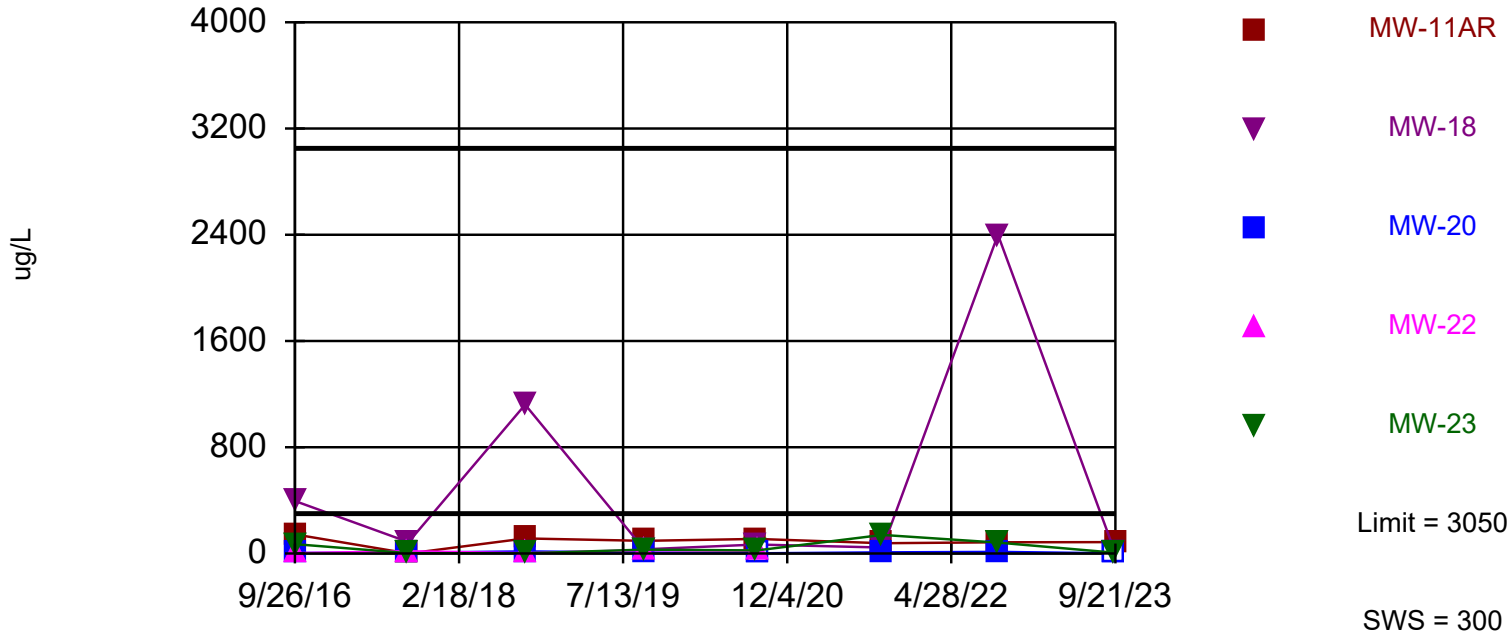
	MW-10 (bg)	MW-11AR	MW-13 (bg)	MW-14 (bg)	MW-18	MW-20	MW-22	MW-23	MW-9 (bg)
9/25/2016			19000						16000
9/26/2016				25000	16600	21100	24000		
9/27/2016	23400	35200							
9/28/2016								13000	
9/13/2017			17900			22200	31200	28900	
9/14/2017		42900		29800	20100				14600
9/15/2017	23900								
9/11/2018			17600			21500	22500	7320	
9/12/2018	21200	39300		21600	16400				16000
9/16/2019			16000	22000		22000	33000	27000	
9/17/2019	20000	32000			18000				16000
9/1/2020		34000		22000	17000			22000	15000
9/2/2020			18000			21000	30000		
4/29/2021	24000								
9/27/2021			19000	23000		20000		27000	
9/28/2021	22000	38000			23000				18000
9/20/2022	18000			19000					16000
9/21/2022		34000	18000		22000	18000		24000	
9/18/2023	23000							20000	
9/20/2023			18000	22000	21000	20000			
9/21/2023		34000							17000

Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Interwell Parametric



Background Data Summary (based on natural log transformation): Mean=4.092, Std. Dev.=1.792, n=32, 3.125% NDs. Insufficient data to test for seasonality; not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9753, critical = 0.904. Kappa = 2.193 (c=14, w=13, 1 of 2, event alpha = 0.1). Report alpha = 0.007498. Individual comparison alpha = 0.0005787. Comparing 5 points to limit. Assumes 8 future values.

Constituent: Manganese Analysis Run 10/30/2023 2:57 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Prediction Limit

Constituent: Manganese (ug/L) Analysis Run 10/30/2023 2:58 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)	MW-11AR	MW-13 (bg)	MW-14 (bg)	MW-18	MW-20	MW-22	MW-23	MW-9 (bg)
9/25/2016			148						515
9/26/2016				118	395	4.2	2.5		
9/27/2016	6.1	144							
9/28/2016								70	
9/13/2017			14.6			6.3	17.2	2.2	
9/14/2017		<0.07		407	85.3				49.8
9/15/2017	3.2								
9/11/2018			59.8			15.7	2.9	2	
9/12/2018	54.9	114		64.9	1120				722
9/16/2019			15	27		7.3 (J)	26	29	
9/17/2019	12	96			31				2100
9/1/2020		110		27	68			23	2000
9/2/2020			110			<4	21		
4/29/2021	77								
9/27/2021			5.7 (J)	36		8.8 (J)		140	
9/28/2021	4.9 (J)	77			45				1100
9/20/2022	33			71					98
9/21/2022		84	79		2400	12		82	
9/18/2023	<3.6 (U)							5.8 (J)	
9/20/2023			21	120	7.5 (J)	<3.6 (U)			
9/21/2023		86							220

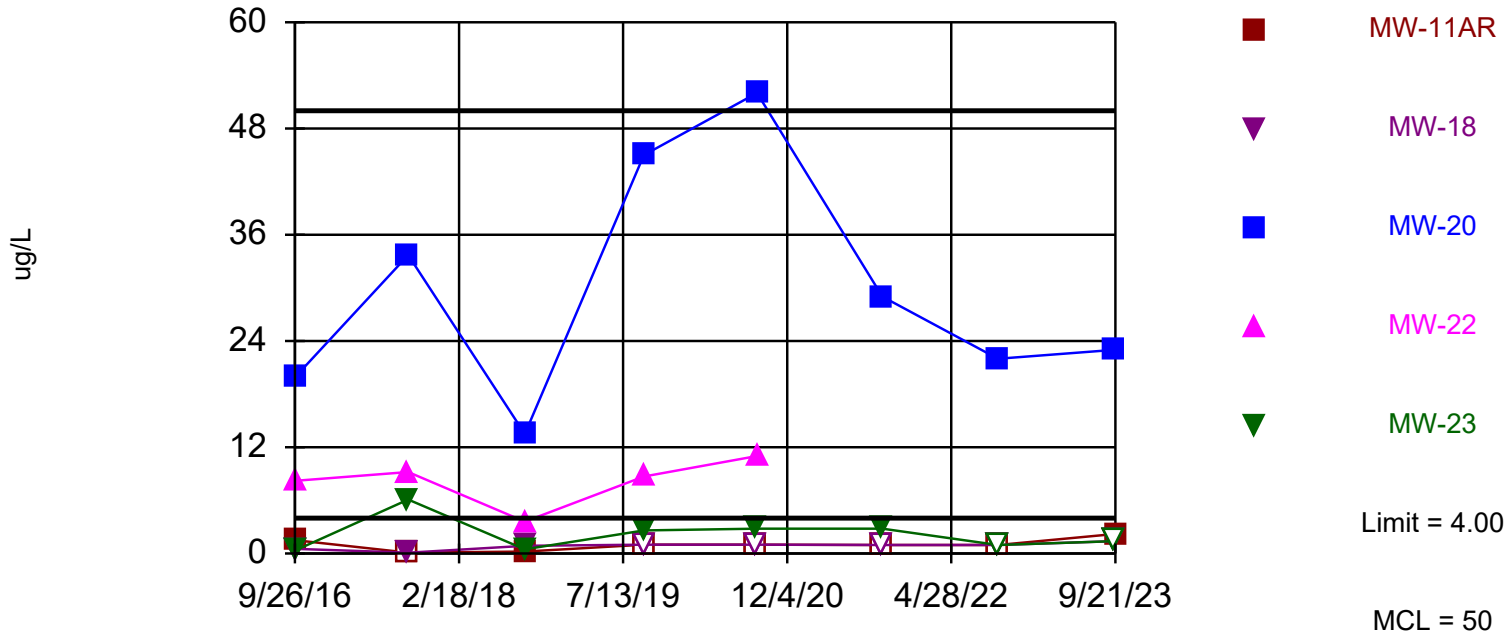
ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Exceeds Limit: MW-20, MW-22

Prediction Limit

Interwell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because censored data exceeded 49%. Limit is highest of 32 background values. 56.25% NDs. Annual per-constituent alpha = 0.02223. Individual comparison alpha = 0.001728 (1 of 2). Comparing 5 points to limit. Assumes 8 future values. Insufficient data to test for seasonality; data will not be deseasonalized.

Constituent: Selenium Analysis Run 10/30/2023 2:58 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Prediction Limit

Constituent: Selenium (ug/L) Analysis Run 10/30/2023 2:58 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

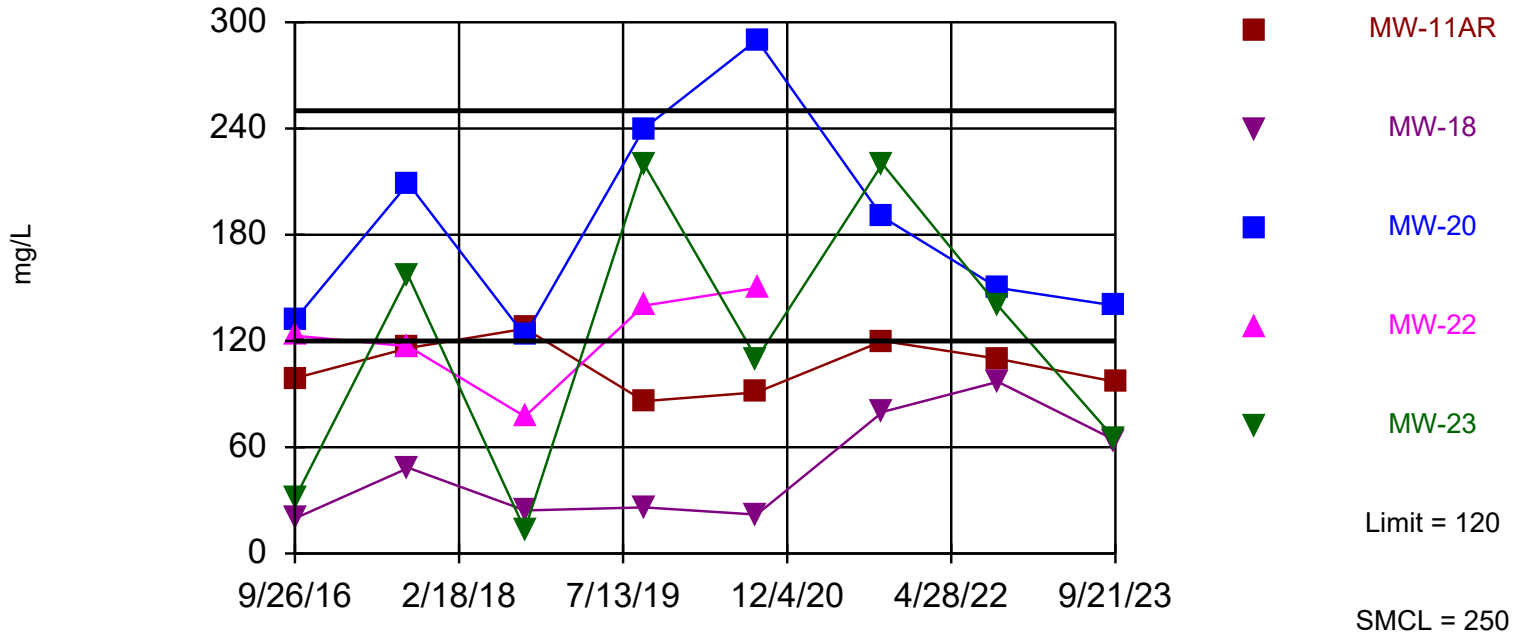
	MW-13 (bg)	MW-9 (bg)	MW-14 (bg)	MW-18	MW-20	MW-22	MW-11AR	MW-10 (bg)	MW-23
9/25/2016	1.1	<0.18							
9/26/2016			1.7	0.52 (J)	19.9	8.2			
9/27/2016							1.5	0.68 (J)	
9/28/2016									0.36 (J)
9/13/2017	1				33.7	9.2			6.1
9/14/2017		<0.086	0.63 (J)	0.094 (J)			<0.086		
9/15/2017								0.66 (J)	
9/11/2018	1.3				13.5	3.6			0.47 (J)
9/12/2018		<0.16	4	0.87 (J)			0.22 (J)	0.71 (J)	
9/16/2019	1.1 (J)		1.7 (J)		45	8.7			2.6 (J)
9/17/2019		<1		<1			<1	<1	
9/1/2020		<1	1.9 (J)	<1			<1		2.8 (J)
9/2/2020	<1				52	11			
4/29/2021								1.6 (J)	
9/27/2021	<0.96		<0.96		29				2.8 (J)
9/28/2021		<0.96		<0.96			<0.96	<0.96	
9/20/2022		<0.96	1.6 (J)					<0.96	
9/21/2022	<0.96			<0.96	22		<0.96		<0.96
9/18/2023								<1.4 (U)	<1.4 (U)
9/20/2023	<1.4 (U)		<1.4 (U)	<1.4 (U)	23				
9/21/2023		<1.4 (U)					2.2 (J)		

ND substitution: RL or RL/2 if <15% NDs.

Exceeds Limit: MW-20, MW-22

Prediction Limit

Interwell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because the Chi Squared normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 100 background values. Annual per-constituent alpha = 0.002506. Individual comparison alpha = 0.000193 (1 of 2). Comparing 5 points to limit. Assumes 8 future values. Insufficient data to test for seasonality; data will not be deseasonalized.

Constituent: Sulfate Analysis Run 10/30/2023 2:58 PM View: East Closed LF

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Prediction Limit

Constituent: Sulfate (mg/L) Analysis Run 10/30/2023 2:58 PM View: East Closed LF

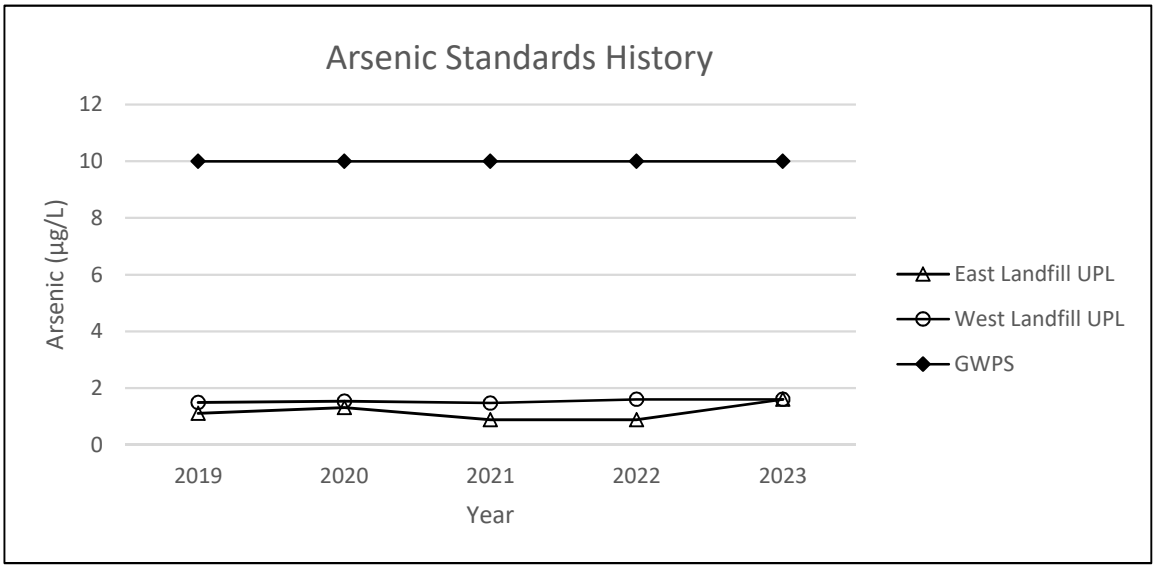
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

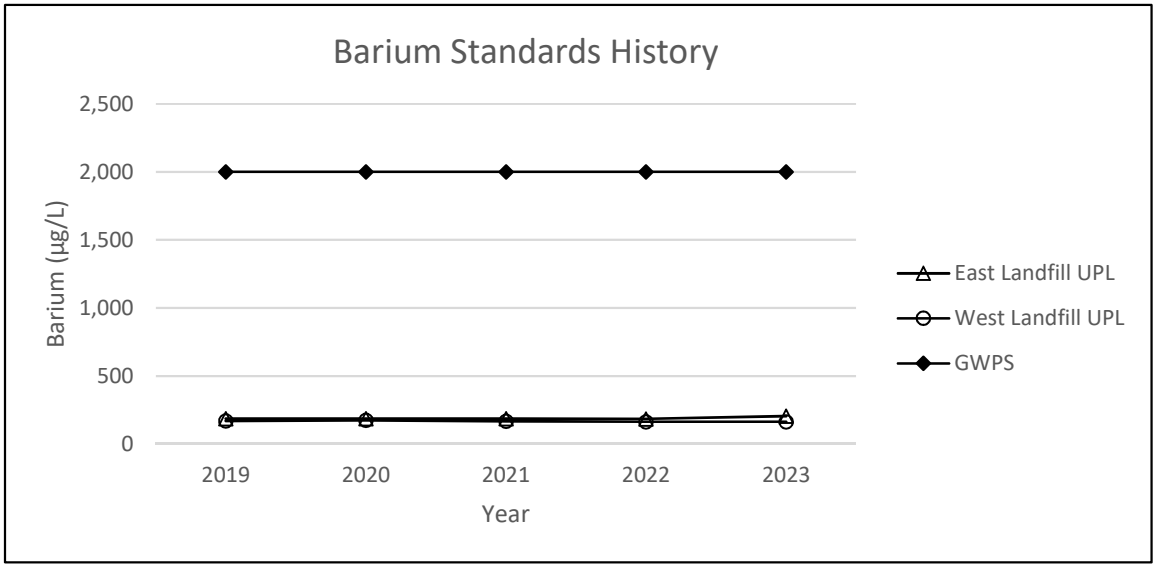
	MW-10 (bg)	MW-13 (bg)	MW-14 (bg)	MW-9 (bg)	MW-22	MW-20	MW-18	MW-11AR	MW-23
9/1/1999	43	56	64	30					
9/1/2000	28	110	48	35					
9/1/2001	14	76	56	38					
9/1/2002	19	110	60	36					
9/1/2003	17	100	32	35					
9/1/2004	31	100	64	39					
9/1/2005	17	120	80	44					
9/1/2006	14.7	60.5	81.2	42.7					
9/1/2007	13.8	106	86.9	28.7					
9/1/2008	8.48	86.5	60	35.2					
9/1/2009	10.1	80.2	56.5	35.6					
9/1/2010	7.17	69.2	54.5	25.6					
9/1/2011	9.16	70.5	51.8	26					
9/1/2012	11.6	72.6	54.2	27.5					
9/1/2013	11.1	69.3	50	19.7					
9/1/2014	10.5	33.6	38.7	24.1					
9/1/2015	6.2	68.9	49	27.2					
9/25/2016		59.7		6.3					
9/26/2016			40		123	132	19.8		
9/27/2016	7.8							99	
9/28/2016									31.8
9/13/2017		67.6			117	209			157
9/14/2017			45.1	12			48.4	116	
9/15/2017	8.4								
9/11/2018		51.6			77.4	123			13.5
9/12/2018	7.8		30.7	9.1			24.3	127	
9/16/2019		48	32		140	240			220
9/17/2019	5.2			5.1			26	86	
9/1/2020			28	5.6			22	91	110
9/2/2020		42			150	290			
4/29/2021	7								
9/27/2021		110	42			190			220
9/28/2021	8.5			12			80	120	
9/20/2022	7.7		30	13					
9/21/2022		120				150	97	110	140
9/18/2023	8								65
9/20/2023		120	35			140	64		
9/21/2023				11				97	

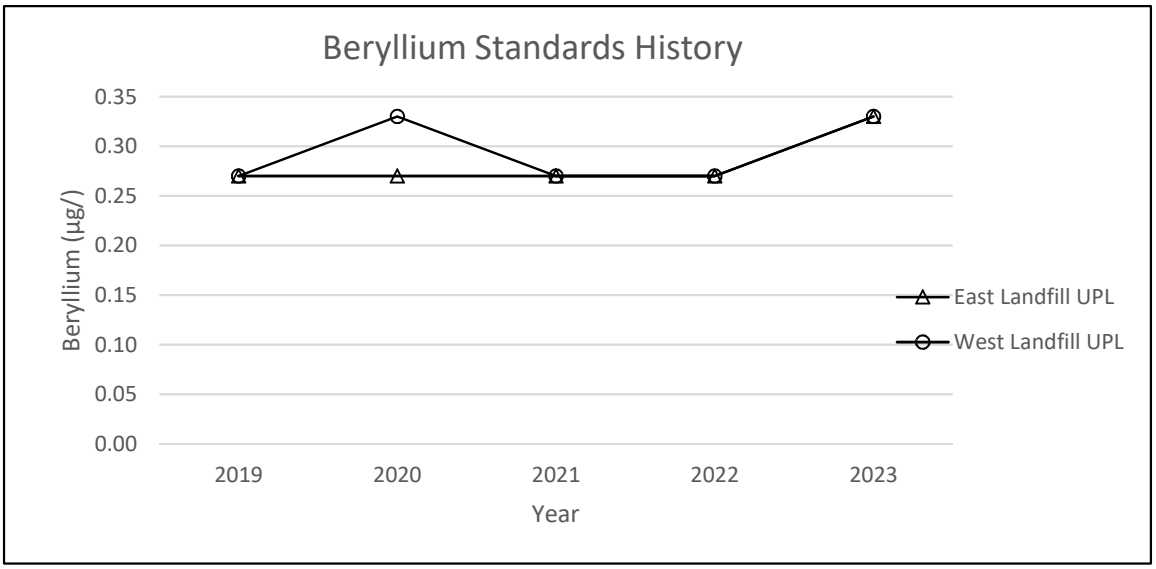
Appendix F

Standards History Graphs

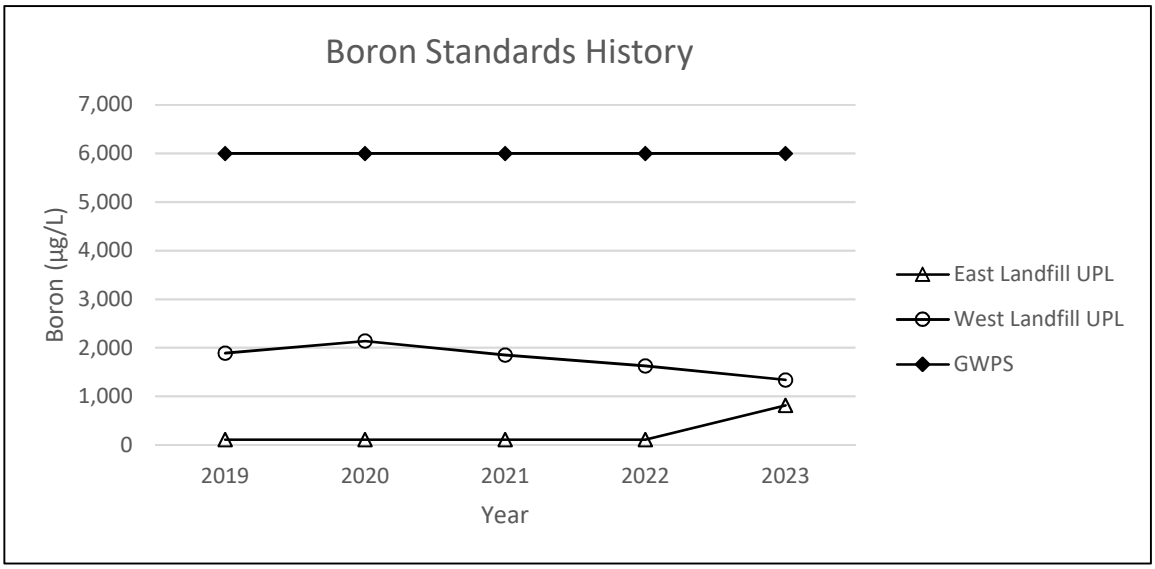
Marshalltown East and West Closed Landfills, Permit #64-SDP-5-91C and #64-SDP-3-90C
Standards History Graphs

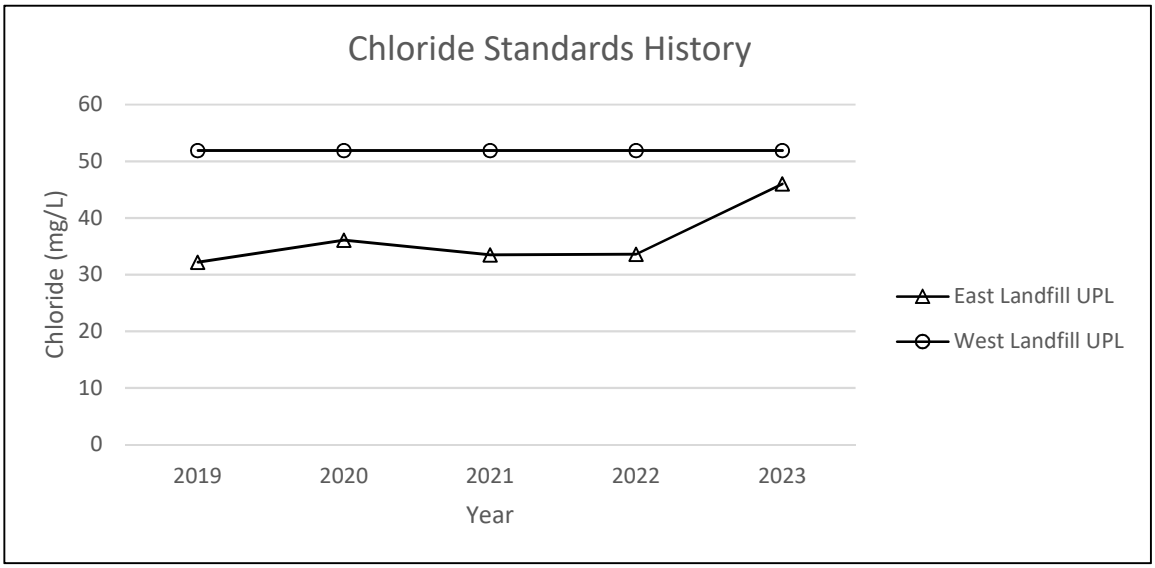


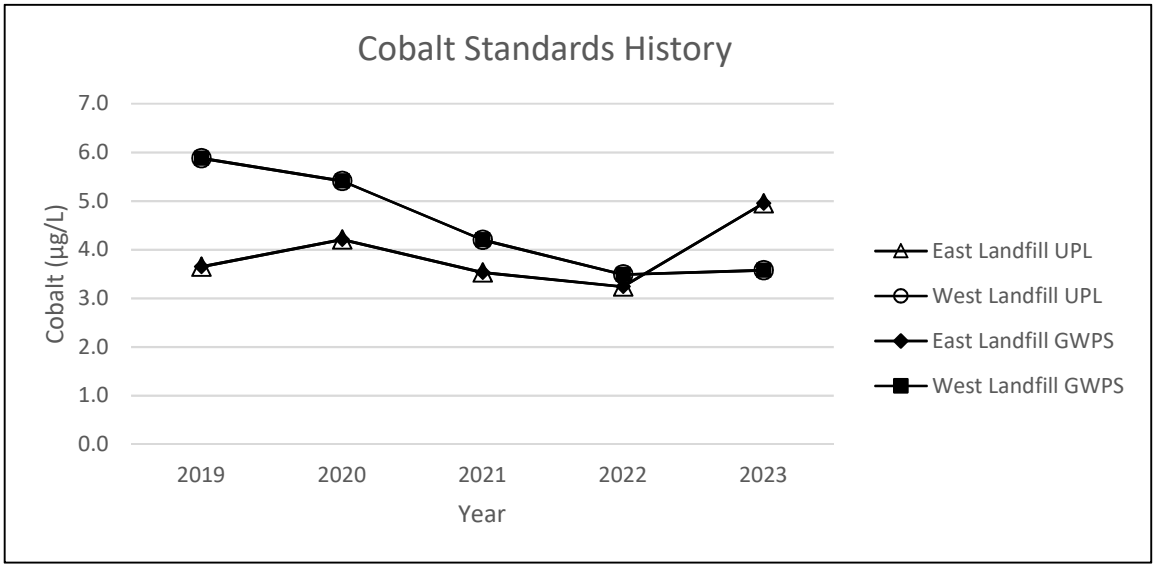




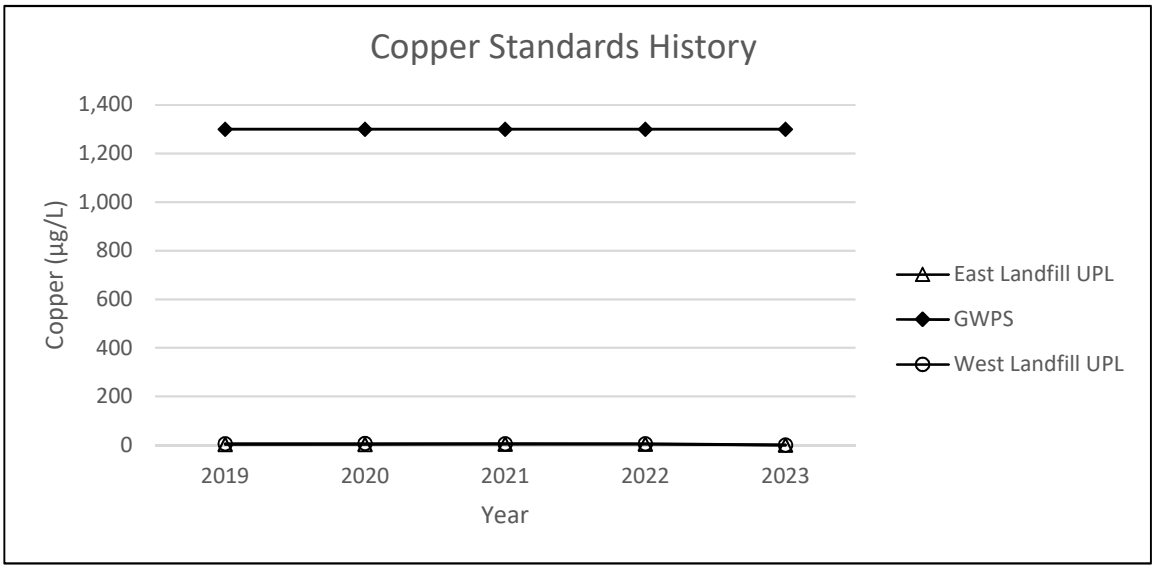
Marshalltown East and West Closed Landfills, Permit #64-SDP-5-91C and #64-SDP-3-90C
Standards History Graphs

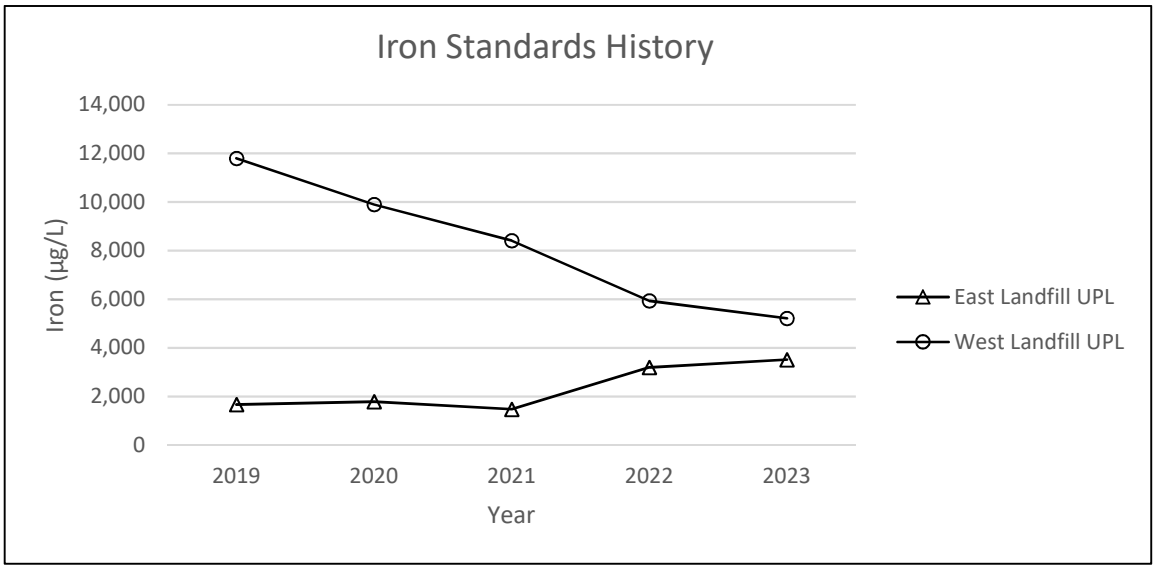


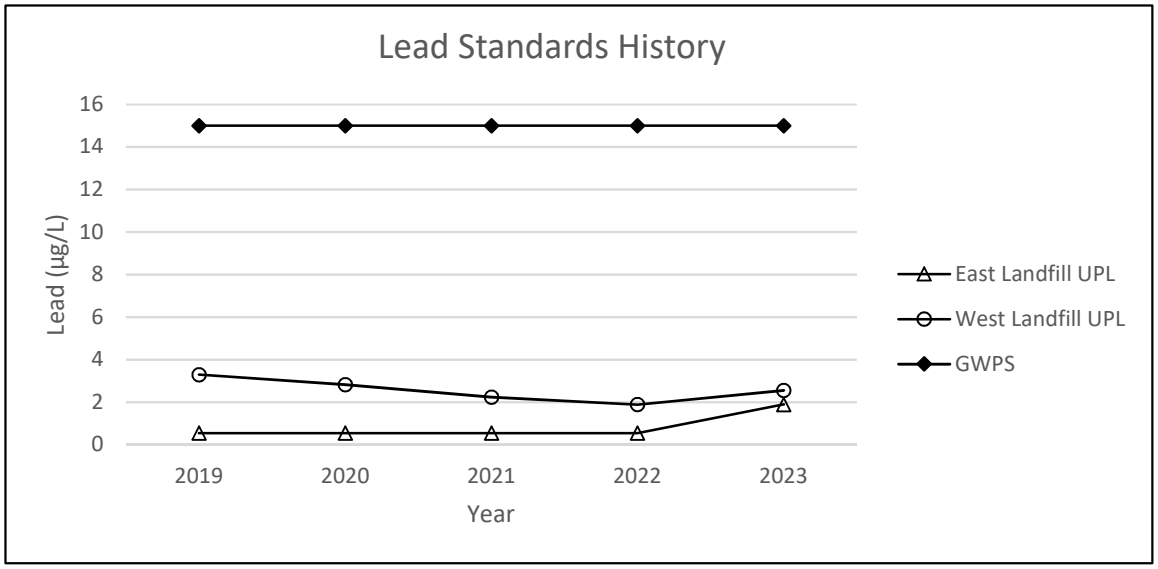




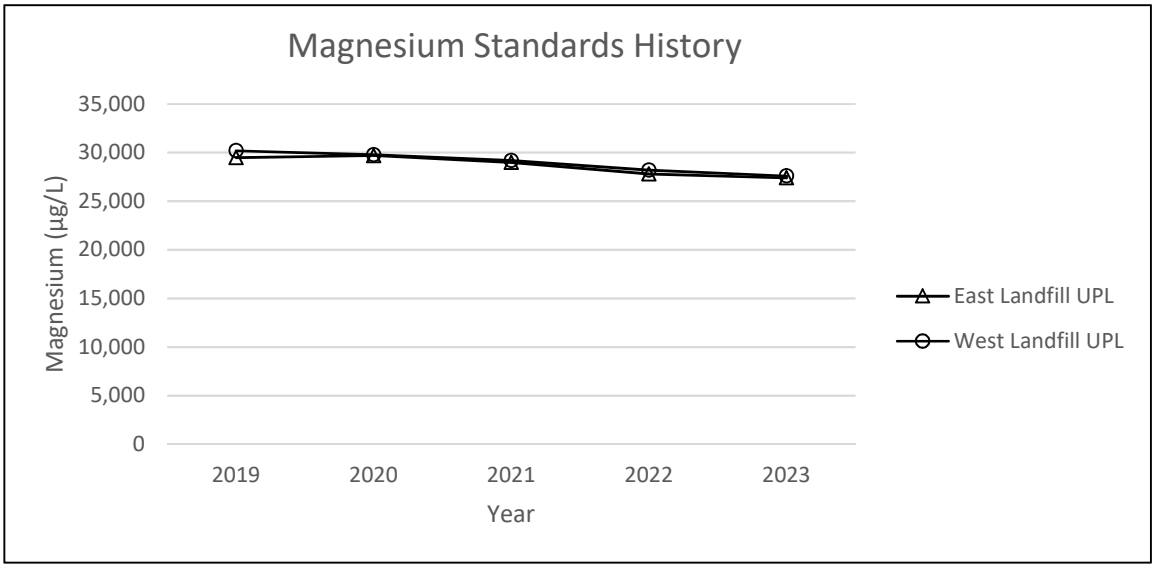
Marshalltown East and West Closed Landfills, Permit #64-SDP-5-91C and #64-SDP-3-90C
Standards History Graphs

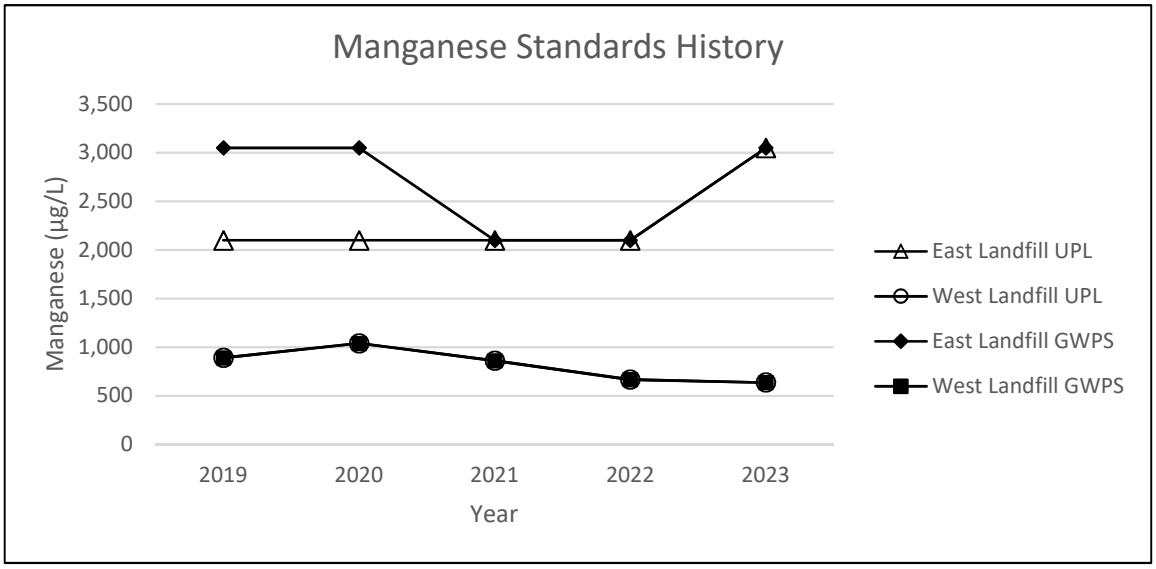


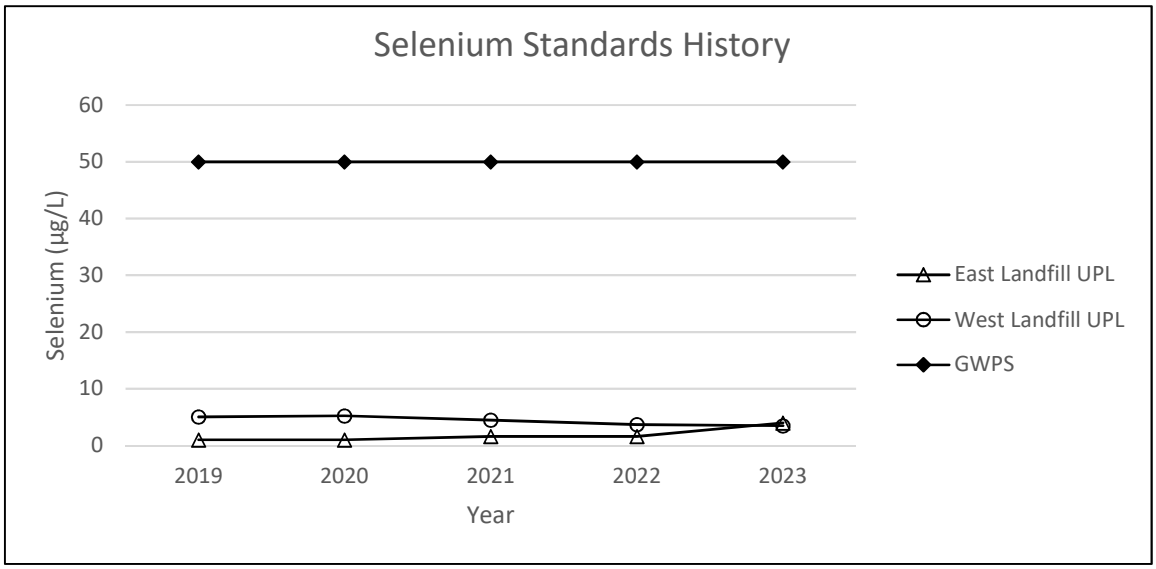




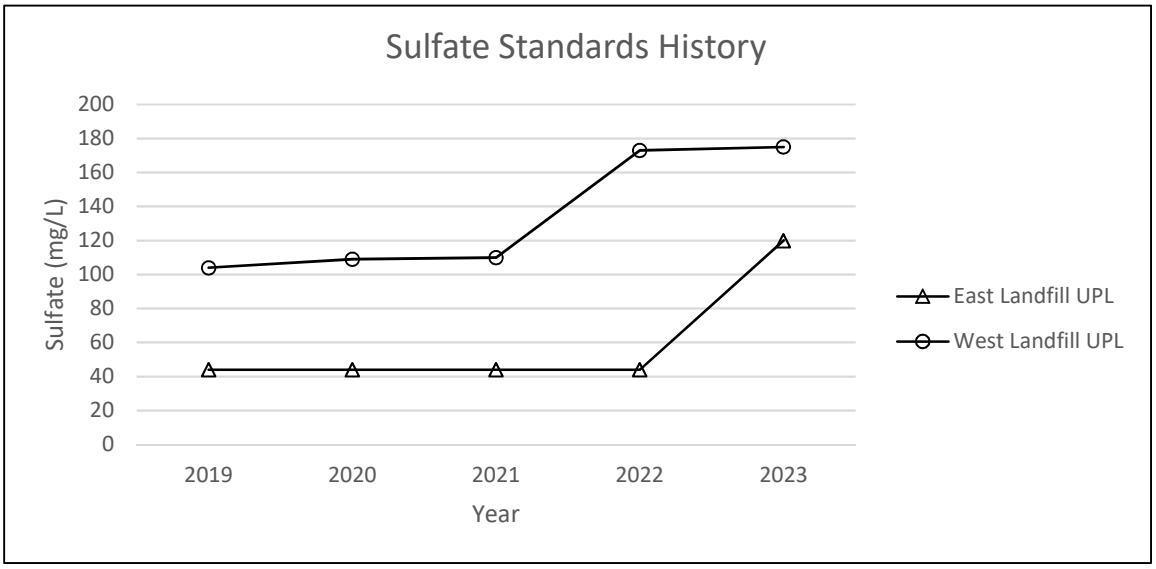
Marshalltown East and West Closed Landfills, Permit #64-SDP-5-91C and #64-SDP-3-90C
Standards History Graphs

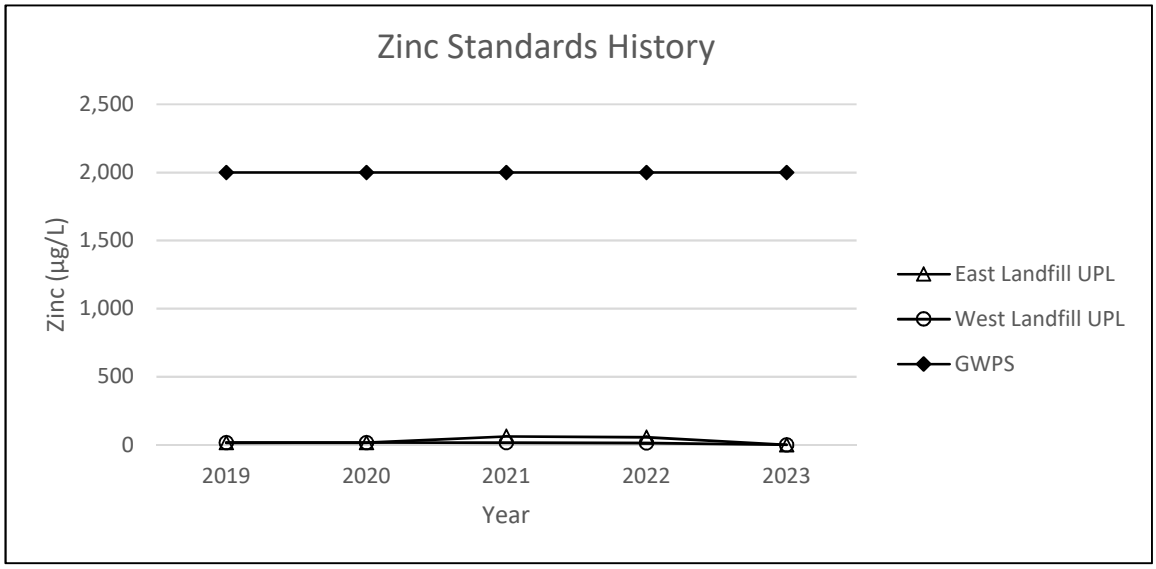






Marshalltown East and West Closed Landfills, Permit #64-SDP-5-91C and #64-SDP-3-90C
Standards History Graphs





