Annual Groundwater Monitoring Report

Appalachian Power Company

John E. Amos Plant

Bottom Ash Pond CCR Management Unit

Winfield, West Virginia

January 2022

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APPALACHIAN POWER

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BOUNDLESS ENERGY

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Abbreviations:
ASD – Alternate Source Demonstration
CCR – Coal Combustion Residual
GWPS – Groundwater Protection Standard
SSI – Statistically Significant Increase
SSL – Statistically Significant Level
AMBAP – Amos Bottom Ash Pond

I. Overview

This *Annual Groundwater Monitoring and Corrective Action Report* (Report) has been prepared to report the status of activities for the preceding year for an existing Bottom Ash Pond (BAP) CCR unit at Appalachian Power Company's, a wholly-owned subsidiary of American Electric Power Company (AEP) John E. Amos Power Plant. The USEPA's CCR rules require that the Annual Groundwater Monitoring Report be posted to the operating record for the preceding year no later than January 31.

In general, the following activities were completed:

- An assessment monitoring program was established for the Amos Bottom Ash Pond (AMBAP) on April 13, 2018.
- The CCR unit began 2021 in assessment monitoring and remained in assessment monitoring throughout all of 2021.
- Groundwater samples were collected and analyzed for Appendix III and Appendix IV constituents, as specified in 40 CFR 257.95 *et seq.* and AEP's *Groundwater Sampling and Analysis Plan (2016)* in March, May, and November 2021.
- Groundwater data underwent various validation tests, including tests for completeness, valid values, transcription errors, and consistent units.
- Analytical results of the March, May, and November rounds of sampling are listed in the tables in **Appendix 1**. Also shown are the groundwater flow rates and flow directions.
- The Statistical Analysis Plan (SAP) for AMBAP that was developed in accordance with the CCR Rule requirements initially in January 2017 was revised in January 2021 and subsequently posted to the operating record and AEP publically available CCR website. This revised SAP is included in **Appendix 2**.
- Statistical analysis of the November 2020 sampling event was completed in February 2021 and is included in **Appendix 2**. There were no exceedances over established groundwater protection standards (GWPS's) so the unit remains in assessment monitoring. However, the following statistically significant increases (SSI's) occurred for Appendix III indicator parameters:
    - MW-1: Calcium, chloride, pH, sulfate, and total dissolved solids (TDS)
    - MW-1604: Boron and TDS
    - MW-1605: Calcium, chloride, sulfate, TDS
    - MW-1606: Calcium, chloride, sulfate, and TDS
- Statistical analysis of the May 2021 sampling event was completed in August 2021 and is included in **Appendix 2**. There were no exceedances over established GWPS's so the

unit remains in assessment monitoring. However, the following SSI's occurred for Appendix III indicator parameters:

  - MW-1: Calcium, chloride, sulfate, and TDS
  - MW-1604: Boron
  - MW-1605: Calcium, chloride, sulfate, and TDS
  - MW-1606: Calcium, chloride, sulfate, and TDS

- November 2021 sampling event data has been received, however, statistical analysis is not yet completed. The statistical analysis will be completed in early 2021. If no SSL's are identified, the unit will remain in assessment monitoring. If SSL's are identified, the unit will either:
  - Attempt an alternative source demonstration, or
  - Transition to the Assessment of Corrective Measures program and make the appropriate transition notifications.

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

- A map/aerial photograph showing the AMBAP Complex CCR 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 (**Appendix 1**).
- Statistical analysis reports completed in 2021 (**Appendix 2**).
- Discussion of any alternative source demonstrations completed (Appendix 3). This is not applicable.
- The notification of the establishment of an assessment monitoring program (**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, if applicable (Appendix 5). This is not applicable.
- Other information required to be included in the annual report such as assessment of corrective measures, 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

Figure 1 depicts the PE-certified groundwater monitoring network, the monitoring well locations, and their corresponding identification numbers. The monitoring well distribution adequately covers downgradient and upgradient areas as detailed in the *Groundwater Monitoring Network Evaluation Report* that was updated in October 2020 and placed on the American Electric Power CCR public internet site. The CCR groundwater quality monitoring network includes the following:

- Four upgradient wells MW-6, MW-1601, MW-1602A, and MW-1603A; and
- Six downgradient wells MW-1, MW-4, MW-5, MW-1604, MW-1605, and MW-1606.

Legend

Monitoring Well Network

- Upgradient Sampling Location
- Downgradient Sampling Location
- Ash Pond System

Notes

- Monitoring well coordinates provided by AEP.
- Site features based on information available in the Ash Pond- CCR Groundwater Monitoring Well Network Evaluation - Amos Plant (Arcadis, 2016) provided by AEP.
- Rev. 1: Updated CCR Unit boundary. September 13, 2018

Site Layout
Ash Pond System

AEP Amos Generating Plant
Winfield, West Virginia

Geosyntec consultants

Columbus, Ohio | 2018/12/24

Figure **1**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Amos\2018\AEP-Amos_BAP_Site_Layout.mxd. ARevezzo. 12/24/2018. CHA8423.

III. Monitoring Wells Installed or Decommissioned

There were no monitoring wells installed or decommissioned in 2021.

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

Appendix 1 contains tables showing the groundwater quality data collected and received during the establishment of background quality and the groundwater monitoring samples collected and received through 2021. Static water elevation data from each monitoring event in 2021 are also shown in **Appendix 1**, along with the groundwater velocity calculations, groundwater flow direction and potentiometric maps developed after each sampling event.

V. Groundwater Quality Data Statistical Analysis

Statistical analysis of the assessment monitoring samples from the November 2020 event was completed in February 2021 (**Appendix 2**). No SSLs above a GWPS were identified. However, the following statistically significant increases occurred for Appendix III indicator parameters:

- MW-1: Calcium, chloride, pH, sulfate, and total dissolved solids (TDS)
- MW-1604: Boron and TDS
- MW-1605: Calcium, chloride, sulfate, TDS
- MW-1606: Calcium, chloride, sulfate, and TDS

Statistical analysis of the May 2021 sampling event was completed in August 2021 and is included in **Appendix 2**. There were no exceedances over established GWPS's so the unit remains in assessment monitoring. However, the following SSI's occurred for Appendix III indicator parameters:

- MW-1: Calcium, chloride, sulfate, and TDS
- MW-1604: Boron
- MW-1605: Calcium, chloride, sulfate, and TDS
- MW-1606: Calcium, chloride, sulfate, and TDS

Additionally, the SAP was updated in January 2021 and is included in **Appendix 2**.

VI. Alternative Source Demonstration

No alternative source demonstrations were performed in 2021.

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

The Amos BAP transitioned from detection monitoring to assessment monitoring on April 13, 2018. The notification per 40 CFR 257.94(e)(3) is included in **Appendix 4**.

Regarding defining an alternate monitoring frequency, the groundwater velocity and monitoring well production are high enough at this facility that no modification to the monitoring frequency is needed.

VIII. Other Information Required

The BAP has progressed from detection monitoring to its current status in assessment monitoring since April 2018. All required information has been included in this annual groundwater monitoring report.

IX. Description of Any Problems Encountered in 2021 and Actions Taken

No significant problems were encountered. The low flow sampling effort went smoothly and the schedule was met to support the 2021 annual groundwater report preparation.

X. A Projection of Key Activities for the Upcoming Year

Key activities for 2022 include:

- Complete statistical analysis on the sampling results from the November 2021 assessment monitoring event
- Respond to any new data received in light of what the CCR rule requires.
- Preparation of the 2022 annual groundwater report.

APPENDIX 1

Figures and Tables follow showing data collected and the rate and direction of groundwater flow. The dates that the samples were collected is shown, as well as, whether the data were collected under background, detection, or assessment monitoring.

Table 1 - Groundwater Data Summary: MW-1
Amos - BAP
Appendix III 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
7/26/2016	Background	0.042	41.6	61.6	< 0.05 U1	5.0	146	320
8/22/2016	Background	0.051	41.6	60.3	< 0.05 U1	4.9	148	320
10/19/2016	Background	0.031	43.7	64.9	< 0.05 U1	5.1	150	348
11/7/2016	Background	--	--	--	--	5.1	--	--
12/13/2016	Background	0.053	42.9	69.0	< 0.05 U1	5.0	153	318
2/7/2017	Background	0.056	40.4	62.9	0.03 J1	5.5	139	314
3/13/2017	Background	0.108	38.1	64.2	0.02 J1	5.2	140	330
5/22/2017	Background	0.082	35.7	62.6	0.03 J1	6.1	138	316
6/20/2017	Background	0.092	38.2	65.1	< 0.02 U1	5.2	147	348
11/1/2017	Detection	0.039	43.7	75.8	0.03 J1	5.0	156	358
1/9/2018	Detection	--	43.2	83.2	--	4.9	164	362
5/3/2018	Assessment	0.095	39.9	71.8	0.02 J1	7.3	154	328
9/4/2018	Assessment	0.094	38.3	67.9	0.03 J1	5.1	145	338
3/14/2019	Assessment	0.2 J1	38.4	55.2	0.03 J1	5.2	138	321
6/10/2019	Assessment	0.08 J1	35.9	64.4	0.03 J1	10.2	141	330
7/22/2019	Assessment	0.05 J1	36.8	57.4	0.02 J1	4.9	143	362
2/12/2020	Assessment	--	--	--	0.03 J1	5.3	--	--
5/7/2020	Assessment	0.126	32.9	53.4	0.02 J1	5.0	137	336
10/27/2020	Assessment	0.04 J1	39.9	64.0	0.03 J1	4.8	161	374
3/16/2021	Assessment	--	--	--	0.04 J1	5.0	--	--
5/11/2021	Assessment	0.117	31.6	51.2	0.03 J1	5.2	142	332
11/9/2021	Assessment	0.023 J1	40.9 M1, P3	76.1	0.03 J1	5.2	166	410

Notes:
mg/L: milligrams per liter
SU: standard unit
<: 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.
- -: Not analyzed
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.
M1: The associated matrix spike (MS) or matrix spike duplicate (MSD) recovery was outside acceptance limits.
P3: The precision on the matrix spike duplicate (MSD) was above acceptance limits.

Table 1 - Groundwater Data Summary: MW-1
Amos - BAP
Appendix IV 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
7/26/2016	Background	0.02 J1	0.13	30.2	0.107	2.09	0.1	10.7	0.528	< 0.05 U1	0.134	0.004	< 0.002 U1	1.67	0.09 J1	0.04 J1
8/22/2016	Background	0.01 J1	0.12	28.5	0.105	2.02	0.1	12.3	0.725	< 0.05 U1	0.081	0.003	< 0.002 U1	1.48	0.1	0.04 J1
10/19/2016	Background	0.02 J1	0.15	31.1	0.119	2.33	0.510	13.9	1.86	< 0.05 U1	0.133	0.0008 J1	< 0.002 U1	2.33	0.1	0.066
11/7/2016	Background	--	--	--	--	--	--	--	0.615	--	--	--	--	--	--	--
12/13/2016	Background	0.01 J1	0.16	28.9	0.115	2.55	1.24	14.6	0.136	< 0.05 U1	0.102	0.014	< 0.002 U1	1.38	0.2	0.04 J1
2/7/2017	Background	0.01 J1	0.20	25.4	0.115	2.43	0.141	14.9	0.609	0.03 J1	0.093	0.004	< 0.002 U1	0.79	0.1	0.056
3/13/2017	Background	0.02 J1	0.14	26.3	0.112	2.36	0.566	12.5	0.675	0.02 J1	0.129	0.002	< 0.002 U1	1.15	0.1	0.03 J1
5/22/2017	Background	0.03 J1	0.09	25.8	0.114	2.54	0.113	9.69	0.707	0.03 J1	0.066	0.006	0.002 J1	0.31	0.1 J1	0.04 J1
6/20/2017	Background	0.02 J1	0.10	27.7	0.123	2.65	0.173	9.38	0.587	< 0.02 U1	0.062	0.005	< 0.002 U1	0.34	0.09 J1	0.04 J1
5/3/2018	Assessment	0.01 J1	0.13	27.8	0.143	3.12	0.093	15.1	1.74	0.02 J1	0.068	0.004	< 0.002 U1	0.62	0.2	0.04 J1
9/4/2018	Assessment	0.22	0.18	29.4	0.130	2.97	0.548	17.7	0.575	0.03 J1	1.16	0.003	--	0.34	0.2	0.05 J1
3/14/2019	Assessment	0.05 J1	0.12	26.9	0.131	3.48	0.255	10.3	0.887	0.03 J1	0.252	< 0.09 U1	--	0.5 J1	0.09 J1	< 0.1 U1
6/10/2019	Assessment	0.02 J1	0.11	27.5	0.125	2.14	0.2 J1	12.8	0.998	0.03 J1	0.08 J1	< 0.009 U1	< 0.002 U1	< 0.4 U1	0.1 J1	< 0.1 U1
7/22/2019	Assessment	< 0.02 U1	0.09 J1	26.4	0.136	2.47	0.06 J1	13.5	0.825	0.02 J1	0.08 J1	0.00257	--	< 0.4 U1	0.2 J1	< 0.1 U1
2/12/2020	Assessment	< 0.02 U1	0.09 J1	25.7	0.139	2.22	0.2 J1	18.6	1.1	0.03 J1	0.07 J1	0.00259	< 0.002 U1	< 0.4 U1	0.1 J1	< 0.1 U1
5/7/2020	Assessment	< 0.02 U1	0.06 J1	25.7	0.126	2.43	0.1 J1	13.9	0.499	0.02 J1	< 0.05 U1	0.00239	--	< 0.4 U1	0.08 J1	< 0.1 U1
10/27/2020	Assessment	< 0.02 U1	0.09 J1	25.4	0.130	2.42	0.1 J1	20.5	1.722	0.03 J1	< 0.05 U1	0.00270	--	< 0.4 U1	0.1 J1	< 0.1 U1
3/16/2021	Assessment	0.03 J1	0.09 J1	25.4	0.129	3.14	0.2 J1	13.9	0.705	0.04 J1	0.06 J1	0.00266	< 0.002 U1	< 0.1 U1	0.1 J1	< 0.04 U1
5/11/2021	Assessment	< 0.02 U1	0.10	24.1	0.127	1.96	0.2 J1	14.0	0.845	0.03 J1	0.05 J1	0.00258	--	0.2 J1	0.09 J1	--
11/9/2021	Assessment	< 0.02 U1	0.14	24.9	0.102	0.881	0.15 J1	11.0	0.45	0.03 J1	0.13 J1	0.00270	--	0.3 J1	0.10 J1	< 0.04 U1

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
<: 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.
- -: Not analyzed
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.

Table 1 - Groundwater Data Summary: MW-4
Amos - BAP
Appendix III 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
7/25/2016	Background	0.074	16.2	11.7	0.07 J1	5.9	44.8	190
8/23/2016	Background	0.054	17.9	10.9	0.04 J1	5.5	39.2	184
10/18/2016	Background	0.070	15.2	12.2	< 0.05 U1	5.7	44.5	206
11/8/2016	Background	--	--	12.8	0.03 J1	5.7	47.3	170
12/12/2016	Background	0.079	16.3	14.0	0.04 J1	5.5	48.0	348
2/8/2017	Background	0.087	15.3	13.4	0.06 J1	5.6	46.1	176
3/14/2017	Background	0.093	15.8	12.9	0.05 J1	5.8	43.5	185
5/22/2017	Background	0.099	15.3	13.2	0.04 J1	6.3	43.9	192
6/19/2017	Background	0.097	15.0	13.3	0.03 J1	5.5	50.9	196
11/1/2017	Detection	0.073	14.2	12.3	0.06	5.5	43.0	210
5/3/2018	Assessment	0.100	15.9	14.4	0.06 J1	5.9	49.2	178
9/5/2018	Assessment	0.067	13.3	13.4	0.06	7.0	42.4	179
3/15/2019	Assessment	< 0.2 U1	14.5	13.3	0.06 J1	5.5	42.8	184
6/10/2019	Assessment	0.06 J1	14.4	13.0	0.06	6.8	43.3	172
7/23/2019	Assessment	0.06 J1	14.8	13.4	0.04 J1	5.4	44.5	186
2/11/2020	Assessment	--	--	--	0.04 J1	5.9	--	--
5/6/2020	Assessment	0.135	17.6	16.9	0.04 J1	5.5	54.6	213
10/30/2020	Assessment	0.085	16.0	12.9	0.05 J1	5.4	39.0	187
3/17/2021	Assessment	--	--	--	0.06	5.5	--	--
5/10/2021	Assessment	0.073	16.4	18.7	0.07	5.9	38.6	190
11/3/2021	Assessment	0.068	14.9	18.6	0.06	5.3	39.9	190

Notes:
mg/L: milligrams per liter
SU: standard unit
<: 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.
- -: Not analyzed
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.

Table 1 - Groundwater Data Summary: MW-4
Amos - BAP
Appendix IV 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
7/25/2016	Background	0.05 J1	13.6	101	0.068	0.18	0.5	26.6	0.539	0.07 J1	0.502	0.007	< 0.002 U1	11.1	0.07 J1	0.055
8/23/2016	Background	0.02 J1	4.34	90.8	0.051	0.03	0.3	5.55	0.405	0.04 J1	0.275	0.002	< 0.002 U1	19.2	0.08 J1	0.01 J1
10/18/2016	Background	0.11	15.8	84.1	0.055	0.53	0.600	85.9	1.884	< 0.05 U1	0.395	0.002	< 0.002 U1	2.44	0.1	0.156
11/8/2016	Background	--	--	--	--	--	--	--	0.457	0.03 J1	--	--	--	--	--	--
12/12/2016	Background	0.03 J1	3.35	96.0	0.049	0.09	1.18	10.9	2.116	0.04 J1	0.255	0.012	< 0.002 U1	0.75	0.1 J1	0.090
2/8/2017	Background	0.02 J1	8.17	82.5	0.045	0.12	0.290	18.9	0.46	0.06 J1	0.306	0.001	< 0.002 U1	0.93	0.07 J1	0.099
3/14/2017	Background	0.03 J1	5.36	91.0	0.043	0.16	0.327	23.3	1.339	0.05 J1	0.192	0.0005 J1	< 0.002 U1	0.51	0.07 J1	0.072
5/22/2017	Background	0.04 J1	6.38	96.2	0.053	0.09	0.226	20.8	0.55	0.04 J1	0.188	0.008	< 0.002 U1	0.49	0.08 J1	0.068
6/19/2017	Background	0.02 J1	5.65	88.5	0.049	0.08	0.216	22.1	0.929	0.03 J1	0.247	0.002	< 0.002 U1	0.31	0.1	0.069
5/3/2018	Assessment	< 0.01 U1	1.15	93.1	0.046	0.04	0.175	7.93	1.569	0.06 J1	0.153	0.0008 J1	< 0.002 U1	0.31	0.06 J1	0.01 J1
9/5/2018	Assessment	0.05 J1	11.0	89.1	0.037	0.21	0.200	25.8	0.623	0.06	0.083	0.003	--	0.28	0.06 J1	0.109
3/15/2019	Assessment	< 0.02 U1	1.63	80.4	0.05 J1	0.05	0.2 J1	9.81	0.501	0.06 J1	0.219	< 0.09 U1	--	< 0.4 U1	0.06 J1	< 0.1 U1
6/10/2019	Assessment	< 0.02 U1	2.50	90.5	0.06 J1	0.07	0.274	10.5	0.787	0.06	0.406	< 0.009 U1	< 0.002 U1	< 0.4 U1	0.08 J1	< 0.1 U1
7/23/2019	Assessment	0.03 J1	2.48	84.6	0.07 J1	0.05	0.236	7.24	0.486	0.04 J1	0.430	0.00162	--	< 0.4 U1	0.1 J1	< 0.1 U1
2/11/2020	Assessment	< 0.02 U1	0.92	96.9	0.04 J1	0.05 J1	0.2 J1	8.30	1.883	0.04 J1	0.2 J1	0.00151	< 0.002 U1	0.9 J1	0.06 J1	< 0.1 U1
5/6/2020	Assessment	< 0.02 U1	5.20	110	0.09 J1	0.05	0.367	8.17	2.176	0.04 J1	0.545	0.00139	--	1 J1	0.2 J1	< 0.1 U1
10/30/2020	Assessment	0.08 J1	21.7	83.5	0.07 J1	0.61	0.308	42.4	0.2618	0.05 J1	0.416	0.00166	--	< 0.4 U1	0.09 J1	0.2 J1
3/17/2021	Assessment	< 0.02 U1	2.15	94.0	0.05 J1	0.06	0.331	8.82	0.515	0.06	0.2 J1	0.00177	< 0.002 U1	< 0.1 U1	< 0.09 U1	< 0.04 U1
5/10/2021	Assessment	< 0.02 U1	1.40	92.6	0.04 J1	0.03 J1	0.334	7.23	0.534	0.07	0.2 J1	0.00172	--	0.2 J1	< 0.09 U1	--
11/3/2021	Assessment	< 0.02 U1	1.42	89.8 M1	0.050	0.040	0.42	7.38	0.76	0.06	0.23	0.00164	--	0.1 J1	< 0.09 U1	< 0.04 U1

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
<: 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.
- -: Not analyzed
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.
M1: The associated matrix spike (MS) or matrix spike duplicate (MSD) recovery was outside acceptance limits.

Table 1 - Groundwater Data Summary: MW-5
Amos - BAP
Appendix III 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
7/26/2016	Background	0.051	19.7	21.4	0.04 J1	5.8	57.7	156
8/23/2016	Background	0.014	18.4	21.3	0.04 J1	5.4	57.5	136
10/18/2016	Background	0.018	18.6	20.0	< 0.05 U1	5.9	56.0	188
11/8/2016	Background	--	--	20.1	0.05 J1	5.8	56.5	176
12/12/2016	Background	0.002 J1	18.1	20.4	0.03 J1	5.7	54.1	154
2/8/2017	Background	0.032	16.3	19.6	0.05 J1	5.8	51.1	158
3/14/2017	Background	0.028	16.5	19.5	0.03 J1	5.9	51.5	172
5/22/2017	Background	0.046	16.8	18.9	0.04 J1	6.6	51.1	180
6/19/2017	Background	0.060	11.4	19.1	0.03 J1	5.6	57.3	170
11/1/2017	Detection	0.033	15.7	17.5	0.05 J1	5.7	53.9	190
5/3/2018	Assessment	0.156	16.6	17.8	0.04 J1	6.3	51.9	166
9/4/2018	Assessment	0.028	15.2	17.8	0.05 J1	5.8	45.4	151
3/15/2019	Assessment	< 0.2 U1	16.2	18.5	0.05 J1	5.7	51.3	180
6/10/2019	Assessment	0.04 J1	15.7	16.9	0.05 J1	5.9	48.4	178
7/23/2019	Assessment	< 0.04 U1	14.9	15.3	0.04 J1	5.6	45.2	162
2/11/2020	Assessment	--	--	--	0.04 J1	6.0	--	--
5/6/2020	Assessment	--	--	--	--	5.5	--	--
7/7/2020	Assessment	0.055	14.7	14.6	0.03 J1	6.1	45.7	156
10/27/2020	Assessment	0.04 J1	14.3	14.3	0.04 J1	5.5	43.5	177
3/17/2021	Assessment	--	--	--	0.05 J1	5.7	--	--
5/11/2021	Assessment	0.050	12.6	11.2	0.05 J1	5.9	42.7	156
11/3/2021	Assessment	0.024 J1	12.1	9.88	0.04 J1	5.4	42.2	150

Notes:
mg/L: milligrams per liter
SU: standard unit
<: 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.
- -: Not analyzed
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.

Table 1 - Groundwater Data Summary: MW-5
Amos - BAP
Appendix IV 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
7/26/2016	Background	0.03 J1	2.71	170	0.039	0.01 J1	0.2	0.966	1.264	0.04 J1	0.123	0.0005 J1	< 0.002 U1	2.15	< 0.03 U1	0.04 J1
8/23/2016	Background	0.01 J1	2.42	157	0.029	0.007 J1	0.2	1.01	0.406	0.04 J1	0.056	0.004	< 0.002 U1	2.57	< 0.03 U1	0.01 J1
10/18/2016	Background	0.05	4.00	166	0.079	0.007 J1	0.841	1.45	1.123	< 0.05 U1	0.667	0.004	< 0.002 U1	2.20	0.09 J1	0.01 J1
11/8/2016	Background	--	--	--	--	--	--	--	1.099	0.05 J1	--	--	--	--	--	--
12/12/2016	Background	0.08	3.41	166	0.053	0.006 J1	0.892	1.14	1.46	0.03 J1	0.264	0.006	< 0.002 U1	1.01	0.04 J1	0.02 J1
2/8/2017	Background	0.04 J1	3.26	141	0.051	0.006 J1	0.237	0.981	3.676	0.05 J1	0.216	0.003	< 0.002 U1	0.99	< 0.03 U1	0.01 J1
3/14/2017	Background	0.03 J1	2.79	152	0.033	0.007 J1	0.170	0.949	1.055	0.03 J1	0.022	0.002	< 0.002 U1	0.49	< 0.03 U1	0.01 J1
5/22/2017	Background	0.04 J1	2.74	151	0.052	0.007 J1	0.195	1.11	1.062	0.04 J1	0.236	0.013	< 0.002 U1	0.31	0.03 J1	< 0.01 U1
6/19/2017	Background	0.02 J1	3.25	155	0.053	0.006 J1	0.237	0.997	1.099	0.03 J1	0.207	0.002	< 0.002 U1	0.22	0.05 J1	< 0.01 U1
5/3/2018	Assessment	0.02 J1	3.18	149	0.049	0.006 J1	0.237	1.03	1.631	0.04 J1	0.147	0.0004 J1	< 0.002 U1	0.31	0.05 J1	< 0.01 U1
9/4/2018	Assessment	0.02 J1	2.34	157	0.034	0.01 J1	0.122	1.03	0.3383	0.05 J1	0.038	0.002	--	0.15	< 0.03 U1	0.03 J1
3/15/2019	Assessment	0.02 J1	3.63	162	0.06 J1	< 0.01 U1	0.344	1.21	0.853	0.05 J1	0.124	< 0.09 U1	--	< 0.4 U1	< 0.03 U1	< 0.1 U1
6/10/2019	Assessment	< 0.02 U1	2.85	155	0.04 J1	< 0.01 U1	0.1 J1	1.13	0.89	0.05 J1	0.04 J1	< 0.009 U1	< 0.002 U1	< 0.4 U1	< 0.03 U1	< 0.1 U1
7/23/2019	Assessment	0.10	6.74	158	0.121	< 0.01 U1	0.291	1.12	0.811	0.04 J1	0.762	0.00153	--	< 0.4 U1	0.08 J1	< 0.1 U1
2/11/2020	Assessment	0.03 J1	4.35	130	0.06 J1	< 0.01 U1	0.273	1.21	1.855	0.04 J1	0.201	0.00147	< 0.002 U1	< 0.4 U1	< 0.03 U1	< 0.1 U1
7/7/2020	Assessment	< 0.02 U1	2.77	140	0.04 J1	< 0.01 U1	0.1 J1	1.39	1.12	0.03 J1	0.08 J1	0.00157	--	0.5 J1	0.06 J1	< 0.1 U1
10/27/2020	Assessment	< 0.02 U1	3.18	134	0.04 J1	< 0.01 U1	0.214	1.42	2.254	0.04 J1	< 0.05 U1	0.00138	--	< 0.4 U1	< 0.03 U1	< 0.1 U1
3/17/2021	Assessment	< 0.02 U1	3.36	128	0.04 J1	< 0.004 U1	0.222	1.23	0.845	0.05 J1	0.06 J1	0.00138	< 0.002 U1	0.1 J1	< 0.09 U1	< 0.04 U1
5/11/2021	Assessment	< 0.02 U1	2.77	132	0.04 J1	0.005 J1	0.236	1.34	0.96	0.05 J1	< 0.05 U1	0.00136	--	0.2 J1	< 0.09 U1	--
11/3/2021	Assessment	< 0.02 U1	3.07	120	0.036 J1	0.004 J1	0.45	1.03	0.55	0.04 J1	< 0.05 U1	0.00132	--	0.2 J1	< 0.09 U1	< 0.04 U1

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
<: 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.
- -: Not analyzed
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.

Table 1 - Groundwater Data Summary: MW-6
Amos - BAP
Appendix III 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
7/26/2016	Background	0.117	12.2	8.88	0.08 J1	6.2	2.8	204
8/24/2016	Background	0.023	12.2	10.7	0.03 J1	5.5	6.1	244
10/19/2016	Background	0.006	11.3	8.67	0.04 J1	6.1	3.7	196
11/8/2016	Background	--	--	--	--	6.0	--	--
12/13/2016	Background	< 0.002 U1	12.4	9.79	0.04 J1	5.9	2.1	190
2/8/2017	Background	0.051	11.6	10.3	0.06 J1	6.0	2.8	170
3/14/2017	Background	0.048	11.5	9.90	0.05 J1	6.1	2.1	203
5/23/2017	Background	0.037	11.9	11.5	0.04 J1	6.2	4.4	238
6/20/2017	Background	0.183	11.6	9.61	0.07	6.0	2.5	222
11/1/2017	Detection	0.017	12.2	11.6	0.07	5.9	5.5	258
5/3/2018	Assessment	0.056	12.0	10.1	0.07	6.3	2.9	188
9/4/2018	Assessment	< 0.002 U1	11.3	8.97	0.09	6.0	1.3	176
3/15/2019	Assessment	< 0.2 U1	12.4	10.4	0.05 J1	5.9	1.6	226
6/10/2019	Assessment	< 0.02 U1	11.8	9.68	0.08	9.3	2.2	205
7/24/2019	Assessment	0.04 J1	12.1	9.71	0.05 J1	5.9	2.2	199
2/12/2020	Assessment	--	--	--	0.06	6.2	--	--
5/5/2020	Assessment	0.04 J1	11.7	8.55	0.09	5.5	1.3	202
10/28/2020	Assessment	< 0.02 U1	12.8	10.8	0.06 J1	5.8	2.6	244
3/16/2021	Assessment	--	--	--	0.09	6.0	--	--
5/11/2021	Assessment	0.02 J1	11.6	9.71	0.07	6.0	2.1	180
11/2/2021	Assessment	< 0.009 U1	10.8	9.11	0.05 J1	7.0	0.75	230

Notes:
mg/L: milligrams per liter
SU: standard unit
<: 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.
- -: Not analyzed
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.

Table 1 - Groundwater Data Summary: MW-6
Amos - BAP
Appendix IV 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
7/26/2016	Background	0.03 J1	33.6	191	0.065	0.01 J1	1.5	13.6	1.3779	0.08 J1	1.25	0.002	< 0.002 U1	1.77	0.2	0.075
8/24/2016	Background	0.01 J1	33.4	185	0.037	0.01 J1	1.0	12.4	0.961	0.03 J1	0.581	0.003	< 0.002 U1	0.97	0.2	0.070
10/19/2016	Background	0.01 J1	34.4	171	0.026	0.006 J1	0.647	11.0	1.941	0.04 J1	0.281	0.0005 J1	< 0.002 U1	0.78	0.2	0.185
11/8/2016	Background	--	--	--	--	--	--	--	1.026	--	--	--	--	--	--	--
12/13/2016	Background	0.02 J1	33.9	169	0.038	0.007 J1	1.88	10.6	1.635	0.04 J1	0.515	0.006	< 0.002 U1	0.53	0.2	0.060
2/8/2017	Background	0.02 J1	32.8	157	0.038	0.007 J1	0.817	12.3	20.83	0.06 J1	0.574	0.004	< 0.002 U1	0.60	0.2	0.055
3/14/2017	Background	0.02 J1	36.3	168	0.037	0.006 J1	1.54	12.0	1.178	0.05 J1	0.416	< 0.0002 U1	< 0.002 U1	0.62	0.2	0.054
5/23/2017	Background	0.04 J1	33.6	183	0.032	0.006 J1	0.748	13.1	1.013	0.04 J1	0.305	0.006	< 0.002 U1	0.41	0.2	0.053
6/20/2017	Background	0.02 J1	32.4	169	0.022	< 0.005 U1	0.496	10.7	1.345	0.07	0.157	0.0003 J1	< 0.002 U1	0.44	0.1	0.055
5/3/2018	Assessment	0.01 J1	34.1	163	0.028	< 0.005 U1	0.455	11.9	2.0087	0.07	0.216	< 0.0002 U1	< 0.002 U1	0.50	0.2	0.092
9/4/2018	Assessment	0.16	29.8	147	0.01 J1	0.03	0.380	9.16	0.769	0.09	0.214	< 0.0002 U1	--	0.46	0.1	0.084
3/15/2019	Assessment	0.06 J1	32.0	184	0.106	0.02 J1	1.82	14.0	0.865	0.05 J1	1.72	< 0.09 U1	--	0.5 J1	0.4	0.1 J1
6/10/2019	Assessment	0.03 J1	34.3	161	< 0.02 U1	< 0.01 U1	0.309	9.72	0.688	0.08	0.104	< 0.009 U1	< 0.002 U1	0.5 J1	0.1 J1	< 0.1 U1
7/24/2019	Assessment	< 0.02 U1	34.2	164	0.03 J1	< 0.01 U1	0.418	8.97	0.657	0.05 J1	0.2 J1	0.00114	--	0.4 J1	0.1 J1	< 0.1 U1
2/12/2020	Assessment	< 0.02 U1	38.5	165	< 0.02 U1	< 0.01 U1	0.433	9.52	1.539	0.06	0.07 J1	0.00118	< 0.002 U1	0.5 J1	0.09 J1	< 0.1 U1
5/5/2020	Assessment	0.17	37.2	149	< 0.02 U1	< 0.01 U1	0.429	8.80	2.62	0.09	0.390	0.00102	--	1 J1	0.09 J1	< 0.1 U1
10/28/2020	Assessment	< 0.02 U1	33.5	152	< 0.02 U1	< 0.01 U1	0.406	8.57	0.573	0.06 J1	< 0.05 U1	0.00113	--	0.4 J1	0.05 J1	< 0.1 U1
3/16/2021	Assessment	< 0.02 U1	36.8	164	0.02 J1	< 0.004 U1	0.519	9.08	0.78	0.09	0.07 J1	0.00121	< 0.002 U1	0.5 J1	0.1 J1	< 0.04 U1
5/11/2021	Assessment	0.02 J1	34.1	155	0.02 J1	< 0.004 U1	0.562	8.54	1.105	0.07	0.2 J1	0.00108	--	0.5 J1	0.1 J1	--
11/2/2021	Assessment	< 0.02 U1	35.4	146	0.013 J1	< 0.004 U1	0.45	8.03	1.33	0.05 J1	0.05 J1	0.00097	--	0.4 J1	0.1 J1	< 0.04 U1

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
<: 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.
- -: Not analyzed
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.

Table 1 - Groundwater Data Summary: MW-1601
Amos - BAP
Appendix III 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
7/26/2016	Background	0.070	11.8	7.17	0.06 J1	5.8	54.5	120
8/24/2016	Background	0.035	10.9	6.54	0.05 J1	5.6	49.1	142
10/18/2016	Background	< 0.002 U1	10.1	6.56	0.05 J1	6.0	39.6	136
11/7/2016	Background	--	--	6.79	0.05 J1	5.9	39.7	122
12/13/2016	Background	< 0.002 U1	10.4	7.79	0.04 J1	5.8	43.6	140
2/7/2017	Background	0.109	11.6	9.09	0.05 J1	6.0	55.6	168
3/13/2017	Background	0.107	11.2	9.89	0.04 J1	6.0	57.4	169
5/23/2017	Background	0.170	11.2	9.75	0.04 J1	5.9	52.8	182
6/20/2017	Background	0.107	10.4	8.59	0.04 J1	5.9	51.3	184
11/2/2017	Detection	0.087	8.91	9.91	0.05 J1	5.8	39.1	164
5/4/2018	Assessment	0.070	11.0	10.3	0.05 J1	6.1	53.0	159
9/5/2018	Assessment	< 0.002 U1	11.6	10.4	0.04 J1	7.8	52.2	157
3/19/2019	Assessment	0.05 J1	11.9	8.80	< 0.01 U1	5.8	52.7	176
6/12/2019	Assessment	< 0.02 U1	11.0	10.0	0.05 J1	6.7	48.8	185
7/24/2019	Assessment	< 0.04 U1	10.3	10.3	0.05 J1	5.9	44.6	154
2/12/2020	Assessment	--	--	--	0.05 J1	5.9	--	--
5/6/2020	Assessment	0.03 J1	9.42	19.0	0.04 J1	5.6	25.9	143
10/28/2020	Assessment	< 0.02 U1	10.8	28.3	0.05 J1	5.6	24.1	156
3/17/2021	Assessment	--	--	--	0.06 J1	5.9	--	--
5/10/2021	Assessment	0.01 J1	9.66	25.6	0.05 J1	6.1	27.2	116
11/9/2021	Assessment	0.052	19.4	42.9	0.04 J1	5.8	75.7	250

Notes:
mg/L: milligrams per liter
SU: standard unit
<: 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.
- -: Not analyzed
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.

Table 1 - Groundwater Data Summary: MW-1601
Amos - BAP
Appendix IV 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
7/26/2016	Background	0.01 J1	4.57	128	0.030	0.02	0.4	7.24	0.106	0.06 J1	0.366	0.003	< 0.002 U1	0.32	0.07 J1	0.01 J1
8/24/2016	Background	< 0.01 U1	5.14	120	0.02 J1	0.02 J1	0.3	6.19	0.975	0.05 J1	0.109	0.007	< 0.002 U1	0.62	0.09 J1	0.02 J1
10/18/2016	Background	0.01 J1	5.64	118	0.027	0.02 J1	0.688	4.04	2.413	0.05 J1	0.265	0.003	< 0.002 U1	0.26	0.1 J1	0.065
11/7/2016	Background	--	--	--	--	--	--	--	0.842	0.05 J1	--	--	--	--	--	--
12/13/2016	Background	0.02 J1	5.38	113	0.027	0.02 J1	1.35	4.67	1.101	0.04 J1	0.272	0.009	< 0.002 U1	0.16	0.1	0.02 J1
2/7/2017	Background	< 0.01 U1	5.09	107	0.025	0.02 J1	0.224	6.20	35.021	0.05 J1	0.227	0.004	< 0.002 U1	0.21	0.1	0.01 J1
3/13/2017	Background	< 0.01 U1	5.54	117	0.023	0.02 J1	0.588	6.47	0.7405	0.04 J1	0.161	0.004	< 0.002 U1	0.16	0.05 J1	0.01 J1
5/23/2017	Background	0.02 J1	7.08	122	0.051	0.02	0.740	5.48	0.573	0.04 J1	0.687	0.007	< 0.002 U1	0.21	0.2	0.02 J1
6/20/2017	Background	0.02 J1	5.57	113	0.02 J1	0.02 J1	0.215	4.72	1.037	0.04 J1	0.142	0.003	< 0.002 U1	0.17	0.06 J1	0.02 J1
5/4/2018	Assessment	0.01 J1	6.44	112	0.038	0.02	0.353	4.43	1.723	0.05 J1	0.397	0.010	< 0.002 U1	0.20	0.1	0.02 J1
9/5/2018	Assessment	0.02 J1	5.39	90.4	0.01 J1	0.02	0.270	6.73	0.252	0.04 J1	0.045	0.002	--	0.08 J1	< 0.03 U1	0.02 J1
3/19/2019	Assessment	< 0.02 U1	6.55	122	0.02 J1	0.01 J1	0.1 J1	3.41	0.666	< 0.01 U1	0.105	0.02 J1	--	< 0.4 U1	0.04 J1	< 0.1 U1
6/12/2019	Assessment	< 0.02 U1	6.02	118	0.04 J1	0.02 J1	0.2 J1	2.75	0.533	0.05 J1	0.154	< 0.009 U1	< 0.002 U1	< 0.4 U1	0.08 J1	< 0.1 U1
7/24/2019	Assessment	< 0.02 U1	6.63	130	0.02 J1	0.01 J1	0.2 J1	3.01	1.005	0.05 J1	0.2 J1	0.00141	--	< 0.4 U1	0.06 J1	< 0.1 U1
2/12/2020	Assessment	0.03 J1	8.26	122	0.05 J1	0.02 J1	0.938	3.19	0.398	0.05 J1	0.602	0.00159	< 0.002 U1	< 0.4 U1	0.1 J1	< 0.1 U1
5/6/2020	Assessment	< 0.02 U1	7.83	115	< 0.02 U1	0.01 J1	0.272	2.78	2.682	0.04 J1	0.2 J1	0.00121	--	0.5 J1	0.04 J1	< 0.1 U1
10/28/2020	Assessment	< 0.02 U1	8.68	127	0.03 J1	0.01 J1	0.369	3.04	0.447	0.05 J1	0.227	0.00138	--	< 0.4 U1	0.07 J1	< 0.1 U1
3/17/2021	Assessment	< 0.02 U1	7.76	133	0.03 J1	0.01 J1	0.488	3.44	0.869	0.06 J1	0.271	0.00153	< 0.002 U1	0.2 J1	< 0.09 U1	< 0.04 U1
5/10/2021	Assessment	< 0.02 U1	10.9	127	0.03 J1	0.02 J1	0.375	2.82	0.717	0.05 J1	0.211	0.00134	--	0.4 J1	< 0.09 U1	--
11/9/2021	Assessment	< 0.02 U1	7.64	168	0.042 J1	0.028	0.73	8.34	1.33	0.04 J1	0.43	0.00201	--	0.2 J1	0.1 J1	< 0.04 U1

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
<: 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.
- -: Not analyzed
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.

Table 1 - Groundwater Data Summary: MW-1602A
Amos - BAP
Appendix III 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
7/26/2016	Background	0.063	18.2	38.4	0.18	7.0	18.7	172
8/24/2016	Background	0.015	18.2	37.9	0.17	6.1	17.7	200
10/19/2016	Background	0.003 J1	17.3	37.2	0.1 J1	6.7	15.0	242
11/9/2016	Background	--	--	--	--	6.3	--	--
12/13/2016	Background	< 0.002 U1	18.8	39.1	0.1 J1	6.5	10.7	170
2/8/2017	Background	0.051	17.7	37.3	0.1 J1	6.7	9.8	144
3/15/2017	Background	0.039	16.1	38.1	0.1 J1	6.8	11.4	209
5/23/2017	Background	0.081	18.5	38.8	0.1 J1	6.7	11.4	224
6/20/2017	Background	0.090	18.5	38.3	0.1 J1	6.5	13.5	178
11/2/2017	Detection	0.050	18.6	38.0	0.1 J1	6.5	12.8	254
5/10/2018	Assessment	0.127	19.5	39.1	0.16	7.2	13.2	184
9/5/2018	Assessment	< 0.002 U1	18.1	40.0	0.14	6.4	12.7	176
3/19/2019	Assessment	0.03 J1	19.6	41.0	0.14	6.6	13.2	232
6/11/2019	Assessment	< 0.02 U1	18.8	41.9	0.16	9.5	13.8	217
7/23/2019	Assessment	< 0.04 U1	16.7	39.4	0.13	6.3	10.3	201
2/12/2020	Assessment	--	--	--	0.14	6.7	--	--
5/6/2020	Assessment	0.03 J1	19.3	43.2	0.11	6.3	12.7	209
10/30/2020	Assessment	< 0.02 U1	20.5	42.8	0.13	6.4	12.3	220
3/17/2021	Assessment	--	--	--	0.17	6.6	--	--
5/7/2021	Assessment	< 0.009 U1	19.7	43.0	0.15	6.5	12.7	202
11/10/2021	Assessment	0.012 J1	19.0	43.4	0.13	6.5	11.9	190

Notes:
mg/L: milligrams per liter
SU: standard unit
<: 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.
- -: Not analyzed
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.

Table 1 - Groundwater Data Summary: MW-1602A
Amos - BAP
Appendix IV 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
7/26/2016	Background	0.12	17.6	220	0.085	0.02 J1	1.7	4.19	7.914	0.18	7.94	0.004	< 0.002 U1	3.62	0.2	0.02 J1
8/24/2016	Background	0.04 J1	18.1	209	0.036	0.006 J1	1.1	3.04	0.569	0.17	2.80	0.003	< 0.002 U1	2.80	0.2	0.01 J1
10/19/2016	Background	0.10	18.3	213	0.064	0.01 J1	1.46	2.38	2.65	0.1 J1	6.56	0.003	0.003 J1	2.00	0.2	0.063
11/9/2016	Background	--	--	--	--	--	--	--	0.874	--	--	--	--	--	--	--
12/13/2016	Background	0.08	19.3	217	0.048	0.01 J1	2.24	2.00	0.989	0.1 J1	4.53	0.006	0.002 J1	1.90	0.2	0.02 J1
2/8/2017	Background	0.05	19.1	194	0.051	0.009 J1	0.981	1.87	6.853	0.1 J1	4.07	0.005	< 0.002 U1	1.68	0.2	0.224
3/15/2017	Background	0.04 J1	21.5	198	0.055	0.008 J1	0.951	1.47	1.094	0.1 J1	2.65	0.0005 J1	0.002 J1	1.22	0.2	0.01 J1
5/23/2017	Background	0.04 J1	20.8	221	0.029	0.006 J1	0.568	1.23	1.833	0.1 J1	2.11	0.005	< 0.002 U1	1.22	0.1	< 0.01 U1
6/20/2017	Background	0.07	20.3	224	0.043	0.01 J1	0.807	1.30	0.901	0.1 J1	2.68	< 0.0002 U1	< 0.002 U1	1.55	0.2	0.01 J1
5/10/2018	Assessment	0.03 J1	20.4	223	0.022	< 0.005 U1	0.437	0.940	0.438	0.16	0.982	0.004	< 0.002 U1	0.91	0.1	< 0.01 U1
9/5/2018	Assessment	0.08	20.5	223	0.055	0.01 J1	0.855	1.05	0.941	0.14	5.99	0.001	--	0.71	0.2	0.03 J1
3/19/2019	Assessment	0.04 J1	19.7	217	0.04 J1	< 0.01 U1	0.472	0.691	0.5231	0.14	2.64	< 0.009 U1	--	0.7 J1	0.09 J1	< 0.1 U1
6/11/2019	Assessment	< 0.04 U1	20.6	229	< 0.04 U1	< 0.02 U1	0.3 J1	0.523	1.144	0.16	0.677	< 0.009 U1	< 0.002 U1	< 0.8 U1	< 0.06 U1	< 0.2 U1
7/23/2019	Assessment	< 0.02 U1	21.7	213	< 0.02 U1	< 0.01 U1	0.297	0.545	0.888	0.13	1.08	0.000908	--	0.7 J1	0.06 J1	< 0.1 U1
2/12/2020	Assessment	0.03 J1	21.9	234	0.03 J1	< 0.01 U1	0.758	0.632	0.699	0.14	1.23	0.00127	< 0.002 U1	0.7 J1	0.05 J1	< 0.1 U1
5/6/2020	Assessment	0.02 J1	21.8	238	< 0.02 U1	< 0.01 U1	0.361	0.468	1.429	0.11	1.22	0.000954	--	0.9 J1	0.07 J1	< 0.1 U1
10/30/2020	Assessment	0.05 J1	22.1	229	0.02 J1	< 0.01 U1	0.749	0.587	1.067	0.13	1.20	0.00117	--	0.8 J1	< 0.03 U1	< 0.1 U1
3/17/2021	Assessment	0.03 J1	20.5	235	0.01 J1	< 0.004 U1	0.458	0.338	0.84	0.17	0.491	0.000988	< 0.002 U1	0.7 J1	< 0.09 U1	< 0.04 U1
5/7/2021	Assessment	< 0.02 U1	21.2	228	0.009 J1	0.008 J1	0.366	0.290	1.103	0.15	0.240	0.000930	--	0.8 J1	< 0.09 U1	--
11/10/2021	Assessment	0.07 J1	17.5	222	0.044 J1	0.021	1.65	0.920	0.86	0.13	2.21	0.00122	--	0.8	0.14 J1	< 0.04 U1

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
<: 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.
- -: Not analyzed
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.

Table 1 - Groundwater Data Summary: MW-1603A
Amos - BAP
Appendix III 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
7/26/2016	Background	0.051	17.4	4.76	0.29	7.3	0.9	116
8/24/2016	Background	0.012	16.9	5.62	0.28	6.2	0.1	84
10/19/2016	Background	< 0.002 U1	17.2	5.11	0.29	7.0	< 0.04 U1	168
11/9/2016	Background	--	--	5.60	0.28	6.5	< 0.04 U1	90
12/13/2016	Background	< 0.002 U1	16.6	5.41	0.20	6.7	< 0.04 U1	93
2/9/2017	Background	0.038	15.5	5.00	0.22	7.0	< 0.04 U1	80
3/15/2017	Background	0.025	15.6	5.12	0.24	7.1	< 0.04 U1	102
5/24/2017	Background	0.061	15.2	5.35	0.23	6.8	< 0.04 U1	108
6/20/2017	Background	0.069	14.6	4.93	0.23	6.7	< 0.04 U1	100
11/2/2017	Detection	0.035	15.2	5.61	0.24	6.7	< 0.04 U1	150
5/2/2018	Assessment	0.051	17.2	5.18	0.28	6.8	< 0.04 U1	100
9/5/2018	Assessment	< 0.002 U1	15.8	4.99	0.28	6.7	< 0.04 U1	89
3/15/2019	Assessment	< 0.2 U1	15.5	5.65	0.27	7.1	< 0.06 U1	95
6/11/2019	Assessment	< 0.02 U1	15.5	5.70	0.31	8.8	< 0.06 U1	95
7/24/2019	Assessment	< 0.04 U1	14.4	5.73	0.28	6.8	< 0.06 U1	102
2/11/2020	Assessment	--	--	--	0.24	6.9	--	--
5/6/2020	Assessment	0.02 J1	15.5	5.87	0.23	6.5	< 0.06 U1	121
10/30/2020	Assessment	< 0.02 U1	16.3	6.03	0.25	6.9	< 0.06 U1	115
3/15/2021	Assessment	--	--	--	0.30	6.9	--	--
5/10/2021	Assessment	0.02 J1	13.8	6.28	0.26	6.8	< 0.06 U1	40 J1
11/5/2021	Assessment	0.011 J1	15.1	6.54	0.25	6.7	< 0.06 U1	90

Notes:
mg/L: milligrams per liter
SU: standard unit
<: 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.
- -: Not analyzed
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.

Table 1 - Groundwater Data Summary: MW-1603A
Amos - BAP
Appendix IV 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
7/26/2016	Background	0.04 J1	78.0	303	0.052	0.01 J1	1.2	1.04	1.619	0.29	1.35	0.002	< 0.002 U1	2.11	0.09 J1	0.01 J1
8/24/2016	Background	0.03 J1	77.6	264	0.044	0.008 J1	1.0	0.725	0.726	0.28	1.07	0.007	< 0.002 U1	1.36	0.1 J1	< 0.01 U1
10/19/2016	Background	0.04 J1	73.7	258	0.096	0.01 J1	1.94	1.23	2.39	0.29	2.18	< 0.0002 U1	< 0.002 U1	1.34	0.2	0.02 J1
11/9/2016	Background	--	--	--	--	--	--	--	1.039	0.28	--	--	--	--	--	--
12/13/2016	Background	0.05 J1	78.3	270	0.102	0.01 J1	3.27	1.13	0.524	0.20	1.81	0.009	< 0.002 U1	1.22	0.2	0.03 J1
2/9/2017	Background	0.01 J1	78.3	229	0.055	0.008 J1	0.915	0.746	0.693	0.22	1.19	0.0005 J1	< 0.002 U1	1.15	0.2	0.075
3/15/2017	Background	0.04 J1	83.4	245	0.070	0.01 J1	1.42	1.02	0.974	0.24	1.25	0.002	0.002 J1	1.27	0.1	0.01 J1
5/24/2017	Background	0.05	63.3	233	0.033	0.009 J1	0.999	0.619	0.72	0.23	0.900	0.011	< 0.002 U1	1.56	0.09 J1	< 0.01 U1
6/20/2017	Background	0.03 J1	81.3	257	0.054	0.02	1.12	0.846	0.603	0.23	0.970	0.004	< 0.002 U1	1.11	0.1	0.01 J1
5/2/2018	Assessment	0.04 J1	80.0	251	0.093	0.01 J1	1.82	1.52	0.23065	0.28	1.60	0.0008 J1	< 0.002 U1	1.21	0.3	0.02 J1
9/5/2018	Assessment	0.02 J1	87.1	242	0.006 J1	0.007 J1	0.180	0.246	0.577	0.28	0.045	0.002	--	1.07	0.04 J1	0.01 J1
3/15/2019	Assessment	< 0.02 U1	89.9	252	< 0.02 U1	< 0.01 U1	0.407	0.360	1.261	0.27	0.232	< 0.09 U1	--	1 J1	0.05 J1	< 0.1 U1
6/11/2019	Assessment	< 0.02 U1	90.3	255	< 0.02 U1	< 0.01 U1	0.280	0.288	0.3562	0.31	0.163	< 0.009 U1	< 0.002 U1	1 J1	0.04 J1	< 0.1 U1
7/24/2019	Assessment	< 0.02 U1	85.8	249	0.04 J1	< 0.01 U1	0.650	0.517	0.439	0.28	0.580	0.000870	--	1 J1	0.07 J1	< 0.1 U1
2/11/2020	Assessment	< 0.02 U1	87.7	241	0.03 J1	< 0.01 U1	0.663	0.376	0.984	0.24	0.347	0.000630	< 0.002 U1	1 J1	0.06 J1	< 0.1 U1
5/6/2020	Assessment	< 0.02 U1	90.2	241	< 0.02 U1	< 0.01 U1	0.362	0.255	2.242	0.23	0.2 J1	0.000339	--	1 J1	< 0.03 U1	< 0.1 U1
10/30/2020	Assessment	0.03 J1	88.9	239	< 0.02 U1	< 0.01 U1	0.293	0.209	0.384	0.25	0.1 J1	0.000324	--	1 J1	< 0.03 U1	< 0.1 U1
3/15/2021	Assessment	< 0.02 U1	86.1	224	< 0.007 U1	< 0.004 U1	0.339	0.152	0.584	0.30	< 0.05 U1	0.000283	< 0.002 U1	1 J1	< 0.09 U1	< 0.04 U1
5/10/2021	Assessment	0.03 J1	86.8	240	0.01 J1	< 0.004 U1	0.335	0.212	0.703	0.26	0.2 J1	0.000303	--	1 J1	< 0.09 U1	--
11/5/2021	Assessment	0.04 J1	85.2	234	0.017 J1	< 0.004 U1	0.67	0.269	1.13	0.25	0.36	0.00037	--	1.0	< 0.09 U1	< 0.04 U1

Notes:
μg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
<: 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.
- -: Not analyzed
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.

Table 1 - Groundwater Data Summary: MW-1604
Amos - BAP
Appendix III 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
7/26/2016	Background	0.116	20.5	23.0	0.1 J1	6.2	2.2	236
8/22/2016	Background	0.074	18.0	22.9	0.05 J1	6.2	0.3	168
10/18/2016	Background	0.059	18.2	22.6	0.05 J1	6.3	0.3	196
11/8/2016	Background	--	--	22.5	0.05 J1	6.2	0.3	206
12/13/2016	Background	0.042	17.9	24.0	0.05 J1	6.1	0.9	182
2/8/2017	Background	0.094	16.6	23.1	0.09	6.2	0.7	172
3/14/2017	Background	0.083	16.1	24.1	0.08	6.4	0.9	204
5/23/2017	Background	0.129	17.4	26.1	0.08	6.1	2.2	222
6/20/2017	Background	0.152	16.2	25.2	0.09	6.2	1.2	224
11/1/2017	Detection	0.153	16.8	23.4	0.10	6.1	0.5	228
5/3/2018	Assessment	0.200	17.8	25.5	0.13	6.4	< 0.04 U1	210
9/5/2018	Assessment	0.043	15.1	22.8	0.12	7.2	< 0.04 U1	180
3/15/2019	Assessment	< 0.2 U1	13.1	16.6	0.09	6.3	< 0.06 U1	170
6/10/2019	Assessment	0.09 J1	16.5	24.4	0.11	8.7	< 0.06 U1	60
7/24/2019	Assessment	0.132	18.7	27.0	0.07	5.9	< 0.06 U1	242
2/12/2020	Assessment	--	--	--	0.08	6.3	--	--
5/6/2020	Assessment	0.175	20.8	29.4	0.06 J1	6.0	< 0.06 U1	241
10/28/2020	Assessment	0.200	19.5	27.7	0.08	6.0	< 0.06 U1	266
3/16/2021	Assessment	--	--	--	0.08	6.2	--	--
5/11/2021	Assessment	0.186	18.1	28.0	0.09	6.2	< 0.06 U1	237
11/4/2021	Assessment	0.143	17.7	25.7	0.06	6.2	< 0.06 U1	210

Notes:
mg/L: milligrams per liter
SU: standard unit
<: 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.
- -: Not analyzed
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.

Table 1 - Groundwater Data Summary: MW-1604
Amos - BAP
Appendix IV 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
7/26/2016	Background	0.05 J1	4.43	139	0.087	0.007 J1	1.9	2.06	3.5822	0.1 J1	1.58	0.002	< 0.002 U1	0.74	0.2	0.02 J1
8/22/2016	Background	0.04 J1	5.15	147	0.063	0.02 J1	1.4	1.06	0.695	0.05 J1	1.14	0.004	0.002 J1	0.64	0.2	0.02 J1
10/18/2016	Background	0.03 J1	4.60	134	0.048	0.005 J1	1.27	0.805	1.387	0.05 J1	0.869	< 0.0002 U1	< 0.002 U1	0.30	0.2	0.01 J1
11/8/2016	Background	--	--	--	--	--	--	--	0.512	0.05 J1	--	--	--	--	--	--
12/13/2016	Background	0.02 J1	4.58	137	0.038	< 0.004 U1	1.20	0.632	1.743	0.05 J1	0.603	0.004	< 0.002 U1	0.25	0.2	0.02 J1
2/8/2017	Background	0.02 J1	4.52	125	0.039	< 0.004 U1	0.814	0.638	1.239	0.09	0.719	0.004	< 0.002 U1	0.32	0.2	0.05 J1
3/14/2017	Background	0.02 J1	4.46	132	0.038	< 0.004 U1	0.824	0.570	0.892	0.08	0.482	0.0008 J1	< 0.002 U1	0.22	0.2	< 0.01 U1
5/23/2017	Background	0.04 J1	3.90	142	0.042	< 0.005 U1	0.836	0.647	0.859	0.08	0.444	0.006	< 0.002 U1	0.21	0.2	< 0.01 U1
6/20/2017	Background	0.02 J1	4.44	146	0.040	< 0.005 U1	0.706	0.601	1.459	0.09	0.406	0.003	< 0.002 U1	0.20	0.2	< 0.01 U1
5/3/2018	Assessment	0.02 J1	6.33	146	0.047	< 0.005 U1	0.556	0.494	1.334	0.13	0.230	< 0.0002 U1	< 0.002 U1	0.25	0.2	0.01 J1
9/5/2018	Assessment	0.03 J1	6.11	135	0.043	< 0.005 U1	0.649	0.533	0.248	0.12	0.349	0.0008 J1	--	0.22	0.3	0.01 J1
3/15/2019	Assessment	0.04 J1	6.78	118	0.07 J1	< 0.01 U1	0.931	0.406	0.596	0.09	1.19	< 0.09 U1	--	< 0.4 U1	0.2	< 0.1 U1
6/10/2019	Assessment	0.05 J1	4.88	142	0.142	< 0.01 U1	0.360	0.306	0.831	0.11	0.148	< 0.009 U1	< 0.002 U1	< 0.4 U1	0.1 J1	< 0.1 U1
7/24/2019	Assessment	< 0.02 U1	4.76	170	0.06 J1	< 0.01 U1	1.33	0.415	0.943	0.07	0.294	0.000485	--	0.4 J1	0.1 J1	< 0.1 U1
2/12/2020	Assessment	< 0.02 U1	3.88	174	0.05 J1	< 0.01 U1	0.798	0.538	1.375	0.08	0.319	0.000626	< 0.002 U1	< 0.4 U1	0.2 J1	< 0.1 U1
5/6/2020	Assessment	< 0.02 U1	4.04	175	0.04 J1	< 0.01 U1	0.484	0.406	1.647	0.06 J1	0.1 J1	0.000430	--	< 0.4 U1	0.2 J1	< 0.1 U1
10/28/2020	Assessment	< 0.02 U1	3.98	156	0.05 J1	< 0.01 U1	0.595	0.387	0.261	0.08	0.232	0.000515	--	< 0.4 U1	0.1 J1	< 0.1 U1
3/16/2021	Assessment	< 0.02 U1	4.89	168	0.04 J1	< 0.004 U1	0.590	0.295	0.66	0.08	0.1 J1	0.000475	< 0.002 U1	0.2 J1	0.2 J1	< 0.04 U1
5/11/2021	Assessment	< 0.02 U1	4.45	163	0.04 J1	< 0.004 U1	0.537	0.256	0.809	0.09	0.08 J1	0.000433	--	0.3 J1	0.1 J1	--
11/4/2021	Assessment	< 0.02 U1	4.38	138	0.054	< 0.004 U1	1.02	0.469	1.18	0.06	0.38	0.00058	--	0.2 J1	0.13 J1	< 0.04 U1

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
<: 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.
- -: Not analyzed
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.

Table 1 - Groundwater Data Summary: MW-1605
Amos - BAP
Appendix III 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
7/26/2016	Background	0.091	63.6	111	0.09	6.2	170	490
8/22/2016	Background	0.038	50.8	114	0.08	5.9	174	440
10/17/2016	Background	0.025	57.5	108	0.06 J1	6.1	161	446
11/8/2016	Background	--	--	116	0.06 J1	5.9	162	456
12/12/2016	Background	< 0.002 U1	53.9	125	< 0.05 U1	5.8	164	920
2/7/2017	Background	0.055	47.6	110	< 0.05 U1	5.9	161	472
3/13/2017	Background	0.039	45.7	106	0.03 J1	5.8	173	455
5/22/2017	Background	0.071	46.4	109	0.03 J1	6.6	171	458
6/19/2017	Background	0.103	48.1	111	< 0.02 U1	5.5	193	462
11/1/2017	Detection	0.076	50.0	113	0.03 J1	5.6	212	488
1/9/2018	Detection	--	45.9	108	--	5.5	202	462
5/3/2018	Assessment	0.109	47.0	97.7	< 0.02 U1	6.1	246	434
9/5/2018	Assessment	< 0.002 U1	49.4	97.1	0.03 J1	5.6	213	483
3/14/2019	Assessment	< 0.2 U1	45.4	92.5	< 0.01 U1	5.6	222	507
6/11/2019	Assessment	0.06 J1	45.5	91.8	0.02 J1	5.7	226	530
7/24/2019	Assessment	0.06 J1	46.5	91.6	0.02 J1	5.4	226	517
2/11/2020	Assessment	--	--	--	0.02 J1	5.7	--	--
5/5/2020	Assessment	0.051	49.6	85.6	0.03 J1	5.3	236	526
10/27/2020	Assessment	0.051	49.7	84.2	0.02 J1	5.3	234	521
3/16/2021	Assessment	--	--	--	0.03 J1	5.5	--	--
5/7/2021	Assessment	0.05 J1	45.4	85.1	< 0.01 U1	5.5	231	504
11/9/2021	Assessment	0.053	46.4	85.3	0.02 J1	5.6	226	520

Notes:
mg/L: milligrams per liter
SU: standard unit
<: 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.
- -: Not analyzed
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.

Table 1 - Groundwater Data Summary: MW-1605
Amos - BAP
Appendix IV 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
7/26/2016	Background	0.04 J1	5.70	83.2	0.035	< 0.004 U1	0.4	32.1	1.722	0.09	0.201	0.008	< 0.002 U1	0.66	0.05 J1	< 0.01 U1
8/22/2016	Background	0.03 J1	4.96	69.1	0.027	< 0.004 U1	0.1	24.5	0.683	0.08	0.062	0.004	< 0.002 U1	0.39	0.06 J1	< 0.01 U1
10/17/2016	Background	0.02 J1	4.98	67.3	0.034	< 0.004 U1	0.244	15.8	5.063	0.06 J1	0.038	0.005	< 0.002 U1	0.27	0.06 J1	< 0.01 U1
11/8/2016	Background	--	--	--	--	--	--	--	1.249	0.06 J1	--	--	--	--	--	--
12/12/2016	Background	0.03 J1	4.33	73.8	0.060	0.005 J1	0.645	11.5	0.853	< 0.05 U1	0.159	0.011	< 0.002 U1	0.30	0.1	0.062
2/7/2017	Background	0.03 J1	4.03	68.8	0.063	< 0.004 U1	0.381	10.3	0.586	< 0.05 U1	0.298	0.004	< 0.002 U1	0.36	0.1	0.04 J1
3/13/2017	Background	0.01 J1	3.70	75.1	0.056	< 0.004 U1	0.456	9.14	1.073	0.03 J1	0.059	0.005	< 0.002 U1	0.12	0.03 J1	< 0.01 U1
5/22/2017	Background	0.03 J1	3.38	80.5	0.062	< 0.005 U1	0.193	8.77	0.852	0.03 J1	0.071	0.003	< 0.002 U1	0.15	0.04 J1	0.02 J1
6/19/2017	Background	0.01 J1	3.64	82.2	0.061	< 0.005 U1	0.250	9.07	0.746	< 0.02 U1	0.050	0.004	< 0.002 U1	0.12	0.08 J1	< 0.01 U1
5/3/2018	Assessment	0.01 J1	3.34	80.4	0.069	0.009 J1	0.176	9.75	1.068	< 0.02 U1	0.148	0.006	< 0.002 U1	0.10	0.1	0.01 J1
9/5/2018	Assessment	0.02 J1	3.19	103	0.074	0.02 J1	0.260	10.7	0.916	0.03 J1	0.080	0.003	--	0.1 J1	0.07 J1	0.02 J1
3/14/2019	Assessment	< 0.02 U1	2.95	88.1	0.08 J1	< 0.01 U1	0.2 J1	8.83	0.3036	< 0.01 U1	0.161	< 0.09 U1	--	< 0.4 U1	0.05 J1	< 0.1 U1
6/11/2019	Assessment	< 0.02 U1	3.01	93.2	0.07 J1	0.01 J1	0.2 J1	9.09	1.061	0.02 J1	0.06 J1	< 0.009 U1	< 0.002 U1	< 0.4 U1	0.06 J1	< 0.1 U1
7/24/2019	Assessment	< 0.02 U1	2.82	108	0.09 J1	< 0.01 U1	0.306	8.57	0.739	0.02 J1	0.2 J1	0.00255	--	< 0.4 U1	0.08 J1	< 0.1 U1
2/11/2020	Assessment	< 0.02 U1	2.75	89.3	0.08 J1	< 0.01 U1	0.205	9.47	2.668	0.02 J1	0.1 J1	0.00259	< 0.002 U1	< 0.4 U1	0.07 J1	< 0.1 U1
5/5/2020	Assessment	0.27	2.99	97.8	0.08 J1	0.01 J1	0.363	9.99	1.427	0.03 J1	0.973	0.00232	--	< 0.4 U1	0.09 J1	< 0.1 U1
10/27/2020	Assessment	< 0.02 U1	2.69	92.3	0.09 J1	< 0.01 U1	0.334	9.65	0.81	0.02 J1	0.230	0.00234	--	< 0.4 U1	0.1 J1	< 0.1 U1
3/16/2021	Assessment	0.04 J1	2.85	104	0.126	0.007 J1	0.865	9.21	3.565	0.03 J1	0.676	0.00269	< 0.002 U1	< 0.1 U1	0.2 J1	< 0.04 U1
5/7/2021	Assessment	< 0.02 U1	3.46	94.9	0.08 J1	0.005 J1	0.390	9.69	0.773	< 0.01 U1	0.2 J1	0.00236	--	< 0.1 U1	< 0.09 U1	--
11/9/2021	Assessment	0.04 J1	4.96	116	0.117	0.012 J1	0.58	9.41	0.78	0.02 J1	0.60	0.00205	--	0.2 J1	0.16 J1	< 0.04 U1

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
<: 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.
- -: Not analyzed
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.

Table 1 - Groundwater Data Summary: MW-1606
Amos - BAP
Appendix III 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
7/25/2016	Background	0.084	43.4	55.5	0.03 J1	5.7	189	410
8/23/2016	Background	0.023	45.6	56.8	< 0.05 U1	5.3	186	372
10/17/2016	Background	0.013	47.3	61.5	< 0.05 U1	5.6	202	390
11/7/2016	Background	--	--	--	--	5.5	--	--
12/12/2016	Background	< 0.002 U1	50.4	27.0	< 0.02 U1	5.3	215	418
2/7/2017	Background	0.048	42.2	57.9	< 0.05 U1	5.7	179	370
3/14/2017	Background	0.036	42.2	59.5	< 0.05 U1	5.6	180	384
5/23/2017	Background	0.061	49.2	75.0	< 0.05 U1	5.6	199	442
6/19/2017	Background	0.108	48.3	78.8	< 0.05 U1	5.3	219	440
11/1/2017	Detection	0.055	51.6	91.4	< 0.05 U1	5.3	227	462
1/8/2018	Detection	--	43.9	88.3	--	8.4	190	400
5/4/2018	Assessment	0.077	53.0	119	0.03 J1	7.5	232	478
9/5/2018	Assessment	0.032	51.7	133	< 0.02 U1	5.4	202	507
3/15/2019	Assessment	< 0.2 U1	59.0	157	< 0.01 U1	5.4	232	597
6/11/2019	Assessment	0.04 J1	56.6	177	0.02 J1	6.7	204	571
7/24/2019	Assessment	0.04 J1	52.8	186	0.02 J1	5.4	191	597
2/12/2020	Assessment	--	--	--	0.02 J1	5.4	--	--
5/6/2020	Assessment	0.03 J1	36.7	116	0.02 J1	5.2	108	372
10/26/2020	Assessment	0.03 J1	32.4	100	0.02 J1	5.6	98.5	335
3/17/2021	Assessment	--	--	--	0.03 J1	5.4	--	--
5/7/2021	Assessment	0.03 J1	23.7	73.4	0.03 J1	5.5	79.3	275
11/4/2021	Assessment	0.032 J1	17.7	81.5	0.03 J1	5.4	78.6	290

Notes:
mg/L: milligrams per liter
SU: standard unit
<: 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.
- -: Not analyzed
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.

Table 1 - Groundwater Data Summary: MW-1606
Amos - BAP
Appendix IV 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
7/25/2016	Background	0.04 J1	2.89	71.8	0.112	0.12	1.3	14.9	0.2045	0.03 J1	1.01	0.005	< 0.002 U1	0.26	0.09 J1	0.03 J1
8/23/2016	Background	0.02 J1	2.58	67.2	0.087	0.14	0.6	14.5	1.039	< 0.05 U1	0.483	0.007	< 0.002 U1	0.14	0.1 J1	0.01 J1
10/17/2016	Background	0.03 J1	2.58	69.5	0.131	0.14	1.58	13.1	1.347	< 0.05 U1	1.20	0.006	0.002 J1	0.15	0.2	0.02 J1
11/7/2016	Background	--	--	--	--	--	--	--	1.331	--	--	--	--	--	--	--
12/12/2016	Background	0.03 J1	2.55	65.8	0.100	0.17	1.03	13.9	0.651	< 0.02 U1	0.588	0.010	< 0.002 U1	0.12	0.2	0.04 J1
2/7/2017	Background	0.03 J1	3.50	57.5	0.134	0.31	1.76	14.2	0.886	< 0.05 U1	1.55	0.003	< 0.002 U1	0.29	0.3	0.05 J1
3/14/2017	Background	0.02 J1	3.52	56.3	0.091	0.16	0.920	13.4	2.45	< 0.05 U1	0.572	0.003	< 0.002 U1	0.14	0.1	0.01 J1
5/23/2017	Background	0.02 J1	2.83	59.8	0.085	0.12	0.286	14.2	0.236	< 0.05 U1	0.448	0.007	< 0.002 U1	0.1 J1	0.1	0.01 J1
6/19/2017	Background	0.03 J1	3.42	61.8	0.097	0.13	0.596	13.7	0.769	< 0.05 U1	0.666	< 0.0002 U1	< 0.002 U1	0.13	0.09 J1	0.02 J1
5/4/2018	Assessment	0.01 J1	2.81	58.7	0.088	0.15	0.289	16.9	1.012	0.03 J1	0.286	0.003	< 0.002 U1	0.07 J1	0.1	0.02 J1
9/5/2018	Assessment	0.01 J1	2.21	61.0	0.073	0.17	0.249	16.4	0.1805	< 0.02 U1	0.088	0.003	--	0.04 J1	0.06 J1	0.01 J1
3/15/2019	Assessment	0.03 J1	2.94	74.6	0.152	0.19	1.24	18.2	0.295	< 0.01 U1	1.06	< 0.09 U1	--	< 0.4 U1	0.2 J1	< 0.1 U1
6/11/2019	Assessment	< 0.02 U1	2.44	64.1	0.08 J1	0.18	0.2 J1	16.5	0.4433	0.02 J1	0.181	< 0.009 U1	< 0.002 U1	< 0.4 U1	0.06 J1	< 0.1 U1
7/24/2019	Assessment	0.03 J1	3.44	72.9	0.140	0.21	1.14	16.2	0.743	0.02 J1	1.11	0.00340	--	< 0.4 U1	0.2 J1	< 0.1 U1
2/12/2020	Assessment	0.04 J1	2.82	50.2	0.112	0.19	0.680	10.1	1.515	0.02 J1	0.644	0.00256	< 0.002 U1	< 0.4 U1	0.07 J1	< 0.1 U1
5/6/2020	Assessment	0.03 J1	3.43	51.3	0.08 J1	0.18	0.645	11.7	1.529	0.02 J1	0.549	0.00239	--	< 0.4 U1	0.09 J1	< 0.1 U1
10/26/2020	Assessment	< 0.02 U1	2.26	41.8	0.06 J1	0.26	0.286	11.6	0.2071	0.02 J1	0.1 J1	0.00228	--	< 0.4 U1	< 0.03 U1	< 0.1 U1
3/17/2021	Assessment	< 0.02 U1	2.62	39.9	0.06 J1	0.24	0.490	9.34	0.824	0.03 J1	0.319	0.00221	< 0.002 U1	< 0.1 U1	< 0.09 U1	< 0.04 U1
5/7/2021	Assessment	< 0.02 U1	2.66	38.9	0.06 J1	0.21	0.302	8.71	0.766	0.03 J1	0.280	0.00217	--	< 0.1 U1	< 0.09 U1	--
11/4/2021	Assessment	< 0.02 U1	2.68	41.2	0.064	0.221	0.38	8.18	0.67	0.03 J1	0.20	0.00229	--	< 0.1 U1	< 0.09 U1	< 0.04 U1

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
<: 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.
- -: Not analyzed
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.

Table 2: Residence Time Calculation Summary
Amos Bottom Ash Pond

			2021-03		2021-05		2021-11	
CCR Management Unit	Monitoring Well	Well Diameter (inches)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)
Bottom Ash Pond	MW-1 [2]	2.0	25.1	2.4	23.4	2.6	21.7	2.8
	MW-4 [2]	2.0	91.7	0.7	58.4	1.0	58.3	1.0
	MW-5 [2]	2.0	39.5	1.5	38.4	1.6	35.5	1.7
	MW-6 [1]	2.0	63.9	1.0	72.4	0.8	84.3	0.7
	MW-1601 [1]	2.0	18.9	3.2	16.6	3.7	18.2	3.3
	MW-1602A [1]	2.0	8.6	7.1	7.9	7.7	8.9	6.8
	MW-1603A [1]	2.0	125.6	0.5	154.3	0.4	170.3	0.4
	MW-1604 [2]	2.0	80.6	0.8	82.6	0.7	91.7	0.7
	MW-1605 [2]	2.0	21.5	2.8	26.4	2.3	23.7	2.6
	MW-1606 [2]	2.0	28.6	2.1	43.0	1.4	25.5	2.4

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

Legend

- Monitoring Well Location
- Groundwater Elevation Contour
- Groundwater Flow Direction

Notes

- Monitoring well coordinates and water level data (collected on March 15, 2021) provided by AEP.
- Groundwater elevation units are feet above mean sea level.
- Site features based on information available in the Ash Pond- CCR Groundwater Monitoring Well Network Evaluation - Amos Plant (Arcadis, 2016) provided by AEP.

500 250 0 500 Feet

Potentiometric Surface Map - Uppermost Aquifer
March 2021

AEP Amos Generating Plant - Ash Pond System
Winfield, West Virginia

Geosyntec consultants

Columbus, Ohio | 2021/06/08

Figure **2**

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Legend

- Monitoring Well Location
- Groundwater Elevation Contour
- Groundwater Flow Direction

Notes

- Monitoring well coordinates and water level data (collected on May 3, 2021) provided by AEP.
- Groundwater elevation units are feet above mean sea level.
- Site features based on information available in the Ash Pond- CCR Groundwater Monitoring Well Network Evaluation - Amos Plant (Arcadis, 2016) provided by AEP.

