Annual Groundwater Monitoring Report

Public Service Company of Oklahoma

Northeastern Power Station

Bottom Ash Pond CCR Management Unit

Permit No. 3566010-SI

7300 E HWY 88

Oologah, Oklahoma

January 31, 2025

Prepared by:
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PUBLIC SERVICE COMPANY OF OKLAHOMA℠

An AEP Company

BOUNDLESS ENERGY℠

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Abbreviations:
ASD - Alternate Source Demonstration
BAP – Bottom Ash Pond
CCR – Coal Combustion Residual
GWPS - Groundwater protection standards
NPS – Northeastern Power Station
SSI - Statistically Significant Increase
SSL - Statistically Significant Level

I. Overview

This *Annual Groundwater Monitoring Report* (Report) has been prepared to report the status of activities for the preceding year for an existing Coal Combustion Residual (CCR) unit at Public Service Company of Oklahoma's (PSO's), a wholly owned subsidiary of American Electric Power Company (AEP), Northeastern Power Station (NPS). The Oklahoma Department of Environmental Quality (ODEQ) CCR rules require that the Annual Groundwater Monitoring Report be posted to the operating record for the preceding year no later than January 31, 2025.
In general, the following activities were completed:

- At the start of the current annual reporting period, the BAP was operating under the Assessment monitoring program.
- At the end of the current annual reporting period, the BAP was operating under the Assessment monitoring program.
- The BAP initiated an assessment monitoring program on April 13, 2018.
- A statistical process in accordance with OAC 252:517 to evaluate groundwater data was updated, certified, and posted to AEP's CCR website titled: *Statistical Analysis Plan (*Geosyntec Nov 2021). The statistical process was guided by USEPA's *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* ("Unified Guidance," USEPA, 2009). This report was approved by ODEQ January 20, 2022.
- Semi-Annual groundwater samples were collected from SP-1, SP-2, SP-4, SP-5R, SP-10 and SP-11 and analyzed for Appendix A and Appendix B constituents, as specified in OAC 255:517-9-6 Assessment Monitoring program and AEP's *Groundwater Sampling and Analysis Plan* (2021).
- Data and statistical analysis not available for the previous reporting period indicated that during the 2nd semi-annual 2023 sampling event (October 2023):
    - Potential SSIs were identified for:
        - Boron at SP-10
        - Chloride at SP-10
        - Fluoride at SP-10
        - Sulfate SP-1 and SP-11
        - TDS at SP-10
    - Potential SSLs were identified for:
        - Lithium, Barium, and Fluoride in SP-10

- During the 1st semi-annual 2024 sampling event (April 2024):
    - Potential SSIs were identified for:
        - Boron at SP-10
        - Calcium at SP-2
        - Chloride at SP-10
        - Fluoride at SP-10
        - Sulfate at SP-1 and SP-11
        - TDS at SP-10
    - Potential SSLs were identified for:
        - Lithium, Barium, and Fluoride in SP-10
- Statistical evaluation of the 2nd semi-annual 2024 groundwater sampling event in October 2024 is underway.
- ASDs for the 1st semi-annual 2023 potential Lithium, Barium, and Fluoride SSLs were certified December 29, 2023, and approved by ODEQ February 22, 2024.
- ASDs for the 2nd semi-annual 2023 potential Lithium, Barium, and Fluoride SSLs were certified May 16, 2024, and approved by ODEQ June 27, 2024.
- ASDs for the 1st semi-annual 2024 potential Lithium, Barium, and Fluoride SSLs have been submitted to ODEQ for review on December 6, 2024.

The major components of this annual report, to the extent applicable at this time, are presented in sections that follow:

- A map, aerial photograph or a drawing showing the BAP CCR management unit, all groundwater monitoring wells and monitoring well identification numbers.
- All of the monitoring data collected, including the rate and direction of groundwater flow, plus a summary showing the number of samples collected per monitoring well, the dates the samples were collected and whether the sample was collected as part of detection monitoring or assessment monitoring programs is included in Appendix 1.
- Statistical comparison of monitoring data to determine if there have been SSI(s) or SSL(s) (Attached as Appendix 2, where applicable).
- A discussion of whether any alternate source demonstrations (ASDs) were performed, and the conclusions (Attached as Appendix 3, where applicable).

- A summary of any transition between monitoring programs or an alternate monitoring frequency, for example the date and circumstances for transitioning from detection monitoring to assessment monitoring, in addition to identifying the constituents detected at a statistically significant increase over background concentrations (Appendix 4).
- Identification of any monitoring wells that were installed, or decommissioned during the preceding year, along with a statement as to why that happened (Attached as Appendix 5, where applicable); and
- Other information required to be included in the annual report such as field sheets and analytical reports, if applicable.

In addition, this report summarizes key actions completed, and where applicable, describes any problems encountered and actions taken to resolve those problems. The report includes a projection of key activities for the upcoming year.

II. Groundwater Monitoring Well Locations and Identification Numbers

The figure that follows depicts the PE-certified groundwater monitoring network, the monitoring well locations and their corresponding identification numbers.

Bottom Ash Pond Monitoring Wells	
Background	Down Gradient
SP-4	SP-1
SP-5R	SP-2
	SP-10
	SP-11

III. Monitoring Wells Installed or Decommissioned

There were no groundwater monitoring wells installed or decommissioned during this reporting period. The network design, as summarized in the *Groundwater Monitoring Network Design Report* (September 2017) and as posted at the CCR website for NPS's Bottom Ash Pond (BAP), did not change. That network design report, viewable on the AEP CCR web site, discusses the facility location, the hydrogeological setting, the hydrostratigraphic units, the uppermost aquifer, downgradient monitoring well locations and the upgradient monitoring well locations.

IV. Groundwater Quality Data and Static Water Elevation Data, With Flow Rate and Direction and Discussion

Appendix 1 contains tables showing the applicable groundwater quality data obtained under OAC 252:517-9-4 through 252:517-9-6 relevant to this reporting period. Static water elevation data from each monitoring event also are shown in Appendix 1, along with the groundwater velocity calculations groundwater flow directions and potentiometric maps developed after each sampling event.

The site-wide groundwater flow velocity varies from the velocity computed in residence time calculations because assumptions used in these calculations vary based on the scale of the application of groundwater flow. The site-wide groundwater flow velocity is determined as a representative average over the entire CCR unit, which is a large area (multiple acres) consisting of different rock formations. The residence time calculation is a localized estimate use to establish the residence time of groundwater within a single well (<100 sq ft). The site-wide groundwater flow velocity utilizes the maximum and minimum hydraulic gradient based on groundwater elevation differences between two widely spaced site monitoring wells. For a localized hydraulic gradient, the residence time calculations use the elevation difference between the target monitoring well and the nearest groundwater elevation contour line. Additionally, the hydraulic conductivity and effective porosity used in the site-wide groundwater flow velocity are represented by average parameters based on field tests conducted at the Unit. The residence time calculation uses an estimated hydraulic conductivity and effective porosity from a reference work representative of the formation in contact with the well.

A summary of the varying methods is shown below:

	Site-Wide Flow Calculation	Residence Time Calculation
Purpose	Determine representative average groundwater flow velocity across the entire Unit (multiple acres)	Determine residence time of groundwater within a 2-inch diameter groundwater monitoring well (<100 square feet)
Hydraulic Gradient	Greatest groundwater elevation difference between two wells monitoring the Unit, and smallest groundwater elevation difference between two wells monitoring the Unit	Elevation difference between target groundwater monitoring well, and nearest groundwater elevation contour line
Hydraulic Conductivity	Average hydraulic conductivity determined from slug tests conducted at the Unit	Estimated hydraulic conductivity from referenced work representative of the formation in contact with the individual well
Effective Porosity	Average effective porosity determined from field tests	Estimated effective porosity from referenced work representative of the formation in contact with the well

ODEQ agreed via email dated August 22, 2022, that the 252:517-9-6(b) sampling event is not needed if all Appendix A and B parameters are collected during each semi-annual sampling event (email attached in Appendix 6). Therefore, PSO no longer conducts the 252:517-9-6(b) sampling event and all Appendix A and B parameters are collected at each monitoring well for this CCR Unit during each semi-annual sampling event.

The semi-annual groundwater sampling events for Appendix A and Appendix B constituents were conducted April 16, 2024, and October 22, 2024. When the data becomes available, it is placed into NPS's Operating Record, satisfying the requirement of 252:517-9-6(d).

Appendix 6 contains the available Field sheets and laboratory reports for this reporting period.

V. Groundwater Quality Data Statistical Analysis

Semi-Annual groundwater samples were collected SP-1, SP-2, SP-4, SP-5R, SP-10 and SP-11 and analyzed for Appendix A and Appendix B constituents, as specified in OAC 255:517-9-6 Assessment Monitoring program and AEP's *Groundwater Sampling and Analysis Plan* (2021) and approved by ODEQ January 20, 2022.

Appendix 2 contains the available statistical analysis reports for this reporting period.

Data and statistical analysis not available for the previous reporting period was certified February 20, 2024, and indicated that during the 2nd semi-annual 2023 sampling event (October 10, 2023):

- Potential SSIs were identified for:
  - Boron at SP-10
  - Chloride at SP-10
  - Fluoride at SP-10
  - Sulfate SP-1 and SP-11
  - TDS at SP-10
- Potential SSLs were identified for:
  - Lithium, Barium, and Fluoride in SP-10

During the 1st semi-annual 2024 sampling event (April 16, 2024) and certified September 11, 2024, indicated:

- Potential SSIs were identified for:
  - Boron at SP-10
  - Calcium at SP-2
  - Chloride at SP-10
  - Fluoride at SP-10
  - Sulfate at SP-1 and SP-11
  - TDS at SP-10
- Potential SSLs were identified for:
  - Lithium, Barium, and Fluoride in SP-10

Statistical evaluation of the 2nd semi-annual 2024 groundwater sampling event in October 2024 is underway.

VI. Alternate Source Demonstrations Completed

An alternate source demonstration (ASD) investigation relative to past SSIs was completed in April 2018. That demonstration concluded that alternate sources could not be identified. Additionally, an ASD investigation was not undertaken for the current SSI(s).

ASDs for the 1st semi-annual 2023 potential Lithium, Barium, and Fluoride SSLs were certified December 29, 2023, and approved by ODEQ February 22, 2024.

ASDs for the 2nd semi-annual 2023 potential Lithium, Barium, and Fluoride SSLs were certified May 16, 2023, and approved by ODEQ June 27, 2024.

ASDs for the 1st semi-annual 2024 potential Lithium, Barium, and Fluoride SSLs have been submitted to ODEQ for review on December 6, 2024.

Because successful ASDs for the potential SSL(s) were identified, but no alternate sources for the SSI(s) were identified, the BAP remained in Assessment Monitoring.

VII. Discussion About Transition Between Monitoring Requirements or Alternate Monitoring Frequency

Because an ASD for the SSIs could not be identified, an assessment monitoring program was established at NE's BAP in April 2018. Assessment monitoring continued throughout the 2024 calendar year.

VIII. Other Information Required

A statistical process in accordance with OAC 252:517 to evaluate groundwater data was updated, certified, and posted to AEP's CCR website in 2022 titled: *Statistical Analysis Plan (*Geosyntec Nov 2021). The statistical process was guided by USEPA's *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* ("Unified Guidance," USEPA, 2009). This report was approved by ODEQ January 20, 2022.

A draft permit was issued on August 20, 2024, and published in the Oologah Lake Leader newspaper on September 26, 2024. After no public comments or requests for a public meeting were received, the final permit No. 3566010-SI was issued November 21, 2024.

Financial Assurance – Corporate Financial Test was accepted by ODEQ in correspondence dated May 9, 2024.

IX. Description of Any Problems Encountered and Actions Taken

No significant problems were encountered. The low flow sampling effort continued, and the schedule was met to support the annual groundwater report preparation covering this reporting period's groundwater monitoring activities.

X. A Projection of Key Activities for the Upcoming Year

Key activities for the next reporting period include:

- As required by OAC 252:517-9-6, conduct assessment monitoring of the groundwater for the BAP CCR unit on a semi-annual basis;
- Evaluation of the assessment monitoring results from a statistical analysis viewpoint, looking for SSLs above GWPS;
- Complete ASDs for potential SSLs and submit to ODEQ for approval;
- Preparation of the next annual groundwater report.

APPENDIX 1

Potentiometric Maps and Tables follow, showing the groundwater monitoring data collected, the rate and direction of groundwater flow, and a summary showing the number of samples collected per monitoring well. The dates that the samples were collected also is shown.

Legend

- Groundwater Monitoring Well
- Approximate Groundwater Flow Direction
- Groundwater Elevation Contour
- Groundwater Elevation Contour (Inferred)
- Bottom Ash Pond
- Impoundment
- Landfill
- Slurry Wall

Notes

1. Monitoring well coordinates and water level data (collected on April 16, 2024) provided by AEP.
2. Groundwater elevation units are feet above mean sea level (ft amsl).
3. Only wells screened in the upper portion of the Oolagah Limestone were used for contouring.
4. Satellite imagery provided by ESRI (December 2023).

500 250 0 500 Feet

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Potentiometric Contours - Uppermost Aquifer
April 2024

AEP Northeastern Power Plant - Bottom Ash Pond
Oologah, Oklahoma

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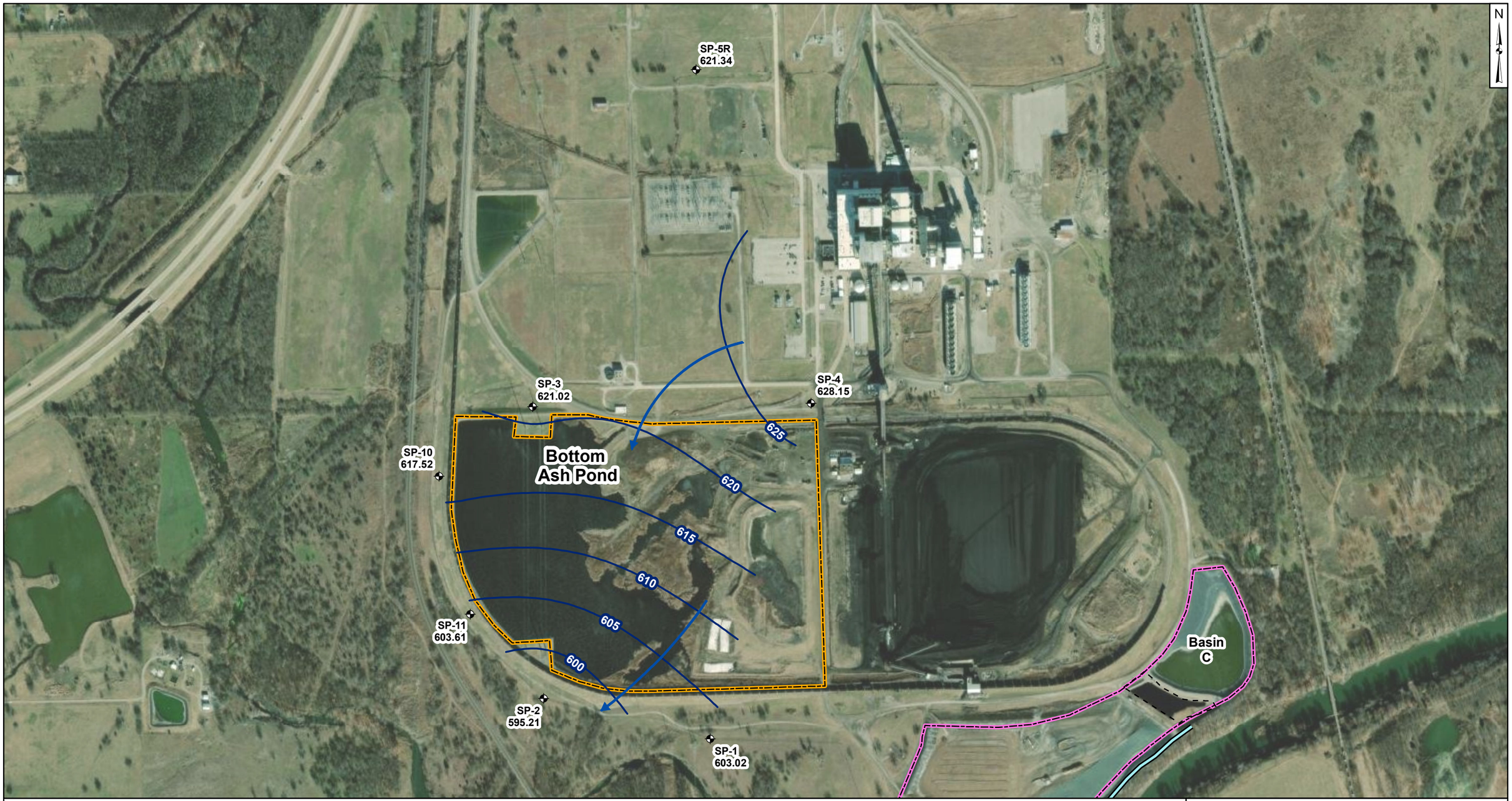
Figure **1**

A:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Northeastern\2024\AEP-Northeastern_BAP_2024-04_Apr.mxd. Okiemute.Commander. 6/6/2024. Project/Phase/Task.



Legend

- Groundwater Monitoring Well
- Approximate Groundwater Flow Direction
- Groundwater Elevation Contour
- Groundwater Elevation Contour (Inferred)
- Bottom Ash Pond
- Impoundment
- Landfill
- Slurry Wall

Notes

1. Monitoring well coordinates and water level data (collected on October 22, 2024) provided by AEP.
2. Groundwater elevation units are feet above mean sea level (ft amsl).
3. Only wells screened in the upper portion of the Oolagah Limestone were used for contouring.
4. Satellite imagery provided by ESRI (December 2023).

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Potentiometric Contours - Uppermost Aquifer October 2024

AEP Northeastern Power Plant - Bottom Ash Pond
Oologah, Oklahoma

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Figure 2

\\annarbor-01\Data\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Northeastern\2024\AEP-Northeastern_BAP_2024-10_Oct.mxd. ASoltero. 11/11/2024. Project/Phase/Task.

Table 1: Residence Time Calculation Summary
Northeastern Bottom Ash Pond

Geosyntec Consultants, Inc.

			2024-04		2024-10	
CCR Management Unit	Monitoring Well	Well Diameter (inches)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)
Bottom Ash Pond	SP-1 [2]	2.0	3.4	18.0	3.9	15.4
	SP-2 [2]	2.0	5.3	11.4	5.7	10.6
	SP-4 [2]	2.0	5.2	11.7	4.1	14.9
	SP-5R [1]	2.0	2.3	26.1	1.4	42.7
	SP-10 [1]	2.0	1.3	48.1	5.4	11.3
	SP-11 [1]	2.0	7.2	8.5	5.6	10.8

Notes:
[1] - Background Well
[2] - Downgradient Well

Table 1. Groundwater Data Summary: SP-1
Northeastern - BAP
Appendix A Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
1/25/2017	Background	0.298	111	60	< 1 U1	7.5	66	514
3/13/2017	Background	0.186	117	548	4	--	30	480
4/24/2017	Background	0.202	108	83	1.02	7.6	60	496
5/18/2017	Background	0.284	131	104	1.3	--	60	574
6/15/2017	Background	0.242	115	50	0.6437 J1	9.3	48	478
6/27/2017	Background	0.232	113	19	0.582 J1	11.1	48	424
7/12/2017	Background	0.287	122	70	0.6283 J1	9.8	56	504
8/4/2017	Background	0.299	125	20	0.542 J1	8.7	52	394
8/17/2017	Background	--	--	--	--	7.9	--	--
8/30/2017	Background	0.25	120	34	0.581 J1	7.7	59	456
9/13/2017	Background	0.369	119	62	0.4042 J1	8.2	54	536
9/20/2017	Background	0.331	129	22	< 0.083 U1	7.3	62	440
10/11/2017	Detection	0.35	152	136	1.4051	7.4	58	676
1/22/2018	Detection	--	119	--	--	6.9	--	--
5/30/2018	Assessment	--	--	--	1.2525	7.3	--	--
7/30/2018	Assessment	0.397	130	46	0.9863 J1	7.0	63	1,060
2/4/2019	Assessment	0.354	150	--	--	--	--	--
2/27/2019	Assessment	0.200	122	42.7	0.80	7.3	87.1	532
6/20/2019	Assessment	0.198	126	25.2	0.77	7.1	61.4	452
8/26/2019	Assessment	0.124	120	9	0.525 J1	9.0	48	438
3/25/2020	Assessment	0.184	96.7	40.8	0.96	8.5	62.9	500
6/30/2020	Assessment	0.180	99.4	29.6	0.81	9.0	49.3	435
7/28/2020	Assessment	--	--	--	--	8.4	--	--
10/20/2020	Assessment	0.146	103	12.9	0.81	8.5	51.1	427
3/3/2021	Assessment	0.169	105	--	0.85	7.4	--	--
4/12/2021	Assessment	0.186	104	37.2	0.88	7.6	50.0	438
12/28/2021	Assessment	0.127	91.2	34.2	0.93	7.1	40.0	410
6/14/2022	Assessment	0.176	102	21.2	0.78	7.3	65.2	430 L1
11/8/2022	Assessment	0.147	102 M1	16.3	0.85	7.3	54.1	400
6/20/2023	Assessment	0.158	100	84.3	0.82	7.2	65.0	460
10/10/2023	Assessment	0.159	102	45.1	0.96	7.4	84.8	470
4/16/2024	Assessment	0.201	113	47.7	0.89	7.8	97.3	460
10/22/2024	Assessment	0.185	123	48.1	0.96	7.5	85.2	510

Table 1. Groundwater Data Summary: SP-1
Northeastern - BAP
Appendix B Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
1/25/2017	Background	< 5 U1	< 5 U1	211	< 1 U1	< 1 U1	< 1 U1	< 5 U1	3.48	< 1 U1	< 5 U1	0.006	< 0.025 U1	11	< 5 U1	< 2 U1
3/13/2017	Background	< 5 U1	< 5 U1	146	< 1 U1	< 1 U1	< 1 U1	< 5 U1	3.014	4	< 5 U1	0.007	< 0.025 U1	16	< 5 U1	< 2 U1
4/24/2017	Background	2.75 J1	1.91 J1	195	0.1 J1	< 0.07 U1	0.84 J1	2.42 J1	4.71	1.02	0.94 J1	0.00789	< 0.005 U1	19.92	4.85 J1	< 0.86 U1
5/18/2017	Background	6.85	5.48	243	0.26 J1	0.22 J1	2.55	2.55 J1	4.12	1.3	1.63 J1	0.00853	0.023 J1	16.77	6.51	< 0.86 U1
6/15/2017	Background	1.14 J1	< 1.05 U1	183	0.04 J1	< 0.07 U1	< 0.23 U1	0.77 J1	2.096	0.6437 J1	< 0.68 U1	0.00407	0.009 J1	7.02	2.54 J1	< 0.86 U1
6/27/2017	Background	< 0.93 U1	< 1.05 U1	187	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.77 J1	14.29	0.582 J1	< 0.68 U1	0.00334	< 0.005 U1	6.42	2.77 J1	< 0.86 U1
7/12/2017	Background	1.25 J1	< 1.05 U1	217	0.09 J1	< 0.07 U1	0.62 J1	1.34 J1	4.01	0.6283 J1	1.24 J1	0.00395	< 0.005 U1	8.14	5.21	0.89 J1
8/4/2017	Background	< 0.93 U1	2.11 J1	298	0.1 J1	< 0.07 U1	0.78 J1	1.33 J1	3.41	0.542 J1	0.94 J1	0.00577	0.009 J1	19.96	11.96	< 0.86 U1
8/30/2017	Background	2.09 J1	1.34 J1	218	0.14 J1	< 0.07 U1	0.55 J1	1.75 J1	4.15	0.581 J1	< 0.68 U1	0.00468	< 0.005 U1	12.08	3.51 J1	< 0.86 U1
9/13/2017	Background	< 0.93 U1	< 1.05 U1	210	0.09 J1	0.08 J1	0.31 J1	1.07 J1	2.584	0.4042 J1	< 0.68 U1	0.00548	< 0.005 U1	14.65	4.13 J1	< 0.86 U1
9/20/2017	Background	< 0.93 U1	< 1.05 U1	168	0.05 J1	0.11 J1	< 0.23 U1	1.15 J1	4.53	< 0.083 U1	< 0.68 U1	0.00318	< 0.005 U1	5.32	< 0.99 U1	< 0.86 U1
5/30/2018	Assessment	< 0.93 U1	< 1.05 U1	190	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.53 J1	3.64	1.2525	< 0.68 U1	0.00785	< 0.005 U1	16.39	4.23 J1	2
7/30/2018	Assessment	0.69	0.93	174	0.06 J1	0.08 J1	1.83	0.676	3.056	0.9863 J1	0.354	0.00615	< 0.005 U1	17.1	5.8	0.09 J1
2/27/2019	Assessment	0.6 J1	0.7 J1	168	< 0.2 U1	< 0.1 U1	2.72	< 0.2 U1	3.056	0.80	0.2 J1	0.00641	< 0.005 U1	10 J1	2.8	< 1 U1
6/20/2019	Assessment	0.93	1.44	242	0.2 J1	0.1 J1	0.7 J1	5.54	2.745	0.77	0.650	0.03 J1	0.01 J1	12.1	9.9	< 0.5 U1
8/26/2019	Assessment	0.43	0.73	160	0.08 J1	0.09	1.49	0.481	2.75	0.525 J1	0.835	0.00285	< 0.005 U1	5.86	3.4	0.1 J1
3/25/2020	Assessment	0.62	0.72	158	0.07 J1	0.08	0.499	0.362	6.67	0.96	0.351	0.00600	< 0.002 U1	15.8	6.6	< 0.1 U1
6/30/2020	Assessment	0.58	0.69	159	0.07 J1	0.07	0.969	0.431	2.531	0.81	0.886	0.00534	< 0.002 U1	13.6	8.3	< 0.1 U1
10/20/2020	Assessment	0.46	0.57	143	0.05 J1	0.08	0.215	0.727	2.82	0.81	0.254	0.00336	< 0.002 U1	11.5	3.8	< 0.1 U1
3/3/2021	Assessment	0.51	0.53	144	0.05 J1	0.08	0.426	0.307	4.27	0.85	0.259	0.00443	< 0.002 U1	14.3	4.5	< 0.1 U1
4/12/2021	Assessment	0.46	0.54	158	0.04 J1	0.05	0.359	0.202	3.47	0.88	0.2 J1	0.00549	< 0.002 U1	13.7	3.9	0.05 J1
12/28/2021	Assessment	0.51	0.51	155	0.040 J1	0.051	0.70	0.246	4.12	0.93	0.24	0.00474	< 0.002 U1	15.2	6.45	0.05 J1
6/14/2022	Assessment	0.72	0.84	161	0.061	0.066	0.60	1.14	3.98	0.78	0.22	0.00473	< 0.002 U1	21.2	9.63	0.07 J1
11/8/2022	Assessment	0.80	0.69	157	0.054	0.055	1.30	0.684	5.68	0.85	0.15 J1	0.00558	< 0.002 U1	28.8	15.4	0.07 J1
6/20/2023	Assessment	0.491	0.45	145	0.091	0.047	0.41	0.174	6.92	0.82	0.24	0.00726	< 0.002 U1	17.2	7.58	0.07 J1
10/10/2023	Assessment	0.745	0.65	138	0.053	0.041	0.47	0.717	3.06	0.96	0.17 J1	0.00819	< 0.002 U1	26.0	11.8	0.11 J1
4/16/2024	Assessment	0.433	0.40	134	0.050	0.053	0.63	0.164	1.95	0.89	0.33	0.00615	< 0.002 U1	14.9	5.43	0.06 J1
10/22/2024	Assessment	0.368	0.62	142	0.120	0.076	1.23	0.536	4.93	0.96	1.18	0.00658	0.003 J1	11.0	5.39	0.08 J1

Table 1. Groundwater Data Summary: SP-2
Northeastern - BAP
Appendix A Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
1/25/2017	Background	0.274	108	607	3	6.4	21	1,786
3/13/2017	Background	0.251	82.6	37	1	--	70	1,340
4/24/2017	Background	0.152	62	527	2.82	6.5	27	1,242
5/18/2017	Background	0.336	117	1,240	3.1	--	15	2,214
6/15/2017	Background	0.303	108	888	2.96	8.3	61	1,912
6/27/2017	Background	0.292	98.5	883	2.8408	7.4	58	1,872
7/12/2017	Background	0.339	111	863	3.581	7.9	58	1,846
8/4/2017	Background	0.28	147	1,064	2.788	7.2	57	2,132
8/17/2017	Background	--	--	--	--	7.6	--	--
8/30/2017	Background	0.275	86.8	1,001	4.0998	7.5	47	2,192
9/13/2017	Background	0.311	91.8	930	3.196	7.0	43	1,956
9/20/2017	Background	0.3	129	856	1.726	6.9	37	1,778
10/11/2017	Detection	0.307	91.9	970	3.5881	7.3	41	2,076
1/22/2018	Detection	--	--	975	--	7.0	--	1,910
5/30/2018	Assessment	--	--	--	3.4972	7.5	--	--
7/30/2018	Assessment	0.276	117	268	2.6556	7.5	30	1,006
2/27/2019	Assessment	0.116	94.0	351	2.68	7.6	26.1	932
6/20/2019	Assessment	0.109	58.2	357	2.69	6.8	28.5	1,044
8/26/2019	Assessment	0.173	211	1,072	2.685	8.5	14	2,246
3/25/2020	Assessment	0.114	60.4	418	2.73	8.8	22.0	1,120
6/30/2020	Assessment	0.163	83.9	420	2.64	8.8	26.3	977
7/28/2020	Assessment	--	--	--	--	8.4	--	--
10/20/2020	Assessment	0.151	75.3	850	2.98	8.7	19.1	1,790
3/3/2021	Assessment	0.140	72.0	--	3.00	7.5	--	--
4/12/2021	Assessment	0.255	91.5	1,130	3.19	7.6	12.4	2,000
12/28/2021	Assessment	0.111	104	341	2.73	7.3	20.8	920
6/14/2022	Assessment	0.228	115	844	3.08	7.4	22.3	1,720 L1
11/8/2022	Assessment	0.108	103	695	2.7	7.3	18.1	1,480
6/20/2023	Assessment	0.105	87.2	--	--	7.3	--	--
6/29/2023	Assessment	--	--	604	3.02	--	18.1	1,780
10/10/2023	Assessment	0.210	151	699	2.79	7.6	20.2	1,470
4/16/2024	Assessment	0.210	172	450	2.74	7.6	19.0	990
10/22/2024	Assessment	0.108	135	365	2.68	7.3	16.5	950 S7

Table 1. Groundwater Data Summary: SP-2
Northeastern - BAP
Appendix B Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
1/25/2017	Background	< 5 U1	11	1,460	< 1 U1	< 1 U1	3	< 5 U1	6.89	3	< 5 U1	0.098	< 0.025 U1	19	< 5 U1	< 2 U1
3/13/2017	Background	< 5 U1	5	1,130	< 1 U1	< 1 U1	1	< 5 U1	9.96	1	< 5 U1	0.073	< 0.025 U1	23	< 5 U1	< 2 U1
4/24/2017	Background	2.09 J1	2.08 J1	760	0.04 J1	< 0.07 U1	0.24 J1	0.87 J1	8.98	2.82	< 0.68 U1	0.05305	< 0.005 U1	24.67	2.04 J1	< 0.86 U1
5/18/2017	Background	8.71	9.02	3,130	0.26 J1	0.18 J1	2.87	2.77 J1	26.48	3.1	2.02 J1	0.111	0.006 J1	11.63	6.16	< 0.86 U1
6/15/2017	Background	11.34	5.5	1,710	0.18 J1	< 0.07 U1	2.04	2.51 J1	22.16	2.96	< 0.68 U1	0.103	0.005 J1	29.57	37.83	< 0.86 U1
6/27/2017	Background	5.15	1.4 J1	1,560	0.06 J1	< 0.07 U1	1.29	1.82 J1	--	2.8408	< 0.68 U1	0.09272	< 0.005 U1	29.62	22.41	< 0.86 U1
7/12/2017	Background	4.74 J1	2.51 J1	1,540	0.07 J1	< 0.07 U1	0.59 J1	1.23 J1	--	3.581	1.41 J1	0.0961	< 0.005 U1	33.32	23.23	< 0.86 U1
8/4/2017	Background	3.51 J1	2.54 J1	1,010	0.09 J1	0.07 J1	1.07	1.08 J1	16.34	2.788	< 0.68 U1	0.09164	0.014 J1	39.4	23.36	< 0.86 U1
8/30/2017	Background	2.95 J1	1.25 J1	1,120	0.12 J1	< 0.07 U1	< 0.23 U1	0.8 J1	14.48	4.0998	< 0.68 U1	0.0931	< 0.005 U1	33.86	11.86	< 0.86 U1
9/13/2017	Background	2.67 J1	1.83 J1	992	0.11 J1	< 0.07 U1	< 0.23 U1	0.87 J1	14.89	3.196	< 0.68 U1	0.09207	0.006 J1	37.61	9.87	< 0.86 U1
9/20/2017	Background	2.64 J1	3.05 J1	1,150	0.2 J1	0.09 J1	3.46	2.55 J1	--	1.726	0.91 J1	0.09111	< 0.005 U1	39.39	9.87	< 0.86 U1
5/30/2018	Assessment	1.3 J1	< 1.05 U1	869	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.55 J1	7.85	3.4972	< 0.68 U1	0.04039	< 0.005 U1	26.46	2.16 J1	< 0.86 U1
7/30/2018	Assessment	1.21	1.42	656	0.05 J1	0.08 J1	< 40 U1	0.400	9.61	2.6556	0.245	0.0346	< 0.005 U1	26.1	2.9	0.06 J1
2/27/2019	Assessment	1.39	1.29	841	< 0.2 U1	< 0.1 U1	4.30	< 0.2 U1	5.76	2.68	0.3 J1	0.0329	< 0.005 U1	25.8	3.7	< 1 U1
6/20/2019	Assessment	1.34	1.43	868	0.1 J1	0.09 J1	0.9 J1	0.434	7.94	2.69	0.4 J1	0.062	< 0.005 U1	25.0	2.9	< 0.5 U1
8/26/2019	Assessment	1.22	1.53	1,220	0.07 J1	0.05	0.701	0.568	8.72	2.685	0.334	0.0582	< 0.005 U1	22.3	3.7	0.1 J1
3/25/2020	Assessment	1.14	1.68	1,060	0.07 J1	0.13	0.806	0.361	9.73	2.73	0.694	0.0352	< 0.002 U1	20.3	2.4	< 0.1 U1
6/30/2020	Assessment	1.26	1.28	1,140	0.109	0.05	0.573	0.733	7.84	2.64	0.263	0.0585	< 0.002 U1	19.7	6.2	< 0.1 U1
10/20/2020	Assessment	1.22	1.08	1,110	0.07 J1	0.04 J1	0.398	0.433	12.96	2.98	0.1 J1	0.0517	< 0.002 U1	20.1	4.4	< 0.1 U1
3/3/2021	Assessment	1.09	1.07	1,050	0.09 J1	0.06	0.700	0.323	11.81	3.00	0.253	0.0523	< 0.002 U1	17.1	3.5	< 0.1 U1
4/12/2021	Assessment	0.84	1.53	1,790	0.112	0.04 J1	0.559	1.10	7.87	3.19	0.211	0.0862	< 0.002 U1	14.6	1.1	0.05 J1
12/28/2021	Assessment	0.97	1.08	1,210	0.055	0.044	0.52	0.312	12.05	2.73	0.16 J1	0.0327	< 0.002 U1	13.8	2.08	< 0.04 U1
6/14/2022	Assessment	1.51	1.11	1,070	0.1 J1	0.063	1.05	0.791	10.83	3.08	0.17 J1	0.084	< 0.002 U1	26.5	9.56	0.07 J1
11/8/2022	Assessment	1.17	1.21	872	0.048 J1	0.328	2.12	0.186	6.75	2.7	0.33	0.0308	< 0.002 U1	22.1	2.36	< 0.04 U1
6/20/2023	Assessment	0.957	1.11	989	0.077	0.076	0.51	0.326	12.46	--	0.17 J1	0.0326	< 0.002 U1	14.8	2.28	0.03 J1
6/29/2023	Assessment	--	--	--	--	--	--	--	--	3.02	--	--	--	--	--	--
10/10/2023	Assessment	1.06	0.82	1,270	0.086	0.047	0.62	0.322	8.06	2.79	0.15 J1	0.0809	< 0.002 U1	15.9	3.63	0.05 J1
4/16/2024	Assessment	0.318	1.40	1,690	0.131	0.034	0.41	1.71	3.83	2.74	0.12 J1	0.0784	< 0.002 U1	11.5	0.37 J1	0.05 J1
10/22/2024	Assessment	0.963	1.33	698	0.121	0.072	1.02	0.383	9.30	2.68	0.53	0.0294	< 0.002 U1	15.8	2.07	0.03 J1

Table 1. Groundwater Data Summary: SP-4
Northeastern - BAP
Appendix A Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
1/25/2017	Background	0.406	57.7	401	3	7.7	37	1,122
3/15/2017	Background	0.399	67	52	4	--	38	1,128
4/25/2017	Background	0.442	58.8	459	3.2	7.0	41	1,128
5/18/2017	Background	0.411	296	232	2.1	--	50	846
6/15/2017	Background	0.395	118	475	3.34	8.3	36	1,164
6/27/2017	Background	0.388	110	471	3.2489	8.1	37	1,388
7/12/2017	Background	0.42	648	489	3.863	8.1	36	1,128
8/4/2017	Background	0.412	1,920	469	3.078	7.7	50	1,150
8/17/2017	Background	0.493	793	460	3.049	7.8	75	1,132
8/30/2017	Background	0.392	612	576	4.086	7.6	74	1,400
9/13/2017	Background	0.387	810	450	3.199	7.7	88	1,236
9/20/2017	Background	0.477	630	440	1.747	7.2	90	1,208
10/11/2017	Detection	0.425	206	431	3.7702	7.4	78	1,200
5/30/2018	Assessment	--	--	--	4.169	7.4	--	--
7/30/2018	Assessment	0.399	164	521	< 0.083 U1	7.6	70	1,180
2/27/2019	Assessment	0.370	85.6	470	3.26	7.4	61.5	1,122
6/20/2019	Assessment	0.325	56.4	450	3.24	7.1	58.0	1,128
8/26/2019	Assessment	0.365	182	458	2.99	8.8	61	1,170
3/25/2020	Assessment	0.340	59.6	476	3.29	9.1	68.6	1,130
6/30/2020	Assessment	0.338	80.5	531	3.16	9.0	70.2	1,160
10/21/2020	Assessment	0.333	63.9	441	3.24	8.9	70.4	1,150
3/3/2021	Assessment	0.347	58.7	--	3.50	7.8	--	--
4/12/2021	Assessment	0.393	70.8	495	3.49	7.7	68.1	1,160
12/28/2021	Assessment	0.342	88.7	458	3.24	7.4	79.6	1,100
6/14/2022	Assessment	0.367	70.2	452	3.25	7.8	80.4	1,160 L1
11/8/2022	Assessment	0.354	97.6	447	3.23	7.4	81.9	1,150
6/20/2023	Assessment	0.323	82.1	468	3.29	7.5	83.0	1,170
10/10/2023	Assessment	0.339	90.9	450	3.19	7.6	81.4	1,160
4/16/2024	Assessment	0.337	108 M1	450	3.22	7.6	81.0	1,270
10/22/2024	Assessment	0.346	98	448	3.22	7.9	79.4	1,120

Table 1. Groundwater Data Summary: SP-4
Northeastern - BAP
Appendix B Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
1/25/2017	Background	< 5 U1	< 5 U1	398	< 1 U1	< 1 U1	< 1 U1	< 5 U1	4.00	3	< 5 U1	0.072	< 0.025 U1	< 5 U1	< 5 U1	< 2 U1
3/15/2017	Background	< 5 U1	< 5 U1	477	< 1 U1	< 1 U1	< 1 U1	< 5 U1	3.57	4	< 5 U1	0.073	< 0.025 U1	< 5 U1	< 5 U1	< 2 U1
4/25/2017	Background	1.36 J1	1.72 J1	578	0.03 J1	0.1 J1	0.64 J1	1.01 J1	2.566	3.2	< 0.68 U1	0.06973	< 0.005 U1	1.5 J1	< 0.99 U1	1.21 J1
5/18/2017	Background	2.04 J1	5.5	762	0.56 J1	0.57 J1	10.73	5.49	6.37	2.1	3.65 J1	0.07998	0.015 J1	1.02 J1	< 0.99 U1	< 0.86 U1
6/15/2017	Background	1.74 J1	4.59 J1	633	0.34 J1	< 0.07 U1	4.04	4.63 J1	4.18	3.34	1.39 J1	0.07422	< 0.005 U1	0.65 J1	1.67 J1	< 0.86 U1
6/27/2017	Background	< 0.93 U1	2.01 J1	576	0.24 J1	< 0.07 U1	2.98	5.29	9.64	3.2489	0.96 J1	0.07041	< 0.005 U1	0.46 J1	< 0.99 U1	< 0.86 U1
7/12/2017	Background	2.66 J1	10.65	1,340	1.28	1.37	22.48	10.64	5.79	3.863	8.47	0.09243	0.01 J1	< 0.29 U1	< 0.99 U1	< 0.86 U1
8/4/2017	Background	3.87 J1	44.98	4,590	4.97	6.55	84.15	40.69	4.04	3.078	36.63	0.136	0.058	5.03	4.99 J1	< 0.86 U1
8/17/2017	Background	< 0.93 U1	19.31	2,310	2.12	2.05	41.82	17.86	6.71	3.049	10.7	0.111	0.03	4.23 J1	1.04 J1	< 0.86 U1
8/30/2017	Background	2.45 J1	9.13	1,490	1.26	1.66	25.81	12.06	8.09	4.086	7.11	0.0962	0.021 J1	4.61 J1	1.86 J1	< 0.86 U1
9/13/2017	Background	< 0.93 U1	16.34	1,910	1.71	2.47	30.83	17.71	5.92	3.199	8.92	0.104	0.029	6.21	1.65 J1	< 0.86 U1
9/20/2017	Background	2.3 J1	13.95	1,930	1.77	1.9	34.55	16.32	--	1.747	9.6	0.101	0.014 J1	7.02	< 0.99 U1	< 0.86 U1
5/30/2018	Assessment	5.14	< 1.05 U1	268	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.49 J1	3.186	4.169	< 0.68 U1	0.06851	< 0.005 U1	3.7 J1	< 0.99 U1	1.62 J1
7/30/2018	Assessment	0.37	1.14	303	0.078	0.07	0.562	0.497	4.85	< 0.083 U1	0.356	0.0627	0.006 J1	3.63	0.7	0.05 J1
2/27/2019	Assessment	0.3 J1	1 J1	276	< 0.2 U1	< 0.1 U1	5.71	< 0.2 U1	3.144	3.26	< 0.2 U1	0.0602	< 0.005 U1	< 4 U1	0.6 J1	< 1 U1
6/20/2019	Assessment	0.3 J1	0.83	337	< 0.1 U1	0.07 J1	1.06	0.388	3.751	3.24	1.07	0.068	0.007 J1	2 J1	0.4 J1	< 0.5 U1
8/26/2019	Assessment	0.25	1.64	359	0.101	0.05	1.01	1.07	3.24	2.99	0.596	0.0554	< 0.005 U1	2 J1	0.6	< 0.1 U1
3/25/2020	Assessment	0.28	0.83	327	0.04 J1	0.04 J1	0.332	0.166	4.28	3.29	0.2 J1	0.0535	< 0.002 U1	4.07	0.7	< 0.1 U1
6/30/2020	Assessment	0.32	1.52	334	0.118	0.04 J1	1.09	1.28	4.16	3.16	0.527	0.0564	< 0.002 U1	3.57	0.7	< 0.1 U1
10/21/2020	Assessment	0.29	1.03	322	0.06 J1	0.07	0.523	0.508	3.42	3.24	0.359	0.0559	< 0.002 U1	3.24	0.7	< 0.1 U1
3/3/2021	Assessment	0.27	0.99	367	0.04 J1	0.06	0.449	0.207	5.49	3.50	1.17	0.0594	< 0.002 U1	3.60	0.6	< 0.1 U1
4/12/2021	Assessment	0.22	1.41	435	0.09 J1	0.04 J1	1.03	0.921	4.09	3.49	0.392	0.0613	< 0.002 U1	2.94	0.4 J1	< 0.04 U1
12/28/2021	Assessment	0.26	0.76	304	0.033 J1	0.035	0.47	0.240	4.48	3.24	0.14 J1	0.0529	< 0.002 U1	3.0	0.48 J1	< 0.04 U1
6/14/2022	Assessment	0.21	0.80	246	0.04 J1	0.024	0.56	0.159	3.56	3.25	0.10 J1	0.0571	< 0.002 U1	3.7	0.38 J1	< 0.04 U1
11/8/2022	Assessment	0.23	0.92	214	0.053	0.059	1.19	0.345	6.29	3.23	0.38	0.0579	< 0.002 U1	3.5	0.39 J1	< 0.04 U1
6/20/2023	Assessment	0.192	1.26	204	0.074	0.044	0.61	0.470	7.96	3.29	0.21	0.0507	< 0.002 U1	2.8	0.41 J1	0.02 J1
10/10/2023	Assessment	0.249	0.84	232	0.036 J1	0.057	0.59	0.218	3.23	3.19	0.38	0.0554	< 0.002 U1	3.3	0.30 J1	0.02 J1
4/16/2024	Assessment	0.169	0.70	190	0.033 J1	0.019 J1	0.27 J1	0.123	3.49	3.22	0.10 J1	0.0527	< 0.002 H2, Q5, Q1, U1	3.2	0.38 J1	< 0.02 U1
10/22/2024	Assessment	0.147	0.70	190	0.038 J1	0.021	0.45	0.146	3.67	3.22	0.09 J1	0.054	< 0.002 U1	2.5	0.28 J1	0.03 J1

Table 1. Groundwater Data Summary: SP-5R
Northeastern - BAP
Appendix A Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
1/25/2017	Background	0.233	52.4	500	3	8.0	10	1,354
3/15/2017	Background	0.236	61.7	62	4	--	10	1,420
4/25/2017	Background	0.245	53.8	674	3.06	7.5	9	1,436
5/18/2017	Background	0.319	79.1	1,834	4	--	8	3,008
6/15/2017	Background	0.231	57.1	607	3	8.3	7	1,368
6/27/2017	Background	0.224	53	636	2.835	8.2	8	1,156
7/12/2017	Background	0.261	53.8	640	3.156	8.2	7	1,388
8/4/2017	Background	0.256	61.3	638	2.889	7.9	8	1,372
8/17/2017	Background	0.293	52	661	3.258	8.2	6	1,378
8/30/2017	Background	0.252	57.3	652	3.5698	7.7	7	1,424
9/13/2017	Background	0.232	55.6	644	2.797	8.4	6	1,452
9/20/2017	Background	0.257	53.7	729	1.535	7.4	6	1,312
10/11/2017	Detection	0.61	71	630	3.7844	7.5	5	1,368
5/30/2018	Assessment	--	--	--	4.1115	7.6	--	--
7/30/2018	Assessment	0.246	131	793	4.3905	8.0	4	1,480
2/27/2019	Assessment	0.233	72.8	739	3.08	7.7	1.6	1,530
6/20/2019	Assessment	0.202	48.5	675	3.06	7.3	0.9 J1	1,428
8/26/2019	Assessment	0.220	128	697	2.789	8.8	3	1,450
3/25/2020	Assessment	0.214	49.2	790	3.13	8.8	0.8 J1	1,580
6/30/2020	Assessment	0.211	64.9	840	2.99	9.0	5.1	1,560
10/21/2020	Assessment	0.188	50.4	584	3.03	8.8	5.0	1,320
3/3/2021	Assessment	0.188	52.4	--	3.18	7.6	--	--
4/12/2021	Assessment	0.215	54.6	725	3.20	7.9	7.0	1,420
12/27/2021	Assessment	0.190	71.7	660	3.09	7.4	6.1	1,370
6/14/2022	Assessment	0.209	52.5	675	3.09	7.7	4.7	1,410 L1
11/8/2022	Assessment	0.256	90.2	1,010	3.28	7.4	2.8	1,940
6/20/2023	Assessment	0.191	94.5	782	3.09	7.5	3.8	1,580
10/10/2023	Assessment	0.228	107	964	3.21	7.3	2.6	1,830
4/16/2024	Assessment	0.189	90.5	690	3.04	7.5	4.4	1,430
10/22/2024	Assessment	0.201	82	721	3.06	7.8	2.3	1,430

Table 1. Groundwater Data Summary: SP-5R
Northeastern - BAP
Appendix B Constituents

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
1/25/2017	Background	< 5 U1	12	1,650	< 1 U1	< 1 U1	< 1 U1	< 5 U1	10.09	3	< 5 U1	0.114	< 0.025 U1	< 5 U1	< 5 U1	< 2 U1
3/15/2017	Background	< 5 U1	13	1,590	< 1 U1	< 1 U1	1	< 5 U1	9.65	4	< 5 U1	0.112	< 0.025 U1	< 5 U1	< 5 U1	< 2 U1
4/25/2017	Background	< 0.93 U1	17.03	1,610	0.03 J1	< 0.07 U1	0.33 J1	0.88 J1	10.27	3.06	< 0.68 U1	0.112	0.016 J1	1.16 J1	< 0.99 U1	< 0.86 U1
5/18/2017	Background	< 0.93 U1	29.42	2,270	0.23 J1	< 0.07 U1	3.41	2.32 J1	15.30	4	2.36 J1	0.163	< 0.005 U1	< 0.29 U1	< 0.99 U1	< 0.86 U1
6/15/2017	Background	2.02 J1	13.7	2,050	0.11 J1	< 0.07 U1	1.42	1.44 J1	10.27	3	< 0.68 U1	0.109	0.016 J1	< 0.29 U1	< 0.99 U1	< 0.86 U1
6/27/2017	Background	< 0.93 U1	12.65	1,790	0.02 J1	< 0.07 U1	0.3 J1	1.01 J1	15.84	2.835	0.76 J1	0.1	< 0.005 U1	< 0.29 U1	< 0.99 U1	< 0.86 U1
7/12/2017	Background	< 0.93 U1	17.24	1,880	0.06 J1	< 0.07 U1	0.5 J1	1.1 J1	12.21	3.156	0.9 J1	0.111	< 0.005 U1	< 0.29 U1	1.14 J1	< 0.86 U1
8/4/2017	Background	< 0.93 U1	21.6	1,800	0.09 J1	< 0.07 U1	1.69	1.32 J1	11.60	2.889	1.44 J1	0.119	0.015 J1	1.27 J1	< 0.99 U1	< 0.86 U1
8/17/2017	Background	1.63 J1	19.11	1,890	0.04 J1	< 0.07 U1	< 0.23 U1	1 J1	10.95	3.258	< 0.68 U1	0.106	< 0.005 U1	< 0.29 U1	< 0.99 U1	< 0.86 U1
8/30/2017	Background	< 0.93 U1	19.47	1,930	0.11 J1	< 0.07 U1	1.16	1.2 J1	12.47	3.5698	< 0.68 U1	0.112	0.009 J1	< 0.29 U1	< 0.99 U1	< 0.86 U1
9/13/2017	Background	< 0.93 U1	20.36	1,930	0.1 J1	0.16 J1	0.62 J1	1 J1	10.62	2.797	< 0.68 U1	0.11	< 0.005 U1	< 0.29 U1	< 0.99 U1	< 0.86 U1
9/20/2017	Background	< 0.93 U1	20.77	1,880	0.05 J1	< 0.07 U1	< 0.23 U1	0.97 J1	10.50	1.535	1.06 J1	0.111	< 0.005 U1	< 0.29 U1	< 0.99 U1	< 0.86 U1
5/30/2018	Assessment	1.21 J1	28.86	1,760	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.88 J1	9.15	4.1115	< 0.68 U1	0.102	< 0.005 U1	< 0.29 U1	< 0.99 U1	< 0.86 U1
7/30/2018	Assessment	0.05 J1	47.3	2,140	0.052	0.02 J1	0.082	0.482	11.28	4.3905	0.415	0.0946	< 0.005 U1	1.17	0.1	0.02 J1
2/27/2019	Assessment	< 0.2 U1	25.7	2,130	< 0.2 U1	< 0.1 U1	2 J1	0.3 J1	6.702	3.08	0.7 J1	0.102	< 0.005 U1	< 4 U1	< 0.3 U1	< 1 U1
6/20/2019	Assessment	< 0.1 U1	59.9	2,410	< 0.1 U1	< 0.05 U1	0.8 J1	0.598	12.977	3.06	0.701	0.111	0.008 J1	< 2 U1	< 0.2 U1	< 0.5 U1
8/26/2019	Assessment	0.06 J1	49.3	2,340	0.06 J1	0.02 J1	0.335	0.485	11.56	2.789	0.545	0.0928	< 0.005 U1	1 J1	0.1 J1	< 0.1 U1
3/25/2020	Assessment	0.05 J1	26.2	2,600	0.04 J1	0.02 J1	0.346	0.296	12.09	3.13	0.371	0.0911	< 0.002 U1	1 J1	0.1 J1	< 0.1 U1
6/30/2020	Assessment	0.13	27.0	2,520	0.151	0.04 J1	1.51	0.774	14.34	2.99	1.65	0.0913	< 0.002 U1	1 J1	0.5	< 0.1 U1
10/21/2020	Assessment	0.10	10.9	2,070	0.05 J1	< 0.01 U1	0.320	0.378	6.502	3.03	0.373	0.0792	< 0.002 U1	0.8 J1	0.2 J1	< 0.1 U1
3/3/2021	Assessment	0.16	6.56	1,840	0.05 J1	0.27	0.496	0.391	13.31	3.18	0.793	0.0856	< 0.002 U1	0.7 J1	0.1 J1	< 0.1 U1
4/12/2021	Assessment	0.09 J1	7.12	2,180	0.05 J1	0.01 J1	0.415	0.378	14.10	3.20	0.325	0.0894	< 0.002 U1	1 J1	0.1 J1	< 0.04 U1
12/27/2021	Assessment	0.09 J1	10.0	1,840	0.031 J1	0.029	0.26	0.257	13.16	3.09	0.18 J1	0.0766	< 0.002 U1	0.9	< 0.09 U1	< 0.04 U1
6/14/2022	Assessment	0.19	20.3	2,010	0.07 J1	0.200	0.47	0.699	11.26	3.09	0.66	0.0896	< 0.002 U1	0.9	0.1 J1	< 0.04 U1
11/8/2022	Assessment	0.16	14.2	2,070	0.066	0.108	0.75	0.511	9.37	3.28	4.34	0.120	< 0.002 U1	0.8	0.11 J1	< 0.04 U1
6/20/2023	Assessment	0.230	9.09	2,120	0.276	0.074	2.73	1.18	16.19	3.09	2.11	0.0822	< 0.002 U1	0.8	0.91	0.05 J1
10/10/2023	Assessment	0.195	15.8	2,770	0.201	0.076	2.64	1.03	24.78	3.21	2.52	0.123	< 0.002 U1	0.7	0.94	0.04 J1
4/16/2024	Assessment	0.131	6.69	1,970	0.061	0.038	0.45	0.321	8.39	3.04	0.66	0.0856	< 0.002 U1	0.7	0.13 J1	< 0.02 U1
10/22/2024	Assessment	0.117	16.1	2,080	0.108	0.038	0.77	0.841	12.38	3.06	1.05	0.086	< 0.002 U1	0.7	0.20 J1	< 0.02 U1

Table 1. Groundwater Data Summary: SP-10
Northeastern - BAP
Appendix A Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
7/12/2017	Background	0.965	53	1,844	6.502	6.7	294	3,416
8/4/2017	Background	1.08	83.1	1,616	< 0.083 U1	7.6	761	5,142
8/17/2017	Background	1.09	91.4	1,700	< 0.083 U1	7.8	915	5,678
8/30/2017	Background	1.09	81.8	1,932	10.2663	7.6	834	5,264
9/13/2017	Background	1.1	76.9	1,592	7.028	8.3	738	5,168
9/20/2017	Background	1.08	64.6	1,946	< 0.083 U1	7.1	544	4,424
9/27/2017	Background	1.07	65.7	1,784	5	7.8	419	4,516
10/4/2017	Background	1.1	52.3	1,553	5.11	7.4	286	3,660
10/11/2017	Detection	1.03	58.4	1,934	7.3938	7.0	188	4,060
1/22/2018	Detection	1.08	--	1,630	5.71	7.0	63.1	3,236
5/30/2018	Assessment	--	--	--	7.333	7.8	--	--
7/30/2018	Assessment	1.17	227	2,283	8.9991	7.6	75	3,632
2/4/2019	Assessment	1.17	144	--	--	--	--	--
2/27/2019	Assessment	1.16	92.6	1,740	5.59	7.8	6.9	3,504
6/20/2019	Assessment	0.916	50.3	1,780	6.40	7.8	30.3	3,512
8/26/2019	Assessment	1.03	216	1,939	4.874	8.9	29	3,446
3/25/2020	Assessment	1.04	44.2	2,000	6.45	8.2	12.6	3,560
6/30/2020	Assessment	0.944	52.1	2,010	6.29	8.9	25.5	3,550
7/28/2020	Assessment	0.914	--	1,960	6.63	8.3	--	3,440
10/20/2020	Assessment	0.955	39.9	1,830	6.55	9.1	9.6	3,540
3/3/2021	Assessment	0.853	40.4	--	7.12	7.7	--	--
4/12/2021	Assessment	1.03	43.8	2,000	6.84	8.1	15.4	3,540
12/27/2021	Assessment	0.868	76.6	1,890	6.7	7.6	10.4	3,440
6/14/2022	Assessment	1.04	56.1	1,810	6.3	7.7	16.3	3,600 L1
11/8/2022	Assessment	0.967	109	1,820	6.8	7.4	16.7	3,330
6/20/2023	Assessment	0.916	83.0	1,960	6.3	7.5	19.7	3,500
10/10/2023	Assessment	0.879	93.0	1,820	6.3	7.7	19.2	3,460
4/16/2024	Assessment	0.892	110	1,950	6.4	7.7	18.2	3,510
10/22/2024	Assessment	1.06	125	1,920	6.7	7.9	15.9	3,490

Table 1. Groundwater Data Summary: SP-10
Northeastern - BAP
Appendix B Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
7/12/2017	Background	4.62 J1	< 1.05 U1	1,900	< 0.02 U1	< 0.07 U1	110	5.96	17.23	6.502	< 0.68 U1	0.278	0.006 J1	934	5.67	< 0.86 U1
8/4/2017	Background	2.51 J1	2.43 J1	330	0.03 J1	< 0.07 U1	2.44	4.74 J1	1.153	< 0.083 U1	< 0.68 U1	0.284	0.029	129	8.82	< 0.86 U1
8/17/2017	Background	< 0.93 U1	< 1.05 U1	282	< 0.02 U1	< 0.07 U1	< 0.23 U1	< 0.14 U1	0.995	< 0.083 U1	< 0.68 U1	0.317	0.027	45.43	< 0.99 U1	< 0.86 U1
8/30/2017	Background	< 0.93 U1	5.66	279	0.06 J1	< 0.07 U1	1.09	4.27 J1	0.763	10.2663	< 0.68 U1	0.306	0.019 J1	30.35	2.56 J1	< 0.86 U1
9/13/2017	Background	< 0.93 U1	9.42	266	0.07 J1	< 0.07 U1	0.46 J1	2.41 J1	0.774	7.028	< 0.68 U1	0.315	0.013 J1	16.28	3.11 J1	< 0.86 U1
9/20/2017	Background	1.16 J1	13.92	399	0.03 J1	< 0.07 U1	0.72 J1	2.19 J1	1.062	< 0.083 U1	< 0.68 U1	0.292	0.016 J1	13.58	2.38 J1	< 0.86 U1
9/27/2017	Background	1.57 J1	15.31	928	0.04 J1	< 0.07 U1	2.07	3.71 J1	1.723	5	< 0.68 U1	0.329	0.013 J1	35.93	3.84 J1	< 0.86 U1
10/4/2017	Background	1.27 J1	4.3 J1	664	0.03 J1	< 0.07 U1	0.36 J1	4.02 J1	3.226	5.11	0.87 J1	0.279	0.015 J1	29.19	< 0.99 U1	< 0.86 U1
5/30/2018	Assessment	< 0.93 U1	8.9	2,550	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.83 J1	6.06	7.333	< 0.68 U1	0.245	< 0.005 U1	2.94 J1	2.26 J1	< 0.86 U1
7/30/2018	Assessment	0.34	7.61	2,330	0.043	0.02 J1	0.06 J1	2.16	7.89	8.9991	0.102	0.242	0.006 J1	18.5	0.09 J1	0.04 J1
2/27/2019	Assessment	2 J1	3.48	5,810	< 0.4 U1	< 0.2 U1	1 J1	< 0.4 U1	15.35	5.59	< 0.4 U1	0.275	< 0.005 U1	< 8 U1	< 0.6 U1	< 2 U1
6/20/2019	Assessment	0.65	3.66	3,880	< 0.1 U1	< 0.05 U1	8.76	0.743	26.4	6.40	0.3 J1	0.290	0.01 J1	9 J1	< 0.2 U1	< 0.5 U1
8/26/2019	Assessment	0.61	3.00	3,060	0.08 J1	0.03 J1	1.61	1.06	8.11	4.874	0.449	0.241	< 0.005 U1	8.22	0.4	< 0.1 U1
3/25/2020	Assessment	0.17	0.61	6,670	< 0.02 U1	0.03 J1	0.383	0.522	26.79	6.45	0.08 J1	0.214	< 0.002 U1	7.39	0.1 J1	< 0.1 U1
6/30/2020	Assessment	0.21	1.40	3,960	0.03 J1	0.01 J1	0.204	0.724	8.33	6.29	0.07 J1	0.226	< 0.002 U1	4.81	0.08 J1	< 0.1 U1
7/28/2020	Assessment	--	--	--	--	--	--	--	--	6.63	--	--	--	--	--	--
10/20/2020	Assessment	0.08 J1	0.42	6,800	0.03 J1	0.01 J1	0.2 J1	0.103	13.9507	6.55	0.1 J1	0.209	< 0.002 U1	0.6 J1	0.09 J1	< 0.1 U1
3/3/2021	Assessment	0.08 J1	0.36	5,530	0.02 J1	0.03 J1	0.409	0.199	18.84	7.12	0.230	0.218	< 0.002 U1	1 J1	0.08 J1	< 0.1 U1
4/12/2021	Assessment	0.12	1.14	6,360	0.03 J1	0.01 J1	0.277	0.218	20.36	6.84	0.1 J1	0.221	< 0.002 U1	5.01	< 0.09 U1	< 0.04 U1
12/27/2021	Assessment	0.08 J1	0.34	6,980	0.019 J1	0.021	0.19 J1	0.044	17.31	6.7	0.05 J1	0.198	< 0.002 U1	0.4 J1	< 0.09 U1	< 0.04 U1
6/14/2022	Assessment	0.03 J1	0.19	7,590	< 0.4 U1	0.033	0.57	0.216	20.11	6.3	0.19 J1	0.289	< 0.002 U1	0.5	< 0.09 U1	< 0.04 U1
11/8/2022	Assessment	0.05 J1	0.61	5,050	0.036 J1	0.017 J1	0.47	0.061	19.09	6.8	0.06 J1	0.242	< 0.002 U1	0.3 J1	< 0.09 U1	< 0.04 U1
6/20/2023	Assessment	0.083 J1	0.29	5,180	0.027 J1	0.009 J1	0.45	0.146	18.07	6.3	0.09 J1	0.206	< 0.002 U1	0.7	< 0.04 U1	< 0.02 U1
10/10/2023	Assessment	0.062 J1	0.65	6,010	0.035 J1	0.007 J1	0.36	0.039	21.79	6.3	0.08 J1	0.235	< 0.002 U1	0.2 J1	0.06 J1	< 0.02 U1
4/16/2024	Assessment	0.076 J1	0.14	5,940	0.020 J1	0.009 J1	0.26 J1	0.101	22.35	6.4	0.12 J1	0.247	< 0.002 U1	0.9	0.05 J1	< 0.02 U1
10/22/2024	Assessment	0.034 J1	0.12	6,270	0.121	0.014 J1	0.46	0.079	20.13	6.7	0.12 J1	0.228	< 0.002 U1	0.3 J1	0.06 J1	< 0.02 U1

Table 1. Groundwater Data Summary: SP-11
Northeastern - BAP
Appendix A Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
7/12/2017	Background	0.839	742	568	2.386	7.4	798	2,880
8/4/2017	Background	0.543	272	567	3.355	7.9	870	3,076
8/17/2017	Background	0.453	171	789	4.52	6.9	741	3,308
8/30/2017	Background	0.428	161	683	4.1325	7.6	541	2,732
9/13/2017	Background	0.447	190	628	3.359	7.2	515	2,420
9/20/2017	Background	0.469	1,220	690	2.016	7.2	329	2,336
9/27/2017	Background	0.447	1,170	759	3.00	7.2	332	2,428
10/4/2017	Background	0.531	1,110	744	2.90	7.5	305	2,288
10/11/2017	Detection	0.446	479	824	4.4661	7.0	223	2,322
1/22/2018	Detection	--	--	470	2.96	6.9	222	1,544
5/30/2018	Assessment	--	--	--	3.574	7.5	--	--
7/30/2018	Assessment	0.280	124	234	3.7832	7.7	79	996
2/27/2019	Assessment	0.375	49.6	241	3.44	7.7	95.1	1,168
6/20/2019	Assessment	0.550	65.6	137	1.67	6.8	203	1,000
8/26/2019	Assessment	0.304	139	129	2.225	8.9	122	970
3/25/2020	Assessment	0.428	40.5	187	2.66	9.0	108	1,060
6/30/2020	Assessment	0.545	57.3	140	1.77	8.9	188	927
7/28/2020	Assessment	0.301	--	--	--	8.6	158	--
10/20/2020	Assessment	0.220	43.8	98.1	3.05	9.2	35.6	764
3/3/2021	Assessment	0.371	39.0	--	2.88	7.7	--	--
4/12/2021	Assessment	0.562	79.6	130	1.66	7.8	232	918
12/27/2021	Assessment	0.459	77.6	78.9	1.76	7.5	193	840
6/14/2022	Assessment	0.627	113	60.0	1.10	7.3	402	1,020 L1
11/8/2022	Assessment	0.510	113	97.3	1.3	7.2	356	1,060
6/20/2023	Assessment	0.543	86.7	99.3	1.43	7.2	358	1,070
10/10/2023	Assessment	0.354	79.1	79.4	2.28	7.2	184	880
4/16/2024	Assessment	0.454	86.8	103	1.73	7.6	236	910
10/22/2024	Assessment	0.419	104	80.6	1.88	7.4	204	870

Table 1. Groundwater Data Summary: SP-11
Northeastern - BAP
Appendix B Constituents

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
7/12/2017	Background	9.43	3.99 J1	194	0.22 J1	1.4	18.52	9.76	--	2.386	5.16	0.04698	0.009 J1	61.27	5.95	< 0.86 U1
8/4/2017	Background	4.7 J1	1.82 J1	98.74	0.07 J1	0.44 J1	5.25	6.52	25.367	3.355	2.01 J1	0.0877	0.023 J1	66.41	6.26	< 0.86 U1
8/17/2017	Background	< 0.93 U1	< 1.05 U1	83.42	< 0.02 U1	< 0.07 U1	< 0.23 U1	< 0.14 U1	0.947	4.52	< 0.68 U1	0.08931	0.007 J1	51.5	< 0.99 U1	< 0.86 U1
8/30/2017	Background	4.29 J1	1.2 J1	93.07	0.07 J1	0.34 J1	2.76	3.85 J1	0.438	4.1325	1.23 J1	0.08933	0.008 J1	44.33	2.49 J1	< 0.86 U1
9/13/2017	Background	2.4 J1	3.66 J1	108	0.08 J1	0.09 J1	2.57	3.21 J1	2.685	3.359	< 0.68 U1	0.105	0.009 J1	36.16	1.55 J1	< 0.86 U1
9/20/2017	Background	7.73	12.14	240	0.39 J1	2.7	31.3	14.62	4.20	2.016	8.16	0.13	0.027	46.9	5.46	< 0.86 U1
9/27/2017	Background	6.89	7.5	269	0.39 J1	3.01	32.71	14.37	--	3.00	8.58	0.129	0.048	48.61	7.47	< 0.86 U1
10/4/2017	Background	4.44 J1	8.47	347	0.35 J1	2.49	29.49	11.99	2.817	2.90	7.05	0.146	0.047	42.14	3.27 J1	< 0.86 U1
5/30/2018	Assessment	< 0.93 U1	5.3	160	< 0.02 U1	< 0.07 U1	0.34 J1	1.61 J1	1.334	3.574	< 0.68 U1	0.04956	< 0.005 U1	3.27 J1	1.43 J1	< 0.86 U1
7/30/2018	Assessment	0.35	4.22	539	0.029	0.04	0.379	5.12	0.95	3.7832	0.404	0.0370	0.005 J1	8.85	0.7	0.03 J1
2/27/2019	Assessment	< 0.2 U1	8.83	529	< 0.2 U1	< 0.1 U1	0.7 J1	0.720	1.81	3.44	0.2 J1	0.0580	< 0.005 U1	6 J1	< 0.3 U1	< 1 U1
6/20/2019	Assessment	0.3 J1	4.18	169	< 0.1 U1	0.06 J1	6.71	0.948	0.81	1.67	0.719	0.047	0.01 J1	< 2 U1	0.3 J1	< 0.5 U1
8/26/2019	Assessment	0.37	6.30	492	0.04 J1	0.13	1.47	2.73	1.623	2.225	0.764	0.0337	< 0.005 U1	5.70	0.8	< 0.1 U1
3/25/2020	Assessment	0.15	2.88	415	0.02 J1	0.05 J1	0.705	0.702	1.73	2.66	0.409	0.0402	0.003 J1	3.01	0.3	< 0.1 U1
6/30/2020	Assessment	0.14	2.79	187	< 0.02 U1	0.01 J1	0.201	0.620	3.845	1.77	0.1 J1	0.0278	0.008	2.15	0.2 J1	< 0.1 U1
10/20/2020	Assessment	0.48	1.49	630	0.03 J1	0.15	2.20	1.16	0.661	3.05	0.719	0.0298	0.004 J1	2 J1	0.5	< 0.1 U1
3/3/2021	Assessment	0.06 J1	1.33	330	< 0.02 U1	0.01 J1	0.243	0.939	0.901	2.88	0.1 J1	0.0396	< 0.002 U1	2 J1	0.2 J1	< 0.1 U1
4/12/2021	Assessment	0.19	2.14	212	0.02 J1	0.02 J1	0.944	1.52	1.354	1.66	0.224	0.0248	< 0.002 U1	2 J1	0.2 J1	< 0.04 U1
12/27/2021	Assessment	0.28	1.11	270	0.013 J1	0.021	0.28	0.259	2.06	1.76	0.14 J1	0.0187	< 0.002 U1	1.8	0.20 J1	< 0.04 U1
6/14/2022	Assessment	0.43	2.73	139	< 0.04 U1	0.027	0.59	2.36	1.17	1.10	0.23	0.0140	< 0.002 U1	2.9	0.19 J1	< 0.04 U1
11/8/2022	Assessment	0.12	2.29	146	0.027 J1	0.009 J1	0.46	1.76	3.32	1.3	0.11 J1	0.0157	< 0.002 U1	1.7	0.15 J1	< 0.04 U1
6/20/2023	Assessment	0.038 J1	1.51	102	0.025 J1	< 0.004 U1	0.34	0.717	1.21	1.43	0.08 J1	0.0179	< 0.002 U1	0.8	0.10 J1	< 0.02 U1
10/10/2023	Assessment	0.075 J1	3.61	455	0.027 J1	0.031	0.90	0.635	2.91	2.28	0.45	0.0222	< 0.002 U1	0.9	0.23 J1	< 0.02 U1
4/16/2024	Assessment	0.090 J1	2.58	191	0.031 J1	0.027	0.46	0.466	6.48	1.73	0.28	0.0182	< 0.002 U1	0.9	0.12 J1	< 0.02 U1
10/22/2024	Assessment	0.054 J1	2.32	285	0.032 J1	0.017 J1	0.45	0.257	1.36	1.88	0.22	0.020	< 0.002 U1	0.5	0.15 J1	< 0.02 U1

Notes:
Combined radium values were calculated from the sum of the reported radium-226 and radium-228 results.
Radium data quality flags were not included. Reported negative radium-226 or radium-228 results were replaced with zero.
--: Not analyzed
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag.
In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
H2: Sample analysis performed past holding time.
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.
L1: The associated laboratory control sample (LCS) or laboratory control sample duplicate (LCSD) recovery was outside acceptance limits.
M1: The associated matrix spike (MS) or matrix spike duplicate (MSD) recovery was outside acceptance limits.
mg/L: milligrams per liter
pCi/L: picocuries per liter
Q1: Sample received in inappropriate sample container.
Q5: Sample was received with improper chemical preservation.
S7: Sample did not achieve constant weight.
SU: standard unit
µg/L: micrograms per liter

APPENDIX 2

Where applicable, shown in this appendix are the results from statistical analyses, and a description of the statistical analysis method chosen.

Geosyntec consultants

engineers | scientists | innovators

STATISTICAL ANALYSIS SUMMARY, BOTTOM ASH POND – SECOND SEMIANNUAL EVENT 2023

Northeastern Power Station
Oologah, Oklahoma

Prepared for

American Electric Power
1 Riverside Plaza
Columbus, Ohio 43215-2372

Prepared by

Geosyntec Consultants, Inc.
500 West Wilson Bridge Road, Suite 250
Worthington, Ohio 43085

Project Number: CHA8500B

February 13, 2024

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ACRONYMS AND ABBREVIATIONS

ASD	alternative source demonstration
BAP	bottom ash pond
CCR	coal combustion residuals
GWPS	groundwater protection standard
LCL	lower confidence limit
LPL	lower prediction limit
mg/L	milligrams per liter
NPS	Northeastern Power Station
OAC	Oklahoma Administrative Code
ODEQ	Oklahoma Department of Environmental Quality
PQL	practical quantitation limit
QA/QC	quality assurance and quality control
SSI	statistically significant increase
SSL	statistically significant level
TDS	total dissolved solids
UPL	upper prediction limit

1. INTRODUCTION

In accordance with Oklahoma Department of Environmental Quality (ODEQ) requirements regarding the disposal of coal combustion residuals (CCRs) in landfills and surface impoundments (Oklahoma Administrative Code [OAC] 252:517), groundwater monitoring has been conducted at the Bottom Ash Pond (BAP), an existing CCR unit at the Northeastern Power Station (NPS) in Oologah, Oklahoma. Recent groundwater monitoring results were used to identify concentrations of Appendix B constituents that are above site-specific groundwater protection standards (GWPSs).

Based on detection monitoring conducted in 2017 and 2018, statistically significant increases (SSIs) over background were concluded for boron, chloride, fluoride, total dissolved solids (TDS), and sulfate at the BAP. In addition, pH values below the lower prediction limit (LPL) resulted in SSIs below background as well. GWPSs were set in accordance with OAC 252:517-9-6(h) and a statistical evaluation of the assessment monitoring was conducted.

During 2023, a sampling event for both Appendix A parameters and Appendix B parameters, as required by OAC 252:517-9-6(d), was completed in June. During the June 2023 assessment monitoring event, statistically significant levels (SSLs) were observed for barium, fluoride, and lithium (Geosyntec 2023a). An alternative source demonstration (ASD) was successfully completed (Geosyntec 2023b). Therefore, the unit remained in assessment monitoring. One assessment monitoring event was conducted at the BAP in October 2023 in accordance with OAC 252:517-9-6(d). The results of the October 2023 assessment event are documented in this report.

Prior to conducting the statistical analyses, the groundwater data underwent several validation tests, including those for completeness, sample tracking accuracy, transcription errors, and consistent use of measurement units. No data quality issues were identified which would impact data usability.

The monitoring data were submitted to Groundwater Stats Consulting, LLC for statistical analysis. GWPSs were reestablished for the Appendix B parameters. Confidence intervals were calculated for Appendix B parameters at the compliance wells to assess whether SSLs of Appendix B parameters were present above the GWPS. SSLs were identified for barium, fluoride, and lithium. Therefore, either the unit will move to an assessment of corrective measures, or an ASD will be conducted to evaluate if the unit can remain in assessment monitoring. Certification of the selected statistical methods by a qualified professional engineer is documented in Attachment A.

2. BOTTOM ASH POND EVALUATION

2.1 Data Validation and QA/QC

During the October 2023 assessment monitoring event, one set of samples was collected for analysis from each background and compliance well to meet the requirements of OAC 252:517-9-6(d)(1). Samples from the October 2023 sampling event were analyzed for all Appendix A and Appendix B parameters. A summary of data collected during this assessment monitoring event are presented in Table 1.

Chemical analysis was completed by a National Environmental Laboratory Accreditation Program–certified analytical laboratory. The laboratory completed analysis of quality assurance and quality control (QA/QC) samples such as laboratory reagent blanks, continuing calibration verification samples, and laboratory fortified blanks.

The analytical data were imported into a Microsoft Access database, where checks were completed to assess the accuracy of sample location identification and analyte identification. Where necessary, unit conversions were applied to standardize reported units across all sampling events. Exported data files were created for use with the Sanitas™ v.10.0.15 statistics software. The export file was checked against the analytical data for transcription errors and completeness.

2.2 Statistical Analysis

Statistical analyses for the BAP were conducted in accordance with the November 2021 *Statistical Analysis Plan* (Geosyntec 2021). Time series plots and results for all completed statistical tests are provided in Attachment B. The data obtained in October 2023 were screened for potential outliers. No outliers were identified for these events.

2.2.1 Establishment of GWPSs

A GWPS was established for each Appendix B parameter in accordance with the Statistical Analysis Plan (Geosyntec 2021). The established GWPS was set to whichever was greater of the background concentration and the maximum contaminant level for each Appendix B parameter. To determine background concentrations, an upper tolerance limit was calculated using data that were pooled from the background wells collected during the background monitoring and assessment monitoring events. Tolerance limits were calculated parametrically with 95% coverage and 95% confidence for antimony, arsenic, cadmium, chromium, combined radium, and lead. Nonparametric tolerance limits were calculated for barium, beryllium, cobalt, fluoride, lithium, molybdenum, and selenium due to apparent nonnormal distributions, and for mercury and thallium due to a high nondetect frequency. Upper tolerance limits and the final GWPSs are summarized in Table 2.

2.2.2 Evaluation of Potential Appendix B SSLs

A confidence interval was constructed for each Appendix B parameter at each compliance well. Confidence limits were generally calculated parametrically ($\alpha = 0.01$). However, nonparametric confidence limits were calculated in some cases (e.g., when the data did not appear to be normally distributed or when the nondetect frequency was too high). Select datasets were truncated if significant serial correlation was observed among the background samples that were collected on

an approximately monthly basis in 2017. A list of the truncated well/constituent pairs used for calculation of the confidence limits is provided in Attachment B.

An SSL was concluded if the lower confidence limit (LCL) exceeded the GWPS (i.e., if the entire confidence interval was above the GWPS). Calculated confidence limits are shown in Attachment B.

The following SSLs were identified at the Northeastern BAP:

- The LCL for barium was above the GWPS of 2.77 milligrams per liter (mg/L) at SP-10 (4.20 mg/L).
- The LCL for fluoride was above the GWPS of 4.39 mg/L at SP-10 (5.59 mg/L).
- The LCL for lithium was above the GWPS of 0.163 mg/L at SP-10 (0.238 mg/L).

ODEQ previously noted in a letter provided to the NPS that "[i]f lithium and fluoride continue to exceed their relative GWPS in the future and conditions have not changed, NPS may refer to the October 29, 2019 ASD approval for lithium and June 4, 2021 approval for fluoride and continue assessment monitoring at the BAP in accordance with OAC 252:517-6(g)(3)(B)" (ODEQ 2021). ODEQ provided a similar letter dated September 20, 2022 documenting ASD approval for a barium SSL at SP-10 which is applicable in the future if conditions do not change (ODEQ 2022). Thus, an ASD will be submitted to ODEQ demonstrating that conditions at the BAP remain unchanged so that the unit will continue assessment monitoring.

2.2.3 Establishment of Appendix A Prediction Limits

Upper prediction limits (UPLs) were previously established for all Appendix A parameters following the background monitoring period. Intrawell tests were used to evaluate potential SSIs for boron, chloride, fluoride, pH, sulfate, and TDS, and interwell tests were used to evaluate potential SSIs for calcium. Interwell and intrawell prediction limits are updated periodically during the assessment monitoring period as sufficient data become available.

For intrawell tests, insufficient data was available to compare against the existing background dataset, and so the prediction limits were not updated for the intrawell tests at this time. The intrawell prediction limits were previously calculated using historical data through June 2022 (Geosyntec 2023c). The established intrawell prediction limits were used to evaluate potential SSIs for calcium.

Prediction limits for the interwell tests were recalculated using data collected during the 2023 assessment monitoring events. New background well data were tested for outliers before being added to the background data set. Background well data were also evaluated for statistically significant trends using the Sen's Slope/Mann-Kendall trend test, and the results are included in Attachment B.

After the revised background set was established, a parametric or nonparametric analysis was selected based on the distribution of the data and the frequency of nondetect data. Estimated results under the reporting limit (i.e., practical quantitation limit [PQL]) but above the method detection

limit—that is, "J-flagged" data—were considered detections and the estimated results were used in the statistical analyses. Nonparametric analyses were selected for data sets with at least 50% nondetect data or data sets that could not be normalized. Parametric analyses were selected for data sets (either transformed or untransformed) that passed the Shapiro-Wilk/Shapiro-Francía test for normality. The Kaplan-Meier nondetect adjustment was applied to data sets with between 15% and 50% nondetect data. For data sets with fewer than 15% nondetect data, nondetect data were replaced with one half of the PQL. The selected analysis (i.e., parametric or nonparametric) and transformation (where applicable) for each background data set are shown in Attachment B.

Interwell UPLs were updated for boron, chloride, fluoride, pH, sulfate, and TDS and interwell LPLs were updated for pH using historical data through October 2023. Intrawell UPLs for calcium were previously updated using data through June 2022 to represent background values. The prediction limits are summarized in Table 3. The prediction limits were calculated for a one-of-two retesting procedure: If at least one sample in a series of two is not above the UPL (or, in the case of pH, is neither less than the LPL nor greater than the UPL), then it can be concluded that an SSI has not occurred. In practice, where the initial result does not exceed the UPL (or, in the case of pH, is neither less than the LPL nor greater than the UPL), a second sample will not be collected. The retesting procedures allow achieving an acceptably high statistical power to detect changes at downgradient wells for constituents evaluated using intrawell prediction limits.

2.2.4 Evaluation of Potential Appendix A SSIs

While SSLs were identified, a review of the Appendix A results were also completed to assess whether concentrations of Appendix A parameters at the compliance wells were above background concentrations. Data collected during the October 2023 assessment monitoring event from each compliance well were compared to updated interwell and previously established intrawell prediction limits to assess whether the results are above background values (Table 3).

The following concentrations were above the UPLs:

- Boron concentrations were above the interwell UPL of 0.496 mg/L at SP-10 (0.879 mg/L).
- Chloride concentrations were above the interwell UPL of 874 mg/L at SP-10 (1,820 mg/L).
- Fluoride concentrations were above the interwell UPL of 4.39 mg/L at SP-10 (6.3 mg/L).
- Sulfate concentrations were above the interwell UPL of 83.0 mg/L at SP-1 (84.8 mg/L) and SP-11 (184 mg/L).
- TDS concentrations were above the interwell UPL of 1,940 mg/L at SP-10 (3,460 mg/L).

While the prediction limits were calculated for a one-of-two retesting procedure, SSIs were conservatively assumed if the October 2023 sample was above the UPL or below the LPL in the case of pH. Based on these results, concentrations of Appendix A constituents appear to be above background concentrations.

2.3 Conclusions

A semiannual assessment monitoring event was conducted in accordance with the CCR Rule. The laboratory and field data were reviewed prior to statistical analysis, and no QA/QC issues that impacted data usability were identified. A review of outliers identified no potential outliers in the October 2023 data. GWPSs were reestablished for the Appendix B parameters. A confidence interval was constructed at each compliance well for each Appendix B parameter; SSLs were concluded if the entire confidence interval was above the GWPS. SSLs were identified for barium, fluoride, and lithium. Appendix A parameters were compared to calculated prediction limits, with exceedances identified for boron, chloride, fluoride, sulfate, and TDS.

Based on this evaluation, the Northeastern BAP CCR unit will either move to an assessment of corrective measures or an ASD will be conducted to evaluate if the unit can remain in assessment monitoring.

3. REFERENCES

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TABLES

Table 1. Groundwater Data Summary
Statistical Analysis Summary
Northeastern – Bottom Ash Pond

Parameter	Unit	SP-1	SP-2	SP-4	SP-5R	SP-10	SP-11
		10/10/2023	10/10/2023	10/10/2023	10/10/2023	10/10/2023	10/10/2023
Antimony	µg/L	0.745	1.06	0.249	0.195	0.062 J1	0.075 J1
Arsenic	µg/L	0.65	0.82	0.84	15.8	0.65	3.61
Barium	µg/L	138	1,270	232	2,770	6,010	455
Beryllium	µg/L	0.053	0.086	0.036 J1	0.201	0.035 J1	0.027 J1
Boron	mg/L	0.159	0.210	0.339	0.228	0.879	0.354
Cadmium	µg/L	0.041	0.047	0.057	0.076	0.007 J1	0.031
Calcium	mg/L	102	151	90.9	107	93.0	79.1
Chloride	mg/L	45.1	699	450	964	1,820	79.4
Chromium	µg/L	0.47	0.62	0.59	2.64	0.36	0.90
Cobalt	µg/L	0.717	0.322	0.218	1.03	0.039	0.635
Combined Radium	pCi/L	3.06	8.06	3.23	24.78	21.79	2.91
Fluoride	mg/L	0.96	2.79	3.19	3.21	6.3	2.28
Lead	µg/L	0.17 J1	0.15 J1	0.38	2.52	0.08 J1	0.45
Lithium	mg/L	0.00819	0.0809	0.0554	0.123	0.235	0.0222
Mercury	µg/L	0.005 U1	0.005 U1	0.005 U1	0.005 U1	0.005 U1	0.005 U1
Molybdenum	µg/L	26.0	15.9	3.3	0.7	0.2 J1	0.9
Selenium	µg/L	11.8	3.63	0.30 J1	0.94	0.06 J1	0.23 J1
Sulfate	mg/L	84.8	20.2	81.4	2.6	19.2	184
Thallium	µg/L	0.11 J1	0.05 J1	0.02 J1	0.04 J1	0.2 U1	0.2 U1
Total Dissolved Solids	mg/L	470	1,470	1,160	1,830	3,460	880
pH	SU	7.42	7.6	7.62	7.32	7.73	7.24

Notes:
J1: Estimated value. Parameter was detected in concentrations below the reporting limit.
mg/L: milligrams per liter
pCi/L: picocuries per liter
SU: standard unit
U1: Non-detect value. For statistical analysis, parameters which were not detected were replaced with the reporting limit.
µg/L: micrograms per liter

Table 2. Appendix B Groundwater Protection Standards *Geosyntec Consultants, Inc.*
Statistical Analysis Summary
Northeastern Plant - Bottom Ash Pond

Constituent Name	MCL	CCR Rule-Specified	Calculated UTL	GWPS
Antimony, Total (mg/L)	0.00600		0.00467	0.00600
Arsenic, Total (mg/L)	0.0100		0.0529	0.0529
Barium, Total (mg/L)	2.00		2.77	2.77
Beryllium, Total (mg/L)	0.00400		0.00212	0.00400
Cadmium, Total (mg/L)	0.00500		0.00022	0.00500
Chromium, Total (mg/L)	0.100		0.00373	0.100
Cobalt, Total (mg/L)	n/a	0.00600	0.0179	0.0179
Combined Radium, Total (pCi/L)	5.00		19.4	19.4
Fluoride, Total (mg/L)	4.00		4.39	4.39
Lead, Total (mg/L)	n/a	0.0150	0.0087	0.0150
Lithium, Total (mg/L)	n/a	0.0400	0.163	0.163
Mercury, Total (mg/L)	0.00200		0.0000300	0.00200
Molybdenum, Total (mg/L)	n/a	0.100	0.0100	0.100
Selenium, Total (mg/L)	0.0500		0.00499	0.0500
Thallium, Total (mg/L)	0.00200		0.00162	0.00200

Notes:
1. Calculated UTL (upper tolerance limit) represents site-specific background values.
2. Grey cells indicate the GWPS is based on the calculated UTL, which is higher than the MCL or CCR Rule-specified value.
CCR: coal combustion residuals
GWPS: groundwater protection standard
MCL: maximum contaminant level
mg/L: milligrams per liter
pCi/L: picocuries per liter

Table 3. Appendix A Data Summary
Statistical Analysis Summary
Northeastern – Bottom Ash Pond

Analyte	Unit	Description	SP-1	SP-2	SP-10	SP-11
			10/10/2023	10/10/2023	10/10/2023	10/10/2023
Boron	mg/L	Interwell Background Value (UPL)	0.496			
		Analytical Result	0.159	0.210	**0.879**	0.354
Calcium	mg/L	Intrawell Background Value (UPL)	141	167	227	156
		Analytical Result	102	151	93.0	79.1
Chloride	mg/L	Interwell Background Value (UPL)	874			
		Analytical Result	45.1	699	**1,820**	79.4
Fluoride	mg/L	Interwell Background Value (UPL)	4.39			
		Analytical Result	0.96	2.79	**6.3**	2.28
pH	SU	Interwell Background Value (UPL)	9.1			
		Interwell Background Value (LPL)	7.0			
		Analytical Result	7.4	7.6	7.7	7.2
Sulfate	mg/L	Interwell Background Value (UPL)	83.0			
		Analytical Result	**84.8**	20.2	19.2	**184**
Total Dissolved Solids	mg/L	Interwell Background Value (UPL)	1,940			
		Analytical Result	470	1,470	**3,460**	880

Notes:
1. Bold values exceed the background value.
2. Background values are shaded gray.
LPL: lower prediction limit
mg/L: milligrams per liter
SU: standard units
UPL: upper prediction limit

ATTACHMENT A
Certification by Qualified Professional Engineer

Certification by Qualified Professional Engineer

I certify that selected and above described statistical method is appropriate for evaluating the groundwater monitoring data for the Northeastern BAP CCR management area and that the requirements of OAC 252:517-9-4(g) have been met.

David Anthony Miller

Printed Name of Licensed Professional Engineer

David Anthony Miller

Signature

26057	Oklahoma	02.20.2024
License Number	Licensing State	Date

ATTACHMENT B
Statistical Analysis Output

GROUNDWATER STATS CONSULTING

January 11, 2024

Geosyntec Consultants
Attn: Ms. Allison Kreinberg
500 W. Wilson Bridge Road, Suite 250
Worthington, OH 43085

Re: Northeastern BAP (Bottom Ash Pond)
Background Update & Assessment Monitoring Statistics – October 2023

Dear Ms. Kreinberg,

Groundwater Stats Consulting (GSC), formerly the statistical consulting division of Sanitas Technologies, is pleased to provide the statistical analysis and background update of 2023 groundwater data for American Electric Power Inc.'s Northeastern BAP. The analysis complies with the Oklahoma Administrative Code (OAC) as well as with the United States Environmental Protection Agency (USEPA) Unified Guidance (2009).

Sampling began at the site for the OAC program in 2017. The monitoring well network, as provided by Geosyntec Consultants, consists of the following:

- **Upgradient wells:** SP-4 and SP-5R
- **Downgradient wells:** SP-1, SP2, SP-10, and SP-11

Data were sent electronically, and the statistical analysis was conducted according to the Statistical Analysis Plan and screening evaluation prepared by GSC and approved by Dr. Kirk Cameron, PhD Statistician with MacStat Consulting, primary author of the USEPA Unified Guidance, and Senior Advisor to GSC. The analysis was reviewed by Kristina Rayner, Senior Statistician and Founder of Groundwater Stats Consulting.

The OAC program consists of the following constituents listed below. The terms "constituent" and "parameter" are interchangeable.

- **Appendix A** (Detection Monitoring) **-** boron, calcium, chloride, fluoride, pH, sulfate, and TDS
- **Appendix B** (Assessment Monitoring) **–** antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, combined radium 226 + 228, fluoride, lead, lithium, mercury, molybdenum, selenium, and thallium

For all constituents, a substitution of the most recent reporting limit is used for non-detect data. For calculating intrawell prediction limits, the substitution is performed for individual wells and may differ across wells. This generally gives the most conservative limit in each case.

Time series plots for Appendix A and B parameters are provided for all wells and are used to evaluate concentrations over time as well as for the purpose of updating statistical limits (Figure A). Additionally, box plots are included for all constituents at upgradient and downgradient wells (Figure B). Values in background which have been flagged as outliers may be seen in a lighter font and as a disconnected symbol on the graph. A summary of these values follows this letter (Figure C). The time series plots are used to initially screen for suspected outliers and trends, while the box plots provide visual representation of variation within individual wells and between all wells.

For regulatory comparison of current observations against statistical limits for Appendix A constituents, the annual site-wide false positive rate is based on the USEPA Unified Guidance (2009) recommendation of 10% (5% for each semi-annual sample event). Power curves were provided with the previous screening and demonstrated that the selected statistical method provides sufficient power to detect a change at any of the downgradient wells which complies with the USEPA Unified Guidance recommendation. The EPA suggests the selected statistical method should provide at least 55% power at 3 standard deviations or at least 80% power at 4 standard deviations. Power curves were based on the following:

Semi-Annual Sampling
1-of-2 resample plan
Constituents, c=7
Downgradient wells, w=4

Summary of Statistical Method – Appendix A Parameters

Based on the original background screening described in the 2017 screening report, the following statistical methods were selected for Appendix A parameters:

1) Intrawell prediction limits, combined with a 1-of-2 resample plan for calcium
2) Interwell prediction limits, combined with a 1-of-2 resample plan for boron, chloride, fluoride, pH, sulfate, and TDS

Parametric prediction limits are utilized when the screened historical data follow a normal or transformed-normal distribution. When data cannot be normalized or the majority of data are non-detects, a nonparametric test is utilized. While the annual false positive rate associated with parametric limits is fixed at 10% as recommended by the EPA Unified Guidance (2009), the false positive rate associated with nonparametric limits is not fixed and depends upon the available background sample size, number of future comparisons, and verification resample plan. The distribution of data is tested using the Shapiro-Wilk/Shapiro-Francia test for normality. After testing for normality and performing any adjustments as discussed below (US EPA, 2009), data are analyzed using either parametric or non-parametric prediction limits as appropriate. Non-detects are handled as follows:

- No statistical analyses are required on wells and analytes containing 100% non-detects (USEPA Unified Guidance, 2009, Chapter 6).
- When data contain <15% non-detects, simple substitution of one-half the reporting limit is utilized in the statistical analysis. The reporting limit utilized for non-detects is the most recent practical quantification limit (PQL) as reported by the laboratory.
- When data contain between 15-50% non-detects, the Kaplan-Meier non-detect adjustment is applied to the background data for parametric limits. This technique adjusts the mean and standard deviation of the historical concentrations to account for concentrations below the reporting limit.
- Nonparametric prediction limits are used on data containing greater than 50% non-detects.

Natural systems continuously evolve due to physical changes made to the environment. Examples include capping a landfill, paving areas near a well, or lining a drainage channel to prevent erosion. Periodic updating of background statistical limits is necessary to accommodate these types of changes. In the intrawell case, data for all wells and constituents may be re-evaluated when a minimum of 4 new data points are available to determine whether earlier concentrations are representative of present-day groundwater

quality. In the interwell case, prediction limits may be updated with upgradient well data following each sampling event after careful screening for any new outliers. In some cases, deselecting the earlier portion of data may be necessary prior to construction of limits so that resulting statistical limits are conservative (lower) from a regulatory perspective and capable of rapidly detecting changes in groundwater quality. Even though the data are excluded from the calculation, the values will continue to be reported and shown in tables and graphs.

Summary of Appendix A Background Screening and Updates

December 2017 – Initial Background Screening

Interwell prediction limits combined with a 1-of-2 verification strategy were recommended for boron, chloride, fluoride, pH, sulfate and TDS; and intrawell prediction limits combined with a 1-of-2 verification strategy were recommended for calcium. All proposed background data were screened for outliers and trends during the background screening. The findings of those reports were submitted with that analysis. Interwell prediction limits utilize all upgradient well data for construction of statistical limits. During each sample event, upgradient well data may be screened for any newly suspected outliers or obvious trending patterns using time series plots. Intrawell prediction limits utilized the background data set that was originally screened in 2017. As recommended in the EPA Unified Guidance (2009), the background data sets are evaluated for the purpose of updating statistical limits, as described below, using the Mann-Whitney test when at least four additional measurements are available.

January 2024 – Background Update Summary

During this analysis, Tukey's outlier test and visual screening were used to evaluate data through October 2023 at upgradient wells for boron, chloride, fluoride, pH, sulfate, and TDS, which are tested using interwell prediction limits (Figure C).

For any parameters which use intrawell prediction limits (calcium), values were not re-evaluated for new outliers as these records had insufficient samples for updating background limits during this evaluation period.

Note that during the previous update, the Rank Von Neumann serial correlation test was used to evaluate whether the measurements collected during 2017 represented independent samples, or whether serial correlation was present among the measurements. Significant serial correlation was identified for the calcium at SP-4 and sulfate both SP-4 and SP-5R; therefore, the records for these well/constituent pairs were

truncated to remove earlier measurements for construction of statistical limits using only more recent data that represent independent samples.

Outlier Analysis

Tukey's outlier test on pooled upgradient well data confirmed previously identified values for chloride, fluoride, and TDS, but no additional values were flagged. Any values identified by Tukey's but not flagged appeared representative of similar concentrations upgradient of the facility. Previously flagged outliers were confirmed by Tukey's test and visual screening, and no changes to values flagged in previous background updates occurred. As mentioned above, any flagged data are displayed in a lighter font and as a disconnected symbol on the time series reports, as well as in a lighter font on the accompanying data pages. A summary table of all flagged outliers follows this report (Figure C).

Intrawell - Prediction Limits

Intrawell prediction limits, combined with a 1-of-2 resample plan, are constructed using historical data through June 2022 for calcium at all wells. A summary table of the limits follows this report (Figure D). A list of well/constituent pairs using a truncated portion of their records follows this report (Date Ranges Table). No comparison of the October 2023 observation was performed in this analysis.

Interwell – Trend Test Evaluation

For parameters tested using interwell analyses (boron, chloride, fluoride, pH, sulfate, and TDS) the Sen's Slope/Mann-Kendall trend test was used on upgradient wells to determine whether concentrations are statistically increasing, decreasing or stable at the 99% confidence level (Figure E). Statistically significant trends were identified for the following upgradient well/constituent pairs:

Increasing:

- Chloride: SP-5R
- Sulfate: SP-4
- TDS: SP-5R

Decreasing:

- Boron: SP-4 and SP-5R

Although statistically significant trends were identified, no records were adjusted since the resulting statistical limits are representative of present-day groundwater quality conditions and truncating the records would lead to statistical limits that are less conservative (i.e., higher) from a regulatory perspective. All available data from upgradient wells were used to construct interwell prediction limits for all Appendix A parameters except calcium, which is tested using intrawell prediction limits. As more data are collected, all upgradient well data will be re-evaluated for possible deselection of earlier measurements if concentrations no longer represent present-day groundwater quality conditions.

Interwell – Prediction Limits

Interwell prediction limits, combined with a 1-of-2 resample plan, were updated using all available data from upgradient wells through October 2023 for boron, chloride, fluoride, pH, sulfate, and TDS (Figure F). Time series plots were included with the interwell prediction limit graphs to display concentrations at upgradient wells that were used to construct the statistical limits. No comparison of the October 2023 data was performed in this analysis.

Evaluation of Appendix B Parameters – October 2023 Event

Prior to evaluating Appendix B parameters, background data are screened through visual screening and Tukey's outlier test for potential outliers and extreme trending patterns that would lead to artificially elevated statistical limits.

As mentioned above, during the previous update, the Rank Von Neumann serial correlation test was used to evaluate whether the measurements collected during 2017 represented independent samples, or whether serial correlation was present among the measurements. The records that showed significant serial correlation were truncated to remove earlier measurements for construction of statistical limits using only more recent data that represent independent samples.

Outlier Analysis

For the current analysis, Tukey's outlier test on pooled upgradient well data identified outliers for fluoride, mercury, and selenium and confirmed previously flagged values. Several of the values identified by Tukey's test were either similar to concentrations upgradient of the facility or were lower than the respective Maximum Contaminant Level (MCL); therefore, the values were not flagged as outliers. Previously flagged outliers were

confirmed by Tukey's test or visual screening. A summary of previously flagged outliers follows this report (Figure C).

Additionally, downgradient well data through October 2023 were screened through visual screening using time series graphs. Since the downgradient well data are used to construct confidence intervals, a regulatory conservative approach is taken in that values that are marginally high relative to the rest of the data are retained unless there is particular justification for excluding them. No new outliers among downgradient wells were flagged during this analysis.

During previous updates, due to no variation in the data, Tukey's outlier test was not performed for cadmium and selenium in well SP-5R along with mercury and thallium in all wells. Among upgradient wells, high values for cadmium, lead, and selenium were identified by Tukey's outlier test. Only the highest values for cadmium and lead were flagged as outliers to maintain statistical limits that are conservative from a regulatory perspective. Substantially high values were identified at upgradient well SP-4 on 8/4/17 through visual screening and the highest values for arsenic, beryllium, cobalt, and mercury were flagged. This step results in upper tolerance limits that are conservative (lower) from a regulatory perspective.

Among downgradient wells, a high value for combined radium 226 + 228 in well SP-1 was flagged as an outlier along with the following values since they did not adequately represent the populations at their respective wells: chromium in well SP-10; combined radium 226 + 228 in well SP-11; lithium in well SP-1; and molybdenum in well SP-10. More recent concentrations for barium in downgradient well SP-10 were noted to be significantly higher than historical concentrations. Therefore, earlier concentrations were deselected prior to constructing confidence intervals in order to evaluate present-day groundwater concentrations of barium at this well. As mentioned above, a list of well/constituent pairs using a truncated portion of their records follows this report (Date Ranges Table).

Interwell Upper Tolerance Limits

Upper tolerance limits were used to calculate background limits from pooled upgradient well data through October 2023 for Appendix B parameters (Figure G). These limits are updated on an annual basis and will be updated again during the Fall 2024 sample event. Parametric tolerance limits are calculated, with a target of 95% confidence and 95% coverage, when data follow a normal or transformed-normal distribution. When data contained greater than 50% non-detects or did not follow a normal or transformed-normal distribution, non-parametric tolerance limits were constructed using the highest

background measurement. The confidence and coverage levels for nonparametric tolerance limits are dependent upon the number of background samples.

Groundwater Protection Standards

These background limits were compared to the Maximum Contaminant Levels (MCLs) and CCR Rule-Specified levels as shown in the Groundwater Protection Standard (GWPS) table following this letter to determine the highest limit for use as the GWPS in the Confidence Interval comparisons (Figure H).

Confidence Intervals

Confidence intervals were constructed on downgradient wells with data through October 2023 for each of the Appendix B parameters and then compared to the GWPS, i.e., the highest limit of the MCL, CCR Rule-Specified level, or background limit as discussed above (Figure I). These intervals were constructed as either parametric or nonparametric confidence intervals depending on the data distribution and percentage of non-detects. When data followed a normal or transformed-normal distribution, parametric confidence intervals were used for Appendix IV parameters. Nonparametric confidence intervals were constructed when data did not follow a normal or transformed-normal distribution or when there were greater than 50% non-detects. The lower confidence limit, which is constructed with 99% confidence for parametric confidence intervals, is compared to the GWPS prepared as described above. The confidence level associated with nonparametric confidence intervals is dependent upon the number samples available.

Only when the entire confidence interval is above a GWPS is the well/constituent pair considered to exceed its respective standard. Complete graphical results of the confidence intervals follow this letter. Exceedances were identified for the following well/constituent pairs:

- Barium: SP-10
- Fluoride: SP-10
- Lithium: SP-10

Trend Test Evaluation

When confidence interval exceedances are identified in downgradient wells, data are further evaluated using the Sen's Slope/Mann Kendall trend test to determine whether concentrations are statistically increasing, decreasing, or stable at the 95% confidence level (Figure J). Utilizing the 95% confidence level for trend tests readily identifies

significant trends and is more sensitive than the 99% confidence level without drastically increasing the false negative rate. Upgradient wells are included in the trend analyses for all parameters found to exceed their confidence intervals in downgradient wells. When similar patterns exist upgradient of the site, it is an indication of variability in groundwater which may be unrelated to practices at the site. Statistically significant trends were identified for the following well/constituent pairs:

Increasing:

- Barium: SP-5R (upgradient) and SP-10

Decreasing:

- Lithium: SP-4 and SP-5R (both upgradient) and SP-10

Thank you for the opportunity to assist you in the statistical analysis of groundwater quality for the Northeastern BAP. If you have any questions or comments, please feel free to contact us.

For Groundwater Stats Consulting,

Andrew T. Collins
Project Manager

Kristina L. Rayner
Senior Statistician

Date Ranges

Date: 1/11/2024 12:00 PM

Northeastern BAP Data: Northeastern BAP

Barium (mg/L)
- SP-10 overall:5/30/2018-10/10/2023
- SP-11 overall:5/30/2018-10/10/2023
- SP-4 overall:5/30/2018-10/10/2023

Cadmium (mg/L)
- SP-1 overall:5/30/2018-10/10/2023
- SP-10 overall:5/30/2018-10/10/2023
- SP-4 overall:5/30/2018-10/10/2023
- SP-5R overall:5/30/2018-10/10/2023

Calcium (mg/L)
- SP-11 background:7/30/2018-6/14/2022
- SP-4 overall:7/30/2018-6/14/2022

Chromium (mg/L)
- SP-4 overall:5/30/2018-10/10/2023

Lead (mg/L)
- SP-10 overall:5/30/2018-10/10/2023

Lithium (mg/L)
- SP-11 overall:5/30/2018-10/10/2023
- SP-4 overall:5/30/2018-10/10/2023

Molybdenum (mg/L)
- SP-2 overall:5/30/2018-10/10/2023

Selenium (mg/L)
- SP-2 overall:5/30/2018-10/10/2023
- SP-5R overall:5/30/2018-10/10/2023

Sulfate (mg/L)
- SP-4 overall:5/30/2018-10/10/2023
- SP-5R overall:5/30/2018-10/10/2023

Thallium (mg/L)
- overall:5/30/2018-10/10/2023

FIGURE A

Time Series

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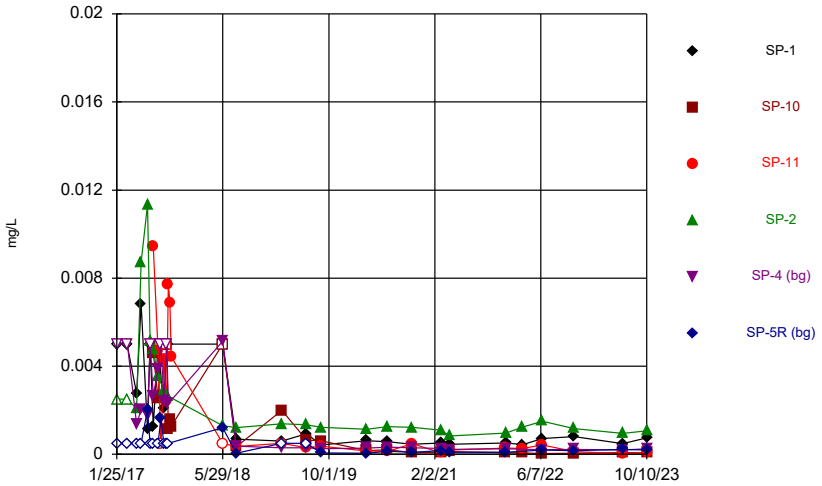
Hollow symbols indicate censored values.

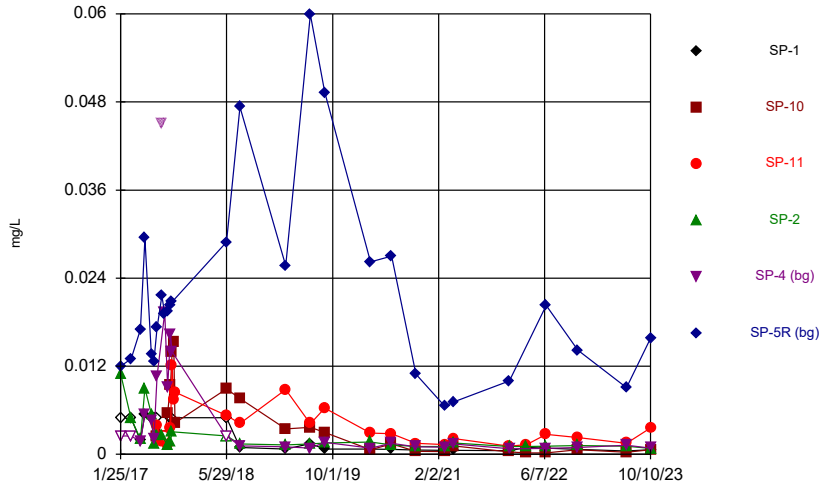
Time Series



Constituent: Antimony Analysis Run 1/10/2024 8:54 AM
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG
Hollow symbols indicate censored values.

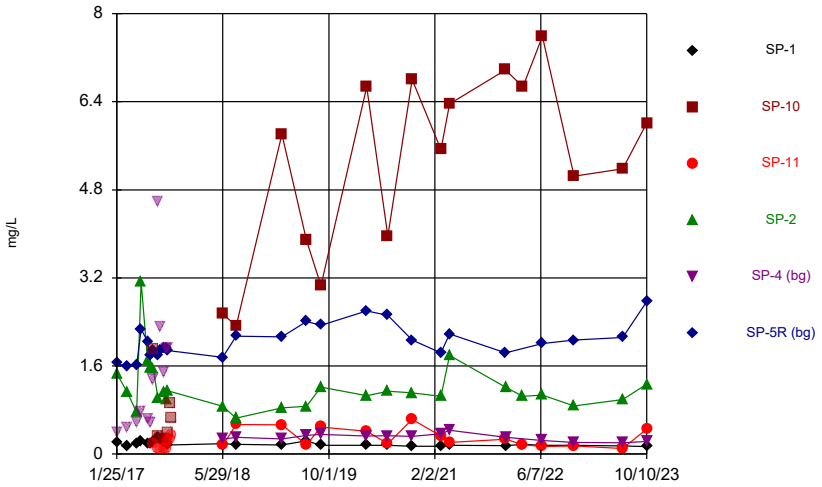
Time Series



Constituent: Arsenic Analysis Run 1/10/2024 8:54 AM
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Time Series



Constituent: Barium Analysis Run 1/10/2024 8:54 AM
Northeastern BAP Data: Northeastern BAP

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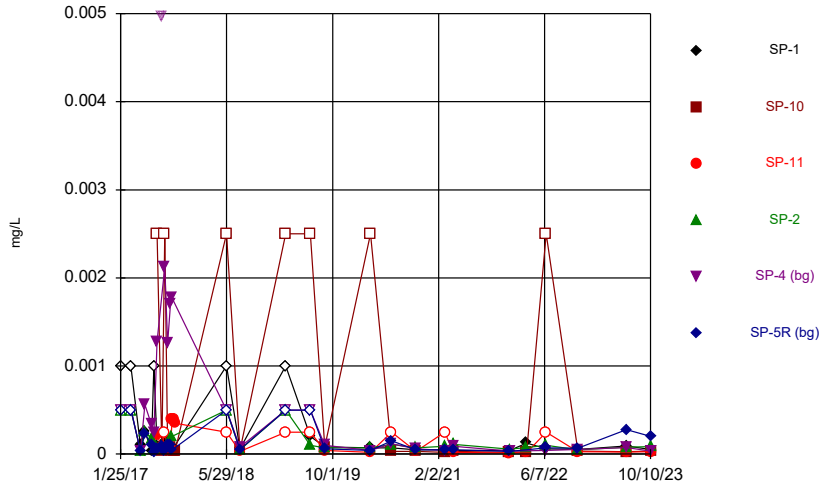
Time Series



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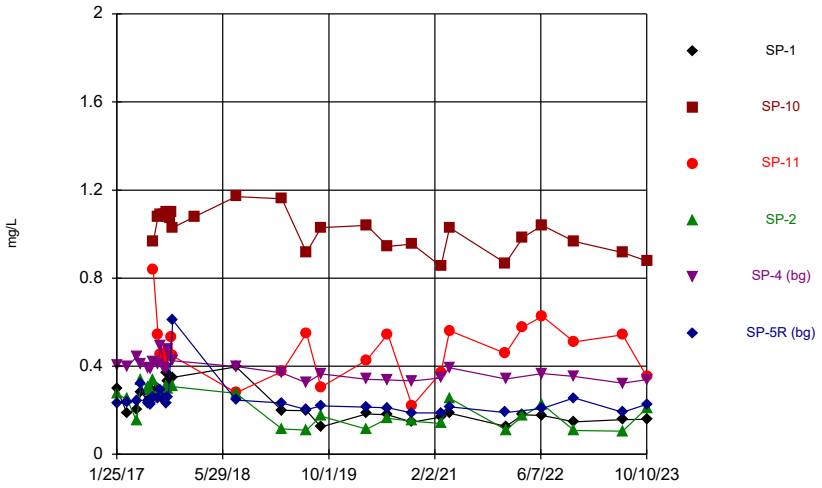
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Time Series



Constituent: Boron Analysis Run 1/10/2024 8:54 AM

Northeastern BAP Data: Northeastern BAP

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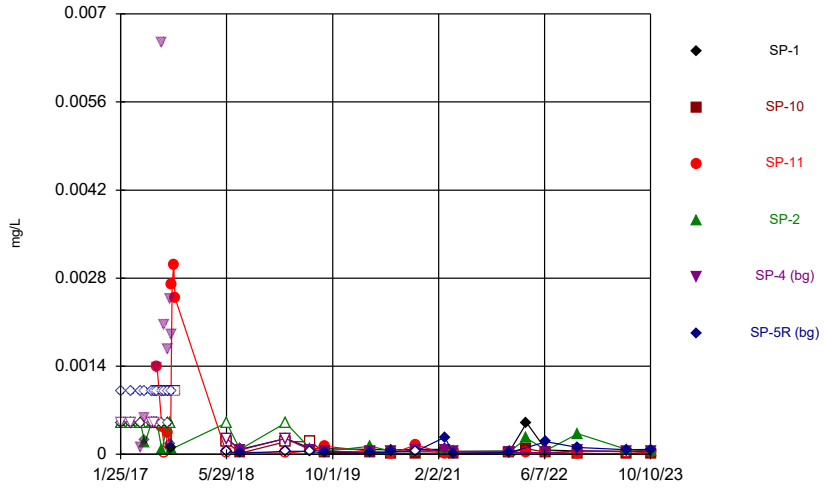
Hollow symbols indicate censored values.

Time Series

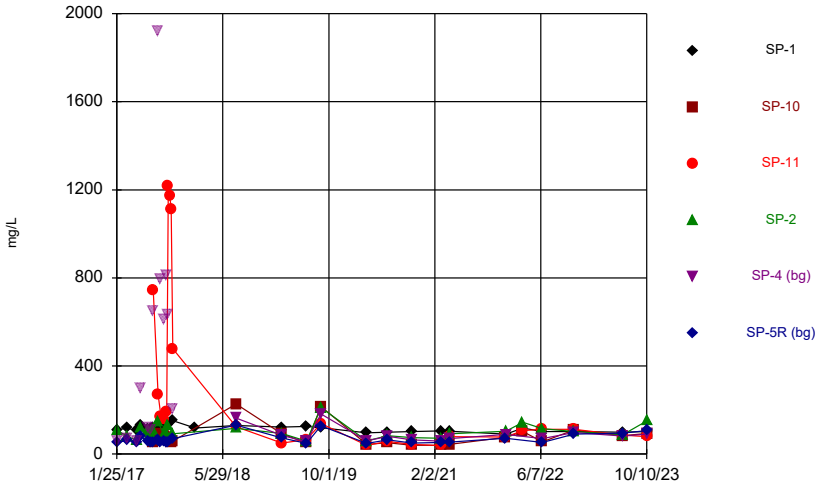


Constituent: Cadmium Analysis Run 1/10/2024 8:54 AM

Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Time Series



Constituent: Calcium Analysis Run 1/10/2024 8:54 AM

Northeastern BAP Data: Northeastern BAP

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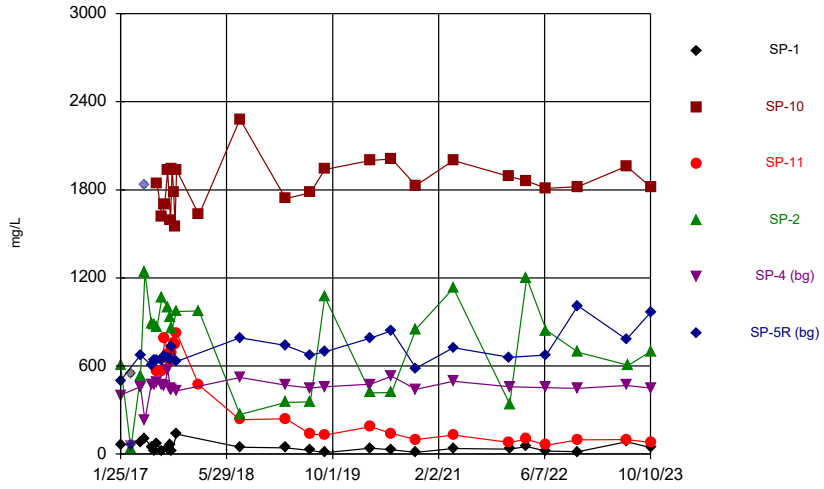
Time Series



Constituent: Chloride Analysis Run 1/10/2024 8:54 AM

Northeastern BAP Data: Northeastern BAP

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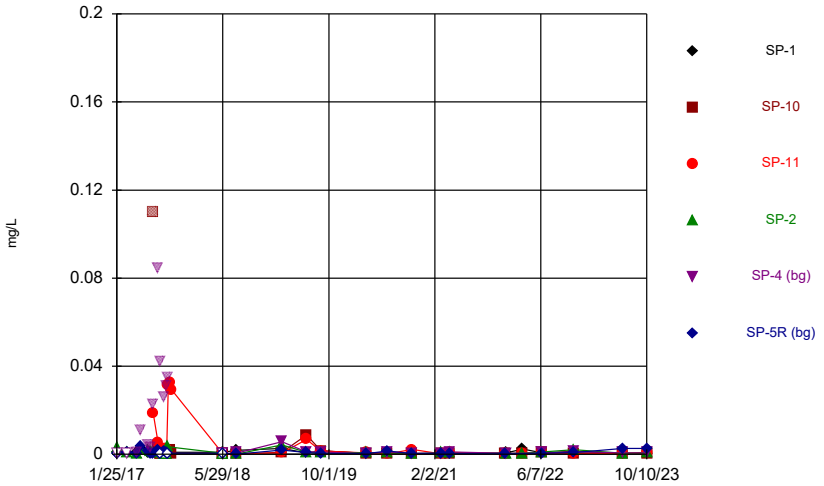
Hollow symbols indicate censored values.

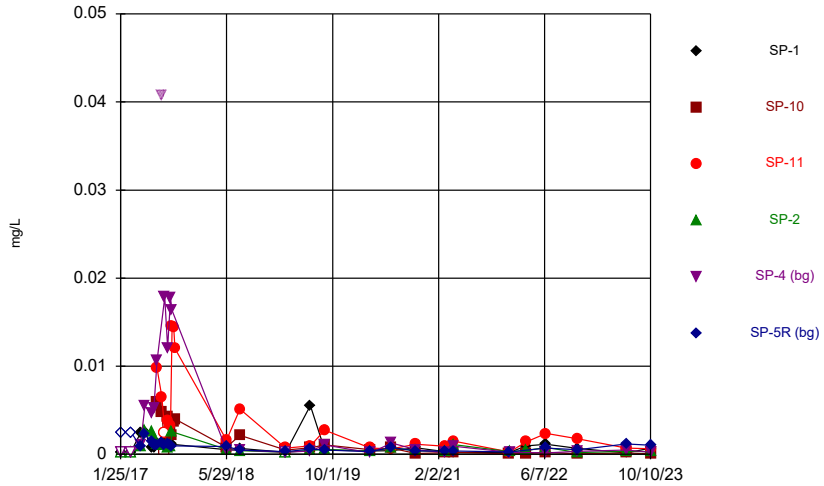
Time Series



Constituent: Chromium Analysis Run 1/10/2024 8:54 AM
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG
Hollow symbols indicate censored values.

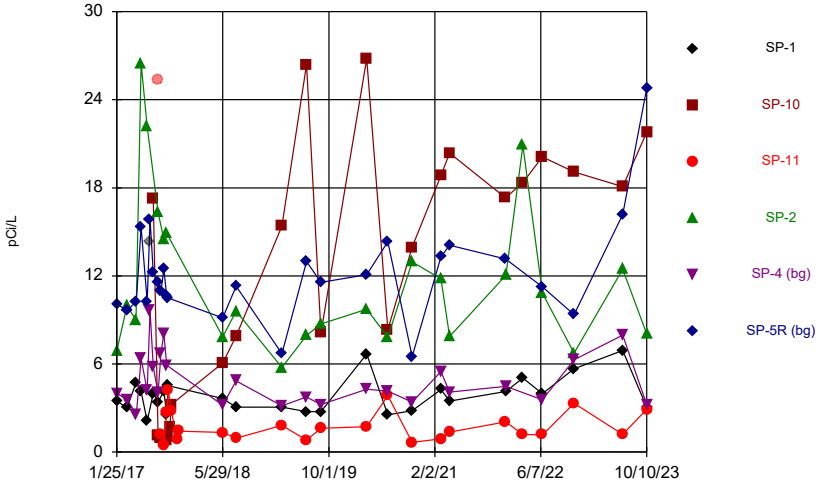
Time Series



Constituent: Cobalt Analysis Run 1/10/2024 8:54 AM
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

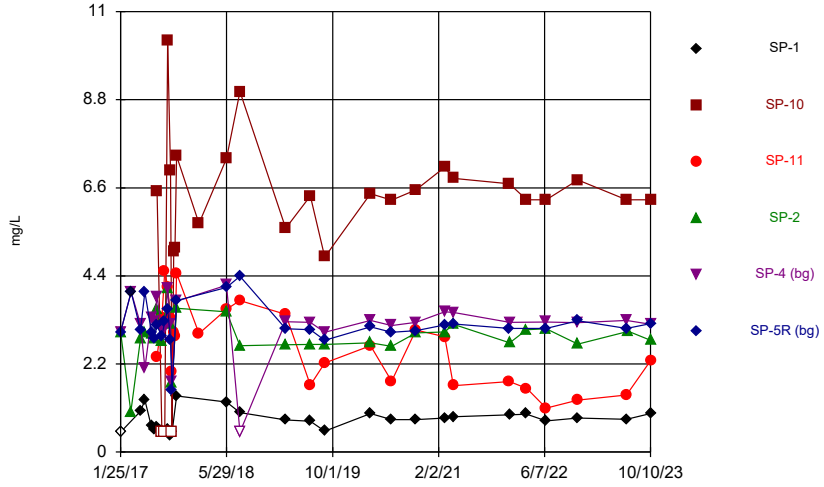
Time Series



Constituent: Combined Radium 226 + 228 Analysis Run 1/10/2024 8:54 AM
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG
Hollow symbols indicate censored values.

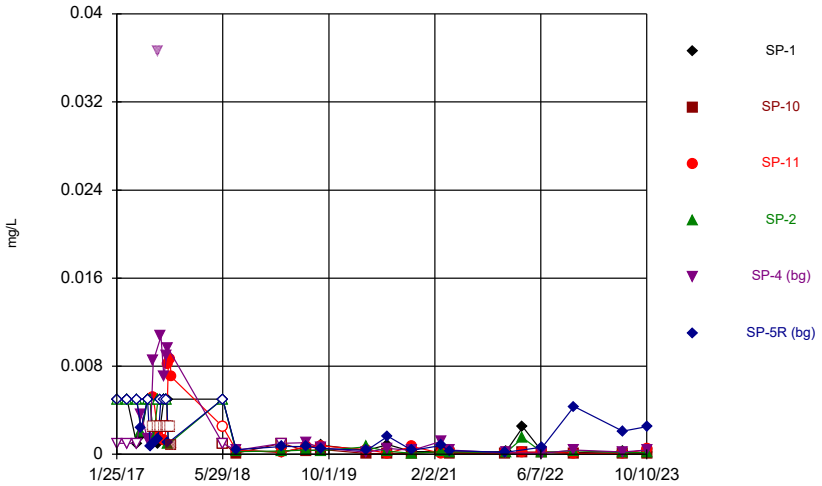
Time Series



Constituent: Fluoride Analysis Run 1/10/2024 8:54 AM
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG
Hollow symbols indicate censored values.

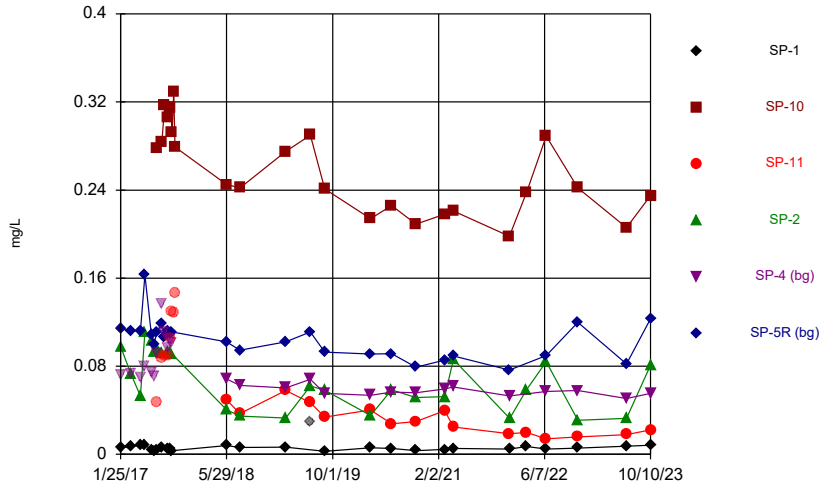
Time Series



Constituent: Lead Analysis Run 1/10/2024 8:54 AM
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

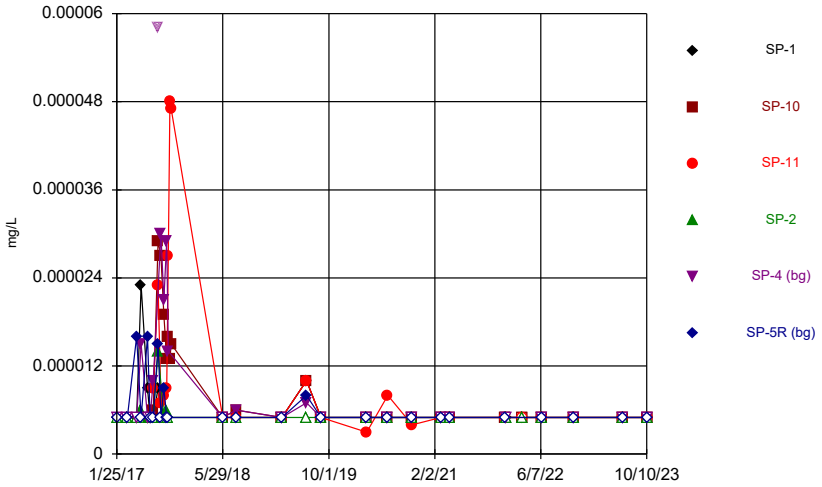
Time Series



Constituent: Lithium Analysis Run 1/10/2024 8:54 AM
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG
Hollow symbols indicate censored values.

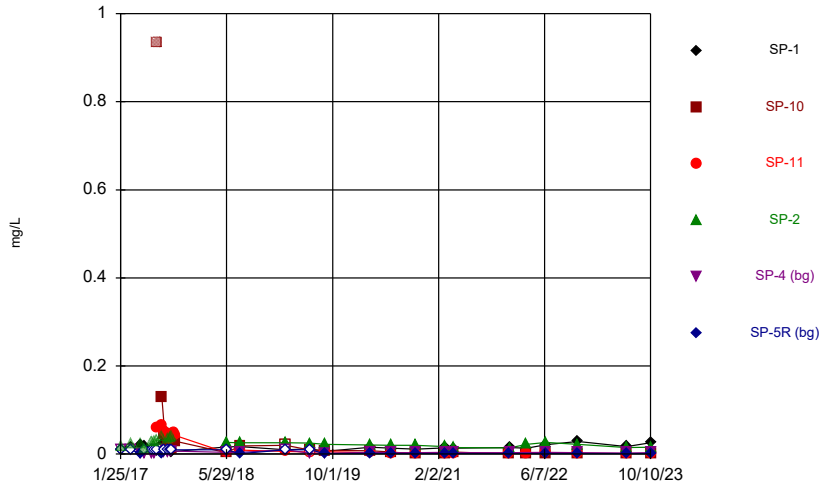
Time Series



Constituent: Mercury Analysis Run 1/10/2024 8:54 AM
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG
Hollow symbols indicate censored values.

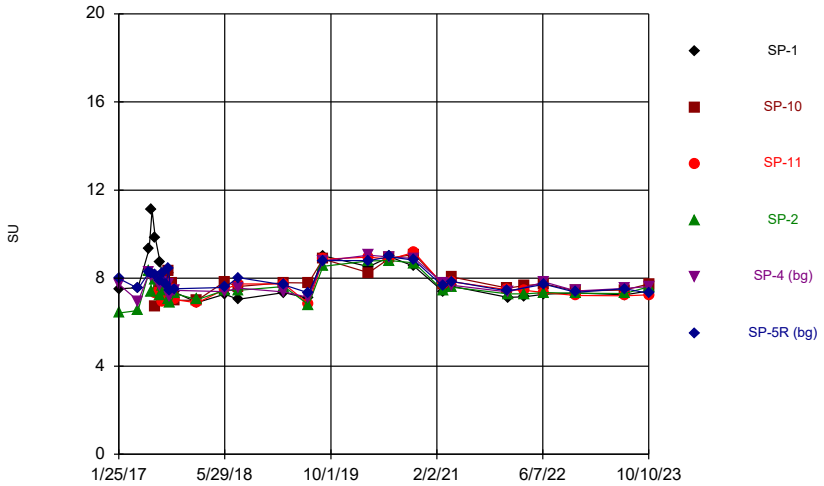
Time Series



Constituent: Molybdenum Analysis Run 1/10/2024 8:54 AM
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Time Series



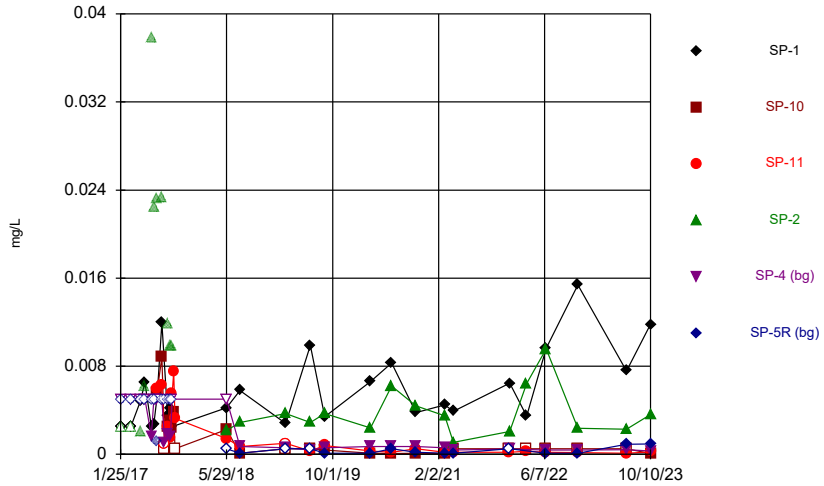
Constituent: pH, field Analysis Run 1/10/2024 8:54 AM

Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Hollow symbols indicate censored values.

Time Series

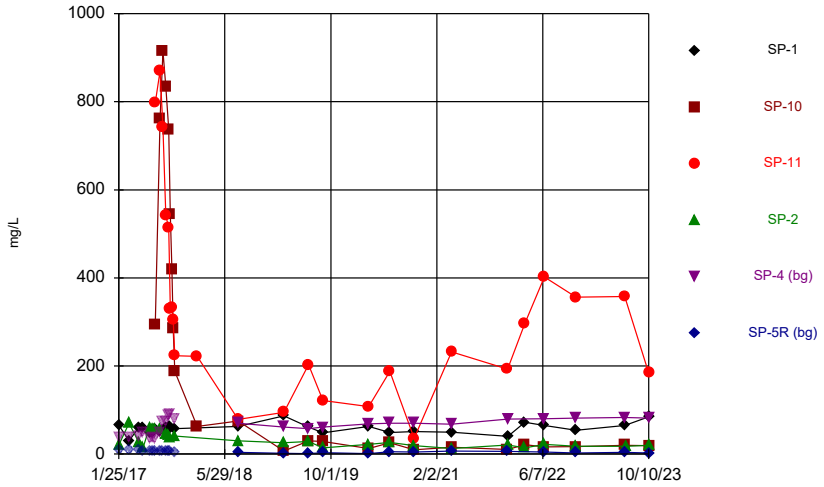


Constituent: Selenium Analysis Run 1/10/2024 8:54 AM

Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Time Series



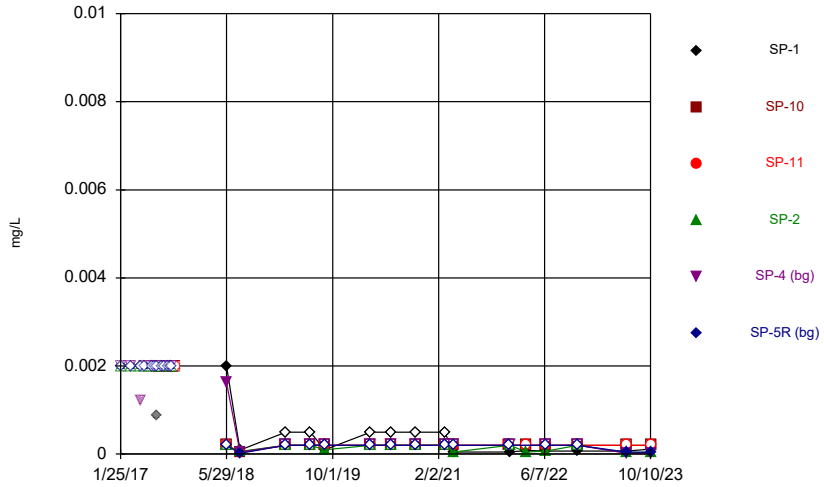
Constituent: Sulfate Analysis Run 1/10/2024 8:54 AM

Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Hollow symbols indicate censored values.

