

Annual Groundwater Monitoring Report

Southwestern Electric Power Company
John W. Turk Power Plant
Landfill CCR Management Unit
Fulton, Arkansas

January 31, 2024

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



An **AEP** Company

BOUNDLESS ENERGY™

Table of Contents

Page

I.	Overview.....	2
II.	Groundwater Monitoring Well Locations and Identification Numbers.....	4
III.	Monitoring Wells Installed or Decommissioned	5
IV.	Groundwater Quality Data and Static Water Elevation Data, With Flow Rate and Direction and Discussion.....	5
V.	Groundwater Quality Data Statistical Analysis	5
VI.	Alternate Source Demonstration.....	5
VII.	Discussion About Transition Between Monitoring Requirements or Alternate Monitoring Frequency.....	6
VIII.	Other Information Required.....	6
IX.	Description of Any Problems Encountered in 2023 and Actions Taken	6
X.	A Projection of Key Activities for the Upcoming Year.....	6

Appendix 1- Groundwater Data Tables and Figures

Appendix 2- Statistical Analysis

Appendix 3- Alternate Source Demonstrations

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, 2024.

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 2022 sampling event (November 2022) with confirmation sampling conducted in January 2023:
 - The following Appendix III parameters exceeded background concentrations for:
 - Calcium at MW-10
- ASD for the 2nd semi-annual 2022 potential calcium SSI was certified July 26, 2023.
- During the 1st semi-annual 2023 sampling event (June 2023):
 - No SSIs were determined
- During the 2nd semi-annual 2023 sampling event (November 2023):
 - No SSIs were determined
- 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 2023. 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 2022 sampling event (November 2022) with confirmation sampling conducted in January 2023:
 - The following Appendix III parameters exceeded background concentrations for:
 - Calcium at MW-10
- During the 1st semi-annual 2023 sampling event (June 2023):
 - No SSIs were determined
- During the 2nd semi-annual 2023 sampling event (November 2023):
 - No SSIs were determined

VI. Alternate Source Demonstration

ASD for the 2nd semi-annual 2022 potential calcium SSI was certified July 26, 2023.

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 2024.

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 2023 and Actions Taken

The low flow sampling effort went smoothly, and the schedule was met to support the annual groundwater report preparation covering the year 2023 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;
- 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

Geosyntec Consultants, Inc.

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
6/14/2023	Detection	0.084	155	169	1.43	7.2	264	1,100
11/29/2023	Detection	0.082	154	180	1.42	7.0	270	1,110

**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	µg/L	pCi/L	mg/L	µg/L	mg/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

Table 1. Groundwater Data Summary: MW-2

Geosyntec Consultants, Inc.

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	0.07	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
1/19/2023	Detection	--	66.6	--	--	7.5	--	--
6/14/2023	Detection	0.054	75.4	4.73	0.31	7.4	49.1	320
11/29/2023	Detection	0.043 J1	81.2	11.6	0.28	7.3	33.3	340

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	µg/L	pCi/L	mg/L	µg/L	mg/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

Table 1. Groundwater Data Summary: MW-3

Geosyntec Consultants, Inc.

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	0.04	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
1/19/2023	Detection	--	--	--	--	7.2	--	--
6/14/2023	Detection	0.077	144	145	0.32	7.3	187	830
11/29/2023	Detection	0.070	154	174	0.29	7.1	185	900

Table 1. Groundwater Data Summary: MW-3

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	µg/L	pCi/L	mg/L	µg/L	mg/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

Table 1. Groundwater Data Summary: MW-4

Geosyntec Consultants, Inc.

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	0.36	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
6/14/2023	Detection	0.215	445	997	0.24	6.7	309	2,640 S7
11/29/2023	Detection	0.143	366	840	0.27	6.7	93	2,170

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	µg/L	pCi/L	mg/L	µg/L	mg/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

Table 1. Groundwater Data Summary: MW-5

Geosyntec Consultants, Inc.

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	0.06	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
6/14/2023	Detection	0.064	279	135	0.28	6.6	312	1,290
11/29/2023	Detection	0.049 J1	51.2	82.9	0.26	6.7	283	1,030

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	µg/L	pCi/L	mg/L	µg/L	mg/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

Table 1. Groundwater Data Summary: MW-10

Geosyntec Consultants, Inc.

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	0.07	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
1/19/2023	Detection	--	696	--	--	6.7	--	--
6/14/2023	Detection	0.052	307	238	0.21	6.8	444	1,580
11/29/2023	Detection	0.038 J1	172	79.2	0.18	6.8	161	900

Table 1. Groundwater Data Summary: MW-10

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	µg/L	pCi/L	mg/L	µg/L	mg/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

**Table 1. Groundwater Data Summary
Turk – Landfill**

Geosyntec Consultants, Inc.

Notes:

--: Not analyzed

<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag.

In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.

J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.

In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.

M1: The associated matrix spike (MS) or matrix spike duplicate (MSD) recovery was outside acceptance limits.

mg/L: milligrams per liter

P3: The precision on the matrix spike duplicate (MSD) was above acceptance limits.

pCi/L: picocuries per liter

S7: Sample did not achieve constant weight.

SU: standard unit

µg/L: micrograms per liter

**Table 1: Residence Time Calculation Summary
Turk Landfill**






CCR Management Unit	Monitoring Well	Well Diameter (inches)	2023-06		2023-11	
			Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)
Landfill	MW-1 ^[1]	2.0	14.2	4.3	14.1	4.3
	MW-2 ^[2]	2.0	10.4	5.8	18.1	3.4
	MW-3 ^[2]	2.0	19.8	3.1	19.4	3.1
	MW-4 ^[2]	2.0	20.5	3.0	19.3	3.1
	MW-5 ^[2]	2.0	20.2	3.0	18.3	3.3
	MW-10 ^[2]	2.0	4.6	13.3	12.6	4.8

Notes:

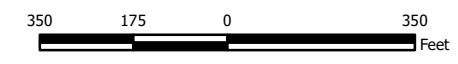
[1] - Background Well


[2] - Downgradient Well



- 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 14, 2023) 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 is screened within the lower aquifer and excluded from the potentiometric surface calculations.
 - Wells MW-1 through MW-10 were resurveyed on August 30, 2023.



