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AmerenEnergy Medina Valley CoGen, LLC

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2022 ANNUAL REPORT

FORMER HUTSONVILLE POWER STATION - ASH POND D

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2022 ANNUAL REPORT
FORMER HUTSONVILLE POWER STATION - ASH POND D

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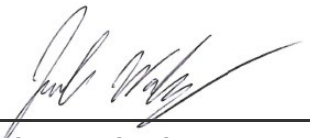

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ACRONYMS AND ABBREVIATIONS

Ameren	AmerenEnergy Medina Valley Cogen, LLC
CCW	Coal Combustion Waste
Collection Trench	Groundwater Collection System
EPA	Environmental Protection Agency
GMZ	Groundwater Management Zone
Hanson	Hanson Professional Services, Inc.
HDPE	High Density Polyethylene
Hutsonville	Former Hutsonville Power Station
IAC	Illinois Administrative Code
IEPA	Illinois Environmental Protection Agency
ILCS	Illinois Compiled Statutes
NRT	Natural Resource Technology, Inc.
TDS	Total Dissolved Solids

1. INTRODUCTION

1.1 Background

This report has been prepared for AmerenEnergy Medina Valley Cogen, LLC (Ameren) to summarize 2022 groundwater monitoring results for closed Ash Pond D at the former Hutsonville Power Station (Hutsonville). Ash Pond D is located near the southeast portion of the former power station (**Figure 1-1**) and received coal combustion waste (CCW) between 1968 and 2000.

Ameren completed closure activities for Ash Pond D in January 2013 in accordance with the site-specific closure requirements of Part 840 of Title 35 of the Illinois Administrative Code (35 IAC 840). Closure activities for Ash Pond D included placement of a 40-mil high density polyethylene (HDPE) cap covered with a three-foot thick vegetative soil layer, construction of surface water control structures, and construction of a groundwater collection system (i.e., Collection Trench). It is important to note that Ameren was unable to initiate operation of the Collection Trench until they received authorization for the associated discharge under Hutsonville's renewed National Pollutant Discharge Elimination System (NPDES) permit (IL0004120) with an effective date of March 1, 2015. Operation of the Collection Trench began in April 2015.

Hutsonville Ash Pond D post-closure care requirements were established in the Post-Closure Care Plan (Hanson Professional Services, Inc. [Hanson], Natural Resource Technology, Inc. [NRT], 2011a) and the Groundwater Monitoring Plan (Hanson, NRT, 2011b), both dated July 26, 2011.The Groundwater Monitoring Plan was prepared in accordance with 35 IAC 840.114 and 35 IAC 840.116 and outlines groundwater monitoring and sampling procedures, establishes the parameters and methods to be used for analyzing the groundwater samples, and describes evaluation methods to assess post-closure groundwater quality and trends to demonstrate compliance with the applicable groundwater standards. The Groundwater Monitoring Program Schedule is provided in **Table 1-1**. Monitoring well locations, installation dates, construction information, and the groundwater zone they monitor are provided in **Table 1-2**. Field and laboratory parameters for evaluating groundwater quality are shown in **Table 1-3**.

The groundwater monitoring system for Ash Pond D (**Figure 1-2**), as defined by the Groundwater Monitoring Plan, originally consisted of two background monitoring wells, MW-10 and MW 10D, and nine downgradient compliance monitoring wells[1], MW-6, MW-7, MW-7D, MW-8, MW-11R, MW-14, MW-115S, MW-115D, and MW-121. Background wells MW-10 and MW-10D were destroyed due to construction unrelated to Ameren operations after the first quarter, 2016 monitoring period. No trace of the former background wells was found using a metal detector, probes, or digging. As a result, these wells were replaced with new background monitoring wells, MW-23S and MW-23D, in November 2017. In addition, several other monitoring wells and piezometers located at Hutsonville are measured for groundwater level so that groundwater elevation contour maps can be created for the entire site.

Closure activities for Ash Ponds A, B, C, and the Bottom Ash Sluice Pond were subsequently completed in June 2016 in accordance with the Closure Plan (Hanson, NRT, 2014a), and 35 IAC 840 to the extent feasible. Ash Ponds B, C, and the Bottom Ash Sluice Pond were clean-closed by relocating accumulated ash to Ash Pond A. Closure activities for Ash Pond A included grading

[1] Note that in the 2017 Annual Report, Section 1.1, well MW-7D was mistakenly left off the list of compliance wells.

according to the Closure Plan, and capping with a low permeability geosynthetic (40-mil HDPE) membrane covered with protective soil.

Post-closure groundwater monitoring and annual reporting for Ash Pond D according to the Groundwater Monitoring Plan and the Post-Closure Care Plan began in 2013. This tenth annual report includes the following elements:

- A summary of groundwater monitoring data collected in 2021 and 2022 and used for annual trend and statistical analysis; data tables are included in **Appendix A**.
- Quarterly Site Inspection Forms, including observations and descriptions of any maintenance activities performed on the pond cap, embankment, and groundwater collection trench and discharge system (**Appendix B**).
- Annual trend and statistical analysis results per Section 5.2 of the Groundwater Monitoring Plan, including an assessment of any statistically significant increasing trends (**Appendix C**).

1.2 Groundwater Quality Overview – 2013 to 2022

1.2.1 Summary of Cover System Construction and Maintenance

The closure activities for Ash Pond D included placement of a cover system, which included a 40-mil HDPE geomembrane covered with a three-foot thick vegetative soil layer, construction of surface water control structures, and construction of the Collection Trench.

Inspections of the cover system are performed on a quarterly schedule. Routine maintenance activities are performed at Ash Pond D as needed and as soon as practicable after issues are identified. These activities include recontouring the ground surface, repairing drainage channels, repairing and replacing channel lining material, revegetating areas, and removing woody vegetation. Maintenance activities are described in more detail in the Post-Closure Plan.

1.2.2 Summary of 2013 to 2022 Groundwater Quality Data Review

Groundwater quality data collected since Ameren completed closure activities for Ash Pond D in 2013 have been reviewed to assess the overall condition of the groundwater and the performance of the cover system. This review has been performed independently from the compliance evaluations required by the Groundwater Monitoring Plan, which are focused on specific compliance criteria and proposed mitigation actions. This review is intended as a holistic view of groundwater quality over time since closure.

Dissolved Boron was identified as the primary indicator parameter for coal ash leachate impacts to groundwater in the Pond D Closure Alternatives Report (NRT, 2009). As such, dissolved boron was selected for this groundwater quality data review. Dissolved Boron concentrations observed since 2013 are presented in **Figures 1-3 through 1-8**. On the figures, the lines through the concentration data represent the best fit linear regressions for boron concentrations in each well. Best fit linear regression lines are included in the figures to provide a convenient means of evaluating general concentration patterns since closure. It should be noted that the regression lines are not equivalent to the statistical trends discussed in the groundwater compliance section of this report. Dissolved boron concentrations in most compliance monitoring wells have been stable or decreasing since 2013 and are currently below the 35 IAC 620.410 Class I Groundwater Standard, with the exceptions of MW-8 and MW-11R, which have dissolved boron concentrations above the Class I standard. As illustrated in **Figure 1-5**, periodic high dissolved boron

concentrations were recently observed at MW-11R (2019-2022). This monitoring well is located on the other side of the Collection Trench from Pond D, and, as described in Section 4, the fluctuations in dissolved boron concentrations at this well may be due to the influence of the Collection Trench and an irrigation pumping well located adjacent to the site to the south. Boron concentration at MW-11R will continue to be monitored and evaluated in 2023.

Dissolved sulfate was also identified as an indicator parameter for coal ash in the Pond D Closure Alternatives Report; however, dissolved sulfate can have other anthropogenic sources for elevated concentrations in groundwater, and dissolved sulfate concentrations can decrease in groundwater under strongly reducing conditions. These caveats make dissolved sulfate a less reliable indicator for coal ash impacts than dissolved boron. Dissolved sulfate concentrations observed since 2013 are presented in **Figures 1-9 through 1-14** along with best fit linear regression lines indicating general concentration patterns since closure. Similar to dissolved boron, dissolved sulfate concentrations have been stable or decreasing since the closure completion. As illustrated in **Figure 1-11**, dissolved sulfate concentrations at MW-11R were recently observed (2019-2022) to fluctuate in a similar manner as dissolved boron concentrations. Dissolved sulfate concentrations at MW-11R will continue to be monitored and evaluated in 2023.

In addition, since completion of closure in 2013, several decreasing trends for various analytical parameters were identified and are discussed in Section 3.3 and summarized on **Tables 3-1 and 3-2**.

1.2.3 Conclusion

The stable or decreasing dissolved boron and sulfate concentrations in the majority of compliance monitoring wells across the site are a strong indication that the cover system is functioning to improve overall groundwater quality beneath the pond.

2. GROUNDWATER MONITORING PLAN COMPLIANCE

2.1 Applicable Groundwater Quality Standards

2.1.1 On-Site Groundwater Standards

As described in Section 5.1.1 of the Groundwater Monitoring Plan and pursuant to 35 IAC 840.16(a):

- Prior to the completion of the post-closure care period, the on-site applicable groundwater quality standards at Ash Pond D are the greater of either the actual groundwater monitoring result, or the Class I Potable Resource Groundwater standard set forth in 35 IAC 620.410.
- After completion of the post-closure care period, if the on-site concentrations of contaminants from Ash Pond D, as determined by groundwater monitoring, exceed the numeric standards for Class I Potable Resource Groundwater set forth in 35 IAC 620.410, the observed concentrations are the applicable groundwater standards at Ash Pond D if the following criteria are addressed to the satisfaction of the Illinois Environmental Protection Agency (IEPA):
  - To the extent practicable, the exceedance has been minimized and beneficial use, as appropriate for the class of groundwater, has been returned on-site.
  - Any threat to public health or the environment on-site has been minimized.
  - An institutional control prohibiting potable uses of groundwater is placed on Ash Pond D in accordance with the Uniform Environmental Covenants Act (765 Illinois Compiled Statutes (ILCS) 122) or an alternative instrument authorized for environmental uses under Illinois law and approved by the IEPA. Existing potable uses of groundwater may be preserved as long as such uses remain fit for human consumption in accordance with accepted water supply principles.

2.1.2 Off-Site Groundwater Standards

As described in Section 5.1.2 of the Groundwater Monitoring Plan and pursuant to 35 IAC 840.116(b):

- Off-site groundwater quality standards are the 35 IAC 620.410 Class I Potable Resource standards for the upper zone (defined during rulemaking as the fine-grained sediments directly beneath Ash Pond D) and the 35 IAC 620 Subpart C non-degradation standards for the lower zone, unless a groundwater management zone (GMZ) has been established as provided in 35 IAC 620.250. Currently, no GMZ is established for Pond D. However, a GMZ is established for Ash Pond A. In conjunction with Ameren's request for approval of the Closure Plan for Ash Pond A, Ameren submitted a request to establish a GMZ at Ash Pond A pursuant to 35 IAC 620.250(a)(2): Ash Ponds Closure, Groundwater Management Zone Application, dated September 8, 2014 (Hanson, NRT, 2014b), which was approved along with the Closure Plan.

2.2 Demonstration of Compliance

2.2.1 On-Site Groundwater Compliance

As described in Section 5.2.1 of the Groundwater Monitoring Plan:

- Compliance with on-site groundwater quality standards will be achieved when no statistically significant increasing trend that can be attributed to Ash Pond D is detected in the

concentrations of all constituents monitored at the compliance (down-gradient) boundary of the site for four consecutive years after changing to an annual monitoring frequency (**Table 1-1**).

2.2.2 Off-Site Groundwater Compliance

As described in Section 5.2.1 of the Groundwater Monitoring Plan:

- For off-site groundwater, the following compliance criteria must be met:
  - Statistically significant decreasing trends in concentration for all constituents monitored in accordance with 35 IAC 840.114 in the upper zone of the aquifer at the compliance boundary are detected for a period of four consecutive years after changing to annual monitoring (**Table 1-1**).
  - No statistically significant increasing trend that can be attributed to Ash Pond D is detected in the concentrations of all constituents monitored in accordance with 35 IAC 840.114 in the lower zone of the aquifer at the compliance boundary for a period of four consecutive years after changing to an annual monitoring frequency.
  - All concentrations of constituents monitored in accordance with 35 IAC 840.114 are at or below the applicable groundwater quality standard as provided in 35 IAC 840.116(b) at the down-gradient boundaries of Ash Pond D.

2.2.3 Compliance Determination

As described in Section 5.2.3 of the Groundwater Monitoring Plan:

- Compliance is demonstrated by performing an annual trend analysis for each monitoring well located at the down-gradient boundaries of Ash Pond D for all constituents monitored in accordance with 35 IAC 840.114. The analysis shall use Sen's Estimate of Slope and be performed on a minimum of four consecutive samples.
- If a GMZ is established for off-site groundwater in the future, the demonstration of compliance will remain consistent with the approved closure and post-closure care plan.
- If the results of sampling and analysis show a positive slope at any compliance monitoring well located at the downgradient boundaries of Ash Pond D, a Mann-Kendall test will be performed at 95 percent confidence to determine whether or not the increasing slope represents a statistically significant increasing trend. Ameren will investigate the cause of a statistically significant increasing trend as described below. If the statistically significant increasing trend occurs during post-closure care, the investigation will include more frequent inspection of the surface of the cover system and evaluation of background concentrations.
  - If the investigation attributes a statistically significant increasing trend to a superseding cause, Ameren will notify IEPA in writing, stating the cause of the increasing trend and providing the rationale used in such a determination.
  - If there is no superseding cause for the statistically significant increasing trend and sampling frequency has been reduced pursuant to semi-annual or annual sampling, a quarterly sampling schedule will be reestablished. After four consecutive quarterly samples show no statistically significant increasing trend, the frequency of groundwater monitoring will return to either semi-annual or annual, whichever frequency was utilized prior to the return to quarterly sampling.

  - Notifications concerning statistically significant increasing trends and revisions of the sampling frequency will be reported to IEPA in writing within 30 days after making the determinations.

- If a statistically significant increasing trend is observed to continue over a period of two or more consecutive years and there are no superseding causes for the trend, then Ameren will perform the following:
  - A hydrogeologic investigation
  - Additional site investigation, if necessary

Based on the outcome of the investigation above, Ameren may take action to mitigate statistically significant increasing trends. Such actions will be proposed as a modification to the post-closure care plan within 180 days after completion of the investigation activities described above.

3. DATA ANALYSIS

3.1 Groundwater Flow

Groundwater flow for 2022 is represented using groundwater elevation contour maps for each quarterly sampling event (**Figures 3-1 through 3-4**). Groundwater in the upper (shallow) zone generally flowed from west to east and northeast towards the Wabash River during 2022, which is consistent with past evaluations. The Collection Trench began operation in April 2015, and, following startup, groundwater elevations have exhibited localized flow toward the trench with groundwater elevations decreasing near the trench, as exhibited by measured groundwater elevations in MW-11R and MW-6 on **Figure 3-5**. In the depictions of groundwater elevation contours, dashed lines have been used to infer the localized drawdown of groundwater levels resulting from trench operation, which is necessary with limited wells situated laterally along the length of the trench.

The horizontal hydraulic gradient in the upper migration zone beneath the northern extent of Ash Pond D ranged from 0.016 to 0.025 feet/feet during 2022 **(Figures 3-1 through Figure 3-4)**. Horizontal hydraulic gradient was not calculated near the southern end of the pond due to the potential influence of the Collection Trench on groundwater flow.

Groundwater flow within the lower (deep alluvial) migration zone along the edge of the Wabash River valley was not contoured since all the deep alluvial monitoring wells are within a narrow zone between Ash Pond D and the Wabash River. Groundwater within the lower zone generally flows from southwest to northeast towards the Wabash River.

3.2 Review of Analytical Data (2021-2022)

Groundwater samples from the most recent eight monitoring events were collected on March 1, 2021; April 26, 2021; September 1, 2021; November 1, 2021; March 21, 2022; June 20, 2022; August 8, 2022; and October 24, 2022. All field and laboratory analytical results are tabulated in **Appendix A**. Sampling anomalies, such as wells that were dry, had water levels too low for sampling, or were not sampled during a sampling event for other reasons, are noted below:

- MW-6: Not sampled in the fourth quarter sampling event of 2022 due to insufficient water level.

Results of groundwater monitoring for constituents that exceeded the 35 IAC 620.410 Class I Groundwater Standard during the 1999 hydrogeologic assessment (NRT, 2009) (dissolved boron, dissolved sulfate, dissolved manganese, and TDS) are discussed below:

- Dissolved boron has been identified as the primary indicator constituent for coal ash impacts to groundwater at Ash Pond D (see Section 1.2.2). In the 2021-2022 monitoring period, dissolved boron concentrations ranged from 0.1 to 17 milligrams per liter (mg/L) in shallow compliance monitoring wells. In deep monitoring wells, dissolved boron concentrations ranged from 0.05 to 0.99 mg/L (**Figures 3-6 3-7**). As discussed in Sections 1.2.2-1.2.3, dissolved boron concentrations have been stable or decreasing in most Ash Pond D compliance monitoring wells since closure. As illustrated in **Figure 3-7**, fluctuations of dissolved boron concentrations above the 35 IAC 620.410 Class I Groundwater Standard were observed at MW-11R. During the current monitoring period (2021-2022), dissolved boron concentrations continue to be stable over time at compliance monitoring wells, with the exception of MW-11R, which is located on south of the Collection Trench opposite to Ash Pond D. This indicates the cover system is

functioning to improve overall groundwater quality beneath the ponds and no further action is required at this time. Dissolved boron concentrations at MW-11R will continue to be monitored and evaluated in 2023.

- Dissolved sulfate has also been identified as an indicator for coal ash impacts to groundwater (see Section 1.2.2). In the 2021-2022 monitoring period, dissolved sulfate concentrations ranged from 1 to 1,200 mg/L in shallow compliance monitoring wells. In deep monitoring wells, dissolved sulfate concentrations ranged from 12 to 270 mg/L (**Figures 3-8 and 3-9**). Dissolved sulfate concentrations were highest at MW-11R in 2021 and 2022, where dissolved boron concentrations were also highest. As illustrated in **Figure 3-9**, fluctuations of dissolved sulfate concentrations above the 35 IAC 620.410 Class I Groundwater Standard were observed at MW-11ROverall, during this reporting period (2021-2022), dissolved sulfate distribution was similar to dissolved boron distribution at Ash Pond D. Dissolved sulfate concentrations at MW-11R will continue to be monitored and evaluated in 2023.
- Box-whisker plots and timeseries plots illustrating concentrations for the most recent eight monitoring events (2021-2022), were developed for additional parameters – dissolved manganese and TDS (**Figures 3-10 through 3-12**). Similar to the identified indicator parameters, these parameters showed generally stable trends during this reporting period (2021-2022).

3.3 Statistical Analyses

Analytical data were evaluated to identify short-term (compliance) data trends in the 2021-2022 dataset. Trends were evaluated according to the procedure outlined in the Groundwater Monitoring plan.

3.3.1 Outlier Analysis

The Grubbs outlier test provides statistical evidence of potential outliers by identifying high or low observations that differ significantly from the other data. The results and test methodology are listed in **Appendix C**. Outliers identified during the compliance period (2021-2022) by the Grubbs outlier test based on the date range of 1984-2022 were not eliminated from further statistical analysis due the lack of documentation indicating that they are not representative of actual field conditions. In addition, these identified outliers did not have any influence on the short-term compliance trends.

3.3.2 Sen's Estimate of Slope

Sen's estimate of slope is a non-parametric estimator of trend. It is the median of all slopes between all possible unique pairs of individual data points in the time period being analyzed. The slopes represent the rate of change of the measured parameter, with the y-axis being the parameter value and the x-axis being calendar time. The method is robust, and fairly insensitive to the presence of a small fraction of outliers and non-detect data values. The test methodology and results are listed in **Appendix C2**.

Data collected in 2021-2022 show 19 cases with positive slopes, 21 cases with negative slopes, and 224 cases with no slope (**Table 3-1**).

3.3.3 Mann-Kendall Trend Analysis

The 21 cases of positive Sen's slopes referenced above were tested using the Mann-Kendall test to determine if the positive slopes represented statistically significant increasing trends. The Mann-Kendall test is a non-parametric, one-tailed test to determine whether a dataset has a statistically significant trend (increasing or decreasing). The test methodology is described in **Appendix C2**. Increasing short-term (compliance) trends are identified in **Tables 3-1 and 3-2**.

The Mann-Kendall test detected five cases of statistically significant increasing trend in the 2021-2022 dataset. These cases occurred for dissolved nitrate at MW-6; dissolved sulfate at MW-6; and TDS at MW-6, MW-7, and MW-11R. During this reporting period, dissolved sulfate and nitrate concentrations at MW-6 and TDS concentrations at MW-6 and MW-7 were below their respective 35 IAC 620.410 Class I Groundwater Standards, whereas TDS concentrations at MW-11R exceeded their respective Class I Groundwater Standard.

3.4 Site Inspection

The Post-Closure Maintenance Program requires quarterly inspections for the first five years after closure. After five years, the inspection frequency can be reduced to semi-annually provided that semi-annual groundwater monitoring has been approved by IEPA. After five years of semi-annual monitoring, the inspection frequency can be reduced to annually pending approval of annual groundwater monitoring. Inspections may be ceased after IEPA approval of the certified Post-Closure Care Report.

Site inspections include assessment of the condition and need for repair of final cover and vegetation, as wells as fencing, monitoring points, surface water control features, and the Collection Trench.

For 2022, the site inspections were performed on March 17, May 13, August 25, and November 22. The May 2022 inspection indicated minor amount of vegetation overgrowth in riprap and paved flume. Herbicide was applied in June 2022 to address the overgrowth. The August 2022 inspection indicated that pump DS-3 had failed and needed replacement, therefore pumps DS-3 and DS-4 were replaced on October 3, 2022. The other components of the closure system were in good condition. The inspection reports for 2022 are included in **Appendix B**.

4. EVALUATION OF COMPLIANCE

The parameters and wells with statistically significant increasing short-term trends and concentrations above the 35 IAC 620.410 Class I Groundwater Standards have been identified in Section 3.3.3 and in **Table 3-1** for the most recent eight monitoring events (2021-2022). TDS at MW-11R had both a statistically significant increasing short-term trend and concentration above the Class I Groundwater Standard during the compliance period (2021-2022).

The short-term statistically significant increasing trend and Class I Groundwater Standard exceedance of TDS at MW-11R was repeated from the 2020-2021 monitoring period. As required by 35 IAC 840.118(c), TDS concentrations at MW-11R were examined to determine a potential superseding cause for the repeated short-term statistically significant increasing trend and Class I Groundwater Standard exceedance. As illustrated in **Figure 4-1**, fluctuations of TDS concentrations at MW-11R were recently observed (2019-2022). Similar trends were also observed for dissolved boron and dissolved sulfate (**Figures 1-5 and 1-11**). Impacts to the south of Ash Pond D were previously identified in the Closure Plan, and the Collection Trench was designed to continuously withdraw groundwater to control the gradient and flow direction of potentially impacted groundwater associated with Ash Pond D. Increasing concentrations of dissolved boron, dissolved sulfate, and TDS at MW-11R are believed to be related to the capture of these impacts by the Collection Trench. Investigation conducted to determine a potential cause for the fluctuating concentrations of dissolved boron, dissolved sulfate, and TDS at MW-11R identified a high-capacity irrigation well (IRR-1) located just south of the Hutsonville property boundary and Collection Trench. A temporal relationship was identified between periodic high concentrations and pump operation, as high concentrations were observed when the irrigation well pumping was discontinued at the end of the growing season. When operational, the irrigation well is anticipated to pump groundwater at a significantly higher flow rate than the Collection Trench. It is believed that this results in localized groundwater flow toward the irrigation well rather than the Collection Trench during the growing season.[2] The fluctuations in concentrations of dissolved boron, dissolved sulfate and TDS observed at MW-11R, located between the Collection Trench and the irrigation well, potentially result from periodic shifts in local groundwater flow directions influenced by operation of the nearby high-capacity irrigation well. Since the short-term statistically significant increasing trend and Class I Groundwater Standard exceedance of TDS at MW-11R for reporting periods 2021-2022 and 2020-2021 have a plausible superseding cause, no further action is required at this time.

[2] The influence of the withdrawal of groundwater from IRR-1 on groundwater movement at Ash Pond D was closely evaluated by the Agency and Ameren during the adoption of the Part 840 regulations. The Pollution Control Board agreed with the findings of the Agency and Ameren that the closure of Ash Pond D under the Part 840 regulations "will be protective of the irrigation wells screened in the deep alluvial aquifer." *In the Matter of Ameren Ash Pond Closure Rules (Hutsonville Power Station)*, PCB R09-21 (October 7, 2010 Order), pp. 49-52. As an added precaution, Ameren has entered into an agreement with the adjacent landowner that restricts the use of shallow groundwater where there is a potential for limited off-site impacts above the Class I groundwater quality standards. *Id.* at 30-31.

5. CONCLUSIONS

Cover system construction and maintenance, as well as stable or decreasing dissolved boron and sulfate concentrations in the majority of Ash Pond D compliance monitoring wells, are strong indications that the cover system is functioning to improve overall groundwater quality beneath the pond.

Statistical analyses of analytical results for the most recent eight rounds of groundwater samples collected for 2021 to 2022 compliance period at the Hutsonville Ash Pond D identified a statistically significant increasing short-term trend for TDS and concentrations above the 35 IAC 620.410 Class I Groundwater Standard (1,200 mg/L) at MW-11R. Although the statistically significant short-term increasing trend and Class I Groundwater Standard exceedance of TDS at MW-11R was repeated from 2020-2021, there is a potential superseding cause for the reporting period (*i.e.,* changes in concentrations of TDS result from periodic shifts in local groundwater flow directions influenced by operation of the nearby high-capacity irrigation well). The concentration of TDS at MW-11R will continue to be monitored and evaluated in 2023.

6. REFERENCES

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TABLES

Table 1-1. Groundwater Monitoring Program Schedule
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Frequency	Duration	Sampling Quarter	Report Due Date
Quarterly	Begins: January 2013 Ends: 5 years after approval of closure plan and upon demonstration that monitoring effectiveness is not compromised and that there are no statistically significant increasing trends attributable to Ash Pond D.	January- March (1) April - June (2) July - September (3) October - December (4)	May 31 August 31 November 30 February 28
Semiannual	Begins: after IEPA approves that quarterly monitoring requirements have been satisfied. Ends: 5 years after initiation of semiannual monitoring and upon demonstration that monitoring effectiveness is not compromised and that there are no increasing trends attributable to the Ash Pond D.	April - June (2) October - December (4)	August 31 February 28
Annual	Begins: Five years after approval of semi-annual monitoring and after Illinois EPA approval. Ends: After successful completion of the post-closure activities required by 35 IAC 840.142 and approval of the Illinois EPA.	April - June (2)	August 31

Table 1-2. Groundwater Monitoring System Wells
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Well	Installation Date	Surface Elevation (ft, MSL[2])	TOC[1] Elevation (ft, MSL)	Top of Screen Elev (ft)	Bottom of Screen Elevation (ft)	Total Well Depth (ft, BGS)	Objective	Position	Monitoring Zone[3]
Ash Pond D Groundwater Monitoring System Wells: Water Quality and Groundwater Elevations									
MW-6	2/9/1984	438.7	443.17	433.9	427.5	11.2	Compliance	Downgradient	UZ - s&g, ss
MW-7	2/8/1984	439.9	442.28	422.9	412.9	27.0	Compliance	Downgradient	UZ - si s&g
MW-7D	10/5/1998	438.9	442.75	398.2	393.2	45.7	Compliance	Downgradient	LZ - si s&g
MW-8	2/8/1984	440.0	443.65	422.9	417.9	22.1	Compliance	Downgradient	UZ - si s
MW-10[4]	10/7/1998	452.9	454.23	447.2	442.2	10.7	Background	Upgradient	UZ - si s&g, ss
MW-10D[4]	10/7/1998	452.9	454.65	436.6	431.6	21.3	Background	Upgradient	UZ - ss
MW-11R	10/3/2001	440.4	443.01	435.4	425.4	15.0	Compliance	Downgradient	UZ - s&g
MW-14	10/3/2001	440.1	442.89	412.9	407.9	32.2	Compliance	Downgradient	LZ - s&g
MW-23D[4]	11/28/2017	453.5	455.90	434.0	428.7	24.8	Background	Upgradient	UZ - ss, sh
MW-23S[4]	11/28/2017	453.4	456.03	444.2	438.9	14.5	Background	Upgradient	UZ - s si, si s, ss
MW-115S	5/1/2004	438.7	440.88	408.4	403.4	35.3	Compliance	Downgradient	LZ - s&g
MW-115D	5/1/2004	439.1	441.39	356.4	351.4	87.7	Compliance	Downgradient	LZ - s&g
MW-121	10/2/2001	439.2	440.23	403.8	398.8	40.3	Compliance	Downgradient	LZ - s&g
Other Monitoring Wells and Piezometers: Groundwater Elevations									
MW-2D	10/14/2015	452.9	455.42	435.1	430.4	23.1	- -	- -	UZ - ss
MW-2R	6/4/2012	453.0	455.37	446.0	435.3	17.8	- -	- -	UZ - s&g
MW-3	2/9/1984	453.7	454.84	447.7	442.7	11.0	- -	- -	UZ - s&g
MW-3D	10/6/1998	453.57	455.01	433.6	428.6	24.971	- -	- -	UZ - ss
MW-4	2/13/1984	454.0	456.76	449.4	441.9	12.1	- -	- -	UZ - s&g, ss
MW-5	2/13/1984	452.1	454.67	447.3	434.3	17.8	- -	- -	UZ - s&g, ss
MW-9	2/14/1984	451.7	454.38	443.5	433.5	18.2	- -	- -	UZ - s&g
MW-12	10/8/1998	455.5	456.74	448.6	438.6	16.9	- -	- -	UZ - s&g
MW-22S	10/14/2015	449.2	451.48	441.9	437.2	12.7	- -	- -	UZ - si s&g, ss
MW-22D	10/14/2015	449.1	451.36	431.7	427.0	22.7	- -	- -	UZ - si s&g, ss

Notes:

1. TOC = top of casing

2. BGS = below ground surface; MSL = mean sea level.

3. UZ = Upper Zone, LZ = Lower Zone (deep alluvial aquifer); s = sand or sandy, s&g = sand and gravel, si = silt or silty, ss = sandstone, sh = shale

4. Background wells MW-10 and MW-10D were damaged and replaced with background wells MW-23D and MW-23S.

- - Not applicable. Wells listed are for development of groundwater elevation contour maps only.

Table 1-3. Groundwater Monitoring Program Parameters
2022 Annual Report
Former Hutsonville Power Station - Ash Pond D

Field Parameters	STORET Code
pH[2]	00400
Specific Conductance[2]	00094
Depth to Water (BMP)	72109
Elevation of GW Surface[2]	71993
Depth of Well (BGS)[2]	72008
Elevation of Measuring Point	72110
Laboratory Parameters[1]	**STORET Code**
Boron[2]	01020
Iron[2]	01046
Manganese[2]	01056
Sulfate[2]	00946
Total Dissolved Solids (TDS)[2]	70300
Antimony	01095
Arsenic	01000
Barium	01005
Beryllium	01010
Cadmium	01025
Chloride	00941
Chromium	01030
Cobalt	01035
Copper	01040
Cyanide	00720
Fluoride	00950
Lead	01049
Mercury	71890
Nickel	01065
Nitrate as N	00618
Selenium	01145
Silver	01075
Thallium	01057
Zinc	01090

Notes:

[1] Reported as dissolved (filtered) concentrations.

[2] Mandatory monitoring parameter per 35 IAC 840.114(a).

Table 3-1. Trend Analysis Results
2022 Annual Report
Former Hutsonville Power Station - Ash Pond D

	MW-6	MW-7	MW-7D	MW-8	MW-11R	MW-14	MW-23D	MW-23S	MW-115S	MW-115D	MW-121
Number of Samples	**7**	**8**	**8**	**8**	**8**	**8**	**8**	**8**	**8**	**8**	**8**
Antimony, dissolved	None	None	None	None	None	None	None	None	None	None	None
Arsenic, dissolved	None	None	None	None	None	None	None	None	None	None	None
Barium, dissolved	None	None	None	None	None	None	None	None	None	None	None
Beryllium, dissolved	None	None	None	None	None	None	None	None	None	None	None
Boron, dissolved	+	+	None	-	+	None	None	None	None	None	None
Cadmium, dissolved	None	None	None	None	None	None	None	None	None	None	None
Chloride, dissolved	+	-	-	+	-	-	-	-	-	-	-
Chromium, dissolved	None	None	None	None	None	None	None	None	None	None	None
Cobalt, dissolved	None	None	None	None	None	None	None	None	None	None	None
Copper, dissolved	None	None	None	None	None	None	None	None	None	None	None
Cyanide, total	None	None	None	None	None	None	None	None	None	None	None
Fluoride, dissolved	None	None	None	None	None	None	None	None	None	None	None
Iron, dissolved	None	None	None	None	None	None	None	None	None	None	None
Lead, dissolved	None	None	None	None	None	None	None	None	None	None	None
Manganese, dissolved	None	None	None	+	None	None	None	None	None	None	None
Mercury, dissolved	None	None	None	None	None	None	None	None	None	None	None
Nickel, dissolved	None	None	None	None	None	None	None	None	None	None	None
Nitrate nitrogen, dissolved	Increase	None	None	None	Decrease	None	None	None	None	None	None
Selenium, dissolved	None	None	None	None	None	None	None	None	None	None	None
Silver, dissolved	None	None	None	None	None	None	None	None	None	None	None
Sulfate, dissolved	Increase	-	-	+	+	-	-	Decrease	Decrease	-	-
Thallium, dissolved	None	None	None	None	None	None	None	None	None	None	None
Total Dissolved Solids	Increase	Increase	-	-	Increase	+	+	+	+	+	+
Zinc, dissolved	None	None	None	None	None	None	None	None	None	None	None

- "+" indicates that the Sen's non-parametric estimate of the median slope is positive. [O: RSD 12/14/2022, C: RAB 12/27/22]
- "-" indicates that the Sen's non-parametric estimate of the median slope is negative.
- "Decrease" indicates a statistically significant decreasing trend
- "Increase" indicates a statistically significant increasing trend
- Mann Kendall Trend analysis done with non-detects at one half the reporting limit.
- The most recent eight sampling events were used for analysis; date range for this analysis is 1/1/2021-12/31/2022.
- Green shading indicates increasing trends as determined using the Mann-Kendall test at 95% confidence for constituents with maximum concentration lower than the Class I groundwater quality standard.
- Yellow shading indicates increasing trends as determined using the Mann-Kendall test at 95% confidence for constituents with maximum concentration higher than the Class I groundwater quality standard.
- ID indicated that there was insufficient data to perform Sen's Estimate of Slope.