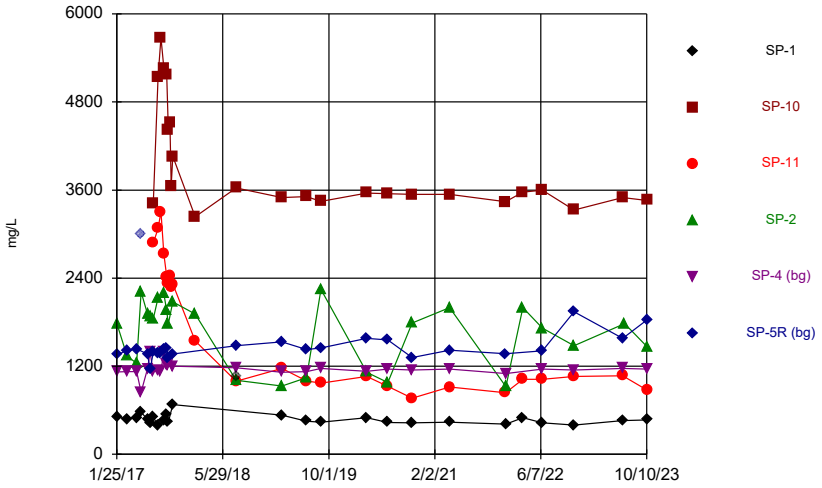
Time Series



Constituent: Thallium Analysis Run 1/10/2024 8:54 AM

Northeastern BAP Data: Northeastern BAP

Time Series



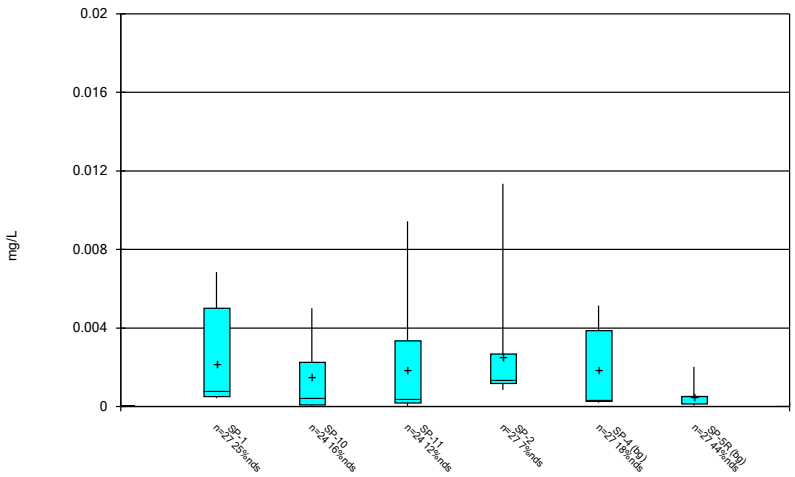
Constituent: Total Dissolved Solids [TDS] Analysis Run 1/10/2024 8:54 AM

Northeastern BAP Data: Northeastern BAP

FIGURE B

Box Plots

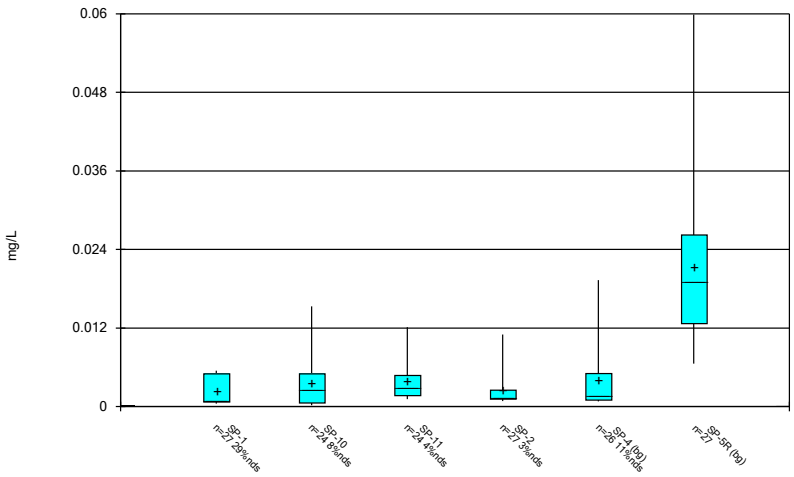
Box & Whiskers Plot



Constituent: Antimony Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

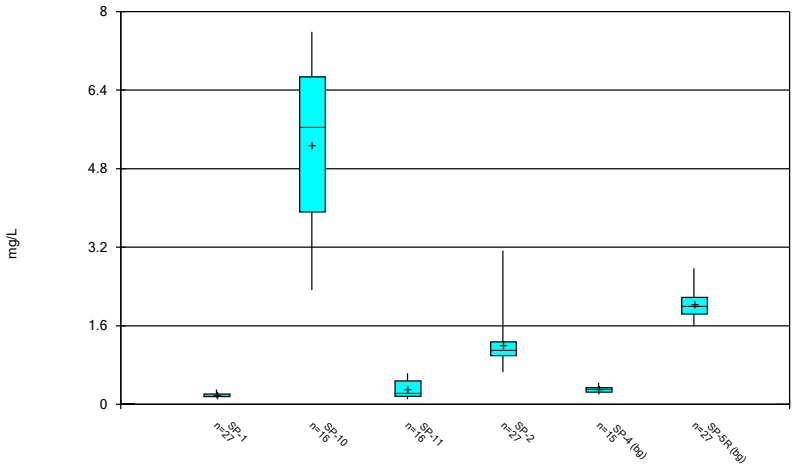
Box & Whiskers Plot



Constituent: Arsenic Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

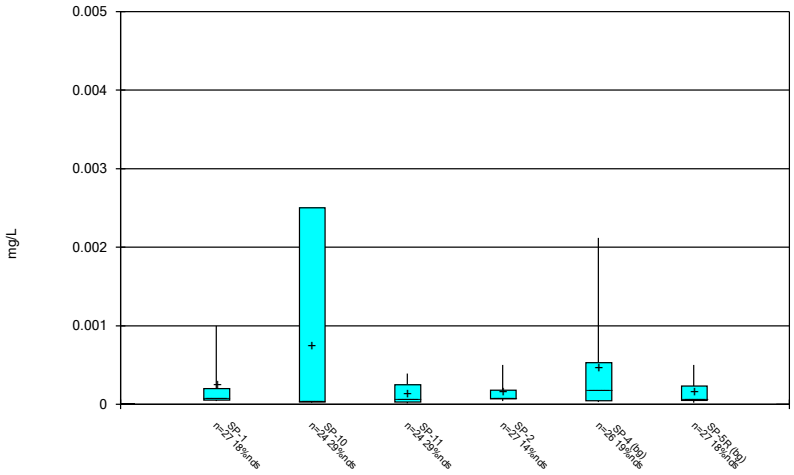
Box & Whiskers Plot



Constituent: Barium Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

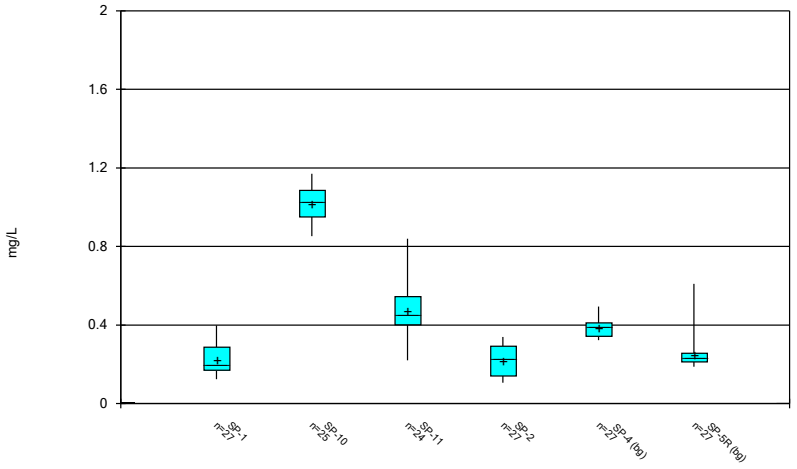
Sanitas™ v.10.0.15 Software licensed to . UG

Box & Whiskers Plot



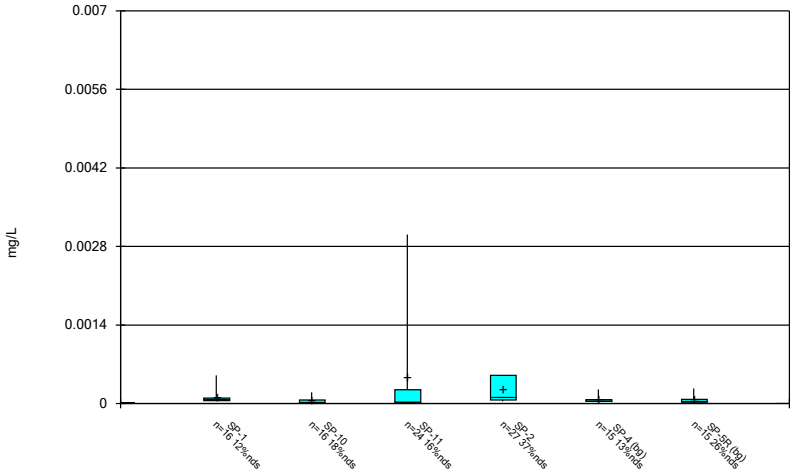
Constituent: Beryllium Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



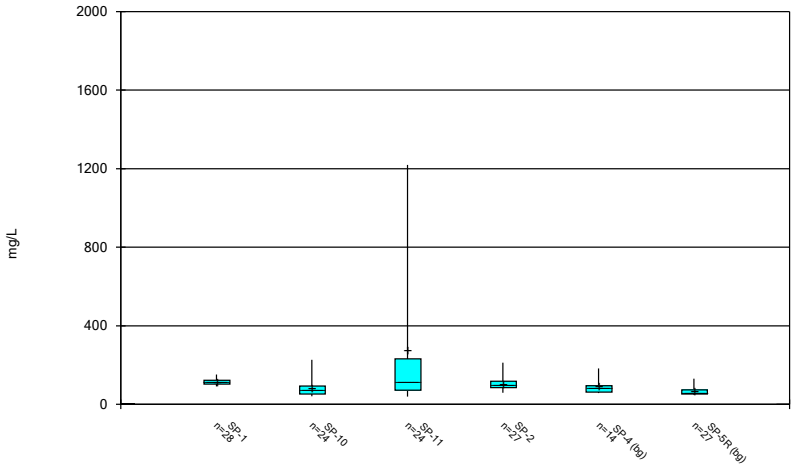
Constituent: Boron Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



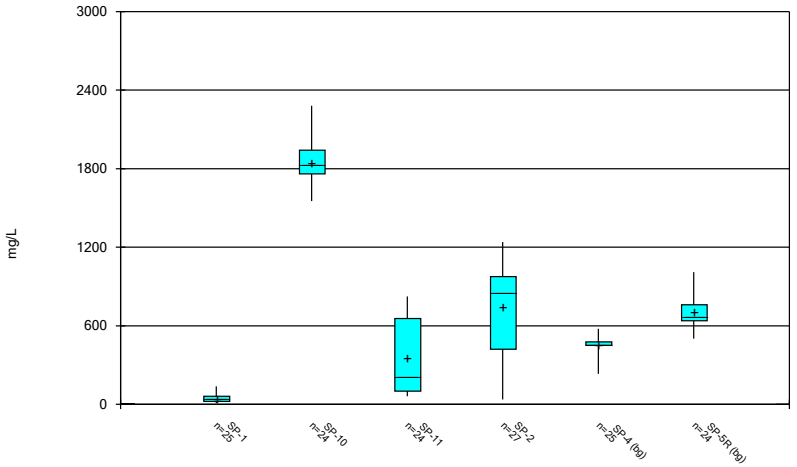
Constituent: Cadmium Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



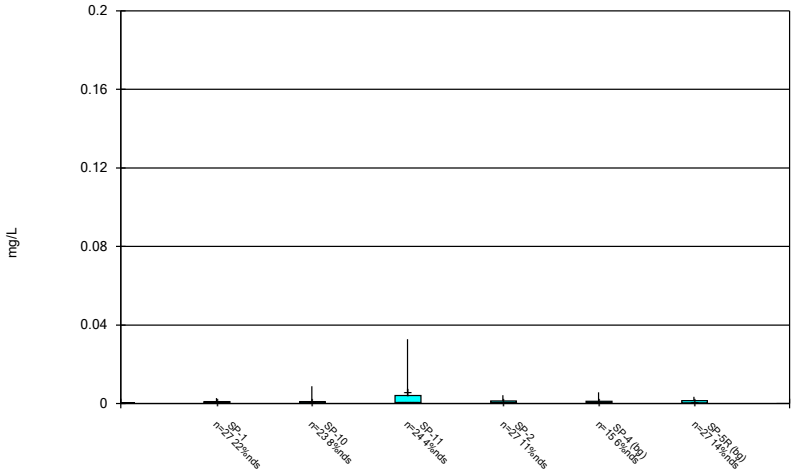
Constituent: Calcium Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



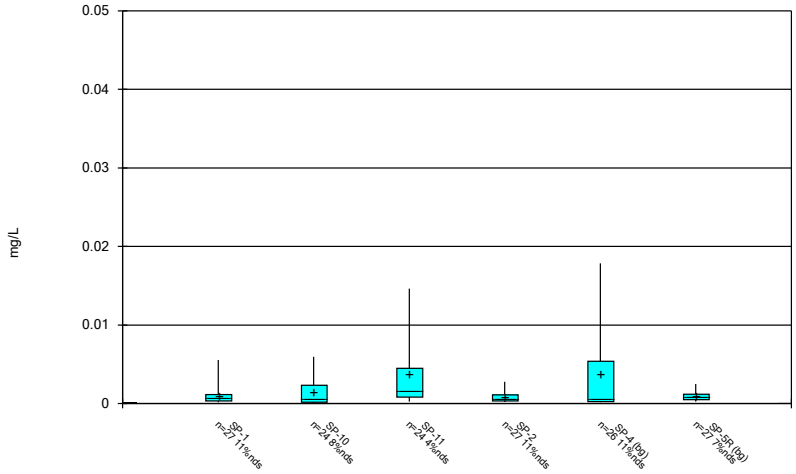
Constituent: Chloride Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



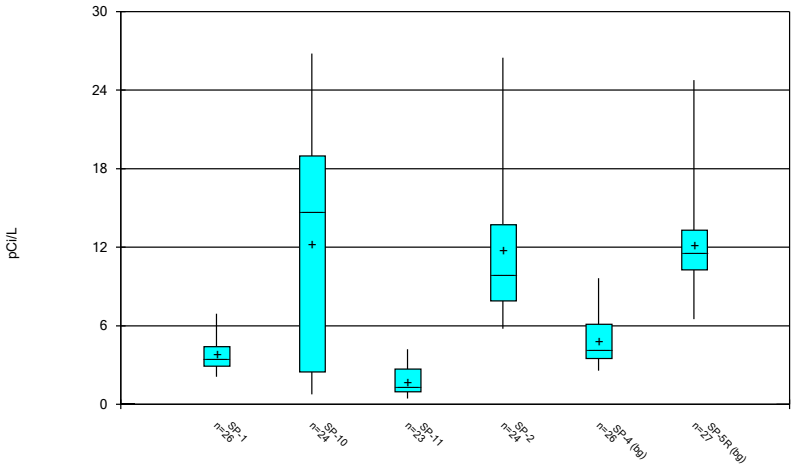
Constituent: Chromium Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



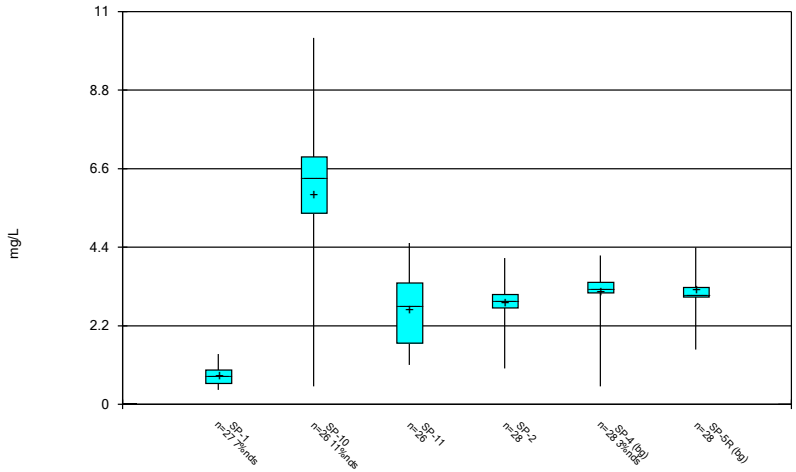
Constituent: Cobalt Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



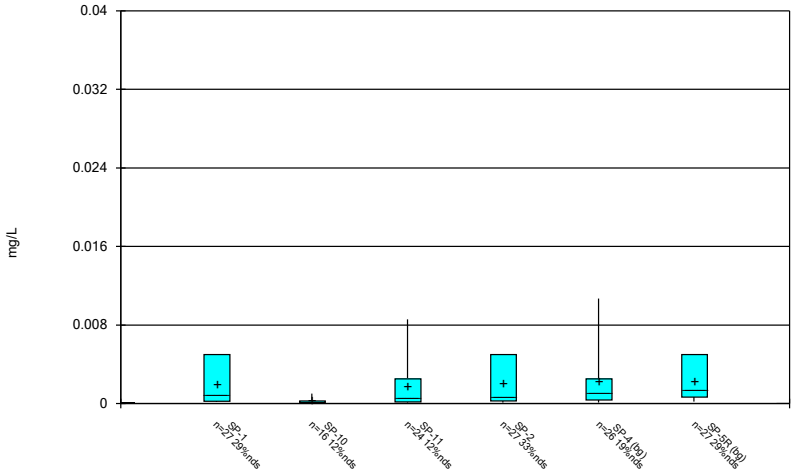
Constituent: Combined Radium 226 + 228 Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



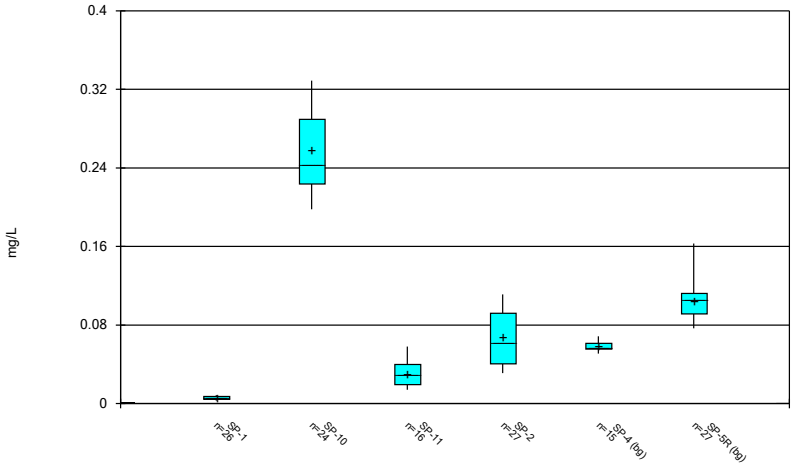
Constituent: Fluoride Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



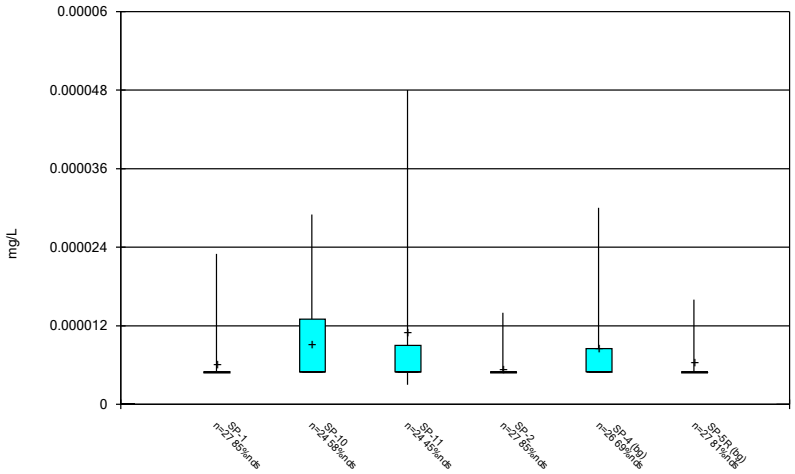
Constituent: Lead Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



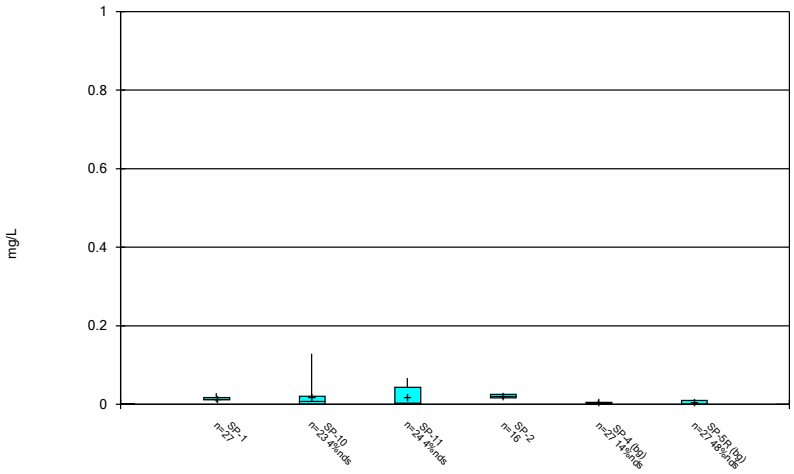
Constituent: Lithium Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



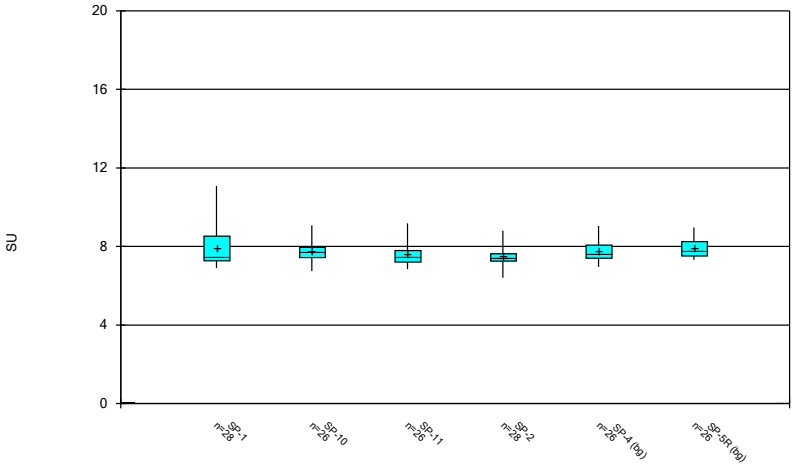
Constituent: Mercury Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



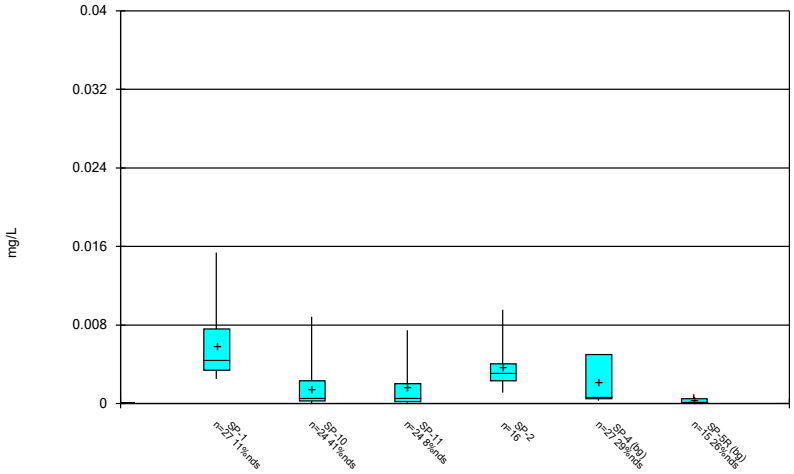
Constituent: Molybdenum Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



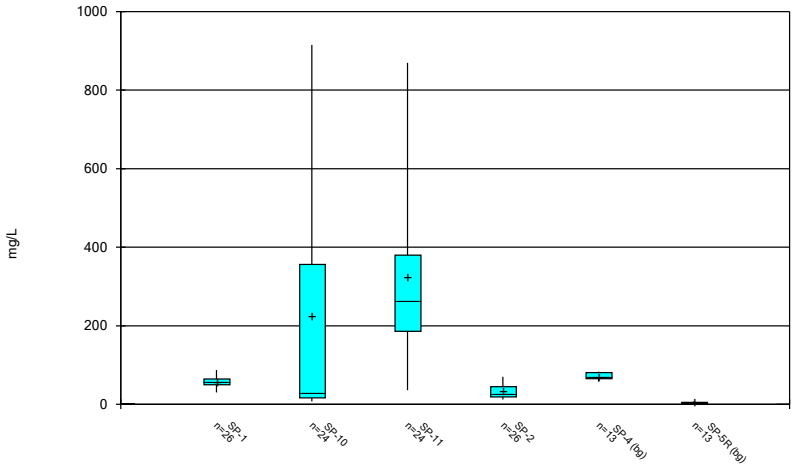
Constituent: pH, field Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



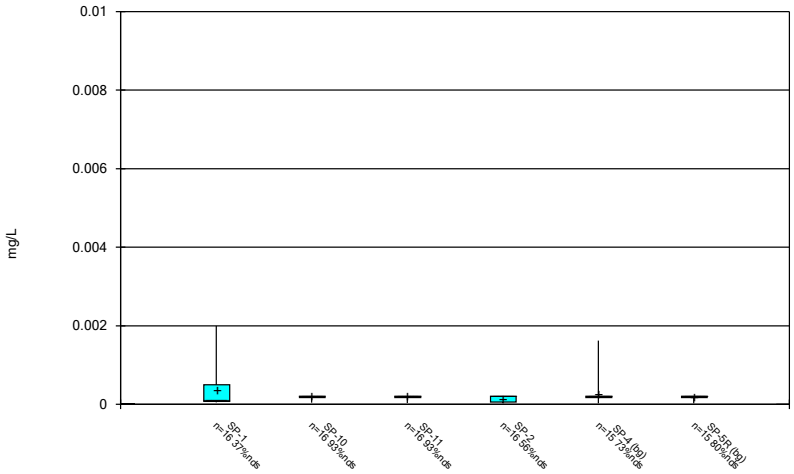
Constituent: Selenium Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



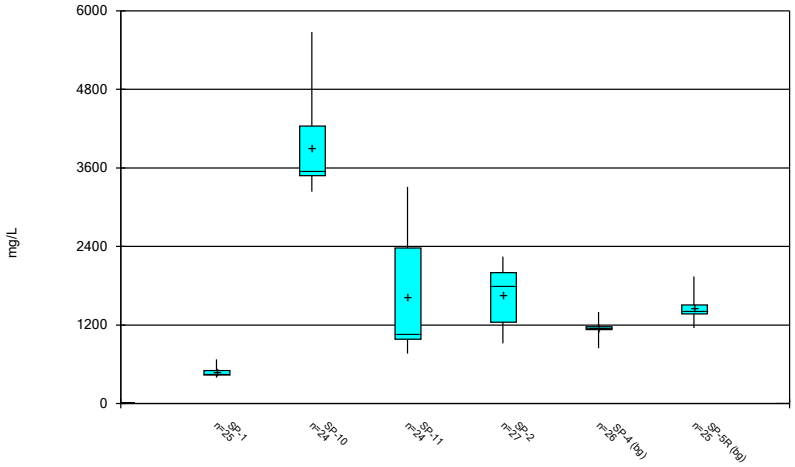
Constituent: Sulfate Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



Constituent: Thallium Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



Constituent: Total Dissolved Solids [TDS] Analysis Run 1/10/2024 9:00 AM

Northeastern BAP Data: Northeastern BAP

FIGURE C

Outlier Summary and Tukey's Outlier Test

Outlier Summary

Northeastern BAP Data: Northeastern BAP Printed 1/11/2024, 12:14 PM

	SP-4 Arsenic (mg/L)	SP-4 Beryllium (mg/L)	SP-1 Chloride (mg/L)	SP-4 Chloride (mg/L)	SP-5R Chloride (mg/L)	SP-10 Chromium (mg/L)	SP-4 Cobalt (mg/L)	SP-1 Combined Radium 226 + 228 (pCi/L)	SP-11 Combined Radium 226 + 228 (pCi/L)	SP-1 Fluoride (mg/L)
3/13/2017			548 (o)							4 (o)
3/15/2017				52 (o)	62 (o)					
5/18/2017					1834 (o)					
6/27/2017								14.29 (o)		
7/13/2017						0.11 (o)				
8/4/2017	0.04498 (o)	0.00497 (o)					0.04069 (o)		25.367 (o)	
7/30/2018										
6/20/2019										

	SP-4 Lead (mg/L)	SP-1 Lithium (mg/L)	SP-4 Mercury (mg/L)	SP-10 Molybdenum (mg/L)	SP-1 Total Dissolved Solids [TDS] (mg/L)	SP-5R Total Dissolved Solids [TDS] (mg/L)
3/13/2017						
3/15/2017						
5/18/2017					3008 (o)	
6/27/2017						
7/13/2017				0.934 (o)		
8/4/2017	0.03663 (o)		5.8E-05 (o)			
7/30/2018					1060 (o)	
6/20/2019		0.03 (J,o)				

Tukey's Outlier Test - Upgradient Wells - Significant Results

Pirkey WBAP Data: Pirkey WBAP Printed 1/4/2024, 12:01 PM

Constituent	Well	Outlier	Value(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Fluoride, total (mg/L)	**AD-12,AD-18,AD-3**	**Yes**	**0.2565,0.213,0.02,0.02,0.02,0.02,0.02,0.02,0.01,0**	**NP**	**NaN**	**77**	**0.07116**	**0.04303**	**ln(x)**	**ShapiroFrancia**
Mercury, total (mg/L)	**AD-12,AD-18,AD-3**	**Yes**	**0.000084**	**NP**	**NaN**	**74**	**0.00001032**	**0.00001278**	**ln(x)**	**ShapiroFrancia**

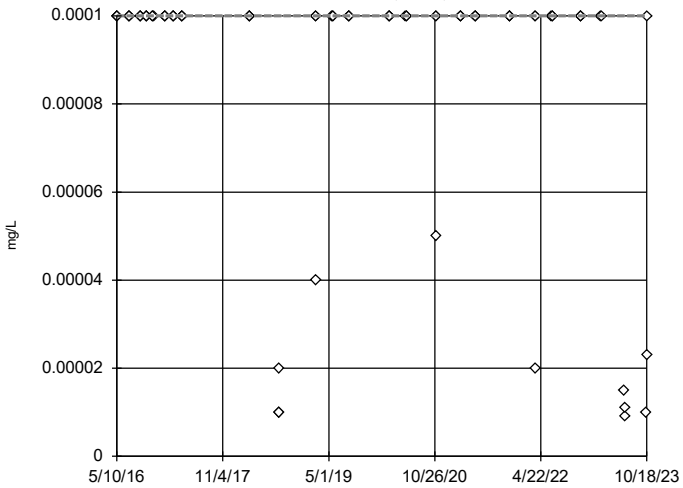
Tukey's Outlier Test - Upgradient Wells - All Results

Pirkey WBAP Data: Pirkey WBAP Printed 1/4/2024, 12:01 PM

Constituent	Well	Outlier	Value(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Antimony, total (mg/L)	AD-12,AD-18,AD-3	n/a	n/a	NP	NaN	74	0.00008808	0.00002915	unknown	ShapiroFrancia
Arsenic, total (mg/L)	AD-12,AD-18,AD-3	No	n/a	NP	NaN	74	0.001202	0.0009703	x^(1/3)	ShapiroFrancia
Barium, total (mg/L)	AD-12,AD-18,AD-3	No	n/a	NP	NaN	74	0.06236	0.03367	sqrt(x)	ShapiroFrancia
Beryllium, total (mg/L)	AD-12,AD-18,AD-3	No	n/a	NP	NaN	74	0.0002513	0.0002456	ln(x)	ShapiroFrancia
Boron, total (mg/L)	AD-12,AD-18,AD-3	No	n/a	NP	NaN	77	0.03168	0.0186	x^(1/3)	ShapiroFrancia
Cadmium, total (mg/L)	AD-12,AD-18,AD-3	No	n/a	NP	NaN	74	0.00005845	0.00004507	ln(x)	ShapiroFrancia
Chloride, total (mg/L)	AD-12,AD-18,AD-3	No	n/a	NP	NaN	77	6.633	1.243	ln(x)	ShapiroFrancia
Chromium, total (mg/L)	AD-12,AD-18,AD-3	No	n/a	NP	NaN	74	0.000665	0.0006099	ln(x)	ShapiroFrancia
Cobalt, total (mg/L)	AD-12,AD-18,AD-3	No	n/a	NP	NaN	74	0.002448	0.002127	ln(x)	ShapiroFrancia
Combined Radium 226 + 228 (pCi/L)	AD-12,AD-18,AD-3	No	n/a	NP	NaN	74	1.199	0.824	x^(1/3)	ShapiroFrancia
Fluoride, total (mg/L)	**AD-12,AD-18,AD-3**	**Yes**	**0.2565,0.213,0.02,0.02,0.02,0.02,0.02,0.02,0.01,0**	**NP**	**NaN**	**77**	**0.07116**	**0.04303**	**ln(x)**	**ShapiroFrancia**
Lead, total (mg/L)	AD-12,AD-18,AD-3	No	n/a	NP	NaN	74	0.0005609	0.0004228	ln(x)	ShapiroFrancia
Lithium, total (mg/L)	AD-12,AD-18,AD-3	No	n/a	NP	NaN	74	0.04176	0.1153	ln(x)	ShapiroFrancia
Mercury, total (mg/L)	**AD-12,AD-18,AD-3**	**Yes**	**0.000084**	**NP**	**NaN**	**74**	**0.00001032**	**0.00001278**	**ln(x)**	**ShapiroFrancia**
Molybdenum, total (mg/L)	AD-12,AD-18,AD-3	n/a	n/a	NP	NaN	74	0.0004969	0.0001231	unknown	ShapiroFrancia
Selenium, total (mg/L)	AD-12,AD-18,AD-3	No	n/a	NP	NaN	74	0.0005129	0.0006234	ln(x)	ShapiroFrancia
Thallium, total (mg/L)	AD-12,AD-18,AD-3	n/a	n/a	NP	NaN	74	0.0001988	0.0001558	unknown	ShapiroFrancia

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 74

No outliers found. Tukey's method selected by user.

Ladder of Powers transformations did not improve normality; analysis run on raw data.

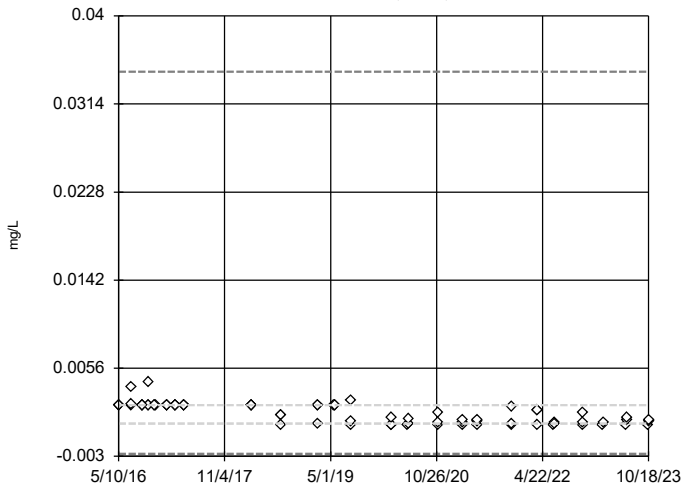
The results were invalidated, because the lower and upper quartiles are equal.

Constituent: Antimony, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Sanitas™ v.10.0.15 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 74

No outliers found. Tukey's method selected by user.

Data were cube root transformed to achieve best W statistic (graph shown in original units).

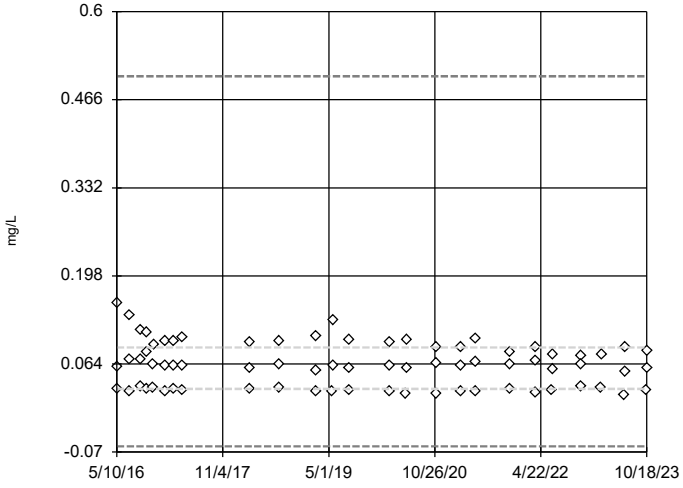
High cutoff = 0.03455, low cutoff = -0.00276, based on IQR multiplier of 3.

Constituent: Arsenic, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Sanitas™ v.10.0.15 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 74

No outliers found. Tukey's method selected by user.

Data were square root transformed to achieve best W statistic (graph shown in original units).

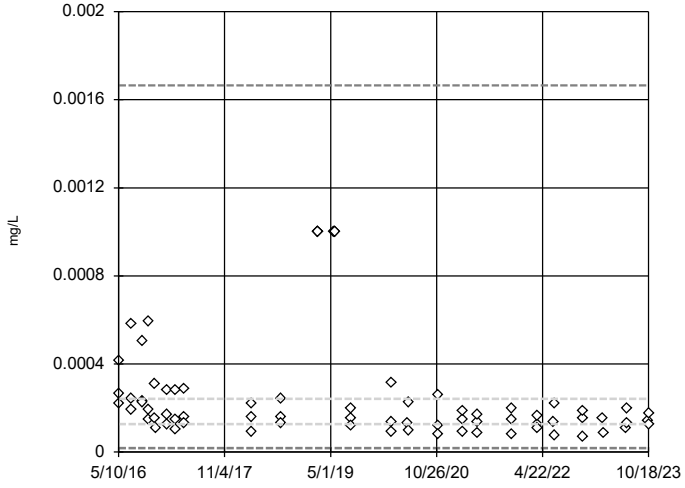
High cutoff = 0.5016, low cutoff = -0.06134, based on IQR multiplier of 3.

Constituent: Barium, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Sanitas™ v.10.0.15 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 74

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

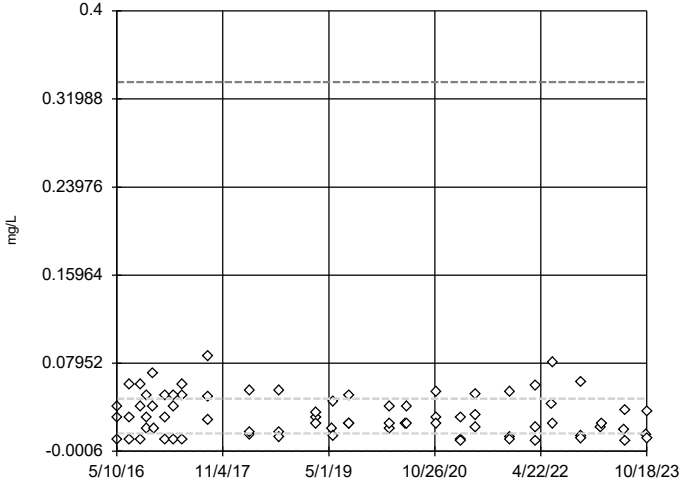
High cutoff = 0.001665, low cutoff = 0.00001843, based on IQR multiplier of 3.

Constituent: Beryllium, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Sanitas™ v.10.0.15 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 77

No outliers found. Tukey's method selected by user.

Data were cube root transformed to achieve best W statistic (graph shown in original units).

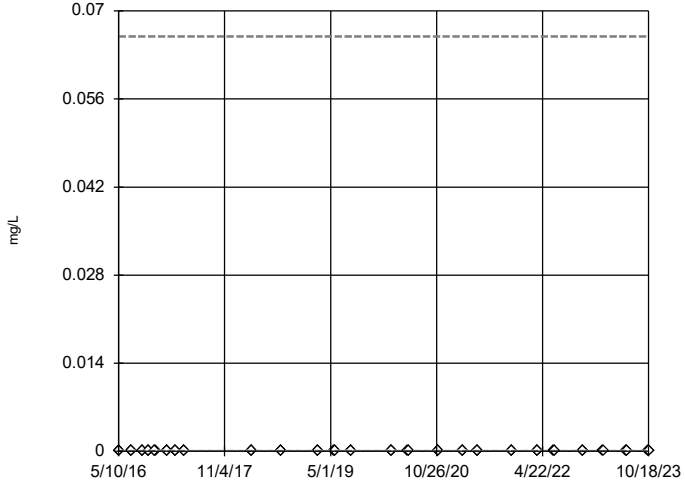
High cutoff = 0.3353, low cutoff = -0.00057, based on IQR multiplier of 3.

Constituent: Boron, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Sanitas™ v.10.0.15 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 74

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

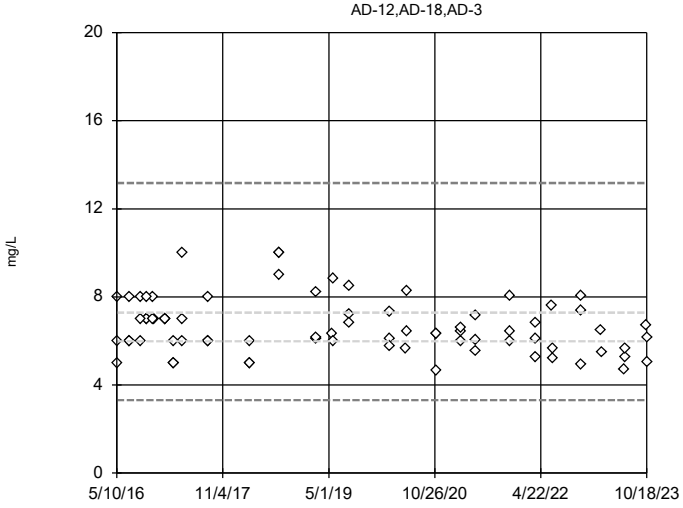
High cutoff = 0.06594, low cutoff = 1.7e-8, based on IQR multiplier of 3.

Constituent: Cadmium, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Sanitas™ v.10.0.15 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 77

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

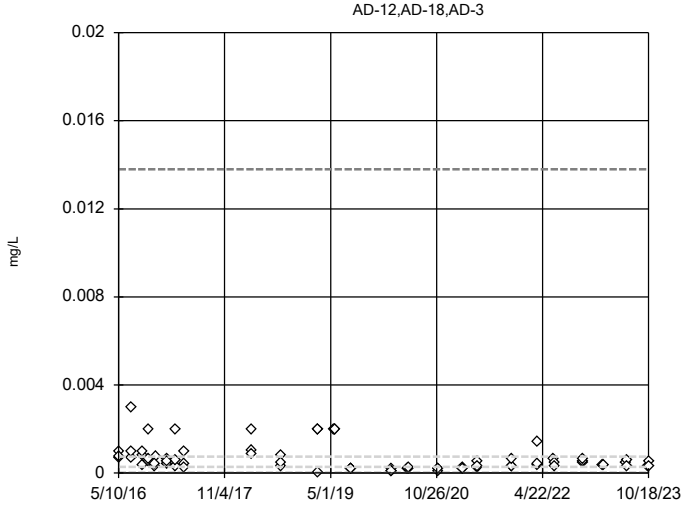
High cutoff = 13.17, low cutoff = 3.312, based on IQR multiplier of 3.

Constituent: Chloride, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Sanitas™ v.10.0.15 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 74

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

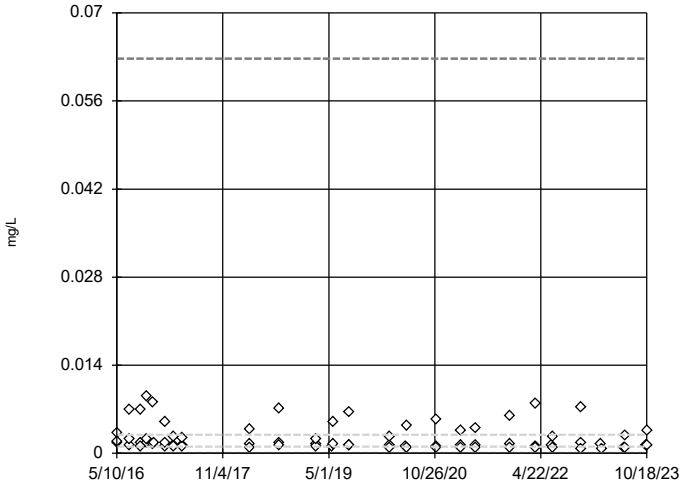
High cutoff = 0.01379, low cutoff = 0.00001555, based on IQR multiplier of 3.

Constituent: Chromium, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Sanitas™ v.10.0.15 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 74

No outliers found.
Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

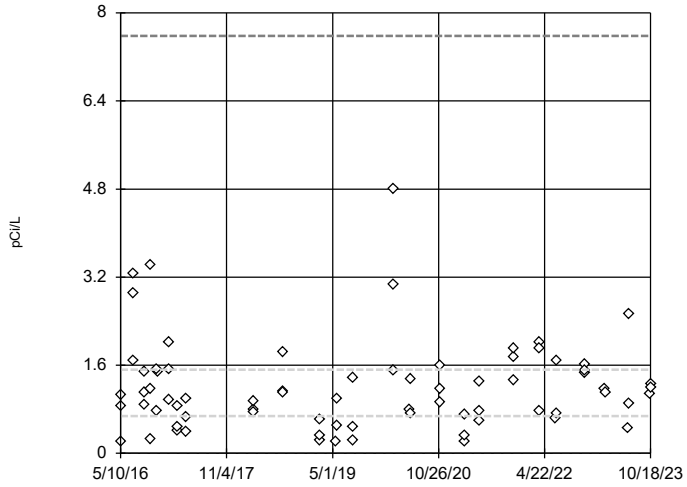
High cutoff = 0.06273, low cutoff = 0.00005026, based on IQR multiplier of 3.

Constituent: Cobalt, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Sanitas™ v.10.0.15 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 74

No outliers found.
Tukey's method selected by user.

Data were cube root transformed to achieve best W statistic (graph shown in original units).

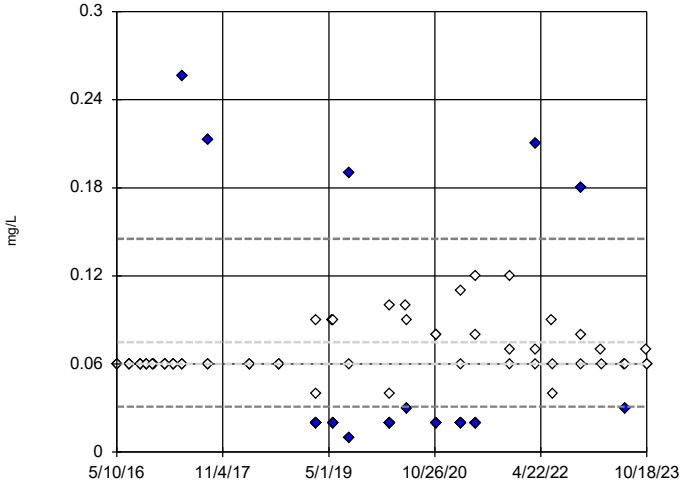
High cutoff = 7.582, low cutoff = 0.0002623, based on IQR multiplier of 3.

Constituent: Combined Radium 226 + 228 Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Sanitas™ v.10.0.15 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 77

Outliers are drawn as solid.
Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

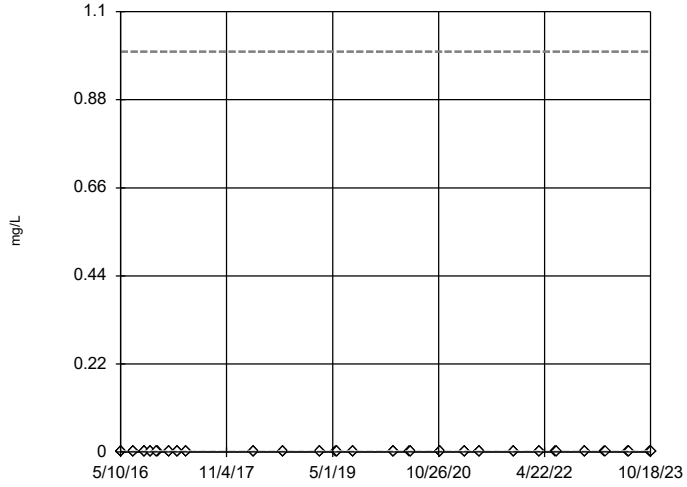
High cutoff = 0.1452, low cutoff = 0.03093, based on IQR multiplier of 3.

Constituent: Fluoride, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Sanitas™ v.10.0.15 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 74

No outliers found.
Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

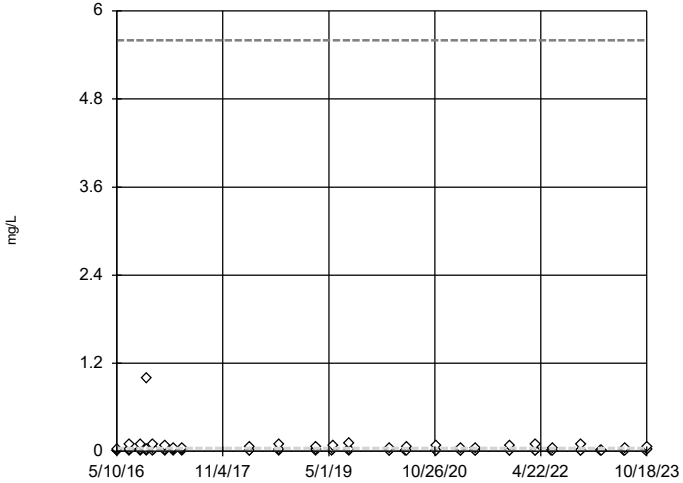
High cutoff = 1, low cutoff = 1.0e-7, based on IQR multiplier of 3.

Constituent: Lead, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Sanitas™ v.10.0.15 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 74

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

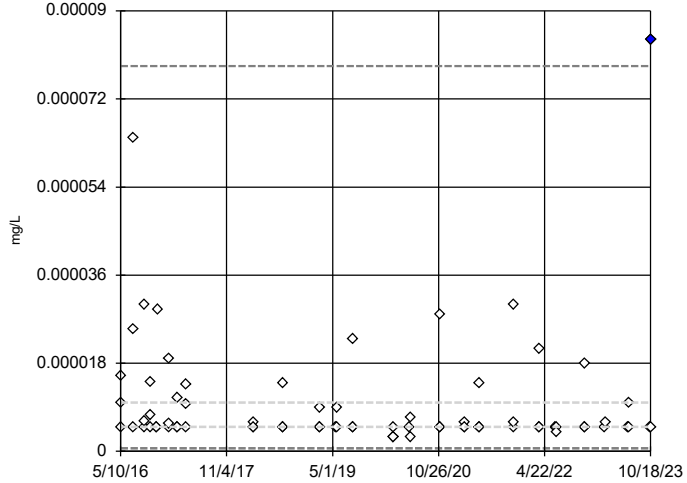
High cutoff = 5.599, low cutoff = 0.00007568, based on IQR multiplier of 3.

Constituent: Lithium, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Sanitas™ v.10.0.15 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 74

Outlier is drawn as solid. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

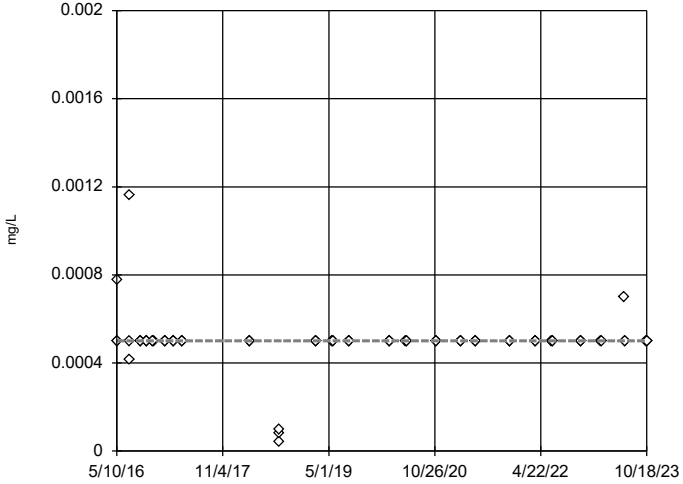
High cutoff = 0.00007873, low cutoff = 6.3e-7, based on IQR multiplier of 3.

Constituent: Mercury, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Sanitas™ v.10.0.15 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 74

No outliers found. Tukey's method selected by user.

Ladder of Powers transformations did not improve normality; analysis run on raw data.

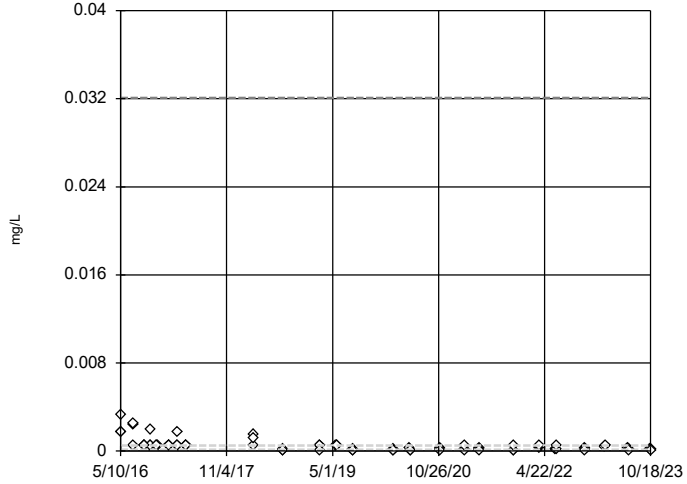
The results were invalidated, because the lower and upper quartiles are equal.

Constituent: Molybdenum, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Sanitas™ v.10.0.15 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 74

No outliers found. Tukey's method selected by user.

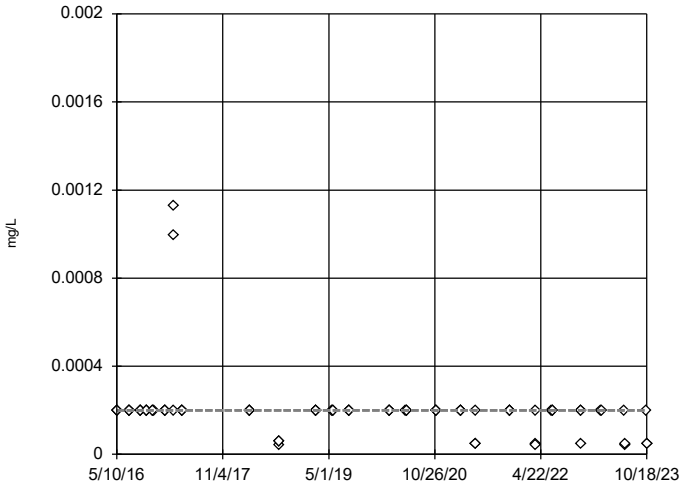
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.03208, low cutoff = 0.000001947, based on IQR multiplier of 3.

Constituent: Selenium, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 74

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

The results were invalidated, because the lower and upper quartiles are equal.

Constituent: Thallium, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test

Pirkey WBAP Data: Pirkey WBAP

FIGURE D

Intrawell PLs

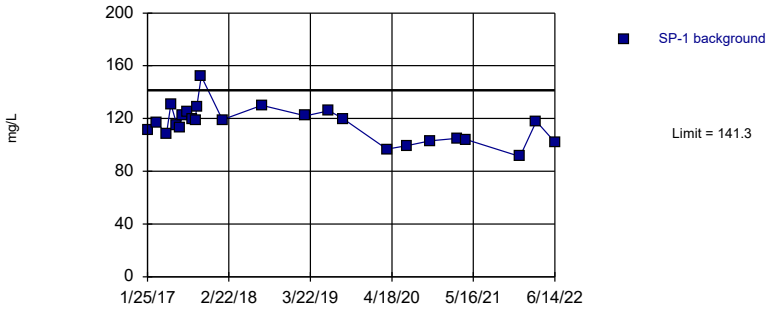
Intrawell Pediction Limits - All Results

Northeastern BAP Data: Northeastern BAP Printed 1/11/2024, 12:04 PM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Calcium (mg/L)	SP-1	141.3	n/a	n/a	1 future	n/a	25	115.9	13.21	0	None	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	SP-10	227	n/a	n/a	1 future	n/a	21	n/a	n/a	0	n/a	n/a	0.003999	NP Intra (normality) 1 of 2
Calcium (mg/L)	SP-11	155.9	n/a	n/a	1 future	n/a	12	78	34.89	0	None	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	SP-2	166.8	n/a	n/a	1 future	n/a	24	102.5	33.2	0	None	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	SP-4	182	n/a	n/a	1 future	n/a	11	n/a	n/a	0	n/a	n/a	0.01276	NP Intra (normality) 1 of 2
Calcium (mg/L)	SP-5R	131	n/a	n/a	1 future	n/a	24	n/a	n/a	0	n/a	n/a	0.003124	NP Intra (normality) 1 of 2

Prediction Limit

Intrawell Parametric, SP-1



Background Data Summary: Mean=115.9, Std. Dev.=13.21, n=25. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9663, critical = 0.888. Kappa = 1.924 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium Analysis Run 1/11/2024 12:01 PM View: Intrawell
Northeastern BAP Data: Northeastern BAP

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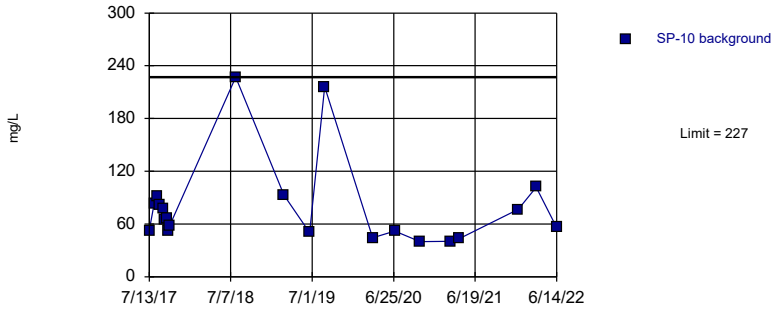
Prediction Limit

Intrawell Non-parametric, SP-10



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 21 background values. Well-constituent pair annual alpha = 0.007982. Individual comparison alpha = 0.003999 (1 of 2). Assumes 1 future value.

Constituent: Calcium Analysis Run 1/11/2024 12:01 PM View: Intrawell
Northeastern BAP Data: Northeastern BAP

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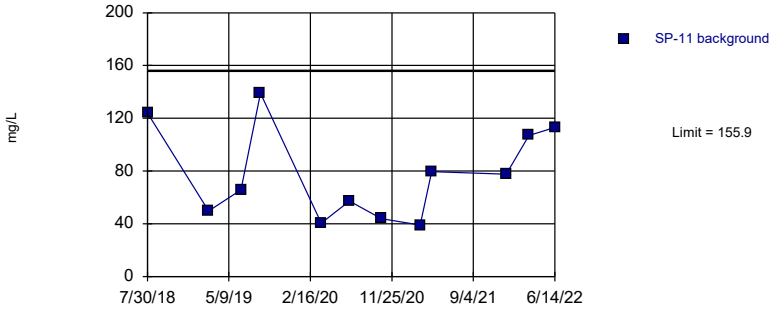
Prediction Limit

Intrawell Parametric, SP-11



Background Data Summary: Mean=78, Std. Dev.=34.89, n=12. Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.9081, critical = 0.859. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium Analysis Run 1/11/2024 12:01 PM View: Intrawell
Northeastern BAP Data: Northeastern BAP

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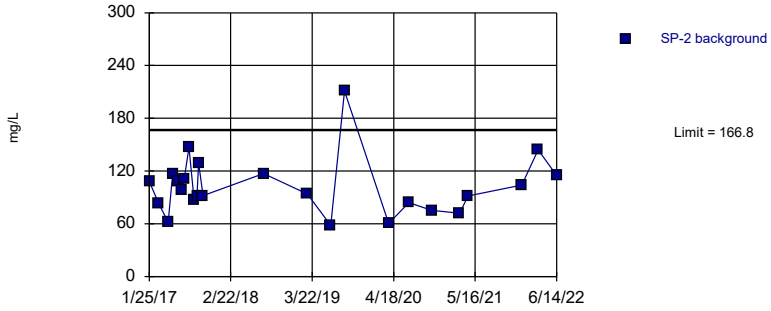
Prediction Limit

Intrawell Parametric, SP-2

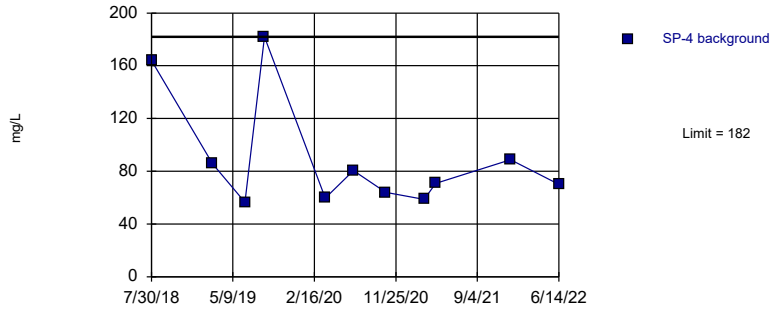


Background Data Summary: Mean=102.5, Std. Dev.=33.2, n=24. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8901, critical = 0.884. Kappa = 1.937 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium Analysis Run 1/11/2024 12:01 PM View: Intrawell
Northeastern BAP Data: Northeastern BAP

Prediction Limit

Intrawell Non-parametric, SP-4 (bg)



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.05 alpha level. Limit is highest of 11 background values. Well-constituent pair annual alpha = 0.02537. Individual comparison alpha = 0.01276 (1 of 2). Assumes 1 future value.

Constituent: Calcium Analysis Run 1/11/2024 12:01 PM View: Intrawell
Northeastern BAP Data: Northeastern BAP

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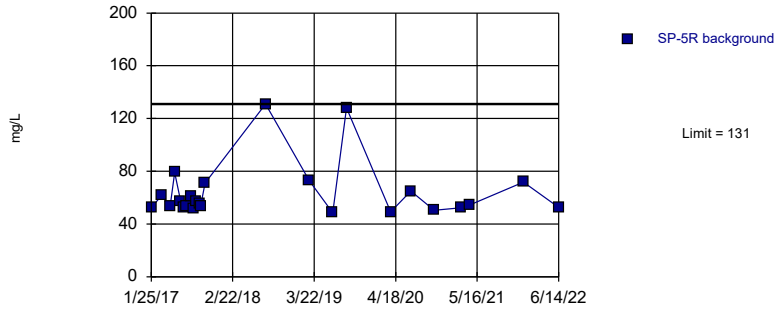
Prediction Limit

Intrawell Non-parametric, SP-5R (bg)



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 24 background values. Well-constituent pair annual alpha = 0.006238. Individual comparison alpha = 0.003124 (1 of 2). Assumes 1 future value.

Constituent: Calcium Analysis Run 1/11/2024 12:01 PM View: Intrawell
Northeastern BAP Data: Northeastern BAP

FIGURE E
Upgradient Trend Tests

Trend Tests - Upgradient Wells - Significant Results

Northeastern BAP Data: Northeastern BAP Printed 1/10/2024, 10:55 AM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Alpha	Method
Boron (mg/L)	**SP-4 (bg)**	**-0.01357**	**-180**	**-124**	**Yes**	**27**	**0**	**n/a**	**0.01**	**NP**
Boron (mg/L)	**SP-5R (bg)**	**-0.00878**	**-138**	**-124**	**Yes**	**27**	**0**	**n/a**	**0.01**	**NP**
Chloride (mg/L)	**SP-5R (bg)**	**34.59**	**135**	**105**	**Yes**	**24**	**0**	**n/a**	**0.01**	**NP**
Sulfate (mg/L)	**SP-4 (bg)**	**4.952**	**54**	**43**	**Yes**	**13**	**0**	**n/a**	**0.01**	**NP**
Total Dissolved Solids [TDS] (mg/L)	**SP-5R (bg)**	**37.61**	**115**	**111**	**Yes**	**25**	**0**	**n/a**	**0.01**	**NP**

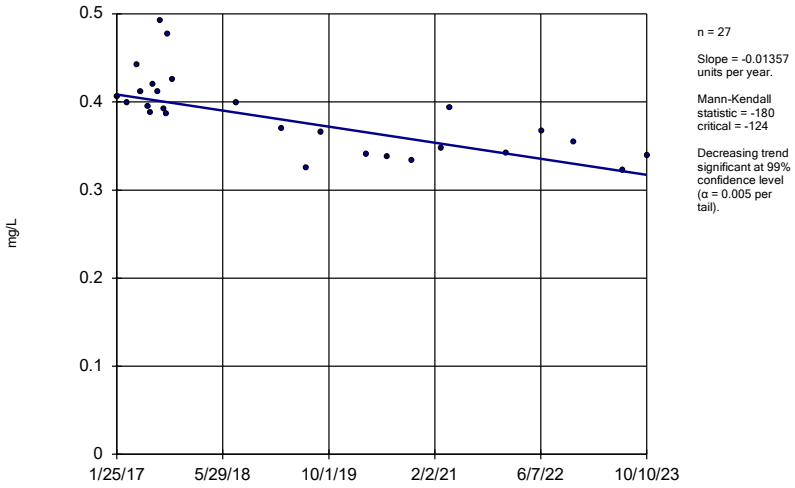
Trend Tests - Upgradient Wells - All Results

Northeastern BAP Data: Northeastern BAP Printed 1/10/2024, 10:55 AM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Alpha	Method
Boron (mg/L)	**SP-4 (bg)**	**-0.01357**	**-180**	**-124**	**Yes**	**27**	**0**	**n/a**	**0.01**	**NP**
Boron (mg/L)	**SP-5R (bg)**	**-0.00878**	**-138**	**-124**	**Yes**	**27**	**0**	**n/a**	**0.01**	**NP**
Chloride (mg/L)	SP-4 (bg)	0	0	111	No	25	0	n/a	0.01	NP
Chloride (mg/L)	**SP-5R (bg)**	**34.59**	**135**	**105**	**Yes**	**24**	**0**	**n/a**	**0.01**	**NP**
Fluoride (mg/L)	SP-4 (bg)	0.005715	10	131	No	28	3.571	n/a	0.01	NP
Fluoride (mg/L)	SP-5R (bg)	0.007758	26	131	No	28	0	n/a	0.01	NP
Sulfate (mg/L)	**SP-4 (bg)**	**4.952**	**54**	**43**	**Yes**	**13**	**0**	**n/a**	**0.01**	**NP**
Sulfate (mg/L)	SP-5R (bg)	0.2705	6	43	No	13	0	n/a	0.01	NP
Total Dissolved Solids [TDS] (mg/L)	SP-4 (bg)	2.056	27	118	No	26	0	n/a	0.01	NP
Total Dissolved Solids [TDS] (mg/L)	**SP-5R (bg)**	**37.61**	**115**	**111**	**Yes**	**25**	**0**	**n/a**	**0.01**	**NP**

Sen's Slope Estimator

SP-4 (bg)



n = 27

Slope = -0.01357 units per year.

Mann-Kendall statistic = -180
critical = -124

Decreasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Boron Analysis Run 1/10/2024 10:55 AM View: Trend Tests
Northeastern BAP Data: Northeastern BAP

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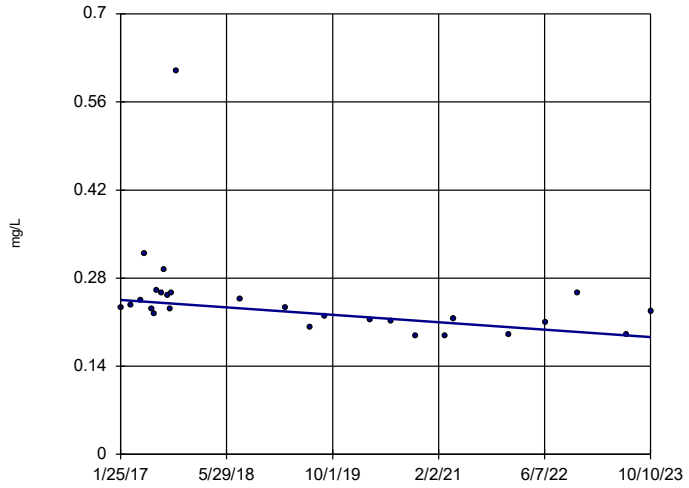
Sen's Slope Estimator

SP-5R (bg)



n = 27

Slope = -0.00878 units per year.

Mann-Kendall statistic = -138
critical = -124

Decreasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Boron Analysis Run 1/10/2024 10:55 AM View: Trend Tests
Northeastern BAP Data: Northeastern BAP

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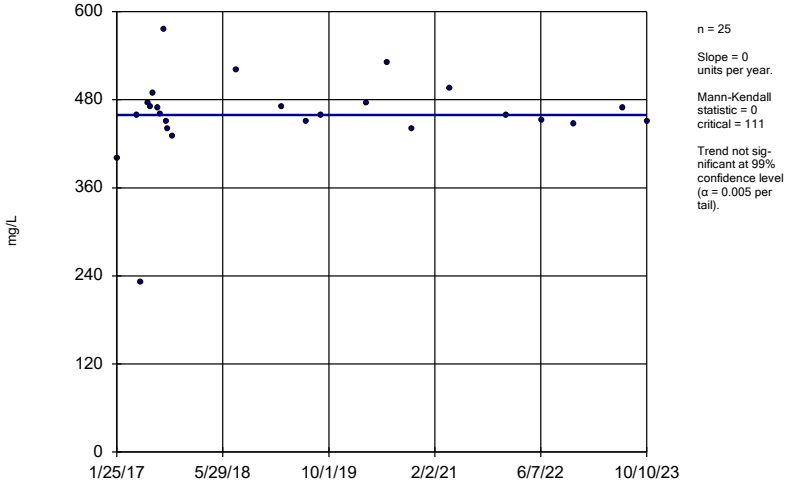
Sen's Slope Estimator

SP-4 (bg)



n = 25

Slope = 0 units per year.

Mann-Kendall statistic = 0
critical = 111

Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Chloride Analysis Run 1/10/2024 10:55 AM View: Trend Tests
Northeastern BAP Data: Northeastern BAP

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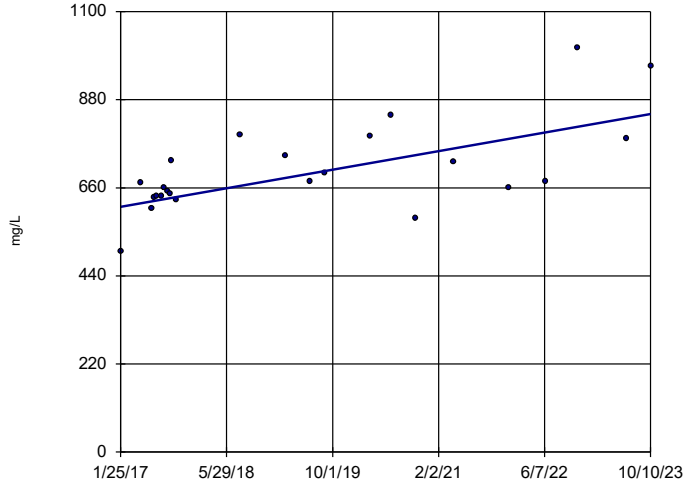
Sen's Slope Estimator

SP-5R (bg)



n = 24

Slope = 34.59 units per year.

Mann-Kendall statistic = 135
critical = 105

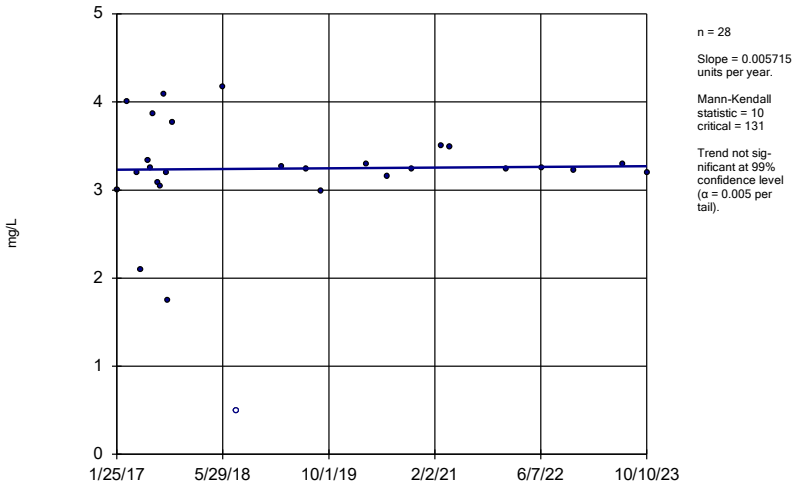
Increasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Chloride Analysis Run 1/10/2024 10:55 AM View: Trend Tests
Northeastern BAP Data: Northeastern BAP

Hollow symbols indicate censored values.

Sen's Slope Estimator

SP-4 (bg)



n = 28

Slope = 0.005715 units per year.

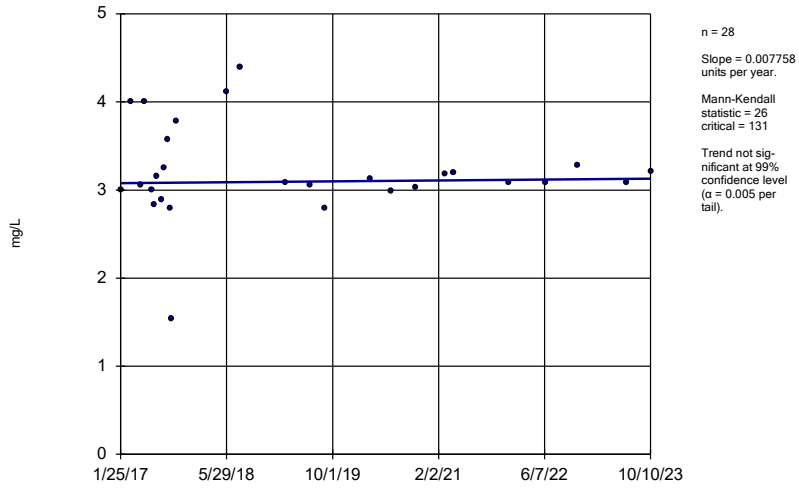
Mann-Kendall statistic = 10
critical = 131

Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Fluoride Analysis Run 1/10/2024 10:55 AM View: Trend Tests
Northeastern BAP Data: Northeastern BAP

Sen's Slope Estimator

SP-5R (bg)



n = 28

Slope = 0.007758 units per year.

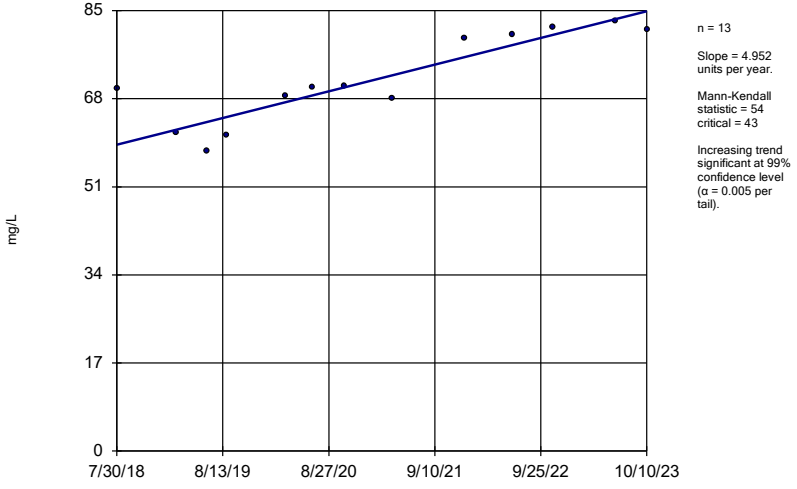
Mann-Kendall statistic = 26
critical = 131

Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Fluoride Analysis Run 1/10/2024 10:55 AM View: Trend Tests
Northeastern BAP Data: Northeastern BAP

Sen's Slope Estimator

SP-4 (bg)



n = 13

Slope = 4.952 units per year.

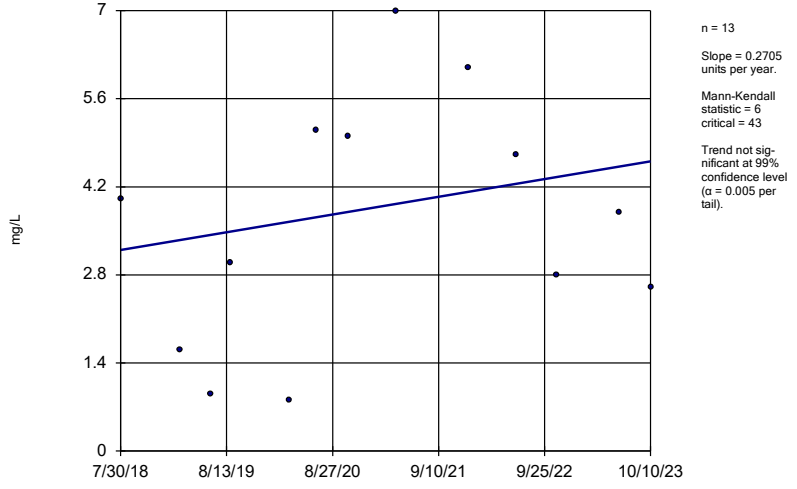
Mann-Kendall statistic = 54
critical = 43

Increasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Sulfate Analysis Run 1/10/2024 10:55 AM View: Trend Tests
Northeastern BAP Data: Northeastern BAP

Sen's Slope Estimator

SP-5R (bg)



n = 13

Slope = 0.2705 units per year.

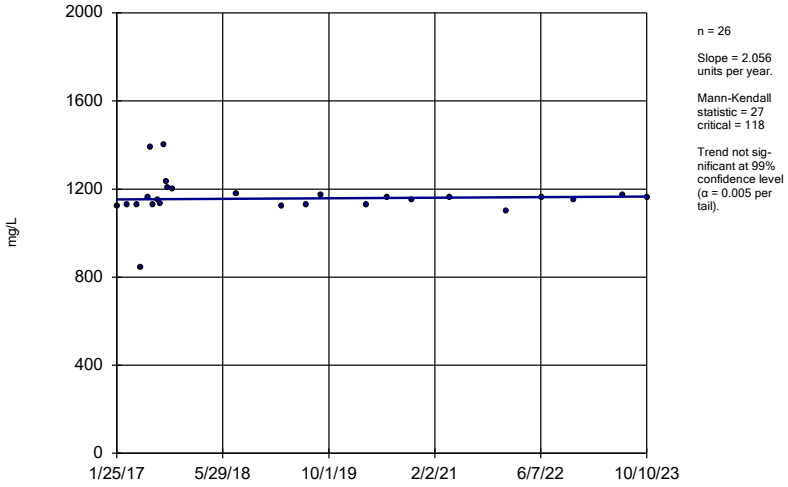
Mann-Kendall statistic = 6
critical = 43

Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Sulfate Analysis Run 1/10/2024 10:55 AM View: Trend Tests
Northeastern BAP Data: Northeastern BAP

Sen's Slope Estimator

SP-4 (bg)



n = 26

Slope = 2.056 units per year.

Mann-Kendall statistic = 27
critical = 118

Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Total Dissolved Solids [TDS] Analysis Run 1/10/2024 10:55 AM View: Trend Tests
Northeastern BAP Data: Northeastern BAP

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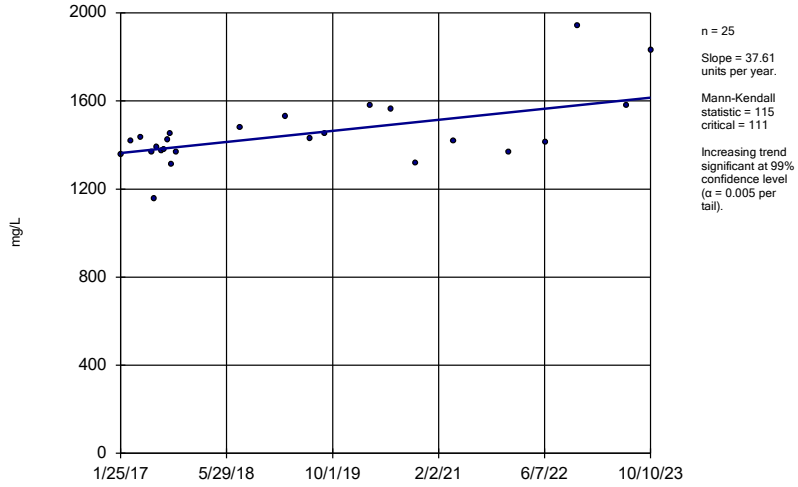
Sen's Slope Estimator

SP-5R (bg)



n = 25

Slope = 37.61 units per year.

Mann-Kendall statistic = 115
critical = 111

Increasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Total Dissolved Solids [TDS] Analysis Run 1/10/2024 10:55 AM View: Trend Tests
Northeastern BAP Data: Northeastern BAP

FIGURE F

Interwell PLs

Interwell Pediction Limits - All Results

Northeastern BAP Data: Northeastern BAP Printed 1/10/2024, 10:58 AM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Boron (mg/L)	n/a	0.4957	n/a	n/a	4 future	n/a	54	0.5554	0.08286	0	None	sqrt(x)	0.00188	Param Inter 1 of 2
Chloride (mg/L)	n/a	873.8	n/a	n/a	4 future	n/a	49	23.88	3.148	0	None	sqrt(x)	0.00188	Param Inter 1 of 2
Fluoride (mg/L)	n/a	4.39	n/a	n/a	4 future	n/a	56	n/a	n/a	1.786	n/a	n/a	0.0006126	NP Inter (normality) 1 of 2
pH, field (SU)	n/a	9.05	6.96	n/a	4 future	n/a	52	n/a	n/a	0	n/a	n/a	0.001402	NP Inter (normality) 1 of 2
Sulfate (mg/L)	n/a	83	n/a	n/a	4 future	n/a	26	n/a	n/a	0	n/a	n/a	0.00258	NP Inter (normality) 1 of 2
Total Dissolved Solids [TDS] (mg/L)	n/a	1940	n/a	n/a	4 future	n/a	51	n/a	n/a	0	n/a	n/a	0.0007231	NP Inter (normality) 1 of 2

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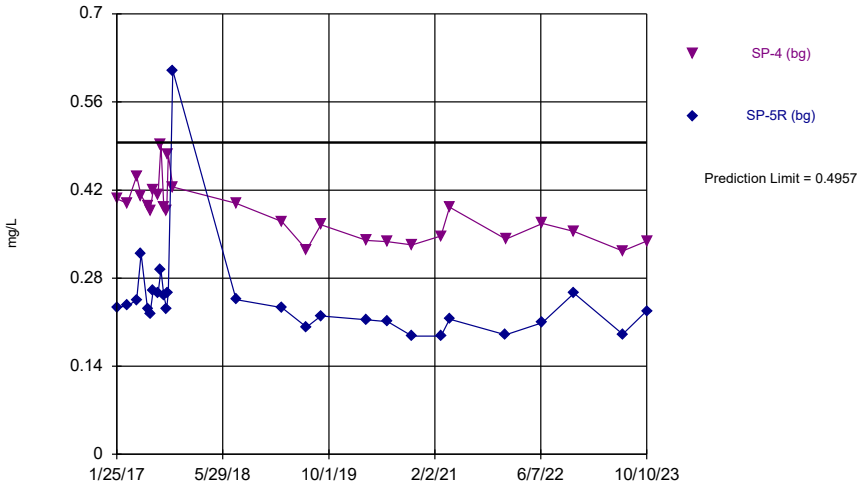
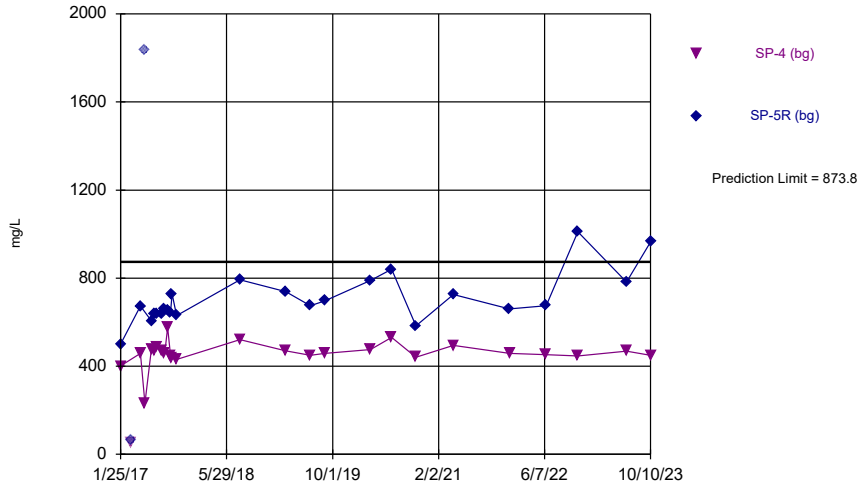
Time Series



Constituent: Boron Analysis Run 1/10/2024 11:57 AM View: Interwell
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

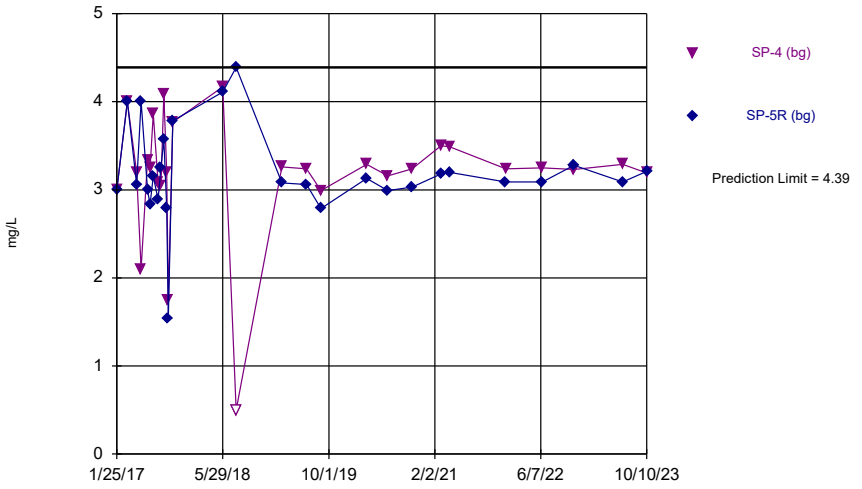
Time Series



Constituent: Chloride Analysis Run 1/10/2024 11:57 AM View: Interwell
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG
Hollow symbols indicate censored values.

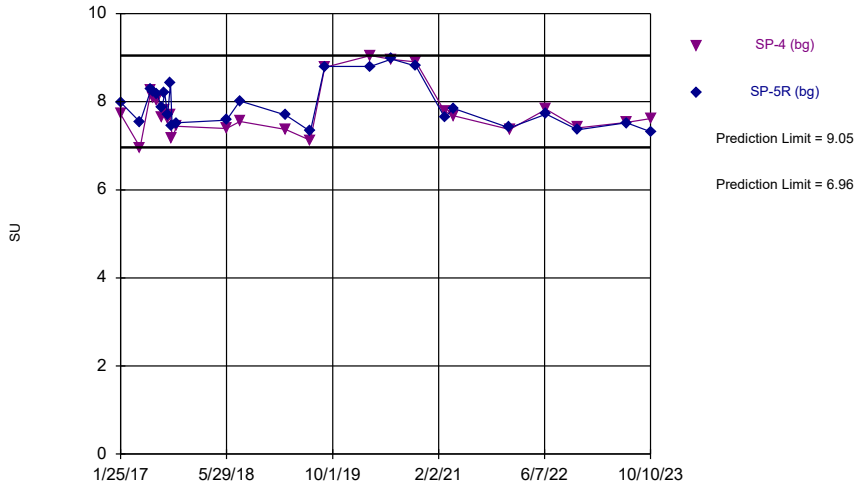
Time Series



Constituent: Fluoride Analysis Run 1/10/2024 11:57 AM View: Interwell
Northeastern BAP Data: Northeastern BAP

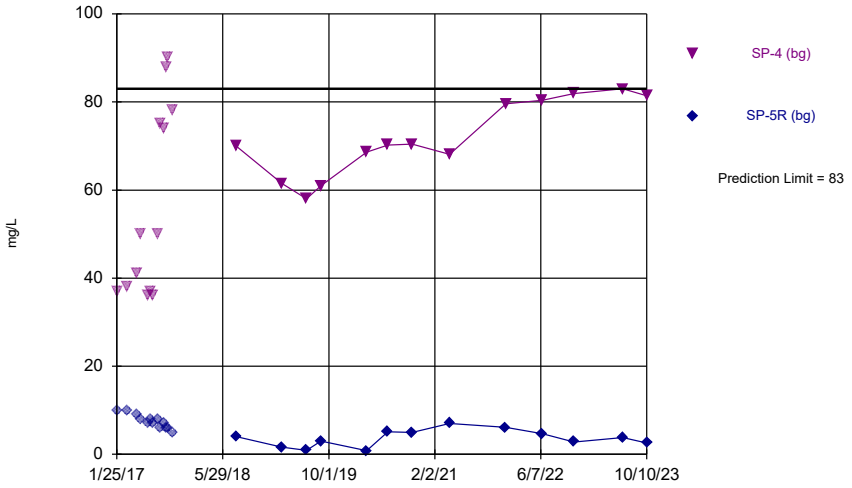
Sanitas™ v.10.0.15 Software licensed to . UG

Time Series



Constituent: pH, field Analysis Run 1/10/2024 11:58 AM View: Interwell
Northeastern BAP Data: Northeastern BAP

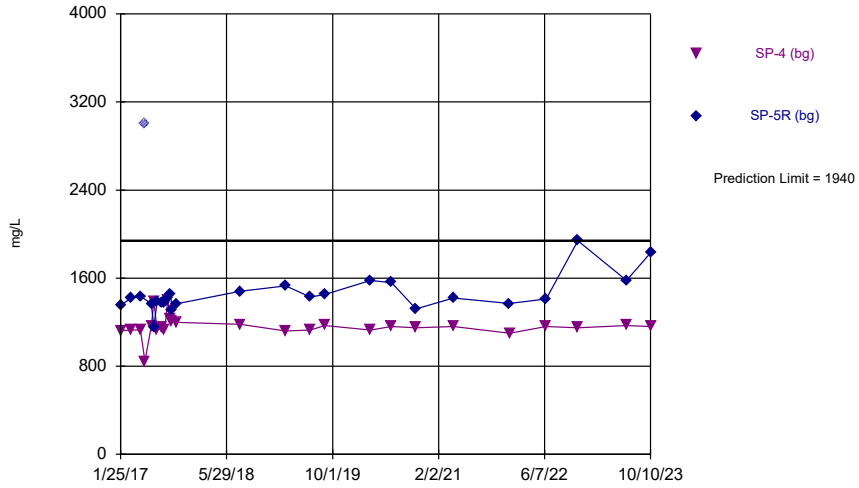
Time Series



Constituent: Sulfate Analysis Run 1/10/2024 12:02 PM View: Interwell
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

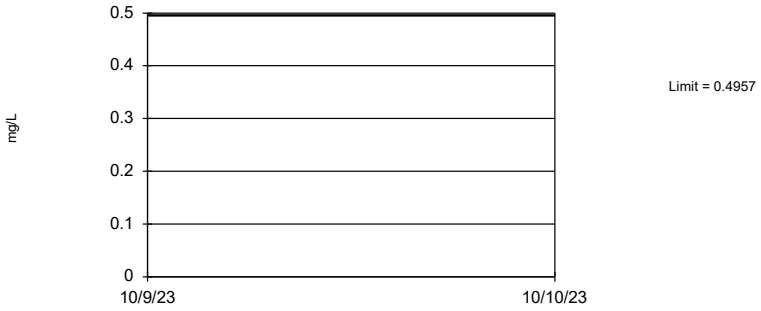
Time Series



Constituent: Total Dissolved Solids [TDS] Analysis Run 1/10/2024 12:02 PM View: Interwell
Northeastern BAP Data: Northeastern BAP

Prediction Limit

Interwell Parametric



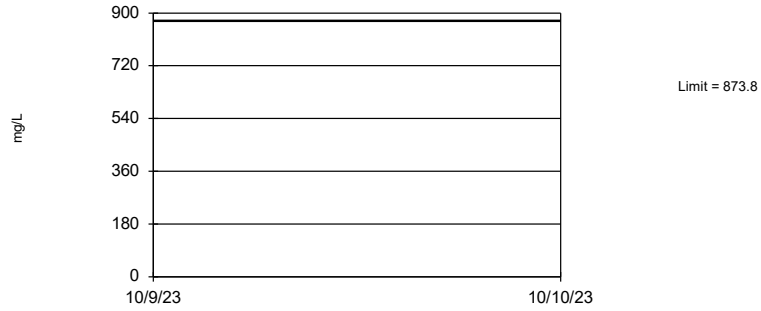
Background Data Summary (based on square root transformation): Mean=0.5554, Std. Dev.=0.08286, n=54. Normality test: Shapiro Francia @alpha = 0.01, calculated = 0.949, critical = 0.939. Kappa = 1.794 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.00188. Assumes 4 future values.

Constituent: Boron Analysis Run 1/10/2024 10:56 AM View: Interwell
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Prediction Limit

Interwell Parametric



Background Data Summary (based on square root transformation): Mean=23.88, Std. Dev.=3.148, n=49. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9416, critical = 0.929. Kappa = 1.805 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.00188. Assumes 4 future values.

Constituent: Chloride Analysis Run 1/10/2024 10:56 AM View: Interwell
Northeastern BAP Data: Northeastern BAP

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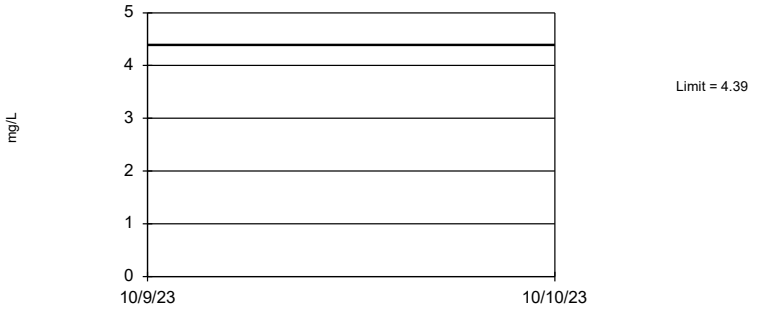
Prediction Limit

Interwell Non-parametric



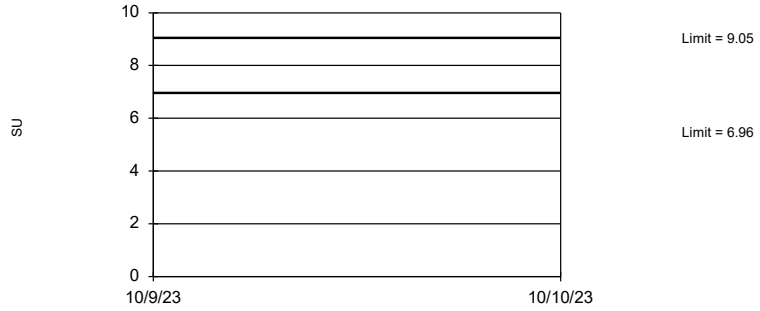
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 56 background values. 1.786% NDs. Annual per-constituent alpha = 0.004891. Individual comparison alpha = 0.0006126 (1 of 2). Assumes 4 future values.

Constituent: Fluoride Analysis Run 1/10/2024 10:56 AM View: Interwell
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Prediction Limit

Interwell Non-parametric

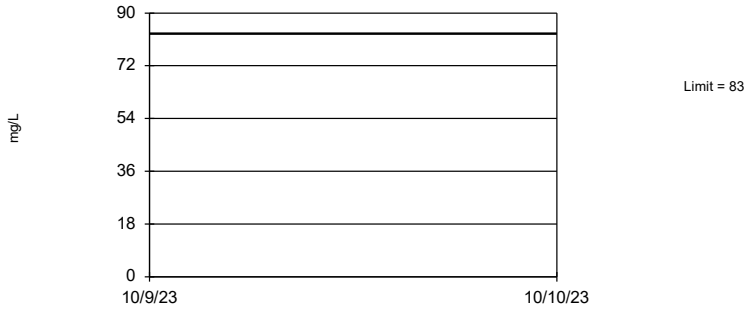


Non-parametric test used in lieu of parametric prediction limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limits are highest and lowest of 52 background values. Annual per-constituent alpha = 0.01119. Individual comparison alpha = 0.001402 (1 of 2). Assumes 4 future values.

Constituent: pH, field Analysis Run 1/10/2024 10:56 AM View: Interwell
Northeastern BAP Data: Northeastern BAP

Prediction Limit

Interwell Non-parametric



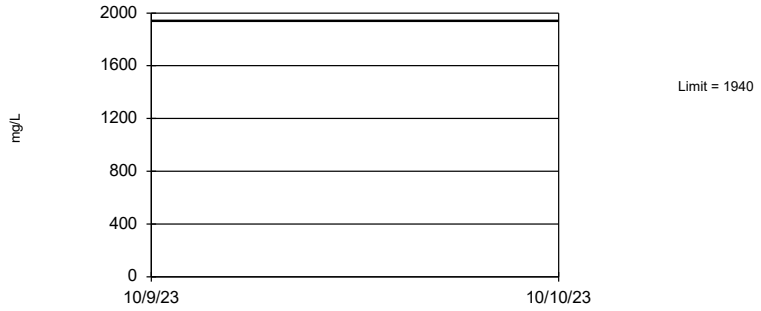
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 26 background values. Annual per-constituent alpha = 0.02045. Individual comparison alpha = 0.00258 (1 of 2). Assumes 4 future values.

Constituent: Sulfate Analysis Run 1/10/2024 10:56 AM View: Interwell
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Prediction Limit

Interwell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 51 background values. Annual per-constituent alpha = 0.00577. Individual comparison alpha = 0.0007231 (1 of 2). Assumes 4 future values.

Constituent: Total Dissolved Solids [TDS] Analysis Run 1/10/2024 10:56 AM View: Interwell
Northeastern BAP Data: Northeastern BAP

FIGURE G

UTLs

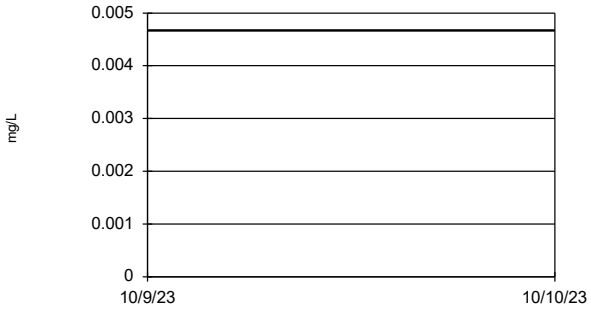
Upper Tolerance Limits Summary Table

Northeastern BAP Data: Northeastern BAP Printed 1/10/2024, 12:19 PM

Constituent	Upper Lim.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Antimony (mg/L)	0.004669	54	-8.028	1.303	31.48	Kaplan-Meier	ln(x)	0.05	Inter
Arsenic (mg/L)	0.0529	53	0.2046	0.08342	5.66	None	x^(1/3)	0.05	Inter
Barium (mg/L)	2.77	42	n/a	n/a	0	n/a	n/a	0.116	NP Inter(normality)
Beryllium (mg/L)	0.00212	53	n/a	n/a	18.87	n/a	n/a	0.06597	NP Inter(normality)
Cadmium (mg/L)	0.0002157	30	-10.33	0.8506	20	Kaplan-Meier	ln(x)	0.05	Inter
Chromium (mg/L)	0.003731	42	-7.265	0.7923	11.9	None	ln(x)	0.05	Inter
Cobalt (mg/L)	0.01786	53	n/a	n/a	9.434	n/a	n/a	0.06597	NP Inter(normality)
Combined Radium 226 + 228 (pCi/L)	19.39	53	2.82	0.773	0	None	sqrt(x)	0.05	Inter
Fluoride (mg/L)	4.39	56	n/a	n/a	1.786	n/a	n/a	0.05656	NP Inter(normality)
Lead (mg/L)	0.008682	53	-7.11	1.154	24.53	Kaplan-Meier	ln(x)	0.05	Inter
Lithium (mg/L)	0.163	42	n/a	n/a	0	n/a	n/a	0.116	NP Inter(normality)
Mercury (mg/L)	0.00003	53	n/a	n/a	75.47	n/a	n/a	0.06597	NP Inter(NDs)
Molybdenum (mg/L)	0.01	54	n/a	n/a	31.48	n/a	n/a	0.06267	NP Inter(normality)
Selenium (mg/L)	0.00499	42	n/a	n/a	28.57	n/a	n/a	0.116	NP Inter(normality)
Thallium (mg/L)	0.00162	30	n/a	n/a	76.67	n/a	n/a	0.2146	NP Inter(NDs)

Tolerance Limit

Interwell Parametric

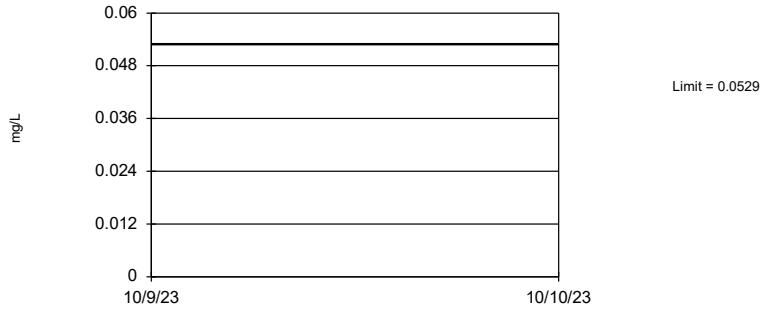


95% coverage. Background Data Summary (based on natural log transformation) (after Kaplan-Meier Adjustment): Mean=-8.028, Std. Dev.=1.303, n=54, 31.48% NDs. Normality test: Shapiro Francia @alpha = 0.01, calculated = 0.9524, critical = 0.939. Report alpha = 0.05.

Constituent: Antimony Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Tolerance Limit

Interwell Parametric

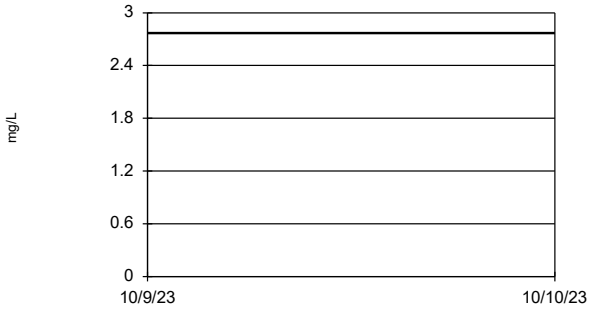


95% coverage. Background Data Summary (based on cube root transformation): Mean=0.2046, Std. Dev.=0.08342, n=53, 5.66% NDs. Normality test: Shapiro Francia @alpha = 0.01, calculated = 0.9413, critical = 0.938. Report alpha = 0.05.

Constituent: Arsenic Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric

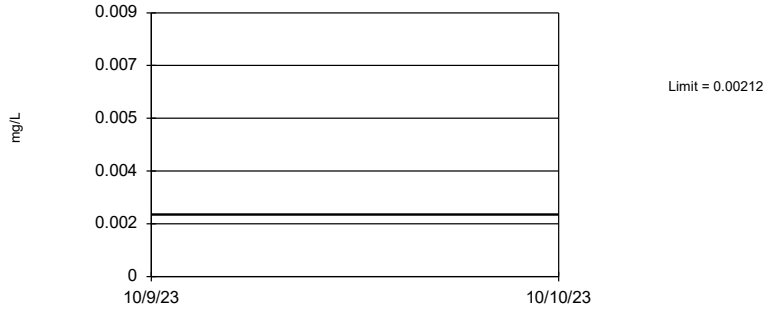


Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 42 background values. 89.65% coverage at alpha=0.01; 93.16% coverage at alpha=0.05; 98.24% coverage at alpha=0.5. Report alpha = 0.116.

Constituent: Barium Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric



Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 53 background values. 18.87% NDs. 91.6% coverage at alpha=0.01; 94.34% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.06597.

Constituent: Beryllium Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Tolerance Limit

Interwell Parametric

95% coverage. Background Data Summary (based on natural log transformation) (after Kaplan-Meier Adjustment): Mean=-10.33, Std. Dev.=0.8506, n=30, 20% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9423, critical = 0.9. Report alpha = 0.05.

Constituent: Cadmium Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

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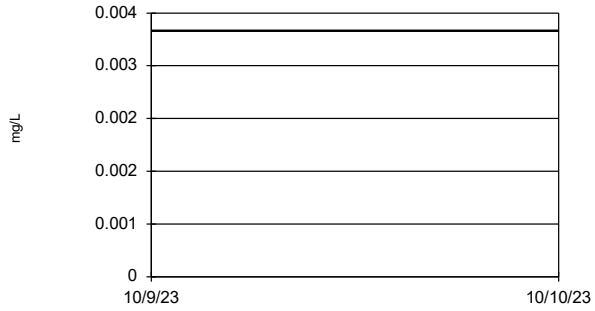
Tolerance Limit

Interwell Parametric



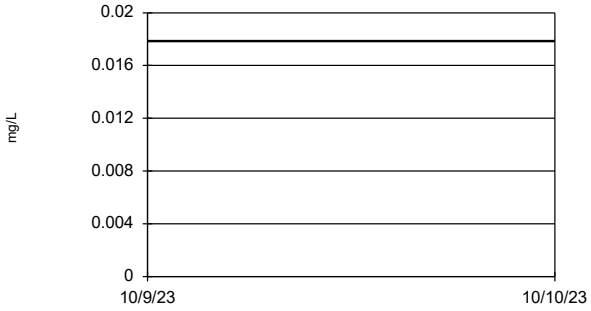
95% coverage. Background Data Summary (based on natural log transformation): Mean=-7.265, Std. Dev.=0.7923, n=42, 11.9% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9556, critical = 0.922. Report alpha = 0.05.

Constituent: Chromium Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Tolerance Limit

Interwell Non-parametric



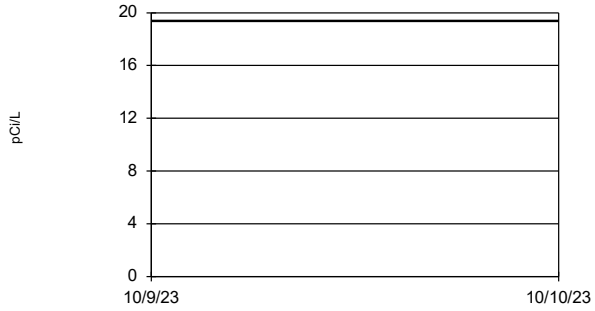
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 53 background values. 9.434% NDs. 91.6% coverage at alpha=0.01; 94.34% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.06597.

Constituent: Cobalt Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Tolerance Limit

Interwell Parametric



95% coverage. Background Data Summary (based on square root transformation): Mean=2.82, Std. Dev.=0.773, n=53. Normality test: Shapiro Francia @alpha = 0.01, calculated = 0.9513, critical = 0.938. Report alpha = 0.05.

Constituent: Combined Radium 226 + 228 Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric

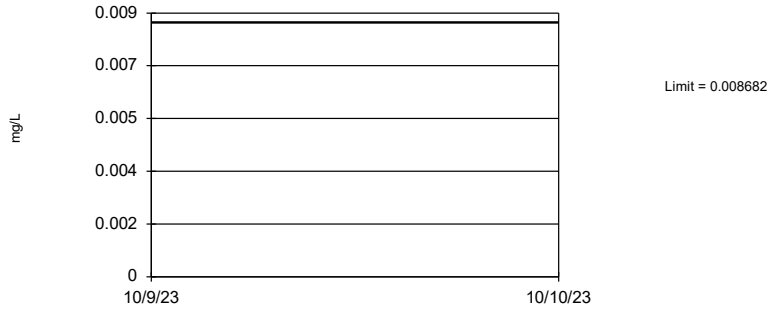
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 56 background values. 1.786% NDs. 91.99% coverage at alpha=0.01; 94.73% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.05656.

Constituent: Fluoride Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Tolerance Limit

Interwell Parametric



95% coverage. Background Data Summary (based on natural log transformation) (after Kaplan-Meier Adjustment): Mean=-7.11, Std. Dev.=1.154, n=53, 24.53% NDs. Normality test: Shapiro Francia @alpha = 0.01, calculated = 0.9393, critical = 0.938. Report alpha = 0.05.

Constituent: Lead Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

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Tolerance Limit

Interwell Non-parametric

Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 42 background values. 89.65% coverage at alpha=0.01; 93.16% coverage at alpha=0.05; 98.24% coverage at alpha=0.5. Report alpha = 0.116.

Constituent: Lithium Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

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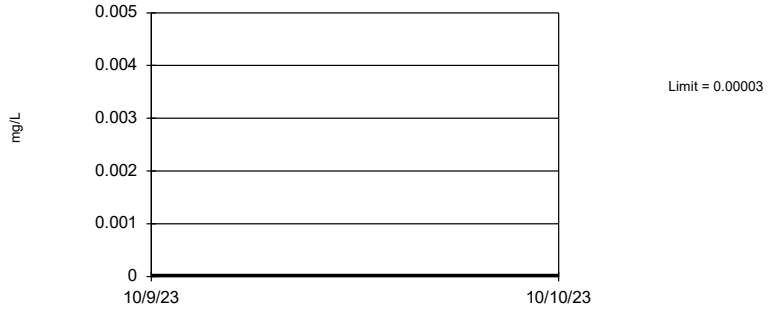
Tolerance Limit

Interwell Non-parametric

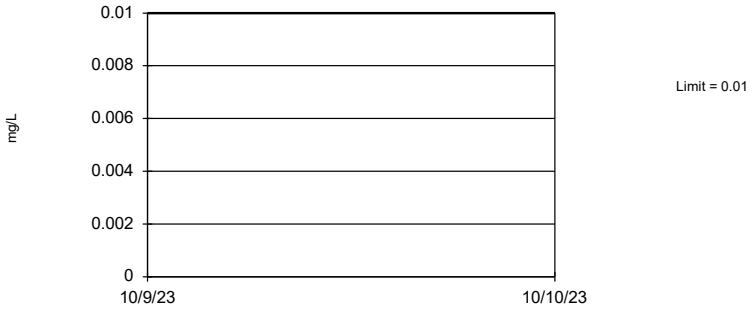


Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 50%. Limit is highest of 53 background values. 75.47% NDs. 91.6% coverage at alpha=0.01; 94.34% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.06597.

Constituent: Mercury Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric



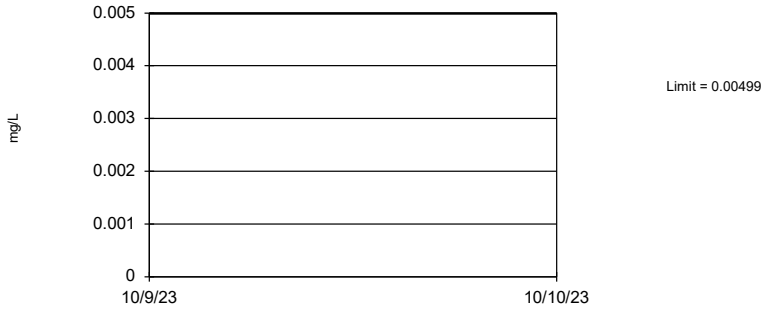
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 54 background values. 31.48% NDs. 91.99% coverage at alpha=0.01; 94.73% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.06267.

Constituent: Molybdenum Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Tolerance Limit

Interwell Non-parametric



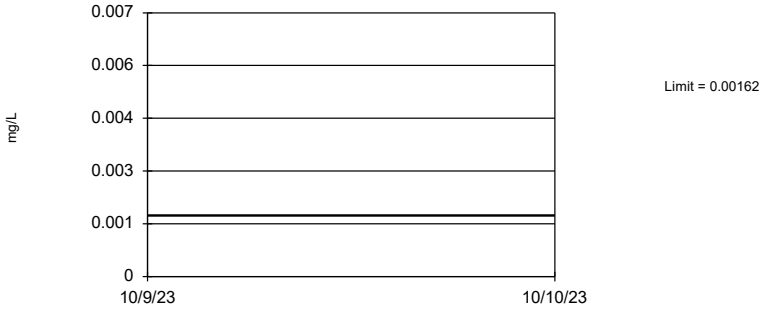
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 42 background values. 28.57% NDs. 89.65% coverage at alpha=0.01; 93.16% coverage at alpha=0.05; 98.24% coverage at alpha=0.5. Report alpha = 0.116.

Constituent: Selenium Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Tolerance Limit

Interwell Non-parametric



Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 50%. Limit is highest of 30 background values. 76.67% NDs. 85.74% coverage at alpha=0.01; 90.43% coverage at alpha=0.05; 97.85% coverage at alpha=0.5. Report alpha = 0.2146.

Constituent: Thallium Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

FIGURE H

GWPS

NORTHEASTERN BAP GWPS				
Constituent Name	**MCL**	**CCR- Rule Specified Level**	**Background Limit**	**GWPS**
Antimony, Total (mg/L)	0.006		0.0047	0.006
Arsenic, Total (mg/L)	0.01		0.053	0.053
Barium, Total (mg/L)	2		2.77	2.77
Beryllium, Total (mg/L)	0.004		0.0021	0.004
Cadmium, Total (mg/L)	0.005		0.00022	0.005
Chromium, Total (mg/L)	0.1		0.037	0.1
Cobalt, Total (mg/L)	n/a	0.006	0.018	0.018
Combined Radium, Total (pCi/L)	5		19.39	19.39
Fluoride, Total (mg/L)	4		4.39	4.39
Lead, Total (mg/L)	n/a	0.015	0.0087	0.015
Lithium, Total (mg/L)	n/a	0.04	0.16	0.16
Mercury, Total (mg/L)	0.002		0.00003	0.002
Molybdenum, Total (mg/L)	n/a	0.1	0.01	0.1
Selenium, Total (mg/L)	0.05		0.005	0.05
Thallium, Total (mg/L)	0.002		0.0016	0.002

**Grey cell indicates Background Limit is higher than MCL*

**GWPS = Groundwater Protection Standard*

**MCL = Maximum Contaminant Level*

**CCR = Coal Combustion Residuals*

FIGURE I

Confidence Intervals

Confidence Intervals - Significant Results

Northeastern BAP Data: Northeastern BAP Printed 1/10/2024, 12:17 PM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Barium (mg/L)	**SP-10**	**6.356**	**4.197**	**2.77**	**Yes**	**16**	**5.277**	**1.659**	**0**	**None**	**No**	**0.01**	**Param.**
Fluoride (mg/L)	**SP-10**	**6.84**	**5.59**	**4.39**	**Yes**	**26**	**5.91**	**2.283**	**11.54**	**None**	**No**	**0.01**	**NP (normality)**
Lithium (mg/L)	**SP-10**	**0.2779**	**0.2378**	**0.16**	**Yes**	**24**	**0.2579**	**0.03932**	**0**	**None**	**No**	**0.01**	**Param.**

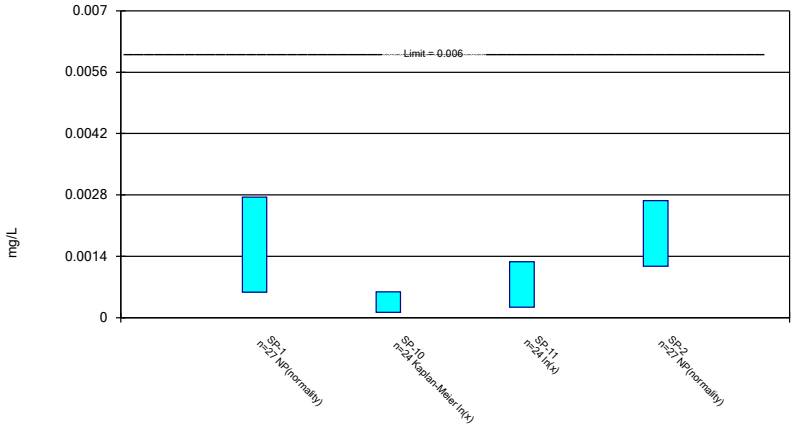
Confidence Intervals - All Results

Northeastern BAP Data: Northeastern BAP Printed 1/10/2024, 12:17 PM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Antimony (mg/L)	SP-1	0.00275	0.00058	0.006	No	27	0.002151	0.002126	25.93	None	No	0.01	NP (normality)
Antimony (mg/L)	SP-10	0.0005862	0.0001217	0.006	No	24	0.00149	0.00192	16.67	Kaplan-Meier	ln(x)	0.01	Param.
Antimony (mg/L)	SP-11	0.001275	0.0002399	0.006	No	24	0.00186	0.002804	12.5	None	ln(x)	0.01	Param.
Antimony (mg/L)	SP-2	0.00267	0.00117	0.006	No	27	0.002508	0.002468	7.407	None	No	0.01	NP (normality)
Arsenic (mg/L)	SP-1	0.005	0.00069	0.053	No	27	0.002287	0.002033	29.63	None	No	0.01	NP (normality)
Arsenic (mg/L)	SP-10	0.004677	0.001184	0.053	No	24	0.003704	0.00434	8.333	None	sqrt(x)	0.01	Param.
Arsenic (mg/L)	SP-11	0.004844	0.002311	0.053	No	24	0.003888	0.002871	4.167	None	sqrt(x)	0.01	Param.
Arsenic (mg/L)	SP-2	0.00251	0.00121	0.053	No	27	0.002458	0.002465	3.704	None	No	0.01	NP (normality)
Barium (mg/L)	SP-1	0.1974	0.1632	2.77	No	27	0.1816	0.03782	0	None	sqrt(x)	0.01	Param.
Barium (mg/L)	**SP-10**	**6.356**	**4.197**	**2.77**	**Yes**	**16**	**5.277**	**1.659**	**0**	**None**	**No**	**0.01**	**Param.**
Barium (mg/L)	SP-11	0.4053	0.1881	2.77	No	16	0.3092	0.1743	0	None	sqrt(x)	0.01	Param.
Barium (mg/L)	SP-2	1.329	0.9879	2.77	No	27	1.208	0.4734	0	None	ln(x)	0.01	Param.
Beryllium (mg/L)	SP-1	0.0002	0.000053	0.004	No	27	0.0002561	0.0003647	18.52	None	No	0.01	NP (normality)
Beryllium (mg/L)	SP-10	0.00008	0.00003	0.004	No	24	0.0007557	0.001143	29.17	None	No	0.01	NP (normality)
Beryllium (mg/L)	SP-11	0.00025	0.000027	0.004	No	24	0.0001486	0.0001327	29.17	None	No	0.01	NP (normality)
Beryllium (mg/L)	SP-2	0.00018	0.00007	0.004	No	27	0.0001571	0.0001535	14.81	None	No	0.01	NP (normality)
Cadmium (mg/L)	SP-1	0.0001	0.00005	0.005	No	16	0.0001183	0.0001206	12.5	None	No	0.01	NP (normality)
Cadmium (mg/L)	SP-10	0.000089	0.00001	0.005	No	16	0.00005725	0.00007341	18.75	None	No	0.01	NP (normality)
Cadmium (mg/L)	SP-11	0.00034	0.00002	0.005	No	24	0.000464	0.0009258	16.67	None	No	0.01	NP (normality)
Cadmium (mg/L)	SP-2	0.0005	0.00006	0.005	No	27	0.000248	0.0002072	37.04	None	No	0.01	NP (normality)
Chromium (mg/L)	SP-1	0.001069	0.0005249	0.1	No	27	0.0009884	0.0006701	22.22	Kaplan-Meier	sqrt(x)	0.01	Param.
Chromium (mg/L)	SP-10	0.0009388	0.0003229	0.1	No	23	0.001027	0.001791	8.696	None	ln(x)	0.01	Param.
Chromium (mg/L)	SP-11	0.00525	0.000379	0.1	No	24	0.005833	0.01052	4.167	None	No	0.01	NP (normality)
Chromium (mg/L)	SP-2	0.001364	0.0005761	0.1	No	27	0.001163	0.00108	11.11	None	x^(1/3)	0.01	Param.
Cobalt (mg/L)	SP-1	0.00116	0.0004813	0.018	No	27	0.001002	0.001103	11.11	None	x^(1/3)	0.01	Param.
Cobalt (mg/L)	SP-10	0.001849	0.0004051	0.018	No	24	0.001478	0.00178	8.333	None	sqrt(x)	0.01	Param.
Cobalt (mg/L)	SP-11	0.004362	0.001305	0.018	No	24	0.003752	0.004424	4.167	None	x^(1/3)	0.01	Param.
Cobalt (mg/L)	SP-2	0.0008877	0.0004265	0.018	No	27	0.0008354	0.0007414	11.11	None	ln(x)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-1	4.435	3.252	19.39	No	26	3.843	1.214	0	None	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-10	16.72	7.758	19.39	No	24	12.24	8.786	0	None	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-11	2.307	1.216	19.39	No	23	1.761	1.043	0	None	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-2	13.79	8.953	19.39	No	24	11.72	5.264	0	None	sqrt(x)	0.01	Param.
Fluoride (mg/L)	SP-1	0.9355	0.6969	4.39	No	27	0.8162	0.2501	7.407	None	No	0.01	Param.
Fluoride (mg/L)	**SP-10**	**6.84**	**5.59**	**4.39**	**Yes**	**26**	**5.91**	**2.283**	**11.54**	**None**	**No**	**0.01**	**NP (normality)**
Fluoride (mg/L)	SP-11	3.145	2.183	4.39	No	26	2.664	0.9872	0	None	No	0.01	Param.
Fluoride (mg/L)	SP-2	3.159	2.692	4.39	No	28	2.883	0.5577	0	None	x^2	0.01	Param.
Lead (mg/L)	SP-1	0.00247	0.000254	0.015	No	27	0.001934	0.00209	29.63	None	No	0.01	NP (normality)
Lead (mg/L)	SP-10	0.0002921	0.00008559	0.015	No	16	0.0002569	0.0003088	12.5	None	ln(x)	0.01	Param.
Lead (mg/L)	SP-11	0.00144	0.0003009	0.015	No	24	0.001852	0.002644	12.5	None	ln(x)	0.01	Param.
Lead (mg/L)	SP-2	0.005	0.000245	0.015	No	27	0.002023	0.002192	33.33	None	No	0.01	NP (normality)
Lithium (mg/L)	SP-1	0.006385	0.004798	0.16	No	26	0.005591	0.001628	0	None	No	0.01	Param.
Lithium (mg/L)	**SP-10**	**0.2779**	**0.2378**	**0.16**	**Yes**	**24**	**0.2579**	**0.03932**	**0**	**None**	**No**	**0.01**	**Param.**
Lithium (mg/L)	SP-11	0.03961	0.02238	0.16	No	16	0.03099	0.01324	0	None	No	0.01	Param.
Lithium (mg/L)	SP-2	0.08005	0.05525	0.16	No	27	0.06765	0.02599	0	None	No	0.01	Param.
Mercury (mg/L)	SP-1	0.000009	0.000005	0.002	No	27	0.000006148	0.000003645	85.19	None	No	0.01	NP (NDs)
Mercury (mg/L)	SP-10	0.000013	0.000005	0.002	No	24	0.000009333	0.000007167	58.33	None	No	0.01	NP (NDs)
Mercury (mg/L)	SP-11	0.000009	0.000005	0.002	No	24	0.00001096	0.0000126	45.83	None	No	0.01	NP (normality)
Mercury (mg/L)	SP-2	0.000005	0.000005	0.002	No	27	0.000005407	0.000001738	85.19	None	No	0.01	NP (NDs)
Molybdenum (mg/L)	SP-1	0.01714	0.0117	0.1	No	27	0.01442	0.005699	0	None	No	0.01	Param.
Molybdenum (mg/L)	SP-10	0.01739	0.002637	0.1	No	23	0.01652	0.02775	4.348	None	x^(1/3)	0.01	Param.
Molybdenum (mg/L)	SP-11	0.04433	0.002	0.1	No	24	0.01864	0.02314	4.167	None	No	0.01	NP (normality)
Molybdenum (mg/L)	SP-2	0.02375	0.01788	0.1	No	16	0.02081	0.004511	0	None	No	0.01	Param.
Selenium (mg/L)	SP-1	0.006934	0.004029	0.05	No	27	0.005798	0.003409	11.11	None	sqrt(x)	0.01	Param.
Selenium (mg/L)	SP-10	0.0007629	0.0001231	0.05	No	24	0.001439	0.002133	41.67	Kaplan-Meier	ln(x)	0.01	Param.
Selenium (mg/L)	SP-11	0.0014	0.0003495	0.05	No	24	0.001675	0.002266	8.333	None	ln(x)	0.01	Param.
Selenium (mg/L)	SP-2	0.004796	0.002357	0.05	No	16	0.003707	0.002116	0	None	sqrt(x)	0.01	Param.
Thallium (mg/L)	SP-1	0.0005	0.00007	0.002	No	16	0.0003556	0.0004853	37.5	None	No	0.01	NP (normality)
Thallium (mg/L)	SP-10	0.0002	0.00004	0.002	No	16	0.00019	0.00004	93.75	None	No	0.01	NP (NDs)
Thallium (mg/L)	SP-11	0.0002	0.00003	0.002	No	16	0.0001894	0.0000425	93.75	None	No	0.01	NP (NDs)
Thallium (mg/L)	SP-2	0.0002	0.00005	0.002	No	16	0.0001381	0.00007378	56.25	None	No	0.01	NP (NDs)

Parametric and Non-Parametric (NP) Confidence Interval

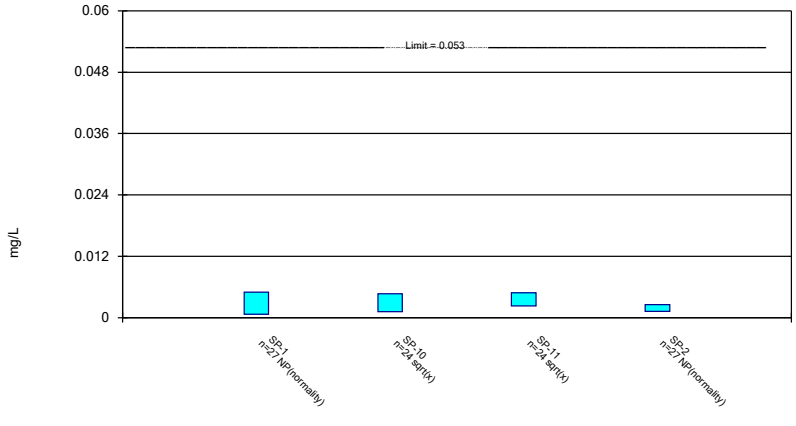
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Antimony Analysis Run 1/10/2024 12:16 PM View: Confidence Intervals
Northeastern BAP Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Arsenic Analysis Run 1/10/2024 12:16 PM View: Confidence Intervals
Northeastern BAP Data: Northeastern BAP

Parametric Confidence Interval

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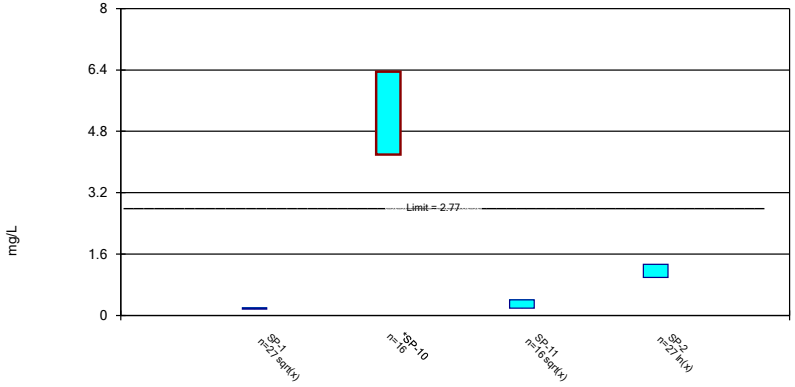
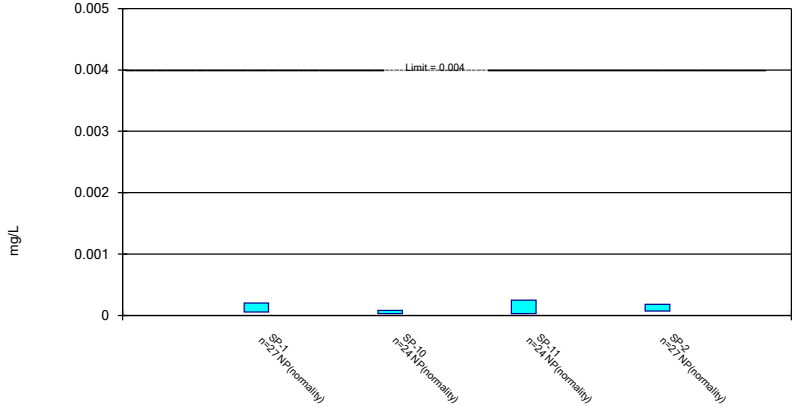


Constituent: Barium Analysis Run 1/10/2024 12:16 PM View: Confidence Intervals
Northeastern BAP Data: Northeastern BAP

Non-Parametric Confidence Interval

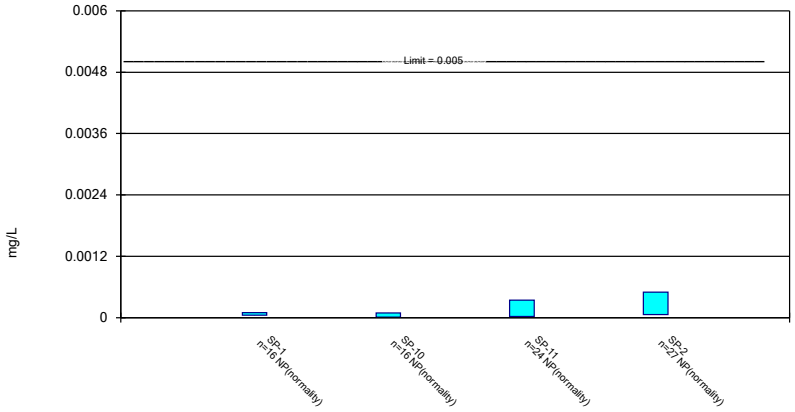
Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Beryllium Analysis Run 1/10/2024 12:16 PM View: Confidence Intervals
Northeastern BAP Data: Northeastern BAP

Non-Parametric Confidence Interval

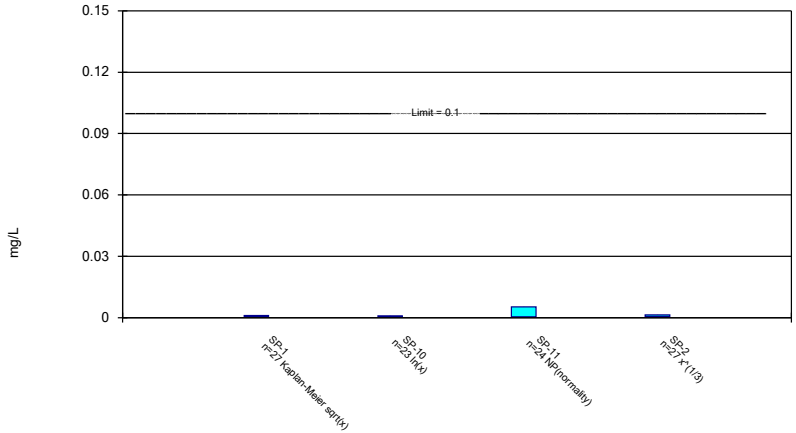
Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Cadmium Analysis Run 1/10/2024 12:16 PM View: Confidence Intervals
Northeastern BAP Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

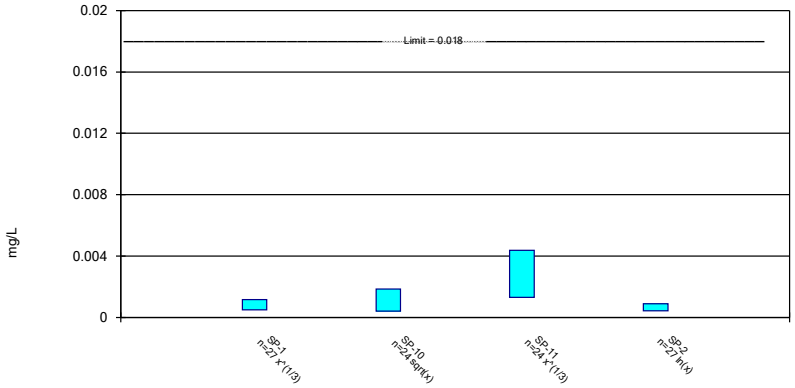
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Chromium Analysis Run 1/10/2024 12:16 PM View: Confidence Intervals
Northeastern BAP Data: Northeastern BAP

Parametric Confidence Interval

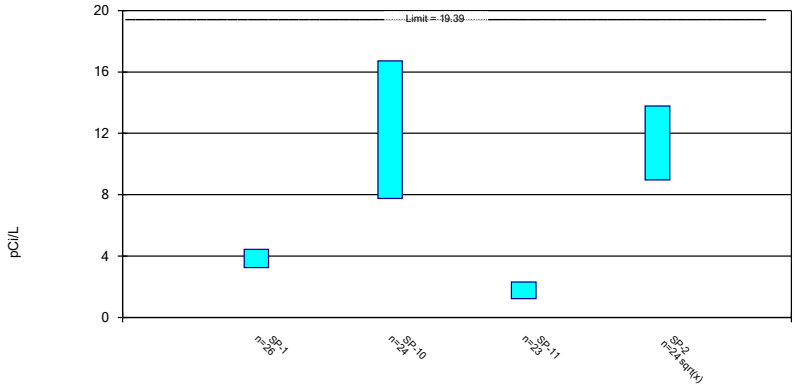
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Cobalt Analysis Run 1/10/2024 12:16 PM View: Confidence Intervals
Northeastern BAP Data: Northeastern BAP

Parametric Confidence Interval

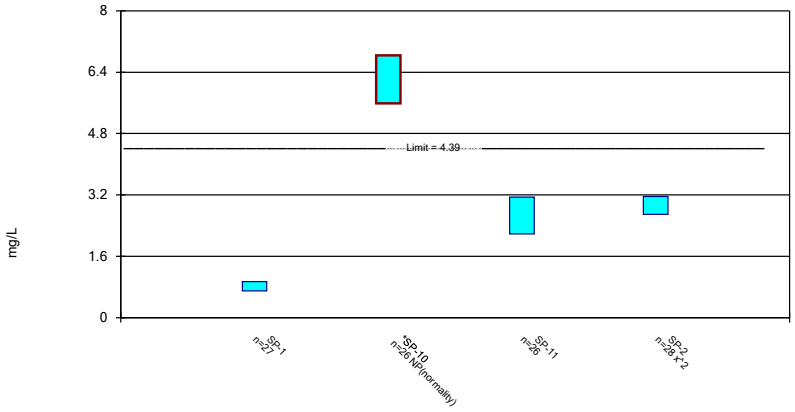
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Combined Radium 226 + 228 Analysis Run 1/10/2024 12:16 PM View: Confidence Intervals
Northeastern BAP Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

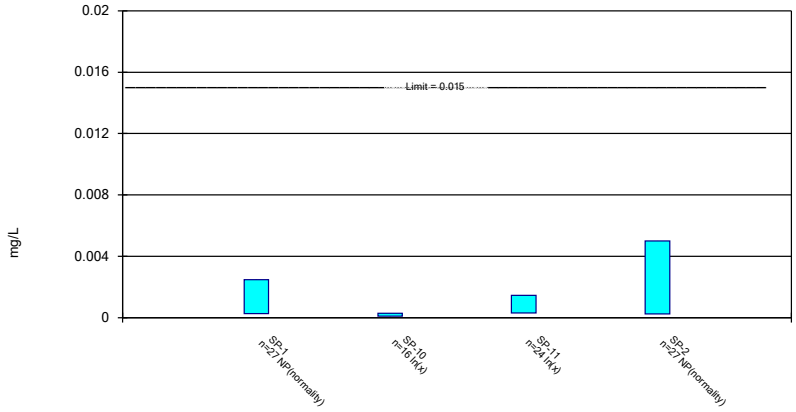
Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Fluoride Analysis Run 1/10/2024 12:16 PM View: Confidence Intervals
Northeastern BAP Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

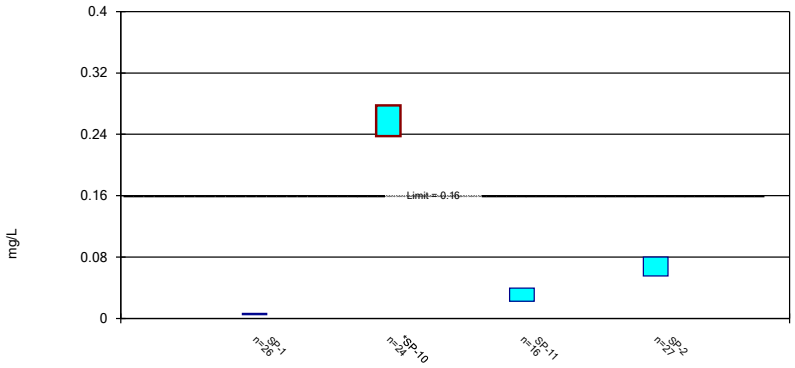
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Lead Analysis Run 1/10/2024 12:16 PM View: Confidence Intervals
Northeastern BAP Data: Northeastern BAP

Parametric Confidence Interval

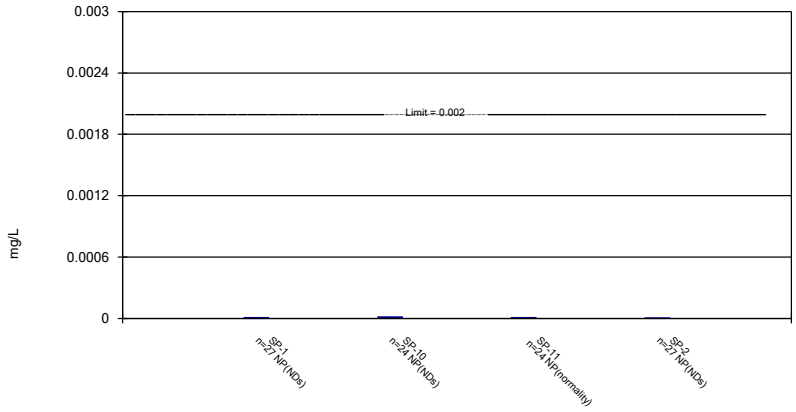
Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Lithium Analysis Run 1/10/2024 12:16 PM View: Confidence Intervals
Northeastern BAP Data: Northeastern BAP

Non-Parametric Confidence Interval

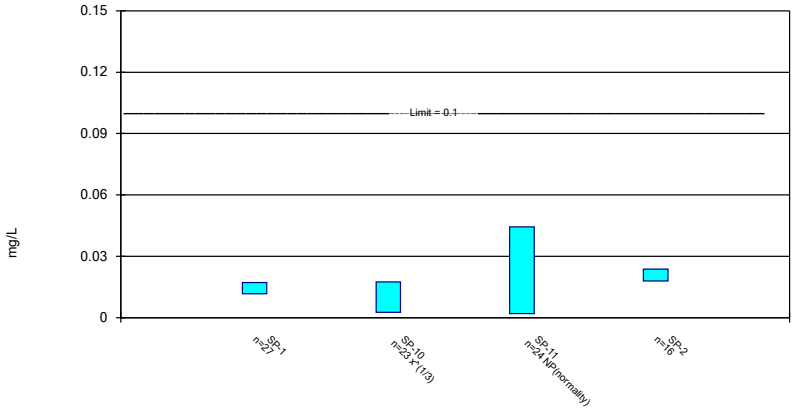
Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Mercury Analysis Run 1/10/2024 12:16 PM View: Confidence Intervals
Northeastern BAP Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

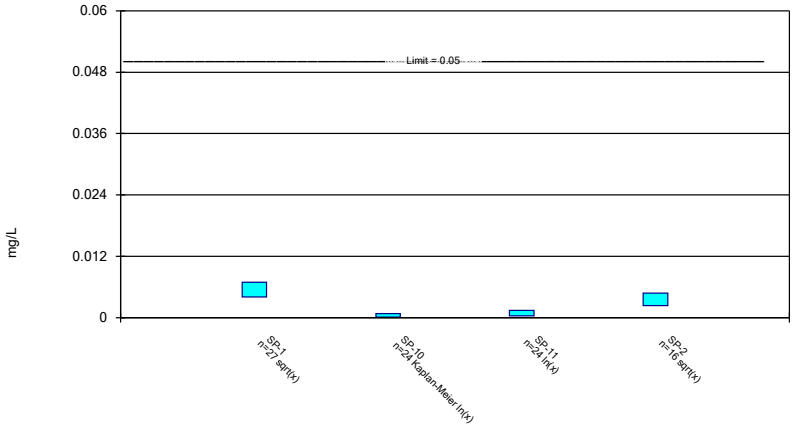
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Molybdenum Analysis Run 1/10/2024 12:16 PM View: Confidence Intervals
Northeastern BAP Data: Northeastern BAP

Parametric Confidence Interval

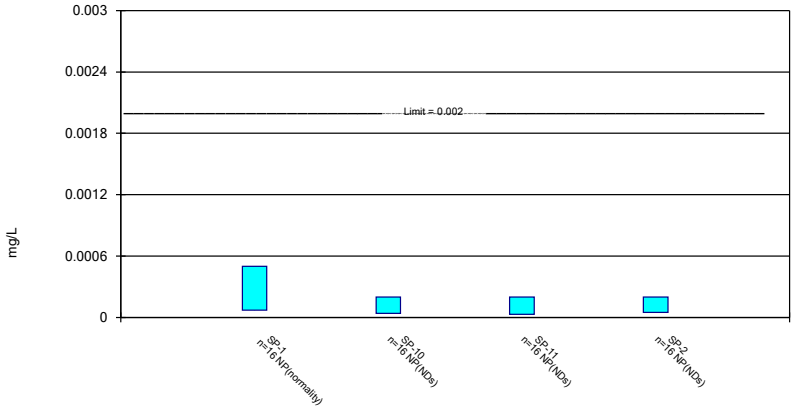
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Selenium Analysis Run 1/10/2024 12:16 PM View: Confidence Intervals
Northeastern BAP Data: Northeastern BAP

Non-Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Thallium Analysis Run 1/10/2024 12:16 PM View: Confidence Intervals
Northeastern BAP Data: Northeastern BAP

FIGURE J

Confidence Intervals – Trend Tests

Trend Tests - Confidence Interval Exceedances - Significant Results

Northeastern BAP Data: Northeastern BAP Printed 1/10/2024, 12:23 PM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Alpha	Method
Barium (mg/L)	**SP-10**	**0.5918**	**49**	**45**	**Yes**	**16**	**0**	**n/a**	**0.05**	**NP**
Barium (mg/L)	**SP-5R (bg)**	**0.08353**	**143**	**96**	**Yes**	**27**	**0**	**n/a**	**0.05**	**NP**
Lithium (mg/L)	**SP-10**	**-0.01416**	**-141**	**-81**	**Yes**	**24**	**0**	**n/a**	**0.05**	**NP**
Lithium (mg/L)	**SP-4 (bg)**	**-0.001794**	**-44**	**-41**	**Yes**	**15**	**0**	**n/a**	**0.05**	**NP**
Lithium (mg/L)	**SP-5R (bg)**	**-0.005489**	**-162**	**-96**	**Yes**	**27**	**0**	**n/a**	**0.05**	**NP**

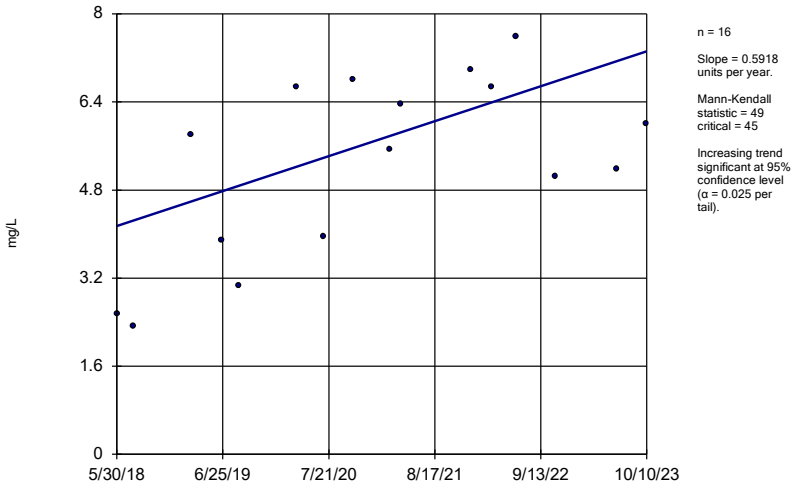
Trend Tests - Confidence Interval Exceedances - All Results

Northeastern BAP Data: Northeastern BAP Printed 1/10/2024, 12:23 PM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Alpha	Method
Barium (mg/L)	**SP-10**	**0.5918**	**49**	**45**	**Yes**	**16**	**0**	**n/a**	**0.05**	**NP**
Barium (mg/L)	SP-4 (bg)	-0.01306	-23	-41	No	15	0	n/a	0.05	NP
Barium (mg/L)	**SP-5R (bg)**	**0.08353**	**143**	**96**	**Yes**	**27**	**0**	**n/a**	**0.05**	**NP**
Fluoride (mg/L)	SP-10	0.1218	42	90	No	26	11.54	n/a	0.05	NP
Fluoride (mg/L)	SP-4 (bg)	0.005715	10	101	No	28	3.571	n/a	0.05	NP
Fluoride (mg/L)	SP-5R (bg)	0.007758	26	101	No	28	0	n/a	0.05	NP
Lithium (mg/L)	**SP-10**	**-0.01416**	**-141**	**-81**	**Yes**	**24**	**0**	**n/a**	**0.05**	**NP**
Lithium (mg/L)	**SP-4 (bg)**	**-0.001794**	**-44**	**-41**	**Yes**	**15**	**0**	**n/a**	**0.05**	**NP**
Lithium (mg/L)	**SP-5R (bg)**	**-0.005489**	**-162**	**-96**	**Yes**	**27**	**0**	**n/a**	**0.05**	**NP**

Sen's Slope Estimator

SP-10



n = 16

Slope = 0.5918 units per year.

