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

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Worthington, Ohio 43085
PH 614.468.0421
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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

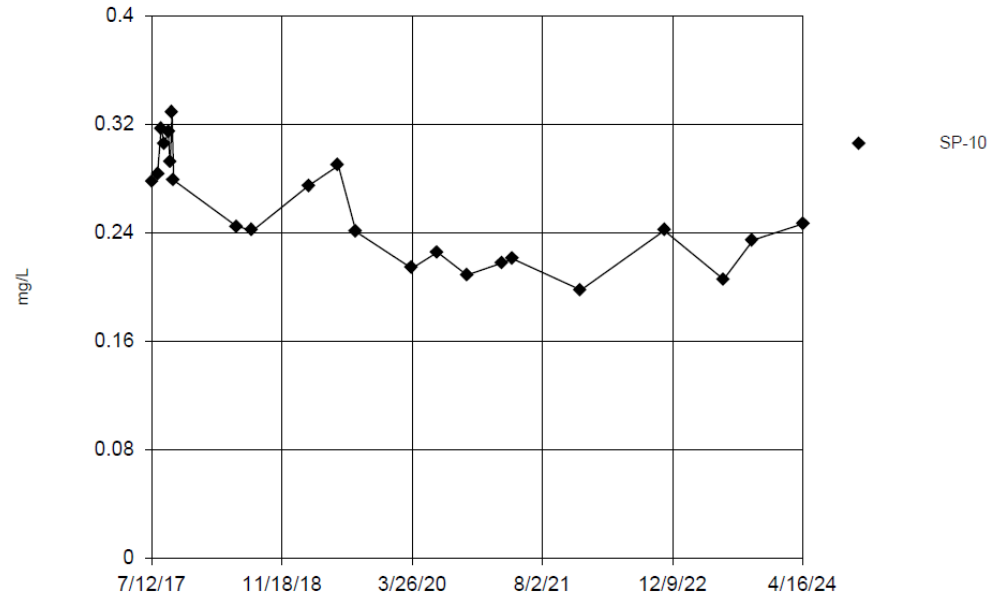
Sample	Sample Date	Lithium Concentration (mg/L)	Fluoride Concentration (mg/L)	Barium Concentration (mg/L)
SPLP Leachate of Bottom Ash	7/10/2019	0.001	0.458	0.352
	8/25/2022	< 0.5	NA	0.22
BAP Surface Water	2/5/2019	0.00874	0.37	0.315
BAP Pore Water	7/10/2019	0.003	< 0.83	0.083
SP-10 April 2024 Result	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



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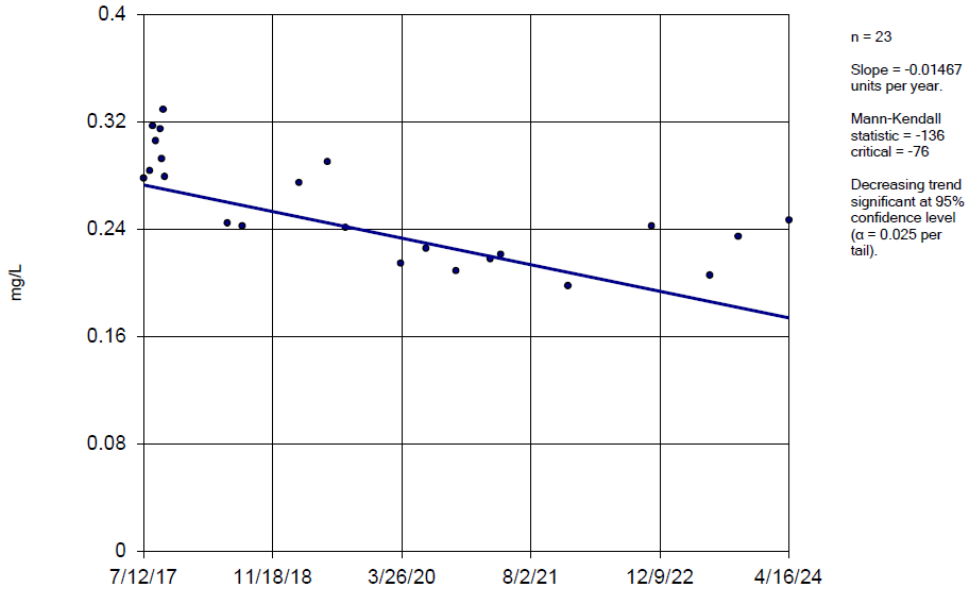
Sanitas™ v.9.6.31 Software for use by regulators in official oversight duties. EPA

Sen's Slope Estimator

SP-10



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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

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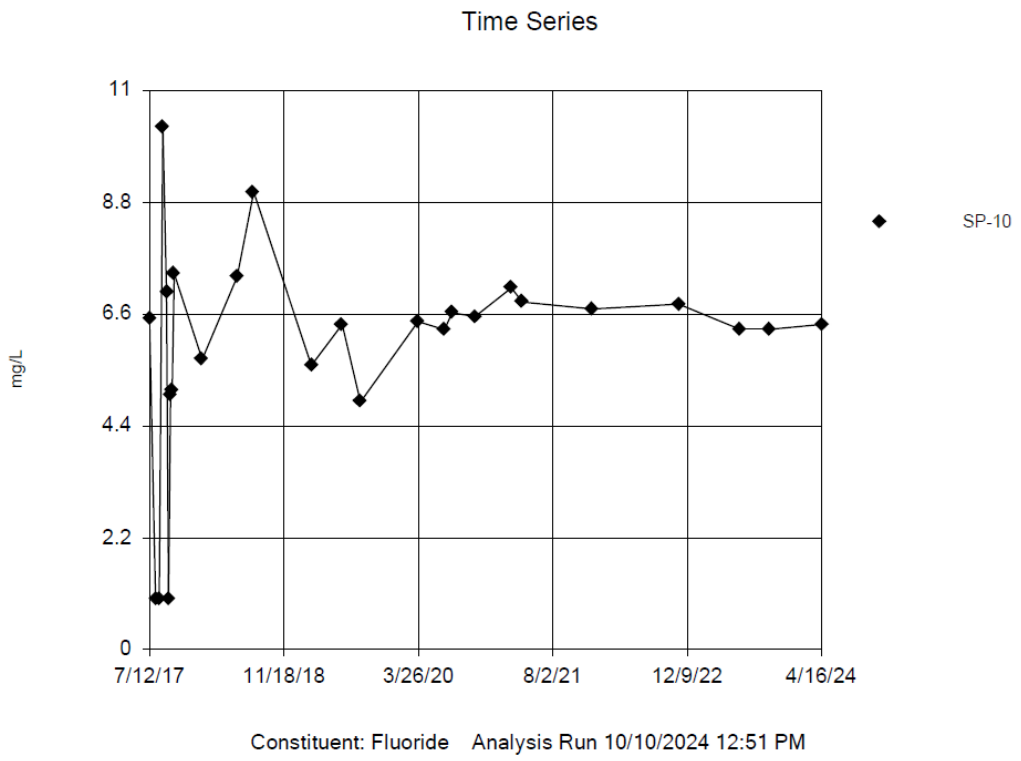

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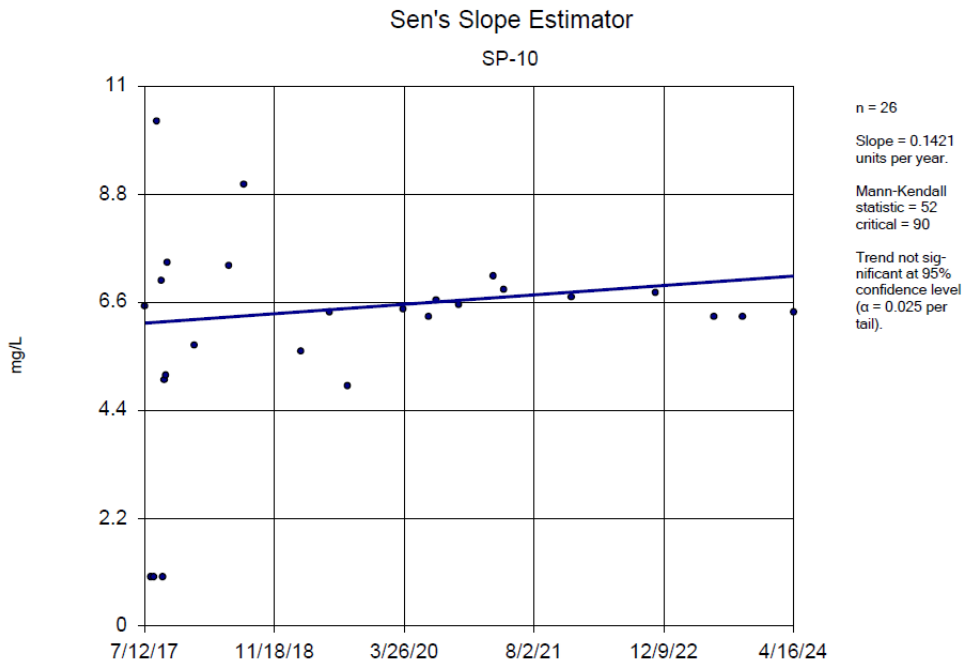

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Notes: Fluoride results from monitoring well SP-10 are displayed on the plots.

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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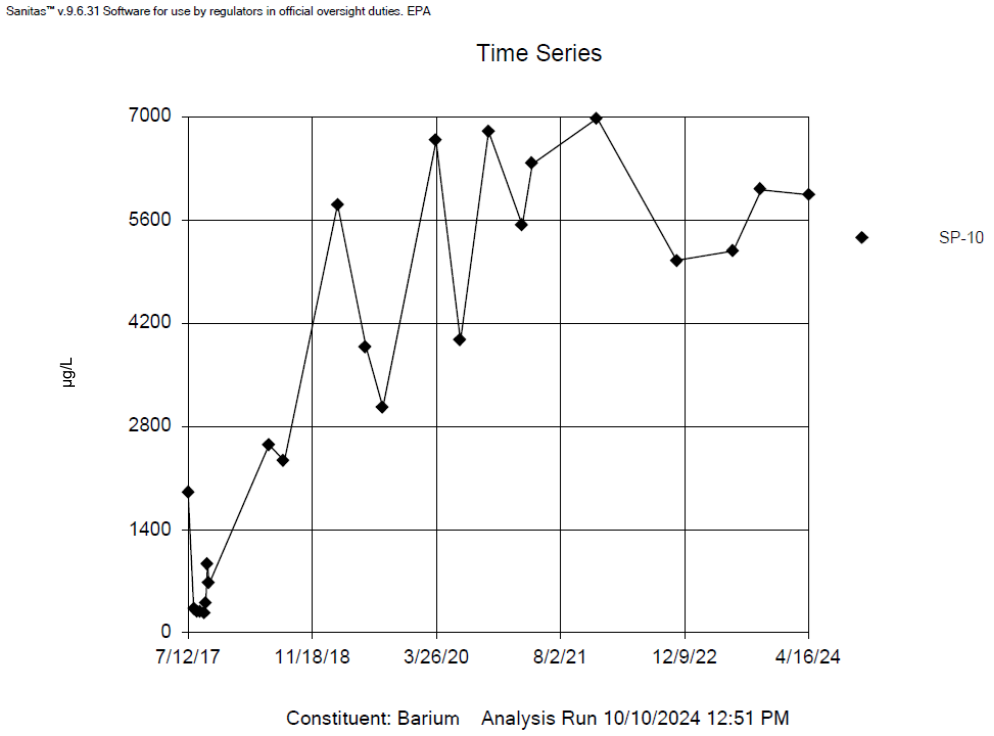
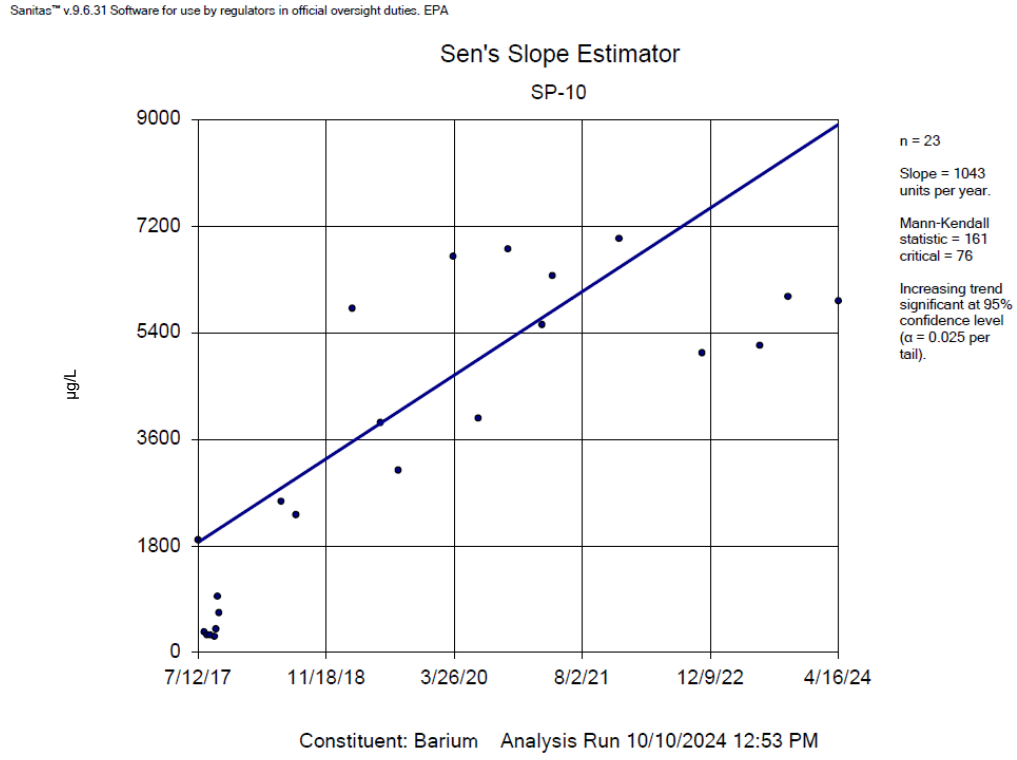
Figure **2**