Groundwater Elevation Contour Map June 2023		Figure 1
AEP Turk Power Plant - Landfill Fulton, Arkansas		
		
Columbus, Ohio	2024/01/15	



- Legend**
- Groundwater Monitoring Well
 - Groundwater Elevation Contour
 - Groundwater Flow Direction
 - Property Boundary

- Notes**
- Monitoring well coordinates and water level data (collected on November 29, 2023) 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 is screened within the lower aquifer and excluded from the potentiometric surface calculations.
 - Wells MW-1 through MW-10 were resurveyed on August 30, 2023.



**Groundwater Elevation Contour Map
November 2023**

AEP Turk Power Plant - Landfill
Fulton, Arkansas

Geosyntec
consultants

Figure
2

Columbus, Ohio

2024/01/15

APPENDIX 2- Statistical Analyses

The reports summarizing the statistical evaluation follow.

Memorandum

Date: April 27, 2023
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 semiannual 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 November 28, 2022. Based on the results, a two-of-two verification sampling was completed on January 19, 2023.

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 calcium concentrations were above the intrawell UPL of 480 mg/L in both the initial (706 mg/L) and second (696 mg/L) samples collected at MW-10. Thus, an SSI over background is concluded for calcium at MW-10.

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 calcium 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
Detection Summary Memorandum
Turk Plant, Landfill

Analyte	Unit	Description	MW-2		MW-3	MW-4	MW-5	MW-10	
			11/28/2022	1/19/2023	11/28/2022	11/28/2022	11/28/2022	11/28/2022	1/19/2023
Boron	mg/L	Intrawell Background Value (UPL)	1.40		0.840	0.605	0.504	0.523	
		Analytical Result	0.064	--	0.077	0.358	0.025	0.267	--
Calcium	mg/L	Intrawell Background Value (UPL)	132		229	779	422	480	
		Analytical Result	143	66.6	207	600	262	706	696
Chloride	mg/L	Intrawell Background Value (UPL)	85.0		660	1,240	821	1,140	
		Analytical Result	52.8	--	265	1,180	166	992	--
Fluoride	mg/L	Intrawell Background Value (UPL)	0.523		0.979	0.620	0.554	1.25	
		Analytical Result	0.26	--	0.29	0.2	0.28	0.33	--
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	7.5	--	7.2	6.9	7.1	6.6	--
Sulfate	mg/L	Intrawell Background Value (UPL)	670		940	964	1,210	1,800	
		Analytical Result	161	--	276	579	273	1,710	--
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	1,040		4,800	4,790	3,400	5,800	
		Analytical Result	610	--	1,160	3,100	1,120	3,800	--

Notes:

Background values exceed the background value.

Background values are shaded gray.

LPL: Lower prediction limit

mg/L: milligrams per liter

SU: standard units

UPL: Upper prediction limit

--: not measured

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

License Number

Arkansas

Licensing State

05.01.2023

Date

Memorandum

Date: September 21, 2023
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 United States Environmental Protection Agency (USEPA) regulations regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments (40 CFR 257 Subpart D, "CCR rule"), the first semiannual detection monitoring event of 2023 at the Landfill (LF), an existing CCR unit at the Turk Power Plant located in Fulton, Arkansas, was completed on June 14, 2023.

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. 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
			6/14/2023	6/14/2023	6/14/2023	6/14/2023	6/14/2023
Boron	mg/L	Intrawell Background Value (UPL)	1.40	0.840	0.605	0.504	0.523
		Analytical Result	0.054	0.077	0.215	0.064	0.052
Calcium	mg/L	Intrawell Background Value (UPL)	132	229	779	422	480
		Analytical Result	75.4	144	445	279	307
Chloride	mg/L	Intrawell Background Value (UPL)	85.0	660	1,240	821	1,140
		Analytical Result	4.73	145	997	135	238
Fluoride	mg/L	Intrawell Background Value (UPL)	0.523	0.979	0.620	0.554	1.25
		Analytical Result	0.31	0.32	0.24	0.28	0.21
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	6.7	6.6	6.8
Sulfate	mg/L	Intrawell Background Value (UPL)	670	940	964	1,210	1,800
		Analytical Result	49.1	187	309	312	444
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	1,040	4,800	4,790	3,400	5,800
		Analytical Result	320	830	2,640	1,290	1,580

Notes:

Bold values exceed the background value.

Background values are shaded gray.

LPL: lower prediction limit

mg/L: milligrams per liter

SU: standard units

UPL: upper prediction limit

ATTACHMENT A

Certification by 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
License Number

Arkansas
Licensing State

09.21.2023
Date

Memorandum

Date: January 25, 2024
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 United States Environmental Protection Agency (USEPA) regulations regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments (40 CFR 257 Subpart D, "CCR rule"), the second semiannual detection monitoring event of 2023 at the Landfill (LF), an existing CCR unit at the Turk Power Plant located in Fulton, Arkansas, was completed on November 29, 2023.

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. 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
Detection Summary Memorandum
Turk Plant – Landfill**

Analyte	Unit	Description	MW-2	MW-3	MW-4	MW-5	MW-10
			11/29/2023	11/29/2023	11/29/2023	11/29/2023	11/29/2023
Boron	mg/L	Intrawell Background Value (UPL)	1.40	0.840	0.605	0.504	0.523
		Analytical Result	0.043	0.070	0.143	0.049	0.038
Calcium	mg/L	Intrawell Background Value (UPL)	132	229	779	422	480
		Analytical Result	81.2	154	366	51.2	172
Chloride	mg/L	Intrawell Background Value (UPL)	85.0	660	1,240	821	1,140
		Analytical Result	11.6	174	840	82.9	79.2
Fluoride	mg/L	Intrawell Background Value (UPL)	0.523	0.979	0.620	0.554	1.25
		Analytical Result	0.28	0.29	0.27	0.26	0.18
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	7.3	7.1	6.7	6.7	6.8
Sulfate	mg/L	Intrawell Background Value (UPL)	670	940	964	1,210	1,800
		Analytical Result	33.3	185	93	283	161
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	1,040	4,800	4,790	3,400	5,800
		Analytical Result	340	900	2,170	1,030	900

Notes:

1. Bold values exceed the background value.

2. Background values are shaded gray.

LPL: lower prediction limit

mg/L: milligrams per liter

SU: standard units

UPL: upper prediction limit

ATTACHMENT A

Certification by 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
License Number

