

Annual Groundwater Monitoring Report

Kentucky Power Company

Mitchell Plant

Landfill

Moundsville, WV

January 2020

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An **AEP** Company

*BOUNDLESS ENERGY*SM

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I. Overview

This *Annual Groundwater Monitoring Report* (Report) has been prepared to report the status of activities for the preceding year for the landfill at Kentucky Power Company's, a wholly owned subsidiary of American Electric Power Company (AEP), Mitchell Power Plant. The USEPA's CCR rules require that the Annual Groundwater Monitoring Report be posted to the operating record for the preceding year no later than January 31st.

In general, the following activities were completed in 2019:

- Groundwater samples were collected and analyzed in June 2019 for Appendix III constituents, as specified in 40 CFR 257.94 and AEP's *Groundwater Sampling and Analysis Plan (2016)*;
- Groundwater data underwent various validation tests, including tests for completeness, valid values, transcription errors, and consistent units;
- Appendix III parameters were compared to prediction limits (intervals for pH) established from background data established previously;
- The statistical evaluation concluded that there were statistically significant increases (SSIs) over background of two Appendix III parameters;
- Because SSIs over background of Appendix III parameters were detected, an alternative source demonstration (ASD) study was conducted resulting in a November 2019 ASD report, as discussed further in Section VI of this report.
- As required by 40 CFR 257.94, groundwater samples were collected and analyzed for all Appendix III constituents during a second semiannual sampling event in October 2019.

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 one or more SSIs over background levels (Attached as **Appendix 2**, where applicable);
- A discussion of whether any alternate source demonstration were performed, and the conclusions (Attached as **Appendix 3**, where applicable);

- A summary of any transition between monitoring programs, for example the date and circumstances for transitioning from detection monitoring to assessment monitoring (Notices attached as **Appendix 4**, where applicable);
- Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a statement as to why that happened (Attached as **Appendix 5**, where applicable); and
- Other information required to be included in the annual report such as an alternate monitoring frequency, or assessment of corrective measures, if applicable.

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

II. Groundwater Monitoring Well Locations and Identification Numbers

A figure that depicts the PE-certified groundwater monitoring network, the monitoring well locations, and their corresponding identification is provided in Appendix 1.

III. Monitoring Wells Installed or Decommissioned

There were no monitoring wells installed or decommissioned in 2019. The network design, as summarized in the *Groundwater Monitoring Network Design Report* (2016) and as posted at the CCR web site for Mitchell Plant, did not change. That design report, viewable on the AEP CCR web site, discusses the facility location, the hydrogeological setting, the hydrostratigraphic units, the uppermost aquifer, downgradient monitoring well locations and the upgradient monitoring well locations.

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

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

V. Groundwater Quality Data Statistical Analysis

Statistical analysis of the detection monitoring samples taken in June 2019 was completed on September 4, 2019. The evaluation concluded that SSIs of chloride and total dissolved solids over background levels were detected in one monitoring well. A memorandum with the results of the statistical evaluation is provided in Appendix 2.

As required by 40 CFR 257.94, groundwater samples were collected and analyzed for all Appendix III constituents during a second semiannual sampling event in October 2019. A statistical evaluation of these results will be completed in 2020.

VI. Alternative Source Demonstrations

Because SSIs over background of Appendix III parameters were detected at Mitchell Plant's landfill, an ASD study was conducted resulting in a November 2019 ASD report. The report concluded that the SSIs are not due to a release from the Mitchell Landfill, but were instead attributed to natural variation in groundwater quality. The report is provided in Appendix 3.

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

No transition between monitoring requirements occurred in 2019; the CCR unit remained in detection monitoring over the entire year. A statement to this effect is provided in Appendix 4. The sampling frequency of twice per year will be maintained for the Appendix III parameters (boron, calcium, chloride, fluoride, pH, sulfate and total dissolved solids).

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

VIII. Other Information Required

The Mitchell landfill has remained in its current status of detection monitoring. All required information has been included in this annual groundwater monitoring report.

IX. Description of Any Problems Encountered in 2019 and Actions Taken

No significant problems were encountered. The low flow sampling effort went smoothly and the schedule was met to support this annual groundwater report preparation. There were, however, dry wells encountered during sampling, but this did not affect the statistical evaluation or monitoring network at the landfill. The minimum requirement of one upgradient and three downgradient wells was still met.

X. A Projection of Key Activities for the Upcoming Year

Key activities for 2020 include:

- Detection monitoring on a semiannual schedule;
- Evaluation of the detection monitoring results from a statistical analysis viewpoint, looking for any SSIs (or decreases with respect to pH);
- Responding to any new data received in light of what the CCR rule requires;
- Preparation of the next annual groundwater report.

APPENDIX 1 - Groundwater Data Tables and Figures

Tables follow showing the groundwater monitoring data collected, the rate of groundwater flow each time groundwater was sampled, the number of samples collected per monitoring well, dates that the samples were collected, and whether each sample was collected as part of a detection monitoring or an assessment monitoring program. Figures follow showing the PE-certified groundwater monitoring network with the corresponding well identifications along with static water elevation data and groundwater flow directions each time groundwater was sampled in the form of annotated satellite images.

Table 1 - Groundwater Data Summary: MW-1101F

Mitchell - LF

Appendix III Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Total Dissolved Solids	Sulfate
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
6/15/2016	Background	0.042	88.3	3.87	0.22	7.4	395	64.3
8/3/2016	Background	0.380	91.0	3.30	0.21	7.4	425	62.1
9/28/2016	Background	0.054	88.6	3.73	0.26	8.7	466	58.1

Notes:

mg/L: milligrams per liter

SU: standard unit

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

J: Estimated value. Parameter was detected at concentration below the reporting limit

--: Not analyzed

**Table 1 - Groundwater Data Summary: MW-1101F
Mitchell - 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
6/15/2016	Background	0.21	1.64	159	0.023	0.08	0.6	0.294	0.304	0.22	0.525	0.012	<0.002 U	3.87	0.2	0.02 J
8/3/2016	Background	0.14	1.46	155	0.033	0.08	0.6	0.244	1.494	0.21	0.673	0.017	<0.002 U	4.04	0.2	<0.01 U
9/28/2016	Background	0.18	1.79	142	0.029	0.12	0.8	0.231	1.561	0.26	0.511	0.016	<0.002 U	3.39	0.3	0.02 J

Notes:

µg/L: micrograms per liter

SU: standard unit

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

J: Estimated value. Parameter was detected at concentration below the reporting limit

- -: Not analyzed

pCi/L: picocuries per liter

Table 1 - Groundwater Data Summary: MW-1101R

Mitchell - LF

Appendix III Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Total Dissolved Solids	Sulfate
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
6/15/2016	Background	0.287	6.91	8.41	1.20	8.2	741	76.4
8/3/2016	Background	0.518	5.00	10.3	1.56	8.4	750	76.4
9/28/2016	Background	0.382	6.12	13.3	1.83	8.5	43.0	43.5
11/16/2016	Background	1.80	19.4	15.2	2.29	8.6	801	32.2
2/14/2017	Background	0.501	2.23	15.4	2.40	8.6	806	32.0
4/12/2017	Background	0.360	4.02	14.4	2.17	8.7	798	39.2
5/24/2017	Background	0.380	1.91	15.1	2.41	8.7	793	28.6
7/25/2017	Background	0.415	1.76	15.8	2.61	8.7	788	28.7
10/11/2017	Detection	0.394	1.87	16.9	2.59	8.7	784	29.1
1/11/2018	Detection	--	1.75	--	--	8.4	--	28.8
4/10/2018	Detection	0.344	1.75	16.5	2.62	8.5	790	29.0
8/29/2018	Detection	0.371	2.42	16.3	2.45	9.0	783	29.7
5/1/2019	Detection	0.376	1.90	16.9	2.62	10.5	809	28.7
6/12/2019	Detection	0.371	2.03	16.2	2.38	8.8	822	27.4

