Annual Groundwater Monitoring Report

Appalachian Power Company

Mountaineer Plant

Landfill CCR Management Unit

Letart, WV

January 2023

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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 standards
SSI - Statistically Significant Increase
SSL - Statistically Significant Level
MTLF – Mountaineer Landfill

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 the landfill CCR unit at Appalachian Power Company's, a wholly-owned subsidiary of American Electric Power Company (AEP), Mountaineer Power Plant. The USEPA's CCR rules require that the Annual Groundwater Monitoring and Corrective Action Report be posted to the operating record for the preceding year no later than January 31st.

In general, the following activities were completed in 2022:

- The Mountaineer Landfill (MTLF) CCR unit began 2022 in detection monitoring and remained in detection monitoring throughout all of 2022.
- Groundwater data underwent various validation tests, including tests for completeness, valid values, transcription errors, and consistent units.
- Groundwater data, flow, and velocities are included in **Appendix 1**.
- The October 2021 detection monitoring event statistical analysis was completed in June 2022 and there were no confirmed statistically significant increases. This statistical analysis report is included in **Appendix 2**.
- The May 2022 detection monitoring event statistical analysis was completed in October 2022 and there were no confirmed statistically significant increases. This statistical analysis report is included in **Appendix 2**.
- The MT LF statistical analysis for background values for detection monitoring parameters was updated in October 2022. This revised report is included in **Appendix 2**.
- The October 2022 detection monitoring event data was received. However, statistical analysis is ongoing and will be completed in early 2023.

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

- A map, aerial photograph or a drawing showing the CCR management unit(s), 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 (Attached as **Appendix 1**).
- Statistical comparison of monitoring data to determine if there have been SSI's over background concentrations (Attached as **Appendix 2**, where applicable).
- A discussion of whether any alternate source demonstration were performed, and the conclusions (Attached as Appendix 3, not applicable).

- A summary of any transition between monitoring program, for example the date and circumstances for transitioning from detection monitoring to assessment monitoring (Notices attached as Appendix 4, not applicable).
- Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a statement as to why that happened (Attached as Appendix 5, not applicable).
- Other information required to be included in the annual report such as an alternate monitoring frequency, or 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. The monitoring well distribution adequately covers downgradient and upgradient areas as detailed in the *Groundwater Monitoring Network Evaluation Report* that is posted to AEP's publically available CCR website. The groundwater quality monitoring network includes the following:

- Two upgradient wells: MW-1612 and MW-30; and
- Five downgradient wells: MW-1611, MW-27, MW-28, MW-38, and MW-39.

Monitoring Well Network

- Downgradient Sampling Location
- Background Sampling Location
- Landfill

Notes

- Monitoring well coordinates provided by AEP.
- Site features based on information available in Little Broad Run Landfill-CCR Groundwater Monitoring Well Network Evaluation (Arcadis, 2016) provided by AEP.

750 375 0 750 Feet

Site Layout
CCR Landfill

AEP Mountaineer Generating Plant
Letart, West Virginia

Geosyntec consultants

Columbus, Ohio | 2018/01/26

Figure **1**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Mountaineer\AEP-Mountaineer_LF_Site_Layout.mxd. ARevezzo. 1/26/2018. CHA8423/07/08.

III. Monitoring Wells Installed or Decommissioned

There were no monitoring wells installed or decommissioned in 2022. The network design, as summarized in the *Groundwater Monitoring Network Design Report* (2016) and as posted at the CCR web site for Mountaineer Plant, did not change. That design report, viewable on the AEP CCR web site, discusses the facility location, the hydrogeological setting, the hydrostratigraphic units, the uppermost aquifer, downgradient monitoring well locations and the upgradient monitoring well locations.

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

Appendix 1 contains tables showing the groundwater quality data collected since background through data received in 2022. Static water elevation data from each monitoring event also are 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

The October 2021 detection monitoring event statistical analysis was completed in June 2022. There were potential SSI's following the initial sampling event in October 2021, therefore a verification event was performed in March 2022. Following the verification sampling event, per the statistical analysis plan, the statistics were completed and there were no SSI's.

The May 2022 detection monitoring event statistical analysis was completed in October 2022. There were potential SSI's following the initial sampling event in May 2022, therefore a verification event was performed in July 2022. Following the verification sampling event, per the statistical analysis plan, the statistics were completed and there were no SSI's.

These statistical analysis reports are included in **Appendix 2**.

The November 2022 detection monitoring event data was received. However, statistical analysis is ongoing and will be completed in early 2023. If any potential SSI's are identified, a resampling event will occur. If any SSI's are confirmed, an ASD will be attempted. If successful, the MTLF will remain in detection monitoring. However, if unsuccessful, the MTLF will transition into assessment monitoring.

Additionally, the MTLF background statistics were updated in October 2022. The revised background statistics are also included in **Appendix 2**.

VI. Alternative Source Demonstrations

No alternative source demonstrations were completed in 2022.

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

There has been no transition between detection monitoring and assessment monitoring at Mountaineer Plant's Landfill. Detection monitoring will continue in 2023. The sampling frequency of twice per year will be maintained for the Appendix III parameters (boron, calcium, chloride, fluoride, pH, sulfate and total dissolved solids).

Regarding defining an alternate monitoring frequency, the groundwater velocity and monitoring well production is high enough at this facility that no modification of the twice-per-year detection monitoring effort is needed.

VIII. Other Information Required

As required by the CCR detection monitoring rules in 40 CFR 257.94, sampling all CCR wells for the Appendix III parameters was completed in 2022. All required information has been included in this annual groundwater monitoring report.

IX. Description of Any Problems Encountered in 2022 and Actions Taken

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

X. A Projection of Key Activities for the Upcoming Year

Key activities for 2023 include:

- Complete the statistical analysis of the October 2022 detection event.
- Detection monitoring on a twice per year schedule.
- Evaluation of the detection monitoring results from a statistical analysis viewpoint, looking for any statistically significant increases, or decreases when pH is considered.
- Responding to any new data received in light of what the CCR rule requires.
- Preparation of the 2023 annual groundwater report.

APPENDIX 1 - Groundwater Data Tables and Figures

Tables follow, showing the groundwater monitoring data collected and the rate and direction of groundwater flow. The dates that the samples were collected also is shown.

Table 1 - Groundwater Data Summary: MW-26
Mountaineer - LF
Appendix III Constituents

Geosyntec Consultants, Inc.

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
9/27/2016	Background	0.097	61.5	5.57	0.12	7.5	9.6	322
11/1/2016	Background	0.117	50.5	5.17	0.13	7.4	10.6	270
12/21/2016	Background	0.074	48.6	5.21	0.13	7.6	10.2	316
2/22/2017	Background	0.145	56.2	5.35	0.13	7.4	6.5	325
3/28/2017	Background	0.222	52.9	6.25	0.13	7.4	7.3	334
4/17/2017	Background	0.169	57.1	5.73	0.13	7.3	6.7	320
5/17/2017	Background	0.161	58.6	5.87	0.13	8.1	6.5	343
6/13/2017	Background	0.121	53.7	5.00	0.12	7.4	5.3	324
10/31/2017	Detection	0.165	54.7	5.48	0.13	7.5	5.8	346
1/22/2018	Detection	--	55.7	--	--	7.3	--	--
9/20/2018	Detection	0.214	49.4	6.04	0.16	8.0	6.3	344
11/26/2018	Detection	0.182	53.6	5.97	0.14	7.4	7.2	364
4/9/2019	Detection	0.128	62.8	6.71	0.13	7.3	7.6	370
6/18/2019	Detection	--	--	7.22	--	7.2	--	387
9/9/2019	Detection	0.099	60.2	5.80	0.14	7.4	5.7	353
7/8/2020	Detection	--	--	--	--	7.4	--	366
10/8/2020	Detection	0.103	51.2	5.74	0.16	6.9	6.4	344
1/4/2021	Detection	--	--	--	--	7.5	--	--
5/13/2021	Detection	0.110	60.2	6.56	0.15	7.2	8.5	378
11/3/2021	Detection	0.091	57.5	5.50	0.14	7.1	5.20	340
3/4/2022	Detection	--	--	--	--	7.5	--	--
5/23/2022	Detection	0.099	64.8	5.97	0.13	7.5	7.90	370 L1
7/25/2022	Detection	--	61.8	--	--	7.7	--	--
11/10/2022	Detection	0.103	58.5	5.69	0.13	7.2	6.58	370

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.
L1: The associated laboratory control sample (LCS) or laboratory control sample duplicate (LCSD) recovery was outside acceptance limits.

Table 1 - Groundwater Data Summary: MW-26
Mountaineer - LF
Appendix IV Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
9/27/2016	Background	0.13	3.57	917	< 0.005 U1	0.01 J1	0.4	0.214	3.25	0.12	0.165	0.010	< 0.002 U1	1.88	0.1	0.03 J1
11/1/2016	Background	0.11	4.06	871	< 0.005 U1	0.005 J1	0.3	0.220	3.57	0.13	0.043	0.006	< 0.002 U1	3.07	0.1	0.02 J1
12/21/2016	Background	0.12	4.51	872	0.01 J1	0.006 J1	1.27	0.329	3.15	0.13	0.167	0.004	< 0.002 U1	3.52	0.2	0.062
2/22/2017	Background	0.09	4.11	717	0.01 J1	0.01 J1	0.731	0.345	3.60	0.13	0.244	0.012	< 0.002 U1	2.53	0.1	0.04 J1
3/28/2017	Background	0.50	3.95	886	0.028	0.01 J1	1.43	0.532	2.88	0.13	0.517	0.014	< 0.002 U1	1.18	0.2	0.03 J1
4/17/2017	Background	0.09	3.60	802	0.007 J1	0.007 J1	0.328	0.299	1.967	0.13	0.164	0.009	< 0.002 U1	1.08	0.1 J1	0.01 J1
5/17/2017	Background	0.06	4.01	869	< 0.004 U1	0.007 J1	0.238	0.251	3.22	0.13	0.090	0.007	< 0.002 U1	3.99	0.1	0.01 J1
6/13/2017	Background	0.10	3.45	905	0.008 J1	0.008 J1	0.405	0.325	3.28	0.12	0.252	0.018	< 0.002 U1	1.23	0.1	0.01 J1

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-27
Mountaineer - LF
Appendix III Constituents

Geosyntec Consultants, Inc.

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
9/27/2016	Background	0.276	18.9	1.82	2.23	9.2	4.9	618
11/1/2016	Background	0.288	1.57	1.86	2.38	9.1	7.2	558
12/21/2016	Background	0.219	1.39	1.69	2.44	9.2	7.3	528
2/22/2017	Background	0.282	1.42	1.48	2.27	9.1	4.3	531
3/28/2017	Background	0.387	1.26	1.59	2.32	9.3	4.7	508
4/17/2017	Background	0.312	1.65	1.56	2.30	9.0	5.0	536
5/17/2017	Background	0.290	1.48	1.59	2.38	11.1	4.8	539
6/13/2017	Background	0.293	1.77	1.64	2.33	9.4	4.5	526
10/31/2017	Detection	0.275	1.33	1.63	2.38	9.2	4.2	544
9/20/2018	Detection	0.357	1.14	1.69	2.41	9.1	4.4	550
11/26/2018	Detection	0.292	1.20	1.52	2.37	9.0	3.6	522
4/9/2019	Detection	0.303	1.19	1.54	2.32	9.0	2.9	542
9/10/2019	Detection	0.285	1.13	1.67	2.71	9.1	3.0	530
7/8/2020	Detection	--	1.20	1.63	--	9.1	--	--
10/8/2020	Detection	0.273	1.20	1.67	2.38	8.7	3.4	541
1/4/2021	Detection	--	--	--	--	9.0	--	--
5/13/2021	Detection	0.288	1.07	1.71	2.54	8.9	3.1	541
11/3/2021	Detection	0.280	1.10	1.60	2.54	8.4	1.53	560
3/4/2022	Detection	--	--	--	--	9.3	--	--
5/23/2022	Detection	0.288	1.70	1.57	2.58	9.3	2.78	550 L1
11/10/2022	Detection	0.296	1.24	1.57	2.54	8.9	2.18	550

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.
L1: The associated laboratory control sample (LCS) or laboratory control sample duplicate (LCSD) recovery was outside acceptance limits.

Table 1 - Groundwater Data Summary: MW-27
Mountaineer - LF
Appendix IV Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
9/27/2016	Background	0.39	8.05	326	0.654	0.11	11.6	4.95	2.565	2.23	17.3	0.016	0.004 J1	24.2	2.2	0.1 J1
11/1/2016	Background	0.26	5.42	151	0.158	0.02	5.0	0.817	2.003	2.38	4.00	0.007	< 0.002 U1	35.6	0.4	0.03 J1
12/21/2016	Background	0.23	4.26	113	0.093	0.01 J1	2.94	0.502	1.489	2.44	8.87	0.001	< 0.002 U1	34.6	0.3	0.04 J1
2/22/2017	Background	0.06	3.76	94.8	0.054	0.009 J1	1.95	0.320	1.419	2.27	1.28	0.012	0.002 J1	32.1	0.1	0.03 J1
3/28/2017	Background	0.08	4.45	105	0.062	0.008 J1	1.69	0.319	0.888	2.32	1.06	0.016	< 0.002 U1	31.5	0.2	0.02 J1
4/17/2017	Background	0.15	4.54	108	0.085	0.01 J1	2.36	0.511	0.486	2.30	1.45	0.005	0.002 J1	32.0	0.2	0.02 J1
5/17/2017	Background	0.11	4.54	94.6	0.052	0.005 J1	1.33	0.335	0.20279	2.38	0.971	0.015	< 0.002 U1	31.6	0.2	0.01 J1
6/13/2017	Background	0.18	4.55	102	0.082	0.01 J1	2.25	0.600	0.797	2.33	1.39	0.015	< 0.002 U1	30.6	0.2	0.02 J1

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-30
Mountaineer - LF
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
10/26/2016	Background	0.239	16.6	250	3.42	8.7	31.5	--
11/2/2016	Background	0.240	10.9	257	3.41	8.6	19.6	1,350
12/28/2016	Background	0.250	9.91	250	3.43	8.0	19.1	1,280
2/22/2017	Background	0.257	2.76	246	3.18	8.6	11.5	1,220
3/29/2017	Background	0.344	2.54	242	3.31	8.7	0.1 J1	1,270
4/19/2017	Background	0.296	2.91	247	3.28	8.5	11.2	1,210
5/17/2017	Background	0.269	2.97	247	1.34	10.1	4.4	1,290
6/13/2017	Background	0.283	4.06	255	3.28	8.9	10.8	1,170
10/31/2017	Detection	0.315	3.27	257	3.30	8.5	11.4	1,210
9/20/2018	Detection	0.315	4.69	253	3.36	8.6	13.0	1,230
11/26/2018	Detection	--	--	--	--	8.4	--	--
11/27/2018	Detection	0.344	3.16	247	3.40	--	11.7	1,240
4/9/2019	Detection	0.290	2.88	245	3.32	8.4	10.6	1,260
9/10/2019	Detection	0.259	3.39	249	3.76	8.3	9.6	1,260
5/18/2020	Detection	0.271	2.95	264	3.54	8.1	10.8	1,240
10/8/2020	Detection	0.249	2.93	247	2.73	8.0	10.9	1,260
5/14/2021	Detection	0.259	2.63	259	3.38	8.3	9.9	1,250
10/28/2021	Detection	0.261	2.80	253	3.47	8.2	8.09	1,250
5/20/2022	Detection	0.289	2.94	259	3.57	8.6	10.7	1,260 L1
11/9/2022	Detection	0.279	3.37	257	3.34	8.3	8.7	1,100

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.
L1: The associated laboratory control sample (LCS) or laboratory control sample duplicate (LCSD) recovery was outside acceptance limits.
Due to limited groundwater volume, pH values for some sampling events were collected the day prior to collection of analytical samples.

Table 1 - Groundwater Data Summary: MW-30
Mountaineer - LF
Appendix IV Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
10/26/2016	Background	0.36	7.38	567	0.692	0.10	13.1	33.8	2.588	3.42	33.2	0.034	0.054	68.7	3.8	0.724
11/2/2016	Background	0.26	7.54	576	0.630	0.09	11.7	33.3	1.404	3.41	30.9	0.026	0.016	73.7	2.7	0.654
12/28/2016	Background	0.91	6.87	360	0.502	0.08	18.1	15.9	2.725	3.43	13.8	0.024	0.026	107	2.6	0.350
2/22/2017	Background	0.52	4.65	223	0.082	0.008 J1	3.24	2.40	2.418	3.18	1.68	0.022	0.004 J1	125	0.5	0.258
3/29/2017	Background	0.66	5.45	243	0.149	0.007 J1	6.13	4.24	1.204	3.31	3.62	0.027	0.003 J1	120	0.7	0.381
4/19/2017	Background	1.55	5.80	246	0.140	0.01 J1	5.76	3.91	3.83	3.28	3.49	0.019	0.061	123	0.7	0.365
5/17/2017	Background	0.75	6.90	241	0.120	< 0.005 U1	3.99	3.63	2.395	1.34	3.41	0.027	0.004 J1	128	0.9	0.287
6/13/2017	Background	2.74	6.86	251	0.197	0.02 J1	6.83	5.35	3.45	3.28	4.80	0.027	0.005 J1	118	0.8	0.366

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-38
Mountaineer - LF
Appendix III Constituents

Geosyntec Consultants, Inc.

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
9/27/2016	Background	0.024	55.7	7.12	0.32	7.1	28.1	410
11/2/2016	Background	0.040	46.3	7.27	0.32	7.0	36.6	358
12/21/2016	Background	0.019	48.2	7.43	0.35	7.4	35.8	404
2/22/2017	Background	0.028	47.2	7.21	0.29	7.0	31.7	409
3/28/2017	Background	0.070	50.0	7.08	0.32	7.0	30.1	390
4/18/2017	Background	0.038	52.5	7.22	0.33	7.0	30.6	422
5/16/2017	Background	0.027	54.5	7.41	0.33	7.6	32.5	421
6/13/2017	Background	0.093	51.4	7.01	0.28	7.0	31.0	406
10/31/2017	Detection	0.045	56.1	7.59	0.38	7.0	28.7	460
1/22/2018	Detection	--	53.8	--	--	6.7	--	419
9/20/2018	Detection	0.068	51.2	7.31	0.36	7.4	31.5	441
11/26/2018	Detection	0.08 J1	48.2	7.06	0.34	7.0	35.2	415
4/9/2019	Detection	0.04 J1	52.0	7.46	0.32	6.9	27.8	427
6/18/2019	Detection	--	--	--	--	7.6	--	--
9/10/2019	Detection	0.03 J1	49.9	7.45	0.35	7.7	28.2	417
10/22/2019	Detection	--	--	--	--	6.9	--	--
5/15/2020	Detection	0.02 J1	48.3	7.59	0.38	6.7	31.4	421
10/8/2020	Detection	0.03 J1	53.4	7.68	0.47	6.8	25.5	452
5/13/2021	Detection	0.03 J1	50.9	7.51	0.43	7.1	23.2	432
10/29/2021	Detection	0.028 J1	44.6	7.26	0.37	6.9	28.7	430
5/20/2022	Detection	0.029 J1	58.8	7.51	0.39	7.2	26.7	440 L1
7/25/2022	Detection	--	53.3	--	--	7.3	--	--
11/9/2022	Detection	0.027 J1	45.4	6.85	0.33	6.9	33.4	380

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.
L1: The associated laboratory control sample (LCS) or laboratory control sample duplicate (LCSD) recovery was outside acceptance limits.

Table 1 - Groundwater Data Summary: MW-38
Mountaineer - LF
Appendix IV Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
9/27/2016	Background	0.09	9.82	221	0.023	0.03	1.0	2.72	2.229	0.32	0.442	0.002	< 0.002 U1	2.76	0.2	0.103
11/2/2016	Background	0.07	8.15	179	< 0.005 U1	0.02 J1	0.4	0.855	1.744	0.32	0.113	0.0009 J1	< 0.002 U1	2.10	0.04 J1	0.04 J1
12/21/2016	Background	0.05	6.62	162	< 0.005 U1	0.02	1.67	0.655	2.06	0.35	0.082	< 0.0002 U1	< 0.002 U1	2.50	0.06 J1	0.082
2/22/2017	Background	0.03 J1	5.74	141	< 0.005 U1	0.02	0.526	0.949	1.00	0.29	0.039	0.004	< 0.002 U1	3.37	0.03 J1	0.04 J1
3/28/2017	Background	0.05 J1	11.5	184	< 0.005 U1	0.03	0.197	0.916	0.548	0.32	0.073	0.006	< 0.002 U1	2.47	0.06 J1	0.05 J1
4/18/2017	Background	0.04 J1	6.34	179	< 0.004 U1	0.03	0.111	2.87	0.494	0.33	0.02 J1	0.003	< 0.002 U1	2.30	< 0.03 U1	0.068
5/16/2017	Background	0.06	5.09	186	< 0.004 U1	0.03	0.093	3.66	0.536	0.33	0.01 J1	0.004	< 0.002 U1	3.76	< 0.03 U1	0.062
6/13/2017	Background	0.06	8.09	187	< 0.004 U1	0.03	0.130	2.53	1.268	0.28	0.056	0.013	< 0.002 U1	2.67	0.04 J1	0.056

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-39
Mountaineer - LF
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
9/26/2016	Background	0.143	12.4	3.00	0.77	8.4	< 0.04 U1	350
11/2/2016	Background	0.134	7.88	3.05	0.83	8.4	< 0.04 U1	344
12/21/2016	Background	0.122	10.5	3.07	0.86	8.8	< 0.04 U1	450
2/22/2017	Background	0.134	7.65	2.98	0.80	8.4	< 0.04 U1	374
3/28/2017	Background	0.202	5.95	2.95	0.78	8.4	0.1 J1	310
4/18/2017	Background	0.156	6.48	2.91	0.78	8.3	< 0.04 U1	344
5/16/2017	Background	0.139	6.74	2.98	0.79	9.5	1.5	367
6/14/2017	Background	0.179	6.15	2.92	0.78	8.5	0.1	340
10/31/2017	Detection	0.171	7.25	3.05	0.78	8.3	0.2	385
9/20/2018	Detection	0.182	6.43	2.99	0.80	8.5	0.1 J1	369
11/26/2018	Detection	0.167	6.33	2.93	0.80	8.3	0.07 J1	380
4/9/2019	Detection	0.158	6.65	2.94	0.77	8.3	< 0.06 U1	376
9/9/2019	Detection	0.144	6.78	3.07	0.84	8.1	< 0.06 U1	369
5/15/2020	Detection	0.148	6.15	3.11	0.84	7.9	0.2 J1	374
7/8/2020	Detection	--	--	--	--	8.4	--	--
10/8/2020	Detection	0.133	6.11	2.98	0.89	7.9	< 0.06 U1	404
1/4/2021	Detection	--	--	--	--	8.4	--	--
5/13/2021	Detection	0.148	5.65	3.08	0.85	8.2	0.1 J1	375
10/29/2021	Detection	0.150	6.10	3.01	0.85	8.1	< 0.06 U1	380
5/23/2022	Detection	0.140	6.46	3.02	0.86	8.6	0.18 J1	370 L1
11/9/2022	Detection	0.144	7.60	2.92	0.78	8.2	< 0.06 U1	370

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.
L1: The associated laboratory control sample (LCS) or laboratory control sample duplicate (LCSD) recovery was outside acceptance limits.

Table 1 - Groundwater Data Summary: MW-39
Mountaineer - LF
Appendix IV Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
9/26/2016	Background	0.06	4.80	264	0.095	0.01 J1	2.2	1.43	1.142	0.77	2.21	0.016	< 0.002 U1	8.51	0.3	0.04 J1
11/2/2016	Background	0.04 J1	3.89	276	0.068	< 0.004 U1	3.2	0.615	1.941	0.83	0.532	0.011	< 0.002 U1	9.54	0.09 J1	0.03 J1
12/21/2016	Background	0.08	3.95	296	0.202	0.006 J1	6.32	2.34	1.311	0.86	1.79	0.008	< 0.002 U1	8.03	0.6	0.070
2/22/2017	Background	0.03 J1	3.91	243	0.041	0.01 J1	1.41	0.539	1.162	0.80	0.467	0.012	0.002 J1	9.23	0.1	0.03 J1
3/28/2017	Background	0.02 J1	3.58	241	0.01 J1	< 0.004 U1	0.560	0.206	0.793	0.78	0.176	0.015	< 0.002 U1	8.50	0.06 J1	0.02 J1
4/18/2017	Background	0.01 J1	3.70	244	0.007 J1	< 0.005 U1	0.243	0.188	0.1602	0.78	0.113	0.009	< 0.002 U1	8.65	0.04 J1	< 0.01 U1
5/16/2017	Background	0.01 J1	3.88	244	0.004 J1	0.02	0.221	0.174	0.611	0.79	0.073	0.017	< 0.002 U1	9.39	0.04 J1	< 0.01 U1
6/14/2017	Background	0.02 J1	3.76	247	0.008 J1	< 0.005 U1	0.203	0.209	0.47	0.78	0.092	0.028	< 0.002 U1	9.06	0.06 J1	< 0.01 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-1611
Mountaineer - LF
Appendix III Constituents

Geosyntec Consultants, Inc.

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
9/26/2016	Background	0.136	25.0	8.72	0.56	7.8	17.3	382
11/2/2016	Background	0.140	22.8	9.36	0.61	7.8	22.7	388
12/20/2016	Background	0.124	22.2	9.39	0.64	7.7	21.8	380
2/22/2017	Background	0.175	22.5	9.10	0.57	7.7	18.0	381
3/28/2017	Background	0.210	22.3	8.04	0.50	7.8	15.7	326
4/18/2017	Background	0.155	22.8	8.59	0.56	7.7	17.7	388
5/16/2017	Background	0.190	23.1	9.14	0.60	8.3	18.7	392
6/12/2017	Background	0.158	22.4	9.29	0.57	7.2	19.4	384
10/31/2017	Detection	0.152	24.0	9.80	0.61	7.8	18.9	402
1/22/2018	Detection	--	22.6	--	--	7.5	--	376
9/20/2018	Detection	0.258	23.2	9.48	0.61	7.8	19.0	416
11/26/2018	Detection	0.147	21.9	9.57	0.62	7.7	18.5	387
4/9/2019	Detection	0.139	26.2	7.96	0.46	7.6	20.7	431
6/18/2019	Detection	--	22.8	9.58	--	7.9	--	--
7/10/2019	Detection	--	--	--	--	7.6	--	402
9/9/2019	Detection	0.136	26.1	10.1	0.62	7.7	17.3	402
5/15/2020	Detection	0.135	24.0	9.35	0.61	7.3	20.8	404
10/8/2020	Detection	0.124	24.8	9.44	0.64	7.3	22.2	451
1/4/2021	Detection	--	--	--	--	7.7	--	407
5/13/2021	Detection	0.132	23.5	10.1	0.64	7.7	19.2	405
10/26/2021	Detection	0.125	24.6	9.91	0.63	7.5	20.8	400
5/20/2022	Detection	0.133	25.1	10.7	0.63	7.7	21.1	410 L1
7/25/2022	Detection	--	--	9.48	--	8.1	--	--
11/9/2022	Detection	0.134	26.1	9.89	0.58	7.6	20.8	420

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.
L1: The associated laboratory control sample (LCS) or laboratory control sample duplicate (LCSD) recovery was outside acceptance limits.

Table 1 - Groundwater Data Summary: MW-1611
Mountaineer - LF
Appendix IV Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
9/26/2016	Background	0.03 J1	1.01	165	0.046	0.02	1.4	0.370	1.258	0.56	0.482	0.004	< 0.002 U1	6.97	0.07 J1	0.088
11/2/2016	Background	0.03 J1	0.97	156	0.030	0.01 J1	0.9	0.245	2.888	0.61	0.310	0.004	< 0.002 U1	5.83	0.06 J1	0.03 J1
12/20/2016	Background	< 0.01 U1	0.74	140	< 0.005 U1	< 0.004 U1	2.10	0.092	0.772	0.64	0.023	0.002	< 0.002 U1	5.46	< 0.03 U1	< 0.01 U1
2/22/2017	Background	< 0.01 U1	0.75	135	0.007 J1	0.006 J1	0.209	0.096	0.5828	0.57	0.055	0.007	0.002 J1	5.36	0.04 J1	0.208
3/28/2017	Background	0.01 J1	0.60	166	0.01 J1	0.005 J1	0.426	0.108	0.645	0.50	0.195	0.011	< 0.002 U1	7.26	0.07 J1	0.02 J1
4/18/2017	Background	0.01 J1	0.69	155	0.01 J1	0.006 J1	0.337	0.104	0.487	0.56	0.133	0.003	< 0.002 U1	6.01	< 0.03 U1	< 0.01 U1
5/16/2017	Background	0.03 J1	0.75	145	0.008 J1	< 0.005 U1	0.661	0.101	2.534	0.60	0.119	0.006	< 0.002 U1	5.49	0.04 J1	0.02 J1
6/12/2017	Background	0.03 J1	0.76	148	0.007 J1	< 0.005 U1	0.138	0.092	0.508	0.57	0.058	0.018	< 0.002 U1	5.39	0.03 J1	< 0.01 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-1612
Mountaineer - LF
Appendix III Constituents

Geosyntec Consultants, Inc.

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
10/26/2016	Background	0.637	9.47	38.1	3.02	8.3	272	--
11/2/2016	Background	0.629	8.48	33.4	3.23	8.3	238	850
12/21/2016	Background	0.501	8.96	36.1	3.33	8.1	271	966
2/22/2017	Background	0.473	7.90	35.6	2.95	8.4	288	1,090
3/29/2017	Background	0.673	7.10	23.7	3.50	8.7	190	1,240
4/19/2017	Background	0.589	8.61	22.4	3.26	8.4	226	1,040
5/16/2017	Background	0.565	12.5	27.8	2.88	8.8	346	1,150
6/13/2017	Background	0.532	8.09	27.4	2.98	8.2	334	1,130
10/31/2017	Detection	0.457	7.22	20.2	3.53	8.2	147	914
9/20/2018	Detection	0.543	4.50	14.6	3.78	8.4	63.9	835
11/26/2018	Detection	0.413	4.25	11.5	3.91	8.0	49.2	764
4/9/2019	Detection	0.449	3.21	10.2	4.02	8.3	54.8	725
9/10/2019	Detection	0.438	4.77	11.1	4.34	8.3	31.3	786
5/18/2020	Detection	0.388	4.18	6.75	4.39	8.2	40.5	637
10/7/2020	Detection	0.351	3.43	6.36	3.92	8.3	40.0	662
5/14/2021	Detection	0.351	4.78	6.72	4.15	8.4	36.4	688
10/26/2021	Detection	0.367	3.4	6.24	4.31	8.4	38.0	630
5/19/2022	Detection	0.394	4.40	9.29	4.17	8.6	91.5	740 L1
11/9/2022	Detection	0.407	4.94	8.81	4.09	8.4	107	780

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.
L1: The associated laboratory control sample (LCS) or laboratory control sample duplicate (LCSD) recovery was outside acceptance limits.

Table 1 - Groundwater Data Summary: MW-1612
Mountaineer - LF
Appendix IV Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
10/26/2016	Background	0.31	12.4	66.2	0.033	0.007 J1	1.63	0.367	2.765	3.02	0.391	0.018	< 0.002 U1	62.1	0.2	0.03 J1
11/2/2016	Background	0.35	16.8	80.4	0.009 J1	< 0.004 U1	0.6	0.197	0.973	3.23	0.168	0.014	0.002 J1	67.6	0.08 J1	0.087
12/21/2016	Background	0.13	14.9	62.1	0.007 J1	< 0.004 U1	0.913	0.111	0.947	3.33	0.121	0.011	0.002 J1	52.2	0.1	< 0.01 U1
2/22/2017	Background	0.31	14.4	72.4	0.058	< 0.004 U1	2.13	0.700	1.084	2.95	0.640	0.018	0.003 J1	38.5	0.1	0.04 J1
3/29/2017	Background	0.77	12.4	141	0.290	0.01 J1	3.19	2.60	0.86	3.50	1.37	0.020	0.014	45.9	0.5	0.03 J1
4/19/2017	Background	0.82	10.7	233	0.551	< 0.05 U1	15.5	3.94	0.425	3.26	4.10	0.019	0.004 J1	58.0	1.2	0.2 J1
5/16/2017	Background	0.15	10.4	77.1	0.02 J1	< 0.005 U1	0.445	0.231	2.744	2.88	0.210	0.022	< 0.002 U1	43.1	0.1	0.02 J1
6/13/2017	Background	0.15	10.7	59.6	0.006 J1	< 0.005 U1	0.227	0.101	0.824	2.98	0.023	0.028	< 0.002 U1	34.3	0.06 J1	< 0.01 U1

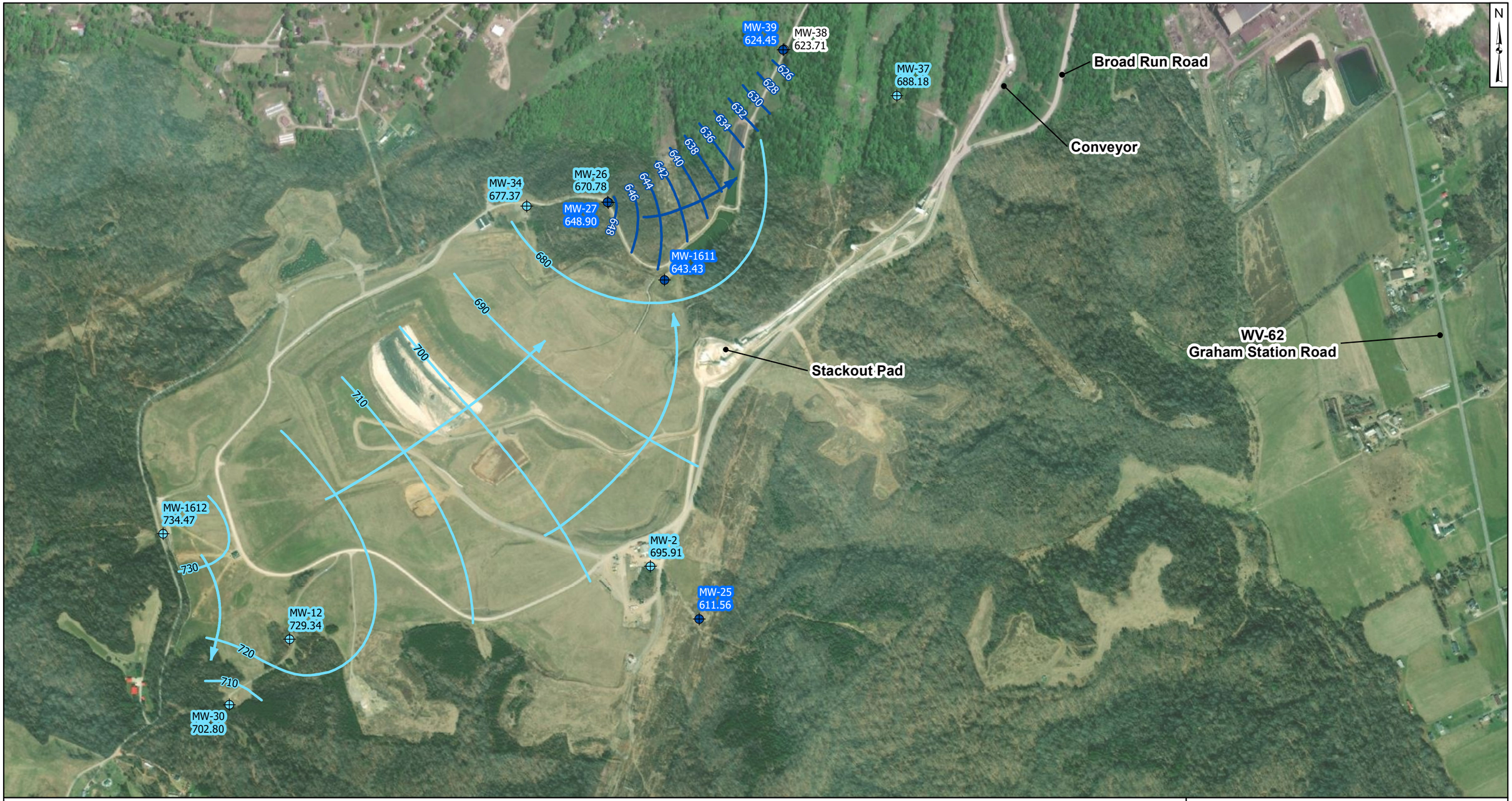
Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag. In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical 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: Residence Time Calculation Summary
Mountaineer Landfill

Geosyntec Consultants, Inc.

			2022-01[3]		2022-05		2022-07[3]		2022-11	
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)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)
Landfill	MW-26 [2]	2.0	1.6	36.6	1.7	36.6	1.9	31.8	1.4	42.7
	MW-27 [2]	2.0	18.9	3.2	18.9	3.2	NC	NC	19.0	3.2
	MW-30 [1]	2.0	NC	NC	5.1	11.9	NC	NC	4.7	13.0
	MW-38 [2]	2.0	NC	NC	NC	NC	NC	NC	NC	NC
	MW-39 [2]	2.0	NC	NC	17.6	3.5	NC	NC	16.8	3.6
	MW-1611 [2]	2.0	NC	NC	9.4	6.5	10.1	6.0	10.1	6.0
	MW-1612 [1]	2.0	NC	NC	15.8	3.9	NC	NC	16.8	3.6

Notes:
[1] - Background Well
[2] - Downgradient Well
[3] - Two-of-two verification sampling
NC - Not Calculated.
Groundwater residence time for MW-38 could not be calculated, as it is the only monitoring well for its lithologic unit (valley alluvium) within the monitoring network.



