AMTECH Associates, L.L.C.
INNOVATION IN ENVIRONMENTAL SOLUTIONS

July 25, 2019

ADDENDUM NO. 1 - REVISED
2017 Annual Groundwater Monitoring and Corrective Action Report

Springerville Generating Station (SGS)
Tucson Electric Power Co. (TEP)
Springerville, Apache County, Arizona

AMTECH Associates L.L.C. (AMTECH) has prepared this revised Addendum to the 2017 Annual Groundwater Monitoring and Corrective Action Report (2017 Annual Report) for the Tucson Electric Power (TEP) Springerville Generating Station (SGS). This replaces the earlier version of Addendum No. 1 prepared on July 18, 2018. The 2017 Annual Report, dated January 31, 2018, presented: ambient monitoring data for the SGS coal combustion residuals (CCR) monitoring well network; numeric limits for each well-constituent pair in all five CCR wells, pursuant to 40 CFR §257.93; and summarized results of the first semiannual sample collected under detection monitoring status for comparison against the numeric limits. The first semiannual sampling event under the regular Detection Monitoring program was conducted on July 8 and July 9, 2017, and results were presented in Table 3 of the 2017 Annual Report.

This revised Addendum presents: 1) revised prediction limits; 2) corrections to typographical errors; and 3) corrects reporting errors by TestAmerica. Tables 2, 3, and 4 of the 2017 Annual Report were updated as a result and are included in this Addendum.

As discussed in the 2017 Annual Report, the results for two well-constituent pairs, 2D-Sulfate and 3D-Sulfate, appeared to have non-normal distributions, even though the numeric results were similar to those of other well-sulfate pairs. Review of the results by TestAmerica revealed that sulfate results had been reported to only two significant digits. AMTECH suspected that this manner of reporting may have been the reason why the data for these two well-sulfate pairs did not fit a normal distribution. Upon request, TestAmerica revised the sulfate results to three significant digits[1]. The updated sulfate data are presented in the revised Table 2 (**Attachment I**).

Following these revisions, AMTECH revised the numeric limits for the 2D-sulfate and 3D-sulfate well-constituent pairs using the same equation described in Section 2.3.2 of the 2017 Annual Report to calculate prediction limits for the revised, *normally distributed data* of 2D-sulfate and 3D-sulfate. AMTECH also revised the prediction limits presented in the 2017 Annual Report after noting an inadvertent error in the Student t-test quantile calculation used to establish

[1] When TestAmerica revised the sulfate results, TestAmerica also revised the results for chloride and fluoride from two to three significant digits, though AMTECH only requested revisions for the sulfate results to calculate a more accurate limit for sulfate. As such, the revised values for chloride and fluoride were not applied in the calculations for detection limits, as Table 2 was already established using the original data at two significant digits. As confirmed earlier, even if the revised results had been used in the calculation of detection limits for these two parameters, there would not be a significant change in the previously established limits.

the prediction limits for all other well-constituent pairs (except pH, which had a different equation). The revised prediction limits are also presented in the revised Table 2 (**Attachment I**).

AMTECH also noted that TestAmerica did not report the metals for samples collected in November 2016 to the method detection limit as requested by TEP. TestAmerica revised that report and any metals originally reported as non-detects were corrected to reflect the values estimated by the laboratory method. Also, Table 4 of the 2017 Annual Report inadvertently reported non-detects as "0" for ambient monitoring results. These corrections have been made and non-detects have been revised to "ND" in the revised Table 4 (**Attachment I**). In addition, Table 4 was also revised to remove the data from the July 2018 sampling event, as it was not part of the 8 background samples.

Finally, a comparative review of the 2017 semiannual sample results with the revised prediction limits verified that there were no statistically significant increases (SSIs) in any well-constituent pair for that first 2017 semiannual sampling event. One typographical error was recently found for 1D-chloride, and its corrected value did not exceed the numeric limit and did not change the determination that there were no SSIs in the first semiannual sampling event. The revised Table 3 is presented in **Attachment I**.

ATTACHMENT I

Table 2 – Revised (from 2017 Annual Report)
Table 3 – Revised (from 2017 Annual Report)
Table 4 – Revised (from 2017 Annual Report)

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CERTIFICATION

The material and data in this report were prepared under the supervision and direction of the undersigned.

AMTECH Associates, L.L.C.

