Annual Groundwater Monitoring Report

Southwestern Electric Power Company

Flint Creek Power Plant

Primary Bottom Ash Pond CCR Management Unit

Gentry, Arkansas

January 2021

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SOUTHWESTERN ELECTRIC POWER COMPANY℠

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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 an existing CCR unit at Southwestern Electric Power Company's, a wholly-owned subsidiary of American Electric Power Company (AEP), Flint Creek 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 31, 2021.

The Flint Creek primary bottom ash pond (PBAP) remained in detection monitoring throughout 2020.

In general, the following activities were completed:

- Groundwater samples were collected on March 23, 2020 and March 24, 2020, then again on October 19, 2020 and October 20, 2020 and analyzed for Appendix III constituents, as specified in 40 CFR 257.94 *et seq.* and AEP's *Groundwater Sampling and Analysis Plan (2016)*;
- Groundwater monitoring 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 no statistically significant increases (SSIs) over background of the Appendix III parameters;
- A potential SSI based on initial sampling was determined for pH in wells AP-59 and AP-60 during the second semiannual groundwater sampling and analysis event in 2019 (occurring on August 27 and August 28); resamples were collected at the two wells and analyzed for pH on December 9, 2019;
- The data from the resamples collected on December 9, 2019 showed that the potential SSIs were not actual SSIs, thus no SSIs were determined for the second semiannual event of 2019;
- Groundwater Monitoring Statistical Evaluation Reports to evaluate groundwater data were prepared and certified in accordance with 40 CFR 257.93. 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 is included in 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 regarding the rationale for the installation/decommission (Attached as Appendix 5, where applicable); and
- Other information required to be included in the annual report such as alternate source demonstration 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

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

PBAP Monitoring Wells	
Upgradient	Downgradient
AP-51	AP-58
AP-53	AP-59
AP-54	AP-60

III. Monitoring Wells Installed or Decommissioned

There were no monitoring wells installed or decommissioned in 2020. The network design, as summarized in the *Groundwater Monitoring Network Design Report Revision 1* (2017) and as posted at the CCR web site for the Flint Creek 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 detection monitoring samples collected on August 27 and August 28, 2019 and resamples collected for pH on December 9, 2019 was completed on April 30, 2020. The evaluation concluded that no SSIs were detected. Statistical analysis of detection monitoring samples collected on March 23 and March 24, 2020 was completed on July 6, 2020. The evaluation concluded that no SSIs were detected. Memoranda with the results of the statistical evaluations are provided in Appendix 2.

During an evaluation for including recently collected Appendix III data to update the background data set at the PBAP, a statistically significant increasing trend in calcium concentrations at compliance well AP-58 was identified. In accordance with the USEPA Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities—Unified Guidance, an investigation was completed to identify possible causes for the increasing trend at the well. This investigation included a geochemical evaluation. Based on the geochemical evaluation, the investigation concluded that the PBAP is not the source of increasing calcium concentrations at AP-58. A memorandum summarizing the investigation and its conclusions 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 on October 21, 2020. A statistical evaluation of these results will be completed in 2021.

VI. Alternate Source Demonstration

Because no SSIs over background of an Appendix III parameter were detected at the Flint Creek PBAP, no alternative source demonstrations were completed in association with the August/December 2019 or March 2020 detection monitoring sampling events and corresponding statistical analyses. A statement to this effect is provided in Appendix 3.

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

No transition between monitoring requirements occurred in 2020; 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 schedule is necessary.

VIII. Other Information Required

The Flint Creek PBAP 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 2020 and Actions Taken

No significant problems were encountered. Through the use of low-flow purging and sampling methodology, samples representative of uppermost aquifer groundwater were obtained and the schedule was met to support this annual groundwater report preparation.

X. A Projection of Key Activities for the Upcoming Year

Key activities for 2021 year include the following:

- Detection monitoring on a semiannual schedule;
- Statistical evaluation of the detection monitoring results to determine any SSIs (or decreases with respect to pH);
- 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

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: AP-51
Flint Creek - PBAP
Appendix III Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
5/24/2016	Background	0.01	4.86	4	< 0.083 U	4.6	2	61
7/18/2016	Background	0.01	5.07	6	< 0.083 U	5.3	4	80
9/13/2016	Background	0.01	5.84	6	< 0.083 U	5.3	3	64
10/5/2016	Background	0.00767833 J	5.24	7	< 0.083 U	5.0	4	80
11/8/2016	Background	0.01	5.23	7	< 0.083 U	5.2	4	76
1/24/2017	Background	0.00849011 J	5.43	5	< 0.083 U	5.1	< 0.14 U	80
3/7/2017	Background	0.01	5.05	5	< 0.083 U	5.0	0.5139 J	40
4/26/2017	Background	0.01475	4.21	6	0.28 J	5.2	6	96
5/16/2017	Background	0.01135	5.55	6	< 0.083 U	5.1	3	60
6/16/2017	Background	0.0186	5.61	7	< 0.083 U	5.1	3	68
8/29/2017	Detection	0.01706	5.13	6	< 0.083 U	4.8	3	50
3/28/2018	Detection	0.01519	11.1	2	< 0.083 U	7.8	9	96
8/28/2018	Detection	0.011	6.69	--	--	7.7	--	74
10/22/2018	Detection	--	--	9.71	< 0.083 U	--	2.14	--
3/11/2019	Detection	0.01 J	6.20	7.84	0.04 J	7.6	< 0.06 U	70
6/10/2019	Detection	< 0.04 U	13.1	7.79	0.05 J	7.2	2.6	106
8/28/2019	Detection	< 0.02 U	6.79	7	< 0.083 U	6.0	1	56
3/24/2020	Detection	< 0.02 U	9.90	8.48	0.04 J	5.9	2.4	107
10/19/2020	Detection	< 0.02 U	7.73	9.86	0.02 J	4.5	< 0.06 U	100

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: AP-51
Flint Creek - PBAP
Appendix IV Constituents

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
5/24/2016	Background	< 0.93 U	< 1.05 U	80	0.257631 J	0.0935902 J	0.258389 J	0.434643 J	1.063	< 0.083 U	< 0.68 U	< 0.00013 U	0.01938 J	0.92212 J	1.24502 J	< 0.86 U
7/18/2016	Background	< 0.93 U	< 1.05 U	86	0.308658 J	< 0.07 U	1	2.39535 J	--	< 0.083 U	0.839767 J	0.003	0.01329 J	< 0.29 U	< 0.99 U	< 0.86 U
9/13/2016	Background	< 0.93 U	< 1.05 U	128	0.373982 J	< 0.07 U	6	14	2.38	< 0.083 U	3.72318 J	0.005	0.00978 J	< 0.29 U	< 0.99 U	< 0.86 U
10/5/2016	Background	< 0.93 U	< 1.05 U	98	0.329677 J	< 0.07 U	2	5	1.656	< 0.083 U	1.49287 J	0.008	< 0.005 U	< 0.29 U	< 0.99 U	< 0.86 U
11/8/2016	Background	1.28923 J	< 1.05 U	105	0.453846 J	0.226326 J	4	9	1.387	< 0.083 U	2.07767 J	0.004	0.00949 J	< 0.29 U	< 0.99 U	< 0.86 U
1/24/2017	Background	< 0.93 U	< 1.05 U	103	0.366323 J	< 0.07 U	2	4.46068 J	1.916	< 0.083 U	< 0.68 U	0.003	< 0.005 U	< 0.29 U	< 0.99 U	< 0.86 U
3/7/2017	Background	7	< 1.05 U	95	0.355243 J	0.128375 J	2	5	1.31	< 0.083 U	0.88397 J	0.002	< 0.005 U	0.586637 J	< 0.99 U	< 0.86 U
4/26/2017	Background	< 0.93 U	< 1.05 U	62.43	0.24 J	< 0.07 U	1.96	4.08 J	0.6089	0.28 J	< 0.68 U	0.00216	< 0.005 U	< 0.29 U	< 0.99 U	< 0.86 U
5/16/2017	Background	< 0.93 U	< 1.05 U	101	0.42 J	0.1 J	1.86	6.92	2.935	< 0.083 U	< 0.68 U	0.00315	< 0.005 U	< 0.29 U	< 0.99 U	< 0.86 U
6/16/2017	Background	< 0.93 U	2.5 J	88.87	0.27 J	< 0.07 U	0.89 J	5.26	1.728	< 0.083 U	< 0.68 U	0.0024	< 0.005 U	< 0.29 U	< 0.99 U	< 0.86 U

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
<: 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: AP-53
Flint Creek - PBAP
Appendix III Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
5/24/2016	Background	0.11	4.15	10	< 0.083 U	4.7	25	80
7/18/2016	Background	0.109	3.49	12	< 0.083 U	4.5	30	104
9/13/2016	Background	0.155	5.54	13	< 0.083 U	4.7	35	104
10/5/2016	Background	0.121	3.39	13	0.205 J	4.9	32	110
11/8/2016	Background	0.138	3.38	14	< 0.083 U	5.0	31	118
1/24/2017	Background	0.158	3.87	14	< 0.083 U	5.0	47	132
3/7/2017	Background	0.137	3.85	13	< 0.083 U	5.0	47	112
4/26/2017	Background	0.124	3.89	15	< 0.083 U	5.6	48	200
5/16/2017	Background	0.118	3.46	14	< 0.083 U	4.5	42	90
6/16/2017	Background	0.122	3.39	14	< 0.083 U	5.0	38	136
8/29/2017	Detection	0.114	2.82	11	< 0.083 U	4.8	34	92
3/28/2018	Detection	0.115	3.51	12	< 0.083 U	5.0	43	114
8/28/2018	Detection	0.124	3.37	--	--	5.6	--	120
10/22/2018	Detection	--	--	19.2	< 0.083 U	--	45	--
3/11/2019	Detection	0.114	3.09	12.3	0.07 J	5.2	34.6	130
6/10/2019	Detection	0.110	3.37	13.4	0.06	5.2	32.8	98
8/28/2019	Detection	0.083	3.11	8	< 0.083 U	5.4	21	96
3/24/2020	Detection	0.055	3.20	9.40	0.05 J	5.2	13.5	76
10/19/2020	Detection	0.139	3.81	12.3	0.05 J	4.7	37.4	105

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: AP-53
Flint Creek - PBAP
Appendix IV Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
5/24/2016	Background	< 0.93 U	6	142	1	0.585577 J	37	12	3.55	< 0.083 U	11	0.006	0.159	2.50374 J	< 0.99 U	< 0.86 U
7/18/2016	Background	< 0.93 U	2.79903 J	76	0.473295 J	0.0914021 J	7	4.26267 J	--	< 0.083 U	1.07393 J	0.004	0.046	0.344001 J	1.20159 J	< 0.86 U
9/13/2016	Background	< 0.93 U	24	258	3	1	94	27	5.93	< 0.083 U	30	0.036	0.085	6	< 0.99 U	0.981236 J
10/5/2016	Background	< 0.93 U	< 1.05 U	63	0.289207 J	< 0.07 U	2	3.26642 J	0.568	0.205 J	< 0.68 U	0.009	0.025	< 0.29 U	< 0.99 U	< 0.86 U
11/8/2016	Background	< 0.93 U	8	122	0.980287 J	3	26	13	2.06	< 0.083 U	8	0.01	0.118	1.0939 J	< 0.99 U	< 0.86 U
1/24/2017	Background	1.37199 J	3.86298 J	97	0.663471 J	0.0732158 J	16	9	2.16	< 0.083 U	3.91103 J	0.006	0.183	0.821188 J	< 0.99 U	< 0.86 U
3/7/2017	Background	1.45983 J	7	110	0.851036 J	0.485904 J	21	15	1.915	< 0.083 U	8	0.007	0.14	1.44927 J	< 0.99 U	< 0.86 U
4/26/2017	Background	1.23 J	4.82 J	102	0.61 J	0.22 J	15.41	7.89	1.552	< 0.083 U	4.13 J	0.00623	< 0.005 U	0.96 J	2.14 J	< 0.86 U
5/16/2017	Background	1.95 J	1.53 J	64.08	0.33 J	< 0.07 U	3.01	2.9 J	1.327	< 0.083 U	< 0.68 U	0.00228	0.04	0.31 J	< 0.99 U	< 0.86 U
6/16/2017	Background	1.15 J	3.1 J	71.32	0.41 J	< 0.07 U	5.78	3 J	2.139	< 0.083 U	0.87 J	0.00357	0.043	< 0.29 U	< 0.99 U	< 0.86 U

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
<: 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: AP-54
Flint Creek - PBAP
Appendix III Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
5/24/2016	Background	0.249	10.4	14	< 0.083 U	5.8	77	180
7/18/2016	Background	0.255	10	16	< 0.083 U	5.8	78	178
9/13/2016	Background	0.266	10.6	16	< 0.083 U	5.6	75	172
10/5/2016	Background	0.255	11.8	15	0.1943 J	5.5	67	164
11/8/2016	Background	0.26	11.3	15	< 0.083 U	5.7	71	168
1/24/2017	Background	0.284	11.2	14	< 0.083 U	5.5	71	164
3/7/2017	Background	0.259	11.3	14	< 0.083 U	5.4	64	150
4/26/2017	Background	0.256	10.8	15	< 0.083 U	6.1	66	154
5/16/2017	Background	0.256	9.58	16	< 0.083 U	5.1	66	136
6/16/2017	Background	0.249	7.53	15	< 0.083 U	5.3	62	192
8/29/2017	Detection	0.259	11.3	13	< 0.083 U	5.5	63	156
3/28/2018	Detection	0.223	5.61	13	< 0.083 U	5.3	64	130
8/28/2018	Detection	0.240	15.5	--	--	5.9	--	168
10/22/2018	Detection	--	--	18.3	< 0.083 U	--	54.4	--
3/11/2019	Detection	0.219	14.5	16.0	0.09 J	6.4	47.2	160
6/10/2019	Detection	0.209	10.7	15.3	0.07	6.5	52.5	134
8/28/2019	Detection	0.213	12.2	12	< 0.083 U	6.8	51	154
3/24/2020	Detection	0.202	7.08	13.2	0.05 J	6.4	45.9	143
10/19/2020	Detection	0.214	8.39	12.8	0.04 J	5.8	47.6	130

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: AP-54
Flint Creek - PBAP
Appendix IV Constituents

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
5/24/2016	Background	< 0.93 U	< 1.05 U	35	0.177109 J	< 0.07 U	0.485517 J	7	1	< 0.083 U	< 0.68 U	0.000736668 J	0.02407 J	< 0.29 U	< 0.99 U	1.05347 J
7/18/2016	Background	< 0.93 U	< 1.05 U	58	0.294165 J	< 0.07 U	1	13	--	< 0.083 U	< 0.68 U	0.001	0.031	< 0.29 U	< 0.99 U	< 0.86 U
9/13/2016	Background	< 0.93 U	< 1.05 U	38	0.0361596 J	< 0.07 U	0.470668 J	7	3.37	< 0.083 U	< 0.68 U	0.000599096 J	0.0122 J	< 0.29 U	< 0.99 U	< 0.86 U
10/5/2016	Background	< 0.93 U	< 1.05 U	35	0.175329 J	< 0.07 U	1	6	1.59	0.1943 J	< 0.68 U	0.006	0.02499 J	< 0.29 U	1.26436 J	< 0.86 U
11/8/2016	Background	< 0.93 U	1.8333 J	227	0.250807 J	0.164026 J	9	19	1.722	< 0.083 U	1.30257 J	0.002	0.049	1.06052 J	< 0.99 U	< 0.86 U
1/24/2017	Background	< 0.93 U	4.57372 J	109	0.660002 J	0.132116 J	25	24	1.107	< 0.083 U	7	0.006	0.082	3.34504 J	< 0.99 U	< 0.86 U
3/7/2017	Background	< 0.93 U	< 1.05 U	96	0.164735 J	< 0.07 U	4	12	2.125	< 0.083 U	< 0.68 U	0.003	0.00568 J	0.545312 J	< 0.99 U	< 0.86 U
4/26/2017	Background	< 0.93 U	< 1.05 U	31.04	0.1 J	< 0.07 U	0.42 J	4.4 J	0.769	< 0.083 U	< 0.68 U	0.00048 J	0.017 J	< 0.29 U	< 0.99 U	< 0.86 U
5/16/2017	Background	< 0.93 U	< 1.05 U	34.92	0.16 J	< 0.07 U	0.44 J	5.33	1.222	< 0.083 U	< 0.68 U	0.00078 J	0.02 J	< 0.29 U	< 0.99 U	< 0.86 U
6/16/2017	Background	5.57	1.65 J	46.98	0.28 J	< 0.07 U	0.53 J	7.14	1.325	< 0.083 U	< 0.68 U	0.00127	0.018 J	< 0.29 U	< 0.99 U	< 0.86 U

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
<: 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: AP-58
Flint Creek - PBAP
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
5/24/2016	Background	1.44	24.9	18	0.8759 J	7.1	213	602
7/18/2016	Background	1.68	27.4	21	0.8849 J	8.4	229	691
9/13/2016	Background	1.66	17.5	23	0.7518 J	8.3	238	644
10/5/2016	Background	1.56	18.9	27	0.8942 J	8.8	231	696
11/7/2016	Background	1.26	30.5	22	0.5598 J	7.8	186	562
1/24/2017	Background	1.09	34.4	16	< 0.083 U	8.1	158	448
3/7/2017	Background	0.829	48.1	14	< 0.083 U	7.0	123	420
4/26/2017	Background	0.613	59	14	0.53 J	7.1	111	374
5/16/2017	Background	0.473	69.3	13	0.4677 J	7.5	104	344
6/16/2017	Background	0.416	70.1	12	< 0.083 U	6.0	101	398
8/29/2017	Detection	0.333	75.5	12	< 0.083 U	7.8	96	344
12/21/2017	Detection	0.268	73.9	--	--	7.4	80	304
3/26/2018	Detection	0.228	77.2	8	< 0.083 U	7.4	70	262
8/28/2018	Detection	0.237	75.9	--	--	6.9	--	300
10/23/2018	Detection	--	--	12.5	< 0.083 U	--	75.5	--
3/12/2019	Detection	0.178	74.8	8.13	0.33	8.4	49.9	290
6/11/2019	Detection	0.173	78.3	7.64	0.36	7.6	52.2	272
8/27/2019	Detection	0.149	76.1	6	0.222 J	7.5	53	292
3/24/2020	Detection	0.129	68.1	5.78	0.32	6.8	39.7	246
10/20/2020	Detection	0.126	67.9	4.98	0.28	6.6	34.8	249

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: AP-58
Flint Creek - PBAP
Appendix IV Constituents

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
5/24/2016	Background	< 0.93 U	5	37	0.105636 J	< 0.07 U	0.810009 J	3.86496 J	0.548	0.8759 J	< 0.68 U	< 0.00013 U	0.032	62	< 0.99 U	< 0.86 U
7/18/2016	Background	< 0.93 U	22	104	3	0.459763 J	8	7	--	0.8849 J	12	0.018	0.042	66	2.81093 J	< 0.86 U
9/13/2016	Background	0.971405 J	25	39	0.162863 J	< 0.07 U	2	2.29869 J	1.007	0.7518 J	2.19582 J	0.007	0.02274 J	68	1.13435 J	1.02461 J
10/5/2016	Background	1.99545 J	18	41	0.382276 J	< 0.07 U	3	2.68738 J	0.787	0.8942 J	1.93685 J	0.017	< 0.005 U	63	2.55318 J	< 0.86 U
11/7/2016	Background	< 0.93 U	14	41	0.108253 J	< 0.07 U	1	1.28551 J	1.65	0.5598 J	< 0.68 U	0.008	0.00775 J	44	< 0.99 U	< 0.86 U
1/24/2017	Background	< 0.93 U	11	56	0.0635907 J	< 0.07 U	2	1.8255 J	1.896	< 0.083 U	< 0.68 U	0.009	0.00625 J	39	< 0.99 U	< 0.86 U
3/7/2017	Background	< 0.93 U	8	42	0.0245 J	< 0.07 U	1	1.05431 J	0.938	< 0.083 U	0.928114 J	0.015	< 0.005 U	26	< 0.99 U	< 0.86 U
4/26/2017	Background	< 0.93 U	6.14	49.86	0.09 J	< 0.07 U	1.57	1.36 J	1.163	0.53 J	< 0.68 U	0.01194	0.006 J	16.9	< 0.99 U	< 0.86 U
5/16/2017	Background	< 0.93 U	4.32 J	43.08	0.03 J	< 0.07 U	0.75 J	0.87 J	0.663	0.4677 J	< 0.68 U	0.01188	< 0.005 U	14.05	< 0.99 U	< 0.86 U
6/16/2017	Background	2.16 J	2.71 J	41.48	0.03 J	< 0.07 U	0.58 J	0.57 J	2.268	< 0.083 U	< 0.68 U	0.01182	< 0.005 U	12.23	< 0.99 U	< 0.86 U

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
<: 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: AP-59
Flint Creek - PBAP
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
5/24/2016	Background	0.25	39.3	19	0.7409 J	7.4	37	240
7/18/2016	Background	0.339	38	14	0.6517 J	6.8	27	220
9/13/2016	Background	0.38	36.5	13	0.583 J	7.3	25	216
10/5/2016	Background	0.347	34.6	14	0.7085 J	7.1	26	220
11/7/2016	Background	0.323	35.6	15	0.5832 J	7.2	32	216
1/24/2017	Background	0.317	38.4	13	< 0.083 U	7.0	40	240
3/7/2017	Background	0.253	42	13	< 0.083 U	7.9	43	236
4/26/2017	Background	0.222	41.4	15	0.61 J	7.2	40	226
5/16/2017	Background	0.208	39.5	13	0.5762 J	7.1	38	186
6/16/2017	Background	0.227	36.2	12	< 0.083 U	6.7	31	224
8/29/2017	Detection	0.295	35.4	12	0.6463 J	7.1	21	210
12/21/2017	Detection	0.279	46.8	--	--	6.9	--	228
3/26/2018	Detection	0.218	43.2	12	< 0.083 U	7.0	40	180
8/28/2018	Detection	0.277	42.2	--	--	7.1	--	180
10/23/2018	Detection	--	--	19	0.548 J	--	26.7	--
3/11/2019	Detection	0.221	45.2	15.0	0.59	7.4	35.5	46
6/11/2019	Detection	0.233	46.7	14.7	0.65	7.3	38.4	88
7/9/2019	Detection	--	45.3	--	--	7.0	--	--
8/27/2019	Detection	0.246	42.6	11	0.413 J	8.9	26	228
12/9/2019	Detection	--	--	--	--	7.3	--	--
3/23/2020	Detection	0.228	45.3	12.3	0.61	7.2	38.1	250
10/20/2020	Detection	0.244	49.7	13.2	0.46	8.7	47.0	257

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: AP-59
Flint Creek - PBAP
Appendix IV Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
5/24/2016	Background	< 0.93 U	< 1.05 U	67	< 0.02 U	< 0.07 U	0.583478 J	2.01538 J	0.711	0.7409 J	< 0.68 U	0.000378518 J	0.029	7	< 0.99 U	1.24044 J
7/18/2016	Background	< 0.93 U	< 1.05 U	72	0.0339425 J	< 0.07 U	3	2.54042 J	--	0.6517 J	1.02999 J	0.000590098 J	0.035	9	< 0.99 U	1.07757 J
9/14/2016	Background	< 0.93 U	< 1.05 U	82	< 0.02 U	< 0.07 U	< 0.23 U	2.3351 J	1.288	0.583 J	< 0.68 U	0.000162193 J	< 0.005 U	9	< 0.99 U	1.01454 J
10/5/2016	Background	< 0.93 U	< 1.05 U	89	< 0.02 U	< 0.07 U	0.300781 J	2.72689 J	0.725	0.7085 J	< 0.68 U	0.011	< 0.005 U	8	< 0.99 U	1.63378 J
11/7/2016	Background	< 0.93 U	< 1.05 U	93	< 0.02 U	< 0.07 U	< 0.23 U	3.0738 J	1.109	0.5832 J	< 0.68 U	0.00039204 J	< 0.005 U	8	< 0.99 U	< 0.86 U
1/24/2017	Background	< 0.93 U	< 1.05 U	107	< 0.02 U	< 0.07 U	< 0.23 U	3.38517 J	0.3279	< 0.083 U	< 0.68 U	0.000152708 J	< 0.005 U	8	< 0.99 U	1.21456 J
3/7/2017	Background	< 0.93 U	< 1.05 U	96	< 0.02 U	< 0.07 U	0.244944 J	3.32152 J	0.713	< 0.083 U	< 0.68 U	0.006	< 0.005 U	7	< 0.99 U	< 0.86 U
4/26/2017	Background	< 0.93 U	1.58 J	104	< 0.02 U	< 0.07 U	< 0.23 U	3.36 J	1.319	0.61 J	< 0.68 U	0.00026 J	< 0.005 U	5.33	< 0.99 U	< 0.86 U
5/16/2017	Background	< 0.93 U	< 1.05 U	93.9	< 0.02 U	< 0.07 U	< 0.23 U	3 J	0.618	0.5762 J	< 0.68 U	0.00033 J	0.006 J	5.66	< 0.99 U	1.09 J
6/16/2017	Background	< 0.93 U	1.96 J	86.79	< 0.02 U	< 0.07 U	< 0.23 U	2.83 J	2.251	< 0.083 U	< 0.68 U	0.00021 J	< 0.005 U	6.4	< 0.99 U	< 0.86 U

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
<: 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: AP-60
Flint Creek - PBAP
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
12/19/2016	Background	1.4	16.7	14	0.0946 J	8.9	165	369
1/24/2017	Background	1.12	33.2	13	< 0.083 U	7.8	152	356
3/7/2017	Background	1.26	25.9	12	< 0.083 U	8.1	145	340
3/29/2017	Background	1.14	43	13	< 0.083 U	8.4	140	368
4/26/2017	Background	1.3	25	15	0.58 J	7.6	160	340
5/16/2017	Background	1.41	16.3	14	0.558 J	8.6	167	302
6/16/2017	Background	1.2	29.2	15	< 0.083 U	7.8	152	368
6/28/2017	Background	1.35	17.7	16	0.5516 J	7.5	166	368
8/29/2017	Detection	1.13	32.3	13	0.4518 J	7.7	146	356
12/21/2017	Detection	0.857	46.2	--	--	7.2	128	332
3/26/2018	Detection	0.645	45.5	9	< 0.083 U	8.6	113	284
8/28/2018	Detection	1.27	31.1	--	--	7.8	--	276
10/23/2018	Detection	--	--	15.7	< 0.083 U	--	135	--
3/11/2019	Detection	0.728	21.2	11.0	0.31	10.9	114	310
6/11/2019	Detection	0.559	3.44	9.79	0.29	10.0	108	304
7/9/2019	Detection	--	--	--	--	7.7	--	--
8/27/2019	Detection	0.756	10.7	8	0.2 J	10.9	99	330
12/9/2019	Detection	--	--	--	--	7.6	--	--
3/23/2020	Detection	1.25	27.9	10.9	0.36	9.8	167	370
10/20/2020	Detection	0.301	9.22	7.52	0.15	10.0	80.7	280

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: AP-60
Flint Creek - PBAP
Appendix IV Constituents

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
12/19/2016	Background	< 0.93 U	9	17	0.0543046 J	< 0.07 U	2	1.92133 J	1.176	0.0946 J	0.742652 J	0.001	< 0.005 U	60	< 0.99 U	< 0.86 U
1/24/2017	Background	1.34724 J	3.61807 J	34	< 0.02 U	< 0.07 U	0.502321 J	0.87237 J	0.771	< 0.083 U	< 0.68 U	0.000637932 J	< 0.005 U	55	< 0.99 U	< 0.86 U
3/7/2017	Background	< 0.93 U	9	15	< 0.02 U	< 0.07 U	0.297514 J	0.458637 J	1.121	< 0.083 U	< 0.68 U	0.003	< 0.005 U	57	< 0.99 U	< 0.86 U
3/29/2017	Background	< 0.93 U	7	41	0.023217 J	< 0.07 U	3	2.22346 J	1.158	< 0.083 U	1.84769 J	0.002	0.00961 J	53	< 0.99 U	< 0.86 U
4/26/2017	Background	< 0.93 U	11.42	24.03	0.12 J	< 0.07 U	3.75	3.01 J	0.429	0.58 J	2.91 J	0.00236	0.01 J	56.38	< 0.99 U	0.98 J
5/16/2017	Background	1 J	11.39	13.05	0.03 J	< 0.07 U	0.91 J	0.66 J	2.082	0.558 J	< 0.68 U	0.00048 J	0.009 J	62.09	< 0.99 U	< 0.86 U
6/16/2017	Background	< 0.93 U	7.69	27.23	< 0.02 U	< 0.07 U	< 0.23 U	0.42 J	3.697	< 0.083 U	< 0.68 U	0.00063 J	< 0.005 U	54.18	< 0.99 U	< 0.86 U
6/28/2017	Background	< 0.93 U	9.32	12.61	< 0.02 U	< 0.07 U	0.37 J	0.37 J	7.167	0.5516 J	< 0.68 U	0.00031 J	0.006 J	63.76	< 0.99 U	< 0.86 U

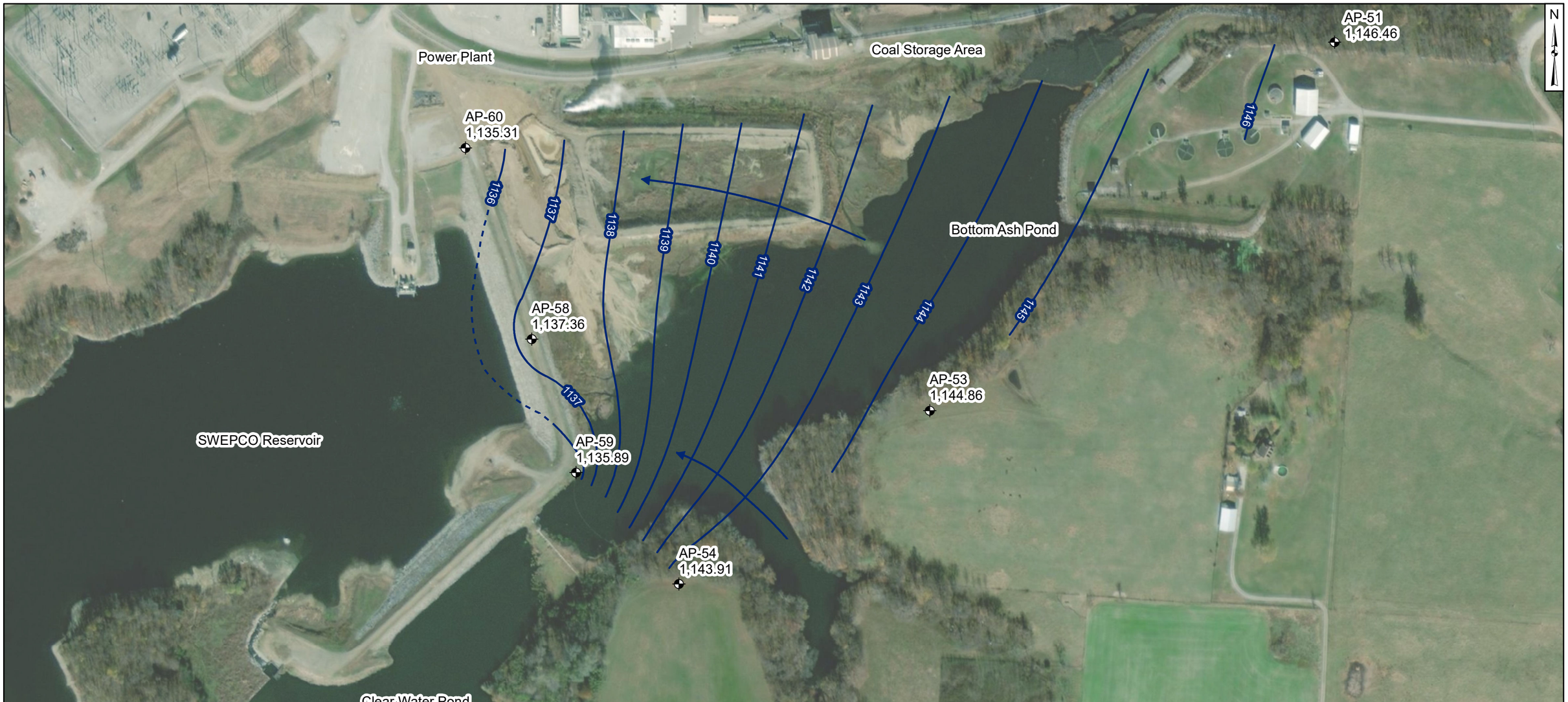
Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.
J: Estimated value. Parameter was detected at concentration below the reporting limit
- -: Not analyzed
pCi/L: picocuries per liter

Table 1: Residence Time Calculation Summary
Flint Creek Primary Bottom Ash Pond

Geosyntec Consultants, Inc.