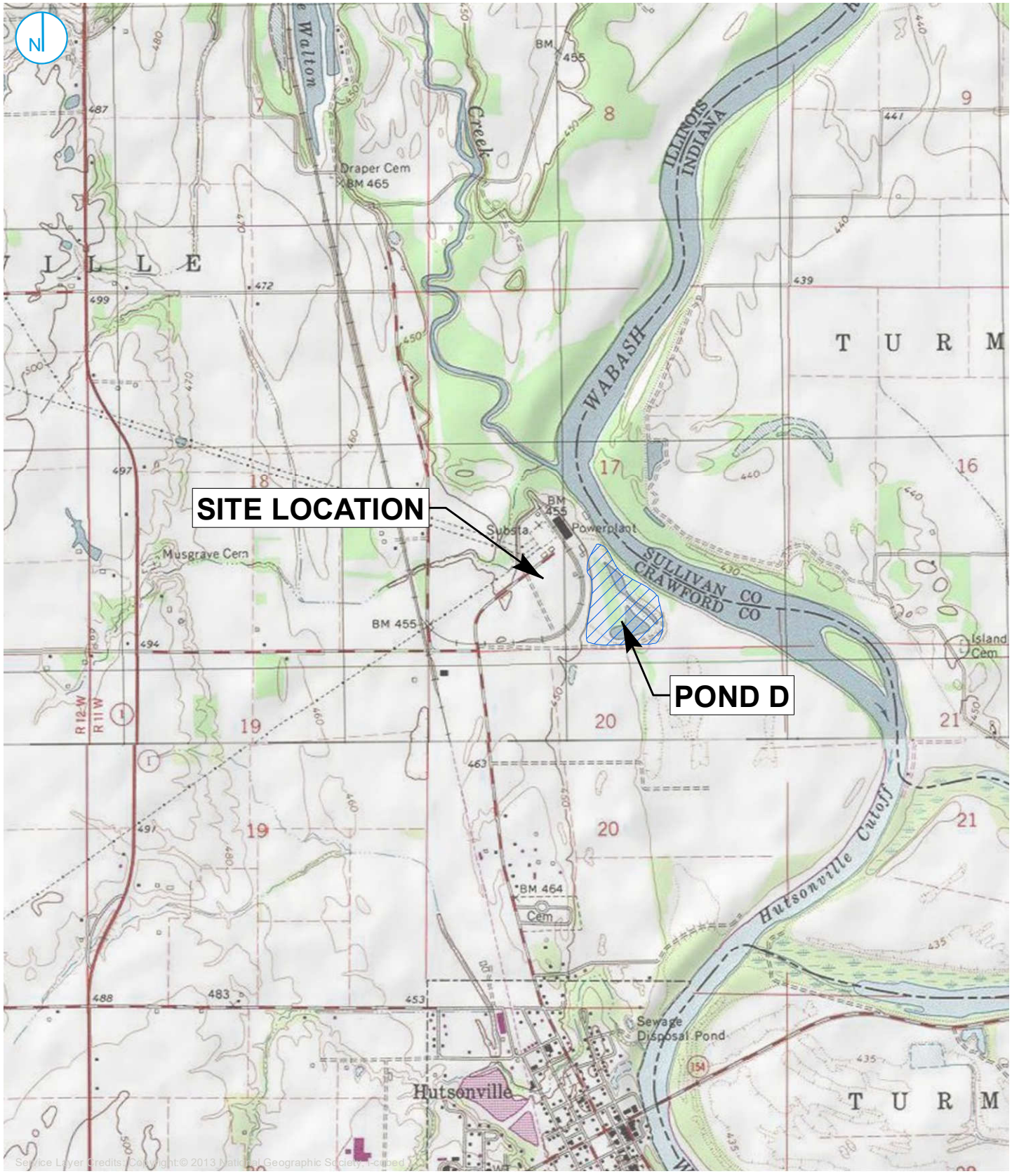
Table 3-2. Summary of Trend Analyses
2022 Annual Report
Former Hutsonville Power Station - Ash Pond D

Time Period	Short-Term Increasing Trends	Long-Term Decreasing Concentration Patterns
2013-2014	7	19
2014-2015	2	
2015-2016	1	
2016-2017	2	
2017-2018	8	
2018-2019	13	
2019-2020	1	
2020-2021	7	
2021-2022	5	

[O: RSD 12/21/2022, C: RAB 12/27/22]

Notes:
Trends based on data collected during the specified periods.
The number of samples per well location for short-term trends are noted on Table 3-1.
Long-terms trends were calculated with data since completion of closure in January 2013.

FIGURES



PROJECT: 72971 | DATED: 1/13/2021 | DESIGNER: galammc

Y:\Mapping\Projects\24\2420\MXDs\2020APD\Figure 1-1_Site Location Map Ash Pond D2.mxd

KEY MAP

Map Scale: 1:1:24,000;
Map Center: 87°39'45"W 39°7'53"N

0 1,000 2,000 Feet

SITE LOCATION MAP

2022 ANNUAL REPORT
FORMER HUTSONVILLE
POWER STATION - ASH POND D
AMEREN ENERGY MEDINA VALLEY COGEN, LLC
HUTSONVILLE, IL

FIGURE 1-1

RAMBOLL AMERICAS
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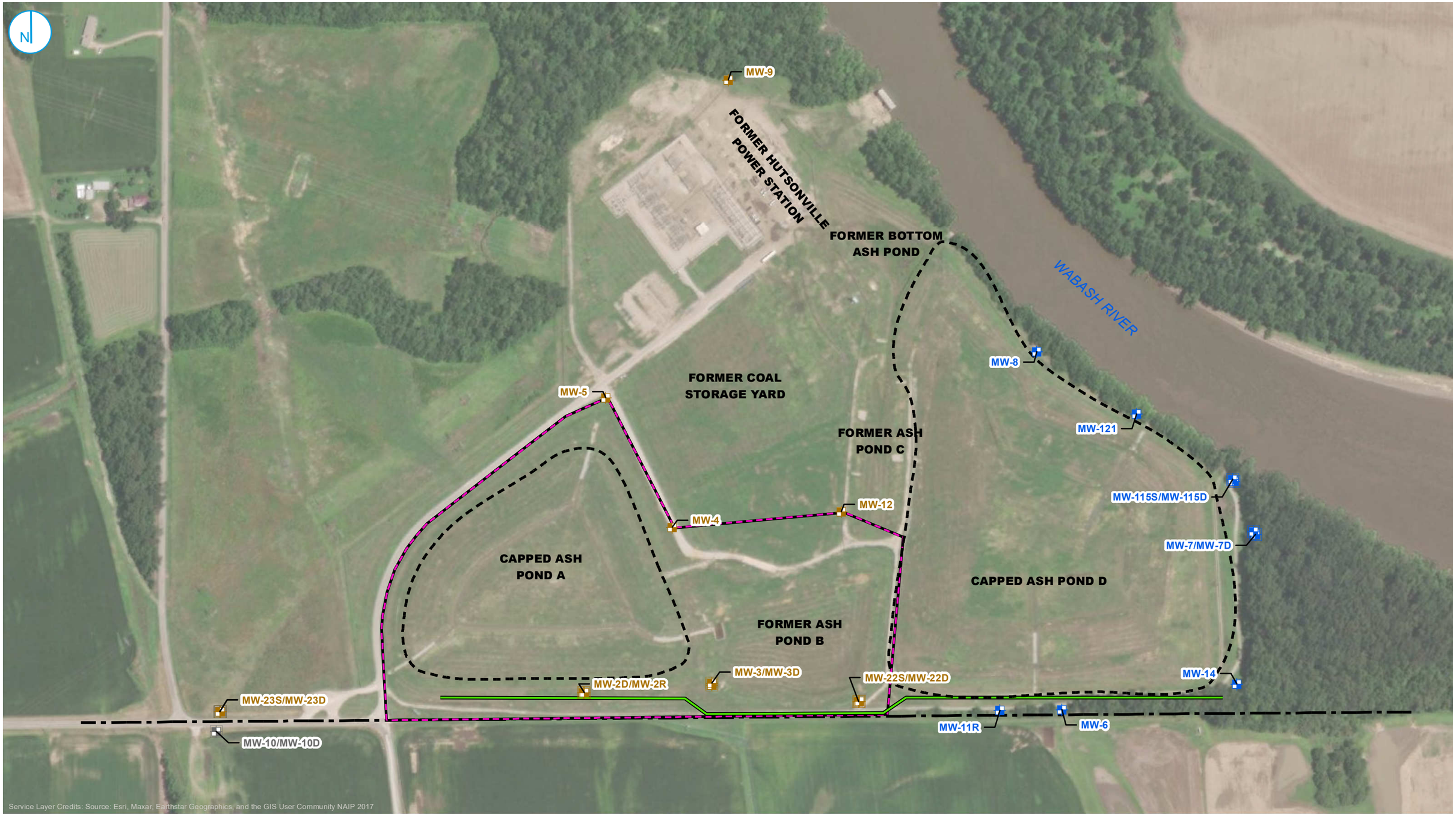
RAMBOLL

Y:\Mapping\Projects\24\24201MXDs\2022APD\Figure 1-2_Monitoring Well Location Map.mxd



PROJECT: 169000XXXX | DATED: 1/24/2023 | DESIGNER: galamnc

- ASH POND D MONITORING WELL LOCATION
- NESTED ASH POND D MONITORING WELL LOCATION
- ASH POND A MONITORING WELL LOCATION
- NESTED ASH POND A MONITORING WELL LOCATION
- ABANDONED NESTED MONITORING WELL LOCATION
- PROPERTY LINE
- APPROXIMATE BOUNDARY OF CAPPED ASH POND
- GROUNDWATER COLLECTION TRENCH (BEGAN OPERATION APRIL 2015)
- LIMITS OF GROUNDWATER MANAGEMENT ZONE

0 150 300 Feet

MONITORING WELL LOCATION MAP

2022 ANNUAL REPORT
FORMER HUTSONVILLE POWER STATION - ASH POND D
AMEREN ENERGY MEDINA VALLEY COGEN, LLC
HUTSONVILLE, IL

FIGURE 1-2

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC
A RAMBOLL COMPANY

RAMBOLL

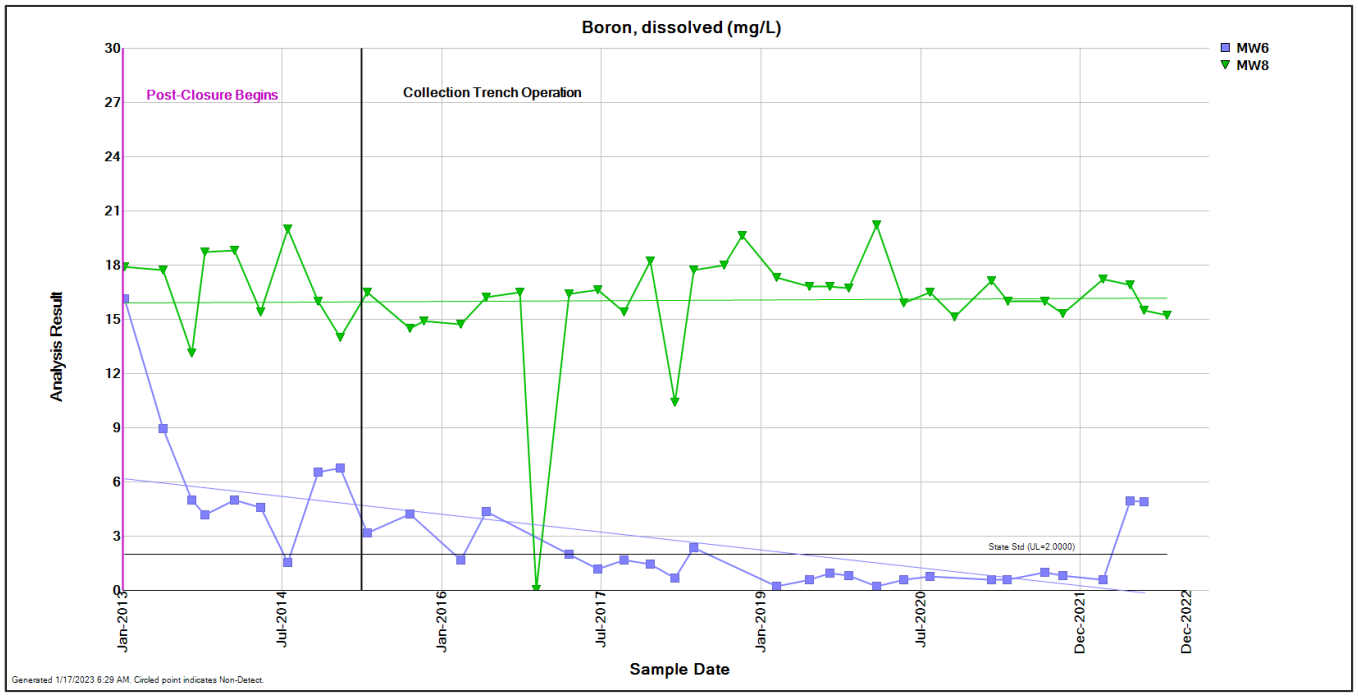


Figure 1-3. Boron concentrations over time since closure completion (2013) at compliance wells MW-6 and MW-8. (Note: Lines through the concentration data represent the best fit linear regressions)

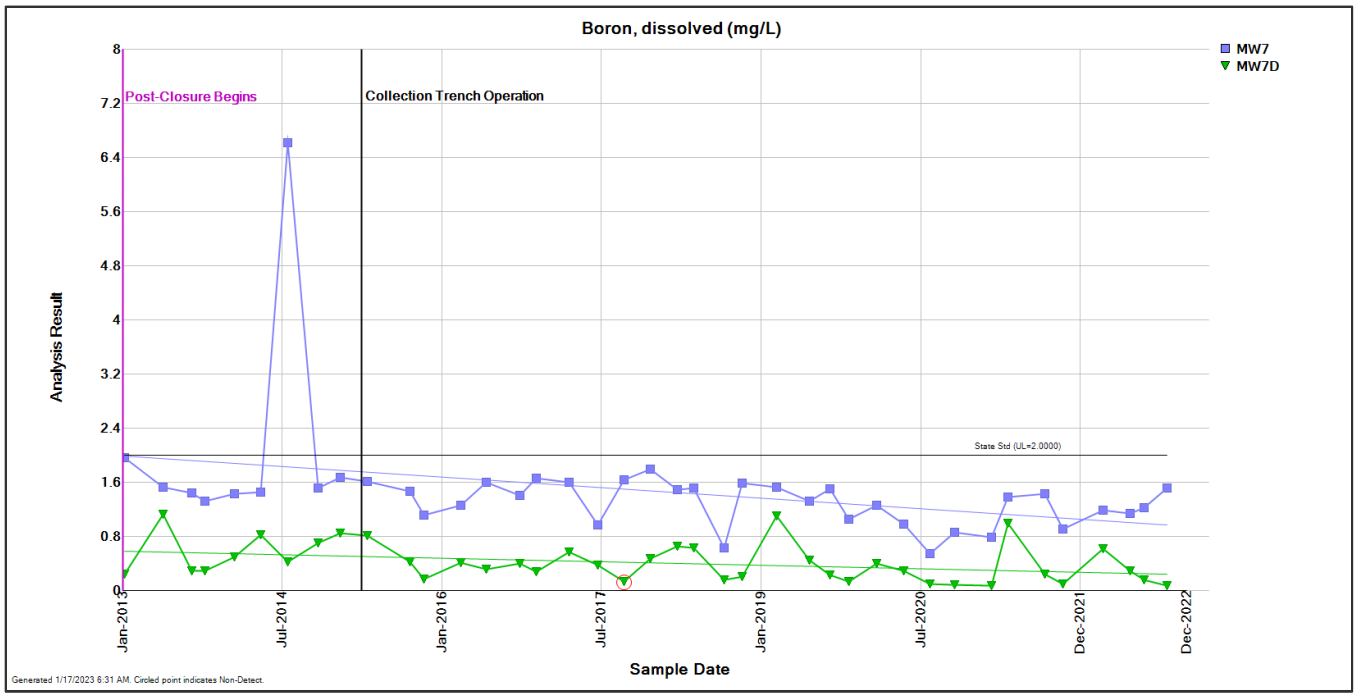


Figure 1-4. Boron concentrations over time since closure completion (2013) at compliance wells MW-7 and MW-7D. Circled results indicate non-detects. (Note: Lines through the concentration data represent the best fit linear regressions)

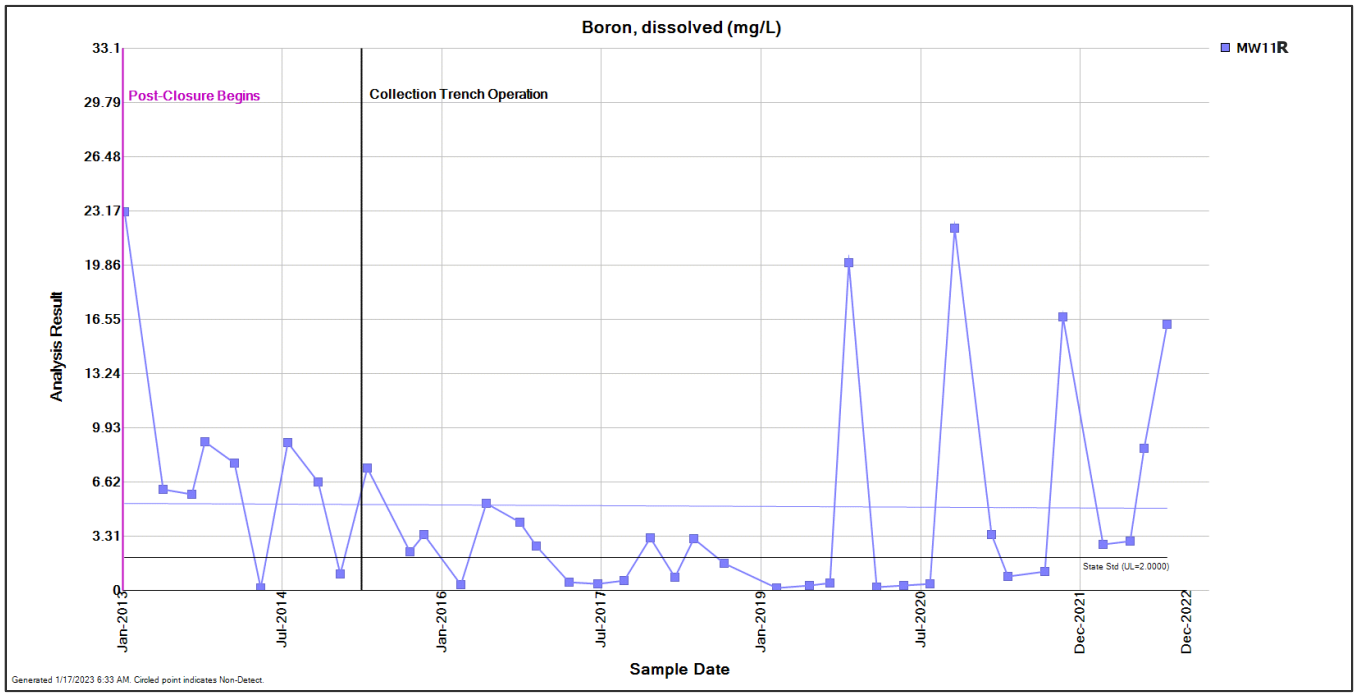


Figure 1-5. Boron concentrations over time since closure completion (2013) at compliance wells MW-11R. (Note: Lines through the concentration data represent the best fit linear regressions)

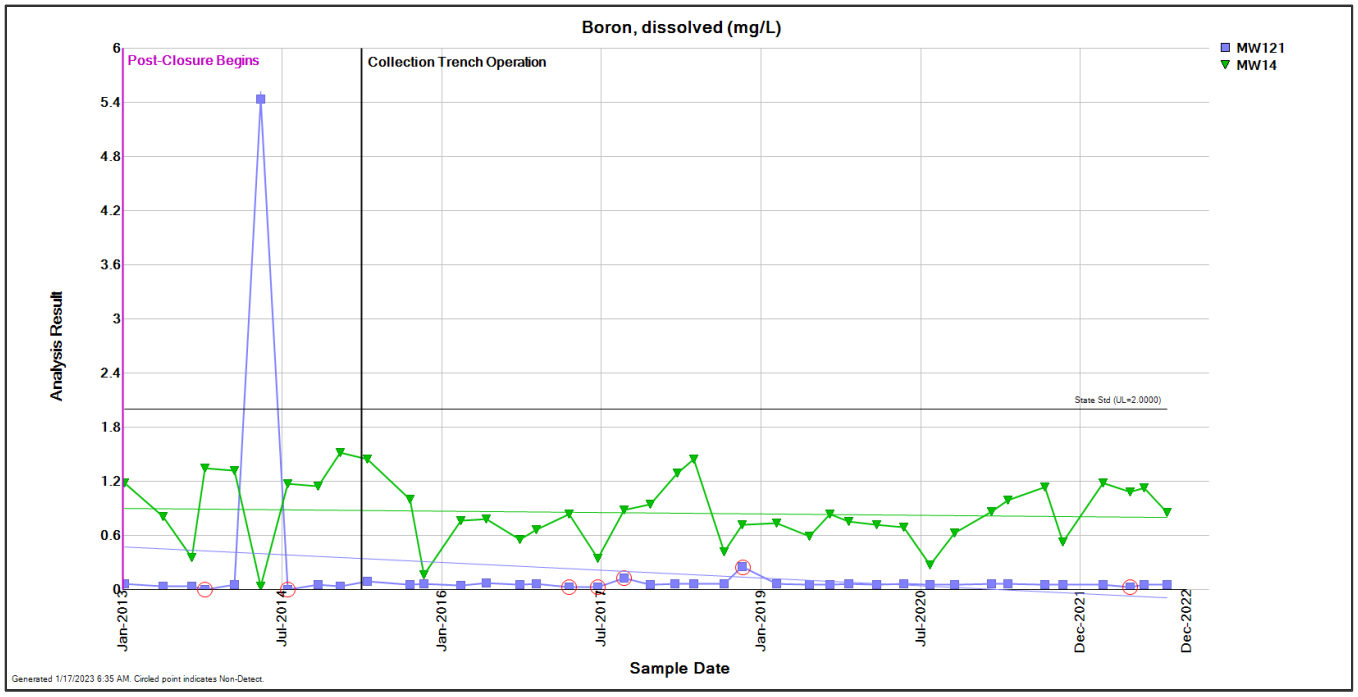


Figure 1-6. Boron concentrations over time since closure completion (2013) at compliance wells MW-121 and MW-14. Circled results indicate non-detects. (Note: Lines through the concentration data represent the best fit linear regressions)

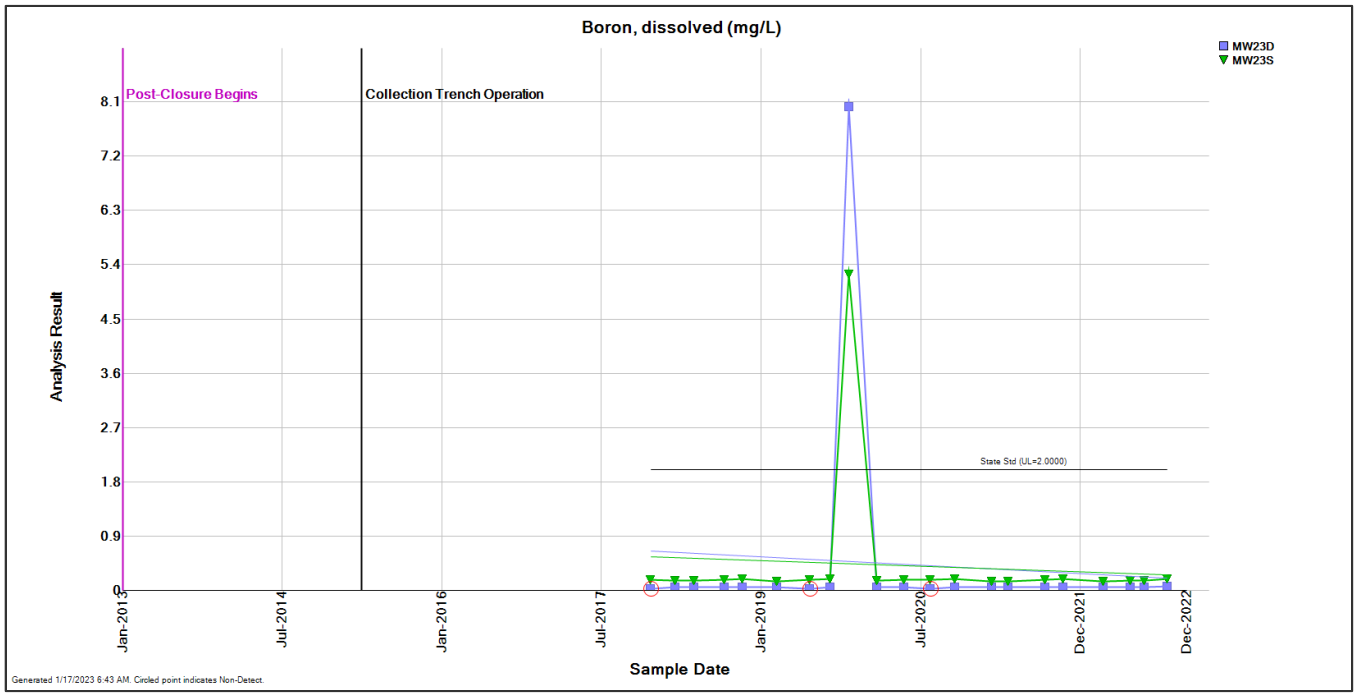


Figure 1-7. Boron concentrations over time since closure completion (2013) at background wells MW-23S and MW-23D. Circled results indicate non-detects. (Note: Lines through the concentration data represent the best fit linear regressions)

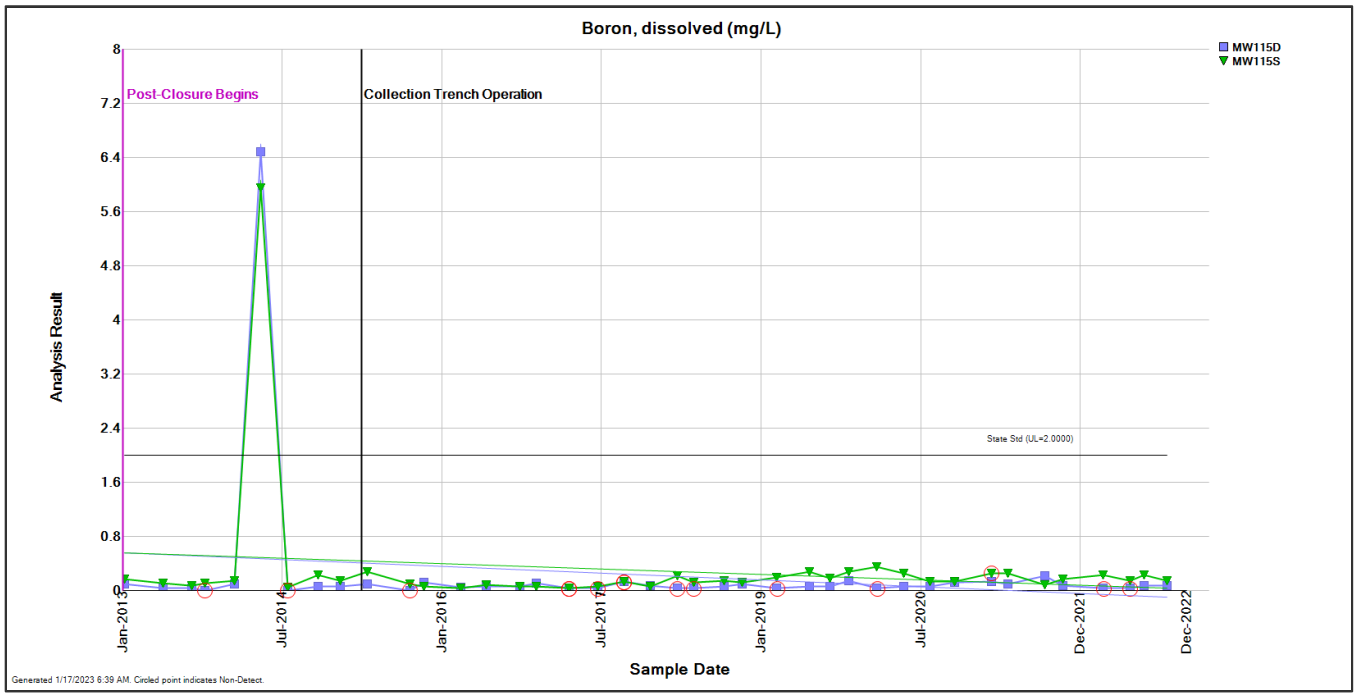


Figure 1-8. Boron concentrations over time since closure completion (2013) at compliance wells MW-115S and MW-115D. Circled results indicate non-detects. (Note: Lines through the concentration data represent the best fit linear regressions)

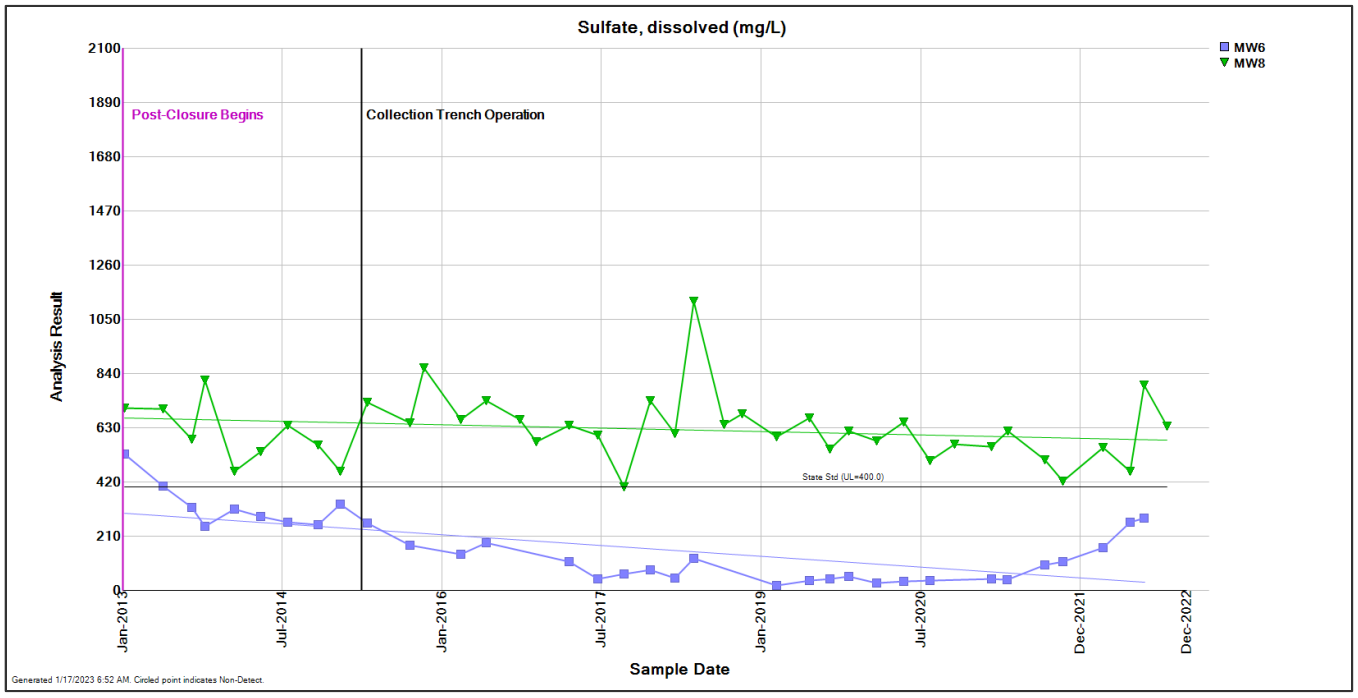


Figure 1-9. Sulfate concentrations over time since closure completion (2013) at compliance wells MW-6 and MW-8. (Note: Lines through the concentration data represent the best fit linear regressions)