Legend

Monitoring Wells

- Alluvium
- Hydrologic Unit 3
- Hydrologic Unit 4

Groundwater Elevation Contours

- Hydrologic Unit 3
- Approximate Groundwater Flow Direction (Unit 3)
- Hydrologic Unit 4
- Approximate Groundwater Flow Direction (Unit 4)

Notes

- Monitoring well coordinates and water level data (collected on May 19, 2022) provided by AEP.
- Site features based on information available in Little Broad Run Landfill-CCR Groundwater Monitoring Well Network Evaluation (Arcadis, 2016) provided by AEP.
- Water level measurements from MW-25 (screened in shale below Unit 4) and MW-38 (screened in alluvium) were not used in ground water contouring.
- Groundwater elevation units are feet above mean sea level.

750 375 0 750 Feet

Potentiometric Surface Map - Uppermost Aquifer
May 2022

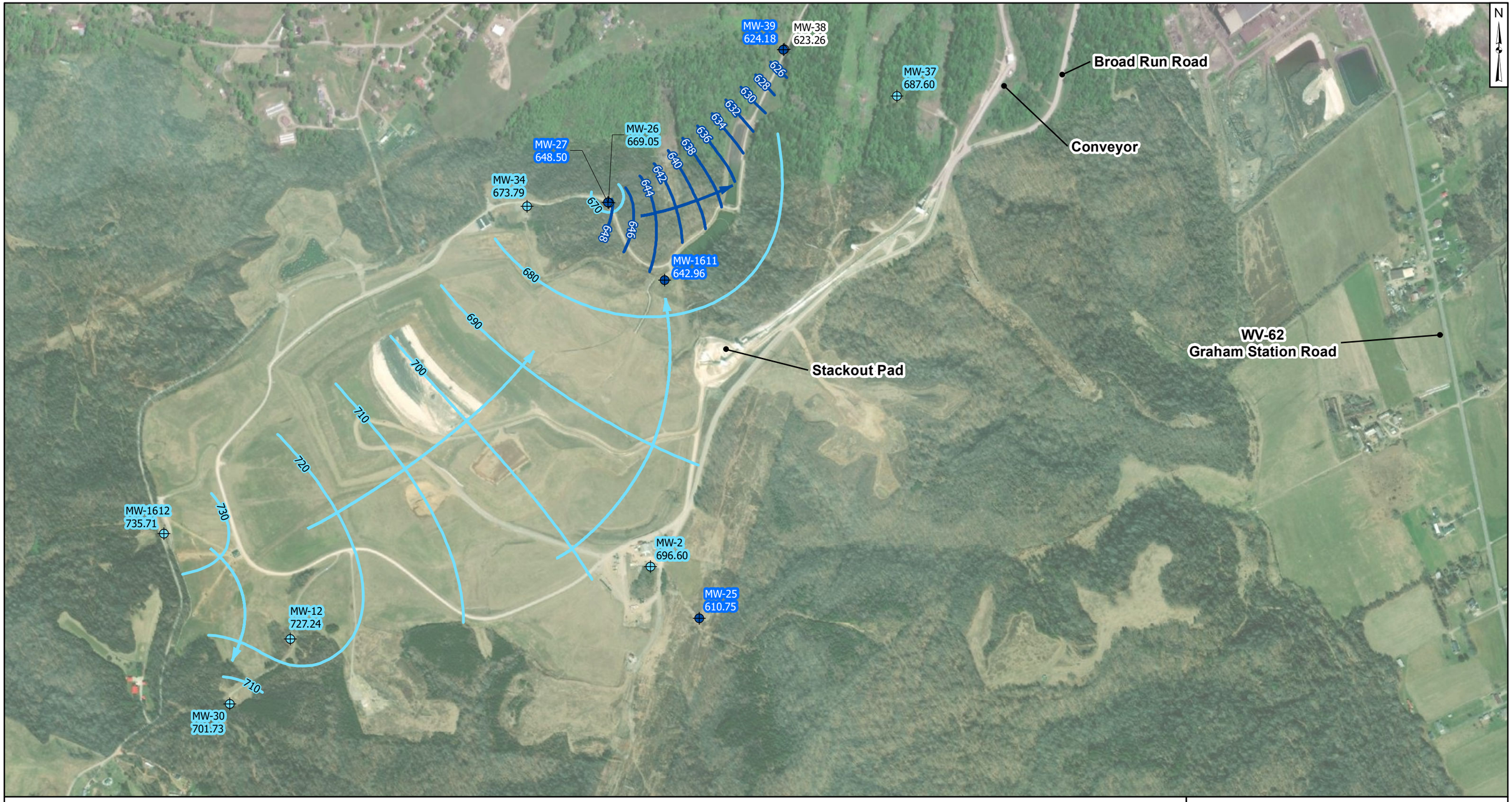
AEP Mountaineer Generating Plant - CCR Landfill
New Haven, West Virginia

Geosyntec consultants

Columbus, Ohio | 2022/07/28

Figure **2**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Mountaineer\2022\AEP-Mountaineer_LF_GW_2022-05.mxd. ASoltero. 7/28/2022. CHA8423/07/08.



Legend

Monitoring Wells
- Alluvium
- Hydrologic Unit 3
- Hydrologic Unit 4

Groundwater Elevation Contours
- Hydrologic Unit 3
- Approximate Groundwater Flow Direction (Unit 3)
- Hydrologic Unit 4
- Approximate Groundwater Flow Direction (Unit 4)

Notes
- Monitoring well coordinates and water level data (collected on November 8, 2022) provided by AEP.
- Site features based on information available in Little Broad Run Landfill-CCR Groundwater Monitoring Well Network Evaluation (Arcadis, 2016) provided by AEP.
- Water level measurements from MW-25 (screened in shale below Unit 4) and MW-38 (screened in alluvium) were not used in ground water contouring.
- Groundwater elevation units are feet above mean sea level.

750 375 0 750
Feet

Potentiometric Surface Map - Uppermost Aquifer November 2022

AEP Mountaineer Generating Plant - CCR Landfill
New Haven, West Virginia

Geosyntec consultants

Columbus, Ohio | 2022/12/07

Figure **3**

W:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Mountaineer\2022\AEP-Mountaineer_LF_GW_2022-11.mxd. ASoltero. 12/7/2022. CHA8423/07/08.

APPENDIX 2 - Statistical Analyses

The statistical analyses completed in 2022 follow.

Geosyntec consultants

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Memorandum

Date:	June 2, 2022
To:	David Miller (AEP)
Copies to:	Benjamin Kepchar (AEP)
From:	Allison Kreinberg (Geosyntec)
Subject:	Evaluation of Detection Monitoring Data at Mountaineer Plant's Landfill (LF)

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 Subpart D, "CCR rule"), the second semi-annual detection monitoring event of 2021 at the Landfill (LF), an existing CCR unit at the Mountaineer Power Plant located in New Haven, West Virginia, was completed from October 26, 2021 to November 3, 2021. Based on the results, verification sampling was completed on March 4, 2022.

Background values for the LF were established in January 2018. After a minimum of four detection monitoring events, the results of those events were compared to the existing background dataset, and the background dataset was updated as appropriate. Revised upper prediction limits (UPLs) were calculated for each Appendix III parameter to represent background values. Lower prediction limits (LPLs) were also calculated for pH. Details on the calculation of these revised background values are described in Geosyntec's *Statistical Analysis Summary* report, dated January 6, 2020.

To achieve an acceptably high statistical power while maintaining a site-wide false-positive rate (SWFPR) of 10% per year or less, prediction limits were calculated based on a one-of-two retesting procedure. With this procedure, a statistically significant increase (SSI) is only concluded if both samples in a series of two exceeds the UPL or, in the case of pH, are below the LPL. In practice, if the initial result did not exceed the UPL and, in the case of pH, is above the LPL, a second sample was not collected or analyzed.

Detection monitoring results and the relevant background values are compared in Table 1. No SSIs were observed at the Mountaineer LF CCR unit, and as a result the Mountaineer LF will remain in detection monitoring.

The statistical analysis was conducted within 90 days of completion of sampling and analysis in accordance with 40 CFR 257.93(h)(2). A certification of these statistics by a qualified professional engineer is provided in Attachment A.

Table 1: Detection Monitoring Data Comparison
Mountaineer - Landfill

Geosyntec Consultants, Inc.

Analyte	Unit	Description	MW-26		MW-27		MW-38	MW-39	MW-1611
			11/3/2021	3/4/2022	11/3/2021	3/4/2022	10/29/2021	10/29/2021	10/26/2021
Boron	mg/L	Intrawell Background Value (UPL)	0.254		0.395		0.104	0.213	0.254
		Analytical Result	0.091	--	0.280	--	0.028	0.150	0.125
Calcium	mg/L	Intrawell Background Value (UPL)	64.9		1.89		58.6	12.4	26.2
		Analytical Result	57.5	--	1.1	--	44.6	6.1	24.6
Chloride	mg/L	Intrawell Background Value (UPL)	7.27		1.90		7.69	3.11	10.4
		Analytical Result	5.50	--	1.60	--	7.26	3.01	9.91
Fluoride	mg/L	Interwell Background Value (UPL)	3.91		3.91		3.91	3.91	3.91
		Analytical Result	0.14	--	2.54	--	0.37	0.85	0.63
pH	SU	Intrawell Background Value (UPL)	8.0		9.5		7.6	8.8	8.1
		Intrawell Background Value (LPL)	7.2		8.8		6.6	8.1	7.3
		Analytical Result	**7.1**	7.5	**8.4**	9.3	6.9	8.1	7.5
Sulfate	mg/L	Intrawell Background Value (UPL)	11.5		7.79		38.5	0.200	23.5
		Analytical Result	5.20	--	1.53	--	28.7	0.06	20.8
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	402		606		469	445	441
		Analytical Result	340	--	560	--	430	380	400

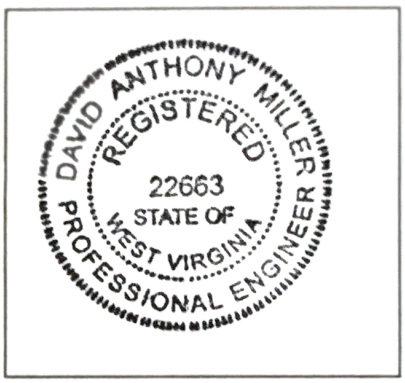
Notes:
UPL: Upper prediction limit
LPL: Lower prediction limit
Bold values exceed the background value.
Background values are shaded gray.

ATTACHMENT A

Certification by a Qualified Professional Engineer

CERTIFICATION BY QUALIFIED PROFESSIONAL ENGINEER

I certify that the selected statistical method, described above and in the January 6, 2020 *Statistical Analysis Summary* report, is appropriate for evaluating the groundwater monitoring data for the Mountaineer LF 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	06.02.22
License Number	Licensing State	Date

Geosyntec consultants

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Memorandum

Date:	August 26, 2022
To:	David Miller (AEP)
Copies to:	Benjamin Kepchar (AEP)
From:	Allison Kreinberg (Geosyntec)
Subject:	Evaluation of Detection Monitoring Data at Mountaineer Plant's Landfill (LF)

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 Subpart D, "CCR rule"), the first semi-annual detection monitoring event of 2022 at the Landfill (LF), an existing CCR unit at the Mountaineer Power Plant located in New Haven, West Virginia, was completed on May 20-23, 2022. Based on the results, verification sampling was completed on July 25, 2022.

Background values for the LF were established in January 2018. After a minimum of four detection monitoring events, the results of those events were compared to the existing background dataset, and the background dataset was updated as appropriate. Revised upper prediction limits (UPLs) were calculated for each Appendix III parameter to represent background values. Lower prediction limits (LPLs) were also calculated for pH. Details on the calculation of these revised background values are described in Geosyntec's *Statistical Analysis Summary – Background Update Calculations* report, dated August 26, 2022.

To achieve an acceptably high statistical power while maintaining a site-wide false-positive rate (SWFPR) of 10% per year or less, prediction limits were calculated based on a one-of-two retesting procedure. With this procedure, a statistically significant increase (SSI) is only concluded if both samples in a series of two exceeds the UPL or, in the case of pH, are below the LPL. In practice, if the initial result did not exceed the UPL and, in the case of pH, is above the LPL, a second sample was not collected or analyzed.

Detection monitoring results and the relevant background values are compared in Table 1. No SSIs were observed at the Mountaineer LF CCR unit, and as a result the Mountaineer LF will remain in detection monitoring.

The statistical analysis was conducted within 90 days of completion of sampling and analysis in accordance with 40 CFR 257.93(h)(2). A certification of these statistics by a qualified professional engineer is provided in Attachment A.

Table 1: Detection Monitoring Data Comparison
Mountaineer - Landfill

Geosyntec Consultants, Inc.

Analyte	Unit	Description	MW-26		MW-27	MW-38		MW-39	MW-1611	
			5/23/2022	7/25/2022	5/23/2022	5/20/2022	7/25/2022	5/23/2022	5/20/2022	7/25/2022
Boron	mg/L	Intrawell Background Value (UPL)	0.233		0.376	0.0935		0.198	0.233	
		Analytical Result	0.099	--	0.288	0.029	--	0.140	0.133	--
Calcium	mg/L	Intrawell Background Value (UPL)	64.7		1.77	57.6		12.4	26.2	
		Analytical Result	**64.8**	61.8	1.70	**58.8**	53.3	6.46	25.1	--
Chloride	mg/L	Intrawell Background Value (UPL)	7.09		1.85	7.76		3.13	10.6	
		Analytical Result	5.97	--	1.57	7.51	--	3.02	**10.7**	9.48
Fluoride	mg/L	Interwell Background Value (UPL)	4.33							
		Analytical Result	0.13	--	2.58	0.39	--	0.86	0.63	--
pH	SU	Intrawell Background Value (UPL)	7.8		9.5	7.6		8.8	8.0	
		Intrawell Background Value (LPL)	7.0		8.6	6.5		7.8	7.2	
		Analytical Result	7.5	--	9.3	7.2	--	8.6	7.7	--
Sulfate	mg/L	Intrawell Background Value (UPL)	10.8		7.48	37.9		0.200	23.4	
		Analytical Result	7.90	--	2.78	26.7	--	0.18	21.1	--
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	399		618	464		434	446	
		Analytical Result	370	--	550	440	--	370	410	--

Notes:
UPL: Upper prediction limit
LPL: Lower prediction limit
Bold values exceed the background value.
Background values are shaded gray.
--: Not sampled

ATTACHMENT A

Certification by a Qualified Professional Engineer

CERTIFICATION BY QUALIFIED PROFESSIONAL ENGINEER

I certify that the selected statistical method, described above and in the August 26, 2022 *Statistical Analysis Summary* report, is appropriate for evaluating the groundwater monitoring data for the Mountaineer LF 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	10.26.22
License Number	Licensing State	Date

STATISTICAL ANALYSIS SUMMARY- Background Update Calculations Landfill – Mountaineer Plant New Haven, West Virginia

Submitted to

AMERICAN ELECTRIC POWER

1 Riverside Plaza
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Submitted by

Geosyntec consultants

engineers | scientists | innovators

500 West Wilson Bridge Road
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Worthington, Ohio 43085

August 26, 2022
CHA8500B

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LIST OF ACRONYMS AND ABBREVIATIONS

ASD	Alternative Source Demonstration
CCR	Coal Combustion Residuals
CCV	Continuing Calibration Value
CFR	Code of Federal Regulations
LF	Landfill
LFB	Laboratory Fortified Blanks
LPL	Lower Prediction Limit
LRB	Laboratory Reagent Blanks
NELAP	National Environmental Laboratory Accreditation Program
PQL	Practical Quantitation Limit
QA	Quality Assurance
QC	Quality Control
SSI	Statistically Significant Increase
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 Landfill (LF), an existing CCR unit at the Mountaineer Power Plant located in New Haven, West Virginia. Recent groundwater monitoring results were incorporated into the LF background dataset as appropriate and the site-specific background values were re-established for use in future detection monitoring events.

Eight monitoring events were completed prior to October 2017 to establish background concentrations for Appendix III and Appendix IV parameters under the CCR rule. Prediction limits for Appendix III parameters were previously updated in January 2020 using data through July 2019 (Geosyntec, 2020a). Since the last background update, five semiannual detection monitoring events were conducted between September 2019 and March 2022. Data from these five events, including both initial and verification results, were evaluated for inclusion in the background dataset. Groundwater data underwent several validation tests, including those for completeness, sample tracking accuracy, transcription errors, and consistent use of measurement units. Two samples from the March 2020 groundwater sampling event were removed from the dataset due to potential data quality issues.

The detection monitoring data were submitted to Groundwater Stats Consulting, LLC for statistical analysis. The compliance data were reviewed for outliers, which were removed (when appropriate) prior to updating upper prediction limits (UPLs) for each Appendix III parameter to represent background values. Certification of the selected statistical methods by a qualified professional engineer is documented in Attachment A.

SECTION 2

LANDFILL EVALUATION

2.1 Previous Background Calculations

Eight background monitoring events were completed from September 2016 through June 2017 to establish background concentrations for Appendix III and Appendix IV parameters under the CCR rule. The data were reviewed for outliers and trends prior to calculating UPLs for each Appendix III parameter. Lower prediction limits (LPLs) were also established for pH. Initial statistical analyses recommended a one-of-two resampling plan with intrawell prediction limits for boron, chloride, sulfate, and total dissolved solids (TDS) and interwell prediction limits for calcium, fluoride, and pH. The statistical analyses to establish background levels were previously documented in the January 2018 *Statistical Analysis Summary* report (Geosyntec, 2018). Tests for calcium and pH were revised to intrawell prediction limits based on an alternative source demonstration (ASD) certified on March 1, 2019 (Geosyntec, 2019).

As recommended in the USEPA *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance* (Unified Guidance), background values should be updated every four to eight measurements assuming no confirmed statistically significant increase (SSI) was identified (USEPA, 2009). Prediction limits for Appendix III parameters were previously updated in January 2020 using data through July 2019 (Geosyntec, 2020a).

2.2 Data Validation & QA/QC

Five semiannual detection monitoring events, which were completed between September 2019 and March 2022, have been conducted at the LF since the previous background update (which used data through July 2019). If the initial results for each detection monitoring event identified possible exceedances, verification sampling was completed on an individual well/parameter basis. A review of the time series graphs for concentrations of several constituents at monitoring wells MW-26 and MW-27 found anomalous results for the May 2020 sampling event, suggesting the potential for sample switching (Figure 1). These results were excuded from statistical analysis due this potential for sample switching. Thus, a minimum of four samples have been collected from each compliance well and were included for statistical evaluation since the previous background update. A summary of data collected during these detection monitoring events is provided 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.9.6.35 statistics software. The export was checked against the analytical data for transcription errors and completeness.

2.3 Statistical Analysis

The detection monitoring data used to conduct the statistical analyses described below are summarized in Table 1. Statistical analyses for the LF were conducted in accordance with the October 2020 *Statistical Analysis Plan* (Geosyntec, 2020b). The complete statistical analysis results are included in Attachment B.

Time series plots of Appendix III parameters are included in Attachment B and were used to evaluate concentrations over time and to provide an initial screening of suspected outliers and trends. Box plots were also compiled to provide visual representation of variations between wells and within individual wells (Attachment B).

2.3.1 Background Outlier Evaluation

Potential outliers were evaluated using Tukey's outlier test; i.e., data points were considered potential outliers if they met one of the following criteria:

$$x_i < \tilde{x}_{0.25} - 3 \times IQR \quad (1)$$

or

$$x_i > \tilde{x}_{0.75} + 3 \times IQR \quad (2)$$

where:

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

Data collected during the detection monitoring period that were evaluated as potential outliers are summarized in Attachment B. Tukey's outlier test indicated one potential outlier for the November 2021 pH result at downgradient well MW-27, which was excluded from the dataset to construct limits that are conservative from a regulatory perspective. Flagged data and outliers will be reevaluated as new data are collected.

2.3.2 Establishment of Updated Background Dataset

Intrawell tests compare compliance data from a single well to background data within the same well and are most appropriate when 1) upgradient wells exhibit spatial variation; 2) when statistical limits constructed from upgradient wells would not be conservative from a regulatory perspective; or 3) when downgradient water quality is not impacted compared to upgradient water quality for the same parameter. Periodic updating of background statistical limits is necessary as natural systems continuously change due to physical changes to the environment. For intrawell analyses, data for all wells and constituents are re-evaluated when a minimum of four new data points are available. These four (or more) new data points are used to determine if earlier concentrations are representative of present-day groundwater quality.

Mann-Whitney (Wilcoxon rank-sum) tests were used to compare the medians of historical data (September 2016 – July 2019) to the new compliance samples (September 2019 – March 2022). 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 Attachment B. Statistically significant differences were found between the two groups for the following upgradient well/parameter pairs:

- A decrease was found for boron at MW-1612;
- A decrease was found for chloride at MW-1612;
- A decrease was found for sulfate at MW-1612; and,
- A decrease was found for TDS at MW-1612.

The background datasets for all upgradient wells were updated to include all available data through March 2022 because the most recent compliance data were similar to historic values reported, and these data represent naturally occurring groundwater quality not impacted by a release.

Statistically significant differences were found between the two groups for the following downgradient well/parameter pairs:

- A decrease was found for boron at MW-1611;

- A decrease was found for calcium at MW-27;
- A decrease was found for pH at MW-30; and,
- A decrease was found for sulfate at MW-27.

The background datasets for all downgradient wells were updated to include all available data through March 2022 because the most recent compliance data were similar to historic values reported, and these data represent naturally occurring groundwater quality not impacted by a release.

2.3.3 Updated Prediction Limits

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 boron, calcium, chloride, pH, sulfate, and TDS using all the historical data through March 2022 to represent background values. Intrawell LPLs were also generated for pH. The interwell UPL for fluoride was updated using all the historical data through March 2022 to represent background values. The updated prediction limits are summarized in Table 2.

Both the interwell fluoride UPL and the intrawell UPLs and LPLs 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 and the pH result was greater than or equal to the LPL, then it can be concluded that an SSI has not occurred. In practice, where the initial result did not exceed the UPL and the pH result was greater than or equal to the LPL, a second sample will not be collected. The retesting procedures allow achieving an acceptably high statistical power to detect changes at downgradient wells for constituents evaluated using intrawell prediction limits.

2.4 Conclusions

Five detection monitoring events were completed in accordance with the CCR Rule. The laboratory and field data from these events were reviewed prior to statistical analysis, with the May 2020 samples for MW-26 and MW-27 removed from the dataset due to potential data quality issues. Mann-Whitney tests were completed to evaluate whether data from the detection

monitoring events could be added to the existing background dataset. Where appropriate, the background datasets were updated, and UPLs and LPLs were recalculated. Intrawell tests using a one-of-two retesting procedure were selected and updated for Appendix III parameters boron, calcium, chloride, pH, sulfate, and TDS. For fluoride, an interwell test using a one-of-two retesting procedure was selected and updated with the most current data.

SECTION 3

REFERENCES

Geosyntec Consultants (Geosyntec), 2018. Statistical Analysis Summary. Landfill – Mountaineer Plant. January 2018.

Geosyntec, 2019. Alternative Source Demonstration – Federal CCR Rule. Mountaineer Plant Landfill. March 2019.

Geosyntec, 2020a. Statistical Analysis Summary. Landfill – Mountaineer Plant. January 2020.

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United States Environmental Protection Agency (USEPA), 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance. EPA 530/R-09-007. March.

TABLES

Table 1: Groundwater Data Summary
Mountaineer - Landfill

Geosyntec Consultants, Inc.

Parameter	Unit	MW-26								MW-27							
		9/9/2019	5/15/2020*	7/8/2020	10/8/2020	1/4/2021	5/13/2021	11/3/2021	3/4/2022	9/10/2019	5/15/2020*	7/8/2020	10/8/2020	1/4/2021	5/13/2021	11/3/2021	3/4/2022
		2019-D2	2020-D1*	2020-D1-R1	2020-D2	2020-D2-R1	2021-D1	2021-D2	2021-D2-R1	2019-D2	2020-D1*	2020-D1-R1	2020-D2	2020-D2-R1	2021-D1	2021-D2	2021-D2-R1
Boron	mg/L	0.099	0.100	-	0.103	-	0.110	0.091	-	0.285	0.100	-	0.273	-	0.288	0.280	-
Calcium	mg/L	60.2	55.6	-	51.2	-	60.2	57.5	-	1.13	54.5	1.20	1.20	-	1.07	1.1	-
Chloride	mg/L	5.80	1.72	-	5.74	-	6.56	5.50	-	1.67	6.06	1.63	1.67	-	1.71	1.60	-
Fluoride	mg/L	0.14	2.56	-	0.16	-	0.15	0.14	-	2.71	0.14	-	2.38	-	2.54	2.54	-
Sulfate	mg/L	5.7	3.9	-	6.4	-	8.5	5.20	-	3.0	7.0	-	3.4	-	3.1	1.53	-
Total Dissolved Solids	mg/L	353	547	366	344	-	378	340	-	530	359	-	541	-	541	560	-
pH	SU	7.4	7.1	7.4	6.9	7.5	7.2	7.1	7.5	9.1	6.1	9.1	8.7	9.0	8.9	8.4	9.3

Parameter	Unit	MW-30					MW-38						MW-39						
		9/10/2019	5/18/2020	10/8/2020	5/14/2021	10/28/2021	9/9/2019	10/22/2019	5/15/2020	10/8/2020	5/13/2021	10/29/2021	9/9/2019	5/15/2020	7/8/2020	10/8/2020	1/4/2021	5/13/2021	10/29/2021
		2019-D2	2020-D1	2020-D2	2021-D1	2021-D2	2019-D2	2019-D2-R1	2020-D1	2020-D2	2021-D1	2021-D2	2019-D2	2020-D1	2020-D1-R1	2020-D2	2020-D2-R1	2021-D1	2021-D2
Boron	mg/L	0.259	0.271	0.249	0.259	0.261	0.03 J	-	0.02 J	0.03 J	0.03 J	0.028 J	0.144	0.148	-	0.133	-	0.148	0.150
Calcium	mg/L	3.39	2.95	2.93	2.63	2.8	49.9	-	48.3	53.4	50.9	44.6	6.78	6.15	-	6.11	-	5.65	6.1
Chloride	mg/L	249	264	247	259	253	7.45	-	7.59	7.68	7.51	7.26	3.07	3.11	-	2.98	-	3.08	3.01
Fluoride	mg/L	3.76	3.54	2.73	3.38	3.47	0.35	-	0.38	0.47	0.43	0.37	0.84	0.84	-	0.89	-	0.85	0.85
Sulfate	mg/L	9.6	10.8	10.9	9.9	8.09	28.2	-	31.4	25.5	23.2	28.7	0.4 U	0.2 J	-	0.4 U	-	0.1 J	0.4 U
Total Dissolved Solids	mg/L	1,260	1,240	1,260	1,250	1,250	406	-	421	452	432	430	369	374	-	404	-	375	380
pH	SU	8.3	8.1	8.0	8.3	8.2	7.7	6.9	6.7	6.8	7.1	6.9	8.1	7.9	8.4	7.9	8.4	8.2	8.1

Parameter	Unit	MW-1611						MW-1612				
		9/9/2019	5/15/2020	10/8/2020	1/4/2021	5/13/2021	10/26/2021	9/10/2019	5/18/2020	10/8/2020	5/14/2021	10/26/2021
		2019-D2	2020-D1	2020-D2	2020-D2-R1	2021-D1	2021-D2	2019-D2	2020-D1	2020-D2	2021-D1	2021-D2
Boron	mg/L	0.136	0.135	0.124	-	0.132	0.125	0.438	0.388	0.351	0.351	0.367
Calcium	mg/L	26.1	24.0	24.8	-	23.5	24.6	4.77	4.18	3.43	4.78	3.4
Chloride	mg/L	10.1	9.35	9.44	-	10.1	9.91	11.1	6.75	6.36	6.72	6.24
Fluoride	mg/L	0.62	0.61	0.64	-	0.64	0.63	4.34	4.39	3.92	4.15	4.31
Sulfate	mg/L	17.3	20.8	22.2	-	19.2	20.8	31.3	40.5	40.0	36.4	38.0
Total Dissolved Solids	mg/L	402	404	451	407	405	400	786	637	662	688	630
pH	SU	7.7	7.3	7.3	7.7	7.7	7.5	8.3	8.2	8.3	8.4	8.4

Notes:
mg/L: milligrams per liter
SU: standard unit
U: Parameter was not present in concentrations above the method detection limit and is reported as the reporting limit
J: Estimated value. Parameter was detected in concentrations below the reporting limit
-: Not Measured
D1: First semi-annual detection monitoring event of the year
D2: Second semi-annual detection monitoring event of the year
R1: First verification event associated with detection monitoring round
*: Values excluded from statistical analysis

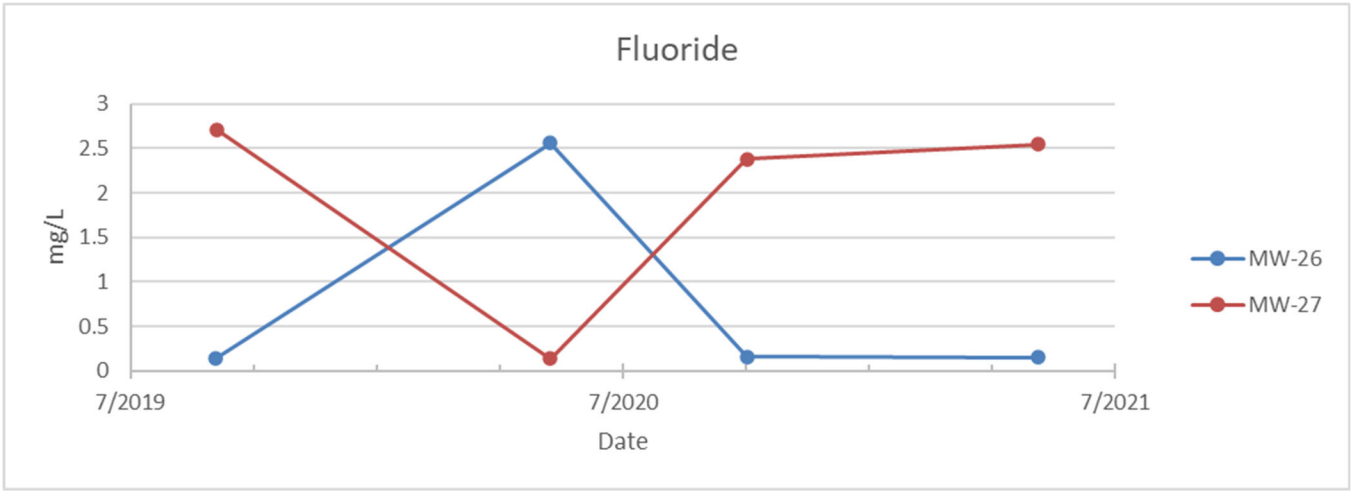
Table 2: Background Level Summary
Mountaineer - Landfill

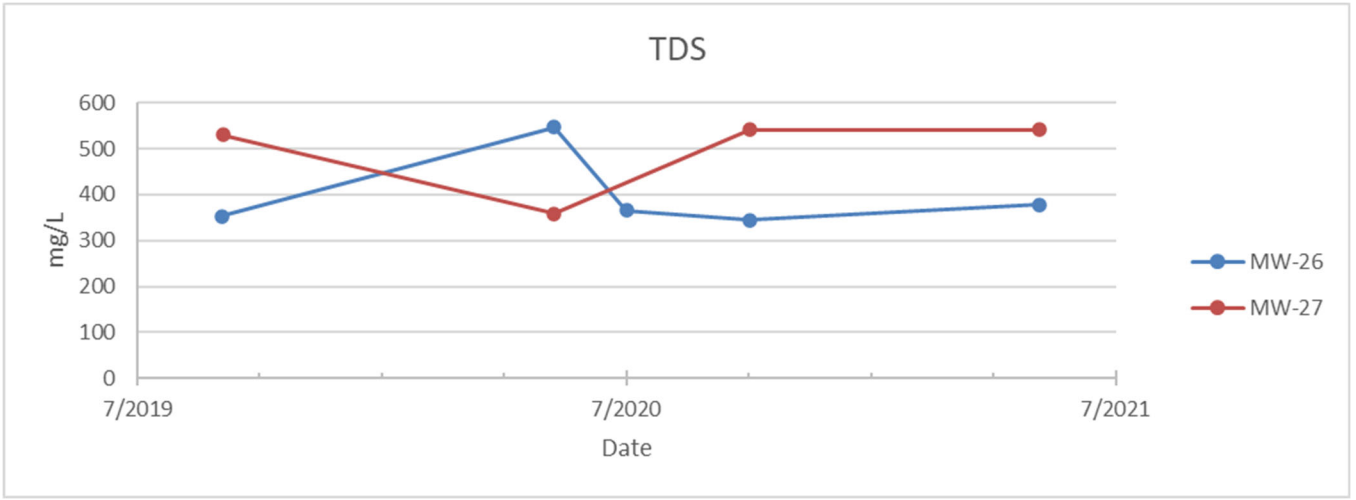
Geosyntec Consultants, Inc.

Analyte	Unit	Description	MW-1611	MW-26	MW-27	MW-38	MW-39
Boron	mg/L	Intrawell Background Value (UPL)	0.233	0.233	0.376	0.0935	0.198
Calcium	mg/L	Intrawell Background Value (UPL)	26.2	64.7	1.77	57.6	12.4
Chloride	mg/L	Intrawell Background Value (UPL)	10.6	7.09	1.85	7.76	3.13
Fluoride	mg/L	Interwell Background Value (UPL)	4.33				
pH	SU	Intrawell Background Value (UPL)	8.0	7.8	9.5	7.6	8.8
		Intrawell Background Value (LPL)	7.2	7.0	8.6	6.5	7.8
Sulfate	mg/L	Intrawell Background Value (UPL)	23.4	10.8	7.48	37.9	0.200
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	446	399	618	464	434

Notes:
UPL: Uper prediction limit
LPL: Lower prediction limit

FIGURES





Fluoride and TDS Time Series Graphs

Geosyntec consultants

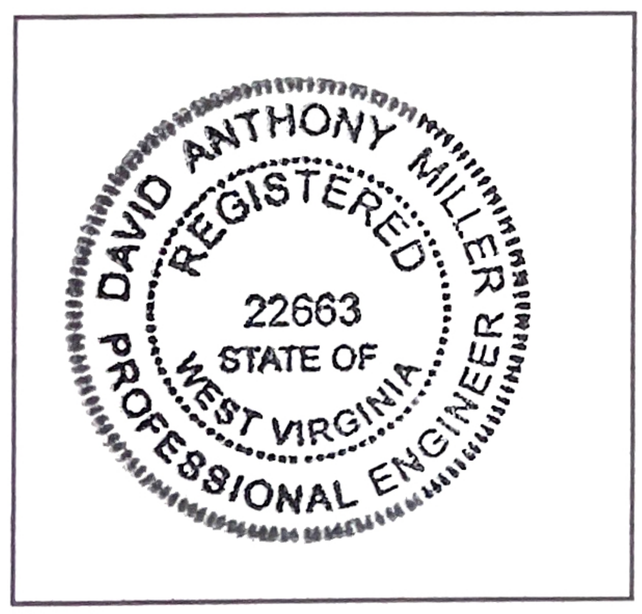
Figure 1

Columbus, Ohio | July 15, 2022

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 Mountaineer Landfill 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	10.26.22
License Number	Licensing State	Date

ATTACHMENT B

Statistical Analysis Output

GROUNDWATER STATS CONSULTING

July 18, 2022

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

RE: Background Update – March 2022 – Mountaineer Landfill

Dear Ms. Kreinberg,

Groundwater Stats Consulting, formerly the statistical consulting division of Sanitas Technologies, is pleased to provide the screening for the proposed background update of prediction limits with data through March 2022 for American Electric Power's Mountaineer Landfill. 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 Mountaineer Landfill for the CCR program in 2016, and 8 background samples were initially collected at each of the groundwater monitoring wells. The monitoring well network, as provided by Geosyntec Consultants, consists of the following:

- **Upgradient wells**: MW-1612 and MW-30
- **Downgradient wells:** MW-1611, MW-26, MW-27, MW-38, and MW-39

Data were sent electronically to Groundwater Stats Consulting, and the statistical analysis report was prepared according to the background screening conducted December 2017 that was approved by Dr. Kirk Cameron, PhD Statistician with MacStat Consulting, primary author of the USEPA Unified Guidance, and Senior Advisor to Groundwater Stats Consulting. The analysis was reviewed by Kristina Rayner, Groundwater Statistician and founder of Groundwater Stats Consulting.

The following CCR Detection Monitoring constituents were evaluated:

- **Appendix III Parameters**: boron, calcium, chloride, fluoride, pH, sulfate, and TDS

Time series plots for Appendix III at all wells are provided for the purpose of screening data at these wells (Figure A). Additionally, box plots are included for all constituents at upgradient and downgradient wells (Figure B). 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.

Data at all wells were evaluated for the following: 1) outliers; 2) trends; 3) most appropriate statistical method for Appendix III parameters based on site characteristics of groundwater data upgradient of the facility; and 4) eligibility of downgradient wells when intrawell statistical methods are recommended.