CCR Management Unit	Monitoring Well	Well Diameter (inches)	2020-03		2020-10	
			Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)
Primary Bottom Ash Pond	AP-51 [1]	2.0	96	0.6	133	0.5
	AP-53 [1]	2.0	176	0.3	273	0.2
	AP-54 [1]	2.0	544	0.1	750	0.1
	AP-58 [2]	2.0	259	0.2	190	0.3
	AP-59 [2]	2.0	630	0.1	723	0.1
	AP-60 [2],[3]	2.0	195	0.3	302	0.2

Notes:
[1] - Background Well
[2] - Downgradient Well
[3] - AP-52 was replaced with AP-60 in December 2016



Legend

- Monitoring Wells
- Groundwater Contour Elevation
- Groundwater Contour Elevation (Inferred)
- Groundwater Flow Direction

Notes

- Monitoring well coordinates and water level data were collected March 23-24. 2020 provided by AEP.
- Site features are based on information available in the Groundwater Monitoring Well Network Evaluation (Terracon, 2017) provided by AEP.
- Groundwater elevation units are feet above mean sea level.
- AP-55, AP-56, and AP-57 were not gauged in March 2020

200 100 0 200 Feet

Potentiometric Surface Map
Uppermost Aquifer - March 2020

AEP Flint Creek Plant - Primary Bottom Ash Pond
Gentry, Arkansas

Geosyntec consultants

Columbus, Ohio | 2020/06/10

Figure **2**

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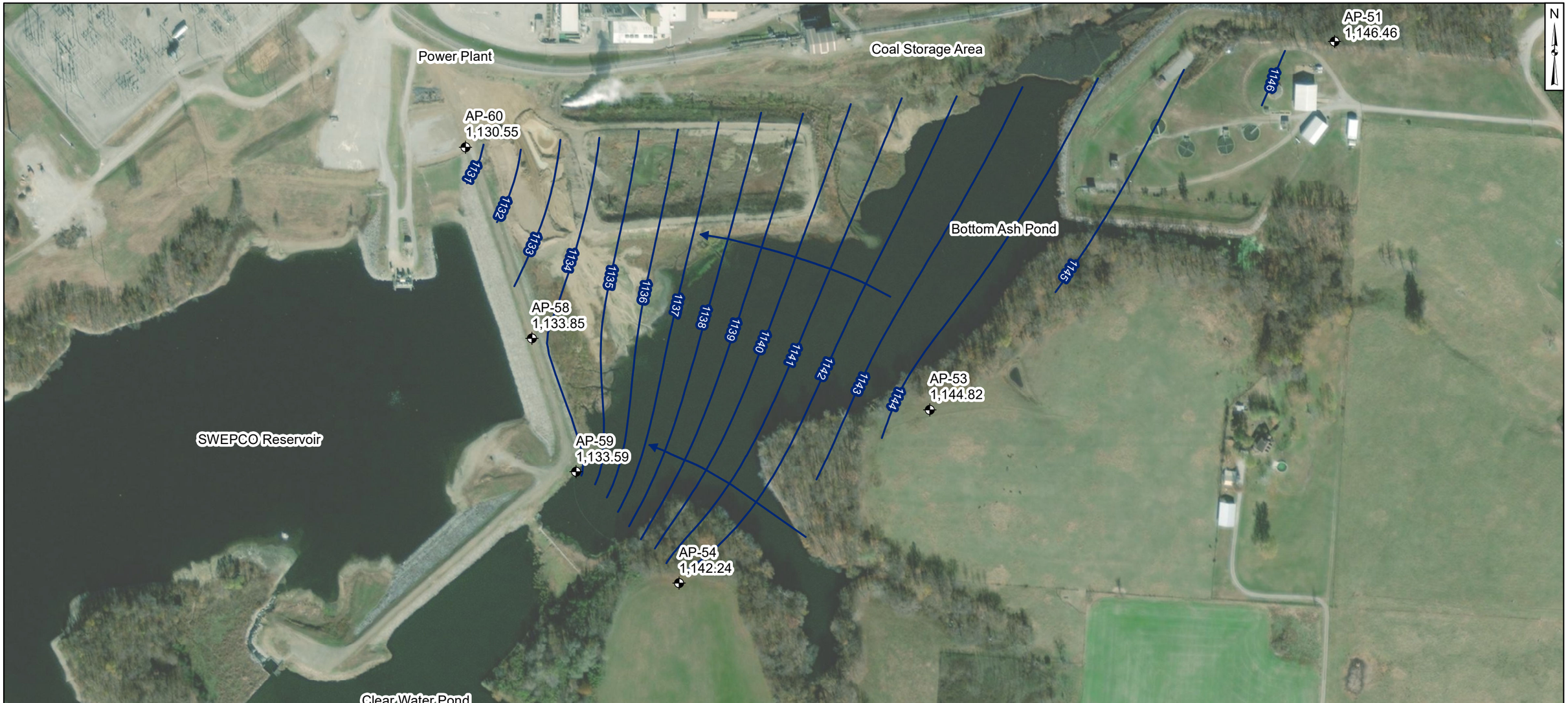

Legend

- Monitoring Wells
- Groundwater Contour Elevation
- Groundwater Flow Direction

Notes

- Monitoring well coordinates and water level data were collected October 19. 2020 provided by AEP.
- Site features are based on information available in the Groundwater Monitoring Well Network Evaluation (Terracon, 2017) provided by AEP.
- Groundwater elevation units are feet above mean sea level.
- AP-55, AP-56, and AP-57 were not gauged in October 2020

200 100 0 200 Feet

Potentiometric Surface Map
Uppermost Aquifer - October 2020

AEP Flint Creek Plant - Primary Bottom Ash Pond
Gentry, Arkansas

Geosyntec consultants

Columbus, Ohio | 2021/01/05

Figure **3**

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APPENDIX 2 - Statistical Analyses

The memoranda summarizing the statistical evaluations for the August/December 2019 and March 2020 detection monitoring sampling events follow.

Geosyntec consultants

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Columbus, Ohio 43212
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Memorandum

Date:	April 30, 2020
To:	David Miller (AEP)
Copies to:	Bill Smith (AEP)
From:	Allison Kreinberg (Geosyntec)
Subject:	Evaluation of Detection Monitoring Data at Flint Creek Plant's Primary Bottom Ash Pond (PBAP)

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 at the Primary Bottom Ash Pond (PBAP), an existing CCR unit at the Flint Creek Power Plant located in Gentry, Arkansas, was completed on August 27, 2019. Based on the results, a one-of-two verification sampling was completed on December 9, 2019.

Background values for the PBAP were previously calculated in January 2018. 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 March 12, 2020. As discussed in the report, the prediction limit calculated in January 2018 will be used for calcium at AP-58 while further research is completed regarding changes in observed calcium concentrations.

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 concluded only 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. No SSIs were observed at the Flint Creek PBAP CCR unit, and as a result the Flint Creek PBAP 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: Appendix III Data Summary
Flint Creek Plant - Primary Bottom Ash Pond

Geosyntec Consultants, Inc.

Parameter	Units	Description	AP-58	AP-59		AP-60	
			8/27/2019	8/27/2019	12/9/2019*	8/27/2019	12/9/2019*
Boron	mg/L	Intrawell Background UPL	0.706	0.386		1.66	
		Analytical Data	0.149	0.246	--	0.756	--
Calcium	mg/L	Intrawell Background UPL	85.1	47.1		51.3	
		Analytical Data	76.1	42.6	--	10.7	--
Chloride	mg/L	Intrawell Background UPL	27.4	19.0		17.7	
		Analytical Data	6.0	11.0	--	8.0	--
Fluoride	mg/L	Intrawell Background UPL	1.00	1.00		1.00	
		Analytical Data	0.22	0.41	--	0.20	--
pH	SU	Intrawell Background UPL	9.0	7.7		10.2	
		Intrawell Background LPL	6.2	6.6		6.4	
		Analytical Data	7.5	**8.9**	7.3	**10.9**	7.6
Sulfate	mg/L	Intrawell Background UPL	135	47.2		183	
		Analytical Data	53	26	--	99	--
Total Dissolved Solids	mg/L	Intrawell Background UPL	440	257		405	
		Analytical Data	292	228	--	330	--

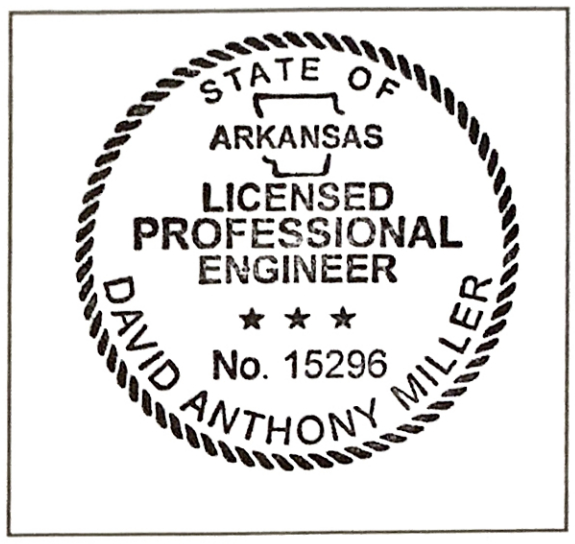
Notes:
UPL: Upper prediction limit
LPL: Lower prediction limit
--: Not analyzed
Bold values exceed the background value
Background values are shaded gray
*: pH data was received on 2/26/2020

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 Flint Creek PBAP CCR management area and that the requirements of 40 CFR 257.93(f) have been met.



DAVID ANTHONY MILLER
Printed Name of Licensed Professional Engineer

David Anthony Miller
Signature

15296	ARKANSAS	05.08.2020
License Number	Licensing State	Date

Geosyntec consultants

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June 23, 2020

Bill Smith
American Electric Power
1 Riverside Plaza, 22nd Floor
Columbus, OH 43215

Subject: Flint Creek Primary Bottom Ash Pond
Statistical Analysis Summary – Background Update Calculations Revision

Dear Mr. Smith:

Geosyntec Consultants, Inc. (Geosyntec) previously prepared the *Statistical Analysis Summary – Background Update Calculations* report for the Flint Creek Primary Bottom Ash Pond on behalf of American Electric Power (AEP) on March 12, 2020. The purpose of this report was to document the update to the background dataset and calculated upper prediction limits (UPLs) and lower prediction limits (LPLs) for pH which were established for Appendix III parameters in accordance with 40 CFR 257 Subpart D ("CCR Rule").

Following completion of the report, it was noted that Table 2 (Background Level Summary) included an incorrect value for the calculated intrawell fluoride UPL at monitoring well AP-60. The statistical calculations provided in Attachment B did include the correct UPL. A revised report which includes a revised Table 2 with the appropriate UPL for fluoride at AP-60 is provided with this letter.

Sincerely,

Allison Kreinberg
Project Manager

20200623 Flint Creek PBAP Background Stats Report Rev1 w Cert

STATISTICAL ANALYSIS SUMMARY-
Background Update Calculations
Revision 1
Primary Bottom Ash Pond –
Flint Creek Plant
Gentry, Arkansas

Submitted to

AMERICAN ELECTRIC POWER

1 Riverside Plaza
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Submitted by

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LIST OF ACRONYMS AND ABBREVIATIONS

ANOVA	Analysis of Variance
CCR	Coal Combustion Residuals
CCV	Continuing Calibration Value
CFR	Code of Federal Regulations
EPA	Environmental Protection Agency
LFB	Laboratory Fortified Blanks
LPL	Lower Prediction Limit
LRB	Laboratory Reagent Blanks
NELAP	National Environmental Laboratory Accreditation Program
PBAP	Primary Bottom Ash Pond
PQL	Practical Quantitation Limit
QA	Quality Assurance
QC	Quality Control
SSI	Statistically Significant Increase
TDS	Total Dissolved Solids
UPL	Upper Prediction Limit
USEPA	United States Environmental Protection Agency

SECTION 1

EXECUTIVE SUMMARY

In accordance with the United States Environmental Protection Agency's (USEPA's) regulations regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments (40 CFR 257.90-257.98, "CCR rule"), groundwater monitoring has been conducted at the Primary Bottom Ash Ponds (PBAP), an existing CCR unit at the Flint Creek Power Plant located in Gentry, Arkansas.

Ten monitoring events were completed prior to August 2017 to establish background concentrations for Appendix III and Appendix IV parameters under the CCR rule. Four semiannual detection monitoring events were conducted between August 2017 and March 2019. Data from these four events, including both initial and verification results, were evaluated for inclusion in the background dataset. Groundwater data underwent several validation tests, including those for completeness, sample tracking accuracy, transcription errors, and consistent use of measurement units. No data quality issues were identified which would impact the usability of the data.

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

SECTION 2

PRIMARY BOTTOM ASH POND EVALUATION

2.1 Previous Background Calculations

Ten background monitoring events were completed from May 2016 through June 2017 to establish background concentrations for Appendix III and Appendix IV parameters under the CCR rule. The data were reviewed for outliers and trends prior to calculating upper prediction limits (UPLs) for each Appendix III parameter. Lower prediction limits (LPLs) were also established for pH. Initial statistical analyses recommended intrawell prediction limits for chloride and interwell prediction limits for all other Appendix III parameters. The statistical analyses to establish background levels were previously documented in the January 2018 *Statistical Analysis Summary* report (Geosyntec, 2018a). A subsequent site investigation supported the use of intrawell limits for all parameters due to natural variations in the abundance of weathered limestone and its effect on groundwater quality (Geosyntec, 2018b). Thus, intrawell prediction limits were selected for all parameters with a one-of-two resampling plan.

2.2 Data Validation & QA/QC

Since August 2017, four semiannual detection monitoring events have been conducted at the PBAP. If the initial results for each detection monitoring event identified possible exceedances, verification sampling was completed on an individual well/parameter basis. Thus, a minimum of four samples were collected from each compliance well. A summary of data collected during these detection monitoring events may be found in Table 1.

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

The analytical data were imported into a Microsoft Access database, where checks were completed to assess the accuracy of sample location identification and analyte identification. Where necessary, unit conversions were applied to standardize reported units across all sampling events. Exported data files were created for use with the Sanitas™ v.9.6.23 statistics software. The export was checked against the analytical data for transcription errors and completeness. No QA/QC issues were noted which would impact data usability.

2.3 Statistical Analysis

The detection monitoring data used to conduct the statistical analyses described below are summarized in Table 1. Statistical analyses for the PBAP were conducted in accordance with the

January 2017 *Statistical Analysis Plan* (AEP, 2017), except where noted below. The complete statistical analysis results are included in Attachment B.

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

2.3.1 Background Outlier Evaluation

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

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

or

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

where:

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

Data collected during the detection monitoring period that were evaluated as potential outliers are summarized in Attachment B. Tukey's outlier test indicated one potential outlier for the March 2018 sampling event at upgradient well AP-51. However, this data was retained in the database as it was similar in concentration to other upgradient locations.

2.3.2 Establishment of Updated Background Levels

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

Mann-Whitney (Wilcoxon rank-sum) tests were used to compare the medians of historical data (May 2016 - June 2017) to the new compliance samples (August 2017 – March 2019). Results

were evaluated to determine if the medians of the two groups were similar at the 99% confidence level. Where no significant difference was found, the new compliance data were added to the background dataset. Where a statistically significant difference was found between the medians of the two groups, the data were reviewed to evaluate the cause of the difference and to determine if adding newer data to the background dataset, replacing the background dataset with the newer data, or continuing to use the existing background dataset was most appropriate. If the differences appeared to have been caused by a release, then the previous background dataset would have continued to be used.

The complete Mann-Whitney test results and a summary of the significant findings can be found in Attachment B. Significant differences were only found between the two groups for boron, calcium, chloride, sulfate, and TDS at AP-58; sulfate at AP-54; and sulfate at AP-60.

However, due to more recent increases in calcium concentrations at well AP-58, the previously calculated upper prediction limit will be used for this well/constituent pair until further research identifies the cause of this trend. Because historical concentrations of boron, sulfate and TDS at well AP-58 were significantly higher than more recent samples these records were truncated to use the more recent data. During the next background update, if lower concentrations continue, the earlier measurements will be deselected such that the statistical limits represent present-day groundwater quality conditions. Although significant differences were observed for chloride at AP-58 and sulfate at AP-54 and AP-60, the datasets were not truncated as the magnitude of the median differences for these well/parameter pairs was substantially lower than the differences observed at AP-58.

After the revised background set was established, a parametric or non-parametric analysis was selected based on the distribution of the data and the frequency of non-detect data. Estimated results less than the practical quantitation limit (PQL) – i.e., "J-flagged" data – were considered detections and the estimated results were used in the statistical analyses. Non-parametric analyses were selected for datasets with at least 50% non-detect data or datasets that could not be normalized. Parametric analyses were selected for datasets (either transformed or untransformed) that passed the Shapiro-Wilk / Shapiro-Francía test for normality. The Kaplan-Meier non-detect adjustment was applied to datasets with between 15% and 50% non-detect data. For datasets with fewer than 15% non-detect data, non-detect data were replaced with one half of the PQL. The selected analysis (i.e., parametric or non-parametric) and transformation (where applicable) for each background dataset are shown in Attachment B.

2.3.3 Updated Prediction Limits

Intrawell UPLs were updated using all the historical data through March 2019 to represent background values. Intrawell LPLs were also generated for pH. The only exception was for calcium at downgradient well AP-58, which used the previously calculated UPL, and for boron, sulfate, and TDS where a truncated dataset was used as described in Section 2.3.2. The updated prediction limits are summarized in Table 2.

The intrawell UPLs were calculated for a one-of-two retesting procedure; i.e., if at least one sample in a series of two does not exceed the UPL, then it can be concluded that an SSI has not occurred. In practice, where the initial result does not exceed the UPL, a second sample will not be collected. The retesting procedures achieve an acceptably high statistical power to detect changes at downgradient wells for constituents evaluated using intrawell prediction limits.

2.4 Conclusions

Four detection monitoring events were completed in accordance with the CCR Rule. The laboratory and field data from these events were reviewed prior to statistical analysis, with no QA/QC issues identified that impacted data usability. Mann-Whitney tests were completed to evaluate whether data from the detection monitoring events could be added to the existing background dataset. Where appropriate, the background datasets were updated, and UPLs and LPLs were recalculated. Intrawell tests using a one-of-two retesting procedure were selected for Appendix III parameters.

SECTION 3

REFERENCES

American Electric Power (AEP). 2017. Statistical Analysis Plan – Flint Creek Plant. January.

Geosyntec Consultants. 2018a. Statistical Analysis Summary. Bottom Ash Storage Pond – Flint Creek Plant. January.

Geosyntec Consultants, 2018b. Alternative Source Demonstration – Federal CCR Rule. Flint Creek Plant - Primary Bottom Ash Pond. April.

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

TABLES

Table 1: Groundwater Data Summary
Flint Creek - Primary Bottom Ash Pond

Parameter	Unit	AP-51						AP-53					
		8/29/2017	3/28/2018	8/28/2018	10/22/2018	3/11/2019	6/10/2019	8/29/2017	3/28/2018	8/28/2018	10/22/2018	3/11/2019	6/10/2019
		2017-D1	2018-D1	2018-D2	2018-D2	2019-D1	2019-D1	2017-D1	2018-D1	2018-D2	2018-D2	2019-D1	2019-D1-R1
Boron	mg/L	0.0171	0.0152	0.0110	-	0.0100 J	7.41	0.114	0.115	0.124	-	0.114	7.19
Calcium	mg/L	5.13	11.1	6.69	-	6.20	181	2.82	3.51	3.37	-	3.09	175
Chloride	mg/L	6.00	2.00	-	9.71	7.84	7.79	11.0	12.0	-	19.2	12.3	13.4
Fluoride	mg/L	1.00 U	1.00 U	-	1.00 U	0.0400 J	0.0500 J	1.00 U	1.00 U	-	1.00 U	0.0700 J	0.0600
Total Dissolved Solids	mg/L	50.0	96.0	74.0	-	70.0	106	92.0	114	120	-	130	98.0
Sulfate	mg/L	3.00	9.00	-	2.14	0.400 U	2.60	34.0	43.0	-	45.0	34.6	32.8
pH	SU	4.8	7.8	7.7	-	7.6	7.2	4.8	5.0	5.6	-	5.2	5.2

Parameter	Unit	AP-54						AP-58						
		8/29/2017	3/28/2018	8/28/2018	10/22/2018	3/11/2019	6/10/2019	8/29/2017	12/21/2017	3/26/2018	8/28/2018	10/23/2018	3/12/2019	6/11/2019
		2017-D1	2018-D1	2018-D2	2018-D2	2019-D1	2019-D1-R1	2017-D1	2017-D1-R1	2018-D1	2018-D2	2018-D2	2019-D1	2019-D1-R1
Boron	mg/L	0.259	0.223	0.240	-	0.219	8.36	0.333	0.268	0.228	0.237	-	0.178	27.4
Calcium	mg/L	11.3	5.61	15.5	-	14.5	156	75.5	73.9	77.2	75.9	-	74.8	247
Chloride	mg/L	13.0	13.0	-	18.3	16.0	15.3	12.0	-	8.00	-	12.5	8.13	7.64
Fluoride	mg/L	1.00 U	1.00 U	-	1.00 U	0.0900 J	0.0700	1.00 U	-	1.00 U	-	1.00 U	0.330	0.360
Total Dissolved Solids	mg/L	156	130	168	-	160	134	344	304	262	300	-	290	272
Sulfate	mg/L	63.0	64.0	-	54.4	47.2	52.5	96.0	80.0	70.0	-	75.5	49.9	52.2
pH	SU	5.5	5.3	5.9	-	6.4	6.5	7.8	7.4	7.4	6.9	-	8.4	7.6

Parameter	Unit	AP-59								AP-60							
		8/29/2017	12/21/2017	3/26/2018	8/28/2018	10/23/2018	3/11/2019	6/11/2019	7/9/2019	8/29/2017	12/21/2017	3/26/2018	8/28/2018	10/23/2018	3/11/2019	6/11/2019	7/9/2019
		2017-D1	2017-D1-R1	2018-D1	2018-D2	2018-D2	2019-D1	2019-D1-R1	2019-D1-R2	2017-D1	2017-D1-R1	2018-D1	2018-D2	2018-D2	2019-D1	2019-D1-R1	2019-D1-R2
Boron	mg/L	0.295	0.279	0.218	0.277	-	0.221	27.0	-	1.13	0.857	0.645	1.27	-	0.728	5.95	-
Calcium	mg/L	35.4	46.8	43.2	42.2	-	45.2	247	45.3	32.3	46.2	45.5	31.1	-	21.2	113	-
Chloride	mg/L	12.0	-	12.0	-	19.0	15.0	14.7	-	13.0	-	9.00	-	15.7	11.0	9.79	-
Fluoride	mg/L	0.646 J	-	1.00 U	-	0.548 J	0.590	0.650	-	0.452 J	-	1.00 U	-	1.00 U	0.310	0.290	-
Total Dissolved Solids	mg/L	210	228	180	180	-	46.0	88.0	-	356	332	284	276	-	310	304	-
Sulfate	mg/L	21.0	-	40.0	-	26.7	35.5	38.4	-	146	128	113	-	135	114	108	-
pH	SU	7.1	6.9	7.0	7.1	-	7.4	7.3	7.0	7.7	7.2	8.6	7.8	-	10.9	10.0	7.7

Notes:
mg/L: milligrams per liter
SU: standard unit
U: Parameter was not present in concentrations above the method detection limit and is reported as the reporting limit
J: Estimated value. Parameter was detected in concentrations below the reporting limit
--: Not Measured
D1: First semi-annual detection monitoring event of the year
D2: Second semi-annual detection monitoring event of the year
R1: First verification event associated with detection monitoring round
R2: Second verification event associated with detection monitoring round
All samples were collected as part of the detection monitoring program.

Table 2: Background Level Summary
Flint Creek Plant - Primary Bottom Ash Pond

Geosyntec Consultants, Inc.

Parameter	Units	Description	AP-58	AP-59	AP-60
Boron	mg/L	Intrawell Background UPL	0.706	0.386	1.66
Calcium	mg/L	Intrawell Background UPL	85.1	47.1	51.3
Chloride	mg/L	Intrawell Background UPL	27.4	19.0	17.7
Fluoride	mg/L	Intrawell Background UPL	1.00	1.00	0.791
pH	SU	Intrawell Background UPL	9.0	7.7	10.2
		Intrawell Background LPL	6.2	6.6	6.4
Sulfate	mg/L	Intrawell Background UPL	135	47.2	183
Total Dissolved Solids	mg/L	Intrawell Background UPL	440	257	405

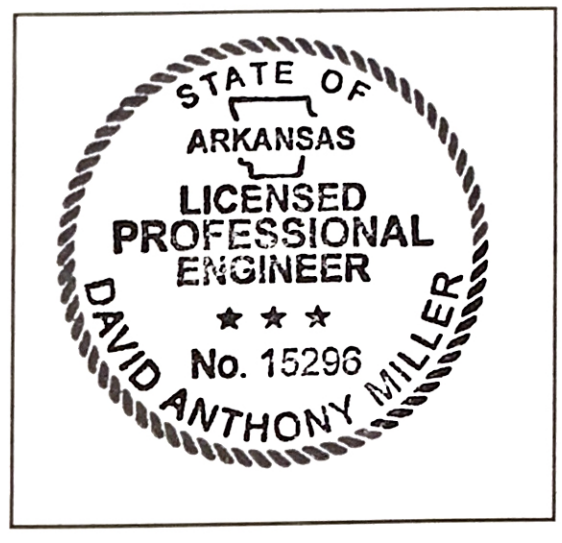
Notes:
UPL: Upper prediction limit
LPL: Lower prediction limit

ATTACHMENT A

Certification by a Qualified Professional Engineer

Certification by a Qualified Professional Engineer

I certify that the selected and above described statistical method is appropriate for evaluating the groundwater monitoring data for the Flint Creek Primary Bottom Ash Pond CCR management area and that the requirements of 40 CFR 257.93(f) have been met.



DAVID ANTHONY MILLER
Printed Name of Licensed Professional Engineer

David Anthony Miller
Signature

15296	ARKANSAS	07.09.2020
License Number	Licensing State	Date

ATTACHMENT B
Statistical Analysis Output

GROUNDWATER STATS CONSULTING

December 20, 2019

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

RE: Flint Creek Bottom Ash Pond – Background Update 2019

Dear Ms. Kreinberg,

Groundwater Stats Consulting, formerly the statistical consulting division of Sanitas Technologies, is pleased to provide the background update of groundwater data for American Electric Power's Flint Creek Bottom Ash Pond. The analysis complies with the federal rule for the Disposal of Coal Combustion Residuals from Electric Utilities (CCR Rule, 2015) as well as with the USEPA Unified Guidance (2009).

Sampling began at Flint Creek Bottom Ash Pond for the CCR program in 2016. The monitoring well network, as provided by Geosyntec Consultants, consists of the following:

- **Upgradient wells:** AP-51, AP-53, and AP-54
- **Downgradient wells:** AP-58, AP-59, and AP-60

Data were provided electronically to Groundwater Stats Consulting, and the statistical analysis was reviewed by Dr. Kirk Cameron, PhD Statistician with MacStat Consulting and primary author of the USEPA Unified Guidance. The background screening and selection of statistical method was conducted in March 2018 and approved by Dr. Cameron. A summary of the screening is provided below.