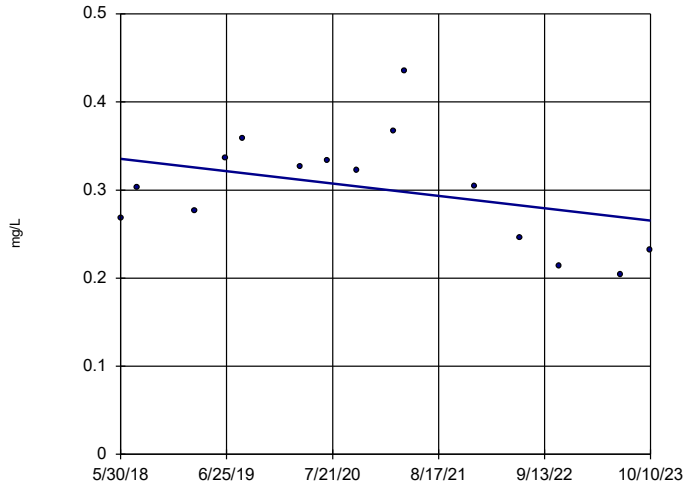
Mann-Kendall statistic = 49
critical = 45

Increasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Barium Analysis Run 1/10/2024 12:21 PM View: Trend Tests
Northeastern BAP Data: Northeastern BAP

Sen's Slope Estimator

SP-4 (bg)



n = 15

Slope = -0.01306 units per year.

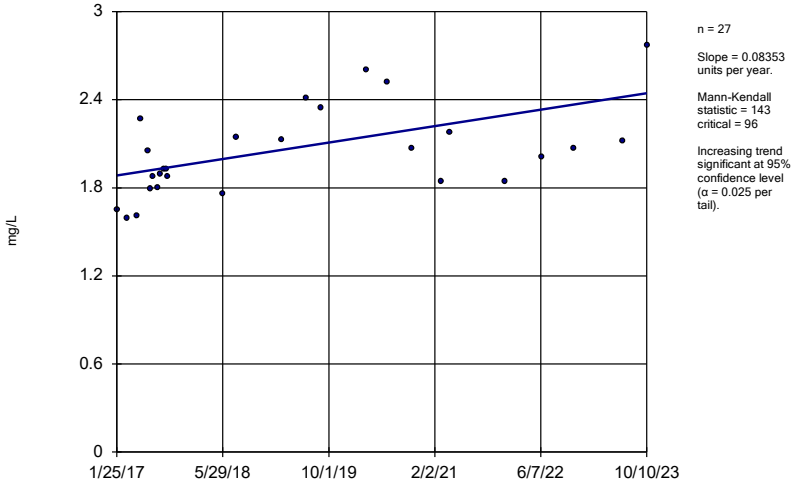
Mann-Kendall statistic = -23
critical = -41

Trend not significant at 95% confidence level (α = 0.025 per tail).

Constituent: Barium Analysis Run 1/10/2024 12:21 PM View: Trend Tests
Northeastern BAP Data: Northeastern BAP

Sen's Slope Estimator

SP-5R (bg)



n = 27

Slope = 0.08353 units per year.

Mann-Kendall statistic = 143
critical = 96

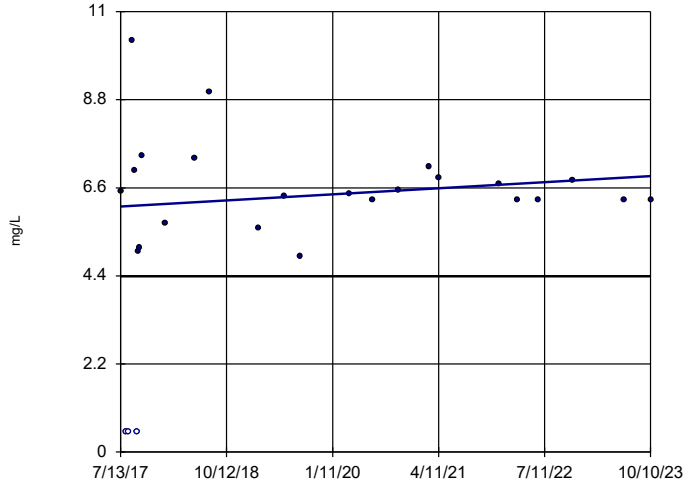
Increasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Barium Analysis Run 1/10/2024 12:21 PM View: Trend Tests
Northeastern BAP Data: Northeastern BAP

Hollow symbols indicate censored values.

Sen's Slope Estimator

SP-10



n = 26

Slope = 0.1218 units per year.

Mann-Kendall statistic = 42
critical = 90

Trend not significant at 95% confidence level (α = 0.025 per tail).

Prediction Limit = 4.39.

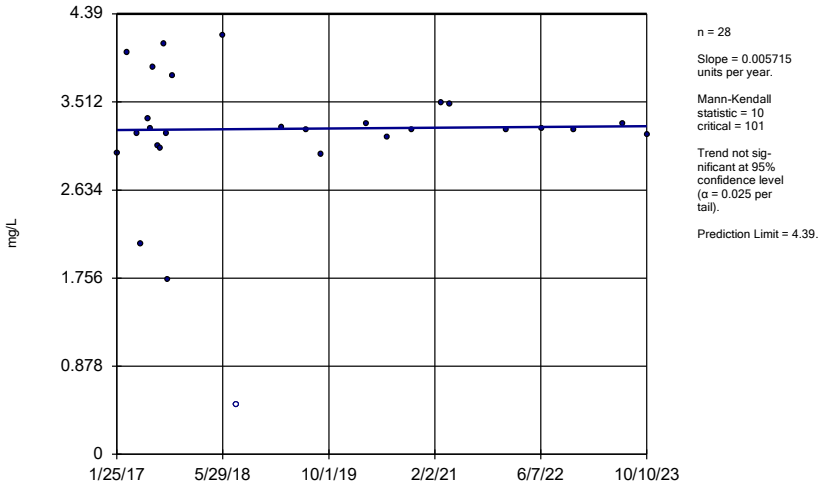
Constituent: Fluoride Analysis Run 1/10/2024 12:21 PM View: Trend Tests
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SP-4 (bg)



n = 28

Slope = 0.005715 units per year.

Mann-Kendall statistic = 10
critical = 101

Trend not significant at 95% confidence level (α = 0.025 per tail).

Prediction Limit = 4.39.

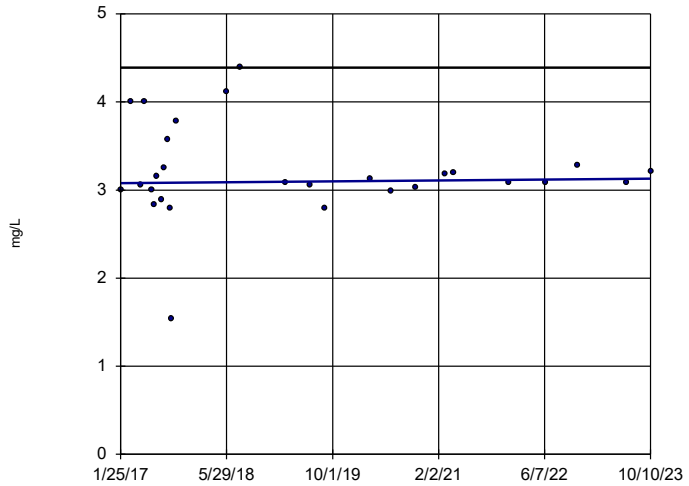
Constituent: Fluoride Analysis Run 1/10/2024 12:21 PM View: Trend Tests

Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Sen's Slope Estimator

SP-5R (bg)



n = 28

Slope = 0.007758 units per year.

Mann-Kendall statistic = 26
critical = 101

Trend not significant at 95% confidence level (α = 0.025 per tail).

Prediction Limit = 4.39.

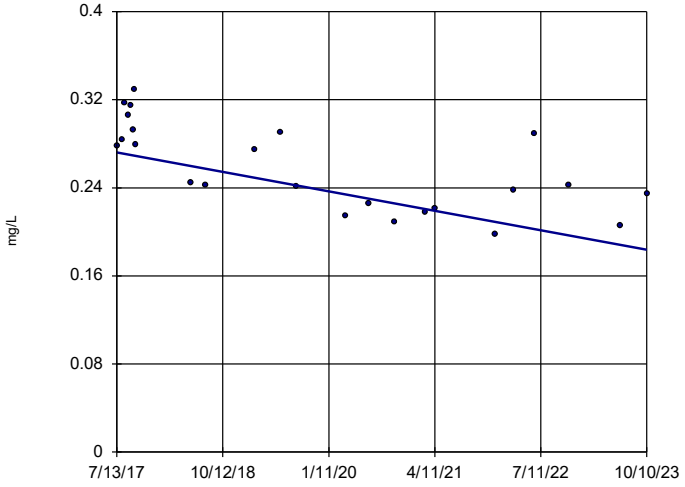
Constituent: Fluoride Analysis Run 1/10/2024 12:21 PM View: Trend Tests

Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Sen's Slope Estimator

SP-10



n = 24

Slope = -0.01416 units per year.

Mann-Kendall statistic = -141
critical = -81

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

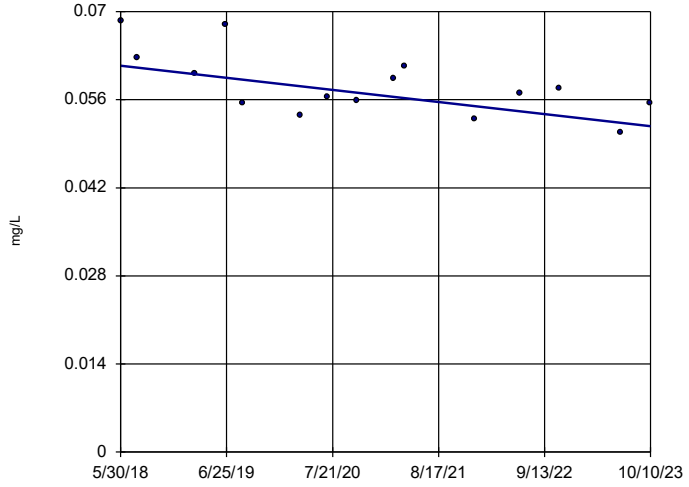
Constituent: Lithium Analysis Run 1/10/2024 12:21 PM View: Trend Tests

Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Sen's Slope Estimator

SP-4 (bg)



n = 15

Slope = -0.001794 units per year.

Mann-Kendall statistic = -44
critical = -41

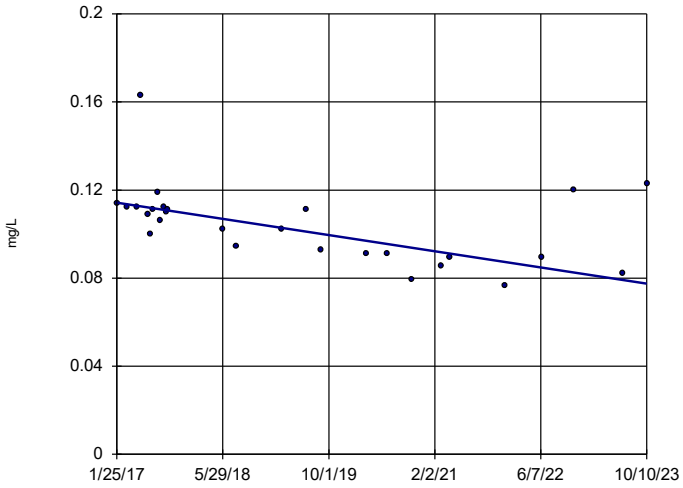
Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Lithium Analysis Run 1/10/2024 12:21 PM View: Trend Tests

Northeastern BAP Data: Northeastern BAP

Sen's Slope Estimator

SP-5R (bg)



n = 27

Slope = -0.005489 units per year.

Mann-Kendall statistic = -162
critical = -96

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Lithium Analysis Run 1/10/2024 12:21 PM View: Trend Tests

Northeastern BAP Data: Northeastern BAP

Geosyntec consultants

engineers | scientists | innovators

STATISTICAL ANALYSIS SUMMARY 2024 1ST SEMIANNUAL EVENT BOTTOM ASH POND

Northeastern Power Station

Oologah, Oklahoma

Prepared for

American Electric Power
1 Riverside Plaza
Columbus, Ohio 43215-2372

Prepared by

Geosyntec Consultants, Inc.
500 West Wilson Bridge Road, Suite 250
Worthington, Ohio 43085

Project Number: CHA8500B

September 11, 2024

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ACRONYMS AND ABBREVIATIONS

ASD	alternative source demonstration
BAP	Bottom Ash Pond
CCR	coal combustion residuals
GWPS	groundwater protection standard
LCL	lower confidence limit
LPL	lower prediction limit
mg/L	milligrams per liter
NPS	Northeastern Power Station
OAC	Oklahoma Administrative Code
ODEQ	Oklahoma Department of Environmental Quality
QA/QC	quality assurance and quality control
SSI	statistically significant increase
SSL	statistically significant level
TDS	total dissolved solids
UPL	upper prediction limit

1. INTRODUCTION

In accordance with Oklahoma Department of Environmental Quality (ODEQ) requirements regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments (Oklahoma Administrative Code [OAC] 252:517), groundwater monitoring has been conducted at the Bottom Ash Pond (BAP), an existing CCR unit at the Northeastern Power Station (NPS) in Oologah, Oklahoma. Recent groundwater monitoring results were used to identify concentrations of Appendix B constituents that are above site-specific groundwater protection standards (GWPSs).

Based on detection monitoring conducted in 2017 and 2018, statistically significant increases (SSIs) over background were concluded for boron, chloride, fluoride, total dissolved solids (TDS), and sulfate at the BAP. In addition, pH values below the lower prediction limit (LPL) resulted in SSIs below background as well. GWPSs were set in accordance with OAC 252:517-9-6(h) and a statistical evaluation of the assessment monitoring data was conducted.

During 2023, a sampling event for both Appendix A parameters and Appendix B parameters, as required by OAC 252:517-9-6(d), was completed in October. During the October 2023 assessment monitoring event, statistically significant levels (SSLs) were observed for barium, fluoride, and lithium (Geosyntec 2024a). An alternative source demonstration (ASD) was successfully completed (Geosyntec 2024b), and the unit therefore remained in assessment monitoring. One assessment monitoring event was conducted at the BAP in April 2024, in accordance with OAC 252:517-9-6(d). Results of this event are documented in this report.

Prior to conducting the statistical analyses, the groundwater data underwent several validation tests, including those for completeness, sample tracking accuracy, transcription errors, and consistent use of measurement units. No data quality issues were identified which would impact data usability.

The monitoring data were submitted to Groundwater Stats Consulting, LLC for statistical analysis. Confidence intervals were calculated for Appendix B parameters at the compliance wells to assess whether SSLs of Appendix B parameters were present above previously established GWPSs. SSLs were identified for barium, fluoride, and lithium. Therefore, either the unit will move to an assessment of corrective measures, or an ASD will be conducted to evaluate if the unit can remain in assessment monitoring. Certification of the selected statistical methods by a qualified professional engineer is documented in Attachment A.

2. BOTTOM ASH POND EVALUATION

2.1 Data Validation and QA/QC

One set of samples was collected in April 2024 for analysis from each background and compliance well to meet the requirements of OAC 252:517-9-6(d)(1). Samples from the April 2024 sampling event were analyzed for all Appendix A and Appendix B parameters. A summary of data collected during this assessment monitoring event are presented in Table 1.

Chemical analysis was completed by a National Environmental Laboratory Accreditation Program–certified analytical laboratory. The laboratory completed analysis of quality assurance and quality control (QA/QC) samples such as laboratory reagent blanks, continuing calibration verification samples, and laboratory fortified blanks.

The analytical data were imported into a Microsoft Access database, where checks were completed to assess the accuracy of sample location identification and analyte identification. Where necessary, unit conversions were applied to standardize reported units across all sampling events. Exported data files were created for use with the Sanitas™ v.10.0.20 statistics software. The export file was checked against the analytical data for transcription errors and completeness. No QA/QC issues that would impact data usability were noted.

2.2 Statistical Analysis

Statistical analyses for the BAP were conducted in accordance with the November 2021 *Statistical Analysis Plan* (Geosyntec 2021). Time series plots and results for all completed statistical tests are provided in Attachment B. The data obtained in April 2024 were screened for potential outliers. No outliers were identified for this event.

2.2.1 Evaluation of Potential Appendix B SSLs

A confidence interval was constructed for each Appendix B parameter at each compliance well. Confidence limits were generally calculated parametrically ($\alpha = 0.01$). However, nonparametric confidence limits were calculated in some cases (e.g., when the data did not appear to be normally distributed or when the nondetect frequency was too high). Select datasets were truncated if significant serial correlation was observed among the background samples that were collected on an approximately monthly basis in 2017. A list of the truncated well/constituent pairs used for calculation of the confidence limits is provided in Attachment B.

An SSL was concluded if the lower confidence limit (LCL) was above the GWPS (i.e., if the entire confidence interval was above the GWPS). The calculated confidence limits (Attachment B) were compared to the GWPSs provided in Table 3. The GWPSs were established during a previous statistical analysis as either (a) the background concentration or (b) the maximum contaminant level and risk-based levels specified in OAC 252:517-9-6(h), whichever was greater (Geosyntec 2024a).

The following SSLs were identified at the Northeastern BAP:

- The LCL for barium was above the GWPS of 2.77 milligrams per liter (mg/L) at SP-10 (4.30 mg/L).

- The LCL for fluoride was above the GWPS of 4.39 mg/L at SP-10 (5.59 mg/L).
- The LCL for lithium was above the GWPS of 0.163 mg/L at SP-10 (0.238 mg/L).

ODEQ previously noted in a letter provided to the NPS that "[i]f lithium and fluoride continue to exceed their relative GWPS in the future and conditions have not changed, NPS may refer to the October 29, 2019 ASD approval for lithium and June 4, 2021 approval for fluoride and continue assessment monitoring for the BAP in accordance with OAC 252:517-6(g)(3)(B)" (ODEQ 2021). ODEQ provided a similar letter dated September 20, 2022 documenting ASD approval for a barium SSL at SP-10 which is applicable in the future if conditions do not change (ODEQ 2022). Therefore, an ASD will be submitted to ODEQ demonstrating that conditions at the BAP remain unchanged so that the unit will continue assessment monitoring.

2.2.2 Evaluation of Potential Appendix A SSIs

While SSLs were identified, a review of the Appendix A results was also completed to assess whether concentrations of Appendix A parameters at the compliance wells were above background concentrations. Data collected during the April 2024 assessment monitoring event from each compliance well were compared to previously calculated prediction limits to assess whether the results are above background values (Table 3). The following concentrations were above the upper prediction limits (UPLs):

- The boron concentration was above the interwell UPL of 0.496 mg/L at SP-10 (0.892 mg/L).
- The calcium concentration was above the intrawell UPL of 167 mg/L at SP-2 (172 mg/L).
- The chloride concentration was above the interwell UPL of 874 mg/L at SP-10 (1,950 mg/L).
- The fluoride concentration was above the interwell UPL of 4.39 mg/L at SP-10 (6.4 mg/L).
- Sulfate concentrations were above the interwell UPL of 83.0 mg/L at SP-1 (97.3 mg/L) and SP-11 (236 mg/L).
- The TDS concentration was above the interwell UPL of 1,940 mg/L at SP-10 (3,510 mg/L).

While the prediction limits were calculated for a one-of-two retesting procedure, SSIs were conservatively assumed if the April 2024 sample was above the UPL or, in the case of pH, below the LPL. Based on these results, concentrations of Appendix A constituents appear to be above background levels.

2.3 Conclusions

A semiannual assessment monitoring event was conducted in April 2024 in accordance with the CCR Rule. The laboratory and field data were reviewed prior to statistical analysis, and no QA/QC issues that impacted data usability were identified. A review of outliers identified no potential

outliers in the April 2024 data. A confidence interval was constructed at each compliance well for each Appendix B parameter; SSLs were concluded if the entire confidence interval was above the GWPSs. SSLs were identified for barium, fluoride, and lithium. Appendix A parameters were compared to prediction limits, with concentrations of boron, calcium, chloride, fluoride, sulfate, and TDS above background levels.

Based on this evaluation, the Northeastern BAP CCR unit will either move to an assessment of corrective measures or an ASD will be conducted to evaluate if the unit can remain in assessment monitoring.

3. REFERENCES

Geosyntec. 2021. *Statistical Analysis Plan – Northeastern Power Station*, *Oologah, Oklahoma*. Geosyntec Consultants, Inc. November.

Geosyntec. 2024a. *Statistical Analysis Summary – Bottom Ash Pond*, *Northeastern Power Station, Oologah, Oklahoma*. Geosyntec Consultants, Inc. February.

Geosyntec. 2024b. *Alternative Source Demonstration Report – State CCR Rule*, *Northeastern Power Station – Bottom Ash Pond, Oologah, Oklahoma*. Geosyntec Consultants, Inc. May.

ODEQ. 2021. Letter Transmittal – Alternate Source Demonstration for Fluoride and Lithium Exceedance – Bottom Ash Pond. Public Service Company of Oklahoma – Northeastern Power Station. Oklahoma Department of Environmental Quality. June.

ODEQ. 2022. Letter Transmittal – Alternate Source Demonstration for Barium, Fluoride, and Lithium Exceedance – Bottom Ash Pond. Public Service Company of Oklahoma – Northeastern Power Station. Oklahoma Department of Environmental Quality. September.

ODEQ. 2023. Letter Transmittal – Alternate Source Demonstration for Fluoride, and Lithium Exceedance – Bottom Ash Pond. Public Service Company of Oklahoma – Northeastern Power Station. Oklahoma Department of Environmental Quality. March.

TABLES

Table 1. Groundwater Data Summary
Statistical Analysis Summary
Northeastern Plant – Bottom Ash Pond

Parameter	Unit	SP-1	SP-2	SP-4	SP-5R	SP-10	SP-11
		4/16/2024	4/16/2024	4/16/2024	4/16/2024	4/16/2024	4/16/2024
Antimony	µg/L	0.433	0.318	0.169	0.131	0.076 J1	0.090 J1
Arsenic	µg/L	0.40	1.40	0.70	6.69	0.14	2.58
Barium	µg/L	134	1,690	190	1,970	5,940	191
Beryllium	µg/L	0.050	0.131	0.033 J1	0.061	0.020 J1	0.031 J1
Boron	mg/L	0.201	0.210	0.337	0.189	0.892	0.454
Cadmium	µg/L	0.053	0.034	0.019 J1	0.038	0.009 J1	0.027
Calcium	mg/L	113	172	108 M1	90.5	110	86.8
Chloride	mg/L	47.7	450	450	690	1,950	103
Chromium	µg/L	0.63	0.41	0.27 J1	0.45	0.26 J1	0.46
Cobalt	µg/L	0.164	1.71	0.123	0.321	0.101	0.466
Combined Radium	pCi/L	1.95	3.83	3.49	8.39	22.35	6.48
Fluoride	mg/L	0.89	2.74	3.22	3.04	6.4	1.73
Lead	µg/L	0.33	0.12 J1	0.10 J1	0.66	0.12 J1	0.28
Lithium	mg/L	0.00615	0.0784	0.0527	0.0856	0.247	0.0182
Mercury	µg/L	0.005 U1	0.005 U1	0.005 H2, Q5, Q1, U1	0.005 U1	0.005 U1	0.005 U1
Molybdenum	µg/L	14.9	11.5	3.2	0.7	0.9	0.9
Selenium	µg/L	5.43	0.37 J1	0.38 J1	0.13 J1	0.05 J1	0.12 J1
Sulfate	mg/L	97.3	19.0	81.0	4.4	18.2	236
Thallium	µg/L	0.06 J1	0.05 J1	0.2 U1	0.2 U1	0.2 U1	0.2 U1
Total Dissolved Solids	mg/L	460	990	1,270	1,430	3,510	910
pH	SU	7.8	7.6	7.6	7.5	7.7	7.6

Notes:
H2: Sample analysis performed past holding time.
J1: Estimated value. Parameter was detected in concentrations below the reporting limit.
M1: The associated matrix spike (MS) or matrix spike duplicate (MSD) recovery was outside acceptance limits.
mg/L: milligrams per liter
pCi/L: picocuries per liter
Q1: Sample received in inappropriate sample container.
Q5: Sample was received with improper chemical preservation.
SU: standard unit
U1: Non-detect value. For statistical analysis, parameters which were not detected were replaced with the reporting limit.
µg/L: micrograms per liter

Table 2. Appendix B Groundwater Protection Standards *Geosyntec Consultants, Inc.*
Statistical Analysis Summary
Northeastern Plant – Bottom Ash Pond

Constituent Name	MCL	CCR Rule-Specified	Calculated UTL	GWPS
Antimony, Total (mg/L)	0.00600		0.00467	0.00600
Arsenic, Total (mg/L)	0.0100		0.0529	0.0529
Barium, Total (mg/L)	2.00		2.77	2.77
Beryllium, Total (mg/L)	0.00400		0.00212	0.00400
Cadmium, Total (mg/L)	0.00500		0.00022	0.00500
Chromium, Total (mg/L)	0.100		0.00373	0.100
Cobalt, Total (mg/L)	n/a	0.00600	0.0179	0.0179
Combined Radium, Total (pCi/L)	5.00		19.4	19.4
Fluoride, Total (mg/L)	4.00		4.39	4.39
Lead, Total (mg/L)	n/a	0.0150	0.0087	0.0150
Lithium, Total (mg/L)	n/a	0.0400	0.163	0.163
Mercury, Total (mg/L)	0.00200		0.0000300	0.00200
Molybdenum, Total (mg/L)	n/a	0.100	0.0100	0.100
Selenium, Total (mg/L)	0.0500		0.00499	0.0500
Thallium, Total (mg/L)	0.00200		0.00162	0.00200

Notes:
1. Calculated UTL (upper tolerance limit) represents site-specific background values.
2. Grey cells indicate the GWPS is based on the calculated UTL, which is higher than the MCL or CCR Rule-specified value.
CCR: coal combustion residuals
GWPS: groundwater protection standard
MCL: maximum contaminant level
mg/L: milligrams per liter
n/a: not applicable
pCi/L: picocuries per liter

Table 3. Appendix A Data Summary
Statistical Analysis Summary
Northeastern Plant – Bottom Ash Pond

Analyte	Unit	Description	SP-1	SP-2	SP-10	SP-11
			4/16/2024	4/16/2024	4/16/2024	4/16/2024
Boron	mg/L	Interwell Background Value (UPL)	0.496			
		Analytical Result	0.201	0.210	**0.892**	0.454
Calcium	mg/L	Intrawell Background Value (UPL)	141	167	227	156
		Analytical Result	113	**172**	110	86.8
Chloride	mg/L	Interwell Background Value (UPL)	874			
		Analytical Result	47.7	450	**1,950**	103
Fluoride	mg/L	Interwell Background Value (UPL)	4.39			
		Analytical Result	0.89	2.74	**6.4**	1.73
pH	SU	Interwell Background Value (UPL)	9.1			
		Interwell Background Value (LPL)	7.0			
		Analytical Result	7.8	7.6	7.7	7.6
Sulfate	mg/L	Interwell Background Value (UPL)	83.0			
		Analytical Result	**97.3**	19.0	18.2	**236**
Total Dissolved Solids	mg/L	Interwell Background Value (UPL)	1,940			
		Analytical Result	460	990	**3,510**	910

Notes:
1. Bold values exceed the background value.
2. Background values are shaded gray.
LPL: lower prediction limit
mg/L: milligrams per liter
SU: standard units
UPL: upper prediction limit

ATTACHMENT A
Certification by Qualified Professional Engineer

Certification by Qualified Professional Engineer

I certify that selected and above described statistical method is appropriate for evaluating the groundwater monitoring data for the Northeastern Bottom Ash Pond CCR management area and that the requirements of OAC 252:517-9-4(g) have been met.

David Anthony Miller

Printed Name of Licensed Professional Engineer

David Anthony Miller

Signature

26057	Oklahoma	09.11.2024
License Number	Licensing State	Date

ATTACHMENT B
Statistical Analysis Output

GROUNDWATER STATS CONSULTING

July 17, 2024

Geosyntec Consultants
Attn: Ms. Allison Kreinberg
500 W. Wilson Bridge Road, Suite 250
Worthington, OH 43085

Re: Northeastern BAP (Bottom Ash Pond)
Assessment Monitoring Statistics – April 2024

Dear Ms. Kreinberg,

Groundwater Stats Consulting (GSC), formerly the statistical consulting division of Sanitas Technologies, is pleased to provide the April 2024 assessment monitoring analysis of groundwater data for American Electric Power Inc.'s Northeastern BAP. The analysis complies with the Oklahoma Administrative Code (OAC) as well as with the United States Environmental Protection Agency (USEPA) Unified Guidance (2009).

Sampling began at the site for the OAC program in 2017. The monitoring well network, as provided by Geosyntec Consultants, consists of the following:

- **Upgradient wells:** SP-4 and SP-5R
- **Downgradient wells:** SP-1, SP2, SP-10, and SP-11

Data were sent electronically, and the statistical analysis was conducted according to the Statistical Analysis Plan and screening evaluation prepared by GSC and approved by Dr. Kirk Cameron, PhD Statistician with MacStat Consulting, primary author of the USEPA Unified Guidance, and Senior Advisor to GSC. The analysis was reviewed by Andrew Collins, Project Manager of GSC.

The OAC program consists of the following constituents listed below. The terms "constituent" and "parameter" are interchangeable.

- **Appendix B** (Assessment Monitoring) **–** antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, combined radium 226 + 228, fluoride, lead, lithium, mercury, molybdenum, selenium, and thallium

For all constituents, a substitution of the most recent reporting limit is used for non-detect data. For several constituents, varying detection limits were present. Time series and box plots are provided for all wells for the parameters listed above (Figures A & B). The time series plots display concentrations over time for each well while the box plots provide visual representation of variation within a given well and across all wells.

Summary of Background Update – Conducted in January 2024

Prior to evaluating Appendix B parameters, background data are screened through visual screening and Tukey's outlier test for potential outliers and extreme trending patterns that would lead to artificially elevated statistical limits.

As mentioned above, during a previous update, the Rank Von Neumann serial correlation test was used to evaluate whether the measurements collected during 2017 represented independent samples, or whether serial correlation was present among the measurements. The records that showed significant serial correlation were truncated to remove earlier measurements for construction of statistical limits using only more recent data that represent independent samples.

Outlier Analysis

Tukey's outlier test on pooled upgradient well data identified outliers for fluoride, mercury, and selenium and confirmed previously flagged values. Several of the values identified by Tukey's test were either similar to concentrations upgradient of the facility or were lower than the respective Maximum Contaminant Level (MCL); therefore, the values were not flagged as outliers. Previously flagged outliers were confirmed by Tukey's test or visual screening. A summary of previously flagged outliers follows this report (Figure C).

Additionally, downgradient well data through October 2023 were screened through visual screening using time series graphs. Since the downgradient well data are used to construct confidence intervals, a regulatory conservative approach is taken in that values that are marginally high relative to the rest of the data are retained unless there is

particular justification for excluding them. No new outliers among downgradient wells were flagged during this analysis.

During previous updates, due to no variation in the data, Tukey's outlier test was not performed for cadmium and selenium in well SP-5R along with mercury and thallium in all wells. Among upgradient wells, high values for cadmium, lead, and selenium were identified by Tukey's outlier test. Only the highest values for cadmium and lead were flagged as outliers to maintain statistical limits that are conservative from a regulatory perspective. Substantially high values were identified at upgradient well SP-4 on 8/4/17 through visual screening and the highest values for arsenic, beryllium, cobalt, and mercury were flagged. This step results in upper tolerance limits that are conservative (lower) from a regulatory perspective.

Among downgradient wells, a high value for combined radium 226 + 228 in well SP-1 was flagged as an outlier along with the following values since they did not adequately represent the populations at their respective wells: chromium in well SP-10; combined radium 226 + 228 in well SP-11; lithium in well SP-1; and molybdenum in well SP-10. More recent concentrations for barium in downgradient well SP-10 were noted to be significantly higher than historical concentrations. Therefore, earlier concentrations were deselected prior to constructing confidence intervals in order to evaluate present-day groundwater concentrations of barium at this well. As mentioned above, a list of well/constituent pairs using a truncated portion of their records follows this report (Date Ranges Table).

Interwell Upper Tolerance Limits

Upper tolerance limits were used to calculate background limits from pooled upgradient well data through October 2023 for Appendix B parameters (Figure G). These limits are updated on an annual basis and will be updated again during the Fall 2024 sample event. Parametric tolerance limits are calculated, with a target of 95% confidence and 95% coverage, when data follow a normal or transformed-normal distribution. When data contained greater than 50% non-detects or did not follow a normal or transformed-normal distribution, non-parametric tolerance limits were constructed using the highest background measurement. The confidence and coverage levels for nonparametric tolerance limits are dependent upon the number of background samples.

Groundwater Protection Standards

These background limits were compared to the Maximum Contaminant Levels (MCLs) and CCR Rule-Specified levels as shown in the Groundwater Protection Standard (GWPS) table

following this letter to determine the highest limit for use as the GWPS in the Confidence Interval comparisons (Figure H).

Evaluation of Appendix B Parameters – April 2024

For Appendix B parameters, confidence intervals for each downgradient well/constituent were compared against corresponding Groundwater Protection Standards (GWPS). GWPS were developed as described below. Downgradient well/constituent pairs that have 100% non-detects do not require analysis; however, no downgradient wells had 100% non-detects, and all well/constituent pairs were eligible for confidence intervals.

Confidence Intervals

Confidence intervals were then constructed on downgradient wells with data through April 2024 for each of the Appendix B parameters using the highest limit of the MCL or background limit as discussed above for the GWPS (Figure F). As mentioned above, the most recent reporting limit is substituted for historical non-detects within a given well, and the reporting limits vary among individual wells. These intervals were constructed as either parametric or nonparametric confidence intervals depending on the data distribution and percentage of non-detects.

When data followed a normal or transformed-normal distribution, parametric confidence intervals were used for Appendix B parameters. Nonparametric confidence intervals, which use the largest and smallest order statistics depending on the sample size as interval limits, were constructed when data did not follow a normal or transformed-normal distribution or when there were greater than 50% non-detects. The lower confidence limit, which is constructed with 99% confidence for parametric confidence intervals, is compared to the GWPS prepared as described above. The confidence level associated with nonparametric confidence intervals is dependent upon the number samples available.

Only when the entire confidence interval is above a GWPS is the well/constituent pair considered to exceed its respective standard. A summary of the confidence interval results follows this letter. Exceedances were found for the following well/constituent pairs:

- Barium: SP-10
- Fluoride: SP-10
- Lithium: SP-10

Trend Test Evaluation – Appendix IV

Data at wells with confidence interval exceedances are further evaluated using the Sen's Slope/Mann Kendall trend test at the 95% confidence level to determine whether concentrations are statistically increasing, decreasing, or stable (Figure G). Although the trend tests for Assessment monitoring pairs were previously evaluated using 99% confidence, the 95% confidence level more rapidly identifies statistically significant trends. Additionally, the 95% confidence level is recommended in cases with limited sample sizes and, particularly, for new assessment wells. Upgradient wells are included in the trend analyses to identify whether similar patterns exist upgradient of the site for the same constituents. When trends are present in upgradient wells, it is an indication of variability in groundwater quality unrelated to practices at the site. A summary of the Appendix IV trend test results follows this letter. Statistically significant trends were identified for the following well/constituent pairs:

Increasing trends:

- Barium: SP-5R (upgradient) and SP-10

Decreasing trends:

- Lithium: SP-4 (upgradient), SP-5R (upgradient), and SP-10

Thank you for the opportunity to assist you in the statistical analysis of groundwater quality for the Northeastern BAP. If you have any questions or comments, please feel free to contact us.

For Groundwater Stats Consulting,

Tristan Clark
Groundwater Analyst

Andrew Collins
Project Manager

Date Ranges

Date: 7/17/2024 8:49 AM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Barium (mg/L)
- SP-10 overall:5/30/2018-4/16/2024
- SP-11 overall:5/30/2018-4/16/2024
- SP-4 overall:5/30/2018-4/16/2024

Cadmium (mg/L)
- SP-1 overall:5/30/2018-4/16/2024
- SP-10 overall:5/30/2018-4/16/2024
- SP-4 overall:5/30/2018-4/16/2024
- SP-5R overall:5/30/2018-4/16/2024

Chromium (mg/L)
- SP-4 overall:5/30/2018-4/16/2024

Lead (mg/L)
- SP-10 overall:5/30/2018-4/16/2024

Lithium (mg/L)
- SP-11 overall:5/30/2018-4/16/2024
- SP-4 overall:5/30/2018-4/16/2024

Molybdenum (mg/L)
- SP-2 overall:5/30/2018-4/16/2024

Selenium (mg/L)
- SP-2 overall:5/30/2018-4/16/2024
- SP-5R overall:5/30/2018-4/16/2024

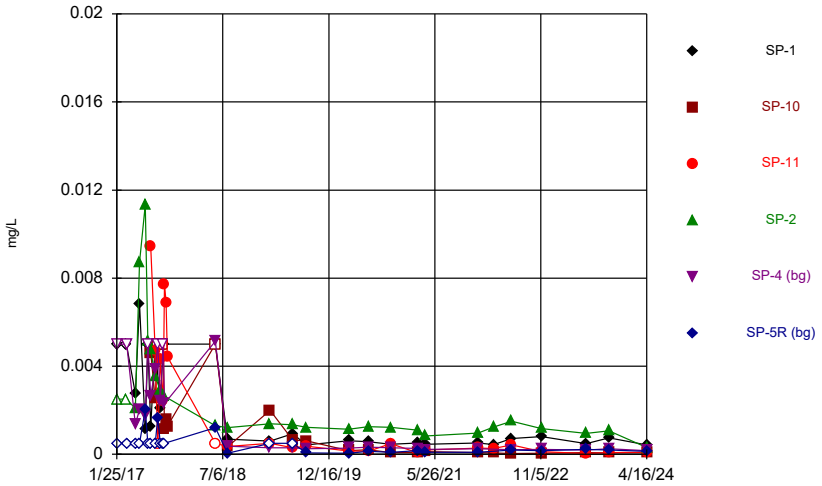
Thallium (mg/L)
- overall:5/30/2018-4/16/2024

FIGURE A

Time Series

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

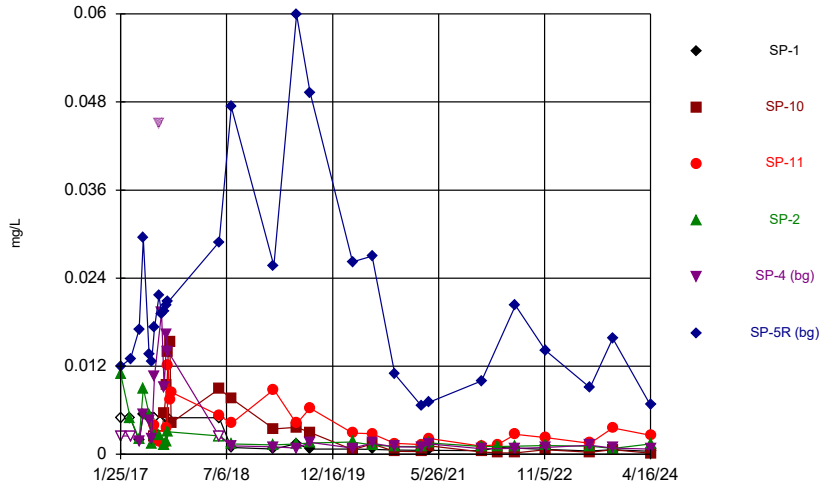
Time Series



Constituent: Antimony Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

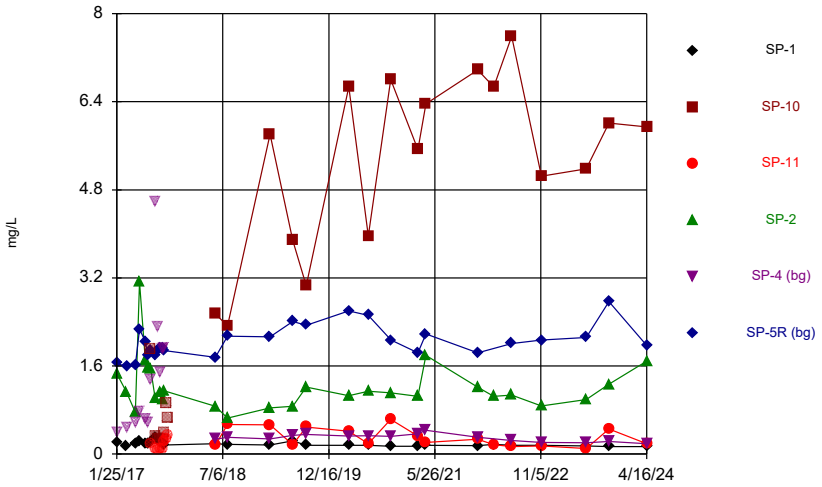
Time Series



Constituent: Arsenic Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG

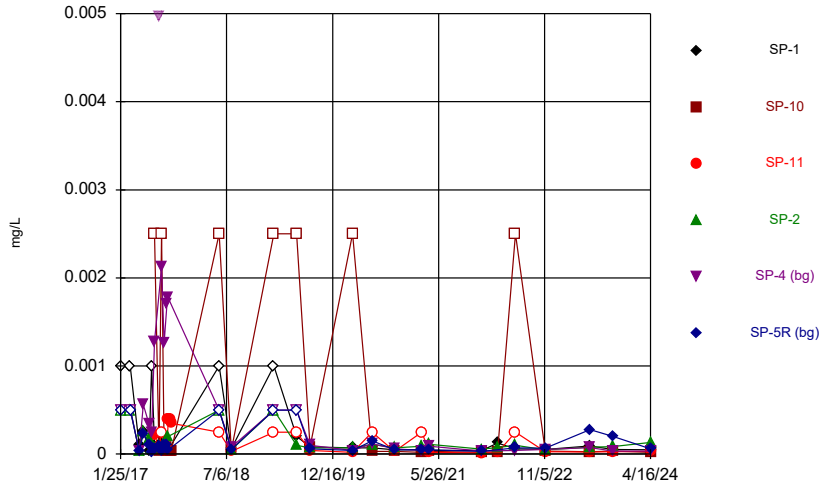
Time Series



Constituent: Barium Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

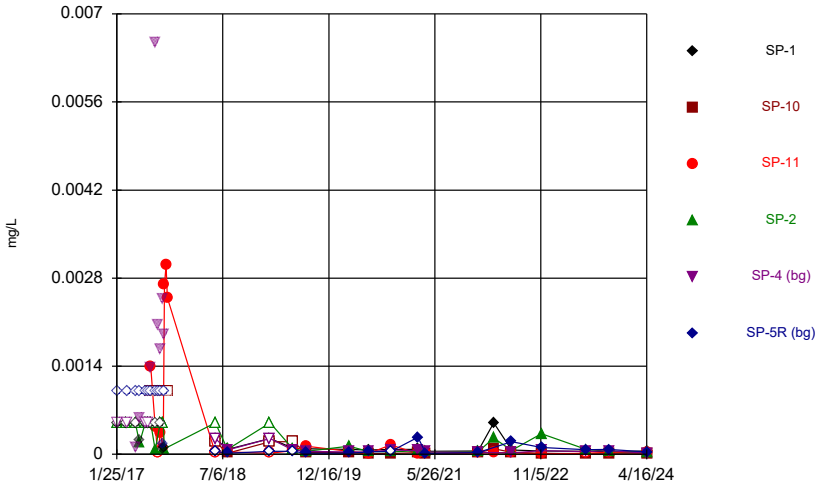
Time Series



Constituent: Beryllium Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

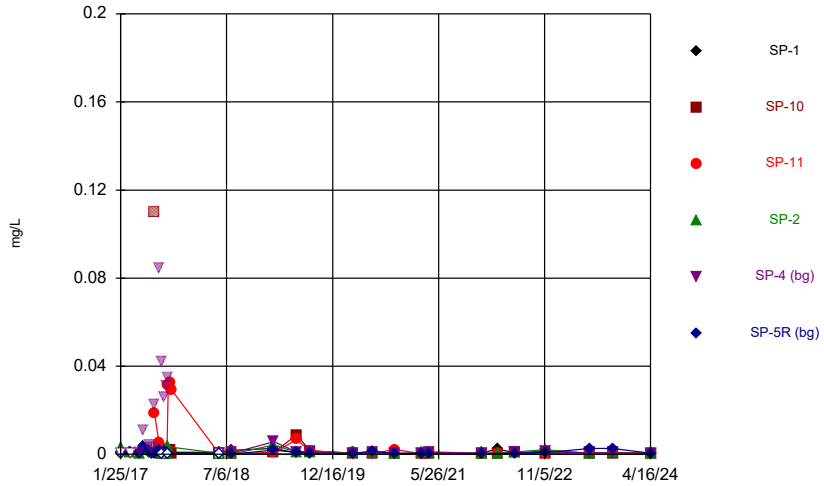
Time Series



Constituent: Cadmium Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

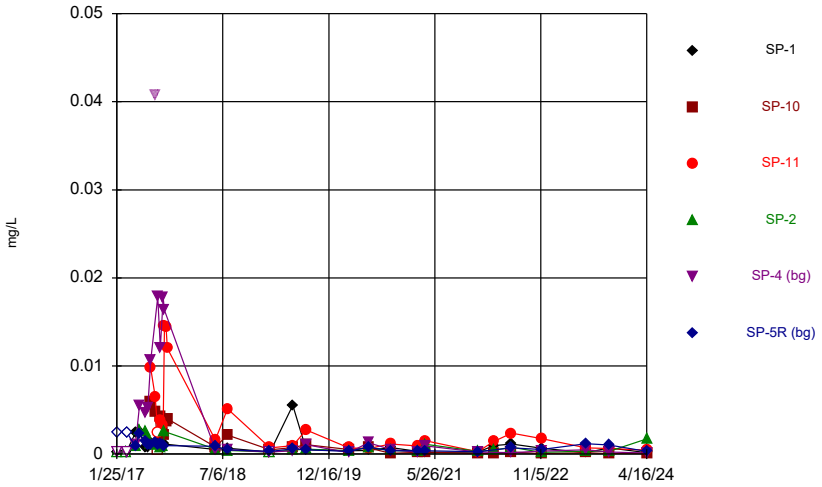
Time Series



Constituent: Chromium Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

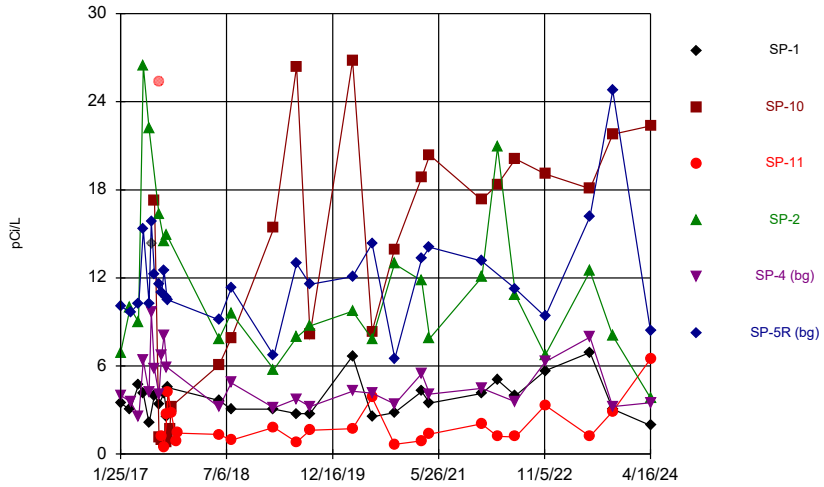
Time Series



Constituent: Cobalt Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG

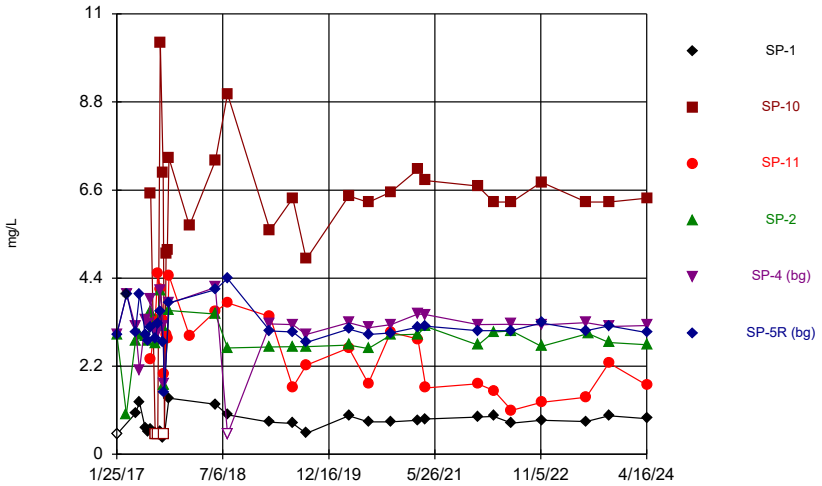
Time Series



Constituent: Combined Radium 226 + 228 Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

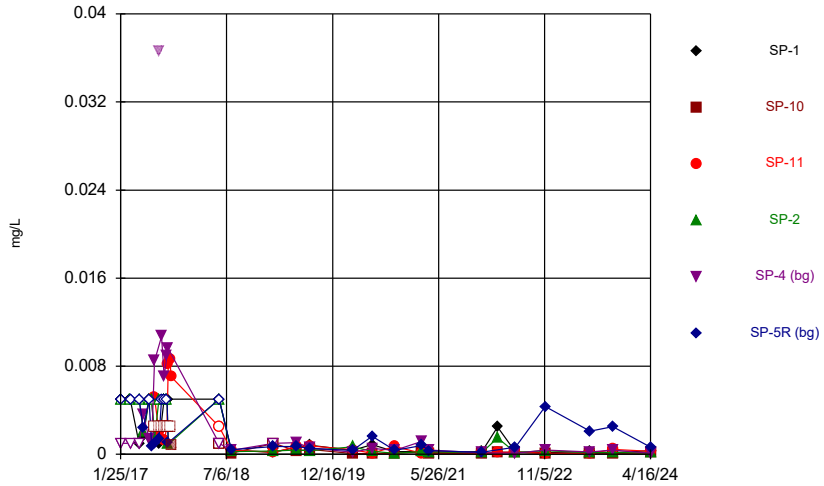
Time Series



Constituent: Fluoride Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

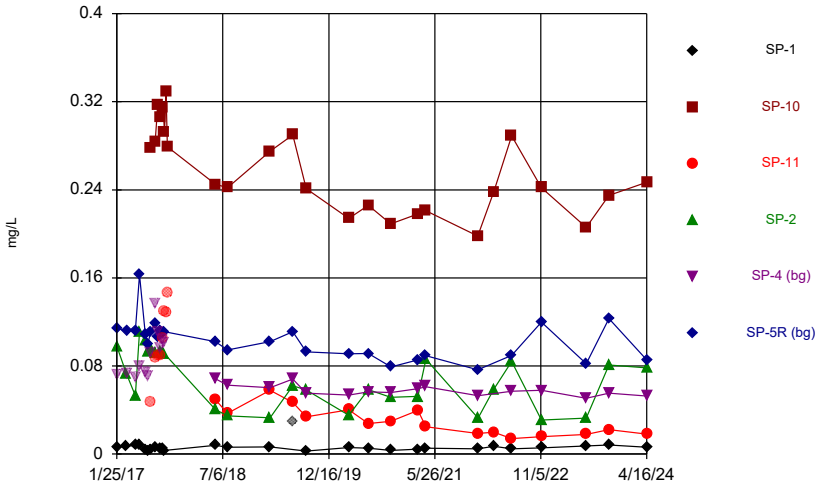
Time Series



Constituent: Lead Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG

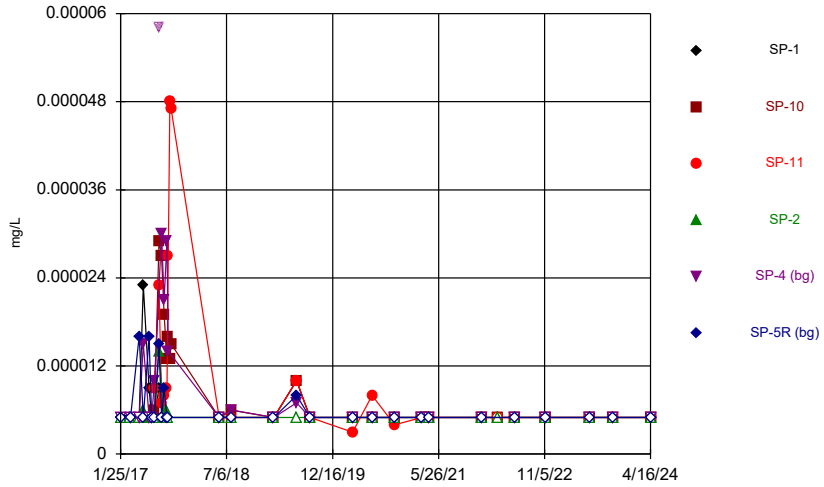
Time Series



Constituent: Lithium Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

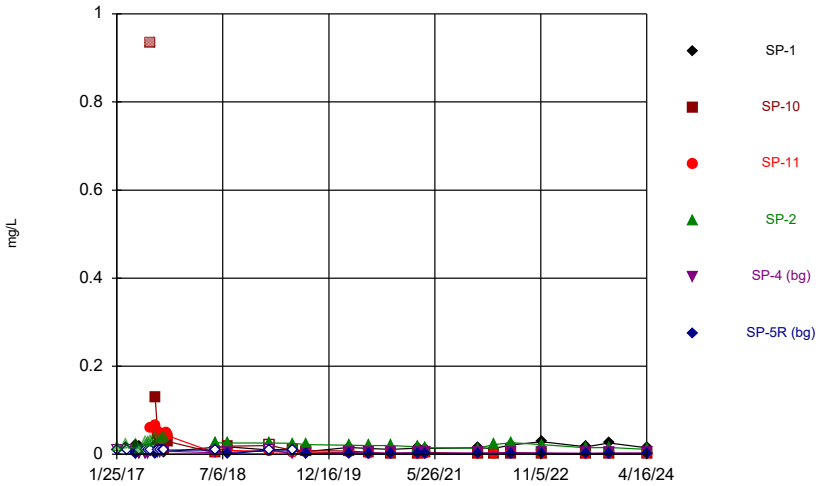
Time Series



Constituent: Mercury Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

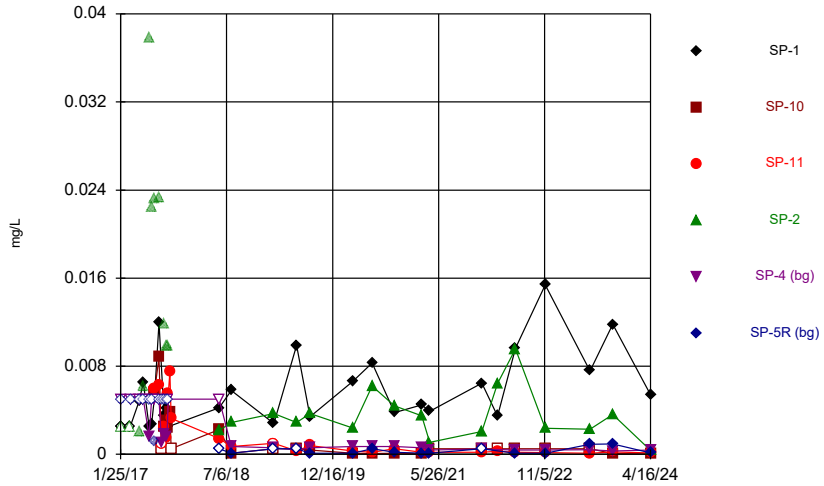
Time Series



Constituent: Molybdenum Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

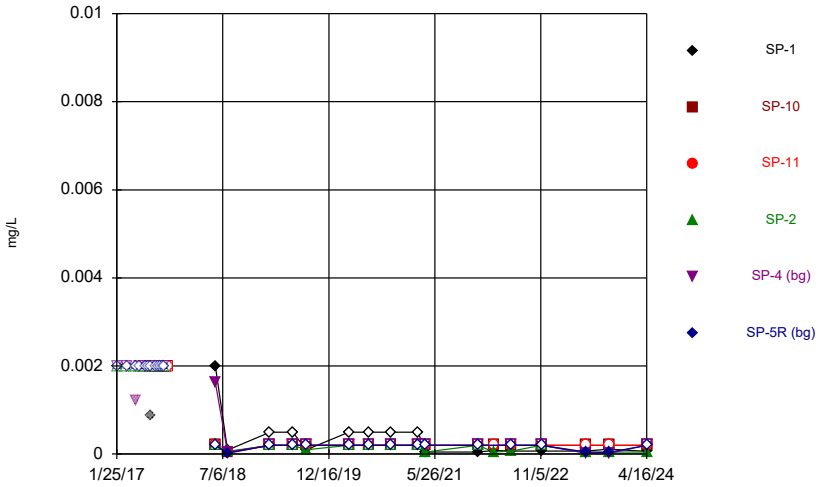
Time Series



Constituent: Selenium Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Time Series

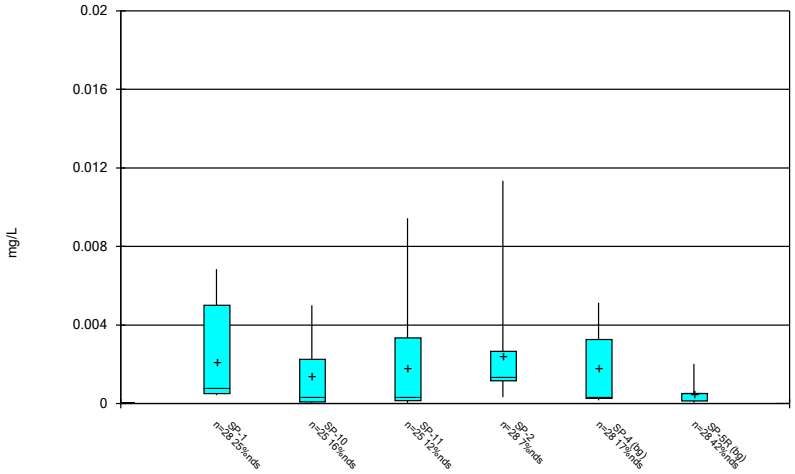


Constituent: Thallium Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

FIGURE B

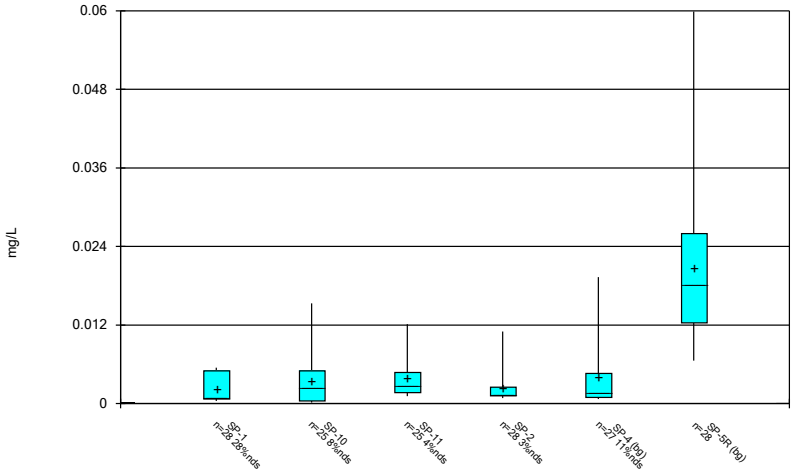
Box Plots

Box & Whiskers Plot



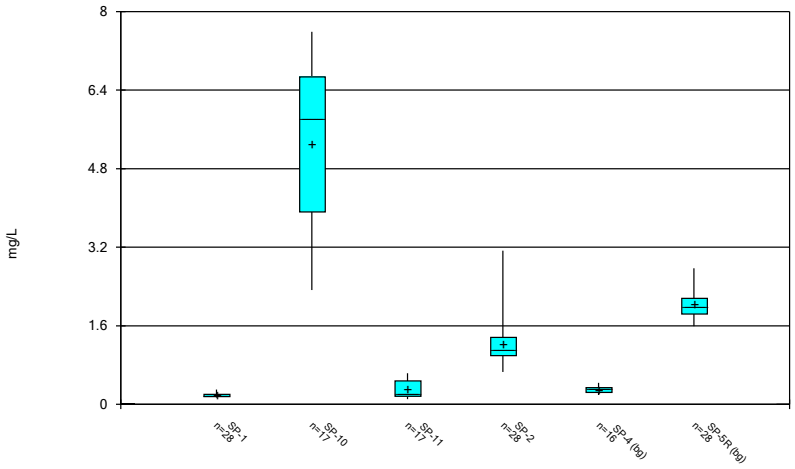
Constituent: Antimony Analysis Run 7/17/2024 1:41 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



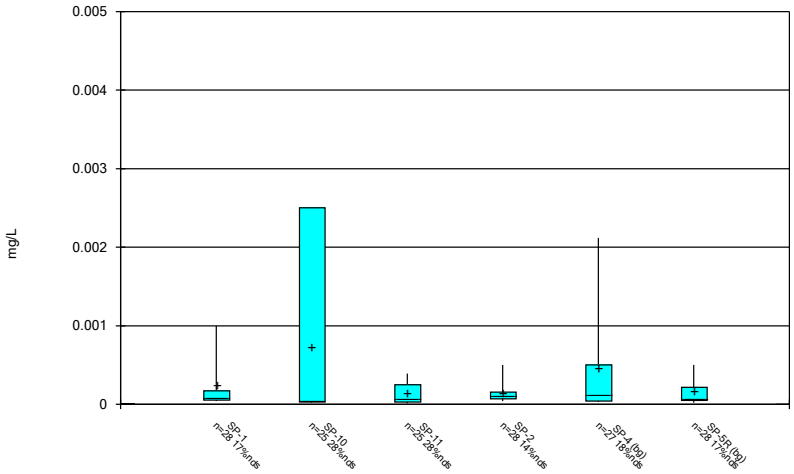
Constituent: Arsenic Analysis Run 7/17/2024 1:41 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



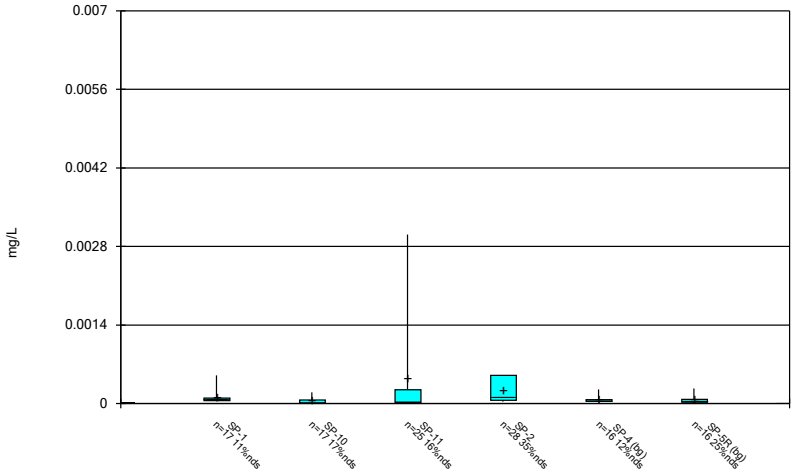
Constituent: Barium Analysis Run 7/17/2024 1:41 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



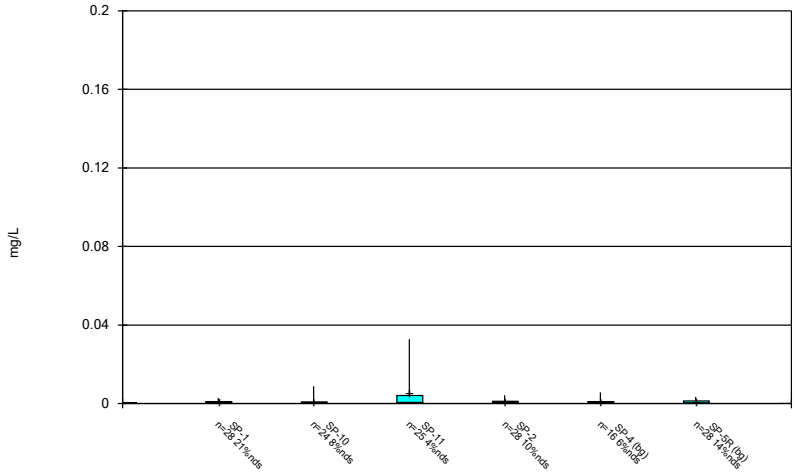
Constituent: Beryllium Analysis Run 7/17/2024 1:41 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



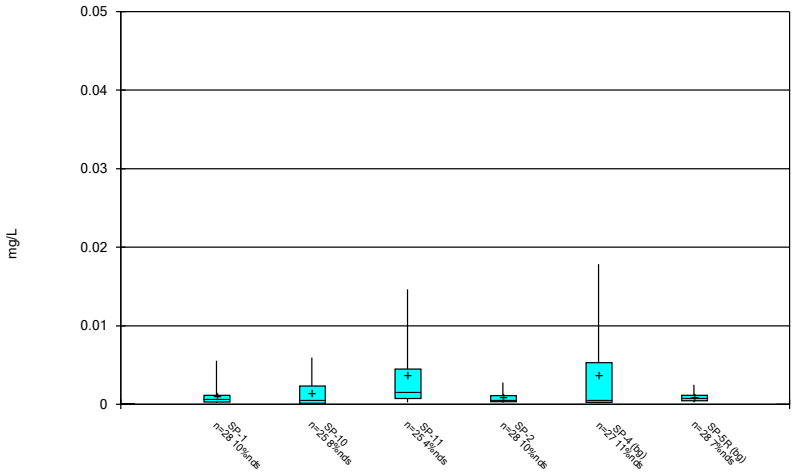
Constituent: Cadmium Analysis Run 7/17/2024 1:41 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



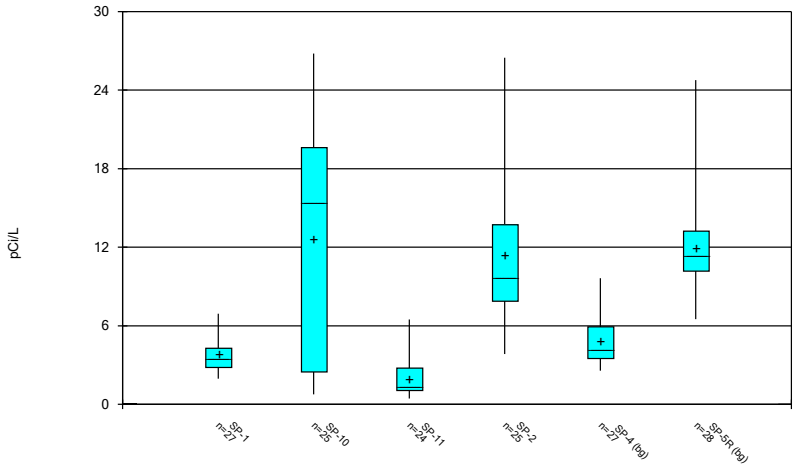
Constituent: Chromium Analysis Run 7/17/2024 1:41 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



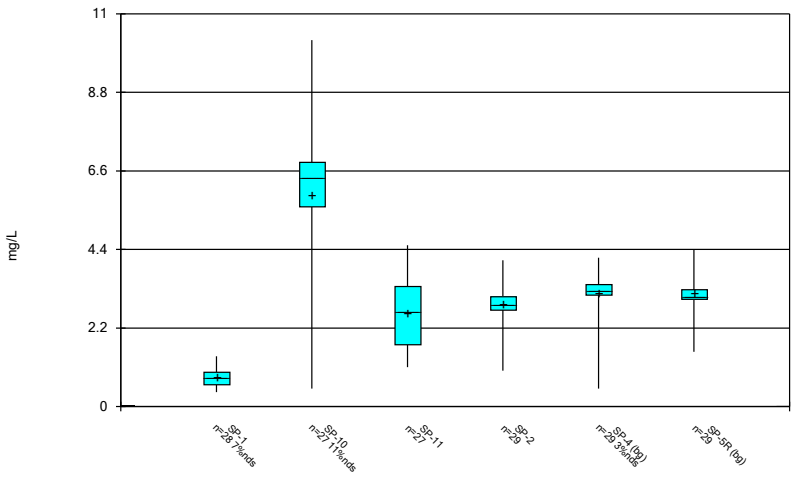
Constituent: Cobalt Analysis Run 7/17/2024 1:41 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



Constituent: Combined Radium 226 + 228 Analysis Run 7/17/2024 1:41 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

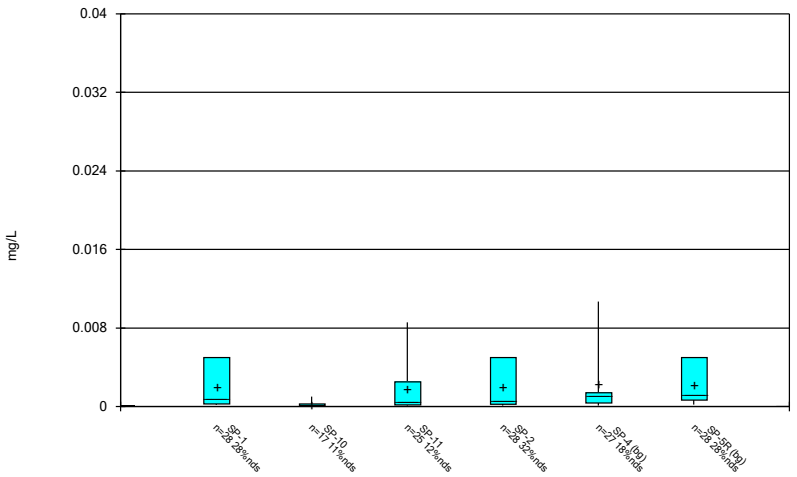
Box & Whiskers Plot



Constituent: Fluoride Analysis Run 7/17/2024 1:41 PM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

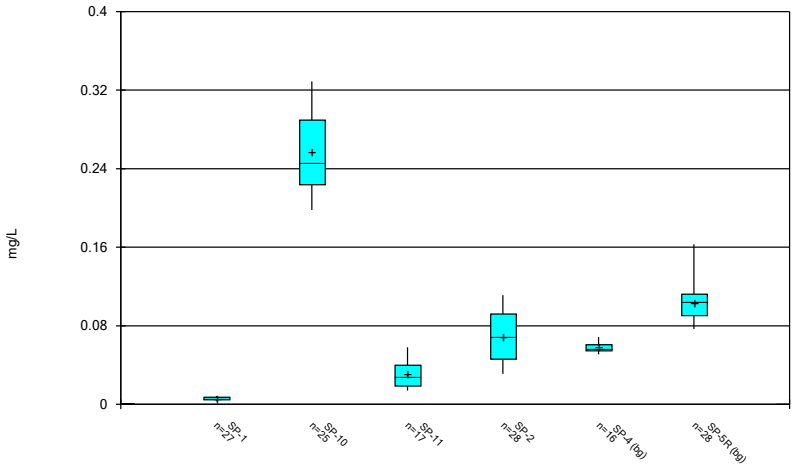
Box & Whiskers Plot



Constituent: Lead Analysis Run 7/17/2024 1:41 PM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

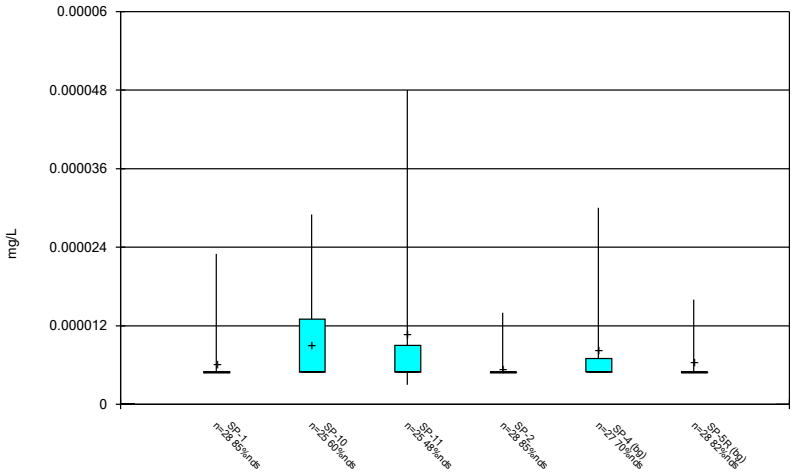
Box & Whiskers Plot



Constituent: Lithium Analysis Run 7/17/2024 1:41 PM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

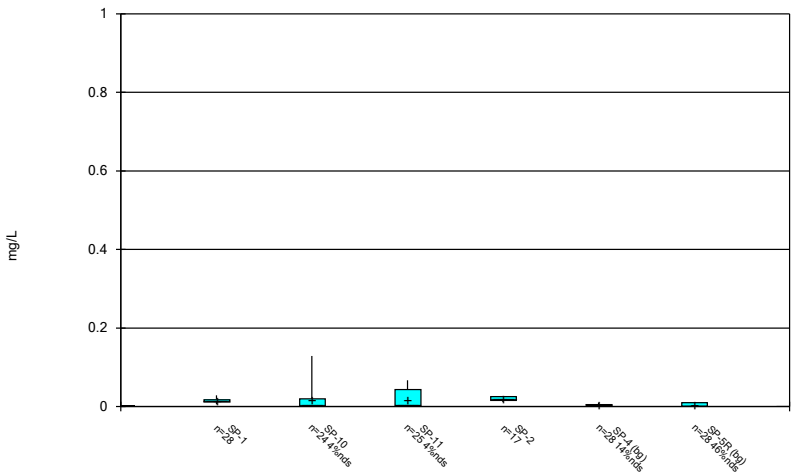
Box & Whiskers Plot



Constituent: Mercury Analysis Run 7/17/2024 1:41 PM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

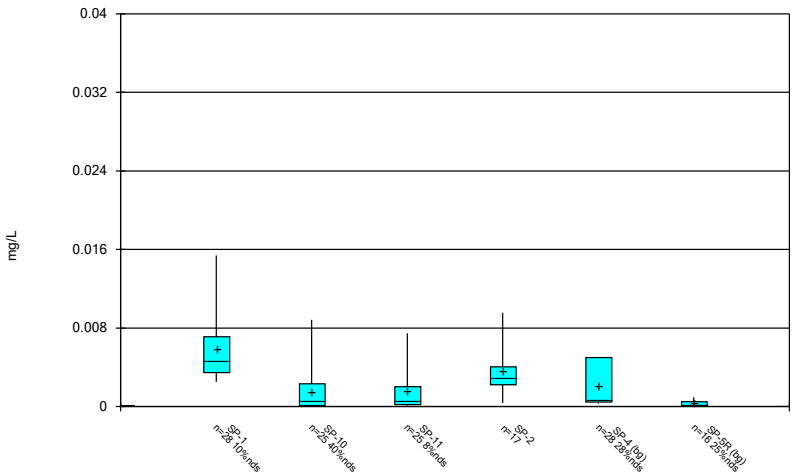
Box & Whiskers Plot



Constituent: Molybdenum Analysis Run 7/17/2024 1:41 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG

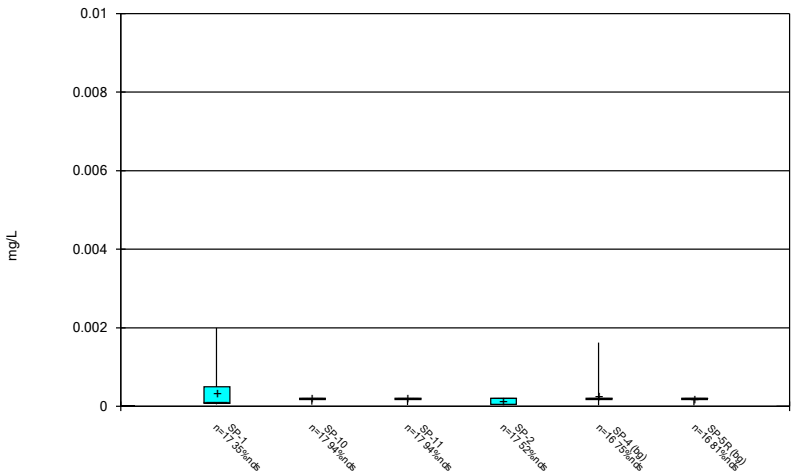
Box & Whiskers Plot



Constituent: Selenium Analysis Run 7/17/2024 1:41 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG

Box & Whiskers Plot



Constituent: Thallium Analysis Run 7/17/2024 1:41 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

FIGURE C
Outlier Summary

Outlier Summary

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 7/15/2024, 8:45 PM

	SP-4 Arsenic (mg/L)	SP-4 Beryllium (mg/L)	SP-10 Chromium (mg/L)	SP-4 Cobalt (mg/L)	SP-1 Combined Radium 226 + 228 (pCi/L)	SP-11 Combined Radium 226 + 228 (pCi/L)	SP-1 Fluoride (mg/L)	SP-4 Lead (mg/L)	SP-1 Lithium (mg/L)	SP-4 Mercury (mg/L)
3/13/2017							4 (o)			
6/27/2017					14.29 (o)					
7/13/2017			0.11 (o)							
8/4/2017	0.04498 (o)	0.00497 (o)		0.04069 (o)		25.367 (o)		0.03663 (o)		5.8E-05 (o)
6/20/2019									0.03 (J,o)	

	SP-10 Molybdenum (mg/L)
3/13/2017	
6/27/2017	
7/13/2017	0.934 (o)
8/4/2017	
6/20/2019	

FIGURE D

UTLs

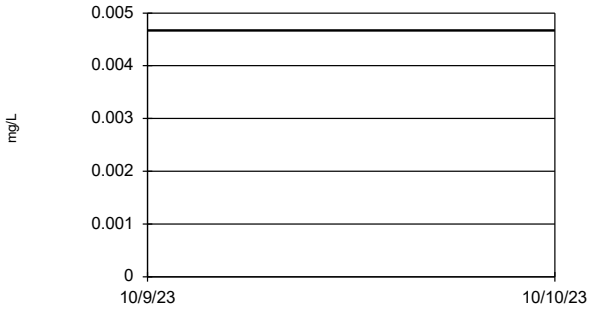
Upper Tolerance Limits Summary Table

Northeastern BAP Data: Northeastern BAP Printed 1/10/2024, 12:19 PM

Constituent	Upper Lim.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Antimony (mg/L)	0.004669	54	-8.028	1.303	31.48	Kaplan-Meier	ln(x)	0.05	Inter
Arsenic (mg/L)	0.0529	53	0.2046	0.08342	5.66	None	x^(1/3)	0.05	Inter
Barium (mg/L)	2.77	42	n/a	n/a	0	n/a	n/a	0.116	NP Inter(normality)
Beryllium (mg/L)	0.00212	53	n/a	n/a	18.87	n/a	n/a	0.06597	NP Inter(normality)
Cadmium (mg/L)	0.0002157	30	-10.33	0.8506	20	Kaplan-Meier	ln(x)	0.05	Inter
Chromium (mg/L)	0.003731	42	-7.265	0.7923	11.9	None	ln(x)	0.05	Inter
Cobalt (mg/L)	0.01786	53	n/a	n/a	9.434	n/a	n/a	0.06597	NP Inter(normality)
Combined Radium 226 + 228 (pCi/L)	19.39	53	2.82	0.773	0	None	sqrt(x)	0.05	Inter
Fluoride (mg/L)	4.39	56	n/a	n/a	1.786	n/a	n/a	0.05656	NP Inter(normality)
Lead (mg/L)	0.008682	53	-7.11	1.154	24.53	Kaplan-Meier	ln(x)	0.05	Inter
Lithium (mg/L)	0.163	42	n/a	n/a	0	n/a	n/a	0.116	NP Inter(normality)
Mercury (mg/L)	0.00003	53	n/a	n/a	75.47	n/a	n/a	0.06597	NP Inter(NDs)
Molybdenum (mg/L)	0.01	54	n/a	n/a	31.48	n/a	n/a	0.06267	NP Inter(normality)
Selenium (mg/L)	0.00499	42	n/a	n/a	28.57	n/a	n/a	0.116	NP Inter(normality)
Thallium (mg/L)	0.00162	30	n/a	n/a	76.67	n/a	n/a	0.2146	NP Inter(NDs)

Tolerance Limit

Interwell Parametric

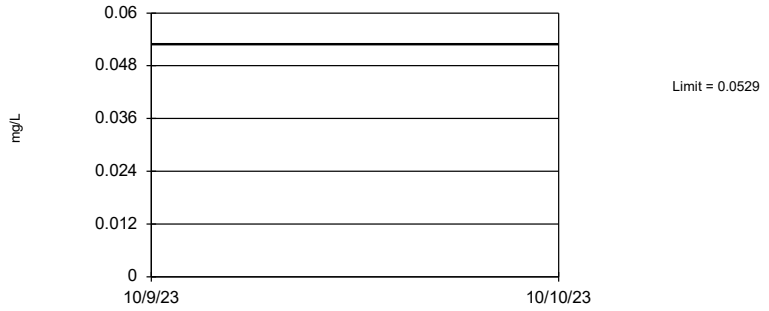


95% coverage. Background Data Summary (based on natural log transformation) (after Kaplan-Meier Adjustment): Mean=-8.028, Std. Dev.=1.303, n=54, 31.48% NDs. Normality test: Shapiro Francia @alpha = 0.01, calculated = 0.9524, critical = 0.939. Report alpha = 0.05.

Constituent: Antimony Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Tolerance Limit

Interwell Parametric

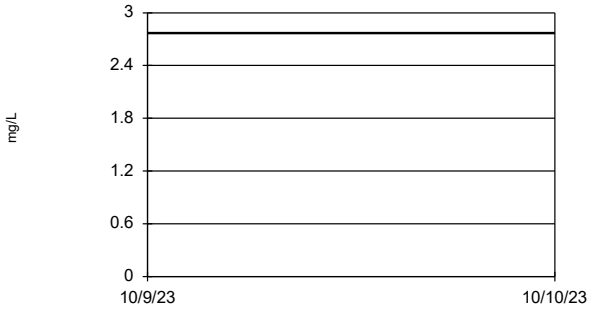


95% coverage. Background Data Summary (based on cube root transformation): Mean=0.2046, Std. Dev.=0.08342, n=53, 5.66% NDs. Normality test: Shapiro Francia @alpha = 0.01, calculated = 0.9413, critical = 0.938. Report alpha = 0.05.

Constituent: Arsenic Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric

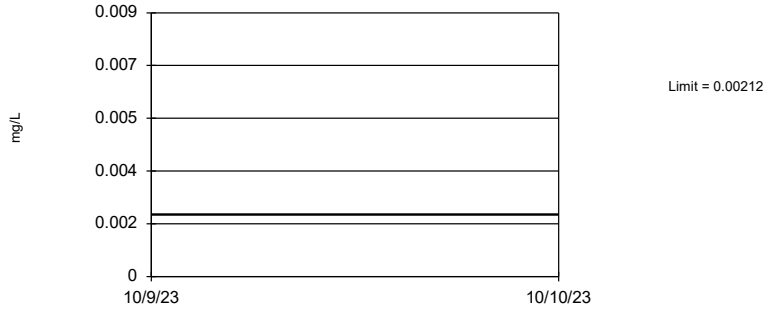


Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 42 background values. 89.65% coverage at alpha=0.01; 93.16% coverage at alpha=0.05; 98.24% coverage at alpha=0.5. Report alpha = 0.116.

Constituent: Barium Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric



Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 53 background values. 18.87% NDs. 91.6% coverage at alpha=0.01; 94.34% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.06597.

Constituent: Beryllium Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Tolerance Limit

Interwell Parametric

95% coverage. Background Data Summary (based on natural log transformation) (after Kaplan-Meier Adjustment): Mean=-10.33, Std. Dev.=0.8506, n=30, 20% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9423, critical = 0.9. Report alpha = 0.05.

Constituent: Cadmium Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

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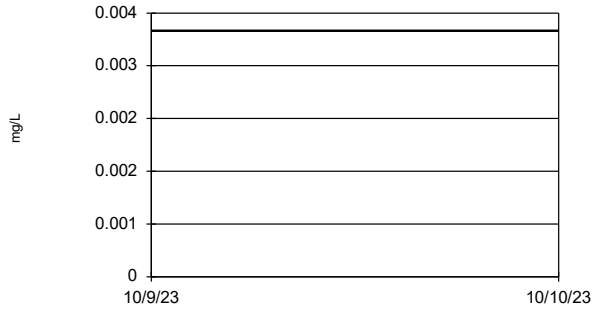
Tolerance Limit

Interwell Parametric



95% coverage. Background Data Summary (based on natural log transformation): Mean=-7.265, Std. Dev.=0.7923, n=42, 11.9% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9556, critical = 0.922. Report alpha = 0.05.

Constituent: Chromium Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

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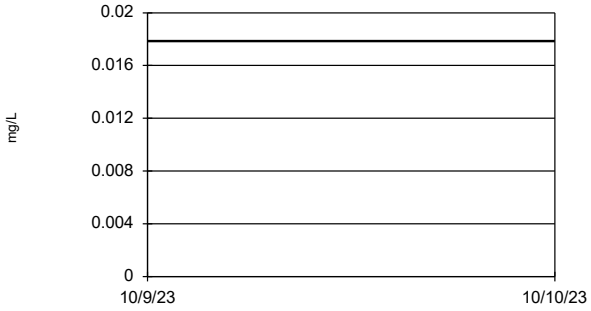
Tolerance Limit

Interwell Non-parametric



Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 53 background values. 9.434% NDs. 91.6% coverage at alpha=0.01; 94.34% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.06597.

Constituent: Cobalt Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

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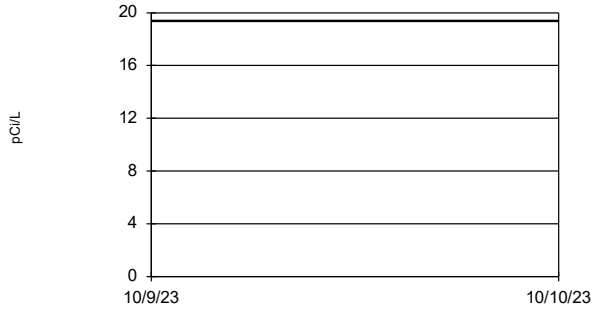
Tolerance Limit

Interwell Parametric



95% coverage. Background Data Summary (based on square root transformation): Mean=2.82, Std. Dev.=0.773, n=53. Normality test: Shapiro Francia @alpha = 0.01, calculated = 0.9513, critical = 0.938. Report alpha = 0.05.

Constituent: Combined Radium 226 + 228 Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric

Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 56 background values. 1.786% NDs. 91.99% coverage at alpha=0.01; 94.73% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.05656.

Constituent: Fluoride Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

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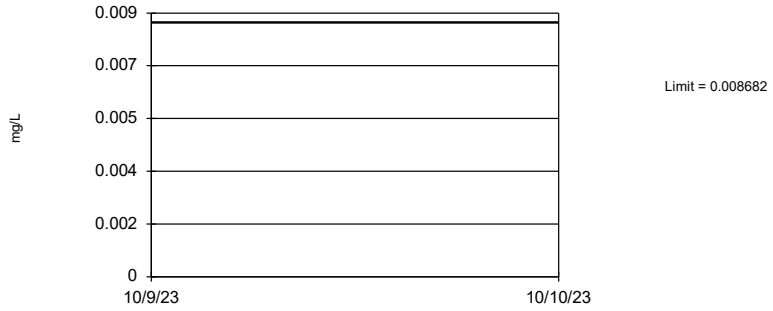
Tolerance Limit

Interwell Parametric



95% coverage. Background Data Summary (based on natural log transformation) (after Kaplan-Meier Adjustment): Mean=-7.11, Std. Dev.=1.154, n=53, 24.53% NDs. Normality test: Shapiro Francia @alpha = 0.01, calculated = 0.9393, critical = 0.938. Report alpha = 0.05.

Constituent: Lead Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

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Tolerance Limit

Interwell Non-parametric

Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 42 background values. 89.65% coverage at alpha=0.01; 93.16% coverage at alpha=0.05; 98.24% coverage at alpha=0.5. Report alpha = 0.116.

Constituent: Lithium Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

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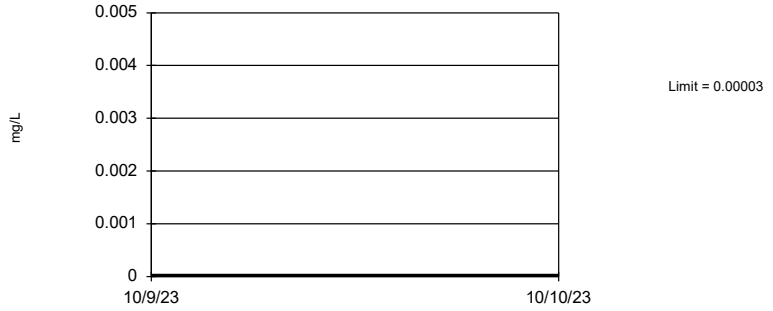
Tolerance Limit

Interwell Non-parametric

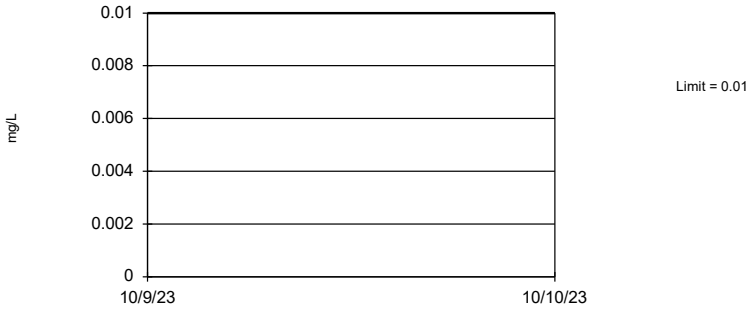


Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 50%. Limit is highest of 53 background values. 75.47% NDs. 91.6% coverage at alpha=0.01; 94.34% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.06597.

Constituent: Mercury Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric



Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 54 background values. 31.48% NDs. 91.99% coverage at alpha=0.01; 94.73% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.06267.

Constituent: Molybdenum Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

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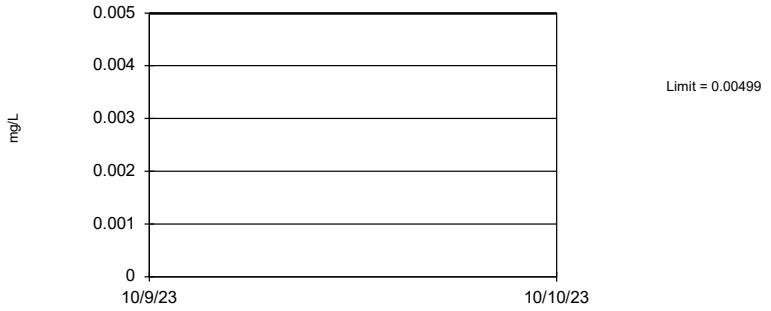
Tolerance Limit

Interwell Non-parametric



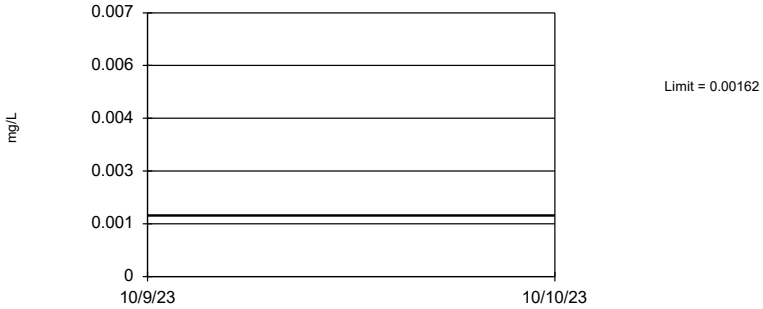
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 42 background values. 28.57% NDs. 89.65% coverage at alpha=0.01; 93.16% coverage at alpha=0.05; 98.24% coverage at alpha=0.5. Report alpha = 0.116.

Constituent: Selenium Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Tolerance Limit

Interwell Non-parametric



Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 50%. Limit is highest of 30 background values. 76.67% NDs. 85.74% coverage at alpha=0.01; 90.43% coverage at alpha=0.05; 97.85% coverage at alpha=0.5. Report alpha = 0.2146.

Constituent: Thallium Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

FIGURE E

GWPS

NORTHEASTERN BAP GWPS				
Constituent Name	**MCL**	**CCR- Rule Specified Level**	**Background Limit**	**GWPS**
Antimony, Total (mg/L)	0.006		0.0047	0.006
Arsenic, Total (mg/L)	0.01		0.053	0.053
Barium, Total (mg/L)	2		2.77	2.77
Beryllium, Total (mg/L)	0.004		0.0021	0.004
Cadmium, Total (mg/L)	0.005		0.00022	0.005
Chromium, Total (mg/L)	0.1		0.037	0.1
Cobalt, Total (mg/L)	n/a	0.006	0.018	0.018
Combined Radium, Total (pCi/L)	5		19.39	19.39
Fluoride, Total (mg/L)	4		4.39	4.39
Lead, Total (mg/L)	n/a	0.015	0.0087	0.015
Lithium, Total (mg/L)	n/a	0.04	0.16	0.16
Mercury, Total (mg/L)	0.002		0.00003	0.002
Molybdenum, Total (mg/L)	n/a	0.1	0.01	0.1
Selenium, Total (mg/L)	0.05		0.005	0.05
Thallium, Total (mg/L)	0.002		0.0016	0.002

**Grey cell indicates Background Limit is higher than MCL*

**GWPS = Groundwater Protection Standard*

**MCL = Maximum Contaminant Level*

**CCR = Coal Combustion Residuals*

FIGURE F
Confidence Intervals

Confidence Interval - Significant Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 7/15/2024, 8:47 PM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Barium (mg/L)	**SP-10**	**6.328**	**4.304**	**2.77**	**Yes**	**17**	**5.316**	**1.615**	**0**	**None**	**No**	**0.01**	**Param.**
Fluoride (mg/L)	**SP-10**	**6.84**	**5.59**	**4.39**	**Yes**	**27**	**5.928**	**2.24**	**11.11**	**None**	**No**	**0.01**	**NP (normality)**
Lithium (mg/L)	**SP-10**	**0.2767**	**0.2382**	**0.16**	**Yes**	**25**	**0.2574**	**0.03855**	**0**	**None**	**No**	**0.01**	**Param.**

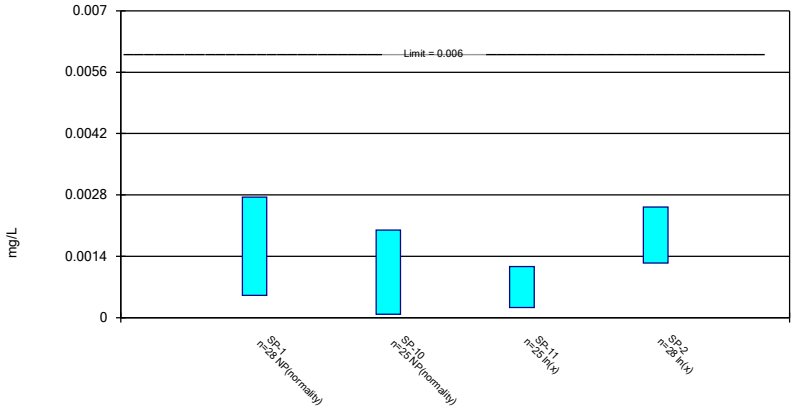
Confidence Interval - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 7/15/2024, 8:47 PM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Antimony (mg/L)	SP-1	0.00275	0.00051	0.006	No	28	0.002089	0.002112	25	None	No	0.01	NP (normality)
Antimony (mg/L)	SP-10	0.002	0.00008	0.006	No	25	0.001434	0.001901	16	None	No	0.01	NP (normality)
Antimony (mg/L)	SP-11	0.001166	0.0002267	0.006	No	25	0.001789	0.002768	12	None	ln(x)	0.01	Param.
Antimony (mg/L)	SP-2	0.002523	0.001244	0.006	No	28	0.00243	0.002457	7.143	None	ln(x)	0.01	Param.
Arsenic (mg/L)	SP-1	0.00211	0.00069	0.053	No	28	0.00222	0.002026	28.57	None	No	0.01	NP (normality)
Arsenic (mg/L)	SP-10	0.004427	0.001096	0.053	No	25	0.003562	0.004308	8	None	sqrt(x)	0.01	Param.
Arsenic (mg/L)	SP-11	0.004738	0.002322	0.053	No	25	0.003836	0.002823	4	None	sqrt(x)	0.01	Param.
Arsenic (mg/L)	SP-2	0.0025	0.00121	0.053	No	28	0.00242	0.002427	3.571	None	No	0.01	NP (normality)
Barium (mg/L)	SP-1	0.1955	0.1616	2.77	No	28	0.1799	0.03819	0	None	sqrt(x)	0.01	Param.
Barium (mg/L)	**SP-10**	**6.328**	**4.304**	**2.77**	**Yes**	**17**	**5.316**	**1.615**	**0**	**None**	**No**	**0.01**	**Param.**
Barium (mg/L)	SP-11	0.3908	0.188	2.77	No	17	0.3022	0.1711	0	None	sqrt(x)	0.01	Param.
Barium (mg/L)	SP-2	1.346	1.003	2.77	No	28	1.226	0.4734	0	None	ln(x)	0.01	Param.
Beryllium (mg/L)	SP-1	0.00014	0.000053	0.004	No	28	0.0002488	0.00036	17.86	None	No	0.01	NP (normality)
Beryllium (mg/L)	SP-10	0.00008	0.000027	0.004	No	25	0.0007262	0.001129	28	None	No	0.01	NP (normality)
Beryllium (mg/L)	SP-11	0.00025	0.000027	0.004	No	25	0.0001439	0.0001321	28	None	No	0.01	NP (normality)
Beryllium (mg/L)	SP-2	0.000131	0.00007	0.004	No	28	0.0001562	0.0001507	14.29	None	No	0.01	NP (normality)
Cadmium (mg/L)	SP-1	0.0001	0.000051	0.005	No	17	0.0001144	0.0001179	11.76	None	No	0.01	NP (normality)
Cadmium (mg/L)	SP-10	0.000089	0.000009	0.005	No	17	0.00005441	0.00007203	17.65	None	No	0.01	NP (normality)
Cadmium (mg/L)	SP-11	0.00015	0.00002	0.005	No	25	0.0004465	0.0009105	16	None	No	0.01	NP (normality)
Cadmium (mg/L)	SP-2	0.0005	0.00006	0.005	No	28	0.0002403	0.0002073	35.71	None	No	0.01	NP (normality)
Chromium (mg/L)	SP-1	0.001053	0.0005316	0.1	No	28	0.0009756	0.000661	21.43	Kapla...	sqrt(x)	0.01	Param.
Chromium (mg/L)	SP-10	0.0008933	0.0003188	0.1	No	24	0.0009951	0.001758	8.333	None	ln(x)	0.01	Param.
Chromium (mg/L)	SP-11	0.00276	0.00043	0.1	No	25	0.005618	0.01035	4	None	No	0.01	NP (normality)
Chromium (mg/L)	SP-2	0.00132	0.0005672	0.1	No	28	0.001136	0.00107	10.71	None	x^(1/3)	0.01	Param.
Cobalt (mg/L)	SP-1	0.001113	0.0004593	0.018	No	28	0.0009724	0.001094	10.71	None	x^(1/3)	0.01	Param.
Cobalt (mg/L)	SP-10	0.001555	0.0003315	0.018	No	25	0.001423	0.001764	8	None	x^(1/3)	0.01	Param.
Cobalt (mg/L)	SP-11	0.004135	0.001241	0.018	No	25	0.003621	0.00438	4	None	x^(1/3)	0.01	Param.
Cobalt (mg/L)	SP-2	0.00101	0.0004692	0.018	No	28	0.0008667	0.0007461	10.71	None	x^(1/3)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-1	4.367	3.18	19.39	No	27	3.773	1.245	0	None	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-10	17.05	8.242	19.39	No	25	12.65	8.836	0	None	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-11	2.426	1.208	19.39	No	24	1.958	1.403	0	None	sqrt(x)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-2	13.46	8.556	19.39	No	25	11.41	5.389	0	None	sqrt(x)	0.01	Param.
Fluoride (mg/L)	SP-1	0.9337	0.7039	4.39	No	28	0.8188	0.2459	7.143	None	No	0.01	Param.
Fluoride (mg/L)	**SP-10**	**6.84**	**5.59**	**4.39**	**Yes**	**27**	**5.928**	**2.24**	**11.11**	**None**	**No**	**0.01**	**NP (normality)**
Fluoride (mg/L)	SP-11	3.099	2.16	4.39	No	27	2.629	0.9845	0	None	No	0.01	Param.
Fluoride (mg/L)	SP-2	3.06	2.7	4.39	No	29	2.878	0.5483	0	None	No	0.01	NP (normality)
Lead (mg/L)	SP-1	0.00247	0.000254	0.015	No	28	0.001877	0.002074	28.57	None	No	0.01	NP (normality)
Lead (mg/L)	SP-10	0.0003	0.00007	0.015	No	17	0.0002489	0.0003009	11.76	None	No	0.01	NP (normality)
Lead (mg/L)	SP-11	0.001352	0.0002995	0.015	No	25	0.00179	0.002608	12	None	ln(x)	0.01	Param.
Lead (mg/L)	SP-2	0.00202	0.000245	0.015	No	28	0.001955	0.002181	32.14	None	No	0.01	NP (normality)
Lithium (mg/L)	SP-1	0.006375	0.004848	0.16	No	27	0.005612	0.0016	0	None	No	0.01	Param.
Lithium (mg/L)	**SP-10**	**0.2767**	**0.2382**	**0.16**	**Yes**	**25**	**0.2574**	**0.03855**	**0**	**None**	**No**	**0.01**	**Param.**
Lithium (mg/L)	SP-11	0.03851	0.02198	0.16	No	17	0.03024	0.01319	0	None	No	0.01	Param.
Lithium (mg/L)	SP-2	0.07999	0.05608	0.16	No	28	0.06804	0.02559	0	None	No	0.01	Param.
Mercury (mg/L)	SP-1	0.000009	0.000005	0.002	No	28	0.000006107	0.000003583	85.71	None	No	0.01	NP (NDs)
Mercury (mg/L)	SP-10	0.000013	0.000005	0.002	No	25	0.00000916	0.000007069	60	None	No	0.01	NP (NDs)
Mercury (mg/L)	SP-11	0.000009	0.000005	0.002	No	25	0.00001072	0.00001239	48	None	No	0.01	NP (normality)
Mercury (mg/L)	SP-2	0.000005	0.000005	0.002	No	28	0.000005393	0.000001707	85.71	None	No	0.01	NP (NDs)
Molybdenum (mg/L)	SP-1	0.01705	0.01182	0.1	No	28	0.01444	0.005594	0	None	No	0.01	Param.
Molybdenum (mg/L)	SP-10	0.0162	0.002499	0.1	No	24	0.01587	0.02733	4.167	None	x^(1/3)	0.01	Param.
Molybdenum (mg/L)	SP-11	0.04214	0.002	0.1	No	25	0.01793	0.02293	4	None	No	0.01	NP (normality)
Molybdenum (mg/L)	SP-2	0.02335	0.01718	0.1	No	17	0.02026	0.004918	0	None	No	0.01	Param.
Selenium (mg/L)	SP-1	0.006872	0.004079	0.05	No	28	0.005785	0.003346	10.71	None	sqrt(x)	0.01	Param.
Selenium (mg/L)	SP-10	0.0006702	0.0001095	0.05	No	25	0.001384	0.002107	40	Kapla...	ln(x)	0.01	Param.
Selenium (mg/L)	SP-11	0.001295	0.0003282	0.05	No	25	0.001613	0.00224	8	None	ln(x)	0.01	Param.
Selenium (mg/L)	SP-2	0.004617	0.002042	0.05	No	17	0.003511	0.002203	0	None	sqrt(x)	0.01	Param.
Thallium (mg/L)	SP-1	0.0005	0.00006	0.002	No	17	0.0003382	0.0004753	35.29	None	No	0.01	NP (normality)
Thallium (mg/L)	SP-10	0.0002	0.00004	0.002	No	17	0.0001906	0.00003881	94.12	None	No	0.01	NP (NDs)
Thallium (mg/L)	SP-11	0.0002	0.00003	0.002	No	17	0.00019	0.00004123	94.12	None	No	0.01	NP (NDs)
Thallium (mg/L)	SP-2	0.0002	0.00005	0.002	No	17	0.0001329	0.00007456	52.94	None	No	0.01	NP (NDs)

Parametric and Non-Parametric (NP) Confidence Interval

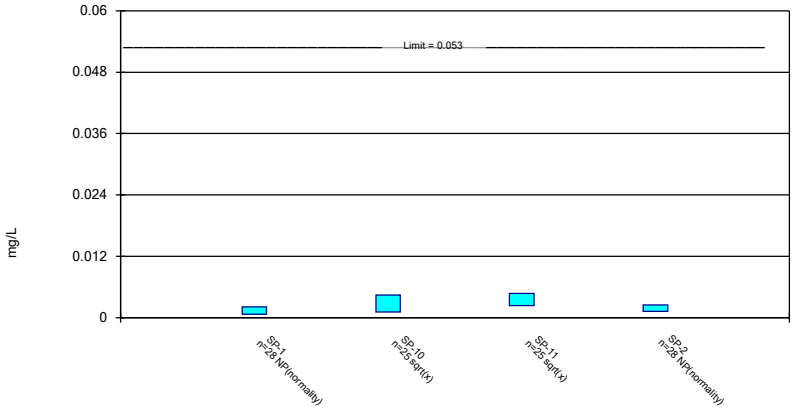
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Antimony Analysis Run 7/15/2024 8:45 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

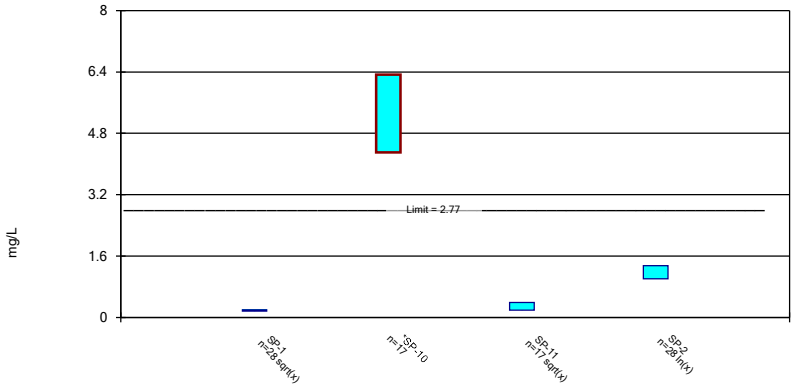
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Arsenic Analysis Run 7/15/2024 8:45 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

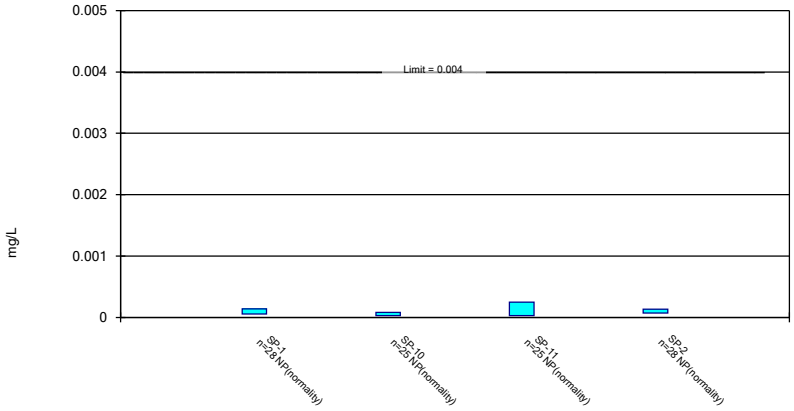
Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Barium Analysis Run 7/15/2024 8:45 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Non-Parametric Confidence Interval

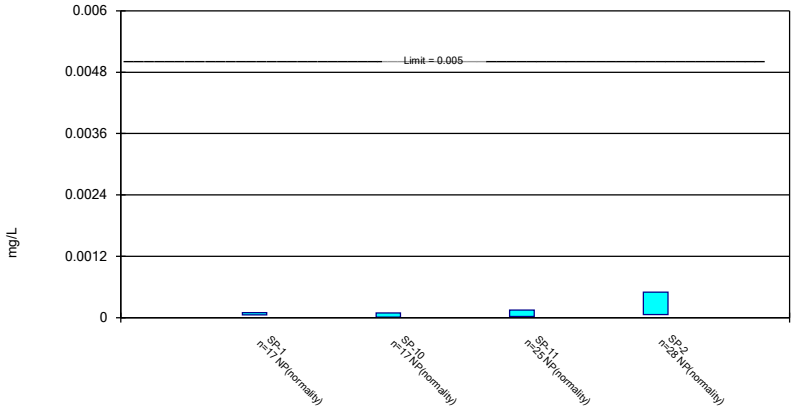
Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Beryllium Analysis Run 7/15/2024 8:45 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Non-Parametric Confidence Interval

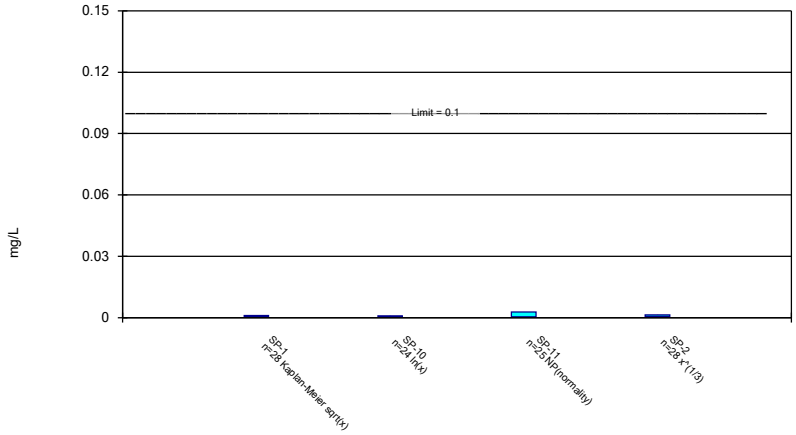
Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Cadmium Analysis Run 7/15/2024 8:45 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

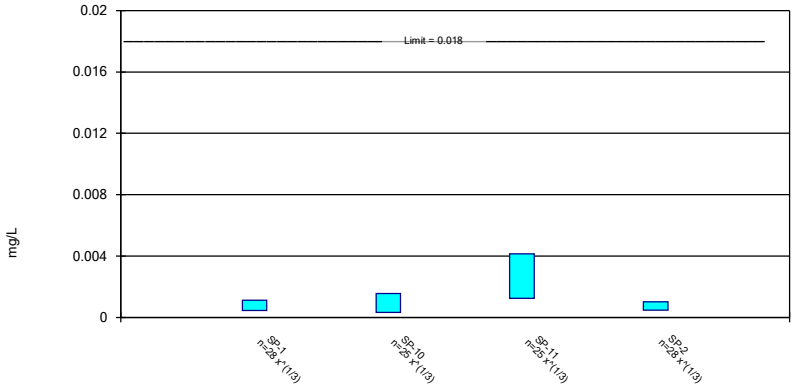
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Chromium Analysis Run 7/15/2024 8:45 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

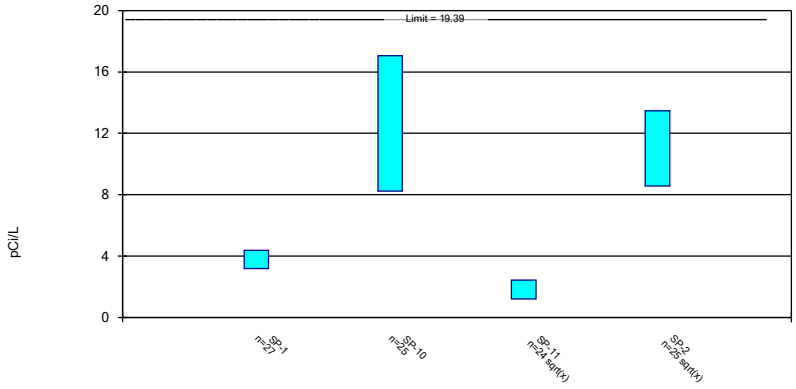
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Cobalt Analysis Run 7/15/2024 8:45 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

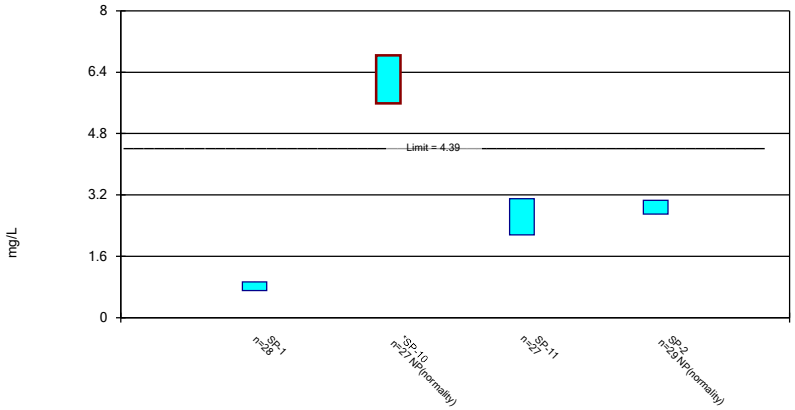
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Combined Radium 226 + 228 Analysis Run 7/15/2024 8:45 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

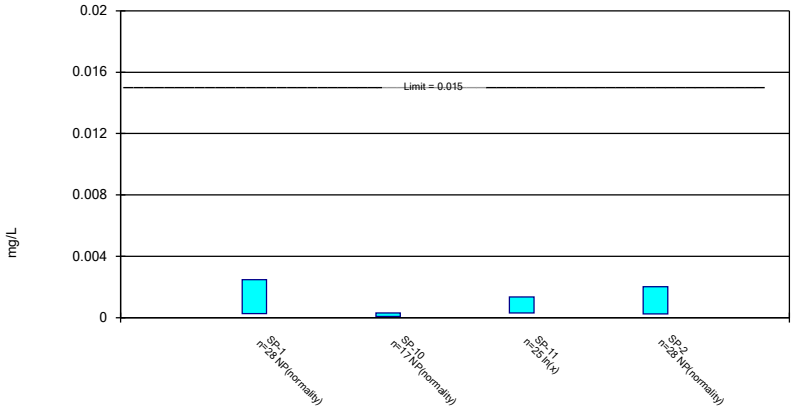
Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Fluoride Analysis Run 7/15/2024 8:45 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

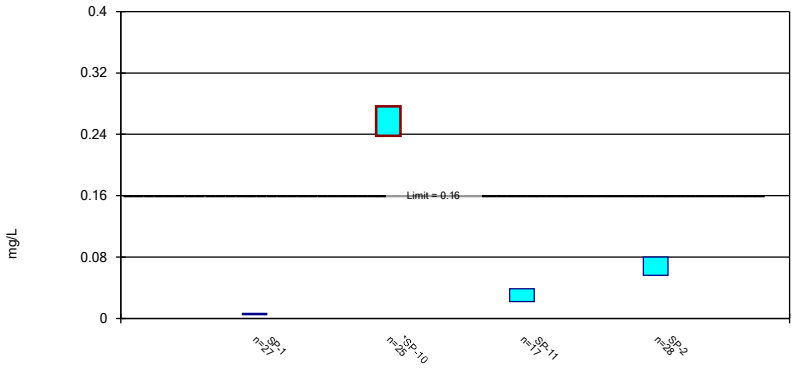
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Lead Analysis Run 7/15/2024 8:45 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

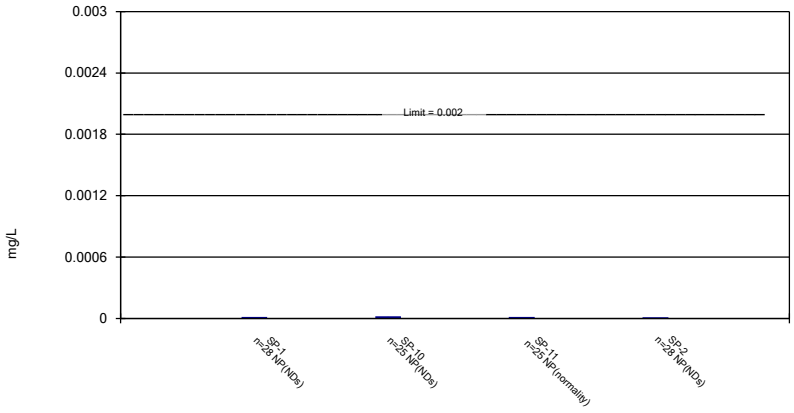
Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Lithium Analysis Run 7/15/2024 8:45 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Non-Parametric Confidence Interval

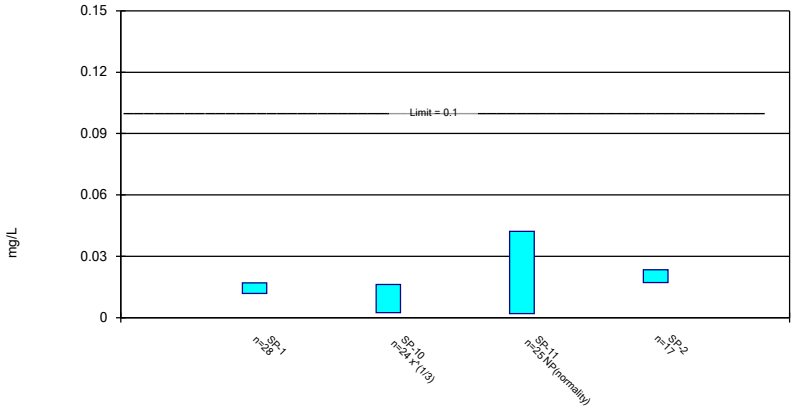
Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Mercury Analysis Run 7/15/2024 8:45 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Molybdenum Analysis Run 7/15/2024 8:45 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

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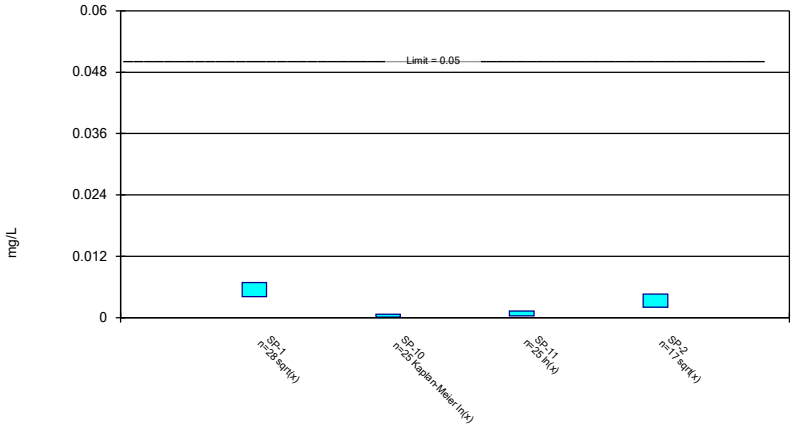
Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Selenium Analysis Run 7/15/2024 8:45 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

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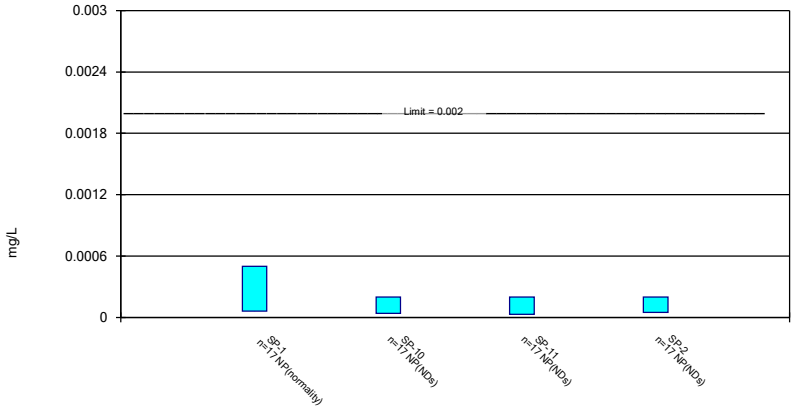
Non-Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Thallium Analysis Run 7/15/2024 8:45 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

FIGURE G

Trend Tests

Appendix IV Trend Test - Significant Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 7/15/2024, 8:49 PM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Xform	Alpha	Method
Barium (mg/L)	**SP-10**	**0.5476**	**51**	**49**	**Yes**	**17**	**0**	**n/a**	**n/a**	**0.05**	**NP**
Barium (mg/L)	**SP-5R (bg)**	**0.07298**	**142**	**101**	**Yes**	**28**	**0**	**n/a**	**n/a**	**0.05**	**NP**
Lithium (mg/L)	**SP-10**	**-0.01229**	**-139**	**-85**	**Yes**	**25**	**0**	**n/a**	**n/a**	**0.05**	**NP**
Lithium (mg/L)	**SP-4 (bg)**	**-0.001771**	**-57**	**-45**	**Yes**	**16**	**0**	**n/a**	**n/a**	**0.05**	**NP**
Lithium (mg/L)	**SP-5R (bg)**	**-0.005108**	**-182**	**-101**	**Yes**	**28**	**0**	**n/a**	**n/a**	**0.05**	**NP**

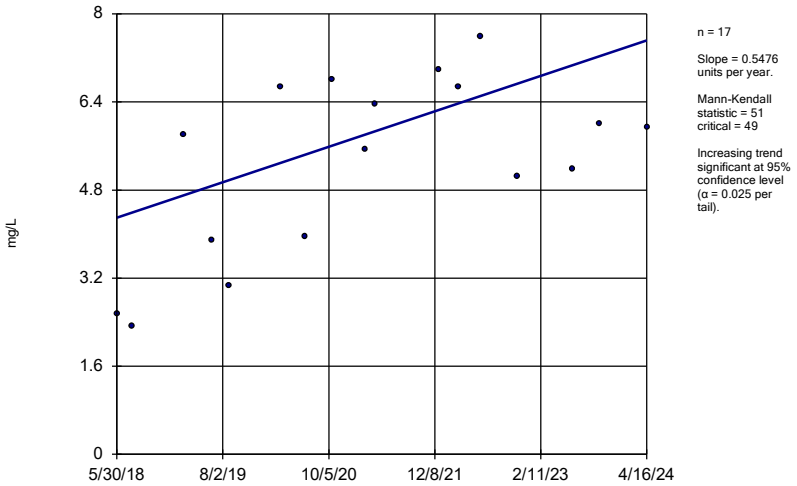
Appendix IV Trend Test - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 7/15/2024, 8:49 PM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Xform	Alpha	Method
Barium (mg/L)	**SP-10**	**0.5476**	**51**	**49**	**Yes**	**17**	**0**	**n/a**	**n/a**	**0.05**	**NP**
Barium (mg/L)	SP-4 (bg)	-0.01669	-38	-45	No	16	0	n/a	n/a	0.05	NP
Barium (mg/L)	**SP-5R (bg)**	**0.07298**	**142**	**101**	**Yes**	**28**	**0**	**n/a**	**n/a**	**0.05**	**NP**
Fluoride (mg/L)	SP-10	0.1122	43	96	No	27	11.11	n/a	n/a	0.05	NP
Fluoride (mg/L)	SP-4 (bg)	0.0001108	4	106	No	29	3.448	n/a	n/a	0.05	NP
Fluoride (mg/L)	SP-5R (bg)	0.004106	16	106	No	29	0	n/a	n/a	0.05	NP
Lithium (mg/L)	**SP-10**	**-0.01229**	**-139**	**-85**	**Yes**	**25**	**0**	**n/a**	**n/a**	**0.05**	**NP**
Lithium (mg/L)	**SP-4 (bg)**	**-0.001771**	**-57**	**-45**	**Yes**	**16**	**0**	**n/a**	**n/a**	**0.05**	**NP**
Lithium (mg/L)	**SP-5R (bg)**	**-0.005108**	**-182**	**-101**	**Yes**	**28**	**0**	**n/a**	**n/a**	**0.05**	**NP**

Sen's Slope Estimator

SP-10



n = 17

Slope = 0.5476 units per year.

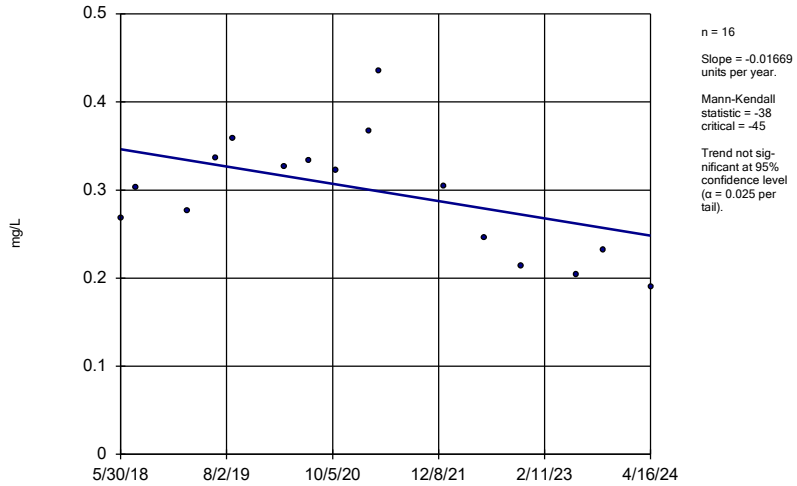
Mann-Kendall statistic = 51
critical = 49

Increasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Barium Analysis Run 7/15/2024 8:48 PM View: Appendix IV Trend Test
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sen's Slope Estimator

SP-4 (bg)



n = 16

Slope = -0.01669 units per year.

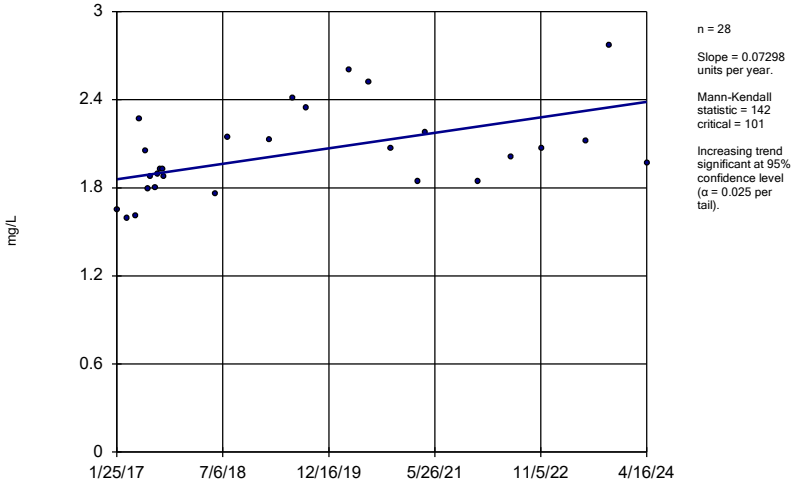
Mann-Kendall statistic = -38
critical = -45

Trend not significant at 95% confidence level (α = 0.025 per tail).