Summary of Statistical Method:

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

Parametric prediction limits are utilized when the screened historical data follow a normal or transformed-normal distribution. When data cannot be normalized or the majority of data are non-detects, a nonparametric test is utilized. 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.

- 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 prediction limits are used on data containing greater than 50% non-detects.

Natural systems continuously evolve due to physical changes made to the environment. Examples include capping a landfill, paving areas near a well, or lining a drainage channel to prevent erosion. Periodic updating of background statistical limits will be necessary to accommodate these types of changes. In the intrawell case, data are evaluated when at least 4 new compliance values are available. In the interwell case, newer data are carefully evaluated during each event for new outliers, and prediction limits are constructed using all available data from upgradient wells.

In cases where downgradient average concentrations are higher than observed concentrations upgradient for a given constituent, an independent study and hydrogeological investigation would be required to identify local geochemical conditions and expected groundwater quality for the region to justify an intrawell approach. Such an assessment is beyond the scope of services provided by Groundwater Stats Consulting. When there is not an obvious explanation for observed concentration differences in downgradient wells relative to reported concentrations in upgradient wells, interwell prediction limits will initially be selected for the statistical method until further evidence shows that concentrations are due to natural variation rather than a result of the facility.

Summary of Background Screening – December 2017

Outlier Evaluation

Time series plots are 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 III 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. The results were submitted with the screening report.

Tukey's outlier test noted a few outliers as may be seen on the Outlier Summary Table and accompanying graphs. Any values flagged as outliers are plotted in a lighter font on the time series graph. The pH values reported during the May 2017 sample event were, reportedly, due to instrumentation error. The test identified two outliers for boron in well MW-27; an outlier for calcium in well MW-1611; a low outlier for pH in well MW-1611; and an outlier for TDS in well MW-1611. However, these values were not flagged due to all concentrations being consistent over time and similar to concentrations in neighboring

wells. A substitution of the most recent reporting limit was applied when varying detection limits existed in data.

Data were re-evaluated using Tukey's outlier test and visual screening with the July 2019 samples in which a low value was noted for fluoride in MW-30 and high values were noted for calcium in well MW-27 and sulfate in well MW-39. 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. A summary of flagged values follows this letter (Figure C).

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. It was noted that for the majority of constituents evaluated, the highest concentrations are reported in the upgradient wells.

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 all data are consistent over time with no statistically significant increasing trends. A few statistically significant decreasing trends were noted; however, the magnitudes of the trends were low relative to the average concentrations. It was noted that boron, sulfate, and TDS concentrations are found to have the highest concentrations in the upgradient wells. No adjustments to any data sets were required.

Appendix III – Determination of Spatial Variation

The Analysis of Variance (ANOVA) was used to statistically evaluate differences in average concentrations among upgradient wells, which assists in identifying the most appropriate statistical approach. Interwell tests, which compare downgradient well data to statistical limits constructed from pooled upgradient well data, are appropriate when average concentrations are similar across upgradient wells. Intrawell tests, which compare compliance data from a single well to screened historical data within the same well, are appropriate when upgradient wells exhibit spatial variation; when statistical limits constructed from upgradient wells would not be conservative from a regulatory perspective; and when downgradient water quality is unimpacted compared to upgradient water quality for the same parameter.

Appendix III - Statistical Limits

Prior to performing intrawell prediction limits, several steps are required to reasonably demonstrate downgradient water quality does not have existing impacts from the practices of the facility. Confidence Intervals for boron, chloride, sulfate, and TDS were found to be within their respective background limits and are, therefore, eligible for intrawell prediction limits. Interwell prediction limits were initially recommended for calcium, fluoride, and pH. However, additional studies provided by Geosyntec Consultants support natural variation in groundwater for calcium and pH; therefore, interwell methods will be used for fluoride only.

Summary of Background Updates

October 2019

Outlier Analysis

Data were re-evaluated using Tukey's outlier test and visual screening with the July 2019 samples. Some well/constituent pairs had background data sets only through April or June 2019. Fluoride is tested using interwell prediction limits and, therefore, only upgradient wells were tested for outliers for this constituent. All other Appendix III parameters, which use intrawell prediction limits, were evaluated at each well. In addition to the pH values previously flagged as outliers due to reported instrumentation error for those samples, a low value was noted for fluoride in MW-30 and high values were noted for calcium in well MW-27 and sulfate in well MW-39. These values were flagged in the database as outliers. Tukey's also identified a high value for fluoride in the pooled upgradient well data; however, this value was similar to concentrations reported in

neighboring wells and was not flagged as an outlier in the database. A similar occurrence was present for TDS in well MW-27, but this value was not flagged in the database as an outlier. It is consistent with the other reported values in this well and the concentrations overall are significantly less than those reported in at least one upgradient well. However, a high sulfate value in well MW-39 was not identified by Tukey's due to the natural log transformation, but this value was flagged as an outlier as this sample did not appear to represent the population for this well/constituent pair.

Mann-Whitney Test

For constituents requiring intrawell prediction limits, the Mann-Whitney (Wilcoxon Rank Sum) test was used to compare the medians of historical data through June 2017 to the new compliance samples at each well through July 2019 to evaluate whether the groups are statistically different at the 99% confidence level, in which case background data may not be updated with more recent compliance data. Statistically significant differences were found for TDS in well MW-26.

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, in the case of TDS at well MW-26, concentrations are lower than those reported in at least one upgradient well and were, therefore, updated. All other records were also updated using data through July 2019 for intrawell prediction limits.

Trend Test

The Sen's Slope/Mann Kendall trend test was used to evaluate data at upgradient wells for fluoride to identify statistically significant increasing or decreasing trends. The results of the trend analyses showed all data are consistent over time with no statistically significant increasing or decreasing trends. Interwell prediction limits were updated using all available data from upgradient wells through July 2019.

March 2022

Intrawell limits constructed from carefully screened background data from within each well serve to provide statistical limits that are conservative (i.e., lower) from a regulatory perspective, and that will rapidly identify a change in more recent compliance data from within a given well. This statistical method removes the element of variation from across wells and eliminates the chance of mistaking natural spatial variation for a release from the facility. Intrawell prediction limits, which compare the most recent compliance sample

from a given well to historical data from the same well, are updated by testing for the appropriateness of consolidating new sampling observations with the screened background data.

During this analysis, all data were evaluated for the purpose of updating statistical limits. This process is described below and requires a minimum of four new data points. Historical data were evaluated for updating with newer data through March 2022 through the use of time series graphs to identify potential outliers when necessary, as well as the Mann Whitney test for equality of medians. Intrawell prediction limits are used to evaluate boron, calcium, chloride, pH, sulfate, and TDS at all wells due to natural spatial variation for these parameters.

Interwell prediction limits, which are constructed from pooled upgradient well data, are updated during each event after screening for new outliers. Data from upgradient wells are also periodically re-screened for newly developing trends, which may require adjustment of the background period to eliminate the trend, as well as for outliers over the entire record. Interwell prediction limits are used to evaluate the most recent sample from downgradient wells for fluoride.

Outlier Analysis

Prior to performing prediction limits, proposed background data through March 2022 were evaluated using Tukey's test at all wells for boron, calcium, chloride, pH, sulfate, and TDS, and at upgradient wells for fluoride. During this update, visual screening and Tukey's outlier test were used to identify potential outliers (Figure C). Note that historical reported values of zero for sulfate at well MW-39 were corrected in the database. These values were reported nondetect values with a reporting limit of 0.4 mg/L.

Tukey's test identified several statistical outliers which were flagged in the database and excluded prior to construction of statistical limits. Exceptions include boron at well MW-27, calcium and sulfate at upgradient well MW-30, and TDS at downgradient well MW-27. The highest and lowest measurements of boron as well as the highest measurement of TDS in well MW-27 were similar to remaining measurements within this well and similar to or lower than concentrations reported in upgradient wells. Additionally, the highest measurements of calcium and sulfate were reported upgradient of the site. Therefore, the assumption is that these values represent natural variation in groundwater quality.

While Tukey's test did not identify the May 2017 concentrations of pH in wells MW-1611, MW-26, MW-30, and MW-38, these values were flagged as outliers due to, reportedly, erroneous values.

Flagged values are excluded from statistical limits to reduce variation, better represent background conditions, and provide limits that are conservative (i.e., lower) from a regulatory perspective.

Tukey's test did not confirm a previously identified outlier for fluoride in upgradient well MW-30; therefore, the reported measurement of 1.34 mg/L was unflagged during this analysis.

When values are confirmed as outliers, these measurements are flagged with "o" and as mentioned above, 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 of flagged outliers follows this report (Figure C).

Mann-Whitney Test

For constituents requiring intrawell prediction limits, the Mann-Whitney (Wilcoxon Rank Sum) test was used to compare the medians of historical data through July 2019 (when available) to compliance data through March 2022 (Figure D). When no statistically significant difference in medians between the two groups is found at a 99% confidence level, background data may be updated with newer compliance data. Statistically significant decreases were found between the two groups for the following well/constituent pairs:

Decrease

- Boron: MW-1611 and MW-1612 (upgradient)
- Calcium: MW-27
- Chloride: MW-1612 (upgradient)
- pH: MW-30
- Sulfate: MW-1612 (upgradient) and MW-27
- TDS: MW-1612 (upgradient)

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. During this background update, statistically significant decreases in medians were identified for a few well/constituent pairs; however, the majority of the more recent compliance

measurements were similar to those reported historically. Therefore, these records were updated through March 2022. A summary of these results follows this letter and the test results are included with the Mann Whitney test section at the end of this report.

Trend Tests

The Sen's Slope/Mann Kendall trend test was used to evaluate the entire record of data through March 2022 at upgradient wells for fluoride which utilizes interwell prediction limits (Figure E). When statistically significant increasing trends are identified in upgradient wells, the earlier portion of data is deselected prior to construction of interwell statistical limits if the trending data would result in statistical limits that are not conservative from a regulatory perspective. A summary of the trend test results follows this report. A statistically significant increasing trend was identified for fluoride in well MW-1612. Concentrations, however, at this well were similar to those reported in upgradient well MW-30. Therefore, no adjustment was required for this record.

Statistical Limits

Intrawell prediction limits using all historical data through March 2022 were constructed and a summary of the updated limits follows this letter (Figure F). Interwell prediction limits, combined with a 1-of-2 resample plan, were updated using all available data from upgradient wells for the same time period for fluoride (Figure G). Interwell prediction limits pool upgradient well data to establish a background limit for an individual constituent. A summary table of the updated limits may be found following this letter in the Prediction Limit Summary Tables.

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

For Groundwater Stats Consulting,

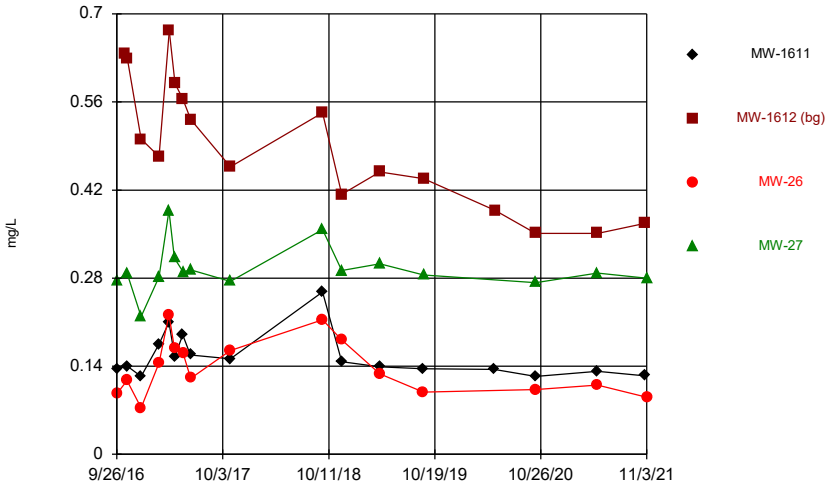
Tristan Clark

Kristina Rayner

Tristan Clark
Groundwater Analyst

Kristina Rayner
Senior Statistician

Time Series



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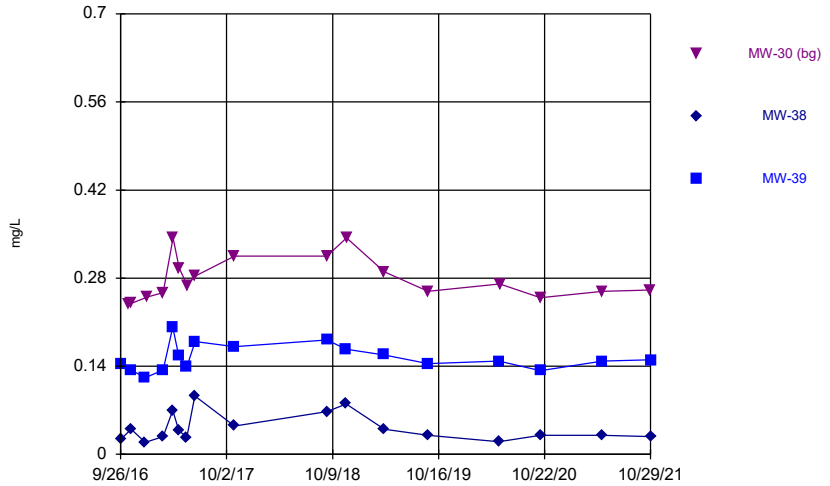
Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



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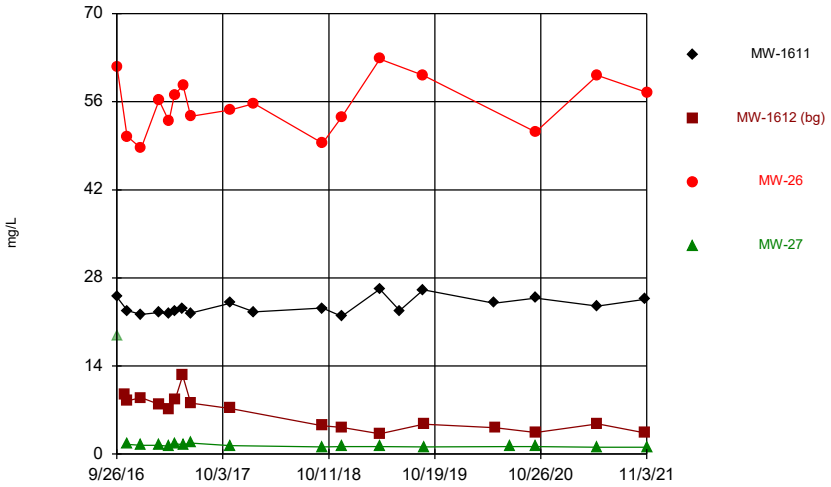
Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



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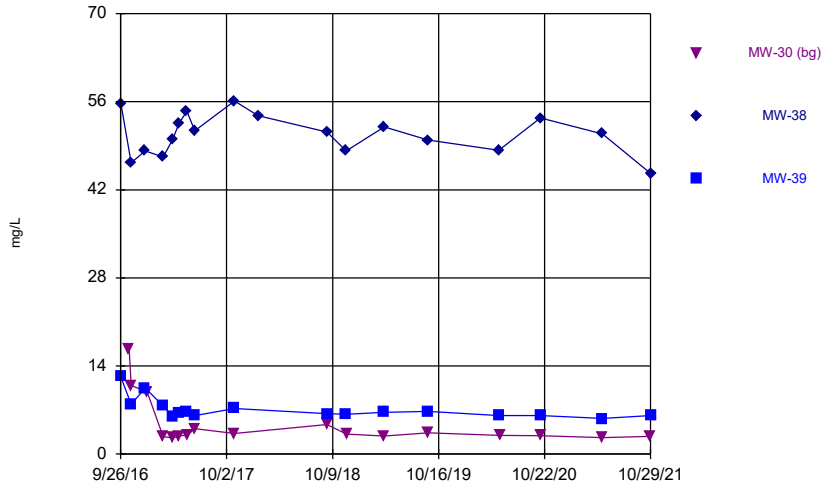
Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



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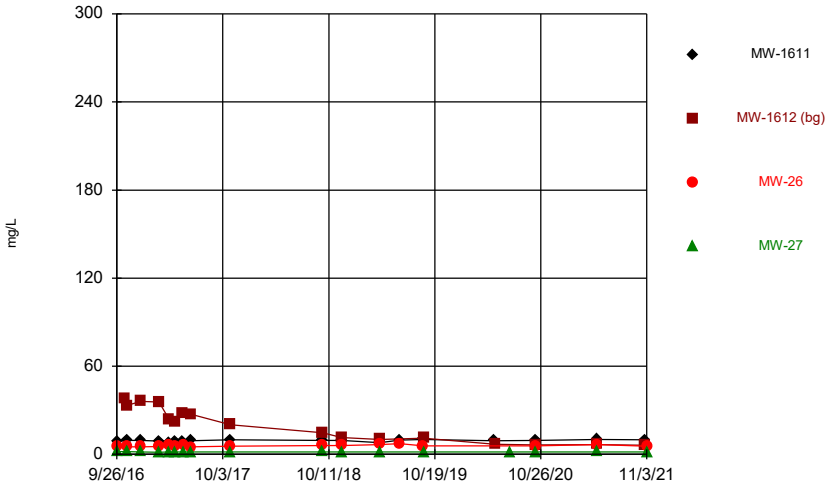
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Time Series



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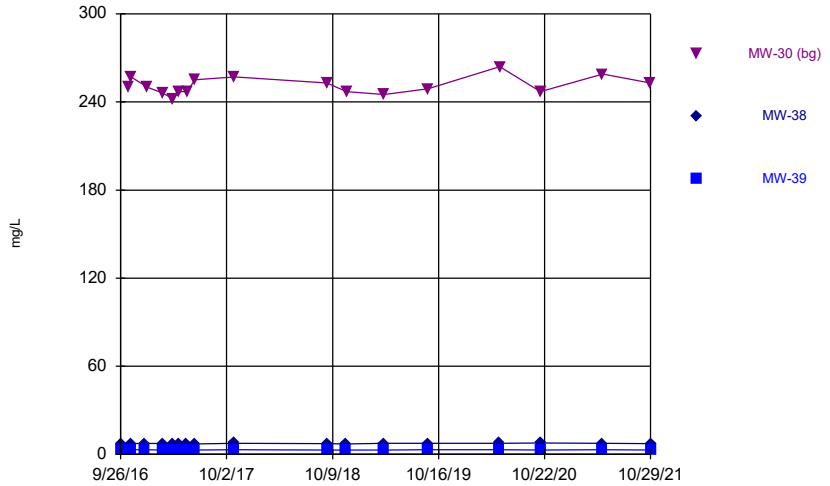
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



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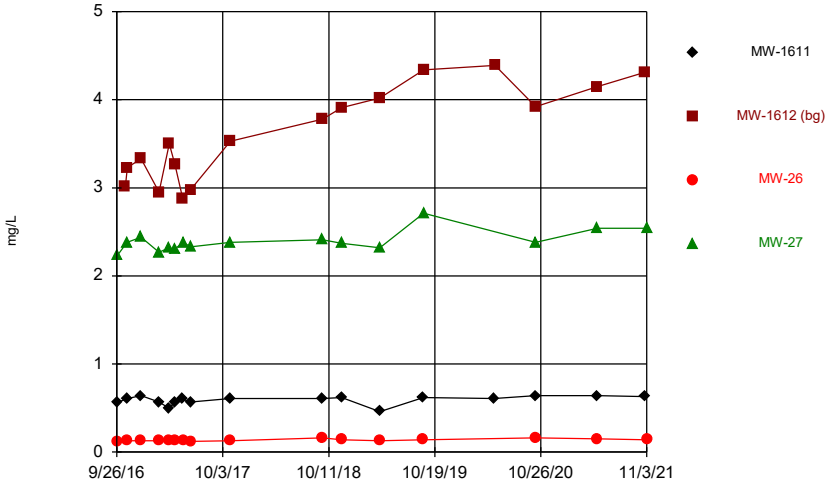
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



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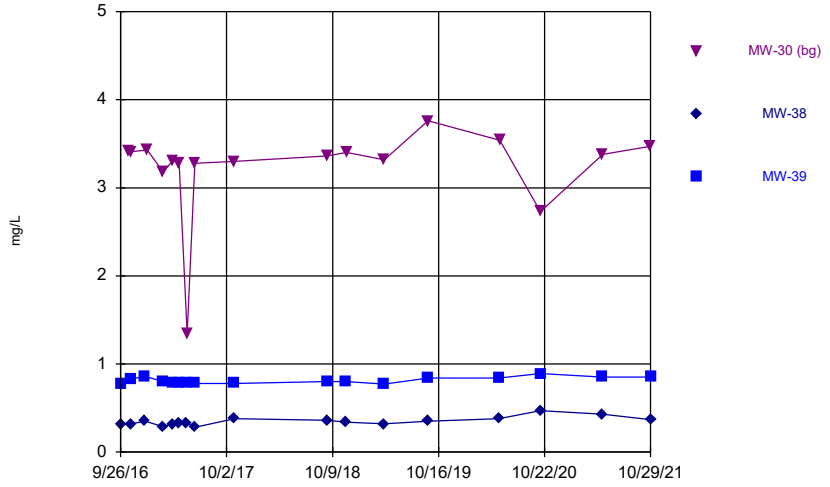
Time Series



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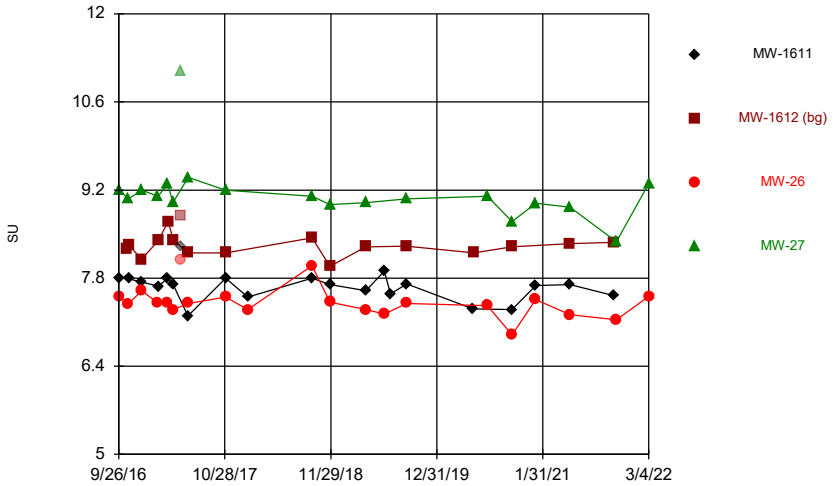

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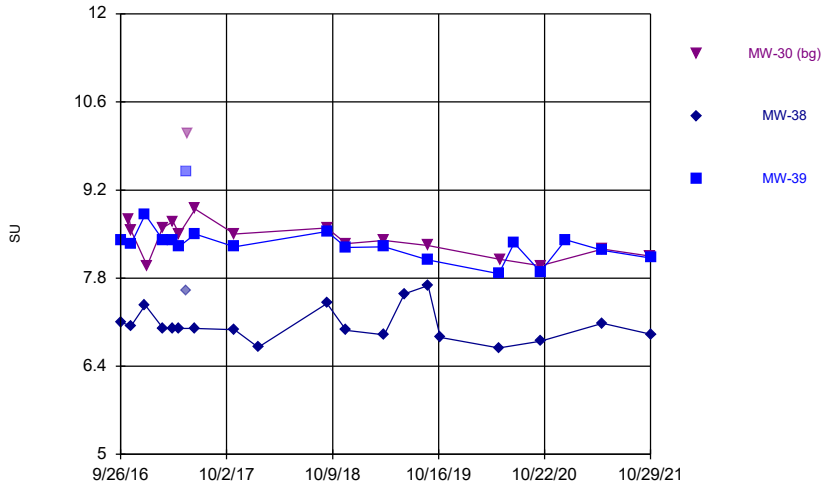
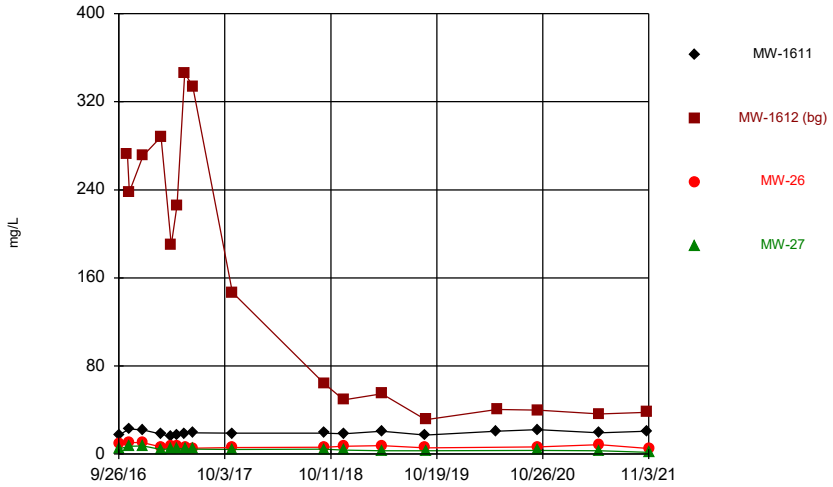
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Time Series



Constituent: pH, field Analysis Run 7/18/2022 11:40 AM View: Descriptive
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

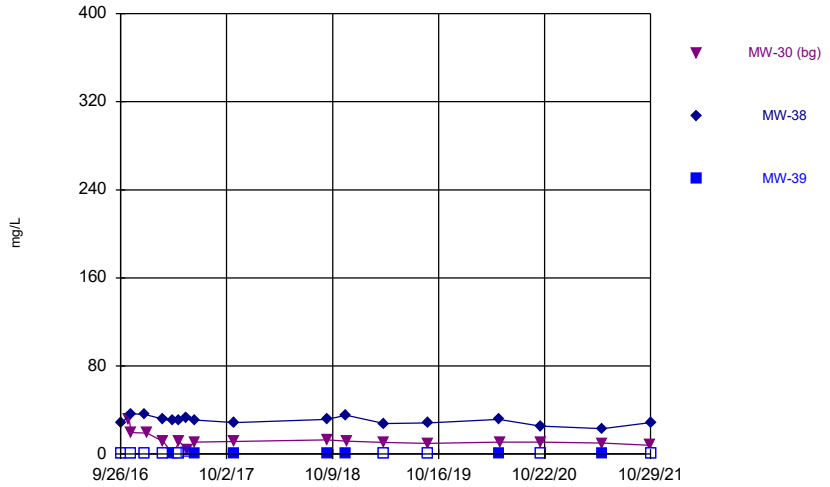
Time Series



Constituent: Sulfate, total Analysis Run 7/18/2022 11:40 AM View: Descriptive
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

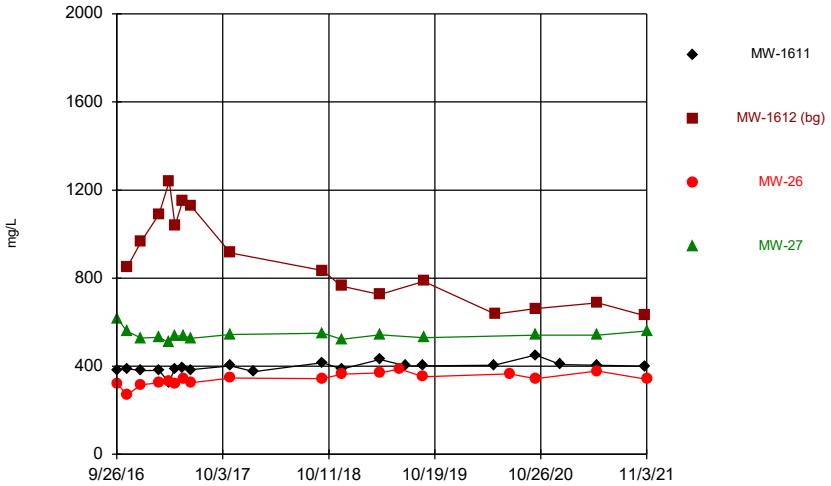
Hollow symbols indicate censored values.

Time Series



Constituent: Sulfate, total Analysis Run 7/18/2022 11:40 AM View: Descriptive
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

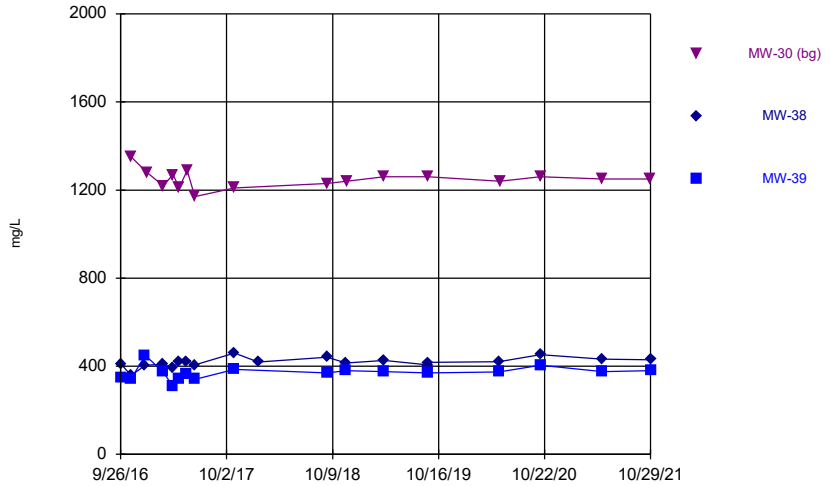
Time Series



Constituent: Total Dissolved Solids [TDS] Analysis Run 7/18/2022 11:40 AM View: Descriptive
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

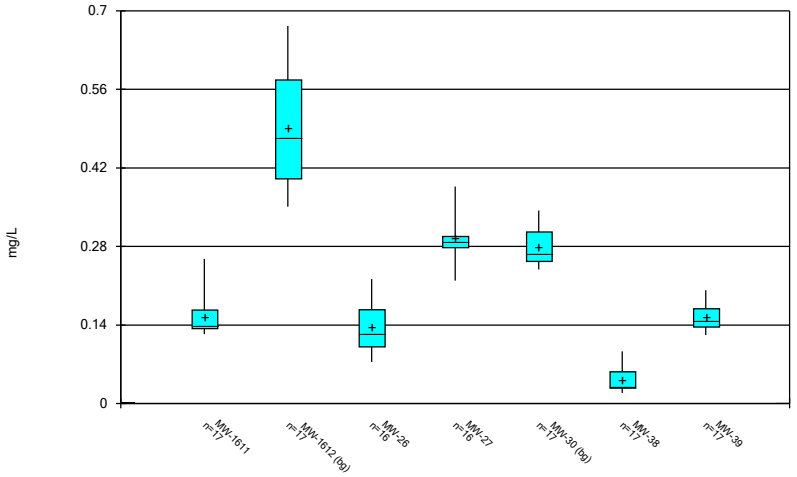
Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



Constituent: Total Dissolved Solids [TDS] Analysis Run 7/18/2022 11:40 AM View: Descriptive
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

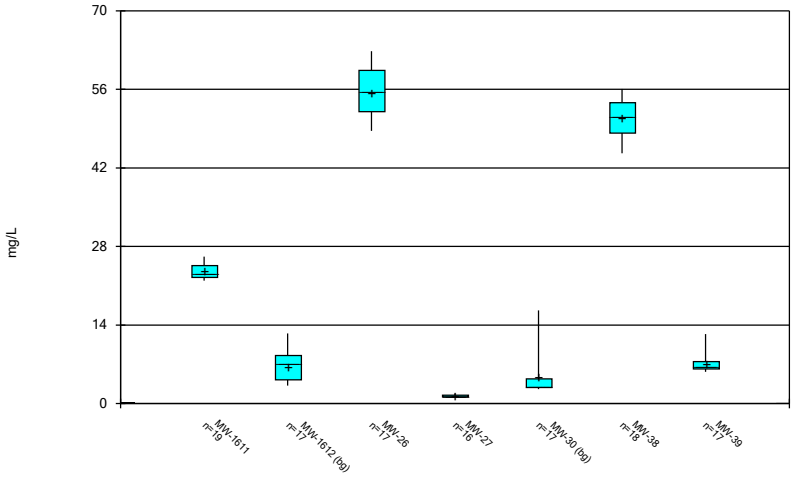
Box & Whiskers Plot



Constituent: Boron, total Analysis Run 7/18/2022 11:44 AM View: Descriptive
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

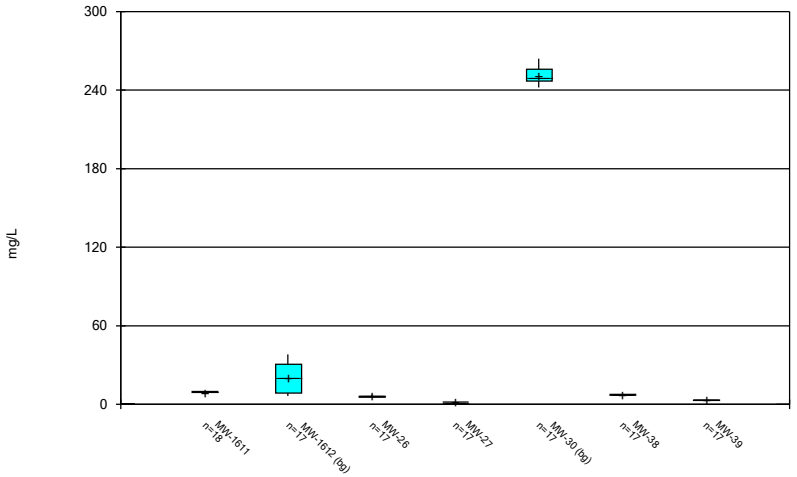
Box & Whiskers Plot



Constituent: Calcium, total Analysis Run 7/18/2022 11:44 AM View: Descriptive
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

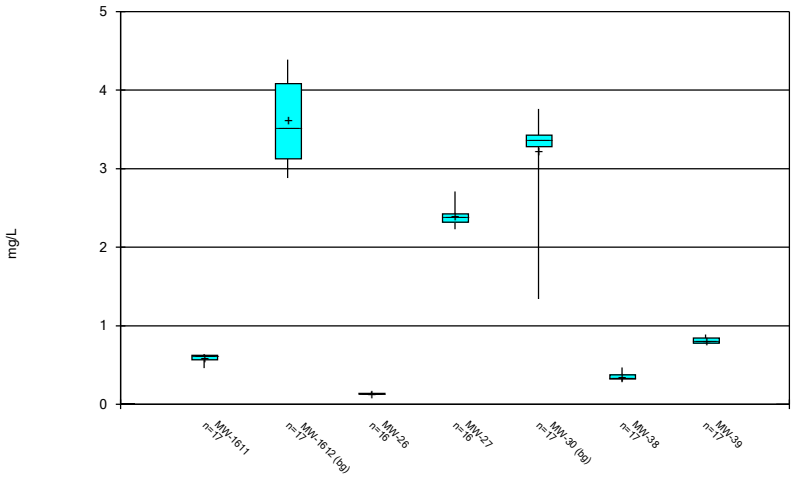
Box & Whiskers Plot



Constituent: Chloride, total Analysis Run 7/18/2022 11:44 AM View: Descriptive
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

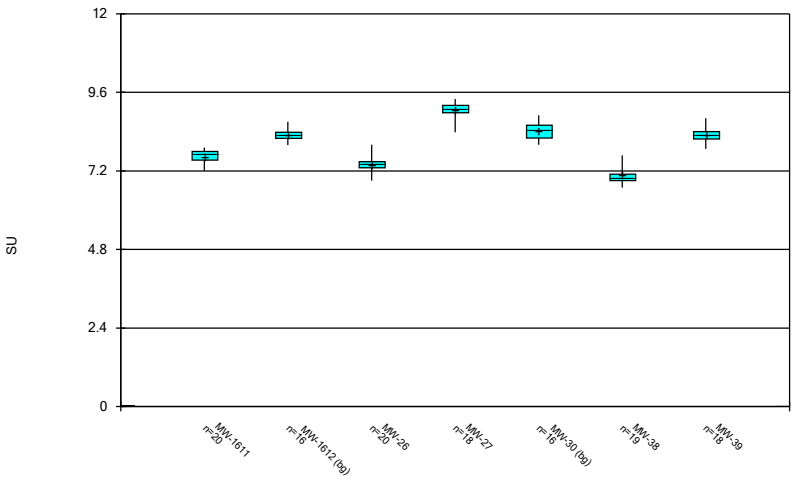
Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Box & Whiskers Plot



Constituent: Fluoride, total Analysis Run 7/18/2022 11:44 AM View: Descriptive
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

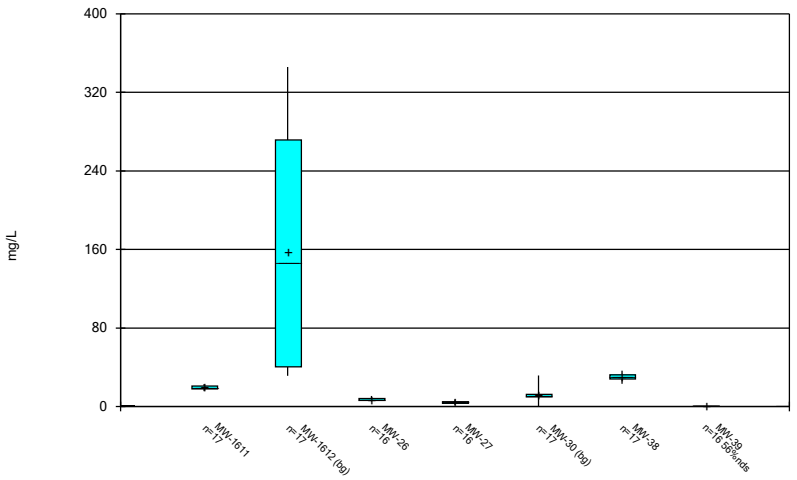
Box & Whiskers Plot



Constituent: pH, field Analysis Run 7/18/2022 11:44 AM View: Descriptive
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

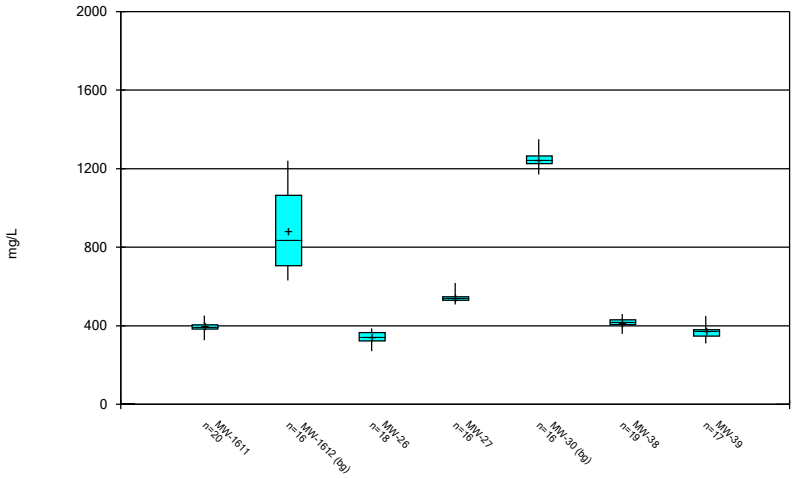
Box & Whiskers Plot



Constituent: Sulfate, total Analysis Run 7/18/2022 11:44 AM View: Descriptive
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Box & Whiskers Plot



Constituent: Total Dissolved Solids [TDS] Analysis Run 7/18/2022 11:44 AM View: Descriptive
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Outlier Summary

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill Printed 7/13/2022, 12:46 PM

	MW-27 Calcium, total (mg/L)	MW-1611 pH, field (SU)	MW-1612 pH, field (SU)	MW-26 pH, field (SU)	MW-27 pH, field (SU)	MW-30 pH, field (SU)	MW-38 pH, field (SU)	MW-39 pH, field (SU)	MW-39 Sulfate, total (mg/L)
9/27/2016	18.9 (O)								
5/16/2017		8.3 (O)	8.8 (O)				7.6 (O)	9.5 (O)	1.5 (O)
5/17/2017				8.09 (O)	11.1 (O)	10.1 (O)			

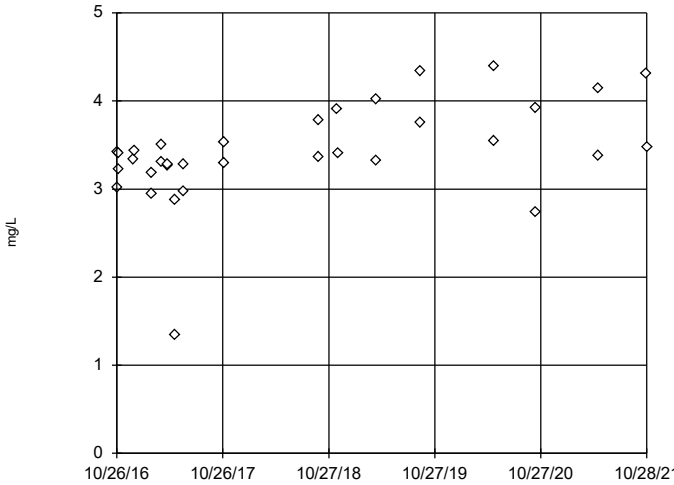
Tukey's Outlier Test (Upgradient Wells) - All Results

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill Printed 7/18/2022, 11:37 AM

Constituent	Well	Outlier	Value(s)	Method	N	Mean	Std. Dev.	Distribution	Normality Test
Fluoride, total (mg/L)	MW-1612,MW-30	No	n/a	NP	34	3.424	0.5538	x^2	ShapiroWilk

Tukey's Outlier Screening, Pooled Background

MW-1612,MW-30



n = 34

No outliers found. Tukey's method select-ed by user.