The following constituents were evaluated:

- **Appendix III parameters** – boron, calcium, chloride, fluoride, pH, sulfate, and TDS;

Time series plots for Appendix III parameters at all wells are provided for the purpose of screening data at these wells (Figure A). Additionally, box plots are included for all constituents at both upgradient and downgradient wells (Figure B). The time series plots are used to initially screen for suspected outliers and trends, while the box plots provide visual representation of variation within individual wells and between all wells.

Data at all wells were evaluated during the previous background screening for the following: 1) outliers; 2) trends; 3) most appropriate statistical method for Appendix III parameters based on site characteristics of groundwater data upgradient of the facility; and 4) eligibility of downgradient wells when intrawell statistical methods are recommended. Power curves were provided with that report and demonstrated that the selected statistical methods for Appendix III parameters comply with the USEPA Unified Guidance recommendations as discussed below.

Summary of Statistical Method:

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

Parametric prediction limits are utilized when the screened historical data follow a normal or transformed-normal distribution. When data cannot be normalized or the majority of data are nondetects, a nonparametric test is utilized. The distribution of data is tested using the Shapiro-Wilk/Shapiro-Francia test for normality. After testing for normality and performing any adjustments as discussed below (US EPA, 2009), data are analyzed using either parametric or non-parametric prediction limits.

- No statistical analyses are required on wells and analytes containing 100% nondetects (USEPA Unified Guidance, 2009, Chapter 6).
- When data contain <15% nondetects in background, simple substitution of one-half the reporting limit is utilized in the statistical analysis. The reporting limit utilized for nondetects is the practical quantification limit (PQL) as reported by the laboratory.
- When data contain between 15-50% nondetects, the Kaplan-Meier nondetect adjustment is applied to the background data. This technique adjusts the mean and standard deviation of the historical concentrations to account for concentrations below the reporting limit.
- Nonparametric prediction limits are used on data containing greater than 50% nondetects.

Historical Summary – March 2018 Background Screening

Outlier Evaluation

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

Tukey's outlier test noted a few outliers which were included on the Outlier Summary Table and accompanying graphs on the previous screening. Any values flagged as outliers are plotted in a lighter font on the time series graph. For arsenic in upgradient wells, the highest value of 0.024 mg/L was flagged as an outlier. The other low level detections identified by the test as possible outliers were not flagged because they were just slightly above the reporting limit. No values were flagged as outliers for mercury in upgradient wells as all values are very low level detections. A substitution of the most recent reporting limit was applied when varying detection limits existed in data.

No true seasonal patterns were observed on the time series plots for any of the detected data; therefore, no deseasonalizing adjustments were made to the data. When seasonal patterns are observed, data may be deseasonalized so that the resulting limits will correctly account for the seasonality as a predictable pattern rather than random variation or a release.

While trends may be visual, a quantification of the trend and its significance is needed. The Sen's Slope/Mann Kendall trend test was used to evaluate all data at each well to identify statistically significant increasing or decreasing trends. In the absence of suspected contamination, significant trending data are typically not included as part of the background data used for construction of prediction limits. This step serves to eliminate the trend and, thus, reduce variation in background. When statistically significant decreasing trends are present, earlier data are evaluated to determine whether earlier concentration levels are significantly different than current reported concentrations and will be deselected as necessary. When the historical records of data are truncated for the reasons above, a summary report will be provided to show the date ranges used in construction of the statistical limits.

The results of the trend analyses showed several statistically significant decreasing trend and were included on Trend Test Summary Table that accompanied the trend tests. A

statistically significant increasing trend was noted for calcium in well AP-58. Because interwell methods are recommended for this well/parameter pair as discussed below, no adjustments were made at this time.

Appendix III – Determination of Spatial Variation

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

The ANOVA identified no variation for fluoride, but variation was identified in groundwater upgradient of the site for all other Appendix III parameters. Data were further evaluated as described for the appropriateness of intrawell testing to accommodate the groundwater quality. A summary table of the ANOVA results was included with the previous screening.

Appendix III – Determination of Spatial Variation

Intrawell limits constructed from carefully screened background data from within each well serve to provide statistical limits that are conservative (i.e. lower) from a regulatory perspective, and that will rapidly identify a change in more recent compliance data from within a given well. This statistical method removes the element of variation from across wells and eliminates the chance of mistaking natural spatial variation for a release from the facility. Prior to performing intrawell prediction limits, several steps were required to reasonably demonstrate downgradient water quality does not have existing impacts from the practices of the facility.

Exploratory data analysis was used as a general comparison of concentrations in downgradient wells for all Appendix III parameters recommended for intrawell analyses to concentrations reported in upgradient wells. Upper tolerance limits were used in conjunction with confidence intervals to determine whether the estimated averages in downgradient wells are higher than observed levels upgradient of the facility. The upper tolerance limits were constructed to represent the extreme upper range of possible background levels at the site.

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

Parametric tolerance limits were constructed with a target of 99% confidence and 95% coverage using pooled upgradient well data for each of the Appendix III parameters recommended for intrawell analyses. The confidence and coverage levels for nonparametric tolerance limits are dependent upon the number of background samples. As more data are collected, the background population is better represented and the confidence and coverage levels increase.

Confidence intervals were constructed on downgradient wells for each of the Appendix III parameters using the tolerance limits discussed above, to determine intrawell eligibility for parameters exhibiting spatial variation. When the entire confidence interval is above a background standard for a given parameter, interwell methods are initially recommended as the statistical method. Therefore, only parameters with confidence intervals which did not exceed background standards are eligible for intrawell prediction limits.

Confidence intervals for the above parameters were found to be within their respective background limit for chloride, but above background limits for all other parameters tested. While typically interwell methods would be recommended for all parameters except chloride, studies conducted by Geosyntec Consultants support the use of intrawell limits for all parameters due to natural differences in lithology and the variable groundwater related to the presence of limestone.

All available data through June 2017 at each well were used to establish intrawell background limits based on a 1-of-2 resample plan that will be used for future comparisons. Future compliance measurements will be compared to these background limits during each subsequent semi-annual sampling event.

Natural systems continuously evolve due to physical changes made to the environment. Examples include capping a landfill, paving areas near a well, or lining a drainage

channel to prevent erosion. Periodic updating of background statistical limits will be necessary to accommodate these types of changes. In the interwell case, upgradient well data will be carefully screened for outliers and trends, and prediction limits will be updated providing data are stable. Alternatively, limits will be updated when a minimum of 2 new samples from each upgradient well are available. In the intrawell case, data for all wells and constituents are re-evaluated when a minimum of 4 new data points are available to determine whether earlier concentrations are representative of present-day groundwater quality. In some cases, the earlier portion of data are deselected prior to construction of limits in order to provide sensitive limits that will rapidly detect changes in groundwater quality. Even though the data are excluded from the calculation, the values will continue to be reported and shown in tables and graphs.

Background Update Summary – October 2019

Prior to updating background data, samples were re-evaluated for outliers using Tukey's outlier test and visual screening on all data through March 2019. Although Tukey's noted a high value for calcium in upgradient well AP-51, this value was similar to concentrations in other upgradient wells, and therefore, no values for Appendix III parameters were flagged (Figure C).

For constituents requiring intrawell prediction limits, the Mann-Whitney (Wilcoxon Rank Sum) test was used to compare the medians of historical data through June 2017 to the new compliance samples at each well through March 2019 to evaluate whether the groups are statistically different at the 99% confidence level, in which case background data may be updated with compliance data (Figure D). Statistically significant differences were found between the two groups for boron, calcium, chloride and TDS in well AP-58; and sulfate in upgradient well AP-54 and downgradient wells AP-58, and AP-60.

Typically, when the test concludes that the medians of the two groups are significantly different, particularly in the downgradient wells, the background are not updated to include the newer data but will be reconsidered in the future. Due to the more recent increase in concentrations for calcium in well AP-58, this record was not updated at this time and will continue to use the prediction limit that was established during the initial background screening which includes the original 8 background samples. Geosyntec Consultants, reportedly, will conduct further studies to determine if the more recent concentrations are reflective of present-day groundwater quality conditions in that region, in which case the record will be updated during the next background update. This will ensure that earlier measurements are not included in construction of the statistical limit.

Regarding boron, sulfate, and TDS in downgradient well AP-58, historical concentrations were significantly higher than more recent reported samples. Therefore, earlier measurements were deselected prior to construction of statistical limits so that resulting limits are conservative from a regulatory perspective and capable of identifying slight increases, should they occur.

Although significant differences were also noted for chloride in well AP-58 and sulfate in wells AP-54 and AP-60, these records were updated since the magnitude of the median differences are substantially lower than cases mentioned previously. A summary of these results follows this letter and the test results are included with the Mann Whitney test section at the end of this report. Additionally, a summary of well/constituent pairs using a truncated portion of their data follows this letter (Figure E).

Intrawell prediction limits using all historical data through March 2019, except for the cases mentioned above, combined with a 1-of-2 resample plan, were constructed and a summary of the updated limits follows this letter (Figure F). Future compliance observations at each well will be compared to these background limits during each subsequent semi-annual sampling event.

Thank you for the opportunity to assist you in the statistical analysis of groundwater quality for the Flint Creek Bottom Ash Pond. If you have any questions or comments, please feel free to contact us.

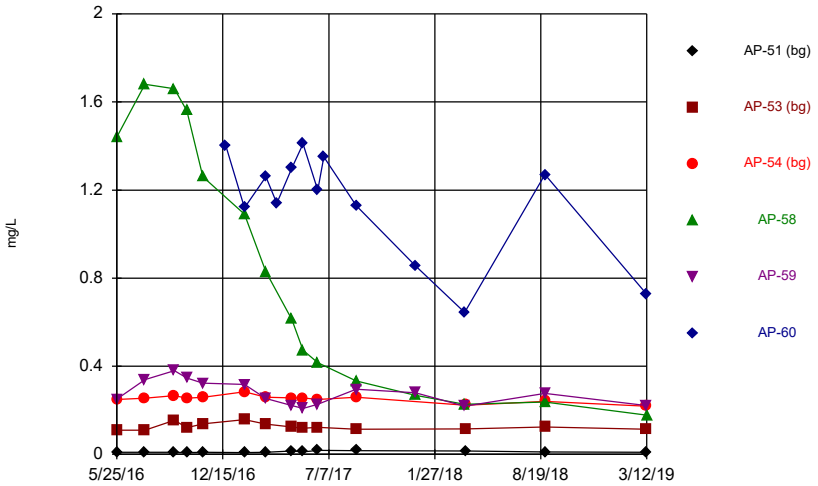
For Groundwater Stats Consulting,

Andrew T. Collins
Groundwater Analyst

Kristina L. Rayner
Groundwater Statistician

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

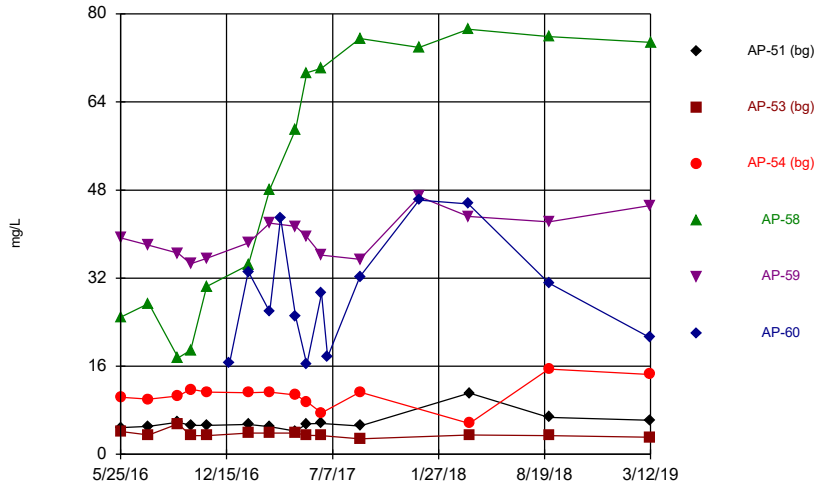
Time Series



Constituent: Boron, total Analysis Run 12/23/2019 9:56 AM View: Time Series
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

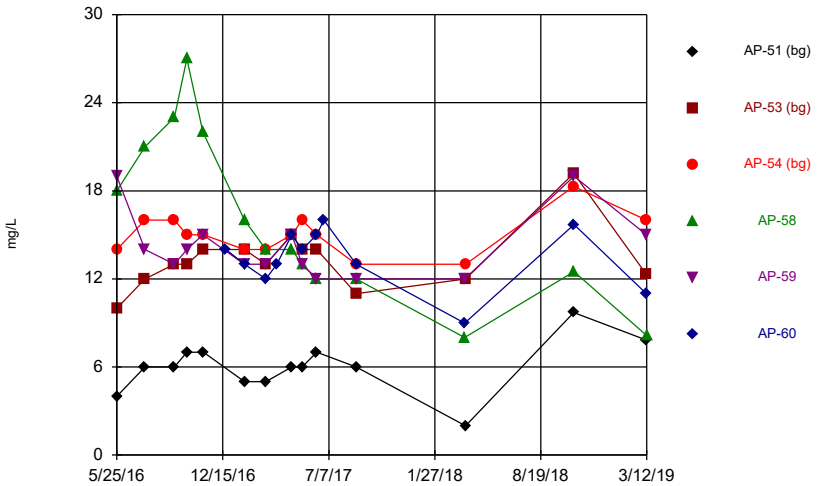
Time Series



Constituent: Calcium, total Analysis Run 12/23/2019 9:56 AM View: Time Series
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

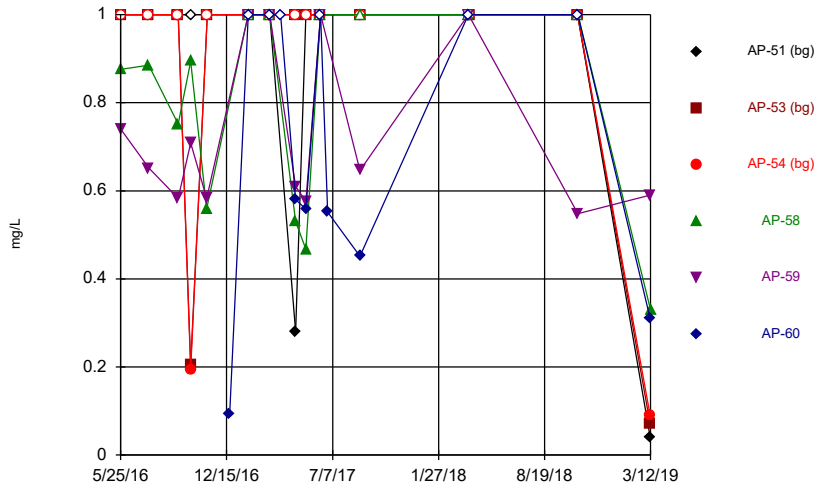
Time Series



Constituent: Chloride, total Analysis Run 12/23/2019 9:56 AM View: Time Series
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

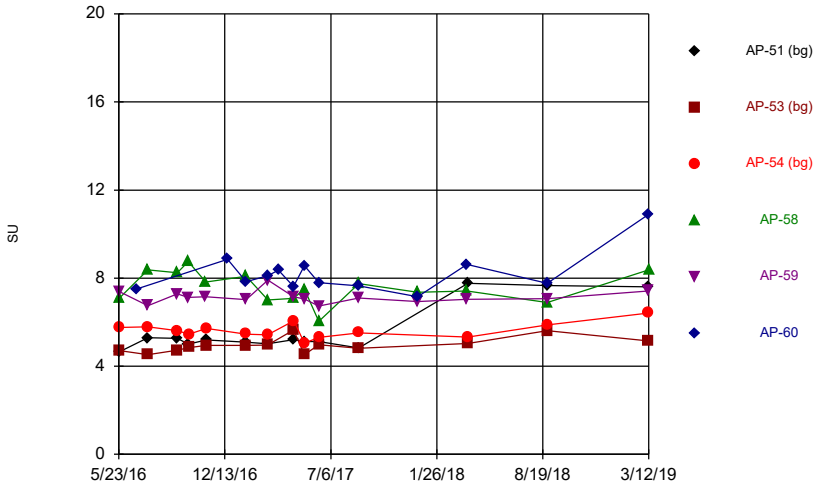
Time Series



Constituent: Fluoride, total Analysis Run 12/23/2019 9:56 AM View: Time Series
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

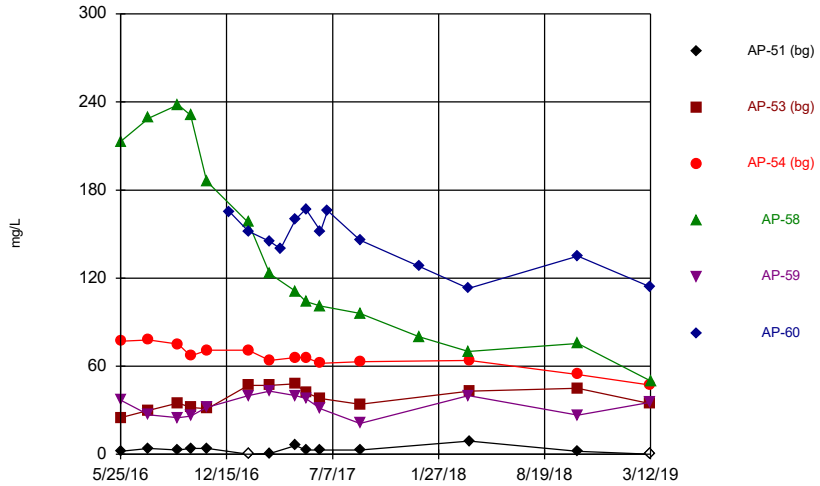
Time Series



Constituent: pH, field Analysis Run 12/23/2019 9:56 AM View: Time Series
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

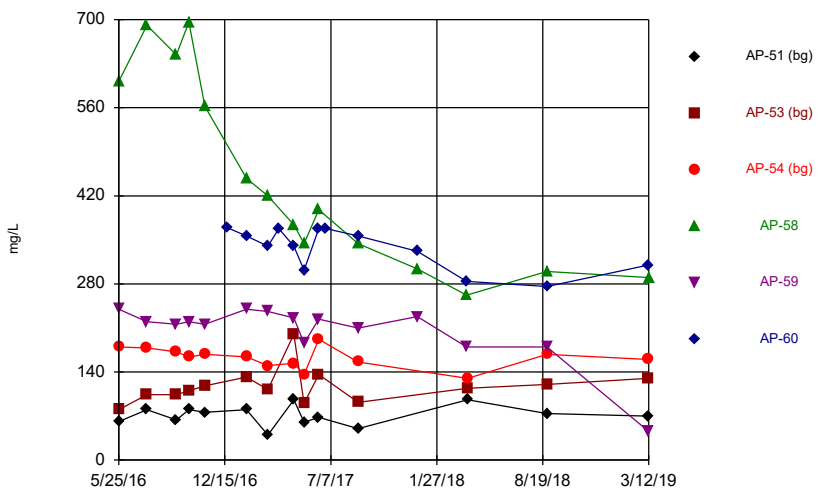
Time Series



Constituent: Sulfate, total Analysis Run 12/23/2019 9:56 AM View: Time Series
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

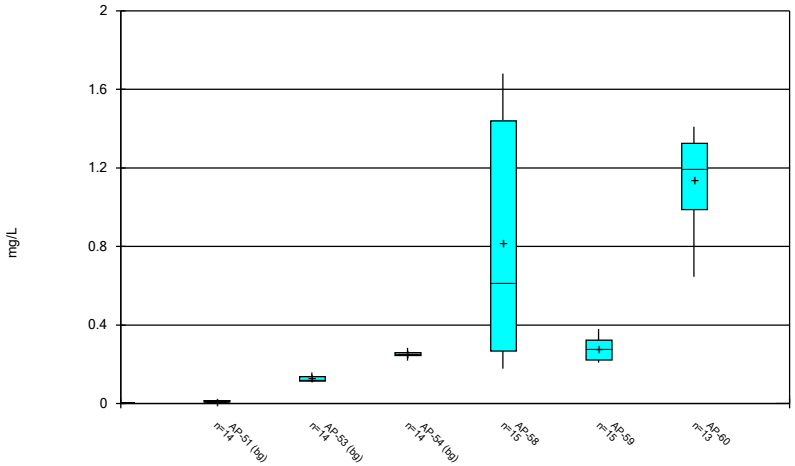
Time Series



Constituent: Total Dissolved Solids [TDS] Analysis Run 12/23/2019 9:56 AM View: Time Series
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

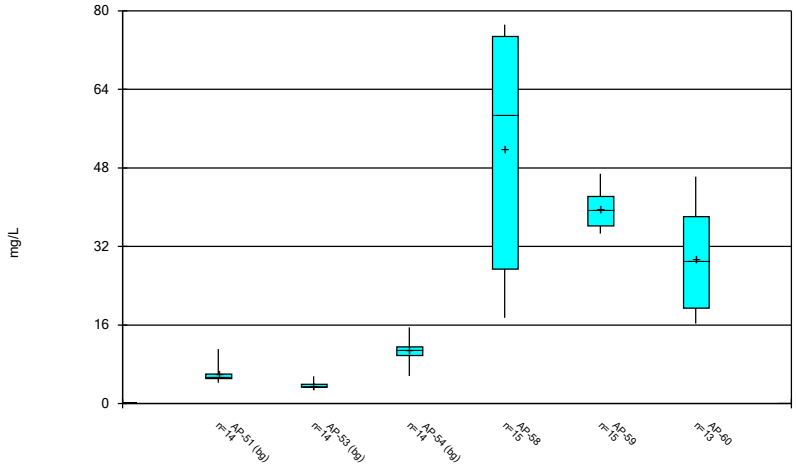
Box & Whiskers Plot



Constituent: Boron, total Analysis Run 12/23/2019 9:57 AM View: Time Series
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

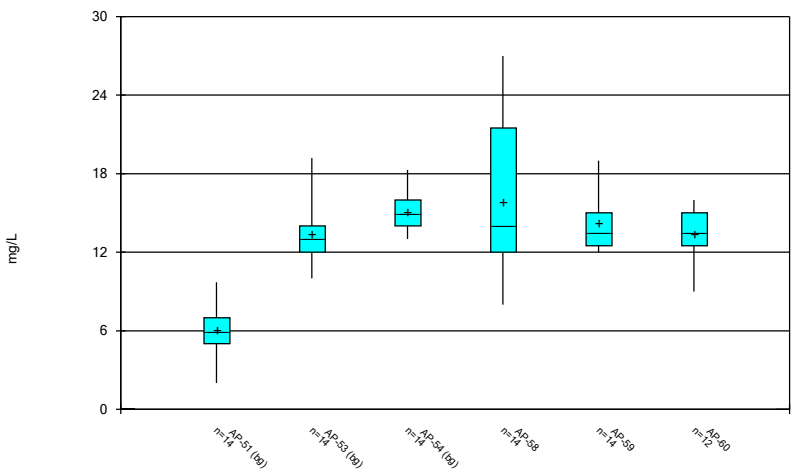
Box & Whiskers Plot



Constituent: Calcium, total Analysis Run 12/23/2019 9:57 AM View: Time Series
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

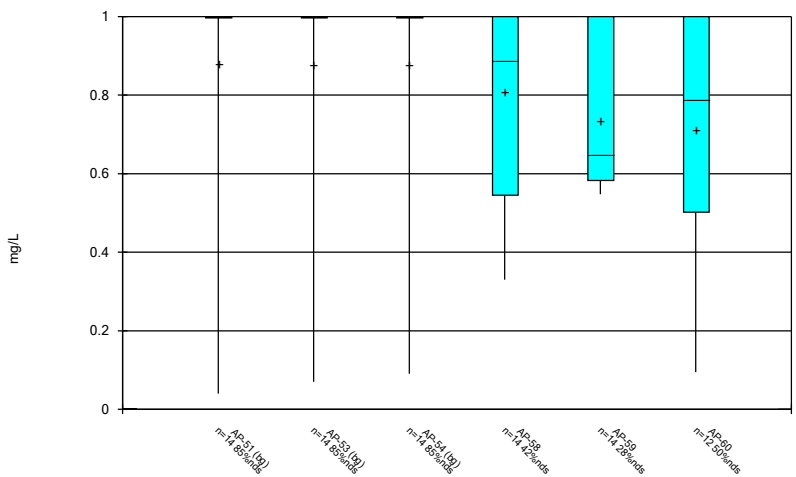
Box & Whiskers Plot



Constituent: Chloride, total Analysis Run 12/23/2019 9:57 AM View: Time Series
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

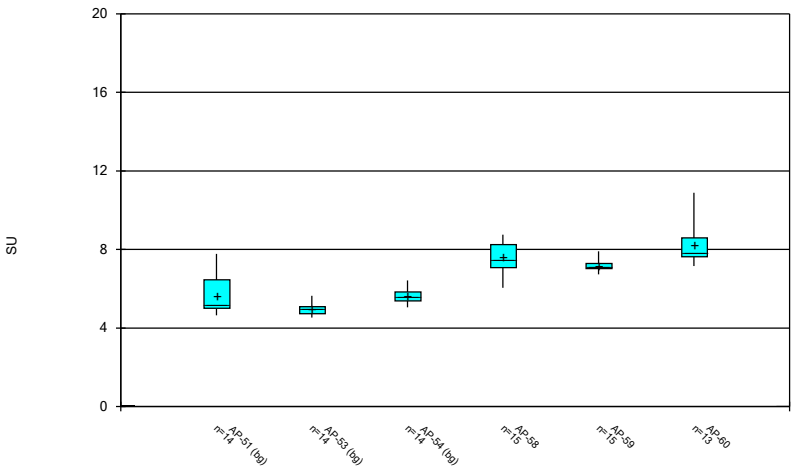
Box & Whiskers Plot



Constituent: Fluoride, total Analysis Run 12/23/2019 9:57 AM View: Time Series
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

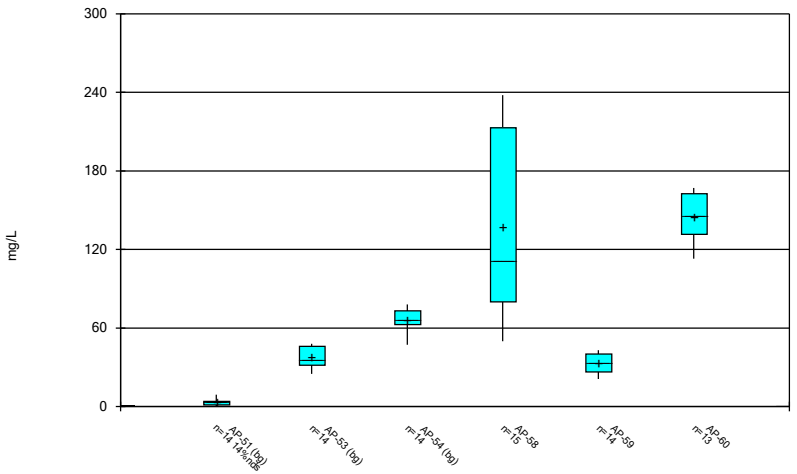
Box & Whiskers Plot



Constituent: pH, field Analysis Run 12/23/2019 9:57 AM View: Time Series
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

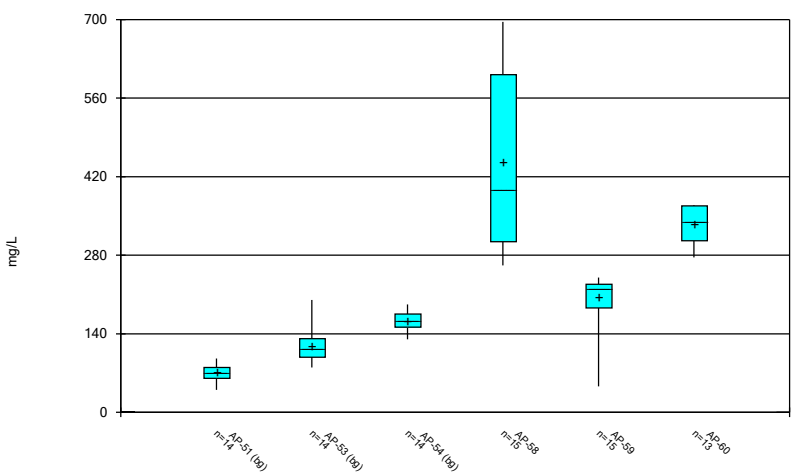
Box & Whiskers Plot



Constituent: Sulfate, total Analysis Run 12/23/2019 9:57 AM View: Time Series
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Box & Whiskers Plot



Constituent: Total Dissolved Solids [TDS] Analysis Run 12/23/2019 9:57 AM View: Time Series
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Outlier Summary

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP Printed 12/16/2019, 1:22 PM

No outliers identified.