Notes:

mg/L: milligrams per liter

SU: standard unit

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J: Estimated value. Parameter was detected at concentration below the reporting limit

--: Not analyzed

Table 1 - Groundwater Data Summary: MW-1101R

Mitchell - 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
6/15/2016	Background	0.82	8.11	185	0.031	0.03	1.1	0.650	0.493	1.20	1.22	0.002	0.003 J	31.8	0.5	0.05 J
8/3/2016	Background	1.10	10.8	149	0.023	0.03	1.0	0.363	0.4776	1.56	0.674	0.012	<0.002 U	32.9	0.5	0.02 J
9/28/2016	Background	0.92	11.1	149	0.01 J	0.02	0.7	0.301	0.565	1.83	0.550	0.009	<0.002 U	26.2	0.5	0.01 J
11/16/2016	Background	0.67	14.2	125	0.01 J	0.02 J	0.595	0.143	1.808	2.29	0.292	0.026	<0.002 U	20.6	0.4	<0.01 U
2/14/2017	Background	0.69	15.3	102	0.01 J	0.02 J	0.512	0.160	1.661	2.40	0.327	0.012	<0.002 U	34.0	0.4	0.02 J
4/12/2017	Background	0.84	12.4	117	0.02 J	0.02 J	0.824	0.333	0.190	2.17	0.634	0.010	0.002 J	16.7	0.5	<0.01 U
5/24/2017	Background	0.66	15.7	102	0.01 J	0.01 J	0.526	0.299	0.759	2.41	0.298	<0.0002 U	<0.002 U	14.8	0.3	<0.01 U
7/25/2017	Background	0.62	14.5	91.3	0.01 J	0.01 J	0.377	0.126	0.977	2.61	0.235	0.009	<0.002 U	18.3	0.3	0.02 J

Notes:

µg/L: micrograms per liter

SU: standard unit

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

J: Estimated value. Parameter was detected at concentration below the reporting limit

- -: Not analyzed

pCi/L: picocuries per liter

Table 1 - Groundwater Data Summary: MW-1102F

Mitchell - LF

Appendix III Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Total Dissolved Solids	Sulfate
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
6/15/2016	Background	0.109	4.34	12.4	0.56	8.0	523	37.2
8/3/2016	Background	0.280	5.48	11.9	0.58	8.2	535	35.9
10/3/2016	Background	0.160	5.45	11.8	0.60	8.1	519	29.5
11/15/2016	Background	0.117	4.87	11.7	0.56	8.1	551	27.4
2/14/2017	Background	0.109	5.04	11.3	0.53	8.2	521	29.9
4/12/2017	Background	0.109	4.67	11.3	0.53	8.3	530	30.6
5/24/2017	Background	0.118	5.31	13.7	0.56	8.3	521	31.8
7/26/2017	Background	0.202	5.41	11.4	0.57	8.3	519	31.5
10/10/2017	Detection	0.278	4.79	12.4	0.57	8.4	526	32.3
1/11/2018	Detection	--	4.47	--	--	7.9	--	32.1
4/10/2018	Detection	0.109	4.40	13.4	0.63	8.2	539	33.2
8/28/2018	Detection	0.247	4.48	14.1	0.64	8.6	549	33.8
5/1/2019	Detection	0.126	4.69	15.2	0.66	9.5	577	37.6
6/12/2019	Detection	0.110	4.36	14.9	0.74	8.2	574	38.0

Notes:

mg/L: milligrams per liter

SU: standard unit

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

J: Estimated value. Parameter was detected at concentration below the reporting limit

--: Not analyzed

Table 1 - Groundwater Data Summary: MW-1102F

Mitchell - 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
6/15/2016	Background	0.71	9.37	214	<0.005 U	0.04	0.4	0.096	0.352	0.56	0.335	0.003	<0.002 U	28.1	0.3	<0.01 U
8/3/2016	Background	0.69	8.16	212	<0.005 U	0.02 J	0.4	0.090	0.881	0.58	0.183	0.006	<0.002 U	25.8	0.3	0.01 J
10/3/2016	Background	0.64	8.45	194	0.005 J	0.01 J	0.5	0.286	0.972	0.60	0.298	0.002	<0.002 U	23.9	0.3	<0.01 U
11/15/2016	Background	0.63	8.49	212	0.005 J	0.008 J	0.435	0.074	1.859	0.56	0.141	0.003	<0.002 U	22.9	0.3	<0.01 U
2/14/2017	Background	0.62	8.66	197	0.006 J	0.006 J	0.411	0.049	1.015	0.53	0.131	0.004	<0.002 U	21.4	0.3	0.02 J
4/12/2017	Background	0.56	7.68	191	0.005 J	0.01 J	0.399	0.079	0.1825	0.53	0.135	0.005	<0.002 U	19.3	0.3	0.01 J
5/24/2017	Background	0.60	8.76	229	0.01 J	0.02	0.807	0.203	0.3252	0.56	0.335	<0.0002 U	<0.002 U	20.0	0.4	0.01 J
7/26/2017	Background	0.54	7.58	205	<0.004 U	0.01 J	0.323	0.072	0.942	0.57	0.121	0.007	<0.002 U	34.7	0.3	0.03 J

Notes:

µg/L: micrograms per liter

SU: standard unit

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

J: Estimated value. Parameter was detected at concentration below the reporting limit

- -: Not analyzed

pCi/L: picocuries per liter

Table 1 - Groundwater Data Summary: MW-1102R

Mitchell - LF

Appendix III Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Total Dissolved Solids	Sulfate
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
6/15/2016	Background	0.339	3.49	219	2.97	8.2	1470	47.8
8/3/2016	Background	0.467	4.05	217	2.98	8.3	1450	44.9
10/3/2016	Background	0.332	5.33	213	2.96	8.3	1530	35.1

Notes:

mg/L: milligrams per liter

SU: standard unit

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

J: Estimated value. Parameter was detected at concentration below the reporting limit

--: Not analyzed

**Table 1 - Groundwater Data Summary: MW-1102R
Mitchell - 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
6/15/2016	Background	2.01	2.64	292	0.02 J	0.35	0.5	0.799	0.710	2.97	0.558	0.015	<0.002 U	68.7	0.9	0.01 J
8/3/2016	Background	1.71	3.57	356	0.128	0.14	3.0	1.75	1.217	2.98	2.82	0.021	0.007 J	66.0	1.2	0.03 J
10/3/2016	Background	1.73	3.37	441	0.307	0.17	3.9	3.01	2.828	2.96	7.24	0.028	0.007	51.4	1.9	0.03 J

Notes:

µg/L: micrograms per liter

SU: standard unit

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

J: Estimated value. Parameter was detected at concentration below the reporting limit