Data were square trans-formed to achieve best W statistic (graph shown in original units).

High cutoff = 5.026, low cutoff = -0.7197, based on IQR multiplier of 3.

Constituent: Fluoride, total Analysis Run 7/18/2022 11:36 AM View: Outlier Testing - Upgradient

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Tukey's Outlier Test - Significant Results

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill Printed 7/18/2022, 11:35 AM

Constituent	Well	Outlier	Value(s)	Method	N	Mean	Std. Dev.	Distribution	Normality Test
Boron, total (mg/L)	**MW-27**	**Yes**	**0.219,0.387**	**NP**	**16**	**0.2938**	**0.03678**	**ln(x)**	**ShapiroWilk**
Calcium, total (mg/L)	**MW-27**	**Yes**	**18.9**	**NP**	**17**	**2.353**	**4.269**	**ln(x)**	**ShapiroWilk**
Calcium, total (mg/L)	**MW-30 (bg)**	**Yes**	**16.6**	**NP**	**17**	**4.785**	**3.918**	**ln(x)**	**ShapiroWilk**
pH, field (SU)	**MW-27**	**Yes**	**11.1,8.38**	**NP**	**19**	**9.163**	**0.5209**	**ln(x)**	**ShapiroWilk**
pH, field (SU)	**MW-39**	**Yes**	**9.5**	**NP**	**19**	**8.373**	**0.3473**	**ln(x)**	**ShapiroWilk**
Sulfate, total (mg/L)	**MW-30 (bg)**	**Yes**	**31.5,0.1**	**NP**	**17**	**12.01**	**6.716**	**sqrt(x)**	**ShapiroWilk**
Total Dissolved Solids [TDS] (mg/L)	**MW-27**	**Yes**	**618**	**NP**	**16**	**542.1**	**24.14**	**ln(x)**	**ShapiroWilk**

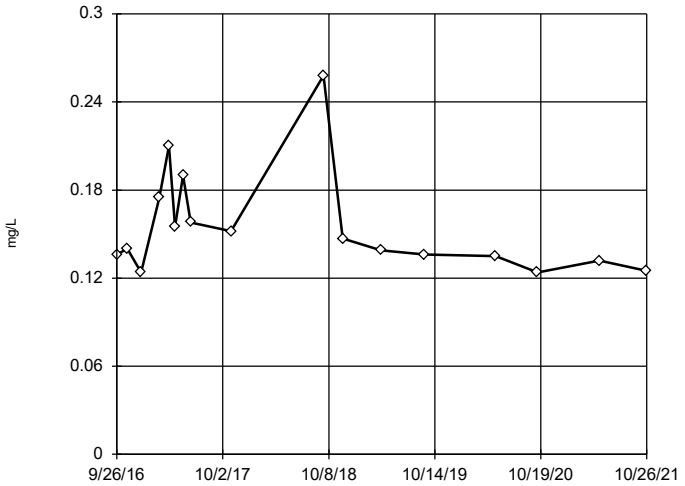
Tukey's Outlier Test - All Results

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill Printed 7/18/2022, 11:35 AM

Constituent	Well	Outlier	Value(s)	Method	N	Mean	Std. Dev.	Distribution	Normality Test
Boron, total (mg/L)	MW-1611	No	n/a	NP	17	0.1551	0.03562	ln(x)	ShapiroWilk
Boron, total (mg/L)	MW-1612 (bg)	No	n/a	NP	17	0.4915	0.1032	x^(1/3)	ShapiroWilk
Boron, total (mg/L)	MW-26	No	n/a	NP	16	0.1374	0.04425	ln(x)	ShapiroWilk
Boron, total (mg/L)	**MW-27**	**Yes**	**0.219,0.387**	**NP**	**16**	**0.2938**	**0.03678**	**ln(x)**	**ShapiroWilk**
Boron, total (mg/L)	MW-30 (bg)	No	n/a	NP	17	0.2789	0.03364	ln(x)	ShapiroWilk
Boron, total (mg/L)	MW-38	No	n/a	NP	17	0.04176	0.02225	ln(x)	ShapiroWilk
Boron, total (mg/L)	MW-39	No	n/a	NP	17	0.1535	0.0209	ln(x)	ShapiroWilk
Calcium, total (mg/L)	MW-1611	No	n/a	NP	19	23.52	1.294	ln(x)	ShapiroWilk
Calcium, total (mg/L)	MW-1612 (bg)	No	n/a	NP	17	6.521	2.679	x^(1/3)	ShapiroWilk
Calcium, total (mg/L)	MW-26	No	n/a	NP	17	55.55	4.277	normal	ShapiroWilk
Calcium, total (mg/L)	**MW-27**	**Yes**	**18.9**	**NP**	**17**	**2.353**	**4.269**	**ln(x)**	**ShapiroWilk**
Calcium, total (mg/L)	**MW-30 (bg)**	**Yes**	**16.6**	**NP**	**17**	**4.785**	**3.918**	**ln(x)**	**ShapiroWilk**
Calcium, total (mg/L)	MW-38	No	n/a	NP	18	50.79	3.247	normal	ShapiroWilk
Calcium, total (mg/L)	MW-39	No	n/a	NP	17	7.129	1.761	ln(x)	ShapiroWilk
Chloride, total (mg/L)	MW-1611	No	n/a	NP	18	9.273	0.6134	x^6	ShapiroWilk
Chloride, total (mg/L)	MW-1612 (bg)	No	n/a	NP	17	19.89	11.59	sqrt(x)	ShapiroWilk
Chloride, total (mg/L)	MW-26	No	n/a	NP	17	5.834	0.5883	ln(x)	ShapiroWilk
Chloride, total (mg/L)	MW-27	No	n/a	NP	17	1.641	0.09865	ln(x)	ShapiroWilk
Chloride, total (mg/L)	MW-30 (bg)	No	n/a	NP	17	251.1	5.815	ln(x)	ShapiroWilk
Chloride, total (mg/L)	MW-38	No	n/a	NP	17	7.333	0.2023	normal	ShapiroWilk
Chloride, total (mg/L)	MW-39	No	n/a	NP	17	3.001	0.06133	ln(x)	ShapiroWilk
pH, field (SU)	MW-1611	No	n/a	NP	21	7.67	0.2349	ln(x)	ShapiroWilk
pH, field (SU)	MW-1612 (bg)	No	n/a	NP	17	8.333	0.1947	ln(x)	ShapiroWilk
pH, field (SU)	MW-26	No	n/a	NP	21	7.42	0.2564	ln(x)	ShapiroWilk
pH, field (SU)	**MW-27**	**Yes**	**11.1,8.38**	**NP**	**19**	**9.163**	**0.5209**	**ln(x)**	**ShapiroWilk**
pH, field (SU)	MW-30 (bg)	No	n/a	NP	17	8.516	0.4835	ln(x)	ShapiroWilk
pH, field (SU)	MW-38	No	n/a	NP	20	7.082	0.2876	ln(x)	ShapiroWilk
pH, field (SU)	**MW-39**	**Yes**	**9.5**	**NP**	**19**	**8.373**	**0.3473**	**ln(x)**	**ShapiroWilk**
Sulfate, total (mg/L)	MW-1611	No	n/a	NP	17	19.34	1.923	ln(x)	ShapiroWilk
Sulfate, total (mg/L)	MW-1612 (bg)	No	n/a	NP	17	156.8	118.7	normal	ShapiroWilk
Sulfate, total (mg/L)	MW-26	No	n/a	NP	16	7.213	1.687	ln(x)	ShapiroWilk
Sulfate, total (mg/L)	MW-27	No	n/a	NP	16	4.302	1.479	sqrt(x)	ShapiroWilk
Sulfate, total (mg/L)	**MW-30 (bg)**	**Yes**	**31.5,0.1**	**NP**	**17**	**12.01**	**6.716**	**sqrt(x)**	**ShapiroWilk**
Sulfate, total (mg/L)	MW-38	No	n/a	NP	17	30.39	3.517	normal	ShapiroWilk
Sulfate, total (mg/L)	MW-39	No	n/a	NP	17	0.2453	0.3271	ln(x)	ShapiroWilk
Total Dissolved Solids [TDS] (mg/L)	MW-1611	No	n/a	NP	20	395.2	24.47	x^3	ShapiroWilk
Total Dissolved Solids [TDS] (mg/L)	MW-1612 (bg)	No	n/a	NP	16	881.7	199.7	ln(x)	ShapiroWilk
Total Dissolved Solids [TDS] (mg/L)	MW-26	No	n/a	NP	18	341.4	27.37	x^4	ShapiroWilk
Total Dissolved Solids [TDS] (mg/L)	**MW-27**	**Yes**	**618**	**NP**	**16**	**542.1**	**24.14**	**ln(x)**	**ShapiroWilk**
Total Dissolved Solids [TDS] (mg/L)	MW-30 (bg)	No	n/a	NP	16	1249	40.24	ln(x)	ShapiroWilk
Total Dissolved Solids [TDS] (mg/L)	MW-38	No	n/a	NP	19	417.9	22.27	x^4	ShapiroWilk
Total Dissolved Solids [TDS] (mg/L)	MW-39	No	n/a	NP	17	370.1	29.93	ln(x)	ShapiroWilk

Tukey's Outlier Screening

MW-1611



n = 17

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

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

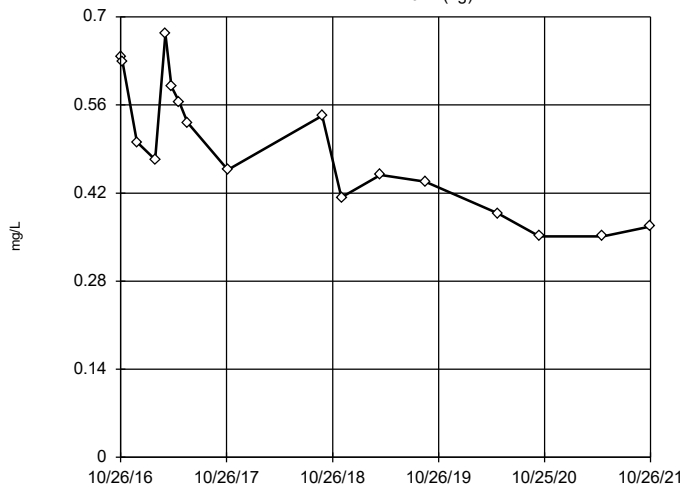
High cutoff = 0.3214, low cutoff = 0.06907, based on IQR multiplier of 3.

Constituent: Boron, total Analysis Run 7/18/2022 11:31 AM View: Outlier Testing
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1612 (bg)



n = 17

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

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

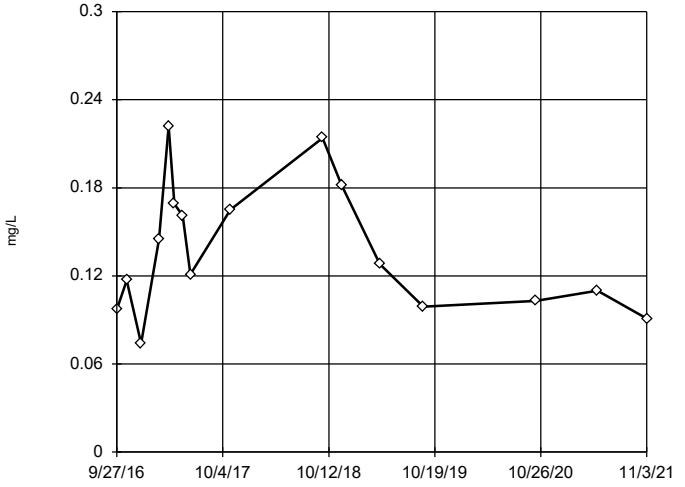
High cutoff = 1.4, low cutoff = 0.09156, based on IQR multiplier of 3.

Constituent: Boron, total Analysis Run 7/18/2022 11:31 AM View: Outlier Testing
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-26



n = 16

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

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

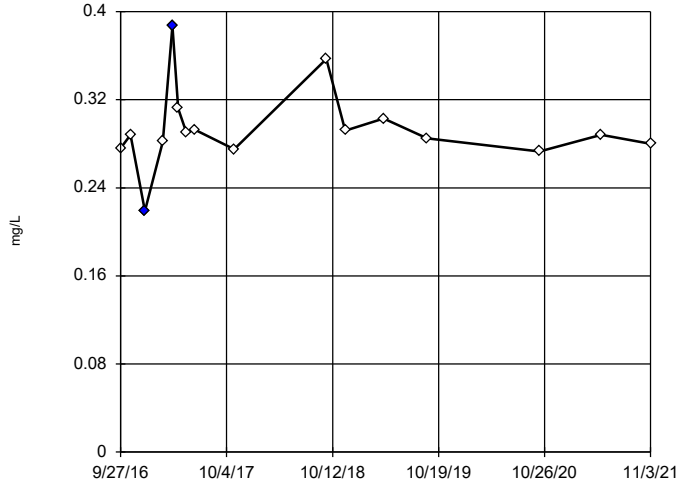
High cutoff = 0.7551, low cutoff = 0.02233, based on IQR multiplier of 3.

Constituent: Boron, total Analysis Run 7/18/2022 11:31 AM View: Outlier Testing
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-27



n = 16

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

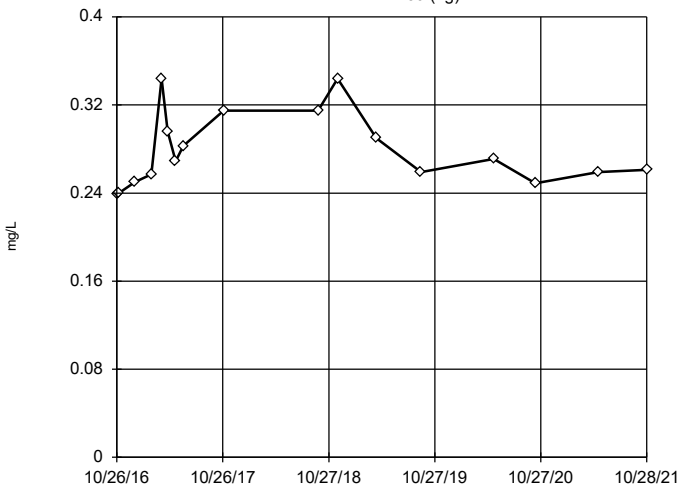
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.3669, low cutoff = 0.2258, based on IQR multiplier of 3.

Constituent: Boron, total Analysis Run 7/18/2022 11:31 AM View: Outlier Testing
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Tukey's Outlier Screening

MW-30 (bg)



n = 17

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

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

High cutoff = 0.5338, low cutoff = 0.145, based on IQR multiplier of 3.

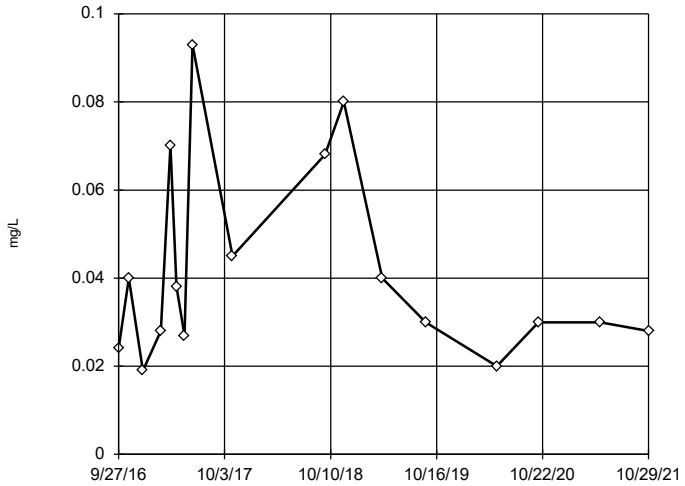
Constituent: Boron, total Analysis Run 7/18/2022 11:31 AM View: Outlier Testing

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-38



n = 17

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

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

High cutoff = 0.4505, low cutoff = 0.003376, based on IQR multiplier of 3.

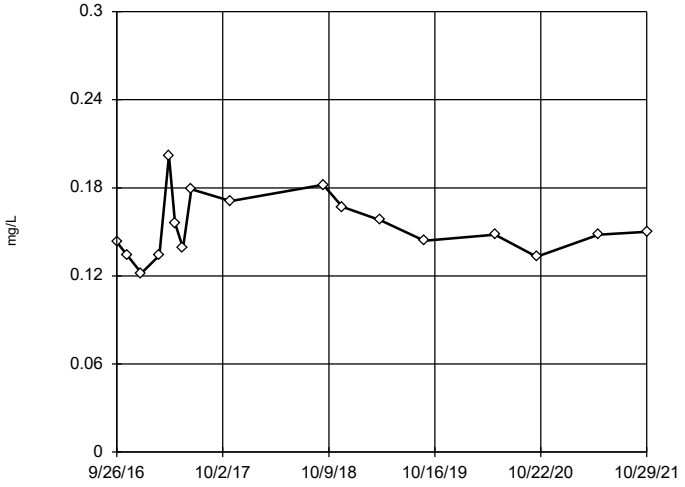
Constituent: Boron, total Analysis Run 7/18/2022 11:31 AM View: Outlier Testing

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-39



n = 17

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

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

High cutoff = 0.3208, low cutoff = 0.07189, based on IQR multiplier of 3.

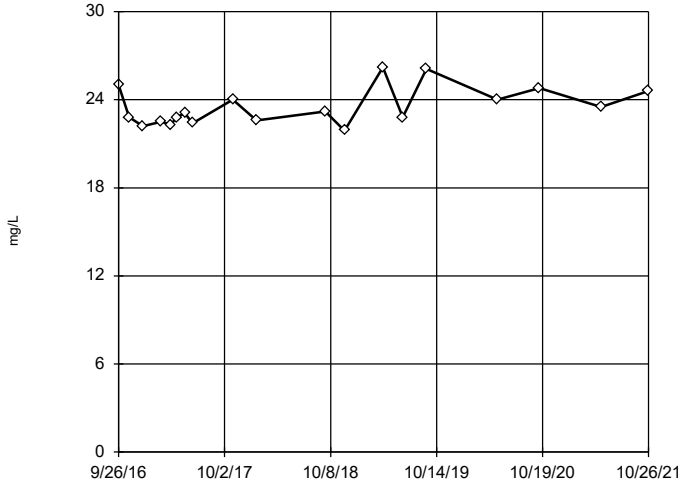
Constituent: Boron, total Analysis Run 7/18/2022 11:31 AM View: Outlier Testing

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1611



n = 19

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

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

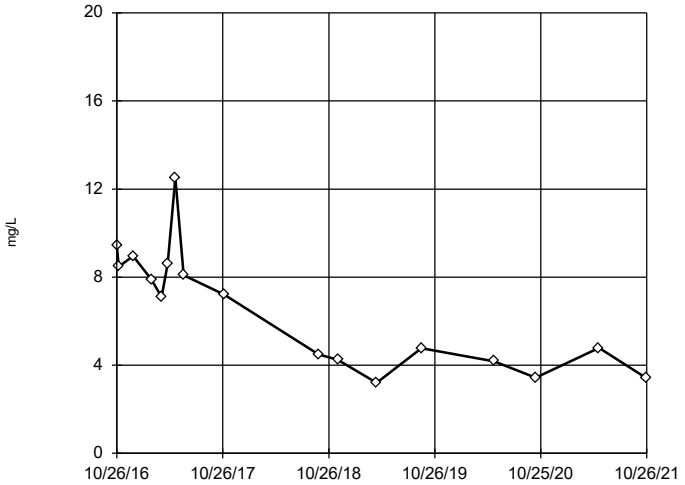
High cutoff = 32.15, low cutoff = 17.22, based on IQR multiplier of 3.

Constituent: Calcium, total Analysis Run 7/18/2022 11:31 AM View: Outlier Testing

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Tukey's Outlier Screening

MW-1612 (bg)



n = 17

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

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

High cutoff = 36.98, low cutoff = 0.03532, based on IQR multiplier of 3.

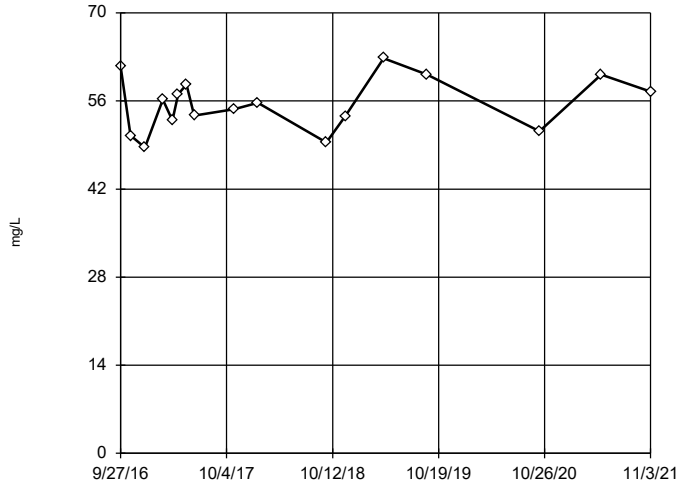
Constituent: Calcium, total Analysis Run 7/18/2022 11:31 AM View: Outlier Testing

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-26



n = 17

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

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

High cutoff = 81.45, low cutoff = 30, based on IQR multiplier of 3.

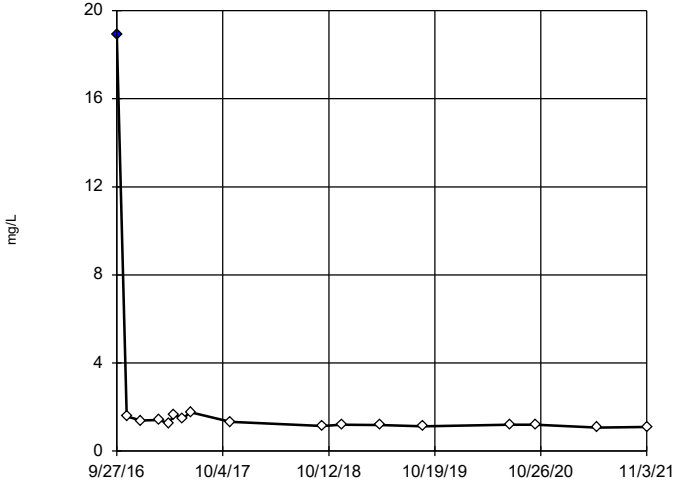
Constituent: Calcium, total Analysis Run 7/18/2022 11:31 AM View: Outlier Testing

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-27



n = 17

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

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

High cutoff = 3.417, low cutoff = 0.5196, based on IQR multiplier of 3.

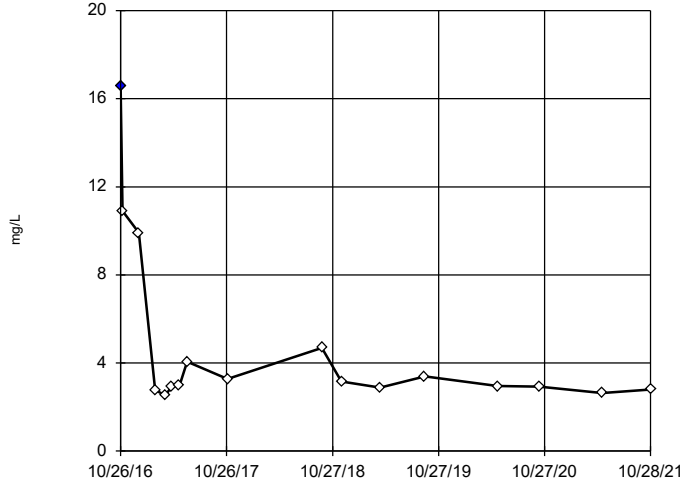
Constituent: Calcium, total Analysis Run 7/18/2022 11:31 AM View: Outlier Testing

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-30 (bg)



n = 17

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

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

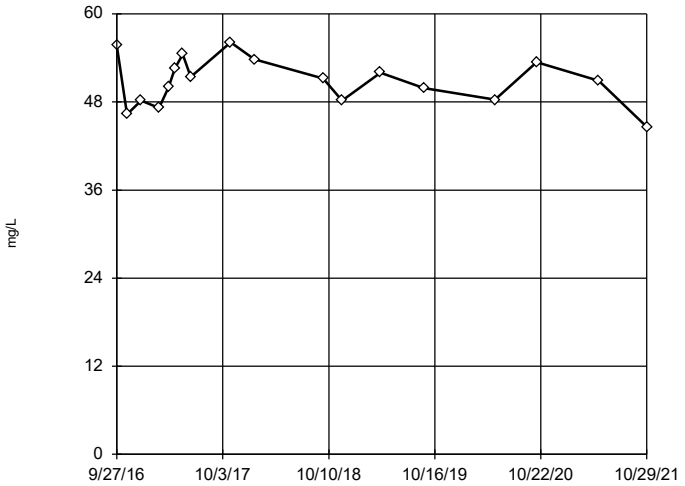
High cutoff = 15.83, low cutoff = 0.7826, based on IQR multiplier of 3.

Constituent: Calcium, total Analysis Run 7/18/2022 11:31 AM View: Outlier Testing

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Tukey's Outlier Screening

MW-38



n = 18

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

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

High cutoff = 69.8, low cutoff = 32, based on IQR multiplier of 3.

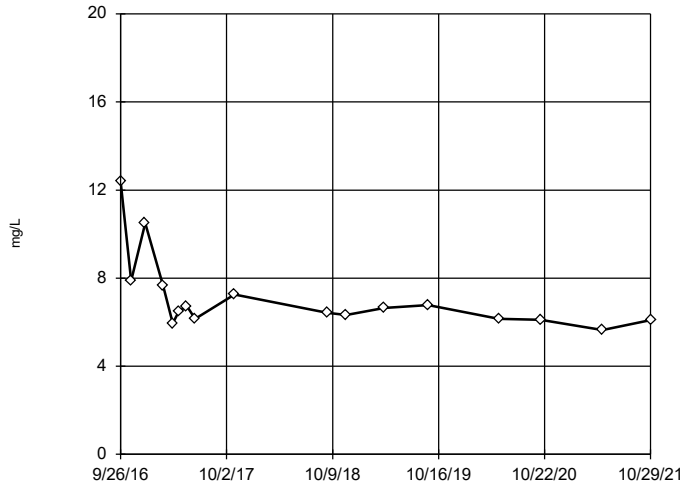
Constituent: Calcium, total Analysis Run 7/18/2022 11:32 AM View: Outlier Testing

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-39



n = 17

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

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

High cutoff = 13.35, low cutoff = 3.418, based on IQR multiplier of 3.

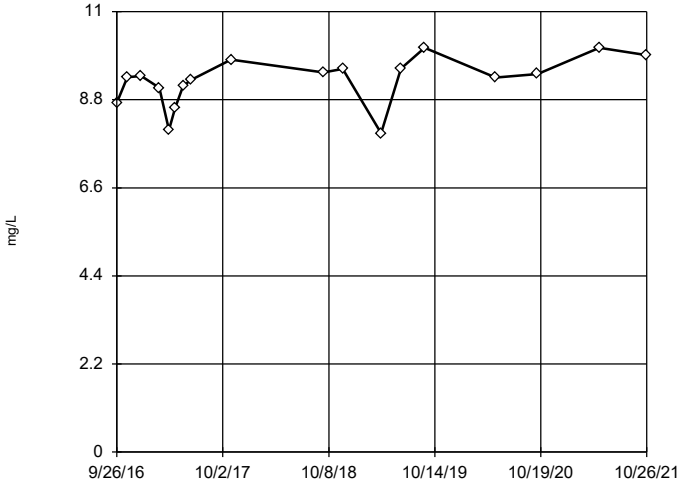
Constituent: Calcium, total Analysis Run 7/18/2022 11:32 AM View: Outlier Testing

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1611



n = 18

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

Data were x^6 transformed to achieve best W statistic (graph shown in original units).

High cutoff = 11.04, low cutoff = -8.828, based on IQR multiplier of 3.

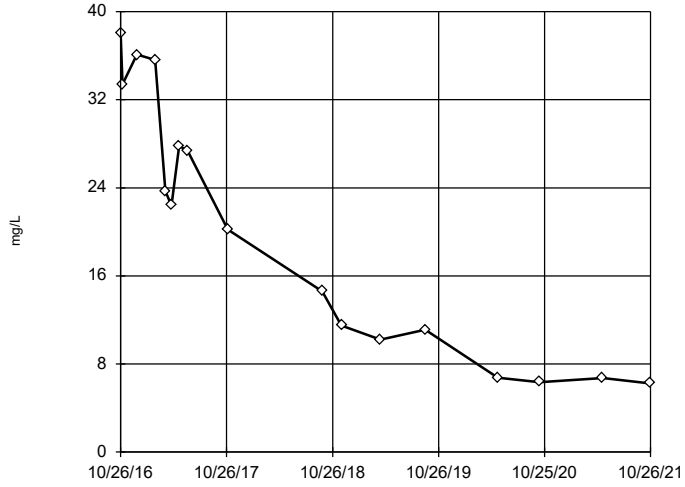
Constituent: Chloride, total Analysis Run 7/18/2022 11:32 AM View: Outlier Testing

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1612 (bg)



n = 17

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

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

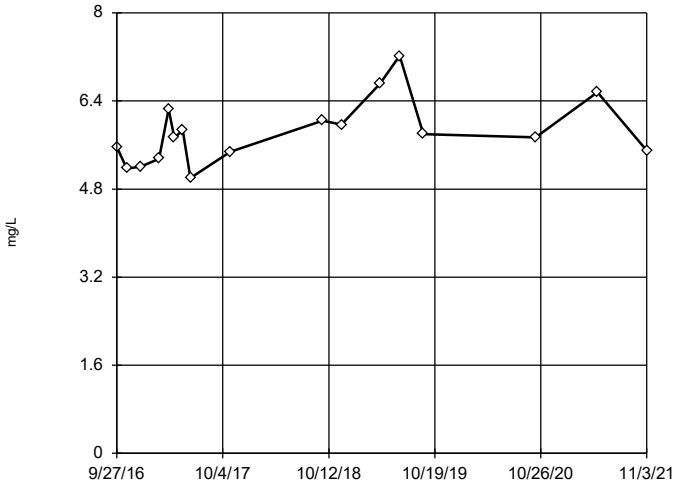
High cutoff = 180, low cutoff = -24.94, based on IQR multiplier of 3.

Constituent: Chloride, total Analysis Run 7/18/2022 11:32 AM View: Outlier Testing

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Tukey's Outlier Screening

MW-26



n = 17

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

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

High cutoff = 8.977, low cutoff = 3.706, based on IQR multiplier of 3.

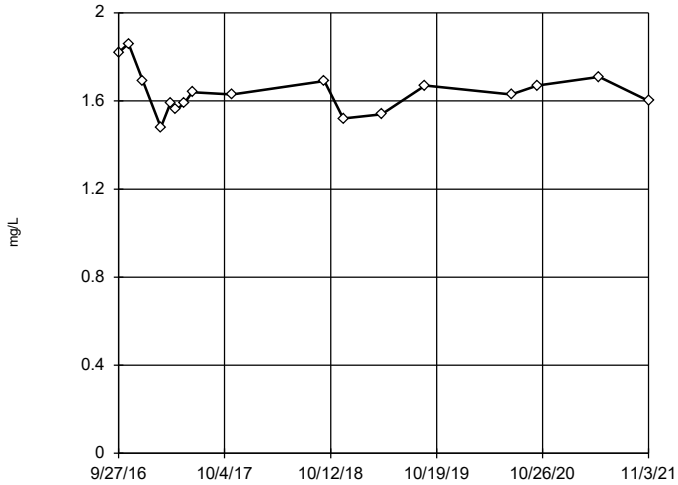
Constituent: Chloride, total Analysis Run 7/18/2022 11:32 AM View: Outlier Testing

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-27



n = 17

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

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

High cutoff = 2.088, low cutoff = 1.275, based on IQR multiplier of 3.

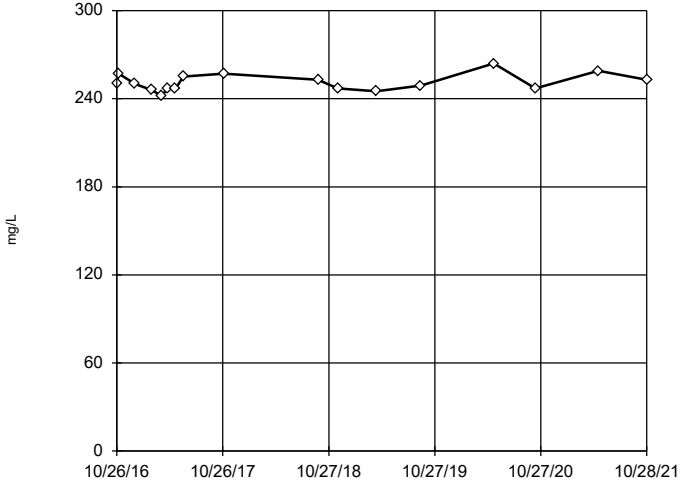
Constituent: Chloride, total Analysis Run 7/18/2022 11:32 AM View: Outlier Testing

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-30 (bg)



n = 17

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

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

High cutoff = 285, low cutoff = 221.9, based on IQR multiplier of 3.