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Managing Member

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ATTACHMENT I

TABLE 2 - REVISED
(from 2017 Annual Report)

SUMMARY OF INITIAL GROUNDWATER MONITORING RESULTS FOR STATISTICAL ANALYSIS OF DETECTION MONITORING PARAMETERS

TABLE 3 - REVISED
(from 2017 Annual Report)

SUMMARY OF SEMIANNUAL GROUNDWATER MONITORING RESULTS FOR DETECTION MONITORING PARAMETERS

TABLE 4 - REVISED
(from 2017 Annual Report)

SUMMARY OF GROUNDWATER MONITORING RESULTS FOR ASSESSMENT MONITORING PARAMETERS

TABLE 2.

SUMMARY OF INITIAL GROUNDWATER MONITORING RESULTS FOR STATISTICAL ANALYSES OF DETECTION MONITORING PARAMETERS

TEP SGS CCR ASH LANDFILL

Well ID	Parameter	Units	Analytial Laboratory Report D								REVISED Numeric Limits (Detection Monitoring)	Units
			550-73080-1	550-74730-1	550-76756-1	550-78056-1	550-79968-1	550-81776-1	550-83310-1	550-84857-1		
			Sampling Date									
			11/15/2016	12/20/2016	01/31/2017	02/21/2017	3/28/2017	4/27/2017	5/23/2017	6/21/2017		
1U	Boron	mg/L	0 87	0.84	0 80	0.84	0 83	0.90	0 87	0.89	0.98	mg/L
1U	Calcium	mg/L	440	430	470	440	440	460	450	460	499	mg/L
1U	Chloride	mg/L	510	470	520	520	500	480	470	460	581	mg/L
1U	Fluoride	mg/L	2.9	3.0	2.7	2.8	2.8	3.1	2.8	2.9	3.4	mg/L
1U	pH	SU	7.0	6.6	6.9	6.9	7.0	6.7	6.7	6.6	5.8-7.3	SU
1U	Sulfate	mg/L	1,240	1,190	1,270	1,250	1,250	1,220	1,260	1,310	1,379	mg/L
1U	TDS	mg/L	3,000	3,100	3,100	2,800	3,000	3,000	3,200	2,800	3,525	mg/L
2U	Boron	mg/L	1.1	1.2	1.1	1.1	1.1	1.2	1.1	1.2	1.33	mg/L
2U	Calcium	mg/L	660	690	680	680	670	710	690	710	752	mg/L
2U	Chloride	mg/L	450	410	460	460	440	420	450	410	516	mg/L
2U	Fluoride	mg/L	2.4	2.5	2.1	2.1	2.1	2.7	2.2	2.3	3.1	mg/L
2U	pH	SU	6.8	6.4	6.7	6.7	6.6	6.5	6.5	6.4	6.0-7.6	SU
2U	Sulfate	mg/L	1,880	1,820	1,860	1,840	1,910	1,850	1,960	1,990	2,112	mg/L
2U	TDS	mg/L	4,000	4,000	4,000	3,900	3,900	3,900	3,900	3,900	4,130	mg/L
1D	Boron	mg/L	0.78	0.86	0.78	0.83	0 82	0.87	0 85	0.89	0.98	mg/L
1D	Calcium	mg/L	350	450	440	420	450	430	420	440	546	mg/L
1D	Chloride	mg/L	480	450	490	490	500	460	440	490	557	mg/L
1D	Fluoride	mg/L	2.9	1.9	2.7	2.8	2.7	2.9	2.8	2.8	3.9	mg/L
1D	pH	SU	7.1	6.5	6.9	6.7	6.9	6.8	6.6	6.6	5.8-7.7	SU
1D	Sulfate	mg/L	957	1,160	1,050	1,130	1,230	1,180	1,110	1,290	1,523	mg/L
1D	TDS	mg/L	2,600	3,000	2,800	2,900	3,000	3,000	2,900	3,100	3,489	mg/L
2D	Boron	mg/L	0 91	0.86	0 85	0.89	0 88	0.91	0 94	0.95	1.03	mg/L
2D	Calcium	mg/L	630	610	660	630	620	630	650	640	693	mg/L
2D	Chloride	mg/L	530	480	530	530	530	480	510	490	596	mg/L
2D	Fluoride	mg/L	2.5	1.8	2.4	2.4	2.4	2.8	2.4	2.8	3.6	mg/L
2D	pH	SU	6.8	6.5	6.9	6.8	6.9	6.6	6.5	6.6	5.9-7.5	SU
2D	Sulfate	mg/L	1,730	1,660	1,690	1,690	1,690	1,690	1,790	1,820	1,929	mg/L
2D	TDS	mg/L	3,600	3,700	3,700	3,800	3,700	3,700	3,700	3,700	3,898	mg/L
3D	Boron	mg/L	0 83	0.85	0 87	0.87	0 83	0.90	0 89	0.90	0 97	mg/L
3D	Calcium	mg/L	410	430	400	440	420	430	450	430	486	mg/L
3D	Chloride	mg/L	530	470	530	540	540	490	480	500	615	mg/L
3D	Fluoride	mg/L	2.7	2.1	2.9	2.8	2.9	3.1	2.9	3.0	3.9	mg/L
3D	pH	SU	6.8	6.6	6.9	6.8	6.8	6.7	6.6	6.6	6.2-7.3	SU
3D	Sulfate	mg/L	1,290	1,210	1,260	1,280	1,280	1,240	1,270	1,330	1,402	mg/L
3D	TDS	mg/L	2,900	3,100	3,000	3,100	3,000	3,100	3,100	3,200	3,402	mg/L