Columbus, Ohio

November 14, 2024





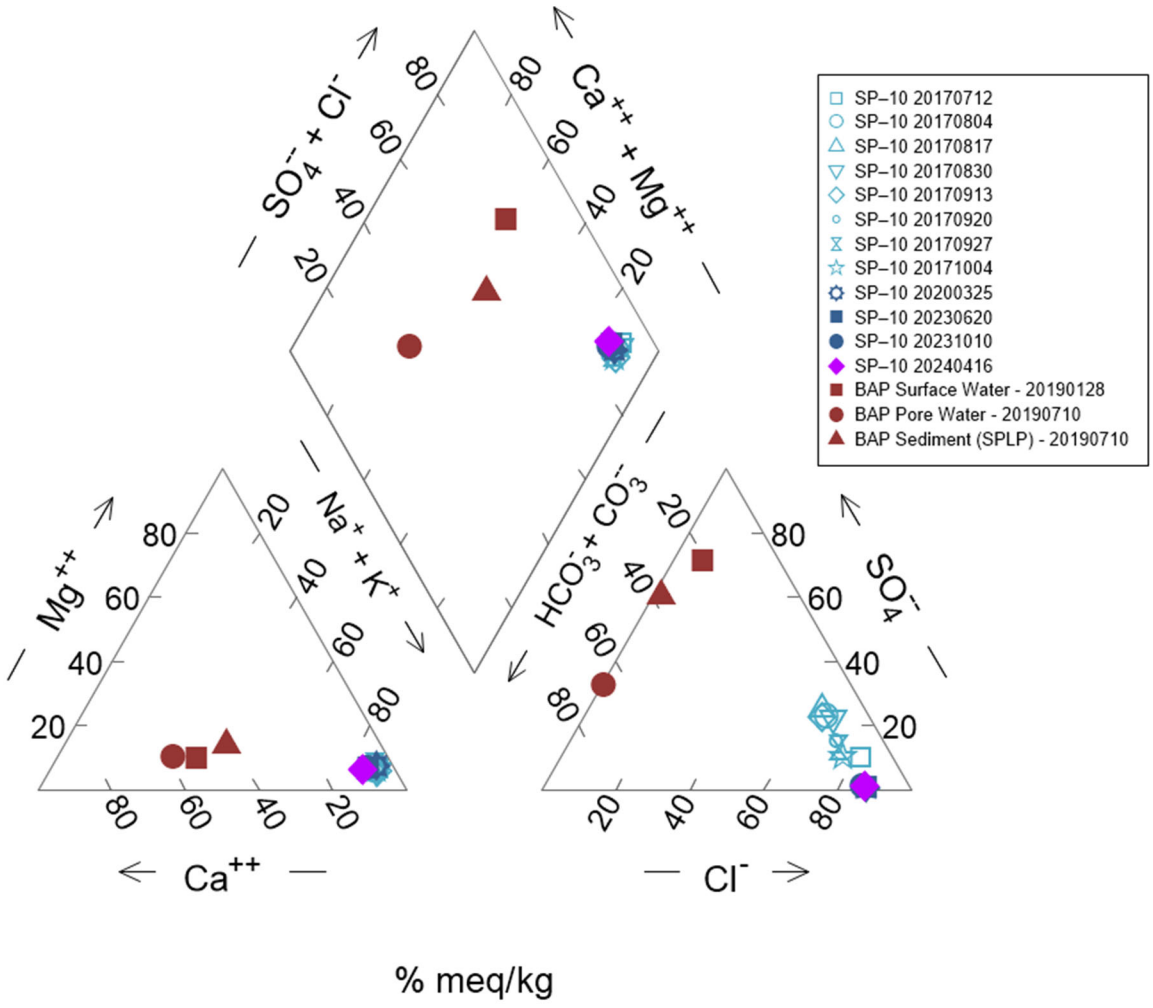
Notes: Barium results from monitoring well SP-10 are displayed on the plots.

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.

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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.

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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

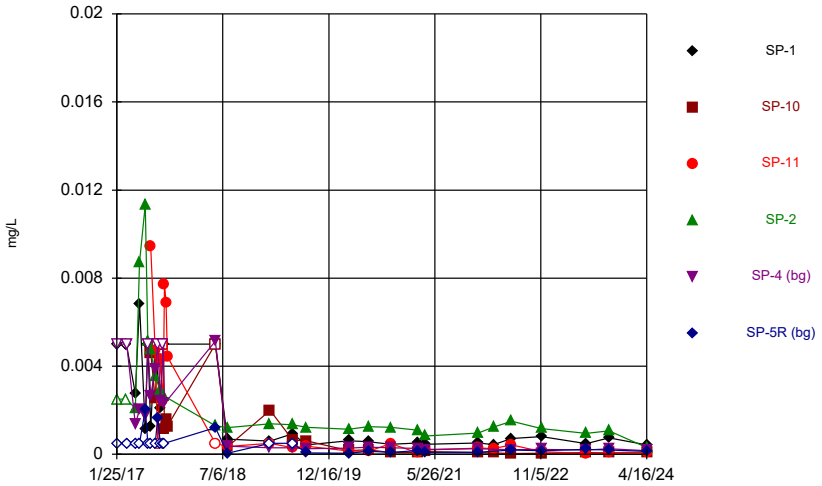
Thallium (mg/L)
- overall:5/30/2018-4/16/2024

FIGURE A

Time Series

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

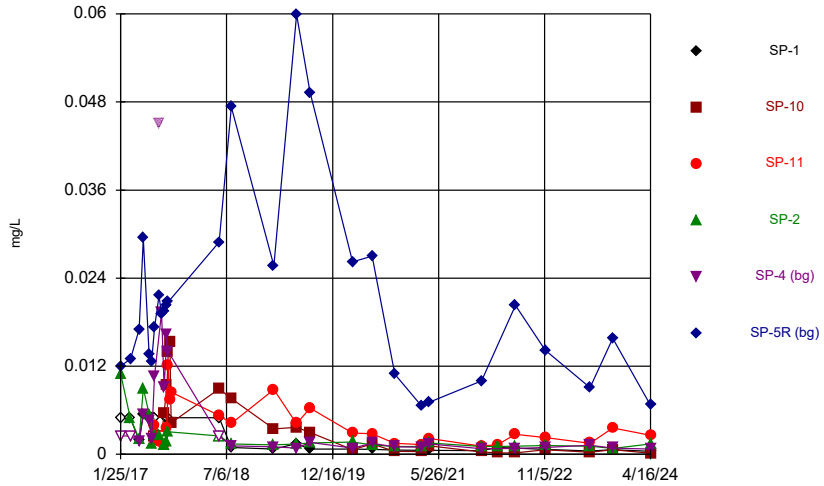
Time Series



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.

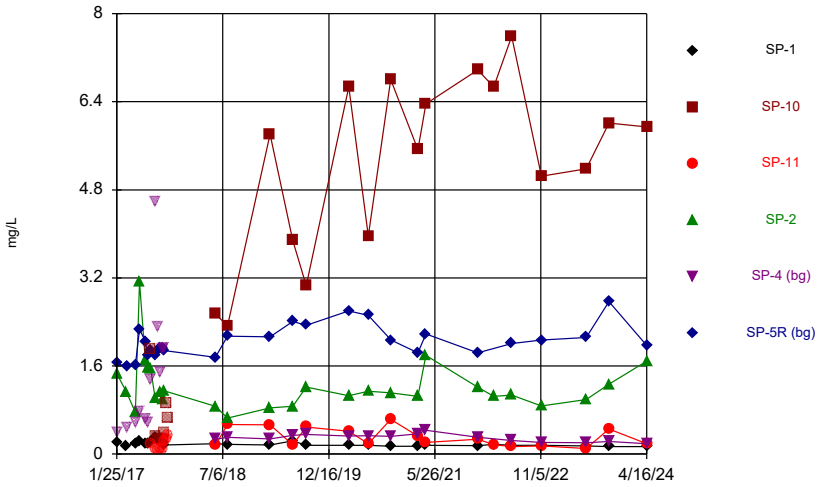
Time Series



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



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

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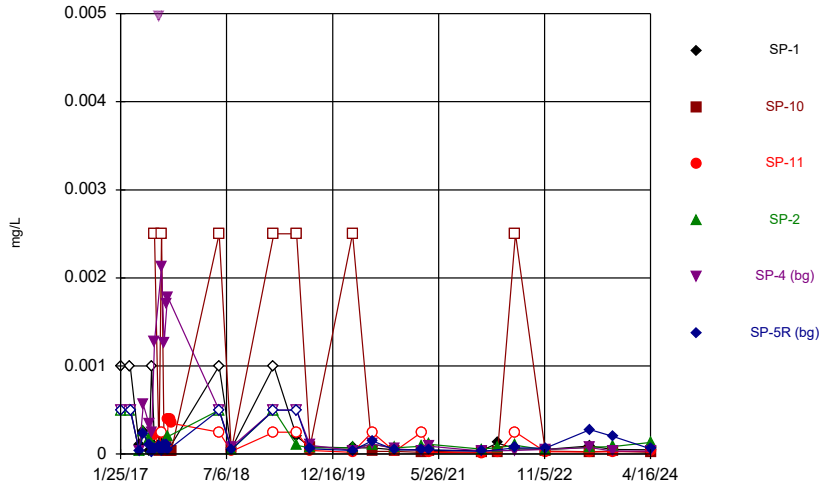
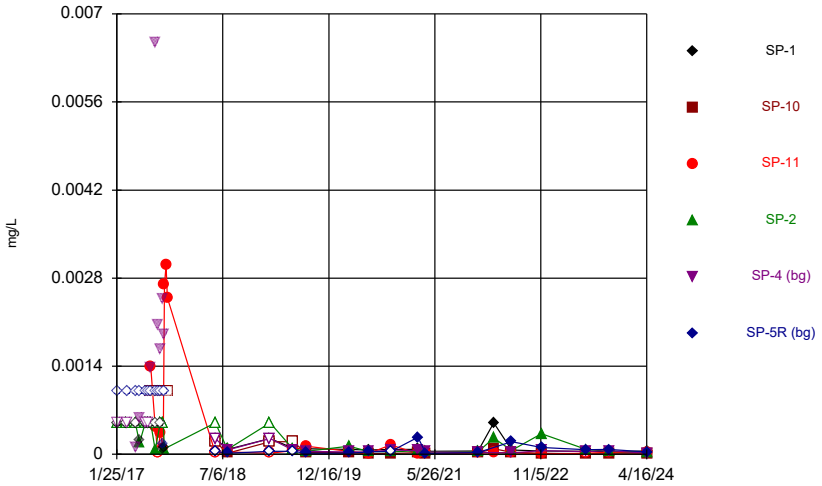