500 250 0 500 Feet

Potentiometric Surface Map - Uppermost Aquifer May 2021

AEP Amos Generating Plant - Ash Pond System
Winfield, West Virginia

Geosyntec consultants

Figure 3

Columbus, Ohio | 2021/09/22

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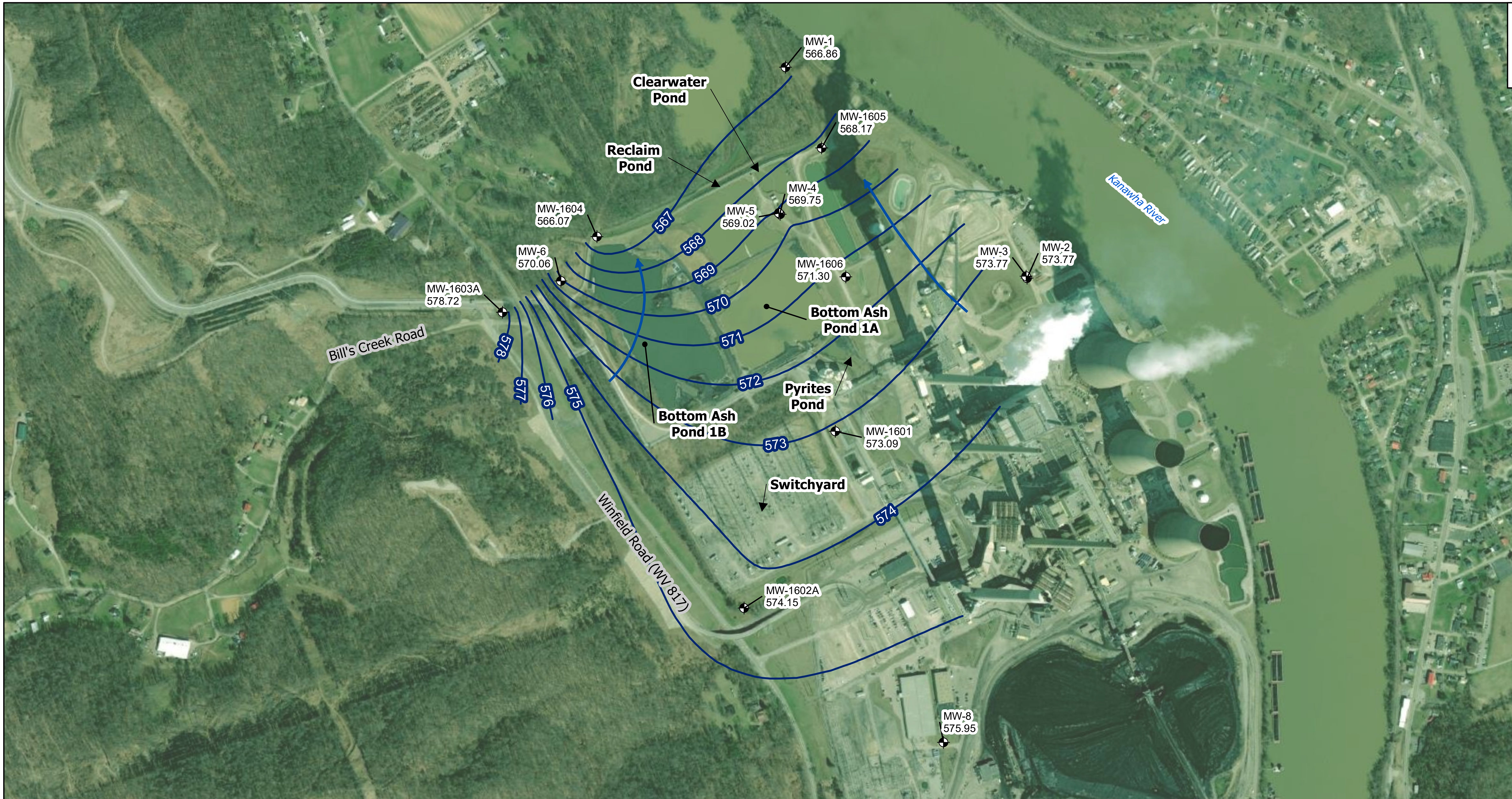

Legend

- Monitoring Well Location
- Groundwater Elevation Contour
- Groundwater Flow Direction

Notes

- Monitoring well coordinates and water level data (collected on November 1, 2021) provided by AEP.
- Groundwater elevation units are feet above mean sea level.
- Site features based on information available in the Ash Pond- CCR Groundwater Monitoring Well Network Evaluation - Amos Plant (Arcadis, 2016) provided by AEP.

500 250 0 500 Feet

Potentiometric Surface Map - Uppermost Aquifer
November 2021

AEP Amos Generating Plant - Ash Pond System
Winfield, West Virginia

Geosyntec consultants

Columbus, Ohio | 2022/01/18

Figure **4**

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APPENDIX 2

Statistical analysis reports completed in 2021 follow.

STATISTICAL ANALYSIS PLAN

APPALACHIAN POWER COMPANY

JOHN AMOS PLANT

Prepared in compliance with USEPA's Coal Combustion Residuals Rule, 40 CFR 257.93

APPALACHIAN POWER

An AEP Company

Revision 0: January 2017

Revision 1: January 2021

STATISTICAL ANALYSIS PLAN

Submitted to

AMERICAN ELECTRIC POWER

1 Riverside Plaza
Columbus, Ohio 43215-2372

Submitted by

Geosyntec consultants

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January 2021
Revision 1

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LIST OF ACRONYMS AND ABBREVIATIONS

Annual Report	Annual Groundwater Monitoring and Corrective Action Report
ANOVA	analysis of variance
CCR	coal combustion residuals
CFR	Code of Federal Regulations
GWPS	groundwater protection standard
LCL	lower confidence limit
MCL	maximum contaminant level
OLS	ordinary least-squares
ORP	oxidation-reduction potential
PQL	practical quantitation limit
QC	quality control
RCRA	Resource Conservation and Recovery Act
RL	reporting limit
ROS	regression on order statistics
SAP	Statistical Analysis Plan
SSI	statistically significant increase
SSL	statistically significant level
SWFPR	site-wide false positive rate
UCL	upper confidence limit
Unified Guidance	*Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* (USEPA, 2009)
UPL	upper prediction limit
USEPA	United States Environmental Protection Agency
UTL	upper tolerance limit

SECTION 1

INTRODUCTION

In April 2015, the United States Environmental Protection Agency (USEPA) issued new regulations regarding the disposal of coal combustion residuals (CCR) in certain landfills and impoundments under 40 CFR 257, Subpart D, referred to as the "CCR rules." Facilities regulated under the CCR rules are required to develop and sample a groundwater monitoring well network to evaluate if landfilled CCR materials are impacting downgradient groundwater quality. As part of the evaluation, the analytical data collected during the sampling events must undergo statistical analysis to identify statistically significant increases (SSIs) in analyte concentrations above background levels. A description of acceptable statistical programs is provided in USEPA's document *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* (USEPA, 2009), which is commonly referred to as the "Unified Guidance".

The CCR rules are not prescriptive regarding what statistical analyses should be selected so that groundwater data are interpreted in a consistent manner and the results meet certification requirements. Geosyntec Consultants, Inc. (Geosyntec) prepared this Statistical Analysis Plan (SAP) on behalf of American Electric Power (AEP) to develop a logic process regarding the appropriate statistical analysis of groundwater data collected in compliance with the CCR rules. The SAP will provide a narrative description of the statistical approach and methods used in accordance with the CCR rule reporting requirements [40 CFR 257.93(f)(6)].

This SAP describes statistical procedures to be used to establish background conditions, implement detection monitoring, implement assessment monitoring (as needed), and implement corrective action monitoring (as needed).

Procedures for collecting, preserving, and shipping groundwater samples are not included in this SAP. It is assumed that samples are collected and handled in accordance with AEP's draft *Groundwater Sampling and Analysis Plan* (AEP, 2016) and the requirements of 40 CFR 257.93 *et seq.*

SECTION 2

ANALYSES FOR REVIEWING AND PREPARING DATA

2.1 Physical Independence

Most statistical analyses require separate sampling events to be statistically independent. Statistical independence of groundwater samples is most likely to be realized when the samples are collected at time intervals that are sufficiently far apart that the samples are not from the same volume of groundwater. In such cases, the samples of groundwater are considered physically independent. To ensure physical independence, the minimum time between sampling events must be longer than the residence time of groundwater that would be collected in the monitoring well. The minimum time interval between sampling events (t_{min}) can be determined by calculating the groundwater velocity, as follows:

$$v = \frac{Ki}{n} \quad (1)$$

$$t_{min} = \frac{v}{D} \quad (2)$$

where:

$v =$	groundwater velocity
$K =$	hydraulic conductivity
$i =$	hydraulic gradient
$n =$	effective porosity
$t_{min} =$	minimum time interval between sampling events
$D =$	well bore volume (i.e., diameter of well and surrounding filter pack)

2.2 Testing for Normality

Many statistical analyses assume that the sample data are normally distributed. If such an analysis is used, the assumption of normality can be tested using the Shapiro-Wilk test (for sample sizes up to 50) or the Shapiro-Francía test (for sample sizes greater than 50). Normality can also be tested by less computationally intensive means such as graphing data on a probability plot. If the data appear not to be normally distributed (e.g., they are skewed in some fashion), then data may be transformed mathematically such that the transformed data do follow a normal distribution (e.g., lognormal distributions, Box-Cox transformations). Alternatively, a non-parametric test (i.e., a test that does not assume a particular distribution of the data) may be used. However, since non-parametric tests generally require large datasets to maintain an adequately low site-wide false positive rate (SWFPR), transforming the data is preferred.

2.3 Testing for Outliers

Outliers are extreme data points that may represent an anomaly or error. Data sets should be visually inspected for outliers using time series and/or box-and-whisker plots. While they are valuable as screening tools, visual methods are not foolproof. For example, if data are skewed according to a lognormal distribution, the boxplot screening may identify more outliers than actually exist. Typically, goodness-of-fit testing must be done on the non-outlier portion of the data to determine at what scale to test the possible outliers.

Potential outliers should be evaluated for potential sources of error (e.g., in transcription or calculation) or evidence that the data point is not representative (e.g., by examining quality control [QC] data, groundwater geochemistry, sampling procedures, etc.). Errors should be corrected prior to further statistical analysis, and data points that are flagged as non-representative should not be used in the statistical analysis. In addition, data points can be considered extreme outliers if they meet one of the following criteria:

$$x_i < \tilde{x}_{0.25} - 3 \times IQR \quad (3)$$

or

$$x_i > \tilde{x}_{0.75} + 3 \times IQR \quad (4)$$

where:

$x_i =$	individual data point
$\tilde{x}_{0.25} =$	first quartile
$\tilde{x}_{0.75} =$	third quartile
$IQR =$	the interquartile range $= \tilde{x}_{0.75} - \tilde{x}_{0.25}$

Extreme outliers may be excluded from the statistical analysis based on professional judgment. Goodness-of-fit testing may be needed to corroborate the classification of data points as extreme outliers. Flagged data and extreme outliers should still be maintained in the database and should be reevaluated as new data are collected.

2.4 Handling Duplicate or Replicate Data

Duplicate or replicate samples are often collected for QC purposes. Averaging the parent sample and duplicate sample results may give a more accurate representation of the constituent concentration at the time, but doing so would reduce the sample variability. Since many statistical tests assume that data are homoscedastic (i.e., the population variance does not change across samples), this technique is not recommended. Unless there is reason to suspect that either the parent sample or the duplicate sample is more representative of site groundwater, one of the samples should be selected at random and that value should be used in the subsequent statistical analysis. However, it should be reported when parent sample and duplicate sample results are different from a decision-making perspective, e.g., when the duplicate sample exceeds the groundwater protection standard (GWPS) but the parent sample does not.

2.5 Handling Non-Detect Data

If non-detect data are infrequent (less than 15%), half of the reporting limit (RL) can be used in place of these data without significantly altering the results of a statistical test. The RL may be either the laboratory practical quantification limit (PQL) or an established project limit which is less than the maximum contaminant level (MCL) or CCR rule-specified screening level for constituents that do not have an MCL. If non-detect data are more frequent, parametric methods that explicitly consider non-detects or non-parametric methods insensitive to the presence of non-detect data should be used. Where available, estimated results less than the RL (i.e., “J-flagged” data) should be used, and these data should be considered detections for the purposes of statistical analysis.

2.6 Deseasonalizing Data

Most statistical tests assume that data are independent and identically distributed. Datasets with seasonal or cyclic patterns violate this assumption. If seasonal trends are not corrected, the variance of the data will be overestimated, lessening the statistical power of the test. False positives may also be identified for elevated results that are caused by seasonal variation instead of a release.

At the same time, deseasonalizing data inherently assumes that the seasonal pattern will continue into the future, so care should be taken when correcting for seasonality. There should be a physical explanation for the seasonal pattern, and the seasonal pattern should be observed for at least three cycles before deseasonalizing data.

To evaluate whether a seasonal pattern exists, data should first be visually inspected on a time series plot. Observing parallel or antiparallel patterns for the same constituent across multiple wells or for multiple constituents within a single well provides greater assurance of a seasonal pattern and may be used to infer a physical explanation.

If a seasonal pattern is observed, the dataset should undergo a statistical test for seasonality before deseasonalizing the data. First, results are categorized into seasons based on the observed seasonal pattern and the frequency of sampling (e.g., summer or winter; dry season or wet season; first, second, third, or fourth quarter; etc.). Then, the Kruskal-Wallis test can be applied to the various seasonal datasets to test whether the different seasons are statistically significantly different from one another.

To deseasonalize the data, a seasonal mean should be calculated for each season based on the categorization for the dataset, and a grand mean (i.e., the overall mean of all data) should be calculated. Each result should then be corrected based on the difference between the grand mean and the seasonal mean for that result’s season. Similar to transforming apparently non-normal data, statistics should be calculated based on the deseasonalized data.

SECTION 3

DETECTION MONITORING

3.1 Establishing Background

By October 17, 2017, eight independent background samples should be collected from each monitoring well in the CCR unit groundwater monitoring system as part of the initial monitoring period [40 CFR 257.94(b)]. Background wells do not necessarily need to be hydraulically upgradient of the CCR unit, but they must not be affected by a release from the CCR unit [40 CFR 257.91(a)(1)]. The sampling frequency should be such that samples are physically independent, as described in **Section 2.1**. Samples should be analyzed for the Appendix III and Appendix IV constituents listed in **Table 1**.

Once analytical data are received, summary statistics (e.g., mean and variance) should be calculated for the background datasets. Initially, analysis should be done independently for each constituent at each well. As part of our protocol in such situations, time series plots and box plots will be prepared along with the summary statistics. The Kaplan-Meier method or robust regression on order statistics (ROS) can be used to compute summary statistics when there are large fractions (i.e., 15% to 50%) of non-detects; these methods are discussed below. If more than 50% of the data are non-detect, then summary statistics cannot be reliably calculated. Procedures for evaluating future data against these background datasets are described in **Section 3.2.1** (for detection monitoring) and **Section 4.1.1** (for assessment monitoring and corrective action monitoring).

Background data will be evaluated for statistically significant temporal trends using (a) ordinary least-squares (OLS) linear regression with a *t*-test ($\alpha = 0.01$) on the slope and/or (b) the non-parametric Theil-Sen slope estimator with Mann-Kendall trend test ($\alpha = 0.05$, or 0.01 for larger datasets). Non-detect data are replaced with half the RL for these analyses. The OLS linear regression or Theil-Sen slope estimator will be used to estimate the rate of change (increasing, no change, or decreasing) over time for each constituent at each well. The *t*-test or Mann-Kendall statistic will be used to determine whether a trend is statistically significant. OLS linear regression should only be used when at most 15% of the data are non-detect, when regression residuals are normally distributed, and when the variance from the regression line does not change over time. The Theil-Sen/Mann-Kendall analysis requires at least five observations for meaningful results; at least eight observations are recommended. Note that a statistically significant increasing trend in background data (or a statistically significant decreasing trend in pH) could indicate an existing release from the CCR unit or another source, and further investigation may be needed to determine the source of this trend.

Background data will also be evaluated for statistically significant seasonal patterns and, if present, will be deseasonalized using the procedure described in **Section 2.6**.

If the trend analysis does not indicate a statistically significant trend, the proposed background data will be tested for normality using one of the methods outlined in **Section 2.2**. When data follow a normal or transformed-normal distribution (e.g. lognormal or other Box-Cox transformation), parametric methods are applied. If fewer than 15% of the data are non-detect, non-detect data may be replaced with half the RL and the mean and variance can be calculated normally. If 15% to 50% of the data are non-detect, two methods – the Kaplan-Meier or Robust ROS method – can be used to determine the sample mean and variance. Kaplan-Meier should not be used if all non-detect data have the same RL or if the maximum detected value is less than the highest RL of the non-detect data. When data do not follow a normal or transformed-normal distribution, or when more than 50% of the data are non-detect, nonparametric methods may be used.

Once the sample mean and variance are calculated for each constituent at each well (assuming no significant trends over time), the data from background wells should be compared for each constituent. The purpose of this exercise is to test for significant spatial variation and to decide between interwell and intrawell approaches. First, the equality of variance across background wells should be tested visually using box-and-whisker plots and/or analytically using Levene's test (α = 0.01). If the variances appear equal, then one-way, parametric analysis of variance (ANOVA) should be conducted across background wells (α = 0.05). If there are no statistically significant differences among the background wells, then interwell comparisons may be appropriate to evaluate SSIs.

If ANOVA indicates statistically significant differences among background wells, then spatial variability can be concluded. As with temporal trends, the existence of spatial variability could indicate an existing release from the CCR unit or another source, and further investigation may be needed to determine the source of this variability. If the spatial variability is not caused by a release from the CCR unit, then intrawell comparisons would be appropriate to evaluate SSIs.

3.2 Evaluating Statistically Significant Increases (SSIs)

After the initial eight rounds of background sampling, groundwater sampling and analysis should be conducted on a semiannual basis. The statistical evaluation of each groundwater monitoring event must be completed within 90 days of receiving the analytical results from the laboratory [40 CFR 257.93(h)(2)].

The CCR rules only require analysis of the Appendix III constituents; however, analyzing additional constituents should be considered. Turbidity, dissolved oxygen, and oxidation-reduction potential (ORP), should be measured in the field in addition to pH. Other geochemical parameters, such as alkalinity, magnesium, potassium, sodium, iron, and manganese, should also be analyzed in the laboratory periodically (e.g., once every one to four years). Both the field and laboratory geochemical parameters can help identify the cause of any apparent change in groundwater quality. Additionally, analyzing for the Appendix IV constituents periodically should be considered to ensure the background dataset for these constituents is complete and current should assessment monitoring be needed. Statistical analyses should still be limited to the Appendix III constituents to help meet the dual goals of a SWFPR less than 10% per year and an adequate statistical power.

The CCR rules specifically list four methods acceptable for statistical analysis: ANOVA, tolerance intervals, prediction intervals, and control charts [40 CFR 257.93(f)]. Of these, the Unified Guidance recommends prediction limits combined with retesting for maintaining a low SWFPR while providing high statistical power (USEPA, 2009). Control charts are also acceptable as long as parametric methods can be used (i.e., the data or transformed data are normally distributed and the frequency of non-detects is at most 50%), as there is no nonparametric counterpart to the control chart. ANOVA is not recommended as the CCR rules mandate a minimum Type I error (α) of 0.05, at which it would be difficult to maintain an annual SWFPR less than 10%.

Prediction intervals and control charts can be used for both interwell and intrawell comparisons. For interwell comparisons, the pooled data from background monitoring wells should be used for the background dataset; for intrawell comparisons, the background dataset should be a subset of historical data at each monitoring well. (See **Section 3.4** below for procedures for updating background datasets.) Interwell comparisons are preferable, but they should only be used when there are no trends and no statistically significant population differences among background wells; otherwise, a significant test result may only indicate natural spatial variability instead of an SSI.

For prediction intervals, the upper prediction limit (UPL) is calculated according to the following formula:

$$\text{UPL} = \bar{x} + ks \quad (5)$$

where:

$\bar{x} =$ mean concentration of the background dataset
$s =$ standard deviation of the background dataset
$k =$ multiplier based on the characteristics of the site and the statistical test

Values for k are chosen to maintain an SWFPR less than 10% and depend on the following: (1) number of wells, (2) number of constituents being evaluated, (3) size of the background dataset, (4) retesting regime, and (5) whether intrawell or interwell comparisons are being used. Values for k are listed in Tables 19-1, 19-2, 19-10, and 19-11 in Appendix D of the Unified Guidance (USEPA, 2009). If the k value that precisely matches site conditions does not appear in these tables, it can be estimated using the provided values by linear interpolation.

A one-of-two or one-of-three testing regime should be employed; i.e., if at least one sample in a series of two or three (respectively) does not exceed the UPL, then it can be concluded that an SSI has not occurred. In practice, if the initial result does not exceed the UPL, then no resampling is needed. If the initial result does exceed the UPL, then a resample should be collected prior to the next regularly scheduled sampling event at the monitoring well(s) and for the constituent(s) exceeding the UPL. Additional geochemical parameters, such as alkalinity, magnesium, potassium, sodium, iron, and manganese, should also be analyzed during resampling to help identify the source of the apparent increase. Enough time should elapse between the initial sample and each resample so that the samples are physically independent (**Section 2.1**). If both the initial result and the subsequent resample(s) exceed the UPL, then an SSI can be concluded.

Choosing between a one-of-two and a one-of-three testing regime should be done before conducting the statistical analysis, as the UPL calculation depends on the resampling regime selected. The choice should depend on site conditions and the size of the background dataset. First, if three physically independent samples cannot be collected in a six-month period, then a one-of-two testing regime should be used. A one-of-two testing regime may also be considered (a) if the background dataset has at least 16 data points or (b) if the CCR unit's monitoring well network has nine or fewer downgradient monitoring wells and a background dataset of at least 8 data points. Otherwise, a one-of-three testing regime should be employed to achieve an acceptably high statistical power and an acceptably low SWFPR.

If two physically independent samples cannot be collected in a six-month period, then a reduced monitoring frequency may be warranted. In this case, a demonstration must be made documenting the need for – and effectiveness of – a reduced monitoring frequency. This demonstration must be certified by a qualified professional engineer, and monitoring must still be done on at least an annual basis [40 CFR 257.94(d)].

The above procedure can be used wherever a mean and variance can be calculated for background data, including datasets that are transformed-normal and datasets where the mean and variance are calculated using the Kaplan-Meier or Robust ROS method. (Note that if data are transformed-normal, prediction intervals or control limits should first be calculated for the transformed data and then be transformed back into concentration terms.) Methods for determining prediction intervals where more than half of the background data are non-detect, where background data are neither normal nor transformed-normal, or where statistically significant trends or seasonal patterns exist are described below.

Different analyses can and should be used for different constituents and different monitoring wells within a CCR unit depending on the background data. For instance, if background wells have similar chloride data but different pH data, then interwell comparisons may be considered for chloride analysis and intrawell comparisons may be considered for pH analysis. If boron data are stable above the RL at MW-1 and mostly non-detect at MW-2, then it would be appropriate to use parametric prediction limits at MW-1 and non-parametric prediction limits at MW-2.

3.2.1 Most Background Data Are Non-Detect

If at least half of the data are non-detect, non-parametric prediction intervals with retesting should be used. In this method, the UPL is set either at the highest or at the second-highest concentration observed in the background dataset. A sufficiently large background dataset is paramount for this procedure to achieve an acceptably low SWFPR. To this end, the Kruskal-Wallis test should be performed on all background monitoring wells where at least 50% of the data for the constituent are non-detect to evaluate spatial variability. If the Kruskal-Wallis test indicates that there is no significant spatial variability among background wells, then the data from the background wells should be pooled to form a larger background dataset and thus to run an interwell test.

The choice between a one-of-two and a one-of-three testing regime should be based on the same criteria used for parametric testing, as described in **Section 3.2**. Choosing between using the highest or second-highest observed concentration as the UPL should depend in part on the size of the background dataset and the number of monitoring wells around the CCR unit. Assuming a one-of-three testing regime is used, the highest observed concentration should be used when the background dataset has fewer than 32 data points and the monitoring network has twelve or fewer wells. If there are at least thirteen wells, the highest observed concentration should be used when the background dataset has fewer than 48 data points. The second-highest observed concentration may be used for larger datasets.

If a one-of-two testing regime must be used due to aquifer conditions, then the highest observed concentration should be used (a) when the background dataset has fewer than 64 data points if there are fifteen or fewer wells or (b) when the background dataset has fewer than 88 data points if there are at least sixteen wells. The second-highest observed concentration may be used for larger data sets.

3.2.2 All Background Data Are Non-Detect

If all of the background data are non-detect, then the Double Quantification Rule should be used. According to this rule, if a sample and verification resample both exceed the PQL, then an SSI can be concluded. This can be thought of as setting the UPL at the PQL with a one-of-two testing regime. The possibility of false positives from this rule does not count against the calculated SWFPR because the false positive risk is small when all previous background data have been non-detect.

3.2.3 Background Data Are neither Normal nor Transformed-Normal

If background data are non-normal and cannot be transformed such that the transformed data do follow a normal distribution, then non-parametric prediction intervals with retesting should be used. In this method, the UPL is set either at the highest or at the second-highest concentration observed in the background dataset. A sufficiently large background dataset is paramount for this procedure to achieve an acceptably low SWFPR. To this end, the Kruskal-Wallis test should be performed on all background monitoring wells where at least 50% of the data for the constituent are non-detect to evaluate spatial variability. If the Kruskal-Wallis test indicates that there is no significant spatial variability among background wells, then the data from the background wells should be pooled to form a larger background dataset and thus to run an interwell test.

The choice between a one-of-two and a one-of-three testing regime should be based on the same criteria used for parametric testing, as described in **Section 3.2**. The choice between using the highest or second-highest observed concentration as the UPL should be based on the same considerations described in **Section 3.2.1**.

3.2.4 A Significant Temporal Trend Exists

True temporal trends in background data (i.e., absent a release from the facility or another source) are considered unlikely. Thus, a truncated dataset that does not exhibit a statistically significant trend may be used. In these cases, UPLs would be calculated as described in the previous sections.

Alternatively, if there is a significant temporal trend in the background data that is not attributable to a release, prediction limits can be constructed around a trend line. A trend line can be constructed parametrically using OLS linear regression. OLS linear regression should only be used when at most 15% of the data are non-detect, when regression residuals are normally distributed, and when the variance from the regression line does not change over time. If OLS linear regression is used, the UPL can be calculated according to the following equation:

$$\text{UPL} = \widehat{x_0} + t_{1-\alpha,n-2} * s_e * \sqrt{1 + \frac{1}{n} + \frac{(t_0 - \bar{t})^2}{(n-1)s_t^2}} \quad (6)$$

where:

$\widehat{x_0} =$	regression-line estimate of the mean concentration at time t_0
$t_{1-\alpha,n-2} =$	one-tailed *t*-value at a confidence of 1 – α and n – 2 degrees of freedom
$s_e =$	standard error of the regression line
$n =$	number of samples in the background dataset
$t_0 =$	date the groundwater sample being compared to the UPL was collected
$\bar{t} =$	mean of the sampling dates in the background dataset
$s_t =$	standard deviation of the sampling dates in the background dataset

The choice between a one-of-two and a one-of-three testing regime should be based on the same criteria used when there is no significant trend, as described in **Section 3.2**. The choice of α depends on the retesting regime and the number of wells within the monitoring network. If a one-of-two testing regime is employed, an α = 0.02 is recommended if there are eighteen or fewer wells and an α = 0.01 is recommended if there are at least nineteen wells within the monitoring network. If a one-of-three testing regime is employed, an α = 0.05 should be used.

3.2.5 A Significant Seasonal Pattern Exists

If a statistically significant seasonal pattern exists and if there is a physical explanation for the seasonality, the background data should be deseasonalized using the procedure described in **Section 2.6**. The background UPL should be calculated based on the deseasonalized data. Results should then be deseasonalized by subtracting the difference between the seasonal mean and the grand mean before comparing results to the UPL.

3.3 Responding to an Identified SSI

If the statistical evaluation indicates that an SSI is present, the data should be evaluated to assess whether the SSI is caused by a release from the CCR unit. If it can be shown that the SSI resulted from a release from another source, from an error in sampling or analysis, or from natural variability, then a demonstration of this must be made in writing and certified by a qualified professional engineer within 90 days of completing the statistical evaluation [40 CFR 257.94(e)(2)]. (The statistical evaluation itself must be completed within 90 days of receiving the analytical data from the laboratory.) If this demonstration is not made within 90 days of completing the statistical evaluation, then the site must begin assessment monitoring [40 CFR 257.94(e)(1)].

3.4 Updating Background

As recommended in the Unified Guidance, background values should be updated every four to eight measurements, assuming no confirmed SSI is identified (USEPA, 2009). (See **Section 4.4** for procedures for updating background if an SSI has been identified.) A Student's *t*-test or the nonparametric Mann-Whitney test (also known as the Wilcoxon rank-sum test) should be conducted to compare the set of new data points against the existing background dataset, as appropriate. An $\alpha = 0.05$ is recommended given the relatively small size of the datasets, particularly if background is updated every four measurements and particularly if the nonparametric Mann-Whitney test is used. However, an α as low as 0.01 may be used if the existing background dataset is sufficiently large (i.e., contains at least five data points) or if Student's *t*-test is used.

If the *t*-test or Mann-Whitney test does not indicate significant differences, the new data should be combined with the existing background data to calculate an updated UPL. Increasing the size of the background dataset will increase the power of subsequent statistical tests.

If the *t*-test or Mann-Whitney test indicates a statistically significant difference between the two populations, then the data should not be combined with the existing background data until further review determines the cause of the difference. If the differences appear to be caused by a release, then the previous background dataset should continue to be used. Absent evidence of a release, the new dataset should be considered more representative of present-day groundwater conditions and used for background. Note that the *t*-test or Mann-Whitney test is used to compare new data to the existing background dataset for the purposes of updating background. The tests are not used to determine whether an SSI is present or whether a release has occurred.

Periodically, spatial variability among background wells may be re-assessed to determine whether using an interwell or intrawell comparison is appropriate on a constituent-by-constituent basis, as outlined in **Section 3.1**.

SECTION 4

ASSESSMENT MONITORING

A CCR unit must begin assessment monitoring if an SSI is identified and is not attributed to some cause besides a release from the CCR unit. Assessment monitoring must begin within 90 days of identifying the SSI. During this 90-day period, the monitoring well network must be sampled for all Appendix IV constituents [40 CFR 257.95(b)]. Within 90 days of obtaining the results from this sampling event, all of the CCR unit wells must be sampled for all Appendix III constituents and those Appendix IV constituents that were detected during the initial assessment monitoring event [40 CFR 257.95(d)(1)].

After these initial assessment monitoring events, the CCR unit wells must be sampled for all Appendix III constituents and previously detected Appendix IV constituents on a semiannual basis [40 CFR 257.95(d)(1)]. Additionally, the CCR unit wells must be sampled for all Appendix IV constituents on an annual basis [40 CFR 257.95(b)].

As with detection monitoring, if physically independent samples cannot be collected on a semiannual basis, then a reduced monitoring frequency may be warranted. A demonstration must be made documenting the need for – and effectiveness of – a reduced monitoring frequency. This demonstration must be certified by a qualified professional engineer, and monitoring must still be done on at least an annual basis [40 CFR 257.95(c)].

GWPSs must be established for each detected Appendix IV constituent. The GWPS shall be the greater of the background concentration and the MCL established by the USEPA for that constituent. There is no established MCL for cobalt, lead, lithium, and molybdenum. For these constituents, the CCR rules specify a screening level that can be used in place of the MCL. For these constituents, the GWPS shall be the greater of the background concentration and the CCR rule-specified screening level [40 CFR 257.95(h)]. An upper tolerance limit (UTL) with 95% confidence and 95% coverage is often used as the representative background concentration.

A single site-wide GWPS would be recommended for each constituent based on pooled background data, even if natural spatial variability exists. If background data are not pooled, background concentrations and consequently GWPSs would vary from well to well. One difficulty with this approach is that concentrations at one monitoring well may exceed the location-specific GWPS and still be below levels considered as natural background at other locations within the site. The pooled background is often more interpretable and less cumbersome for developing a single background-based GWPS per constituent.

To determine whether a move to corrective action is warranted, a confidence interval constructed on recent data at each compliance monitoring well should be compared to the site-wide GWPS. When the lower confidence limit (LCL) of this interval exceeds the GWPS, an assessment of corrective measures may be justified.

When corrective action is not warranted, to return from assessment monitoring to detection monitoring, the CCR rules specify that all Appendix III and IV constituents must be at or below background levels for two consecutive sampling events [40 CFR 257.95(e)]. Procedures for comparing results to background are described in **Section 4.2**.

4.1 Comparing Data to the GWPS

As stated in **Section 4**, the GWPS is set at the MCL (or CCR rule-specified screening level for cobalt, lead, lithium, and molybdenum) or a value based on background data, whichever is greater. The UTL calculated from the background dataset is often used as the background value.

Tolerance intervals are similar to prediction intervals. However, whereas prediction intervals represent a range where a future result is expected to lie, tolerance intervals represent a range where a proportion of the population is expected to lie. Tolerance intervals have both an associated coverage (i.e., the proportion of the population covered by the tolerance interval) and an associated confidence. A coverage of 95% ($\gamma = 0.95$) and a confidence of 95% ($\alpha = 0.05$) are typically used.

The UTL is calculated similarly to the UPL:

$$\text{UTL} = \bar{x} + \tau s \quad (7)$$

Similar to the UPL calculation, $\bar{x}$ is the mean concentration and s is the standard deviation of the background dataset. However, in this case the multiplier τ is different from that of the UPL calculation and is a function of the chosen coverage and confidence and the size of the background dataset. Values of τ are tabulated in Table 17-3 in Appendix D of the Unified Guidance (USEPA, 2009). As with prediction limits, if the τ value that precisely matches site conditions does not appear in these tables, it can be estimated using the provided values by linear interpolation.

Once a GWPS is established, new data must be evaluated to determine whether they are statistically significantly higher than the GWPS. The statistical analyses listed in 40 CFR 257.93(f) are appropriate for comparing new data to a background dataset but are not appropriate for comparing new data to a fixed standard. For these cases, the Unified Guidance recommends using confidence intervals around the mean or median (USEPA, 2009).

Evaluations should be done for each detected Appendix IV constituent at each well. Data from different wells should not be pooled. When selecting which data to include in the recent dataset, time series plots of concentration data at each well should be created and visually inspected. Only data that exhibit the same behavior as recent data should be included. For instance, if the last eight arsenic results cluster around 9 µg/L and the previous eight results cluster around 4 µg/L, then only the eight most recent results should be used in the statistical analysis. Similarly, if chromium concentrations steadily increased over the last ten samples and were stable previously, then the statistical analysis should only use the ten most recent results and (since they are steadily increasing) should involve constructing a confidence interval around a trend line.

At the same time, datasets should also be sufficiently large to maintain statistical power. As many data points that exhibit the same behavior as recent data as possible should be included, including data collected prior to assessment monitoring (e.g., during the initial eight monitoring events). Ideally, datasets should have at least eight data points; in no case should a dataset have fewer than four data points.

If at least 50% of the recent dataset is non-detect, then a parametric confidence interval should not be used, and the procedure in **Section 4.1.1** should be followed.

New data will be evaluated for statistically significant temporal trends using (1) OLS linear regression with a *t*-test ($\alpha = 0.01$) on the slope and/or (2) the non-parametric Theil-Sen slope estimator with Mann-Kendall trend test ($\alpha = 0.05$, or 0.01 for larger datasets). Non-detect data are replaced with half the RL for these analyses. The OLS linear regression or Theil-Sen slope estimator will be used to estimate the rate of change (increasing, no change, or decreasing) over time for each constituent at each well. The *t*-test or Mann-Kendall statistic will be used to determine whether a trend is statistically significant. OLS linear regression should only be used when at most 15% of the data are non-detect, when regression residuals are normally distributed, and when the variance from the regression line does not change over time. The Theil-Sen/Mann-Kendall analysis requires at least five observations for meaningful results; at least eight observations are recommended. If a significant temporal trend exists, then a confidence interval around the trend line should be constructed as outlined in **Section 4.1.3**.

If the trend analysis does not indicate a statistically significant trend, then the mean and variance should be calculated. If fewer than 15% of the data are non-detect, then the non-detect data can be replaced with half the RL and the mean and variance can be calculated normally. Tolerance intervals are sensitive to the choice of population distribution. Normality should be confirmed using the Shapiro-Wilk (or Shapiro-Francía) test and/or probability plots, as described in **Section 2.2**. If data appear not to be normally distributed, data should be transformed so that the transformed data are normally distributed.

Two methods – the Kaplan-Meier or Robust ROS method – can be used to determine the sample mean and variance when 15% to 50% of the data are non-detect. Kaplan-Meier should not be used if all non-detect data have the same RL or if the maximum detected value is less than the highest RL of the non-detect data.

When most of the data are detections, data are normally distributed, and there is no significant temporal trend, the LCL is calculated according to the following equation:

$$\mathrm{LCL} = \bar{x} - t_{1-\alpha,n-1} * \frac{s}{\sqrt{n}} \quad (8)$$

where:

$\bar{x} =$	mean concentration of the recent dataset
$t_{1-\alpha,n-1} =$	one-tailed t-value at a confidence of $1 - \alpha$ and at $n - 1$ degrees of freedom
$s =$	standard deviation of the recent dataset
$n =$	number of samples in the recent dataset

The *t* value must be chosen in such a way to balance the competing goals of a low false-positive rate and a high statistical power. The Unified Guidance recommends that the statistical test have at least 80% power ($1 - \beta = 0.8$) when the underlying mean concentration is twice the MCL (USEPA, 2009). Values of the minimum α (from which *t* values can be determined) are tabulated for this criterion for various values of *n* in Table 22-2 in Appendix D of the Unified Guidance (USEPA, 2009). The selected α should be the maximum of the value in Table 22-2 and 0.01.

If data are transformed normal, the LCL should first be calculated for the transformed data and then be transformed back into concentration terms. Correction factors are available but are not expected to be required. Alternatively, a non-parametric LCL can be used, as described in **Section 4.1.2**.

If data are non-normal and cannot be transformed such that the transformed data do follow a normal distribution, then a non-parametric LCL should be used, as described in **Section 4.1.2**.

If the LCL exceeds the GWPS, then a statistically significant exceedance can be concluded. If this occurs, the owner/operator is required to take several actions, including potentially moving the facility to corrective action, as described in **Section 4.3**.

4.1.1 Most Data Are Non-Detect

If background data are mostly non-detect, non-parametric tolerance intervals should be used. In these cases, the UTL is set at either the highest or second-highest concentration observed in the background dataset. If all background data are non-detect, then the UTL would default to the RL. The highest or second-highest observed concentration (or RL) effectively becomes the GWPS when this value is greater than the MCL (or CCR rule-specified screening level for cobalt, lead, lithium, and molybdenum). However, if most background data are non-detect, then detected concentrations are likely less than the MCL (or CCR rule-specified screening level), and the GWPS will be set at the MCL (or CCR rule-specified screening level).

If recent data are mostly non-detect, non-parametric confidence intervals can be constructed around the median by ranking the data from least to greatest and setting the LCL equal to one of the lower values of data. The confidence can be calculated based on the rank of the data point used and the sample size. Confidence values are tabulated in Table 21-11 in Appendix D of the Unified Guidance for sample sizes up to 20 (USEPA, 2009).

However, if most of the recent data are non-detect, then the data point selected for the LCL will also be non-detect. If the RL is less than the GWPS, then no statistically significant exceedance has occurred.

GWPSs should only be determined for detected Appendix IV constituents [40 CFR 257.95(d)(2)]. If all the data for a constituent are non-detect, no statistical evaluation need be performed.

4.1.2 Data Are neither Normal nor Transformed-Normal

If background data are non-normal and cannot be transformed such that the transformed data do follow a normal distribution, then non-parametric tolerance intervals should be used. In these cases, the UTL is set at either the highest or second-highest concentration observed in the background dataset.

If recent data are non-normal and cannot be transformed such that the transformed data do follow a normal distribution, non-parametric confidence intervals can be constructed around the median by ranking the data from least to greatest and setting the LCL equal to one of the lower values of data. The confidence can be calculated based on the rank of the data point used and the sample size. Confidence values are tabulated in Table 21-11 in Appendix D of the Unified Guidance for sample sizes up to 20 (USEPA, 2009).

4.1.3 A Significant Temporal Trend Exists

If recent data show a significant temporal trend, then an LCL below the trend line can be calculated according to the following equation:

$$\mathrm{LCL} = \widehat{x_0} - \sqrt{2s_e^2 * F_{1-2\alpha,2,n-2} * \left(\frac{1}{n} + \frac{(t_0 - \bar{t})^2}{(n-1)s_t^2}\right)} \quad (9)$$

where:

$\widehat{x_0} =$	regression-line estimate of the mean concentration at time t_0
$s_e =$	standard error of the regression line
$F_{1-2\alpha,2,n-2} =$	upper (1 - 2α)th percentage point from an *F*-distribution with 2 and n – 2 degrees of freedom
$n =$	number of samples in the recent dataset
$t_0 =$	date of the most recent groundwater sample
$\bar{t} =$	mean of the sampling dates in the recent dataset
$s_t =$	standard deviation of the sampling dates in the recent dataset

Note that the LCL is a function of time; to assess current compliance, the date of the most recent sample should be used for t_0. If and only if the LCL is greater than the GWPS at this time, then a statistically significant exceedance can be concluded. This equation can also be used to assess when the LCL will exceed the GWPS (assuming the current trend continues).

The same α that would have been selected if there were no significant trend (as described in **Section 4.1**) should be used here to determine the proper *F* value.

If the Theil-Sen method is used to determine the trend line, a computationally intensive technique known as bootstrapping can be used to determine the LCL. This procedure is described in Section 21.3.2 of the Unified Guidance (USEPA, 2009).

4.1.4 A Significant Seasonal Pattern Exists

If a statistically significant seasonal pattern exists in the background data and if there is a physical explanation for the seasonality, the background data should be deseasonalized using the procedure described in **Section 2.6**. The background-based UTL should be calculated based on the deseasonalized data, and the GWPS should be set at the MCL (or CCR rule-specified screening level) or the background-based UTL, whichever is greater.

Similarly, if a statistically significant seasonal pattern exists in compliance well data and if there is a physical explanation for the seasonality, the compliance well data should be deseasonalized using the procedure described in **Section 2.6**. The LCL to be compared to the GWPS should be calculated based on the deseasonalized compliance well data.

4.2 Comparing Data to Background

Assessment monitoring data must be compared to the GWPS (the higher of the MCL, CCR rule-specified level, or background level) to assess whether corrective action is warranted at the CCR unit (i.e. the LCL exceeds the GWPS). Additionally, assessment monitoring data may be compared to background data to assess whether the CCR unit can move from assessment monitoring back to detection monitoring.

To return from assessment monitoring to detection monitoring, the CCR rules specify that all Appendix III and IV constituents must be at or below background levels for two consecutive sampling events [40 CFR 257.95(e)]. However, the analysis of all Appendix III and IV constituents is not required for every monitoring event. Therefore, all Appendix III and IV constituents should be collected during two consecutive sampling events on a periodic basis (e.g., every two to four years) and/or when statistical evaluation of assessment monitoring data suggests groundwater concentrations are at or below background levels.

A UTL can be used to represent "a reasonable maximum on likely background concentrations" for Appendix III and IV constituents (USEPA, 2009). As described previously, UTLs can be determined parametrically or non-parametrically. For the parametric intervals, the UTL is calculated according to Equation 7. Non-parametric UTLs can be determined by setting the UTL to the highest or second-highest measured background value. If all background data are non-detect, then non-detect results in compliance wells can be considered statistically similar to background. If a temporal trend in background data exists and is not attributable to a release, background data can be truncated so that no significant temporal trend is evident.

To determine whether Appendix III and IV constituents are at or below background levels, a confidence interval constructed on recent data at each compliance monitoring well should be compared to the background UTL for each constituent. When the upper confidence limit (UCL) is below the background UTL, then it can be concluded that concentrations are at or below background. If UCLs are less than background UTLs for every constituent at every monitoring well for two consecutive events, then the CCR unit may return to detection monitoring.

When most of the data are detections, data are normally distributed, and there is no significant temporal trend, the UCL is calculated according to the following equation:

$$\text{UCL} = \bar{x} + t_{1-\alpha,n-1} * \frac{s}{\sqrt{n}} \quad (10)$$

where:

$\bar{x} =$ mean concentration of the recent dataset
$t_{1-\alpha,n-1} =$ one-tailed *t*-value at a confidence of $1 - \alpha$ and at $n - 1$ degrees of freedom
$s =$ standard deviation of the recent dataset
$n =$ number of samples in the recent dataset

If recent data are mostly non-detect or are non-normal and cannot be transformed such that the transformed data follow a normal distribution, non-parametric confidence intervals can be constructed around the median by ranking the data from least to greatest and setting the UCL equal to one of the higher values of data. The confidence can be calculated based on the rank of the data point used and the sample size. Confidence values are tabulated in Table 21-11 in Appendix D of the Unified Guidance for sample sizes up to 20 (USEPA, 2009).

If recent data show a significant temporal trend, then a UCL above the trend line can be calculated according to the following equation:

$$\text{UCL} = \widehat{x_0} + \sqrt{2s_e^2 * F_{1-2\alpha,2,n-2} * \left(\frac{1}{n} + \frac{(t_0 - \bar{t})^2}{(n-1)s_t^2}\right)} \quad (11)$$

where:

$\widehat{x_0}$ = regression-line estimate of the mean concentration at time t_0
s_e = standard error of the regression line
$F_{1-2\alpha,2,n-2}$ = upper (1 - 2α)th percentage point from an F-distribution with 2 and n – 2 degrees of freedom
n = number of samples in the recent dataset
t_0 = date of the most recent groundwater sample
$\bar{t}$ = mean of the sampling dates in the recent dataset
s_t = standard deviation of the sampling dates in the recent dataset

In all cases, the choice of τ and α (for parametric UTLs and UCLs, respectively), the choice of the highest or second-highest data point (for non-parametric UTLs and UCLs), etc. should be made based on sound statistical judgment and site characteristics (e.g., size of datasets, number of monitoring wells, etc.).

4.3 Required Responses to the Results of the Statistical Evaluation

If the statistical evaluation demonstrates that the concentrations of all Appendix III and Appendix IV constituents are at or below background levels for two consecutive sampling events, then the CCR unit may return to detection monitoring [40 CFR 257.95(e)]. A notification that the CCR unit is returning to detection monitoring must be placed in the facility's operating record.

If the statistical evaluation demonstrates that some Appendix III or Appendix IV constituents are at concentrations above background levels but there are no statistically significant exceedances of GWPSs, then the CCR unit must remain in assessment monitoring [40 CFR 257.95(f)].

If the statistical evaluation demonstrates that an Appendix IV constituent is present at a statistically significant level (SSL) above its GWPS (i.e., if the LCL exceeds the GWPS), then the owner/operator must:

- Include a notification in the facility's operating record that identifies the constituents exceeding GWPSs [40 CFR 257.95(g)];

- Characterize the nature and extent of the release, including installing monitoring wells needed to delineate the plume, installing a monitoring well at the downgradient property boundary, quantifying the nature and the amount of the release, and sampling all wells for Appendix III and detected Appendix IV constituents [40 CFR 257.95(g)(1)];

- If the plume has migrated off-site, notify property owners overlying the plume [40 CFR 257.95(g)(2)]; and

- Either begin an assessment of corrective measures or demonstrate that the SSL is not due to a release from the CCR unit within 90 days of completing the statistical evaluation [40 CFR 257.95(g)(3)]. This demonstration must be made in writing and certified by a qualified professional engineer. The CCR rules require the previous three actions to be taken even if it can be demonstrated that the SSL is not due to a release from the CCR unit.

Reporting requirements for assessment monitoring are summarized in **Section 6.2**.

4.4 Updating Background

Care should be taken when updating background during assessment monitoring since, by definition, an SSI over background has already occurred. Data that appear to be affected by a release from the CCR unit should not be included in updated background datasets. However, it may be possible to update some background datasets (e.g., constituents not associated with a release, wells upgradient of the CCR unit, etc.). Formal updating of Appendix III constituents may be considered when there are at least four new points.

Data should be reviewed every four to eight measurements to assess the possibility of updating background datasets. Professional judgment should first be applied; any data that appear to be affected by a release should be excluded from the background update, even if there is no statistically significant difference between the new data and the existing background data.

For data that appear not to be affected by a release, a Student's *t*-test or Mann-Whitney test should be conducted to compare the set of new data points against the existing background dataset. If the *t*-test or Mann-Whitney test corroborates that there are no significant differences, the new data should be combined with the existing background data to create an updated and expanded background dataset. Increasing the size of the background dataset will increase the power of subsequent statistical tests.

If the *t*-test or Mann-Whitney test indicates a statistically significant difference between the two datasets, then it should be considered that the difference results from a release and the existing background dataset should continue to be used. If and only if there is evidence to suggest that the difference is not related to a release from the CCR unit, then the newer set of measurements should be used for background so that resulting statistical limits are representative of present-day groundwater quality conditions.

Periodically, spatial variability among background wells may be re-assessed to determine whether using an interwell or intrawell comparison is appropriate on a constituent-by-constituent basis, as outlined in **Section 3.1**.

SECTION 5

CORRECTIVE ACTION MONITORING

A CCR unit must begin an assessment of corrective measures if an SSL is identified and is not attributed to some cause other than a release from the CCR unit. The assessment of corrective measures must begin within 90 days of identifying the SSL [40 CFR 257.95(g)(3)]. Based on the results of the corrective measures assessment, a remedy must be selected as soon as feasible [40 CFR 257.97(a)]. A schedule for implementing and completing the remedial activities must be included in the remedy selection [40 CFR 257.97(d)]. The owner/operator must begin remedial activities within 90 days of selecting a remedy, and a corrective action groundwater monitoring program must be implemented based on the schedule established as part of the remedy selection [40 CFR 257.98(a)].

The corrective action monitoring program must:

- Meet the requirements of an assessment monitoring program [40 CFR 257.98(a)(1)(i)];
- Document the effectiveness of the remedy [40 CFR 257.98(a)(1)(ii)]; and
- Demonstrate compliance with the GWPS [40 CFR 257.98(a)(1)(iii)].

The statistical methods used in corrective action monitoring are similar to those used in assessment monitoring. For each detected Appendix IV constituent, a GWPS is set at the MCL (or CCR rule-specified screening level for cobalt, lead, lithium, and molybdenum) or a value based on background data, whichever is greater. A confidence interval is constructed based on recent data at each compliance well, and the confidence interval is compared to the site-wide GWPS. However, in assessment monitoring, the presumption is that a release has not occurred, and a release is concluded when average concentrations are higher than the GWPS (i.e., when the *lower* confidence limit [LCL] is *greater* than the GWPS). If a CCR unit is in corrective action monitoring, then evidence of a release has already been identified. Therefore, in corrective action monitoring, the presumption is that a release has occurred, and the conclusion that the remedy has successfully decreased concentrations below the GWPS is made when average concentrations are less than the GWPS (i.e., when the *upper* confidence limit [UCL] is *less* than the GWPS). (Note that this presumption only applies to well-constituent pairs where an SSL has previously been identified. Well-constituent pairs in assessment monitoring where an SSL has not been identified effectively remain in assessment monitoring until the entire unit returns to detection monitoring.)

A remedy is considered complete when, among other things, confidence intervals constructed for Appendix IV constituents for wells identified with SSLs have not exceeded the GWPS for three consecutive years [40 CFR 257.98(c)(2)]. In this instance, a return to assessment monitoring would be warranted.

Upon completion of the remedy, the owner/operator must prepare a notification stating that the remedy is complete. The notification must be certified by a qualified professional engineer or approved by the State Director or USEPA and placed in the operating record [40 CFR 257.98(e)]. Otherwise, the owner/operator should follow the reporting requirements for assessment monitoring, as summarized in **Section 6.2**.

5.1 Comparing Data to the GWPS

As stated in **Section 5**, the GWPS is set at the MCL (or CCR rule-specified screening level for cobalt, lead, lithium, and molybdenum) or a value based on background data, whichever is greater. The UTL calculated from the background dataset is often used as the background value. The UTL is calculated as described in **Section 4.1**. Methods for updating background are described in **Section 4.4**.

For well-constituent pairs in corrective action monitoring, new data must be evaluated to determine whether they are statistically significantly lower than the GWPS. The statistical analyses listed in 40 CFR 257.93(f) are appropriate for comparing new data to a background dataset but are not appropriate for comparing new data to a fixed standard. For these cases, the Unified Guidance recommends using confidence intervals around the mean or median (USEPA, 2009).

When selecting which data to include in the recent dataset, time series plots of concentration data at each well should be created and visually inspected. Only data that exhibit the same behavior as recent data should be included. For instance, if the last eight arsenic results cluster around 9 µg/L and the previous eight results cluster around 4 µg/L, then only the eight most recent results should be used in the statistical analysis. Similarly, if chromium concentrations steadily increased over the last ten samples and were stable previously, then the statistical analysis should only use the ten most recent results and (since they are steadily increasing) should involve constructing a confidence interval around a trend line.

At the same time, datasets should also be sufficiently large to maintain statistical power. As many data points that exhibit the same behavior as recent data as possible should be included, including data collected prior to assessment monitoring (e.g., during the initial eight monitoring events). Ideally, datasets should have at least eight data points; in no case should a dataset have fewer than four data points.

If at least 50% of the recent dataset is non-detect, then a parametric confidence interval should not be used, and the procedure in **Section 5.1.1** should be followed.

New data will be evaluated for statistically significant temporal trends using (1) OLS linear regression with a *t*-test ($\alpha = 0.01$) on the slope and/or (2) the non-parametric Theil-Sen slope estimator with Mann-Kendall trend test ($\alpha = 0.05$, or 0.01 for larger datasets). Non-detect data are replaced with half the RL for these analyses. The OLS linear regression or Theil-Sen slope estimator will be used to estimate the rate of change (increasing, no change, or decreasing) over time for each constituent at each well. The *t*-test or Mann-Kendall statistic will be used to determine whether a trend is statistically significant. OLS linear regression should only be used when at most 15% of the data are non-detect, when regression residuals are normally distributed, and when the variance from the regression line does not change over time. The Theil-Sen/Mann-Kendall analysis requires at least five observations for meaningful results; at least eight observations are recommended. If a significant temporal trend exists, then a confidence interval around the trend line should be constructed as outlined in **Section 5.1.3**.

If the trend analysis does not indicate a statistically significant trend, then the mean and variance should be calculated. If fewer than 15% of the data are non-detect, then the non-detect data can be replaced with half the RL and the mean and variance can be calculated normally. Tolerance intervals are sensitive to the choice of population distribution. Normality should be confirmed using the Shapiro-Wilk (or Shapiro-Francía) test and/or probability plots, as described in **Section 2.2**. If data appear not to be normally distributed, data should be transformed so that the transformed data are normally distributed.

Two methods – the Kaplan-Meier or Robust ROS method – can be used to determine the sample mean and variance when 15% to 50% of the data are non-detect. Kaplan-Meier should not be used if all non-detect data have the same RL or if the maximum detected value is less than the highest RL of the non-detect data.

When most of the data are detections, data are normally distributed, and there is no significant temporal trend, the UCL is calculated according to the following equation:

$$\mathrm{UCL} = \bar{x} + t_{1-\alpha,n-1} * \frac{s}{\sqrt{n}} \quad (10)$$

where:

$\bar{x} =$	mean concentration of the recent dataset
$t_{1-\alpha,n-1} =$	one-tailed *t*-value at a confidence of 1 – α and at n – 1 degrees of freedom
$s =$	standard deviation of the recent dataset
$n =$	number of samples in the recent dataset

The *t* value must be chosen in such a way to balance the competing goals of a low false-positive rate and a high statistical power. The Unified Guidance recommends that the statistical test have at least 80% power ($1 - \beta = 0.8$) when the underlying mean concentration is twice the MCL (USEPA, 2009). Values of the minimum α (from which *t* values can be determined) are tabulated for this criterion for various values of *n* in Table 22-2 in Appendix D of the Unified Guidance (USEPA, 2009). The selected α should be the maximum of the value in Table 22-2 and 0.01.

If data are transformed normal, the UCL should first be calculated for the transformed data and then be transformed back into concentration terms. Correction factors are available but are not expected to be required. Alternatively, a non-parametric LCL can be used, as described in **Section 5.1.2**.

If data are non-normal and cannot be transformed such that the transformed data do follow a normal distribution, then a non-parametric LCL should be used, as described in **Section 5.1.2**.

5.1.1 Most Data Are Non-Detect

If recent data are mostly non-detect, non-parametric confidence intervals can be constructed around the median by ranking the data from least to greatest and setting the UCL equal to one of the higher values of data. The confidence can be calculated based on the rank of the data point used and the sample size. Confidence values are tabulated in Table 21-11 in Appendix D of the Unified Guidance for sample sizes up to 20 (USEPA, 2009).

5.1.2 Data Are neither Normal nor Transformed-Normal

If recent data are non-normal and cannot be transformed such that the transformed data do follow a normal distribution, non-parametric confidence intervals can be constructed around the median by ranking the data from least to greatest and setting the UCL equal to one of the higher values of data. The confidence can be calculated based on the rank of the data point used and the sample size. Confidence values are tabulated in Table 21-11 in Appendix D of the Unified Guidance for sample sizes up to 20 (USEPA, 2009).

5.1.3 A Significant Temporal Trend Exists

If recent data show a significant temporal trend, then a UCL above the trend line can be calculated according to the following equation:

$$\mathrm{UCL} = \widehat{x_0} + \sqrt{2s_e^2 * F_{1-2\alpha,2,n-2} * \left(\frac{1}{n} + \frac{(t_0 - \bar{t})^2}{(n-1)s_t^2}\right)} \quad (11)$$

where:

$\widehat{x_0} =$ regression-line estimate of the mean concentration at time t_0
$s_e =$ standard error of the regression line
$F_{1-2\alpha,2,n-2} =$ upper (1 - 2α)th percentage point from an *F*-distribution with 2 and *n* – 2 degrees of freedom
$n =$ number of samples in the recent dataset
$t_0 =$ date of the most recent groundwater sample
$\bar{t} =$ mean of the sampling dates in the recent dataset
$s_t =$ standard deviation of the sampling dates in the recent dataset

Note that the UCL is a function of time; to assess current compliance, the date of the most recent sample should be used for t_0. If and only if the UCL is less than the GWPS at this time, then it can be concluded that the remedy has successfully decreased concentrations below the GWPS. This equation can also be used to assess when the UCL will decrease below the GWPS (assuming the current trend continues).

The same α that would have been selected if there were no significant trend (as described in **Section 5.1**) should be used here to determine the proper *F* value.

If the Theil-Sen method is used to determine the trend line, a computationally intensive technique known as bootstrapping can be used to determine the UCL. This procedure is described in Section 21.3.2 of the Unified Guidance (USEPA, 2009).

5.1.4 A Significant Seasonal Pattern Exists

If a statistically significant seasonal pattern exists in compliance well data and if there is a physical explanation for the seasonality, the compliance well data should be deseasonalized using the procedure described in **Section 2.6**. The UCL to be compared to the GWPS should be calculated based on the deseasonalized compliance well data.

SECTION 6

REPORTING REQUIREMENTS

The CCR rule specifies reporting requirements throughout the monitoring process. Throughout the process, the required documentation is required to be posted both to the site's operating record and to a public internet set for review. As required by 40 CFR 257.93(f)(6), the chosen statistical methods described within this SAP are certified by a qualified professional engineer as appropriate for groundwater evaluation (**Section 7**).

By January 31 of each year, all existing facilities must submit an Annual Groundwater Monitoring and Corrective Action Report (Annual Report) [40 CFR 257.90(e)]. The Annual Report should be prepared and posted to both the site operating record and the public internet site. A notification should be sent to the State Director (and/or appropriate tribal authority) once the Annual Report is available.

The Annual Report should document site status, summarize key actions taken, describe problems encountered and their resolutions, and project key actions to be taken for the following year. The Annual Report should also include:

- A figure showing the CCR unit and the monitoring well network [40 CFR 257.90(e)(1)];
- An identification of monitoring wells installed or abandoned during the preceding year and the rationale for doing so [40 CFR 257.90(e)(2)];
- A summary of groundwater samples collected, which wells were sampled, what dates the samples were collected, and whether the samples were collected for detection monitoring, assessment monitoring, or corrective action monitoring [40 CFR 257.90(e)(3)]; and
- A discussion of any transition between monitoring programs (i.e., detection monitoring vs. assessment monitoring vs. corrective action monitoring) [40 CFR 257.90(e)(4)].

If appropriate, the Annual Report should detail a demonstration for an alternative groundwater sampling frequency. If no SSIs are identified during each sampling event, an updated Annual Report should be submitted yearly. If SSIs are identified, additional reporting requirements are summarized below.

6.1 Detection Monitoring

If SSIs are identified, the facility should demonstrate within 90 days of the detection, where possible, that SSIs over background are not due to a release from the facility, along with a certification by a qualified professional engineer that the information is accurate. If the SSIs over background are attributed to a release from the facility, the facility should prepare and place on the operating record within 90 days a notification stating that an assessment monitoring program has been established [40 CFR 257.94(e)(3)].

6.2 Assessment Monitoring

If an assessment monitoring program is in place, the Annual Report must also include [40 CFR 257.95(d)(3)]:

- Analytical results for Appendix III and detected Appendix IV constituents,
- Background concentrations for all Appendix III and Appendix IV constituents, and
- GWPSs established for detected Appendix IV constituents.

The semiannual analytical results for Appendix III and detected Appendix IV constituents must also be posted to the facility's operating record within 90 days of receipt [40 CFR 257.95(d)(1)].

If a constituent is detected at an SSL above its GWPS, a notification must be reported to the site's operating record. Additionally, the facility must notify any person who owns or resides on land that directly overlies any part of an off-site contaminant plume and record the notifications in the facility's operating record. Within 90 days, the facility must either initiate an assessment of corrective measures or demonstrate that the SSL is not due to a release from the CCR unit. The demonstration must be supported by a report certified by a qualified professional engineer [40 CFR 257.95(g)].

If statistics are performed by mid-October 2017 for the first compliance event, one or more resamples would normally be collected and re-analyzed within 90 days. By the end of January 2018, the initial exceedance will be either confirmed or determined to be a false positive. If it is confirmed, then assessment monitoring must be initiated within 90 days, which would fall at the same time as the next regular semi-annual event. In that case, the semi-annual event (March/April timeframe) would be for both assessment and detection monitoring (if assessment monitoring was initiated).

If the facility determines it may return to detection monitoring, the facility should issue a notification to the operating record and public site within 30 days.

6.3 Corrective Action Monitoring

If a corrective action monitoring program is in place, it must meet the requirements of an assessment monitoring program [40 CFR 257.98(a)(1)(i)]. Thus, the reporting requirements for corrective action monitoring will be similar to assessment monitoring, as described in **Section 6.2**. Upon completion of the remedy, the facility must prepare a notification that the remedy has been completed. The notification must be certified by a qualified professional engineer or approved by the State Director or USEPA and placed in the operating record [40 CFR 257.98(e)]

SECTION 7

CERTIFICATION BY QUALIFIED PROFESSIONAL ENGINEER

By means of this certification, I certify that I am a qualified professional engineer as defined in 40 CFR 257.53, that I have reviewed this SAP, and that the statistical methods described therein are appropriate and meet the requirements of 40 CFR 257.93.

DAVID ANTHONY MILLER

Printed Name of Qualified Professional Engineer

DAVID ANTHONY MILLER
REGISTERED
22663
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

David Anthony Miller

Signature

22663	WEST VIRGINIA	01.22.2021
Registration No.	Registration State	Date

SECTION 8

REFERENCES

American Electric Power. 2016. Draft Groundwater Sampling and Analysis Plan. April 1, 2016.

Criteria for Classification of Solid Waste Disposal Facilities and Practices. 40 CFR §257. (2016).

Electric Power Research Institute. 2015. Groundwater Monitoring Guidance for the Coal Combustion Residuals Rule. Palo Alto, CA. 3002006287.

Environmental Protection Agency. 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities: Unified Guidance. EPA 530/R-09-007.

Table 1

Monitored Constituents Under the CCR Rules

Appendix III to 40 CFR 257 – Constituents for Detection Monitoring

Boron
Calcium
Chloride
Fluoride
pH
Sulfate
Total Dissolved Solids (TDS)

Appendix IV to 40 CFR 257 – Constituents for Assessment Monitoring

Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Fluoride
Lead
Lithium
Mercury
Molybdenum
Selenium
Thallium
Radium 226 and 228 combined

APPENDIX A

RECORD OF REVISIONS

Revision 1 (January 2021)

- Added statistical procedures used to implement corrective action monitoring (Section 5) and reporting requirements for corrective action monitoring (Section 6.3).
- Added references to CCR rule-specified screening levels for constituents that do not have an MCL (i.e., cobalt, lead, lithium, and molybdenum) in Sections 2.5, 4, 4.1, and 5.1.
- Removed text from Section 4 regarding a potential assessment monitoring approach for constituents that do not have an MCL because the CCR rule was revised to specify screening levels for these constituents.
- Added statistical procedures used to evaluate whether a seasonal pattern exists and to deseasonalize data (Sections 2.6, 3.2.5, 4.1.4, and 5.1.4).
- Specified that the Mann-Kendall trend test can use an α of 0.01 for sufficiently large datasets (Sections 3.1, 4.1, and 5.1).
- Removed references to control limits in Section 3.2 because prediction limits are generally being used to conduct detection monitoring.
- Removed references to using trend tests to evaluate SSIs at the end of Section 3.2 because prediction limits are generally being used to conduct detection monitoring.
- Clarified that non-parametric limits should be used when data are non-normal and cannot be transformed such that the transformed data do follow a normal distribution (Sections 3.2.3, 4.1.2, and 5.1.2).
- Referred to the Wilcoxon rank-sum/Mann-Whitney test as the Mann-Whitney test to match the statistical output from Sanitas (Sections 3.4 and 4.4).
- Clarified that a background dataset that contains at least five data points is sufficiently large to use an α as low as 0.01 to conduct the Mann-Whitney test as part of a background update, in line with recommendations in the Unified Guidance (Section 3.4).
- Clarified the procedure to be used if the Mann-Whitney test indicates a statistically significant difference between existing background data and newer data (Sections 3.4 and 4.4).

- Clarified that spatial variability among background wells may be assessed periodically as part of a background update because spatial variability is evaluated when background values are initially established (Sections 3.4 and 4.4).

- Clarified that UPLs are used to establish background values for Appendix III constituents and UTLs are used to establish background values for Appendix IV constituents (Section 4.2).

- Added statistical procedures to determine when Appendix III and Appendix IV concentrations are at or below background to evaluate whether units in assessment monitoring may return to detection monitoring (Section 4.2).

- Generally replaced "parameter" with "constituent".

- Added references to the Unified Guidance and the CCR rule throughout the document.

- Made minor grammatical and stylistic changes throughout the document.

STATISTICAL ANALYSIS SUMMARY
BOTTOM ASH POND
Amos Plant
Winfield, West Virginia

Submitted to

AMERICAN ELECTRIC POWER

1 Riverside Plaza
Columbus, Ohio 43215-2372

Submitted by

Geosyntec consultants

engineers | scientists | innovators

941 Chatham Lane
Suite 103
Columbus, Ohio 43221

February 26, 2021

CHA8500

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LIST OF ACRONYMS AND ABBREVIATIONS

AEP	American Electric Power
BAP	Bottom Ash Pond
CCR	Coal Combustion Residuals
CCV	Continuing Calibration Verification
CFR	Code of Federal Regulations
GWPS	Groundwater Protection Standard
LCL	Lower Confidence Limit
LFB	Laboratory Fortified Blanks
LPL	Lower Prediction Limit
LRB	Laboratory Reagent Blanks
MCL	Maximum Contaminant Level
NELAP	National Environmental Laboratory Accreditation Program
QA	Quality Assurance
QC	Quality Control
SSI	Statistically Significant Increase
SSL	Statistically Significant Level
SU	Standard Units
TDS	Total Dissolved Solids
UPL	Upper Prediction Limit
USEPA	United States Environmental Protection Agency
UTL	Upper Tolerance Limit

SECTION 1

EXECUTIVE SUMMARY

In accordance with the United States Environmental Protection Agency's (USEPA's) regulations regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments (40 CFR 257.90-257.98, "CCR rule"), groundwater monitoring has been conducted at the Bottom Ash Pond (BAP), an existing CCR unit at the Amos Power Plant located in Winfield, West Virginia.

Based on detection monitoring conducted in 2017 and 2018, statistically significant increases (SSIs) over background were concluded for calcium, chloride, total dissolved solids (TDS), and sulfate at the BAP. An alternative source was not identified following the detection monitoring events, so the BAP has been in assessment monitoring since 2018. During the most recent assessment monitoring event, completed in July 2020, no statistically significant levels (SSLs) were identified during this event and the unit remained in assessment monitoring (Geosyntec, 2020). One assessment monitoring event was conducted at the BAP in October 2020, in accordance with 40 CFR 257.95. The statistical summary of the results of the October 2020 sampling event is 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. Groundwater protection standards (GWPSs) were re-established for the Appendix IV parameters. Confidence intervals were calculated for Appendix IV parameters at the compliance wells to assess whether any were present at concentrations above the GWPSs. No statistically significant levels (SSLs) were identified; however, concentrations of Appendix III parameters remained above background. Thus, the unit will remain in assessment monitoring. Certification of the selected statistical methods by a qualified professional engineer is documented in Attachment A.

SECTION 2

BOTTOM ASH POND EVALUATION

2.1 Data Validation & QA/QC

During the assessment monitoring program, one set of samples was collected for analysis from each upgradient and downgradient well to meet the requirements of 40 CFR 257.95(d)(1) (October 2020). Samples from the October 2020 sample event were analyzed for all Appendix III and all Appendix IV parameters except mercury, which was not detected in the 40 CFR 257.95(b) screening event completed in February 2020. A summary of data collected during this assessment monitoring event may be found in Table 1.

Chemical analysis was completed by an analytical laboratory certified by the National Environmental Laboratory Accreditation Program (NELAP). Quality assurance and quality control (QA/QC) samples completed by the analytical laboratory included the use of laboratory reagent blanks (LRBs), continuing calibration verification (CCV) samples, and laboratory fortified blanks (LFBs).

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.9.6.27 statistics software. The export file was checked against the analytical data for transcription errors and completeness. No QA/QC issues were noted which would impact data usability.

2.2 Statistical Analysis

Statistical analyses for the BAP were conducted in accordance with the October 2020 *Statistical Analysis Plan* (AEP, 2020). Time series plots and results for all completed statistical tests are provided in Attachment B.

The data obtained in October 2020 were screened for potential outliers; however, no outliers were identified (Attachment B).

2.2.1 Establishment of GWPSs

A GWPS was established for each Appendix IV parameter in accordance with 40 CFR 257.95(h) and the *Statistical Analysis Plan* (AEP, 2020). The established GWPS was determined to be the greater value of the background concentration and the maximum contaminant level (MCL) or risk-based level specified in 40 CFR 257.95(h)(2) for each Appendix IV parameter. To determine background concentrations, an upper tolerance limit (UTL) was calculated using pooled data from the background wells collected during the background monitoring and assessment monitoring events. Parametric tolerance limits were calculated for barium, chromium, combined radium, lead, lithium, and molybdenum. Non-parametric tolerance limits were calculated for antimony, arsenic, beryllium, cadmium, fluoride, selenium, and thallium due to apparent non-normal distributions. A non-parametric tolerance limit was calculated for mercury because greater than 50% of the data was non-detect results. Tolerance limits and the final GWPSs are summarized in Table 2.

2.2.2 Evaluation of Potential Appendix IV SSLs

A confidence interval was constructed for each Appendix IV parameter at each compliance well. Confidence limits were generally calculated parametrically ($\alpha = 0.01$); however, non-parametric confidence limits were calculated in some cases (e.g., when the data did not appear to be normally distributed or when the non-detect frequency was too high). An SSL was concluded if the lower confidence limit (LCL) exceeded the GWPS (i.e., if the entire confidence interval exceeded the GWPS). Calculated confidence limits are shown in Attachment B.

No SSLs were identified at the Amos BAP.

2.2.3 Establishment of Appendix III Prediction Limits

Upper prediction limits (UPL) for Appendix III parameters were previously updated after sufficient data were collected following the background monitoring period (Geosyntec, 2019). Intrawell tests were used to evaluate potential SSIs for fluoride and pH, whereas interwell tests were used to evaluate potential SSIs for boron, calcium, chloride, sulfate, and TDS. Prediction limits were updated using data through May 2020 for intrawell prediction limits and October 2020 for interwell prediction limits.

Mann-Whitney (Wilcoxon rank-sum) tests were performed to determine whether the newer data are affected by a release from the BAP. Because the interwell Appendix III limits and the Appendix IV GWPSs are based on data from upgradient wells which we would not expect to have been impacted by a release, these tests were used for intrawell Appendix III tests only. Mann-Whitney tests were used to compare the medians of historical data (July 2016 – March 2019) to the new compliance samples (June 2019 – May 2020) for fluoride and pH. Results were evaluated to determine if the medians of the two groups were similar at the 99% confidence level. Where no significant difference was found, the new compliance data were added to the background dataset. Where a statistically significant difference was found between the medians of the two groups, the data were reviewed to evaluate the cause of the difference and to determine if adding newer data to the background dataset, replacing the background dataset with the newer data, or continuing to use the existing background dataset was most appropriate. If the differences appeared to have been caused by a release, then the previous background dataset would have continued to be used.

The complete Mann-Whitney test results and a summary of the significant findings can be found in Appendix B. A statistically significant difference was found for fluoride in well MW-1606. The difference was due to estimated (J-flagged) values which were less than reporting limits in recent events which were compared to mostly non-detect values in the existing background dataset. Thus, the background concentration for fluoride in well MW-1606 was updated to include data through May 2020.

After the revised background set was established, a parametric or non-parametric analysis was selected based on the distribution of the data and the frequency of non-detect data. Estimated results less than the practical quantitation limit (PQL) – i.e., "J-flagged" data – were considered detections and the estimated results were used in the statistical analyses. Non-parametric analyses were selected for datasets with at least 50% non-detect data or datasets that could not be normalized. Parametric analyses were selected for datasets (either transformed or untransformed) that passed the Shapiro-Wilk / Shapiro-Francía test for normality. The Kaplan-Meier non-detect adjustment was applied to datasets with between 15% and 50% non-detect data. For datasets with fewer than 15% non-detect data, non-detect data were replaced with one half of the PQL. The selected analysis (i.e., parametric or non-parametric) and transformation (where applicable) for each background dataset are shown in Attachment B.

Intrawell UPLs were updated using all the historical data through May 2020 to represent background values. LPLs were also updated for pH. Interwell UPLs were updated using all data through October 2020. The updated prediction limits are summarized in Table 3. Intrawell tests continued to be used to evaluate potential SSIs for fluoride and pH, whereas interwell tests continued to be used to evaluate potential SSIs for boron, calcium, chloride, sulfate, and TDS. The UPLs were calculated for a one-of-two retesting procedure; i.e., if at least one sample in a series of two does not exceed the UPL, then it can be concluded that an SSI has not occurred. The retesting procedures allowed 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 III SSIs

The Appendix III results were analyzed to assess whether concentrations of Appendix III parameters at the compliance wells exceeded background concentrations. Data collected during the October 2020 assessment monitoring events from each compliance well were compared to the prediction limits to assess whether the results are above background values. The results from these events and the prediction limits are summarized in Table 3. The following exceedances of the upper prediction limits (UPLs) were noted:

- Boron concentrations exceeded the interwell UPL of 0.180 mg/L at MW-1604 (0.200 mg/L).
- Calcium concentrations exceeded the interwell UPL of 20.0 mg/L at MW-1 (39.9 mg/L), MW-1605 (49.7 mg/L), and MW-1606 (32.4 mg/L).
- Chloride concentrations exceeded the interwell UPL of 43.0 mg/L at MW-1 (64.0 mg/L), MW-1605 (84.2 mg/L), and MW-1606 (100 mg/L).
- The pH value at MW-1 of 4.8 standard units (SU) was below the intrawell LPL of 4.9 SU.

- Sulfate concentrations exceeded the interwell UPL of 57.0 mg/L at MW-1 (161 mg/L), MW-1605 (234 mg/L), and at MW-1606 (98.5 mg/L).