Arkansas
Licensing State

01.25.2024
Date

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

Prepared for

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

Prepared by

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

Project CHA8495

July 2023

TABLE OF CONTENTS

1. INTRODUCTION AND SUMMARY	1
1.1 CCR Rule Requirements	1
1.2 Demonstration of Alternative Sources	1
2. SUMMARY OF SITE CONDITIONS	3
2.1 Landfill Design and Construction	3
2.2 Regional Geology / Site Hydrogeology	3
2.3 Groundwater Monitoring History and Flow Conditions	3
3. ALTERNATIVE SOURCE DEMONSTRATION.....	5
3.1 Comparison to Landfill Leachate	5
3.2 Proposed Alternative Source	5
3.3 Sampling Requirements	6
4. CONCLUSIONS AND RECOMMENDATIONS.....	7
5. REFERENCES.....	8

LIST OF TABLES

Table 1:	Detection Monitoring Data Summary
----------	-----------------------------------

LIST OF FIGURES

Figure 1:	Groundwater Elevation Contour Map – November 2022
Figure 2:	Calcium Time Series
Figure 3:	MW-10 Calcium Concentrations and Groundwater Elevations
Figure 4:	MW-10 Redevelopment Impact on Chloride

LIST OF ATTACHMENTS

Attachment A:	MW-10 Redevelopment Log
Attachment B:	MW-10 Sampling Forms
Attachment C:	MW-10 Field Boring Log and Monitoring Well Construction Form
Attachment D:	Certification by a Qualified Professional Engineer

ACRONYMS AND ABBREVIATIONS

AEP	American Electric Power
ASD	Alternative Source Demonstration
CCR	coal combustion residuals
CFR	Code of Federal Regulations
DEQ	Division of Environmental Quality
EPRI	Electric Power Research Institute
LPL	lower prediction limit
mg/L	milligrams per liter
NTU	nephelometric turbidity unit
SSI	statistically significant increase
UPL	upper prediction limit
USEPA	United States Environmental Protection Agency

1. INTRODUCTION AND SUMMARY

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

Prediction limits are used to determine whether there has been an SSI for a groundwater monitoring parameter for the Turk Landfill. Background values for monitoring parameters were most recently updated in July 2022 (Geosyntec 2022). These prediction limits were calculated based on a one-of-two retesting procedure in accordance with the Unified Guidance (United States Environmental Protection Agency [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 second semiannual detection monitoring event of 2022 was performed in November 2022, and the results were compared to the calculated prediction limits. Where initial exceedances were identified, verification resampling was completed in January 2023. Following verification resampling, an SSI was identified for calcium at MW-10 using intrawell comparisons. A summary of the detection monitoring analytical results related to the previously mentioned SSIs and the calculated prediction limits to which they were compared is provided in **Table 1**.

1.1 CCR Rule Requirements

In accordance with the USEPA regulations regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments, Title 40, §257.94(e)(2) of the Code of Federal Regulations (CFR) allows the following response if 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 document whether the SSI identified for calcium at MW-10 is from a source other than leachate impacts derived from the Turk Landfill.

1.2 Demonstration of Alternative Sources

An evaluation was completed to assess alternative sources to which the identified SSI could be attributed. Alternative sources were identified from amongst five types, based on the methods 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
- ASD Type V: Alternative Sources

A demonstration was conducted to assess whether the increases in calcium concentrations at well MW-10 were based on Type I causes (sampling) and not caused by a release from the Turk Landfill.

2. SUMMARY OF SITE CONDITIONS

The Turk Landfill design and construction, site hydrogeology, and groundwater monitoring history and flow conditions are described below.

2.1 Landfill Design and Construction

The Turk Landfill was permitted in 2011 as a 73-acre CCR disposal facility to be developed in five cells, each with a geomembrane/compacted-clay composite liner and overlying continuous leachate collection system. Construction began on the landfill in 2011, and to date Cells 1 and 2, which occupy 28 acres, have been constructed. Waste was first placed in Cell 1 in 2013. Cell 2 was constructed in 2018, and waste was first placed there in 2019. Cell 1 has reached its maximum waste fill capacity and is being graded before placement of temporary soil cover, and Cell 2 is undergoing active filling (American Electric Power [AEP] 2022).

Leachate from the landfill 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 landfill operations began in 2013.

2.2 Regional Geology / Site Hydrogeology

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

Geology at and around the landfill 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 that 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.

2.3 Groundwater Monitoring History and Flow Conditions

The groundwater monitoring well network for the Turk Landfill consists of six wells (background location MW-1, compliance wells MW-2 through MW-5, and compliance well MW-10) installed in September 2011 in accordance with a work plan approved by the Arkansas Division of

Environmental Quality (DEQ). The monitoring well of concern, MW-10, is screened within Hydrogeologic Unit A with a ten-foot screen set from 14.5 to 24.5 feet below ground surface. Groundwater analytical data were collected prior to waste placement in Cell 1 to establish background conditions. As the remaining Turk Landfill 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-10 and the other network wells, as well as potentiometric contours from the November 2022 sampling event, is presented as **Figure 1**. Groundwater flow is generally toward the 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).

3. ALTERNATIVE SOURCE DEMONSTRATION

The ASD evaluation methods, the proposed alternative source of calcium at MW-10, and the future groundwater sampling requirements are described below.

An initial review of the laboratory and statistical analyses did not identify any Type II (laboratory causes) or Type III (statistical evaluation causes) issues. A review of site geochemistry and site historical data did not identify any Type IV (natural variation) causes. 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 SSI observed at monitoring well MW-10 is attributed to sampling causes, which is a Type I issue.

3.1 Comparison to Landfill Leachate

A comparison of calcium concentrations in Turk Landfill leachate with concentrations observed in groundwater from MW-10 supports the conclusion that groundwater quality changes should not be attributed to a release from the landfill. A time-series plot of calcium concentrations in Turk Landfill leachate and groundwater from MW-10 (**Figure 2**) shows that observed concentrations of calcium have been lower in leachate than in MW-10 groundwater since November 2020, and that observed concentrations of calcium in leachate have been lower than the current UPL prediction limit for MW-10 groundwater since 2018. Given this disparity in concentrations and that the landfill cells were constructed with a modern composite liner system, which provides a high level of leachate containment, concentrations observed in groundwater do not appear to be attributable to a release from the landfill.