Constituent: Beryllium Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

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

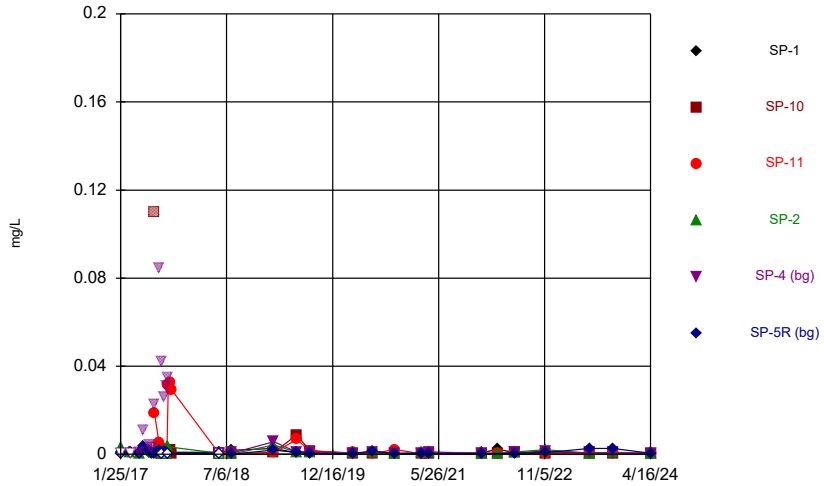
Time Series



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

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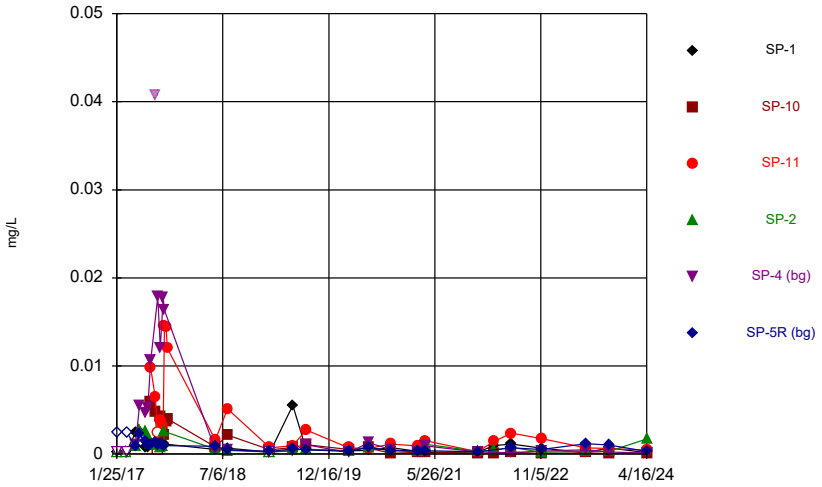
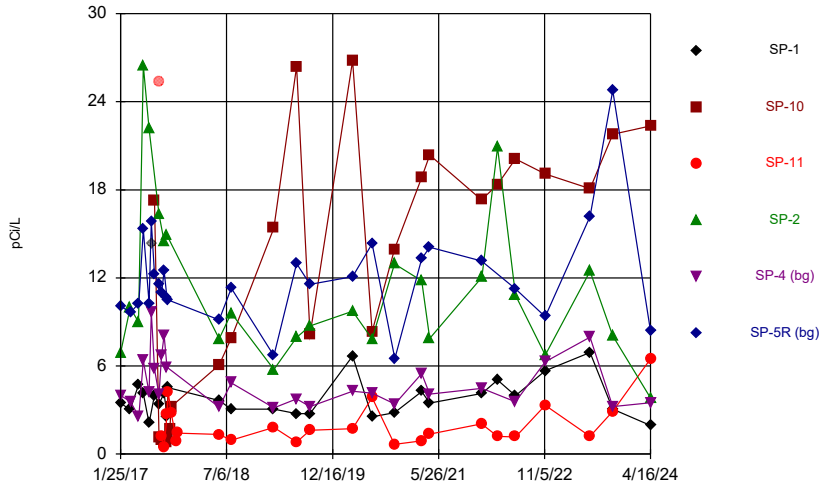


Constituent: Cobalt Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

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

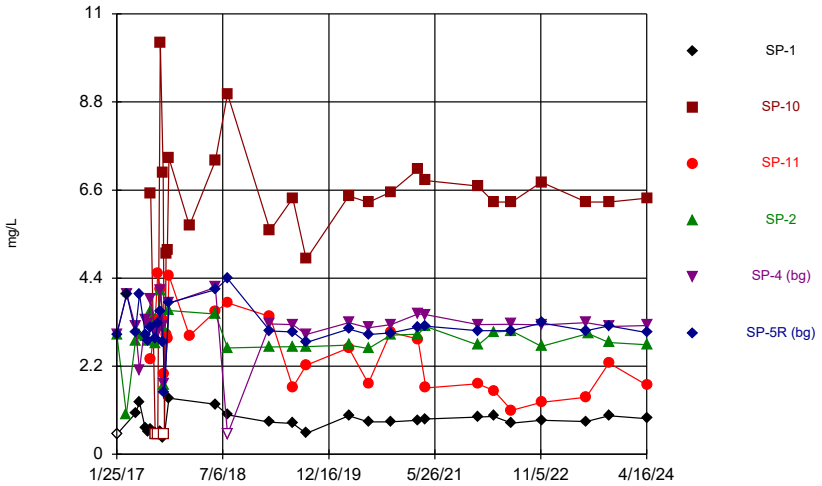
Time Series



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.

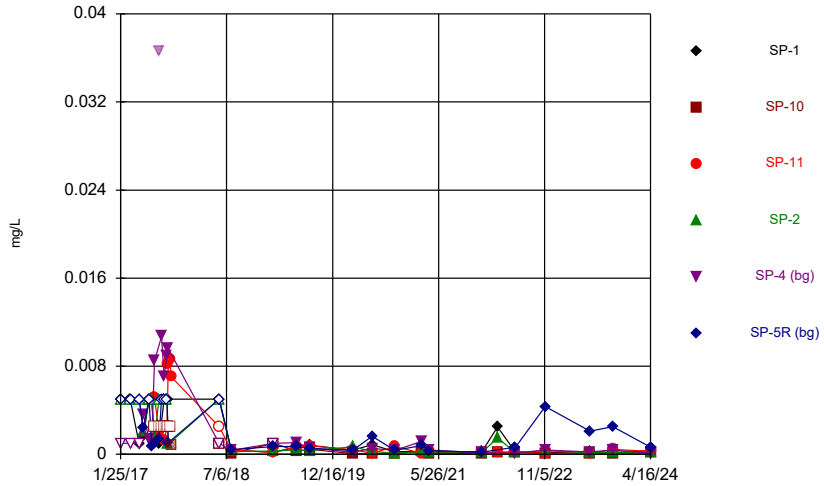
Time Series



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.

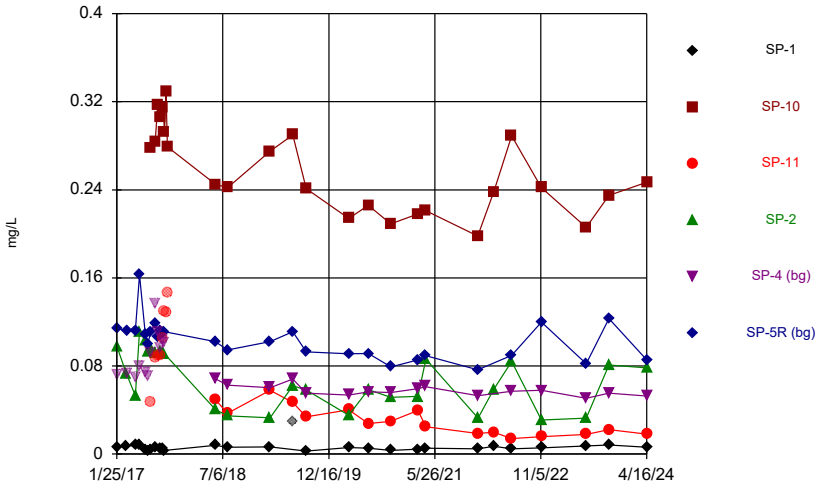
Time Series



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

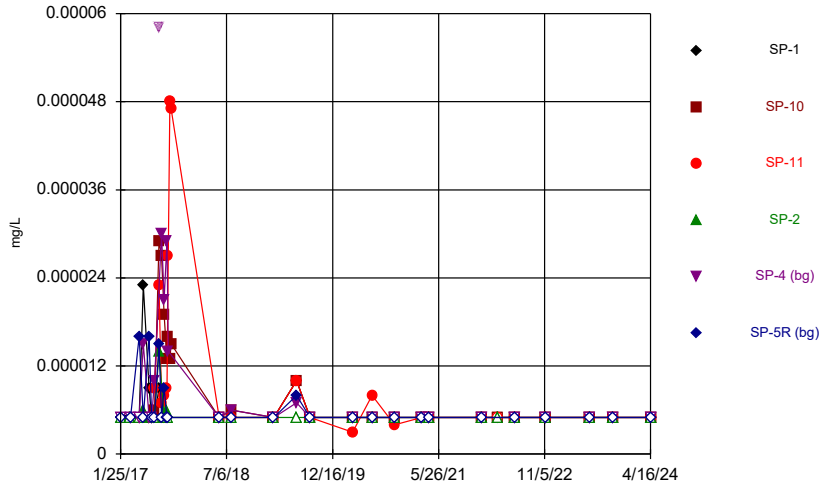
Time Series



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.

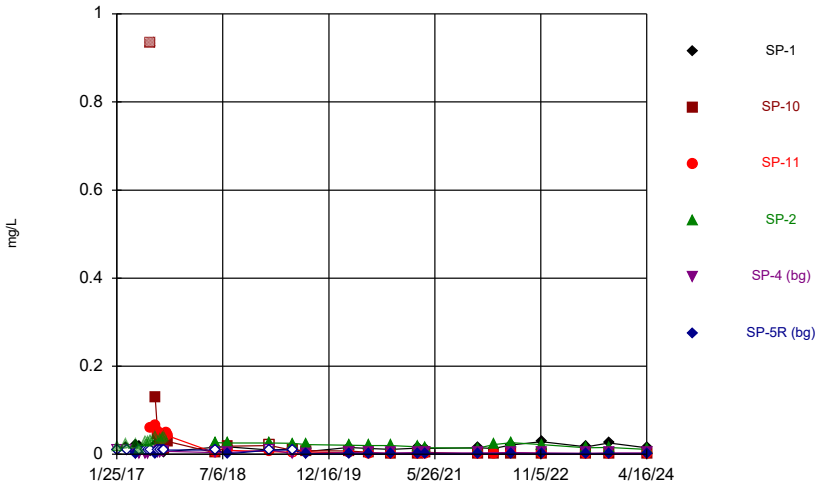
Time Series



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.