Appendix G

Trend Analysis

Trend Test

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input Printed 11/1/2023, 11:38 AM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Xform	Alpha	Method
Arsenic (ug/L)	MW-10 (bg)	0.0784	14	20	No	8	62.5	n/a	n/a	0.02	NP
Arsenic (ug/L)	MW-11AR	-0.0529	-2	-20	No	8	12.5	n/a	n/a	0.02	NP
Arsenic (ug/L)	MW-13 (bg)	0.0616	9	20	No	8	62.5	n/a	n/a	0.02	NP
Arsenic (ug/L)	MW-14 (bg)	-0.00...	-3	-20	No	8	62.5	n/a	n/a	0.02	NP
Arsenic (ug/L)	MW-18	-0.02742	-1	-20	No	8	50	n/a	n/a	0.02	NP
Arsenic (ug/L)	MW-19	0.07216	12	20	No	8	62.5	n/a	n/a	0.02	NP
Arsenic (ug/L)	MW-20	-0.06377	-15	-20	No	8	0	n/a	n/a	0.02	NP
Arsenic (ug/L)	MW-21	0.02709	9	20	No	8	37.5	n/a	n/a	0.02	NP
Arsenic (ug/L)	MW-22	0.1169	8	10	No	5	40	n/a	n/a	0.02	NP
Arsenic (ug/L)	MW-23	0.04782	7	20	No	8	62.5	n/a	n/a	0.02	NP
Arsenic (ug/L)	MW-3	0.05909	11	20	No	8	37.5	n/a	n/a	0.02	NP
Arsenic (ug/L)	MW-4	-0.5457	-12	-20	No	8	0	n/a	n/a	0.02	NP
Arsenic (ug/L)	MW-5	-0.00...	0	20	No	8	0	n/a	n/a	0.02	NP
Arsenic (ug/L)	MW-7	0.06953	13	20	No	8	62.5	n/a	n/a	0.02	NP
Arsenic (ug/L)	MW-8 (bg)	0.04033	5	17	No	7	42.86	n/a	n/a	0.02	NP
Arsenic (ug/L)	MW-9 (bg)	0.04007	7	20	No	8	62.5	n/a	n/a	0.02	NP
Boron (ug/L)	MW-10 (bg)	6.165	11	20	No	8	75	n/a	n/a	0.02	NP
Boron (ug/L)	MW-11AR	-36.46	-13	-20	No	8	0	n/a	n/a	0.02	NP
Boron (ug/L)	MW-13 (bg)	10.24	12	20	No	8	0	n/a	n/a	0.02	NP
Boron (ug/L)	MW-14 (bg)	4.037	0	20	No	8	0	n/a	n/a	0.02	NP
Boron (ug/L)	MW-18	10.19	17	20	No	8	25	n/a	n/a	0.02	NP
Boron (ug/L)	MW-19	-15.81	-10	-20	No	8	50	n/a	n/a	0.02	NP
Boron (ug/L)	MW-20	-55.85	-2	-20	No	8	0	n/a	n/a	0.02	NP
Boron (ug/L)	MW-21	-90.95	-6	-20	No	8	0	n/a	n/a	0.02	NP
Boron (ug/L)	MW-22	-43.95	-2	-10	No	5	0	n/a	n/a	0.02	NP
Boron (ug/L)	MW-23	7.48	8	20	No	8	12.5	n/a	n/a	0.02	NP
Boron (ug/L)	MW-3	77.76	18	20	No	8	0	n/a	n/a	0.02	NP
Boron (ug/L)	MW-4	-112.6	-11	-20	No	8	0	n/a	n/a	0.02	NP
Boron (ug/L)	MW-5	-9.17	-8	-20	No	8	0	n/a	n/a	0.02	NP
Boron (ug/L)	MW-7	0.8925	0	20	No	8	12.5	n/a	n/a	0.02	NP
Boron (ug/L)	MW-8 (bg)	4.986	7	17	No	7	42.86	n/a	n/a	0.02	NP
Boron (ug/L)	MW-9 (bg)	4.553	4	20	No	8	75	n/a	n/a	0.02	NP
Lead (ug/L)	MW-10 (bg)	0.005676	5	20	No	8	62.5	n/a	n/a	0.02	NP
Lead (ug/L)	MW-11AR	0.08797	8	20	No	8	12.5	n/a	n/a	0.02	NP
Lead (ug/L)	MW-13 (bg)	-0.02296	-4	-20	No	8	37.5	n/a	n/a	0.02	NP
Lead (ug/L)	MW-14 (bg)	-0.1054	-16	-20	No	8	12.5	n/a	n/a	0.02	NP
Lead (ug/L)	MW-18	0.01601	2	20	No	8	37.5	n/a	n/a	0.02	NP
Lead (ug/L)	MW-19	0.005318	5	20	No	8	50	n/a	n/a	0.02	NP
Lead (ug/L)	MW-20	0.01596	10	20	No	8	50	n/a	n/a	0.02	NP
Lead (ug/L)	MW-21	0.1234	10	20	No	8	0	n/a	n/a	0.02	NP
Lead (ug/L)	MW-22	-0.01009	-1	-10	No	5	20	n/a	n/a	0.02	NP
Lead (ug/L)	MW-23	0.01332	3	20	No	8	62.5	n/a	n/a	0.02	NP
Lead (ug/L)	MW-3	0.05443	6	20	No	8	12.5	n/a	n/a	0.02	NP
Lead (ug/L)	MW-4	0.007881	5	20	No	8	37.5	n/a	n/a	0.02	NP
Lead (ug/L)	MW-5	0.1234	6	20	No	8	0	n/a	n/a	0.02	NP
Lead (ug/L)	MW-7	0.02104	10	20	No	8	62.5	n/a	n/a	0.02	NP
Lead (ug/L)	MW-8 (bg)	0.05118	9	17	No	7	0	n/a	n/a	0.02	NP
Lead (ug/L)	MW-9 (bg)	0.01006	8	20	No	8	62.5	n/a	n/a	0.02	NP
Manganese (ug/L)	MW-10 (bg)	-0.2363	-2	-20	No	8	12.5	n/a	n/a	0.02	NP
Manganese (ug/L)	MW-11AR	-6.509	-8	-20	No	8	12.5	n/a	n/a	0.02	NP

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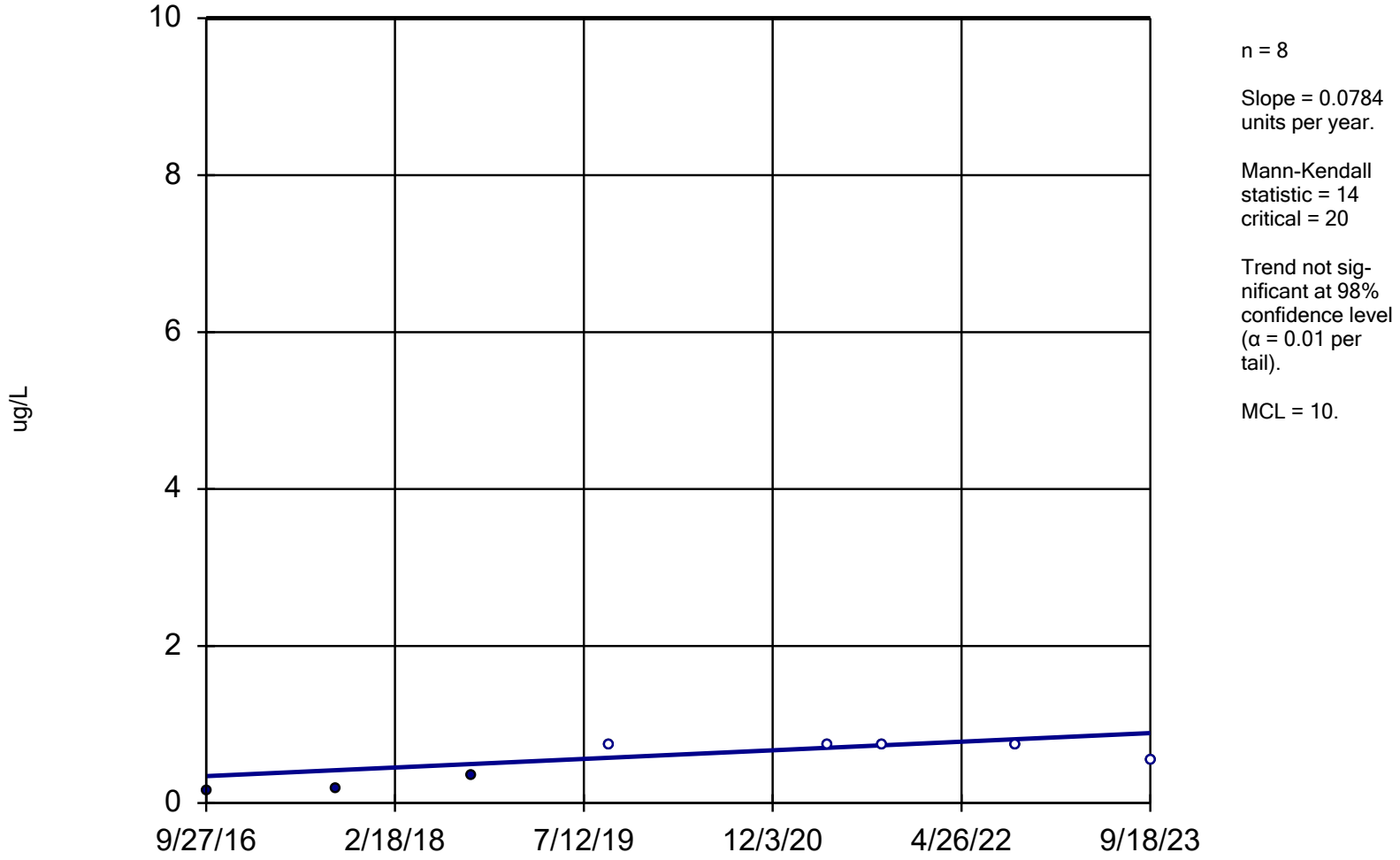
Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Xform	Alpha	Method
Manganese (ug/L)	MW-13 (bg)	-6.146	-4	-20	No	8	0	n/a	n/a	0.02	NP
Manganese (ug/L)	MW-14 (bg)	-3.926	-1	-20	No	8	0	n/a	n/a	0.02	NP
Manganese (ug/L)	MW-18	-15.94	-8	-20	No	8	0	n/a	n/a	0.02	NP
Manganese (ug/L)	MW-19	0.4962	2	20	No	8	12.5	n/a	n/a	0.02	NP
Manganese (ug/L)	MW-20	0.2236	0	20	No	8	25	n/a	n/a	0.02	NP
Manganese (ug/L)	MW-21	18.01	12	20	No	8	0	n/a	n/a	0.02	NP
Manganese (ug/L)	MW-22	4.541	6	10	No	5	0	n/a	n/a	0.02	NP
Manganese (ug/L)	MW-23	1.381	4	20	No	8	0	n/a	n/a	0.02	NP
Manganese (ug/L)	MW-3	8.108	12	20	No	8	0	n/a	n/a	0.02	NP
Manganese (ug/L)	**MW-4**	**104.6**	**23**	**20**	**Yes**	**8**	**0**	**n/a**	**n/a**	**0.02**	**NP**
Manganese (ug/L)	MW-5	-12.57	-2	-20	No	8	0	n/a	n/a	0.02	NP
Manganese (ug/L)	MW-7	2.898	16	20	No	8	12.5	n/a	n/a	0.02	NP
Manganese (ug/L)	MW-8 (bg)	12.65	7	17	No	7	0	n/a	n/a	0.02	NP
Manganese (ug/L)	MW-9 (bg)	-16.29	0	20	No	8	0	n/a	n/a	0.02	NP
Selenium (ug/L)	MW-10 (bg)	0.07817	15	20	No	8	50	n/a	n/a	0.02	NP
Selenium (ug/L)	MW-11AR	0.1544	6	20	No	8	62.5	n/a	n/a	0.02	NP
Selenium (ug/L)	MW-13 (bg)	-0.00893	-5	-20	No	8	50	n/a	n/a	0.02	NP
Selenium (ug/L)	MW-14 (bg)	-0.03806	-5	-20	No	8	25	n/a	n/a	0.02	NP
Selenium (ug/L)	MW-18	0.1137	16	20	No	8	62.5	n/a	n/a	0.02	NP
Selenium (ug/L)	MW-19	0.02991	3	20	No	8	0	n/a	n/a	0.02	NP
Selenium (ug/L)	MW-20	0.3972	2	20	No	8	0	n/a	n/a	0.02	NP
Selenium (ug/L)	MW-21	-0.6196	-8	-20	No	8	0	n/a	n/a	0.02	NP
Selenium (ug/L)	MW-22	0.6584	4	10	No	5	0	n/a	n/a	0.02	NP
Selenium (ug/L)	MW-23	0.07735	3	20	No	8	25	n/a	n/a	0.02	NP
Selenium (ug/L)	MW-3	0.2978	9	20	No	8	0	n/a	n/a	0.02	NP
Selenium (ug/L)	MW-4	0.1265	8	20	No	8	50	n/a	n/a	0.02	NP
Selenium (ug/L)	MW-5	7.965	18	20	No	8	0	n/a	n/a	0.02	NP
Selenium (ug/L)	MW-7	0.1365	14	20	No	8	0	n/a	n/a	0.02	NP
Selenium (ug/L)	MW-8 (bg)	0.09966	8	17	No	7	57.14	n/a	n/a	0.02	NP
Selenium (ug/L)	MW-9 (bg)	0.1743	14	20	No	8	100	n/a	n/a	0.02	NP

Hollow symbols indicate censored values.

Arsenic

MW-10 (bg)



n = 8

Slope = 0.0784 units per year.

Mann-Kendall statistic = 14 critical = 20

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

MCL = 10.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:34 AM

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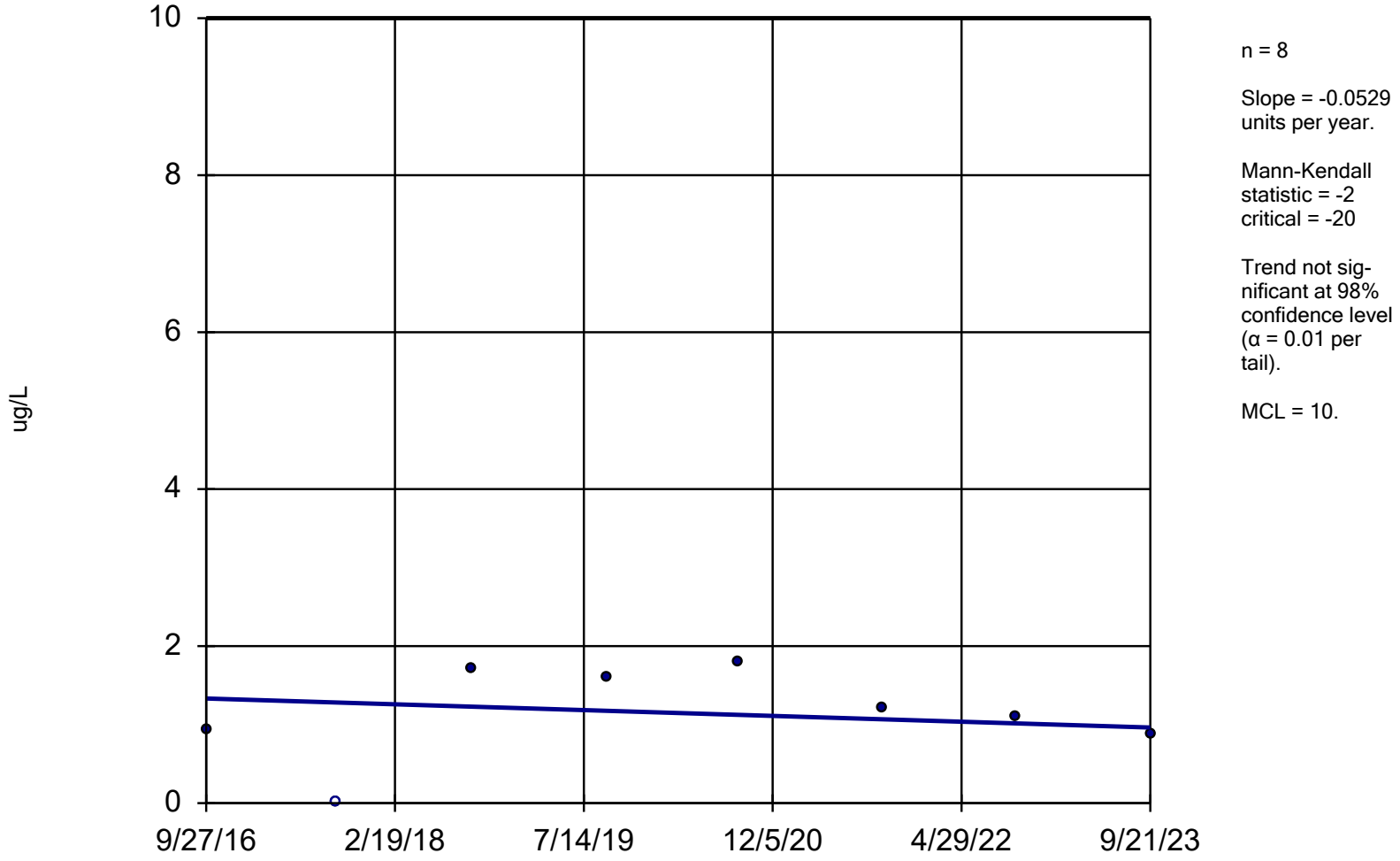
	MW-10 (bg)
9/27/2016	0.14 (J)
9/15/2017	0.17 (J)
9/12/2018	0.36 (J)
9/17/2019	<0.75
4/29/2021	<0.75
9/28/2021	<0.75
9/20/2022	<0.75
9/18/2023	<0.53 (U)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Arsenic

MW-11AR



n = 8

Slope = -0.0529 units per year.

Mann-Kendall statistic = -2
critical = -20

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

MCL = 10.

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Constituent: Arsenic (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

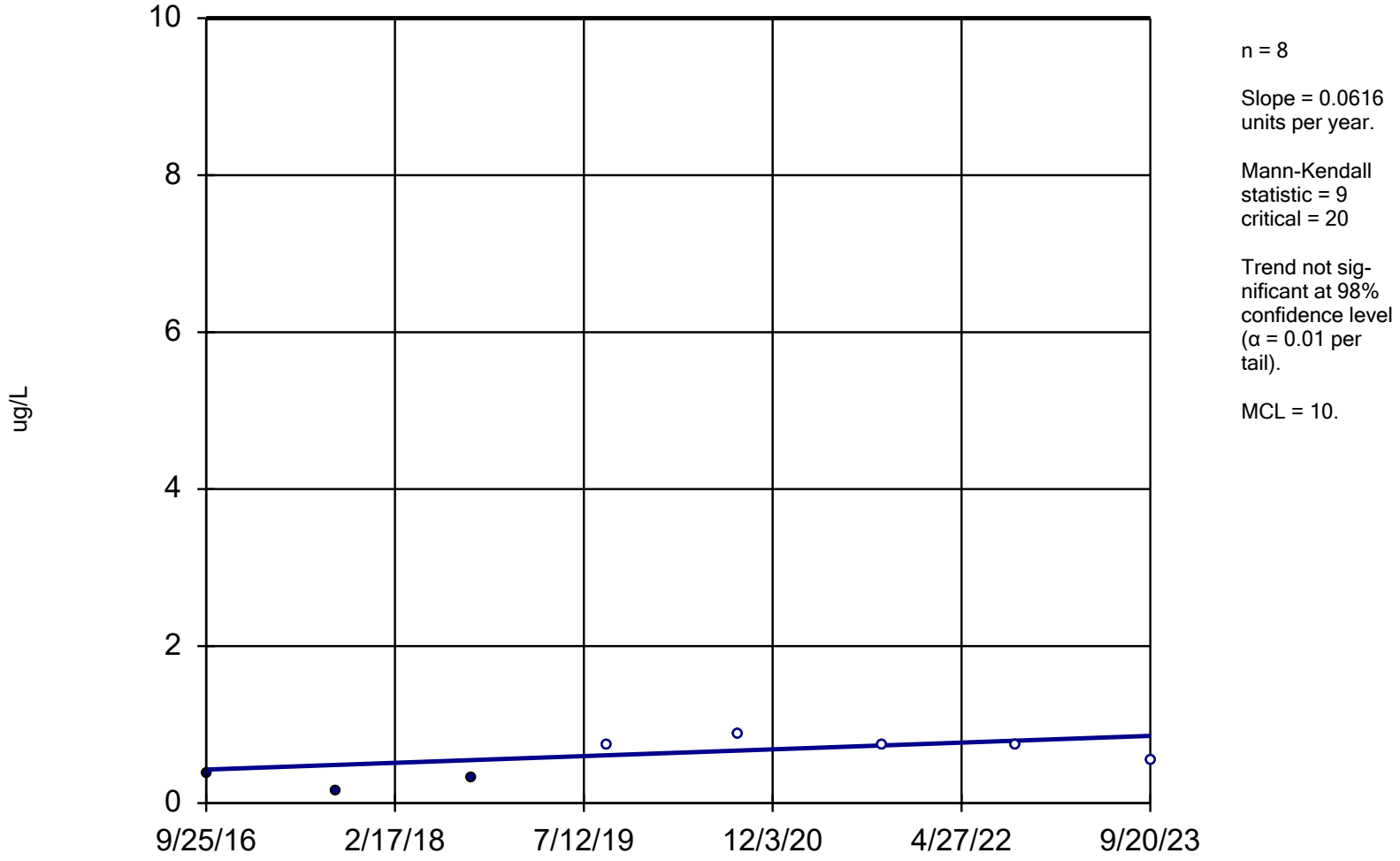
	MW-11AR
9/27/2016	0.94 (J)
9/14/2017	<0.052
9/12/2018	1.7
9/17/2019	1.6 (J)
9/1/2020	1.8 (J)
9/28/2021	1.2 (J)
9/21/2022	1.1 (J)
9/21/2023	0.89 (J)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Arsenic

MW-13 (bg)



n = 8

Slope = 0.0616 units per year.

Mann-Kendall statistic = 9
critical = 20

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

MCL = 10.

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Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

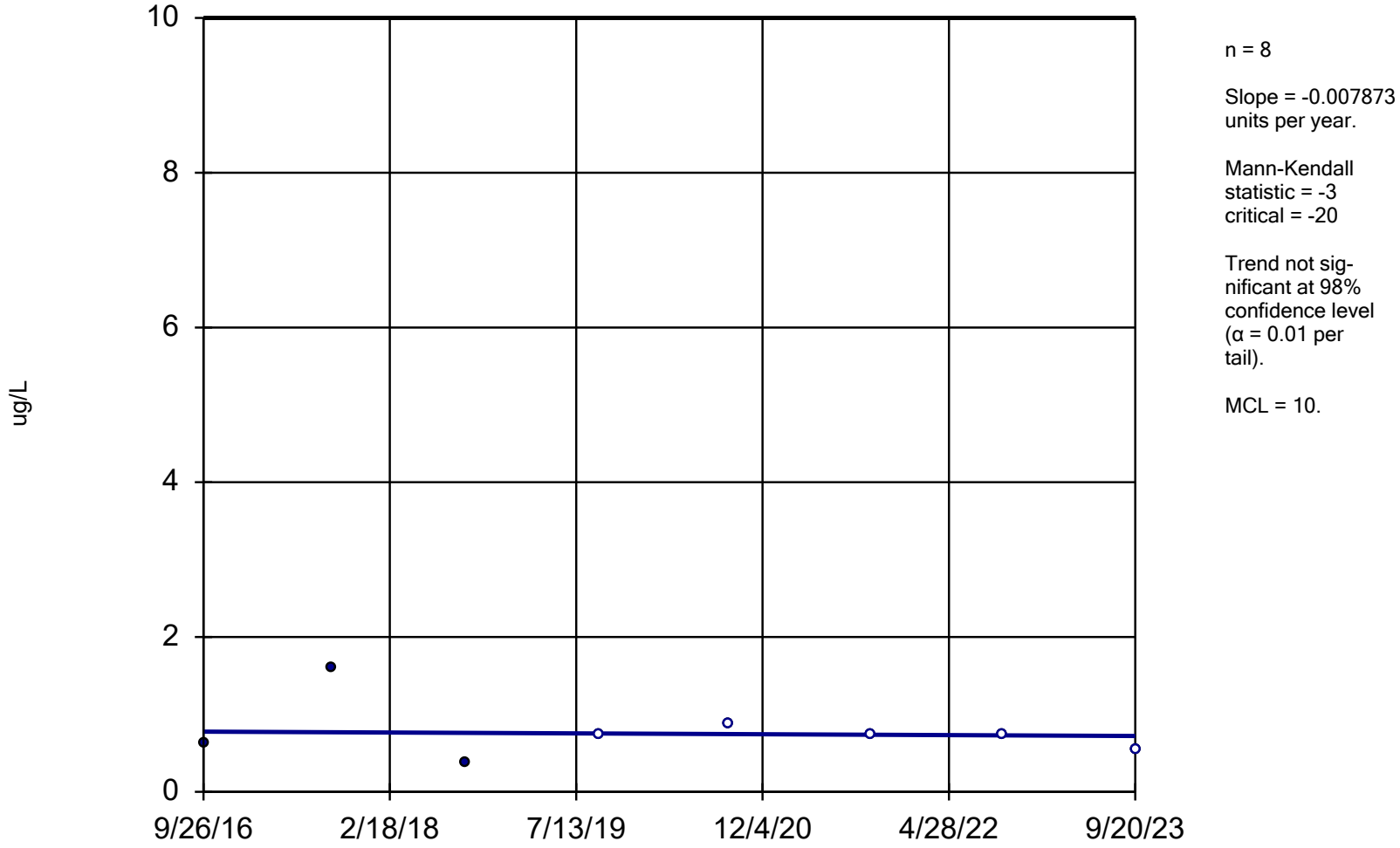
	MW-13 (bg)
9/25/2016	0.38 (J)
9/13/2017	0.16 (J)
9/11/2018	0.33 (J)
9/16/2019	<0.75
9/2/2020	<0.88
9/27/2021	<0.75
9/21/2022	<0.75
9/20/2023	<0.53 (U)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Arsenic

MW-14 (bg)



n = 8

Slope = -0.007873 units per year.

Mann-Kendall statistic = -3
critical = -20

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

MCL = 10.

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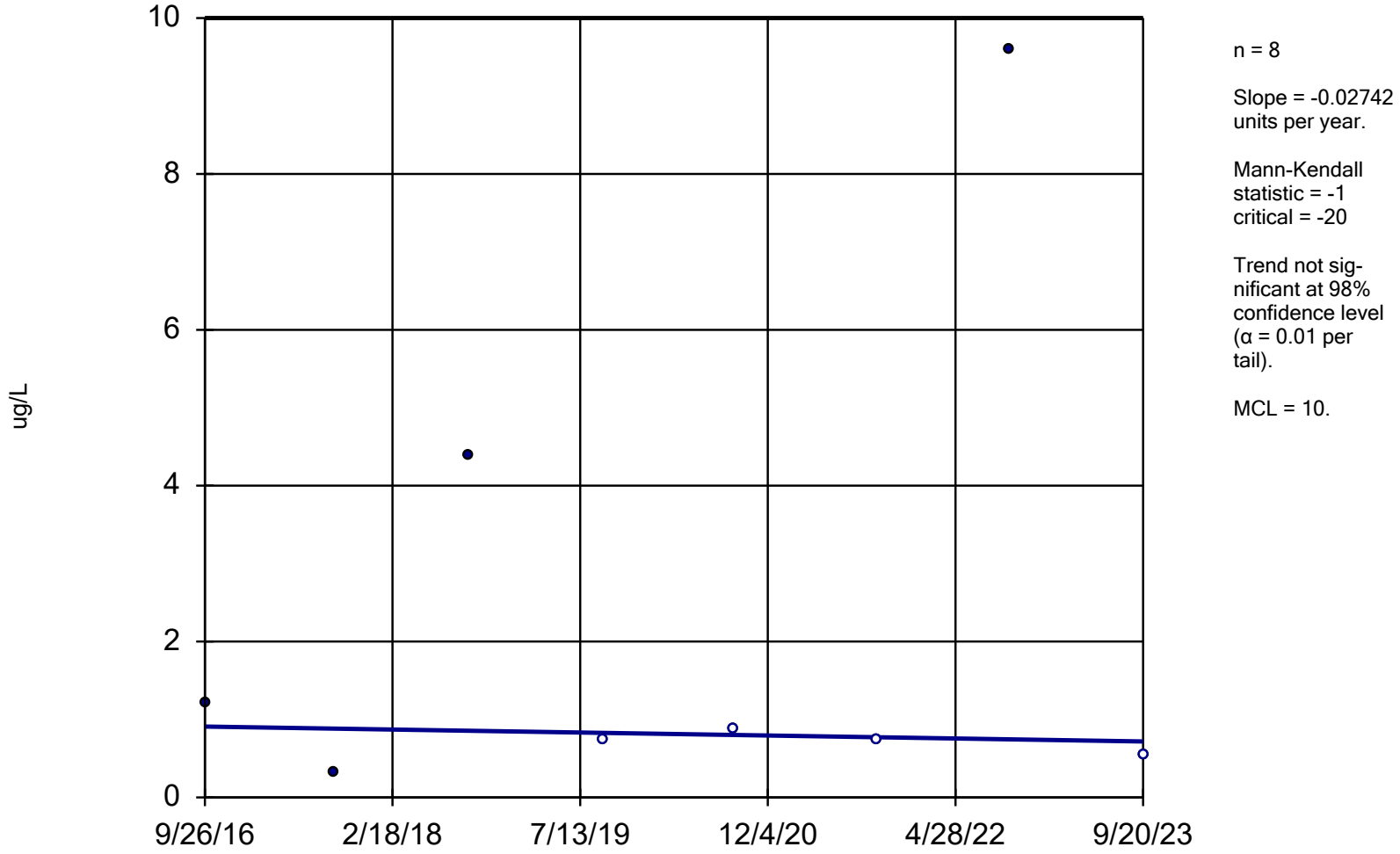
	MW-14 (bg)
9/26/2016	0.64 (J)
9/14/2017	1.6
9/12/2018	0.38 (J)
9/16/2019	<0.75
9/1/2020	<0.88
9/27/2021	<0.75
9/20/2022	<0.75
9/20/2023	<0.53 (U)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Arsenic

MW-18



n = 8

Slope = -0.02742 units per year.

Mann-Kendall statistic = -1
critical = -20

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

MCL = 10.

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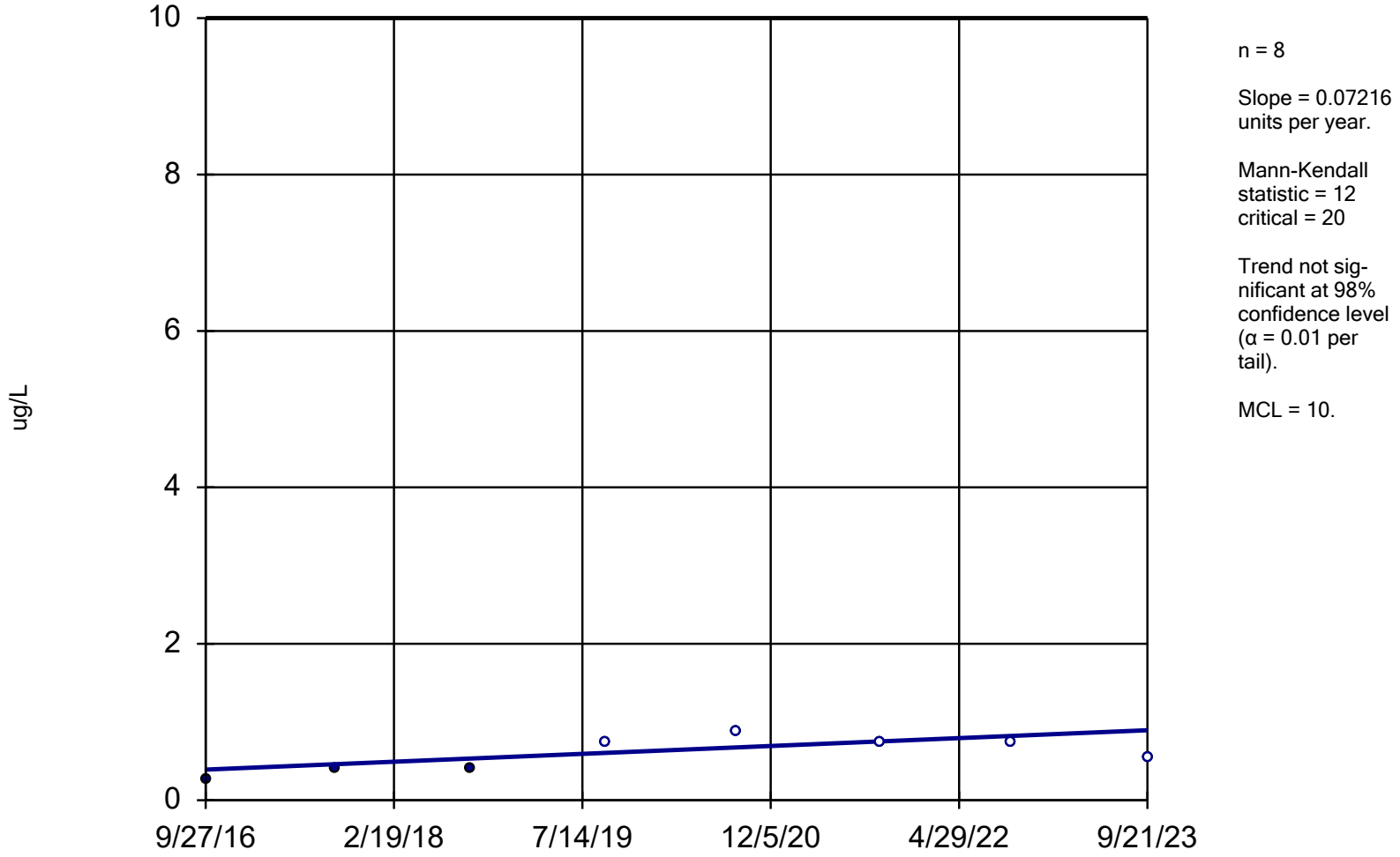
	MW-18
9/26/2016	1.2
9/14/2017	0.32 (J)
9/12/2018	4.4
9/17/2019	<0.75
9/1/2020	<0.88
9/28/2021	<0.75
9/21/2022	9.6
9/20/2023	<0.53 (U)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Arsenic

MW-19



n = 8

Slope = 0.07216 units per year.

Mann-Kendall statistic = 12
critical = 20

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

MCL = 10.

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Sen's Slope Estimator

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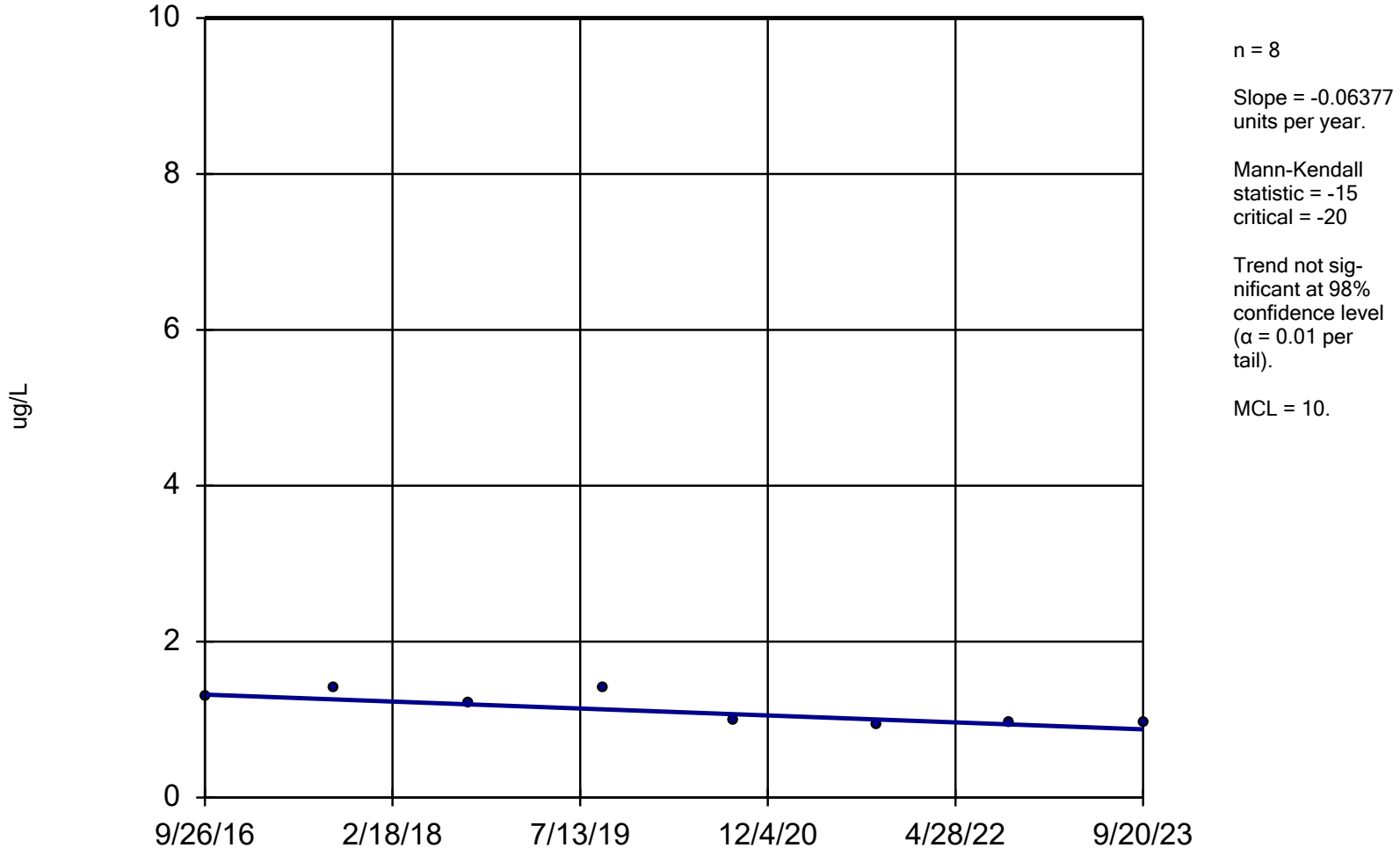
	MW-19
9/27/2016	0.26 (J)
9/14/2017	0.41 (J)
9/12/2018	0.41 (J)
9/17/2019	<0.75
9/2/2020	<0.88
9/29/2021	<0.75
9/20/2022	<0.75
9/21/2023	<0.53 (U)

ND substitution: RL or RL/2 if <15% NDs.

Arsenic

MW-20



n = 8

Slope = -0.06377 units per year.

Mann-Kendall statistic = -15
critical = -20

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

MCL = 10.

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Sen's Slope Estimator

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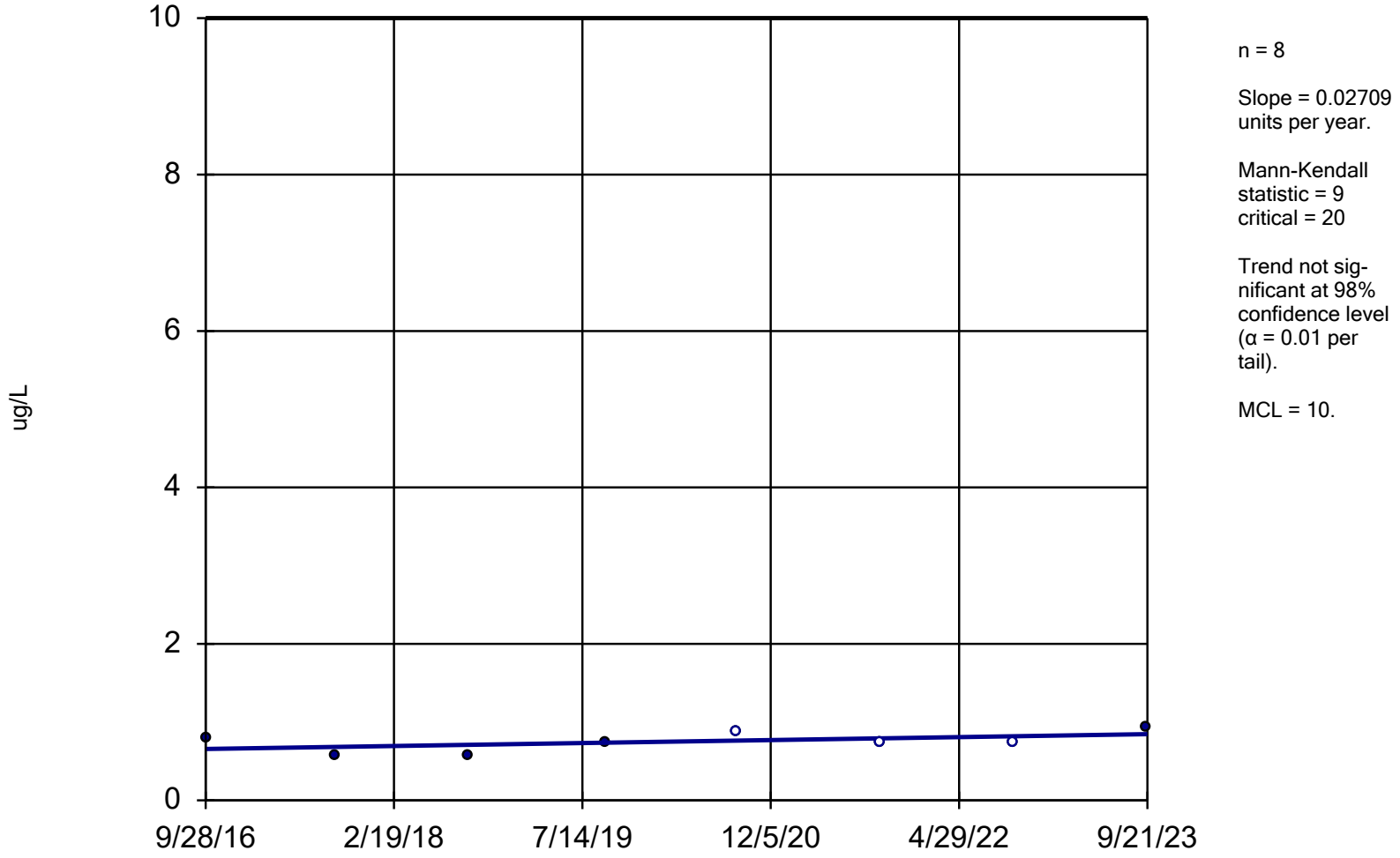
	MW-20
9/26/2016	1.3
9/13/2017	1.4
9/11/2018	1.2
9/16/2019	1.4 (J)
9/2/2020	1 (J)
9/27/2021	0.93 (J)
9/21/2022	0.95 (J)
9/20/2023	0.96 (J)

Hollow symbols indicate censored values.

Arsenic

MW-21



n = 8

Slope = 0.02709 units per year.

Mann-Kendall statistic = 9
critical = 20

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

MCL = 10.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:34 AM

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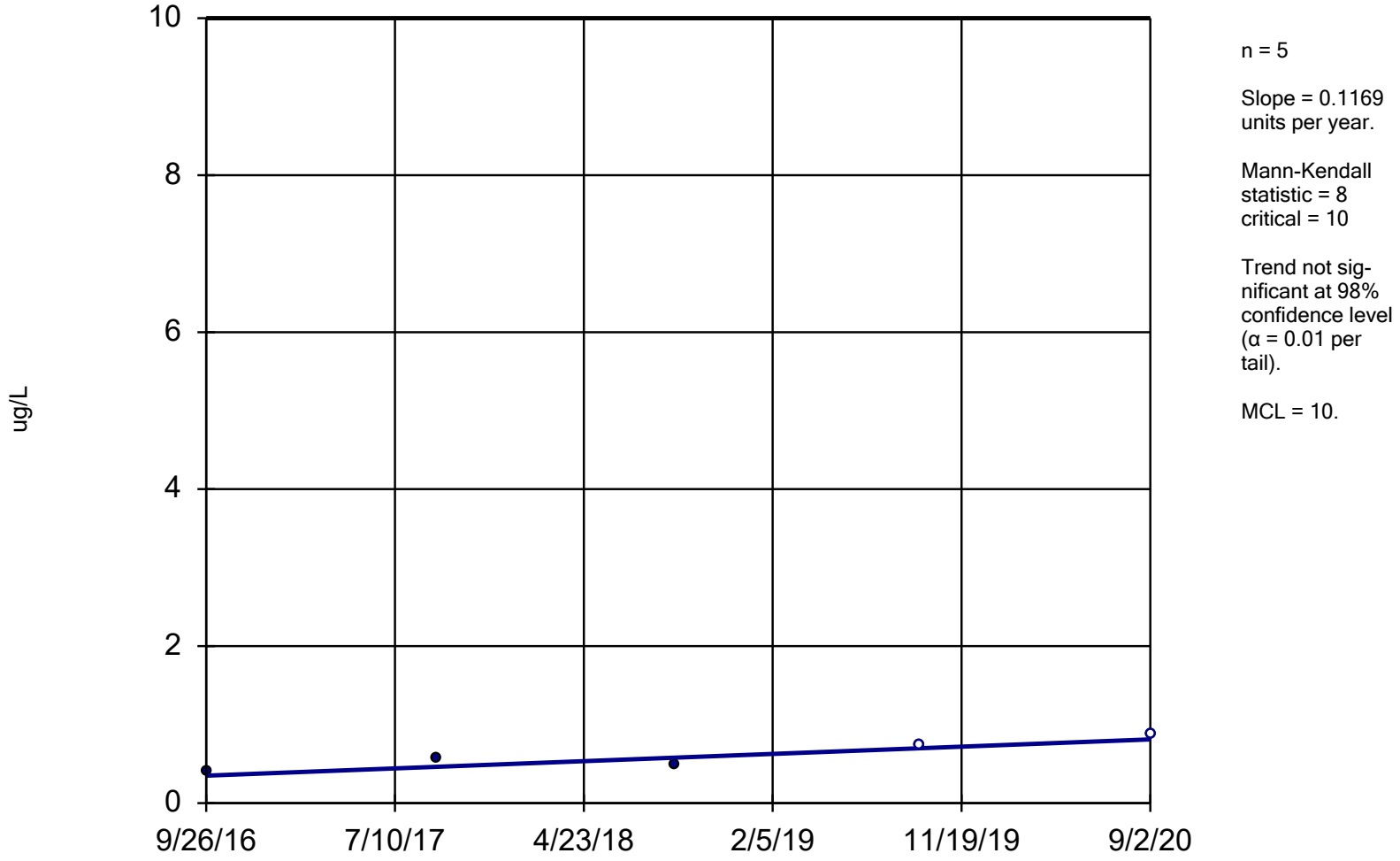
	MW-21
9/28/2016	0.8 (J)
9/14/2017	0.58 (J)
9/11/2018	0.57 (J)
9/17/2019	0.75 (J)
9/2/2020	<0.88
9/29/2021	<0.75
9/22/2022	<0.75
9/21/2023	0.92 (J)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Arsenic

MW-22



n = 5

Slope = 0.1169 units per year.

Mann-Kendall statistic = 8
critical = 10

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

MCL = 10.

Sen's Slope Estimator Analysis Run 11/1/2023 11:34 AM

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Sen's Slope Estimator

Constituent: Arsenic (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

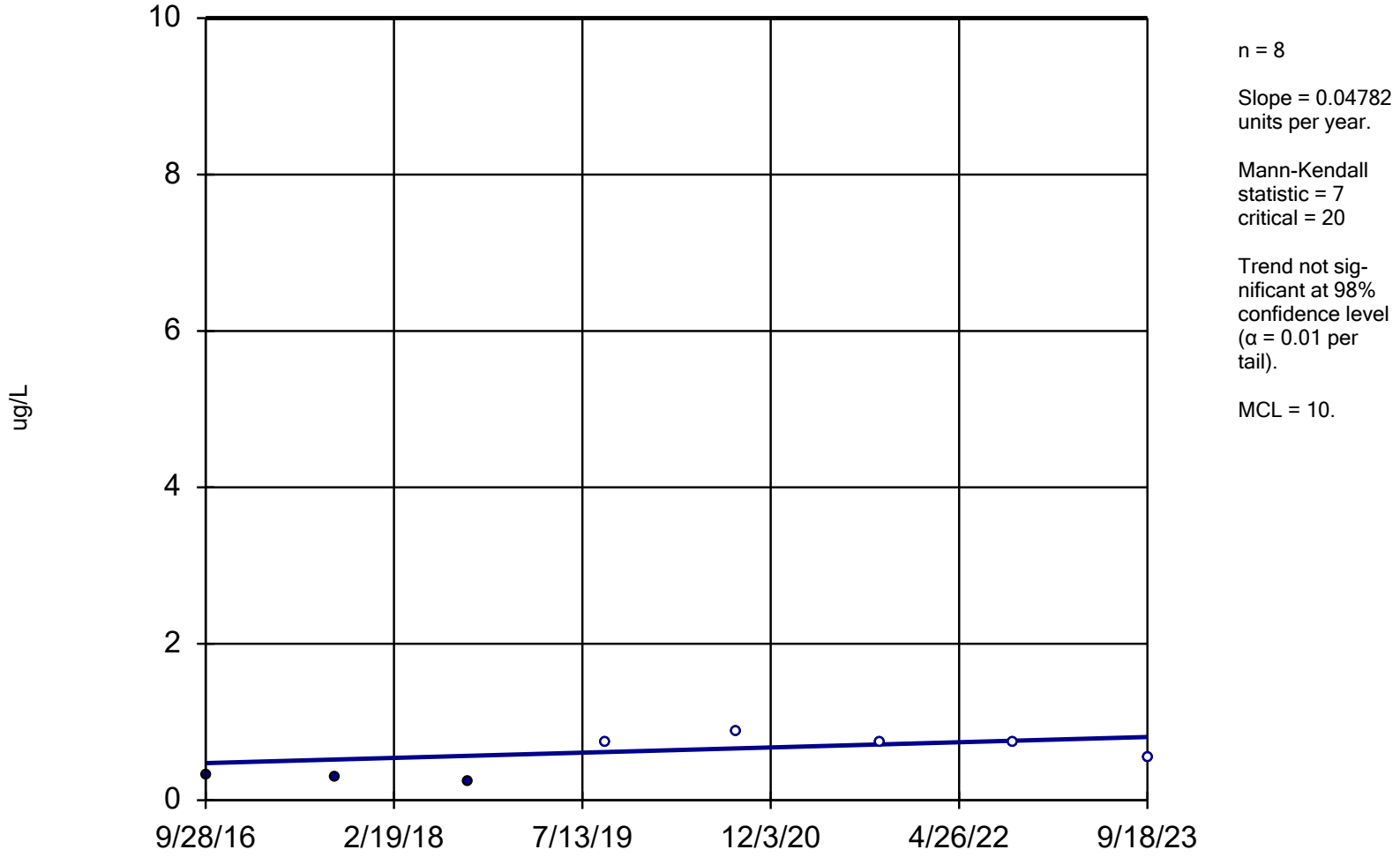
	MW-22
9/26/2016	0.41 (J)
9/13/2017	0.58 (J)
9/11/2018	0.49 (J)
9/16/2019	<0.75
9/2/2020	<0.88

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Arsenic

MW-23



n = 8

Slope = 0.04782 units per year.