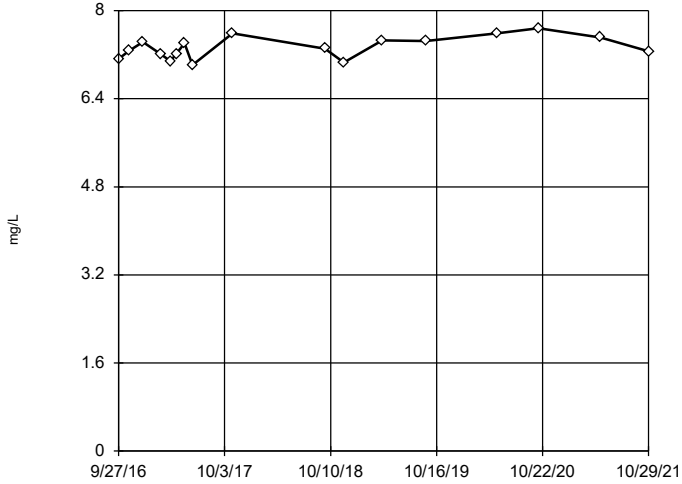
Constituent: Chloride, total Analysis Run 7/18/2022 11:32 AM View: Outlier Testing

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-38



n = 17

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

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

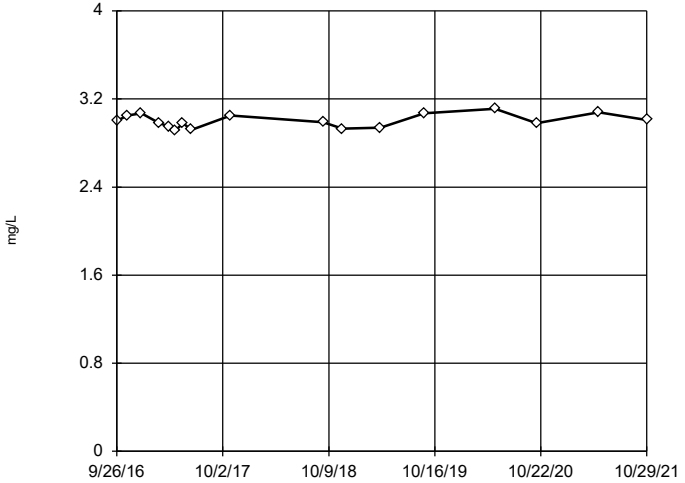
High cutoff = 8.445, low cutoff = 6.205, based on IQR multiplier of 3.

Constituent: Chloride, total Analysis Run 7/18/2022 11:32 AM View: Outlier Testing

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Tukey's Outlier Screening

MW-39



n = 17

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

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

High cutoff = 3.433, low cutoff = 2.625, based on IQR multiplier of 3.

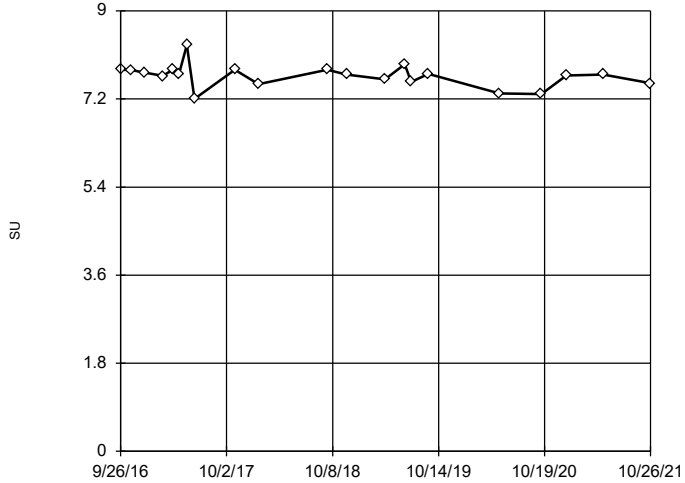
Constituent: Chloride, total Analysis Run 7/18/2022 11:32 AM View: Outlier Testing

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1611



n = 21

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

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

High cutoff = 8.652, low cutoff = 6.793, based on IQR multiplier of 3.

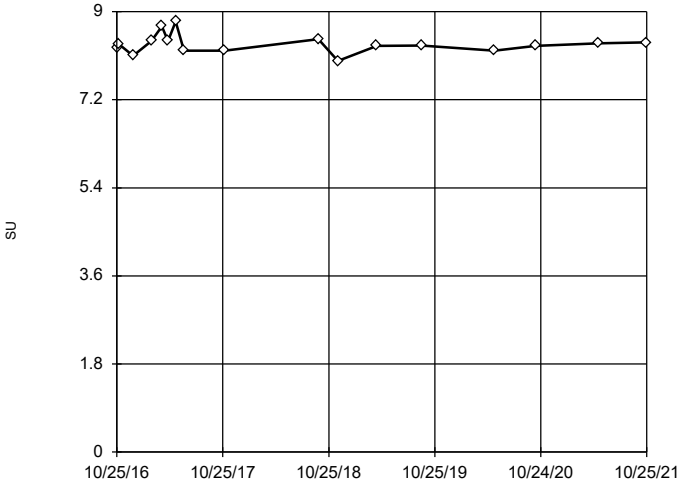
Constituent: pH, field Analysis Run 7/18/2022 11:32 AM View: Outlier Testing

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1612 (bg)



n = 17

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

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

High cutoff = 9.03, low cutoff = 7.628, based on IQR multiplier of 3.

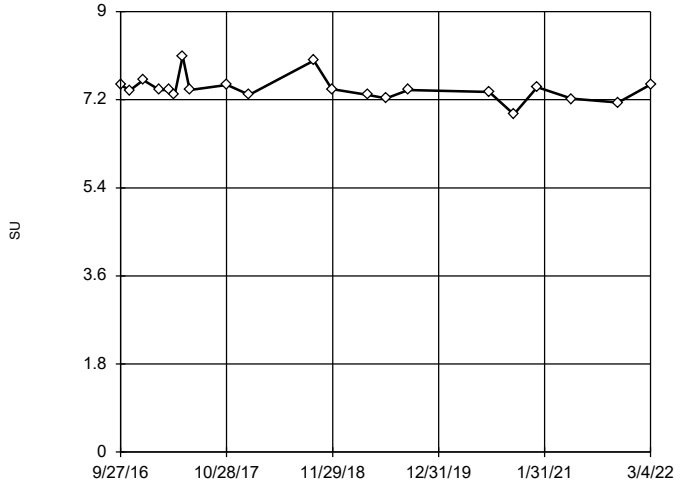
Constituent: pH, field Analysis Run 7/18/2022 11:32 AM View: Outlier Testing

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-26



n = 21

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

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

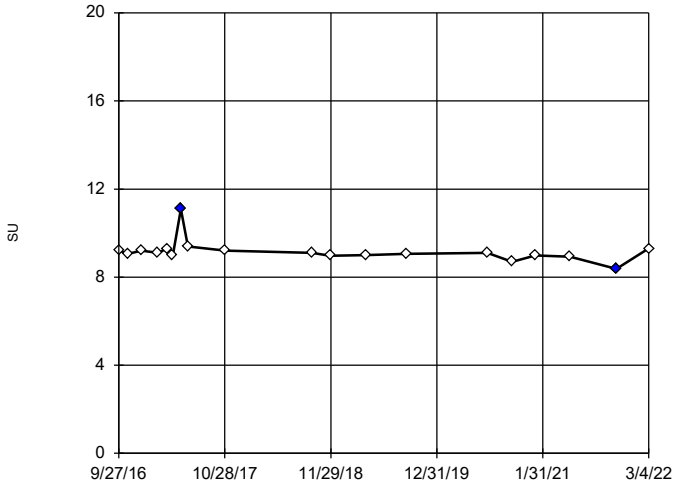
High cutoff = 8.133, low cutoff = 6.731, based on IQR multiplier of 3.

Constituent: pH, field Analysis Run 7/18/2022 11:32 AM View: Outlier Testing

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Tukey's Outlier Screening

MW-27



n = 19

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

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

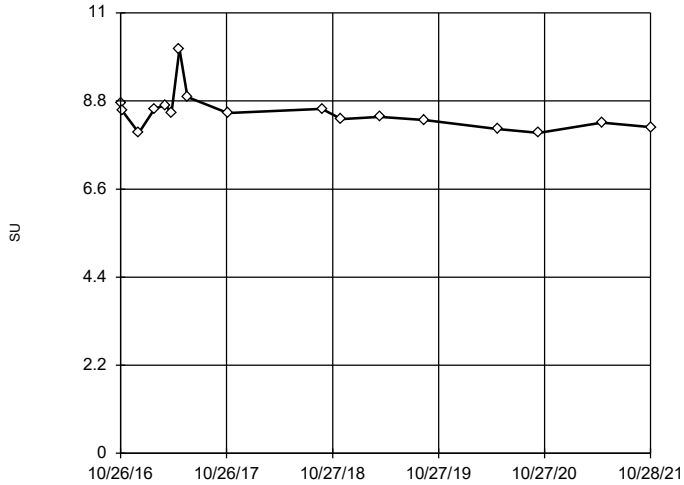
High cutoff = 9.86, low cutoff = 8.388, based on IQR multiplier of 3.

Constituent: pH, field Analysis Run 7/18/2022 11:32 AM View: Outlier Testing
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-30 (bg)



n = 17

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

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

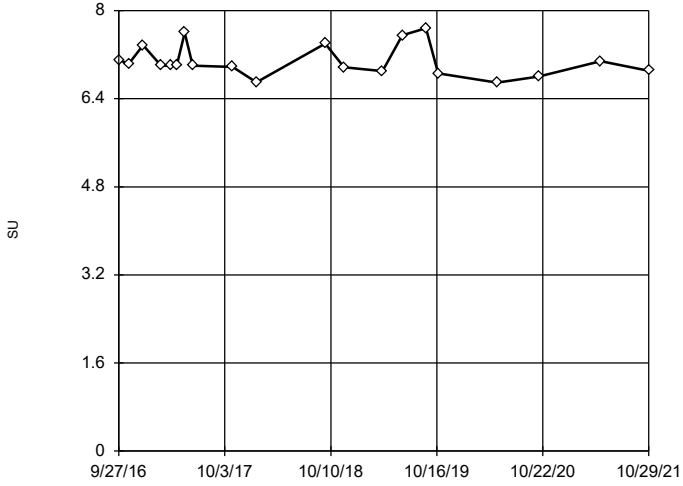
High cutoff = 10.14, low cutoff = 7.002, based on IQR multiplier of 3.

Constituent: pH, field Analysis Run 7/18/2022 11:32 AM View: Outlier Testing
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-38



n = 20

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

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

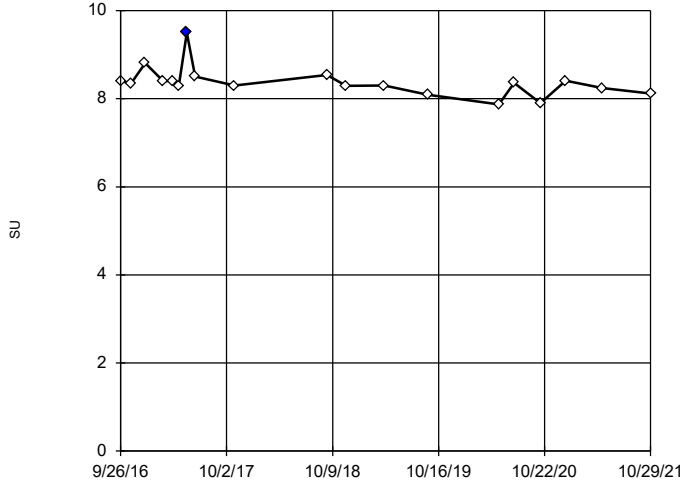
High cutoff = 8.317, low cutoff = 6.006, based on IQR multiplier of 3.

Constituent: pH, field Analysis Run 7/18/2022 11:32 AM View: Outlier Testing
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-39



n = 19

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

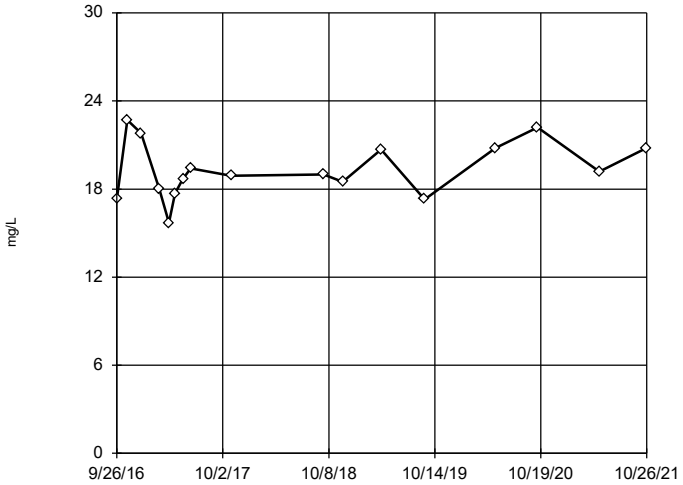
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 8.941, low cutoff = 7.75, based on IQR multiplier of 3.

Constituent: pH, field Analysis Run 7/18/2022 11:32 AM View: Outlier Testing
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Tukey's Outlier Screening

MW-1611



n = 17

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

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

High cutoff = 32.91, low cutoff = 11.28, based on IQR multiplier of 3.

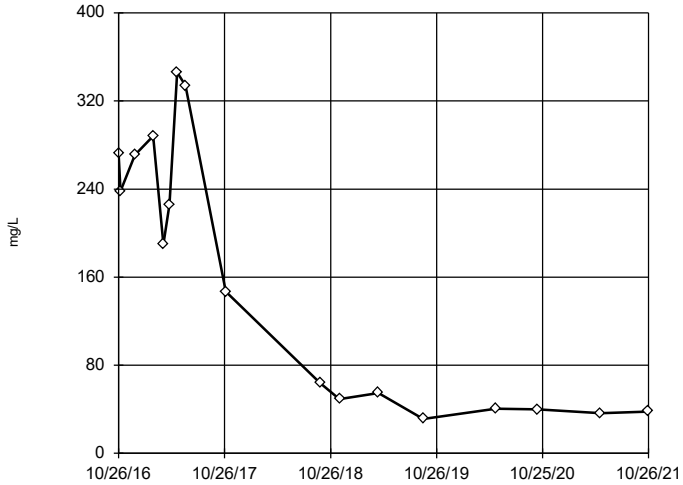
Constituent: Sulfate, total Analysis Run 7/18/2022 11:32 AM View: Outlier Testing

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1612 (bg)



n = 17

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

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

High cutoff = 965.3, low cutoff = -653.5, based on IQR multiplier of 3.

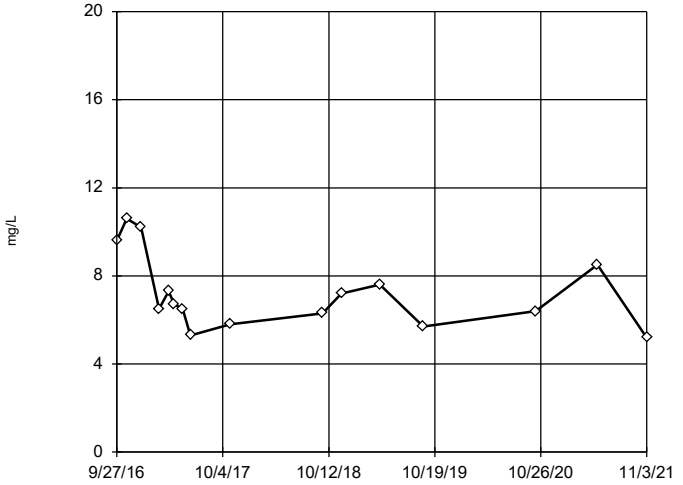
Constituent: Sulfate, total Analysis Run 7/18/2022 11:32 AM View: Outlier Testing

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-26



n = 16

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

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

High cutoff = 18.89, low cutoff = 2.572, based on IQR multiplier of 3.

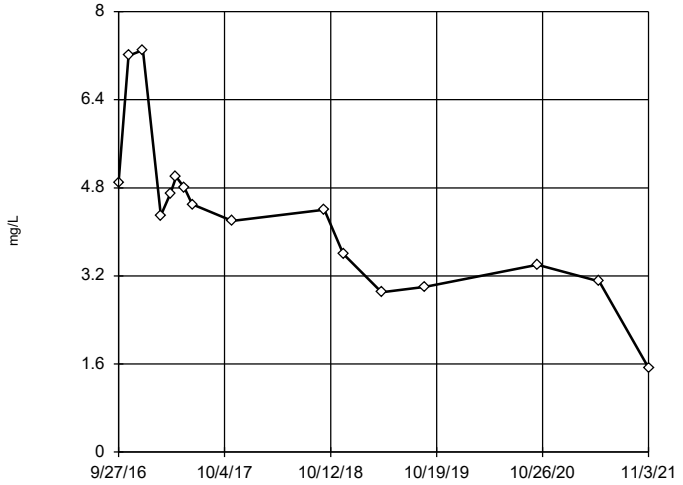
Constituent: Sulfate, total Analysis Run 7/18/2022 11:32 AM View: Outlier Testing

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-27



n = 16

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

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

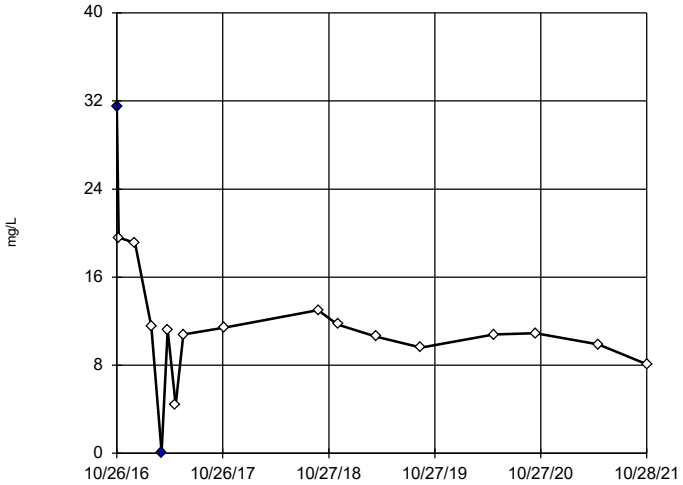
High cutoff = 11.57, low cutoff = 0.363, based on IQR multiplier of 3.

Constituent: Sulfate, total Analysis Run 7/18/2022 11:32 AM View: Outlier Testing

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Tukey's Outlier Screening

MW-30 (bg)



n = 17

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

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

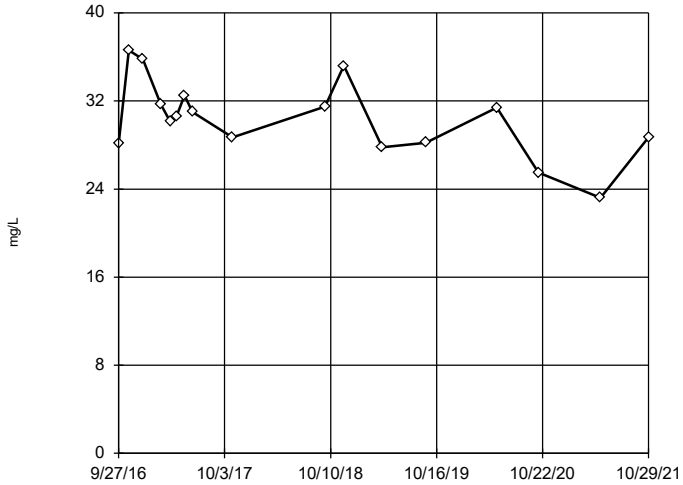
High cutoff = 21.95, low cutoff = 3.804, based on IQR multiplier of 3.

Constituent: Sulfate, total Analysis Run 7/18/2022 11:32 AM View: Outlier Testing
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-38



n = 17

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

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

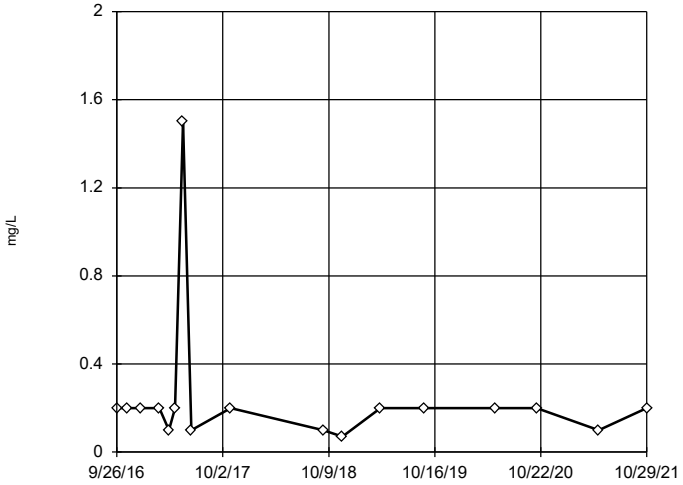
High cutoff = 43.95, low cutoff = 16.3, based on IQR multiplier of 3.

Constituent: Sulfate, total Analysis Run 7/18/2022 11:32 AM View: Outlier Testing
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-39



n = 17

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

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

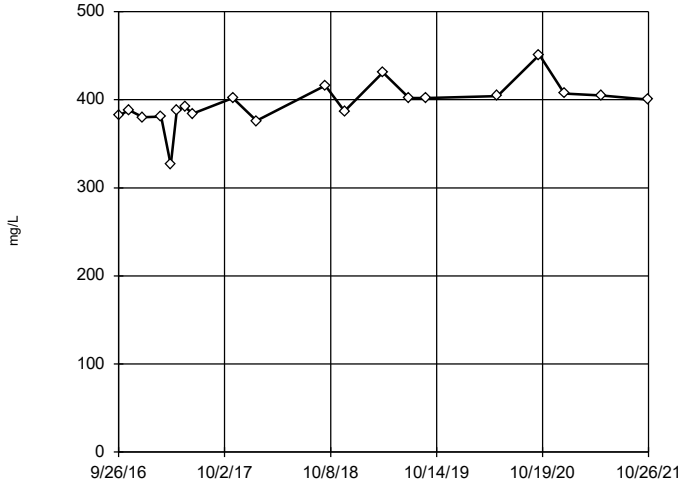
High cutoff = 1.6, low cutoff = 0.0125, based on IQR multiplier of 3.

Constituent: Sulfate, total Analysis Run 7/18/2022 11:32 AM View: Outlier Testing
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1611



n = 20

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

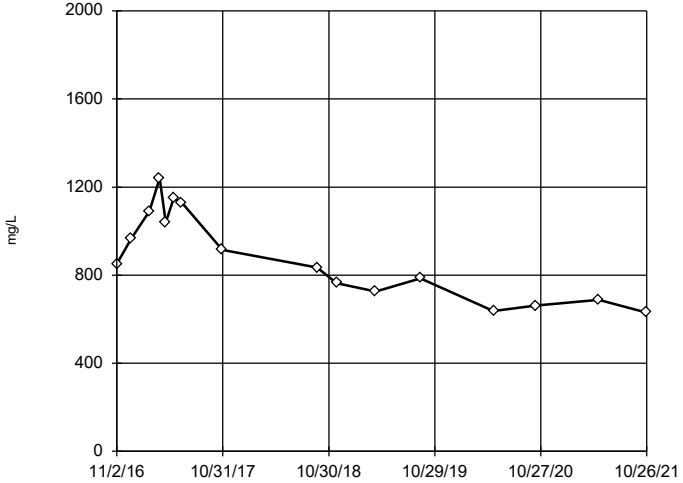
Data were cube transformed to achieve best W statistic (graph shown in original units).

High cutoff = 458.2, low cutoff = 296.9, based on IQR multiplier of 3.

Constituent: Total Dissolved Solids [TDS] Analysis Run 7/18/2022 11:32 AM View: Outlier Testing
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Tukey's Outlier Screening

MW-1612 (bg)



n = 16

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

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

High cutoff = 3648, low cutoff = 206.1, based on IQR multiplier of 3.

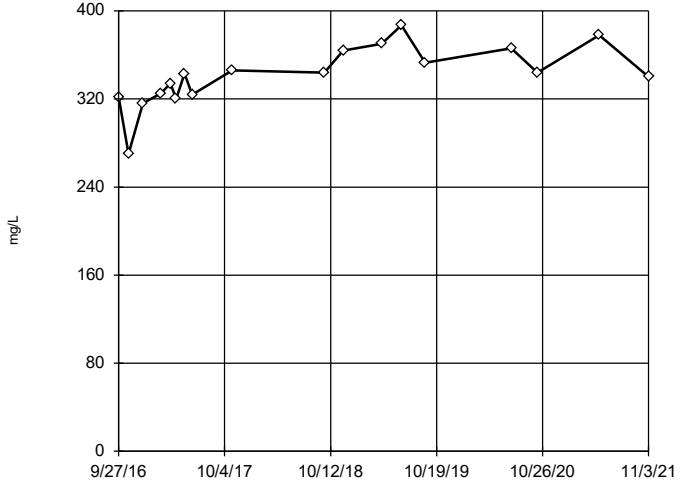
Constituent: Total Dissolved Solids [TDS] Analysis Run 7/18/2022 11:32 AM View: Outlier Testing

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-26



n = 18

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

Data were x^4 transformed to achieve best W statistic (graph shown in original units).

High cutoff = 442.5, low cutoff = -313.9, based on IQR multiplier of 3.

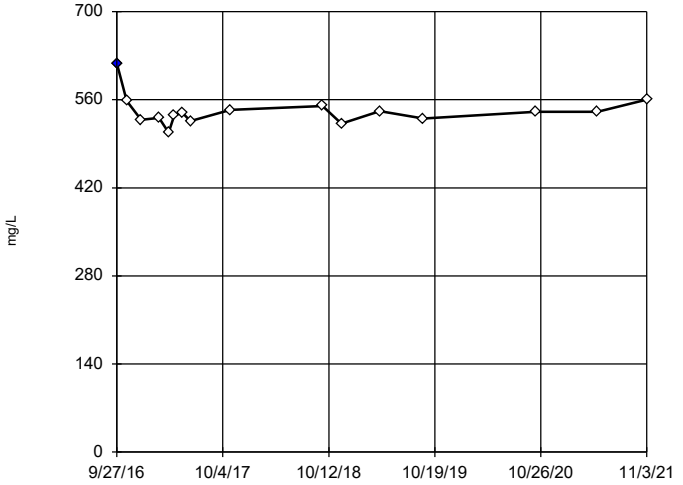
Constituent: Total Dissolved Solids [TDS] Analysis Run 7/18/2022 11:32 AM View: Outlier Testing

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-27



n = 16

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

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

High cutoff = 604.7, low cutoff = 478.5, based on IQR multiplier of 3.

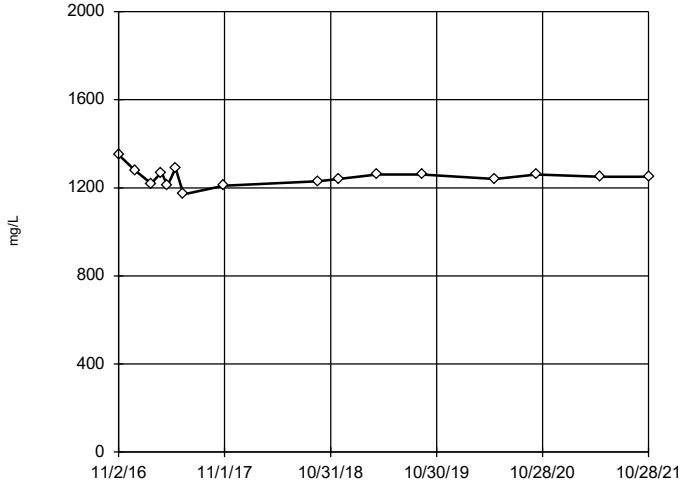
Constituent: Total Dissolved Solids [TDS] Analysis Run 7/18/2022 11:32 AM View: Outlier Testing

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-30 (bg)



n = 16

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

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

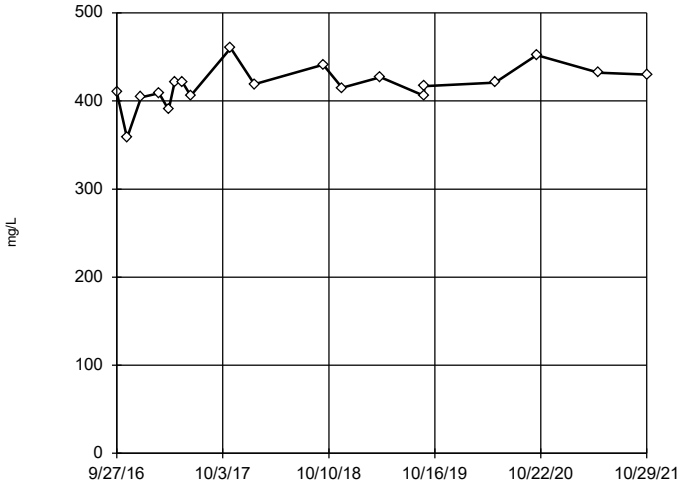
High cutoff = 1393, low cutoff = 1112, based on IQR multiplier of 3.

Constituent: Total Dissolved Solids [TDS] Analysis Run 7/18/2022 11:32 AM View: Outlier Testing

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Tukey's Outlier Screening

MW-38



n = 19

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

Data were x^4 transformed to achieve best W statistic (graph shown in original units).

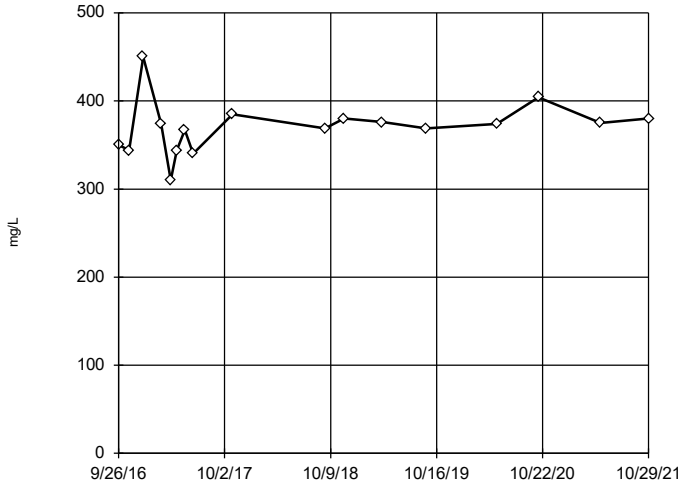
High cutoff = 484.8, low cutoff = 279.7, based on IQR multiplier of 3.

Constituent: Total Dissolved Solids [TDS] Analysis Run 7/18/2022 11:32 AM View: Outlier Testing
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-39



n = 17

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

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

High cutoff = 499.1, low cutoff = 264.2, based on IQR multiplier of 3.

Constituent: Total Dissolved Solids [TDS] Analysis Run 7/18/2022 11:32 AM View: Outlier Testing
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Mann-Whitney Summary - Significant Results

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill Printed 7/18/2022, 11:48 AM

Constituent	Well	Calc.	0.01	Sig.	Method
Boron, total (mg/L)	**MW-1611**	**-2.691**	**Yes**	**Yes**	**Mann-W**
Boron, total (mg/L)	**MW-1612 (bg)**	**-3.111**	**Yes**	**Yes**	**Mann-W**
Calcium, total (mg/L)	**MW-27**	**-2.613**	**Yes**	**Yes**	**Mann-W**
Chloride, total (mg/L)	**MW-1612 (bg)**	**-3.11**	**Yes**	**Yes**	**Mann-W**
pH, field (SU)	**MW-30 (bg)**	**-2.668**	**Yes**	**Yes**	**Mann-W**
Sulfate, total (mg/L)	**MW-1612 (bg)**	**-3.215**	**Yes**	**Yes**	**Mann-W**
Sulfate, total (mg/L)	**MW-27**	**-2.607**	**Yes**	**Yes**	**Mann-W**
Total Dissolved Solids [TDS] (mg/L)	**MW-1612 (bg)**	**-2.945**	**Yes**	**Yes**	**Mann-W**

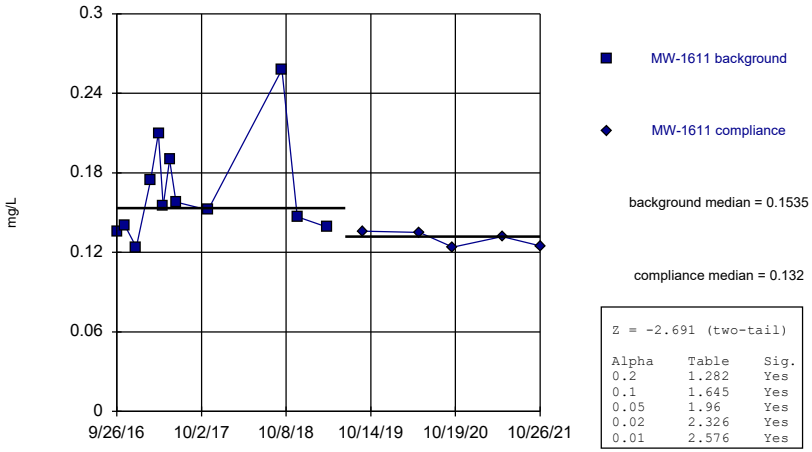
Mann-Whitney Summary - All Results

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill Printed 7/18/2022, 11:48 AM

Constituent	Well	Calc.	0.01	Sig.	Method
Boron, total (mg/L)	**MW-1611**	**-2.691**	**Yes**	**Yes**	**Mann-W**
Boron, total (mg/L)	**MW-1612 (bg)**	**-3.111**	**Yes**	**Yes**	**Mann-W**
Boron, total (mg/L)	MW-26	-2.122	No	No	Mann-W
Boron, total (mg/L)	MW-27	-1.456	No	No	Mann-W
Boron, total (mg/L)	MW-30 (bg)	-1.214	No	No	Mann-W
Boron, total (mg/L)	MW-38	-1.481	No	No	Mann-W
Boron, total (mg/L)	MW-39	-1.003	No	No	Mann-W
Calcium, total (mg/L)	MW-1611	2.227	No	No	Mann-W
Calcium, total (mg/L)	MW-1612 (bg)	-2.266	No	No	Mann-W
Calcium, total (mg/L)	MW-26	0.963	No	No	Mann-W
Calcium, total (mg/L)	**MW-27**	**-2.613**	**Yes**	**Yes**	**Mann-W**
Calcium, total (mg/L)	MW-30 (bg)	-1.318	No	No	Mann-W
Calcium, total (mg/L)	MW-38	-1.085	No	No	Mann-W
Calcium, total (mg/L)	MW-39	-2.109	No	No	Mann-W
Chloride, total (mg/L)	MW-1611	2.17	No	No	Mann-W
Chloride, total (mg/L)	**MW-1612 (bg)**	**-3.11**	**Yes**	**Yes**	**Mann-W**
Chloride, total (mg/L)	MW-26	0.3963	No	No	Mann-W
Chloride, total (mg/L)	MW-27	0.8453	No	No	Mann-W
Chloride, total (mg/L)	MW-30 (bg)	1.328	No	No	Mann-W
Chloride, total (mg/L)	MW-38	2.109	No	No	Mann-W
Chloride, total (mg/L)	MW-39	2.116	No	No	Mann-W
pH, field (SU)	MW-1611	-1.7	No	No	Mann-W
pH, field (SU)	MW-1612 (bg)	0.0569	No	No	Mann-W
pH, field (SU)	MW-26	-1.235	No	No	Mann-W
pH, field (SU)	MW-27	-1.822	No	No	Mann-W
pH, field (SU)	**MW-30 (bg)**	**-2.668**	**Yes**	**Yes**	**Mann-W**
pH, field (SU)	MW-38	-1.189	No	No	Mann-W
pH, field (SU)	MW-39	-2.365	No	No	Mann-W
Sulfate, total (mg/L)	MW-1611	1.055	No	No	Mann-W
Sulfate, total (mg/L)	**MW-1612 (bg)**	**-3.215**	**Yes**	**Yes**	**Mann-W**
Sulfate, total (mg/L)	MW-26	-1.396	No	No	Mann-W
Sulfate, total (mg/L)	**MW-27**	**-2.607**	**Yes**	**Yes**	**Mann-W**
Sulfate, total (mg/L)	MW-30 (bg)	-1.793	No	No	Mann-W
Sulfate, total (mg/L)	MW-38	-2.109	No	No	Mann-W
Sulfate, total (mg/L)	MW-39	0.3782	No	No	Mann-W
Total Dissolved Solids [TDS] (mg/L)	MW-1611	2.355	No	No	Mann-W
Total Dissolved Solids [TDS] (mg/L)	**MW-1612 (bg)**	**-2.945**	**Yes**	**Yes**	**Mann-W**
Total Dissolved Solids [TDS] (mg/L)	MW-26	1.529	No	No	Mann-W
Total Dissolved Solids [TDS] (mg/L)	MW-27	0.5461	No	No	Mann-W
Total Dissolved Solids [TDS] (mg/L)	MW-30 (bg)	0.2847	No	No	Mann-W
Total Dissolved Solids [TDS] (mg/L)	MW-38	1.185	No	No	Mann-W
Total Dissolved Solids [TDS] (mg/L)	MW-39	1.268	No	No	Mann-W

Mann-Whitney (Wilcoxon Rank Sum)

MW-1611



Z = -2.691 (two-tail)

