Annual Groundwater Monitoring Report

Southwestern Electric Power Company

John W. Turk Power Plant

Landfill CCR Management Unit

Fulton, Arkansas

January 31, 2023

Prepared by:
American Electric Power Service Corporation
1 Riverside Plaza
Columbus, Ohio 43215

SOUTHWESTERN ELECTRIC POWER COMPANY℠

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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

I. Overview

This *Annual Groundwater Monitoring Report* (Report) has been prepared to report the status of activities for the preceding year at the Landfill (LF) Coal Combustion Residual (CCR) unit at Turk Power Plant. The Southwestern Electric Power Company is wholly-owned subsidiary of American Electric Power Company (AEP). The USEPA's CCR rules require that the Annual Groundwater Monitoring Report be posted to the operating record for the preceding year no later than January 31, 2023.

In general, the following activities were completed:

- At the start of the current annual reporting period, the LF was operating under the Detection monitoring program.
- At the end of the current annual reporting period, the LF was operating under the Detection monitoring program.
- Groundwater samples were collected and analyzed for Appendix III constituents, as specified in 40 CFR 257.94 *et seq.* and AEP's *Groundwater Sampling and Analysis Plan (2021)*.
- Groundwater data underwent various validation tests, including tests for completeness, valid values, transcription errors, and consistent units.
- Data and statistical analysis not available for the previous reporting period indicated that during the 2nd semi-annual 2021 sampling event (November 2021):
    - No SSIs were determined
- During the 1st semi-annual 2022 sampling event (June 2022) with confirmation sampling conducted in June 2022:
    - The following Appendix III parameters exceeded background concentrations for:
        - pH at MW-4
- ASD for the 1st semi-annual 2022 potential pH SSI was certified December 19, 2022.
- The 2nd semi-annual event (November 2022) data are still undergoing statistical analysis.
- The background data was re-established in July 2022.
- A statistical process in accordance with 40 CFR 257.93 to evaluate groundwater data was updated, certified, and posted to AEP's CCR website in 2021 titled: AEP's *Statistical Analysis Plan (*Geosyntec 2021). The statistical process was guided by USEPA's *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* ("Unified Guidance," USEPA, 2009).

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

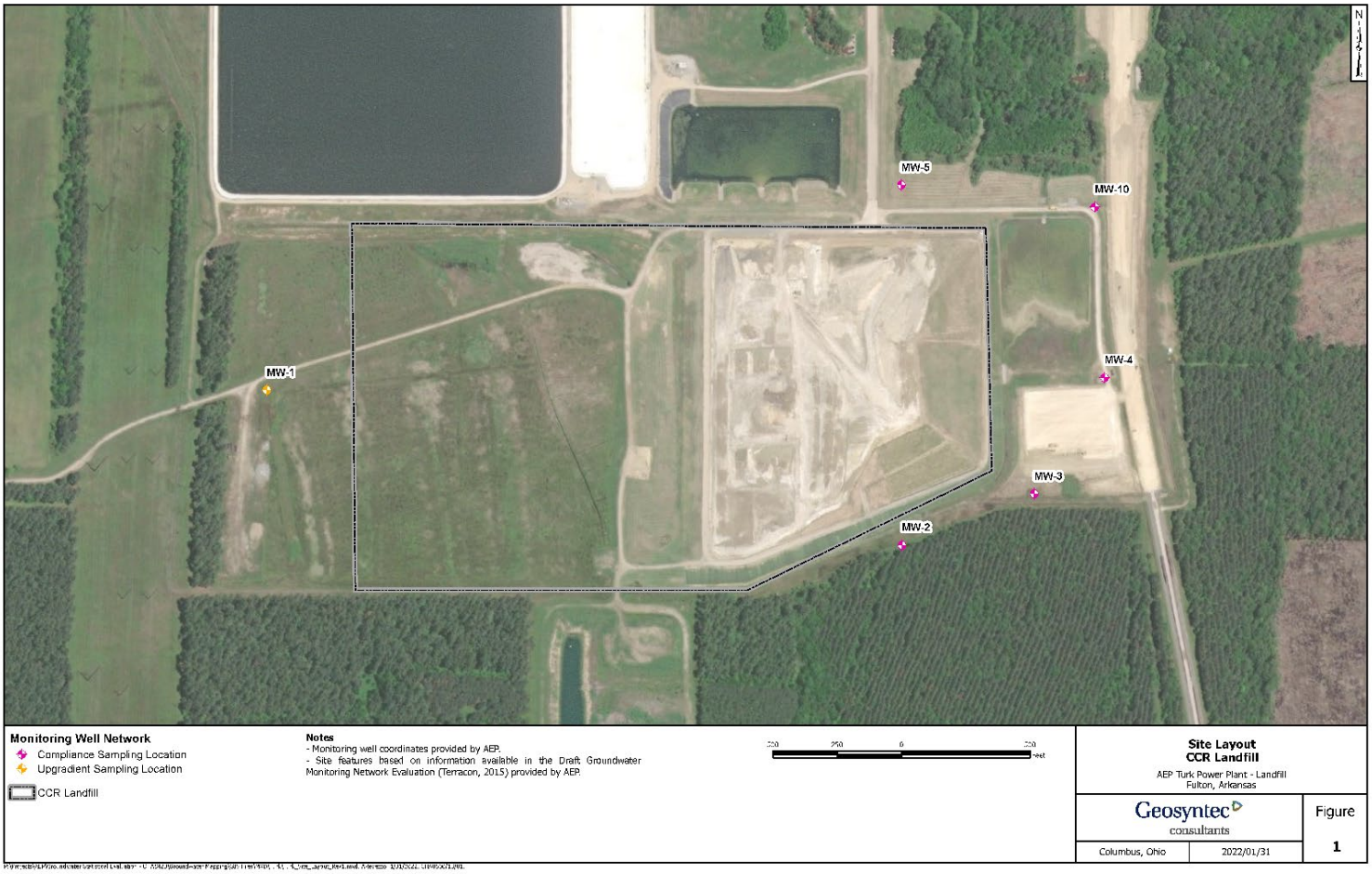
- A map, aerial photograph or a drawing showing the CCR management unit(s), all groundwater monitoring wells and monitoring well identification numbers;
- All of the monitoring data collected, including the rate and direction of groundwater flow, plus a summary showing the number of samples collected 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) (Attached as **Appendix 2**);
- A discussion of whether any alternate source demonstrations were performed, and the conclusions (where applicable Attached as **Appendix 3**);
- A summary of any transition between monitoring programs, or an alternate monitoring frequency, for example the date and circumstances for transitioning from detection monitoring to assessment monitoring, in addition to identifying the constituents detected at a SSI over background concentrations, if applicable;
- Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a statement as to why that happened, if applicable;
- Other information required to be included in the annual report such as assessment of corrective measures, if applicable.

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

II. Groundwater Monitoring Well Locations and Identification Numbers

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

Landfill Monitoring Wells	
Up Gradient	Down Gradient
MW-1	MW-2
	MW-3
	MW-4
	MW-5
	MW-10



III. Monitoring Wells Installed or Decommissioned

There were no new groundwater monitoring wells installed or decommissioned during 2022. The network design is summarized in the *Groundwater Monitoring Network Design Report* (October 2016) and is posted at the CCR website for Turk Power Plant's LF. That network design report, viewable on the AEP CCR web site, discusses the facility location, the hydrogeological setting, the hydrostratigraphic units, the uppermost aquifer, downgradient monitoring well locations and the upgradient monitoring well locations.

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

Appendix 1 contains the groundwater velocity, groundwater flow direction, potentiometric maps developed after each sampling event and the groundwater quality data collected during this time period.

- The groundwater flow rate and direction for the confirmatory sampling events reflect that seen during the semi-annual sampling events.

V. Groundwater Quality Data Statistical Analysis

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

As required by the detection monitoring rules, 40 CFR 257.94, two rounds of sampling were conducted in June and November including all Appendix III parameters.

- Data and statistical analysis not available for the previous reporting period indicated that during the 2nd semi-annual 2021 sampling event (November 2021):
  - No SSIs were determined
- During the 1st semi-annual 2022 sampling event (June 2022) with confirmation sampling conducted in June 2022:
  - The following Appendix III parameters exceeded background concentrations for:
    - pH at MW-4
- The 2nd semi-annual event (November 2022) data are still undergoing statistical analysis.

VI. Alternate Source Demonstration

ASD for the 1st semi-annual 2022 potential pH SSI was certified December 19, 2022.

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

No transition was made during the reporting period and the CCR Unit remained in detection monitoring.

Detection monitoring will continue in 2023.

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

VIII. Other Information Required

The background data was re-established in July 2022.

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

An obstruction was encountered in MW-10 during the June sampling event. This obstruction in the well prevented it from being properly purged prior to sampling. A groundwater sample was collected in June but strictly for observation purposes only. After many attempts, the obstruction was removed September 15, 2022. The well was determined to be intact and redeveloped prior to the November sampling event.

The low flow sampling effort went smoothly, and the schedule was met to support the annual groundwater report preparation covering the year 2022 groundwater monitoring activities.

X. A Projection of Key Activities for the Upcoming Year

Key activities for the next include:

- Detection monitoring on a twice per year schedule all constituents listed in Appendix III as required by 40 CFR 257.94;
- Complete the statistical evaluation of the second semi-annual groundwater monitoring event that took place in November 2022.
- Perform statistical analysis on the sampling results for the Appendix III parameters as required by 40 CFR 257.94.
- Evaluation of the detection monitoring results from a statistical analysis viewpoint, looking for any SSIs above background;
- Responding to any new data received in light of CCR rule requirements;
- Preparation of the next annual groundwater report.

APPENDIX 1- Groundwater Data Tables and Figures

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

Table 1 - Groundwater Data Summary: MW-1
Turk - 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
6/1/2016	Background	0.247	218	284	1.1734	7.0	478	1,752
7/25/2016	Background	0.274	247	294	0.7506 J1	6.5	767	2,245
9/1/2016	Background	0.258	251	271	1.0888	6.5	469	1,742
11/2/2016	Background	0.321	275	360	0.5629 J1	6.6	1,479	3,008
12/15/2016	Background	0.333	310	350	2	6.7	830	2,328
2/1/2017	Background	0.212	230	331	2	7.0	461	1,812
2/21/2017	Background	0.184	215	281	1.1213	7.0	407	1,660
5/2/2017	Background	0.137	176	230	1.23	7.4	334	1,020
6/29/2017	Background	0.135	177	202	1.1529	7.4	301	1,374
7/19/2017	Background	0.17	183	226	1.1435	6.7	407	1,504
8/10/2017	Detection	0.181	207	243	0.9589 J1	7.0	417	1,600
4/26/2018	Detection	0.126	153	166	1.657	7.3	294	1,220
9/5/2018	Detection	0.098	198	216	< 0.083 U1	7.1	280	1,216
4/17/2019	Detection	0.120	160	197	1.51	7.5	317	1,188
9/19/2019	Detection	0.242	244	239	1.03	7.4	463	1,462
5/27/2020	Detection	0.109	157	172	1.37	8.1	269	1,120
11/9/2020	Detection	0.086	156	186	1.52	8.1	274	1,160
12/27/2020	Detection	--	--	--	--	7.3	--	--
6/29/2021	Detection	0.084	141	166	1.45	7.0	264	1,140
11/29/2021	Detection	0.25	289 M1, P3	227	1.07	7.0	774	1,970
6/7/2022	Detection	0.159	180	171	1.36	7.3	353	1,240
11/28/2022	Detection	0.396	287 M1	264	1.17	7.2	718	1,830

Notes:
mg/L: milligrams per liter
SU: standard unit
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag.
In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.
M1: The associated matrix spike (MS) or matrix spike duplicate (MSD) was above acceptance limits.
P3: The precision on the matrix spike duplicate (MSD) was above acceptance limits.

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

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
6/1/2016	Background	< 0.93 U1	< 1.05 U1	38	0.0809225 J1	< 0.07 U1	1	1.08847 J1	--	1.1734	1.15566 J1	0.099	0.01991 J1	2.54209 J1	2.09098 J1	1.23972 J1
7/25/2016	Background	< 0.93 U1	< 1.05 U1	49	0.159579 J1	< 0.07 U1	1	1.25472 J1	--	0.7506 J1	< 0.68 U1	0.118	0.01078 J1	3.09725 J1	3.00699 J1	< 0.86 U1
9/1/2016	Background	1.45614 J1	< 1.05 U1	41	0.16559 J1	0.810967 J1	0.406151 J1	0.950716 J1	1.844	1.0888	< 0.68 U1	0.087	0.01003 J1	4.13353 J1	3.88471 J1	< 0.86 U1
11/2/2016	Background	3.5 J1	< 1.05 U1	42.76	< 0.02 U1	< 0.07 U1	0.9 J1	1.1 J1	1.287	0.5629 J1	< 0.68 U1	0.105	< 0.005 U1	1.57 J1	3.33 J1	< 0.86 U1
12/15/2016	Background	0.950637 J1	< 1.05 U1	39	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.605475 J1	2.076	2	< 0.68 U1	0.102	< 0.005 U1	1.57771 J1	< 0.99 U1	< 0.86 U1
2/1/2017	Background	< 0.93 U1	< 1.05 U1	32	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.688421 J1	1.203	2	< 0.68 U1	0.081	0.01216 J1	1.43338 J1	< 0.99 U1	< 0.86 U1
2/21/2017	Background	< 0.93 U1	< 1.05 U1	31	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.564016 J1	0.899	1.1213	< 0.68 U1	0.078	0.00711 J1	1.7175 J1	2.52261 J1	< 0.86 U1
5/2/2017	Background	< 0.93 U1	< 1.05 U1	29.84	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.57 J1	1.114	1.23	0.74 J1	0.06633	< 0.005 U1	2.15 J1	3.43 J1	< 0.86 U1
6/29/2017	Background	< 0.93 U1	< 1.05 U1	27.71	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.33 J1	4.687	1.1529	< 0.68 U1	0.05943	< 0.005 U1	1.68 J1	< 0.99 U1	< 0.86 U1
7/19/2017	Background	< 0.93 U1	< 1.05 U1	30.71	< 0.02 U1	< 0.07 U1	0.24 J1	0.78 J1	0.842	1.1435	0.71 J1	0.06479	< 0.005 U1	1.82 J1	< 0.99 U1	< 0.86 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-2
Turk - 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
6/1/2016	Background	0.07	57.4	12	0.5064 J1	7.9	42	343
7/25/2016	Background	0.152	120	10	0.4781 J1	6.9	121	486
9/1/2016	Background	0.128	109	15	0.4811 J1	6.9	108	514
11/2/2016	Background	0.369	398	25	0.493 J1	6.9	346	960
12/15/2016	Background	0.109	95.2	47	0.5233 J1	7.0	79	562
2/1/2017	Background	0.05	38.9	9	0.5086 J1	7.5	28	248
2/21/2017	Background	0.05	40.8	10	< 0.083 U1	7.9	33	252
5/2/2017	Background	0.04823	51.2	5	0.52 J1	7.9	19	208
6/29/2017	Background	0.05514	59.6	7	0.4428 J1	7.9	48	336
7/19/2017	Background	0.08324	65.5	8	0.4694 J1	7.5	44	332
8/10/2017	Detection	0.07471	62.9	10	0.451 J1	7.5	25	304
4/26/2018	Detection	0.04343	51.8	6	< 0.083 U1	7.6	22	264
9/5/2018	Detection	0.098	111	13	< 0.083 U1	7.4	66	348
4/17/2019	Detection	0.037	76.8	5.86	0.34	7.9	18.6	310
9/19/2019	Detection	0.098	113	10.1	0.30	8.0	76.8	416
5/27/2020	Detection	0.051	75.7	6.17	0.28	8.5	17.2	311
7/14/2020	Detection	--	--	--	--	7.9	--	--
11/9/2020	Detection	0.059	89.9	7.55	0.34	8.5	52.9	332
12/22/2020	Detection	--	--	--	--	7.8	--	--
6/29/2021	Detection	0.034 J1	75.1	3.26	0.30	7.4	15.5	320
11/29/2021	Detection	0.045 J1	89.3	13.9	0.29	7.5	40.9	340
6/7/2022	Detection	0.035 J1	67.3	5.26	0.33	7.4	21.8	280
11/28/2022	Detection	0.064	143	52.8	0.26	7.5	161	610

Notes:
mg/L: milligrams per liter
SU: standard unit
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag.
In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.

Table 1 - Groundwater Data Summary: MW-2
Turk - LF
Appendix IV Constituents

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
6/1/2016	Background	< 0.93 U1	1.75982 J1	120	0.122549 J1	< 0.07 U1	2	0.904166 J1	--	0.5064 J1	2.01553 J1	0.015	0.01145 J1	2.82795 J1	1.14538 J1	< 0.86 U1
7/25/2016	Background	< 0.93 U1	1.39254 J1	152	0.131235 J1	< 0.07 U1	0.862157 J1	1.21412 J1	--	0.4781 J1	< 0.68 U1	0.048	0.00701 J1	4.69255 J1	< 0.99 U1	< 0.86 U1
9/1/2016	Background	5	< 1.05 U1	162	0.141798 J1	< 0.07 U1	3	1.1267 J1	3.045	0.4811 J1	1.22736 J1	0.031	0.01382 J1	6	3.91967 J1	< 0.86 U1
11/2/2016	Background	1.91737 J1	< 1.05 U1	107	0.0819 J1	< 0.07 U1	3	1.53886 J1	1.939	0.493 J1	1.26945 J1	0.088	0.00947 J1	5	1.45298 J1	< 0.86 U1
12/15/2016	Background	1.7294 J1	< 1.05 U1	158	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.355698 J1	1.919	0.5233 J1	< 0.68 U1	0.028	< 0.005 U1	2.15202 J1	1.67636 J1	< 0.86 U1
2/1/2017	Background	< 0.93 U1	< 1.05 U1	80	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.217505 J1	0.933	0.5086 J1	< 0.68 U1	0.011	< 0.005 U1	2.91607 J1	< 0.99 U1	< 0.86 U1
2/21/2017	Background	< 0.93 U1	< 1.05 U1	83	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.233088 J1	1.335	< 0.083 U1	< 0.68 U1	0.012	< 0.005 U1	2.62555 J1	< 0.99 U1	< 0.86 U1
5/2/2017	Background	1.46 J1	1.37 J1	93	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.32 J1	1.935	0.52 J1	< 0.68 U1	0.00925	< 0.005 U1	1.08 J1	1.32 J1	< 0.86 U1
6/29/2017	Background	< 0.93 U1	< 1.05 U1	101	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.58 J1	3.373	0.4428 J1	< 0.68 U1	0.01089	< 0.005 U1	0.87 J1	< 0.99 U1	< 0.86 U1
7/19/2017	Background	< 0.93 U1	< 1.05 U1	97.5	0.02 J1	< 0.07 U1	0.76 J1	0.71 J1	2.712	0.4694 J1	1.14 J1	0.01387	0.005 J1	1.18 J1	< 0.99 U1	< 0.86 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-3
Turk - 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
6/1/2016	Background	0.04	93.9	3	0.3926 J1	7.6	17	357
7/25/2016	Background	0.168	393	37	0.4403 J1	7.4	699	1,612
9/1/2016	Background	0.09	149	14	0.4288 J1	7.3	119	564
11/2/2016	Background	0.151	264	48	0.5852 J1	7.4	424	1,188
12/15/2016	Background	0.06	67.8	15	0.6047 J1	7.4	43	408
2/1/2017	Background	0.03	53	7	< 0.083 U1	7.4	19	220
2/21/2017	Background	0.05	81.5	12	< 0.083 U1	7.6	76	340
5/2/2017	Background	0.04375	77.3	6	0.37 J1	7.6	27	328
6/29/2017	Background	0.05282	95.6	6	0.3475 J1	7.6	32	332
7/19/2017	Background	0.09178	122	15	< 0.083 U1	7.2	95	510
8/10/2017	Detection	0.09788	160	23	0.438 J1	7.5	190	716
4/26/2018	Detection	0.03713	61.3	4	< 0.083 U1	7.4	28	278
9/5/2018	Detection	0.073	160	58	< 0.083 U1	7.3	554	1,234
1/22/2019	Detection	--	--	7.3	--	--	--	--
4/17/2019	Detection	0.035	81.1	3.70	0.21	7.5	13.7	364
9/19/2019	Detection	0.074	143	27.3	0.22	7.9	148	612
5/27/2020	Detection	0.053	82.0	11.3	0.22	8.2	11.7	370
7/14/2020	Detection	--	--	--	--	7.9	--	--
11/9/2020	Detection	0.056	85.6	28.8	0.29	8.1	12.9	402
12/22/2020	Detection	--	--	--	--	7.3	--	--
6/29/2021	Detection	0.067	118	88.8	0.29	7.2	92.0	670
11/29/2021	Detection	0.07 J1	225	263	0.25	7.0	193	1,040
6/7/2022	Detection	0.050	122	123	0.30	7.3	100	710
11/28/2022	Detection	0.077	207	265	0.29	7.2	276	1,160

Notes:
mg/L: milligrams per liter
SU: standard unit
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag.
In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.

Table 1 - Groundwater Data Summary: MW-3
Turk - 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
6/1/2016	Background	< 0.93 U1	< 1.05 U1	73	0.194411 J1	< 0.07 U1	1	0.664792 J1	--	0.3926 J1	0.940276 J1	0.01	0.01506 J1	0.949404 J1	< 0.99 U1	< 0.86 U1
7/25/2016	Background	< 0.93 U1	< 1.05 U1	238	0.137503 J1	< 0.07 U1	0.493284 J1	0.785774 J1	--	0.4403 J1	< 0.68 U1	0.075	< 0.005 U1	1.16782 J1	< 0.99 U1	< 0.86 U1
9/1/2016	Background	1.90159 J1	< 1.05 U1	81	0.185901 J1	< 0.07 U1	0.955367 J1	0.803817 J1	3.55	0.4288 J1	< 0.68 U1	0.014	< 0.005 U1	1.14299 J1	1.25976 J1	< 0.86 U1
11/2/2016	Background	1.9135 J1	2.32209 J1	160	0.0958 J1	< 0.07 U1	0.571016 J1	1.33502 J1	2.83	0.5852 J1	1.51713 J1	0.03	< 0.005 U1	1.68622 J1	< 0.99 U1	< 0.86 U1
12/15/2016	Background	1.36647 J1	1.8418 J1	55	0.261831 J1	< 0.07 U1	0.471105 J1	0.395502 J1	1.92	0.6047 J1	< 0.68 U1	0.009	< 0.005 U1	0.30882 J1	< 0.99 U1	< 0.86 U1
2/1/2017	Background	1.38687 J1	< 1.05 U1	55	0.157528 J1	< 0.07 U1	0.906786 J1	0.761635 J1	0.942	< 0.083 U1	< 0.68 U1	0.003	0.00701 J1	1.02923 J1	< 0.99 U1	< 0.86 U1
2/21/2017	Background	1.75888 J1	< 1.05 U1	66	0.239409 J1	< 0.07 U1	4	1.21066 J1	1.156	< 0.083 U1	2.18988 J1	0.008	0.00692 J1	0.551231 J1	< 0.99 U1	0.918887 J1
5/2/2017	Background	< 0.93 U1	2.37 J1	47.28	0.1 J1	< 0.07 U1	0.31 J1	0.35 J1	2.80	0.37 J1	< 0.68 U1	0.00679	< 0.005 U1	< 0.29 U1	< 0.99 U1	< 0.86 U1
6/29/2017	Background	< 0.93 U1	< 1.05 U1	63.01	0.13 J1	< 0.07 U1	1.64	0.89 J1	1.894	0.3475 J1	1.12 J1	0.00836	< 0.005 U1	< 0.29 U1	< 0.99 U1	< 0.86 U1
7/19/2017	Background	< 0.93 U1	< 1.05 U1	79.28	0.15 J1	< 0.07 U1	0.58 J1	0.72 J1	3.43	< 0.083 U1	< 0.68 U1	0.01353	< 0.005 U1	< 0.29 U1	< 0.99 U1	< 0.86 U1

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag. In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit. In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.

Table 1 - Groundwater Data Summary: MW-4
Turk - 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
6/1/2016	Background	0.36	391	653	0.6203 J1	7.2	190	2,352
7/25/2016	Background	0.455	729	1,055	< 0.083 U1	7.4	694	4,084
9/1/2016	Background	0.402	569	1,065	0.5614 J1	7.1	671	3,500
11/2/2016	Background	0.393	513	993	0.374 J1	7.4	538	3,450
12/15/2016	Background	0.305	280	930	0.3995 J1	7.3	434	2,980
2/1/2017	Background	0.445	669	1,159	< 0.083 U1	6.8	747	3,720
2/21/2017	Background	0.365	439	730	< 0.083 U1	7.2	186	2,404
5/2/2017	Background	0.376	496	1,024	0.44 J1	6.9	572	3,370
6/29/2017	Background	0.264	264	659	0.4605 J1	7.0	157	2,276
7/19/2017	Background	0.296	306	1,052	< 0.083 U1	6.9	557	3,120
8/10/2017	Detection	0.429	648	1,105	0.512 J1	7.0	692	3,788
4/26/2018	Detection	0.347	383	1,140	< 0.083 U1	7.0	557	3,654
9/5/2018	Detection	0.255	516	1,241	< 0.083 U1	6.8	748	5,442
12/20/2018	Detection	--	--	110	--	--	--	2,792
4/17/2019	Detection	0.261	452	1,000	0.38	7.0	164	2,798
9/19/2019	Detection	0.330	573	895	0.34	7.0	157	2,780
5/27/2020	Detection	0.206	328	831	0.27	7.5	246	2,390
11/9/2020	Detection	0.384	664	1,150	0.26	7.5	634	3,150
12/22/2020	Detection	--	--	--	--	6.4	--	--
6/29/2021	Detection	0.390	458	895	0.32	6.8	351	2,630
11/29/2021	Detection	0.49	692	1,020	0.22	6.7	496	2,900
6/7/2022	Detection	0.263	492	1,010	0.2 J1	5.7	497	4,100
6/24/2022	Detection	--	--	--	--	6.1	--	--
11/28/2022	Detection	0.358	600	1,180	0.2 J1	6.9	579	3,100

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.

Table 1 - Groundwater Data Summary: MW-4
Turk - LF
Appendix IV Constituents

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
6/1/2016	Background	< 0.93 U1	1.83781 J1	69	0.23746 J1	< 0.07 U1	7	3.34813 J1	--	0.6203 J1	1.47143 J1	0.131	0.01634 J1	2.98754 J1	6	< 0.86 U1
7/25/2016	Background	< 0.93 U1	< 1.05 U1	110	0.454281 J1	< 0.07 U1	19	8	--	< 0.083 U1	4.81995 J1	0.162	0.01917 J1	1.38966 J1	3.81662 J1	< 0.86 U1
9/1/2016	Background	1.44388 J1	1.75655 J1	144	0.506995 J1	< 0.07 U1	23	9	1.909	0.5614 J1	6	0.098	0.028	3.08827 J1	13	< 0.86 U1
11/2/2016	Background	2.65159 J1	1.40633 J1	56	0.0976 J1	< 0.07 U1	4	2.56138 J1	1.195	0.374 J1	2.26641 J1	0.105	< 0.005 U1	1.80188 J1	13	< 0.86 U1
12/15/2016	Background	< 0.93 U1	2.20107 J1	63	0.0334569 J1	< 0.07 U1	0.630135 J1	0.943538 J1	2.64	0.3995 J1	< 0.68 U1	0.125	< 0.005 U1	3.76575 J1	< 0.99 U1	< 0.86 U1
2/1/2017	Background	1.15118 J1	< 1.05 U1	29	< 0.02 U1	< 0.07 U1	0.266332 J1	0.771837 J1	0.913	< 0.083 U1	< 0.68 U1	0.072	0.00591 J1	0.342891 J1	11	< 0.86 U1
2/21/2017	Background	0.987123 J1	< 1.05 U1	78	0.170596 J1	< 0.07 U1	9	4.18392 J1	4.46	< 0.083 U1	2.76588 J1	0.104	0.01482 J1	2.52827 J1	7	< 0.86 U1
5/2/2017	Background	2.26 J1	< 1.05 U1	41.07	0.03 J1	< 0.07 U1	0.33 J1	1.02 J1	4.274	0.44 J1	< 0.68 U1	0.09813	0.006 J1	1.41 J1	4.09 J1	< 0.86 U1
6/29/2017	Background	< 0.93 U1	< 1.05 U1	65.4	0.05 J1	< 0.07 U1	1.05	1.64 J1	13.21	0.4605 J1	< 0.68 U1	0.116	< 0.005 U1	2.65 J1	< 0.99 U1	< 0.86 U1
7/19/2017	Background	< 0.93 U1	2.44 J1	64.91	0.07 J1	< 0.07 U1	1.4	1.64 J1	3.521	< 0.083 U1	1.34 J1	0.133	0.013 J1	3.06 J1	1.18 J1	< 0.86 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-5
Turk - 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
6/1/2016	Background	0.06	284	100	0.4866 J1	7.7	329	1,272
7/25/2016	Background	0.04	491	188	0.4938 J1	7.7	465	1,694
9/1/2016	Background	0.05	251	96	0.408 J1	7.5	319	1,250
11/2/2016	Background	0.06	234	80	0.5023 J1	7.6	281	1,034
12/15/2016	Background	0.03	217	55	0.2941 J1	7.7	220	1,036
2/1/2017	Background	0.05	272	78	0.7224 J1	6.8	265	1,092
2/21/2017	Background	0.06	270	80	< 0.083 U1	7.7	273	1,156
5/2/2017	Background	0.06152	275	91	0.54 J1	7.1	287	1,192
6/29/2017	Background	0.04842	248	73	< 0.083 U1	7.0	228	1,104
7/19/2017	Background	0.04983	208	66	< 0.083 U1	6.6	216	932
8/10/2017	Detection	0.06474	267	70	< 0.083 U1	6.8	233	1,052
4/26/2018	Detection	0.08795	310	105	< 0.083 U1	7.0	303	1,408
9/5/2018	Detection	0.086	380	134	< 0.083 U1	6.4	273	1,502
4/17/2019	Detection	0.082	290	138	0.30	7.2	343	1,292
9/19/2019	Detection	0.075	306	110	0.27	6.8	275	1,326
5/27/2020	Detection	0.078	301	114	0.28	7.4	319	1,320
11/9/2020	Detection	0.060	240	75.2	0.30	7.5	273	1,080
12/22/2020	Detection	--	--	--	--	6.5	--	--
6/29/2021	Detection	0.095	284	140	0.33	6.8	339	1,400
11/29/2021	Detection	0.16 J1	419	155	0.30	6.7	371	1,430
6/7/2022	Detection	0.035 J1	220	62.3	0.27	6.4	210	950
11/28/2022	Detection	0.025 J1	262	166	0.28	7.1	273	1,120

Notes:
mg/L: milligrams per liter
SU: standard unit
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag.
In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.

Table 1 - Groundwater Data Summary: MW-5
Turk - LF
Appendix IV Constituents

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
6/1/2016	Background	< 0.93 U1	< 1.05 U1	40	0.0620377 J1	< 0.07 U1	0.662999 J1	0.611001 J1	--	0.4866 J1	< 0.68 U1	0.049	0.02124 J1	1.45446 J1	2.29756 J1	< 0.86 U1
7/25/2016	Background	4.2029 J1	< 1.05 U1	42	0.165141 J1	< 0.07 U1	2	1.38215 J1	--	0.4938 J1	1.36311 J1	0.164	0.01234 J1	4.13266 J1	8	< 0.86 U1
9/1/2016	Background	0.948881 J1	< 1.05 U1	41	0.141298 J1	< 0.07 U1	0.560473 J1	0.970337 J1	1.411	0.408 J1	< 0.68 U1	0.024	0.01038 J1	3.3054 J1	1.06126 J1	< 0.86 U1
11/2/2016	Background	< 0.93 U1	< 1.05 U1	38	< 0.02 U1	< 0.07 U1	0.37232 J1	0.68278 J1	3.11	0.5023 J1	< 0.68 U1	0.024	< 0.005 U1	0.760667 J1	1.57137 J1	< 0.86 U1
12/15/2016	Background	< 0.93 U1	< 1.05 U1	35	< 0.02 U1	< 0.07 U1	0.558695 J1	0.494922 J1	1.159	0.2941 J1	< 0.68 U1	0.015	< 0.005 U1	< 0.29 U1	< 0.99 U1	< 0.86 U1
2/1/2017	Background	< 0.93 U1	< 1.05 U1	43	< 0.02 U1	< 0.07 U1	0.86197 J1	0.547445 J1	0.632	0.7224 J1	< 0.68 U1	0.018	0.01495 J1	0.862299 J1	< 0.99 U1	< 0.86 U1
2/21/2017	Background	< 0.93 U1	< 1.05 U1	43	< 0.02 U1	< 0.07 U1	1	0.733647 J1	0.747	< 0.083 U1	< 0.68 U1	0.021	0.00912 J1	0.957474 J1	< 0.99 U1	< 0.86 U1
5/2/2017	Background	1.2 J1	< 1.05 U1	38.42	< 0.02 U1	< 0.07 U1	0.42 J1	0.6 J1	4.45	0.54 J1	< 0.68 U1	0.02349	0.016 J1	1.11 J1	< 0.99 U1	< 0.86 U1
6/29/2017	Background	< 0.93 U1	< 1.05 U1	35.21	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.68 J1	5.057	< 0.083 U1	< 0.68 U1	0.01696	0.011 J1	2.2 J1	< 0.99 U1	< 0.86 U1
7/19/2017	Background	< 0.93 U1	< 1.05 U1	35.22	< 0.02 U1	< 0.07 U1	0.46 J1	0.81 J1	1.381	< 0.083 U1	0.95 J1	0.01583	0.026	0.97 J1	< 0.99 U1	< 0.86 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-10
Turk - 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
6/1/2016	Background	0.07	245	509	0.5264 J1	7.8	582	2,252
7/25/2016	Background	0.07	348	680	0.4623 J1	6.7	960	2,936
9/1/2016	Background	0.08	349	400	0.5157 J1	6.6	444	1,896
11/2/2016	Background	0.09	407	378	0.373 J1	6.8	499	1,916
12/15/2016	Background	0.05	363	514	0.3419 J1	6.3	559	2,298
2/1/2017	Background	0.05	369	53	1.2456	6.0	62	2,280
2/21/2017	Background	0.177	673	762	< 0.083 U1	7.8	1,452	3,814
5/2/2017	Background	0.08024	213	305	0.52 J1	5.8	371	1,618
6/29/2017	Background	0.08018	256	277	1.1688	5.8	389	1,666
7/19/2017	Background	0.0858	454	470	3.17	6.3	560	2,146
8/10/2017	Detection	0.07623	392	544	0.37 J1	6.2	619	2,252
4/26/2018	Detection	0.06224	298	326	0.9038 J1	7.3	452	1,826
9/5/2018	Detection	0.074	410	405	< 0.083 U1	7.5	484	1,872
4/17/2019	Detection	0.046	313	431	0.21	7.4	554	2,002
9/19/2019	Detection	0.05 J1	339	365	0.21	6.6	481	1,900
5/27/2020	Detection	0.04 J1	389	378	0.19	7.6	487	1,780
11/9/2020	Detection	0.04 J1	264	282	0.24	6.4	366	1,610
6/29/2021	Detection	0.033 J1	254	320	0.24	6.2	420	1,720
11/29/2021	Detection	0.03 J1	222	240	0.18	6.4	278	1,430
6/24/2022	Detection	0.200	216	207	0.15	6.4	295	1,230
11/28/2022	Detection	0.267	706	992	0.33	6.6	1,710	3,800

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.
While an obstruction was observed in well MW-10, the results from June 24, 2022 were comparable to previous results and were used to evaluate potential exceedances for the first semiannual detection monitoring event of 2022. However, these data will not be incorporated into future background calculations.

Table 1 - Groundwater Data Summary: MW-10
Turk - 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
6/1/2016	Background	< 0.93 U1	< 1.05 U1	68	0.0420664 J1	< 0.07 U1	2	0.608593 J1	--	0.5264 J1	< 0.68 U1	0.039	0.01929 J1	0.808299 J1	1.28039 J1	< 0.86 U1
7/25/2016	Background	< 0.93 U1	< 1.05 U1	57	0.0790461 J1	< 0.07 U1	0.841449 J1	0.890358 J1	--	0.4623 J1	< 0.68 U1	0.073	0.00766 J1	1.38895 J1	1.70224 J1	0.912736 J1
9/1/2016	Background	< 0.93 U1	< 1.05 U1	55	0.0599978 J1	< 0.07 U1	1	0.876633 J1	0.525	0.5157 J1	< 0.68 U1	0.029	0.00756 J1	1.18242 J1	< 0.99 U1	< 0.86 U1
11/2/2016	Background	1.07709 J1	< 1.05 U1	51	< 0.02 U1	< 0.07 U1	0.843928 J1	0.995858 J1	0.658	0.373 J1	0.773158 J1	0.042	< 0.005 U1	1.02999 J1	< 0.99 U1	< 0.86 U1
12/15/2016	Background	< 0.93 U1	< 1.05 U1	51	< 0.02 U1	< 0.07 U1	1	0.642068 J1	0.951	0.3419 J1	< 0.68 U1	0.017	< 0.005 U1	0.729956 J1	< 0.99 U1	< 0.86 U1
2/1/2017	Background	< 0.93 U1	< 1.05 U1	60	< 0.02 U1	< 0.07 U1	1	0.67122 J1	0.344	1.2456	< 0.68 U1	0.02	0.00911 J1	0.7751 J1	< 0.99 U1	< 0.86 U1
2/21/2017	Background	< 0.93 U1	< 1.05 U1	47	< 0.02 U1	< 0.07 U1	2	0.951093 J1	0.630	< 0.083 U1	0.870989 J1	0.095	0.01349 J1	2.06399 J1	< 0.99 U1	< 0.86 U1
5/2/2017	Background	< 0.93 U1	< 1.05 U1	58.09	< 0.02 U1	< 0.07 U1	1.43	0.74 J1	1.4731	0.52 J1	< 0.68 U1	0.01559	< 0.005 U1	0.59 J1	< 0.99 U1	< 0.86 U1
6/29/2017	Background	< 0.93 U1	< 1.05 U1	52.23	< 0.02 U1	< 0.07 U1	1.24	0.61 J1	2.112	1.1688	0.83 J1	0.01916	< 0.005 U1	0.59 J1	< 0.99 U1	< 0.86 U1
7/19/2017	Background	< 0.93 U1	< 1.05 U1	48.43	< 0.02 U1	< 0.07 U1	1.9	0.77 J1	3.154	3.17	1.1 J1	0.0401	0.007 J1	0.87 J1	< 0.99 U1	< 0.86 U1

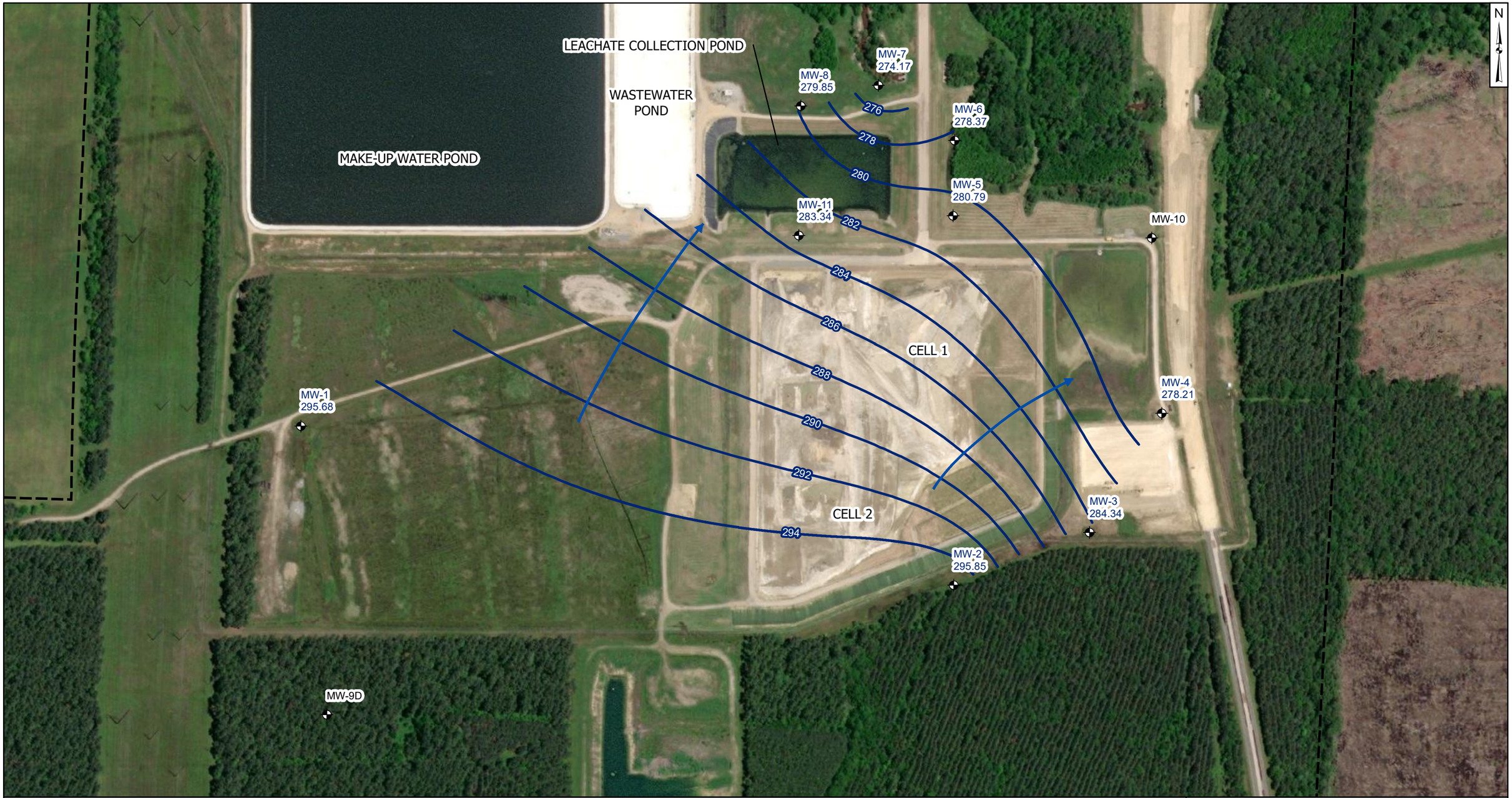
Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag. In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical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

Geosyntec Consultants, Inc.