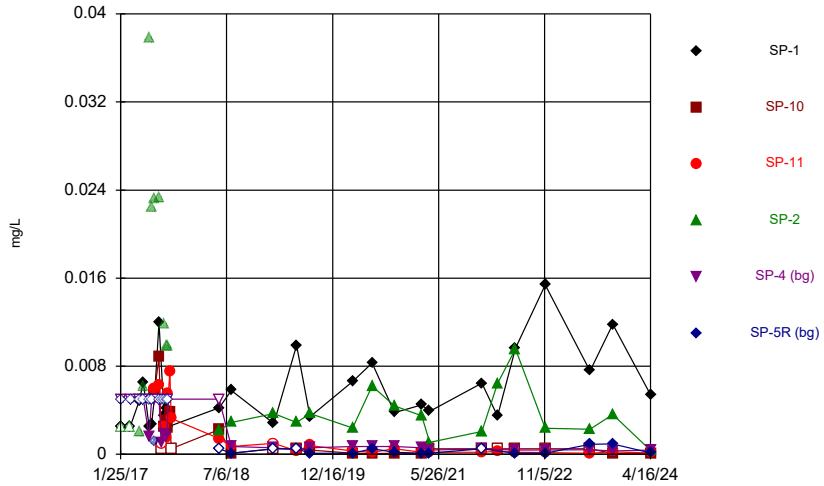
Time Series



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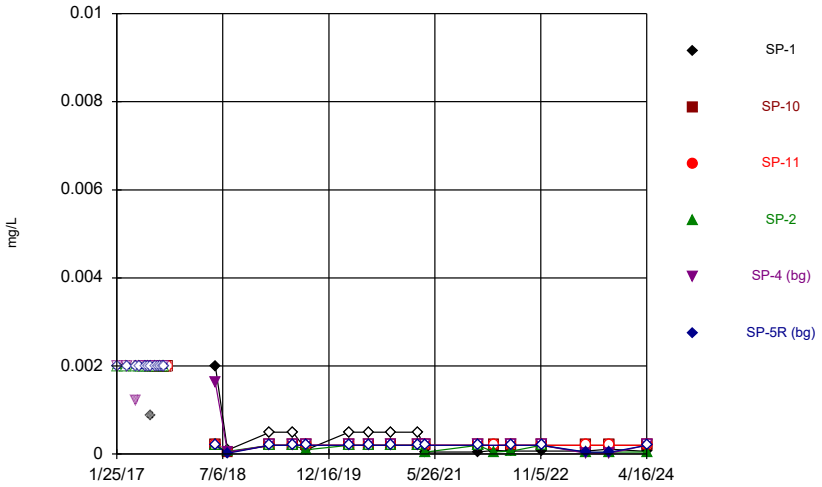
Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Time Series

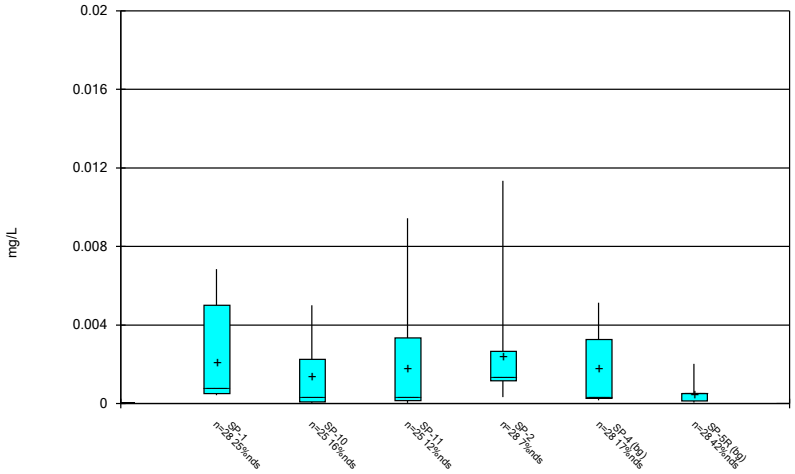


Constituent: Thallium Analysis Run 7/17/2024 1:39 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

FIGURE B

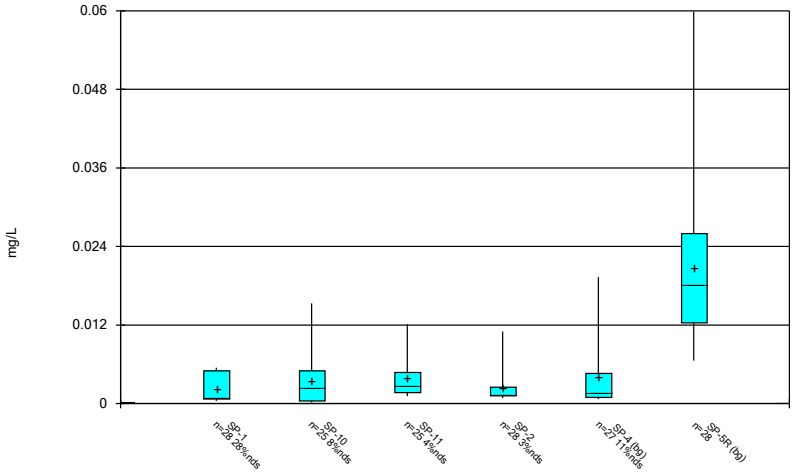
Box Plots

Box & Whiskers Plot



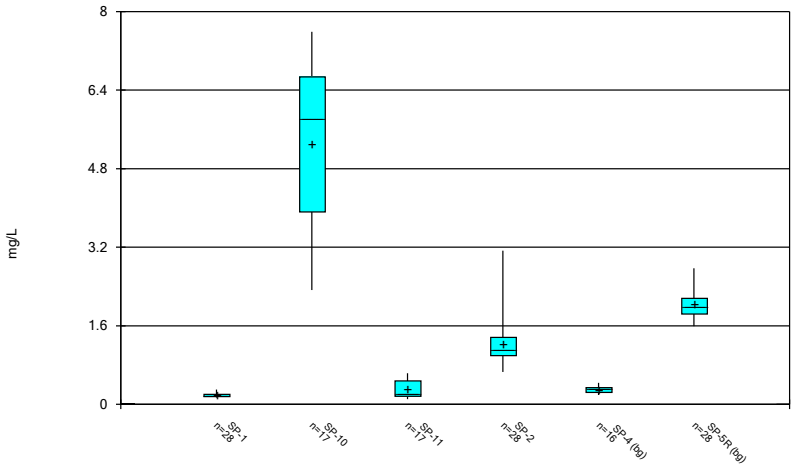
Constituent: Antimony Analysis Run 7/17/2024 1:41 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



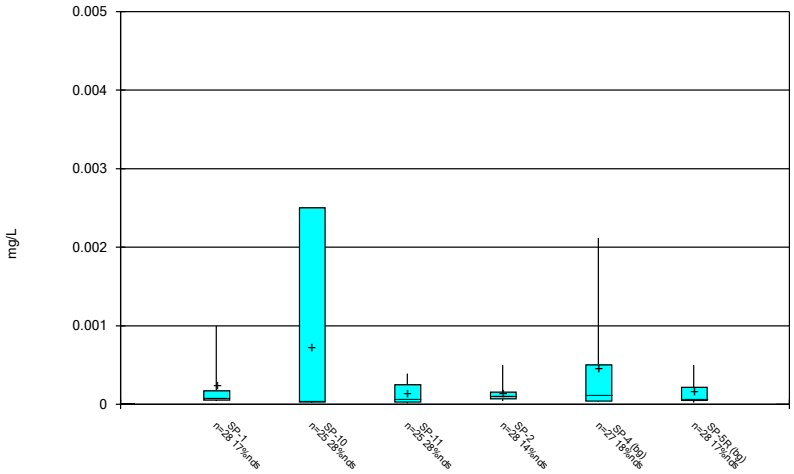
Constituent: Arsenic Analysis Run 7/17/2024 1:41 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



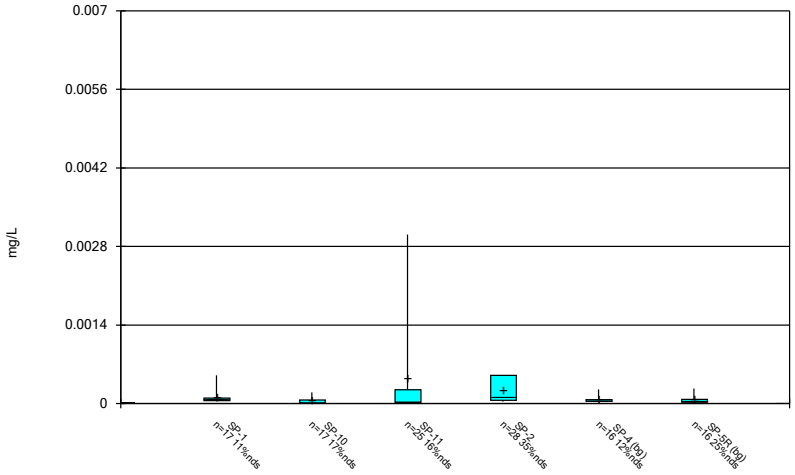
Constituent: Barium Analysis Run 7/17/2024 1:41 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



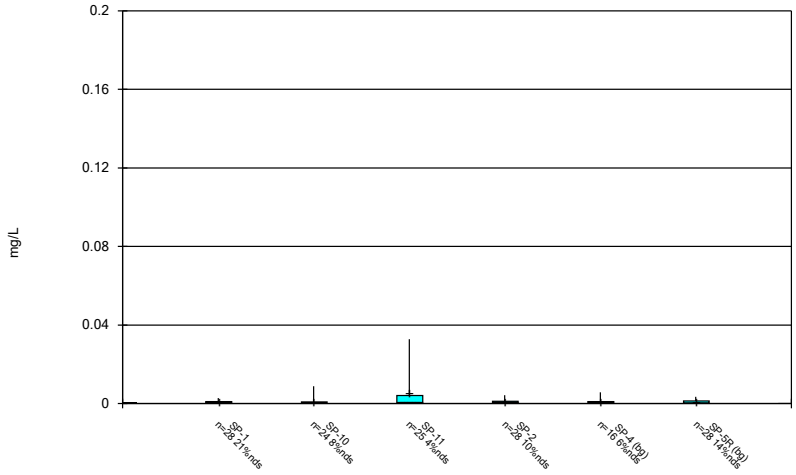
Constituent: Beryllium Analysis Run 7/17/2024 1:41 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



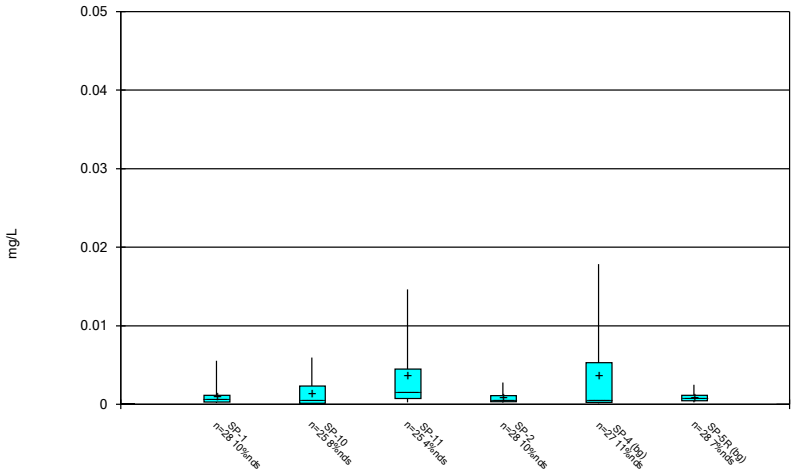
Constituent: Cadmium Analysis Run 7/17/2024 1:41 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



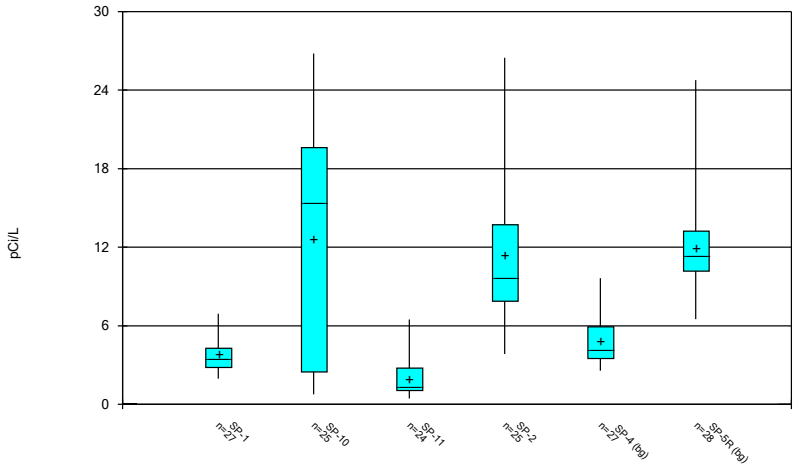
Constituent: Chromium Analysis Run 7/17/2024 1:41 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