3.2 Proposed Alternative Source

A review of field forms and sampling logs suggests that the calcium SSI is associated with anomalous groundwater conditions at MW-10 during the initial and verification resampling events and not due to a release from the landfill. Calcium concentrations at MW-10 have exceeded the current intrawell UPL of 480 milligrams per liter (mg/L) once prior to the November 2022 sampling event and are typically below 400 mg/L (**Figure 2**). On November 14, 2022, MW-10 was redeveloped as part of an effort to redevelop all Turk Landfill monitoring wells. The MW-10 field redevelopment log (**Attachment A**) indicates that MW-10 was purged for a total period of 27 minutes before the well ran dry, during which 6.25 gallons of water were removed from the well. Field measurements collected during the redevelopment purging process noted that 3 minutes before the well ran dry, turbidity was measured at over 1,000 nephelometric turbidity units (NTU), indicating that the water removed at the end of the redevelopment was highly turbid and contained particulate material that was not entirely purged from the well during the redevelopment process. A second attempt was made to redevelop MW-10 on November 15, 2022, but no recharge had occurred.

MW-10 was sampled for the Federal CCR program on November 28, 14 days following redevelopment (**Figure 3**). The MW-10 field sampling log (**Attachment B**) documented that the depth to groundwater in the well at the start of the sampling process was 27.85 feet below the top of the well casing, which is 3.58 feet above the bottom of the well. The 3.58 feet of water column was drawn down 0.56 feet during purging before sample collection, and the sample was collected before stabilization parameters were met due to the potential for the well to run dry (**Attachment**

B). Attachments A and B indicate that water levels at MW-10 recovered only 3.58 feet over a 14-day period. Limited recharge of the well is assumed to be associated with the primarily clayey composition within which the well is screened (**Attachment C**).

The verification resampling event associated with the calcium SSI was completed on January 19, 2023 (**Figure 3**). The MW-10 field sampling log (**Attachment B**) indicates that water levels had at this point recovered to 18.86 feet below top of casing (8.99 feet of water column). This value represents partial water-level recovery within the well, because the groundwater elevation during this event was still low compared to typical measurements reported prior to redevelopment (**Figure 3**). MW-10 was next sampled on June 14, 2023. The groundwater elevation at MW-10 had returned to typical values by the time of this event, and the calcium concentration was well below the UPL.

As shown on **Figure 3**, calcium concentrations in MW-10 increase following the well redevelopment event during which the entire water column was depleted from the well before all particulate was removed. The well was sampled shortly after redevelopment before the well was able to recharge, and therefore the sample is not representative of the true groundwater condition. MW-10 had fully recharged by the June 2023 sampling event, and calcium concentrations during this event had returned to typical values. The observed concentration increases during the low-water-level sampling events were not constrained to only calcium: concentrations of other major ions also increased during the November 2022 event and returned to typically observed concentrations by the June 2023 event (**Figure 4**). These relationships strongly suggest that MW-10 had not recovered following redevelopment efforts at the time of sampling, and a representative groundwater sample could not be collected until MW-10 had fully recharged.

3.3 Sampling Requirements

The ASD described above supports the determination that the identified calcium SSI was due to the inability of the well to yield a representative groundwater sample following redevelopment efforts, and not due to a release from the Turk Landfill. Therefore, no further action is warranted, and the Turk Landfill will remain in the detection monitoring program.

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 calcium at MW-10 should be attributed to sampling causes and not to a release from the Turk Landfill. Therefore, no further action is warranted, and the Turk Landfill will remain in the detection monitoring program. Certification of this ASD by a qualified professional engineer is provided in **Attachment D**.

5. REFERENCES

- AEP, 2022. 2022 Annual Landfill Inspection Report, CCR Landfill, Turk Power Plant, Southwestern Electric Power Company. Fulton, Arkansas. October.
- AEP, 2023. Annual Groundwater Monitoring Report – Southwestern Electric Power Company – John W. Turk Power Plan Landfill. American Electric Power. January.
- EPRI. 2017. Guidelines for Development of Alternative Source Demonstrations at Coal Combustion Residual Sites. Electric Power Research Institute. 3002010920. October.
- Geosyntec. 2021. Statistical Analysis Plan. Revision 1. Geosyntec Consultants, Inc. January.
- Geosyntec. 2022. Statistical Analysis Summary – Background Update Calculations, Landfill – John W. Turk, Jr. Plant. Geosyntec Consultants, Inc. 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
Detection Summary Memorandum
Turk Plant, Landfill**