- -: Not analyzed

pCi/L: picocuries per liter

Table 1 - Groundwater Data Summary: MW-1103F

Mitchell - LF

Appendix III Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Total Dissolved Solids	Sulfate
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
6/15/2016	Background	0.355	3.01	243	3.11	8.3	1390	0.5
8/2/2016	Background	0.402	2.99	247	3.20	8.3	1420	0.3
10/3/2016	Background	0.321	3.12	242	3.34	8.4	1380	<0.04 U
11/16/2016	Background	0.323	2.97	240	2.96	8.4	1370	0.2
2/15/2017	Background	0.303	2.82	240	3.07	8.5	1400	0.2
4/11/2017	Background	0.304	2.57	234	3.05	8.6	1400	0.4
5/23/2017	Background	0.346	2.88	237	3.23	8.5	1370	0.4
7/26/2017	Background	0.343	2.76	240	3.24	8.5	1370	0.3
10/11/2017	Detection	0.328	3.09	247	3.17	8.6	1390	0.5
4/10/2018	Detection	0.286	2.58	239	3.16	8.3	1390	0.5
8/29/2018	Detection	0.332	2.76	244	3.03	8.6	1380	0.4
5/2/2019	Detection	0.342	2.95	245	3.13	9.1	1360	0.8
6/12/2019	Detection	0.329	2.96	233	3.55	8.3	1410	0.9

Notes:

mg/L: milligrams per liter

SU: standard unit

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

J: Estimated value. Parameter was detected at concentration below the reporting limit

--: Not analyzed

**Table 1 - Groundwater Data Summary: MW-1103F
Mitchell - 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
6/15/2016	Background	0.16	8.03	639	0.029	0.02	1.0	0.351	1.10	3.11	0.674	0.012	<0.002 U	10.1	0.2	0.01 J
8/2/2016	Background	0.14	7.01	704	0.026	0.01 J	0.9	0.299	0.899	3.20	0.479	0.016	<0.002 U	2.61	0.2	<0.01 U
10/3/2016	Background	0.04 J	5.80	558	0.01 J	0.03	0.4	0.180	1.026	3.34	0.313	0.016	<0.004 U	2.66	0.1 J	0.01 J
11/16/2016	Background	0.10	7.71	723	0.01 J	0.009 J	0.471	0.159	1.57	2.96	0.218	0.015	<0.002 U	2.57	0.1	<0.01 U
2/15/2017	Background	0.03 J	7.67	631	0.009 J	0.008 J	0.336	0.147	1.416	3.07	0.213	0.016	<0.002 U	2.81	0.09 J	0.03 J
4/11/2017	Background	0.07	8.46	618	0.006 J	0.006 J	0.262	0.102	2.183	3.05	0.088	0.015	<0.002 U	3.19	0.1	<0.01 U
5/23/2017	Background	0.03 J	7.85	688	0.006 J	0.007 J	0.26	0.149	1.214	3.23	0.194	0.006	<0.002 U	2.80	0.06 J	<0.01 U
7/26/2017	Background	0.02 J	6.81	562	<0.004 U	0.007 J	0.112	0.136	1.798	3.24	0.103	0.015	<0.002 U	5.46	0.07 J	0.02 J

Notes:

µg/L: micrograms per liter

SU: standard unit

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

J: Estimated value. Parameter was detected at concentration below the reporting limit

--: Not analyzed

pCi/L: picocuries per liter

**Table 1 - Groundwater Data Summary: MW-1104R
Mitchell - LF
Appendix III Constituents**

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Total Dissolved Solids	Sulfate
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
6/21/2016	Background	0.431	39.4	485	1.18	7.87	2390	162

Notes:

mg/L: milligrams per liter

SU: standard unit

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

J: Estimated value. Parameter was detected at concentration below the reporting limit

- -: Not analyzed

Mitchell - 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
6/21/2016	Background	0.66	4.35	182	0.57	0.18	3.4	4.36	0.153	1.18	9.41	0.014	<0.09 U	42.3	2.3	0.133

Notes:

µg/L: micrograms per liter

SU: standard unit

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

J: Estimated value. Parameter was detected at concentration below the reporting limit

- -: Not analyzed

pCi/L: picocuries per liter

Table 1 - Groundwater Data Summary: MW-1502R

Mitchell - LF

Appendix III Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Total Dissolved Solids	Sulfate
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
6/20/2016	Background	0.268	71.5	33.4	0.18	7.3	474	155
8/9/2016	Background	0.160	95.4	34.0	0.17	7.3	547	187
9/27/2016	Background	0.376	103	39.7	0.1 J	7.4	560	183
11/9/2016	Background	0.214	87.3	25.4	0.1 J	7.4	551	186
2/15/2017	Background	0.069	90.0	167	0.16	7.5	564	90.1
4/12/2017	Background	0.075	72.2	79.5	0.16	7.6	507	102
5/23/2017	Background	0.100	73.9	52.4	0.17	7.6	466	118
7/25/2017	Background	0.158	61.7	18.8	0.20	7.3	358	88.6
10/11/2017	Detection	0.132	91.0	24.5	0.1 J	7.3	535	159
1/11/2018	Detection	--	240	--	--	7.0	--	149
4/10/2018	Detection	0.051	78.3	196	0.19	7.4	616	87.6
8/29/2018	Detection	0.150	95.7	99.3	0.17	7.7	650	167
5/2/2019	Detection	0.1 J	93.6	245	0.17	8.5	702	105
6/12/2019	Detection	0.127	80.7	155	0.23	7.3	661	114

Notes:

mg/L: milligrams per liter

SU: standard unit

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

J: Estimated value. Parameter was detected at concentration below the reporting limit

--: Not analyzed

Table 1 - Groundwater Data Summary: MW-1502R

Mitchell - 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
6/20/2016	Background	0.22	0.28	30.6	<0.005 U	0.005 J	0.3	0.082	0.143	0.18	0.064	0.002	<0.09 U	3.48	8.2	0.01 J
8/9/2016	Background	0.20	0.26	34.1	<0.005 U	0.006 J	0.3	0.068	1.029	0.17	0.089	0.010	<0.002 U	8.71	7.4	<0.01 U
9/27/2016	Background	0.16	0.27	38.2	<0.005 U	0.004 J	0.4	0.076	0.429	0.1 J	0.064	0.012	<0.002 U	8.40	8.8	<0.01 U
11/9/2016	Background	0.20	0.84	44.2	0.062	0.009 J	1.44	0.507	2.497	0.1 J	0.764	0.006	<0.002 U	3.19	5.3	0.03 J
2/15/2017	Background	0.13	0.24	27.7	0.006 J	<0.004 U	1.90	0.069	2.61	0.16	0.061	0.009	<0.002 U	1.84	4.3	0.03 J
4/12/2017	Background	0.13	0.69	29.2	0.053	0.008 J	1.20	0.426	0.613	0.16	0.630	0.015	0.002 J	1.91	4.8	0.02 J
5/23/2017	Background	0.15	0.53	32.2	0.033	<0.005 U	0.918	0.238	0.647	0.17	0.364	0.002	<0.002 U	2.46	4.7	0.01 J
7/25/2017	Background	0.21	0.30	19.0	0.008 J	<0.005 U	0.196	0.082	0.6323	0.20	0.088	0.009	<0.002 U	2.47	3.2	0.03 J

Notes:

µg/L: micrograms per liter

SU: standard unit

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

J: Estimated value. Parameter was detected at concentration below the reporting limit

- -: Not analyzed

pCi/L: picocuries per liter

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

CCR Management Unit	Monitoring Well Pair	Well Diameter (inches)	2019-05		2019-06	
			Vertical Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Vertical Groundwater Velocity (ft/year)	Groundwater Residence Time (days)
Landfill	MW1101F/R ^[1]	2.0	2.4	26	2.4	25
	MW1102F/R ^[1]	2.0	1.4	43	1.4	45
	MW1103F/R ^[2]	2.0	1.8	35	1.7	35
	MW1104F/R ^[2]	2.0	0.8	80	0.8	76
	MW1501F/R ^[3]	4.0	2.2	56	2.2	56
	MW1502R ^[3]	4.0	NC	NC	NC	NC
	MW1503F/R ^[3]	4.0	1.3	93	1.3	93

Notes:

[1] - Sidegradient Well

[2] - Background Well

[3] - Downgradient Well

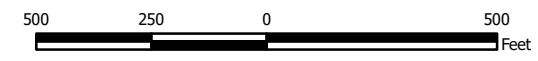
NC - No calculation can be generated



- Legend**
- ◆ Compliance Sampling Location
 - ◆ Upgradient Sampling Location
 - CCR Landfill (Approximate Limits of Waste)

Notes

- Monitoring well coordinates provided by AEP.
- Site features based on information available in the Groundwater Monitoring Network Evaluation (CEC, 2016) provided by AEP.