Notes: Samples analyzed by TestAmerica. pH values measured by sampling team (Confluence).

Abbreviations: TDS - Total Dissolved Solids. mg/L - milligrams per liter. SU - standard units. NA - not analyzed.

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TABLE 3.

SUMMARY OF GROUNDWATER MONITORING RESULTS FOR EVALUATION OF DETECTION MONITORING PARAMETERS

TEP SGS CCR ASH LANDFILL

Well ID	Parameter	Units	Sample Date 7/8/2017 Results	REVISED Numeric Limits (Detection Monitoring)	Units
1U	Boron	mg/L	0.85	0.98	mg/L
1U	Calcium	mg/L	440	499	mg/L
1U	Chloride	mg/L	498	581	mg/L
1U	Fluoride	mg/L	3.05	3.4	mg/L
1U	pH	SU	6.6	5.8-7.3	SU
1U	Sulfate	mg/L	1,300	1,379	mg/L
1U	TDS	mg/L	3,300	3,525	mg/L
2U	Boron	mg/L	1.1	1.33	mg/L
2U	Calcium	mg/L	690	752	mg/L
2U	Chloride	mg/L	441	516	mg/L
2U	Fluoride	mg/L	2.62	3.1	mg/L
2U	pH	SU	6.4	6.0-7.6	SU
2U	Sulfate	mg/L	1,980	2,112	mg/L
2U	TDS	mg/L	4,000	4,130	mg/L
1D	Boron	mg/L	0.86	0.98	mg/L
1D	Calcium	mg/L	450	546	mg/L
1D	Chloride	mg/L	395	557	mg/L
1D	Fluoride	mg/L	2.4	3.9	mg/L
1D	pH	SU	6.5	5.8-7.7	SU
1D	Sulfate	mg/L	1,300	1,523	mg/L
1D	TDS	mg/L	3,200	3,489	mg/L
2D	Boron	mg/L	0.88	1.03	mg/L
2D	Calcium	mg/L	630	693	mg/L
2D	Chloride	mg/L	491	596	mg/L
2D	Fluoride	mg/L	2.84	3.6	mg/L
2D	pH	SU	6.6	5.9-7.5	SU
2D	Sulfate	mg/L	1,800	1,929	mg/L
2D	TDS	mg/L	3,800	3,898	mg/L
3D	Boron	mg/L	0.89	0.97	mg/L
3D	Calcium	mg/L	450	486	mg/L
3D	Chloride	mg/L	497	615	mg/L
3D	Fluoride	mg/L	3.1	3.9	mg/L
3D	pH	SU	6.6	6.2-7.3	SU
3D	Sulfate	mg/L	1,320	1,402	mg/L
3D	TDS	mg/L	3,200	3,402	mg/L

Notes: Samples analyzed by TestAmerica. pH values measured by sampling team (Confluence).

Abbreviations: TDS - Total Dissolved Solids. mg/L - milligrams per liter. SU - standard units.