			2022-06-07		2022-06-24[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)
Landfill	MW-1 [1]	2.0	13.5	4.5	NC	NC	14.7	4.1
	MW-2 [2]	2.0	51.7	1.2	NC	NC	13.4	4.5
	MW-3 [2]	2.0	32.4	1.9	NC	NC	25.5	2.4
	MW-4 [2]	2.0	29.2	2.1	15.5	3.9	27.6	2.2
	MW-5 [2]	2.0	22.1	2.8	NC	NC	17.9	3.4
	MW-10 [2]	2.0	11.7	5.2	NC	NC	52.5	1.2

Notes:
[1] - Background Well
[2] - Downgradient Well
[3] - Only select wells were gauged as part of two-of-two verification sampling
NC - Not Calculated



Legend

- Groundwater Monitoring Well
- Groundwater Elevation Contour
- Groundwater Elevation Contour (Inferred)
- Groundwater Flow Direction
- Property Boundary

Notes

- Monitoring well coordinates and water level data (collected on June 7, 2022) provided by AEP.
- Site features based on information available in Report 1 - Groundwater Monitoring Network for CCR Compliance - John W. Turk, Jr. Power Plant Class 3N Landfill (Terracon, October 2016) provided by AEP.
- Groundwater elevation units are feet above mean sea level.
- MW-10 (Elevation = 282.07 ft amsl) was not used for potentiometric surface contours due to anomalous readings as a result of a well obstruction.
- MW-9D (Elevation = 257.81 ft amsl) is screened within the lower aquifer and excluded from the potentiometric surface calculations.

350 175 0 350 Feet

Groundwater Elevation Contour Map
June 2022

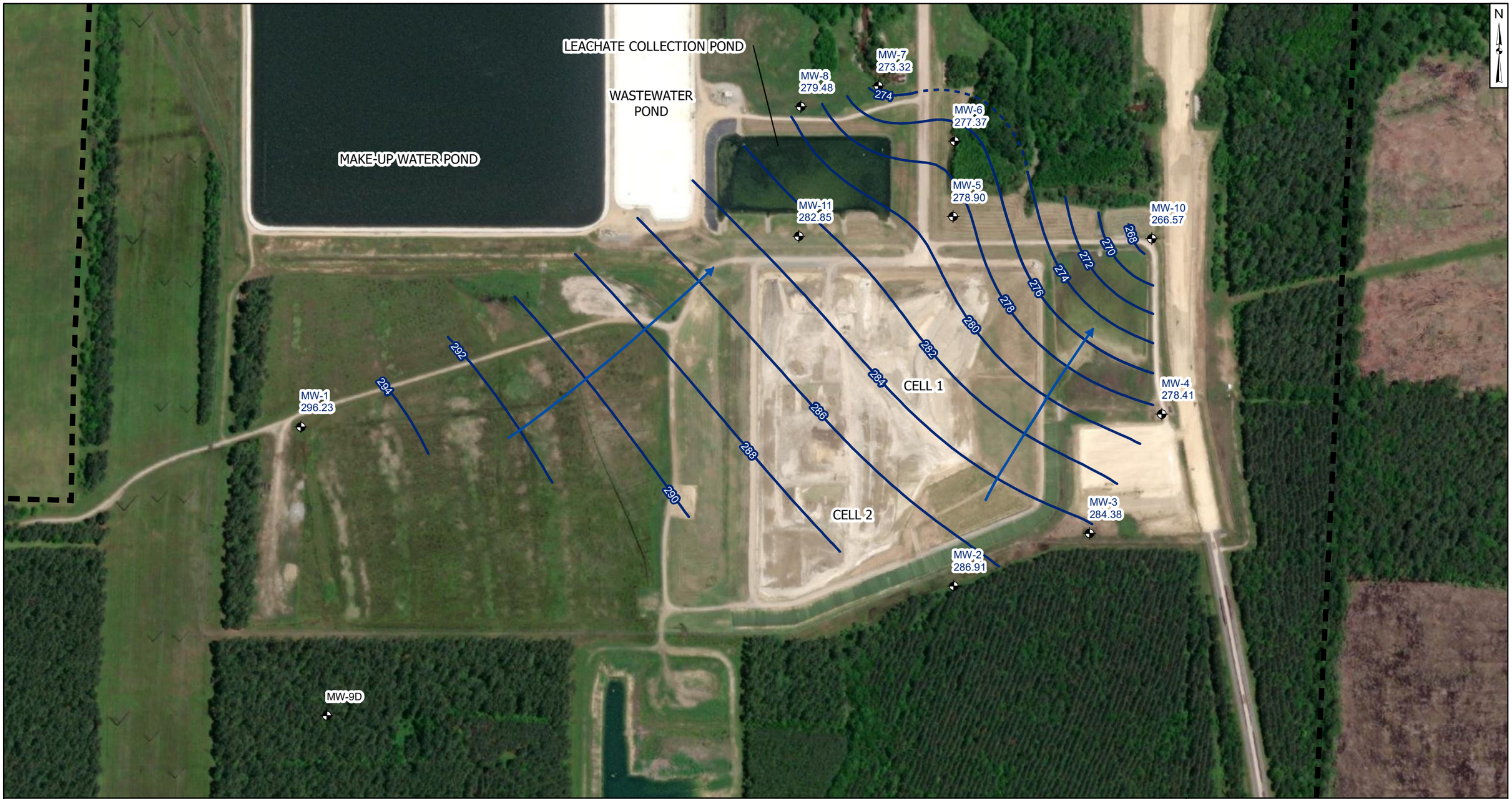
AEP Turk Power Plant - Landfill
Fulton, Arkansas

Geosyntec consultants

Columbus, Ohio | 2022/09/01

Figure **1**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Turk\2022\Turk_June2022.mxd. ASoltero. 9/1/2022. CHA8423/02/08.



Legend

- Groundwater Monitoring Well
- Groundwater Elevation Contour
- Groundwater Elevation Contour (Inferred)
- Groundwater Flow Direction
- Property Boundary

Notes

- Monitoring well coordinates and water level data (collected on November 28, 2022) provided by AEP.
- Site features based on information available in Report 1 - Groundwater Monitoring Network for CCR Compliance - John W. Turk, Jr. Power Plant Class 3N Landfill (Terracon, October 2016) provided by AEP.
- Groundwater elevation units are feet above mean sea level.
- MW-9D (Elevation = 254.96 ft amsl) is screened within the lower aquifer and excluded from the potentiometric surface calculations.

Groundwater Elevation Contour Map
November 2022

AEP Turk Power Plant - Landfill
Fulton, Arkansas

Geosyntec consultants

Columbus, Ohio | 2023/01/11

Figure **2**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Turk\2022\Turk_Nov2022.mxd. ASoltero. 1/11/2023. CHA8423/02/08.

APPENDIX 2- Statistical Analyses

The reports summarizing the statistical evaluation follow.

Geosyntec consultants

941 Chatham Lane, Suite 103
Columbus, Ohio 43212
PH 614.468.0415
FAX 614.468.0416
www.geosyntec.com

Memorandum

Date:	March 22, 2022
To:	David Miller (AEP)
Copies to:	Leslie Fuershbach (AEP)
From:	Allison Kreinberg (Geosyntec)
Subject:	Evaluation of Detection Monitoring Data at Turk 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 257 Subpart D, "CCR rule"), the second semi-annual detection monitoring event of 2021 at the Landfill (LF), an existing CCR unit at the Turk Power Plant located in Fulton, Arkansas, was completed on November 29, 2021.

Background values for the Turk LF were previously calculated in December 2017. After a minimum of four detection monitoring events, the results of those events were compared to the existing background and the 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 8, 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 are below the LPL for pH).

Detection monitoring results and the relevant background values are summarized in Table 1. No SSIs were observed at the Turk LF CCR unit, and as a result the Turk 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 Summary
Turk Plant - Landfill

Analyte	Unit	Description	MW-2	MW-3	MW-4	MW-5	MW-10
			11/29/2021	11/29/2021	11/29/2021	11/29/2021	11/29/2021
Boron	mg/L	Intrawell Background Value (UPL)	1.40	1.30	0.609	0.504	0.430
		Analytical Result	0.045	0.07	0.49	0.16	0.03
Calcium	mg/L	Intrawell Background Value (UPL)	135	246	799	451	615
		Analytical Result	89.3	225	692	419	222
Chloride	mg/L	Intrawell Background Value (UPL)	140	660	1,240	708	1,180
		Analytical Result	13.9	263	1,020	155	240
Fluoride	mg/L	Intrawell Background Value (UPL)	1.40	1.03	0.620	0.584	0.908
		Analytical Result	0.29	0.25	0.22	0.30	0.18
pH	SU	Intrawell Background Value (UPL)	8.1	7.8	7.5	7.8	7.7
		Intrawell Background Value (LPL)	6.3	6.4	6.4	6.1	5.7
		Analytical Result	7.5	7.0	6.7	6.7	6.4
Sulfate	mg/L	Intrawell Background Value (UPL)	1,900	2,300	971	1,180	1,800
		Analytical Result	40.9	193	496	371	278
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	3,800	4,800	4,880	3,360	5,240
		Analytical Result	340	1,040	2,900	1,430	1,430

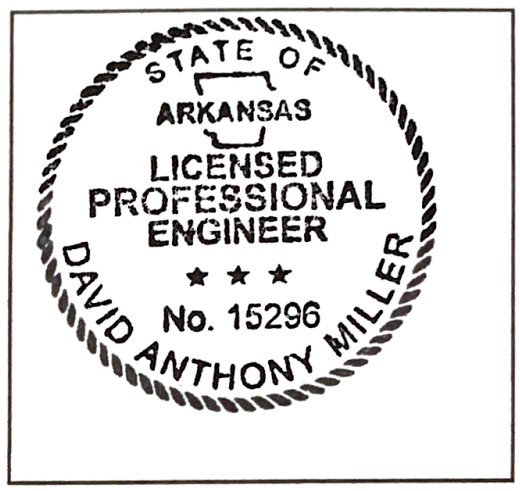
Notes:
UPL: Upper prediction limit
LPL: Lower prediction limit
Bold values exceed the background value.
Background values are shaded gray.

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 8, 2020 *Statistical Analysis Summary* report, is appropriate for evaluating the groundwater monitoring data for the Turk 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

15296	ARKANSAS	03.22.22
License Number	Licensing State	Date

Geosyntec consultants

500 West Wilson Bridge Road, Suite 250
Worthington, Ohio 43085
PH 614.468.0415
FAX 614.468.0416
www.geosyntec.com

Memorandum

Date:	September 19, 2022
To:	David Miller (AEP)
Copies to:	Leslie Fuershbach (AEP)
From:	Allison Kreinberg (Geosyntec)
Subject:	Evaluation of Detection Monitoring Data at Turk 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 257 Subpart D, "CCR rule"), the first semi-annual detection monitoring event of 2022 at the Landfill (LF), an existing CCR unit at the Turk Power Plant located in Fulton, Arkansas, was completed on June 7 and 24, 2022.

Background values for the Turk LF were previously calculated in December 2017 and January 2020. After a minimum of four detection monitoring events, the results of those events were compared to the existing background and the 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 July 13, 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 are below the LPL for pH).

Detection monitoring results and the relevant background values are compared in Table 1 and noted exceedances are described in the list below.

- The pH values at MW-4 were below the intrawell LPL of 6.3 standard units (SU) in both the initial (5.7 SU) and second (6.1 SU) samples collected at MW-4. Thus, an SSI below background is concluded for pH at MW-4.

While an obstruction was observed in well MW-10, the results from June 24, 2022 were comparable to previous results and were used to evaluate potential exceedances for the first semiannual detection monitoring event of 2022. However, these data will not be incorporated into future background calculations.

In response to the exceedance noted above, the Turk LF CCR unit will either transition to assessment monitoring or an alternative source demonstration (ASD) for pH will be conducted in accordance with 40 CFR 257.94(e)(2). If the ASD is successful, the Turk 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 Summary
Turk Plant - Landfill

Geosyntec Consultants

Analyte	Unit	Description	MW-2	MW-3	MW-4		MW-5	MW-10
			6/7/2022	6/7/2022	6/7/2022	6/24/2022	6/7/2022	6/24/2022
Boron	mg/L	Intrawell Background Value (UPL)	1.40	0.840	0.605		0.504	0.523
		Analytical Result	0.035	0.050	0.263	--	0.035	0.200
Calcium	mg/L	Intrawell Background Value (UPL)	132	229	779		422	480
		Analytical Result	67.3	122	492	--	220	216
Chloride	mg/L	Intrawell Background Value (UPL)	85.0	660	1,240		821	1140
		Analytical Result	5.26	123	1,010	--	62.3	207
Fluoride	mg/L	Intrawell Background Value (UPL)	0.523	0.979	0.620		0.554	1.25
		Analytical Result	0.33	0.30	0.2	--	0.27	0.15
pH	SU	Intrawell Background Value (UPL)	8.4	8.1	7.5		7.8	7.7
		Intrawell Background Value (LPL)	6.3	6.4	6.3		6.1	5.7
		Analytical Result	7.4	7.3	**5.7**	**6.1**	6.4	6.4
Sulfate	mg/L	Intrawell Background Value (UPL)	670	940	964		1,210	1,800
		Analytical Result	21.8	100	497	--	210	295
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	1,040	4,800	4,790		3,400	5,800
		Analytical Result	280	710	4,100	--	950	1,230

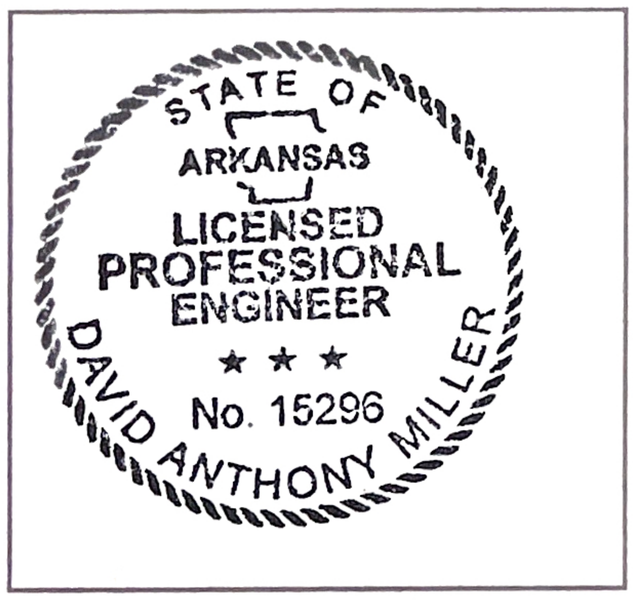
Notes:
UPL: Upper prediction limit
LPL: Lower prediction limit
Bold values exceed the background value.
Background values are shaded gray.

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 July 13, 2022 *Statistical Analysis Summary* report, is appropriate for evaluating the groundwater monitoring data for the Turk 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

15296	ARKANSAS	09.22.22
License Number	Licensing State	Date

STATISTICAL ANALYSIS SUMMARY-
Background Update Calculations
Landfill – John W. Turk, Jr. Plant
Fulton, Arkansas

Submitted to

SOUTHWESTERN ELECTRIC POWER COMPANY
An AEP Company
BOUNDLESS ENERGY

1 Riverside Plaza
Columbus, Ohio 43215-2372

Submitted by

Geosyntec consultants
engineers | scientists | innovators

941 Chatham Lane
Suite 103
Columbus, Ohio 43221

July 13, 2022
CHA8500

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LIST OF ACRONYMS AND ABBREVIATIONS

CCR	Coal Combustion Residuals
CCV	Continuing Calibration Value
CFR	Code of Federal Regulations
EPA	Environmental Protection Agency
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
RCRA	Resource Conservation and Recovery Act
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 Subpart D, "CCR rule"), groundwater monitoring has been conducted at the lined landfill (LF), an existing CCR unit at the John W. Turk, Jr. Power Plant located in Fulton, Arkansas. 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.

Ten monitoring events were completed prior to July 2017 to establish background concentrations for Appendix III and Appendix IV parameters under the CCR rule. Additional data, including data collected prior to the start of operations at the Turk Power Plant and placement of CCR at the Turk Landfill, were also included in the initial background calculations. Prediction limits for Appendix III parameters were previously updated in January 2020 using data until April 2019 (Geosyntec, 2020a). Since the last background update, four semiannual detection monitoring events were conducted between September 2019 and June 2021. Data from these four 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. No data quality issues were identified which would impact the usability of the data.

The detection monitoring data were submitted to Groundwater Stats Consulting, LLC for statistical analysis. The compliance data were reviewed for outliers, and no values were removed from the four recent detection monitoring events prior to updating upper prediction limits (UPLs) for each Appendix III parameter to represent background values. Oversight on the use of statistical calculations was provided by Dr. Jim Loftis, Professor Emeritus of Civil & Environmental Engineering at Colorado State University and Senior Advisor to Groundwater Stats Consulting.

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

Ten background monitoring events were completed from May 2016 through June 2017 to establish background concentrations for Appendix III and Appendix IV parameters under the CCR rule. Additional data were collected prior to background monitoring for the CCR Rule at the Turk Landfill. Portions of these data were collected prior to the start of operations at the Turk Plant in December 2012 and prior to the placement of CCR at the Turk Landfill. The historical data collected for boron, chloride, fluoride, pH, sulfate, and total dissolved solids (TDS) were also included in the previous background calculation. The data were reviewed for outliers and trends prior to calculating upper prediction limits (UPLs) for each Appendix III parameter. Lower prediction limits (LPLs) were also established for pH. Intrawell prediction limits were selected for all parameters with a one-of-two resampling plan. The statistical analyses to establish background levels were previously documented in the December 2017 *Statistical Analysis Summary* report (Geosyntec, 2017).

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 SSI is identified (USEPA, 2009). Prediction limits for Appendix III parameters were previously updated in January 2020 using data until April 2019 (Geosyntec, 2020a).

2.2 Data Validation & QA/QC

Since April 2019, four semiannual detection monitoring events have been conducted at the LF. If the initial results for each detection monitoring event identified possible exceedances, verification sampling was completed on an individual well/parameter basis. Thus, a minimum of four samples were collected from each compliance well. A summary of data collected during these detection monitoring events may be found in Table 1.

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

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

checked against the analytical data for transcription errors and completeness. No QA/QC issues were noted which would impact data usability.

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 $= \tilde{x}_{0.75} - \tilde{x}_{0.25}$

No potential outliers were identified in the data collected for the four most recent detection monitoring events. Select historical values were flagged as outliers and removed from the dataset based on professional judgment. Removal of these flagged values resulted in the generation of more conservative background values. Flagged data and outliers will be reevaluated as new data are collected; data which were previously flagged as outliers may be reincorporated into the dataset in accordance with the Unified Guidance (USEPA, 2009).

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 2011 – April 2019) to the new compliance samples (September 2019 – June 2021). 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. Significant differences with an α=0.01 were found between the two groups for the following upgradient well/parameter pairs:

- A decrease was found for boron at MW-1;
- A decrease was found for chloride at MW-1;
- An increase was found for pH at MW-1;
- A decrease was found for sulfate at MW-1; and,
- A decrease was found for TDS at MW-1.

During this background update, the datasets for all upgradient wells were updated because these data represent naturally occurring groundwater quality and are not impacted by a release.

Significnat differences with an α=0.01 were found between the two groups for the following downgradient well/parameter pairs:

- A decrease was found for boron at MW-10; and,
- Increases were found for pH at MW-2 and MW-3.

For downgradient wells MW-2 and MW-3, at least one of the results in the newer data was similar to historical data, and the results had similar patterns as those observed in upgradient well MW-1. Similar patterns between upgradient and downgradient monitoring wells indicate that the groundwater quality may be naturally changing unrelated to activities at the site; thus, the

background dataset was updated to include the newer data. A similar pattern was observed for boron at downgradient well MW-10 and upgradient well MW-1. The earlier (higher) boron concentrations at downgradient well MW-10 are prior to waste placement and represent pre-waste conditions and naturally occurring variability. Thus, the dataset was not truncated to exclude earlier (higher values).

No statistically significant differences were identified for boron at downgradient well MW-3, sulfate at downgradient wells MW-2 and MW-3, and TDS at downgradient well MW-2. However, earlier values were markedly higher than more recent concentrations. Thus, these dataset were truncated to exclude earlier (higher) values and provide more conservative statistical limits to detect changes in future compliance data.

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.

Except as noted in Section 2.3.2, intrawell UPLs were updated using all the historical data through June 2021 to represent background values. Intrawell LPLs were also updated for pH. The revised prediction limits are summarized in Table 2.

The prediction limits 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, or in the case of pH, is neither less than the LPL nor greater than the UPL, then it can be concluded that an SSI has not occurred. In practice, where the initial result does not exceed the UPL, or in the case of pH, is neither less than the LPL nor greater than the UPL, a second sample will not be collected. The retesting procedures allow achieving an acceptably high statistical power to detect changes at downgradient wells for constituents evaluated using intrawell prediction limits.

2.4 Conclusions

Four 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 no QA/QC issues identified that impacted data usability. Mann-Whitney tests were completed to evaluate whether data from the detection monitoring events could be added to the existing background dataset. The background datasets were updated, and UPLs and LPLs were

recalculated. Intrawell tests using a one-of-two retesting procedure were selected for Appendix III parameters.

SECTION 3

REFERENCES

Geosyntec Consultants, 2017. Statistical Analysis Summary. Landfill – John W. Turk Power Plant. December 2017.

Geosyntec Consultants, 2020a. Statistical Analysis Summary. Landfill – John W. Turk Power Plant. January 2020.

Geosyntec Consultants. 2020b. Statistical Analysis Plan. October 2020.

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

TABLES

Table 1: Groundwater Data Summary
Turk Plant - Landfill

Geosyntec Consultants, Inc.

Parameter	Unit	MW-1					MW-2						MW-3					
		9/19/2019	5/27/2020	11/9/2020	12/27/2020	6/29/2021	9/19/2019	5/27/2020	7/14/2020	11/9/2020	12/22/2020	6/29/2021	9/19/2019	5/27/2020	7/14/2020	11/9/2020	12/22/2020	6/29/2021
		2019-D2	2020-D1	2020-D2	2020-D2-R1	2021-D1	2019-D2	2020-D1	2020-D1-R1	2020-D2	2020-D2-R1	2021-D1	2019-D2	2020-D1	2020-D1-R1	2020-D2	2020-D2-R1	2021-D1
Boron	mg/L	0.242	0.109	0.086	-	0.084	0.098	0.051	-	0.059	-	0.034 J	0.074	0.053	-	0.056	-	0.067
Calcium	mg/L	244	157	156	-	141	113	75.7	-	89.9	-	75.1	143	82.0	-	85.6	-	118
Chloride	mg/L	239	172	186	-	166	10.1	6.17	-	7.55	-	3.26	27.3	11.3	-	28.8	-	88.8
Fluoride	mg/L	1.03	1.37	1.52	-	1.45	0.30	0.28	-	0.34	-	0.30	0.22	0.22	-	0.29	-	0.29
Sulfate	mg/L	463	269	274	-	264	76.8	17.2	-	52.9	-	15.5	148	11.7	-	12.9	-	92.0
Total Dissolved Solids	mg/L	1,462	1,120	1,160	-	1,140	416	311	-	332	-	320	612	370	-	402	-	670
pH	SU	7.4	8.1	8.1	7.3	7.0	8.0	8.5	7.9	8.5	7.8	7.4	7.9	8.2	7.9	8.1	7.3	7.2

Parameter	Unit	MW-4					MW-5					MW-10			
		9/19/2019	5/27/2020	11/9/2020	12/22/2020	6/29/2021	9/19/2019	5/27/2020	11/9/2020	12/22/2020	6/29/2021	9/19/2019	5/27/2020	11/9/2020	6/29/2021
		2019-D2	2020-D1	2020-D2	2020-D2-R1	2021-D1	2019-D2	2020-D1	2020-D2	2020-D2-R1	2021-D1	2019-D2	2020-D1	2020-D2	2021-D1
Boron	mg/L	0.330	0.206	0.384	-	0.390	0.075	0.078	0.060	-	0.095	0.05 J	0.04 J	0.04 J	0.033 J
Calcium	mg/L	573	328	664	-	458	306	301	240	-	284	339	389	264	254
Chloride	mg/L	895	831	1,150	-	895	110	114	75.2	-	140	365	378	282	320
Fluoride	mg/L	0.34	0.27	0.26	-	0.32	0.27	0.28	0.30	-	0.33	0.21	0.19	0.24	0.24
Sulfate	mg/L	157	246	634	-	351	275	319	273	-	339	481	487	366	420
Total Dissolved Solids	mg/L	2,780	2,390	3,150	-	2,630	1,326	1,320	1,080	-	1,400	1,900	1,780	1,610	1,720
pH	SU	7.0	7.5	7.5	6.4	6.8	6.8	7.4	7.5	6.5	6.8	6.6	7.6	6.4	6.2

Notes:
mg/L: milligrams per liter
SU: standard unit
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

Table 2: Background Level Summary
Turk Plant - Landfill

Geosyntec Consultants, Inc.

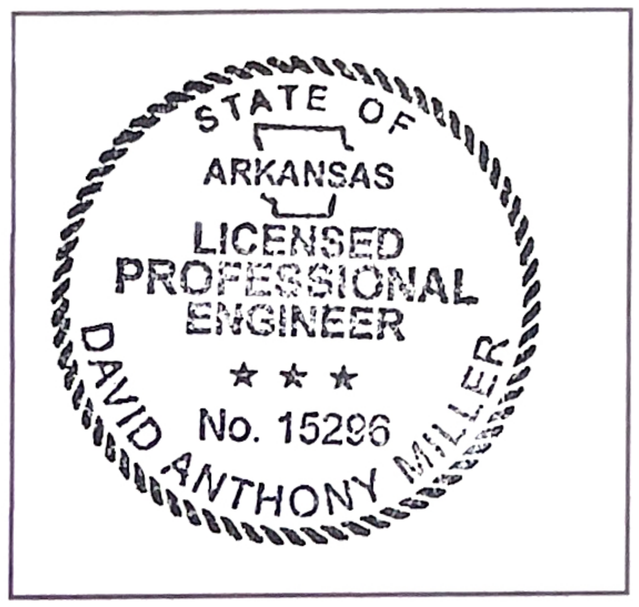
Analyte	Unit	Description	MW-2	MW-3	MW-4	MW-5	MW-10
Boron	mg/L	Intrawell Background Value (UPL)	1.40	0.840	0.605	0.504	0.523
Calcium	mg/L	Intrawell Background Value (UPL)	132	229	779	422	480
Chloride	mg/L	Intrawell Background Value (UPL)	85.0	660	1,240	821	1,140
Fluoride	mg/L	Intrawell Background Value (UPL)	0.523	0.979	0.620	0.554	1.25
pH	SU	Intrawell Background Value (UPL)	8.4	8.1	7.5	7.8	7.7
		Intrawell Background Value (LPL)	6.3	6.4	6.3	6.1	5.7
Sulfate	mg/L	Intrawell Background Value (UPL)	670	940	964	1,210	1,800
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	1,040	4,800	4,790	3,400	5,800

Notes
UPL: Upper prediction limit
LPL: Lower prediction limit
SU: Standard units

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 Turk 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

15296	ARKANSAS	01.23.23
License Number	Licensing State	Date

ATTACHMENT B

Statistical Analysis Output

GROUNDWATER STATS CONSULTING

July 13, 2022

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

RE: Background Update 2022 – Turk Landfill

Dear Ms. Kreinberg,

Groundwater Stats Consulting, formerly the statistical consulting division of Sanitas Technologies, is pleased to provide the proposed background update of prediction limits with data through June 2021 for American Electric Power's Turk Landfill. The analysis complies with the federal rule for the Disposal of Coal Combustion Residuals (CCR) from Electric Utilities (CCR Rule, 2015) as well as with the United States Environmental Protection Agency (USEPA) Unified Guidance (2009).

The Turk Landfill is a lined landfill that has been sampling groundwater at each well for the CCR program since June 2016. Prior to regulation under this program, groundwater data collection began in 2011 before waste was placed at the Landfill in 2013. Groundwater sampling continued through March 2016 and prior to the start of sampling under the CCR regulations. All data collected through March 2016 are, reportedly, considered background data due downgradient well placement of approximately 300 feet away from the Landfill and transport times of groundwater estimated at 30 ft./year. Additionally, the landfill is lined, and pre-waste data are available to characterize natural conditions of groundwater.

The monitoring well network, as provided by Geosyntec Consultants, consists of the following: upgradient well MW-1; and downgradient wells MW-2, MW-3, MW-4, MW-5, and MW-10.

Data were sent electronically to Groundwater Stats Consulting, and the statistical analysis was reviewed by Dr. Jim Loftis, Civil & Environmental Engineering professor emeritus at Colorado State University and Senior Advisor to Groundwater Stats Consulting. The statistical analysis was prepared according to the background screening conducted in December 2017 that was approved by Dr. Kirk Cameron.

The following CCR Detection Monitoring constituents were evaluated:

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

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

During the initial background screening conducted in December 2017 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. Power curves were provided with the screening to demonstrate that the selected statistical methods for Appendix III parameters comply with the USEPA Unified Guidance recommendations as discussed below.

Summary of Statistical Method:

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

Parametric prediction limits are utilized when the screened historical data follow a normal or transformed-normal distribution. When data cannot be normalized or the majority of data are non-detects, a nonparametric test is utilized. While the false positive rate associated with the parametric limits is based on an annual 10% as recommended by the EPA Unified Guidance (2009), the false positive rate associated with the nonparametric limits is dependent upon the available background sample size, number of future comparisons, and verification resample plan. The distribution of data is tested using the

Shapiro-Wilk/Shapiro-Francia test for normality. After testing for normality and performing any adjustments as discussed below (US EPA, 2009), data are analyzed using either parametric or non-parametric prediction limits. Non-detects are handled as follows:

- No statistical analyses are required on wells and analytes containing 100% non-detects (USEPA Unified Guidance, 2009, Chapter 6).
- When data contain <15% non-detects 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 is necessary to accommodate these types of changes. In the intrawell case, data for all wells and constituents are re-evaluated when a minimum of 4 new data points for each well are available to determine whether earlier concentrations are representative of present-day groundwater quality. In some cases, the earlier portion of data are deselected prior to construction of limits in order to provide sensitive limits that will rapidly detect changes in groundwater quality. Even though the data are excluded from the calculation, the values will continue to be reported and shown in tables and graphs.

Summary of Initial Background Screening – December 2017

Outlier Evaluation

Time series plots were used to identify suspected outliers, or extreme values that would result in limits that are not conservative from a regulatory perspective, in proposed background data through July 2017. Suspected outliers at all wells for Appendix III and Appendix IV parameters were formally tested using Tukey's box plot method and, when identified, flagged in the computer database with "o" and deselected prior to construction of statistical limits. The results were submitted with the background screening report.

Seasonality

While several data sets exhibited variation, particularly in the earlier portion of the records, no seasonal patterns were observed in the entire record the time series plots for any of the detected data; therefore, no deseasonalizing adjustments were required. 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.

Trends

While trends may be identified visually, 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 may be deselected as necessary to obtain regulatory conservative limits. When the historical records of data are truncated for the reasons above, a summary report is provided to show the date ranges used in construction of the statistical limits.

The results of the trend analyses showed several statistically significant trends, both decreasing and increasing. The majority of these trends were relatively low in magnitude when compared to average concentrations. Therefore, no adjustments were made to the data sets with a few exceptions as described below.

While the test identified an increasing trend for fluoride at well MW-10, the trend was low in magnitude compared to average concentrations at this well; however, the most recent reported measurement in July 2017 was higher than all other historic measurements. Therefore, this record utilized historical data through June 2017 for construction of intrawell prediction limits.

A few other well/constituent pairs utilized a truncated background period to establish statistical limits due to decreasing trends. For those cases, distinct concentration differences were apparent in background data, with the more recent concentrations considerably lower than historical measurements. Selecting the more recent measurements for construction of statistical limits results in lower limits that are considered more conservative from a regulatory perspective. The truncated

well/constituent pairs included: chloride in wells MW-2 and MW-3; sulfate in wells MW-2 and MW-3; and total dissolved solids in well MW-3. A summary was included with the December 2017 report. Background data sets were later updated in September 2019 and those results were submitted at that time. Below is a summary of the current background update conducted during this analysis.

Appendix III – Determination of Spatial Variation

Since pre-waste data are available for all wells at the Turk Landfill, the Analysis of Variance (ANOVA) was used to evaluate whether natural spatial variation exists in groundwater among the entire well network at the site using all pre-CCR data through March 2016. In all cases except pH, variation was identified by the ANOVA. Because pre-waste data are available and groundwater downgradient of the facility is not suspected to be affected from practices at the site, the intrawell method was recommended for each of the Appendix III parameters.

Interwell tests, which compare downgradient well data to statistical limits constructed from pooled upgradient well data, are appropriate when multiple upgradient wells are available and 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 spatial variability is present or when statistical limits constructed from upgradient wells would not be conservative from a regulatory perspective. Additionally, downgradient water quality must be considered to be unimpacted from the facility.

All Appendix III parameters were evaluated during the background screening, and the results of those findings were submitted with that report. All available data through July 2017, with the exceptions noted above for truncated background periods, at each well were used to establish intrawell background limits, based on a 1-of-2 resample plan, that are used for future comparisons of compliance data at each well during subsequent semi-annual sample events.

In the event of an initial exceedance of compliance well data, the 1-of-2 resample plan allows for collection of an additional sample to determine whether the initial exceedance is confirmed. When the resample confirms the initial exceedance, a statistically significant increase (SSI) is identified, and further research would be required to identify the cause of the exceedance (i.e. impact from the site, natural variation, or an off-site source). If the resample falls within the statistical limit, the initial exceedance is considered to be a false positive result, and therefore, no further action is necessary.

Background Update – March 2022

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. This process requires a minimum of four new measurements as mentioned above. Background data sets were last updated in September 2019. A summary of those findings was included with that report, and are not repeated here. Well/constituent pairs were updated with background data through April 2019 at that time.

During the March 2022 analysis, historical data, as discussed below, were evaluated for updating background records with newer data through June 2021. Time series graphs and Tukey's outlier test were used to identify potential outliers. The Mann-Whitney test was used to compare the medians of newer data to the medians of previous background data.

Outlier Evaluation

The Appendix III parameters at all wells were screened for outliers using Tukey's outlier test (Figure C). The test did not identify any new statistical outliers since the original background screening discussed earlier. However, due to the natural log transformation as well as high degree of variation in some records, Tukey's test did not identify a few values that were flagged as outliers and deselected prior to construction of prediction limits during this analysis. These measurements were considerably higher than remaining concentrations within a given well and would have resulted in statistical limits that are not conservative from a regulatory perspective. A summary of all flagged values follows this letter.

Mann-Whitney Evaluation

Since intrawell prediction limits are used for all wells and Appendix III constituents, the Mann-Whitney test is used to compare the previous background data through April 2019 for each well/constituent pair to newer data through June 2021 (Figure D). When no statistically significant difference in medians between the two groups is found at a 99% confidence level, the older background data may be updated with newer compliance data. Statistically significant differences (either an increase or decrease in median concentrations) were found between the two groups for the following well/constituent pairs:

Increase:

- pH: MW-1 (upgradient), MW-2, and MW-3

Decrease:

- Boron: MW-1 (upgradient) and MW-10
- Chloride: MW-1 (upgradient)
- Sulfate: MW-1 (upgradient)
- TDS: MW-1 (upgradient)

It was noted that the increases in concentrations of pH in downgradient wells MW-2 and MW-3 followed a similar pattern to that observed in upgradient MW-1. When changes are observed upgradient of the facility, it is an indication that groundwater quality is changing naturally and unrelated to practices at the facility. Additionally, some of the more recent reported concentrations are similar to historical data within each well. Therefore, these records were updated with more recent data through June 2021. While the Mann Whitney test did not identify statistical differences for boron at well MW-3, sulfate at wells MW-2 and MW-3, and TDS at well MW-2, the earlier portions of each of these records contained reported measurements that are markedly higher than more recent concentrations. Therefore, these records were truncated to construct statistical limits that are conservative (i.e., lower) from a regulatory perspective and capable of detecting changes in future compliance data.

For all other cases found to have statistically significant decreasing differences, which primarily occurred in groundwater quality upgradient of the facility, earlier measurements were retained. Those earlier data represent pre-waste conditions and naturally occurring variation. Therefore, similar patterns may be observed at a later time, either upgradient or downgradient of the facility, as a result of natural variation. In addition, well/constituent pairs that had been truncated during the previous background screening were now updated to use all available data through June 2021.

Prediction Limits

With the few exceptions noted in the Date Range Table, intrawell prediction limits were constructed using all historical data through June 2021, combined with a 1-of-2 resample plan (Figure E). A summary of the updated limits follows this letter.