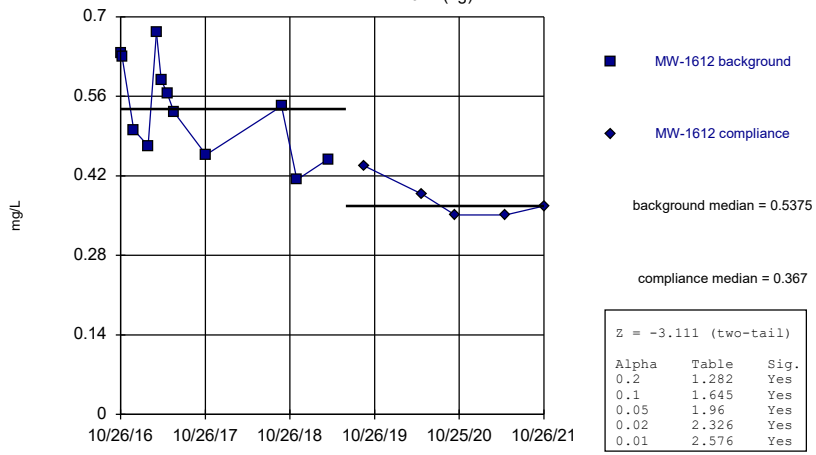
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	Yes
0.01	2.576	Yes

Constituent: Boron, total Analysis Run 7/18/2022 11:46 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-1612 (bg)



Z = -3.111 (two-tail)

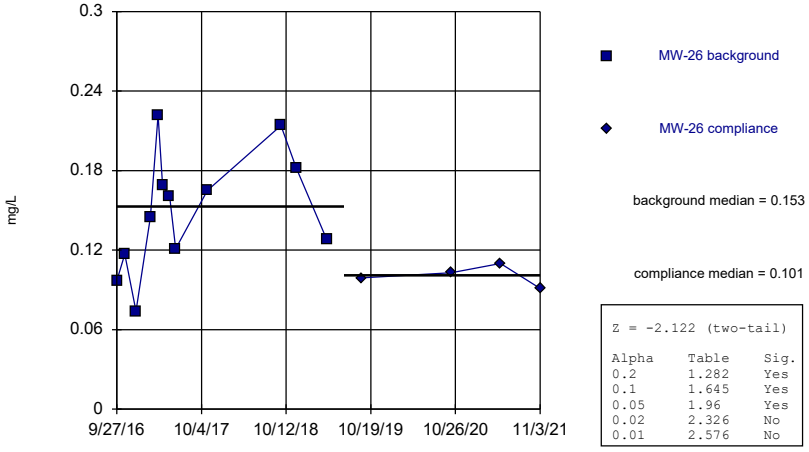
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	Yes
0.01	2.576	Yes

Constituent: Boron, total Analysis Run 7/18/2022 11:46 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-26



Z = -2.122 (two-tail)

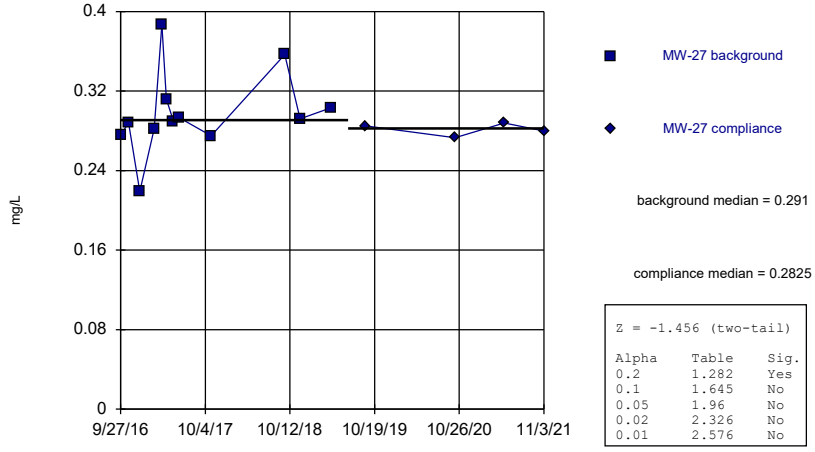
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	No
0.01	2.576	No

Constituent: Boron, total Analysis Run 7/18/2022 11:46 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-27



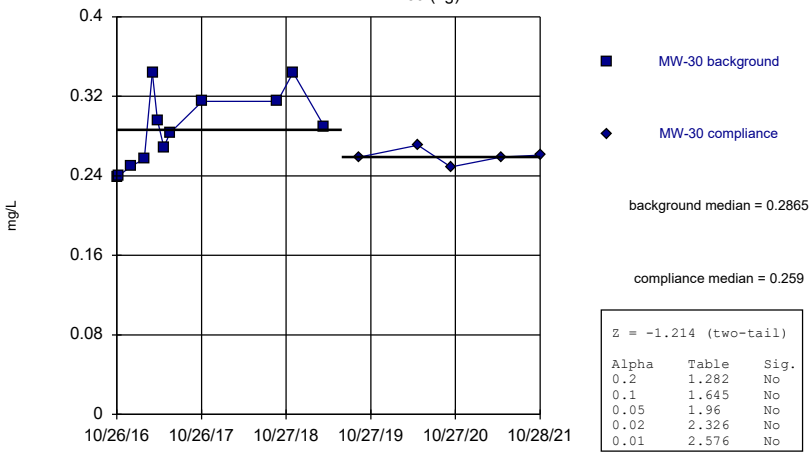
Z = -1.456 (two-tail)

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

Constituent: Boron, total Analysis Run 7/18/2022 11:46 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Mann-Whitney (Wilcoxon Rank Sum)

MW-30 (bg)



background median = 0.2865

compliance median = 0.259

Z = -1.214 (two-tail)

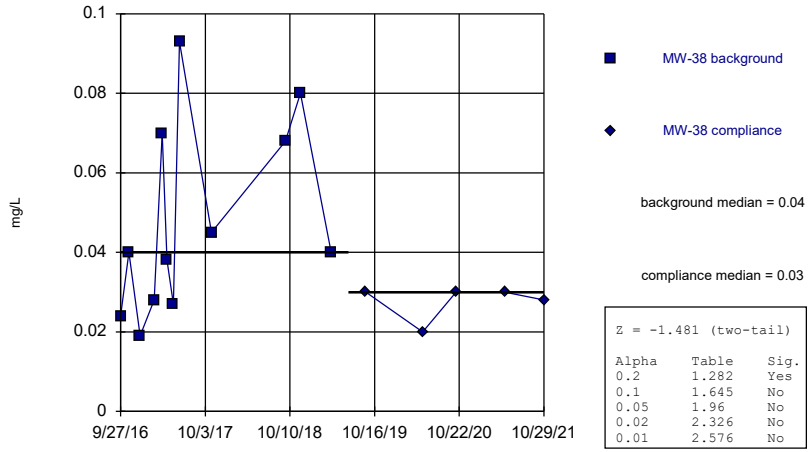
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Boron, total Analysis Run 7/18/2022 11:46 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-38



background median = 0.04

compliance median = 0.03

Z = -1.481 (two-tail)

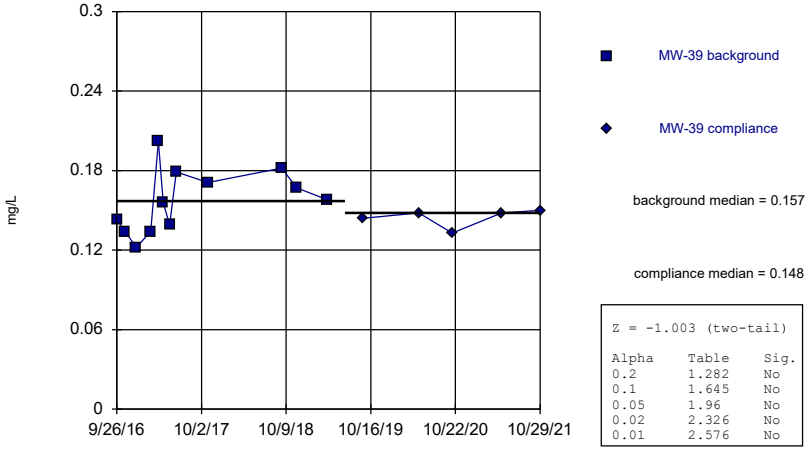
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Boron, total Analysis Run 7/18/2022 11:46 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-39



background median = 0.157

compliance median = 0.148

Z = -1.003 (two-tail)

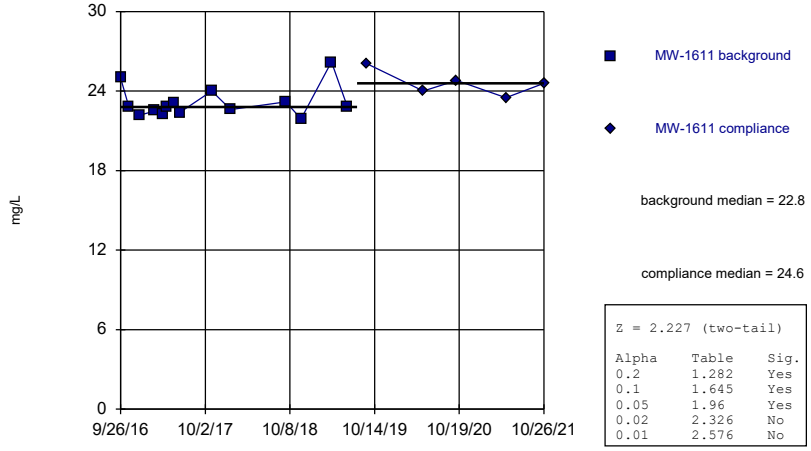
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Boron, total Analysis Run 7/18/2022 11:46 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-1611



background median = 22.8

compliance median = 24.6

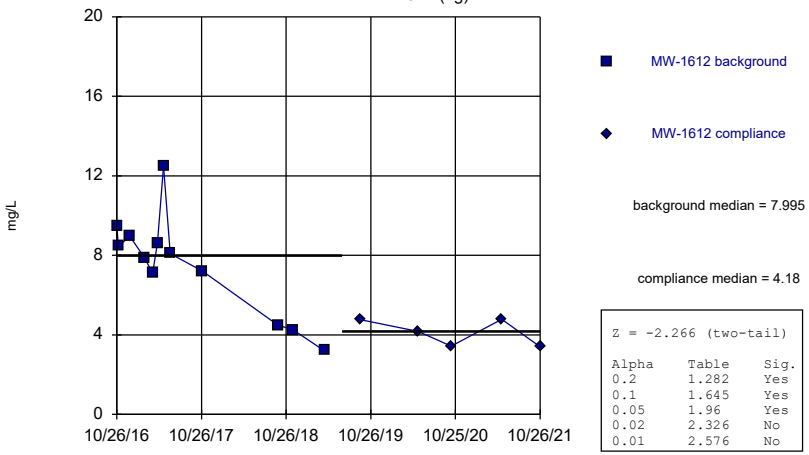
Z = 2.227 (two-tail)

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

Constituent: Calcium, total Analysis Run 7/18/2022 11:46 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Mann-Whitney (Wilcoxon Rank Sum)

MW-1612 (bg)



Z = -2.266 (two-tail)

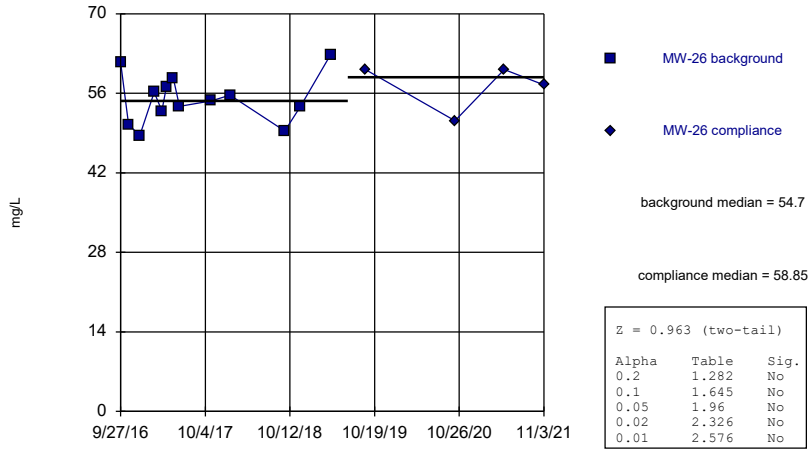
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	No
0.01	2.576	No

Constituent: Calcium, total Analysis Run 7/18/2022 11:46 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-26



Z = 0.963 (two-tail)

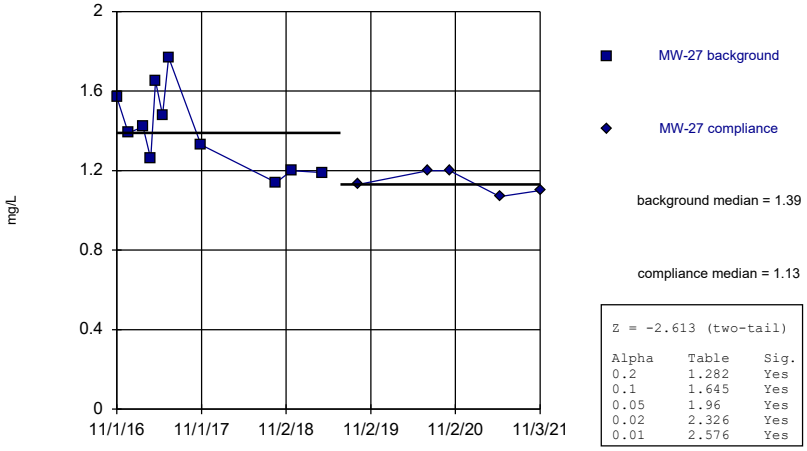
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Calcium, total Analysis Run 7/18/2022 11:46 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-27



Z = -2.613 (two-tail)

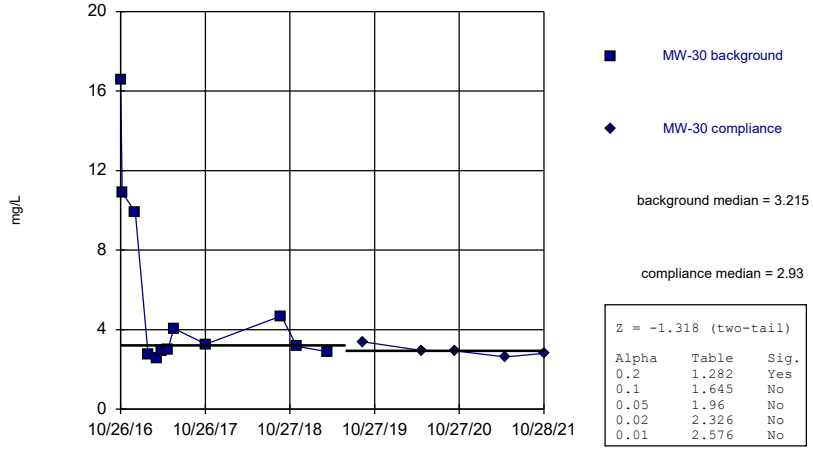
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	Yes
0.01	2.576	Yes

Constituent: Calcium, total Analysis Run 7/18/2022 11:46 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-30 (bg)



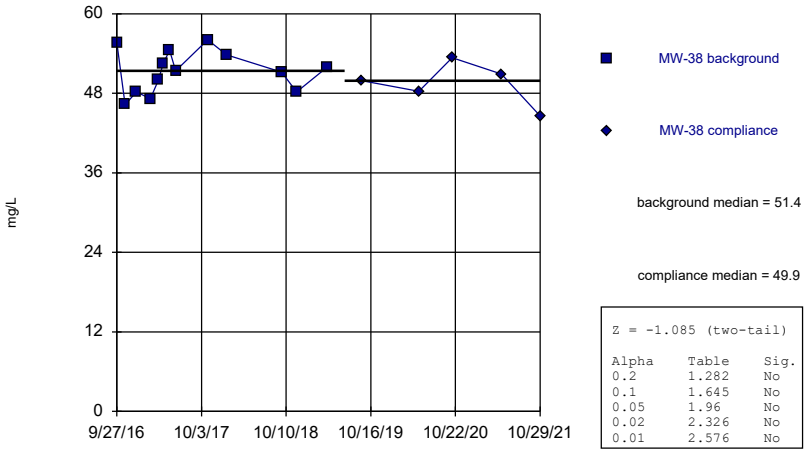
Z = -1.318 (two-tail)

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

Constituent: Calcium, total Analysis Run 7/18/2022 11:46 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Mann-Whitney (Wilcoxon Rank Sum)

MW-38



Z = -1.085 (two-tail)

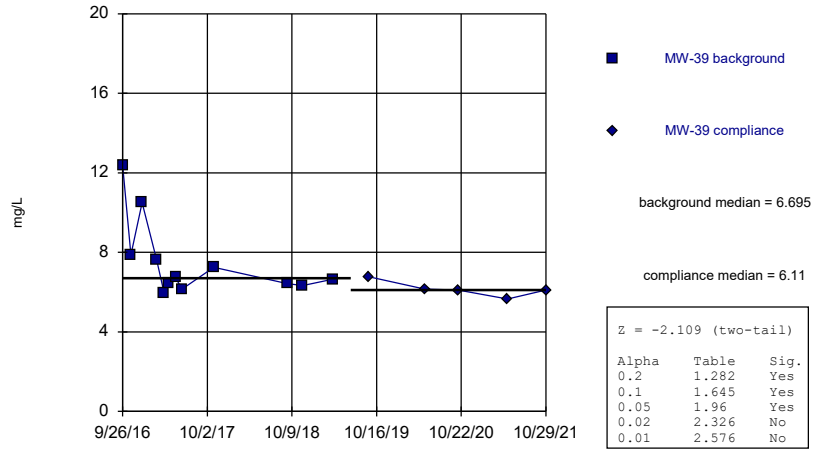
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Calcium, total Analysis Run 7/18/2022 11:46 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-39



Z = -2.109 (two-tail)

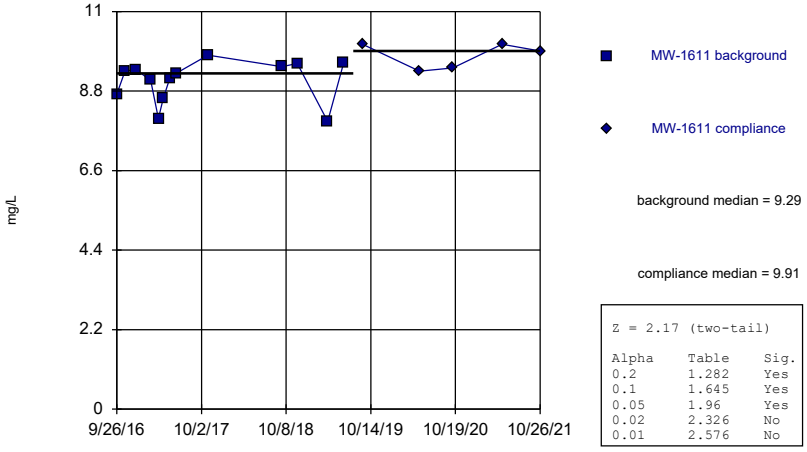
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	No
0.01	2.576	No

Constituent: Calcium, total Analysis Run 7/18/2022 11:46 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-1611



Z = 2.17 (two-tail)

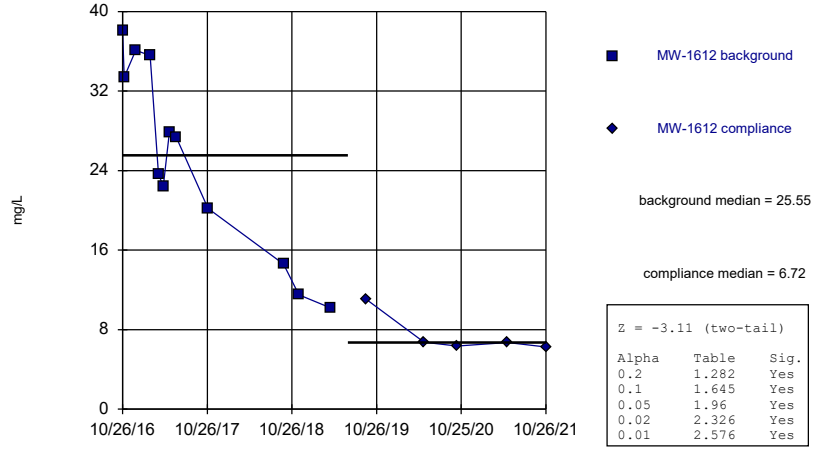
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	No
0.01	2.576	No

Constituent: Chloride, total Analysis Run 7/18/2022 11:47 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-1612 (bg)



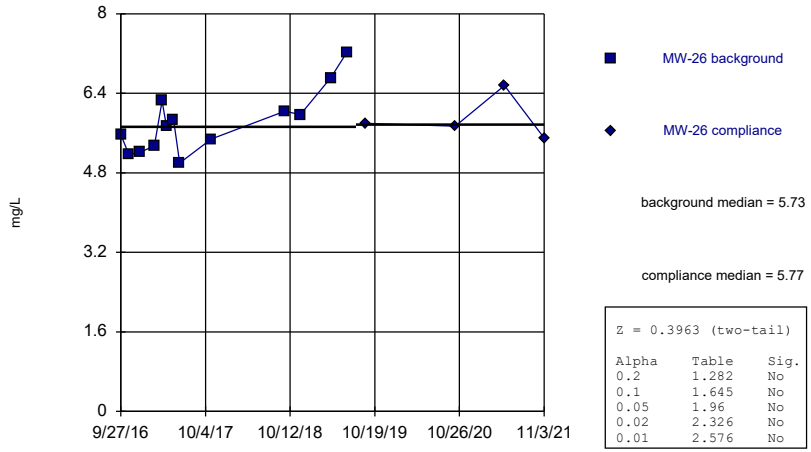
Z = -3.11 (two-tail)

Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	Yes
0.01	2.576	Yes

Constituent: Chloride, total Analysis Run 7/18/2022 11:47 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Mann-Whitney (Wilcoxon Rank Sum)

MW-26

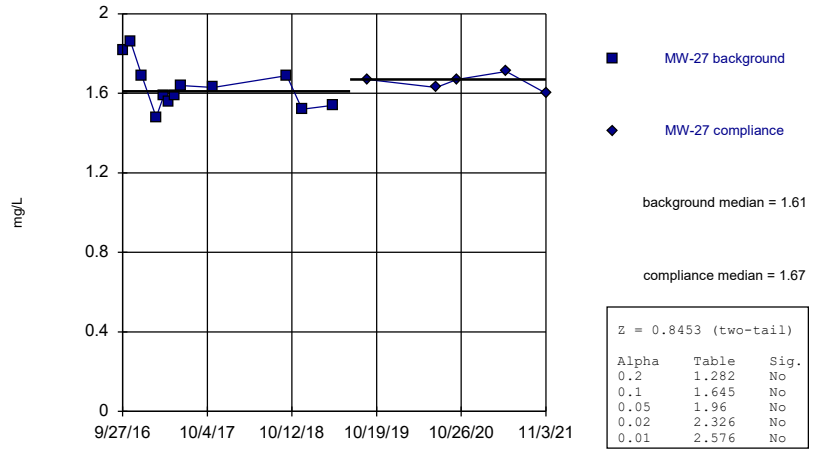


Constituent: Chloride, total Analysis Run 7/18/2022 11:47 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-27

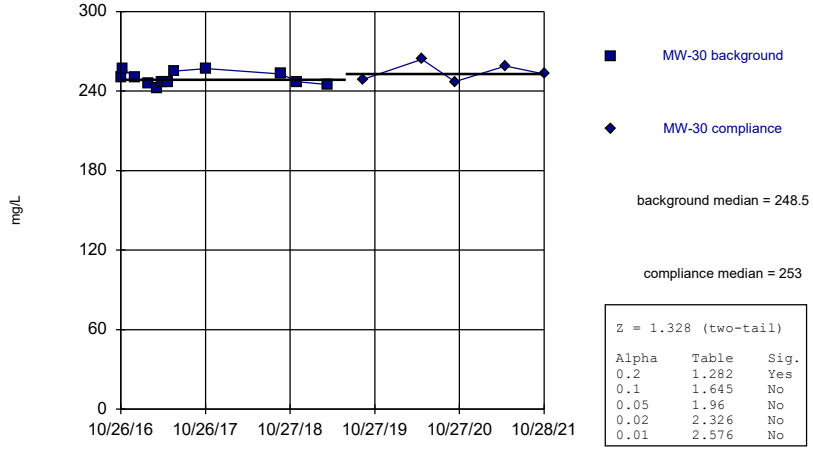


Constituent: Chloride, total Analysis Run 7/18/2022 11:47 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-30 (bg)

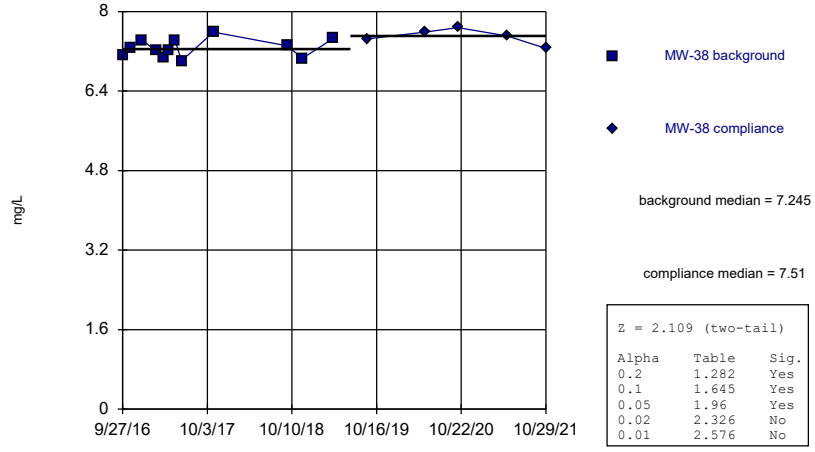


Constituent: Chloride, total Analysis Run 7/18/2022 11:47 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

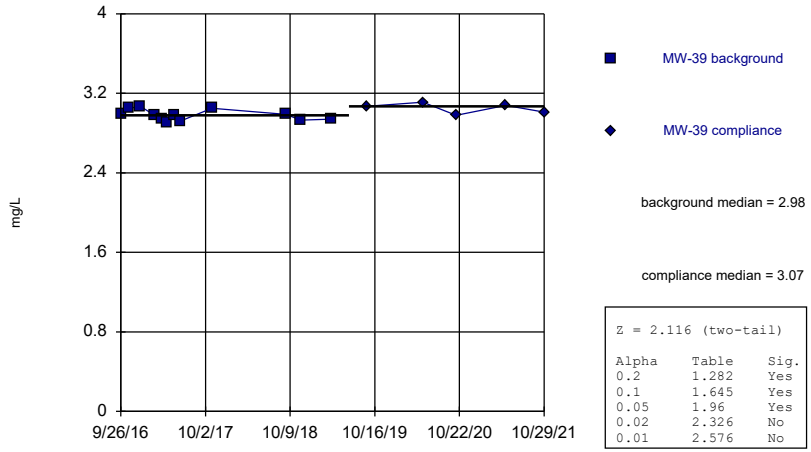
MW-38



Constituent: Chloride, total Analysis Run 7/18/2022 11:47 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Mann-Whitney (Wilcoxon Rank Sum)

MW-39

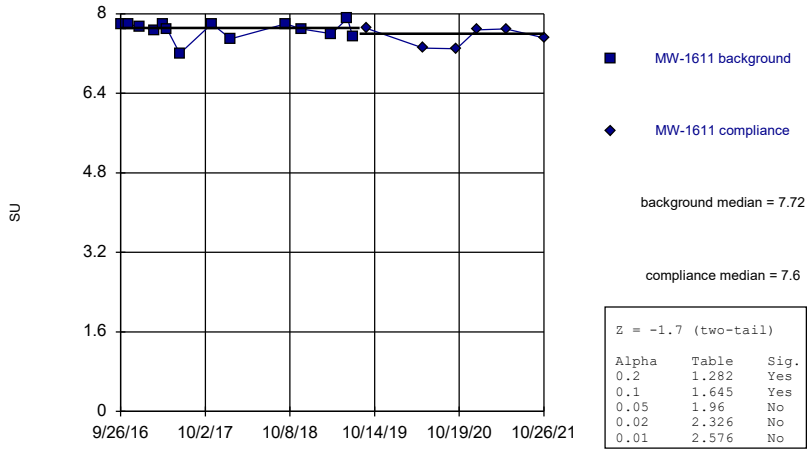


Constituent: Chloride, total Analysis Run 7/18/2022 11:47 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-1611

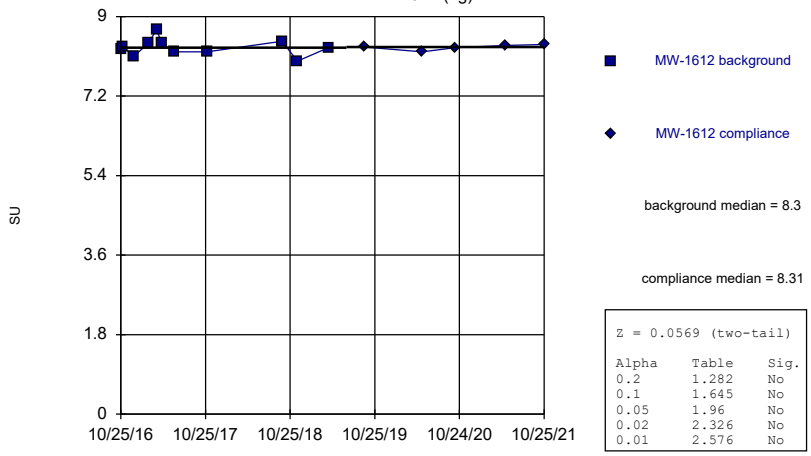


Constituent: pH, field Analysis Run 7/18/2022 11:47 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-1612 (bg)

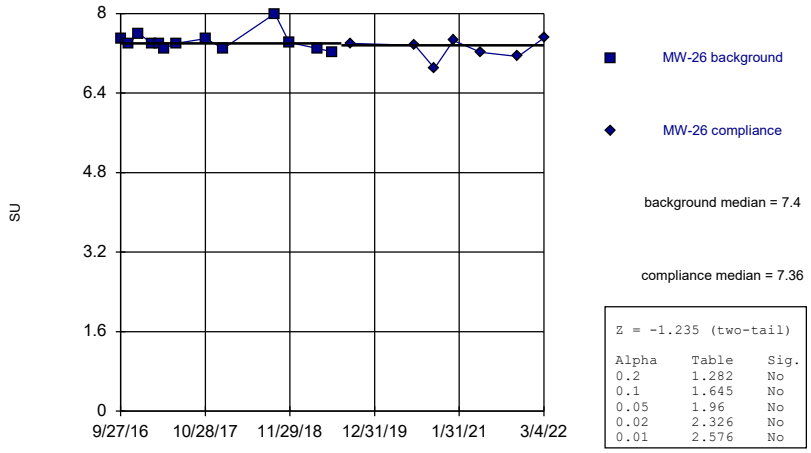


Constituent: pH, field Analysis Run 7/18/2022 11:47 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

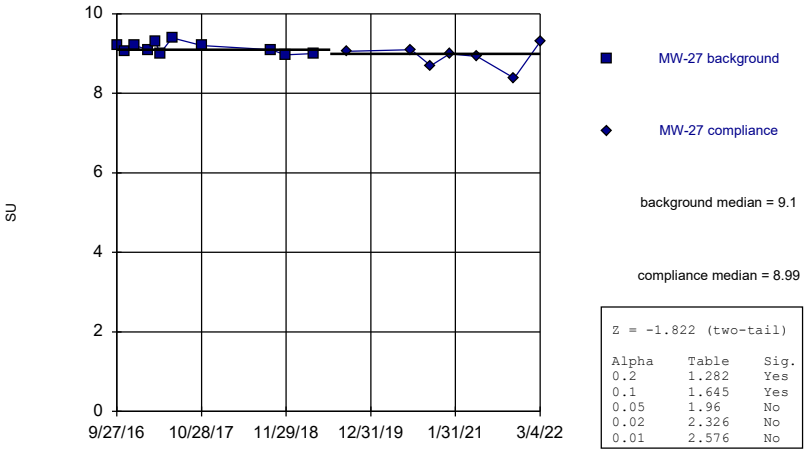
MW-26



Constituent: pH, field Analysis Run 7/18/2022 11:47 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Mann-Whitney (Wilcoxon Rank Sum)

MW-27



background median = 9.1

compliance median = 8.99

Z = -1.822 (two-tail)

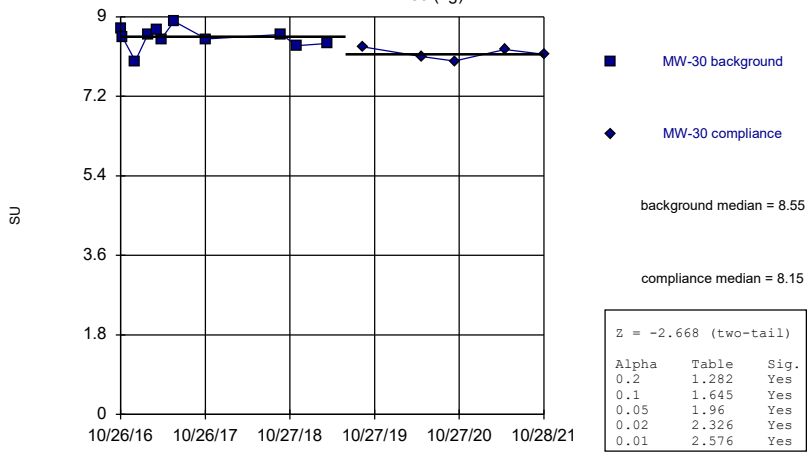
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: pH, field Analysis Run 7/18/2022 11:47 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-30 (bg)



background median = 8.55

compliance median = 8.15

Z = -2.668 (two-tail)

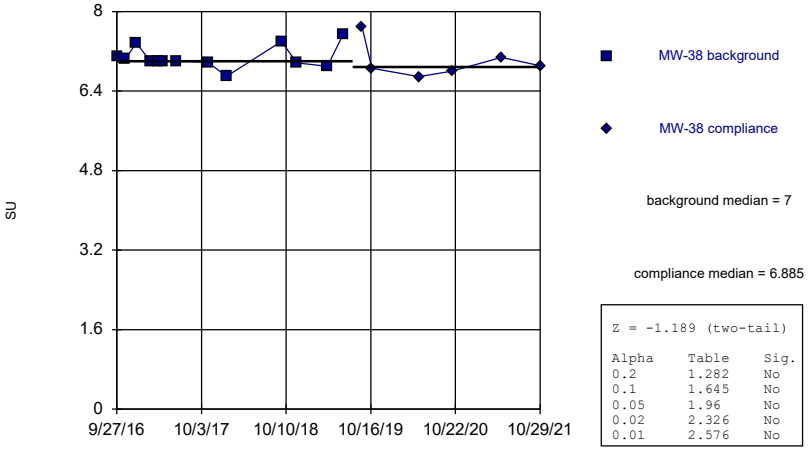
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	Yes
0.01	2.576	Yes

Constituent: pH, field Analysis Run 7/18/2022 11:47 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-38



background median = 7

compliance median = 6.885

Z = -1.189 (two-tail)

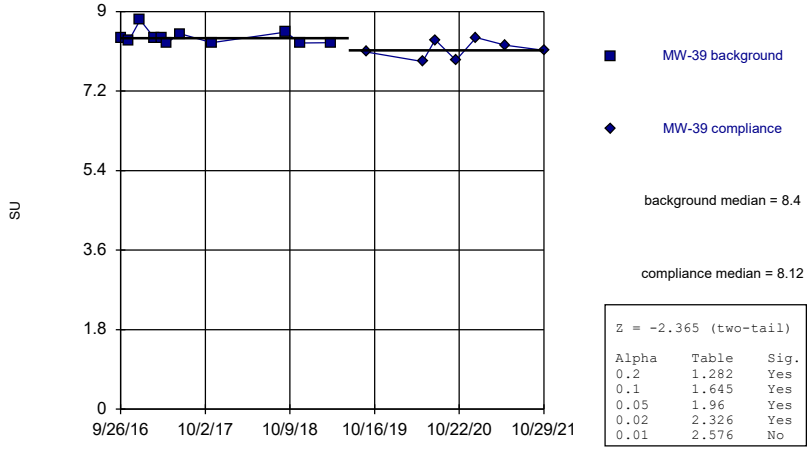
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: pH, field Analysis Run 7/18/2022 11:47 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-39



background median = 8.4

compliance median = 8.12

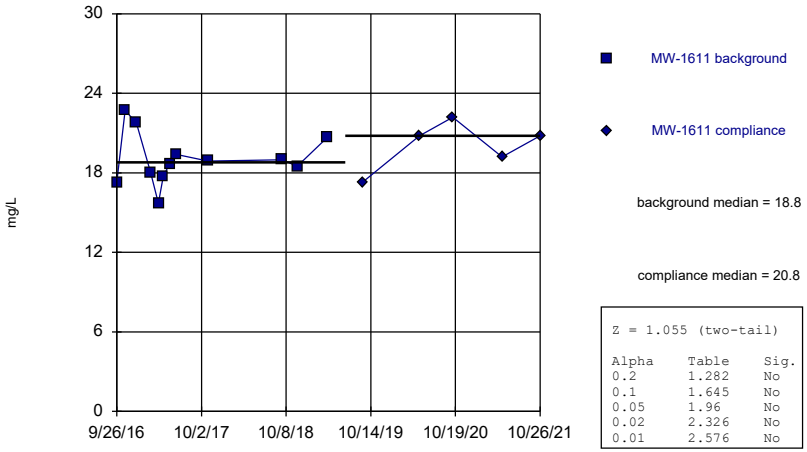
Z = -2.365 (two-tail)