Mann-Kendall statistic = 7
critical = 20

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

MCL = 10.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:34 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Arsenic (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

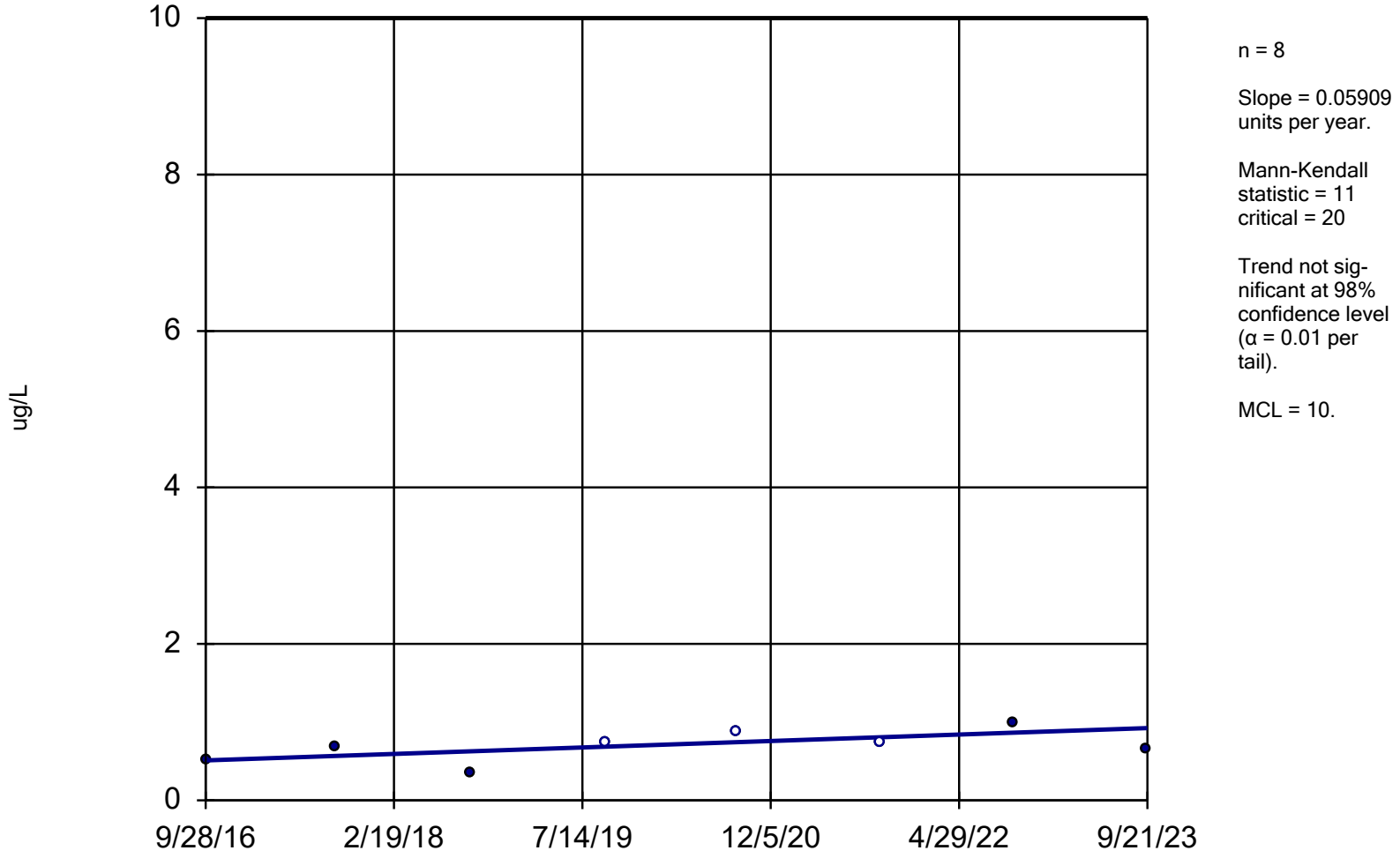
	MW-23
9/28/2016	0.32 (J)
9/13/2017	0.29 (J)
9/11/2018	0.25 (J)
9/16/2019	<0.75
9/1/2020	<0.88
9/27/2021	<0.75
9/21/2022	<0.75
9/18/2023	<0.53 (U)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Arsenic

MW-3



n = 8

Slope = 0.05909 units per year.

Mann-Kendall statistic = 11
critical = 20

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

MCL = 10.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:34 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Arsenic (ug/L) Analysis Run 11/1/2023 11:38 AM

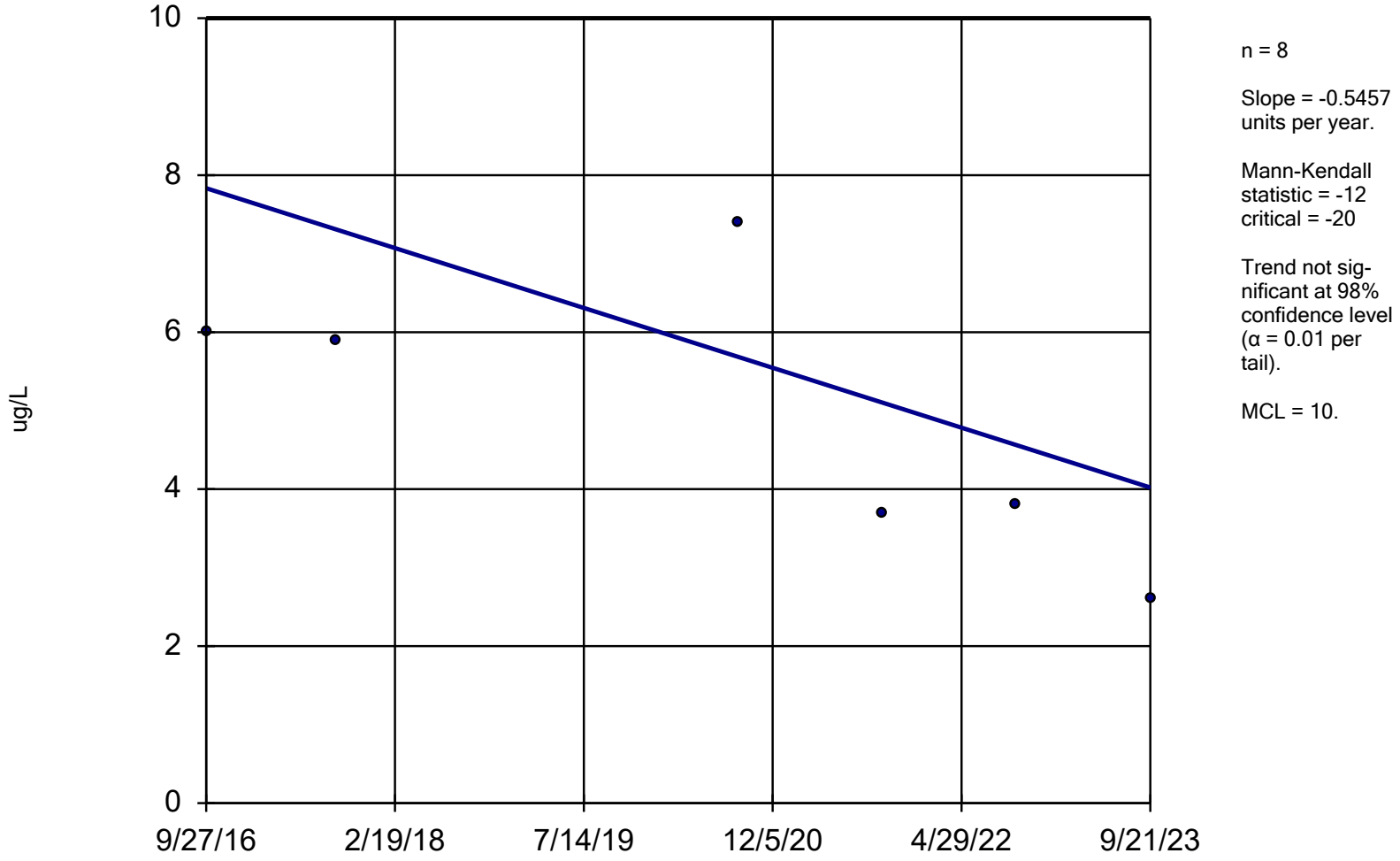
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-3
9/28/2016	0.52 (J)
9/14/2017	0.68 (J)
9/13/2018	0.35 (J)
9/17/2019	<0.75
9/2/2020	<0.88
9/29/2021	<0.75
9/21/2022	1 (J)
9/21/2023	0.65 (J)

ND substitution: RL or RL/2 if <15% NDs.

Arsenic

MW-4



n = 8

Slope = -0.5457 units per year.

Mann-Kendall statistic = -12
critical = -20

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

MCL = 10.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:34 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

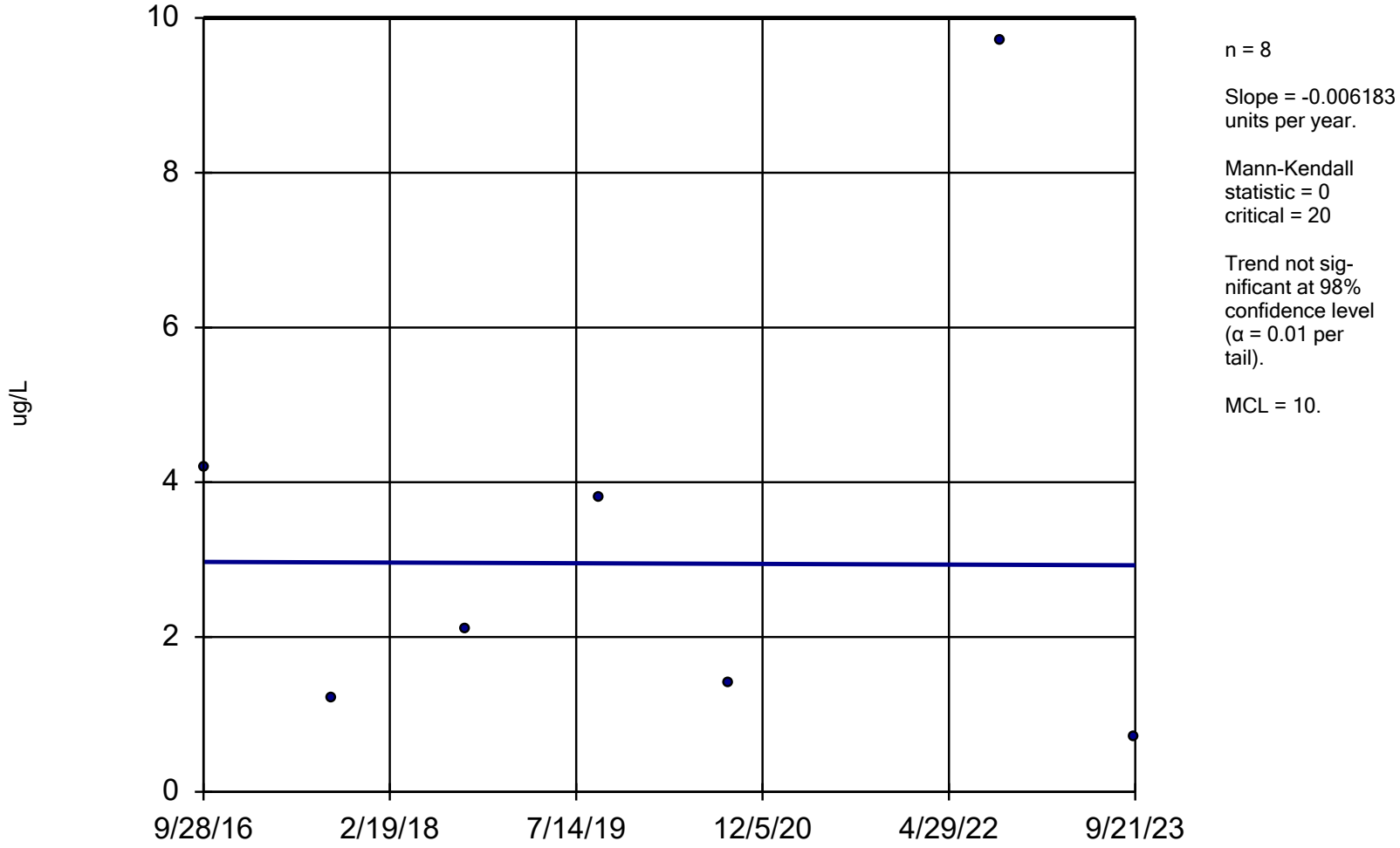
Constituent: Arsenic (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-4
9/27/2016	6
9/13/2017	5.9
9/12/2018	18.7
9/17/2019	21
9/2/2020	7.4
9/29/2021	3.7
9/22/2022	3.8
9/21/2023	2.6

Arsenic

MW-5



n = 8

Slope = -0.006183 units per year.

Mann-Kendall statistic = 0
critical = 20

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

MCL = 10.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:34 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Arsenic (ug/L) Analysis Run 11/1/2023 11:38 AM

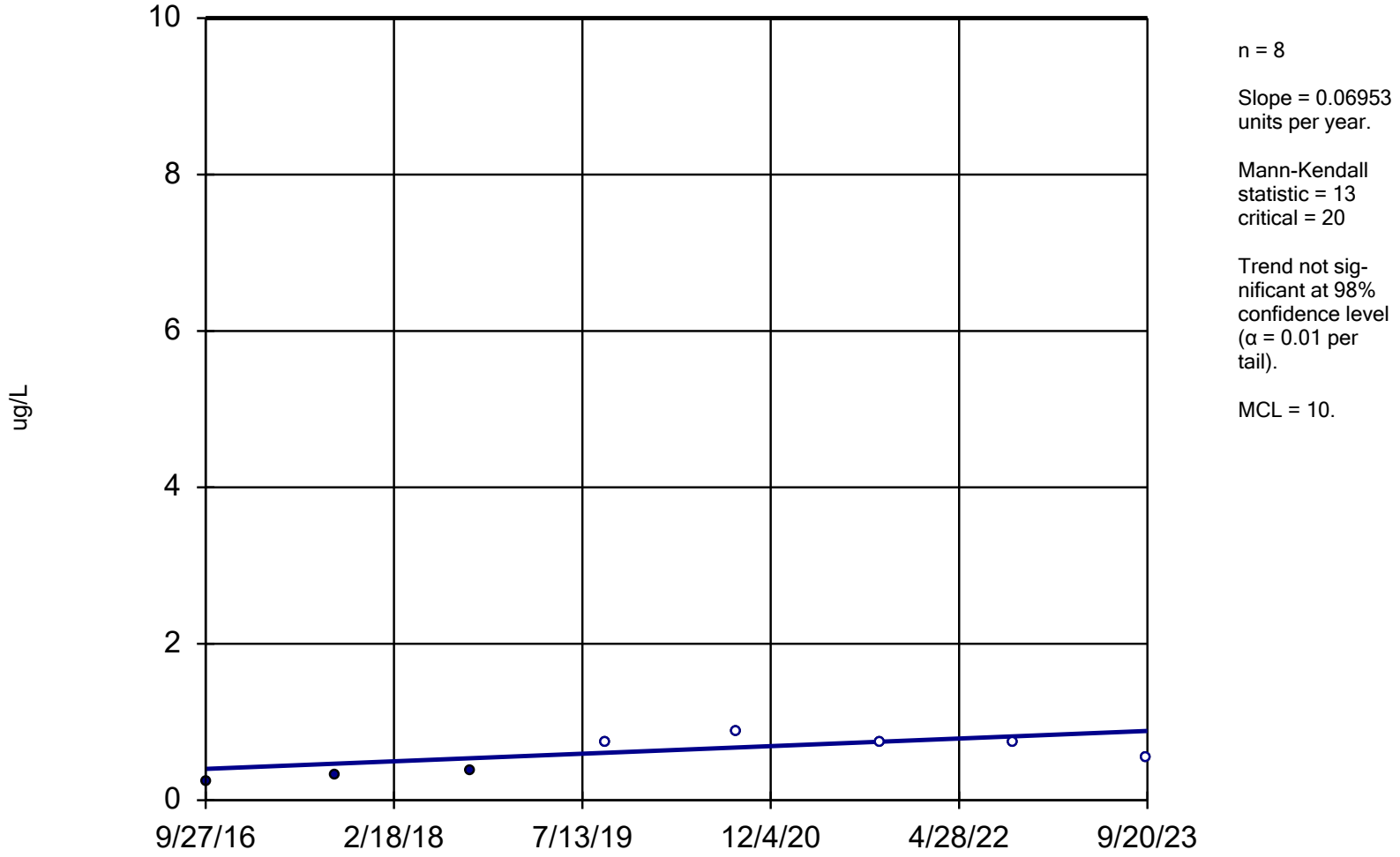
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-5
9/28/2016	4.2
9/14/2017	1.2
9/12/2018	2.1
9/17/2019	3.8
9/2/2020	1.4 (J)
9/29/2021	18
9/20/2022	9.7
9/21/2023	0.72 (J)

Hollow symbols indicate censored values.

Arsenic

MW-7



n = 8

Slope = 0.06953 units per year.

Mann-Kendall statistic = 13
critical = 20

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

MCL = 10.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:34 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Arsenic (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

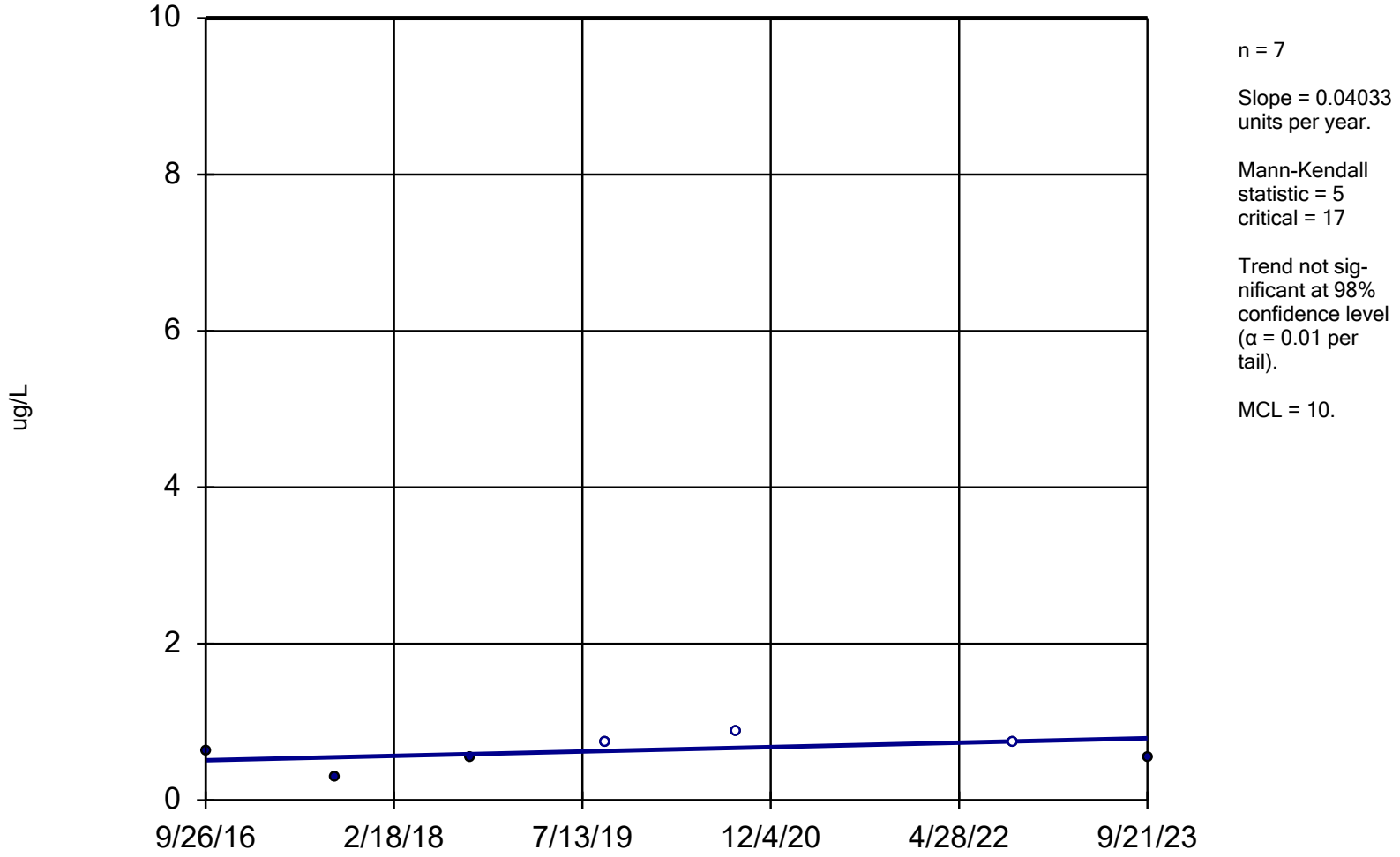
	MW-7
9/27/2016	0.25 (J)
9/13/2017	0.32 (J)
9/13/2018	0.38 (J)
9/17/2019	<0.75
9/1/2020	<0.88
9/28/2021	<0.75
9/20/2022	<0.75
9/20/2023	<0.53 (U)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Arsenic

MW-8 (bg)



n = 7

Slope = 0.04033 units per year.

Mann-Kendall statistic = 5
critical = 17

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

MCL = 10.

Sen's Slope Estimator Analysis Run 11/1/2023 11:34 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Arsenic (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

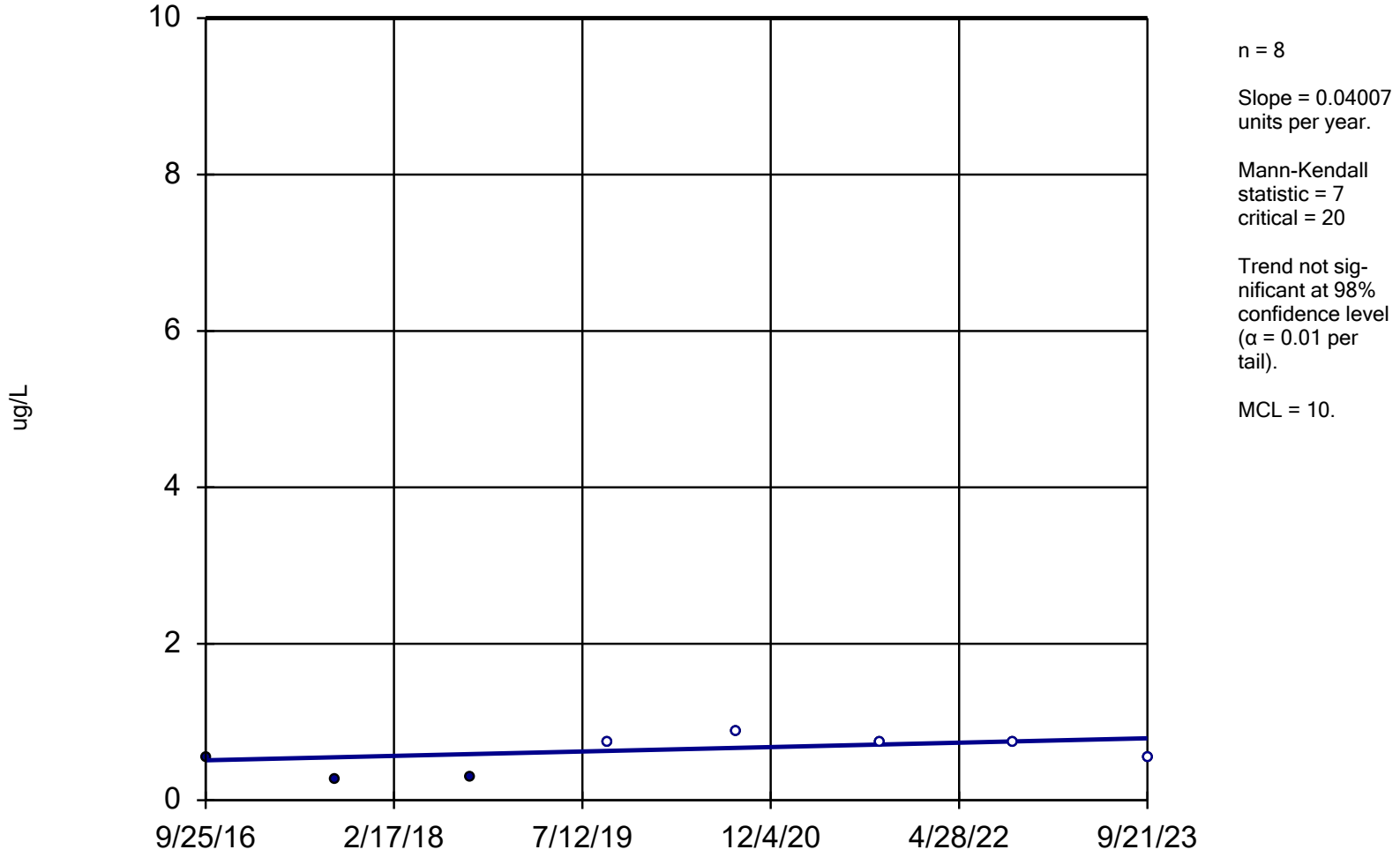
	MW-8 (bg)
9/26/2016	0.63 (J)
9/13/2017	0.29 (J)
9/12/2018	0.55 (J)
9/17/2019	<0.75
9/1/2020	<0.88
9/20/2022	<0.75
9/21/2023	0.55 (J)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Arsenic

MW-9 (bg)



n = 8

Slope = 0.04007 units per year.

Mann-Kendall statistic = 7
critical = 20

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

MCL = 10.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:34 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Arsenic (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

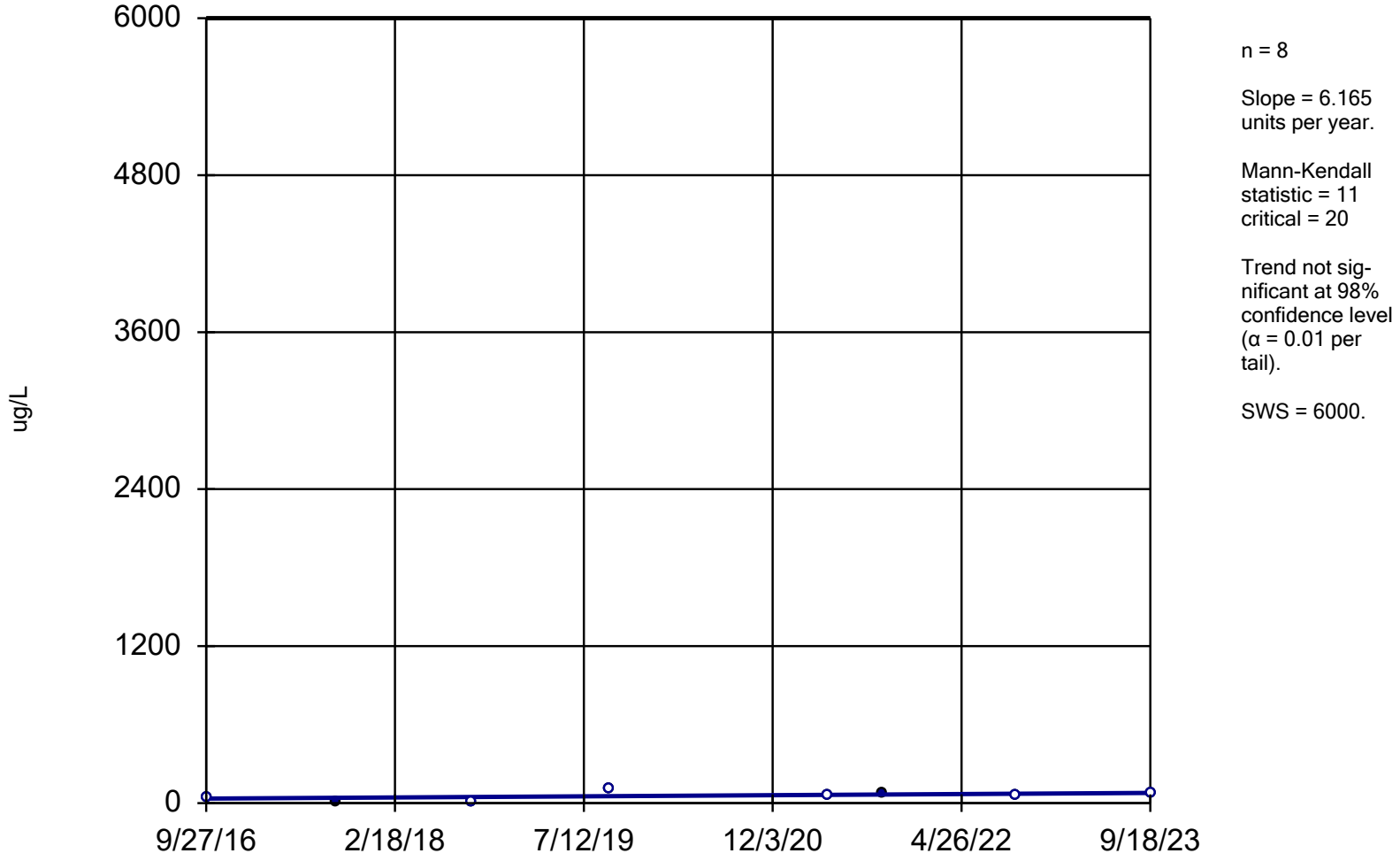
	MW-9 (bg)
9/25/2016	0.55 (J)
9/14/2017	0.26 (J)
9/12/2018	0.3 (J)
9/17/2019	<0.75
9/1/2020	<0.88
9/28/2021	<0.75
9/20/2022	<0.75
9/21/2023	<0.53 (U)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Boron

MW-10 (bg)



n = 8

Slope = 6.165 units per year.

Mann-Kendall statistic = 11
critical = 20

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

SWS = 6000.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:34 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Boron (ug/L) Analysis Run 11/1/2023 11:38 AM

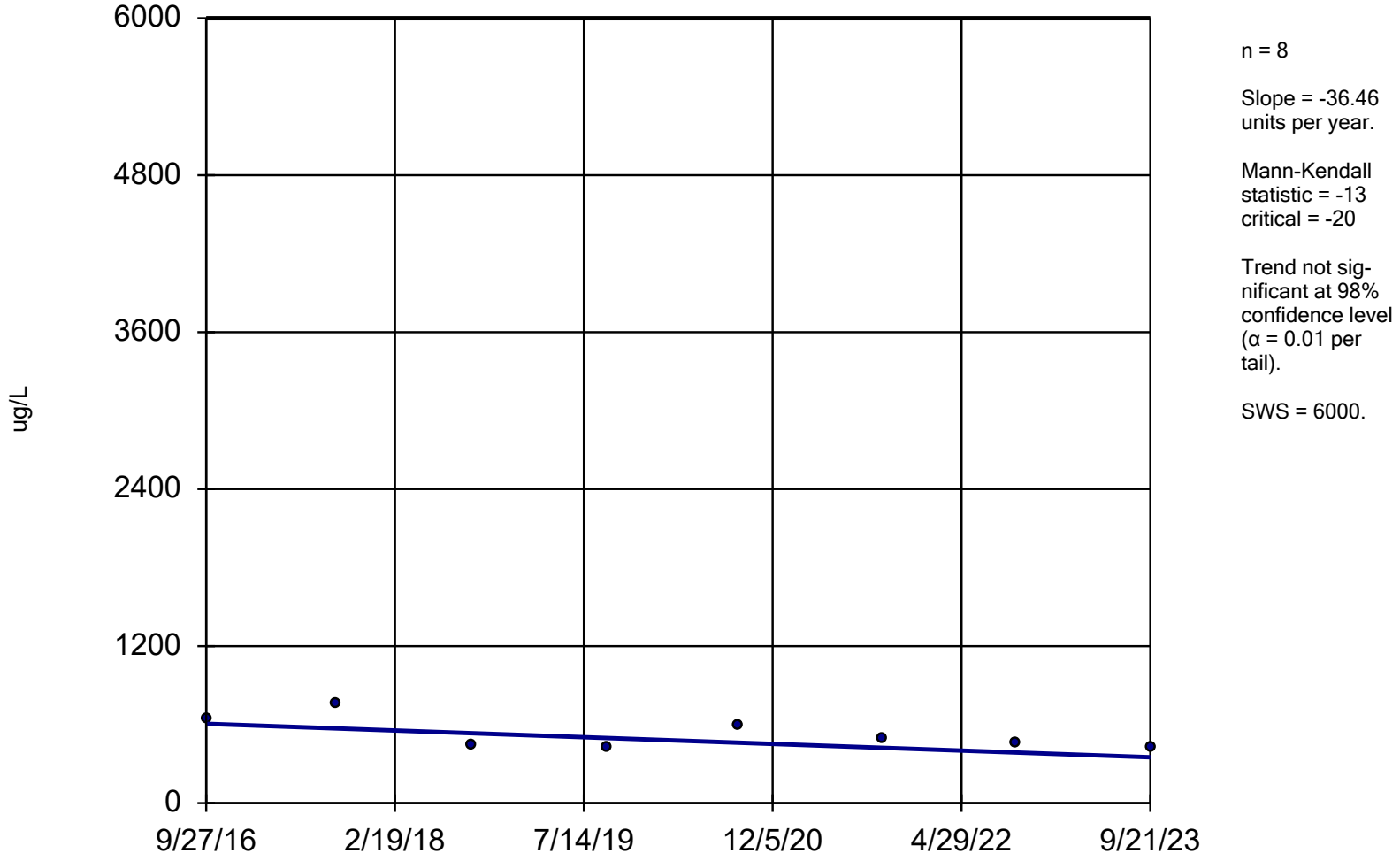
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-10 (bg)
9/27/2016	<50
9/15/2017	14.1 (J)
9/12/2018	<12.5
9/17/2019	<110
4/29/2021	<58
9/28/2021	74 (J)
9/20/2022	<58
9/18/2023	<76 (U)

ND substitution: RL or RL/2 if <15% NDs.

Boron

MW-11AR



n = 8

Slope = -36.46 units per year.

Mann-Kendall statistic = -13
critical = -20

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

SWS = 6000.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:34 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

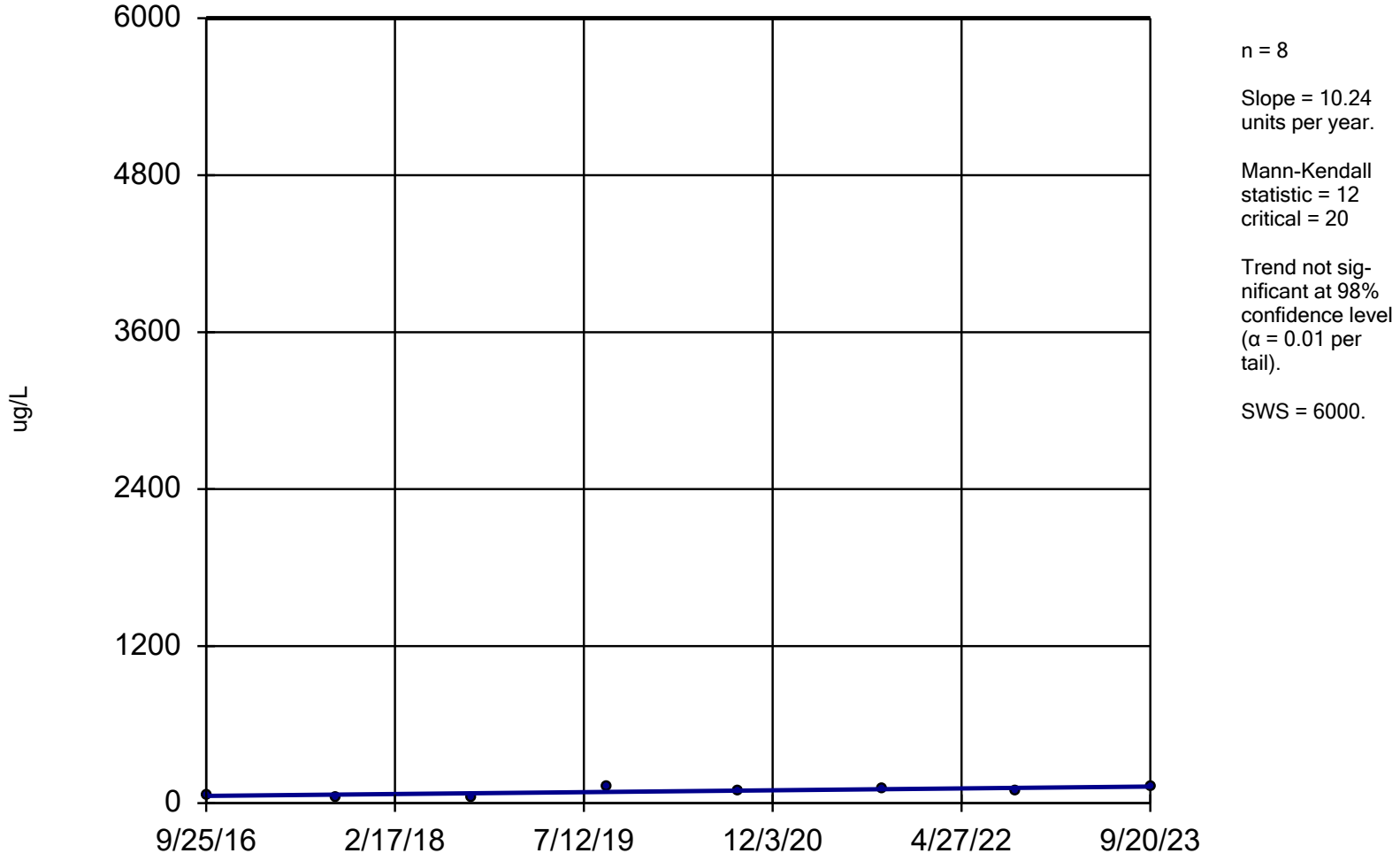
Constituent: Boron (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-11AR
9/27/2016	650
9/14/2017	755
9/12/2018	443
9/17/2019	420
9/1/2020	600
9/28/2021	500
9/21/2022	460
9/21/2023	420

Boron

MW-13 (bg)



n = 8

Slope = 10.24 units per year.

Mann-Kendall statistic = 12
critical = 20

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

SWS = 6000.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:34 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

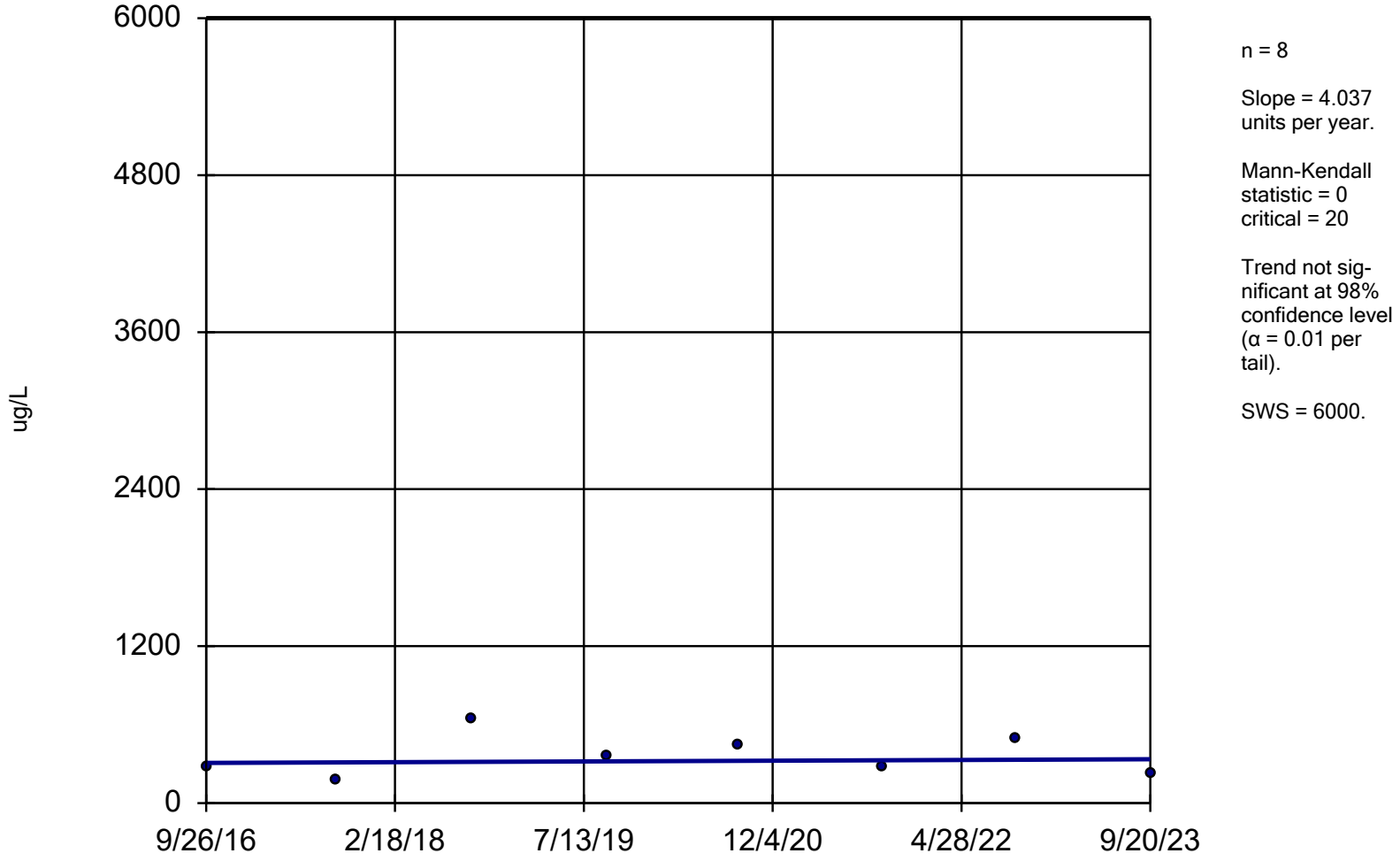
Constituent: Boron (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)
9/25/2016	50.2 (J)
9/13/2017	48.6 (J)
9/11/2018	41.4 (J)
9/16/2019	130 (J)
9/2/2020	88 (J)
9/27/2021	110
9/21/2022	94 (J)
9/20/2023	120

Boron

MW-14 (bg)



n = 8

Slope = 4.037 units per year.

Mann-Kendall statistic = 0
critical = 20

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

SWS = 6000.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:34 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Boron (ug/L) Analysis Run 11/1/2023 11:38 AM

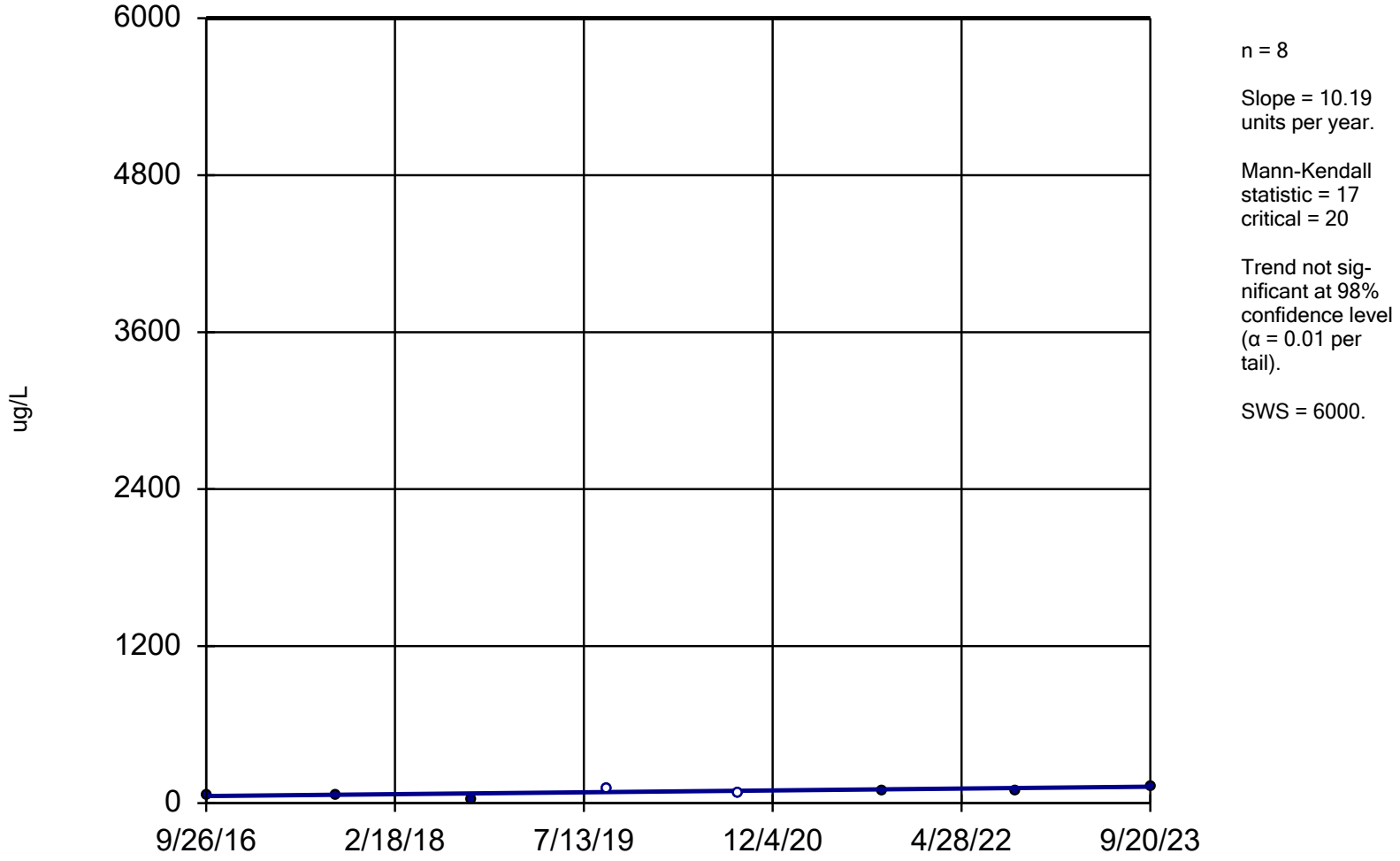
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-14 (bg)
9/26/2016	282
9/14/2017	169
9/12/2018	651
9/16/2019	360
9/1/2020	450
9/27/2021	280
9/20/2022	500
9/20/2023	220

Hollow symbols indicate censored values.

Boron

MW-18



n = 8

Slope = 10.19 units per year.

Mann-Kendall statistic = 17 critical = 20

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

SWS = 6000.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:34 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Boron (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

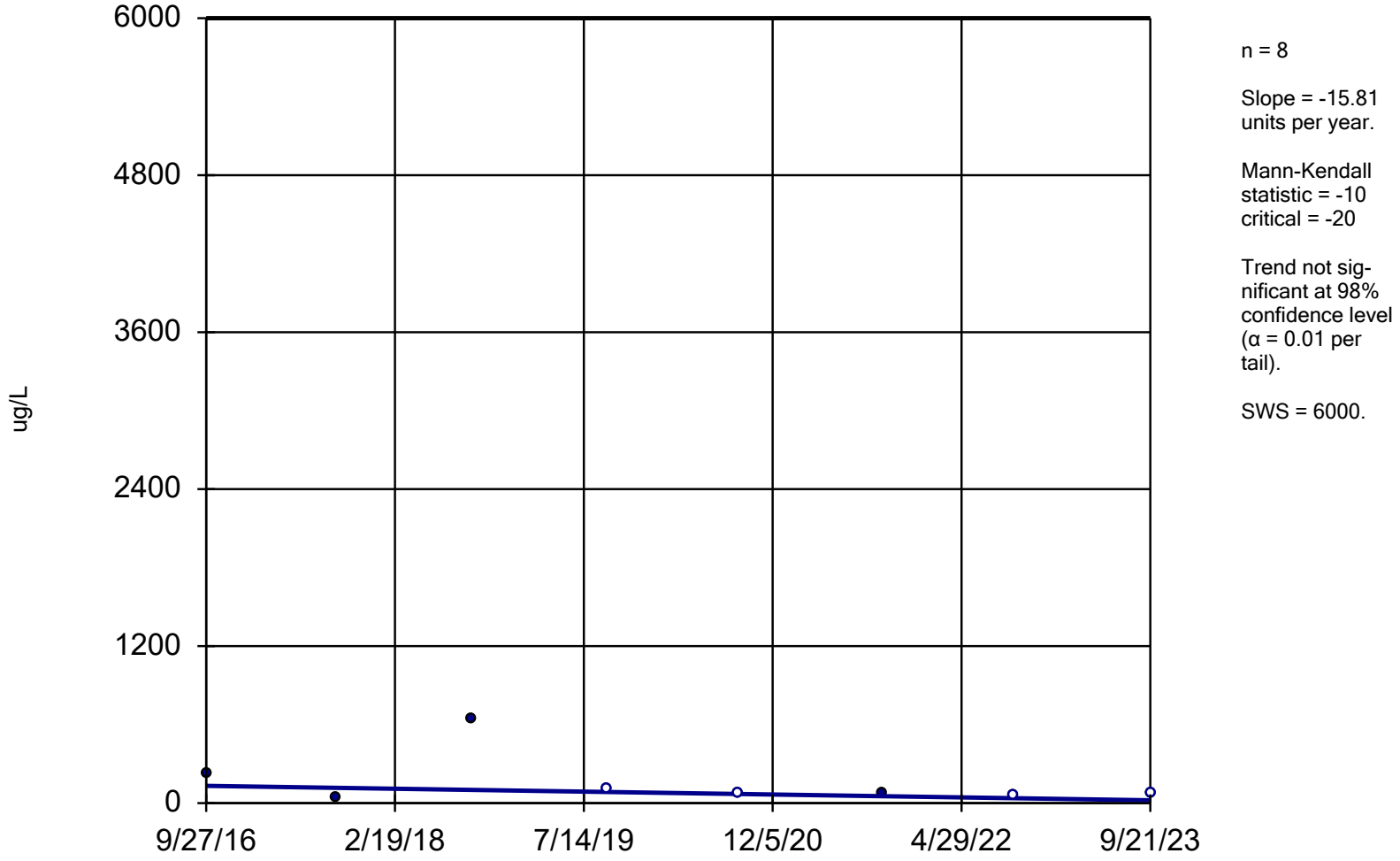
	MW-18
9/26/2016	53.8 (J)
9/14/2017	57 (J)
9/12/2018	21.6 (J)
9/17/2019	<110
9/1/2020	<80
9/28/2021	100
9/21/2022	100
9/20/2023	130

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Boron

MW-19



n = 8

Slope = -15.81 units per year.