Constituent: Barium Analysis Run 7/15/2024 8:48 PM View: Appendix IV Trend Test
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sen's Slope Estimator

SP-5R (bg)



n = 28

Slope = 0.07298 units per year.

Mann-Kendall statistic = 142
critical = 101

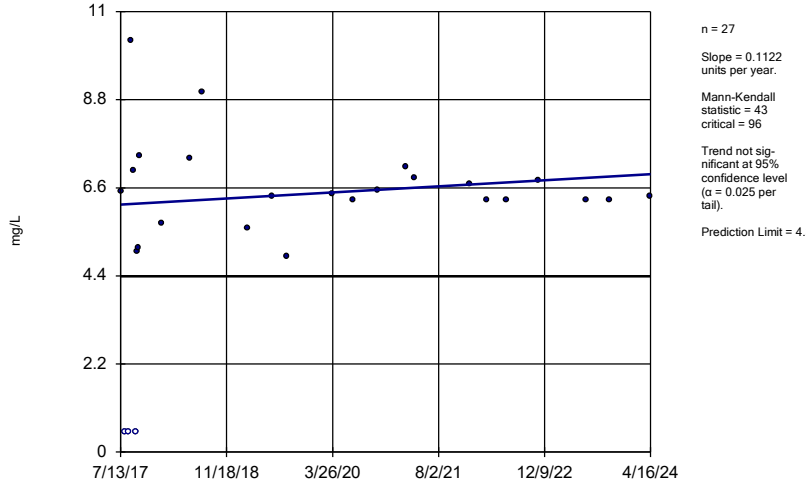
Increasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Barium Analysis Run 7/15/2024 8:48 PM View: Appendix IV Trend Test
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Hollow symbols indicate censored values.

Sen's Slope Estimator

SP-10



n = 27

Slope = 0.1122 units per year.

Mann-Kendall statistic = 43
critical = 96

Trend not significant at 95% confidence level (α = 0.025 per tail).

Prediction Limit = 4.39.

Constituent: Fluoride Analysis Run 7/15/2024 8:48 PM View: Appendix IV Trend Test
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

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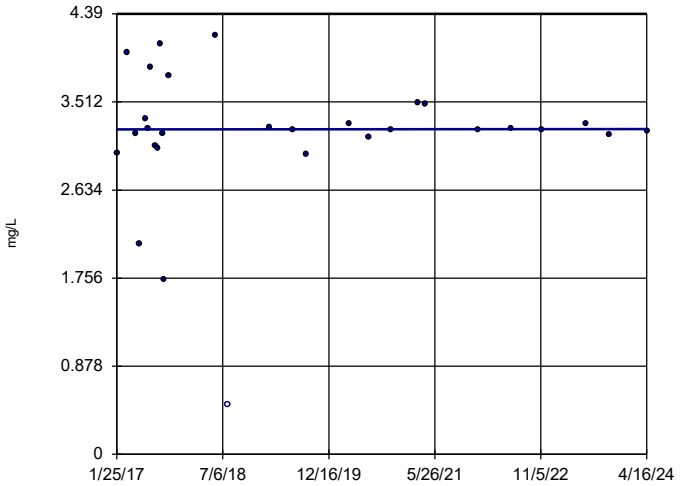
Hollow symbols indicate censored values.

Sen's Slope Estimator

SP-4 (bg)



n = 29

Slope = 0.0001108 units per year.

Mann-Kendall statistic = 4
critical = 106

Trend not significant at 95% confidence level (α = 0.025 per tail).

Prediction Limit = 4.39.

Constituent: Fluoride Analysis Run 7/15/2024 8:48 PM View: Appendix IV Trend Test

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

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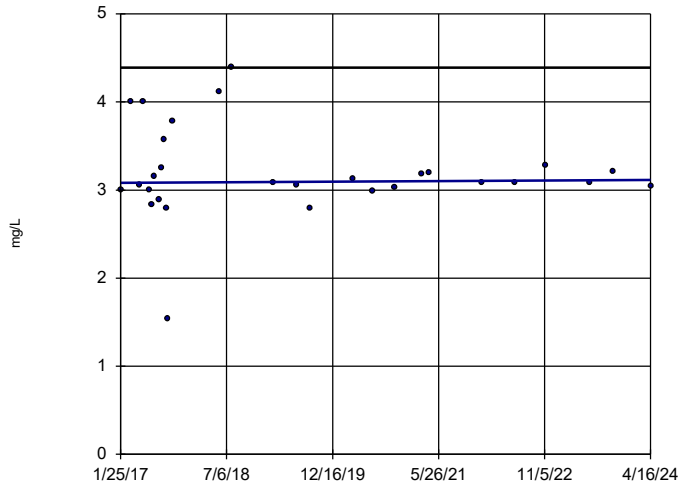
Sen's Slope Estimator

SP-5R (bg)



n = 29

Slope = 0.004106 units per year.

Mann-Kendall statistic = 16
critical = 106

Trend not significant at 95% confidence level (α = 0.025 per tail).

Prediction Limit = 4.39.

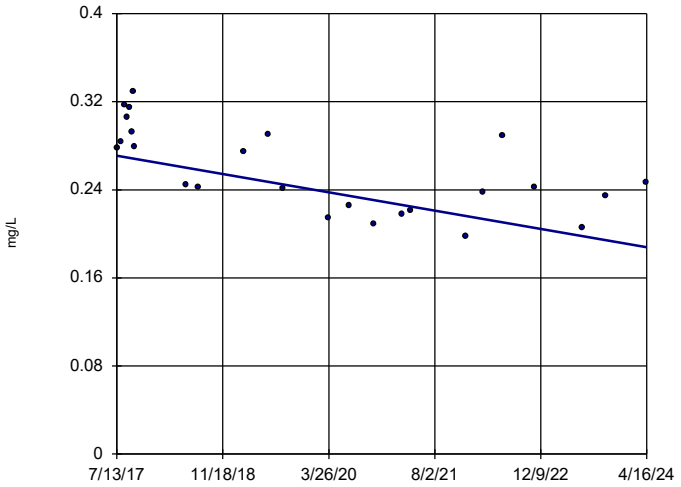
Constituent: Fluoride Analysis Run 7/15/2024 8:48 PM View: Appendix IV Trend Test

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.19h Software licensed to Groundwater Stats Consulting. UG

Sen's Slope Estimator

SP-10



n = 25

Slope = -0.01229 units per year.

Mann-Kendall statistic = -139
critical = -85

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

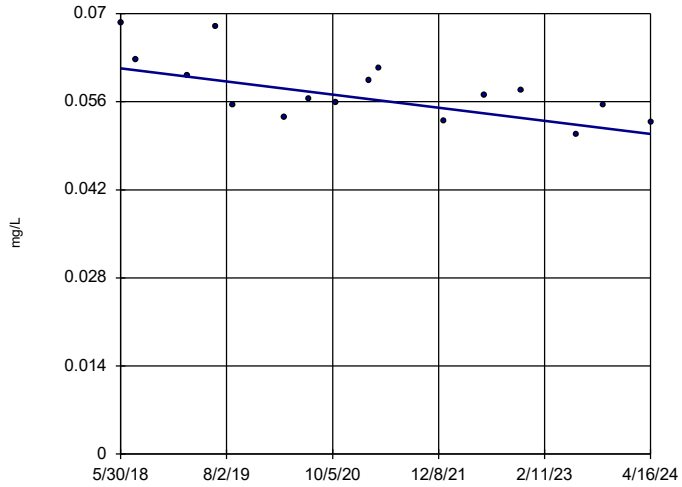
Constituent: Lithium Analysis Run 7/15/2024 8:48 PM View: Appendix IV Trend Test

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.19h Software licensed to Groundwater Stats Consulting. UG

Sen's Slope Estimator

SP-4 (bg)



n = 16

Slope = -0.001771 units per year.

Mann-Kendall statistic = -57
critical = -45

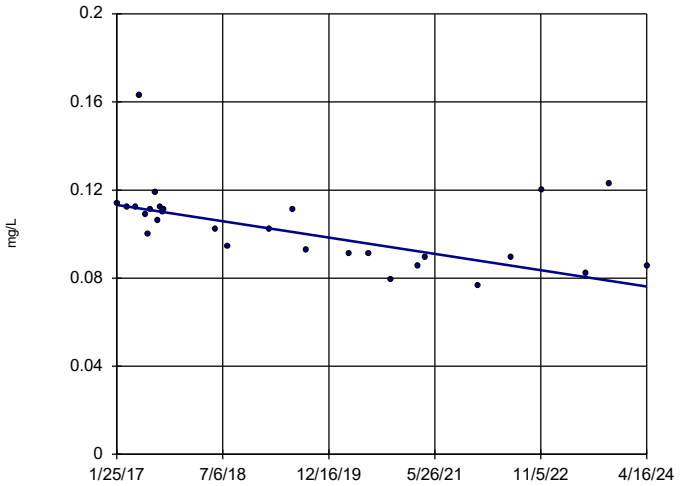
Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Lithium Analysis Run 7/15/2024 8:48 PM View: Appendix IV Trend Test

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sen's Slope Estimator

SP-5R (bg)



n = 28

Slope = -0.005108 units per year.

Mann-Kendall statistic = -182
critical = -101

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Lithium Analysis Run 7/15/2024 8:48 PM View: Appendix IV Trend Test
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

APPENDIX 3

Alternative Source Demonstrations

Scott A. Thompson
Executive Director

OKLAHOMA Environmental Quality

Kevin Stitt
Governor

February 22, 2024

Ms. Rebecca Jones, P.G.
American Electric Power
502 North Allen Avenue
Shreveport, LA 71101

Re: Alternate Source Demonstration for Barium, Fluoride and Lithium Exceedances –Bottom Ash Pond
Public Service Company of Oklahoma - Northeastern Power Station, Rogers County
Solid Waste Permit No. none

Dear Ms. Jones:

The Oklahoma Department of Environmental Quality received the Alternate Source Demonstration (ASD) dated January 2, 2024. The ASD was submitted by American Electric Power (AEP) Public Service Company of Oklahoma – Northeastern Power Station (PSO-NES) for the Bottom Ash Pond. During the June 20, 2023 sampling event, potential statistically significant levels (SSLs) were identified for lithium, barium, and fluoride in SP-10. The Lower Confidence Levels (LCL) for lithium, barium, and fluoride exceeded the Groundwater Protection Standards (GWPS). The detected concentrations for each constituent also exceeded their respective LCL.

On October 29, 2019, DEQ approved the revised ASD for lithium detected in monitoring well SP-10 for the BAP. The 2019 ASD proposed that naturally occurring lithium in the shale lenses was the source of the potential SSL. On June 4, 2021, DEQ approved an ASD for fluoride exceedances detected in SP-10 for the BAP. The 2021 ASD also proposed that naturally occurring fluoride in the shale lenses was the source of the potential SSL.

On September 20, 2022, DEQ approved the ASD for barium, lithium, and fluoride exceedances detected in SP-10. The 2022 ASD proposed that naturally occurring barium in the shale lenses was the source of the potential SSL. The 2022 ASD approval stated it is applicable for lithium, fluoride, and barium exceedances of the GWPS in SP-10 if conditions do not change.

The lithium and fluoride concentrations in SP-10 from the June 2023 sampling event are consistent with previous results and continue to show no statistically positive trends. However, the time-series plot and Mann-Kendall analysis of the reported barium concentration over time, indicate a statistically significant increasing trend.

The Piper Diagram continues to show that the SP-10 samples are chemically distinct from the BAP surface water, pore water, and sediment samples. The geochemistry at SP-10 does not change over time in a manner indicative of a release from the BAP. The June 2023 SP-10 sample concentration of barium was detected at 5.18 mg/L, far greater than the August 25, 2022 sample concentration from the leachate of bottom ash, detected at 0.22 mg/L.

AEP may refer to the ASD approval and continue assessment monitoring for the BAP in accordance with OAC 252:517-9-6(g)(3)(B). If exceedances of GWPSs are determined in other monitoring wells, AEP is required to submit a separate ASD for constituents in those monitoring wells if applicable.

The ASD for barium, fluoride, and lithium exceedances in SP-10 is accepted as submitted. If you have any questions, please contact Kaylee Daneshmand at (405) 702-5196 or at Kaylee.daneshmand@deq.ok.gov.

Sincerely,

Hillary Young, P.E.
Chief Engineer
Land Protection Division

HY/kd

American Electric Power
502 North Allen Avenue
Shreveport, LA 71101
AEP.com

January 2, 2024

Via electronic mail

Ms. Kaylee Daneshmand
Oklahoma Department of Environmental Quality (ODEQ)
707 North Robinson, P.O. Box 1677
Oklahoma City, OK 73101-1677

Re: Alternate Source Demonstration (ASD)
Bottom Ash Pond (BAP)
Public Service Company of Oklahoma (PSO) - Northeastern Power Station (NPS)
Roger County
Solid Waste Permit No. Pending

Dear Ms. Daneshmand,

AEP/PSO received ODEQ's correspondence dated July 12, 2023, in which ODEQ accepted the ASD for the lithium, fluoride, and barium detected in SP-10 during the May 24, 2023, sampling event. ODEQ indicated that if lithium, fluoride, and barium continue to exceed the groundwater protection standards (GWPS) in the future and conditions have not changed, NPS may refer to the October 24, 2019, ASD approval for lithium, June 4, 2021, ASD approval for fluoride, and to the March 9, 2023, ASD approval for barium and continue assessment monitoring for the BAP in accordance with OAC 252:517-9-6(g)(3)(B).

On October 4, 2023, the statistical evaluation of the first semi-annual 2023 assessment monitoring event (June 20, 2023) for the BAP was certified and in that statistical evaluation report, potential SSLs were identified for lithium, fluoride, and barium at SP-10.

The statistical findings are summarized as follows:

The Lower Confidence Level (LCL) for lithium (0.240 mg/L) exceeded the GWPS (a calculated Upper Tolerance Limit (UTL)) of 0.163 mg/L at SP-10. The actual detected lithium concentration in SP-10 was 0.206 mg/l.

The LCL for fluoride (5.36 mg/L) exceeded the GWPS (UTL of 4.39 mg/L) was exceeded as at SP-10. The actual detected fluoride concentration in SP-10 was 6.3 mg/L.

The LCL for barium (4.07 mg/L) exceeded the GWPS (UTL of 2.60 mg/L) was exceeded as at SP-10. The actual detected barium concentration in SP-10 was 5.18 mg/L.

Attached are the alternative source demonstrations for your review outlining the lines of evidence that these exceedances are the result of natural variations occurring in the groundwater at SP-10 and that the conditions at the BAP have not changed.

Please do not hesitate to contact me if you have any questions or would like to discuss. I can be reached by email at: rdjones2@aep.com or by phone at: (737) 330-3725.

Sincerely,

Rebecca D Jones

Rebecca D. Jones, P.G.

AEP, Environmental Specialist

Attachments

Geosyntec consultants

500 W. Wilson Bridge Rd, Suite 250
Worthington, Ohio 43085
PH 614.468.0421
www.geosyntec.com

Memorandum

Date:	December 28, 2023
To:	Rebecca Jones, American Electric Power (AEP)
From:	Beth Gross, PhD, PE (OK) and Allison Kreinberg, Geosyntec
Subject:	Alternative Source Demonstration Update Northeastern Power Station Bottom Ash Pond Oologah, Rogers County, Oklahoma

The Bottom Ash Pond (BAP) is a regulated coal combustion residual (CCR) management unit at the Northeastern Power Station (NPS) in Oologah, Oklahoma. A semiannual assessment monitoring event was completed at the BAP on June 20, 2023, in accordance with the assessment monitoring requirements of Oklahoma Administrative Code (OAC) 252:517-9-6. Analysis of the June 2023 data identified statistically significant levels (SSLs) above the groundwater protection standards (GWPSs) for lithium, fluoride, and barium at SP-10 (Attachment B). The following SSLs were identified at the Northeastern BAP:

- The lower confidence limit (LCL) for lithium exceeded the GWPS of 0.163 milligrams per liter (mg/L) at SP-10 (0.240 mg/L).
- The LCL for fluoride exceeded the GWPS of 4.39 mg/L at SP-10 (5.36 mg/L).
- The LCL for barium exceeded the GWPS of 2.60 mg/L at SP-10 (4.07 mg/L).

Key analytical results for samples collected from the BAP and from SP-10 are provided in **Table 1**. As described in previous alternative source demonstrations (ASDs) (Geosyntec 2019, Geosyntec 2021a, Geosyntec 2021b, Geosyntec 2021c, Geosyntec 2022, Geosyntec 2023a, Geosyntec 2023b), concentrations of lithium, fluoride, and barium in the BAP water (including pore water) and BAP sediments that are lower than concentrations observed at SP-10 suggest that the BAP is not the source of these exceedances. These previous ASDs demonstrate that the release of lithium from the clay minerals in the shale lens located at 46 feet below ground surface in the screened interval of SP-10 is the likely source of lithium in groundwater at that location. Analytical results suggest that naturally occurring barium and fluoride are also associated with the shale lenses and are contributing to aqueous barium and fluoride concentrations at SP-10.

The Oklahoma Department of Environmental Quality (DEQ) previously noted in a letter to the NPS dated June 4, 2021, that "[i]f lithium and fluoride continue to exceed their relative GWPS in the future and conditions have not changed, NPS may refer to the October 29, 2019 ASD approval

for lithium and this [June 4, 2021] approval for fluoride and continue assessment monitoring for the BAP in accordance with OAC 252:517-6(g)(3)(B)" (DEQ 2021). DEQ provided a similar letter to the NPS dated September 20, 2022, that indicated that the July 14, 2022 ASD "is applicable for the barium exceedance in SP-10 of the GWPS if conditions do not change. AEP may refer to the ASD approval for barium and continue assessment monitoring for the BAP in accordance with OAC 252:517-9-6(g)(3)(B)" (DEQ 2022). This ASD update presents an evaluation of the BAP for changing conditions that may affect previously approved ASDs for lithium, fluoride, and barium exceedances at SP-10.

The sample collected from the June 2023 monitoring event at SP-10 contained a lithium concentration of 0.206 mg/L, fluoride concentration of 6.3 mg/L, and barium concentration of 5.18 mg/L. The lithium concentration (**Figure 1**) and fluoride concentration (**Figure 2**) are consistent with previous results collected during the assessment monitoring period and continue to show no statistically significant positive trends. This is an indication that conditions have not changed substantially since the preceding ASD was submitted (Geosyntec 2023b), and the arguments presented in the previous ASDs are still valid. Thus, the lithium and fluoride concentrations at SP-10 during the June 2023 assessment monitoring event are not attributed to a release from the BAP.

A time series plot of the barium concentrations at SP-10 and a Mann-Kendall statistical analysis of the reported barium results over time are shown in **Figure 3**. The analysis determined that barium concentrations at SP-10 display a statistically significant increasing trend. However, based on a Piper diagram showing select events where the full suite of major cations and anions were sampled (**Figure 4**), the geochemistry at monitoring well SP-10 does not change over time in a manner indicative of a release from the BAP. The June 2023 sample is displayed on the plot as the purple triangle. **Figure 4** demonstrates that the geochemistry of SP-10 has remained consistent over the past several years, indicating that groundwater condition at SP-10 is geochemically stable.

The information above, as well as the information presented in previous ASDs (Geosyntec 2019, Geosyntec 2021a, Geosyntec 2021b, Geosyntec 2021c, Geosyntec 2022, Geosyntec 2023a, Geosyntec 2023b), continues to support the position that barium, fluoride, and lithium concentrations are a result of natural variation in the underlying lithology, including the presence of shale lenses containing barium, fluoride, and lithium within the screened interval at SP-10. Therefore, no further action is warranted, and the BAP will remain in the assessment monitoring program. Certification of this ASD memorandum by a qualified professional engineer is in Attachment A.

******

REFERENCES

DEQ. 2021. Alternate Source Demonstration for Fluoride and Lithium Exceedance – Bottom Ash Pond, Public Service Company of Oklahoma Northeastern Power Station, Rogers County. Oklahoma Department of Environmental Quality. June 4.

DEQ. 2022. Alternative Source Demonstration for Barium, Fluoride, and Lithium Exceedances – Bottom Ash Pond, Public Service Company of Oklahoma - Northeastern Power Station, Rogers County. Oklahoma Department of Environmental Quality. September 20.

Geosyntec. 2019. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. Geosyntec Consultants. April.

Geosyntec. 2021a. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. Geosyntec Consultants. January.

Geosyntec. 2021b. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. Geosyntec Consultants. May.

Geosyntec. 2021c. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. Geosyntec Consultants. October.

Geosyntec. 2022. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. Geosyntec Consultants. July.

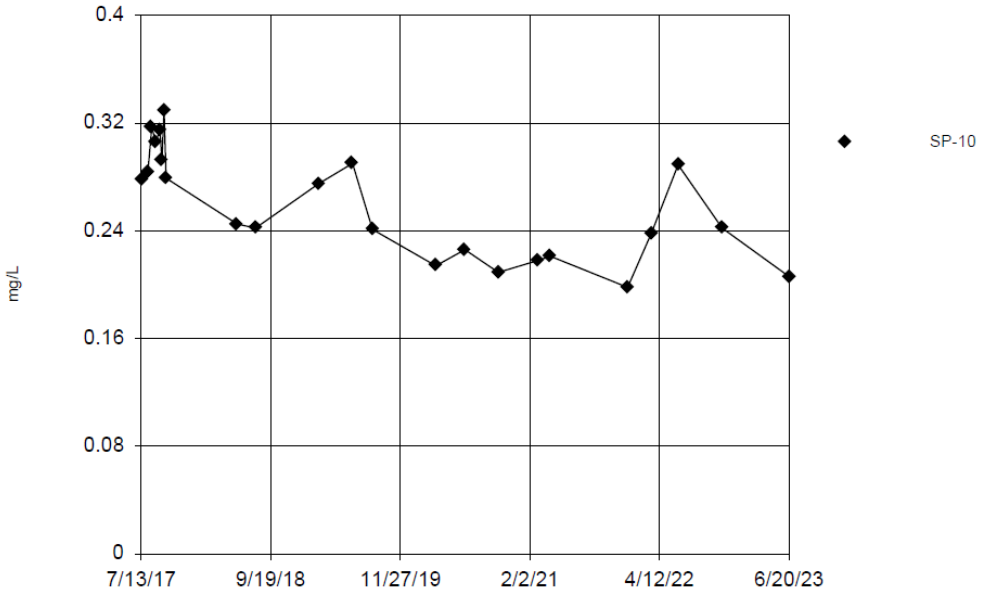
Geosyntec. 2023a. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. Geosyntec Consultants. January.

Geosyntec. 2023b. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. Geosyntec Consultants. May.

FIGURES

Sanitas™ v.10.0.15 Software licensed to Geosyntec Consultants, Inc. EPA

Time Series



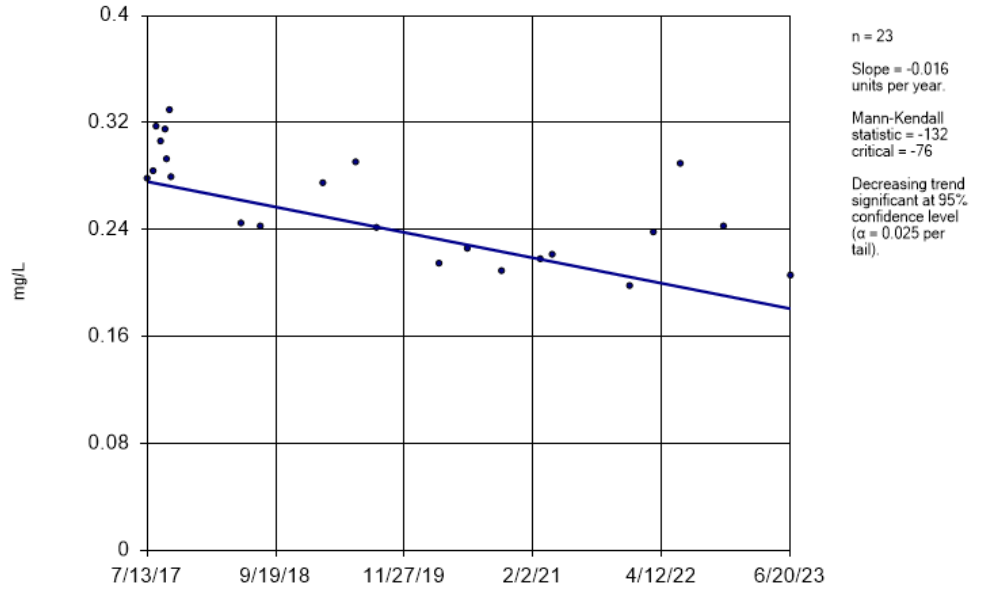
Constituent: Lithium Analysis Run 12/19/2023 2:29 PM

Northeastern Plant Client: AEP Data: 20231219_AEP_NE_BAP_ASD

Sanitas™ v.10.0.15 Software licensed to Geosyntec Consultants, Inc. EPA

Sen's Slope Estimator

SP-10



Constituent: Lithium Analysis Run 12/19/2023 3:04 PM

Northeastern Plant Client: AEP Data: 20231219_AEP_NE_BAP_ASD

Notes: Lithium results from monitoring well SP-10 are displayed on the plots.

AEP: American Electric Power
mg/L: milligrams per liter

Lithium Time Series and Trend Test: SP-10

Northeastern Bottom Ash Pond

Geosyntec consultants

AMERICAN ELECTRIC POWER

Figure 1

Columbus, Ohio

December 28, 2023

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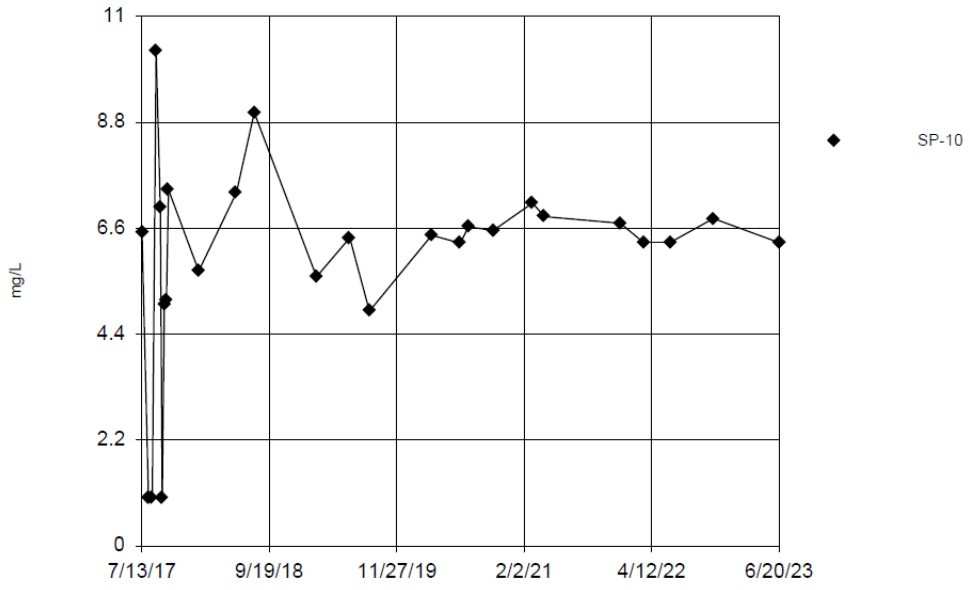
Time Series



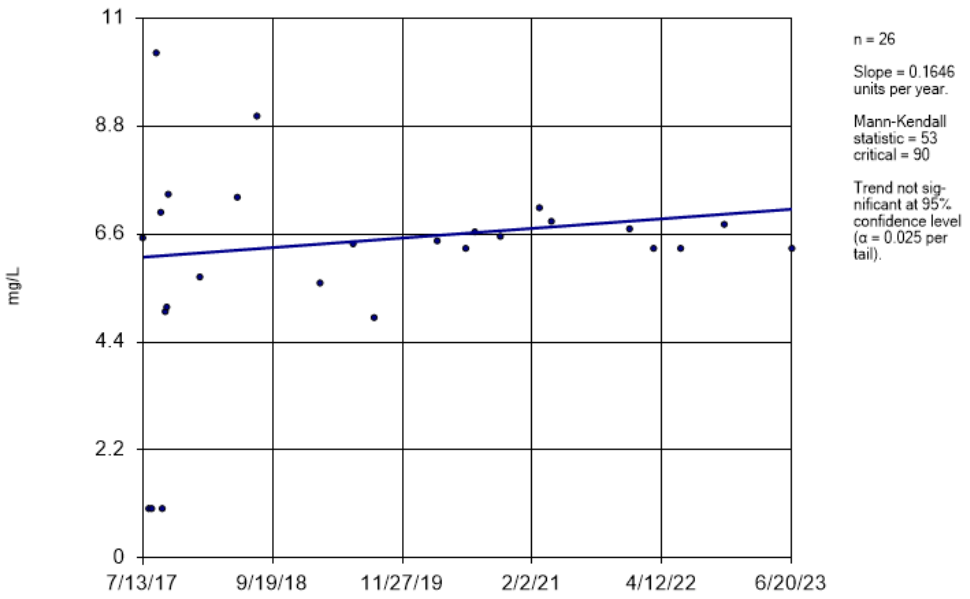
Constituent: Fluoride Analysis Run 12/18/2023 11:30 AM

Northeastern Plant Client: AEP Data: 20231218_AEP_NE_BAP_ASD

Sanitas™ v.10.0.15 Software licensed to Geosyntec Consultants, Inc. EPA

Sen's Slope Estimator

SP-10



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Northeastern Plant Client: AEP Data: 20231219_AEP_NE_BAP_ASD

Notes: Fluoride results from monitoring well SP-10 are displayed on the plots.

AEP: American Electric Power
mg/L: milligrams per liter

Fluoride Time Series and Trend Test: SP-10

Northeastern Bottom Ash Pond

Geosyntec consultants

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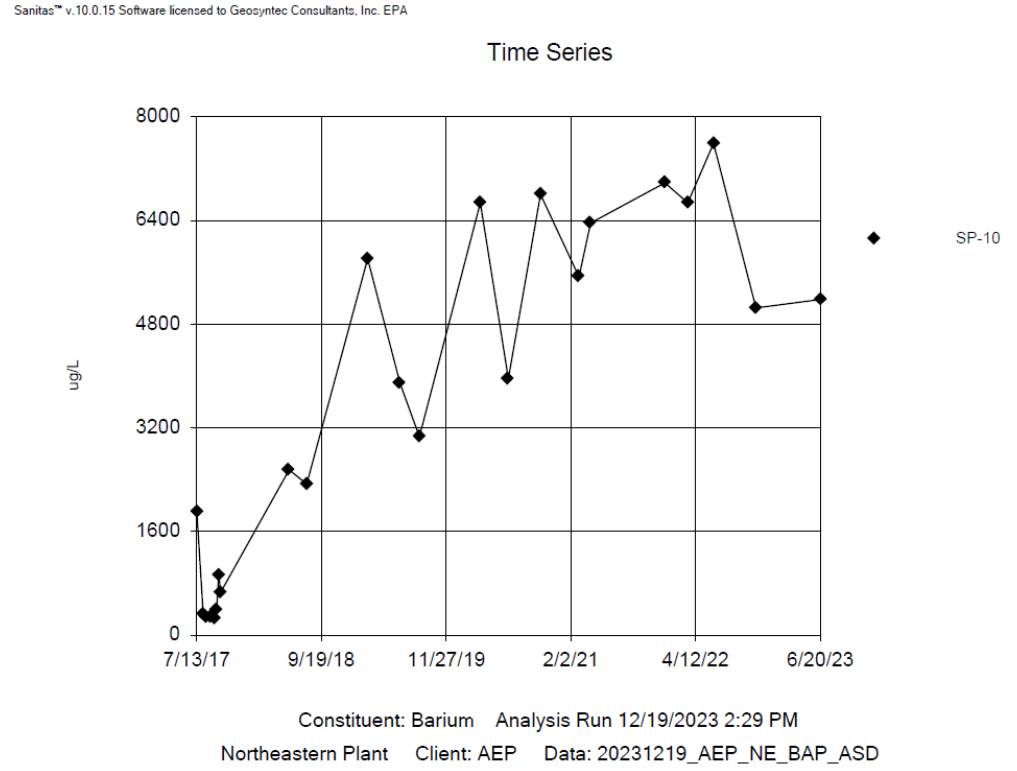
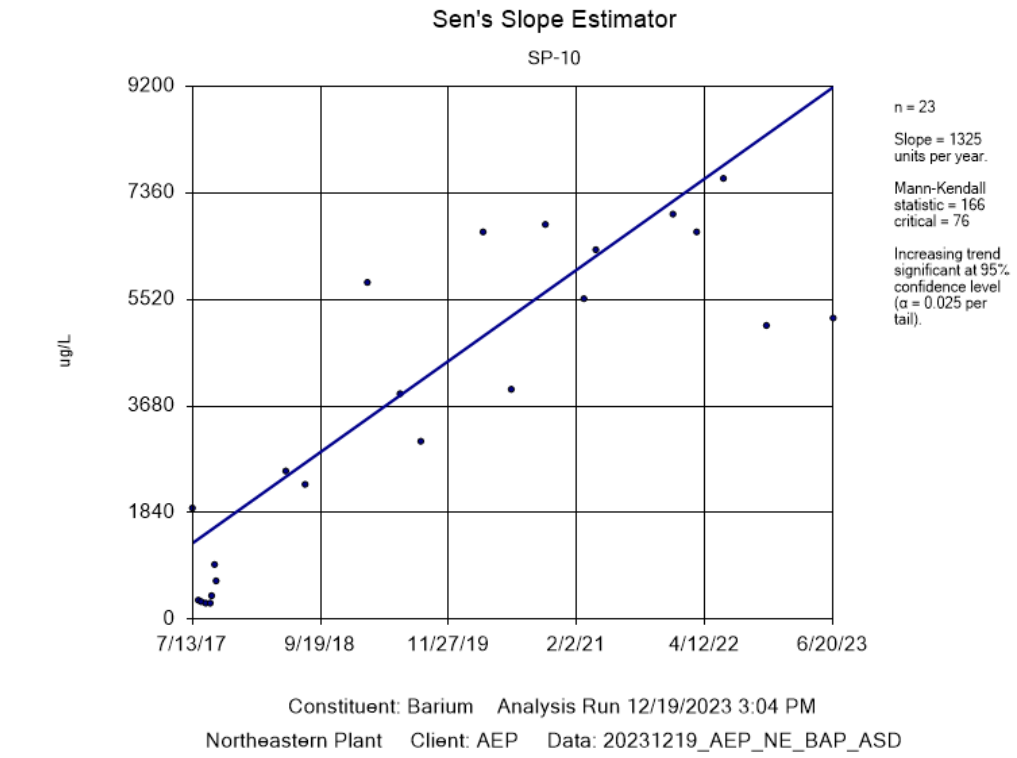
Figure **2**

Columbus, Ohio

December 28, 2023





Notes: Barium results from monitoring well SP-10 are displayed on the plots.

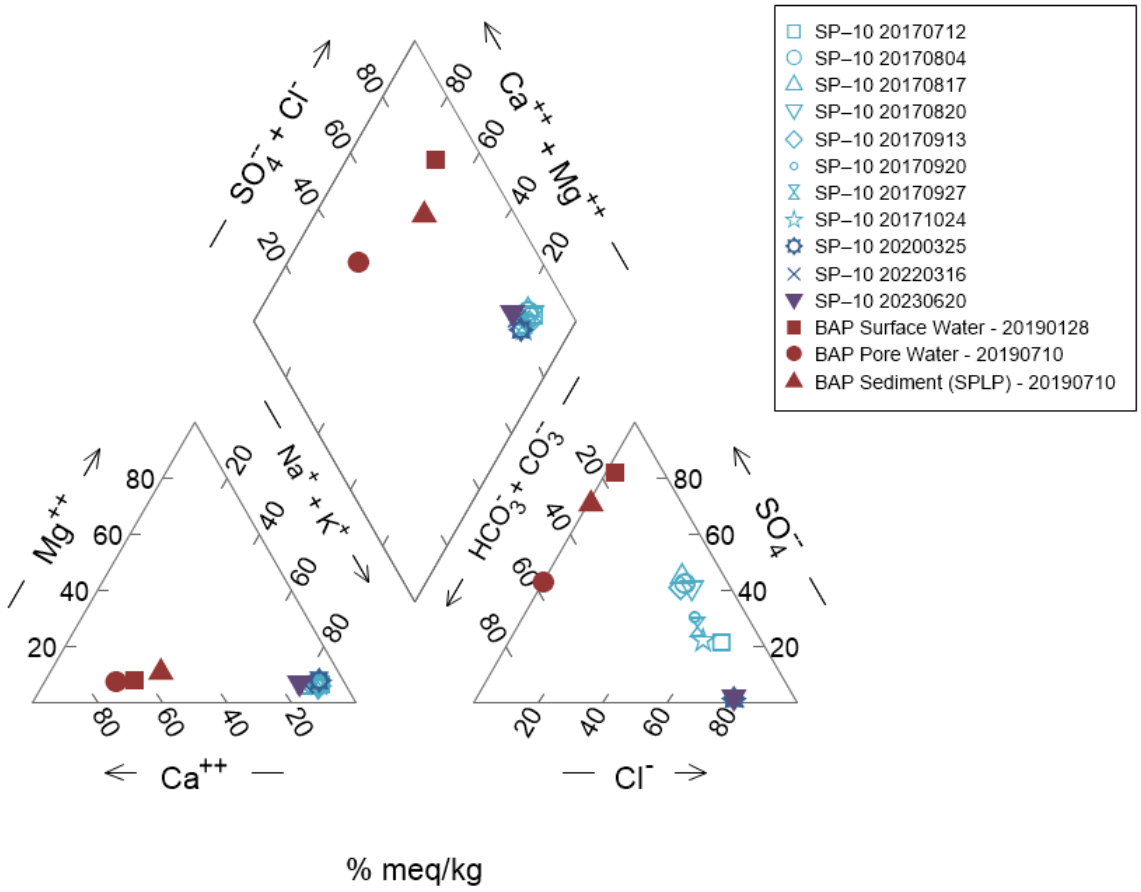
AEP: American Electric Power
ug/L: micrograms per liter

Barium Time Series and Trend Test: SP-10
Northeastern Bottom Ash Pond

Geosyntec consultants | AMERICAN ELECTRIC POWER

Columbus, Ohio | December 28, 2023

Figure 3



Notes:
AEP: American Electric Power
SPLP – synthetic precipitation leaching procedure
% meq/kg – percent milliequivalents per kilogram

Piper Diagram – SP-10 and BAP Samples
Northeastern Bottom Ash Pond

Geosyntec consultants

AMERICAN ELECTRIC POWER

Figure **4**

Columbus, Ohio

December 28, 2023

internal info: path, date revised, author

TABLES

Table 1. Summary of Key Analytical Data
Alternative Source Demonstration Update Memorandum
Northeastern Power Station Bottom Ash Pond, Oologah, Oklahoma

Sample	Sample Date	Lithium Concentration (mg/L)	Fluoride Concentration (mg/L)	Barium Concentration (mg/L)
SPLP Leachate of Bottom Ash	7/10/2019	0.001	0.458	0.352
	8/25/2022	< 0.5	NA	0.22
BAP Surface Water	2/5/2019	0.00874	0.37	0.315
BAP Pore Water	7/10/2019	0.003	< 0.83	0.083
SP-10 June 2023 Result	6/20/2023	0.206	6.3	5.18

Notes:
1. Nondetect results are shown as less than the reporting limit.
BAP: Bottom Ash Pond
mg/L: milligram per liter
NA: not analyzed
SPLP: synthetic precipitation leaching procedure

ATTACHMENT A

Certification by Qualified Professional Engineer

CERTIFICATION BY A QUALIFIED PROFESSIONAL ENGINEER

I certify that the above described alternative source demonstration is appropriate for evaluating the groundwater monitoring data for the Bottom Ash Pond CCR management area at the Northeastern Power Station and that the requirements of OAC 252:517-9-6(g)(3)(B) have been met.

Beth Ann Gross
Printed Name of Licensed Professional Engineer

Beth Ann Gross
Signature

Geosyntec Consultants
2039 Centre Pointe Boulevard, Suite 103
Tallahassee, Florida 32308

Oklahoma Firm Certificate of
Authorization No. 1996
Exp. 6/30/2024

18167	Oklahoma	12/29/2023
License Number	Licensing State	Date

* * * * *

ATTACHMENT B

Assessment Statistics Report

2023 First Semiannual Event

Geosyntec consultants

engineers | scientists | innovators

STATISTICAL ANALYSIS SUMMARY, BOTTOM ASH POND

Northeastern Power Station

Oologah, Oklahoma

Prepared for

American Electric Power
1 Riverside Plaza
Columbus, Ohio 43215-2372

Prepared by

Geosyntec Consultants, Inc.
500 West Wilson Bridge Road, Suite 250
Worthington, Ohio 43085

Project Number: CHA8500B

October 3, 2023

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ACRONYMS AND ABBREVIATIONS

ASD	alternative source demonstration
BAP	Bottom Ash Pond
CCR	coal combustion residuals
GWPS	groundwater protection standard
LCL	lower confidence limit
LPL	lower prediction limit
mg/L	milligrams per liter
NPS	Northeastern Power Station
OAC	Oklahoma Administrative Code
ODEQ	Oklahoma Department of Environmental Quality
QA/QC	quality assurance and quality control
SSI	statistically significant increase
SSL	statistically significant level
TDS	total dissolved solids
UPL	upper prediction limit

1. INTRODUCTION

In accordance with Oklahoma Department of Environmental Quality (ODEQ) requirements regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments (Oklahoma Administrative Code [OAC] 252:517), groundwater monitoring has been conducted at the Bottom Ash Pond (BAP), an existing CCR unit at the Northeastern Power Station (NPS) in Oologah, Oklahoma. Recent groundwater monitoring results were used to identify concentrations of Appendix B constituents that are above the groundwater protection standards (GWPSs).

Based on detection monitoring conducted in 2017 and 2018, statistically significant increases (SSIs) over background were concluded for boron, chloride, fluoride, total dissolved solids (TDS), and sulfate at the BAP. In addition, pH values below the lower prediction limit (LPL) resulted in SSIs below background as well. GWPSs were set in accordance with OAC 252:517-9-6(h) and a statistical evaluation of the assessment monitoring data was conducted.

An assessment monitoring event was conducted at the BAP in November 2022 in accordance with OAC 252:517-9-6(d). During the November 2022 assessment monitoring event, statistically significant levels (SSLs) were observed for barium, fluoride, and lithium (Geosyntec 2023a). An alternative source demonstration (ASD) was successfully completed (Geosyntec 2023b), and the unit therefore remained in assessment monitoring. One assessment monitoring event was conducted at the BAP in June 2023, in accordance with OAC 252:517-9-6(d). Results of this event are documented in this report.

Before the statistical analyses were conducted, the groundwater data underwent several validation tests, including those for completeness, sample tracking accuracy, transcription errors, and consistent use of measurement units. No data quality issues that would impact the usability of the data were identified.

The monitoring data were submitted to Groundwater Stats Consulting, LLC for statistical analysis. Confidence intervals were calculated for Appendix B parameters at the compliance wells to assess whether SSLs were present above previously established GWPSs. SSLs were identified for barium, fluoride, and lithium. Therefore, either the unit will move to an assessment of corrective measures or an ASD will be conducted to evaluate whether the unit can remain in assessment monitoring. Certification of the selected statistical methods by a qualified professional engineer is documented in Attachment A. The statistical analysis and certification of the selected methods were completed within 90 days of obtaining the data.

2. BOTTOM ASH POND EVALUATION

2.1 Data Validation and QA/QC

During the assessment monitoring program, one set of samples was collected in June 2023 for analysis from each upgradient and downgradient well to meet the requirements of OAC 252:517-9-6(d)(1). Samples from this sampling event were analyzed for both the Appendix A and Appendix B parameters. A summary of data collected during this assessment monitoring event may be found in Table 1. An additional sample was collected from SP-10 for dissolved Appendix B parameters based on a request from ODEQ (2023). The results for both the total and dissolved samples collected from SP-10 on June 20, 2023 are provided in Table 2.

Chemical analysis was completed by a National Environmental Laboratory Accreditation Program certified analytical laboratory. The laboratory completed analysis of quality assurance and quality control (QA/QC) samples such as laboratory reagent blanks, continuing calibration verification samples, and laboratory fortified blanks.

The analytical data were imported into a Microsoft Access database, where checks were completed to assess the accuracy of sample location identification and analyte identification. Where necessary, unit conversions were applied to standardize reported units across all sampling events. Exported data files were created for use with the Sanitas™ v.9.6.33 statistics software. The export file was checked against the analytical data for transcription errors and completeness. No QA/QC issues that would impact data usability were noted.

2.2 Statistical Analysis

Statistical analyses for the BAP were conducted in accordance with the November 2021 *Statistical Analysis Plan* (Geosyntec 2021) for the samples collected in June 2023. Time series plots and results for all completed statistical tests are provided in Attachment B.

The data obtained in June 2023 were screened for potential outliers. No outliers were identified for this event.

2.2.1 Evaluation of Potential Appendix B SSLs

A confidence interval was constructed for each Appendix B parameter at each compliance well. Confidence limits were generally calculated parametrically ($\alpha = 0.01$); however, nonparametric confidence limits were calculated in some cases (e.g., when the data did not appear to be normally distributed or when the nondetect frequency was too high). Select datasets were truncated if significant serial correlation was observed among the background samples that were collected on an approximately monthly basis in 2017. Additionally, the dataset for barium at SP-10 was truncated because earlier values were noted to be significantly lower than more recent results. A list of the truncated well/constituent pairs used for calculation of the confidence limits is provided in Attachment B.

An SSL was concluded if the lower confidence limit (LCL) was above the GWPS (i.e., if the entire confidence interval was above the GWPS). The calculated confidence limits (Attachment B) were compared to the GWPSs provided in Table 3. The GWPSs were established during a previous statistical analysis as either (a) the background concentration or (b) the maximum contaminant

level and risk-based levels specified in OAC 252:517-9-6(h), whichever was greater (Geosyntec 2023a).

The following SSLs were identified at the Northeastern BAP:

- The LCL for barium was above the GWPS of 2.60 milligrams per liter (mg/L) at SP-10 (4.07 mg/L).
- The LCL for fluoride was above the GWPS of 4.39 mg/L at SP-10 (5.36 mg/L).
- The LCL for lithium was above the GWPS of 0.163 mg/L at SP-10 (0.240 mg/L).

ODEQ previously noted in a letter provided to the NPS that "[i]f lithium and fluoride continue to exceed their relative GWPS in the future and conditions have not changed, NPS may refer to the October 29, 2019 ASD approval for lithium and June 4, 2021 approval for fluoride and continue assessment monitoring for the BAP in accordance with OAC 252:517-6(g)(3)(B)" (ODEQ 2021). ODEQ provided a similar letter dated September 20, 2022 documenting ASD approval for a barium SSL at SP-10 which is applicable in the future if conditions do not change (ODEQ 2022). Therefore, an ASD will be submitted to ODEQ demonstrating that conditions at the BAP remain unchanged so that the unit will continue assessment monitoring.

2.2.2 Evaluation of Potential Appendix A SSIs

While SSLs were identified, a review of the Appendix A results was also completed to assess whether concentrations of Appendix A parameters at the compliance wells were above background concentrations.

Data collected during the June 2023 assessment monitoring event from each compliance well were compared to previously calculated prediction limits to evaluate results above background values (Table 4). The following SSIs above the upper prediction limits (UPLs) were noted:

- Boron concentrations were above the interwell UPL of 0.503 mg/L at SP-10 (0.916 mg/L) and SP-11 (0.543 mg/L).
- Chloride concentrations were above the interwell UPL of 834 mg/L at SP-10 (1,960 mg/L).
- Fluoride concentrations were above the interwell UPL of 4.39 mg/L at SP-10 (6.3 mg/L).
- Sulfate concentrations were above the interwell UPL of 81.9 mg/L at SP-11 (358 mg/L).
- TDS concentrations were above the interwell UPL of 1,640 mg/L at SP-2 (1,780 mg/L) and SP-10 (3,500 mg/L).

While the prediction limits were calculated for a one-of-two retesting procedure, SSIs were conservatively assumed if the June 2023 sample was above the UPL or below the lower prediction limit. Based on these results, boron, chloride, fluoride, sulfate, and TDS concentrations were above background levels at compliance wells at the Northeastern BAP during assessment monitoring.

2.3 Conclusions

A semiannual assessment monitoring event was conducted in June 2023 in accordance with the CCR Rule. The laboratory and field data were reviewed prior to statistical analysis, and no QA/QC issues that impacted data usability were identified. A review of outliers identified no potential outliers in the June 2023 data. A confidence interval was constructed at each compliance well for each Appendix B parameter; SSLs were concluded if the entire confidence interval was above the GWPSs. SSLs were identified for barium, fluoride, and lithium. Appendix A parameters were compared to prediction limits, with concentrations of boron, chloride, fluoride, sulfate, and TDS above background levels.

Based on this evaluation, either the Northeastern BAP CCR unit will move to an assessment of corrective measures or an ASD will be conducted to evaluate whether the unit can remain in assessment monitoring.

3. REFERENCES

Geosyntec. 2021. *Statistical Analysis Plan – Northeastern Power Station*, *Oologah, Oklahoma*. Geosyntec Consultants, Inc. November.

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Geosyntec. 2023b. *Alternative Source Demonstration Report – State CCR Rule*, *Northeastern Power Station – Bottom Ash Pond, Oologah, Oklahoma*. Geosyntec Consultants, Inc. May.

ODEQ. 2021. Letter Transmittal – Alternate Source Demonstration for Fluoride and Lithium Exceedance – Bottom Ash Pond. Public Service Company of Oklahoma – Northeastern Power Station. Oklahoma Department of Environmental Quality. June.

ODEQ. 2022. Letter Transmittal – Alternate Source Demonstration for Barium, Fluoride, and Lithium Exceedance – Bottom Ash Pond. Public Service Company of Oklahoma – Northeastern Power Station. Oklahoma Department of Environmental Quality. September.

ODEQ. 2023. Letter Transmittal – Alternate Source Demonstration for Fluoride, and Lithium Exceedance – Bottom Ash Pond. Public Service Company of Oklahoma – Northeastern Power Station. Oklahoma Department of Environmental Quality. March.

TABLES

Table 1. Groundwater Data Summary
Statistical Analysis Summary
Northeastern Plant - Bottom Ash Pond

Parameter	Unit	SP-1	SP-2	SP-4	SP-5R	SP-10	SP-11
		6/20/2023	6/20/2023	6/20/2023	6/20/2023	6/20/2023	6/20/2023
Antimony	µg/L	0.491	0.957	0.192	0.230	0.083 J1	0.038 J1
Arsenic	µg/L	0.45	1.11	1.26	9.09	0.29	1.51
Barium	µg/L	145	989	204	2,120	5,180	102
Beryllium	µg/L	0.091	0.077	0.074	0.276	0.027 J1	0.025 J1
Boron	mg/L	0.158	0.105	0.323	0.191	0.916	0.543
Cadmium	µg/L	0.047	0.076	0.044	0.074	0.009 J1	0.020 U1
Calcium	mg/L	100	87.2	82.1	94.5	83.0	86.7
Chloride	mg/L	84.3	604	468	782	1,960	99.3
Chromium	µg/L	0.41	0.51	0.61	2.73	0.45	0.34
Cobalt	µg/L	0.174	0.326	0.470	1.18	0.146	0.717
Combined Radium	pCi/L	6.92	12.46	7.96	16.19	18.07	1.21
Fluoride	mg/L	0.82	3.02	3.29	3.09	6.3	1.43
Lead	µg/L	0.24	0.17 J1	0.21	2.11	0.09 J1	0.08 J1
Lithium	mg/L	0.0073	0.0326	0.0507	0.0822	0.206	0.0179
Mercury	µg/L	0.005 U1	0.005 U1	0.005 U1	0.005 U1	0.005 U1	0.005 U1
Molybdenum	µg/L	17.2	14.8	2.8	0.8	0.7	0.8
Selenium	µg/L	7.58	2.28	0.41 J1	0.91	0.5 U1	0.10 J1
Sulfate	mg/L	65.0	18.1	83.0	3.8	19.7	358
Thallium	µg/L	0.07 J1	0.03 J1	0.02 J1	0.05 J1	0.20 U1	0.20 U1
Total Dissolved Solids	mg/L	460	1,780	1,170	1,580	3,500	1,070
pH	SU	7.24	7.3	7.53	7.52	7.46	7.2

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
SU: standard unit
U: Nondetect value. For statistical analysis, parameters that were not detected were replaced with the reporting limit.
J: Estimated value. Parameter was detected in concentrations below the reporting limit.

Table 2. SP-10 Total v. Dissolved Data
Statistical Analysis Summary
Northeastern Plant - Bottom Ash Pond

Parameter	Unit	SP-10	
		Total	Dissolved
Antimony	µg/L	0.083 J1	0.089 J1
Arsenic	µg/L	0.29	0.40
Barium	µg/L	5,180	5,280
Beryllium	µg/L	0.027 J1	0.022 J1
Boron	mg/L	0.916	0.916
Cadmium	µg/L	0.009 J1	0.02 U1
Calcium	mg/L	83.0	128
Chromium	µg/L	0.45	0.18 J1
Cobalt	µg/L	0.146	0.065
Combined Radium	pCi/L	18.07	20.00
Fluoride	mg/L	6.3	6.3
Lead	µg/L	0.09 J1	0.20 U1
Lithium	mg/L	0.206	0.214
Mercury	µg/L	0.005 U1	0.005 U1
Molybdenum	µg/L	0.7	0.9
Selenium	µg/L	0.5 U1	0.05 J1
Thallium	µg/L	0.20 U1	0.20 U1

Notes:
1. Both samples were collected on 6/20/2023.
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
SU: standard unit
U: Nondetect value. For statistical analysis, parameters that were not detected were replaced with the reporting limit.
J: Estimated value. Parameter was detected in concentrations below the reporting limit.
-: Not analyzed

Table 3. Appendix B Groundwater Protection Standards
Statistical Analysis Summary
Northeastern Plant - Bottom Ash Pond

Geosyntec Consultants, Inc.

Constituent Name	MCL	CCR Rule-Specified	Calculated UTL	GWPS
Antimony, Total (mg/L)	0.00600		0.00570	0.00600
Arsenic, Total (mg/L)	0.0100		0.0599	0.0599
Barium, Total (mg/L)	2.00		2.60	2.60
Beryllium, Total (mg/L)	0.00400		0.00212	0.00400
Cadmium, Total (mg/L)	0.00500		0.00207	0.00500
Chromium, Total (mg/L)	0.100		0.00342	0.100
Cobalt, Total (mg/L)	n/a	0.00600	0.0179	0.0179
Combined Radium, Total (pCi/L)	5.00		15.8	15.8
Fluoride, Total (mg/L)	4.00		4.39	4.39
Lead, Total (mg/L)	n/a	0.0150	0.0107	0.0150
Lithium, Total (mg/L)	n/a	0.0400	0.163	0.163
Mercury, Total (mg/L)	0.00200		0.0000300	0.00200
Molybdenum, Total (mg/L)	n/a	0.100	0.0100	0.100
Selenium, Total (mg/L)	0.0500		0.00499	0.0500
Thallium, Total (mg/L)	0.00200		0.00162	0.00200

Notes:
1. Calculated UTL (Upper Tolerance Limit) represents site-specific background values.
2. Grey cells indicate the GWPS is based on the calculated UTL, which is higher than the MCL or CCR Rule-specified value.
CCR: Coal Combustion Residuals
GWPS: Groundwater Protection Standard
MCL: Maximum Contaminant Level
mg/L: milligrams per liter
pCi/L: picocuries per liter

Table 4. Appendix A Data Summary
Statistical Analysis Summary
Northeastern Plant - Bottom Ash Pond

Geosyntec Consultants, Inc.

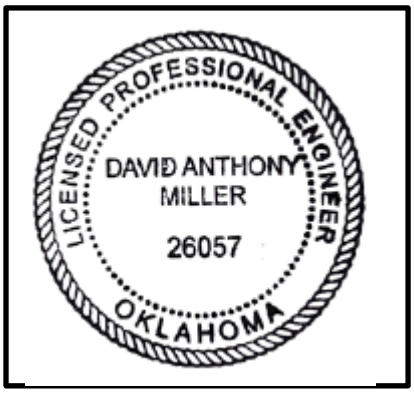
Analyte	Unit	Description	SP-1	SP-2	SP-10	SP-11
			6/20/2023	6/20/2023	6/20/2023	6/20/2023
Boron	mg/L	Interwell Background Value (UPL)	0.503			
		Analytical Result	0.158	0.105	**0.916**	**0.543**
Calcium	mg/L	Intrawell Background Value (UPL)	141	167		156
		Analytical Result	100	87.2	83.0	86.7
Chloride	mg/L	Interwell Background Value (UPL)	834			
		Analytical Result	84.3	604	**1,960**	99.3
Fluoride	mg/L	Interwell Background Value (UPL)	4.39			
		Analytical Result	0.82	3.02	**6.3**	1.43
pH	SU	Interwell Background Value (UPL)	9.1			
		Interwell Background Value (LPL)	7.0			
		Analytical Result	7.2	7.3	7.5	7.2
Sulfate	mg/L	Interwell Background Value (UPL)	81.9			
		Analytical Result	65.0	18.1	19.7	**358**
Total Dissolved Solids	mg/L	Interwell Background Value (UPL)	1,640			
		Analytical Result	460	**1,780**	**3,500**	1,070

Notes:
1. Bold values exceed the background value.
2. Background values are shaded gray.
LPL: lower prediction limit
mg/L: milligrams per liter
SU: standard units
UPL: upper prediction limit

ATTACHMENT A
Certification by Qualified Professional Engineer

Certification by Qualified Professional Engineer

I certify that selected and above described statistical method is appropriate for evaluating the groundwater monitoring data for the Northeastern Bottom Ash Pond CCR management area and that the requirements of OAC 252:517-9-4(g) have been met.



David Anthony Miller

Printed Name of Licensed Professional Engineer

David Anthony Miller

Signature

26057	Oklahoma	10.04.2023
License Number	Licensing State	Date

ATTACHMENT B
Statistical Analysis Output

GROUNDWATER STATS CONSULTING

August 7, 2023

Geosyntec Consultants
Attn: Ms. Allison Kreinberg
500 W. Wilson Bridge Road, Suite 250
Worthington, OH 43085

Re: Northeastern BAP (Bottom Ash Pond)
Assessment Monitoring Statistics – June 2023

Dear Ms. Kreinberg,

Groundwater Stats Consulting (GSC), formerly the statistical consulting division of Sanitas Technologies, is pleased to provide the June 2023 assessment monitoring analysis of groundwater data for American Electric Power Inc.'s Northeastern BAP. The analysis complies with the Oklahoma Administrative Code (OAC) as well as with the United States Environmental Protection Agency (USEPA) Unified Guidance (2009).

Sampling began at the site for the OAC program in 2017. The monitoring well network, as provided by Geosyntec Consultants, consists of the following:

- **Upgradient wells:** SP-4 and SP-5R
- **Downgradient wells:** SP-1, SP2, SP-10, and SP-11

Data were sent electronically, and the statistical analysis was conducted according to the Statistical Analysis Plan and screening evaluation prepared by GSC and approved by Dr. Kirk Cameron, PhD Statistician with MacStat Consulting, primary author of the USEPA Unified Guidance, and Senior Advisor to GSC. The analysis was reviewed by Andrew Collins, Project Manager of GSC.

The OAC program consists of the following constituents listed below. The terms "constituent" and "parameter" are interchangeable.

- **Appendix B** (Assessment Monitoring) **–** antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, combined radium 226 + 228, fluoride, lead, lithium, mercury, molybdenum, selenium, and thallium

For all constituents, a substitution of the most recent reporting limit is used for non-detect data. For several constituents, varying detection limits were present. Time series and box plots are provided for all wells for the parameters listed above (Figures A & B). The time series plots display concentrations over time for each well while the box plots provide visual representation of variation within a given well and across all wells.

Summary of Background Screening

Evaluation of Appendix B Parameters – November 2022

Prior to evaluating Appendix B parameters, background data are screened through visual screening and Tukey's outlier test for potential outliers and extreme trending patterns that would lead to artificially elevated statistical limits.

Outlier Analysis

For the current analysis, Tukey's outlier test on pooled upgradient well data identified outliers for fluoride, lead, mercury, and selenium and confirmed previously flagged values. Several of the values identified by Tukey's test were either similar to concentrations upgradient of the facility or were lower than the respective Maximum Contaminant Level (MCL); therefore, the values were not flagged as outliers. A summary of previously flagged outliers follows this report (Figure C).

During previous screenings, due to no variation in the data, Tukey's outlier test was not performed for cadmium in well SP-5R, mercury in all wells, selenium in well SP-5R, and thallium in all wells. Among upgradient wells, high values for cadmium, lead, and selenium were identified by Tukey's outlier test. Only the highest values for cadmium and lead were flagged as outliers to maintain statistical limits that are conservative from a regulatory perspective. Substantially high values were identified for upgradient well SP-4 on 8/4/17 through visual screening and the highest values for arsenic, beryllium, cobalt, and mercury were flagged. This step will result in upper tolerance limits that are conservative (lower) from a regulatory perspective. More recent concentrations for barium in downgradient well SP-10 were noted to be significantly higher than historical concentrations. Therefore,

earlier concentrations were previously deselected prior to constructing confidence intervals in order to evaluate present-day groundwater concentrations of barium at this well. As mentioned above, list of well/constituent pairs using a truncated portion of their records follows this report (Date Ranges Table).

Additionally, downgradient well data through November 2022 were screened through visual screening using time series graphs. Since the downgradient well data are used to construct confidence intervals, a regulatory conservative approach is taken in that values that are marginally high relative to the rest of the data are retained unless there is particular justification for excluding them. No additional outliers among downgradient wells were flagged during this analysis. Previously a high value for combined radium 226 + 228 in well SP-1 was flagged as an outlier. The following additional values were flagged as outliers as they did not adequately represent the populations at their respective wells: chromium in well SP-10; combined radium 226 + 228 in well SP-11; lithium in well SP-1; and molybdenum in well SP-10.

Rank Von Neumann

As mentioned above, background samples were collected approximately on a monthly basis during 2017 at all wells for Appendix B constituents. Since the EPA Unified Guidance recommends collection of independent groundwater samples, the Rank Von Neumann test for serial correlation was used to determine whether serial correlation was present among these earlier samples. Significant serial correlation was identified for the following Appendix B well/constituent pairs:

- Barium: SP-4 (upgradient) and SP-11
- Cadmium: SP-4 and SP-5R (both upgradient), SP-1, and SP-10
- Chromium: SP-4 (upgradient)
- Lead: SP-10
- Lithium: SP-4 (upgradient) and SP-11
- Molybdenum: SP-2
- Selenium: SP-5R (upgradient) and SP-2
- Thallium: SP-4 and SP-5R (both upgradient), SP-1, SP-2, SP-10, and SP-11

As a result, the records for these well/constituent pairs were truncated to remove earlier measurements for construction of statistical limits using only more recent data that represent independent samples. Results of the Rank Von Neumann test were included with the previous update.

Tolerance Limits

Parametric tolerance limits were used to calculate background limits from pooled upgradient well data through November 2022 for Appendix B parameters with a target of 95% confidence and 95% coverage to determine background limits. These limits will be updated on an annual basis at the end of each year and will be updated again at the end of 2023. The confidence and coverage levels for nonparametric tolerance limits are dependent upon the number of background samples. These limits were compared to the MCLs and background limits in the Groundwater Protection Standard (GWPS) table following this letter to determine the highest limit for use as the GWPS in the Confidence Interval comparisons (Figure D).

Groundwater Protection Standards

The upper tolerance limits were compared to the Maximum Contaminant Levels (MCLs) and background limits in the Groundwater Protection Standard (GWPS) table following this letter to determine the highest limit for use as the GWPS in the Confidence Interval comparisons (Figure E).

Evaluation of Appendix B Parameters – June 2023

For Appendix B parameters, confidence intervals for each downgradient well/constituent were compared against corresponding Groundwater Protection Standards (GWPS). GWPS were developed as described below. Downgradient well/constituent pairs that have 100% non-detects do not require analysis; however, no downgradient wells had 100% non-detects, and all well/constituent pairs were eligible for confidence intervals.

Confidence Intervals

Confidence intervals were then constructed on downgradient wells with data through June 2023 for each of the Appendix B parameters using the highest limit of the MCL or background limit as discussed above for the GWPS (Figure F). As mentioned above, the most recent reporting limit is substituted for historical non-detects within a given well, and the reporting limits vary among individual wells. These intervals were constructed as either parametric or nonparametric confidence intervals depending on the data distribution and percentage of non-detects.

When data followed a normal or transformed-normal distribution, parametric confidence intervals were used for Appendix B parameters. Nonparametric confidence intervals, which use the largest and smallest order statistics depending on the sample size as

interval limits, were constructed when data did not follow a normal or transformed-normal distribution or when there were greater than 50% non-detects. The lower confidence limit, which is constructed with 99% confidence for parametric confidence intervals, is compared to the GWPS prepared as described above. The confidence level associated with nonparametric confidence intervals is dependent upon the number samples available.

Only when the entire confidence interval is above a GWPS is the well/constituent pair considered to exceed its respective standard. A summary of the confidence interval results follows this letter. Exceedances were found for the following well/constituent pairs:

- Barium: SP-10
- Fluoride: SP-10
- Lithium: SP-10

Thank you for the opportunity to assist you in the statistical analysis of groundwater quality for the Northeastern BAP. If you have any questions or comments, please feel free to contact us.

For Groundwater Stats Consulting,

Tristan Clark
Groundwater Analyst

Andrew Collins
Project Manager

Date Ranges

Date: 8/5/2023 4:44 PM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Barium (mg/L)
- SP-10 overall:5/30/2018-6/20/2023
- SP-11 overall:5/30/2018-6/20/2023
- SP-4 overall:5/30/2018-6/20/2023

Cadmium (mg/L)
- SP-1 overall:5/30/2018-6/20/2023
- SP-10 overall:5/30/2018-6/20/2023
- SP-4 overall:5/30/2018-6/20/2023
- SP-5R overall:5/30/2018-6/20/2023

Calcium (mg/L)
- SP-11 background:7/30/2018-6/20/2023
- SP-4 overall:1/22/2018-6/20/2023

Chromium (mg/L)
- SP-4 overall:5/30/2018-6/20/2023

Lead (mg/L)
- SP-10 overall:5/30/2018-6/20/2023

Lithium (mg/L)
- SP-11 overall:5/30/2018-6/20/2023
- SP-4 overall:5/30/2018-6/20/2023

Molybdenum (mg/L)
- SP-2 overall:5/30/2018-6/20/2023

Selenium (mg/L)
- SP-2 overall:5/30/2018-6/20/2023
- SP-5R overall:5/30/2018-6/20/2023

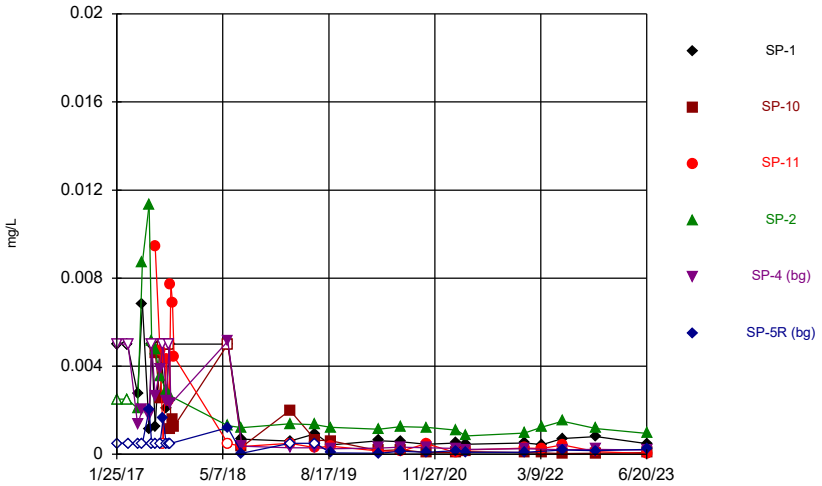
Sulfate (mg/L)
- SP-4 overall:5/30/2018-6/20/2023
- SP-5R overall:5/30/2018-6/20/2023

Thallium (mg/L)
- overall:5/30/2018-6/20/2023

FIGURE A
Time Series

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

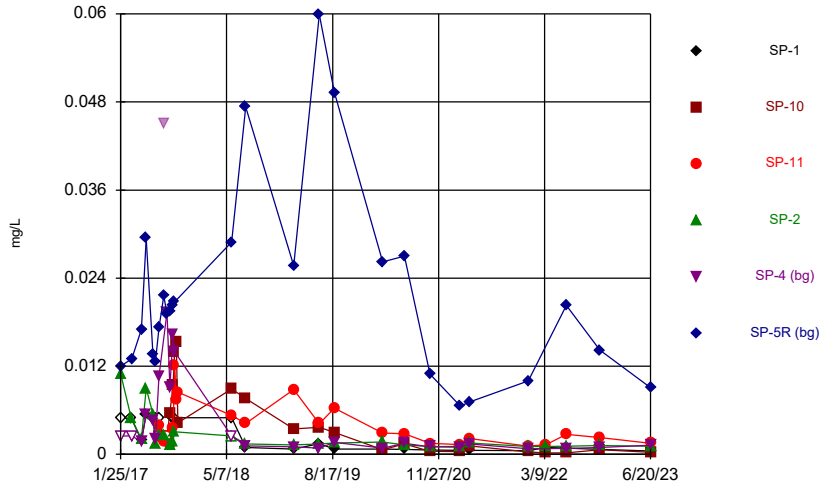
Time Series



Constituent: Antimony Analysis Run 8/3/2023 4:42 PM View: Appendix B
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

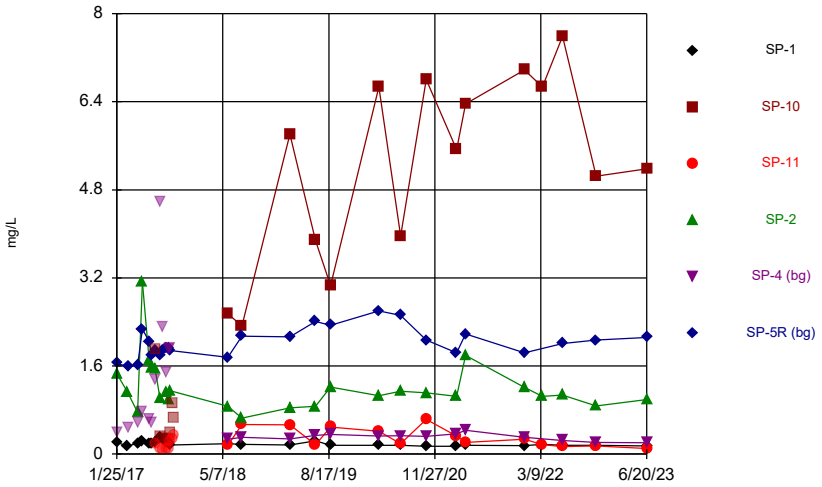
Time Series



Constituent: Arsenic Analysis Run 8/3/2023 4:42 PM View: Appendix B
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



Constituent: Barium Analysis Run 8/3/2023 4:42 PM View: Appendix B
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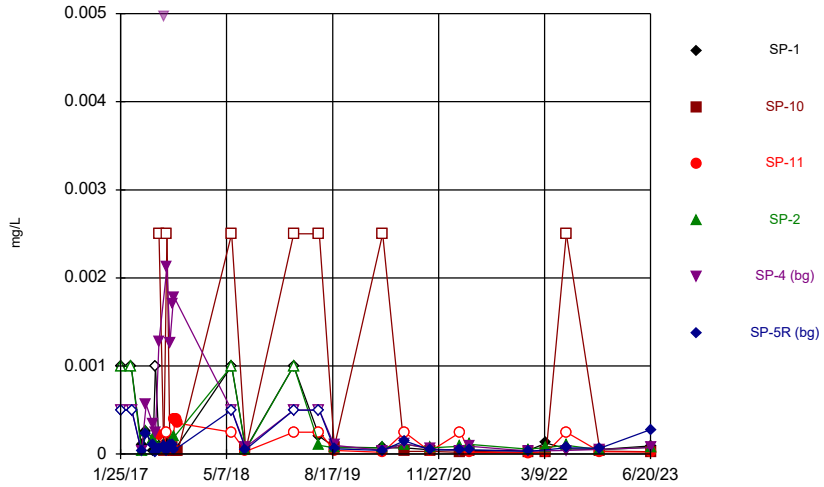
Hollow symbols indicate censored values.

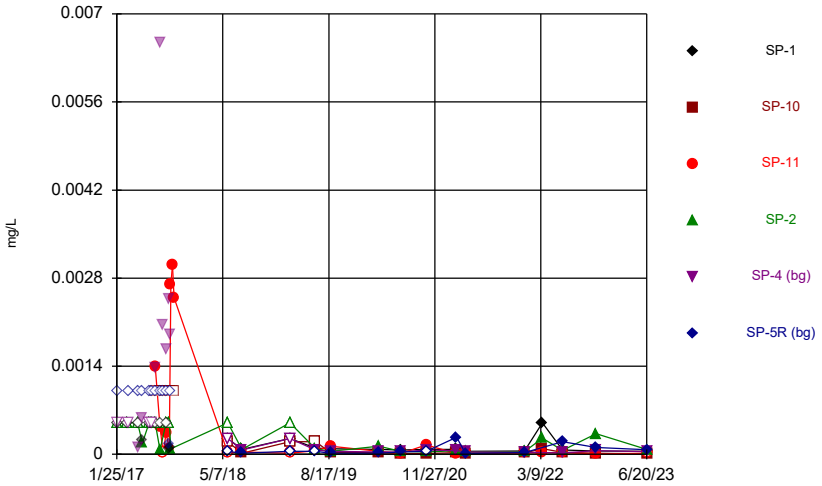
Time Series



Constituent: Beryllium Analysis Run 8/3/2023 4:42 PM View: Appendix B
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

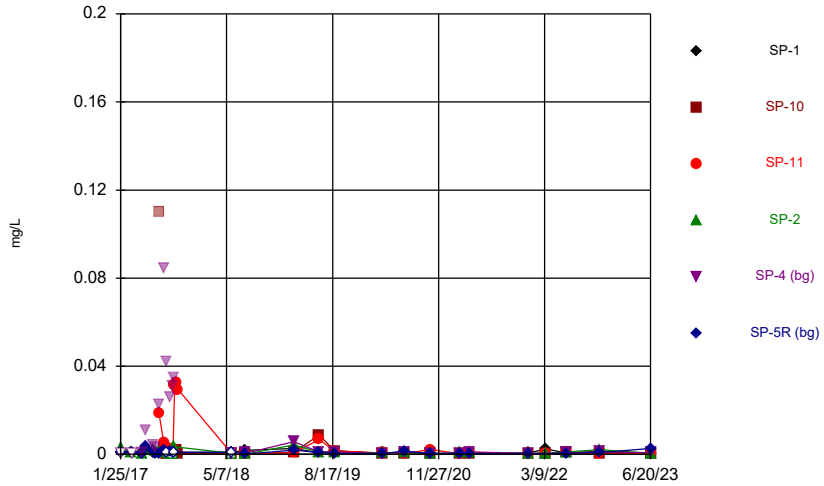
Time Series



Constituent: Cadmium Analysis Run 8/3/2023 4:42 PM View: Appendix B
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

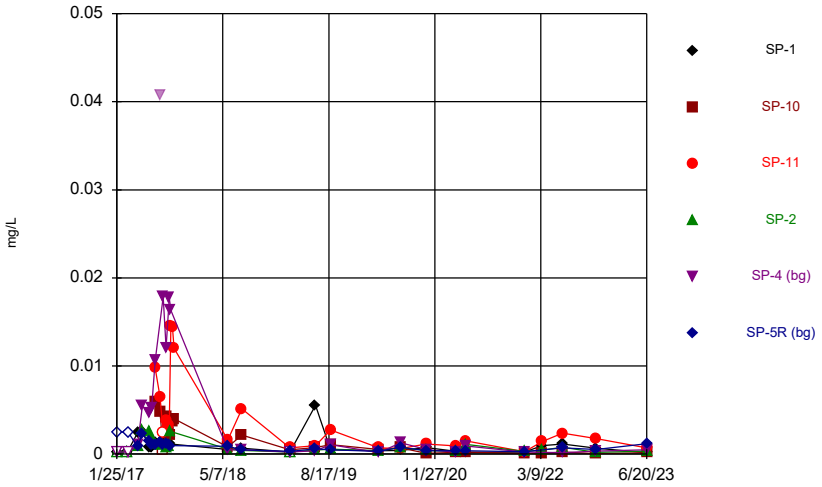
Time Series



Constituent: Chromium Analysis Run 8/3/2023 4:42 PM View: Appendix B
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

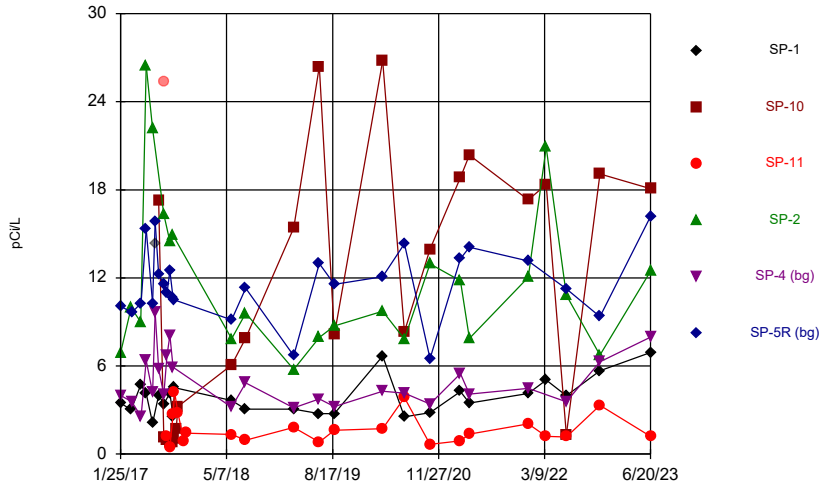
Time Series



Constituent: Cobalt Analysis Run 8/3/2023 4:42 PM View: Appendix B
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG

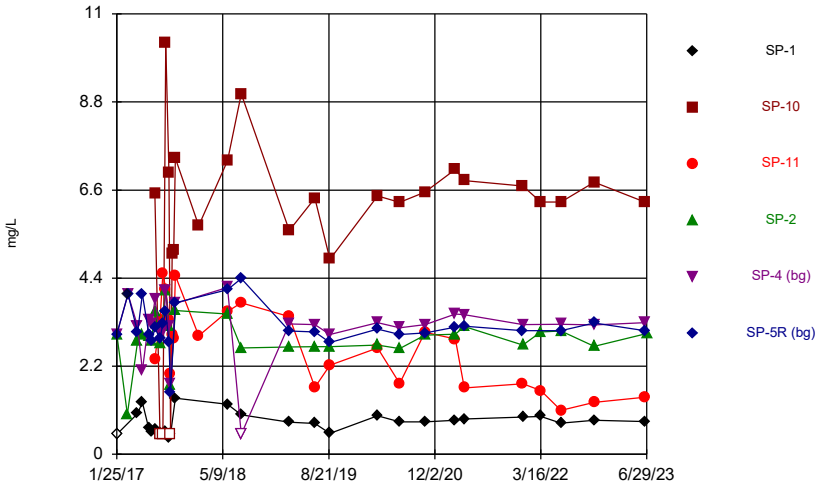
Time Series



Constituent: Combined Radium 226 + 228 Analysis Run 8/3/2023 4:42 PM View: Appendix B
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

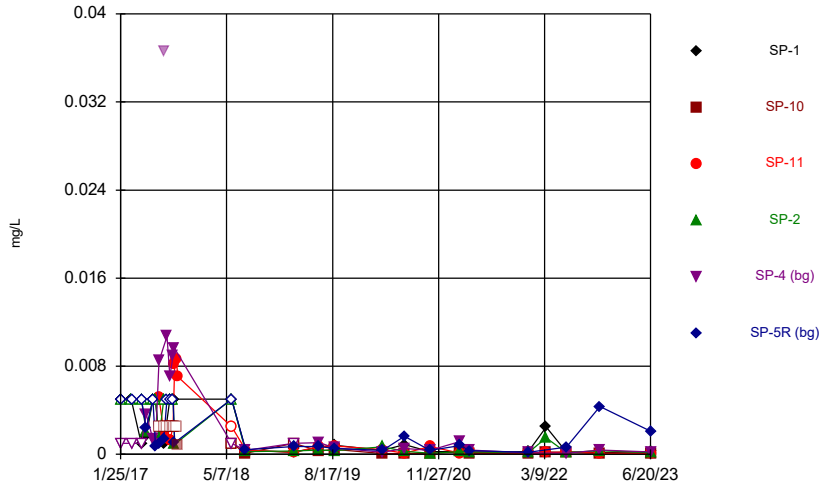
Time Series



Constituent: Fluoride Analysis Run 8/3/2023 4:42 PM View: Appendix B
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

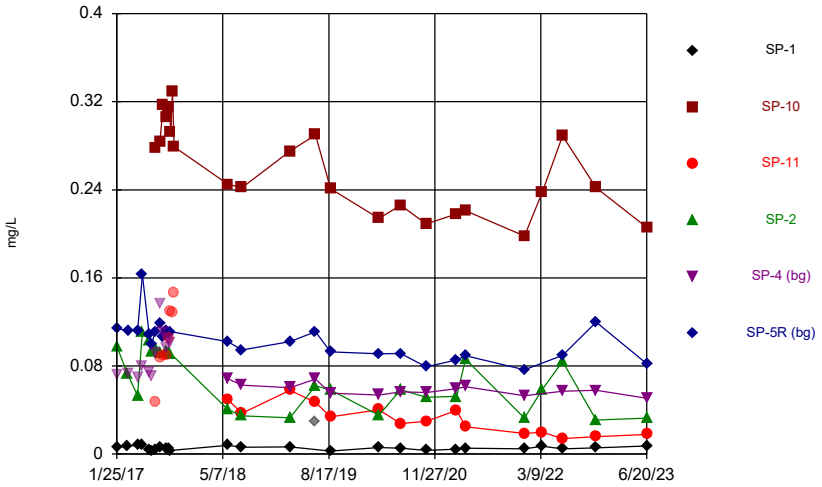
Time Series



Constituent: Lead Analysis Run 8/3/2023 4:42 PM View: Appendix B
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG

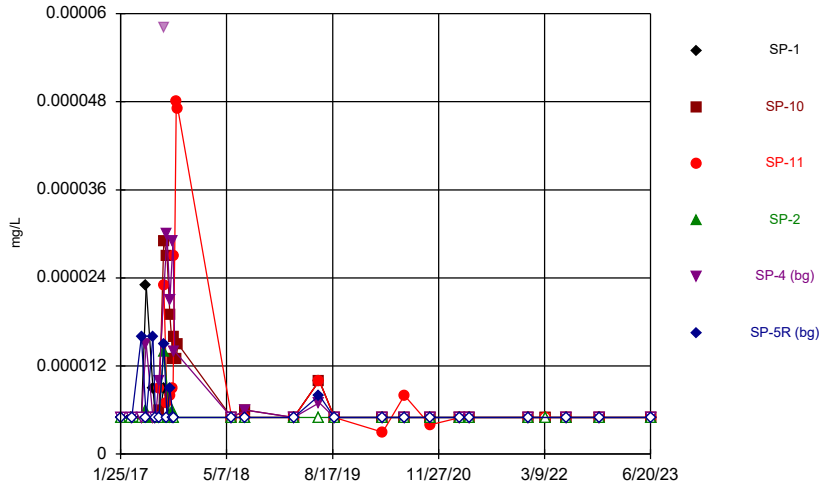
Time Series



Constituent: Lithium Analysis Run 8/3/2023 4:42 PM View: Appendix B
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

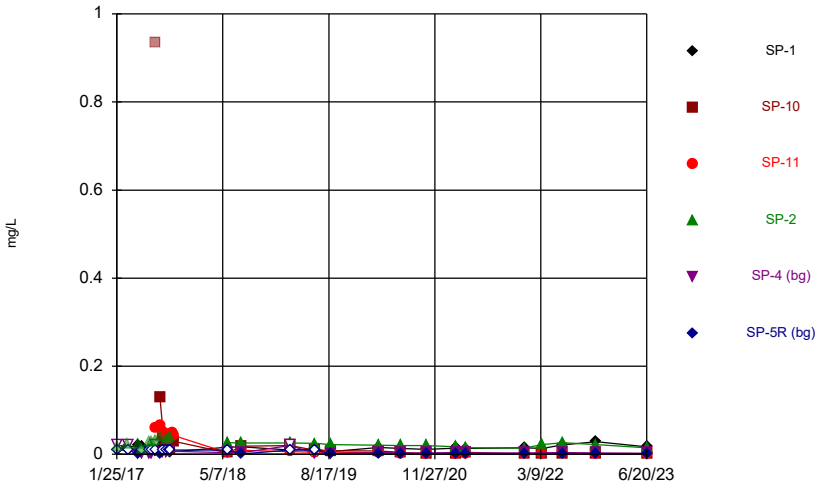
Time Series



Constituent: Mercury Analysis Run 8/3/2023 4:42 PM View: Appendix B
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

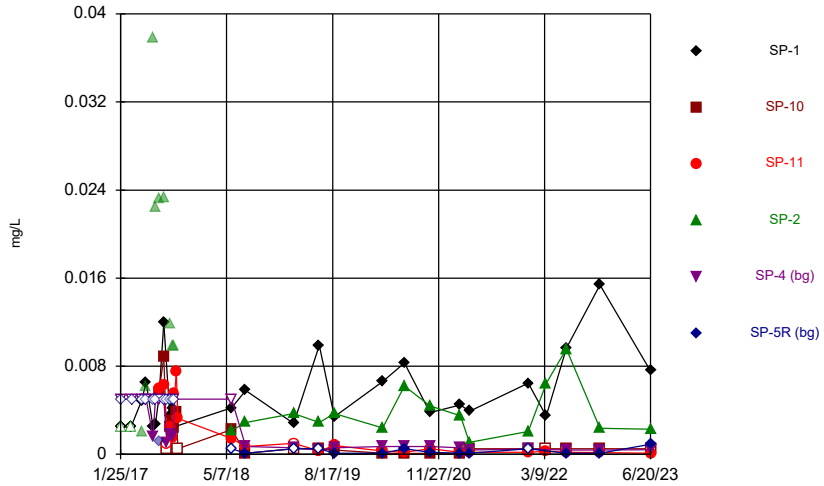
Time Series



Constituent: Molybdenum Analysis Run 8/3/2023 4:42 PM View: Appendix B
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

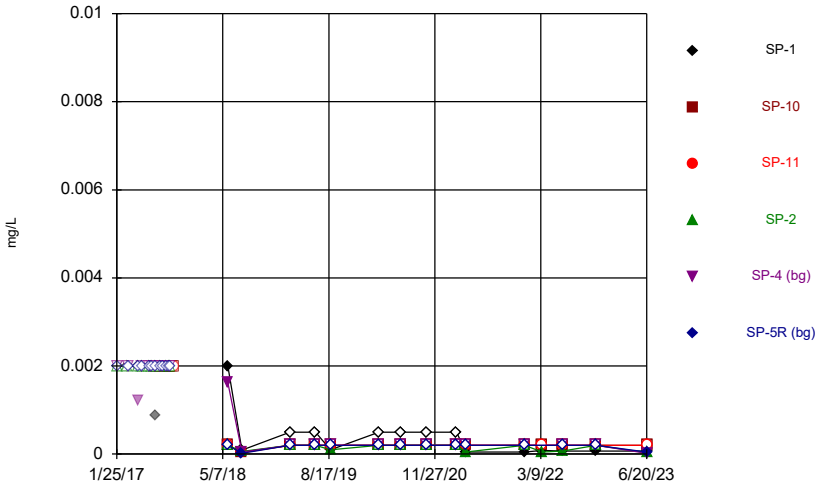
Time Series



Constituent: Selenium Analysis Run 8/3/2023 4:42 PM View: Appendix B
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

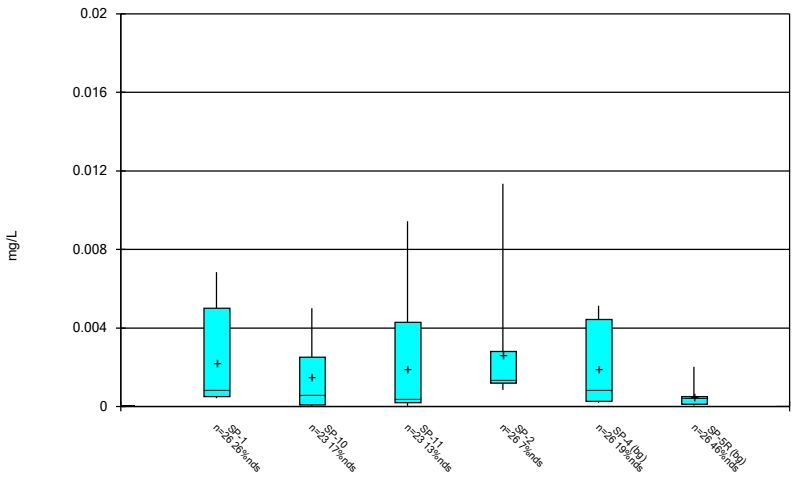
Time Series



Constituent: Thallium Analysis Run 8/3/2023 4:42 PM View: Appendix B
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

FIGURE B
Box Plots

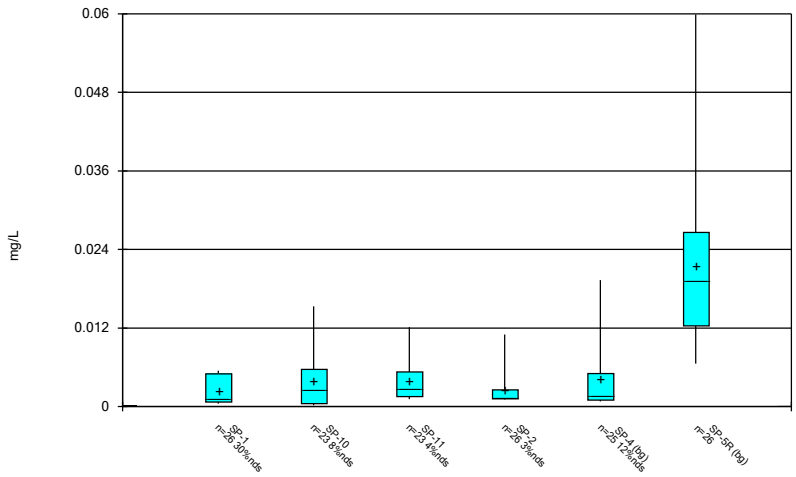
Box & Whiskers Plot



Constituent: Antimony Analysis Run 8/3/2023 4:42 PM View: Appendix B
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG

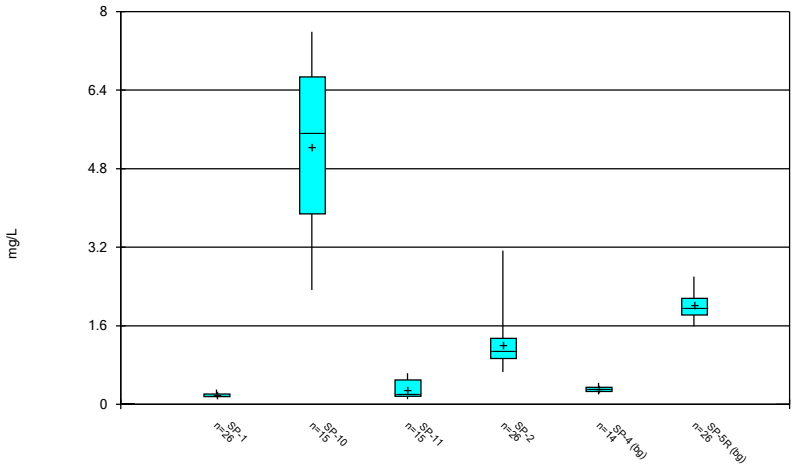
Box & Whiskers Plot



Constituent: Arsenic Analysis Run 8/3/2023 4:42 PM View: Appendix B
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG

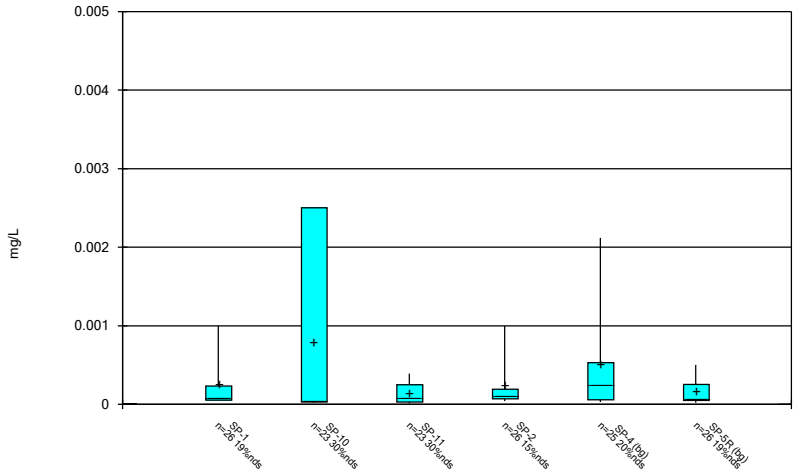
Box & Whiskers Plot



Constituent: Barium Analysis Run 8/3/2023 4:42 PM View: Appendix B
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

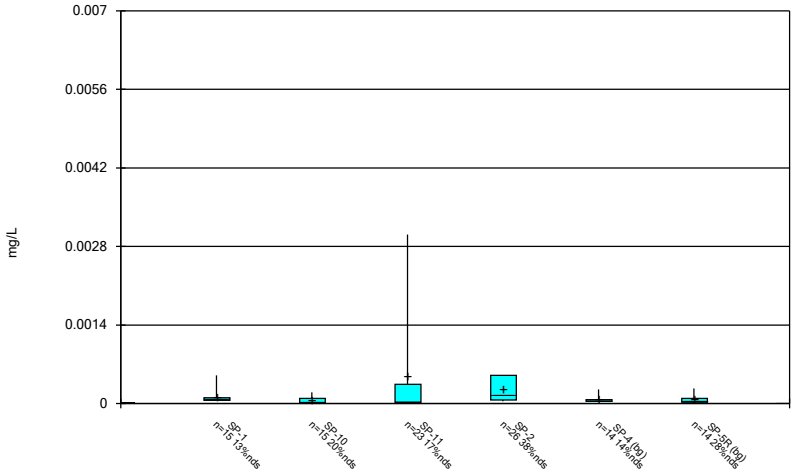
Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG

Box & Whiskers Plot



Constituent: Beryllium Analysis Run 8/3/2023 4:42 PM View: Appendix B
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

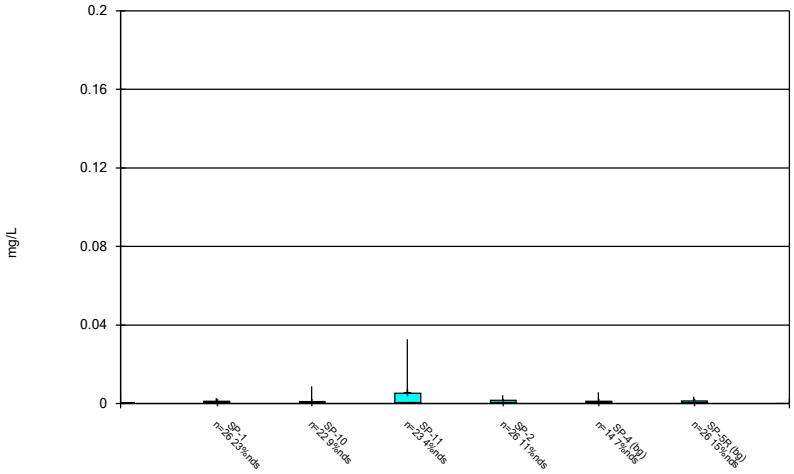
Box & Whiskers Plot



Constituent: Cadmium Analysis Run 8/3/2023 4:42 PM View: Appendix B
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG

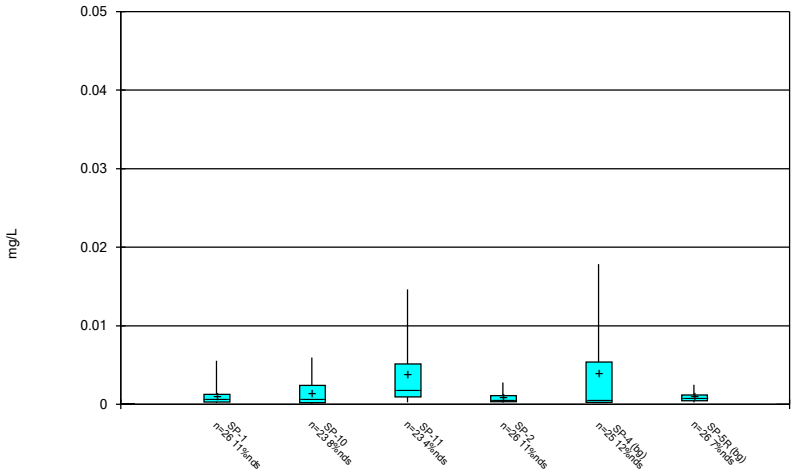
Box & Whiskers Plot



Constituent: Chromium Analysis Run 8/3/2023 4:42 PM View: Appendix B
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG

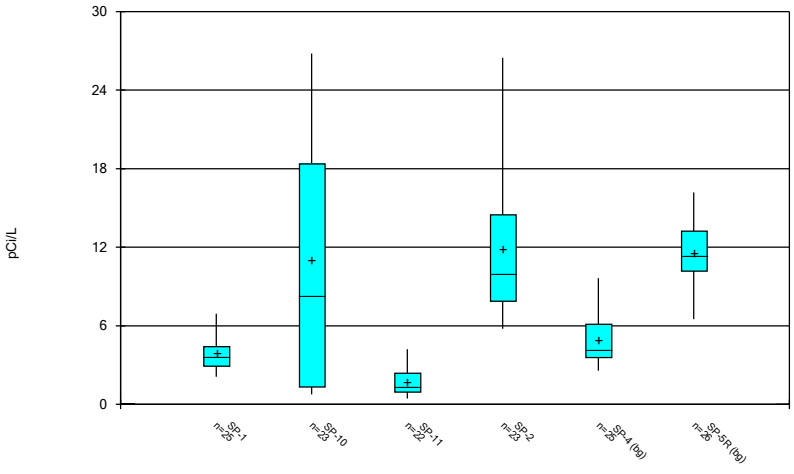
Box & Whiskers Plot



Constituent: Cobalt Analysis Run 8/3/2023 4:42 PM View: Appendix B
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

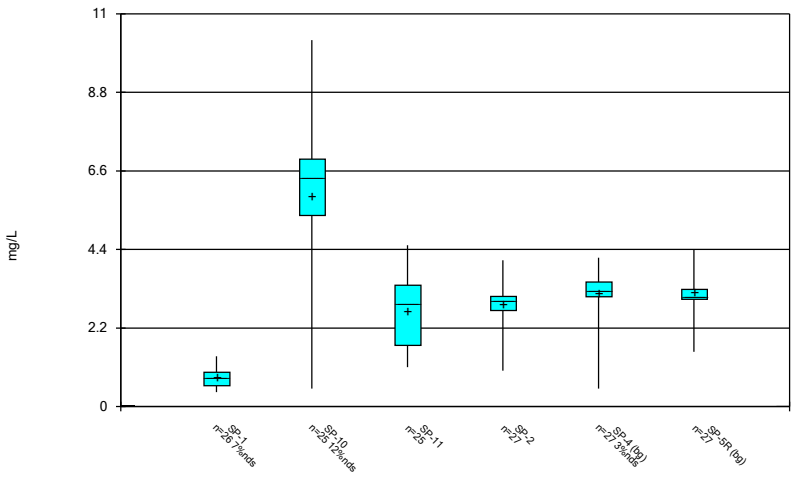
Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG

Box & Whiskers Plot



Constituent: Combined Radium 226 + 228 Analysis Run 8/3/2023 4:42 PM View: Appendix B
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

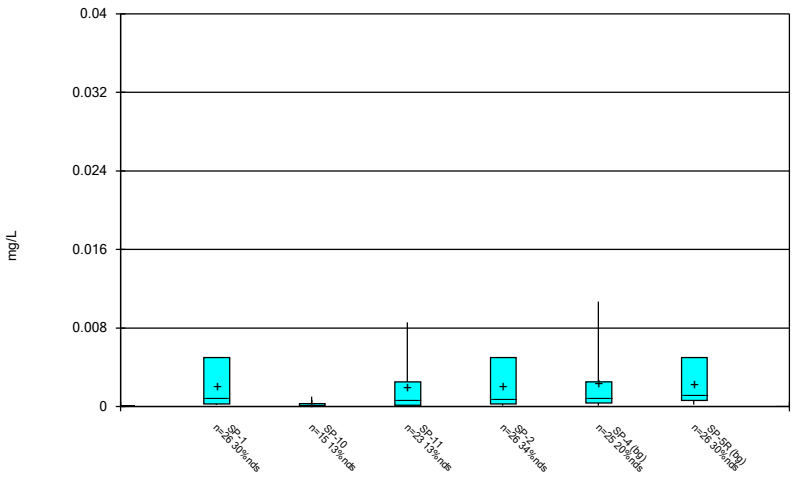
Box & Whiskers Plot



Constituent: Fluoride Analysis Run 8/3/2023 4:43 PM View: Appendix B
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG

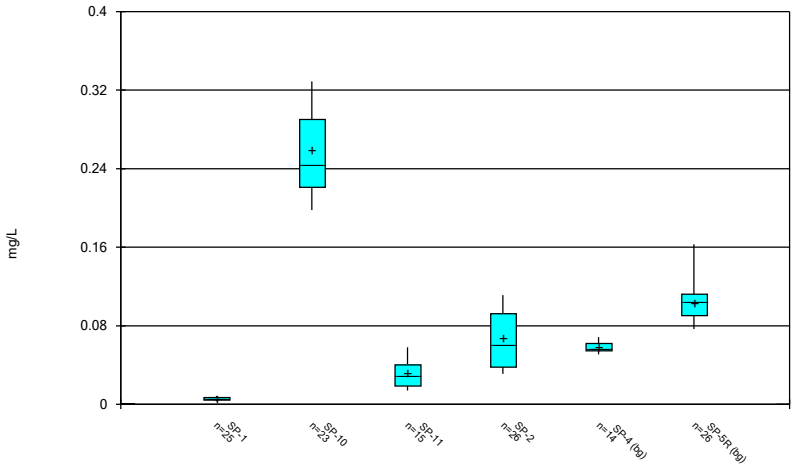
Box & Whiskers Plot



Constituent: Lead Analysis Run 8/3/2023 4:43 PM View: Appendix B
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG

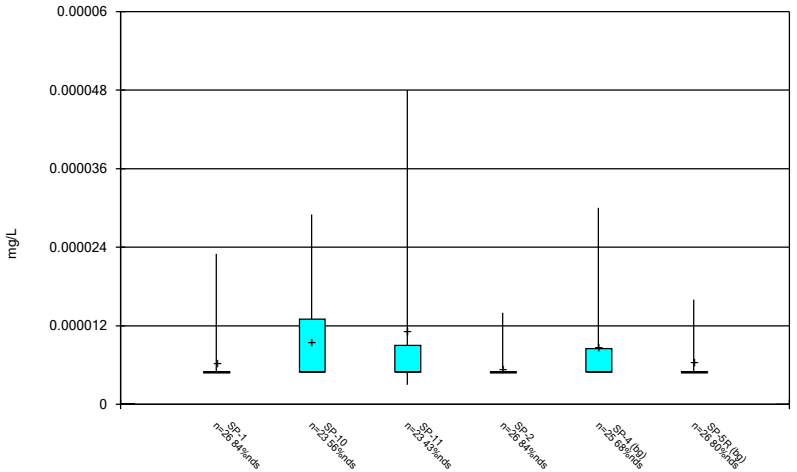
Box & Whiskers Plot



Constituent: Lithium Analysis Run 8/3/2023 4:43 PM View: Appendix B
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

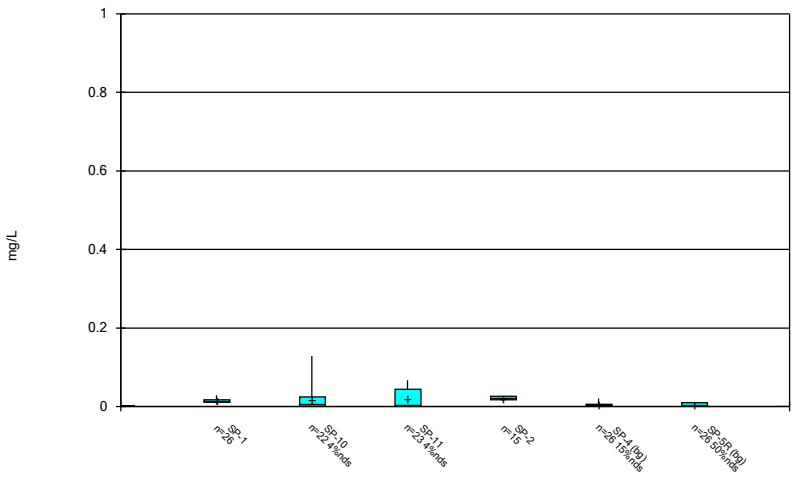
Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG

Box & Whiskers Plot



Constituent: Mercury Analysis Run 8/3/2023 4:43 PM View: Appendix B
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

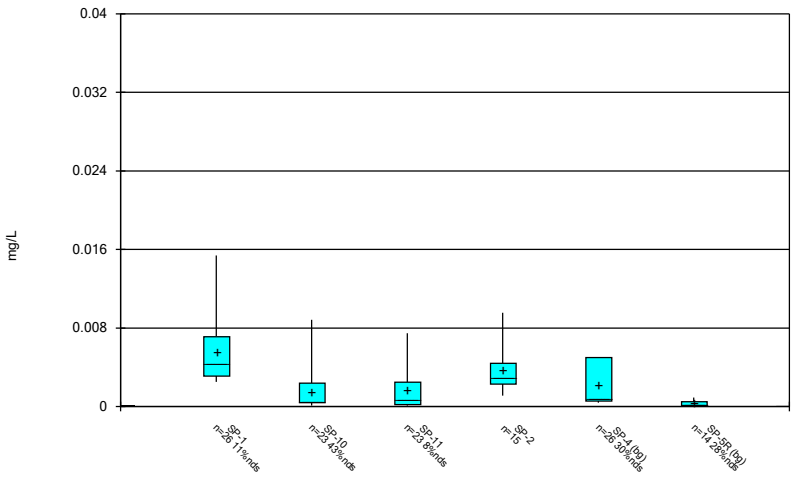
Box & Whiskers Plot



Constituent: Molybdenum Analysis Run 8/3/2023 4:43 PM View: Appendix B
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG

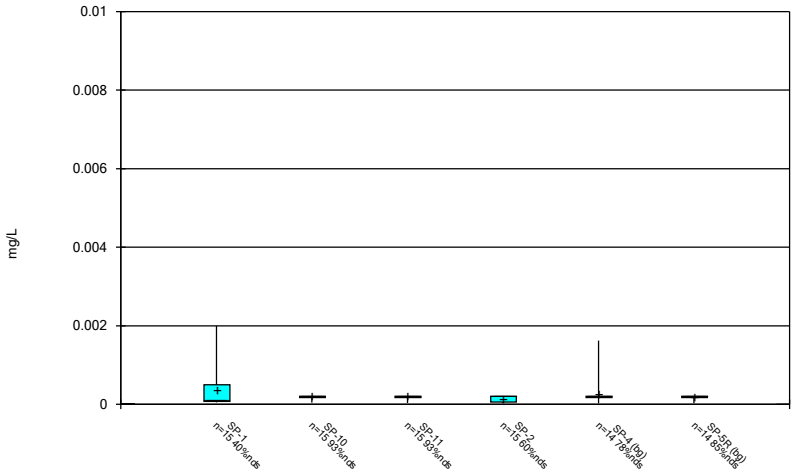
Box & Whiskers Plot



Constituent: Selenium Analysis Run 8/3/2023 4:43 PM View: Appendix B
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.37a Sanitas software utilized by Groundwater Stats Consulting. UG

Box & Whiskers Plot



Constituent: Thallium Analysis Run 8/3/2023 4:43 PM View: Appendix B
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

FIGURE C
Outlier Summary

Outlier Summary

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 8/3/2023, 3:18 PM

	SP-4 Arsenic (mg/L)	SP-4 Beryllium (mg/L)	SP-10 Chromium (mg/L)	SP-4 Cobalt (mg/L)	SP-1 Combined Radium 226 + 228 (pCi/L)	SP-11 Combined Radium 226 + 228 (pCi/L)	SP-1 Fluoride (mg/L)	SP-4 Lead (mg/L)	SP-1 Lithium (mg/L)	SP-4 Mercury (mg/L)
3/13/2017							4 (o)			
6/27/2017					14.29 (o)					
7/13/2017			0.11 (o)							
8/4/2017	0.04498 (o)	0.00497 (o)		0.04069 (o)		25.367 (o)		0.03663 (o)		5.8E-05 (o)
6/20/2019									0.03 (Jo)	

	SP-10 Molybdenum (mg/L)
3/13/2017	
6/27/2017	
7/13/2017	0.934 (o)
8/4/2017	
6/20/2019	

FIGURE D

UTLs

Upper Tolerance Limits Summary Table

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 2/13/2023, 11:12 AM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Antimony (mg/L)	n/a	0.005698	n/a	n/a	n/a	n/a 50	-7.963	1.354	34	Kaplan-Meier	ln(x)	0.05	Inter
Arsenic (mg/L)	n/a	0.0599	n/a	n/a	n/a	n/a 49	n/a	n/a	6.122	n/a	n/a	0.08099	NP Inter(normality)
Barium (mg/L)	n/a	2.6	n/a	n/a	n/a	n/a 38	n/a	n/a	0	n/a	n/a	0.1424	NP Inter(normality)
Beryllium (mg/L)	n/a	0.00212	n/a	n/a	n/a	n/a 49	n/a	n/a	20.41	n/a	n/a	0.08099	NP Inter(normality)
Cadmium (mg/L)	n/a	0.0002066	n/a	n/a	n/a	n/a 26	-10.48	0.8742	23.08	Kaplan-Meier	ln(x)	0.05	Inter
Chromium (mg/L)	n/a	0.003419	n/a	n/a	n/a	n/a 38	-7.327	0.7698	13.16	None	ln(x)	0.05	Inter
Cobalt (mg/L)	n/a	0.01786	n/a	n/a	n/a	n/a 49	n/a	n/a	10.2	n/a	n/a	0.08099	NP Inter(normality)
Combined Radium 226 + 228 (pCi/L)	n/a	15.84	n/a	n/a	n/a	n/a 49	n/a	n/a	0	n/a	n/a	0.08099	NP Inter(normality)
Fluoride (mg/L)	n/a	4.39	n/a	n/a	n/a	n/a 52	n/a	n/a	1.923	n/a	n/a	0.06944	NP Inter(normality)
Lead (mg/L)	n/a	0.0107	n/a	n/a	n/a	n/a 49	n/a	n/a	26.53	n/a	n/a	0.08099	NP Inter(normality)
Lithium (mg/L)	n/a	0.163	n/a	n/a	n/a	n/a 38	n/a	n/a	0	n/a	n/a	0.1424	NP Inter(normality)
Mercury (mg/L)	n/a	0.00003	n/a	n/a	n/a	n/a 49	n/a	n/a	73.47	n/a	n/a	0.08099	NP Inter(NDs)
Molybdenum (mg/L)	n/a	0.01	n/a	n/a	n/a	n/a 50	n/a	n/a	34	n/a	n/a	0.07694	NP Inter(normality)
Selenium (mg/L)	n/a	0.00499	n/a	n/a	n/a	n/a 38	n/a	n/a	31.58	n/a	n/a	0.1424	NP Inter(normality)
Thallium (mg/L)	n/a	0.00162	n/a	n/a	n/a	n/a 26	n/a	n/a	88.46	n/a	n/a	0.2635	NP Inter(NDs)

Tolerance Limit

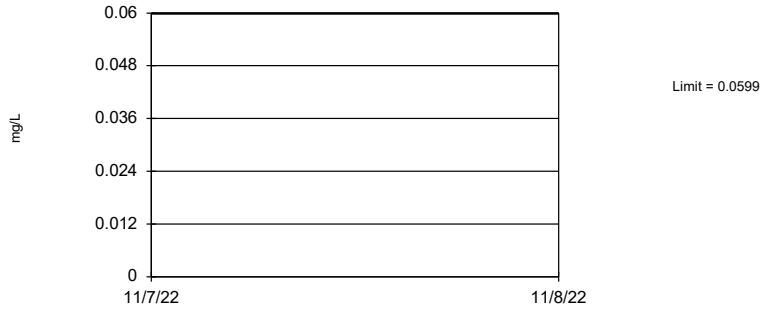
Interwell Parametric

95% coverage. Background Data Summary (based on natural log transformation) (after Kaplan-Meier Adjustment): Mean=-7.963, Std. Dev.=1.354, n=50, 34% NDs. Normality test: Shapiro Francia @alpha = 0.01, calculated = 0.9543, critical = 0.935. Report alpha = 0.05.

Constituent: Antimony Analysis Run 2/13/2023 11:11 AM View: Upper Tolerance Limits
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric

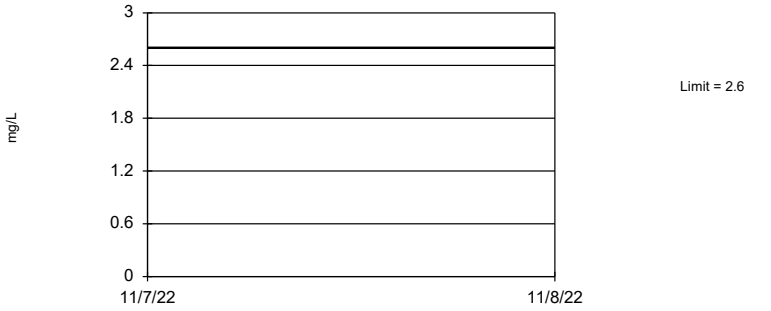


Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 49 background values. 6.122% NDs. 91.21% coverage at alpha=0.01; 93.95% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.08099.

Constituent: Arsenic Analysis Run 2/13/2023 11:11 AM View: Upper Tolerance Limits
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric

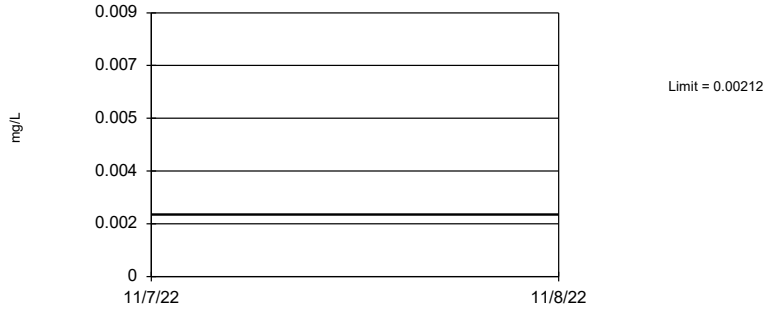


Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 38 background values. 88.48% coverage at alpha=0.01; 92.38% coverage at alpha=0.05; 98.24% coverage at alpha=0.5. Report alpha = 0.1424.

Constituent: Barium Analysis Run 2/13/2023 11:11 AM View: Upper Tolerance Limits
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric

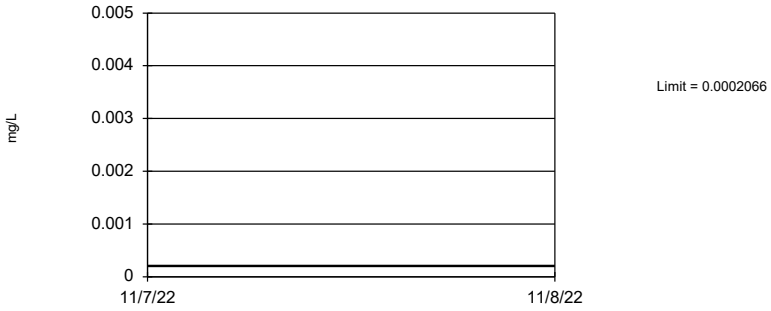


Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 49 background values. 20.41% NDs. 91.21% coverage at alpha=0.01; 93.95% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.08099.

Constituent: Beryllium Analysis Run 2/13/2023 11:11 AM View: Upper Tolerance Limits
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tolerance Limit

Interwell Parametric



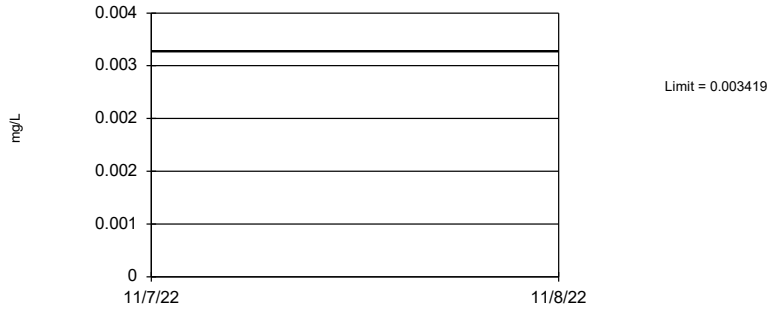
95% coverage. Background Data Summary (based on natural log transformation) (after Kaplan-Meier Adjustment): Mean=-10.48, Std. Dev.=0.8742, n=26, 23.08% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9372, critical = 0.891. Report alpha = 0.05.

Constituent: Cadmium Analysis Run 2/13/2023 11:11 AM View: Upper Tolerance Limits
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Tolerance Limit

Interwell Parametric



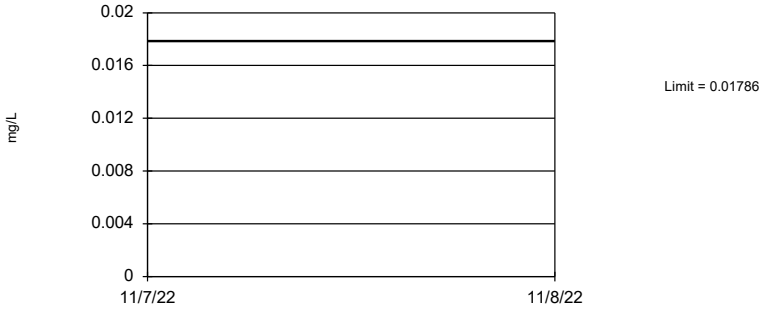
95% coverage. Background Data Summary (based on natural log transformation): Mean=-7.327, Std. Dev.=0.7698, n=38, 13.16% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9508, critical = 0.916. Report alpha = 0.05.

Constituent: Chromium Analysis Run 2/13/2023 11:11 AM View: Upper Tolerance Limits
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Tolerance Limit

Interwell Non-parametric



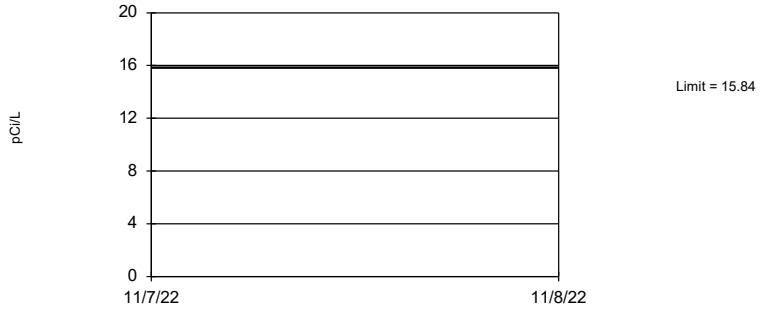
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 49 background values. 10.2% NDs. 91.21% coverage at alpha=0.01; 93.95% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.08099.

Constituent: Cobalt Analysis Run 2/13/2023 11:11 AM View: Upper Tolerance Limits
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Tolerance Limit

Interwell Non-parametric

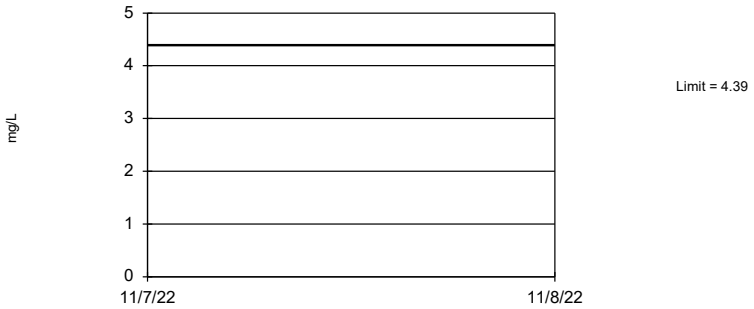


Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 49 background values. 91.21% coverage at alpha=0.01; 93.95% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.08099.

Constituent: Combined Radium 226 + 228 Analysis Run 2/13/2023 11:11 AM View: Upper Tolerance Limit
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric



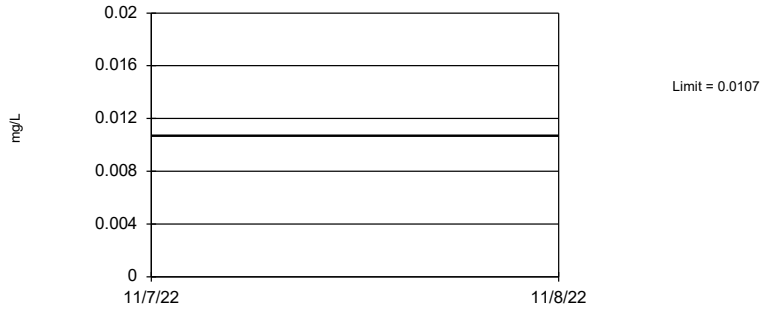
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 52 background values. 1.923% NDs. 91.6% coverage at alpha=0.01; 94.34% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.06944.

Constituent: Fluoride Analysis Run 2/13/2023 11:11 AM View: Upper Tolerance Limits
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Tolerance Limit

Interwell Non-parametric



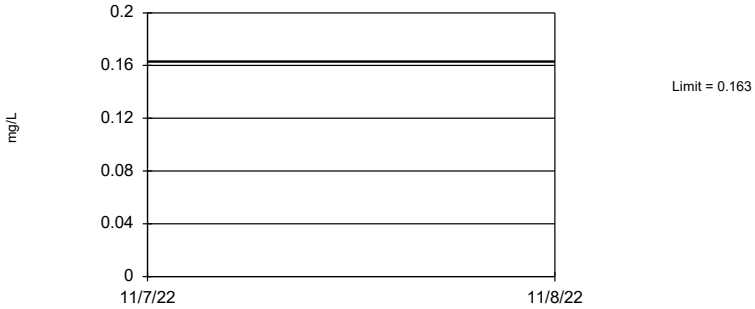
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 49 background values. 26.53% NDs. 91.21% coverage at alpha=0.01; 93.95% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.08099.

Constituent: Lead Analysis Run 2/13/2023 11:11 AM View: Upper Tolerance Limits
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Tolerance Limit

Interwell Non-parametric



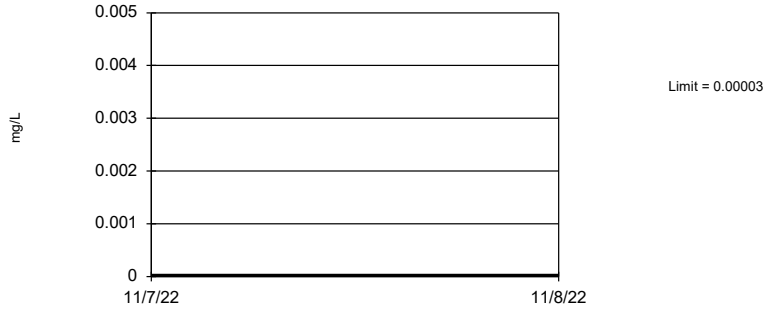
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 38 background values. 88.48% coverage at alpha=0.01; 92.38% coverage at alpha=0.05; 98.24% coverage at alpha=0.5. Report alpha = 0.1424.

Constituent: Lithium Analysis Run 2/13/2023 11:11 AM View: Upper Tolerance Limits
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.36 Groundwater Stats Consulting. UG

Tolerance Limit

Interwell Non-parametric

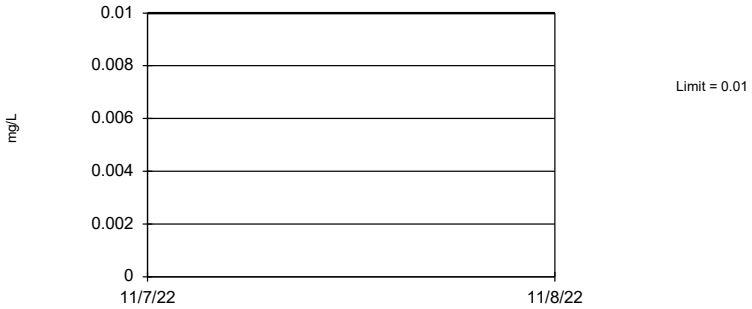


Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 50%. Limit is highest of 49 background values. 73.47% NDs. 91.21% coverage at alpha=0.01; 93.95% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.08099.

Constituent: Mercury Analysis Run 2/13/2023 11:11 AM View: Upper Tolerance Limits
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric



Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 50 background values. 34% NDs. 91.21% coverage at alpha=0.01; 94.34% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.07694.

Constituent: Molybdenum Analysis Run 2/13/2023 11:11 AM View: Upper Tolerance Limits
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tolerance Limit

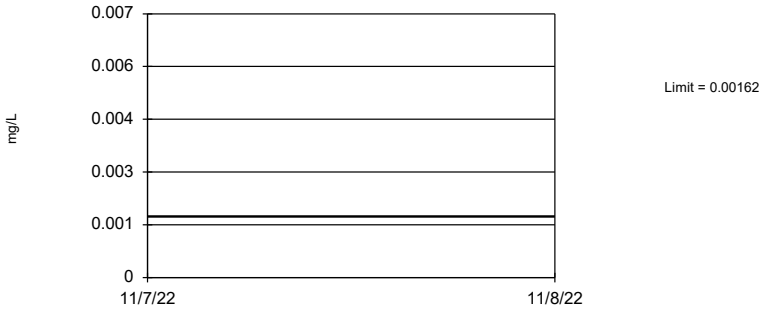
Interwell Non-parametric

Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 38 background values. 31.58% NDs. 88.48% coverage at alpha=0.01; 92.38% coverage at alpha=0.05; 98.24% coverage at alpha=0.5. Report alpha = 0.1424.

Constituent: Selenium Analysis Run 2/13/2023 11:11 AM View: Upper Tolerance Limits
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric



Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 50%. Limit is highest of 26 background values. 88.46% NDs. 83.79% coverage at alpha=0.01; 89.26% coverage at alpha=0.05; 97.46% coverage at alpha=0.5. Report alpha = 0.2635.