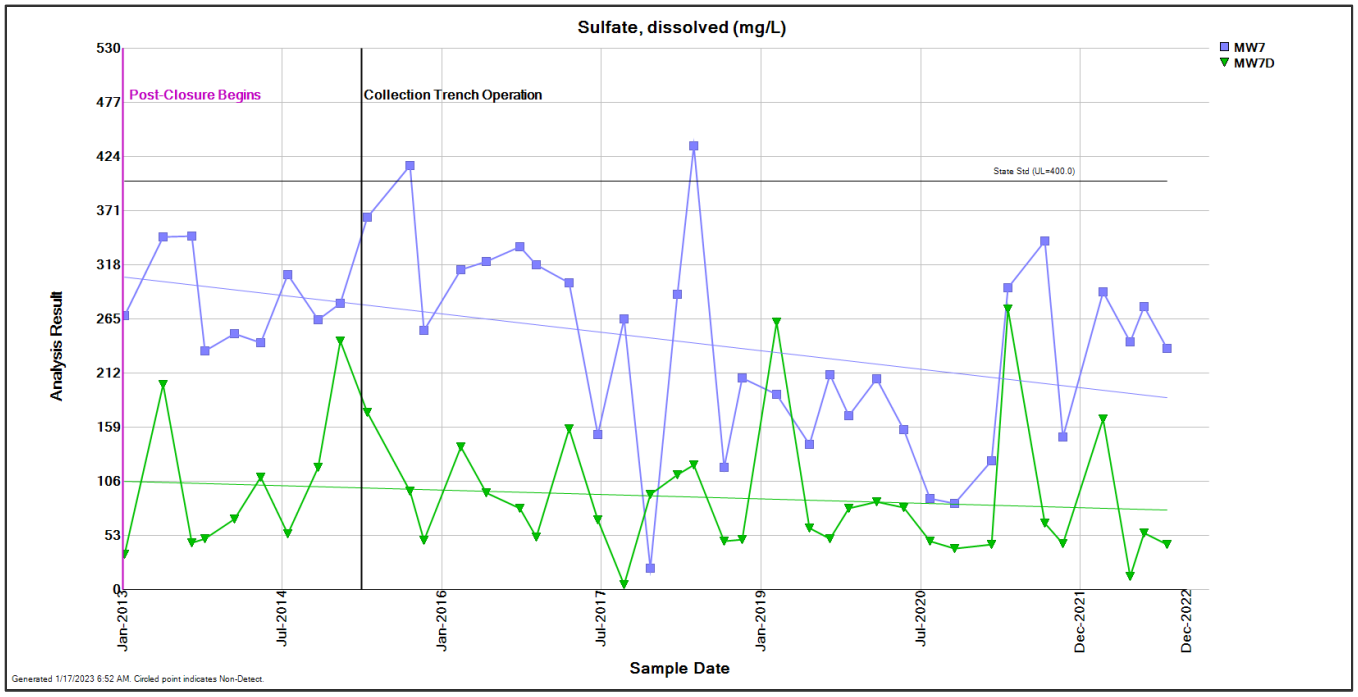


Figure 1-10. Sulfate concentrations over time since closure completion (2013) at compliance wells MW-7 and MW-7D. (Note: Lines through the concentration data represent the best fit linear regressions)

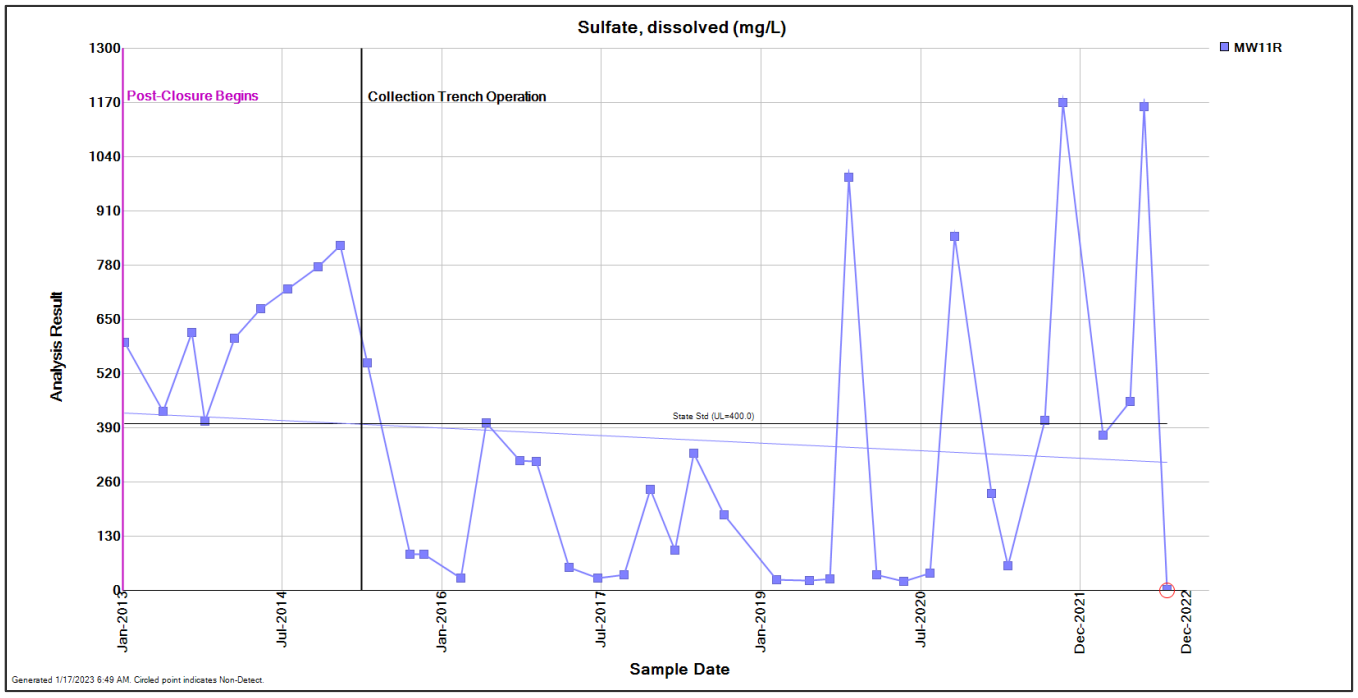


Figure 1-11. Sulfate concentrations over time since closure completion (2013) at compliance wells MW-11R. Circled results indicate non-detects. (Note: Lines through the concentration data represent the best fit linear regressions)

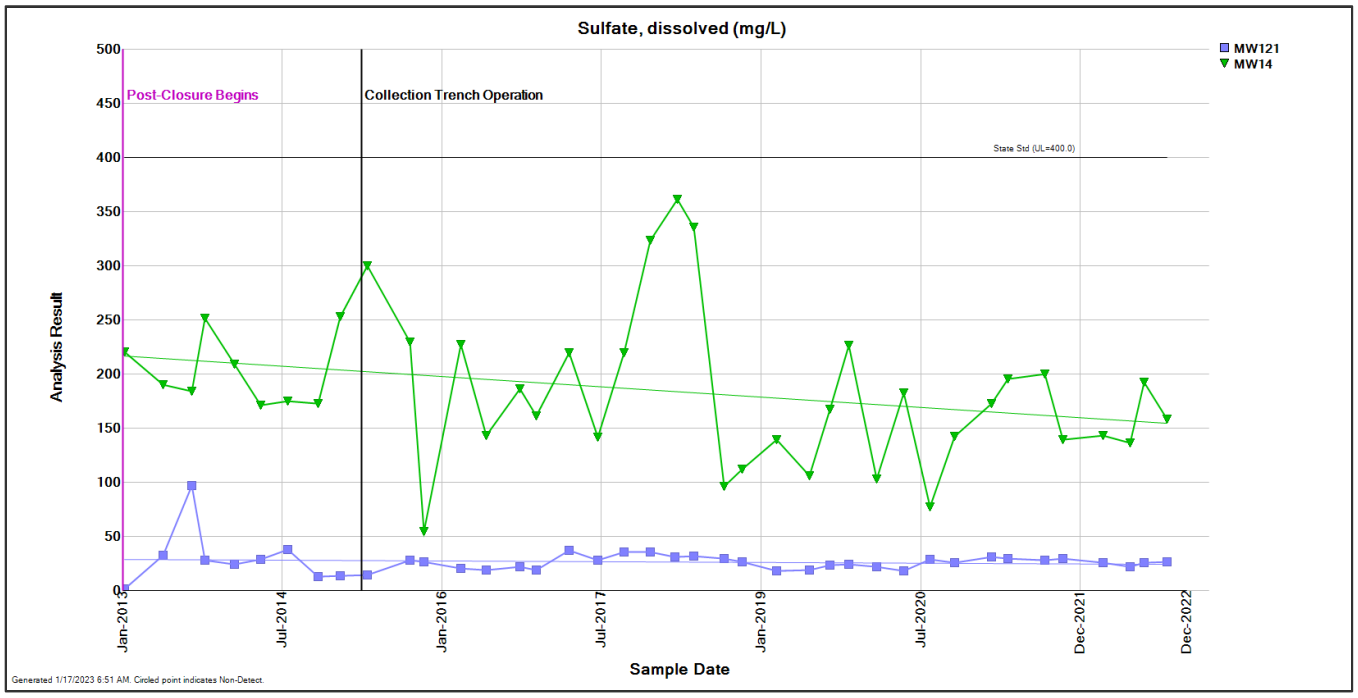


Figure 1-12. Sulfate concentrations over time since closure completion (2013) at compliance wells MW-121 and MW-14. (Note: Lines through the concentration data represent the best fit linear regressions)

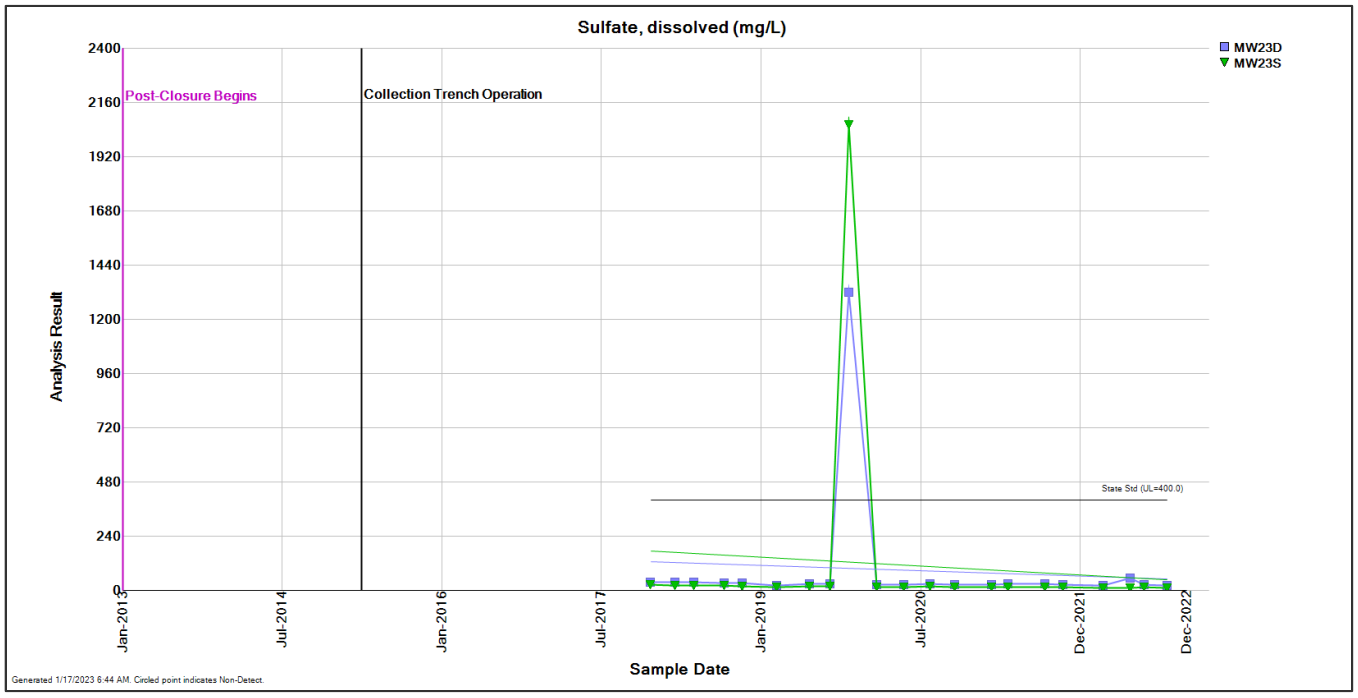


Figure 1-13. Sulfate concentrations over time since closure completion (2013) at background wells MW-23S and MW-23D. (Note: Lines through the concentration data represent the best fit linear regressions)

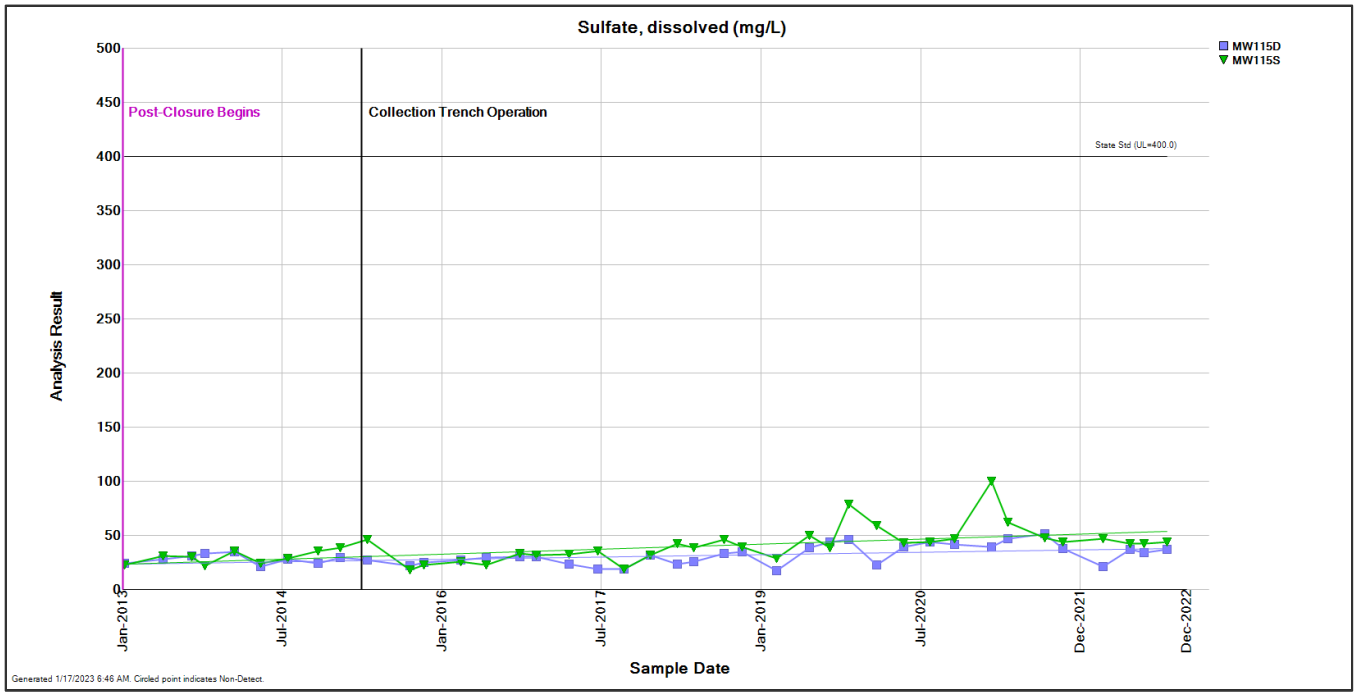
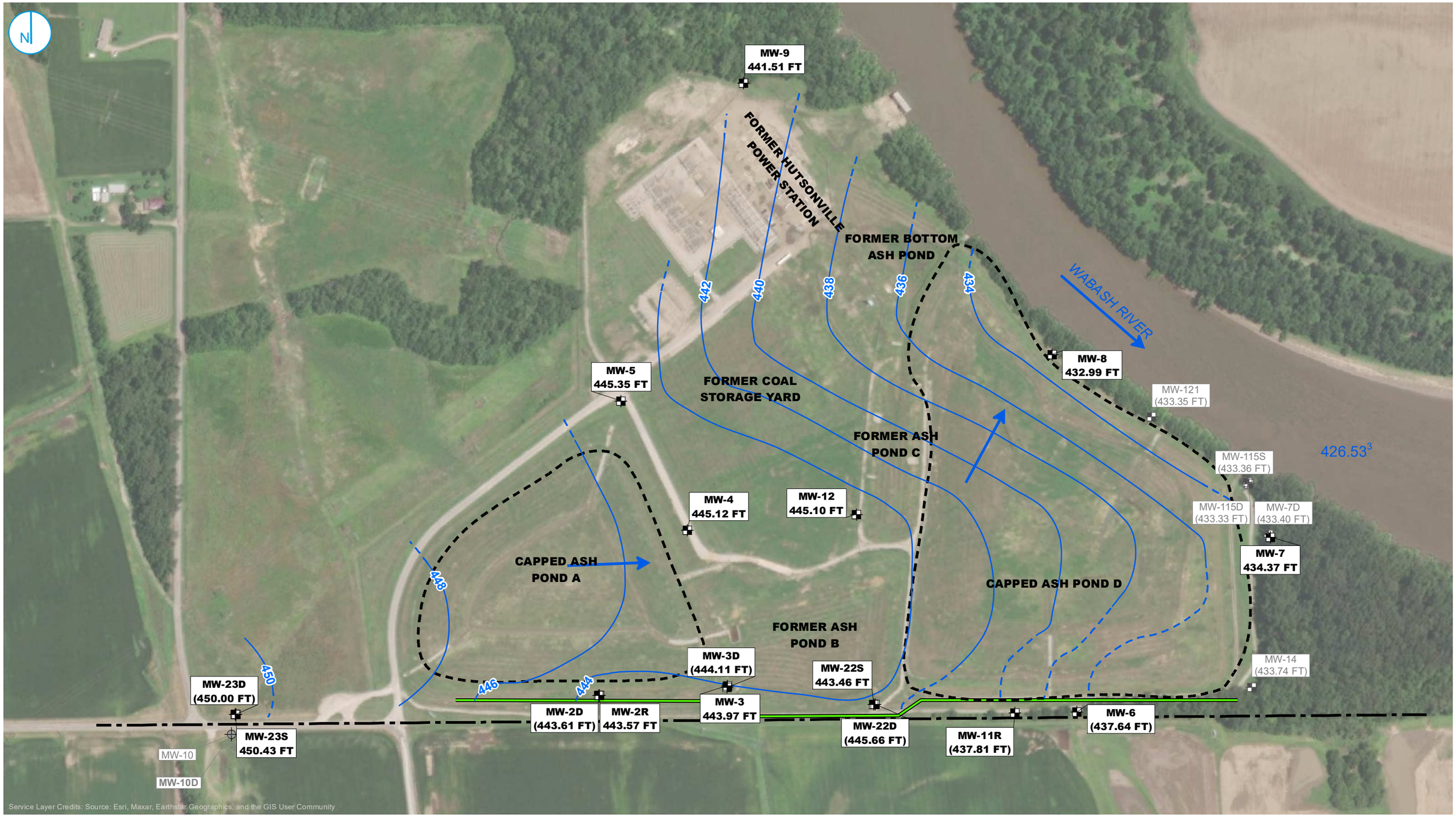


Figure 1-14. Sulfate concentrations over time since closure completion (2013) at compliance wells MW-115S and MW-115D. (Note: Lines through the concentration data represent the best fit linear regressions)



- UPPER MIGRATION ZONE MONITORING WELL
- DEEP MIGRATION ZONE MONITORING WELL
- ABANDONED MONITORING WELL LOCATION
- PROPERTY LINE
- GROUNDWATER ELEVATION CONTOUR (2-FT CONTOUR INTERVAL)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- APPROXIMATE BOUNDARY OF CAPPED ASH POND
- GROUNDWATER COLLECTION TRENCH (BEGAN OPERATION APRIL 2015)

0 150 300 Feet

Notes
1) GROUNDWATER AND RIVER ELEVATIONS REPORTED IN FEET NORTH AMERICAN VERTICAL DATUM OF 1988.
2) GROUNDWATER ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.
3) WABASH RIVER ELEVATIONS AS REPORTED BY USGS FROM USGS 03342000 WABASH RIVER AT RIVERTON, IN LOCATED APPROXIMATELY 12.5 RIVER MILES DOWNSTREAM. RIVER ELEVATION REPORTED IN FEET NATIONAL GEODETIC VERTICAL DATUM OF 1929 AND CONVERTED TO FEET NORTH AMERICAN VERTICAL DATUM OF 1988.

Q1 UPPER MIGRATION ZONE GROUNDWATER ELEVATION CONTOUR MAP MARCH 21, 2022

2022 ANNUAL REPORT
FORMER HUTSONVILLE POWER STATION - ASH POND D
AMEREN ENERGY MEDINA VALLEY COGEN, LLC
HUTSONVILLE, IL

FIGURE 3-1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC
A RAMBOLL COMPANY

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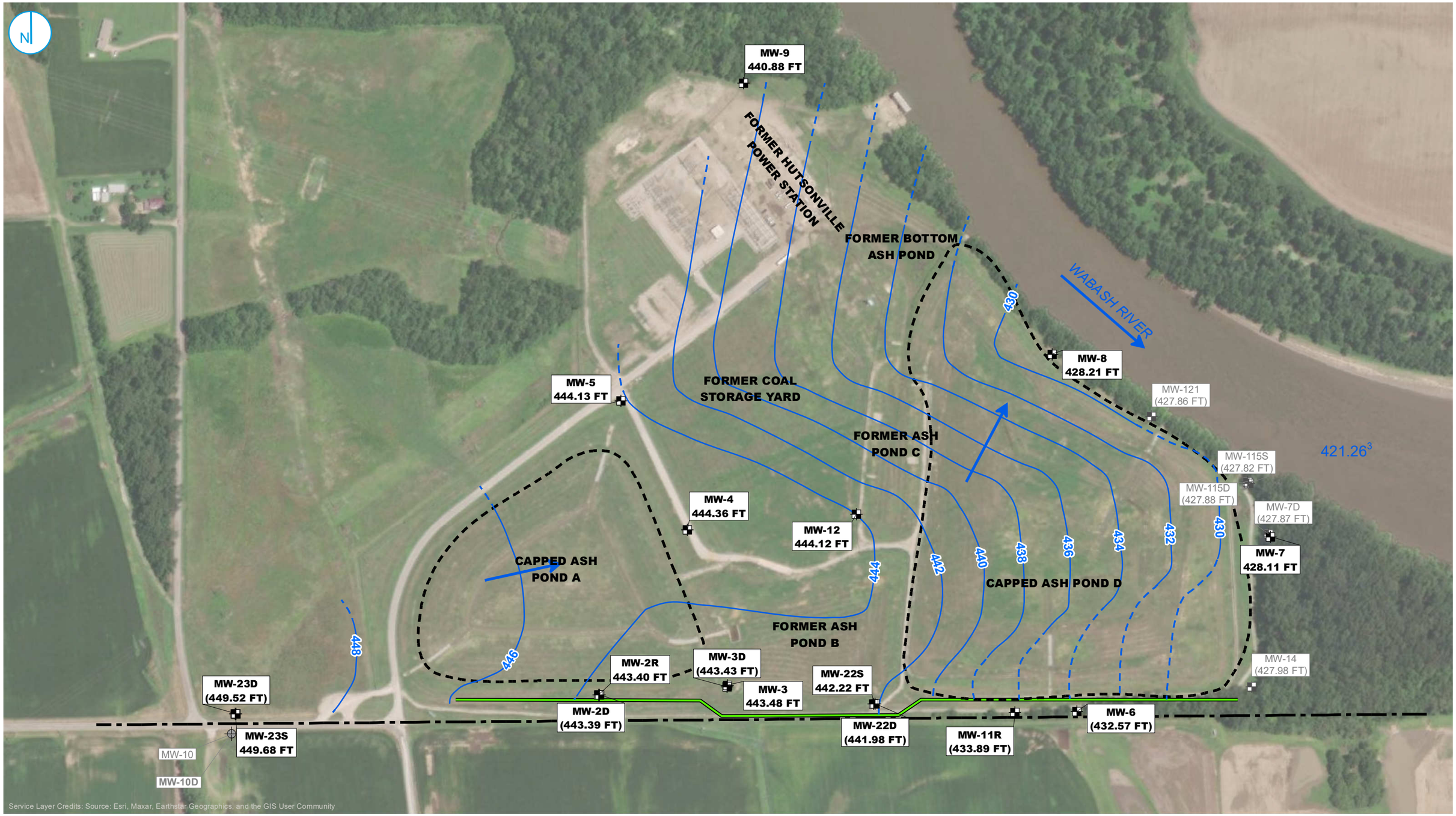


- UPPER MIGRATION ZONE MONITORING WELL
- DEEP MIGRATION ZONE MONITORING WELL
- ABANDONED MONITORING WELL LOCATION
- PROPERTY LINE
- GROUNDWATER ELEVATION CONTOUR (2-FT CONTOUR INTERVAL)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- APPROXIMATE BOUNDARY OF CAPPED ASH POND
- GROUNDWATER COLLECTION TRENCH (BEGAN OPERATION APRIL 2015)

0 150 300 Feet

Notes
1) GROUNDWATER AND RIVER ELEVATIONS REPORTED IN FEET NORTH AMERICAN VERTICAL DATUM OF 1988.
2) GROUNDWATER ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.
3) WABASH RIVER ELEVATIONS AS REPORTED BY USGS FROM USGS 03342000 WABASH RIVER AT RIVERTON, IN LOCATED APPROXIMATELY 12.5 RIVER MILES DOWNSTREAM. RIVER ELEVATION REPORTED IN FEET NATIONAL GEODETIC VERTICAL DATUM OF 1929 AND CONVERTED TO FEET NORTH AMERICAN VERTICAL DATUM OF 1988.

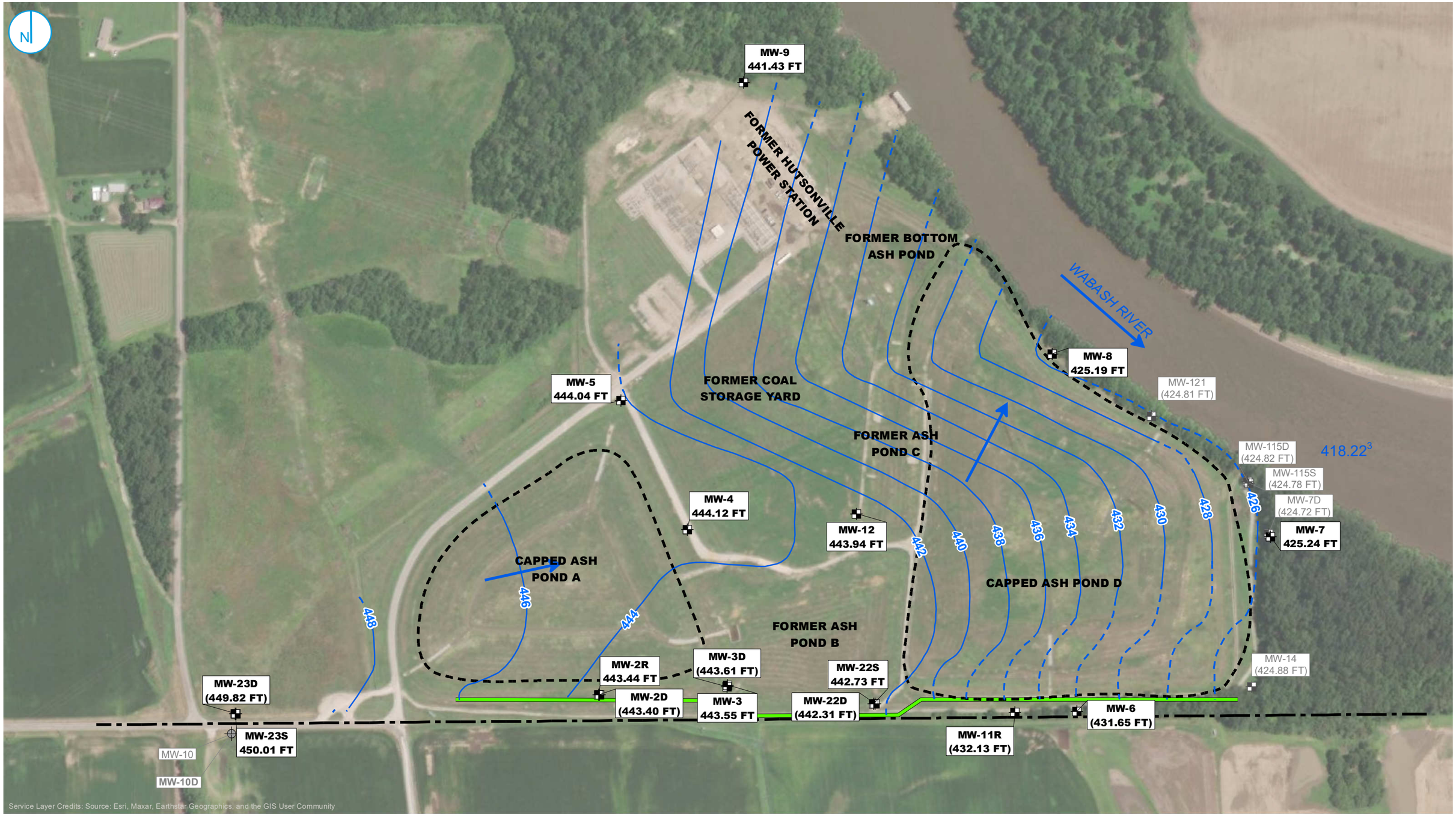
Q2 UPPER MIGRATION ZONE GROUNDWATER ELEVATION CONTOUR MAP JUNE 20, 2022

2022 ANNUAL REPORT
FORMER HUTSONVILLE POWER STATION - ASH POND D
AMEREN ENERGY MEDINA VALLEY COGEN, LLC
HUTSONVILLE, IL

FIGURE 3-2

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC
A RAMBOLL COMPANY

RAMBOLL



- UPPER MIGRATION ZONE MONITORING WELL
- DEEP MIGRATION ZONE MONITORING WELL
- ABANDONED MONITORING WELL LOCATION
- PROPERTY LINE
- GROUNDWATER ELEVATION CONTOUR (2-FT CONTOUR INTERVAL)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- APPROXIMATE BOUNDARY OF CAPPED ASH POND
- GROUNDWATER COLLECTION TRENCH (BEGAN OPERATION APRIL 2015)

0 150 300 Feet

Notes
1) GROUNDWATER AND RIVER ELEVATIONS REPORTED IN FEET NORTH AMERICAN VERTICAL DATUM OF 1988.
2) GROUNDWATER ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.
3) WABASH RIVER ELEVATIONS AS REPORTED BY USGS FROM USGS 03342000 WABASH RIVER AT RIVERTON, IN LOCATED APPROXIMATELY 12.5 RIVER MILES DOWNSTREAM. RIVER ELEVATION REPORTED IN FEET NATIONAL GEODETIC VERTICAL DATUM OF 1929 AND CONVERTED TO FEET NORTH AMERICAN VERTICAL DATUM OF 1988.

Q3 UPPER MIGRATION ZONE GROUNDWATER ELEVATION CONTOUR MAP AUGUST 8, 2022

2022 ANNUAL REPORT
FORMER HUTSONVILLE POWER STATION - ASH POND D
AMEREN ENERGY MEDINA VALLEY COGEN, LLC
HUTSONVILLE, IL

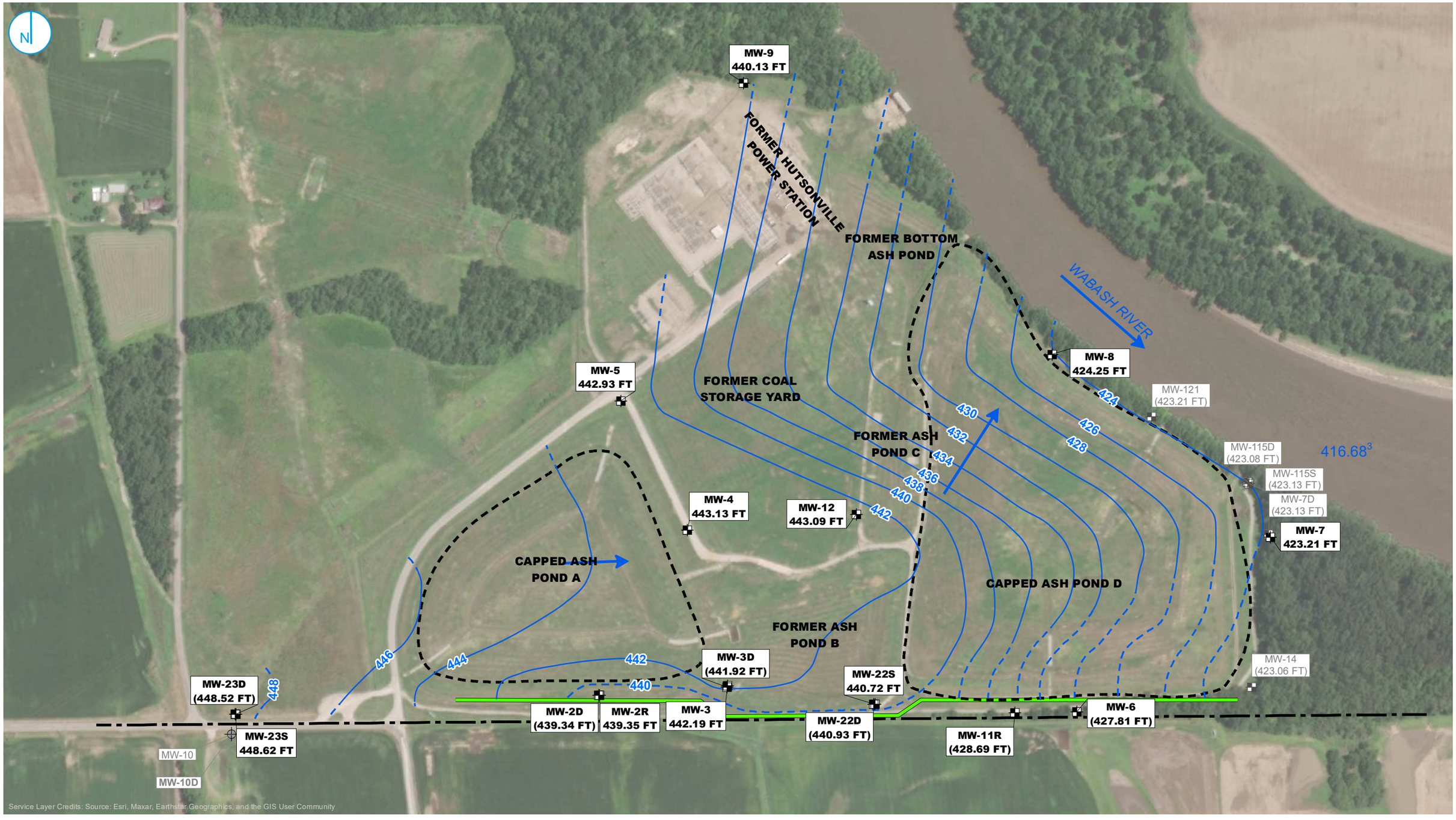
FIGURE 3-3

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC
A RAMBOLL COMPANY

RAMBOLL

Y:\Mapping\Projects\241420\MXDs\2022APD\Figure 3-4_Q4_2022_GW_Elevation.mxd

PROJECT: 169000XXXX | DATED: 1/19/2023 | DESIGNER: galammc



- UPPER MIGRATION ZONE MONITORING WELL
- DEEP MIGRATION ZONE MONITORING WELL
- ABANDONED MONITORING WELL LOCATION
- PROPERTY LINE
- GROUNDWATER ELEVATION CONTOUR (2-FT CONTOUR INTERVAL)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- APPROXIMATE BOUNDARY OF CAPPED ASH POND
- GROUNDWATER COLLECTION TRENCH (BEGAN OPERATION APRIL 2015)

0 150 300 Feet

Notes
1) GROUNDWATER AND RIVER ELEVATIONS REPORTED IN FEET NORTH AMERICAN VERTICAL DATUM OF 1988.
2) GROUNDWATER ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.
3) WABASH RIVER ELEVATIONS AS REPORTED BY USGS FROM USGS 03342000 WABASH RIVER AT RIVERTON, IN LOCATED APPROXIMATELY 12.5 RIVER MILES DOWNSTREAM. RIVER ELEVATION REPORTED IN FEET NATIONAL GEODETIC VERTICAL DATUM OF 1929 AND CONVERTED TO FEET NORTH AMERICAN VERTICAL DATUM OF 1988.