Mann-Kendall statistic = -10
critical = -20

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

SWS = 6000.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:34 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

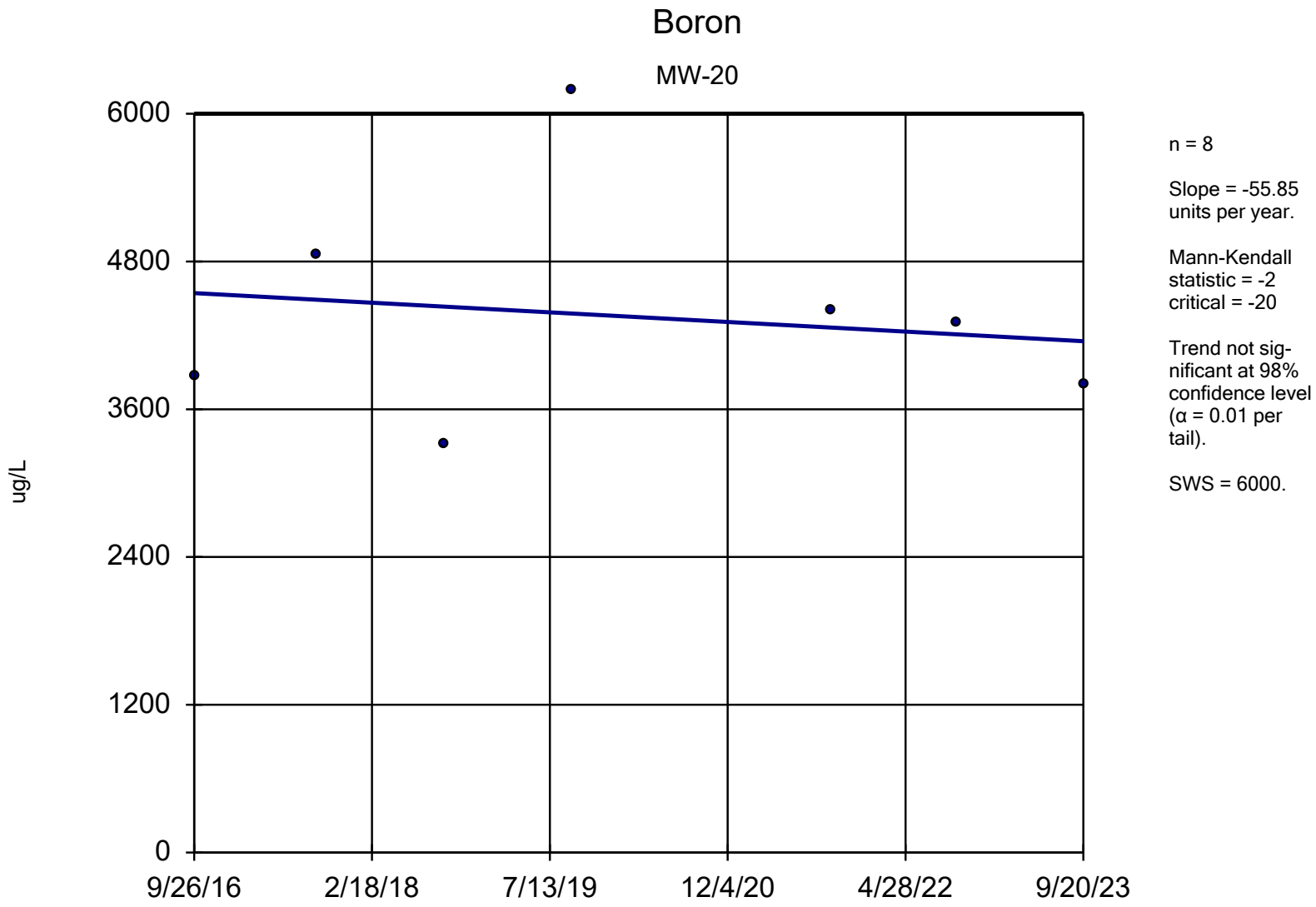
Sen's Slope Estimator

Constituent: Boron (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-19
9/27/2016	226
9/14/2017	44.7 (J)
9/12/2018	645
9/17/2019	<110
9/2/2020	<80
9/29/2021	72 (J)
9/20/2022	<58
9/21/2023	<76 (U)

ND substitution: RL or RL/2 if <15% NDs.



Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:34 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

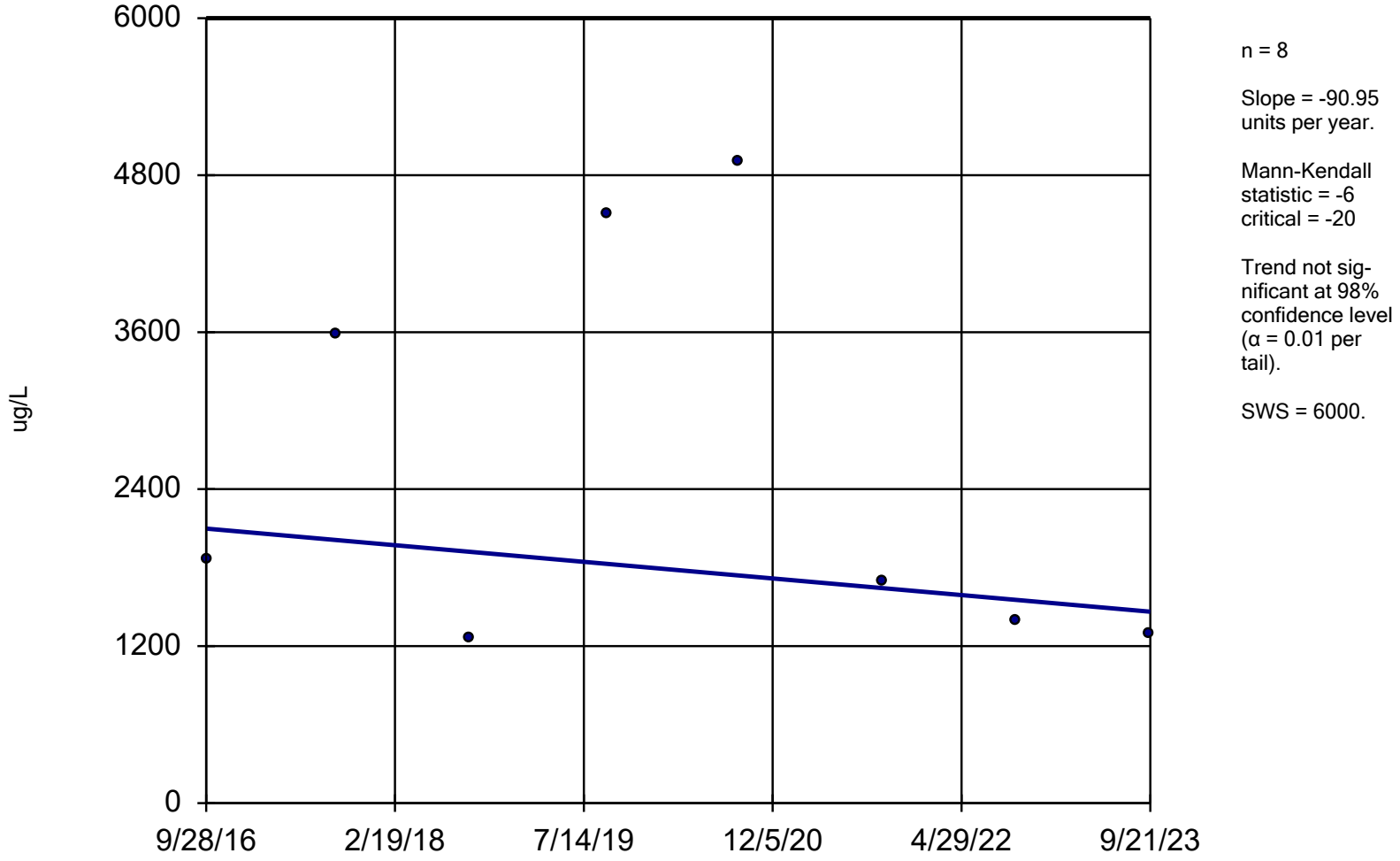
Constituent: Boron (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-20
9/26/2016	3870
9/13/2017	4860
9/11/2018	3310
9/16/2019	6200
9/2/2020	7700
9/27/2021	4400
9/21/2022	4300
9/20/2023	3800

Boron

MW-21



n = 8

Slope = -90.95 units per year.

Mann-Kendall statistic = -6
critical = -20

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

SWS = 6000.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:34 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

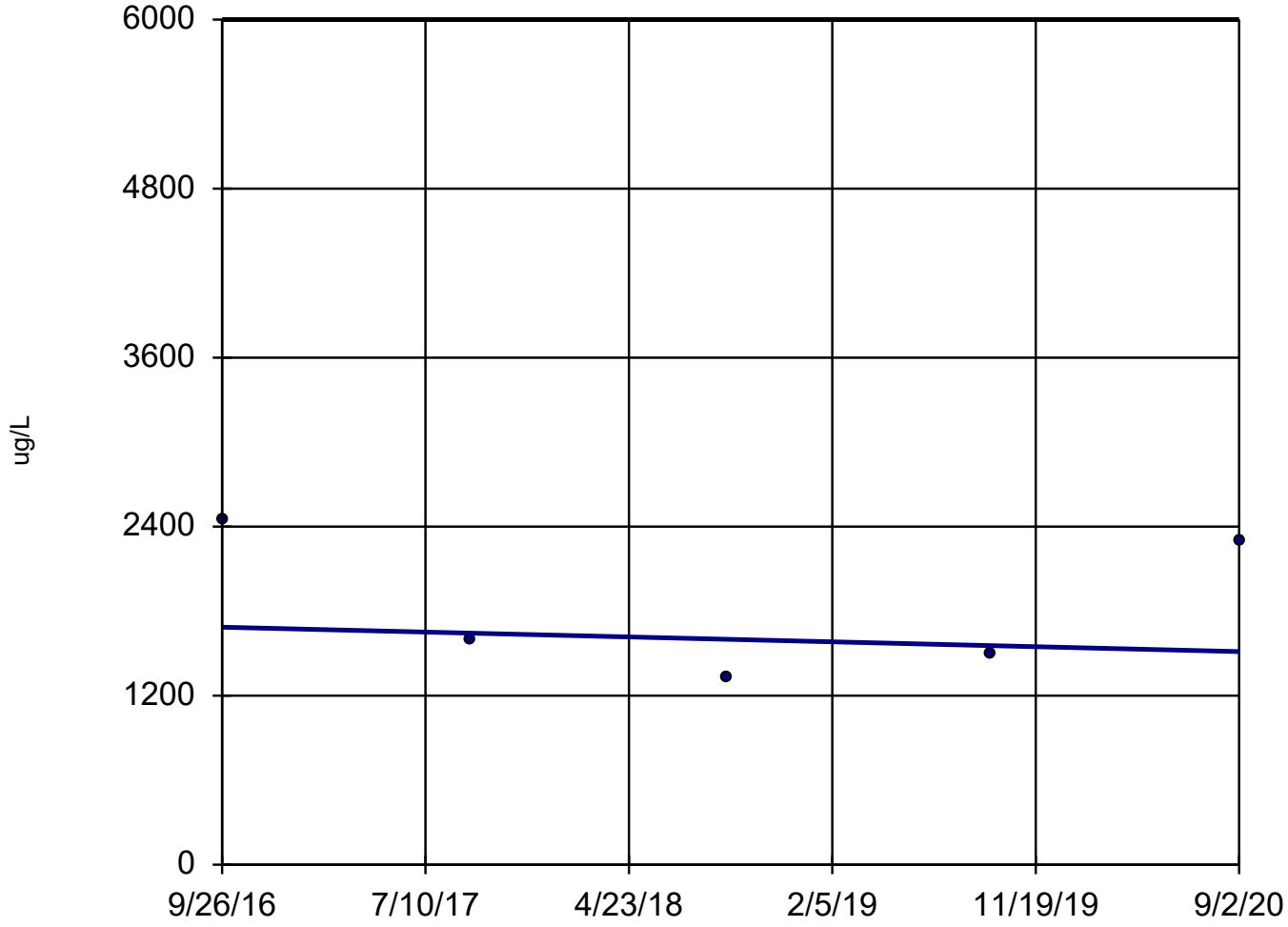
Constituent: Boron (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-21
9/28/2016	1870
9/14/2017	3580
9/11/2018	1270
9/17/2019	4500
9/2/2020	4900
9/29/2021	1700
9/22/2022	1400
9/21/2023	1300

Boron

MW-22



n = 5

Slope = -43.95 units per year.

Mann-Kendall statistic = -2
critical = -10

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

SWS = 6000.

Sen's Slope Estimator Analysis Run 11/1/2023 11:34 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Boron (ug/L) Analysis Run 11/1/2023 11:38 AM

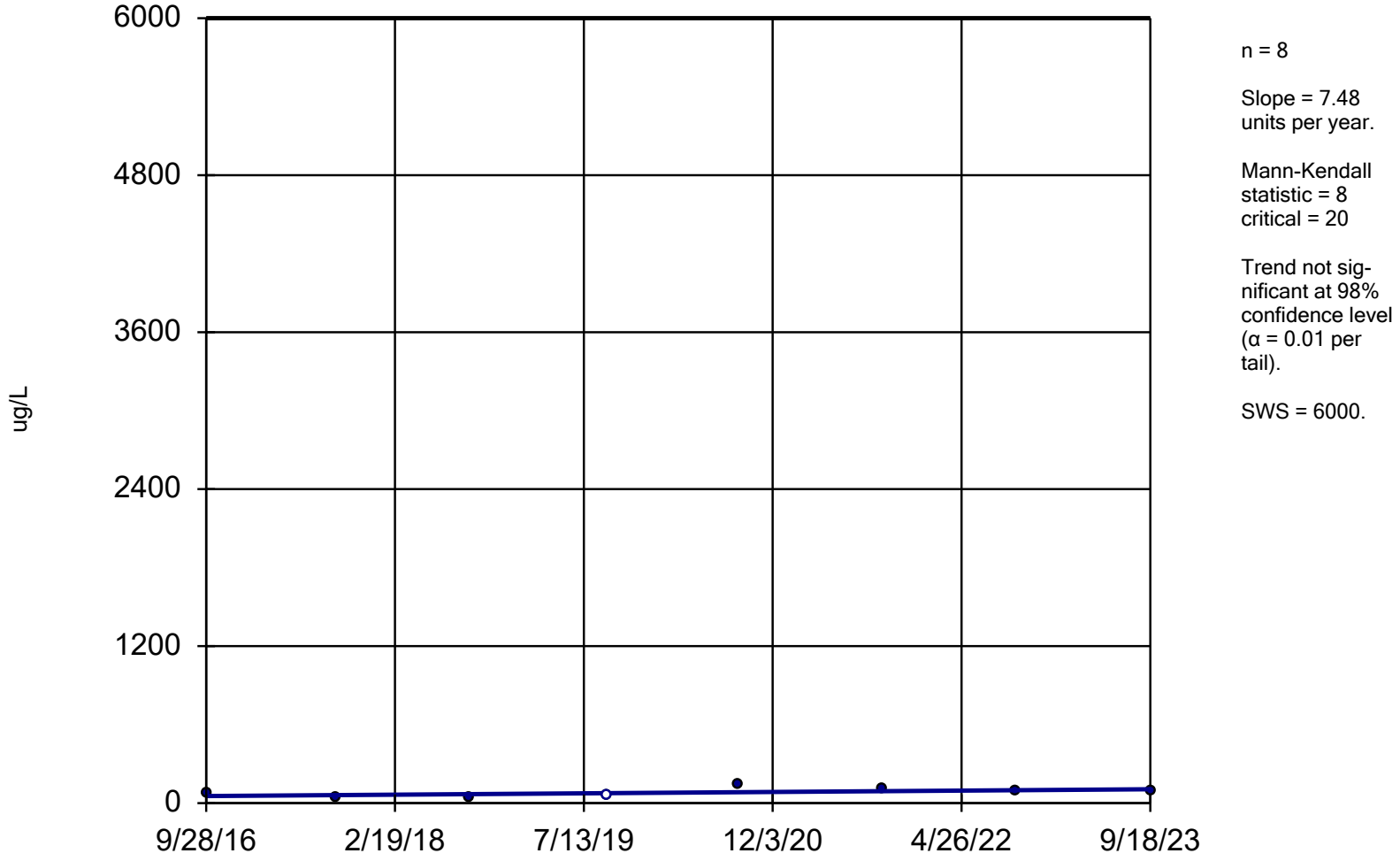
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-22
9/26/2016	2450
9/13/2017	1600
9/11/2018	1330
9/16/2019	1500
9/2/2020	2300

Hollow symbols indicate censored values.

Boron

MW-23



Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:34 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Boron (ug/L) Analysis Run 11/1/2023 11:38 AM

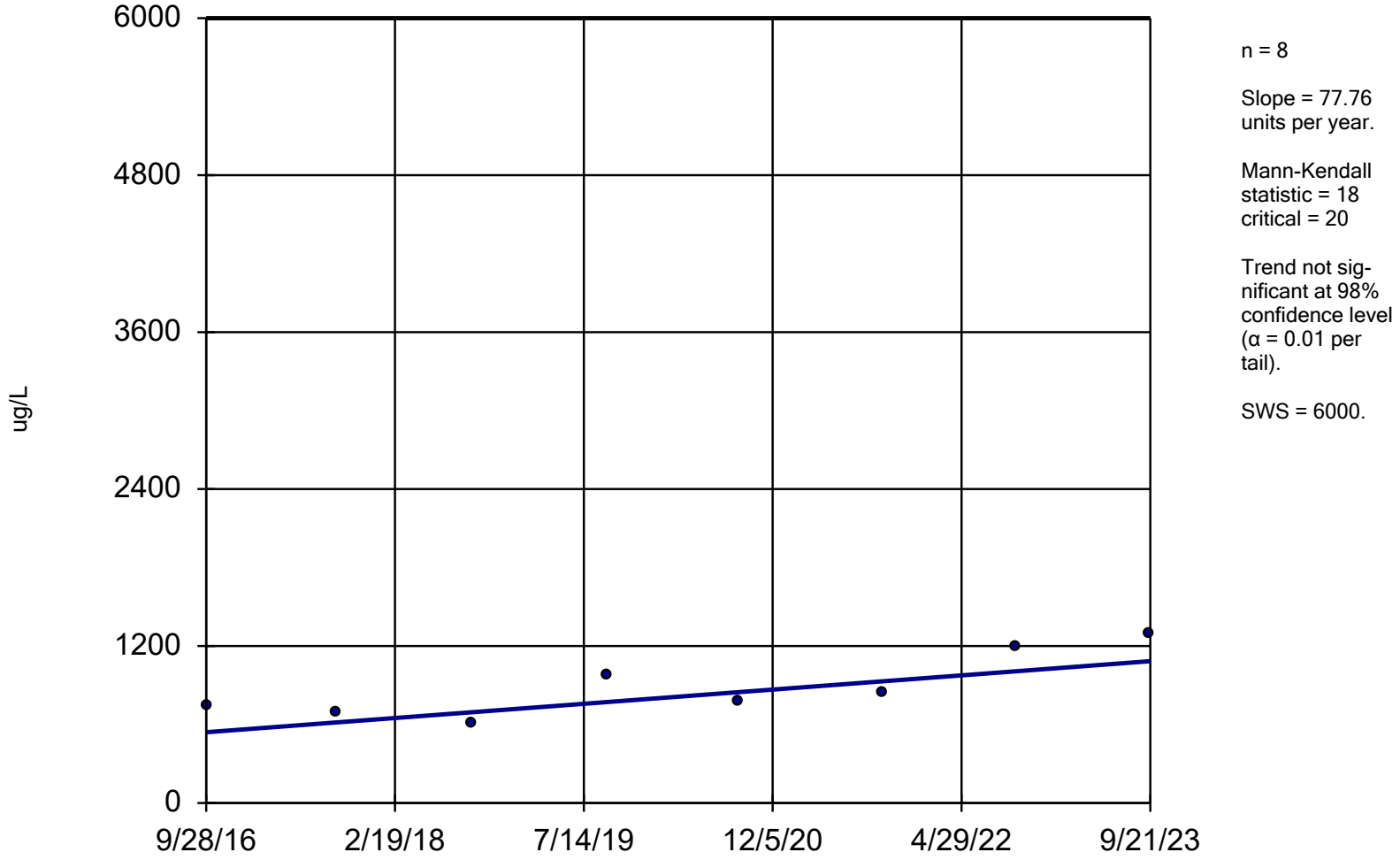
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-23
9/28/2016	70.1 (J)
9/13/2017	47 (J)
9/11/2018	42.9 (J)
9/16/2019	<110
9/1/2020	140
9/27/2021	110
9/21/2022	92 (J)
9/18/2023	89 (J)

ND substitution: RL or RL/2 if <15% NDs.

Boron

MW-3



Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:34 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

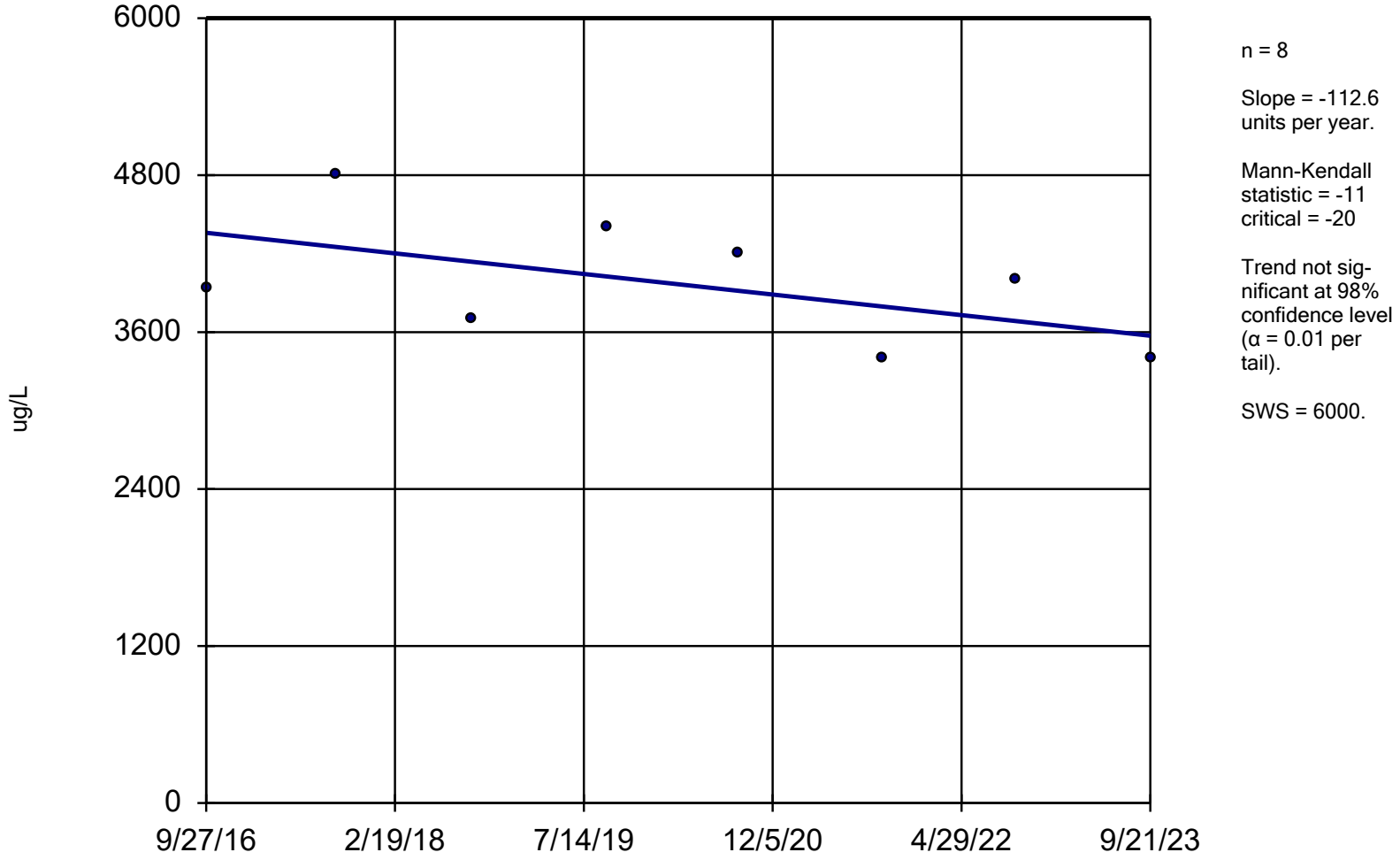
Constituent: Boron (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-3
9/28/2016	740
9/14/2017	700
9/13/2018	616
9/17/2019	970
9/2/2020	770
9/29/2021	850
9/21/2022	1200
9/21/2023	1300

Boron

MW-4



n = 8

Slope = -112.6 units per year.

Mann-Kendall statistic = -11
critical = -20

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

SWS = 6000.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:34 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

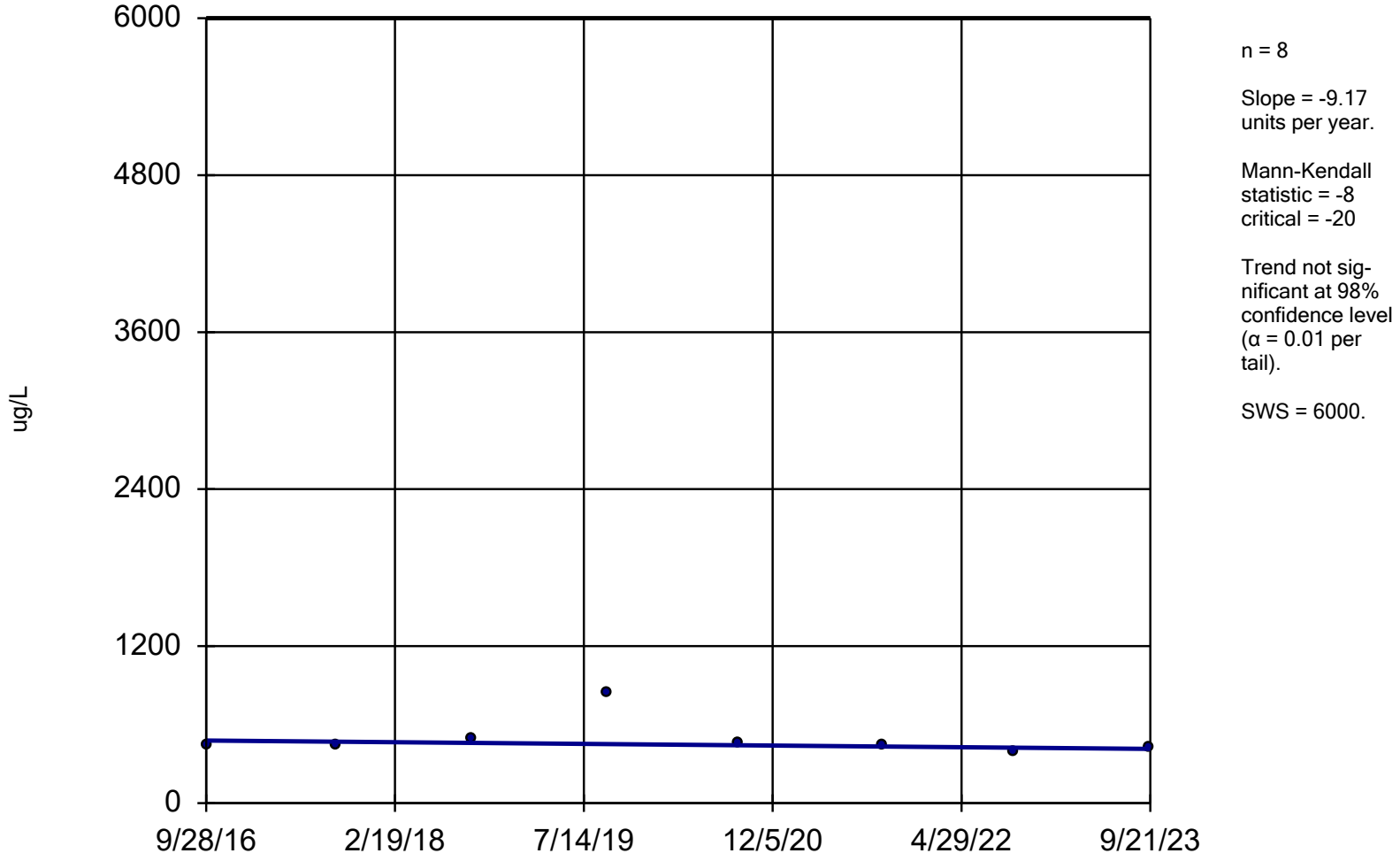
Constituent: Boron (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-4
9/27/2016	3940
9/13/2017	4810
9/12/2018	3710
9/17/2019	4400
9/2/2020	4200
9/29/2021	3400
9/22/2022	4000
9/21/2023	3400

Boron

MW-5



n = 8

Slope = -9.17 units per year.

Mann-Kendall statistic = -8 critical = -20

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

SWS = 6000.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:35 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Boron (ug/L) Analysis Run 11/1/2023 11:38 AM

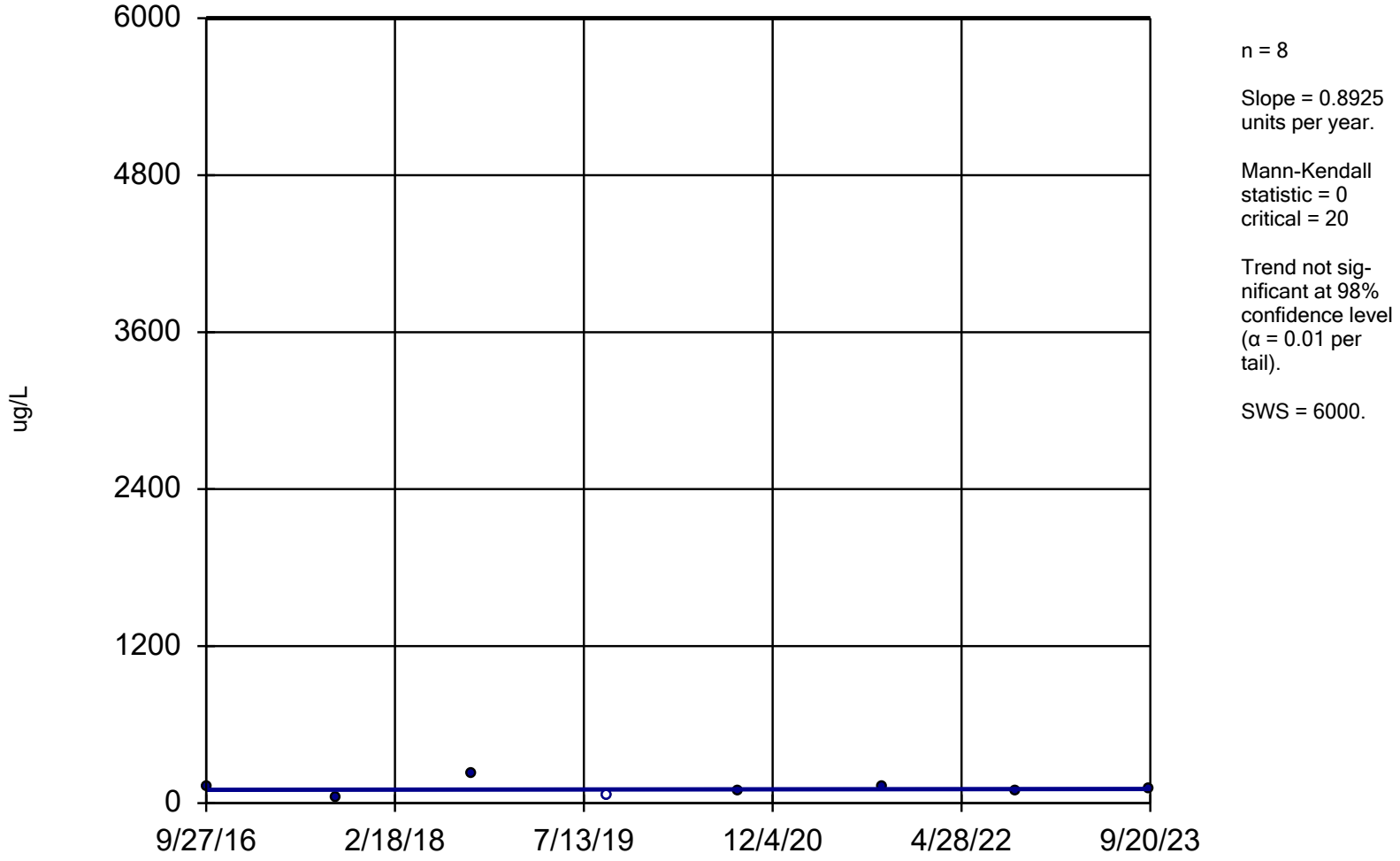
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-5
9/28/2016	444
9/14/2017	440
9/12/2018	490
9/17/2019	840
9/2/2020	460
9/29/2021	450
9/20/2022	390
9/21/2023	420

Hollow symbols indicate censored values.

Boron

MW-7



n = 8

Slope = 0.8925 units per year.

Mann-Kendall statistic = 0
critical = 20

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

SWS = 6000.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:35 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Boron (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

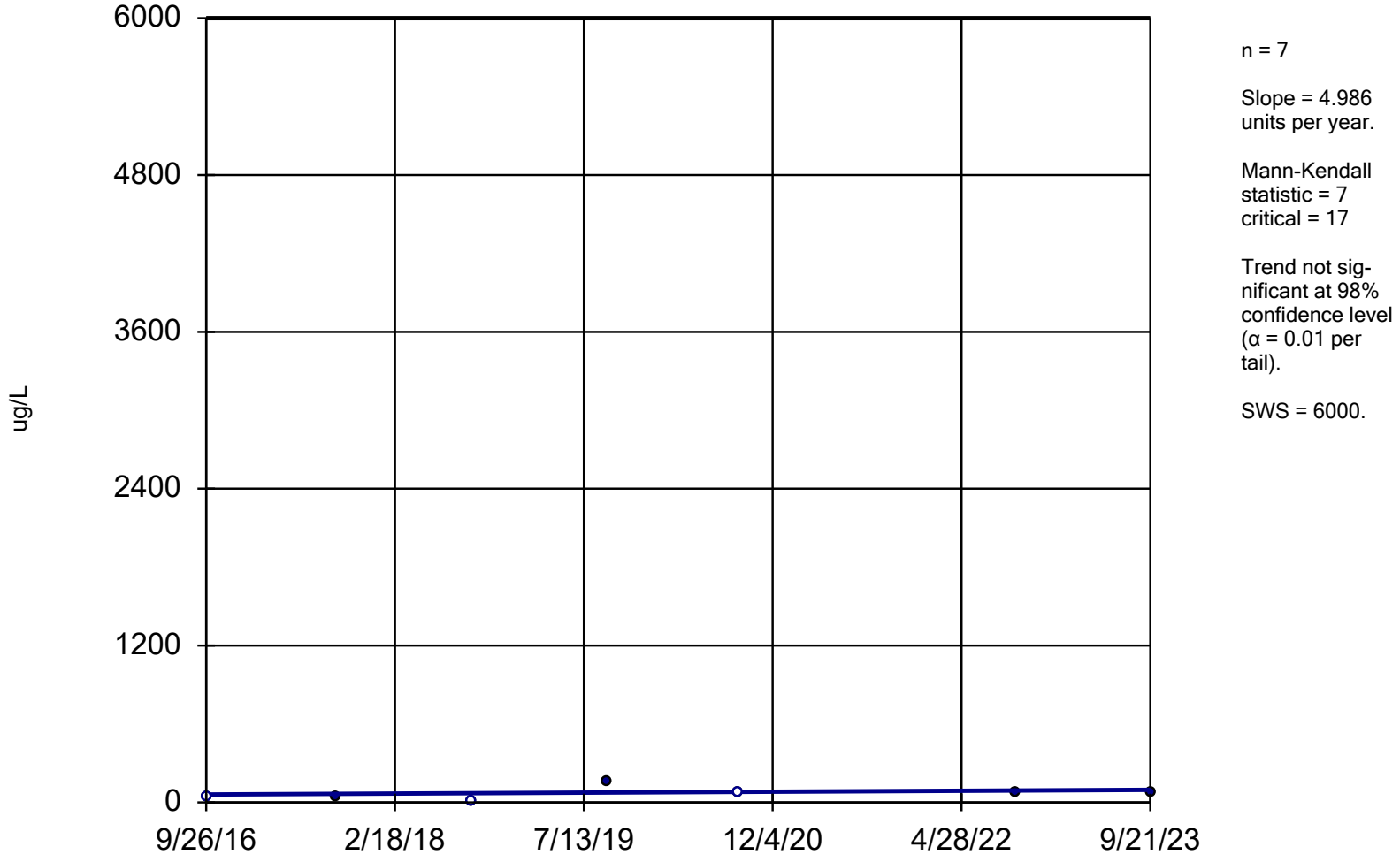
	MW-7
9/27/2016	126
9/13/2017	49 (J)
9/13/2018	228
9/17/2019	<110
9/1/2020	100
9/28/2021	120
9/20/2022	92 (J)
9/20/2023	110

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Boron

MW-8 (bg)



n = 7

Slope = 4.986 units per year.

Mann-Kendall statistic = 7
critical = 17

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

SWS = 6000.

Sen's Slope Estimator Analysis Run 11/1/2023 11:35 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Boron (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

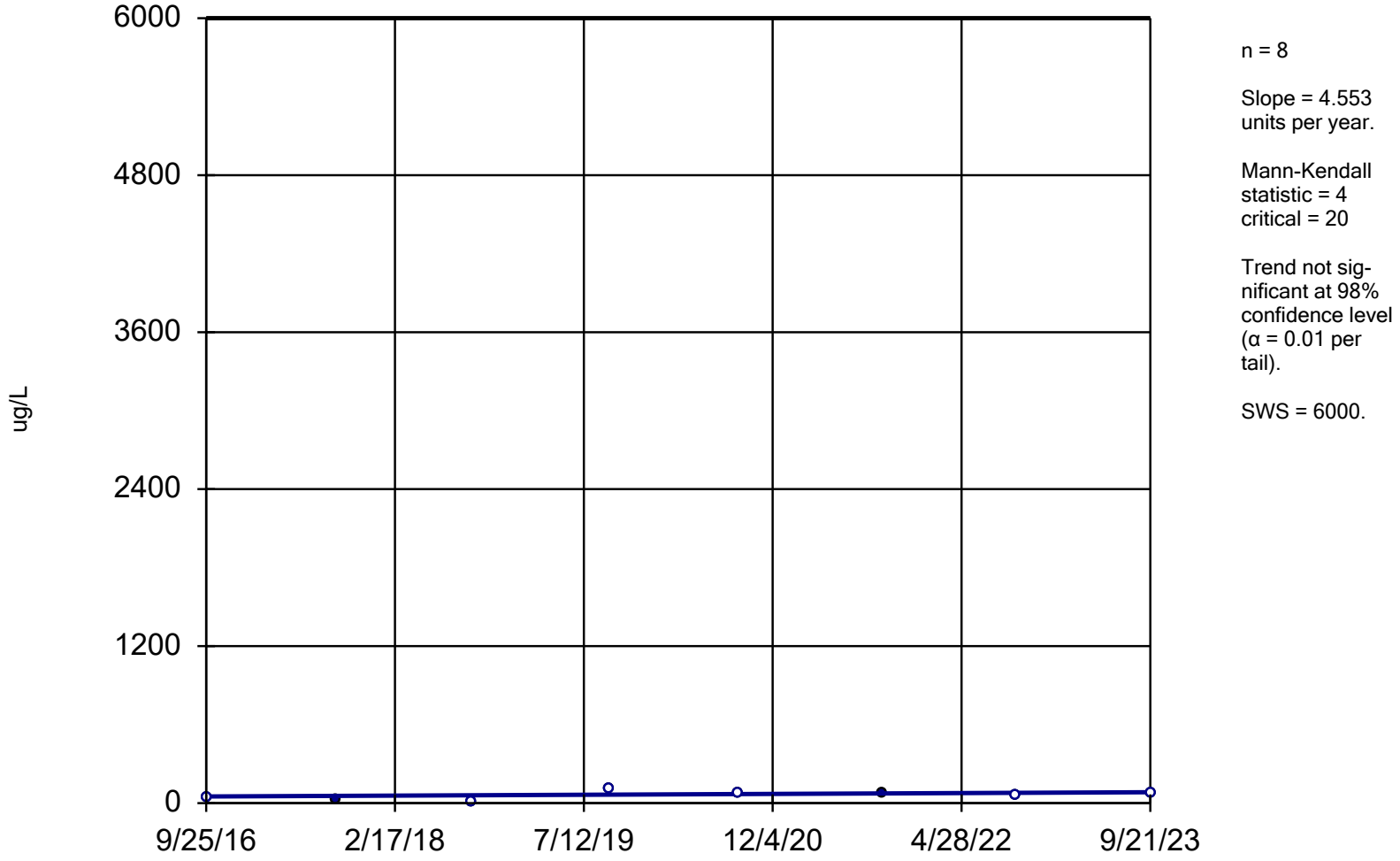
	MW-8 (bg)
9/26/2016	<50
9/13/2017	37.6 (J)
9/12/2018	<12.5
9/17/2019	160 (J)
9/1/2020	<80
9/20/2022	76 (J)
9/21/2023	81 (J)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Boron

MW-9 (bg)



n = 8

Slope = 4.553 units per year.

Mann-Kendall statistic = 4
critical = 20

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

SWS = 6000.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:35 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Boron (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

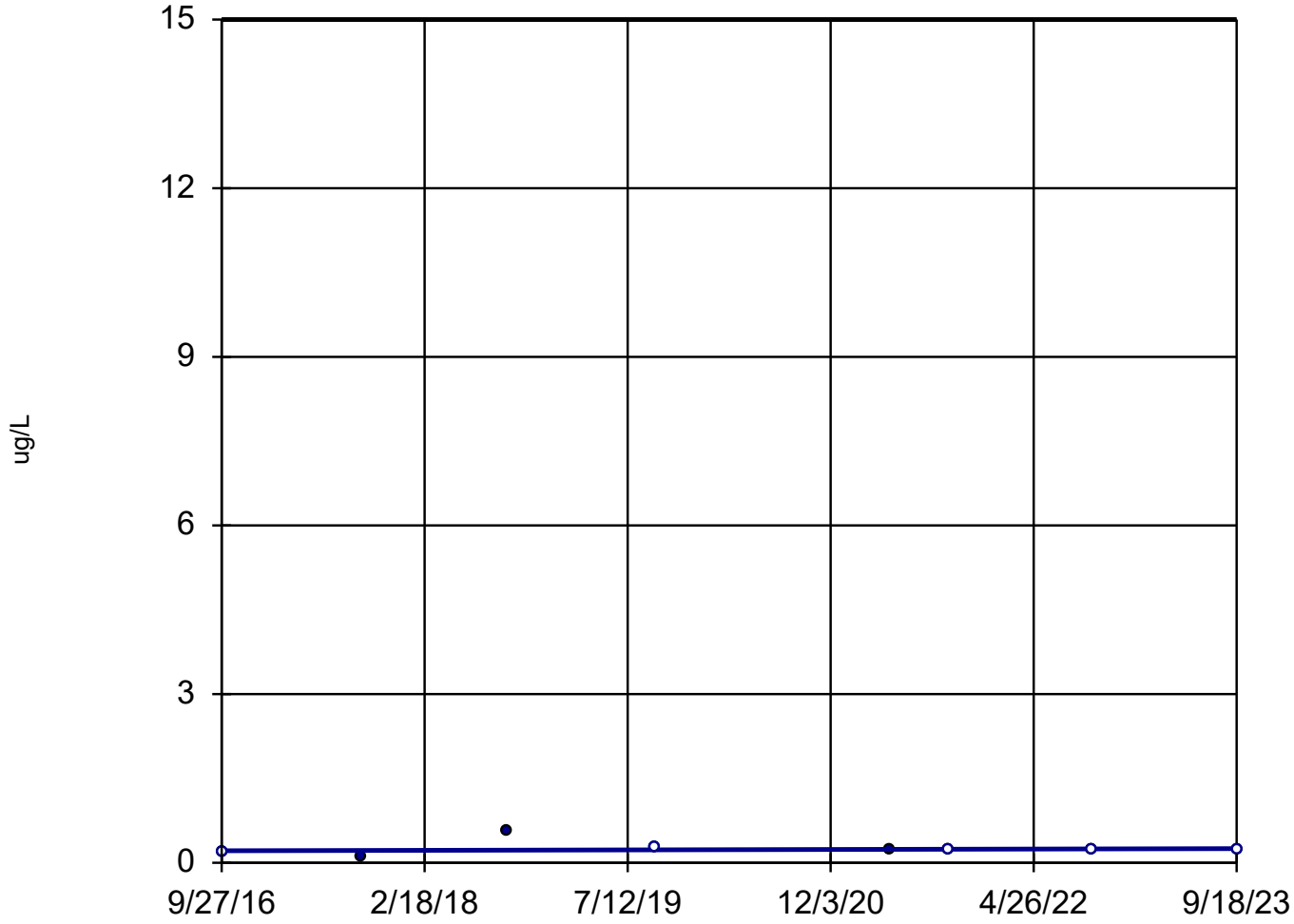
	MW-9 (bg)
9/25/2016	<50
9/14/2017	17.2 (J)
9/12/2018	<12.5
9/17/2019	<110
9/1/2020	<80
9/28/2021	77 (J)
9/20/2022	<58
9/21/2023	<76 (U)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Lead

MW-10 (bg)



n = 8

Slope = 0.005676 units per year.