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

For Groundwater Stats Consulting,

Kristina L. Rayner
Groundwater Statistician

Date Ranges

Date: 3/14/2022 12:36 PM

Turk Landfill Client: Geosyntec Data: Turk Landfill

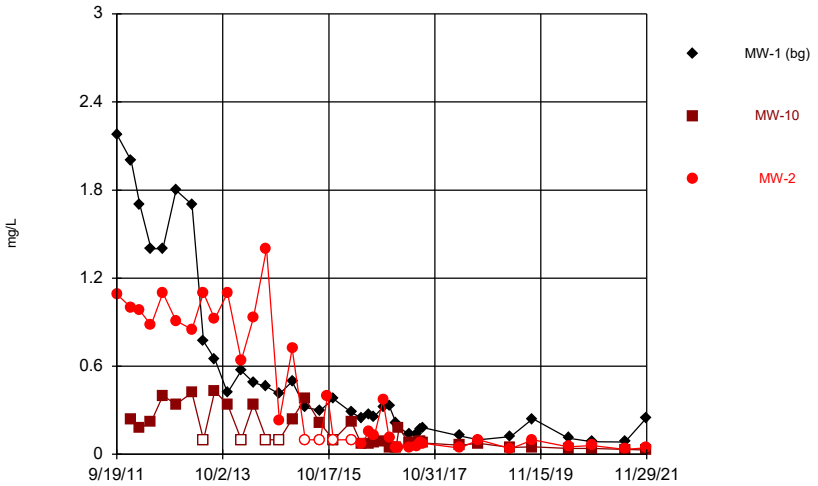
Boron (mg/L)
- MW-3 background:8/6/2013-6/29/2021

Sulfate (mg/L)
- MW-2 background:8/5/2014-6/29/2021
- MW-3 background:5/5/2014-6/29/2021

Total Dissolved Solids (mg/L)
- MW-2 background:11/5/2014-6/29/2021

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Time Series



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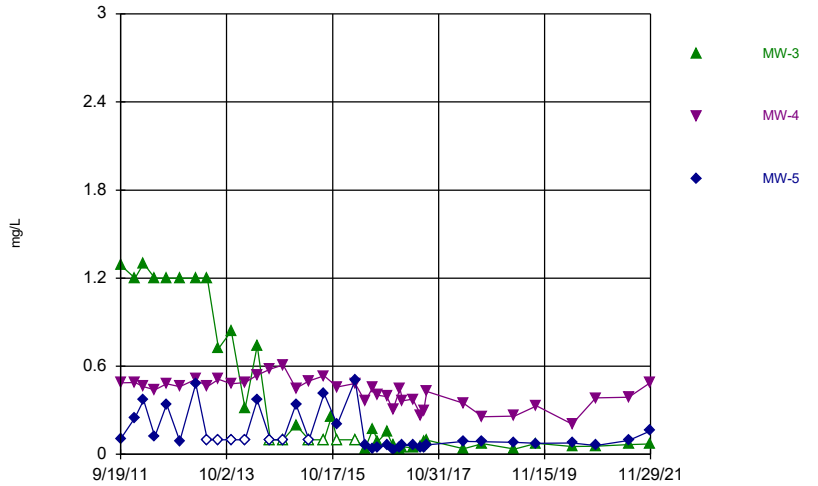
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Time Series



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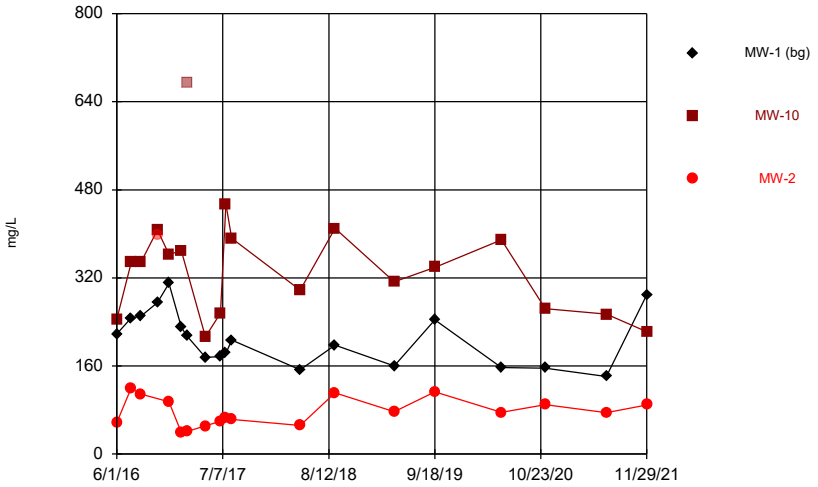
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



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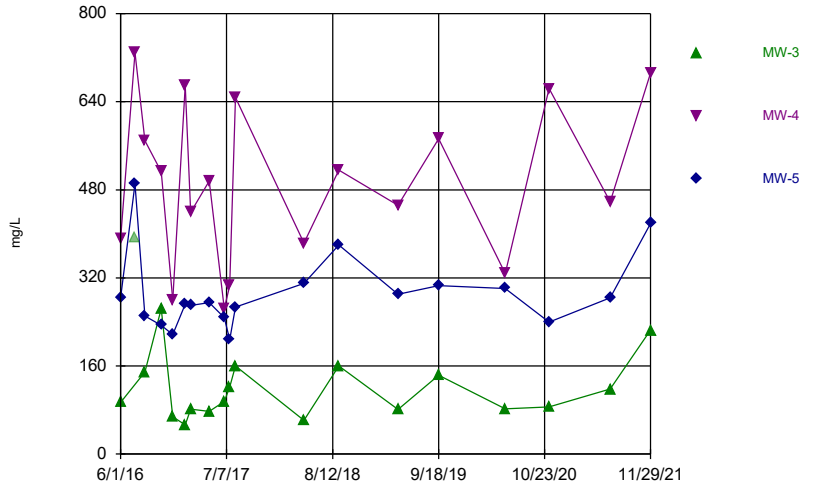
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



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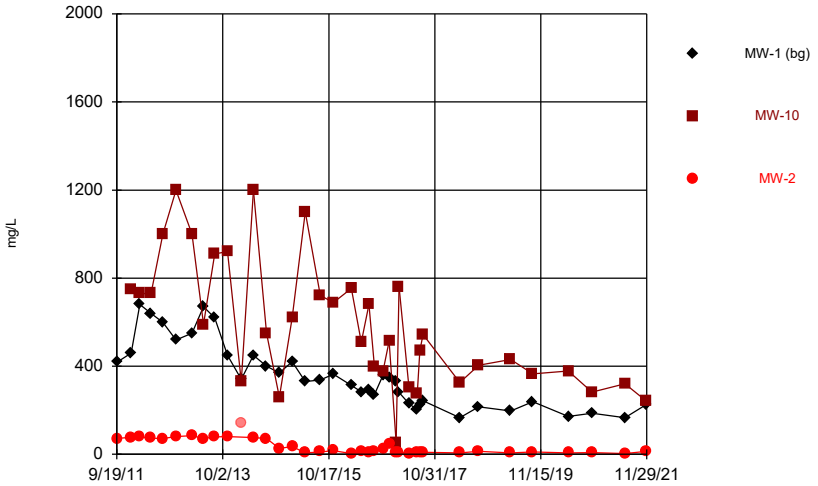
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



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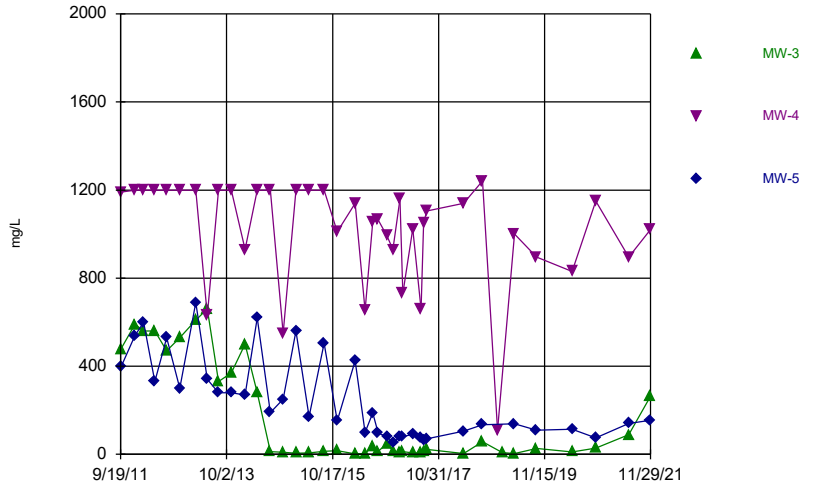
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



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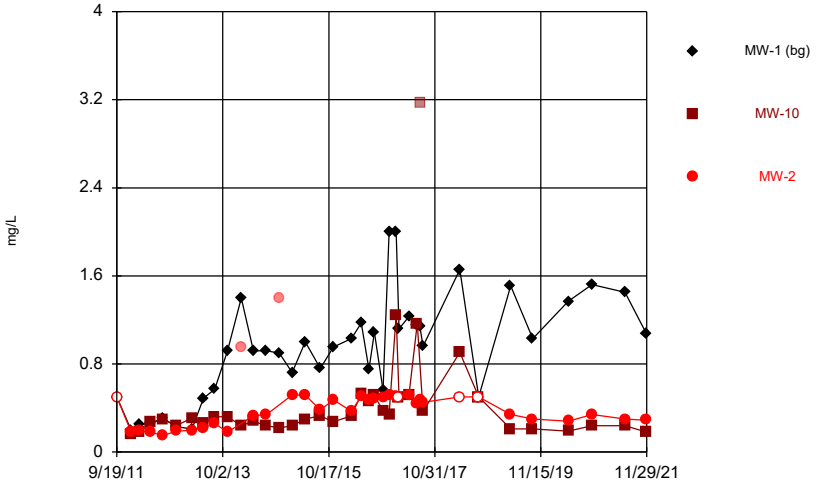
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Time Series



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Turk Landfill Client: Geosyntec Data: Turk Landfill

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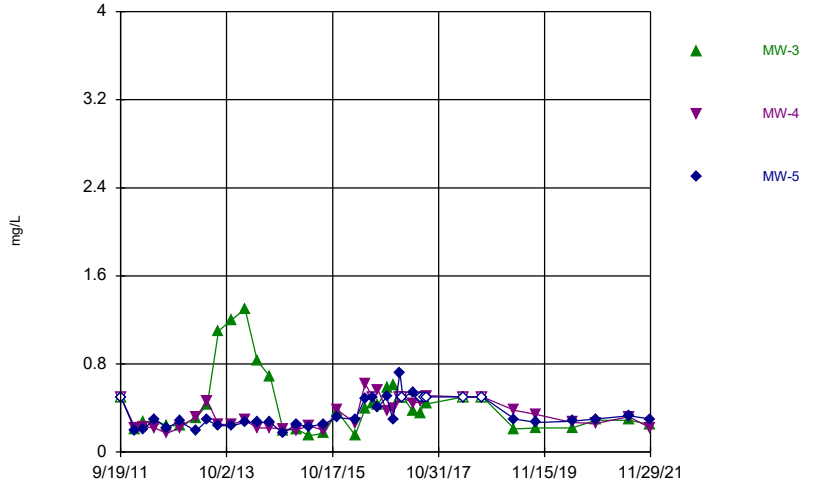
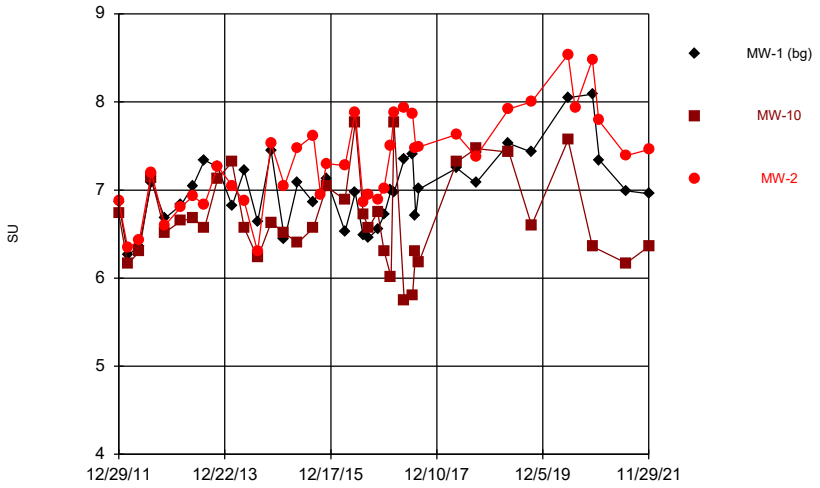
Hollow symbols indicate censored values.

Time Series



Constituent: Fluoride Analysis Run 3/14/2022 1:46 PM View: Descriptive - Appendix III
Turk Landfill Client: Geosyntec Data: Turk Landfill

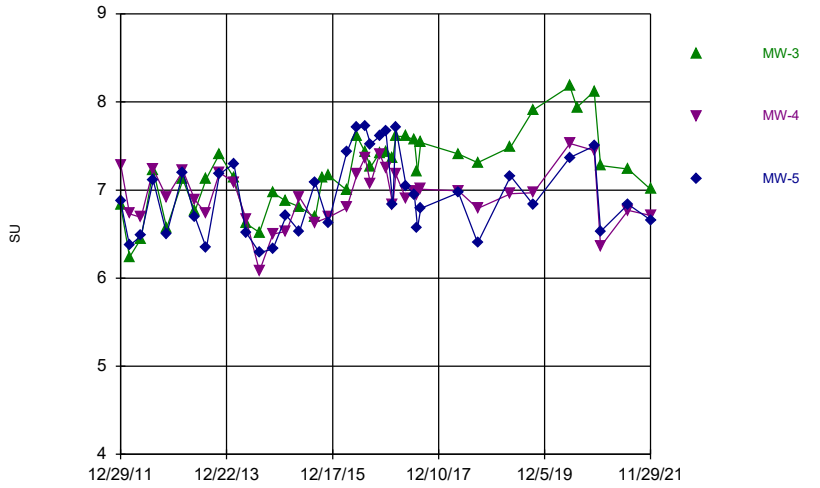
Time Series



Constituent: pH Analysis Run 3/14/2022 1:46 PM View: Descriptive - Appendix III
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



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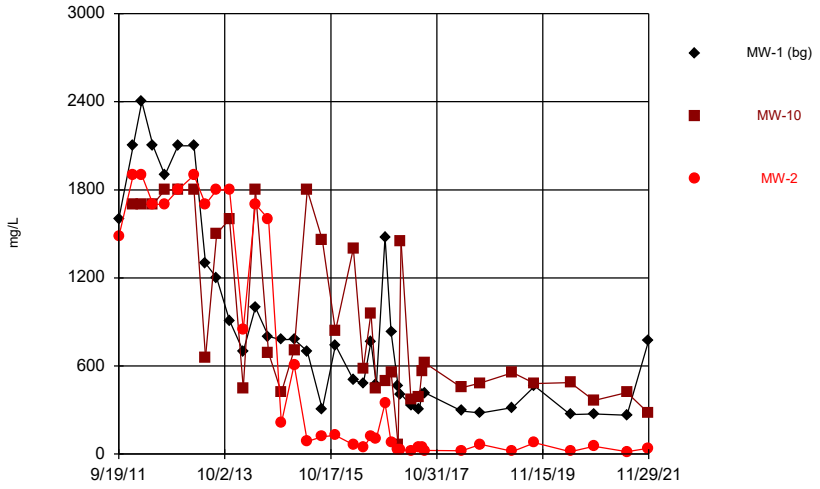
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



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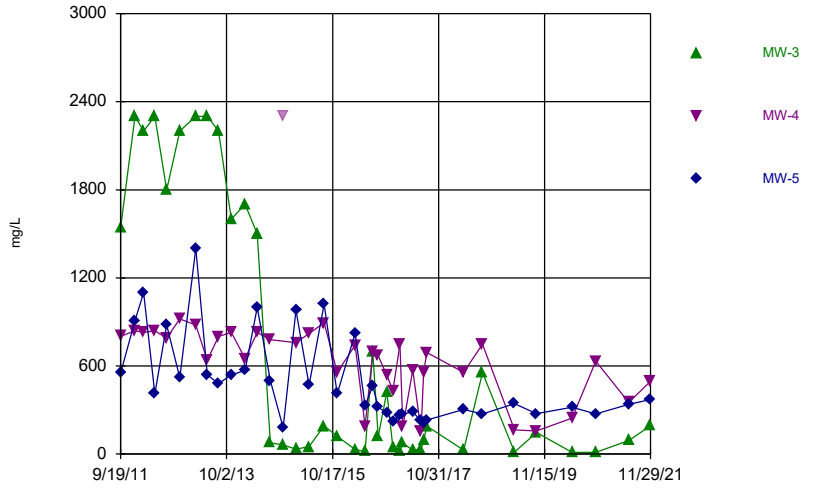
Turk Landfill Client: Geosyntec Data: Turk Landfill

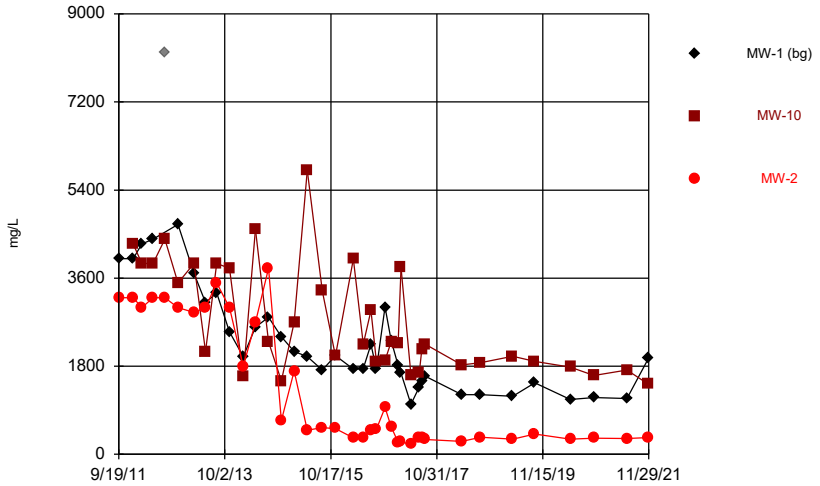
Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



Constituent: Sulfate Analysis Run 3/14/2022 1:46 PM View: Descriptive - Appendix III
Turk Landfill Client: Geosyntec Data: Turk Landfill

Time Series



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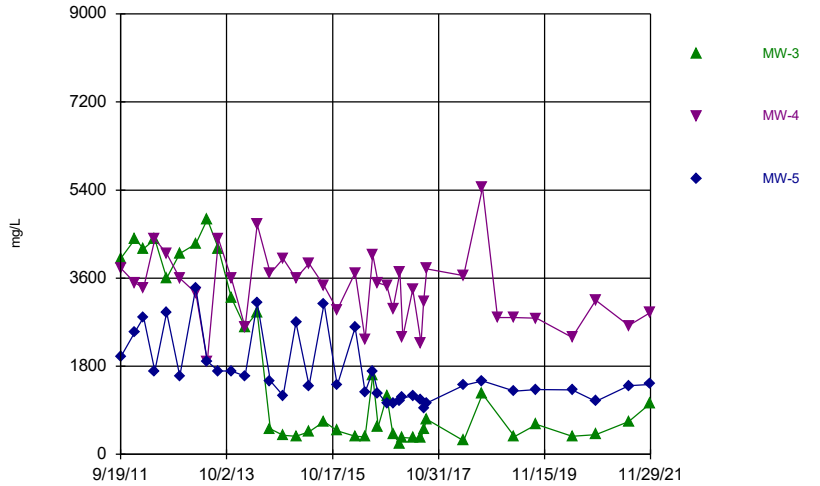
Turk Landfill Client: Geosyntec Data: Turk Landfill

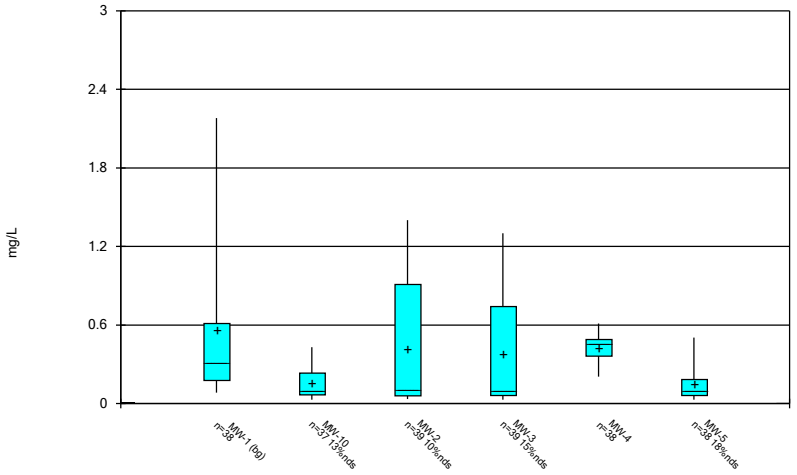
Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



Constituent: Total Dissolved Solids Analysis Run 3/14/2022 1:46 PM View: Descriptive - Appendix III
Turk Landfill Client: Geosyntec Data: Turk Landfill

Box & Whiskers Plot



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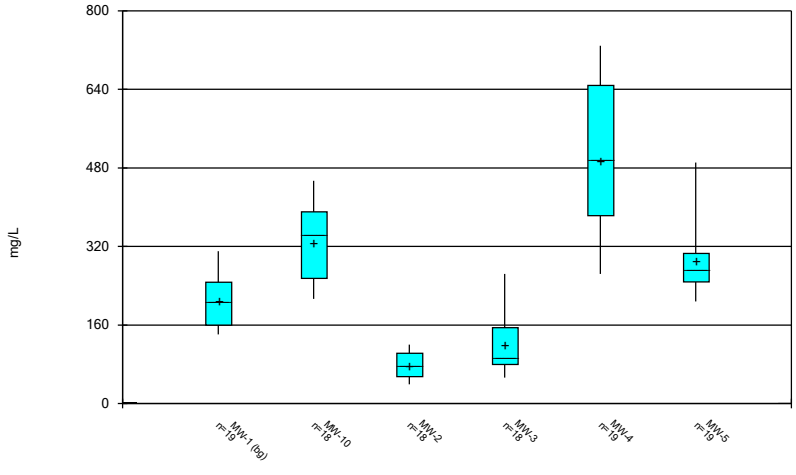
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Box & Whiskers Plot



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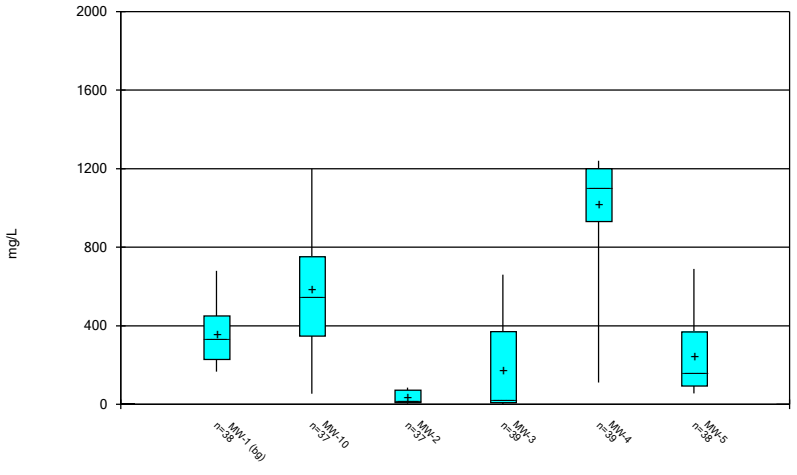
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Box & Whiskers Plot



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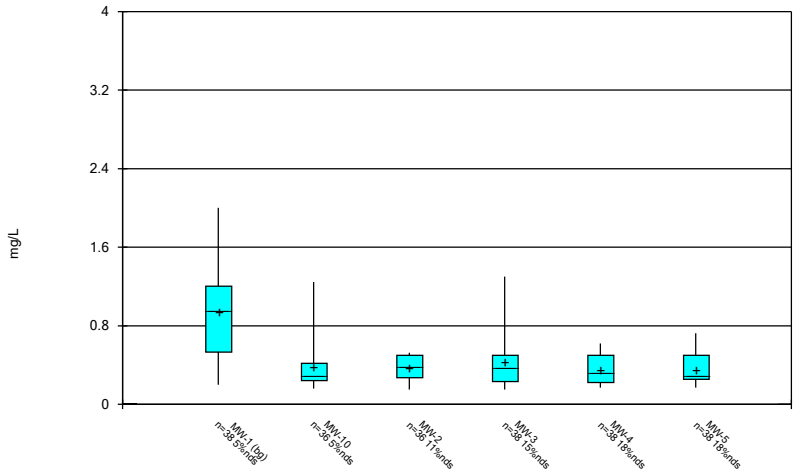
Turk Landfill Client: Geosyntec Data: Turk Landfill

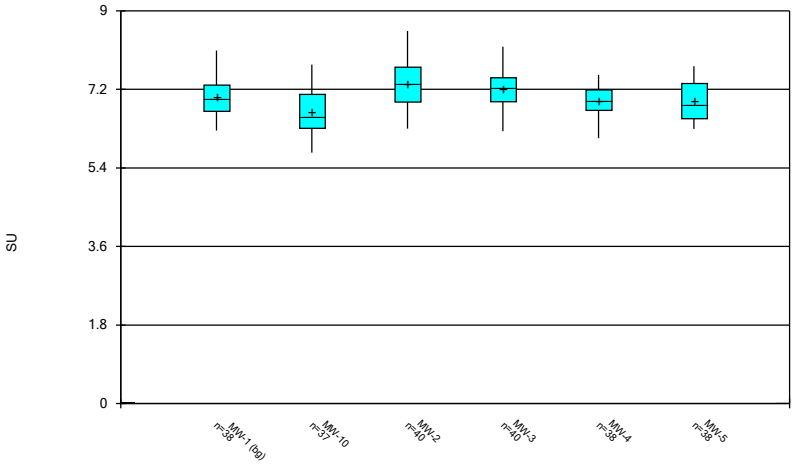
Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Box & Whiskers Plot



Constituent: Fluoride Analysis Run 3/14/2022 1:48 PM View: Descriptive - Appendix III
Turk Landfill Client: Geosyntec Data: Turk Landfill

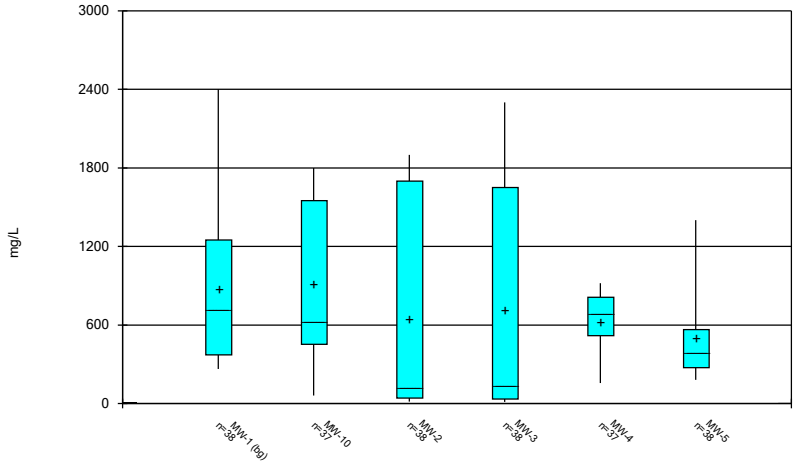
Box & Whiskers Plot



Constituent: pH Analysis Run 3/14/2022 1:48 PM View: Descriptive - Appendix III
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

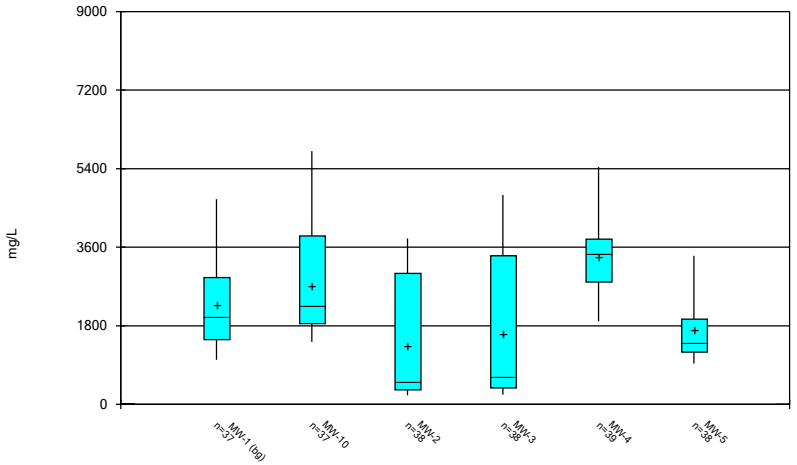
Box & Whiskers Plot



Constituent: Sulfate Analysis Run 3/14/2022 1:48 PM View: Descriptive - Appendix III
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Box & Whiskers Plot



Constituent: Total Dissolved Solids Analysis Run 3/14/2022 1:48 PM View: Descriptive - Appendix III
Turk Landfill Client: Geosyntec Data: Turk Landfill

Outlier Summary

Turk Landfill Client: Geosyntec Data: Turk Landfill Printed 3/14/2022, 1:55 PM

	MW-10 Calcium (mg/L)	MW-2 Calcium (mg/L)	MW-3 Calcium (mg/L)	MW-2 Chloride (mg/L)	MW-10 Fluoride (mg/L)	MW-2 Fluoride (mg/L)	MW-4 Sulfate (mg/L)	MW-1 Total Dissolved Solids (mg/L)
8/8/2012								8200 (o)
2/10/2014				140 (o)		0.95 (o)		
11/5/2014						1.4 (o)	2300 (o)	
7/25/2016			393 (o)					
11/2/2016		398 (o)						
2/21/2017	673 (o)							
7/19/2017					3.17 (o)			

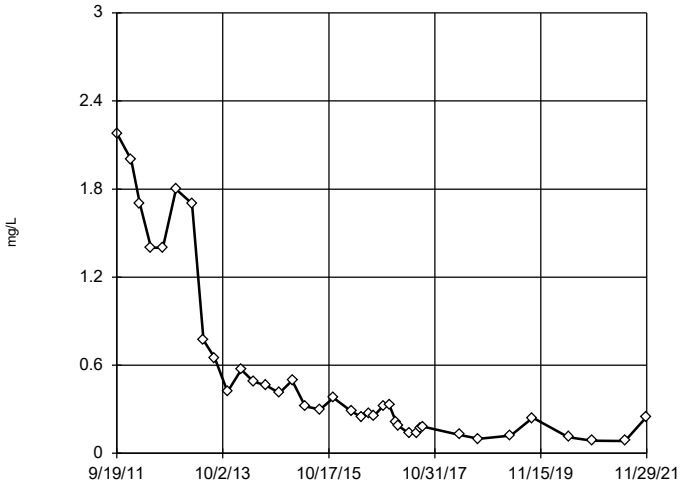
Outlier Analysis - All Results (No Significant)

Turk Landfill Client: Geosyntec Data: Turk Landfill Printed 3/3/2022, 11:04 AM

Constituent	Well	Outlier	Value(s)	Method	N	Mean	Std. Dev.	Distribution	Normality Test
Boron (mg/L)	MW-1 (bg)	No	n/a	NP	38	0.5604	0.6004	ln(x)	ShapiroWilk
Boron (mg/L)	MW-10	No	n/a	NP	37	0.1553	0.1253	ln(x)	ShapiroWilk
Boron (mg/L)	MW-2	No	n/a	NP	39	0.4181	0.4409	ln(x)	ShapiroWilk
Boron (mg/L)	MW-3	No	n/a	NP	39	0.3794	0.4739	ln(x)	ShapiroWilk
Boron (mg/L)	MW-4	No	n/a	NP	38	0.4256	0.09396	x^2	ShapiroWilk
Boron (mg/L)	MW-5	No	n/a	NP	38	0.147	0.1325	ln(x)	ShapiroWilk
Calcium (mg/L)	MW-1 (bg)	No	n/a	NP	19	209.8	49.73	ln(x)	ShapiroWilk
Calcium (mg/L)	MW-10	No	n/a	NP	19	345.2	105.7	ln(x)	ShapiroWilk
Calcium (mg/L)	MW-2	No	n/a	NP	19	93.74	77.74	ln(x)	ShapiroWilk
Calcium (mg/L)	MW-3	No	n/a	NP	19	132.3	84.13	ln(x)	ShapiroWilk
Calcium (mg/L)	MW-4	No	n/a	NP	19	493.2	145.5	normal	ShapiroWilk
Calcium (mg/L)	MW-5	No	n/a	NP	19	291.9	70.07	ln(x)	ShapiroWilk
Chloride (mg/L)	MW-1 (bg)	No	n/a	NP	38	357.2	149	ln(x)	ShapiroWilk
Chloride (mg/L)	MW-10	No	n/a	NP	37	586.3	287.7	sqrt(x)	ShapiroWilk
Chloride (mg/L)	MW-2	No	n/a	NP	38	36.41	35.5	ln(x)	ShapiroWilk
Chloride (mg/L)	MW-3	No	n/a	NP	39	171.3	231.1	ln(x)	ShapiroWilk
Chloride (mg/L)	MW-4	No	n/a	NP	39	1019	241.2	x^4	ShapiroWilk
Chloride (mg/L)	MW-5	No	n/a	NP	38	246.7	187.6	ln(x)	ShapiroWilk
Fluoride (mg/L)	MW-1 (bg)	No	n/a	NP	38	0.943	0.4738	normal	ShapiroWilk
Fluoride (mg/L)	MW-10	No	n/a	NP	37	0.4509	0.5213	ln(x)	ShapiroWilk
Fluoride (mg/L)	MW-2	No	n/a	NP	38	0.4147	0.2268	ln(x)	ShapiroWilk
Fluoride (mg/L)	MW-3	No	n/a	NP	38	0.4326	0.2767	ln(x)	ShapiroWilk
Fluoride (mg/L)	MW-4	No	n/a	NP	38	0.348	0.1286	ln(x)	ShapiroWilk
Fluoride (mg/L)	MW-5	No	n/a	NP	38	0.348	0.1304	ln(x)	ShapiroWilk
pH (SU)	MW-1 (bg)	No	n/a	NP	38	7.007	0.4176	ln(x)	ShapiroWilk
pH (SU)	MW-10	No	n/a	NP	37	6.683	0.5174	ln(x)	ShapiroWilk
pH (SU)	MW-2	No	n/a	NP	40	7.324	0.5369	ln(x)	ShapiroWilk
pH (SU)	MW-3	No	n/a	NP	40	7.216	0.4435	sqrt(x)	ShapiroWilk
pH (SU)	MW-4	No	n/a	NP	38	6.933	0.3113	x^3	ShapiroWilk
pH (SU)	MW-5	No	n/a	NP	38	6.947	0.4475	ln(x)	ShapiroWilk
Sulfate (mg/L)	MW-1 (bg)	No	n/a	NP	38	876.7	640.8	ln(x)	ShapiroWilk
Sulfate (mg/L)	MW-10	No	n/a	NP	37	914.8	577.9	x^(1/3)	ShapiroWilk
Sulfate (mg/L)	MW-2	No	n/a	NP	38	638.1	784	ln(x)	ShapiroWilk
Sulfate (mg/L)	MW-3	No	n/a	NP	38	718.5	908.7	ln(x)	ShapiroWilk
Sulfate (mg/L)	MW-4	No	n/a	NP	38	665.7	357.9	x^(1/3)	ShapiroWilk
Sulfate (mg/L)	MW-5	No	n/a	NP	38	497.4	300	ln(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	MW-1 (bg)	No	n/a	NP	38	2424	1404	ln(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	MW-10	No	n/a	NP	37	2723	1118	ln(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	MW-2	No	n/a	NP	38	1341	1292	ln(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	MW-3	No	n/a	NP	38	1618	1631	ln(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	MW-4	No	n/a	NP	39	3389	725.2	sqrt(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	MW-5	No	n/a	NP	38	1693	680.4	ln(x)	ShapiroWilk

Tukey's Outlier Screening

MW-1 (bg)



n = 38

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

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

High cutoff = 25.43, low cutoff = 0.004198, based on IQR multiplier of 3.

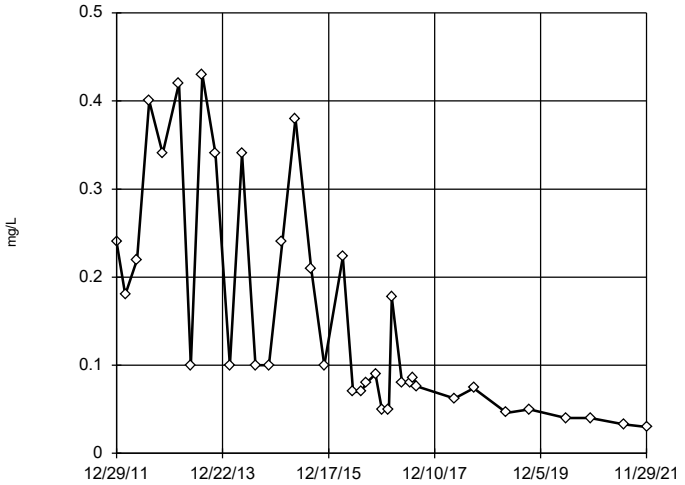
Constituent: Boron Analysis Run 3/3/2022 11:02 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-10



n = 37

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

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

High cutoff = 9.96, low cutoff = 0.001533, based on IQR multiplier of 3.

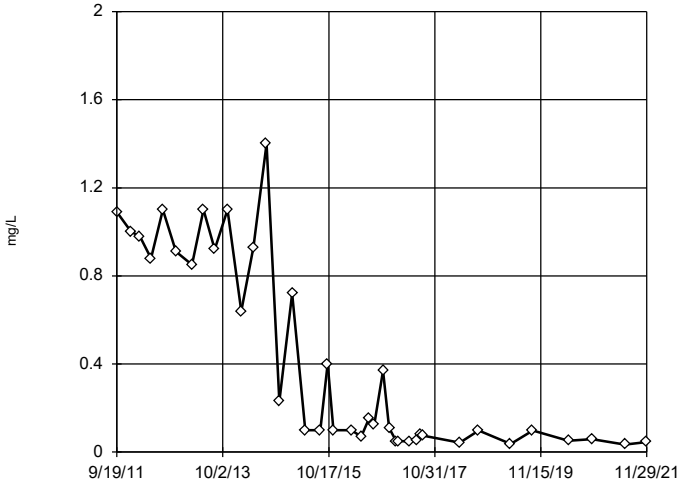
Constituent: Boron Analysis Run 3/3/2022 11:02 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-2



n = 39

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

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

High cutoff = 3339, low cutoff = 0.00001608, based on IQR multiplier of 3.

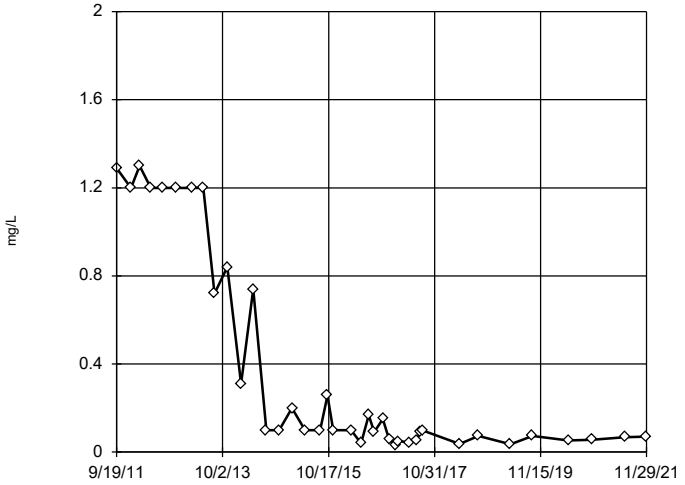
Constituent: Boron Analysis Run 3/3/2022 11:02 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-3



n = 39

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

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

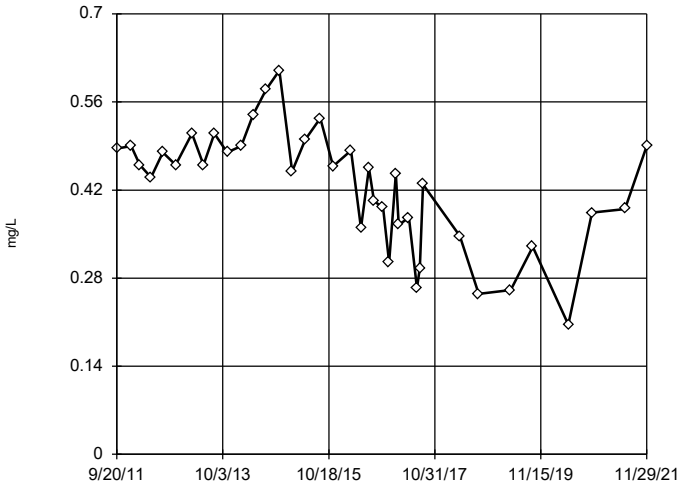
High cutoff = 1388, low cutoff = 0.00003198, based on IQR multiplier of 3.

Constituent: Boron Analysis Run 3/3/2022 11:02 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Tukey's Outlier Screening

MW-4



n = 38

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

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

High cutoff = 0.7524, low cutoff = -0.4412, based on IQR multiplier of 3.

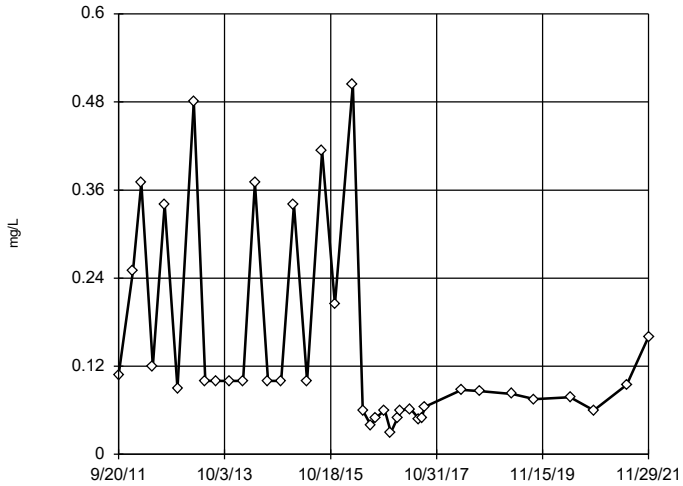
Constituent: Boron Analysis Run 3/3/2022 11:02 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-5



n = 38

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 = 4.932, low cutoff = 0.002198, based on IQR multiplier of 3.

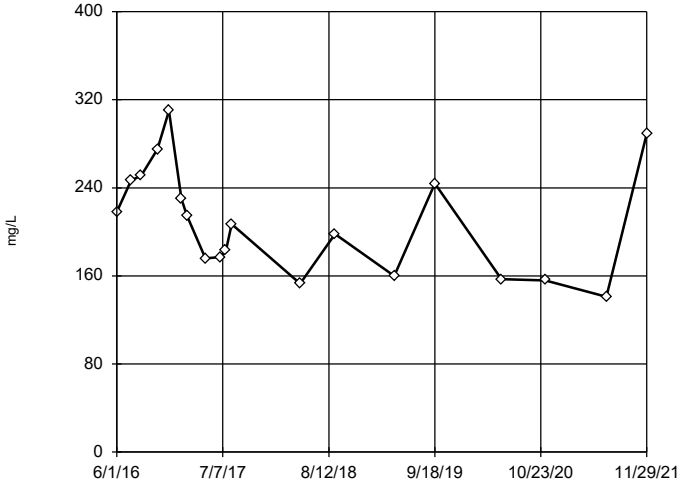
Constituent: Boron Analysis Run 3/3/2022 11:02 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1 (bg)



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 = 908.7, low cutoff = 43.49, based on IQR multiplier of 3.

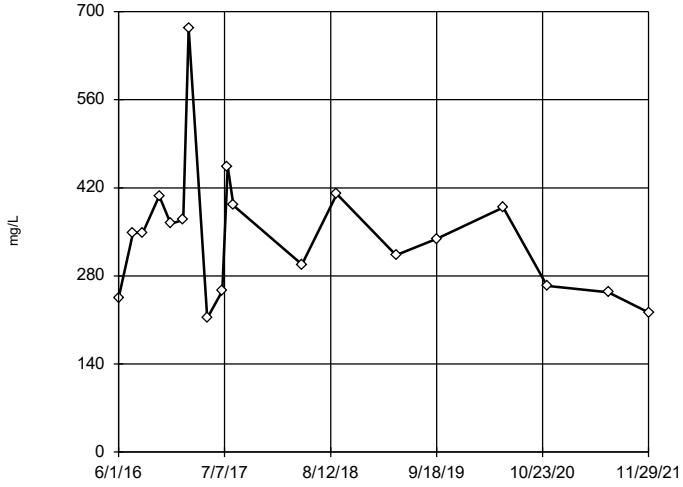
Constituent: Calcium Analysis Run 3/3/2022 11:02 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-10



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).