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

Constituent: pH, field Analysis Run 7/18/2022 11:47 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Mann-Whitney (Wilcoxon Rank Sum)

MW-1611



Z = 1.055 (two-tail)

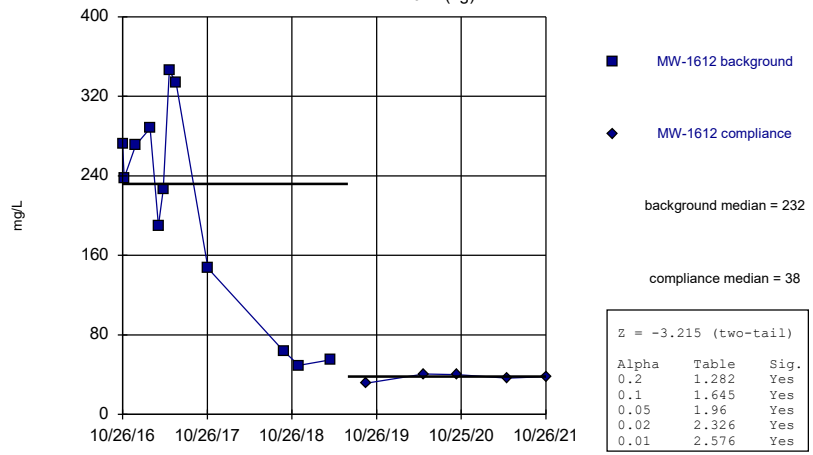
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Sulfate, total Analysis Run 7/18/2022 11:47 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-1612 (bg)



Z = -3.215 (two-tail)

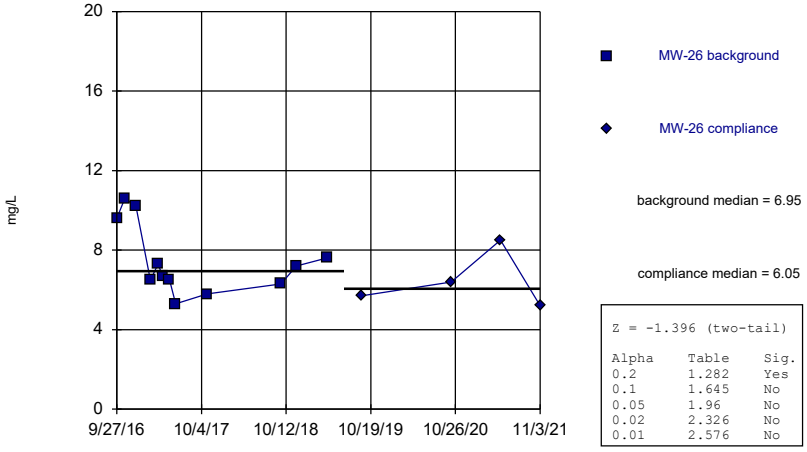
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	Yes
0.01	2.576	Yes

Constituent: Sulfate, total Analysis Run 7/18/2022 11:47 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-26



Z = -1.396 (two-tail)

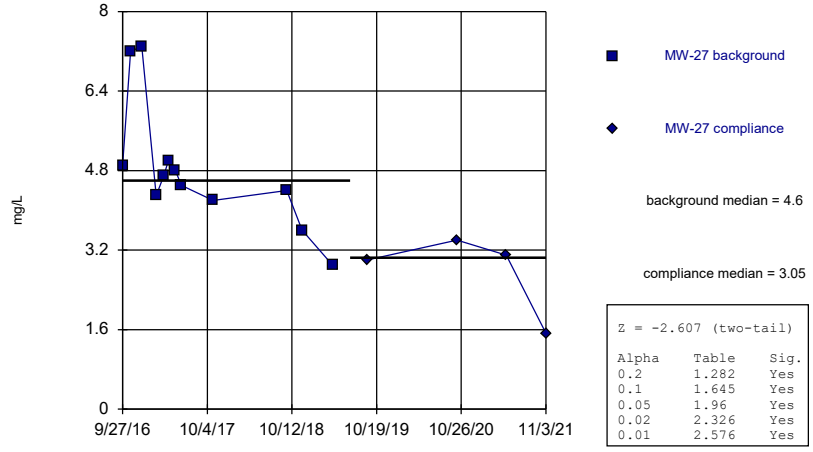
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Sulfate, total Analysis Run 7/18/2022 11:47 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-27



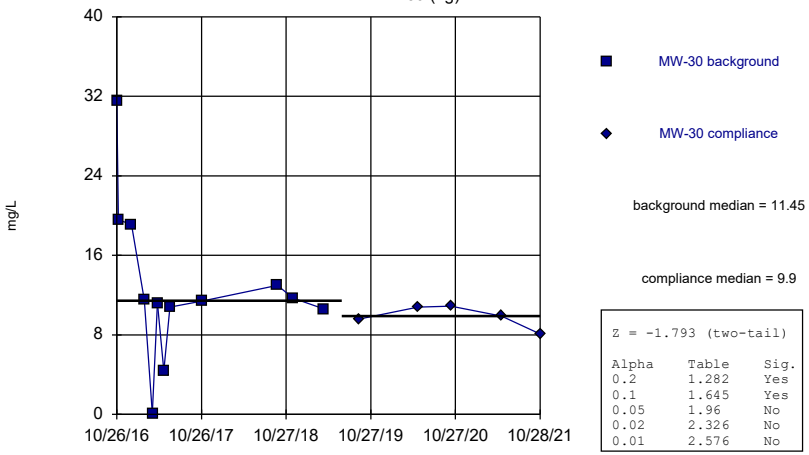
Z = -2.607 (two-tail)

Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	Yes
0.01	2.576	Yes

Constituent: Sulfate, total Analysis Run 7/18/2022 11:47 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Mann-Whitney (Wilcoxon Rank Sum)

MW-30 (bg)



background median = 11.45

compliance median = 9.9

Z = -1.793 (two-tail)

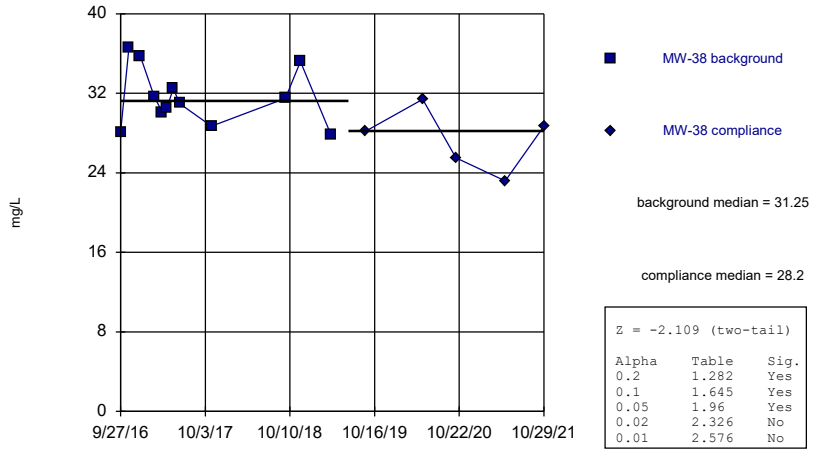
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Sulfate, total Analysis Run 7/18/2022 11:47 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-38



background median = 31.25

compliance median = 28.2

Z = -2.109 (two-tail)

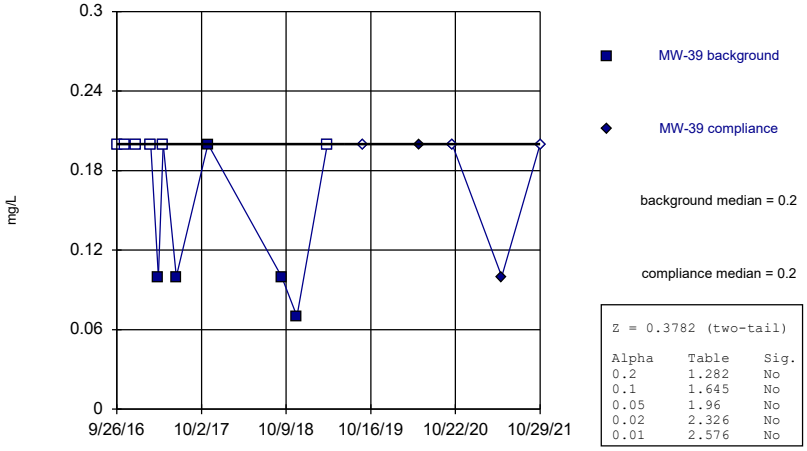
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	No
0.01	2.576	No

Constituent: Sulfate, total Analysis Run 7/18/2022 11:47 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Mann-Whitney (Wilcoxon Rank Sum)

MW-39



background median = 0.2

compliance median = 0.2

Z = 0.3782 (two-tail)

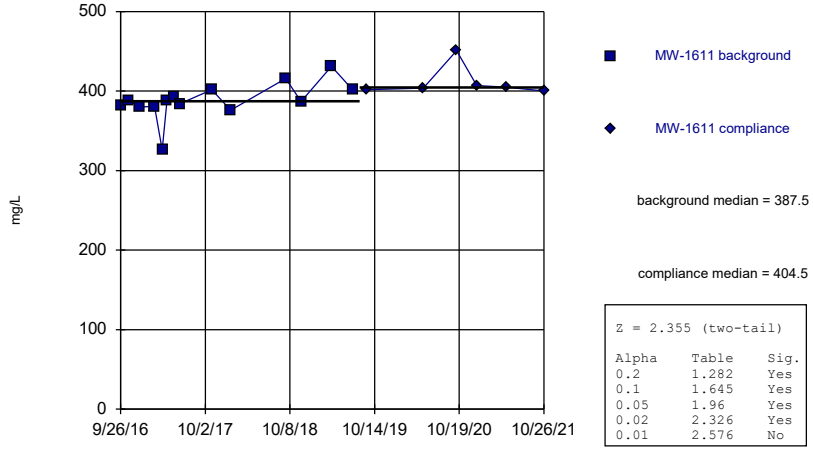
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Sulfate, total Analysis Run 7/18/2022 11:47 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-1611



background median = 387.5

compliance median = 404.5

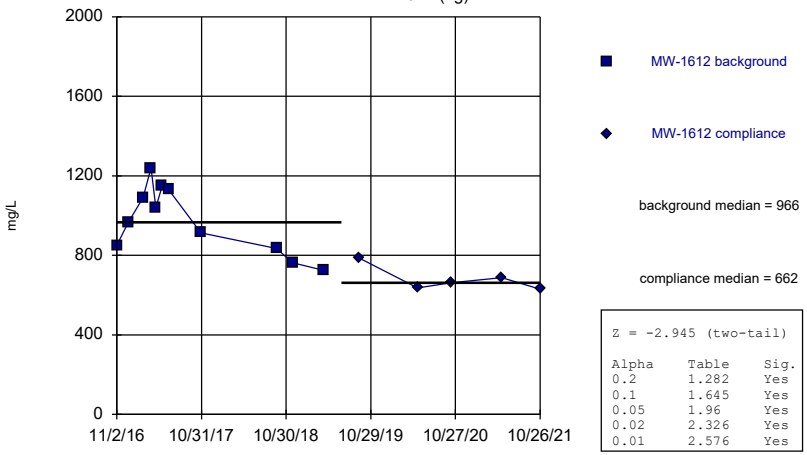
Z = 2.355 (two-tail)

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

Constituent: Total Dissolved Solids [TDS] Analysis Run 7/18/2022 11:47 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Mann-Whitney (Wilcoxon Rank Sum)

MW-1612 (bg)



Z = -2.945 (two-tail)

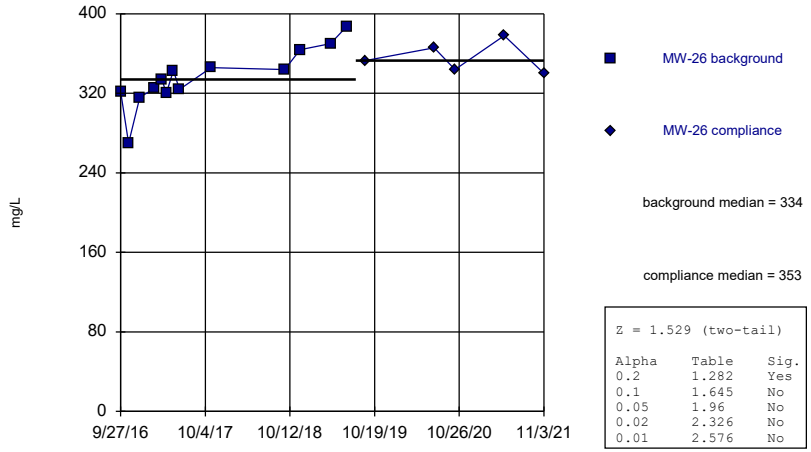
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	Yes
0.01	2.576	Yes

Constituent: Total Dissolved Solids [TDS] Analysis Run 7/18/2022 11:47 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-26



Z = 1.529 (two-tail)

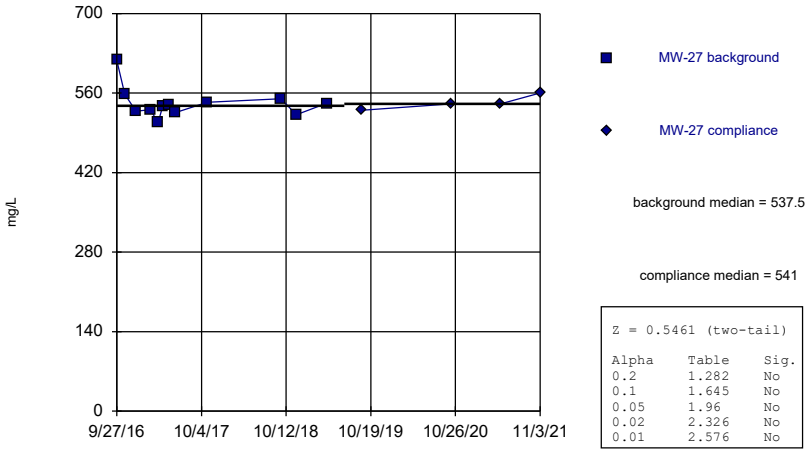
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Total Dissolved Solids [TDS] Analysis Run 7/18/2022 11:47 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-27



Z = 0.5461 (two-tail)

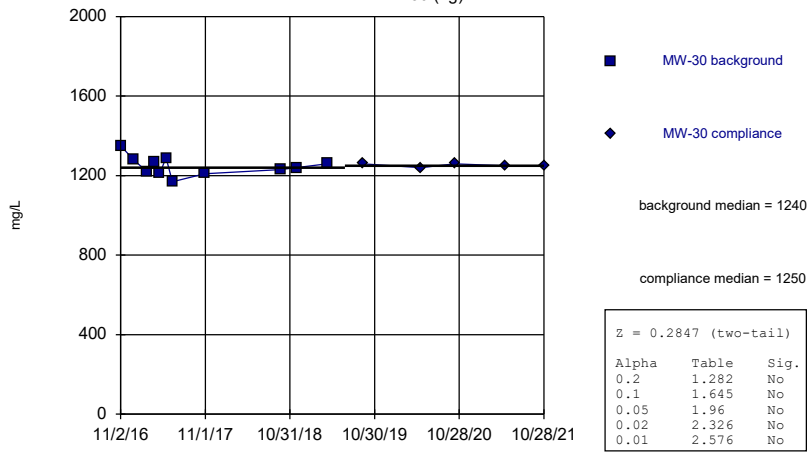
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Total Dissolved Solids [TDS] Analysis Run 7/18/2022 11:47 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-30 (bg)



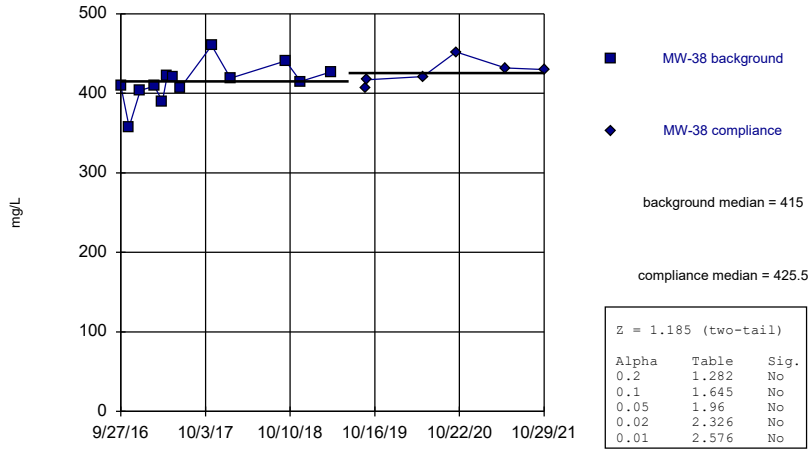
Z = 0.2847 (two-tail)

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: Total Dissolved Solids [TDS] Analysis Run 7/18/2022 11:47 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Mann-Whitney (Wilcoxon Rank Sum)

MW-38



Z = 1.185 (two-tail)

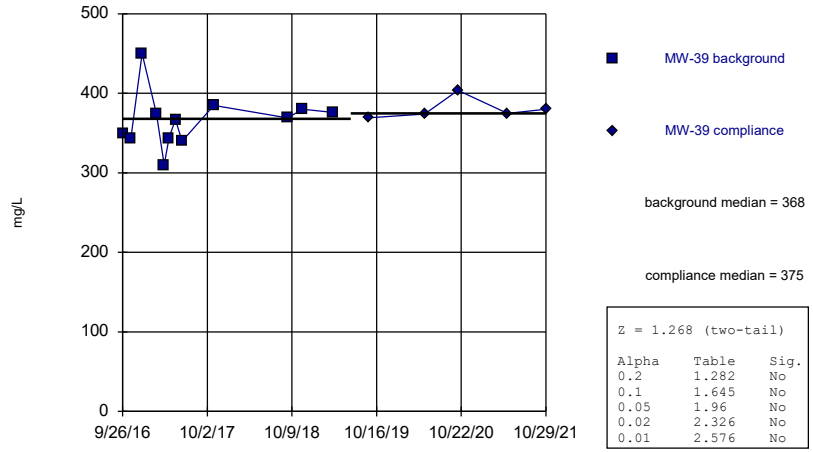
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Total Dissolved Solids [TDS] Analysis Run 7/18/2022 11:47 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-39



Z = 1.268 (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: Total Dissolved Solids [TDS] Analysis Run 7/18/2022 11:47 AM View: Mann Whitney
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Trend Test Summary (Upgradient Wells) - Significant Results

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill Printed 7/13/2022, 12:55 PM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Xform	Alpha	Method
Fluoride, total (mg/L)	**MW-1612 (bg)**	**0.3002**	**90**	**63**	**Yes**	**17**	**0**	**n/a**	**n/a**	**0.01**	**NP**

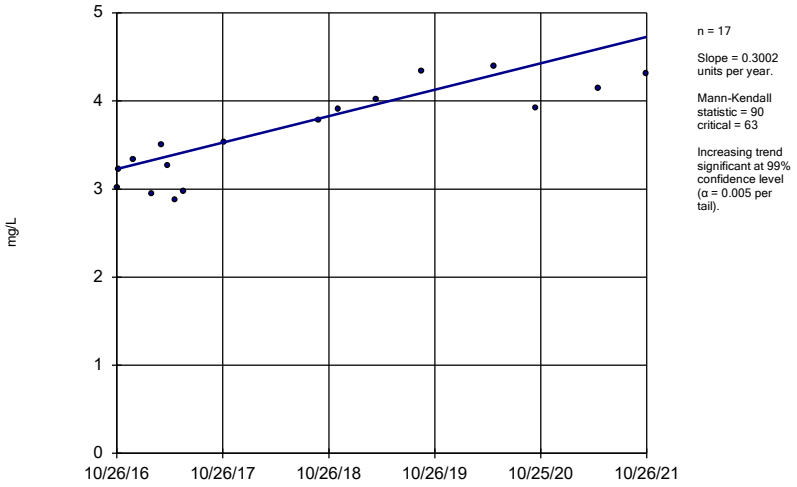
Trend Test Summary (Upgradient Wells) - All Results

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill Printed 7/13/2022, 12:55 PM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Xform	Alpha	Method
Fluoride, total (mg/L)	**MW-1612 (bg)**	**0.3002**	**90**	**63**	**Yes**	**17**	**0**	**n/a**	**n/a**	**0.01**	**NP**
Fluoride, total (mg/L)	MW-30 (bg)	0.02228	19	63	No	17	0	n/a	n/a	0.01	NP

Sen's Slope Estimator

MW-1612 (bg)



n = 17

Slope = 0.3002 units per year.

Mann-Kendall statistic = 90 critical = 63

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

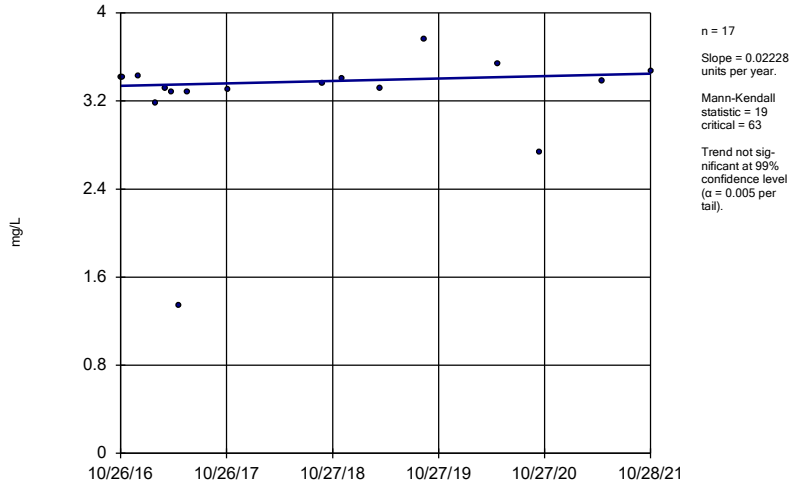
Constituent: Fluoride, total Analysis Run 7/13/2022 12:54 PM View: Trend Tests (Upgradient Wells)

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Sen's Slope Estimator

MW-30 (bg)



n = 17

Slope = 0.02228 units per year.

Mann-Kendall statistic = 19 critical = 63

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

Constituent: Fluoride, total Analysis Run 7/13/2022 12:54 PM View: Trend Tests (Upgradient Wells)

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

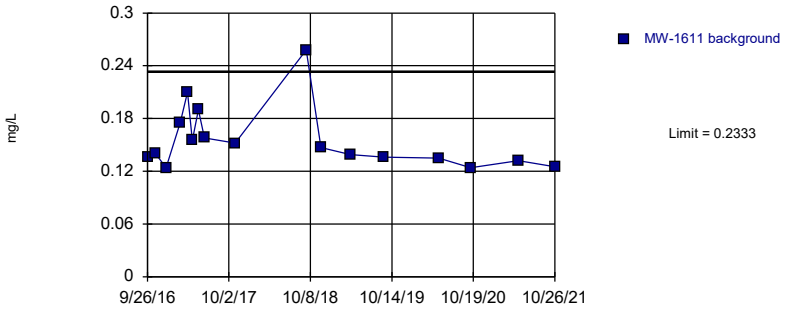
Intrawell Prediction Limit Summary

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill Printed 7/18/2022, 11:51 AM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Boron, total (mg/L)	MW-1611	0.2333	n/a	n/a	1 future	n/a	17	-1.885	0.2018	0	None	ln(x)	0.001504	Param Intra 1 of 2
Boron, total (mg/L)	MW-1612	0.711	n/a	n/a	1 future	n/a	17	0.4915	0.1032	0	None	No	0.001504	Param Intra 1 of 2
Boron, total (mg/L)	MW-26	0.2325	n/a	n/a	1 future	n/a	16	0.1374	0.04425	0	None	No	0.001504	Param Intra 1 of 2
Boron, total (mg/L)	MW-27	0.3755	n/a	n/a	1 future	n/a	16	0.541	0.03336	0	None	sqrt(x)	0.001504	Param Intra 1 of 2
Boron, total (mg/L)	MW-30	0.3504	n/a	n/a	1 future	n/a	17	0.2789	0.03364	0	None	No	0.001504	Param Intra 1 of 2
Boron, total (mg/L)	MW-38	0.09349	n/a	n/a	1 future	n/a	17	0.1984	0.05047	0	None	sqrt(x)	0.001504	Param Intra 1 of 2
Boron, total (mg/L)	MW-39	0.198	n/a	n/a	1 future	n/a	17	0.1535	0.0209	0	None	No	0.001504	Param Intra 1 of 2
Calcium, total (mg/L)	MW-1611	26.21	n/a	n/a	1 future	n/a	19	23.52	1.294	0	None	No	0.001504	Param Intra 1 of 2
Calcium, total (mg/L)	MW-1612	12.22	n/a	n/a	1 future	n/a	17	6.521	2.679	0	None	No	0.001504	Param Intra 1 of 2
Calcium, total (mg/L)	MW-26	64.65	n/a	n/a	1 future	n/a	17	55.55	4.277	0	None	No	0.001504	Param Intra 1 of 2
Calcium, total (mg/L)	MW-27	1.769	n/a	n/a	1 future	n/a	16	1.319	0.2094	0	None	No	0.001504	Param Intra 1 of 2
Calcium, total (mg/L)	MW-30	16.6	n/a	n/a	1 future	n/a	17	n/a	n/a	0	n/a	n/a	0.005914	NP Intra (normality) 1 of 2
Calcium, total (mg/L)	MW-38	57.62	n/a	n/a	1 future	n/a	18	50.79	3.247	0	None	No	0.001504	Param Intra 1 of 2
Calcium, total (mg/L)	MW-39	12.4	n/a	n/a	1 future	n/a	17	n/a	n/a	0	n/a	n/a	0.005914	NP Intra (normality) 1 of 2
Chloride, total (mg/L)	MW-1611	10.56	n/a	n/a	1 future	n/a	18	9.273	0.6134	0	None	No	0.001504	Param Intra 1 of 2
Chloride, total (mg/L)	MW-1612	44.54	n/a	n/a	1 future	n/a	17	19.89	11.59	0	None	No	0.001504	Param Intra 1 of 2
Chloride, total (mg/L)	MW-26	7.085	n/a	n/a	1 future	n/a	17	5.834	0.5883	0	None	No	0.001504	Param Intra 1 of 2
Chloride, total (mg/L)	MW-27	1.85	n/a	n/a	1 future	n/a	17	1.641	0.09865	0	None	No	0.001504	Param Intra 1 of 2
Chloride, total (mg/L)	MW-30	263.4	n/a	n/a	1 future	n/a	17	251.1	5.815	0	None	No	0.001504	Param Intra 1 of 2
Chloride, total (mg/L)	MW-38	7.763	n/a	n/a	1 future	n/a	17	7.333	0.2023	0	None	No	0.001504	Param Intra 1 of 2
Chloride, total (mg/L)	MW-39	3.132	n/a	n/a	1 future	n/a	17	3.001	0.06133	0	None	No	0.001504	Param Intra 1 of 2
pH, field (SU)	MW-1611	8.031	7.247	n/a	1 future	n/a	20	7.639	0.1903	0	None	No	0.000752	Param Intra 1 of 2
pH, field (SU)	MW-1612	8.644	7.964	n/a	1 future	n/a	16	8.304	0.1581	0	None	No	0.000752	Param Intra 1 of 2
pH, field (SU)	MW-26	7.82	6.953	n/a	1 future	n/a	20	7.387	0.2106	0	None	No	0.000752	Param Intra 1 of 2
pH, field (SU)	MW-27	9.545	8.565	n/a	1 future	n/a	18	9.055	0.233	0	None	No	0.000752	Param Intra 1 of 2
pH, field (SU)	MW-30	8.992	7.841	n/a	1 future	n/a	16	8.417	0.2676	0	None	No	0.000752	Param Intra 1 of 2
pH, field (SU)	MW-38	7.611	6.497	n/a	1 future	n/a	19	7.054	0.2676	0	None	No	0.000752	Param Intra 1 of 2
pH, field (SU)	MW-39	8.775	7.845	n/a	1 future	n/a	18	8.31	0.2209	0	None	No	0.000752	Param Intra 1 of 2
Sulfate, total (mg/L)	MW-1611	23.42	n/a	n/a	1 future	n/a	17	19.34	1.923	0	None	No	0.001504	Param Intra 1 of 2
Sulfate, total (mg/L)	MW-1612	346	n/a	n/a	1 future	n/a	17	n/a	n/a	0	n/a	n/a	0.005914	NP Intra (normality) 1 of 2
Sulfate, total (mg/L)	MW-26	10.84	n/a	n/a	1 future	n/a	16	7.213	1.687	0	None	No	0.001504	Param Intra 1 of 2
Sulfate, total (mg/L)	MW-27	7.481	n/a	n/a	1 future	n/a	16	4.302	1.479	0	None	No	0.001504	Param Intra 1 of 2
Sulfate, total (mg/L)	MW-30	31.5	n/a	n/a	1 future	n/a	17	n/a	n/a	0	n/a	n/a	0.005914	NP Intra (normality) 1 of 2
Sulfate, total (mg/L)	MW-38	37.87	n/a	n/a	1 future	n/a	17	30.39	3.517	0	None	No	0.001504	Param Intra 1 of 2
Sulfate, total (mg/L)	MW-39	0.2	n/a	n/a	1 future	n/a	16	n/a	n/a	56.25	n/a	n/a	0.006456	NP Intra (NDs) 1 of 2
Total Dissolved Solids [TDS] (mg/L)	MW-1611	445.6	n/a	n/a	1 future	n/a	20	395.2	24.47	0	None	No	0.001504	Param Intra 1 of 2
Total Dissolved Solids [TDS] (mg/L)	MW-1612	1311	n/a	n/a	1 future	n/a	16	881.7	199.7	0	None	No	0.001504	Param Intra 1 of 2
Total Dissolved Solids [TDS] (mg/L)	MW-26	399	n/a	n/a	1 future	n/a	18	341.4	27.37	0	None	No	0.001504	Param Intra 1 of 2
Total Dissolved Solids [TDS] (mg/L)	MW-27	618	n/a	n/a	1 future	n/a	16	n/a	n/a	0	n/a	n/a	0.006456	NP Intra (normality) 1 of 2
Total Dissolved Solids [TDS] (mg/L)	MW-30	1336	n/a	n/a	1 future	n/a	16	1249	40.24	0	None	No	0.001504	Param Intra 1 of 2
Total Dissolved Solids [TDS] (mg/L)	MW-38	464.2	n/a	n/a	1 future	n/a	19	417.9	22.27	0	None	No	0.001504	Param Intra 1 of 2
Total Dissolved Solids [TDS] (mg/L)	MW-39	433.7	n/a	n/a	1 future	n/a	17	370.1	29.93	0	None	No	0.001504	Param Intra 1 of 2

Prediction Limit

Intrawell Parametric, MW-1611



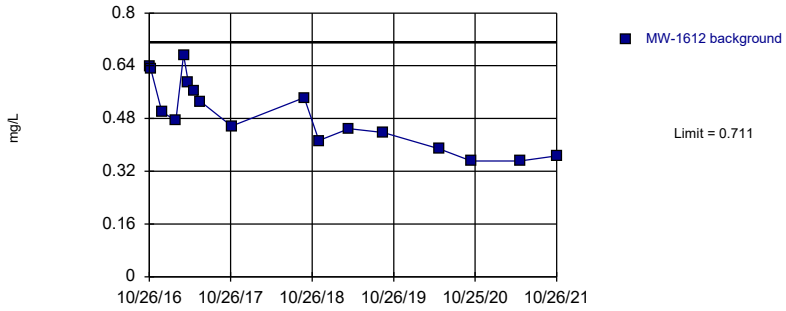
Background Data Summary (based on natural log transformation): Mean=-1.885, Std. Dev.=0.2018, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8572, critical = 0.851. Kappa = 2.127 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Boron, total Analysis Run 7/18/2022 11:49 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-1612 (bg)



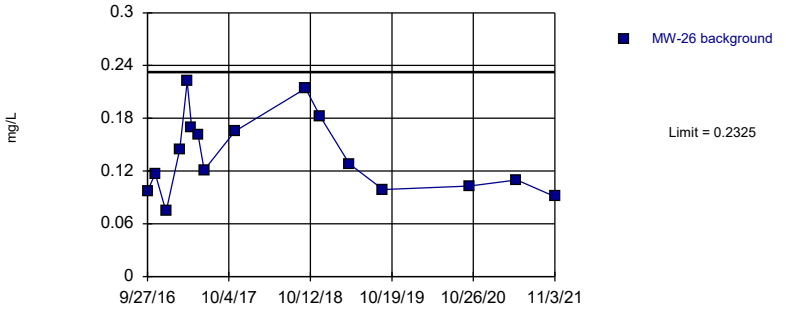
Background Data Summary: Mean=0.4915, Std. Dev.=0.1032, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9509, critical = 0.851. Kappa = 2.127 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Boron, total Analysis Run 7/18/2022 11:49 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-26



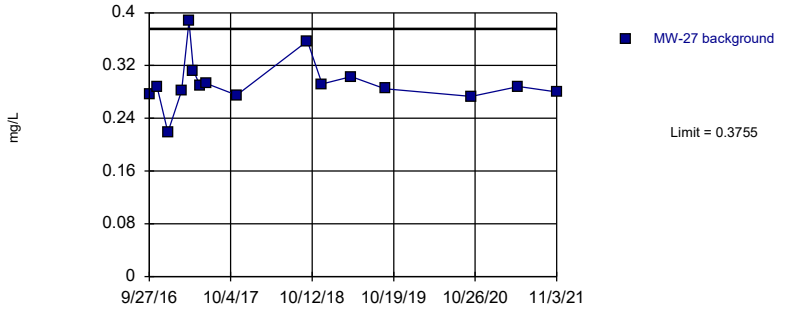
Background Data Summary: Mean=0.1374, Std. Dev.=0.04425, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9402, critical = 0.844. Kappa = 2.15 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Boron, total Analysis Run 7/18/2022 11:49 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-27

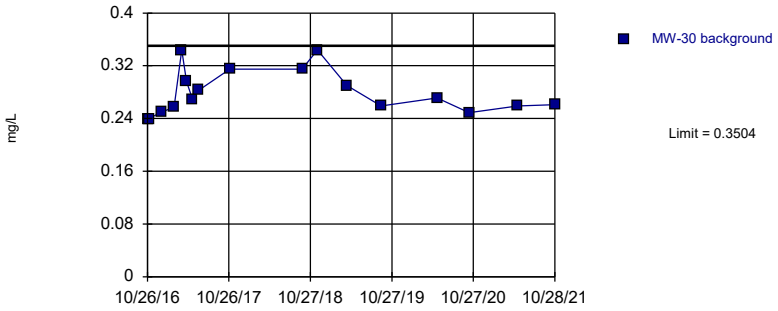


Background Data Summary (based on square root transformation): Mean=0.541, Std. Dev.=0.03336, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8488, critical = 0.844. Kappa = 2.15 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Boron, total Analysis Run 7/18/2022 11:49 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Prediction Limit

Intrawell Parametric, MW-30 (bg)

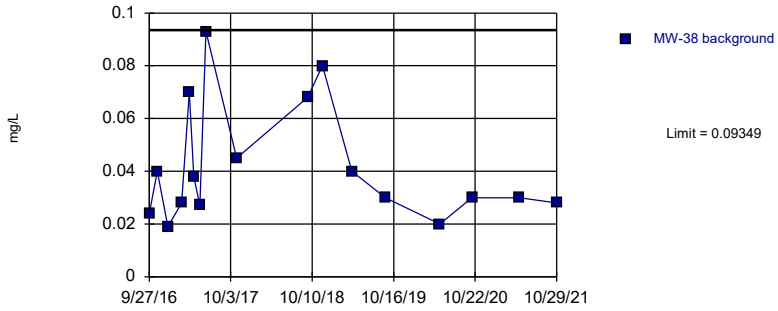


Background Data Summary: Mean=0.2789, Std. Dev.=0.03364, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8962, critical = 0.851. Kappa = 2.127 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Boron, total Analysis Run 7/18/2022 11:49 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Prediction Limit

Intrawell Parametric, MW-38

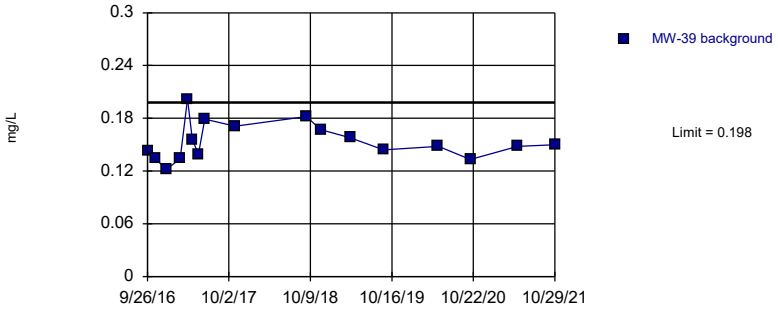


Background Data Summary (based on square root transformation): Mean=0.1984, Std. Dev.=0.05047, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8811, critical = 0.851. Kappa = 2.127 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Boron, total Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Prediction Limit