- TDS concentrations exceeded the interwell UPL of 260 mg/L at MW-1 (374 mg/L), MW-1604 (266 mg/L), MW-1605 (521 mg/L), and MW-1606 (335 mg/L).

While the prediction limits were calculated for a one-of-two retesting procedure, SSIs were conservatively assumed if the October 2020 sample was above the UPL or below the LPL. Based on this evaluation, concentrations of Appendix III constituents appear to be above background concentrations and the unit will remain in assessment monitoring.

2.3 Conclusions

A semi-annual assessment monitoring event was conducted in accordance with the CCR Rule. The laboratory and field data were reviewed prior to statistical analysis, with no QA/QC issues identified that impacted data usability. A review of outliers identified no potential outliers in the October 2020 data. GWPSs were re-established for the Appendix IV parameters. A confidence interval was constructed at each compliance well for each Appendix IV parameter; SSLs were concluded if the entire confidence interval exceeded the GWPSs. No SSLs were identified.

The Appendix III results were evaluated to assess whether concentrations of Appendix III parameters exceeded background levels. Boron, calcium, chloride, pH, sulfate, and TDS results exceeded background levels at select downgradient wells. Based on this evaluation, the Amos BAP CCR unit will remain in assessment monitoring.

SECTION 3

REFERENCES

American Electric Power (AEP). 2020. Statistical Analysis Plan – Amos Plant. October 2020.

Geosyntec Consultants (Geosyntec). 2019. Statistical Analysis Summary – Bottom Ash Pond, Amos Plant, Winfield, West Virginia. December 23, 2019.

Geosyntec Consultants (Geosyntec). 2020. Statistical Analysis Summary – Bottom Ash Pond, Amos Plant, Winfield, West Virginia. September 2, 2020.

TABLES

Table 1 - Groundwater Data Summary
Amos Plant - Bottom Ash Pond

Parameter	Unit	MW-1	MW-4	MW-5	MW-6	MW-1601	MW-1602A	MW-1603A	MW-1604	MW-1605	MW-1606
		10/27/2020	10/30/2020	10/27/2020	10/28/2020	10/28/2020	10/30/2020	10/30/2020	10/28/2020	10/27/2020	10/26/2020
Antimony	µg/L	0.1 U	0.08 J	0.1 U	0.1 U	0.1 U	0.05 J	0.03 J	0.1 U	0.1 U	0.1 U
Arsenic	µg/L	0.09 J	21.7	3.18	33.5	8.68	22.1	88.9	3.98	2.69	2.26
Barium	µg/L	25.4	83.5	134	152	127	229	239	156	92.3	41.8
Beryllium	µg/L	0.130	0.07 J	0.04 J	0.1 U	0.03 J	0.02 J	0.1 U	0.05 J	0.09 J	0.06 J
Boron	mg/L	0.04 J	0.085	0.04 J	0.05 U	0.05 U	0.05 U	0.05 U	0.200	0.051	0.03 J
Cadmium	µg/L	2.42	0.61	0.05 U	0.05 U	0.01 J	0.05 U	0.05 U	0.05 U	0.05 U	0.26
Calcium	mg/L	39.9	16.0	14.3	12.8	10.8	20.5	16.3	19.5	49.7	32.4
Chloride	mg/L	64.0	12.9	14.3	10.8	28.3	42.8	6.03	27.7	84.2	100
Chromium	µg/L	0.1 J	0.308	0.214	0.406	0.369	0.749	0.293	0.595	0.334	0.286
Cobalt	µg/L	20.5	42.4	1.42	8.57	3.04	0.587	0.209	0.387	9.65	11.6
Combined Radium	pCi/L	1.722	0.2618	2.254	0.573	0.447	1.067	0.384	0.261	0.81	0.2071
Fluoride	mg/L	0.03 J	0.05 J	0.04 J	0.06 J	0.05 J	0.13	0.25	0.08	0.02 J	0.02 J
Lead	µg/L	0.2 U	0.416	0.2 U	0.2 U	0.227	1.20	0.1 J	0.232	0.230	0.1 J
Lithium	mg/L	0.00270	0.00166	0.00138	0.00113	0.00138	0.00117	0.000324	0.000515	0.00234	0.00228
Mercury	µg/L	-	-	-	-	-	-	-	-	-	-
Molybdenum	µg/L	2 U	2 U	2 U	0.4 J	2 U	0.8 J	1 J	2 U	2 U	2 U
Selenium	µg/L	0.1 J	0.09 J	0.2 U	0.05 J	0.07 J	0.2 U	0.2 U	0.1 J	0.1 J	0.2 U
Sulfate	mg/L	161	39.0	43.5	2.6	24.1	12.3	0.4 U	0.4 U	234	98.5
Thallium	µg/L	0.5 U	0.2 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Total Dissolved Solids	mg/L	374	187	177	244	156	220	115	266	521	335
pH	SU	4.8	5.4	5.5	5.8	5.6	6.4	6.9	6.0	5.3	5.6

Notes:
mg/L: milligrams per liter
µg/L: micrograms per liter
SU: standard unit
pCi/L: picocuries per liter
U: Parameter was not present in concentrations above method detection limit and is reported as the reporting limit
J: Estimated value. Parameter was detected in concentrations below the reporting limit
- : Not sampled
All samples were collected as part of the assessment monitoring program in accordance with 40 CFR 257.90(e)(3).

Table 2: Groundwater Protection Standards
Amos Plant - Bottom Ash Pond

Constituent Name	MCL	CCR Rule-Specified	Calculated UTL	GWPS
Antimony, Total (mg/L)	0.006		0.0002	0.006
Arsenic, Total (mg/L)	0.01		0.09	0.09
Barium, Total (mg/L)	2		0.3	2
Beryllium, Total (mg/L)	0.004		0.0001	0.004
Cadmium, Total (mg/L)	0.005		0.00005	0.005
Chromium, Total (mg/L)	0.1		0.0020	0.1
Cobalt, Total (mg/L)	n/a	0.006	0.014	0.014
Combined Radium, Total (pCi/L)	5		3.9	5
Fluoride, Total (mg/L)	4		0.31	4
Lead, Total (mg/L)	n/a	0.015	0.0068	0.015
Lithium, Total (mg/L)	n/a	0.04	0.008	0.04
Mercury, Total (mg/L)	0.002		0.000005	0.002
Molybdenum, Total (mg/L)	n/a	0.1	0.0024	0.1
Selenium, Total (mg/L)	0.05		0.0004	0.05
Thallium, Total (mg/L)	0.002		0.0005	0.002

Notes:
MCL = Maximum Contaminant Level
CCR = Coal Combustion Residual
GWPS = Groundwater Protection Standard
Calculated UTL (Upper Tolerance Limit) represents site-specific background values.
Grey cells indicate the GWPS is based on the calculated UTL, which is higher than the MCL or CCR Rule-specified value.

Table 3 - Appendix III Data Summary
Amos - Bottom Ash Pond

Analyte	Unit	Description	MW-1	MW-4	MW-5	MW-1604	MW-1605	MW-1606
			10/27/2020	10/30/2020	10/27/2020	10/28/2020	10/27/2020	10/26/2020
Boron	mg/L	Interwell Background Value (UPL)	0.180					
		Analytical Result	0.04	0.085	0.04	**0.200**	0.051	0.03
Calcium	mg/L	Interwell Background Value (UPL)	20.0					
		Analytical Result	**39.9**	16.0	14.3	19.5	**49.7**	**32.4**
Chloride	mg/L	Interwell Background Value (UPL)	43.0					
		Analytical Result	**64.0**	12.9	14.3	27.7	**84.2**	**100**
Fluoride	mg/L	Intrawell Background Value (UPL)	0.030	0.076	0.050	0.140	0.090	0.030
		Analytical Result	0.03	0.05	0.04	0.08	0.02	0.02
pH	SU	Intrawell Background Value (UPL)	7.3	7.0	6.4	7.2	6.5	6.7
		Intrawell Background Value (LPL)	4.9	5.4	5.2	5.9	5.1	5.2
		Analytical Result	**4.8**	5.4	5.5	6.0	5.3	5.6
Sulfate	mg/L	Interwell Background Value (UPL)	57.0					
		Analytical Result	**161**	39.0	43.5	0.06	**234**	**98.5**
Total Dissolved Solids	mg/L	Interwell Background Value (UPL)	260					
		Analytical Result	**374**	187	177	**266**	**521**	**335**

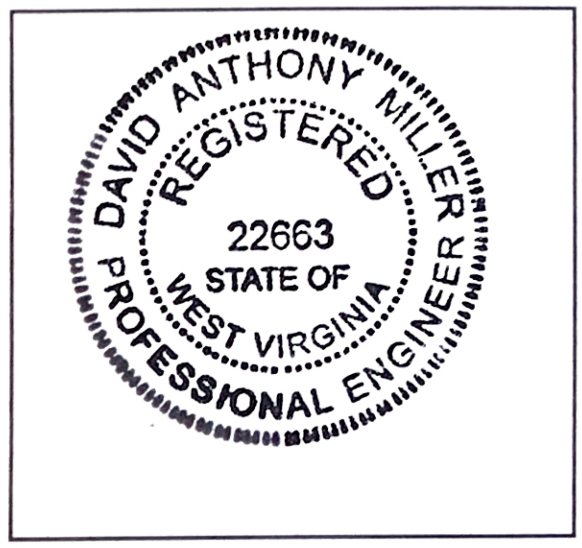
Notes:
UPL: Upper prediction limit
LPL: Lower prediction limit
Bold values exceed the background value.
Background values are shaded gray.

ATTACHMENT A

Certification by Qualified Professional Engineer

Certification by Qualified Professional Engineer

I certify that the selected and above described statistical method is appropriate for evaluating the groundwater monitoring data for the Amos Bottom Ash Pond CCR management area and that the requirements of 40 CFR 257.93(f) have been met.



DAVID ANTHONY MILLER

Printed Name of Licensed Professional Engineer

David Anthony Miller

Signature

22663	WEST VIRGINIA	02.26.21
License Number	Licensing State	Date

ATTACHMENT B

Statistical Analysis Output

GROUNDWATER STATS CONSULTING

February 26, 2021

Geosyntec Consultants
Attn: Ms. Allison Kreinberg
941 Chatham Lane, #103
Columbus, OH 43221

Re: Amos Bottom Ash Pond
Background Update & Statistical Analysis – Fall 2020

Dear Ms. Kreinberg,

Groundwater Stats Consulting (GSC), formerly the statistical consulting division of Sanitas Technologies, is pleased to provide the background update of Appendix III constituents and the statistical analysis of the Appendix IV constituents for the October 2020 sample event at American Electric Power Company's Amos Bottom Ash Pond. The analysis complies with the federal rule for the Disposal of Coal Combustion Residuals from Electric Utilities (CCR Rule, 2015) as well as with the USEPA Unified Guidance (2009).

Sampling began at the site for the CCR program in 2016. The monitoring well network, as provided by Geosyntec Consultants, consists of the following:

- **Upgradient wells:** BAP-MW-1601, BAP-MW-1602A, BAP-MW-1603A, and BAP-MW-6
- **Downgradient wells:** BAP-MW-1, BAP-MW-1604, BAP-MW-1605, BAP-MW-1606, BAP-MW-4, and BAP-MW-5

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 Kirk Cameron, PhD, statistician and owner of MacStat Consulting, primary author of the USEPA Unified Guidance and Senior Advisor for GSC. The analysis was reviewed by Jim Loftis, PhD, emeritus professor of Civil and Environmental Engineering at Colorado State University and Senior Adviser for GSC.

The CCR program consists of the following constituents:

- **Appendix III** (Detection Monitoring) **-** boron, calcium, chloride, fluoride, pH, sulfate, and TDS
- **Appendix IV** (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, as described below, is used for nondetect data. In the time series plots, a single reporting limit substitution is used across all wells for a given parameter since the wells are plotted as a group. 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 III and IV parameters are provided for all wells and are used to evaluate concentrations over time and for 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 III 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 included with the original background screening conducted in December 2017 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=6

Summary of Statistical Methods:

1) Intrawell prediction limits, combined with a 1-of-2 resample plan for fluoride and pH
2) Interwell prediction limits combined with a 1-of-2 resample plan for boron, calcium, chloride, 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 nondetects, a nonparametric test is utilized. 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. Nondetects are handled as follows.

- No statistical analyses are required on wells and analytes containing 100% nondetects (USEPA Unified Guidance, 2009, Chapter 6).
- When data contain <15% nondetects in background, simple substitution of one-half the reporting limit is utilized in the statistical analysis. The reporting limit utilized for nondetects is the most recent practical quantification limit (PQL) as reported by the laboratory.
- When data contain between 15-50% nondetects, the Kaplan-Meier nondetect adjustment is applied to the background data. 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% nondetects.

Note that values shown on data pages reflect raw data as reported by the laboratory. Any non-detects that have been substituted with one-half of the reporting limit due to data sets containing <15% nondetects as described above are shown as the original reporting limit (for example: fluoride in wells BAP-MW-4 and BAP-MW-5).

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 are 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.

Background Update – Appendix III Parameters – November 2019

Prior to updating background data, samples were re-evaluated at all wells for constituents utilizing intrawell prediction limits and at all upgradient wells for parameters utilizing interwell prediction limits using Tukey's outlier test and visual screening with the July 2019 samples. The Tukey's test results were included with the November 2019 background update report. Note that the reporting limit during the March 2019 event for boron in wells BAP-MW-1603A, BAP-MW-1604, BAP-MW-1605, BAP-MW-1606, BAP-MW-4, BAP-MW-5, and BAP-MW-6 was 1.0 mg/L compared to a historical reporting limit of 0.005 mg/L. Additionally, the reporting limit for fluoride during the October 2016 sample event in wells BAP-MW-4and BAP-MW-5 was 0.2 mg/L compared to a historical reporting limit of 0.06 mg/L. Therefore, nondetects that were censored at these higher reporting limits were flagged as outliers and excluded from the prediction limits to avoid setting a statistical limit that would not be conservative from a regulatory perspective.

As mentioned above, 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. An updated summary of flagged values follows this letter.

For constituents requiring intrawell prediction limits, the Mann-Whitney (Wilcoxon Rank Sum) test at the 99% confidence level was used to compare the medians of historical data through June 2017 to the medians of new compliance samples at each well through March 2019. When no statistically significant difference between the two groups is found, background data may be updated with compliance data. Typically, when the test concludes that the medians of the two groups are significantly different, particularly in the downgradient wells, the background data sets are not updated to include the newer data but will be reconsidered in the future. No statistically significant differences were found between the two groups for any of the well/constituent pairs. The full Mann Whitney test results were included with the background update report.

For parameters tested using interwell analyses, the Sen's Slope/Mann-Kendall trend test was used to evaluate data through March 2019 at upgradient wells to determine whether concentrations are statistically increasing, decreasing or stable. No statistically significant increasing or decreasing trends were noted with the exception of increasing trends for chloride in upgradient wells BAP-MW-1601 and BAP-MW-1602A. The magnitudes of these trends, however, were low relative to the average concentrations in these wells. Therefore, no adjustments were required. The results were submitted with the background update report.

Background Update – Appendix III Parameters – October 2020

Prior to updating background data, Tukey's outlier test and visual screening were used to evaluate data for outliers at all wells for fluoride and pH, which utilize intrawell prediction limits. Outliers were evaluated at all upgradient wells, using pooled data, for boron, calcium, chloride, sulfate, and TDS which utilize interwell prediction limits (Figure C).

Outliers were noted for pH in a number of upgradient and downgradient wells. The highest values were flagged for wells BAP-MW-1, BAP-MW-1602A, BAP-MW-1603A, BAP-MW-1604, BAP-MW-1606, and BAP-MW-6. The values identified as outliers in upgradient well BAP-MW-1601 were not flagged as they appear to represent natural variation in groundwater quality.

Tukey's outlier test on pooled upgradient well data for calcium, chloride, sulfate, and TDS which are tested using interwell limits did not identify any potential outliers. Several values were identified as outliers for boron; however, other than the high nondetects discussed above, none of these values were flagged as outliers as they appear to represent natural variation in groundwater quality. 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).

For constituents requiring intrawell prediction limits, the Mann-Whitney (Wilcoxon Rank Sum) test at the 99% confidence level was used to compare the medians of historical data through March 2019 to the new compliance samples at each well through May 2020. When no statistically significant difference between the two groups is found, background data may be updated with compliance data (Figure D). No statistically significant differences were found except for fluoride in well BAP-MW-1606.

Typically, when the test concludes that the medians of the two groups are significantly different, particularly in the downgradient wells, the background are not updated to include the newer data but will be reconsidered in the future. However, the significant difference noted for fluoride resulted from recent reported trace values (less than the reporting limit) compared to mostly nondetects in background, censored at the reporting limit. Therefore, the record was updated. The full results of the Mann-Whitney test are included with this report (Figure D).

For parameters tested using interwell analyses, the Sen's Slope/Mann-Kendall trend test was used to evaluate data through October 2020 in upgradient wells to determine whether concentrations are statistically increasing, decreasing or stable. Statistically significantly increasing trends were noted for chloride in upgradient wells BAP-MW-1601, BAP-MW-1602A, and BAP-MW-1603A. The magnitude of these trends, however, was low relative to the average concentrations in these wells. Therefore, no adjustments were required. However, the most recent two observations of chloride in well AP-MW-1601 show a sharp upward trend. If this trend continues, adjustment of the background period may be needed. Summary tables and graphical trend test results are included with this report (Figure E).

Intrawell prediction limits using all historical data through May 2020, combined with a 1-of-2 resample plan, were constructed for fluoride and pH, and results of the updated limits follow this letter (Figure F).

Interwell prediction limits, combined with a 1-of-2 resample plan, were updated using all available data from upgradient wells through October 2020 for boron, calcium, chloride, sulfate, and TDS. Interwell prediction limits pool upgradient well data to establish a background limit for an individual constituent. A summary table and graphical results for the updated limits follow this letter (Figure G).

Evaluation of Appendix IV Parameters – October 2020

Prior to evaluating Appendix IV parameters, background (upgradient) 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. High outliers are also 'cautiously' flagged in the downgradient wells when they are clearly much different from the rest of the data. This is intended to be a regulatory conservative approach in that it will reduce the variance and thus reduce the width of parametric confidence intervals; although it will also reduce the mean and thus lower the entire interval. The intent is to better represent the actual downgradient mean.

Tukey's outlier test results for Appendix IV parameters in downgradient wells are shown in the Intrawell Outlier Analysis section following this letter (Figure C). Tukey's test identified high values for cobalt in well BAP-MW-1605 and for lead in well BAP-MW-1. These values were not flagged as they are in downgradient wells and are somewhat similar to remaining concentrations within these wells.

Tukey's outlier test results on pooled upgradient well data are shown in the Interwell Outlier Analysis section following this letter (Figure C). Tukey's test identified two high values for combined radium 226 + 228 which were both flagged. A chromium outlier in well BAP-MW-1603A was identified visually and flagged. All flagged values may be seen on the Outlier Summary following this letter (Figure C).

Interwell upper tolerance limits were used to calculate background limits from all available pooled upgradient well data for each Appendix IV parameter (Figure H). In the case of cobalt, the parametric upper tolerance limit resulted in a limit of 0.029 mg/L due to a transformation that was required to fit the data to a normal distribution. Therefore, a nonparametric upper tolerance limit, which establishes the limit based on the highest background value, was constructed and resulted in a more conservative (lower) limit of 0.014 mg/L.

Parametric limits use a target of 95% confidence and 95% coverage. The confidence and coverage levels for nonparametric tolerance limits are dependent upon the number of background samples. These limits were compared to the Maximum Contaminant Levels (MCLs) and CCR-Rule specified levels 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 I).

Confidence intervals were then constructed on downgradient wells for each of the Appendix IV parameters and compared to the GWPS as discussed above (Figure J). Only when the entire confidence interval is above a GWPS is the well/constituent pair considered to exceed its respective standard. No exceedances were noted for any of the well/constituent pairs. A summary of the confidence interval results follows this letter.

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

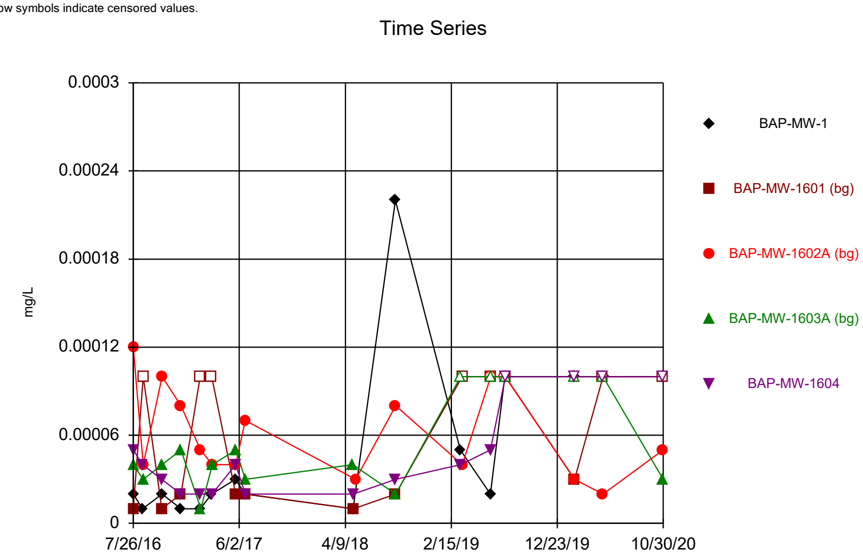
For Groundwater Stats Consulting,

Abdul Diane
Groundwater Analyst

Kristina L. Rayner
Groundwater Statistician

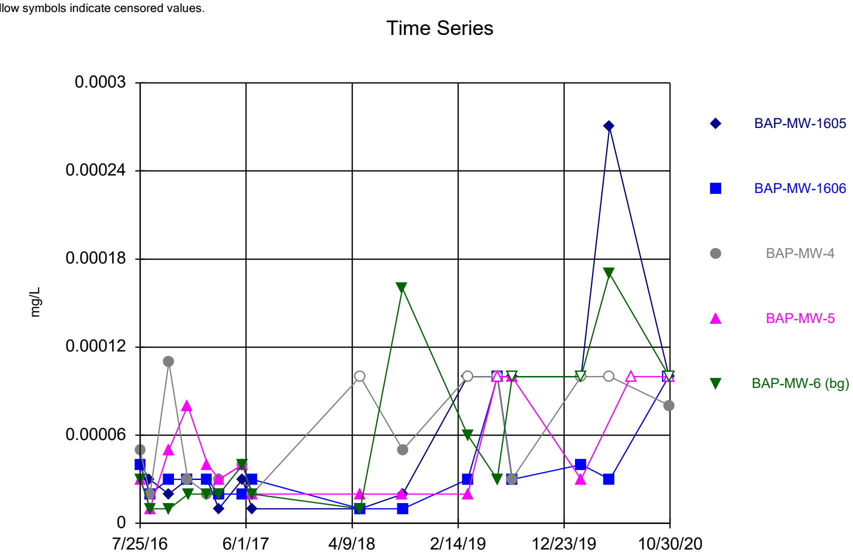
FIGURE A. Time Series

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.



Constituent: Antimony, total Analysis Run 2/25/2021 2:40 PM
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.



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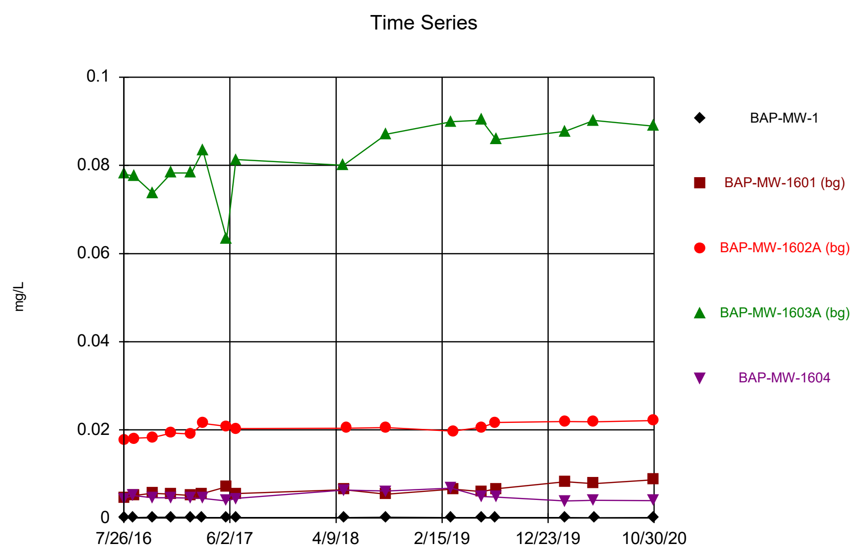

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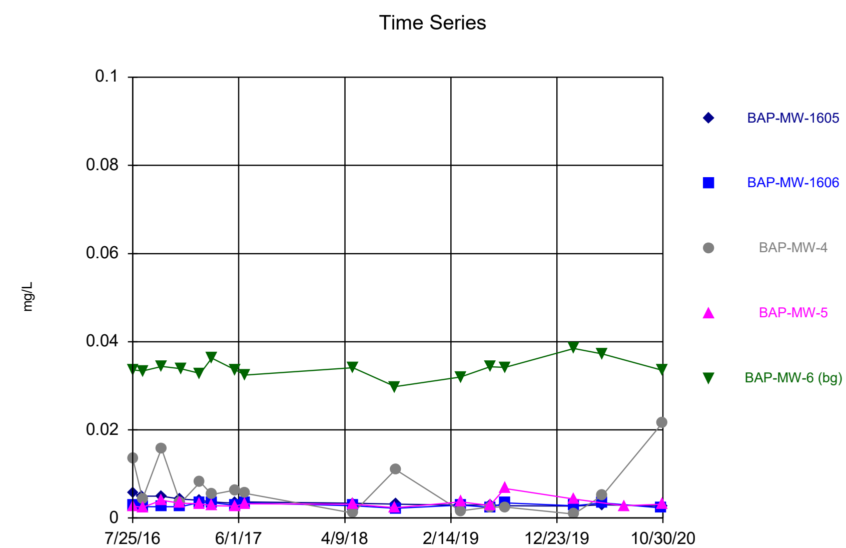

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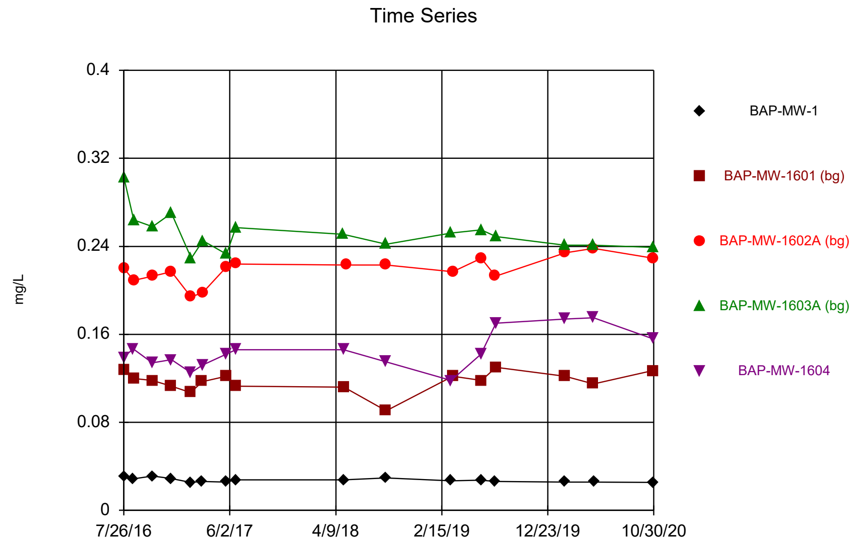

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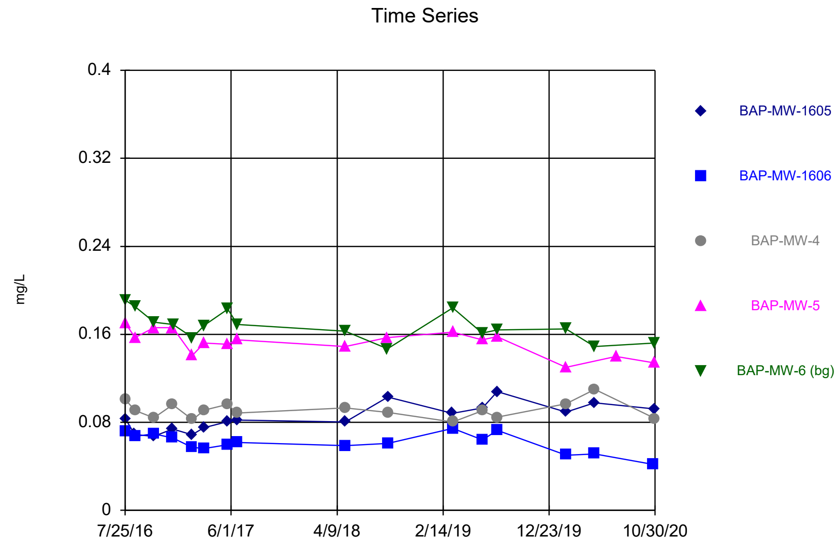

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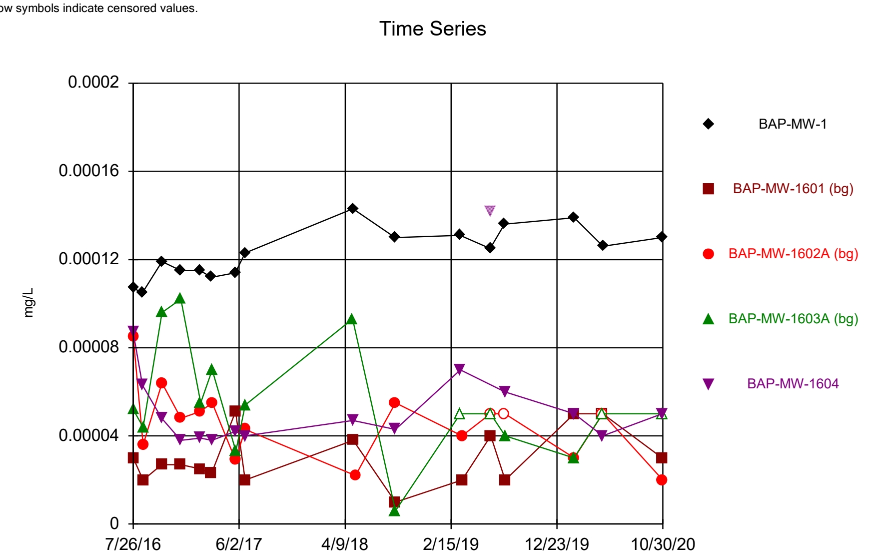
Hollow symbols indicate censored values.



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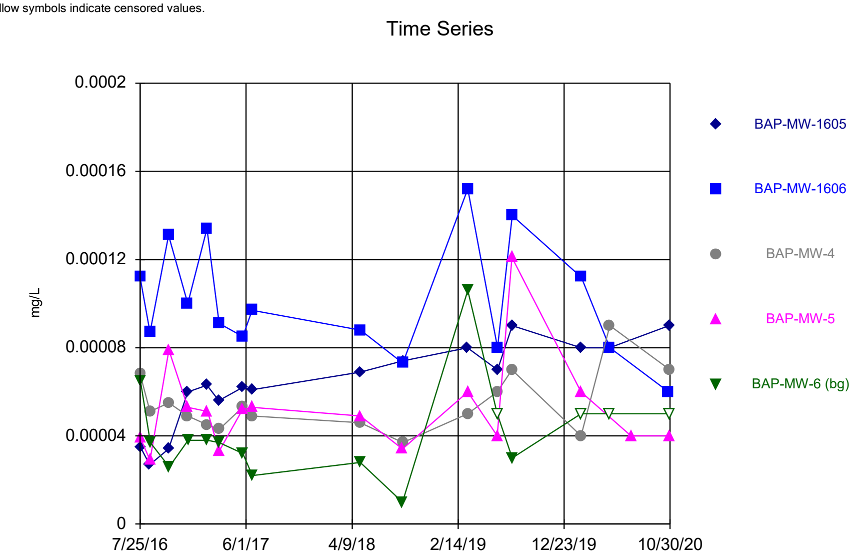
Hollow symbols indicate censored values.



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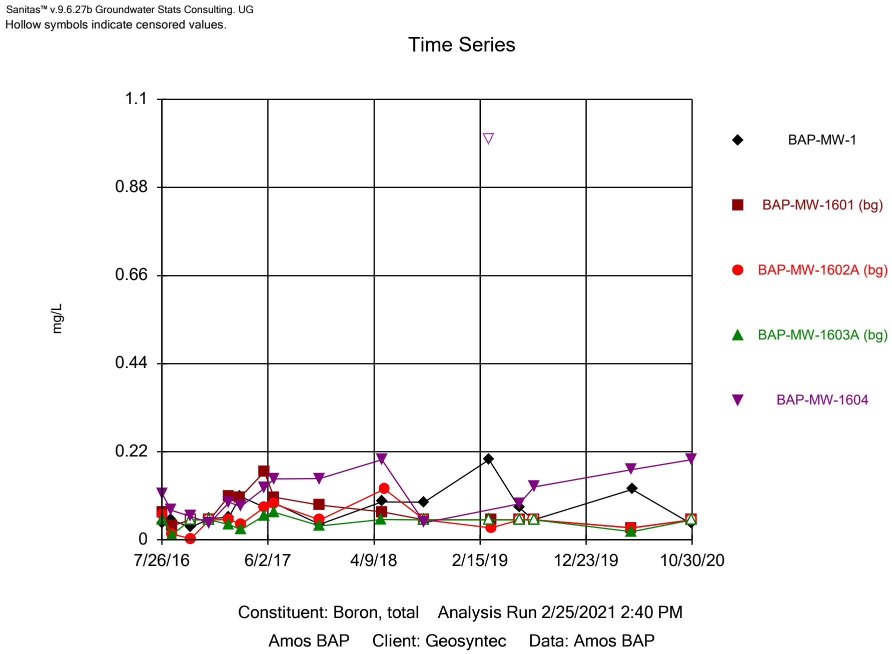
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Hollow symbols indicate censored values.
Time Series
mg/L
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0.88
0.66
0.44
0.22
0
7/26/16
6/2/17
4/9/18
2/15/19
12/23/19
10/30/20
BAP-MW-1
BAP-MW-1601 (bg)
BAP-MW-1602A (bg)
BAP-MW-1603A (bg)
BAP-MW-1604
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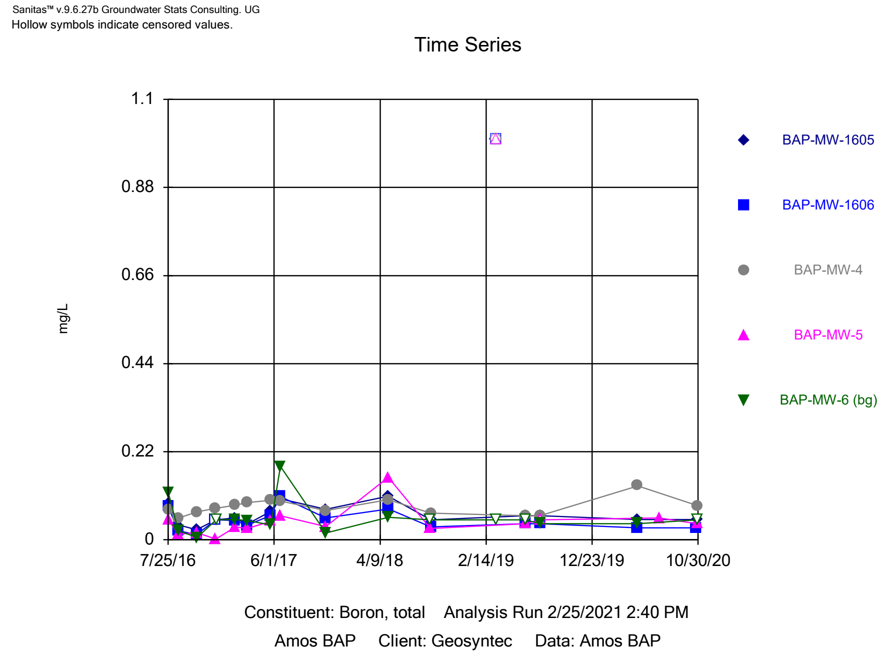
Amos BAP Client: Geosyntec Data: Amos BAP


Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.
Time Series
mg/L
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0.88
0.66
0.44
0.22
0
7/25/16
6/1/17
4/9/18
2/14/19
12/23/19
10/30/20
BAP-MW-1605
BAP-MW-1606
BAP-MW-4
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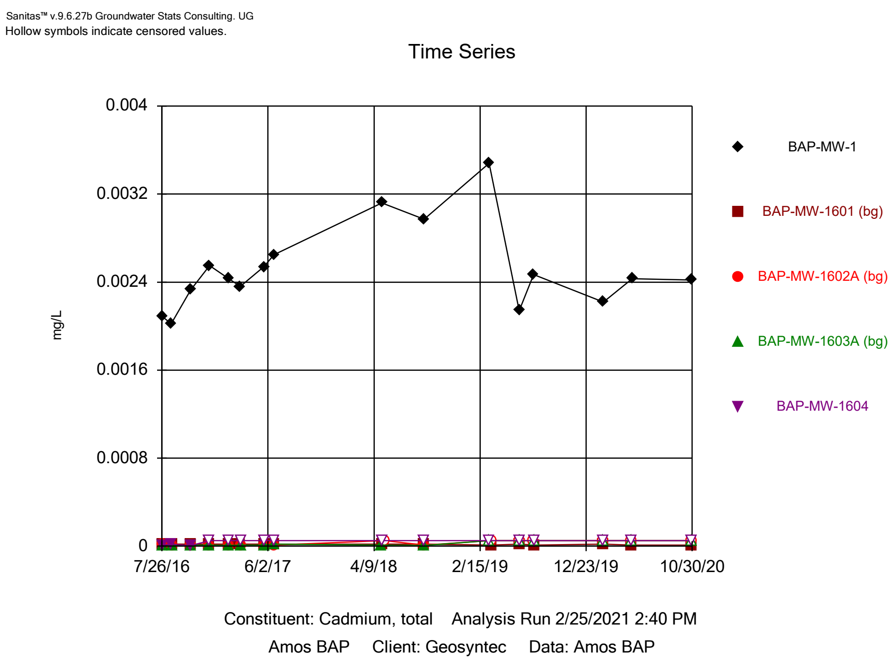
BAP-MW-6 (bg)
Constituent: Boron, total Analysis Run 2/25/2021 2:40 PM
Amos BAP Client: Geosyntec Data: Amos BAP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Hollow symbols indicate censored values.
Time Series
mg/L
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0.0032
0.0024
0.0016
0.0008
0
7/26/16
6/2/17
4/9/18
2/15/19
12/23/19
10/30/20
BAP-MW-1
BAP-MW-1601 (bg)
BAP-MW-1602A (bg)
BAP-MW-1603A (bg)
BAP-MW-1604
Constituent: Cadmium, total Analysis Run 2/25/2021 2:40 PM
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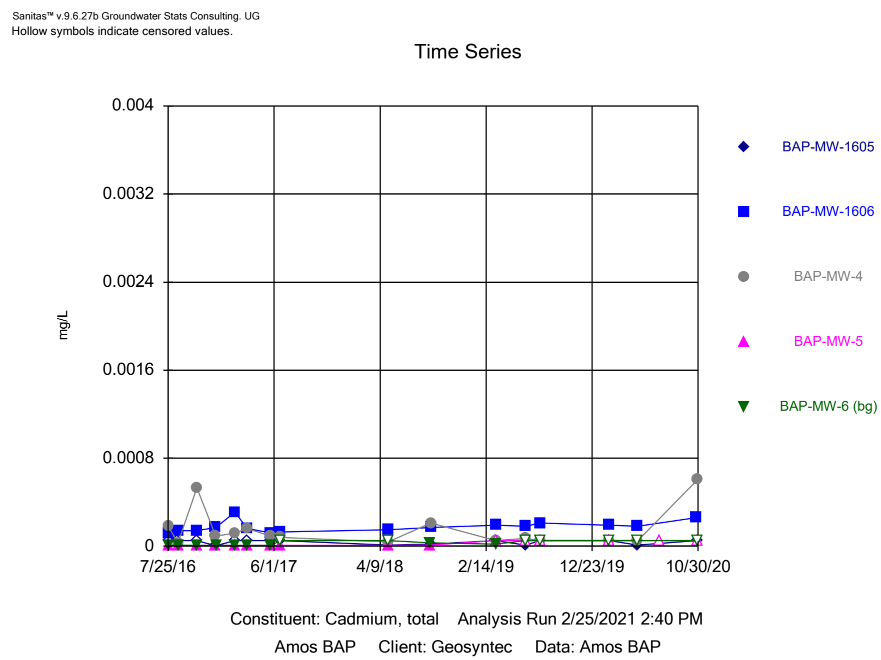
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.
Time Series
mg/L
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0.0032
0.0024
0.0016
0.0008
0
7/25/16
6/1/17
4/9/18
2/14/19
12/23/19
10/30/20
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BAP-MW-1606
BAP-MW-4
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BAP-MW-6 (bg)
Constituent: Cadmium, total Analysis Run 2/25/2021 2:40 PM
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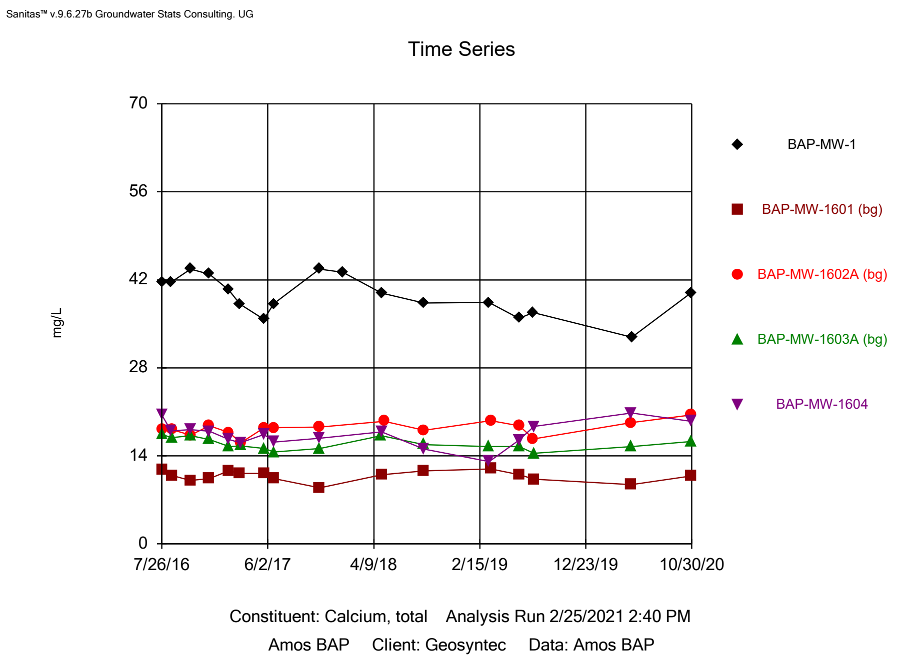
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mg/L
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28
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BAP-MW-1602A (bg)
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BAP-MW-1604
Constituent: Calcium, total Analysis Run 2/25/2021 2:40 PM
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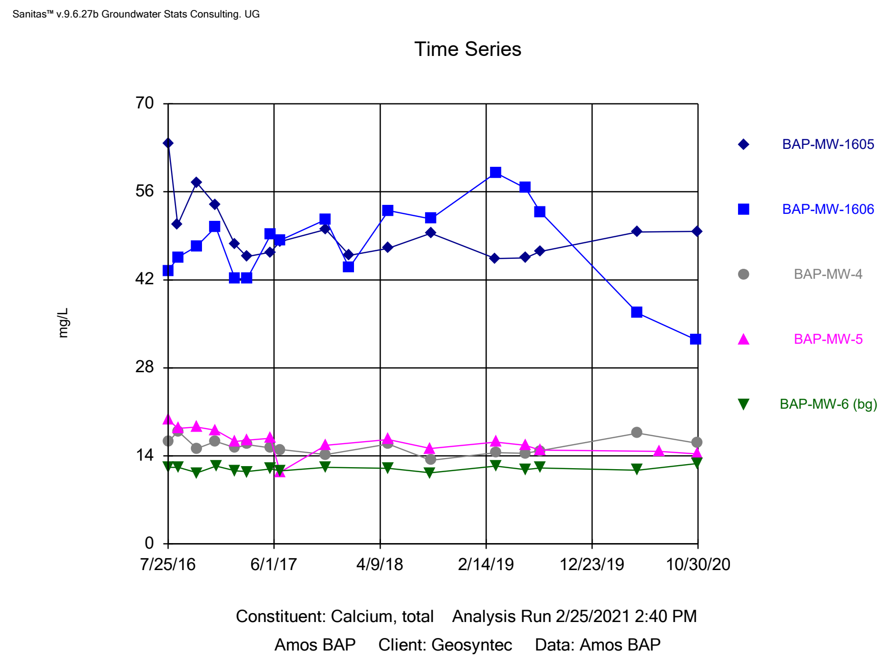
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10/30/20
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BAP-MW-1606
BAP-MW-4
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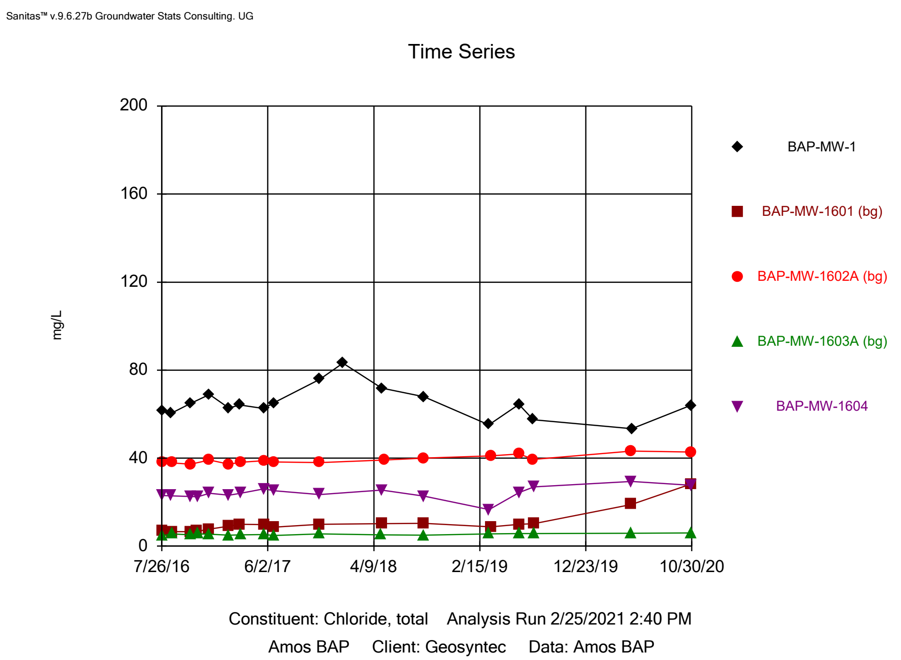
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BAP-MW-1602A (bg)
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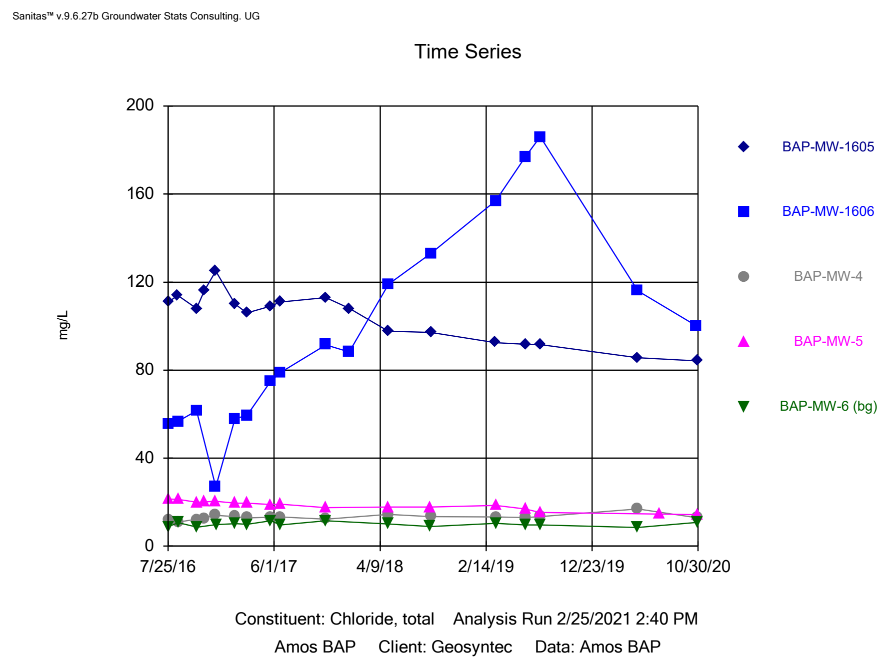
BAP-MW-1604
Constituent: Chloride, total Analysis Run 2/25/2021 2:40 PM
Amos BAP Client: Geosyntec Data: Amos BAP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mg/L
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80
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10/30/20
BAP-MW-1605
BAP-MW-1606
BAP-MW-4
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Constituent: Chloride, total Analysis Run 2/25/2021 2:40 PM
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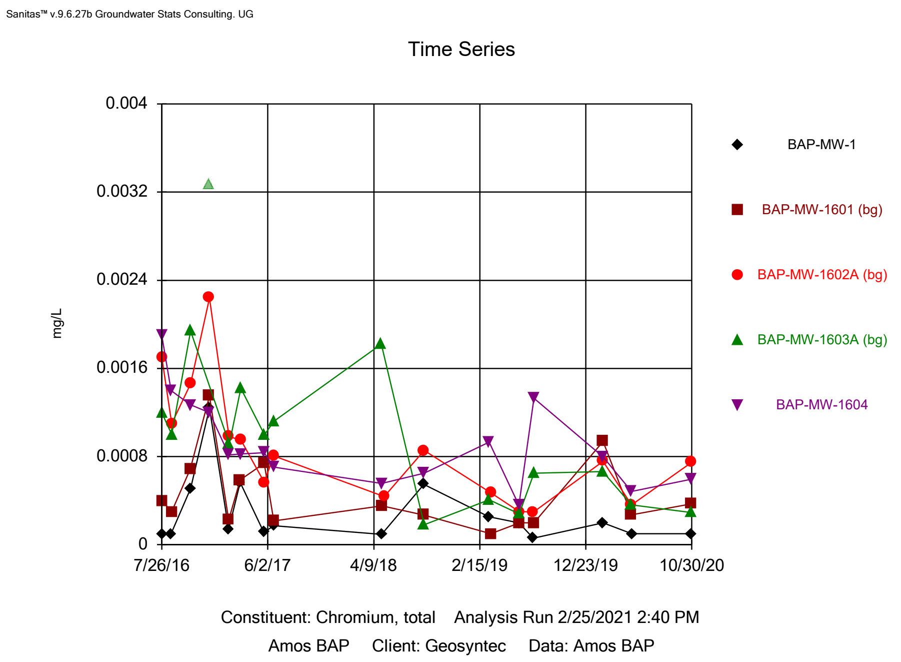

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6/2/17
4/9/18
2/15/19
12/23/19
10/30/20
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BAP-MW-1602A (bg)
BAP-MW-1603A (bg)
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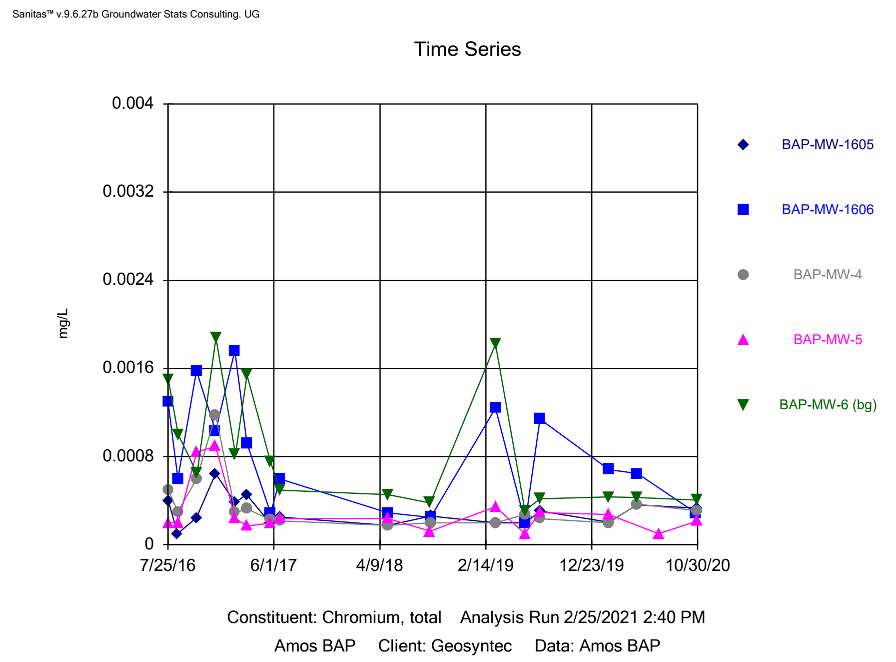
Constituent: Chromium, total Analysis Run 2/25/2021 2:40 PM
Amos BAP Client: Geosyntec Data: Amos BAP



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0.0008
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mg/L
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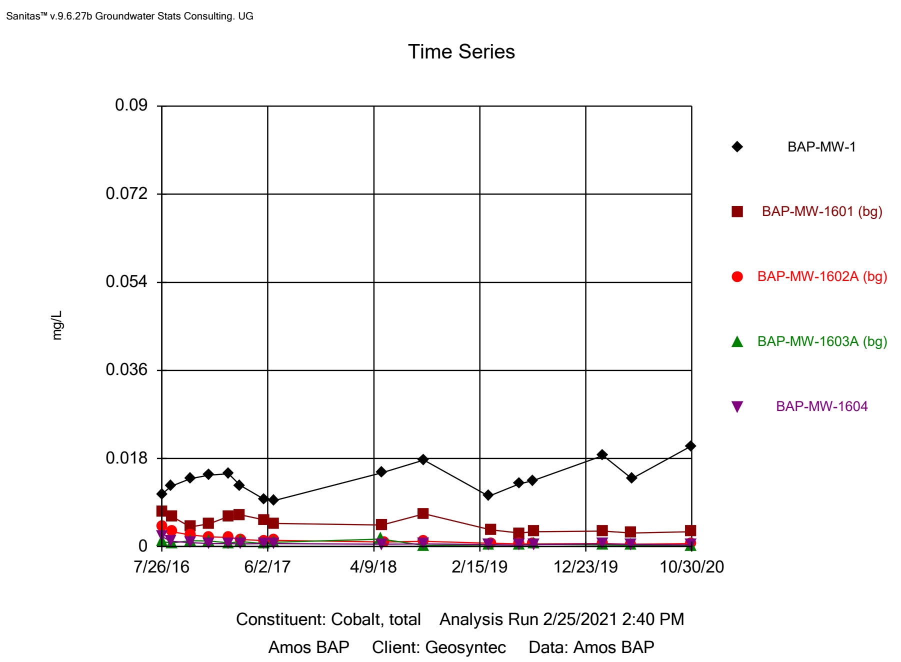
6/1/17
4/9/18
2/14/19
12/23/19
10/30/20
BAP-MW-1605
BAP-MW-1606
BAP-MW-4
BAP-MW-5
BAP-MW-6 (bg)
Constituent: Chromium, total Analysis Run 2/25/2021 2:40 PM
Amos BAP Client: Geosyntec Data: Amos BAP



Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Time Series
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0.054
0.036
0.018
0
mg/L
7/26/16
6/2/17
4/9/18
2/15/19
12/23/19
10/30/20
BAP-MW-1
BAP-MW-1601 (bg)
BAP-MW-1602A (bg)
BAP-MW-1603A (bg)
BAP-MW-1604
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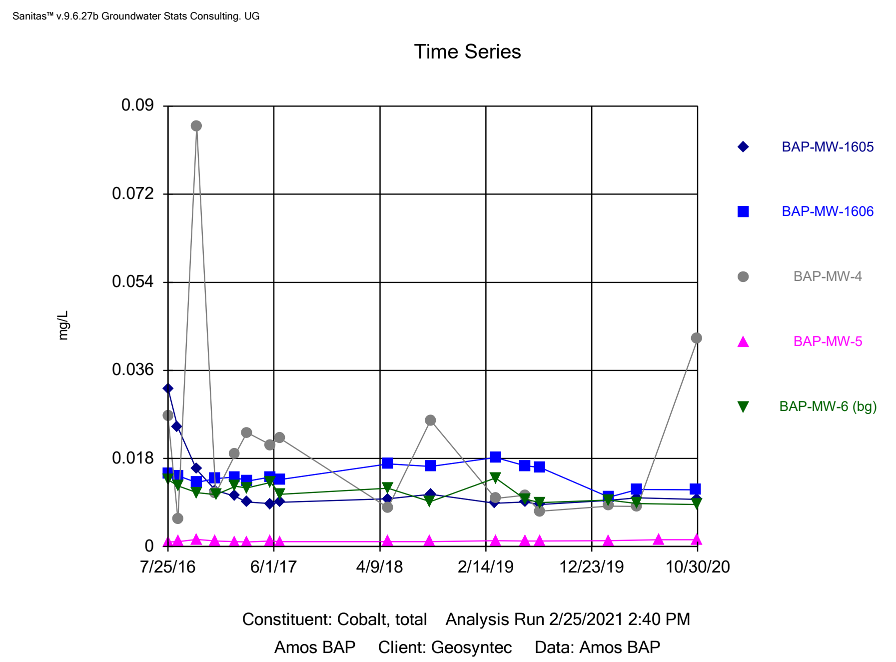

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Time Series
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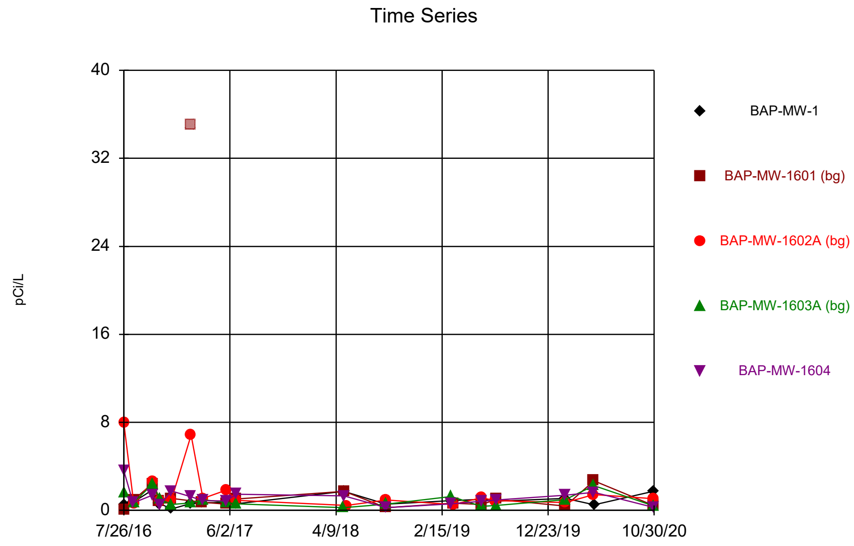
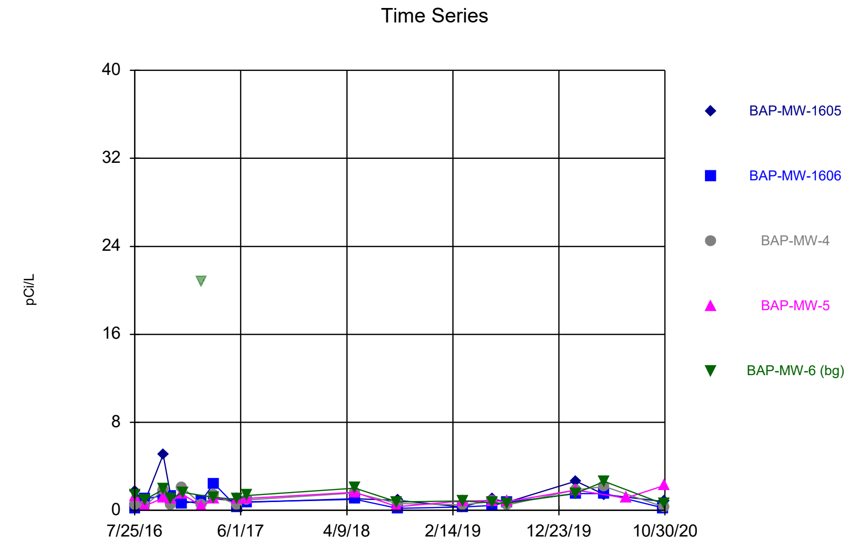
0.036
0.018
0
mg/L
7/25/16
6/1/17
4/9/18
2/14/19
12/23/19
10/30/20
BAP-MW-1605
BAP-MW-1606
BAP-MW-4
BAP-MW-5
BAP-MW-6 (bg)
Constituent: Cobalt, total Analysis Run 2/25/2021 2:40 PM
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



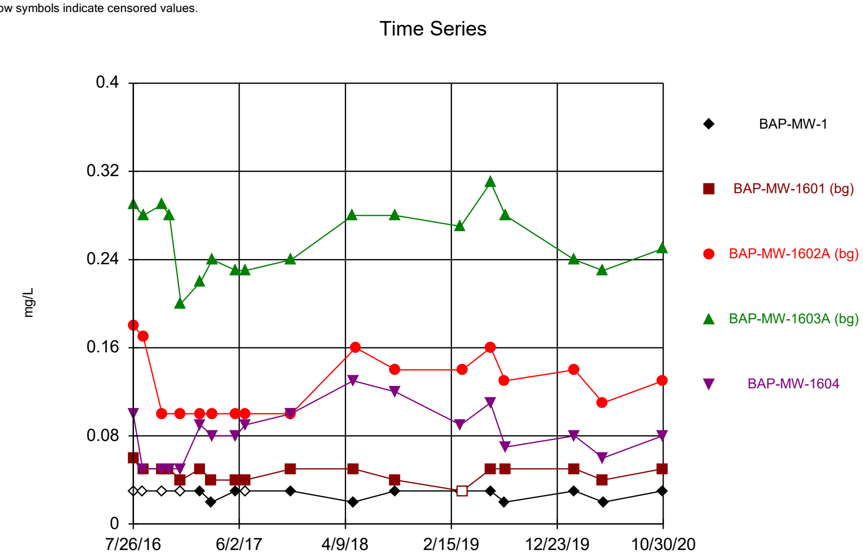
Constituent: Combined Radium 226 + 228 Analysis Run 2/25/2021 2:40 PM
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



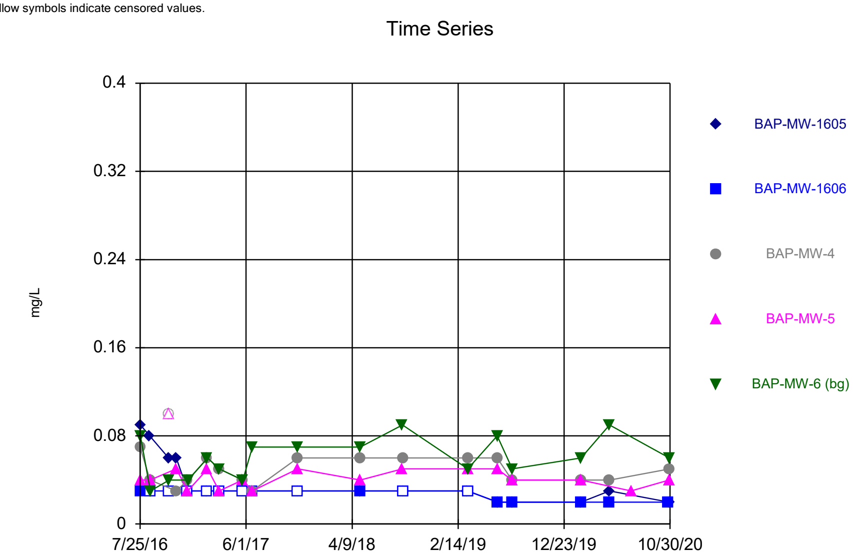
Constituent: Combined Radium 226 + 228 Analysis Run 2/25/2021 2:40 PM
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

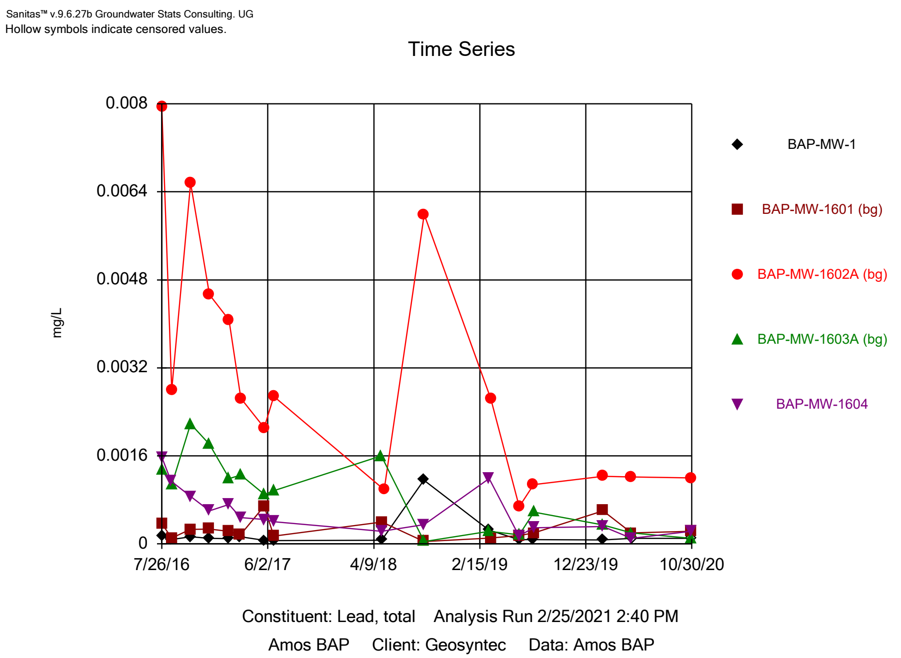


Constituent: Fluoride, total Analysis Run 2/25/2021 2:40 PM
Amos BAP Client: Geosyntec Data: Amos BAP

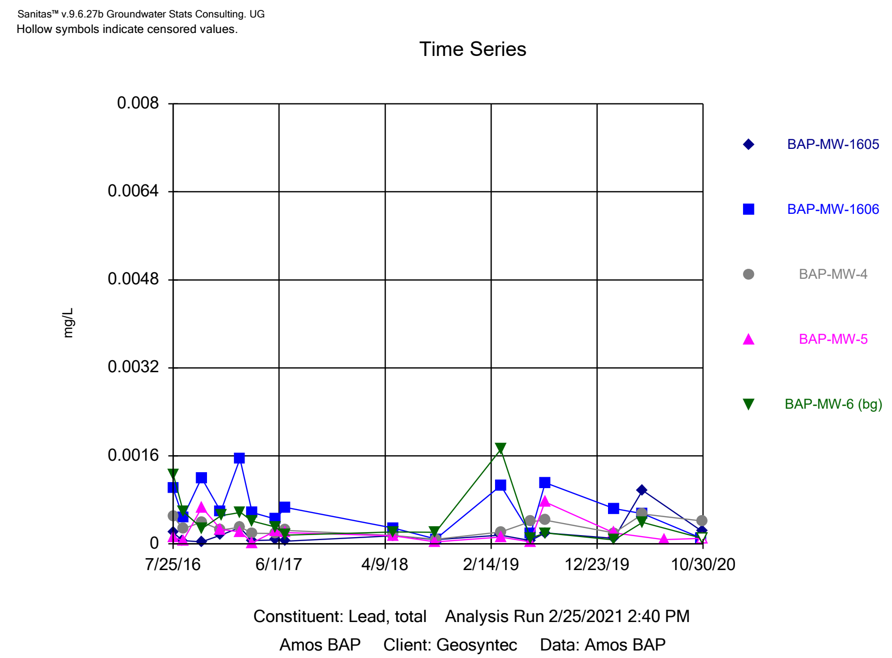
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.