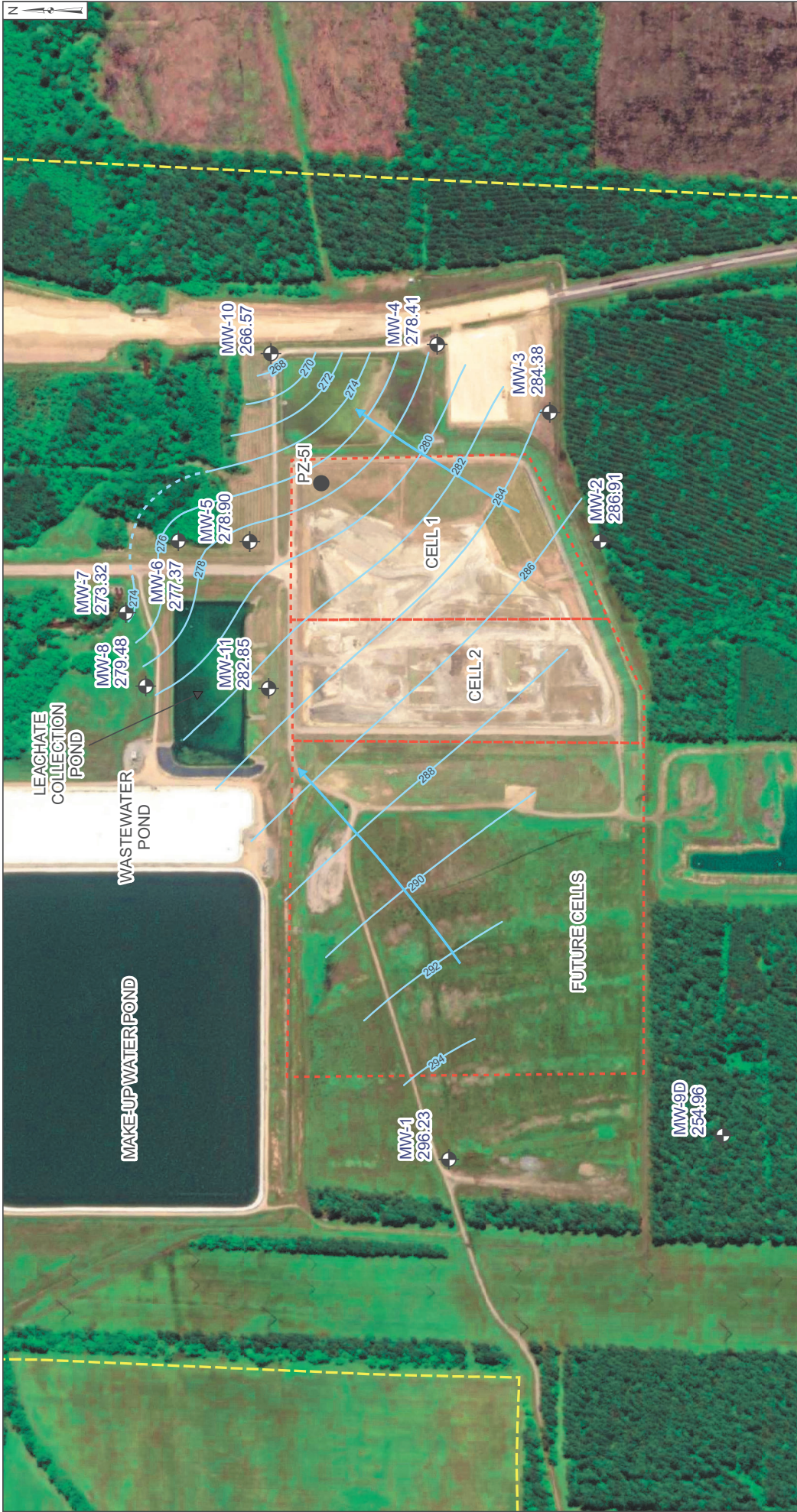
Analyte	Unit	Description	MW-2		MW-3	MW-4	MW-5	MW-10	
			11/28/2022	1/19/2023	11/28/2022	11/28/2022	11/28/2022	11/28/2022	11/28/2022
Boron	mg/L	Intrawell Background Value (UPL)	1.40	--	0.840	0.605	0.504	0.523	
		Analytical Result	0.064	--	0.077	0.358	0.025	0.267	--
Calcium	mg/L	Intrawell Background Value (UPL)	132	66.6	229	779	422	480	
		Analytical Result	143		207	600	262	706	696
Chloride	mg/L	Intrawell Background Value (UPL)	85.0	--	660	1,240	821	1,140	
		Analytical Result	52.8	--	265	1,180	166	992	--
Fluoride	mg/L	Intrawell Background Value (UPL)	0.523	--	0.979	0.620	0.554	1.25	
		Analytical Result	0.26	--	0.29	0.2	0.28	0.33	--
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	Analytical Result	7.5	--	7.2	6.9	7.1	6.6	--
		Intrawell Background Value (UPL)	670	--	940	964	1,210	1,800	
Total Dissolved Solids	mg/L	Analytical Result	161	--	276	579	273	1,710	--
		Intrawell Background Value (UPL)	1,040	--	4,800	4,790	3,400	5,800	
		Analytical Result	610	--	1,160	3,100	1,120	3,800	--

Notes:

- 1. Bold values exceed the background value.**
- 2. Background values are shaded gray.**

LPL: Lower prediction limit
mg/L: milligrams per liter
SU: standard units
UPL: Upper prediction limit
--: not measured