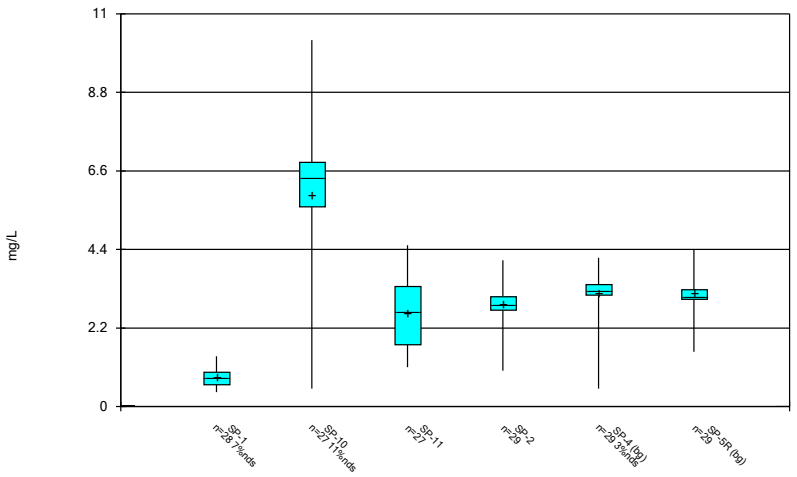
Constituent: Cobalt Analysis Run 7/17/2024 1:41 PM
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

Box & Whiskers Plot



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

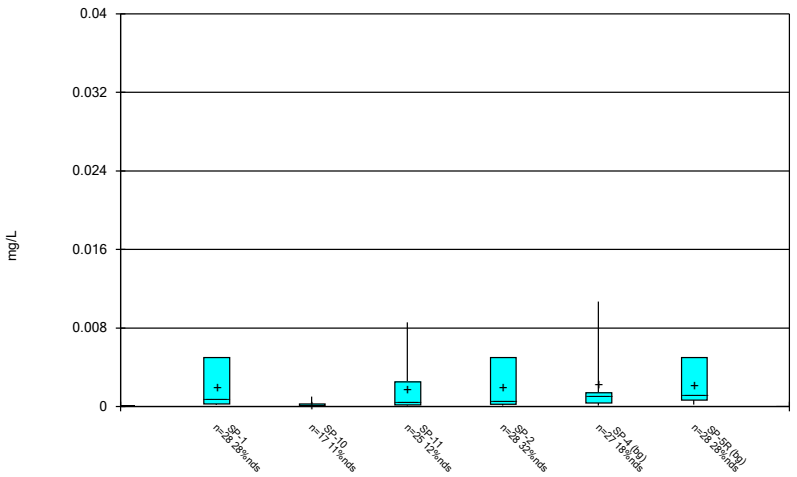
Box & Whiskers Plot



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

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

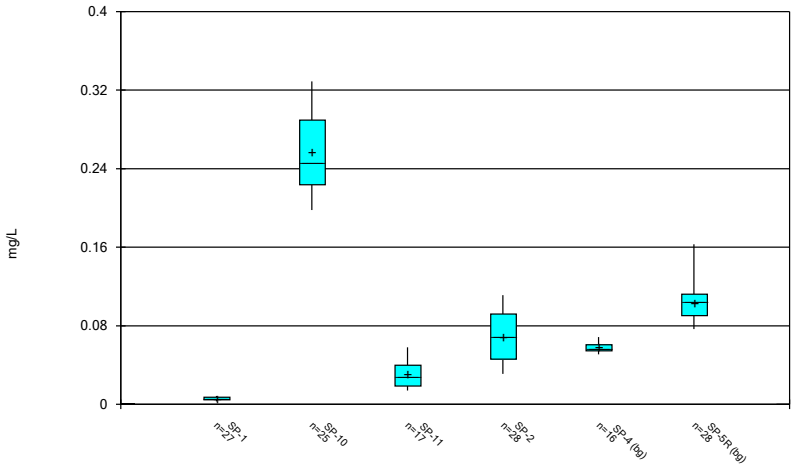
Box & Whiskers Plot



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

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

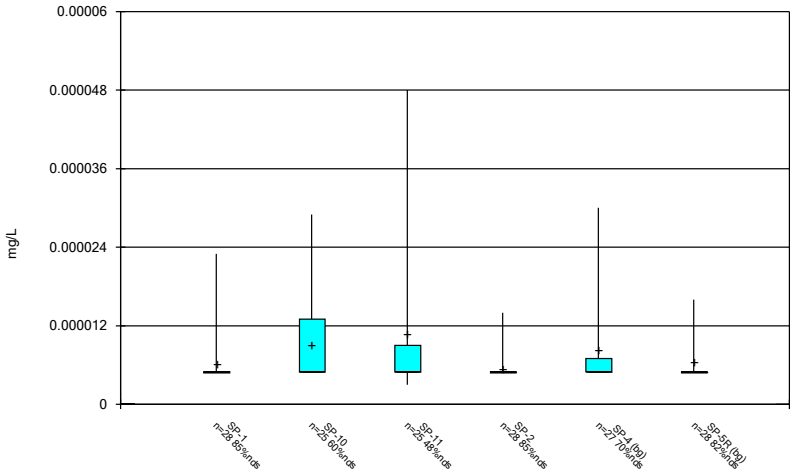
Box & Whiskers Plot



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

Northeastern BAP Client: Geosyntec Data: Northeastern BAP

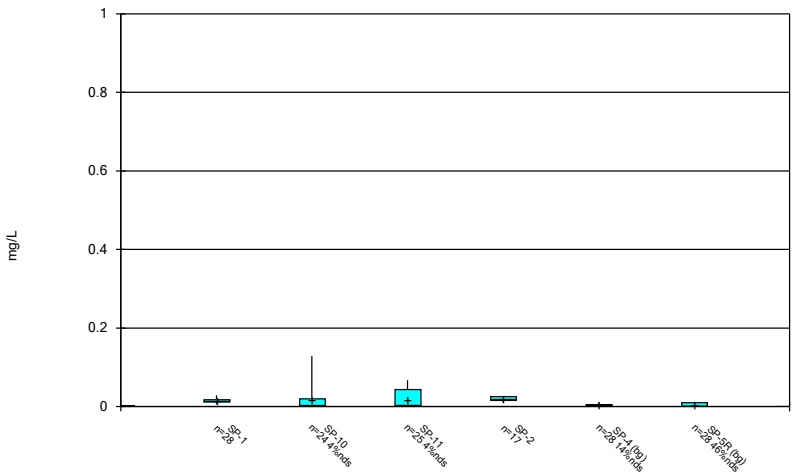
Box & Whiskers Plot



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

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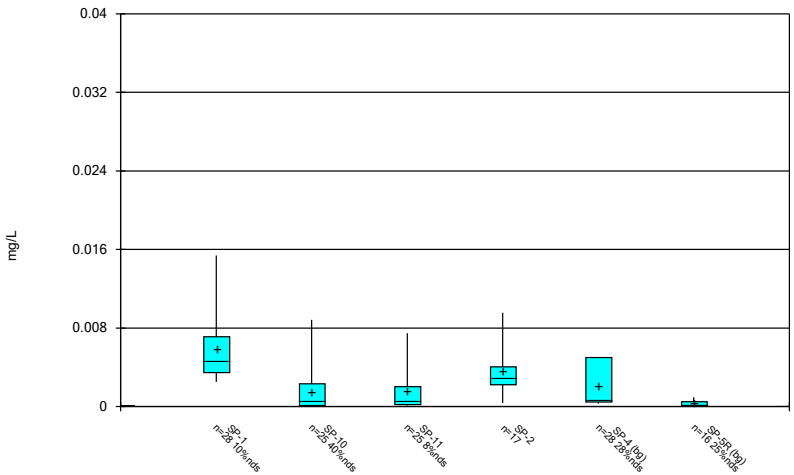
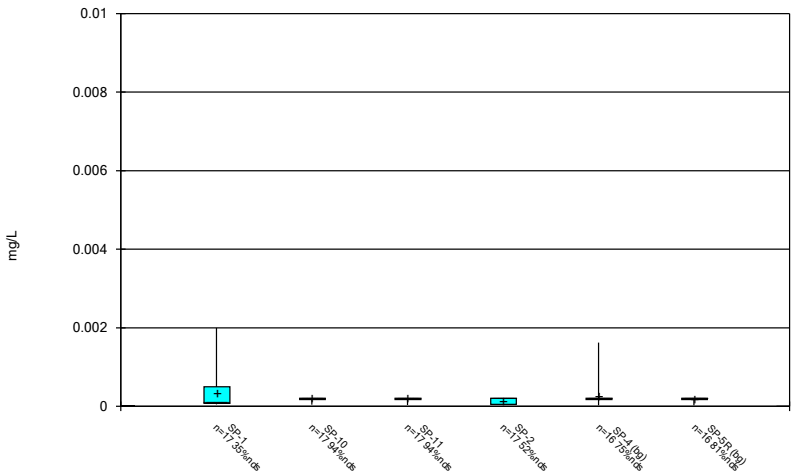
Box & Whiskers Plot



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

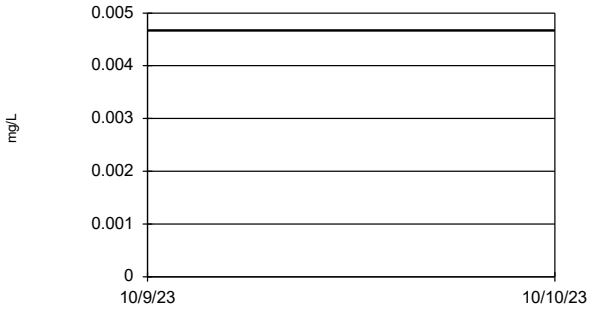
Upper Tolerance Limits Summary Table

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

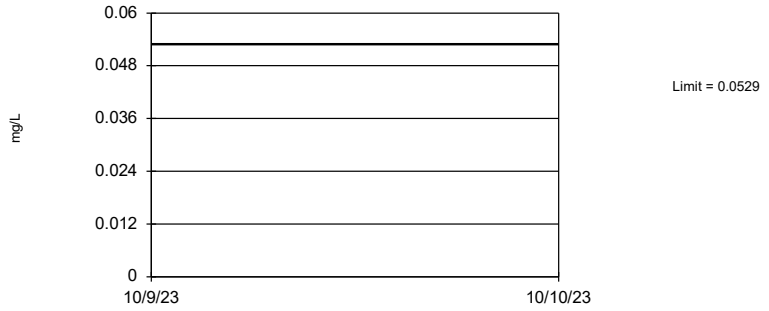


95% coverage. Background Data Summary (based on natural log transformation) (after Kaplan-Meier Adjustment): Mean=-8.028, Std. Dev.=1.303, n=54, 31.48% NDs. Normality test: Shapiro Francia @alpha = 0.01, calculated = 0.9524, critical = 0.939. Report alpha = 0.05.

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

Tolerance Limit

Interwell Parametric

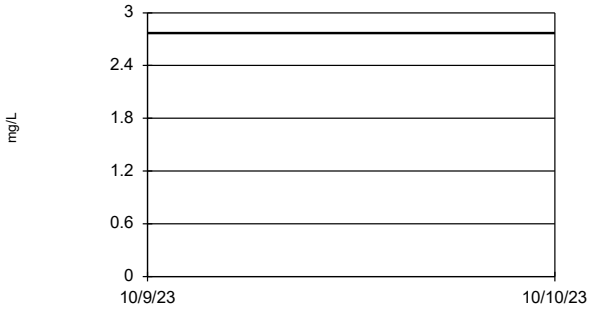


95% coverage. Background Data Summary (based on cube root transformation): Mean=0.2046, Std. Dev.=0.08342, n=53, 5.66% NDs. Normality test: Shapiro Francia @alpha = 0.01, calculated = 0.9413, critical = 0.938. Report alpha = 0.05.