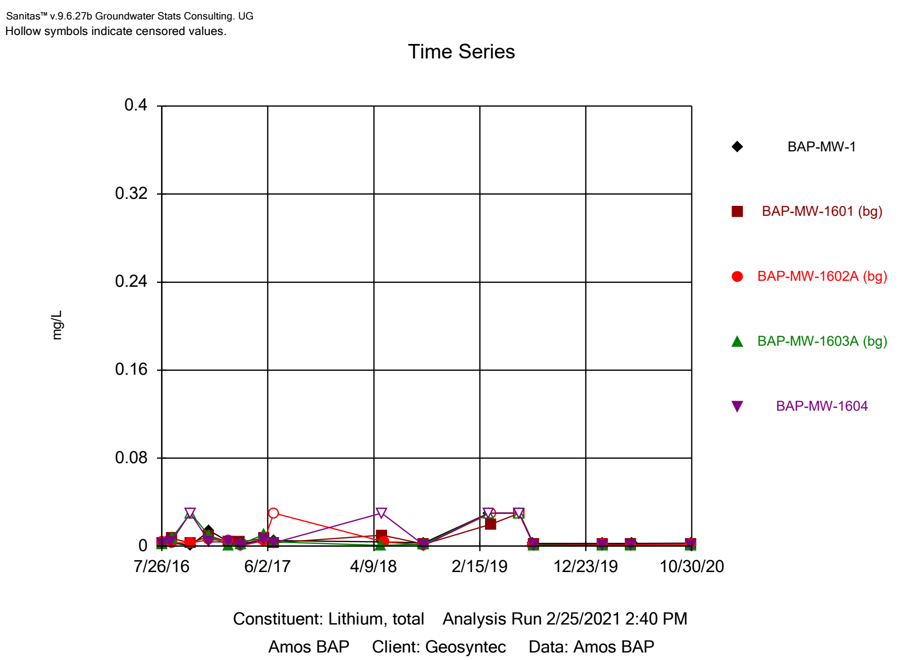
Constituent: Fluoride, total Analysis Run 2/25/2021 2:40 PM
Amos BAP Client: Geosyntec Data: Amos BAP



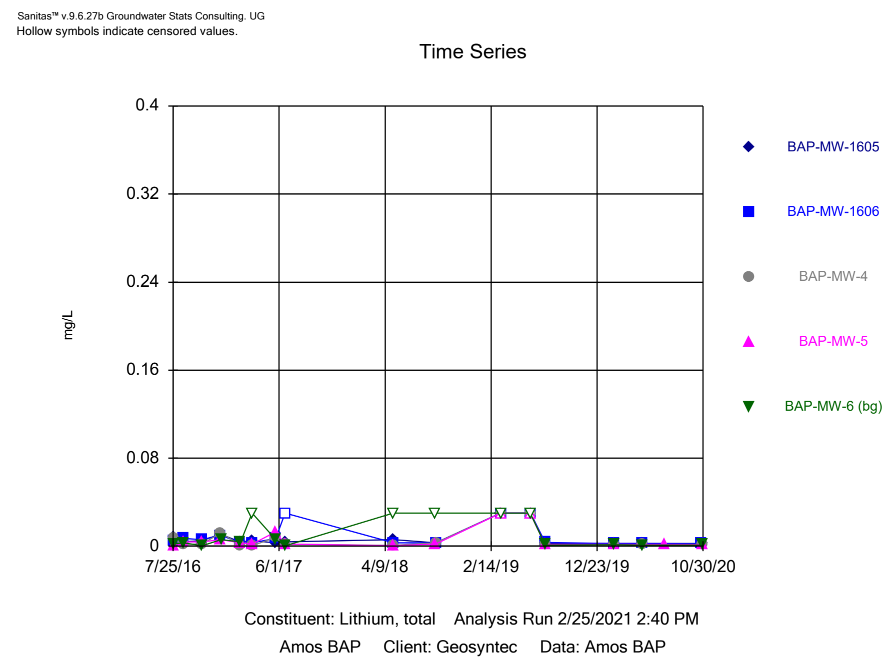
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.
Time Series
mg/L
0.008
0.0064
0.0048
0.0032
0.0016
0
7/26/16
6/2/17
4/9/18
2/15/19
12/23/19
10/30/20
BAP-MW-1
BAP-MW-1601 (bg)
BAP-MW-1602A (bg)
BAP-MW-1603A (bg)
BAP-MW-1604
Constituent: Lead, total Analysis Run 2/25/2021 2:40 PM
Amos BAP Client: Geosyntec Data: Amos BAP



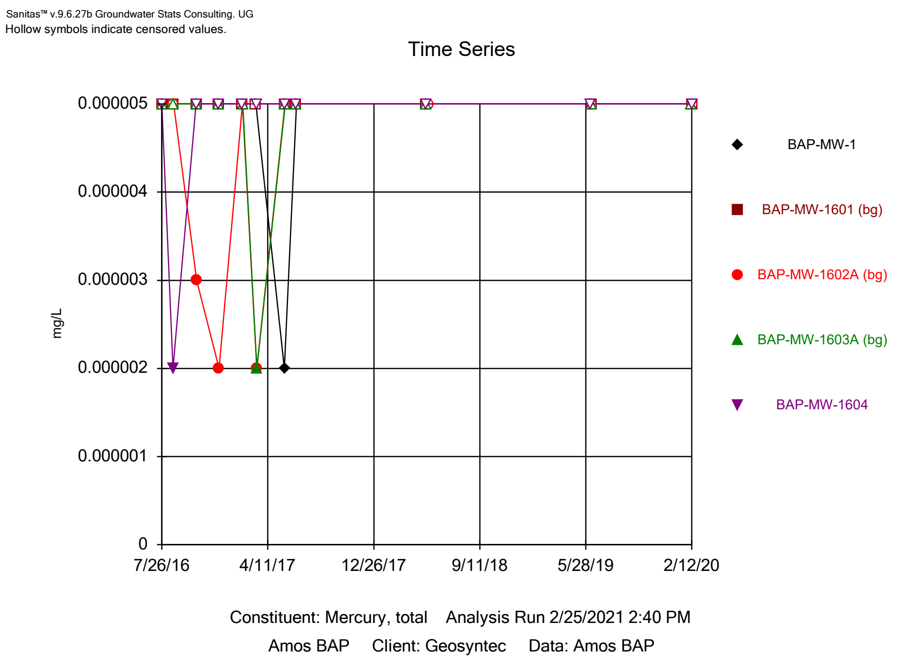
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.
Time Series
mg/L
0.008
0.0064
0.0048
0.0032
0.0016
0
7/25/16
6/1/17
4/9/18
2/14/19
12/23/19
10/30/20
BAP-MW-1605
BAP-MW-1606
BAP-MW-4
BAP-MW-5
BAP-MW-6 (bg)
Constituent: Lead, total Analysis Run 2/25/2021 2:40 PM
Amos BAP Client: Geosyntec Data: Amos BAP

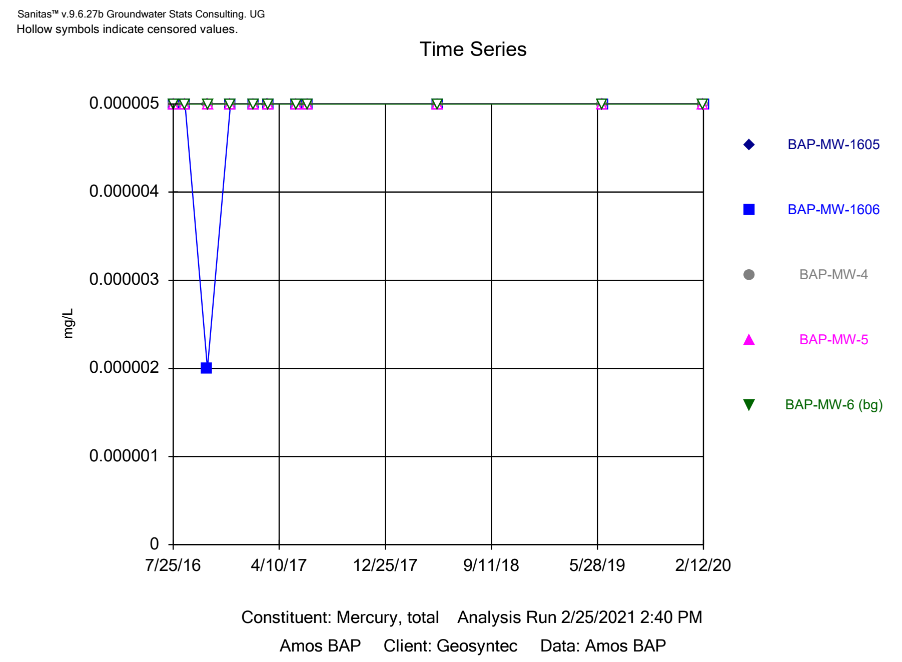


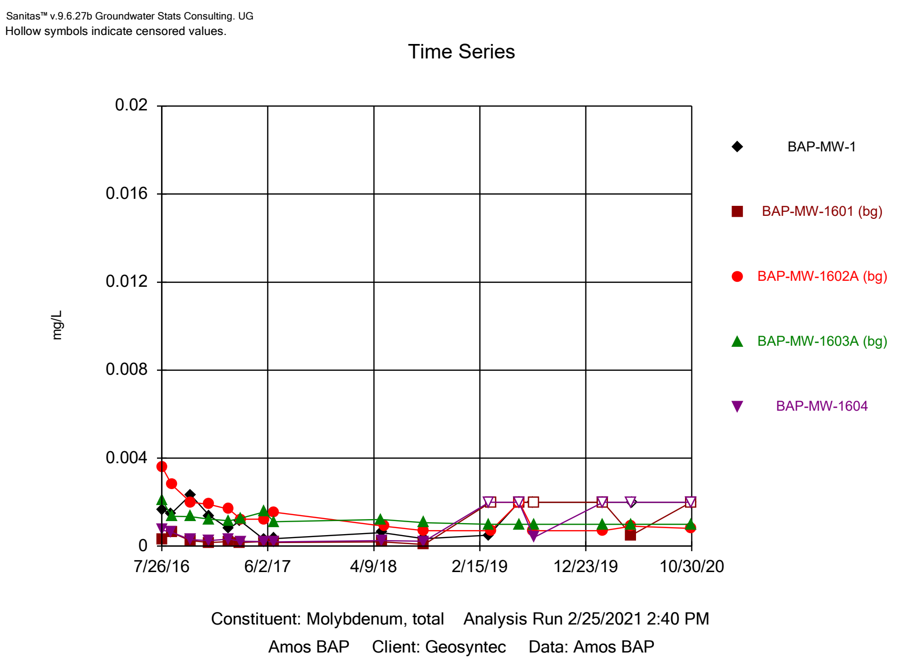
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.
Time Series
mg/L
0.4
0.32
0.24
0.16
0.08
0
7/26/16
6/2/17
4/9/18
2/15/19
12/23/19
10/30/20
BAP-MW-1
BAP-MW-1601 (bg)
BAP-MW-1602A (bg)
BAP-MW-1603A (bg)
BAP-MW-1604
Constituent: Lithium, total Analysis Run 2/25/2021 2:40 PM
Amos BAP Client: Geosyntec Data: Amos BAP

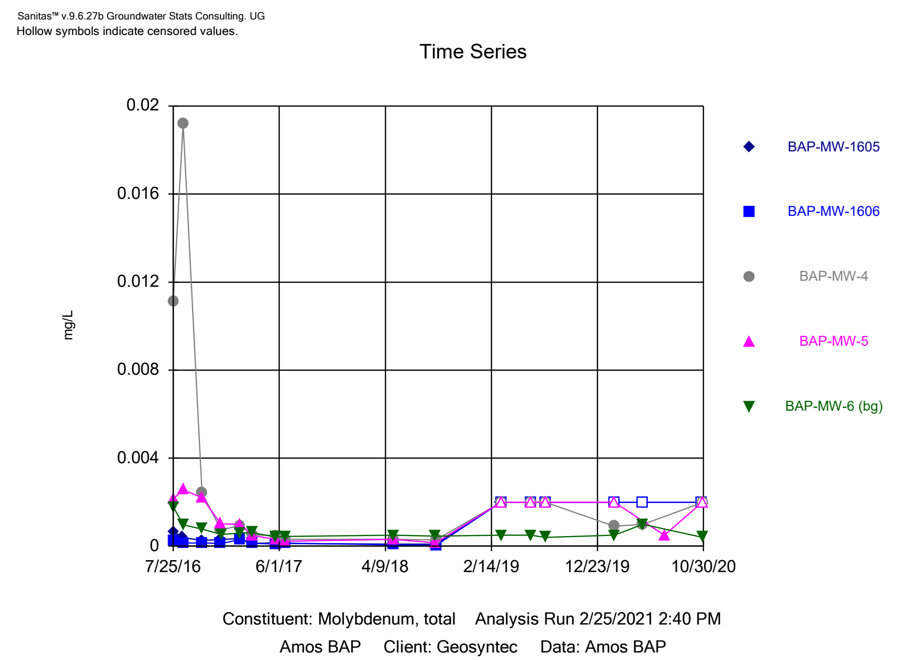


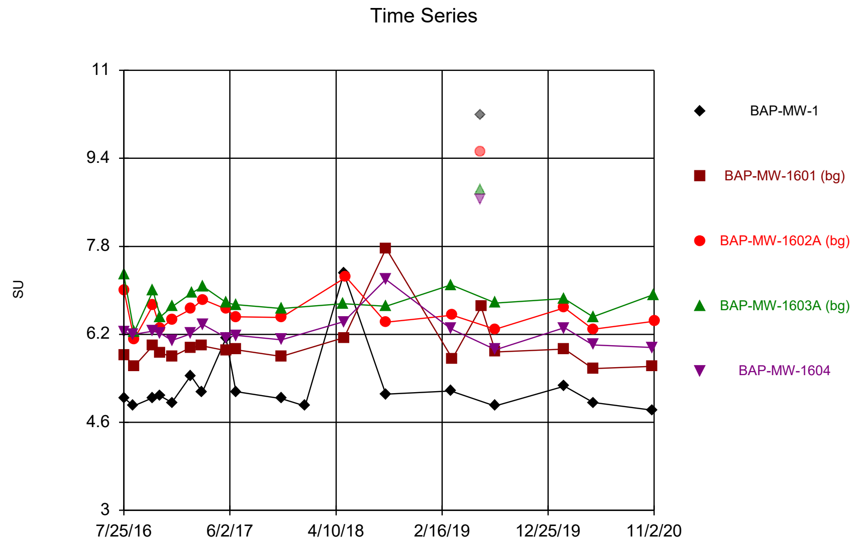
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.
Time Series
mg/L
0.4
0.32
0.24
0.16
0.08
0
7/25/16
6/1/17
4/9/18
2/14/19
12/23/19
10/30/20
BAP-MW-1605
BAP-MW-1606
BAP-MW-4
BAP-MW-5
BAP-MW-6 (bg)
Constituent: Lithium, total Analysis Run 2/25/2021 2:40 PM
Amos BAP Client: Geosyntec Data: Amos BAP


Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.
Time Series
0.000005
0.000004
0.000003
0.000002
0.000001
0
mg/L
7/26/16
4/11/17
12/26/17
9/11/18
5/28/19
2/12/20
BAP-MW-1
BAP-MW-1601 (bg)
BAP-MW-1602A (bg)
BAP-MW-1603A (bg)
BAP-MW-1604
Constituent: Mercury, total Analysis Run 2/25/2021 2:40 PM
Amos BAP Client: Geosyntec Data: Amos BAP


Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.
Time Series
0.000005
0.000004
0.000003
0.000002
0.000001
0
mg/L
7/25/16
4/10/17
12/25/17
9/11/18
5/28/19
2/12/20
BAP-MW-1605
BAP-MW-1606
BAP-MW-4
BAP-MW-5
BAP-MW-6 (bg)
Constituent: Mercury, total Analysis Run 2/25/2021 2:40 PM
Amos BAP Client: Geosyntec Data: Amos BAP

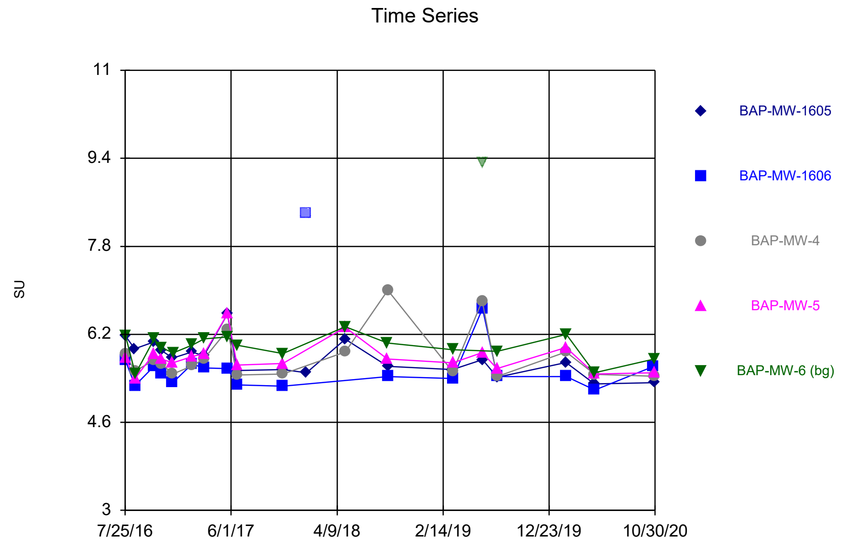

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.
Time Series
0.02
0.016
0.012
0.008
0.004
0
mg/L
7/26/16
6/2/17
4/9/18
2/15/19
12/23/19
10/30/20
BAP-MW-1
BAP-MW-1601 (bg)
BAP-MW-1602A (bg)
BAP-MW-1603A (bg)
BAP-MW-1604
Constituent: Molybdenum, total Analysis Run 2/25/2021 2:40 PM
Amos BAP Client: Geosyntec Data: Amos BAP


Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.
Time Series
0.02
0.016
0.012
0.008
0.004
0
mg/L
7/25/16
6/1/17
4/9/18
2/14/19
12/23/19
10/30/20
BAP-MW-1605
BAP-MW-1606
BAP-MW-4
BAP-MW-5
BAP-MW-6 (bg)
Constituent: Molybdenum, total Analysis Run 2/25/2021 2:40 PM
Amos BAP Client: Geosyntec Data: Amos BAP



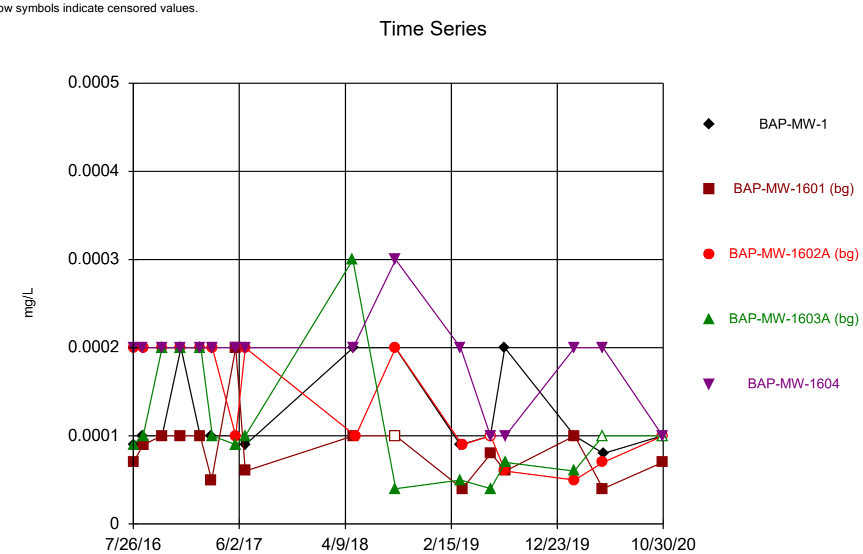
Constituent: pH, field Analysis Run 2/25/2021 2:40 PM
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



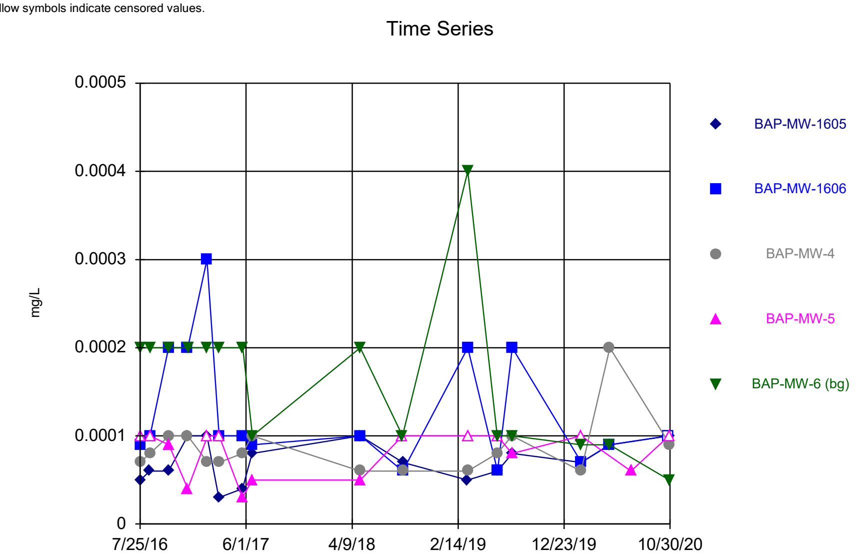
Constituent: pH, field Analysis Run 2/25/2021 2:40 PM
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

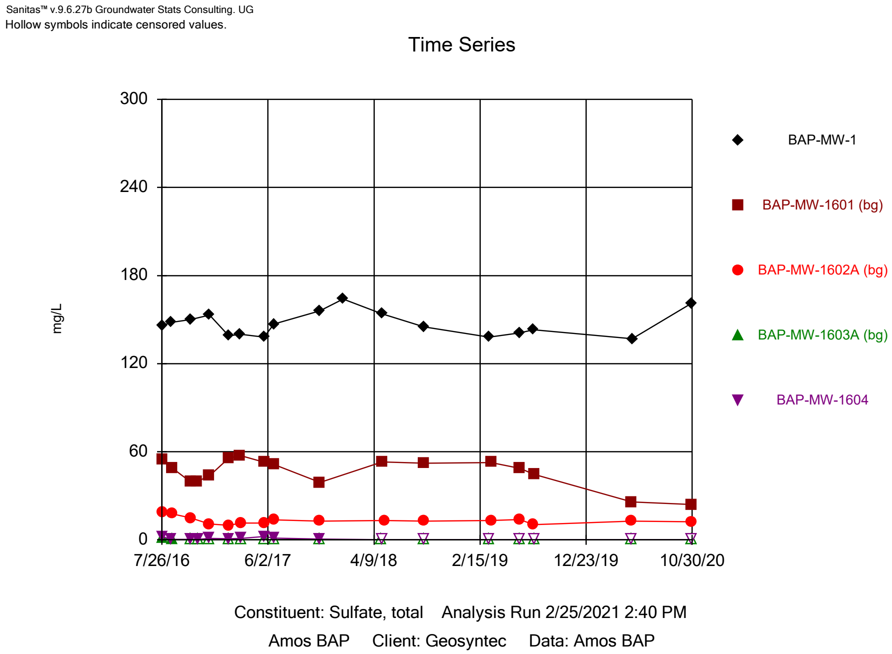


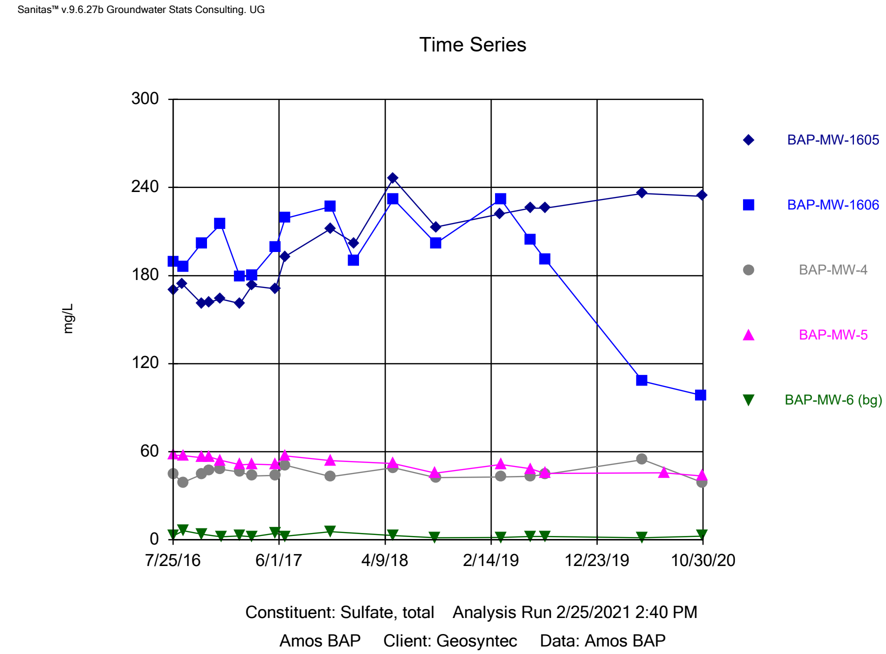
Constituent: Selenium, total Analysis Run 2/25/2021 2:40 PM
Amos BAP Client: Geosyntec Data: Amos BAP

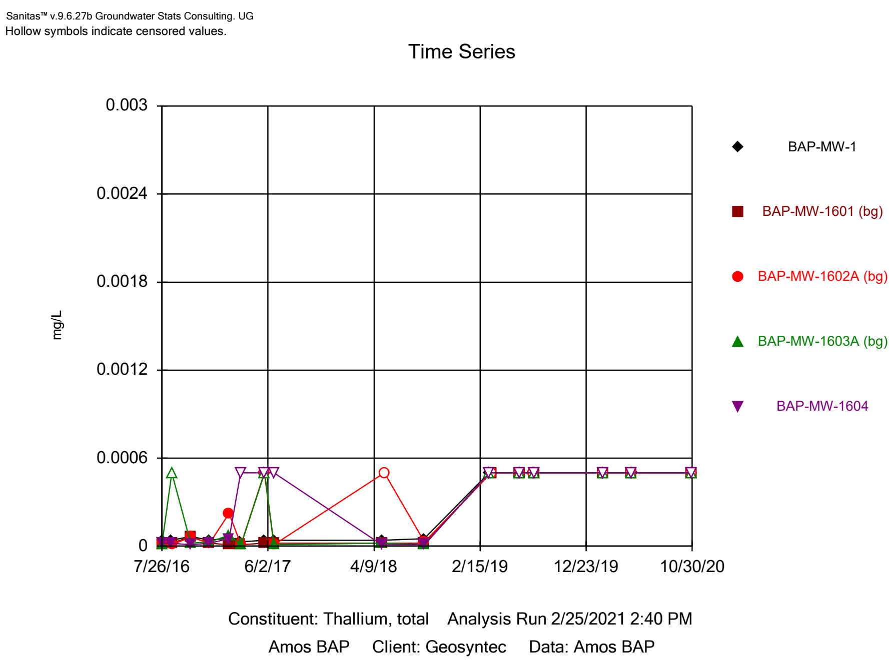
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

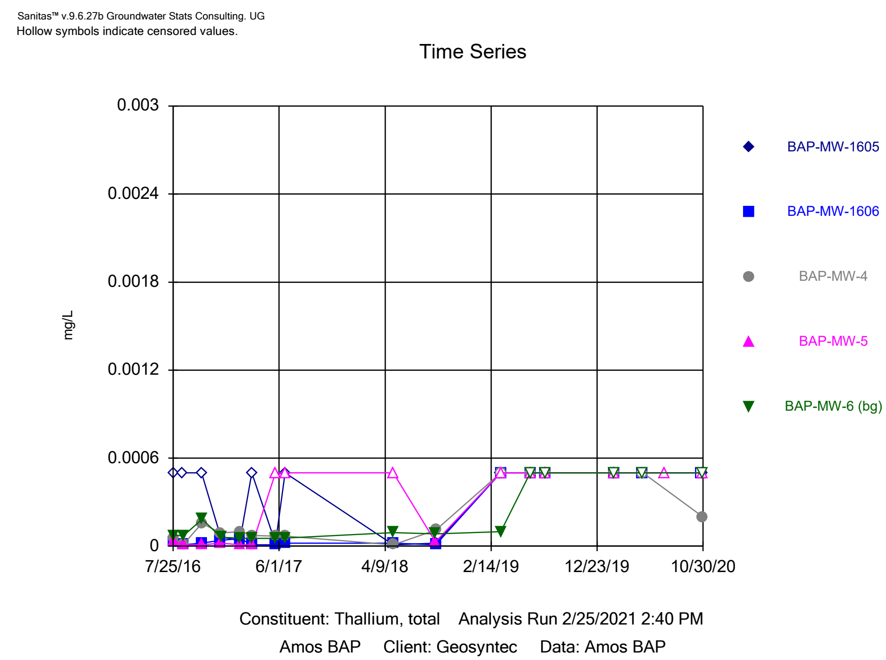


Constituent: Selenium, total Analysis Run 2/25/2021 2:40 PM
Amos BAP Client: Geosyntec Data: Amos BAP


Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.
Time Series
300
240
180
120
60
0
mg/L
7/26/16
6/2/17
4/9/18
2/15/19
12/23/19
10/30/20
BAP-MW-1
BAP-MW-1601 (bg)
BAP-MW-1602A (bg)
BAP-MW-1603A (bg)
BAP-MW-1604
Constituent: Sulfate, total Analysis Run 2/25/2021 2:40 PM
Amos BAP Client: Geosyntec Data: Amos BAP

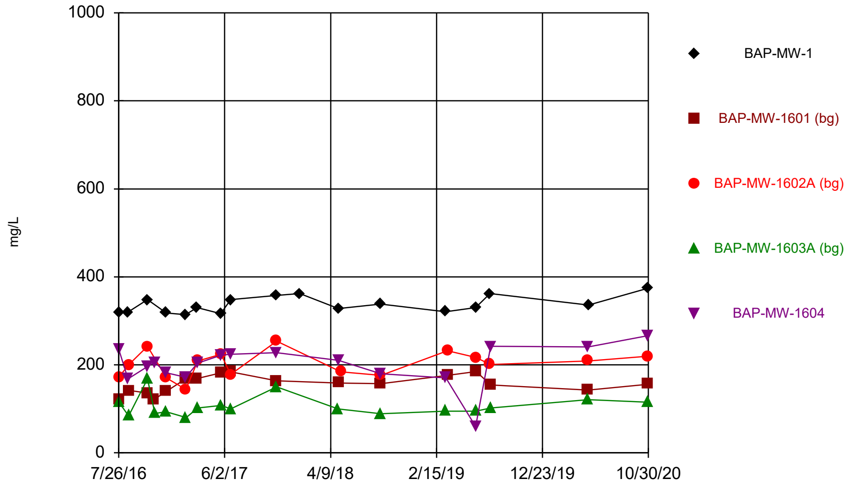

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Time Series
300
240
180
120
60
0
mg/L
7/25/16
6/1/17
4/9/18
2/14/19
12/23/19
10/30/20
BAP-MW-1605
BAP-MW-1606
BAP-MW-4
BAP-MW-5
BAP-MW-6 (bg)
Constituent: Sulfate, total Analysis Run 2/25/2021 2:40 PM
Amos BAP Client: Geosyntec Data: Amos BAP


Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.
Time Series
0.003
0.0024
0.0018
0.0012
0.0006
0
mg/L
7/26/16
6/2/17
4/9/18
2/15/19
12/23/19
10/30/20
BAP-MW-1
BAP-MW-1601 (bg)
BAP-MW-1602A (bg)
BAP-MW-1603A (bg)
BAP-MW-1604
Constituent: Thallium, total Analysis Run 2/25/2021 2:40 PM
Amos BAP Client: Geosyntec Data: Amos BAP


Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.
Time Series
0.003
0.0024
0.0018
0.0012
0.0006
0
mg/L
7/25/16
6/1/17
4/9/18
2/14/19
12/23/19
10/30/20
BAP-MW-1605
BAP-MW-1606
BAP-MW-4
BAP-MW-5
BAP-MW-6 (bg)
Constituent: Thallium, total Analysis Run 2/25/2021 2:40 PM
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG

Time Series

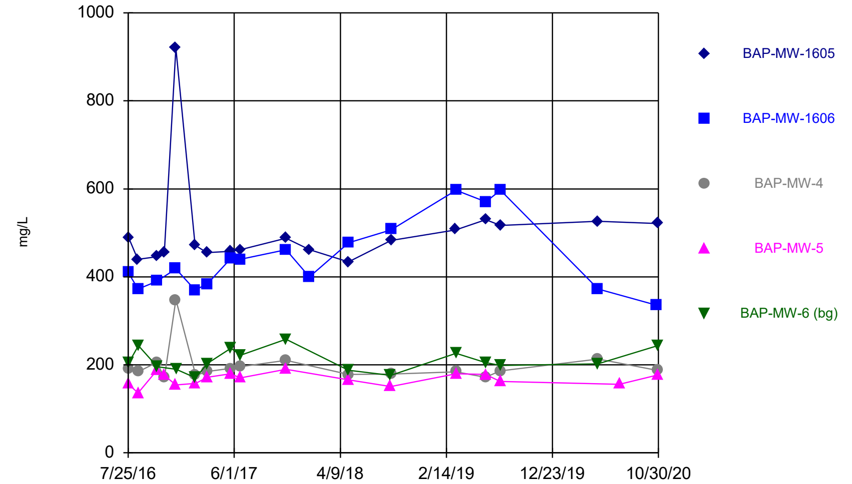


Constituent: Total Dissolved Solids [TDS]   Analysis Run 2/25/2021 2:40 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG

Time Series



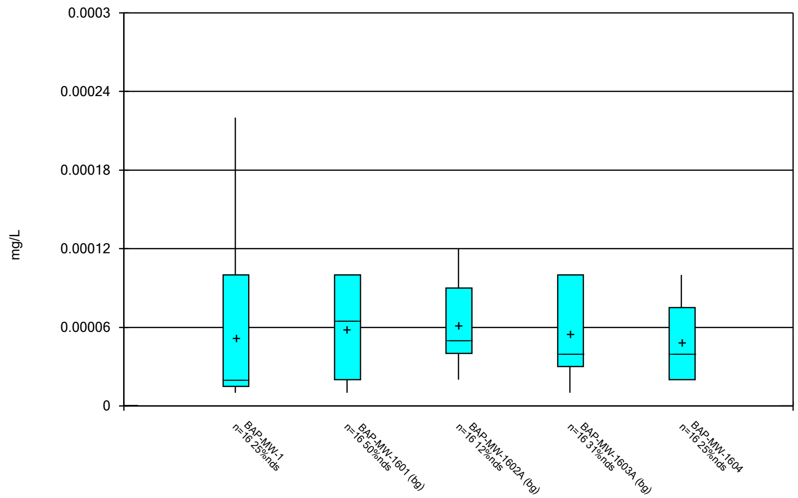
Constituent: Total Dissolved Solids [TDS]   Analysis Run 2/25/2021 2:40 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

FIGURE B. Box Plots

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG

Box & Whiskers Plot

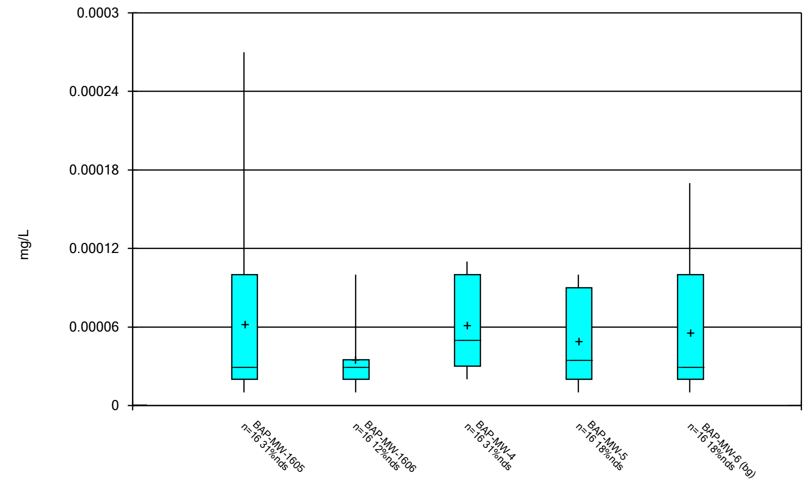


Constituent: Antimony, total   Analysis Run 2/26/2021 1:50 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG

Box & Whiskers Plot

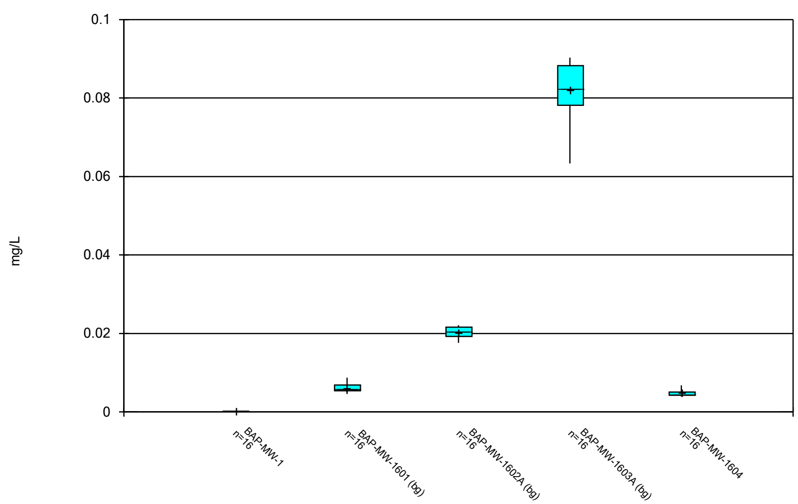


Constituent: Antimony, total   Analysis Run 2/26/2021 1:50 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG

Box & Whiskers Plot

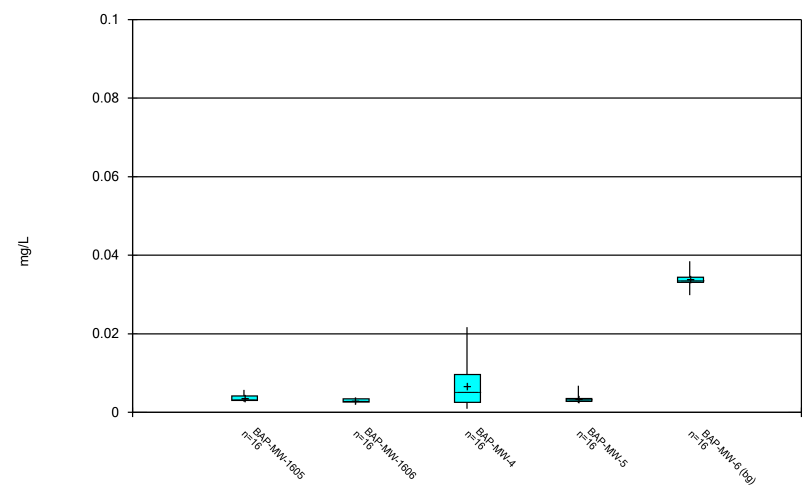


Constituent: Arsenic, total   Analysis Run 2/26/2021 1:50 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG

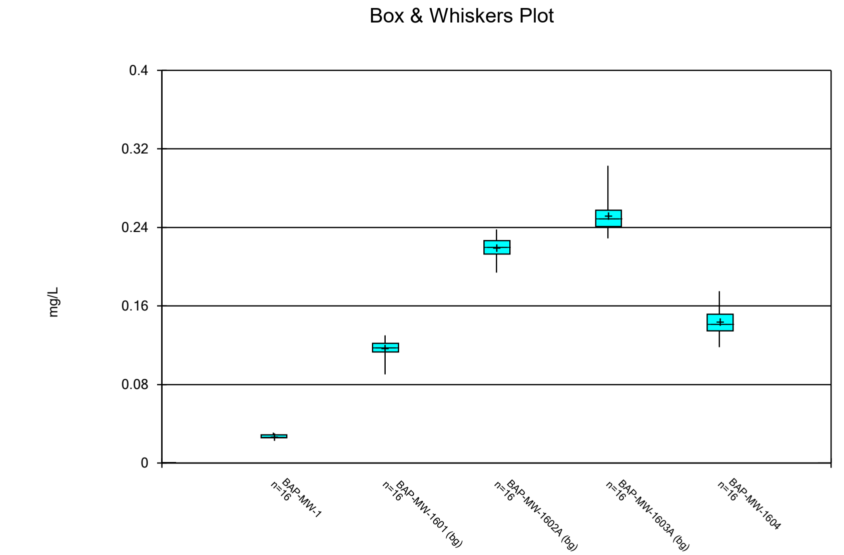
Box & Whiskers Plot



Constituent: Arsenic, total   Analysis Run 2/26/2021 1:50 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

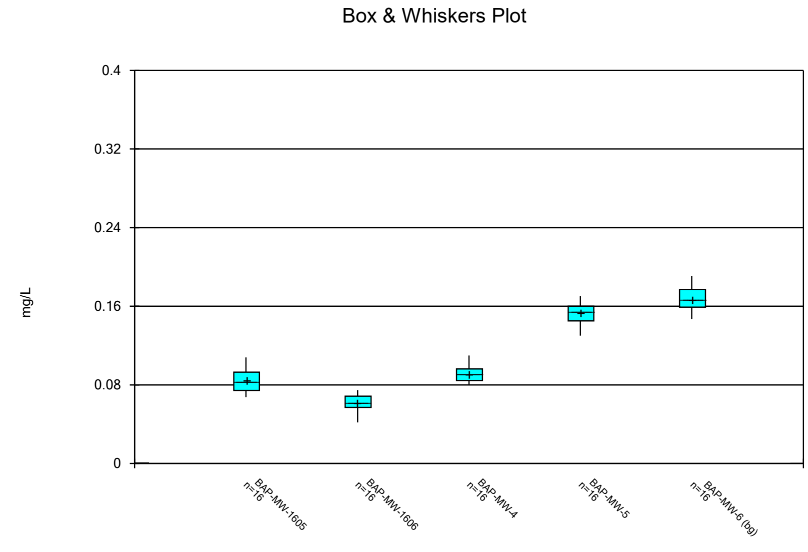
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



Constituent: Barium, total   Analysis Run 2/26/2021 1:50 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

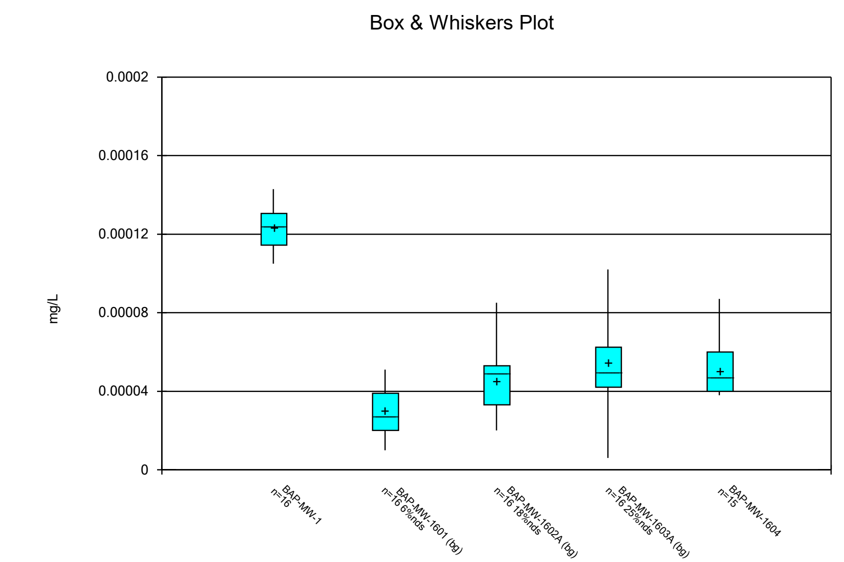
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



Constituent: Barium, total   Analysis Run 2/26/2021 1:50 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

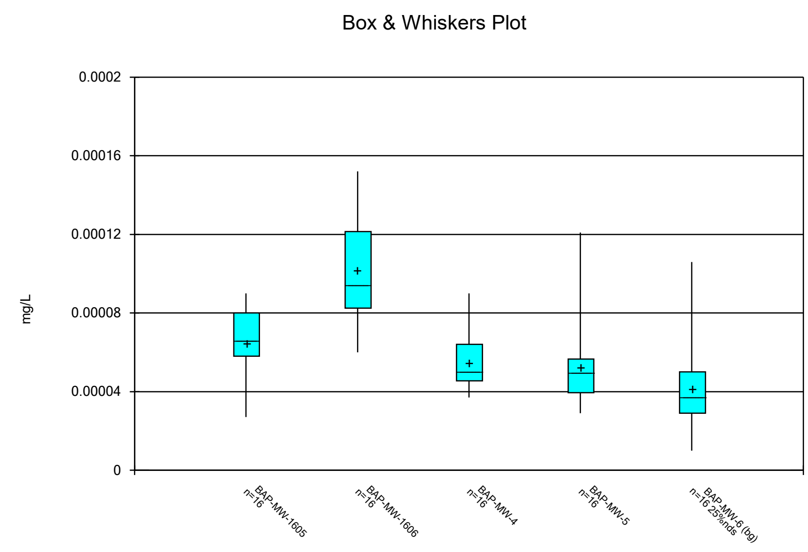
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



Constituent: Beryllium, total   Analysis Run 2/26/2021 1:50 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

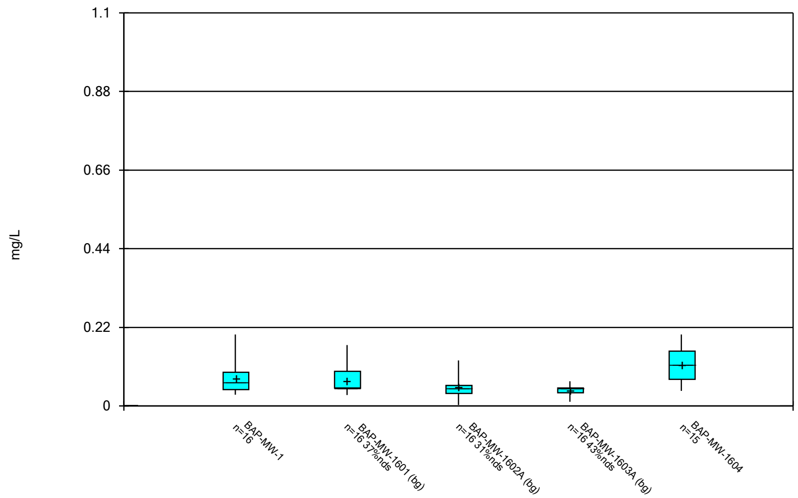
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



Constituent: Beryllium, total   Analysis Run 2/26/2021 1:50 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

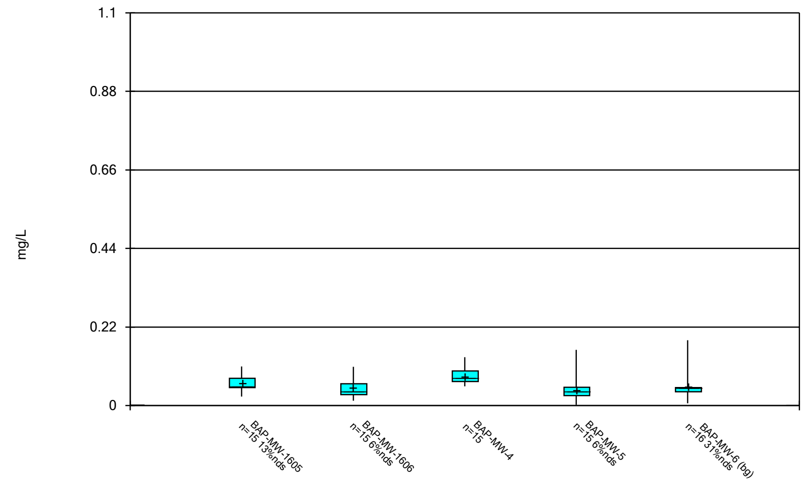
Box & Whiskers Plot



Constituent: Boron, total Analysis Run 2/26/2021 1:50 PM

Amos BAP Client: Geosyntec Data: Amos BAP

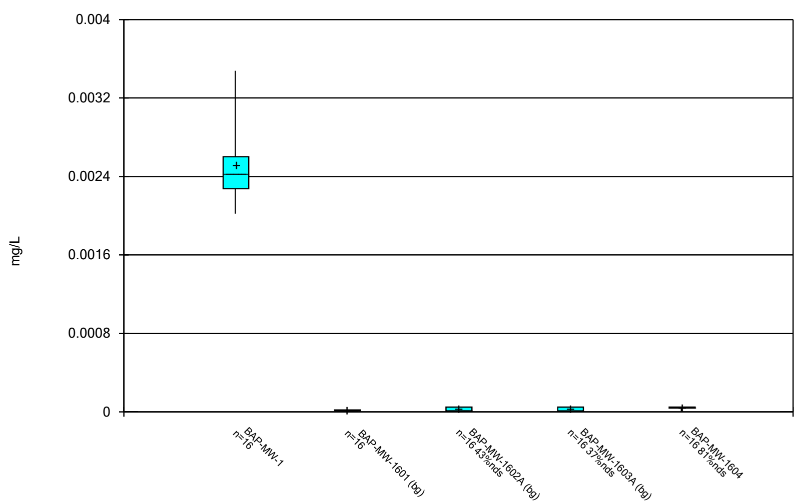
Box & Whiskers Plot



Constituent: Boron, total Analysis Run 2/26/2021 1:50 PM

Amos BAP Client: Geosyntec Data: Amos BAP

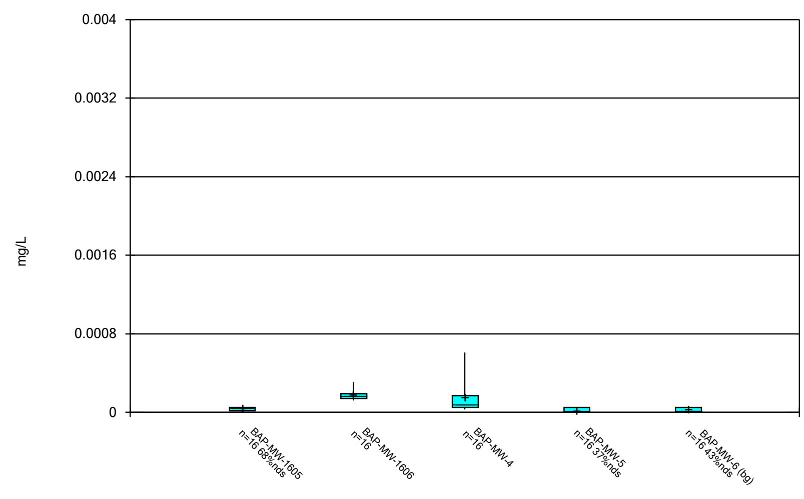
Box & Whiskers Plot



Constituent: Cadmium, total Analysis Run 2/26/2021 1:50 PM

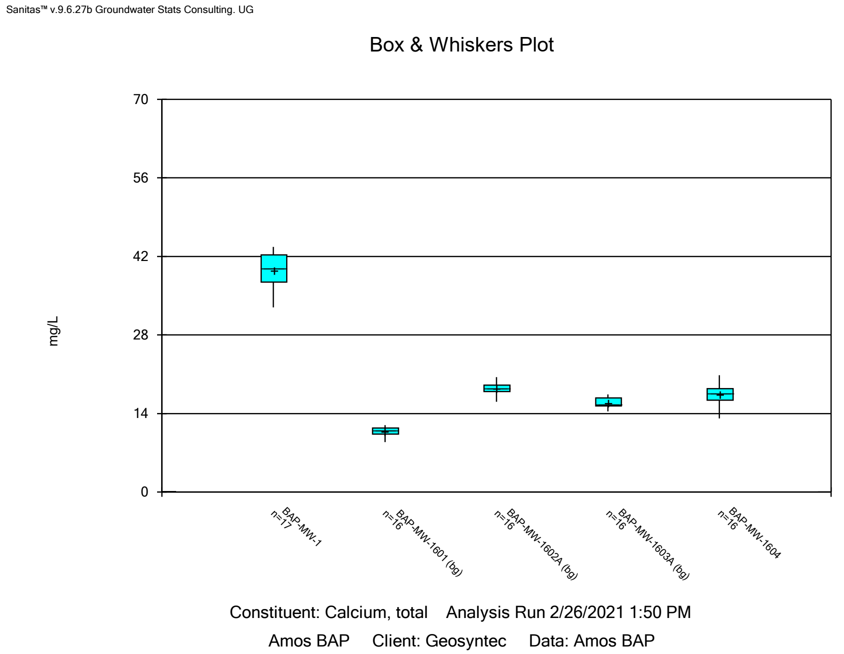
Amos BAP Client: Geosyntec Data: Amos BAP

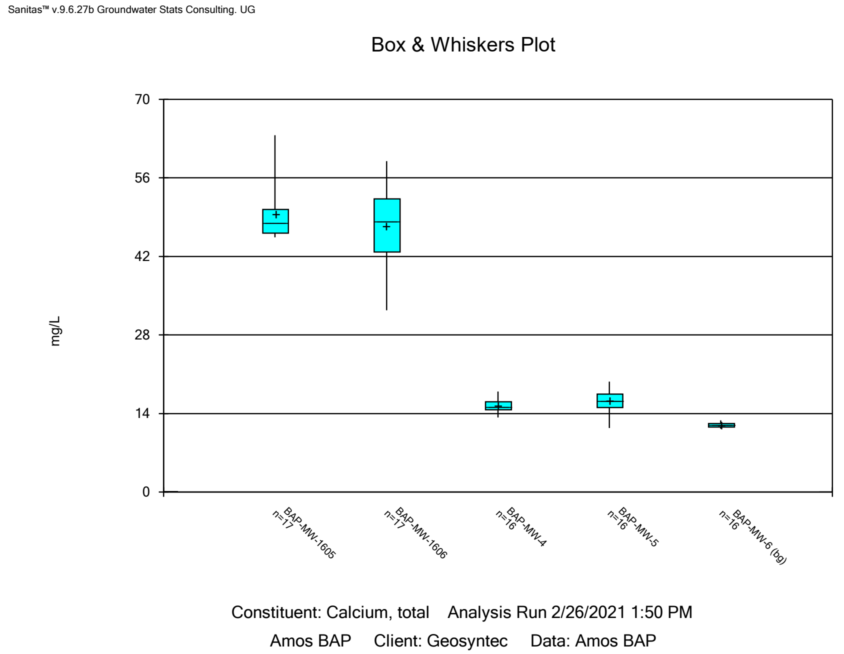
Box & Whiskers Plot

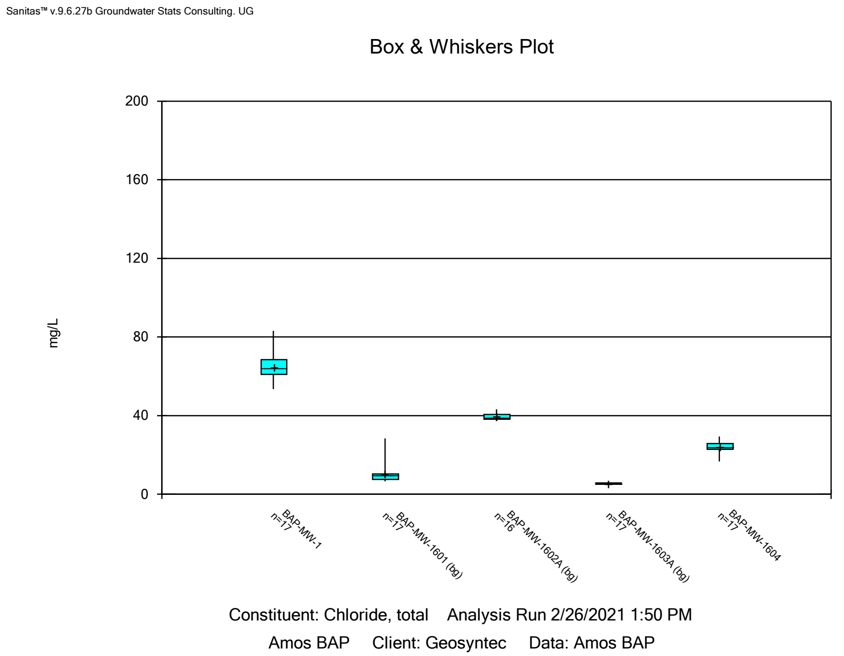


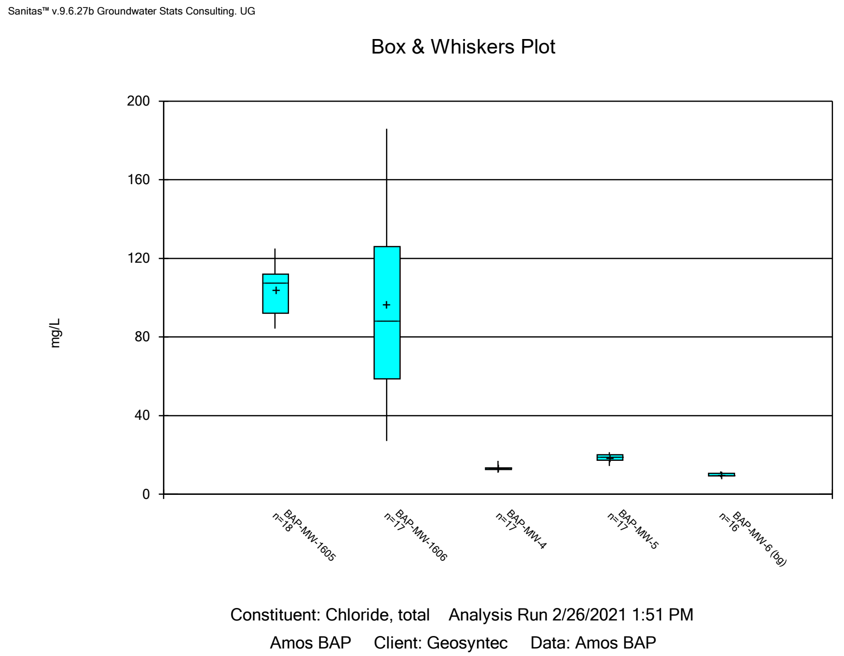
Constituent: Cadmium, total Analysis Run 2/26/2021 1:50 PM

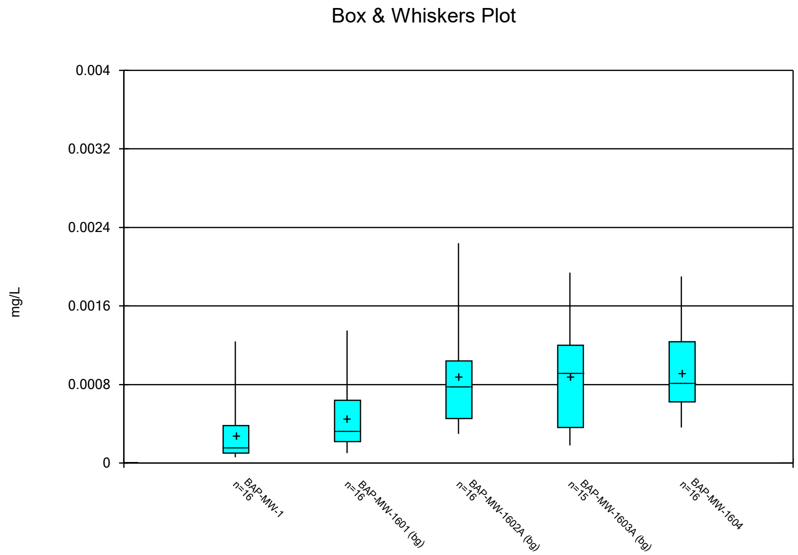
Amos BAP Client: Geosyntec Data: Amos BAP


Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Box & Whiskers Plot
mg/L
70
56
42
28
14
0
BAP-MW-1 n=17
BAP-MW-1601 (bg) n=16
BAP-MW-1602A (bg) n=16
BAP-MW-1603A (bg) n=16
BAP-MW-1604 n=16
Constituent: Calcium, total Analysis Run 2/26/2021 1:50 PM
Amos BAP Client: Geosyntec Data: Amos BAP


Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Box & Whiskers Plot
mg/L
70
56
42
28
14
0
BAP-MW-1605 n=17
BAP-MW-1606 n=17
BAP-MW-4 n=16
BAP-MW-5 n=16
BAP-MW-6 (bg) n=16
Constituent: Calcium, total Analysis Run 2/26/2021 1:50 PM
Amos BAP Client: Geosyntec Data: Amos BAP

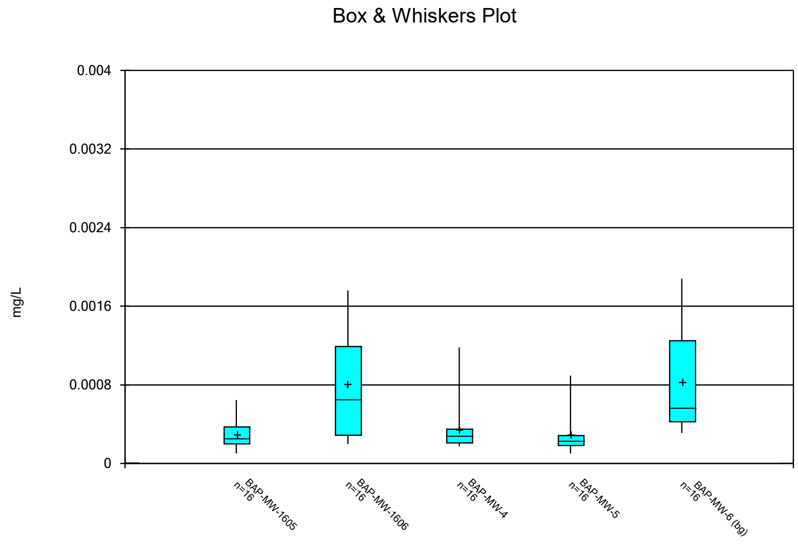

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Box & Whiskers Plot
mg/L
200
160
120
80
40
0
BAP-MW-1 n=17
BAP-MW-1601 (bg) n=17
BAP-MW-1602A (bg) n=16
BAP-MW-1603A (bg) n=17
BAP-MW-1604 n=17
Constituent: Chloride, total Analysis Run 2/26/2021 1:50 PM
Amos BAP Client: Geosyntec Data: Amos BAP


Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Box & Whiskers Plot
mg/L
200
160
120
80
40
0
BAP-MW-1605 n=18
BAP-MW-1606 n=17
BAP-MW-4 n=17
BAP-MW-5 n=17
BAP-MW-6 (bg) n=16
Constituent: Chloride, total Analysis Run 2/26/2021 1:51 PM
Amos BAP Client: Geosyntec Data: Amos BAP



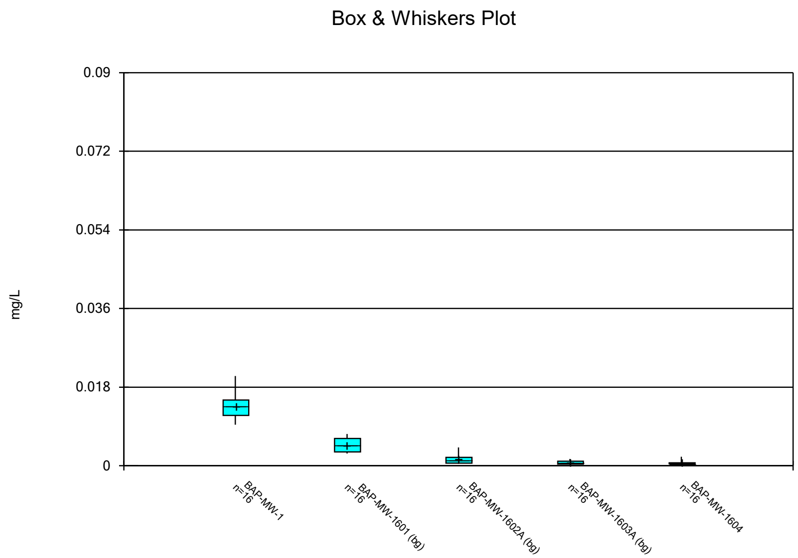
Constituent: Chromium, total Analysis Run 2/26/2021 1:51 PM
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



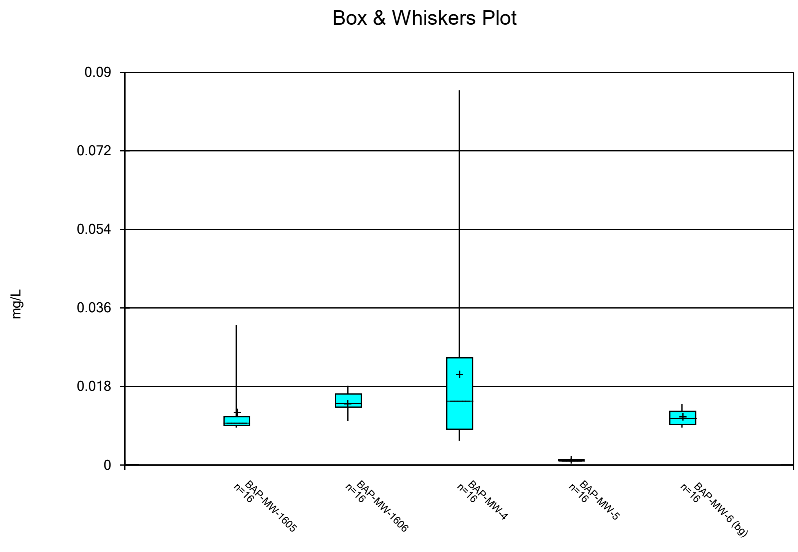
Constituent: Chromium, total Analysis Run 2/26/2021 1:51 PM
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



Constituent: Cobalt, total Analysis Run 2/26/2021 1:51 PM
Amos BAP Client: Geosyntec Data: Amos BAP

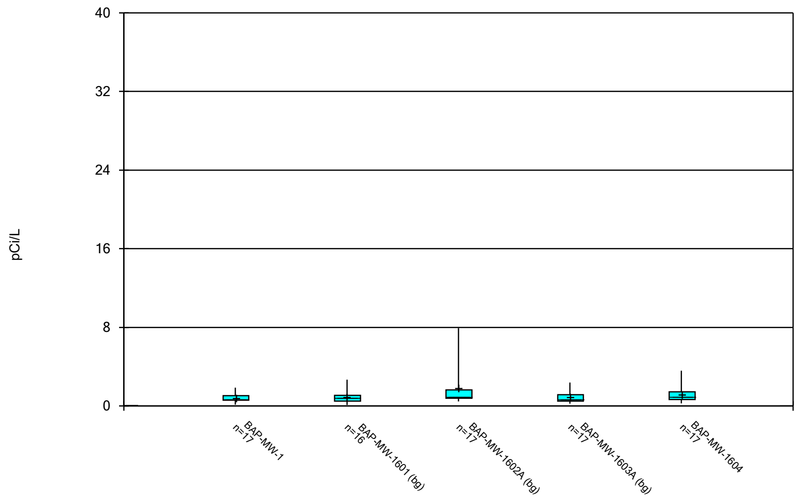
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



Constituent: Cobalt, total Analysis Run 2/26/2021 1:51 PM
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG

Box & Whiskers Plot

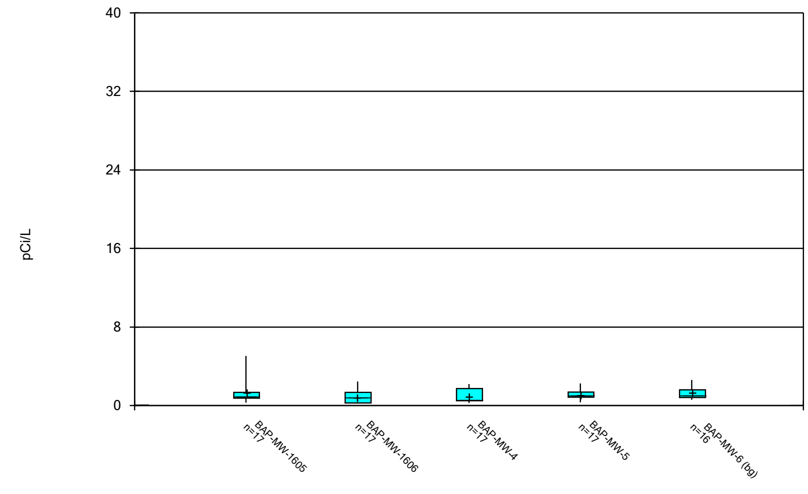


Constituent: Combined Radium 226 + 228   Analysis Run 2/26/2021 1:51 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG

Box & Whiskers Plot

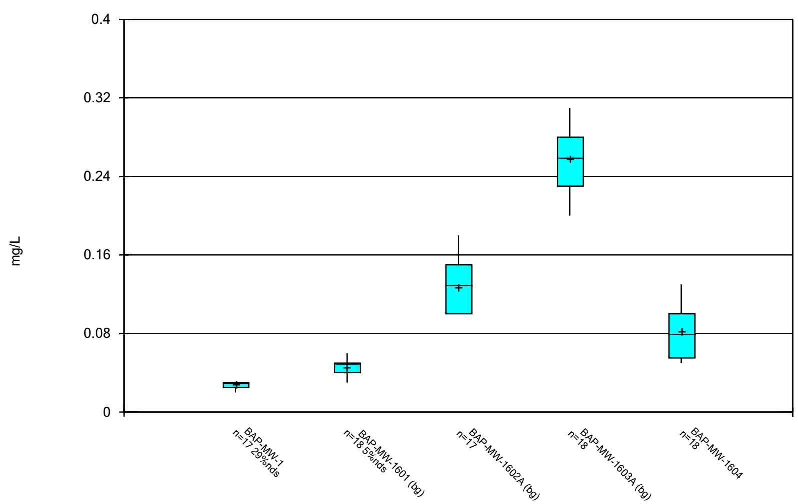


Constituent: Combined Radium 226 + 228   Analysis Run 2/26/2021 1:51 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG

Box & Whiskers Plot

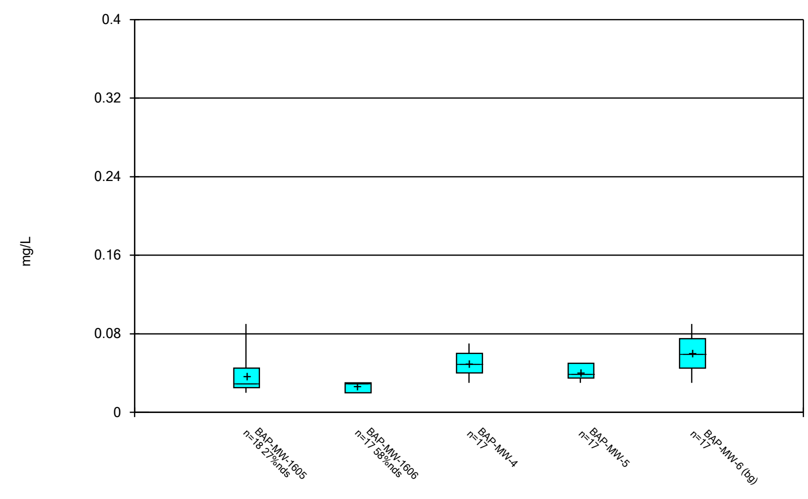


Constituent: Fluoride, total   Analysis Run 2/26/2021 1:51 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG

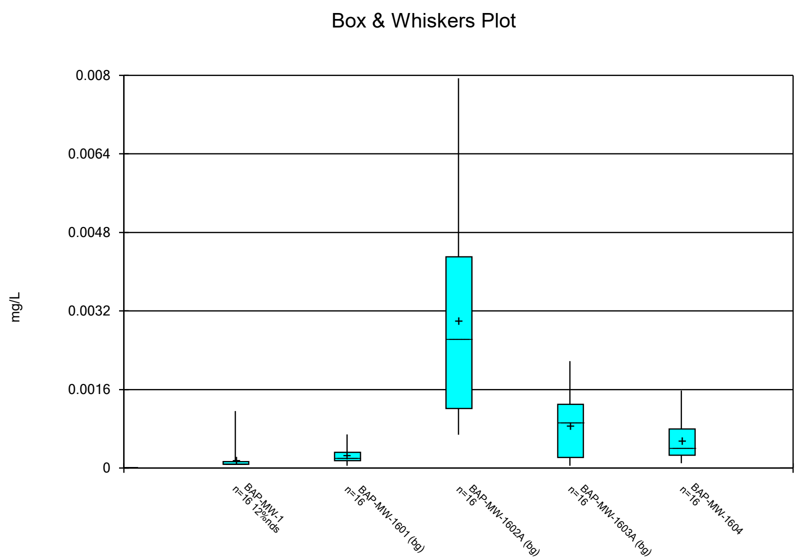
Box & Whiskers Plot



Constituent: Fluoride, total   Analysis Run 2/26/2021 1:51 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

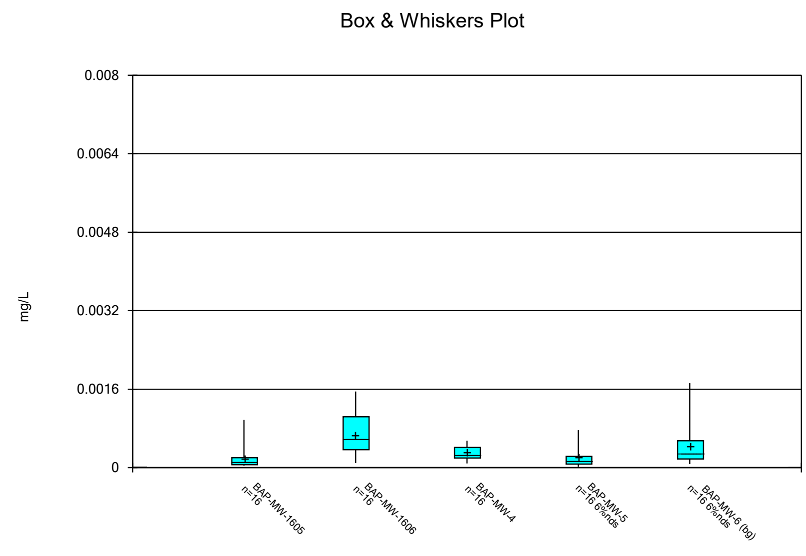
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



Constituent: Lead, total   Analysis Run 2/26/2021 1:51 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

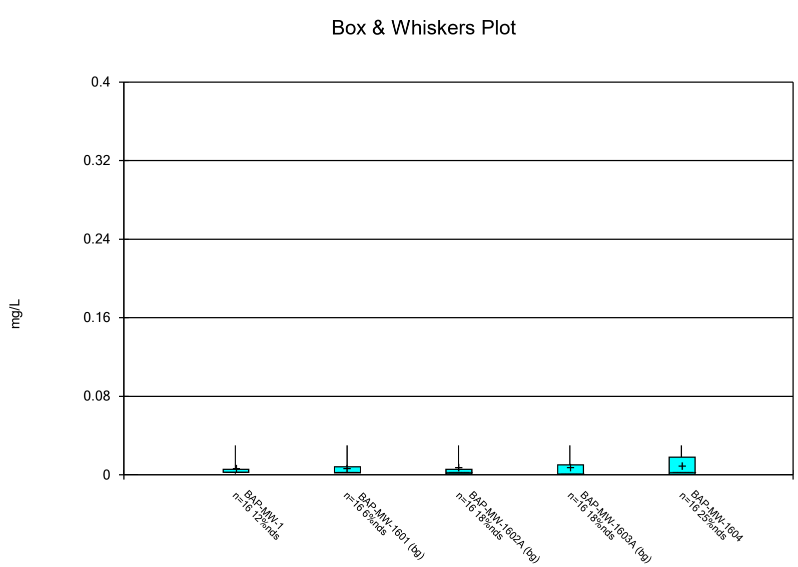
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



Constituent: Lead, total   Analysis Run 2/26/2021 1:51 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

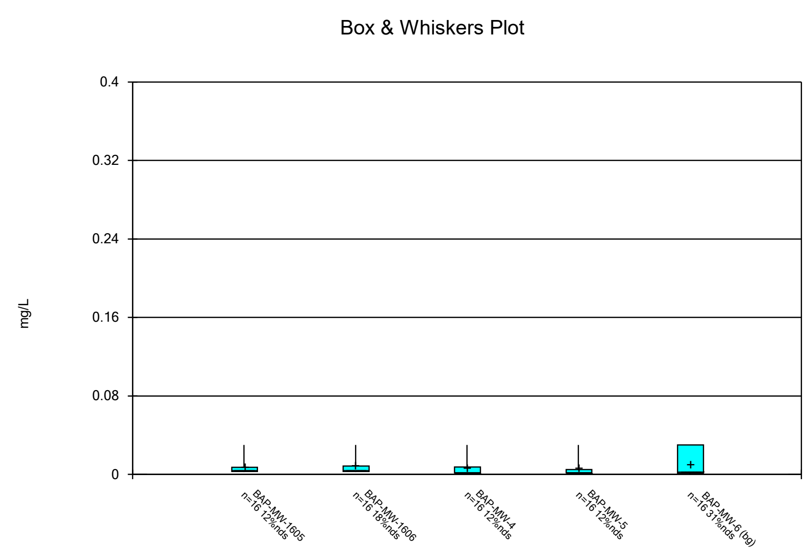
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



Constituent: Lithium, total   Analysis Run 2/26/2021 1:51 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

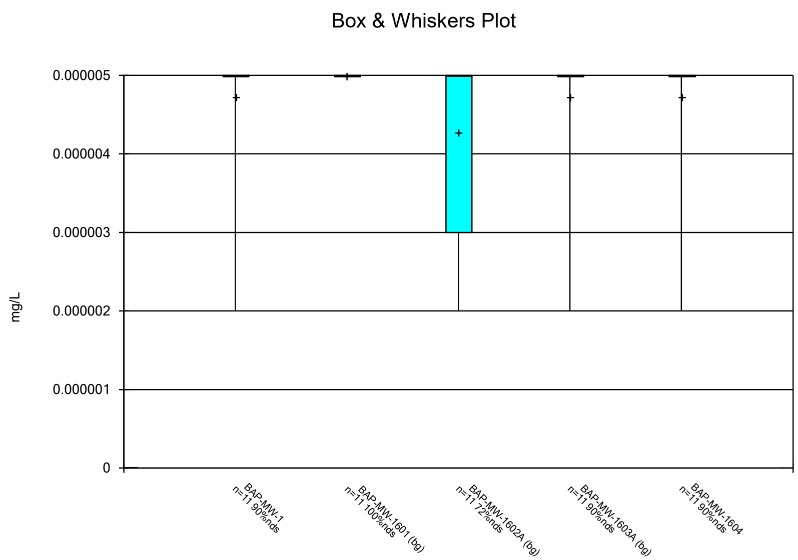
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



Constituent: Lithium, total   Analysis Run 2/26/2021 1:51 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

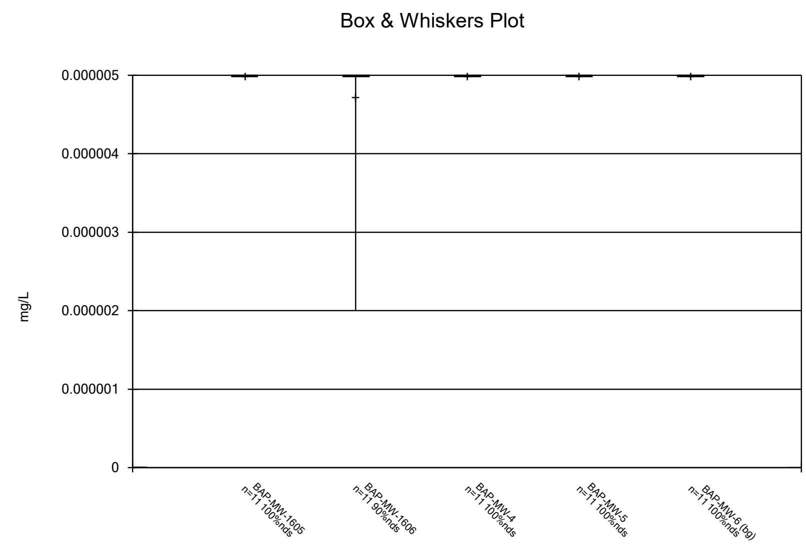
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



Constituent: Mercury, total   Analysis Run 2/26/2021 1:51 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

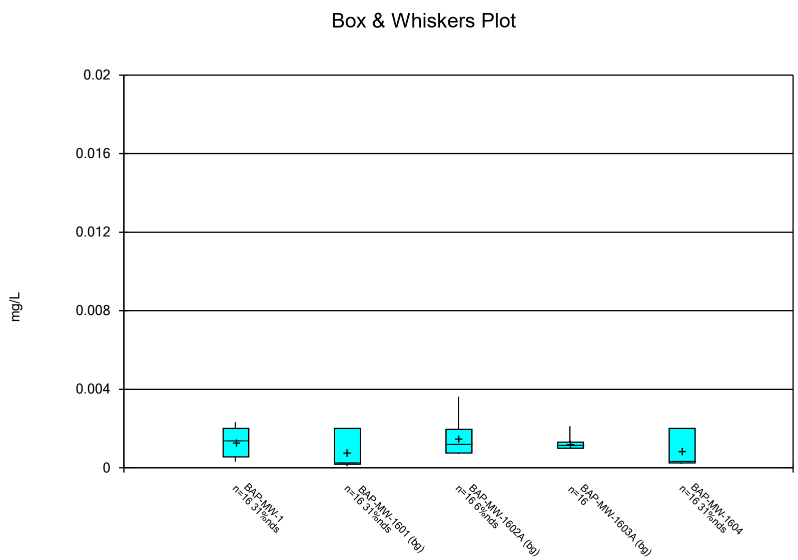
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



Constituent: Mercury, total   Analysis Run 2/26/2021 1:51 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

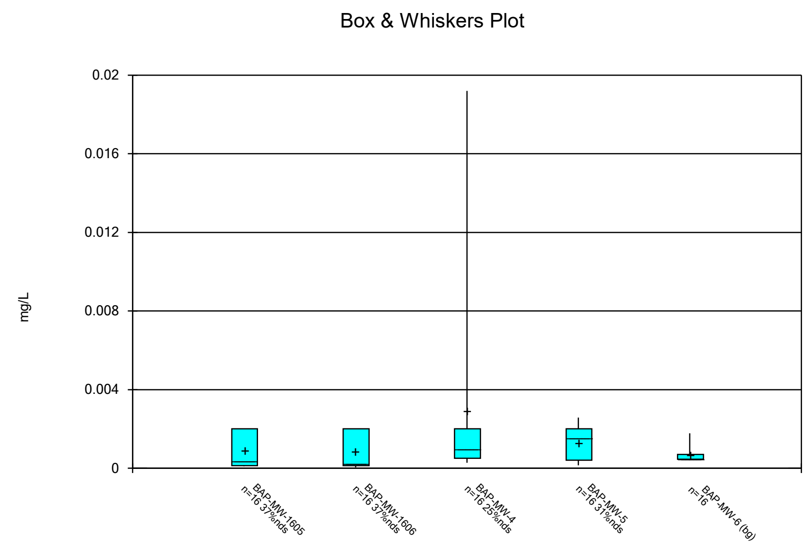
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



Constituent: Molybdenum, total   Analysis Run 2/26/2021 1:51 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

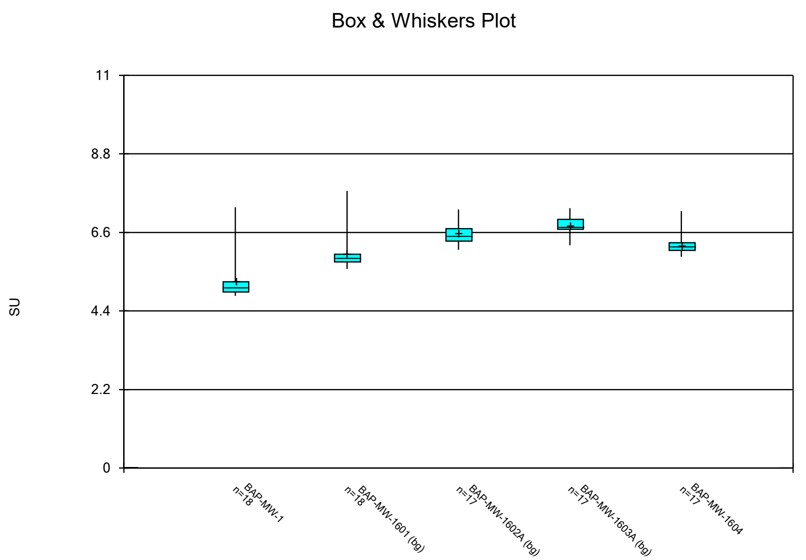
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



Constituent: Molybdenum, total   Analysis Run 2/26/2021 1:51 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