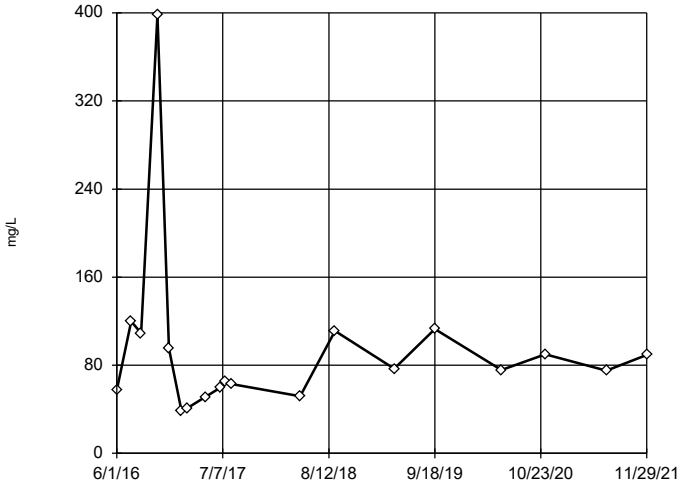
High cutoff = 1407, low cutoff = 71.3, based on IQR multiplier of 3.

Constituent: Calcium Analysis Run 3/3/2022 11:02 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Tukey's Outlier Screening

MW-2



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 = 746.4, low cutoff = 8.382, based on IQR multiplier of 3.

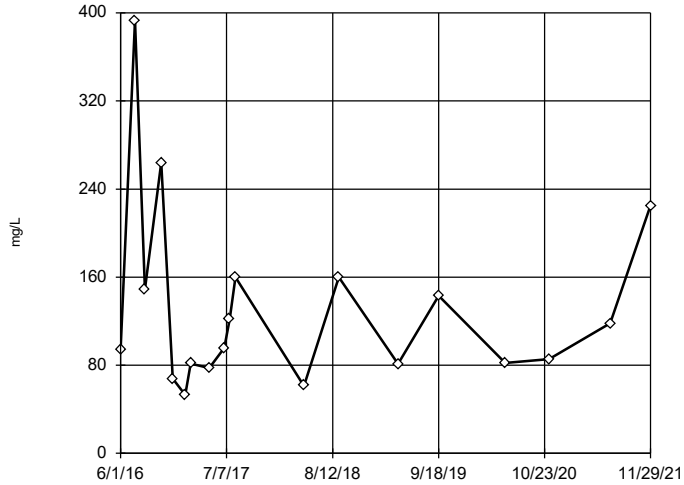
Constituent: Calcium Analysis Run 3/3/2022 11:02 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-3



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 = 1229, low cutoff = 10.56, based on IQR multiplier of 3.

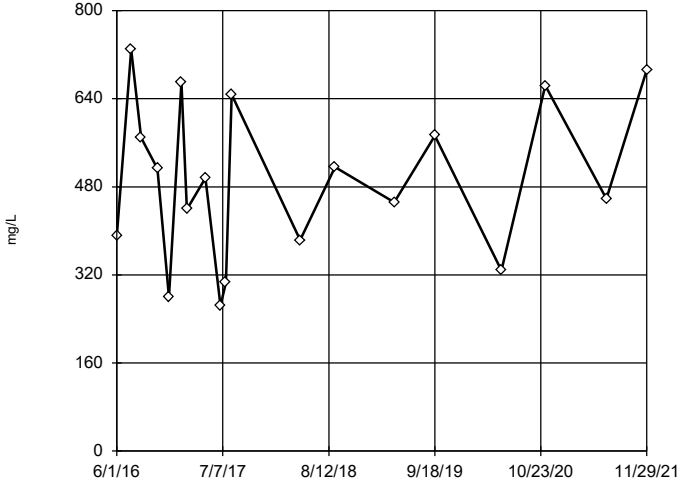
Constituent: Calcium Analysis Run 3/3/2022 11:02 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-4



n = 19

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

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

High cutoff = 1443, low cutoff = -412, based on IQR multiplier of 3.

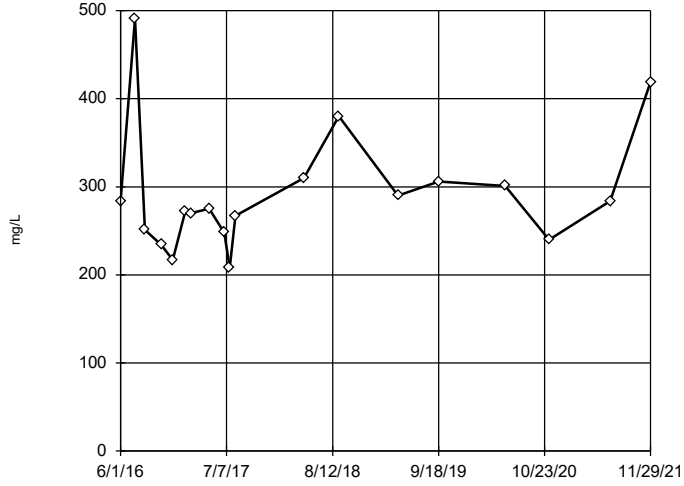
Constituent: Calcium Analysis Run 3/3/2022 11:02 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-5



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).

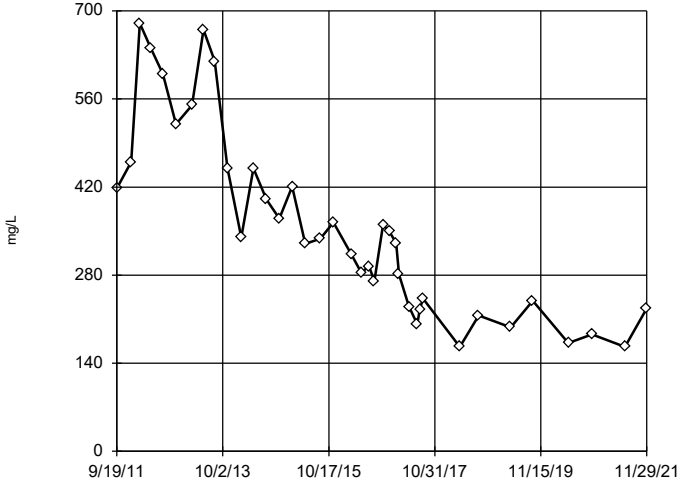
High cutoff = 574.8, low cutoff = 132, based on IQR multiplier of 3.

Constituent: Calcium Analysis Run 3/3/2022 11:02 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Tukey's Outlier Screening

MW-1 (bg)



n = 38

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 = 3437, low cutoff = 29.91, based on IQR multiplier of 3.

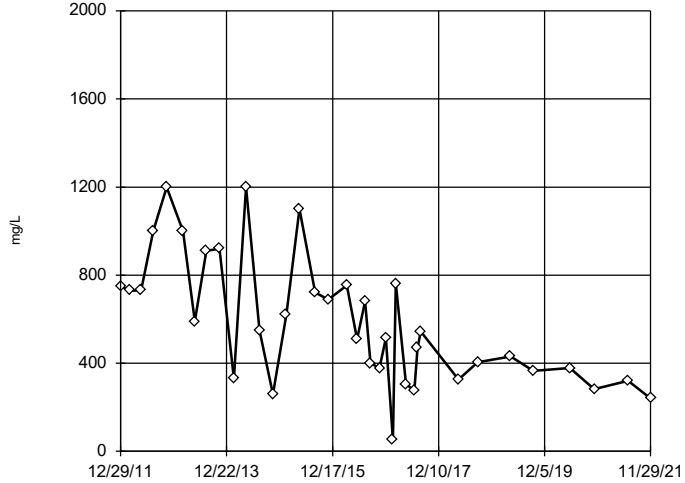
Constituent: Chloride Analysis Run 3/3/2022 11:02 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-10



n = 37

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 = 2889, low cutoff = -59.27, based on IQR multiplier of 3.

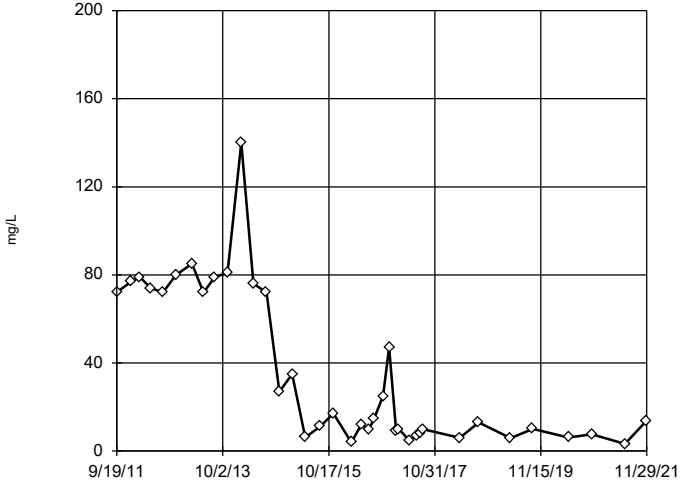
Constituent: Chloride Analysis Run 3/3/2022 11:02 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-2



n = 38

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 = 60811, low cutoff = 0.009342, based on IQR multiplier of 3.

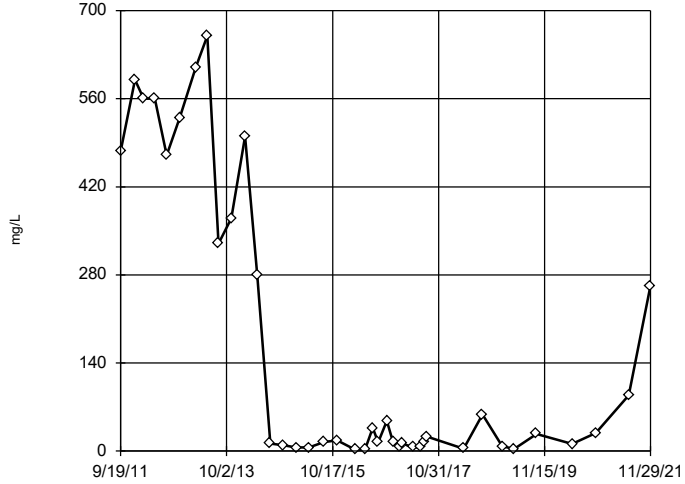
Constituent: Chloride Analysis Run 3/3/2022 11:02 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-3



n = 39

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

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

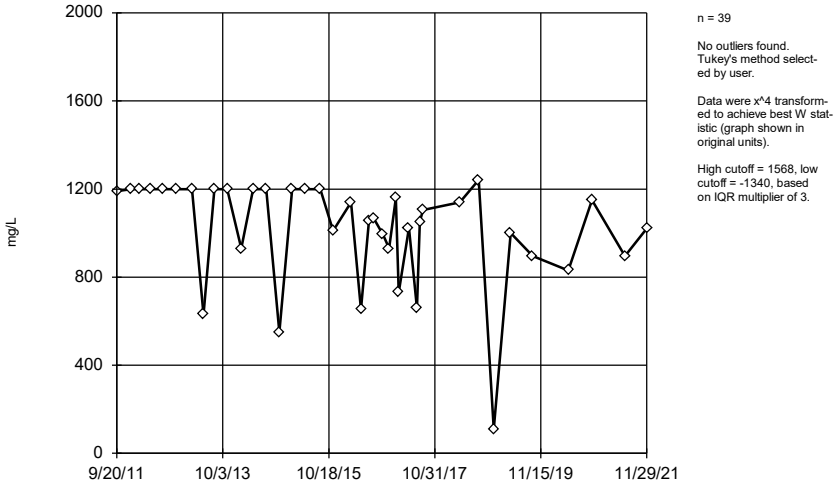
High cutoff = 4.8e7, low cutoff = 0.00005606, based on IQR multiplier of 3.

Constituent: Chloride Analysis Run 3/3/2022 11:02 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Tukey's Outlier Screening

MW-4



n = 39

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 = 1568, low cutoff = -1340, based on IQR multiplier of 3.

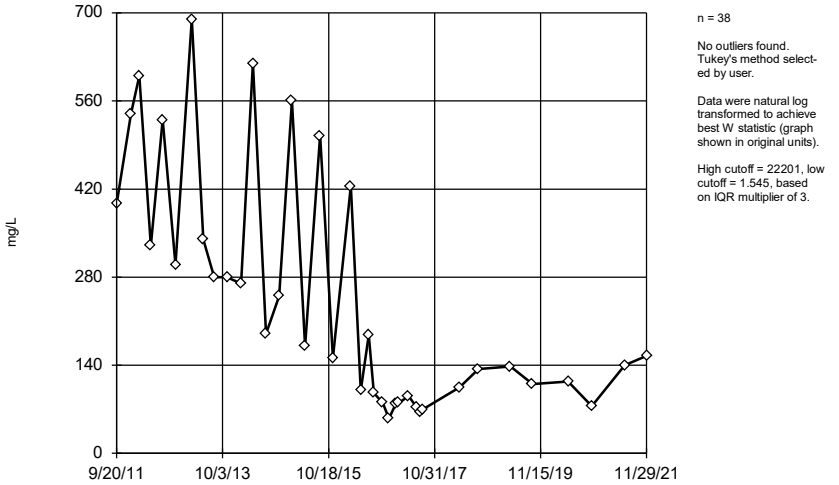
Constituent: Chloride Analysis Run 3/3/2022 11:02 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-5



n = 38

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 = 22201, low cutoff = 1.545, based on IQR multiplier of 3.

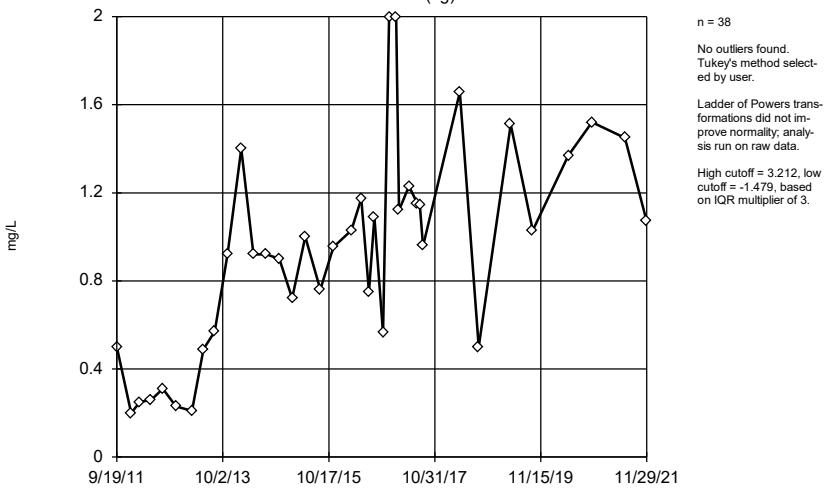
Constituent: Chloride Analysis Run 3/3/2022 11:02 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1 (bg)



n = 38

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

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

High cutoff = 3.212, low cutoff = -1.479, based on IQR multiplier of 3.

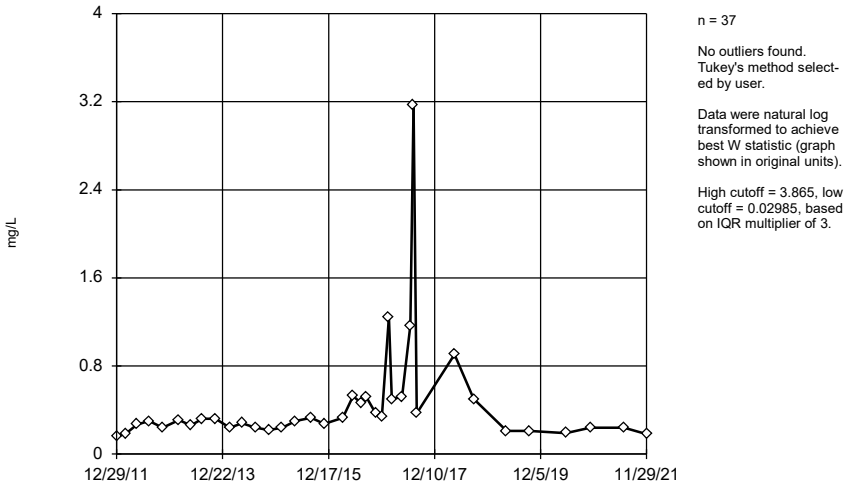
Constituent: Fluoride Analysis Run 3/3/2022 11:02 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-10



n = 37

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

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

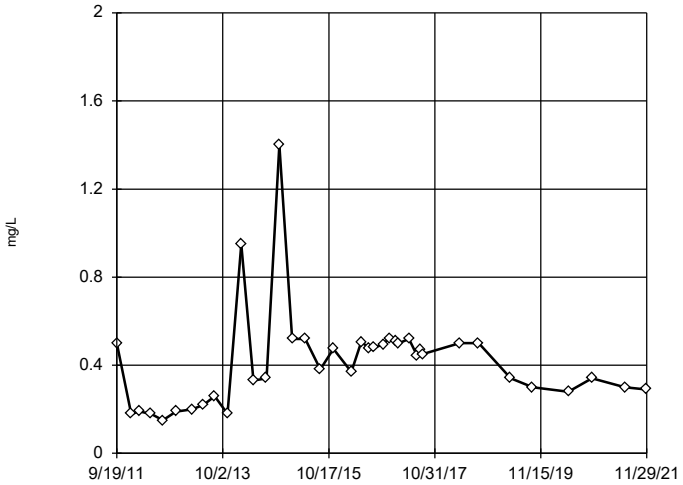
High cutoff = 3.865, low cutoff = 0.02985, based on IQR multiplier of 3.

Constituent: Fluoride Analysis Run 3/3/2022 11:02 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Tukey's Outlier Screening

MW-2



n = 38

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 = 3.182, low cutoff = 0.0424, based on IQR multiplier of 3.

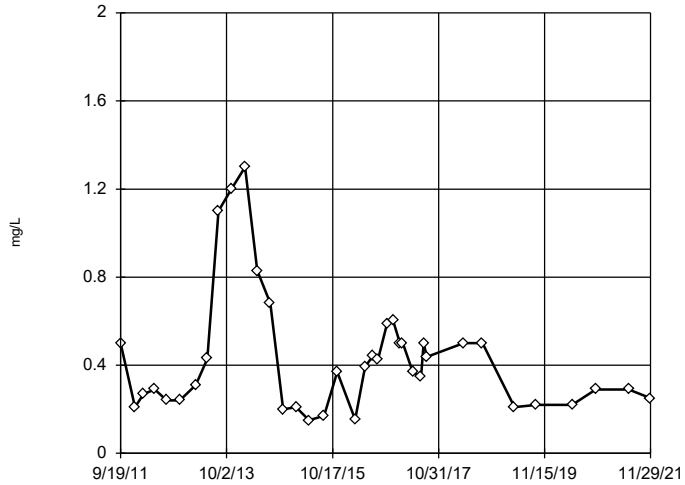
Constituent: Fluoride Analysis Run 3/3/2022 11:03 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-3



n = 38

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

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

High cutoff = 5.151, low cutoff = 0.0223, based on IQR multiplier of 3.

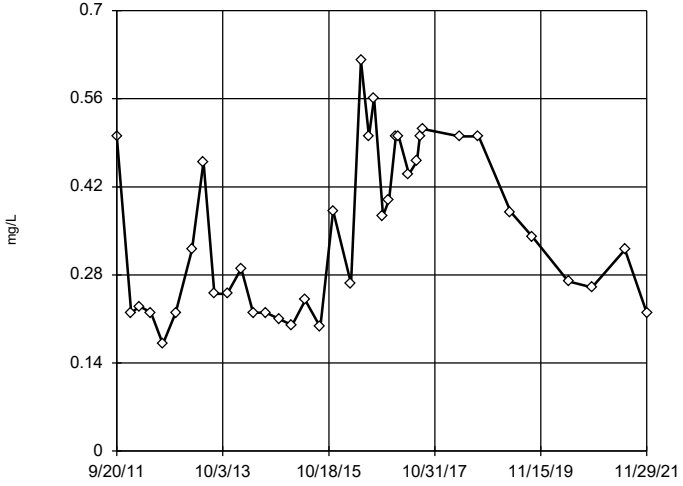
Constituent: Fluoride Analysis Run 3/3/2022 11:03 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-4



n = 38

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

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

High cutoff = 5.87, low cutoff = 0.01874, based on IQR multiplier of 3.

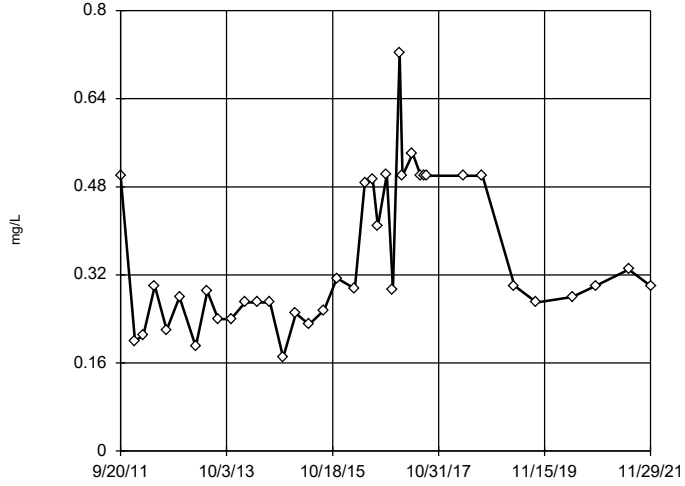
Constituent: Fluoride Analysis Run 3/3/2022 11:03 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-5



n = 38

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

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

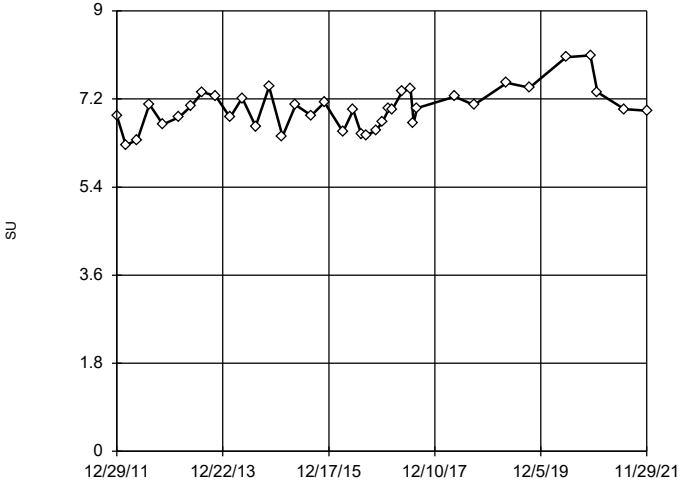
High cutoff = 3.86, low cutoff = 0.03277, based on IQR multiplier of 3.

Constituent: Fluoride Analysis Run 3/3/2022 11:03 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Tukey's Outlier Screening

MW-1 (bg)



n = 38

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 = 9.463, low cutoff = 5.165, based on IQR multiplier of 3.

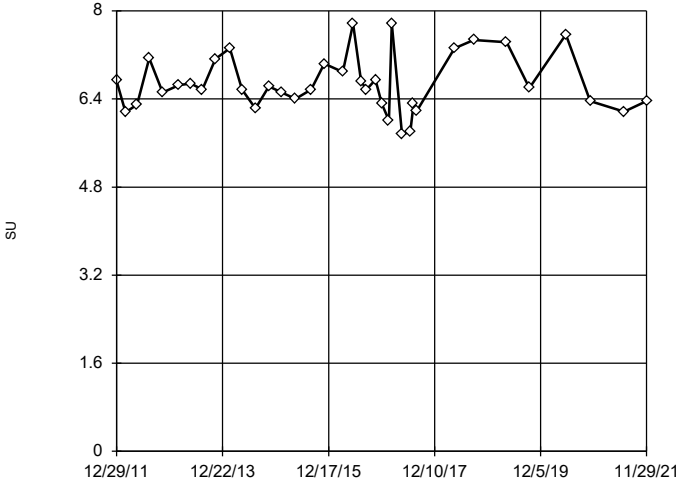
Constituent: pH Analysis Run 3/3/2022 11:03 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-10



n = 37

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 = 10.03, low cutoff = 4.458, based on IQR multiplier of 3.

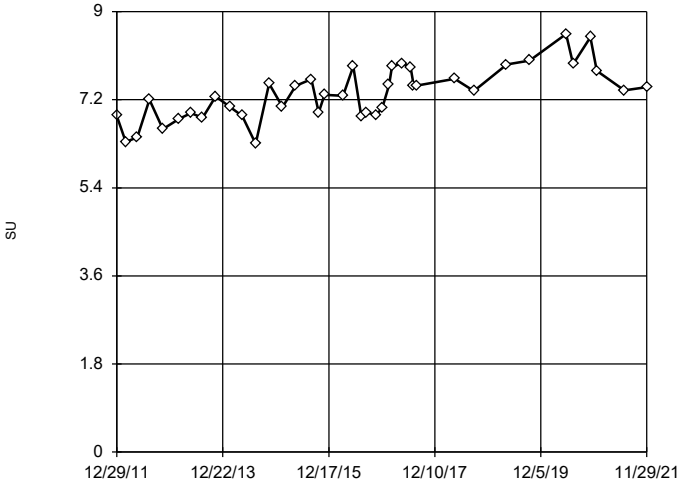
Constituent: pH Analysis Run 3/3/2022 11:03 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-2



n = 40

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 = 10.71, low cutoff = 4.975, based on IQR multiplier of 3.

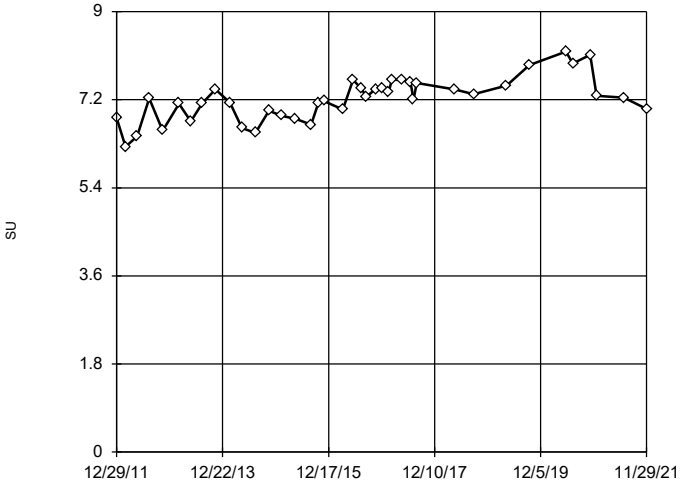
Constituent: pH Analysis Run 3/3/2022 11:03 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-3



n = 40

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

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

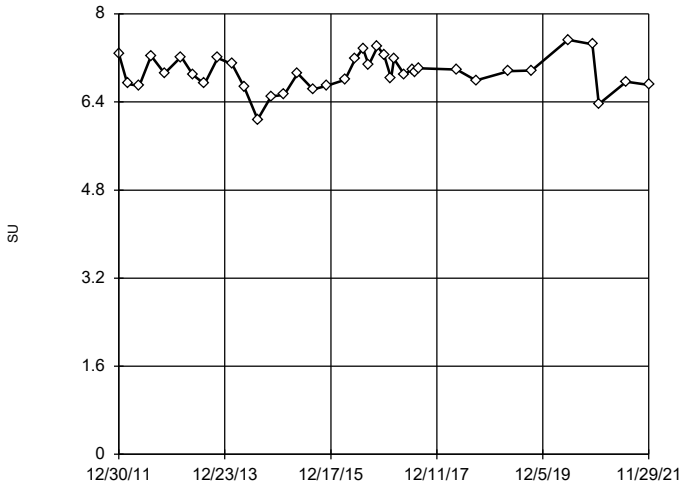
High cutoff = 9.224, low cutoff = 5.409, based on IQR multiplier of 3.

Constituent: pH Analysis Run 3/3/2022 11:03 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Tukey's Outlier Screening

MW-4



n = 38

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 = 8.322, low cutoff = 4.623, based on IQR multiplier of 3.

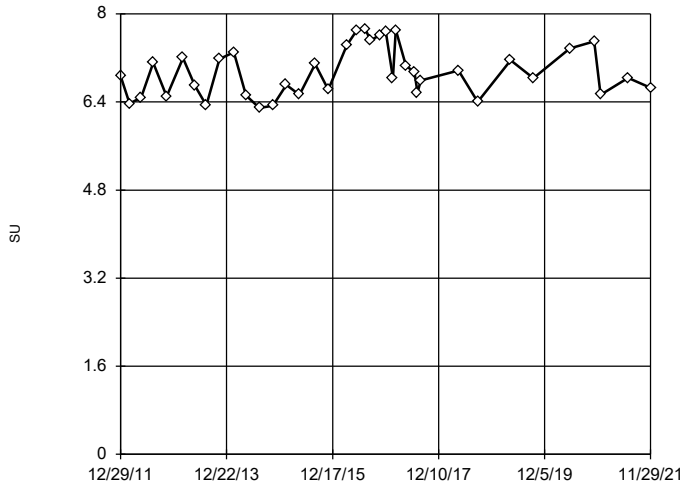
Constituent: pH Analysis Run 3/3/2022 11:03 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-5



n = 38

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 = 10.4, low cutoff = 4.608, based on IQR multiplier of 3.

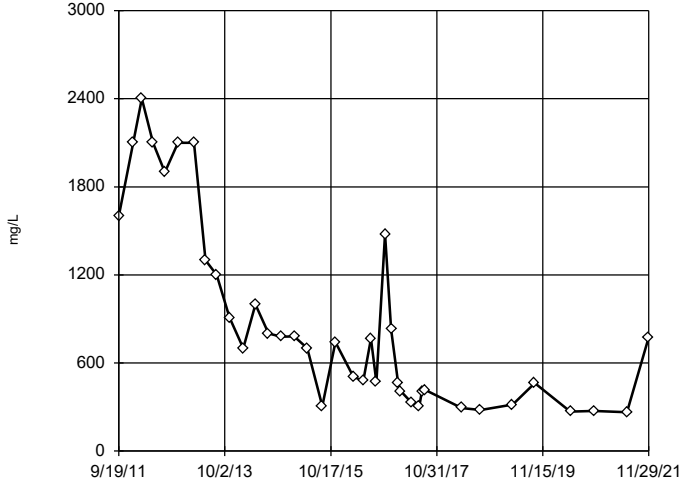
Constituent: pH Analysis Run 3/3/2022 11:03 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1 (bg)



n = 38

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 = 48555, low cutoff = 9.484, based on IQR multiplier of 3.

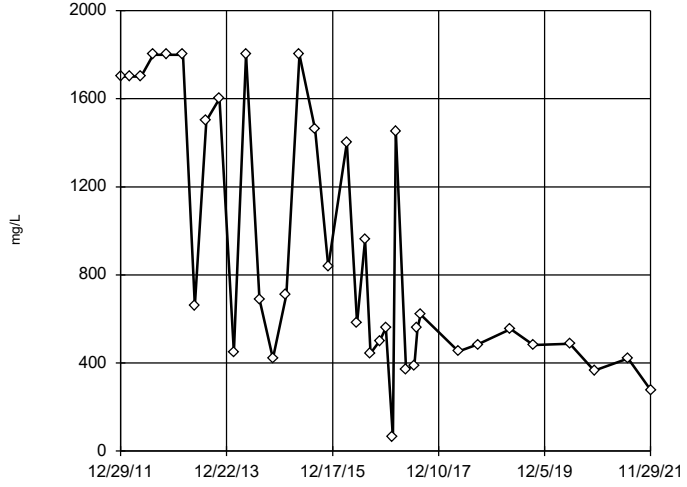
Constituent: Sulfate Analysis Run 3/3/2022 11:03 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-10



n = 37

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

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

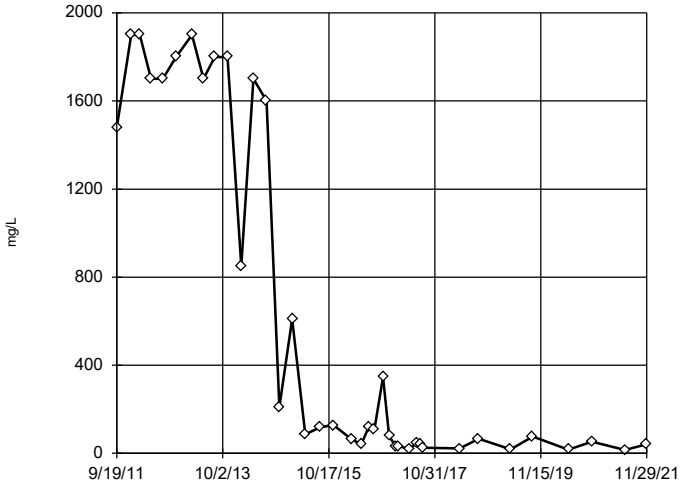
High cutoff = 12617, low cutoff = -65.93, based on IQR multiplier of 3.

Constituent: Sulfate Analysis Run 3/3/2022 11:03 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Tukey's Outlier Screening

MW-2



n = 38

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 = 1.2e8, low cutoff = 0.0006006, based on IQR multiplier of 3.

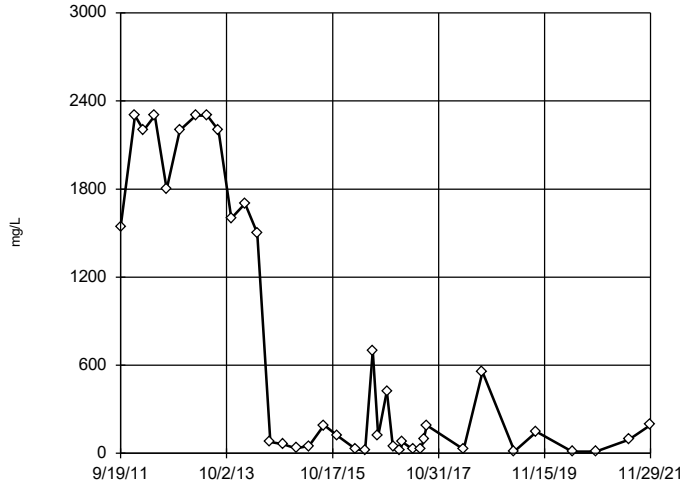
Constituent: Sulfate Analysis Run 3/3/2022 11:03 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-3



n = 38

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 = 2.1e8, low cutoff = 0.0002639, based on IQR multiplier of 3.

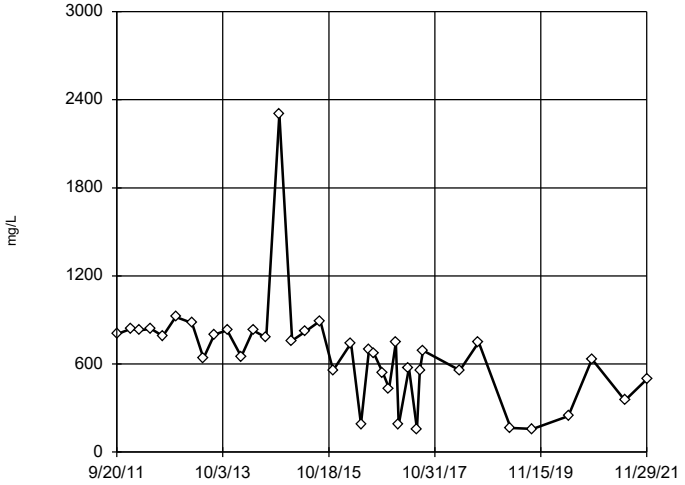
Constituent: Sulfate Analysis Run 3/3/2022 11:03 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-4



n = 38

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 = 2429, low cutoff = 62.16, based on IQR multiplier of 3.

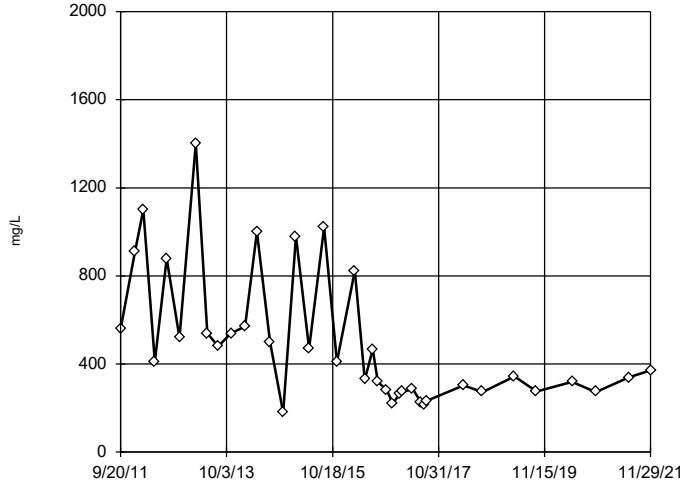
Constituent: Sulfate Analysis Run 3/3/2022 11:03 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-5



n = 38

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

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

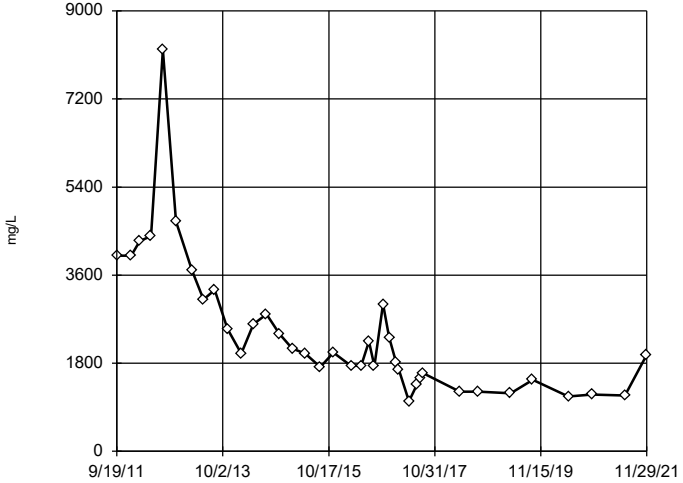
High cutoff = 4918, low cutoff = 31.42, based on IQR multiplier of 3.

Constituent: Sulfate Analysis Run 3/3/2022 11:03 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Tukey's Outlier Screening

MW-1 (bg)



n = 38

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 = 26668, low cutoff = 169.8, based on IQR multiplier of 3.

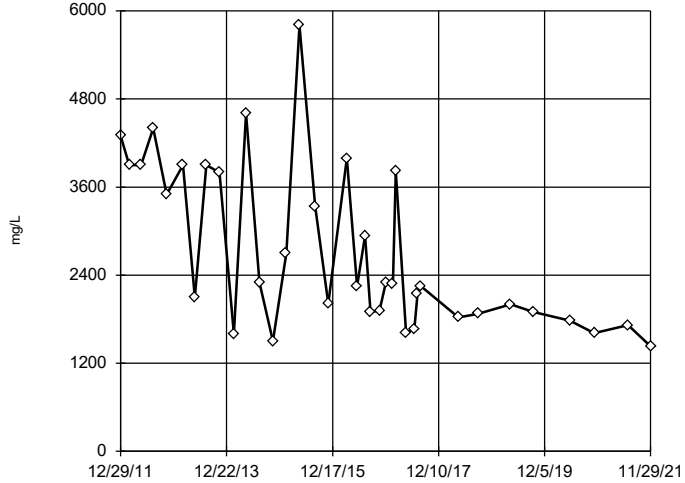
Constituent: Total Dissolved Solids Analysis Run 3/3/2022 11:03 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-10



n = 37

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 = 35009, low cutoff = 203.7, based on IQR multiplier of 3.

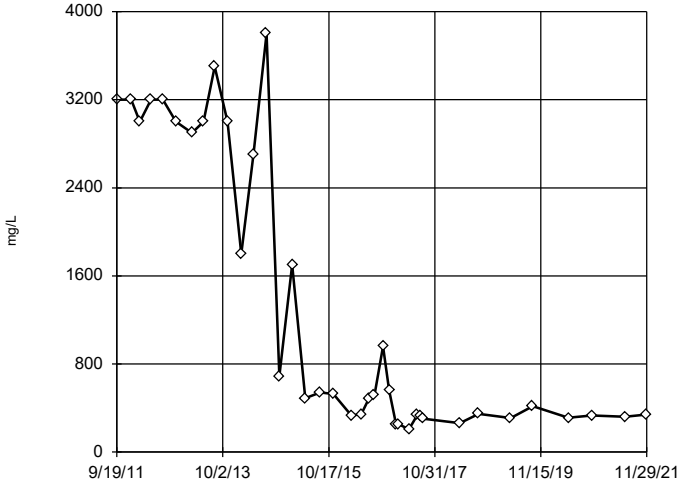
Constituent: Total Dissolved Solids Analysis Run 3/3/2022 11:03 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-2



n = 38

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 = 2213455, low cutoff = 0.45, based on IQR multiplier of 3.