<p>Site Layout Landfill - Fish Creek Aquifer</p> <p>Mitchell Power Generation Plant Marshall County, West Virginia</p>		<p>Figure 1a</p>
<p>Geosyntec consultants</p>		
<p>Columbus, Ohio</p>	<p>2018/01/26</p>	

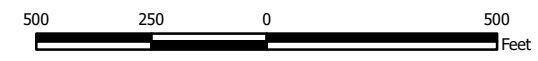


Legend

- ◆ Compliance Sampling Location
- ◆ Upgradient Sampling Location
- CCR Landfill (Approximate Limits of Waste)

Notes

- Monitoring well coordinates provided by AEP.
- Site features based on information available in the Groundwater Monitoring Network Evaluation (CEC, 2016) provided by AEP.



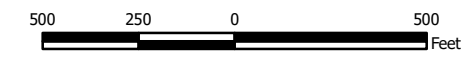
Site Layout	
Landfill - Rush Run Aquifer	
Mitchell Power Generation Plant Marshall County, West Virginia	
Geosyntec consultants	
Columbus, Ohio	2018/01/26
Figure 1b	



- Legend**
- ⊕ Groundwater Monitoring Well
 - Groundwater Flow Direction
 - Groundwater Elevation Contour
 - - - Groundwater Elevation Contours (Inferred)

Notes

- Monitoring well coordinates and water level data (collected on May 1-2, 2019) provided by AEP.
- Site features based on information available in the Groundwater Monitoring Network Evaluation (AMEC, 2016) provided by AEP.
- Groundwater elevation units are feet above mean sea level (NAVD 88).



**Potentiometric Surface Map - Fish Creek
May 2019**

Mitchell Power Generation Plant
Marshall County, West Virginia

Geosyntec
consultants

Columbus, Ohio

2019/12/13

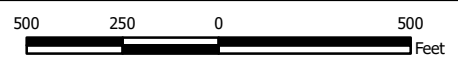
Figure
2



- Legend**
- ⊕ Groundwater Monitoring Well
 - Groundwater Flow Direction
 - Groundwater Elevation Contour
 - - - Groundwater Elevation Contour (Inferred)

Notes

- Monitoring well coordinates and water level data (collected on May 1-2, 2019) provided by AEP.
- Site features based on information available in the Groundwater Monitoring Network Evaluation (CEC, 2016) provided by AEP.
- Groundwater elevation units are feet above mean sea level (NAVD 88).



**Potentiometric Surface Map - Rush Run
May 2019**

Mitchell Power Generation Plant
Marshall County, West Virginia



Columbus, Ohio 2019/12/13

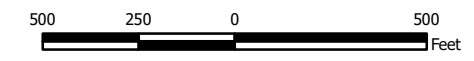
Figure
3



- Legend**
- ⊕ Groundwater Monitoring Well
 - ➔ Groundwater Flow Direction
 - Groundwater Elevation Contour
 - - - Groundwater Elevation Contours (Inferred)

Notes

- Monitoring well coordinates and water level data (collected on June 12, 2019) provided by AEP.
- Site features based on information available in the Groundwater Monitoring Network Evaluation (AMEC, 2016) provided by AEP.
- Groundwater elevation units are feet above mean sea level (NAVD 88).



**Potentiometric Surface Map - Fish Creek
June 2019**

Mitchell Power Generation Plant
Marshall County, West Virginia

Geosyntec
consultants

Columbus, Ohio

2020/01/29

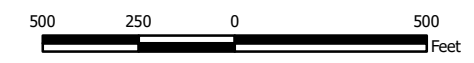
Figure
4



- Legend**
- ⊕ Groundwater Monitoring Well
 - Groundwater Flow Direction
 - Groundwater Elevation Contour
 - - - Groundwater Elevation Contour (Inferred)

Notes

- Monitoring well coordinates and water level data (collected on June 12, 2019) provided by AEP.
- Site features based on information available in the Groundwater Monitoring Network Evaluation (CEC, 2016) provided by AEP.
- Groundwater elevation units are feet above mean sea level (NAVD 88).



**Potentiometric Surface Map - Rush Run
June 2019**

Mitchell Power Generation Plant
Marshall County, West Virginia

Geosyntec
consultants

Columbus, Ohio 2020/01/29

Figure
5

APPENDIX 2 - Statistical Analyses

The memorandum summarizing the September 2019 statistical evaluation follows.

Memorandum

Date: September 4, 2019

To: David Miller (AEP)

Copies to: Justin Jent (AEP)

From: Allison Kreinberg and Bruce Sass, Ph.D. (Geosyntec)

Subject: Evaluation of Detection Monitoring Data at
Mitchell 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 at the Landfill (LF), an existing CCR unit at the Mitchell Power Plant located in Moundsville, West Virginia was completed on May 1-2, 2019. Based on the results, verification sampling was completed on June 12, 2019.

Eight background monitoring events were conducted at the Mitchell LF prior to these detection monitoring events, and 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 background values are described in Geosyntec's *Statistical Analysis Summary* report, dated January 15, 2018.

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). In practice, if the initial result did not exceed the UPL, a second sample was not collected or analyzed.

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

- Chloride concentrations exceeded the intrawell UPL of 14.1 mg/L in both the initial (15.2 mg/L) and second (14.9 mg/L) samples collected at MW-1102F. Therefore, an SSI over background is concluded for chloride at MW-1102F.
- Total Dissolved Solids (TDS) concentrations exceeded the intrawell UPL of 551 mg/L in both the initial (577 mg/L) and second (574 mg/L) samples collected at MW-1102F. Therefore, an SSI over background is concluded for TDS at MW-1102F.

In response to the exceedances noted above, the Mitchell LF CCR unit will either transition to assessment monitoring or an alternative source demonstration (ASD) for chloride and TDS will be conducted in accordance with 40 CFR 257.94(e)(2). If the ASD is successful, the Mitchell 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 Evaluation
Mitchell Plant - Landfill**

Geosyntec Consultants, Inc.

Parameter	Units	Description	MW-1101R		MW-1102F		MW-1502R	
			5/1/2019	6/12/2019	5/1/2019	6/12/2019	5/2/2019	6/12/2019
Boron	mg/L	Intrawell Background Value (UPL)	0.651		0.320		0.467	
		Detection Monitoring Data	0.376	--	0.126	--	0.100	--
Calcium	mg/L	Intrawell Background Value (UPL)	25.0		6.22		121	
		Detection Monitoring Data	1.9	--	4.69	--	93.6	--
Chloride	mg/L	Intrawell Background Value (UPL)	18.6		14.1		213	
		Detection Monitoring Data	16.9	--	15.2	14.9	245	155
Fluoride	mg/L	Intrawell Background Value (UPL)	3.49		0.67		0.25	
		Detection Monitoring Data	2.62	--	0.66	--	0.17	--
pH	SU	Intrawell Background Value (UPL)	9.1		8.6		7.7	
		Intrawell Background Value (LPL)	7.8		7.5		7.1	
		Detection Monitoring Data	10.5	8.8	9.5	8.2	8.5	7.4
Sulfate	mg/L	Intrawell Background Value (UPL)	67.3		47.1		259	
		Detection Monitoring Data	28.7	--	37.6	--	105	--
TDS	mg/L	Intrawell Background Value (UPL)	1600		551		696	
		Detection Monitoring Data	809	--	577	574	702	661

Notes

UPL: Upper prediction limit

LPL: Lower prediction limit

TDS: Total dissolved solids

Bold values exceed the background value.