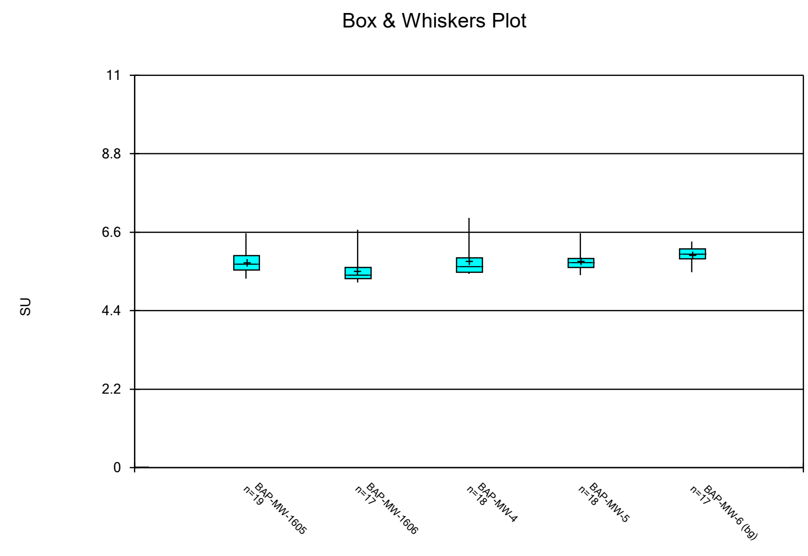
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



Constituent: pH, field Analysis Run 2/26/2021 1:51 PM

Amos BAP Client: Geosyntec Data: Amos BAP

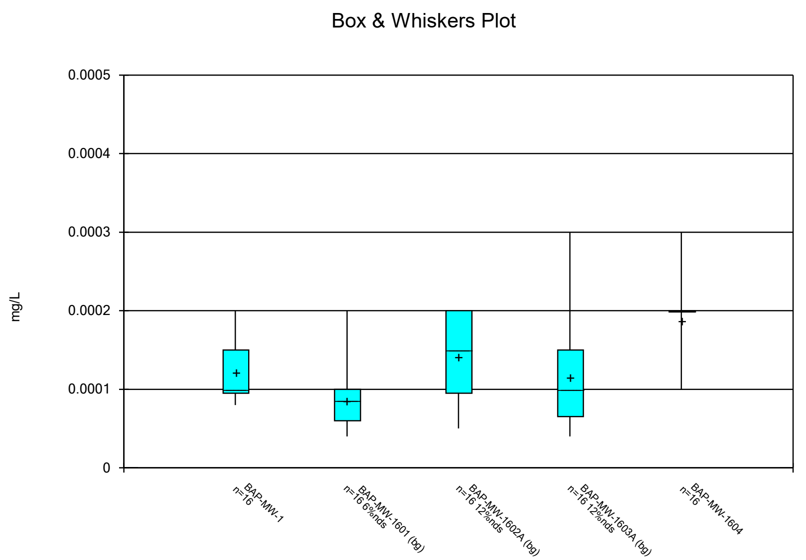
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



Constituent: pH, field Analysis Run 2/26/2021 1:51 PM

Amos BAP Client: Geosyntec Data: Amos BAP

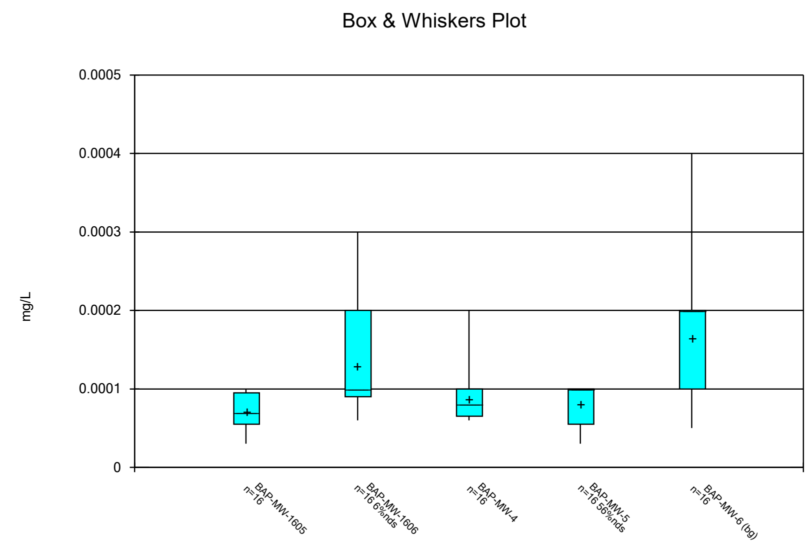
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



Constituent: Selenium, total Analysis Run 2/26/2021 1:51 PM

Amos BAP Client: Geosyntec Data: Amos BAP

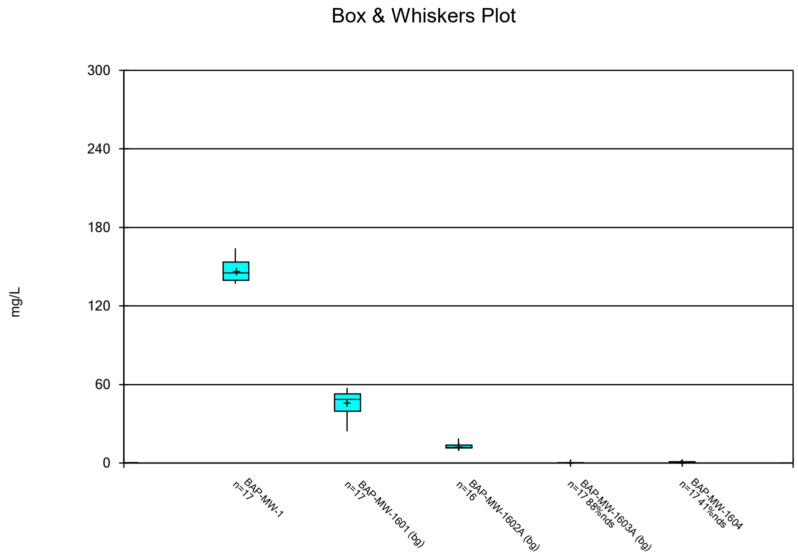
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



Constituent: Selenium, total Analysis Run 2/26/2021 1:51 PM

Amos BAP Client: Geosyntec Data: Amos BAP

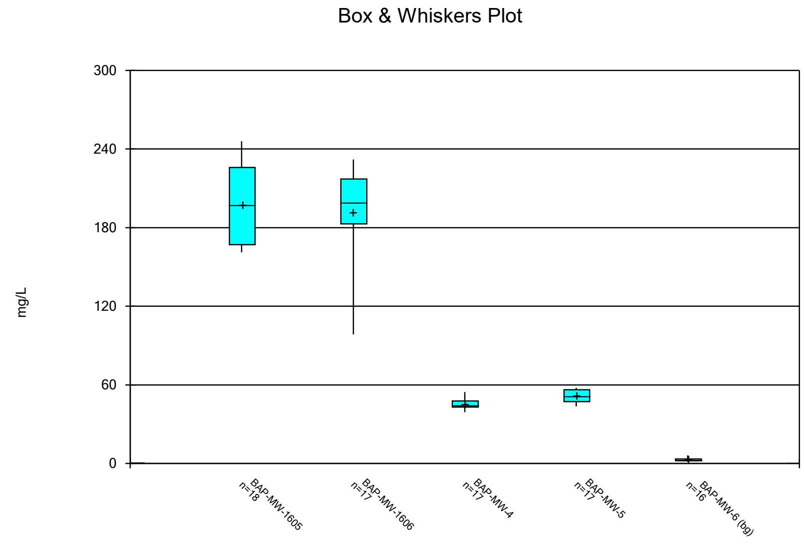
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



Constituent: Sulfate, total Analysis Run 2/26/2021 1:51 PM

Amos BAP Client: Geosyntec Data: Amos BAP

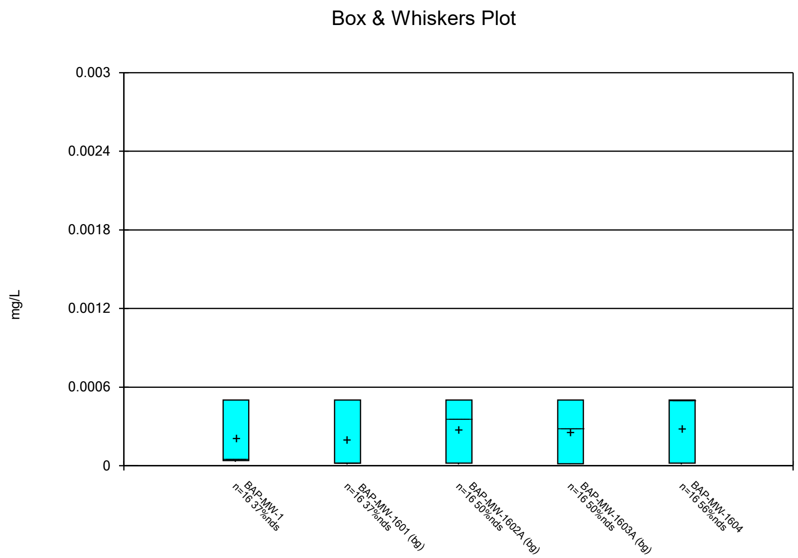
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



Constituent: Sulfate, total Analysis Run 2/26/2021 1:51 PM

Amos BAP Client: Geosyntec Data: Amos BAP

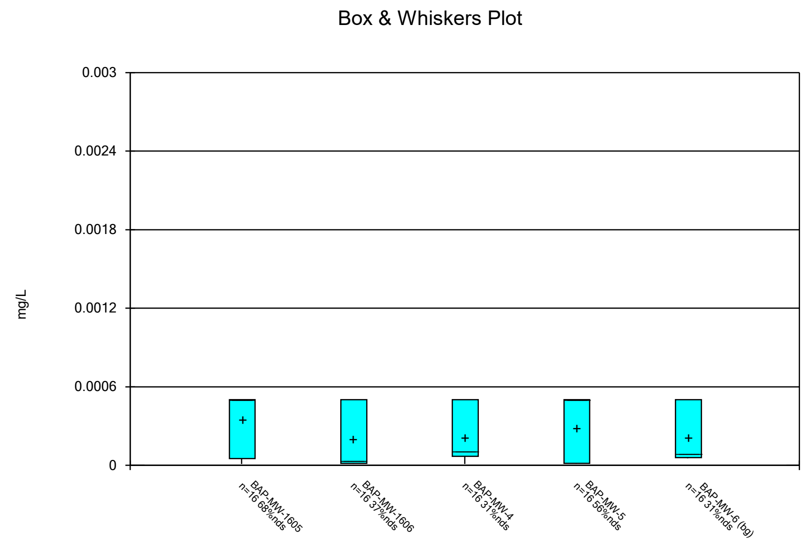
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



Constituent: Thallium, total Analysis Run 2/26/2021 1:51 PM

Amos BAP Client: Geosyntec Data: Amos BAP

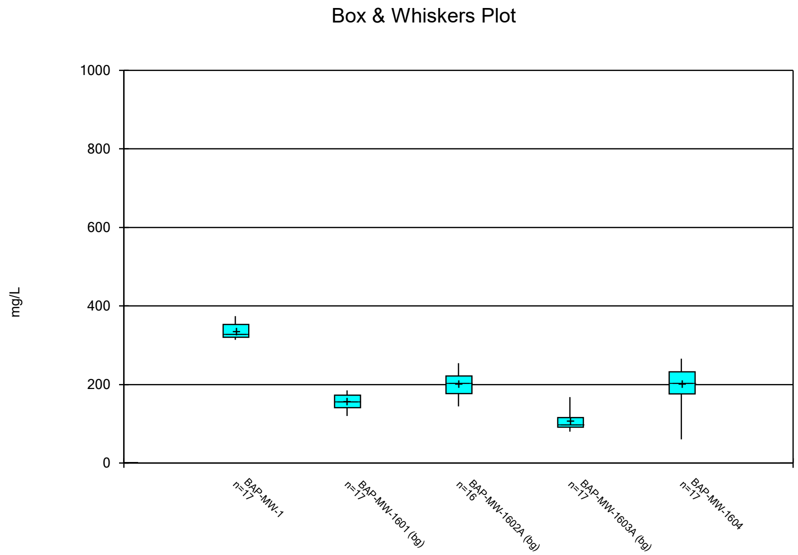
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



Constituent: Thallium, total Analysis Run 2/26/2021 1:51 PM

Amos BAP Client: Geosyntec Data: Amos BAP

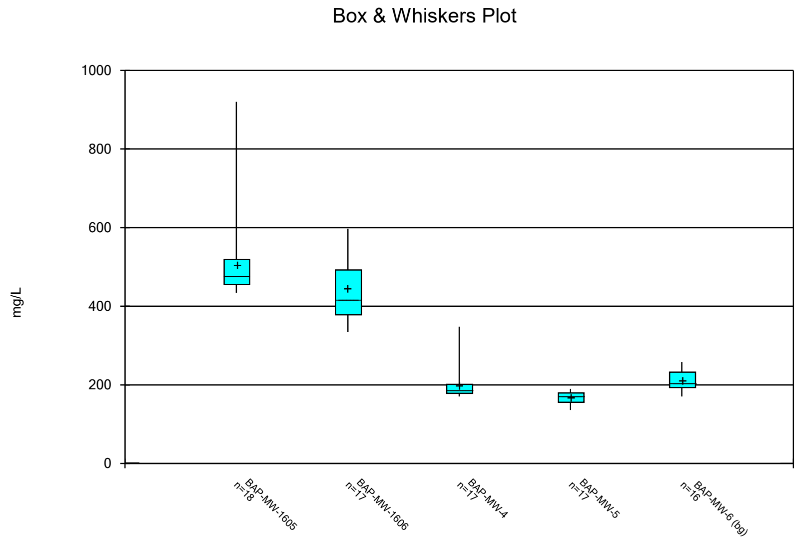
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



Constituent: Total Dissolved Solids [TDS] Analysis Run 2/26/2021 1:51 PM

Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



Constituent: Total Dissolved Solids [TDS] Analysis Run 2/26/2021 1:51 PM

Amos BAP Client: Geosyntec Data: Amos BAP

FIGURE C. Outlier Summary

Outlier Summary

Amos BAP   Client: Geosyntec   Data: Amos BAP   Printed 2/25/2021, 2:47 PM

	BAP-MW-1604 Beryllium, total (mg/L)	BAP-MW-1604 Boron, total (mg/L)	BAP-MW-1605 Boron, total (mg/L)	BAP-MW-1606 Boron, total (mg/L)	BAP-MW-4 Boron, total (mg/L)	BAP-MW-5 Boron, total (mg/L)	BAP-MW-1603A Chromium, total (mg/L)	BAP-MW-1601 Combined Radium 226 + 228 (pCi/L)	BAP-MW-6 Combined Radium 226 + 228 (pCi/L)	BAP-MW-4 Fluoride, total (mg/L)
10/18/2016										<0.2 (o)
12/13/2016							0.00327 (o)			
2/7/2017								35.021 (o)		
2/8/2017									20.83 (o)	
1/8/2018										
3/14/2019			<1 (o)							
3/15/2019		<1 (o)		<1 (o)	<1 (o)	<1 (o)				
6/10/2019	0.000142 (o)									
6/11/2019										

	BAP-MW-5 Fluoride, total (mg/L)	BAP-MW-1 pH, field (SU)	BAP-MW-1602A pH, field (SU)	BAP-MW-1603A pH, field (SU)	BAP-MW-1604 pH, field (SU)	BAP-MW-1606 pH, field (SU)	BAP-MW-6 pH, field (SU)
10/18/2016	<0.2 (o)						
12/13/2016							
2/7/2017							
2/8/2017							
1/8/2018						8.4 (o)	
3/14/2019							
3/15/2019							
6/10/2019		10.19 (o)			8.65 (o)		9.32 (o)
6/11/2019			9.51 (o)	8.82 (o)			

FIGURE D. Mann-Whitney

Welch's t-test/Mann-Whitney - Significant Results

Amos BAP Client: Geosyntec Data: Amos BAP Printed 1/13/2021, 1:18 PM

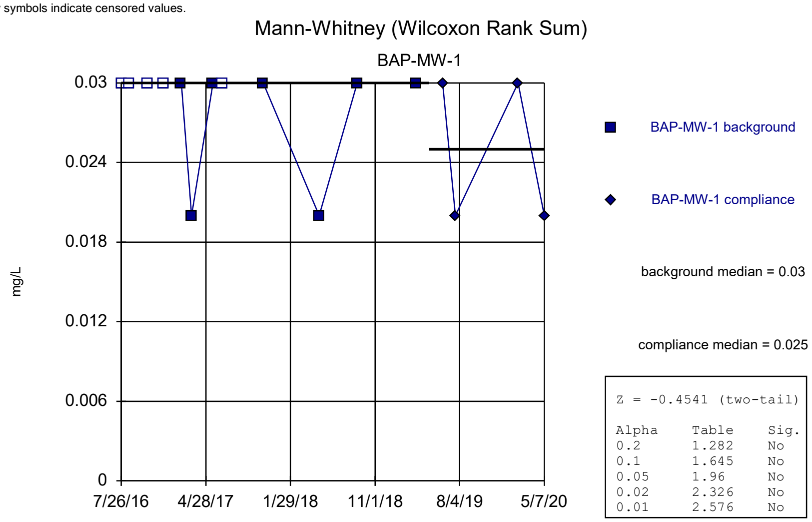
Constituent	Well	Calc.	0.01	Method
Fluoride, total (mg/L)	**BAP-MW-1606**	**-3.451**	**Yes**	**Mann-W**

Welch's t-test/Mann-Whitney - All Results

Amos BAP   Client: Geosyntec   Data: Amos BAP   Printed 1/13/2021, 1:18 PM

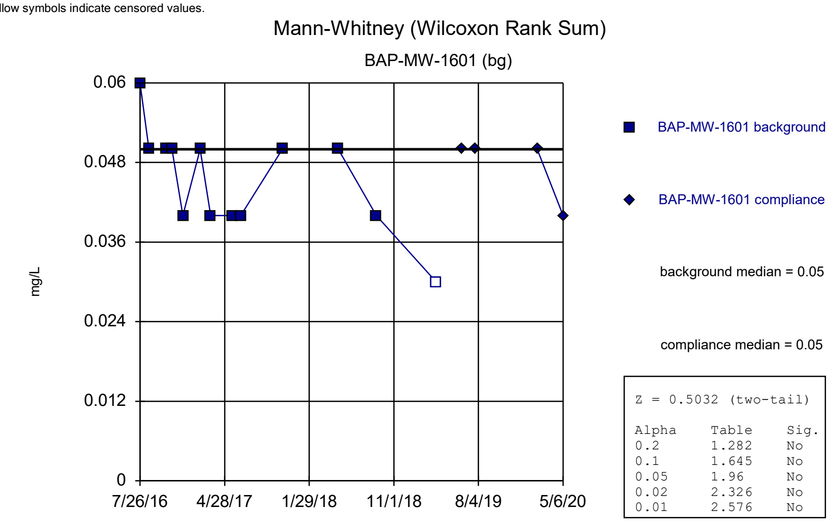
Constituent	Well	Calc.	0.01	Method
Fluoride, total (mg/L)	BAP-MW-1	-0.4541	No	Mann-W
Fluoride, total (mg/L)	BAP-MW-1601 (bg)	0.5032	No	Mann-W
Fluoride, total (mg/L)	BAP-MW-1602A (bg)	0.8897	No	Mann-W
Fluoride, total (mg/L)	BAP-MW-1603A (bg)	0.4035	No	Mann-W
Fluoride, total (mg/L)	BAP-MW-1604	-0.2864	No	Mann-W
Fluoride, total (mg/L)	BAP-MW-1605	-2.271	No	Mann-W
Fluoride, total (mg/L)	**BAP-MW-1606**	**-3.451**	**Yes**	**Mann-W**
Fluoride, total (mg/L)	BAP-MW-4	-0.8888	No	Mann-W
Fluoride, total (mg/L)	BAP-MW-5	-0.6557	No	Mann-W
Fluoride, total (mg/L)	BAP-MW-6 (bg)	1.104	No	Mann-W
pH, field (SU)	BAP-MW-1	0	No	Mann-W
pH, field (SU)	BAP-MW-1601 (bg)	-0.05665	No	Mann-W
pH, field (SU)	BAP-MW-1602A (bg)	-0.2834	No	Mann-W
pH, field (SU)	BAP-MW-1603A (bg)	0.3968	No	Mann-W
pH, field (SU)	BAP-MW-1604	-0.3963	No	Mann-W
pH, field (SU)	BAP-MW-1605	-1.966	No	Mann-W
pH, field (SU)	BAP-MW-1606	-0.3973	No	Mann-W
pH, field (SU)	BAP-MW-4	-0.3401	No	Mann-W
pH, field (SU)	BAP-MW-5	-0.2836	No	Mann-W
pH, field (SU)	BAP-MW-6 (bg)	0.2832	No	Mann-W

Sanitas™ v.9.6.27 . UG
Hollow symbols indicate censored values.



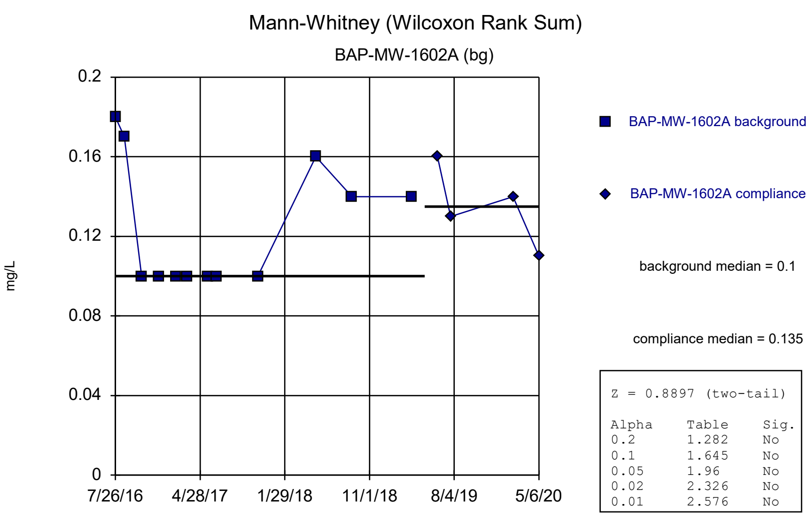
Constituent: Fluoride, total Analysis Run 1/13/2021 1:15 PM View: Mann Whitney
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27 . UG
Hollow symbols indicate censored values.



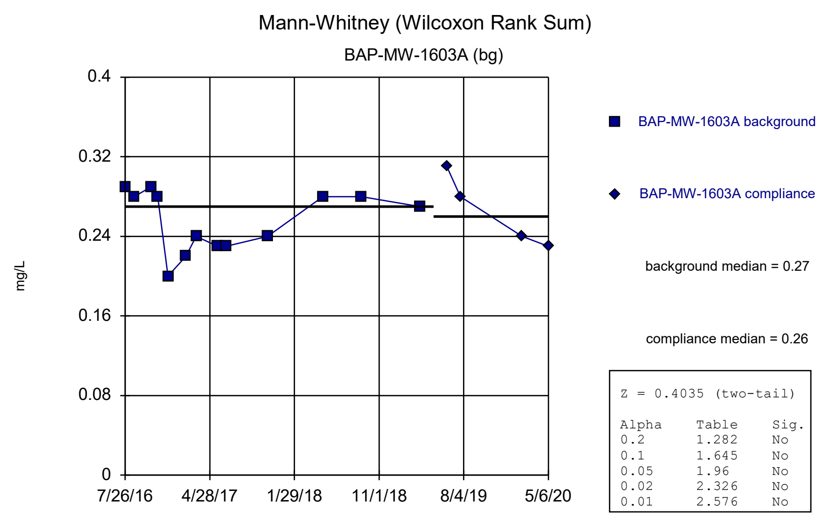
Constituent: Fluoride, total Analysis Run 1/13/2021 1:15 PM View: Mann Whitney
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27 . UG



Constituent: Fluoride, total Analysis Run 1/13/2021 1:15 PM View: Mann Whitney
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27 . UG

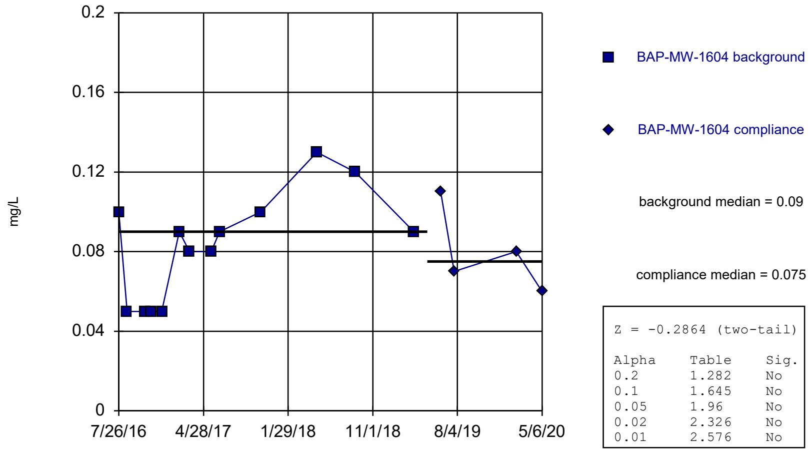


Constituent: Fluoride, total Analysis Run 1/13/2021 1:15 PM View: Mann Whitney
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27 . UG

Mann-Whitney (Wilcoxon Rank Sum)

BAP-MW-1604

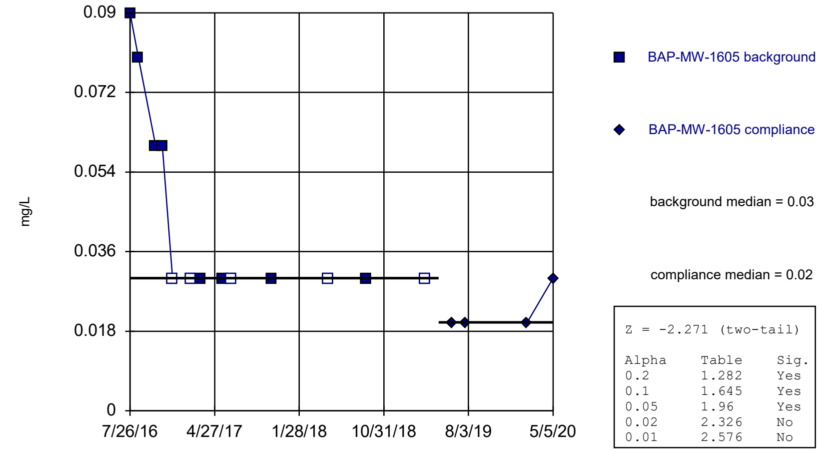


Constituent: Fluoride, total Analysis Run 1/13/2021 1:15 PM View: Mann Whitney
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27 . UG
Hollow symbols indicate censored values.

Mann-Whitney (Wilcoxon Rank Sum)

BAP-MW-1605

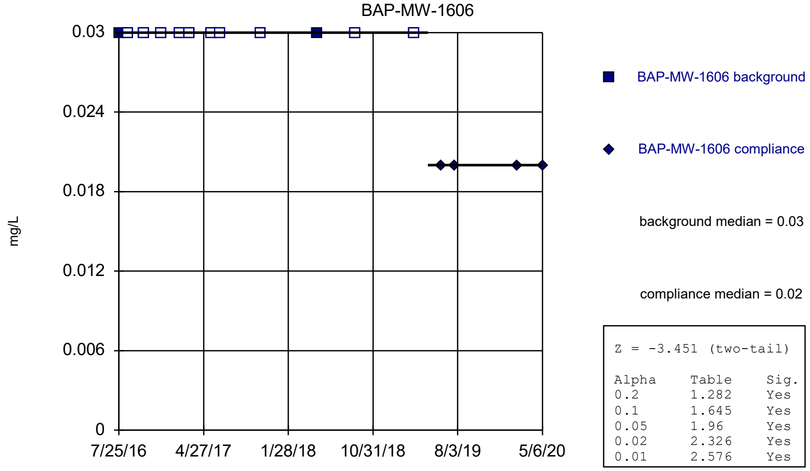


Constituent: Fluoride, total Analysis Run 1/13/2021 1:15 PM View: Mann Whitney
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27 . UG
Hollow symbols indicate censored values.

Mann-Whitney (Wilcoxon Rank Sum)

BAP-MW-1606

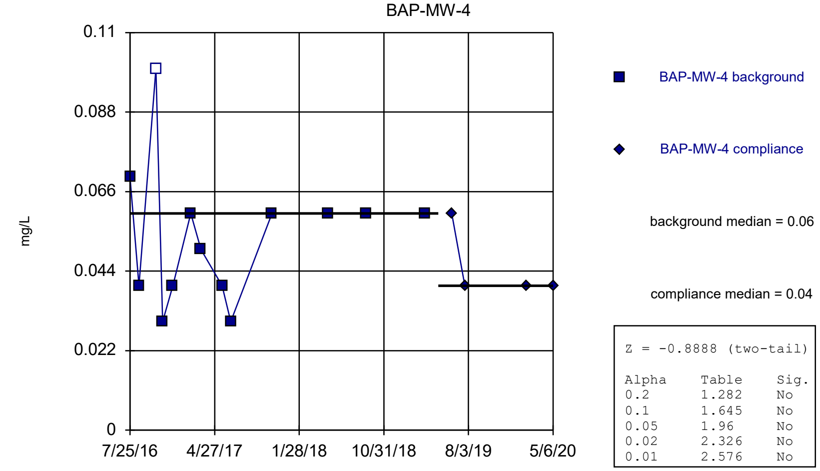


Constituent: Fluoride, total Analysis Run 1/13/2021 1:15 PM View: Mann Whitney
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27 . UG
Hollow symbols indicate censored values.

Mann-Whitney (Wilcoxon Rank Sum)

BAP-MW-4

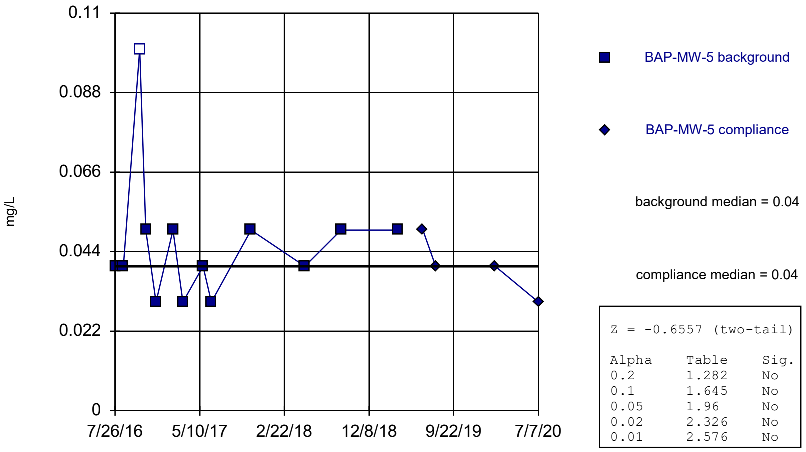


Constituent: Fluoride, total Analysis Run 1/13/2021 1:15 PM View: Mann Whitney
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27 . UG
Hollow symbols indicate censored values.

Mann-Whitney (Wilcoxon Rank Sum)

BAP-MW-5

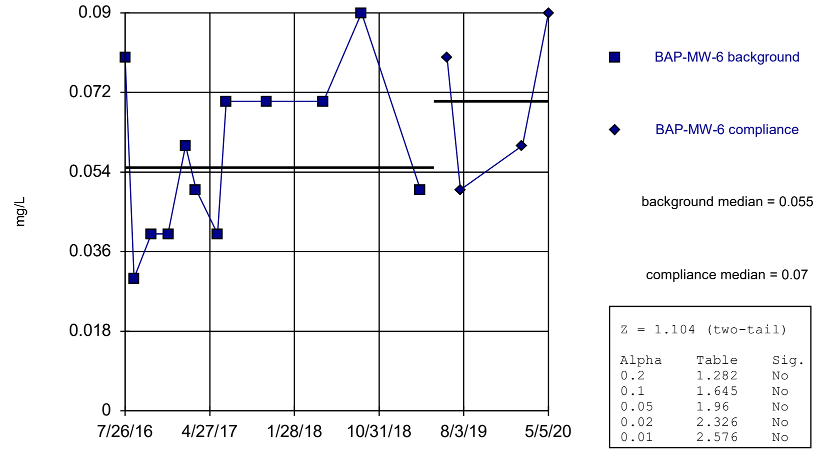


Constituent: Fluoride, total Analysis Run 1/13/2021 1:15 PM View: Mann Whitney
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27 . UG

Mann-Whitney (Wilcoxon Rank Sum)

BAP-MW-6 (bg)

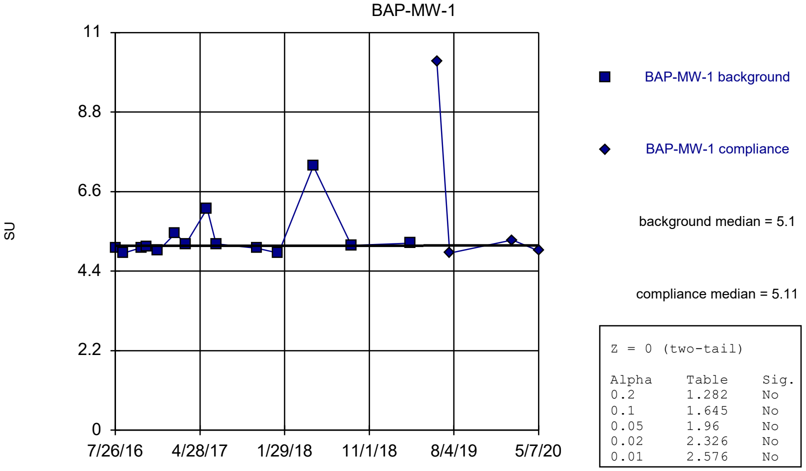


Constituent: Fluoride, total Analysis Run 1/13/2021 1:15 PM View: Mann Whitney
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27 . UG

Mann-Whitney (Wilcoxon Rank Sum)

BAP-MW-1

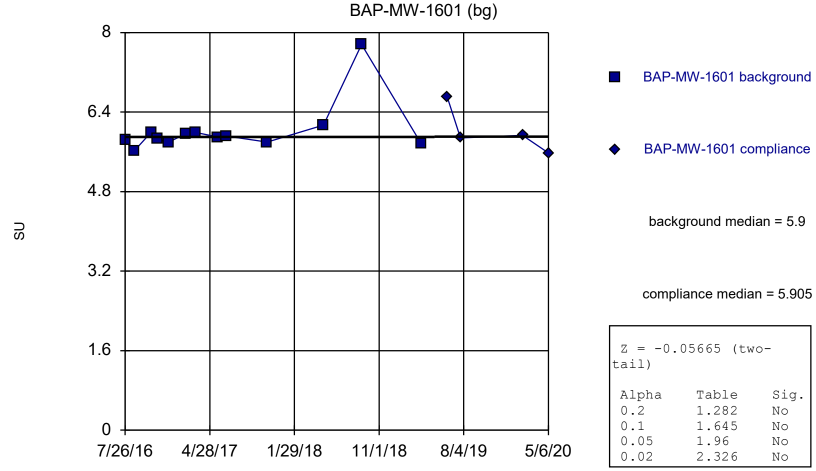


Constituent: pH, field Analysis Run 1/13/2021 1:15 PM View: Mann Whitney
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27 . UG

Mann-Whitney (Wilcoxon Rank Sum)

BAP-MW-1601 (bg)

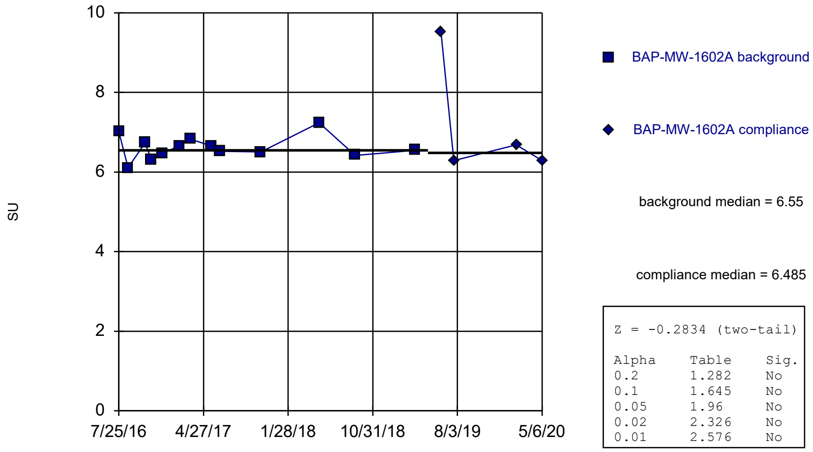


Constituent: pH, field Analysis Run 1/13/2021 1:15 PM View: Mann Whitney
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27 . UG

Mann-Whitney (Wilcoxon Rank Sum)

BAP-MW-1602A (bg)

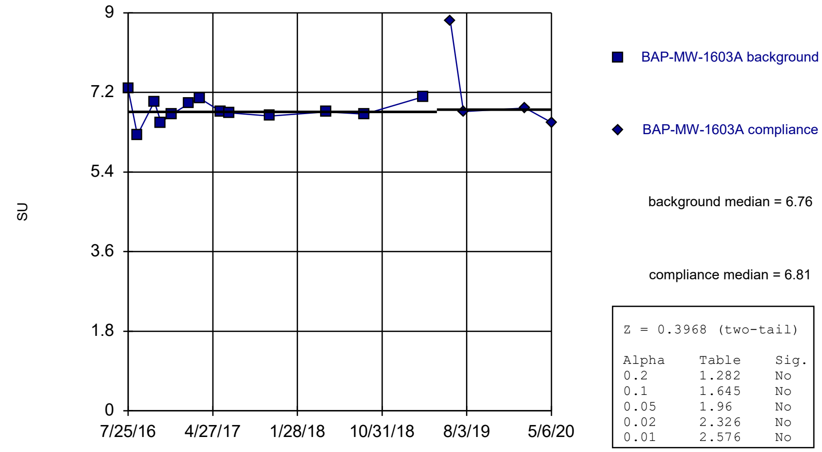


Constituent: pH, field   Analysis Run 1/13/2021 1:15 PM   View: Mann Whitney
Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.27 . UG

Mann-Whitney (Wilcoxon Rank Sum)

BAP-MW-1603A (bg)

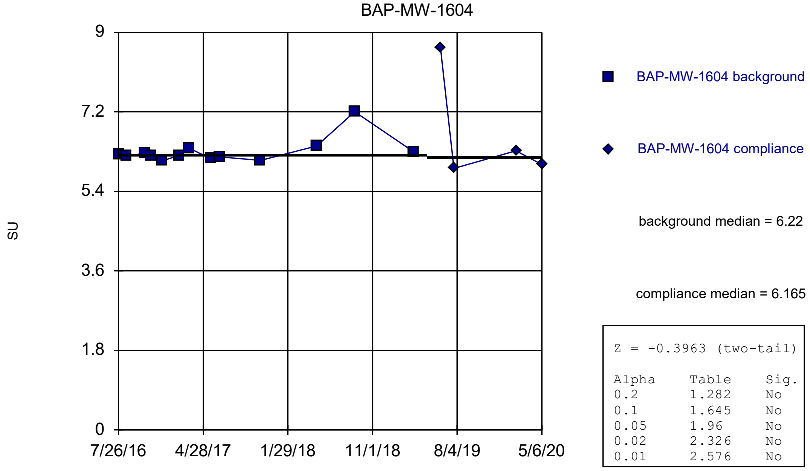


Constituent: pH, field   Analysis Run 1/13/2021 1:15 PM   View: Mann Whitney
Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.27 . UG

Mann-Whitney (Wilcoxon Rank Sum)

BAP-MW-1604

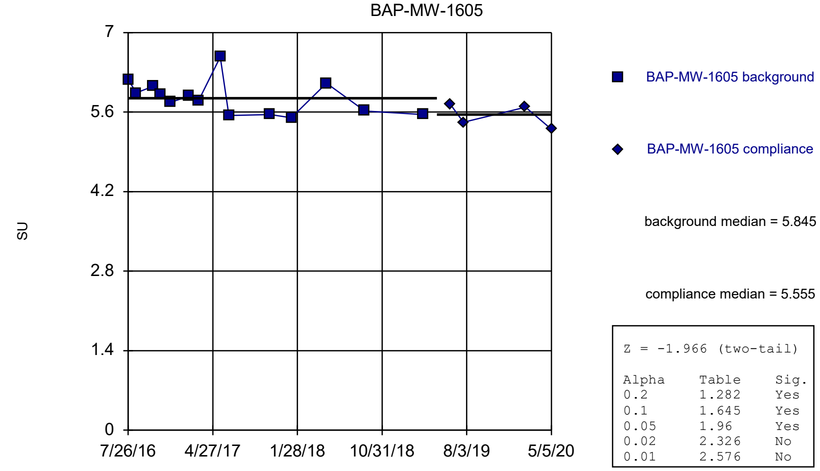


Constituent: pH, field   Analysis Run 1/13/2021 1:15 PM   View: Mann Whitney
Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.27 . UG

Mann-Whitney (Wilcoxon Rank Sum)

BAP-MW-1605

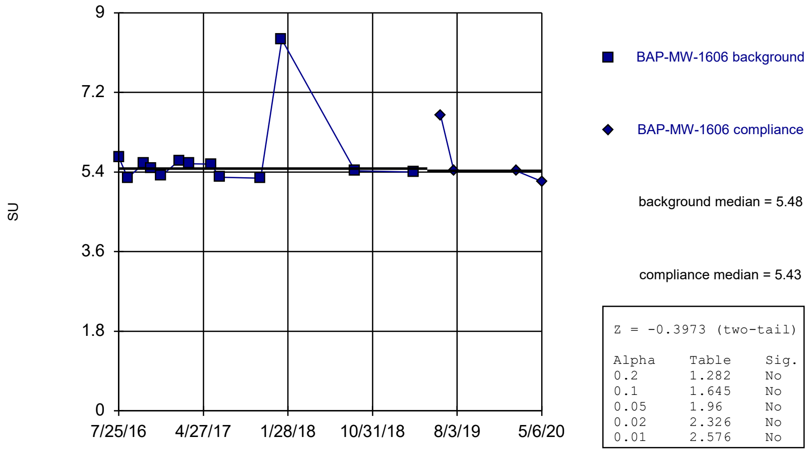


Constituent: pH, field   Analysis Run 1/13/2021 1:15 PM   View: Mann Whitney
Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.27 . UG

Mann-Whitney (Wilcoxon Rank Sum)

BAP-MW-1606



background median = 5.48

compliance median = 5.43

Z = -0.3973 (two-tail)

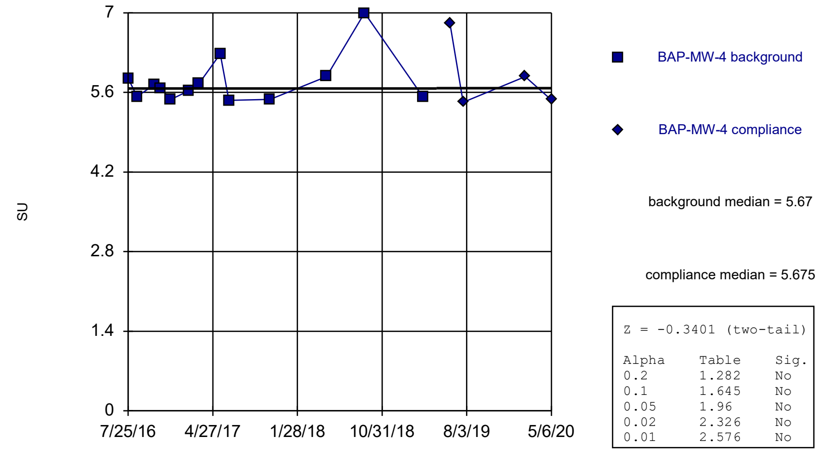
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: pH, field Analysis Run 1/13/2021 1:15 PM View: Mann Whitney
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27 . UG

Mann-Whitney (Wilcoxon Rank Sum)

BAP-MW-4



background median = 5.67

compliance median = 5.675

Z = -0.3401 (two-tail)

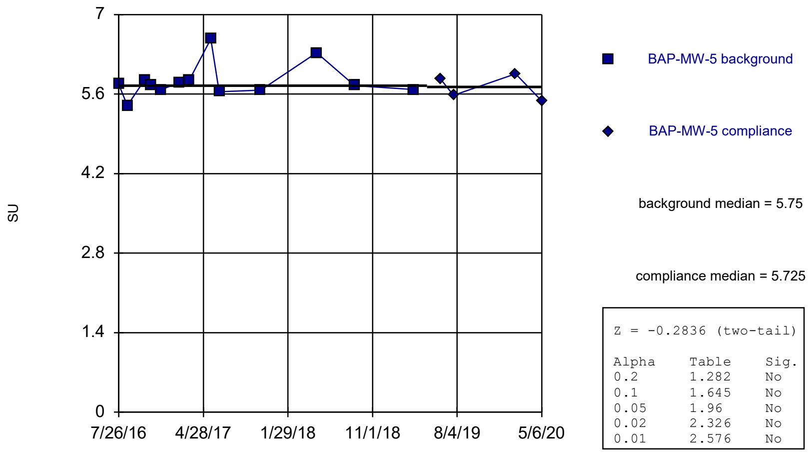
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: pH, field Analysis Run 1/13/2021 1:15 PM View: Mann Whitney
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27 . UG

Mann-Whitney (Wilcoxon Rank Sum)

BAP-MW-5



background median = 5.75

compliance median = 5.725

Z = -0.2836 (two-tail)

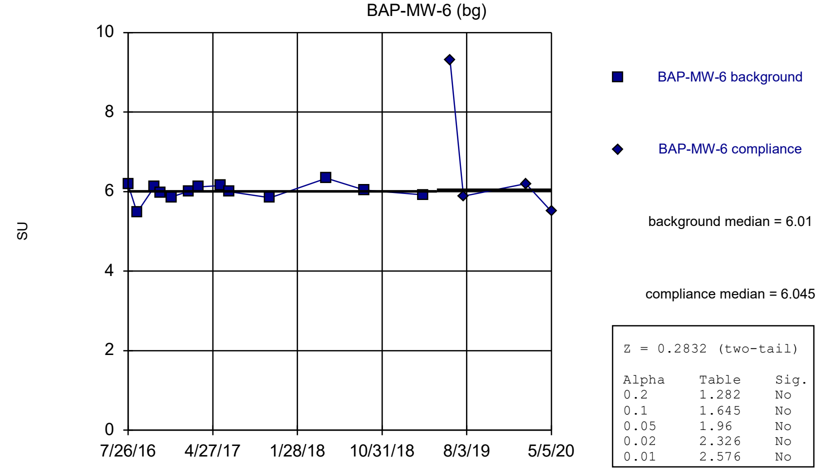
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: pH, field Analysis Run 1/13/2021 1:15 PM View: Mann Whitney
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27 . UG

Mann-Whitney (Wilcoxon Rank Sum)

BAP-MW-6 (bg)



background median = 6.01

compliance median = 6.045

Z = 0.2832 (two-tail)

Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: pH, field Analysis Run 1/13/2021 1:15 PM View: Mann Whitney
Amos BAP Client: Geosyntec Data: Amos BAP

FIGURE E. Trend Test

Trend Test - Upgradient Wells - Significant Results

Amos BAP Client: Geosyntec Data: Amos BAP Printed 2/25/2021, 2:59 PM

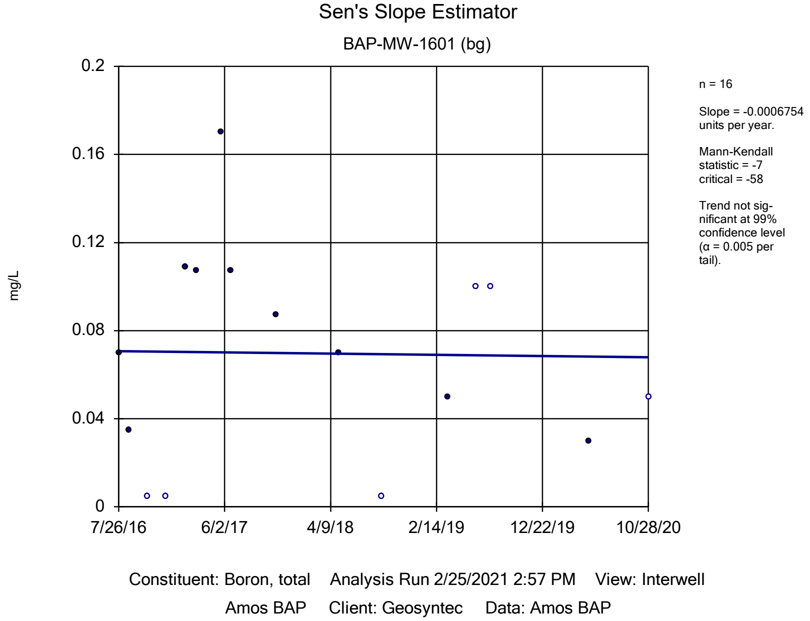
Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Xform	Alpha	Method
Chloride, total (mg/L)	**BAP-MW-1601 (bg)**	**2.008**	**103**	**63**	**Yes**	**17**	**0**	**n/a**	**n/a**	**0.01**	**NP**
Chloride, total (mg/L)	**BAP-MW-1602A (bg)**	**1.208**	**77**	**58**	**Yes**	**16**	**0**	**n/a**	**n/a**	**0.01**	**NP**
Chloride, total (mg/L)	**BAP-MW-1603A (bg)**	**0.183**	**64**	**63**	**Yes**	**17**	**0**	**n/a**	**n/a**	**0.01**	**NP**

Trend Test - Upgradient Wells - All Results

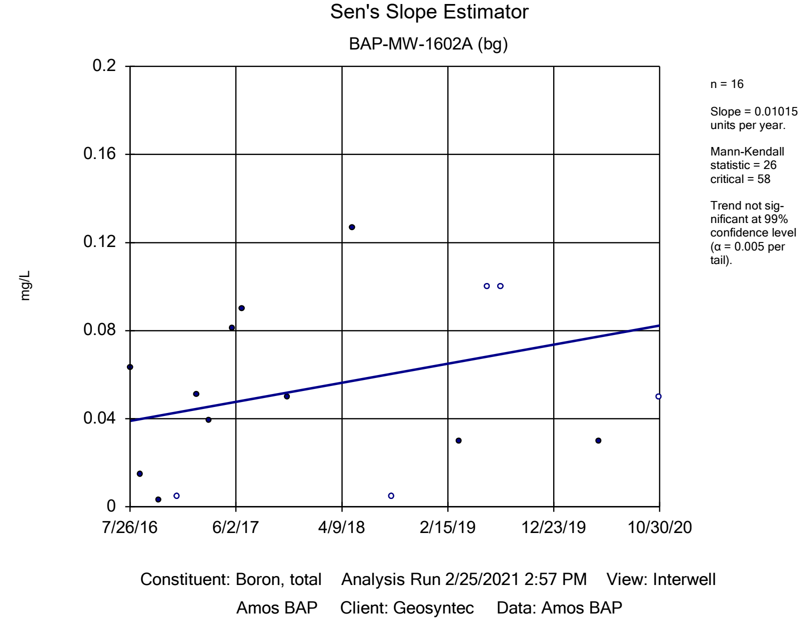
Amos BAP Client: Geosyntec Data: Amos BAP Printed 2/25/2021, 2:59 PM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Xform	Alpha	Method
Boron, total (mg/L)	BAP-MW-1601 (bg)	-0.0006754	-7	-58	No	16	37.5	n/a	n/a	0.01	NP
Boron, total (mg/L)	BAP-MW-1602A (bg)	0.01015	26	58	No	16	31.25	n/a	n/a	0.01	NP
Boron, total (mg/L)	BAP-MW-1603A (bg)	0.01571	33	58	No	16	43.75	n/a	n/a	0.01	NP
Boron, total (mg/L)	BAP-MW-6 (bg)	0.005214	14	58	No	16	31.25	n/a	n/a	0.01	NP
Calcium, total (mg/L)	BAP-MW-1601 (bg)	-0.1038	-18	-58	No	16	0	n/a	n/a	0.01	NP
Calcium, total (mg/L)	BAP-MW-1602A (bg)	0.3644	45	58	No	16	0	n/a	n/a	0.01	NP
Calcium, total (mg/L)	BAP-MW-1603A (bg)	-0.4449	-42	-58	No	16	0	n/a	n/a	0.01	NP
Calcium, total (mg/L)	BAP-MW-6 (bg)	0.06974	12	58	No	16	0	n/a	n/a	0.01	NP
Chloride, total (mg/L)	**BAP-MW-1601 (bg)**	**2.008**	**103**	**63**	**Yes**	**17**	**0**	**n/a**	**n/a**	**0.01**	**NP**
Chloride, total (mg/L)	**BAP-MW-1602A (bg)**	**1.208**	**77**	**58**	**Yes**	**16**	**0**	**n/a**	**n/a**	**0.01**	**NP**
Chloride, total (mg/L)	**BAP-MW-1603A (bg)**	**0.183**	**64**	**63**	**Yes**	**17**	**0**	**n/a**	**n/a**	**0.01**	**NP**
Chloride, total (mg/L)	BAP-MW-6 (bg)	0.03907	4	58	No	16	0	n/a	n/a	0.01	NP
Sulfate, total (mg/L)	BAP-MW-1601 (bg)	-2.343	-36	-63	No	17	0	n/a	n/a	0.01	NP
Sulfate, total (mg/L)	BAP-MW-1602A (bg)	-0.36	-23	-58	No	16	0	n/a	n/a	0.01	NP
Sulfate, total (mg/L)	BAP-MW-1603A (bg)	0	39	63	No	17	88.24	n/a	n/a	0.01	NP
Sulfate, total (mg/L)	BAP-MW-6 (bg)	-0.4071	-38	-58	No	16	0	n/a	n/a	0.01	NP
Total Dissolved Solids [TDS] (mg/L)	BAP-MW-1601 (bg)	7.318	38	63	No	17	0	n/a	n/a	0.01	NP
Total Dissolved Solids [TDS] (mg/L)	BAP-MW-1602A (bg)	8.226	27	58	No	16	0	n/a	n/a	0.01	NP
Total Dissolved Solids [TDS] (mg/L)	BAP-MW-1603A (bg)	2.296	19	63	No	17	0	n/a	n/a	0.01	NP
Total Dissolved Solids [TDS] (mg/L)	BAP-MW-6 (bg)	1.389	7	58	No	16	0	n/a	n/a	0.01	NP

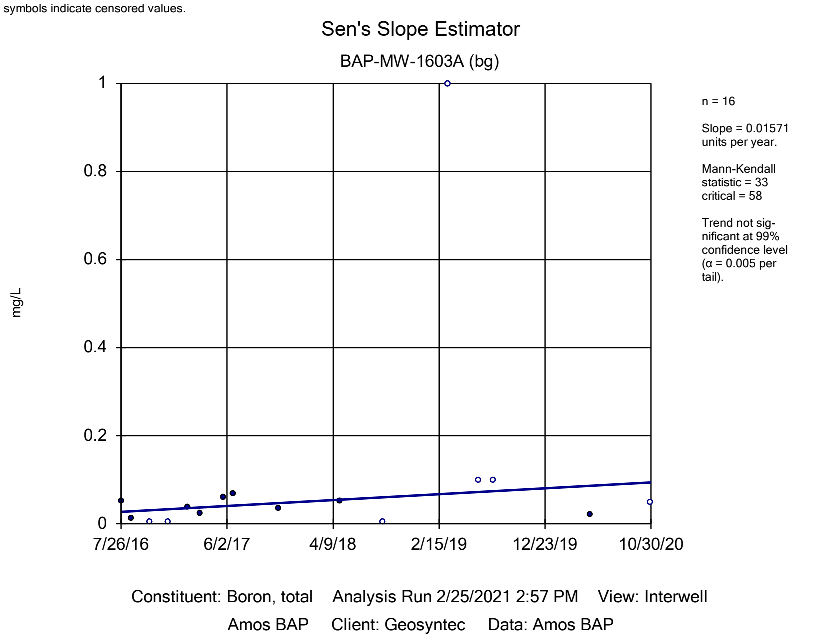
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.



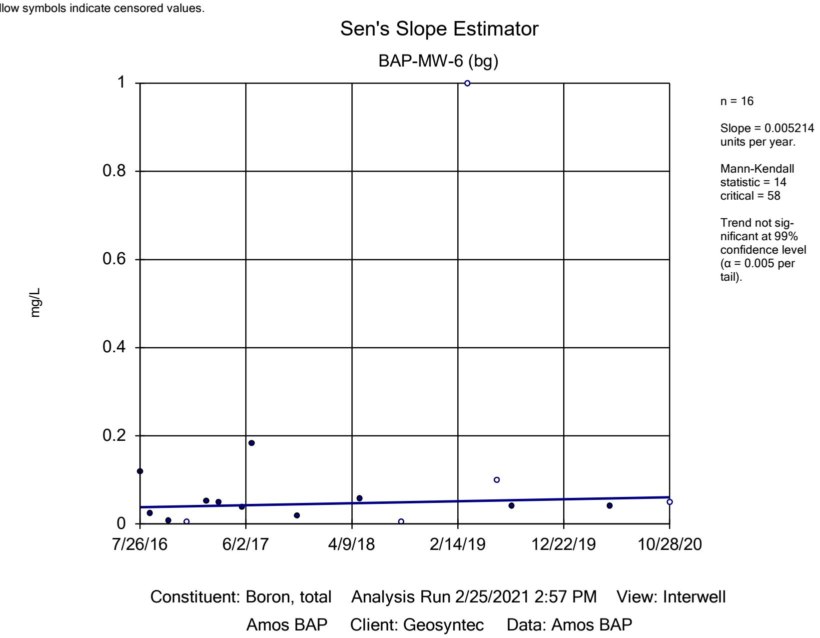
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.



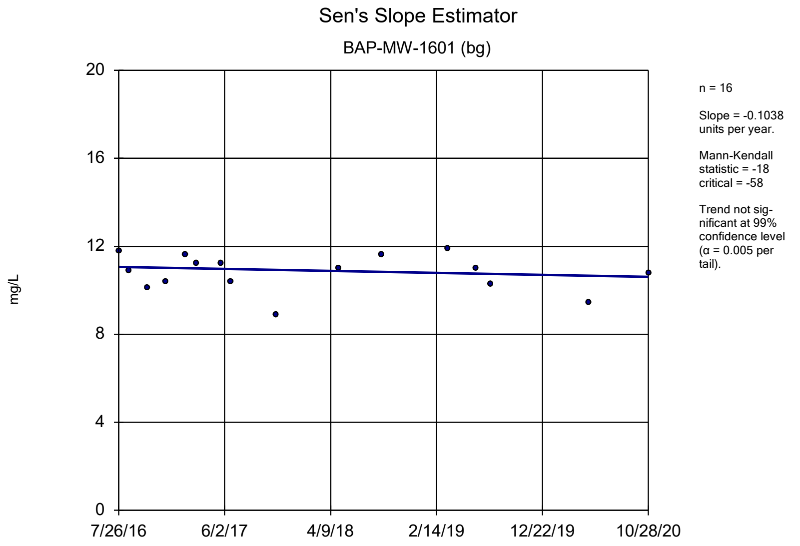
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.



Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

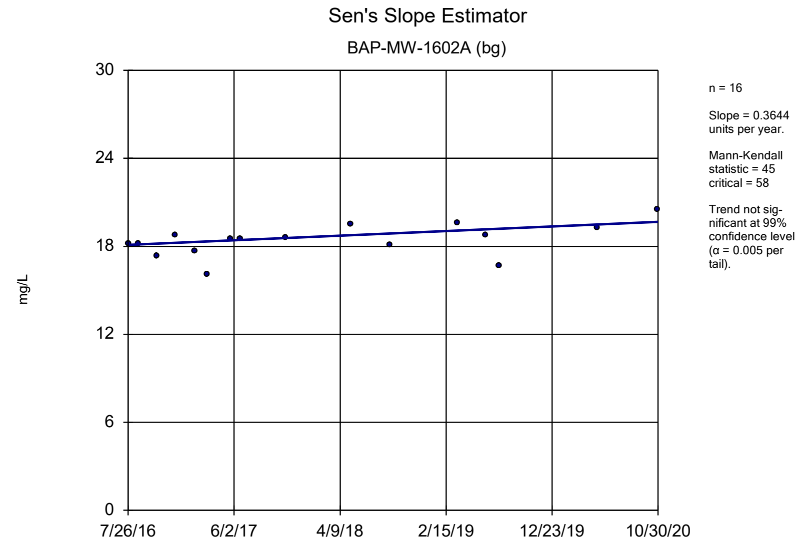


Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



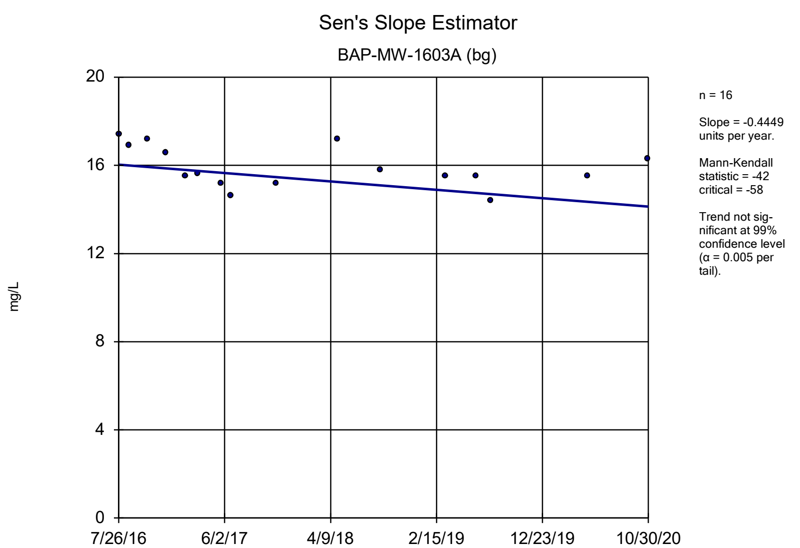
Constituent: Calcium, total Analysis Run 2/25/2021 2:57 PM View: Interwell
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



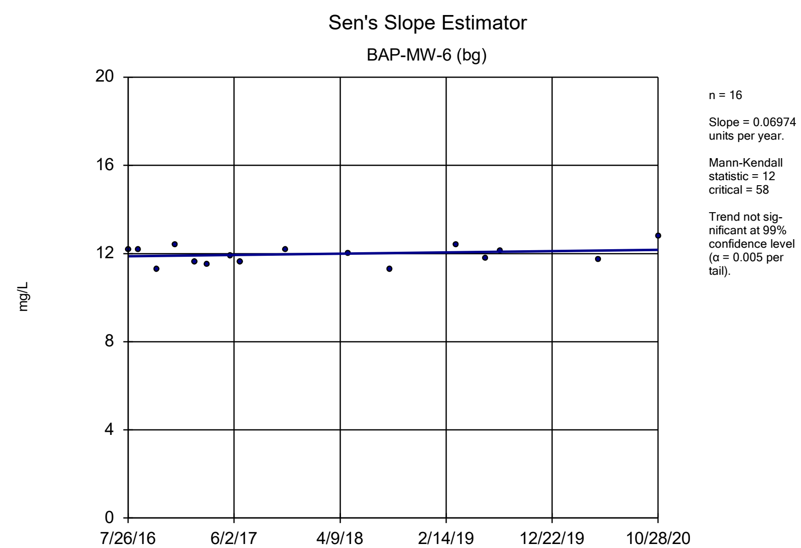
Constituent: Calcium, total Analysis Run 2/25/2021 2:57 PM View: Interwell
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



Constituent: Calcium, total Analysis Run 2/25/2021 2:57 PM View: Interwell
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG

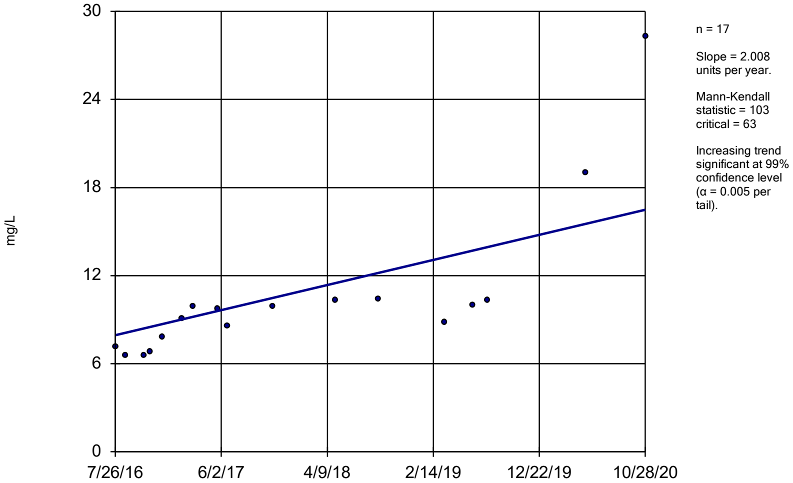


Constituent: Calcium, total Analysis Run 2/25/2021 2:57 PM View: Interwell
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG

Sen's Slope Estimator

BAP-MW-1601 (bg)

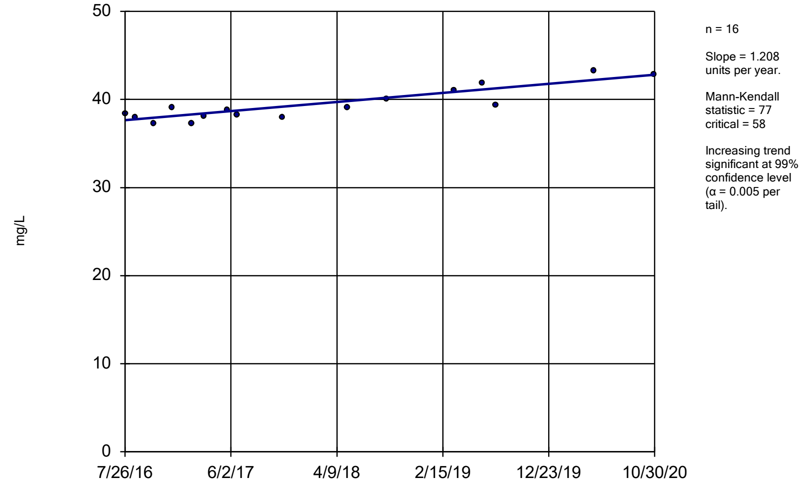


Constituent: Chloride, total   Analysis Run 2/25/2021 2:57 PM   View: Interwell
Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG

Sen's Slope Estimator

BAP-MW-1602A (bg)

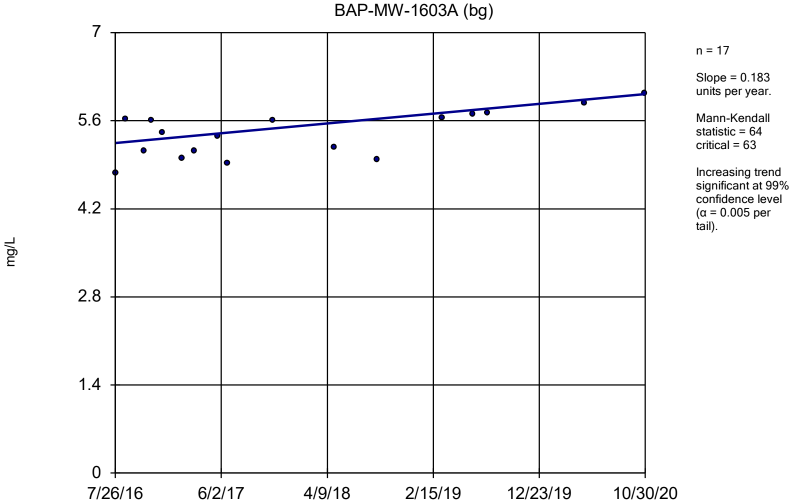


Constituent: Chloride, total   Analysis Run 2/25/2021 2:57 PM   View: Interwell
Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG

Sen's Slope Estimator

BAP-MW-1603A (bg)

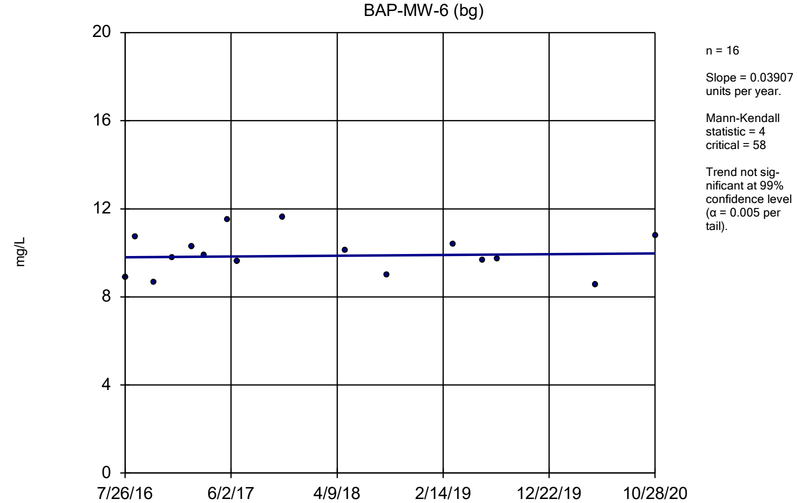


Constituent: Chloride, total   Analysis Run 2/25/2021 2:57 PM   View: Interwell
Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG

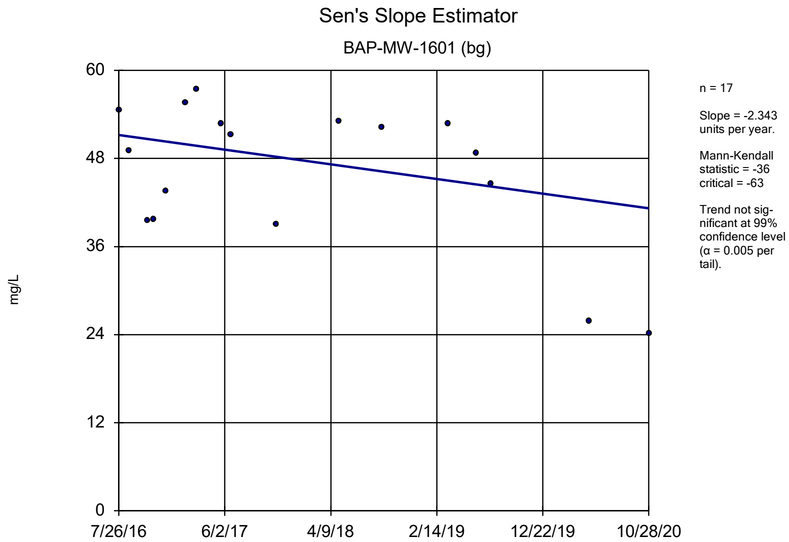
Sen's Slope Estimator

BAP-MW-6 (bg)



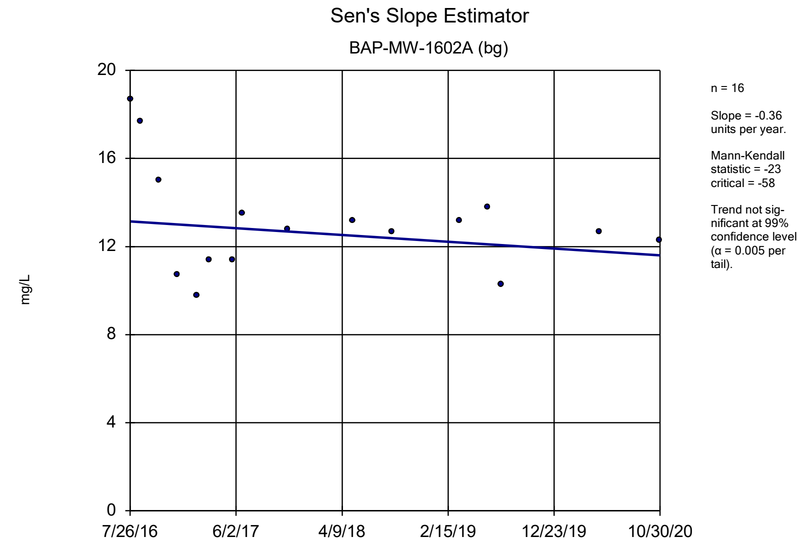
Constituent: Chloride, total   Analysis Run 2/25/2021 2:57 PM   View: Interwell
Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



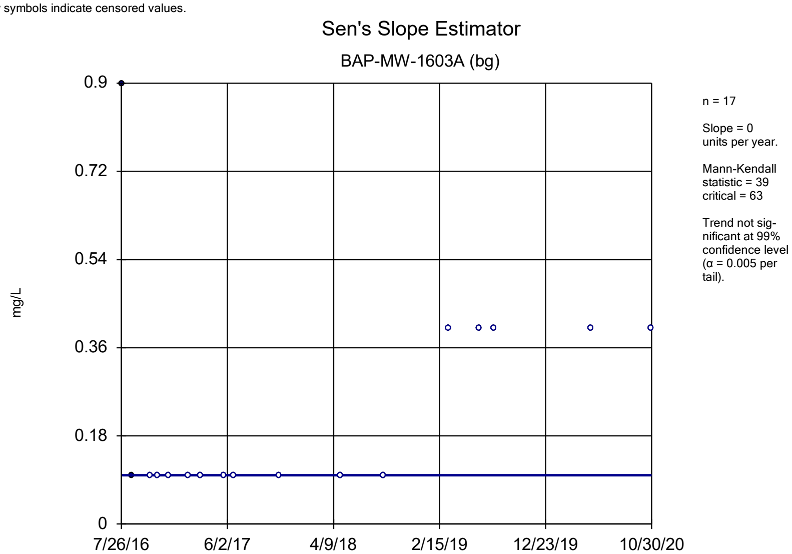
Constituent: Sulfate, total Analysis Run 2/25/2021 2:57 PM View: Interwell
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



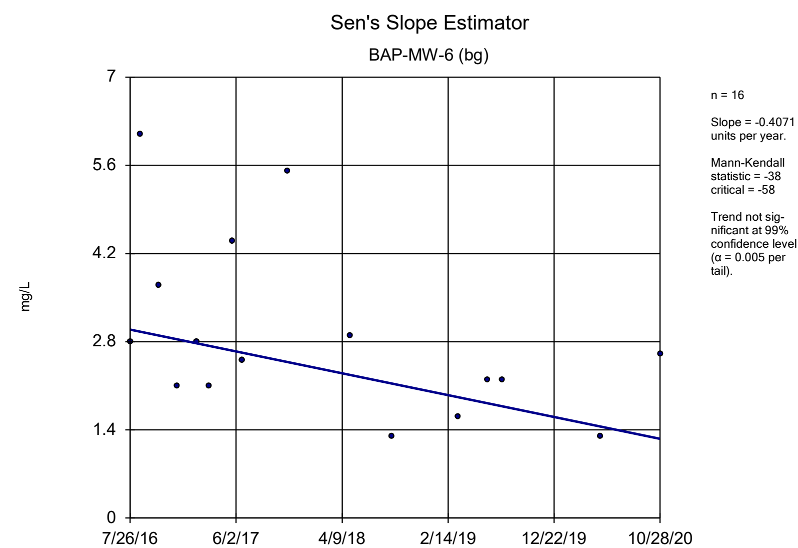
Constituent: Sulfate, total Analysis Run 2/25/2021 2:57 PM View: Interwell
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