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

Tolerance Limit

Interwell Non-parametric

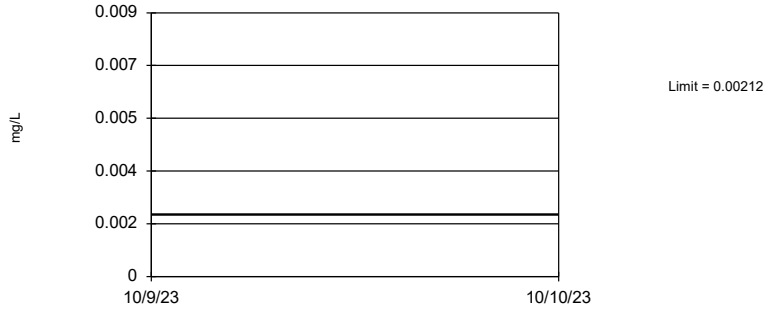


Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 42 background values. 89.65% coverage at alpha=0.01; 93.16% coverage at alpha=0.05; 98.24% coverage at alpha=0.5. Report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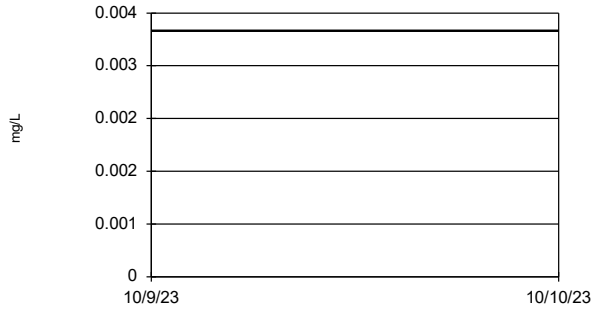
Tolerance Limit

Interwell Parametric



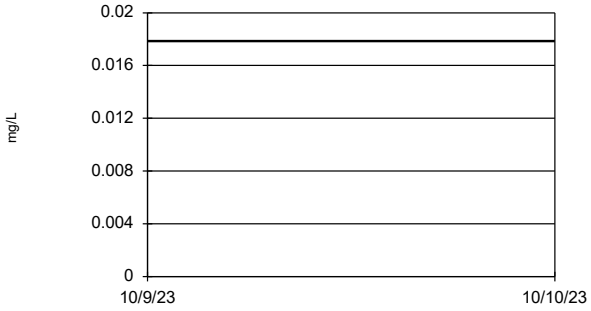
95% coverage. Background Data Summary (based on natural log transformation): Mean=-7.265, Std. Dev.=0.7923, n=42, 11.9% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9556, critical = 0.922. Report alpha = 0.05.

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



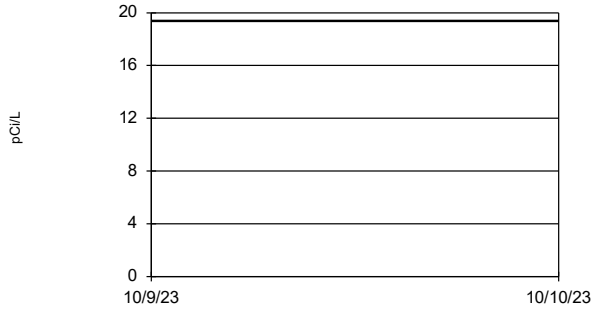
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 53 background values. 9.434% NDs. 91.6% coverage at alpha=0.01; 94.34% coverage at alpha=0.05; 98.63% coverage at alpha=0.5.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

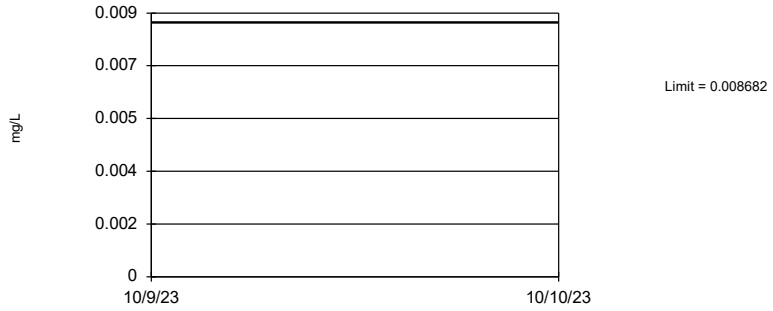
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 56 background values. 1.786% NDs. 91.99% coverage at alpha=0.01; 94.73% coverage at alpha=0.05; 98.63% coverage at alpha=0.5.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

Sanitas™ v.10.0.15 Software licensed to . UG

Tolerance Limit

Interwell Non-parametric

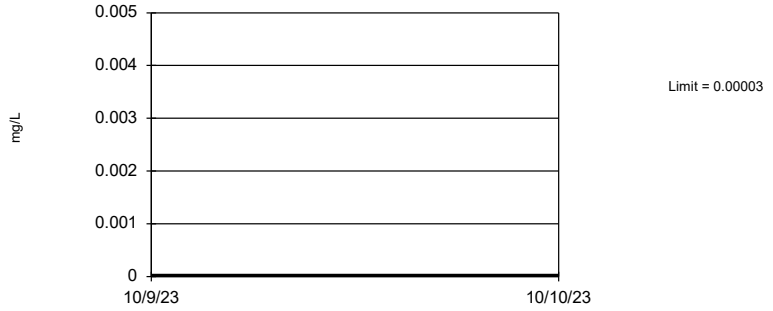
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 42 background values. 89.65% coverage at alpha=0.01; 93.16% coverage at alpha=0.05; 98.24% coverage at alpha=0.5. Report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

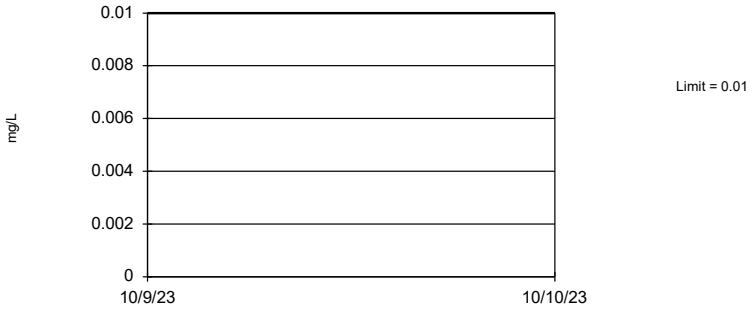


Non-parametric test used in lieu of parametric tolerance limit because censored data exceeded 50%. Limit is highest of 53 background values. 75.47% NDs. 91.6% coverage at alpha=0.01; 94.34% coverage at alpha=0.05; 98.63% coverage at alpha=0.5. Report alpha = 0.06597.

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

Tolerance Limit

Interwell Non-parametric



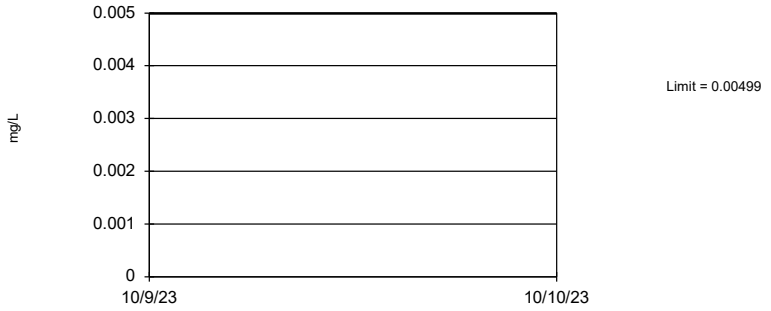
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Francia normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 54 background values. 31.48% NDs. 91.99% coverage at alpha=0.01; 94.73% coverage at alpha=0.05; 98.63% coverage at alpha=0.5.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



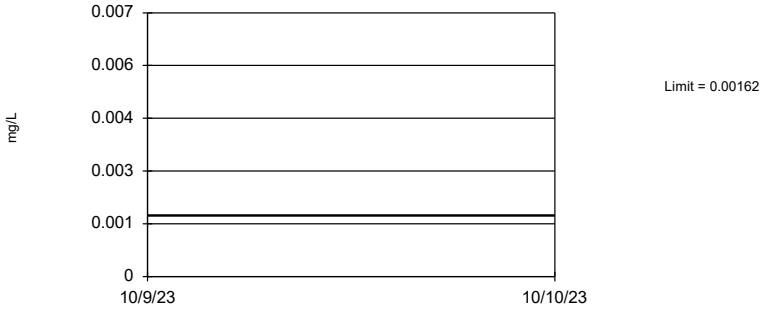
Non-parametric test used in lieu of parametric tolerance limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 42 background values. 28.57% NDs. 89.65% coverage at alpha=0.01; 93.16% coverage at alpha=0.05; 98.24% coverage at alpha=0.5.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

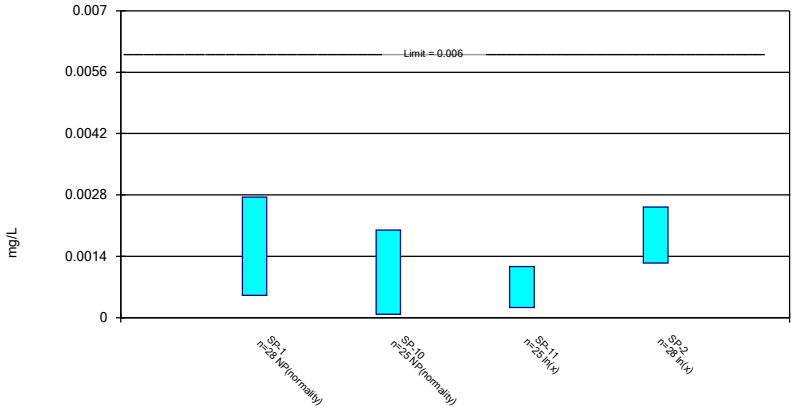
Confidence Interval - All Results

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

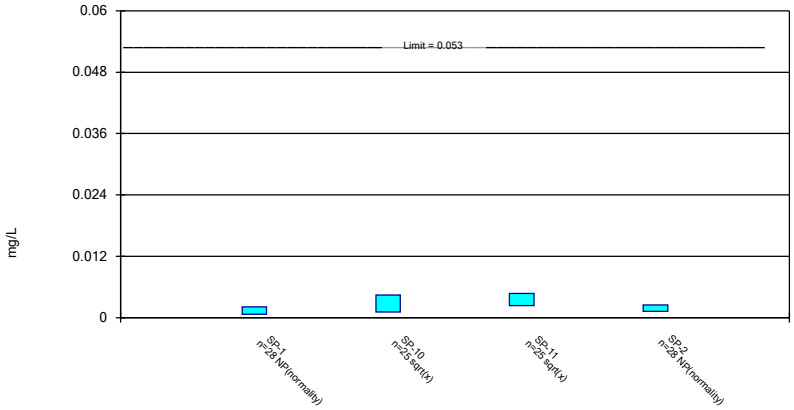
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



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

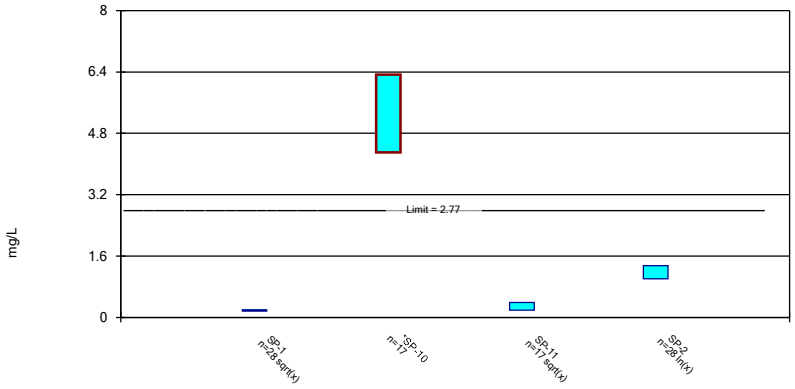
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



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

Parametric Confidence Interval

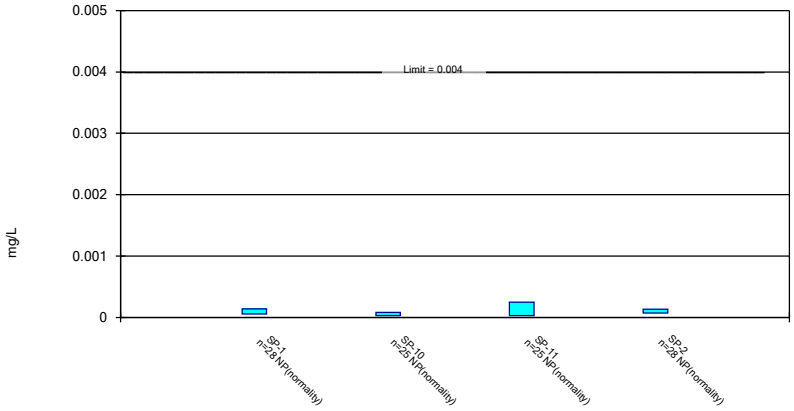
Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



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

Non-Parametric Confidence Interval

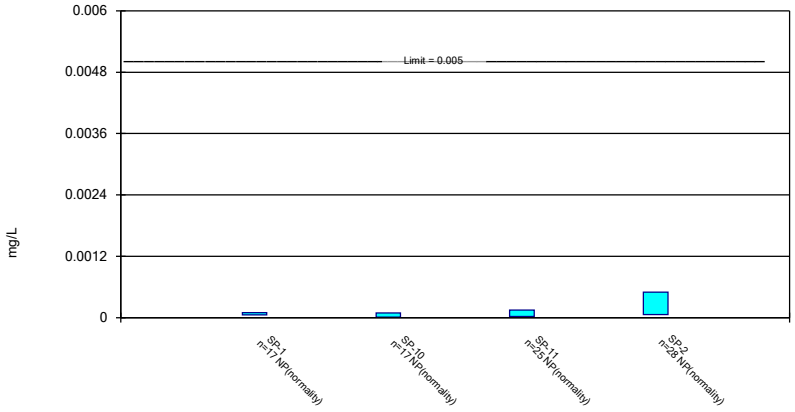
Compliance Limit is not exceeded. Per-well alpha = 0.01.