Intrawell Parametric, MW-39

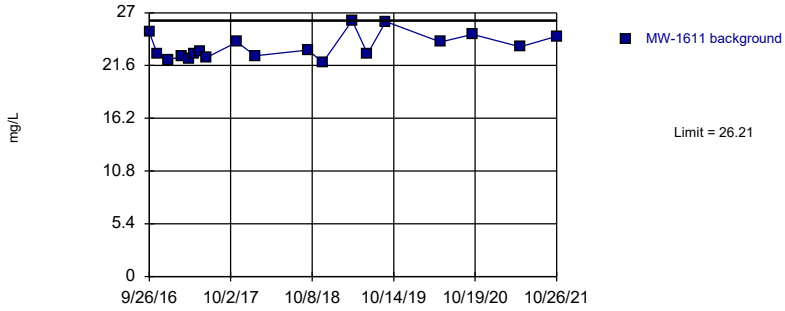


Background Data Summary: Mean=0.1535, Std. Dev.=0.0209, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9494, critical = 0.851. Kappa = 2.127 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Boron, total Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Prediction Limit

Intrawell Parametric, MW-1611

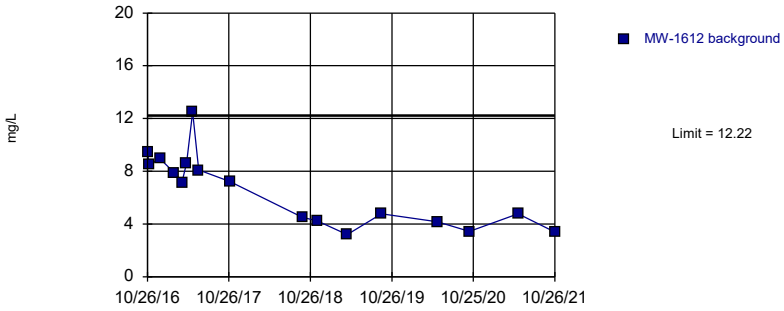


Background Data Summary: Mean=23.52, Std. Dev.=1.294, n=19. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8986, critical = 0.863. Kappa = 2.081 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Calcium, total Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Prediction Limit

Intrawell Parametric, MW-1612 (bg)



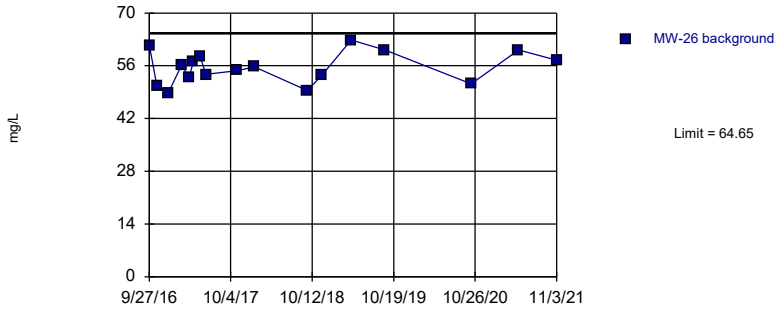
Background Data Summary: Mean=6.521, Std. Dev.=2.679, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9137, critical = 0.851. Kappa = 2.127 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Calcium, total Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-26



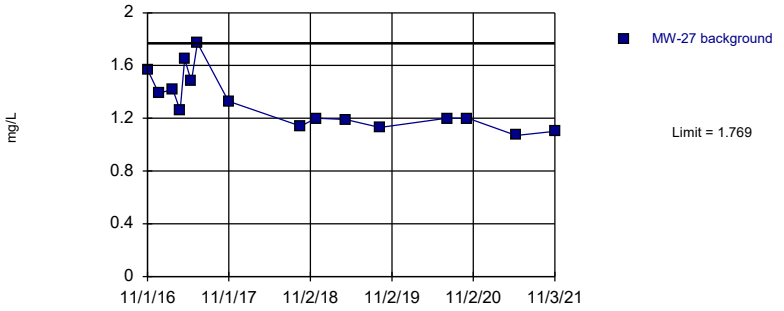
Background Data Summary: Mean=55.55, Std. Dev.=4.277, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9723, critical = 0.851. Kappa = 2.127 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Calcium, total Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-27



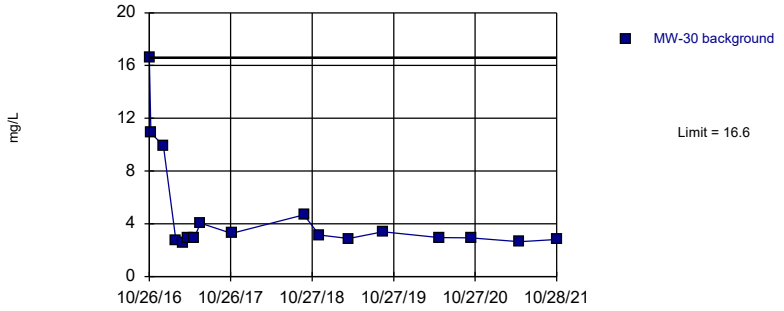
Background Data Summary: Mean=1.319, Std. Dev.=0.2094, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9086, critical = 0.844. Kappa = 2.15 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Calcium, total Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Non-parametric, MW-30 (bg)

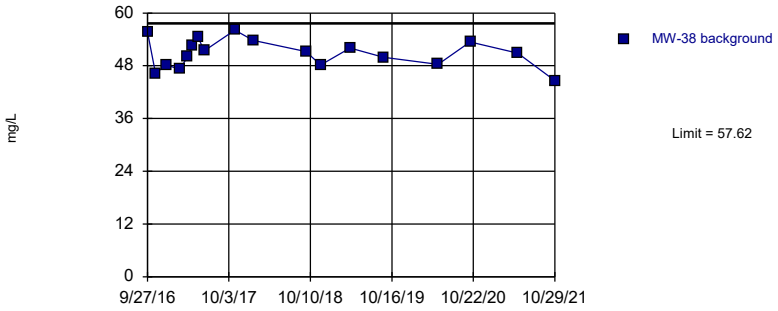


Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 17 background values. Well-constituent pair annual alpha = 0.01179. Individual comparison alpha = 0.005914 (1 of 2). Assumes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

Constituent: Calcium, total Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Prediction Limit

Intrawell Parametric, MW-38



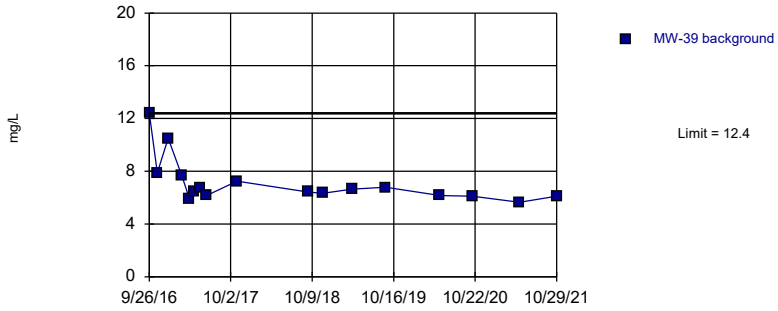
Background Data Summary: Mean=50.79, Std. Dev.=3.247, n=18. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9798, critical = 0.858. Kappa = 2.104 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Calcium, total Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Non-parametric, MW-39



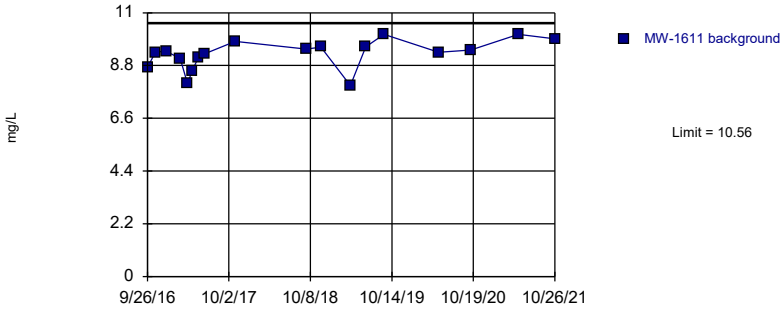
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 17 background values. Well-constituent pair annual alpha = 0.01179. Individual comparison alpha = 0.005914 (1 of 2). Assumes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

Constituent: Calcium, total Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-1611



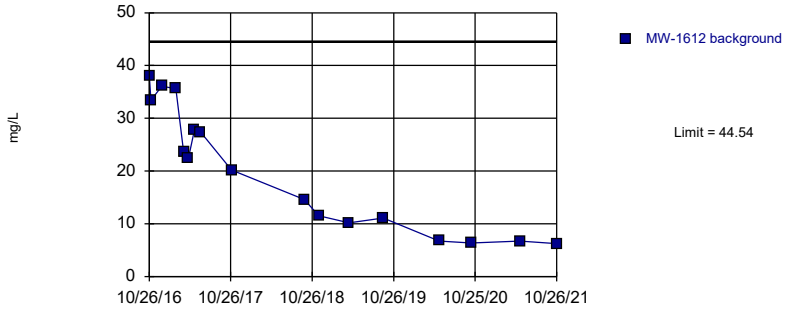
Background Data Summary: Mean=9.273, Std. Dev.=0.6134, n=18. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9157, critical = 0.858. Kappa = 2.104 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Chloride, total Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-1612 (bg)

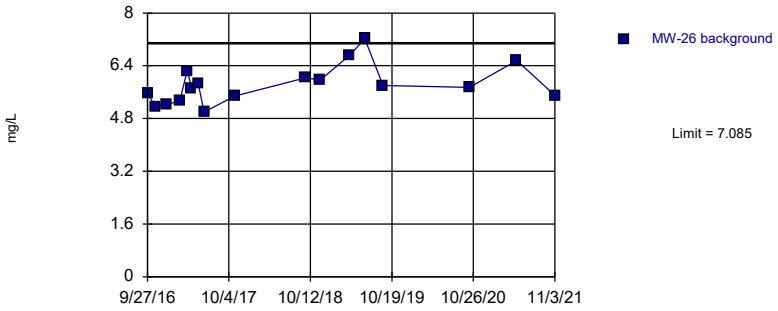


Background Data Summary: Mean=19.89, Std. Dev.=11.59, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8949, critical = 0.851. Kappa = 2.127 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Chloride, total Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Prediction Limit

Intrawell Parametric, MW-26



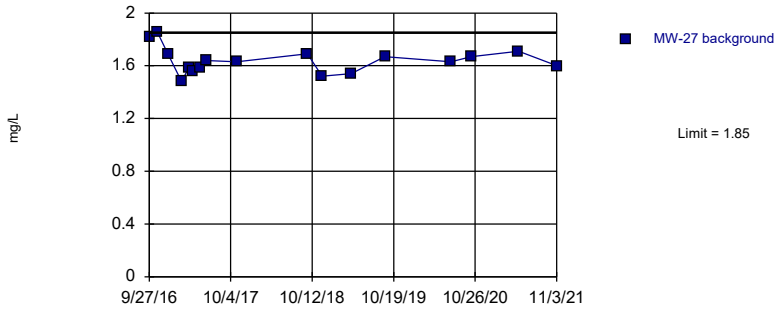
Background Data Summary: Mean=5.834, Std. Dev.=0.5883, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9473, critical = 0.851. Kappa = 2.127 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Chloride, total Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-27



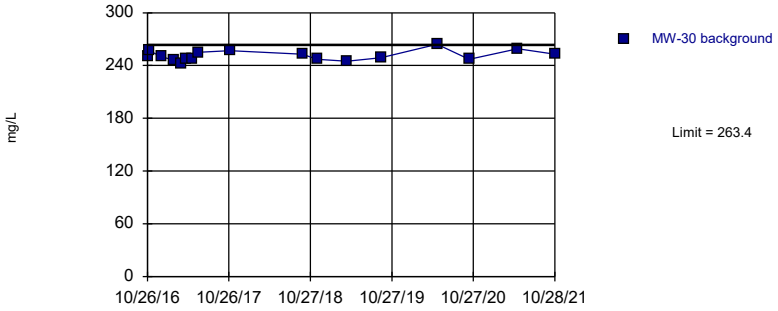
Background Data Summary: Mean=1.641, Std. Dev.=0.09865, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9547, critical = 0.851. Kappa = 2.127 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Chloride, total Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-30 (bg)



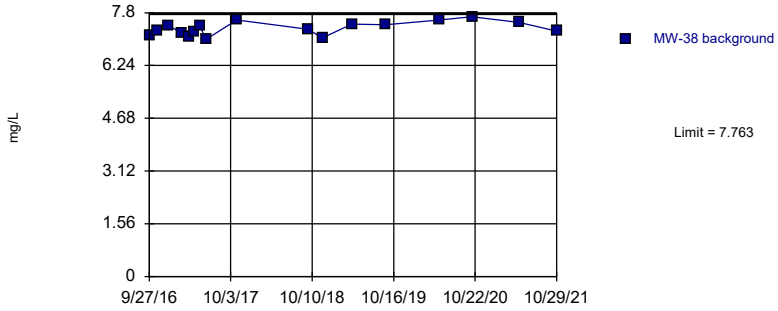
Background Data Summary: Mean=251.1, Std. Dev.=5.815, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9483, critical = 0.851. Kappa = 2.127 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Chloride, total Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-38

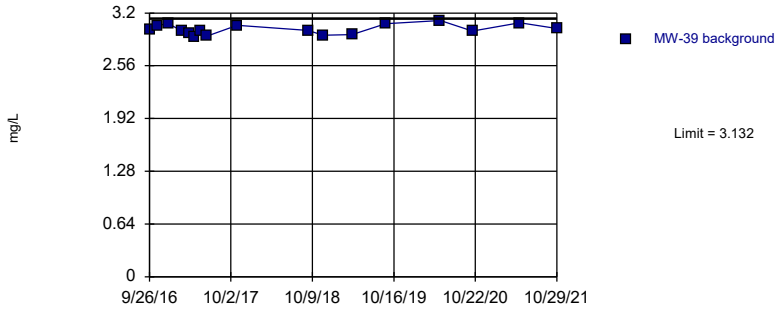


Background Data Summary: Mean=7.333, Std. Dev.=0.2023, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9634, critical = 0.851. Kappa = 2.127 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Chloride, total Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Prediction Limit

Intrawell Parametric, MW-39



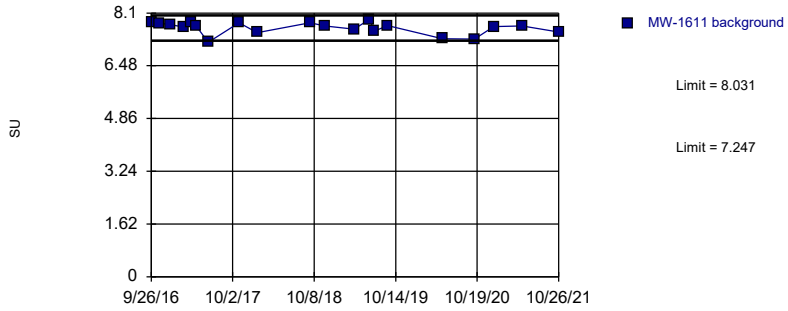
Background Data Summary: Mean=3.001, Std. Dev.=0.06133, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9494, critical = 0.851. Kappa = 2.127 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Chloride, total Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-1611



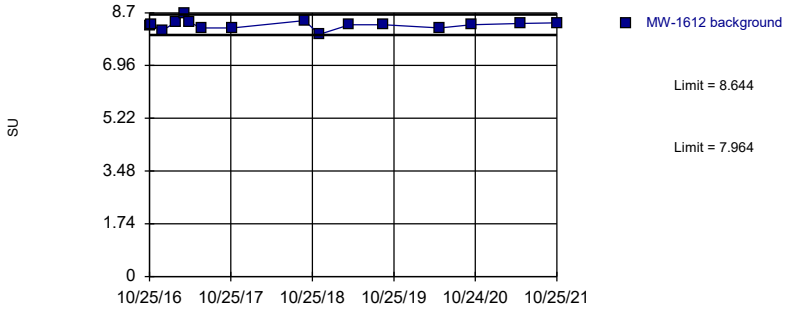
Background Data Summary: Mean=7.639, Std. Dev.=0.1903, n=20. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8891, critical = 0.868. Kappa = 2.058 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: pH, field Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-1612 (bg)



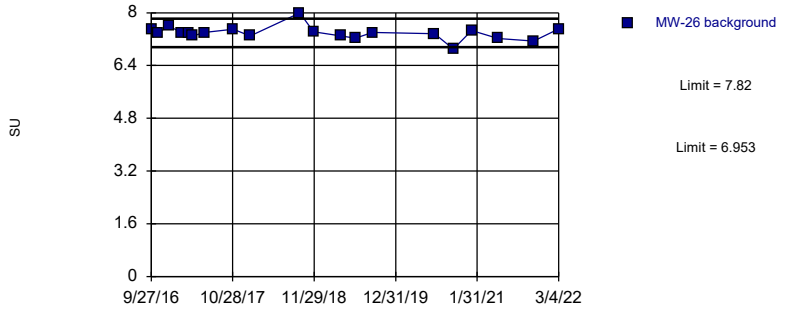
Background Data Summary: Mean=8.304, Std. Dev.=0.1581, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9435, critical = 0.844. Kappa = 2.15 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: pH, field Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-26

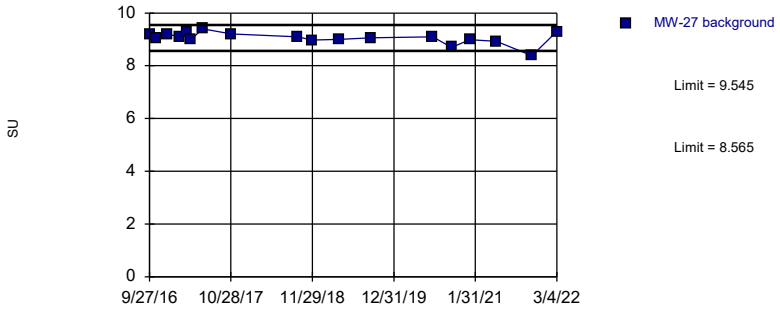


Background Data Summary: Mean=7.387, Std. Dev.=0.2106, n=20. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.897, critical = 0.868. Kappa = 2.058 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: pH, field Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Prediction Limit

Intrawell Parametric, MW-27



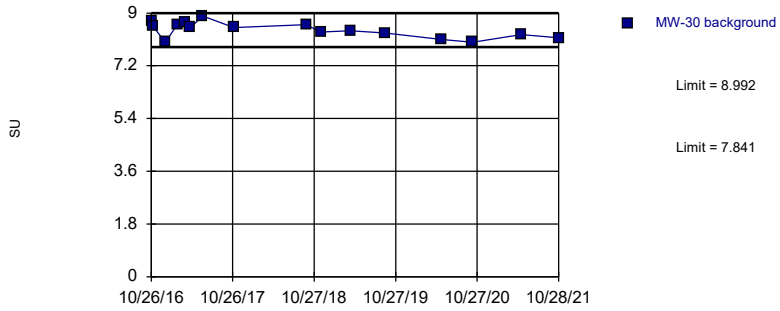
Background Data Summary: Mean=9.055, Std. Dev.=0.233, n=18. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8832, critical = 0.858. Kappa = 2.104 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: pH, field Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-30 (bg)



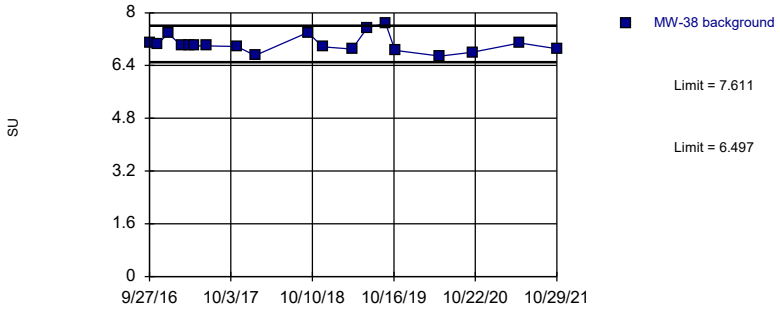
Background Data Summary: Mean=8.417, Std. Dev.=0.2676, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9686, critical = 0.844. Kappa = 2.15 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: pH, field Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-38



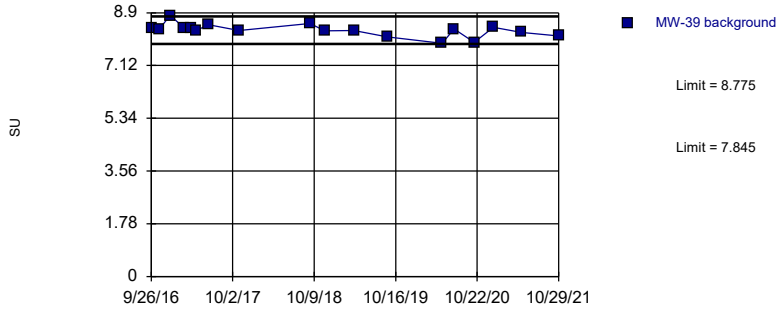
Background Data Summary: Mean=7.054, Std. Dev.=0.2676, n=19. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8907, critical = 0.863. Kappa = 2.081 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: pH, field Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-39

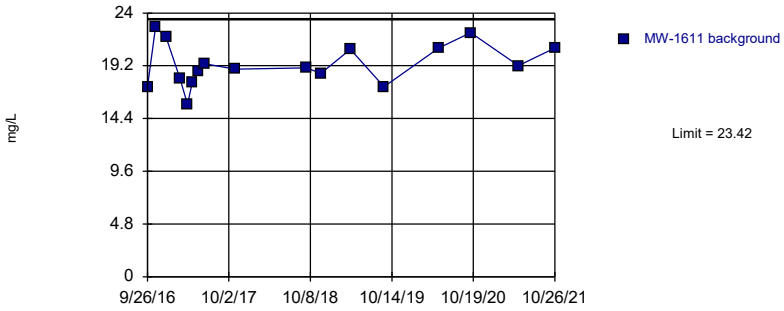


Background Data Summary: Mean=8.31, Std. Dev.=0.2209, n=18. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9374, critical = 0.858. Kappa = 2.104 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: pH, field Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Prediction Limit

Intrawell Parametric, MW-1611



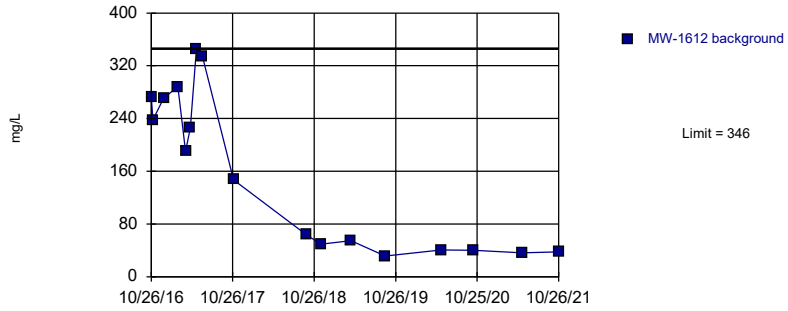
Background Data Summary: Mean=19.34, Std. Dev.=1.923, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9697, critical = 0.851. Kappa = 2.127 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Sulfate, total Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Non-parametric, MW-1612 (bg)



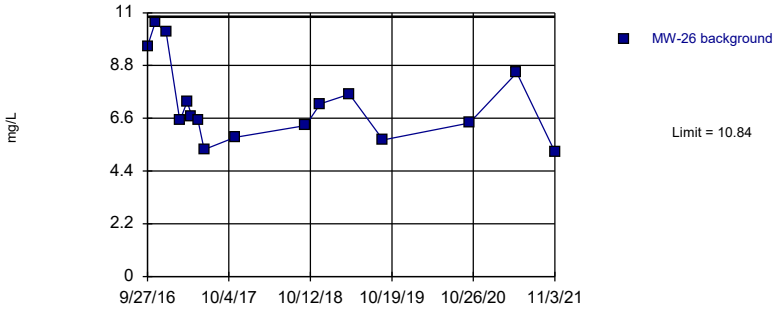
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 17 background values. Well-constituent pair annual alpha = 0.01179. Individual comparison alpha = 0.005914 (1 of 2). Assumes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

Constituent: Sulfate, total Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-26



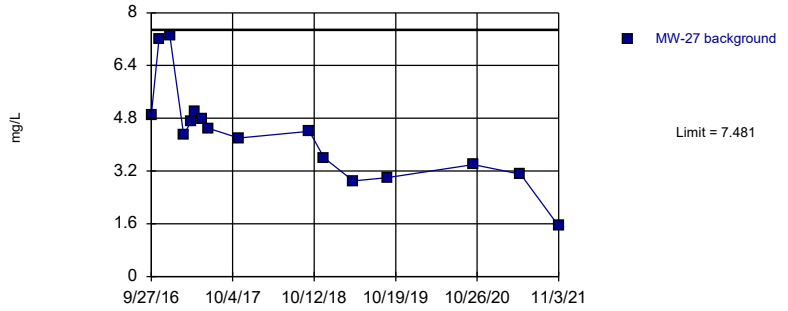
Background Data Summary: Mean=7.213, Std. Dev.=1.687, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8929, critical = 0.844. Kappa = 2.15 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Sulfate, total Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-27

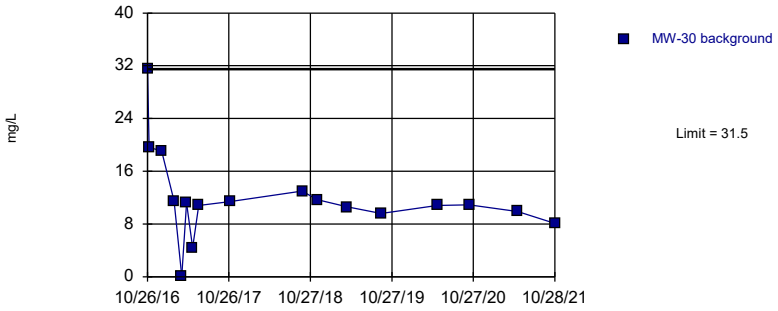


Background Data Summary: Mean=4.302, Std. Dev.=1.479, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9285, critical = 0.844. Kappa = 2.15 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Sulfate, total Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Prediction Limit

Intrawell Non-parametric, MW-30 (bg)

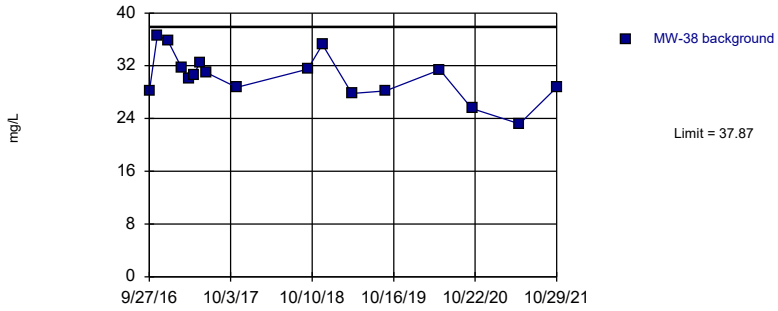


Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 17 background values. Well-constituent pair annual alpha = 0.01179. Individual comparison alpha = 0.005914 (1 of 2). Assumes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

Constituent: Sulfate, total Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Prediction Limit

Intrawell Parametric, MW-38



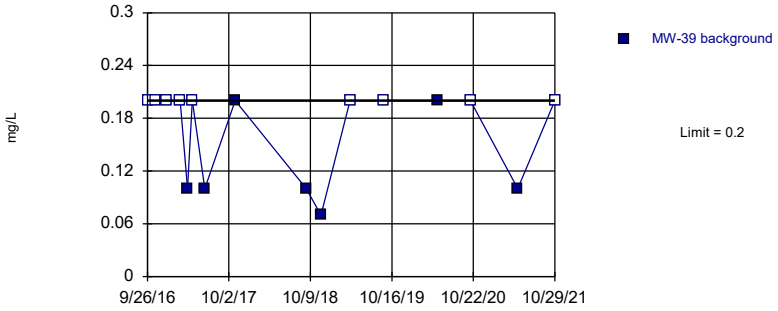
Background Data Summary: Mean=30.39, Std. Dev.=3.517, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9697, critical = 0.851. Kappa = 2.127 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Sulfate, total Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Hollow symbols indicate censored values.

Prediction Limit

Intrawell Non-parametric, MW-39

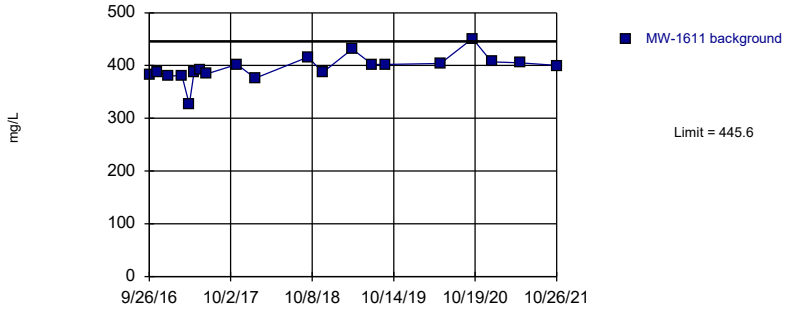


Non-parametric test used in lieu of parametric prediction limit because censored data exceeded 50%. Limit is highest of 16 background values. 56.25% NDs. Well-constituent pair annual alpha = 0.01287. Individual comparison alpha = 0.006456 (1 of 2). Assumes 1 future value.

Constituent: Sulfate, total Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Prediction Limit

Intrawell Parametric, MW-1611

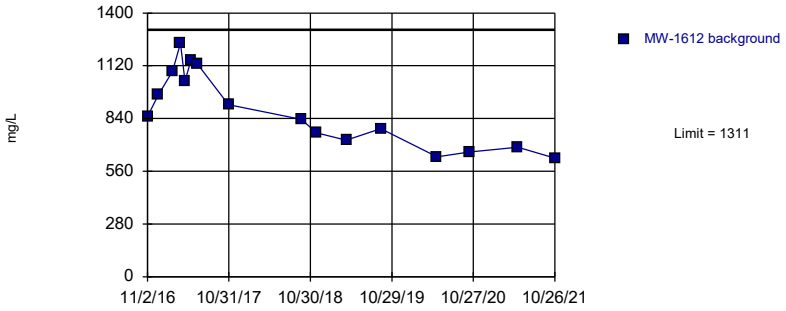


Background Data Summary: Mean=395.2, Std. Dev.=24.47, n=20. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9015, critical = 0.868. Kappa = 2.058 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Total Dissolved Solids [TDS] Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Prediction Limit

Intrawell Parametric, MW-1612 (bg)

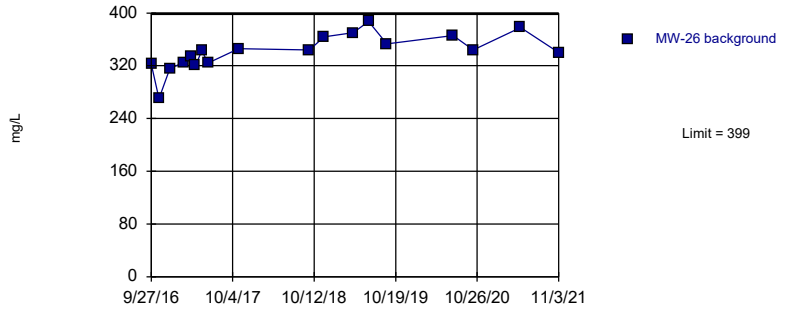


Background Data Summary: Mean=881.7, Std. Dev.=199.7, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9322, critical = 0.844. Kappa = 2.15 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Total Dissolved Solids [TDS] Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Prediction Limit

Intrawell Parametric, MW-26

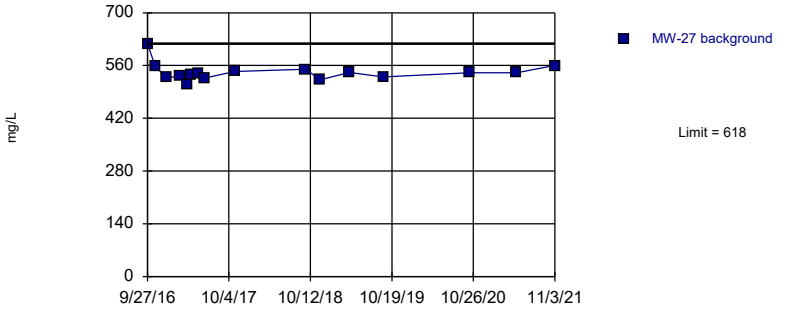


Background Data Summary: Mean=341.4, Std. Dev.=27.37, n=18. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9494, critical = 0.858. Kappa = 2.104 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Total Dissolved Solids [TDS] Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Prediction Limit

Intrawell Non-parametric, MW-27

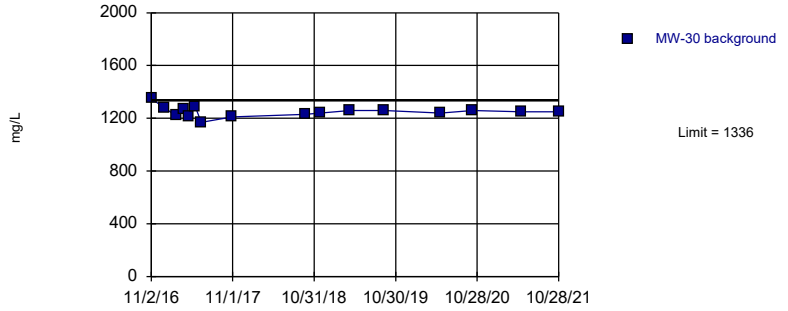


Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. Well-constituent pair annual alpha = 0.01287. Individual comparison alpha = 0.006456 (1 of 2). Assumes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

Constituent: Total Dissolved Solids [TDS] Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Prediction Limit

Intrawell Parametric, MW-30 (bg)

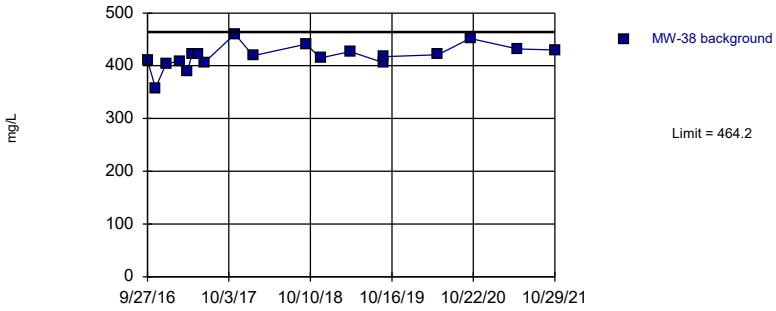


Background Data Summary: Mean=1249, Std. Dev.=40.24, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9536, critical = 0.844. Kappa = 2.15 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Total Dissolved Solids [TDS] Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Prediction Limit

Intrawell Parametric, MW-38



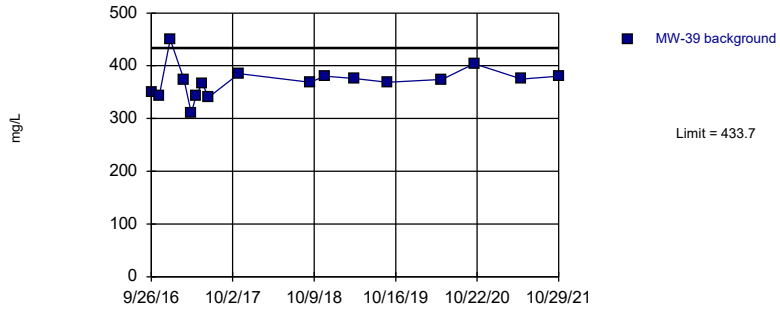
Background Data Summary: Mean=417.9, Std. Dev.=22.27, n=19. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9427, critical = 0.863. Kappa = 2.081 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Total Dissolved Solids [TDS] Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

Sanitas™ v.9.6.35 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-39



Background Data Summary: Mean=370.1, Std. Dev.=29.93, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9105, critical = 0.851. Kappa = 2.127 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Total Dissolved Solids [TDS] Analysis Run 7/18/2022 11:50 AM View: PLs - Intrawell
Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

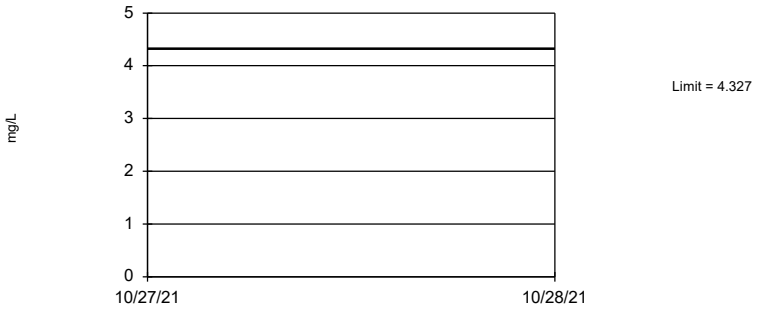
Interwell Prediction Limit Summary

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill Printed 7/18/2022, 11:53 AM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Fluoride, total (mg/L)	n/a	4.327	n/a	n/a	5 future	n/a	34	12.02	3.498	0	None	x^2	0.001504	Param 1 of 2

Prediction Limit

Interwell Parametric



Background Data Summary (based on square transformation): Mean=12.02, Std. Dev.=3.498, n=34. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9319, critical = 0.908. Kappa = 1.916 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.001504. Assumes 5 future values.

Constituent: Fluoride, total Analysis Run 7/18/2022 11:52 AM View: PLs Interwell

Mountaineer Landfill Client: Geosyntec Data: Mountaineer Landfill

APPENDIX 3 – Alternative Source Demonstrations

No alternative source demonstrations were necessary in 2022.

APPENDIX 4 - Notices for Monitoring Program Transitions

Not applicable at this time.

APPENDIX 5 - Well Installation/Decommissioning Logs

Not applicable at this time.