FIGURES

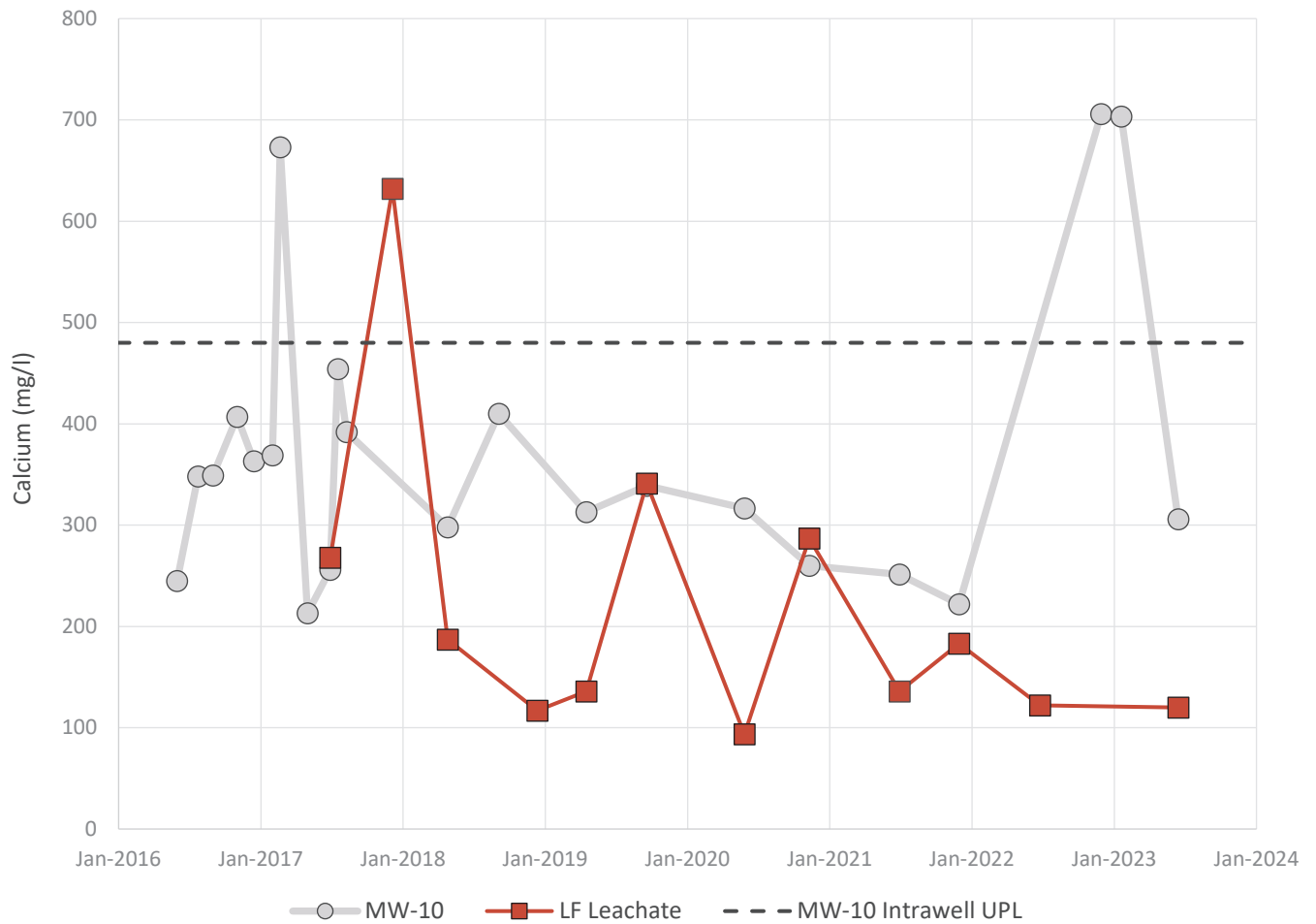


Groundwater Elevation Contour Map
November 2022
 Turk Landfill

	Figure
	1

Columbus, Ohio July 2023

- Legend**
- Piezometer
 - Monitoring Wells
 - Groundwater Elevation Contour (Infered)
 - 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 Second Half 2022 Groundwater Analysis Report (AEP, 2023) provided by AEP.
 - Aerial imagery provided by ArcGIS Map Services (2020).
 - Piezometer PZ-51 was plugged and abandoned in 2011 as part of Cell 1 construction.



Notes: Calcium time-series diagram for compliance well MW-10 and Turk Landfill leachate. Data for MW-10 were collected as part of federal groundwater monitoring program requirements. Data for the Turk Landfill leachate were collected as part of the state CCR program.

CCR: Coal Combustion Residuals
 mg/L: milligrams per liter
 UPL: Upper prediction limit

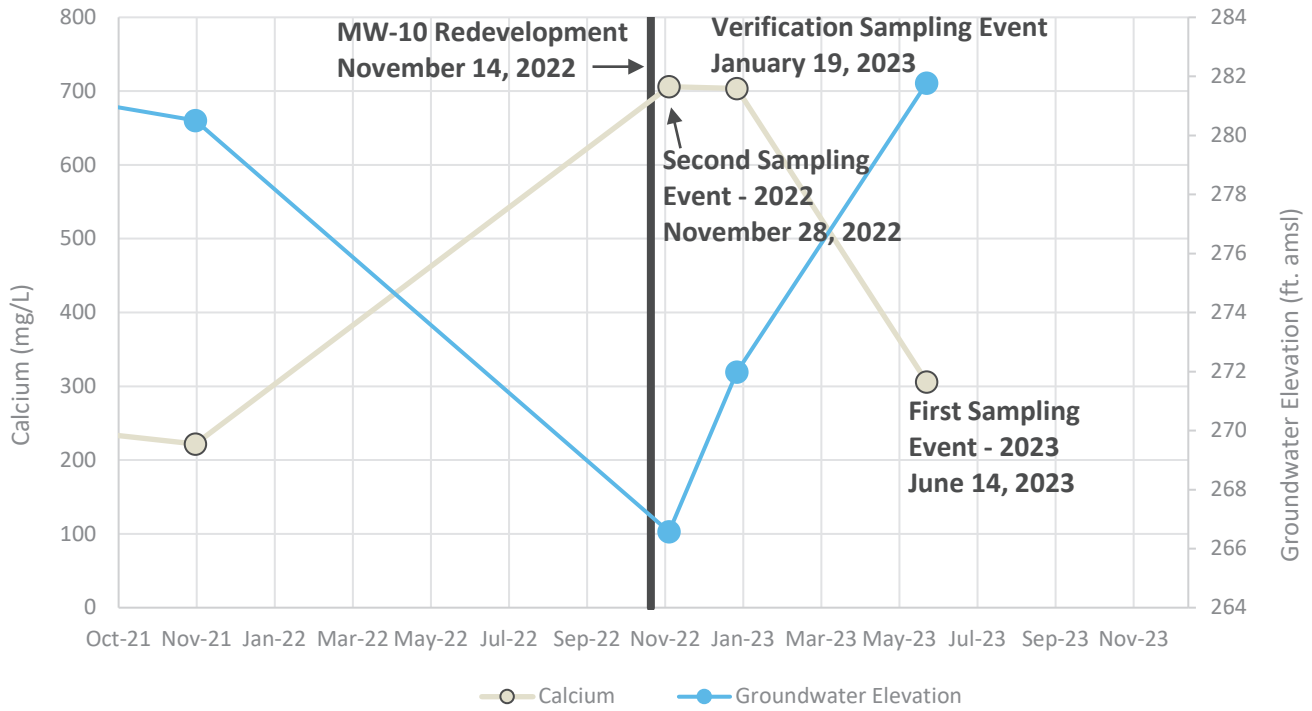
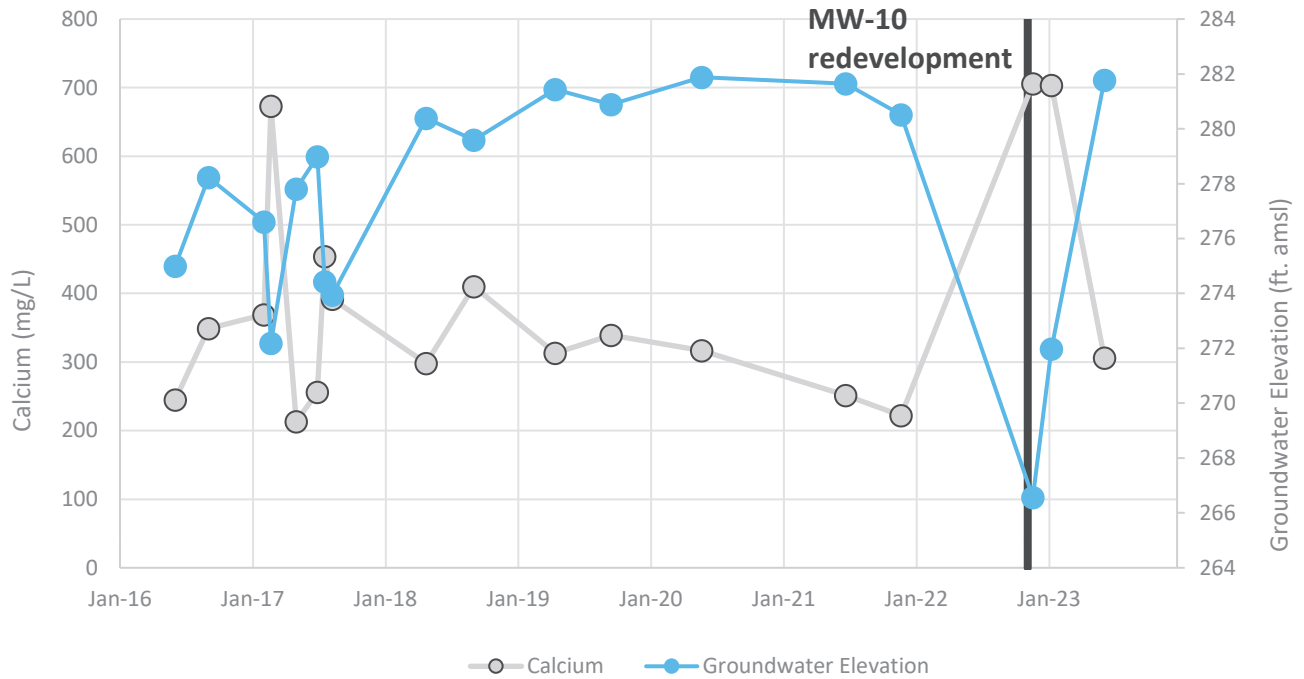
Calcium Time Series Turk Landfill