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

Non-Parametric Confidence Interval

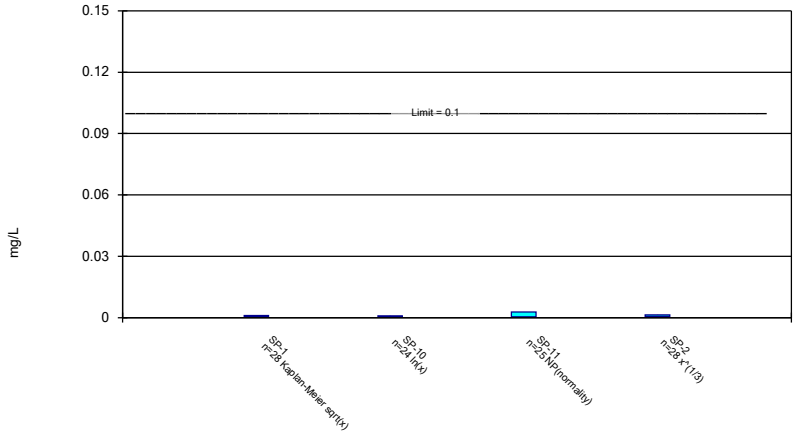
Compliance Limit is not exceeded. Per-well alpha = 0.01.



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

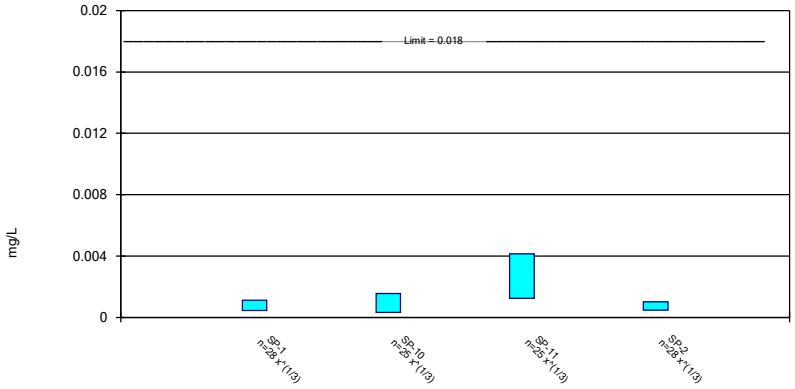
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



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

Parametric Confidence Interval

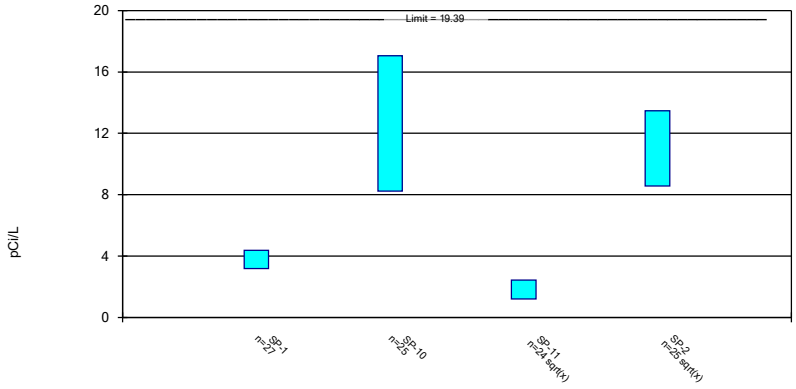
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



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

Parametric Confidence Interval

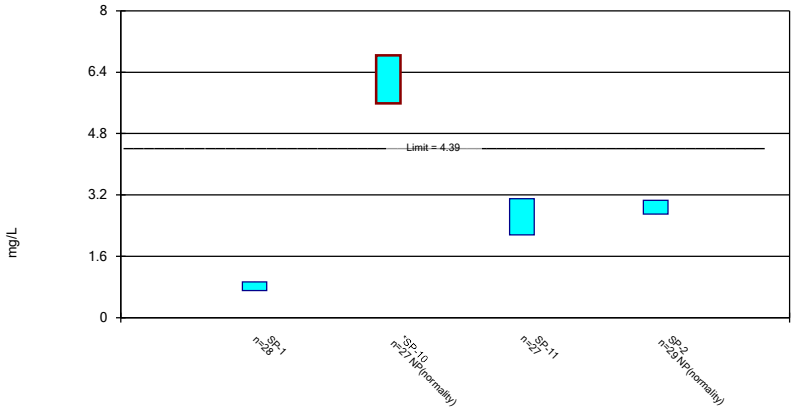
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



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

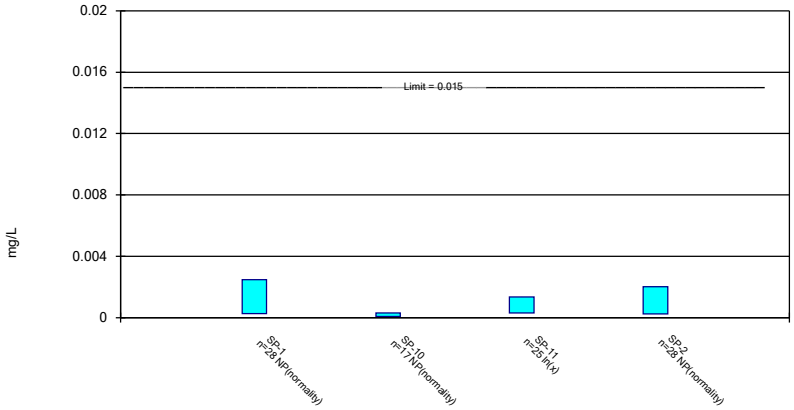
Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



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

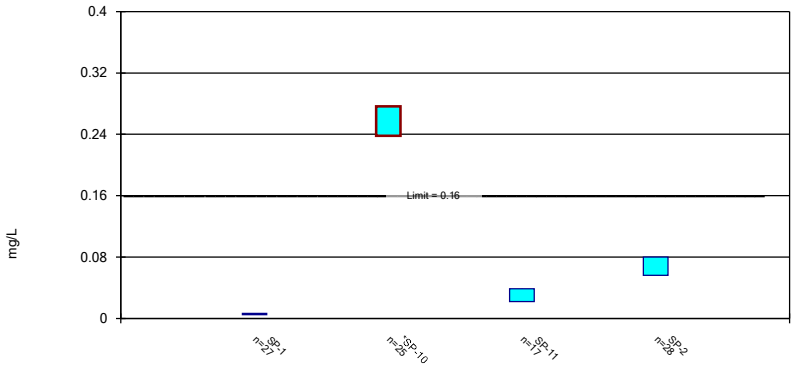
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



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

Parametric Confidence Interval

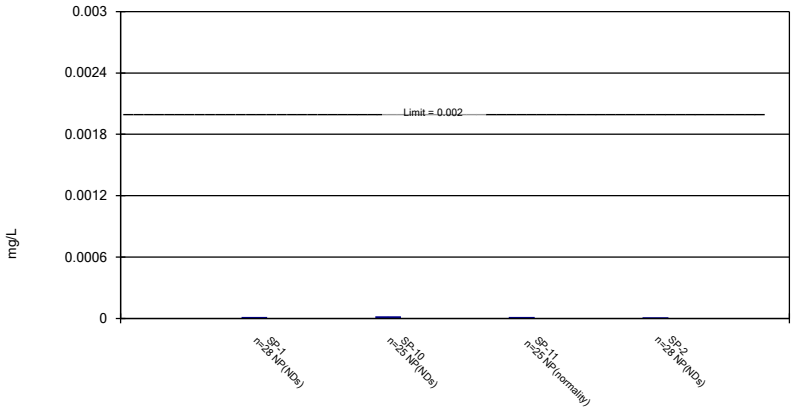
Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



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

Non-Parametric Confidence Interval

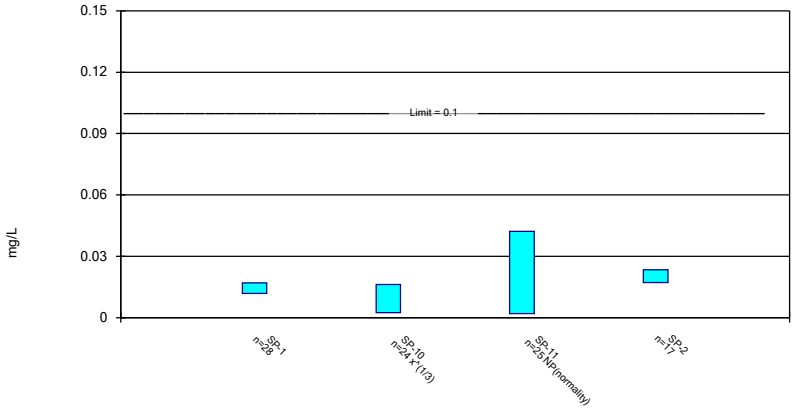
Compliance Limit is not exceeded. Per-well alpha = 0.01.



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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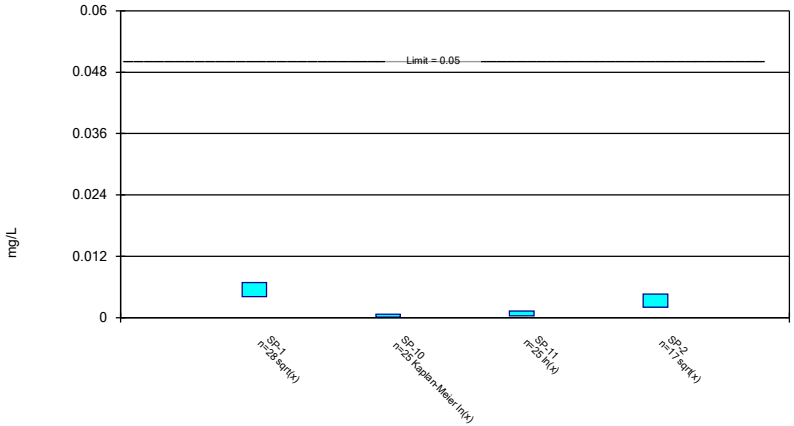
Parametric Confidence Interval

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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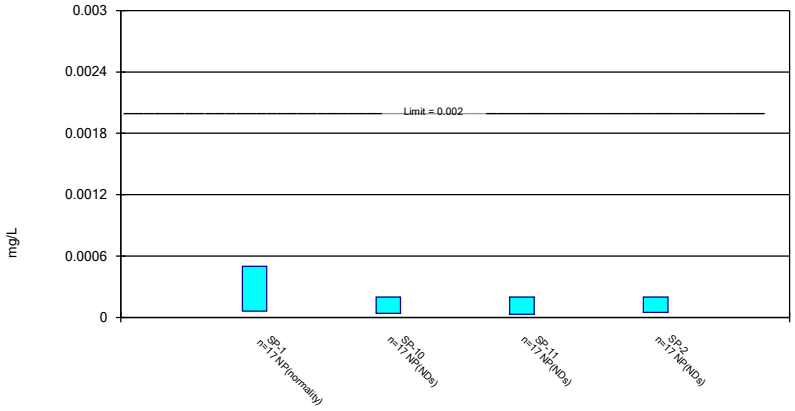
Non-Parametric Confidence Interval

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**

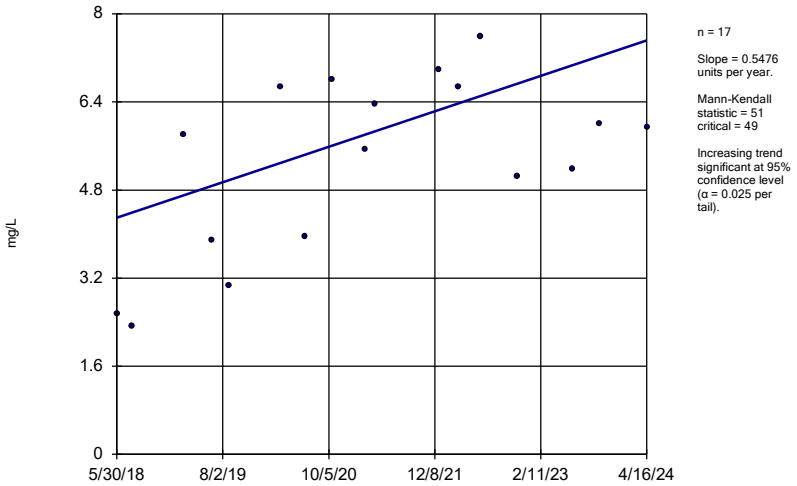
Appendix IV Trend Test - All Results

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.