Background values are shaded gray.

ATTACHMENT A

Certification by Qualified Professional Engineer

CERTIFICATION BY QUALIFIED PROFESSIONAL ENGINEER

I certify that the selected statistical method, described above and in the January 15, 2018 *Statistical Analysis Summary* report, is appropriate for evaluating the groundwater monitoring data for the Mitchell LF CCR management area and that the requirements of 40 CFR 257.93(f) have been met.

DAVID ANTHONY MILLER

Printed Name of Licensed Professional Engineer

David Anthony Miller

Signature



22663

License Number

WEST VIRGINIA

Licensing State

09.06.2019

Date

APPENDIX 3 – Alternative Source Demonstrations

The November 2019 ASD report follows.

ALTERNATIVE SOURCE DEMONSTRATION REPORT FEDERAL CCR RULE

Mitchell Plant Landfill Marshall County, West Virginia

Submitted to



1 Riverside Plaza
Columbus, Ohio 43215-2372

Submitted by



engineers | scientists | innovators

941 Chatham Lane, Suite 103
Columbus, Ohio 43221

November 26, 2019

CHA8462

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Figure 3	Leachate and MW-1102F Concentration Comparison
Figure 4	Leachate and MW-1102F Mixing Model
Figure 5	Boron and Sulfate Time Series Graphs

LIST OF ATTACHMENTS

Attachment A	Certification by a Qualified Professional Engineer
--------------	--

LIST OF ACRONYMS AND ABBREVIATIONS

AEP	American Electric Power
ASD	Alternative Source Demonstration
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
EPA	Environmental Protection Agency
LPL	Lower Prediction Limit
QC	Quality Control
SSI	Statistically Significant Increase
TDS	Total Dissolved Solids
UPL	Upper Prediction Limit
USEPA	United States Environmental Protection Agency

SECTION 1

INTRODUCTION AND SUMMARY

Statistically significant increases (SSIs) in groundwater were identified for chloride and total dissolved solids (TDS) at MW-1102F during the first semi-annual detection monitoring event of 2019. This report presents an alternative source demonstration (ASD) which documents that the SSIs should not be attributed to the Mitchell Plant Landfill.

Following completion of eight background monitoring events at the Mitchell Landfill, upper prediction limits (UPLs) were calculated for each Appendix III parameter to represent background values. A lower prediction limit (LPL) was also calculated for pH. Prediction limits were calculated based on a one-of-two retesting procedure. With this procedure, an SSI is concluded only if both samples in a series of two exceeds the UPL, or in the case of pH is above the LPL. In practice, if the initial result did not result in an exceedance, a second sample was not collected or analyzed.

The first semi-annual detection monitoring event of 2019 at the Landfill was performed in May 2019 (initial sampling event) and June 2019 (verification sampling event) and the results were compared to the calculated prediction limits. 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) states the following:

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.

The first semi-annual detection monitoring event for 2019 was completed in May and June 2019 at the Mitchell Plant Landfill. Pursuant to 40 CFR 257.94(e)(2), Geosyntec Consultants, Inc. (Geosyntec) has prepared this ASD report, which documents that the SSIs cited above should not be attributed to the Landfill.

1.2 **Demonstration of Alternative Sources**

An evaluation was completed to assess possible alternative sources to which identified SSIs could be attributed. Alternative sources were identified amongst five types:

- 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 show that the increases in constituent concentrations were based on Type IV causes and not by a release from the Landfill.

SECTION 2

ALTERNATIVE SOURCE DEMONSTRATION

The Federal CCR Rule (40 CFR 257) allows the owner or operator 90 days from the determination of an SSI to demonstrate that a source other than the CCR unit caused the SSI. A brief description of the site geology, ASD evaluation methodology, and the proposed alternative source are described below.

2.1 Site Geology

According to the monitoring well network report, the local geology consists of sandstone units separated by sharp contacts with shale or coal seams (CEC, 2016). From top to bottom, the named sandstone units underlying the Landfill include: the Burton Sandstone, the Fish Creek Sandstone, the Rush Run Sandstone, the Jollytown Sandstone, and the Hundred Sandstone. The Burton Sandstone was not identified as a hydrostatic unit that required monitoring because the unit is not water-bearing upgradient of the Landfill.

2.2 Groundwater Monitoring History

Groundwater at the Landfill has been monitored under the West Virginia Solid Waste Management Rule (33CSR1) since 2012, which is prior to construction of the Landfill in 2013 and the initial waste placement in 2014 (CEC, 2016). Background monitoring under the Federal CCR Rule began in 2016. Wells set within both the Fish Creek Sandstone and Rush Run Sandstone are included in the monitoring network for the Federal program (CEC, 2016). The well of concern (MW-1102F) is set within the Fish Creek Formation. While there are two background wells set within the Fish Creek Formation (MW-1103F and MW-1104F), only MW-1103F consistently produced water during sampling completed under the Federal program. A site map showing the location of Fish Creek Formation monitoring wells is provided in Figure 1.

2.3 Proposed Alternative Source

An initial review of sampling and laboratory data did not identify any Type I (sampling) errors. A review of the laboratory and statistical analyses did not identify any Type II or III issues. An initial review of site geochemistry identified natural variation (Type IV) as the source of the observed chloride and TDS SSIs at well MW-1102F.

2.3.1 Comparison to Background Concentrations

Chloride and TDS at the Landfill are both monitored using intrawell prediction limits. However, a comparison of the reported concentrations for both parameters between MW-1102F and background well MW-1103F shows that concentrations at the background location have consistently been higher (Figure 2). While chloride concentrations are consistently around 250 mg/L at background well MW-1103F, chloride concentrations at downgradient well MW-1102F

have not exceeded 20 mg/L. Similarly, TDS concentrations at MW-1102F are consistently several hundred milligrams per liter lower than the concentrations observed at the background location. Thus, the changes in chloride and TDS concentrations at MW-1102F likely represent natural variation in the dilution of ion-rich groundwater as it moves through the aquifer.

2.3.2 Comparison of Groundwater Chemistry to Landfill Leachate

The average concentrations of all major cations and anions are higher in the Landfill leachate than in the groundwater at MW-1102F (Table 2). These data are also shown graphically in Figure 3. Boron and sulfate concentrations are both several orders of magnitude higher in the leachate compared to the average concentration at MW-1102F, whereas the difference in chloride concentrations is less than two orders of magnitude.

A mixing model was created to illustrate how concentrations at MW-1102F would be expected to change if there were a release from the Landfill. Groundwater data at MW-1102F collected under the state program in February 2012, which is prior to waste placement, was used to represent initial conditions at the monitoring location. The sample was mixed with leachate data at varying ratios, and the output was compared to the actual groundwater concentrations at MW-1102F in July 2017, which was the last sample collected under the Federal program where data for all major cations and anions were available.