Figure
 2

Columbus, Ohio

July 2023



Notes: Groundwater elevation measurements were recorded in the field during sampling events. Data were collected as part of federal groundwater monitoring program requirements.

mg/L: milligrams per liter
ft. amsl: feet above mean sea level

MW-10 Calcium Concentrations and Groundwater Elevation

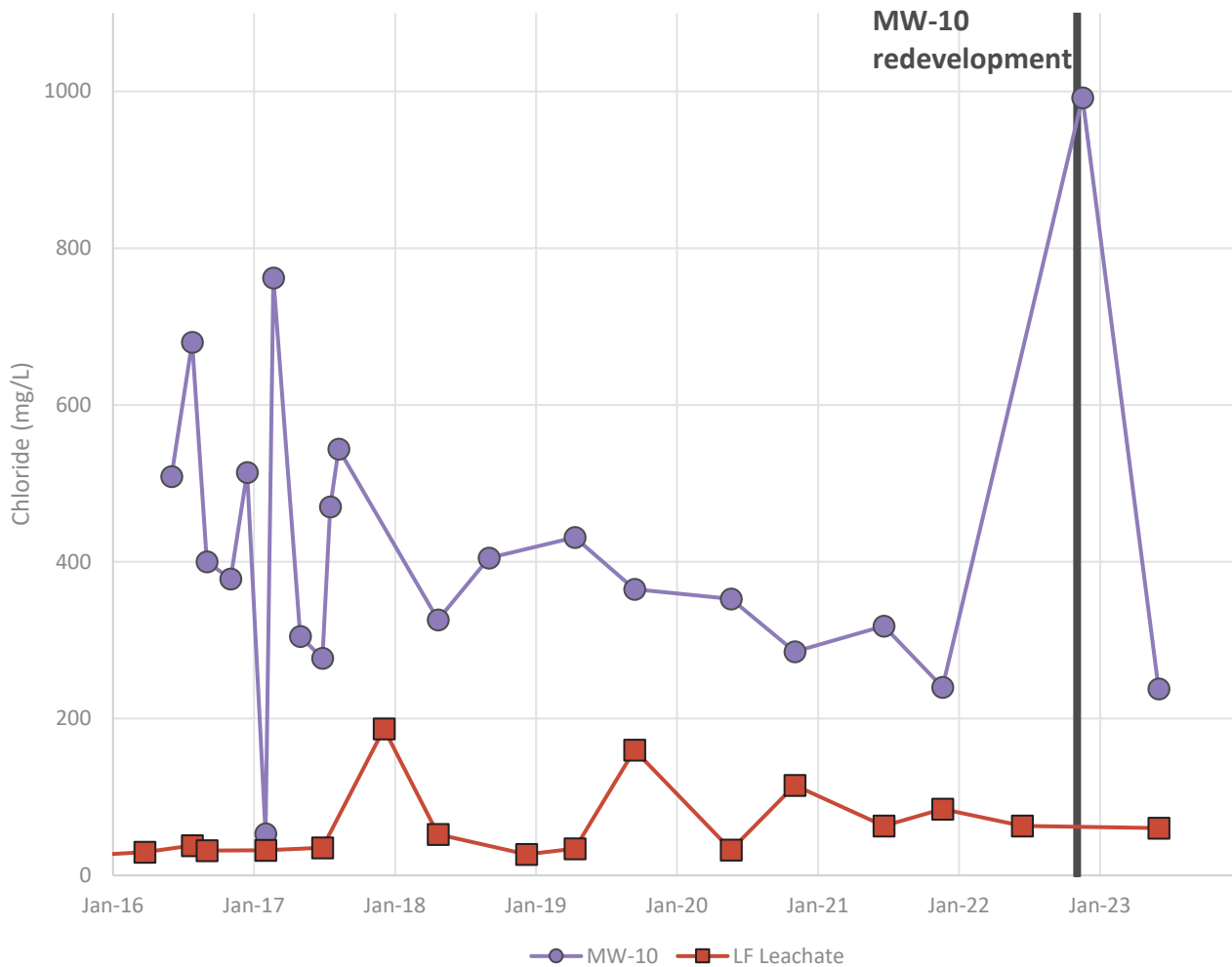
Turk Landfill



Figure
3

Columbus, Ohio

July 2023



Notes: Data for MW-10 were collected as part of federal groundwater monitoring program requirements. Data for Turk Landfill leachate were collected as part of the state CCR program.

CCR: Coal Combustion Residuals
 mg/L: milligrams per liter

MW-10 Redevelopment Impact on Chloride
 Turk Landfill



Figure
4

Columbus, Ohio

July 2023

ATTACHMENT A

MW-10 Redevelopment Log

ATTACHMENT B
MW-10 Sampling Forms

ATTACHMENT C
MW-10 Field Boring Log and
Monitoring Well Construction Form



Consulting Engineers and Scientists

25809 Interstate-30
PH. (501) 847-9292

BRYANT, AR. 72022
FAX. (501) 847-9210

FIELD BORING LOG

BORING NO.: MW-10

PAGE: 1 of 1

TOTAL DEPTH: 25 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AEP - JOHN W. TURK - FULTON, AR.