Outlier Analysis - Significant Results

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP Printed 12/23/2019, 10:03 AM

Constituent	Well	Outlier	Value(s)	Date(s)	Method	N	Mean	Std. Dev.	Distribution	Normality Test
Calcium, total (mg/L)	**AP-51 (bg)**	**Yes**	**11.1**	**3/28/2018**	**NP**	**14**	**5.801**	**1.638**	**ln(x)**	**ShapiroWilk**

Outlier Analysis - All Results

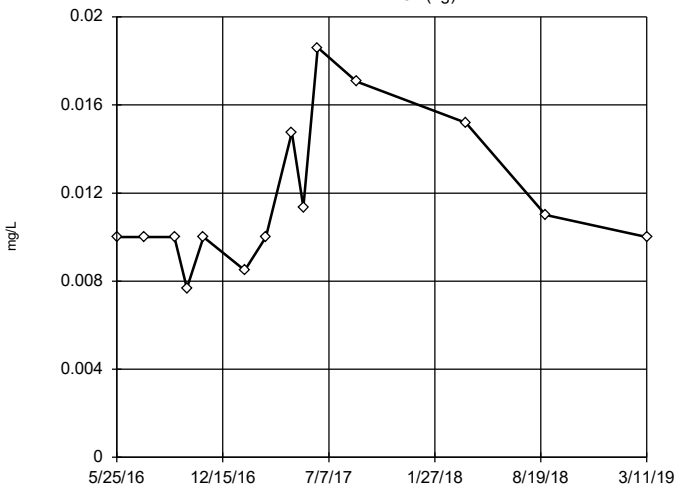
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP Printed 12/23/2019, 10:03 AM

Constituent	Well	Outlier	Value(s)	Date(s)	Method	N	Mean	Std. Dev.	Distribution	Normality Test
Boron, total (mg/L)	AP-51 (bg)	No	n/a	n/a	NP	14	0.01172	0.003308	ln(x)	ShapiroWilk
Boron, total (mg/L)	AP-53 (bg)	No	n/a	n/a	NP	14	0.1256	0.01568	ln(x)	ShapiroWilk
Boron, total (mg/L)	AP-54 (bg)	No	n/a	n/a	NP	14	0.2521	0.01646	x^3	ShapiroWilk
Boron, total (mg/L)	AP-58	No	n/a	n/a	NP	15	0.8177	0.5741	ln(x)	ShapiroWilk
Boron, total (mg/L)	AP-59	No	n/a	n/a	NP	15	0.2771	0.05451	ln(x)	ShapiroWilk
Boron, total (mg/L)	AP-60	No	n/a	n/a	NP	13	1.139	0.2484	x^4	ShapiroWilk
Calcium, total (mg/L)	**AP-51 (bg)**	**Yes**	**11.1**	**3/28/2018**	**NP**	**14**	**5.801**	**1.638**	**ln(x)**	**ShapiroWilk**
Calcium, total (mg/L)	AP-53 (bg)	No	n/a	n/a	NP	14	3.657	0.6408	ln(x)	ShapiroWilk
Calcium, total (mg/L)	AP-54 (bg)	No	n/a	n/a	NP	14	10.82	2.444	normal	ShapiroWilk
Calcium, total (mg/L)	AP-58	No	n/a	n/a	NP	15	51.83	23.67	sqrt(x)	ShapiroWilk
Calcium, total (mg/L)	AP-59	No	n/a	n/a	NP	15	39.62	3.74	ln(x)	ShapiroWilk
Calcium, total (mg/L)	AP-60	No	n/a	n/a	NP	13	29.48	10.49	x^(1/3)	ShapiroWilk
Chloride, total (mg/L)	AP-51 (bg)	No	n/a	n/a	NP	14	6.039	1.8	normal	ShapiroWilk
Chloride, total (mg/L)	AP-53 (bg)	No	n/a	n/a	NP	14	13.32	2.157	ln(x)	ShapiroWilk
Chloride, total (mg/L)	AP-54 (bg)	No	n/a	n/a	NP	14	15.02	1.411	ln(x)	ShapiroWilk
Chloride, total (mg/L)	AP-58	No	n/a	n/a	NP	14	15.76	5.693	x^(1/3)	ShapiroWilk
Chloride, total (mg/L)	AP-59	No	n/a	n/a	NP	14	14.21	2.293	ln(x)	ShapiroWilk
Chloride, total (mg/L)	AP-60	No	n/a	n/a	NP	12	13.39	2.033	x^3	ShapiroWilk
Fluoride, total (mg/L)	AP-51 (bg)	n/a	n/a	n/a	NP	14	0.88	0.3086	unknown	ShapiroWilk
Fluoride, total (mg/L)	AP-53 (bg)	n/a	n/a	n/a	NP	14	0.8768	0.3143	unknown	ShapiroWilk
Fluoride, total (mg/L)	AP-54 (bg)	n/a	n/a	n/a	NP	14	0.8775	0.3122	unknown	ShapiroWilk
Fluoride, total (mg/L)	AP-58	No	n/a	n/a	NP	14	0.8067	0.2362	x^3	ShapiroWilk
Fluoride, total (mg/L)	AP-59	No	n/a	n/a	NP	14	0.7313	0.1838	ln(x)	ShapiroWilk
Fluoride, total (mg/L)	AP-60	No	n/a	n/a	NP	12	0.7122	0.3268	normal	ShapiroWilk
pH, field (SU)	AP-51 (bg)	No	n/a	n/a	NP	14	5.63	1.124	ln(x)	ShapiroWilk
pH, field (SU)	AP-53 (bg)	No	n/a	n/a	NP	14	4.96	0.3326	ln(x)	ShapiroWilk
pH, field (SU)	AP-54 (bg)	No	n/a	n/a	NP	14	5.629	0.3483	ln(x)	ShapiroWilk
pH, field (SU)	AP-58	No	n/a	n/a	NP	15	7.587	0.7144	x^2	ShapiroWilk
pH, field (SU)	AP-59	No	n/a	n/a	NP	15	7.144	0.287	ln(x)	ShapiroWilk
pH, field (SU)	AP-60	No	n/a	n/a	NP	13	8.209	0.9448	ln(x)	ShapiroWilk
Sulfate, total (mg/L)	AP-51 (bg)	No	n/a	n/a	NP	14	3.147	2.342	sqrt(x)	ShapiroWilk
Sulfate, total (mg/L)	AP-53 (bg)	No	n/a	n/a	NP	14	37.97	7.372	sqrt(x)	ShapiroWilk
Sulfate, total (mg/L)	AP-54 (bg)	No	n/a	n/a	NP	14	66.11	8.402	x^3	ShapiroWilk
Sulfate, total (mg/L)	AP-58	No	n/a	n/a	NP	15	137.7	65.55	ln(x)	ShapiroWilk
Sulfate, total (mg/L)	AP-59	No	n/a	n/a	NP	14	33.01	6.972	normal	ShapiroWilk
Sulfate, total (mg/L)	AP-60	No	n/a	n/a	NP	13	144.8	18.37	x^3	ShapiroWilk
Total Dissolved Solids [TDS] (mg/L)	AP-51 (bg)	No	n/a	n/a	NP	14	71.07	15.71	normal	ShapiroWilk
Total Dissolved Solids [TDS] (mg/L)	AP-53 (bg)	No	n/a	n/a	NP	14	117.3	28.82	ln(x)	ShapiroWilk
Total Dissolved Solids [TDS] (mg/L)	AP-54 (bg)	No	n/a	n/a	NP	14	162.3	16.66	x^2	ShapiroWilk
Total Dissolved Solids [TDS] (mg/L)	AP-58	No	n/a	n/a	NP	15	445.3	153.1	ln(x)	ShapiroWilk
Total Dissolved Solids [TDS] (mg/L)	AP-59	No	n/a	n/a	NP	15	204.5	48.07	x^6	ShapiroWilk
Total Dissolved Solids [TDS] (mg/L)	AP-60	No	n/a	n/a	NP	13	336.1	33.1	x^6	ShapiroWilk

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-51 (bg)



n = 14

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

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

High cutoff = 0.0502, low cutoff = 0.002982, based on IQR multiplier of 3.

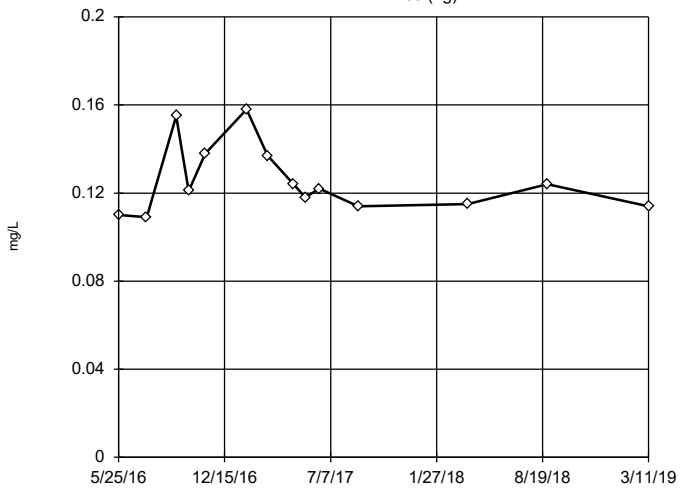
Constituent: Boron, total Analysis Run 12/23/2019 9:58 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-53 (bg)



n = 14

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

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

High cutoff = 0.2413, low cutoff = 0.06497, based on IQR multiplier of 3.

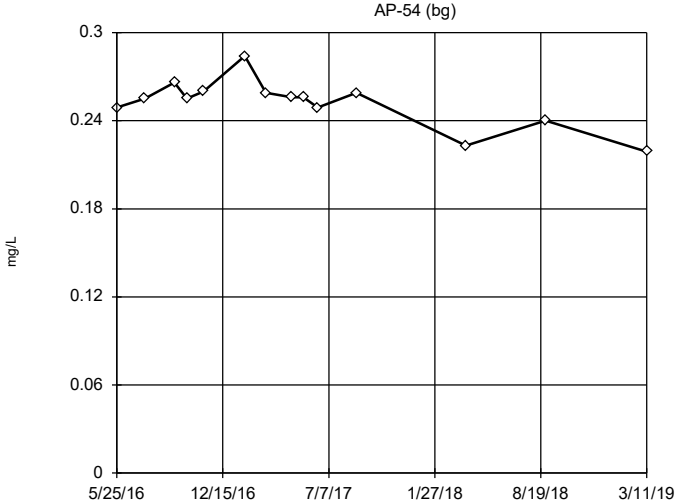
Constituent: Boron, total Analysis Run 12/23/2019 9:58 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-54 (bg)



n = 14

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

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

High cutoff = 0.2963, low cutoff = 0.1827, based on IQR multiplier of 3.

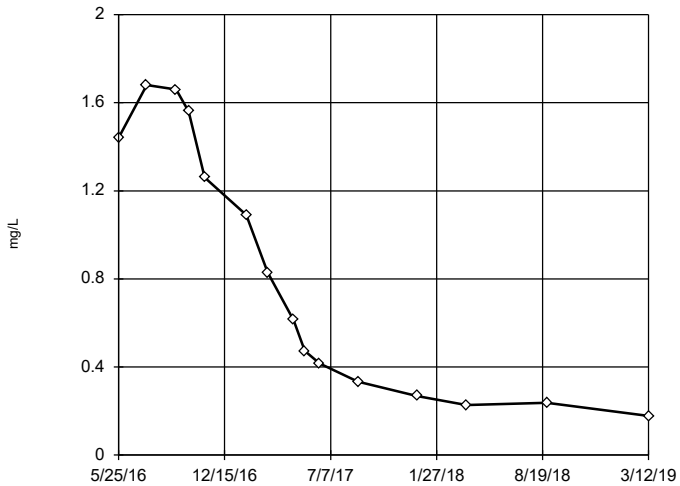
Constituent: Boron, total Analysis Run 12/23/2019 9:58 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-58



n = 15

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

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

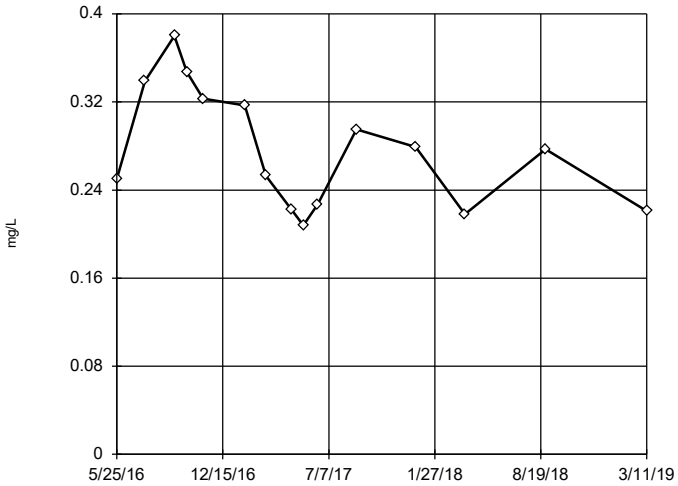
High cutoff = 223.4, low cutoff = 0.001728, based on IQR multiplier of 3.

Constituent: Boron, total Analysis Run 12/23/2019 9:58 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Tukey's Outlier Screening

AP-59



n = 15

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

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

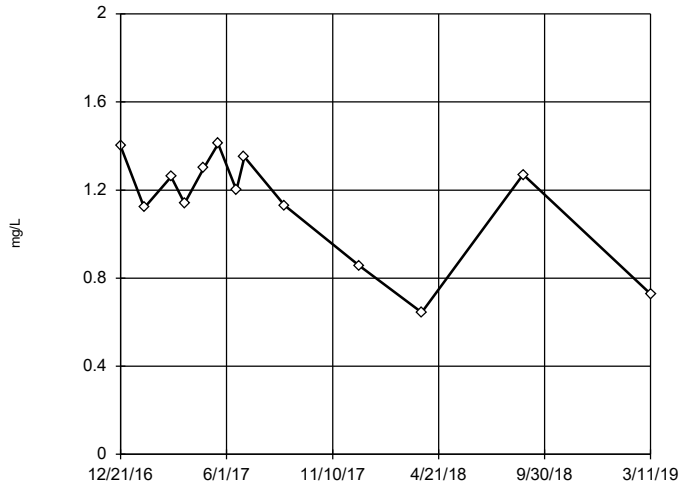
High cutoff = 0.9948, low cutoff = 0.07208, based on IQR multiplier of 3.

Constituent: Boron, total Analysis Run 12/23/2019 9:58 AM View: Time Series
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-60



n = 13

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

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

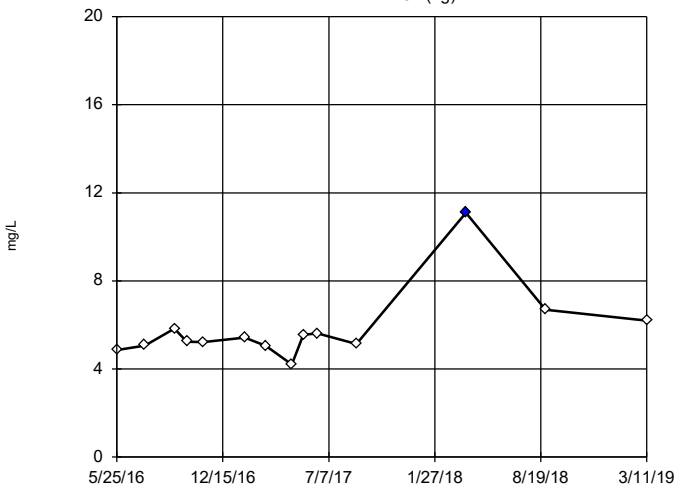
High cutoff = 1.741, low cutoff = -1.498, based on IQR multiplier of 3.

Constituent: Boron, total Analysis Run 12/23/2019 9:58 AM View: Time Series
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-51 (bg)



n = 14

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

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

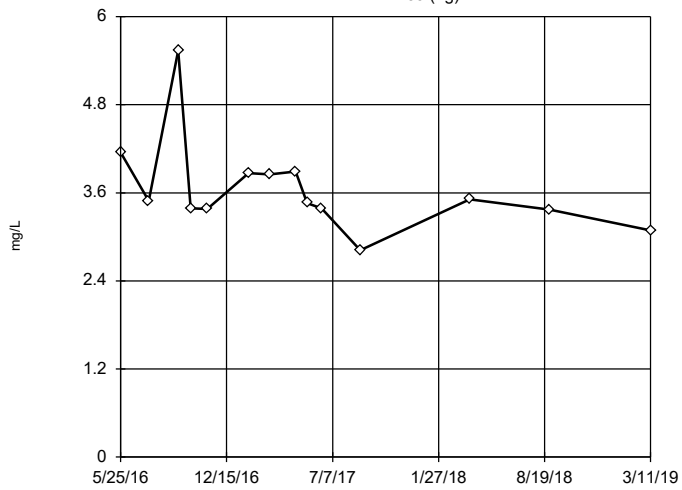
High cutoff = 10.12, low cutoff = 3.009, based on IQR multiplier of 3.

Constituent: Calcium, total Analysis Run 12/23/2019 9:58 AM View: Time Series
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-53 (bg)



n = 14

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

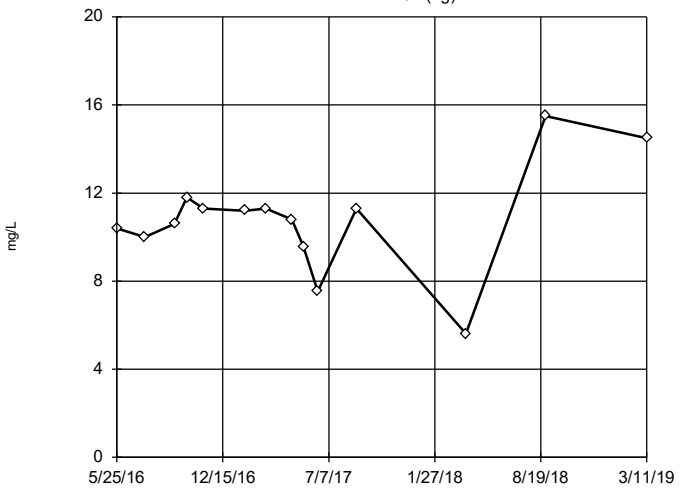
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 5.895, low cutoff = 2.221, based on IQR multiplier of 3.

Constituent: Calcium, total Analysis Run 12/23/2019 9:58 AM View: Time Series
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Tukey's Outlier Screening

AP-54 (bg)



n = 14

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

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

High cutoff = 16.83, low cutoff = 4.51, based on IQR multiplier of 3.

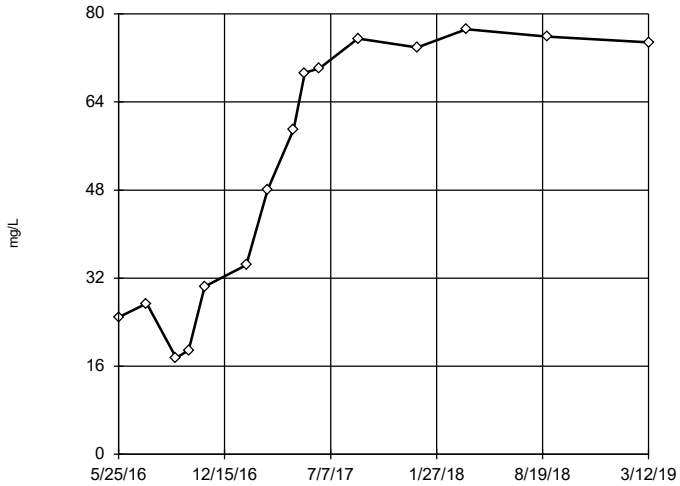
Constituent: Calcium, total Analysis Run 12/23/2019 9:58 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-58



n = 15

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

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

High cutoff = 356.9, low cutoff = -25.08, based on IQR multiplier of 3.

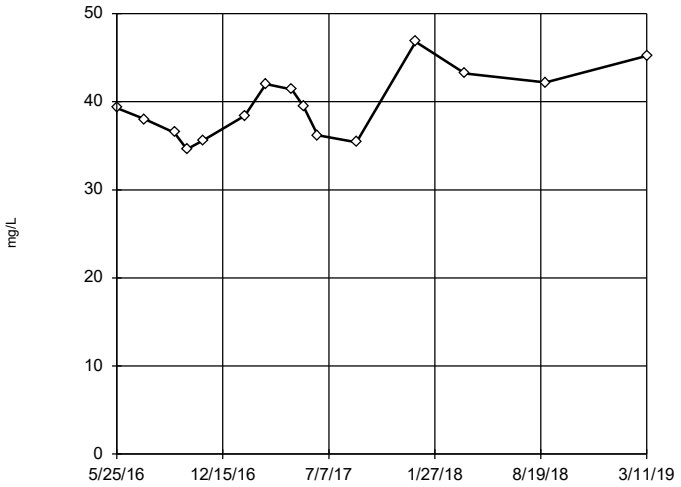
Constituent: Calcium, total Analysis Run 12/23/2019 9:58 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-59



n = 15

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

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

High cutoff = 66.85, low cutoff = 22.85, based on IQR multiplier of 3.

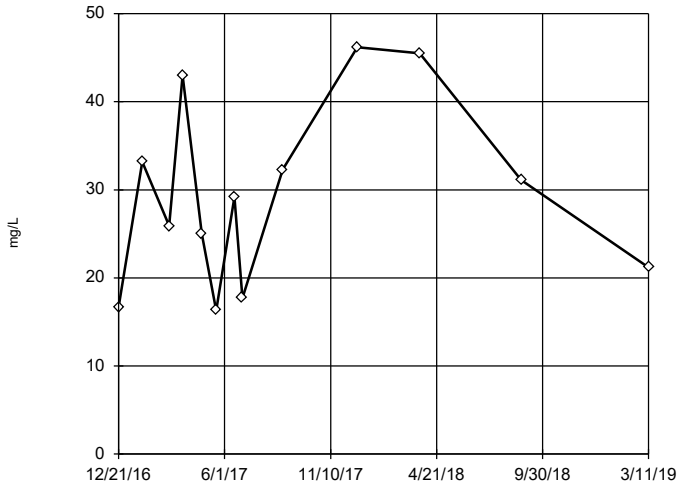
Constituent: Calcium, total Analysis Run 12/23/2019 9:58 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-60



n = 13

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

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

High cutoff = 155.2, low cutoff = 0.3027, based on IQR multiplier of 3.

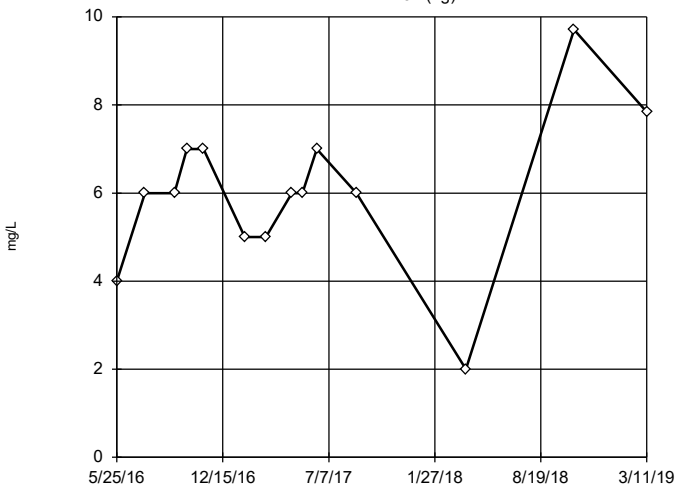
Constituent: Calcium, total Analysis Run 12/23/2019 9:58 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-51 (bg)



n = 14

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

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

High cutoff = 13, low cutoff = -1, based on IQR multiplier of 3.

Constituent: Chloride, total Analysis Run 12/23/2019 9:58 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-53 (bg)

n = 14

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

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

High cutoff = 22.23, low cutoff = 7.557, based on IQR multiplier of 3.

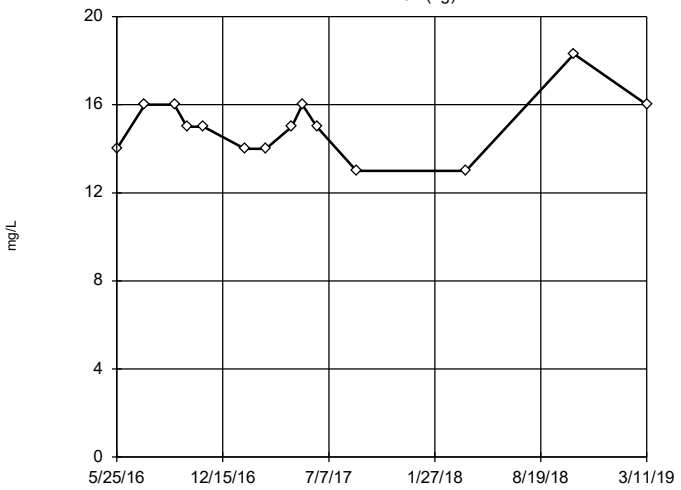
Constituent: Chloride, total Analysis Run 12/23/2019 9:58 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-54 (bg)



n = 14

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

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

High cutoff = 23.88, low cutoff = 9.379, based on IQR multiplier of 3.

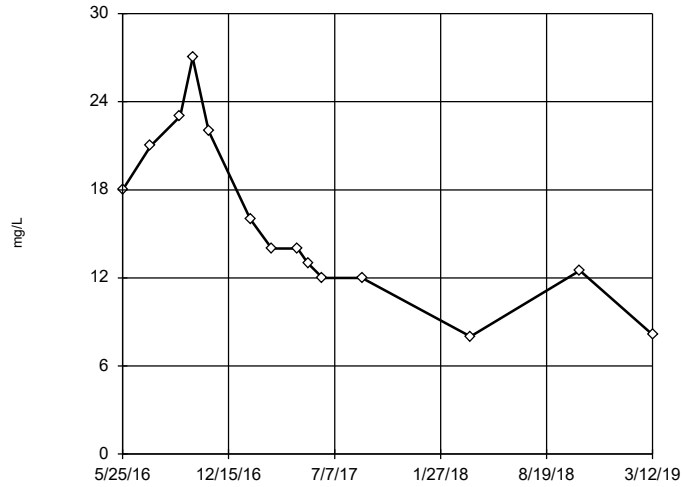
Constituent: Chloride, total Analysis Run 12/23/2019 9:58 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-58



n = 14

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

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

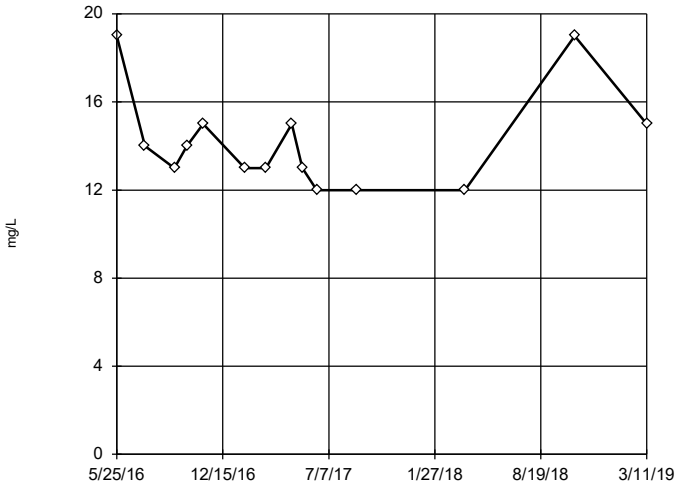
High cutoff = 76.96, low cutoff = 0.5439, based on IQR multiplier of 3.

Constituent: Chloride, total Analysis Run 12/23/2019 9:58 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Tukey's Outlier Screening

AP-59



n = 14

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

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

High cutoff = 25.98, low cutoff = 7.211, based on IQR multiplier of 3.

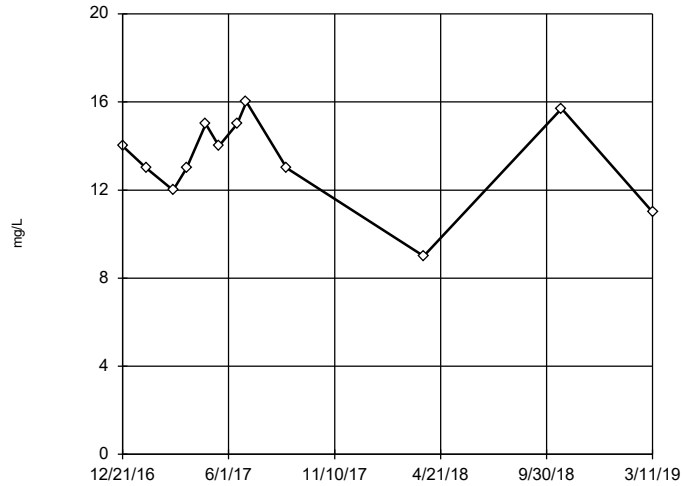
Constituent: Chloride, total Analysis Run 12/23/2019 9:58 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-60



n = 12

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

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

High cutoff = 19.67, low cutoff = -13.15, based on IQR multiplier of 3.

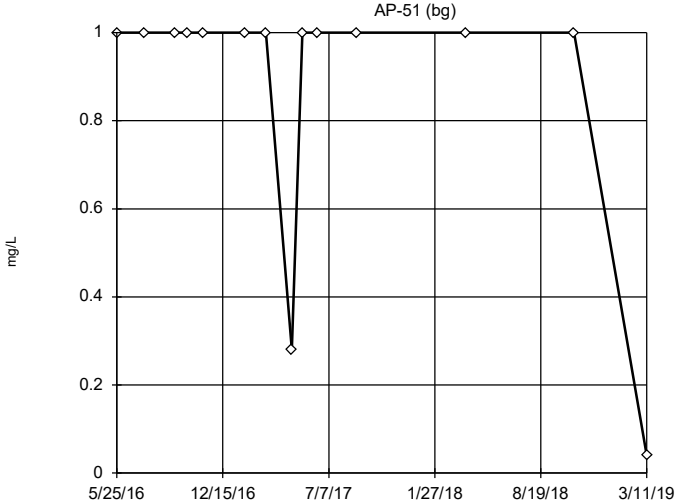
Constituent: Chloride, total Analysis Run 12/23/2019 9:58 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-51 (bg)



n = 14

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

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

The results were invalidated, because the lower and upper quartiles are equal.

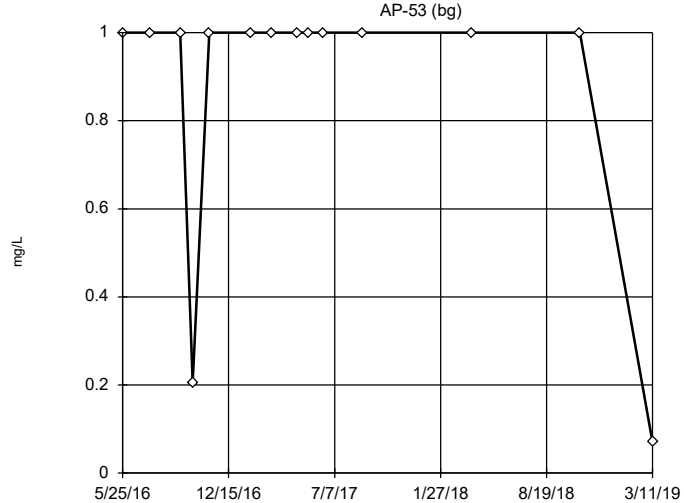
Constituent: Fluoride, total Analysis Run 12/23/2019 9:58 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-53 (bg)



n = 14

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

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

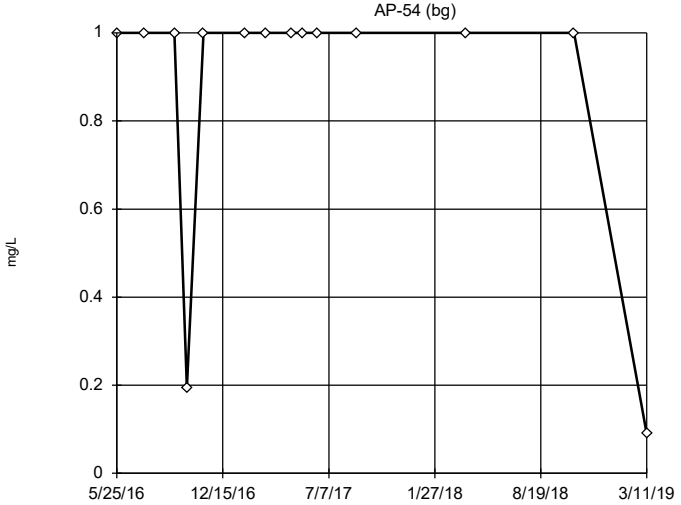
The results were invalidated, because the lower and upper quartiles are equal.