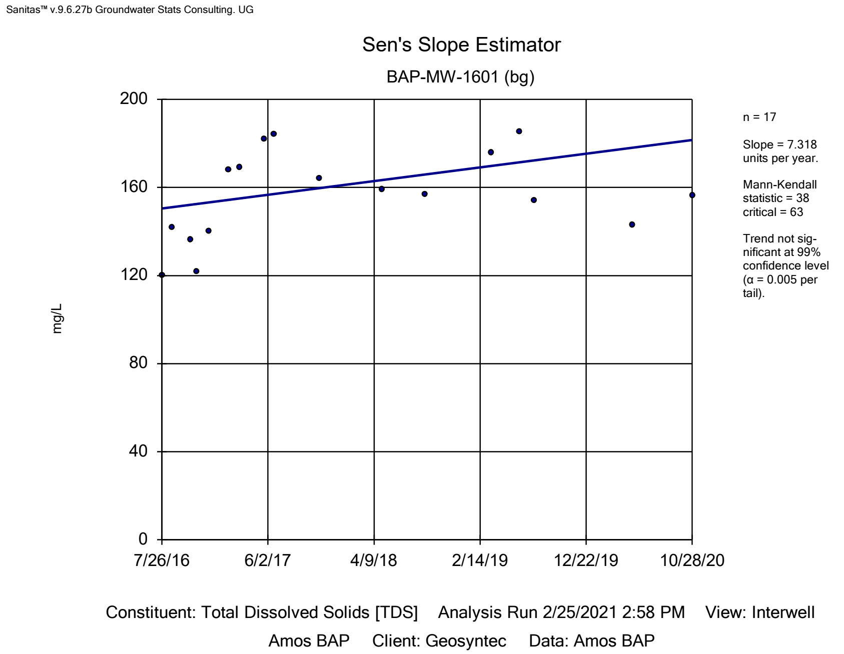


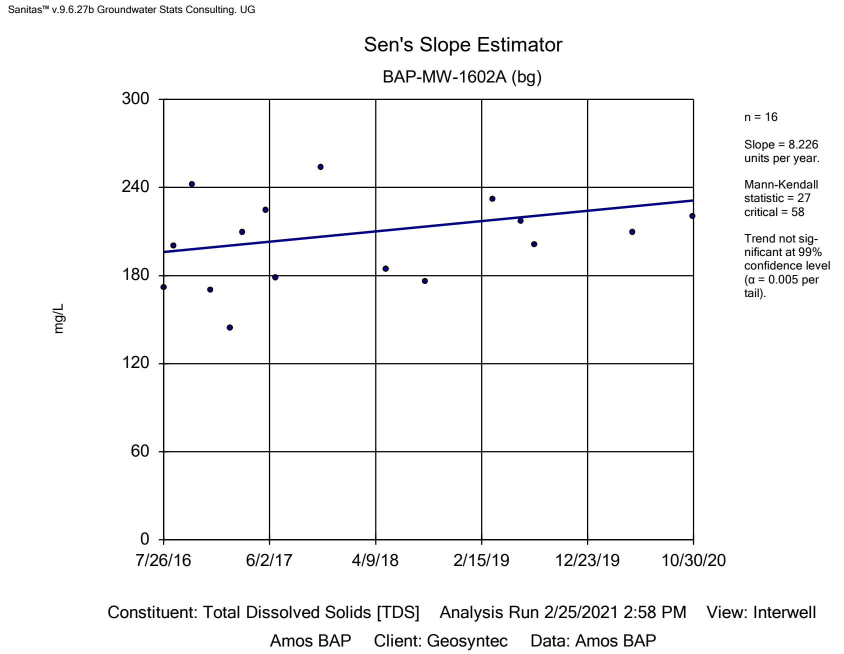
Constituent: Sulfate, total Analysis Run 2/25/2021 2:58 PM View: Interwell
Amos BAP Client: Geosyntec Data: Amos BAP

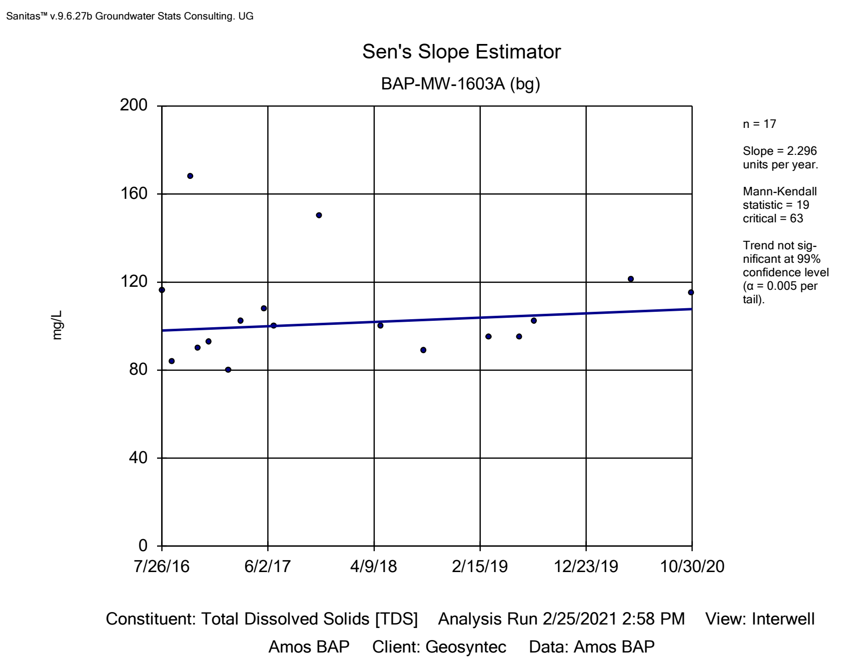
Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG



Constituent: Sulfate, total Analysis Run 2/25/2021 2:58 PM View: Interwell
Amos BAP Client: Geosyntec Data: Amos BAP


Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Sen's Slope Estimator
BAP-MW-1601 (bg)
mg/L
200
160
120
80
40
0
7/26/16
6/2/17
4/9/18
2/14/19
12/22/19
10/28/20
n = 17
Slope = 7.318 units per year.
Mann-Kendall statistic = 38 critical = 63
Trend not significant at 99% confidence level (α = 0.005 per tail).
Constituent: Total Dissolved Solids [TDS] Analysis Run 2/25/2021 2:58 PM View: Interwell
Amos BAP Client: Geosyntec Data: Amos BAP


Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Sen's Slope Estimator
BAP-MW-1602A (bg)
mg/L
300
240
180
120
60
0
7/26/16
6/2/17
4/9/18
2/15/19
12/23/19
10/30/20
n = 16
Slope = 8.226 units per year.
Mann-Kendall statistic = 27 critical = 58
Trend not significant at 99% confidence level (α = 0.005 per tail).
Constituent: Total Dissolved Solids [TDS] Analysis Run 2/25/2021 2:58 PM View: Interwell
Amos BAP Client: Geosyntec Data: Amos BAP


Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Sen's Slope Estimator
BAP-MW-1603A (bg)
mg/L
200
160
120
80
40
0
7/26/16
6/2/17
4/9/18
2/15/19
12/23/19
10/30/20
n = 17
Slope = 2.296 units per year.
Mann-Kendall statistic = 19 critical = 63
Trend not significant at 99% confidence level (α = 0.005 per tail).
Constituent: Total Dissolved Solids [TDS] Analysis Run 2/25/2021 2:58 PM View: Interwell
Amos BAP Client: Geosyntec Data: Amos BAP

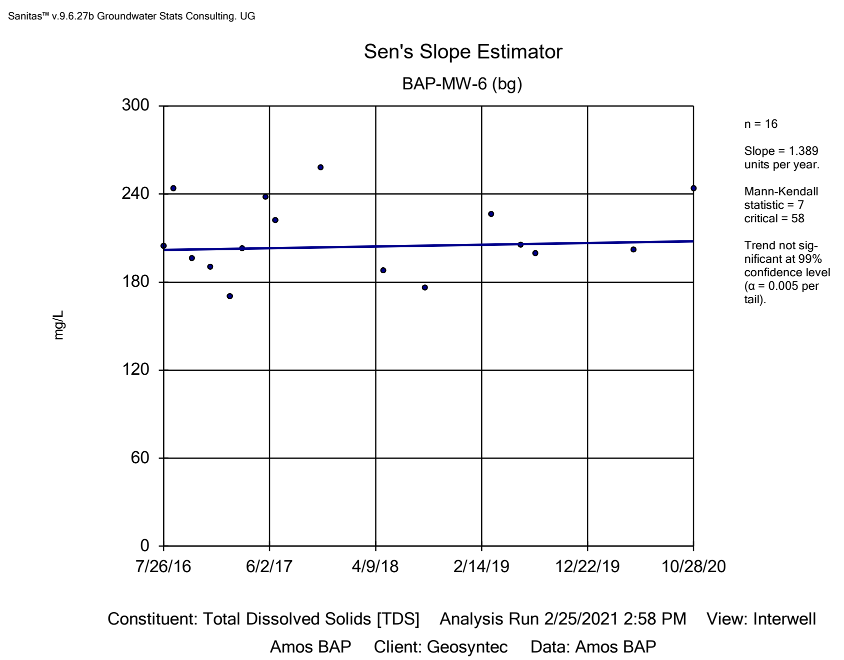

Sanitas™ v.9.6.27b Groundwater Stats Consulting. UG
Sen's Slope Estimator
BAP-MW-6 (bg)
mg/L
300
240
180
120
60
0
7/26/16
6/2/17
4/9/18
2/14/19
12/22/19
10/28/20
n = 16
Slope = 1.389 units per year.
Mann-Kendall statistic = 7 critical = 58
Trend not significant at 99% confidence level (α = 0.005 per tail).
Constituent: Total Dissolved Solids [TDS] Analysis Run 2/25/2021 2:58 PM View: Interwell
Amos BAP Client: Geosyntec Data: Amos BAP

FIGURE F. Intrawell

Intrawell Prediction Limit - All Results

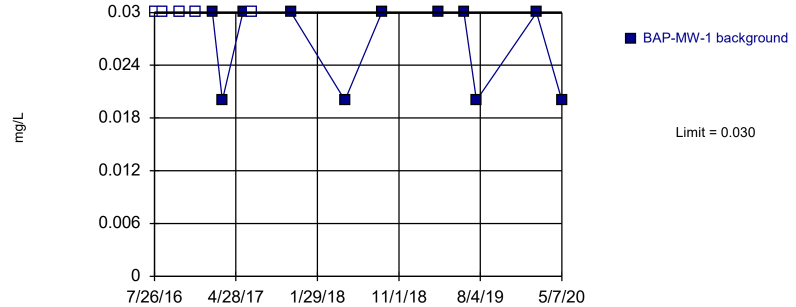
Amos BAP Client: Geosyntec Data: Amos BAP Printed 1/13/2021, 6:27 PM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	%NDs	ND Adj.	Transform	Alpha	Method
Fluoride, total (mg/L)	BAP-MW-1	0.030	n/a	n/a	1 future	n/a	16	31.25	n/a	n/a	0.006456	NP Intra (normality) 1 of 2
Fluoride, total (mg/L)	BAP-MW-1601	0.060	n/a	n/a	1 future	n/a	17	5.882	n/a	n/a	0.005914	NP Intra (normality) 1 of 2
Fluoride, total (mg/L)	BAP-MW-1602A	0.18	n/a	n/a	1 future	n/a	16	0	n/a	n/a	0.006456	NP Intra (normality) 1 of 2
Fluoride, total (mg/L)	BAP-MW-1603A	0.33	n/a	n/a	1 future	n/a	17	0	None	No	0.001254	Param Intra 1 of 2
Fluoride, total (mg/L)	BAP-MW-1604	0.14	n/a	n/a	1 future	n/a	17	0	None	No	0.001254	Param Intra 1 of 2
Fluoride, total (mg/L)	BAP-MW-1605	0.090	n/a	n/a	1 future	n/a	17	29.41	n/a	n/a	0.005914	NP Intra (normality) 1 of 2
Fluoride, total (mg/L)	BAP-MW-1606	0.030	n/a	n/a	1 future	n/a	16	62.5	n/a	n/a	0.006456	NP Intra (NDs) 1 of 2
Fluoride, total (mg/L)	BAP-MW-4	0.076	n/a	n/a	1 future	n/a	16	0	None	No	0.001254	Param Intra 1 of 2
Fluoride, total (mg/L)	BAP-MW-5	0.050	n/a	n/a	1 future	n/a	15	0	n/a	n/a	0.007533	NP Intra (normality) 1 of 2
Fluoride, total (mg/L)	BAP-MW-6	0.1	n/a	n/a	1 future	n/a	16	0	None	No	0.001254	Param Intra 1 of 2
pH, field (SU)	BAP-MW-1	7.3	4.9	n/a	1 future	n/a	17	0	n/a	n/a	0.01183	NP Intra (normality) 1 of 2
pH, field (SU)	BAP-MW-1601	7.8	5.6	n/a	1 future	n/a	17	0	n/a	n/a	0.01183	NP Intra (normality) 1 of 2
pH, field (SU)	BAP-MW-1602A	7.2	5.9	n/a	1 future	n/a	16	0	None	No	0.0006268	Param Intra 1 of 2
pH, field (SU)	BAP-MW-1603A	7.3	6.2	n/a	1 future	n/a	16	0	None	No	0.0006268	Param Intra 1 of 2
pH, field (SU)	BAP-MW-1604	7.2	5.9	n/a	1 future	n/a	16	0	n/a	n/a	0.01291	NP Intra (normality) 1 of 2
pH, field (SU)	BAP-MW-1605	6.5	5.1	n/a	1 future	n/a	18	0	None	No	0.0006268	Param Intra 1 of 2
pH, field (SU)	BAP-MW-1606	6.7	5.2	n/a	1 future	n/a	16	0	n/a	n/a	0.01291	NP Intra (normality) 1 of 2
pH, field (SU)	BAP-MW-4	7.0	5.4	n/a	1 future	n/a	17	0	n/a	n/a	0.01183	NP Intra (normality) 1 of 2
pH, field (SU)	BAP-MW-5	6.4	5.2	n/a	1 future	n/a	17	0	None	No	0.0006268	Param Intra 1 of 2
pH, field (SU)	BAP-MW-6	6.5	5.5	n/a	1 future	n/a	16	0	None	No	0.0006268	Param Intra 1 of 2

Sanitas™ v.9.6.27 . UG
Hollow symbols indicate censored values.

Prediction Limit

Intrawell Non-parametric, BAP-MW-1



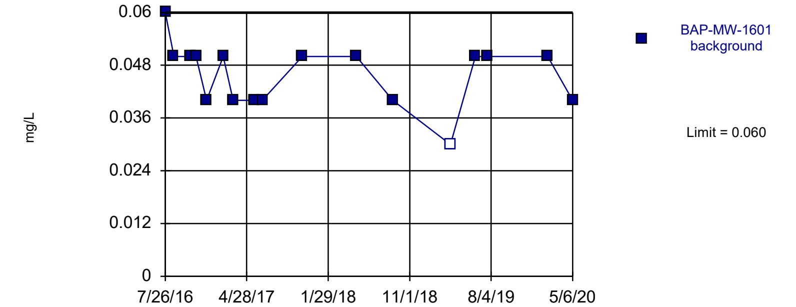
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 31.25% NDs. Well-constituent pair annual alpha = 0.01287. Individual comparison alpha = 0.006456 (1 of 2). Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 1/13/2021 6:24 PM View: Appendix III Intrawell
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27 . UG
Hollow symbols indicate censored values.

Prediction Limit

Intrawell Non-parametric, BAP-MW-1601 (bg)



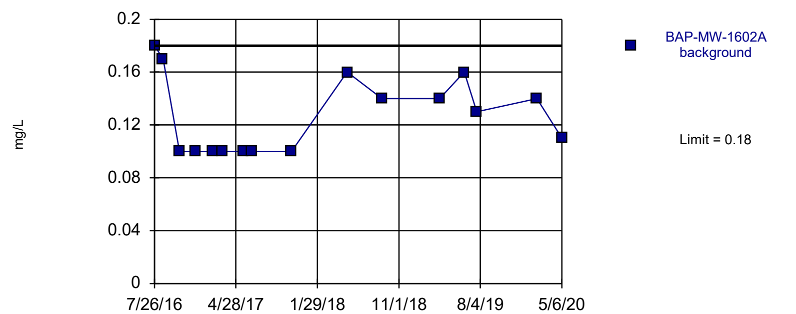
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 17 background values. 5.882% NDs. Well-constituent pair annual alpha = 0.01179. Individual comparison alpha = 0.005914 (1 of 2). Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 1/13/2021 6:24 PM View: Appendix III Intrawell
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27 . UG

Prediction Limit

Intrawell Non-parametric, BAP-MW-1602A (bg)



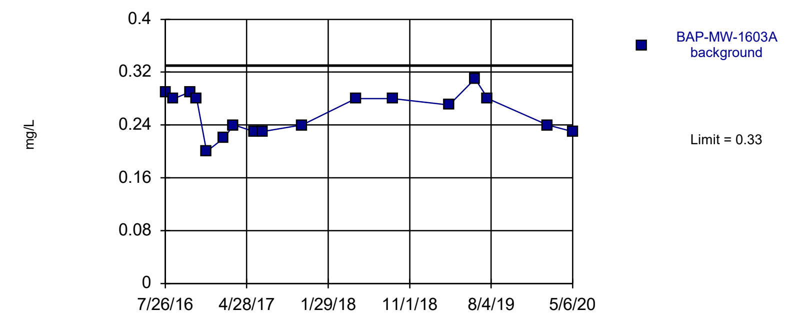
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. Well-constituent pair annual alpha = 0.01287. Individual comparison alpha = 0.006456 (1 of 2). Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 1/13/2021 6:24 PM View: Appendix III Intrawell
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27 . UG

Prediction Limit

Intrawell Parametric, BAP-MW-1603A (bg)



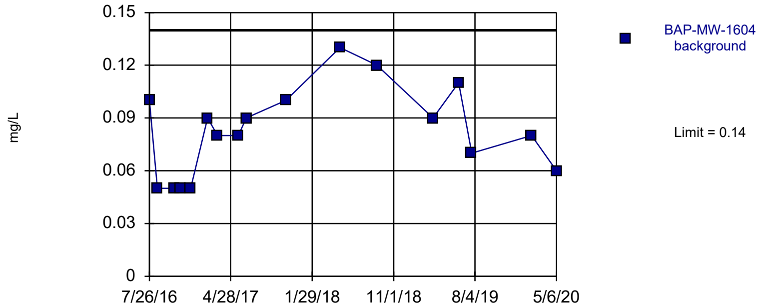
Background Data Summary: Mean=0.2582, Std. Dev.=0.03107, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9188, critical = 0.851. Kappa = 2.181 (c=7, w=6, 1 of 2, event alpha = 0.05132). Report alpha = 0.001254. Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 1/13/2021 6:24 PM View: Appendix III Intrawell
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27 . UG

Prediction Limit

Intrawell Parametric, BAP-MW-1604



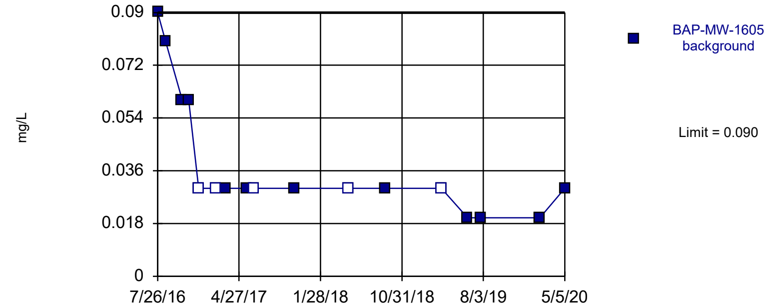
Background Data Summary: Mean=0.08235, Std. Dev.=0.02513, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9355, critical = 0.851. Kappa = 2.181 (c=7, w=6, 1 of 2, event alpha = 0.05132). Report alpha = 0.001254. Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 1/13/2021 6:24 PM View: Appendix III Intrawell
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27 . UG
Hollow symbols indicate censored values.

Prediction Limit

Intrawell Non-parametric, BAP-MW-1605



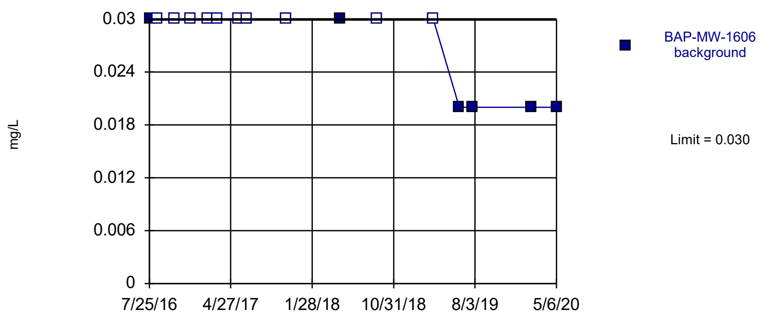
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 17 background values. 29.41% NDs. Well-constituent pair annual alpha = 0.01179. Individual comparison alpha = 0.005914 (1 of 2). Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 1/13/2021 6:24 PM View: Appendix III Intrawell
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27 . UG
Hollow symbols indicate censored values.

Prediction Limit

Intrawell Non-parametric, BAP-MW-1606



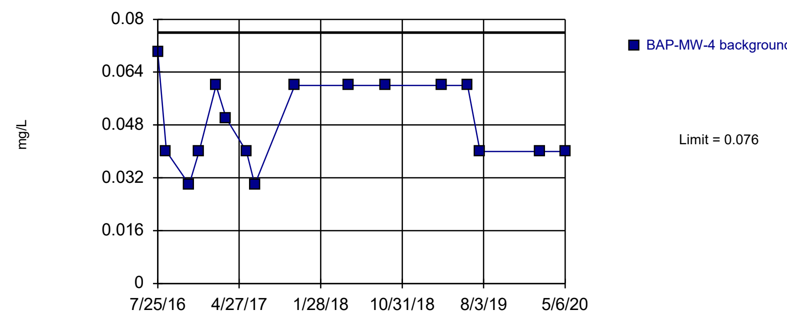
Non-parametric test used in lieu of parametric prediction limit because censored data exceeded 50%. Limit is highest of 16 background values. 62.5% NDs. Well-constituent pair annual alpha = 0.01287. Individual comparison alpha = 0.006456 (1 of 2). Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 1/13/2021 6:24 PM View: Appendix III Intrawell
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27 . UG

Prediction Limit

Intrawell Parametric, BAP-MW-4

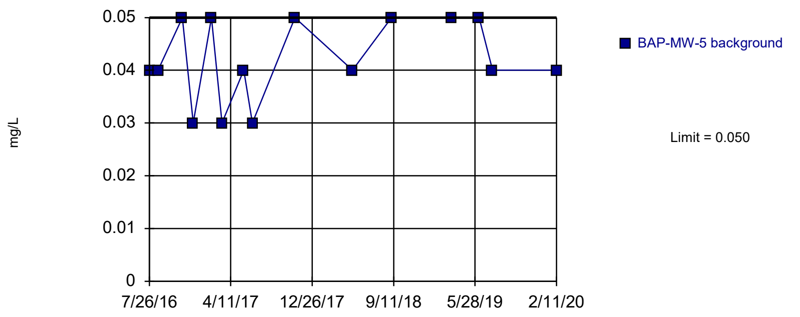


Background Data Summary: Mean=0.04875, Std. Dev.=0.01258, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.864, critical = 0.844. Kappa = 2.205 (c=7, w=6, 1 of 2, event alpha = 0.05132). Report alpha = 0.001254. Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 1/13/2021 6:24 PM View: Appendix III Intrawell
Amos BAP Client: Geosyntec Data: Amos BAP

Prediction Limit

Intrawell Non-parametric, BAP-MW-5

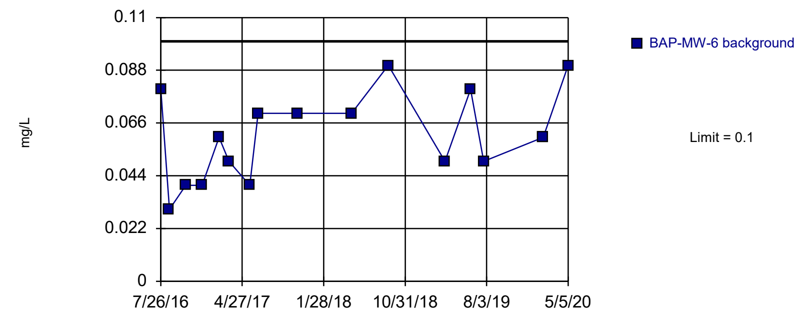


Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 15 background values. Well-constituent pair annual alpha = 0.01501. Individual comparison alpha = 0.007533 (1 of 2). Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 1/13/2021 6:24 PM View: Appendix III Intrawell
Amos BAP Client: Geosyntec Data: Amos BAP

Prediction Limit

Intrawell Parametric, BAP-MW-6 (bg)

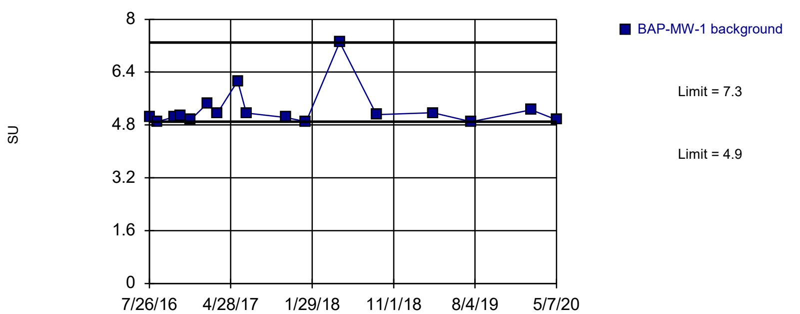


Background Data Summary: Mean=0.06063, Std. Dev.=0.01879, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9447, critical = 0.844. Kappa = 2.205 (c=7, w=6, 1 of 2, event alpha = 0.05132). Report alpha = 0.001254. Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 1/13/2021 6:24 PM View: Appendix III Intrawell
Amos BAP Client: Geosyntec Data: Amos BAP

Prediction Limit

Intrawell Non-parametric, BAP-MW-1

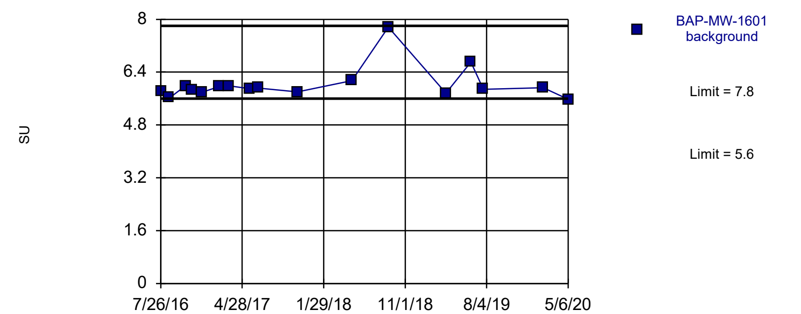


Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limits are highest and lowest of 17 background values. Well-constituent pair annual alpha = 0.02359. Individual comparison alpha = 0.01183 (1 of 2). Assumes 1 future value.

Constituent: pH, field Analysis Run 1/13/2021 6:24 PM View: Appendix III Intrawell
Amos BAP Client: Geosyntec Data: Amos BAP

Prediction Limit

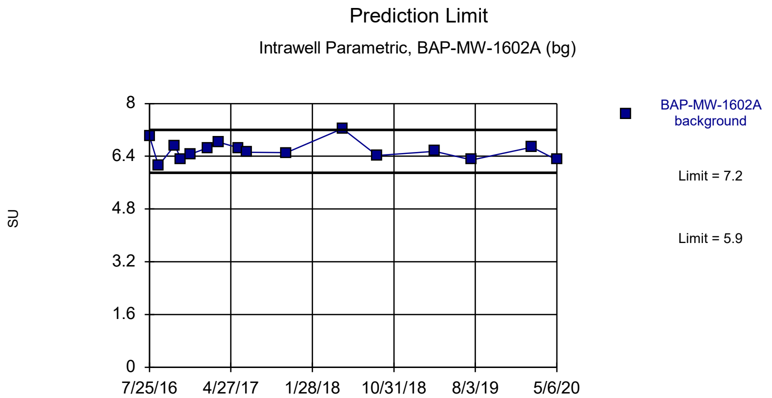
Intrawell Non-parametric, BAP-MW-1601 (bg)



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. Limits are highest and lowest of 17 background values. Well-constituent pair annual alpha = 0.02359. Individual comparison alpha = 0.01183 (1 of 2). Assumes 1 future value.

Constituent: pH, field Analysis Run 1/13/2021 6:24 PM View: Appendix III Intrawell
Amos BAP Client: Geosyntec Data: Amos BAP

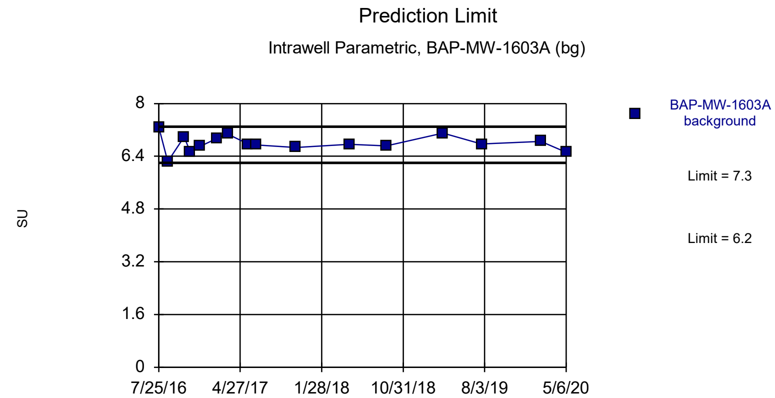
Sanitas™ v.9.6.27 . UG



Background Data Summary: Mean=6.579, Std. Dev.=0.2879, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9628, critical = 0.844. Kappa = 2.205 (c=7, w=6, 1 of 2, event alpha = 0.05132). Report alpha = 0.001254. Assumes 1 future value.

Constituent: pH, field Analysis Run 1/13/2021 6:24 PM View: Appendix III Intrawell
Amos BAP Client: Geosyntec Data: Amos BAP

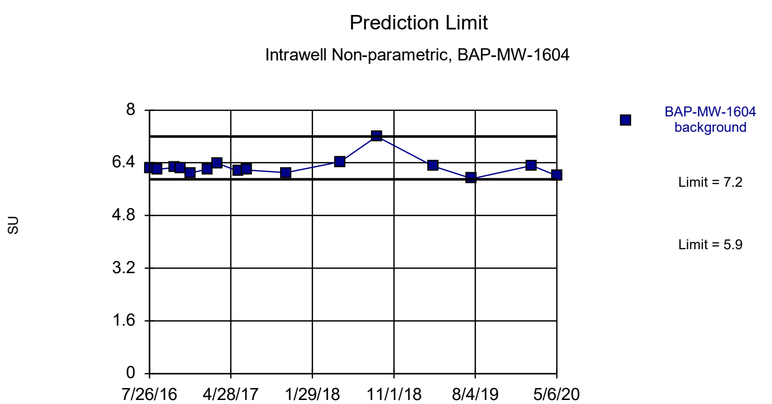
Sanitas™ v.9.6.27 . UG



Background Data Summary: Mean=6.79, Std. Dev.=0.2537, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.974, critical = 0.844. Kappa = 2.205 (c=7, w=6, 1 of 2, event alpha = 0.05132). Report alpha = 0.001254. Assumes 1 future value.

Constituent: pH, field Analysis Run 1/13/2021 6:24 PM View: Appendix III Intrawell
Amos BAP Client: Geosyntec Data: Amos BAP

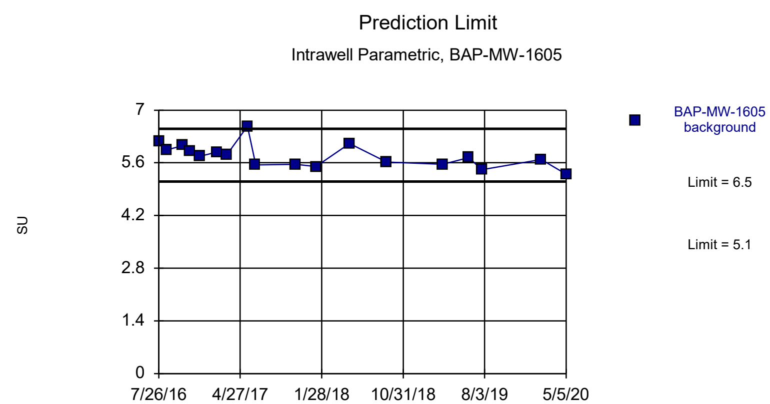
Sanitas™ v.9.6.27 . UG



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. Limits are highest and lowest of 16 background values. Well-constituent pair annual alpha = 0.02574. Individual comparison alpha = 0.01291 (1 of 2). Assumes 1 future value.

Constituent: pH, field Analysis Run 1/13/2021 6:24 PM View: Appendix III Intrawell
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27 . UG



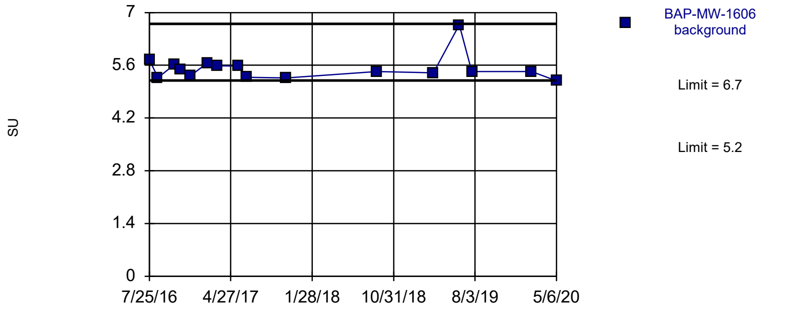
Background Data Summary: Mean=5.786, Std. Dev.=0.311, n=18. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9594, critical = 0.858. Kappa = 2.157 (c=7, w=6, 1 of 2, event alpha = 0.05132). Report alpha = 0.001254. Assumes 1 future value.

Constituent: pH, field Analysis Run 1/13/2021 6:24 PM View: Appendix III Intrawell
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27 . UG

Prediction Limit

Intrawell Non-parametric, BAP-MW-1606



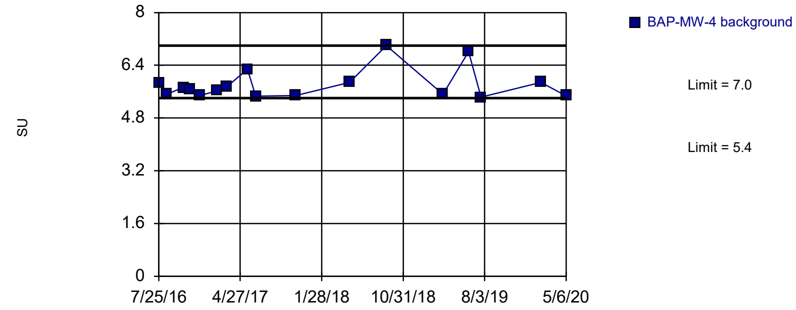
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limits are highest and lowest of 16 background values. Well-constituent pair annual alpha = 0.02574. Individual comparison alpha = 0.01291 (1 of 2). Assumes 1 future value.

Constituent: pH, field Analysis Run 1/13/2021 6:24 PM View: Appendix III Intrawell
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27 . UG

Prediction Limit

Intrawell Non-parametric, BAP-MW-4



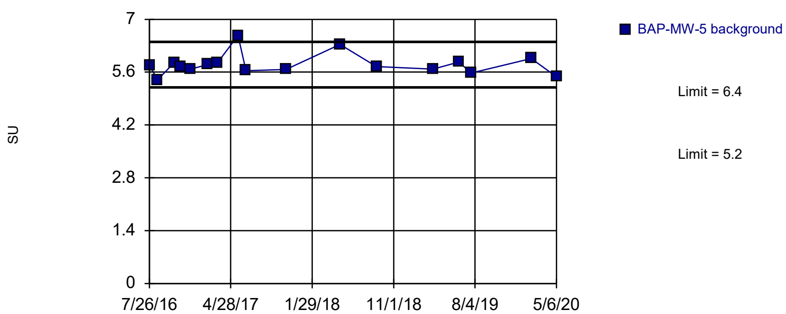
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limits are highest and lowest of 17 background values. Well-constituent pair annual alpha = 0.02359. Individual comparison alpha = 0.01183 (1 of 2). Assumes 1 future value.

Constituent: pH, field Analysis Run 1/13/2021 6:24 PM View: Appendix III Intrawell
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27 . UG

Prediction Limit

Intrawell Parametric, BAP-MW-5



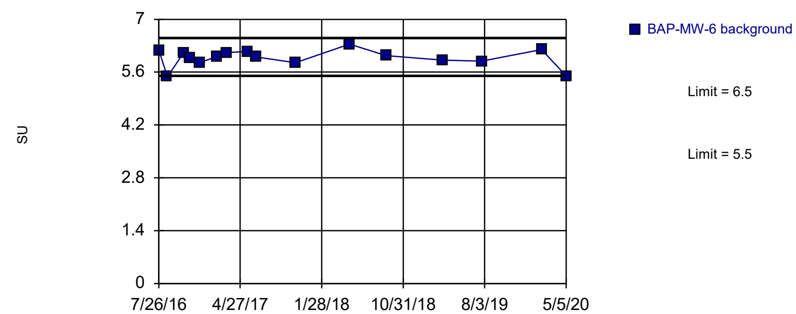
Background Data Summary: Mean=5.802, Std. Dev.=0.2847, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8619, critical = 0.851. Kappa = 2.181 (c=7, w=6, 1 of 2, event alpha = 0.05132). Report alpha = 0.001254. Assumes 1 future value.

Constituent: pH, field Analysis Run 1/13/2021 6:24 PM View: Appendix III Intrawell
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27 . UG

Prediction Limit

Intrawell Parametric, BAP-MW-6 (bg)



Background Data Summary: Mean=5.976, Std. Dev.=0.233, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.914, critical = 0.844. Kappa = 2.205 (c=7, w=6, 1 of 2, event alpha = 0.05132). Report alpha = 0.001254. Assumes 1 future value.

Constituent: pH, field Analysis Run 1/13/2021 6:24 PM View: Appendix III Intrawell
Amos BAP Client: Geosyntec Data: Amos BAP

FIGURE G. Interwell PL Upgradient

Interwell Prediction Limit - All Results

Amos BAP   Client: Geosyntec   Data: Amos BAP   Printed 1/18/2021, 9:00 PM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	%NDs	ND Adj.	Transform	Alpha	Method
Boron, total (mg/L)	n/a	0.18	n/a	n/a	6 future	n/a	60	31.67	n/a	n/a	0.0005218	NP Inter (normality) 1 of 2
Calcium, total (mg/L)	n/a	20	n/a	n/a	6 future	n/a	60	0	n/a	n/a	0.0005218	NP Inter (normality) 1 of 2
Chloride, total (mg/L)	n/a	43	n/a	n/a	6 future	n/a	62	0	n/a	n/a	0.0004949	NP Inter (normality) 1 of 2
Mercury, total (mg/L)	n/a	0.0000050	n/a	n/a	6 future	n/a	44	90.91	n/a	n/a	0.0009736	NP Inter (NDs) 1 of 2
Total Dissolved Solids [TDS] (mg/L)	n/a	260	n/a	n/a	6 future	n/a	62	0	None	No	0.001254	Param Inter 1 of 2

FIGURE H. UTLs

Tolerance Limit Summary Table

Amos BAP   Client: Geosyntec   Data: Amos BAP   Printed 1/19/2021, 9:06 AM

Constituent	Well	Upper Lim.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Antimony, total (mg/L)	n/a	0.00017	64	n/a	n/a	28.13	n/a	n/a	0.03752	NP Inter(normality)
Arsenic, total (mg/L)	n/a	0.090	64	n/a	n/a	0	n/a	n/a	0.03752	NP Inter(normality)
Barium, total (mg/L)	n/a	0.3	64	0.1888	0.05317	0	None	No	0.05	Inter
Beryllium, total (mg/L)	n/a	0.00011	64	n/a	n/a	18.75	n/a	n/a	0.03752	NP Inter(normality)
Cadmium, total (mg/L)	n/a	0.000050	64	n/a	n/a	31.25	n/a	n/a	0.03752	NP Inter(normality)
Chromium, total (mg/L)	n/a	0.002	63	0.02602	0.009081	0	None	sqrt(x)	0.05	Inter
Cobalt, total (mg/L)	n/a	0.014	64	n/a	n/a	0	n/a	n/a	0.03752	NP Inter
Combined Radium 226 + 228 (pCi/L)	n/a	3.9	66	-0.05814	0.7163	0	None	ln(x)	0.05	Inter
Fluoride, total (mg/L)	n/a	0.31	70	n/a	n/a	1.429	n/a	n/a	0.02758	NP Inter(normality)
Lead, total (mg/L)	n/a	0.0068	64	-7.528	1.266	1.563	None	ln(x)	0.05	Inter
Lithium, total (mg/L)	n/a	0.0082	64	-6.811	1.004	18.75	Kaplan-Meier	ln(x)	0.05	Inter
Mercury, total (mg/L)	n/a	0.0000050	44	n/a	n/a	90.91	n/a	n/a	0.1047	NP Inter(NDs)
Molybdenum, total (mg/L)	n/a	0.0024	64	0.02904	0.009838	9.375	None	sqrt(x)	0.05	Inter
Selenium, total (mg/L)	n/a	0.00040	64	n/a	n/a	7.813	n/a	n/a	0.03752	NP Inter(normality)
Thallium, total (mg/L)	n/a	0.00050	64	n/a	n/a	42.19	n/a	n/a	0.03752	NP Inter(normality)

FIGURE I. GWPS

AMOS BAP GWPS				
Constituent Name	**MCL**	**CCR Rule-Based**	**Background**	**GWPS**
Antimony, Total (mg/L)	0.006		0.00017	0.006
Arsenic, Total (mg/L)	0.01		0.09	0.09
Barium, Total (mg/L)	2		0.3	2
Beryllium, Total (mg/L)	0.004		0.00011	0.004
Cadmium, Total (mg/L)	0.005		0.00005	0.005
Chromium, Total (mg/L)	0.1		0.002	0.1
Cobalt, Total (mg/L)	n/a	0.006	0.014	0.014
Combined Radium, Total (pCi/L)	5		3.9	5
Fluoride, Total (mg/L)	4		0.31	4
Lead, Total (mg/L)	0.015		0.0068	0.015
Lithium, Total (mg/L)	n/a	0.04	0.0082	0.04
Mercury, Total (mg/L)	0.002		0.000005	0.002
Molybdenum, Total (mg/L)	n/a	0.1	0.0024	0.1
Selenium, Total (mg/L)	0.05		0.0004	0.05
Thallium, Total (mg/L)	0.002		0.0005	0.002

Grey cell indicates Background is higher than MCL

MCL = Maximum Contaminant Level

GWPS - Groundwater Protection Standard

FIGURE J. Confidence Intervals

Confidence Interval Summary Table - All Results (No Significant)

Amos BAP Client: Geosyntec Data: Amos BAP Printed 1/19/2021, 9:18 AM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Antimony, total (mg/L)	BAP-MW-1	0.0001	0.00001	0.006	No	16	0.0000525	0.00005779	25	None	No	0.01	NP (normality)
Antimony, total (mg/L)	BAP-MW-1604	0.0001	0.00002	0.006	No	16	0.00004875	0.00003222	25	None	No	0.01	NP (normality)
Antimony, total (mg/L)	BAP-MW-1605	0.00003023	0.000009799	0.006	No	16	0.0000625	0.00006668	31.25	Kaplan-Meier	ln(x)	0.01	Param.
Antimony, total (mg/L)	BAP-MW-1606	0.00004	0.00002	0.006	No	16	0.00003562	0.00002658	12.5	None	No	0.01	NP (normality)
Antimony, total (mg/L)	BAP-MW-4	0.0001	0.00002	0.006	No	16	0.00006125	0.00003557	31.25	None	No	0.01	NP (normality)
Antimony, total (mg/L)	BAP-MW-5	0.00003501	0.00001211	0.006	No	16	0.00004937	0.00003415	18.75	Kaplan-Meier	ln(x)	0.01	Param.
Arsenic, total (mg/L)	BAP-MW-1	0.0001467	0.00009833	0.09	No	16	0.0001225	0.00003715	0	None	No	0.01	Param.
Arsenic, total (mg/L)	BAP-MW-1604	0.00611	0.00398	0.09	No	16	0.004803	0.000878	0	None	No	0.01	NP (normality)
Arsenic, total (mg/L)	BAP-MW-1605	0.004192	0.003061	0.09	No	16	0.003654	0.0009104	0	None	sqrt(x)	0.01	Param.
Arsenic, total (mg/L)	BAP-MW-1606	0.003181	0.002596	0.09	No	16	0.002889	0.0004495	0	None	No	0.01	Param.
Arsenic, total (mg/L)	BAP-MW-4	0.009579	0.002895	0.09	No	16	0.006827	0.005906	0	None	sqrt(x)	0.01	Param.
Arsenic, total (mg/L)	BAP-MW-5	0.004	0.00271	0.09	No	16	0.003351	0.001053	0	None	No	0.01	NP (normality)
Barium, total (mg/L)	BAP-MW-1	0.02858	0.02625	2	No	16	0.02742	0.00179	0	None	No	0.01	Param.
Barium, total (mg/L)	BAP-MW-1604	0.1557	0.1341	2	No	16	0.1449	0.01659	0	None	No	0.01	Param.
Barium, total (mg/L)	BAP-MW-1605	0.0925	0.07651	2	No	16	0.08451	0.01229	0	None	No	0.01	Param.
Barium, total (mg/L)	BAP-MW-1606	0.06735	0.05569	2	No	16	0.06152	0.008957	0	None	No	0.01	Param.
Barium, total (mg/L)	BAP-MW-4	0.09615	0.08612	2	No	16	0.09114	0.007709	0	None	No	0.01	Param.
Barium, total (mg/L)	BAP-MW-5	0.1602	0.1452	2	No	16	0.1527	0.01153	0	None	No	0.01	Param.
Beryllium, total (mg/L)	BAP-MW-1	0.0001305	0.0001158	0.004	No	16	0.0001231	0.00001133	0	None	No	0.01	Param.
Beryllium, total (mg/L)	BAP-MW-1604	0.00005776	0.00004121	0.004	No	15	0.00005033	0.00001407	0	None	ln(x)	0.01	Param.
Beryllium, total (mg/L)	BAP-MW-1605	0.00007688	0.000052	0.004	No	16	0.00006444	0.00001912	0	None	No	0.01	Param.
Beryllium, total (mg/L)	BAP-MW-1606	0.0001185	0.00008421	0.004	No	16	0.0001014	0.00002638	0	None	No	0.01	Param.
Beryllium, total (mg/L)	BAP-MW-4	0.00006373	0.00004577	0.004	No	16	0.00005475	0.00001381	0	None	No	0.01	Param.
Beryllium, total (mg/L)	BAP-MW-5	0.00006141	0.00003871	0.004	No	16	0.00005206	0.00002228	0	None	ln(x)	0.01	Param.
Cadmium, total (mg/L)	BAP-MW-1	0.002766	0.002261	0.005	No	16	0.002514	0.0003883	0	None	No	0.01	Param.
Cadmium, total (mg/L)	BAP-MW-1604	0.00005	0.00002	0.005	No	16	0.00004262	0.00001613	81.25	None	No	0.01	NP (NDs)
Cadmium, total (mg/L)	BAP-MW-1605	0.00005	0.00001	0.005	No	16	0.00003775	0.00001898	68.75	None	No	0.01	NP (normality)
Cadmium, total (mg/L)	BAP-MW-1606	0.0002054	0.0001437	0.005	No	16	0.0001763	0.00005071	0	None	sqrt(x)	0.01	Param.
Cadmium, total (mg/L)	BAP-MW-4	0.0001748	0.00005563	0.005	No	16	0.0001506	0.0001725	0	None	ln(x)	0.01	Param.
Cadmium, total (mg/L)	BAP-MW-5	0.00005	0.000006	0.005	No	16	0.00002325	0.00002143	37.5	None	No	0.01	NP (normality)
Chromium, total (mg/L)	BAP-MW-1	0.0003309	0.00011	0.1	No	16	0.0002812	0.0003069	0	None	ln(x)	0.01	Param.
Chromium, total (mg/L)	BAP-MW-1604	0.001179	0.0006522	0.1	No	16	0.0009158	0.0004052	0	None	No	0.01	Param.
Chromium, total (mg/L)	BAP-MW-1605	0.0003815	0.0002076	0.1	No	16	0.0002946	0.0001336	0	None	No	0.01	Param.
Chromium, total (mg/L)	BAP-MW-1606	0.001124	0.0004756	0.1	No	16	0.0008001	0.0004986	0	None	No	0.01	Param.
Chromium, total (mg/L)	BAP-MW-4	0.0005	0.0002	0.1	No	16	0.0003499	0.0002494	0	None	No	0.01	NP (normality)
Chromium, total (mg/L)	BAP-MW-5	0.000353	0.0001582	0.1	No	16	0.0002908	0.0002343	0	None	ln(x)	0.01	Param.
Cobalt, total (mg/L)	BAP-MW-1	0.01583	0.01172	0.014	No	16	0.01377	0.003162	0	None	No	0.01	Param.
Cobalt, total (mg/L)	BAP-MW-1604	0.000805	0.000406	0.014	No	16	0.0006561	0.0004164	0	None	No	0.01	NP (normality)
Cobalt, total (mg/L)	BAP-MW-1605	0.0158	0.00883	0.014	No	16	0.01233	0.006615	0	None	No	0.01	NP (normality)
Cobalt, total (mg/L)	BAP-MW-1606	0.01575	0.01294	0.014	No	16	0.01434	0.002155	0	None	No	0.01	Param.
Cobalt, total (mg/L)	BAP-MW-4	0.02529	0.009619	0.014	No	16	0.02089	0.02	0	None	ln(x)	0.01	Param.
Cobalt, total (mg/L)	BAP-MW-5	0.001235	0.001027	0.014	No	16	0.001134	0.0001635	0	None	sqrt(x)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	BAP-MW-1	1.12	0.5498	5	No	17	0.8699	0.4818	0	None	sqrt(x)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	BAP-MW-1604	1.52	0.664	5	No	17	1.153	0.7737	0	None	sqrt(x)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	BAP-MW-1605	1.53	0.7018	5	No	17	1.284	1.109	0	None	ln(x)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	BAP-MW-1606	1.262	0.4833	5	No	17	0.8728	0.6215	0	None	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	BAP-MW-4	1.23	0.5272	5	No	17	0.998	0.6725	0	None	ln(x)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	BAP-MW-5	1.418	0.7803	5	No	17	1.099	0.5085	0	None	No	0.01	Param.
Fluoride, total (mg/L)	BAP-MW-1	0.06	0.02	4	No	17	0.03647	0.01618	29.41	None	No	0.01	NP (normality)
Fluoride, total (mg/L)	BAP-MW-1604	0.09698	0.06747	4	No	18	0.08222	0.02439	0	None	No	0.01	Param.
Fluoride, total (mg/L)	BAP-MW-1605	0.06	0.02	4	No	18	0.04556	0.02229	27.78	None	No	0.01	NP (normality)
Fluoride, total (mg/L)	BAP-MW-1606	0.06	0.02	4	No	17	0.04471	0.01908	58.82	None	No	0.01	NP (normality)
Fluoride, total (mg/L)	BAP-MW-4	0.06	0.04	4	No	17	0.04882	0.01219	0	None	No	0.01	NP (normality)
Fluoride, total (mg/L)	BAP-MW-5	0.05	0.03	4	No	17	0.04118	0.007812	0	None	No	0.01	NP (normality)
Lead, total (mg/L)	BAP-MW-1	0.000134	0.000068	0.015	No	16	0.0001694	0.0002681	12.5	None	No	0.01	NP (normality)

Confidence Interval Summary Table - All Results (No Significant)

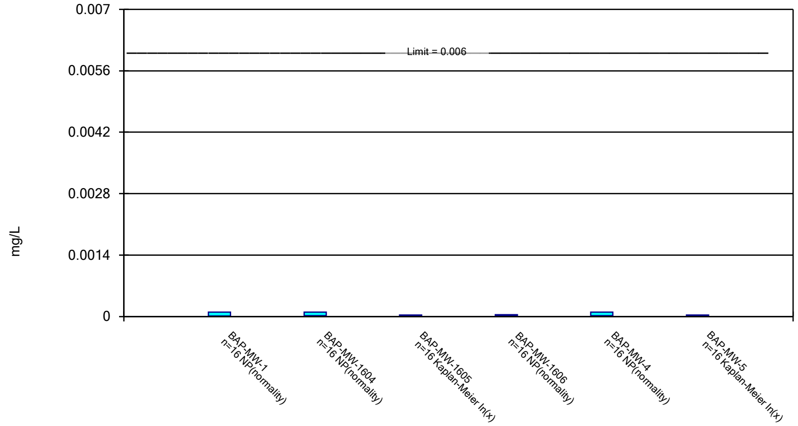
Amos BAP   Client: Geosyntec   Data: Amos BAP   Printed 1/19/2021, 9:18 AM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Lead, total (mg/L)	BAP-MW-1604	0.0007794	0.0002845	0.015	No	16	0.0005691	0.000425	0	None	sqrt(x)	0.01	Param.
Lead, total (mg/L)	BAP-MW-1605	0.0002094	0.00007107	0.015	No	16	0.0001806	0.0002245	0	None	ln(x)	0.01	Param.
Lead, total (mg/L)	BAP-MW-1606	0.0009335	0.0003834	0.015	No	16	0.0006584	0.0004227	0	None	No	0.01	Param.
Lead, total (mg/L)	BAP-MW-4	0.0003875	0.000214	0.015	No	16	0.0003008	0.0001333	0	None	No	0.01	Param.
Lead, total (mg/L)	BAP-MW-5	0.000292	0.0000756	0.015	No	16	0.0002052	0.0002133	6.25	None	sqrt(x)	0.01	Param.
Lithium, total (mg/L)	BAP-MW-1	0.014	0.00239	0.04	No	16	0.007253	0.009353	12.5	None	No	0.01	NP (normality)
Lithium, total (mg/L)	BAP-MW-1604	0.03	0.000515	0.04	No	16	0.009166	0.01253	25	None	No	0.01	NP (normality)
Lithium, total (mg/L)	BAP-MW-1605	0.011	0.00255	0.04	No	16	0.007675	0.009013	12.5	None	No	0.01	NP (normality)
Lithium, total (mg/L)	BAP-MW-1606	0.01	0.00256	0.04	No	16	0.009227	0.01053	18.75	None	No	0.01	NP (normality)
Lithium, total (mg/L)	BAP-MW-4	0.006561	0.001326	0.04	No	16	0.00653	0.009686	12.5	None	ln(x)	0.01	Param.
Lithium, total (mg/L)	BAP-MW-5	0.006526	0.001297	0.04	No	16	0.006428	0.009682	12.5	None	ln(x)	0.01	Param.
Mercury, total (mg/L)	BAP-MW-1	0.000005	0.000005	0.002	No	11	0.0000047279.0e-7		90.91	None	No	0.006	NP (NDs)
Mercury, total (mg/L)	BAP-MW-1604	0.000005	0.000005	0.002	No	11	0.0000047279.0e-7		90.91	None	No	0.006	NP (NDs)
Mercury, total (mg/L)	BAP-MW-1605	0.000005	0.000005	0.002	No	11	0.000005	0	100	None	No	0.006	NP (NDs)
Mercury, total (mg/L)	BAP-MW-1606	0.000005	0.000005	0.002	No	11	0.0000047279.0e-7		90.91	None	No	0.006	NP (NDs)
Mercury, total (mg/L)	BAP-MW-4	0.000005	0.000005	0.002	No	11	0.000005	0	100	None	No	0.006	NP (NDs)
Mercury, total (mg/L)	BAP-MW-5	0.000005	0.000005	0.002	No	11	0.000005	0	100	None	No	0.006	NP (NDs)
Molybdenum, total (mg/L)	BAP-MW-1	0.002	0.0005	0.1	No	16	0.001307	0.0007254	31.25	None	No	0.01	NP (normality)
Molybdenum, total (mg/L)	BAP-MW-1604	0.002	0.00022	0.1	No	16	0.0008594	0.0008083	31.25	None	No	0.01	NP (normality)
Molybdenum, total (mg/L)	BAP-MW-1605	0.002	0.00012	0.1	No	16	0.0009106	0.0008826	37.5	None	No	0.01	NP (normality)
Molybdenum, total (mg/L)	BAP-MW-1606	0.002	0.0001	0.1	No	16	0.00084	0.0009299	37.5	None	No	0.01	NP (normality)
Molybdenum, total (mg/L)	BAP-MW-4	0.001961	0.0004077	0.1	No	16	0.002889	0.005062	25	Kaplan-Meier	ln(x)	0.01	Param.
Molybdenum, total (mg/L)	BAP-MW-5	0.00215	0.00031	0.1	No	16	0.001306	0.0008764	31.25	None	No	0.01	NP (normality)
Selenium, total (mg/L)	BAP-MW-1	0.0002	0.00009	0.05	No	16	0.0001219	0.00004694	0	None	No	0.01	NP (normality)
Selenium, total (mg/L)	BAP-MW-1604	0.0003	0.0001	0.05	No	16	0.0001875	0.00005	0	None	No	0.01	NP (normality)
Selenium, total (mg/L)	BAP-MW-1605	0.00008606	0.00005644	0.05	No	16	0.00007125	0.00002277	0	None	No	0.01	Param.
Selenium, total (mg/L)	BAP-MW-1606	0.0002	0.00007	0.05	No	16	0.0001287	0.00006888	6.25	None	No	0.01	NP (normality)
Selenium, total (mg/L)	BAP-MW-4	0.0001	0.00006	0.05	No	16	0.00008625	0.00003403	0	None	No	0.01	NP (normality)
Selenium, total (mg/L)	BAP-MW-5	0.0001	0.00005	0.05	No	16	0.00008125	0.00002579	56.25	None	No	0.01	NP (normality)
Thallium, total (mg/L)	BAP-MW-1	0.0005	0.00004	0.002	No	16	0.0002151	0.000228	37.5	None	No	0.01	NP (normality)
Thallium, total (mg/L)	BAP-MW-1604	0.0005	0.00001	0.002	No	16	0.00029	0.0002461	56.25	None	No	0.01	NP (normality)
Thallium, total (mg/L)	BAP-MW-1605	0.0005	0.00004	0.002	No	16	0.0003533	0.0002251	68.75	None	No	0.01	NP (normality)
Thallium, total (mg/L)	BAP-MW-1606	0.0005	0.00001	0.002	No	16	0.0002013	0.0002392	37.5	None	No	0.01	NP (normality)
Thallium, total (mg/L)	BAP-MW-4	0.0005	0.000055	0.002	No	16	0.0002149	0.0002038	31.25	None	No	0.01	NP (normality)
Thallium, total (mg/L)	BAP-MW-5	0.0005	0.00001	0.002	No	16	0.0002894	0.0002468	56.25	None	No	0.01	NP (normality)

Sanitas™ v.9.6.27b Sanitas software utilized by Groundwater Stats Consulting. UG

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.

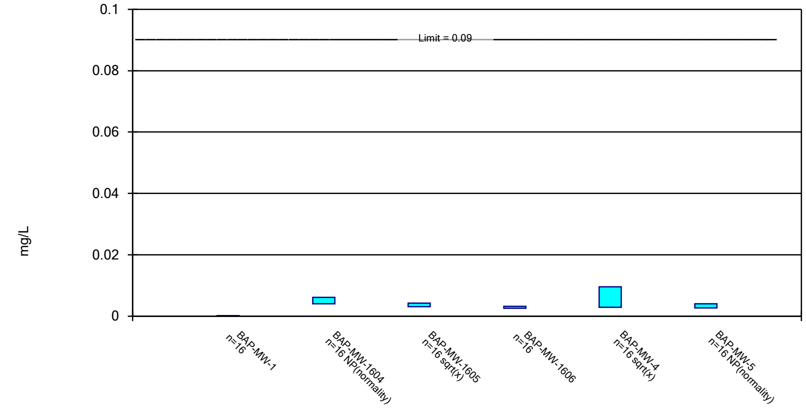


Constituent: Antimony, total Analysis Run 1/19/2021 9:16 AM View: Confidence Intervals
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27b Sanitas software utilized by Groundwater Stats Consulting. UG

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.

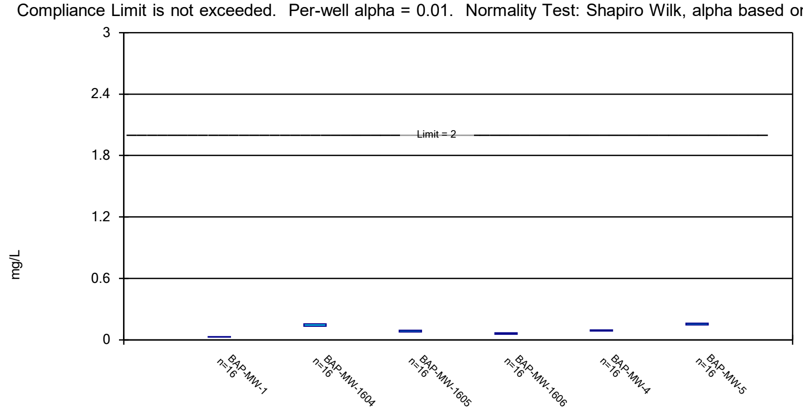


Constituent: Arsenic, total Analysis Run 1/19/2021 9:16 AM View: Confidence Intervals
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27b Sanitas software utilized by Groundwater Stats Consulting. UG

Parametric Confidence Interval

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

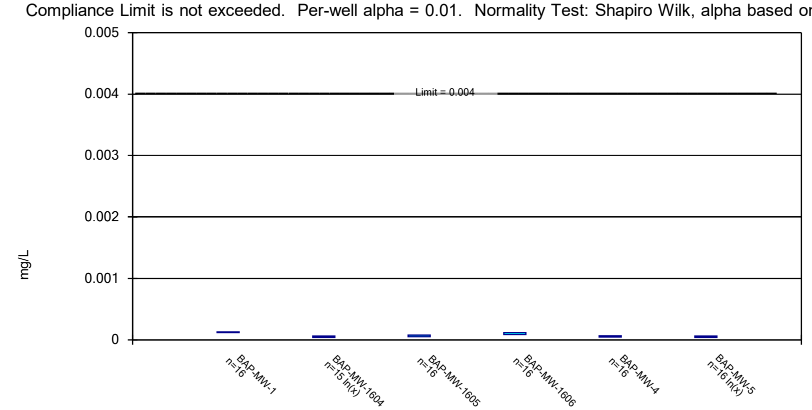


Constituent: Barium, total Analysis Run 1/19/2021 9:16 AM View: Confidence Intervals
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27b Sanitas software utilized by Groundwater Stats Consulting. UG

Parametric Confidence Interval

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

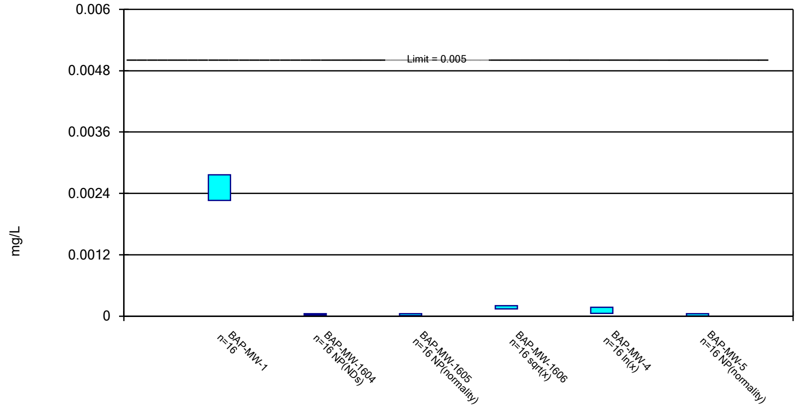


Constituent: Beryllium, total Analysis Run 1/19/2021 9:16 AM View: Confidence Intervals
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27b Sanitas software utilized by Groundwater Stats Consulting. UG

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.



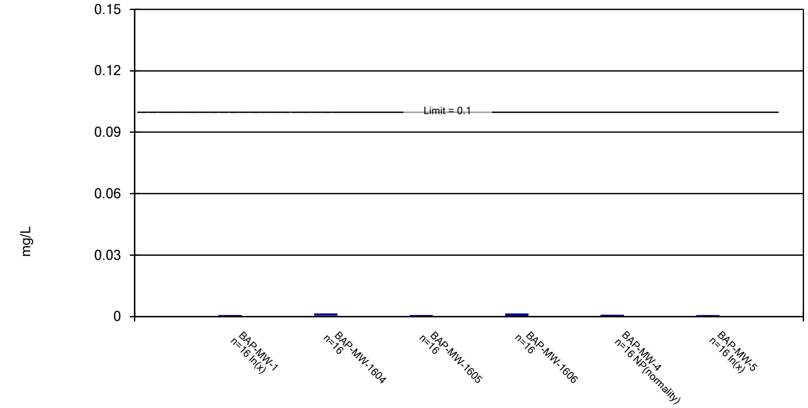
Constituent: Cadmium, total Analysis Run 1/19/2021 9:16 AM View: Confidence Intervals

Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27b Sanitas software utilized by Groundwater Stats Consulting. UG

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.



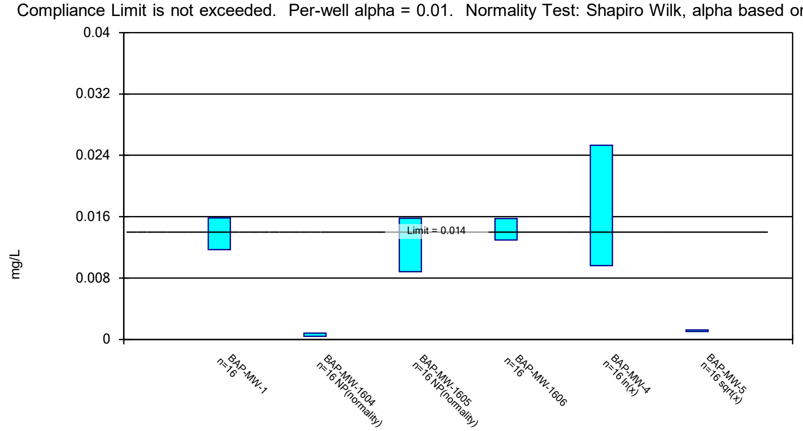
Constituent: Chromium, total Analysis Run 1/19/2021 9:16 AM View: Confidence Intervals

Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27b Sanitas software utilized by Groundwater Stats Consulting. UG

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.



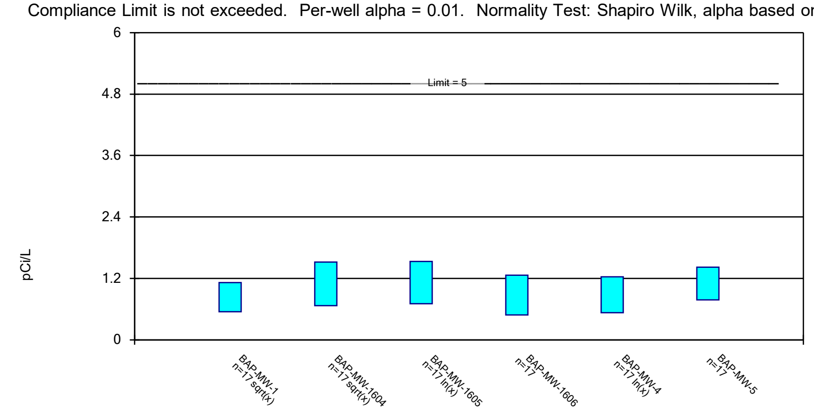
Constituent: Cobalt, total Analysis Run 1/19/2021 9:16 AM View: Confidence Intervals

Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27b Sanitas software utilized by Groundwater Stats Consulting. UG

Parametric Confidence Interval

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



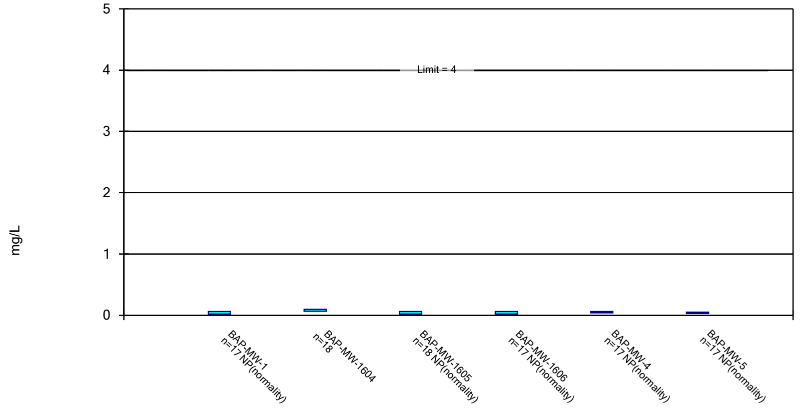
Constituent: Combined Radium 226 + 228 Analysis Run 1/19/2021 9:16 AM View: Confidence Intervals

Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27b Sanitas software utilized by Groundwater Stats Consulting. UG

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.



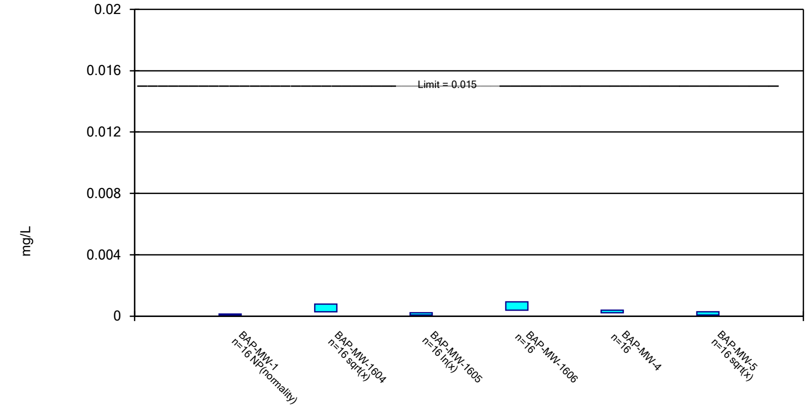
Constituent: Fluoride, total   Analysis Run 1/19/2021 9:16 AM   View: Confidence Intervals

Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.27b Sanitas software utilized by Groundwater Stats Consulting. UG

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.



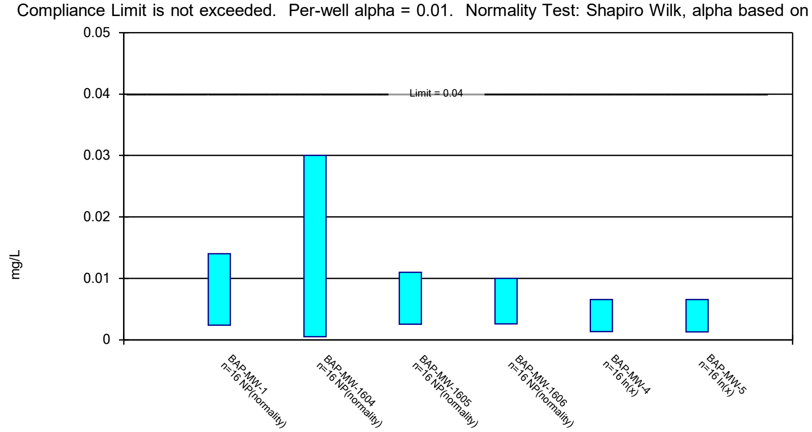
Constituent: Lead, total   Analysis Run 1/19/2021 9:16 AM   View: Confidence Intervals

Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.27b Sanitas software utilized by Groundwater Stats Consulting. UG

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.



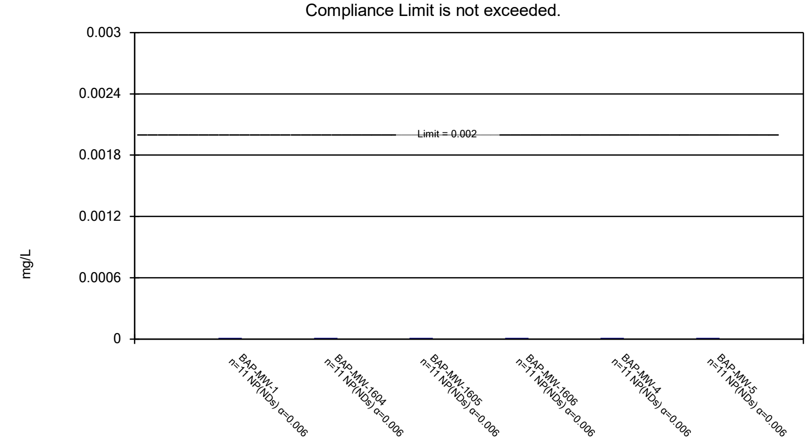
Constituent: Lithium, total   Analysis Run 1/19/2021 9:16 AM   View: Confidence Intervals

Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.27b Sanitas software utilized by Groundwater Stats Consulting. UG

Non-Parametric Confidence Interval

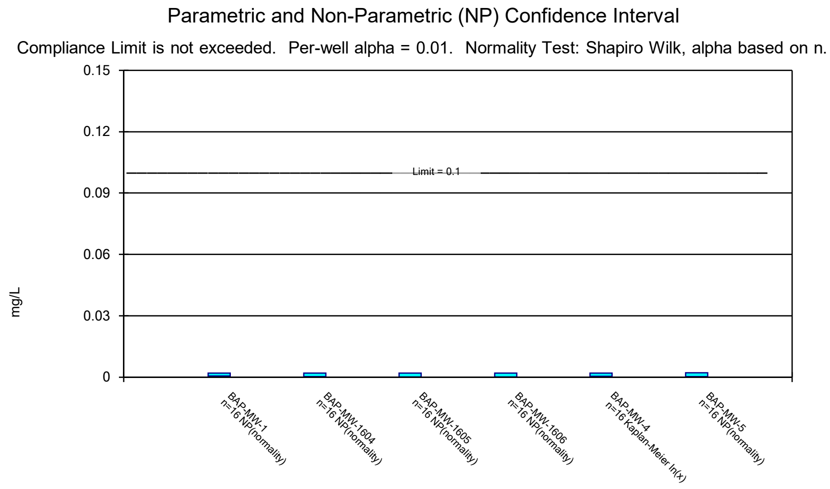
Compliance Limit is not exceeded.



Constituent: Mercury, total   Analysis Run 1/19/2021 9:16 AM   View: Confidence Intervals

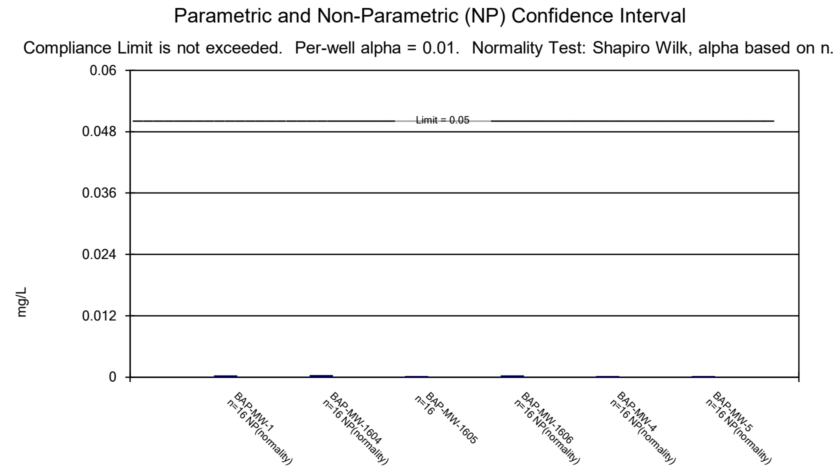
Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.27b Sanitas software utilized by Groundwater Stats Consulting. UG



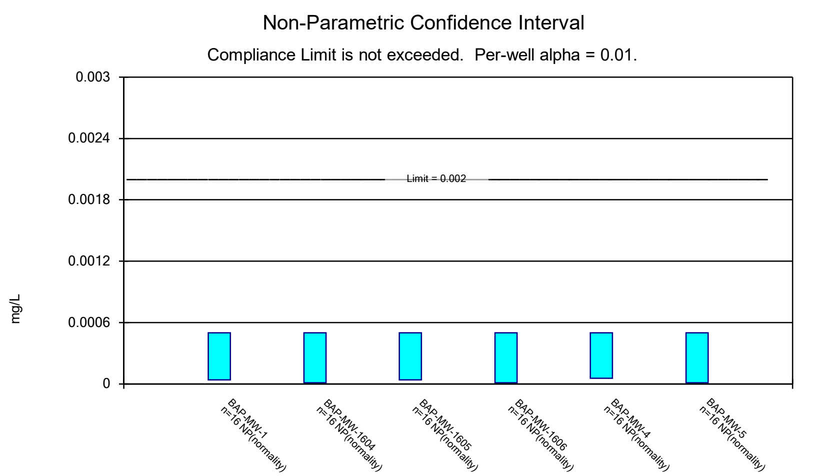
Constituent: Molybdenum, total Analysis Run 1/19/2021 9:16 AM View: Confidence Intervals
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27b Sanitas software utilized by Groundwater Stats Consulting. UG



Constituent: Selenium, total Analysis Run 1/19/2021 9:17 AM View: Confidence Intervals
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.27b Sanitas software utilized by Groundwater Stats Consulting. UG



Constituent: Thallium, total Analysis Run 1/19/2021 9:17 AM View: Confidence Intervals
Amos BAP Client: Geosyntec Data: Amos BAP

STATISTICAL ANALYSIS SUMMARY
BOTTOM ASH POND
Amos Plant
Winfield, West Virginia

Submitted to

American Electric Power

1 Riverside Plaza
Columbus, Ohio 43215-2372

Submitted by

Geosyntec consultants

engineers | scientists | innovators

941 Chatham Lane
Suite 103
Columbus, Ohio 43221

August 27, 2021

CHA8500

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LIST OF ATTACHMENTS

LIST OF ACRONYMS AND ABBREVIATIONS

AEP	American Electric Power
BAP	Bottom Ash Pond
CCR	Coal Combustion Residuals
CCV	Continuing Calibration Verification
CFR	Code of Federal Regulations
GWPS	Groundwater Protection Standard
LCL	Lower Confidence Limit
LFB	Laboratory Fortified Blanks
LPL	Lower Prediction Limit
LRB	Laboratory Reagent Blanks
MCL	Maximum Contaminant Level
NELAP	National Environmental Laboratory Accreditation Program
QA	Quality Assurance
QC	Quality Control
SSI	Statistically Significant Increase
SSL	Statistically Significant Level
TDS	Total Dissolved Solids
UPL	Upper Prediction Limit
USEPA	United States Environmental Protection Agency

SECTION 1

EXECUTIVE SUMMARY

In accordance with the United States Environmental Protection Agency's (USEPA's) regulations regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments (40 CFR 257.90-257.98, "CCR rule"), groundwater monitoring has been conducted at the Bottom Ash Pond (BAP), an existing CCR unit at the Amos Power Plant located in Winfield, West Virginia.