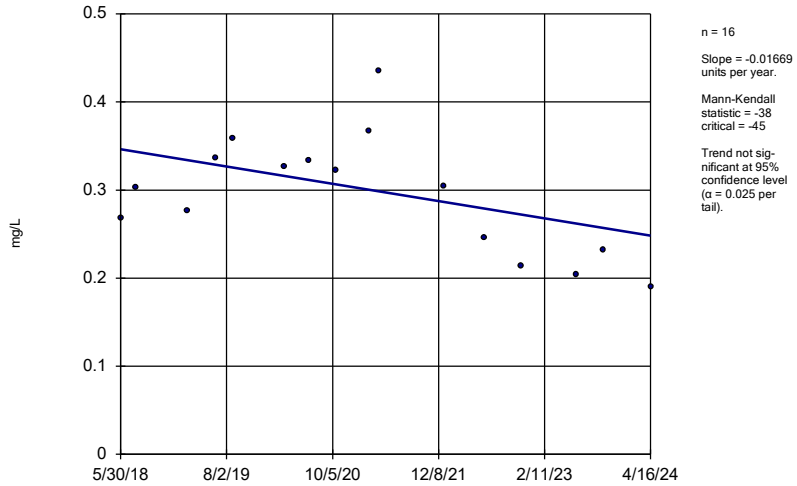
Mann-Kendall statistic = 51
critical = 49

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.

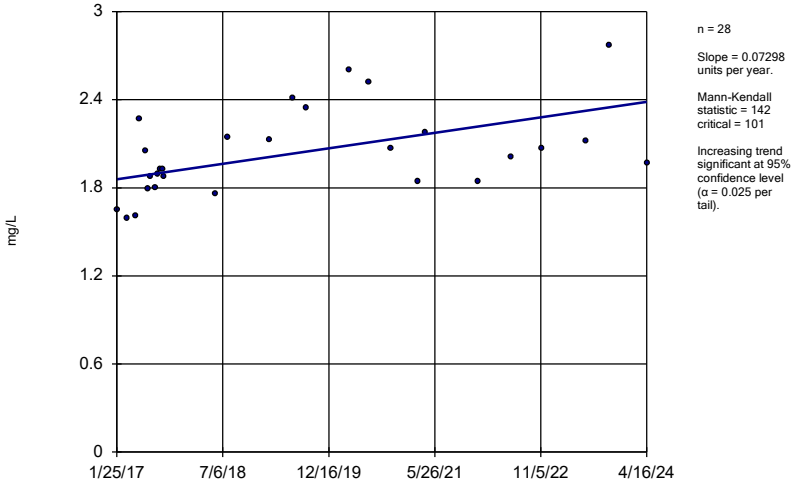
Mann-Kendall statistic = -38
critical = -45

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

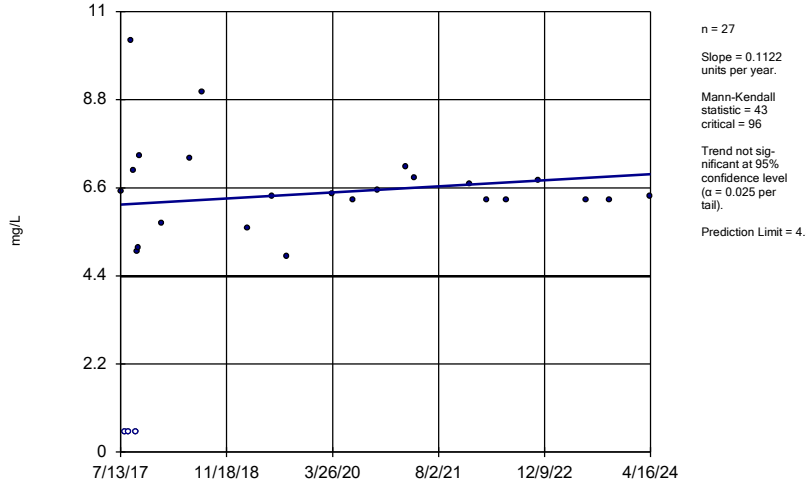
Increasing trend significant at 95% confidence level (α = 0.025 per tail).

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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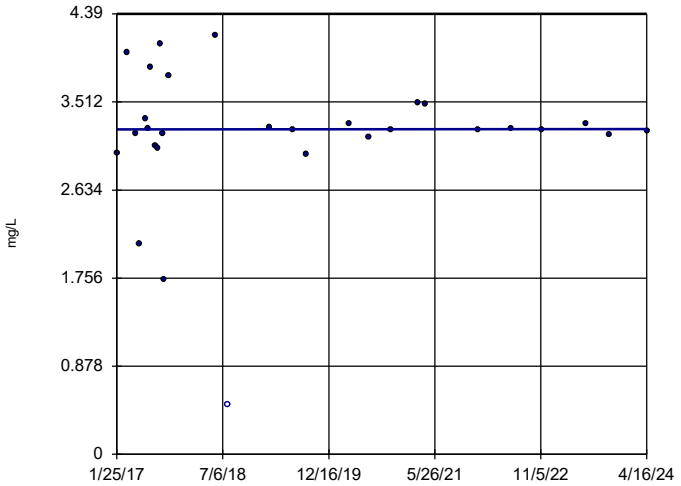
Hollow symbols indicate censored values.

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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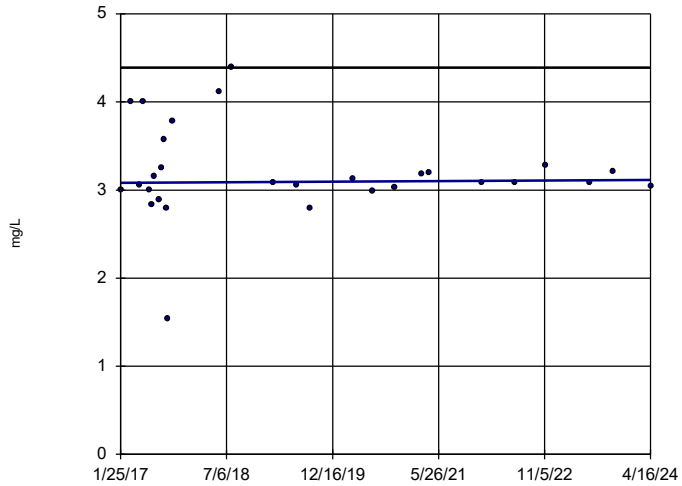
Sen's Slope Estimator

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

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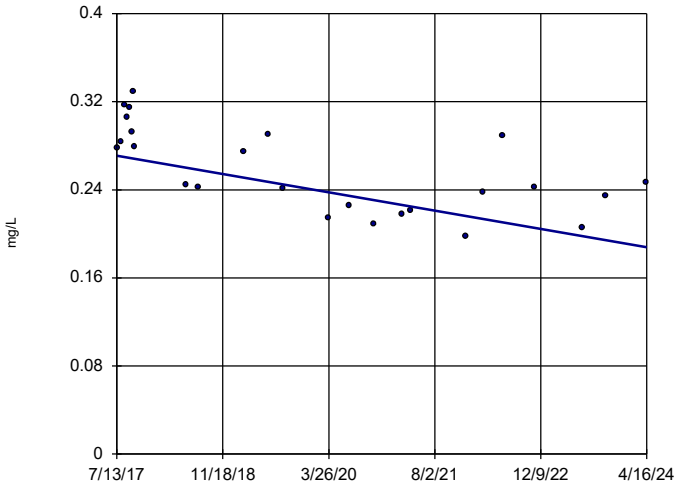
Sen's Slope Estimator

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

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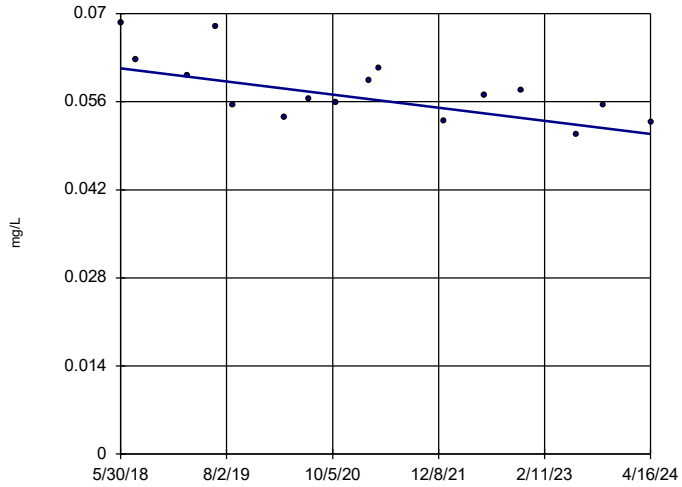
Sen's Slope Estimator

SP-4 (bg)



n = 16

Slope = -0.001771 units per year.

Mann-Kendall statistic = -57
critical = -45

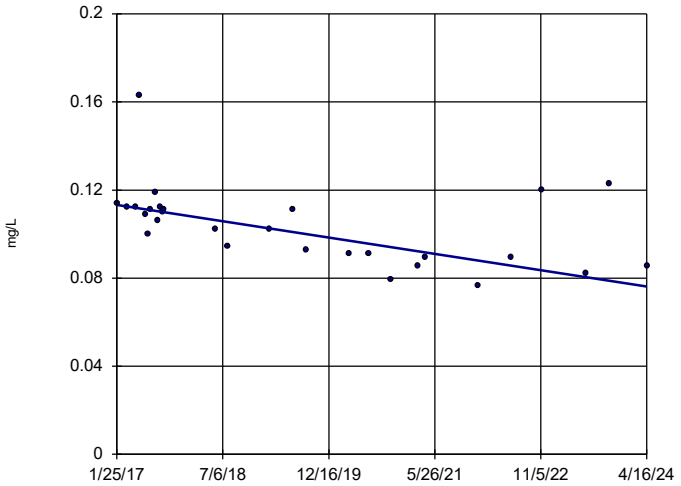
Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

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).

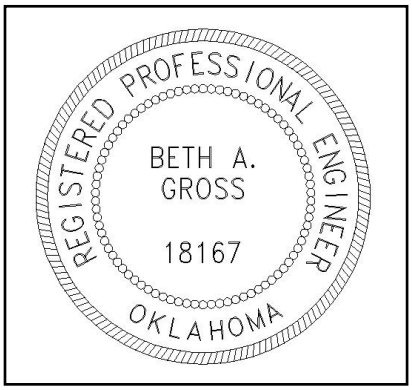
Constituent: Lithium Analysis Run 7/15/2024 8:48 PM View: Appendix IV Trend Test
Northeastern BAP Client: Geosyntec Data: Northeastern BAP

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

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