Q4 UPPER MIGRATION ZONE GROUNDWATER ELEVATION CONTOUR MAP OCTOBER 24, 2022

2022 ANNUAL REPORT
FORMER HUTSONVILLE POWER STATION - ASH POND D
AMEREN ENERGY MEDINA VALLEY COGEN, LLC
HUTSONVILLE, IL

FIGURE 3-4

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC
A RAMBOLL COMPANY

RAMBOLL

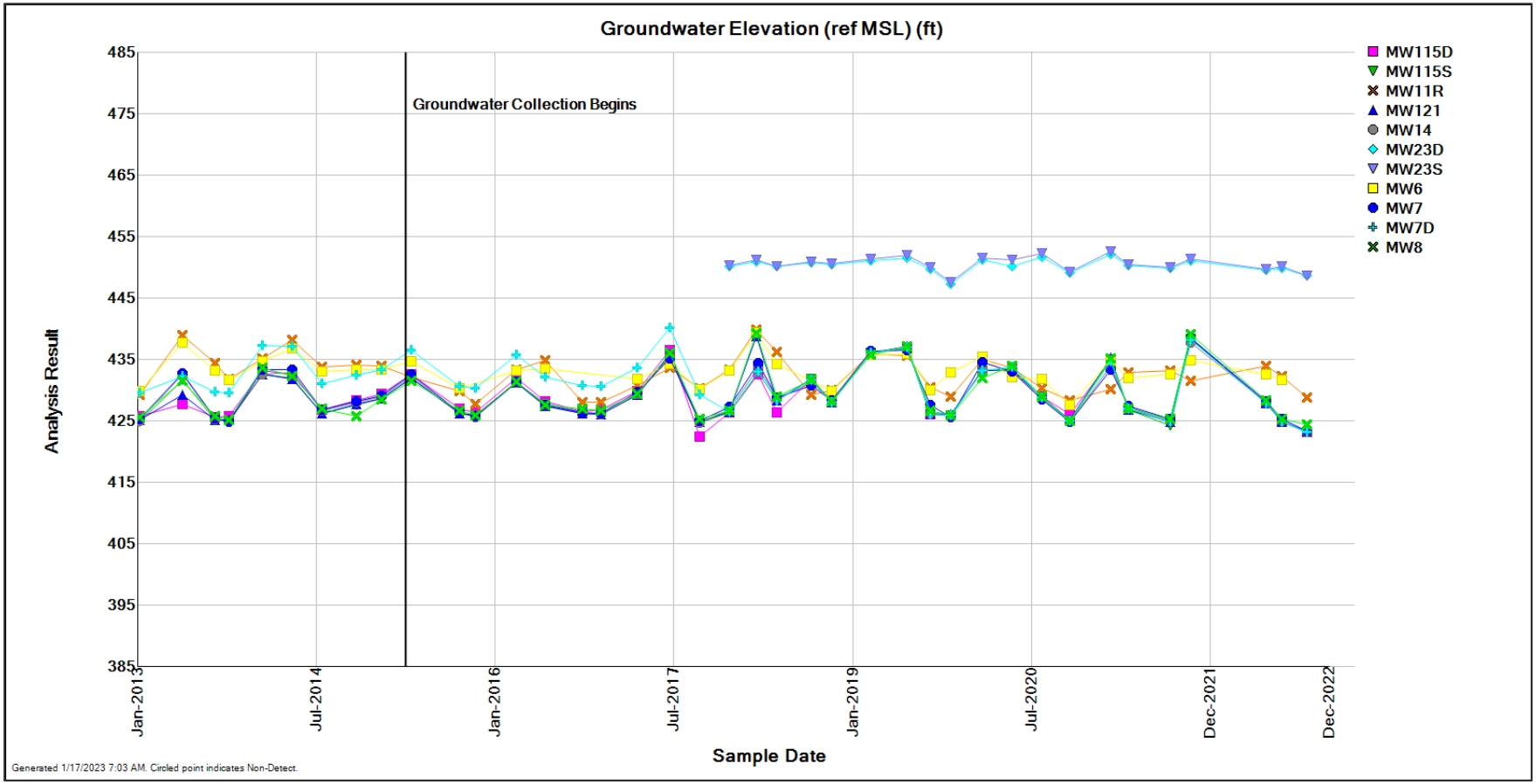


Figure 3-5. Groundwater elevations near groundwater collection trench.

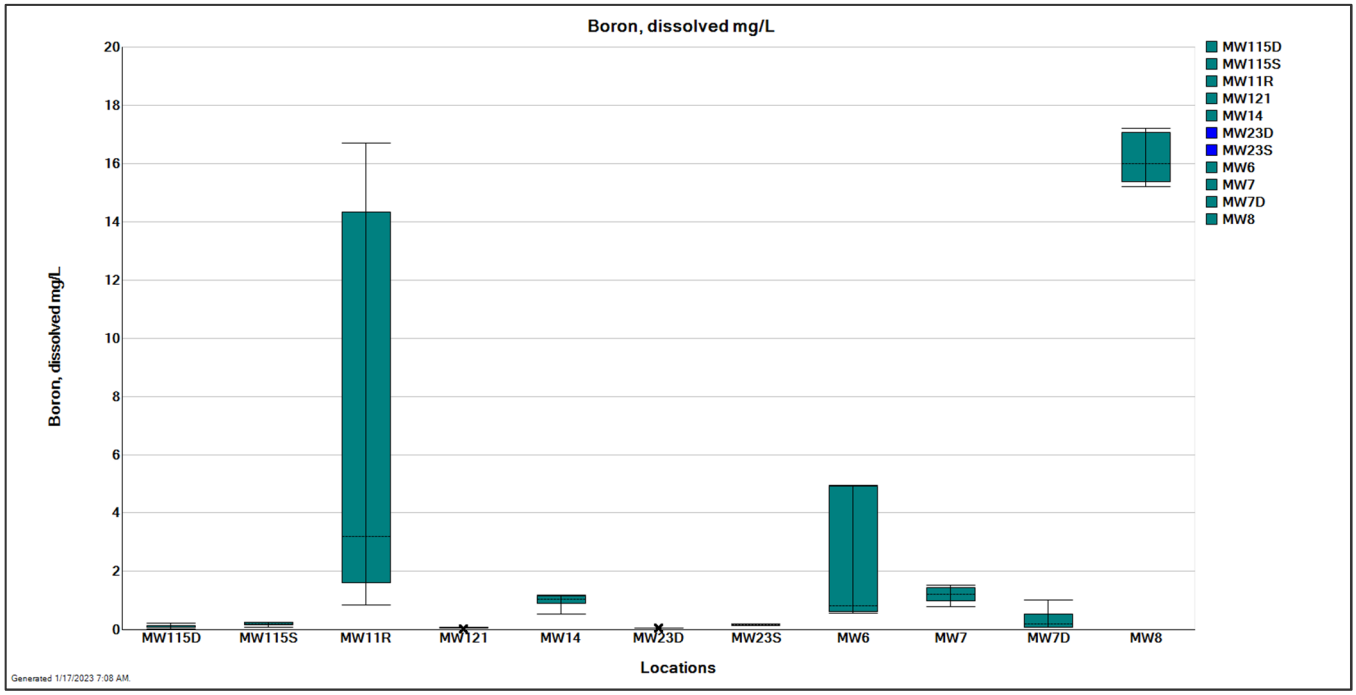


Figure 3-6. Box-whisker plot showing distribution of **boron** concentration by monitoring well for data collected in 2021 and 2022. Note: Note: Box-whisker plots for background wells are blue and box-whisker plots for compliance wells are green.

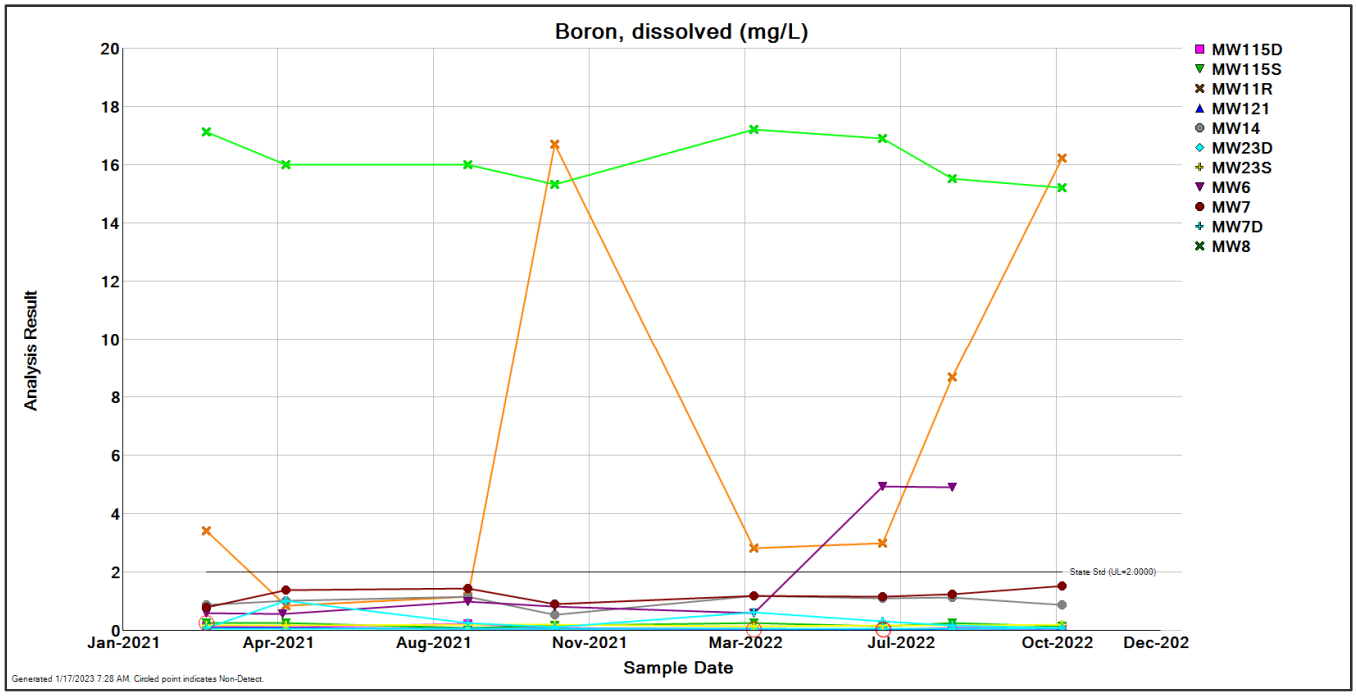


Figure 3-7. Boron concentrations during the reporting period (2021-2022) at all background and compliance wells. Circled results indicate non-detects.

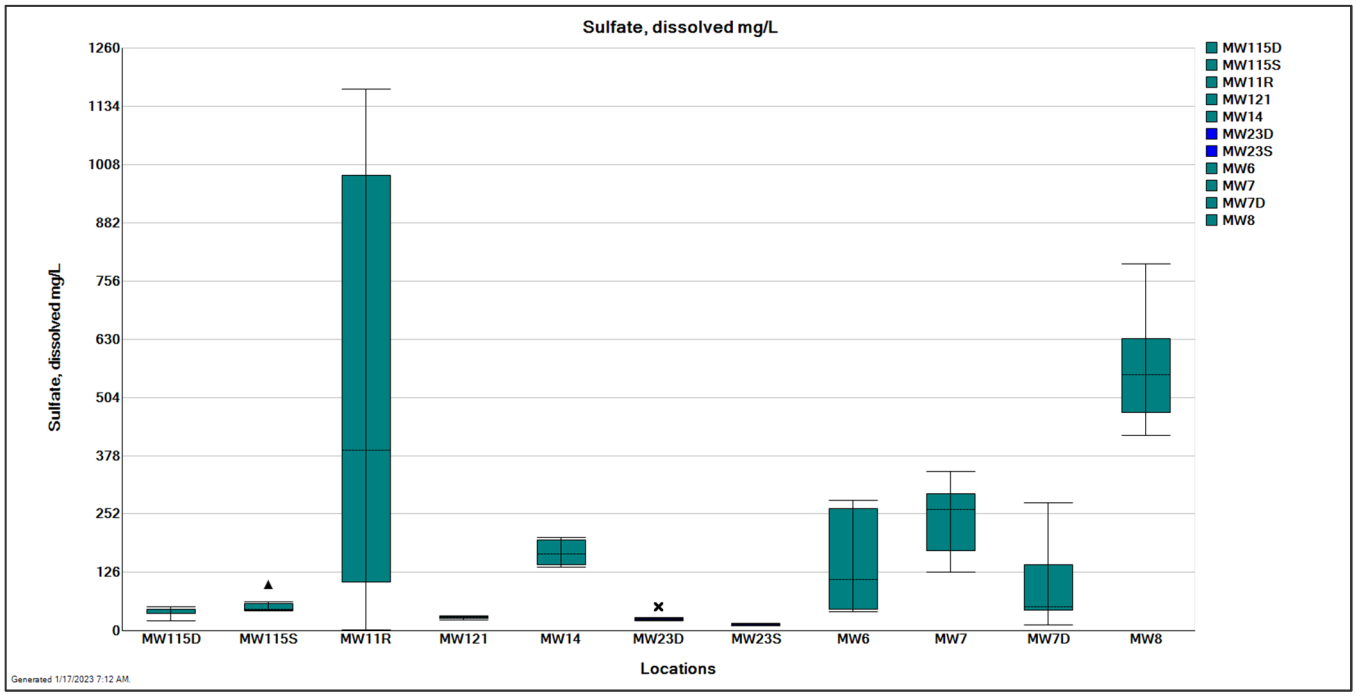


Figure 3-8. Box-whisker plot showing distribution of **sulfate** concentration by monitoring well for data collected in 2021 and 2022. Note: Box-whisker plots for background wells are blue and box-whisker plots for compliance wells are green.

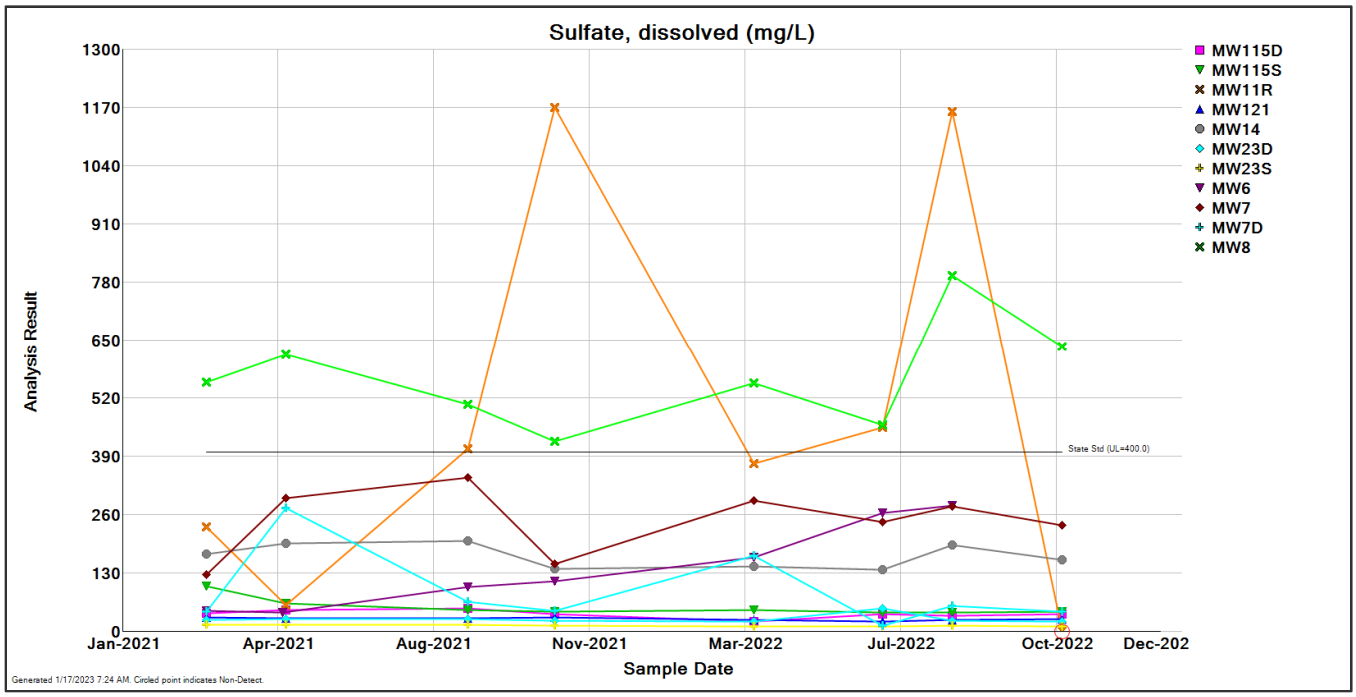


Figure 3-9. Sulfate concentrations during the reporting period (2021-2022) at all background and compliance wells. Circled results indicate non-detects.

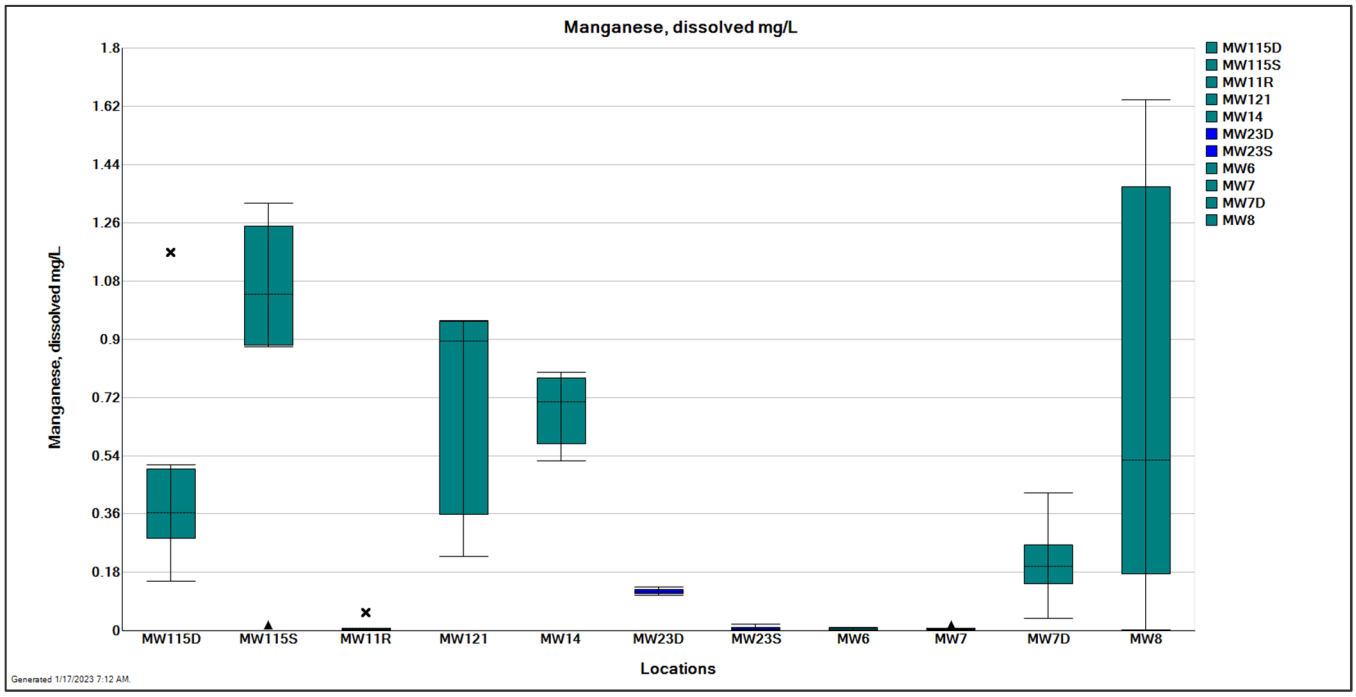


Figure 3-10. Box-whisker plot showing distribution of **manganese** concentration by monitoring well for data collected in 2021 and 2022. Note: Box-whisker plots for background wells are blue and box-whisker plots for compliance wells are green.

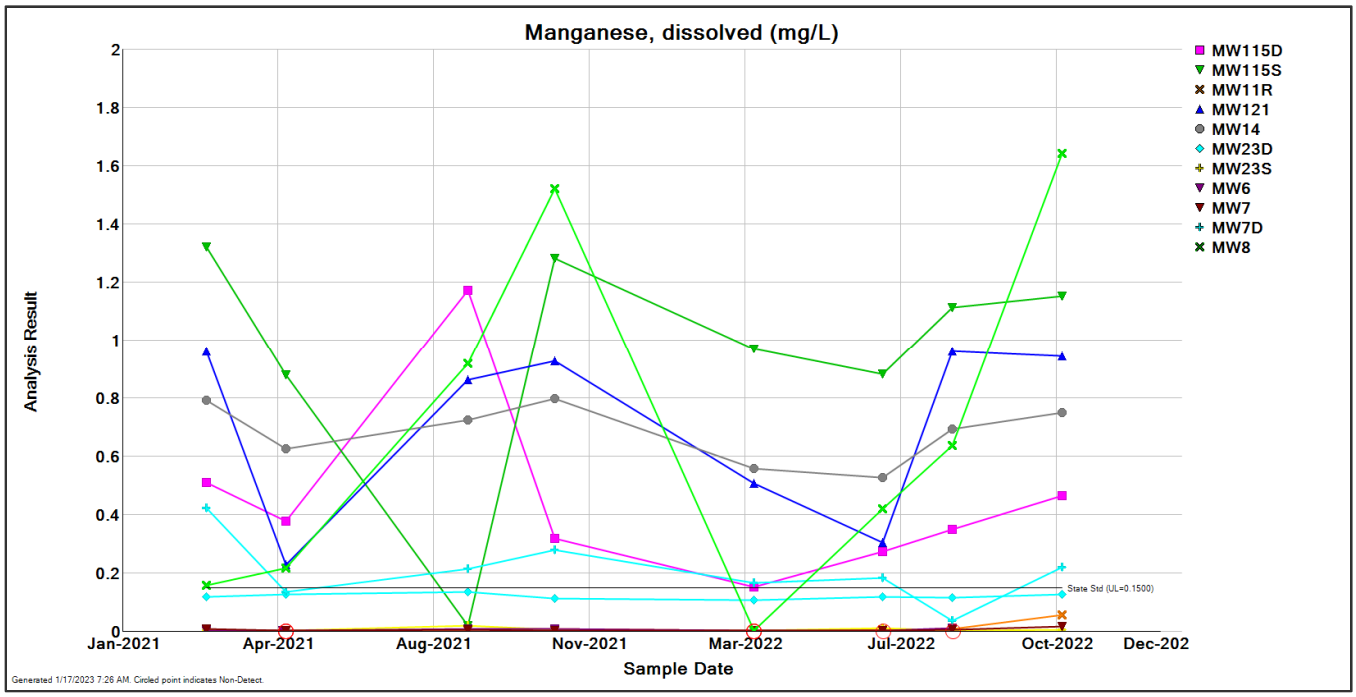


Figure 3-11. Manganese concentrations during the reporting period (2021-2022) at at all background and compliance wells. Circled results indicate non-detects.

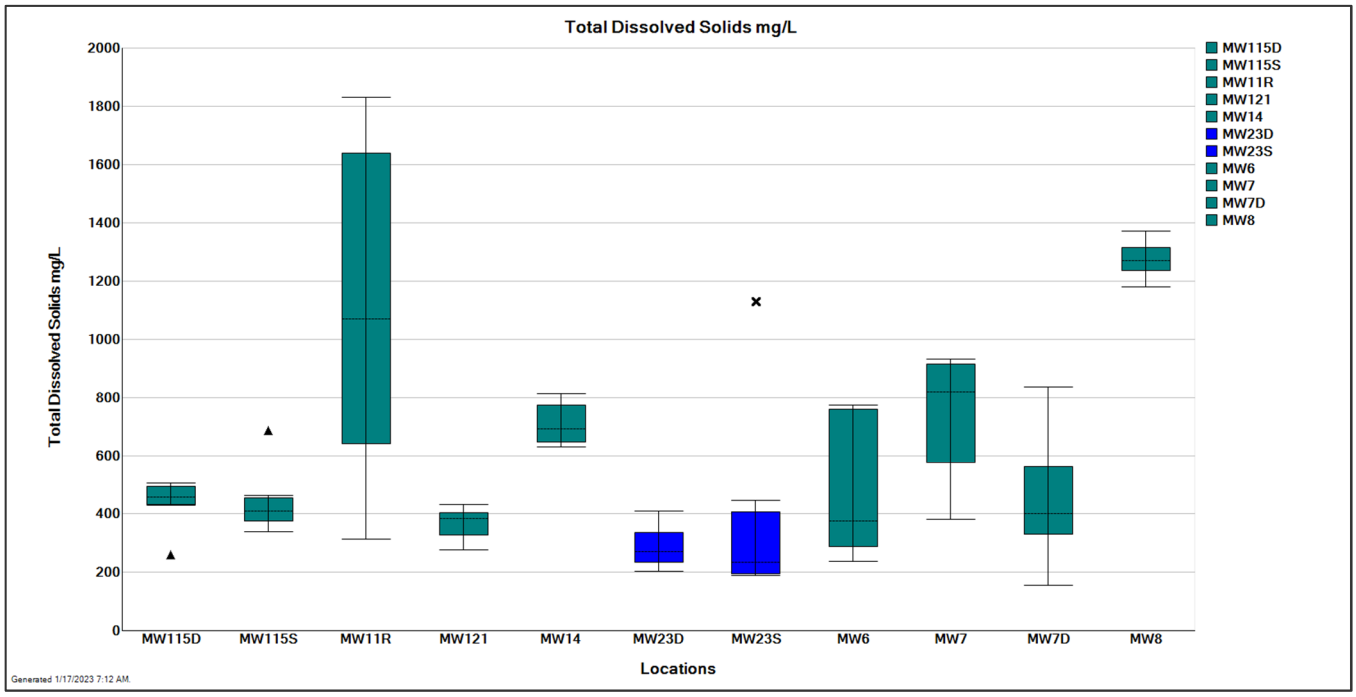


Figure 3-12. Box-whisker plot showing distribution of **total dissolved solids** concentration by monitoring well for data collected in 2021 and 2022. Note: Box-whisker plots for background wells are blue and box-whisker plots for compliance wells are green.

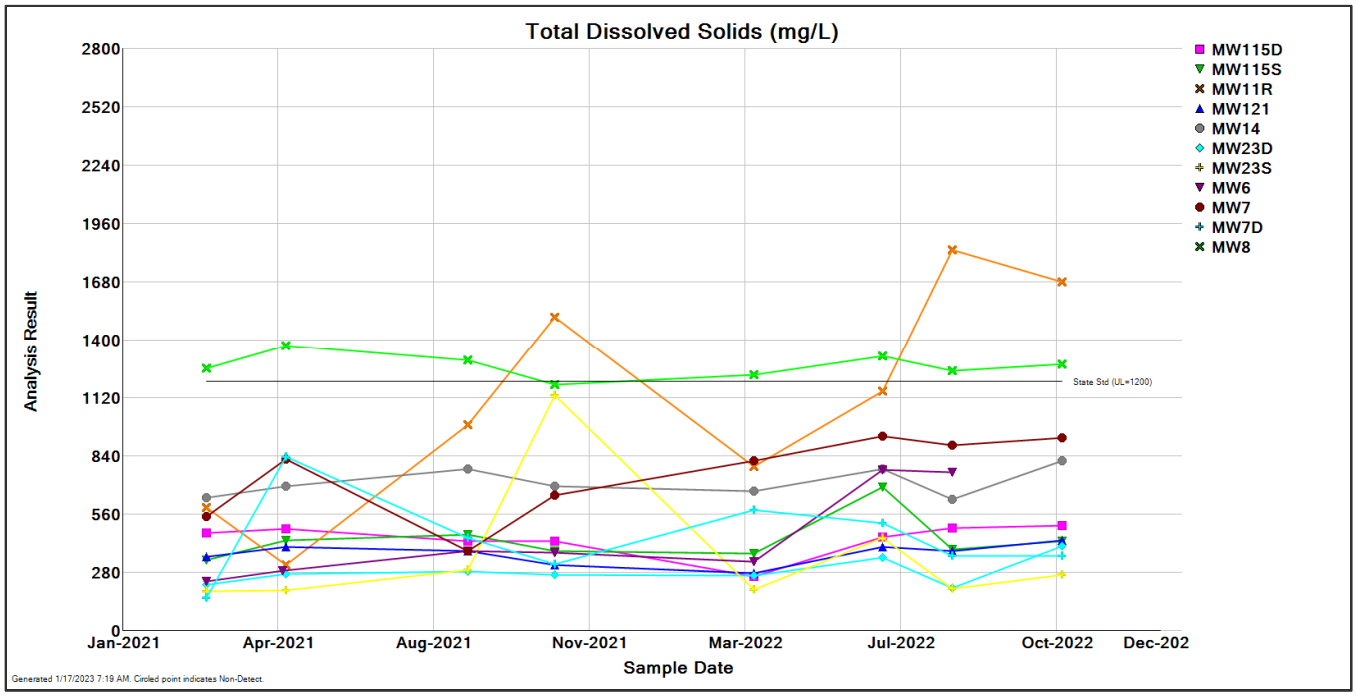


Figure 3-13. Total dissolved solids concentrations during the reporting period (2021-2022) at all background and compliance wells.