Based on detection monitoring conducted in 2017 and 2018, statistically significant increases (SSIs) over background were concluded for calcium, chloride, total dissolved solids (TDS), and sulfate at the BAP. An alternative source was not identified following the detection monitoring events, so the BAP has been in assessment monitoring since 2018. During the most recent assessment monitoring event, completed in October 2020, no statistically significant levels (SSLs) were identified during this event and the unit remained in assessment monitoring (Geosyntec, 2021). Two assessment monitoring events were conducted at the BAP in March 2021 and May 2021, in accordance with 40 CFR 257.95. The statistical summary of the results of these assessment sampling events 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 IV parameters at the compliance wells to assess whether Appendix IV parameters were present at SSLs above the GWPS. No statistically significant levels (SSLs) were identified; however, concentrations of Appendix III parameters remained above background. Thus, the unit will remain in assessment monitoring. Certification of the selected statistical methods by a qualified professional engineer is documented in Attachment A.

SECTION 2

BOTTOM ASH POND EVALUATION

2.1 Data Validation & QA/QC

During the assessment monitoring program, two sets of samples were collected for analysis from each upgradient and downgradient well to meet the requirements of 40 CFR 257.95(b) (March 2021) and 257.95(d)(1) (May 2021). Samples from the March 2021 event were analyzed for Appendix IV parameters only, whereas samples from the May 2021 sample event were analyzed for all Appendix III and detected Appendix IV parameters based on the results of the March event. A summary of data collected during these assessment monitoring events may be found in Table 1.

Chemical analysis was completed by an analytical laboratory certified by the National Environmental Laboratory Accreditation Program (NELAP). Quality assurance and quality control (QA/QC) samples completed by the analytical laboratory included the use of laboratory reagent blanks (LRBs), continuing calibration verification (CCV) samples, and laboratory fortified blanks (LFBs).

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.9.6.30 statistics software. The export file was checked against the analytical data for transcription errors and completeness. No QA/QC issues were noted which would impact data usability.

2.2 Statistical Analysis

Statistical analyses for the BAP were conducted in accordance with the October 2020 *Statistical Analysis Plan* (Geosyntec, 2020), except where noted below. Time series plots and results for all completed statistical tests are provided in Attachment B.

The data obtained in March and May 2021 were screened for potential outliers; however, no outliers were identified in either set of data (Attachment B).

2.2.1 Evaluation of Potential Appendix IV SSLs

A confidence interval was constructed for each Appendix IV parameter at each compliance well. Confidence limits were generally calculated parametrically ($\alpha = 0.01$); however, non-parametric confidence limits were calculated in some cases (e.g., when the data did not appear to be normally distributed or when the non-detect frequency was too high). An SSL was concluded if the lower confidence limit (LCL) exceeded the GWPS (i.e., if the entire confidence interval exceeded the GWPS). Calculated confidence limits are shown in Attachment B. Calculated confidence limits are shown in Attachment B. The calculated confidence limits were compared to the GWPSs provided in Table 2. The GWPSs were established during a previous statistical analysis as either the greater value of the background concentration or the maximum contaminant level (MCL) and risk-based level specified in 40 CFR 257.95(h)(2) (Geosyntec, 2021).

No SSLs were identified at the Amos BAP.

2.2.2 Evaluation of Potential Appendix III SSIs

The Appendix III results were analyzed to assess whether concentrations of Appendix III parameters at the compliance wells exceeded background concentrations. Data collected during the May 2021 assessment monitoring event from each compliance well were compared to previously established prediction limits to assess whether the results are above background values. The results from these events and the prediction limits are summarized in Table 3. The following exceedances of the upper prediction limits (UPLs) were noted:

- Boron concentrations exceeded the interwell UPL of 0.180 mg/L at MW-1604 (0.186 mg/L).
- Calcium concentrations exceeded the interwell UPL of 20.0 mg/L at MW-1 (31.6 mg/L), MW-1605 (45.4 mg/L), and MW-1606 (23.7 mg/L).
- Chloride concentrations exceeded the interwell UPL of 43.0 mg/L at MW-1 (51.2 mg/L), MW-1605 (85.1 mg/L), and MW-1606 (73.4 mg/L).
- Sulfate concentrations exceeded the interwell UPL of 57.0 mg/L at MW-1 (142 mg/L), MW-1605 (231 mg/L), and at MW-1606 (79.3 mg/L).
- TDS concentrations exceeded the interwell UPL of 260 mg/L at MW-1 (332 mg/L), MW-1605 (504 mg/L), and MW-1606 (275 mg/L).

While the prediction limits were calculated for a one-of-two retesting procedure, SSIs were conservatively assumed if the May 2021 sample was above the UPL or below the lower prediction limit (LPL). Based on this evaluation, concentrations of Appendix III constituents appear to be above background concentrations and the unit will remain in assessment monitoring.

2.3 Conclusions

A semi-annual assessment monitoring event was conducted in accordance with the CCR Rule. The laboratory and field data were reviewed prior to statistical analysis, with no QA/QC issues identified that impacted data usability. A review of outliers identified no potential outliers in the March 2021 and May 2021 data. A confidence interval was constructed at each compliance well for each Appendix IV parameter; SSLs were concluded if the entire confidence interval exceeded the GWPS. No SSLs were identified. Appendix III parameters were compared to prediction limits, with exceedances identified for boron, calcium, chloride, sulfate, and TDS.

Based on this evaluation, the Amos BAP CCR unit will remain in assessment monitoring.

SECTION 3

REFERENCES

Geosyntec Consultants (Geosyntec). 2020. Statistical Analysis Plan – Amos Plant. October 2020.

Geosyntec. 2021. Statistical Analysis Summary – Bottom Ash Pond, Amos Plant, Winfield, West Virginia. February 26, 2021.

TABLES

Table 1 - Groundwater Data Summary
Amos Plant - Bottom Ash Pond

Parameter	Unit	MW-1		MW-1601		MW-1602A		MW-1603		MW-1604	
		3/15/2021	5/11/2021	3/17/2021	5/10/2021	3/17/2021	5/7/2021	3/15/2021	5/10/2021	3/16/2021	5/11/2021
Antimony	µg/L	0.03 J	0.1 U	0.1 U	0.1 U	0.03 J	0.1 U	0.1 U	0.03 J	0.1 U	0.1 U
Arsenic	µg/L	0.09 J	0.10	7.76	10.9	20.5	21.2	86.1	86.8	4.89	4.45
Barium	µg/L	25.4	24.1	133	127	235	228	224	240	168	163
Beryllium	µg/L	0.129	0.127	0.03 J	0.03 J	0.01 J	0.009 J	0.1 U	0.01 J	0.04 J	0.04 J
Boron	mg/L	-	0.117	-	0.01 J	-	0.05 U	-	0.02 J	-	0.186
Cadmium	µg/L	3.14	1.96	0.01 J	0.02 J	0.05 U	0.008 J	0.05 U	0.05 U	0.05 U	0.05 U
Calcium	mg/L	-	31.6	-	9.66	-	19.7	-	13.8	-	18.1
Chloride	mg/L	-	51.2	-	25.6	-	43.0	-	6.28	-	28.0
Chromium	µg/L	0.2 J	0.2 J	0.488	0.375	0.458	0.366	0.339	0.335	0.590	0.537
Cobalt	µg/L	13.9	14.0	3.44	2.82	0.338	0.290	0.152	0.212	0.295	0.256
Combined Radium	pCi/L	0.705	0.845	0.869	0.717	0.84	1.103	0.584	0.703	0.66	0.809
Fluoride	mg/L	0.04 J	0.03 J	0.06 J	0.05 J	0.17	0.15	0.30	0.26	0.08	0.09
Lead	µg/L	0.06 J	0.05 J	0.271	0.211	0.491	0.240	0.2 U	0.2 J	0.1 J	0.08 J
Lithium	mg/L	0.00266	0.00258	0.00153	0.00134	0.000988	0.000930	0.000283	0.000303	0.000475	0.000433
Mercury	µg/L	0.005 U	-	0.005 U	-	0.005 U	-	0.005 U	-	0.005 U	-
Molybdenum	µg/L	2 U	0.2 J	0.2 J	0.4 J	0.7 J	0.8 J	1 J	1 J	0.2 J	0.3 J
Selenium	µg/L	0.1 J	0.09 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.2 J	0.1 J
Sulfate	mg/L	-	142	-	27.2	-	12.7	-	0.4 U	-	0.4 U
Thallium	µg/L	0.5 U	-	0.5 U	-	0.5 U	-	0.5 U	-	0.5 U	-
Total Dissolved Solids	mg/L	-	332	-	116	-	202	-	40 J	-	237
pH	SU	5.0	5.2	5.9	6.1	6.6	6.5	6.9	6.8	6.2	6.2

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

Table 1 - Groundwater Data Summary
Amos Plant - Bottom Ash Pond

Parameter	Unit	MW-1605		MW-1606		MW-4		MW-5		MW-6	
		3/15/2021	5/7/2021	3/17/2021	5/7/2021	3/17/2021	5/10/2021	3/17/2021	5/11/2021	3/16/2021	5/11/2021
Antimony	µg/L	0.04 J	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.02 J
Arsenic	µg/L	2.85	3.46	2.62	2.66	2.15	1.40	3.36	2.77	36.8	34.1
Barium	µg/L	104	94.9	39.9	38.9	94.0	92.6	128	132	164	155
Beryllium	µg/L	0.126	0.08 J	0.06 J	0.06 J	0.05 J	0.04 J	0.04 J	0.04 J	0.02 J	0.02 J
Boron	mg/L	-	0.05 J	-	0.03 J	-	0.073	-	0.050	-	0.02 J
Cadmium	µg/L	0.007 J	0.005 J	0.24	0.21	0.06	0.03 J	0.05 U	0.005 J	0.05 U	0.05 U
Calcium	mg/L	-	45.4	-	23.7	-	16.4	-	12.6	-	11.6
Chloride	mg/L	-	85.1	-	73.4	-	18.7	-	11.2	-	9.71
Chromium	µg/L	0.865	0.390	0.490	0.302	0.331	0.334	0.222	0.236	0.519	0.562
Cobalt	µg/L	9.21	9.69	9.34	8.71	8.82	7.23	1.23	1.34	9.08	8.54
Combined Radium	pCi/L	3.565	0.773	0.824	0.766	0.515	0.534	0.845	0.96	0.78	1.105
Fluoride	mg/L	0.03 J	0.06 U	0.03 J	0.03 J	0.06	0.07	0.05 J	0.05 J	0.09	0.07
Lead	µg/L	0.676	0.2 J	0.319	0.280	0.2 J	0.2 J	0.06 J	0.2 U	0.07 J	0.2 J
Lithium	mg/L	0.00269	0.00236	0.00221	0.00217	0.00177	0.00172	0.00138	0.00136	0.00121	0.00108
Mercury	µg/L	0.005 U	-	0.005 U	-	0.005 U	-	0.005 U	-	0.005 U	-
Molybdenum	µg/L	2 U	2 U	2 U	2 U	2 U	0.2 J	0.1 J	0.2 J	0.5 J	0.5 J
Selenium	µg/L	0.2 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.1 J	0.1 J
Sulfate	mg/L	-	231	-	79.3	-	38.6	-	42.7	-	2.1
Thallium	µg/L	0.5 U	-	0.5 U	-	0.5 U	-	0.5 U	-	0.5 U	-
Total Dissolved Solids	mg/L	-	504	-	275	-	190	-	156	-	180
pH	SU	5.5	5.5	5.4	5.5	5.5	5.9	5.7	5.9	6.0	6.0

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

Table 2: Groundwater Protection Standards
Amos Plant - Bottom Ash Pond

Constituent Name	MCL	CCR Rule-Specified	Calculated UTL	GWPS
Antimony, Total (mg/L)	0.006		0.0002	0.006
Arsenic, Total (mg/L)	0.01		0.09	0.09
Barium, Total (mg/L)	2		0.3	2
Beryllium, Total (mg/L)	0.004		0.0001	0.004
Cadmium, Total (mg/L)	0.005		0.00005	0.005
Chromium, Total (mg/L)	0.1		0.0020	0.1
Cobalt, Total (mg/L)	n/a	0.006	0.014	0.014
Combined Radium, Total (pCi/L)	5		3.9	5
Fluoride, Total (mg/L)	4		0.31	4
Lead, Total (mg/L)	n/a	0.015	0.0068	0.015
Lithium, Total (mg/L)	n/a	0.04	0.008	0.04
Mercury, Total (mg/L)	0.002		0.000005	0.002
Molybdenum, Total (mg/L)	n/a	0.1	0.0024	0.1
Selenium, Total (mg/L)	0.05		0.0004	0.05
Thallium, Total (mg/L)	0.002		0.0005	0.002

Notes:
MCL = Maximum Contaminant Level
CCR = Coal Combustion Residual
GWPS = Groundwater Protection Standard
Calculated UTL (Upper Tolerance Limit) represents site-specific background values.
Grey cells indicate the GWPS is based on the calculated UTL, which is higher than the MCL or CCR Rule-specified value.

Table 3 - Appendix III Data Summary
Amos - Bottom Ash Pond

Analyte	Unit	Description	MW-1	MW-1604	MW-1605	MW-1606	MW-4	MW-5
			5/11/2021	5/11/2021	5/7/2021	5/7/2021	5/10/2021	5/11/2021
Boron	mg/L	Interwell Background Value (UPL)	0.180					
		Analytical Result	0.117	**0.186**	0.05	0.03	0.073	0.050
Calcium	mg/L	Interwell Background Value (UPL)	20.0					
		Analytical Result	**31.6**	18.1	**45.4**	**23.7**	16.4	12.6
Chloride	mg/L	Interwell Background Value (UPL)	43.0					
		Analytical Result	**51.2**	28.0	**85.1**	**73.4**	18.7	11.2
Fluoride	mg/L	Intrawell Background Value (UPL)	0.0300	0.140	0.0900	0.0300	0.0760	0.0500
		Analytical Result	0.03	0.09	0.01	0.03	0.07	0.05
pH	SU	Intrawell Background Value (UPL)	7.3	7.2	6.5	6.7	7.0	6.4
		Intrawell Background Value (LPL)	4.9	5.9	5.1	5.2	5.4	5.2
		Analytical Result	5.2	6.2	5.5	5.5	5.9	5.9
Sulfate	mg/L	Interwell Background Value (UPL)	57					
		Analytical Result	**142**	0.06	**231**	**79.3**	38.6	42.7
Total Dissolved Solids	mg/L	Interwell Background Value (UPL)	260					
		Analytical Result	**332**	237	**504**	**275**	190	156

Notes:
UPL: Upper prediction limit
LPL: Lower prediction limit
Bold values exceed the background value.
Background values are shaded gray.

ATTACHMENT A

Certification by Qualified Professional Engineer

Certification by Qualified Professional Engineer

I certify that the selected and above described statistical method is appropriate for evaluating the groundwater monitoring data for the Amos Bottom Ash Pond CCR management area and that the requirements of 40 CFR 257.93(f) have been met.

DAVID ANTHONY MILLER
Printed Name of Licensed Professional Engineer

David Anthony Miller
Signature

DAVID ANTHONY MILLER
REGISTERED
22663
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

22663
License Number

WEST VIRGINIA
Licensing State

08.27.21
Date

ATTACHMENT B

Statistical Analysis Output

GROUNDWATER STATS CONSULTING

August 26, 2021

Geosyntec Consultants
Attn: Ms. Allison Kreinberg
941 Chatham Lane, #103
Columbus, OH 43221

Re: Amos Bottom Ash Pond
Assessment Monitoring Summary – May 2021

Dear Ms. Kreinberg,

Groundwater Stats Consulting (GSC), formerly the statistical consulting division of Sanitas Technologies, is pleased to provide the Assessment Monitoring statistical analysis of groundwater data through May 2021 at American Electric Power Company's Amos Bottom Ash Pond. The analysis complies with the federal rule for the Disposal of Coal Combustion Residuals from Electric Utilities (CCR Rule, 2015) as well as with the United States Environmental Protection Agency (USEPA) Unified Guidance (2009).

Sampling began at the site for the CCR program in 2016. The monitoring well network, as provided by Geosyntec Consultants, consists of the following:

- **Upgradient wells:** BAP-MW-1601, BAP-MW-1602A, BAP-MW-1603A, and BAP-MW-6
- **Downgradient wells:** BAP-MW-1, BAP-MW-1604, BAP-MW-1605, BAP-MW-1606, BAP-MW-4, and BAP-MW-5

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, Groundwater Statistician and Founder of Groundwater Stats Consulting.

The CCR program consists of the following constituents:

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

Note that no samples were collected during the May 2021 sampling event for mercury and thallium because there were no detections during the March 2021 sampling event. Data in this analysis extend through May 2021 to include the March and May 2021 sampling events.

Time series and box plots for Appendix IV parameters are provided for all wells and constituents; and are used to evaluate concentrations over the entire record (Figures A and B, respectively). Values in background, which have previously been flagged as outliers, may be seen in a lighter font and disconnected symbol on the graphs. Additionally, a summary of flagged values follows this letter (Figure C). While the reporting limits may vary from well to well, a single reporting limit substitution is used across all wells for a given parameter in the time series plots since the wells are plotted as a group.

Summary of Statistical Methods – Appendix IV Parameters

Parametric tolerance 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. 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 (USEPA, 2009), data are analyzed using either parametric or non-parametric prediction limits as appropriate.

- 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 in background, 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. This technique adjusts the mean and standard deviation of the historical concentrations to account for concentrations below the reporting limit.
- Nonparametric tolerance limits are used on data containing greater than 50% non-detects.

History of Initial Background Screening Conducted in December 2017

Outlier Analysis

Time series plots were used to identify suspected outliers, or extreme values that would result in limits that are not conservative from a regulatory perspective, in proposed background data. Suspected outliers at all wells for Appendix IV parameters were formally tested using Tukey's box plot method and, when identified, flagged in the computer database with "o" and deselected prior to construction of statistical limits.

Tukey's outlier test noted a few outliers and a summary of that report was submitted with the screening at that time. Any values flagged as outliers may be seen on the summary table following this letter and are plotted in a lighter font on the time series graph. The test identified an outlier for arsenic in well BAP-MW-1604; however, these concentrations were similar to concentrations in neighboring wells and were not flagged as outliers. A substitution of the most recent reporting limit was applied when varying detection limits existed in data.

Seasonality

No true seasonal patterns were observed on the time series plots for any of the detected data; therefore, no deseasonalizing adjustments were made to the data. When seasonal patterns are observed, data may be deseasonalized so that the resulting limits will correctly account for the seasonality as a predictable pattern rather than random variation or a release.

Trend Tests

While trends may be visual, a quantification of the trend and its significance is needed. The Sen's Slope/Mann Kendall trend test was used to evaluate all data at each well to identify statistically significant increasing or decreasing trends. In the absence of suspected contamination, significant trending data are typically not included as part of the background data used for construction of prediction limits. This step serves to eliminate the trend and, thus, reduce variation in background. When statistically significant decreasing trends are present, earlier data are evaluated to determine whether earlier concentration levels are significantly different than current reported concentrations and will be deselected as necessary. When the historical records of data are truncated for the reasons above, a summary report will be provided to show the date ranges used in construction of the statistical limits.

The results of the trend analyses showed a couple statistically significant increasing trends and several statistically significant decreasing trends and a summary of those results were included with the screening. All trends were relatively low in magnitude when compared to average concentrations and data; therefore, no adjustments were required.

Background Update – Conducted in February 2021

Outlier Analysis

Prior to evaluating Appendix IV parameters, background (upgradient) data were screened through visual screening and Tukey's outlier test for potential outliers and extreme trending patterns that would lead to artificially elevated statistical limits. High outliers are also 'cautiously' flagged in the downgradient wells when they are clearly much different from the rest of the data. This is intended to be a regulatory conservative approach in that it will reduce the variance and thus reduce the width of parametric confidence intervals; although it will also reduce the mean and thus lower the entire interval. The intent is to better represent the actual downgradient mean.

Tukey's outlier test results for Appendix IV parameters were included with the background update conducted in February 2021. As mentioned above, a list of flagged values follows this report (Figure C).

Tolerance Limits

Interwell upper tolerance limits were used to calculate background limits from all available pooled upgradient well data for each Appendix IV parameter through October 2020 (Figure D). In the case of cobalt, the parametric upper tolerance limit resulted in a limit of 0.029 mg/L due to a transformation that was required to fit the data to a normal distribution. Therefore, a nonparametric upper tolerance limit, which establishes the limit based on the highest background value, was constructed and resulted in a more conservative (i.e., lower) limit of 0.014 mg/L.

Parametric limits use a target of 95% confidence and 95% coverage. The confidence and coverage levels for nonparametric tolerance limits are dependent upon the number of background samples. These limits were compared to the Maximum Contaminant Levels (MCLs) and CCR-Rule specified levels 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). GWPS will be updated during Fall 2021.

Evaluation of Appendix IV Parameters – May 2021

Confidence intervals were then constructed with data through May 2021 on downgradient wells for each of the Appendix IV parameters using the highest limit of the MCL, CCR-Rule specified levels, or background limit as the GWPS as discussed above (Figure F). Only when the entire confidence interval is above a GWPS is the well/constituent pair considered to exceed its respective standard. No exceedances were noted for any of the well/constituent pairs. A summary of the confidence interval results follows this letter.

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

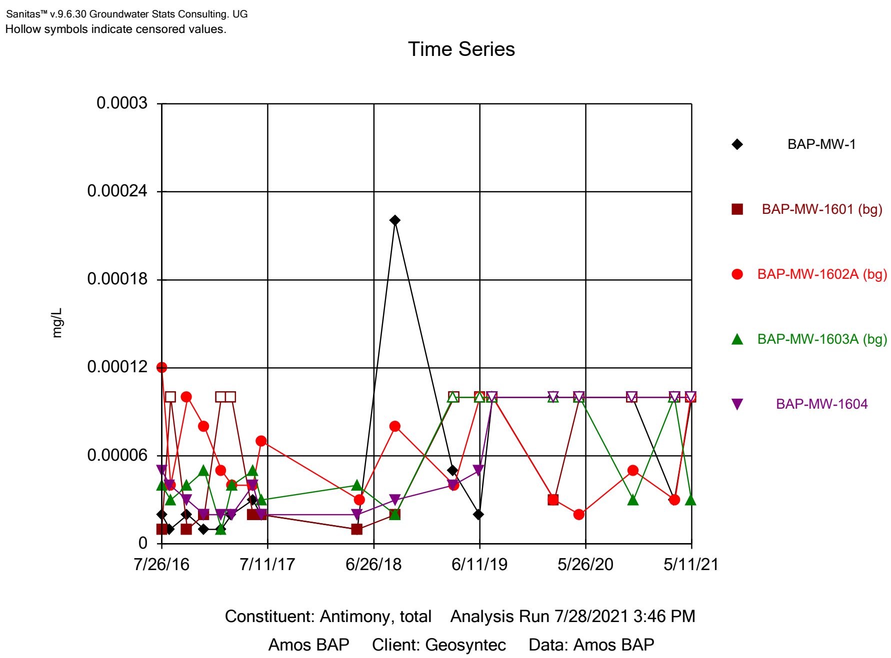
For Groundwater Stats Consulting,

A Collins

Kristina Rayner

Andrew T. Collins
Project Manager

Kristina L. Rayner
Groundwater Statistician


Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.
Time Series
mg/L
0.0003
0.00024
0.00018
0.00012
0.00006
0
7/26/16
7/11/17
6/26/18
6/11/19
5/26/20
5/11/21
BAP-MW-1
BAP-MW-1601 (bg)
BAP-MW-1602A (bg)
BAP-MW-1603A (bg)
BAP-MW-1604
Constituent: Antimony, total Analysis Run 7/28/2021 3:46 PM
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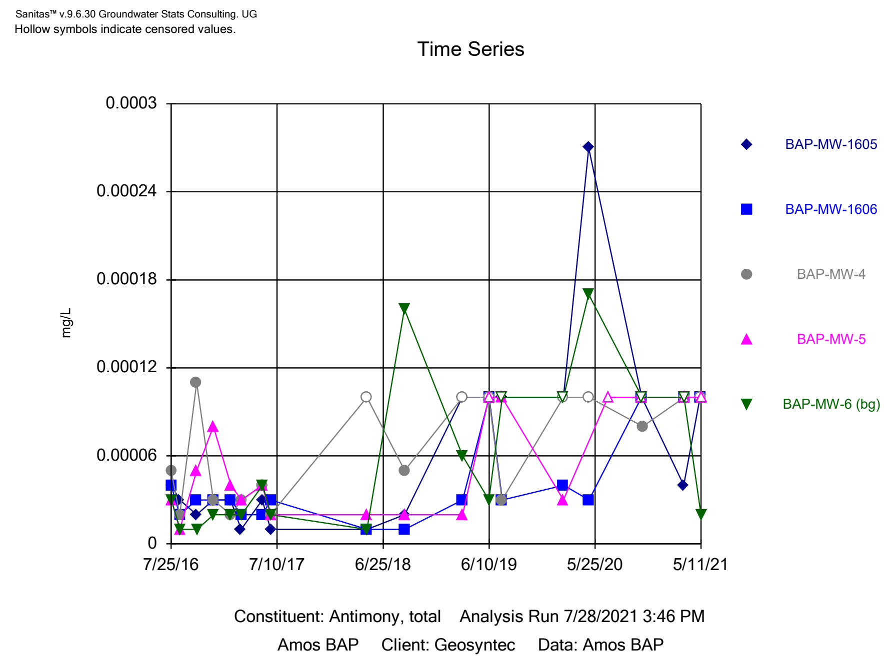
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Hollow symbols indicate censored values.
Time Series
mg/L
0.0003
0.00024
0.00018
0.00012
0.00006
0
7/25/16
7/10/17
6/25/18
6/10/19
5/25/20
5/11/21
BAP-MW-1605
BAP-MW-1606
BAP-MW-4
BAP-MW-5
BAP-MW-6 (bg)
Constituent: Antimony, total Analysis Run 7/28/2021 3:46 PM
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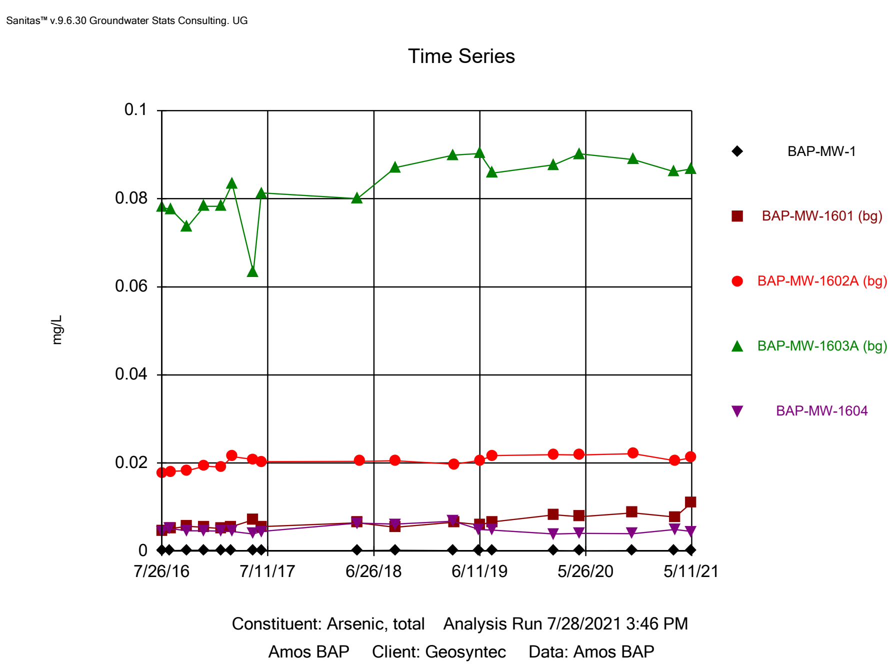
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Time Series
mg/L
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0.08
0.06
0.04
0.02
0
7/26/16
7/11/17
6/26/18
6/11/19
5/26/20
5/11/21
BAP-MW-1
BAP-MW-1601 (bg)
BAP-MW-1602A (bg)
BAP-MW-1603A (bg)
BAP-MW-1604
Constituent: Arsenic, total Analysis Run 7/28/2021 3:46 PM
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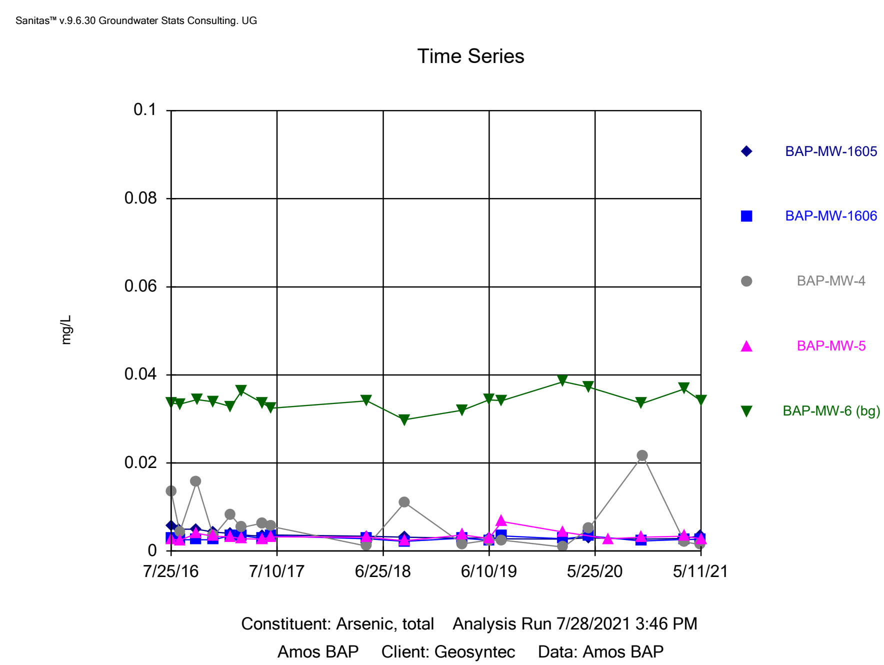
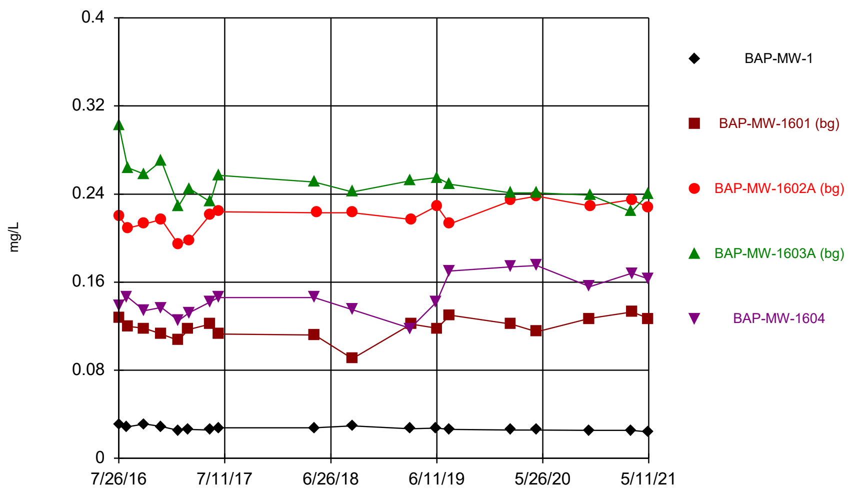

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG
Time Series
mg/L
0.1
0.08
0.06
0.04
0.02
0
7/25/16
7/10/17
6/25/18
6/10/19
5/25/20
5/11/21
BAP-MW-1605
BAP-MW-1606
BAP-MW-4
BAP-MW-5
BAP-MW-6 (bg)
Constituent: Arsenic, total Analysis Run 7/28/2021 3:46 PM
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

Time Series



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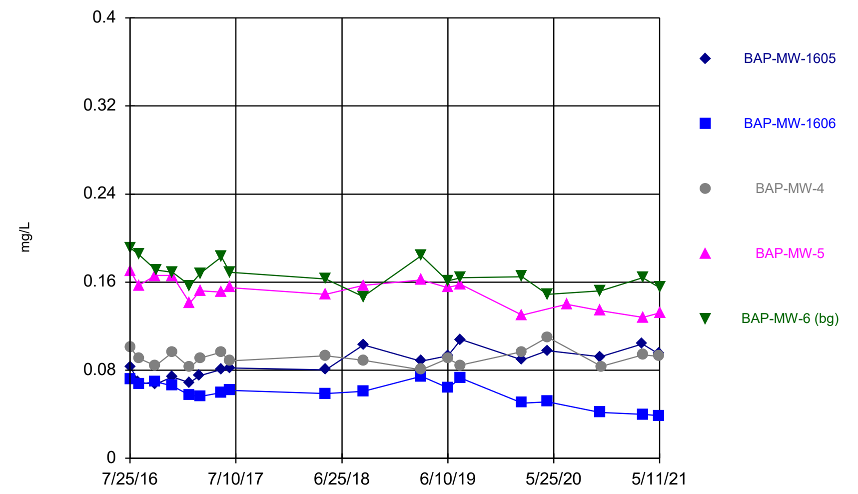
Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

Time Series



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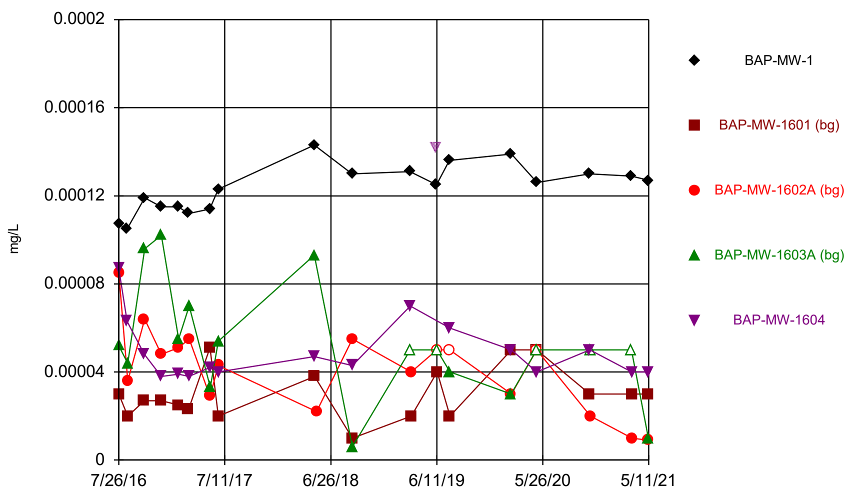
Hollow symbols indicate censored values.

Time Series



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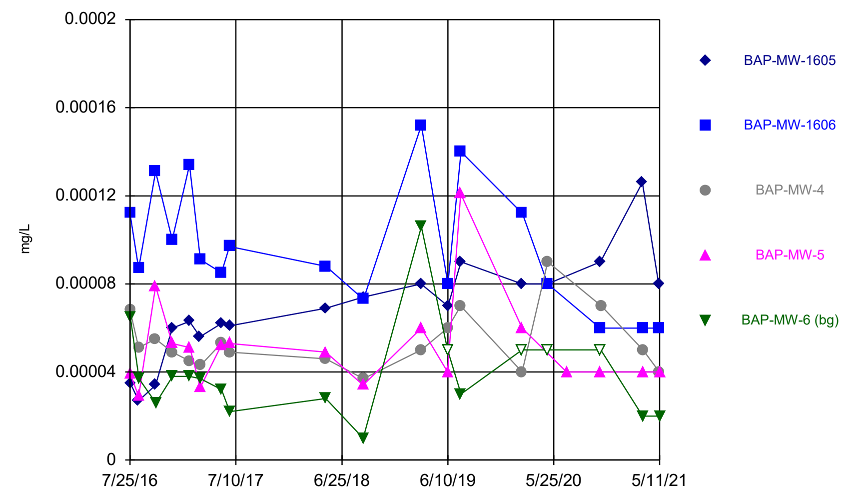
Hollow symbols indicate censored values.

Time Series



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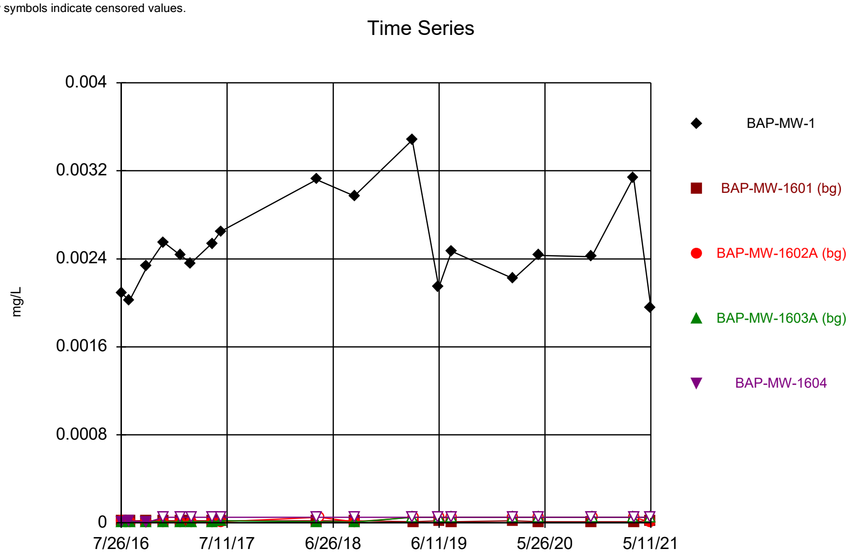
Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.



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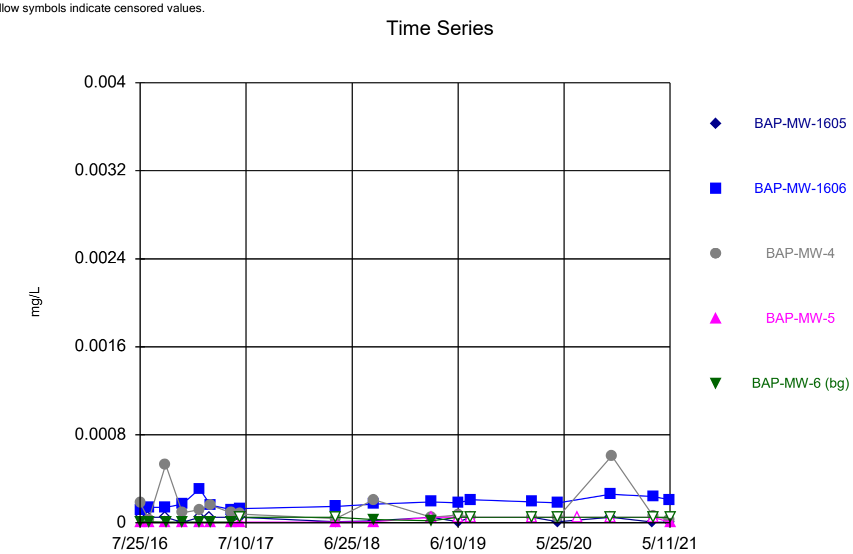
Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.



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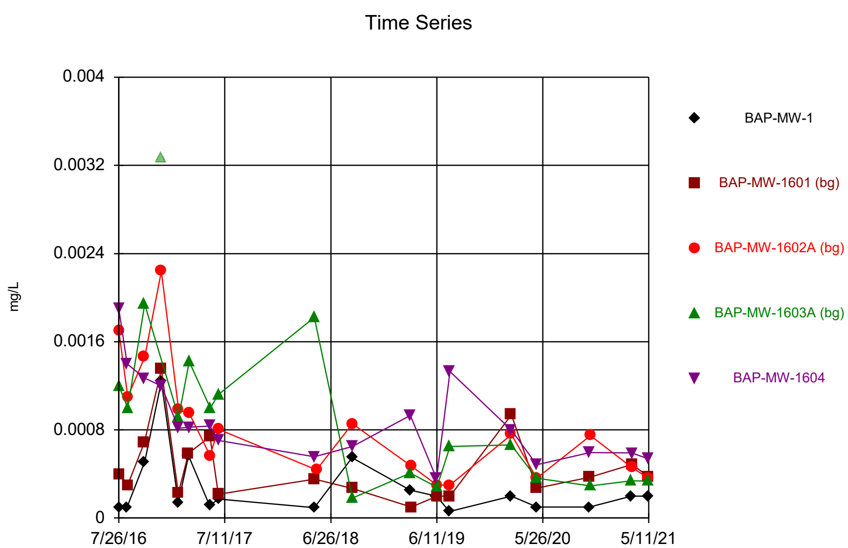
Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG



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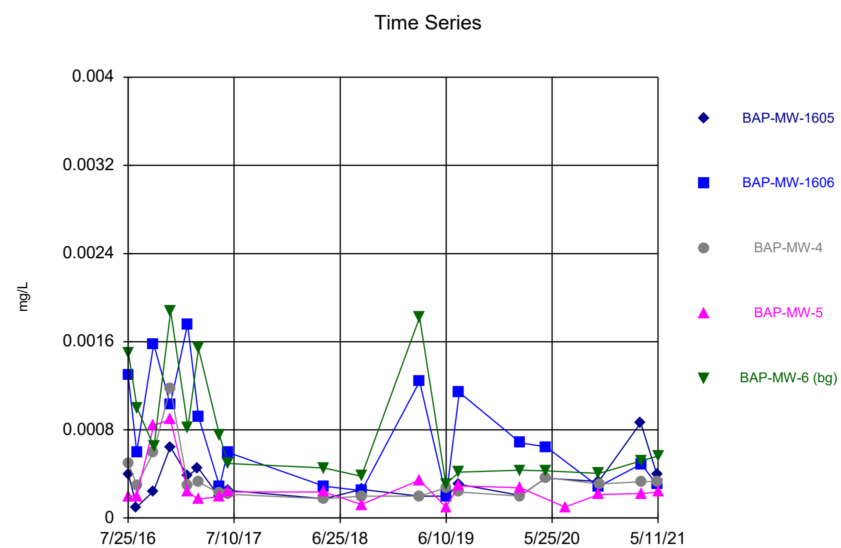

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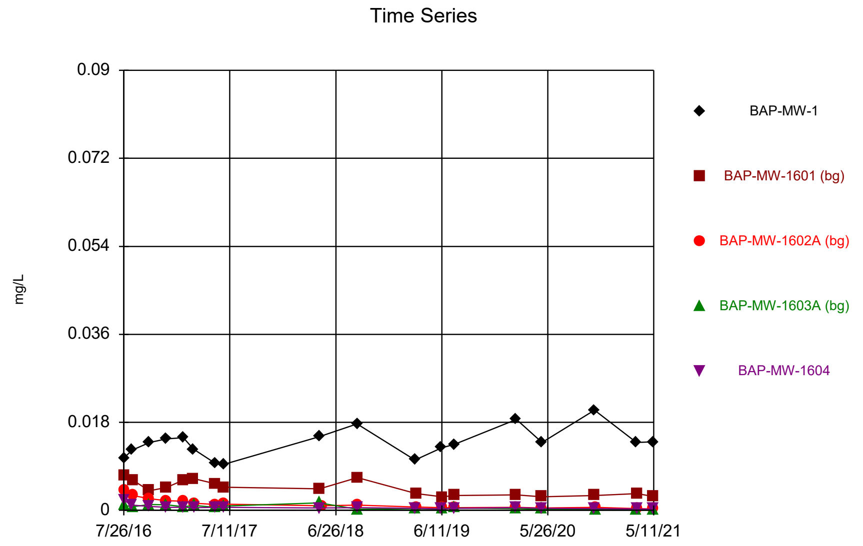

Constituent: Cobalt, total Analysis Run 7/28/2021 3:46 PM

Amos BAP Client: Geosyntec Data: Amos BAP

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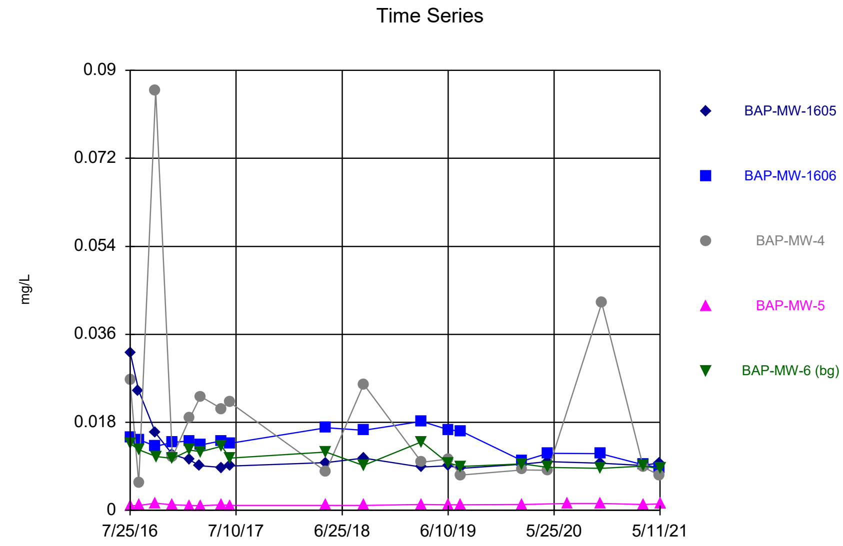

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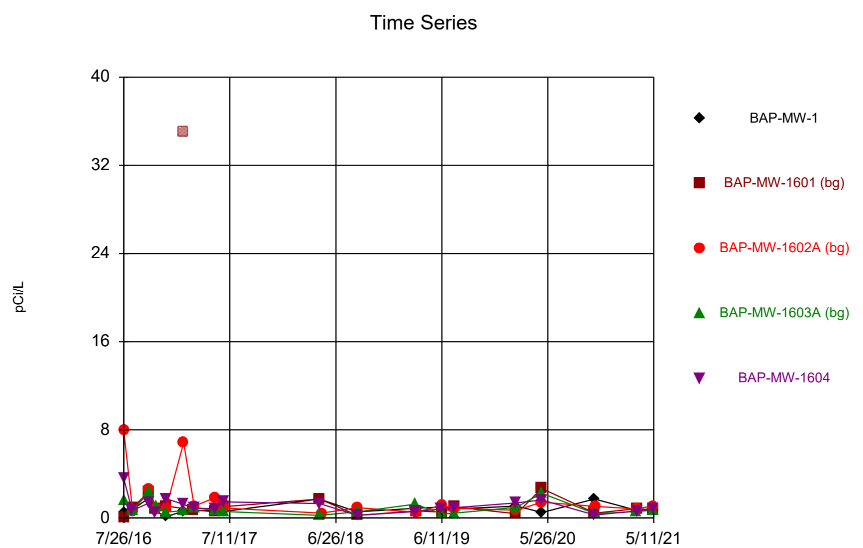

Constituent: Combined Radium 226 + 228 Analysis Run 7/28/2021 3:46 PM

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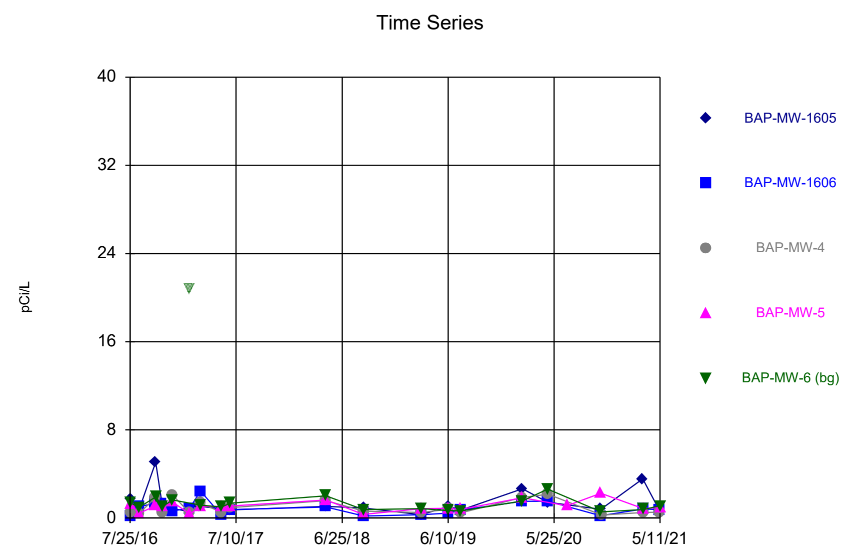

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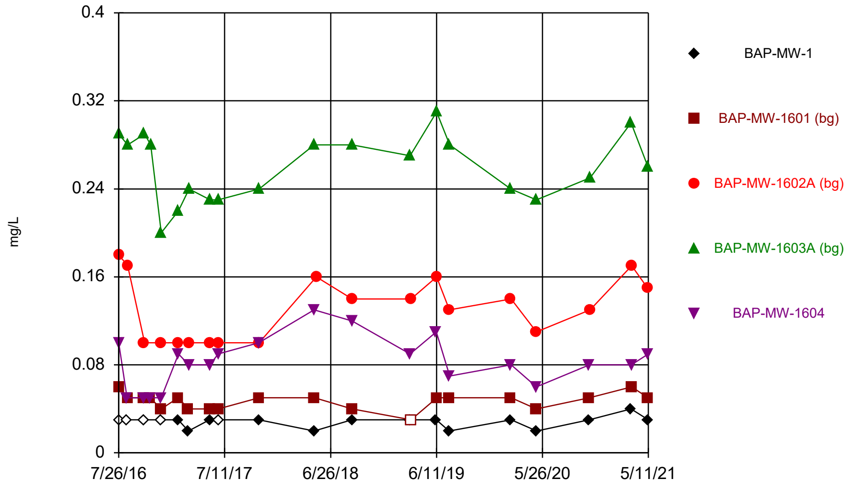
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Time Series



Constituent: Fluoride, total Analysis Run 7/28/2021 3:46 PM
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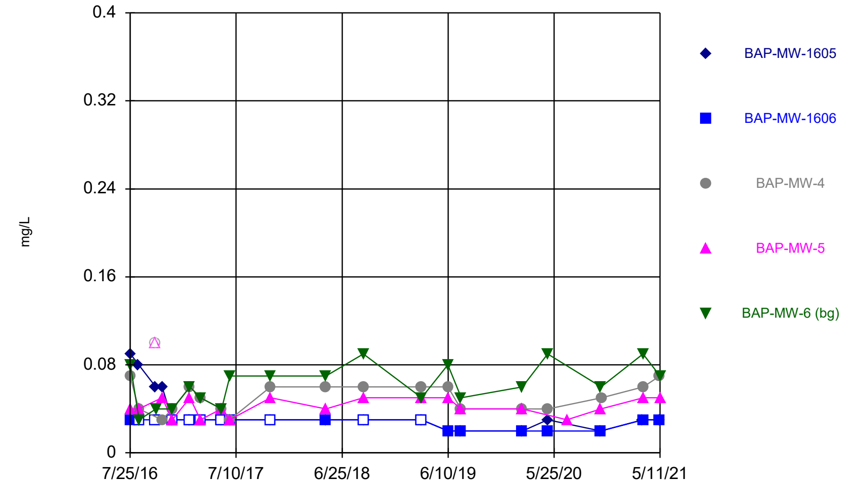
Hollow symbols indicate censored values.

Time Series



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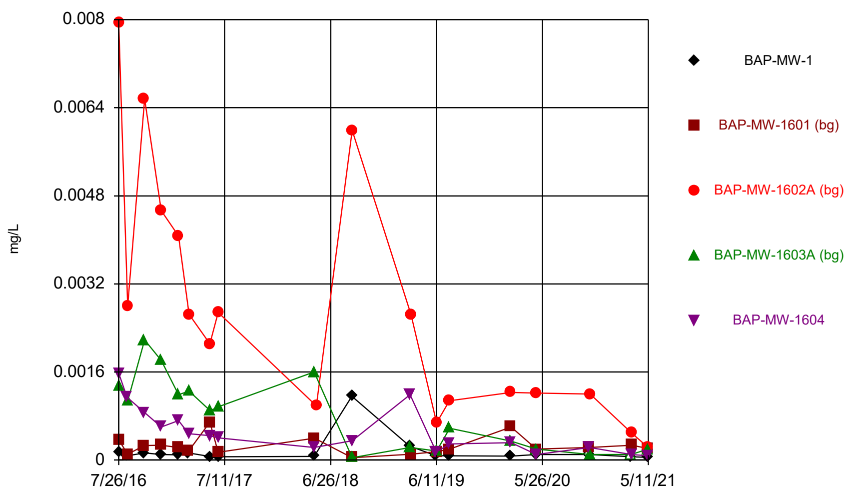
Time Series



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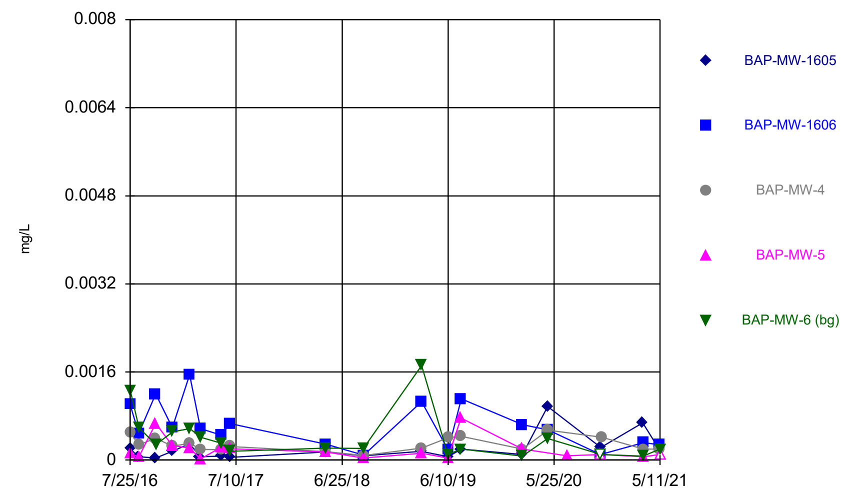
Hollow symbols indicate censored values.

Time Series



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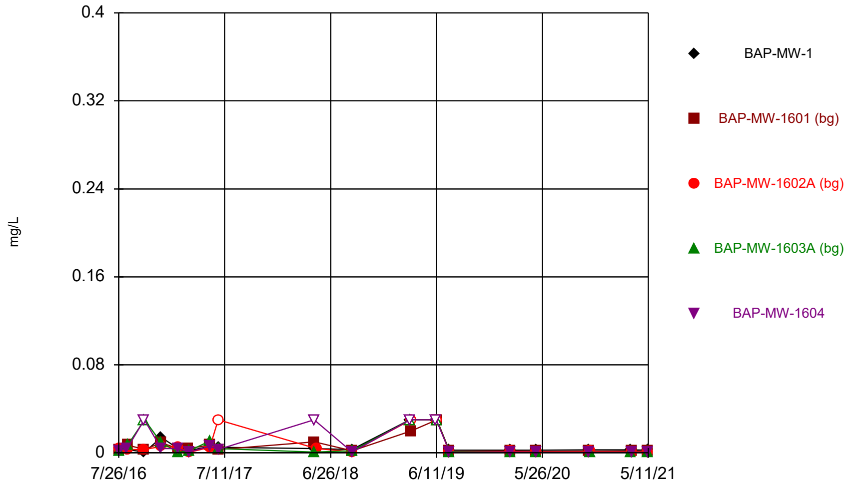
Hollow symbols indicate censored values.

Time Series



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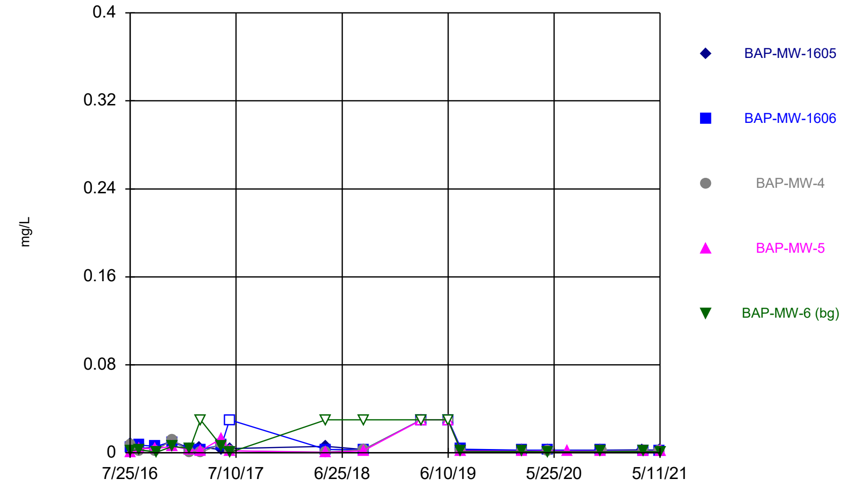
Hollow symbols indicate censored values.

Time Series



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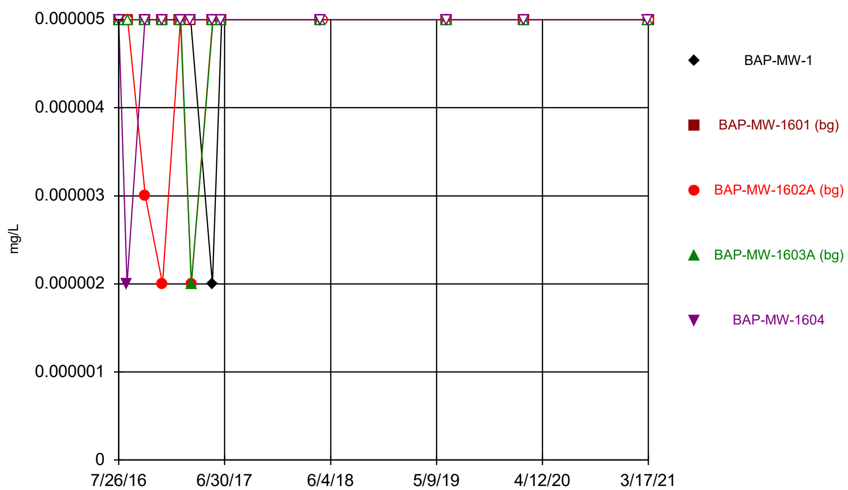
Hollow symbols indicate censored values.

Time Series



Constituent: Mercury, total   Analysis Run 7/28/2021 3:47 PM
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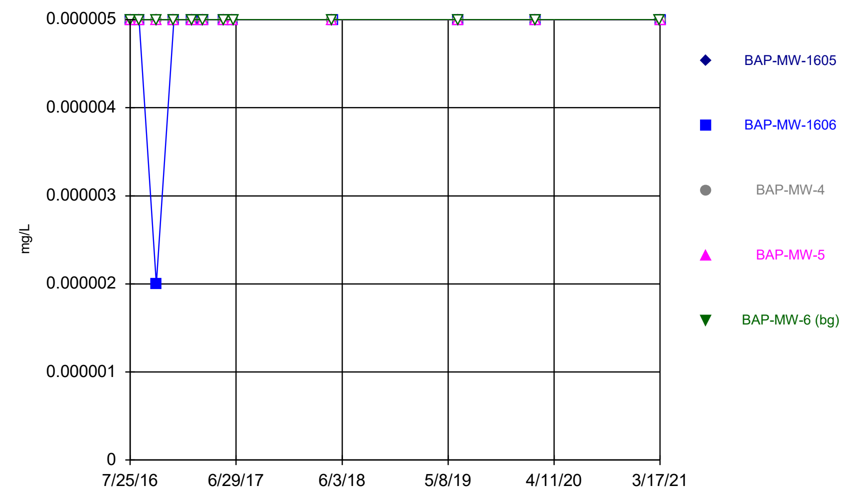
Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Time Series



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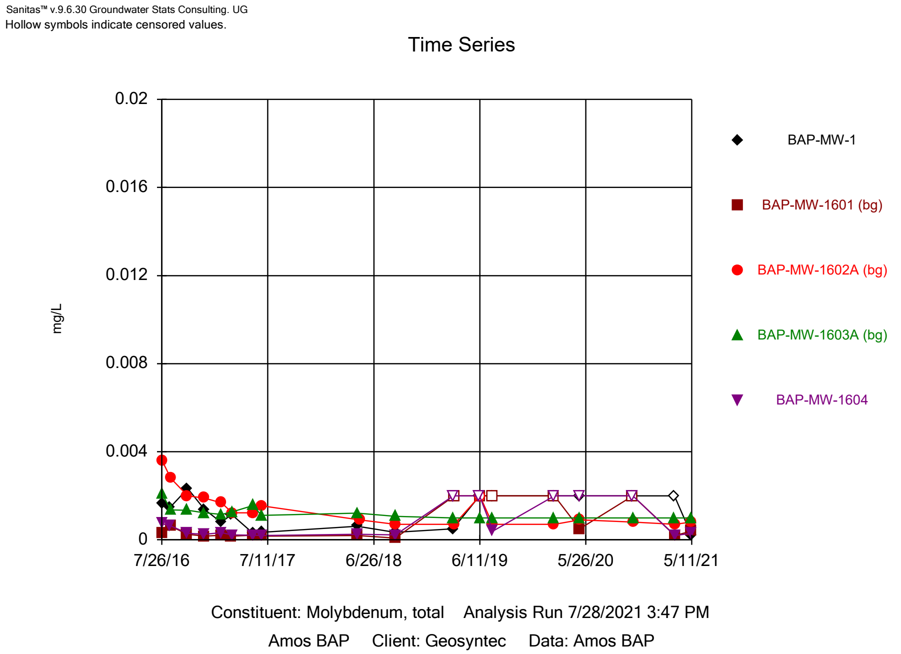
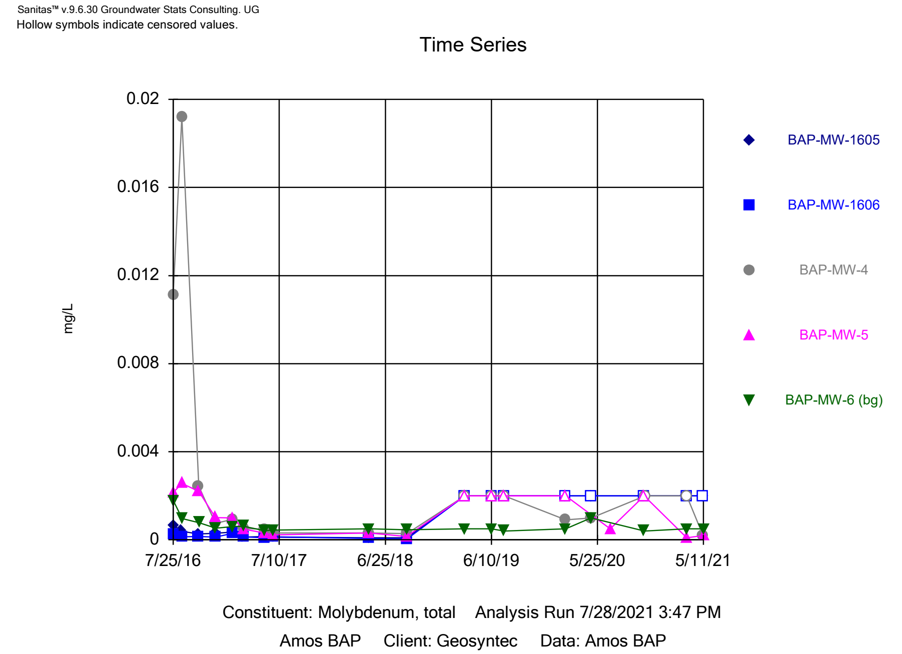


Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.
Time Series
0.02
0.016
0.012
0.008
0.004
0
mg/L
7/26/16
7/11/17
6/26/18
6/11/19
5/26/20
5/11/21
BAP-MW-1
BAP-MW-1601 (bg)
BAP-MW-1602A (bg)
BAP-MW-1603A (bg)
BAP-MW-1604
Constituent: Molybdenum, total Analysis Run 7/28/2021 3:47 PM
Amos BAP Client: Geosyntec Data: Amos BAP



Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.
Time Series
0.02
0.016
0.012
0.008
0.004
0
mg/L
7/25/16
7/10/17
6/25/18
6/10/19
5/25/20
5/11/21
BAP-MW-1605
BAP-MW-1606
BAP-MW-4
BAP-MW-5
BAP-MW-6 (bg)
Constituent: Molybdenum, total Analysis Run 7/28/2021 3:47 PM
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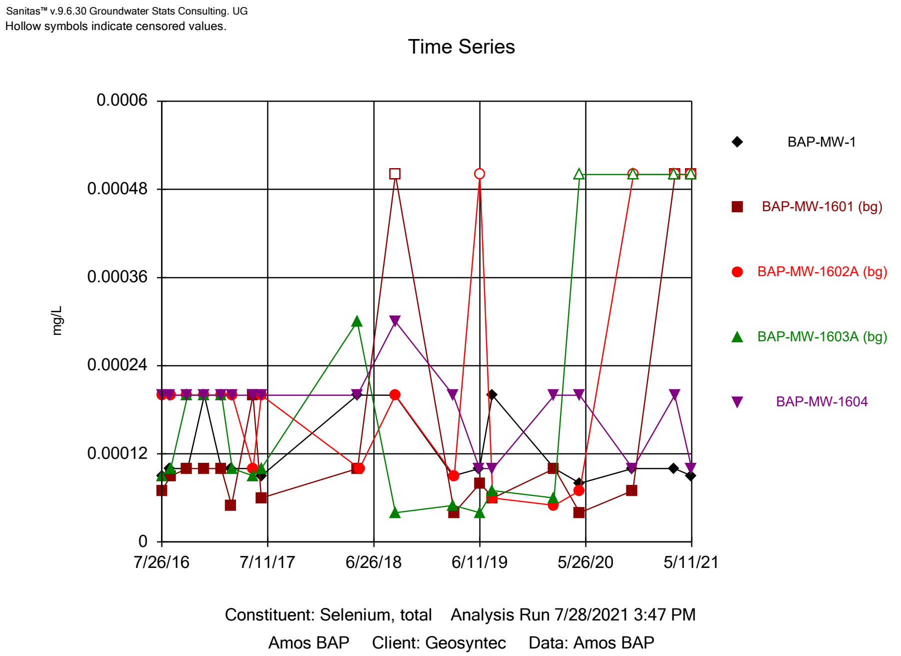

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Hollow symbols indicate censored values.
Time Series
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0.00036
0.00024
0.00012
0
mg/L
7/26/16
7/11/17
6/26/18
6/11/19
5/26/20
5/11/21
BAP-MW-1
BAP-MW-1601 (bg)
BAP-MW-1602A (bg)
BAP-MW-1603A (bg)
BAP-MW-1604
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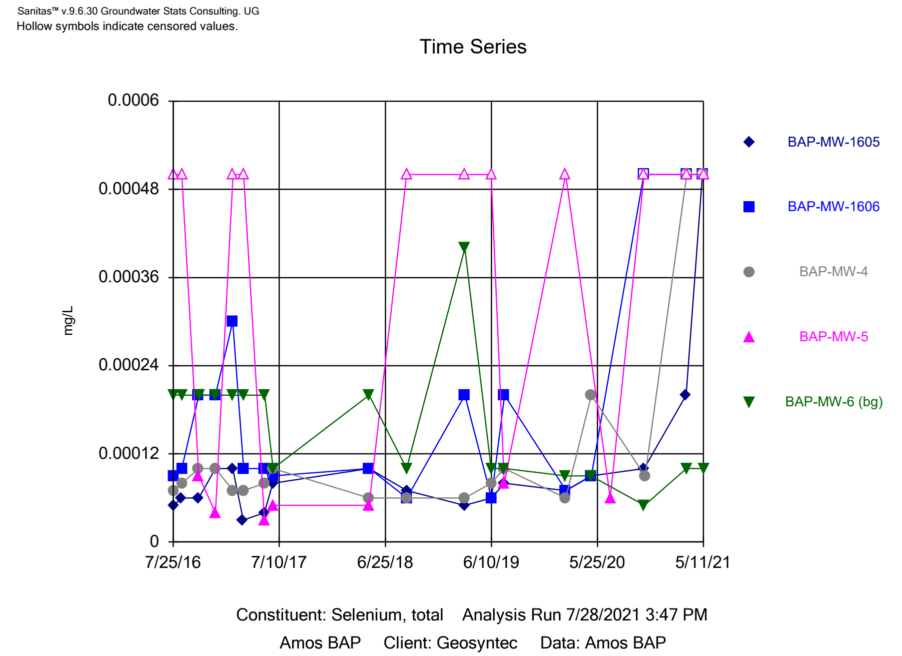
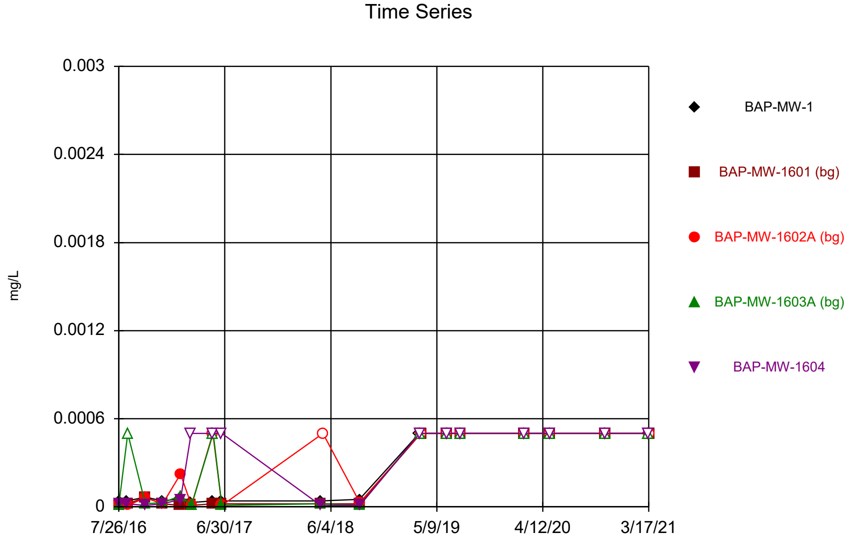
Amos BAP Client: Geosyntec Data: Amos BAP



Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.
Time Series
0.0006
0.00048
0.00036
0.00024
0.00012
0
mg/L
7/25/16
7/10/17
6/25/18
6/10/19
5/25/20
5/11/21
BAP-MW-1605
BAP-MW-1606
BAP-MW-4
BAP-MW-5
BAP-MW-6 (bg)
Constituent: Selenium, total Analysis Run 7/28/2021 3:47 PM
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.



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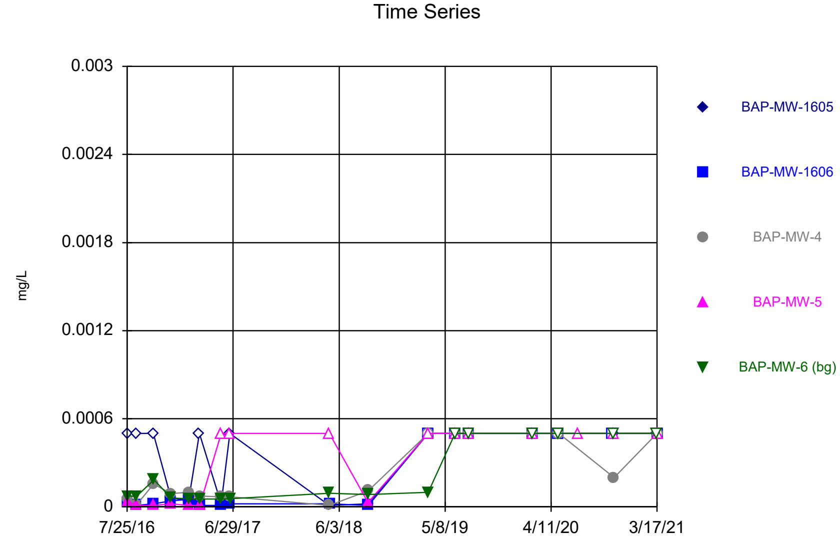
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.