A slight increase in chloride would be expected if leachate were mixing with groundwater as shown in Figure 4. However, a greater increase in sulfate and boron would be expected, based on the multiple order of magnitude difference in initial concentrations between the leachate and the groundwater. Additionally, both boron and sulfate are conservative species that are not readily attenuated. Time series graphs for boron and sulfate at MW-1102F are provided in Figure 5. While there may be seasonal effects on boron concentrations at MW-1102F, the concentrations remain below the Federal intrawell UPL and do not appear to be consistently trending upwards as would be expected if there were a release from the Landfill. Concentrations of sulfate at MW-1102F remain below both those reported for initial sampling prior to waste placement and the Federal intrawell UPL.

Additionally, if leachate were mixing with groundwater at MW-1102F, then the concentrations of calcium and magnesium would also have increased (Figure 4). Results of the mixing calculation show that the opposite occurred: calcium and magnesium concentrations decreased between February 2012 and July 2017 (Figure 4). The relatively stable and low concentrations of boron and sulfate at MW-1102F and the lack of increases in other cations suggest that the well is not impacted by a release from the Landfill.

2.4 Sampling Requirements

As the ASD described above supports the position that the identified SSIs are not due to a release from the Mitchell Landfill, the unit will remain in the detection monitoring program. Groundwater at the unit will be sampled for Appendix III parameters on a semi-annual basis.

SECTION 3

CONCLUSIONS

This ASD has been prepared in accordance with 40 CFR 257.94(e)(2) and supports the conclusion that the SSIs for chloride and TDS observed during the first semiannual sampling event of 2019 are not due to a release from the Mitchell Landfill. The observed chloride and TDS SSIs were instead attributed to natural variation. Therefore, no further action is warranted and the Mitchell Landfill will remain in the detection monitoring program. Certification of this ASD by a qualified professional engineer is provided in Attachment A.

SECTION 4

REFERENCES

- Civil & Environmental Consultants, Inc. (CEC). 2016. CCR Groundwater Monitoring System Demonstration. Mitchell Landfill – Mitchell Power Generation Plant. March.
- U.S. EPA, 2015. Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities (Final Rule). Fed. Reg. 80 FR 21301, pp. 21301-21501, 40 CFR Parts 257 and 261, April.

TABLES

**Table 1: Detection Monitoring Data Evaluation
Mitchell Plant - Landfill**

Parameter	Units	Description	MW-1101R		MW-1102F		MW-1502R	
			5/1/2019	6/12/2019	5/1/2019	6/12/2019	5/2/2019	6/12/2019
Boron	mg/L	Intrawell Background Value (UPL)	0.651		0.320		0.467	
		Detection Monitoring Data	0.376	--	0.126	--	0.100	--
Calcium	mg/L	Intrawell Background Value (UPL)	25.0		6.22		121	
		Detection Monitoring Data	1.9	--	4.69	--	93.6	--
Chloride	mg/L	Intrawell Background Value (UPL)	18.6		14.1		213	
		Detection Monitoring Data	16.9	--	15.2	14.9	245	155
Fluoride	mg/L	Intrawell Background Value (UPL)	3.49		0.67		0.25	
		Detection Monitoring Data	2.62	--	0.66	--	0.17	--
pH	SU	Intrawell Background Value (UPL)	9.1		8.6		7.7	
		Intrawell Background Value (LPL)	7.8		7.5		7.1	
		Detection Monitoring Data	10.5	8.8	9.5	8.2	8.5	7.4
Sulfate	mg/L	Intrawell Background Value (UPL)	67.3		47.1		259	
		Detection Monitoring Data	28.7	--	37.6	--	105	--
TDS	mg/L	Intrawell Background Value (UPL)	1600		551		696	
		Detection Monitoring Data	809	--	577	574	702	661

Notes

UPL: Upper prediction limit

LPL: Lower prediction limit

TDS: Total dissolved solids

Bold values exceed the background value.

Background values are shaded gray.

**Table 2: Leachate and MW-1102F Concentration Comparison
Mitchell Plant - Landfill**

	Leachate	MW-1102F
Boron	66.7	0.168
Calcium	342	5.21
Chloride	464	13.6
Fluoride	2.20	0.635
pH	8.7	8.3
Sulfate	8917	35.0
TDS	13140	576
Sodium	1806	228
Potassium	222	1.58

Notes:

TDS - Total dissolved solids

Average concentrations are shown for all parameters.

All concentrations except pH are shown in milligrams per liter (mg/L).

pH is reported as standard units (SU).

FIGURES

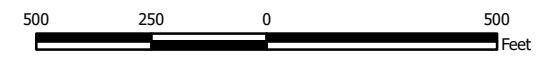


Legend

- ◆ Compliance Sampling Location
- ◆ Upgradient Sampling Location
- CCR Landfill (Approximate Limits of Waste)

Notes

- Monitoring well coordinates provided by AEP.
- Site features based on information available in the Groundwater Monitoring Network Evaluation (CEC, 2016) provided by AEP.



**Fish Creek Formation
Site Layout**

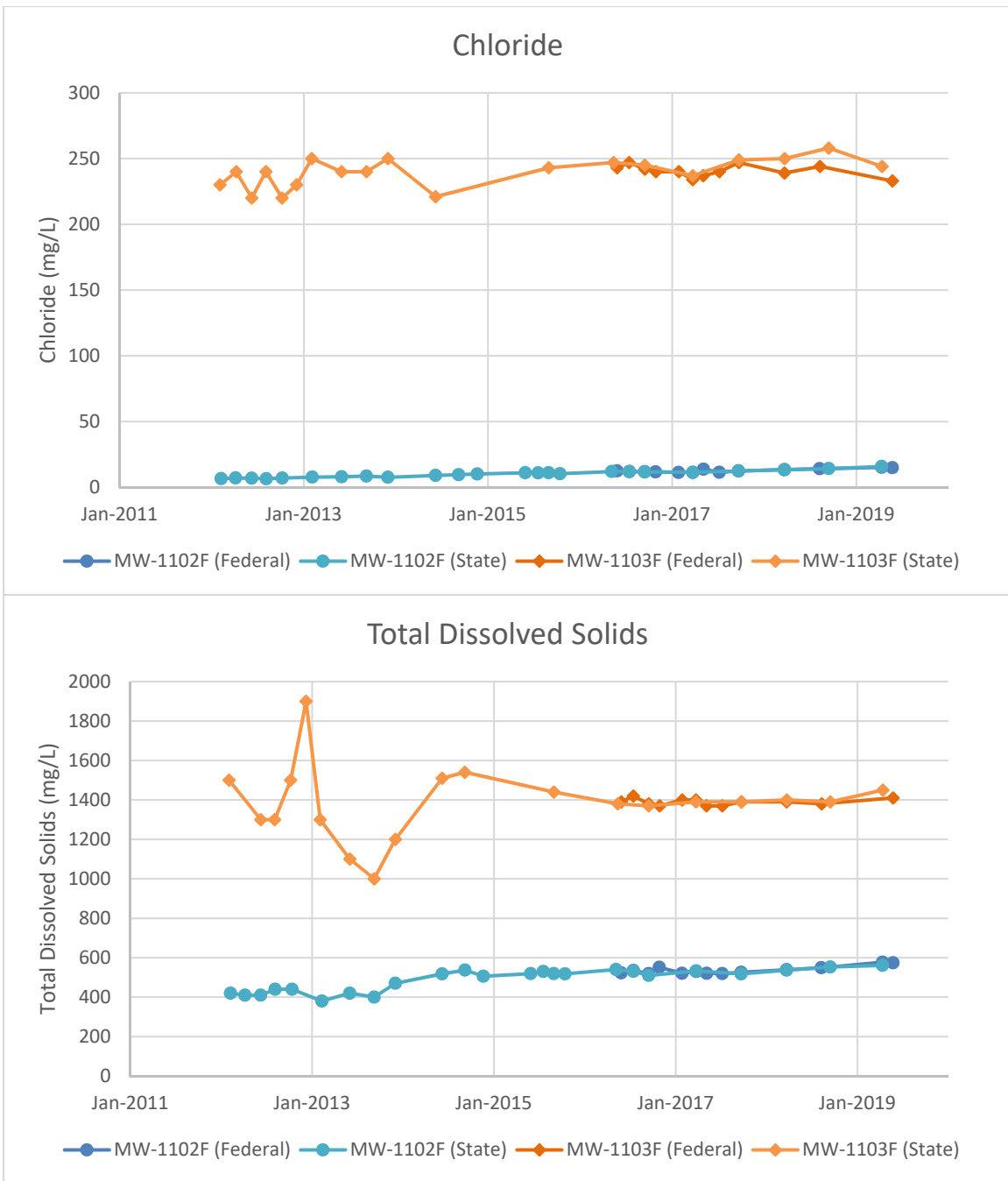
Mitchell Power Generation Plant
Marshall County, West Virginia