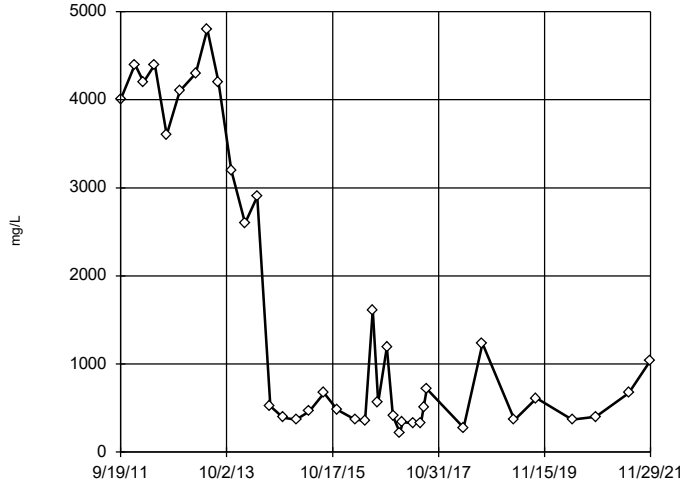
Constituent: Total Dissolved Solids Analysis Run 3/3/2022 11:03 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-3



n = 38

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

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

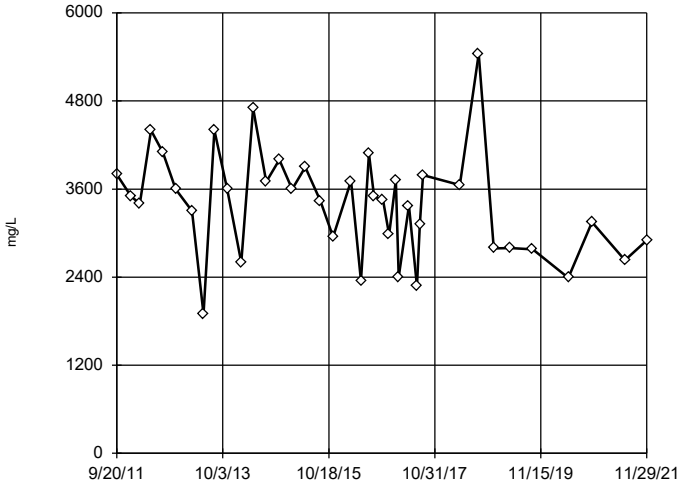
High cutoff = 2619991, low cutoff = 0.4793, based on IQR multiplier of 3.

Constituent: Total Dissolved Solids Analysis Run 3/3/2022 11:03 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Tukey's Outlier Screening

MW-4



n = 39

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 = 7656, low cutoff = 726, based on IQR multiplier of 3.

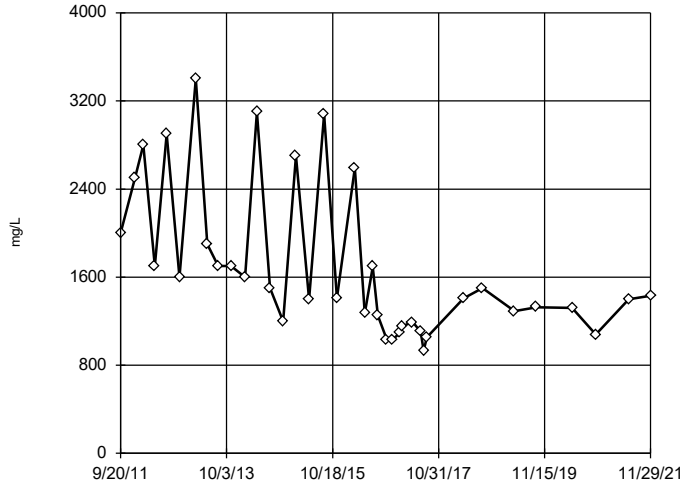
Constituent: Total Dissolved Solids Analysis Run 3/3/2022 11:03 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-5



n = 38

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 = 8441, low cutoff = 276.2, based on IQR multiplier of 3.

Constituent: Total Dissolved Solids Analysis Run 3/3/2022 11:03 AM View: Outlier Screening App III

Turk Landfill Client: Geosyntec Data: Turk Landfill

Mann-Whitney Summary - Significant Results

Turk Landfill Client: Geosyntec Data: Turk Landfill Printed 3/3/2022, 11:15 AM

Constituent	Well	Calc.	0.01	Sig.	Method
Boron (mg/L)	**MW-1 (bg)**	**-2.764**	**Yes**	**Yes**	**Mann-W**
Boron (mg/L)	**MW-10**	**-3.144**	**Yes**	**Yes**	**Mann-W**
Chloride (mg/L)	**MW-1 (bg)**	**-2.837**	**Yes**	**Yes**	**Mann-W**
pH (SU)	**MW-1 (bg)**	**2.577**	**Yes**	**Yes**	**Mann-W**
pH (SU)	**MW-2**	**3.134**	**Yes**	**Yes**	**Mann-W**
pH (SU)	**MW-3**	**2.784**	**Yes**	**Yes**	**Mann-W**
Sulfate (mg/L)	**MW-1 (bg)**	**-2.765**	**Yes**	**Yes**	**Mann-W**
Total Dissolved Solids (mg/L)	**MW-1 (bg)**	**-2.844**	**Yes**	**Yes**	**Mann-W**

Mann-Whitney Summary - All Results

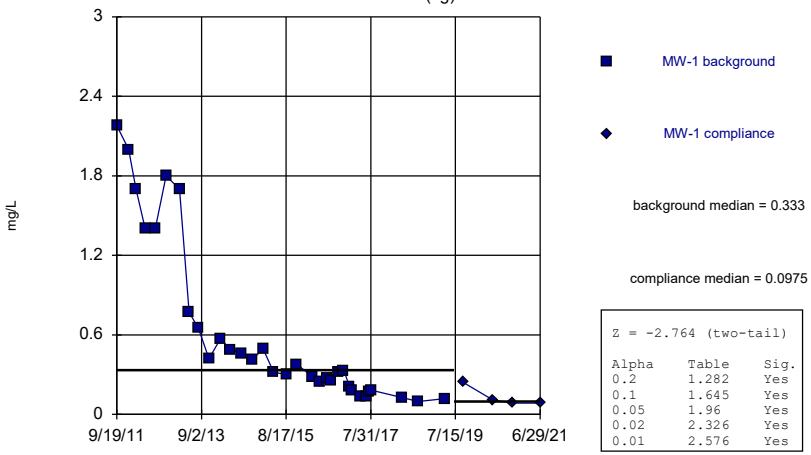
Turk Landfill Client: Geosyntec Data: Turk Landfill Printed 3/3/2022, 11:15 AM

Constituent	Well	Calc.	0.01	Sig.	Method
Boron (mg/L)	**MW-1 (bg)**	**-2.764**	**Yes**	**Yes**	**Mann-W**
Boron (mg/L)	**MW-10**	**-3.144**	**Yes**	**Yes**	**Mann-W**
Boron (mg/L)	MW-2	-2.285	No	No	Mann-W
Boron (mg/L)	MW-3	-1.791	No	No	Mann-W
Boron (mg/L)	MW-4	-2.129	No	No	Mann-W
Boron (mg/L)	MW-5	-1.08	No	No	Mann-W
Calcium (mg/L)	MW-1 (bg)	-1.752	No	No	Mann-W
Calcium (mg/L)	MW-10	-0.8492	No	No	Mann-W
Calcium (mg/L)	MW-2	1.189	No	No	Mann-W
Calcium (mg/L)	MW-3	0.2832	No	No	Mann-W
Calcium (mg/L)	MW-4	0.4779	No	No	Mann-W
Calcium (mg/L)	MW-5	0.6375	No	No	Mann-W
Chloride (mg/L)	**MW-1 (bg)**	**-2.837**	**Yes**	**Yes**	**Mann-W**
Chloride (mg/L)	MW-10	-2.266	No	No	Mann-W
Chloride (mg/L)	MW-2	-2.191	No	No	Mann-W
Chloride (mg/L)	MW-3	0.1189	No	No	Mann-W
Chloride (mg/L)	MW-4	-1.578	No	No	Mann-W
Chloride (mg/L)	MW-5	-1.345	No	No	Mann-W
Fluoride (mg/L)	MW-1 (bg)	2.055	No	No	Mann-W
Fluoride (mg/L)	MW-10	-2.392	No	No	Mann-W
Fluoride (mg/L)	MW-2	-1.272	No	No	Mann-W
Fluoride (mg/L)	MW-3	-1.545	No	No	Mann-W
Fluoride (mg/L)	MW-4	-0.3931	No	No	Mann-W
Fluoride (mg/L)	MW-5	-0.1719	No	No	Mann-W
pH (SU)	**MW-1 (bg)**	**2.577**	**Yes**	**Yes**	**Mann-W**
pH (SU)	MW-10	-0.2771	No	No	Mann-W
pH (SU)	**MW-2**	**3.134**	**Yes**	**Yes**	**Mann-W**
pH (SU)	**MW-3**	**2.784**	**Yes**	**Yes**	**Mann-W**
pH (SU)	MW-4	0.5111	No	No	Mann-W
pH (SU)	MW-5	0.3333	No	No	Mann-W
Sulfate (mg/L)	**MW-1 (bg)**	**-2.765**	**Yes**	**Yes**	**Mann-W**
Sulfate (mg/L)	MW-10	-2.269	No	No	Mann-W
Sulfate (mg/L)	MW-2	-2.277	No	No	Mann-W
Sulfate (mg/L)	MW-3	-1.836	No	No	Mann-W
Sulfate (mg/L)	MW-4	-2.317	No	No	Mann-W
Sulfate (mg/L)	MW-5	-1.321	No	No	Mann-W
Total Dissolved Solids (mg/L)	**MW-1 (bg)**	**-2.844**	**Yes**	**Yes**	**Mann-W**
Total Dissolved Solids (mg/L)	MW-10	-2.393	No	No	Mann-W
Total Dissolved Solids (mg/L)	MW-2	-1.713	No	No	Mann-W
Total Dissolved Solids (mg/L)	MW-3	-0.7338	No	No	Mann-W
Total Dissolved Solids (mg/L)	MW-4	-2.165	No	No	Mann-W
Total Dissolved Solids (mg/L)	MW-5	-1.272	No	No	Mann-W

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-1 (bg)



background median = 0.333

compliance median = 0.0975

Z = -2.764 (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 Analysis Run 3/3/2022 11:13 AM View: Mann Whitney

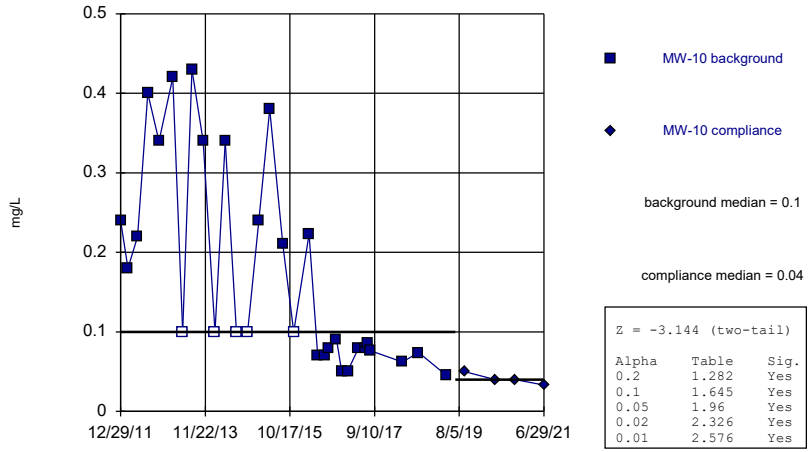
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Hollow symbols indicate censored values.

Mann-Whitney (Wilcoxon Rank Sum)

MW-10



background median = 0.1

compliance median = 0.04

Z = -3.144 (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 Analysis Run 3/3/2022 11:13 AM View: Mann Whitney

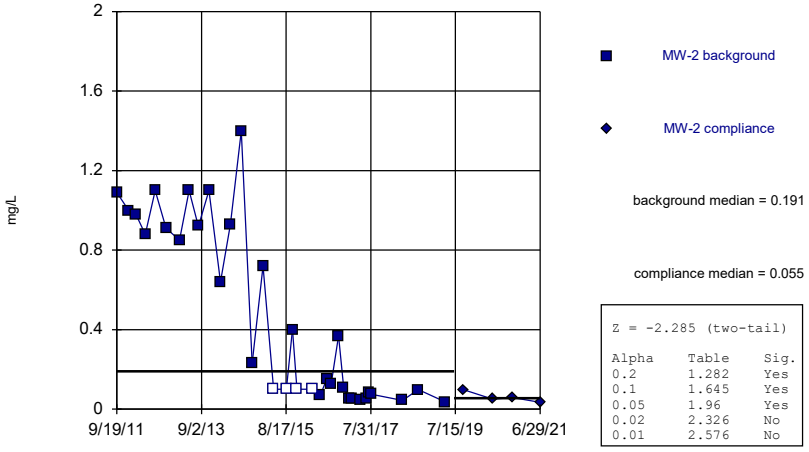
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Hollow symbols indicate censored values.

Mann-Whitney (Wilcoxon Rank Sum)

MW-2



background median = 0.191

compliance median = 0.055

Z = -2.285 (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 Analysis Run 3/3/2022 11:13 AM View: Mann Whitney

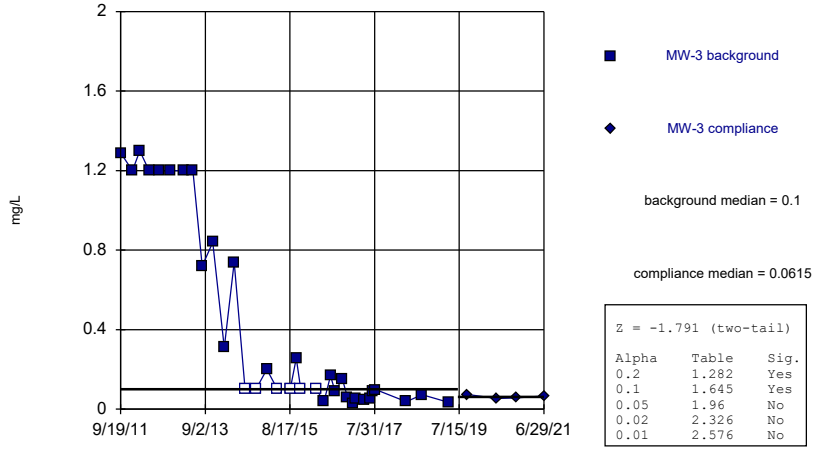
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Hollow symbols indicate censored values.

Mann-Whitney (Wilcoxon Rank Sum)

MW-3



background median = 0.1

compliance median = 0.0615

Z = -1.791 (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

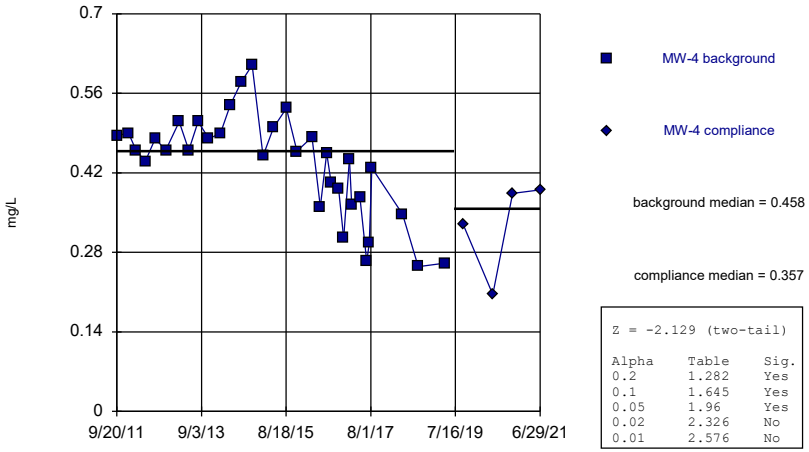
Constituent: Boron Analysis Run 3/3/2022 11:13 AM View: Mann Whitney

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-4

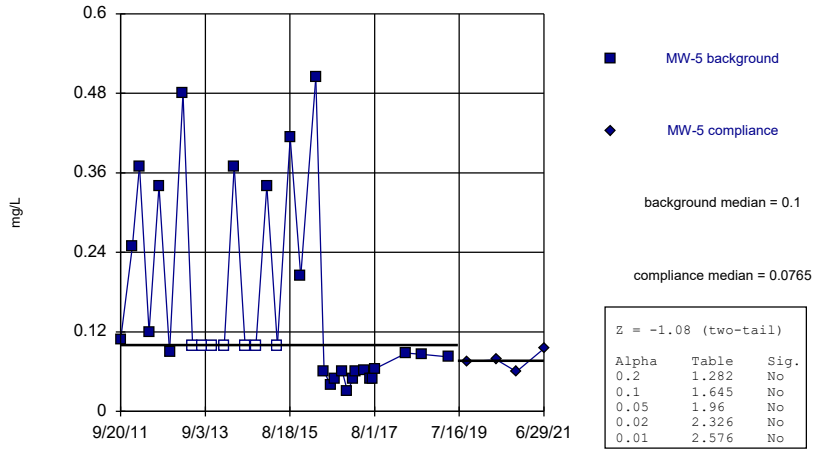


Constituent: Boron Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Mann-Whitney (Wilcoxon Rank Sum)

MW-5

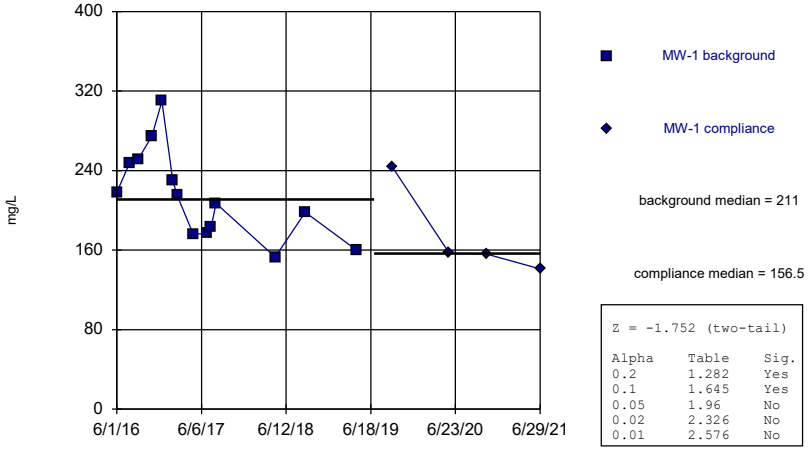


Constituent: Boron Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-1 (bg)

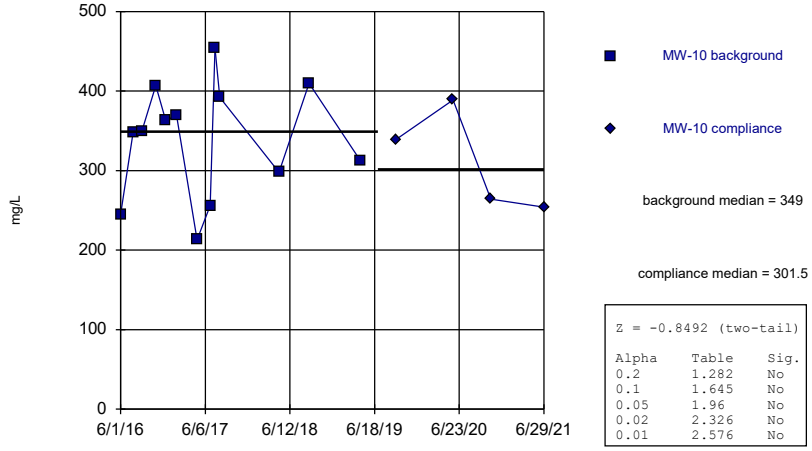


Constituent: Calcium Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

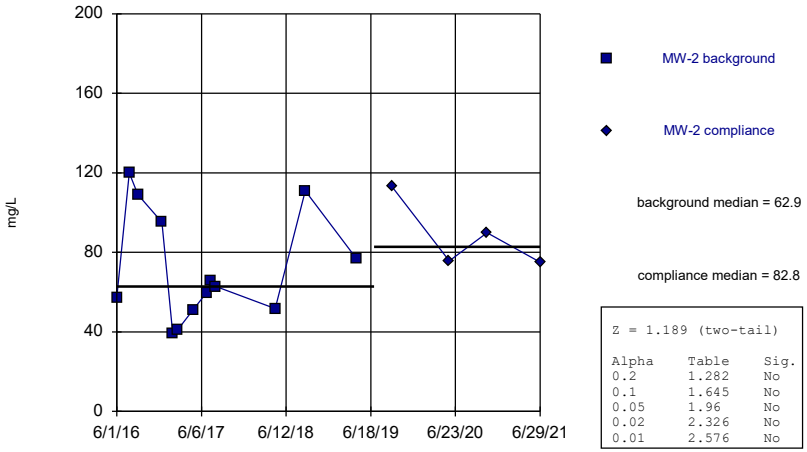
MW-10



Constituent: Calcium Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Mann-Whitney (Wilcoxon Rank Sum)

MW-2



Z = 1.189 (two-tail)

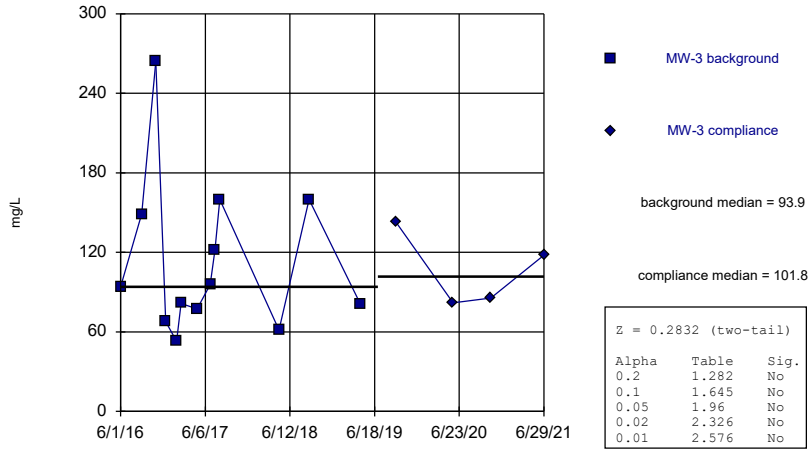
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Calcium Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-3



Z = 0.2832 (two-tail)

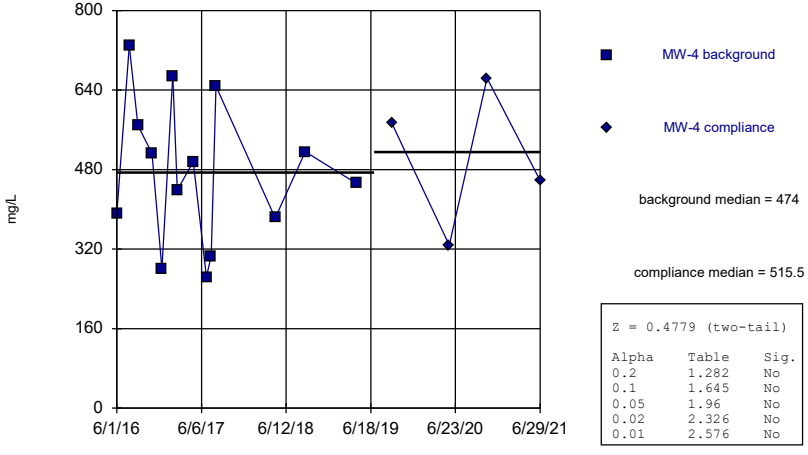
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Calcium Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-4



Z = 0.4779 (two-tail)

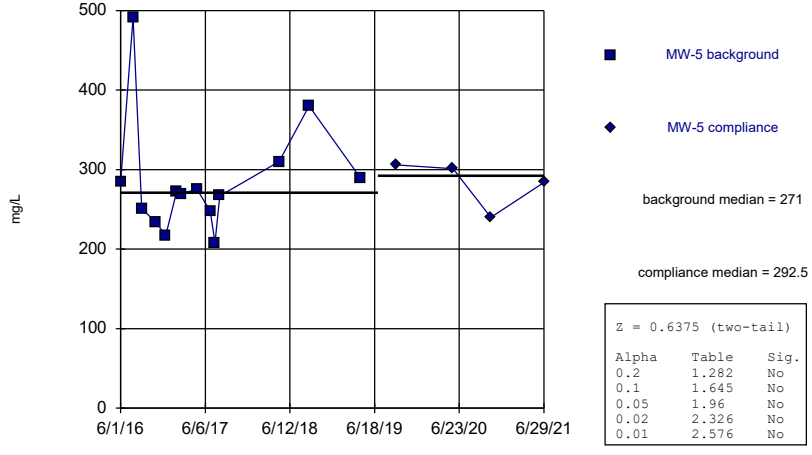
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Calcium Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-5



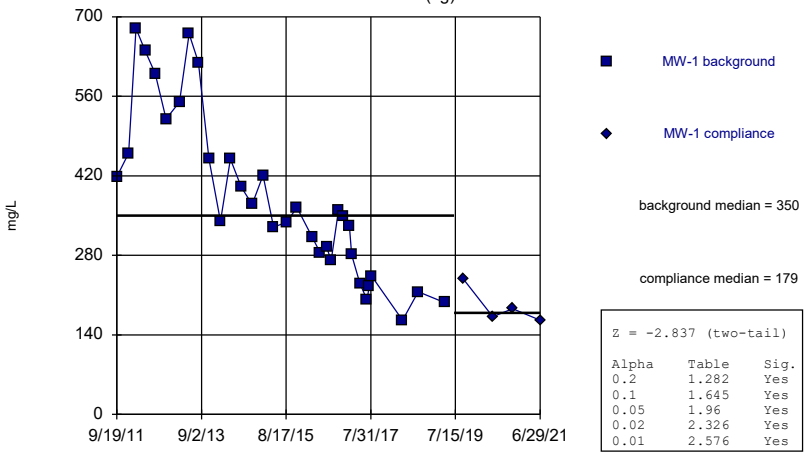
Z = 0.6375 (two-tail)

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 Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Mann-Whitney (Wilcoxon Rank Sum)

MW-1 (bg)



Z = -2.837 (two-tail)

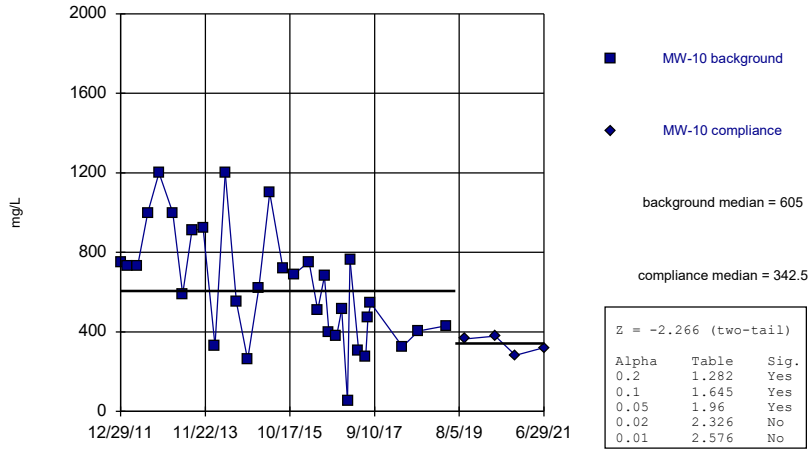
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	Yes
0.01	2.576	Yes

Constituent: Chloride Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-10



Z = -2.266 (two-tail)

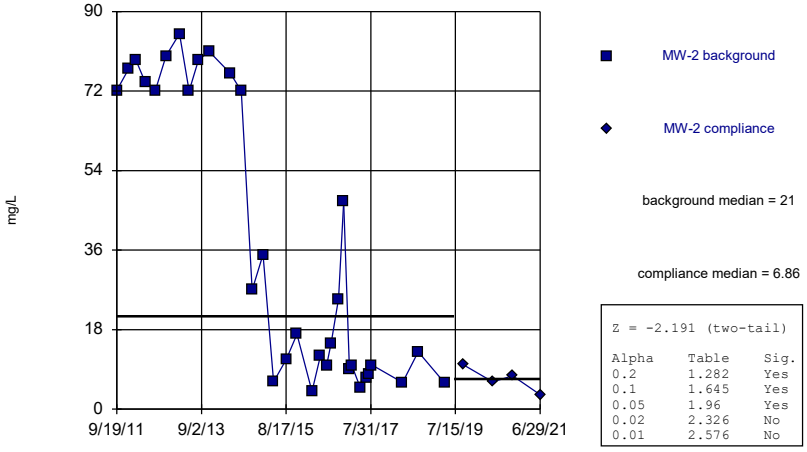
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	No
0.01	2.576	No

Constituent: Chloride Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-2



Z = -2.191 (two-tail)

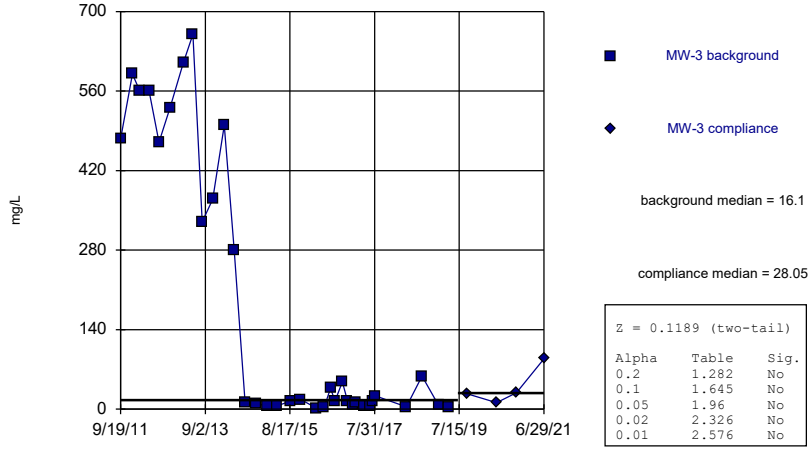
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	No
0.01	2.576	No

Constituent: Chloride Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-3



Z = 0.1189 (two-tail)

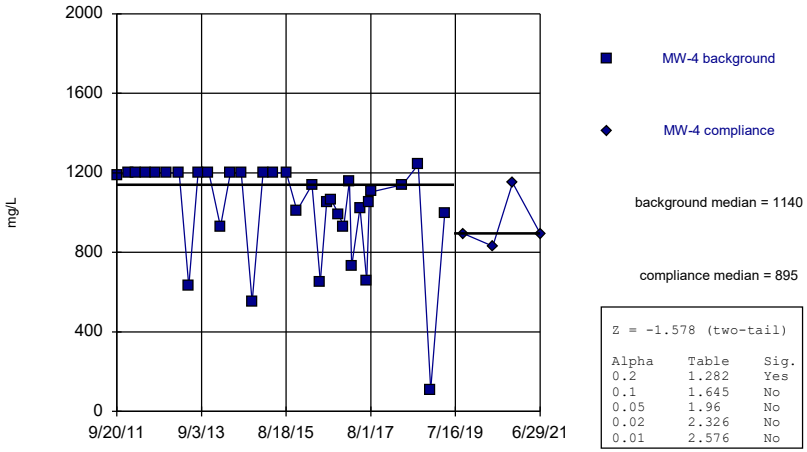
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Chloride Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-4



Z = -1.578 (two-tail)

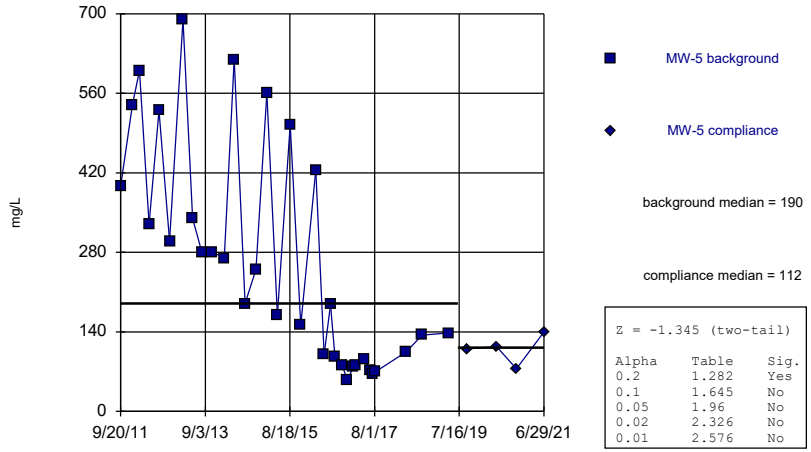
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Chloride Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-5



Z = -1.345 (two-tail)

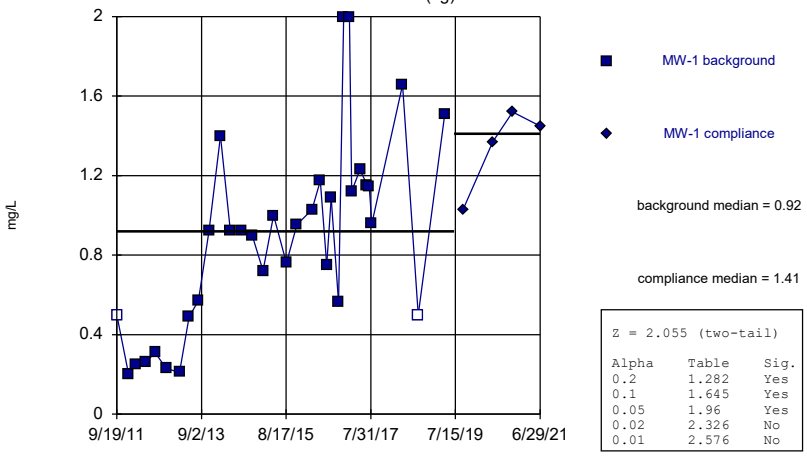
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Chloride Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Mann-Whitney (Wilcoxon Rank Sum)

MW-1 (bg)



Z = 2.055 (two-tail)

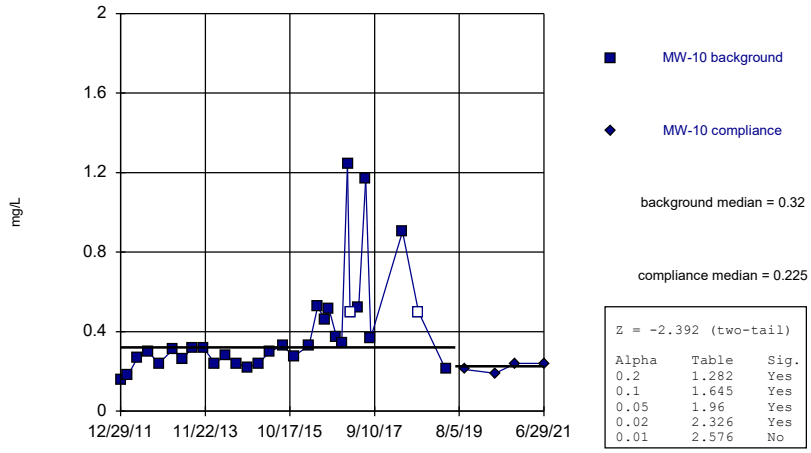
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	No
0.01	2.576	No

Constituent: Fluoride Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Mann-Whitney (Wilcoxon Rank Sum)

MW-10



Z = -2.392 (two-tail)

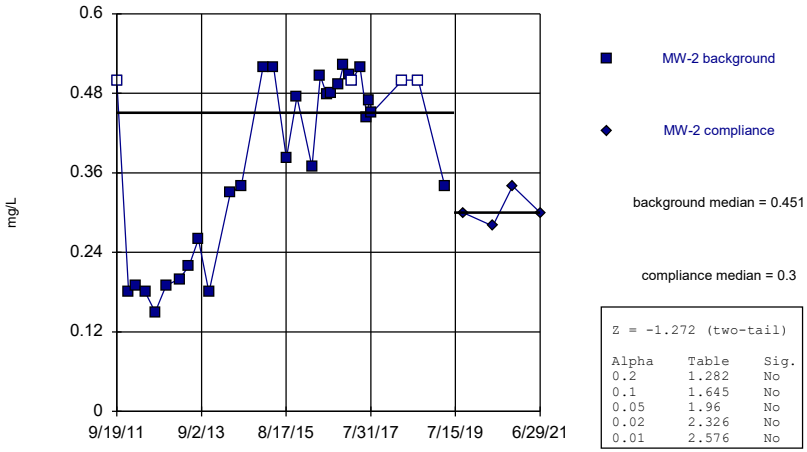
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	Yes
0.01	2.576	No

Constituent: Fluoride Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Mann-Whitney (Wilcoxon Rank Sum)

MW-2



background median = 0.451

compliance median = 0.3

Z = -1.272 (two-tail)

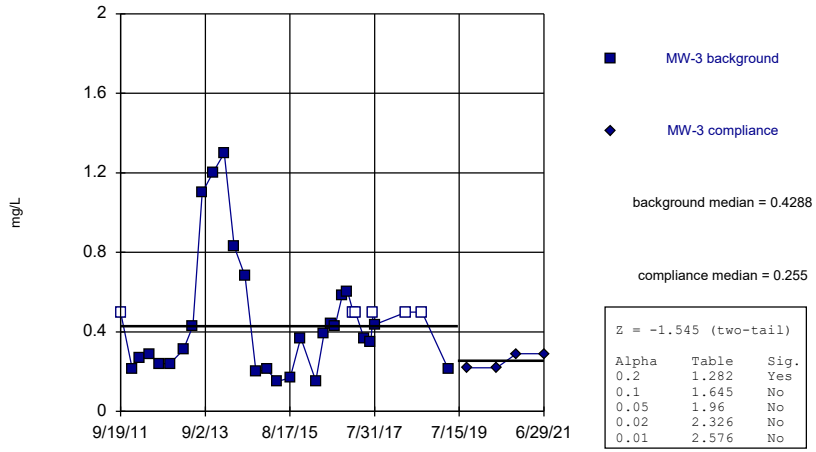
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Fluoride Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Mann-Whitney (Wilcoxon Rank Sum)

MW-3



background median = 0.4288

compliance median = 0.255

Z = -1.545 (two-tail)

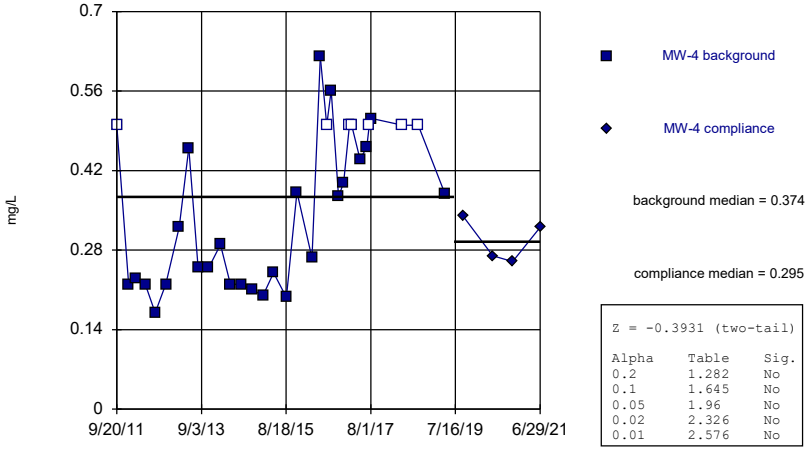
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Fluoride Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Mann-Whitney (Wilcoxon Rank Sum)

MW-4



background median = 0.374

compliance median = 0.295

Z = -0.3931 (two-tail)

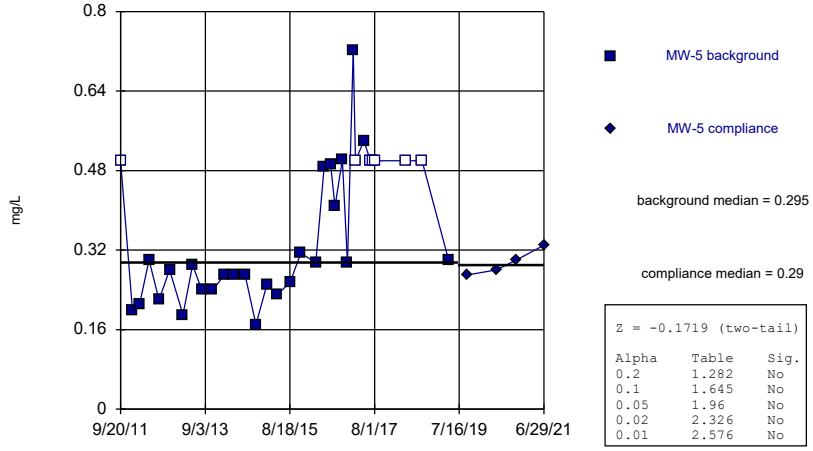
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Fluoride Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Mann-Whitney (Wilcoxon Rank Sum)

MW-5



background median = 0.295

compliance median = 0.29

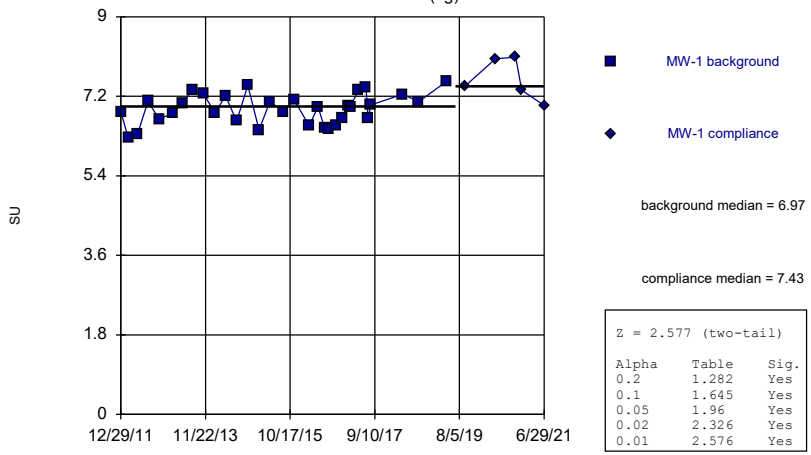
Z = -0.1719 (two-tail)