Constituent: Fluoride, total Analysis Run 12/23/2019 9:58 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Tukey's Outlier Screening

AP-54 (bg)



n = 14

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

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

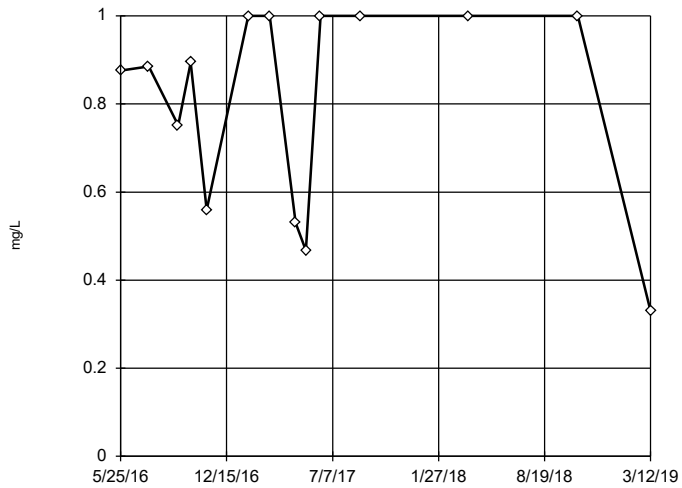
The results were invalidated, because the lower and upper quartiles are equal.

Constituent: Fluoride, total Analysis Run 12/23/2019 9:58 AM View: Time Series
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-58



n = 14

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

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

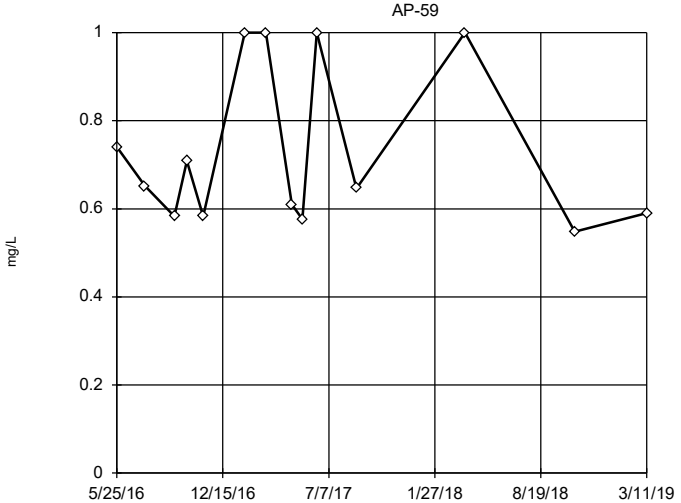
High cutoff = 1.52, low cutoff = -1.33, based on IQR multiplier of 3.

Constituent: Fluoride, total Analysis Run 12/23/2019 9:58 AM View: Time Series
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-59



n = 14

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

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

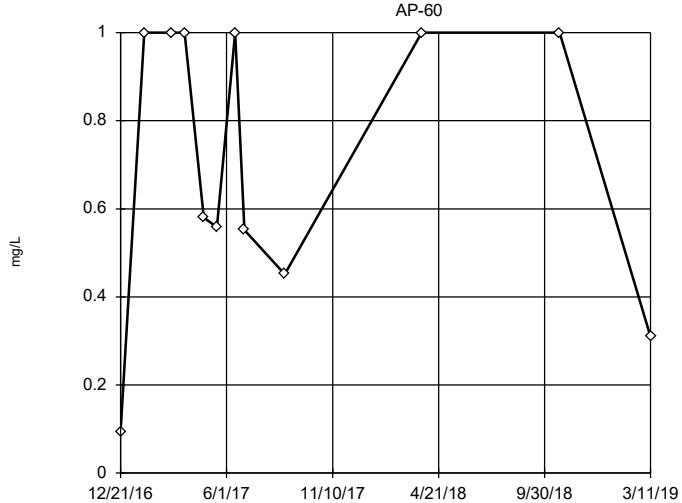
High cutoff = 5.044, low cutoff = 0.1156, based on IQR multiplier of 3.

Constituent: Fluoride, total Analysis Run 12/23/2019 9:58 AM View: Time Series
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-60



n = 12

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

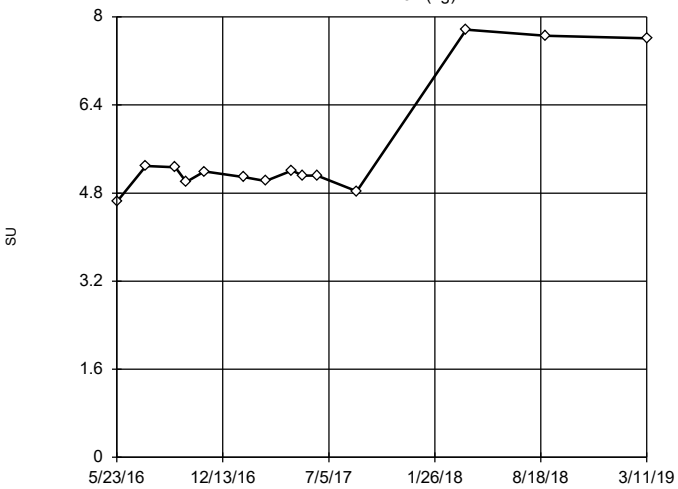
Ladder of Powers transformations did not improve normality; analysis run on raw data.

High cutoff = 2.495, low cutoff = -0.9932, based on IQR multiplier of 3.

Constituent: Fluoride, total Analysis Run 12/23/2019 9:58 AM View: Time Series
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Tukey's Outlier Screening

AP-51 (bg)



n = 14

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

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

High cutoff = 12.89, low cutoff = 2.467, based on IQR multiplier of 3.

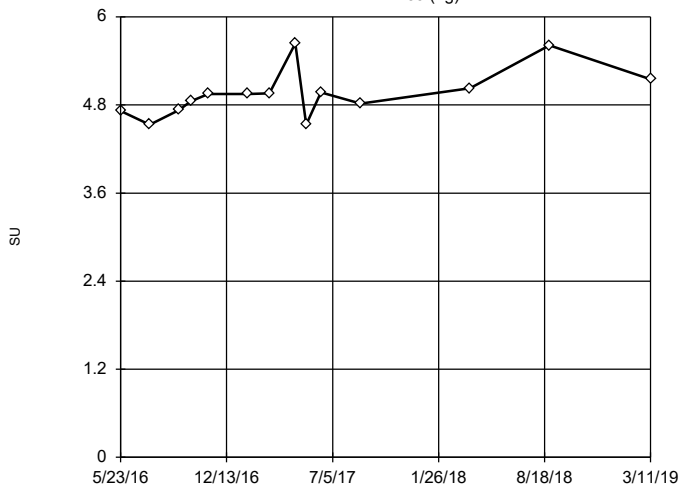
Constituent: pH, field Analysis Run 12/23/2019 9:58 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-53 (bg)



n = 14

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

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

High cutoff = 6.361, low cutoff = 3.78, based on IQR multiplier of 3.

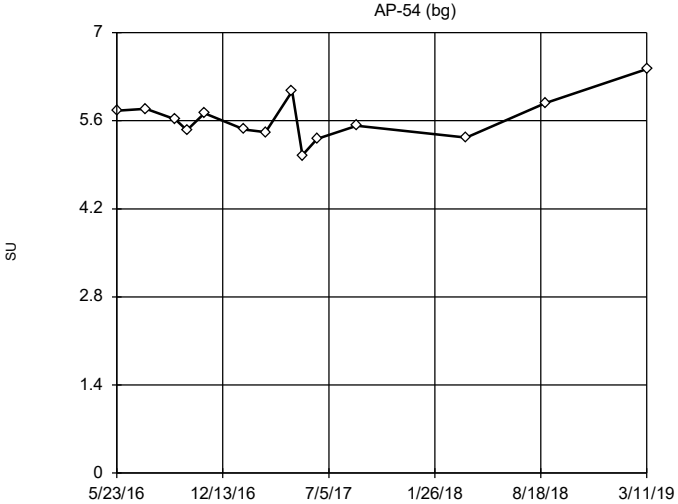
Constituent: pH, field Analysis Run 12/23/2019 9:58 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-54 (bg)



n = 14

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

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

High cutoff = 7.465, low cutoff = 4.201, based on IQR multiplier of 3.

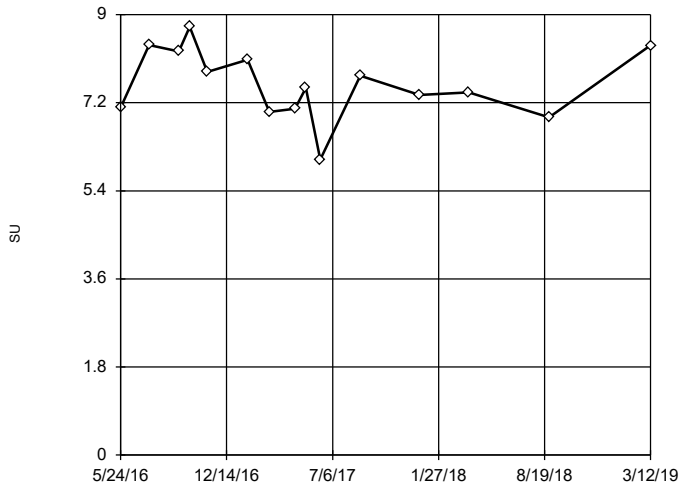
Constituent: pH, field Analysis Run 12/23/2019 9:58 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-58



n = 15

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

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

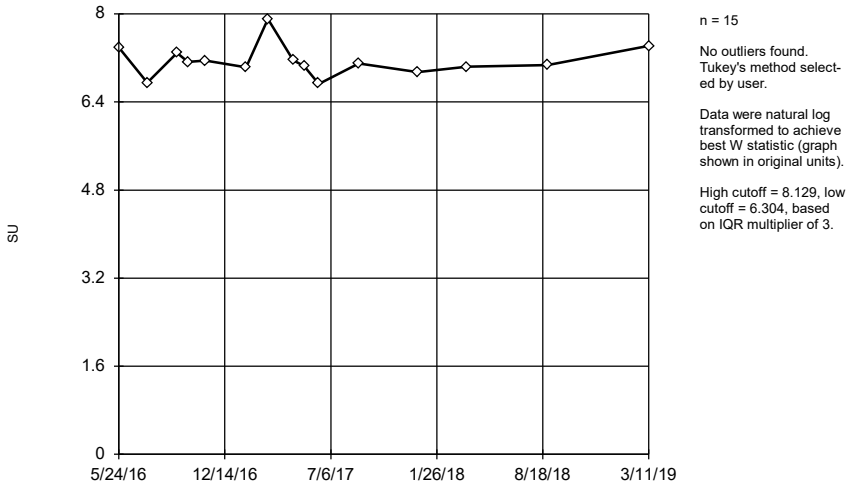
High cutoff = 11.04, low cutoff = -1.919, based on IQR multiplier of 3.

Constituent: pH, field Analysis Run 12/23/2019 9:58 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Tukey's Outlier Screening

AP-59



n = 15

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

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

High cutoff = 8.129, low cutoff = 6.304, based on IQR multiplier of 3.

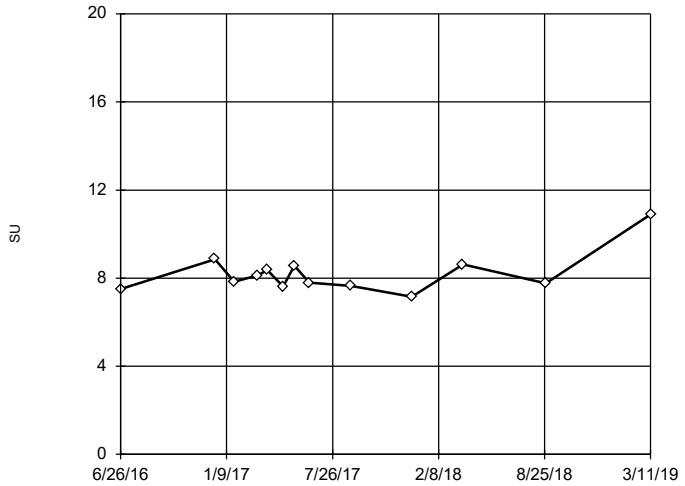
Constituent: pH, field Analysis Run 12/23/2019 9:58 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-60



n = 13

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

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

High cutoff = 12.23, low cutoff = 5.361, based on IQR multiplier of 3.

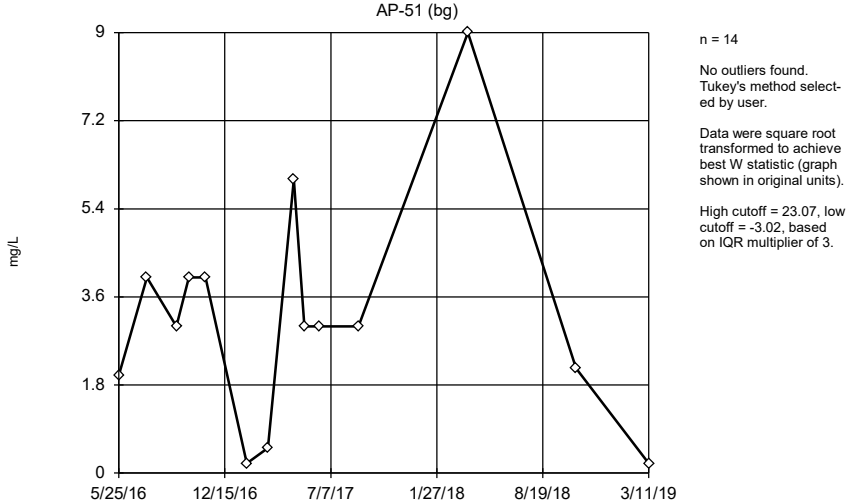
Constituent: pH, field Analysis Run 12/23/2019 9:58 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-51 (bg)



n = 14

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

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

High cutoff = 23.07, low cutoff = -3.02, based on IQR multiplier of 3.

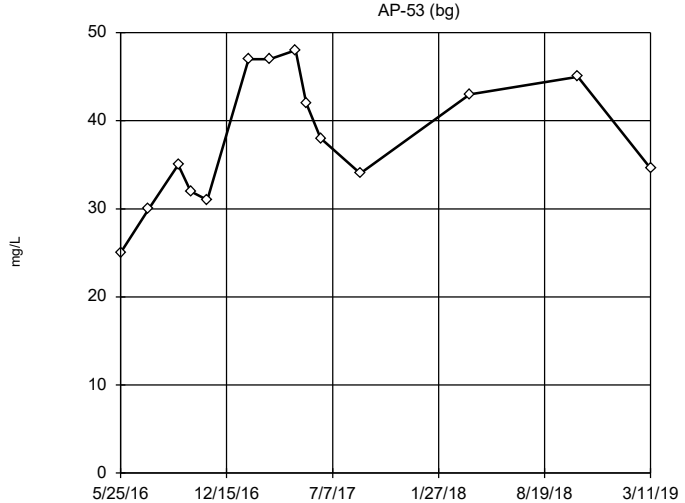
Constituent: Sulfate, total Analysis Run 12/23/2019 9:58 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-53 (bg)



n = 14

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

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

High cutoff = 105.9, low cutoff = 4.424, based on IQR multiplier of 3.

Constituent: Sulfate, total Analysis Run 12/23/2019 9:58 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-54 (bg)

n = 14

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

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

High cutoff = 93.86, low cutoff = -57.78, based on IQR multiplier of 3.

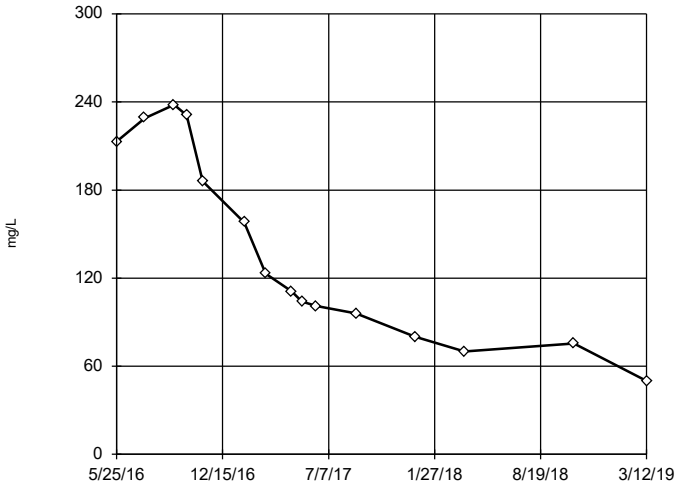
Constituent: Sulfate, total Analysis Run 12/23/2019 9:58 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-58



n = 15

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

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

High cutoff = 4020, low cutoff = 4.239, based on IQR multiplier of 3.

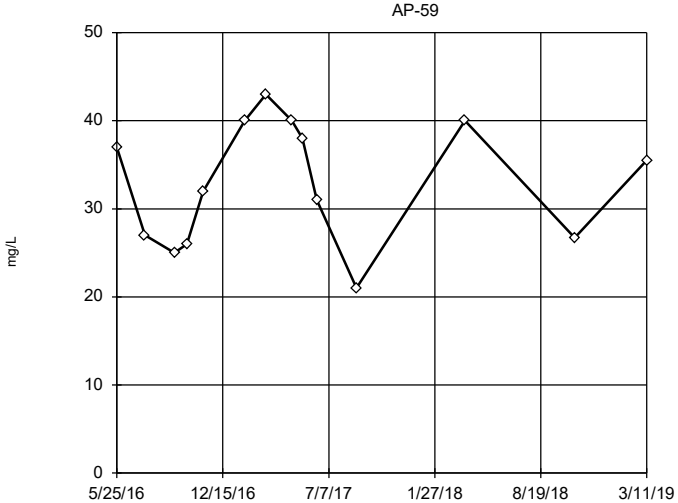
Constituent: Sulfate, total Analysis Run 12/23/2019 9:58 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-59



n = 14

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

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

High cutoff = 80.95, low cutoff = -14.6, based on IQR multiplier of 3.

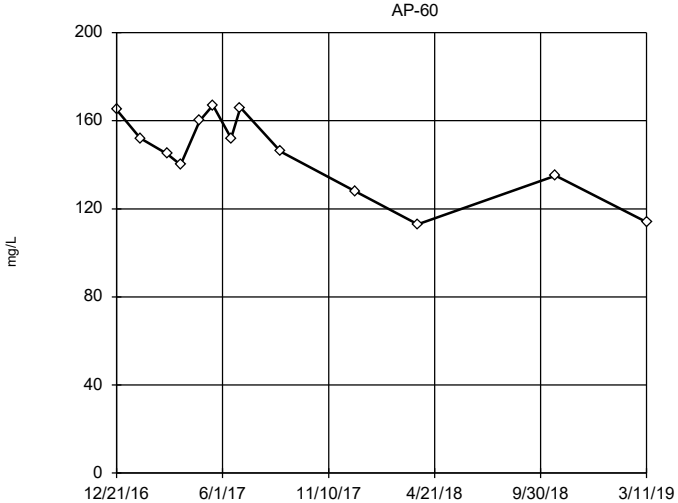
Constituent: Sulfate, total Analysis Run 12/23/2019 9:59 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-60



n = 13

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

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

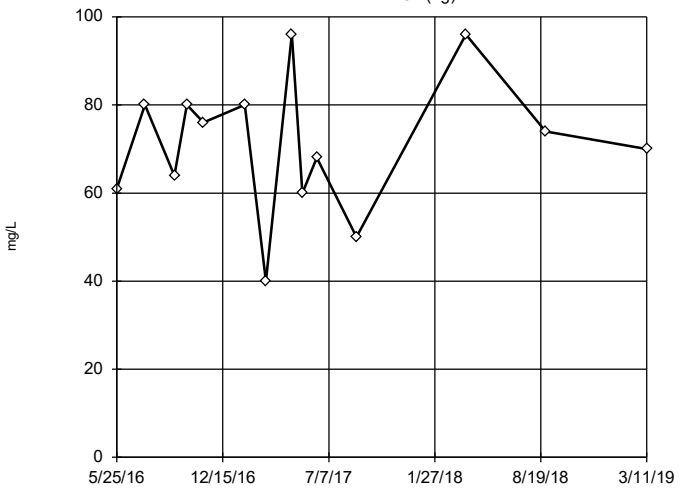
High cutoff = 217.9, low cutoff = -155.6, based on IQR multiplier of 3.

Constituent: Sulfate, total Analysis Run 12/23/2019 9:59 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Tukey's Outlier Screening

AP-51 (bg)



n = 14

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

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

High cutoff = 138.5, low cutoff = 2, based on IQR multiplier of 3.

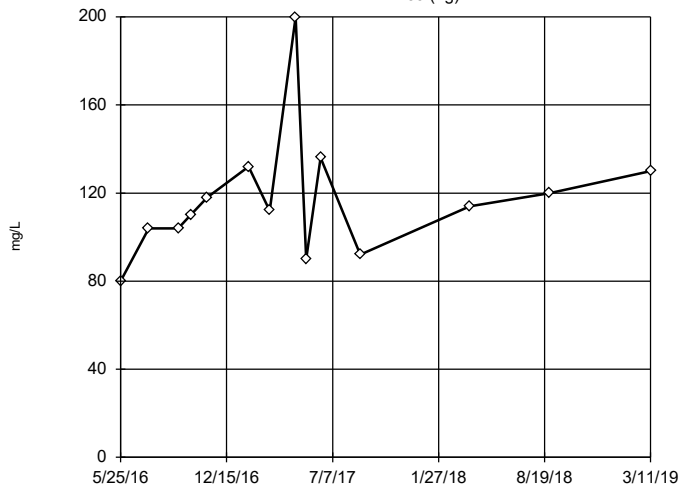
Constituent: Total Dissolved Solids [TDS] Analysis Run 12/23/2019 9:59 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-53 (bg)



n = 14

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

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

High cutoff = 314.6, low cutoff = 40.73, based on IQR multiplier of 3.

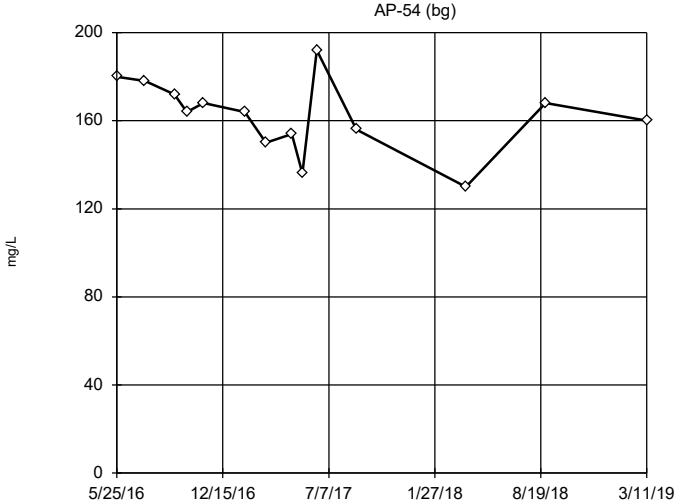
Constituent: Total Dissolved Solids [TDS] Analysis Run 12/23/2019 9:59 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-54 (bg)



n = 14

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

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

High cutoff = 230.7, low cutoff = 23.02, based on IQR multiplier of 3.

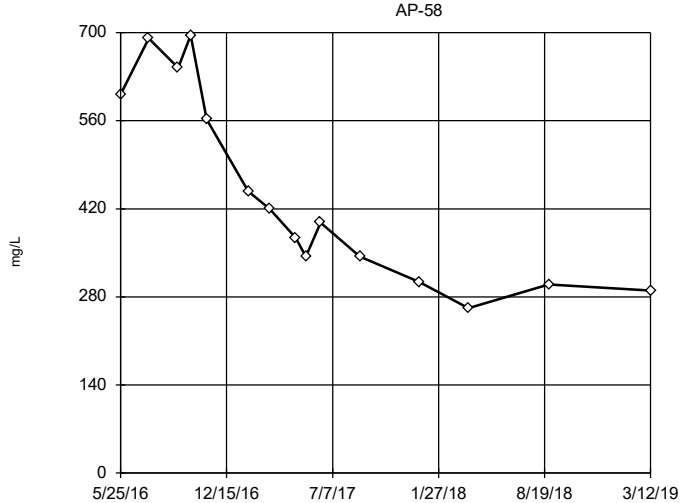
Constituent: Total Dissolved Solids [TDS] Analysis Run 12/23/2019 9:59 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-58



n = 15

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

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

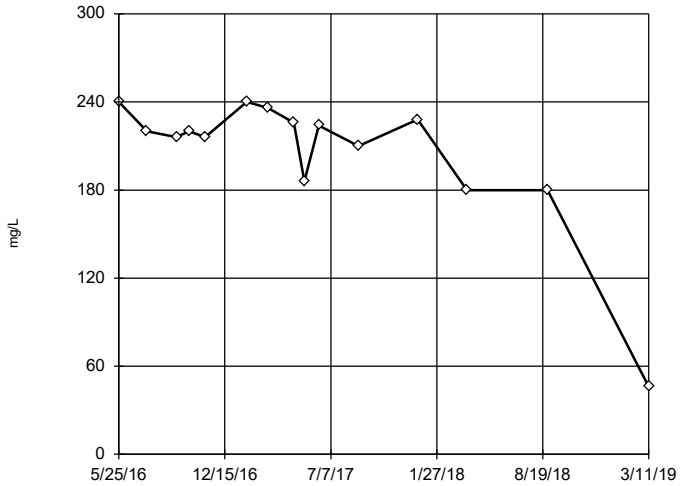
High cutoff = 4675, low cutoff = 39.15, based on IQR multiplier of 3.

Constituent: Total Dissolved Solids [TDS] Analysis Run 12/23/2019 9:59 AM View: Time Series

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Tukey's Outlier Screening

AP-59



n = 15

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

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

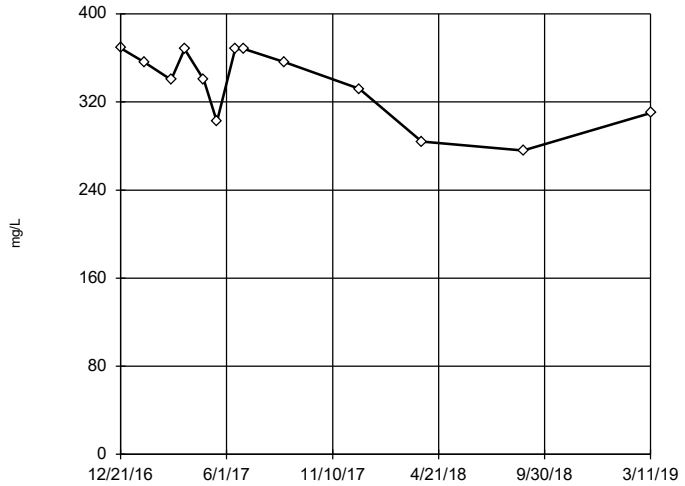
High cutoff = 275.5, low cutoff = -252, based on IQR multiplier of 3.

Constituent: Total Dissolved Solids [TDS] Analysis Run 12/23/2019 9:59 AM View: Time Series
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

AP-60



n = 13

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

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

High cutoff = 442.1, low cutoff = -401, based on IQR multiplier of 3.