Geosyntec
consultants

Columbus, Ohio

20-Nov-2019

Figure
1



Notes: Data are shown for both the federal and state monitoring program. MW-1103F is a background monitoring location for the Fish Creek Formation. Downgradient location MW-1102F is also screened in the Fish Creek Formation.

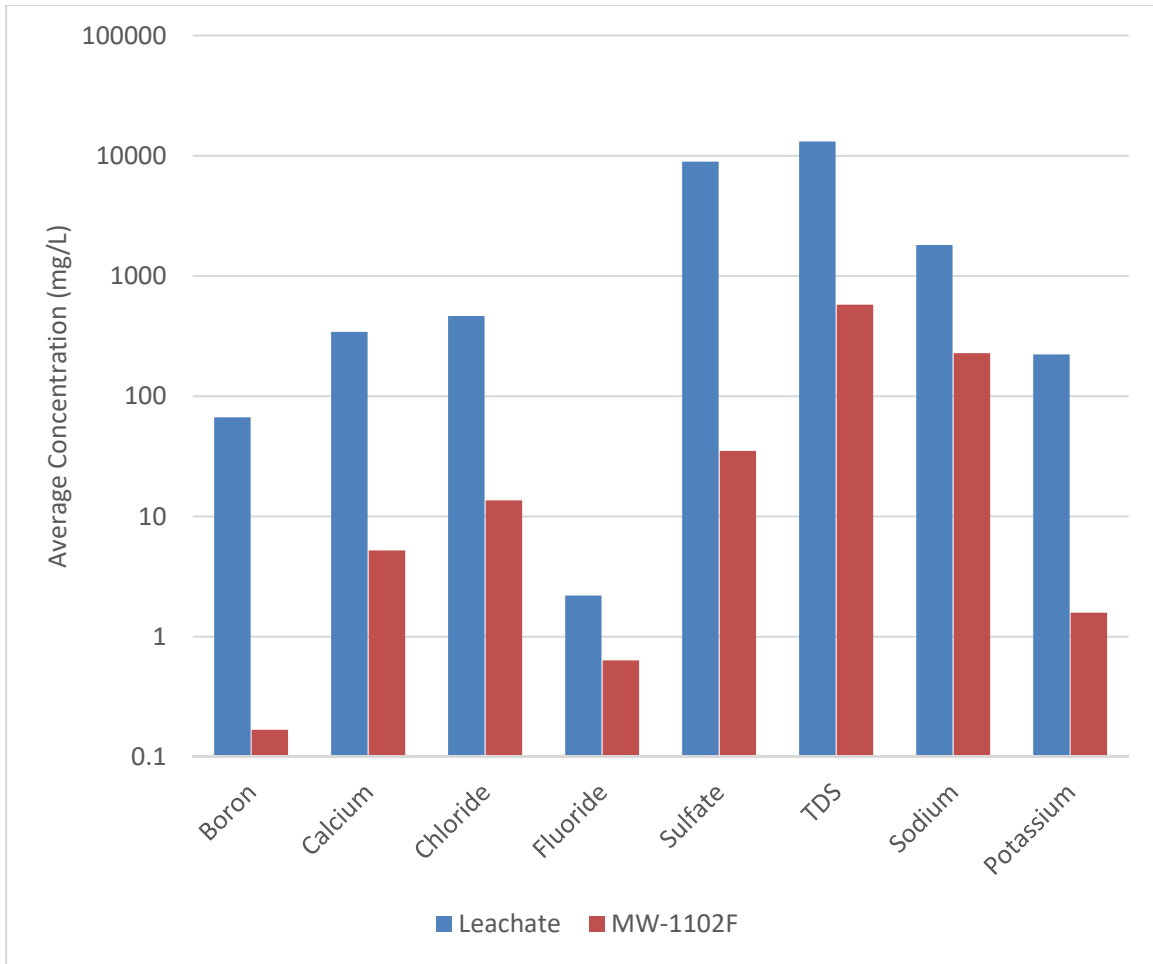
Chloride and TDS Time Series Graphs
Mitchell Landfill



Columbus, Ohio

20-Nov-2019

Figure
2



Notes: pH is not shown, as it is measured in log scale. The average concentration for samples collected during the Federal monitoring program at MW-1102F are shown. Leachate data were collected under the state monitoring program.

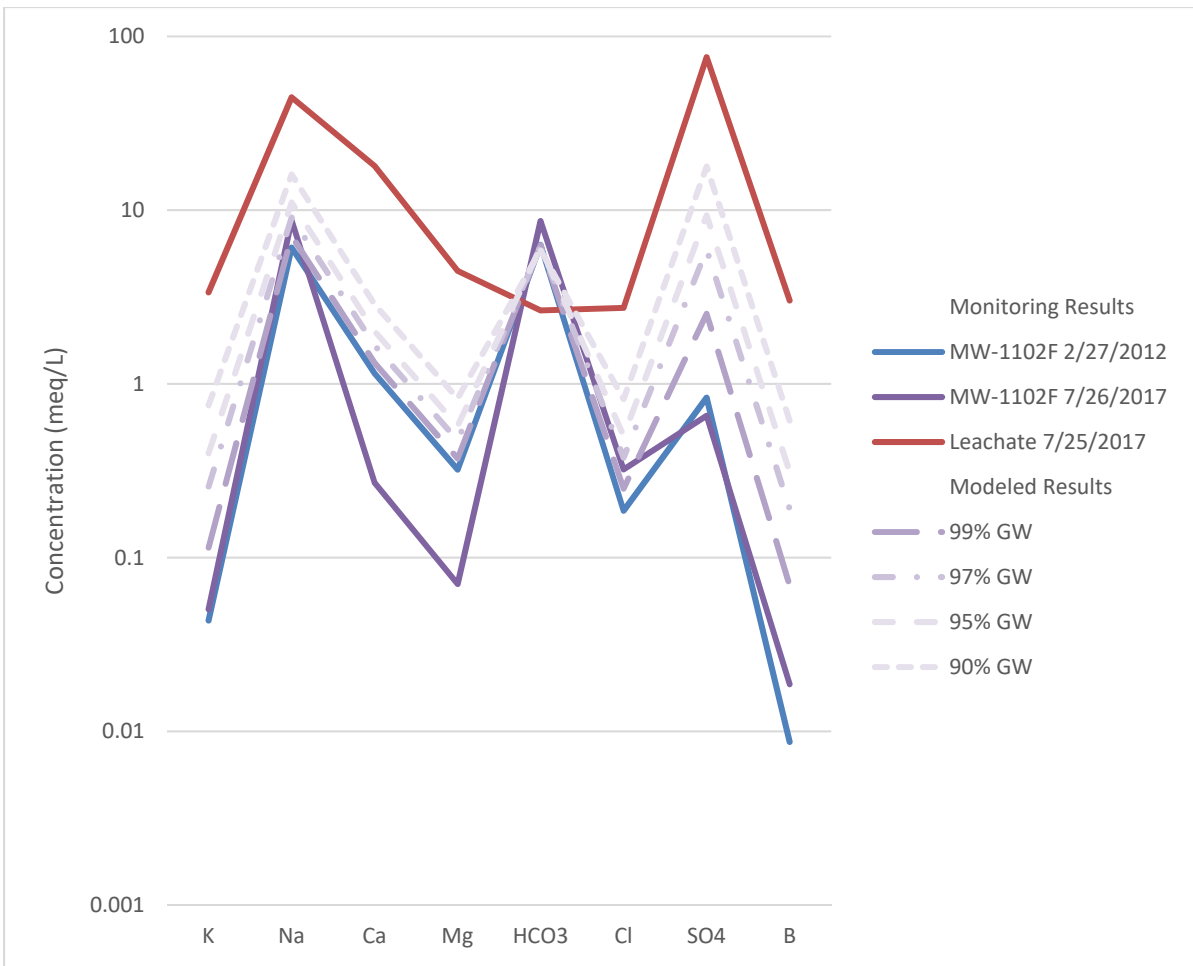
Leachate and MW-1102F Concentration Comparison
Mitchell Landfill