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: Fluoride Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Mann-Whitney (Wilcoxon Rank Sum)

MW-1 (bg)



background median = 6.97

compliance median = 7.43

Z = 2.577 (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

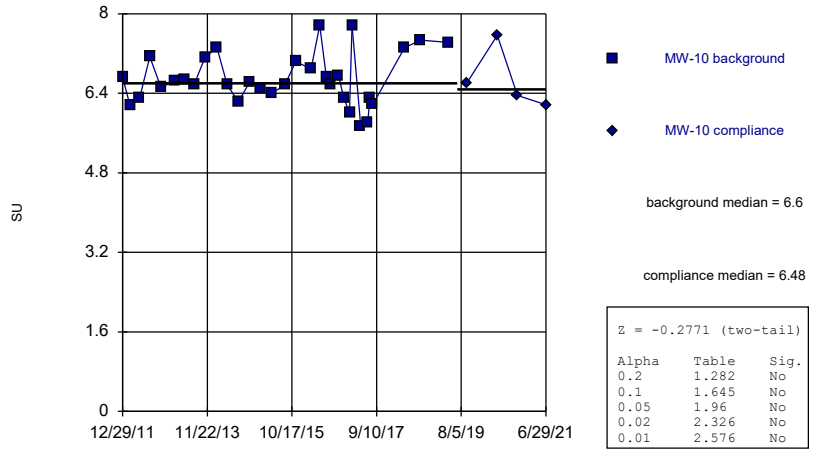
Constituent: pH Analysis Run 3/3/2022 11:13 AM View: Mann Whitney

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-10



background median = 6.6

compliance median = 6.48

Z = -0.2771 (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

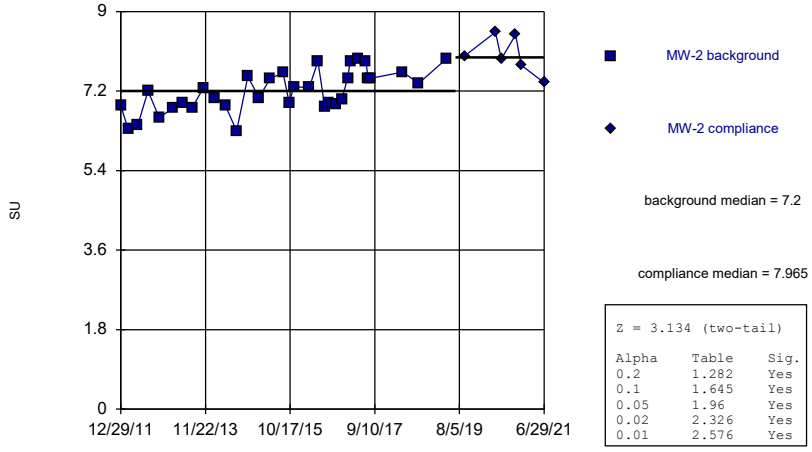
Constituent: pH Analysis Run 3/3/2022 11:13 AM View: Mann Whitney

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-2



background median = 7.2

compliance median = 7.965

Z = 3.134 (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

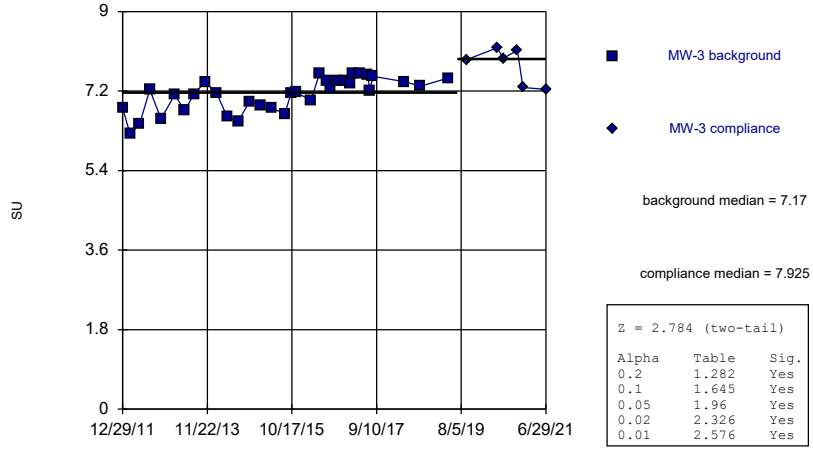
Constituent: pH Analysis Run 3/3/2022 11:13 AM View: Mann Whitney

Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-3



background median = 7.17

compliance median = 7.925

Z = 2.784 (two-tail)

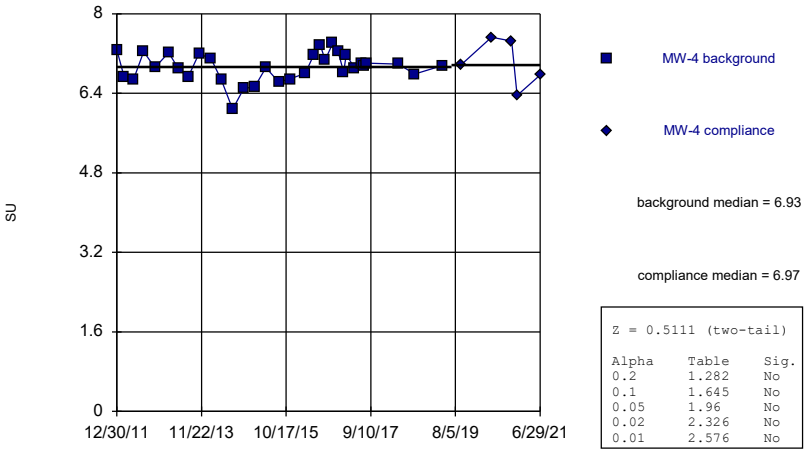
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	Yes
0.01	2.576	Yes

Constituent: pH Analysis Run 3/3/2022 11:13 AM View: Mann Whitney

Turk Landfill Client: Geosyntec Data: Turk Landfill

Mann-Whitney (Wilcoxon Rank Sum)

MW-4

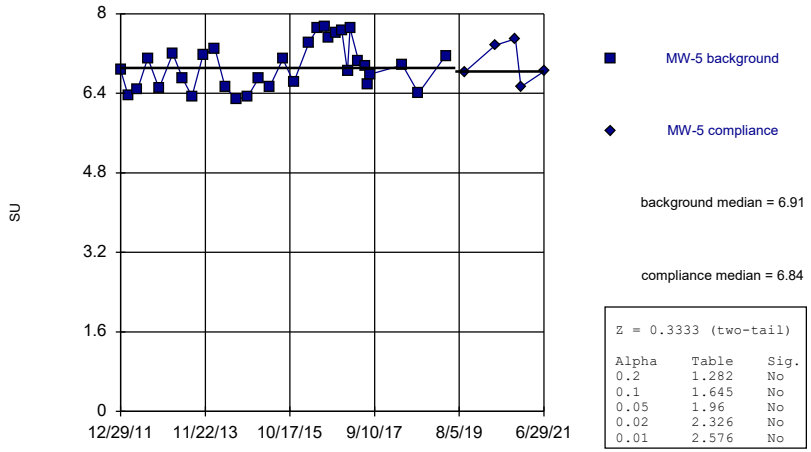


Constituent: pH Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-5

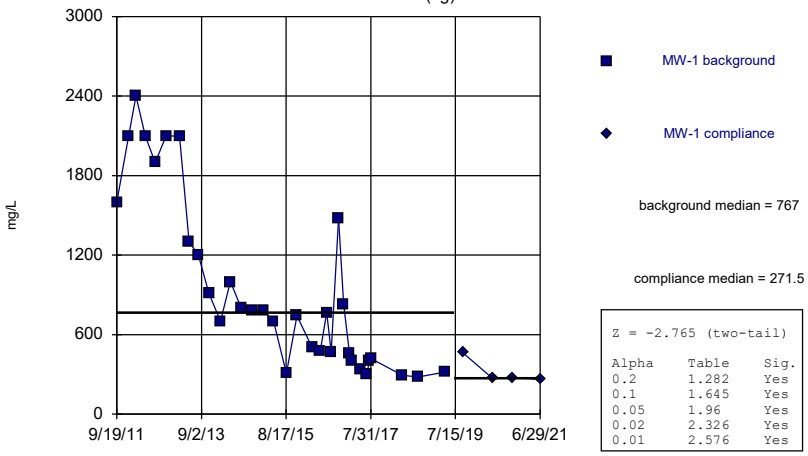


Constituent: pH Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-1 (bg)

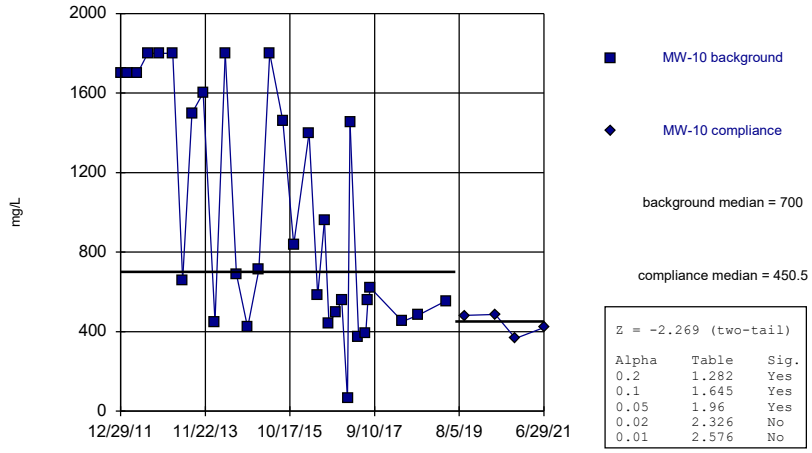


Constituent: Sulfate Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

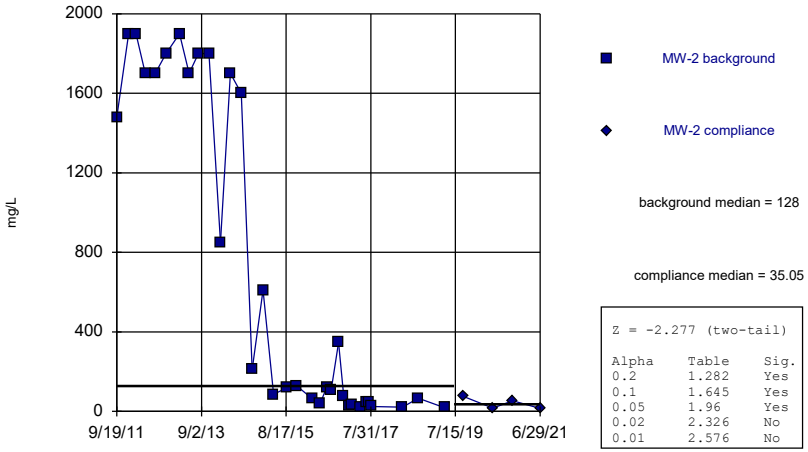
MW-10



Constituent: Sulfate Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Mann-Whitney (Wilcoxon Rank Sum)

MW-2

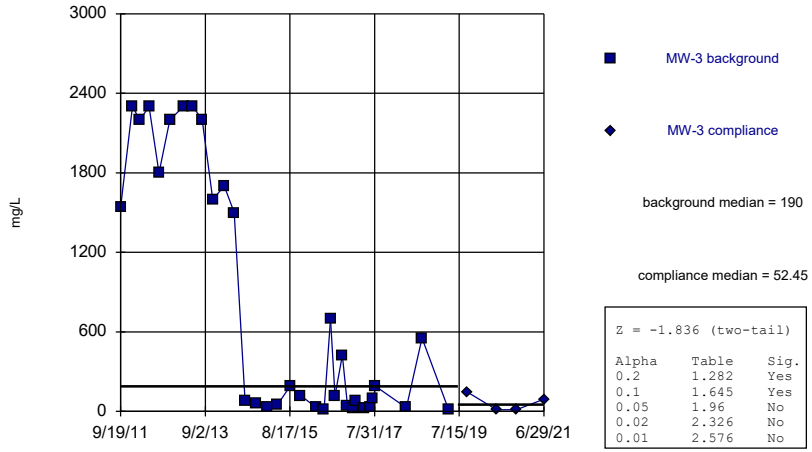


Constituent: Sulfate Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-3

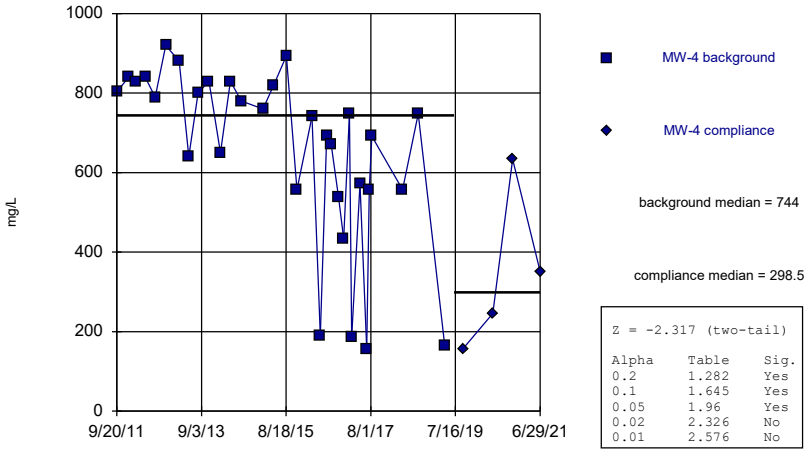


Constituent: Sulfate Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-4

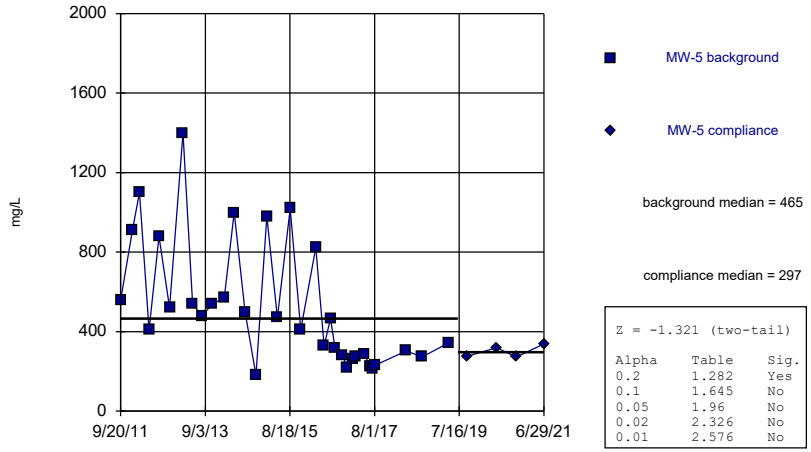


Constituent: Sulfate Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

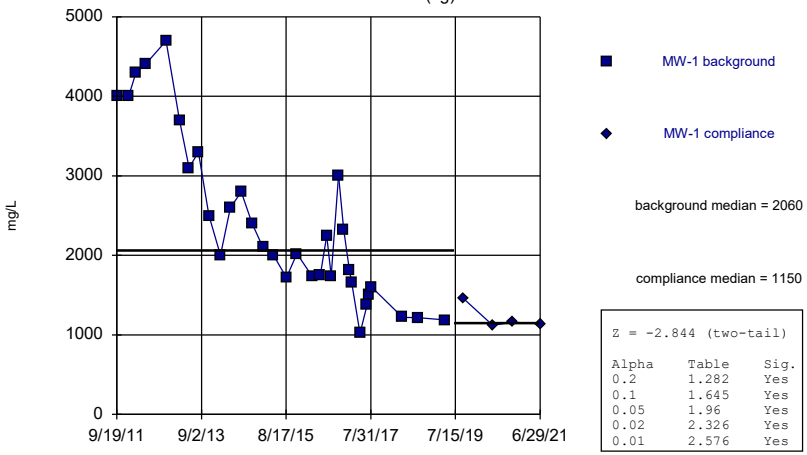
MW-5



Constituent: Sulfate Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Mann-Whitney (Wilcoxon Rank Sum)

MW-1 (bg)



Z = -2.844 (two-tail)

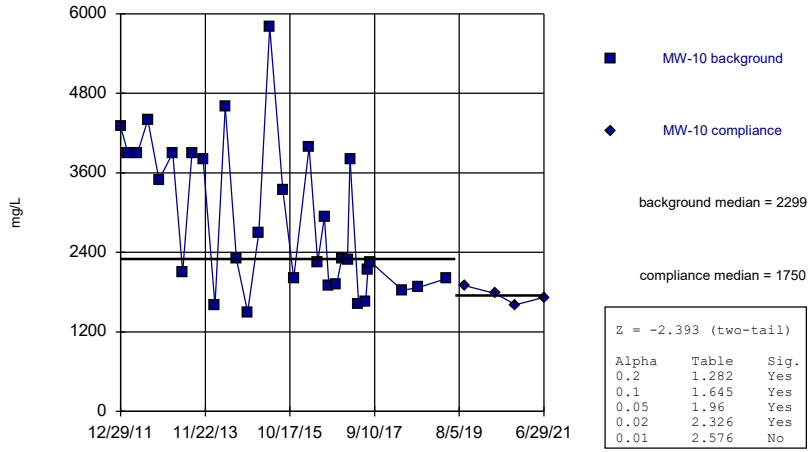
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	Yes
0.01	2.576	Yes

Constituent: Total Dissolved Solids Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-10



Z = -2.393 (two-tail)

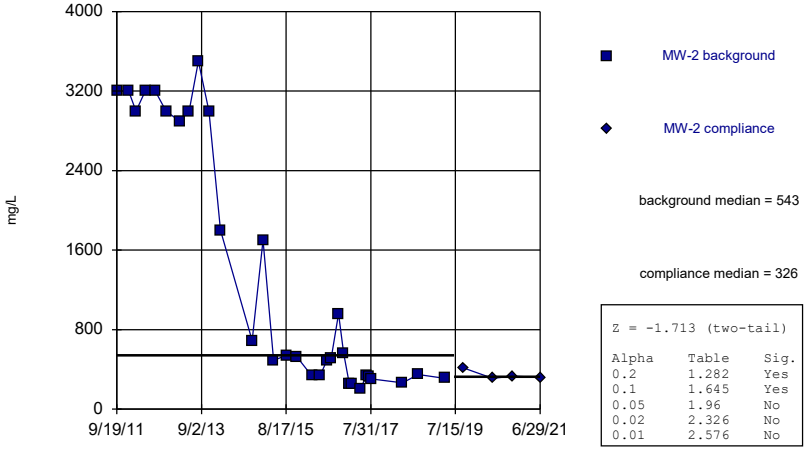
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	Yes
0.01	2.576	No

Constituent: Total Dissolved Solids Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-2



Z = -1.713 (two-tail)

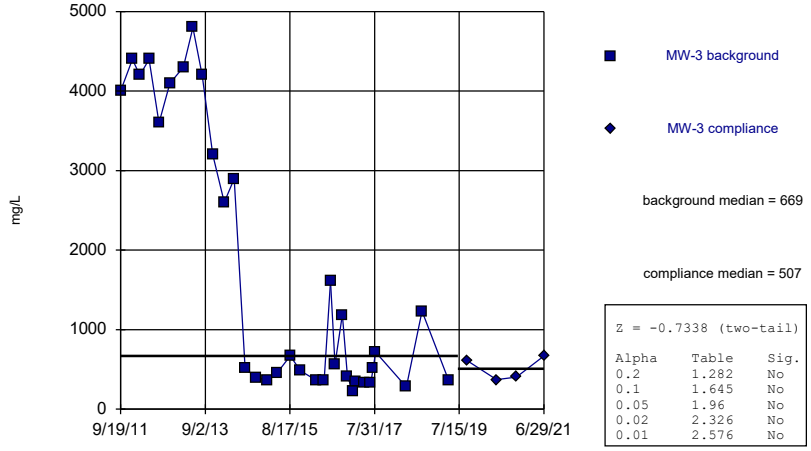
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Total Dissolved Solids Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-3



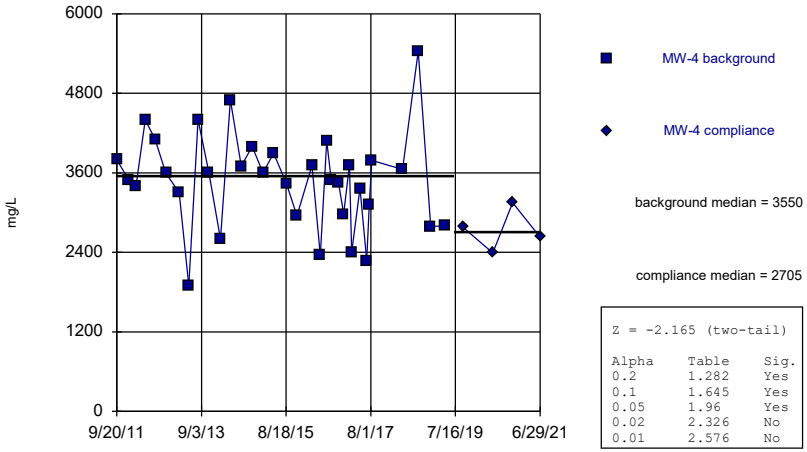
Z = -0.7338 (two-tail)

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 Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Mann-Whitney (Wilcoxon Rank Sum)

MW-4



Z = -2.165 (two-tail)

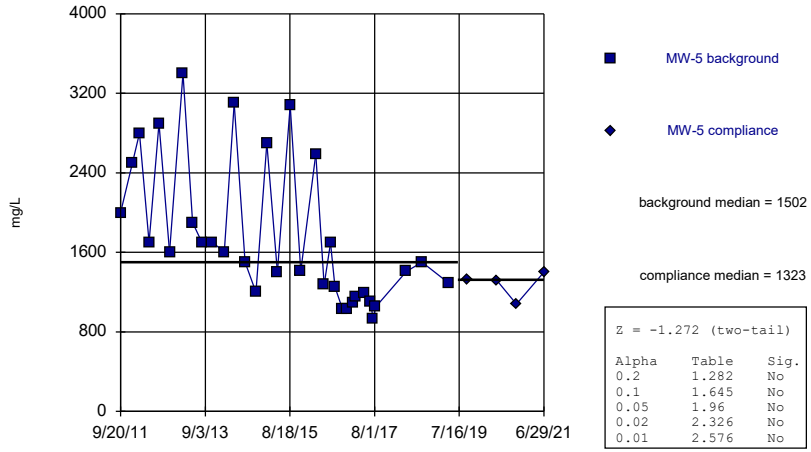
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	No
0.01	2.576	No

Constituent: Total Dissolved Solids Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.30f Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-5



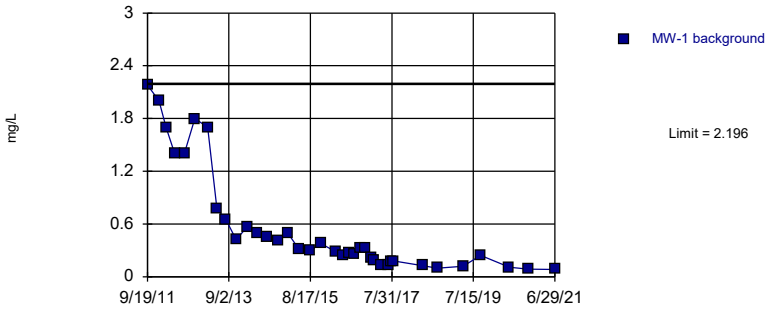
Z = -1.272 (two-tail)

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 Analysis Run 3/3/2022 11:13 AM View: Mann Whitney
Turk Landfill Client: Geosyntec Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-1 (bg)



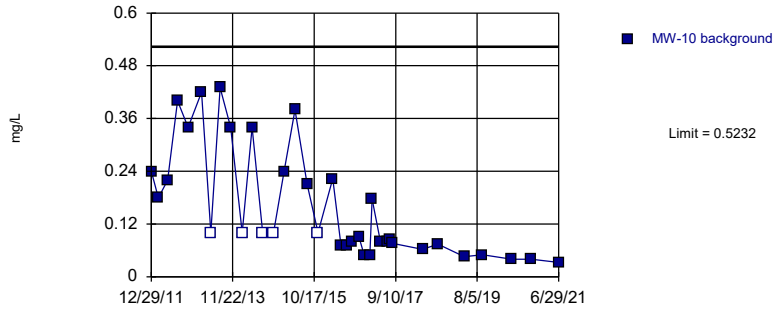
Background Data Summary (based on natural log transformation): Mean=-1.029, Std. Dev.=0.9513, n=37. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9325, critical = 0.914. Kappa = 1.908 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Boron Analysis Run 3/14/2022 1:49 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Hollow symbols indicate censored values.

Prediction Limit

Intrawell Parametric, MW-10



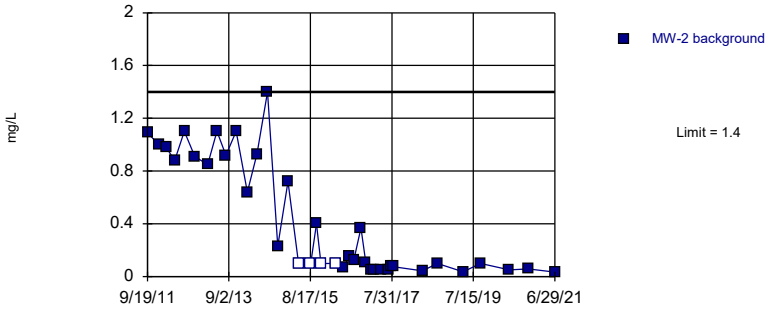
Background Data Summary (based on natural log transformation): Mean=-2.135, Std. Dev.=0.7776, n=36, 13.89% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9184, critical = 0.912. Kappa = 1.912 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Boron Analysis Run 3/14/2022 1:49 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Hollow symbols indicate censored values.

Prediction Limit

Intrawell Non-parametric, MW-2



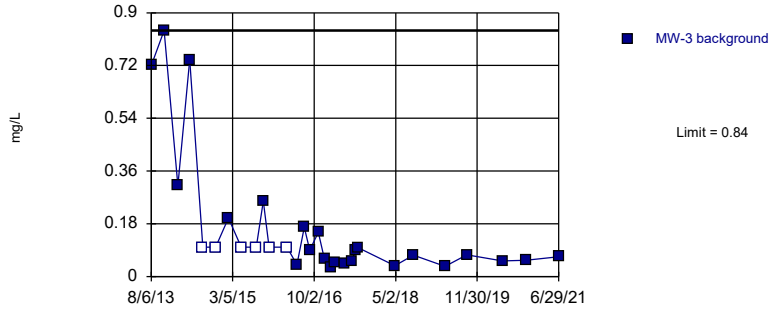
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 38 background values. 10.53% NDs. Well-constituent pair annual alpha = 0.002586. Individual comparison alpha = 0.001294 (1 of 2). Assumes 1 future value.

Constituent: Boron Analysis Run 3/14/2022 1:49 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Hollow symbols indicate censored values.

Prediction Limit

Intrawell Non-parametric, MW-3

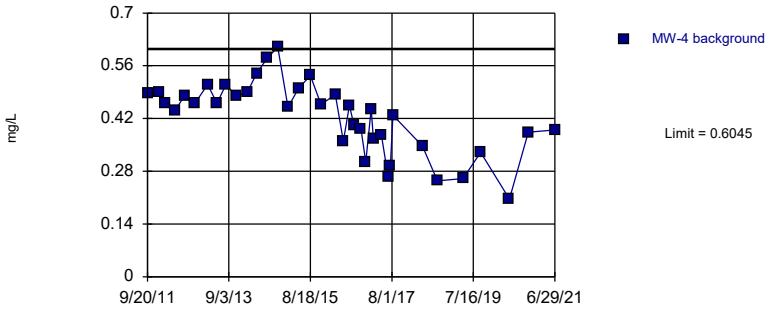


Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 30 background values. 20% NDs. Well-constituent pair annual alpha = 0.004011. Individual comparison alpha = 0.002008 (1 of 2). Assumes 1 future value.

Constituent: Boron Analysis Run 3/14/2022 1:49 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-4



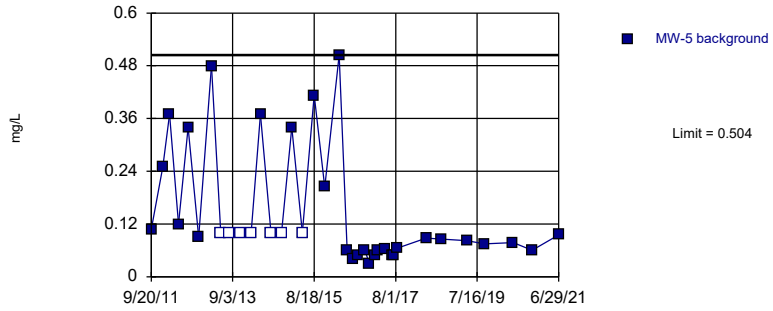
Background Data Summary: Mean=0.4239, Std. Dev.=0.09464, n=37. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9644, critical = 0.914. Kappa = 1.908 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Boron Analysis Run 3/14/2022 1:49 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Hollow symbols indicate censored values.

Prediction Limit

Intrawell Non-parametric, MW-5

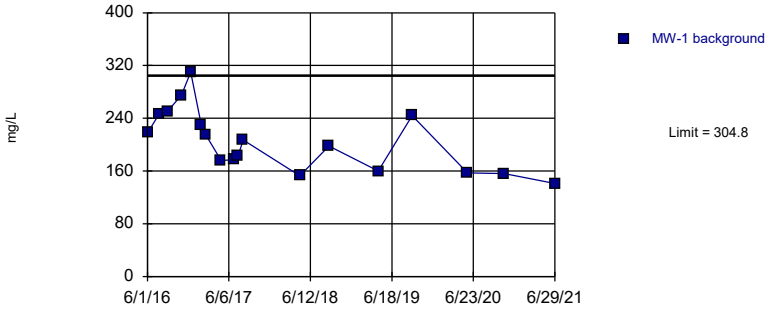


Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 37 background values. 18.92% NDs. Well-constituent pair annual alpha = 0.002721. Individual comparison alpha = 0.001361 (1 of 2). Assumes 1 future value.

Constituent: Boron Analysis Run 3/14/2022 1:49 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-1 (bg)

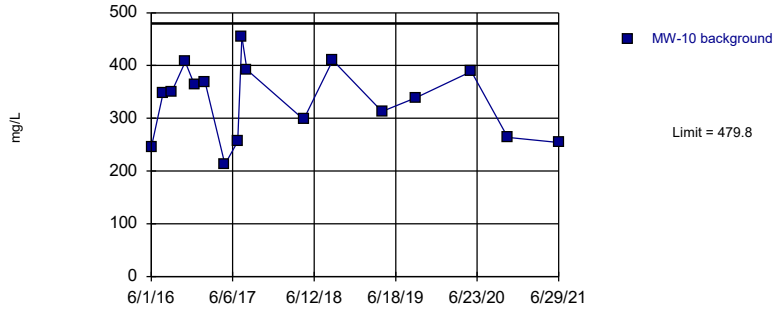


Background Data Summary: Mean=205.4, Std. Dev.=47.22, n=18. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9495, critical = 0.858. Kappa = 2.104 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Calcium Analysis Run 3/14/2022 1:49 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-10

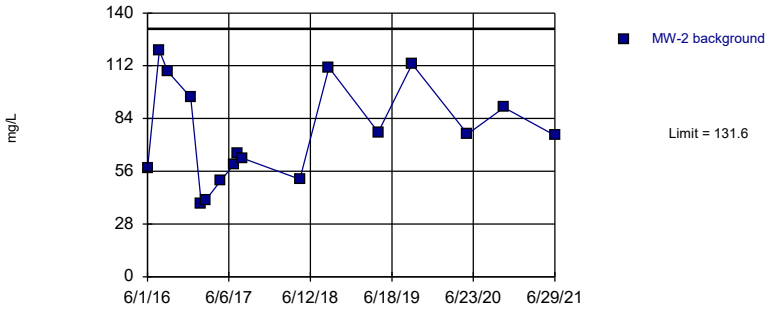


Background Data Summary: Mean=333.1, Std. Dev.=68.95, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9621, critical = 0.851. Kappa = 2.127 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Calcium Analysis Run 3/14/2022 1:49 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-2



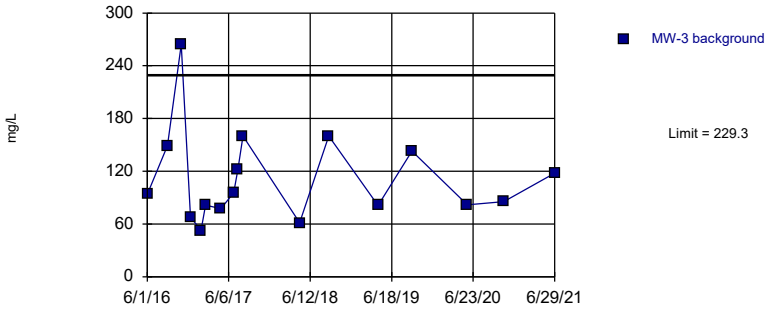
Background Data Summary: Mean=76.11, Std. Dev.=26.09, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9359, critical = 0.851. Kappa = 2.127 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Calcium Analysis Run 3/14/2022 1:49 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-3



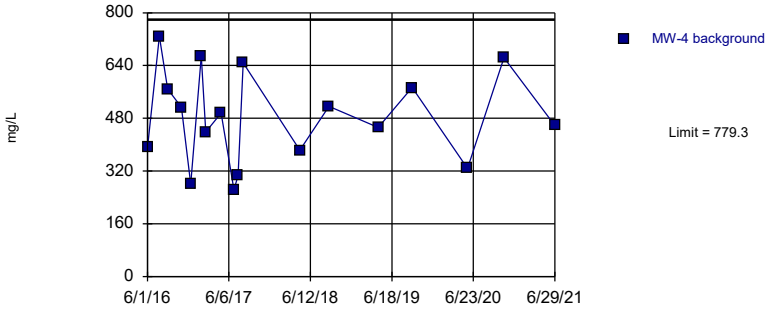
Background Data Summary (based on square root transformation): Mean=10.33, Std. Dev.=2.264, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9137, critical = 0.851. Kappa = 2.127 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Calcium Analysis Run 3/14/2022 1:49 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-4



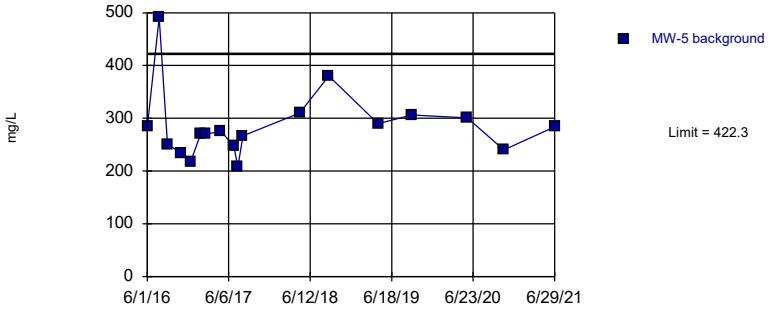
Background Data Summary: Mean=482.1, Std. Dev.=141.3, n=18. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9629, critical = 0.858. Kappa = 2.104 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Calcium Analysis Run 3/14/2022 1:49 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-5

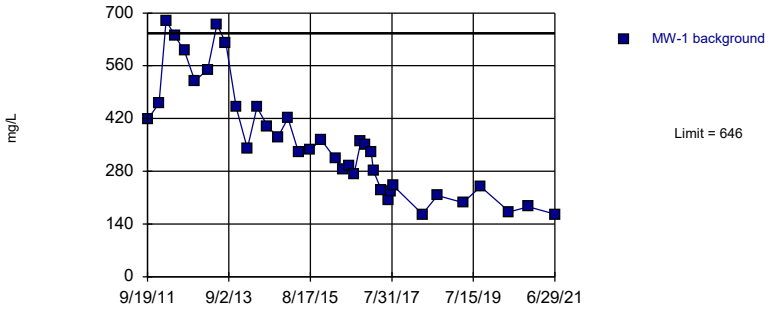


Background Data Summary (based on cube root transformation): Mean=6.55, Std. Dev.=0.453, n=18. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8706, critical = 0.858. Kappa = 2.104 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Calcium Analysis Run 3/14/2022 1:49 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-1 (bg)



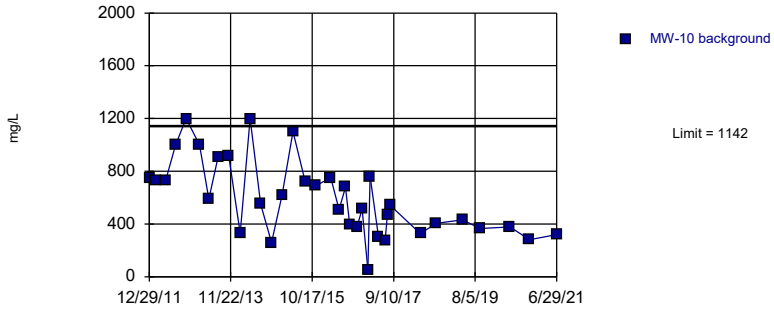
Background Data Summary: Mean=360.8, Std. Dev.=149.5, n=37. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9179, critical = 0.914. Kappa = 1.908 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Chloride Analysis Run 3/14/2022 1:49 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-10



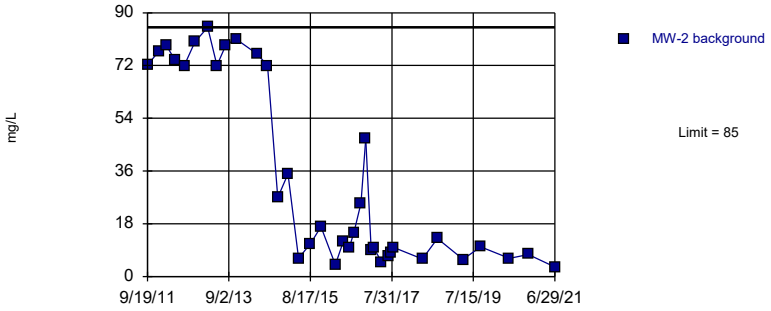
Background Data Summary: Mean=595.9, Std. Dev.=285.7, n=36. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9496, critical = 0.912. Kappa = 1.912 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Chloride Analysis Run 3/14/2022 1:49 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Non-parametric, MW-2



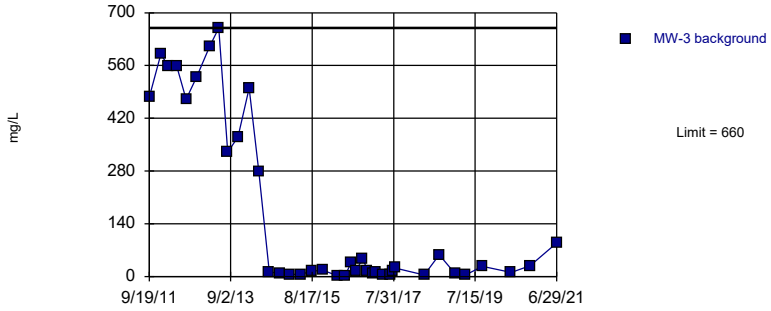
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 36 background values. Well-constituent pair annual alpha = 0.002856. Individual comparison alpha = 0.001429 (1 of 2). Assumes 1 future value.

Constituent: Chloride Analysis Run 3/14/2022 1:49 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Non-parametric, MW-3

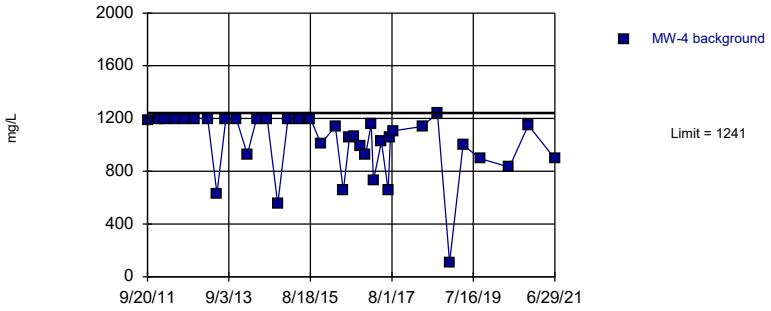


Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 38 background values. Well-constituent pair annual alpha = 0.002586. Individual comparison alpha = 0.001294 (1 of 2). Assumes 1 future value.