Mann-Kendall statistic = 5
critical = 20

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

SWS = 15.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:35 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Lead (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

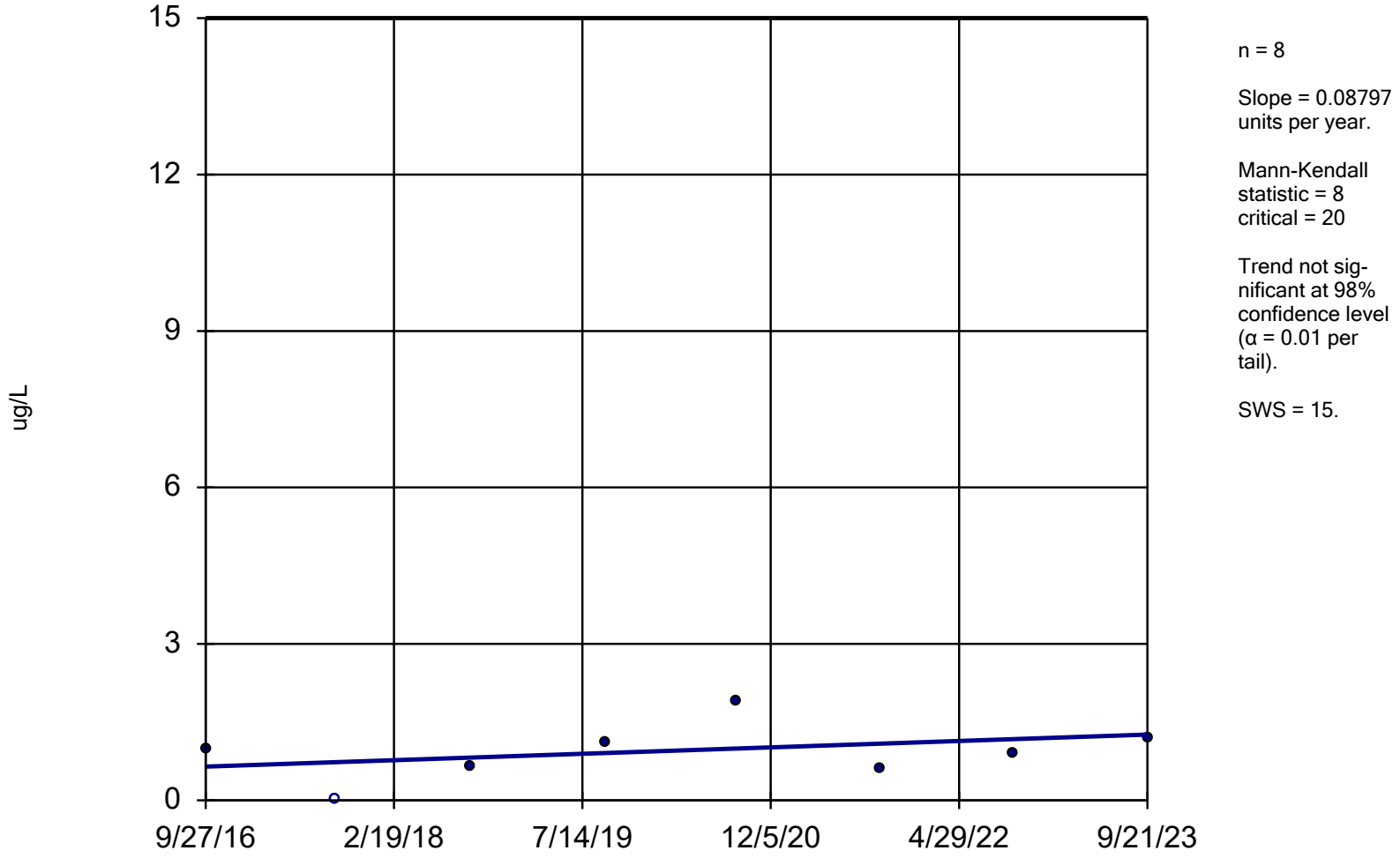
	MW-10 (bg)
9/27/2016	<0.19
9/15/2017	0.12 (J)
9/12/2018	0.55 (J)
9/17/2019	<0.27
4/29/2021	0.23 (J)
9/28/2021	<0.21
9/20/2022	<0.24
9/18/2023	<0.24 (U)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Lead

MW-11AR



n = 8

Slope = 0.08797 units per year.

Mann-Kendall statistic = 8
critical = 20

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

SWS = 15.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:35 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Lead (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

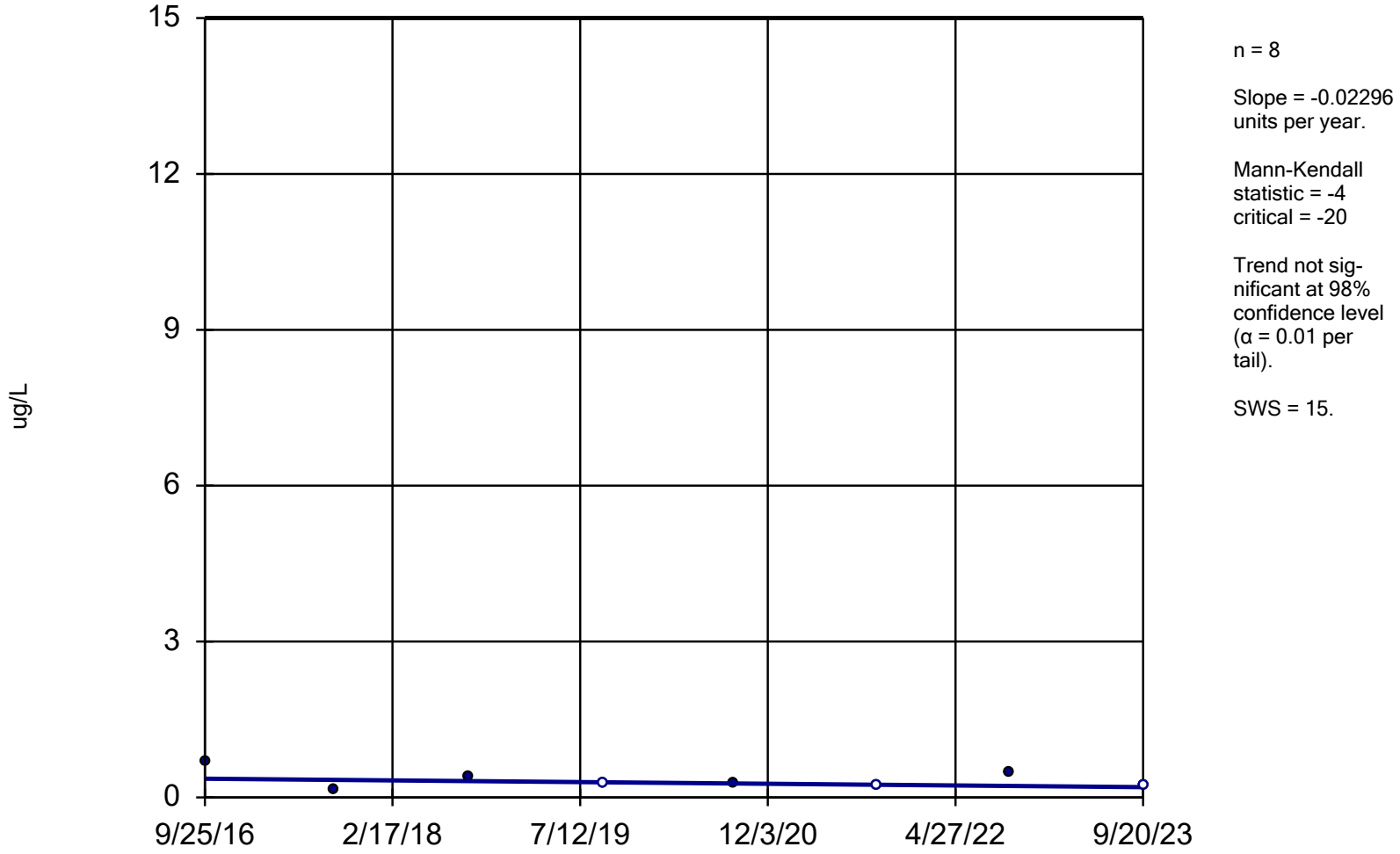
	MW-11AR
9/27/2016	1
9/14/2017	<0.033
9/12/2018	0.64 (J)
9/17/2019	1.1
9/1/2020	1.9
9/28/2021	0.61
9/21/2022	0.9
9/21/2023	1.2

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Lead

MW-13 (bg)



n = 8

Slope = -0.02296 units per year.

Mann-Kendall statistic = -4
critical = -20

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

SWS = 15.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:35 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Lead (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

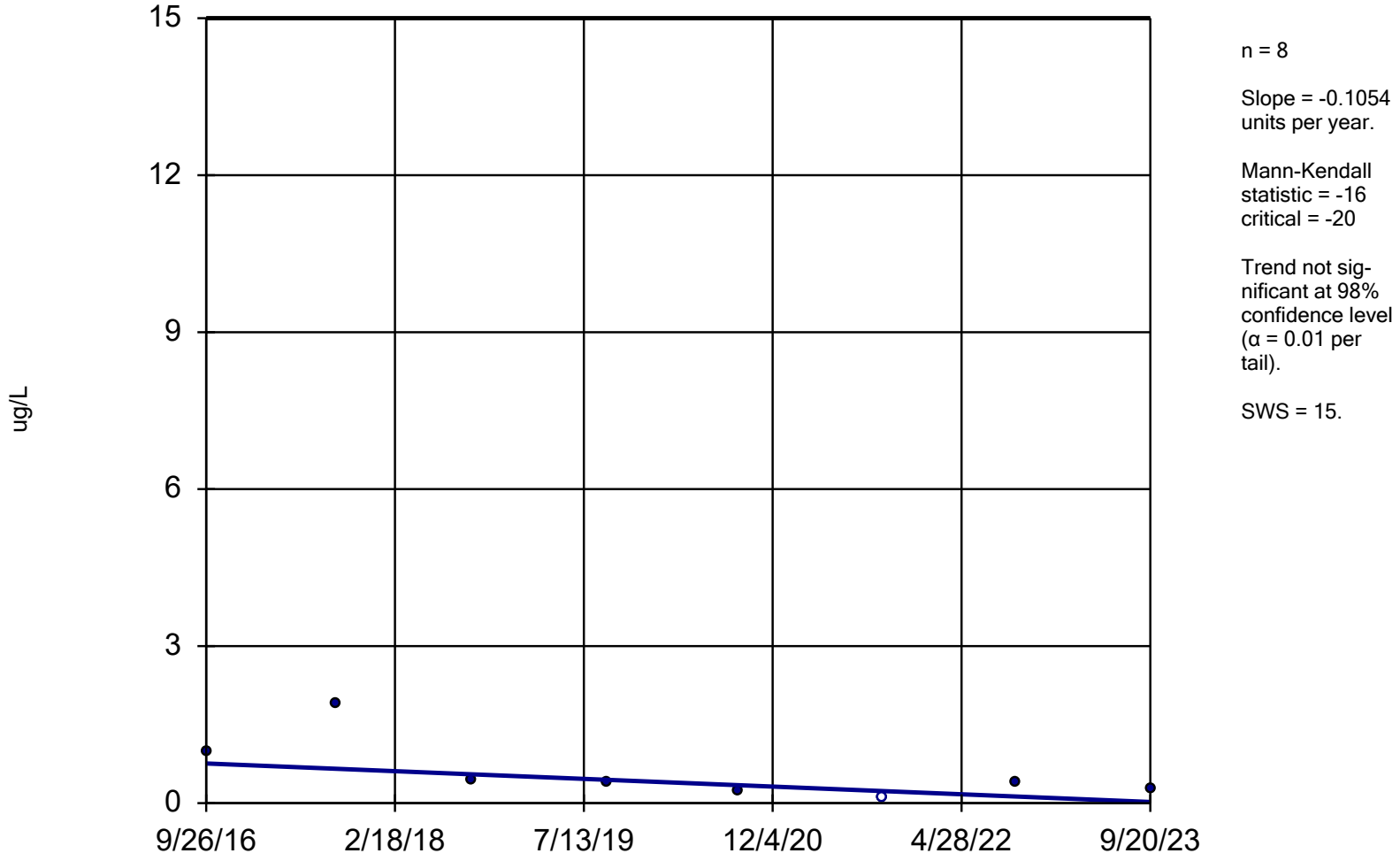
	MW-13 (bg)
9/25/2016	0.71 (J)
9/13/2017	0.13 (J)
9/11/2018	0.39 (J)
9/16/2019	<0.27
9/2/2020	0.29 (J)
9/27/2021	<0.21
9/21/2022	0.47 (J)
9/20/2023	<0.24 (U)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Lead

MW-14 (bg)



n = 8

Slope = -0.1054 units per year.

Mann-Kendall statistic = -16
critical = -20

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

SWS = 15.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:35 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Lead (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

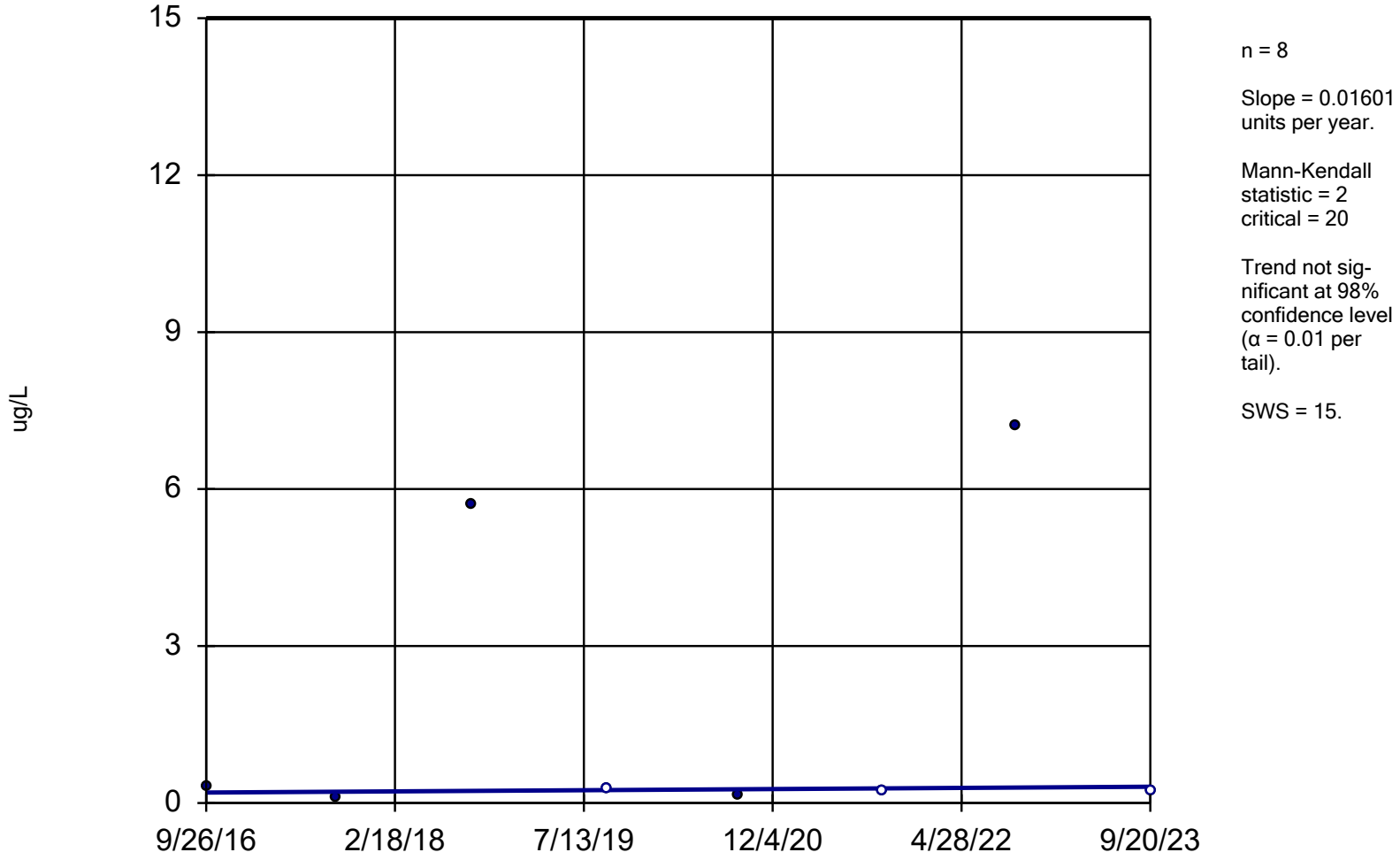
	MW-14 (bg)
9/26/2016	0.98 (J)
9/14/2017	1.9
9/12/2018	0.42 (J)
9/16/2019	0.39 (J)
9/1/2020	0.22 (J)
9/27/2021	<0.21
9/20/2022	0.4 (J)
9/20/2023	0.26 (J)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Lead

MW-18



Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:35 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Lead (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

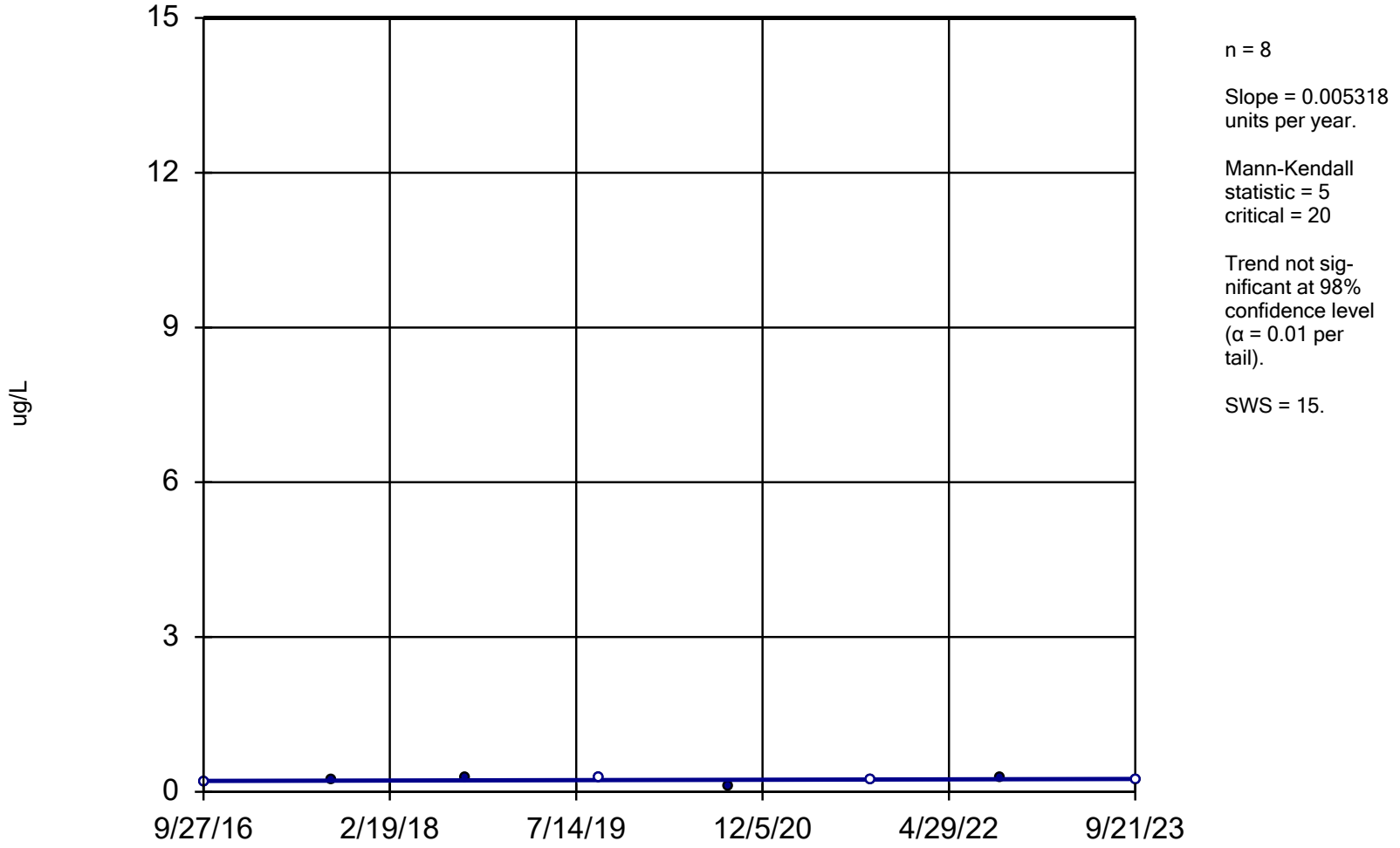
	MW-18
9/26/2016	0.31 (J)
9/14/2017	0.1 (J)
9/12/2018	5.7
9/17/2019	<0.27
9/1/2020	0.15 (J)
9/28/2021	<0.21
9/21/2022	7.2
9/20/2023	<0.24 (U)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Lead

MW-19



n = 8

Slope = 0.005318 units per year.

Mann-Kendall statistic = 5
critical = 20

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

SWS = 15.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:35 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Lead (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

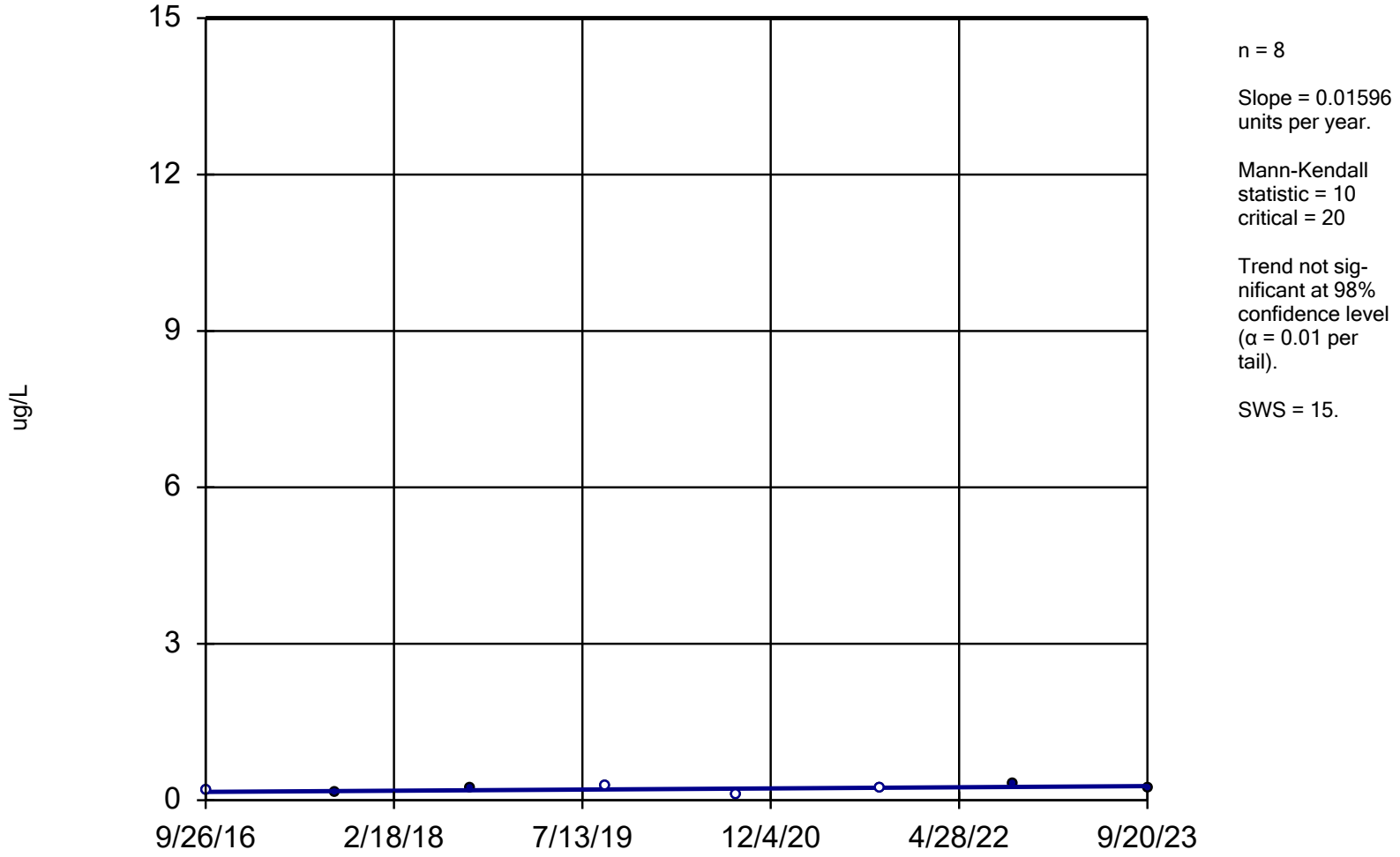
	MW-19
9/27/2016	<0.19
9/14/2017	0.22 (J)
9/12/2018	0.29 (J)
9/17/2019	<0.27
9/2/2020	0.12 (J)
9/29/2021	<0.21
9/20/2022	0.29 (J)
9/21/2023	<0.24 (U)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Lead

MW-20



n = 8

Slope = 0.01596 units per year.

Mann-Kendall statistic = 10
critical = 20

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

SWS = 15.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:35 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Lead (ug/L) Analysis Run 11/1/2023 11:38 AM

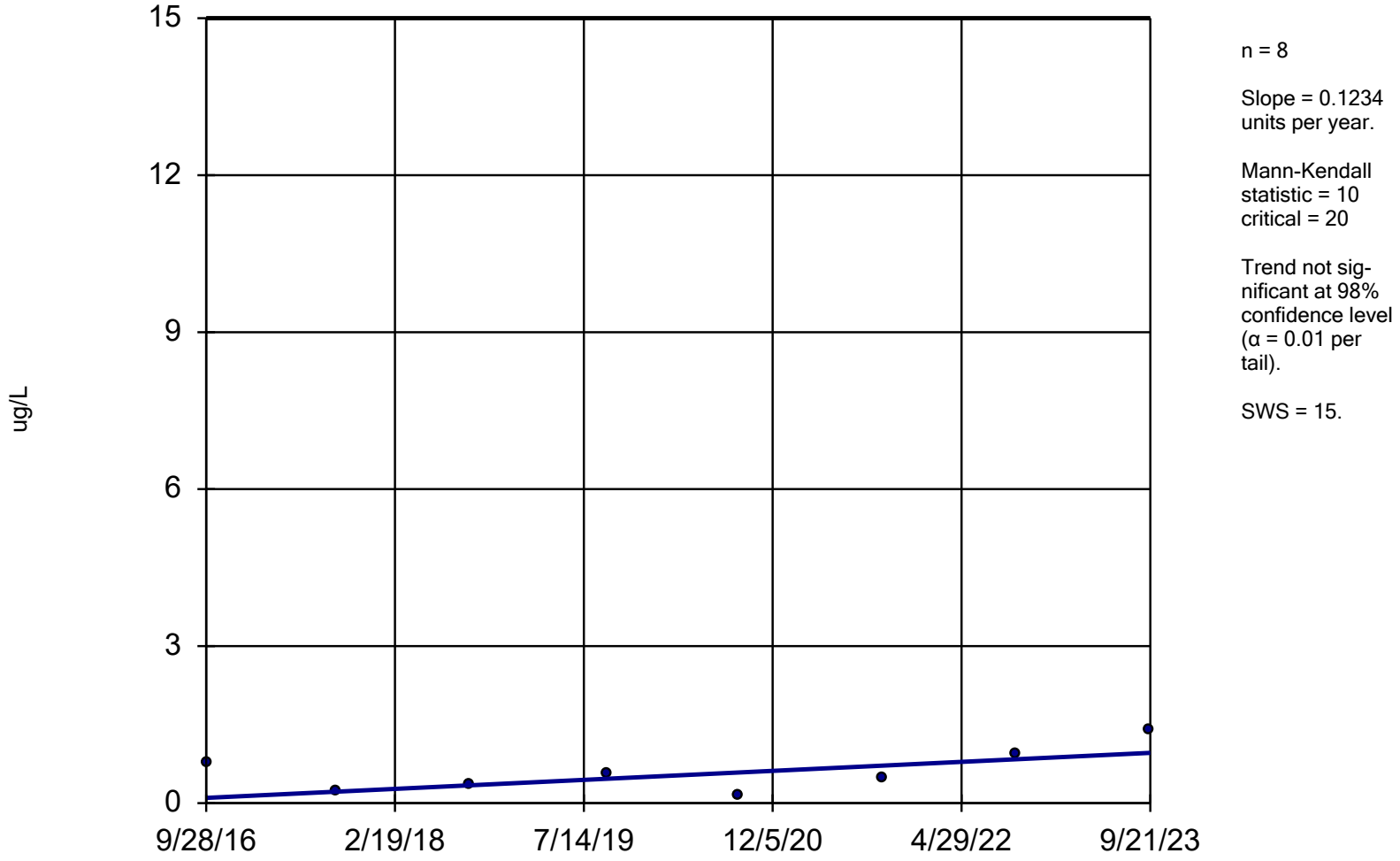
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-20
9/26/2016	<0.19
9/13/2017	0.14 (J)
9/11/2018	0.22 (J)
9/16/2019	<0.27
9/2/2020	<0.11
9/27/2021	<0.21
9/21/2022	0.33 (J)
9/20/2023	0.24 (J)

ND substitution: RL or RL/2 if <15% NDs.

Lead

MW-21



n = 8

Slope = 0.1234 units per year.

Mann-Kendall statistic = 10
critical = 20

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

SWS = 15.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:35 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Lead (ug/L) Analysis Run 11/1/2023 11:38 AM

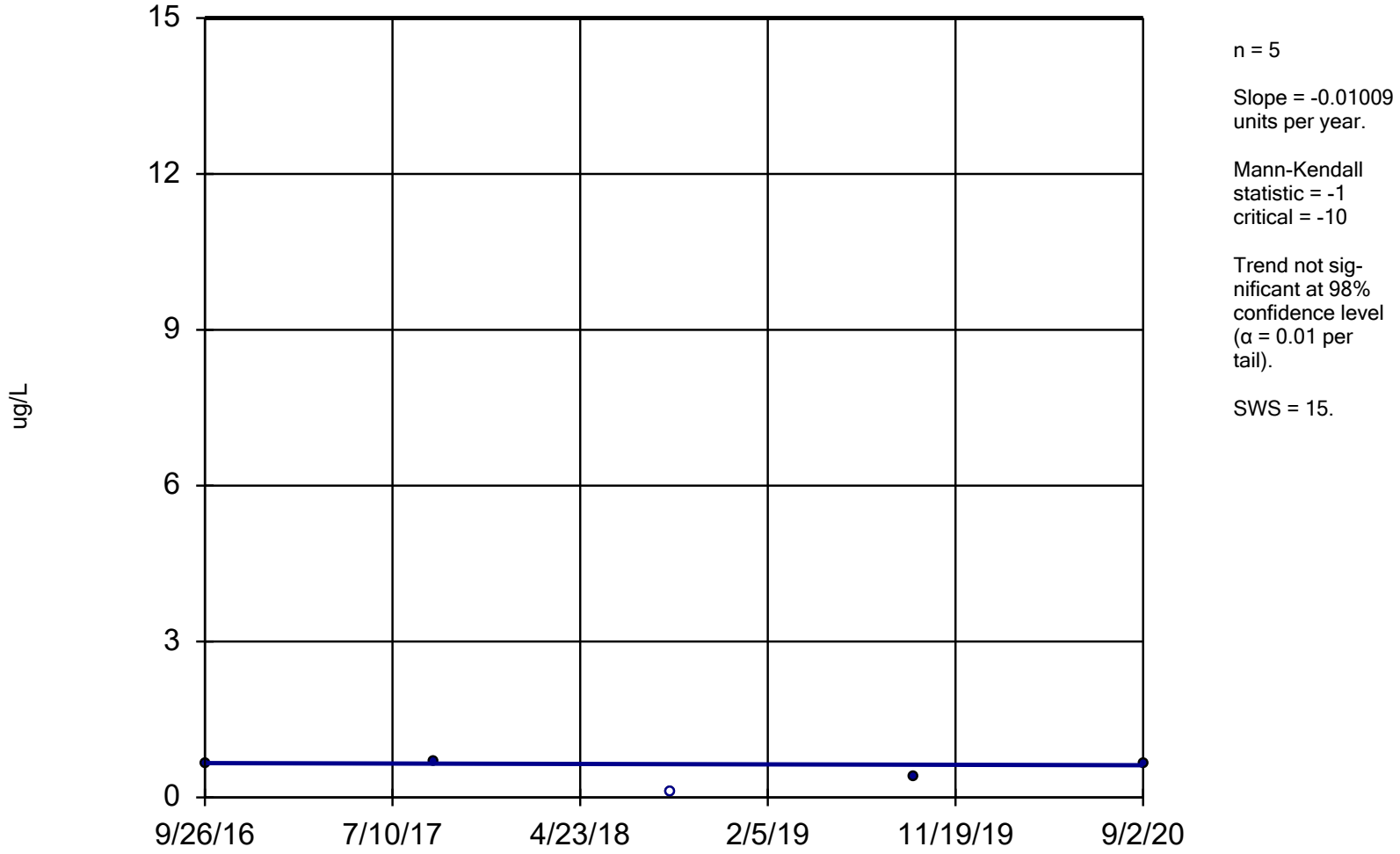
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-21
9/28/2016	0.77 (J)
9/14/2017	0.23 (J)
9/11/2018	0.34 (J)
9/17/2019	0.55
9/2/2020	0.15 (J)
9/29/2021	0.5
9/22/2022	0.96
9/21/2023	1.4

Hollow symbols indicate censored values.

Lead

MW-22



n = 5

Slope = -0.01009 units per year.

Mann-Kendall statistic = -1
critical = -10

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

SWS = 15.

Sen's Slope Estimator Analysis Run 11/1/2023 11:35 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Lead (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

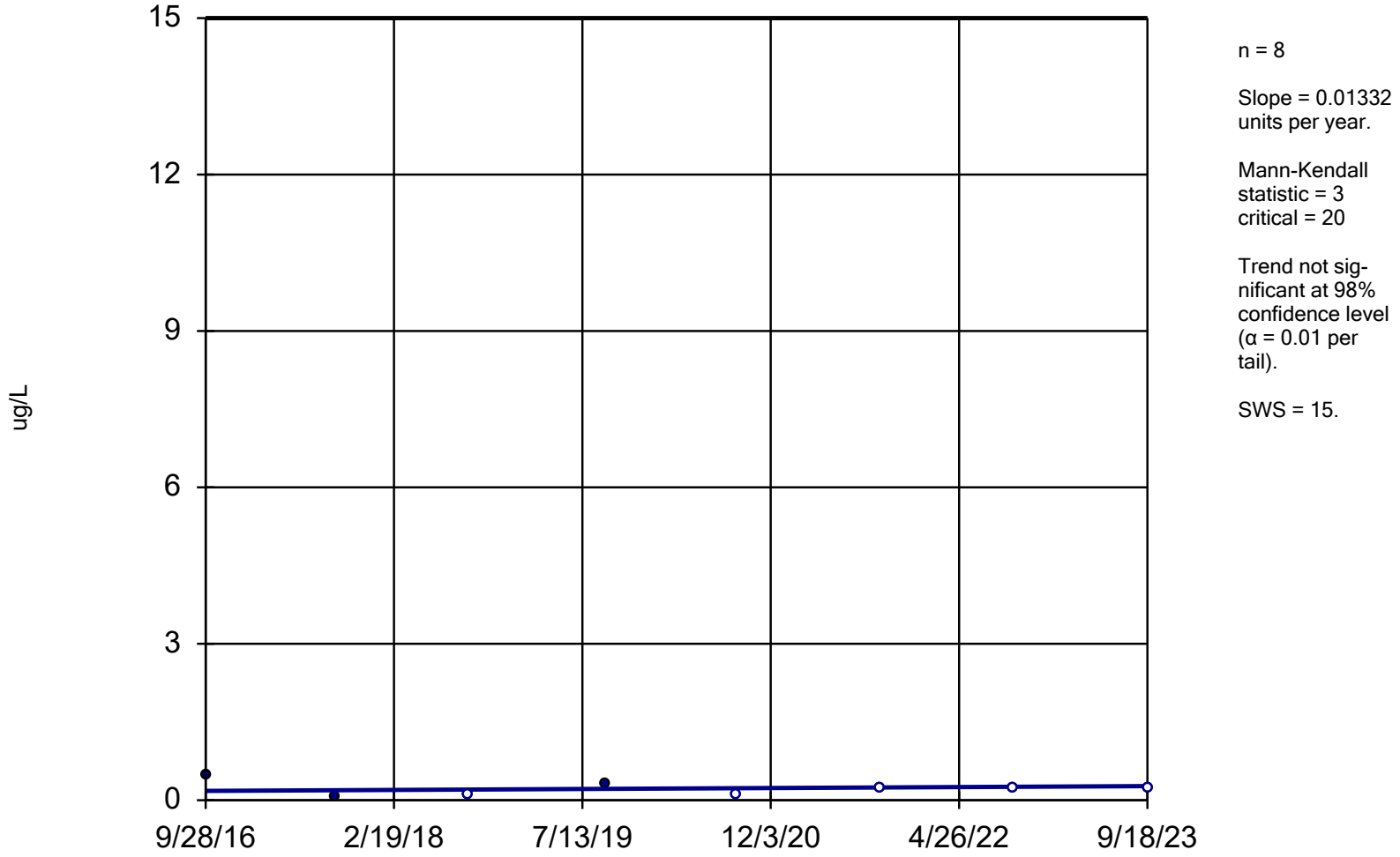
	MW-22
9/26/2016	0.64 (J)
9/13/2017	0.7 (J)
9/11/2018	<0.12
9/16/2019	0.38 (J)
9/2/2020	0.64

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Lead

MW-23



n = 8

Slope = 0.01332 units per year.

Mann-Kendall statistic = 3
critical = 20

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

SWS = 15.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:35 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Lead (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

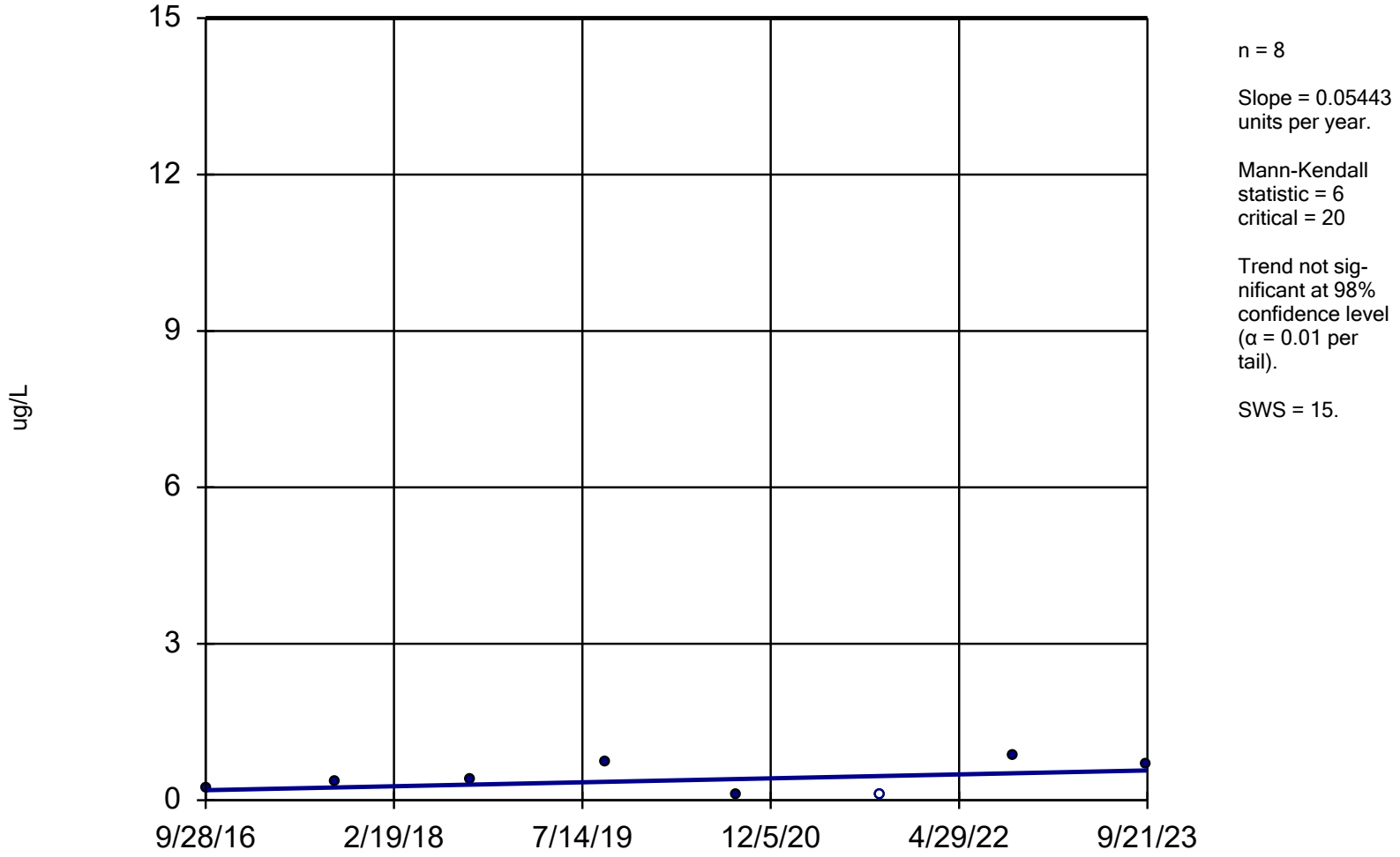
	MW-23
9/28/2016	0.5 (J)
9/13/2017	0.076 (J)
9/11/2018	<0.12
9/16/2019	0.31 (J)
9/1/2020	<0.11
9/27/2021	<0.21
9/21/2022	<0.24
9/18/2023	<0.24 (U)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Lead

MW-3



n = 8

Slope = 0.05443 units per year.

Mann-Kendall statistic = 6
critical = 20

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

SWS = 15.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:35 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Lead (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

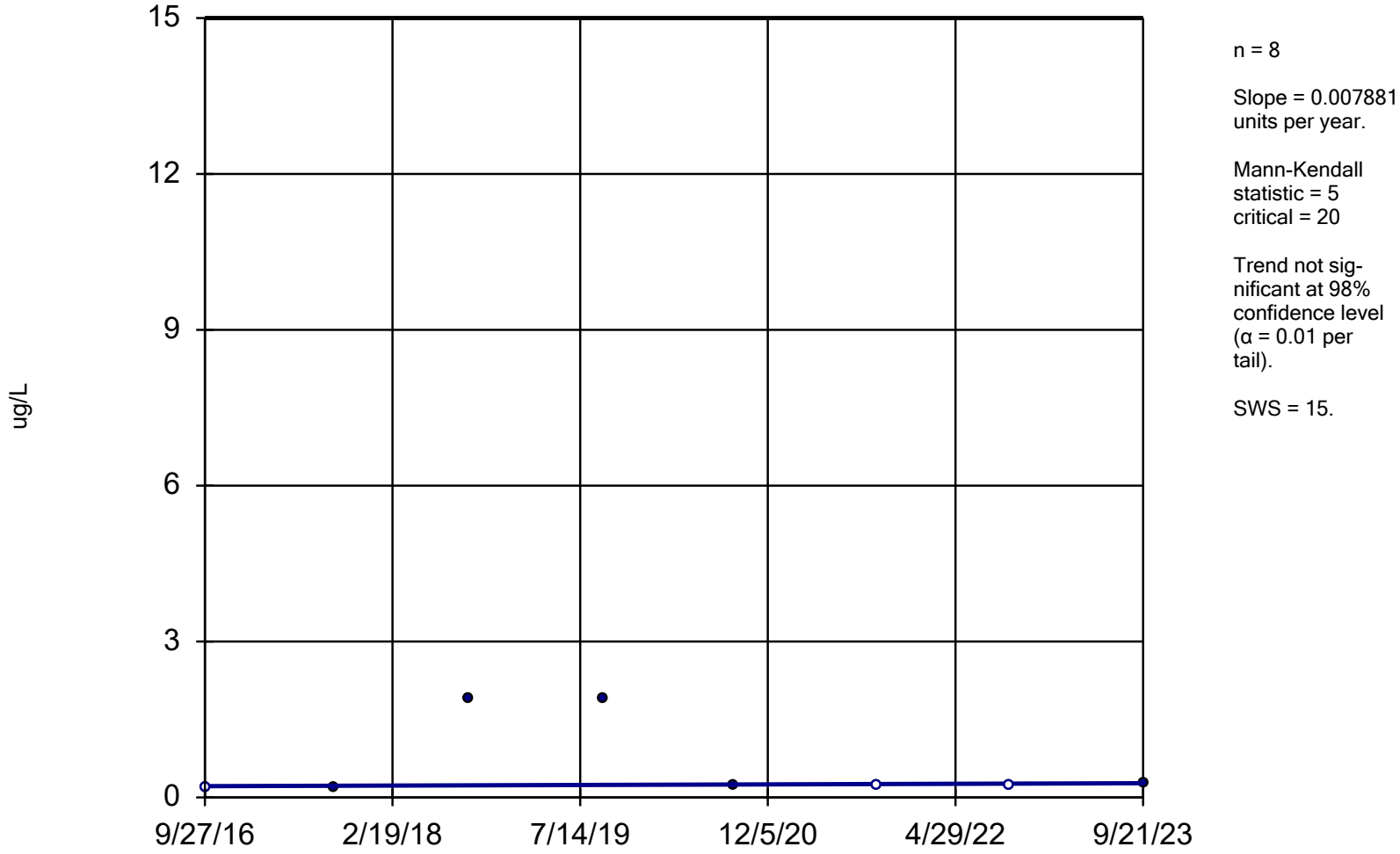
	MW-3
9/28/2016	0.24 (J)
9/14/2017	0.36 (J)
9/13/2018	0.4 (J)
9/17/2019	0.73
9/2/2020	0.12 (J)
9/29/2021	<0.21
9/21/2022	0.85
9/21/2023	0.68

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Lead

MW-4



n = 8

Slope = 0.007881 units per year.

Mann-Kendall statistic = 5
critical = 20

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

SWS = 15.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:35 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Lead (ug/L) Analysis Run 11/1/2023 11:38 AM

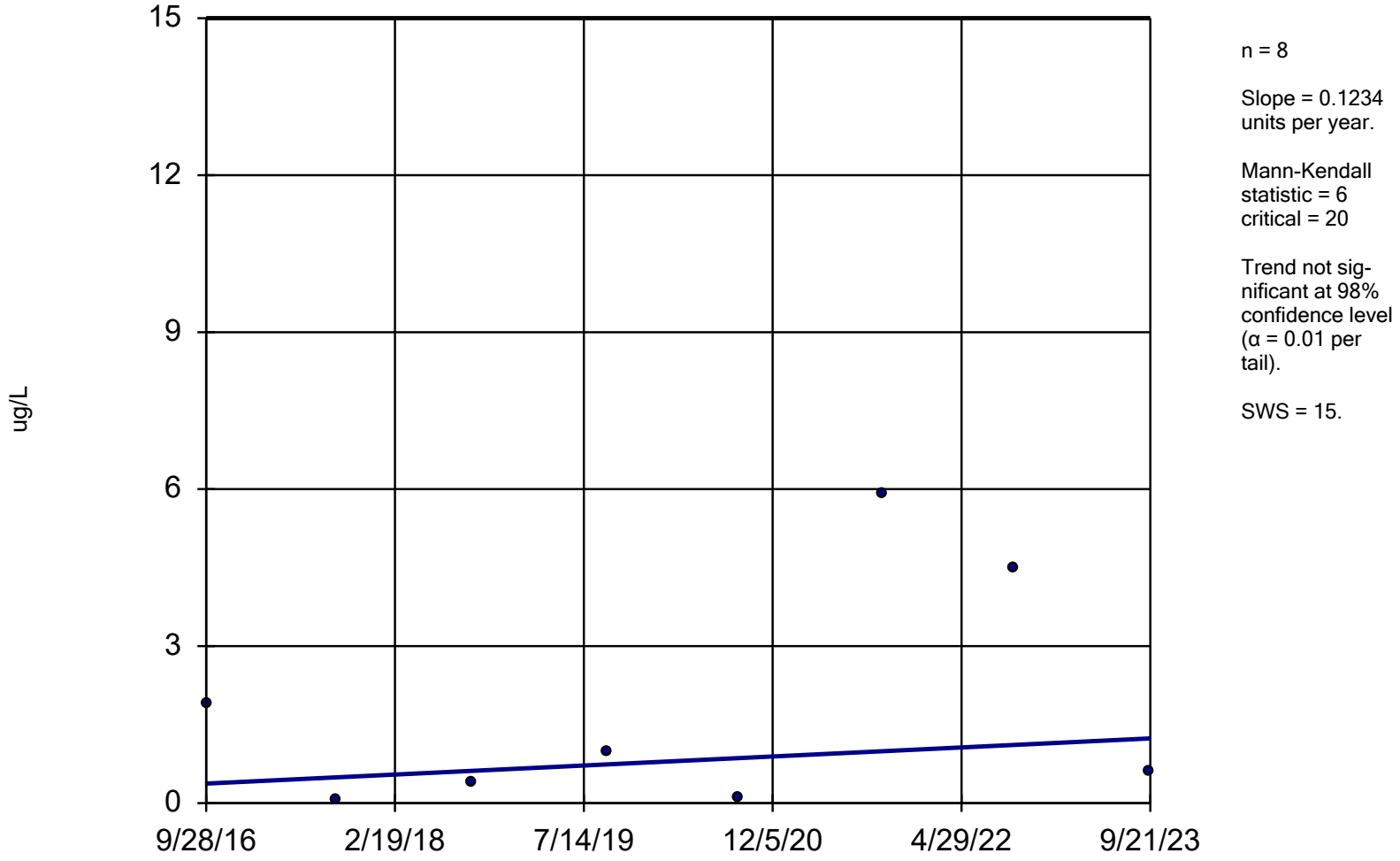
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-4
9/27/2016	<0.19
9/13/2017	0.18 (J)
9/12/2018	1.9
9/17/2019	1.9
9/2/2020	0.25 (J)
9/29/2021	<0.21
9/22/2022	<0.24
9/21/2023	0.28 (J)

ND substitution: RL or RL/2 if <15% NDs.

Lead

MW-5



n = 8

Slope = 0.1234 units per year.