Figure
3

Columbus, Ohio

20-Nov-2019



Notes: Solid lines represent reported concentrations for MW-1120F in 2012 (prior to waste placement) and for MW-1120F and Landfill leachate in 2017. Dashed lines represent output of a mixing model for MW-1120F data from 2012 mixed with leachate at varying ratios.

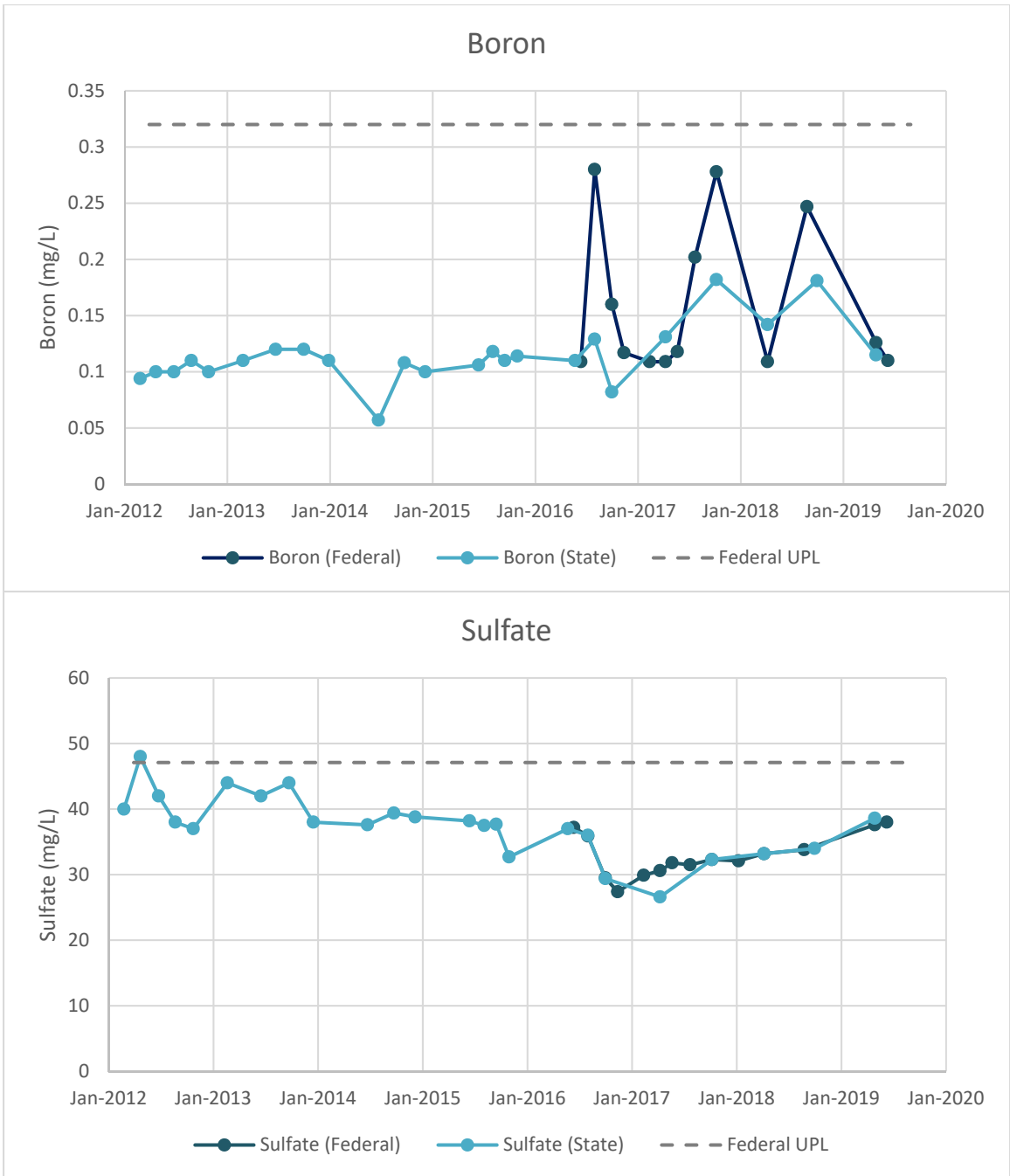
Leachate and MW-1102F Mixing Model
Mitchell Landfill



Figure
4

Columbus, Ohio

20-Nov-2019



Notes: Data are shown for both the Federal and state monitoring program. UPLs shown were calculated for the Federal monitoring program.

Boron and Sulfate Time Series Graphs
Mitchell Landfill



Figure
5

Columbus, Ohio

20-Nov-2019

ATTACHMENT A

**CERTIFICATION BY A QUALIFIED
PROFESSIONAL ENGINEER**

CERTIFICATION BY A QUALIFIED PROFESSIONAL ENGINEER

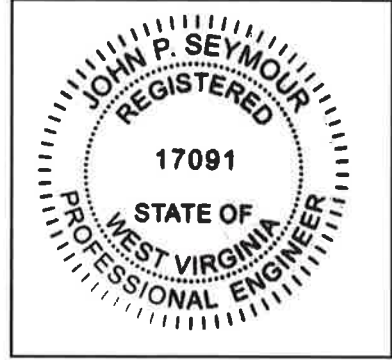
I certify that the selected and above described alternative source demonstration is appropriate for evaluating the groundwater monitoring data for the Mitchell Landfill CCR management area and that the requirements of 40 CFR 257.94(e)(2) have been met.

John Seymour

Printed Name of Licensed Professional Engineer



Signature



017091

License Number

West Virginia

Licensing State

12/2/2019

Date

APPENDIX 4 - Notices for Monitoring Program Transitions

No transition between monitoring requirements occurred in 2019; the CCR unit remained in detection monitoring over the entire year. Notices for monitoring program transitions are not applicable at this time.

APPENDIX 5 - Well Installation/Decommissioning Logs

No monitoring wells installed or decommissioned in 2019. Well installation/decommissioning logs are not applicable at this time.