Constituent: Chloride Analysis Run 3/14/2022 1:49 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Prediction Limit

Intrawell Non-parametric, MW-4

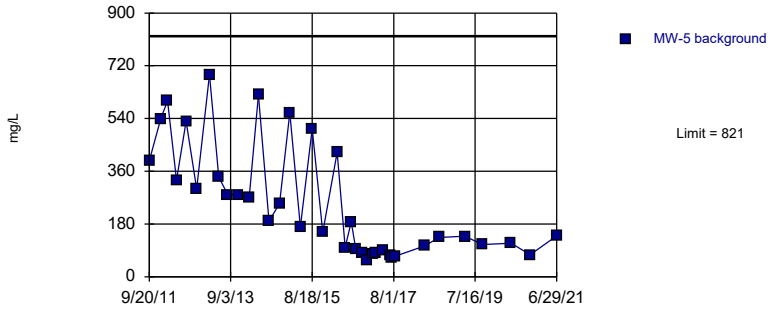


Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 38 background values. Well-constituent pair annual alpha = 0.002586. Individual comparison alpha = 0.001294 (1 of 2). Assumes 1 future value.

Constituent: Chloride Analysis Run 3/14/2022 1:49 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-5



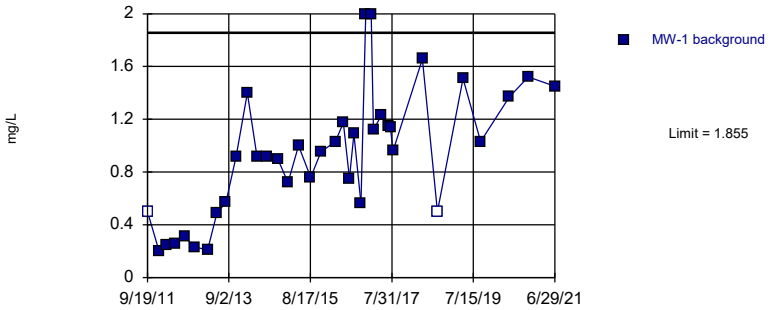
Background Data Summary (based on natural log transformation): Mean=5.232, Std. Dev.=0.7748, n=37. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9236, critical = 0.914. Kappa = 1.908 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Chloride Analysis Run 3/14/2022 1:49 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Hollow symbols indicate censored values.

Prediction Limit

Intrawell Parametric, MW-1 (bg)



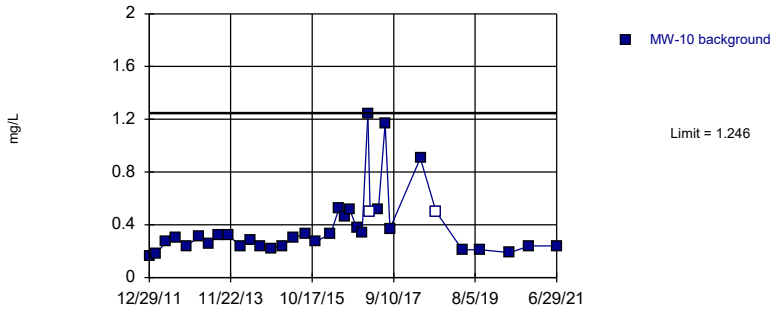
Background Data Summary: Mean=0.9396, Std. Dev.=0.4798, n=37, 5.405% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9558, critical = 0.914. Kappa = 1.908 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Fluoride Analysis Run 3/14/2022 1:49 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Hollow symbols indicate censored values.

Prediction Limit

Intrawell Non-parametric, MW-10



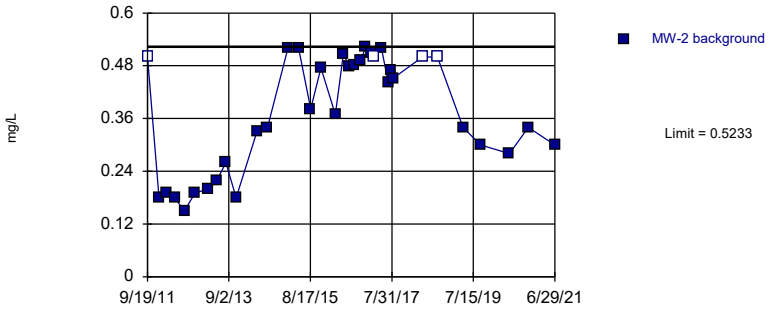
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 35 background values. 5.714% NDs. Well-constituent pair annual alpha = 0.002991. Individual comparison alpha = 0.001497 (1 of 2). Assumes 1 future value.

Constituent: Fluoride Analysis Run 3/14/2022 1:49 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Prediction Limit

Intrawell Non-parametric, MW-2



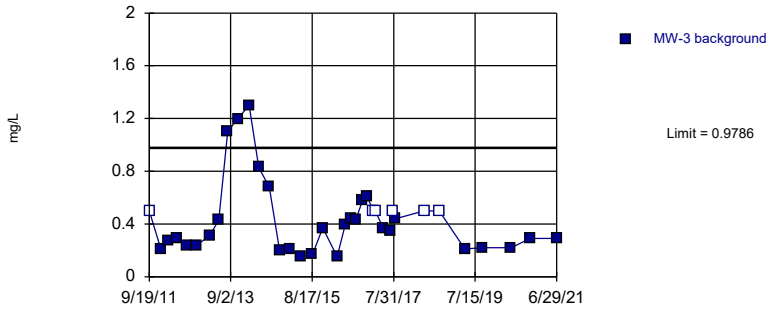
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 35 background values. 11.43% NDs. Well-constituent pair annual alpha = 0.002991. Individual comparison alpha = 0.001497 (1 of 2). Assumes 1 future value.

Constituent: Fluoride Analysis Run 3/14/2022 1:50 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Prediction Limit

Intrawell Parametric, MW-3



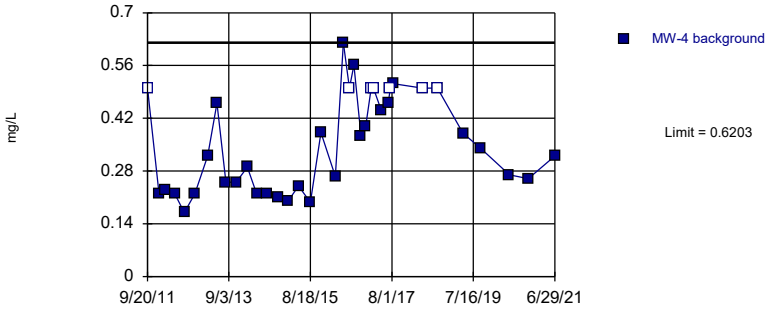
Background Data Summary (based on cube root transformation) (after Kaplan-Meier Adjustment): Mean=0.6984, Std. Dev.=0.1543, n=37, 16.22% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9232, critical = 0.914. Kappa = 1.908 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Fluoride Analysis Run 3/14/2022 1:50 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Prediction Limit

Intrawell Non-parametric, MW-4



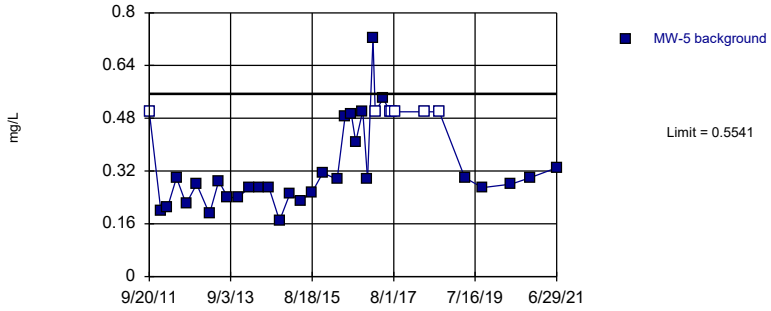
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 37 background values. 18.92% NDs. Well-constituent pair annual alpha = 0.002721. Individual comparison alpha = 0.001361 (1 of 2). Assumes 1 future value.

Constituent: Fluoride Analysis Run 3/14/2022 1:50 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Prediction Limit

Intrawell Parametric, MW-5

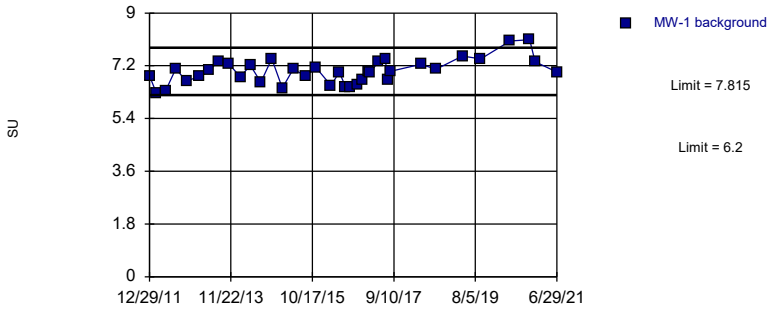


Background Data Summary (based on natural log transformation) (after Kaplan-Meier Adjustment): Mean=-1.27, Std. Dev.=0.3562, n=37, 18.92% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9155, critical = 0.914. Kappa = 1.908 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Fluoride Analysis Run 3/14/2022 1:50 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-1 (bg)



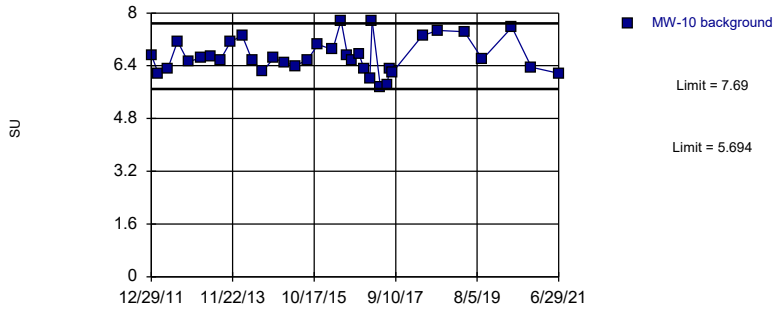
Background Data Summary: Mean=7.008, Std. Dev.=0.4233, n=37. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9618, critical = 0.914. Kappa = 1.908 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: pH Analysis Run 3/14/2022 1:50 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-10



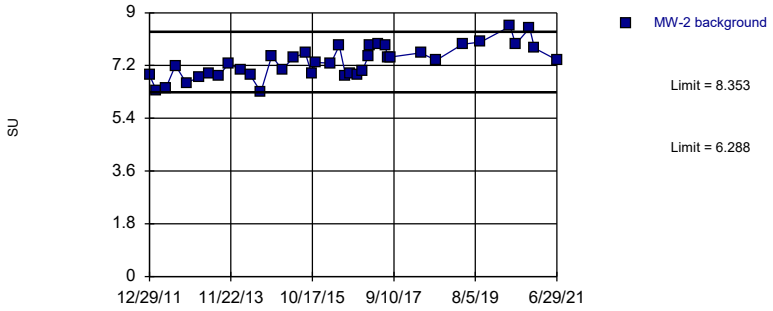
Background Data Summary: Mean=6.692, Std. Dev.=0.5218, n=36. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.951, critical = 0.912. Kappa = 1.912 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: pH Analysis Run 3/14/2022 1:50 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-2



Background Data Summary: Mean=7.321, Std. Dev.=0.5435, n=39. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.969, critical = 0.917. Kappa = 1.9 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: pH Analysis Run 3/14/2022 1:50 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

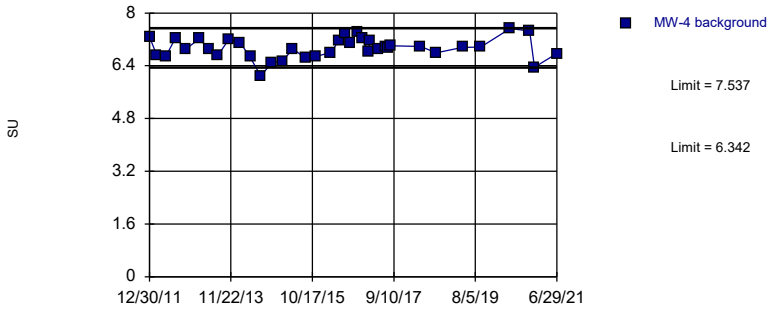
Intrawell Parametric, MW-3

Background Data Summary: Mean=7.221, Std. Dev.=0.448, n=39. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9799, critical = 0.917. Kappa = 1.9 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: pH Analysis Run 3/14/2022 1:50 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-4



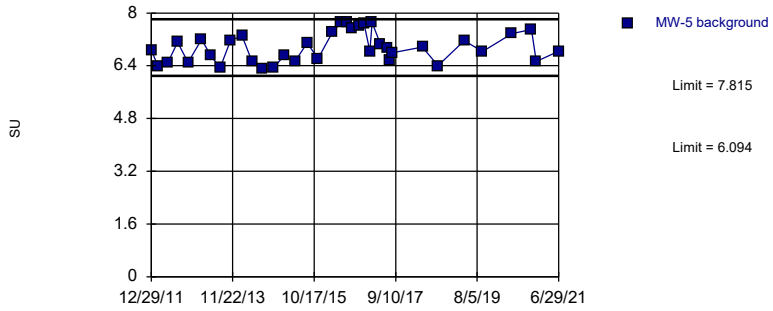
Background Data Summary: Mean=6.939, Std. Dev.=0.3134, n=37. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9824, critical = 0.914. Kappa = 1.908 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: pH Analysis Run 3/14/2022 1:50 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-5



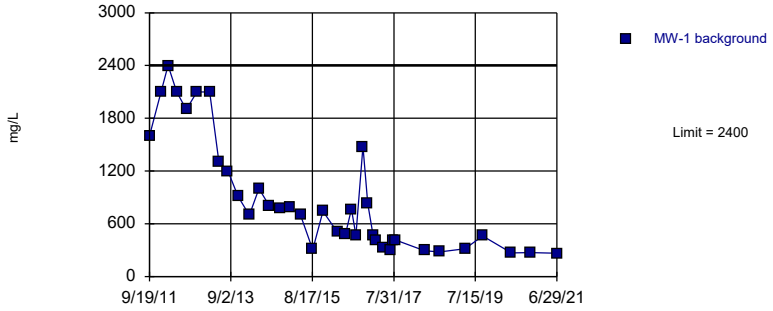
Background Data Summary: Mean=6.955, Std. Dev.=0.4511, n=37. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9301, critical = 0.914. Kappa = 1.908 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: pH Analysis Run 3/14/2022 1:50 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Non-parametric, MW-1 (bg)



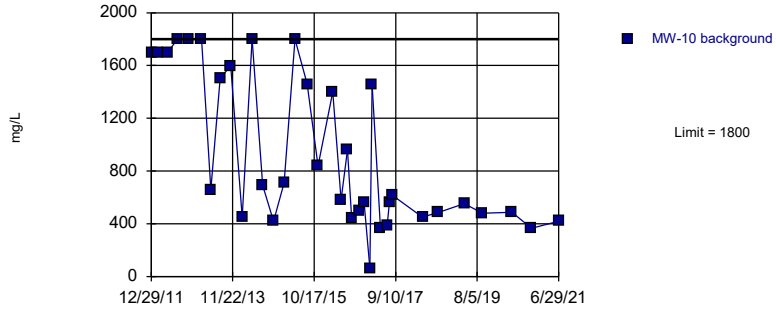
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 37 background values. Well-constituent pair annual alpha = 0.002721. Individual comparison alpha = 0.001361 (1 of 2). Assumes 1 future value.

Constituent: Sulfate Analysis Run 3/14/2022 1:50 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Non-parametric, MW-10

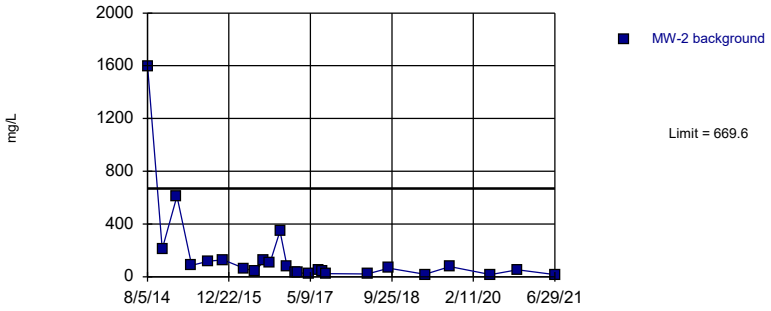


Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 36 background values. Well-constituent pair annual alpha = 0.002856. Individual comparison alpha = 0.001429 (1 of 2). Assumes 1 future value.

Constituent: Sulfate Analysis Run 3/14/2022 1:50 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-2



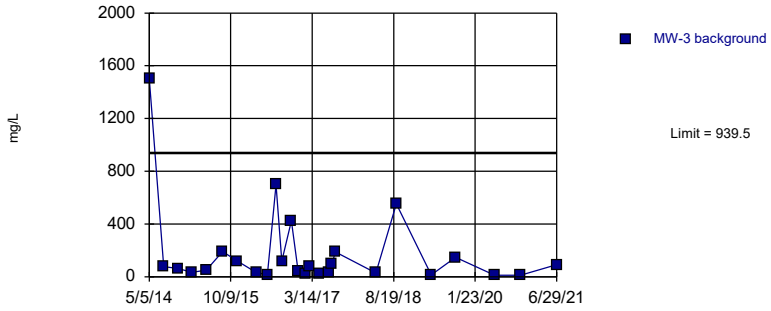
Background Data Summary (based on natural log transformation): Mean=4.222, Std. Dev.=1.148, n=25. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9249, critical = 0.888. Kappa = 1.99 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Sulfate Analysis Run 3/14/2022 1:50 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-3



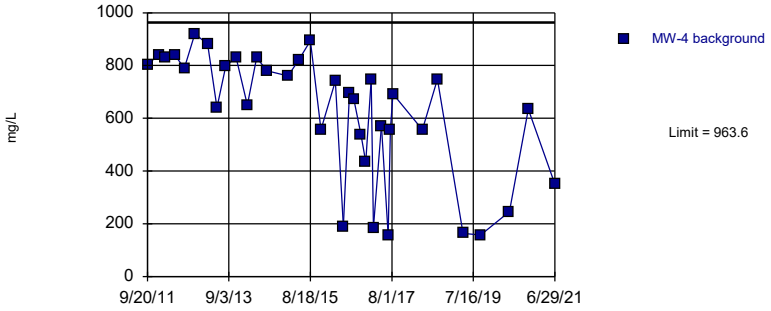
Background Data Summary (based on natural log transformation): Mean=4.283, Std. Dev.=1.293, n=26. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9527, critical = 0.891. Kappa = 1.981 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Sulfate Analysis Run 3/14/2022 1:50 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-4



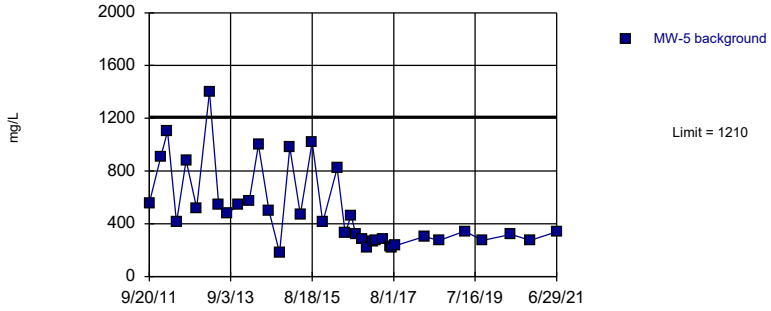
Background Data Summary (based on square transformation): Mean=445683, Std. Dev.=252559, n=36. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9167, critical = 0.912. Kappa = 1.912 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Sulfate Analysis Run 3/14/2022 1:50 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-5

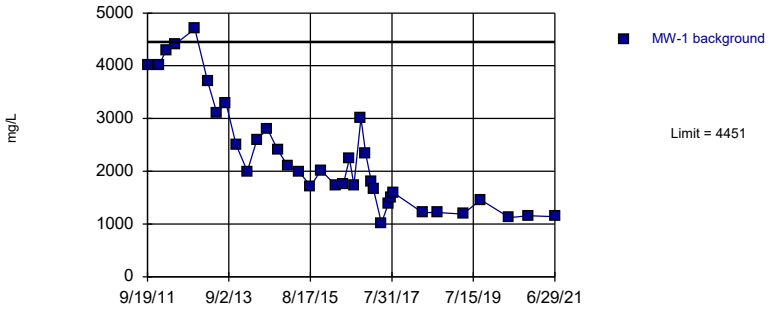


Background Data Summary (based on natural log transformation): Mean=6.064, Std. Dev.=0.5423, n=37. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9323, critical = 0.914. Kappa = 1.908 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Sulfate Analysis Run 3/14/2022 1:50 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-1 (bg)



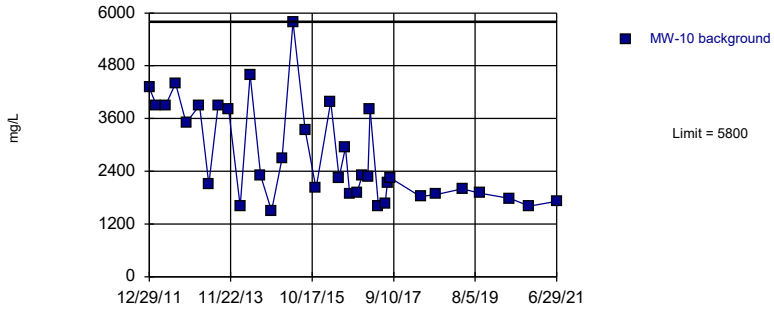
Background Data Summary (based on square root transformation): Mean=46.56, Std. Dev.=10.54, n=36. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9247, critical = 0.912. Kappa = 1.912 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Total Dissolved Solids Analysis Run 3/14/2022 1:50 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Non-parametric, MW-10



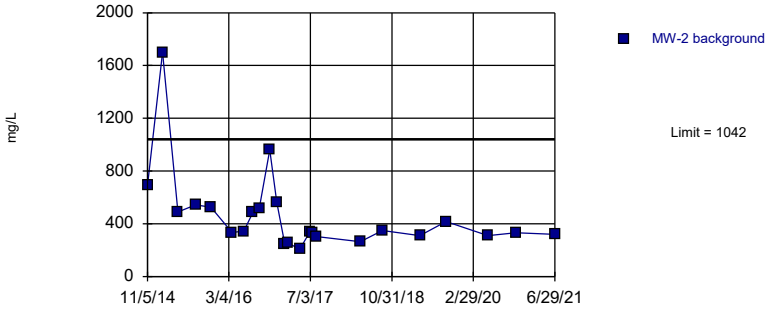
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 36 background values. Well-constituent pair annual alpha = 0.002856. Individual comparison alpha = 0.001429 (1 of 2). Assumes 1 future value.

Constituent: Total Dissolved Solids Analysis Run 3/14/2022 1:50 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-2



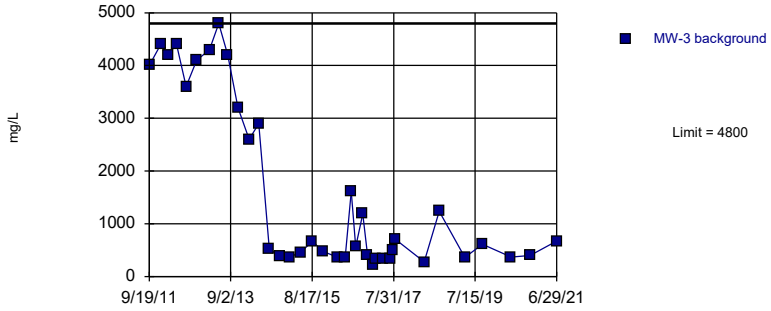
Background Data Summary (based on natural log transformation): Mean=6.01, Std. Dev.=0.4685, n=24. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8864, critical = 0.884. Kappa = 2.004 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Total Dissolved Solids Analysis Run 3/14/2022 1:50 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Non-parametric, MW-3

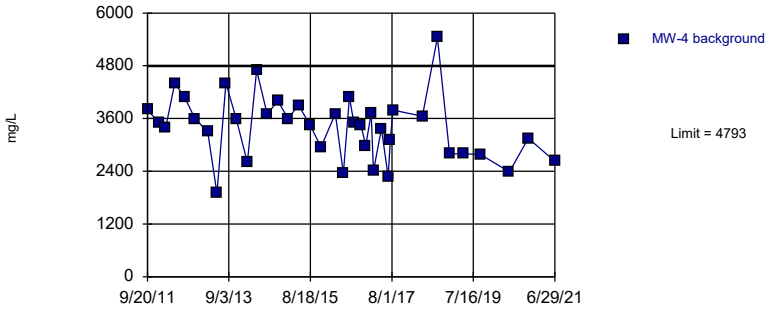


Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 37 background values. Well-constituent pair annual alpha = 0.002721. Individual comparison alpha = 0.001361 (1 of 2). Assumes 1 future value.

Constituent: Total Dissolved Solids Analysis Run 3/14/2022 1:50 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-4



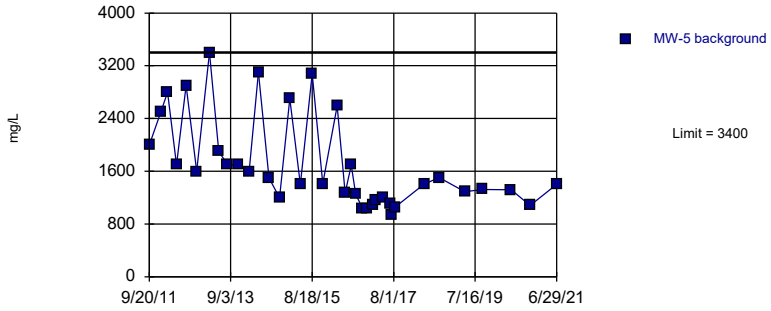
Background Data Summary: Mean=3402, Std. Dev.=730.4, n=38. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9801, critical = 0.916. Kappa = 1.904 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Total Dissolved Solids Analysis Run 3/14/2022 1:50 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Sanitas™ v.9.6.32e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Non-parametric, MW-5



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 37 background values. Well-constituent pair annual alpha = 0.002721. Individual comparison alpha = 0.001361 (1 of 2). Assumes 1 future value.

Constituent: Total Dissolved Solids Analysis Run 3/14/2022 1:50 PM View: PL's - Intrawell
Turk Landfill Client: Geosyntec Data: Turk Landfill

Prediction Limits Summary Table

Turk Landfill Client: Geosyntec Data: Turk Landfill Printed 3/14/2022, 1:54 PM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Boron (mg/L)	MW-1	2.196	n/a	n/a	1 future	n/a	37	-1.029	0.9513	0	None	ln(x)	0.001504	Param Intra 1 of 2
Boron (mg/L)	MW-10	0.5232	n/a	n/a	1 future	n/a	36	-2.135	0.7776	13.89	None	ln(x)	0.001504	Param Intra 1 of 2
Boron (mg/L)	MW-2	1.4	n/a	n/a	1 future	n/a	38	n/a	n/a	10.53	n/a	n/a	0.001294	NP Intra (normality) 1 of 2
Boron (mg/L)	MW-3	0.84	n/a	n/a	1 future	n/a	30	n/a	n/a	20	n/a	n/a	0.002008	NP Intra (normality) 1 of 2
Boron (mg/L)	MW-4	0.6045	n/a	n/a	1 future	n/a	37	0.4239	0.09464	0	None	No	0.001504	Param Intra 1 of 2
Boron (mg/L)	MW-5	0.504	n/a	n/a	1 future	n/a	37	n/a	n/a	18.92	n/a	n/a	0.001361	NP Intra (normality) 1 of 2
Calcium (mg/L)	MW-1	304.8	n/a	n/a	1 future	n/a	18	205.4	47.22	0	None	No	0.001504	Param Intra 1 of 2
Calcium (mg/L)	MW-10	479.8	n/a	n/a	1 future	n/a	17	333.1	68.95	0	None	No	0.001504	Param Intra 1 of 2
Calcium (mg/L)	MW-2	131.6	n/a	n/a	1 future	n/a	17	76.11	26.09	0	None	No	0.001504	Param Intra 1 of 2
Calcium (mg/L)	MW-3	229.3	n/a	n/a	1 future	n/a	17	10.33	2.264	0	None	sqrt(x)	0.001504	Param Intra 1 of 2
Calcium (mg/L)	MW-4	779.3	n/a	n/a	1 future	n/a	18	482.1	141.3	0	None	No	0.001504	Param Intra 1 of 2
Calcium (mg/L)	MW-5	422.3	n/a	n/a	1 future	n/a	18	6.55	0.453	0	None	x^(1/3)	0.001504	Param Intra 1 of 2
Chloride (mg/L)	MW-1	646	n/a	n/a	1 future	n/a	37	360.8	149.5	0	None	No	0.001504	Param Intra 1 of 2
Chloride (mg/L)	MW-10	1142	n/a	n/a	1 future	n/a	36	595.9	285.7	0	None	No	0.001504	Param Intra 1 of 2
Chloride (mg/L)	MW-2	85	n/a	n/a	1 future	n/a	36	n/a	n/a	0	n/a	n/a	0.001429	NP Intra (normality) 1 of 2
Chloride (mg/L)	MW-3	660	n/a	n/a	1 future	n/a	38	n/a	n/a	0	n/a	n/a	0.001294	NP Intra (normality) 1 of 2
Chloride (mg/L)	MW-4	1241	n/a	n/a	1 future	n/a	38	n/a	n/a	0	n/a	n/a	0.001294	NP Intra (normality) 1 of 2
Chloride (mg/L)	MW-5	821	n/a	n/a	1 future	n/a	37	5.232	0.7748	0	None	ln(x)	0.001504	Param Intra 1 of 2
Fluoride (mg/L)	MW-1	1.855	n/a	n/a	1 future	n/a	37	0.9396	0.4798	5.405	None	No	0.001504	Param Intra 1 of 2
Fluoride (mg/L)	MW-10	1.246	n/a	n/a	1 future	n/a	35	n/a	n/a	5.714	n/a	n/a	0.001497	NP Intra (normality) 1 of 2
Fluoride (mg/L)	MW-2	0.5233	n/a	n/a	1 future	n/a	35	n/a	n/a	11.43	n/a	n/a	0.001497	NP Intra (normality) 1 of 2
Fluoride (mg/L)	MW-3	0.9786	n/a	n/a	1 future	n/a	37	0.6984	0.1543	16.22	Kaplan-Meier	x^(1/3)	0.001504	Param Intra 1 of 2
Fluoride (mg/L)	MW-4	0.6203	n/a	n/a	1 future	n/a	37	n/a	n/a	18.92	n/a	n/a	0.001361	NP Intra (normality) 1 of 2
Fluoride (mg/L)	MW-5	0.5541	n/a	n/a	1 future	n/a	37	-1.27	0.3562	18.92	Kaplan-Meier	ln(x)	0.001504	Param Intra 1 of 2
pH (SU)	MW-1	7.815	6.2	n/a	1 future	n/a	37	7.008	0.4233	0	None	No	0.000752	Param Intra 1 of 2
pH (SU)	MW-10	7.69	5.694	n/a	1 future	n/a	36	6.692	0.5218	0	None	No	0.000752	Param Intra 1 of 2
pH (SU)	MW-2	8.353	6.288	n/a	1 future	n/a	39	7.321	0.5435	0	None	No	0.000752	Param Intra 1 of 2
pH (SU)	MW-3	8.072	6.37	n/a	1 future	n/a	39	7.221	0.448	0	None	No	0.000752	Param Intra 1 of 2
pH (SU)	MW-4	7.537	6.342	n/a	1 future	n/a	37	6.939	0.3134	0	None	No	0.000752	Param Intra 1 of 2
pH (SU)	MW-5	7.815	6.094	n/a	1 future	n/a	37	6.955	0.4511	0	None	No	0.000752	Param Intra 1 of 2
Sulfate (mg/L)	MW-1	2400	n/a	n/a	1 future	n/a	37	n/a	n/a	0	n/a	n/a	0.001361	NP Intra (normality) 1 of 2
Sulfate (mg/L)	MW-10	1800	n/a	n/a	1 future	n/a	36	n/a	n/a	0	n/a	n/a	0.001429	NP Intra (normality) 1 of 2
Sulfate (mg/L)	MW-2	669.6	n/a	n/a	1 future	n/a	25	4.222	1.148	0	None	ln(x)	0.001504	Param Intra 1 of 2
Sulfate (mg/L)	MW-3	939.5	n/a	n/a	1 future	n/a	26	4.283	1.293	0	None	ln(x)	0.001504	Param Intra 1 of 2
Sulfate (mg/L)	MW-4	963.6	n/a	n/a	1 future	n/a	36	445683	252559	0	None	x^2	0.001504	Param Intra 1 of 2
Sulfate (mg/L)	MW-5	1210	n/a	n/a	1 future	n/a	37	6.064	0.5423	0	None	ln(x)	0.001504	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	MW-1	4451	n/a	n/a	1 future	n/a	36	46.56	10.54	0	None	sqrt(x)	0.001504	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	MW-10	5800	n/a	n/a	1 future	n/a	36	n/a	n/a	0	n/a	n/a	0.001429	NP Intra (normality) 1 of 2
Total Dissolved Solids (mg/L)	MW-2	1042	n/a	n/a	1 future	n/a	24	6.01	0.4685	0	None	ln(x)	0.001504	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	MW-3	4800	n/a	n/a	1 future	n/a	37	n/a	n/a	0	n/a	n/a	0.001361	NP Intra (normality) 1 of 2
Total Dissolved Solids (mg/L)	MW-4	4793	n/a	n/a	1 future	n/a	38	3402	730.4	0	None	No	0.001504	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	MW-5	3400	n/a	n/a	1 future	n/a	37	n/a	n/a	0	n/a	n/a	0.001361	NP Intra (normality) 1 of 2

APPENDIX 3- Alternate Source Demonstrations

Alternate source demonstrations are included in this appendix. Alternate sources are sources or reasons that explain that statistically significant increases over background or statistically significant levels above the groundwater protection standard are not attributable to the CCR unit.

ALTERNATIVE SOURCE DEMONSTRATION REPORT FEDERAL CCR RULE

John W. Turk, Jr. Power Plant Landfill Fulton, Arkansas

Submitted to

1 Riverside Plaza
Columbus, Ohio 43215-2372

Submitted by

Geosyntec consultants

engineers | scientists | innovators

500 W. Wilson Bridge Rd, Suite 250
Worthington, Ohio 43085

December 2022

TABLE OF CONTENTS

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LIST OF ACRONYMS AND ABBREVIATIONS

AEP	American Electric Power
ASD	Alternative Source Demonstration
CCR	Coal Combustion Residuals
DEQ	Arkansas Division of Environmental Quality
EPRI	Electric Power Research Institute
LF	Landfill
LPL	Lower Prediction Limit
SSI	Statistically Significant Increase
SU	Standard Units
UPL	Upper Prediction Limit
USEPA	United States Environmental Protection Agency

SECTION 1

INTRODUCTION AND SUMMARY

This Alternative Source Demonstration (ASD) report has been prepared to address a statistically significant increase (SSI) for pH in the groundwater monitoring network at the John W. Turk, Jr. Power Plant Landfill (Turk LF) in Fulton, Arkansas, following the first semiannual detection monitoring event of 2022.

Prediction limits are used to determine if there has been an SSI for a groundwater monitoring parameter for the LF. In accordance with the Statistical Analysis Plan (Geosyntec, 2021), background values for monitoring parameters should be updated every four to eight measurements if no confirmed SSIs are identified. Following the completion of four detection monitoring events since the previous update in January 2020, the upper prediction limits (UPLs) for the LF were recalculated for each Appendix III parameter to represent background values (Geosyntec, 2022). A lower prediction limit (LPL) was also recalculated for pH. The revised prediction limits were calculated based on a one-of-two retesting procedure in accordance with the Unified Guidance (USEPA, 2009) and the statistical analysis plan developed for the site (Geosyntec, 2021). With this procedure, an SSI is concluded only if both samples in a series of two exceed the UPL or, in the case of pH, are below the LPL. In practice, if the initial result did not exceed the UPL or was not below the LPL, a second sample was not collected or analyzed.

The first semi-annual detection monitoring event of 2022 was performed on June 7, 2022 (initial sampling event for all wells except MW-10, which was sampled on June 24, 2022 due to an obstruction in the well on June 7), and the results were compared to the calculated prediction limits. Where initial exceedances were identified, verification resampling was completed on June 24, 2022. Following verification resampling, an SSI was identified for pH at MW-4 using intrawell comparisons. A summary of the detection monitoring analytical results for all constituents listed in 40 CFR Part 257 Appendix III and the calculated prediction limits to which they were compared is provided in **Table 1**.

1.1 CCR Rule Requirements

In accordance with the United States Environmental Protection Agency (USEPA) regulations regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments, Rule 40 CFR 257.94(e)(2) allows the following response if is there is an SSI over background levels for an Appendix III parameter at any monitoring wells at the waste boundary:

> *The owner or operator may demonstrate that a source other than the CCR unit caused the statistically significant increase over background levels for a constituent or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. The owner or operator must complete the written demonstration within 90 days of detecting a statistically significant increase over background levels to include*

obtaining a certification from a qualified professional engineer … verifying the accuracy of the information in the report.

Pursuant to 40 CFR 257.94(e)(2), Geosyntec Consultants, Inc. (Geosyntec) has prepared this ASD report to identify whether the SSI identified for pH at MW-4 is from a source other than leachate impacts derived from the Turk LF.

1.2 Demonstration of Alternative Sources

An evaluation was completed to assess possible alternative sources to which the identified SSI could be attributed. Alternative sources were identified from amongst five types, based on the methodology provided by the Electric Power Research Institute (EPRI, 2017):

- ASD Type I: Sampling Causes;
- ASD Type II: Laboratory Causes;
- ASD Type III: Statistical Evaluation Causes;
- ASD Type IV: Natural Variation; and
- ASD Type V: Alternative Sources.

A demonstration was conducted to assess whether the decrease in pH values at well MW-4 was based on Type IV causes (natural variation) and not by a direct release from the LF.

SECTION 2

SUMMARY OF SITE CONDITIONS

Descriptions of the Turk LF design and construction, site hydrogeology, and groundwater monitoring history and flow conditions are described below.

2.1 LF Design and Construction

The Turk LF was permitted in 2011 as a 73-acre disposal facility that will be developed in five cells, each with a geomembrane/compacted clay composite liner and overlying continuous leachate collection system. To date, Cells 1 and 2, which occupy 28 acres, have been constructed. Cell 1 has nearly reached final fill grades, and Cell 2 is undergoing active filling (AEP, 2021).

Leachate from the LF is piped by gravity to the adjacent Leachate Collection Pond, which was also constructed with a composite liner. Leachate samples have been collected and analyzed in accordance with the state permit (Permit Number 0311-S3N-R1) since LF operations began in 2013.

2.2 Regional Geology/Site Hydrogeology

As described by Terracon (2016), the Turk LF is underlain by the Arkadelphia Marl Formation, which, in turn, is underlain by the Nacatoch Sand Formation. Regionally, the Arkadelphia Marl Formation is primarily a marl or marly clay with some sandstone, sandy clay, sandy limestone, concretionary limestone, and impure chalk. The Nacatoch Sand Formation is comprised primarily of quartz sand, hard sandy limestone, coarse highly glauconitic sand, argillaceous sand, and clay and marl.

Geology at and around the LF has previously been classified into three distinct hydrogeologic units, from top to bottom, generally described by Terracon (2016) as follows:

- **Hydrogeologic Unit A (part of Arkadelphia Marl):** Clay with intermittent chert gravel. Some silty clay and sandy clay present. Clayey gravel intervals present near the northern portion of the site. Gypsum veins generally present near the lower contact of the unit. Groundwater may move through the unit due to the blocky fissile nature of the material.

- **Hydrogeologic Unit B (part of Arkadelphia Marl):** Calcareous shaley clay/clayey shale which is hard and fissile in nature. This unit has lower permeability than Unit A and may act as a confining unit.

- **Hydrogeologic Unit C (part of Nacatoch Sand):** Sandstone with calcareous cement overlying fine-grained, loosely cemented sand. Groundwater flow occurs under confined conditions in the loosely cemented sand.

Geologic cross-sections originally included in the Groundwater Monitoring Network Report (Terracon, 2016) are included as **Attachment A**.

2.3 Groundwater Monitoring History and Flow Conditions

The groundwater monitoring well network for the LF consists of six wells (background location MW-1 and compliance wells MW-2 through MW-5 and MW-10) installed in September 2011 in accordance with an Arkansas Division of Environmental Quality (DEQ)-approved work plan. The monitoring well of concern, MW-4, is screened within Hydrogeologic Unit A. Groundwater analytical data were collected prior to waste placement in Cell 1 to establish background conditions. As the remaining LF cells are developed, additional monitoring wells will be installed as needed to maintain an effective monitoring network.

A site map showing the location of MW-4 and the other network wells, as well as potentiometric contours from the June 2022 sampling event is presented as **Figure 1**. Groundwater flow is generally toward the east and northeast, as shown on **Figure 1**. Groundwater flow in Hydrogeologic Unit A is believed to occur primarily along laminations and contacts between the different subsurface lithologies due to the blocky, fissile nature of clay and shale variations comprising soil, and through gravely intervals (Terracon, 2016).

SECTION 3

ALTERNATIVE SOURCE DEMONSTRATION

The ASD evaluation methodology and proposed alternative source of pH at MW-4 and the future groundwater sampling requirements are described below.

3.1 Proposed Alternative Source

An initial review of groundwater sampling field forms, site geochemistry, and site historical data did not identify alternative sources due to a Type I issue (sampling causes). A review of the laboratory and statistical analyses did not identify any Type II (laboratory causes) or Type III (statistical evaluation causes) issues. Further, an initial review of site geochemistry and site use history did not identify evidence of any Type V (anthropogenic) impacts. As described below, the SSIs observed at monitoring well MW-4 is attributed to natural variation, which is a Type IV cause.