Mann-Kendall statistic = 6
critical = 20

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

SWS = 15.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:35 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Lead (ug/L) Analysis Run 11/1/2023 11:38 AM

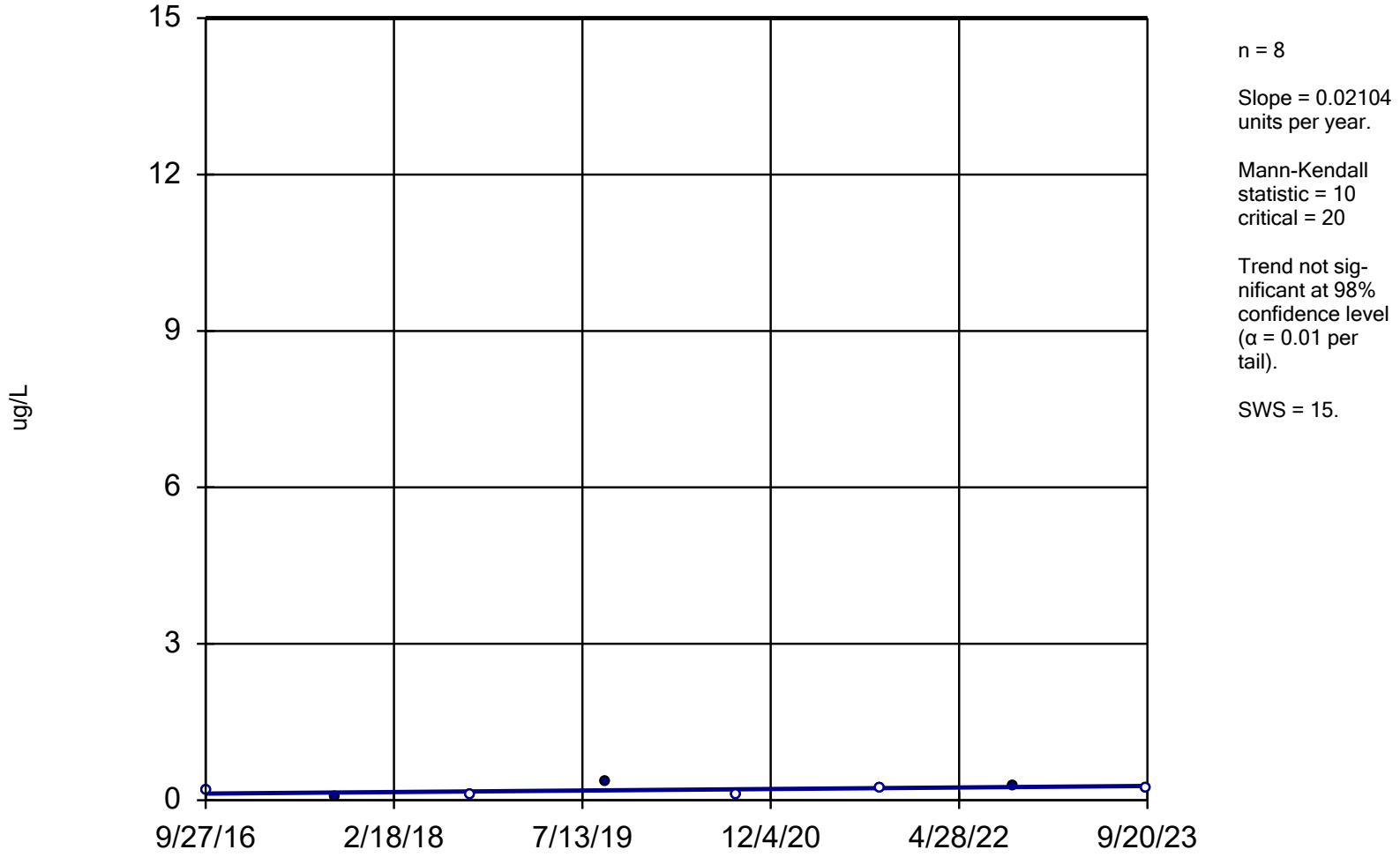
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-5
9/28/2016	1.9
9/14/2017	0.08 (J)
9/12/2018	0.38 (J)
9/17/2019	1
9/2/2020	0.11 (J)
9/29/2021	5.9
9/20/2022	4.5
9/21/2023	0.6

Hollow symbols indicate censored values.

Lead

MW-7



n = 8

Slope = 0.02104 units per year.

Mann-Kendall statistic = 10
critical = 20

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

SWS = 15.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:35 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Lead (ug/L) Analysis Run 11/1/2023 11:38 AM

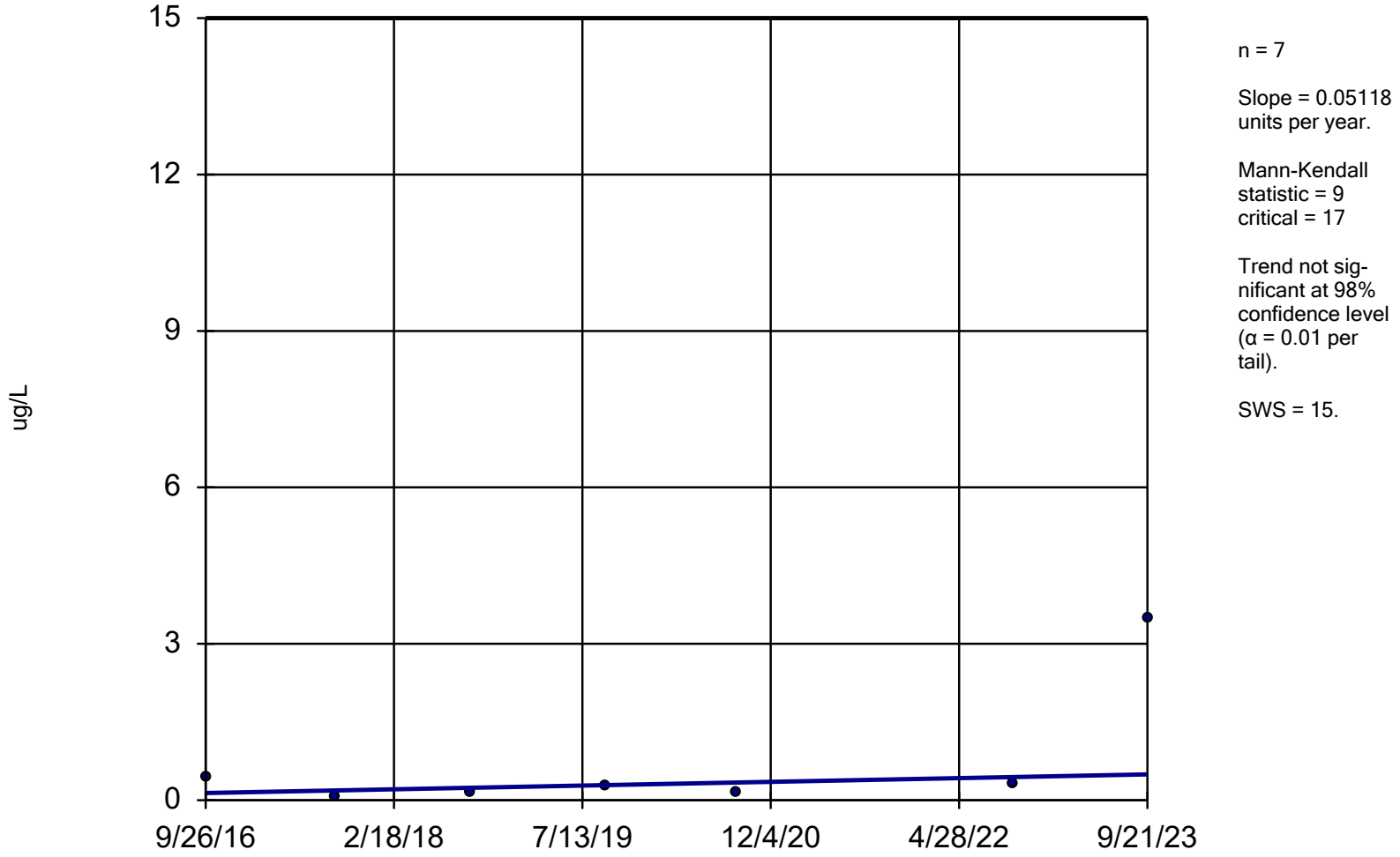
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-7
9/27/2016	<0.19
9/13/2017	0.056 (J)
9/13/2018	<0.12
9/17/2019	0.34 (J)
9/1/2020	<0.11
9/28/2021	<0.21
9/20/2022	0.29 (J)
9/20/2023	<0.24 (U)

ND substitution: RL or RL/2 if <15% NDs.

Lead

MW-8 (bg)



n = 7

Slope = 0.05118 units per year.

Mann-Kendall statistic = 9
critical = 17

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

SWS = 15.

Sen's Slope Estimator Analysis Run 11/1/2023 11:35 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Lead (ug/L) Analysis Run 11/1/2023 11:38 AM

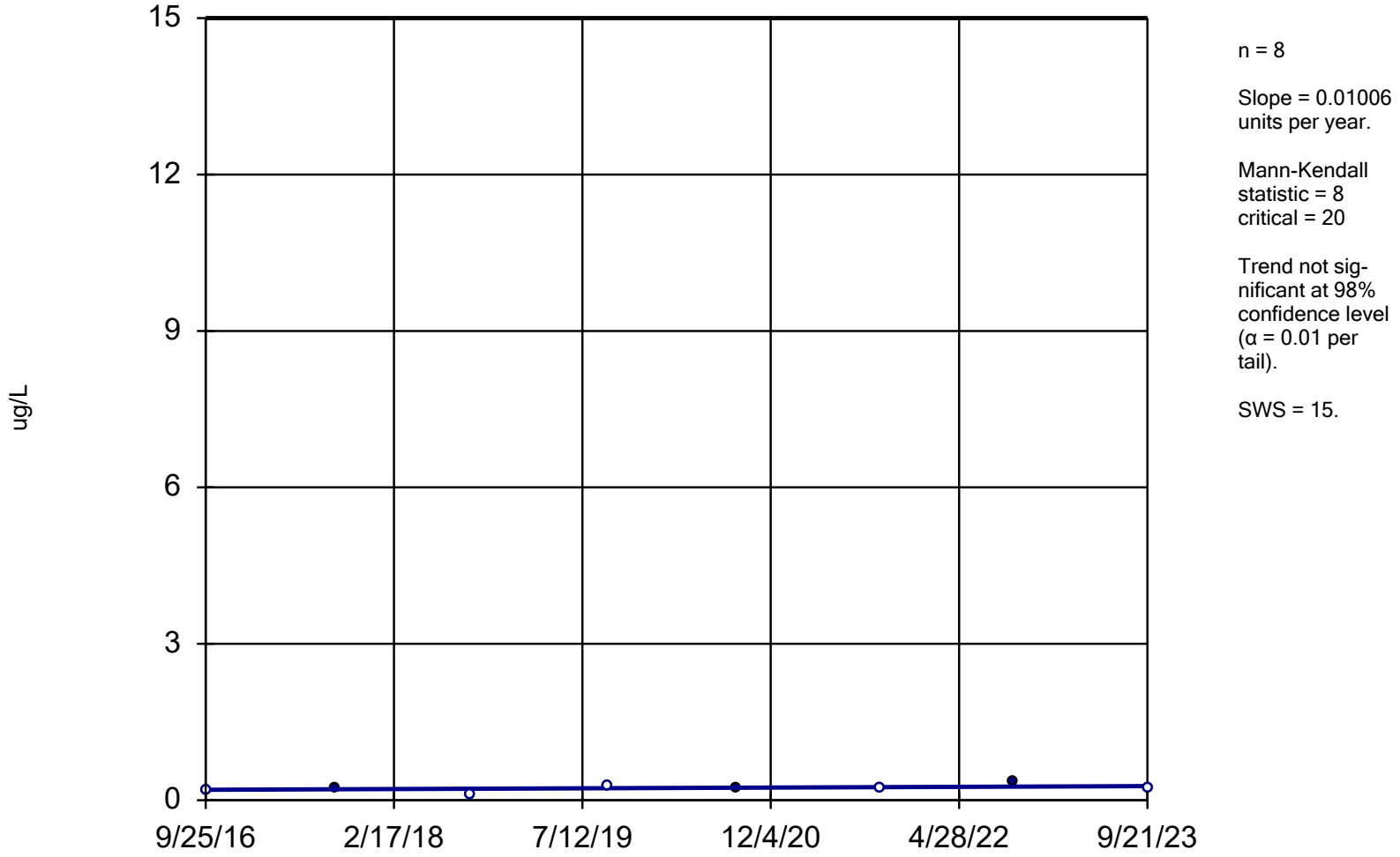
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-8 (bg)
9/26/2016	0.42 (J)
9/13/2017	0.053 (J)
9/12/2018	0.14 (J)
9/17/2019	0.29 (J)
9/1/2020	0.16 (J)
9/20/2022	0.31 (J)
9/21/2023	3.5

Hollow symbols indicate censored values.

Lead

MW-9 (bg)



n = 8

Slope = 0.01006 units per year.

Mann-Kendall statistic = 8
critical = 20

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

SWS = 15.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:35 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Lead (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

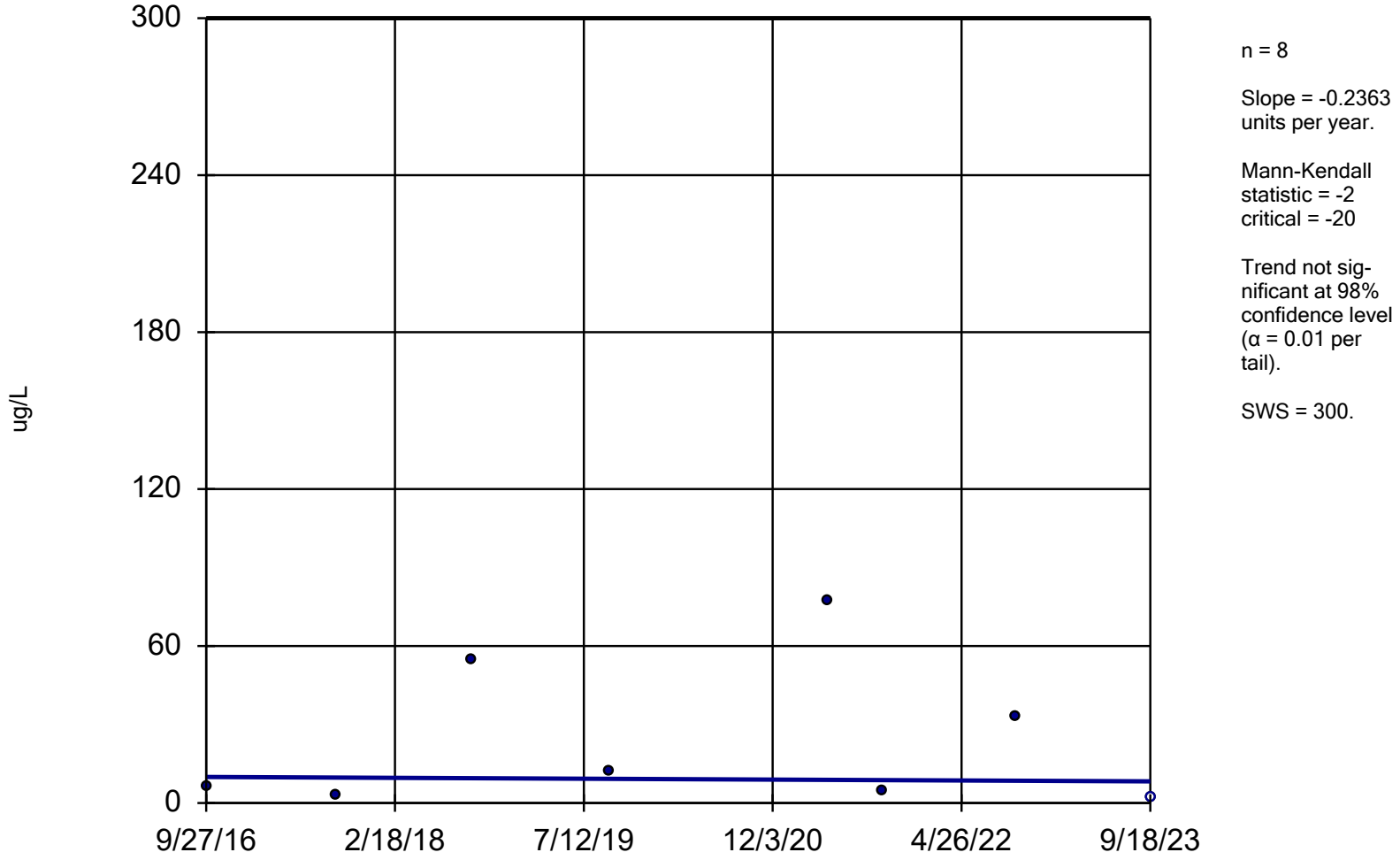
	MW-9 (bg)
9/25/2016	<0.19
9/14/2017	0.25 (J)
9/12/2018	<0.12
9/17/2019	<0.27
9/1/2020	0.23 (J)
9/28/2021	<0.21
9/20/2022	0.37 (J)
9/21/2023	<0.24 (U)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Manganese

MW-10 (bg)



n = 8

Slope = -0.2363 units per year.

Mann-Kendall statistic = -2
critical = -20

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

SWS = 300.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:35 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Manganese (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

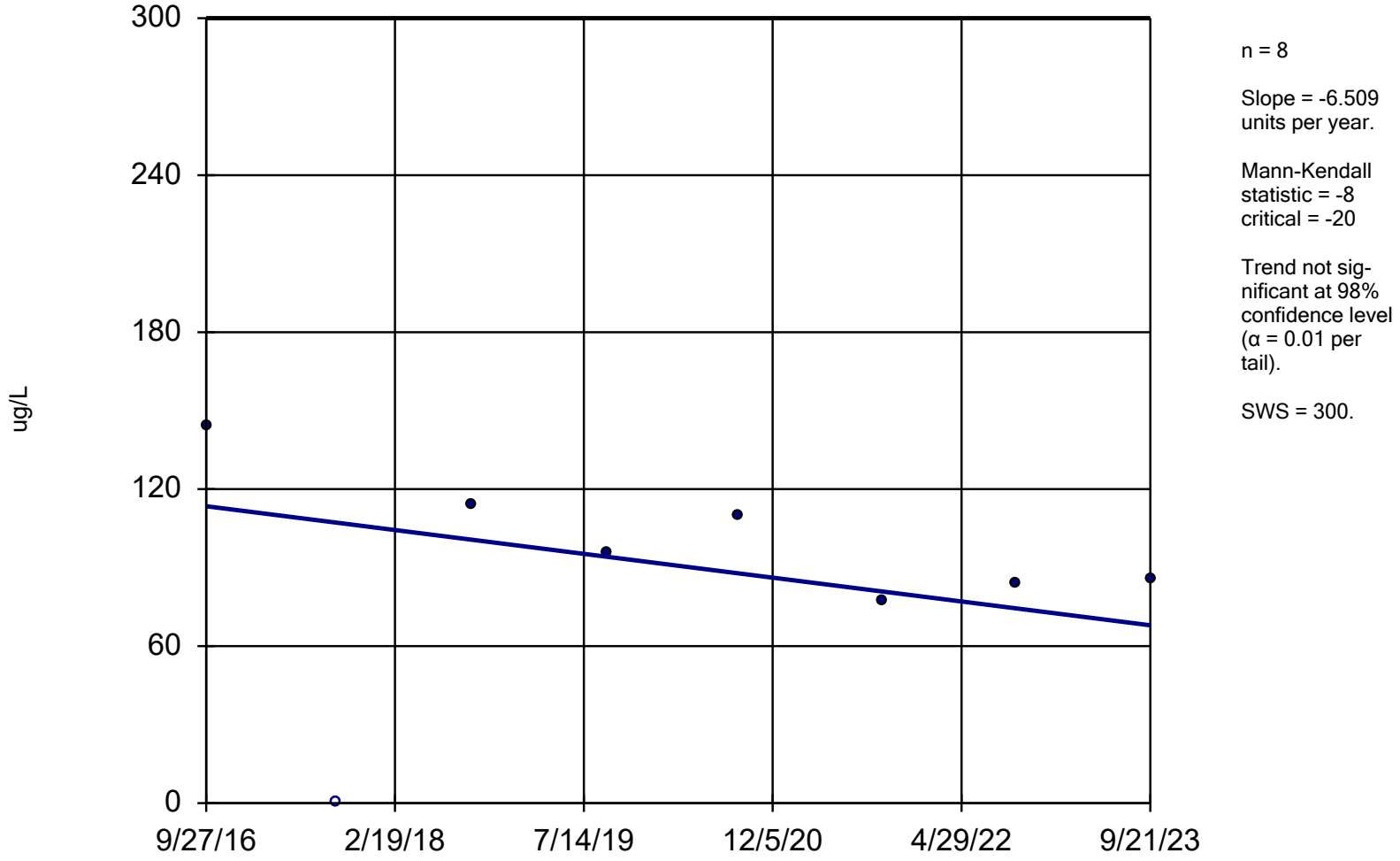
	MW-10 (bg)
9/27/2016	6.1
9/15/2017	3.2
9/12/2018	54.9
9/17/2019	12
4/29/2021	77
9/28/2021	4.9 (J)
9/20/2022	33
9/18/2023	<3.6 (U)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Manganese

MW-11AR



n = 8

Slope = -6.509 units per year.

Mann-Kendall statistic = -8
critical = -20

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

SWS = 300.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:35 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Manganese (ug/L) Analysis Run 11/1/2023 11:38 AM

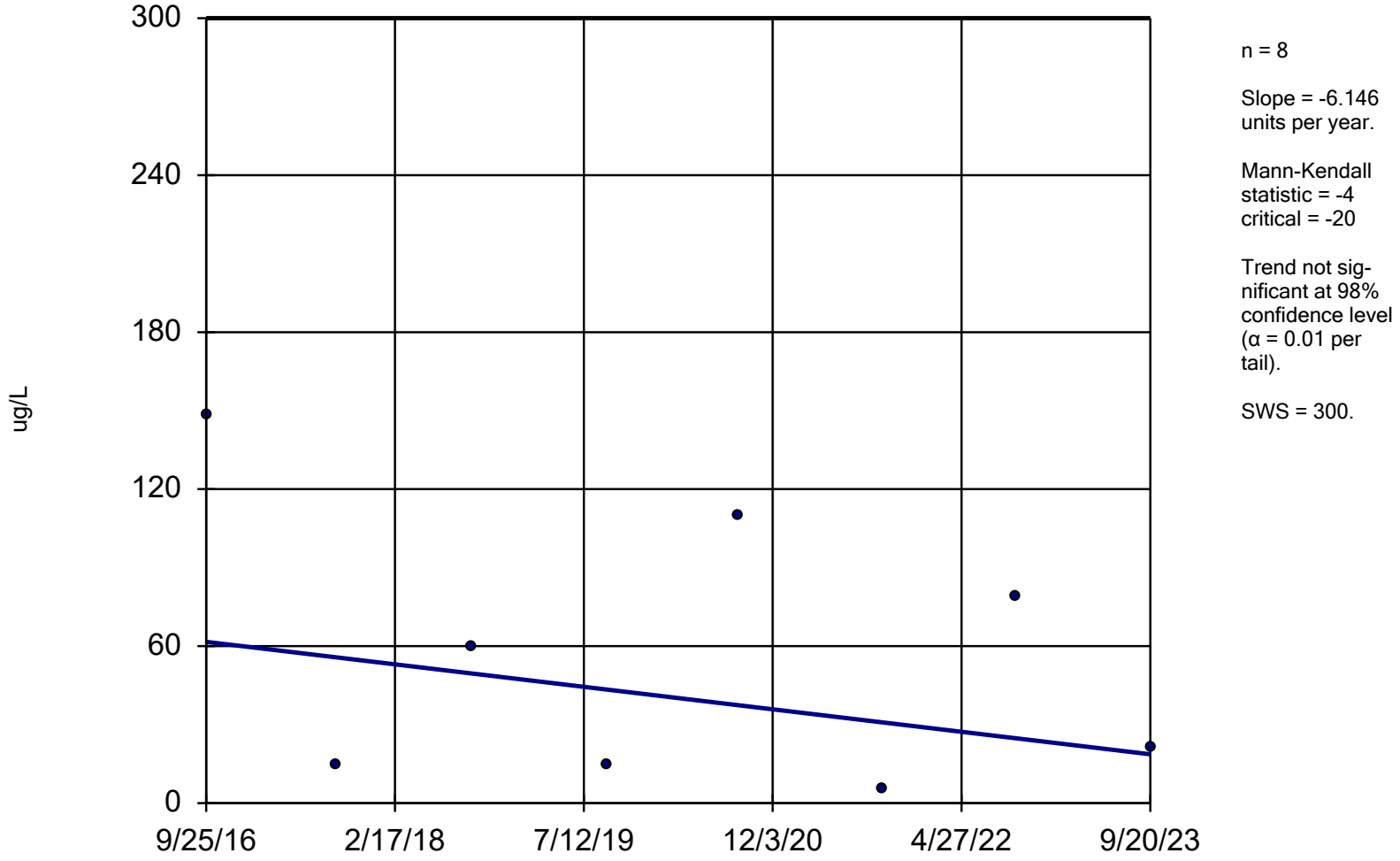
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-11AR
9/27/2016	144
9/14/2017	<0.07
9/12/2018	114
9/17/2019	96
9/1/2020	110
9/28/2021	77
9/21/2022	84
9/21/2023	86

ND substitution: RL or RL/2 if <15% NDs.

Manganese

MW-13 (bg)



n = 8

Slope = -6.146 units per year.

Mann-Kendall statistic = -4
critical = -20

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

SWS = 300.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:35 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

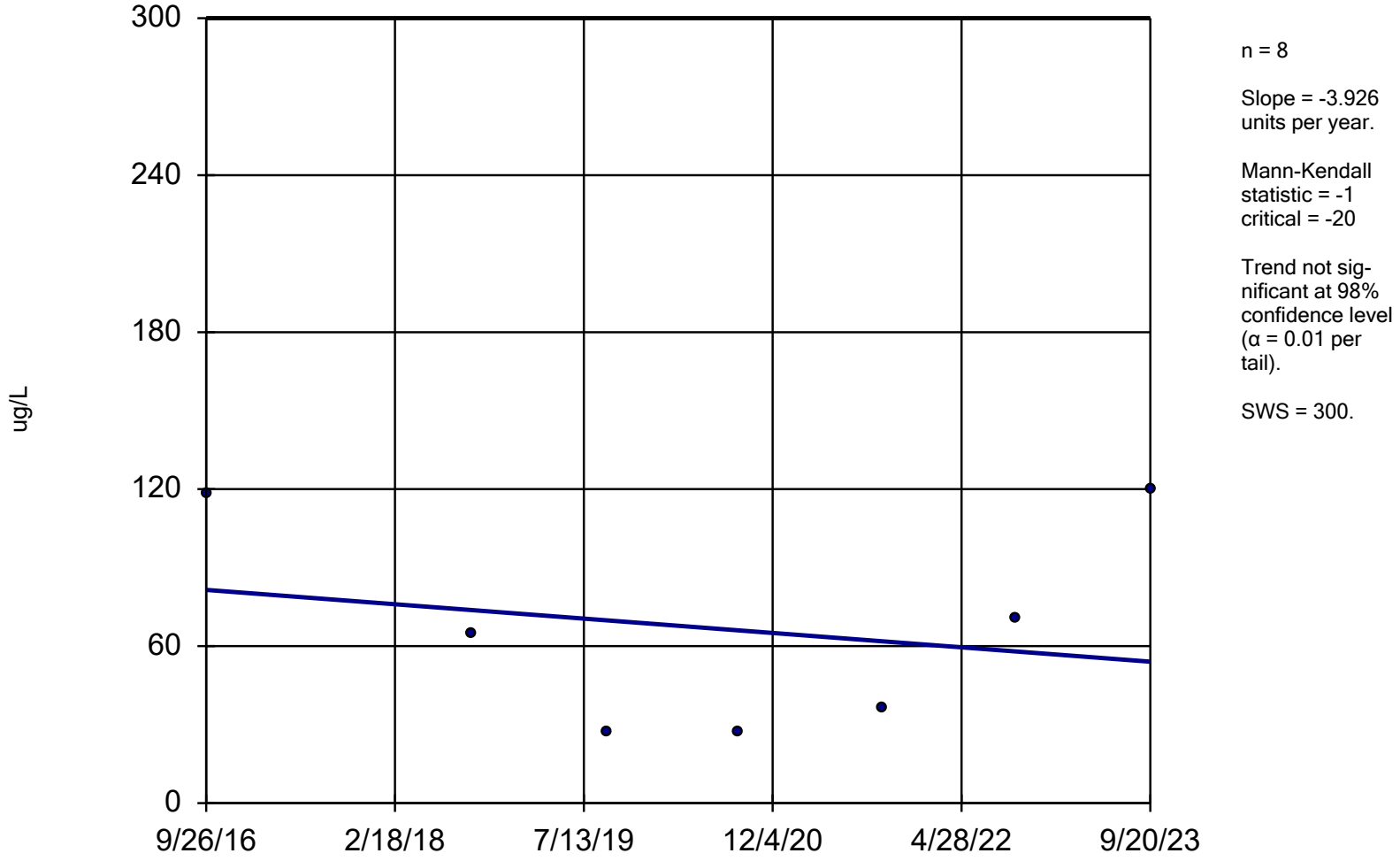
Constituent: Manganese (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-13 (bg)
9/25/2016	148
9/13/2017	14.6
9/11/2018	59.8
9/16/2019	15
9/2/2020	110
9/27/2021	5.7 (J)
9/21/2022	79
9/20/2023	21

Manganese

MW-14 (bg)



n = 8

Slope = -3.926 units per year.

Mann-Kendall statistic = -1
critical = -20

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

SWS = 300.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:35 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

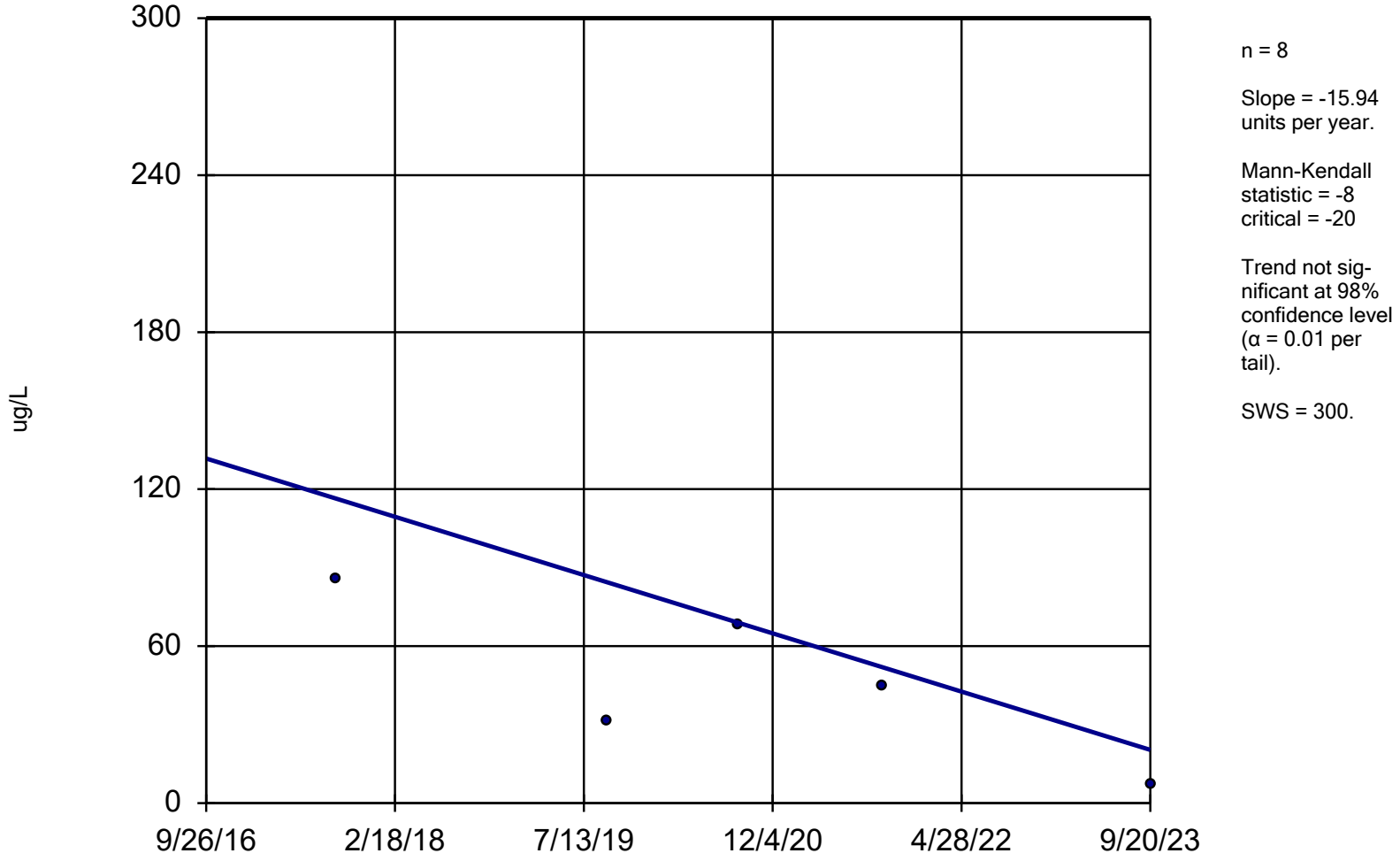
Constituent: Manganese (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-14 (bg)
9/26/2016	118
9/14/2017	407
9/12/2018	64.9
9/16/2019	27
9/1/2020	27
9/27/2021	36
9/20/2022	71
9/20/2023	120

Manganese

MW-18



n = 8

Slope = -15.94 units per year.

Mann-Kendall statistic = -8
critical = -20

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

SWS = 300.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:35 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Manganese (ug/L) Analysis Run 11/1/2023 11:38 AM

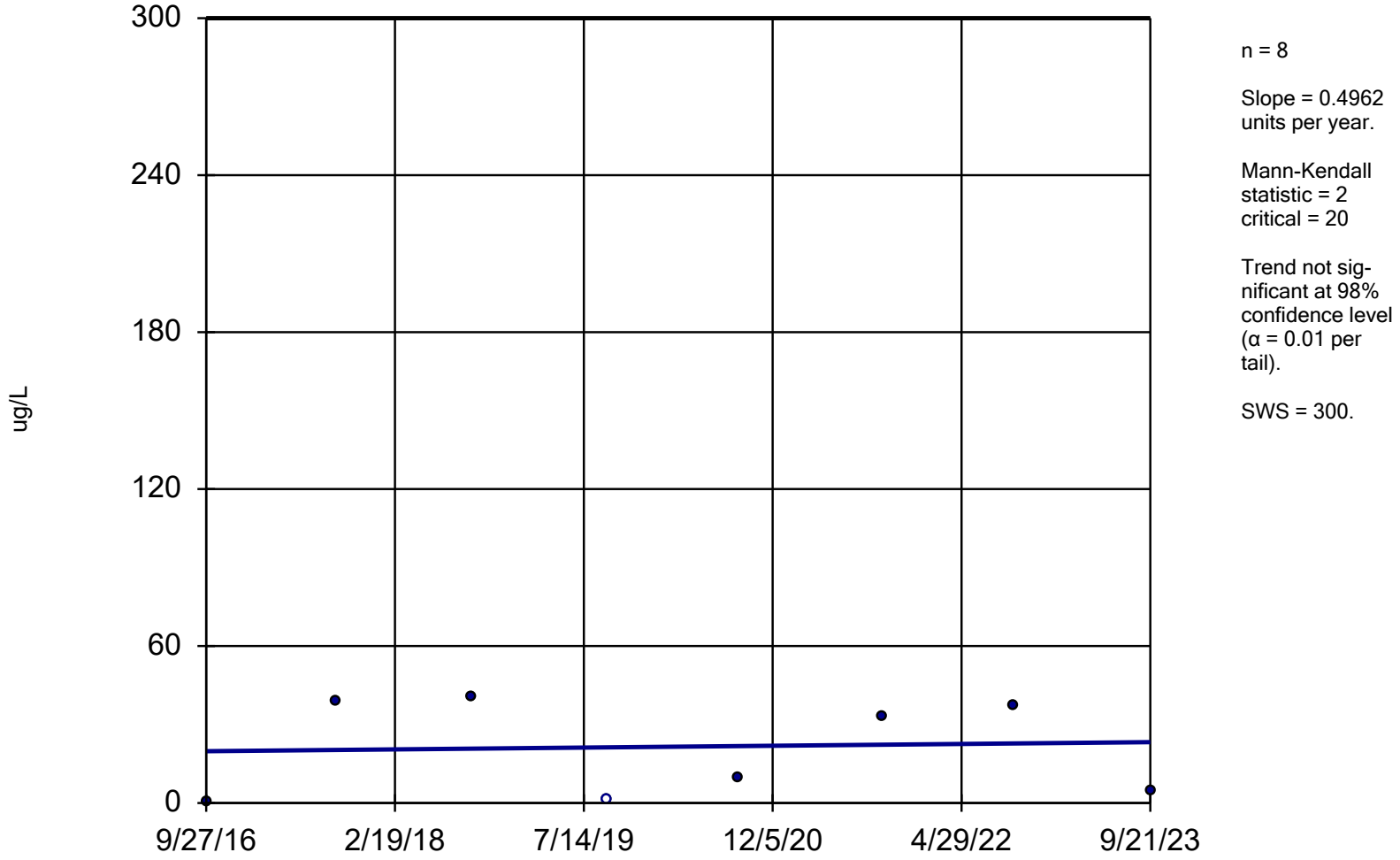
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-18
9/26/2016	395
9/14/2017	85.3
9/12/2018	1120
9/17/2019	31
9/1/2020	68
9/28/2021	45
9/21/2022	2400
9/20/2023	7.5 (J)

Hollow symbols indicate censored values.

Manganese

MW-19



n = 8

Slope = 0.4962 units per year.

Mann-Kendall statistic = 2
critical = 20

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

SWS = 300.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:36 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Manganese (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

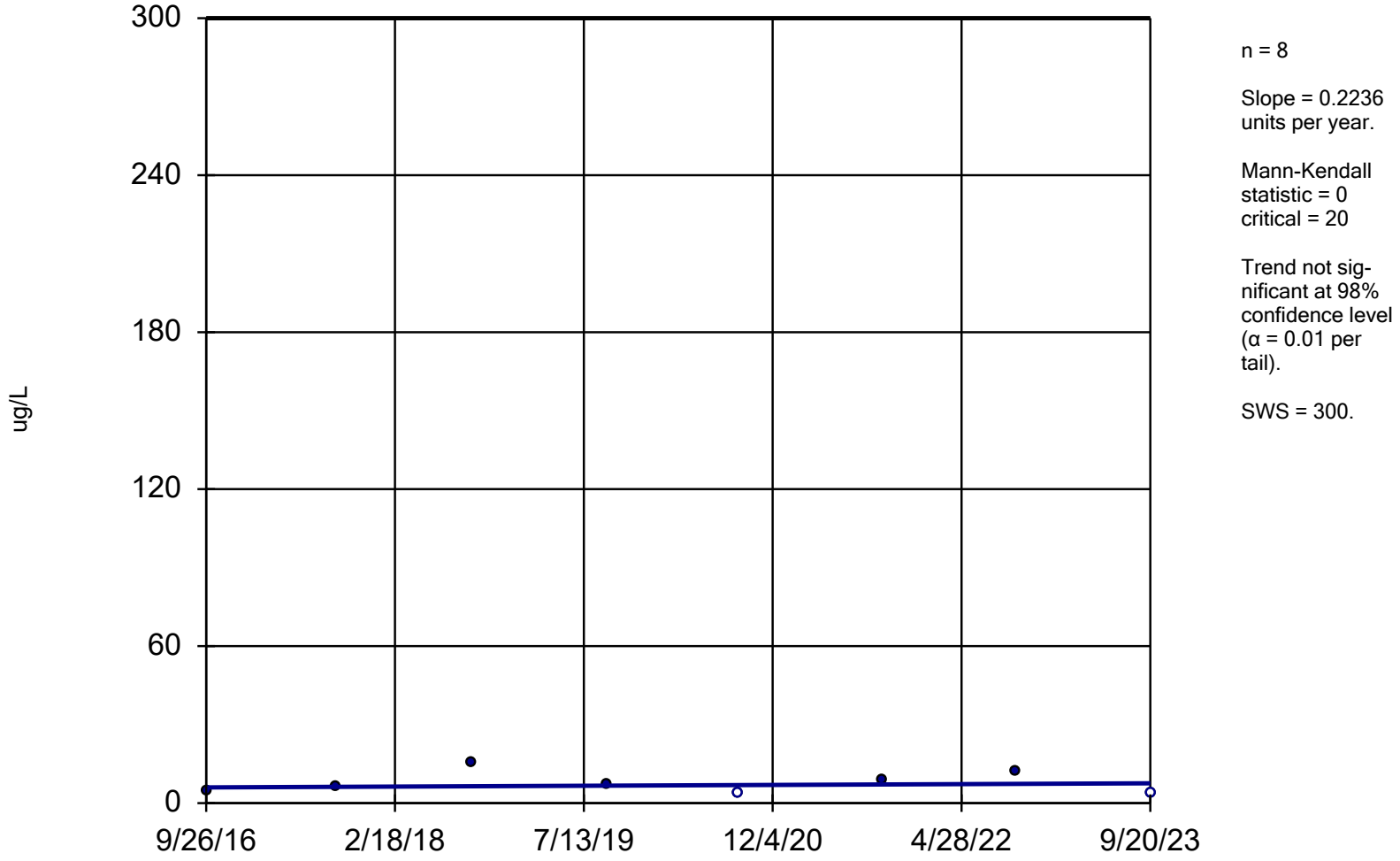
	MW-19
9/27/2016	0.3 (J)
9/14/2017	39.1
9/12/2018	40.9
9/17/2019	<2.5
9/2/2020	10
9/29/2021	33
9/20/2022	37
9/21/2023	5 (J)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Manganese

MW-20



n = 8

Slope = 0.2236 units per year.

Mann-Kendall statistic = 0
critical = 20

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

SWS = 300.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:36 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Manganese (ug/L) Analysis Run 11/1/2023 11:38 AM

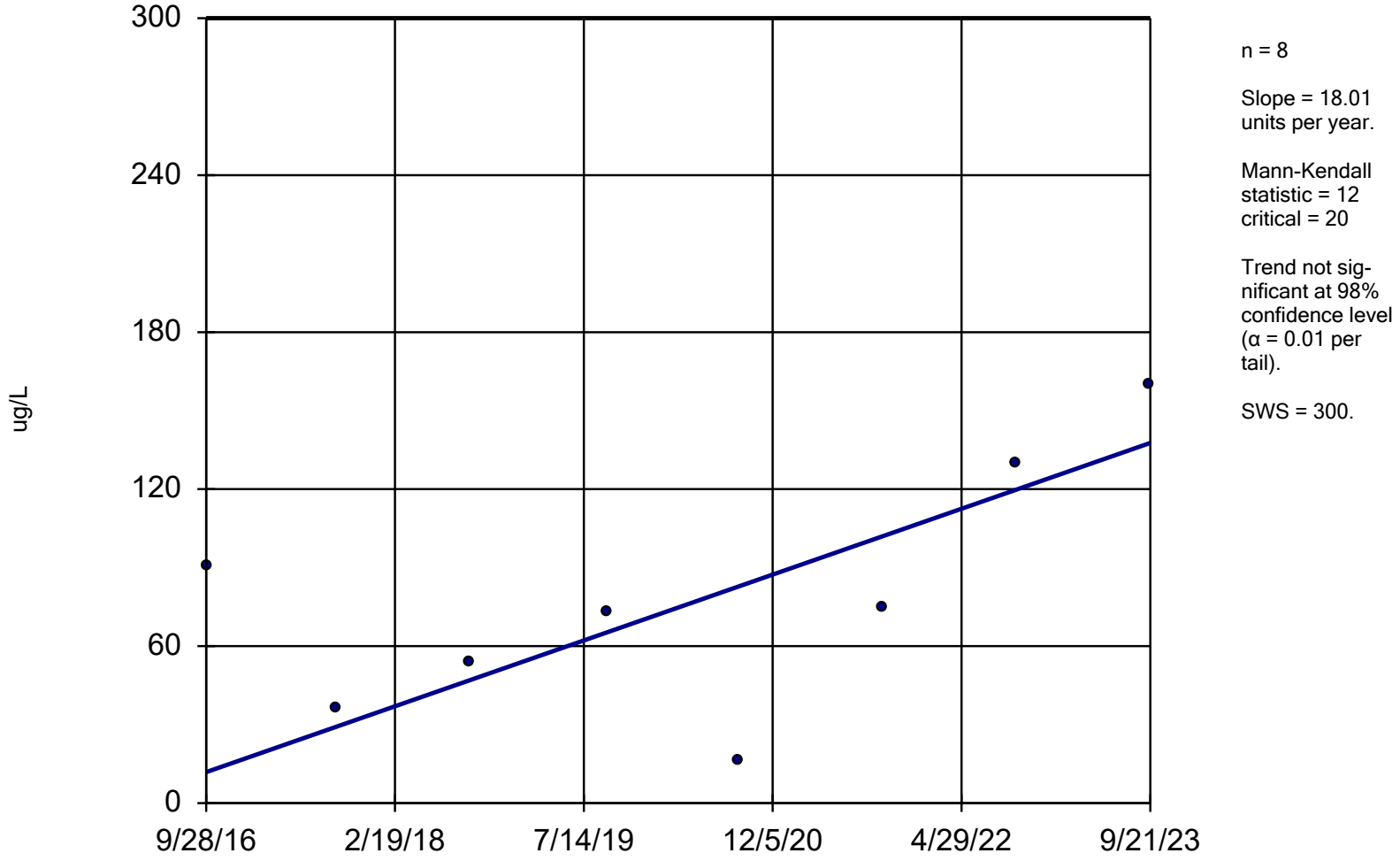
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-20
9/26/2016	4.2
9/13/2017	6.3
9/11/2018	15.7
9/16/2019	7.3 (J)
9/2/2020	<4
9/27/2021	8.8 (J)
9/21/2022	12
9/20/2023	<3.6 (U)

ND substitution: RL or RL/2 if <15% NDs.

Manganese

MW-21



n = 8

Slope = 18.01 units per year.

Mann-Kendall statistic = 12
critical = 20

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

SWS = 300.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:36 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

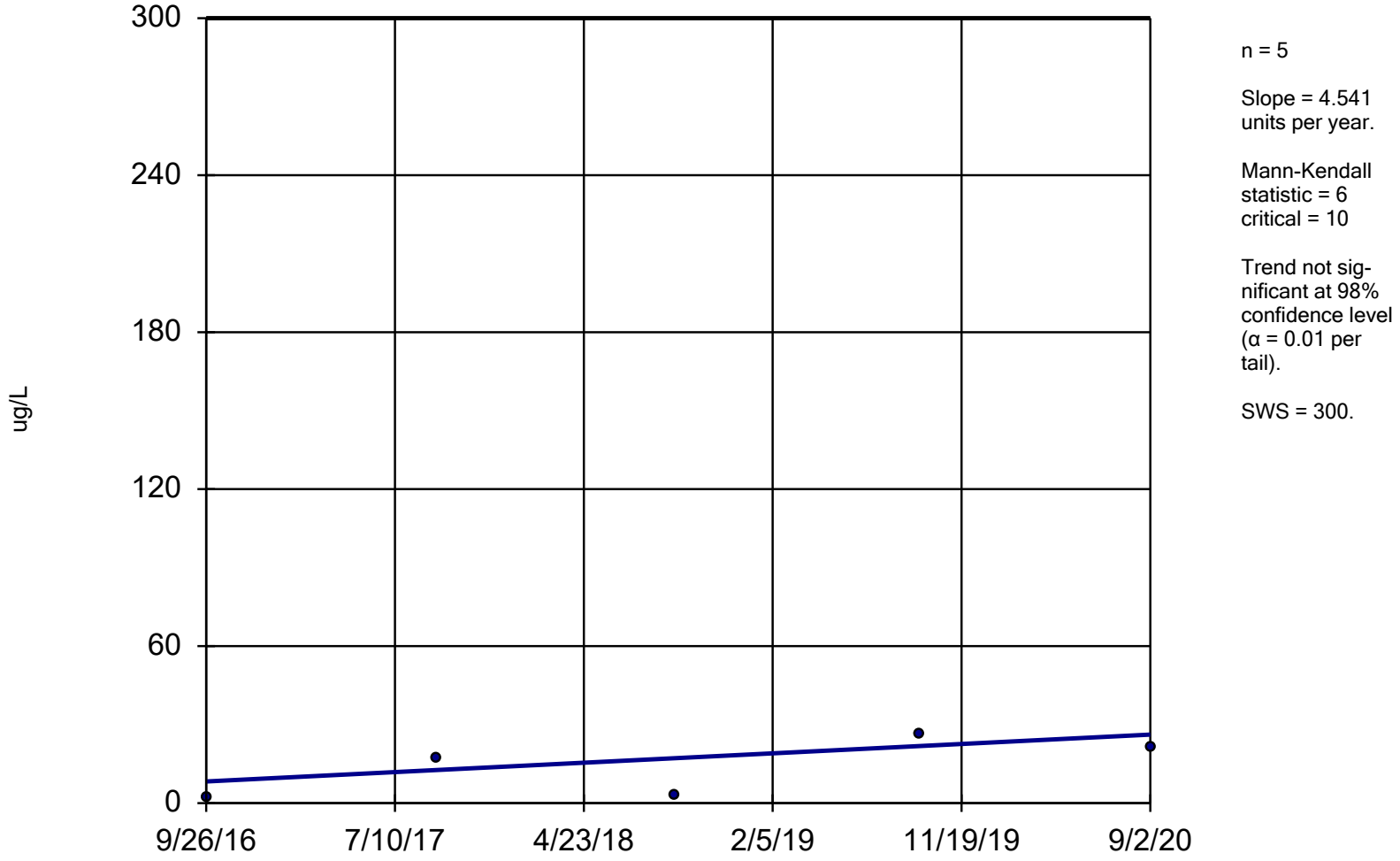
Constituent: Manganese (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-21
9/28/2016	90.3
9/14/2017	36.1
9/11/2018	53.6
9/17/2019	73
9/2/2020	16
9/29/2021	75
9/22/2022	130
9/21/2023	160

Manganese

MW-22



n = 5

Slope = 4.541 units per year.