Constituent: Thallium Analysis Run 2/13/2023 11:11 AM View: Upper Tolerance Limits
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

FIGURE E

GWPS

NORTHEASTERN BAP GWPS				
Constituent Name	**MCL**	**CCR- Rule Specified Level**	**Background Limit**	**GWPS**
Antimony, Total (mg/L)	0.006		0.0057	0.006
Arsenic, Total (mg/L)	0.01		0.06	0.06
Barium, Total (mg/L)	2		2.6	2.6
Beryllium, Total (mg/L)	0.004		0.0021	0.004
Cadmium, Total (mg/L)	0.005		0.00021	0.005
Chromium, Total (mg/L)	0.1		0.034	0.1
Cobalt, Total (mg/L)	n/a	0.006	0.018	0.018
Combined Radium, Total (pCi/L)	5		15.84	15.84
Fluoride, Total (mg/L)	4		4.39	4.39
Lead, Total (mg/L)	n/a	0.015	0.011	0.015
Lithium, Total (mg/L)	n/a	0.04	0.16	0.16
Mercury, Total (mg/L)	0.002		0.00003	0.002
Molybdenum, Total (mg/L)	n/a	0.1	0.01	0.1
Selenium, Total (mg/L)	0.05		0.005	0.05
Thallium, Total (mg/L)	0.002		0.0016	0.002

**Grey cell indicates Background Limit is higher than MCL*

**GWPS = Groundwater Protection Standard*

**MCL = Maximum Contaminant Level*

**CCR = Coal Combustion Residuals*

FIGURE F

Confidence Interval

Confidence Intervals - Significant Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 8/8/2023, 2:19 PM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Lower Compl.	Sig.	N	Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Barium (mg/L)	**SP-10**	**6.384**	**4.072**	**2.6**	**n/a**	**Yes**	**15**	**5.228**	**1.705**	**0**	**None**	**No**	**0.01**	**Param.**
Fluoride (mg/L)	**SP-10**	**7.156**	**5.356**	**4.39**	**n/a**	**Yes**	**25**	**5.894**	**2.328**	**12**	**None**	**x^2**	**0.01**	**Param.**
Lithium (mg/L)	**SP-10**	**0.2797**	**0.238**	**0.16**	**n/a**	**Yes**	**23**	**0.2589**	**0.03989**	**0**	**None**	**No**	**0.01**	**Param.**

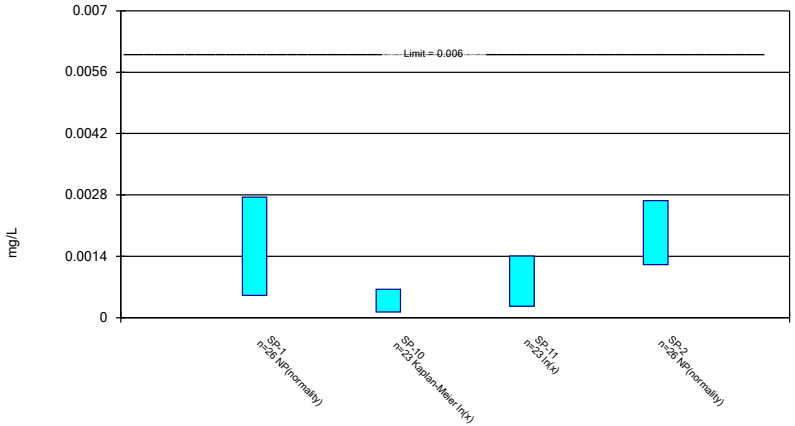
Confidence Intervals - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 8/8/2023, 2:19 PM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Lower Compl.	Sig.	N	Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Antimony (mg/L)	SP-1	0.00275	0.00051	0.006	n/a	No	26	0.002205	0.002149	26.92	None	No	0.01	NP (normality)
Antimony (mg/L)	SP-10	0.0006446	0.0001272	0.006	n/a	No	23	0.001552	0.001939	17.39	Kaplan-Meier	ln(x)	0.01	Param.
Antimony (mg/L)	SP-11	0.001405	0.000259	0.006	n/a	No	23	0.001937	0.002841	13.04	None	ln(x)	0.01	Param.
Antimony (mg/L)	SP-2	0.00267	0.00121	0.006	n/a	No	26	0.002564	0.0025	7.692	None	No	0.01	NP (normality)
Arsenic (mg/L)	SP-1	0.005	0.00069	0.06	n/a	No	26	0.00235	0.002046	30.77	None	No	0.01	NP (normality)
Arsenic (mg/L)	SP-10	0.004912	0.001223	0.06	n/a	No	23	0.003837	0.004387	8.696	None	sqrt(x)	0.01	Param.
Arsenic (mg/L)	SP-11	0.004908	0.002257	0.06	n/a	No	23	0.0039	0.002935	4.348	None	sqrt(x)	0.01	Param.
Arsenic (mg/L)	SP-2	0.00251	0.00121	0.06	n/a	No	26	0.002521	0.002492	3.846	None	No	0.01	NP (normality)
Barium (mg/L)	SP-1	0.1994	0.1647	2.6	n/a	No	26	0.1833	0.03753	0	None	sqrt(x)	0.01	Param.
Barium (mg/L)	**SP-10**	**6.384**	**4.072**	**2.6**	**n/a**	**Yes**	**15**	**5.228**	**1.705**	**0**	**None**	**No**	**0.01**	**Param.**
Barium (mg/L)	SP-11	0.3995	0.1761	2.6	n/a	No	15	0.2995	0.1758	0	None	sqrt(x)	0.01	Param.
Barium (mg/L)	SP-2	1.332	0.9783	2.6	n/a	No	26	1.206	0.4826	0	None	ln(x)	0.01	Param.
Beryllium (mg/L)	SP-1	0.0002	0.000054	0.004	n/a	No	26	0.0002639	0.0003696	19.23	None	No	0.01	NP (normality)
Beryllium (mg/L)	SP-10	0.0025	0.00003	0.004	n/a	No	23	0.000787	0.001159	30.43	None	No	0.01	NP (normality)
Beryllium (mg/L)	SP-11	0.00025	0.000027	0.004	n/a	No	23	0.0001539	0.0001331	30.43	None	No	0.01	NP (normality)
Beryllium (mg/L)	SP-2	0.00018	0.00007	0.004	n/a	No	26	0.0002368	0.0003355	15.38	None	No	0.01	NP (normality)
Cadmium (mg/L)	SP-1	0.00025	0.000051	0.005	n/a	No	15	0.0001234	0.000123	13.33	None	No	0.01	NP (normality)
Cadmium (mg/L)	SP-10	0.0002	0.00001	0.005	n/a	No	15	0.0000606	0.00007471	20	None	No	0.01	NP (normality)
Cadmium (mg/L)	SP-11	0.00034	0.00002	0.005	n/a	No	23	0.0004828	0.0009419	17.39	None	No	0.01	NP (normality)
Cadmium (mg/L)	SP-2	0.0005	0.000063	0.005	n/a	No	26	0.0002557	0.0002073	38.46	None	No	0.01	NP (normality)
Chromium (mg/L)	SP-1	0.001097	0.0005286	0.1	n/a	No	26	0.001008	0.0006751	23.08	Kaplan-Meier	sqrt(x)	0.01	Param.
Chromium (mg/L)	SP-10	0.000981	0.0003212	0.1	n/a	No	22	0.001057	0.001827	9.091	None	ln(x)	0.01	Param.
Chromium (mg/L)	SP-11	0.00525	0.000379	0.1	n/a	No	23	0.006047	0.0107	4.348	None	No	0.01	NP (normality)
Chromium (mg/L)	SP-2	0.001474	0.0005998	0.1	n/a	No	26	0.001184	0.001096	11.54	None	sqrt(x)	0.01	Param.
Cobalt (mg/L)	SP-1	0.001182	0.0004726	0.018	n/a	No	26	0.001013	0.001123	11.54	None	x^(1/3)	0.01	Param.
Cobalt (mg/L)	SP-10	0.001962	0.0004423	0.018	n/a	No	23	0.00154	0.001793	8.696	None	sqrt(x)	0.01	Param.
Cobalt (mg/L)	SP-11	0.004598	0.001359	0.018	n/a	No	23	0.003888	0.004472	4.348	None	x^(1/3)	0.01	Param.
Cobalt (mg/L)	SP-2	0.001011	0.0004548	0.018	n/a	No	26	0.0008552	0.0007488	11.54	None	x^(1/3)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-1	4.487	3.263	15.84	n/a	No	25	3.875	1.228	0	None	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-10	15.62	6.401	15.84	n/a	No	23	11.01	8.809	0	None	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-11	2.118	1.116	15.84	n/a	No	22	1.709	1.036	0	None	sqrt(x)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-2	14.05	9.011	15.84	n/a	No	23	11.88	5.323	0	None	sqrt(x)	0.01	Param.
Fluoride (mg/L)	SP-1	0.9342	0.6872	4.39	n/a	No	26	0.8107	0.2534	7.692	None	No	0.01	Param.
Fluoride (mg/L)	**SP-10**	**7.156**	**5.356**	**4.39**	**n/a**	**Yes**	**25**	**5.894**	**2.328**	**12**	**None**	**x^2**	**0.01**	**Param.**
Fluoride (mg/L)	SP-11	3.18	2.179	4.39	n/a	No	25	2.679	1.004	0	None	No	0.01	Param.
Fluoride (mg/L)	SP-2	3.172	2.688	4.39	n/a	No	27	2.887	0.568	0	None	x^2	0.01	Param.
Lead (mg/L)	SP-1	0.00247	0.000254	0.015	n/a	No	26	0.002002	0.002101	30.77	None	No	0.01	NP (normality)
Lead (mg/L)	SP-10	0.0003167	0.00008644	0.015	n/a	No	15	0.0002687	0.0003159	13.33	None	ln(x)	0.01	Param.
Lead (mg/L)	SP-11	0.001519	0.000295	0.015	n/a	No	23	0.001913	0.002687	13.04	None	ln(x)	0.01	Param.
Lead (mg/L)	SP-2	0.005	0.000253	0.015	n/a	No	26	0.002095	0.002203	34.62	None	No	0.01	NP (normality)
Lithium (mg/L)	SP-1	0.006273	0.004705	0.16	n/a	No	25	0.005489	0.001573	0	None	No	0.01	Param.
Lithium (mg/L)	**SP-10**	**0.2797**	**0.238**	**0.16**	**n/a**	**Yes**	**23**	**0.2589**	**0.03989**	**0**	**None**	**No**	**0.01**	**Param.**
Lithium (mg/L)	SP-11	0.04072	0.02244	0.16	n/a	No	15	0.03158	0.01349	0	None	No	0.01	Param.
Lithium (mg/L)	SP-2	0.07999	0.05429	0.16	n/a	No	26	0.06714	0.02637	0	None	No	0.01	Param.
Mercury (mg/L)	SP-1	0.000009	0.000005	0.002	n/a	No	26	0.000006192	0.00000371	84.62	None	No	0.01	NP (NDs)
Mercury (mg/L)	SP-10	0.000013	0.000005	0.002	n/a	No	23	0.000009522	0.000007267	56.52	None	No	0.01	NP (NDs)
Mercury (mg/L)	SP-11	0.000009	0.000005	0.002	n/a	No	23	0.00001122	0.00001282	43.48	None	No	0.01	NP (normality)
Mercury (mg/L)	SP-2	0.000005	0.000005	0.002	n/a	No	26	0.000005423	0.00000177	84.62	None	No	0.01	NP (NDs)
Molybdenum (mg/L)	SP-1	0.01656	0.01139	0.1	n/a	No	26	0.01397	0.005312	0	None	No	0.01	Param.
Molybdenum (mg/L)	SP-10	0.01887	0.00297	0.1	n/a	No	22	0.01726	0.02817	4.545	None	x^(1/3)	0.01	Param.
Molybdenum (mg/L)	SP-11	0.04433	0.002	0.1	n/a	No	23	0.01941	0.02334	4.348	None	No	0.01	NP (normality)
Molybdenum (mg/L)	SP-2	0.02417	0.01811	0.1	n/a	No	15	0.02114	0.004469	0	None	No	0.01	Param.
Selenium (mg/L)	SP-1	0.006678	0.003883	0.05	n/a	No	26	0.005567	0.003255	11.54	None	sqrt(x)	0.01	Param.
Selenium (mg/L)	SP-10	0.0008877	0.0001458	0.05	n/a	No	23	0.001499	0.002161	43.48	Kaplan-Meier	ln(x)	0.01	Param.
Selenium (mg/L)	SP-11	0.001502	0.0003588	0.05	n/a	No	23	0.001738	0.002295	8.696	None	ln(x)	0.01	Param.
Selenium (mg/L)	SP-2	0.004896	0.002271	0.05	n/a	No	15	0.003712	0.00219	0	None	sqrt(x)	0.01	Param.
Thallium (mg/L)	SP-1	0.0005	0.00007	0.002	n/a	No	15	0.000372	0.0004977	40	None	No	0.01	NP (normality)
Thallium (mg/L)	SP-10	0.0002	0.00004	0.002	n/a	No	15	0.0001893	0.00004131	93.33	None	No	0.01	NP (NDs)
Thallium (mg/L)	SP-11	0.0002	0.00003	0.002	n/a	No	15	0.0001887	0.00004389	93.33	None	No	0.01	NP (NDs)
Thallium (mg/L)	SP-2	0.0002	0.00005	0.002	n/a	No	15	0.000144	0.00007239	60	None	No	0.01	NP (NDs)

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Antimony Analysis Run 8/8/2023 2:18 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

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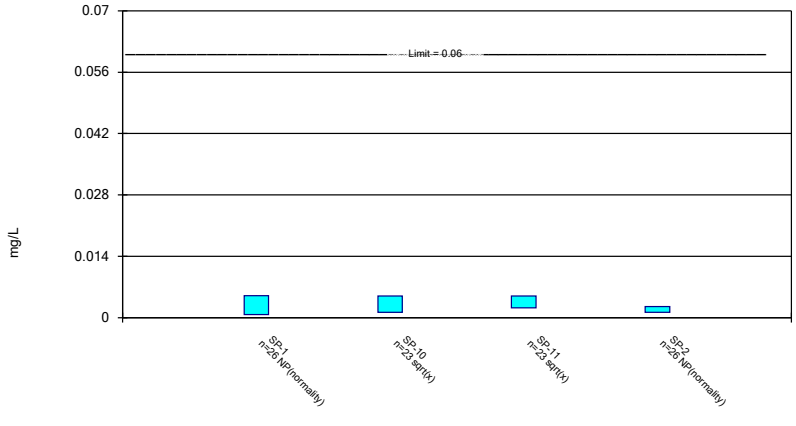
Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

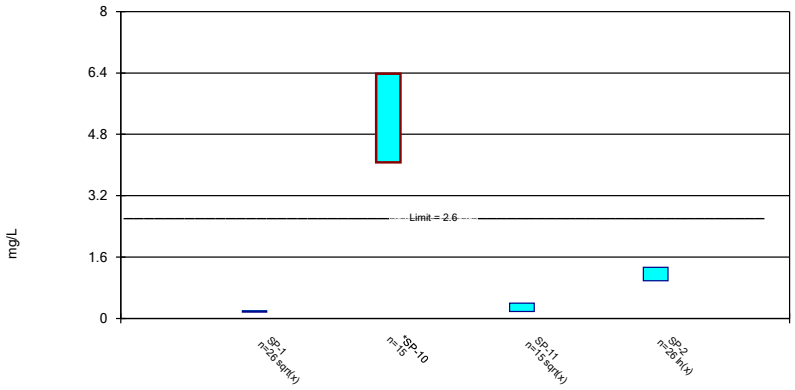


Constituent: Arsenic Analysis Run 8/8/2023 2:18 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.37 Groundwater Stats Consulting. UG

Parametric Confidence Interval

Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Barium Analysis Run 8/8/2023 2:18 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

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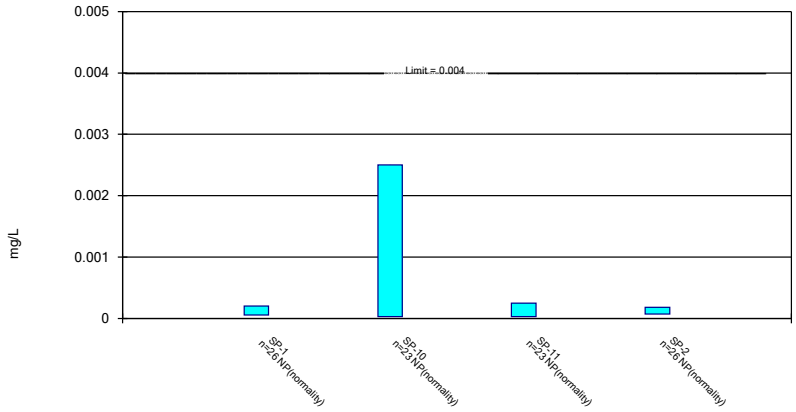
Non-Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Beryllium Analysis Run 8/8/2023 2:18 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Non-Parametric Confidence Interval

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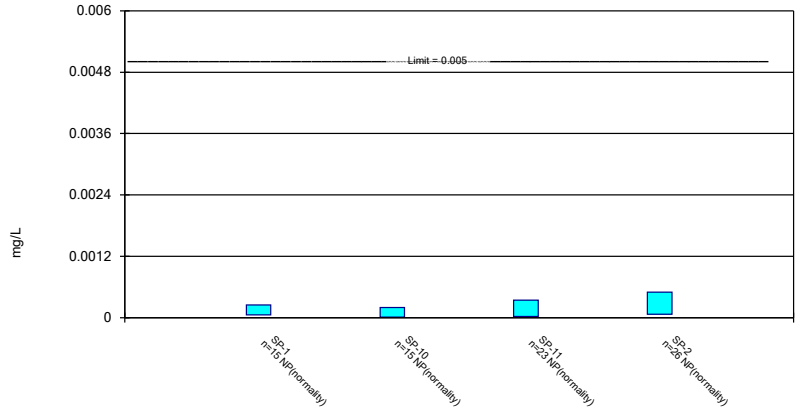
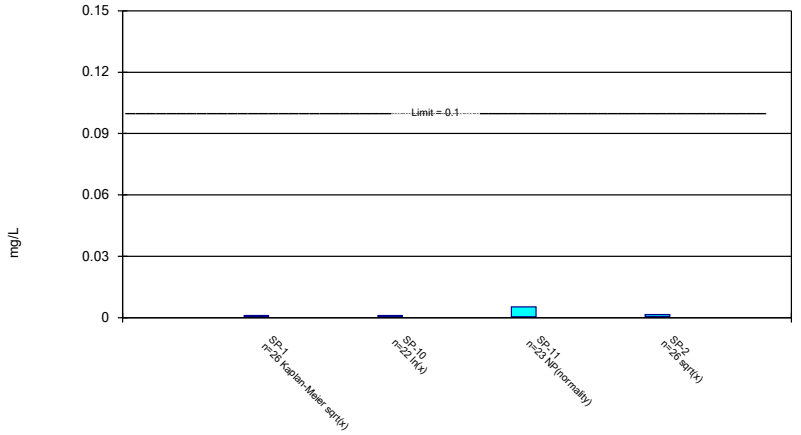


Constituent: Cadmium Analysis Run 8/8/2023 2:18 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Chromium Analysis Run 8/8/2023 2:18 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

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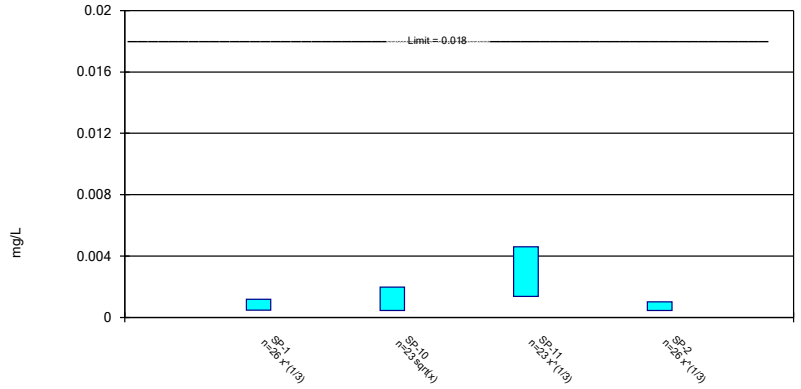

Constituent: Cobalt Analysis Run 8/8/2023 2:18 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

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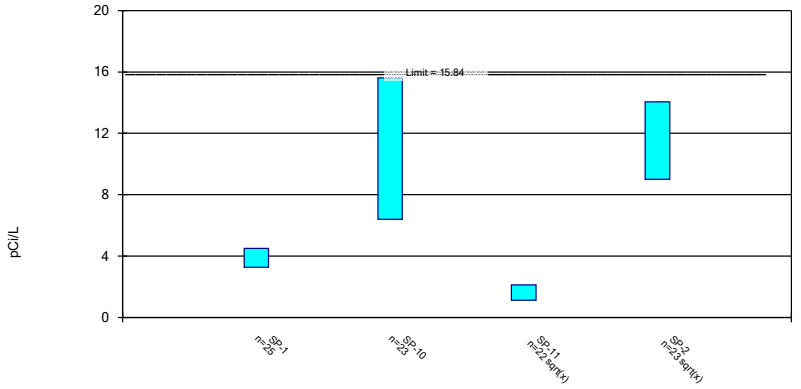
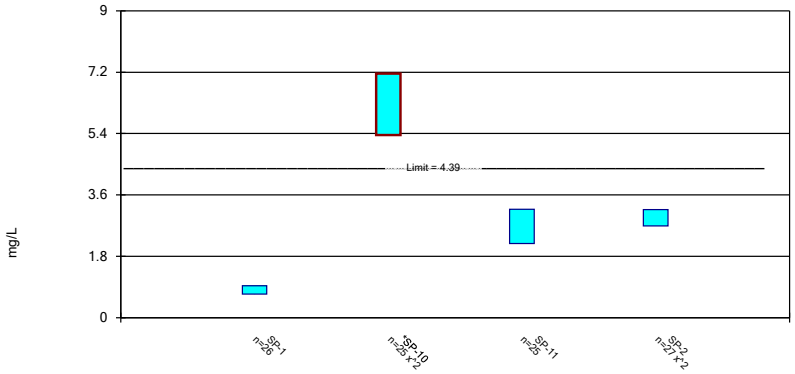


Constituent: Combined Radium 226 + 228 Analysis Run 8/8/2023 2:18 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Fluoride Analysis Run 8/8/2023 2:18 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

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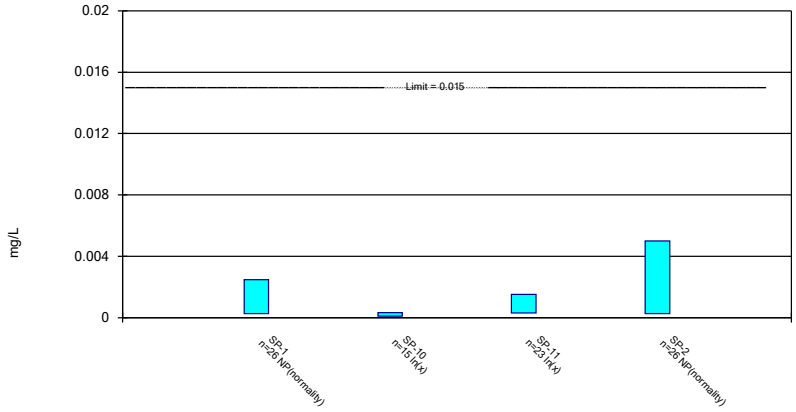
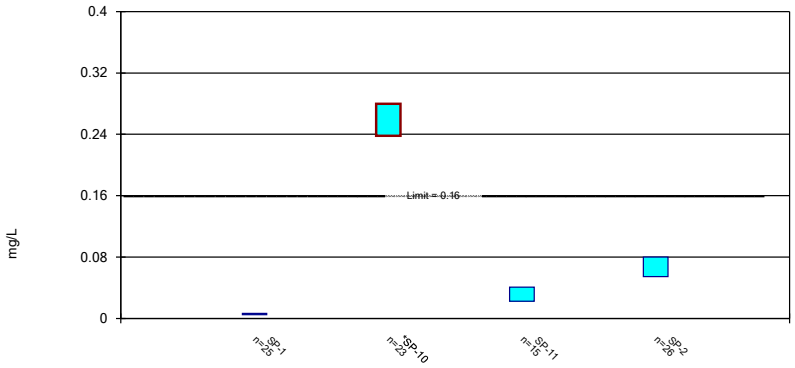


Constituent: Lead Analysis Run 8/8/2023 2:18 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

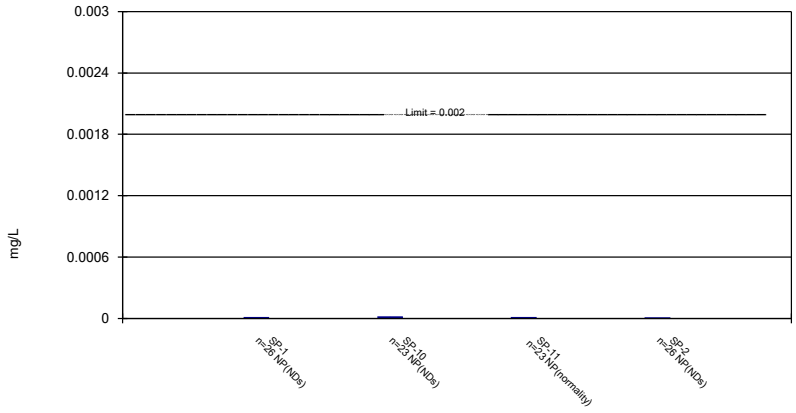
Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Lithium Analysis Run 8/8/2023 2:18 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Non-Parametric Confidence Interval

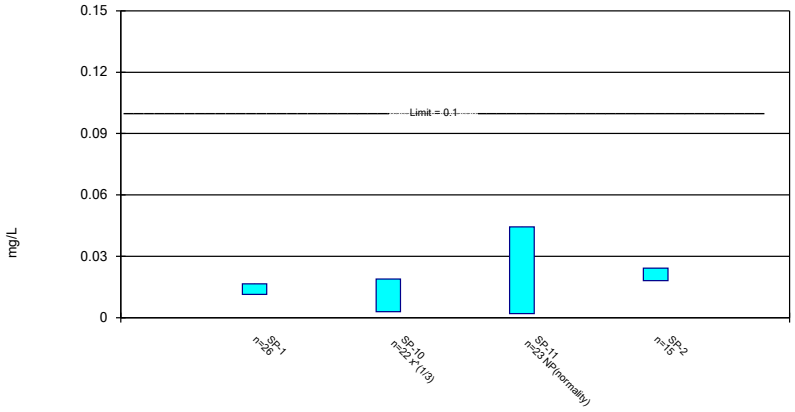
Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Mercury Analysis Run 8/8/2023 2:18 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Molybdenum Analysis Run 8/8/2023 2:18 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

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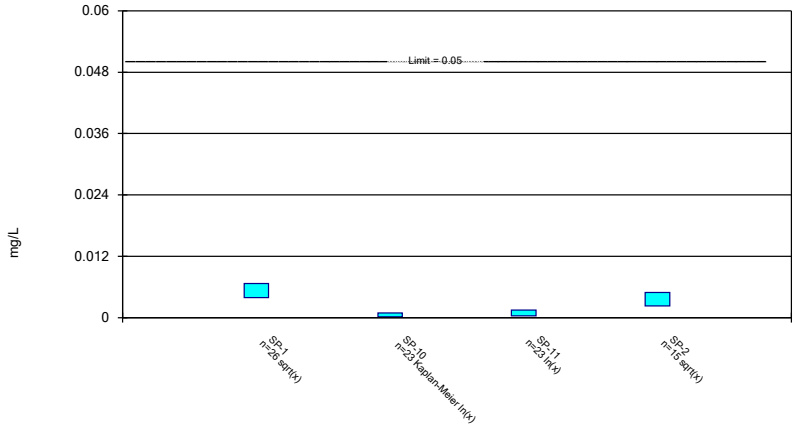
Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

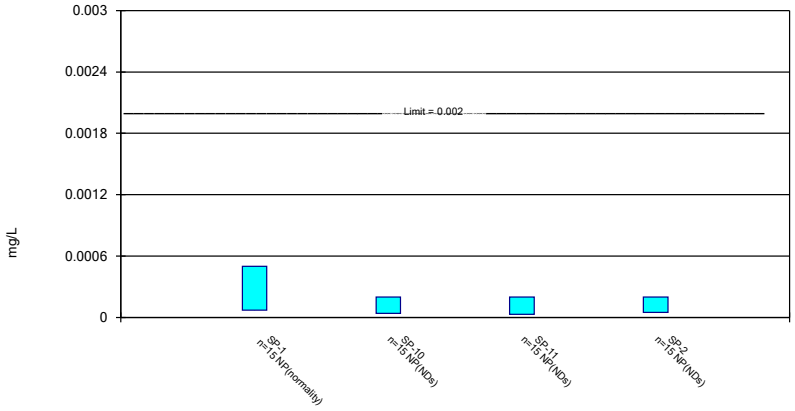


Constituent: Selenium Analysis Run 8/8/2023 2:18 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.9.6.37 Groundwater Stats Consulting. UG

Non-Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Thallium Analysis Run 8/8/2023 2:18 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Robert Singletary
Executive Director

OKLAHOMA Environmental Quality

Kevin Stitt
Governor

June 27, 2024

Ms. Rebecca Jones, P.G.
American Electric Power
502 North Allen Avenue
Shreveport, LA 71101

Re: Alternate Source Demonstration for Barium, Fluoride and Lithium Exceedances –Bottom Ash Pond
Public Service Company of Oklahoma - Northeastern Power Station, Rogers County
Solid Waste Permit No. none

Dear Ms. Jones:

The Oklahoma Department of Environmental Quality received the Alternate Source Demonstration (ASD) dated May 16, 2024. The ASD was submitted by American Electric Power (AEP) Public Service Company of Oklahoma – Northeastern Power Station (PSO-NES) for the Bottom Ash Pond (BAP). During the October 10, 2023 sampling event, potential statistically significant levels (SSLs) were identified for lithium, barium, and fluoride in SP-10. The Lower Confidence Levels (LCL) for lithium (0.238 mg/L), barium (4.20 mg/L), and fluoride (5.59 mg/L) exceeded their respective Groundwater Protection Standards (GWPS) of 0.163 mg/L for lithium, 2.77 mg/L for barium, and 4.39 mg/L for fluoride. The detected 2023 concentrations for each constituent (0.235 mg/L, 6.01 mg/L, and 6.3 mg/L for lithium, barium, and fluoride, respectively) also exceeded their respective GWPSs.

On October 29, 2019, DEQ approved the revised ASD for lithium detected in monitoring well SP-10 for the BAP. The 2019 ASD proposed that naturally occurring lithium in the shale lenses was the source of the potential SSL. On June 4, 2021, DEQ approved an ASD for fluoride exceedances detected in SP-10 for the BAP. The 2021 ASD also proposed that naturally occurring fluoride in the shale lenses was the source of the potential SSL.

On September 20, 2022, DEQ approved the ASD for barium, lithium, and fluoride exceedances detected in SP-10. The 2022 ASD proposed that naturally occurring barium in the shale lenses was the source of the potential SSL. The 2022 ASD approval stated it is applicable for lithium, fluoride, and barium exceedances of the GWPS in SP-10 if conditions do not change.

The lithium and fluoride concentrations in SP-10 from the October 2023 sampling event are consistent with previous results and continue to show no statistically positive trends. However, the time-series plot and Mann-Kendall analysis of the reported barium concentration over time, indicate a statistically significant increasing trend.

AEP provided additional evidence to demonstrate conditions have not changed and the BAP is not the source of the potential SSLs. The Piper Diagram continues to show that the SP-10 samples are chemically distinct from the BAP surface water, pore water, and sediment samples. The geochemistry

at SP-10 does not change significantly over time in a manner indicative of a release from the BAP. The October 2023 SP-10 sample concentration of barium was detected at 6.01 mg/L, far greater than the 2019 samples of the leachate from bottom ash, surface water in the BAP, and pore water beneath the BAP, detected at 0.352 mg/L, 0.315 mg/L, and 0.083 mg/L, respectively.

AEP may refer to the ASD approval and continue assessment monitoring for the BAP in accordance with Oklahoma Administrative Code (OAC) 252:517-9-6(g)(3)(B). If exceedances of GWPSs are determined in other monitoring wells, AEP is required to submit a separate ASD for constituents in those monitoring wells if applicable.

The ASD for barium, fluoride, and lithium exceedances in SP-10 is accepted as submitted. If you have any questions, please contact Kaylee Daneshmand at (405) 702-5196 or at Kaylee.daneshmand@deq.ok.gov.

Sincerely,

Hillary Young, P.E.
Chief Engineer
Land Protection Division

HY/kd

American Electric Power
7300 E Hwy 88
Oologah, OK 74053-0220
AEP.com

May 17, 2024

Via electronic mail

Ms. Kaylee Daneshmand
Oklahoma Department of Environmental Quality (ODEQ)
707 North Robinson, P.O. Box 1677
Oklahoma City, OK 73101-1677

Re: Alternate Source Demonstration (ASD)
Bottom Ash Pond (BAP)
Public Service Company of Oklahoma (PSO) - Northeastern Power Station (NPS)
Roger County
Solid Waste Permit No. Pending

Dear Ms. Daneshmand,

AEP/PSO received ODEQ's correspondence dated February 22, 2024, in which ODEQ accepted the ASD for the lithium, fluoride, and barium detected in SP-10 during the October 4, 2023, sampling event. ODEQ indicated that if lithium, fluoride, and barium continue to exceed the groundwater protection standards (GWPS) in the future and conditions have not changed, NPS may refer to the October 24, 2019, ASD approval for lithium, June 4, 2021, ASD approval for fluoride, and to the March 9, 2023, ASD approval for barium and continue assessment monitoring for the BAP in accordance with OAC 252:517-9-6(g)(3)(B).

On February 20, 2024, the statistical evaluation of the second semi-annual 2023 assessment monitoring event (October 10, 2023) for the BAP was certified and in that statistical evaluation report, potential SSLs were identified for lithium, fluoride, and barium at SP-10.

The statistical findings are summarized as follows:

The Lower Confidence Level (LCL) for lithium (0.238 mg/L) exceeded the GWPS (a calculated Upper Tolerance Limit (UTL)) of 0.163 mg/L at SP-10. The actual detected lithium concentration in SP-10 was 0.235 mg/l.

The LCL for fluoride (5.59 mg/L) exceeded the GWPS (UTL of 4.39 mg/L) was exceeded as at SP-10. The actual detected fluoride concentration in SP-10 was 6.3 mg/L.

The LCL for barium (4.20 mg/L) exceeded the GWPS (UTL of 2.77 mg/L) was exceeded as at SP-10. The actual detected barium concentration in SP-10 was 6.01 mg/L.

Attached are the alternative source demonstrations for your review outlining the lines of evidence that these exceedances are the result of natural variations occurring in the groundwater at SP-10 and that the conditions at the BAP have not changed.

Please do not hesitate to contact me if you have any questions or would like to discuss. I can be reached by email at: rdjones2@aep.com or by phone at: (737) 330-3725.

Sincerely,

Rebecca D Jones

Rebecca D. Jones, P.G.

AEP, Environmental Specialist

Attachments

Geosyntec consultants

500 W. Wilson Bridge Rd, Suite 250
Worthington, Ohio 43085
PH 614.468.0421
www.geosyntec.com

Memorandum

Date:	May 16, 2024
To:	Rebecca Jones, American Electric Power (AEP)
From:	Beth Gross, PhD, PE (OK) and Allison Kreinberg, Geosyntec
Subject:	Alternative Source Demonstration Update Northeastern Power Station Bottom Ash Pond Oologah, Rogers County, Oklahoma

The Bottom Ash Pond (BAP) is a regulated coal combustion residual (CCR) management unit at the Northeastern Power Station (NPS) in Oologah, Oklahoma. A semiannual assessment monitoring event was completed at the BAP on October 10, 2023, in accordance with the assessment monitoring requirements of Oklahoma Administrative Code (OAC) 252:517-9-6. Analysis of the October 2023 data identified statistically significant levels (SSLs) above the groundwater protection standards (GWPSs) for lithium, fluoride, and barium at SP-10 (Attachment B). The following SSLs were identified at the Northeastern BAP:

- The lower confidence limit (LCL) for lithium exceeded the GWPS of 0.163 milligrams per liter (mg/L) at SP-10 (0.238 mg/L).
- The LCL for fluoride exceeded the GWPS of 4.39 mg/L at SP-10 (5.59 mg/L).
- The LCL for barium exceeded the GWPS of 2.77 mg/L at SP-10 (4.20 mg/L).

Key analytical results for samples collected from the BAP and from SP-10 are provided in **Table 1**. As described in previous alternative source demonstrations (ASDs) (Geosyntec 2019, Geosyntec 2021a, Geosyntec 2021b, Geosyntec 2021c, Geosyntec 2022, Geosyntec 2023a, Geosyntec 2023b, Geosyntec 2023c), concentrations of lithium, fluoride, and barium in the BAP water (including pore water) and BAP sediments that are lower than concentrations observed at SP-10 suggest that the BAP is not the source of these exceedances. These previous ASDs demonstrate that the release of lithium from the clay minerals in the shale lens located at 46 feet below ground surface in the screened interval of SP-10 is the likely source of lithium in groundwater at that location. Analytical results suggest that naturally occurring barium and fluoride are also associated with the shale lenses and are contributing to aqueous barium and fluoride concentrations at SP-10.

The Oklahoma Department of Environmental Quality (DEQ) previously noted in a letter to the NPS dated June 4, 2021, that "[i]f lithium and fluoride continue to exceed their relative GWPS in the future and conditions have not changed, NPS may refer to the October 29, 2019 ASD approval

for lithium and this [June 4, 2021] approval for fluoride and continue assessment monitoring for the BAP in accordance with OAC 252:517-6(g)(3)(B)" (DEQ 2021). DEQ provided a similar letter to the NPS dated September 20, 2022, that indicated that the July 14, 2022 ASD "is applicable for the barium exceedance in SP-10 of the GWPS if conditions do not change. AEP may refer to the ASD approval for barium and continue assessment monitoring for the BAP in accordance with OAC 252:517-9-6(g)(3)(B)" (DEQ 2022). This ASD update presents an evaluation of the BAP for changing conditions that may affect previously approved ASDs for lithium, fluoride, and barium exceedances at SP-10.

The sample collected from the October 2023 monitoring event at SP-10 contained a lithium concentration of 0.235 mg/L, fluoride concentration of 6.3 mg/L, and barium concentration of 6.01 mg/L. The lithium concentration (**Figure 1**) and fluoride concentration (**Figure 2**) are consistent with previous results collected during the assessment monitoring period and continue to show no statistically significant positive trends. This is an indication that conditions have not changed substantially since the preceding ASD was submitted (Geosyntec 2023c), and the arguments presented in the previous ASDs are still valid. Therefore, the lithium and fluoride concentrations at SP-10 during the October 2023 assessment monitoring event are not attributed to a release from the BAP.

A time series plot of the barium concentrations at SP-10 and a Mann-Kendall statistical analysis of the reported barium results over time are shown in **Figure 3**. The analysis determined that barium concentrations at SP-10 display a statistically significant increasing trend. However, based on a Piper diagram showing select events where the full suite of major cations and anions were sampled (**Figure 4**), the geochemistry at monitoring well SP-10 does not change over time in a manner indicative of a release from the BAP. The October 2023 sample is displayed on the plot as the purple diamond. **Figure 4** demonstrates that the geochemistry of SP-10 has remained consistent over the past several years, indicating that groundwater condition at SP-10 is geochemically stable.

The information above, as well as the information presented in previous ASDs (Geosyntec 2019, Geosyntec 2021a, Geosyntec 2021b, Geosyntec 2021c, Geosyntec 2022, Geosyntec 2023a, Geosyntec 2023b, Geosyntec 2023c), continues to support the position that barium, fluoride, and lithium concentrations are a result of natural variation in the underlying lithology, including the presence of shale lenses containing barium, fluoride, and lithium within the screened interval at SP-10. Therefore, no further action is warranted, and the BAP will remain in the assessment monitoring program. Certification of this ASD memorandum by a qualified professional engineer is in Attachment A.

******

REFERENCES

DEQ. 2021. Alternate Source Demonstration for Fluoride and Lithium Exceedance – Bottom Ash Pond, Public Service Company of Oklahoma Northeastern Power Station, Rogers County. Oklahoma Department of Environmental Quality. June 4.

DEQ. 2022. Alternative Source Demonstration for Barium, Fluoride, and Lithium Exceedances – Bottom Ash Pond, Public Service Company of Oklahoma - Northeastern Power Station, Rogers County. Oklahoma Department of Environmental Quality. September 20.

Geosyntec. 2019. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. Geosyntec Consultants. April.

Geosyntec. 2021a. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. Geosyntec Consultants. January.

Geosyntec. 2021b. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. Geosyntec Consultants. May.

Geosyntec. 2021c. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. Geosyntec Consultants. October.

Geosyntec. 2022. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. Geosyntec Consultants. July.

Geosyntec. 2023a. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. Geosyntec Consultants. January.

Geosyntec. 2023b. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. Geosyntec Consultants. May.

Geosyntec. 2023c. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. Geosyntec Consultants. December.

TABLES

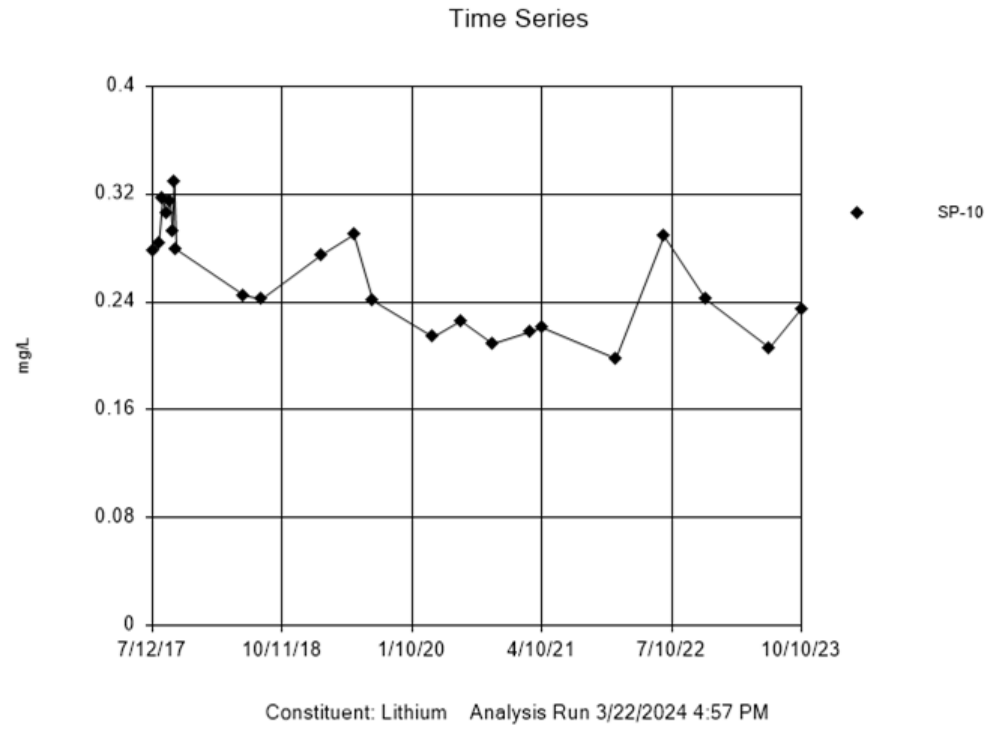
Table 1. Summary of Key Analytical Data
Alternative Source Demonstration Update Memorandum
Northeastern Power Station Bottom Ash Pond, Oologah, Oklahoma

Sample	Sample Date	Lithium Concentration (mg/L)	Fluoride Concentration (mg/L)	Barium Concentration (mg/L)
SPLP Leachate of Bottom Ash	7/10/2019	0.001	0.458	0.352
	8/25/2022	< 0.5	NA	0.22
BAP Surface Water	2/5/2019	0.00874	0.37	0.315
BAP Pore Water	7/10/2019	0.003	< 0.83	0.083
SP-10 October 2023 Result	10/10/2023	0.235	6.3	6.01

Notes:
1. Nondetect results are shown as less than the reporting limit.
BAP: Bottom Ash Pond
mg/L: milligram per liter
NA: not analyzed
SPLP: synthetic precipitation leaching procedure

FIGURES

Sanitas™ v.9.6.31 Software for use by regulators in official oversight duties. EPA



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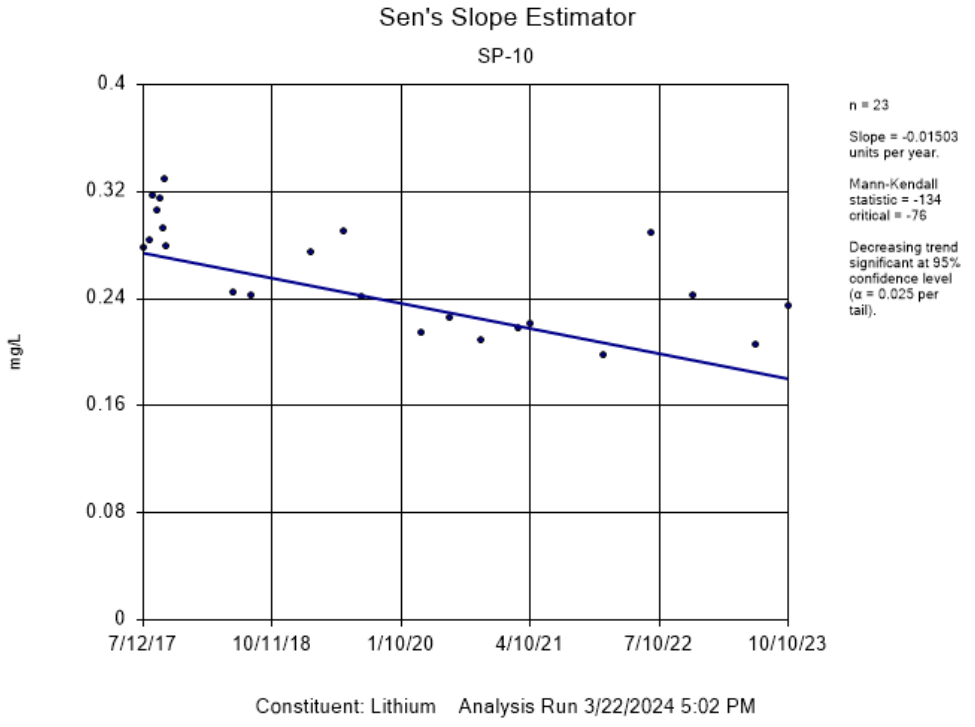
Sanitas™ v.9.6.31 Software for use by regulators in official oversight duties. EPA



Constituent: Lithium Analysis Run 3/22/2024 5:02 PM

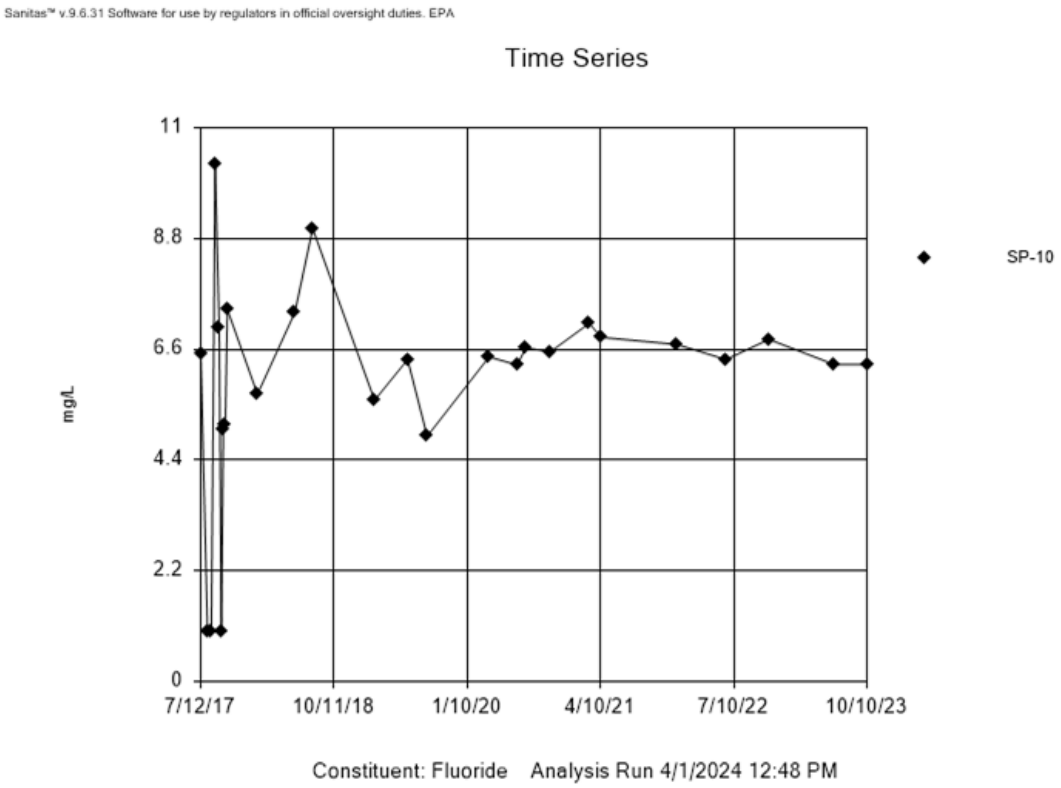
Notes: Lithium results from monitoring well SP-10 are displayed on the plots.

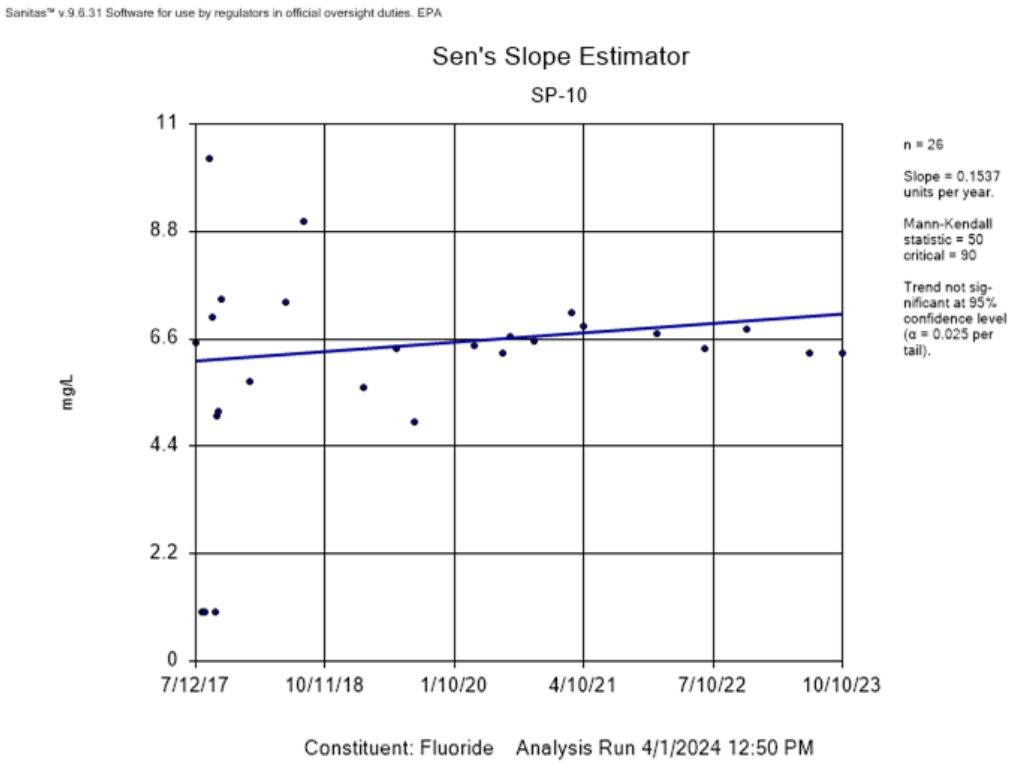
AEP: American Electric Power
mg/L: milligrams per liter

Lithium Time Series and Trend Test: SP-10
Northeastern Bottom Ash Pond

Geosyntec consultants | AMERICAN ELECTRIC POWER | Figure 1

Columbus, Ohio | May, 2024





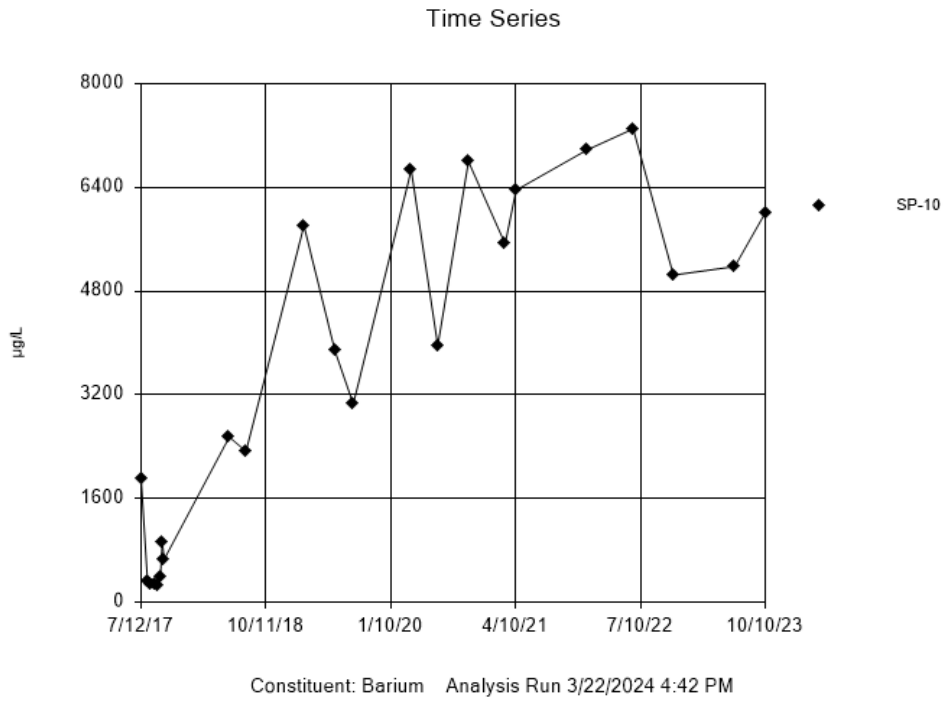
Notes: Fluoride results from monitoring well SP-10 are displayed on the plots.

AEP: American Electric Power
mg/L: milligrams per liter

Fluoride Time Series and Trend Test: SP-10
Northeastern Bottom Ash Pond

Geosyntec consultants | AMERICAN ELECTRIC POWER | Figure 2

Columbus, Ohio | May, 2024



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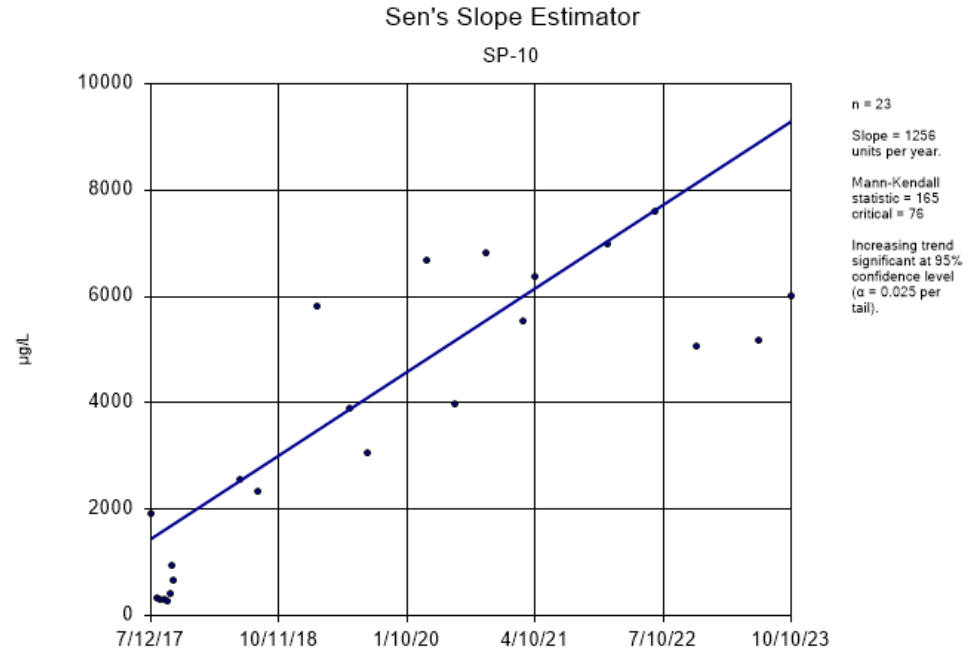


Constituent: Barium Analysis Run 3/22/2024 5:05 PM

Notes: Barium results from monitoring well SP-10 are displayed on the plots.

AEP: American Electric Power
ug/L: micrograms per liter

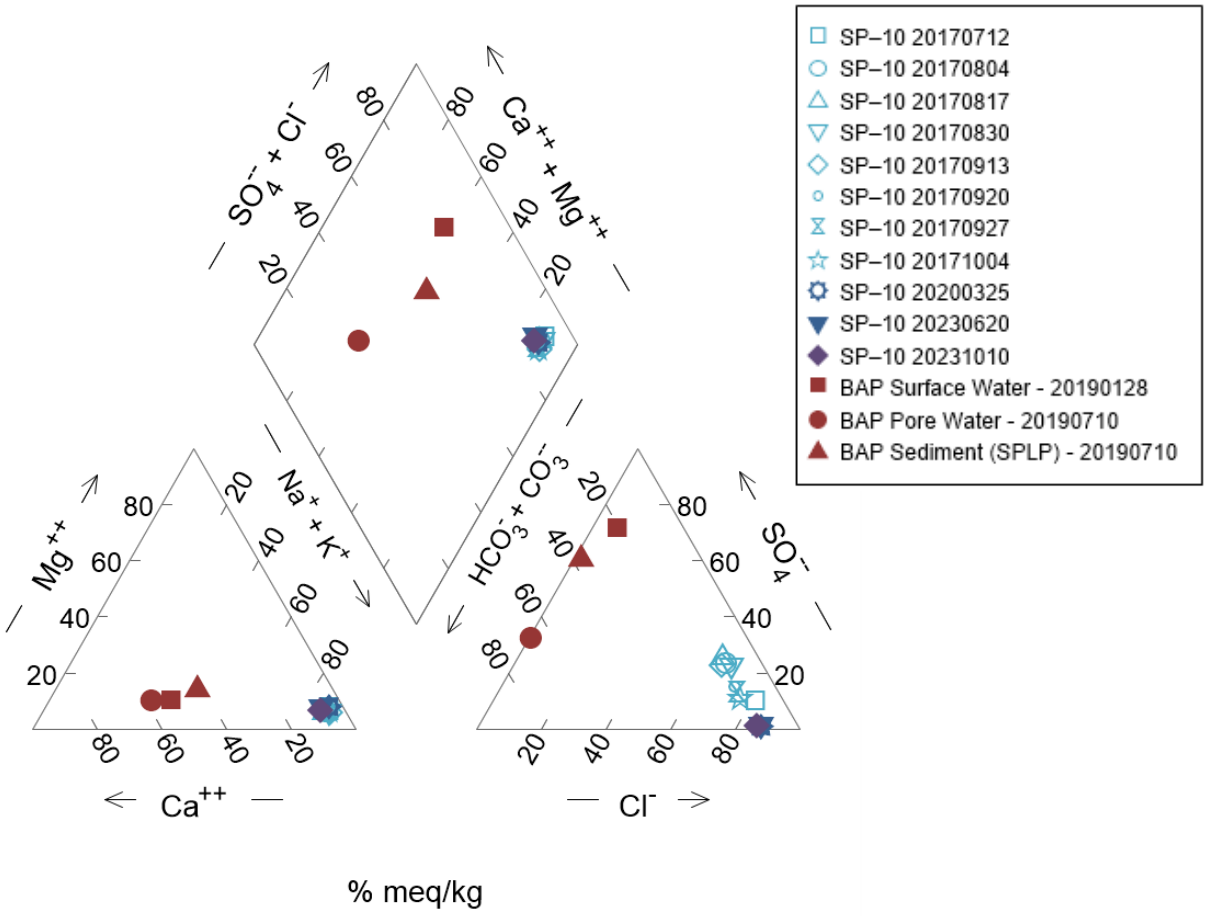
Barium Time Series and Trend Test: SP-10
Northeastern Bottom Ash Pond

Geosyntec consultants

AMERICAN ELECTRIC POWER

Figure **3**

Columbus, Ohio | May, 2024



Notes:
SPLP – Synthetic Precipitation Leaching Procedure.

% meq/kg – percent milliequivalents per kilogram

Piper Diagram – SP-10 and BAP Samples
Northeastern Bottom Ash Pond

Geosyntec consultants | AMERICAN ELECTRIC POWER

Columbus, Ohio | May 2024

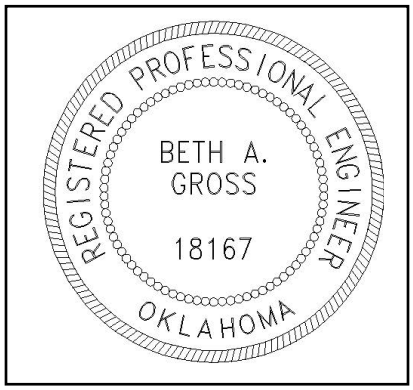
Figure **4**

ATTACHMENT A

Certification by Qualified Professional Engineer

CERTIFICATION BY A QUALIFIED PROFESSIONAL ENGINEER

I certify that the above described alternative source demonstration is appropriate for evaluating the groundwater monitoring data for the Bottom Ash Pond CCR management area at the Northeastern Power Station and that the requirements of OAC 252:517-9-6(g)(3)(B) have been met.



Beth Ann Gross
Printed Name of Licensed Professional Engineer

Beth Ann Gross
Signature

Geosyntec Consultants
2039 Centre Pointe Boulevard, Suite 103
Tallahassee, Florida 32308

Oklahoma Firm Certificate of
Authorization No. 1996
Exp. 6/30/2024

18167	Oklahoma	5/16/2024
License Number	Licensing State	Date

* * * * *

ATTACHMENT B

Assessment Statistics Summary

2023 Second Semiannual Event

Geosyntec consultants

engineers | scientists | innovators

STATISTICAL ANALYSIS SUMMARY, BOTTOM ASH POND – SECOND SEMIANNUAL EVENT 2023

Northeastern Power Station
Oologah, Oklahoma

Prepared for

American Electric Power
1 Riverside Plaza
Columbus, Ohio 43215-2372

Prepared by

Geosyntec Consultants, Inc.
500 West Wilson Bridge Road, Suite 250
Worthington, Ohio 43085

Project Number: CHA8500B

February 13, 2024

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ACRONYMS AND ABBREVIATIONS

ASD	alternative source demonstration
BAP	bottom ash pond
CCR	coal combustion residuals
GWPS	groundwater protection standard
LCL	lower confidence limit
LPL	lower prediction limit
mg/L	milligrams per liter
NPS	Northeastern Power Station
OAC	Oklahoma Administrative Code
ODEQ	Oklahoma Department of Environmental Quality
PQL	practical quantitation limit
QA/QC	quality assurance and quality control
SSI	statistically significant increase
SSL	statistically significant level
TDS	total dissolved solids
UPL	upper prediction limit

1. INTRODUCTION

In accordance with Oklahoma Department of Environmental Quality (ODEQ) requirements regarding the disposal of coal combustion residuals (CCRs) in landfills and surface impoundments (Oklahoma Administrative Code [OAC] 252:517), groundwater monitoring has been conducted at the Bottom Ash Pond (BAP), an existing CCR unit at the Northeastern Power Station (NPS) in Oologah, Oklahoma. Recent groundwater monitoring results were used to identify concentrations of Appendix B constituents that are above site-specific groundwater protection standards (GWPSs).

Based on detection monitoring conducted in 2017 and 2018, statistically significant increases (SSIs) over background were concluded for boron, chloride, fluoride, total dissolved solids (TDS), and sulfate at the BAP. In addition, pH values below the lower prediction limit (LPL) resulted in SSIs below background as well. GWPSs were set in accordance with OAC 252:517-9-6(h) and a statistical evaluation of the assessment monitoring was conducted.

During 2023, a sampling event for both Appendix A parameters and Appendix B parameters, as required by OAC 252:517-9-6(d), was completed in June. During the June 2023 assessment monitoring event, statistically significant levels (SSLs) were observed for barium, fluoride, and lithium (Geosyntec 2023a). An alternative source demonstration (ASD) was successfully completed (Geosyntec 2023b). Therefore, the unit remained in assessment monitoring. One assessment monitoring event was conducted at the BAP in October 2023 in accordance with OAC 252:517-9-6(d). The results of the October 2023 assessment event are documented in this report.

Prior to conducting the statistical analyses, the groundwater data underwent several validation tests, including those for completeness, sample tracking accuracy, transcription errors, and consistent use of measurement units. No data quality issues were identified which would impact data usability.

The monitoring data were submitted to Groundwater Stats Consulting, LLC for statistical analysis. GWPSs were reestablished for the Appendix B parameters. Confidence intervals were calculated for Appendix B parameters at the compliance wells to assess whether SSLs of Appendix B parameters were present above the GWPS. SSLs were identified for barium, fluoride, and lithium. Therefore, either the unit will move to an assessment of corrective measures, or an ASD will be conducted to evaluate if the unit can remain in assessment monitoring. Certification of the selected statistical methods by a qualified professional engineer is documented in Attachment A.

2. BOTTOM ASH POND EVALUATION

2.1 Data Validation and QA/QC

During the October 2023 assessment monitoring event, one set of samples was collected for analysis from each background and compliance well to meet the requirements of OAC 252:517-9-6(d)(1). Samples from the October 2023 sampling event were analyzed for all Appendix A and Appendix B parameters. A summary of data collected during this assessment monitoring event are presented in Table 1.

Chemical analysis was completed by a National Environmental Laboratory Accreditation Program–certified analytical laboratory. The laboratory completed analysis of quality assurance and quality control (QA/QC) samples such as laboratory reagent blanks, continuing calibration verification samples, and laboratory fortified blanks.

The analytical data were imported into a Microsoft Access database, where checks were completed to assess the accuracy of sample location identification and analyte identification. Where necessary, unit conversions were applied to standardize reported units across all sampling events. Exported data files were created for use with the Sanitas™ v.10.0.15 statistics software. The export file was checked against the analytical data for transcription errors and completeness.

2.2 Statistical Analysis

Statistical analyses for the BAP were conducted in accordance with the November 2021 *Statistical Analysis Plan* (Geosyntec 2021). Time series plots and results for all completed statistical tests are provided in Attachment B. The data obtained in October 2023 were screened for potential outliers. No outliers were identified for these events.

2.2.1 Establishment of GWPSs

A GWPS was established for each Appendix B parameter in accordance with the Statistical Analysis Plan (Geosyntec 2021). The established GWPS was set to whichever was greater of the background concentration and the maximum contaminant level for each Appendix B parameter. To determine background concentrations, an upper tolerance limit was calculated using data that were pooled from the background wells collected during the background monitoring and assessment monitoring events. Tolerance limits were calculated parametrically with 95% coverage and 95% confidence for antimony, arsenic, cadmium, chromium, combined radium, and lead. Nonparametric tolerance limits were calculated for barium, beryllium, cobalt, fluoride, lithium, molybdenum, and selenium due to apparent nonnormal distributions, and for mercury and thallium due to a high nondetect frequency. Upper tolerance limits and the final GWPSs are summarized in Table 2.

2.2.2 Evaluation of Potential Appendix B SSLs

A confidence interval was constructed for each Appendix B parameter at each compliance well. Confidence limits were generally calculated parametrically ($\alpha = 0.01$). However, nonparametric confidence limits were calculated in some cases (e.g., when the data did not appear to be normally distributed or when the nondetect frequency was too high). Select datasets were truncated if significant serial correlation was observed among the background samples that were collected on

an approximately monthly basis in 2017. A list of the truncated well/constituent pairs used for calculation of the confidence limits is provided in Attachment B.

An SSL was concluded if the lower confidence limit (LCL) exceeded the GWPS (i.e., if the entire confidence interval was above the GWPS). Calculated confidence limits are shown in Attachment B.

The following SSLs were identified at the Northeastern BAP:

- The LCL for barium was above the GWPS of 2.77 milligrams per liter (mg/L) at SP-10 (4.20 mg/L).
- The LCL for fluoride was above the GWPS of 4.39 mg/L at SP-10 (5.59 mg/L).
- The LCL for lithium was above the GWPS of 0.163 mg/L at SP-10 (0.238 mg/L).

ODEQ previously noted in a letter provided to the NPS that "[i]f lithium and fluoride continue to exceed their relative GWPS in the future and conditions have not changed, NPS may refer to the October 29, 2019 ASD approval for lithium and June 4, 2021 approval for fluoride and continue assessment monitoring at the BAP in accordance with OAC 252:517-6(g)(3)(B)" (ODEQ 2021). ODEQ provided a similar letter dated September 20, 2022 documenting ASD approval for a barium SSL at SP-10 which is applicable in the future if conditions do not change (ODEQ 2022). Thus, an ASD will be submitted to ODEQ demonstrating that conditions at the BAP remain unchanged so that the unit will continue assessment monitoring.

2.2.3 Establishment of Appendix A Prediction Limits

Upper prediction limits (UPLs) were previously established for all Appendix A parameters following the background monitoring period. Intrawell tests were used to evaluate potential SSIs for boron, chloride, fluoride, pH, sulfate, and TDS, and interwell tests were used to evaluate potential SSIs for calcium. Interwell and intrawell prediction limits are updated periodically during the assessment monitoring period as sufficient data become available.

For intrawell tests, insufficient data was available to compare against the existing background dataset, and so the prediction limits were not updated for the intrawell tests at this time. The intrawell prediction limits were previously calculated using historical data through June 2022 (Geosyntec 2023c). The established intrawell prediction limits were used to evaluate potential SSIs for calcium.

Prediction limits for the interwell tests were recalculated using data collected during the 2023 assessment monitoring events. New background well data were tested for outliers before being added to the background data set. Background well data were also evaluated for statistically significant trends using the Sen's Slope/Mann-Kendall trend test, and the results are included in Attachment B.

After the revised background set was established, a parametric or nonparametric analysis was selected based on the distribution of the data and the frequency of nondetect data. Estimated results under the reporting limit (i.e., practical quantitation limit [PQL]) but above the method detection

limit—that is, "J-flagged" data—were considered detections and the estimated results were used in the statistical analyses. Nonparametric analyses were selected for data sets with at least 50% nondetect data or data sets that could not be normalized. Parametric analyses were selected for data sets (either transformed or untransformed) that passed the Shapiro-Wilk/Shapiro-Francía test for normality. The Kaplan-Meier nondetect adjustment was applied to data sets with between 15% and 50% nondetect data. For data sets with fewer than 15% nondetect data, nondetect data were replaced with one half of the PQL. The selected analysis (i.e., parametric or nonparametric) and transformation (where applicable) for each background data set are shown in Attachment B.

Interwell UPLs were updated for boron, chloride, fluoride, pH, sulfate, and TDS and interwell LPLs were updated for pH using historical data through October 2023. Intrawell UPLs for calcium were previously updated using data through June 2022 to represent background values. The prediction limits are summarized in Table 3. The prediction limits were calculated for a one-of-two retesting procedure: If at least one sample in a series of two is not above the UPL (or, in the case of pH, is neither less than the LPL nor greater than the UPL), then it can be concluded that an SSI has not occurred. In practice, where the initial result does not exceed the UPL (or, in the case of pH, is neither less than the LPL nor greater than the UPL), a second sample will not be collected. The retesting procedures allow achieving an acceptably high statistical power to detect changes at downgradient wells for constituents evaluated using intrawell prediction limits.

2.2.4 Evaluation of Potential Appendix A SSIs

While SSLs were identified, a review of the Appendix A results were also completed to assess whether concentrations of Appendix A parameters at the compliance wells were above background concentrations. Data collected during the October 2023 assessment monitoring event from each compliance well were compared to updated interwell and previously established intrawell prediction limits to assess whether the results are above background values (Table 3).

The following concentrations were above the UPLs:

- Boron concentrations were above the interwell UPL of 0.496 mg/L at SP-10 (0.879 mg/L).
- Chloride concentrations were above the interwell UPL of 874 mg/L at SP-10 (1,820 mg/L).
- Fluoride concentrations were above the interwell UPL of 4.39 mg/L at SP-10 (6.3 mg/L).
- Sulfate concentrations were above the interwell UPL of 83.0 mg/L at SP-1 (84.8 mg/L) and SP-11 (184 mg/L).
- TDS concentrations were above the interwell UPL of 1,940 mg/L at SP-10 (3,460 mg/L).

While the prediction limits were calculated for a one-of-two retesting procedure, SSIs were conservatively assumed if the October 2023 sample was above the UPL or below the LPL in the case of pH. Based on these results, concentrations of Appendix A constituents appear to be above background concentrations.

2.3 Conclusions

A semiannual assessment monitoring event was conducted in accordance with the CCR Rule. The laboratory and field data were reviewed prior to statistical analysis, and no QA/QC issues that impacted data usability were identified. A review of outliers identified no potential outliers in the October 2023 data. GWPSs were reestablished for the Appendix B parameters. A confidence interval was constructed at each compliance well for each Appendix B parameter; SSLs were concluded if the entire confidence interval was above the GWPS. SSLs were identified for barium, fluoride, and lithium. Appendix A parameters were compared to calculated prediction limits, with exceedances identified for boron, chloride, fluoride, sulfate, and TDS.

Based on this evaluation, the Northeastern BAP CCR unit will either move to an assessment of corrective measures or an ASD will be conducted to evaluate if the unit can remain in assessment monitoring.

3. REFERENCES

Geosyntec. 2021. Statistical Analysis Plan – Northeastern Power Station. Geosyntec Consultants, Inc. November.

Geosyntec. 2023a. Statistical Analysis Summary – Bottom Ash Pond, Northeastern Power Station, Oologah, Oklahoma. Geosyntec Consultants, Inc. October.

Geosyntec. 2023b. Alternative Source Demonstration Update. Northeastern Power Station, Bottom Ash Pond, Oologah, Oklahoma. Geosyntec Consultants, Inc. December.

Geosyntec. 2023c. Statistical Analysis Summary – Bottom Ash Pond, Northeastern Power Station, Oologah, Oklahoma. Geosyntec Consultants, Inc. February.

ODEQ. 2021. Letter Transmittal – Alternative Source Demonstration for Fluoride and Lithium Exceedance – Bottom Ash Pond. Public Service Company of Oklahoma – Northeastern Power Station. Oklahoma Department of Environmental Quality. June.

ODEQ. 2022. Letter Transmittal – Alternative Source Demonstration for Barium, Fluoride, and Lithium Exceedance – Bottom Ash Pond. Public Service Company of Oklahoma – Northeastern Power Station. Oklahoma Department of Environmental Quality. September.

TABLES

Table 1. Groundwater Data Summary
Statistical Analysis Summary
Northeastern – Bottom Ash Pond

Parameter	Unit	SP-1	SP-2	SP-4	SP-5R	SP-10	SP-11
		10/10/2023	10/10/2023	10/10/2023	10/10/2023	10/10/2023	10/10/2023
Antimony	µg/L	0.745	1.06	0.249	0.195	0.062 J1	0.075 J1
Arsenic	µg/L	0.65	0.82	0.84	15.8	0.65	3.61
Barium	µg/L	138	1,270	232	2,770	6,010	455
Beryllium	µg/L	0.053	0.086	0.036 J1	0.201	0.035 J1	0.027 J1
Boron	mg/L	0.159	0.210	0.339	0.228	0.879	0.354
Cadmium	µg/L	0.041	0.047	0.057	0.076	0.007 J1	0.031
Calcium	mg/L	102	151	90.9	107	93.0	79.1
Chloride	mg/L	45.1	699	450	964	1,820	79.4
Chromium	µg/L	0.47	0.62	0.59	2.64	0.36	0.90
Cobalt	µg/L	0.717	0.322	0.218	1.03	0.039	0.635
Combined Radium	pCi/L	3.06	8.06	3.23	24.78	21.79	2.91
Fluoride	mg/L	0.96	2.79	3.19	3.21	6.3	2.28
Lead	µg/L	0.17 J1	0.15 J1	0.38	2.52	0.08 J1	0.45
Lithium	mg/L	0.00819	0.0809	0.0554	0.123	0.235	0.0222
Mercury	µg/L	0.005 U1	0.005 U1	0.005 U1	0.005 U1	0.005 U1	0.005 U1
Molybdenum	µg/L	26.0	15.9	3.3	0.7	0.2 J1	0.9
Selenium	µg/L	11.8	3.63	0.30 J1	0.94	0.06 J1	0.23 J1
Sulfate	mg/L	84.8	20.2	81.4	2.6	19.2	184
Thallium	µg/L	0.11 J1	0.05 J1	0.02 J1	0.04 J1	0.2 U1	0.2 U1
Total Dissolved Solids	mg/L	470	1,470	1,160	1,830	3,460	880
pH	SU	7.42	7.6	7.62	7.32	7.73	7.24

Notes:
J1: Estimated value. Parameter was detected in concentrations below the reporting limit.
mg/L: milligrams per liter
pCi/L: picocuries per liter
SU: standard unit
U1: Non-detect value. For statistical analysis, parameters which were not detected were replaced with the reporting limit.
µg/L: micrograms per liter

Table 2. Appendix B Groundwater Protection Standards *Geosyntec Consultants, Inc.*
Statistical Analysis Summary
Northeastern Plant - Bottom Ash Pond

Constituent Name	MCL	CCR Rule-Specified	Calculated UTL	GWPS
Antimony, Total (mg/L)	0.00600		0.00467	0.00600
Arsenic, Total (mg/L)	0.0100		0.0529	0.0529
Barium, Total (mg/L)	2.00		2.77	2.77
Beryllium, Total (mg/L)	0.00400		0.00212	0.00400
Cadmium, Total (mg/L)	0.00500		0.00022	0.00500
Chromium, Total (mg/L)	0.100		0.00373	0.100
Cobalt, Total (mg/L)	n/a	0.00600	0.0179	0.0179
Combined Radium, Total (pCi/L)	5.00		19.4	19.4
Fluoride, Total (mg/L)	4.00		4.39	4.39
Lead, Total (mg/L)	n/a	0.0150	0.0087	0.0150
Lithium, Total (mg/L)	n/a	0.0400	0.163	0.163
Mercury, Total (mg/L)	0.00200		0.0000300	0.00200
Molybdenum, Total (mg/L)	n/a	0.100	0.0100	0.100
Selenium, Total (mg/L)	0.0500		0.00499	0.0500
Thallium, Total (mg/L)	0.00200		0.00162	0.00200

Notes:
1. Calculated UTL (upper tolerance limit) represents site-specific background values.
2. Grey cells indicate the GWPS is based on the calculated UTL, which is higher than the MCL or CCR Rule-specified value.
CCR: coal combustion residuals
GWPS: groundwater protection standard
MCL: maximum contaminant level
mg/L: milligrams per liter
pCi/L: picocuries per liter

Table 3. Appendix A Data Summary
Statistical Analysis Summary
Northeastern – Bottom Ash Pond

Analyte	Unit	Description	SP-1	SP-2	SP-10	SP-11
			10/10/2023	10/10/2023	10/10/2023	10/10/2023
Boron	mg/L	Interwell Background Value (UPL)	0.496			
		Analytical Result	0.159	0.210	**0.879**	0.354
Calcium	mg/L	Intrawell Background Value (UPL)	141	167	227	156
		Analytical Result	102	151	93.0	79.1
Chloride	mg/L	Interwell Background Value (UPL)	874			
		Analytical Result	45.1	699	**1,820**	79.4
Fluoride	mg/L	Interwell Background Value (UPL)	4.39			
		Analytical Result	0.96	2.79	**6.3**	2.28
pH	SU	Interwell Background Value (UPL)	9.1			
		Interwell Background Value (LPL)	7.0			
		Analytical Result	7.4	7.6	7.7	7.2
Sulfate	mg/L	Interwell Background Value (UPL)	83.0			
		Analytical Result	**84.8**	20.2	19.2	**184**
Total Dissolved Solids	mg/L	Interwell Background Value (UPL)	1,940			
		Analytical Result	470	1,470	**3,460**	880

Notes:
1. Bold values exceed the background value.
2. Background values are shaded gray.
LPL: lower prediction limit
mg/L: milligrams per liter
SU: standard units
UPL: upper prediction limit

ATTACHMENT A
Certification by Qualified Professional Engineer

Certification by Qualified Professional Engineer

I certify that selected and above described statistical method is appropriate for evaluating the groundwater monitoring data for the Northeastern BAP CCR management area and that the requirements of OAC 252:517-9-4(g) have been met.

David Anthony Miller

Printed Name of Licensed Professional Engineer

David Anthony Miller

Signature

26057	Oklahoma	02.20.2024
License Number	Licensing State	Date

ATTACHMENT B
Statistical Analysis Output

GROUNDWATER STATS CONSULTING

January 11, 2024

Geosyntec Consultants
Attn: Ms. Allison Kreinberg
500 W. Wilson Bridge Road, Suite 250
Worthington, OH 43085

Re: Northeastern BAP (Bottom Ash Pond)
Background Update & Assessment Monitoring Statistics – October 2023

Dear Ms. Kreinberg,

Groundwater Stats Consulting (GSC), formerly the statistical consulting division of Sanitas Technologies, is pleased to provide the statistical analysis and background update of 2023 groundwater data for American Electric Power Inc.'s Northeastern BAP. The analysis complies with the Oklahoma Administrative Code (OAC) as well as with the United States Environmental Protection Agency (USEPA) Unified Guidance (2009).

Sampling began at the site for the OAC program in 2017. The monitoring well network, as provided by Geosyntec Consultants, consists of the following:

- **Upgradient wells:** SP-4 and SP-5R
- **Downgradient wells:** SP-1, SP2, SP-10, and SP-11

Data were sent electronically, and the statistical analysis was conducted according to the Statistical Analysis Plan and screening evaluation prepared by GSC and approved by Dr. Kirk Cameron, PhD Statistician with MacStat Consulting, primary author of the USEPA Unified Guidance, and Senior Advisor to GSC. The analysis was reviewed by Kristina Rayner, Senior Statistician and Founder of Groundwater Stats Consulting.

The OAC program consists of the following constituents listed below. The terms "constituent" and "parameter" are interchangeable.

- **Appendix A** (Detection Monitoring) **-** boron, calcium, chloride, fluoride, pH, sulfate, and TDS
- **Appendix B** (Assessment Monitoring) **–** antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, combined radium 226 + 228, fluoride, lead, lithium, mercury, molybdenum, selenium, and thallium

For all constituents, a substitution of the most recent reporting limit is used for non-detect data. For calculating intrawell prediction limits, the substitution is performed for individual wells and may differ across wells. This generally gives the most conservative limit in each case.

Time series plots for Appendix A and B parameters are provided for all wells and are used to evaluate concentrations over time as well as for the purpose of updating statistical limits (Figure A). Additionally, box plots are included for all constituents at upgradient and downgradient wells (Figure B). Values in background which have been flagged as outliers may be seen in a lighter font and as a disconnected symbol on the graph. A summary of these values follows this letter (Figure C). The time series plots are used to initially screen for suspected outliers and trends, while the box plots provide visual representation of variation within individual wells and between all wells.

For regulatory comparison of current observations against statistical limits for Appendix A constituents, the annual site-wide false positive rate is based on the USEPA Unified Guidance (2009) recommendation of 10% (5% for each semi-annual sample event). Power curves were provided with the previous screening and demonstrated that the selected statistical method provides sufficient power to detect a change at any of the downgradient wells which complies with the USEPA Unified Guidance recommendation. The EPA suggests the selected statistical method should provide at least 55% power at 3 standard deviations or at least 80% power at 4 standard deviations. Power curves were based on the following:

Semi-Annual Sampling
1-of-2 resample plan
Constituents, c=7
Downgradient wells, w=4

Summary of Statistical Method – Appendix A Parameters

Based on the original background screening described in the 2017 screening report, the following statistical methods were selected for Appendix A parameters:

1) Intrawell prediction limits, combined with a 1-of-2 resample plan for calcium
2) Interwell prediction limits, combined with a 1-of-2 resample plan for boron, chloride, fluoride, pH, sulfate, and TDS

Parametric prediction limits are utilized when the screened historical data follow a normal or transformed-normal distribution. When data cannot be normalized or the majority of data are non-detects, a nonparametric test is utilized. While the annual false positive rate associated with parametric limits is fixed at 10% as recommended by the EPA Unified Guidance (2009), the false positive rate associated with nonparametric limits is not fixed and depends upon the available background sample size, number of future comparisons, and verification resample plan. The distribution of data is tested using the Shapiro-Wilk/Shapiro-Francia test for normality. After testing for normality and performing any adjustments as discussed below (US EPA, 2009), data are analyzed using either parametric or non-parametric prediction limits as appropriate. Non-detects are handled as follows:

- No statistical analyses are required on wells and analytes containing 100% non-detects (USEPA Unified Guidance, 2009, Chapter 6).
- When data contain <15% non-detects, simple substitution of one-half the reporting limit is utilized in the statistical analysis. The reporting limit utilized for non-detects is the most recent practical quantification limit (PQL) as reported by the laboratory.
- When data contain between 15-50% non-detects, the Kaplan-Meier non-detect adjustment is applied to the background data for parametric limits. This technique adjusts the mean and standard deviation of the historical concentrations to account for concentrations below the reporting limit.
- Nonparametric prediction limits are used on data containing greater than 50% non-detects.

Natural systems continuously evolve due to physical changes made to the environment. Examples include capping a landfill, paving areas near a well, or lining a drainage channel to prevent erosion. Periodic updating of background statistical limits is necessary to accommodate these types of changes. In the intrawell case, data for all wells and constituents may be re-evaluated when a minimum of 4 new data points are available to determine whether earlier concentrations are representative of present-day groundwater

quality. In the interwell case, prediction limits may be updated with upgradient well data following each sampling event after careful screening for any new outliers. In some cases, deselecting the earlier portion of data may be necessary prior to construction of limits so that resulting statistical limits are conservative (lower) from a regulatory perspective and capable of rapidly detecting changes in groundwater quality. Even though the data are excluded from the calculation, the values will continue to be reported and shown in tables and graphs.

Summary of Appendix A Background Screening and Updates

December 2017 – Initial Background Screening

Interwell prediction limits combined with a 1-of-2 verification strategy were recommended for boron, chloride, fluoride, pH, sulfate and TDS; and intrawell prediction limits combined with a 1-of-2 verification strategy were recommended for calcium. All proposed background data were screened for outliers and trends during the background screening. The findings of those reports were submitted with that analysis. Interwell prediction limits utilize all upgradient well data for construction of statistical limits. During each sample event, upgradient well data may be screened for any newly suspected outliers or obvious trending patterns using time series plots. Intrawell prediction limits utilized the background data set that was originally screened in 2017. As recommended in the EPA Unified Guidance (2009), the background data sets are evaluated for the purpose of updating statistical limits, as described below, using the Mann-Whitney test when at least four additional measurements are available.

January 2024 – Background Update Summary

During this analysis, Tukey's outlier test and visual screening were used to evaluate data through October 2023 at upgradient wells for boron, chloride, fluoride, pH, sulfate, and TDS, which are tested using interwell prediction limits (Figure C).

For any parameters which use intrawell prediction limits (calcium), values were not re-evaluated for new outliers as these records had insufficient samples for updating background limits during this evaluation period.

Note that during the previous update, the Rank Von Neumann serial correlation test was used to evaluate whether the measurements collected during 2017 represented independent samples, or whether serial correlation was present among the measurements. Significant serial correlation was identified for the calcium at SP-4 and sulfate both SP-4 and SP-5R; therefore, the records for these well/constituent pairs were

truncated to remove earlier measurements for construction of statistical limits using only more recent data that represent independent samples.

Outlier Analysis

Tukey's outlier test on pooled upgradient well data confirmed previously identified values for chloride, fluoride, and TDS, but no additional values were flagged. Any values identified by Tukey's but not flagged appeared representative of similar concentrations upgradient of the facility. Previously flagged outliers were confirmed by Tukey's test and visual screening, and no changes to values flagged in previous background updates occurred. As mentioned above, any flagged data are displayed in a lighter font and as a disconnected symbol on the time series reports, as well as in a lighter font on the accompanying data pages. A summary table of all flagged outliers follows this report (Figure C).

Intrawell - Prediction Limits

Intrawell prediction limits, combined with a 1-of-2 resample plan, are constructed using historical data through June 2022 for calcium at all wells. A summary table of the limits follows this report (Figure D). A list of well/constituent pairs using a truncated portion of their records follows this report (Date Ranges Table). No comparison of the October 2023 observation was performed in this analysis.

Interwell – Trend Test Evaluation

For parameters tested using interwell analyses (boron, chloride, fluoride, pH, sulfate, and TDS) the Sen's Slope/Mann-Kendall trend test was used on upgradient wells to determine whether concentrations are statistically increasing, decreasing or stable at the 99% confidence level (Figure E). Statistically significant trends were identified for the following upgradient well/constituent pairs:

Increasing:

- Chloride: SP-5R
- Sulfate: SP-4
- TDS: SP-5R

Decreasing:

- Boron: SP-4 and SP-5R

Although statistically significant trends were identified, no records were adjusted since the resulting statistical limits are representative of present-day groundwater quality conditions and truncating the records would lead to statistical limits that are less conservative (i.e., higher) from a regulatory perspective. All available data from upgradient wells were used to construct interwell prediction limits for all Appendix A parameters except calcium, which is tested using intrawell prediction limits. As more data are collected, all upgradient well data will be re-evaluated for possible deselection of earlier measurements if concentrations no longer represent present-day groundwater quality conditions.

Interwell – Prediction Limits

Interwell prediction limits, combined with a 1-of-2 resample plan, were updated using all available data from upgradient wells through October 2023 for boron, chloride, fluoride, pH, sulfate, and TDS (Figure F). Time series plots were included with the interwell prediction limit graphs to display concentrations at upgradient wells that were used to construct the statistical limits. No comparison of the October 2023 data was performed in this analysis.

Evaluation of Appendix B Parameters – October 2023 Event

Prior to evaluating Appendix B parameters, background data are screened through visual screening and Tukey's outlier test for potential outliers and extreme trending patterns that would lead to artificially elevated statistical limits.

As mentioned above, during the previous update, the Rank Von Neumann serial correlation test was used to evaluate whether the measurements collected during 2017 represented independent samples, or whether serial correlation was present among the measurements. The records that showed significant serial correlation were truncated to remove earlier measurements for construction of statistical limits using only more recent data that represent independent samples.

Outlier Analysis

For the current analysis, Tukey's outlier test on pooled upgradient well data identified outliers for fluoride, mercury, and selenium and confirmed previously flagged values. Several of the values identified by Tukey's test were either similar to concentrations upgradient of the facility or were lower than the respective Maximum Contaminant Level (MCL); therefore, the values were not flagged as outliers. Previously flagged outliers were

confirmed by Tukey's test or visual screening. A summary of previously flagged outliers follows this report (Figure C).

Additionally, downgradient well data through October 2023 were screened through visual screening using time series graphs. Since the downgradient well data are used to construct confidence intervals, a regulatory conservative approach is taken in that values that are marginally high relative to the rest of the data are retained unless there is particular justification for excluding them. No new outliers among downgradient wells were flagged during this analysis.

During previous updates, due to no variation in the data, Tukey's outlier test was not performed for cadmium and selenium in well SP-5R along with mercury and thallium in all wells. Among upgradient wells, high values for cadmium, lead, and selenium were identified by Tukey's outlier test. Only the highest values for cadmium and lead were flagged as outliers to maintain statistical limits that are conservative from a regulatory perspective. Substantially high values were identified at upgradient well SP-4 on 8/4/17 through visual screening and the highest values for arsenic, beryllium, cobalt, and mercury were flagged. This step results in upper tolerance limits that are conservative (lower) from a regulatory perspective.

Among downgradient wells, a high value for combined radium 226 + 228 in well SP-1 was flagged as an outlier along with the following values since they did not adequately represent the populations at their respective wells: chromium in well SP-10; combined radium 226 + 228 in well SP-11; lithium in well SP-1; and molybdenum in well SP-10. More recent concentrations for barium in downgradient well SP-10 were noted to be significantly higher than historical concentrations. Therefore, earlier concentrations were deselected prior to constructing confidence intervals in order to evaluate present-day groundwater concentrations of barium at this well. As mentioned above, a list of well/constituent pairs using a truncated portion of their records follows this report (Date Ranges Table).

Interwell Upper Tolerance Limits

Upper tolerance limits were used to calculate background limits from pooled upgradient well data through October 2023 for Appendix B parameters (Figure G). These limits are updated on an annual basis and will be updated again during the Fall 2024 sample event. Parametric tolerance limits are calculated, with a target of 95% confidence and 95% coverage, when data follow a normal or transformed-normal distribution. When data contained greater than 50% non-detects or did not follow a normal or transformed-normal distribution, non-parametric tolerance limits were constructed using the highest

background measurement. The confidence and coverage levels for nonparametric tolerance limits are dependent upon the number of background samples.

Groundwater Protection Standards

These background limits were compared to the Maximum Contaminant Levels (MCLs) and CCR Rule-Specified levels as shown in the Groundwater Protection Standard (GWPS) table following this letter to determine the highest limit for use as the GWPS in the Confidence Interval comparisons (Figure H).

Confidence Intervals

Confidence intervals were constructed on downgradient wells with data through October 2023 for each of the Appendix B parameters and then compared to the GWPS, i.e., the highest limit of the MCL, CCR Rule-Specified level, or background limit as discussed above (Figure I). These intervals were constructed as either parametric or nonparametric confidence intervals depending on the data distribution and percentage of non-detects. When data followed a normal or transformed-normal distribution, parametric confidence intervals were used for Appendix IV parameters. Nonparametric confidence intervals were constructed when data did not follow a normal or transformed-normal distribution or when there were greater than 50% non-detects. The lower confidence limit, which is constructed with 99% confidence for parametric confidence intervals, is compared to the GWPS prepared as described above. The confidence level associated with nonparametric confidence intervals is dependent upon the number samples available.

Only when the entire confidence interval is above a GWPS is the well/constituent pair considered to exceed its respective standard. Complete graphical results of the confidence intervals follow this letter. Exceedances were identified for the following well/constituent pairs:

- Barium: SP-10
- Fluoride: SP-10
- Lithium: SP-10

Trend Test Evaluation

When confidence interval exceedances are identified in downgradient wells, data are further evaluated using the Sen's Slope/Mann Kendall trend test to determine whether concentrations are statistically increasing, decreasing, or stable at the 95% confidence level (Figure J). Utilizing the 95% confidence level for trend tests readily identifies

significant trends and is more sensitive than the 99% confidence level without drastically increasing the false negative rate. Upgradient wells are included in the trend analyses for all parameters found to exceed their confidence intervals in downgradient wells. When similar patterns exist upgradient of the site, it is an indication of variability in groundwater which may be unrelated to practices at the site. Statistically significant trends were identified for the following well/constituent pairs:

Increasing:

- Barium: SP-5R (upgradient) and SP-10

Decreasing:

- Lithium: SP-4 and SP-5R (both upgradient) and SP-10

Thank you for the opportunity to assist you in the statistical analysis of groundwater quality for the Northeastern BAP. If you have any questions or comments, please feel free to contact us.

For Groundwater Stats Consulting,

Andrew T. Collins
Project Manager

Kristina L. Rayner
Senior Statistician

Date Ranges

Date: 1/11/2024 12:00 PM

Northeastern BAP Data: Northeastern BAP

Barium (mg/L)
- SP-10 overall:5/30/2018-10/10/2023
- SP-11 overall:5/30/2018-10/10/2023
- SP-4 overall:5/30/2018-10/10/2023

Cadmium (mg/L)
- SP-1 overall:5/30/2018-10/10/2023
- SP-10 overall:5/30/2018-10/10/2023
- SP-4 overall:5/30/2018-10/10/2023
- SP-5R overall:5/30/2018-10/10/2023

Calcium (mg/L)
- SP-11 background:7/30/2018-6/14/2022
- SP-4 overall:7/30/2018-6/14/2022

Chromium (mg/L)
- SP-4 overall:5/30/2018-10/10/2023

Lead (mg/L)
- SP-10 overall:5/30/2018-10/10/2023

Lithium (mg/L)
- SP-11 overall:5/30/2018-10/10/2023
- SP-4 overall:5/30/2018-10/10/2023

Molybdenum (mg/L)
- SP-2 overall:5/30/2018-10/10/2023

Selenium (mg/L)
- SP-2 overall:5/30/2018-10/10/2023
- SP-5R overall:5/30/2018-10/10/2023

Sulfate (mg/L)
- SP-4 overall:5/30/2018-10/10/2023
- SP-5R overall:5/30/2018-10/10/2023

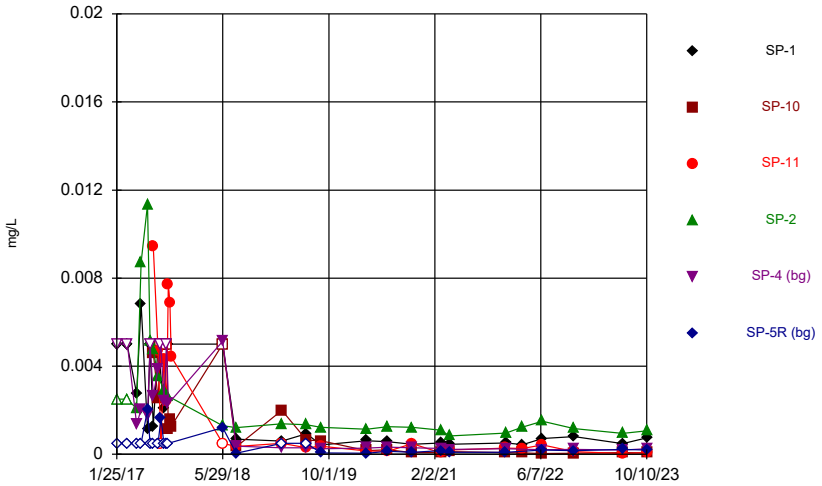
Thallium (mg/L)
- overall:5/30/2018-10/10/2023

FIGURE A

Time Series

Sanitas™ v.10.0.15 Software licensed to . UG
Hollow symbols indicate censored values.

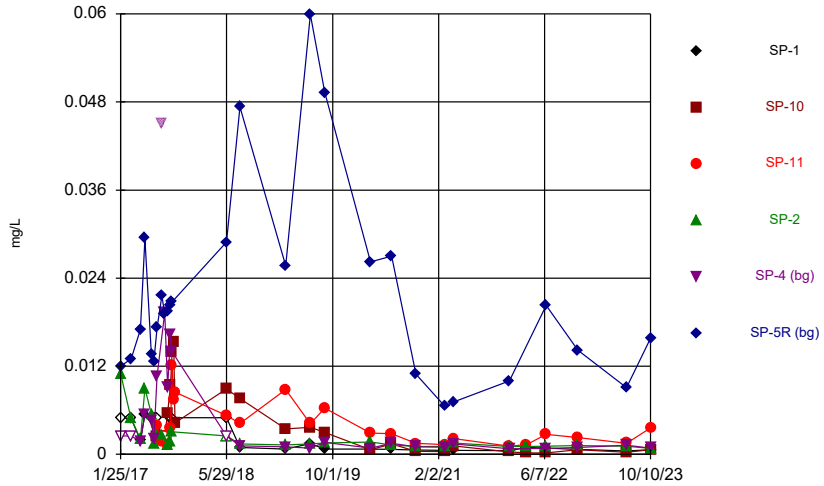
Time Series



Constituent: Antimony Analysis Run 1/10/2024 8:54 AM
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG
Hollow symbols indicate censored values.

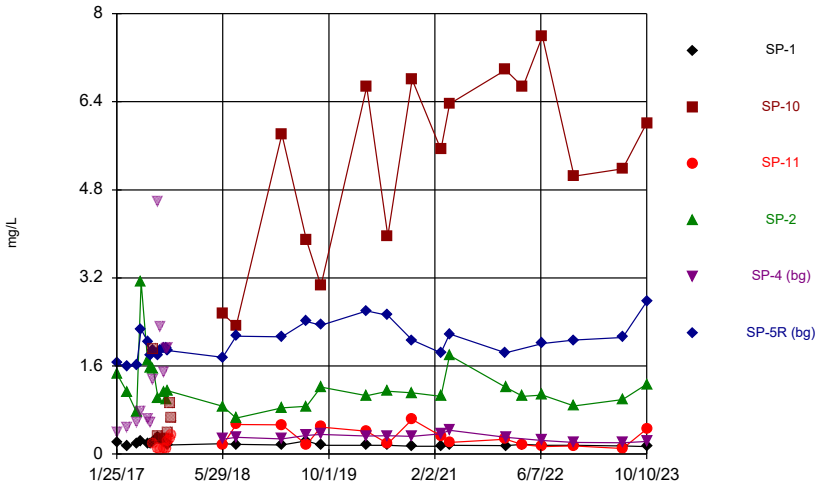
Time Series



Constituent: Arsenic Analysis Run 1/10/2024 8:54 AM
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

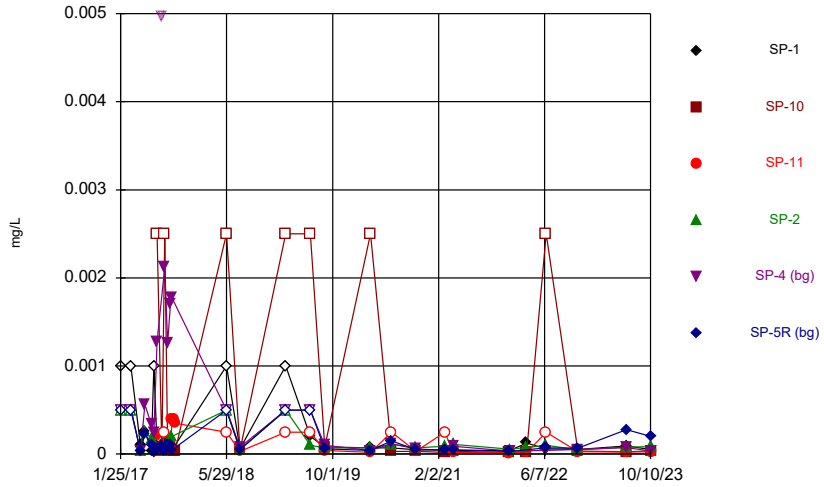
Time Series



Constituent: Barium Analysis Run 1/10/2024 8:54 AM
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG
Hollow symbols indicate censored values.

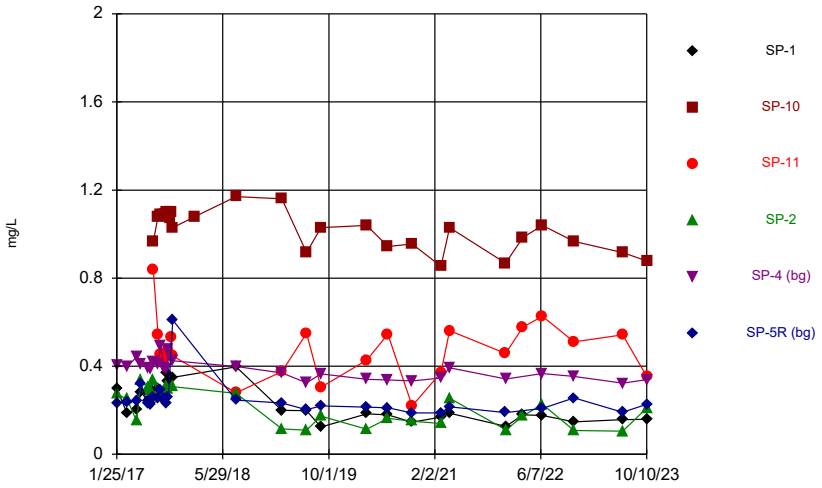
Time Series



Constituent: Beryllium Analysis Run 1/10/2024 8:54 AM
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Time Series



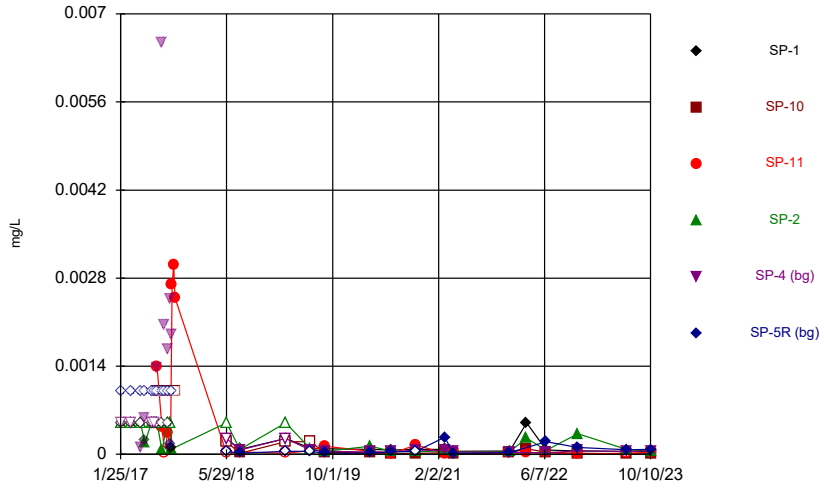
Constituent: Boron Analysis Run 1/10/2024 8:54 AM

Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Hollow symbols indicate censored values.

Time Series

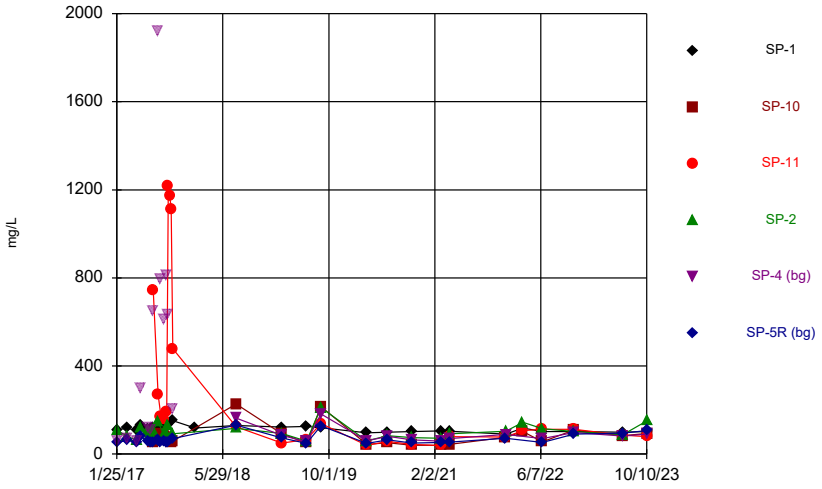


Constituent: Cadmium Analysis Run 1/10/2024 8:54 AM

Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Time Series

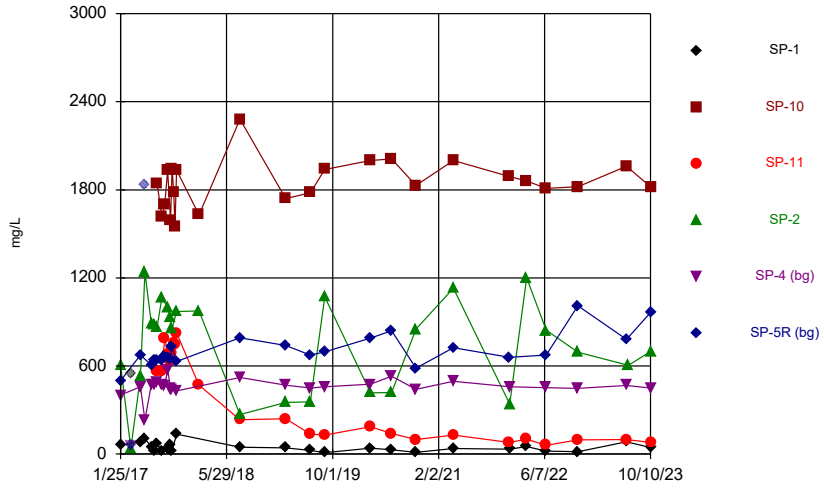


Constituent: Calcium Analysis Run 1/10/2024 8:54 AM

Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Time Series

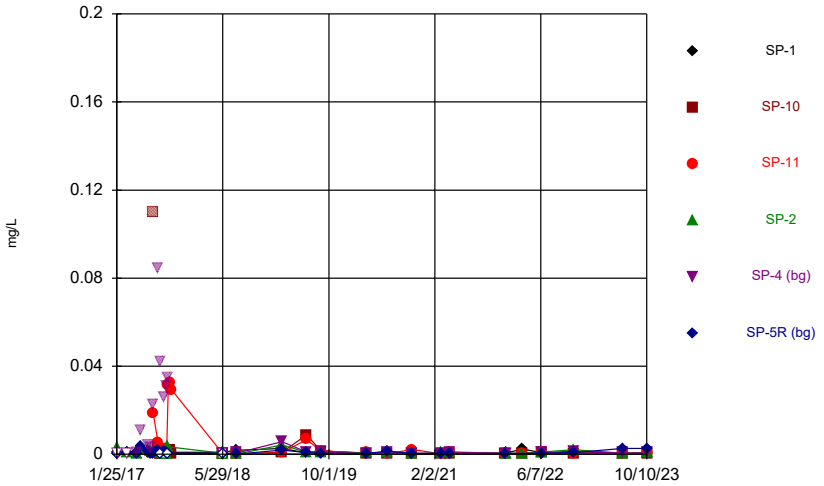


Constituent: Chloride Analysis Run 1/10/2024 8:54 AM

Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG
Hollow symbols indicate censored values.

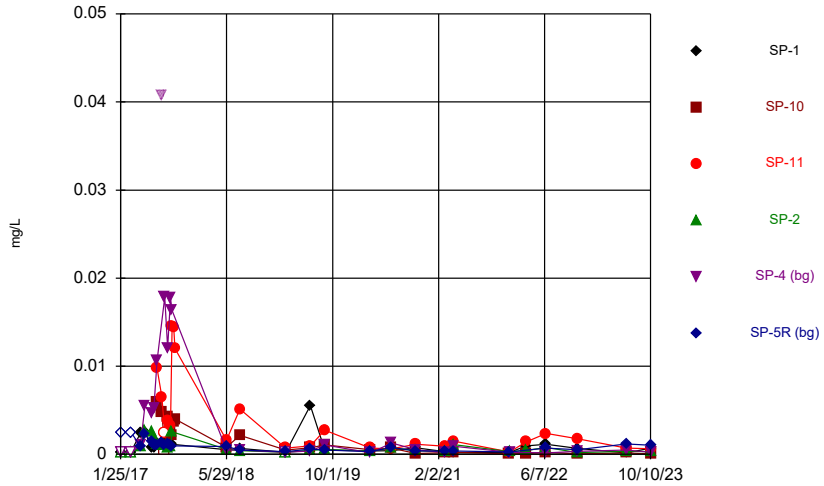
Time Series



Constituent: Chromium Analysis Run 1/10/2024 8:54 AM
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG
Hollow symbols indicate censored values.

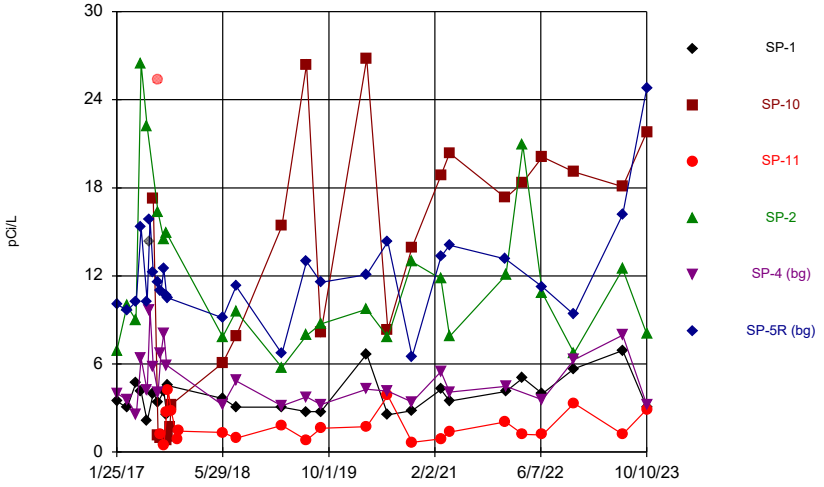
Time Series



Constituent: Cobalt Analysis Run 1/10/2024 8:54 AM
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

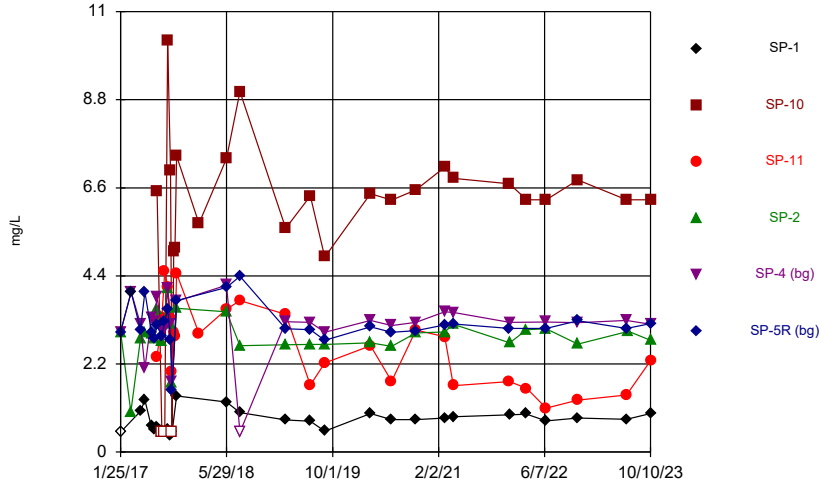
Time Series



Constituent: Combined Radium 226 + 228 Analysis Run 1/10/2024 8:54 AM
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG
Hollow symbols indicate censored values.

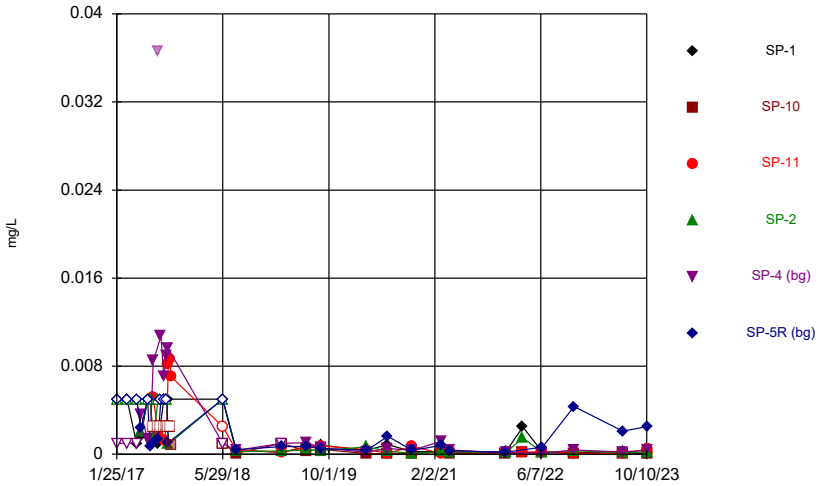
Time Series



Constituent: Fluoride Analysis Run 1/10/2024 8:54 AM
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG
Hollow symbols indicate censored values.

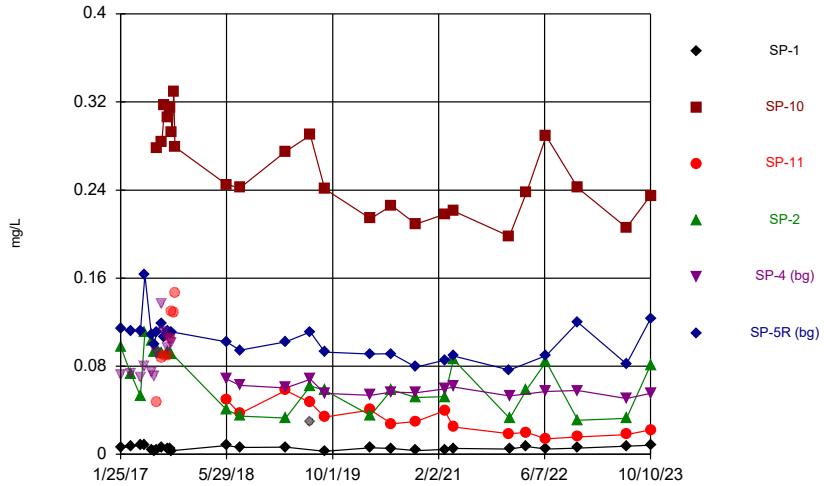
Time Series



Constituent: Lead Analysis Run 1/10/2024 8:54 AM
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

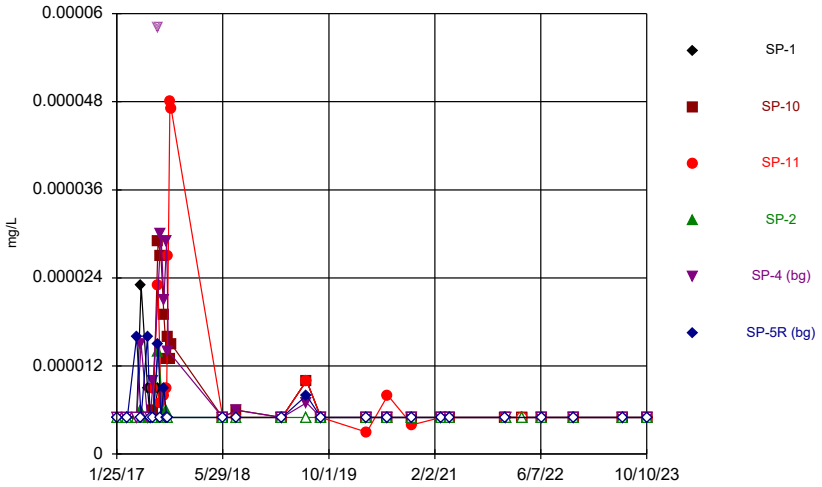
Time Series



Constituent: Lithium Analysis Run 1/10/2024 8:54 AM
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG
Hollow symbols indicate censored values.

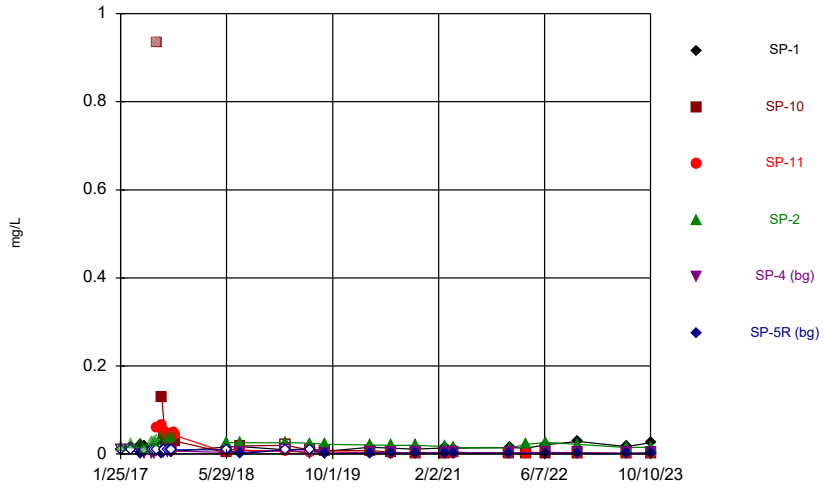
Time Series



Constituent: Mercury Analysis Run 1/10/2024 8:54 AM
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG
Hollow symbols indicate censored values.

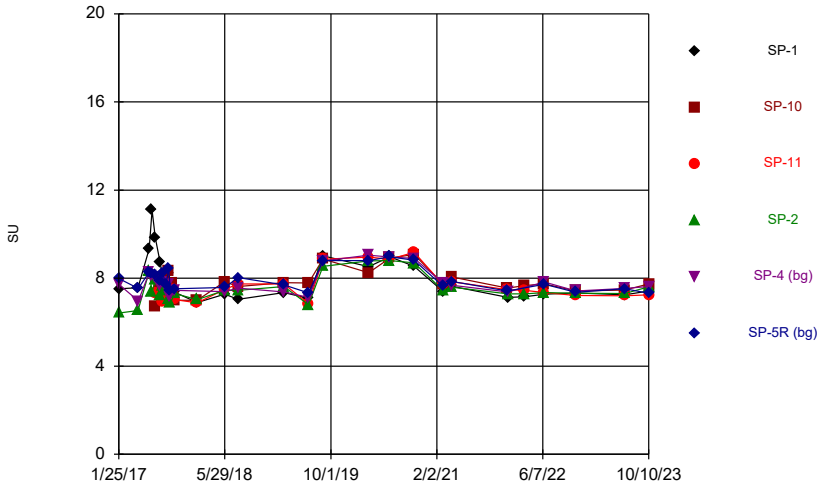
Time Series



Constituent: Molybdenum Analysis Run 1/10/2024 8:54 AM
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Time Series



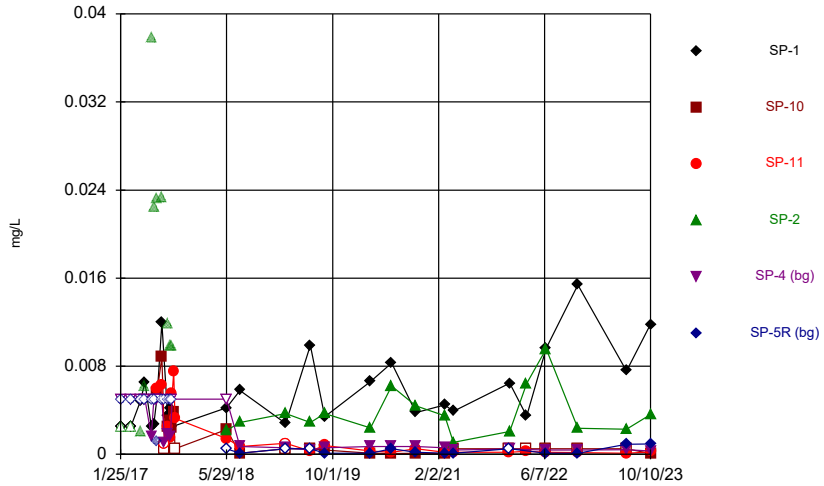
Constituent: pH, field Analysis Run 1/10/2024 8:54 AM

Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Hollow symbols indicate censored values.

Time Series

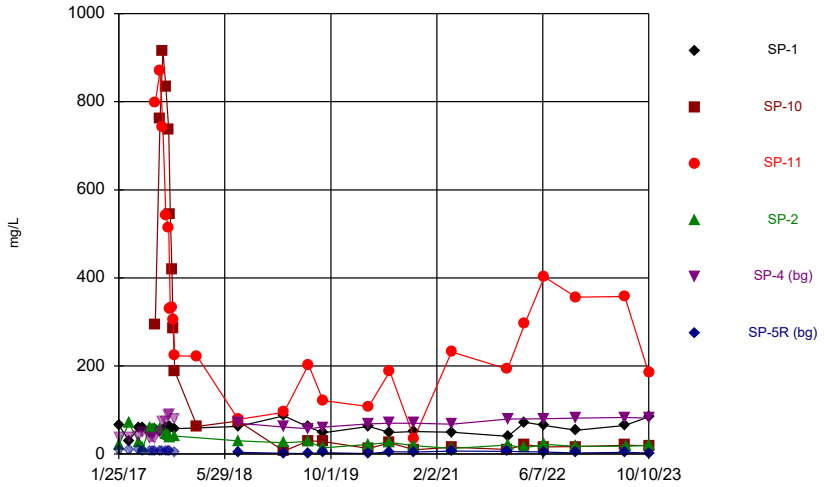


Constituent: Selenium Analysis Run 1/10/2024 8:54 AM

Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Time Series



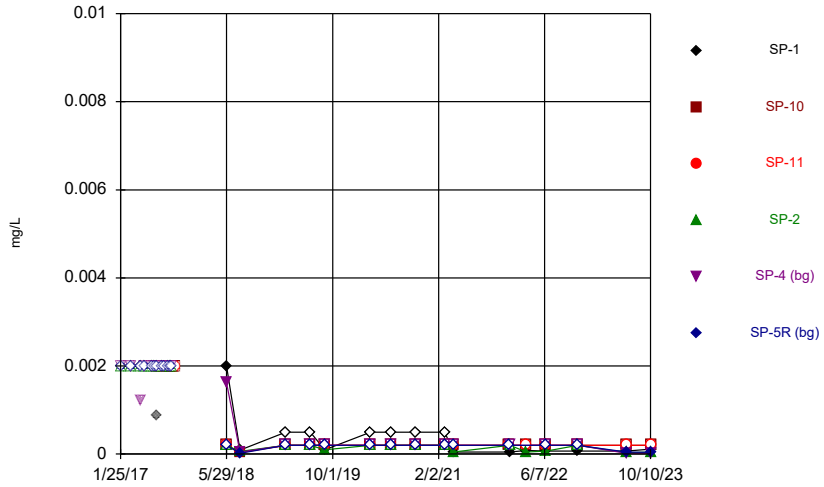
Constituent: Sulfate Analysis Run 1/10/2024 8:54 AM

Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Hollow symbols indicate censored values.

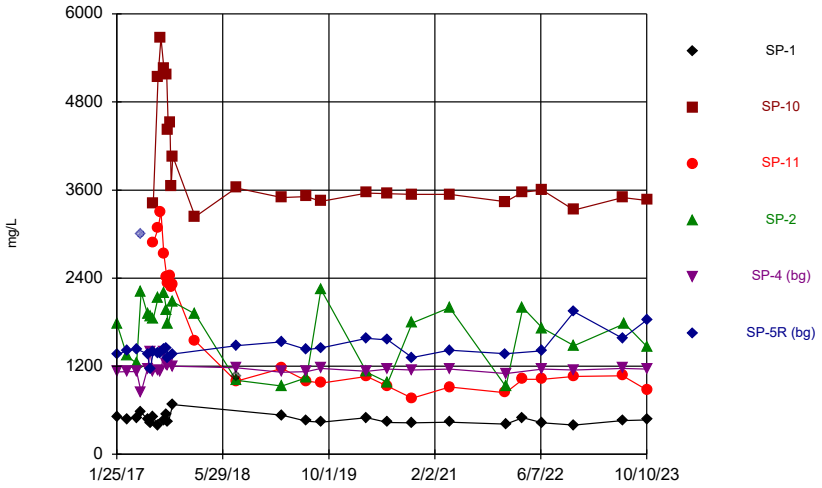
Time Series



Constituent: Thallium Analysis Run 1/10/2024 8:54 AM

Northeastern BAP Data: Northeastern BAP

Time Series



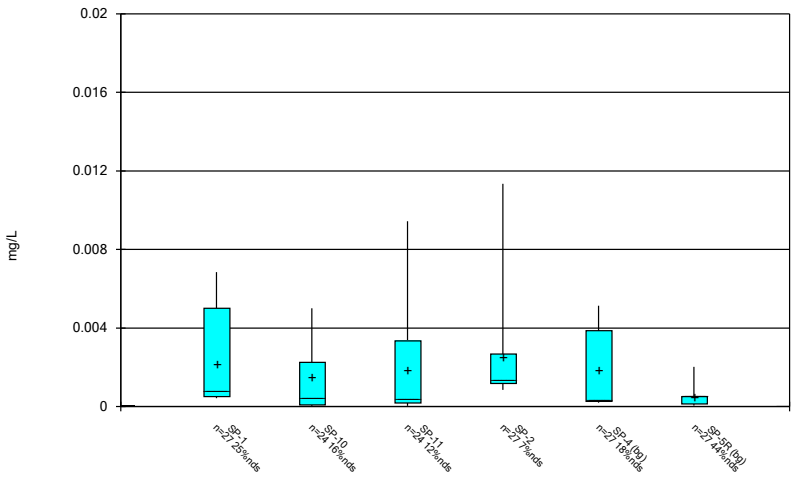
Constituent: Total Dissolved Solids [TDS] Analysis Run 1/10/2024 8:54 AM

Northeastern BAP Data: Northeastern BAP

FIGURE B

Box Plots

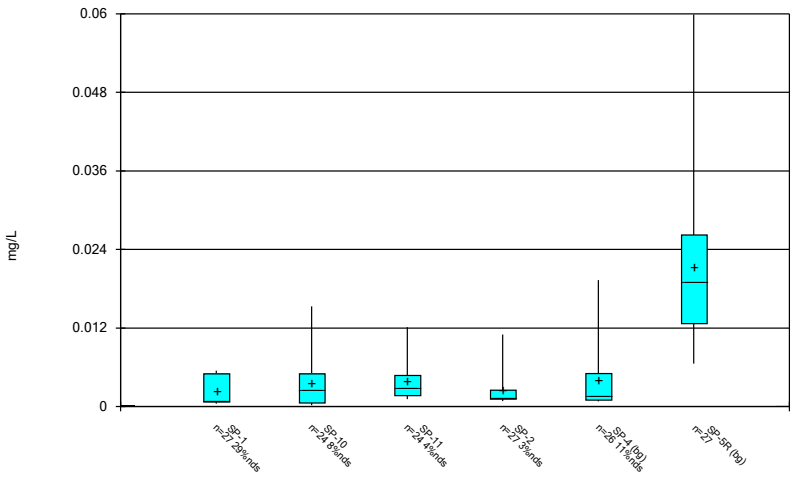
Box & Whiskers Plot



Constituent: Antimony Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

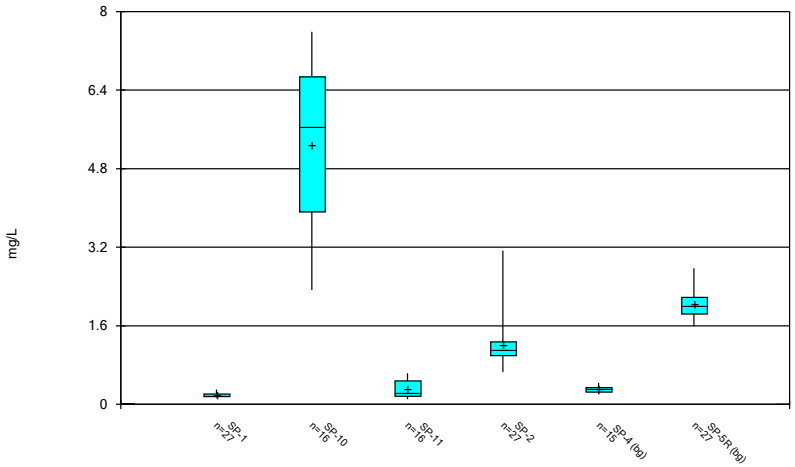
Box & Whiskers Plot



Constituent: Arsenic Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

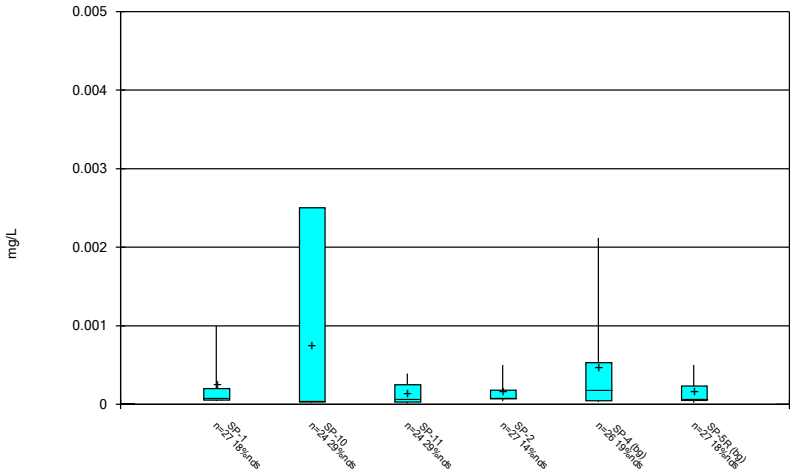
Box & Whiskers Plot



Constituent: Barium Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

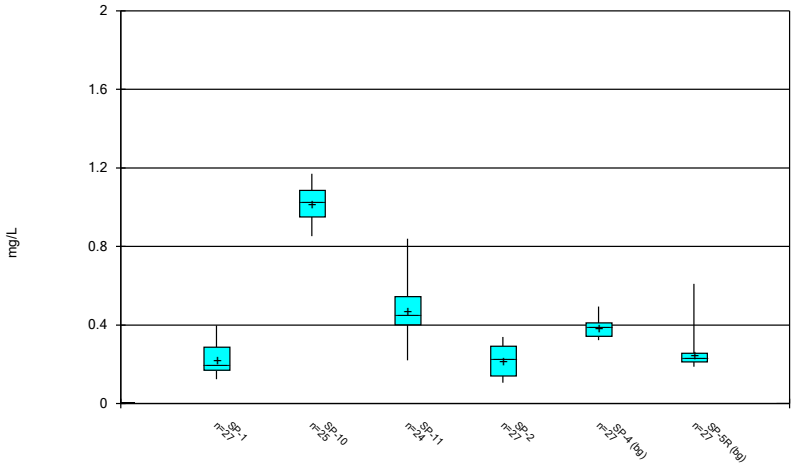
Sanitas™ v.10.0.15 Software licensed to . UG

Box & Whiskers Plot



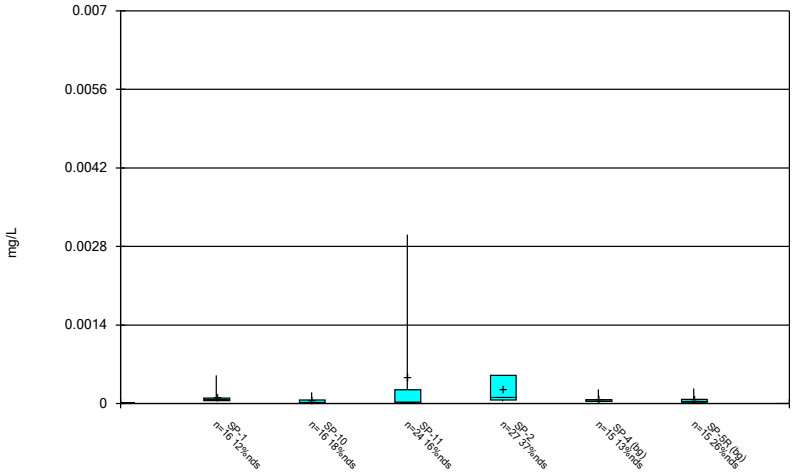
Constituent: Beryllium Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



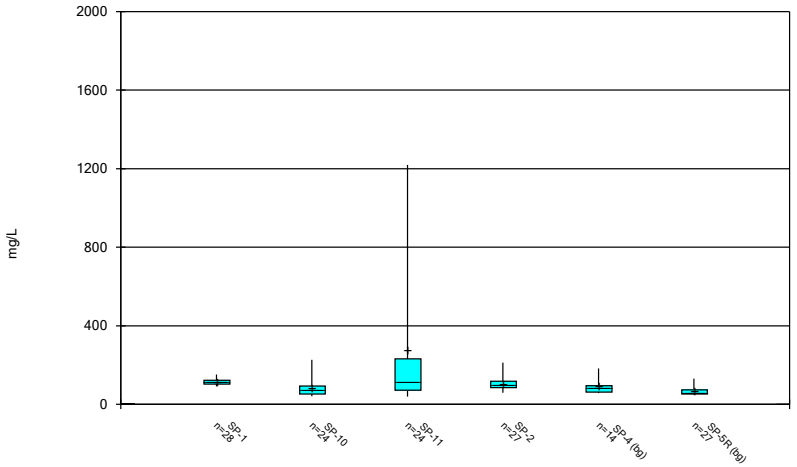
Constituent: Boron Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



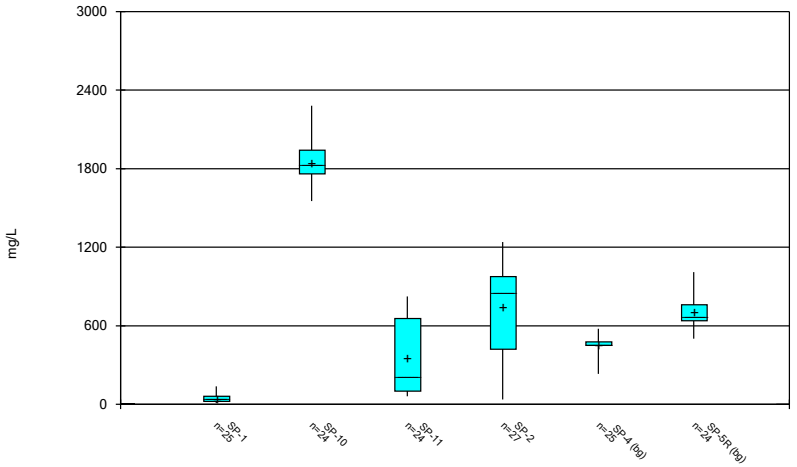
Constituent: Cadmium Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



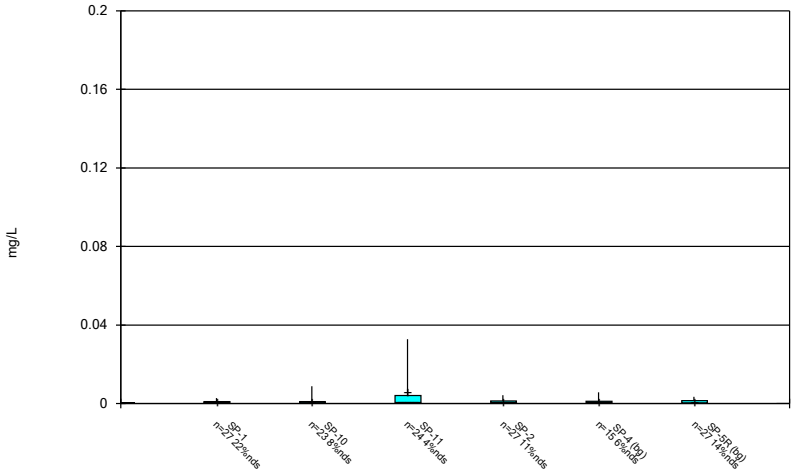
Constituent: Calcium Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



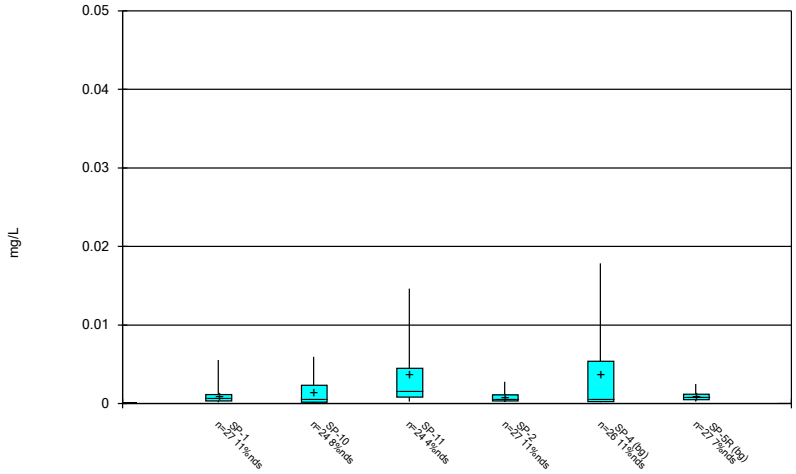
Constituent: Chloride Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



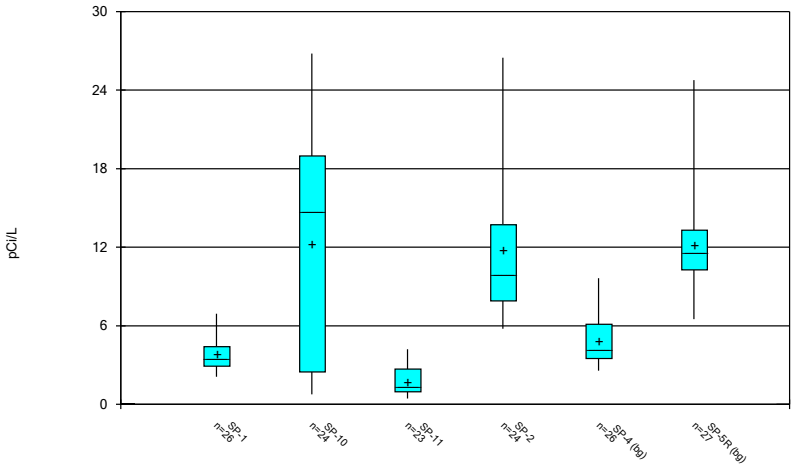
Constituent: Chromium Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



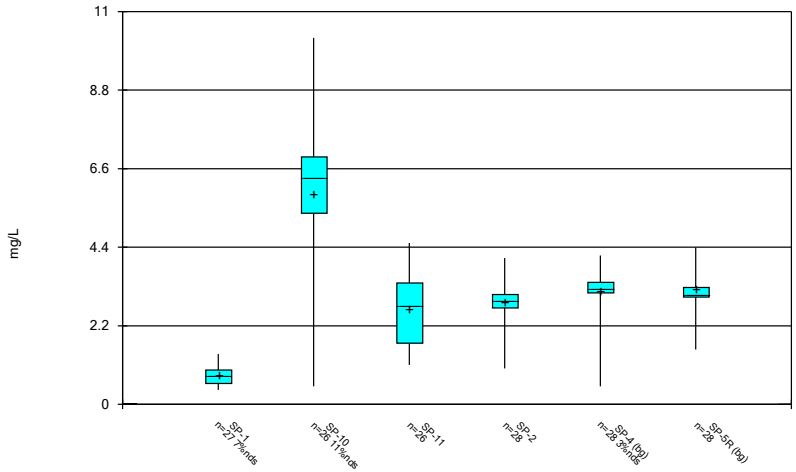
Constituent: Cobalt Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



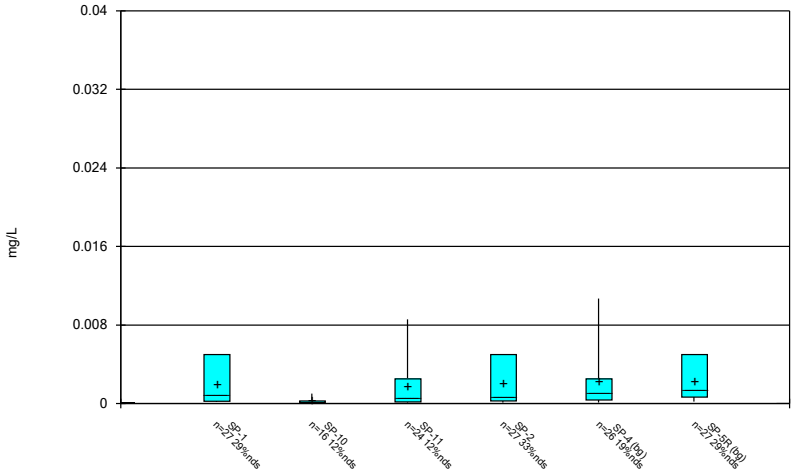
Constituent: Combined Radium 226 + 228 Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



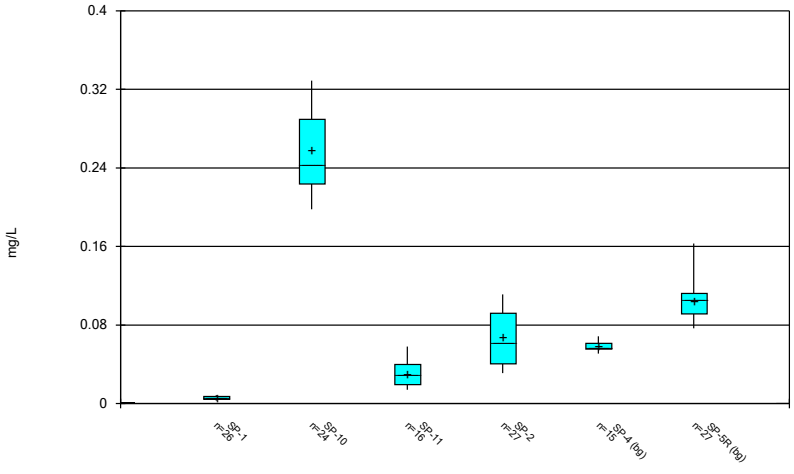
Constituent: Fluoride Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



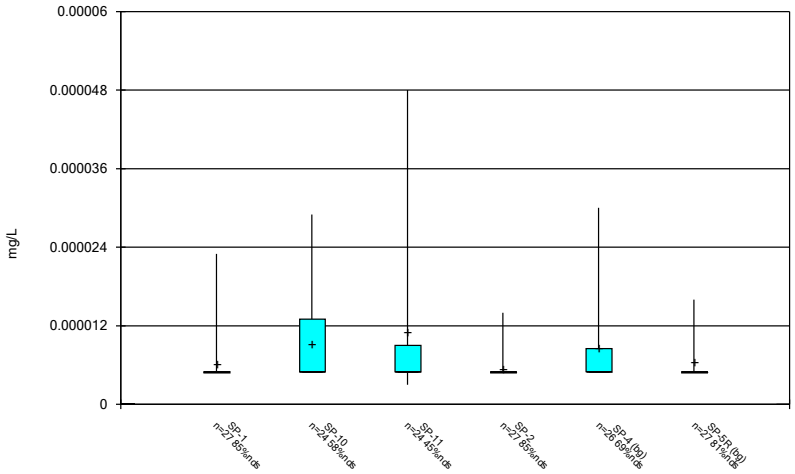
Constituent: Lead Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



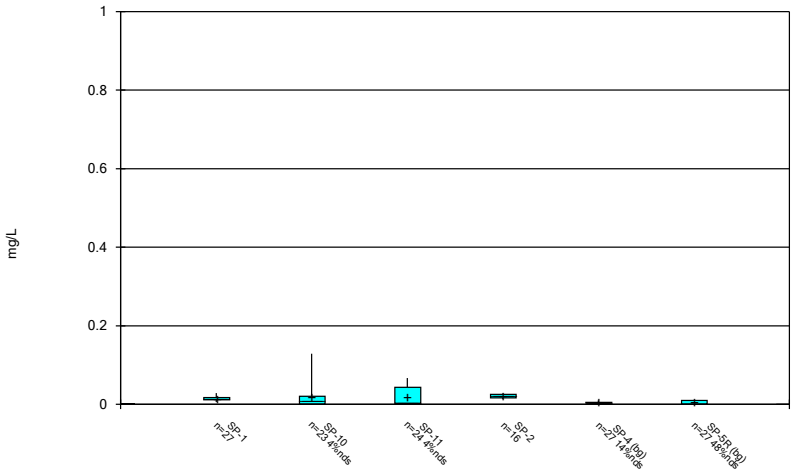
Constituent: Lithium Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



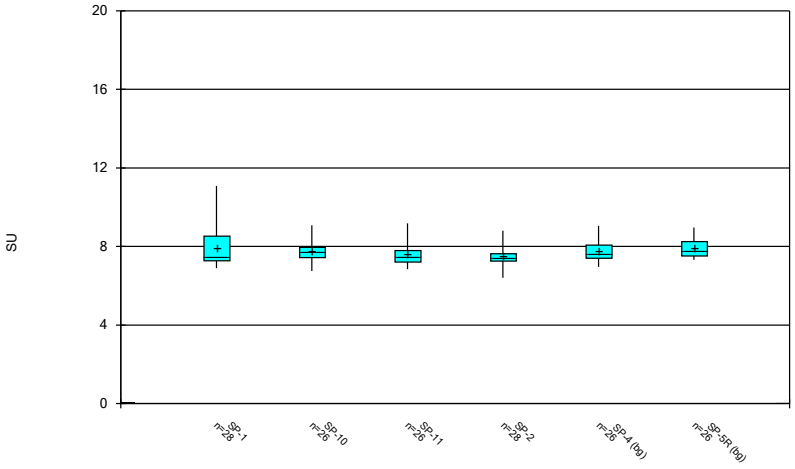
Constituent: Mercury Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



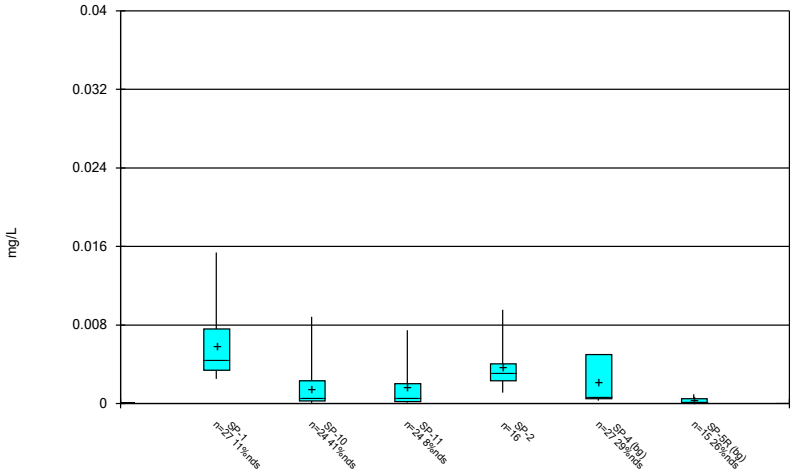
Constituent: Molybdenum Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



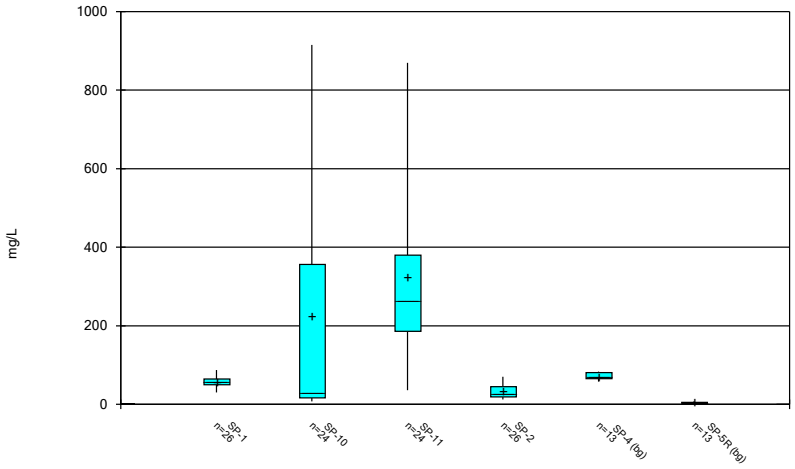
Constituent: pH, field Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



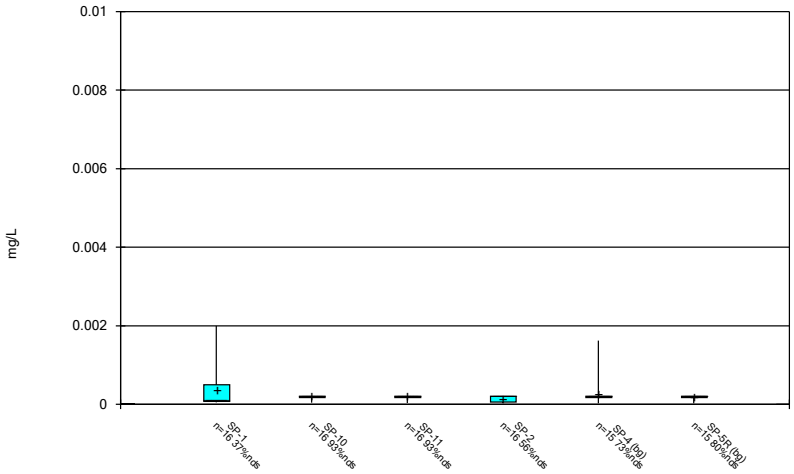
Constituent: Selenium Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



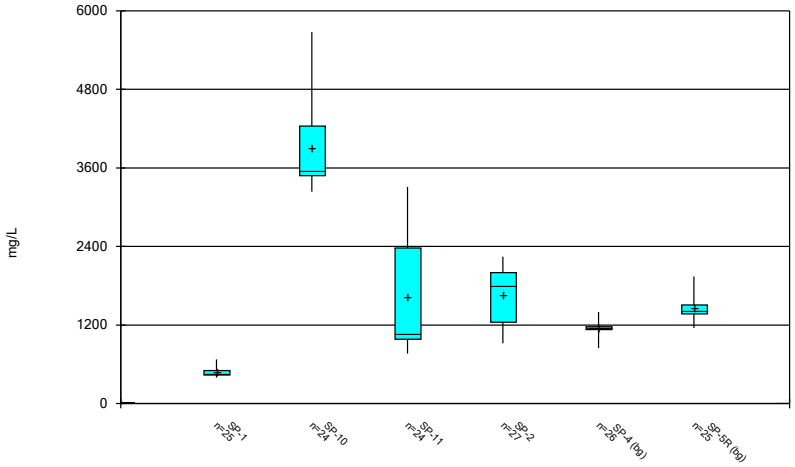
Constituent: Sulfate Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



Constituent: Thallium Analysis Run 1/10/2024 9:00 AM
Northeastern BAP Data: Northeastern BAP

Box & Whiskers Plot



Constituent: Total Dissolved Solids [TDS] Analysis Run 1/10/2024 9:00 AM

Northeastern BAP Data: Northeastern BAP

FIGURE C

Outlier Summary and Tukey's Outlier Test

Outlier Summary

Northeastern BAP Data: Northeastern BAP Printed 1/11/2024, 12:14 PM

	SP-4 Arsenic (mg/L)	SP-4 Beryllium (mg/L)	SP-1 Chloride (mg/L)	SP-4 Chloride (mg/L)	SP-5R Chloride (mg/L)	SP-10 Chromium (mg/L)	SP-4 Cobalt (mg/L)	SP-1 Combined Radium 226 + 228 (pCi/L)	SP-11 Combined Radium 226 + 228 (pCi/L)	SP-1 Fluoride (mg/L)
3/13/2017			548 (o)							4 (o)
3/15/2017				52 (o)	62 (o)					
5/18/2017					1834 (o)					
6/27/2017								14.29 (o)		
7/13/2017						0.11 (o)				
8/4/2017	0.04498 (o)	0.00497 (o)					0.04069 (o)		25.367 (o)	
7/30/2018										
6/20/2019										

	SP-4 Lead (mg/L)	SP-1 Lithium (mg/L)	SP-4 Mercury (mg/L)	SP-10 Molybdenum (mg/L)	SP-1 Total Dissolved Solids [TDS] (mg/L)	SP-5R Total Dissolved Solids [TDS] (mg/L)
3/13/2017						
3/15/2017						
5/18/2017					3008 (o)	
6/27/2017						
7/13/2017				0.934 (o)		
8/4/2017	0.03663 (o)		5.8E-05 (o)			
7/30/2018					1060 (o)	
6/20/2019		0.03 (J,o)				

Tukey's Outlier Test - Upgradient Wells - Significant Results

Pirkey WBAP Data: Pirkey WBAP Printed 1/4/2024, 12:01 PM

Constituent	Well	Outlier	Value(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Fluoride, total (mg/L)	**AD-12,AD-18,AD-3**	**Yes**	**0.2565,0.213,0.02,0.02,0.02,0.02,0.02,0.02,0.01,0**	**NP**	**NaN**	**77**	**0.07116**	**0.04303**	**ln(x)**	**ShapiroFrancia**
Mercury, total (mg/L)	**AD-12,AD-18,AD-3**	**Yes**	**0.000084**	**NP**	**NaN**	**74**	**0.00001032**	**0.00001278**	**ln(x)**	**ShapiroFrancia**

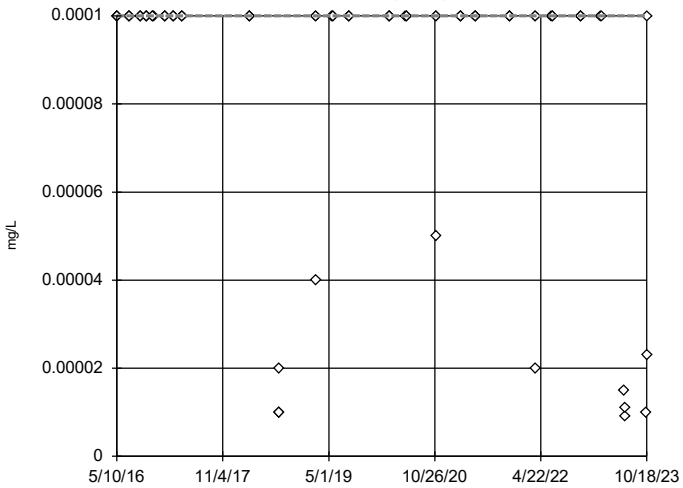
Tukey's Outlier Test - Upgradient Wells - All Results

Pirkey WBAP Data: Pirkey WBAP Printed 1/4/2024, 12:01 PM

Constituent	Well	Outlier	Value(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Antimony, total (mg/L)	AD-12,AD-18,AD-3	n/a	n/a	NP	NaN	74	0.00008808	0.00002915	unknown	ShapiroFrancia
Arsenic, total (mg/L)	AD-12,AD-18,AD-3	No	n/a	NP	NaN	74	0.001202	0.0009703	x^(1/3)	ShapiroFrancia
Barium, total (mg/L)	AD-12,AD-18,AD-3	No	n/a	NP	NaN	74	0.06236	0.03367	sqrt(x)	ShapiroFrancia
Beryllium, total (mg/L)	AD-12,AD-18,AD-3	No	n/a	NP	NaN	74	0.0002513	0.0002456	ln(x)	ShapiroFrancia
Boron, total (mg/L)	AD-12,AD-18,AD-3	No	n/a	NP	NaN	77	0.03168	0.0186	x^(1/3)	ShapiroFrancia
Cadmium, total (mg/L)	AD-12,AD-18,AD-3	No	n/a	NP	NaN	74	0.00005845	0.00004507	ln(x)	ShapiroFrancia
Chloride, total (mg/L)	AD-12,AD-18,AD-3	No	n/a	NP	NaN	77	6.633	1.243	ln(x)	ShapiroFrancia
Chromium, total (mg/L)	AD-12,AD-18,AD-3	No	n/a	NP	NaN	74	0.000665	0.0006099	ln(x)	ShapiroFrancia
Cobalt, total (mg/L)	AD-12,AD-18,AD-3	No	n/a	NP	NaN	74	0.002448	0.002127	ln(x)	ShapiroFrancia
Combined Radium 226 + 228 (pCi/L)	AD-12,AD-18,AD-3	No	n/a	NP	NaN	74	1.199	0.824	x^(1/3)	ShapiroFrancia
Fluoride, total (mg/L)	**AD-12,AD-18,AD-3**	**Yes**	**0.2565,0.213,0.02,0.02,0.02,0.02,0.02,0.02,0.01,0**	**NP**	**NaN**	**77**	**0.07116**	**0.04303**	**ln(x)**	**ShapiroFrancia**
Lead, total (mg/L)	AD-12,AD-18,AD-3	No	n/a	NP	NaN	74	0.0005609	0.0004228	ln(x)	ShapiroFrancia
Lithium, total (mg/L)	AD-12,AD-18,AD-3	No	n/a	NP	NaN	74	0.04176	0.1153	ln(x)	ShapiroFrancia
Mercury, total (mg/L)	**AD-12,AD-18,AD-3**	**Yes**	**0.000084**	**NP**	**NaN**	**74**	**0.00001032**	**0.00001278**	**ln(x)**	**ShapiroFrancia**
Molybdenum, total (mg/L)	AD-12,AD-18,AD-3	n/a	n/a	NP	NaN	74	0.0004969	0.0001231	unknown	ShapiroFrancia
Selenium, total (mg/L)	AD-12,AD-18,AD-3	No	n/a	NP	NaN	74	0.0005129	0.0006234	ln(x)	ShapiroFrancia
Thallium, total (mg/L)	AD-12,AD-18,AD-3	n/a	n/a	NP	NaN	74	0.0001988	0.0001558	unknown	ShapiroFrancia

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 74

No outliers found. Tukey's method selected by user.