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TABLE 4

SUMMARY OF GROUNDWATER MONITORING RESULTS FOR ASSESSMENT MONITORING PARAMETERS

TEP SGS CCR Ash Landfill

Well ID	Parameter	Units	SAMPLE DATE 11/15/2016 Results	SAMPLE DATE 12/20/2016 Results	SAMPLE DATE 01/31/2017 Results	SAMPLE DATE 02/21/2017 Results	SAMPLE DATE 3/28/2017 Results	SAMPLE DATE 4/27/2017 Results	SAMPLE DATE 5/23/2017 Results	SAMPLE DATE 6/21/2017 Results
1U	Fluoride	mg/L	2.9	3.0	2.7	2.8	2.8	3.1	2.8	2.9
1U	Antimony	mg/L	0.00064	0.00028	0.00025	0.000081	0.000059	0.000064	0.000061	0.000065
1U	Arsenic	mg/L	0.45	0.31	0.29	0.30	0.31	0.33	0.29	0.34
1U	Barium	mg/L	0.027	0.040	0.029	0.024	0.023	0.024	0.022	0.023
1U	Beryllium	mg/L	0.00032	0.00036	0.00026	0.00039	0.00033	0.00037	0.00047	0.00073
1U	Cadmium	mg/L	ND	ND	ND	ND	ND	ND	ND	ND
1U	Chromium	mg/L	0.010	0.0016	ND	ND	ND	ND	ND	ND
1U	Cobalt	mg/L	0.0083	0.014	0.016	0.015	0.014	0.014	0.014	0.015
1U	Lead	mg/L	ND	ND	ND	ND	ND	0.00051	ND	ND
1U	Lithium	mg/L	0.53	0.51	0.51	0.53	0.52	0.54	0.50	0.50
1U	Mercury	mg/L	ND	ND	ND	ND	ND	ND	ND	ND
1U	Molybdenum	mg/L	0.011	0.0088	0.0083	0.0079	0.0077	0.0079	0.0074	0.0085
1U	Selenium	mg/L	0.00016	0.00012	ND	0.00012	ND	ND	ND	0.000093
1U	Thallium	mg/L	ND	0.00012	0.00017	0.00021	0.00014	0.00020	0.00021	0.00022
1U	Comb. Radium	pCi/L	0.6	0.4	0.8	ND	ND	0.6	ND	ND
2U	Fluoride	mg/L	2.4	2.5	2.1	2.1	2.1	2.7	2.2	2.3
2U	Antimony	mg/L	0.00041	0.00012	0.00022	0.000072	ND	ND	ND	0.000053
2U	Arsenic	mg/L	0.057	0.060	0.061	0.060	0.060	0.060	0.056	0.060
2U	Barium	mg/L	0.012	0.012	0.012	0.011	0.011	0.011	0.011	0.011
2U	Beryllium	mg/L	0.00093	0.0011	0.0011	0.0011	0.00095	0.0011	0.0012	0.0016
2U	Cadmium	mg/L	ND	ND	0.000041	ND	ND	ND	ND	ND
2U	Chromium	mg/L	0.00044	0.015	ND	ND	0.0014	0.00056	ND	ND
2U	Cobalt	mg/L	0.00017	0.00030	0.00019	ND	0.00014	0.00015	0.00015	0.00022
2U	Lead	mg/L	ND	ND	ND	ND	ND	ND	ND	ND
2U	Lithium	mg/L	0.62	0.64	0.67	0.63	0.61	0.65	0.61	0.58
2U	Mercury	mg/L	0.00011	ND	ND	ND	ND	ND	ND	ND
2U	Molybdenum	mg/L	0.0016	0.0018	0.0018	0.0017	0.0017	0.0016	0.0016	0.0017
2U	Selenium	mg/L	0.00014	ND	0.00014	0.00012	0.00011	ND	ND	0.00014
2U	Thallium	mg/L	0.00043	0.00043	0.00048	0.00041	0.00040	0.00040	0.00038	0.00043
2U	Comb. Radium	pCi/L	16.6	15.1	19.2	6.6	19.9	18.9	13.9	16.2
1D	Fluoride	mg/L	2.9	1.9	2.7	2.8	2.7	2.9	2.8	2.8
1D	Antimony	mg/L	0.00049	0.00024	0.00094	ND	0.000059	0.000043	ND	ND
1D	Arsenic	mg/L	0.032	0.017	0.031	0.020	0.019	0.019	0.018	0.020
1D	Barium	mg/L	0.017	0.021	0.026	0.019	0.020	0.025	0.017	0.021
1D	Beryllium	mg/L	0.00045	0.00059	0.00060	0.00066	0.00072	0.00060	0.00068	0.0011
1D	Cadmium	mg/L	ND	ND	0.000025	ND	ND	ND	ND	ND