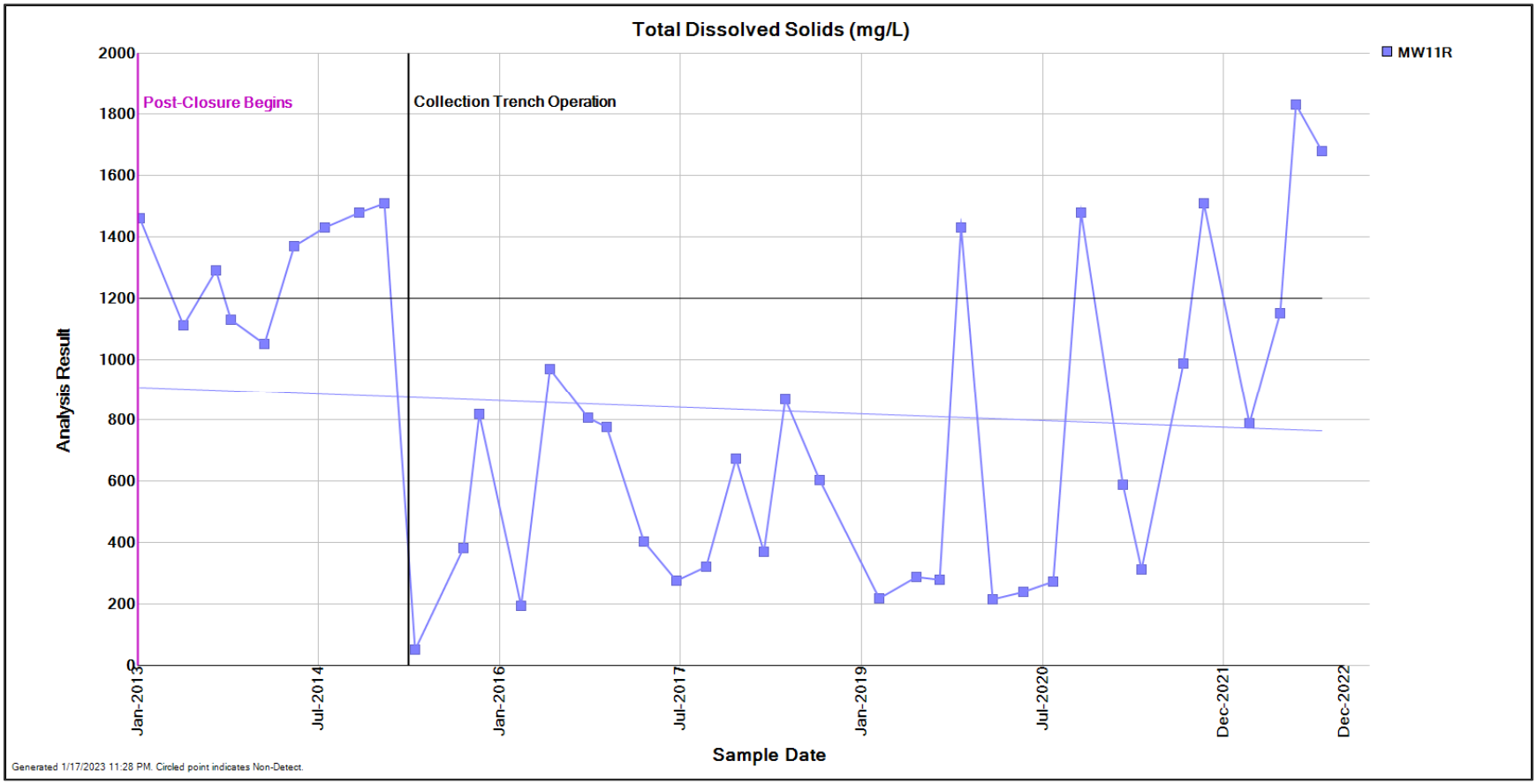


Figure 4-1. Total dissolved soilds concentrations over time since closure completion (2013) at compliance wells MW-11R. (Note: Lines through the concentration data represent the best fit linear regressions)

APPENDIX A
GROUNDWATER MONITORING RESULTS 2021-2022

Hutsonville Ash Impoundment
Analysis Results by Date (column) and Parameter (row)

Date Range: 01/01/2021 to 12/31/2022
Well: MW6

	3/1/2021	4/24/2021	9/1/2021	11/1/2021	3/21/2022	6/20/2022	8/8/2022
Ag, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
As, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
B, diss, mg/L	0.5800	0.5500	0.9600	0.8100	0.5800	4.9100	4.8800
Ba, diss, mg/L	0.010	0.020	0.020	0.019	0.027	0.033	0.066
Be, diss, mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Cd, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Cl, diss, mg/L	8.6	11.5	8.1	15.9	15.6	13.4	12.5
CN, total, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Co, diss, mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cr, diss, mg/L	0.0003	0.0003	<0.0010	0.0003	0.0003	<0.0010	<0.0010
Cu, diss, mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
F, diss, mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fe, diss, mg/L	<0.010	0.047	0.237	0.135	0.085	<0.010	<0.010
GW Depth (TOC), ft	8.35	11.35	10.67	8.35	5.53	10.60	11.52
GW Elv, ft	434.82	431.82	432.50	434.82		432.57	431.65
Hg, diss, mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Mn, diss, mg/L	0.0010	0.0023	0.0067	0.0057	<0.0010	<0.0010	0.0085
Ni, diss, mg/L	0.0003	0.0003	0.0003	<0.0003	0.0002	0.0011	0.0010
NO3, diss, mg/L	0.282	0.852	1.400	0.209	1.130	2.480	2.560
Pb, diss, mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
pH (field), STD	7.01	6.98	6.64	6.82	7.08	6.60	6.54
Sb, diss, mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Se, diss, mg/L	0.0054	0.0045	0.0016	0.0039	0.0024	0.0014	0.0011
SO4, diss, mg/L	44.2	40.7	98.4	110.0	164.0	262.0	280.0
Spec. Cond. (field), micromho	609	533	628	897	751	863	1110
TDS, mg/L	234	286	382	374	328	772	760
Temp (Fahrenheit), degrees F	48.0	52.2	65.8	59.1	50.8	59.8	68.4
Tl, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Zn, diss, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Hutsonville Ash Impoundment
Analysis Results by Date (column) and Parameter (row)

Date Range: 01/01/2021 to 12/31/2022
Well: MW7

	3/1/2021	4/26/2021	9/1/2021	11/1/2021	3/21/2022	6/20/2022	8/8/2022	10/24/2022
Ag, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
As, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
B, diss, mg/L	0.7800	1.3800	1.4300	0.9000	1.1800	1.1300	1.2200	1.5100
Ba, diss, mg/L	0.031	0.049	0.052	0.044	0.054	0.046	0.056	0.050
Be, diss, mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Cd, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Cl, diss, mg/L	19.5	6.9	9.6	15.7	20.4	11.6	11.2	8.7
CN, total, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Co, diss, mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cr, diss, mg/L	<0.0010	0.0003	<0.0010	<0.0010	0.0004	<0.0010	<0.0010	<0.0010
Cu, diss, mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
F, diss, mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fe, diss, mg/L	<0.010	0.044	0.250	0.144	0.088	<0.010	<0.010	<0.010
GW Depth (TOC), ft	8.95	14.93	17.08	3.90	7.91	14.17	17.04	19.07
GW Elv, ft	433.33	427.35	425.20	438.38		428.11	425.24	423.21
Hg, diss, mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Mn, diss, mg/L	0.0058	<0.0010	0.0032	0.0024	<0.0010	0.0022	0.0047	0.0168
Ni, diss, mg/L	0.0012	0.0004	0.0004	0.0002	0.0003	0.0005	0.0006	0.0005
NO3, diss, mg/L	<0.100	0.742	1.310	0.454	1.080	0.895	0.904	0.499
Pb, diss, mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
pH (field), STD	6.85	6.78	6.66	6.88	6.84	6.67	6.72	6.73
Sb, diss, mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Se, diss, mg/L	<0.0005	0.0043	0.0037	0.0019	0.0035	0.0019	0.0013	<0.0005
SO4, diss, mg/L	126.0	295.0	341.0	149.0	291.0	242.0	277.0	236.0
Spec. Cond. (field), micromho	1000	1220	1300	1080	1250	1100	1320	1090
TDS, mg/L	548	824	380	650	814	932	888	924
Temp (Fahrenheit), degrees F	54.0	54.8	59.4	56.0	56.1	56.7	65.0	62.4
Tl, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Zn, diss, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Hutsonville Ash Impoundment
Analysis Results by Date (column) and Parameter (row)

Date Range: 01/01/2021 to 12/31/2022
Well: MW7D

	3/1/2021	4/26/2021	9/1/2021	11/1/2021	3/21/2022	6/20/2022	8/8/2022	10/24/2022
Ag, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
As, diss, mg/L	0.0016	0.0018	0.0018	0.0020	0.0014	0.0017	0.0005	0.0018
B, diss, mg/L	0.0700	0.9900	0.2400	0.0900	0.6100	0.2900	0.1500	0.0700
Ba, diss, mg/L	0.033	0.066	0.042	0.036	0.055	0.037	0.036	0.041
Be, diss, mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Cd, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Cl, diss, mg/L	16.8	6.7	16.0	16.7	18.1	14.2	16.3	13.1
CN, total, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Co, diss, mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cr, diss, mg/L	<0.0010	<0.0010	<0.0010	<0.0010	0.0003	<0.0010	<0.0010	<0.0010
Cu, diss, mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
F, diss, mg/L	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fe, diss, mg/L	0.045	0.408	0.645	0.155	0.115	0.102	<0.010	0.033
GW Depth (TOC), ft	8.20	15.84	17.95	4.65	9.35	14.88	18.03	19.62
GW Elv, ft	434.55	426.91	424.80	438.10		427.87	424.72	423.13
Hg, diss, mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Mn, diss, mg/L	0.4220	0.1330	0.2120	0.2770	0.1640	0.1820	0.0356	0.2170
Ni, diss, mg/L	0.0003	0.0008	0.0006	0.0002	0.0005	0.0007	0.0006	0.0007
NO3, diss, mg/L	<0.100	0.276	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Pb, diss, mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
pH (field), STD	7.45	6.95	7.31	7.46	7.22	6.96	7.11	7.21
Sb, diss, mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Se, diss, mg/L	<0.0005	0.0018	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
SO4, diss, mg/L	43.4	274.0	65.0	44.7	167.0	12.4	55.4	43.6
Spec. Cond. (field), micromho	690	1220	760	667	992	711	697	526
TDS, mg/L	154	834	442	318	576	514	358	358
Temp (Fahrenheit), degrees F	52.1	56.3	59.0	55.8	57.7	59.5	65.1	61.6
Tl, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Zn, diss, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Hutsonville Ash Impoundment
Analysis Results by Date (column) and Parameter (row)

Date Range: 01/01/2021 to 12/31/2022
Well: MW8

	3/1/2021	4/26/2021	9/1/2021	11/1/2021	3/21/2022	6/20/2022	8/8/2022	10/24/2022
Ag, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
As, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
B, diss, mg/L	17.1000	16.0000	16.0000	15.3000	17.2000	16.9000	15.5000	15.2000
Ba, diss, mg/L	0.014	0.016	0.017	0.015	0.017	0.015	0.016	0.020
Be, diss, mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Cd, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Cl, diss, mg/L	11.3	10.0	11.2	15.6	14.1	11.0	11.0	12.7
CN, total, mg/L	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01
Co, diss, mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cr, diss, mg/L	<0.0010	<0.0010	<0.0010	<0.0010	0.0004	<0.0010	<0.0010	<0.0010
Cu, diss, mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
F, diss, mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fe, diss, mg/L	<0.010	0.046	0.335	0.142	0.116	<0.010	<0.010	<0.010
GW Depth (TOC), ft	8.53	16.76	18.44	4.62	10.66	15.44	18.46	19.40
GW Elv, ft	435.12	426.89	425.21	439.03		428.21	425.19	424.25
Hg, diss, mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Mn, diss, mg/L	0.1560	0.2150	0.9170	1.5200	0.0021	0.4190	0.6350	1.6400
Ni, diss, mg/L	0.0045	0.0049	0.0060	0.0066	0.0042	0.0070	0.0066	0.0074
NO3, diss, mg/L	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Pb, diss, mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
pH (field), STD	6.95	7.09	6.83	6.86	7.21	6.82	6.84	6.83
Sb, diss, mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Se, diss, mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
SO4, diss, mg/L	554.0	616.0	504.0	422.0	552.0	459.0	793.0	635.0
Spec. Cond. (field), micromho	1730	1600	1620	1650	1620	1320	1540	1450
TDS, mg/L	1260	1370	1300	1180	1230	1320	1250	1280
Temp (Fahrenheit), degrees F	51.6	59.2	63.5	62.9	59.8	63.5	69.2	68.4
Tl, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Zn, diss, mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Hutsonville Ash Impoundment
Analysis Results by Date (column) and Parameter (row)

Date Range: 01/01/2021 to 12/31/2022
Well: MW11R

	3/1/2021	4/26/2021	9/1/2021	11/1/2021	3/21/2022	6/20/2022	8/8/2022	10/24/2022
Ag, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0005	<0.0003	<0.0003	<0.0003	<0.0003
As, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
B, diss, mg/L	3.3900	0.8300	1.1500	16.7000	2.8000	2.9600	8.6500	16.2000
Ba, diss, mg/L	0.042	0.036	0.098	0.085	0.060	0.054	0.072	0.066
Be, diss, mg/L	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010
Cd, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	0.0006	<0.0003
Cl, diss, mg/L	15.9	9.3	10.2	21.2	16.6	11.4	7.7	8.0
CN, total, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Co, diss, mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cr, diss, mg/L	<0.0010	<0.0010	<0.0010	<0.0010	0.0004	<0.0010	<0.0010	<0.0010
Cu, diss, mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
F, diss, mg/L	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fe, diss, mg/L	<0.010	0.041	0.157	0.129	0.107	<0.010	<0.010	<0.010
GW Depth (TOC), ft	12.94	10.25	9.91	11.53	5.20	9.12	10.88	14.32
GW Elv, ft	430.07	432.76	433.10	431.48		433.89	432.13	428.69
Hg, diss, mg/L	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001
Mn, diss, mg/L	0.0008	<0.0010	0.0035	0.0062	<0.0010	0.0031	0.0060	0.0563
Ni, diss, mg/L	0.0005	0.0002	0.0011	0.0013	0.0015	0.0027	0.0020	0.0019
NO3, diss, mg/L	8.660	8.390	2.800	<0.100	1.770	4.000	0.947	0.569
Pb, diss, mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
pH (field), STD	6.93	7.31	6.55	6.68	6.63	6.21	6.47	6.76
Sb, diss, mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Se, diss, mg/L	0.0018	<0.0005	0.0016	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
SO4, diss, mg/L	231.0	58.4	406.0	1170.0	372.0	453.0	1160.0	<0.5
Spec. Cond. (field), micromho	1110	534	1270	760	1130	1070	2340	1630
TDS, mg/L	588	312	986	1510	788	1150	1830	1680
Temp (Fahrenheit), degrees F	54.0	52.1	65.7	59.7	50.9	61.1	71.9	66.3
Tl, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Zn, diss, mg/L	<0.01	<0.01	0.01	<0.01	<0.01	0.01	0.02	<0.01

Hutsonville Ash Impoundment
Analysis Results by Date (column) and Parameter (row)

Date Range: 01/01/2021 to 12/31/2022
Well: MW14

	3/1/2021	4/26/2021	9/1/2021	11/1/2021	3/21/2022	6/20/2022	8/8/2022	10/24/2022
Ag, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
As, diss, mg/L	0.0012	0.0019	0.0009	0.0023	0.0010	0.0007	0.0008	0.0010
B, diss, mg/L	0.8600	0.9900	1.1300	0.5200	1.1800	1.0800	1.1200	0.8500
Ba, diss, mg/L	0.063	0.073	0.074	0.070	0.077	0.072	0.074	0.071
Be, diss, mg/L	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010
Cd, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Cl, diss, mg/L	26.0	18.2	19.7	24.6	20.3	15.8	18.3	18.4
CN, total, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Co, diss, mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cr, diss, mg/L	<0.0010	<0.0010	<0.0010	<0.0010	0.0003	<0.0010	<0.0010	<0.0010
Cu, diss, mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
F, diss, mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fe, diss, mg/L	0.139	0.398	0.715	0.816	0.077	<0.010	<0.010	<0.010
GW Depth (TOC), ft	9.02	15.74	17.95	5.26	9.15	14.91	18.01	19.83
GW Elv, ft	433.87	427.15	424.94	437.63		427.98	424.88	423.06
Hg, diss, mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Mn, diss, mg/L	0.7890	0.6240	0.7220	0.7970	0.5570	0.5240	0.6920	0.7490
Ni, diss, mg/L	0.0011	0.0018	0.0015	0.0012	0.0018	0.0022	0.0026	0.0017
NO3, diss, mg/L	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Pb, diss, mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
pH (field), STD	6.89	6.89	6.90	6.99	7.10	6.84	6.87	6.93
Sb, diss, mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Se, diss, mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
SO4, diss, mg/L	172.0	195.0	200.0	139.0	143.0	136.0	192.0	158.0
Spec. Cond. (field), micromho	1230	1110	1150	1140	1030	890	1070	905
TDS, mg/L	636	692	774	692	670	774	630	814
Temp (Fahrenheit), degrees F	50.7	54.9	57.7	54.1	55.6	57.9	65.1	63.2
Tl, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Zn, diss, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Hutsonville Ash Impoundment
Analysis Results by Date (column) and Parameter (row)

Date Range: 01/01/2021 to 12/31/2022
Well: MW23D

	3/1/2021	4/26/2021	9/1/2021	11/1/2021	3/21/2022	6/20/2022	8/8/2022	10/24/2022
Ag, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
As, diss, mg/L	0.0012	0.0030	0.0025	0.0027	0.0012	0.0098	0.0023	0.0026
B, diss, mg/L	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0600
Ba, diss, mg/L	0.043	0.049	0.048	0.042	0.051	0.045	0.048	0.047
Be, diss, mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Cd, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Cl, diss, mg/L	4.9	4.1	4.7	4.6	4.2	3.7	4.1	7.1
CN, total, mg/L	<0.01	<0.01	<0.01	<0.01	0.06	0.05	<0.01	<0.01
Co, diss, mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cr, diss, mg/L	0.0003	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Cu, diss, mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
F, diss, mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fe, diss, mg/L	0.076	0.248	0.557	0.445	0.123	<0.010	0.059	0.249
GW Depth (TOC), ft	3.78	5.62	6.14	4.85	5.90	6.38	6.08	7.38
GW Elv, ft	452.12	450.28	449.76	451.05		449.52	449.82	448.52
Hg, diss, mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Mn, diss, mg/L	0.1160	0.1250	0.1340	0.1100	0.1070	0.1180	0.1150	0.1240
Ni, diss, mg/L	<0.0003	0.0002	0.0003	<0.0003	0.0002	0.0003	0.0016	0.0005
NO3, diss, mg/L	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Pb, diss, mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
pH (field), STD	7.34	7.31	7.30	7.34	7.44	7.01	4.83	7.16
Sb, diss, mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Se, diss, mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
SO4, diss, mg/L	24.1	25.8	26.8	22.2	21.2	51.0	22.0	20.7
Spec. Cond. (field), micromho	524	492	506	482	495	430	465	442
TDS, mg/L	218	272	282	266	264	350	202	406
Temp (Fahrenheit), degrees F	52.3	58.2	64.5	60.0	58.9	63.1	82.5	67.5
Tl, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Zn, diss, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Hutsonville Ash Impoundment
Analysis Results by Date (column) and Parameter (row)

Date Range: 01/01/2021 to 12/31/2022
Well: MW23S

	3/1/2021	4/26/2021	9/1/2021	11/1/2021	3/21/2022	6/20/2022	8/8/2022	10/24/2022
Ag, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
As, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
B, diss, mg/L	0.1500	0.1500	0.1700	0.1800	0.1400	0.1600	0.1600	0.1800
Ba, diss, mg/L	0.034	0.042	0.040	0.037	0.039	0.032	0.040	0.037
Be, diss, mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Cd, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Cl, diss, mg/L	3.5	1.6	1.9	4.2	9.3	1.3	1.9	1.2
CN, total, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01
Co, diss, mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cr, diss, mg/L	<0.0010	<0.0010	<0.0010	<0.0010	0.0003	<0.0010	<0.0010	<0.0010
Cu, diss, mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
F, diss, mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fe, diss, mg/L	<0.010	0.036	0.285	0.056	0.105	<0.010	<0.010	<0.010
GW Depth (TOC), ft	3.58	5.59	6.12	4.68	5.60	6.35	6.02	7.41
GW Elv, ft	452.45	450.44	449.91	451.35		449.68	450.01	448.62
Hg, diss, mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Mn, diss, mg/L	0.0020	<0.0010	0.0194	0.0055	0.0025	0.0111	<0.0010	0.0035
Ni, diss, mg/L	0.0002	0.0003	0.0002	<0.0003	0.0002	0.0004	0.0005	0.0003
NO3, diss, mg/L	0.262	0.269	<0.100	0.248	<0.100	<0.100	<0.100	<0.100
Pb, diss, mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
pH (field), STD	7.06	6.81	6.79	6.98	6.99	6.76	6.87	6.96
Sb, diss, mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Se, diss, mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
SO4, diss, mg/L	13.2	14.5	13.4	11.5	10.7	9.5	11.6	9.2
Spec. Cond. (field), micromho	533	444	422	479	488	310	388	349
TDS, mg/L	188	190	288	1130	194	444	200	266
Temp (Fahrenheit), degrees F	51.7	57.9	66.9	61.2	55.5	63.0	69.5	69.5
Tl, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Zn, diss, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Hutsonville Ash Impoundment
Analysis Results by Date (column) and Parameter (row)

Date Range: 01/01/2021 to 12/31/2022
Well: MW115D

	3/1/2021	4/26/2021	9/1/2021	11/1/2021	3/21/2022	6/20/2022	8/8/2022	10/24/2022
Ag, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
As, diss, mg/L	0.0017	0.0031	0.0012	0.0021	0.0011	0.0009	0.0019	0.0024
B, diss, mg/L	0.1300	0.0900	0.2100	0.0700	<0.0250	<0.0250	0.0700	0.0700
Ba, diss, mg/L	0.052	0.069	0.052	0.068	0.061	0.060	0.065	0.059
Be, diss, mg/L	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010
Cd, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Cl, diss, mg/L	119.0	59.2	19.2	40.1	24.8	18.6	60.1	56.4
CN, total, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Co, diss, mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cr, diss, mg/L	<0.0010	<0.0010	<0.0010	<0.0010	0.0004	<0.0010	<0.0010	<0.0010
Cu, diss, mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
F, diss, mg/L	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fe, diss, mg/L	0.163	0.126	1.300	1.180	0.125	<0.010	0.232	<0.010
GW Depth (TOC), ft	6.56	14.58	16.14	3.11	8.06	13.51	16.57	18.31
GW Elv, ft	434.83	426.81	425.25	438.28		427.88	424.82	423.08
Hg, diss, mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Mn, diss, mg/L	0.5080	0.3770	1.1700	0.3180	0.1500	0.2720	0.3470	0.4630
Ni, diss, mg/L	0.0004	0.0005	0.0014	0.0002	0.0039	0.0013	0.0004	0.0006
NO3, diss, mg/L	<0.100	<0.100	<0.100	<0.100	3.420	0.219	<0.100	<0.100
Pb, diss, mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
pH (field), STD	7.29	7.39	7.18	7.36	7.69	6.36	7.27	7.29
Sb, diss, mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Se, diss, mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
SO4, diss, mg/L	39.3	46.4	51.2	37.4	21.1	36.9	33.4	36.8
Spec. Cond. (field), micromho	1180	882	734	945	466	537	831	714
TDS, mg/L	466	488	428	426	258	446	492	502
Temp (Fahrenheit), degrees F	49.4	56.9	59.1	55.9	58.6	61.0	67.7	62.9
Tl, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Zn, diss, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Hutsonville Ash Impoundment
Analysis Results by Date (column) and Parameter (row)

Date Range: 01/01/2021 to 12/31/2022
Well: MW115S

	3/1/2021	4/26/2021	9/1/2021	11/1/2021	3/21/2022	6/20/2022	8/8/2022	10/24/2022
Ag, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
As, diss, mg/L	0.0014	0.0037	0.0006	0.0028	0.0019	0.0021	0.0009	0.0022
B, diss, mg/L	<0.2500	0.2500	0.0800	0.1600	0.2300	0.1400	0.2300	0.1400
Ba, diss, mg/L	0.050	0.057	0.055	0.053	0.055	0.048	0.052	0.054
Be, diss, mg/L	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010
Cd, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Cl, diss, mg/L	17.7	17.6	44.9	15.9	17.0	16.7	16.5	17.7
CN, total, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	0.08	<0.01	<0.01
Co, diss, mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cr, diss, mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Cu, diss, mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
F, diss, mg/L	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1
Fe, diss, mg/L	0.493	0.130	0.357	0.136	0.096	<0.010	0.021	0.445
GW Depth (TOC), ft	6.02	14.07	16.70	2.57	7.52	13.06	16.10	17.75
GW Elv, ft	434.86	426.81	424.18	438.31		427.82	424.78	423.13
Hg, diss, mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Mn, diss, mg/L	1.3200	0.8770	0.0175	1.2800	0.9680	0.8810	1.1100	1.1500
Ni, diss, mg/L	0.0009	0.0008	0.0005	0.0007	0.0010	0.0010	0.0008	0.0009
NO3, diss, mg/L	<0.100	<0.100	0.371	<0.100	<0.100	<0.100	<0.100	<0.100
Pb, diss, mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
pH (field), STD	7.38	7.41	7.45	7.46	7.56	7.10	7.29	7.34
Sb, diss, mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Se, diss, mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
SO4, diss, mg/L	99.8	61.4	47.4	43.6	46.4	41.8	41.7	43.2
Spec. Cond. (field), micromho	865	746	827	750	702	597	743	574
TDS, mg/L	336	430	460	382	370	688	390	426
Temp (Fahrenheit), degrees F	50.8	57.0	59.9	55.8	58.2	60.8	67.5	62.3
Tl, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Zn, diss, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Hutsonville Ash Impoundment
Analysis Results by Date (column) and Parameter (row)

Date Range: 01/01/2021 to 12/31/2022
Well: MW121

	3/1/2021	4/26/2021	9/1/2021	11/1/2021	3/21/2022	6/20/2022	8/8/2022	10/24/2022
Ag, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
As, diss, mg/L	0.0013	0.0017	0.0023	0.0029	0.0024	0.0025	0.0032	0.0041
B, diss, mg/L	0.0600	0.0600	0.0500	0.0500	0.0500	<0.0250	0.0500	0.0500
Ba, diss, mg/L	0.043	0.046	0.041	0.050	0.047	0.033	0.039	0.036
Be, diss, mg/L	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010
Cd, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Cl, diss, mg/L	18.3	16.4	18.7	19.8	23.3	18.3	17.5	14.6
CN, total, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Co, diss, mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cr, diss, mg/L	<0.0010	<0.0010	<0.0010	<0.0010	0.0003	<0.0010	<0.0010	<0.0010
Cu, diss, mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
F, diss, mg/L	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1
Fe, diss, mg/L	0.110	0.111	2.600	1.550	0.115	0.027	0.030	0.050
GW Depth (TOC), ft	5.05	13.48	15.51	1.79	6.88	12.37	15.42	17.02
GW Elv, ft	435.18	426.75	424.72	438.44		427.86	424.81	423.21
Hg, diss, mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Mn, diss, mg/L	0.9580	0.2270	0.8600	0.9260	0.5050	0.3030	0.9580	0.9410
Ni, diss, mg/L	0.0005	0.0004	0.0003	0.0003	0.0007	0.0006	0.0006	0.0008
NO3, diss, mg/L	<0.100	0.379	<0.100	<0.100	0.324	0.204	<0.100	<0.100
Pb, diss, mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
pH (field), STD	7.32	7.29	7.14	7.31	7.63	6.93	7.19	7.25
Sb, diss, mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Se, diss, mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
SO4, diss, mg/L	30.4	29.2	27.8	29.4	25.2	21.9	25.5	26.1
Spec. Cond. (field), micromho	747	696	725	732	542	463	645	554
TDS, mg/L	354	402	382	314	276	400	380	430
Temp (Fahrenheit), degrees F	53.4	59.1	60.1	59.4	61.5	60.5	68.7	66.6
Tl, diss, mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Zn, diss, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

APPENDIX B
SITE INSPECTION REPORTS

Hutsonville Power Station
Ash Pond D Closure Cap - Post-Closure Care Plan

Quarterly Site Inspection Checksheet

Date	03/17/2022
Inspector	MRK and LAM
Temperature	65 °F
Weather	Mostly Sunny

	Item	Condition Code *	Comments
Pond Cap	**Vent Pipes**	**GC**	Vent holes clear of pipes inspected, no weed overgrowth inside cement vent barriers.
	Drainage Berms	**GC**	No excessive standing water; no eroded or scoured drainage channels.
	Vegetation	**GC**	No vegetation overgrowth; no bare patches in excess of 100 sq. ft.
	Erosion on Cap	**GC**	No erosion or gullies 6 inches or deeper on cap.
	Liner	**GC**	No exposed liner; no visual indication of rips, tears, punctures, or other damage to liner.
	Water Control Features (berms, vegetated flumes, etc.)	**GC**	Small amount of dead vegetation in drainage channels but does not affect drainage.
	Other		
Embankment	**Vegetation**	**GC**	No overgrowth or bare patches on embankments
	Liner	**GC**	No exposure
	Erosion	**GC**	No erosion or gullies 6 inches or deeper on embankments or toe.
	Fencing	**GC**	Fending around site perimeter is secure.
	Drainage Channels (rip-rap, paved flumes, etc.)	**GC**	No overgrowth; rip-rap good condition.
	Other		
Groundwater Collection Trench and Discharge System	**Control Panels**	**GC**	Exterior of panels in good condition.
	Drainage Sumps / Manholes	**GC**	Lids are secure.
	Pumps	**NI**	Not in service.
	Groundwater Monitoring Wells	**GC**	Accessible; no excessive weed growth; no flooding.
	Flow Meter Totalizer	**NI**	Not in service.
	Diver-Mate Data Collector (data download)	**NI**	Not in service.
	Other		

Condition Codes

IM = Item needing Immediate Maintenance. Remediation should be completed within 1 month.
MM = Item needing Minor Maintenance and/or repairs within the year.
OB = Condition requires regular observation to ensure that the condition does not become worse.
GC = Good Condition. Working properly.
NE = No Evidence of a problem.
NI = Not Inspected. Reason should be stated in comment

Hutsonville Power Station – Ash Pond D

South View of CAP

West View of CAP

North View of CAP

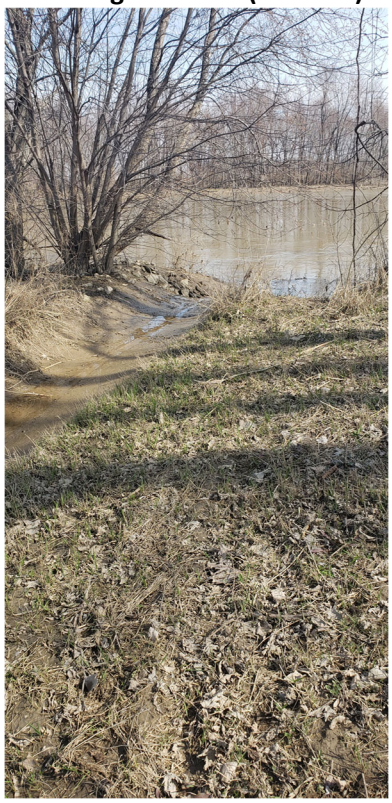
South embankment (facing west)

North Embankment (West view)

North Embankment Toe (facing NW towards Bottom Ash Sluce Basin)

Outfall 002 **West Trench (south view)**

Discharge to River (NE view)



Outfall 005 **RipRap from CAP (SW view)**

Discharge to River (NE View)

Hutsonville Power Station
Ash Pond D Closure Cap - Post-Closure Care Plan
Quarterly Site Inspection Checksheet

Date	05/13/2022
Inspector	LAM
Temperature	70 °F
Weather	Sunny

	Item	Condition Code *	Comments
Pond Cap	**Vent Pipes**	**GC**	Vent holes clear of pipes inspected, no weed overgrowth inside cement vent barriers.
	Drainage Berms	**GC**	No excessive standing water; no eroded or scoured drainage channels.
	Vegetation	**GC**	No excessive vegetation overgrowth; no bare patches in excess of 100 sq. ft. Mowing by Blankenship scheduled for June 16th.
	Erosion on Cap	**GC**	No erosion or gullies 6 inches or deeper on cap.
	Liner	**GC**	No exposed liner; no visual indication of rips, tears, punctures, or other damage to liner.
	Water Control Features (berms, vegetated flumes, etc.)	**GC**	Small amount of dead vegetation in drainage channels but does not affect drainage.
	Other		
Embankment	**Vegetation**	**GC**	Embankment mowing completed on 5/18/22.
	Liner	**GC**	No exposure
	Erosion	**GC**	No erosion or gullies 6 inches or deeper on embankments or toe.
	Fencing	**GC**	Fending around site perimeter is secure.
	Drainage Channels (rip-rap, paved flumes, etc.)	**MM**	Minor vegiation overgrowth in rip-rap and paved flume; Woolsey scheduled to apply herbicide in June; rip-rap itself in good condition.
	Other		
Groundwater Collection Trench and Discharge System	**Control Panels**	**GC**	Exterior of panels in good condition.
	Drainage Sumps / Manholes	**GC**	Lids are secure.
	Pumps	**NI**	Not in service.
	Groundwater Monitoring Wells	**GC**	Accessible; no excessive weed growth; no flooding.
	Flow Meter Totalizer	**NI**	Not in service.
	Diver-Mate Data Collector (data download)	**NI**	Not in service.
	Other		

Condition Codes

IM = Item needing Immediate Maintenance. Remediation should be completed within 1 month.
MM = Item needing Minor Maintenance and/or repairs within the year.
OB = Condition requires regular observation to ensure that the condition does not become worse.
GC = Good Condition. Working properly.
NE = No Evidence of a problem.
NI = Not Inspected. Reason should be stated in comment

Hutsonville Power Station – Ash Pond D

West side of CAP (facing S)

South end of Cap (facing W)

North berm (facing NW)

East berm (facing S)