Ladder of Powers transformations did not improve normality; analysis run on raw data.

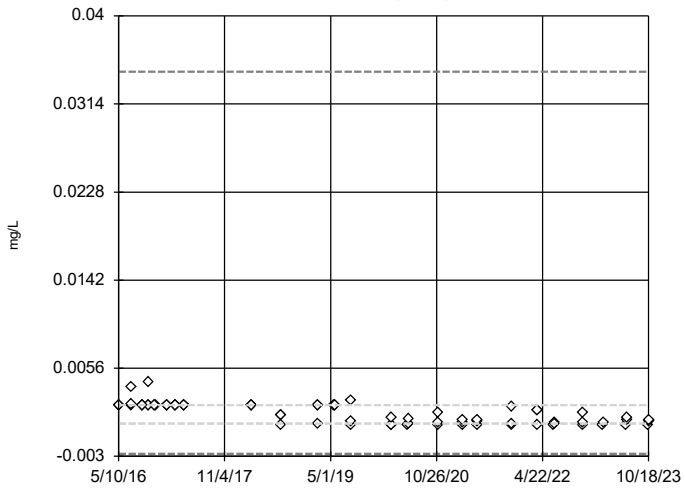
The results were invalidated, because the lower and upper quartiles are equal.

Constituent: Antimony, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Sanitas™ v.10.0.15 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 74

No outliers found. Tukey's method selected by user.

Data were cube root transformed to achieve best W statistic (graph shown in original units).

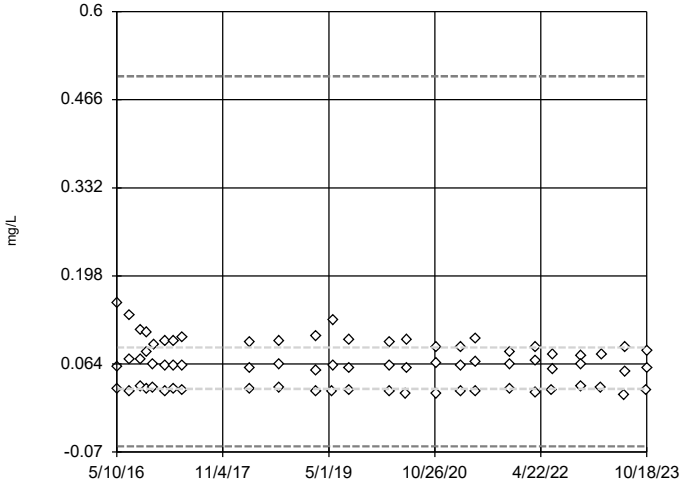
High cutoff = 0.03455, low cutoff = -0.00276, based on IQR multiplier of 3.

Constituent: Arsenic, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Sanitas™ v.10.0.15 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 74

No outliers found. Tukey's method selected by user.

Data were square root transformed to achieve best W statistic (graph shown in original units).

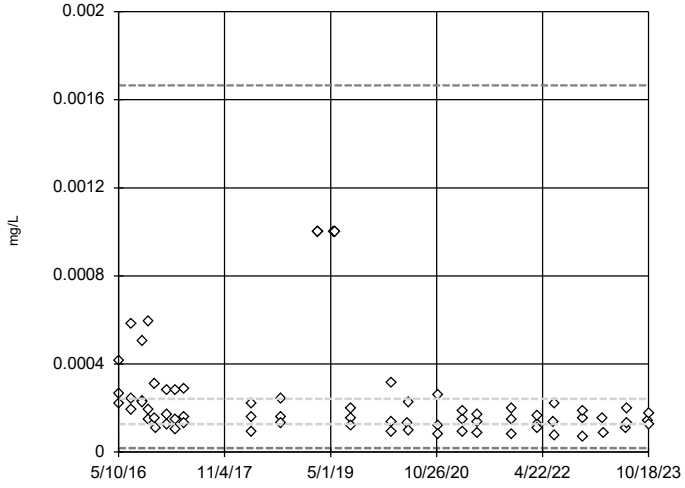
High cutoff = 0.5016, low cutoff = -0.06134, based on IQR multiplier of 3.

Constituent: Barium, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Sanitas™ v.10.0.15 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 74

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

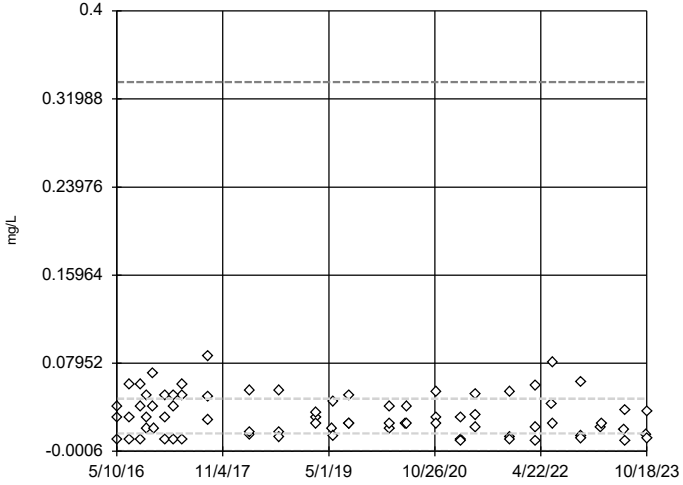
High cutoff = 0.001665, low cutoff = 0.00001843, based on IQR multiplier of 3.

Constituent: Beryllium, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Sanitas™ v.10.0.15 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 77

No outliers found. Tukey's method selected by user.

Data were cube root transformed to achieve best W statistic (graph shown in original units).

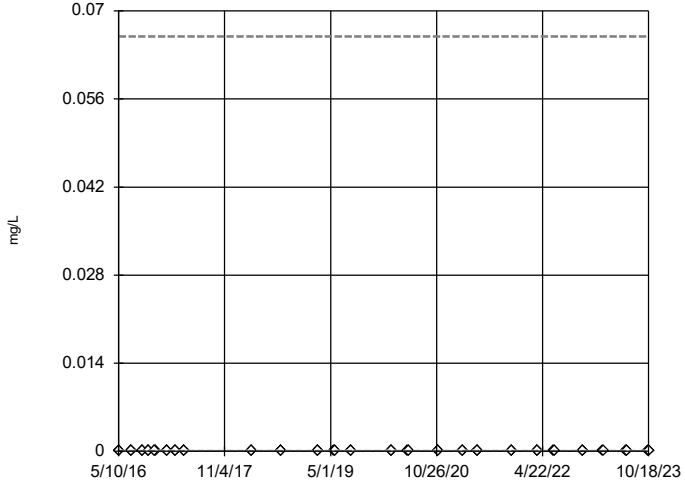
High cutoff = 0.3353, low cutoff = -0.00057, based on IQR multiplier of 3.

Constituent: Boron, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Sanitas™ v.10.0.15 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 74

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

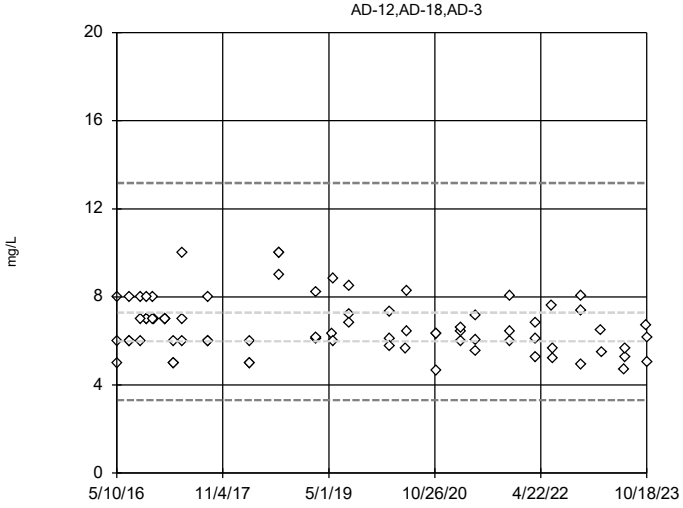
High cutoff = 0.06594, low cutoff = 1.7e-8, based on IQR multiplier of 3.

Constituent: Cadmium, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Sanitas™ v.10.0.15 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 77

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

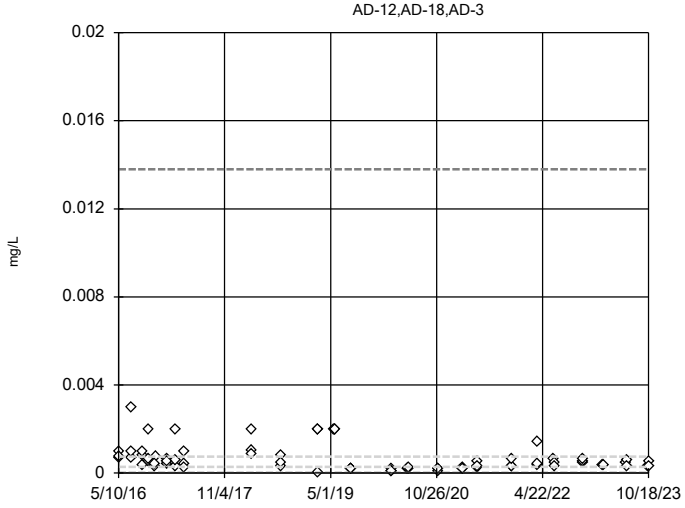
High cutoff = 13.17, low cutoff = 3.312, based on IQR multiplier of 3.

Constituent: Chloride, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Sanitas™ v.10.0.15 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 74

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

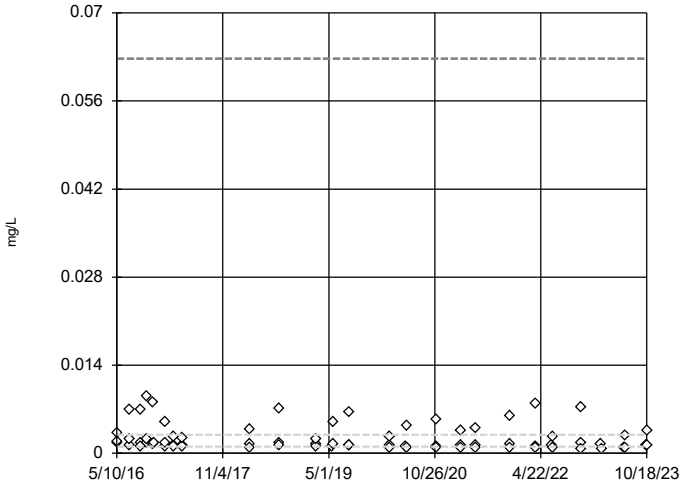
High cutoff = 0.01379, low cutoff = 0.00001555, based on IQR multiplier of 3.

Constituent: Chromium, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Sanitas™ v.10.0.15 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 74

No outliers found.
Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

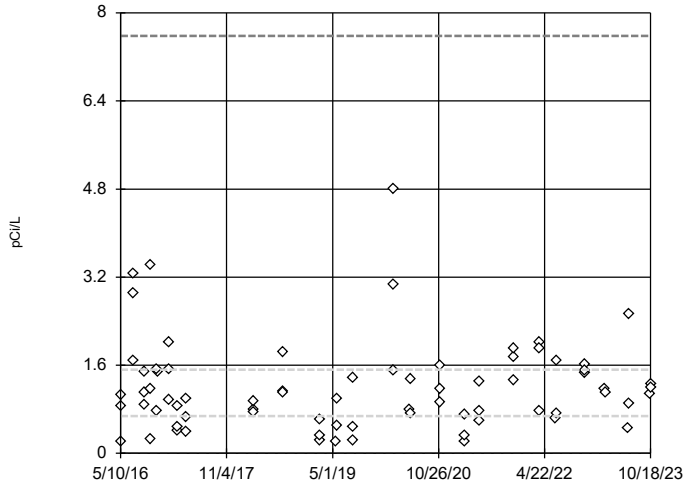
High cutoff = 0.06273, low cutoff = 0.00005026, based on IQR multiplier of 3.

Constituent: Cobalt, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Sanitas™ v.10.0.15 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 74

No outliers found.
Tukey's method selected by user.

Data were cube root transformed to achieve best W statistic (graph shown in original units).

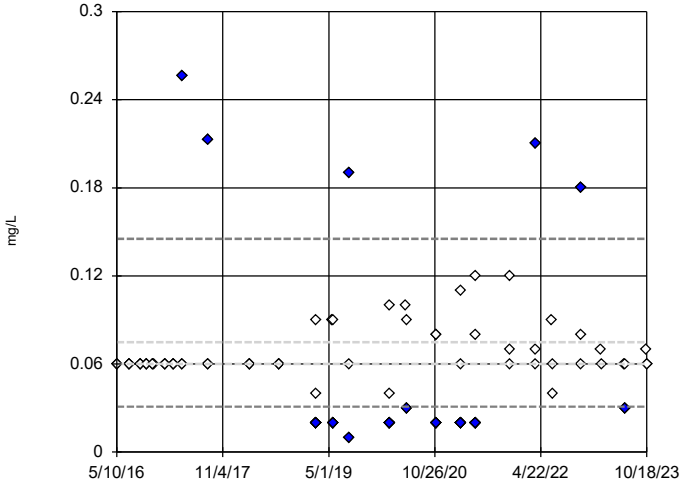
High cutoff = 7.582, low cutoff = 0.0002623, based on IQR multiplier of 3.

Constituent: Combined Radium 226 + 228 Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Sanitas™ v.10.0.15 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 77

Outliers are drawn as solid.
Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

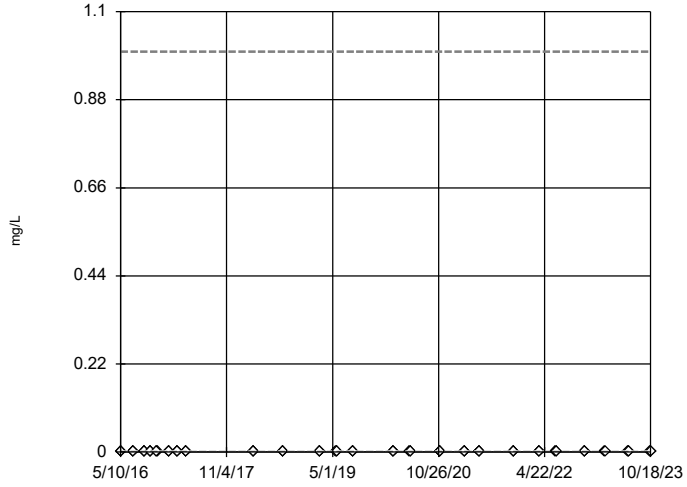
High cutoff = 0.1452, low cutoff = 0.03093, based on IQR multiplier of 3.

Constituent: Fluoride, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Sanitas™ v.10.0.15 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 74

No outliers found.
Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

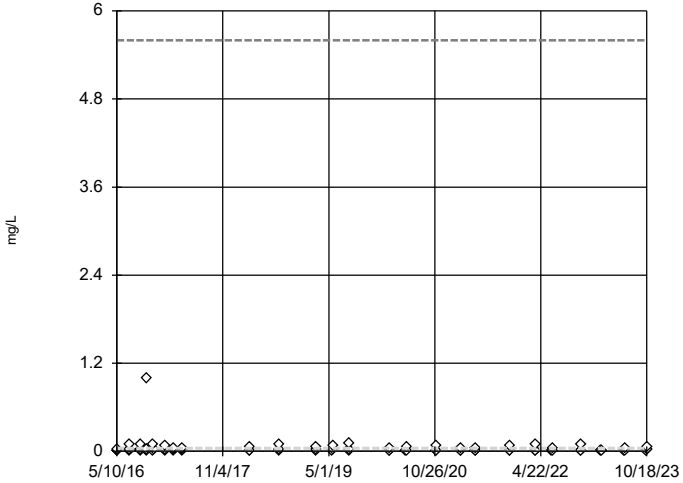
High cutoff = 1, low cutoff = 1.0e-7, based on IQR multiplier of 3.

Constituent: Lead, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Sanitas™ v.10.0.15 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 74

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

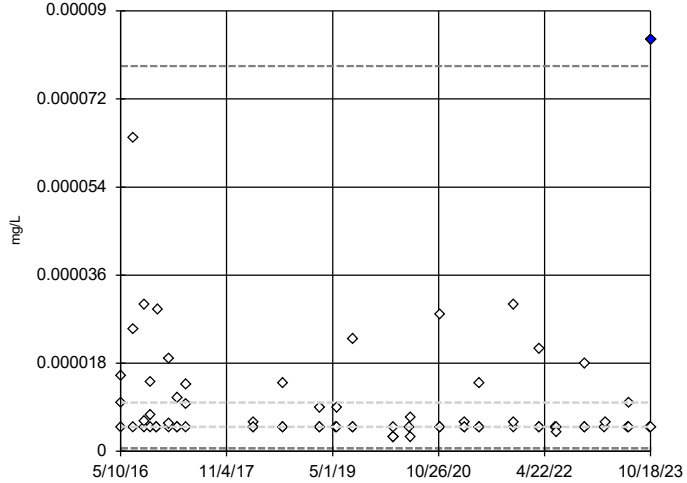
High cutoff = 5.599, low cutoff = 0.00007568, based on IQR multiplier of 3.

Constituent: Lithium, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Sanitas™ v.10.0.15 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 74

Outlier is drawn as solid. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

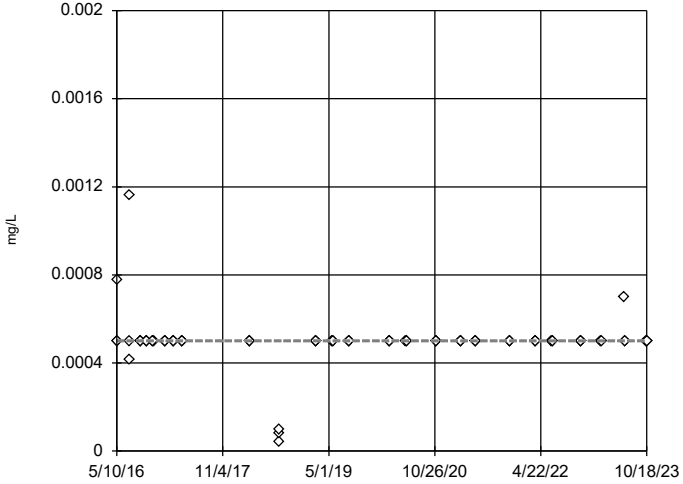
High cutoff = 0.00007873, low cutoff = 6.3e-7, based on IQR multiplier of 3.

Constituent: Mercury, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Sanitas™ v.10.0.15 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 74

No outliers found. Tukey's method selected by user.

Ladder of Powers transformations did not improve normality; analysis run on raw data.

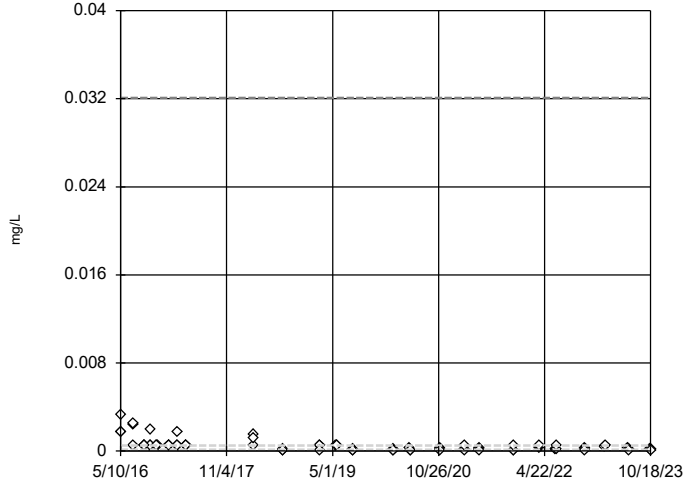
The results were invalidated, because the lower and upper quartiles are equal.

Constituent: Molybdenum, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Sanitas™ v.10.0.15 . UG

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 74

No outliers found. Tukey's method selected by user.

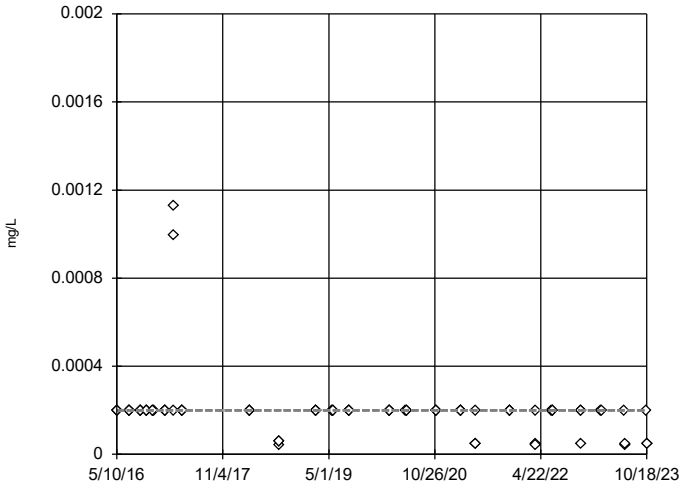
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.03208, low cutoff = 0.000001947, based on IQR multiplier of 3.

Constituent: Selenium, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test
Pirkey WBAP Data: Pirkey WBAP

Tukey's Outlier Screening, Pooled Background

AD-12,AD-18,AD-3



n = 74

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

The results were invalidated, because the lower and upper quartiles are equal.

Constituent: Thallium, total Analysis Run 1/4/2024 12:00 PM View: Tukey's Outlier Test

Pirkey WBAP Data: Pirkey WBAP

FIGURE D

Intrawell PLs

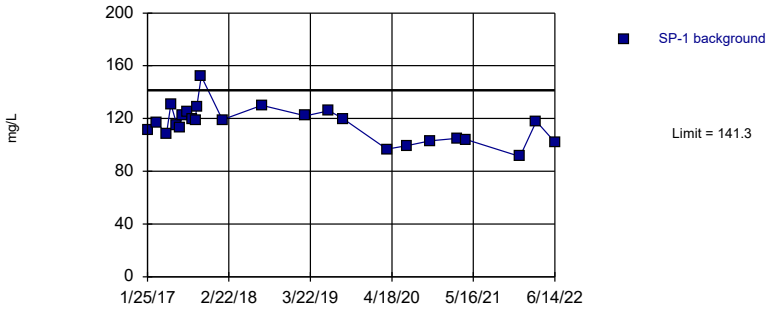
Intrawell Pediction Limits - All Results

Northeastern BAP Data: Northeastern BAP Printed 1/11/2024, 12:04 PM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Calcium (mg/L)	SP-1	141.3	n/a	n/a	1 future	n/a	25	115.9	13.21	0	None	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	SP-10	227	n/a	n/a	1 future	n/a	21	n/a	n/a	0	n/a	n/a	0.003999	NP Intra (normality) 1 of 2
Calcium (mg/L)	SP-11	155.9	n/a	n/a	1 future	n/a	12	78	34.89	0	None	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	SP-2	166.8	n/a	n/a	1 future	n/a	24	102.5	33.2	0	None	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	SP-4	182	n/a	n/a	1 future	n/a	11	n/a	n/a	0	n/a	n/a	0.01276	NP Intra (normality) 1 of 2
Calcium (mg/L)	SP-5R	131	n/a	n/a	1 future	n/a	24	n/a	n/a	0	n/a	n/a	0.003124	NP Intra (normality) 1 of 2

Prediction Limit

Intrawell Parametric, SP-1



Background Data Summary: Mean=115.9, Std. Dev.=13.21, n=25. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9663, critical = 0.888. Kappa = 1.924 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium Analysis Run 1/11/2024 12:01 PM View: Intrawell
Northeastern BAP Data: Northeastern BAP

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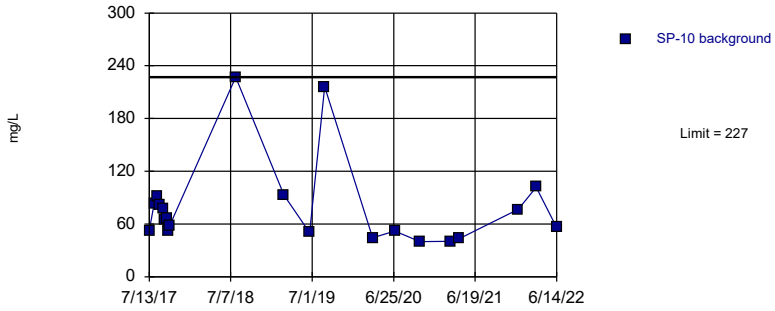
Prediction Limit

Intrawell Non-parametric, SP-10



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 21 background values. Well-constituent pair annual alpha = 0.007982. Individual comparison alpha = 0.003999 (1 of 2). Assumes 1 future value.

Constituent: Calcium Analysis Run 1/11/2024 12:01 PM View: Intrawell
Northeastern BAP Data: Northeastern BAP

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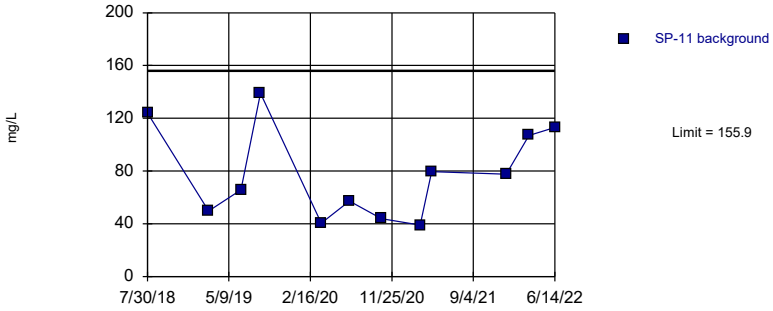
Prediction Limit

Intrawell Parametric, SP-11



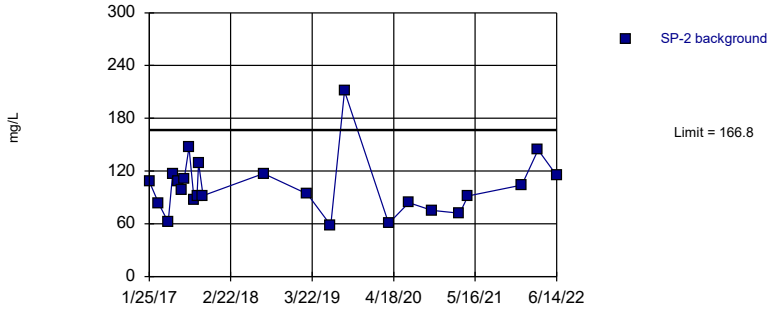
Background Data Summary: Mean=78, Std. Dev.=34.89, n=12. Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.9081, critical = 0.859. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium Analysis Run 1/11/2024 12:01 PM View: Intrawell
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Prediction Limit

Intrawell Parametric, SP-2

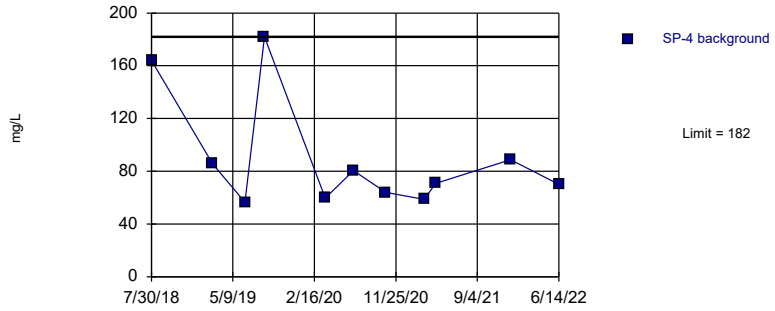


Background Data Summary: Mean=102.5, Std. Dev.=33.2, n=24. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8901, critical = 0.884. Kappa = 1.937 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium Analysis Run 1/11/2024 12:01 PM View: Intrawell
Northeastern BAP Data: Northeastern BAP

Prediction Limit

Intrawell Non-parametric, SP-4 (bg)



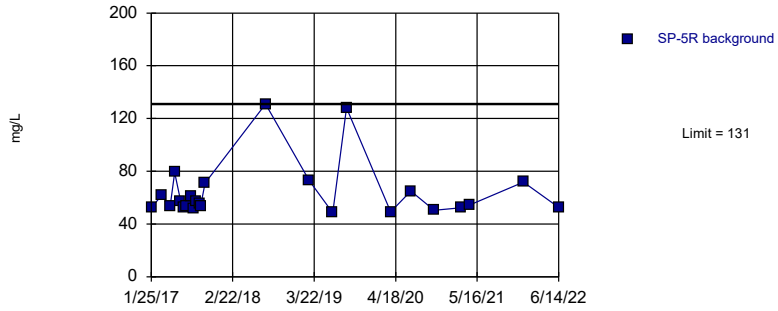
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.05 alpha level. Limit is highest of 11 background values. Well-constituent pair annual alpha = 0.02537. Individual comparison alpha = 0.01276 (1 of 2). Assumes 1 future value.

Constituent: Calcium Analysis Run 1/11/2024 12:01 PM View: Intrawell
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Prediction Limit

Intrawell Non-parametric, SP-5R (bg)



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 24 background values. Well-constituent pair annual alpha = 0.006238. Individual comparison alpha = 0.003124 (1 of 2). Assumes 1 future value.

Constituent: Calcium Analysis Run 1/11/2024 12:01 PM View: Intrawell
Northeastern BAP Data: Northeastern BAP

FIGURE E
Upgradient Trend Tests

Trend Tests - Upgradient Wells - Significant Results

Northeastern BAP Data: Northeastern BAP Printed 1/10/2024, 10:55 AM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Alpha	Method
Boron (mg/L)	**SP-4 (bg)**	**-0.01357**	**-180**	**-124**	**Yes**	**27**	**0**	**n/a**	**0.01**	**NP**
Boron (mg/L)	**SP-5R (bg)**	**-0.00878**	**-138**	**-124**	**Yes**	**27**	**0**	**n/a**	**0.01**	**NP**
Chloride (mg/L)	**SP-5R (bg)**	**34.59**	**135**	**105**	**Yes**	**24**	**0**	**n/a**	**0.01**	**NP**
Sulfate (mg/L)	**SP-4 (bg)**	**4.952**	**54**	**43**	**Yes**	**13**	**0**	**n/a**	**0.01**	**NP**
Total Dissolved Solids [TDS] (mg/L)	**SP-5R (bg)**	**37.61**	**115**	**111**	**Yes**	**25**	**0**	**n/a**	**0.01**	**NP**

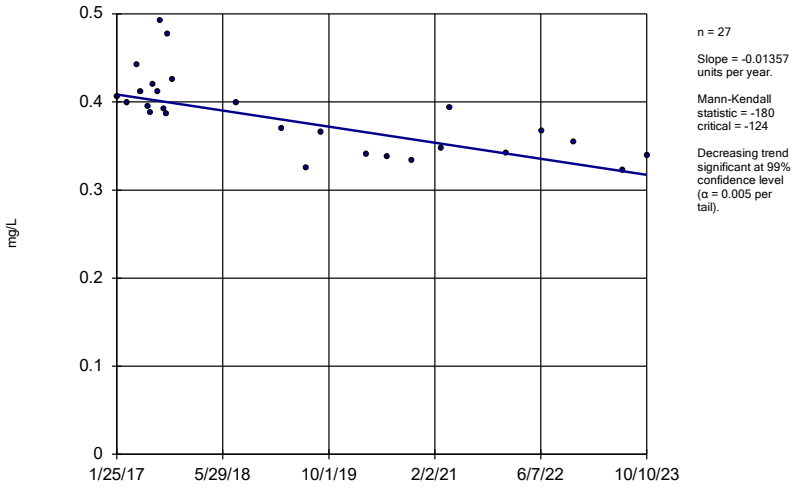
Trend Tests - Upgradient Wells - All Results

Northeastern BAP Data: Northeastern BAP Printed 1/10/2024, 10:55 AM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Alpha	Method
Boron (mg/L)	**SP-4 (bg)**	**-0.01357**	**-180**	**-124**	**Yes**	**27**	**0**	**n/a**	**0.01**	**NP**
Boron (mg/L)	**SP-5R (bg)**	**-0.00878**	**-138**	**-124**	**Yes**	**27**	**0**	**n/a**	**0.01**	**NP**
Chloride (mg/L)	SP-4 (bg)	0	0	111	No	25	0	n/a	0.01	NP
Chloride (mg/L)	**SP-5R (bg)**	**34.59**	**135**	**105**	**Yes**	**24**	**0**	**n/a**	**0.01**	**NP**
Fluoride (mg/L)	SP-4 (bg)	0.005715	10	131	No	28	3.571	n/a	0.01	NP
Fluoride (mg/L)	SP-5R (bg)	0.007758	26	131	No	28	0	n/a	0.01	NP
Sulfate (mg/L)	**SP-4 (bg)**	**4.952**	**54**	**43**	**Yes**	**13**	**0**	**n/a**	**0.01**	**NP**
Sulfate (mg/L)	SP-5R (bg)	0.2705	6	43	No	13	0	n/a	0.01	NP
Total Dissolved Solids [TDS] (mg/L)	SP-4 (bg)	2.056	27	118	No	26	0	n/a	0.01	NP
Total Dissolved Solids [TDS] (mg/L)	**SP-5R (bg)**	**37.61**	**115**	**111**	**Yes**	**25**	**0**	**n/a**	**0.01**	**NP**

Sen's Slope Estimator

SP-4 (bg)



n = 27

Slope = -0.01357 units per year.

Mann-Kendall statistic = -180
critical = -124

Decreasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Boron Analysis Run 1/10/2024 10:55 AM View: Trend Tests
Northeastern BAP Data: Northeastern BAP

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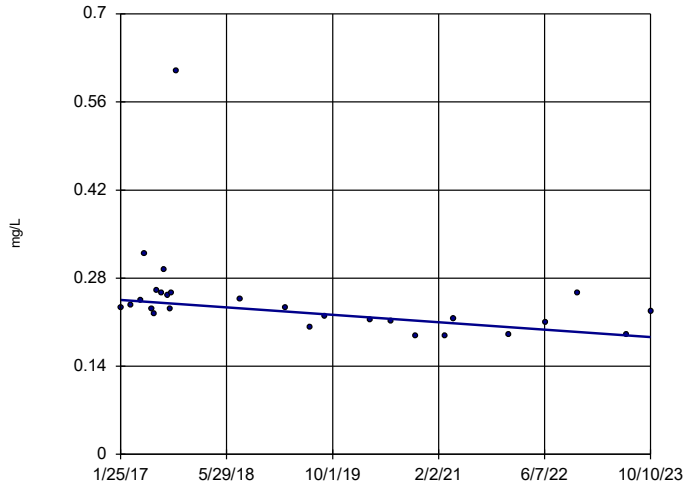
Sen's Slope Estimator

SP-5R (bg)



n = 27

Slope = -0.00878 units per year.

Mann-Kendall statistic = -138
critical = -124

Decreasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Boron Analysis Run 1/10/2024 10:55 AM View: Trend Tests
Northeastern BAP Data: Northeastern BAP

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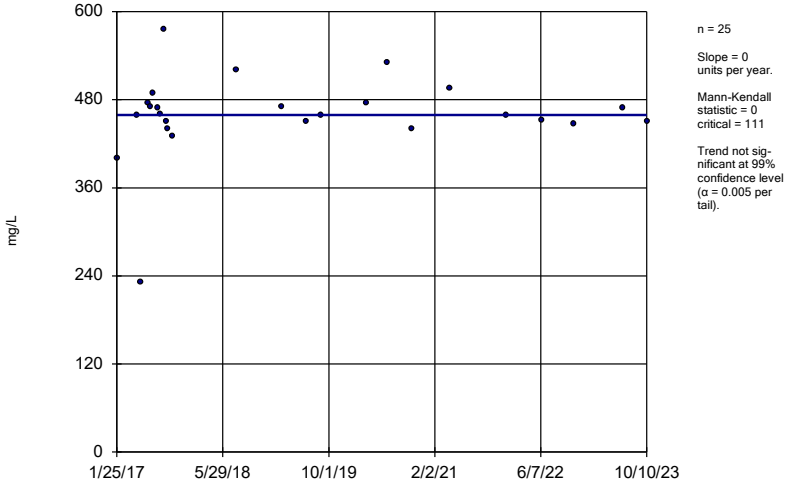
Sen's Slope Estimator

SP-4 (bg)



n = 25

Slope = 0 units per year.

Mann-Kendall statistic = 0
critical = 111

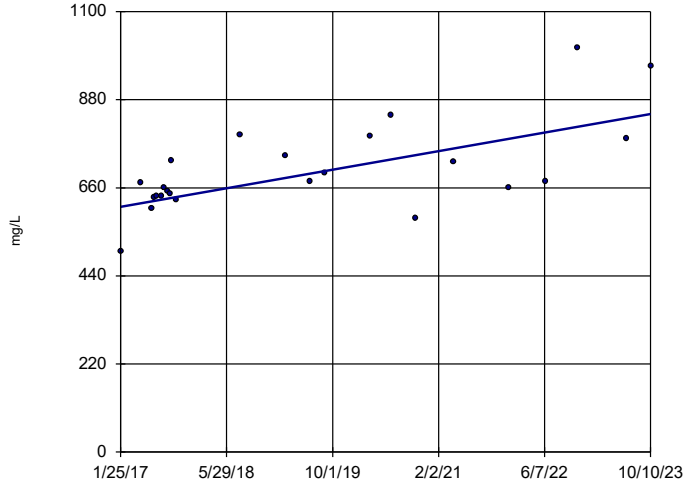
Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Chloride Analysis Run 1/10/2024 10:55 AM View: Trend Tests
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Sen's Slope Estimator

SP-5R (bg)



n = 24

Slope = 34.59 units per year.

Mann-Kendall statistic = 135
critical = 105

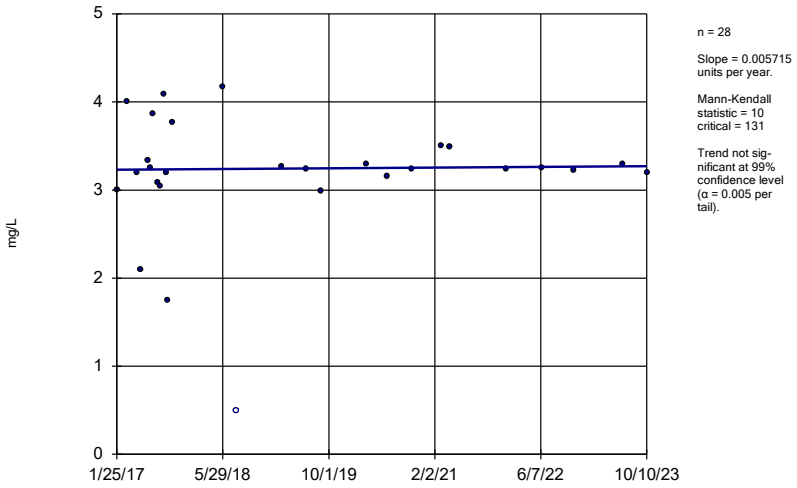
Increasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Chloride Analysis Run 1/10/2024 10:55 AM View: Trend Tests
Northeastern BAP Data: Northeastern BAP

Hollow symbols indicate censored values.

Sen's Slope Estimator

SP-4 (bg)



n = 28

Slope = 0.005715 units per year.

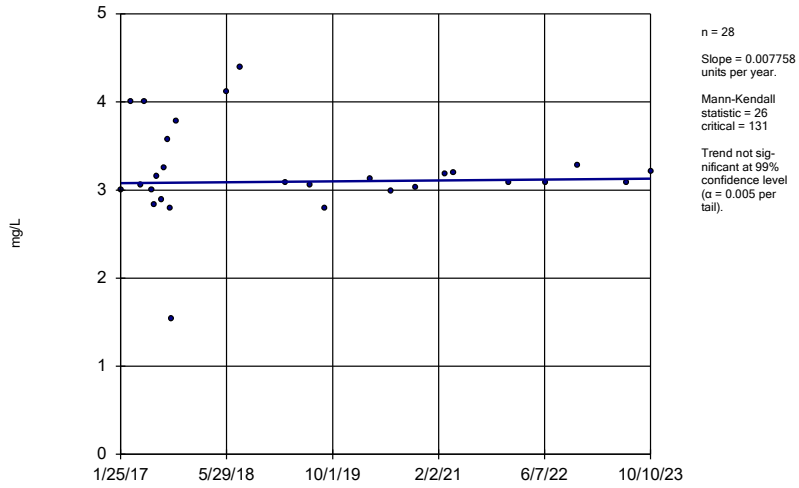
Mann-Kendall statistic = 10
critical = 131

Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Fluoride Analysis Run 1/10/2024 10:55 AM View: Trend Tests
Northeastern BAP Data: Northeastern BAP

Sen's Slope Estimator

SP-5R (bg)



n = 28

Slope = 0.007758 units per year.

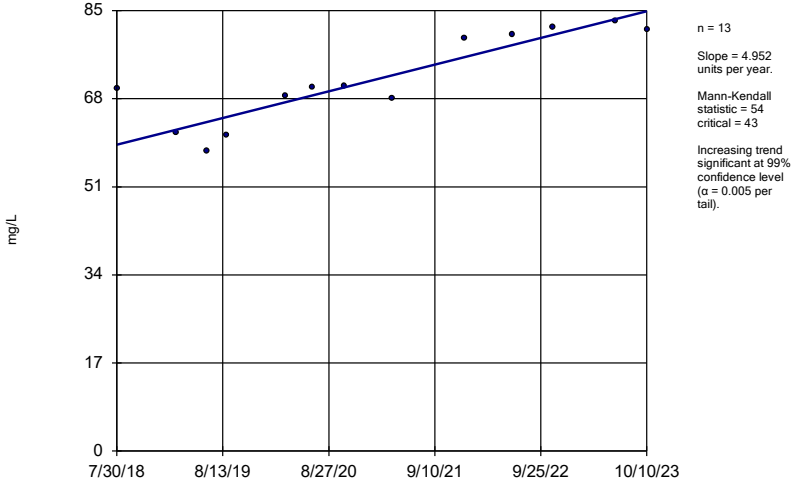
Mann-Kendall statistic = 26
critical = 131

Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Fluoride Analysis Run 1/10/2024 10:55 AM View: Trend Tests
Northeastern BAP Data: Northeastern BAP

Sen's Slope Estimator

SP-4 (bg)



n = 13

Slope = 4.952 units per year.

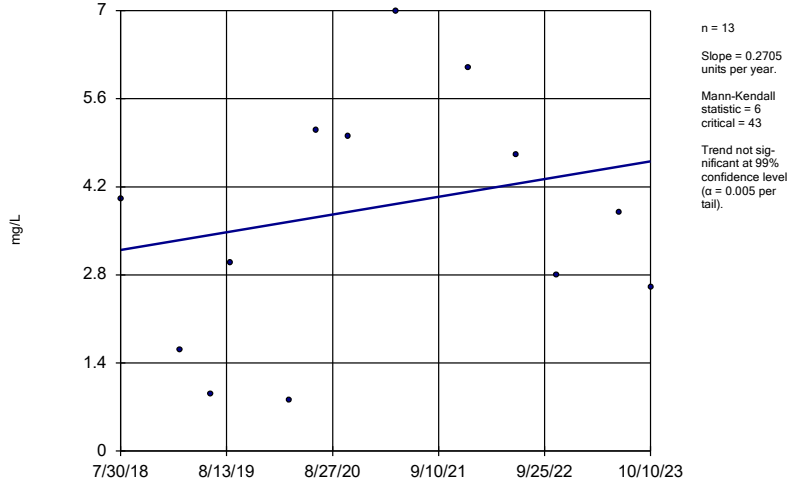
Mann-Kendall statistic = 54
critical = 43

Increasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Sulfate Analysis Run 1/10/2024 10:55 AM View: Trend Tests
Northeastern BAP Data: Northeastern BAP

Sen's Slope Estimator

SP-5R (bg)



n = 13

Slope = 0.2705 units per year.

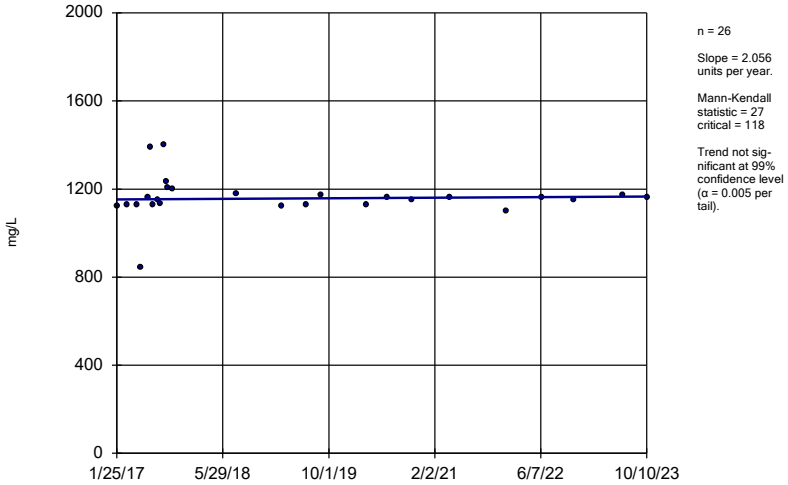
Mann-Kendall statistic = 6
critical = 43

Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Sulfate Analysis Run 1/10/2024 10:55 AM View: Trend Tests
Northeastern BAP Data: Northeastern BAP

Sen's Slope Estimator

SP-4 (bg)



n = 26

Slope = 2.056 units per year.

Mann-Kendall statistic = 27
critical = 118

Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Total Dissolved Solids [TDS] Analysis Run 1/10/2024 10:55 AM View: Trend Tests
Northeastern BAP Data: Northeastern BAP

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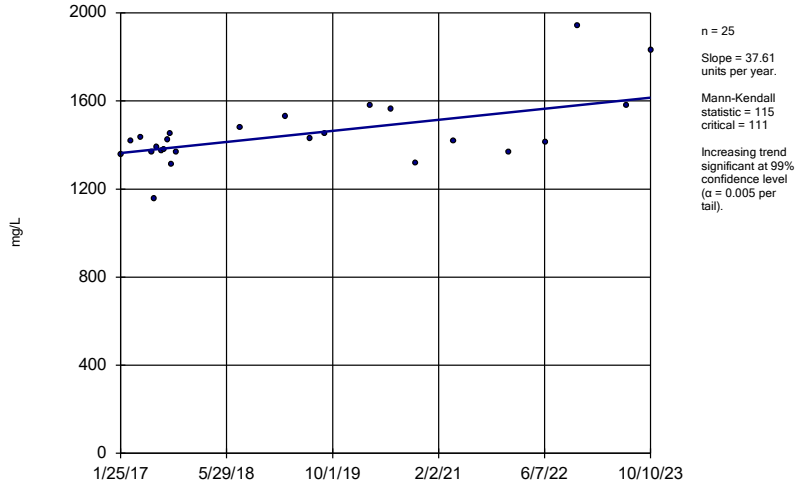
Sen's Slope Estimator

SP-5R (bg)



n = 25

Slope = 37.61 units per year.

Mann-Kendall statistic = 115
critical = 111

Increasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Total Dissolved Solids [TDS] Analysis Run 1/10/2024 10:55 AM View: Trend Tests
Northeastern BAP Data: Northeastern BAP

FIGURE F

Interwell PLs

Interwell Pediction Limits - All Results

Northeastern BAP Data: Northeastern BAP Printed 1/10/2024, 10:58 AM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Boron (mg/L)	n/a	0.4957	n/a	n/a	4 future	n/a	54	0.5554	0.08286	0	None	sqrt(x)	0.00188	Param Inter 1 of 2
Chloride (mg/L)	n/a	873.8	n/a	n/a	4 future	n/a	49	23.88	3.148	0	None	sqrt(x)	0.00188	Param Inter 1 of 2
Fluoride (mg/L)	n/a	4.39	n/a	n/a	4 future	n/a	56	n/a	n/a	1.786	n/a	n/a	0.0006126	NP Inter (normality) 1 of 2
pH, field (SU)	n/a	9.05	6.96	n/a	4 future	n/a	52	n/a	n/a	0	n/a	n/a	0.001402	NP Inter (normality) 1 of 2
Sulfate (mg/L)	n/a	83	n/a	n/a	4 future	n/a	26	n/a	n/a	0	n/a	n/a	0.00258	NP Inter (normality) 1 of 2
Total Dissolved Solids [TDS] (mg/L)	n/a	1940	n/a	n/a	4 future	n/a	51	n/a	n/a	0	n/a	n/a	0.0007231	NP Inter (normality) 1 of 2

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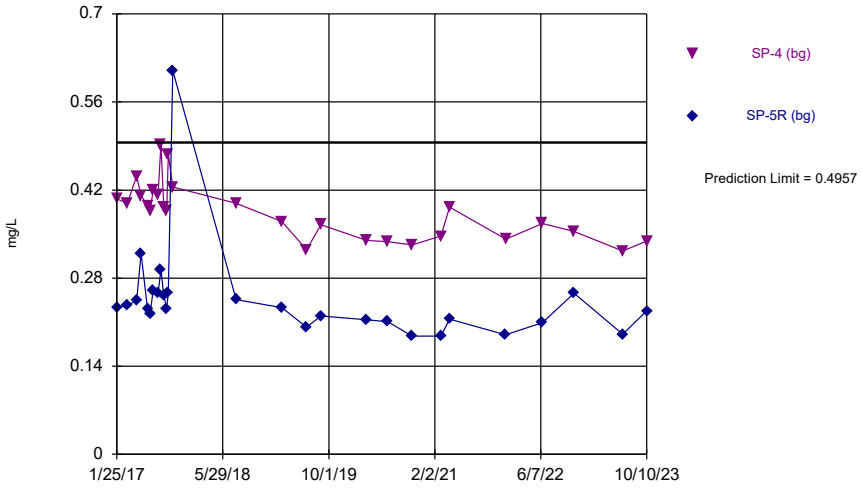
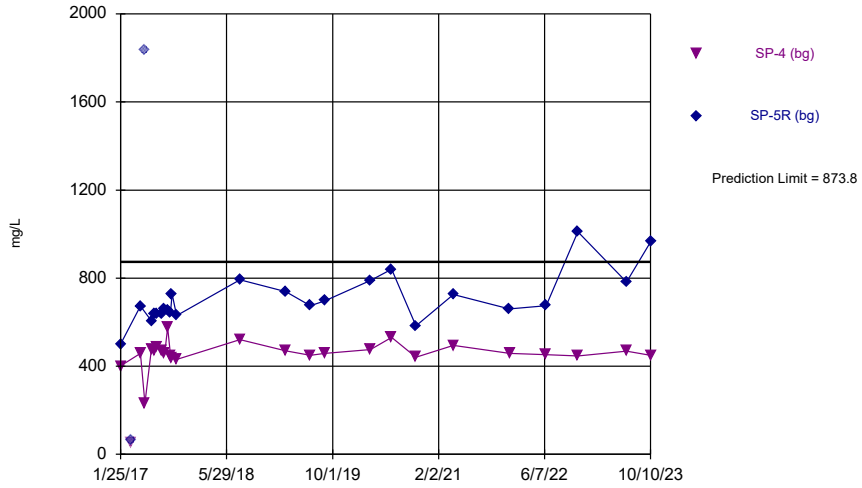
Time Series



Constituent: Boron Analysis Run 1/10/2024 11:57 AM View: Interwell
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Time Series



Constituent: Chloride Analysis Run 1/10/2024 11:57 AM View: Interwell
Northeastern BAP Data: Northeastern BAP

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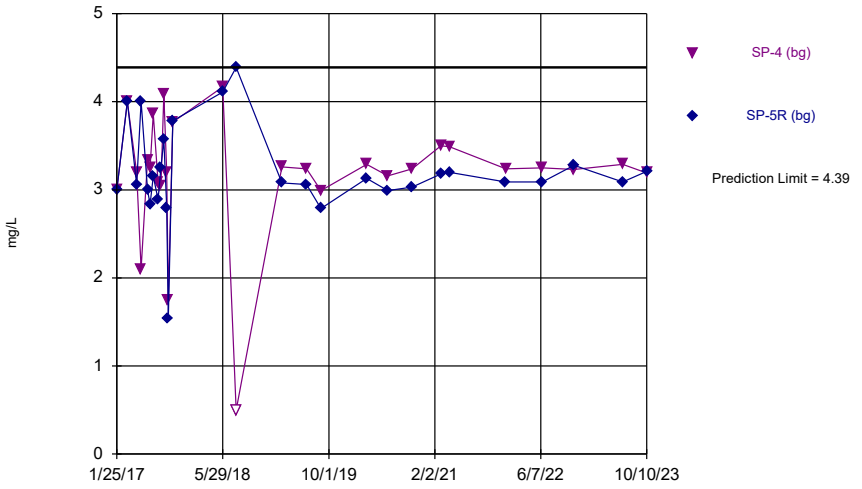
Hollow symbols indicate censored values.

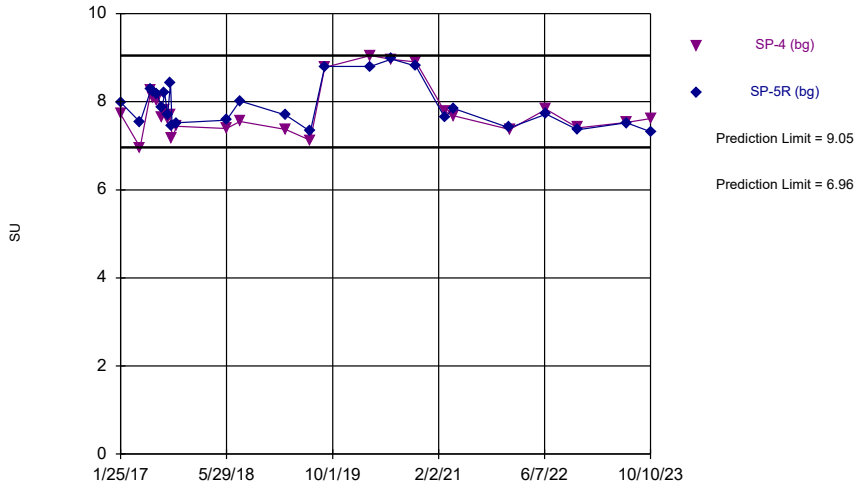
Time Series



Constituent: Fluoride Analysis Run 1/10/2024 11:57 AM View: Interwell
Northeastern BAP Data: Northeastern BAP

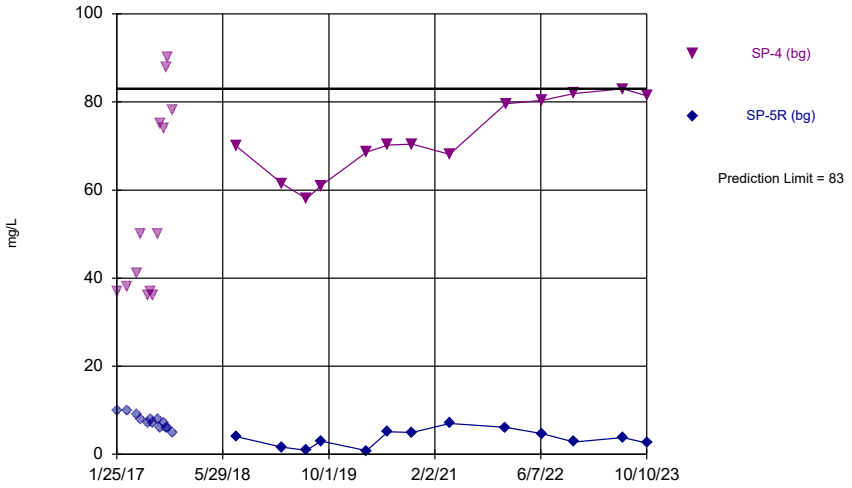
Sanitas™ v.10.0.15 Software licensed to . UG

Time Series



Constituent: pH, field Analysis Run 1/10/2024 11:58 AM View: Interwell
Northeastern BAP Data: Northeastern BAP

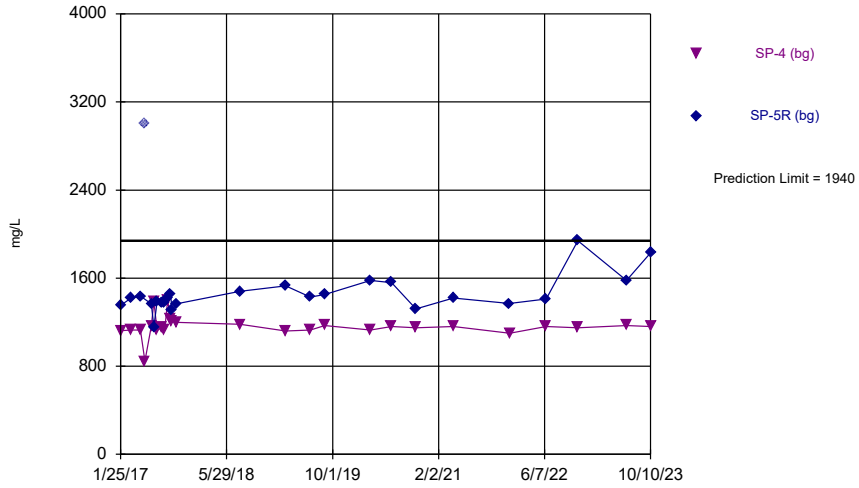
Time Series



Constituent: Sulfate Analysis Run 1/10/2024 12:02 PM View: Interwell
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

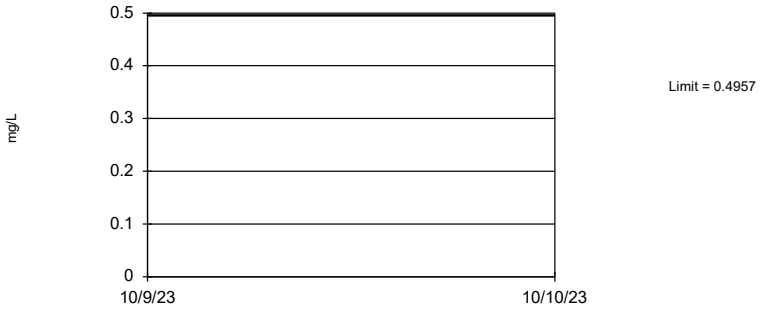
Time Series



Constituent: Total Dissolved Solids [TDS] Analysis Run 1/10/2024 12:02 PM View: Interwell
Northeastern BAP Data: Northeastern BAP

Prediction Limit

Interwell Parametric

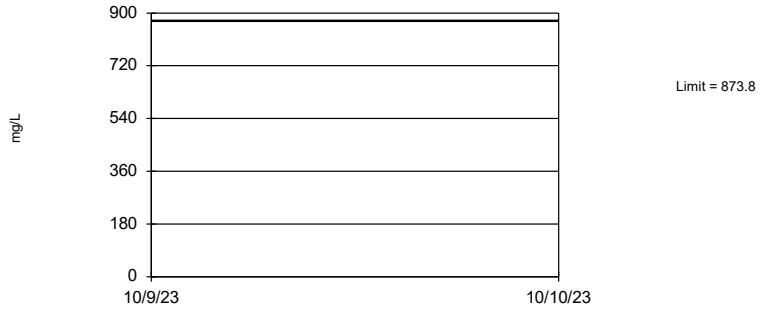


Background Data Summary (based on square root transformation): Mean=0.5554, Std. Dev.=0.08286, n=54. Normality test: Shapiro Francia @alpha = 0.01, calculated = 0.949, critical = 0.939. Kappa = 1.794 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.00188. Assumes 4 future values.

Constituent: Boron Analysis Run 1/10/2024 10:56 AM View: Interwell
Northeastern BAP Data: Northeastern BAP

Prediction Limit

Interwell Parametric

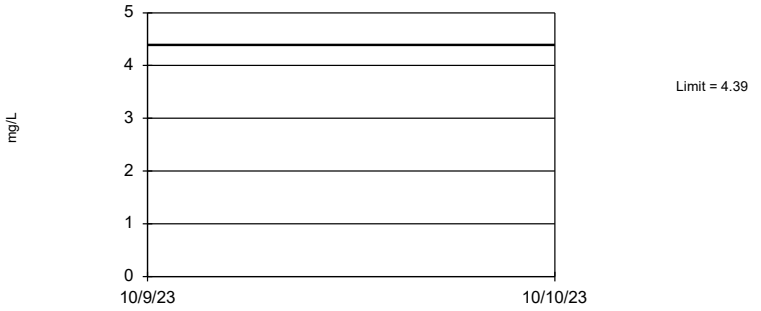


Background Data Summary (based on square root transformation): Mean=23.88, Std. Dev.=3.148, n=49. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9416, critical = 0.929. Kappa = 1.805 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.00188. Assumes 4 future values.

Constituent: Chloride Analysis Run 1/10/2024 10:56 AM View: Interwell
Northeastern BAP Data: Northeastern BAP

Prediction Limit

Interwell Non-parametric

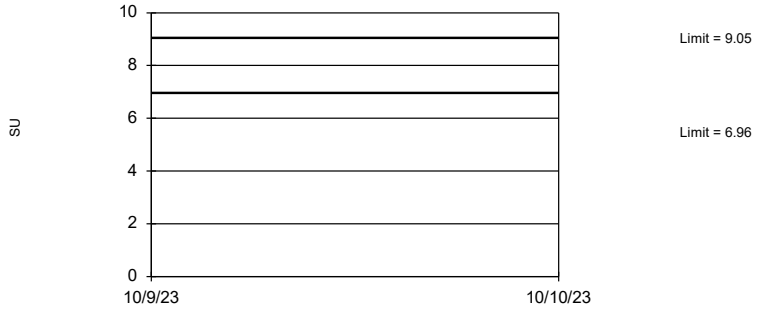


Non-parametric test used in lieu of parametric prediction limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 56 background values. 1.786% NDs. Annual per-constituent alpha = 0.004891. Individual comparison alpha = 0.0006126 (1 of 2). Assumes 4 future values.

Constituent: Fluoride Analysis Run 1/10/2024 10:56 AM View: Interwell
Northeastern BAP Data: Northeastern BAP

Prediction Limit

Interwell Non-parametric

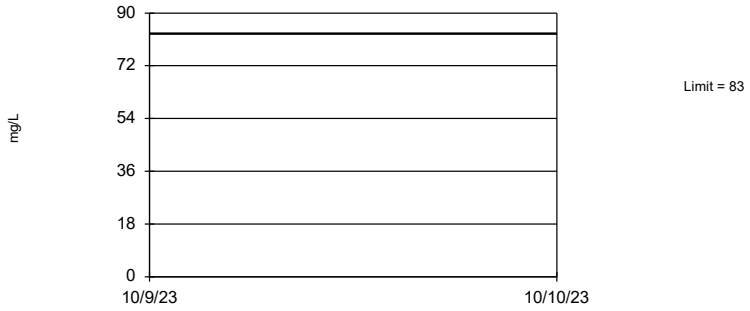


Non-parametric test used in lieu of parametric prediction limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limits are highest and lowest of 52 background values. Annual per-constituent alpha = 0.01119. Individual comparison alpha = 0.001402 (1 of 2). Assumes 4 future values.

Constituent: pH, field Analysis Run 1/10/2024 10:56 AM View: Interwell
Northeastern BAP Data: Northeastern BAP

Prediction Limit

Interwell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 26 background values. Annual per-constituent alpha = 0.02045. Individual comparison alpha = 0.00258 (1 of 2). Assumes 4 future values.

Constituent: Sulfate Analysis Run 1/10/2024 10:56 AM View: Interwell
Northeastern BAP Data: Northeastern BAP

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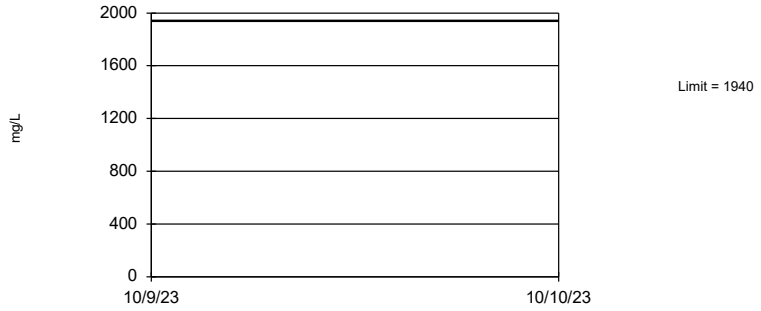
Prediction Limit

Interwell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 51 background values. Annual per-constituent alpha = 0.00577. Individual comparison alpha = 0.0007231 (1 of 2). Assumes 4 future values.

Constituent: Total Dissolved Solids [TDS] Analysis Run 1/10/2024 10:56 AM View: Interwell
Northeastern BAP Data: Northeastern BAP

FIGURE G

UTLs

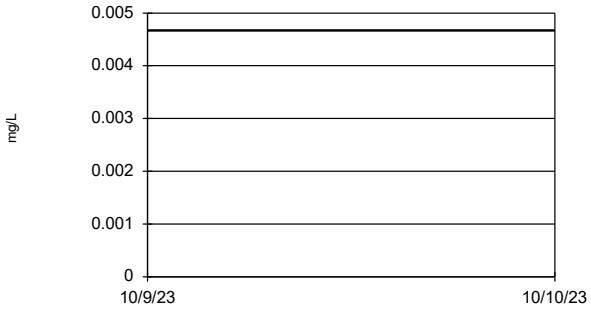
Upper Tolerance Limits Summary Table

Northeastern BAP Data: Northeastern BAP Printed 1/10/2024, 12:19 PM

Constituent	Upper Lim.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Antimony (mg/L)	0.004669	54	-8.028	1.303	31.48	Kaplan-Meier	ln(x)	0.05	Inter
Arsenic (mg/L)	0.0529	53	0.2046	0.08342	5.66	None	x^(1/3)	0.05	Inter
Barium (mg/L)	2.77	42	n/a	n/a	0	n/a	n/a	0.116	NP Inter(normality)
Beryllium (mg/L)	0.00212	53	n/a	n/a	18.87	n/a	n/a	0.06597	NP Inter(normality)
Cadmium (mg/L)	0.0002157	30	-10.33	0.8506	20	Kaplan-Meier	ln(x)	0.05	Inter
Chromium (mg/L)	0.003731	42	-7.265	0.7923	11.9	None	ln(x)	0.05	Inter
Cobalt (mg/L)	0.01786	53	n/a	n/a	9.434	n/a	n/a	0.06597	NP Inter(normality)
Combined Radium 226 + 228 (pCi/L)	19.39	53	2.82	0.773	0	None	sqrt(x)	0.05	Inter
Fluoride (mg/L)	4.39	56	n/a	n/a	1.786	n/a	n/a	0.05656	NP Inter(normality)
Lead (mg/L)	0.008682	53	-7.11	1.154	24.53	Kaplan-Meier	ln(x)	0.05	Inter
Lithium (mg/L)	0.163	42	n/a	n/a	0	n/a	n/a	0.116	NP Inter(normality)
Mercury (mg/L)	0.00003	53	n/a	n/a	75.47	n/a	n/a	0.06597	NP Inter(NDs)
Molybdenum (mg/L)	0.01	54	n/a	n/a	31.48	n/a	n/a	0.06267	NP Inter(normality)
Selenium (mg/L)	0.00499	42	n/a	n/a	28.57	n/a	n/a	0.116	NP Inter(normality)
Thallium (mg/L)	0.00162	30	n/a	n/a	76.67	n/a	n/a	0.2146	NP Inter(NDs)

Tolerance Limit

Interwell Parametric

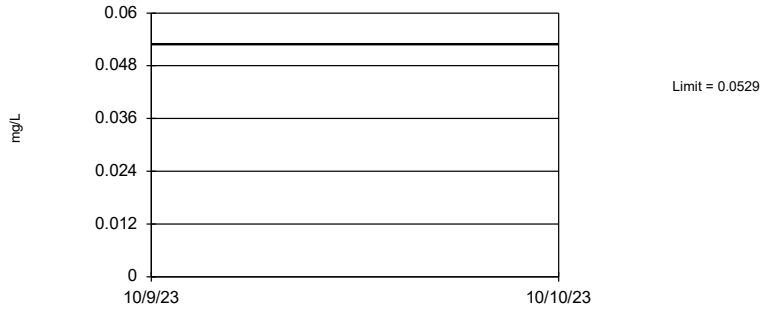


95% coverage. Background Data Summary (based on natural log transformation) (after Kaplan-Meier Adjustment): Mean=-8.028, Std. Dev.=1.303, n=54, 31.48% NDs. Normality test: Shapiro Francia @alpha = 0.01, calculated = 0.9524, critical = 0.939. Report alpha = 0.05.

Constituent: Antimony Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Tolerance Limit

Interwell Parametric

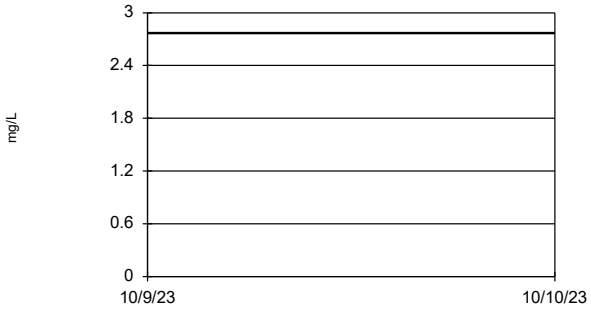


95% coverage. Background Data Summary (based on cube root transformation): Mean=0.2046, Std. Dev.=0.08342, n=53, 5.66% NDs. Normality test: Shapiro Francia @alpha = 0.01, calculated = 0.9413, critical = 0.938. Report alpha = 0.05.

Constituent: Arsenic Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric

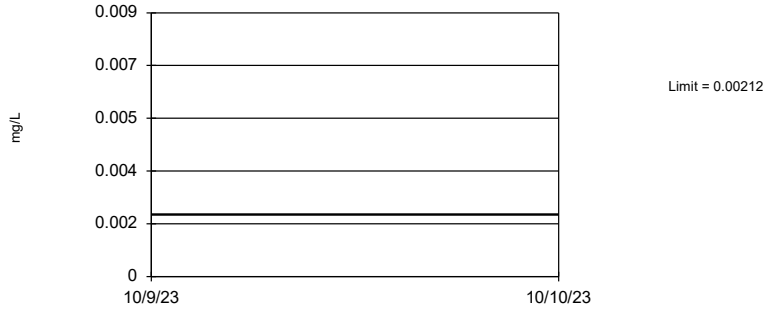


Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 42 background values. 89.65% coverage at alpha=0.01; 93.16% coverage at alpha=0.05; 98.24% coverage at alpha=0.5. Report alpha = 0.116.

Constituent: Barium Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric



Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 53 background values. 18.87% NDs. 91.6% coverage at alpha=0.01; 94.34% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.06597.

Constituent: Beryllium Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Tolerance Limit

Interwell Parametric

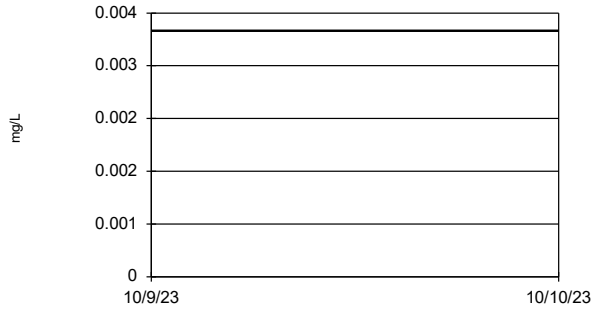
95% coverage. Background Data Summary (based on natural log transformation) (after Kaplan-Meier Adjustment): Mean=-10.33, Std. Dev.=0.8506, n=30, 20% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9423, critical = 0.9. Report alpha = 0.05.

Constituent: Cadmium Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Tolerance Limit

Interwell Parametric



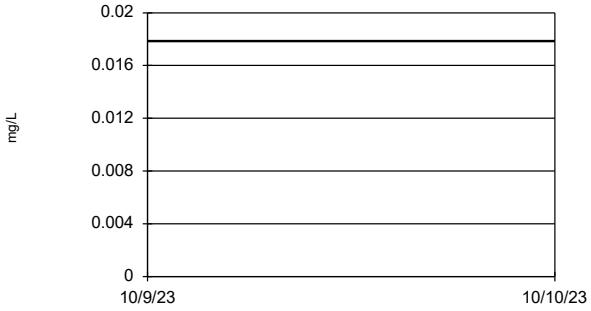
95% coverage. Background Data Summary (based on natural log transformation): Mean=-7.265, Std. Dev.=0.7923, n=42, 11.9% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9556, critical = 0.922. Report alpha = 0.05.

Constituent: Chromium Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Tolerance Limit

Interwell Non-parametric



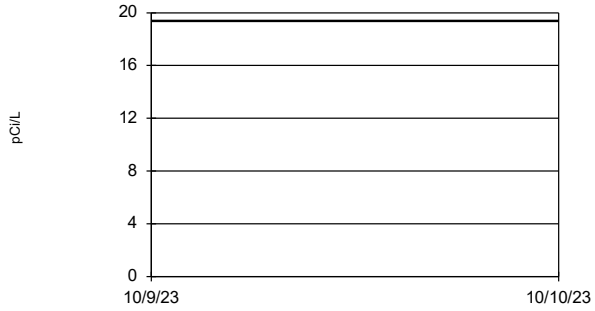
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 53 background values. 9.434% NDs. 91.6% coverage at alpha=0.01; 94.34% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.06597.

Constituent: Cobalt Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Tolerance Limit

Interwell Parametric



95% coverage. Background Data Summary (based on square root transformation): Mean=2.82, Std. Dev.=0.773, n=53. Normality test: Shapiro Francia @alpha = 0.01, calculated = 0.9513, critical = 0.938. Report alpha = 0.05.

Constituent: Combined Radium 226 + 228 Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric

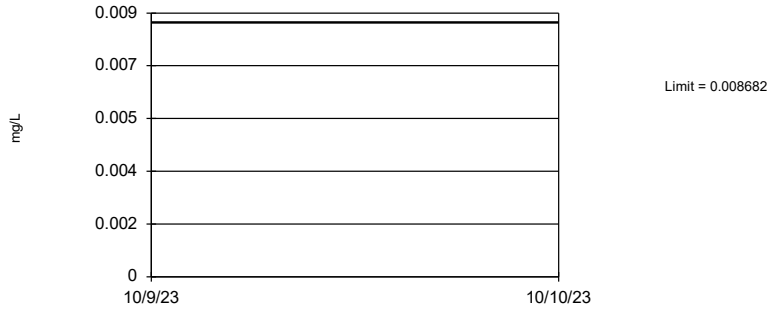
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 56 background values. 1.786% NDs. 91.99% coverage at alpha=0.01; 94.73% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.05656.

Constituent: Fluoride Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Tolerance Limit

Interwell Parametric



95% coverage. Background Data Summary (based on natural log transformation) (after Kaplan-Meier Adjustment): Mean=-7.11, Std. Dev.=1.154, n=53, 24.53% NDs. Normality test: Shapiro Francia @alpha = 0.01, calculated = 0.9393, critical = 0.938. Report alpha = 0.05.

Constituent: Lead Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

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Tolerance Limit

Interwell Non-parametric

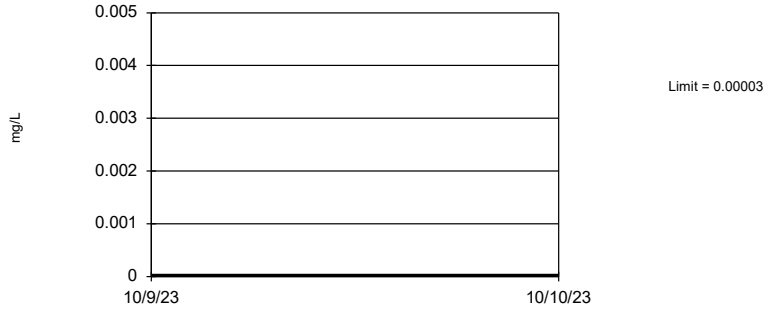
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 42 background values. 89.65% coverage at alpha=0.01; 93.16% coverage at alpha=0.05; 98.24% coverage at alpha=0.5. Report alpha = 0.116.

Constituent: Lithium Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Tolerance Limit

Interwell Non-parametric

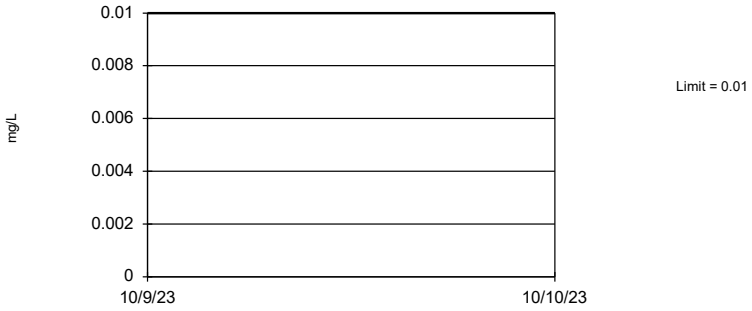


Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 50%. Limit is highest of 53 background values. 75.47% NDs. 91.6% coverage at alpha=0.01; 94.34% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.06597.

Constituent: Mercury Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric



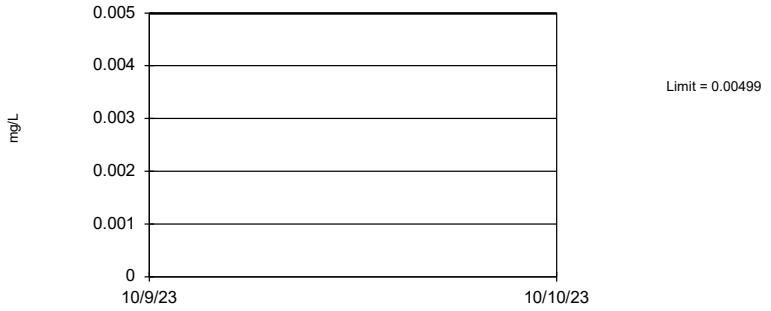
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 54 background values. 31.48% NDs. 91.99% coverage at alpha=0.01; 94.73% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.06267.

Constituent: Molybdenum Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Tolerance Limit

Interwell Non-parametric



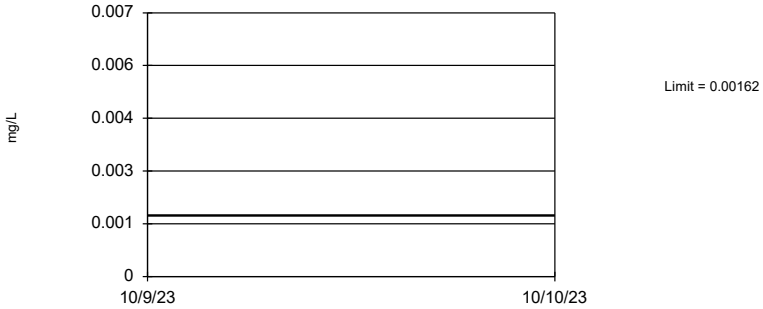
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 42 background values. 28.57% NDs. 89.65% coverage at alpha=0.01; 93.16% coverage at alpha=0.05; 98.24% coverage at alpha=0.5. Report alpha = 0.116.

Constituent: Selenium Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Tolerance Limit

Interwell Non-parametric



Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 50%. Limit is highest of 30 background values. 76.67% NDs. 85.74% coverage at alpha=0.01; 90.43% coverage at alpha=0.05; 97.85% coverage at alpha=0.5. Report alpha = 0.2146.

Constituent: Thallium Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

FIGURE H

GWPS

NORTHEASTERN BAP GWPS				
Constituent Name	**MCL**	**CCR- Rule Specified Level**	**Background Limit**	**GWPS**
Antimony, Total (mg/L)	0.006		0.0047	0.006
Arsenic, Total (mg/L)	0.01		0.053	0.053
Barium, Total (mg/L)	2		2.77	2.77
Beryllium, Total (mg/L)	0.004		0.0021	0.004
Cadmium, Total (mg/L)	0.005		0.00022	0.005
Chromium, Total (mg/L)	0.1		0.037	0.1
Cobalt, Total (mg/L)	n/a	0.006	0.018	0.018
Combined Radium, Total (pCi/L)	5		19.39	19.39
Fluoride, Total (mg/L)	4		4.39	4.39
Lead, Total (mg/L)	n/a	0.015	0.0087	0.015
Lithium, Total (mg/L)	n/a	0.04	0.16	0.16
Mercury, Total (mg/L)	0.002		0.00003	0.002
Molybdenum, Total (mg/L)	n/a	0.1	0.01	0.1
Selenium, Total (mg/L)	0.05		0.005	0.05
Thallium, Total (mg/L)	0.002		0.0016	0.002

**Grey cell indicates Background Limit is higher than MCL*

**GWPS = Groundwater Protection Standard*

**MCL = Maximum Contaminant Level*

**CCR = Coal Combustion Residuals*

FIGURE I

Confidence Intervals

Confidence Intervals - Significant Results

Northeastern BAP Data: Northeastern BAP Printed 1/10/2024, 12:17 PM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Barium (mg/L)	**SP-10**	**6.356**	**4.197**	**2.77**	**Yes**	**16**	**5.277**	**1.659**	**0**	**None**	**No**	**0.01**	**Param.**
Fluoride (mg/L)	**SP-10**	**6.84**	**5.59**	**4.39**	**Yes**	**26**	**5.91**	**2.283**	**11.54**	**None**	**No**	**0.01**	**NP (normality)**
Lithium (mg/L)	**SP-10**	**0.2779**	**0.2378**	**0.16**	**Yes**	**24**	**0.2579**	**0.03932**	**0**	**None**	**No**	**0.01**	**Param.**

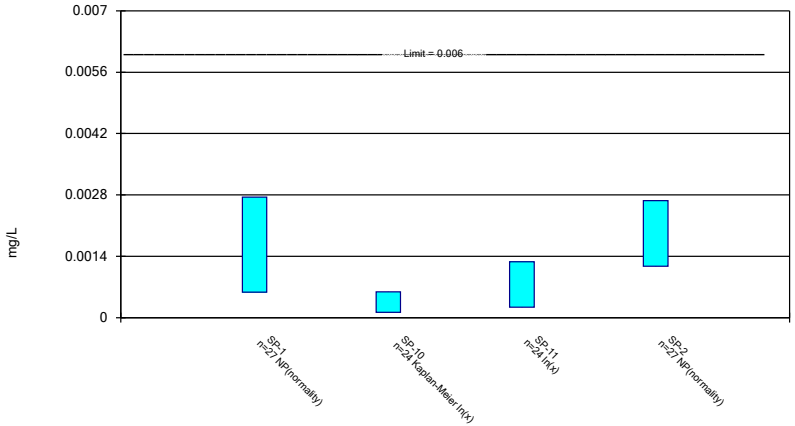
Confidence Intervals - All Results

Northeastern BAP Data: Northeastern BAP Printed 1/10/2024, 12:17 PM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Antimony (mg/L)	SP-1	0.00275	0.00058	0.006	No	27	0.002151	0.002126	25.93	None	No	0.01	NP (normality)
Antimony (mg/L)	SP-10	0.0005862	0.0001217	0.006	No	24	0.00149	0.00192	16.67	Kaplan-Meier	ln(x)	0.01	Param.
Antimony (mg/L)	SP-11	0.001275	0.0002399	0.006	No	24	0.00186	0.002804	12.5	None	ln(x)	0.01	Param.
Antimony (mg/L)	SP-2	0.00267	0.00117	0.006	No	27	0.002508	0.002468	7.407	None	No	0.01	NP (normality)
Arsenic (mg/L)	SP-1	0.005	0.00069	0.053	No	27	0.002287	0.002033	29.63	None	No	0.01	NP (normality)
Arsenic (mg/L)	SP-10	0.004677	0.001184	0.053	No	24	0.003704	0.00434	8.333	None	sqrt(x)	0.01	Param.
Arsenic (mg/L)	SP-11	0.004844	0.002311	0.053	No	24	0.003888	0.002871	4.167	None	sqrt(x)	0.01	Param.
Arsenic (mg/L)	SP-2	0.00251	0.00121	0.053	No	27	0.002458	0.002465	3.704	None	No	0.01	NP (normality)
Barium (mg/L)	SP-1	0.1974	0.1632	2.77	No	27	0.1816	0.03782	0	None	sqrt(x)	0.01	Param.
Barium (mg/L)	**SP-10**	**6.356**	**4.197**	**2.77**	**Yes**	**16**	**5.277**	**1.659**	**0**	**None**	**No**	**0.01**	**Param.**
Barium (mg/L)	SP-11	0.4053	0.1881	2.77	No	16	0.3092	0.1743	0	None	sqrt(x)	0.01	Param.
Barium (mg/L)	SP-2	1.329	0.9879	2.77	No	27	1.208	0.4734	0	None	ln(x)	0.01	Param.
Beryllium (mg/L)	SP-1	0.0002	0.000053	0.004	No	27	0.0002561	0.0003647	18.52	None	No	0.01	NP (normality)
Beryllium (mg/L)	SP-10	0.00008	0.00003	0.004	No	24	0.0007557	0.001143	29.17	None	No	0.01	NP (normality)
Beryllium (mg/L)	SP-11	0.00025	0.000027	0.004	No	24	0.0001486	0.0001327	29.17	None	No	0.01	NP (normality)
Beryllium (mg/L)	SP-2	0.00018	0.00007	0.004	No	27	0.0001571	0.0001535	14.81	None	No	0.01	NP (normality)
Cadmium (mg/L)	SP-1	0.0001	0.00005	0.005	No	16	0.0001183	0.0001206	12.5	None	No	0.01	NP (normality)
Cadmium (mg/L)	SP-10	0.000089	0.00001	0.005	No	16	0.00005725	0.00007341	18.75	None	No	0.01	NP (normality)
Cadmium (mg/L)	SP-11	0.00034	0.00002	0.005	No	24	0.000464	0.0009258	16.67	None	No	0.01	NP (normality)
Cadmium (mg/L)	SP-2	0.0005	0.00006	0.005	No	27	0.000248	0.0002072	37.04	None	No	0.01	NP (normality)
Chromium (mg/L)	SP-1	0.001069	0.0005249	0.1	No	27	0.0009884	0.0006701	22.22	Kaplan-Meier	sqrt(x)	0.01	Param.
Chromium (mg/L)	SP-10	0.0009388	0.0003229	0.1	No	23	0.001027	0.001791	8.696	None	ln(x)	0.01	Param.
Chromium (mg/L)	SP-11	0.00525	0.000379	0.1	No	24	0.005833	0.01052	4.167	None	No	0.01	NP (normality)
Chromium (mg/L)	SP-2	0.001364	0.0005761	0.1	No	27	0.001163	0.00108	11.11	None	x^(1/3)	0.01	Param.
Cobalt (mg/L)	SP-1	0.00116	0.0004813	0.018	No	27	0.001002	0.001103	11.11	None	x^(1/3)	0.01	Param.
Cobalt (mg/L)	SP-10	0.001849	0.0004051	0.018	No	24	0.001478	0.00178	8.333	None	sqrt(x)	0.01	Param.
Cobalt (mg/L)	SP-11	0.004362	0.001305	0.018	No	24	0.003752	0.004424	4.167	None	x^(1/3)	0.01	Param.
Cobalt (mg/L)	SP-2	0.0008877	0.0004265	0.018	No	27	0.0008354	0.0007414	11.11	None	ln(x)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-1	4.435	3.252	19.39	No	26	3.843	1.214	0	None	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-10	16.72	7.758	19.39	No	24	12.24	8.786	0	None	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-11	2.307	1.216	19.39	No	23	1.761	1.043	0	None	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-2	13.79	8.953	19.39	No	24	11.72	5.264	0	None	sqrt(x)	0.01	Param.
Fluoride (mg/L)	SP-1	0.9355	0.6969	4.39	No	27	0.8162	0.2501	7.407	None	No	0.01	Param.
Fluoride (mg/L)	**SP-10**	**6.84**	**5.59**	**4.39**	**Yes**	**26**	**5.91**	**2.283**	**11.54**	**None**	**No**	**0.01**	**NP (normality)**
Fluoride (mg/L)	SP-11	3.145	2.183	4.39	No	26	2.664	0.9872	0	None	No	0.01	Param.
Fluoride (mg/L)	SP-2	3.159	2.692	4.39	No	28	2.883	0.5577	0	None	x^2	0.01	Param.
Lead (mg/L)	SP-1	0.00247	0.000254	0.015	No	27	0.001934	0.00209	29.63	None	No	0.01	NP (normality)
Lead (mg/L)	SP-10	0.0002921	0.00008559	0.015	No	16	0.0002569	0.0003088	12.5	None	ln(x)	0.01	Param.
Lead (mg/L)	SP-11	0.00144	0.0003009	0.015	No	24	0.001852	0.002644	12.5	None	ln(x)	0.01	Param.
Lead (mg/L)	SP-2	0.005	0.000245	0.015	No	27	0.002023	0.002192	33.33	None	No	0.01	NP (normality)
Lithium (mg/L)	SP-1	0.006385	0.004798	0.16	No	26	0.005591	0.001628	0	None	No	0.01	Param.
Lithium (mg/L)	**SP-10**	**0.2779**	**0.2378**	**0.16**	**Yes**	**24**	**0.2579**	**0.03932**	**0**	**None**	**No**	**0.01**	**Param.**
Lithium (mg/L)	SP-11	0.03961	0.02238	0.16	No	16	0.03099	0.01324	0	None	No	0.01	Param.
Lithium (mg/L)	SP-2	0.08005	0.05525	0.16	No	27	0.06765	0.02599	0	None	No	0.01	Param.
Mercury (mg/L)	SP-1	0.000009	0.000005	0.002	No	27	0.000006148	0.000003645	85.19	None	No	0.01	NP (NDs)
Mercury (mg/L)	SP-10	0.000013	0.000005	0.002	No	24	0.000009333	0.000007167	58.33	None	No	0.01	NP (NDs)
Mercury (mg/L)	SP-11	0.000009	0.000005	0.002	No	24	0.00001096	0.0000126	45.83	None	No	0.01	NP (normality)
Mercury (mg/L)	SP-2	0.000005	0.000005	0.002	No	27	0.000005407	0.000001738	85.19	None	No	0.01	NP (NDs)
Molybdenum (mg/L)	SP-1	0.01714	0.0117	0.1	No	27	0.01442	0.005699	0	None	No	0.01	Param.
Molybdenum (mg/L)	SP-10	0.01739	0.002637	0.1	No	23	0.01652	0.02775	4.348	None	x^(1/3)	0.01	Param.
Molybdenum (mg/L)	SP-11	0.04433	0.002	0.1	No	24	0.01864	0.02314	4.167	None	No	0.01	NP (normality)
Molybdenum (mg/L)	SP-2	0.02375	0.01788	0.1	No	16	0.02081	0.004511	0	None	No	0.01	Param.
Selenium (mg/L)	SP-1	0.006934	0.004029	0.05	No	27	0.005798	0.003409	11.11	None	sqrt(x)	0.01	Param.
Selenium (mg/L)	SP-10	0.0007629	0.0001231	0.05	No	24	0.001439	0.002133	41.67	Kaplan-Meier	ln(x)	0.01	Param.
Selenium (mg/L)	SP-11	0.0014	0.0003495	0.05	No	24	0.001675	0.002266	8.333	None	ln(x)	0.01	Param.
Selenium (mg/L)	SP-2	0.004796	0.002357	0.05	No	16	0.003707	0.002116	0	None	sqrt(x)	0.01	Param.
Thallium (mg/L)	SP-1	0.0005	0.00007	0.002	No	16	0.0003556	0.0004853	37.5	None	No	0.01	NP (normality)
Thallium (mg/L)	SP-10	0.0002	0.00004	0.002	No	16	0.00019	0.00004	93.75	None	No	0.01	NP (NDs)
Thallium (mg/L)	SP-11	0.0002	0.00003	0.002	No	16	0.0001894	0.0000425	93.75	None	No	0.01	NP (NDs)
Thallium (mg/L)	SP-2	0.0002	0.00005	0.002	No	16	0.0001381	0.00007378	56.25	None	No	0.01	NP (NDs)

Parametric and Non-Parametric (NP) Confidence Interval

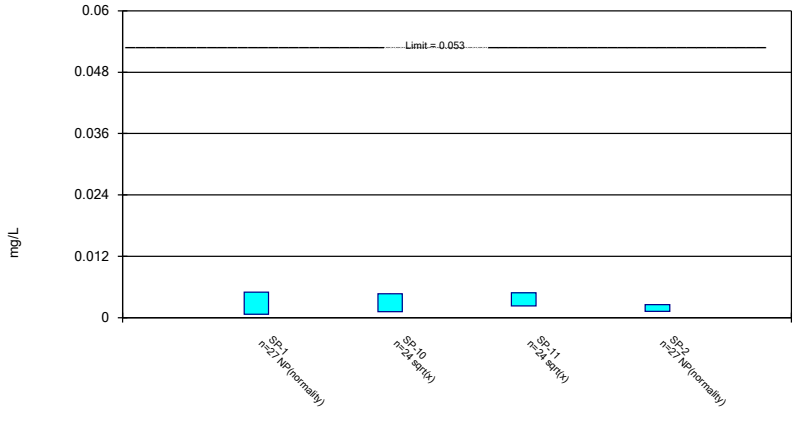
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Antimony Analysis Run 1/10/2024 12:16 PM View: Confidence Intervals
Northeastern BAP Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

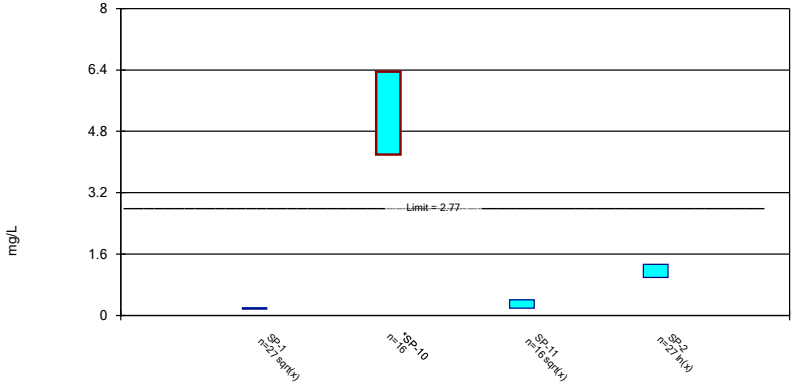
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Arsenic Analysis Run 1/10/2024 12:16 PM View: Confidence Intervals
Northeastern BAP Data: Northeastern BAP

Parametric Confidence Interval

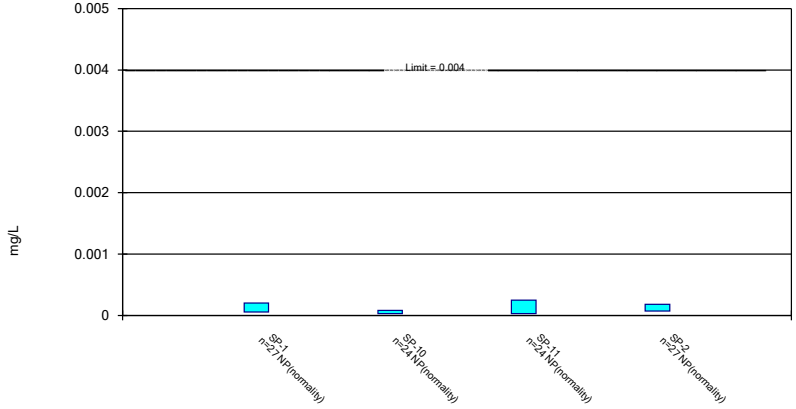
Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Barium Analysis Run 1/10/2024 12:16 PM View: Confidence Intervals
Northeastern BAP Data: Northeastern BAP

Non-Parametric Confidence Interval

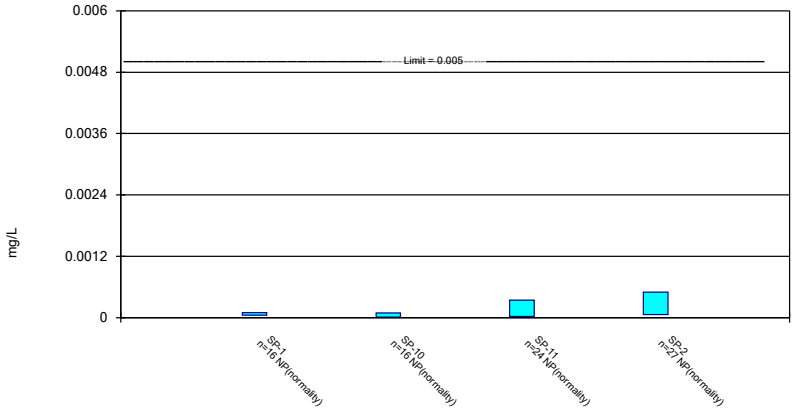
Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Beryllium Analysis Run 1/10/2024 12:16 PM View: Confidence Intervals
Northeastern BAP Data: Northeastern BAP

Non-Parametric Confidence Interval

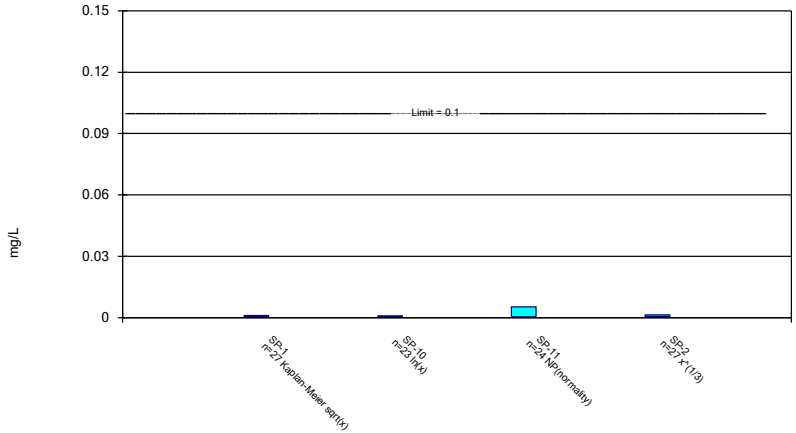
Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Cadmium Analysis Run 1/10/2024 12:16 PM View: Confidence Intervals
Northeastern BAP Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

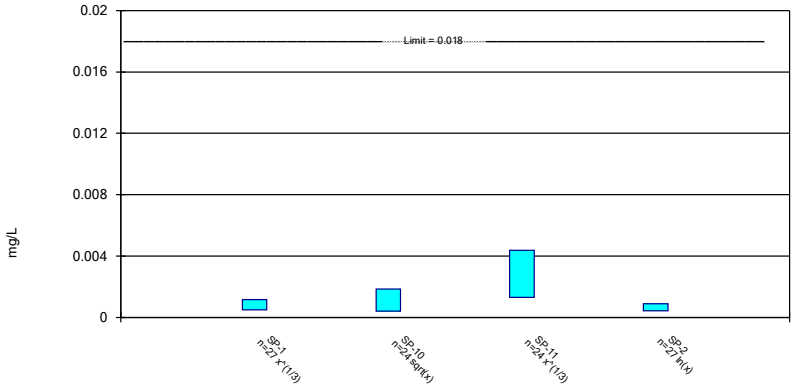
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Chromium Analysis Run 1/10/2024 12:16 PM View: Confidence Intervals
Northeastern BAP Data: Northeastern BAP

Parametric Confidence Interval

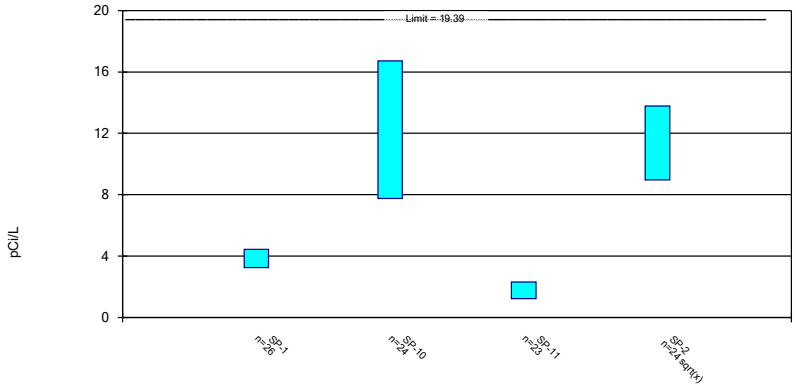
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Cobalt Analysis Run 1/10/2024 12:16 PM View: Confidence Intervals
Northeastern BAP Data: Northeastern BAP

Parametric Confidence Interval

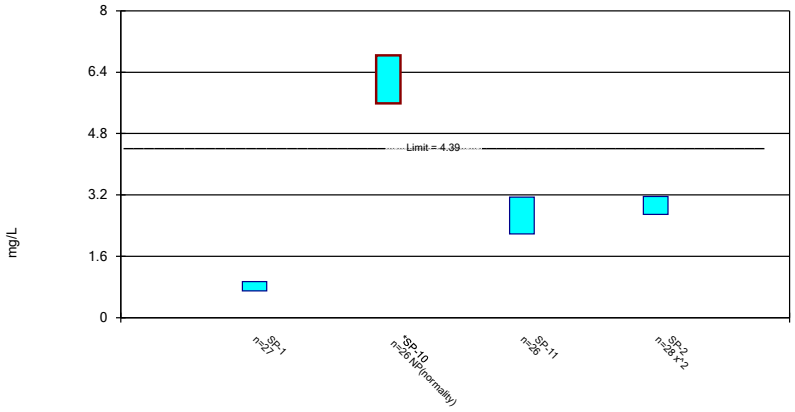
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Combined Radium 226 + 228 Analysis Run 1/10/2024 12:16 PM View: Confidence Intervals
Northeastern BAP Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

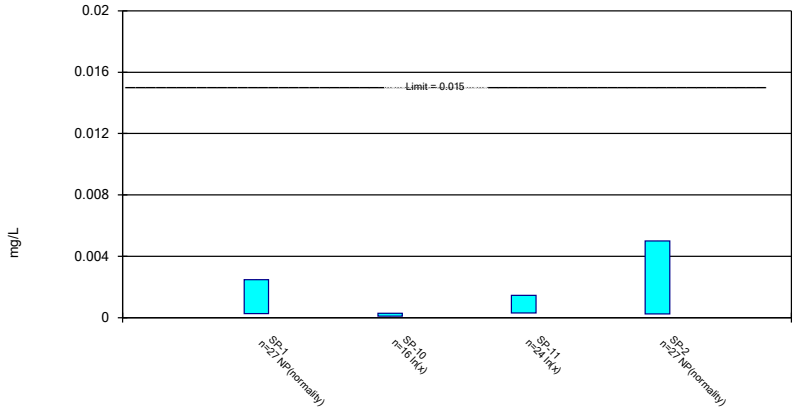
Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Fluoride Analysis Run 1/10/2024 12:16 PM View: Confidence Intervals
Northeastern BAP Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

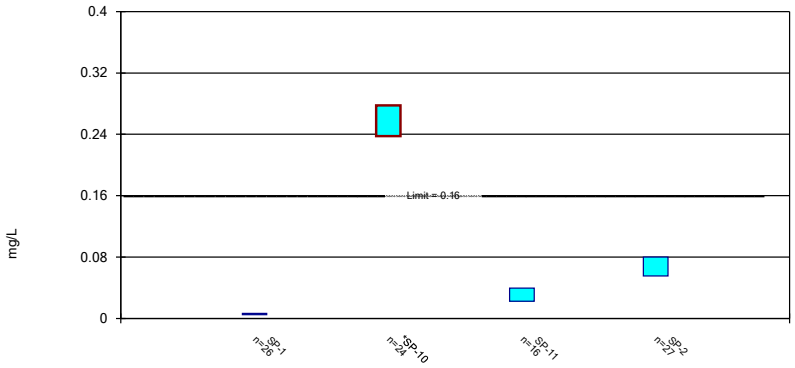
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Lead Analysis Run 1/10/2024 12:16 PM View: Confidence Intervals
Northeastern BAP Data: Northeastern BAP

Parametric Confidence Interval

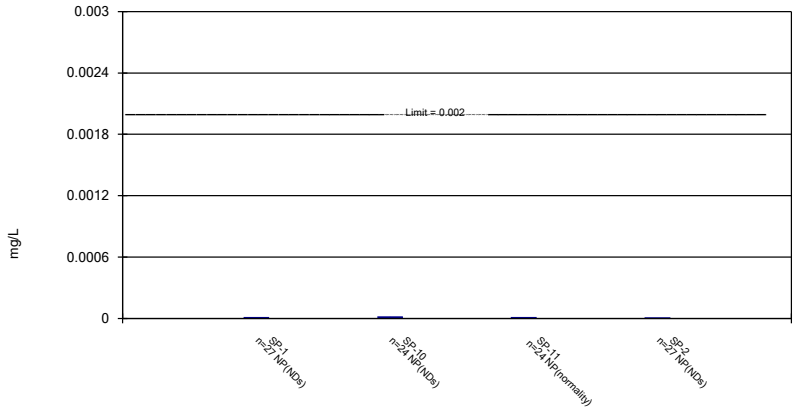
Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Lithium Analysis Run 1/10/2024 12:16 PM View: Confidence Intervals
Northeastern BAP Data: Northeastern BAP

Non-Parametric Confidence Interval

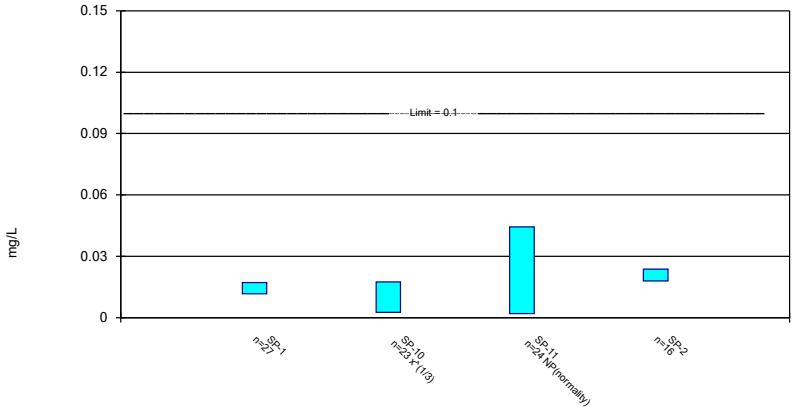
Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Mercury Analysis Run 1/10/2024 12:16 PM View: Confidence Intervals
Northeastern BAP Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

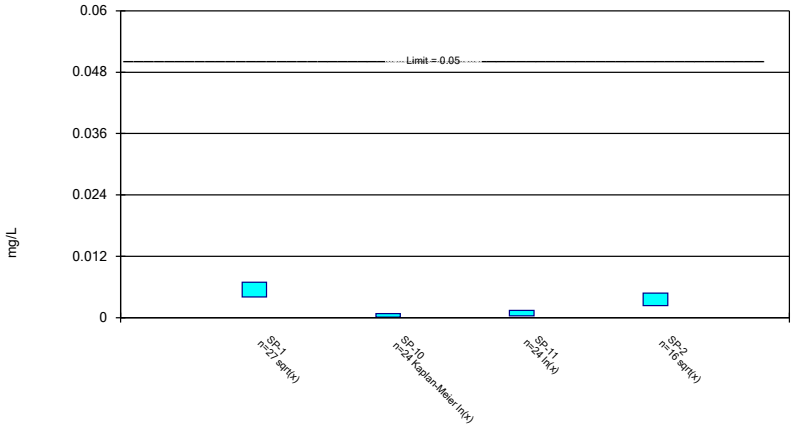
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Molybdenum Analysis Run 1/10/2024 12:16 PM View: Confidence Intervals
Northeastern BAP Data: Northeastern BAP

Parametric Confidence Interval

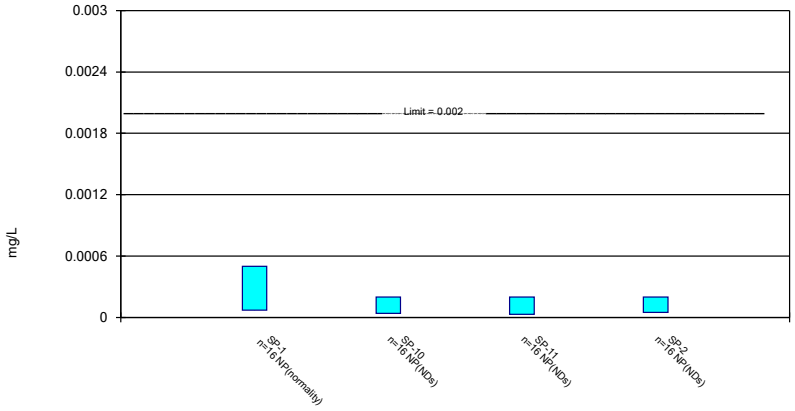
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Selenium Analysis Run 1/10/2024 12:16 PM View: Confidence Intervals
Northeastern BAP Data: Northeastern BAP

Non-Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Thallium Analysis Run 1/10/2024 12:16 PM View: Confidence Intervals
Northeastern BAP Data: Northeastern BAP

FIGURE J

Confidence Intervals – Trend Tests

Trend Tests - Confidence Interval Exceedances - Significant Results

Northeastern BAP Data: Northeastern BAP Printed 1/10/2024, 12:23 PM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Alpha	Method
Barium (mg/L)	**SP-10**	**0.5918**	**49**	**45**	**Yes**	**16**	**0**	**n/a**	**0.05**	**NP**
Barium (mg/L)	**SP-5R (bg)**	**0.08353**	**143**	**96**	**Yes**	**27**	**0**	**n/a**	**0.05**	**NP**
Lithium (mg/L)	**SP-10**	**-0.01416**	**-141**	**-81**	**Yes**	**24**	**0**	**n/a**	**0.05**	**NP**
Lithium (mg/L)	**SP-4 (bg)**	**-0.001794**	**-44**	**-41**	**Yes**	**15**	**0**	**n/a**	**0.05**	**NP**
Lithium (mg/L)	**SP-5R (bg)**	**-0.005489**	**-162**	**-96**	**Yes**	**27**	**0**	**n/a**	**0.05**	**NP**

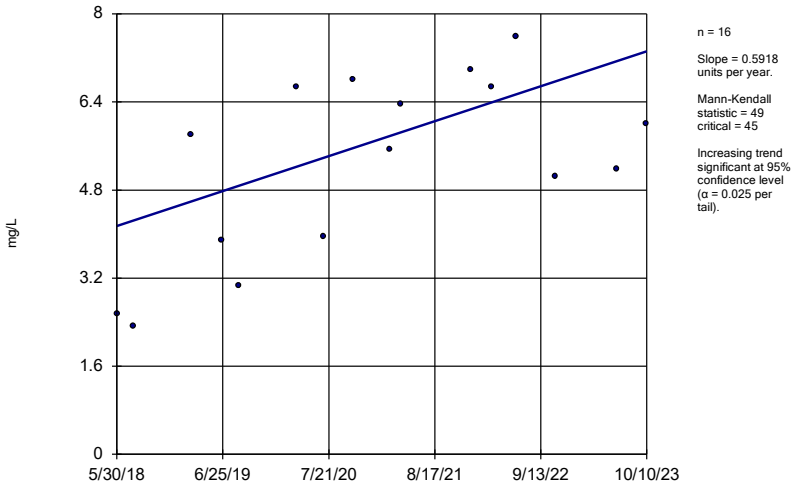
Trend Tests - Confidence Interval Exceedances - All Results

Northeastern BAP Data: Northeastern BAP Printed 1/10/2024, 12:23 PM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Alpha	Method
Barium (mg/L)	**SP-10**	**0.5918**	**49**	**45**	**Yes**	**16**	**0**	**n/a**	**0.05**	**NP**
Barium (mg/L)	SP-4 (bg)	-0.01306	-23	-41	No	15	0	n/a	0.05	NP
Barium (mg/L)	**SP-5R (bg)**	**0.08353**	**143**	**96**	**Yes**	**27**	**0**	**n/a**	**0.05**	**NP**
Fluoride (mg/L)	SP-10	0.1218	42	90	No	26	11.54	n/a	0.05	NP
Fluoride (mg/L)	SP-4 (bg)	0.005715	10	101	No	28	3.571	n/a	0.05	NP
Fluoride (mg/L)	SP-5R (bg)	0.007758	26	101	No	28	0	n/a	0.05	NP
Lithium (mg/L)	**SP-10**	**-0.01416**	**-141**	**-81**	**Yes**	**24**	**0**	**n/a**	**0.05**	**NP**
Lithium (mg/L)	**SP-4 (bg)**	**-0.001794**	**-44**	**-41**	**Yes**	**15**	**0**	**n/a**	**0.05**	**NP**
Lithium (mg/L)	**SP-5R (bg)**	**-0.005489**	**-162**	**-96**	**Yes**	**27**	**0**	**n/a**	**0.05**	**NP**

Sen's Slope Estimator

SP-10



n = 16

Slope = 0.5918 units per year.

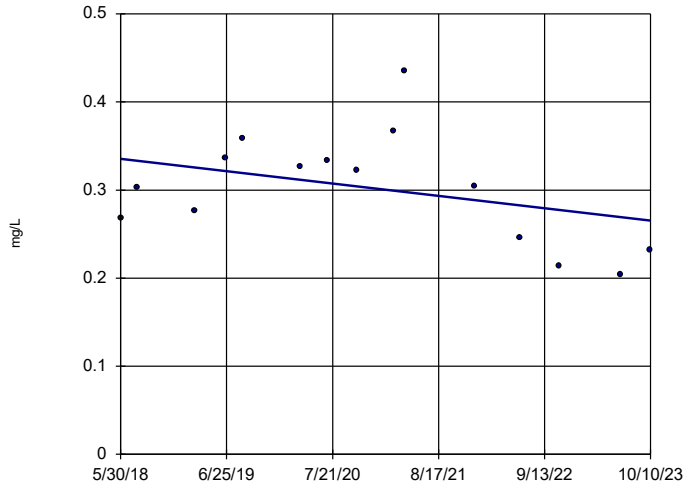
Mann-Kendall statistic = 49
critical = 45

Increasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Barium Analysis Run 1/10/2024 12:21 PM View: Trend Tests
Northeastern BAP Data: Northeastern BAP

Sen's Slope Estimator

SP-4 (bg)



n = 15

Slope = -0.01306 units per year.

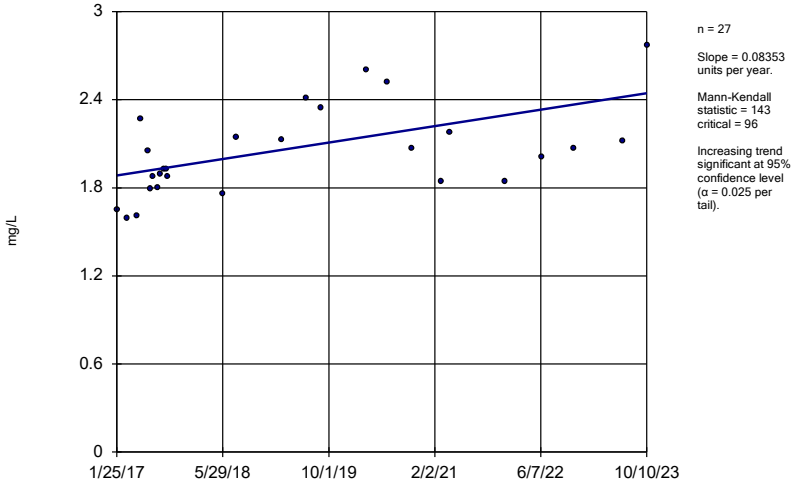
Mann-Kendall statistic = -23
critical = -41

Trend not significant at 95% confidence level (α = 0.025 per tail).

Constituent: Barium Analysis Run 1/10/2024 12:21 PM View: Trend Tests
Northeastern BAP Data: Northeastern BAP

Sen's Slope Estimator

SP-5R (bg)



n = 27

Slope = 0.08353 units per year.

Mann-Kendall statistic = 143
critical = 96

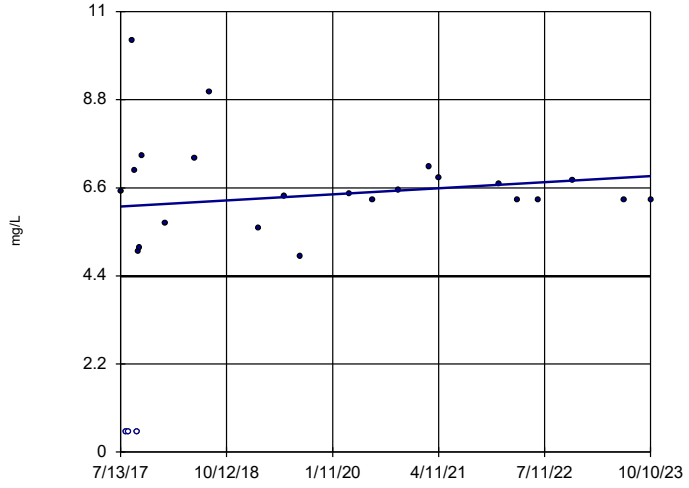
Increasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Barium Analysis Run 1/10/2024 12:21 PM View: Trend Tests
Northeastern BAP Data: Northeastern BAP

Hollow symbols indicate censored values.

Sen's Slope Estimator

SP-10



n = 26

Slope = 0.1218 units per year.

Mann-Kendall statistic = 42
critical = 90

Trend not significant at 95% confidence level (α = 0.025 per tail).

Prediction Limit = 4.39.

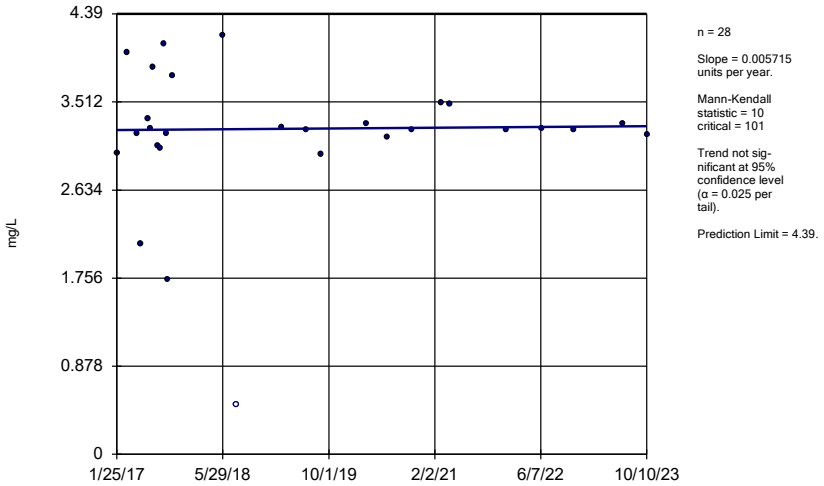
Constituent: Fluoride Analysis Run 1/10/2024 12:21 PM View: Trend Tests
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Hollow symbols indicate censored values.

Sen's Slope Estimator

SP-4 (bg)



n = 28

Slope = 0.005715 units per year.

Mann-Kendall statistic = 10
critical = 101

Trend not significant at 95% confidence level (α = 0.025 per tail).

Prediction Limit = 4.39.

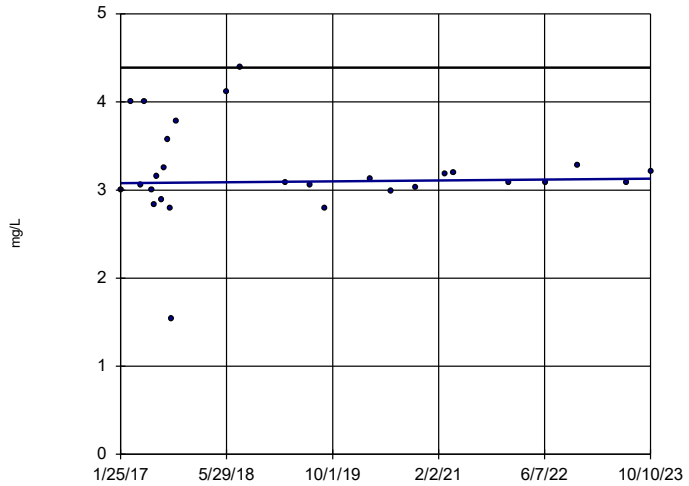
Constituent: Fluoride Analysis Run 1/10/2024 12:21 PM View: Trend Tests

Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Sen's Slope Estimator

SP-5R (bg)



n = 28

Slope = 0.007758 units per year.

Mann-Kendall statistic = 26
critical = 101

Trend not significant at 95% confidence level (α = 0.025 per tail).

Prediction Limit = 4.39.