3.1.1 Supporting Evidence: pH Results

Prior to the second semiannual sampling event of 2022, all groundwater monitoring wells in the network were redeveloped. The second semi-annual sampling event was conducted on November 1, 2022. The reported pH value for MW-4 was 6.3 standard units [SU], which is above the calculated intrawell LPL and below the calculated intrawell UPL (**Figure 2**). Based on the three results for MW-4 during the 2022 groundwater monitoring events, a decreasing trend is not demonstrated for pH. Thus, the observed pH values during the first semi-annual event of 2022 are not considered indicative of a release from the Landfill.

3.1.2 Supporting Evidence: Leachate Chemistry

A comparison of pH values in Turk LF leachate to values observed in groundwater from MW-4 supports the conclusion that groundwater quality changes should not be attributed to a release from the LF. A time series plot of pH values from Turk LF leachate and groundwater from MW-4 (**Figure 3**) show that Turk LF leachate is slightly basic and would not result in low pH measurements at MW-4 at the time of the June 2022 sampling event. Rather, the influence of LF leachate would cause an increase in pH at downgradient monitoring wells, which is the opposite of recent MW-4 pH observations.

Results from the June and October 2022 sampling events show that the pH values observed at MW-4 are below the most recent sample of LF leachate (8.2 standard units [SU]) and historical pH trends observed in the LF leachate (**Figure 3**). Further, the average pH observed in the LF leachate from 2016 to present (7.9 SU) is one standard unit higher than the average pH value observed at MW-4 (6.9 SU) and two standard units higher than the pH values observed at MW-4 at the time of the June 2022 sampling event (5.7 SU). The calculated groundwater seepage rate predicts that groundwater underneath the landfill would take over 20 years to reach MW-4 (AEP,

2022); therefore, the anomalous decrease in leachate pH in 2020 would not be causing the recent decrease at MW-4.

Groundwater chemistry at MW-4 has been variable, but distinct from LF leachate, since installation of the well (**Figure 4**). The Piper diagram shown in **Figure 4** demonstrates that major cation chemistry fluctuates between variable relative proportions of calcium and monovalent cations (sodium and potassium), and major anions fluctuate between variable relative proportions of chloride and alkalinity, with a smaller contribution of sulfate. In contrast, samples of the LF leachate collected since 2017, including the results plotted in Figure 4, indicate that leachate concentrations have been relatively consistent and contain elevated relative proportions of sulfate. If LF leachate were impacting MW-4 groundwater, this impact would likely be observable on a Piper diagram as groundwater major ion chemistry begins to become more geochemically similar to leachate. While **Figure 4** illustrates significant natural variability within MW-4 groundwater, there is a clear lack of a leachate signature on the major ion composition at MW-4.

Given the above noted disparities in pH values and that the LF cells were constructed with a modern composite liner system providing a high level of leachate containment, pH changes observed in groundwater are not attributable to a release from the LF.

3.1.3 Supporting Evidence: Boron and Sulfate Concentrations

Boron and sulfate are geochemically conservative parameters which can function as ‘tracers’ for potential CCR unit releases due to their lack of attenuation by chemical processes (e.g., sorption, precipitation) during groundwater flow. Their higher relative concentrations in the LF leachate compared to downgradient groundwater make them ideal tracers to determine potential impacts from LF leachate to downgradient locations. In June 2022, the concentration of boron in the LF leachate was 0.947 mg/L (**Figure 5**); in contrast, boron concentration at MW-4 was 0.263 mg/L. Historically, boron concentrations at MW-4 are consistently below 0.5 mg/L and show no discernable trend. The June 2022 concentration of sulfate in the LF leachate was 1,090 mg/L (**Figure 5**), compared to a concentration of 497 mg/L at MW-4, also with no discernable trend.

If LF leachate, which has a boron concentration over three times greater than MW-4 and a sulfate concentration two times greater than MW-4, were impacting groundwater quality at downgradient monitoring wells, an increasing trend in boron and sulfate concentrations at MW-4 would be expected. Boron and sulfate concentrations at MW-4 do not display increasing or decreasing trends, which suggests that changes in groundwater quality are not attributable to a release from the LF (**Figure 5**).

3.2 Sampling Requirements

The ASD described above supports the determination that the identified pH SSI is from natural variation within site groundwater and not due to a release from the Turk LF. Therefore, the unit will remain in the detection monitoring program. Groundwater at the unit will continue to be sampled for the parameters included in the LF permit on a semi-annual basis, and prediction limits will be updated when appropriate to incorporate recent data.

SECTION 4

CONCLUSIONS AND RECOMMENDATIONS

The preceding information serves as the ASD prepared in accordance with 40 CFR 257.94(e)(2) and supports the position that the identified SSI for pH at MW-4 should be attributed to natural variation and is not due to a release from the Turk LF. Therefore, no further action is warranted, and the Turk LF will remain in the detection monitoring program. Certification of this ASD by a qualified professional engineer is provided in **Attachment B**.

SECTION 5

REFERENCES

AEP, 2021. 2021 Annual Landfill Inspection Report, CCR Landfill, Turk Power Plant, Southwestern Electric Power Company. Fulton, Arkansas. November.

AEP, 2022. Annual Groundwater Monitoring Report – Southwestern Electric Power Company – John W. Turk Power Plan Landfill. Fulton, Arkansas. January.

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Geosyntec Consultants (Geosyntec), 2021. Statistical Analysis Plan. Revision 1.January.

Geosyntec, 2022. Statistical Analysis Summary – Background Update Calculations, Landfill – John W. Turk, Jr. Plant. Fulton, Arkansas. July.

Terracon, 2016. Report 1 – Groundwater Monitoring Network for CCR Compliance. SWEPCO – John W. Turk, Jr. Power Plan. Class 3N Landfill. October.

TABLES

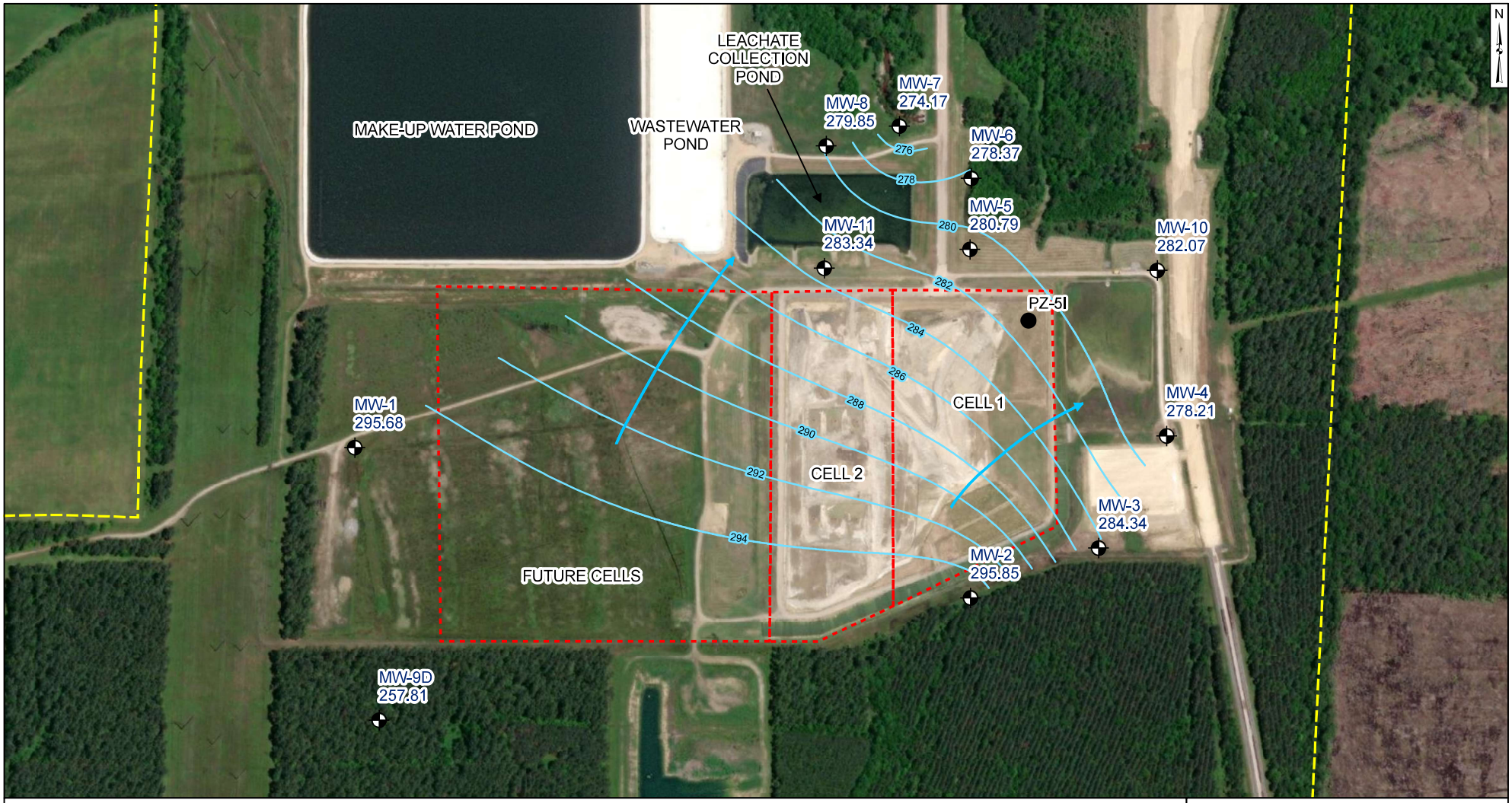
Table 1: Detection Monitoring Data Summary
Turk Plant - Landfill

Geosyntec Consultants

Analyte	Unit	Description	MW-2	MW-3	MW-4		MW-5	MW-10
			6/7/2022	6/7/2022	6/7/2022	6/24/2022	6/7/2022	6/24/2022
Boron	mg/L	Intrawell Background Value (UPL)	1.40	0.840	0.605		0.504	0.523
		Analytical Result	0.035	0.050	0.263	--	0.035	0.200
Calcium	mg/L	Intrawell Background Value (UPL)	132	229	779		422	480
		Analytical Result	67.3	122	492	--	220	216
Chloride	mg/L	Intrawell Background Value (UPL)	85.0	660	1,240		821	1140
		Analytical Result	5.26	123	1,010	--	62.3	207
Fluoride	mg/L	Intrawell Background Value (UPL)	0.523	0.979	0.620		0.554	1.25
		Analytical Result	0.33	0.30	0.2	--	0.27	0.15
pH	SU	Intrawell Background Value (UPL)	8.4	8.1	7.5		7.8	7.7
		Intrawell Background Value (LPL)	6.3	6.4	6.3		6.1	5.7
		Analytical Result	7.4	7.3	**5.7**	**6.1**	6.4	6.4
Sulfate	mg/L	Intrawell Background Value (UPL)	670	940	964		1,210	1,800
		Analytical Result	21.8	100	497	--	210	295
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	1,040	4,800	4,790		3,400	5,800
		Analytical Result	280	710	4,100	--	950	1,230

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

FIGURES



Legend

- Piezometer
- Monitoring Wells
- Groundwater Elevation Contour
- Groundwater Elevation Contour (Inferred)
- Groundwater Flow Direction
- Property Boundary
- Landfill Cell Extent

Notes

- Site features based on information available in Report 1 - Groundwater Monitoring Network for CCR Compliance - John W. Turk, Jr. Power Plant Class 3N Landfill (Terracon, October 2016) provided by AEP.
- Groundwater elevations and potentiometric contours taken from Figure 1 of First Half 2022 Groundwater Analysis Report (AEP, 2022) provided by AEP.
- Aerial imagery provided by ArcGIS Map Services (2020).

Groundwater Elevation Contour Map
June 2022

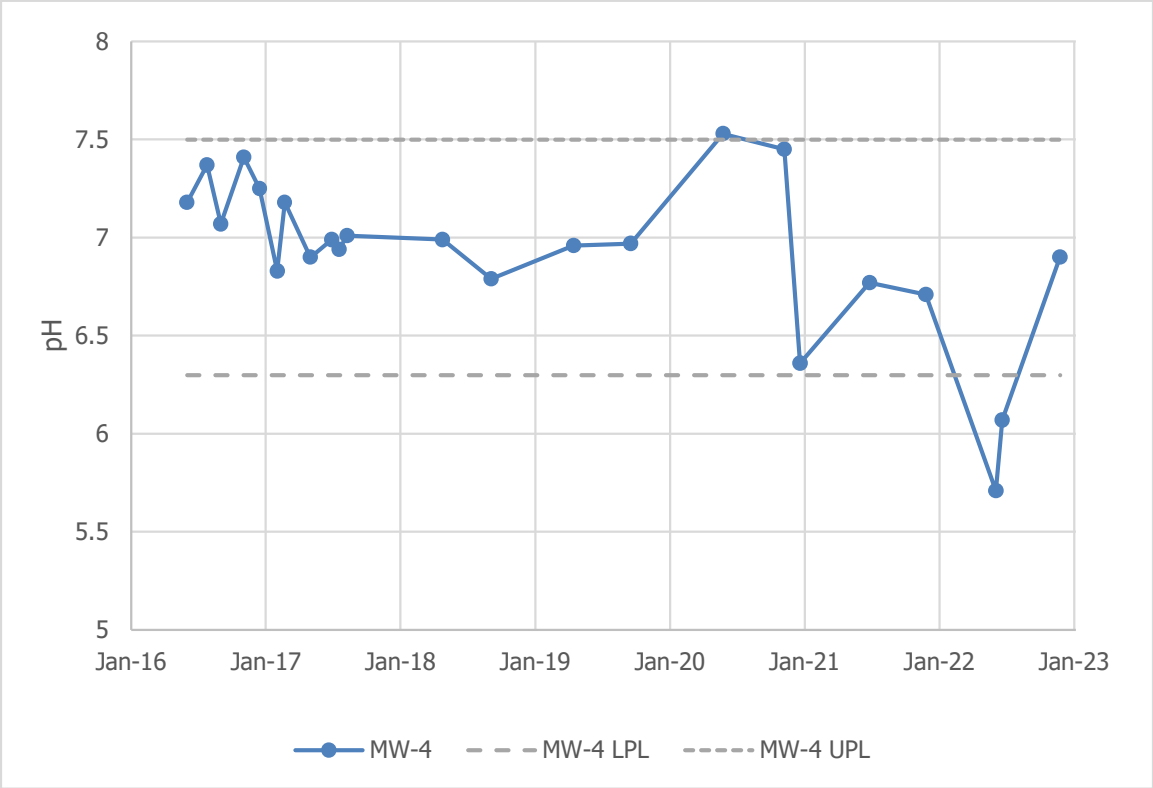
AEP Turk Power Plant - Landfill
Fulton, Arkansas

Geosyntec consultants

Columbus, Ohio | 2022/11/10

Figure 1

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Turk\2022\Turk_June2022_ASD.mxd. ASoltero. 11/10/2022. CHA8423/02/08.



Notes: pH time series diagram for well MW-4. Federal intrawell lower prediction limit (LPL) and upper prediction limit (UPL) for MW-4 are shown.

MW-4 pH Comparison to Prediction Limits
Turk Landfill

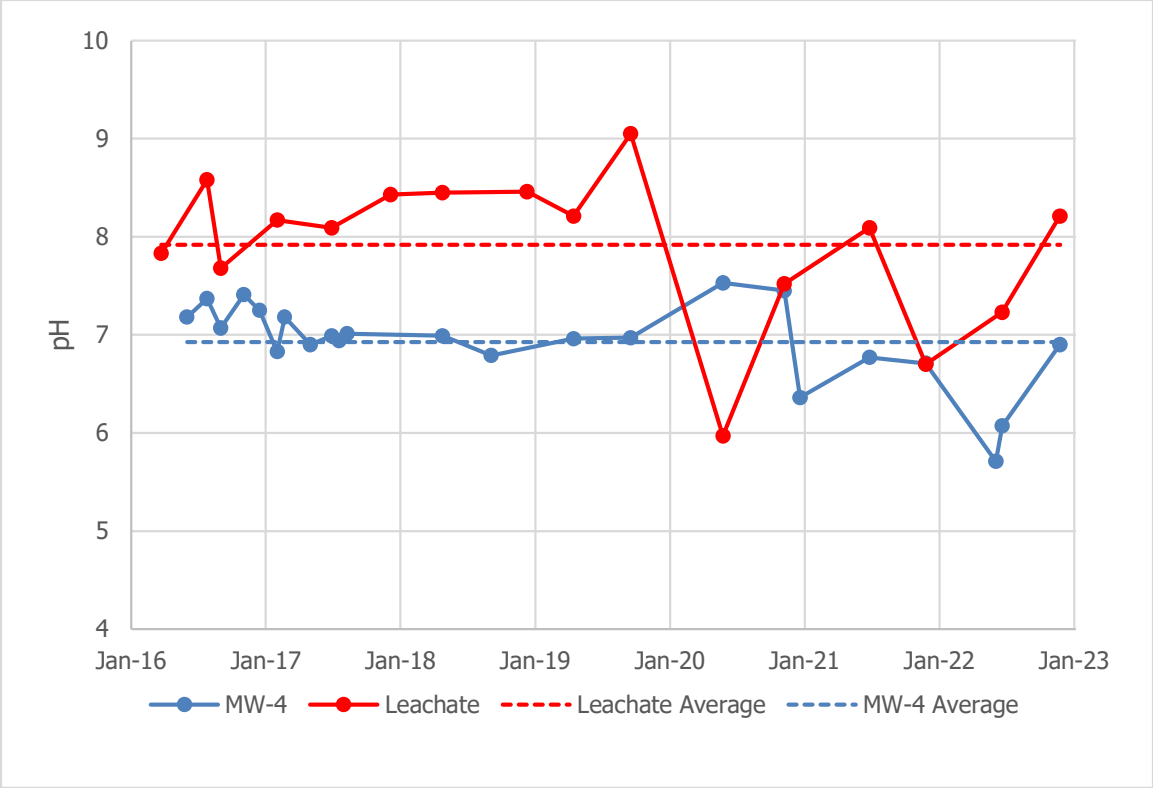
Geosyntec consultants

AMERICAN ELECTRIC POWER

Figure 2

Columbus, Ohio

November 2022



Notes: pH time series diagram for LF leachate and well MW-4. Data collected as part of federal and state groundwater monitoring program requirements. Average pH values calculated from 2016 - present.

pH Time Series Graph
Turk Landfill

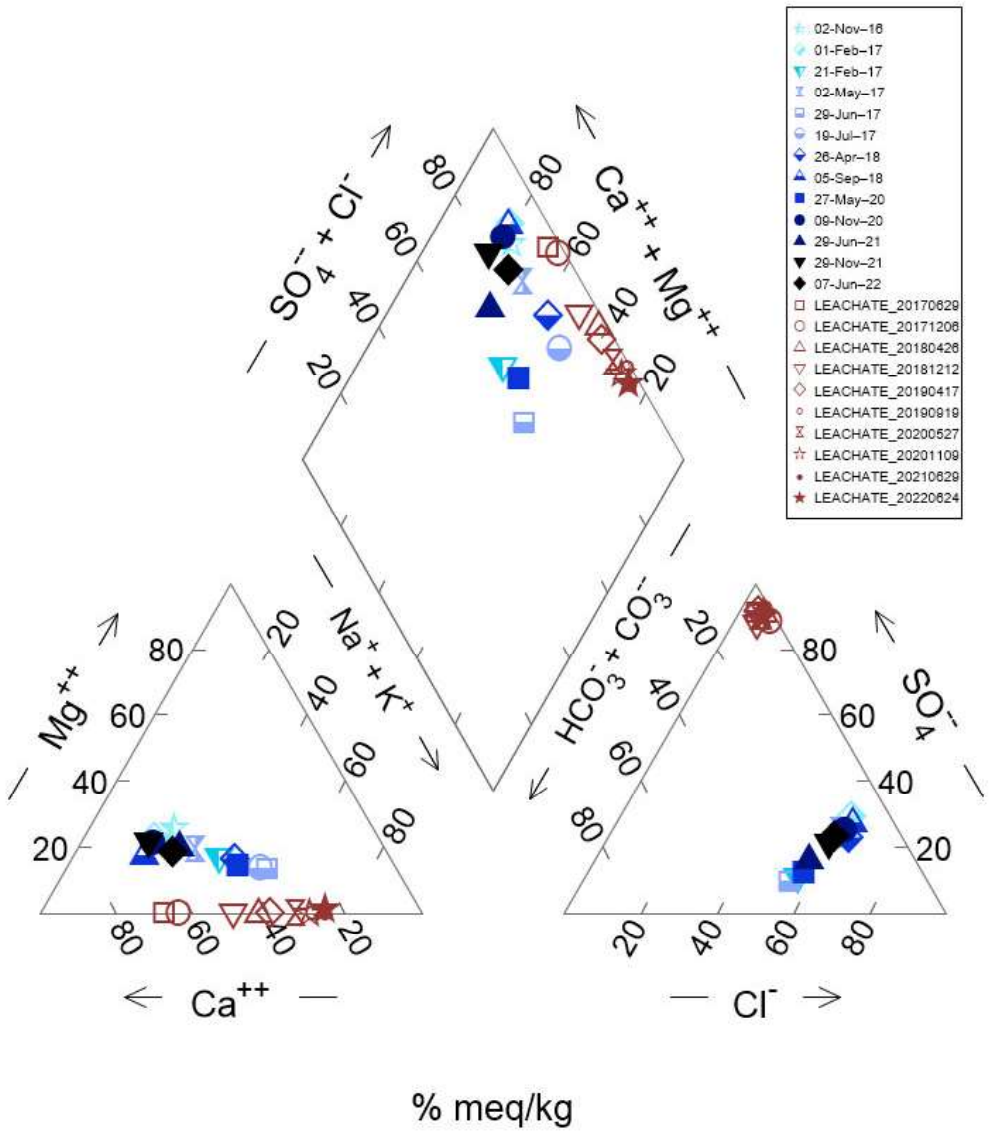
Geosyntec consultants

AMERICAN ELECTRIC POWER

Figure 3

Columbus, Ohio

November 2022



Notes: Magnesium was not available for all leachate samples collected before June 24, 2022. Data collected as part of federal and state groundwater monitoring program requirements.

MW-4 and Leachate Piper Diagram
Turk Landfill

Geosyntec consultants

AMERICAN ELECTRIC POWER

Figure 4

Columbus, Ohio

December 2022

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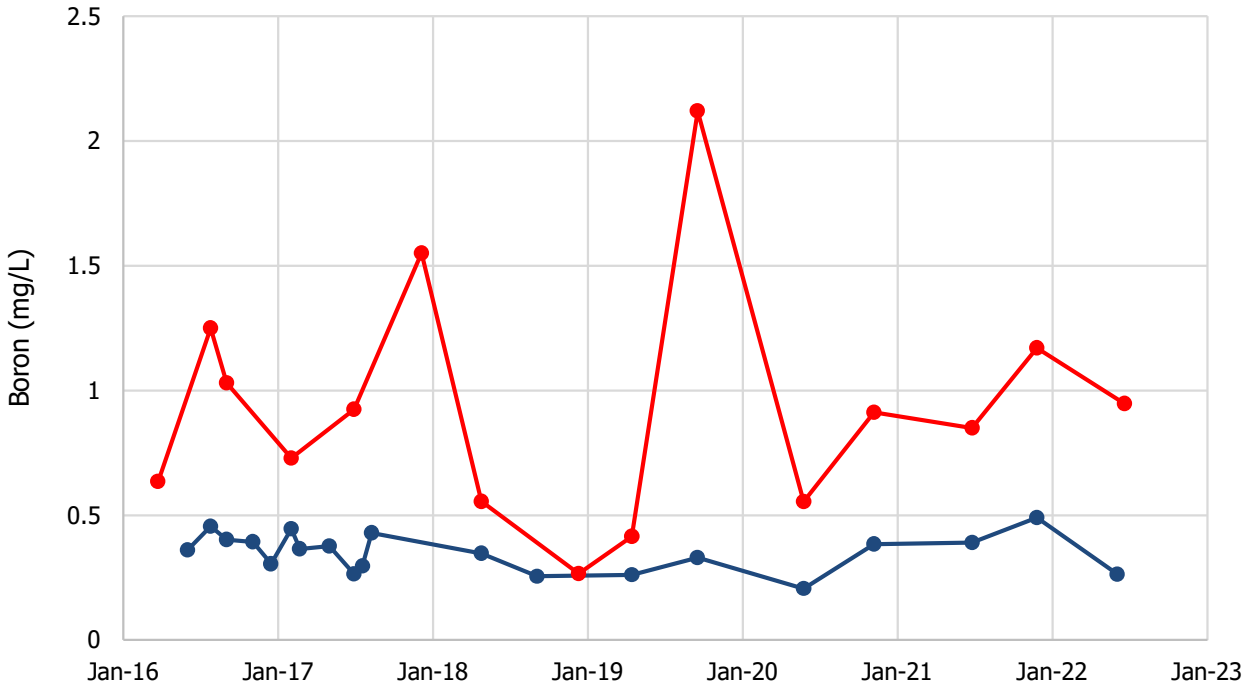

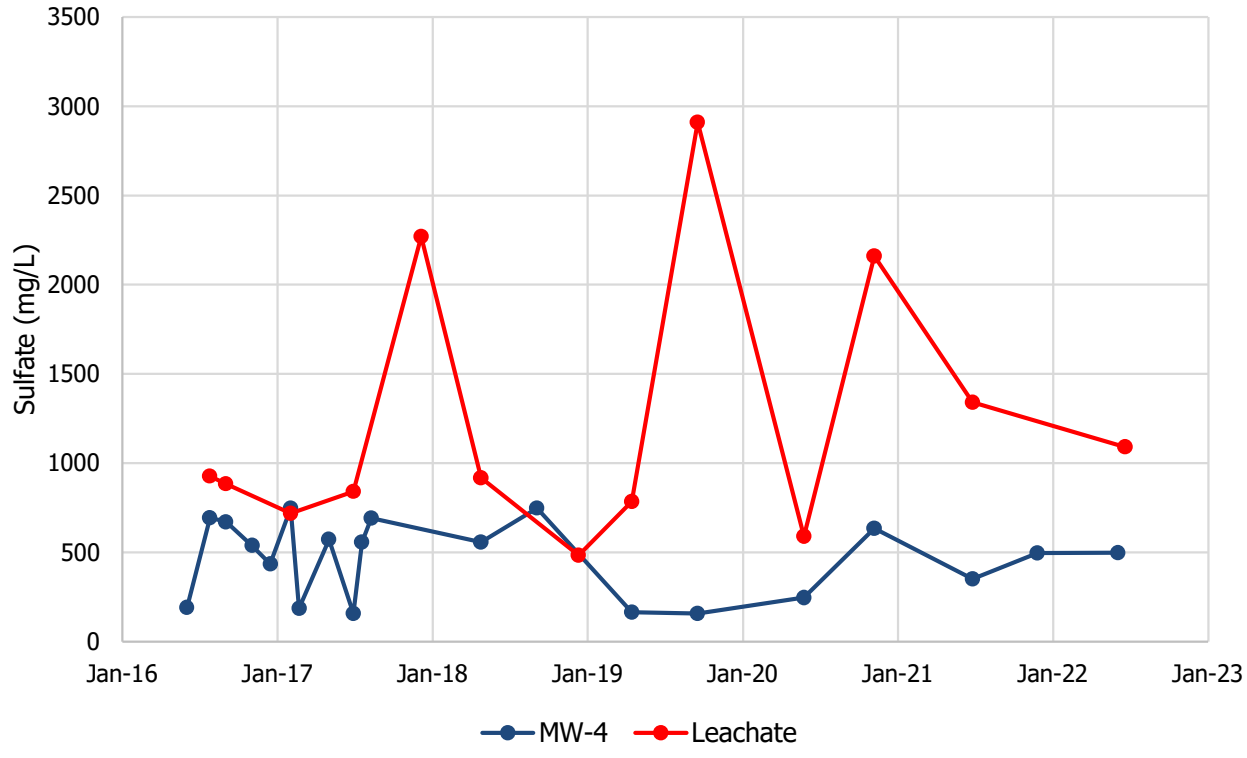

Notes: Boron and sulfate time series diagrams for LF leachate and well MW-4. Data collected as part of federal and state groundwater monitoring program requirements.

Boron and Sulfate Time Series Graphs
Turk Landfill

Geosyntec consultants

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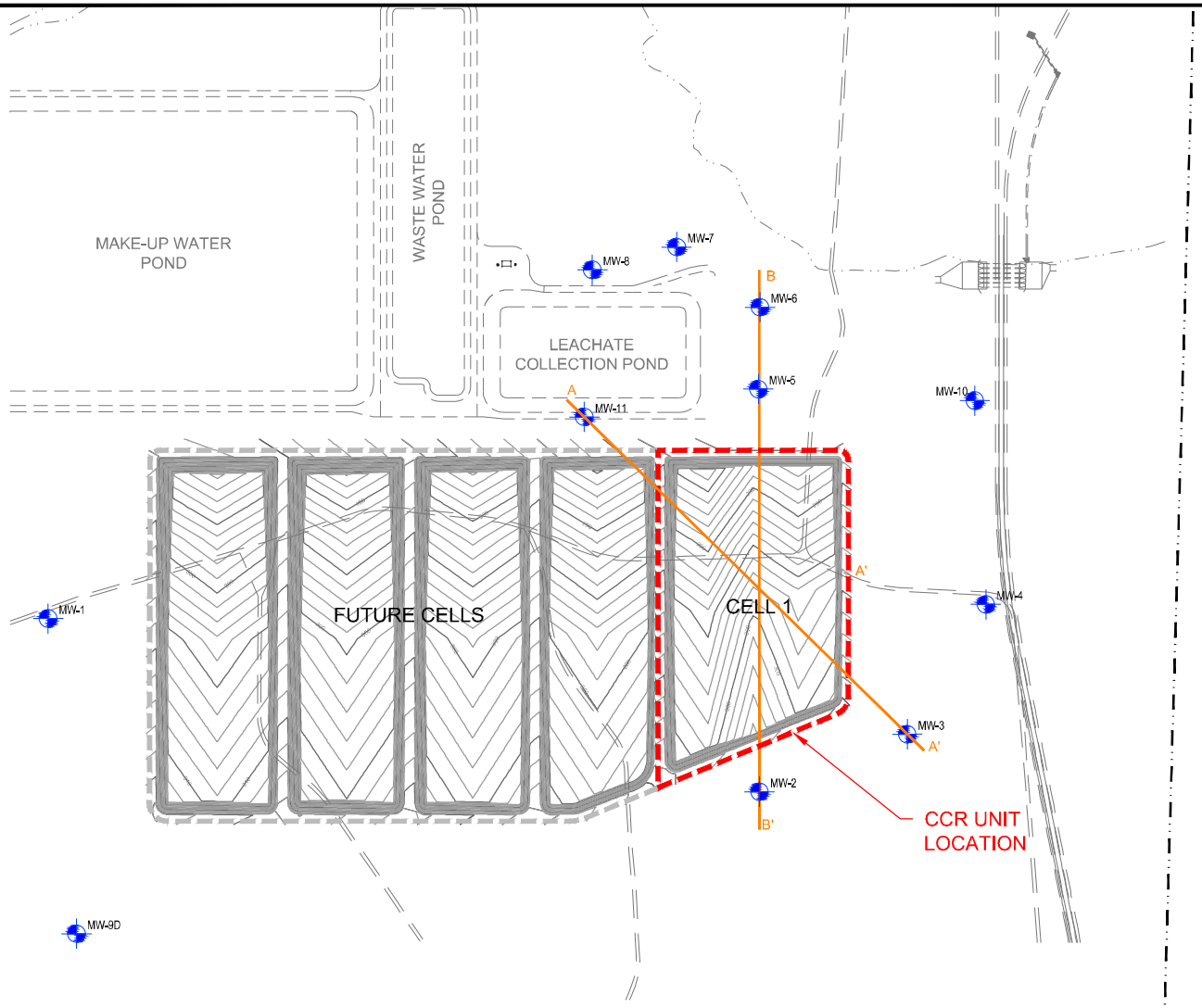
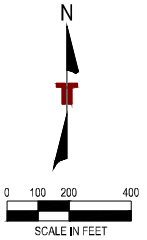
Figure 5

Columbus, Ohio

October 2022

ATTACHMENT A
Geologic Cross-Sections





LEGEND:

- PROPERTY BOUNDARY
- CCR UNIT BOUNDARY
- FUTURE CELL BOUNDARY
- MONITORING WELL

NOTE:
FUTURE CELLS ARE NOT PART OF THE CURRENT CCR UNIT.

Note: Cell 2, shown as a future cell adjacent to Cell 1 on this cross section location map, became an active cell in 2021. (Geosyntec, 2022)

SHEET 1

DESIGNED BY:	TLB
DRAWN BY:	SRE
APP'D. BY:	DCM
SCALE:	SEE BARSCALE
DATE:	06-15-16
JOB NO.	216-002-25157126
ACAD NO.	R-1201
SHEET NO.:	1 OF 3

GEOLOGICAL CROSS SECTION LOCATION MAP

GROUNDWATER MONITORING NETWORK

AMERICAN ELECTRIC POWER

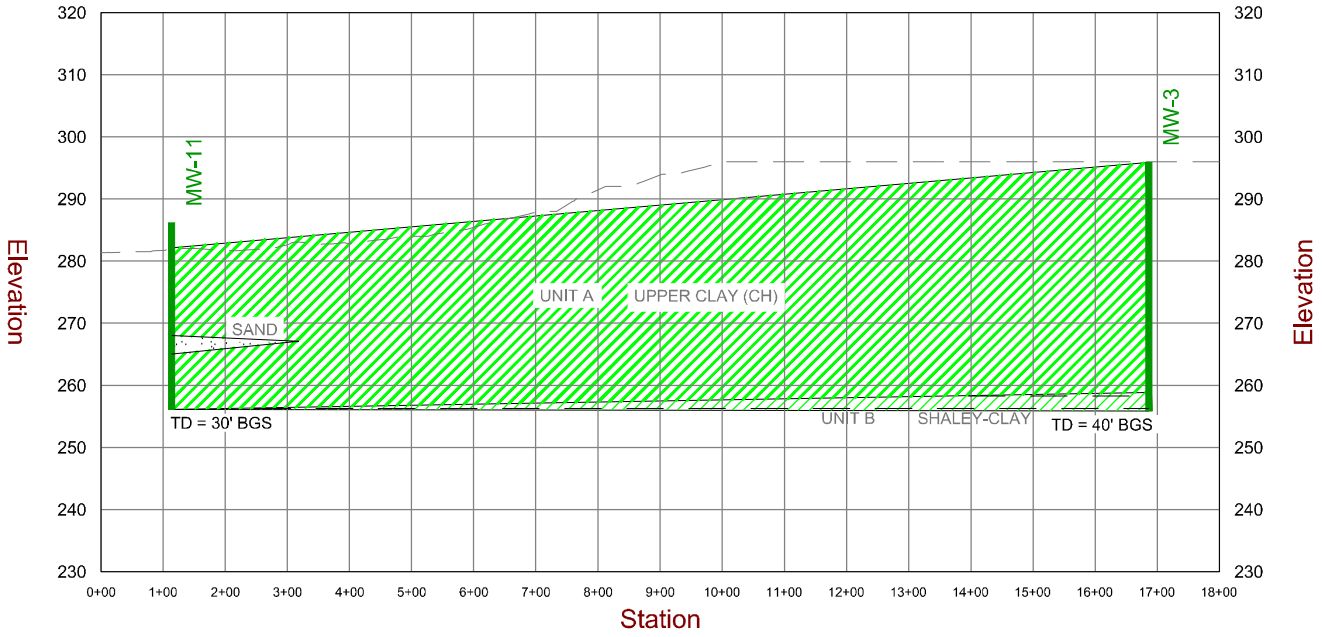
JOHN W. TURK, JR. POWER PLANT

FULTON ARKANSAS

Terracon
Consulting Engineers and Scientists
25809 I-30 SOUTH
PH. (501) 847-9292
BRYANT, AR 72022
FAX: (501) 847-9210

REV.	DATE	BY	DESCRIPTION

PROFILE -A-A'



CLAY (CH)
(NATIVE GROUND)

SAND (CL)
(NATIVE GROUND)

SHALEY CLAY
(NATIVE GROUND)

SCALES:
1" = 200' (HORIZONTAL)
1" = 20' (VERTICAL)
VERTICAL EXAGGERATION = x 10

200 0 50 100 200
SCALE IN FEET

SHEET 2

DESIGNED BY:	TLB
DRAWN BY:	SRE
APP'D. BY:	DCM
SCALE:	SEE BAR/SCALE
DATE:	06-17-16
JOB NO.	216-002-26157126
ACAD NO.	Rx-1.dgn
SHEET NO.:	2 OF 3

CROSS SECTIONS

GROUNDWATER MONITORING NETWORK
AMERICAN ELECTRIC POWER
JOHN W. TURK, JR. POWER PLANT
FULTON ARKANSAS

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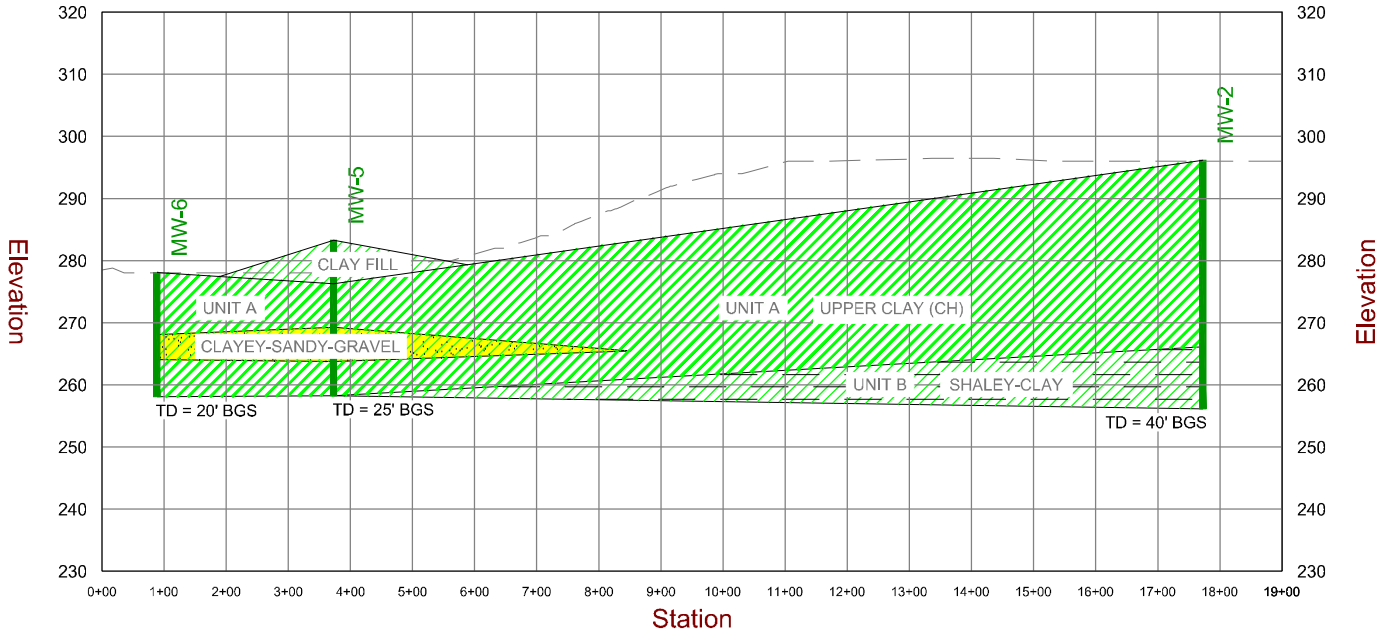
REV.	DATE	BY	DESCRIPTION

PROFILE -B-B'



CLAY (CH)
(NATIVE GROUND)

LEAN CLAY WITH SAND (CL)
(NATIVE GROUND)

SHALEY CLAY
(NATIVE GROUND)

SCALES:
1" = 200' (HORIZONTAL)
1" = 20' (VERTICAL)
VERTICAL EXAGGERATION = x 10

200 0 50 100 200
SCALE IN FEET

SHEET 3

DESIGNED BY:	TLB
DRAWN BY:	SRE
APP'D. BY:	DCM
SCALE:	SEE BAR/SCALE
DATE:	06-15-16
JOB NO.	216-002-26157126
ACAD NO.	R-1.2dgt
SHEET NO.:	3 OF 3

CROSS SECTIONS

GROUNDWATER MONITORING NETWORK
AMERICAN ELECTRIC POWER
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REV.	DATE	BY	DESCRIPTION

ATTACHMENT B

Certification by a Qualified Professional Engineer

CERTIFICATION BY A QUALIFIED PROFESSIONAL ENGINEER

I certify that the selected and above described alternative source demonstration is appropriate for evaluating the groundwater monitoring data for the Turk Landfill management area and that the requirements of 40 CFR 257.94(e)(2) have been met.

Beth Ann Gross
Printed Name of Licensed Professional Engineer

Beth Ann Gross
Signature

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

Arkansas Firm Certificate of
Authorization No. 52
Exp. 12/31/2022

9864	Arkansas	12/19/2022
License Number	Licensing State	Date