Mann-Kendall statistic = 6
critical = 10

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

SWS = 300.

Sen's Slope Estimator Analysis Run 11/1/2023 11:36 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

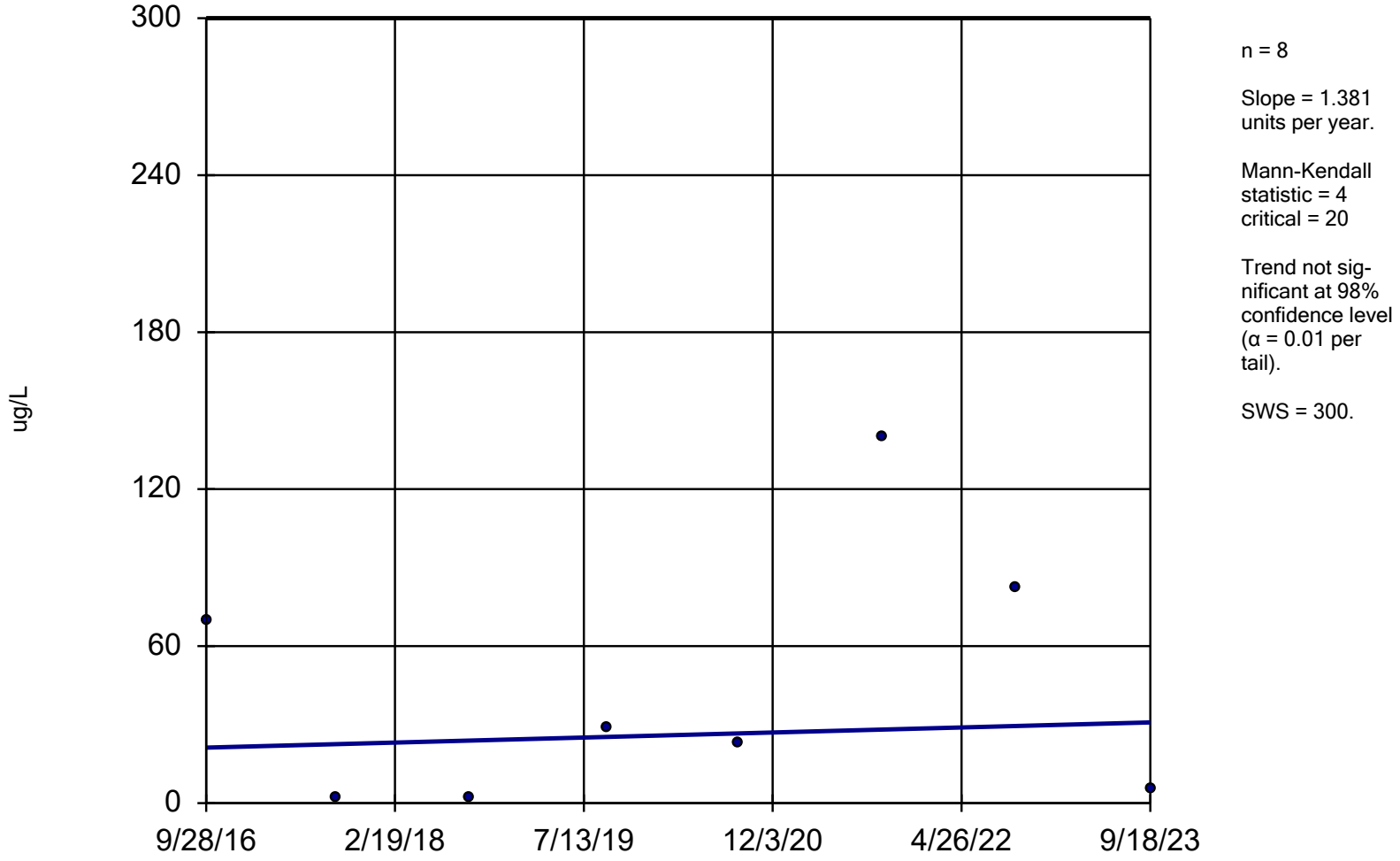
Constituent: Manganese (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-22
9/26/2016	2.5
9/13/2017	17.2
9/11/2018	2.9
9/16/2019	26
9/2/2020	21

Manganese

MW-23



n = 8

Slope = 1.381 units per year.

Mann-Kendall statistic = 4
critical = 20

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

SWS = 300.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:36 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

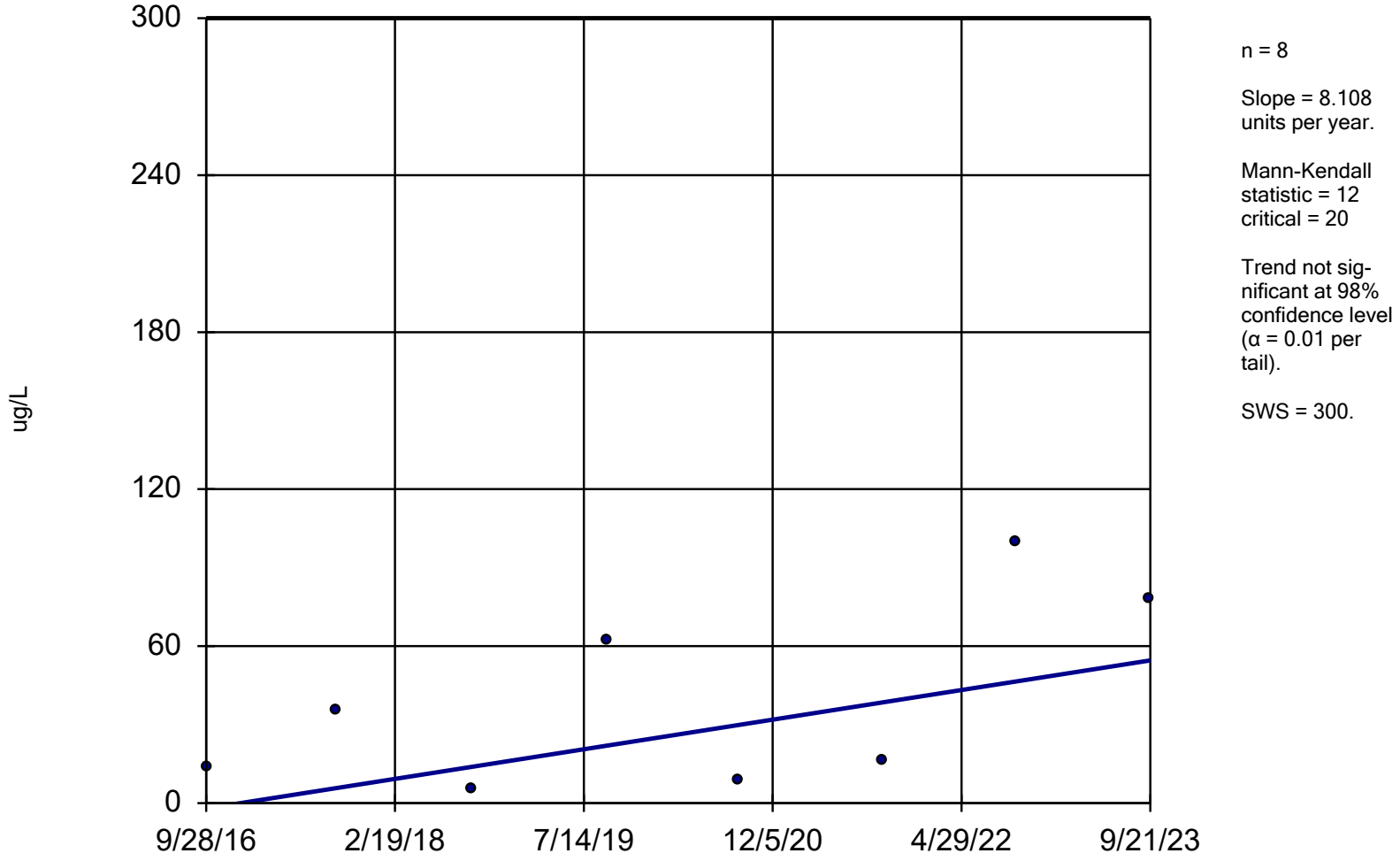
Constituent: Manganese (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-23
9/28/2016	70
9/13/2017	2.2
9/11/2018	2
9/16/2019	29
9/1/2020	23
9/27/2021	140
9/21/2022	82
9/18/2023	5.8 (J)

Manganese

MW-3



n = 8

Slope = 8.108 units per year.

Mann-Kendall statistic = 12
critical = 20

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

SWS = 300.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:36 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

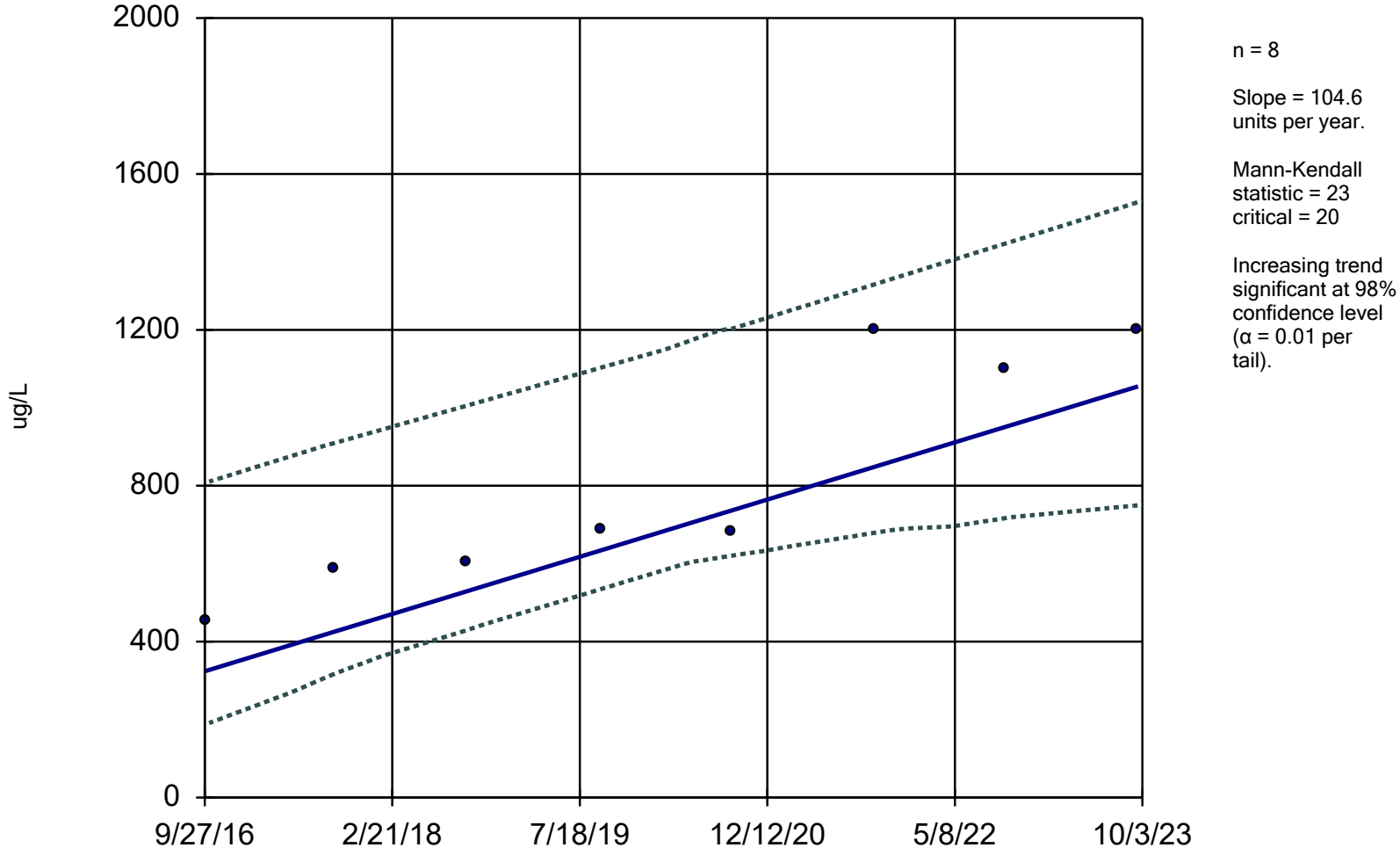
Constituent: Manganese (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-3
9/28/2016	13.7
9/14/2017	35.8
9/13/2018	5.2
9/17/2019	62
9/2/2020	8.6 (J)
9/29/2021	16
9/21/2022	100
9/21/2023	78

Manganese

MW-4



n = 8

Slope = 104.6 units per year.

Mann-Kendall statistic = 23
critical = 20

Increasing trend significant at 98% confidence level (α = 0.01 per tail).

Sen's Slope and 95% Confidence Band Analysis Run 11/7/2023 9:37 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

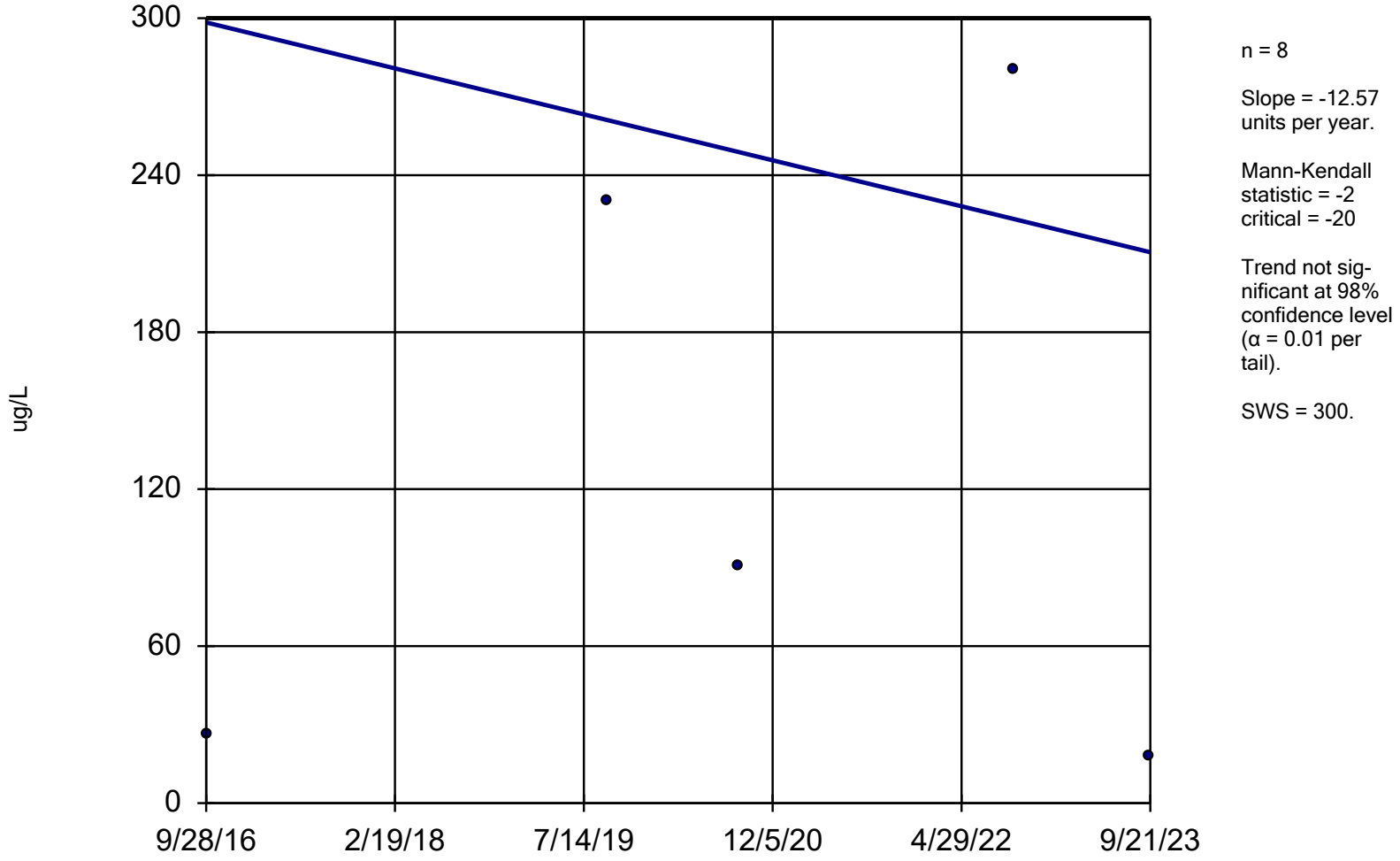
Constituent: Manganese (ug/L) Analysis Run 11/7/2023 9:42 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-4	LCL	UCL
9/27/2016	454	187.1	807.1
9/13/2017	585	316.5	908.7
9/12/2018	602	429.1	1005
9/17/2019	690	535.4	1104
9/2/2020	680	619.9	1201
9/29/2021	1200	678.8	1316
9/22/2022	1100	716.6	1421
9/21/2023	1200	749.7	1528

Manganese

MW-5



n = 8

Slope = -12.57 units per year.

Mann-Kendall statistic = -2
critical = -20

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

SWS = 300.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:36 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Manganese (ug/L) Analysis Run 11/1/2023 11:38 AM

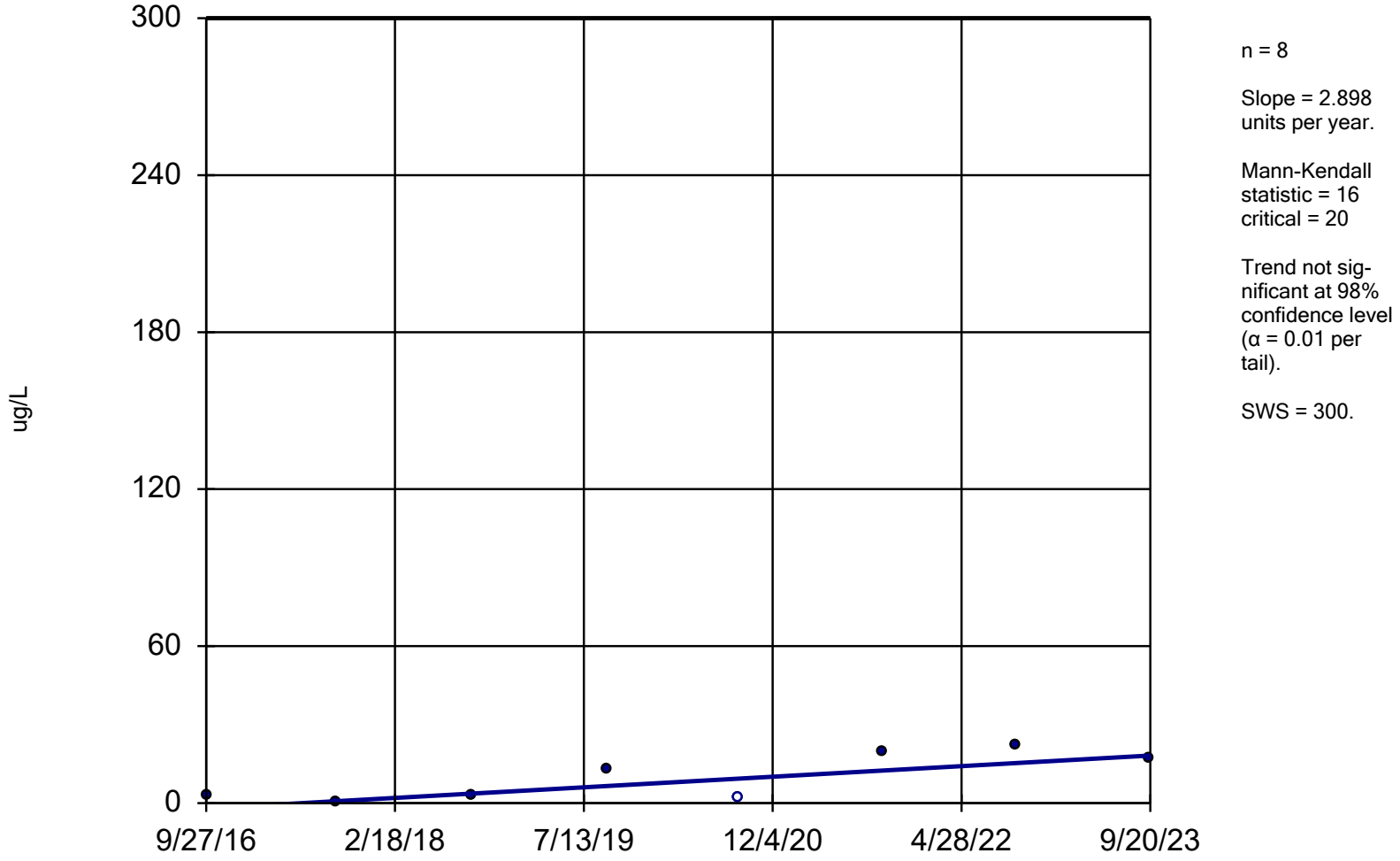
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-5
9/28/2016	26.6
9/14/2017	422
9/12/2018	466
9/17/2019	230
9/2/2020	91
9/29/2021	660
9/20/2022	280
9/21/2023	18

Hollow symbols indicate censored values.

Manganese

MW-7



n = 8

Slope = 2.898 units per year.

Mann-Kendall statistic = 16
critical = 20

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

SWS = 300.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:36 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Manganese (ug/L) Analysis Run 11/1/2023 11:38 AM

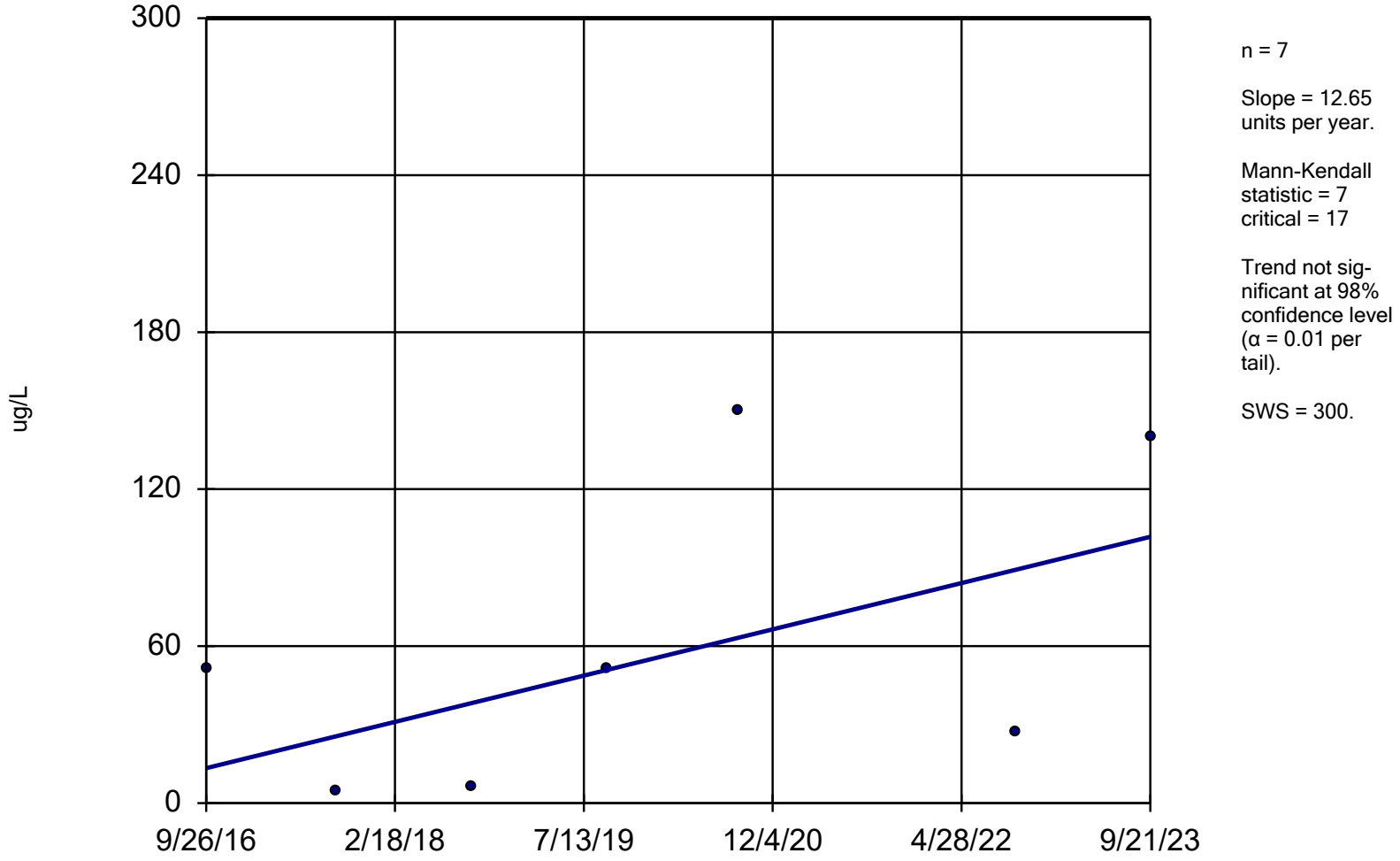
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-7
9/27/2016	2.6
9/13/2017	0.78 (J)
9/13/2018	2.9
9/17/2019	13
9/1/2020	<4
9/28/2021	20
9/20/2022	22
9/20/2023	17

ND substitution: RL or RL/2 if <15% NDs.

Manganese

MW-8 (bg)



n = 7

Slope = 12.65 units per year.

Mann-Kendall statistic = 7
critical = 17

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

SWS = 300.

Sen's Slope Estimator Analysis Run 11/1/2023 11:36 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

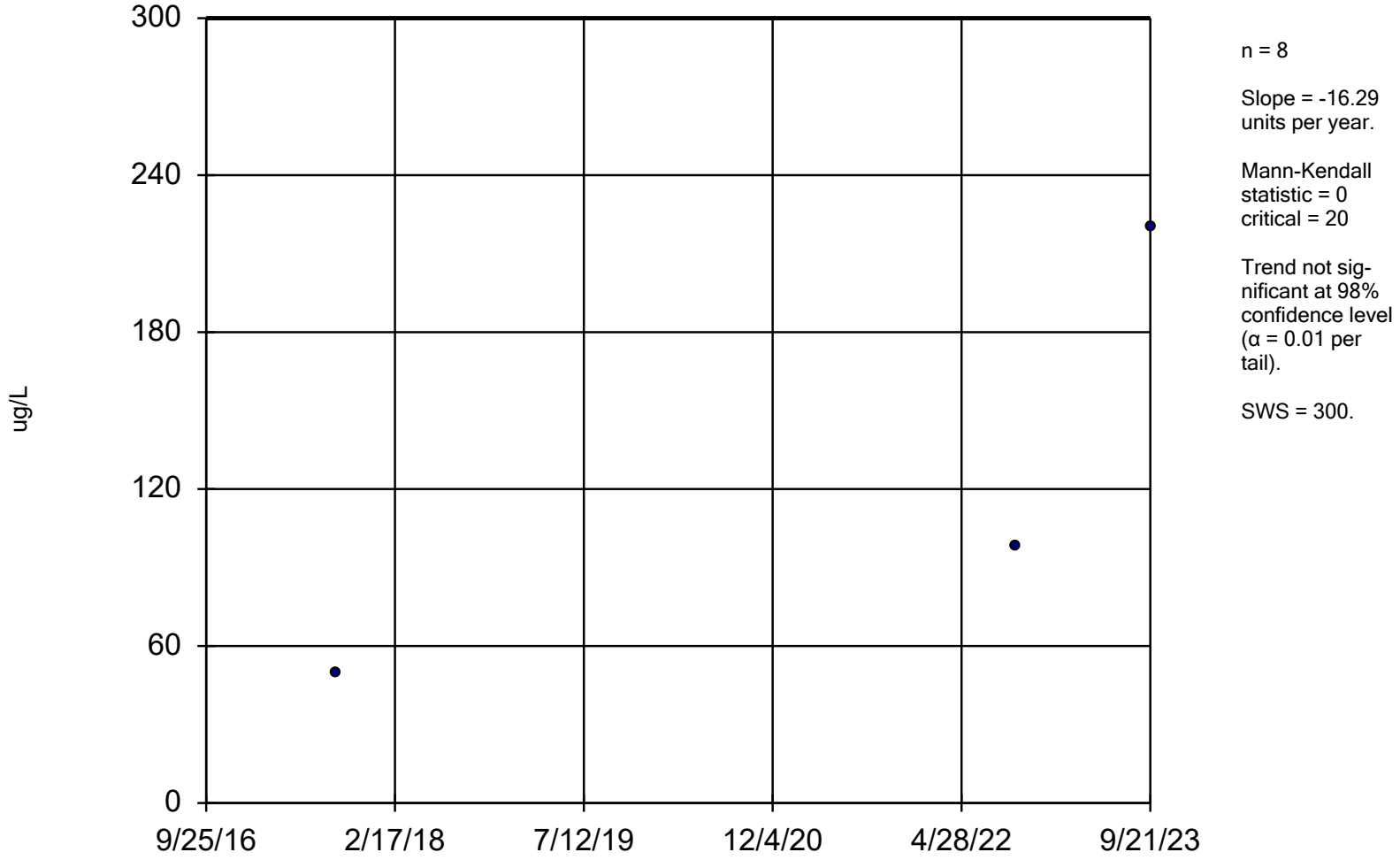
Constituent: Manganese (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-8 (bg)
9/26/2016	51.6
9/13/2017	4.3
9/12/2018	6.6
9/17/2019	51
9/1/2020	150
9/20/2022	27
9/21/2023	140

Manganese

MW-9 (bg)



n = 8

Slope = -16.29 units per year.

Mann-Kendall statistic = 0
critical = 20

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

SWS = 300.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:36 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Manganese (ug/L) Analysis Run 11/1/2023 11:38 AM

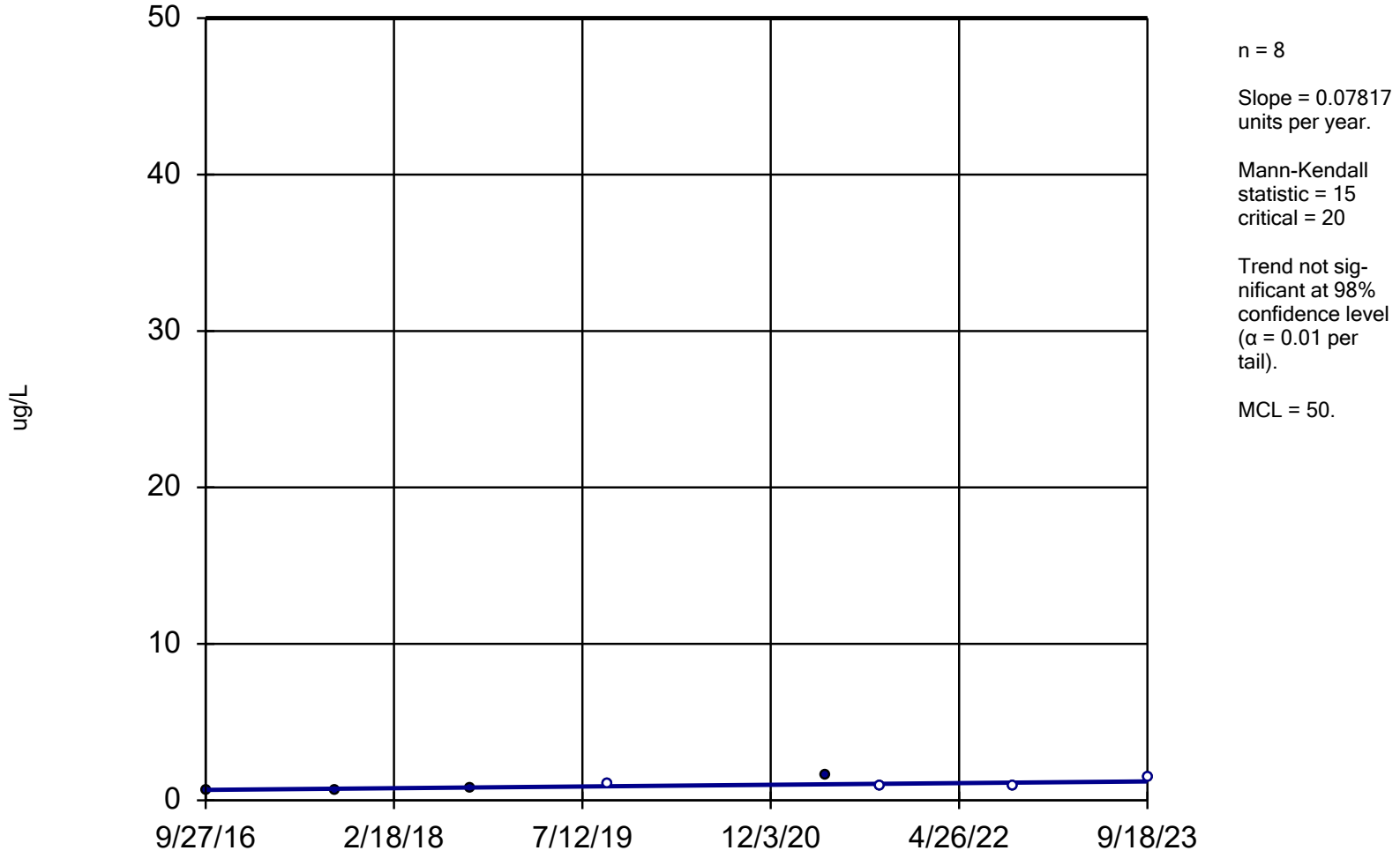
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-9 (bg)
9/25/2016	515
9/14/2017	49.8
9/12/2018	722
9/17/2019	2100
9/1/2020	2000
9/28/2021	1100
9/20/2022	98
9/21/2023	220

Hollow symbols indicate censored values.

Selenium

MW-10 (bg)



n = 8

Slope = 0.07817 units per year.

Mann-Kendall statistic = 15
critical = 20

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

MCL = 50.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:36 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Selenium (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

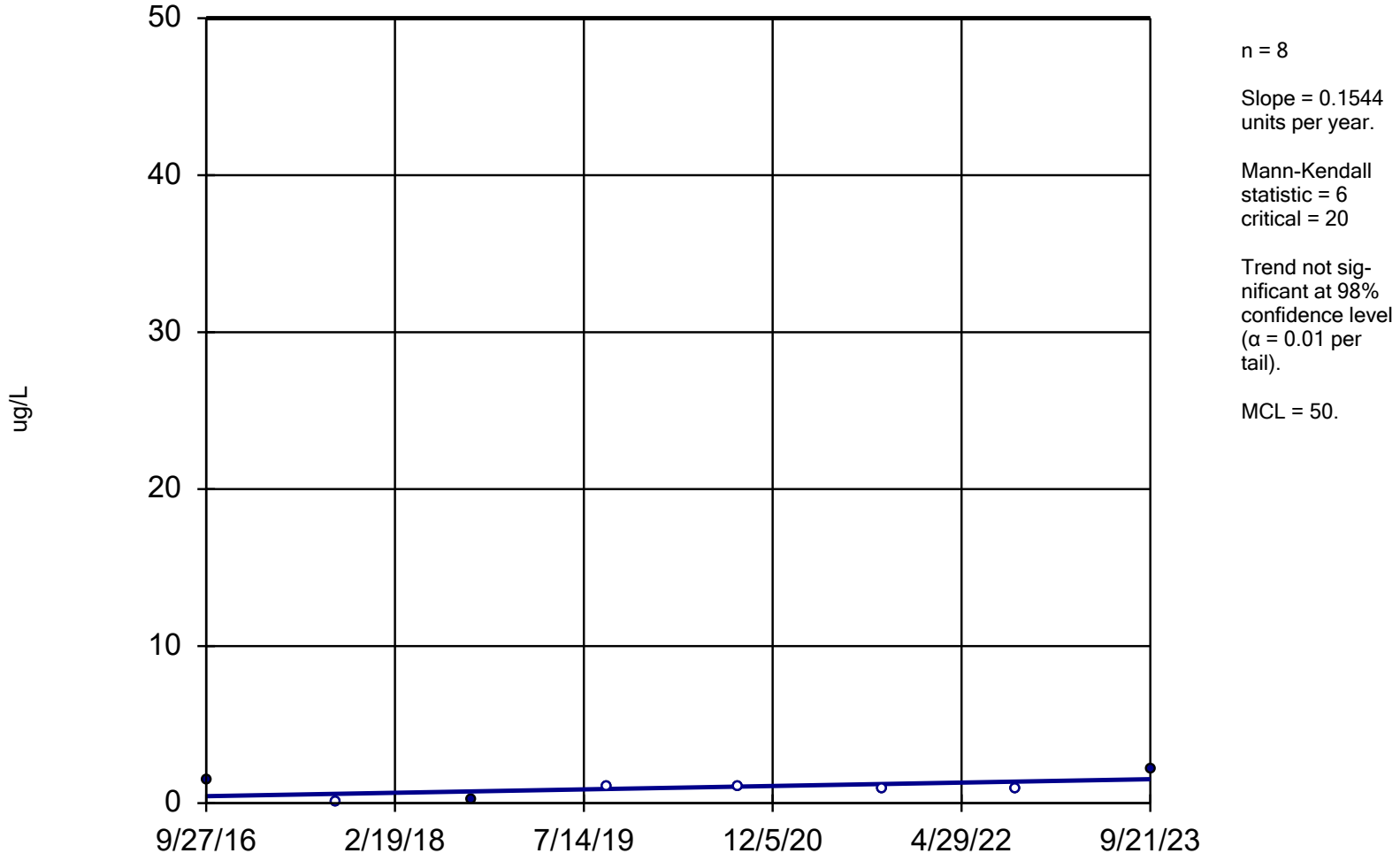
	MW-10 (bg)
9/27/2016	0.68 (J)
9/15/2017	0.66 (J)
9/12/2018	0.71 (J)
9/17/2019	<1
4/29/2021	1.6 (J)
9/28/2021	<0.96
9/20/2022	<0.96
9/18/2023	<1.4 (U)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Selenium

MW-11AR



n = 8

Slope = 0.1544 units per year.

Mann-Kendall statistic = 6
critical = 20

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

MCL = 50.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:36 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Selenium (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

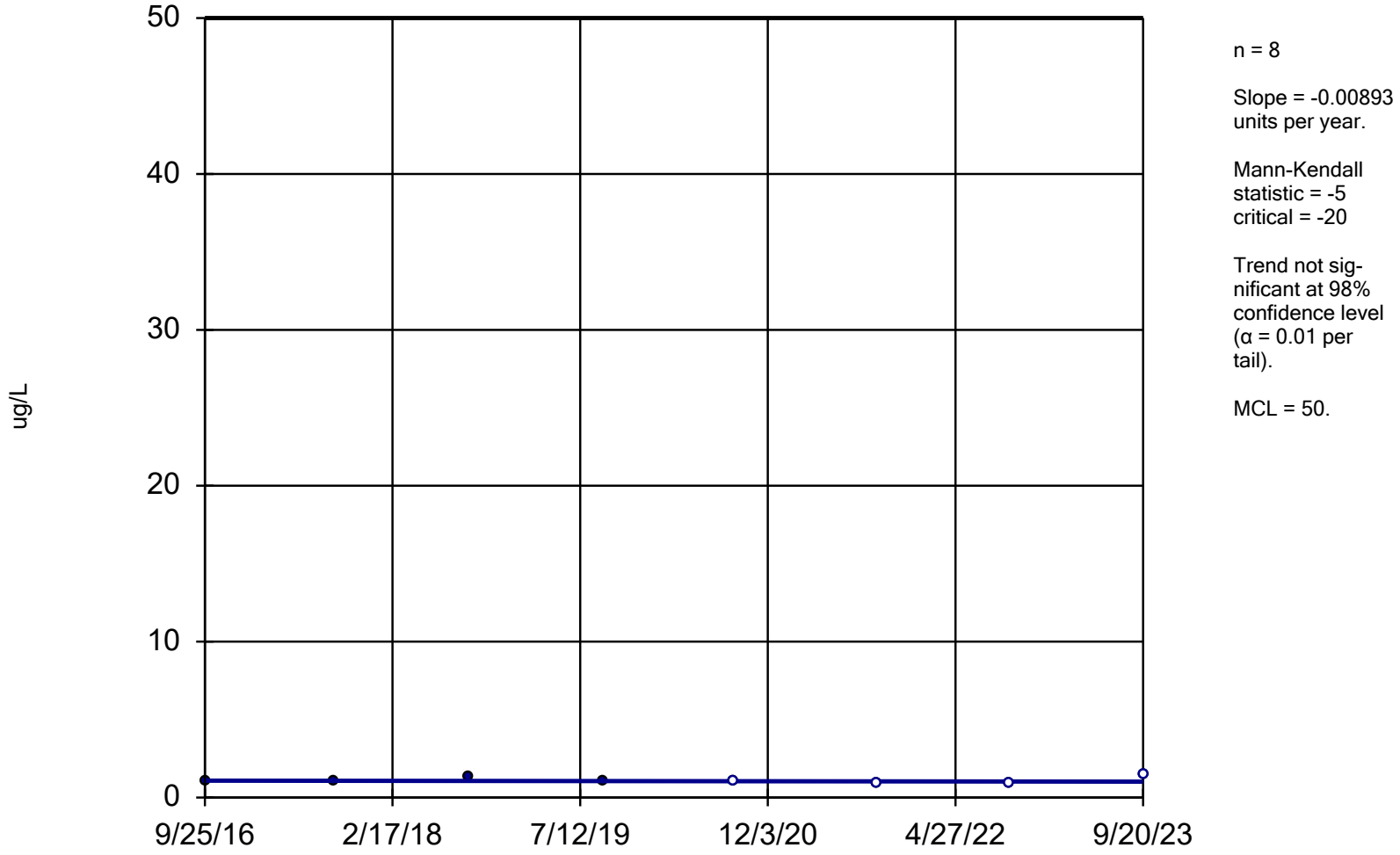
	MW-11AR
9/27/2016	1.5
9/14/2017	<0.086
9/12/2018	0.22 (J)
9/17/2019	<1
9/1/2020	<1
9/28/2021	<0.96
9/21/2022	<0.96
9/21/2023	2.2 (J)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Selenium

MW-13 (bg)



n = 8

Slope = -0.00893 units per year.

Mann-Kendall statistic = -5
critical = -20

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

MCL = 50.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:36 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Selenium (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

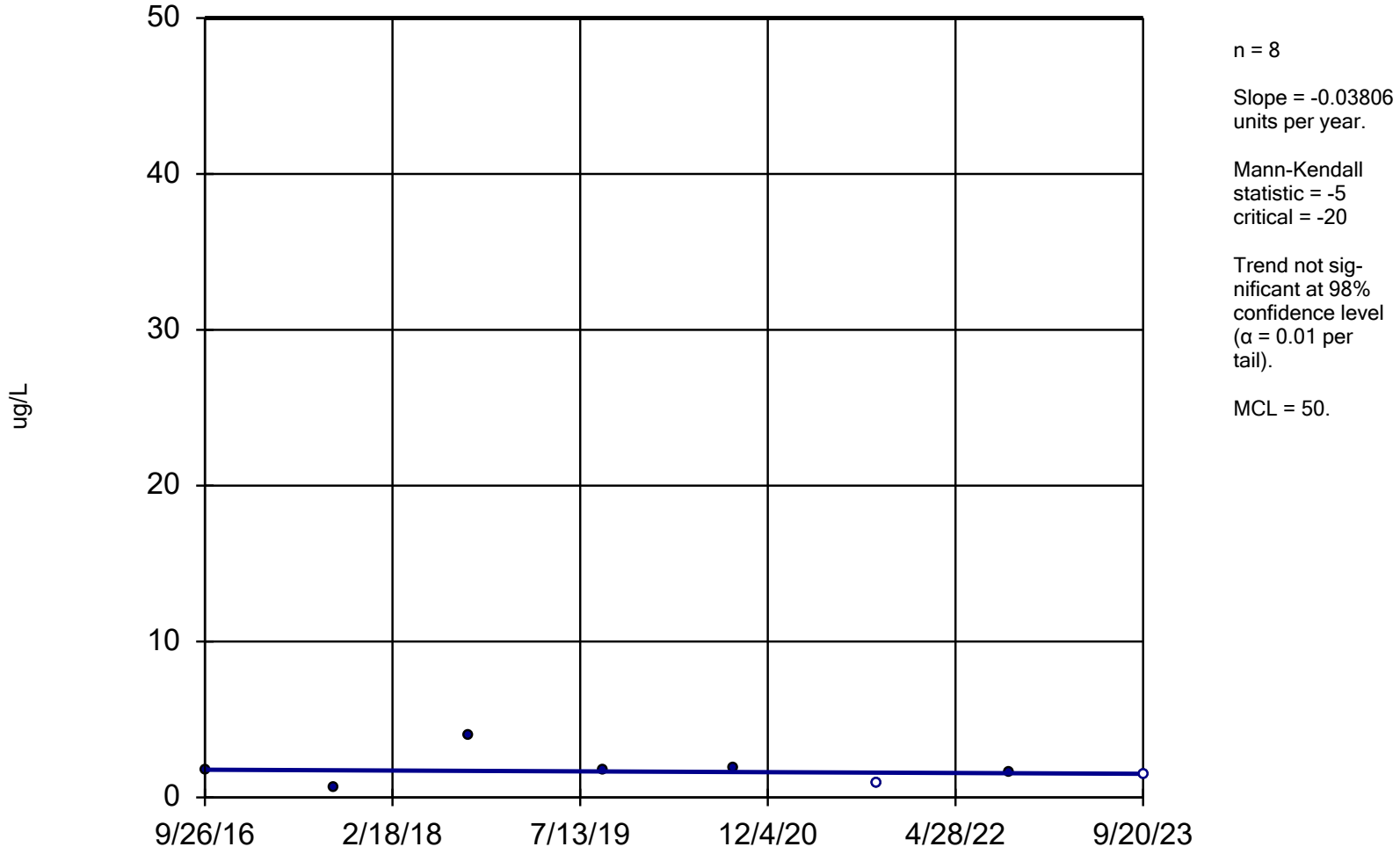
	MW-13 (bg)
9/25/2016	1.1
9/13/2017	1
9/11/2018	1.3
9/16/2019	1.1 (J)
9/2/2020	<1
9/27/2021	<0.96
9/21/2022	<0.96
9/20/2023	<1.4 (U)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Selenium

MW-14 (bg)



n = 8

Slope = -0.03806 units per year.