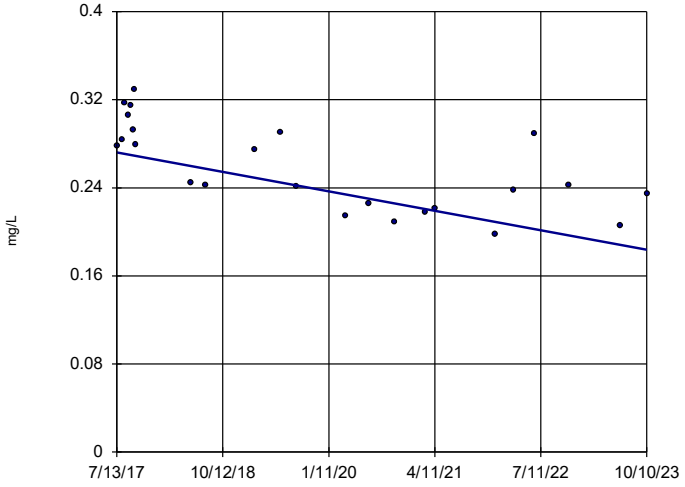
Constituent: Fluoride Analysis Run 1/10/2024 12:21 PM View: Trend Tests

Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Sen's Slope Estimator

SP-10



n = 24

Slope = -0.01416 units per year.

Mann-Kendall statistic = -141
critical = -81

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

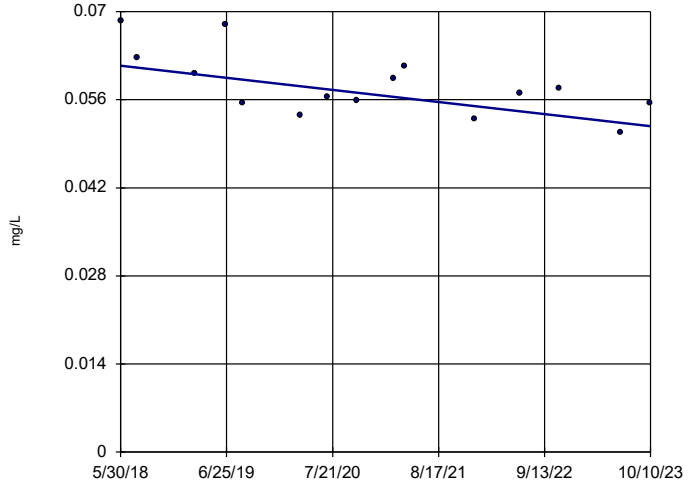
Constituent: Lithium Analysis Run 1/10/2024 12:21 PM View: Trend Tests

Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Sen's Slope Estimator

SP-4 (bg)



n = 15

Slope = -0.001794 units per year.

Mann-Kendall statistic = -44
critical = -41

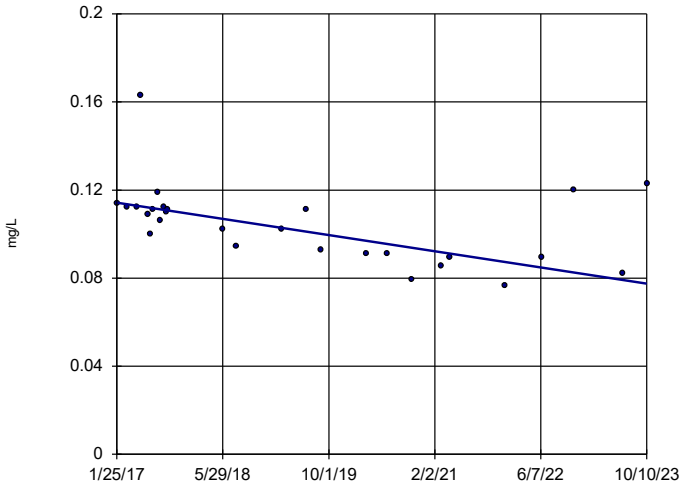
Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Lithium Analysis Run 1/10/2024 12:21 PM View: Trend Tests

Northeastern BAP Data: Northeastern BAP

Sen's Slope Estimator

SP-5R (bg)



n = 27

Slope = -0.005489 units per year.

Mann-Kendall statistic = -162
critical = -96

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Lithium Analysis Run 1/10/2024 12:21 PM View: Trend Tests

Northeastern BAP Data: Northeastern BAP

American Electric Power
7300 E Hwy 88
Oologah, OK 74053-0220
AEP.com

December 6, 2024

Via electronic mail

Ms. Kaylee Daneshmand
Oklahoma Department of Environmental Quality (ODEQ)
707 North Robinson, P.O. Box 1677
Oklahoma City, OK 73101-1677

Re: Alternate Source Demonstration (ASD)
Bottom Ash Pond (BAP)
Public Service Company of Oklahoma (PSO) - Northeastern Power Station (NPS)
Roger County
Solid Waste Permit No. New

Dear Ms. Daneshmand,

AEP/PSO received ODEQ's correspondence dated June 27, 2024, in which ODEQ accepted the ASD for the lithium, fluoride, and barium detected in SP-10 during the April 16, 2024, sampling event. ODEQ indicated that if lithium, fluoride, and barium continue to exceed the groundwater protection standards (GWPS) in the future and conditions have not changed, NPS may refer to the October 24, 2019, ASD approval for lithium, June 4, 2021, ASD approval for fluoride, and to the March 9, 2023, ASD approval for barium and continue assessment monitoring for the BAP in accordance with OAC 252:517-9-6(g)(3)(B).

On December 5, 2024, the statistical evaluation of the first semi-annual 2024 assessment monitoring event (April 16, 2024) for the BAP was certified and in that statistical evaluation report, potential SSLs were identified for lithium, fluoride, and barium at SP-10.

The statistical findings are summarized as follows:

The Lower Confidence Level (LCL) for lithium (0.238 mg/L) exceeded the GWPS (a calculated Upper Tolerance Limit (UTL)) of 0.163 mg/L at SP-10. The actual detected lithium concentration in SP-10 was 0.247 mg/l.

The LCL for fluoride (5.59 mg/L) exceeded the GWPS (UTL of 4.39 mg/L) was exceeded as at SP-10. The actual detected fluoride concentration in SP-10 was 6.4 mg/L.

The LCL for barium (4.30 mg/L) exceeded the GWPS (UTL of 2.77 mg/L) was exceeded as at SP-10. The actual detected barium concentration in SP-10 was 5.94 mg/L.

Attached are the alternative source demonstrations for your review outlining the lines of evidence that these exceedances are the result of natural variations occurring in the groundwater at SP-10 and that the conditions at the BAP have not changed.

Please do not hesitate to contact me if you have any questions or would like to discuss. I can be reached by email at: pwarren1@aep.com or by phone at: (325) 310-6668.

Sincerely,

Sidney Pryce Warren

Sidney Pryce Warren
AEP, Environmental Specialist

Attachments

Geosyntec consultants

500 W. Wilson Bridge Rd, Suite 250
Worthington, Ohio 43085
PH 614.468.0421
www.geosyntec.com

Memorandum

Date:	December 4, 2024
To:	Pryce Warren, American Electric Power (AEP)
From:	Beth Gross, PhD, PE (OK) and Allison Kreinberg, Geosyntec
Subject:	Alternative Source Demonstration Update – 1st Semiannual Event 2024 Northeastern Power Station Bottom Ash Pond Oologah, Rogers County, Oklahoma

The Bottom Ash Pond (BAP) is a regulated coal combustion residual (CCR) management unit at the Northeastern Power Station (NPS) in Oologah, Oklahoma. A semiannual assessment monitoring event was completed at the BAP on April 16, 2024, in accordance with the assessment monitoring requirements of Oklahoma Administrative Code (OAC) 252:517-9-6. Analysis of the April 2024 data identified statistically significant levels (SSLs) above the groundwater protection standards (GWPSs) for lithium, fluoride, and barium at SP-10 (**Attachment A**). The following SSLs were identified at the Northeastern BAP:

- The lower confidence limit (LCL) for lithium exceeded the GWPS of 0.163 milligrams per liter (mg/L) at SP-10 (0.238 mg/L).
- The LCL for fluoride exceeded the GWPS of 4.39 mg/L at SP-10 (5.59 mg/L).
- The LCL for barium exceeded the GWPS of 2.77 mg/L at SP-10 (4.30 mg/L).

Key analytical results for samples collected from the BAP and from SP-10 are provided in **Table 1**. As described in previous alternative source demonstrations (ASDs) (Geosyntec 2019, Geosyntec 2021a, Geosyntec 2021b, Geosyntec 2021c, Geosyntec 2022, Geosyntec 2023a, Geosyntec 2023b, Geosyntec 2023c, Geosyntec 2024), concentrations of lithium, fluoride, and barium in the BAP water (including pore water) and BAP sediments that are lower than concentrations observed at SP-10 suggest that the BAP is not the source of these exceedances. These previous ASDs demonstrate that the release of lithium from the clay minerals in the shale lens located at 46 feet below ground surface in the screened interval of SP-10 is the likely source of lithium in groundwater at that location. Analytical results suggest that naturally occurring barium and fluoride are also associated with the shale lenses and are contributing to aqueous barium and fluoride concentrations at SP-10.

The Oklahoma Department of Environmental Quality (DEQ) previously noted in a letter to the NPS dated June 4, 2021, that "[i]f lithium and fluoride continue to exceed their relative GWPS in

the future and conditions have not changed, NPS may refer to the October 29, 2019 ASD approval for lithium and this [June 4, 2021] approval for fluoride and continue assessment monitoring for the BAP in accordance with OAC 252:517-6(g)(3)(B)" (DEQ 2021). DEQ provided a similar letter to the NPS dated September 20, 2022, that indicated that the July 14, 2022 ASD "is applicable for the barium exceedance in SP-10 of the GWPS if conditions do not change. AEP may refer to the ASD approval for barium and continue assessment monitoring for the BAP in accordance with OAC 252:517-9-6(g)(3)(B)" (DEQ 2022). This ASD update presents an evaluation of the BAP for changing conditions that may affect previously approved ASDs for lithium, fluoride, and barium exceedances at SP-10.

The sample collected from the April 2024 monitoring event at SP-10 contained a lithium concentration of 0.247 mg/L, fluoride concentration of 6.4 mg/L, and barium concentration of 5.94 mg/L. The lithium concentration (**Figure 1**) and fluoride concentration (**Figure 2**) are consistent with previous results collected during the assessment monitoring period and continue to show no statistically significant positive trends. This is an indication that conditions have not changed substantially since the preceding ASD was submitted (Geosyntec 2024), and the arguments presented in the previous ASDs are still valid. Therefore, the lithium and fluoride concentrations at SP-10 during the April 2024 assessment monitoring event are not attributed to a release from the BAP.

A time series plot of the barium concentrations at SP-10 and a Mann-Kendall statistical analysis of the reported barium results over time are shown in **Figure 3**. The analysis determined that barium concentrations at SP-10 display a statistically significant increasing trend. However, based on a Piper diagram showing select events where the full suite of major cations and anions were sampled (**Figure 4**), the geochemistry at monitoring well SP-10 does not change over time in a manner indicative of a release from the BAP. The April 2024 sample is displayed on the plot as the purple diamond. **Figure 4** demonstrates that the geochemistry of SP-10 has remained consistent over the past several years, indicating that groundwater condition at SP-10 is geochemically stable.

The information above, as well as the information presented in previous ASDs (Geosyntec 2019, Geosyntec 2021a, Geosyntec 2021b, Geosyntec 2021c, Geosyntec 2022, Geosyntec 2023a, Geosyntec 2023b, Geosyntec 2023c, Geosyntec 2024), continues to support the position that barium, fluoride, and lithium concentrations are a result of natural variation in the underlying lithology, including the presence of shale lenses containing barium, fluoride, and lithium within the screened interval at SP-10. Therefore, no further action is warranted. Certification of this ASD memorandum by a qualified professional engineer is in **Attachment B**.

******

REFERENCES

DEQ. 2021. Alternate Source Demonstration for Fluoride and Lithium Exceedance – Bottom Ash Pond, Public Service Company of Oklahoma Northeastern Power Station, Rogers County. Oklahoma Department of Environmental Quality. June 4.

DEQ. 2022. Alternative Source Demonstration for Barium, Fluoride, and Lithium Exceedances – Bottom Ash Pond, Public Service Company of Oklahoma - Northeastern Power Station, Rogers County. Oklahoma Department of Environmental Quality. September 20.

Geosyntec. 2019. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. Geosyntec Consultants. April.

Geosyntec. 2021a. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. Geosyntec Consultants. January.

Geosyntec. 2021b. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. Geosyntec Consultants. May.

Geosyntec. 2021c. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. Geosyntec Consultants. October.

Geosyntec. 2022. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. Geosyntec Consultants. July.

Geosyntec. 2023a. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. Geosyntec Consultants. January.

Geosyntec. 2023b. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. Geosyntec Consultants. May.

Geosyntec. 2023c. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. Geosyntec Consultants. December.

Geosyntec. 2024. Alternative Source Demonstration. Bottom Ash Pond – Northeastern Power Station, Oologah, Oklahoma. Geosyntec Consultants. May.

TABLES

Table 1. Summary of Key Analytical Data
Alternative Source Demonstration Update Memorandum
Northeastern Power Station Bottom Ash Pond, Oologah, Oklahoma

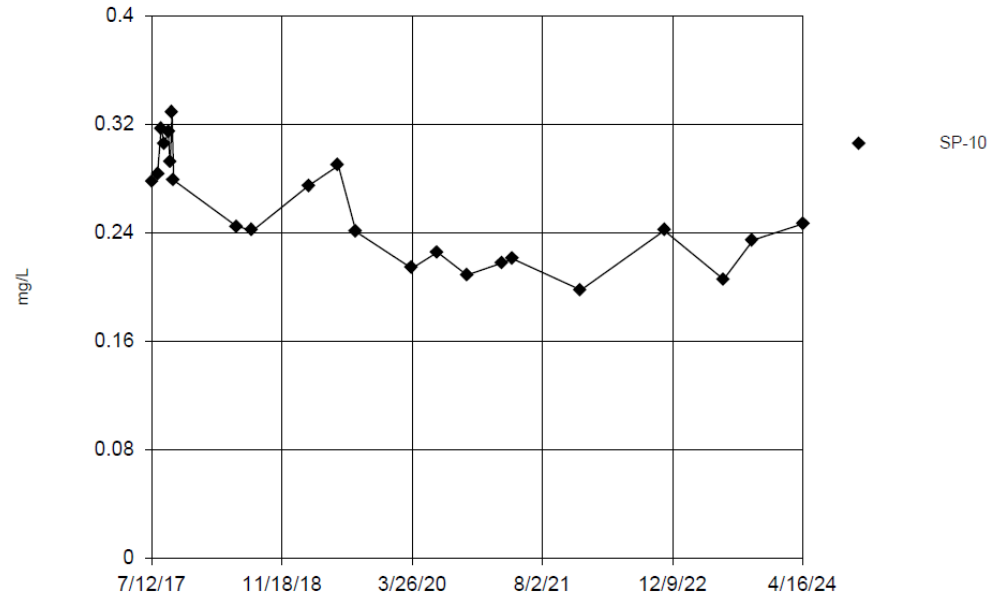
Sample	Sample Date	Lithium Concentration (mg/L)	Fluoride Concentration (mg/L)	Barium Concentration (mg/L)
SPLP Leachate of Bottom Ash	7/10/2019	0.001	0.458	0.352
	8/25/2022	< 0.5	NA	0.22
BAP Surface Water	2/5/2019	0.00874	0.37	0.315
BAP Pore Water	7/10/2019	0.003	< 0.83	0.083
SP-10 April 2024 Result	4/16/2024	0.247	6.4	5.94

Notes:
1. Nondetect results are shown as less than the reporting limit.
BAP: Bottom Ash Pond
mg/L: milligram per liter
NA: not analyzed
SPLP: synthetic precipitation leaching procedure

FIGURES

Sanitas™ v.9.6.31 Software for use by regulators in official oversight duties. EPA

Time Series

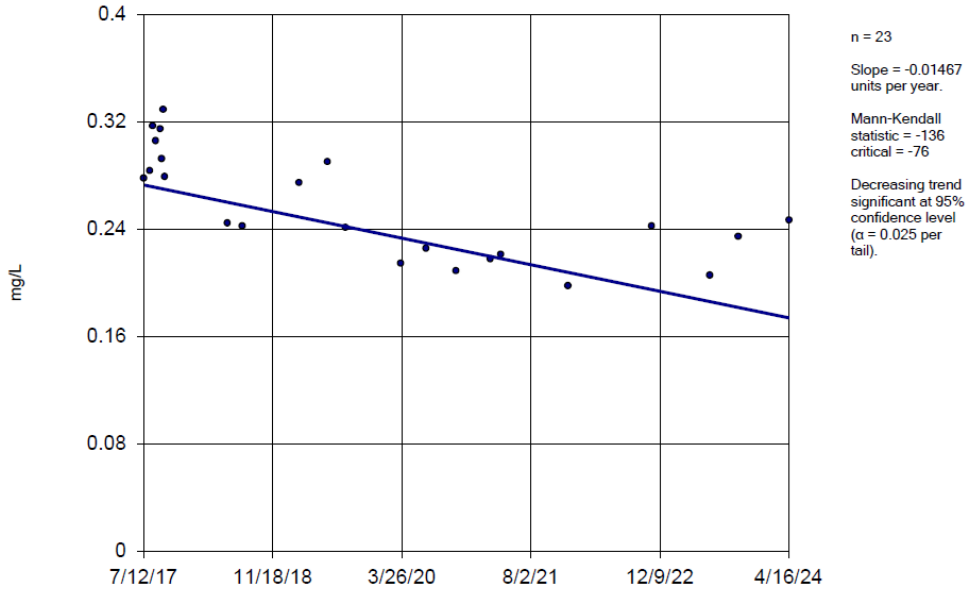


Constituent: Lithium Analysis Run 10/10/2024 12:51 PM

Sanitas™ v.9.6.31 Software for use by regulators in official oversight duties. EPA

Sen's Slope Estimator

SP-10



Constituent: Lithium Analysis Run 10/10/2024 12:53 PM

Notes: Lithium results from monitoring well SP-10 are displayed on the plots.

AEP: American Electric Power
mg/L: milligrams per liter

Lithium Time Series and Trend Test: SP-10
Northeastern Bottom Ash Pond

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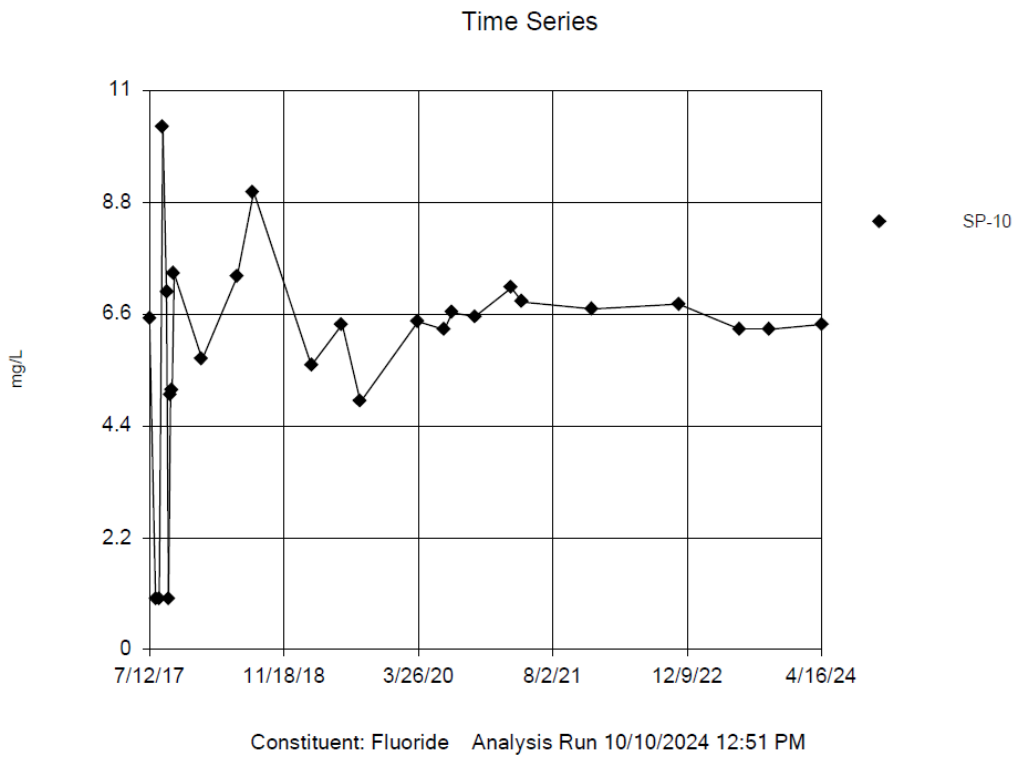
Figure 1

Columbus, Ohio

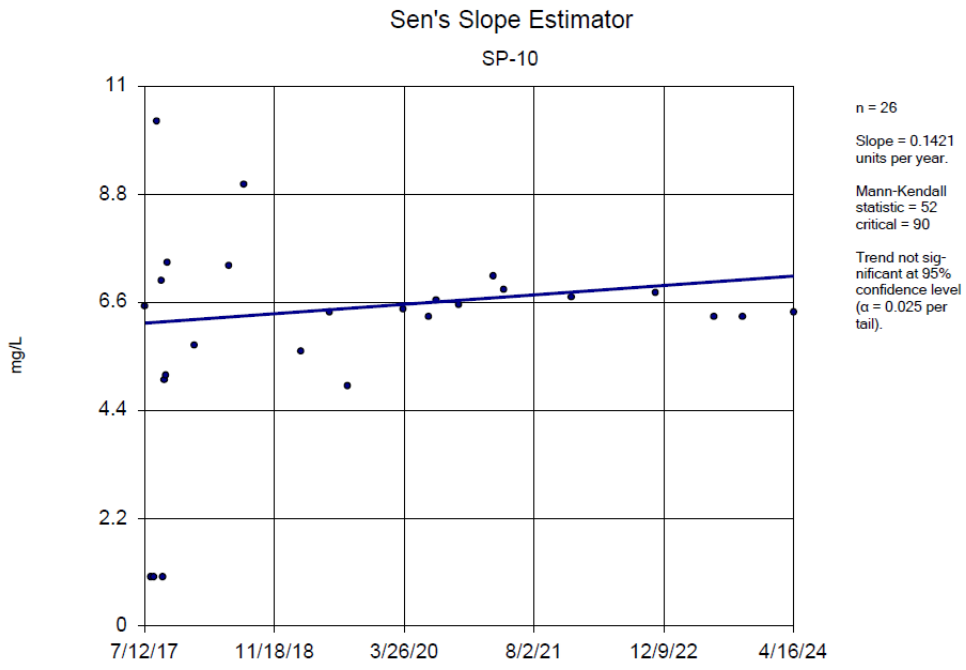
November 14, 2024

Sanitas™ v.9.6.31 Software for use by regulators in official oversight duties. EPA



Constituent: Fluoride Analysis Run 10/10/2024 12:51 PM

Sanitas™ v.9.6.31 Software for use by regulators in official oversight duties. EPA



Constituent: Fluoride Analysis Run 10/10/2024 12:53 PM

Notes: Fluoride results from monitoring well SP-10 are displayed on the plots.

AEP: American Electric Power
mg/L: milligrams per liter

Fluoride Time Series and Trend Test: SP-10
Northeastern Bottom Ash Pond

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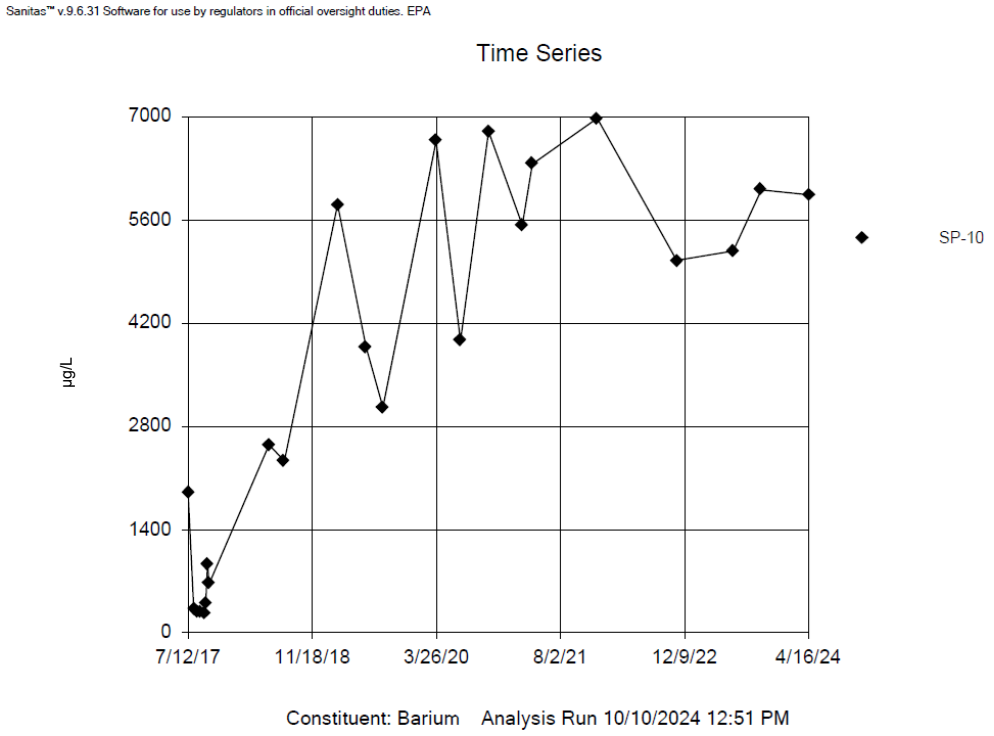
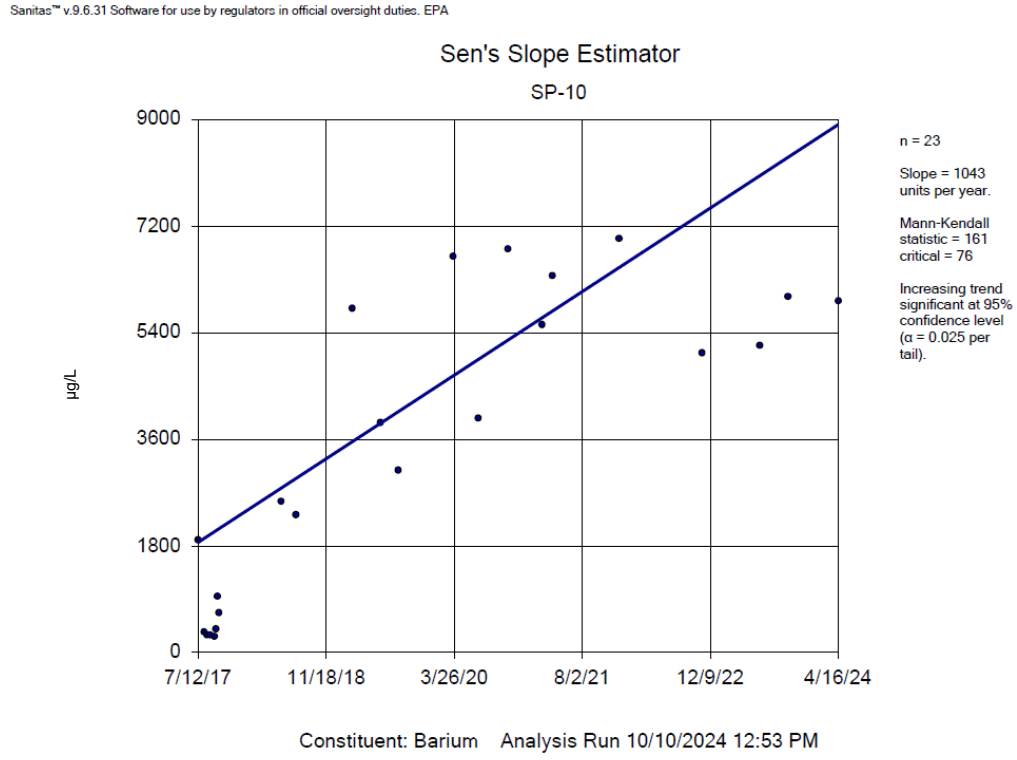
Figure **2**

Columbus, Ohio

November 14, 2024





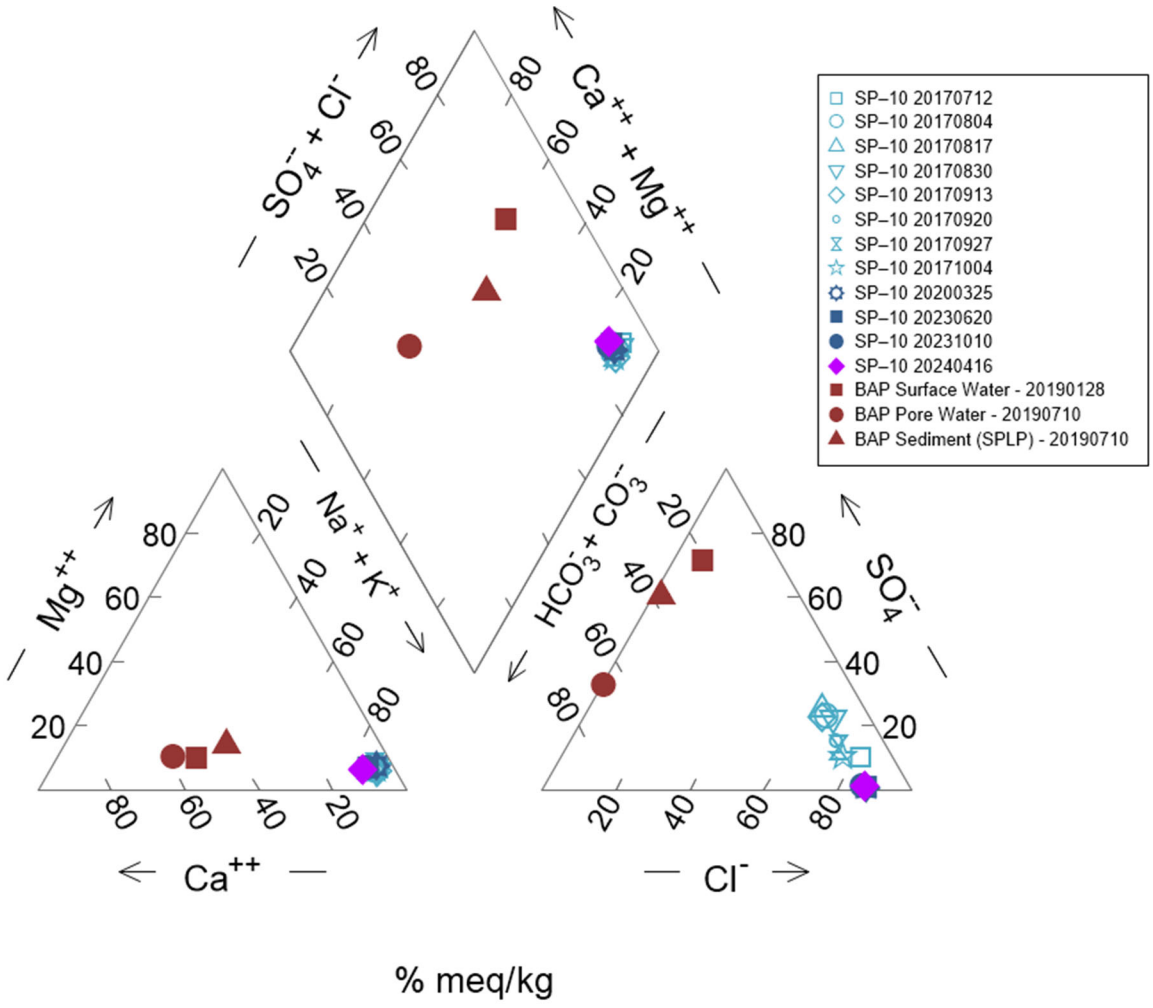
Notes: Barium results from monitoring well SP-10 are displayed on the plots.

AEP: American Electric Power
µg/L: micrograms per liter

Barium Time Series and Trend Test: SP-10
Northeastern Bottom Ash Pond

Geosyntec consultants | AMERICAN ELECTRIC POWER | Figure 3

Columbus, Ohio | November 14, 2024



Notes:
% meq/kg: percent milliequivalents per kilogram
SPLP: synthetic precipitation leaching procedure

Piper Diagram – SP-10 and BAP Samples
Northeastern Bottom Ash Pond

Geosyntec consultants | AMERICAN ELECTRIC POWER

Columbus, Ohio | October 2024

Figure **4**

ATTACHMENT A

Assessment Statistics Summary

2024 First Semiannual Event

Geosyntec consultants

engineers | scientists | innovators

STATISTICAL ANALYSIS SUMMARY 2024 1ST SEMIANNUAL EVENT BOTTOM ASH POND

Northeastern Power Station

Oologah, Oklahoma

Prepared for

American Electric Power
1 Riverside Plaza
Columbus, Ohio 43215-2372

Prepared by

Geosyntec Consultants, Inc.
500 West Wilson Bridge Road, Suite 250
Worthington, Ohio 43085

Project Number: CHA8500B

September 11, 2024

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ACRONYMS AND ABBREVIATIONS

ASD	alternative source demonstration
BAP	Bottom Ash Pond
CCR	coal combustion residuals
GWPS	groundwater protection standard
LCL	lower confidence limit
LPL	lower prediction limit
mg/L	milligrams per liter
NPS	Northeastern Power Station
OAC	Oklahoma Administrative Code
ODEQ	Oklahoma Department of Environmental Quality
QA/QC	quality assurance and quality control
SSI	statistically significant increase
SSL	statistically significant level
TDS	total dissolved solids
UPL	upper prediction limit

1. INTRODUCTION

In accordance with Oklahoma Department of Environmental Quality (ODEQ) requirements regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments (Oklahoma Administrative Code [OAC] 252:517), groundwater monitoring has been conducted at the Bottom Ash Pond (BAP), an existing CCR unit at the Northeastern Power Station (NPS) in Oologah, Oklahoma. Recent groundwater monitoring results were used to identify concentrations of Appendix B constituents that are above site-specific groundwater protection standards (GWPSs).

Based on detection monitoring conducted in 2017 and 2018, statistically significant increases (SSIs) over background were concluded for boron, chloride, fluoride, total dissolved solids (TDS), and sulfate at the BAP. In addition, pH values below the lower prediction limit (LPL) resulted in SSIs below background as well. GWPSs were set in accordance with OAC 252:517-9-6(h) and a statistical evaluation of the assessment monitoring data was conducted.

During 2023, a sampling event for both Appendix A parameters and Appendix B parameters, as required by OAC 252:517-9-6(d), was completed in October. During the October 2023 assessment monitoring event, statistically significant levels (SSLs) were observed for barium, fluoride, and lithium (Geosyntec 2024a). An alternative source demonstration (ASD) was successfully completed (Geosyntec 2024b), and the unit therefore remained in assessment monitoring. One assessment monitoring event was conducted at the BAP in April 2024, in accordance with OAC 252:517-9-6(d). Results of this event are documented in this report.

Prior to conducting the statistical analyses, the groundwater data underwent several validation tests, including those for completeness, sample tracking accuracy, transcription errors, and consistent use of measurement units. No data quality issues were identified which would impact data usability.

The monitoring data were submitted to Groundwater Stats Consulting, LLC for statistical analysis. Confidence intervals were calculated for Appendix B parameters at the compliance wells to assess whether SSLs of Appendix B parameters were present above previously established GWPSs. SSLs were identified for barium, fluoride, and lithium. Therefore, either the unit will move to an assessment of corrective measures, or an ASD will be conducted to evaluate if the unit can remain in assessment monitoring. Certification of the selected statistical methods by a qualified professional engineer is documented in Attachment A.

2. BOTTOM ASH POND EVALUATION

2.1 Data Validation and QA/QC

One set of samples was collected in April 2024 for analysis from each background and compliance well to meet the requirements of OAC 252:517-9-6(d)(1). Samples from the April 2024 sampling event were analyzed for all Appendix A and Appendix B parameters. A summary of data collected during this assessment monitoring event are presented in Table 1.

Chemical analysis was completed by a National Environmental Laboratory Accreditation Program–certified analytical laboratory. The laboratory completed analysis of quality assurance and quality control (QA/QC) samples such as laboratory reagent blanks, continuing calibration verification samples, and laboratory fortified blanks.

The analytical data were imported into a Microsoft Access database, where checks were completed to assess the accuracy of sample location identification and analyte identification. Where necessary, unit conversions were applied to standardize reported units across all sampling events. Exported data files were created for use with the Sanitas™ v.10.0.20 statistics software. The export file was checked against the analytical data for transcription errors and completeness. No QA/QC issues that would impact data usability were noted.

2.2 Statistical Analysis

Statistical analyses for the BAP were conducted in accordance with the November 2021 *Statistical Analysis Plan* (Geosyntec 2021). Time series plots and results for all completed statistical tests are provided in Attachment B. The data obtained in April 2024 were screened for potential outliers. No outliers were identified for this event.

2.2.1 Evaluation of Potential Appendix B SSLs

A confidence interval was constructed for each Appendix B parameter at each compliance well. Confidence limits were generally calculated parametrically ($\alpha = 0.01$). However, nonparametric confidence limits were calculated in some cases (e.g., when the data did not appear to be normally distributed or when the nondetect frequency was too high). Select datasets were truncated if significant serial correlation was observed among the background samples that were collected on an approximately monthly basis in 2017. A list of the truncated well/constituent pairs used for calculation of the confidence limits is provided in Attachment B.

An SSL was concluded if the lower confidence limit (LCL) was above the GWPS (i.e., if the entire confidence interval was above the GWPS). The calculated confidence limits (Attachment B) were compared to the GWPSs provided in Table 3. The GWPSs were established during a previous statistical analysis as either (a) the background concentration or (b) the maximum contaminant level and risk-based levels specified in OAC 252:517-9-6(h), whichever was greater (Geosyntec 2024a).

The following SSLs were identified at the Northeastern BAP:

- The LCL for barium was above the GWPS of 2.77 milligrams per liter (mg/L) at SP-10 (4.30 mg/L).

- The LCL for fluoride was above the GWPS of 4.39 mg/L at SP-10 (5.59 mg/L).
- The LCL for lithium was above the GWPS of 0.163 mg/L at SP-10 (0.238 mg/L).

ODEQ previously noted in a letter provided to the NPS that "[i]f lithium and fluoride continue to exceed their relative GWPS in the future and conditions have not changed, NPS may refer to the October 29, 2019 ASD approval for lithium and June 4, 2021 approval for fluoride and continue assessment monitoring for the BAP in accordance with OAC 252:517-6(g)(3)(B)" (ODEQ 2021). ODEQ provided a similar letter dated September 20, 2022 documenting ASD approval for a barium SSL at SP-10 which is applicable in the future if conditions do not change (ODEQ 2022). Therefore, an ASD will be submitted to ODEQ demonstrating that conditions at the BAP remain unchanged so that the unit will continue assessment monitoring.

2.2.2 Evaluation of Potential Appendix A SSIs

While SSLs were identified, a review of the Appendix A results was also completed to assess whether concentrations of Appendix A parameters at the compliance wells were above background concentrations. Data collected during the April 2024 assessment monitoring event from each compliance well were compared to previously calculated prediction limits to assess whether the results are above background values (Table 3). The following concentrations were above the upper prediction limits (UPLs):

- The boron concentration was above the interwell UPL of 0.496 mg/L at SP-10 (0.892 mg/L).
- The calcium concentration was above the intrawell UPL of 167 mg/L at SP-2 (172 mg/L).
- The chloride concentration was above the interwell UPL of 874 mg/L at SP-10 (1,950 mg/L).
- The fluoride concentration was above the interwell UPL of 4.39 mg/L at SP-10 (6.4 mg/L).
- Sulfate concentrations were above the interwell UPL of 83.0 mg/L at SP-1 (97.3 mg/L) and SP-11 (236 mg/L).
- The TDS concentration was above the interwell UPL of 1,940 mg/L at SP-10 (3,510 mg/L).

While the prediction limits were calculated for a one-of-two retesting procedure, SSIs were conservatively assumed if the April 2024 sample was above the UPL or, in the case of pH, below the LPL. Based on these results, concentrations of Appendix A constituents appear to be above background levels.

2.3 Conclusions

A semiannual assessment monitoring event was conducted in April 2024 in accordance with the CCR Rule. The laboratory and field data were reviewed prior to statistical analysis, and no QA/QC issues that impacted data usability were identified. A review of outliers identified no potential

outliers in the April 2024 data. A confidence interval was constructed at each compliance well for each Appendix B parameter; SSLs were concluded if the entire confidence interval was above the GWPSs. SSLs were identified for barium, fluoride, and lithium. Appendix A parameters were compared to prediction limits, with concentrations of boron, calcium, chloride, fluoride, sulfate, and TDS above background levels.

Based on this evaluation, the Northeastern BAP CCR unit will either move to an assessment of corrective measures or an ASD will be conducted to evaluate if the unit can remain in assessment monitoring.

3. REFERENCES

Geosyntec. 2021. *Statistical Analysis Plan – Northeastern Power Station*, *Oologah, Oklahoma*. Geosyntec Consultants, Inc. November.

Geosyntec. 2024a. *Statistical Analysis Summary – Bottom Ash Pond*, *Northeastern Power Station, Oologah, Oklahoma*. Geosyntec Consultants, Inc. February.

Geosyntec. 2024b. *Alternative Source Demonstration Report – State CCR Rule*, *Northeastern Power Station – Bottom Ash Pond, Oologah, Oklahoma*. Geosyntec Consultants, Inc. May.

ODEQ. 2021. Letter Transmittal – Alternate Source Demonstration for Fluoride and Lithium Exceedance – Bottom Ash Pond. Public Service Company of Oklahoma – Northeastern Power Station. Oklahoma Department of Environmental Quality. June.

ODEQ. 2022. Letter Transmittal – Alternate Source Demonstration for Barium, Fluoride, and Lithium Exceedance – Bottom Ash Pond. Public Service Company of Oklahoma – Northeastern Power Station. Oklahoma Department of Environmental Quality. September.

ODEQ. 2023. Letter Transmittal – Alternate Source Demonstration for Fluoride, and Lithium Exceedance – Bottom Ash Pond. Public Service Company of Oklahoma – Northeastern Power Station. Oklahoma Department of Environmental Quality. March.

TABLES

Table 1. Groundwater Data Summary
Statistical Analysis Summary
Northeastern Plant – Bottom Ash Pond

Parameter	Unit	SP-1	SP-2	SP-4	SP-5R	SP-10	SP-11
		4/16/2024	4/16/2024	4/16/2024	4/16/2024	4/16/2024	4/16/2024
Antimony	µg/L	0.433	0.318	0.169	0.131	0.076 J1	0.090 J1
Arsenic	µg/L	0.40	1.40	0.70	6.69	0.14	2.58
Barium	µg/L	134	1,690	190	1,970	5,940	191
Beryllium	µg/L	0.050	0.131	0.033 J1	0.061	0.020 J1	0.031 J1
Boron	mg/L	0.201	0.210	0.337	0.189	0.892	0.454
Cadmium	µg/L	0.053	0.034	0.019 J1	0.038	0.009 J1	0.027
Calcium	mg/L	113	172	108 M1	90.5	110	86.8
Chloride	mg/L	47.7	450	450	690	1,950	103
Chromium	µg/L	0.63	0.41	0.27 J1	0.45	0.26 J1	0.46
Cobalt	µg/L	0.164	1.71	0.123	0.321	0.101	0.466
Combined Radium	pCi/L	1.95	3.83	3.49	8.39	22.35	6.48
Fluoride	mg/L	0.89	2.74	3.22	3.04	6.4	1.73
Lead	µg/L	0.33	0.12 J1	0.10 J1	0.66	0.12 J1	0.28
Lithium	mg/L	0.00615	0.0784	0.0527	0.0856	0.247	0.0182
Mercury	µg/L	0.005 U1	0.005 U1	0.005 H2, Q5, Q1, U1	0.005 U1	0.005 U1	0.005 U1
Molybdenum	µg/L	14.9	11.5	3.2	0.7	0.9	0.9
Selenium	µg/L	5.43	0.37 J1	0.38 J1	0.13 J1	0.05 J1	0.12 J1
Sulfate	mg/L	97.3	19.0	81.0	4.4	18.2	236
Thallium	µg/L	0.06 J1	0.05 J1	0.2 U1	0.2 U1	0.2 U1	0.2 U1
Total Dissolved Solids	mg/L	460	990	1,270	1,430	3,510	910
pH	SU	7.8	7.6	7.6	7.5	7.7	7.6

Notes:
H2: Sample analysis performed past holding time.
J1: Estimated value. Parameter was detected in concentrations below the reporting limit.
M1: The associated matrix spike (MS) or matrix spike duplicate (MSD) recovery was outside acceptance limits.
mg/L: milligrams per liter
pCi/L: picocuries per liter
Q1: Sample received in inappropriate sample container.
Q5: Sample was received with improper chemical preservation.
SU: standard unit
U1: Non-detect value. For statistical analysis, parameters which were not detected were replaced with the reporting limit.
µg/L: micrograms per liter

Table 2. Appendix B Groundwater Protection Standards *Geosyntec Consultants, Inc.*
Statistical Analysis Summary
Northeastern Plant – Bottom Ash Pond

Constituent Name	MCL	CCR Rule-Specified	Calculated UTL	GWPS
Antimony, Total (mg/L)	0.00600		0.00467	0.00600
Arsenic, Total (mg/L)	0.0100		0.0529	0.0529
Barium, Total (mg/L)	2.00		2.77	2.77
Beryllium, Total (mg/L)	0.00400		0.00212	0.00400
Cadmium, Total (mg/L)	0.00500		0.00022	0.00500
Chromium, Total (mg/L)	0.100		0.00373	0.100
Cobalt, Total (mg/L)	n/a	0.00600	0.0179	0.0179
Combined Radium, Total (pCi/L)	5.00		19.4	19.4
Fluoride, Total (mg/L)	4.00		4.39	4.39
Lead, Total (mg/L)	n/a	0.0150	0.0087	0.0150
Lithium, Total (mg/L)	n/a	0.0400	0.163	0.163
Mercury, Total (mg/L)	0.00200		0.0000300	0.00200
Molybdenum, Total (mg/L)	n/a	0.100	0.0100	0.100
Selenium, Total (mg/L)	0.0500		0.00499	0.0500
Thallium, Total (mg/L)	0.00200		0.00162	0.00200

Notes:
1. Calculated UTL (upper tolerance limit) represents site-specific background values.
2. Grey cells indicate the GWPS is based on the calculated UTL, which is higher than the MCL or CCR Rule-specified value.
CCR: coal combustion residuals
GWPS: groundwater protection standard
MCL: maximum contaminant level
mg/L: milligrams per liter
n/a: not applicable
pCi/L: picocuries per liter

Table 3. Appendix A Data Summary
Statistical Analysis Summary
Northeastern Plant – Bottom Ash Pond

Analyte	Unit	Description	SP-1	SP-2	SP-10	SP-11
			4/16/2024	4/16/2024	4/16/2024	4/16/2024
Boron	mg/L	Interwell Background Value (UPL)	0.496			
		Analytical Result	0.201	0.210	**0.892**	0.454
Calcium	mg/L	Intrawell Background Value (UPL)	141	167	227	156
		Analytical Result	113	**172**	110	86.8
Chloride	mg/L	Interwell Background Value (UPL)	874			
		Analytical Result	47.7	450	**1,950**	103
Fluoride	mg/L	Interwell Background Value (UPL)	4.39			
		Analytical Result	0.89	2.74	**6.4**	1.73
pH	SU	Interwell Background Value (UPL)	9.1			
		Interwell Background Value (LPL)	7.0			
		Analytical Result	7.8	7.6	7.7	7.6
Sulfate	mg/L	Interwell Background Value (UPL)	83.0			
		Analytical Result	**97.3**	19.0	18.2	**236**
Total Dissolved Solids	mg/L	Interwell Background Value (UPL)	1,940			
		Analytical Result	460	990	**3,510**	910

Notes:
1. Bold values exceed the background value.
2. Background values are shaded gray.
LPL: lower prediction limit
mg/L: milligrams per liter
SU: standard units
UPL: upper prediction limit

ATTACHMENT A
Certification by Qualified Professional Engineer

Certification by Qualified Professional Engineer

I certify that selected and above described statistical method is appropriate for evaluating the groundwater monitoring data for the Northeastern Bottom Ash Pond CCR management area and that the requirements of OAC 252:517-9-4(g) have been met.

David Anthony Miller

Printed Name of Licensed Professional Engineer

David Anthony Miller

Signature

26057	Oklahoma	09.11.2024
License Number	Licensing State	Date

ATTACHMENT B
Statistical Analysis Output

GROUNDWATER STATS CONSULTING

July 17, 2024

Geosyntec Consultants
Attn: Ms. Allison Kreinberg
500 W. Wilson Bridge Road, Suite 250
Worthington, OH 43085

Re: Northeastern BAP (Bottom Ash Pond)
Assessment Monitoring Statistics – April 2024

Dear Ms. Kreinberg,

Groundwater Stats Consulting (GSC), formerly the statistical consulting division of Sanitas Technologies, is pleased to provide the April 2024 assessment monitoring analysis of groundwater data for American Electric Power Inc.'s Northeastern BAP. The analysis complies with the Oklahoma Administrative Code (OAC) as well as with the United States Environmental Protection Agency (USEPA) Unified Guidance (2009).

Sampling began at the site for the OAC program in 2017. The monitoring well network, as provided by Geosyntec Consultants, consists of the following:

- **Upgradient wells:** SP-4 and SP-5R
- **Downgradient wells:** SP-1, SP2, SP-10, and SP-11

Data were sent electronically, and the statistical analysis was conducted according to the Statistical Analysis Plan and screening evaluation prepared by GSC and approved by Dr. Kirk Cameron, PhD Statistician with MacStat Consulting, primary author of the USEPA Unified Guidance, and Senior Advisor to GSC. The analysis was reviewed by Andrew Collins, Project Manager of GSC.

The OAC program consists of the following constituents listed below. The terms "constituent" and "parameter" are interchangeable.

- **Appendix B** (Assessment Monitoring) **–** antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, combined radium 226 + 228, fluoride, lead, lithium, mercury, molybdenum, selenium, and thallium

For all constituents, a substitution of the most recent reporting limit is used for non-detect data. For several constituents, varying detection limits were present. Time series and box plots are provided for all wells for the parameters listed above (Figures A & B). The time series plots display concentrations over time for each well while the box plots provide visual representation of variation within a given well and across all wells.

Summary of Background Update – Conducted in January 2024

Prior to evaluating Appendix B parameters, background data are screened through visual screening and Tukey's outlier test for potential outliers and extreme trending patterns that would lead to artificially elevated statistical limits.

As mentioned above, during a previous update, the Rank Von Neumann serial correlation test was used to evaluate whether the measurements collected during 2017 represented independent samples, or whether serial correlation was present among the measurements. The records that showed significant serial correlation were truncated to remove earlier measurements for construction of statistical limits using only more recent data that represent independent samples.

Outlier Analysis

Tukey's outlier test on pooled upgradient well data identified outliers for fluoride, mercury, and selenium and confirmed previously flagged values. Several of the values identified by Tukey's test were either similar to concentrations upgradient of the facility or were lower than the respective Maximum Contaminant Level (MCL); therefore, the values were not flagged as outliers. Previously flagged outliers were confirmed by Tukey's test or visual screening. A summary of previously flagged outliers follows this report (Figure C).

Additionally, downgradient well data through October 2023 were screened through visual screening using time series graphs. Since the downgradient well data are used to construct confidence intervals, a regulatory conservative approach is taken in that values that are marginally high relative to the rest of the data are retained unless there is

particular justification for excluding them. No new outliers among downgradient wells were flagged during this analysis.

During previous updates, due to no variation in the data, Tukey's outlier test was not performed for cadmium and selenium in well SP-5R along with mercury and thallium in all wells. Among upgradient wells, high values for cadmium, lead, and selenium were identified by Tukey's outlier test. Only the highest values for cadmium and lead were flagged as outliers to maintain statistical limits that are conservative from a regulatory perspective. Substantially high values were identified at upgradient well SP-4 on 8/4/17 through visual screening and the highest values for arsenic, beryllium, cobalt, and mercury were flagged. This step results in upper tolerance limits that are conservative (lower) from a regulatory perspective.

Among downgradient wells, a high value for combined radium 226 + 228 in well SP-1 was flagged as an outlier along with the following values since they did not adequately represent the populations at their respective wells: chromium in well SP-10; combined radium 226 + 228 in well SP-11; lithium in well SP-1; and molybdenum in well SP-10. More recent concentrations for barium in downgradient well SP-10 were noted to be significantly higher than historical concentrations. Therefore, earlier concentrations were deselected prior to constructing confidence intervals in order to evaluate present-day groundwater concentrations of barium at this well. As mentioned above, a list of well/constituent pairs using a truncated portion of their records follows this report (Date Ranges Table).

Interwell Upper Tolerance Limits

Upper tolerance limits were used to calculate background limits from pooled upgradient well data through October 2023 for Appendix B parameters (Figure G). These limits are updated on an annual basis and will be updated again during the Fall 2024 sample event. Parametric tolerance limits are calculated, with a target of 95% confidence and 95% coverage, when data follow a normal or transformed-normal distribution. When data contained greater than 50% non-detects or did not follow a normal or transformed-normal distribution, non-parametric tolerance limits were constructed using the highest background measurement. The confidence and coverage levels for nonparametric tolerance limits are dependent upon the number of background samples.

Groundwater Protection Standards

These background limits were compared to the Maximum Contaminant Levels (MCLs) and CCR Rule-Specified levels as shown in the Groundwater Protection Standard (GWPS) table

following this letter to determine the highest limit for use as the GWPS in the Confidence Interval comparisons (Figure H).

Evaluation of Appendix B Parameters – April 2024

For Appendix B parameters, confidence intervals for each downgradient well/constituent were compared against corresponding Groundwater Protection Standards (GWPS). GWPS were developed as described below. Downgradient well/constituent pairs that have 100% non-detects do not require analysis; however, no downgradient wells had 100% non-detects, and all well/constituent pairs were eligible for confidence intervals.

Confidence Intervals

Confidence intervals were then constructed on downgradient wells with data through April 2024 for each of the Appendix B parameters using the highest limit of the MCL or background limit as discussed above for the GWPS (Figure F). As mentioned above, the most recent reporting limit is substituted for historical non-detects within a given well, and the reporting limits vary among individual wells. These intervals were constructed as either parametric or nonparametric confidence intervals depending on the data distribution and percentage of non-detects.

When data followed a normal or transformed-normal distribution, parametric confidence intervals were used for Appendix B parameters. Nonparametric confidence intervals, which use the largest and smallest order statistics depending on the sample size as interval limits, were constructed when data did not follow a normal or transformed-normal distribution or when there were greater than 50% non-detects. The lower confidence limit, which is constructed with 99% confidence for parametric confidence intervals, is compared to the GWPS prepared as described above. The confidence level associated with nonparametric confidence intervals is dependent upon the number samples available.

Only when the entire confidence interval is above a GWPS is the well/constituent pair considered to exceed its respective standard. A summary of the confidence interval results follows this letter. Exceedances were found for the following well/constituent pairs:

- Barium: SP-10
- Fluoride: SP-10
- Lithium: SP-10

Trend Test Evaluation – Appendix IV

Data at wells with confidence interval exceedances are further evaluated using the Sen's Slope/Mann Kendall trend test at the 95% confidence level to determine whether concentrations are statistically increasing, decreasing, or stable (Figure G). Although the trend tests for Assessment monitoring pairs were previously evaluated using 99% confidence, the 95% confidence level more rapidly identifies statistically significant trends. Additionally, the 95% confidence level is recommended in cases with limited sample sizes and, particularly, for new assessment wells. Upgradient wells are included in the trend analyses to identify whether similar patterns exist upgradient of the site for the same constituents. When trends are present in upgradient wells, it is an indication of variability in groundwater quality unrelated to practices at the site. A summary of the Appendix IV trend test results follows this letter. Statistically significant trends were identified for the following well/constituent pairs:

Increasing trends:

- Barium: SP-5R (upgradient) and SP-10

Decreasing trends:

- Lithium: SP-4 (upgradient), SP-5R (upgradient), and SP-10

Thank you for the opportunity to assist you in the statistical analysis of groundwater quality for the Northeastern BAP. If you have any questions or comments, please feel free to contact us.

For Groundwater Stats Consulting,

Tristan Clark
Groundwater Analyst

Andrew Collins
Project Manager

Date Ranges

Date: 7/17/2024 8:49 AM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Barium (mg/L)
- SP-10 overall:5/30/2018-4/16/2024
- SP-11 overall:5/30/2018-4/16/2024
- SP-4 overall:5/30/2018-4/16/2024

Cadmium (mg/L)
- SP-1 overall:5/30/2018-4/16/2024
- SP-10 overall:5/30/2018-4/16/2024
- SP-4 overall:5/30/2018-4/16/2024
- SP-5R overall:5/30/2018-4/16/2024

Chromium (mg/L)
- SP-4 overall:5/30/2018-4/16/2024

Lead (mg/L)
- SP-10 overall:5/30/2018-4/16/2024

Lithium (mg/L)
- SP-11 overall:5/30/2018-4/16/2024
- SP-4 overall:5/30/2018-4/16/2024

Molybdenum (mg/L)
- SP-2 overall:5/30/2018-4/16/2024

Selenium (mg/L)
- SP-2 overall:5/30/2018-4/16/2024
- SP-5R overall:5/30/2018-4/16/2024

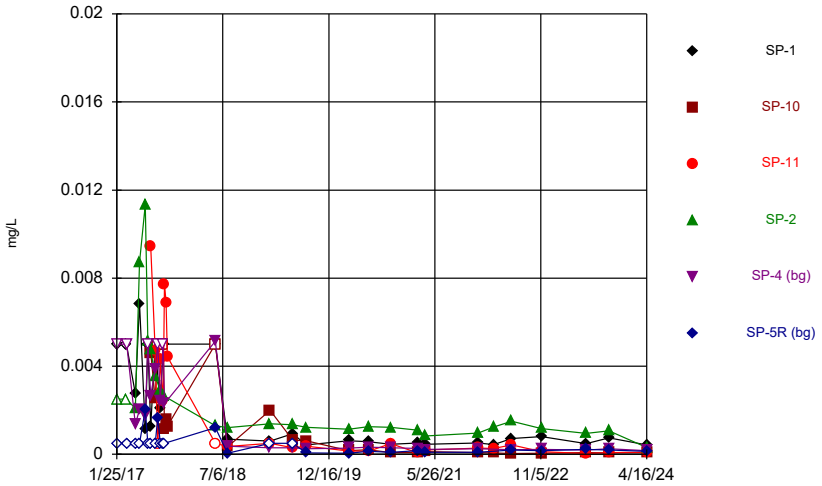
Thallium (mg/L)
- overall:5/30/2018-4/16/2024

FIGURE A

Time Series

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

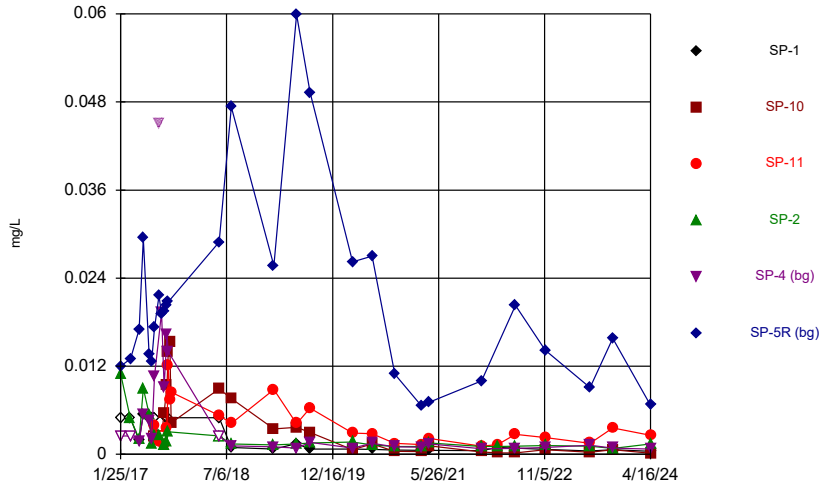
Time Series



Constituent: Antimony Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

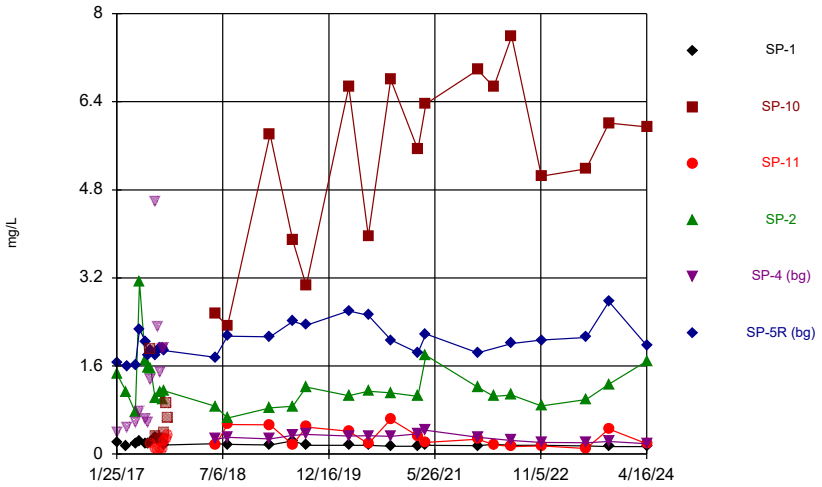
Time Series



Constituent: Arsenic Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG

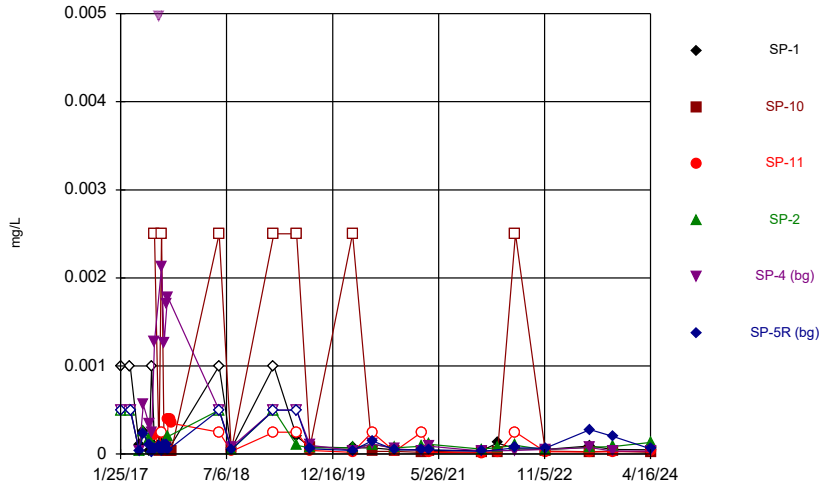
Time Series



Constituent: Barium Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

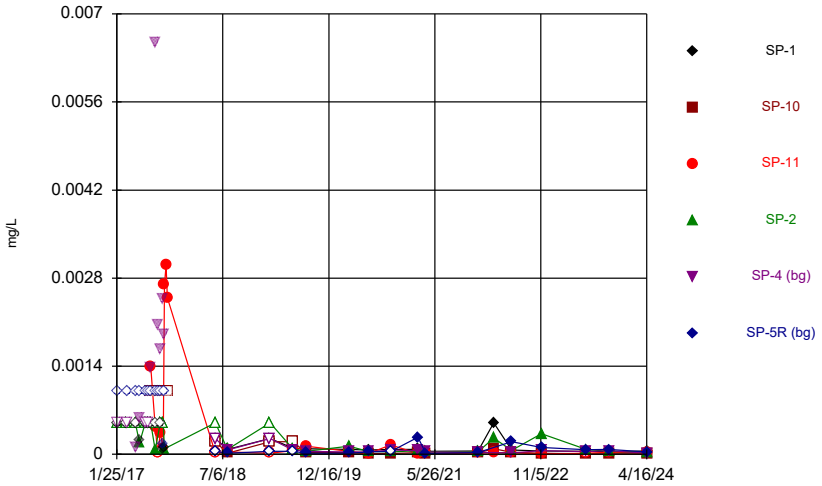
Time Series



Constituent: Beryllium Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

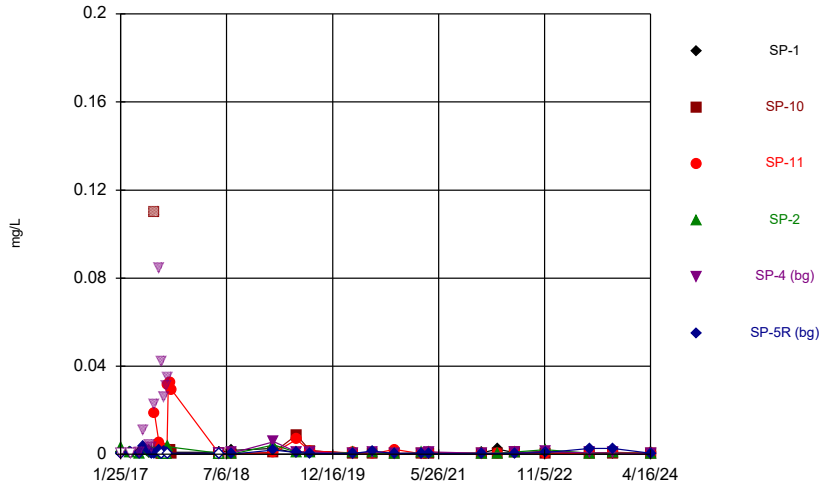
Time Series



Constituent: Cadmium Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

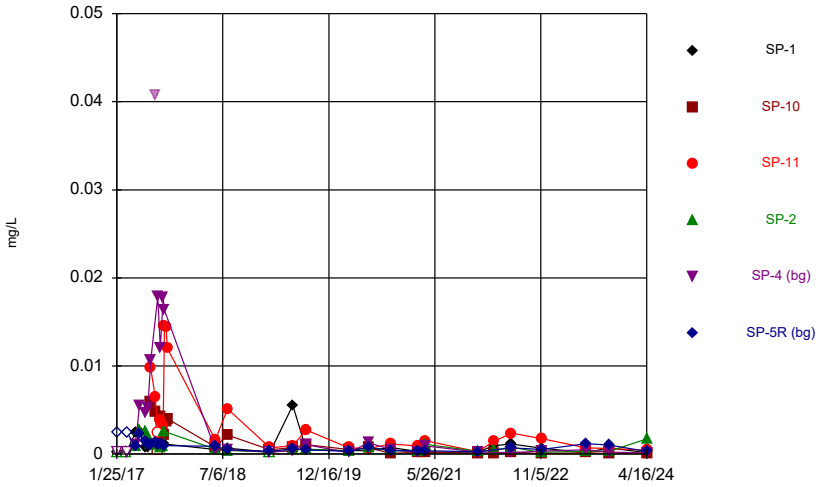
Time Series



Constituent: Chromium Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

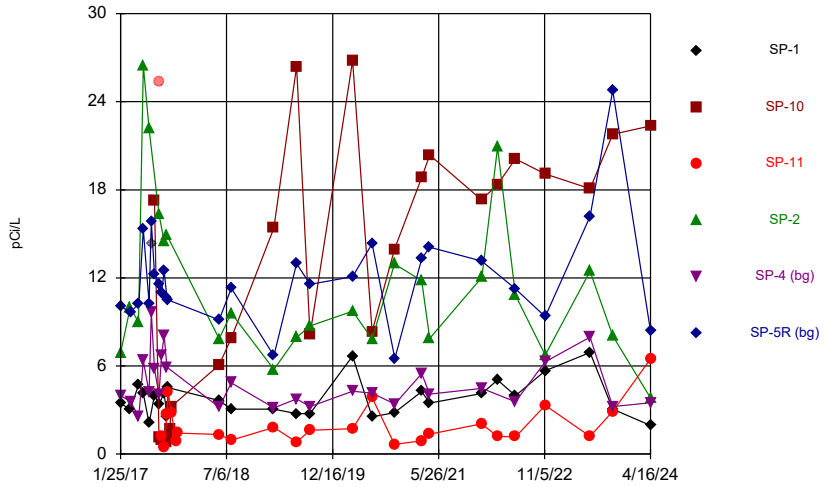
Time Series



Constituent: Cobalt Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG

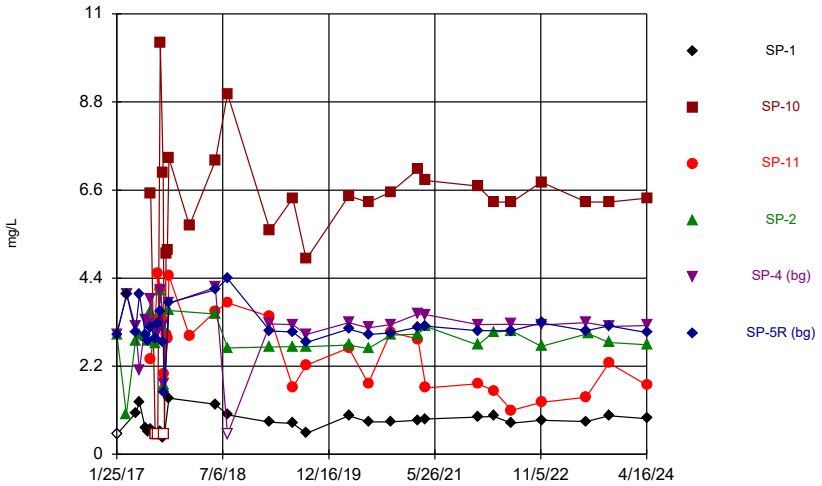
Time Series



Constituent: Combined Radium 226 + 228 Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

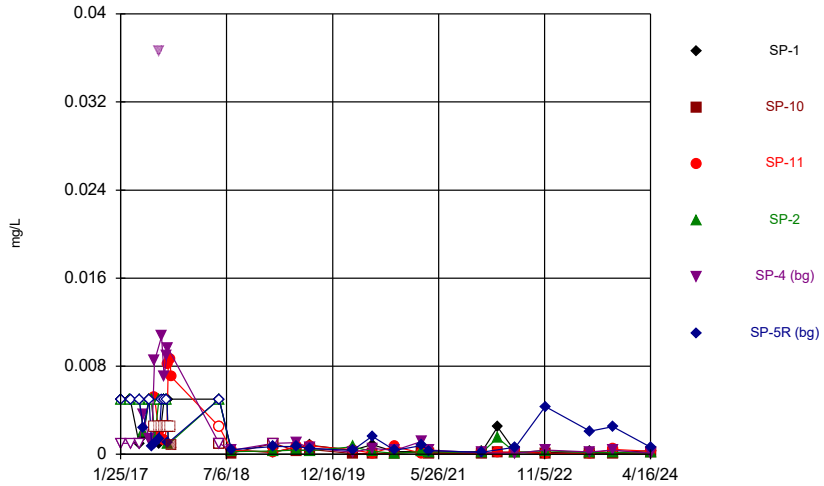
Time Series



Constituent: Fluoride Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

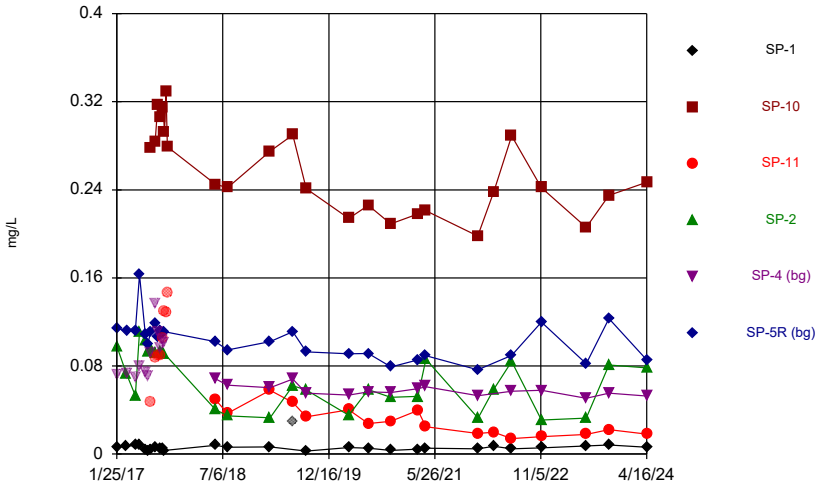
Time Series



Constituent: Lead Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG

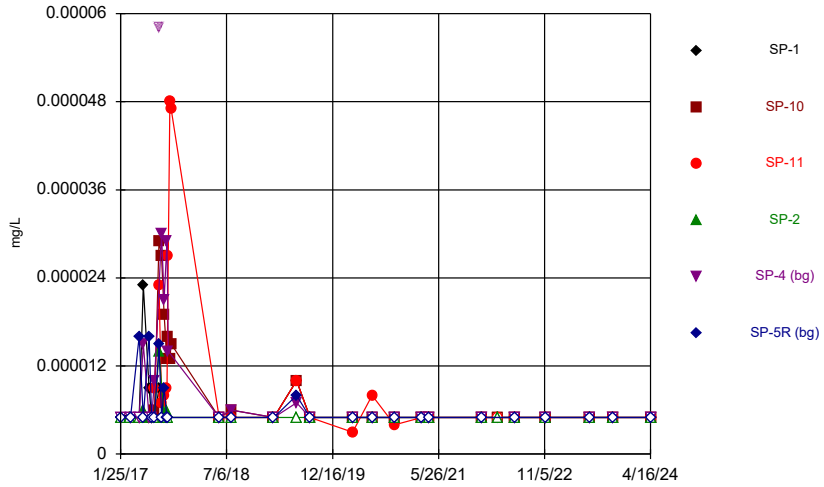
Time Series



Constituent: Lithium Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

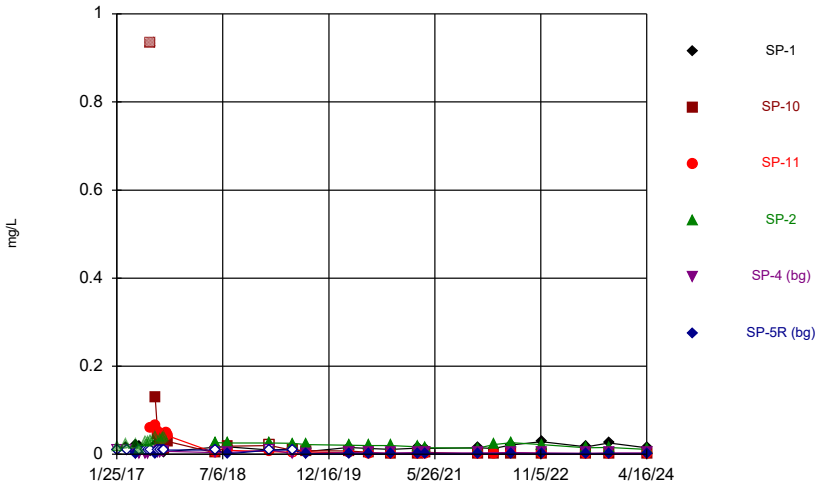
Time Series



Constituent: Mercury Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

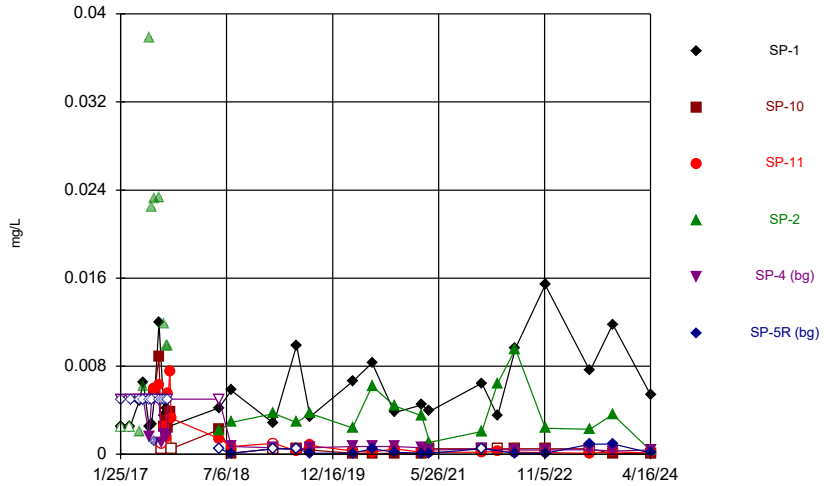
Time Series



Constituent: Molybdenum Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

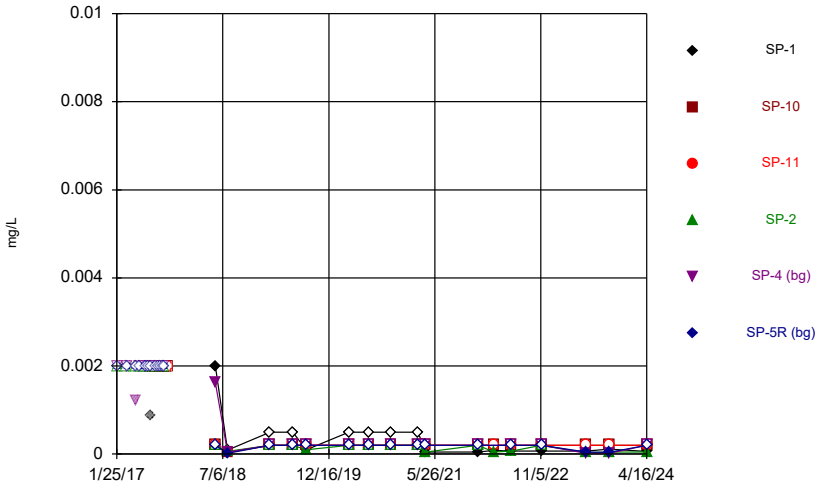
Time Series



Constituent: Selenium Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Time Series

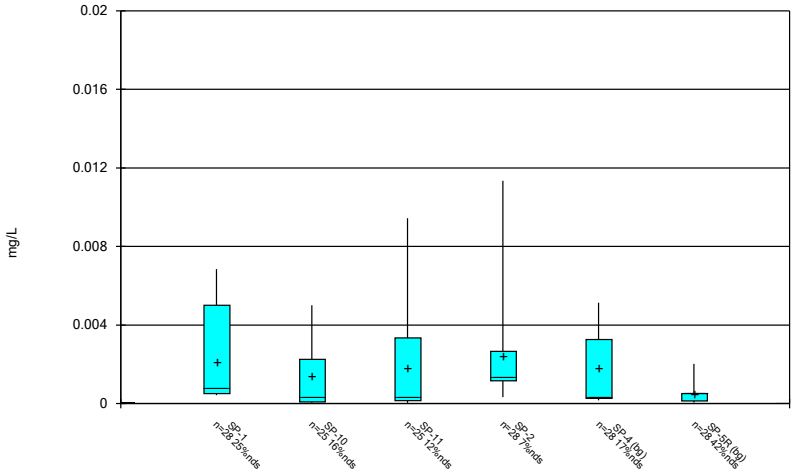


Constituent: Thallium Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

FIGURE B

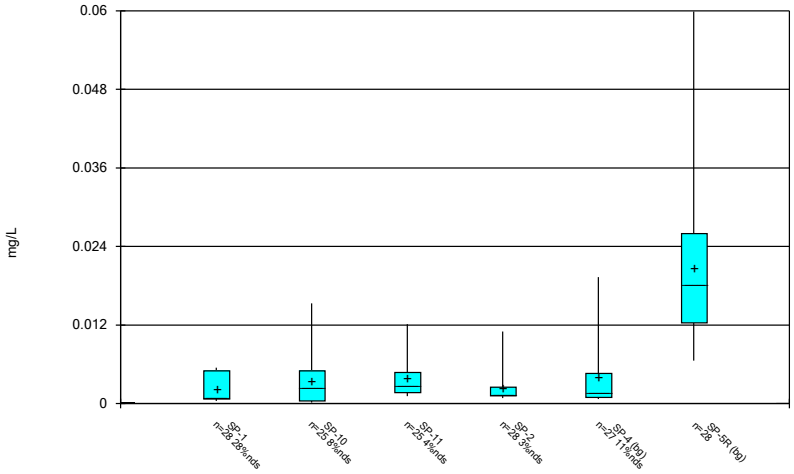
Box Plots

Box & Whiskers Plot



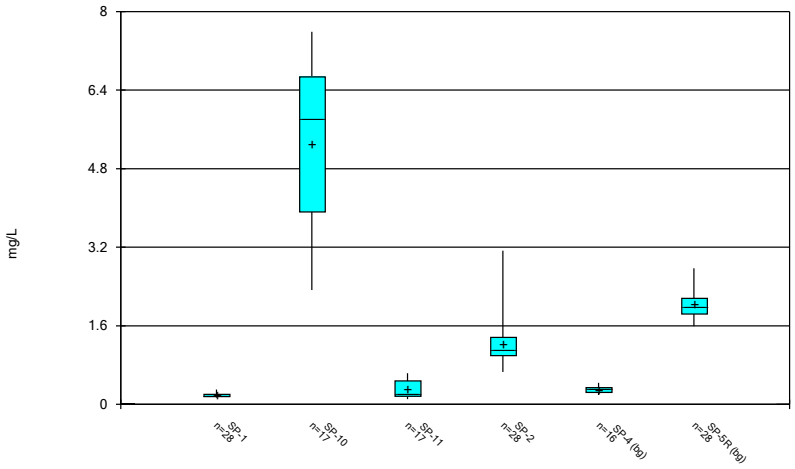
Constituent: Antimony Analysis Run 7/17/2024 1:41 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



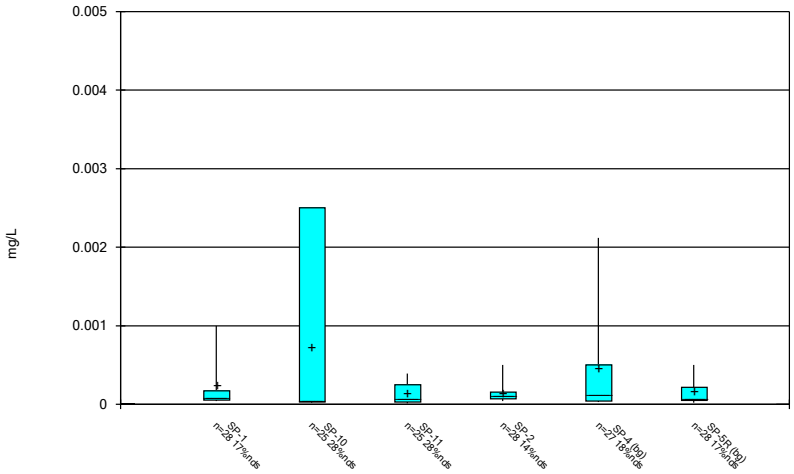
Constituent: Arsenic Analysis Run 7/17/2024 1:41 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



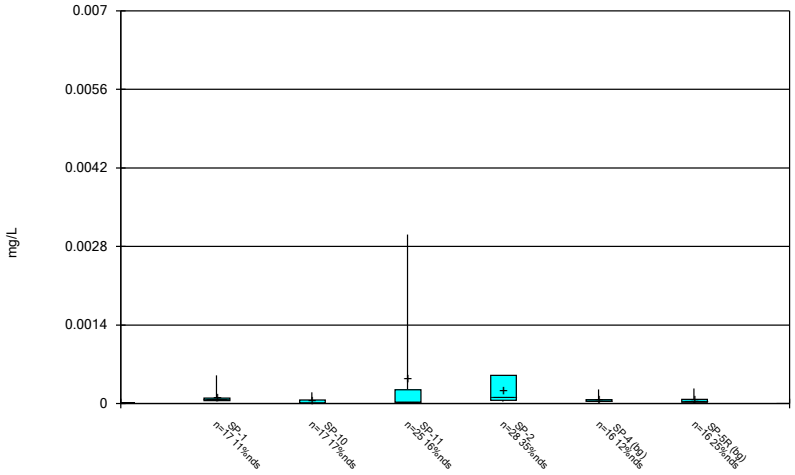
Constituent: Barium Analysis Run 7/17/2024 1:41 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



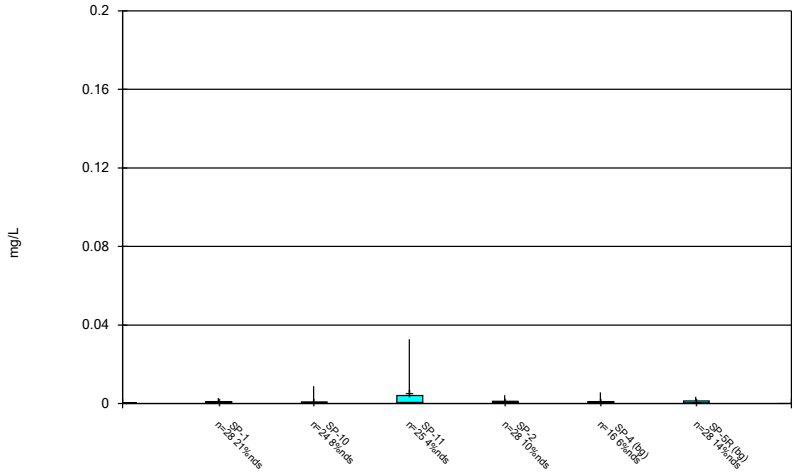
Constituent: Beryllium Analysis Run 7/17/2024 1:41 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



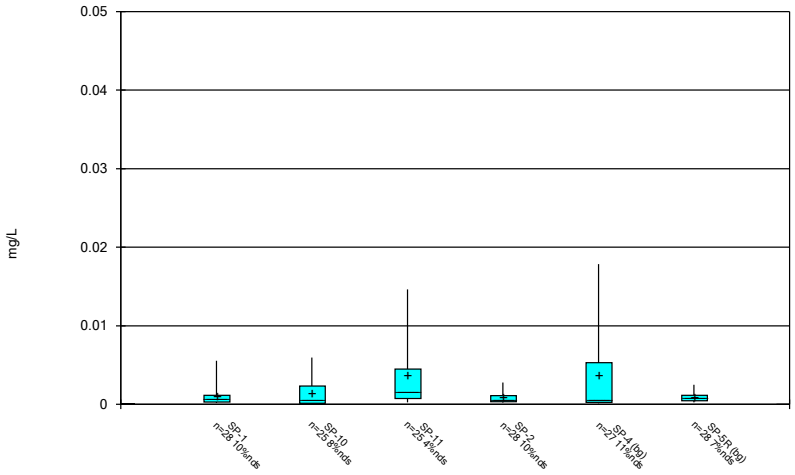
Constituent: Cadmium Analysis Run 7/17/2024 1:41 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



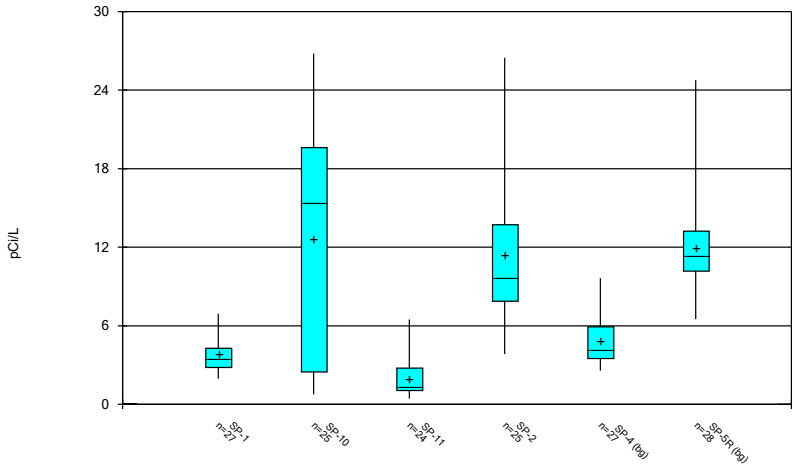
Constituent: Chromium Analysis Run 7/17/2024 1:41 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



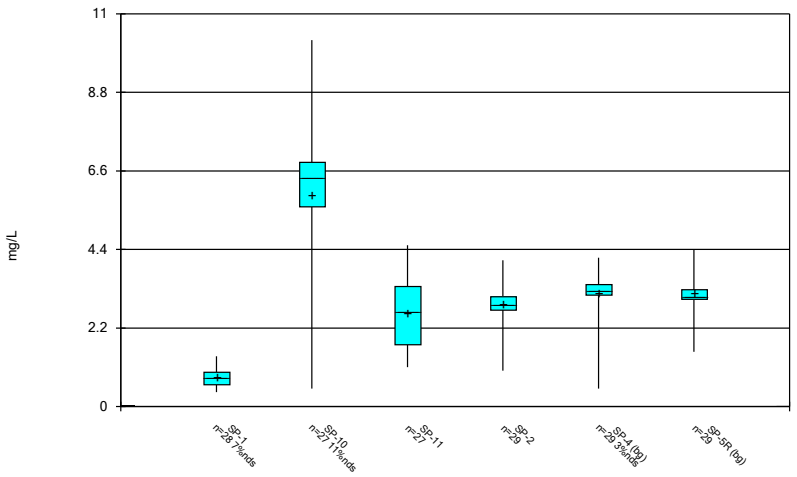
Constituent: Cobalt Analysis Run 7/17/2024 1:41 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



Constituent: Combined Radium 226 + 228 Analysis Run 7/17/2024 1:41 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

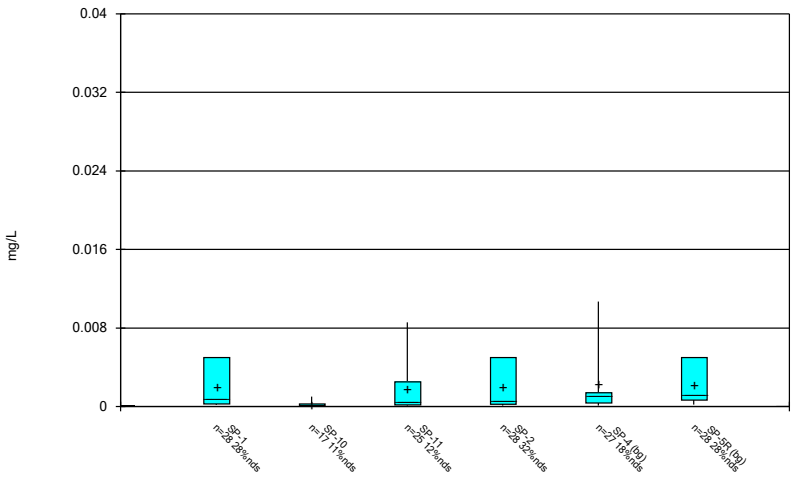
Box & Whiskers Plot



Constituent: Fluoride Analysis Run 7/17/2024 1:41 PM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

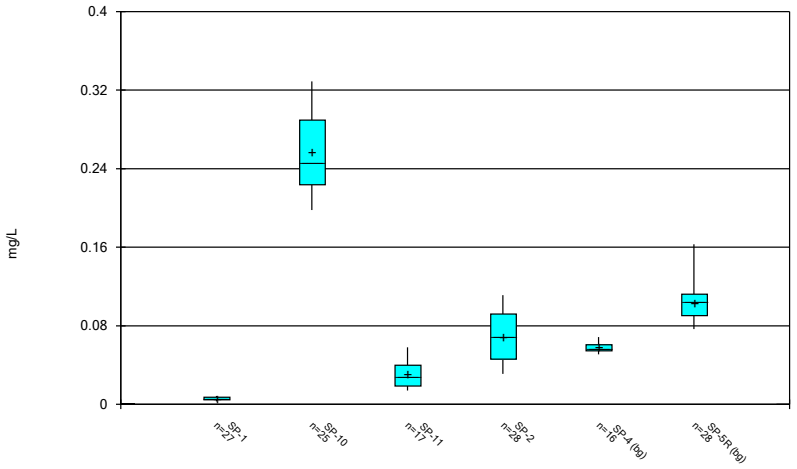
Box & Whiskers Plot



Constituent: Lead Analysis Run 7/17/2024 1:41 PM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

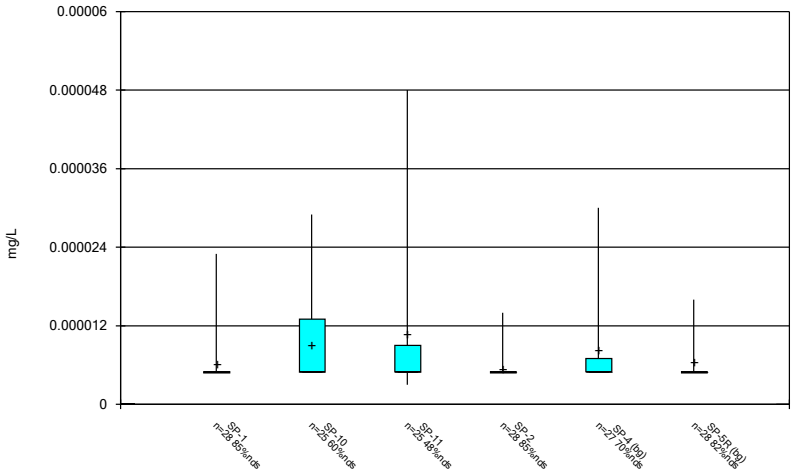
Box & Whiskers Plot



Constituent: Lithium Analysis Run 7/17/2024 1:41 PM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

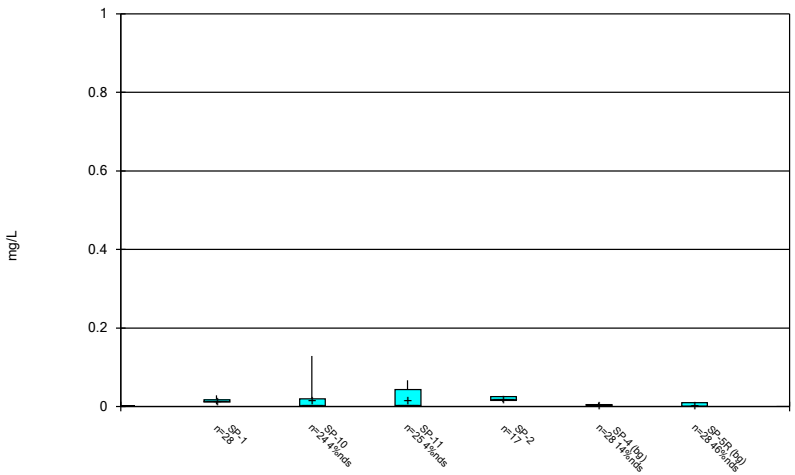
Box & Whiskers Plot



Constituent: Mercury Analysis Run 7/17/2024 1:41 PM

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

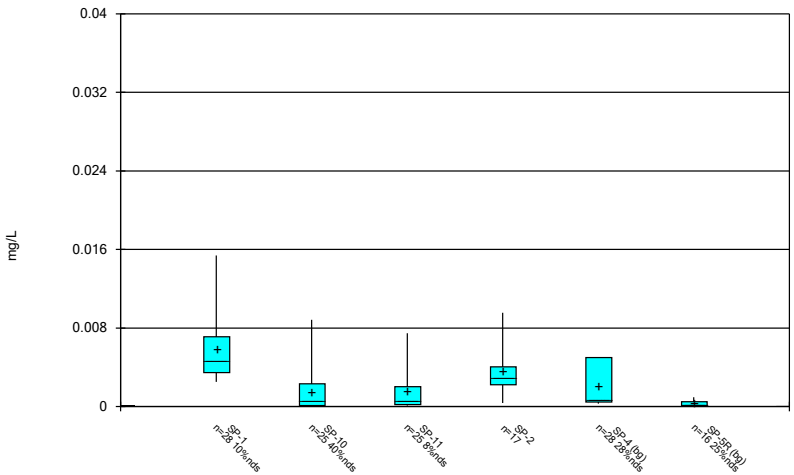
Box & Whiskers Plot



Constituent: Molybdenum Analysis Run 7/17/2024 1:41 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG

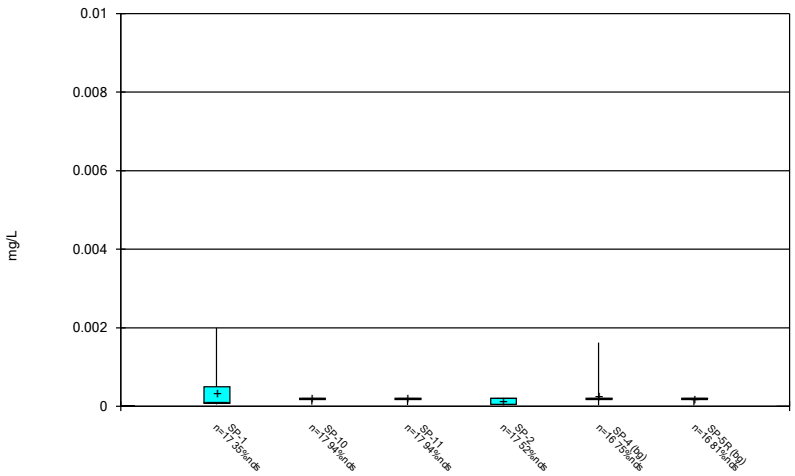
Box & Whiskers Plot



Constituent: Selenium Analysis Run 7/17/2024 1:41 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG

Box & Whiskers Plot



Constituent: Thallium Analysis Run 7/17/2024 1:41 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

FIGURE C
Outlier Summary

Outlier Summary

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 7/15/2024, 8:45 PM

	SP-4 Arsenic (mg/L)	SP-4 Beryllium (mg/L)	SP-10 Chromium (mg/L)	SP-4 Cobalt (mg/L)	SP-1 Combined Radium 226 + 228 (pCi/L)	SP-11 Combined Radium 226 + 228 (pCi/L)	SP-1 Fluoride (mg/L)	SP-4 Lead (mg/L)	SP-1 Lithium (mg/L)	SP-4 Mercury (mg/L)
3/13/2017							4 (o)			
6/27/2017					14.29 (o)					
7/13/2017			0.11 (o)							
8/4/2017	0.04498 (o)	0.00497 (o)		0.04069 (o)		25.367 (o)		0.03663 (o)		5.8E-05 (o)
6/20/2019									0.03 (J,o)	

	SP-10 Molybdenum (mg/L)
3/13/2017	
6/27/2017	
7/13/2017	0.934 (o)
8/4/2017	
6/20/2019	

FIGURE D

UTLs

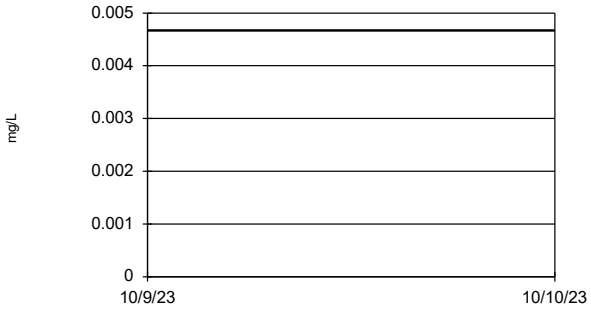
Upper Tolerance Limits Summary Table

Northeastern BAP Data: Northeastern BAP Printed 1/10/2024, 12:19 PM

Constituent	Upper Lim.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Antimony (mg/L)	0.004669	54	-8.028	1.303	31.48	Kaplan-Meier	ln(x)	0.05	Inter
Arsenic (mg/L)	0.0529	53	0.2046	0.08342	5.66	None	x^(1/3)	0.05	Inter
Barium (mg/L)	2.77	42	n/a	n/a	0	n/a	n/a	0.116	NP Inter(normality)
Beryllium (mg/L)	0.00212	53	n/a	n/a	18.87	n/a	n/a	0.06597	NP Inter(normality)
Cadmium (mg/L)	0.0002157	30	-10.33	0.8506	20	Kaplan-Meier	ln(x)	0.05	Inter
Chromium (mg/L)	0.003731	42	-7.265	0.7923	11.9	None	ln(x)	0.05	Inter
Cobalt (mg/L)	0.01786	53	n/a	n/a	9.434	n/a	n/a	0.06597	NP Inter(normality)
Combined Radium 226 + 228 (pCi/L)	19.39	53	2.82	0.773	0	None	sqrt(x)	0.05	Inter
Fluoride (mg/L)	4.39	56	n/a	n/a	1.786	n/a	n/a	0.05656	NP Inter(normality)
Lead (mg/L)	0.008682	53	-7.11	1.154	24.53	Kaplan-Meier	ln(x)	0.05	Inter
Lithium (mg/L)	0.163	42	n/a	n/a	0	n/a	n/a	0.116	NP Inter(normality)
Mercury (mg/L)	0.00003	53	n/a	n/a	75.47	n/a	n/a	0.06597	NP Inter(NDs)
Molybdenum (mg/L)	0.01	54	n/a	n/a	31.48	n/a	n/a	0.06267	NP Inter(normality)
Selenium (mg/L)	0.00499	42	n/a	n/a	28.57	n/a	n/a	0.116	NP Inter(normality)
Thallium (mg/L)	0.00162	30	n/a	n/a	76.67	n/a	n/a	0.2146	NP Inter(NDs)

Tolerance Limit

Interwell Parametric

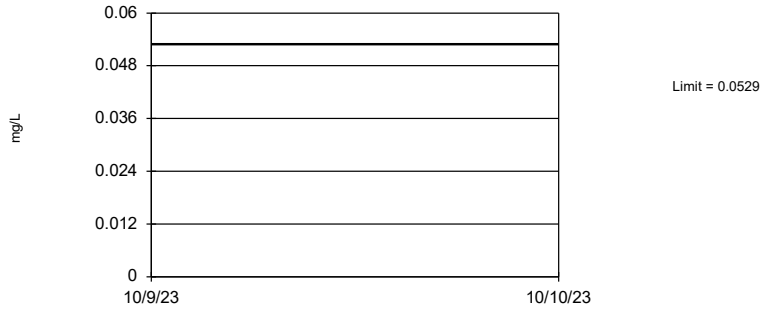


95% coverage. Background Data Summary (based on natural log transformation) (after Kaplan-Meier Adjustment): Mean=-8.028, Std. Dev.=1.303, n=54, 31.48% NDs. Normality test: Shapiro Francia @alpha = 0.01, calculated = 0.9524, critical = 0.939. Report alpha = 0.05.

Constituent: Antimony Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Tolerance Limit

Interwell Parametric

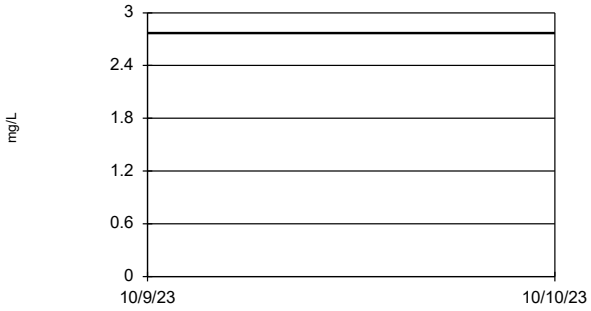


95% coverage. Background Data Summary (based on cube root transformation): Mean=0.2046, Std. Dev.=0.08342, n=53, 5.66% NDs. Normality test: Shapiro Francia @alpha = 0.01, calculated = 0.9413, critical = 0.938. Report alpha = 0.05.

Constituent: Arsenic Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric

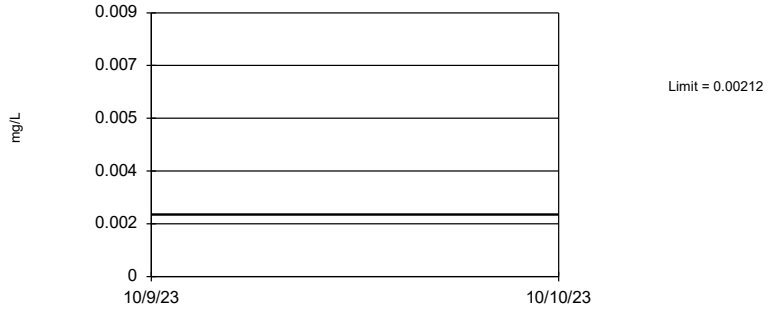


Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 42 background values. 89.65% coverage at alpha=0.01; 93.16% coverage at alpha=0.05; 98.24% coverage at alpha=0.5. Report alpha = 0.116.

Constituent: Barium Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric



Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 53 background values. 18.87% NDs. 91.6% coverage at alpha=0.01; 94.34% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.06597.

Constituent: Beryllium Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Tolerance Limit

Interwell Parametric

95% coverage. Background Data Summary (based on natural log transformation) (after Kaplan-Meier Adjustment): Mean=-10.33, Std. Dev.=0.8506, n=30, 20% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9423, critical = 0.9. Report alpha = 0.05.

Constituent: Cadmium Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

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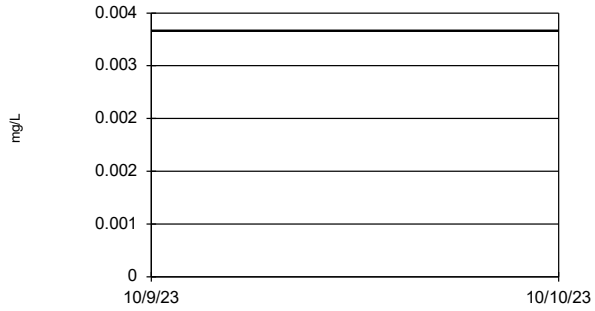
Tolerance Limit

Interwell Parametric



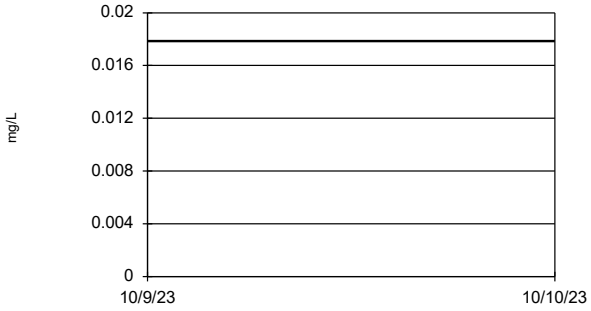
95% coverage. Background Data Summary (based on natural log transformation): Mean=-7.265, Std. Dev.=0.7923, n=42, 11.9% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9556, critical = 0.922. Report alpha = 0.05.

Constituent: Chromium Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Tolerance Limit

Interwell Non-parametric



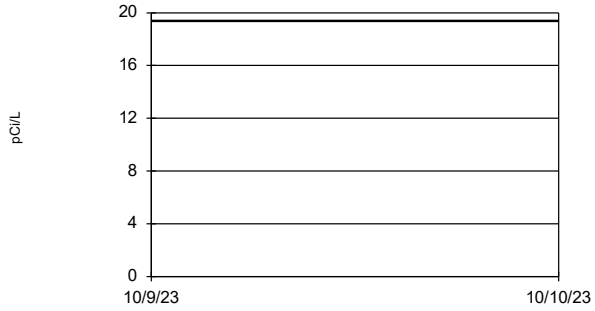
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 53 background values. 9.434% NDs. 91.6% coverage at alpha=0.01; 94.34% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.06597.

Constituent: Cobalt Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Tolerance Limit

Interwell Parametric



95% coverage. Background Data Summary (based on square root transformation): Mean=2.82, Std. Dev.=0.773, n=53. Normality test: Shapiro Francia @alpha = 0.01, calculated = 0.9513, critical = 0.938. Report alpha = 0.05.

Constituent: Combined Radium 226 + 228 Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric

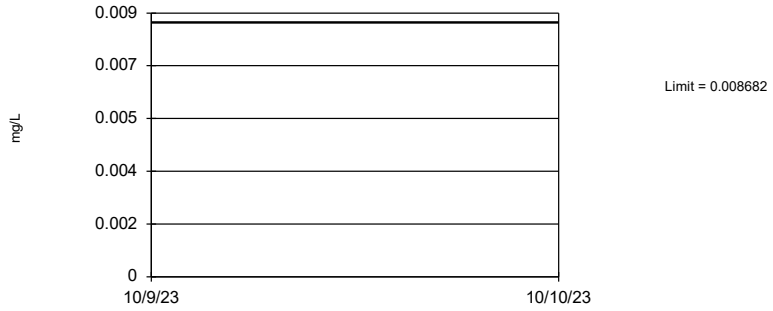
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 56 background values. 1.786% NDs. 91.99% coverage at alpha=0.01; 94.73% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.05656.

Constituent: Fluoride Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Tolerance Limit

Interwell Parametric



95% coverage. Background Data Summary (based on natural log transformation) (after Kaplan-Meier Adjustment): Mean=-7.11, Std. Dev.=1.154, n=53, 24.53% NDs. Normality test: Shapiro Francia @alpha = 0.01, calculated = 0.9393, critical = 0.938. Report alpha = 0.05.

Constituent: Lead Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

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Tolerance Limit

Interwell Non-parametric

Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 42 background values. 89.65% coverage at alpha=0.01; 93.16% coverage at alpha=0.05; 98.24% coverage at alpha=0.5. Report alpha = 0.116.

Constituent: Lithium Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

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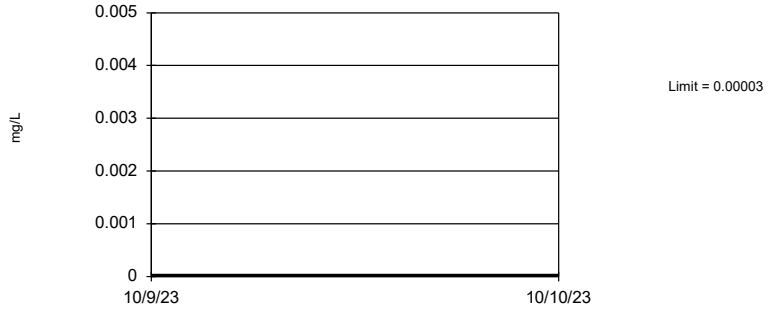
Tolerance Limit

Interwell Non-parametric

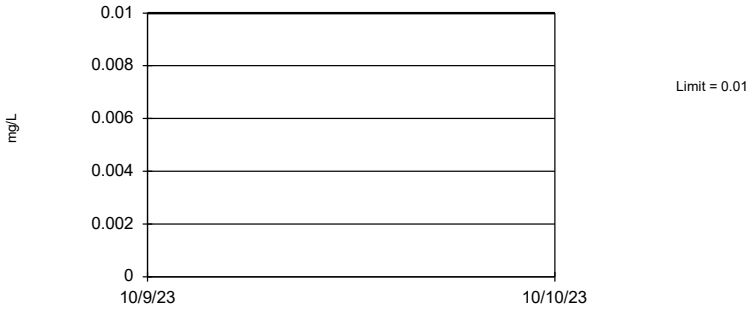


Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 50%. Limit is highest of 53 background values. 75.47% NDs. 91.6% coverage at alpha=0.01; 94.34% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.06597.

Constituent: Mercury Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Tolerance Limit

Interwell Non-parametric



Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 54 background values. 31.48% NDs. 91.99% coverage at alpha=0.01; 94.73% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.06267.

Constituent: Molybdenum Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

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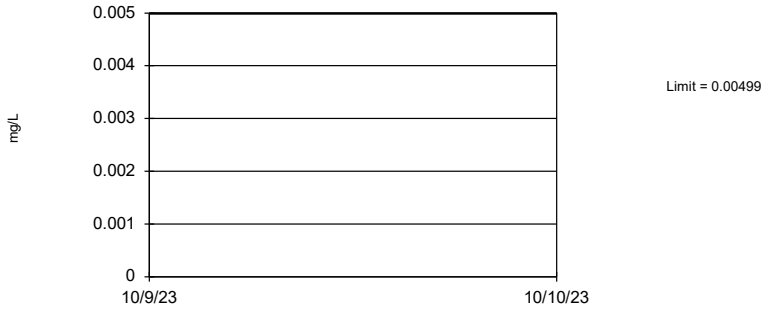
Tolerance Limit

Interwell Non-parametric



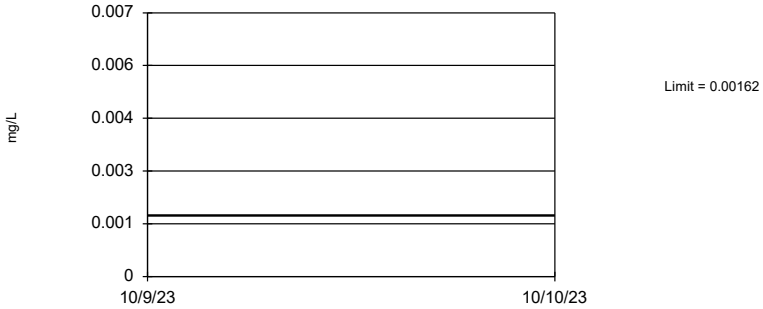
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 42 background values. 28.57% NDs. 89.65% coverage at alpha=0.01; 93.16% coverage at alpha=0.05; 98.24% coverage at alpha=0.5. Report alpha = 0.116.

Constituent: Selenium Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

Sanitas™ v.10.0.15 Software licensed to . UG

Tolerance Limit

Interwell Non-parametric



Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 50%. Limit is highest of 30 background values. 76.67% NDs. 85.74% coverage at alpha=0.01; 90.43% coverage at alpha=0.05; 97.85% coverage at alpha=0.5. Report alpha = 0.2146.

Constituent: Thallium Analysis Run 1/10/2024 12:18 PM View: UTLs
Northeastern BAP Data: Northeastern BAP

FIGURE E

GWPS

NORTHEASTERN BAP GWPS				
Constituent Name	**MCL**	**CCR- Rule Specified Level**	**Background Limit**	**GWPS**
Antimony, Total (mg/L)	0.006		0.0047	0.006
Arsenic, Total (mg/L)	0.01		0.053	0.053
Barium, Total (mg/L)	2		2.77	2.77
Beryllium, Total (mg/L)	0.004		0.0021	0.004
Cadmium, Total (mg/L)	0.005		0.00022	0.005
Chromium, Total (mg/L)	0.1		0.037	0.1
Cobalt, Total (mg/L)	n/a	0.006	0.018	0.018
Combined Radium, Total (pCi/L)	5		19.39	19.39
Fluoride, Total (mg/L)	4		4.39	4.39
Lead, Total (mg/L)	n/a	0.015	0.0087	0.015
Lithium, Total (mg/L)	n/a	0.04	0.16	0.16
Mercury, Total (mg/L)	0.002		0.00003	0.002
Molybdenum, Total (mg/L)	n/a	0.1	0.01	0.1
Selenium, Total (mg/L)	0.05		0.005	0.05
Thallium, Total (mg/L)	0.002		0.0016	0.002

**Grey cell indicates Background Limit is higher than MCL*

**GWPS = Groundwater Protection Standard*

**MCL = Maximum Contaminant Level*

**CCR = Coal Combustion Residuals*

FIGURE F
Confidence Intervals

Confidence Interval - Significant Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 7/15/2024, 8:47 PM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Barium (mg/L)	**SP-10**	**6.328**	**4.304**	**2.77**	**Yes**	**17**	**5.316**	**1.615**	**0**	**None**	**No**	**0.01**	**Param.**
Fluoride (mg/L)	**SP-10**	**6.84**	**5.59**	**4.39**	**Yes**	**27**	**5.928**	**2.24**	**11.11**	**None**	**No**	**0.01**	**NP (normality)**
Lithium (mg/L)	**SP-10**	**0.2767**	**0.2382**	**0.16**	**Yes**	**25**	**0.2574**	**0.03855**	**0**	**None**	**No**	**0.01**	**Param.**

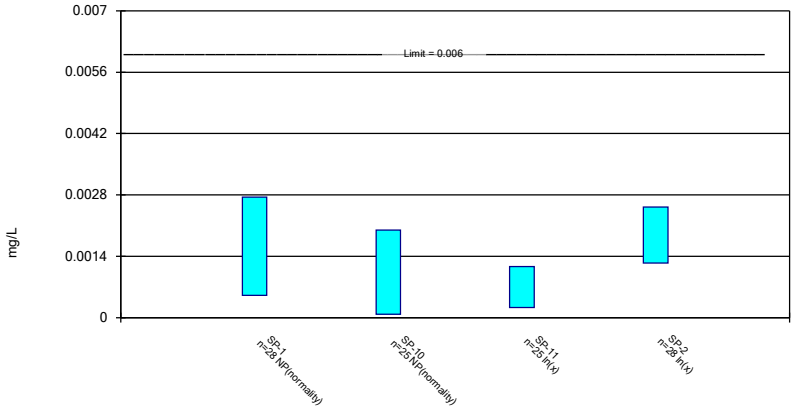
Confidence Interval - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 7/15/2024, 8:47 PM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Antimony (mg/L)	SP-1	0.00275	0.00051	0.006	No	28	0.002089	0.002112	25	None	No	0.01	NP (normality)
Antimony (mg/L)	SP-10	0.002	0.00008	0.006	No	25	0.001434	0.001901	16	None	No	0.01	NP (normality)
Antimony (mg/L)	SP-11	0.001166	0.0002267	0.006	No	25	0.001789	0.002768	12	None	ln(x)	0.01	Param.
Antimony (mg/L)	SP-2	0.002523	0.001244	0.006	No	28	0.00243	0.002457	7.143	None	ln(x)	0.01	Param.
Arsenic (mg/L)	SP-1	0.00211	0.00069	0.053	No	28	0.00222	0.002026	28.57	None	No	0.01	NP (normality)
Arsenic (mg/L)	SP-10	0.004427	0.001096	0.053	No	25	0.003562	0.004308	8	None	sqrt(x)	0.01	Param.
Arsenic (mg/L)	SP-11	0.004738	0.002322	0.053	No	25	0.003836	0.002823	4	None	sqrt(x)	0.01	Param.
Arsenic (mg/L)	SP-2	0.0025	0.00121	0.053	No	28	0.00242	0.002427	3.571	None	No	0.01	NP (normality)
Barium (mg/L)	SP-1	0.1955	0.1616	2.77	No	28	0.1799	0.03819	0	None	sqrt(x)	0.01	Param.
Barium (mg/L)	**SP-10**	**6.328**	**4.304**	**2.77**	**Yes**	**17**	**5.316**	**1.615**	**0**	**None**	**No**	**0.01**	**Param.**
Barium (mg/L)	SP-11	0.3908	0.188	2.77	No	17	0.3022	0.1711	0	None	sqrt(x)	0.01	Param.
Barium (mg/L)	SP-2	1.346	1.003	2.77	No	28	1.226	0.4734	0	None	ln(x)	0.01	Param.
Beryllium (mg/L)	SP-1	0.00014	0.000053	0.004	No	28	0.0002488	0.00036	17.86	None	No	0.01	NP (normality)
Beryllium (mg/L)	SP-10	0.00008	0.000027	0.004	No	25	0.0007262	0.001129	28	None	No	0.01	NP (normality)
Beryllium (mg/L)	SP-11	0.00025	0.000027	0.004	No	25	0.0001439	0.0001321	28	None	No	0.01	NP (normality)
Beryllium (mg/L)	SP-2	0.000131	0.00007	0.004	No	28	0.0001562	0.0001507	14.29	None	No	0.01	NP (normality)
Cadmium (mg/L)	SP-1	0.0001	0.000051	0.005	No	17	0.0001144	0.0001179	11.76	None	No	0.01	NP (normality)
Cadmium (mg/L)	SP-10	0.000089	0.000009	0.005	No	17	0.00005441	0.00007203	17.65	None	No	0.01	NP (normality)
Cadmium (mg/L)	SP-11	0.00015	0.00002	0.005	No	25	0.0004465	0.0009105	16	None	No	0.01	NP (normality)
Cadmium (mg/L)	SP-2	0.0005	0.00006	0.005	No	28	0.0002403	0.0002073	35.71	None	No	0.01	NP (normality)
Chromium (mg/L)	SP-1	0.001053	0.0005316	0.1	No	28	0.0009756	0.000661	21.43	Kapla...	sqrt(x)	0.01	Param.
Chromium (mg/L)	SP-10	0.0008933	0.0003188	0.1	No	24	0.0009951	0.001758	8.333	None	ln(x)	0.01	Param.
Chromium (mg/L)	SP-11	0.00276	0.00043	0.1	No	25	0.005618	0.01035	4	None	No	0.01	NP (normality)
Chromium (mg/L)	SP-2	0.00132	0.0005672	0.1	No	28	0.001136	0.00107	10.71	None	x^(1/3)	0.01	Param.
Cobalt (mg/L)	SP-1	0.001113	0.0004593	0.018	No	28	0.0009724	0.001094	10.71	None	x^(1/3)	0.01	Param.
Cobalt (mg/L)	SP-10	0.001555	0.0003315	0.018	No	25	0.001423	0.001764	8	None	x^(1/3)	0.01	Param.
Cobalt (mg/L)	SP-11	0.004135	0.001241	0.018	No	25	0.003621	0.00438	4	None	x^(1/3)	0.01	Param.
Cobalt (mg/L)	SP-2	0.00101	0.0004692	0.018	No	28	0.0008667	0.0007461	10.71	None	x^(1/3)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-1	4.367	3.18	19.39	No	27	3.773	1.245	0	None	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-10	17.05	8.242	19.39	No	25	12.65	8.836	0	None	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-11	2.426	1.208	19.39	No	24	1.958	1.403	0	None	sqrt(x)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	SP-2	13.46	8.556	19.39	No	25	11.41	5.389	0	None	sqrt(x)	0.01	Param.
Fluoride (mg/L)	SP-1	0.9337	0.7039	4.39	No	28	0.8188	0.2459	7.143	None	No	0.01	Param.
Fluoride (mg/L)	**SP-10**	**6.84**	**5.59**	**4.39**	**Yes**	**27**	**5.928**	**2.24**	**11.11**	**None**	**No**	**0.01**	**NP (normality)**
Fluoride (mg/L)	SP-11	3.099	2.16	4.39	No	27	2.629	0.9845	0	None	No	0.01	Param.
Fluoride (mg/L)	SP-2	3.06	2.7	4.39	No	29	2.878	0.5483	0	None	No	0.01	NP (normality)
Lead (mg/L)	SP-1	0.00247	0.000254	0.015	No	28	0.001877	0.002074	28.57	None	No	0.01	NP (normality)
Lead (mg/L)	SP-10	0.0003	0.00007	0.015	No	17	0.0002489	0.0003009	11.76	None	No	0.01	NP (normality)
Lead (mg/L)	SP-11	0.001352	0.0002995	0.015	No	25	0.00179	0.002608	12	None	ln(x)	0.01	Param.
Lead (mg/L)	SP-2	0.00202	0.000245	0.015	No	28	0.001955	0.002181	32.14	None	No	0.01	NP (normality)
Lithium (mg/L)	SP-1	0.006375	0.004848	0.16	No	27	0.005612	0.0016	0	None	No	0.01	Param.
Lithium (mg/L)	**SP-10**	**0.2767**	**0.2382**	**0.16**	**Yes**	**25**	**0.2574**	**0.03855**	**0**	**None**	**No**	**0.01**	**Param.**
Lithium (mg/L)	SP-11	0.03851	0.02198	0.16	No	17	0.03024	0.01319	0	None	No	0.01	Param.
Lithium (mg/L)	SP-2	0.07999	0.05608	0.16	No	28	0.06804	0.02559	0	None	No	0.01	Param.
Mercury (mg/L)	SP-1	0.000009	0.000005	0.002	No	28	0.000006107	0.000003583	85.71	None	No	0.01	NP (NDs)
Mercury (mg/L)	SP-10	0.000013	0.000005	0.002	No	25	0.00000916	0.000007069	60	None	No	0.01	NP (NDs)
Mercury (mg/L)	SP-11	0.000009	0.000005	0.002	No	25	0.00001072	0.00001239	48	None	No	0.01	NP (normality)
Mercury (mg/L)	SP-2	0.000005	0.000005	0.002	No	28	0.000005393	0.000001707	85.71	None	No	0.01	NP (NDs)
Molybdenum (mg/L)	SP-1	0.01705	0.01182	0.1	No	28	0.01444	0.005594	0	None	No	0.01	Param.
Molybdenum (mg/L)	SP-10	0.0162	0.002499	0.1	No	24	0.01587	0.02733	4.167	None	x^(1/3)	0.01	Param.
Molybdenum (mg/L)	SP-11	0.04214	0.002	0.1	No	25	0.01793	0.02293	4	None	No	0.01	NP (normality)
Molybdenum (mg/L)	SP-2	0.02335	0.01718	0.1	No	17	0.02026	0.004918	0	None	No	0.01	Param.
Selenium (mg/L)	SP-1	0.006872	0.004079	0.05	No	28	0.005785	0.003346	10.71	None	sqrt(x)	0.01	Param.
Selenium (mg/L)	SP-10	0.0006702	0.0001095	0.05	No	25	0.001384	0.002107	40	Kapla...	ln(x)	0.01	Param.
Selenium (mg/L)	SP-11	0.001295	0.0003282	0.05	No	25	0.001613	0.00224	8	None	ln(x)	0.01	Param.
Selenium (mg/L)	SP-2	0.004617	0.002042	0.05	No	17	0.003511	0.002203	0	None	sqrt(x)	0.01	Param.
Thallium (mg/L)	SP-1	0.0005	0.00006	0.002	No	17	0.0003382	0.0004753	35.29	None	No	0.01	NP (normality)
Thallium (mg/L)	SP-10	0.0002	0.00004	0.002	No	17	0.0001906	0.00003881	94.12	None	No	0.01	NP (NDs)
Thallium (mg/L)	SP-11	0.0002	0.00003	0.002	No	17	0.00019	0.00004123	94.12	None	No	0.01	NP (NDs)
Thallium (mg/L)	SP-2	0.0002	0.00005	0.002	No	17	0.0001329	0.00007456	52.94	None	No	0.01	NP (NDs)

Parametric and Non-Parametric (NP) Confidence Interval

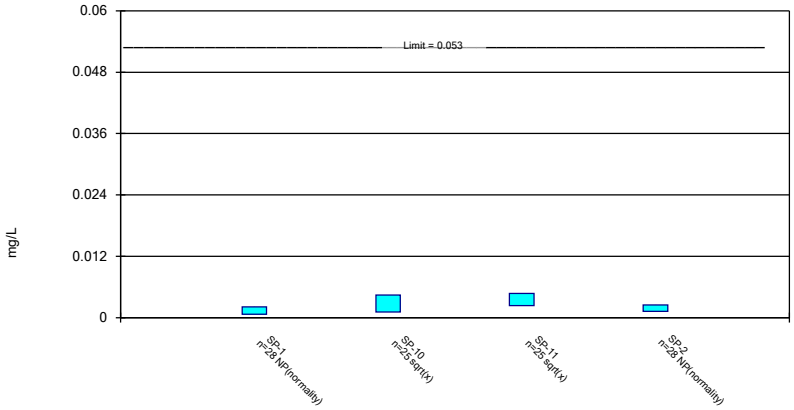
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Antimony Analysis Run 7/15/2024 8:45 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

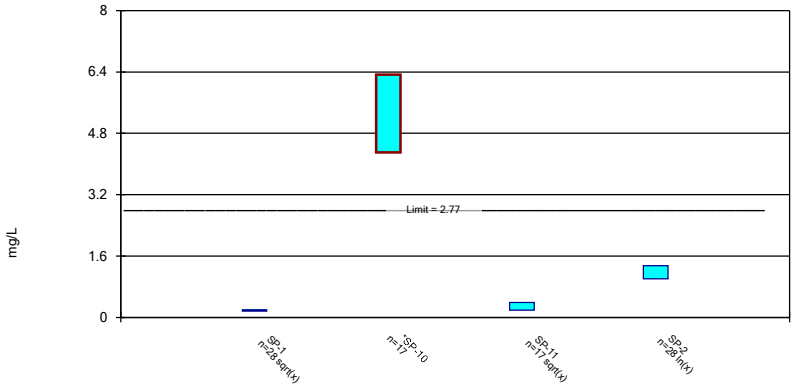
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Arsenic Analysis Run 7/15/2024 8:45 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

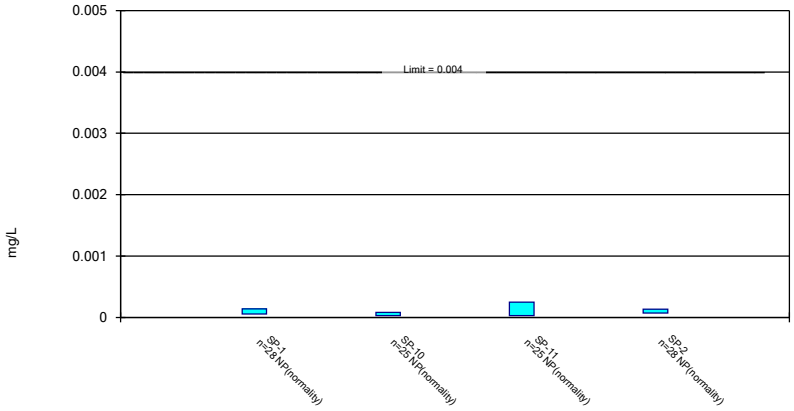
Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Barium Analysis Run 7/15/2024 8:45 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Non-Parametric Confidence Interval

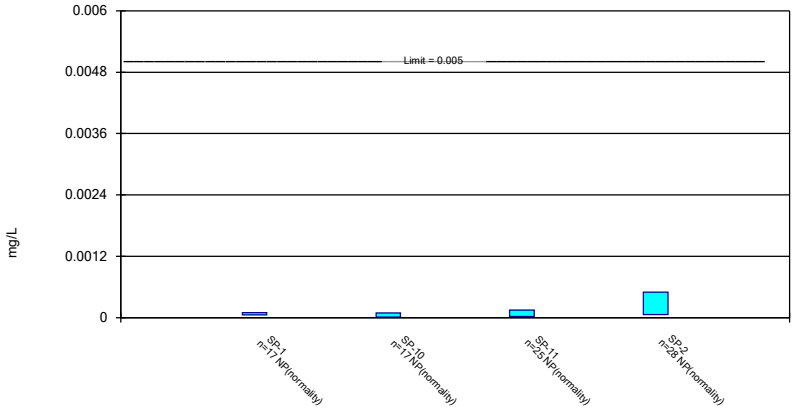
Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Beryllium Analysis Run 7/15/2024 8:45 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Non-Parametric Confidence Interval

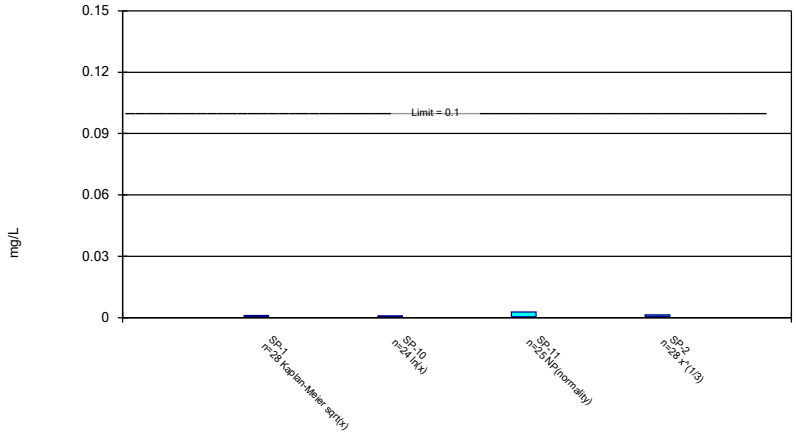
Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Cadmium Analysis Run 7/15/2024 8:45 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

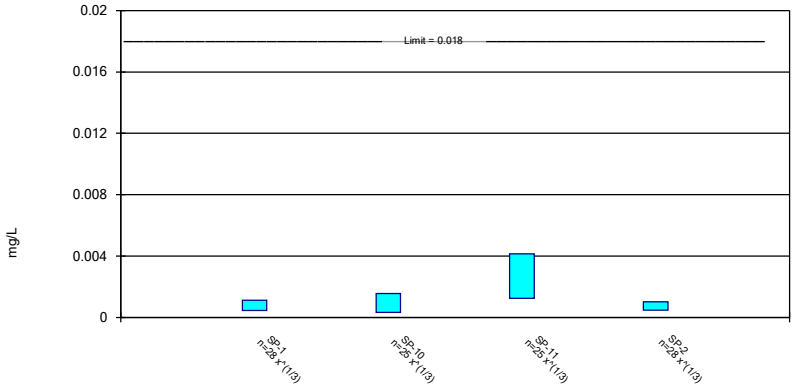
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Chromium Analysis Run 7/15/2024 8:45 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

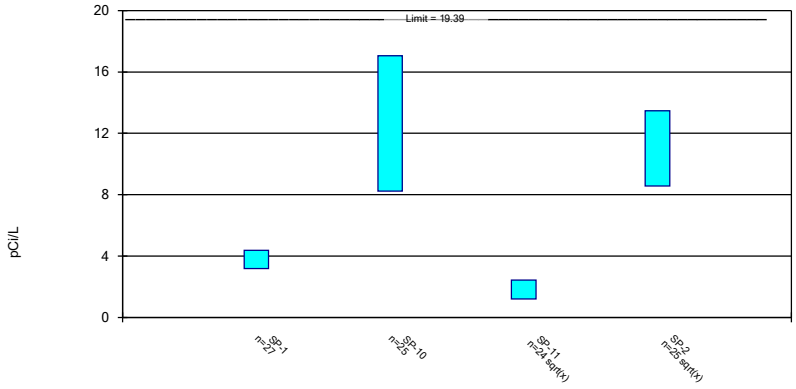
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Cobalt Analysis Run 7/15/2024 8:45 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

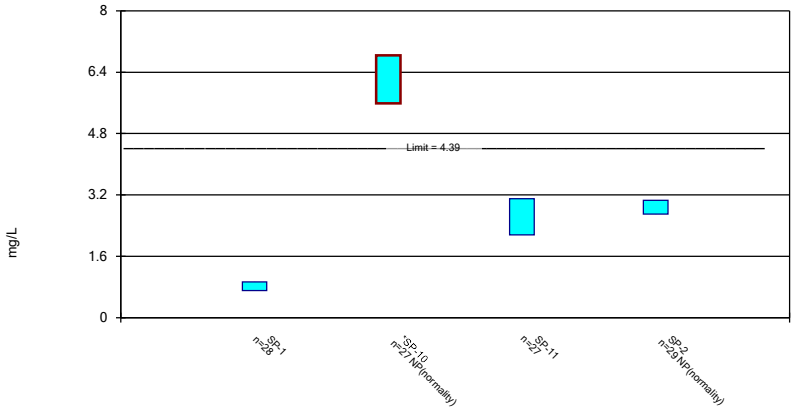
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Combined Radium 226 + 228 Analysis Run 7/15/2024 8:45 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

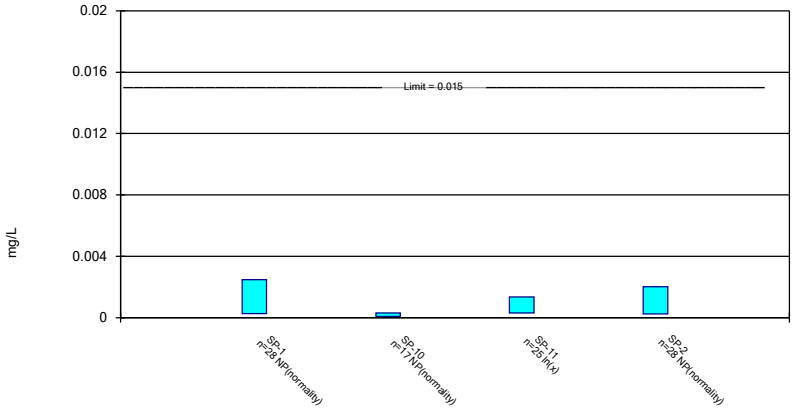
Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Fluoride Analysis Run 7/15/2024 8:45 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

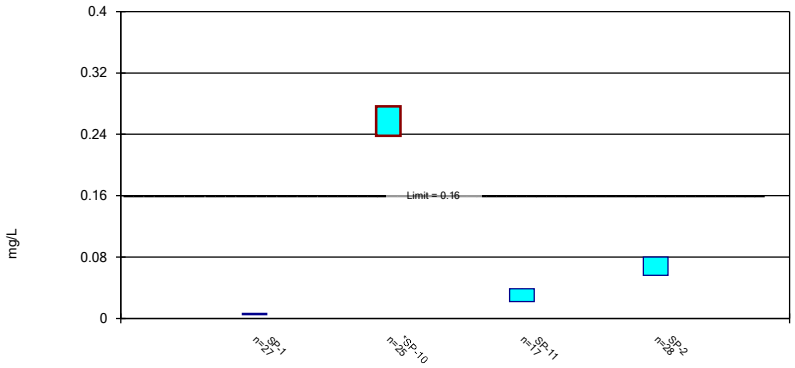
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Lead Analysis Run 7/15/2024 8:45 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric Confidence Interval

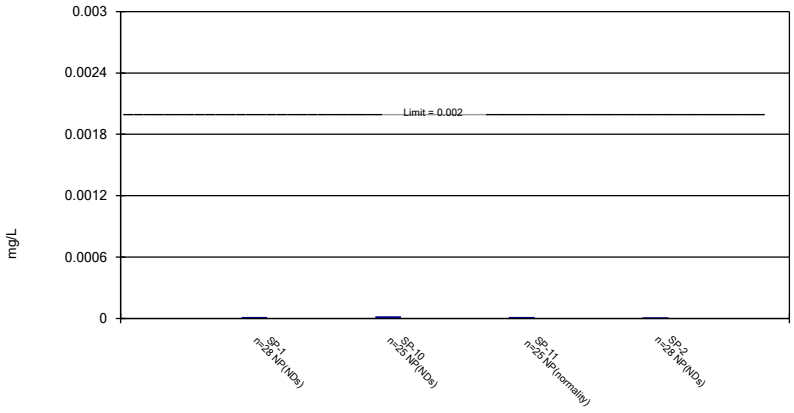
Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Lithium Analysis Run 7/15/2024 8:45 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Non-Parametric Confidence Interval

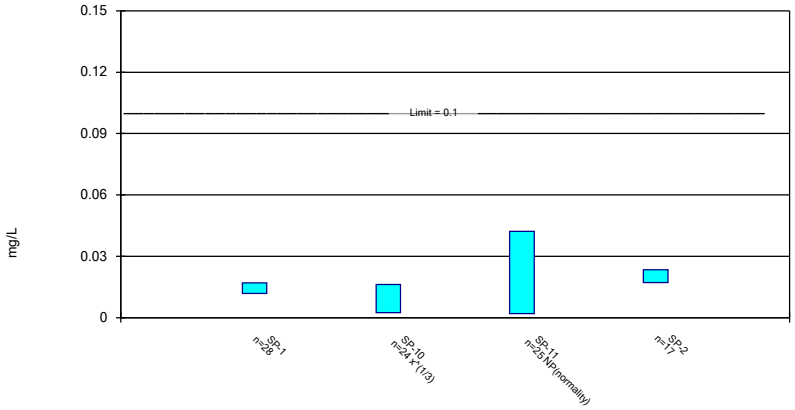
Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Mercury Analysis Run 7/15/2024 8:45 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Molybdenum Analysis Run 7/15/2024 8:45 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

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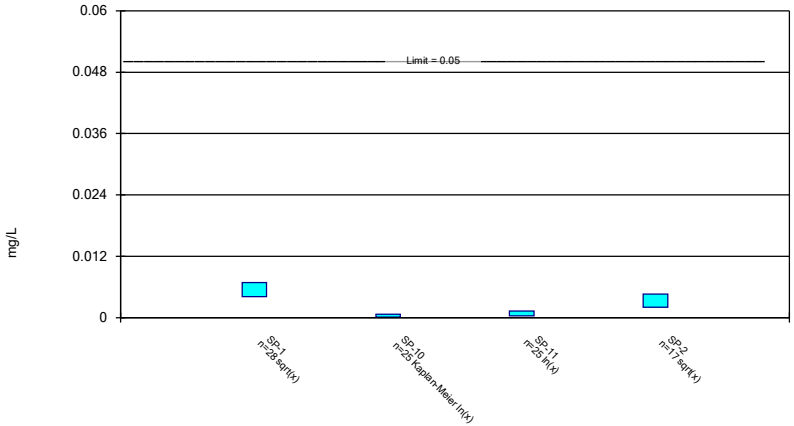
Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

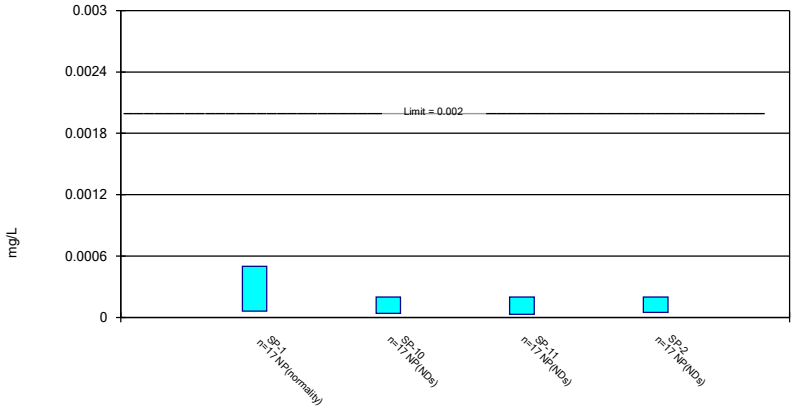


Constituent: Selenium Analysis Run 7/15/2024 8:45 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.19h Software licensed to Groundwater Stats Consulting. UG

Non-Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Thallium Analysis Run 7/15/2024 8:45 PM View: Confidence Intervals
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

FIGURE G

Trend Tests

Appendix IV Trend Test - Significant Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 7/15/2024, 8:49 PM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Xform	Alpha	Method
Barium (mg/L)	**SP-10**	**0.5476**	**51**	**49**	**Yes**	**17**	**0**	**n/a**	**n/a**	**0.05**	**NP**
Barium (mg/L)	**SP-5R (bg)**	**0.07298**	**142**	**101**	**Yes**	**28**	**0**	**n/a**	**n/a**	**0.05**	**NP**
Lithium (mg/L)	**SP-10**	**-0.01229**	**-139**	**-85**	**Yes**	**25**	**0**	**n/a**	**n/a**	**0.05**	**NP**
Lithium (mg/L)	**SP-4 (bg)**	**-0.001771**	**-57**	**-45**	**Yes**	**16**	**0**	**n/a**	**n/a**	**0.05**	**NP**
Lithium (mg/L)	**SP-5R (bg)**	**-0.005108**	**-182**	**-101**	**Yes**	**28**	**0**	**n/a**	**n/a**	**0.05**	**NP**

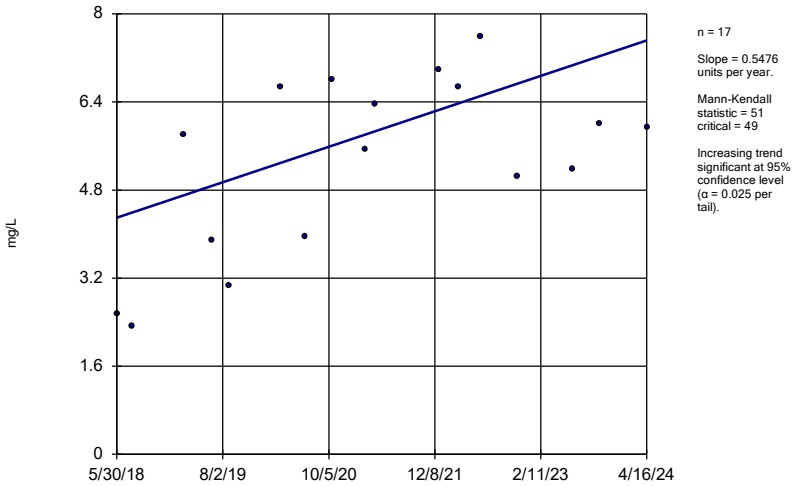
Appendix IV Trend Test - All Results

Northeastern BAP Client: Geosyntec Data: Northeastern BAP Printed 7/15/2024, 8:49 PM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Xform	Alpha	Method
Barium (mg/L)	**SP-10**	**0.5476**	**51**	**49**	**Yes**	**17**	**0**	**n/a**	**n/a**	**0.05**	**NP**
Barium (mg/L)	SP-4 (bg)	-0.01669	-38	-45	No	16	0	n/a	n/a	0.05	NP
Barium (mg/L)	**SP-5R (bg)**	**0.07298**	**142**	**101**	**Yes**	**28**	**0**	**n/a**	**n/a**	**0.05**	**NP**
Fluoride (mg/L)	SP-10	0.1122	43	96	No	27	11.11	n/a	n/a	0.05	NP
Fluoride (mg/L)	SP-4 (bg)	0.0001108	4	106	No	29	3.448	n/a	n/a	0.05	NP
Fluoride (mg/L)	SP-5R (bg)	0.004106	16	106	No	29	0	n/a	n/a	0.05	NP
Lithium (mg/L)	**SP-10**	**-0.01229**	**-139**	**-85**	**Yes**	**25**	**0**	**n/a**	**n/a**	**0.05**	**NP**
Lithium (mg/L)	**SP-4 (bg)**	**-0.001771**	**-57**	**-45**	**Yes**	**16**	**0**	**n/a**	**n/a**	**0.05**	**NP**
Lithium (mg/L)	**SP-5R (bg)**	**-0.005108**	**-182**	**-101**	**Yes**	**28**	**0**	**n/a**	**n/a**	**0.05**	**NP**

Sen's Slope Estimator

SP-10



n = 17

Slope = 0.5476 units per year.