South berm and drainage trough (facing E) – a few areas need vegetation removal

West berm riprap (facing S) – entire length needs herbicide spray

North End

Center section

South end

South letdown rip-rap – needs herbicide application

Hutsonville Power Station
Ash Pond D Closure Cap - Post-Closure Care Plan

Quarterly Site Inspection Checksheet

Date	08/25/2022
Inspector	LAM
Temperature	82 °F
Weather	Sunny

	Item	Condition Code *	Comments
Pond Cap	**Vent Pipes**	**GC**	Vent holes clear of pipes inspected, no weed overgrowth inside cement vent barriers.
	Drainage Berms	**GC**	No excessive standing water; no eroded or scoured drainage channels.
	Vegetation	**GC**	No excessive vegetation overgrowth; no bare patches in excess of 100 sq. ft. Last mowing was 6/16/22. Mowing scheduled for week of 8/29/22.
	Erosion on Cap	**GC**	No erosion or gullies 6 inches or deeper on cap.
	Liner	**GC**	No exposed liner; no visual indication of rips, tears, punctures, or other damage to liner.
	Water Control Features (berms, vegetated flumes, etc.)	**GC**	Small amount of dead vegetation in drainage channels but does not affect drainage.
	Other		
Embankment	**Vegetation**	**GC**	No overgrowth or bare patches on embankments.
	Liner	**GC**	No exposure
	Erosion	**GC**	No erosion or gullies 6 inches or deeper on embankments or toe.
	Fencing	**GC**	Fending around site perimeter is secure.
	Drainage Channels (rip-rap, paved flumes, etc.)	**MM**	Woolsey applied herbicide in June but may need two annual treatments; rip-rap itself in good condition.
	Other		
Groundwater Collection Trench and Discharge System	**Control Panels**	**GC**	Exterior of panels in good condition.
	Drainage Sumps / Manholes	**GC**	Lids are secure.
	Pumps	**IM**	Pump DS-3 failed. Replacement of both DS-3 and DS-4 scheduled for October 2022.
	Groundwater Monitoring Wells	**GC**	Accessible; no excessive weed growth; no flooding. Blankenship weed-wacked on 8/3/22.
	Flow Meter Totalizer	**NI**	Not in service.
	Diver-Mate Data Collector (data download)	**NI**	Not in service.
	Other		

Condition Codes

IM = Item needing Immediate Maintenance. Remediation should be completed within 1 month.
MM = Item needing Minor Maintenance and/or repairs within the year.
OB = Condition requires regular observation to ensure that the condition does not become worse.
GC = Good Condition. Working properly.
NE = No Evidence of a problem.
NI = Not Inspected. Reason should be stated in comment

Hutsonville Power Station
Ash Pond D Closure Cap - Post-Closure Care Plan

Quarterly Site Inspection Checksheet

Date	11/22/2022
Inspector	LAM
Temperature	60 °F
Weather	Sunny

	Item	Condition Code *	Comments
Pond Cap	**Vent Pipes**	**GC**	Vent holes clear of pipes inspected, no weed overgrowth inside cement vent barriers.
	Drainage Berms	**GC**	No excessive standing water; no eroded or scoured drainage channels.
	Vegetation	**GC**	No excessive vegetation overgrowth; no bare patches in excess of 100 sq. ft. Last mowing was 8/29/22.
	Erosion on Cap	**GC**	No erosion or gullies 6 inches or deeper on cap.
	Liner	**GC**	No exposed liner; no visual indication of rips, tears, punctures, or other damage to liner.
	Water Control Features (berms, vegetated flumes, etc.)	**GC**	Small amount of dead vegetation in drainage channels but does not affect drainage.
	Other		
Embankment	**Vegetation**	**GC**	No overgrowth or bare patches on embankments.
	Liner	**GC**	No exposure
	Erosion	**GC**	No erosion or gullies 6 inches or deeper on embankments or toe.
	Fencing	**GC**	Fending around site perimeter is secure.
	Drainage Channels (rip-rap, paved flumes, etc.)	**GC**	No overgrowth; rip-rap good condition. Last herbicide application was 9/21/22.
	Other		
Groundwater Collection Trench and Discharge System	**Control Panels**	**GC**	Exterior of panels in good condition.
	Drainage Sumps / Manholes	**GC**	Lids are secure.
	Pumps	**GC**	Pumps replaced Oct 3, 2022.
	Groundwater Monitoring Wells	**GC**	Accessible; no excessive weed growth; no flooding. Blankenship weed-wacked on 8/3/22.
	Flow Meter Totalizer	**GC**	Operational.
	Diver-Mate Data Collector (data download)	**GC**	Operational.
	Other		

Condition Codes

IM = Item needing Immediate Maintenance. Remediation should be completed within 1 month.
MM = Item needing Minor Maintenance and/or repairs within the year.
OB = Condition requires regular observation to ensure that the condition does not become worse.
GC = Good Condition. Working properly.
NE = No Evidence of a problem.
NI = Not Inspected. Reason should be stated in comment

Hutsonville Power Station – Ash Pond D

West Embankment – north end (facing S)

West Embankment – south end (facing S)

East (river) embankment (facing N)

South embankment and outfall trench (facing E)

Groundwater Discharge Pipe Collection Box

Outfall drainage trench (facing N)

Outfall Discharge (facing east)

South letdown

CAP Top (facing south)

Farm Irrigation Well near Sample MW #14

APPENDIX C
STATISTICAL OUTPUT

APPENDIX C1
OUTLIER TEST

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Antimony, dissolved, mg/L
Location: MW115D

Mean of all data: 0.00100
Standard Deviation of all data: 0.00101
Largest Observation Concentration of all data: Xn = 0.00200
Test Statistic, high extreme of all data: Tn = 0.990
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Antimony, dissolved, mg/L
Location: MW115S

Mean of all data: 0.00100
Standard Deviation of all data: 0.00101
Largest Observation Concentration of all data: Xn = 0.00200
Test Statistic, high extreme of all data: Tn = 0.990
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Antimony, dissolved, mg/L
Location: MW11R

Mean of all data: 0.00123
Standard Deviation of all data: 0.00155
Largest Observation Concentration of all data: Xn = 0.00900
Test Statistic, high extreme of all data: Tn = 5.01
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	0.00900	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Antimony, dissolved, mg/L
Location: MW121

Mean of all data: 0.00108
Standard Deviation of all data: 0.00109
Largest Observation Concentration of all data: Xn = 0.00400
Test Statistic, high extreme of all data: Tn = 2.68
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Antimony, dissolved, mg/L
Location: MW14

Mean of all data: 0.00100
Standard Deviation of all data: 0.00101
Largest Observation Concentration of all data: Xn = 0.00200
Test Statistic, high extreme of all data: Tn = 0.990
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Antimony, dissolved, mg/L
Location: MW23D

Mean of all data: 0.00200
Standard Deviation of all data: 0.0
Largest Observation Concentration of all data: Xn = 0.00200
Test Statistic, high extreme of all data: Tn = 0.0
T Critical of all data: Tcr = 0.0

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Antimony, dissolved, mg/L
Location: MW23S

Mean of all data: 0.00200
Standard Deviation of all data: 0.0
Largest Observation Concentration of all data: Xn = 0.00200
Test Statistic, high extreme of all data: Tn = 0.0
T Critical of all data: Tcr = 0.0

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Antimony, dissolved, mg/L
Location: MW6

Mean of all data: 0.00105
Standard Deviation of all data: 0.00105
Largest Observation Concentration of all data: Xn = 0.00300
Test Statistic, high extreme of all data: Tn = 1.86
T Critical of all data: Tcr = 2.88

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Antimony, dissolved, mg/L
Location: MW7

Mean of all data: 0.00113
Standard Deviation of all data: 0.00123
Largest Observation Concentration of all data: Xn = 0.00600
Test Statistic, high extreme of all data: Tn = 3.96
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	0.00600	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Antimony, dissolved, mg/L

Location: MW7D

Mean of all data: 0.00102
Standard Deviation of all data: 0.00101
Largest Observation Concentration of all data: Xn = 0.00200
Test Statistic, high extreme of all data: Tn = 0.968
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Antimony, dissolved, mg/L

Location: MW8

Mean of all data: 0.00121
Standard Deviation of all data: 0.00164
Largest Observation Concentration of all data: Xn = 0.0100
Test Statistic, high extreme of all data: Tn = 5.37
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/18/2012	0.0100	False		1

Arsenic, dissolved, mg/L

Location: MW115D

Mean of all data: 0.00277
Standard Deviation of all data: 0.00324
Largest Observation Concentration of all data: Xn = 0.0150
Test Statistic, high extreme of all data: Tn = 3.77
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/18/2012	0.0150	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Arsenic, dissolved, mg/L
Location: MW115S

Mean of all data: 0.00255
Standard Deviation of all data: 0.00260
Largest Observation Concentration of all data: Xn = 0.0150
Test Statistic, high extreme of all data: Tn = 4.78
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/18/2012	0.0150	False		1

Arsenic, dissolved, mg/L
Location: MW11R

Mean of all data: 0.000629
Standard Deviation of all data: 0.00165
Largest Observation Concentration of all data: Xn = 0.00900
Test Statistic, high extreme of all data: Tn = 5.08
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
01/07/2013	0.00900	False		1

Arsenic, dissolved, mg/L
Location: MW121

Mean of all data: 0.00324
Standard Deviation of all data: 0.00264
Largest Observation Concentration of all data: Xn = 0.0120
Test Statistic, high extreme of all data: Tn = 3.32
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
01/07/2013	0.0120	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Arsenic, dissolved, mg/L
Location: MW14

Mean of all data: 0.00128
Standard Deviation of all data: 0.00169
Largest Observation Concentration of all data: Xn = 0.00900
Test Statistic, high extreme of all data: Tn = 4.58
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
01/07/2013	0.00900	False		1

Arsenic, dissolved, mg/L
Location: MW23D

Mean of all data: 0.00293
Standard Deviation of all data: 0.00181
Largest Observation Concentration of all data: Xn = 0.00980
Test Statistic, high extreme of all data: Tn = 3.80
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
06/20/2022	0.00980	False		1

Arsenic, dissolved, mg/L
Location: MW23S

Mean of all data: 0.000676
Standard Deviation of all data: 0.00195
Largest Observation Concentration of all data: Xn = 0.00920
Test Statistic, high extreme of all data: Tn = 4.36
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	0.00920	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Arsenic, dissolved, mg/L
Location: MW6

Mean of all data: 0.000399
Standard Deviation of all data: 0.000624
Largest Observation Concentration of all data: Xn = 0.00210
Test Statistic, high extreme of all data: Tn = 2.73
T Critical of all data: Tcr = 2.88

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Arsenic, dissolved, mg/L
Location: MW7

Mean of all data: 0.000444
Standard Deviation of all data: 0.00121
Largest Observation Concentration of all data: Xn = 0.00800
Test Statistic, high extreme of all data: Tn = 6.25
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
01/07/2013	0.00800	False		1

Arsenic, dissolved, mg/L
Location: MW7D

Mean of all data: 0.00307
Standard Deviation of all data: 0.00329
Largest Observation Concentration of all data: Xn = 0.0140
Test Statistic, high extreme of all data: Tn = 3.32
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/18/2012	0.0140	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Arsenic, dissolved, mg/L
Location: MW8

Mean of all data: 0.000457
Standard Deviation of all data: 0.000995
Largest Observation Concentration of all data: Xn = 0.00610
Test Statistic, high extreme of all data: Tn = 5.67
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
12/18/2017	0.00610	False		1

Barium, dissolved, mg/L
Location: MW115D

Mean of all data: 0.0609
Standard Deviation of all data: 0.0191
Largest Observation Concentration of all data: Xn = 0.158
Test Statistic, high extreme of all data: Tn = 5.07
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	0.158	False		1

Barium, dissolved, mg/L
Location: MW115S

Mean of all data: 0.0587
Standard Deviation of all data: 0.0285
Largest Observation Concentration of all data: Xn = 0.206
Test Statistic, high extreme of all data: Tn = 5.17
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	0.206	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Barium, dissolved, mg/L
Location: MW11R

Mean of all data: 0.0420
Standard Deviation of all data: 0.0382
Largest Observation Concentration of all data: Xn = 0.204
Test Statistic, high extreme of all data: Tn = 4.24
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	0.204	False		1

Barium, dissolved, mg/L
Location: MW121

Mean of all data: 0.0560
Standard Deviation of all data: 0.0248
Largest Observation Concentration of all data: Xn = 0.198
Test Statistic, high extreme of all data: Tn = 5.72
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	0.198	False		1

Barium, dissolved, mg/L
Location: MW14

Mean of all data: 0.0769
Standard Deviation of all data: 0.0187
Largest Observation Concentration of all data: Xn = 0.127
Test Statistic, high extreme of all data: Tn = 2.68
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Barium, dissolved, mg/L
Location: MW23D

Mean of all data: 0.0444
Standard Deviation of all data: 0.00610
Largest Observation Concentration of all data: Xn = 0.0560
Test Statistic, high extreme of all data: Tn = 1.90
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Barium, dissolved, mg/L
Location: MW23S

Mean of all data: 0.0345
Standard Deviation of all data: 0.00855
Largest Observation Concentration of all data: Xn = 0.0490
Test Statistic, high extreme of all data: Tn = 1.70
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	0.00900	False	-1	

Barium, dissolved, mg/L
Location: MW6

Mean of all data: 0.0226
Standard Deviation of all data: 0.0121
Largest Observation Concentration of all data: Xn = 0.0660
Test Statistic, high extreme of all data: Tn = 3.58
T Critical of all data: Tcr = 2.88

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
08/08/2022	0.0660	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Barium, dissolved, mg/L
Location: MW7

Mean of all data: 0.0508
Standard Deviation of all data: 0.0138
Largest Observation Concentration of all data: Xn = 0.119
Test Statistic, high extreme of all data: Tn = 4.94
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
07/09/2012	0.119	False		1

Barium, dissolved, mg/L
Location: MW7D

Mean of all data: 0.0485
Standard Deviation of all data: 0.0154
Largest Observation Concentration of all data: Xn = 0.0960
Test Statistic, high extreme of all data: Tn = 3.08
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
07/21/2014	0.0960	False		1

Barium, dissolved, mg/L
Location: MW8

Mean of all data: 0.0212
Standard Deviation of all data: 0.00539
Largest Observation Concentration of all data: Xn = 0.0330
Test Statistic, high extreme of all data: Tn = 2.19
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Beryllium, dissolved, mg/L
Location: MW115D

Mean of all data: 0.000583
Standard Deviation of all data: 0.000821
Largest Observation Concentration of all data: Xn = 0.00500
Test Statistic, high extreme of all data: Tn = 5.38
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
11/01/2021	<0.00500	True		1

Beryllium, dissolved, mg/L
Location: MW115S

Mean of all data: 0.000583
Standard Deviation of all data: 0.000821
Largest Observation Concentration of all data: Xn = 0.00500
Test Statistic, high extreme of all data: Tn = 5.38
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
11/01/2021	<0.00500	True		1

Beryllium, dissolved, mg/L
Location: MW11R

Mean of all data: 0.000574
Standard Deviation of all data: 0.000827
Largest Observation Concentration of all data: Xn = 0.00500
Test Statistic, high extreme of all data: Tn = 5.35
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
11/01/2021	<0.00500	True		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Beryllium, dissolved, mg/L

Location: MW121

Mean of all data: 0.000625
Standard Deviation of all data: 0.000841
Largest Observation Concentration of all data: Xn = 0.00500
Test Statistic, high extreme of all data: Tn = 5.20
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
11/01/2021	<0.00500	True		1

Beryllium, dissolved, mg/L

Location: MW14

Mean of all data: 0.000583
Standard Deviation of all data: 0.000821
Largest Observation Concentration of all data: Xn = 0.00500
Test Statistic, high extreme of all data: Tn = 5.38
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
11/01/2021	<0.00500	True		1

Beryllium, dissolved, mg/L

Location: MW23D

Mean of all data: 0.00100
Standard Deviation of all data: 0.0
Largest Observation Concentration of all data: Xn = 0.00100
Test Statistic, high extreme of all data: Tn = 0.0
T Critical of all data: Tcr = 0.0

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Beryllium, dissolved, mg/L
Location: MW23S

Mean of all data: 0.00134
Standard Deviation of all data: 0.00157
Largest Observation Concentration of all data: Xn = 0.00820
Test Statistic, high extreme of all data: Tn = 4.36
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	0.00820	False		1

Beryllium, dissolved, mg/L
Location: MW6

Mean of all data: 0.000488
Standard Deviation of all data: 0.000506
Largest Observation Concentration of all data: Xn = 0.00100
Test Statistic, high extreme of all data: Tn = 1.01
T Critical of all data: Tcr = 2.88

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Beryllium, dissolved, mg/L
Location: MW7

Mean of all data: 0.000500
Standard Deviation of all data: 0.000505
Largest Observation Concentration of all data: Xn = 0.00100
Test Statistic, high extreme of all data: Tn = 0.990
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Beryllium, dissolved, mg/L
Location: MW7D

Mean of all data: 0.000511
Standard Deviation of all data: 0.000505
Largest Observation Concentration of all data: Xn = 0.00100
Test Statistic, high extreme of all data: Tn = 0.968
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Beryllium, dissolved, mg/L
Location: MW8

Mean of all data: 0.000500
Standard Deviation of all data: 0.000505
Largest Observation Concentration of all data: Xn = 0.00100
Test Statistic, high extreme of all data: Tn = 0.990
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Boron, dissolved, mg/L
Location: MW115D

Mean of all data: 0.203
Standard Deviation of all data: 0.926
Largest Observation Concentration of all data: Xn = 6.48
Test Statistic, high extreme of all data: Tn = 6.78
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	6.48	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Boron, dissolved, mg/L
Location: MW115S

Mean of all data: 0.256
Standard Deviation of all data: 0.843
Largest Observation Concentration of all data: Xn = 5.95
Test Statistic, high extreme of all data: Tn = 6.76
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	5.95	False		1

Boron, dissolved, mg/L
Location: MW11R

Mean of all data: 8.13
Standard Deviation of all data: 9.31
Largest Observation Concentration of all data: Xn = 35.0
Test Statistic, high extreme of all data: Tn = 2.89
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Boron, dissolved, mg/L
Location: MW121

Mean of all data: 0.168
Standard Deviation of all data: 0.776
Largest Observation Concentration of all data: Xn = 5.43
Test Statistic, high extreme of all data: Tn = 6.78
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	5.43	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Boron, dissolved, mg/L
Location: MW14

Mean of all data: 0.808
Standard Deviation of all data: 0.348
Largest Observation Concentration of all data: Xn = 1.51
Test Statistic, high extreme of all data: Tn = 2.02
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Boron, dissolved, mg/L
Location: MW23D

Mean of all data: 0.426
Standard Deviation of all data: 1.74
Largest Observation Concentration of all data: Xn = 8.02
Test Statistic, high extreme of all data: Tn = 4.36
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	8.02	False		1

Boron, dissolved, mg/L
Location: MW23S

Mean of all data: 0.409
Standard Deviation of all data: 1.11
Largest Observation Concentration of all data: Xn = 5.24
Test Statistic, high extreme of all data: Tn = 4.36
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	5.24	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Boron, dissolved, mg/L
Location: MW6

Mean of all data: 6.10
Standard Deviation of all data: 7.32
Largest Observation Concentration of all data: Xn = 23.0
Test Statistic, high extreme of all data: Tn = 2.31
T Critical of all data: Tcr = 2.88

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Boron, dissolved, mg/L
Location: MW7

Mean of all data: 1.54
Standard Deviation of all data: 0.833
Largest Observation Concentration of all data: Xn = 6.61
Test Statistic, high extreme of all data: Tn = 6.09
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
07/21/2014	6.61	False		1

Boron, dissolved, mg/L
Location: MW7D

Mean of all data: 0.449
Standard Deviation of all data: 0.320
Largest Observation Concentration of all data: Xn = 1.30
Test Statistic, high extreme of all data: Tn = 2.66
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Boron, dissolved, mg/L
Location: MW8

Mean of all data: 16.3
Standard Deviation of all data: 3.09
Largest Observation Concentration of all data: Xn = 20.2
Test Statistic, high extreme of all data: Tn = 1.27
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
11/21/2016	0.0124	False	-1	

Cadmium, dissolved, mg/L
Location: MW115D

Mean of all data: 0.000125
Standard Deviation of all data: 0.000126
Largest Observation Concentration of all data: Xn = 0.000250
Test Statistic, high extreme of all data: Tn = 0.990
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Cadmium, dissolved, mg/L
Location: MW115S

Mean of all data: 0.000125
Standard Deviation of all data: 0.000126
Largest Observation Concentration of all data: Xn = 0.000250
Test Statistic, high extreme of all data: Tn = 0.990
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Cadmium, dissolved, mg/L
Location: MW11R

Mean of all data: 0.000185
Standard Deviation of all data: 0.000279
Largest Observation Concentration of all data: Xn = 0.00150
Test Statistic, high extreme of all data: Tn = 4.71
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
05/24/2011	0.00150	False		1

Cadmium, dissolved, mg/L
Location: MW121

Mean of all data: 0.000167
Standard Deviation of all data: 0.000298
Largest Observation Concentration of all data: Xn = 0.00200
Test Statistic, high extreme of all data: Tn = 6.16
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
11/03/2014	0.00200	False		1

Cadmium, dissolved, mg/L
Location: MW14

Mean of all data: 0.000125
Standard Deviation of all data: 0.000126
Largest Observation Concentration of all data: Xn = 0.000250
Test Statistic, high extreme of all data: Tn = 0.990
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Cadmium, dissolved, mg/L
Location: MW23D

Mean of all data: 0.000314
Standard Deviation of all data: 0.000295
Largest Observation Concentration of all data: Xn = 0.00160
Test Statistic, high extreme of all data: Tn = 4.36
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	0.00160	False		1

Cadmium, dissolved, mg/L
Location: MW23S

Mean of all data: 0.000481
Standard Deviation of all data: 0.00106
Largest Observation Concentration of all data: Xn = 0.00510
Test Statistic, high extreme of all data: Tn = 4.36
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	0.00510	False		1

Cadmium, dissolved, mg/L
Location: MW6

Mean of all data: 0.000122
Standard Deviation of all data: 0.000127
Largest Observation Concentration of all data: Xn = 0.000250
Test Statistic, high extreme of all data: Tn = 1.01
T Critical of all data: Tcr = 2.88

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Cadmium, dissolved, mg/L
Location: MW7

Mean of all data: 0.000125
Standard Deviation of all data: 0.000126
Largest Observation Concentration of all data: Xn = 0.000250
Test Statistic, high extreme of all data: Tn = 0.990
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Cadmium, dissolved, mg/L
Location: MW7D

Mean of all data: 0.000133
Standard Deviation of all data: 0.000126
Largest Observation Concentration of all data: Xn = 0.000250
Test Statistic, high extreme of all data: Tn = 0.925
T Critical of all data: Tcr = 2.91

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Cadmium, dissolved, mg/L
Location: MW8

Mean of all data: 0.000125
Standard Deviation of all data: 0.000126
Largest Observation Concentration of all data: Xn = 0.000250
Test Statistic, high extreme of all data: Tn = 0.990
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Chloride, dissolved, mg/L
Location: MW115D

Mean of all data: 45.7
Standard Deviation of all data: 38.9
Largest Observation Concentration of all data: Xn = 213.
Test Statistic, high extreme of all data: Tn = 4.30
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
11/02/2015	213.	False		1

Chloride, dissolved, mg/L
Location: MW115S

Mean of all data: 29.4
Standard Deviation of all data: 51.3
Largest Observation Concentration of all data: Xn = 373.
Test Statistic, high extreme of all data: Tn = 6.70
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
01/20/2014	373.	False		1

Chloride, dissolved, mg/L
Location: MW11R

Mean of all data: 14.3
Standard Deviation of all data: 4.45
Largest Observation Concentration of all data: Xn = 25.0
Test Statistic, high extreme of all data: Tn = 2.40
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Chloride, dissolved, mg/L
Location: MW121

Mean of all data: 24.7
Standard Deviation of all data: 30.6
Largest Observation Concentration of all data: Xn = 230.
Test Statistic, high extreme of all data: Tn = 6.70
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
01/20/2014	230.	False		1

Chloride, dissolved, mg/L
Location: MW14

Mean of all data: 19.8
Standard Deviation of all data: 5.51
Largest Observation Concentration of all data: Xn = 28.1
Test Statistic, high extreme of all data: Tn = 1.51
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Chloride, dissolved, mg/L
Location: MW23D

Mean of all data: 5.43
Standard Deviation of all data: 1.30
Largest Observation Concentration of all data: Xn = 9.70
Test Statistic, high extreme of all data: Tn = 3.28
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	9.70	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Chloride, dissolved, mg/L
Location: MW23S

Mean of all data: 3.35
Standard Deviation of all data: 2.45
Largest Observation Concentration of all data: Xn = 10.1
Test Statistic, high extreme of all data: Tn = 2.75
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	10.1	False		1

Chloride, dissolved, mg/L
Location: MW6

Mean of all data: 16.3
Standard Deviation of all data: 5.23
Largest Observation Concentration of all data: Xn = 28.0
Test Statistic, high extreme of all data: Tn = 2.24
T Critical of all data: Tcr = 2.88

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Chloride, dissolved, mg/L
Location: MW7

Mean of all data: 12.3
Standard Deviation of all data: 3.61
Largest Observation Concentration of all data: Xn = 21.3
Test Statistic, high extreme of all data: Tn = 2.49
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Chloride, dissolved, mg/L
Location: MW7D

Mean of all data: 17.5
Standard Deviation of all data: 6.77
Largest Observation Concentration of all data: Xn = 44.0
Test Statistic, high extreme of all data: Tn = 3.91
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/11/2011	44.0	False		1

Chloride, dissolved, mg/L
Location: MW8

Mean of all data: 12.7
Standard Deviation of all data: 2.85
Largest Observation Concentration of all data: Xn = 29.0
Test Statistic, high extreme of all data: Tn = 5.72
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/11/2011	29.0	False		1

Chromium, dissolved, mg/L
Location: MW115D

Mean of all data: 0.00212
Standard Deviation of all data: 0.00515
Largest Observation Concentration of all data: Xn = 0.0330
Test Statistic, high extreme of all data: Tn = 5.99
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	0.0330	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Chromium, dissolved, mg/L
Location: MW115S

Mean of all data: 0.00158
Standard Deviation of all data: 0.00353
Largest Observation Concentration of all data: Xn = 0.0220
Test Statistic, high extreme of all data: Tn = 5.78
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	0.0220	False		1

Chromium, dissolved, mg/L
Location: MW11R

Mean of all data: 0.000966
Standard Deviation of all data: 0.00208
Largest Observation Concentration of all data: Xn = 0.0130
Test Statistic, high extreme of all data: Tn = 5.79
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	0.0130	False		1

Chromium, dissolved, mg/L
Location: MW121

Mean of all data: 0.00126
Standard Deviation of all data: 0.00272
Largest Observation Concentration of all data: Xn = 0.0180
Test Statistic, high extreme of all data: Tn = 6.15
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	0.0180	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Chromium, dissolved, mg/L
Location: MW14

Mean of all data: 0.00144
Standard Deviation of all data: 0.00239
Largest Observation Concentration of all data: Xn = 0.0100
Test Statistic, high extreme of all data: Tn = 3.58
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	0.0100	False		1

Chromium, dissolved, mg/L
Location: MW23D

Mean of all data: 0.000967
Standard Deviation of all data: 0.000153
Largest Observation Concentration of all data: Xn = 0.00100
Test Statistic, high extreme of all data: Tn = 0.218
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
03/01/2021	0.000300	False	-1	

Chromium, dissolved, mg/L
Location: MW23S

Mean of all data: 0.000933
Standard Deviation of all data: 0.000211
Largest Observation Concentration of all data: Xn = 0.00100
Test Statistic, high extreme of all data: Tn = 0.317
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
03/21/2022	0.000300	False	-1	

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Chromium, dissolved, mg/L
Location: MW6

Mean of all data: 0.00121
Standard Deviation of all data: 0.00306
Largest Observation Concentration of all data: Xn = 0.0140
Test Statistic, high extreme of all data: Tn = 4.19
T Critical of all data: Tcr = 2.86

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	0.0140	False		1

Chromium, dissolved, mg/L
Location: MW7

Mean of all data: 0.00161
Standard Deviation of all data: 0.00338
Largest Observation Concentration of all data: Xn = 0.0190
Test Statistic, high extreme of all data: Tn = 5.15
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
08/26/2013	0.0190	False		1

Chromium, dissolved, mg/L
Location: MW7D

Mean of all data: 0.00247
Standard Deviation of all data: 0.00782
Largest Observation Concentration of all data: Xn = 0.0510
Test Statistic, high extreme of all data: Tn = 6.21
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
08/26/2013	0.0510	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Chromium, dissolved, mg/L
Location: MW8

Mean of all data: 0.00142
Standard Deviation of all data: 0.00296
Largest Observation Concentration of all data: Xn = 0.0160
Test Statistic, high extreme of all data: Tn = 4.92
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/13/2012	0.0160	False		1

Cobalt, dissolved, mg/L
Location: MW115D

Mean of all data: 0.000563
Standard Deviation of all data: 0.000542
Largest Observation Concentration of all data: Xn = 0.00200
Test Statistic, high extreme of all data: Tn = 2.65
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Cobalt, dissolved, mg/L
Location: MW115S

Mean of all data: 0.000583
Standard Deviation of all data: 0.000539
Largest Observation Concentration of all data: Xn = 0.00200
Test Statistic, high extreme of all data: Tn = 2.63
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Cobalt, dissolved, mg/L
Location: MW11R

Mean of all data: 0.00127
Standard Deviation of all data: 0.00238
Largest Observation Concentration of all data: Xn = 0.0150
Test Statistic, high extreme of all data: Tn = 5.76
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
01/20/2014	0.0150	False		1

Cobalt, dissolved, mg/L
Location: MW121

Mean of all data: 0.000604
Standard Deviation of all data: 0.000644
Largest Observation Concentration of all data: Xn = 0.00300
Test Statistic, high extreme of all data: Tn = 3.72
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
11/03/2014	0.00300	False		1

Cobalt, dissolved, mg/L
Location: MW14

Mean of all data: 0.000729
Standard Deviation of all data: 0.000707
Largest Observation Concentration of all data: Xn = 0.00300
Test Statistic, high extreme of all data: Tn = 3.21
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
07/21/2014	0.00300	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Cobalt, dissolved, mg/L
Location: MW23D

Mean of all data: 0.00652
Standard Deviation of all data: 0.0227
Largest Observation Concentration of all data: Xn = 0.105
Test Statistic, high extreme of all data: Tn = 4.34
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	0.105	False		1

Cobalt, dissolved, mg/L
Location: MW23S

Mean of all data: 0.00529
Standard Deviation of all data: 0.0196
Largest Observation Concentration of all data: Xn = 0.0910
Test Statistic, high extreme of all data: Tn = 4.36
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	0.0910	False		1

Cobalt, dissolved, mg/L
Location: MW6

Mean of all data: 0.000539
Standard Deviation of all data: 0.000559
Largest Observation Concentration of all data: Xn = 0.00210
Test Statistic, high extreme of all data: Tn = 2.79
T Critical of all data: Tcr = 2.88

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Cobalt, dissolved, mg/L
Location: MW7

Mean of all data: 0.000500
Standard Deviation of all data: 0.000505
Largest Observation Concentration of all data: Xn = 0.00100
Test Statistic, high extreme of all data: Tn = 0.990
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Cobalt, dissolved, mg/L
Location: MW7D

Mean of all data: 0.000647
Standard Deviation of all data: 0.000661
Largest Observation Concentration of all data: Xn = 0.00300
Test Statistic, high extreme of all data: Tn = 3.56
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
07/21/2014	0.00300	False		1

Cobalt, dissolved, mg/L
Location: MW8

Mean of all data: 0.000635
Standard Deviation of all data: 0.000861
Largest Observation Concentration of all data: Xn = 0.00500
Test Statistic, high extreme of all data: Tn = 5.07
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
12/18/2017	0.00500	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Copper, dissolved, mg/L
Location: MW115D

Mean of all data: 0.00105
Standard Deviation of all data: 0.00317
Largest Observation Concentration of all data: Xn = 0.0220
Test Statistic, high extreme of all data: Tn = 6.60
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	0.0220	False		1

Copper, dissolved, mg/L
Location: MW115S

Mean of all data: 0.00131
Standard Deviation of all data: 0.00352
Largest Observation Concentration of all data: Xn = 0.0190
Test Statistic, high extreme of all data: Tn = 5.02
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	0.0190	False		1

Copper, dissolved, mg/L
Location: MW11R

Mean of all data: 0.000770
Standard Deviation of all data: 0.00123
Largest Observation Concentration of all data: Xn = 0.00500
Test Statistic, high extreme of all data: Tn = 3.43
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/20/2015	0.00500	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Copper, dissolved, mg/L
Location: MW121

Mean of all data: 0.000825
Standard Deviation of all data: 0.00167
Largest Observation Concentration of all data: Xn = 0.0100
Test Statistic, high extreme of all data: Tn = 5.49
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	0.0100	False		1

Copper, dissolved, mg/L
Location: MW14

Mean of all data: 0.00153
Standard Deviation of all data: 0.00562
Largest Observation Concentration of all data: Xn = 0.0371
Test Statistic, high extreme of all data: Tn = 6.33
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
08/26/2019	0.0371	False		1

Copper, dissolved, mg/L
Location: MW23D

Mean of all data: 0.000500
Standard Deviation of all data: 0.0
Largest Observation Concentration of all data: Xn = 0.000500
Test Statistic, high extreme of all data: Tn = 0.0
T Critical of all data: Tcr = 0.0

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Copper, dissolved, mg/L
Location: MW23S

Mean of all data: 0.00113
Standard Deviation of all data: 0.00200
Largest Observation Concentration of all data: Xn = 0.00780
Test Statistic, high extreme of all data: Tn = 3.34
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	0.00780	False		1

Copper, dissolved, mg/L
Location: MW6

Mean of all data: 0.000646
Standard Deviation of all data: 0.000785
Largest Observation Concentration of all data: Xn = 0.00300
Test Statistic, high extreme of all data: Tn = 3.00
T Critical of all data: Tcr = 2.88

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
01/30/2012	0.00300	False		1

Copper, dissolved, mg/L
Location: MW7

Mean of all data: 0.000667
Standard Deviation of all data: 0.000996
Largest Observation Concentration of all data: Xn = 0.00500
Test Statistic, high extreme of all data: Tn = 4.35
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	0.00500	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Copper, dissolved, mg/L
Location: MW7D

Mean of all data: 0.000766
Standard Deviation of all data: 0.00162
Largest Observation Concentration of all data: Xn = 0.0100
Test Statistic, high extreme of all data: Tn = 5.71
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	0.0100	False		1