Constituent: Total Dissolved Solids [TDS] Analysis Run 12/23/2019 9:59 AM View: Time Series
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Welch's t-test/Mann-Whitney - Significant Results

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP Printed 12/16/2019, 1:34 PM

Constituent	Well	Calc.	0.01	Method
Boron, total (mg/L)	**AP-58**	**-3.123**	**Yes**	**Mann-W**
Calcium, total (mg/L)	**AP-58**	**3.001**	**Yes**	**Mann-W**
Chloride, total (mg/L)	**AP-58**	**-2.693**	**Yes**	**Mann-W**
Sulfate, total (mg/L)	**AP-54 (bg)**	**-2.824**	**Yes**	**Mann-W**
Sulfate, total (mg/L)	**AP-58**	**-3.308**	**Yes**	**Mann-W**
Sulfate, total (mg/L)	**AP-60**	**-2.908**	**Yes**	**Mann-W**
Total Dissolved Solids [TDS] (mg/L)	**AP-58**	**-2.832**	**Yes**	**Mann-W**

Welch's t-test/Mann-Whitney - All Results

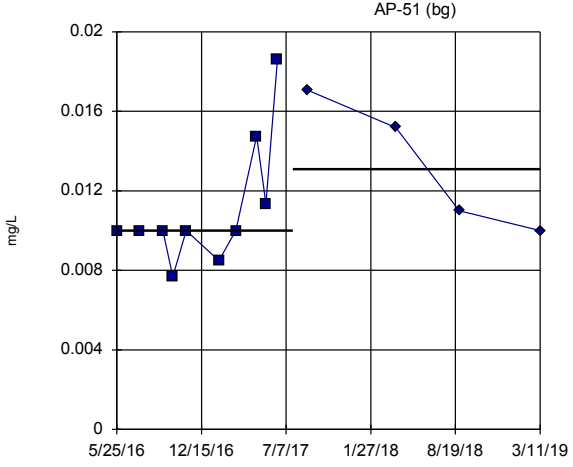
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP Printed 12/16/2019, 1:34 PM

Constituent	Well	Calc.	0.01	Method
Boron, total (mg/L)	AP-51 (bg)	1.325	No	Mann-W
Boron, total (mg/L)	AP-53 (bg)	-1.276	No	Mann-W
Boron, total (mg/L)	AP-54 (bg)	-1.989	No	Mann-W
Boron, total (mg/L)	**AP-58**	**-3.123**	**Yes**	**Mann-W**
Boron, total (mg/L)	AP-59	-1.041	No	Mann-W
Boron, total (mg/L)	AP-60	-2.269	No	Mann-W
Calcium, total (mg/L)	AP-51 (bg)	1.909	No	Mann-W
Calcium, total (mg/L)	AP-53 (bg)	-2.194	No	Mann-W
Calcium, total (mg/L)	AP-54 (bg)	1.065	No	Mann-W
Calcium, total (mg/L)	**AP-58**	**3.001**	**Yes**	**Mann-W**
Calcium, total (mg/L)	AP-59	1.898	No	Mann-W
Calcium, total (mg/L)	AP-60	1.537	No	Mann-W
Chloride, total (mg/L)	AP-51 (bg)	0.6546	No	Mann-W
Chloride, total (mg/L)	AP-53 (bg)	-0.8629	No	Mann-W
Chloride, total (mg/L)	AP-54 (bg)	-0.2909	No	Mann-W
Chloride, total (mg/L)	**AP-58**	**-2.693**	**Yes**	**Mann-W**
Chloride, total (mg/L)	AP-59	-0.2893	No	Mann-W
Chloride, total (mg/L)	AP-60	-1.287	No	Mann-W
Fluoride, total (mg/L)	AP-51 (bg)	-0.9282	No	Mann-W
Fluoride, total (mg/L)	AP-53 (bg)	-0.9282	No	Mann-W
Fluoride, total (mg/L)	AP-54 (bg)	-0.9282	No	Mann-W
Fluoride, total (mg/L)	AP-58	0.736	No	Mann-W
Fluoride, total (mg/L)	AP-59	-0.715	No	Mann-W
Fluoride, total (mg/L)	AP-60	-0.4532	No	Mann-W
pH, field (SU)	AP-51 (bg)	1.487	No	Mann-W
pH, field (SU)	AP-53 (bg)	1.488	No	Mann-W
pH, field (SU)	AP-54 (bg)	0.7778	No	Mann-W
pH, field (SU)	AP-58	-0.4287	No	Mann-W
pH, field (SU)	AP-59	-0.4287	No	Mann-W
pH, field (SU)	AP-60	-0.2196	No	Mann-W
Sulfate, total (mg/L)	AP-51 (bg)	-0.3759	No	Mann-W
Sulfate, total (mg/L)	AP-53 (bg)	0.2454	No	Mann-W
Sulfate, total (mg/L)	**AP-54 (bg)**	**-2.824**	**Yes**	**Mann-W**
Sulfate, total (mg/L)	**AP-58**	**-3.308**	**Yes**	**Mann-W**
Sulfate, total (mg/L)	AP-59	-1.291	No	Mann-W
Sulfate, total (mg/L)	**AP-60**	**-2.908**	**Yes**	**Mann-W**
Total Dissolved Solids [TDS] (mg/L)	AP-51 (bg)	0	No	Mann-W
Total Dissolved Solids [TDS] (mg/L)	AP-53 (bg)	-0.08463	No	Mann-W
Total Dissolved Solids [TDS] (mg/L)	AP-54 (bg)	-1.608	No	Mann-W
Total Dissolved Solids [TDS] (mg/L)	**AP-58**	**-2.832**	**Yes**	**Mann-W**
Total Dissolved Solids [TDS] (mg/L)	AP-59	-1.774	No	Mann-W
Total Dissolved Solids [TDS] (mg/L)	AP-60	-1.888	No	Mann-W

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

AP-51 (bg)



AP-51 background

AP-51 compliance

background median = 0.01

compliance median = 0.0131

Z = 1.325 (two-tail)

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

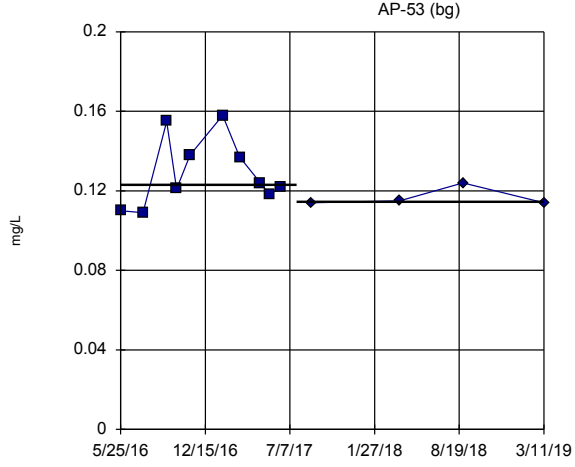
Constituent: Boron, total Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

AP-53 (bg)



AP-53 background

AP-53 compliance

background median = 0.123

compliance median = 0.1145

Z = -1.276 (two-tail)

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

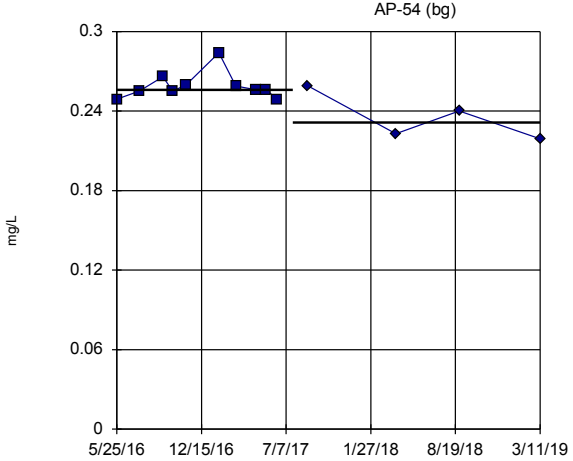
Constituent: Boron, total Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

AP-54 (bg)



AP-54 background

AP-54 compliance

background median = 0.256

compliance median = 0.2315

Z = -1.989 (two-tail)

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

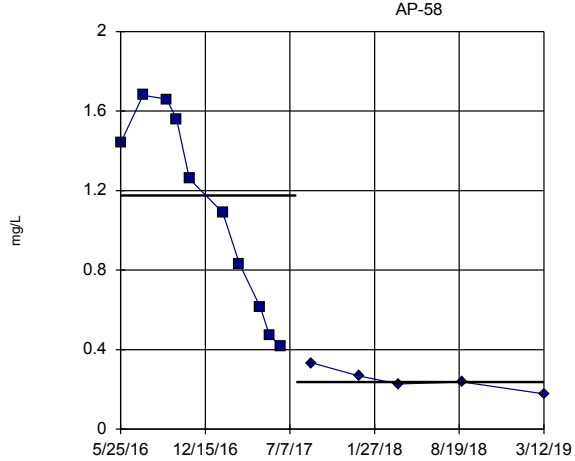
Constituent: Boron, total Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

AP-58



AP-58 background

AP-58 compliance

background median = 1.175

compliance median = 0.237

Z = -3.123 (two-tail)

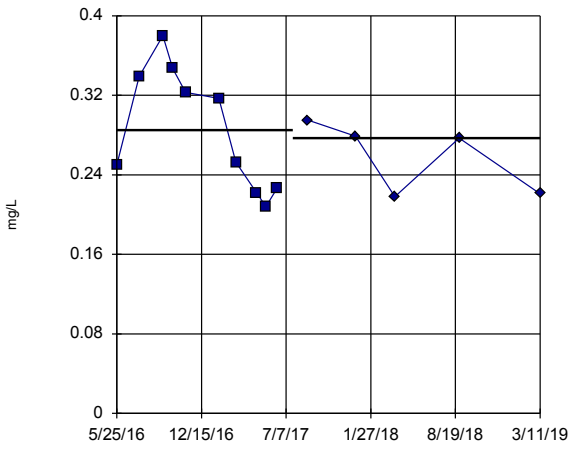
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	Yes
0.01	2.576	Yes

Constituent: Boron, total Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Mann-Whitney (Wilcoxon Rank Sum)

AP-59



AP-59 background

AP-59 compliance

background median = 0.285

compliance median = 0.277

Z = -1.041 (two-tail)

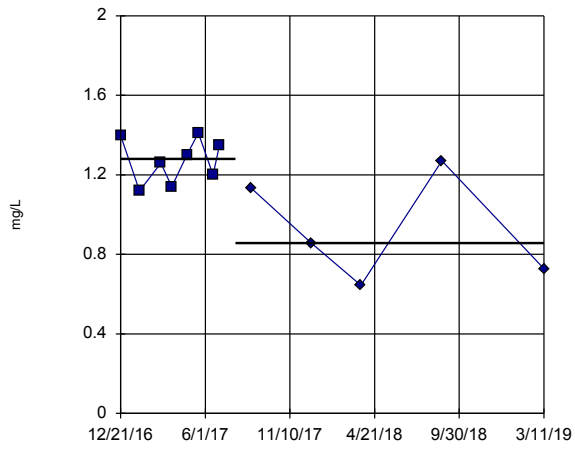
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Boron, total Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Mann-Whitney (Wilcoxon Rank Sum)

AP-60



AP-60 background

AP-60 compliance

background median = 1.28

compliance median = 0.857

Z = -2.269 (two-tail)

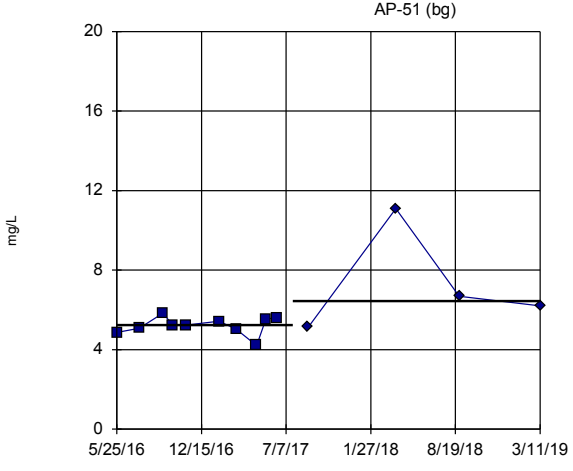
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	No
0.01	2.576	No

Constituent: Boron, total Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Mann-Whitney (Wilcoxon Rank Sum)

AP-51 (bg)



AP-51 background

AP-51 compliance

background median = 5.235

compliance median = 6.445

Z = 1.909 (two-tail)

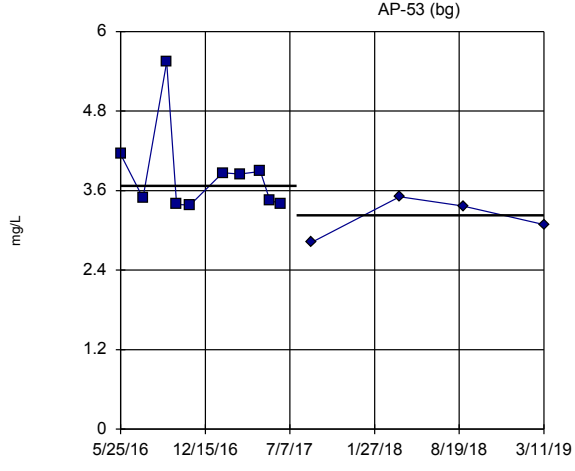
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Calcium, total Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Mann-Whitney (Wilcoxon Rank Sum)

AP-53 (bg)



AP-53 background

AP-53 compliance

background median = 3.67

compliance median = 3.23

Z = -2.194 (two-tail)

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

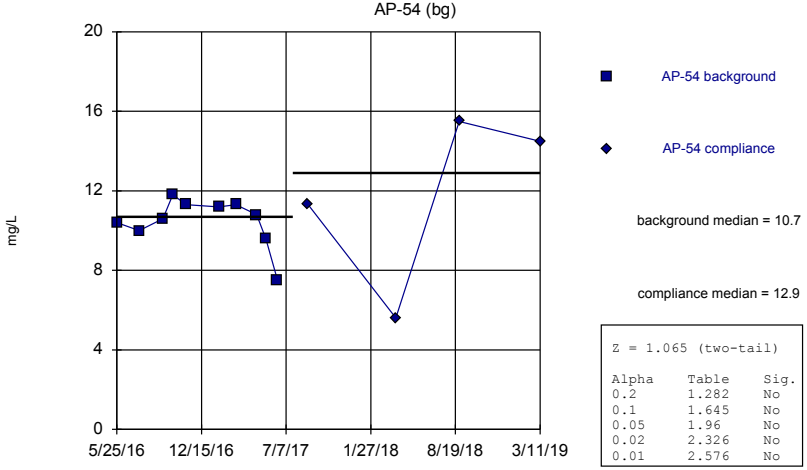
Constituent: Calcium, total Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

AP-54 (bg)



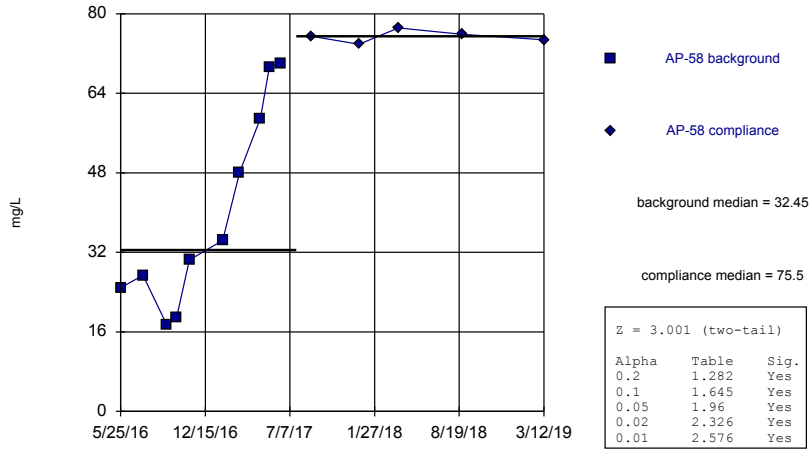
Constituent: Calcium, total Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

AP-58



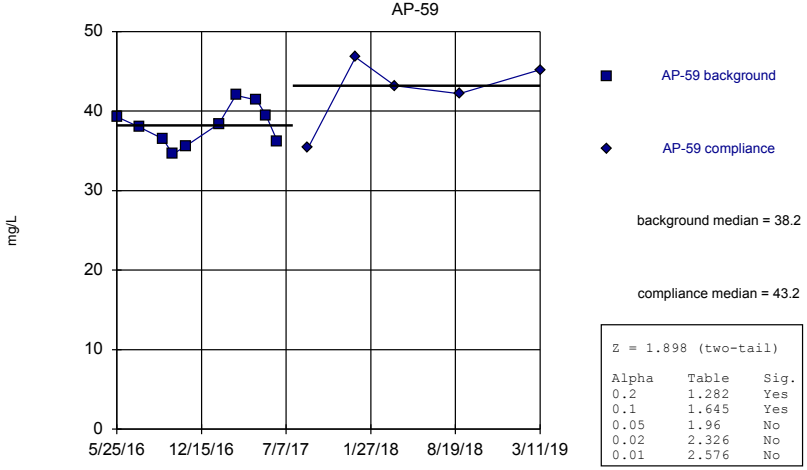
Constituent: Calcium, total Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

AP-59



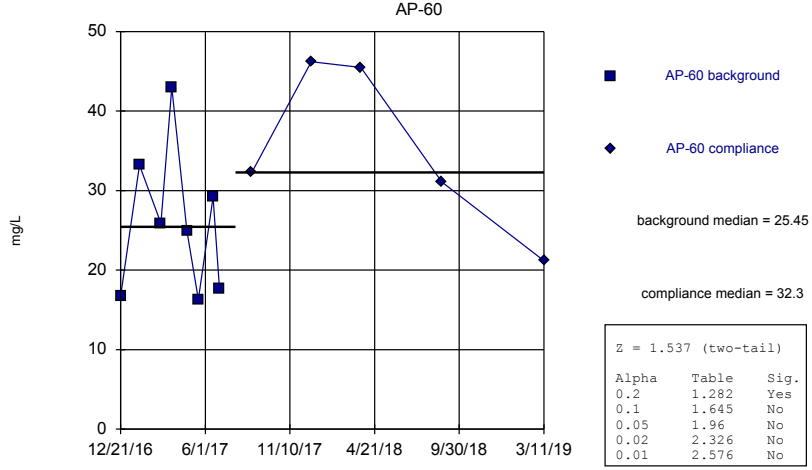
Constituent: Calcium, total Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

AP-60



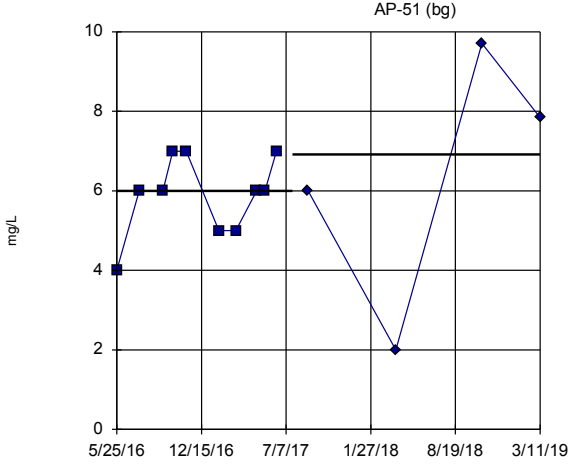
Constituent: Calcium, total Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

AP-51 (bg)



AP-51 background

AP-51 compliance

background median = 6

compliance median = 6.92

Z = 0.6546 (two-tail)

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

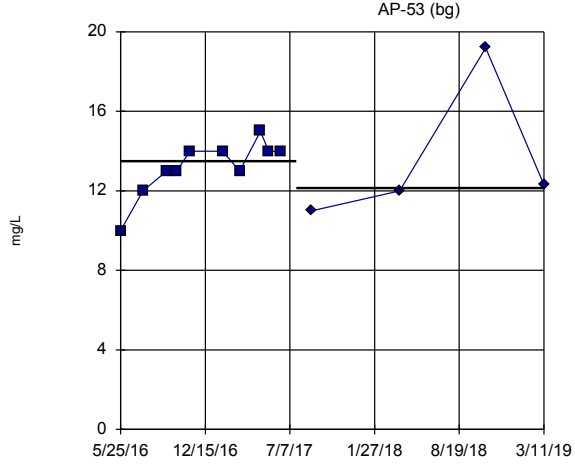
Constituent: Chloride, total Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

AP-53 (bg)



AP-53 background

AP-53 compliance

background median = 13.5

compliance median = 12.15

Z = -0.8629 (two-tail)

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

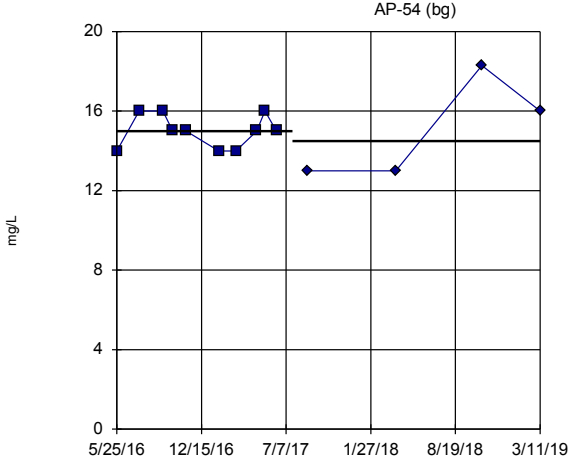
Constituent: Chloride, total Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

AP-54 (bg)



AP-54 background

AP-54 compliance

background median = 15

compliance median = 14.5

Z = -0.2909 (two-tail)

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

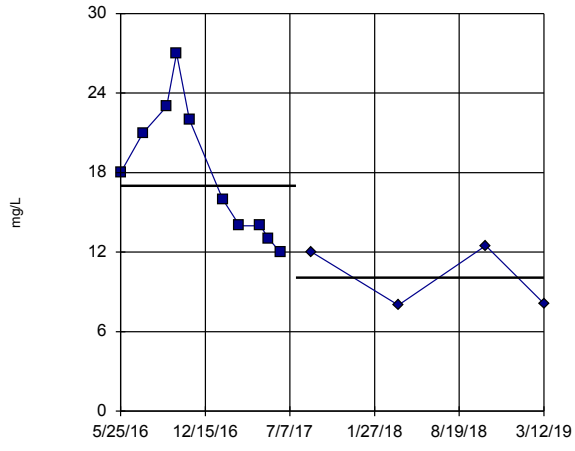
Constituent: Chloride, total Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

AP-58



AP-58 background

AP-58 compliance

background median = 17

compliance median = 10.07

Z = -2.693 (two-tail)

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

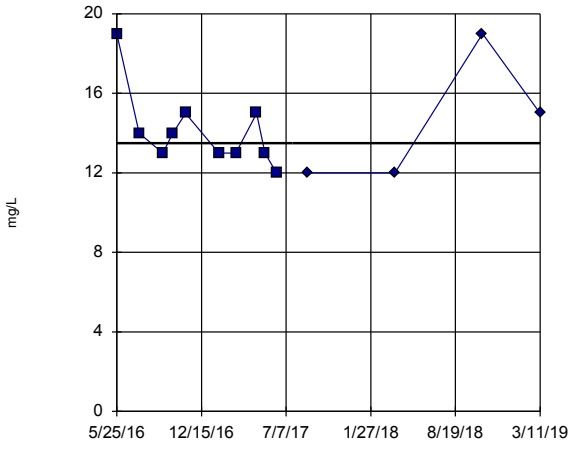
Constituent: Chloride, total Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

AP-59



AP-59 background

AP-59 compliance

background median = 13.5

compliance median = 13.5

Z = -0.2893 (two-tail)

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

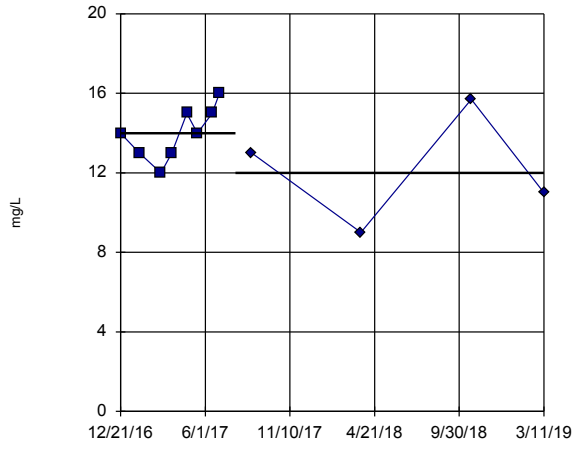
Constituent: Chloride, total Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

AP-60



AP-60 background

AP-60 compliance

background median = 14

compliance median = 12

Z = -1.287 (two-tail)

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

Constituent: Chloride, total Analysis Run 12/16/2019 1:30 PM

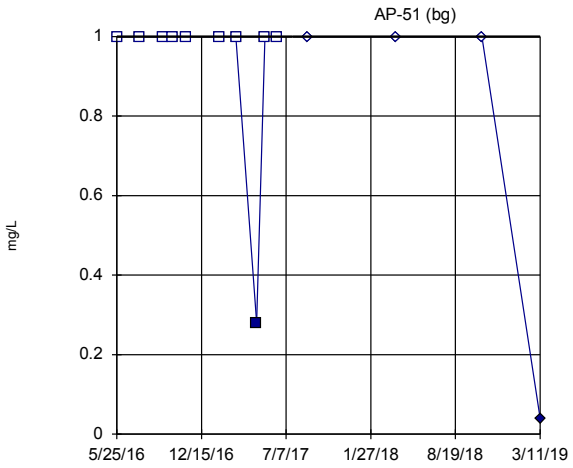
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Hollow symbols indicate censored values.

Mann-Whitney (Wilcoxon Rank Sum)

AP-51 (bg)



AP-51 background

AP-51 compliance

background median = 1

compliance median = 1

Z = -0.9282 (two-tail)

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

Constituent: Fluoride, total Analysis Run 12/16/2019 1:30 PM

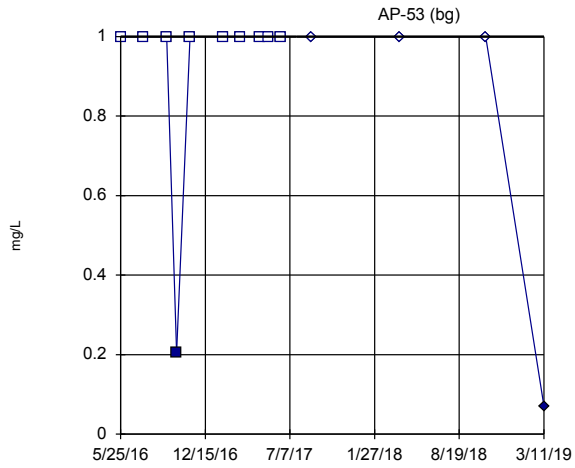
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Hollow symbols indicate censored values.

Mann-Whitney (Wilcoxon Rank Sum)

AP-53 (bg)



AP-53 background

AP-53 compliance

background median = 1

compliance median = 1

Z = -0.9282 (two-tail)

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

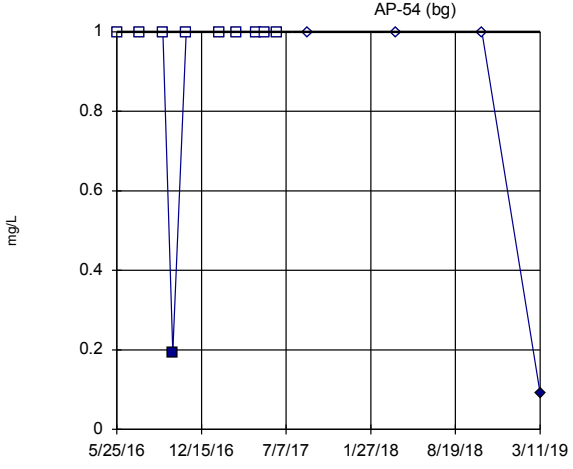
Constituent: Fluoride, total Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Mann-Whitney (Wilcoxon Rank Sum)

AP-54 (bg)



AP-54 background

AP-54 compliance

background median = 1

compliance median = 1

Z = -0.9282 (two-tail)

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

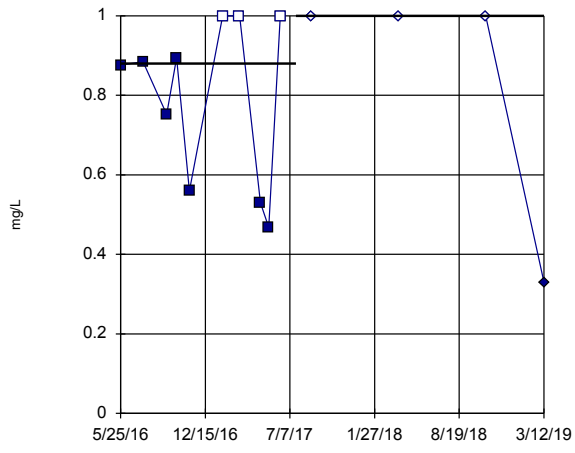
Constituent: Fluoride, total Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Mann-Whitney (Wilcoxon Rank Sum)

AP-58



AP-58 background

AP-58 compliance

background median = 0.8804

compliance median = 1

Z = 0.736 (two-tail)

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

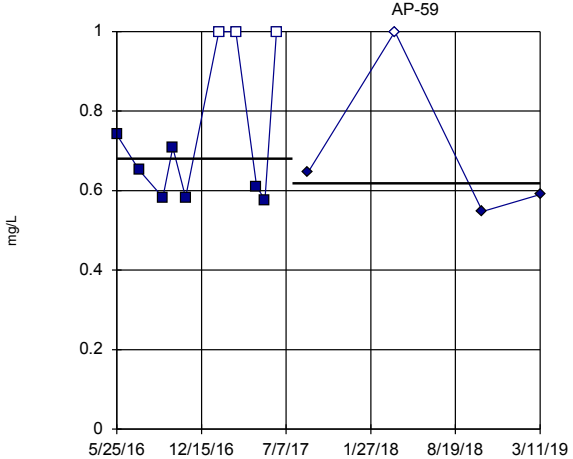
Constituent: Fluoride, total Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Mann-Whitney (Wilcoxon Rank Sum)

AP-59



AP-59 background

AP-59 compliance

background median = 0.6801

compliance median = 0.6182

Z = -0.715 (two-tail)

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

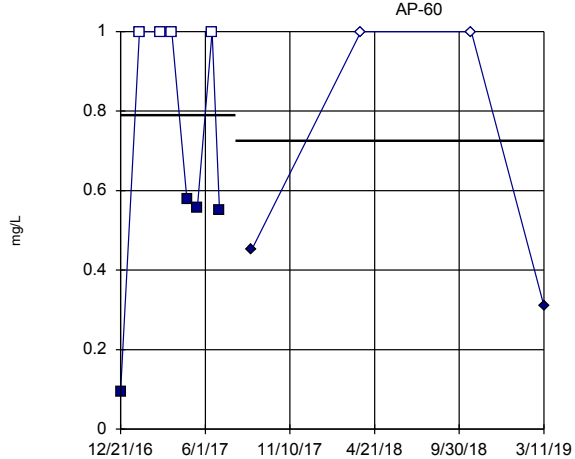
Constituent: Fluoride, total Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Mann-Whitney (Wilcoxon Rank Sum)

AP-60



AP-60 background

AP-60 compliance

background median = 0.79

compliance median = 0.7259

Z = -0.4532 (two-tail)

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

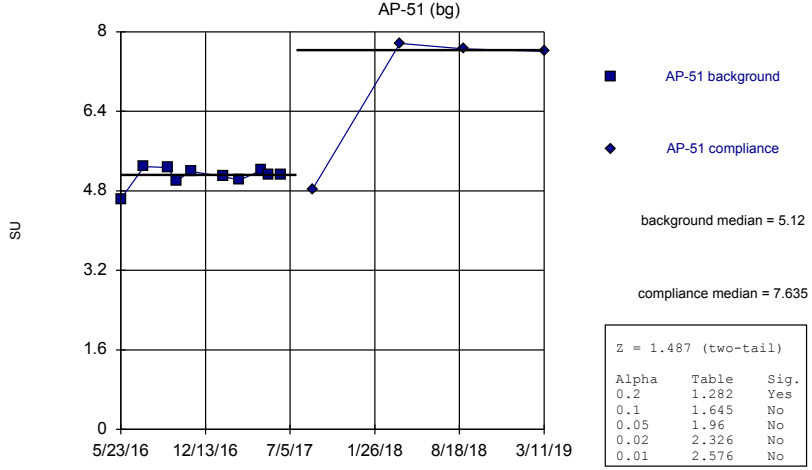
Constituent: Fluoride, total Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