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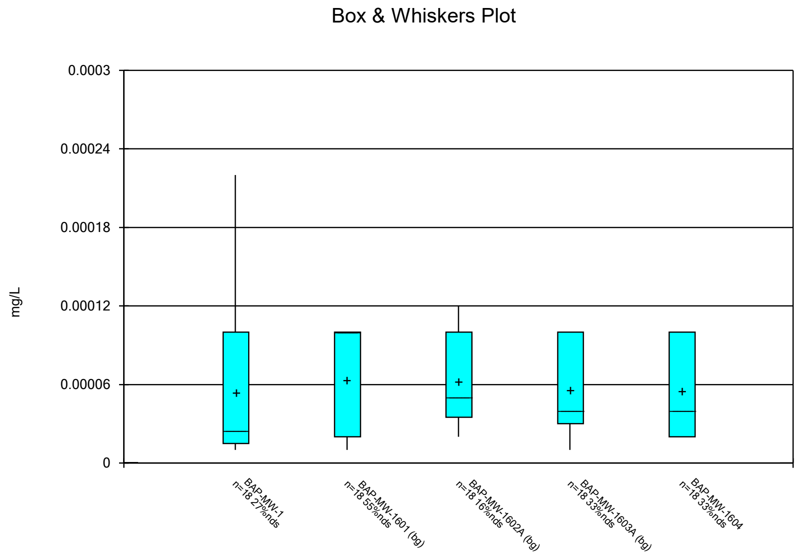
Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG



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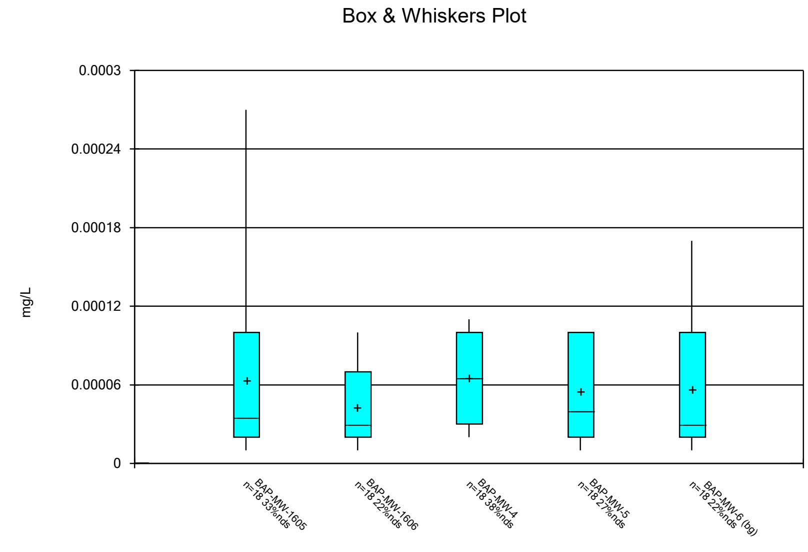
Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG



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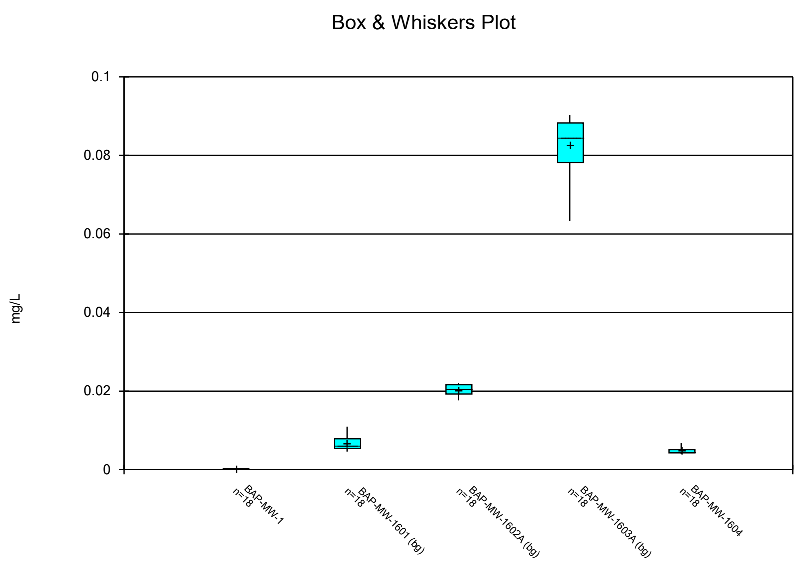
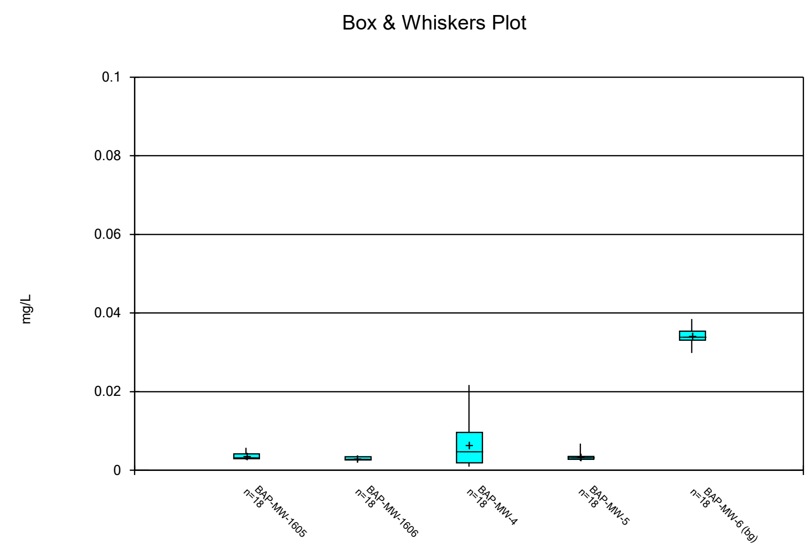
Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG



Constituent: Arsenic, total   Analysis Run 7/28/2021 3:59 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

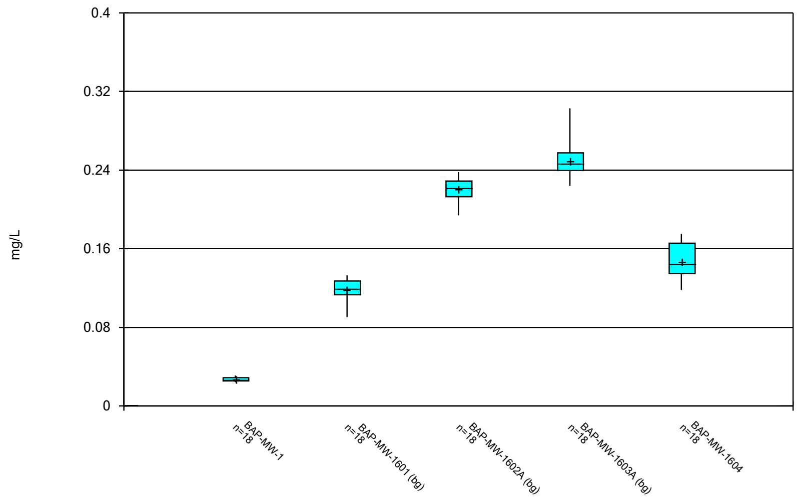


Constituent: Arsenic, total   Analysis Run 7/28/2021 3:59 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

Box & Whiskers Plot

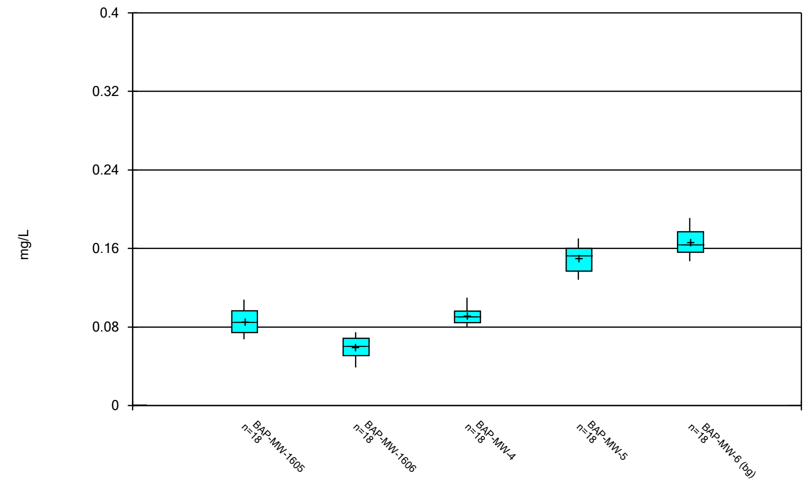


Constituent: Barium, total   Analysis Run 7/28/2021 3:59 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

Box & Whiskers Plot

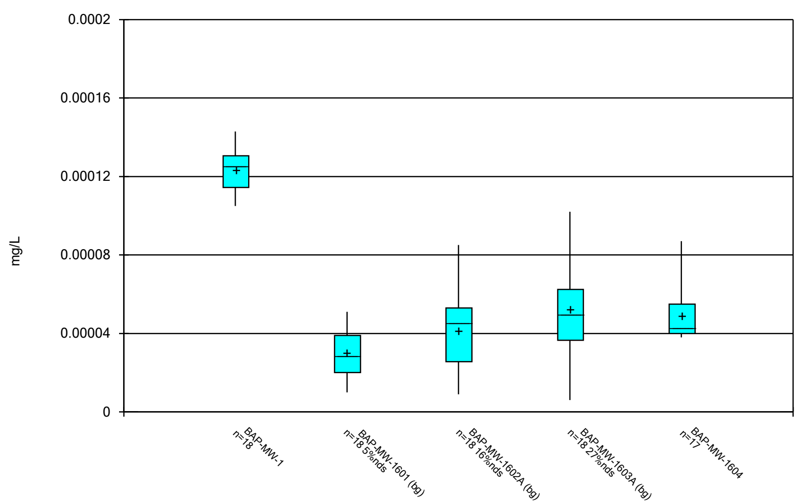


Constituent: Barium, total   Analysis Run 7/28/2021 3:59 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

Box & Whiskers Plot

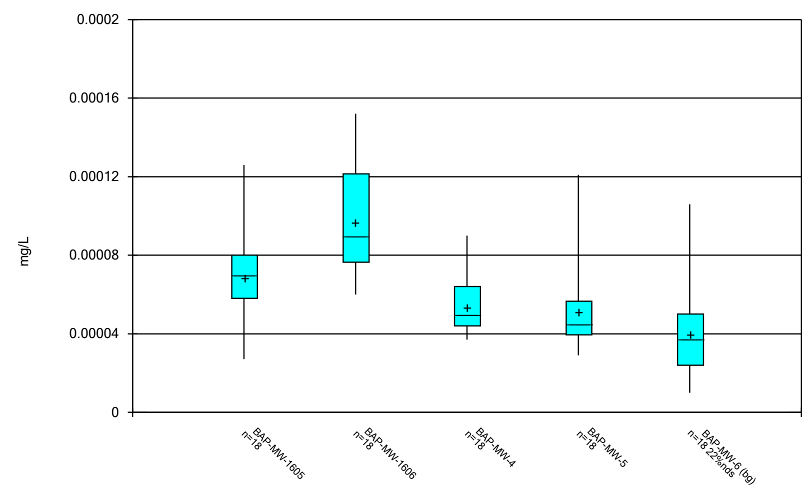


Constituent: Beryllium, total   Analysis Run 7/28/2021 3:59 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

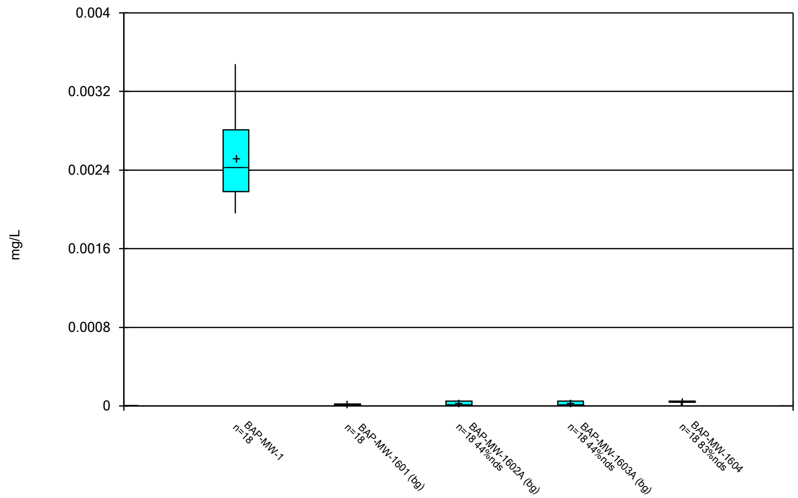
Box & Whiskers Plot



Constituent: Beryllium, total   Analysis Run 7/28/2021 3:59 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

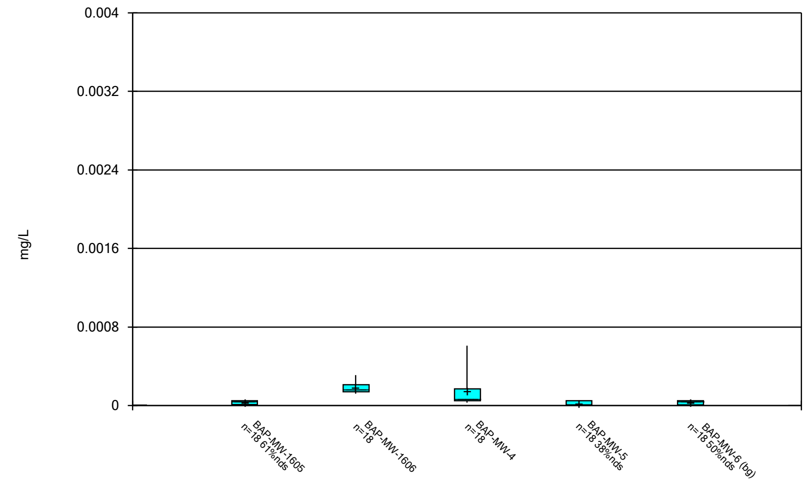
Box & Whiskers Plot



Constituent: Cadmium, total Analysis Run 7/28/2021 3:59 PM

Amos BAP Client: Geosyntec Data: Amos BAP

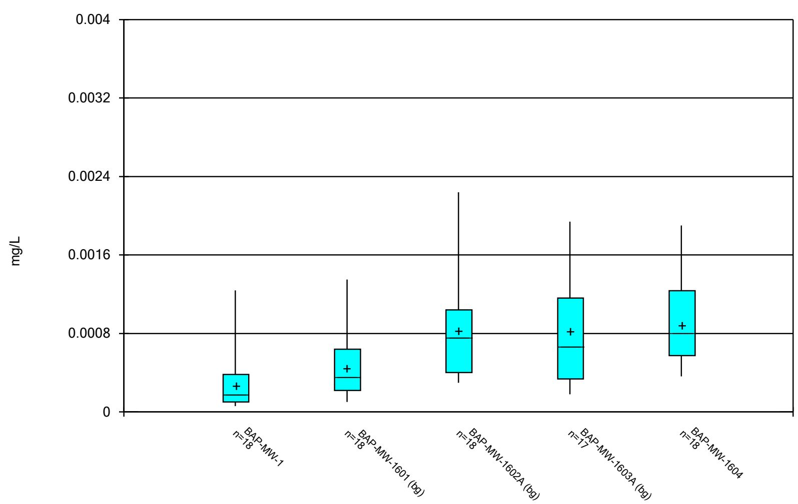
Box & Whiskers Plot



Constituent: Cadmium, total Analysis Run 7/28/2021 3:59 PM

Amos BAP Client: Geosyntec Data: Amos BAP

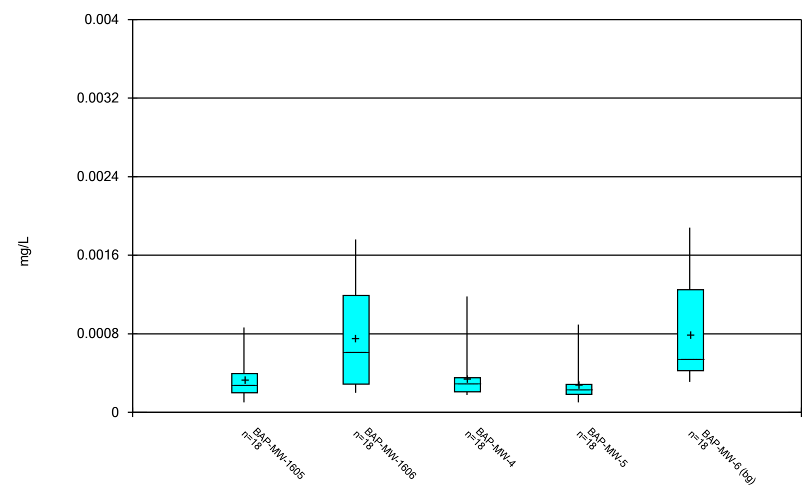
Box & Whiskers Plot



Constituent: Chromium, total Analysis Run 7/28/2021 3:59 PM

Amos BAP Client: Geosyntec Data: Amos BAP

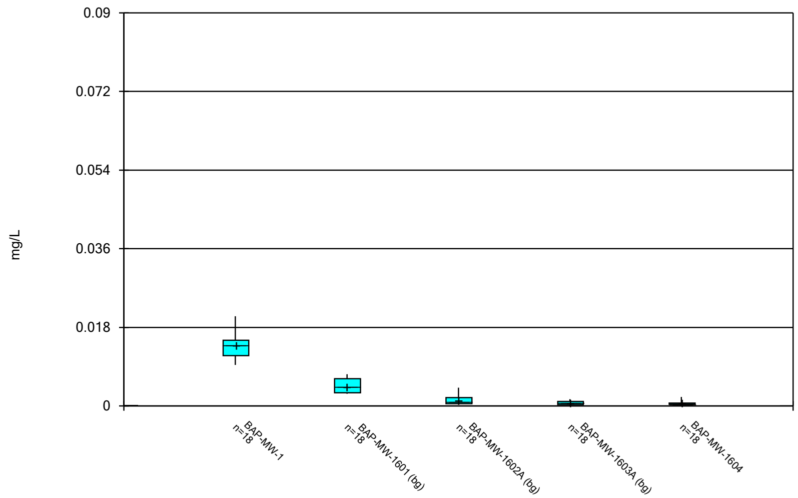
Box & Whiskers Plot



Constituent: Chromium, total Analysis Run 7/28/2021 3:59 PM

Amos BAP Client: Geosyntec Data: Amos BAP

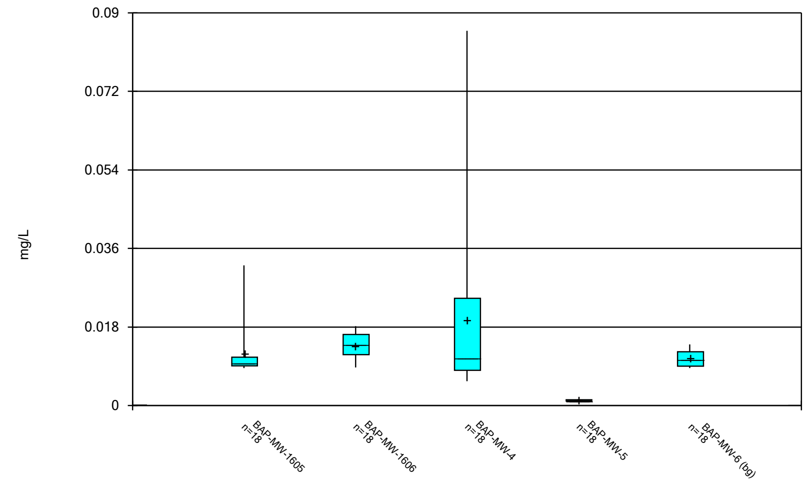
Box & Whiskers Plot



Constituent: Cobalt, total   Analysis Run 7/28/2021 3:59 PM
Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

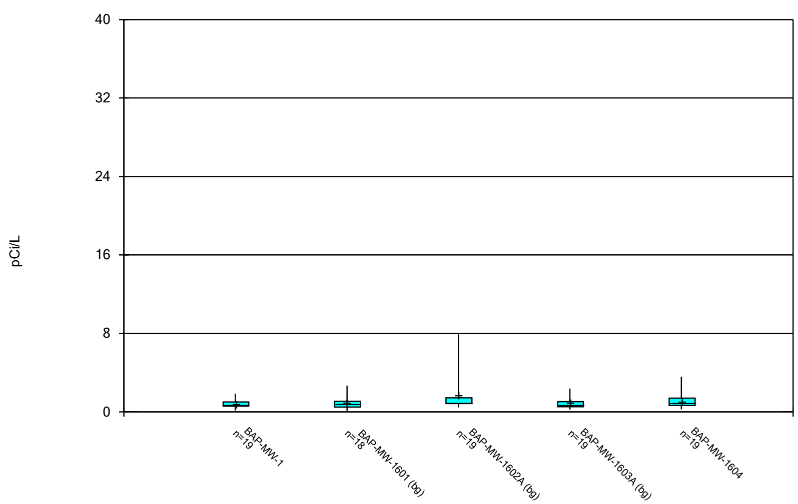
Box & Whiskers Plot



Constituent: Cobalt, total   Analysis Run 7/28/2021 3:59 PM
Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

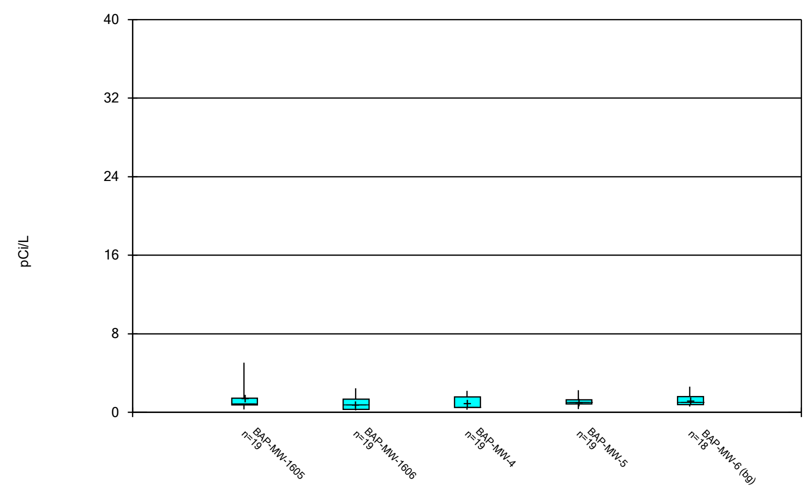
Box & Whiskers Plot



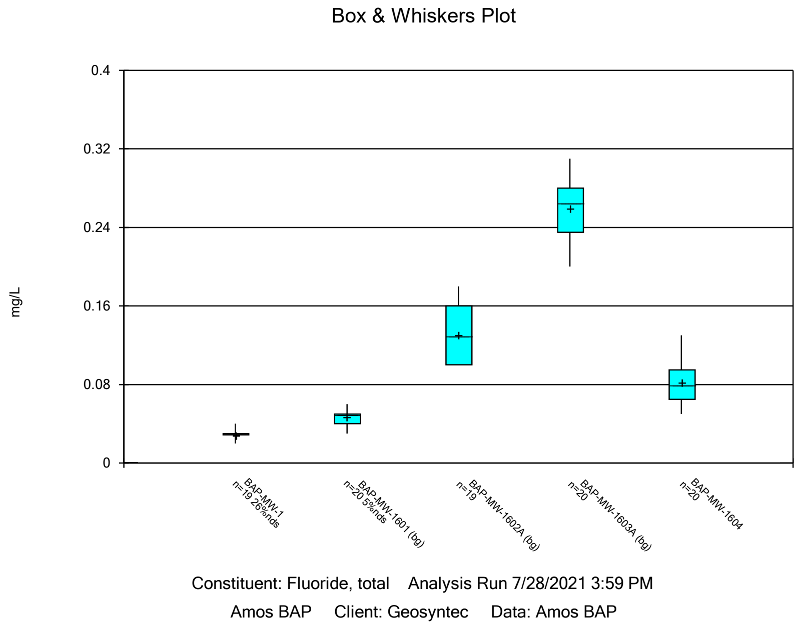
Constituent: Combined Radium 226 + 228   Analysis Run 7/28/2021 3:59 PM
Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

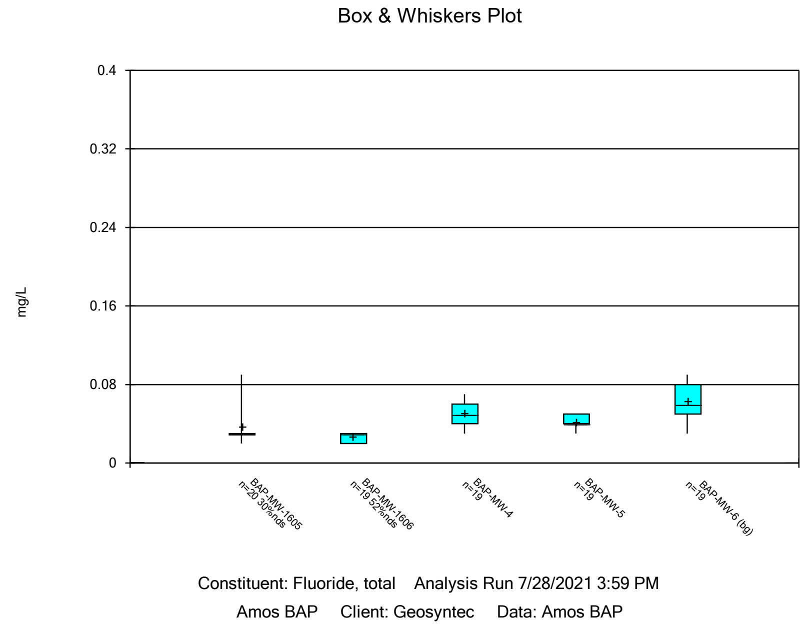
Box & Whiskers Plot



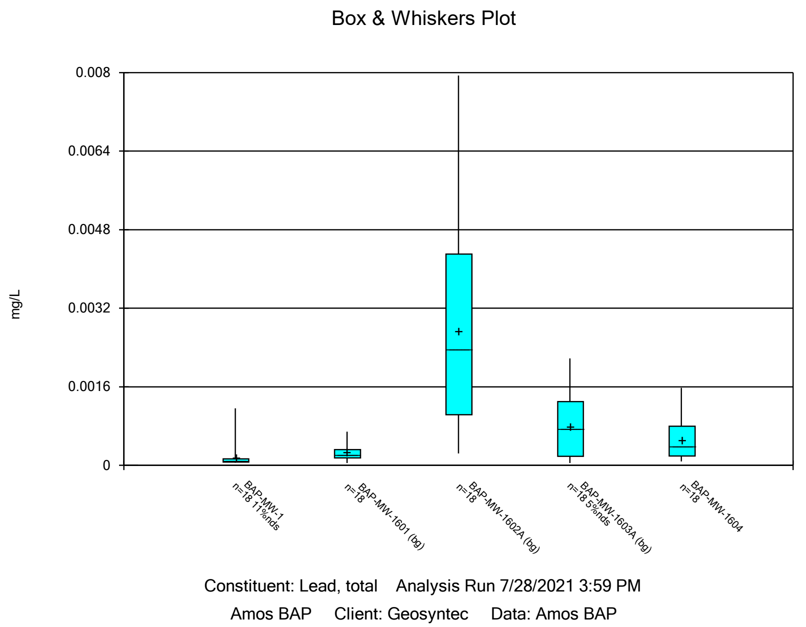
Constituent: Combined Radium 226 + 228   Analysis Run 7/28/2021 3:59 PM
Amos BAP   Client: Geosyntec   Data: Amos BAP



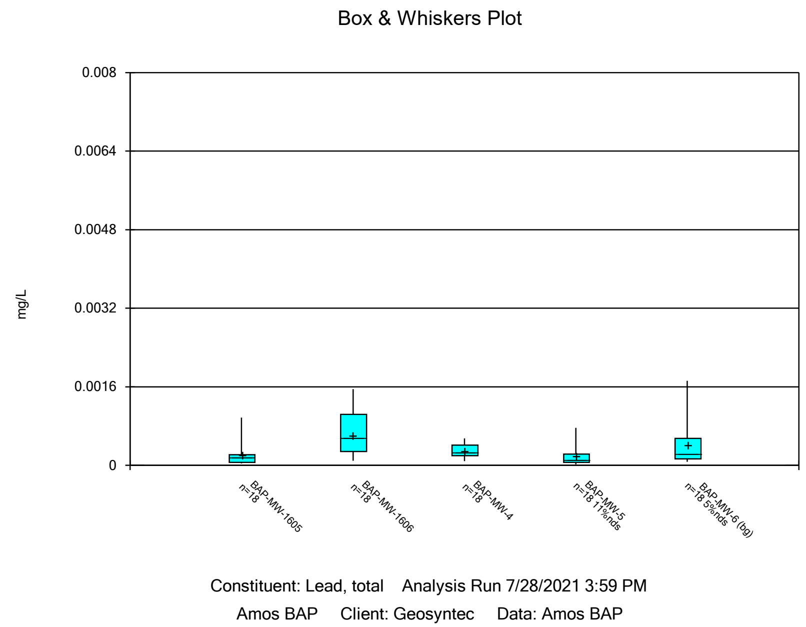
Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG



Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

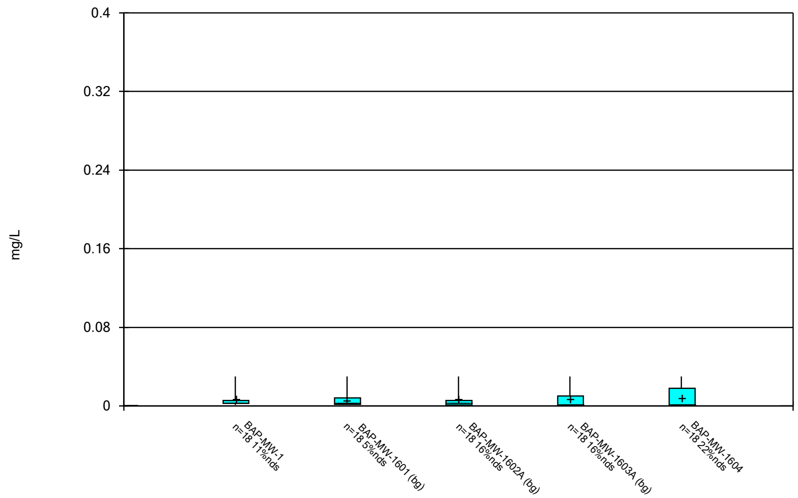


Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG



Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

Box & Whiskers Plot

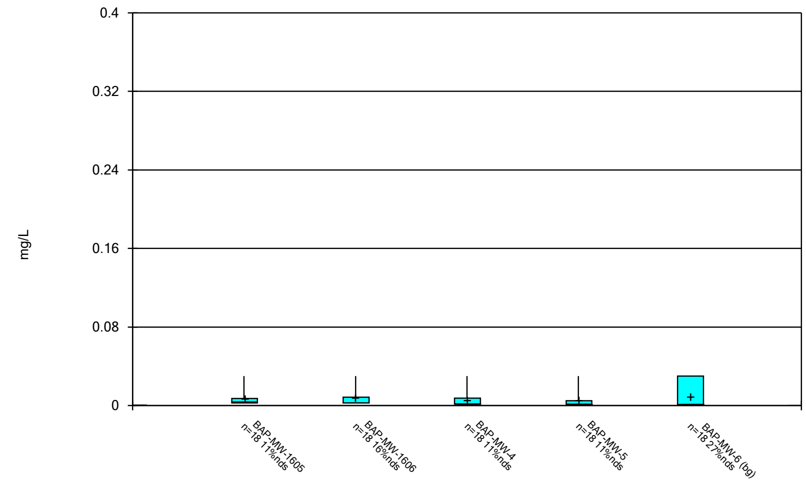


Constituent: Lithium, total   Analysis Run 7/28/2021 3:59 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

Box & Whiskers Plot

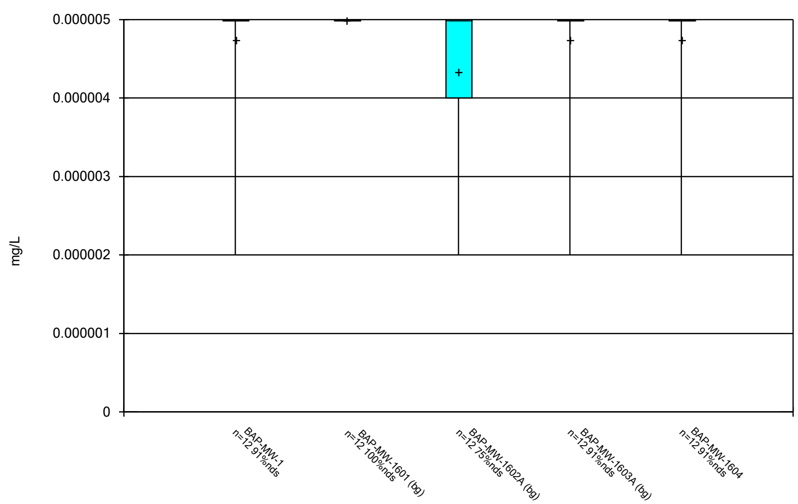


Constituent: Lithium, total   Analysis Run 7/28/2021 3:59 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

Box & Whiskers Plot

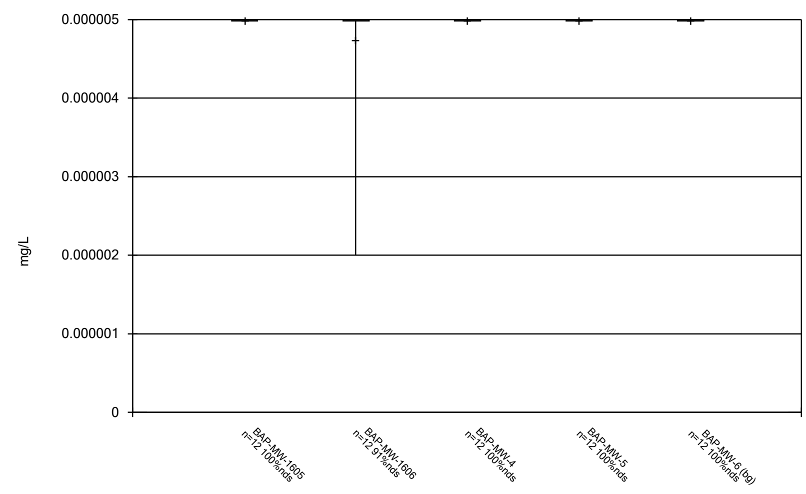


Constituent: Mercury, total   Analysis Run 7/28/2021 3:59 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

Box & Whiskers Plot

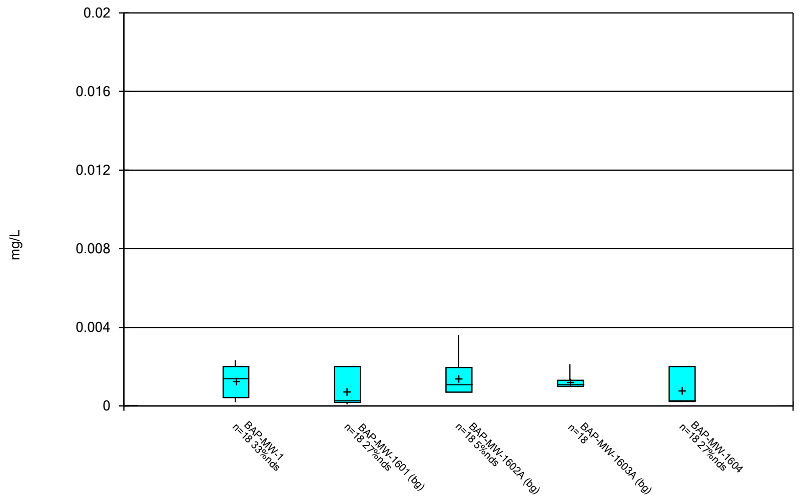


Constituent: Mercury, total   Analysis Run 7/28/2021 3:59 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

Box & Whiskers Plot

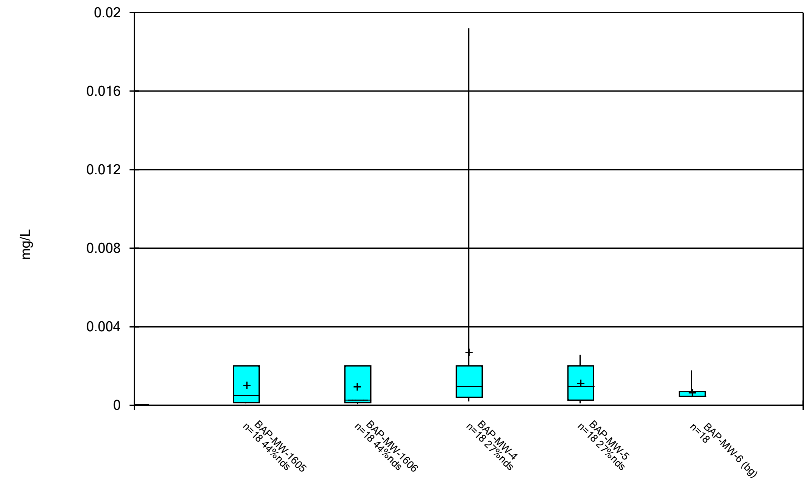


Constituent: Molybdenum, total   Analysis Run 7/28/2021 3:59 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

Box & Whiskers Plot

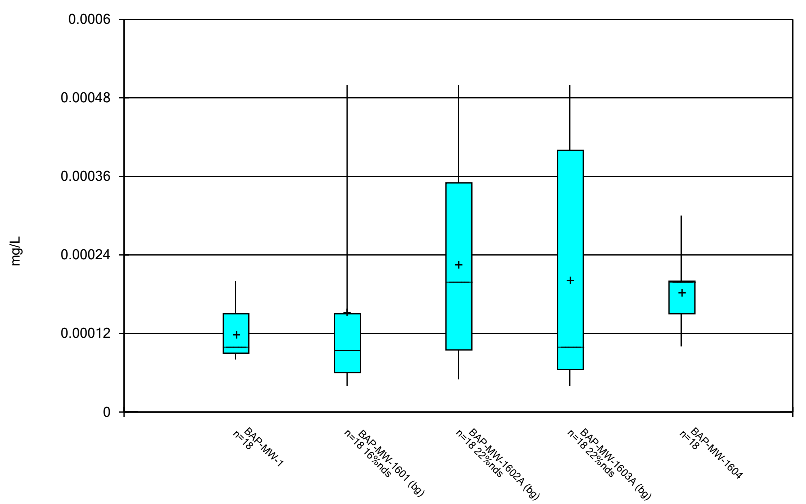


Constituent: Molybdenum, total   Analysis Run 7/28/2021 3:59 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

Box & Whiskers Plot

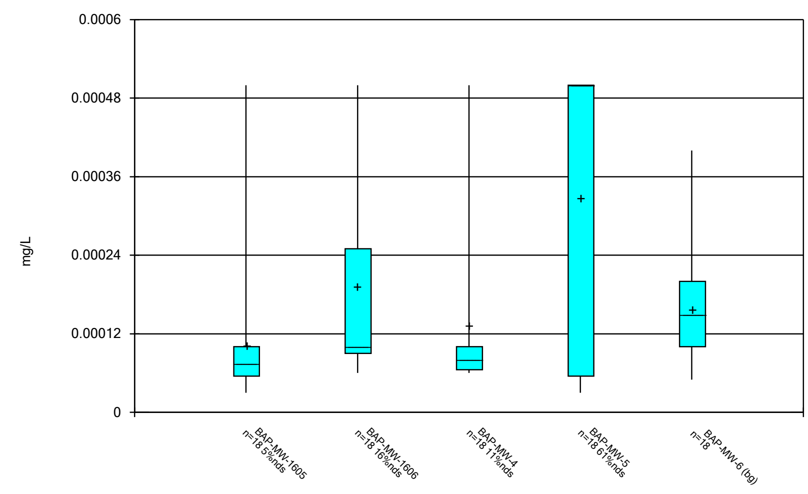


Constituent: Selenium, total   Analysis Run 7/28/2021 3:59 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

Box & Whiskers Plot

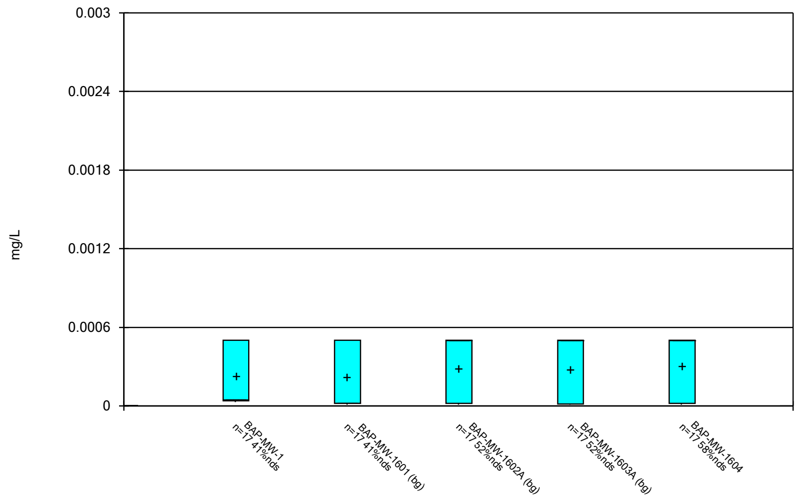


Constituent: Selenium, total   Analysis Run 7/28/2021 3:59 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

Box & Whiskers Plot

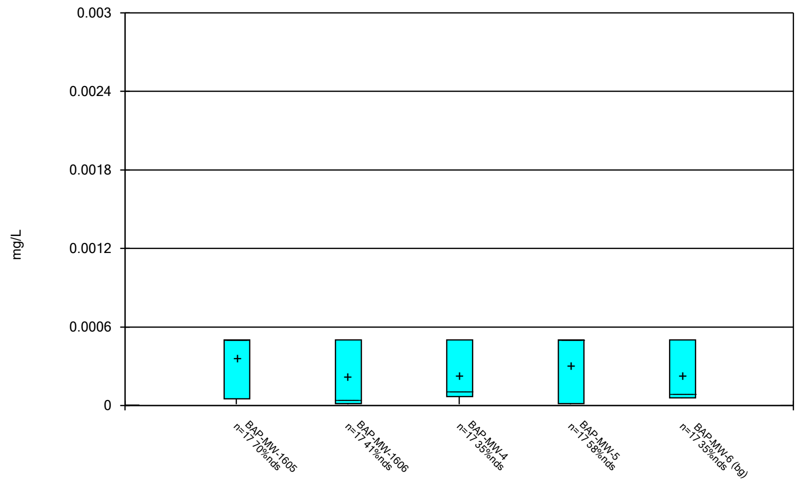


Constituent: Thallium, total   Analysis Run 7/28/2021 3:59 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

Box & Whiskers Plot



Constituent: Thallium, total   Analysis Run 7/28/2021 3:59 PM

Amos BAP   Client: Geosyntec   Data: Amos BAP

Outlier Summary

Amos BAP Client: Geosyntec Data: Amos BAP Printed 8/26/2021, 1:47 PM

	BAP-MW-1604 Beryllium, total (mg/L)	BAP-MW-1603A Chromium, total (mg/L)	BAP-MW-1601 Combined Radium 226 + 228 (pCi/L)	BAP-MW-6 Combined Radium 226 + 228 (pCi/L)	BAP-MW-4 Fluoride, total (mg/L)	BAP-MW-5 Fluoride, total (mg/L)
10/18/2016					<0.2 (o)	<0.2 (o)
12/13/2016		0.00327 (o)				
2/7/2017			35.021 (o)			
2/8/2017				20.83 (o)		
6/10/2019	0.000142 (o)					

Tolerance Limit Summary Table

Amos BAP   Client: Geosyntec   Data: Amos BAP   Printed 1/19/2021, 9:06 AM

Constituent	Well	Upper Lim.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Antimony, total (mg/L)	n/a	0.00017	64	n/a	n/a	28.13	n/a	n/a	0.03752	NP Inter(normality)
Arsenic, total (mg/L)	n/a	0.090	64	n/a	n/a	0	n/a	n/a	0.03752	NP Inter(normality)
Barium, total (mg/L)	n/a	0.3	64	0.1888	0.05317	0	None	No	0.05	Inter
Beryllium, total (mg/L)	n/a	0.00011	64	n/a	n/a	18.75	n/a	n/a	0.03752	NP Inter(normality)
Cadmium, total (mg/L)	n/a	0.000050	64	n/a	n/a	31.25	n/a	n/a	0.03752	NP Inter(normality)
Chromium, total (mg/L)	n/a	0.002	63	0.02602	0.009081	0	None	sqrt(x)	0.05	Inter
Cobalt, total (mg/L)	n/a	0.014	64	n/a	n/a	0	n/a	n/a	0.03752	NP Inter
Combined Radium 226 + 228 (pCi/L)	n/a	3.9	66	-0.05814	0.7163	0	None	ln(x)	0.05	Inter
Fluoride, total (mg/L)	n/a	0.31	70	n/a	n/a	1.429	n/a	n/a	0.02758	NP Inter(normality)
Lead, total (mg/L)	n/a	0.0068	64	-7.528	1.266	1.563	None	ln(x)	0.05	Inter
Lithium, total (mg/L)	n/a	0.0082	64	-6.811	1.004	18.75	Kaplan-Meier	ln(x)	0.05	Inter
Mercury, total (mg/L)	n/a	0.0000050	44	n/a	n/a	90.91	n/a	n/a	0.1047	NP Inter(NDs)
Molybdenum, total (mg/L)	n/a	0.0024	64	0.02904	0.009838	9.375	None	sqrt(x)	0.05	Inter
Selenium, total (mg/L)	n/a	0.00040	64	n/a	n/a	7.813	n/a	n/a	0.03752	NP Inter(normality)
Thallium, total (mg/L)	n/a	0.00050	64	n/a	n/a	42.19	n/a	n/a	0.03752	NP Inter(normality)

AMOS BAP GWPS				
Constituent Name	**MCL**	**CCR Rule-Based**	**Background**	**GWPS**
Antimony, Total (mg/L)	0.006		0.00017	0.006
Arsenic, Total (mg/L)	0.01		0.09	0.09
Barium, Total (mg/L)	2		0.3	2
Beryllium, Total (mg/L)	0.004		0.00011	0.004
Cadmium, Total (mg/L)	0.005		0.00005	0.005
Chromium, Total (mg/L)	0.1		0.002	0.1
Cobalt, Total (mg/L)	n/a	0.006	0.014	0.014
Combined Radium, Total (pCi/L)	5		3.9	5
Fluoride, Total (mg/L)	4		0.31	4
Lead, Total (mg/L)	0.015		0.0068	0.015
Lithium, Total (mg/L)	n/a	0.04	0.0082	0.04
Mercury, Total (mg/L)	0.002		0.000005	0.002
Molybdenum, Total (mg/L)	n/a	0.1	0.0024	0.1
Selenium, Total (mg/L)	0.05		0.0004	0.05
Thallium, Total (mg/L)	0.002		0.0005	0.002

Grey cell indicates Background is higher than MCL or CCR-Rule Specified Level

CCR = Coal Combustion Residual

MCL = Maximum Contaminant Level

GWPS - Groundwater Protection Standard

Confidence Intervals - All Results (No Significant)

Amos BAP Client: Geosyntec Data: Amos BAP Printed 7/29/2021, 3:45 PM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Antimony, total (mg/L)	BAP-MW-1	0.0001	0.00001	0.006	No	18	0.00005389	0.00005575	27.78	None	No	0.01	NP (normality)
Antimony, total (mg/L)	BAP-MW-1604	0.0001	0.00002	0.006	No	18	0.00005444	0.00003451	33.33	None	No	0.01	NP (normality)
Antimony, total (mg/L)	BAP-MW-1605	0.00002764	0.00001009	0.006	No	18	0.00006333	0.00006352	33.33	Kaplan-Meier	ln(x)	0.01	Param.
Antimony, total (mg/L)	BAP-MW-1606	0.00004	0.00002	0.006	No	18	0.00004278	0.0000325	22.22	None	No	0.01	NP (normality)
Antimony, total (mg/L)	BAP-MW-4	0.0001	0.00003	0.006	No	18	0.00006556	0.00003568	38.89	None	No	0.01	NP (normality)
Antimony, total (mg/L)	BAP-MW-5	0.0001	0.00002	0.006	No	18	0.000055	0.00003601	27.78	None	No	0.01	NP (normality)
Arsenic, total (mg/L)	BAP-MW-1	0.0001413	0.00009763	0.09	No	18	0.0001194	0.00003605	0	None	No	0.01	Param.
Arsenic, total (mg/L)	BAP-MW-1604	0.00515	0.00404	0.09	No	18	0.004788	0.0008293	0	None	No	0.01	NP (normality)
Arsenic, total (mg/L)	BAP-MW-1605	0.004056	0.003066	0.09	No	18	0.003598	0.0008765	0	None	x^(1/3)	0.01	Param.
Arsenic, total (mg/L)	BAP-MW-1606	0.003121	0.002601	0.09	No	18	0.002861	0.0004299	0	None	No	0.01	Param.
Arsenic, total (mg/L)	BAP-MW-4	0.008547	0.002671	0.09	No	18	0.006266	0.005785	0	None	sqrt(x)	0.01	Param.
Arsenic, total (mg/L)	BAP-MW-5	0.00363	0.00274	0.09	No	18	0.003319	0.0009988	0	None	No	0.01	NP (normality)
Barium, total (mg/L)	BAP-MW-1	0.02827	0.02597	2	No	18	0.02712	0.001903	0	None	No	0.01	Param.
Barium, total (mg/L)	BAP-MW-1604	0.1574	0.1369	2	No	18	0.1472	0.01697	0	None	No	0.01	Param.
Barium, total (mg/L)	BAP-MW-1605	0.0938	0.07854	2	No	18	0.08617	0.01261	0	None	No	0.01	Param.
Barium, total (mg/L)	BAP-MW-1606	0.06574	0.05238	2	No	18	0.05906	0.01104	0	None	No	0.01	Param.
Barium, total (mg/L)	BAP-MW-4	0.09578	0.08697	2	No	18	0.09138	0.007279	0	None	No	0.01	Param.
Barium, total (mg/L)	BAP-MW-5	0.1581	0.1422	2	No	18	0.1502	0.0131	0	None	No	0.01	Param.
Beryllium, total (mg/L)	BAP-MW-1	0.0001302	0.0001172	0.004	No	18	0.0001237	0.00001076	0	None	No	0.01	Param.
Beryllium, total (mg/L)	BAP-MW-1604	0.00006	0.000039	0.004	No	17	0.00004912	0.0000136	0	None	No	0.01	NP (normality)
Beryllium, total (mg/L)	BAP-MW-1605	0.00008278	0.00005466	0.004	No	18	0.00006872	0.00002324	0	None	No	0.01	Param.
Beryllium, total (mg/L)	BAP-MW-1606	0.0001138	0.00007974	0.004	No	18	0.00009678	0.00002816	0	None	No	0.01	Param.
Beryllium, total (mg/L)	BAP-MW-4	0.00006093	0.00004552	0.004	No	18	0.00005367	0.00001346	0	None	sqrt(x)	0.01	Param.
Beryllium, total (mg/L)	BAP-MW-5	0.00005856	0.00003885	0.004	No	18	0.00005072	0.00002129	0	None	ln(x)	0.01	Param.
Cadmium, total (mg/L)	BAP-MW-1	0.00277	0.002265	0.005	No	18	0.002518	0.0004173	0	None	No	0.01	Param.
Cadmium, total (mg/L)	BAP-MW-1604	0.00005	0.00002	0.005	No	18	0.00004344	0.00001534	83.33	None	No	0.01	NP (NDs)
Cadmium, total (mg/L)	BAP-MW-1605	0.00005	0.000009	0.005	No	18	0.00003422	0.00002058	61.11	None	No	0.01	NP (NDs)
Cadmium, total (mg/L)	BAP-MW-1606	0.0002122	0.0001511	0.005	No	18	0.0001817	0.00005044	0	None	No	0.01	Param.
Cadmium, total (mg/L)	BAP-MW-4	0.0001527	0.00005277	0.005	No	18	0.0001389	0.0001657	0	None	ln(x)	0.01	Param.
Cadmium, total (mg/L)	BAP-MW-5	0.00005	0.000006	0.005	No	18	0.00002372	0.00002161	38.89	None	No	0.01	NP (normality)
Chromium, total (mg/L)	BAP-MW-1	0.0003103	0.0001185	0.1	No	18	0.0002722	0.0002895	0	None	ln(x)	0.01	Param.
Chromium, total (mg/L)	BAP-MW-1604	0.001117	0.0006362	0.1	No	18	0.0008767	0.0003974	0	None	No	0.01	Param.
Chromium, total (mg/L)	BAP-MW-1605	0.0004181	0.0002202	0.1	No	18	0.0003316	0.0001843	0	None	sqrt(x)	0.01	Param.
Chromium, total (mg/L)	BAP-MW-1606	0.00105	0.0004603	0.1	No	18	0.0007552	0.0004873	0	None	No	0.01	Param.
Chromium, total (mg/L)	BAP-MW-4	0.000367	0.000216	0.1	No	18	0.000348	0.0002343	0	None	No	0.01	NP (normality)
Chromium, total (mg/L)	BAP-MW-5	0.000291	0.00017	0.1	No	18	0.0002839	0.000221	0	None	No	0.01	NP (normality)
Cobalt, total (mg/L)	BAP-MW-1	0.01559	0.012	0.014	No	18	0.01379	0.002971	0	None	No	0.01	Param.
Cobalt, total (mg/L)	BAP-MW-1604	0.0007223	0.0003986	0.014	No	18	0.0006138	0.0004101	0	None	ln(x)	0.01	Param.
Cobalt, total (mg/L)	BAP-MW-1605	0.0115	0.00907	0.014	No	18	0.01201	0.006283	0	None	No	0.01	NP (normality)
Cobalt, total (mg/L)	BAP-MW-1606	0.01536	0.01214	0.014	No	18	0.01375	0.002659	0	None	No	0.01	Param.
Cobalt, total (mg/L)	BAP-MW-4	0.02254	0.009301	0.014	No	18	0.01946	0.01924	0	None	ln(x)	0.01	Param.
Cobalt, total (mg/L)	BAP-MW-5	0.001249	0.001053	0.014	No	18	0.001151	0.0001623	0	None	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	BAP-MW-1	1.076	0.5745	5	No	19	0.8599	0.4558	0	None	sqrt(x)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	BAP-MW-1604	1.423	0.6711	5	No	19	1.109	0.7417	0	None	sqrt(x)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	BAP-MW-1605	1.599	0.7414	5	No	19	1.377	1.178	0	None	ln(x)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	BAP-MW-1606	1.208	0.5211	5	No	19	0.8646	0.5866	0	None	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	BAP-MW-4	1.883	0.46	5	No	19	0.9482	0.6514	0	None	No	0.01	NP (normality)
Combined Radium 226 + 228 (pCi/L)	BAP-MW-5	1.362	0.795	5	No	19	1.078	0.4838	0	None	No	0.01	Param.
Fluoride, total (mg/L)	BAP-MW-1	0.06	0.02	4	No	19	0.03632	0.01535	26.32	None	No	0.01	NP (normality)
Fluoride, total (mg/L)	BAP-MW-1604	0.09564	0.06936	4	No	20	0.0825	0.02314	0	None	No	0.01	Param.
Fluoride, total (mg/L)	BAP-MW-1605	0.06	0.02	4	No	20	0.0455	0.02164	30	None	No	0.01	NP (normality)
Fluoride, total (mg/L)	BAP-MW-1606	0.06	0.02	4	No	19	0.04316	0.01857	52.63	None	No	0.01	NP (NDs)
Fluoride, total (mg/L)	BAP-MW-4	0.06	0.04	4	No	19	0.05053	0.01268	0	None	No	0.01	NP (normality)
Fluoride, total (mg/L)	BAP-MW-5	0.05	0.03	4	No	19	0.04211	0.007873	0	None	No	0.01	NP (normality)

Confidence Intervals - All Results (No Significant)

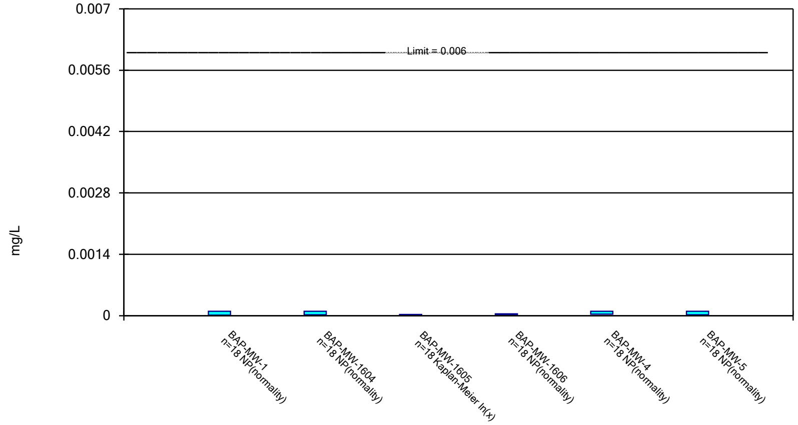
Amos BAP Client: Geosyntec Data: Amos BAP Printed 7/29/2021, 3:45 PM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Lead, total (mg/L)	BAP-MW-1	0.000133	0.000066	0.015	No	18	0.0001567	0.0002546	11.11	None	No	0.01	NP (normality)
Lead, total (mg/L)	BAP-MW-1604	0.0006973	0.0002405	0.015	No	18	0.0005158	0.0004282	0	None	sqrt(x)	0.01	Param.
Lead, total (mg/L)	BAP-MW-1605	0.0002353	0.00008083	0.015	No	18	0.0002092	0.000241	0	None	ln(x)	0.01	Param.
Lead, total (mg/L)	BAP-MW-1606	0.0008689	0.0003682	0.015	No	18	0.0006186	0.0004138	0	None	No	0.01	Param.
Lead, total (mg/L)	BAP-MW-4	0.0003678	0.0002113	0.015	No	18	0.0002896	0.0001294	0	None	No	0.01	Param.
Lead, total (mg/L)	BAP-MW-5	0.000247	0.0000748	0.015	No	18	0.0001913	0.0002045	11.11	None	x^(1/3)	0.01	Param.
Lithium, total (mg/L)	BAP-MW-1	0.006	0.00257	0.04	No	18	0.005072	0.004568	11.11	None	No	0.01	NP (normality)
Lithium, total (mg/L)	BAP-MW-1604	0.006	0.000485	0.04	No	18	0.004865	0.00581	22.22	None	No	0.01	NP (normality)
Lithium, total (mg/L)	BAP-MW-1605	0.008	0.00255	0.04	No	18	0.005436	0.004144	11.11	None	No	0.01	NP (normality)
Lithium, total (mg/L)	BAP-MW-1606	0.01	0.00239	0.04	No	18	0.005945	0.004681	16.67	None	No	0.01	NP (normality)
Lithium, total (mg/L)	BAP-MW-4	0.008	0.00139	0.04	No	18	0.004332	0.004898	11.11	None	No	0.01	NP (normality)
Lithium, total (mg/L)	BAP-MW-5	0.00464	0.001322	0.04	No	18	0.004199	0.004872	11.11	None	ln(x)	0.01	Param.
Mercury, total (mg/L)	BAP-MW-1	0.000005	0.000002	0.002	No	12	0.00000475	8.7e-7	91.67	None	No	0.01	NP (NDs)
Mercury, total (mg/L)	BAP-MW-1604	0.000005	0.000002	0.002	No	12	0.00000475	8.7e-7	91.67	None	No	0.01	NP (NDs)
Mercury, total (mg/L)	BAP-MW-1605	0.000005	0.000005	0.002	No	12	0.000005	0	100	None	No	0.01	NP (NDs)
Mercury, total (mg/L)	BAP-MW-1606	0.000005	0.000002	0.002	No	12	0.00000475	8.7e-7	91.67	None	No	0.01	NP (NDs)
Mercury, total (mg/L)	BAP-MW-4	0.000005	0.000005	0.002	No	12	0.000005	0	100	None	No	0.01	NP (NDs)
Mercury, total (mg/L)	BAP-MW-5	0.000005	0.000005	0.002	No	12	0.000005	0	100	None	No	0.01	NP (NDs)
Molybdenum, total (mg/L)	BAP-MW-1	0.002	0.00034	0.1	No	18	0.001284	0.0007511	33.33	None	No	0.01	NP (normality)
Molybdenum, total (mg/L)	BAP-MW-1604	0.002	0.00022	0.1	No	18	0.0007917	0.0007846	27.78	None	No	0.01	NP (normality)
Molybdenum, total (mg/L)	BAP-MW-1605	0.002	0.00012	0.1	No	18	0.001032	0.0009008	44.44	None	No	0.01	NP (normality)
Molybdenum, total (mg/L)	BAP-MW-1606	0.002	0.00012	0.1	No	18	0.0009689	0.0009507	44.44	None	No	0.01	NP (normality)
Molybdenum, total (mg/L)	BAP-MW-4	0.001614	0.0003648	0.1	No	18	0.00269	0.0048	27.78	Kaplan-Meier	ln(x)	0.01	Param.
Molybdenum, total (mg/L)	BAP-MW-5	0.00215	0.00022	0.1	No	18	0.001178	0.0009043	27.78	None	No	0.01	NP (normality)
Selenium, total (mg/L)	BAP-MW-1	0.0002	0.00009	0.05	No	18	0.0001189	0.00004497	0	None	No	0.01	NP (normality)
Selenium, total (mg/L)	BAP-MW-1604	0.0003	0.0001	0.05	No	18	0.0001833	0.00005145	0	None	No	0.01	NP (normality)
Selenium, total (mg/L)	BAP-MW-1605	0.0001	0.00005	0.05	No	18	0.0001022	0.000106	5.556	None	No	0.01	NP (normality)
Selenium, total (mg/L)	BAP-MW-1606	0.0003	0.00009	0.05	No	18	0.0001922	0.0001555	16.67	None	No	0.01	NP (normality)
Selenium, total (mg/L)	BAP-MW-4	0.0002	0.00006	0.05	No	18	0.0001322	0.0001376	11.11	None	No	0.01	NP (normality)
Selenium, total (mg/L)	BAP-MW-5	0.0005	0.00005	0.05	No	18	0.0003278	0.0002225	61.11	None	No	0.01	NP (NDs)
Thallium, total (mg/L)	BAP-MW-1	0.0005	0.00004	0.002	No	17	0.0002319	0.0002314	41.18	None	No	0.01	NP (normality)
Thallium, total (mg/L)	BAP-MW-1604	0.0005	0.00002	0.002	No	17	0.0003024	0.0002437	58.82	None	No	0.01	NP (NDs)
Thallium, total (mg/L)	BAP-MW-1605	0.0005	0.00004	0.002	No	17	0.0003619	0.0002208	70.59	None	No	0.01	NP (NDs)
Thallium, total (mg/L)	BAP-MW-1606	0.0005	0.00001	0.002	No	17	0.0002188	0.0002427	41.18	None	No	0.01	NP (normality)
Thallium, total (mg/L)	BAP-MW-4	0.0005	0.000068	0.002	No	17	0.0002316	0.0002091	35.29	None	No	0.01	NP (normality)
Thallium, total (mg/L)	BAP-MW-5	0.0005	0.00001	0.002	No	17	0.0003018	0.0002443	58.82	None	No	0.01	NP (NDs)

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

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.



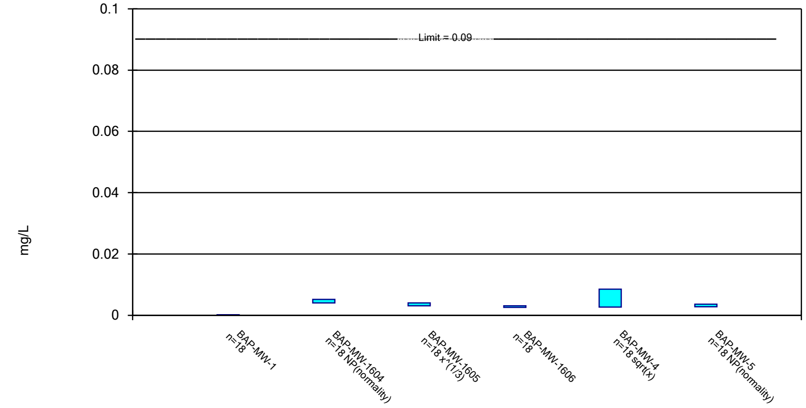
Constituent: Antimony, total Analysis Run 7/29/2021 3:44 PM View: Confidence Intervals

Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

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.



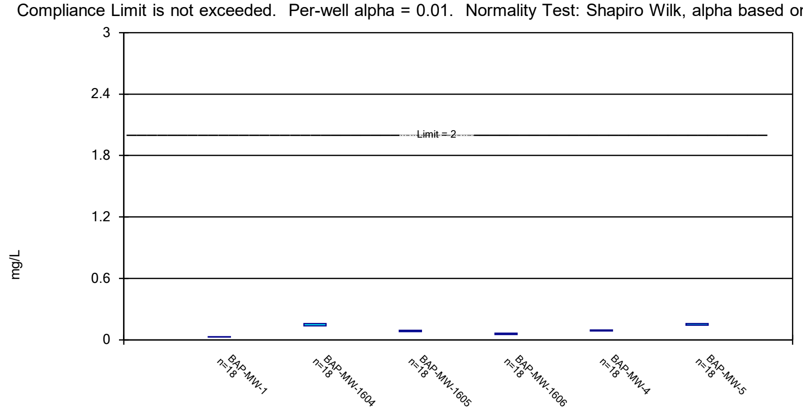
Constituent: Arsenic, total Analysis Run 7/29/2021 3:44 PM View: Confidence Intervals

Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

Parametric Confidence Interval

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



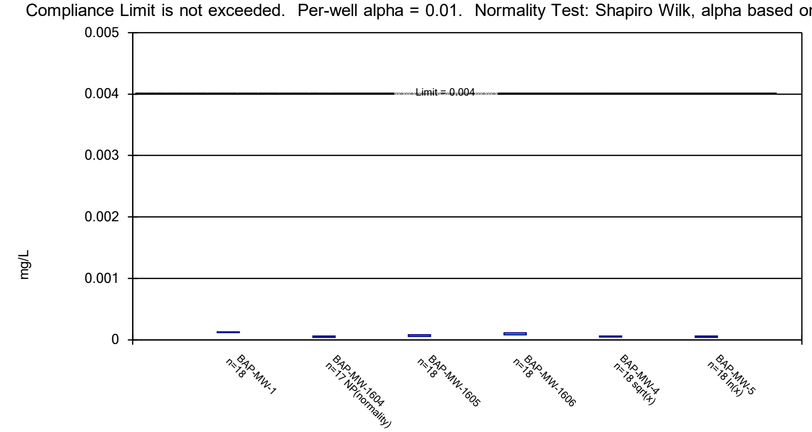
Constituent: Barium, total Analysis Run 7/29/2021 3:44 PM View: Confidence Intervals

Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

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.



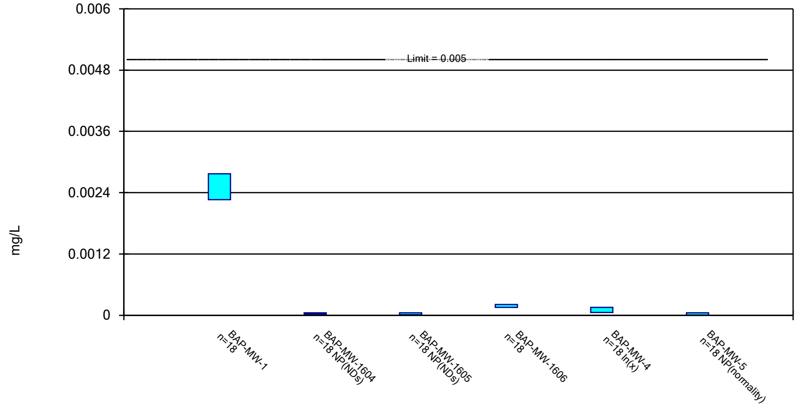
Constituent: Beryllium, total Analysis Run 7/29/2021 3:44 PM View: Confidence Intervals

Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

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.

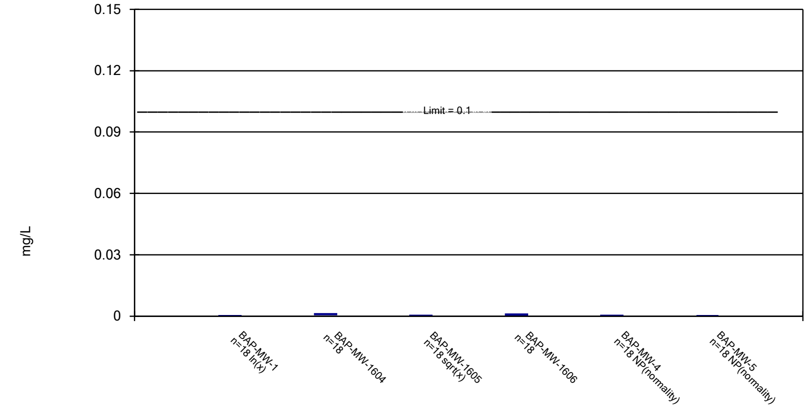


Constituent: Cadmium, total Analysis Run 7/29/2021 3:44 PM View: Confidence Intervals
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

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.

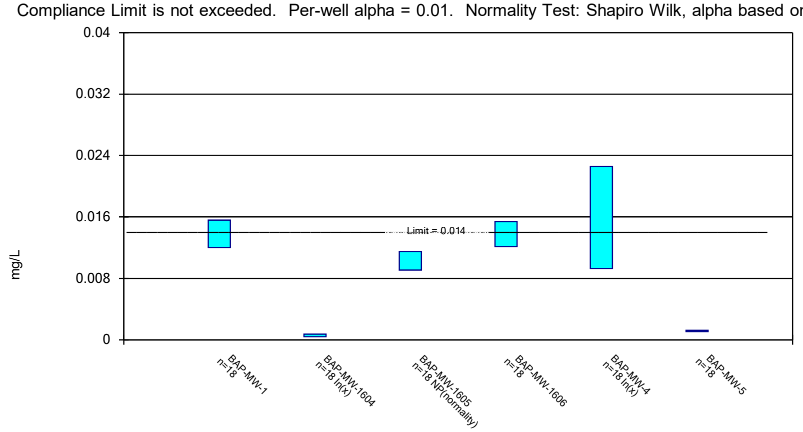


Constituent: Chromium, total Analysis Run 7/29/2021 3:44 PM View: Confidence Intervals
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

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.

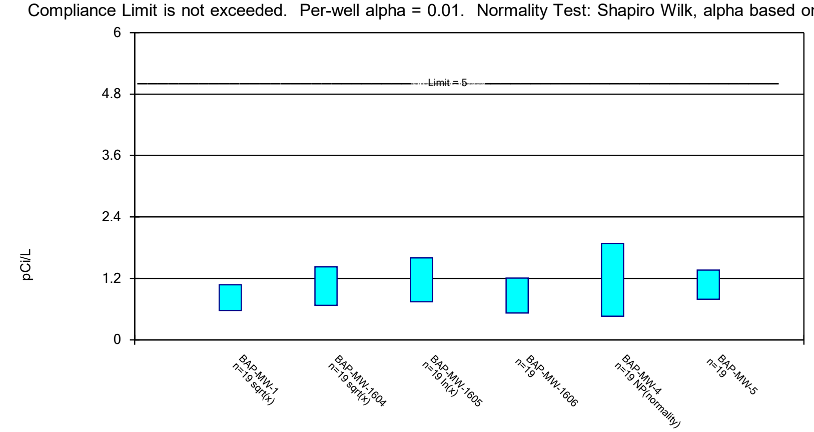


Constituent: Cobalt, total Analysis Run 7/29/2021 3:44 PM View: Confidence Intervals
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

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.

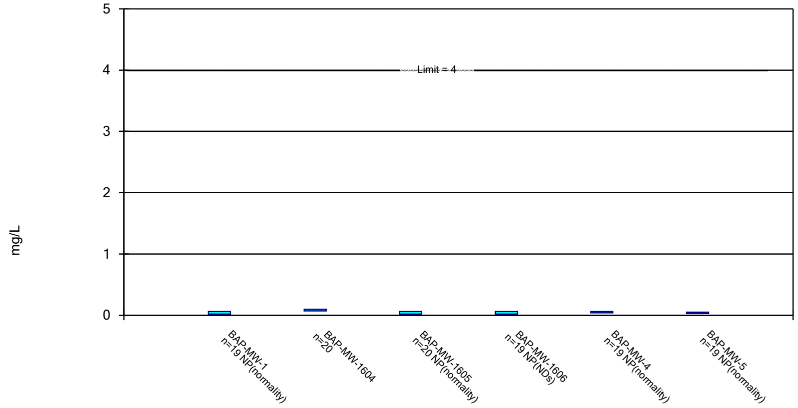


Constituent: Combined Radium 226 + 228 Analysis Run 7/29/2021 3:44 PM View: Confidence Intervals
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

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.

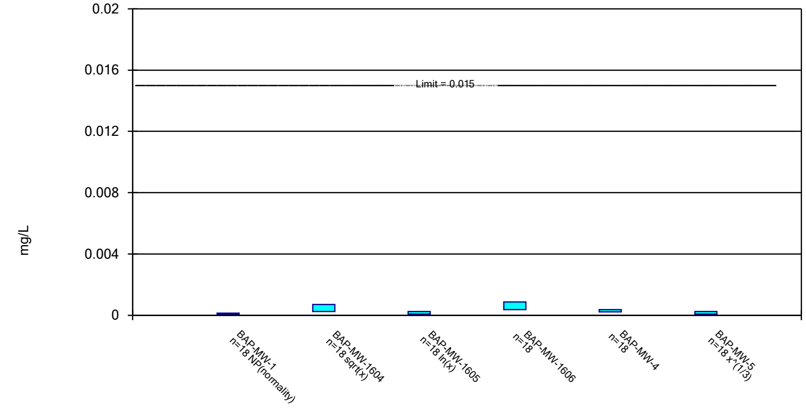


Constituent: Fluoride, total Analysis Run 7/29/2021 3:44 PM View: Confidence Intervals
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

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.

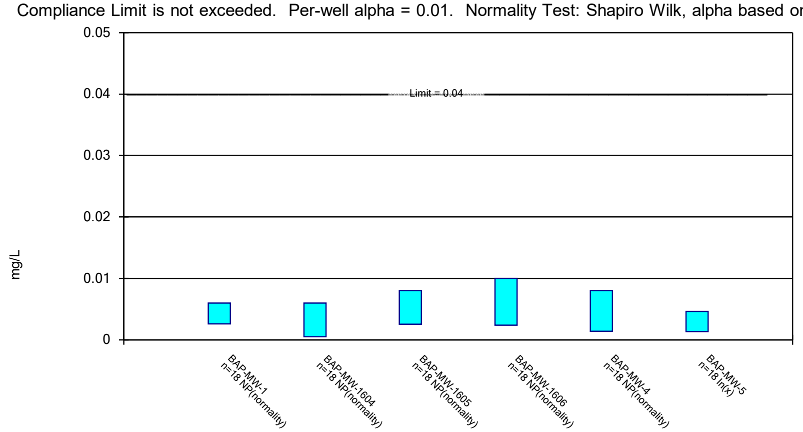


Constituent: Lead, total Analysis Run 7/29/2021 3:44 PM View: Confidence Intervals
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

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.

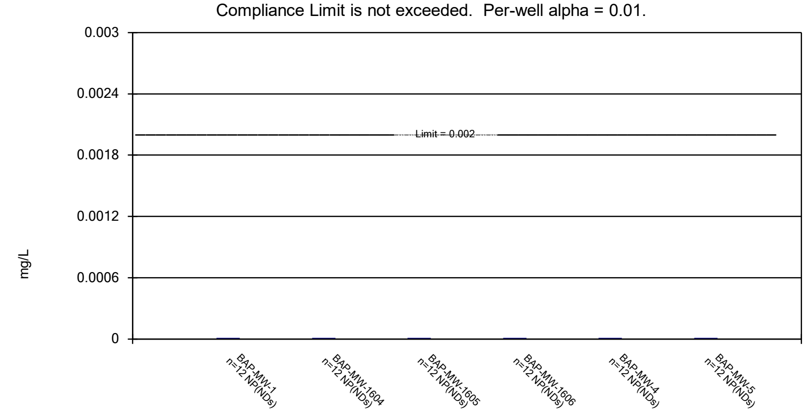


Constituent: Lithium, total Analysis Run 7/29/2021 3:44 PM View: Confidence Intervals
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

Non-Parametric Confidence Interval

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

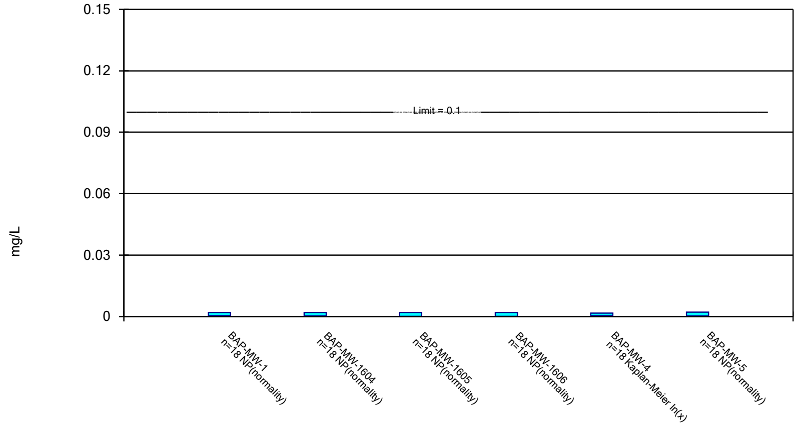


Constituent: Mercury, total Analysis Run 7/29/2021 3:44 PM View: Confidence Intervals
Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

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.



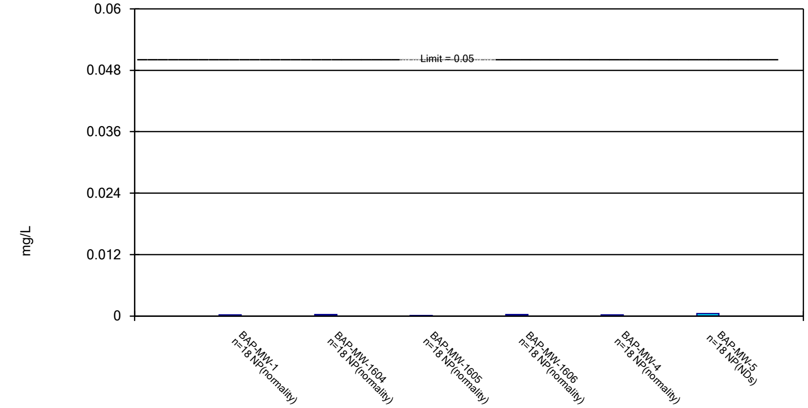
Constituent: Molybdenum, total Analysis Run 7/29/2021 3:44 PM View: Confidence Intervals

Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

Non-Parametric Confidence Interval

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



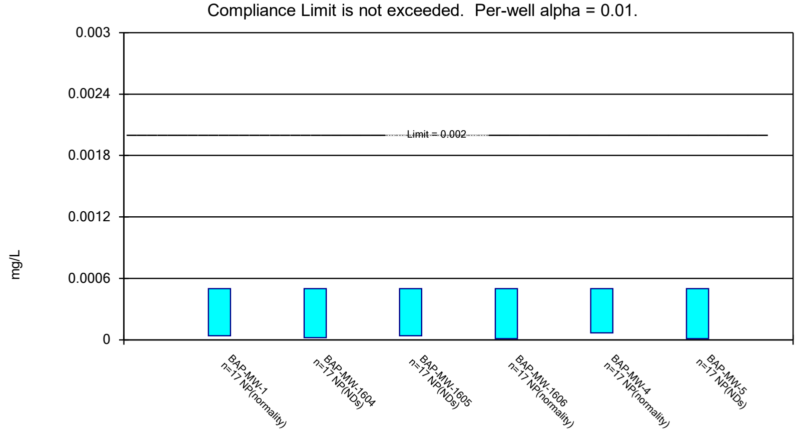
Constituent: Selenium, total Analysis Run 7/29/2021 3:44 PM View: Confidence Intervals

Amos BAP Client: Geosyntec Data: Amos BAP

Sanitas™ v.9.6.30 Groundwater Stats Consulting. UG

Non-Parametric Confidence Interval

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



Constituent: Thallium, total Analysis Run 7/29/2021 3:44 PM View: Confidence Intervals

Amos BAP Client: Geosyntec Data: Amos BAP

APPENDIX 3

Not applicable.

APPENDIX 4

The notification of the establishment of an assessment monitoring program follows.

John Amos Plant

Notice of Assessment Monitoring Program Establishment

Bottom Ash Pond

On January 15, 2018, it was determined that Amos Plant's Bottom Ash Pond had statistically significant increases over background for Calcium, Chloride. 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) 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).

APPENDIX 5

Not applicable.