Copper, dissolved, mg/L
Location: MW8

Mean of all data: 0.00142
Standard Deviation of all data: 0.00450
Largest Observation Concentration of all data: Xn = 0.0307
Test Statistic, high extreme of all data: Tn = 6.51
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
03/13/2017	0.0307	False		1

Cyanide, total, mg/L
Location: MW115D

Mean of all data: 0.00432
Standard Deviation of all data: 0.00450
Largest Observation Concentration of all data: Xn = 0.0100
Test Statistic, high extreme of all data: Tn = 1.26
T Critical of all data: Tcr = 2.96

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Cyanide, total, mg/L
Location: MW115S

Mean of all data: 0.00590
Standard Deviation of all data: 0.0115
Largest Observation Concentration of all data: Xn = 0.0800
Test Statistic, high extreme of all data: Tn = 6.42
T Critical of all data: Tcr = 2.96

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
06/20/2022	0.0800	False		1

Cyanide, total, mg/L
Location: MW11R

Mean of all data: 0.00676
Standard Deviation of all data: 0.0110
Largest Observation Concentration of all data: Xn = 0.0700
Test Statistic, high extreme of all data: Tn = 5.76
T Critical of all data: Tcr = 2.95

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
06/19/2017	0.0700	False		1

Cyanide, total, mg/L
Location: MW121

Mean of all data: 0.00440
Standard Deviation of all data: 0.00448
Largest Observation Concentration of all data: Xn = 0.0100
Test Statistic, high extreme of all data: Tn = 1.25
T Critical of all data: Tcr = 2.96

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Cyanide, total, mg/L
Location: MW14

Mean of all data: 0.00718
Standard Deviation of all data: 0.0170
Largest Observation Concentration of all data: Xn = 0.120
Test Statistic, high extreme of all data: Tn = 6.62
T Critical of all data: Tcr = 2.96

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
11/21/2016	0.120	False		1

Cyanide, total, mg/L
Location: MW23D

Mean of all data: 0.0131
Standard Deviation of all data: 0.0142
Largest Observation Concentration of all data: Xn = 0.0600
Test Statistic, high extreme of all data: Tn = 3.31
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
03/21/2022	0.0600	False		1

Cyanide, total, mg/L
Location: MW23S

Mean of all data: 0.00976
Standard Deviation of all data: 0.00512
Largest Observation Concentration of all data: Xn = 0.0300
Test Statistic, high extreme of all data: Tn = 3.95
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
06/20/2022	0.0300	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Cyanide, total, mg/L
Location: MW6

Mean of all data: 0.00484
Standard Deviation of all data: 0.00492
Largest Observation Concentration of all data: Xn = 0.0180
Test Statistic, high extreme of all data: Tn = 2.67
T Critical of all data: Tcr = 2.90

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Cyanide, total, mg/L
Location: MW7

Mean of all data: 0.00540
Standard Deviation of all data: 0.00720
Largest Observation Concentration of all data: Xn = 0.0450
Test Statistic, high extreme of all data: Tn = 5.50
T Critical of all data: Tcr = 2.96

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
05/20/2013	0.0450	False		1

Cyanide, total, mg/L
Location: MW7D

Mean of all data: 0.00810
Standard Deviation of all data: 0.0212
Largest Observation Concentration of all data: Xn = 0.150
Test Statistic, high extreme of all data: Tn = 6.68
T Critical of all data: Tcr = 2.95

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
05/20/2013	0.150	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Cyanide, total, mg/L
Location: MW8

Mean of all data: 0.00498
Standard Deviation of all data: 0.00563
Largest Observation Concentration of all data: Xn = 0.0300
Test Statistic, high extreme of all data: Tn = 4.45
T Critical of all data: Tcr = 2.96

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
03/21/2022	0.0300	False		1

Fluoride, dissolved, mg/L
Location: MW115D

Mean of all data: 0.158
Standard Deviation of all data: 0.107
Largest Observation Concentration of all data: Xn = 0.466
Test Statistic, high extreme of all data: Tn = 2.89
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Fluoride, dissolved, mg/L
Location: MW115S

Mean of all data: 0.182
Standard Deviation of all data: 0.124
Largest Observation Concentration of all data: Xn = 0.571
Test Statistic, high extreme of all data: Tn = 3.14
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
11/02/2015	0.571	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Fluoride, dissolved, mg/L
Location: MW11R

Mean of all data: 0.126
Standard Deviation of all data: 0.142
Largest Observation Concentration of all data: Xn = 0.645
Test Statistic, high extreme of all data: Tn = 3.65
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
11/02/2015	0.645	False		1

Fluoride, dissolved, mg/L
Location: MW121

Mean of all data: 0.164
Standard Deviation of all data: 0.113
Largest Observation Concentration of all data: Xn = 0.504
Test Statistic, high extreme of all data: Tn = 3.01
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
11/02/2015	0.504	False		1

Fluoride, dissolved, mg/L
Location: MW14

Mean of all data: 0.0963
Standard Deviation of all data: 0.115
Largest Observation Concentration of all data: Xn = 0.534
Test Statistic, high extreme of all data: Tn = 3.81
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
11/02/2015	0.534	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Fluoride, dissolved, mg/L
Location: MW23D

Mean of all data: 0.135
Standard Deviation of all data: 0.118
Largest Observation Concentration of all data: Xn = 0.600
Test Statistic, high extreme of all data: Tn = 3.93
T Critical of all data: Tcr = 2.56

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	0.600	False		1

Fluoride, dissolved, mg/L
Location: MW23S

Mean of all data: 0.174
Standard Deviation of all data: 0.204
Largest Observation Concentration of all data: Xn = 0.900
Test Statistic, high extreme of all data: Tn = 3.56
T Critical of all data: Tcr = 2.56

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	0.900	False		1

Fluoride, dissolved, mg/L
Location: MW6

Mean of all data: 0.130
Standard Deviation of all data: 0.105
Largest Observation Concentration of all data: Xn = 0.400
Test Statistic, high extreme of all data: Tn = 2.57
T Critical of all data: Tcr = 2.88

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Fluoride, dissolved, mg/L
Location: MW7

Mean of all data: 0.443
Standard Deviation of all data: 2.50
Largest Observation Concentration of all data: Xn = 17.4
Test Statistic, high extreme of all data: Tn = 6.78
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
11/02/2015	17.4	False		1

Fluoride, dissolved, mg/L
Location: MW7D

Mean of all data: 0.157
Standard Deviation of all data: 0.120
Largest Observation Concentration of all data: Xn = 0.529
Test Statistic, high extreme of all data: Tn = 3.10
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
11/02/2015	0.529	False		1

Fluoride, dissolved, mg/L
Location: MW8

Mean of all data: 0.0672
Standard Deviation of all data: 0.0660
Largest Observation Concentration of all data: Xn = 0.300
Test Statistic, high extreme of all data: Tn = 3.53
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
03/12/2018	0.300	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Iron, dissolved, mg/L
Location: MW115D

Mean of all data: 1.23
Standard Deviation of all data: 1.50
Largest Observation Concentration of all data: Xn = 4.91
Test Statistic, high extreme of all data: Tn = 2.46
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Iron, dissolved, mg/L
Location: MW115S

Mean of all data: 1.55
Standard Deviation of all data: 2.92
Largest Observation Concentration of all data: Xn = 17.6
Test Statistic, high extreme of all data: Tn = 5.49
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/13/2012	17.6	False		1

Iron, dissolved, mg/L
Location: MW11R

Mean of all data: 0.422
Standard Deviation of all data: 0.778
Largest Observation Concentration of all data: Xn = 4.06
Test Statistic, high extreme of all data: Tn = 4.68
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	4.06	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Iron, dissolved, mg/L
Location: MW121

Mean of all data: 1.43
Standard Deviation of all data: 1.32
Largest Observation Concentration of all data: Xn = 5.40
Test Statistic, high extreme of all data: Tn = 3.00
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/20/2015	5.40	False		1

Iron, dissolved, mg/L
Location: MW14

Mean of all data: 0.711
Standard Deviation of all data: 0.715
Largest Observation Concentration of all data: Xn = 3.07
Test Statistic, high extreme of all data: Tn = 3.30
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
03/13/2017	3.07	False		1

Iron, dissolved, mg/L
Location: MW23D

Mean of all data: 3.67
Standard Deviation of all data: 15.2
Largest Observation Concentration of all data: Xn = 70.0
Test Statistic, high extreme of all data: Tn = 4.36
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	70.0	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Iron, dissolved, mg/L
Location: MW23S

Mean of all data: 9.77
Standard Deviation of all data: 44.5
Largest Observation Concentration of all data: Xn = 204.
Test Statistic, high extreme of all data: Tn = 4.36
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	204.	False		1

Iron, dissolved, mg/L
Location: MW6

Mean of all data: 0.336
Standard Deviation of all data: 0.461
Largest Observation Concentration of all data: Xn = 1.94
Test Statistic, high extreme of all data: Tn = 3.48
T Critical of all data: Tcr = 2.91

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/13/2012	1.94	False		1

Iron, dissolved, mg/L
Location: MW7

Mean of all data: 0.378
Standard Deviation of all data: 0.777
Largest Observation Concentration of all data: Xn = 4.96
Test Statistic, high extreme of all data: Tn = 5.89
T Critical of all data: Tcr = 2.97

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
07/09/2012	4.96	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Iron, dissolved, mg/L
Location: MW7D

Mean of all data: 1.29
Standard Deviation of all data: 1.16
Largest Observation Concentration of all data: Xn = 5.14
Test Statistic, high extreme of all data: Tn = 3.31
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
07/21/2014	5.14	False		1

Iron, dissolved, mg/L
Location: MW8

Mean of all data: 0.850
Standard Deviation of all data: 1.14
Largest Observation Concentration of all data: Xn = 5.25
Test Statistic, high extreme of all data: Tn = 3.86
T Critical of all data: Tcr = 2.97

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
07/09/2012	5.25	False		1

Lead, dissolved, mg/L
Location: MW115D

Mean of all data: 0.000604
Standard Deviation of all data: 0.000644
Largest Observation Concentration of all data: Xn = 0.00300
Test Statistic, high extreme of all data: Tn = 3.72
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	0.00300	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Lead, dissolved, mg/L
Location: MW115S

Mean of all data: 0.000938
Standard Deviation of all data: 0.00176
Largest Observation Concentration of all data: Xn = 0.0110
Test Statistic, high extreme of all data: Tn = 5.73
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/13/2012	0.0110	False		1

Lead, dissolved, mg/L
Location: MW11R

Mean of all data: 0.000617
Standard Deviation of all data: 0.000644
Largest Observation Concentration of all data: Xn = 0.00300
Test Statistic, high extreme of all data: Tn = 3.70
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
01/19/2015	0.00300	False		1

Lead, dissolved, mg/L
Location: MW121

Mean of all data: 0.00110
Standard Deviation of all data: 0.00315
Largest Observation Concentration of all data: Xn = 0.0220
Test Statistic, high extreme of all data: Tn = 6.63
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
08/26/2013	0.0220	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Lead, dissolved, mg/L
Location: MW14

Mean of all data: 0.000500
Standard Deviation of all data: 0.000505
Largest Observation Concentration of all data: Xn = 0.00100
Test Statistic, high extreme of all data: Tn = 0.990
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Lead, dissolved, mg/L
Location: MW23D

Mean of all data: 0.00105
Standard Deviation of all data: 0.000218
Largest Observation Concentration of all data: Xn = 0.00200
Test Statistic, high extreme of all data: Tn = 4.36
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	0.00200	False		1

Lead, dissolved, mg/L
Location: MW23S

Mean of all data: 0.00171
Standard Deviation of all data: 0.00231
Largest Observation Concentration of all data: Xn = 0.0100
Test Statistic, high extreme of all data: Tn = 3.59
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
08/26/2019	<0.0100	True		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Lead, dissolved, mg/L
Location: MW6

Mean of all data: 0.000537
Standard Deviation of all data: 0.000552
Largest Observation Concentration of all data: Xn = 0.00200
Test Statistic, high extreme of all data: Tn = 2.65
T Critical of all data: Tcr = 2.88

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Lead, dissolved, mg/L
Location: MW7

Mean of all data: 0.000750
Standard Deviation of all data: 0.00147
Largest Observation Concentration of all data: Xn = 0.0100
Test Statistic, high extreme of all data: Tn = 6.31
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
07/09/2012	0.0100	False		1

Lead, dissolved, mg/L
Location: MW7D

Mean of all data: 0.000660
Standard Deviation of all data: 0.000939
Largest Observation Concentration of all data: Xn = 0.00600
Test Statistic, high extreme of all data: Tn = 5.69
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
07/21/2014	0.00600	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Lead, dissolved, mg/L
Location: MW8

Mean of all data: 0.000706
Standard Deviation of all data: 0.000816
Largest Observation Concentration of all data: Xn = 0.00390
Test Statistic, high extreme of all data: Tn = 3.92
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/11/2011	0.00390	False		1

Manganese, dissolved, mg/L
Location: MW115D

Mean of all data: 0.343
Standard Deviation of all data: 0.238
Largest Observation Concentration of all data: Xn = 1.17
Test Statistic, high extreme of all data: Tn = 3.48
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
09/01/2021	1.17	False		1

Manganese, dissolved, mg/L
Location: MW115S

Mean of all data: 0.947
Standard Deviation of all data: 0.349
Largest Observation Concentration of all data: Xn = 1.78
Test Statistic, high extreme of all data: Tn = 2.39
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Manganese, dissolved, mg/L
Location: MW11R

Mean of all data: 0.502
Standard Deviation of all data: 1.13
Largest Observation Concentration of all data: Xn = 5.87
Test Statistic, high extreme of all data: Tn = 4.73
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/18/2012	5.87	False		1

Manganese, dissolved, mg/L
Location: MW121

Mean of all data: 0.829
Standard Deviation of all data: 0.386
Largest Observation Concentration of all data: Xn = 1.90
Test Statistic, high extreme of all data: Tn = 2.78
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Manganese, dissolved, mg/L
Location: MW14

Mean of all data: 0.610
Standard Deviation of all data: 0.277
Largest Observation Concentration of all data: Xn = 1.59
Test Statistic, high extreme of all data: Tn = 3.54
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
03/07/2016	1.59	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Manganese, dissolved, mg/L
Location: MW23D

Mean of all data: 0.527
Standard Deviation of all data: 1.85
Largest Observation Concentration of all data: Xn = 8.60
Test Statistic, high extreme of all data: Tn = 4.36
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	8.60	False		1

Manganese, dissolved, mg/L
Location: MW23S

Mean of all data: 0.667
Standard Deviation of all data: 2.94
Largest Observation Concentration of all data: Xn = 13.5
Test Statistic, high extreme of all data: Tn = 4.36
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	13.5	False		1

Manganese, dissolved, mg/L
Location: MW6

Mean of all data: 0.0997
Standard Deviation of all data: 0.175
Largest Observation Concentration of all data: Xn = 0.840
Test Statistic, high extreme of all data: Tn = 4.23
T Critical of all data: Tcr = 2.88

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/11/2011	0.840	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Manganese, dissolved, mg/L

Location: MW7

Mean of all data: 0.0491
Standard Deviation of all data: 0.169
Largest Observation Concentration of all data: Xn = 1.16
Test Statistic, high extreme of all data: Tn = 6.57
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
07/09/2012	1.16	False		1

Manganese, dissolved, mg/L

Location: MW7D

Mean of all data: 0.519
Standard Deviation of all data: 0.531
Largest Observation Concentration of all data: Xn = 3.23
Test Statistic, high extreme of all data: Tn = 5.11
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
09/14/2015	3.23	False		1

Manganese, dissolved, mg/L

Location: MW8

Mean of all data: 1.67
Standard Deviation of all data: 1.39
Largest Observation Concentration of all data: Xn = 4.11
Test Statistic, high extreme of all data: Tn = 1.75
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Mercury, dissolved, mg/L
Location: MW115D

Mean of all data: 0.0000917
Standard Deviation of all data: 0.000286
Largest Observation Concentration of all data: Xn = 0.00200
Test Statistic, high extreme of all data: Tn = 6.68
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/10/2013	0.00200	False		1

Mercury, dissolved, mg/L
Location: MW115S

Mean of all data: 0.0000500
Standard Deviation of all data: 0.0000505
Largest Observation Concentration of all data: Xn = 0.000100
Test Statistic, high extreme of all data: Tn = 0.990
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Mercury, dissolved, mg/L
Location: MW11R

Mean of all data: 0.000102
Standard Deviation of all data: 0.000292
Largest Observation Concentration of all data: Xn = 0.00200
Test Statistic, high extreme of all data: Tn = 6.49
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/10/2013	0.00200	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Mercury, dissolved, mg/L
Location: MW121

Mean of all data: 0.0000500
Standard Deviation of all data: 0.0000505
Largest Observation Concentration of all data: Xn = 0.000100
Test Statistic, high extreme of all data: Tn = 0.990
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Mercury, dissolved, mg/L
Location: MW14

Mean of all data: 0.000102
Standard Deviation of all data: 0.000287
Largest Observation Concentration of all data: Xn = 0.00200
Test Statistic, high extreme of all data: Tn = 6.61
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/10/2013	0.00200	False		1

Mercury, dissolved, mg/L
Location: MW23D

Mean of all data: 0.000100
Standard Deviation of all data: 0.0
Largest Observation Concentration of all data: Xn = 0.000100
Test Statistic, high extreme of all data: Tn = 0.0
T Critical of all data: Tcr = 0.0

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Mercury, dissolved, mg/L
Location: MW23S

Mean of all data: 0.000143
Standard Deviation of all data: 0.000196
Largest Observation Concentration of all data: Xn = 0.00100
Test Statistic, high extreme of all data: Tn = 4.36
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
08/26/2019	<0.00100	True		1

Mercury, dissolved, mg/L
Location: MW6

Mean of all data: 0.0000707
Standard Deviation of all data: 0.000142
Largest Observation Concentration of all data: Xn = 0.000900
Test Statistic, high extreme of all data: Tn = 5.85
T Critical of all data: Tcr = 2.88

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
07/21/2014	0.000900	False		1

Mercury, dissolved, mg/L
Location: MW7

Mean of all data: 0.0000563
Standard Deviation of all data: 0.0000616
Largest Observation Concentration of all data: Xn = 0.000300
Test Statistic, high extreme of all data: Tn = 3.96
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/13/2012	0.000300	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Mercury, dissolved, mg/L
Location: MW7D

Mean of all data: 0.0000553
Standard Deviation of all data: 0.0000544
Largest Observation Concentration of all data: Xn = 0.000200
Test Statistic, high extreme of all data: Tn = 2.66
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Mercury, dissolved, mg/L
Location: MW8

Mean of all data: 0.000533
Standard Deviation of all data: 0.00317
Largest Observation Concentration of all data: Xn = 0.0220
Test Statistic, high extreme of all data: Tn = 6.78
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	0.0220	False		1

Nickel, dissolved, mg/L
Location: MW115D

Mean of all data: 0.00238
Standard Deviation of all data: 0.00397
Largest Observation Concentration of all data: Xn = 0.0240
Test Statistic, high extreme of all data: Tn = 5.44
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	0.0240	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Nickel, dissolved, mg/L
Location: MW115S

Mean of all data: 0.00305
Standard Deviation of all data: 0.00402
Largest Observation Concentration of all data: Xn = 0.0180
Test Statistic, high extreme of all data: Tn = 3.72
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	0.0180	False		1

Nickel, dissolved, mg/L
Location: MW11R

Mean of all data: 0.00763
Standard Deviation of all data: 0.0103
Largest Observation Concentration of all data: Xn = 0.0410
Test Statistic, high extreme of all data: Tn = 3.24
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
01/20/2014	0.0410	False		1

Nickel, dissolved, mg/L
Location: MW121

Mean of all data: 0.00253
Standard Deviation of all data: 0.00382
Largest Observation Concentration of all data: Xn = 0.0170
Test Statistic, high extreme of all data: Tn = 3.79
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
11/03/2014	0.0170	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Nickel, dissolved, mg/L
Location: MW14

Mean of all data: 0.00450
Standard Deviation of all data: 0.00469
Largest Observation Concentration of all data: Xn = 0.0170
Test Statistic, high extreme of all data: Tn = 2.67
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Nickel, dissolved, mg/L
Location: MW23D

Mean of all data: 0.00272
Standard Deviation of all data: 0.0101
Largest Observation Concentration of all data: Xn = 0.0465
Test Statistic, high extreme of all data: Tn = 4.35
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	0.0465	False		1

Nickel, dissolved, mg/L
Location: MW23S

Mean of all data: 0.00611
Standard Deviation of all data: 0.0259
Largest Observation Concentration of all data: Xn = 0.119
Test Statistic, high extreme of all data: Tn = 4.36
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	0.119	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Nickel, dissolved, mg/L
Location: MW6

Mean of all data: 0.00559
Standard Deviation of all data: 0.00822
Largest Observation Concentration of all data: Xn = 0.0300
Test Statistic, high extreme of all data: Tn = 2.97
T Critical of all data: Tcr = 2.88

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
08/26/2013	0.0300	False		1

Nickel, dissolved, mg/L
Location: MW7

Mean of all data: 0.00604
Standard Deviation of all data: 0.0153
Largest Observation Concentration of all data: Xn = 0.102
Test Statistic, high extreme of all data: Tn = 6.29
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
08/26/2013	0.102	False		1

Nickel, dissolved, mg/L
Location: MW7D

Mean of all data: 0.00849
Standard Deviation of all data: 0.0345
Largest Observation Concentration of all data: Xn = 0.238
Test Statistic, high extreme of all data: Tn = 6.65
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
08/26/2013	0.238	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Nickel, dissolved, mg/L
Location: MW8

Mean of all data: 0.0112
Standard Deviation of all data: 0.00907
Largest Observation Concentration of all data: Xn = 0.0370
Test Statistic, high extreme of all data: Tn = 2.84
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Nitrate nitrogen, dissolved, mg/L
Location: MW115D

Mean of all data: 1.25
Standard Deviation of all data: 1.79
Largest Observation Concentration of all data: Xn = 5.32
Test Statistic, high extreme of all data: Tn = 2.28
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Nitrate nitrogen, dissolved, mg/L
Location: MW115S

Mean of all data: 0.317
Standard Deviation of all data: 0.614
Largest Observation Concentration of all data: Xn = 2.40
Test Statistic, high extreme of all data: Tn = 3.39
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
07/12/2011	2.40	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Nitrate nitrogen, dissolved, mg/L
Location: MW11R

Mean of all data: 5.06
Standard Deviation of all data: 4.03
Largest Observation Concentration of all data: Xn = 17.0
Test Statistic, high extreme of all data: Tn = 2.96
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
09/14/2015	17.0	False		1

Nitrate nitrogen, dissolved, mg/L
Location: MW121

Mean of all data: 0.395
Standard Deviation of all data: 0.894
Largest Observation Concentration of all data: Xn = 3.72
Test Statistic, high extreme of all data: Tn = 3.72
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	3.72	False		1

Nitrate nitrogen, dissolved, mg/L
Location: MW14

Mean of all data: 0.241
Standard Deviation of all data: 0.478
Largest Observation Concentration of all data: Xn = 2.72
Test Statistic, high extreme of all data: Tn = 5.18
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
06/02/2016	2.72	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Nitrate nitrogen, dissolved, mg/L

Location: MW23D

Mean of all data: 0.0833
Standard Deviation of all data: 0.0242
Largest Observation Concentration of all data: Xn = 0.100
Test Statistic, high extreme of all data: Tn = 0.690
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Nitrate nitrogen, dissolved, mg/L

Location: MW23S

Mean of all data: 0.208
Standard Deviation of all data: 0.119
Largest Observation Concentration of all data: Xn = 0.450
Test Statistic, high extreme of all data: Tn = 2.03
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Nitrate nitrogen, dissolved, mg/L

Location: MW6

Mean of all data: 3.24
Standard Deviation of all data: 3.01
Largest Observation Concentration of all data: Xn = 10.2
Test Statistic, high extreme of all data: Tn = 2.31
T Critical of all data: Tcr = 2.88

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Nitrate nitrogen, dissolved, mg/L

Location: MW7

Mean of all data: 0.800
Standard Deviation of all data: 0.519
Largest Observation Concentration of all data: Xn = 1.95
Test Statistic, high extreme of all data: Tn = 2.22
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Nitrate nitrogen, dissolved, mg/L

Location: MW7D

Mean of all data: 0.243
Standard Deviation of all data: 0.506
Largest Observation Concentration of all data: Xn = 2.92
Test Statistic, high extreme of all data: Tn = 5.29
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/20/2015	2.92	False		1

Nitrate nitrogen, dissolved, mg/L

Location: MW8

Mean of all data: 0.0781
Standard Deviation of all data: 0.0934
Largest Observation Concentration of all data: Xn = 0.410
Test Statistic, high extreme of all data: Tn = 3.56
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
03/12/2018	0.410	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

pH (field), STD
Location: MW115D

Mean of all data: 7.40
Standard Deviation of all data: 0.34
Largest Observation Concentration of all data: Xn = 8.24
Test Statistic, high extreme of all data: Tn = 2.50
T Critical of all data: Tcr = 3.06

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
06/09/2009	6.30	False	-1	

pH (field), STD
Location: MW115S

Mean of all data: 7.41
Standard Deviation of all data: 0.31
Largest Observation Concentration of all data: Xn = 7.97
Test Statistic, high extreme of all data: Tn = 1.83
T Critical of all data: Tcr = 3.06

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
03/04/2009	6.00	False	-1	

pH (field), STD
Location: MW11R

Mean of all data: 6.81
Standard Deviation of all data: 0.39
Largest Observation Concentration of all data: Xn = 7.47
Test Statistic, high extreme of all data: Tn = 1.70
T Critical of all data: Tcr = 3.13

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
01/20/2014	5.31	False	-1	

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

pH (field), STD
Location: MW121

Mean of all data: 7.34
Standard Deviation of all data: 0.26
Largest Observation Concentration of all data: Xn = 7.90
Test Statistic, high extreme of all data: Tn = 2.18
T Critical of all data: Tcr = 3.13

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
03/11/2009	6.40	False	-1	

pH (field), STD
Location: MW14

Mean of all data: 6.99
Standard Deviation of all data: 0.29
Largest Observation Concentration of all data: Xn = 7.89
Test Statistic, high extreme of all data: Tn = 3.14
T Critical of all data: Tcr = 3.13

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
09/14/2015	7.89	False		1

pH (field), STD
Location: MW23D

Mean of all data: 7.10
Standard Deviation of all data: 0.70
Largest Observation Concentration of all data: Xn = 7.62
Test Statistic, high extreme of all data: Tn = 0.74
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
08/08/2022	4.83	False	-1	

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

pH (field), STD
Location: MW23S

Mean of all data: 6.81
Standard Deviation of all data: 0.72
Largest Observation Concentration of all data: Xn = 7.35
Test Statistic, high extreme of all data: Tn = 0.75
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	3.75	False	-1	

pH (field), STD
Location: MW6

Mean of all data: 6.88
Standard Deviation of all data: 0.27
Largest Observation Concentration of all data: Xn = 7.60
Test Statistic, high extreme of all data: Tn = 2.66
T Critical of all data: Tcr = 3.23

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

pH (field), STD
Location: MW7

Mean of all data: 6.92
Standard Deviation of all data: 0.23
Largest Observation Concentration of all data: Xn = 7.98
Test Statistic, high extreme of all data: Tn = 4.55
T Critical of all data: Tcr = 3.25

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
03/30/1999	7.98	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

pH (field), STD
Location: MW7D

Mean of all data: 7.29
Standard Deviation of all data: 0.34
Largest Observation Concentration of all data: Xn = 8.64
Test Statistic, high extreme of all data: Tn = 3.96
T Critical of all data: Tcr = 3.13

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
08/26/2013	8.64	False		1

pH (field), STD
Location: MW8

Mean of all data: 7.08
Standard Deviation of all data: 0.25
Largest Observation Concentration of all data: Xn = 7.92
Test Statistic, high extreme of all data: Tn = 3.31
T Critical of all data: Tcr = 3.25

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
02/26/1999	7.92	False		1

Selenium, dissolved, mg/L
Location: MW115D

Mean of all data: 0.000679
Standard Deviation of all data: 0.00153
Largest Observation Concentration of all data: Xn = 0.0100
Test Statistic, high extreme of all data: Tn = 6.10
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/10/2013	0.0100	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Selenium, dissolved, mg/L
Location: MW115S

Mean of all data: 0.000577
Standard Deviation of all data: 0.00147
Largest Observation Concentration of all data: Xn = 0.0100
Test Statistic, high extreme of all data: Tn = 6.39
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/10/2013	0.0100	False		1

Selenium, dissolved, mg/L
Location: MW11R

Mean of all data: 0.00173
Standard Deviation of all data: 0.00366
Largest Observation Concentration of all data: Xn = 0.0170
Test Statistic, high extreme of all data: Tn = 4.17
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
07/12/2011	0.0170	False		1

Selenium, dissolved, mg/L
Location: MW121

Mean of all data: 0.000585
Standard Deviation of all data: 0.00159
Largest Observation Concentration of all data: Xn = 0.0110
Test Statistic, high extreme of all data: Tn = 6.54
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/10/2013	0.0110	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Selenium, dissolved, mg/L
Location: MW14

Mean of all data: 0.00141
Standard Deviation of all data: 0.00569
Largest Observation Concentration of all data: Xn = 0.0387
Test Statistic, high extreme of all data: Tn = 6.55
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/20/2015	0.0387	False		1

Selenium, dissolved, mg/L
Location: MW23D

Mean of all data: 0.000714
Standard Deviation of all data: 0.000982
Largest Observation Concentration of all data: Xn = 0.00500
Test Statistic, high extreme of all data: Tn = 4.36
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	<0.00500	True		1

Selenium, dissolved, mg/L
Location: MW23S

Mean of all data: 0.000714
Standard Deviation of all data: 0.000982
Largest Observation Concentration of all data: Xn = 0.00500
Test Statistic, high extreme of all data: Tn = 4.36
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	<0.00500	True		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Selenium, dissolved, mg/L
Location: MW6

Mean of all data: 0.00286
Standard Deviation of all data: 0.00304
Largest Observation Concentration of all data: Xn = 0.0120
Test Statistic, high extreme of all data: Tn = 3.01
T Critical of all data: Tcr = 2.88

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
08/26/2013	0.0120	False		1

Selenium, dissolved, mg/L
Location: MW7

Mean of all data: 0.00167
Standard Deviation of all data: 0.00220
Largest Observation Concentration of all data: Xn = 0.0100
Test Statistic, high extreme of all data: Tn = 3.79
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
07/12/2011	0.0100	False		1

Selenium, dissolved, mg/L
Location: MW7D

Mean of all data: 0.000943
Standard Deviation of all data: 0.00306
Largest Observation Concentration of all data: Xn = 0.0210
Test Statistic, high extreme of all data: Tn = 6.56
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
03/15/2012	0.0210	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Selenium, dissolved, mg/L
Location: MW8

Mean of all data: 0.00129
Standard Deviation of all data: 0.00305
Largest Observation Concentration of all data: Xn = 0.0160
Test Statistic, high extreme of all data: Tn = 4.83
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
07/21/2014	0.0160	False		1

Silver, dissolved, mg/L
Location: MW115D

Mean of all data: 0.000438
Standard Deviation of all data: 0.00188
Largest Observation Concentration of all data: Xn = 0.0130
Test Statistic, high extreme of all data: Tn = 6.70
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/10/2013	0.0130	False		1

Silver, dissolved, mg/L
Location: MW115S

Mean of all data: 0.000125
Standard Deviation of all data: 0.000126
Largest Observation Concentration of all data: Xn = 0.000250
Test Statistic, high extreme of all data: Tn = 0.990
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Silver, dissolved, mg/L
Location: MW11R

Mean of all data: 0.000426
Standard Deviation of all data: 0.00203
Largest Observation Concentration of all data: Xn = 0.0140
Test Statistic, high extreme of all data: Tn = 6.69
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/10/2013	0.0140	False		1

Silver, dissolved, mg/L
Location: MW121

Mean of all data: 0.000167
Standard Deviation of all data: 0.000298
Largest Observation Concentration of all data: Xn = 0.00200
Test Statistic, high extreme of all data: Tn = 6.16
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
11/03/2014	0.00200	False		1

Silver, dissolved, mg/L
Location: MW14

Mean of all data: 0.000333
Standard Deviation of all data: 0.00143
Largest Observation Concentration of all data: Xn = 0.0100
Test Statistic, high extreme of all data: Tn = 6.76
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/10/2013	0.0100	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Silver, dissolved, mg/L
Location: MW23D

Mean of all data: 0.000250
Standard Deviation of all data: 0.0
Largest Observation Concentration of all data: Xn = 0.000250
Test Statistic, high extreme of all data: Tn = 0.0
T Critical of all data: Tcr = 0.0

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Silver, dissolved, mg/L
Location: MW23S

Mean of all data: 0.000250
Standard Deviation of all data: 0.0
Largest Observation Concentration of all data: Xn = 0.000250
Test Statistic, high extreme of all data: Tn = 0.0
T Critical of all data: Tcr = 0.0

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Silver, dissolved, mg/L
Location: MW6

Mean of all data: 0.000122
Standard Deviation of all data: 0.000127
Largest Observation Concentration of all data: Xn = 0.000250
Test Statistic, high extreme of all data: Tn = 1.01
T Critical of all data: Tcr = 2.88

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Silver, dissolved, mg/L
Location: MW7

Mean of all data: 0.000125
Standard Deviation of all data: 0.000126
Largest Observation Concentration of all data: Xn = 0.000250
Test Statistic, high extreme of all data: Tn = 0.990
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Silver, dissolved, mg/L
Location: MW7D