AP-51 (bg)



Z = 1.487 (two-tail)

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

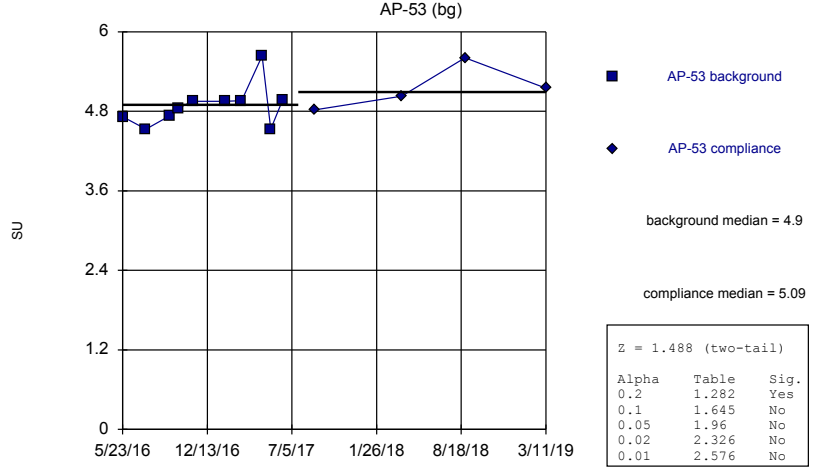
Constituent: pH, field Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

AP-53 (bg)



Z = 1.488 (two-tail)

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

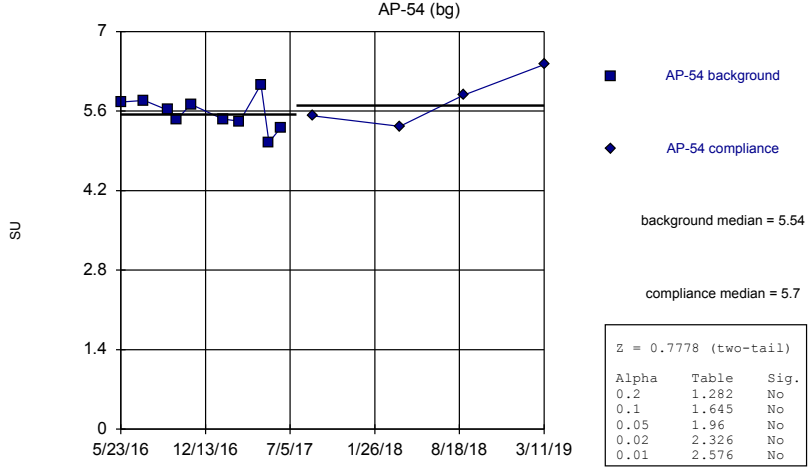
Constituent: pH, field Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

AP-54 (bg)



Z = 0.7778 (two-tail)

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

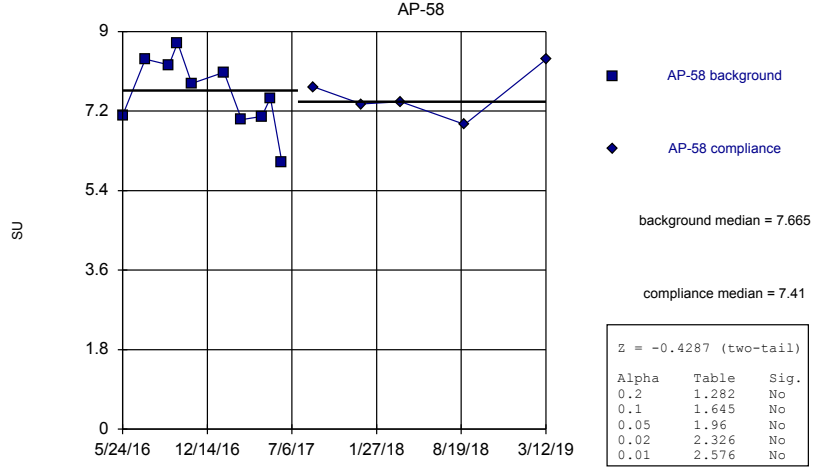
Constituent: pH, field Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

AP-58



Z = -0.4287 (two-tail)

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

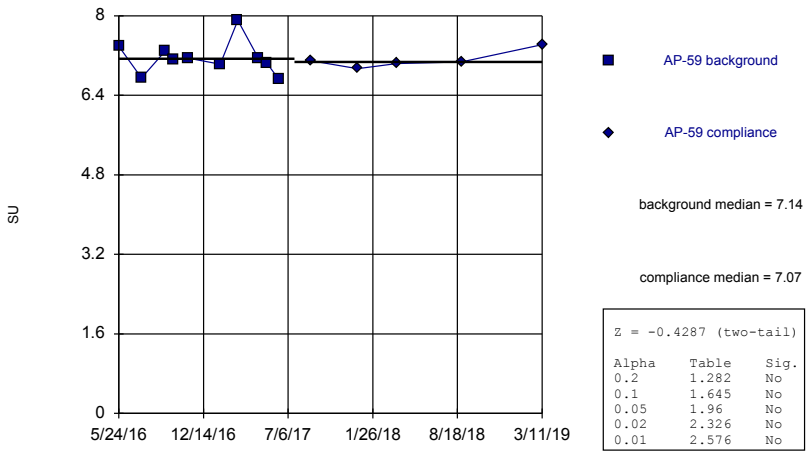
Constituent: pH, field Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

AP-59



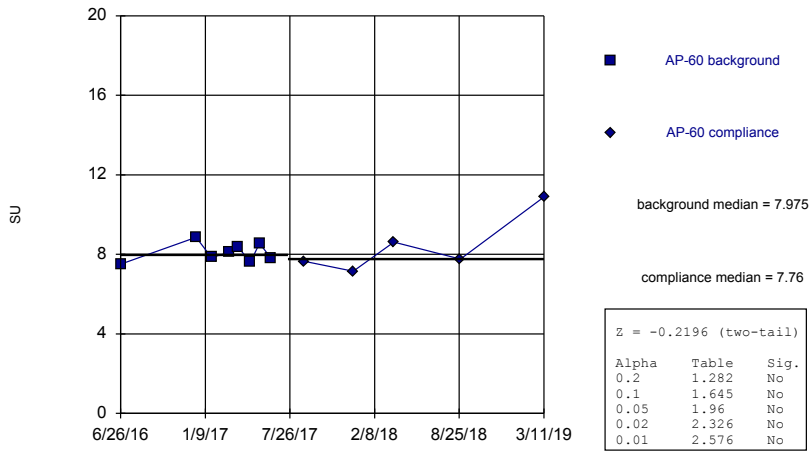
Constituent: pH, field Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

AP-60



Constituent: pH, field Analysis Run 12/16/2019 1:30 PM

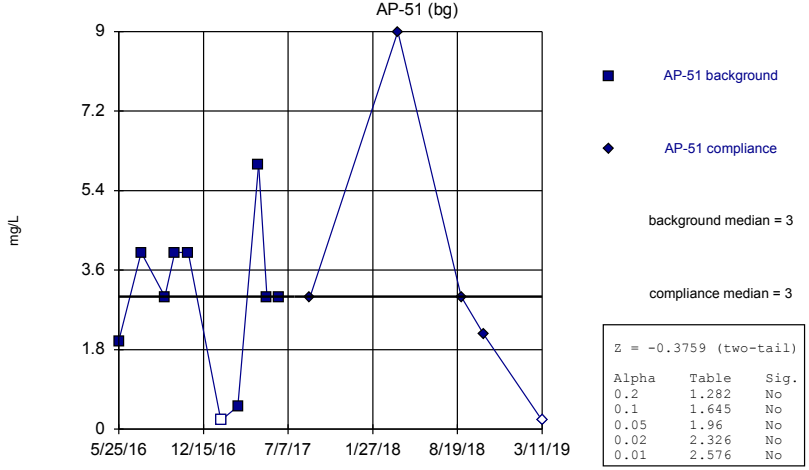
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Hollow symbols indicate censored values.

Mann-Whitney (Wilcoxon Rank Sum)

AP-51 (bg)



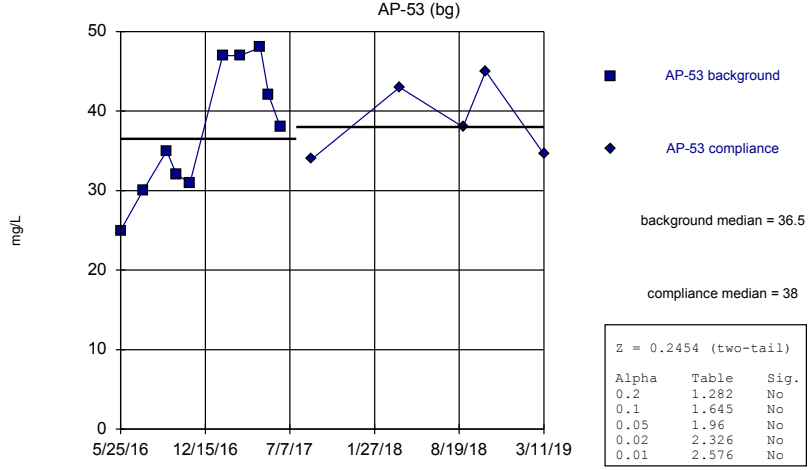
Constituent: Sulfate, total Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

AP-53 (bg)



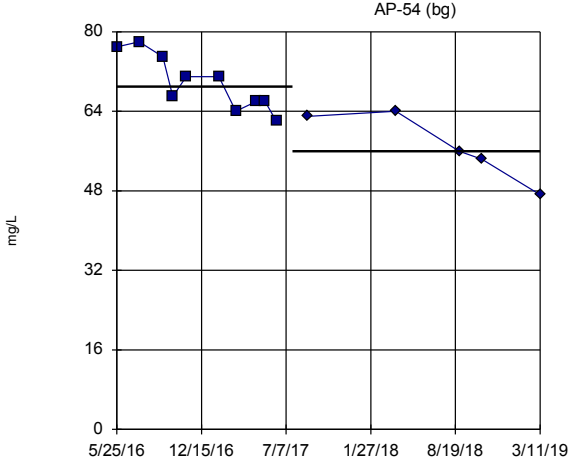
Constituent: Sulfate, total Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

AP-54 (bg)



AP-54 background

AP-54 compliance

background median = 69

compliance median = 56

Z = -2.824 (two-tail)

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

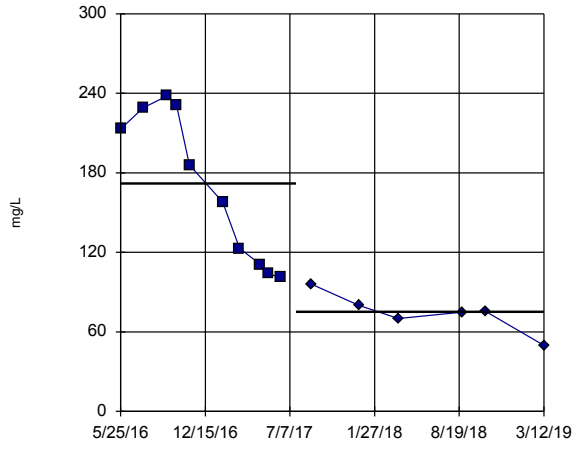
Constituent: Sulfate, total Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

AP-58



AP-58 background

AP-58 compliance

background median = 172

compliance median = 75.25

Z = -3.308 (two-tail)

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

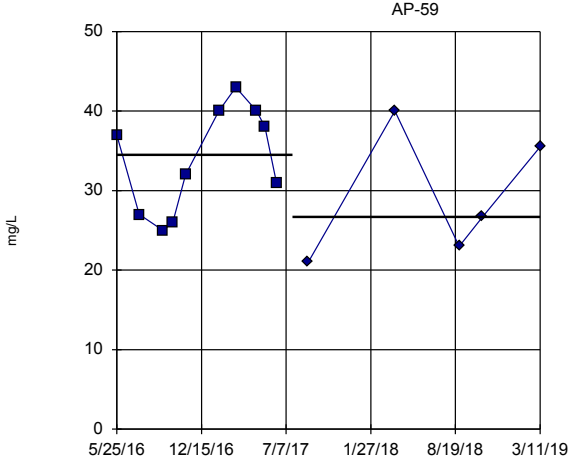
Constituent: Sulfate, total Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

AP-59



AP-59 background

AP-59 compliance

background median = 34.5

compliance median = 26.7

Z = -1.291 (two-tail)

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

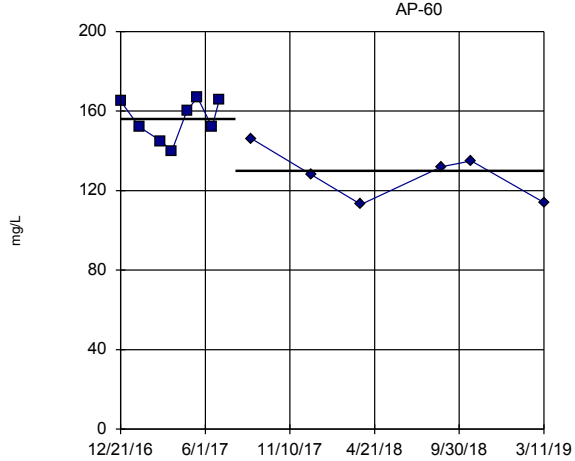
Constituent: Sulfate, total Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

AP-60



AP-60 background

AP-60 compliance

background median = 156

compliance median = 130

Z = -2.908 (two-tail)

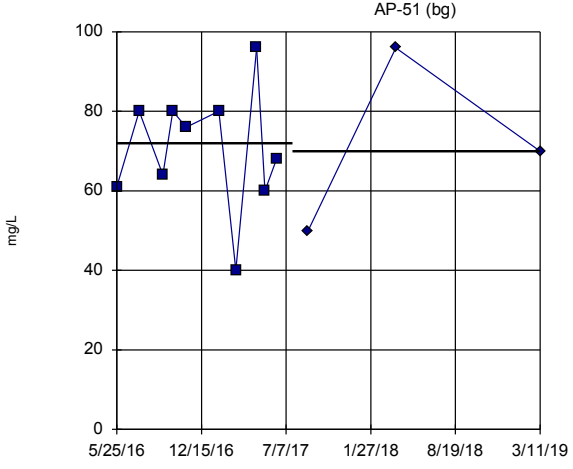
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	Yes
0.01	2.576	Yes

Constituent: Sulfate, total Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Mann-Whitney (Wilcoxon Rank Sum)

AP-51 (bg)



AP-51 background

AP-51 compliance

background median = 72

compliance median = 70

Z = 0 (two-tail)

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

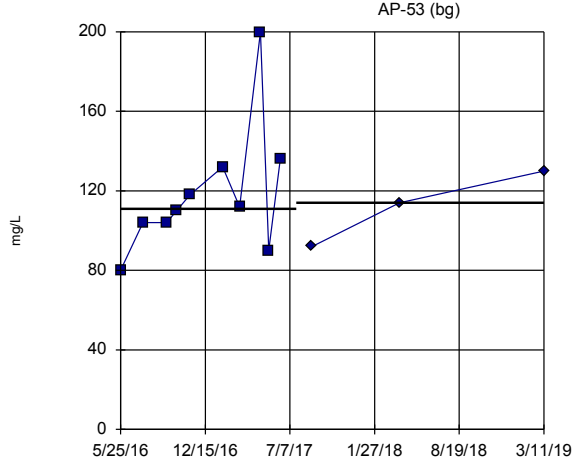
Constituent: Total Dissolved Solids [TDS] Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

AP-53 (bg)



AP-53 background

AP-53 compliance

background median = 111

compliance median = 114

Z = -0.08463 (two-tail)

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

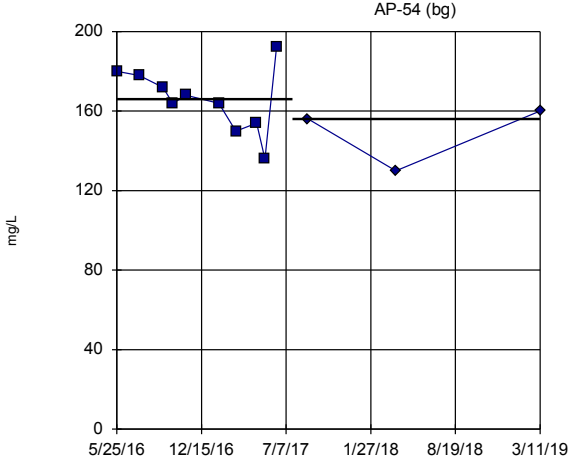
Constituent: Total Dissolved Solids [TDS] Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

AP-54 (bg)



AP-54 background

AP-54 compliance

background median = 166

compliance median = 156

Z = -1.608 (two-tail)

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

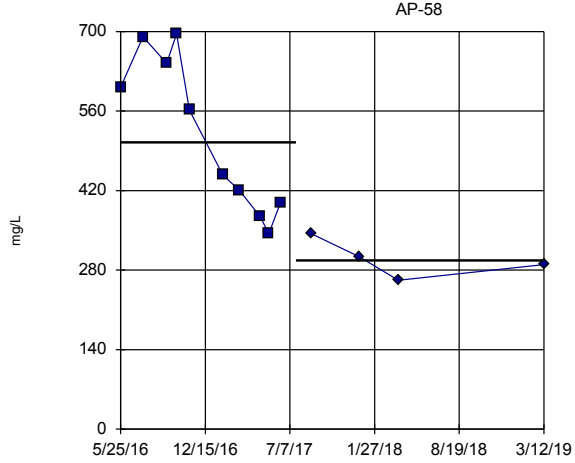
Constituent: Total Dissolved Solids [TDS] Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

AP-58



AP-58 background

AP-58 compliance

background median = 505

compliance median = 297

Z = -2.832 (two-tail)

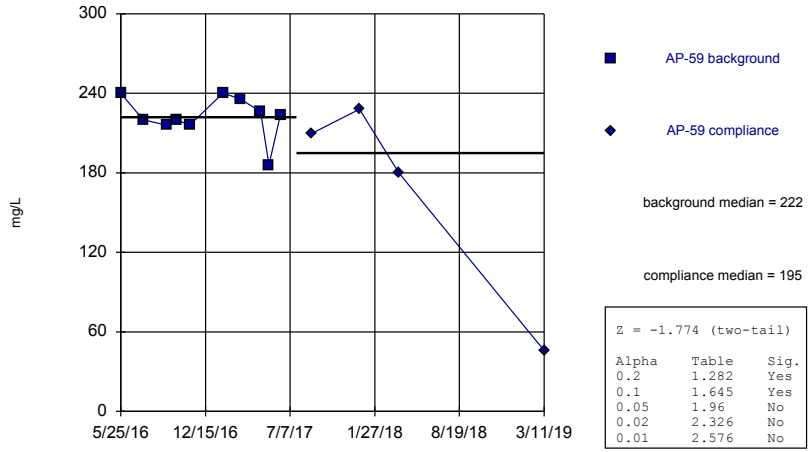
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	Yes
0.01	2.576	Yes

Constituent: Total Dissolved Solids [TDS] Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Mann-Whitney (Wilcoxon Rank Sum)

AP-59



Z = -1.774 (two-tail)

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

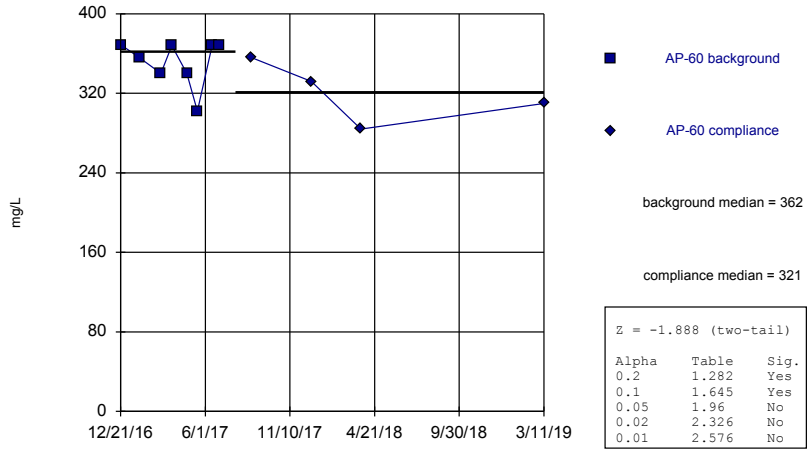
Constituent: Total Dissolved Solids [TDS] Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

AP-60



Z = -1.888 (two-tail)

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

Constituent: Total Dissolved Solids [TDS] Analysis Run 12/16/2019 1:30 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Date Ranges

Date: 12/16/2019 1:36 PM

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Boron, total (mg/L)
AP-58 background:4/27/2017-3/12/2019
Calcium, total (mg/L)
AP-58 background:5/23/2016-6/28/2017
Sulfate, total (mg/L)
AP-58 background:5/17/2017-3/12/2019
Total Dissolved Solids [TDS] (mg/L)
AP-58 background:4/27/2017-3/12/2019

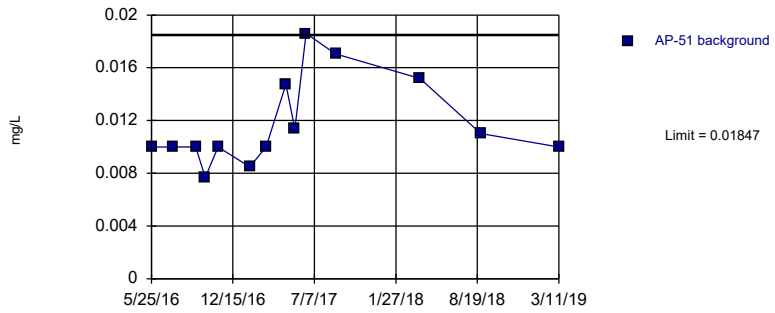
Intrawell Prediction Limit Summary

Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP Printed 12/23/2019, 9:51 AM

Constituent	Well	Upper Lim.	Lower Lim.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Boron, total (mg/L)	AP-51	0.01847	n/a	14	0.01172	0.003308	0	None	No	0.002505	Param Intra 1 of 2
Boron, total (mg/L)	AP-53	0.1576	n/a	14	0.1256	0.01568	0	None	No	0.002505	Param Intra 1 of 2
Boron, total (mg/L)	AP-54	0.2857	n/a	14	0.2521	0.01646	0	None	No	0.002505	Param Intra 1 of 2
Boron, total (mg/L)	AP-58	0.7061	n/a	8	0.3433	0.1476	0	None	No	0.002505	Param Intra 1 of 2
Boron, total (mg/L)	AP-59	0.3864	n/a	15	0.2771	0.05451	0	None	No	0.002505	Param Intra 1 of 2
Boron, total (mg/L)	AP-60	1.655	n/a	13	1.139	0.2484	0	None	No	0.002505	Param Intra 1 of 2
Calcium, total (mg/L)	AP-51	11.1	n/a	14	n/a	n/a	0	n/a	n/a	0.008612	NP Intra (normality) 1 of 2
Calcium, total (mg/L)	AP-53	4.968	n/a	14	1.906	0.1581	0	None	sqrt(x)	0.002505	Param Intra 1 of 2
Calcium, total (mg/L)	AP-54	15.8	n/a	14	10.82	2.444	0	None	No	0.002505	Param Intra 1 of 2
Calcium, total (mg/L)	AP-58	85.09	n/a	10	40.01	20.14	0	None	No	0.002505	Param Intra 1 of 2
Calcium, total (mg/L)	AP-59	47.12	n/a	15	39.62	3.74	0	None	No	0.002505	Param Intra 1 of 2
Calcium, total (mg/L)	AP-60	51.27	n/a	13	29.48	10.49	0	None	No	0.002505	Param Intra 1 of 2
Chloride, total (mg/L)	AP-51	9.713	n/a	14	6.039	1.8	0	None	No	0.002505	Param Intra 1 of 2
Chloride, total (mg/L)	AP-53	17.72	n/a	14	13.32	2.157	0	None	No	0.002505	Param Intra 1 of 2
Chloride, total (mg/L)	AP-54	17.9	n/a	14	15.02	1.411	0	None	No	0.002505	Param Intra 1 of 2
Chloride, total (mg/L)	AP-58	27.38	n/a	14	15.76	5.693	0	None	No	0.002505	Param Intra 1 of 2
Chloride, total (mg/L)	AP-59	18.99	n/a	14	3.76	0.2928	0	None	sqrt(x)	0.002505	Param Intra 1 of 2
Chloride, total (mg/L)	AP-60	17.68	n/a	12	13.39	2.033	0	None	No	0.002505	Param Intra 1 of 2
Fluoride, total (mg/L)	AP-51	1	n/a	14	n/a	n/a	85.71	n/a	n/a	0.008612	NP Intra (NDs) 1 of 2
Fluoride, total (mg/L)	AP-53	1	n/a	14	n/a	n/a	85.71	n/a	n/a	0.008612	NP Intra (NDs) 1 of 2
Fluoride, total (mg/L)	AP-54	1	n/a	14	n/a	n/a	85.71	n/a	n/a	0.008612	NP Intra (NDs) 1 of 2
Fluoride, total (mg/L)	AP-58	1	n/a	14	n/a	n/a	42.86	n/a	n/a	0.008612	NP Intra (normality) 1 of 2
Fluoride, total (mg/L)	AP-59	1	n/a	14	n/a	n/a	28.57	n/a	n/a	0.008612	NP Intra (normality) 1 of 2
Fluoride, total (mg/L)	AP-60	0.791	n/a	12	0.4243	0.1736	50	Kaplan-Meier	No	0.002505	Param Intra 1 of 2
pH, field (SU)	AP-51	7.77	4.64	14	n/a	n/a	0	n/a	n/a	0.01722	NP Intra (normality) 1 of 2
pH, field (SU)	AP-53	5.639	4.281	14	4.96	0.3326	0	None	No	0.001253	Param Intra 1 of 2
pH, field (SU)	AP-54	6.339	4.918	14	5.629	0.3483	0	None	No	0.001253	Param Intra 1 of 2
pH, field (SU)	AP-58	9.02	6.155	15	7.587	0.7144	0	None	No	0.001253	Param Intra 1 of 2
pH, field (SU)	AP-59	7.72	6.568	15	7.144	0.287	0	None	No	0.001253	Param Intra 1 of 2
pH, field (SU)	AP-60	10.17	6.416	13	2.861	0.158	0	None	sqrt(x)	0.001253	Param Intra 1 of 2
Sulfate, total (mg/L)	AP-51	7.927	n/a	14	3.147	2.342	14.29	None	No	0.002505	Param Intra 1 of 2
Sulfate, total (mg/L)	AP-53	53.02	n/a	14	37.97	7.372	0	None	No	0.002505	Param Intra 1 of 2
Sulfate, total (mg/L)	AP-54	83.26	n/a	14	66.11	8.402	0	None	No	0.002505	Param Intra 1 of 2
Sulfate, total (mg/L)	AP-58	134.5	n/a	7	82.34	19.41	0	None	No	0.002505	Param Intra 1 of 2
Sulfate, total (mg/L)	AP-59	47.24	n/a	14	33.01	6.972	0	None	No	0.002505	Param Intra 1 of 2
Sulfate, total (mg/L)	AP-60	183	n/a	13	144.8	18.37	0	None	No	0.002505	Param Intra 1 of 2
Total Dissolved Solids [TDS] (mg/L)	AP-51	103.1	n/a	14	71.07	15.71	0	None	No	0.002505	Param Intra 1 of 2
Total Dissolved Solids [TDS] (mg/L)	AP-53	176.1	n/a	14	117.3	28.82	0	None	No	0.002505	Param Intra 1 of 2
Total Dissolved Solids [TDS] (mg/L)	AP-54	196.3	n/a	14	162.3	16.66	0	None	No	0.002505	Param Intra 1 of 2
Total Dissolved Solids [TDS] (mg/L)	AP-58	439.6	n/a	8	327	45.79	0	None	No	0.002505	Param Intra 1 of 2
Total Dissolved Solids [TDS] (mg/L)	AP-59	257.3	n/a	15	9622386	3696114	0	None	x^3	0.002505	Param Intra 1 of 2
Total Dissolved Solids [TDS] (mg/L)	AP-60	404.8	n/a	13	336.1	33.1	0	None	No	0.002505	Param Intra 1 of 2

Prediction Limit

Intrawell Parametric, AP-51 (bg)



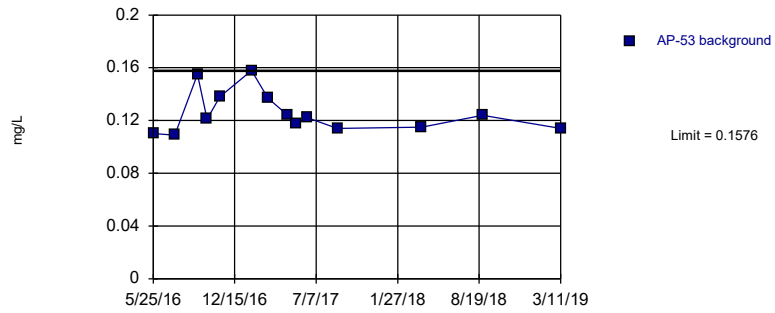
Background Data Summary: Mean=0.01172, Std. Dev.=0.003308, n=14. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8431, critical = 0.825. Kappa = 2.041 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Boron, total Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AP-53 (bg)



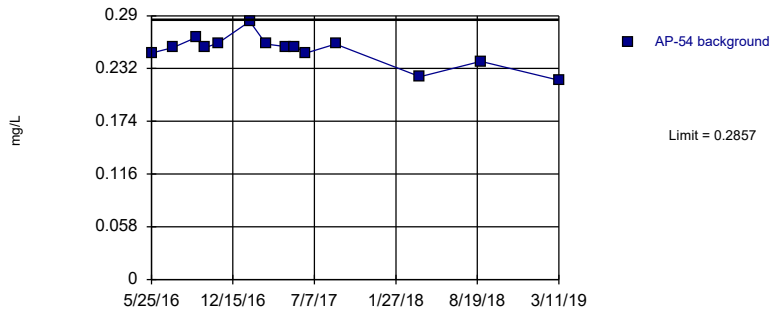
Background Data Summary: Mean=0.1256, Std. Dev.=0.01568, n=14. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8556, critical = 0.825. Kappa = 2.041 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Boron, total Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AP-54 (bg)