1D	Chromium	mg/L	0.0048	0.0083	0.0022	0.00054	0.0058	ND	ND	ND
1D	Cobalt	mg/L	0.0065	0.0013	0.014	0.00062	0.0013	0.00085	0.00033	0.0012
1D	Lead	mg/L	ND	ND	0.0011	ND	ND	ND	ND	ND
1D	Lithium	mg/L	0.50	0.53	0.49	0.52	0.52	0.51	0.49	0.47
1D	Mercury	mg/L	ND	ND	ND	ND	ND	ND	ND	ND
1D	Molybdenum	mg/L	0.0046	0.0039	0.0069	0.0026	0.0038	0.0037	0.0032	0.0041
1D	Selenium	mg/L	0.00013	0.000076	0.00039	ND	0.00012	ND	ND	ND
1D	Thallium	mg/L	0.00011	0.00012	0.00049	0.000090	0.000077	0.000058	0.000032	0.000088
1D	Comb. Radium	pCi/L	8.3	5.3	4.6	4.3	6.4	3.2	5.5	6.0
2D	Fluoride	mg/L	2.5	1.8	2.4	2.4	2.4	2.8	2.4	2.8
2D	Antimony	mg/L	0.0011	0.0016	0.0014	0.00089	0.00069	0.00068	0.00061	0.00066
2D	Arsenic	mg/L	0.051	0.049	0.043	0.050	0.049	0.053	0.049	0.053
2D	Barium	mg/L	0.012	0.013	0.012	0.011	0.011	0.011	0.010	0.011
2D	Beryllium	mg/L	0.00069	0.00079	0.00043	0.00085	0.00091	0.00081	0.00090	0.0014
2D	Cadmium	mg/L	ND	ND	ND	ND	ND	ND	ND	ND
2D	Chromium	mg/L	0.00068	0.00090	ND	0.0011	ND	0.00046	ND	ND
2D	Cobalt	mg/L	0.00029	0.00057	0.00033	0.00031	0.00026	0.00027	0.00027	0.00029
2D	Lead	mg/L	ND	0.00050	0.00026	0.00023	ND	ND	ND	ND
2D	Lithium	mg/L	0.56	0.56	0.53	0.56	0.55	0.56	0.55	0.48
2D	Mercury	mg/L	ND	ND	ND	ND	ND	ND	ND	0.00023
2D	Molybdenum	mg/L	0.0025	0.0027	0.0028	0.0026	0.0025	0.0026	0.0025	0.0028
2D	Selenium	mg/L	0.00015	0.00018	0.000085	0.00012	0.00014	ND	ND	ND
2D	Thallium	mg/L	0.00046	0.00083	0.00057	0.00054	0.00048	0.00050	0.00050	0.00051
2D	Comb. Radium	pCi/L	8.2	8.5	7.1	8.5	9.2	2.7	9.3	6.4
3D	Fluoride	mg/L	2.7	2.1	2.9	2.8	2.9	3.1	2.9	3.0
3D	Antimony	mg/L	0.0013	0.0013	0.0022	0.0020	0.00049	0.00040	0.0012	0.00048
3D	Arsenic	mg/L	0.0089	0.024	0.028	0.052	0.016	0.016	0.033	0.013
3D	Barium	mg/L	0.013	0.011	0.018	0.012	0.011	0.011	0.011	0.011
3D	Beryllium	mg/L	0.00021	0.00035	0.00051	0.00042	0.00021	0.00024	0.00042	0.00071
3D	Cadmium	mg/L	ND	ND	0.000052	ND	ND	ND	ND	ND
3D	Chromium	mg/L	0.0048	0.0014	0.0038	0.0010	0.0012	ND	0.00058	ND
3D	Cobalt	mg/L	0.0033	0.0019	0.0047	0.0019	0.0016	0.0015	0.0017	0.0016
3D	Lead	mg/L	ND	0.00041	0.0014	0.00030	ND	ND	ND	ND
3D	Lithium	mg/L	0.53	0.54	0.51	0.54	0.53	0.56	0.54	0.48
3D	Mercury	mg/L	ND	ND	ND	ND	ND	ND	ND	ND
3D	Molybdenum	mg/L	0.0021	0.0023	0.0030	0.0025	0.0022	0.0023	0.0024	0.0024
3D	Selenium	mg/L	0.00029	0.000092	0.00067	0.00024	0.00016	ND	0.00012	ND
3D	Thallium	mg/L	0.0017	0.0016	0.0021	0.0013	0.0010	0.00095	0.0010	0.0010
3D	Comb. Radium	pCi/L	3.6	4.1	2.5	3.3	3.5	8.6	3.5	2.4

Notes: Samples analyzed by TestAmerica.

Abbreviations: Comb. Radium - Radium 226 & 228. mg/L - milligrams per liter. pCi/L - picoCuries per liter. ND - Non-detect.

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