Mean of all data: 0.000128
Standard Deviation of all data: 0.000126
Largest Observation Concentration of all data: Xn = 0.000250
Test Statistic, high extreme of all data: Tn = 0.968
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Silver, dissolved, mg/L
Location: MW8

Mean of all data: 0.000125
Standard Deviation of all data: 0.000126
Largest Observation Concentration of all data: Xn = 0.000250
Test Statistic, high extreme of all data: Tn = 0.990
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Specific Conductance @ 25C (field), micromhos/cm
Location: MW115D

Mean of all data: 658
Standard Deviation of all data: 232
Largest Observation Concentration of all data: Xn = 1180
Test Statistic, high extreme of all data: Tn = 2
T Critical of all data: Tcr = 3

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Specific Conductance @ 25C (field), micromhos/cm
Location: MW115S

Mean of all data: 616
Standard Deviation of all data: 174
Largest Observation Concentration of all data: Xn = 1390
Test Statistic, high extreme of all data: Tn = 4
T Critical of all data: Tcr = 3

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/20/2015	1390	False		1

Specific Conductance @ 25C (field), micromhos/cm
Location: MW11R

Mean of all data: 1156
Standard Deviation of all data: 549
Largest Observation Concentration of all data: Xn = 2340
Test Statistic, high extreme of all data: Tn = 2
T Critical of all data: Tcr = 3

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Specific Conductance @ 25C (field), micromhos/cm
Location: MW121

Mean of all data: 599
Standard Deviation of all data: 97
Largest Observation Concentration of all data: Xn = 747
Test Statistic, high extreme of all data: Tn = 2
T Critical of all data: Tcr = 3

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Specific Conductance @ 25C (field), micromhos/cm
Location: MW14

Mean of all data: 1019
Standard Deviation of all data: 189
Largest Observation Concentration of all data: Xn = 1270
Test Statistic, high extreme of all data: Tn = 1
T Critical of all data: Tcr = 3

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
11/02/2015	457	False	-1	

Specific Conductance @ 25C (field), micromhos/cm
Location: MW23D

Mean of all data: 543
Standard Deviation of all data: 379
Largest Observation Concentration of all data: Xn = 2180
Test Statistic, high extreme of all data: Tn = 4
T Critical of all data: Tcr = 3

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	2180	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Specific Conductance @ 25C (field), micromhos/cm
Location: MW23S

Mean of all data: 499
Standard Deviation of all data: 538
Largest Observation Concentration of all data: Xn = 2800
Test Statistic, high extreme of all data: Tn = 4
T Critical of all data: Tcr = 3

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	2800	False		1

Specific Conductance @ 25C (field), micromhos/cm
Location: MW6

Mean of all data: 959
Standard Deviation of all data: 318
Largest Observation Concentration of all data: Xn = 1566
Test Statistic, high extreme of all data: Tn = 2
T Critical of all data: Tcr = 3

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Specific Conductance @ 25C (field), micromhos/cm
Location: MW7

Mean of all data: 1146
Standard Deviation of all data: 185
Largest Observation Concentration of all data: Xn = 1470
Test Statistic, high extreme of all data: Tn = 2
T Critical of all data: Tcr = 3

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Specific Conductance @ 25C (field), micromhos/cm
Location: MW7D

Mean of all data: 779
Standard Deviation of all data: 248
Largest Observation Concentration of all data: Xn = 1340
Test Statistic, high extreme of all data: Tn = 2
T Critical of all data: Tcr = 3

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Specific Conductance @ 25C (field), micromhos/cm
Location: MW8

Mean of all data: 1349
Standard Deviation of all data: 374
Largest Observation Concentration of all data: Xn = 1899
Test Statistic, high extreme of all data: Tn = 1
T Critical of all data: Tcr = 3

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
01/07/2013	20	False	-1	

Sulfate, dissolved, mg/L
Location: MW115D

Mean of all data: 31.3
Standard Deviation of all data: 7.97
Largest Observation Concentration of all data: Xn = 51.2
Test Statistic, high extreme of all data: Tn = 2.50
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Sulfate, dissolved, mg/L
Location: MW115S

Mean of all data: 37.6
Standard Deviation of all data: 15.5
Largest Observation Concentration of all data: Xn = 99.8
Test Statistic, high extreme of all data: Tn = 4.00
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
03/01/2021	99.8	False		1

Sulfate, dissolved, mg/L
Location: MW11R

Mean of all data: 399.
Standard Deviation of all data: 321.
Largest Observation Concentration of all data: Xn = 1170.
Test Statistic, high extreme of all data: Tn = 2.40
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Sulfate, dissolved, mg/L
Location: MW121

Mean of all data: 26.1
Standard Deviation of all data: 13.1
Largest Observation Concentration of all data: Xn = 96.6
Test Statistic, high extreme of all data: Tn = 5.37
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
08/26/2013	96.6	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Sulfate, dissolved, mg/L
Location: MW14

Mean of all data: 179.
Standard Deviation of all data: 65.2
Largest Observation Concentration of all data: Xn = 361.
Test Statistic, high extreme of all data: Tn = 2.80
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Sulfate, dissolved, mg/L
Location: MW23D

Mean of all data: 89.1
Standard Deviation of all data: 282.
Largest Observation Concentration of all data: Xn = 1320.
Test Statistic, high extreme of all data: Tn = 4.36
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	1320.	False		1

Sulfate, dissolved, mg/L
Location: MW23S

Mean of all data: 112.
Standard Deviation of all data: 446.
Largest Observation Concentration of all data: Xn = 2060.
Test Statistic, high extreme of all data: Tn = 4.36
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	2060.	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Sulfate, dissolved, mg/L
Location: MW6

Mean of all data: 237.
Standard Deviation of all data: 196.
Largest Observation Concentration of all data: Xn = 610.
Test Statistic, high extreme of all data: Tn = 1.90
T Critical of all data: Tcr = 2.88

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Sulfate, dissolved, mg/L
Location: MW7

Mean of all data: 253.
Standard Deviation of all data: 86.0
Largest Observation Concentration of all data: Xn = 434.
Test Statistic, high extreme of all data: Tn = 2.11
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Sulfate, dissolved, mg/L
Location: MW7D

Mean of all data: 93.8
Standard Deviation of all data: 65.4
Largest Observation Concentration of all data: Xn = 274.
Test Statistic, high extreme of all data: Tn = 2.75
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Sulfate, dissolved, mg/L
Location: MW8

Mean of all data: 641.
Standard Deviation of all data: 129.
Largest Observation Concentration of all data: Xn = 1120.
Test Statistic, high extreme of all data: Tn = 3.72
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
05/14/2018	1120.	False		1

Thallium, dissolved, mg/L
Location: MW115D

Mean of all data: 0.000188
Standard Deviation of all data: 0.000433
Largest Observation Concentration of all data: Xn = 0.00300
Test Statistic, high extreme of all data: Tn = 6.50
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
01/07/2013	0.00300	False		1

Thallium, dissolved, mg/L
Location: MW115S

Mean of all data: 0.000125
Standard Deviation of all data: 0.000126
Largest Observation Concentration of all data: Xn = 0.000250
Test Statistic, high extreme of all data: Tn = 0.990
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Thallium, dissolved, mg/L
Location: MW11R

Mean of all data: 0.000205
Standard Deviation of all data: 0.000565
Largest Observation Concentration of all data: Xn = 0.00390
Test Statistic, high extreme of all data: Tn = 6.54
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
01/19/2015	0.00390	False		1

Thallium, dissolved, mg/L
Location: MW121

Mean of all data: 0.000188
Standard Deviation of all data: 0.000433
Largest Observation Concentration of all data: Xn = 0.00300
Test Statistic, high extreme of all data: Tn = 6.50
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
11/03/2014	0.00300	False		1

Thallium, dissolved, mg/L
Location: MW14

Mean of all data: 0.000188
Standard Deviation of all data: 0.000433
Largest Observation Concentration of all data: Xn = 0.00300
Test Statistic, high extreme of all data: Tn = 6.50
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
01/07/2013	0.00300	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Thallium, dissolved, mg/L
Location: MW23D

Mean of all data: 0.000250
Standard Deviation of all data: 0.0
Largest Observation Concentration of all data: Xn = 0.000250
Test Statistic, high extreme of all data: Tn = 0.0
T Critical of all data: Tcr = 0.0

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Thallium, dissolved, mg/L
Location: MW23S

Mean of all data: 0.000357
Standard Deviation of all data: 0.000491
Largest Observation Concentration of all data: Xn = 0.00250
Test Statistic, high extreme of all data: Tn = 4.36
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
08/26/2019	<0.00250	True		1

Thallium, dissolved, mg/L
Location: MW6

Mean of all data: 0.000122
Standard Deviation of all data: 0.000127
Largest Observation Concentration of all data: Xn = 0.000250
Test Statistic, high extreme of all data: Tn = 1.01
T Critical of all data: Tcr = 2.88

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Thallium, dissolved, mg/L
Location: MW7

Mean of all data: 0.000188
Standard Deviation of all data: 0.000433
Largest Observation Concentration of all data: Xn = 0.00300
Test Statistic, high extreme of all data: Tn = 6.50
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
01/07/2013	0.00300	False		1

Thallium, dissolved, mg/L
Location: MW7D

Mean of all data: 0.000277
Standard Deviation of all data: 0.00101
Largest Observation Concentration of all data: Xn = 0.00700
Test Statistic, high extreme of all data: Tn = 6.66
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
03/15/2012	0.00700	False		1

Thallium, dissolved, mg/L
Location: MW8

Mean of all data: 0.000146
Standard Deviation of all data: 0.000177
Largest Observation Concentration of all data: Xn = 0.00100
Test Statistic, high extreme of all data: Tn = 4.81
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
07/21/2014	0.00100	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Total Dissolved Solids, mg/L
Location: MW115D

Mean of all data: 381.
Standard Deviation of all data: 157.
Largest Observation Concentration of all data: Xn = 920.
Test Statistic, high extreme of all data: Tn = 3.43
T Critical of all data: Tcr = 3.03

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
09/14/2015	920.	False		1

Total Dissolved Solids, mg/L
Location: MW115S

Mean of all data: 325.
Standard Deviation of all data: 117.
Largest Observation Concentration of all data: Xn = 688.
Test Statistic, high extreme of all data: Tn = 3.11
T Critical of all data: Tcr = 3.03

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
06/20/2022	688.	False		1

Total Dissolved Solids, mg/L
Location: MW11R

Mean of all data: 983.
Standard Deviation of all data: 421.
Largest Observation Concentration of all data: Xn = 1830.
Test Statistic, high extreme of all data: Tn = 2.01
T Critical of all data: Tcr = 3.09

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Total Dissolved Solids, mg/L
Location: MW121

Mean of all data: 340.
Standard Deviation of all data: 92.5
Largest Observation Concentration of all data: Xn = 604.
Test Statistic, high extreme of all data: Tn = 2.86
T Critical of all data: Tcr = 3.10

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
01/20/2014	<0.0	True	-1	

Total Dissolved Solids, mg/L
Location: MW14

Mean of all data: 727.
Standard Deviation of all data: 129.
Largest Observation Concentration of all data: Xn = 1040.
Test Statistic, high extreme of all data: Tn = 2.42
T Critical of all data: Tcr = 3.10

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
08/28/2018	289.	False	-1	

Total Dissolved Solids, mg/L
Location: MW23D

Mean of all data: 338.
Standard Deviation of all data: 336.
Largest Observation Concentration of all data: Xn = 1790.
Test Statistic, high extreme of all data: Tn = 4.32
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	1790.	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Total Dissolved Solids, mg/L
Location: MW23S

Mean of all data: 395.
Standard Deviation of all data: 588.
Largest Observation Concentration of all data: Xn = 2800.
Test Statistic, high extreme of all data: Tn = 4.09
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	2800.	False		1

Total Dissolved Solids, mg/L
Location: MW6

Mean of all data: 795.
Standard Deviation of all data: 322.
Largest Observation Concentration of all data: Xn = 1660.
Test Statistic, high extreme of all data: Tn = 2.68
T Critical of all data: Tcr = 3.21

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Total Dissolved Solids, mg/L
Location: MW7

Mean of all data: 840.
Standard Deviation of all data: 155.
Largest Observation Concentration of all data: Xn = 1320.
Test Statistic, high extreme of all data: Tn = 3.11
T Critical of all data: Tcr = 3.24

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
01/20/2014	230.	False	-1	

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Total Dissolved Solids, mg/L

Location: MW7D

Mean of all data: 466.
Standard Deviation of all data: 185.
Largest Observation Concentration of all data: Xn = 1010.
Test Statistic, high extreme of all data: Tn = 2.95
T Critical of all data: Tcr = 3.11

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Total Dissolved Solids, mg/L

Location: MW8

Mean of all data: 1260.
Standard Deviation of all data: 347.
Largest Observation Concentration of all data: Xn = 1960.
Test Statistic, high extreme of all data: Tn = 2.02
T Critical of all data: Tcr = 3.23

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side

No Outliers

Zinc, dissolved, mg/L

Location: MW115D

Mean of all data: 0.00734
Standard Deviation of all data: 0.0174
Largest Observation Concentration of all data: Xn = 0.119
Test Statistic, high extreme of all data: Tn = 6.42
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	0.119	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Zinc, dissolved, mg/L
Location: MW115S

Mean of all data: 0.00777
Standard Deviation of all data: 0.0156
Largest Observation Concentration of all data: Xn = 0.0880
Test Statistic, high extreme of all data: Tn = 5.14
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	0.0880	False		1

Zinc, dissolved, mg/L
Location: MW11R

Mean of all data: 0.0159
Standard Deviation of all data: 0.0238
Largest Observation Concentration of all data: Xn = 0.137
Test Statistic, high extreme of all data: Tn = 5.08
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
01/20/2014	0.137	False		1

Zinc, dissolved, mg/L
Location: MW121

Mean of all data: 0.00610
Standard Deviation of all data: 0.0119
Largest Observation Concentration of all data: Xn = 0.0740
Test Statistic, high extreme of all data: Tn = 5.72
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	0.0740	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Zinc, dissolved, mg/L
Location: MW14

Mean of all data: 0.00457
Standard Deviation of all data: 0.00664
Largest Observation Concentration of all data: Xn = 0.0420
Test Statistic, high extreme of all data: Tn = 5.63
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	0.0420	False		1

Zinc, dissolved, mg/L
Location: MW23D

Mean of all data: 0.0138
Standard Deviation of all data: 0.0404
Largest Observation Concentration of all data: Xn = 0.190
Test Statistic, high extreme of all data: Tn = 4.36
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	0.190	False		1

Zinc, dissolved, mg/L
Location: MW23S

Mean of all data: 0.0333
Standard Deviation of all data: 0.130
Largest Observation Concentration of all data: Xn = 0.600
Test Statistic, high extreme of all data: Tn = 4.36
T Critical of all data: Tcr = 2.58

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
10/28/2019	0.600	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Zinc, dissolved, mg/L
Location: MW6

Mean of all data: 0.00566
Standard Deviation of all data: 0.00635
Largest Observation Concentration of all data: Xn = 0.0290
Test Statistic, high extreme of all data: Tn = 3.68
T Critical of all data: Tcr = 2.88

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	0.0290	False		1

Zinc, dissolved, mg/L
Location: MW7

Mean of all data: 0.00494
Standard Deviation of all data: 0.00630
Largest Observation Concentration of all data: Xn = 0.0320
Test Statistic, high extreme of all data: Tn = 4.29
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	0.0320	False		1

Zinc, dissolved, mg/L
Location: MW7D

Mean of all data: 0.00567
Standard Deviation of all data: 0.00922
Largest Observation Concentration of all data: Xn = 0.0480
Test Statistic, high extreme of all data: Tn = 4.59
T Critical of all data: Tcr = 2.93

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
04/21/2014	0.0480	False		1

Based on Grubbs one-sided outlier test

Hutsonville Ash Impoundment
Outlier Analysis Results

User Supplied Information

Date Range: 01/01/1984 to 10/24/2022
LT Multiplier: x 0.50
Confidence Level: 95%
Number of Outliers: One Outlier
Transform: None

Zinc, dissolved, mg/L
Location: MW8

Mean of all data: 0.00765
Standard Deviation of all data: 0.0102
Largest Observation Concentration of all data: Xn = 0.0600
Test Statistic, high extreme of all data: Tn = 5.15
T Critical of all data: Tcr = 2.94

Sample Date	Value	LT_Value	Outlier Low Side	Outlier High Side
07/21/2014	0.0600	False		1

Based on Grubbs one-sided outlier test

APPENDIX C2
TEST DESCRIPTIONS

ELECTRIC POWER RESEARCH INSTITUTE

MANAGES

Groundwater Data Management and Evaluation Software

Software Manual Product ID #1012581

Software Manual, February 2010

EPRI Project Manager
K. Ladwig

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10
STATISTICAL ANALYSIS

Stand-Alone Statistical Tests

Statistical Evaluation Report

The Statistical Evaluation Report is comprised of a series of subreports as described below.

User Selections:

- One location.
- Sample date range for data selection.
- Interval length: the length of the averaging period in months (1,2,3,4, or 6).
- One parameter.
- Non-detect processing: multiplier between 0 and 1.
- One-sided confidence $(1-\alpha)$ level – 0.90, 0.95 or 0.99.
- Limit type: used in the statistical overview to determine exceedances.

Mann-Kendall Trend and Seasonal Analysis Tests

The Mann-Kendall test for trend is insensitive to the presence or absence of seasonality. The test is non-parametric and does not assume any type of data distribution. Nonetheless, two forms of the test are provided in MANAGES, one ignoring data seasonality even if it is present, and one considering data seasonality. In the test, the null hypothesis, H_0, is that the Sen trend is zero, and the alternate hypothesis, H_a, is that the trend is non-zero.

In general, the Mann-Kendall test considering seasonality indicates a larger range for allowable Sen estimate of trend when seasonality is actually present than the range indicated by the test performed ignoring seasonality.

In the Mann-Kendall Trend Analysis, available in under the Statistical Evaluation Report and in the Statistical Procedure for Detection Monitoring, and Mann-Kendall Seasonal Analysis, found under the Statistical Evaluation Report, MANAGES first calculates the Sen slope and the upper and lower confidence limits of the Sen slope, and then determines whether the Sen slope is statistically significant. Slope is statistically significant if it is non-zero.

Mann-Kendall Test for Sen Slope Significance – a two-sided, non-parametric method for data sets as small as 10, unless there are many tied (e.g., equal, NDs are treated as tieds) values (Gilbert, 1987; p. 208)	
Indicator Function $\mathrm{sgn}(x_{ij} - x_{jk})$	= 1 if $(x_{ij} - x_{jk}) > 0$ = 0 if $(x_{ij} - x_{jk}) = 0$ = -1 if $(x_{ij} - x_{jk}) < 0$ where $x_{i1}, x_{i2}, \ldots, x_{in}$ are the time ordered data (n_i is total of data in the i-th season).
Mann-Kendall Statistic, S_i	$= \sum_{k=1}^{n_i-1} \sum_{j=k+1}^{n_i} \mathrm{sgn}(x_{ij} - x_{jk})$
Variance of S_i $VAR(S_i)$	$VAR(S_i) =$ $\frac{1}{18}\left\{ n_i(n_i-1)(2n_i+5) - \sum_{p=1}^{g_i} t_{ip}(t_{ip}-1)(2t_{ip}+5) - \sum_{q=1}^{h_i} u_{iq}(u_{iq}-1)(2u_{iq}+5) \right\}$ $+ \frac{\sum_{p=1}^{g_i} t_{ip}(t_{ip}-1)(t_{ip}-2) \sum_{q=1}^{h_i} u_{iq}(u_{iq}-1)(u_{iq}-2)}{9n_i(n_i-1)(n_i-2)}$ $+ \frac{\sum_{p=1}^{g_i} t_{ip}(t_{ip}-1) \sum_{q=1}^{h_i} u_{iq}(u_{iq}-1)}{2n_i(n_i-1)}.$ The variable g_i is the number of tied groups (equal-valued) data in the i-th season, t_{ip} is the number of tied data in the p-th group for the i-th season, h_i is the number of sampling times (or time periods) in the i-th season that contain multiple data, u_{iq} is the number of multiple data in the q-th time period in the i-th season, and n_i is the number of data values in the i-th season.

Test Statistic, Z	If $S' = \sum_{i=1}^{K} S_i$, where K is the number of seasons, then the test statistic Z is computed as: $$Z = \begin{cases} \dfrac{S'-1}{[VAR(S')]^{1/2}} & \text{iff } S' > 0 \\ 0 & \text{iff } S' = 0 \\ \dfrac{S'+1}{[VAR(S')]^{1/2}} & \text{iff } S' < 0 \end{cases}$$ Where "iff" is an acroym meaning: if-and-only-if. A positive Z value means an upward trend and a negative Z value means a negative trend.
Hypothesis Test: H_0 = no trend H_a = trend present This is a two-sided test at the α significance level.	Accept the null hypothesis H_0 of no trend if $\lvert Z \rvert \leq Z_{1-\alpha/2}$ Reject the null hypothesis H_0 if $\lvert Z \rvert > Z_{1-\alpha/2}$ where $Z_{1-\alpha/2}$ is obtained from Table A1 in Gilbert (1987; p. 254).

Kruskal-Wallis Analysis (Test for Seasonality)

To perform the Kruskal-Wallis test for data seasonality, data points are first segmented according to season (Gilbert, 1987). The null hypothesis, H_0, is that all seasons have the same mean value. The alternative hypothesis, H_a ,is that at least one season has a mean larger or smaller than the mean of at least one other season. Montgomery et al. (1987) provide additional information on groundwater data seasonality. This is a two-sided, non-parametric test.

In MANAGES, the Kruskal-Wallis Test for Seasonality is found under Data Review // Non-Parametric Methods // Kruskal-Wallis Analysis. It determines whether the seasonal means for the specified parameter at the specified location are statistically the same.

	or $Z_i \geq SCL$.

Outlier Tests

Outlier tests are useful in detecting inconsistencies of measurement within a data set. An outlier is defined as an observation that appears to deviate markedly from other values of a sample set. There are many possible reasons for the presence of an outlier, including 1) the presence of a true but extreme value from a single population, resulting from random variability inherent in the data; 2) an improper identification of the underlying distribution describing the population from which the sample set comes from; 3) the occurrence of some unknown event(s) such as a spill, creating a mixture of two or more populations; 4) a gross deviation from prescribed sampling procedures or laboratory analysis; 5) a transcription error in the data value or data unit of measurement.

USEPA (1989; p. 8-11) states that the purpose of a test for outliers is to determine whether or not there is statistical evidence that an observation that appears extreme does not fit the distribution of the rest of the data. If an observation is identified as an outlier, then steps need to be taken to determine whether it is the result of an error or a valid extreme observation. If a true error, such as in transcription, dilution, or analytical procedure, can be identified, then the suspect value should be replaced with its corrected value. If the source of the error can be determined but no correction is possible, then the observation is deleted and the reason for deletion is reported along with any statistical analysis. If no source of error can be documented, then it must be assumed that the observation is a true but extreme value of the data set. If this is the case, the outlier observation(s) must not be altered or excluded from any statistical analysis. Identification of an observation as an outlier but with no error documented could be used to suggest resampling to confirm the value (USEPA, 1989; p. 8-13).

The outlier tests provided in MANAGES are based on either the single outlier test of Grubbs (1969), which is used by USEPA (1989; pp. 8-10 to 8-13) or the single outlier test of Dixon (1951, 1953), which is used by USEPA (2000; pp. 4-24) and by ASTM (1998). The outlier tests assume the data come from a normal distribution. Only one outlier, either an extreme low or an extreme high, can be detected during a single analysis of a data set. Additional outliers can be detected by temporarily removing a previously detected outlier from a data set and then repeating the test on the remaining, reduced, data set. During each pass of the outlier test, the sample mean, standard deviation, and sample size used in the test statistics are computed using only the data remaining in the set. The process can be continued until there is either an insufficient amount of data remaining (a minimum of 3 values) or when no additional outliers are found. When using MANAGES, the user will be asked how many outliers are to be checked and it will then automatically perform all of the recursive calls and data reductions with the Grubbs or Dixon routine. When done, a report can be generated that will show each outlier marked with a flag indicating the sequential order in which the outliers were identified.

Critical values used in the one-sided Grubbs test are taken directly from those in Grubbs and Beck (1972) for sample sizes smaller than 147 observations. Critical values for sample sizes larger than 147 were generated numerically using a Monte Carlo routine, where each sampling event was simulated 100,000 times. Sample sizes ranging from 148 to 5,000 where used and then their resultant test statistic T_n curve fitted at specific significance levels. By this method, it was possible to match Grubbs results to at least four significant digits for corresponding tabulated values.

Critical values used in the one-sided Dixon outlier test are taken directly from tables given in Dixon (1951), Dixon (1953; page 89), and USEPA (2000; p. A-5, Table A-3). The critical values were then curve fitted for every sample size between 3 and 25 as a function of the significance level. By this method, it was possible to match Dixon's results to at least four significant digits for corresponding tabulated values. Note that the Dixon test assumes the data are either normally or lognormally distributed. Hence, sample sizes can only range between 3 and 25, inclusive. Dixon never developed an outlier test for sample sizes larger than 25.

User Selections:

- One or up to 100 locations: a separate test is performed for each location.
- One or up to 100 parameters: a separate test is performed for each parameter.
- Evaluation date range.
- Confidence $(1-\alpha)$ level: 0.90, 0.95 or 0.99.
- Non-detect processing: multiplier between 0 and 1.
- Data transformation option: none and log (base e).
- Number of outliers: one, two, first 5%, first 10%. Selecting any option other than one causes MANAGES to rerun the test, with outliers from prior tests removed, until either no outliers are detected or the specified number of outliers are detected.

Technical Details

Grubbs Outlier Test – The Grubbs outlier test determines whether there is statistical evidence that an observation does not fit the remaining data (USEPA, 1989; p. 8-11). This significance test looks at either the highest or the lowest observation in normal samples.	
The number of observations taken during a specified scoping period; n	*n*

Mean of the observed data during the scoping period; $\overline{X}$	$\overline{X} = \frac{1}{n}\sum_{i=1}^{n} X_i$ where X_i is the i-th observation.
Standard deviation of observed data; S_x.	$S_x = \sqrt{\frac{1}{(n-1)}\sum_{i=1}^{n}(X_i - \overline{X})^2}$
Test statistics: T_l & T_n	Sort the data into ascending order, then compute the statistics $T_l = (\overline{X} - X_l)/S_x$ $T_n = (X_n - \overline{X})/S_x$ where X_l is the smallest value of the n observations and X_n is the largest value of the n observations.
One-sided test with a (1-α) confidence level that there is a single extreme outlier within the n observations.	Grubbs single, one-sided test of either an extreme low outlier : X_l *is an outlier if* $T_l \geq T_{cr(1-\alpha,n)}$ or an extreme high outlier: X_n *is an outlier if* $T_n \geq T_{cr(1-\alpha,n)}$. The function $T_{cr(1-\alpha,n)}$ is the critical value, given in Grubbs and Beck (1972; Table 1) and USEPA (1989; p. B-11, Table 8) . Note that the critical value assumes that the mean and standard deviation are computed from the sample being tested.

Dixon Outlier Test – The Dixon outlier test determines whether there is statistical evidence that an extreme observation does not fit the remaining data (USEPA, 2000; p. 4-24 and ASTM D6312, 1998). This significance test looks at both the highest and the

lowest observations in a sample data set. However, the routine will only perform the outlier tests if several conditions are first satisfied. For example, the Dixon outlier algorithm checks the distribution of the sample data for both normality and lognormality using the Shapiro-Wilk W-test. The outlier routine will not proceed with a data set if the W-test fails. In addition, the Dixon outlier test is limited to a minimum of 3 and a maximum sample size n of 25 data values.	
The number of observations taken during a specified scoping period; n	Number of observations, n, where $3 \le n \le 25$.
Sorting the sample data	Sort the data into ascending order, with the minimum data value $X_{(1)}$ first and the maximum data value $X_{(n)}$ last. Use the natural log of the data values if data are lognormally distributed, i.e., $X_{(j)} = Ln[X_{(j)}]$.
Goodness-of fit tests	After temporarily excluding either the minimum or maximum value of the data set, the Shapiro-Wilk's W-test is used to determine if the remaining $n-1$ values are normally or lognormally distributed. If not, the Dixon outlier test can't be used.
Test statistic, T_s, for the minimum data value	Compute the T_s test statistic for $X_{(1)}$ as an outlier: $T_s = \frac{X_{(2)} - X_{(1)}}{X_{(n)} - X_{(1)}}$ *for* $3 \le n \le 7$ $T_s = \frac{X_{(2)} - X_{(1)}}{X_{(n-1)} - X_{(1)}}$ *for* $8 \le n \le 10$ $T_s = \frac{X_{(3)} - X_{(1)}}{X_{(n-1)} - X_{(1)}}$ *for* $11 \le n \le 13$ $T_s = \frac{X_{(3)} - X_{(1)}}{X_{(n-2)} - X_{(1)}}$ *for* $14 \le n \le 25.$
Test statistic, T_s, for the maximum data value	Compute the T_s test statistic for $X_{(n)}$ as an outlier:

	$T_s = \frac{X_{(n)} - X_{(n-1)}}{X_{(n)} - X_{(1)}}$ *for* $3 \le n \le 7$ $T_s = \frac{X_{(n)} - X_{(n-1)}}{X_{(n)} - X_{(2)}}$ *for* $8 \le n \le 10$ $T_s = \frac{X_{(n)} - X_{(n-2)}}{X_{(n)} - X_{(2)}}$ *for* $11 \le n \le 13$ $T_s = \frac{X_{(n)} - X_{(n-2)}}{X_{(n)} - X_{(3)}}$ *for* $14 \le n \le 25$.
Critical value T_c	USEPA (2000; p. A-5, Table A-3) lists the critical values of the Dixon test as a function of sample size for a one-sided extreme value test at the significance levels α of 0.1, 0.05, and 0.01.
One-sided test with a (1-α) confidence level that there is a single extreme outlier within the n observations.	Dixon's single, one-sided test for statistical evidence of either an extreme low-valued outlier: $X_{(1)}$ *is an outlier if* $T_s \ge T_c$ or an extreme high-valued outlier: $X_{(n)}$ *is an outlier if* $T_s \ge T_c$. The function T_c is the critical value, given in Dixon (1953; page 89) and USEPA (2000; p. A-5, Table A-3). Note that the critical value assumes that the data are either normally or lognormally distributed.

Other Statistical Calculations Used in MANAGES

Sen Estimate of Slope

The Sen estimate of slope is the median of all slopes between all possible unique pairs of individual data points in the time period being analyzed (Gilbert, 1987). The slopes represent the rate of change of the measured parameter, with the y-axis being the parameter value and the x-axis being calendar days. Sen's estimate of slope is a non-parametric estimator of trend. The method is robust, and fairly insensitive to the presence of a small fraction of outliers and non-detect data values. In contrast, linear regression and other least squares estimators of slope are significantly more sensitive, and more likely to give erroneous slope indications, even when only a few outlier values are present.

When data averaging is not activated, the Sen slope is calculated using individual data points and actual sampling dates. When data averaging is activated, multiple data points within each specified season period are reduced to one data point by arithmetic averaging over each of the season periods. These averaged values are then assigned to the day that corresponds to the middle of that season's period.

The approximate lower and upper confidence limits for the Sen slope can also be calculated using normal theory (Gilbert, 1987). It should be noted that confidence limits for the Sen slope are not necessarily symmetrical about the estimated slope since ranked values of slope are used in the calculation.

MANAGES calculates Sen slope in the Sen Slope Overlay Graph, Statistical Summary reports and in the two Mann-Kendall tests performed under the Statistical Evaluation Report.

Sen's Estimate of Slope – two-sided, non-parametric method that calculates the trend of a single data series. It is less sensitive to outliers and non-detect values than linear regression (Gilbert, 1987; p. 217).	
Slope, Q	$= \dfrac{x_{i'} - x_i}{i' - i}$ where $X_{i'}$ and x_i are data values at times i' and i, respectively, and where $i'>i$. Typically, i' and i are expressed in units of either days for trend analysis or years for seasonal analysis.
N′	Number of unique data point pairs that can be made for the observations in the data set, for $i'>i$. For n monitoring events, N′ is given as: N′ = n(n-1)/2

Sen's Slope Estimate	Sen's slope estimator = median slope $= Q_{[(N'+1)/2]}$ if N' is odd $= \frac{1}{2}(Q_{[N'/2]} + Q_{[(N'+2)/2]})$ if N' is even where the Q values have first been ranked from smallest to largest.
$Z_{1-\alpha/2}$	Statistic for the cumulative normal distribution (Gilbert, 1987; p. 254) for the two-sided, α significance level.
Variance estimate of the Mann-Kendall S Statistic, VAR(S)	VAR(S) $= \frac{1}{18}\left[n(n-1)(2n+5) - \sum_{p=1}^{g} t_p(t_p-1)(2t_p+5)\right]$ where g is the number of tied groups, t_p is the number of data in the pth group, and n is the number of data values.
C_α	$= Z_{1-\alpha/2}\sqrt{VAR(S)}$
Sen's Slope , a two-sided test at the α significance level	$M_1 = \frac{(N'-C_\alpha)}{2}$ $M_2 = \frac{(N'+C_\alpha)}{2}$ Lower limit of confidence interval is the M_1-th largest slope, and upper limit of confidence interval is the (M_2+1)-th largest of the N′ ordered slope estimates.

Coefficient of Skewness for Normality

The coefficient of skewness is another measure for data normality (Gilbert, 1987). MANAGES provides the value of the coefficient of skewness in the Statistical Evalueation Report, Statistical Overview. Additional information on data normality is given by Montgomery, et al. (1987).