Mann-Kendall statistic = -5
critical = -20

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

MCL = 50.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:36 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Selenium (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

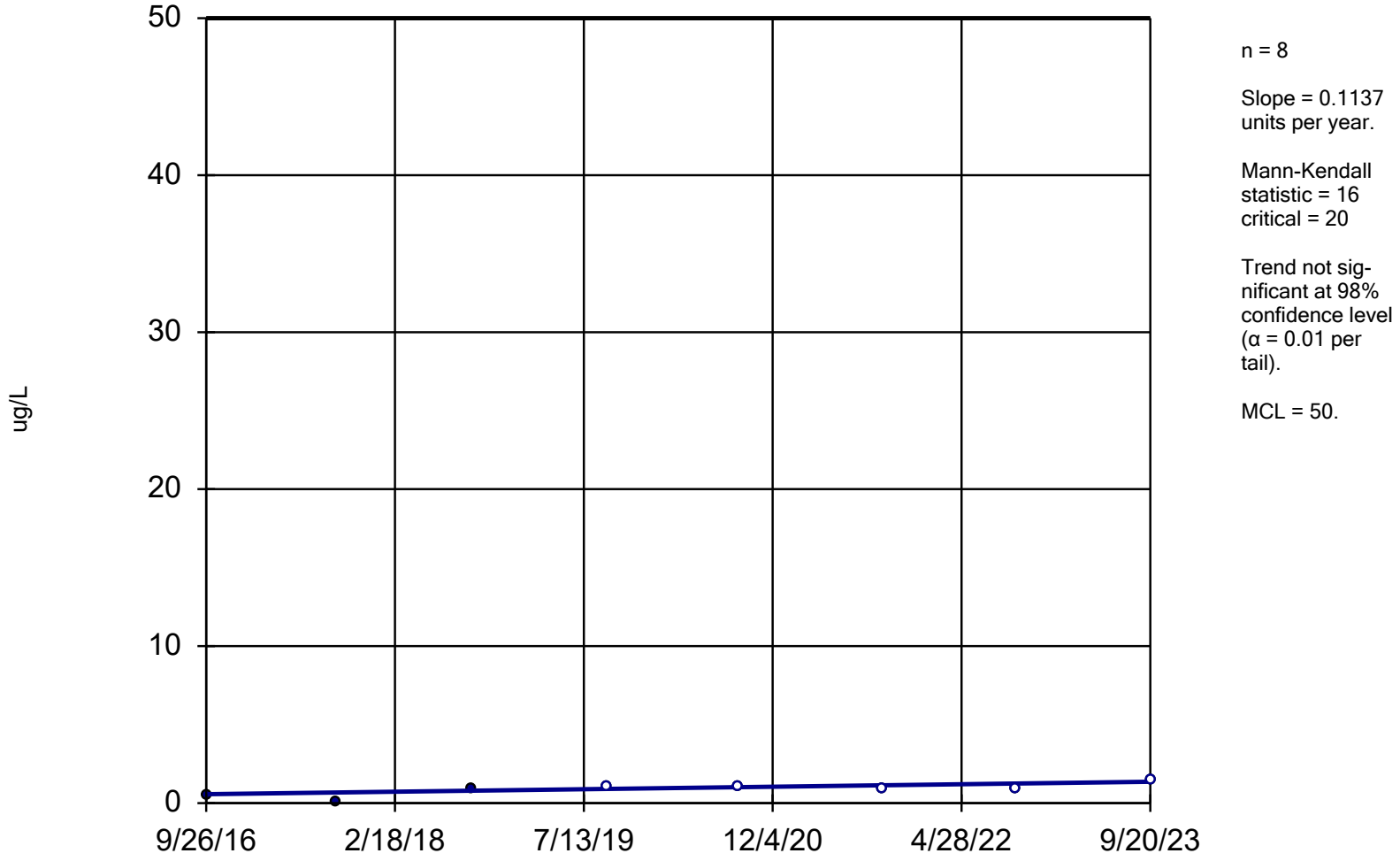
	MW-14 (bg)
9/26/2016	1.7
9/14/2017	0.63 (J)
9/12/2018	4
9/16/2019	1.7 (J)
9/1/2020	1.9 (J)
9/27/2021	<0.96
9/20/2022	1.6 (J)
9/20/2023	<1.4 (U)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Selenium

MW-18



Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:36 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Selenium (ug/L) Analysis Run 11/1/2023 11:38 AM

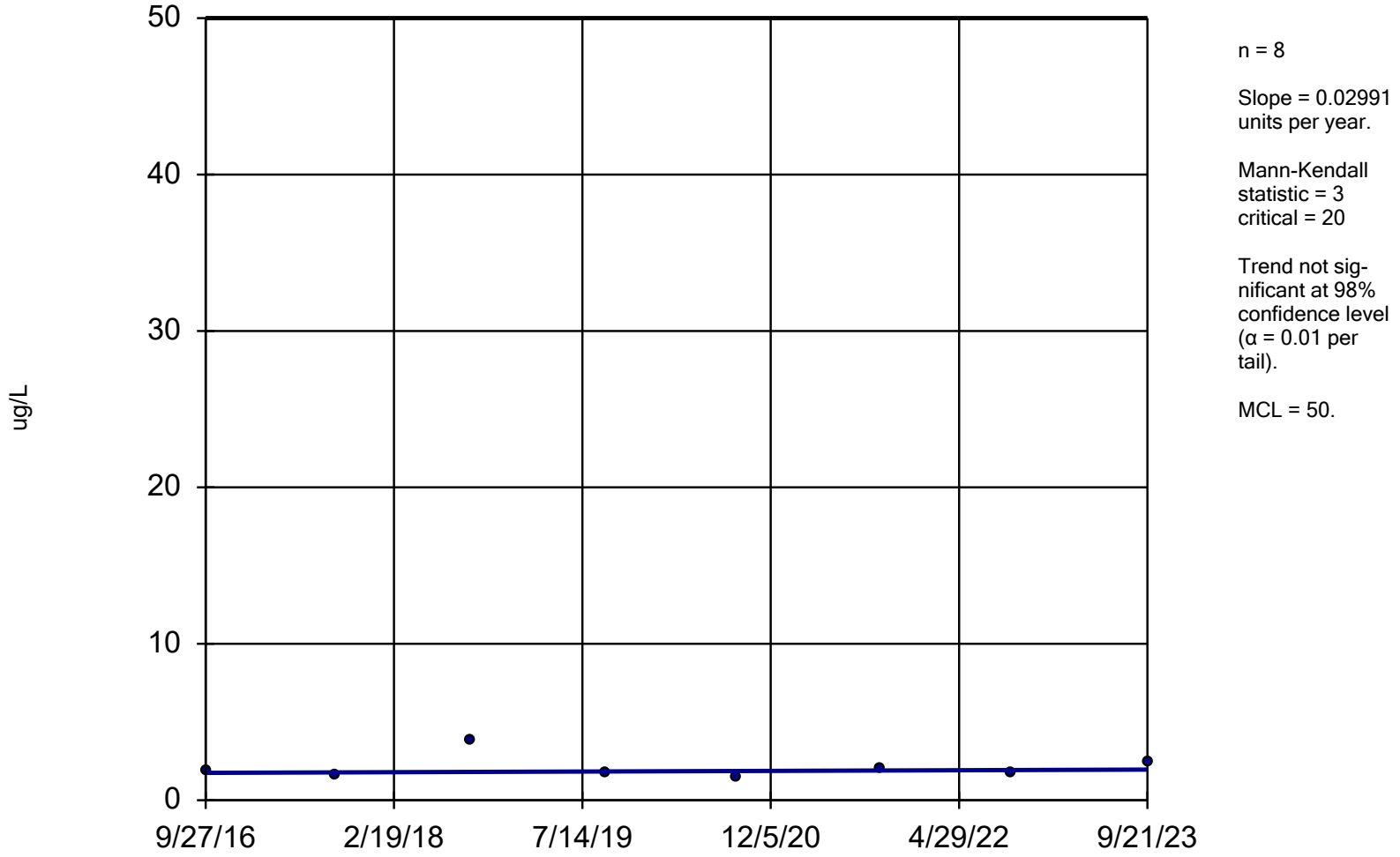
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-18
9/26/2016	0.52 (J)
9/14/2017	0.094 (J)
9/12/2018	0.87 (J)
9/17/2019	<1
9/1/2020	<1
9/28/2021	<0.96
9/21/2022	<0.96
9/20/2023	<1.4 (U)

ND substitution: RL or RL/2 if <15% NDs.

Selenium

MW-19



n = 8

Slope = 0.02991 units per year.

Mann-Kendall statistic = 3
critical = 20

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

MCL = 50.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:36 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

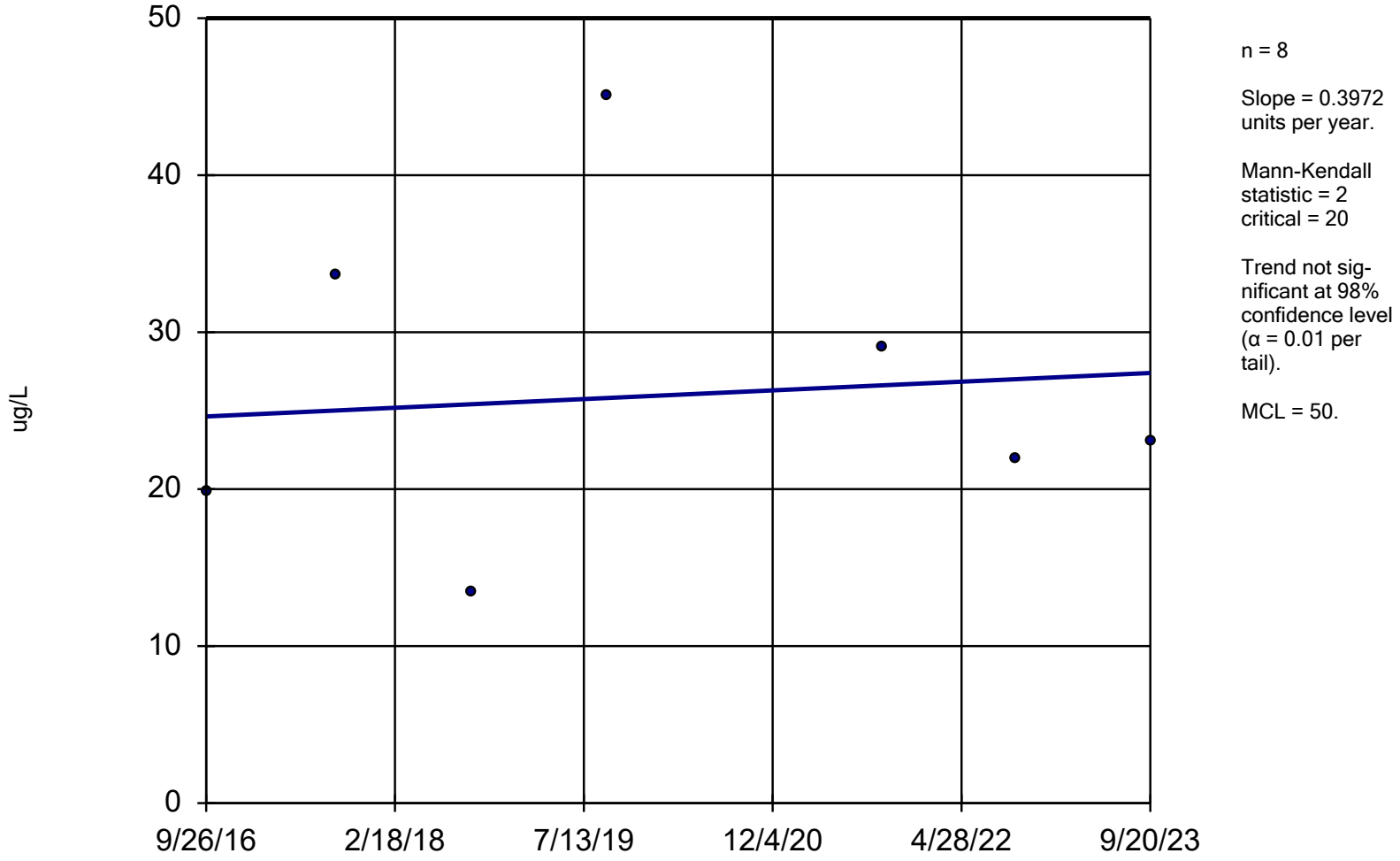
Constituent: Selenium (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-19
9/27/2016	1.9
9/14/2017	1.6
9/12/2018	3.8
9/17/2019	1.8 (J)
9/2/2020	1.4 (J)
9/29/2021	2 (J)
9/20/2022	1.8 (J)
9/21/2023	2.4 (J)

Selenium

MW-20



Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:36 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

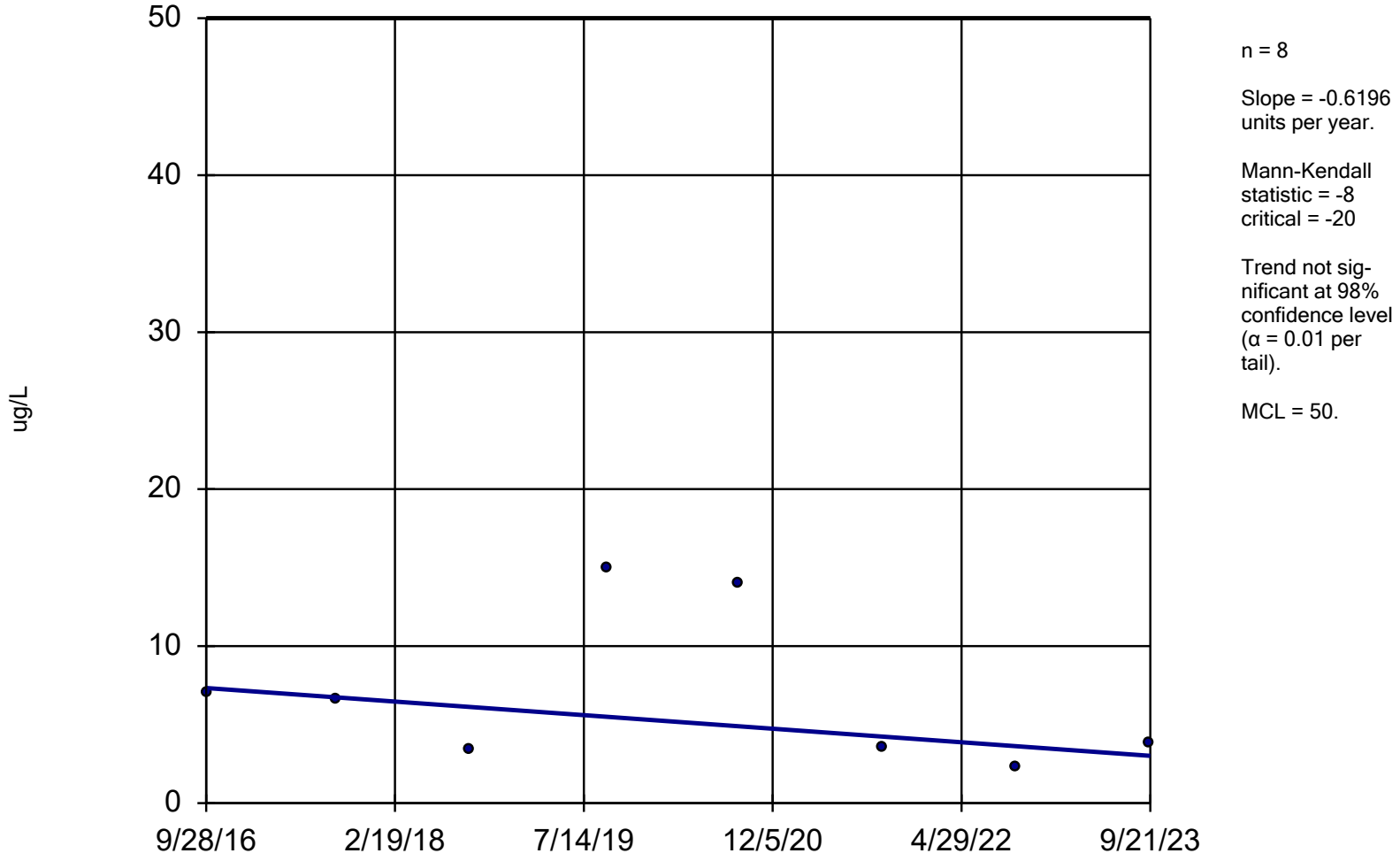
Constituent: Selenium (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-20
9/26/2016	19.9
9/13/2017	33.7
9/11/2018	13.5
9/16/2019	45
9/2/2020	52
9/27/2021	29
9/21/2022	22
9/20/2023	23

Selenium

MW-21



n = 8

Slope = -0.6196 units per year.

Mann-Kendall statistic = -8
critical = -20

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

MCL = 50.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:36 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

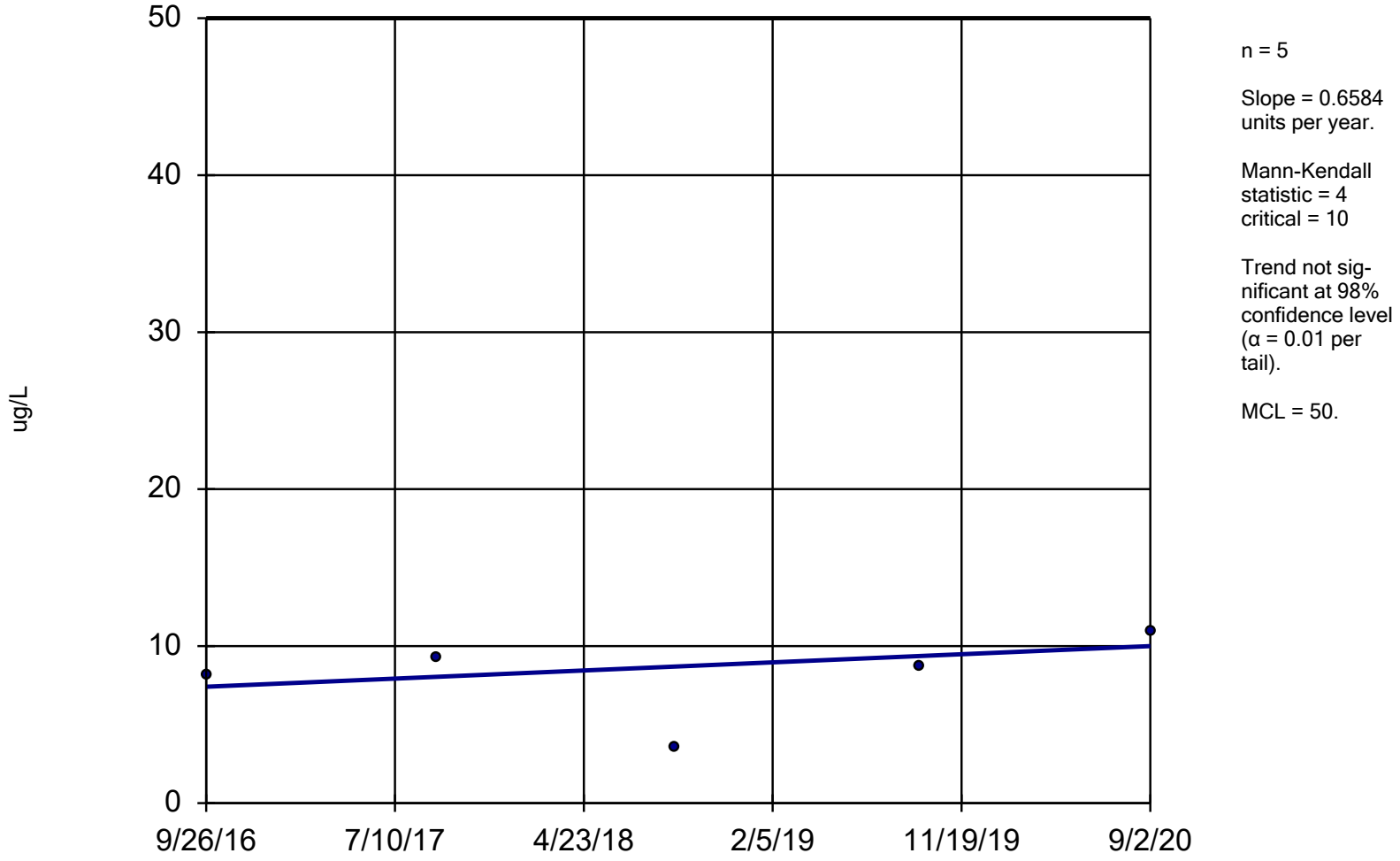
Constituent: Selenium (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-21
9/28/2016	7.1
9/14/2017	6.6
9/11/2018	3.4
9/17/2019	15
9/2/2020	14
9/29/2021	3.5 (J)
9/22/2022	2.3 (J)
9/21/2023	3.8 (J)

Selenium

MW-22



n = 5

Slope = 0.6584 units per year.

Mann-Kendall statistic = 4
critical = 10

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

MCL = 50.

Sen's Slope Estimator Analysis Run 11/1/2023 11:36 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Selenium (ug/L) Analysis Run 11/1/2023 11:38 AM

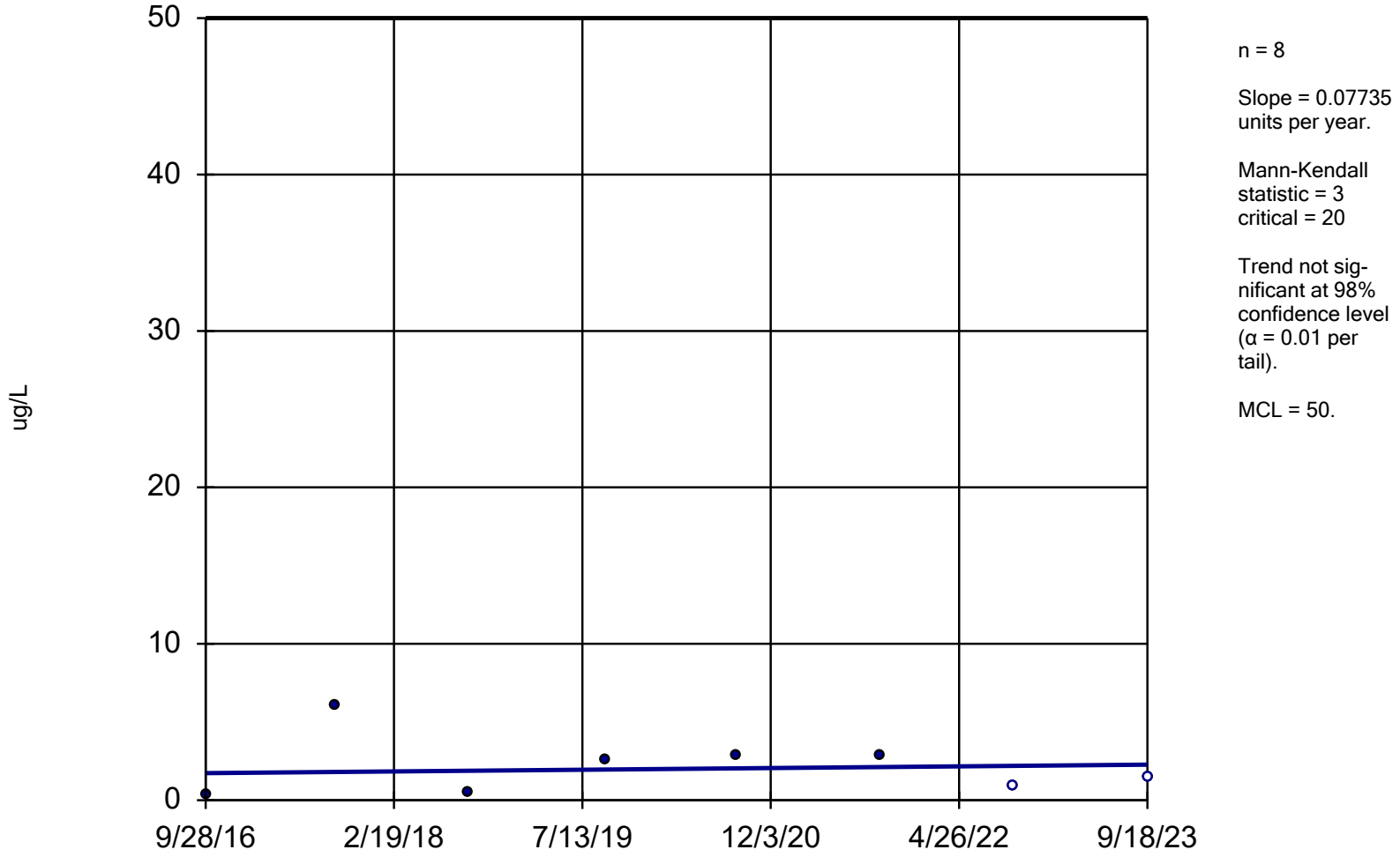
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-22
9/26/2016	8.2
9/13/2017	9.2
9/11/2018	3.6
9/16/2019	8.7
9/2/2020	11

Hollow symbols indicate censored values.

Selenium

MW-23



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Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Selenium (ug/L) Analysis Run 11/1/2023 11:38 AM

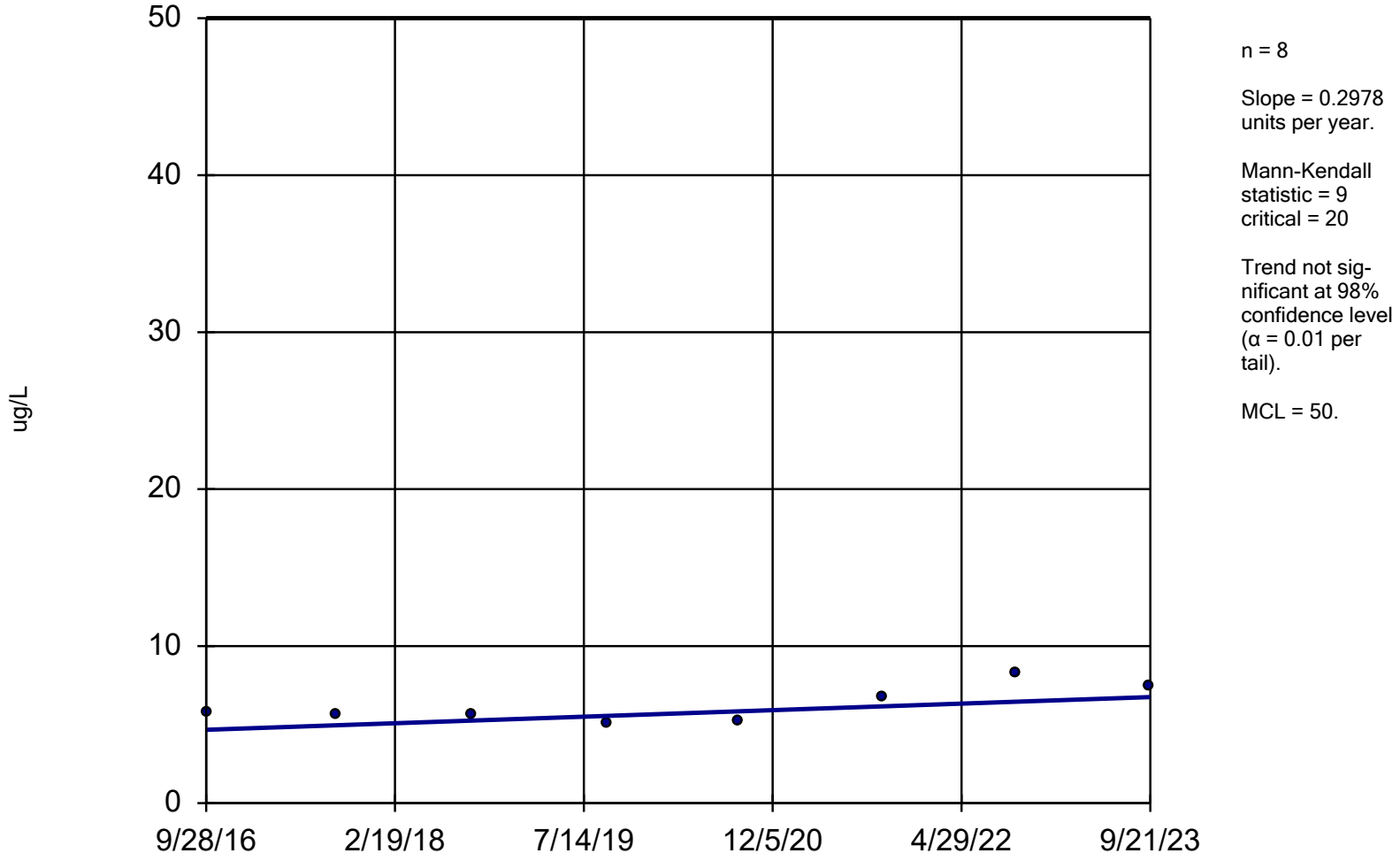
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-23
9/28/2016	0.36 (J)
9/13/2017	6.1
9/11/2018	0.47 (J)
9/16/2019	2.6 (J)
9/1/2020	2.8 (J)
9/27/2021	2.8 (J)
9/21/2022	<0.96
9/18/2023	<1.4 (U)

ND substitution: RL or RL/2 if <15% NDs.

Selenium

MW-3



n = 8

Slope = 0.2978 units per year.

Mann-Kendall statistic = 9
critical = 20

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

MCL = 50.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:36 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Selenium (ug/L) Analysis Run 11/1/2023 11:38 AM

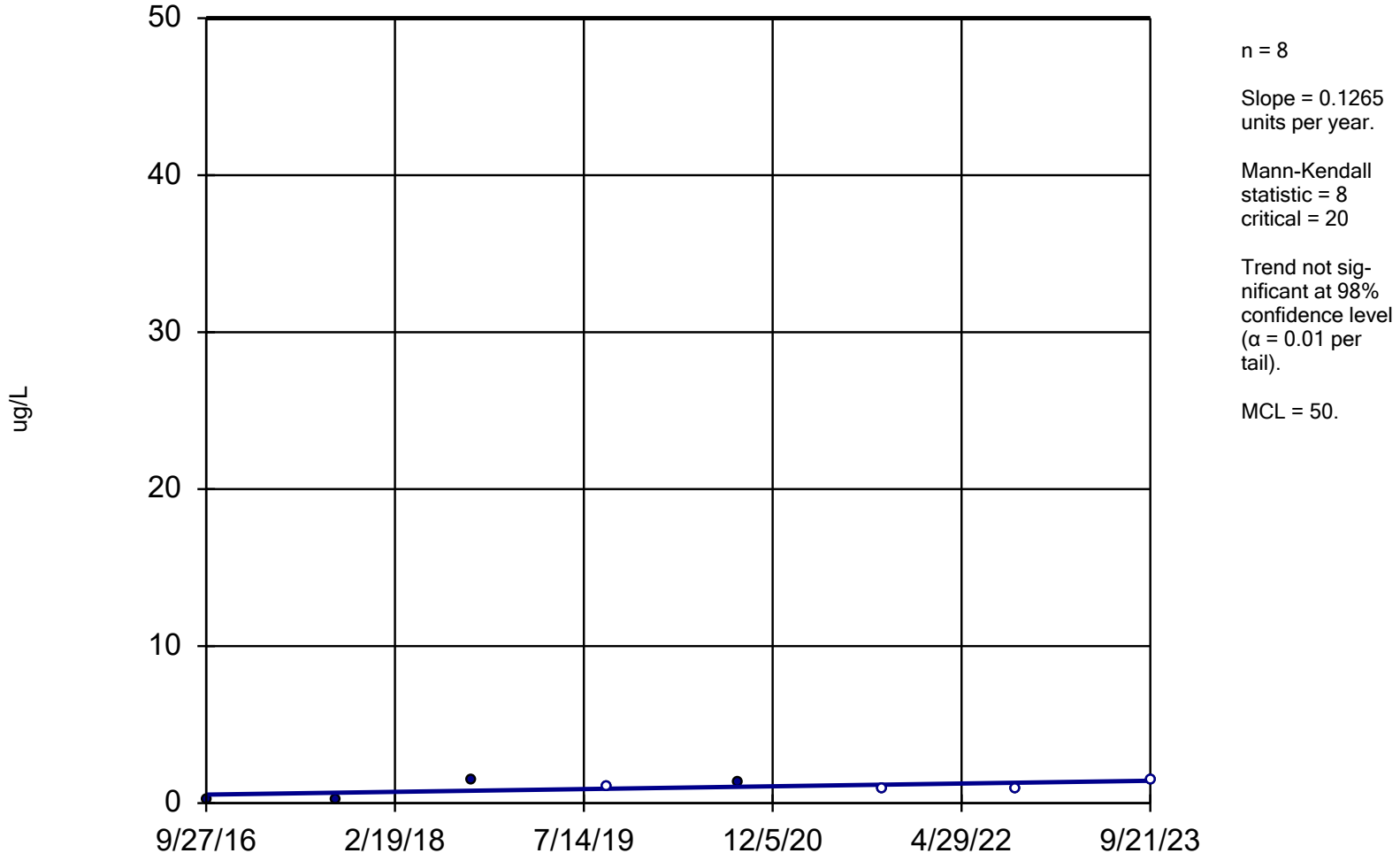
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-3
9/28/2016	5.8
9/14/2017	5.6
9/13/2018	5.6
9/17/2019	5.1
9/2/2020	5.2
9/29/2021	6.8
9/21/2022	8.3
9/21/2023	7.4

Hollow symbols indicate censored values.

Selenium

MW-4



Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:36 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Selenium (ug/L) Analysis Run 11/1/2023 11:38 AM

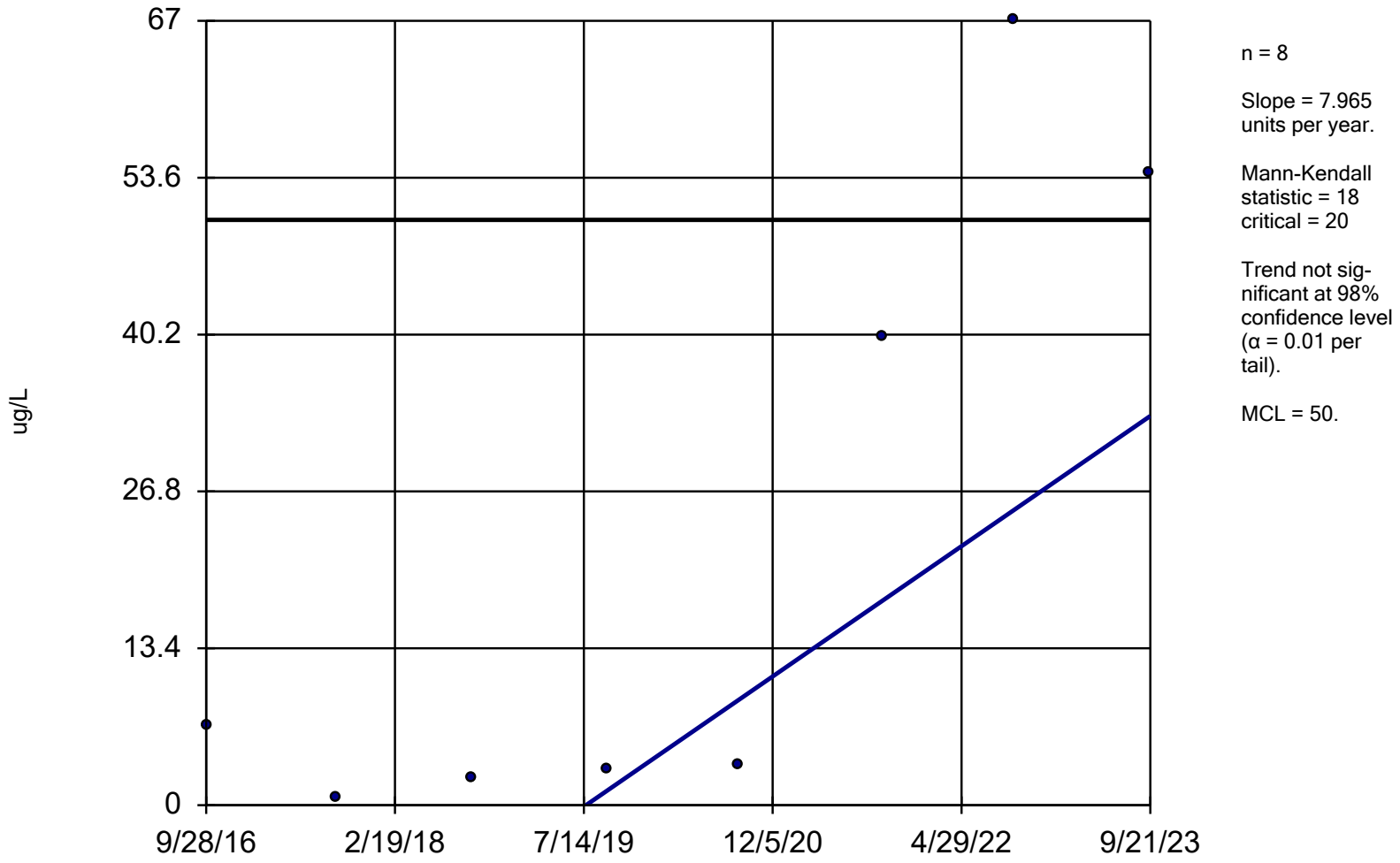
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-4
9/27/2016	0.27 (J)
9/13/2017	0.17 (J)
9/12/2018	1.4
9/17/2019	<1
9/2/2020	1.3 (J)
9/29/2021	<0.96
9/22/2022	<0.96
9/21/2023	<1.4 (U)

ND substitution: RL or RL/2 if <15% NDs.

Selenium

MW-5



Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:36 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

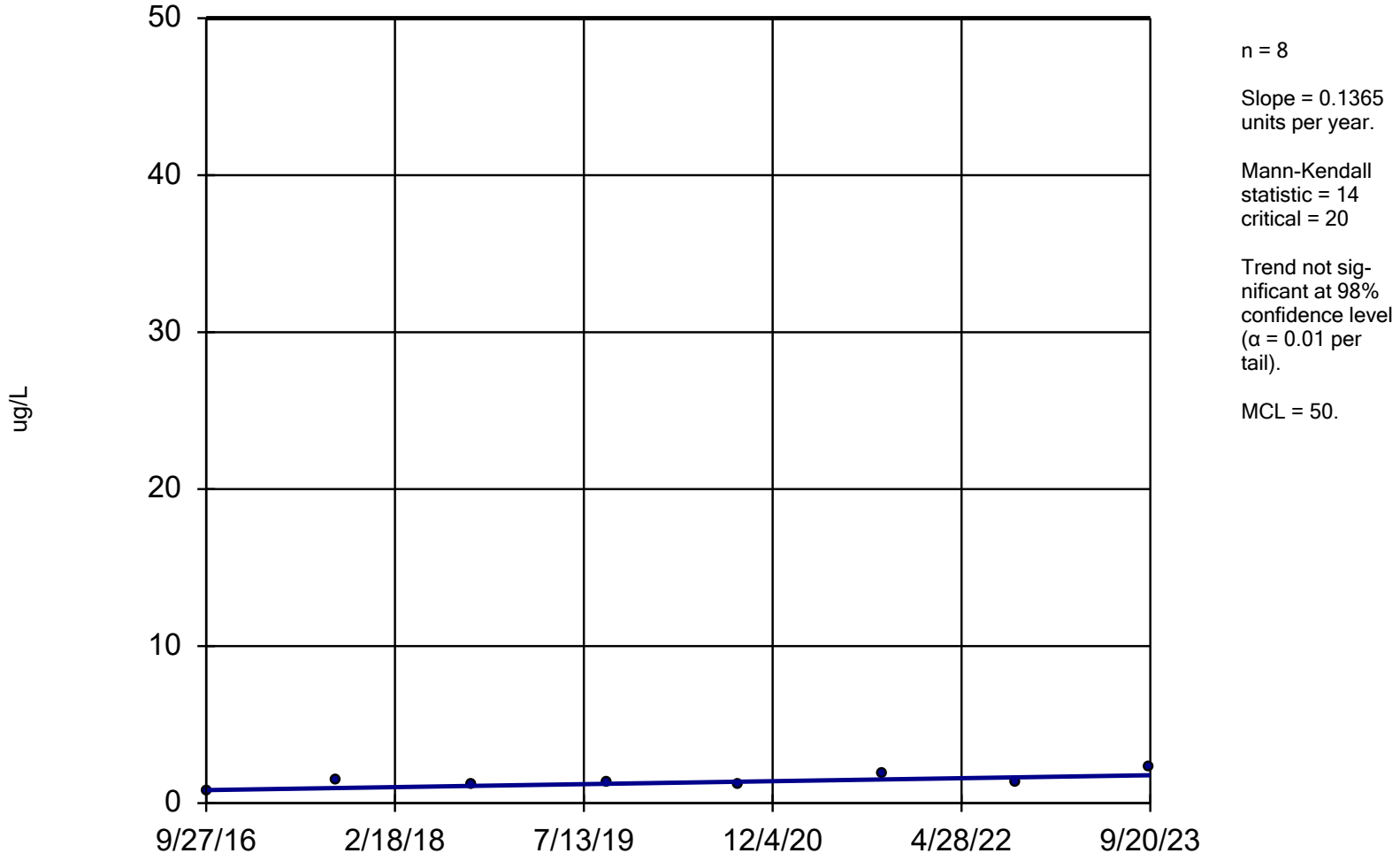
Constituent: Selenium (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-5
9/28/2016	6.8
9/14/2017	0.69 (J)
9/12/2018	2.3
9/17/2019	3 (J)
9/2/2020	3.4 (J)
9/29/2021	40
9/20/2022	67
9/21/2023	54

Selenium

MW-7



n = 8

Slope = 0.1365 units per year.

Mann-Kendall statistic = 14
critical = 20

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

MCL = 50.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:36 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Selenium (ug/L) Analysis Run 11/1/2023 11:38 AM

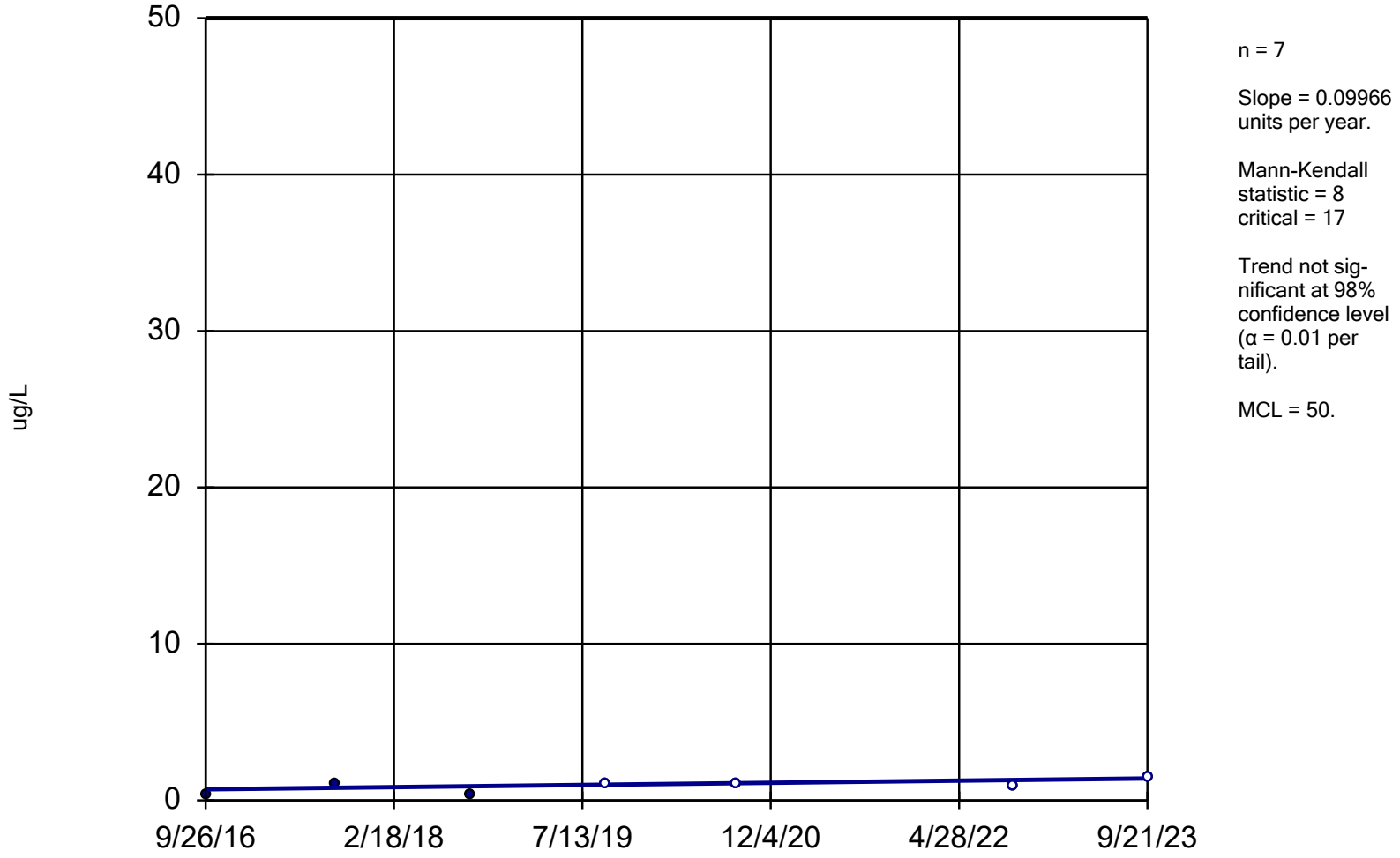
Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-7
9/27/2016	0.8 (J)
9/13/2017	1.4
9/13/2018	1.2
9/17/2019	1.3 (J)
9/1/2020	1.2 (J)
9/28/2021	1.9 (J)
9/20/2022	1.3 (J)
9/20/2023	2.3 (J)

Hollow symbols indicate censored values.

Selenium

MW-8 (bg)



n = 7

Slope = 0.09966 units per year.

Mann-Kendall statistic = 8
critical = 17

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

MCL = 50.

Sen's Slope Estimator Analysis Run 11/1/2023 11:36 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Selenium (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

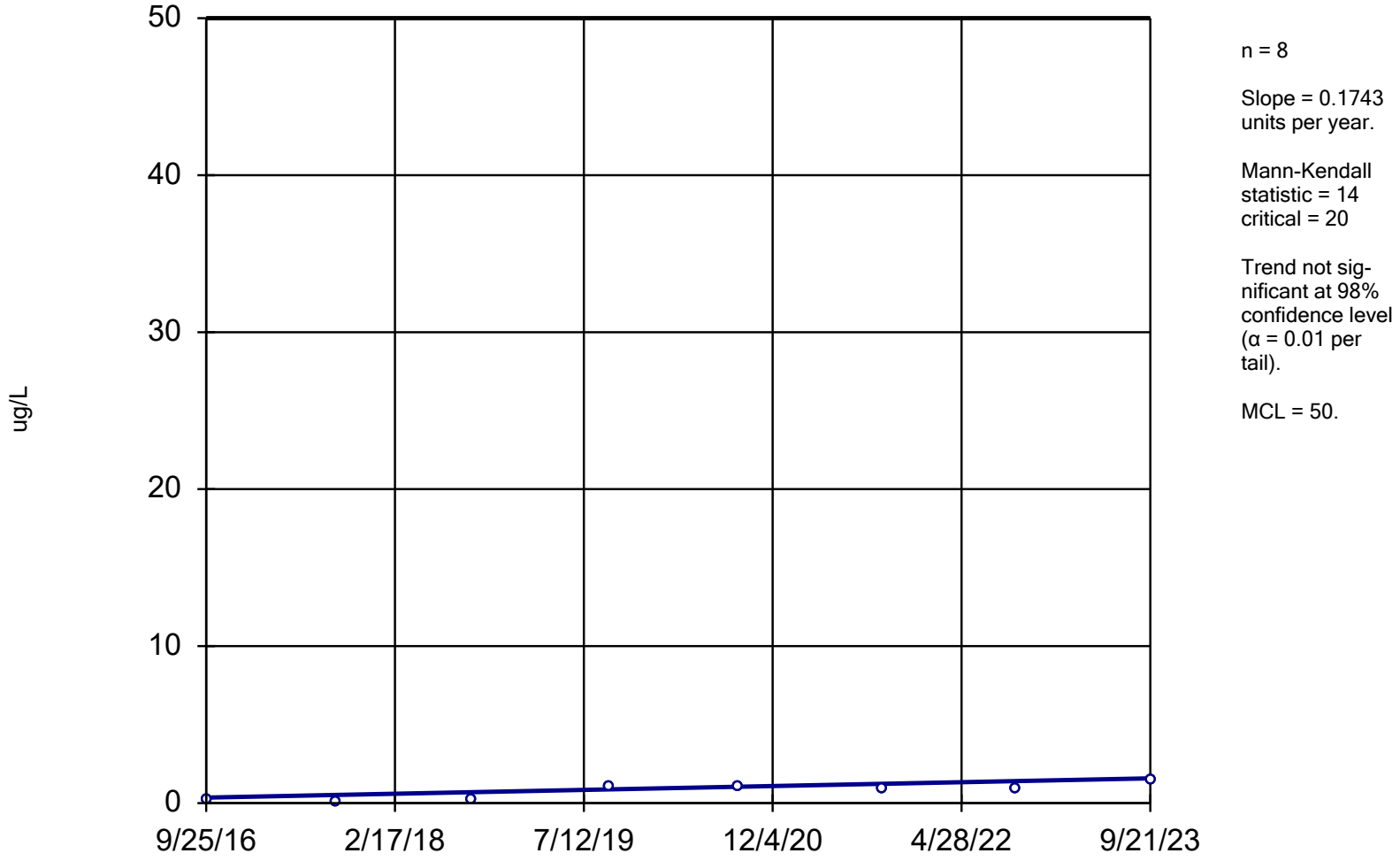
	MW-8 (bg)
9/26/2016	0.41 (J)
9/13/2017	1
9/12/2018	0.34 (J)
9/17/2019	<1
9/1/2020	<1
9/20/2022	<0.96
9/21/2023	<1.4 (U)

ND substitution: RL or RL/2 if <15% NDs.

Hollow symbols indicate censored values.

Selenium

MW-9 (bg)



n = 8

Slope = 0.1743 units per year.

Mann-Kendall statistic = 14
critical = 20

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

MCL = 50.

Sen's Slope and 95% Confidence Band Analysis Run 11/1/2023 11:37 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

Sen's Slope Estimator

Constituent: Selenium (ug/L) Analysis Run 11/1/2023 11:38 AM

Marshalltown E and W Closed LFs Client: SCS Engineers Data: Marshal_input

	MW-9 (bg)
9/25/2016	<0.18
9/14/2017	<0.086
9/12/2018	<0.16
9/17/2019	<1
9/1/2020	<1
9/28/2021	<0.96
9/20/2022	<0.96
9/21/2023	<1.4 (U)

ND substitution: RL or RL/2 if <15% NDs.