PROJECT: GROUNDWATER WELL INSTALLATION

JOB NO.: 216-002-35117123-010

DRILLING CO.: ANDERSON ENGINEERING

LOGGED BY: JODY ADAMS

DRILLER: GARRY MOYERS

DATE DRILLED: 8/25/11

RIG TYPE: ATV

DRILLING METHOD: HOLLOW STEM AUGER

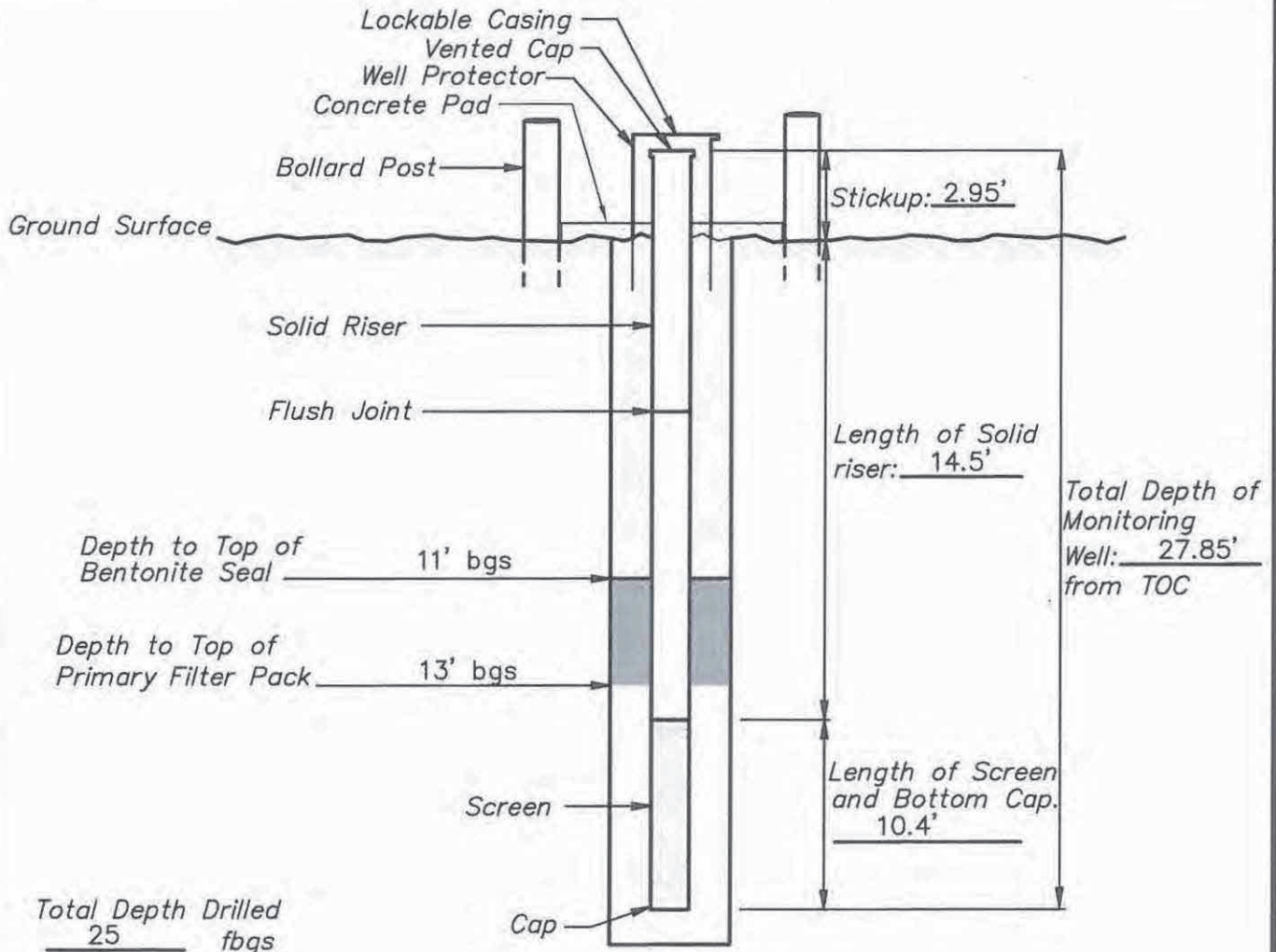
SAMPLING METHOD: CONTINUOUS SAMPLER

N: 1670983.69		E: 762082.01		G.S. ELEV. 287.89		Litho. Symbol	Run #	% Recovery	Remarks
DESCRIPTION									
Depth BGS	0	0'-1' GRAVELLY CLAY FILL brown							
		1'-8' CLAY FILL brown, gray and tan, mottled				1	0'-5' 30" rec.		
	5	8'-13' CLAY gray with reddish brown mottles, firm				2	5'-10' 8" rec.		
	10	13'-17' CLAY gray, firm				3	10'-15' 60" rec.		
	15	17'-19' CLAYEY GRAVEL (clay is red) gravel consists of approx. 1" rounded chert				4	15'-20' 50" rec.		
	20	19'-25' CLAY tan and gray, blocky, hard				5	20'-25' 60" rec.		Allowed boring to sit open for 1 hour at 20' bgs. boring remained dry.
25	Total Depth of Boring = 25' bgs								
30									
35									
40									

Allowed boring to sit open for 1 hour at 20' bgs. boring remained dry.
Allowed boring to sit open for 1 hour at 25' bgs. boring remained dry.

MONITORING WELL INSTALLATION RECORD

Job Name AEP-JOHN W. TURK-MONITORING WELL INSTALLATION Well Number MW-10
 Job Number 35117123 Installation Date 8/25/2011 Location FULTON, AR.
 Datum Elevation 290.84 Surface Elevation 287.89
 Datum for Water Level Measurement T.O.C.
 Screen Diameter & Material 2" PVC Slot Size 0.010"
 Riser Diameter & Material 2" PVC Borehole Diameter 8"
 Granular Backfill Material 12-20 SAND Terracon Representative JODY ADAMS
 Drilling Method HOLLOW STEM AUGER Drilling Contractor ANDERSON ENGINEERING



Total Depth Drilled
25 fbgs

- Bentonite Chips
- Bentonite Plug
- Granular Backfill

(Not to Scale)

Terracon
Consulting Engineers and Scientists

25809 I-30 South BRYANT, AR. 72022
PH. (501) 847-9292 FAX. (501) 847-9210

MONITORING WELL INSTALLATION RECORD

PROJECT NUMBER: 216-002-35117123

WELL NUMBER: MW-10

DRAWING NUMBER: 020

CHECKED BY: MR

ATTACHMENT D
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 Blvd, Suite 103
Tallahassee, Florida 32308

Arkansas Firm Certificate of
Authorization No. 52
Exp. 12/31/2024

9864
License Number

Arkansas
Licensing State

July 26, 2023
Date