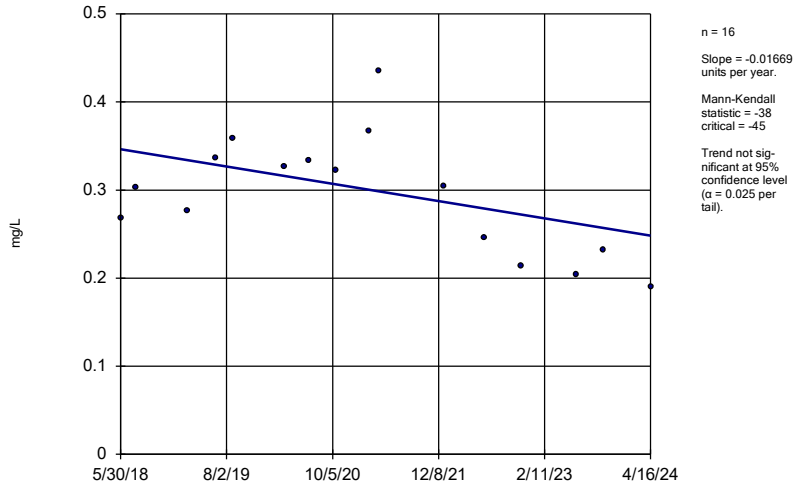
Mann-Kendall statistic = 51
critical = 49

Increasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Barium Analysis Run 7/15/2024 8:48 PM View: Appendix IV Trend Test
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sen's Slope Estimator

SP-4 (bg)



n = 16

Slope = -0.01669 units per year.

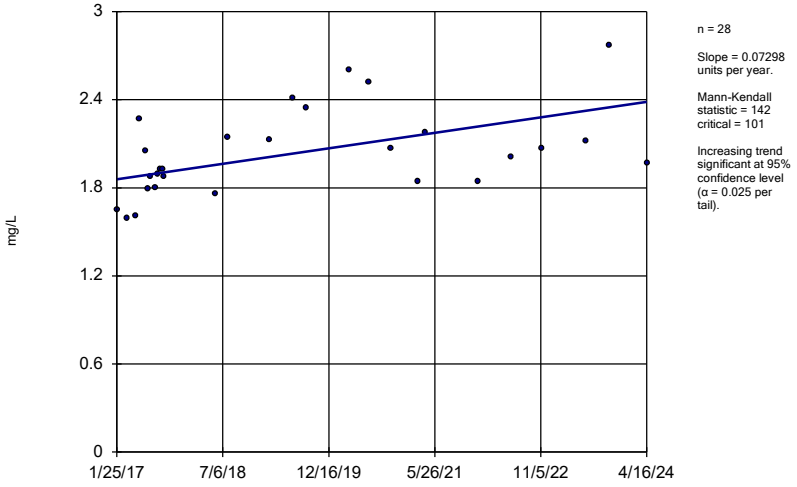
Mann-Kendall statistic = -38
critical = -45

Trend not significant at 95% confidence level (α = 0.025 per tail).

Constituent: Barium Analysis Run 7/15/2024 8:48 PM View: Appendix IV Trend Test
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sen's Slope Estimator

SP-5R (bg)



n = 28

Slope = 0.07298 units per year.

Mann-Kendall statistic = 142
critical = 101

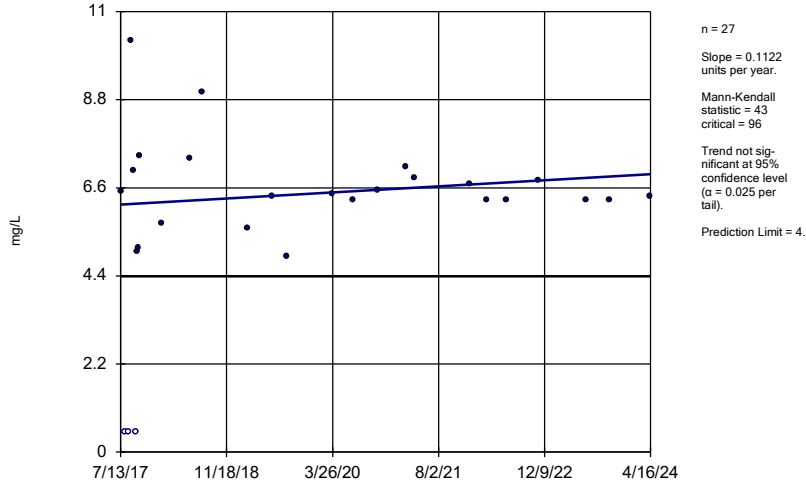
Increasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Barium Analysis Run 7/15/2024 8:48 PM View: Appendix IV Trend Test
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Hollow symbols indicate censored values.

Sen's Slope Estimator

SP-10



n = 27

Slope = 0.1122 units per year.

Mann-Kendall statistic = 43
critical = 96

Trend not significant at 95% confidence level (α = 0.025 per tail).

Prediction Limit = 4.39.

Constituent: Fluoride Analysis Run 7/15/2024 8:48 PM View: Appendix IV Trend Test
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

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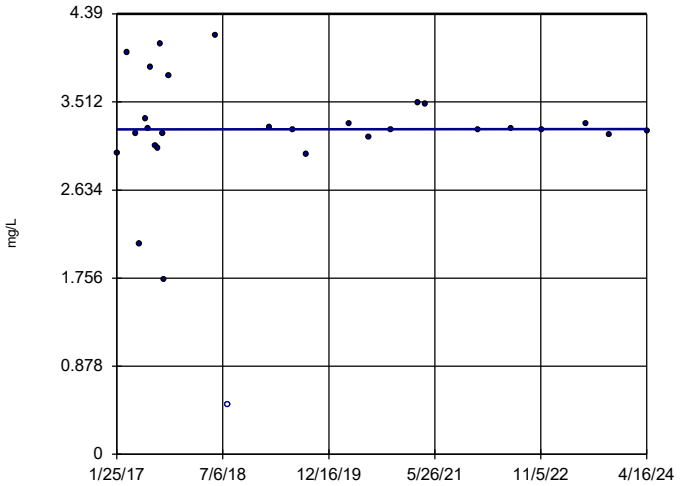
Hollow symbols indicate censored values.

Sen's Slope Estimator

SP-4 (bg)



n = 29

Slope = 0.0001108 units per year.

Mann-Kendall statistic = 4
critical = 106

Trend not significant at 95% confidence level (α = 0.025 per tail).

Prediction Limit = 4.39.

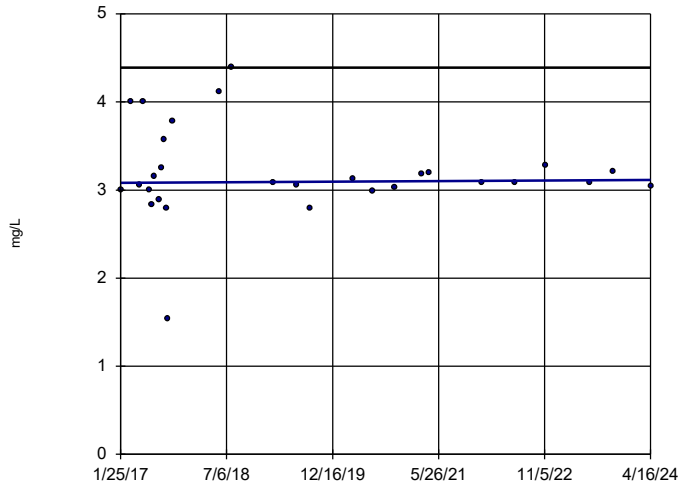
Constituent: Fluoride Analysis Run 7/15/2024 8:48 PM View: Appendix IV Trend Test

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.19h Software licensed to Groundwater Stats Consulting. UG

Sen's Slope Estimator

SP-5R (bg)



n = 29

Slope = 0.004106 units per year.

Mann-Kendall statistic = 16
critical = 106

Trend not significant at 95% confidence level (α = 0.025 per tail).

Prediction Limit = 4.39.

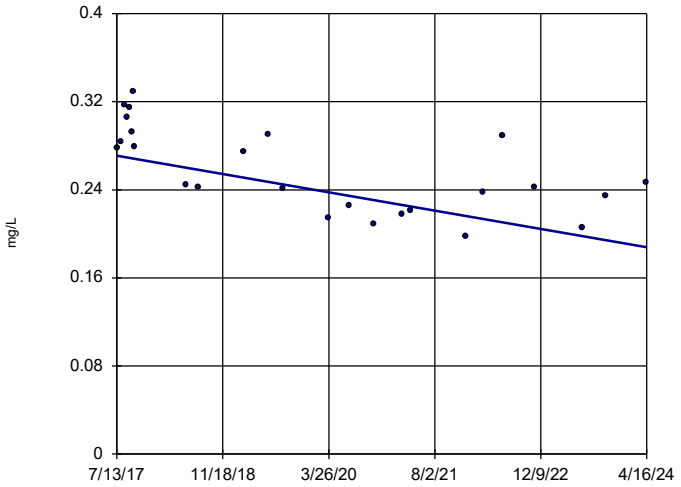
Constituent: Fluoride Analysis Run 7/15/2024 8:48 PM View: Appendix IV Trend Test

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.19h Software licensed to Groundwater Stats Consulting. UG

Sen's Slope Estimator

SP-10



n = 25

Slope = -0.01229 units per year.

Mann-Kendall statistic = -139
critical = -85

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

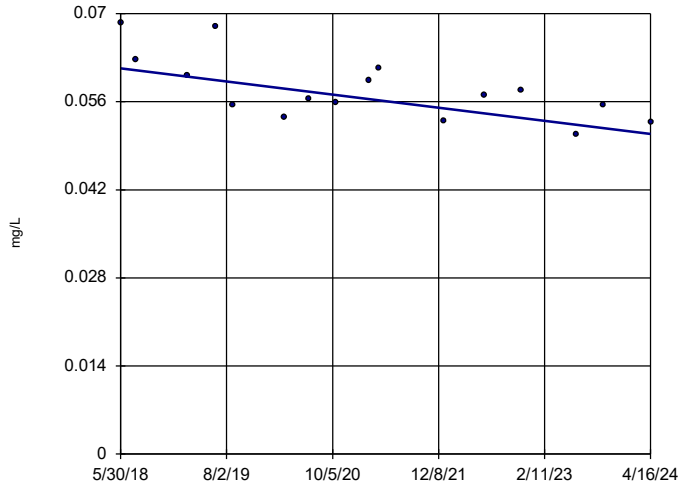
Constituent: Lithium Analysis Run 7/15/2024 8:48 PM View: Appendix IV Trend Test

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sanitas™ v.10.0.19h Software licensed to Groundwater Stats Consulting. UG

Sen's Slope Estimator

SP-4 (bg)



n = 16

Slope = -0.001771 units per year.

Mann-Kendall statistic = -57
critical = -45

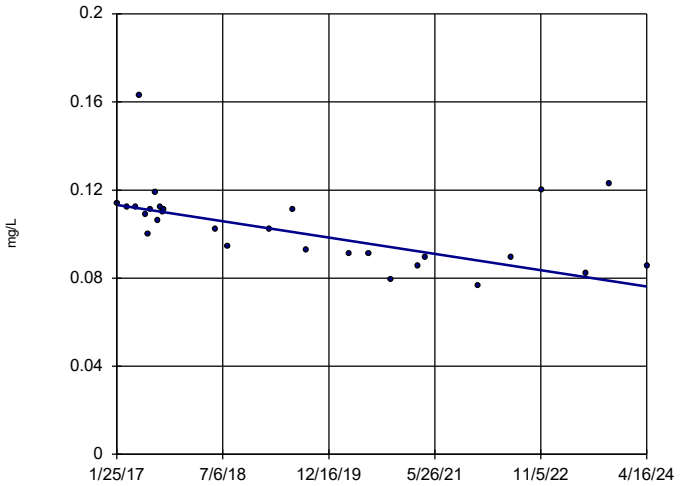
Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Lithium Analysis Run 7/15/2024 8:48 PM View: Appendix IV Trend Test

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Sen's Slope Estimator

SP-5R (bg)



n = 28

Slope = -0.005108 units per year.

Mann-Kendall statistic = -182
critical = -101

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

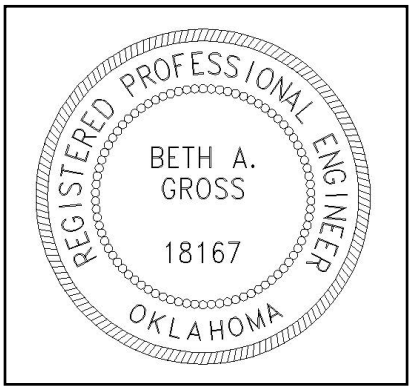
Constituent: Lithium Analysis Run 7/15/2024 8:48 PM View: Appendix IV Trend Test
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

ATTACHMENT B

Certification by Qualified Professional Engineer

CERTIFICATION BY A QUALIFIED PROFESSIONAL ENGINEER

I certify that the above described alternative source demonstration is appropriate for evaluating the groundwater monitoring data for the Bottom Ash Pond CCR management area at the Northeastern Power Station and that the requirements of OAC 252:517-9-6(g)(3)(B) have been met.



Beth Ann Gross
Printed Name of Licensed Professional Engineer

Beth Ann Gross
Signature

Geosyntec Consultants
2039 Centre Pointe Boulevard, Suite 103
Tallahassee, Florida 32308

Oklahoma Firm Certificate of
Authorization No. 1996
Exp. 6/30/2026

18167	Oklahoma	12/5/2024
License Number	Licensing State	Date

* * * * *

APPENDIX 4

Notices for Monitoring Program Transitions

Northeastern Power Station

Notice of Establishing Assessment Monitoring Program (EAP)

Bottom Ash Pond

On January 22, 2018, it was determined that Northeastern's Bottom Ash Pond had statistically significant increases over background for Boron, Chloride, Fluoride, pH, Sulfate, and Total Dissolved Solids (TDS). An alternative source demonstration was not successful within the 90 day period as allowed for in 257.94(e)(2) and 252:517-9-5(e)(2) prompting the initiation of an assessment monitoring program, which was established on April 13, 2018. Therefore this notice is being placed in the operating record in accordance with the requirement of 257.94(e)(3) and 252:517-9-5(e)(3).

PUBLIC SERVICE COMPANY OF OKLAHOMA℠

An AEP Company

BOUNDLESS ENERGY℠

Rev 1 - Rescinded by ODEQ on November 4, 2019

Northeastern Power Station

Notice of Initiating an Assessment of Corrective Measures

CCR Unit – Bottom Ash Pond

As required by OAC 252:517-9-6(g)(5), this is a notification that an Assessment of Corrective Measures was initiated on July 8, 2019 for Northeastern Power Station's Bottom Ash Pond due to the statistically significant level detected above the established groundwater protection standard for lithium. This notification is being placed in the plant's operating record, as required by OAC 252:517-19-1(h)(9).

SCOTT A. THOMPSON
Executive Director

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

KEVIN STITT
Governor

November 4, 2019

Ms. Jill Parker-Witt, P.E.
American Electric Power
502 North Allen Avenue
Shreveport, LA 71101

Re: Assessment of Corrective Measures Plan and Schedule for Analyzing an Environmental Release for Lithium –Bottom Ash Pond
Public Service Company of Oklahoma
Northeastern Power Station
Rogers County
Solid Waste Permit No. none

Dear Ms. Parker-Witt:

On July 8, 2019, the Oklahoma Department of Environmental Quality (DEQ) denied the May 1, 2019 alternate source demonstration (ASD) for lithium in the Bottom Ash Pond (BAP). Accordingly, AEP/Public Service Company of Oklahoma Northeastern Power Station (NPS) submitted, by email on October 5, 2019, the Assessment of Corrective Measures Plan and Schedule for Analyzing an Environmental Release (ACM)" as required by Oklahoma Administrative Code (OAC) 252:517-9-6(g)(4).

On September 13, 2019, NPS submitted a revised ASD that addressed concerns DEQ had with the May 1, 2019 ASD. In a letter dated October 29, 2019, DEQ approved the revised ASD.

With the approval of the revised ASD, OAC 252:517-9-6(g)(3)(B) allows NPS to continue monitoring in accordance with the assessment monitoring program. NPS is no longer required to initiate the assessment of corrective measures requirements; therefore, the ACM is withdrawn.

If you have any questions, please contact Ms. Cindy Hailes at (405) 702-5114.

Sincerely,

Hillary Young, P.E.
Chief Engineer
Land Protection Division

HY/ckh

APPENDIX 5

Well Installation/Decommissioning Logs – NA

APPENDIX 6

Groundwater monitoring Field and Laboratory Reports

NORTHEASTERN POWER PLANT
GROUNDWATER SAMPLING DATA FORM

SAMPLED BY: Kenny McDonald/Matt Hamilton . **DATE:** 04/16/24 .

Well Identification Number	MW-1D	MW-1S	MW-2D	MW-2S	MW-3D	MW-3S
Activities	Gauge	Gauge	Gauge	Gauge	Gauge	Gauge
Samples	Landfill	NA	Landfill	Slurry Wall	Landfill	Slurry Wall
Depth to Water (ft)	55.20	23.41	56.71	33.41	37.80	22.37
Measured Depth Total Depth of Well (ft.)	58.25	37.76	61.80	36.75	62.95	27.21
Height of Water Column (ft.)	3.05	14.35	5.09	3.34	25.15	4.84
Well Size (I.D.) (inches)	2	2	2	2	2	2
Volume of Water in Well (gallons)	0.50	2.34	0.83	0.54	4.10	0.79
Water Removed From Well (gallons)	0.25	----	2.00	1.25	13.00	1.50
Method of Removal	Pump	----	Pump	Pump	Pump	Pump
Was Well Purged Dry?	Yes	----	Yes	Yes	No	Yes
pH (standard units)	----	----	10.34	8.01	7.54	7.31
Temperature (°C)	----	----	20.86	21.42	22.23	20.73
Conductivity (µmhos/cc)	----	----	1850	2,440	953	3380
Turbidity (NTU)	----	----	15.2	147	7.4	162
Appearance	----	----	Slightly Turbid	Slightly Turbid	Clear	Slightly Turbid
Odor	----	----	None	None	None	None
Containers	250 mL HNO3 1 L Cool 0-6C	----	250 mL HNO3 1 L Cool 0-6C	250 mL HNO3 250 mL HCL 1 L Cool 0-6C	250 mL HNO3 1 L Cool 0-6C	250 mL HNO3 250 mL HCL 1 L Cool 0-6C
Sample Time	----	----	1718	1713	1557	1606
Sample Date	----	----	4/16/2024	4/16/2024	4/16/2024	4/16/2024

Landfill Dup
1430

For 2" well multiply by	0.163
For 4" well multiply by	0.653

NORTHEASTERN POWER PLANT
GROUNDWATER SAMPLING DATA FORM

SAMPLED BY: Kenny McDonald/Matt Hamilton . **DATE:** 04/16/24 .

Well Identification Number	MW-4D	MW-4S	MW-5D	MW-5S	MW-6D	MW-6S
Activities	Gauge	Gauge	Gauge	Gauge	Gauge	Gauge
Samples	Landfill	NA	Landfill	NA	Landfill	Slurry Wall
Depth to Water (ft)	43.80	Dry	25.27	21.11	34.48	Dry
Measured Depth Total Depth of Well (ft.)	53.86	32.94	58.42	33.15	58.51	28.20
Height of Water Column (ft.)	10.06	----	33.15	12.04	24.03	----
Well Size (I.D.) (inches)	2	2	2	2	2	2
Volume of Water in Well (gallons)	1.64	----	5.40	1.96	3.92	----
Water Removed From Well (gallons)	9.00	----	14.25	----	8.25	----
Method of Removal	Pump	----	Pump	----	Pump	----
Was Well Purged Dry?	No	----	Yes	----	Yes	----
pH (standard units)	7.19	----	7.35	----	7.49	----
Temperature (°C)	19.67	----	20.24	----	20.38	----
Conductivity (µmhos/cc)	1,140	----	1100	----	1,500	----
Turbidity (NTU)	19.7	----	5.6	----	124	----
Appearance	Clear	----	Clear	----	Slightly Turbid	----
Odor	None	----	None	----	None	----
Containers	250 mL HNO3 1 L Cool 0-6C	----	250 mL HNO3 1 L Cool 0-6C	----	250 mL HNO3 1 L Cool 0-6C	250 mL HNO3 250 mL HCL 1 L Cool 0-6C
Sample Time	1802	----	1729	----	1621	----
Sample Date	4/16/2024	----	4/16/2024	----	4/16/2024	----

For 2" well multiply by	0.163
For 4" well multiply by	0.653

NORTHEASTERN POWER PLANT
GROUNDWATER SAMPLING DATA FORM

SAMPLED BY: Kenny McDonald/Matt Hamilton . **DATE:** 04/16/24 .

Well Identification Number	MW-7D	MW-7S	MW-8D	MW-8S	MW-9D	MW-9S
Activities	Gauge	Gauge	Gauge	Gauge	Gauge	Gauge
Samples	NA	NA	NA	NA	Landfill	Slurry Wall
Depth to Water (ft)	11.74	11.79	18.88	7.40	51.03	27.36
Measured Depth Total Depth of Well (ft.)	58.70	33.54	64.50	43.30	63.10	36.71
Height of Water Column (ft.)	46.96	21.75	45.62	35.90	12.07	9.35
Well Size (I.D.) (inches)	2	2	2	2	2	2
Volume of Water in Well (gallons)	7.65	3.55	7.44	5.85	1.97	1.52
Water Removed From Well (gallons)	----	----	----	----	3.75	3.00
Method of Removal	----	----	----	----	Pump	Pump
Was Well Purged Dry?	----	----	----	----	Yes	Yes
pH (standard units)	----	----	----	----	7.85	11.93
Temperature (°C)	----	----	----	----	19.89	20.41
Conductivity (µmhos/cc)	----	----	----	----	1,710	3,400
Turbidity (NTU)	----	----	----	----	108	30.7
Appearance	----	----	----	----	Turbid	Yellowish
Odor	----	----	----	----	None	Sulphur
Containers	------	------	------	------	250 mL HNO3 1 L Cool 0-6C	250 mL HNO3 250 mL HCL 1 L Cool 0-6C
Sample Time	----	----	----	----	1637	1645
Sample Date	----	----	----	----	4/16/2024	4/16/2024

Slurry Wall Dup
1300

For 2" well multiply by	0.163
For 4" well multiply by	0.653

NORTHEASTERN POWER PLANT
GROUNDWATER SAMPLING DATA FORM

SAMPLED BY: Kenny McDonald/Matt Hamilton . **DATE:** 04/16/24 .

Well Identification Number	MW-10D	MW-10S	MW-11D	MW-11S	MW-12D	MW-12S
Activities	Gauge	Gauge	Gauge	Gauge	Gauge	Gauge
Samples	Landfill	NA	Landfill	NA	Landfill	Slurry Wall
Depth to Water (ft)	68.61	21.07	48.48	16.17	16.98	11.93
Measured Depth Total Depth of Well (ft.)	71.33	36.22	50.34	31.02	44.92	22.94
Height of Water Column (ft.)	2.72	15.15	1.86	14.85	27.94	11.01
Well Size (I.D.) (inches)	2	2	2	2	2	2
Volume of Water in Well (gallons)	0.44	2.47	0.30	2.42	4.55	1.79
Water Removed From Well (gallons)	0.25	----	0.25	----	13.00	2.25
Method of Removal	Pump	----	Pump	----	Pump	Pump
Was Well Purged Dry?	----	----	----	----	Yes	Yes
pH (standard units)	----	----	----	----	8.36	6.86
Temperature (°C)	----	----	----	----	20.78	20.91
Conductivity (µmhos/cc)	----	----	----	----	1,220	1,340
Turbidity (NTU)	----	----	----	----	83.6	65.2
Appearance	----	----	----	----	Slightly Turbid	Slightly Turbid
Odor	----	----	----	----	None	Sewage
Containers	250 mL HNO3 1 L Cool 0-6C	------	250 mL HNO3 1 L Cool 0-6C	------	250 mL HNO3 1 L Cool 0-6C	250 mL HNO3 250 mL HCL 1 L Cool 0-6C
Sample Time	----	----	----	----	1438	1434
Sample Date	----	----	----	----	4/16/2024	4/16/2024

For 2" well multiply by	0.163
For 4" well multiply by	0.653

NORTHEASTERN POWER PLANT
GROUNDWATER SAMPLING DATA FORM

SAMPLED BY: Kenny McDonald/Matt Hamilton . **DATE:** 04/16/24 .

Well Identification Number	MW-13D	MW-13S	MW-14	MW-15	MW-16	MW-17
Activities	Gauge	Gauge	Gauge	Gauge	Gauge	Gauge
Samples	Landfill	Slurry Wall	Landfill	Landfill	Landfill	Landfill
Depth to Water (ft)	44.51	13.83	68.59	57.65	62.71	52.19
Measured Depth Total Depth of Well (ft.)	47.56	18.12	78.96	74.21	64.15	58.41
Height of Water Column (ft.)	3.05	4.29	10.37	16.56	1.44	6.22
Well Size (I.D.) (inches)	2	2	2	2	2	2
Volume of Water in Well (gallons)	0.50	0.70	1.69	2.70	0.23	1.01
Water Removed From Well (gallons)	1.00	2.25	1.50	4.50	----	0.75
Method of Removal	Pump	Pump	Pump	Pump	----	Pump
Was Well Purged Dry?	Yes	No	Yes	Yes	----	Yes
pH (standard units)	7.24	7.26	7.28	7.94	----	----
Temperature (°C)	21.79	19.82	20.23	20.96	----	----
Conductivity (µmhos/cc)	1,520	1330	9,140	1,430	----	----
Turbidity (NTU)	134	13.2	18.7	21.1	----	----
Appearance	Slightly Turbid	Clear	Clear	Clear	----	----
Odor	None	None	None	None	----	----
Containers	250 mL HNO3 1 L Cool 0-6C	250 mL HNO3 250 mL HCL 1 L Cool 0-6C	250 mL HNO3 1 L Cool 0-6C	250 mL HNO3 1 L Cool 0-6C	250 mL HNO3 1 L Cool 0-6C	250 mL HNO3 1 L Cool 0-6C
Sample Time	1413	1419	1743	1701	----	----
Sample Date	4/16/2024	4/16/2024	4/16/2024	4/16/2024	----	----

For 2" well multiply by	0.163
For 4" well multiply by	0.653

NORTHEASTERN POWER PLANT
GROUNDWATER SAMPLING DATA FORM

SAMPLED BY: Kenny McDonald/Matt Hamilton . **DATE:** 04/16/24 .

Well Identification Number	MW-18	MW-19				
Activities	Gauge	Gauge				
Samples	Landfill	Landfill				
Depth to Water (ft)	37.25	21.49				
Measured Depth Total Depth of Well (ft.)	93.78	93.80				
Height of Water Column (ft.)	56.53	72.31				
Well Size (I.D.) (inches)	2	2				
Volume of Water in Well (gallons)	9.21	11.79				
Water Removed From Well (gallons)	7.75	16.50				
Method of Removal	Pump	Pump				
Was Well Purged Dry?	Yes	Yes				
pH (standard units)	6.94	7.21				
Temperature (°C)	20.48	20.86				
Conductivity (µmhos/cc)	41,200	38,600				
Turbidity (NTU)	13.7	19.8				
Appearance	Clear	Clear				
Odor	None	Sulphur				
Containers	250 mL HNO3 1 L Cool 0-6C	250 mL HNO3 1 L Cool 0-6C				
Sample Time	1827	1816				
Sample Date	4/16/2024	4/16/2024				

For 2" well multiply by	0.163
For 4" well multiply by	0.653

NORTHEASTERN POWER PLANT
GROUNDWATER SAMPLING DATA FORM

SAMPLED BY: Kenny McDonald/Matt Hamilton . **DATE:** 04/16/24 .

Well Identification Number	SP-1	SP-2	SP-4	SP-5R	SP-10	SP-11
Activities	Gauge	Gauge	Gauge	Gauge	Gauge	Gauge
Samples	BAP	BAP	BAP	BAP	BAP++	BAP
Depth to Water (ft)	16.70	21.73	12.90	5.51	13.87	7.64
Measured Depth Total Depth of Well (ft.)	37.99	38.19	38.30	78.00	54.10	34.51
Height of Water Column (ft.)	21.29	16.46	25.40	72.49	40.23	26.87
Well Size (I.D.) (inches)	2	2	2	2	2	2
Volume of Water in Well (gallons)	3.47	2.68	4.14	11.82	6.56	4.38
Water Removed From Well (gallons)	12.00	12.00	10.25	27.75	20.50	9.25
Method of Removal	Pump	Pump	Pump	Pump	Pump	Pump
Was Well Purged Dry?	No	No	Yes	Yes	Yes	Yes
pH (standard units)	7.76	7.61	7.58	7.54	7.69	7.59
Temperature (°C)	19.72	20.14	20.47	20.24	19.89	19.82
Conductivity (µmhos/cc)	879	3,510	2,180	3,120	6,100	1,590
Turbidity (NTU)	13.2	28.2	20.2	47.1	10.2	38.9
Appearance	Clear	Clear	Clear	Clear	Slight Black Tint	Clear
Odor	None	None	None	None	Sulphur	None
Containers	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C
Sample Time	1535	1522	1841	1906	1500	1511
Sample Date	4/16/2024	4/16/2024	4/16/2024	4/16/2024	4/16/2024	4/16/2024

BAP DUP 1400

For 2" well multiply by	0.163
For 4" well multiply by	0.653

NORTHEASTERN POWER PLANT
GROUNDWATER SAMPLING DATA FORM

SAMPLED BY: Kenny McDonald/Matt Hamilton . **DATE:** 04/16/24 .

Well Identification Number	SP-3	SP-6	SP-7	SP-8	SP-9	
Activities	Gauge	Gauge	Gauge	Gauge	Gauge	
Samples	NA	NA	NA	NA	NA	
Depth to Water (ft)	14.97	20.14	23.93	5.99	43.00	
Measured Depth Total Depth of Well (ft.)	37.90	73.93	84.02	74.06	78.82	
Height of Water Column (ft.)	37.90	53.79	60.09	68.07	35.82	
Well Size (I.D.) (inches)	2	2	2	2	2	
Volume of Water in Well (gallons)	6.18	8.77	9.79	11.10	5.84	
Water Removed From Well (gallons)	----	----	----	----	----	
Method of Removal	----	----	----	----	----	
Was Well Purged Dry?	----	----	----	----	----	
pH (standard units)	----	----	----	----	----	
Temperature (°C)	----	----	----	----	----	
Conductivity (µmhos/cc)	----	----	----	----	----	
Turbidity (NTU)	----	----	----	----	----	
Appearance	----	----	----	----	----	
Odor	----	----	----	----	----	
Containers	------	------	-------	------	------	
Sample Time	----	----	----	----	----	
Sample Date	----	----	----	----	----	

For 2" well multiply by	0.163
For 4" well multiply by	0.653

NORTHEASTERN POWER PLANT
GROUNDWATER SAMPLING DATA FORM

SAMPLED BY: Kenny McDonald . **DATE:** 10/22/24 .

Well Identification Number	MW-1D	MW-1S	MW-2D	MW-2S	MW-3D	MW-3S
Activities	Gauge	Gauge	Gauge	Gauge	Gauge	Gauge
Samples	Landfill	NA	Landfill	Slurry Wall	Landfill	Slurry Wall
Depth to Water (ft)	54.34	26.78	60.81	35.65	37.80	25.62
Measured Depth Total Depth of Well (ft.)	58.25	37.76	61.80	36.75	62.95	27.21
Height of Water Column (ft.)	3.91	10.98	0.99	1.10	25.15	1.59
Well Size (I.D.) (inches)	2	2	2	2	2	2
Volume of Water in Well (gallons)	0.64	1.79	0.16	0.18	4.10	0.26
Water Removed From Well (gallons)	0.50	----	0.00	0.00	12.50	0.25
Method of Removal	Pump	----	Pump	Pump	Pump	Pump
Was Well Purged Dry?	Yes	----	Yes	Yes	Yes	Yes
pH (standard units)	----	----	----	----	7.31	----
Temperature (°C)	----	----	----	----	19.79	----
Conductivity (µmhos/cc)	----	----	----	----	960	----
Turbidity (NTU)	----	----	----	----	65.4	----
Appearance	----	----	----	----	Slightly Turbid	----
Odor	----	----	----	----	None	----
Containers	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C	----	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C	250 mL HNO3 250 mL HCL 1 L Cool 0-6C	250 mL HNO3 1 L Cool 0-6C	250 mL HNO3 250 mL HCL 1 L Cool 0-6C
Sample Time	----	----	----	----	947	----
Sample Date	----	----	----	----	10/22/2024	----

For 2" well multiply by	0.163
For 4" well multiply by	0.653

NORTHEASTERN POWER PLANT
GROUNDWATER SAMPLING DATA FORM

SAMPLED BY: Kenny McDonald . **DATE:** 10/22/24 .

Well Identification Number	MW-4D	MW-4S	MW-5D	MW-5S	MW-6D	MW-6S
Activities	Gauge	Gauge	Gauge	Gauge	Gauge	Gauge
Samples	Landfill	NA	Landfill	NA	Landfill	Slurry Wall
Depth to Water (ft)	44.20	Dry	30.06	24.75	34.23	Dry
Measured Depth Total Depth of Well (ft.)	53.86	32.94	58.42	33.15	58.51	28.20
Height of Water Column (ft.)	9.66	----	28.36	8.40	24.28	----
Well Size (I.D.) (inches)	2	2	2	2	2	2
Volume of Water in Well (gallons)	1.57	----	4.62	1.37	3.96	----
Water Removed From Well (gallons)	6.25	----	11.75	----	8.00	----
Method of Removal	Pump	----	Pump	----	Pump	----
Was Well Purged Dry?	Yes	----	Yes	----	Yes	----
pH (standard units)	7.08	----	7.11	----	7.37	----
Temperature (°C)	20.09	----	21.21	----	20.58	----
Conductivity (µmhos/cc)	1,180	----	914	----	1,390	----
Turbidity (NTU)	137	----	34.6	----	104	----
Appearance	Turbid	----	Clear	----	Slightly Turbid	----
Odor	None	----	None	----	None	----
Containers	250 mL HNO3 1 L Cool 0-6C	----	250 mL HNO3 1 L Cool 0-6C	----	250 mL HNO3 1 L Cool 0-6C	250 mL HNO3 250 mL HCL 1 L Cool 0-6C
Sample Time	834	----	1213	----	1025	----
Sample Date	10/22/2024	----	10/22/2024	----	10/22/2024	----

Landfill Dup 1230

For 2" well multiply by	0.163
For 4" well multiply by	0.653

NORTHEASTERN POWER PLANT
GROUNDWATER SAMPLING DATA FORM

SAMPLED BY: Kenny McDonald . **DATE:** 10/22/24 .

Well Identification Number	MW-7D	MW-7S	MW-8D	MW-8S	MW-9D	MW-9S
Activities	Gauge	Gauge	Gauge	Gauge	Gauge	Gauge
Samples	NA	NA	NA	NA	Landfill	Slurry Wall
Depth to Water (ft)	13.25	13.39	27.92	11.18	44.93	28.37
Measured Depth Total Depth of Well (ft.)	58.70	33.54	64.50	43.30	63.10	36.71
Height of Water Column (ft.)	45.45	20.15	36.58	32.12	18.17	8.34
Well Size (I.D.) (inches)	2	2	2	2	2	2
Volume of Water in Well (gallons)	7.41	3.28	5.96	5.24	2.96	1.36
Water Removed From Well (gallons)	----	----	----	----	4.25	2.50
Method of Removal	----	----	----	----	Pump	Pump
Was Well Purged Dry?	----	----	----	----	Yes	Yes
pH (standard units)	----	----	----	----	8.27	12.01
Temperature (°C)	----	----	----	----	20.94	21.93
Conductivity (µmhos/cc)	----	----	----	----	1,570	3,190
Turbidity (NTU)	----	----	----	----	204	52.4
Appearance	----	----	----	----	Turbid	Brown
Odor	----	----	----	----	None	None
Containers	----	----	----	----	250 mL HNO3 3 x 1L HNO3 1 L Cool 0-6C	250 mL HNO3 250 mL HCL 1 L Cool 0-6C
Sample Time	----	----	----	----	1104	1052
Sample Date	----	----	----	----	10/22/2024	10/22/2024

Slurry Wall Dup
1200

For 2" well multiply by	0.163
For 4" well multiply by	0.653

NORTHEASTERN POWER PLANT
GROUNDWATER SAMPLING DATA FORM

SAMPLED BY: Kenny McDonald . **DATE:** 10/22/24 .

Well Identification Number	MW-10D	MW-10S	MW-11D	MW-11S	MW-12D	MW-12S
Activities	Gauge	Gauge	Gauge	Gauge	Gauge	Gauge
Samples	Landfill	NA	Landfill	NA	Landfill	Slurry Wall
Depth to Water (ft)	67.86	26.51	48.33	17.60	19.39	19.77
Measured Depth Total Depth of Well (ft.)	71.33	36.22	50.34	31.02	44.92	22.94
Height of Water Column (ft.)	3.47	9.71	2.01	13.42	25.53	3.17
Well Size (I.D.) (inches)	2	2	2	2	2	2
Volume of Water in Well (gallons)	0.57	1.58	0.33	2.19	4.16	0.52
Water Removed From Well (gallons)	0.25	----	0.25	----	10.75	1.50
Method of Removal	Pump	----	Pump	----	Pump	Pump
Was Well Purged Dry?	Yes	----	Yes	----	Yes	Yes
pH (standard units)	----	----	----	----	8.18	6.81
Temperature (°C)	----	----	----	----	20.67	24.12
Conductivity (µmhos/cc)	----	----	----	----	1,200	1,600
Turbidity (NTU)	----	----	----	----	97.3	32.6
Appearance	----	----	----	----	Slightly Turbid	Slightly Turbid
Odor	----	----	----	----	None	None
Containers	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C	----	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C	----	250 mL HNO3 1 L Cool 0-6C	250 mL HNO3 250 mL HCL 1 L Cool 0-6C
Sample Time	----	----	----	----	1506	1452
Sample Date	----	----	----	----	10/22/2024	10/22/2024

For 2" well multiply by	0.163
For 4" well multiply by	0.653

NORTHEASTERN POWER PLANT
GROUNDWATER SAMPLING DATA FORM

SAMPLED BY: Kenny McDonald . **DATE:** 10/22/24 .

Well Identification Number	MW-13D	MW-13S	MW-14	MW-15	MW-16	MW-17
Activities	Gauge	Gauge	Gauge	Gauge	Gauge	Gauge
Samples	Landfill	Slurry Wall	Landfill	Landfill	Landfill	Landfill
Depth to Water (ft)	38.40	Dry	59.71	61.75	63.23	50.16
Measured Depth Total Depth of Well (ft.)	47.56	18.12	78.96	74.21	64.15	58.41
Height of Water Column (ft.)	9.16	----	19.25	12.46	0.92	8.25
Well Size (I.D.) (inches)	2	2	2	2	2	2
Volume of Water in Well (gallons)	1.49	----	3.14	2.03	0.15	1.34
Water Removed From Well (gallons)	4.00	----	5.25	4.75	----	1.00
Method of Removal	Pump	----	Pump	Pump	----	Pump
Was Well Purged Dry?	Yes	----	Yes	Yes	----	Yes
pH (standard units)	7.26	----	7.67	8.21	----	----
Temperature (°C)	22.84	----	21.69	20.78	----	----
Conductivity (µmhos/cc)	1,460	----	4,510	1,340	----	----
Turbidity (NTU)	42.7	----	20.6	127	----	----
Appearance	Clear	----	Clear	Slightly Turbid	----	----
Odor	None	----	None	None	----	----
Containers	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C	250 mL HNO3 250 mL HCL 1 L Cool 0-6C	250 mL HNO3 3 x 1L HNO3 1 L Cool 0-6C	250 mL HNO3 1 L Cool 0-6C	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C
Sample Time	1425	----	1247	1136	----	----
Sample Date	10/22/2024	----	10/22/2024	10/22/2024	----	----

For 2" well multiply by	0.163
For 4" well multiply by	0.653

NORTHEASTERN POWER PLANT
GROUNDWATER SAMPLING DATA FORM

SAMPLED BY: Kenny McDonald . **DATE:** 10/22/24 .

Well Identification Number	MW-18	MW-19				
Activities	Gauge	Gauge				
Samples	Landfill	Landfill				
Depth to Water (ft)	22.30	21.16				
Measured Depth Total Depth of Well (ft.)	93.78	93.80				
Height of Water Column (ft.)	71.48	72.64				
Well Size (I.D.) (inches)	2	2				
Volume of Water in Well (gallons)	11.65	11.84				
Water Removed From Well (gallons)	12.25	19.25				
Method of Removal	Pump	Pump				
Was Well Purged Dry?	Yes	Yes				
pH (standard units)	7.36	8.15				
Temperature (°C)	20.06	20.13				
Conductivity (µmhos/cc)	32,300	41,000				
Turbidity (NTU)	16.5	24.8				
Appearance	Clear	Clear				
Odor	Sulphur	None				
Containers	250 mL HNO3 1 L Cool 0-6C	250 mL HNO3 1 L Cool 0-6C				
Sample Time	1704	1736				
Sample Date	10/22/2024	10/22/2024				

For 2" well multiply by	0.163
For 4" well multiply by	0.653

NORTHEASTERN POWER PLANT
GROUNDWATER SAMPLING DATA FORM

SAMPLED BY: Kenny McDonald . **DATE:** 10/22/24 .

Well Identification Number	SP-1	SP-2	SP-4	SP-5R	SP-10	SP-11
Activities	Gauge	Gauge	Gauge	Gauge	Gauge	Gauge
Samples	BAP	BAP	BAP	BAP	BAP++	BAP
Depth to Water (ft)	18.24	22.28	11.01	9.83	0.00	11.56
Measured Depth Total Depth of Well (ft.)	37.99	38.19	38.30	78.00	54.10	34.51
Height of Water Column (ft.)	19.75	15.91	27.29	68.17	54.10	22.95
Well Size (I.D.) (inches)	2	2	2	2	2	2
Volume of Water in Well (gallons)	3.22	2.59	4.45	11.11	8.82	3.74
Water Removed From Well (gallons)	11.00	9.00	10.00	25.75	21.75	6.75
Method of Removal	Pump	Pump	Pump	Pump	Pump	Pump
Was Well Purged Dry?	No	No	Yes	Yes	Yes	Yes
pH (standard units)	7.49	7.32	7.94	7.83	7.91	7.39
Temperature (°C)	22.87	22.71	21.83	19.32	22.35	22.42
Conductivity (µmhos/cc)	853	1,890	2,000	2,700	6,210	1,360
Turbidity (NTU)	11.4	10.7	14.9	18.6	10.7	14.8
Appearance	Clear	Clear	Clear	Clear	Clear	Clear
Odor	None	None	None	None	Slight Sulphur	None
Containers	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C	250 mL HNO3 125 mL HCL 3 x 1L HNO3 1 L Cool 0-6C
Sample Time	1608	1537	1641	1809	1316	1349
Sample Date	10/22/2024	10/22/2024	10/22/2024	10/22/2024	10/22/2024	10/22/2024

BAP Dup 1300

For 2" well multiply by	0.163
For 4" well multiply by	0.653

NORTHEASTERN POWER PLANT
GROUNDWATER SAMPLING DATA FORM

SAMPLED BY: Kenny McDonald . **DATE:** 10/22/24 .

Well Identification Number	SP-3	SP-6	SP-7	SP-8	SP-9	
Activities	Gauge	Gauge	Gauge	Gauge	Gauge	
Samples	NA	NA	NA	NA	NA	
Depth to Water (ft)	0.00	20.21	23.73	7.88	39.61	
Measured Depth Total Depth of Well (ft.)	37.90	73.93	84.02	74.06	78.82	
Height of Water Column (ft.)	37.90	53.72	60.29	66.18	39.21	
Well Size (I.D.) (inches)	2	2	2	2	2	
Volume of Water in Well (gallons)	6.18	8.76	9.83	10.79	6.39	
Water Removed From Well (gallons)	----	----	----	----	----	
Method of Removal	----	----	----	----	----	
Was Well Purged Dry?	----	----	----	----	----	
pH (standard units)	----	----	----	----	----	
Temperature (°C)	----	----	----	----	----	
Conductivity (µmhos/cc)	----	----	----	----	----	
Turbidity (NTU)	----	----	----	----	----	
Appearance	----	----	----	----	----	
Odor	----	----	----	----	----	
Containers	----	----	----	----	----	
Sample Time	----	----	----	----	----	
Sample Date	----	----	----	----	----	

For 2" well multiply by	0.163
For 4" well multiply by	0.653

Water Analysis Report

Reissued

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 241340 **Customer: Northeastern 3&4 Power Station** **Date Reported: 07/02/2024**

Customer Sample ID: SP-1
Lab Number: 241340-001
Date Collected: 04/16/2024 16:35 EDT

Customer Description:
Preparation:
Date Received: 04/23/2024 10:00 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.433	µg/L	1	0.100	0.008		GES	05/08/2024 19:36	EPA 200.8-1994, Rev. 5.4
Arsenic	0.40	µg/L	1	0.10	0.03		GES	05/08/2024 19:36	EPA 200.8-1994, Rev. 5.4
Barium	134	µg/L	1	0.20	0.05		GES	05/08/2024 19:36	EPA 200.8-1994, Rev. 5.4
Beryllium	0.050	µg/L	1	0.050	0.007		GES	05/08/2024 19:36	EPA 200.8-1994, Rev. 5.4
Boron	0.201	mg/L	1	0.050	0.007		GES	05/08/2024 19:36	EPA 200.8-1994, Rev. 5.4
Cadmium	0.053	µg/L	1	0.020	0.004		GES	05/08/2024 19:36	EPA 200.8-1994, Rev. 5.4
Calcium	113	mg/L	1	0.05	0.02		GES	05/08/2024 19:36	EPA 200.8-1994, Rev. 5.4
Chromium	0.63	µg/L	1	0.30	0.07		GES	05/08/2024 19:36	EPA 200.8-1994, Rev. 5.4
Cobalt	0.164	µg/L	1	0.020	0.005		GES	05/08/2024 19:36	EPA 200.8-1994, Rev. 5.4
Lead	0.33	µg/L	1	0.20	0.05		GES	05/08/2024 19:36	EPA 200.8-1994, Rev. 5.4
Lithium	0.00615	mg/L	1	0.00030	0.00006		GES	05/08/2024 19:36	EPA 200.8-1994, Rev. 5.4
Magnesium	27.5	mg/L	1	0.100	0.009		GES	05/08/2024 19:36	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	04/25/2024 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	14.9	µg/L	1	0.5	0.1		GES	05/08/2024 19:36	EPA 200.8-1994, Rev. 5.4
Potassium	0.98	mg/L	1	0.10	0.01		GES	05/08/2024 19:36	EPA 200.8-1994, Rev. 5.4
Selenium	5.43	µg/L	1	0.50	0.04		GES	05/08/2024 19:36	EPA 200.8-1994, Rev. 5.4
Sodium	51.2	mg/L	1	0.20	0.02		GES	05/08/2024 19:36	EPA 200.8-1994, Rev. 5.4
Thallium	0.06	µg/L	1	0.20	0.02	J1	GES	05/08/2024 19:36	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	1.63	pCi/L	0.21	0.19	L1, P2	ST	05/15/2024 08:26	SW-846 9315-1986, Rev. 0
Carrier Recovery	97.1	%						
Radium-228	0.32	pCi/L	0.16	0.55		TTP	05/16/2024 15:02	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	84.5	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 241340 **Customer: Northeastern 3&4 Power Station** **Date Reported: 07/02/2024**

Customer Sample ID: SP-2
Lab Number: 241340-002
Date Collected: 04/16/2024 16:22 EDT

Customer Description:
Preparation:
Date Received: 04/23/2024 10:00 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.318	µg/L	1	0.100	0.008		GES	05/08/2024 19:41	EPA 200.8-1994, Rev. 5.4
Arsenic	1.40	µg/L	1	0.10	0.03		GES	05/08/2024 19:41	EPA 200.8-1994, Rev. 5.4
Barium	1690	µg/L	1	0.20	0.05		GES	05/08/2024 19:41	EPA 200.8-1994, Rev. 5.4
Beryllium	0.131	µg/L	1	0.050	0.007		GES	05/08/2024 19:41	EPA 200.8-1994, Rev. 5.4
Boron	0.210	mg/L	1	0.050	0.007		GES	05/08/2024 19:41	EPA 200.8-1994, Rev. 5.4
Cadmium	0.034	µg/L	1	0.020	0.004		GES	05/08/2024 19:41	EPA 200.8-1994, Rev. 5.4
Calcium	172	mg/L	1	0.05	0.02		GES	05/08/2024 19:41	EPA 200.8-1994, Rev. 5.4
Chromium	0.41	µg/L	1	0.30	0.07		GES	05/08/2024 19:41	EPA 200.8-1994, Rev. 5.4
Cobalt	1.71	µg/L	1	0.020	0.005		GES	05/08/2024 19:41	EPA 200.8-1994, Rev. 5.4
Lead	0.12	µg/L	1	0.20	0.05	J1	GES	05/08/2024 19:41	EPA 200.8-1994, Rev. 5.4
Lithium	0.0784	mg/L	1	0.00030	0.00006		GES	05/08/2024 19:41	EPA 200.8-1994, Rev. 5.4
Magnesium	65.1	mg/L	1	0.100	0.009		GES	05/08/2024 19:41	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	04/25/2024 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	11.5	µg/L	1	0.5	0.1		GES	05/08/2024 19:41	EPA 200.8-1994, Rev. 5.4
Potassium	3.64	mg/L	1	0.10	0.01		GES	05/08/2024 19:41	EPA 200.8-1994, Rev. 5.4
Selenium	0.37	µg/L	1	0.50	0.04	J1	GES	05/08/2024 19:41	EPA 200.8-1994, Rev. 5.4
Sodium	571	mg/L	5	1.0	0.1		GES	05/08/2024 19:46	EPA 200.8-1994, Rev. 5.4
Thallium	0.05	µg/L	1	0.20	0.02	J1	GES	05/08/2024 19:41	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	3.56	pCi/L	0.28	0.12	L1, P2	ST	05/15/2024 08:26	SW-846 9315-1986, Rev. 0
Carrier Recovery	108	%						
Radium-228	0.27	pCi/L	0.22	0.75		TTP	05/16/2024 15:02	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	96.9	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 241340 **Customer: Northeastern 3&4 Power Station** **Date Reported: 07/02/2024**

Customer Sample ID: SP-4
Lab Number: 241340-003
Date Collected: 04/16/2024 19:41 EDT

Customer Description:
Preparation:
Date Received: 04/23/2024 10:00 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.169	µg/L	1	0.100	0.008		GES	05/08/2024 19:51	EPA 200.8-1994, Rev. 5.4
Arsenic	0.70	µg/L	1	0.10	0.03		GES	05/08/2024 19:51	EPA 200.8-1994, Rev. 5.4
Barium	190	µg/L	1	0.20	0.05		GES	05/08/2024 19:51	EPA 200.8-1994, Rev. 5.4
Beryllium	0.033	µg/L	1	0.050	0.007	J1	GES	05/08/2024 19:51	EPA 200.8-1994, Rev. 5.4
Boron	0.337	mg/L	1	0.050	0.007		GES	05/08/2024 19:51	EPA 200.8-1994, Rev. 5.4
Cadmium	0.019	µg/L	1	0.020	0.004	J1	GES	05/08/2024 19:51	EPA 200.8-1994, Rev. 5.4
Calcium	108	mg/L	1	0.05	0.02	M1	GES	05/08/2024 19:51	EPA 200.8-1994, Rev. 5.4
Chromium	0.27	µg/L	1	0.30	0.07	J1	GES	05/08/2024 19:51	EPA 200.8-1994, Rev. 5.4
Cobalt	0.123	µg/L	1	0.020	0.005		GES	05/08/2024 19:51	EPA 200.8-1994, Rev. 5.4
Lead	0.10	µg/L	1	0.20	0.05	J1	GES	05/08/2024 19:51	EPA 200.8-1994, Rev. 5.4
Lithium	0.0527	mg/L	1	0.00030	0.00006		GES	05/08/2024 19:51	EPA 200.8-1994, Rev. 5.4
Magnesium	37.6	mg/L	1	0.100	0.009	M1	GES	05/08/2024 19:51	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	H2, Q5, Q1, U1	RLP	07/02/2024 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	3.2	µg/L	1	0.5	0.1		GES	05/08/2024 19:51	EPA 200.8-1994, Rev. 5.4
Potassium	2.45	mg/L	1	0.10	0.01		GES	05/08/2024 19:51	EPA 200.8-1994, Rev. 5.4
Selenium	0.38	µg/L	1	0.50	0.04	J1	GES	05/08/2024 19:51	EPA 200.8-1994, Rev. 5.4
Sodium	335	mg/L	5	1.0	0.1	M1	GES	05/08/2024 19:57	EPA 200.8-1994, Rev. 5.4
Thallium	<0.02	µg/L	1	0.20	0.02	U1	GES	05/08/2024 19:51	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	3.04	pCi/L	0.27	0.15	L1, P2	ST	05/15/2024 08:26	SW-846 9315-1986, Rev. 0
Carrier Recovery	103	%						
Radium-228	0.45	pCi/L	0.14	0.46		TTP	05/16/2024 15:02	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	79.7	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 241340 **Customer: Northeastern 3&4 Power Station** **Date Reported: 07/02/2024**

Customer Sample ID: SP-5R
Lab Number: 241340-004
Date Collected: 04/16/2024 20:06 EDT

Customer Description:
Preparation:
Date Received: 04/23/2024 10:00 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.131	µg/L	1	0.100	0.008		GES	05/09/2024 10:10	EPA 200.8-1994, Rev. 5.4
Arsenic	6.69	µg/L	1	0.10	0.03		GES	05/09/2024 10:10	EPA 200.8-1994, Rev. 5.4
Barium	1970	µg/L	5	1.0	0.3		GES	05/09/2024 10:15	EPA 200.8-1994, Rev. 5.4
Beryllium	0.061	µg/L	1	0.050	0.007		GES	05/09/2024 10:10	EPA 200.8-1994, Rev. 5.4
Boron	0.189	mg/L	1	0.050	0.007		GES	05/09/2024 10:10	EPA 200.8-1994, Rev. 5.4
Cadmium	0.038	µg/L	1	0.020	0.004		GES	05/09/2024 10:10	EPA 200.8-1994, Rev. 5.4
Calcium	90.5	mg/L	1	0.05	0.02		GES	05/09/2024 10:10	EPA 200.8-1994, Rev. 5.4
Chromium	0.45	µg/L	1	0.30	0.07		GES	05/09/2024 10:10	EPA 200.8-1994, Rev. 5.4
Cobalt	0.321	µg/L	1	0.020	0.005		GES	05/09/2024 10:10	EPA 200.8-1994, Rev. 5.4
Lead	0.66	µg/L	1	0.20	0.05		GES	05/09/2024 10:10	EPA 200.8-1994, Rev. 5.4
Lithium	0.0856	mg/L	1	0.00030	0.00006		GES	05/09/2024 10:10	EPA 200.8-1994, Rev. 5.4
Magnesium	30.2	mg/L	1	0.100	0.009		GES	05/09/2024 10:10	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	04/25/2024 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	0.7	µg/L	1	0.5	0.1		GES	05/09/2024 10:10	EPA 200.8-1994, Rev. 5.4
Potassium	2.71	mg/L	1	0.10	0.01		GES	05/09/2024 10:10	EPA 200.8-1994, Rev. 5.4
Selenium	0.13	µg/L	1	0.50	0.04	J1	GES	05/09/2024 10:10	EPA 200.8-1994, Rev. 5.4
Sodium	438	mg/L	5	1.0	0.1		GES	05/09/2024 10:15	EPA 200.8-1994, Rev. 5.4
Thallium	<0.02	µg/L	1	0.20	0.02	U1	GES	05/09/2024 10:10	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	7.81	pCi/L	0.39	0.11	L1, P2	ST	05/15/2024 08:26	SW-846 9315-1986, Rev. 0
Carrier Recovery	121	%						
Radium-228	0.58	pCi/L	0.13	0.41		TTP	05/16/2024 15:02	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	84.5	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 241340 **Customer: Northeastern 3&4 Power Station** **Date Reported: 07/02/2024**

Customer Sample ID: SP-10
Lab Number: 241340-005
Date Collected: 04/16/2024 16:00 EDT

Customer Description:
Preparation:
Date Received: 04/23/2024 10:00 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.076	µg/L	1	0.100	0.008	J1	GES	05/09/2024 10:20	EPA 200.8-1994, Rev. 5.4
Arsenic	0.14	µg/L	1	0.10	0.03		GES	05/09/2024 10:20	EPA 200.8-1994, Rev. 5.4
Barium	5940	µg/L	10	2.0	0.5		GES	05/09/2024 10:25	EPA 200.8-1994, Rev. 5.4
Beryllium	0.020	µg/L	1	0.050	0.007	J1	GES	05/09/2024 10:20	EPA 200.8-1994, Rev. 5.4
Boron	0.892	mg/L	1	0.050	0.007		GES	05/09/2024 10:20	EPA 200.8-1994, Rev. 5.4
Cadmium	0.009	µg/L	1	0.020	0.004	J1	GES	05/09/2024 10:20	EPA 200.8-1994, Rev. 5.4
Calcium	110	mg/L	1	0.05	0.02		GES	05/09/2024 10:20	EPA 200.8-1994, Rev. 5.4
Chromium	0.26	µg/L	1	0.30	0.07	J1	GES	05/09/2024 10:20	EPA 200.8-1994, Rev. 5.4
Cobalt	0.101	µg/L	1	0.020	0.005		GES	05/09/2024 10:20	EPA 200.8-1994, Rev. 5.4
Lead	0.12	µg/L	1	0.20	0.05	J1	GES	05/09/2024 10:20	EPA 200.8-1994, Rev. 5.4
Lithium	0.247	mg/L	1	0.00030	0.00006		GES	05/09/2024 10:20	EPA 200.8-1994, Rev. 5.4
Magnesium	47.3	mg/L	1	0.100	0.009		GES	05/09/2024 10:20	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	04/25/2024 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	0.9	µg/L	1	0.5	0.1		GES	05/09/2024 10:20	EPA 200.8-1994, Rev. 5.4
Potassium	6.58	mg/L	1	0.10	0.01		GES	05/09/2024 10:20	EPA 200.8-1994, Rev. 5.4
Selenium	0.05	µg/L	1	0.50	0.04	J1	GES	05/09/2024 10:20	EPA 200.8-1994, Rev. 5.4
Sodium	1240	mg/L	10	2.0	0.2		GES	05/09/2024 10:25	EPA 200.8-1994, Rev. 5.4
Thallium	<0.02	µg/L	1	0.20	0.02	U1	GES	05/09/2024 10:20	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	21.20	pCi/L	0.59	0.13	L1, P2	ST	05/15/2024 08:26	SW-846 9315-1986, Rev. 0
Carrier Recovery	139	%						
Radium-228	1.15	pCi/L	0.15	0.48		TTP	05/16/2024 15:02	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	120	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

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4001 Bixby Road
Groveport, OH 43125
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Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 241340 **Customer: Northeastern 3&4 Power Station** **Date Reported: 07/02/2024**

Customer Sample ID: SP-11
Lab Number: 241340-006
Date Collected: 04/16/2024 16:11 EDT

Customer Description:
Preparation:
Date Received: 04/23/2024 10:00 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.090	µg/L	1	0.100	0.008	J1	GES	05/09/2024 10:30	EPA 200.8-1994, Rev. 5.4
Arsenic	2.58	µg/L	1	0.10	0.03		GES	05/09/2024 10:30	EPA 200.8-1994, Rev. 5.4
Barium	191	µg/L	1	0.20	0.05		GES	05/09/2024 10:30	EPA 200.8-1994, Rev. 5.4
Beryllium	0.031	µg/L	1	0.050	0.007	J1	GES	05/09/2024 10:30	EPA 200.8-1994, Rev. 5.4
Boron	0.454	mg/L	1	0.050	0.007		GES	05/09/2024 10:30	EPA 200.8-1994, Rev. 5.4
Cadmium	0.027	µg/L	1	0.020	0.004		GES	05/09/2024 10:30	EPA 200.8-1994, Rev. 5.4
Calcium	86.8	mg/L	1	0.05	0.02		GES	05/09/2024 10:30	EPA 200.8-1994, Rev. 5.4
Chromium	0.46	µg/L	1	0.30	0.07		GES	05/09/2024 10:30	EPA 200.8-1994, Rev. 5.4
Cobalt	0.466	µg/L	1	0.020	0.005		GES	05/09/2024 10:30	EPA 200.8-1994, Rev. 5.4
Lead	0.28	µg/L	1	0.20	0.05		GES	05/09/2024 10:30	EPA 200.8-1994, Rev. 5.4
Lithium	0.0182	mg/L	1	0.00030	0.00006		GES	05/09/2024 10:30	EPA 200.8-1994, Rev. 5.4
Magnesium	14.3	mg/L	1	0.100	0.009		GES	05/09/2024 10:30	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	04/25/2024 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	0.9	µg/L	1	0.5	0.1		GES	05/09/2024 10:30	EPA 200.8-1994, Rev. 5.4
Potassium	3.46	mg/L	1	0.10	0.01		GES	05/09/2024 10:30	EPA 200.8-1994, Rev. 5.4
Selenium	0.12	µg/L	1	0.50	0.04	J1	GES	05/09/2024 10:30	EPA 200.8-1994, Rev. 5.4
Sodium	252	mg/L	5	1.0	0.1		GES	05/09/2024 11:23	EPA 200.8-1994, Rev. 5.4
Thallium	<0.02	µg/L	1	0.20	0.02	U1	GES	05/09/2024 10:30	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	0.36	pCi/L	0.06	0.06		ST	05/21/2024 10:22	SW-846 9315-1986, Rev. 0
Carrier Recovery	187	%						
Radium-228	6.12	pCi/L	0.37	1.06		TTP	05/16/2024 15:02	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	80.6	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 241340 **Customer: Northeastern 3&4 Power Station** **Date Reported: 07/02/2024**

Customer Sample ID: BAP DUPLICATE
Customer Description:
Lab Number: 241340-007
Preparation:
Date Collected: 04/16/2024 15:00 EDT
Date Received: 04/23/2024 10:00 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.399	µg/L	1	0.100	0.008		GES	05/09/2024 10:35	EPA 200.8-1994, Rev. 5.4
Arsenic	1.35	µg/L	1	0.10	0.03		GES	05/09/2024 10:35	EPA 200.8-1994, Rev. 5.4
Barium	1750	µg/L	1	0.20	0.05		GES	05/09/2024 10:35	EPA 200.8-1994, Rev. 5.4
Beryllium	0.134	µg/L	1	0.050	0.007		GES	05/09/2024 10:35	EPA 200.8-1994, Rev. 5.4
Boron	0.199	mg/L	1	0.050	0.007		GES	05/09/2024 10:35	EPA 200.8-1994, Rev. 5.4
Cadmium	0.053	µg/L	1	0.020	0.004		GES	05/09/2024 10:35	EPA 200.8-1994, Rev. 5.4
Calcium	157	mg/L	1	0.05	0.02		GES	05/09/2024 10:35	EPA 200.8-1994, Rev. 5.4
Chromium	0.38	µg/L	1	0.30	0.07		GES	05/09/2024 10:35	EPA 200.8-1994, Rev. 5.4
Cobalt	1.16	µg/L	1	0.020	0.005		GES	05/09/2024 10:35	EPA 200.8-1994, Rev. 5.4
Lead	0.12	µg/L	1	0.20	0.05	J1	GES	05/09/2024 10:35	EPA 200.8-1994, Rev. 5.4
Lithium	0.0806	mg/L	1	0.00030	0.00006		GES	05/09/2024 10:35	EPA 200.8-1994, Rev. 5.4
Magnesium	62.4	mg/L	1	0.100	0.009		GES	05/09/2024 10:35	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	04/25/2024 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	11.8	µg/L	1	0.5	0.1		GES	05/09/2024 10:35	EPA 200.8-1994, Rev. 5.4
Potassium	3.36	mg/L	1	0.10	0.01		GES	05/09/2024 10:35	EPA 200.8-1994, Rev. 5.4
Selenium	0.85	µg/L	1	0.50	0.04		GES	05/09/2024 10:35	EPA 200.8-1994, Rev. 5.4
Sodium	530	mg/L	5	1.0	0.1		GES	05/09/2024 11:28	EPA 200.8-1994, Rev. 5.4
Thallium	0.05	µg/L	1	0.20	0.02	J1	GES	05/09/2024 10:35	EPA 200.8-1994, Rev. 5.4

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 241340 **Customer: Northeastern 3&4 Power Station** **Date Reported: 07/02/2024**

Customer Sample ID: BAP Equipment Blank
Lab Number: 241340-008
Date Collected: 04/16/2024 16:25 EDT

Customer Description:
Preparation:
Date Received: 04/23/2024 10:00 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.008	µg/L	1	0.100	0.008	U1	GES	05/09/2024 10:40	EPA 200.8-1994, Rev. 5.4
Arsenic	<0.03	µg/L	1	0.10	0.03	U1	GES	05/09/2024 10:40	EPA 200.8-1994, Rev. 5.4
Barium	0.47	µg/L	1	0.20	0.05		GES	05/09/2024 10:40	EPA 200.8-1994, Rev. 5.4
Beryllium	<0.007	µg/L	1	0.050	0.007	U1	GES	05/09/2024 10:40	EPA 200.8-1994, Rev. 5.4
Boron	<0.007	mg/L	1	0.050	0.007	U1	GES	05/09/2024 10:40	EPA 200.8-1994, Rev. 5.4
Cadmium	<0.004	µg/L	1	0.020	0.004	U1	GES	05/09/2024 10:40	EPA 200.8-1994, Rev. 5.4
Calcium	0.04	mg/L	1	0.05	0.02	J1	GES	05/09/2024 10:40	EPA 200.8-1994, Rev. 5.4
Chromium	0.31	µg/L	1	0.30	0.07		GES	05/09/2024 10:40	EPA 200.8-1994, Rev. 5.4
Cobalt	0.016	µg/L	1	0.020	0.005	J1	GES	05/09/2024 10:40	EPA 200.8-1994, Rev. 5.4
Lead	<0.05	µg/L	1	0.20	0.05	U1	GES	05/09/2024 10:40	EPA 200.8-1994, Rev. 5.4
Lithium	<0.00006	mg/L	1	0.00030	0.00006	U1	GES	05/09/2024 10:40	EPA 200.8-1994, Rev. 5.4
Magnesium	0.016	mg/L	1	0.100	0.009	J1	GES	05/09/2024 10:40	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	04/25/2024 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	05/09/2024 10:40	EPA 200.8-1994, Rev. 5.4
Potassium	0.01	mg/L	1	0.10	0.01	J1	GES	05/09/2024 10:40	EPA 200.8-1994, Rev. 5.4
Selenium	<0.04	µg/L	1	0.50	0.04	U1	GES	05/09/2024 10:40	EPA 200.8-1994, Rev. 5.4
Sodium	0.30	mg/L	1	0.20	0.02		GES	05/09/2024 10:40	EPA 200.8-1994, Rev. 5.4
Thallium	<0.02	µg/L	1	0.20	0.02	U1	GES	05/09/2024 10:40	EPA 200.8-1994, Rev. 5.4

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 241340 **Customer: Northeastern 3&4 Power Station** **Date Reported: 07/02/2024**

Customer Sample ID: BAP Field Blank
Lab Number: 241340-009
Date Collected: 04/16/2024 19:39 EDT

Customer Description:
Preparation:
Date Received: 04/23/2024 10:00 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.008	µg/L	1	0.100	0.008	U1	GES	05/09/2024 10:46	EPA 200.8-1994, Rev. 5.4
Arsenic	<0.03	µg/L	1	0.10	0.03	U1	GES	05/09/2024 10:46	EPA 200.8-1994, Rev. 5.4
Barium	0.08	µg/L	1	0.20	0.05	J1	GES	05/09/2024 10:46	EPA 200.8-1994, Rev. 5.4
Beryllium	<0.007	µg/L	1	0.050	0.007	U1	GES	05/09/2024 10:46	EPA 200.8-1994, Rev. 5.4
Boron	<0.007	mg/L	1	0.050	0.007	U1	GES	05/09/2024 10:46	EPA 200.8-1994, Rev. 5.4
Cadmium	<0.004	µg/L	1	0.020	0.004	U1	GES	05/09/2024 10:46	EPA 200.8-1994, Rev. 5.4
Calcium	<0.02	mg/L	1	0.05	0.02	U1	GES	05/09/2024 10:46	EPA 200.8-1994, Rev. 5.4
Chromium	0.19	µg/L	1	0.30	0.07	J1	GES	05/09/2024 10:46	EPA 200.8-1994, Rev. 5.4
Cobalt	0.005	µg/L	1	0.020	0.005	J1	GES	05/09/2024 10:46	EPA 200.8-1994, Rev. 5.4
Lead	<0.05	µg/L	1	0.20	0.05	U1	GES	05/09/2024 10:46	EPA 200.8-1994, Rev. 5.4
Lithium	<0.00006	mg/L	1	0.00030	0.00006	U1	GES	05/09/2024 10:46	EPA 200.8-1994, Rev. 5.4
Magnesium	<0.009	mg/L	1	0.100	0.009	U1	GES	05/09/2024 10:46	EPA 200.8-1994, Rev. 5.4
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	GES	05/09/2024 10:46	EPA 200.8-1994, Rev. 5.4
Potassium	<0.01	mg/L	1	0.10	0.01	U1	GES	05/09/2024 10:46	EPA 200.8-1994, Rev. 5.4
Selenium	<0.04	µg/L	1	0.50	0.04	U1	GES	05/09/2024 10:46	EPA 200.8-1994, Rev. 5.4
Sodium	0.13	mg/L	1	0.20	0.02	J1	GES	05/09/2024 10:46	EPA 200.8-1994, Rev. 5.4
Thallium	<0.02	µg/L	1	0.20	0.02	U1	GES	05/09/2024 10:46	EPA 200.8-1994, Rev. 5.4

241340
Job Comments:

Original report issued 5/22/24. Report reissued 7/2/24 with addition of Hg on 241340-003 analyzed out of hold.

241340-003
Comments:

Mercury bottle was found to be broken upon arrival at lab. Sample analyzed past hold time and from wrong container type and preservation for Hg.

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Reissued

Job ID: 241340 **Customer: Northeastern 3&4 Power Station** **Date Reported: 07/02/2024**

Report Verification

This report and the above data have been confirmed by the following analyst.

Michael Ohlinger, Chemist
Email: msohlinger@aep.com
Phone: 614-836-4184
Audinet: 8-210-4184

Data Qualifer Legend

U1 - Not detected at or below method detection limit (MDL).
J1 - Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
L1 - The associated laboratory control sample (LCS) or laboratory control sample duplicate (LCSD) recovery was outside acceptance limits.
P2 - The precision on the laboratory control sample duplicate (LCSD) was above acceptance limits.
M1 - The associated matrix spike (MS) or matrix spike duplicate (MSD) recovery was outside acceptance limits.
H2 - Sample analysis performed past holding time.
Q5 - Sample was received with improper chemical preservation.
Q1 - Sample was received in inappropriate sample container.

Chain of Custody Record

Program: Coal Combustion Residuals (CCR)

Dolan Chemical Laboratory (DCL)
4001 Bixby Road
Groveport, Ohio 43125
Contacts: Jonathan Barnhill (313-673-3803)
Michael Ohlinger (614-836-4134)

Project Name: NE PS BAP Semi-Annual CCR sampling

Contact Name: Rebecca Jones

Contact Phone: 737-330-3725

Sampler(s): Kenny McDonald

Analysis Turnaround Time (In Calendar Days)
Routine (28 days for Monitoring Wells)

Site Contact:

Date:

For Lab Use Only:
COC/Order #: 24134J

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	250 mL bottle, pH<2, HNO_3: As, B, Ba, Be, Ca, Cd, Cr, Co, K, Li, Na, Pb, Mg, Mo, Sb, Se, Tl	1 L bottle, Cool, 0-6°C: TDS, F, Cl, SO_4	Three (six every 10th*) 1 L bottles, pH<2, HNO_3: Ra-226, Ra-228	250 mL Glass or 125/250 mL PTFE lined bottle, HCL**, pH<2: Hg	Field-filter 500 mL bottle, then pH<2, HNO_3: dissolved Fe and Mn	Sample Specific Notes:
SP-1	4/16/2024	1535	G	GW	5		X		X	X		
SP-2	4/16/2024	1522	G	GW	8		X		X	X		
SP-4	4/16/2024	1841	G	GW	5		X		X	X		
SP-5R	4/16/2024	1906	G	GW	5		X		X	X		
SP-10	4/16/2024	1500	G	GW	5		X		X	X		
SP-11	4/16/2024	1511	G	GW	5		X		X	X		
BAP DUPLICATE	4/16/2024	1400	G	GW	2		X			X		
BAP EQUIPMENT BLANK	4/16/2024	1525	G	W	2		X			X		
BAP FIELD BLANK	4/16/2024	1839	G	W	1		X					
Preservation Used: 1= Ice, 2= HCl; 3= H_2SO_4; 4= HNO_3; 5= NaOH; 6= Other _____; F= filter in field							4	1	4			

* Six 1L Bottles must be collected for Radium for every 10th sample.

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by: Michael Ohlinger	Date/Time: 4/23/24 1050

AEP WATER & WASTE SAMPLE RECEIPT FORM

Package Type	Delivery Type
(Cooler) Box Bag Envelope	PONY UPS (FedEX) USPS
	Other _____

Plant/Customer Northwestern **Number of Plastic Containers:** 30

Opened By MGK/MSO **Number of Glass Containers:** -

Date/Time 4/23/24 1000 **Number of Mercury Containers:** 8

Were all temperatures within 0-6°C? Y / N or (N/A) **Initial:** _____ on ice / no ice

(IR Gun Ser# 240009843, *Expir.* 01/03/2026) - If No, specify each deviation: _____

Was container in good condition? (Y) / N Comments _____

Was Chain of Custody received? (Y) / N Comments _____

Requested turnaround: Routine If **RUSH**, who was notified? _____

pH (15 min)	Cr^{+6} (pres) (24 hr)	NO_2 or NO_3 (48 hr)	*ortho*-PO_4 (48 hr)	Hg-diss (pres) (48 hr)

Was COC filled out properly? (Y) / N Comments _____

Were samples labeled properly? (Y) / N Comments _____

Were correct containers used? (Y) / N Comments _____

Was pH checked & Color Coding done? (Y) / N or N/A **Initial & Date:** MGK 4/23/24

pH paper (circle one): MQuant,PN1.09535.0001,LOT# _____ [OR] Lab Rat,PN4801,LOT# X000RWDG21 Exp 11/15/2024

- Was Add'l Preservative needed? Y / (N) If Yes: By whom & when: _____ (See Prep Book)

Is sample filtration requested? Y / (N) Comments _____ (See Prep Book)

Was the customer contacted? If Yes: Person Contacted: _____

Lab ID# 241340 Initial & Date & Time : _____

Comments: SP-4 Hg bottle was received broken.

Logged by MSO

Reviewed by [signature] 4/24/24

REMINDER: Document the pertinent sample integrity information and deviations in sample receipt (as noted above) in the "Notes" field in the LIMS to be included on the report to the customer.

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 241289 **Customer: Northeastern 3&4 Power Station** **Date Reported: 05/07/2024**

Customer Sample ID: SP-1 Customer Description:
Lab Number: 241289-001 Preparation:
Date Collected: 04/16/2024 16:35 EDT Date Received: 04/18/2024 10:00 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	47.7	mg/L	5	0.15	0.05		CRJ	05/02/2024 15:54	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.89	mg/L	5	0.15	0.05		CRJ	05/02/2024 15:54	EPA 300.1 -1997, Rev. 1.0
Sulfate	97.3	mg/L	5	1.5	0.3		CRJ	05/02/2024 15:54	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	460	mg/L	2	100	40		ELT	04/22/2024 09:41	SM 2540C-2015

Customer Sample ID: SP-2 Customer Description:
Lab Number: 241289-002 Preparation:
Date Collected: 04/16/2024 16:22 EDT Date Received: 04/18/2024 10:00 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	450	mg/L	50	1.5	0.5		CRJ	05/02/2024 19:11	EPA 300.1 -1997, Rev. 1.0
Fluoride	2.74	mg/L	5	0.15	0.05		CRJ	05/02/2024 10:23	EPA 300.1 -1997, Rev. 1.0
Sulfate	19.0	mg/L	5	1.5	0.3		CRJ	05/02/2024 10:23	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	990	mg/L	2	100	40		ELT	04/22/2024 09:47	SM 2540C-2015

Customer Sample ID: SP-4 Customer Description:
Lab Number: 241289-003 Preparation:
Date Collected: 04/16/2024 19:41 EDT Date Received: 04/18/2024 10:00 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	450	mg/L	50	1.5	0.5		CRJ	05/02/2024 19:44	EPA 300.1 -1997, Rev. 1.0
Fluoride	3.22	mg/L	5	0.15	0.05		CRJ	05/02/2024 12:02	EPA 300.1 -1997, Rev. 1.0
Sulfate	81.0	mg/L	5	1.5	0.3		CRJ	05/02/2024 12:02	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	1270	mg/L	2	100	40		ELT	04/22/2024 09:47	SM 2540C-2015

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 241289 **Customer: Northeastern 3&4 Power Station** **Date Reported: 05/07/2024**

Customer Sample ID: SP-5R
Lab Number: 241289-004
Date Collected: 04/16/2024 20:06 EDT
Customer Description:
Preparation:
Date Received: 04/18/2024 10:00 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	690	mg/L	50	1.5	0.5		CRJ	05/02/2024 20:17	EPA 300.1 -1997, Rev. 1.0
Fluoride	3.04	mg/L	5	0.15	0.05		CRJ	05/02/2024 12:35	EPA 300.1 -1997, Rev. 1.0
Sulfate	4.4	mg/L	5	1.5	0.3		CRJ	05/02/2024 12:35	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	1430	mg/L	2	100	40		ELT	04/22/2024 09:52	SM 2540C-2015

Customer Sample ID: SP-10
Lab Number: 241289-005
Date Collected: 04/16/2024 16:00 EDT
Customer Description:
Preparation:
Date Received: 04/18/2024 10:00 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	1950	mg/L	250	8	3		CRJ	05/02/2024 15:21	EPA 300.1 -1997, Rev. 1.0
Fluoride	6.4	mg/L	10	0.3	0.1		CRJ	05/02/2024 14:14	EPA 300.1 -1997, Rev. 1.0
Sulfate	18.2	mg/L	10	3.0	0.6		CRJ	05/02/2024 14:14	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	459	mg/L	1	20	5		MGK	04/18/2024 18:19	SM 2320B-2011
Bicarbonate Alkalinity	454	mg/L	1	20	5		MGK	04/18/2024 18:19	SM 4500 CO2D-2011
TDS, Filterable Residue	3510	mg/L	2	100	40		ELT	04/22/2024 09:52	SM 2540C-2015

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 241289 **Customer: Northeastern 3&4 Power Station** **Date Reported: 05/07/2024**

Customer Sample ID: SP-11
Customer Description:
Lab Number: 241289-006
Preparation:
Date Collected: 04/16/2024 16:11 EDT
Date Received: 04/18/2024 10:00 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	103	mg/L	10	0.3	0.1		CRJ	05/03/2024 11:12	EPA 300.1 -1997, Rev. 1.0
Fluoride	1.73	mg/L	5	0.15	0.05		CRJ	05/03/2024 07:55	EPA 300.1 -1997, Rev. 1.0
Sulfate	236	mg/L	10	3.0	0.6		CRJ	05/03/2024 11:12	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	910	mg/L	2	100	40		ELT	04/22/2024 09:57	SM 2540C-2015

Customer Sample ID: BAP DUPLICATE
Customer Description:
Lab Number: 241289-007
Preparation:
Date Collected: 04/16/2024 15:00 EDT
Date Received: 04/18/2024 10:00 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	903	mg/L	50	1.5	0.5		CRJ	05/02/2024 20:50	EPA 300.1 -1997, Rev. 1.0
Fluoride	2.92	mg/L	5	0.15	0.05		CRJ	05/02/2024 13:41	EPA 300.1 -1997, Rev. 1.0
Sulfate	13.7	mg/L	5	1.5	0.3		CRJ	05/02/2024 13:41	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	1750	mg/L	2	100	40		ELT	04/22/2024 09:57	SM 2540C-2015

Water Analysis Report

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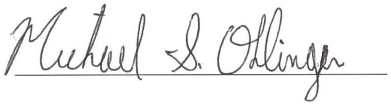
Job ID: 241289 **Customer: Northeastern 3&4 Power Station** **Date Reported: 05/07/2024**

Report Verification

This report and the above data have been confirmed by the following analyst.



Michael Ohlinger, Chemist
Email: msohlinger@aep.com
Phone: 614-836-4184
Audinet: 8-210-4184

Chain of Custody Record

Program: Coal Combustion Residuals (CCR)

Dolan Chemical Laboratory (DCL)
4001 Bixby Road
Groveport, Ohio 43125
Contacts: Jonathan Barnhill (318-673-3803)
Michael Ohlinger (614-836-4184)

Project Name: NE PS BAP Semi-Annual CCR sampling

Contact Name: Rebecca Jones

Contact Phone: 737-330-3725

Sampler(s): Kenny McDonald

Analysis Turnaround Time (in Calendar Days)
Routine (28 days for Monitoring Wells)

Site Contact:

Date:

For Lab Use Only:
COC/Order #: 24289

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	250 mL bottle, pH<2, HNO_3 As, B, Ba, Be, Ca,Cd, Cr, Co, K, Li, Na, Pb, Mg, Mo, Sb, Se, TL	1 L bottle, Cool, 0-6°C TDS, F, Cl, SO_4	Three (six every 10th*) 1 L bottles, pH<2, HNO_3 Ra-226, Ra-228	250 mL Glass bottle, HCL**, pH<2 Hg	Field-filter 250 mL bottle, pH<2, HNO_3 dissolved Fe and Mn	1 L bottle Cool, 0-6°C TDS, F, CL, SO4, TOTAL ALKALINITY, BICARBONATE ALKALINITY	Sample Specific Notes:
SP-1	4/16/2024	1535	G	GW	1			X					
SP-2	4/16/2024	1522	G	GW	1			X					
SP-4	4/16/2024	1841	G	GW	1			X					
SP-5R	4/16/2024	1906	G	GW	1			X					
SP-10	4/16/2024	1500	G	GW	1							X	
SP-11	4/16/2024	1511	G	GW	1			X					
BAP DUPLICATE	4/16/2024	1400	G	GW	1			X					
Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____; F= filter in field							4	1	4				

** Six 1L Bottles must be collected for Radium for every 10th sample.*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Kstnl	Facet	04/17/24 1400		
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Date/Time:
			Michael Ohly	4/18/24 1000

AEP WATER & WASTE SAMPLE RECEIPT FORM

Package Type	Delivery Type
(Cooler) Box Bag Envelope	PONY UPS (FedEX) USPS
	Other _____

Plant/Customer Northeastern 3094 P.S **Number of Plastic Containers:** 7

Opened By William **Number of Glass Containers:** _____

Date/Time 04/18/24 10:00Am **Number of Mercury Containers:** _____

Were all temperatures within 0-6°C? (Y) / N or N/A **Initial:** WCG (on ice) / no ice

(IR Gun Ser# 240009843, *Expir.* 01/03/2026) - If No, specify each deviation: _____

Was container in good condition? (Y) / N Comments _____

Was Chain of Custody received? (Y) / N Comments _____

Requested turnaround: 28 days If **RUSH**, who was notified? _____

pH (15 min)	Cr^{+6} (pres) (24 hr)	NO_2 or NO_3 (48 hr)	*ortho*-PO_4 (48 hr)	Hg-diss (pres) (48 hr)

Was COC filled out properly? (Y) / N Comments _____

Were samples labeled properly? (Y) / N Comments _____

Were correct containers used? (Y) / N Comments _____

Was pH checked & Color Coding done? (Y) / N or N/A **Initial & Date:** WCG 04/18/24

pH paper (circle one): MQuant,PN1.09535.0001,LOT#_____ [OR] Lab Rat,PN4801,LOT# X000RVDG21 Exp 11/15/2024

- Was Add'l Preservative needed? Y / (N) If Yes: By whom & when: _____ (See Prep Book)

Is sample filtration requested? Y / (N) Comments _____ (See Prep Book)

Was the customer contacted? If Yes: Person Contacted: _____

Lab ID# 24/289 Initial & Date & Time : _____

Comments: _____

Logged by MSO _____

_____

Reviewed by MGK _____

_____

REMINDER: Document the pertinent sample integrity information and deviations in sample receipt (as noted above) in the "Notes" field in the LIMS to be included on the report to the customer.

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 243183 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/03/2024**

Customer Sample ID: SP-1
Lab Number: 243183-001
Date Collected: 10/22/2024 17:08 EDT

Customer Description:
Preparation:
Date Received: 10/28/2024 11:40 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.368	µg/L	1	0.100	0.008		ELH	11/12/2024 05:25	EPA 200.8-1994, Rev. 5.4
Arsenic	0.62	µg/L	1	0.10	0.03		ELH	11/12/2024 05:25	EPA 200.8-1994, Rev. 5.4
Barium	142	µg/L	1	0.20	0.05		ELH	11/12/2024 05:25	EPA 200.8-1994, Rev. 5.4
Beryllium	0.120	µg/L	1	0.050	0.007		ELH	11/25/2024 20:25	EPA 200.8-1994, Rev. 5.4
Boron	0.185	mg/L	1	0.050	0.007		ELH	11/12/2024 05:25	EPA 200.8-1994, Rev. 5.4
Cadmium	0.076	µg/L	1	0.020	0.004		ELH	11/12/2024 05:25	EPA 200.8-1994, Rev. 5.4
Calcium	123	mg/L	1	0.05	0.02		ELH	11/25/2024 20:25	EPA 200.8-1994, Rev. 5.4
Chromium	1.23	µg/L	1	0.30	0.07		ELH	11/12/2024 05:25	EPA 200.8-1994, Rev. 5.4
Cobalt	0.536	µg/L	1	0.020	0.005		ELH	11/12/2024 05:25	EPA 200.8-1994, Rev. 5.4
Lead	1.18	µg/L	1	0.20	0.05		ELH	11/12/2024 05:25	EPA 200.8-1994, Rev. 5.4
Lithium	0.00658	mg/L	1	0.00030	0.00006		ELH	11/12/2024 05:25	EPA 200.8-1994, Rev. 5.4
Magnesium	27.4	mg/L	1	0.100	0.009		ELH	11/25/2024 20:25	EPA 200.8-1994, Rev. 5.4
Mercury	3	ng/L	1	5	2	J1	RLP	11/01/2024 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	11.0	µg/L	1	0.5	0.1		ELH	11/12/2024 05:25	EPA 200.8-1994, Rev. 5.4
Potassium	1.00	mg/L	1	0.10	0.01		ELH	11/12/2024 05:25	EPA 200.8-1994, Rev. 5.4
Selenium	5.39	µg/L	1	0.50	0.04		ELH	11/12/2024 05:25	EPA 200.8-1994, Rev. 5.4
Sodium	47	mg/L	50	10	1		ELH	11/12/2024 05:20	EPA 200.8-1994, Rev. 5.4
Thallium	0.08	µg/L	1	0.20	0.02	J1	ELH	11/12/2024 05:25	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	1.76	pCi/L	0.30	0.43		ST	11/07/2024 12:13	SW-846 9315-1986, Rev. 0
Carrier Recovery	101	%						
Radium-228	3.17	pCi/L	0.17	0.47	P2, L1	TTP	11/11/2024 18:56	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	80.1	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

Water Analysis Report

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Job ID: 243183 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/03/2024**

Customer Sample ID: SP-2
Lab Number: 243183-002
Date Collected: 10/22/2024 16:37 EDT

Customer Description:
Preparation:
Date Received: 10/28/2024 11:40 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.963	µg/L	1	0.100	0.008		ELH	11/12/2024 05:36	EPA 200.8-1994, Rev. 5.4
Arsenic	1.33	µg/L	1	0.10	0.03		ELH	11/12/2024 05:36	EPA 200.8-1994, Rev. 5.4
Barium	698	µg/L	1	0.20	0.05		ELH	11/12/2024 05:36	EPA 200.8-1994, Rev. 5.4
Beryllium	0.121	µg/L	1	0.050	0.007		ELH	11/25/2024 20:36	EPA 200.8-1994, Rev. 5.4
Boron	0.108	mg/L	1	0.050	0.007		ELH	11/12/2024 05:36	EPA 200.8-1994, Rev. 5.4
Cadmium	0.072	µg/L	1	0.020	0.004		ELH	11/12/2024 05:36	EPA 200.8-1994, Rev. 5.4
Calcium	135	mg/L	1	0.05	0.02		ELH	11/25/2024 20:36	EPA 200.8-1994, Rev. 5.4
Chromium	1.02	µg/L	1	0.30	0.07		ELH	11/12/2024 05:36	EPA 200.8-1994, Rev. 5.4
Cobalt	0.383	µg/L	1	0.020	0.005		ELH	11/12/2024 05:36	EPA 200.8-1994, Rev. 5.4
Lead	0.53	µg/L	1	0.20	0.05		ELH	11/12/2024 05:36	EPA 200.8-1994, Rev. 5.4
Lithium	0.0294	mg/L	1	0.00030	0.00006		ELH	11/12/2024 05:36	EPA 200.8-1994, Rev. 5.4
Magnesium	57.6	mg/L	1	0.100	0.009		ELH	11/25/2024 20:36	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	11/01/2024 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	15.8	µg/L	1	0.5	0.1		ELH	11/12/2024 05:36	EPA 200.8-1994, Rev. 5.4
Potassium	1.87	mg/L	1	0.10	0.01		ELH	11/12/2024 05:36	EPA 200.8-1994, Rev. 5.4
Selenium	2.07	µg/L	1	0.50	0.04		ELH	11/12/2024 05:36	EPA 200.8-1994, Rev. 5.4
Sodium	202	mg/L	50	10	1		ELH	11/12/2024 05:31	EPA 200.8-1994, Rev. 5.4
Thallium	0.03	µg/L	1	0.20	0.02	J1	ELH	11/12/2024 05:36	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	5.26	pCi/L	0.44	0.23	R2	ST	11/07/2024 12:13	SW-846 9315-1986, Rev. 0
Carrier Recovery	131	%						
Radium-228	4.04	pCi/L	0.15	0.39	P2, L1	TTP	11/11/2024 18:56	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	97.9	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

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Audinet: 210-4221

Water Analysis Report

Job ID: 243183 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/03/2024**

Customer Sample ID: SP-4
Lab Number: 243183-003
Date Collected: 10/22/2024 17:41 EDT

Customer Description:
Preparation:
Date Received: 10/28/2024 11:40 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.147	µg/L	1	0.100	0.008		ELH	11/12/2024 15:15	EPA 200.8-1994, Rev. 5.4
Arsenic	0.70	µg/L	1	0.10	0.03		ELH	11/12/2024 15:15	EPA 200.8-1994, Rev. 5.4
Barium	190	µg/L	1	0.20	0.05		ELH	11/12/2024 15:15	EPA 200.8-1994, Rev. 5.4
Beryllium	0.038	µg/L	1	0.050	0.007	J1	ELH	11/12/2024 15:15	EPA 200.8-1994, Rev. 5.4
Boron	0.346	mg/L	1	0.050	0.007		ELH	11/12/2024 15:15	EPA 200.8-1994, Rev. 5.4
Cadmium	0.021	µg/L	1	0.020	0.004		ELH	11/12/2024 15:15	EPA 200.8-1994, Rev. 5.4
Calcium	98	mg/L	50	3	1		ELH	11/25/2024 20:47	EPA 200.8-1994, Rev. 5.4
Chromium	0.45	µg/L	1	0.30	0.07		ELH	11/12/2024 15:15	EPA 200.8-1994, Rev. 5.4
Cobalt	0.146	µg/L	1	0.020	0.005		ELH	11/12/2024 15:15	EPA 200.8-1994, Rev. 5.4
Lead	0.09	µg/L	1	0.20	0.05	J1	ELH	11/12/2024 15:15	EPA 200.8-1994, Rev. 5.4
Lithium	0.054	mg/L	50	0.015	0.003		ELH	11/12/2024 15:10	EPA 200.8-1994, Rev. 5.4
Magnesium	42.6	mg/L	50	5.0	0.5		ELH	11/25/2024 20:47	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	11/01/2024 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	2.5	µg/L	1	0.5	0.1		ELH	11/12/2024 15:15	EPA 200.8-1994, Rev. 5.4
Potassium	2.27	mg/L	1	0.10	0.01		ELH	11/12/2024 15:15	EPA 200.8-1994, Rev. 5.4
Selenium	0.28	µg/L	1	0.50	0.04	J1	ELH	11/12/2024 15:15	EPA 200.8-1994, Rev. 5.4
Sodium	300	mg/L	500	100	10		ELH	11/25/2024 20:42	EPA 200.8-1994, Rev. 5.4
Thallium	0.03	µg/L	1	0.20	0.02	J1	ELH	11/12/2024 15:15	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	2.32	pCi/L	0.34	0.34		ST	11/07/2024 12:13	SW-846 9315-1986, Rev. 0
Carrier Recovery	96.0	%						
Radium-228	1.35	pCi/L	0.13	0.41	P2, L1	TTP	11/11/2024 18:56	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	92.0	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

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Water Analysis Report

Job ID: 243183 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/03/2024**

Customer Sample ID: SP-5R
Lab Number: 243183-004
Date Collected: 10/22/2024 19:09 EDT

Customer Description:
Preparation:
Date Received: 10/28/2024 11:40 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.117	µg/L	1	0.100	0.008		ELH	11/12/2024 15:26	EPA 200.8-1994, Rev. 5.4
Arsenic	16.1	µg/L	1	0.10	0.03		ELH	11/12/2024 15:26	EPA 200.8-1994, Rev. 5.4
Barium	2080	µg/L	50	10	3		ELH	11/12/2024 15:21	EPA 200.8-1994, Rev. 5.4
Beryllium	0.108	µg/L	1	0.050	0.007		ELH	11/12/2024 15:26	EPA 200.8-1994, Rev. 5.4
Boron	0.201	mg/L	1	0.050	0.007		ELH	11/12/2024 15:26	EPA 200.8-1994, Rev. 5.4
Cadmium	0.038	µg/L	1	0.020	0.004		ELH	11/12/2024 15:26	EPA 200.8-1994, Rev. 5.4
Calcium	82	mg/L	50	3	1		ELH	11/25/2024 21:58	EPA 200.8-1994, Rev. 5.4
Chromium	0.77	µg/L	1	0.30	0.07		ELH	11/12/2024 15:26	EPA 200.8-1994, Rev. 5.4
Cobalt	0.841	µg/L	1	0.020	0.005		ELH	11/12/2024 15:26	EPA 200.8-1994, Rev. 5.4
Lead	1.05	µg/L	1	0.20	0.05		ELH	11/12/2024 15:26	EPA 200.8-1994, Rev. 5.4
Lithium	0.086	mg/L	50	0.015	0.003		ELH	11/12/2024 15:21	EPA 200.8-1994, Rev. 5.4
Magnesium	33.3	mg/L	50	5.0	0.5		ELH	11/25/2024 21:58	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	11/01/2024 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	0.7	µg/L	1	0.5	0.1		ELH	11/12/2024 15:26	EPA 200.8-1994, Rev. 5.4
Potassium	2.59	mg/L	1	0.10	0.01		ELH	11/12/2024 15:26	EPA 200.8-1994, Rev. 5.4
Selenium	0.20	µg/L	1	0.50	0.04	J1	ELH	11/12/2024 15:26	EPA 200.8-1994, Rev. 5.4
Sodium	410	mg/L	500	100	10		ELH	11/25/2024 21:53	EPA 200.8-1994, Rev. 5.4
Thallium	<0.02	µg/L	1	0.20	0.02	U1	ELH	11/12/2024 15:26	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	8.81	pCi/L	0.62	0.25		ST	11/07/2024 12:13	SW-846 9315-1986, Rev. 0
Carrier Recovery	124	%						
Radium-228	3.57	pCi/L	0.16	0.45	P2, L1	TTP	11/11/2024 18:56	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	101	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

Water Analysis Report

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Audinet: 210-4221

Job ID: 243183 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/03/2024**

Customer Sample ID: SP-10
Lab Number: 243183-005
Date Collected: 10/22/2024 14:16 EDT

Customer Description:
Preparation:
Date Received: 10/28/2024 11:40 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.034	µg/L	1	0.100	0.008	J1	ELH	11/12/2024 15:37	EPA 200.8-1994, Rev. 5.4
Arsenic	0.12	µg/L	1	0.10	0.03		ELH	11/12/2024 15:37	EPA 200.8-1994, Rev. 5.4
Barium	6270	µg/L	1	0.20	0.05		ELH	11/12/2024 15:37	EPA 200.8-1994, Rev. 5.4
Beryllium	0.121	µg/L	1	0.050	0.007		ELH	11/12/2024 15:37	EPA 200.8-1994, Rev. 5.4
Boron	1.06	mg/L	1	0.050	0.007		ELH	11/12/2024 15:37	EPA 200.8-1994, Rev. 5.4
Cadmium	0.014	µg/L	1	0.020	0.004	J1	ELH	11/12/2024 15:37	EPA 200.8-1994, Rev. 5.4
Calcium	125	mg/L	50	3	1		ELH	11/25/2024 22:09	EPA 200.8-1994, Rev. 5.4
Chromium	0.46	µg/L	1	0.30	0.07		ELH	11/12/2024 15:37	EPA 200.8-1994, Rev. 5.4
Cobalt	0.079	µg/L	1	0.020	0.005		ELH	11/12/2024 15:37	EPA 200.8-1994, Rev. 5.4
Lead	0.12	µg/L	1	0.20	0.05	J1	ELH	11/12/2024 15:37	EPA 200.8-1994, Rev. 5.4
Lithium	0.228	mg/L	50	0.015	0.003		ELH	11/12/2024 15:32	EPA 200.8-1994, Rev. 5.4
Magnesium	47.3	mg/L	50	5.0	0.5		ELH	11/25/2024 22:09	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	11/01/2024 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	0.3	µg/L	1	0.5	0.1	J1	ELH	11/12/2024 15:37	EPA 200.8-1994, Rev. 5.4
Potassium	6.68	mg/L	1	0.10	0.01		ELH	11/12/2024 15:37	EPA 200.8-1994, Rev. 5.4
Selenium	0.06	µg/L	1	0.50	0.04	J1	ELH	11/12/2024 15:37	EPA 200.8-1994, Rev. 5.4
Sodium	1230	mg/L	2000	400	40		ELH	11/25/2024 22:04	EPA 200.8-1994, Rev. 5.4
Thallium	<0.02	µg/L	1	0.20	0.02	U1	ELH	11/12/2024 15:37	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	18.50	pCi/L	0.93	0.31	R2	ST	11/07/2024 12:13	SW-846 9315-1986, Rev. 0
Carrier Recovery	144	%						
Radium-228	1.63	pCi/L	0.12	0.36	P2, L1	TTP	11/11/2024 18:56	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	98.4	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Job ID: 243183 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/03/2024**

Customer Sample ID: SP-11
Lab Number: 243183-006
Date Collected: 10/22/2024 14:49 EDT

Customer Description:
Preparation:
Date Received: 10/28/2024 11:40 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.054	µg/L	1	0.100	0.008	J1	ELH	11/12/2024 15:48	EPA 200.8-1994, Rev. 5.4
Arsenic	2.32	µg/L	1	0.10	0.03		ELH	11/12/2024 15:48	EPA 200.8-1994, Rev. 5.4
Barium	285	µg/L	50	10	3		ELH	11/12/2024 15:43	EPA 200.8-1994, Rev. 5.4
Beryllium	0.032	µg/L	1	0.050	0.007	J1	ELH	11/12/2024 15:48	EPA 200.8-1994, Rev. 5.4
Boron	0.419	mg/L	1	0.050	0.007		ELH	11/12/2024 15:48	EPA 200.8-1994, Rev. 5.4
Cadmium	0.017	µg/L	1	0.020	0.004	J1	ELH	11/12/2024 15:48	EPA 200.8-1994, Rev. 5.4
Calcium	104	mg/L	50	3	1		ELH	11/25/2024 22:15	EPA 200.8-1994, Rev. 5.4
Chromium	0.45	µg/L	1	0.30	0.07		ELH	11/12/2024 15:48	EPA 200.8-1994, Rev. 5.4
Cobalt	0.257	µg/L	1	0.020	0.005		ELH	11/12/2024 15:48	EPA 200.8-1994, Rev. 5.4
Lead	0.22	µg/L	1	0.20	0.05		ELH	11/12/2024 15:48	EPA 200.8-1994, Rev. 5.4
Lithium	0.020	mg/L	50	0.015	0.003		ELH	11/12/2024 15:43	EPA 200.8-1994, Rev. 5.4
Magnesium	19.2	mg/L	50	5.0	0.5		ELH	11/25/2024 22:15	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	11/01/2024 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	0.5	µg/L	1	0.5	0.1		ELH	11/12/2024 15:48	EPA 200.8-1994, Rev. 5.4
Potassium	2.92	mg/L	1	0.10	0.01		ELH	11/12/2024 15:48	EPA 200.8-1994, Rev. 5.4
Selenium	0.15	µg/L	1	0.50	0.04	J1	ELH	11/12/2024 15:48	EPA 200.8-1994, Rev. 5.4
Sodium	239	mg/L	50	10	1		ELH	11/12/2024 15:43	EPA 200.8-1994, Rev. 5.4
Thallium	<0.02	µg/L	1	0.20	0.02	U1	ELH	11/12/2024 15:48	EPA 200.8-1994, Rev. 5.4

Radiochemistry

Parameter	Result	Units	UNC*(+/-)	MDA*	Data Qualifiers	Analyst	Analysis Date	Method
Radium-226	1.12	pCi/L	0.18	0.17	R2	ST	11/07/2024 12:13	SW-846 9315-1986, Rev. 0
Carrier Recovery	149	%						
Radium-228	0.24	pCi/L	0.10	0.35	P2, L1	TTP	11/11/2024 18:56	SW-846 9320-2014, Rev. 1.0
Carrier Recovery	93.2	%						

* The Required Detection Limit (RDL) is equivalent to the RL and for Radium-226 and Radium-228, the RDL is calculated to be 1.0 pCi/L. The Minimal Detectable Activity (MDA) listed with these results is sample specific and empirical. The combined standard uncertainty (UNC) is a counting uncertainty representing "one-sigma" which has the same units of measurement as the result.

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 243183 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/03/2024**

Customer Sample ID: BAP DUPLICATE
Customer Description:
Lab Number: 243183-007
Preparation:
Date Collected: 10/22/2024 14:00 EDT
Date Received: 10/28/2024 11:40 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	0.039	µg/L	1	0.100	0.008	J1	ELH	11/12/2024 15:59	EPA 200.8-1994, Rev. 5.4
Arsenic	0.12	µg/L	1	0.10	0.03		ELH	11/12/2024 15:59	EPA 200.8-1994, Rev. 5.4
Barium	5910	µg/L	50	10	3		ELH	11/12/2024 15:54	EPA 200.8-1994, Rev. 5.4
Beryllium	0.088	µg/L	1	0.050	0.007		ELH	11/12/2024 15:59	EPA 200.8-1994, Rev. 5.4
Boron	1.03	mg/L	1	0.050	0.007		ELH	11/12/2024 15:59	EPA 200.8-1994, Rev. 5.4
Cadmium	0.022	µg/L	1	0.020	0.004		ELH	11/12/2024 15:59	EPA 200.8-1994, Rev. 5.4
Calcium	136	mg/L	50	3	1		ELH	11/25/2024 22:26	EPA 200.8-1994, Rev. 5.4
Chromium	0.49	µg/L	1	0.30	0.07		ELH	11/12/2024 15:59	EPA 200.8-1994, Rev. 5.4
Cobalt	0.086	µg/L	1	0.020	0.005		ELH	11/12/2024 15:59	EPA 200.8-1994, Rev. 5.4
Lead	0.15	µg/L	1	0.20	0.05	J1	ELH	11/12/2024 15:59	EPA 200.8-1994, Rev. 5.4
Lithium	0.232	mg/L	50	0.015	0.003		ELH	11/12/2024 15:54	EPA 200.8-1994, Rev. 5.4
Magnesium	51.2	mg/L	50	5.0	0.5		ELH	11/25/2024 22:26	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	11/01/2024 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	0.3	µg/L	1	0.5	0.1	J1	ELH	11/12/2024 15:59	EPA 200.8-1994, Rev. 5.4
Potassium	6.64	mg/L	1	0.10	0.01		ELH	11/12/2024 15:59	EPA 200.8-1994, Rev. 5.4
Selenium	0.06	µg/L	1	0.50	0.04	J1	ELH	11/12/2024 15:59	EPA 200.8-1994, Rev. 5.4
Sodium	1180	mg/L	2000	400	40		ELH	11/25/2024 22:20	EPA 200.8-1994, Rev. 5.4
Thallium	<0.02	µg/L	1	0.20	0.02	U1	ELH	11/12/2024 15:59	EPA 200.8-1994, Rev. 5.4

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 243183 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/03/2024**

Customer Sample ID: BAP EQUIPMENT BLANK
Customer Description:
Lab Number: 243183-008
Preparation:
Date Collected: 10/22/2024 14:20 EDT
Date Received: 10/28/2024 11:40 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.008	µg/L	1	0.100	0.008	U1	ELH	11/12/2024 16:10	EPA 200.8-1994, Rev. 5.4
Arsenic	<0.03	µg/L	1	0.10	0.03	U1	ELH	11/12/2024 16:10	EPA 200.8-1994, Rev. 5.4
Barium	0.06	µg/L	1	0.20	0.05	J1	ELH	11/12/2024 16:10	EPA 200.8-1994, Rev. 5.4
Beryllium	<0.007	µg/L	1	0.050	0.007	U1	ELH	11/12/2024 16:10	EPA 200.8-1994, Rev. 5.4
Boron	<0.007	mg/L	1	0.050	0.007	U1	ELH	11/12/2024 16:10	EPA 200.8-1994, Rev. 5.4
Cadmium	<0.004	µg/L	1	0.020	0.004	U1	ELH	11/12/2024 16:10	EPA 200.8-1994, Rev. 5.4
Calcium	<0.02	mg/L	1	0.05	0.02	U1	ELH	11/25/2024 22:31	EPA 200.8-1994, Rev. 5.4
Chromium	0.29	µg/L	1	0.30	0.07	J1	ELH	11/12/2024 16:10	EPA 200.8-1994, Rev. 5.4
Cobalt	<0.005	µg/L	1	0.020	0.005	U1	ELH	11/12/2024 16:10	EPA 200.8-1994, Rev. 5.4
Lead	<0.05	µg/L	1	0.20	0.05	U1	ELH	11/12/2024 16:10	EPA 200.8-1994, Rev. 5.4
Lithium	<0.00006	mg/L	1	0.00030	0.00006	U1	ELH	11/12/2024 16:10	EPA 200.8-1994, Rev. 5.4
Magnesium	<0.009	mg/L	1	0.100	0.009	U1	ELH	11/25/2024 22:31	EPA 200.8-1994, Rev. 5.4
Mercury	<2	ng/L	1	5	2	U1	RLP	11/01/2024 00:00	EPA 245.7-2005, Rev. 2.0
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	ELH	11/12/2024 16:10	EPA 200.8-1994, Rev. 5.4
Potassium	0.01	mg/L	1	0.10	0.01	J1	ELH	11/12/2024 16:10	EPA 200.8-1994, Rev. 5.4
Selenium	<0.04	µg/L	1	0.50	0.04	U1	ELH	11/12/2024 16:10	EPA 200.8-1994, Rev. 5.4
Sodium	0.18	mg/L	1	0.20	0.02	J1	ELH	11/12/2024 16:10	EPA 200.8-1994, Rev. 5.4
Thallium	<0.02	µg/L	1	0.20	0.02	U1	ELH	11/12/2024 16:10	EPA 200.8-1994, Rev. 5.4

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 243183 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/03/2024**

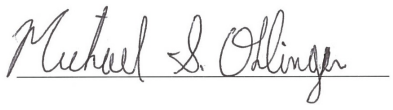
Customer Sample ID: FIELD BLANK	Customer Description:
Lab Number: 243183-009	Preparation:
Date Collected: 10/22/2024 17:46 EDT	Date Received: 10/28/2024 11:40 EDT

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Antimony	<0.008	µg/L	1	0.100	0.008	U1	ELH	11/12/2024 17:26	EPA 200.8-1994, Rev. 5.4
Arsenic	<0.03	µg/L	1	0.10	0.03	U1	ELH	11/12/2024 17:26	EPA 200.8-1994, Rev. 5.4
Barium	0.17	µg/L	1	0.20	0.05	J1	ELH	11/12/2024 17:26	EPA 200.8-1994, Rev. 5.4
Beryllium	<0.007	µg/L	1	0.050	0.007	U1	ELH	11/12/2024 17:26	EPA 200.8-1994, Rev. 5.4
Boron	<0.007	mg/L	1	0.050	0.007	U1	ELH	11/12/2024 17:26	EPA 200.8-1994, Rev. 5.4
Cadmium	<0.004	µg/L	1	0.020	0.004	U1	ELH	11/12/2024 17:26	EPA 200.8-1994, Rev. 5.4
Calcium	<0.02	mg/L	1	0.05	0.02	U1	ELH	11/25/2024 22:37	EPA 200.8-1994, Rev. 5.4
Chromium	0.33	µg/L	1	0.30	0.07		ELH	11/12/2024 17:26	EPA 200.8-1994, Rev. 5.4
Cobalt	0.009	µg/L	1	0.020	0.005	J1	ELH	11/12/2024 17:26	EPA 200.8-1994, Rev. 5.4
Lead	<0.05	µg/L	1	0.20	0.05	U1	ELH	11/12/2024 17:26	EPA 200.8-1994, Rev. 5.4
Lithium	<0.00006	mg/L	1	0.00030	0.00006	U1	ELH	11/12/2024 17:26	EPA 200.8-1994, Rev. 5.4
Magnesium	<0.009	mg/L	1	0.100	0.009	U1	ELH	11/25/2024 22:37	EPA 200.8-1994, Rev. 5.4
Molybdenum	<0.1	µg/L	1	0.5	0.1	U1	ELH	11/12/2024 17:26	EPA 200.8-1994, Rev. 5.4
Potassium	0.01	mg/L	1	0.10	0.01	J1	ELH	11/12/2024 17:26	EPA 200.8-1994, Rev. 5.4
Selenium	<0.04	µg/L	1	0.50	0.04	U1	ELH	11/12/2024 17:26	EPA 200.8-1994, Rev. 5.4
Sodium	0.03	mg/L	1	0.20	0.02	J1	ELH	11/12/2024 17:26	EPA 200.8-1994, Rev. 5.4
Thallium	<0.02	µg/L	1	0.20	0.02	U1	ELH	11/12/2024 17:26	EPA 200.8-1994, Rev. 5.4

Report Verification

This report and the above data have been confirmed by the following analyst.



Michael Ohlinger, Chemist
Email: msohlinger@aep.com
Phone: 614-836-4184
Audinet: 8-210-4184

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 243183 **Customer: Northeastern 3&4 Power Station** **Date Reported: 12/03/2024**

Data Qualifer Legend

J1 - Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
P2 - The precision on the laboratory control sample duplicate (LCSD) was above acceptance limits.
L1 - The associated laboratory control sample (LCS) or laboratory control sample duplicate (LCSD) recovery was outside acceptance limits.
U1 - Not detected at or below method detection limit (MDL).
R2 - Carrier recovery was outside acceptance limits.

Chain of Custody Record

Program: Coal Combustion Residuals (CCR)

Dolan Chemical Laboratory (DCL)
4001 Bixby Road
Groveport, Ohio 43125
Contacts: Jonathan Barnhill (318-673-3803)
Michael Ohlinger (614-836-4184)

Project Name: NE PS BAP Semi-Annual CCR sampling

Contact Name: Rebecca Jones

Contact Phone: 737-330-3725

Sampler(s): Kenny McDonald

Analysis Turnaround Time (In Calendar Days)
Routine (28 days for Monitoring Wells)

Site Contact:

Date:

For Lab Use Only:
COC/Order #: 243183

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	250 mL bottle, pH<2, HNO_3 As, B, Ba, Be, Ca,Cd, Cr, Co,K, Li, Na, Pb, Mg, Mo, Sb, Se, TL [17]	1 L bottle, Cool, 0-6°C TDS, F, Cl, SO_4	Three (six every 10th*) 1 L bottles, pH<2, HNO_3 Ra-226, Ra-228	250 mL Glass or 125/250 mL PTFE lined bottle, HCL**, pH<2 Hg	Field-filter 500 mL bottle, then pH<2, HNO_3 dissolved Fe and Mn		Sample Specific Notes:
SP-1	10/22/2024	1608	G	GW	5		X		X	X			
SP-2	10/22/2024	1537	G	GW	5		X		X	X			
SP-4	10/22/2024	1641`	G	GW	5		X		X	X			
SP-5R	10/22/2024	1809	G	GW	5		X		X	X			
SP-10	10/22/2024	1316	G	GW	8		X		X	X			
SP-11	10/22/2024	1349	G	GW	5		X		X	X			
BAP DUPLICATE	10/22/2024	1300	G	GW	2		X			X			
BAP EQUIPMENT BLANK	10/22/2024	1320	G	W	2		X			X			
FIELD BLANK	10/22/2024	1646	G	W	1		X						
Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____; F= filter in field							4	1	4				

* *Six 1L Bottles must be collected for Radium for every 10th sample.*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
[signature]	EAGLE	10/25/24 1400		
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by: [signature]	Date/Time: 10/28/24 11:40

WATER & WASTE SAMPLE RECEIPT FORM

Form SOP-7102 Sample Receipt Form Rev.9, 10/07/24

Package Type

(Cooler) Box Bag Envelope

Delivery Type

(UPS) FedEX USPS

Other _____

Plant/Customer Northeastern **Total # of Containers RECEIVED in Job:** 38

Opened By MGK

Date/Time 10/28/24 11:40

Were all temperatures within 0-6°C? Y / N or (N/A) (Temps) **Initial:** MGK on ice / (no ice)

If No, specify each deviation(s) on back of form. (IR Gun Ser# 240093386, *Expir.* 01/31/2026)

Was container in good condition? (Y) / N Comments _____

Was Chain of Custody received? (Y) / N Comments _____

Requested turnaround: Routine If **RUSH**, who was notified? _____

pH (15 min) Cr^{+6} (pres) (24 hr) NO_2 or NO_3 (48 hr) *ortho*-PO_4 (48 hr) Hg-diss (pres) (48 hr)

Was pH checked & Color Coding done? (Y) / N or N/A (pH) **Initial & Date:** MGK 10/28/24

pH paper mfr LabRat, PN 4801, LOT# X000RWDG21, EXPIR DATE 11/30/2025

*** Note changes to pH paper in comments below***

Was Add'l Preservative needed? Y / (N) If Yes: By whom & when: _____ (See Prep Book)

(Dissolved) Is sample filtration requested? Y / (N) Comments _____ (See Prep Book)

Was COC filled out properly? (Y) / N Comments _____

Were samples labeled properly? (Y) / N Comments _____

Were correct containers used? (Y) / N Comments _____

Was the customer contacted? If Yes: Person Contacted: _____

Initial & Date & Time : _____

Lab ID# 243183

Logged by VSB

(Record Test Count on back of form)

Comments: CoC unclear with location for Northeastern & previous login used as reference

Total # of Containers LISTED on COC: 38

WATER & WASTE SAMPLE RECEIPT FORM (CONT)

Form SOP-7102 Sample Receipt Form Rev.9, 10/07/24

REMINDER: Document the pertinent sample integrity information and deviations in sample receipt (as noted above) in the Sample or Job "Comments" field in the LIMS. **Comments below**:
i.e. Mark "LF" if needs Lab filtered, Temperature or Preservative deviation, Preserved upon arrival , etc.

JOB # : 243183 **Initial/ Date:** [illegible] 10/28/24 **Peer Review Initial/ Date:** WG 10/29/24

Login Test Count from COC	LIMS Sample ID (or COC Sample Name)	Comments /Nonconformities	Peer Review Test Count from COC
20	243183-001		20
	-002		
	-003		
	-004		
	-005		
	-006		
	-007		18
	-008		18
	-009		17

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 243159 **Customer: Northeastern 3&4 Power Station** **Date Reported: 11/12/2024**

Customer Sample ID: SP-1 **Customer Description:**
Lab Number: 243159-001 **Preparation:**
Date Collected: 10/22/2024 17:08 EDT **Date Received: 10/24/2024 10:00 EDT**

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	48.1	mg/L	5	0.15	0.05		CRJ	11/01/2024 15:45	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.96	mg/L	5	0.15	0.05		CRJ	11/01/2024 15:45	EPA 300.1 -1997, Rev. 1.0
Sulfate	85.2	mg/L	5	1.5	0.3		CRJ	11/01/2024 15:45	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	510	mg/L	2	100	40		BLB	10/25/2024 12:33	SM 2540C-2015

Customer Sample ID: SP-2 **Customer Description:**
Lab Number: 243159-002 **Preparation:**
Date Collected: 10/22/2024 16:37 EDT **Date Received: 10/24/2024 10:00 EDT**

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	365	mg/L	50	1.5	0.5		CRJ	11/01/2024 16:18	EPA 300.1 -1997, Rev. 1.0
Fluoride	2.68	mg/L	5	0.15	0.05		CRJ	11/01/2024 22:21	EPA 300.1 -1997, Rev. 1.0
Sulfate	16.5	mg/L	5	1.5	0.3		CRJ	11/01/2024 22:21	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	950	mg/L	2	100	40	S7	BLB	10/25/2024 12:33	SM 2540C-2015

Customer Sample ID: SP-4 **Customer Description:**
Lab Number: 243159-003 **Preparation:**
Date Collected: 10/22/2024 17:41 EDT **Date Received: 10/24/2024 10:00 EDT**

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	448	mg/L	50	1.5	0.5		CRJ	11/01/2024 16:51	EPA 300.1 -1997, Rev. 1.0
Fluoride	3.22	mg/L	5	0.15	0.05		CRJ	11/01/2024 22:54	EPA 300.1 -1997, Rev. 1.0
Sulfate	79.4	mg/L	5	1.5	0.3		CRJ	11/01/2024 22:54	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	1120	mg/L	2	100	40		BLB	10/25/2024 12:40	SM 2540C-2015

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Job ID: 243159 **Customer: Northeastern 3&4 Power Station** **Date Reported: 11/12/2024**

Customer Sample ID: SP-5R
Lab Number: 243159-004
Date Collected: 10/22/2024 19:09 EDT
Customer Description:
Preparation:
Date Received: 10/24/2024 10:00 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	721	mg/L	50	1.5	0.5		CRJ	11/01/2024 17:24	EPA 300.1 -1997, Rev. 1.0
Fluoride	3.06	mg/L	5	0.15	0.05		CRJ	11/01/2024 23:59	EPA 300.1 -1997, Rev. 1.0
Sulfate	2.3	mg/L	5	1.5	0.3		CRJ	11/01/2024 23:59	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	1430	mg/L	2	100	40		BLB	10/25/2024 12:40	SM 2540C-2015

Customer Sample ID: SP-10
Lab Number: 243159-005
Date Collected: 10/22/2024 14:16 EDT
Customer Description:
Preparation:
Date Received: 10/24/2024 10:00 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	1920	mg/L	250	8	3		CRJ	11/01/2024 18:30	EPA 300.1 -1997, Rev. 1.0
Fluoride	6.7	mg/L	10	0.3	0.1		CRJ	11/02/2024 00:32	EPA 300.1 -1997, Rev. 1.0
Sulfate	15.9	mg/L	10	3.0	0.6		CRJ	11/02/2024 00:32	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	422	mg/L	1	20	5		MGK	10/28/2024 14:49	SM 2320B-2011
Bicarbonate Alkalinity	421	mg/L	1	20	5		MGK	10/28/2024 14:49	SM 4500 CO2D-2011
TDS, Filterable Residue	3490	mg/L	2	100	40		BLB	10/25/2024 12:46	SM 2540C-2015

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 243159 **Customer: Northeastern 3&4 Power Station** **Date Reported: 11/12/2024**

Customer Sample ID: SP-11
Customer Description:
Lab Number: 243159-006
Preparation:
Date Collected: 10/22/2024 14:49 EDT
Date Received: 10/24/2024 10:00 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	80.6	mg/L	10	0.3	0.1		CRJ	11/01/2024 19:03	EPA 300.1 -1997, Rev. 1.0
Fluoride	1.88	mg/L	2	0.06	0.02		CRJ	11/02/2024 01:38	EPA 300.1 -1997, Rev. 1.0
Sulfate	204	mg/L	10	3.0	0.6		CRJ	11/01/2024 19:03	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	870	mg/L	2	100	40		BLB	10/28/2024 07:28	SM 2540C-2015

Customer Sample ID: BAP DUPLICATE
Customer Description:
Lab Number: 243159-007
Preparation:
Date Collected: 10/22/2024 14:00 EDT
Date Received: 10/24/2024 10:00 EDT

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	1930	mg/L	250	8	3		CRJ	11/01/2024 14:07	EPA 300.1 -1997, Rev. 1.0
Fluoride	6.6	mg/L	10	0.3	0.1		CRJ	11/01/2024 14:40	EPA 300.1 -1997, Rev. 1.0
Sulfate	15.1	mg/L	10	3.0	0.6		CRJ	11/01/2024 14:40	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
TDS, Filterable Residue	3500	mg/L	2	100	40		BLB	10/28/2024 07:34	SM 2540C-2015

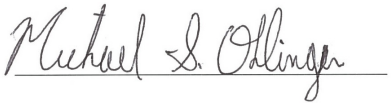
Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 243159 **Customer: Northeastern 3&4 Power Station** **Date Reported: 11/12/2024**

Report Verification

This report and the above data have been confirmed by the following analyst.



Michael Ohlinger, Chemist
Email: msohlinger@aep.com
Phone: 614-836-4184
Audinet: 8-210-4184

Data Qualifer Legend

S7 - Sample did not achieve constant weight.

Chain of Custody Record

Program: Coal Combustion Residuals (CCR)

Dolan Chemical Laboratory (DCL)
4001 Bixby Road
Groveport, Ohio 43125
Contacts: Jonathan Barnhill (318-673-3803)
Michael Ohlinger (614-836-4184)

Project Name: NE PS BAP Semi-Annual CCR sampling

Contact Name: Rebecca Jones

Contact Phone: 737-330-3725

Sampler(s): Kenny McDonald

Analysis Turnaround Time (in Calendar Days)
Routine (28 days for Monitoring Wells)

Site Contact: | **Date:**

For Lab Use Only:
COC/Order #: 243159

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sampler(s) Initials	As, B, Ba, Be, Ca,Cd, Cr, Co, K, Li, Na, Pb, Mg, Mo, Sb, Se, TL (250 mL bottle, pH<2, HNO_3)	TDS, F, Cl, SO_4 (1 L bottle, Cool, 0-6°C)	Ra-226, Ra-228 (Three (six every 10th*) 1 L bottles, pH<2, HNO_3)	Hg (250 mL Glass bottle, HCL**, pH<2)	dissolved Fe and Mn (Field-filter 250 mL bottle, pH<2, HNO_3)	TDS, F, CL, SO4, TOTAL ALKALINITY, BICARBONATE ALKALINITY (1 L bottle Cool, 0-6°C)	Sample Specific Notes:
SP-1	10/22/2024	1608	G	GW	1			X					
SP-2	10/22/2024	1537	G	GW	1			X					
SP-4	10/22/2024	1641	G	GW	1			X					
SP-5R	10/22/2024	1809	G	GW	1			X					
SP-10	10/22/2024	1316	G	GW	1							X	
SP-11	10/22/2024	1349	G	GW	1			X					
BAP DUPLICATE	10/22/2024	1300	G	GW	1			X					
Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____; F= filter in field							4	1	4				

** Six 1L Bottles must be collected for Radium for every 10th sample.*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company: FAO LT	Date/Time: 10/23/24 1400	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Date/Time: 10/24/24 8:00

WATER & WASTE SAMPLE RECEIPT FORM

Form SOP-7102 Sample Receipt Form Rev.9, 10/07/24

Package Type	Delivery Type
(Cooler) Box Bag Envelope	UPS (FedEx) USPS
	Other _____

Plant/Customer Northeastern **Total # of Containers RECEIVED in Job:** 7

Opened By MSO/WCG

Date/Time 10/24/24 1012

Were all temperatures within 0-6°C? (Y) / N or N/A (Temps) **Initial:** WCG on (ice) / no ice

If No, specify each deviation(s) on back of form. (IR Gun Ser# 240093386, *Expir.* 01/31/2026)

Was container in good condition? (Y) / N Comments _____

Was Chain of Custody received? (Y) / N Comments _____

Requested turnaround: Routine If **RUSH**, who was notified? _____

pH (15 min) Cr^{+6} (pres) (24 hr) NO_2 or NO_3 (48 hr) *ortho*-PO_4 (48 hr) Hg-diss (pres) (48 hr)

Was pH checked & Color Coding done? (Y) / N or N/A (pH) **Initial & Date:** WCG 10/24/24

pH paper mfr LabRat ,PN 4801 ,LOT# X000RWDG21 ,EXPIR DATE 11/30/2025

***** Note changes to pH paper in comments below***

Was Add'l Preservative needed? Y / (N) If Yes: By whom & when: _____ (See Prep Book)

(Dissolved) Is sample filtration requested? Y / (N) Comments _____ (See Prep Book)

Was COC filled out properly? (Y) / N Comments _____

Were samples labeled properly? (Y) / N Comments _____

Were correct containers used? (Y) / N Comments _____

Was the customer contacted? If Yes: Person Contacted: _____

Initial & Date & Time : _____

Lab ID# 243159

Comments: _____

Logged by MSO

(Record Test Count on back of form)

Total # of Containers LISTED on COC: 7

WATER & WASTE SAMPLE RECEIPT FORM (CONT)

Form SOP-7102 Sample Receipt Form Rev.9. 10/07/24

REMINDER: Document the pertinent sample integrity information and deviations in sample receipt (as noted above) in the Sample or Job "Comments" field in the LIMS. **Comments below**:
i.e. Mark "LF" if needs Lab filtered, Temperature or Preservative deviation, Preserved upon arrival , etc.

JOB # : 243159 **Initial/ Date:** MBO 10/24/24 **Peer Review Initial/ Date:** WCG 10/24/24

Login Test Count from COC	LIMS Sample ID (or COC Sample Name)	Comments /Nonconformities	Peer Review Test Count from COC
4	243159-001		4
4	-002		4
4	-003		4
4	-004		4
6	-005		6
4	-006		4
4	-007		4