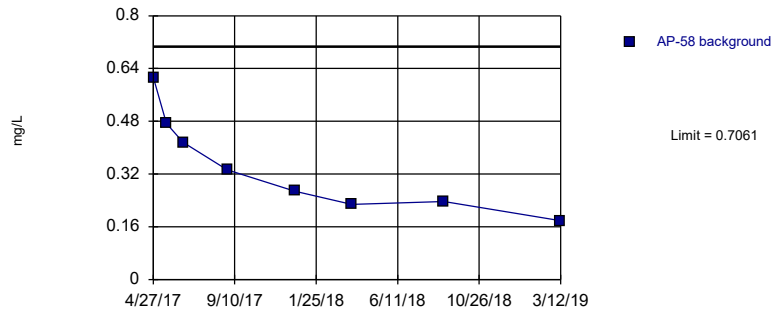
Background Data Summary: Mean=0.2521, Std. Dev.=0.01646, n=14. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9046, critical = 0.825. Kappa = 2.041 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Boron, total Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AP-58

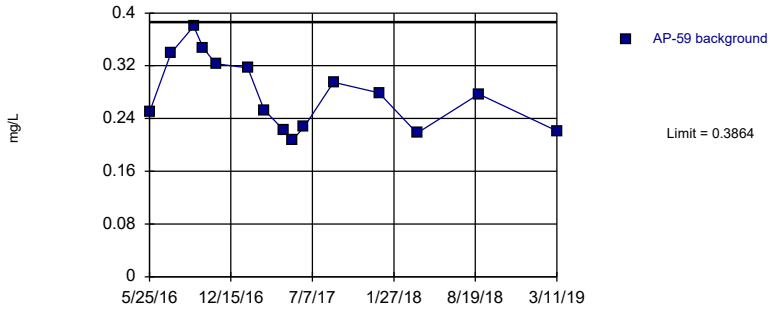


Background Data Summary: Mean=0.3433, Std. Dev.=0.1476, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.925, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Boron, total Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Prediction Limit

Intrawell Parametric, AP-59



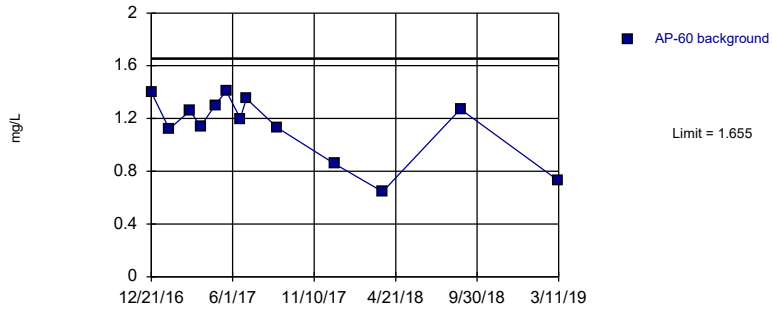
Background Data Summary: Mean=0.2771, Std. Dev.=0.05451, n=15. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9318, critical = 0.835. Kappa = 2.006 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Boron, total Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AP-60



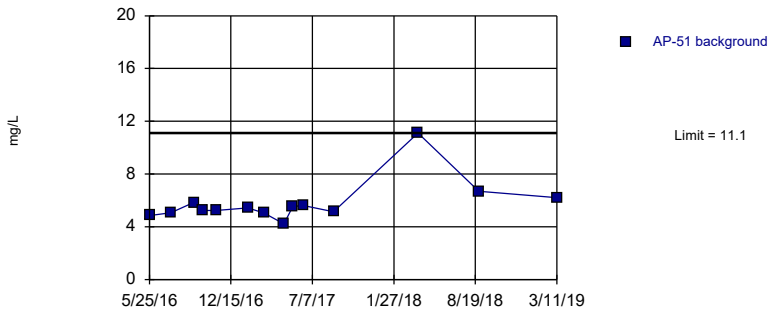
Background Data Summary: Mean=1.139, Std. Dev.=0.2484, n=13. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8749, critical = 0.814. Kappa = 2.077 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Boron, total Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Non-parametric, AP-51 (bg)



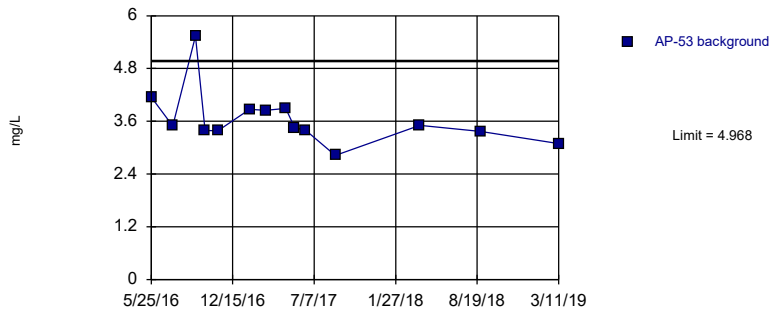
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 14 background values. Well-constituent pair annual alpha = 0.01715. Individual comparison alpha = 0.008612 (1 of 2). Assumes 1 future value.

Constituent: Calcium, total Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AP-53 (bg)

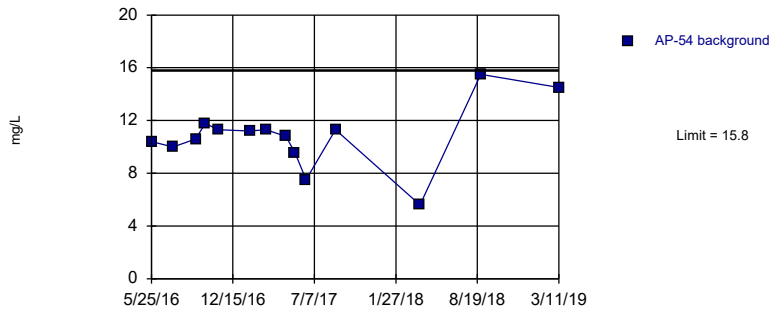


Background Data Summary (based on square root transformation): Mean=1.906, Std. Dev.=0.1581, n=14. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8362, critical = 0.825. Kappa = 2.041 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Calcium, total Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Prediction Limit

Intrawell Parametric, AP-54 (bg)



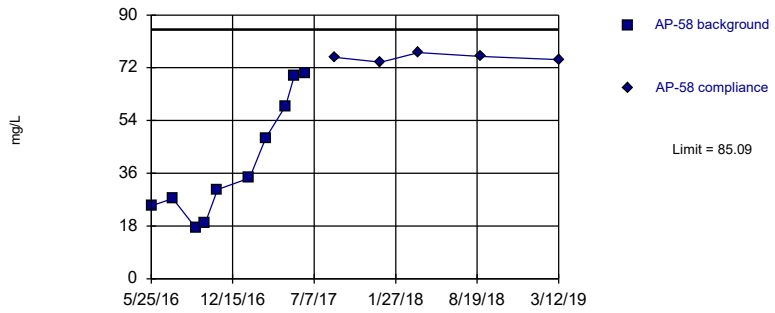
Background Data Summary: Mean=10.82, Std. Dev.=2.444, n=14. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9214, critical = 0.825. Kappa = 2.041 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Calcium, total Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Within Limit

Prediction Limit

Intrawell Parametric

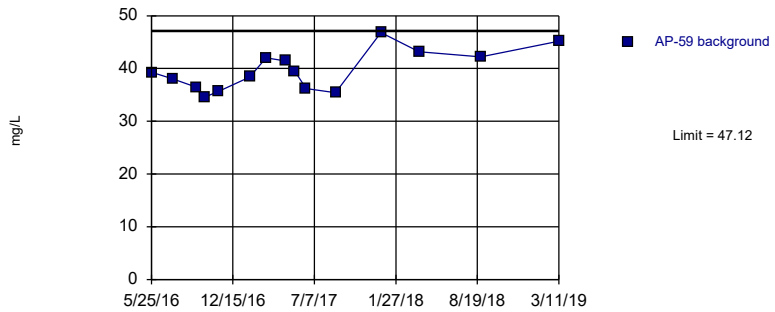


Background Data Summary: Mean=40.01, Std. Dev.=20.14, n=10. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8825, critical = 0.781. Kappa = 2.238 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Calcium, total Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Prediction Limit

Intrawell Parametric, AP-59

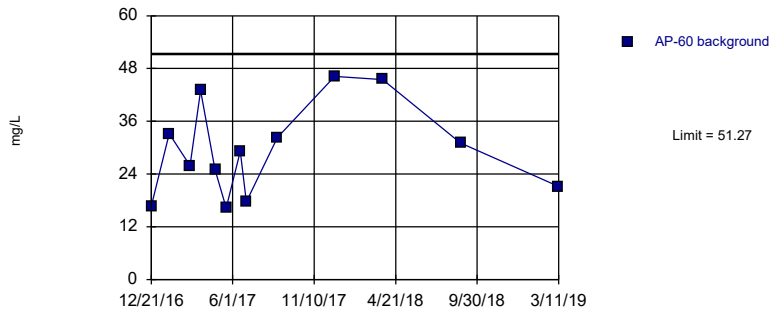


Background Data Summary: Mean=39.62, Std. Dev.=3.74, n=15. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9496, critical = 0.835. Kappa = 2.006 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Calcium, total Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Prediction Limit

Intrawell Parametric, AP-60

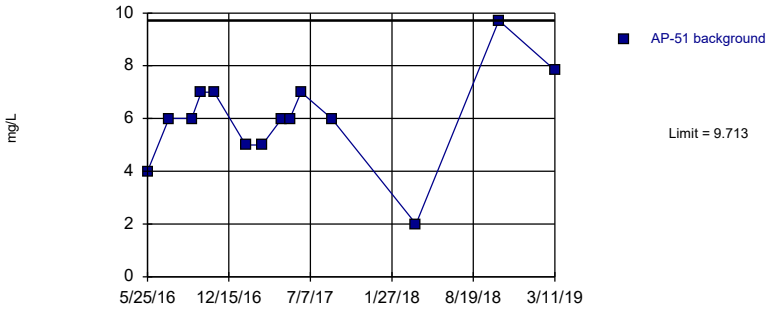


Background Data Summary: Mean=29.48, Std. Dev.=10.49, n=13. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9187, critical = 0.814. Kappa = 2.077 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Calcium, total Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Prediction Limit

Intrawell Parametric, AP-51 (bg)



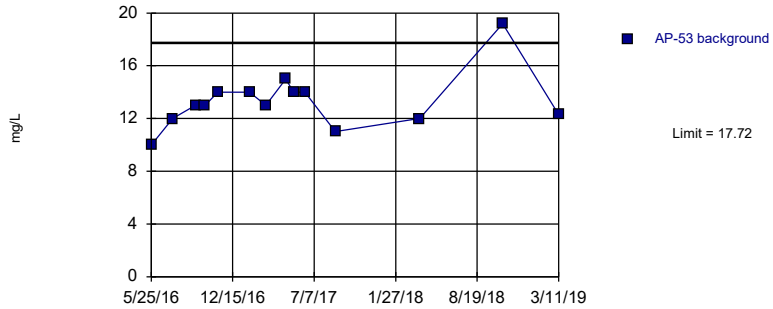
Background Data Summary: Mean=6.039, Std. Dev.=1.8, n=14. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9418, critical = 0.825. Kappa = 2.041 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Chloride, total Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AP-53 (bg)



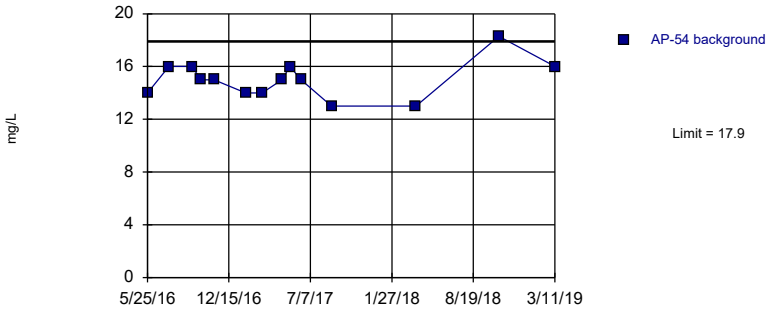
Background Data Summary: Mean=13.32, Std. Dev.=2.157, n=14. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8796, critical = 0.825. Kappa = 2.041 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Chloride, total Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AP-54 (bg)



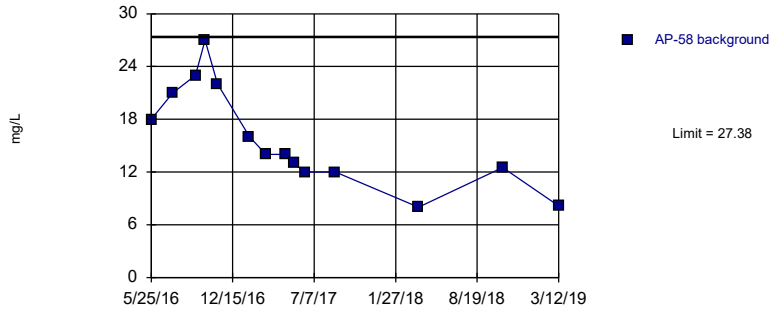
Background Data Summary: Mean=15.02, Std. Dev.=1.411, n=14. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9196, critical = 0.825. Kappa = 2.041 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Chloride, total Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AP-58



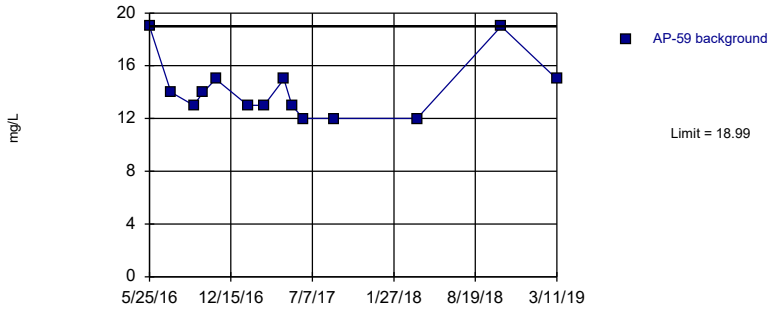
Background Data Summary: Mean=15.76, Std. Dev.=5.693, n=14. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9391, critical = 0.825. Kappa = 2.041 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Chloride, total Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AP-59



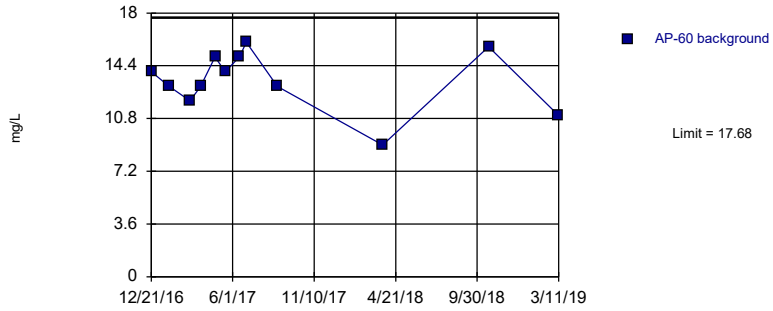
Background Data Summary (based on square root transformation): Mean=3.76, Std. Dev.=0.2928, n=14. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8302, critical = 0.825. Kappa = 2.041 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Chloride, total Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AP-60



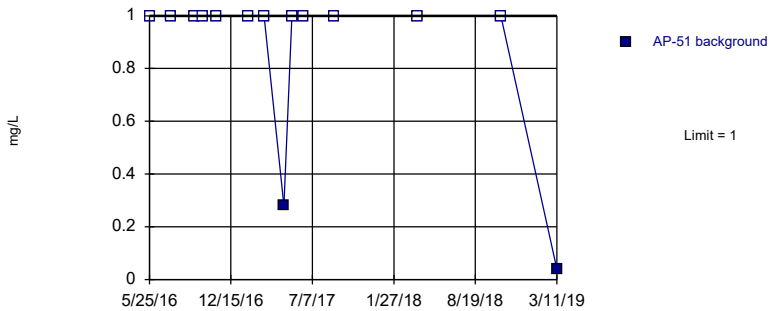
Background Data Summary: Mean=13.39, Std. Dev.=2.033, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9408, critical = 0.805. Kappa = 2.112 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Chloride, total Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Prediction Limit

Intrawell Non-parametric, AP-51 (bg)



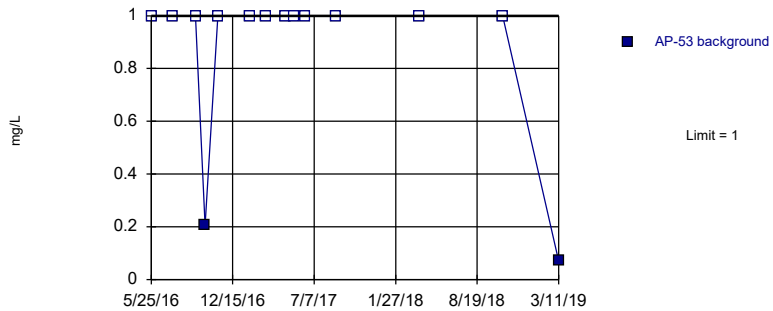
Non-parametric test used in lieu of parametric prediction limit because censored data exceeded 50%. Limit is highest of 14 background values. 85.71% NDs. Well-constituent pair annual alpha = 0.01715. Individual comparison alpha = 0.008612 (1 of 2). Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Prediction Limit

Intrawell Non-parametric, AP-53 (bg)



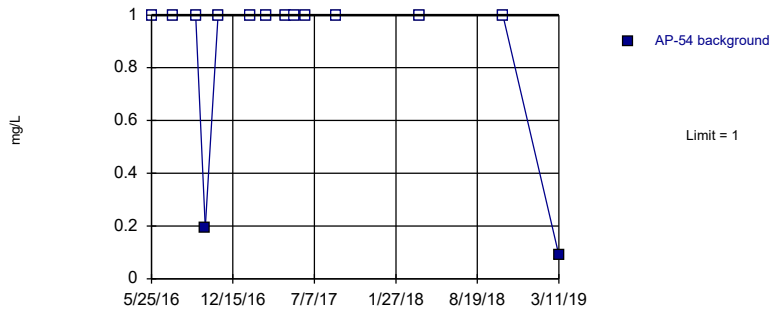
Non-parametric test used in lieu of parametric prediction limit because censored data exceeded 50%. Limit is highest of 14 background values. 85.71% NDs. Well-constituent pair annual alpha = 0.01715. Individual comparison alpha = 0.008612 (1 of 2). Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Prediction Limit

Intrawell Non-parametric, AP-54 (bg)



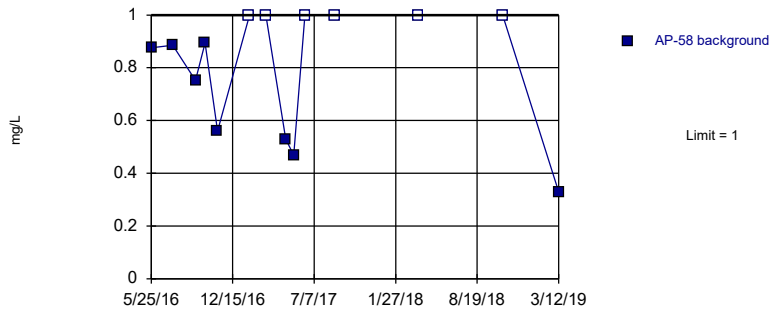
Non-parametric test used in lieu of parametric prediction limit because censored data exceeded 50%. Limit is highest of 14 background values. 85.71% NDs. Well-constituent pair annual alpha = 0.01715. Individual comparison alpha = 0.008612 (1 of 2). Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Prediction Limit

Intrawell Non-parametric, AP-58



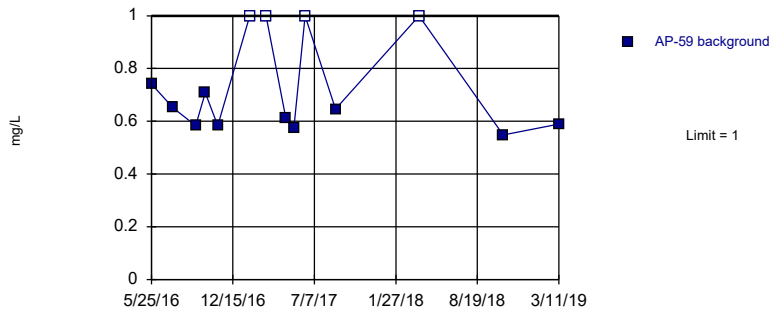
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 14 background values. 42.86% NDs. Well-constituent pair annual alpha = 0.01715. Individual comparison alpha = 0.008612 (1 of 2). Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Prediction Limit

Intrawell Non-parametric, AP-59



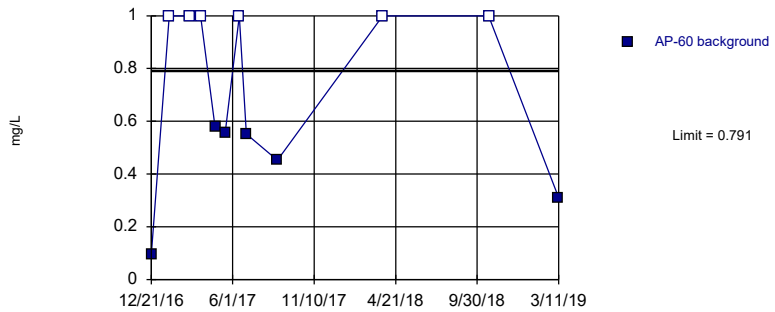
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 14 background values. 28.57% NDs. Well-constituent pair annual alpha = 0.01715. Individual comparison alpha = 0.008612 (1 of 2). Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Prediction Limit

Intrawell Parametric, AP-60

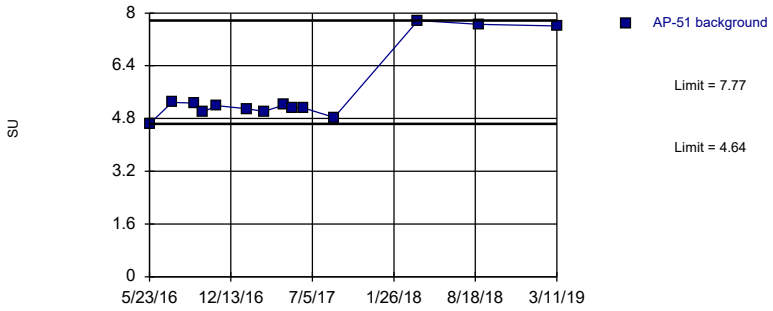


Background Data Summary (after Kaplan-Meier Adjustment): Mean=0.4243, Std. Dev.=0.1736, n=12, 50% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8147, critical = 0.805. Kappa = 2.112 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Prediction Limit

Intrawell Non-parametric, AP-51 (bg)



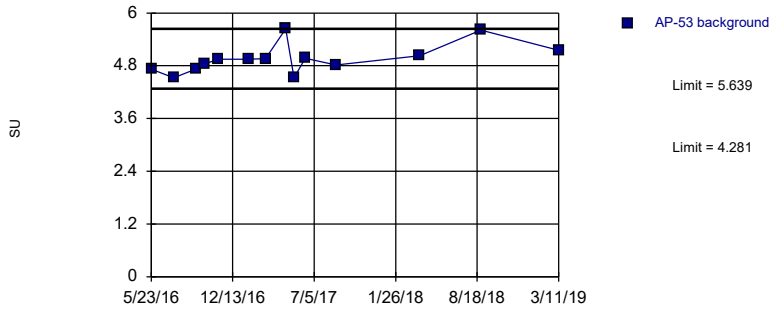
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limits are highest and lowest of 14 background values. Well-constituent pair annual alpha = 0.0343. Individual comparison alpha = 0.01722 (1 of 2). Assumes 1 future value.

Constituent: pH, field Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AP-53 (bg)



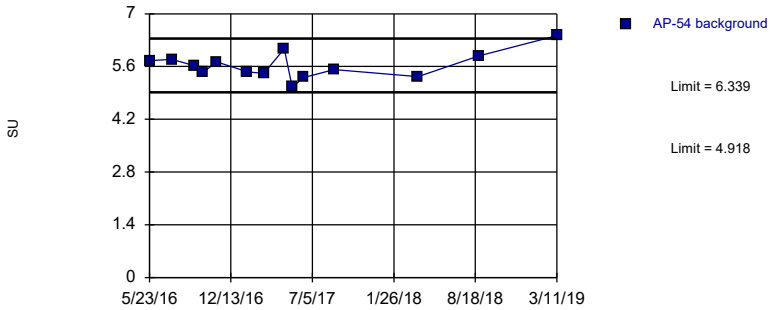
Background Data Summary: Mean=4.96, Std. Dev.=0.3326, n=14. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8841, critical = 0.825. Kappa = 2.041 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: pH, field Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AP-54 (bg)



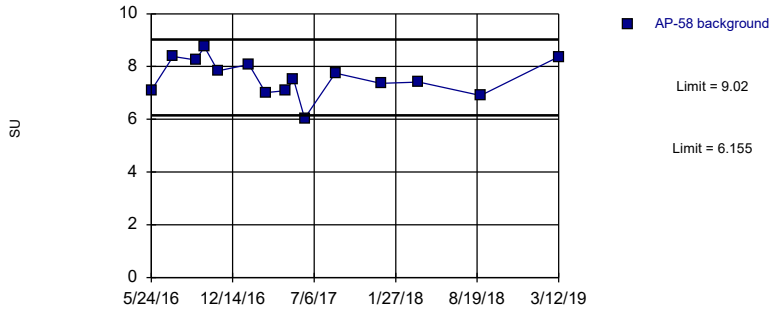
Background Data Summary: Mean=5.629, Std. Dev.=0.3483, n=14. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9644, critical = 0.825. Kappa = 2.041 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: pH, field Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AP-58



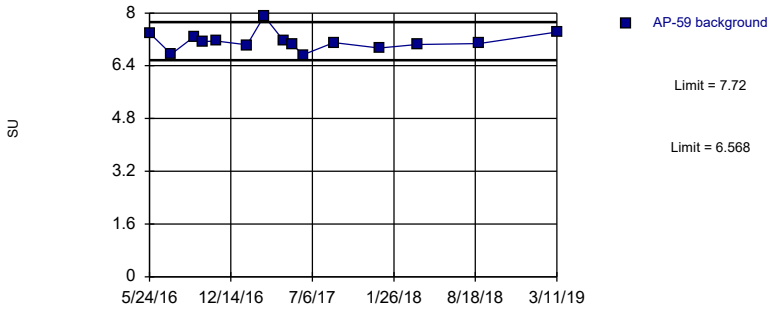
Background Data Summary: Mean=7.587, Std. Dev.=0.7144, n=15. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.97, critical = 0.835. Kappa = 2.006 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: pH, field Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AP-59



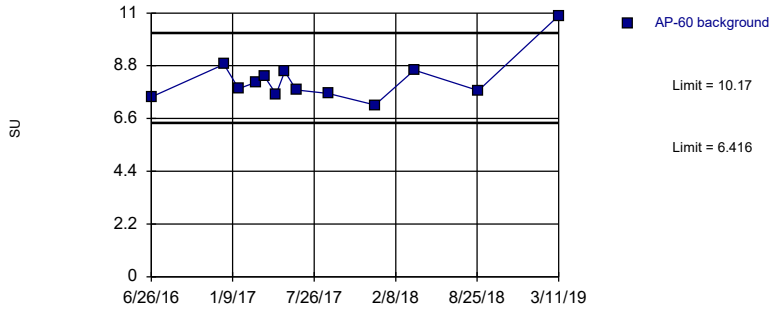
Background Data Summary: Mean=7.144, Std. Dev.=0.287, n=15. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8983, critical = 0.835. Kappa = 2.006 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: pH, field Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AP-60



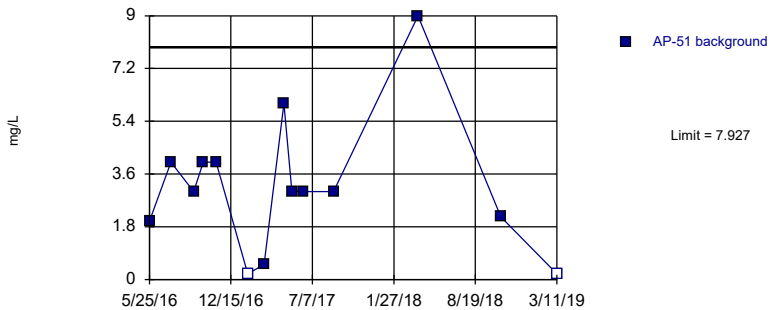
Background Data Summary (based on square root transformation): Mean=2.861, Std. Dev.=0.158, n=13. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8272, critical = 0.814. Kappa = 2.077 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: pH, field Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Prediction Limit

Intrawell Parametric, AP-51 (bg)



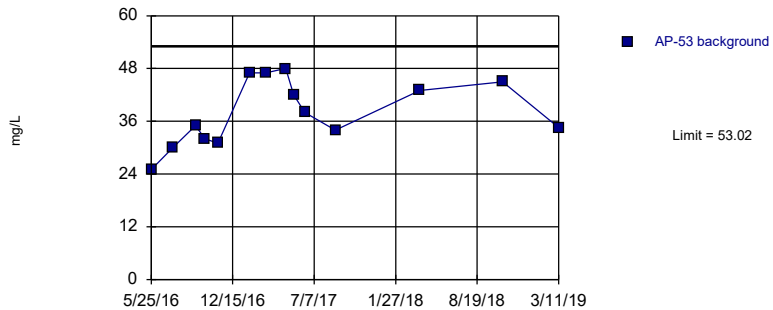
Background Data Summary: Mean=3.147, Std. Dev.=2.342, n=14, 14.29% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8963, critical = 0.825. Kappa = 2.041 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Sulfate, total Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AP-53 (bg)

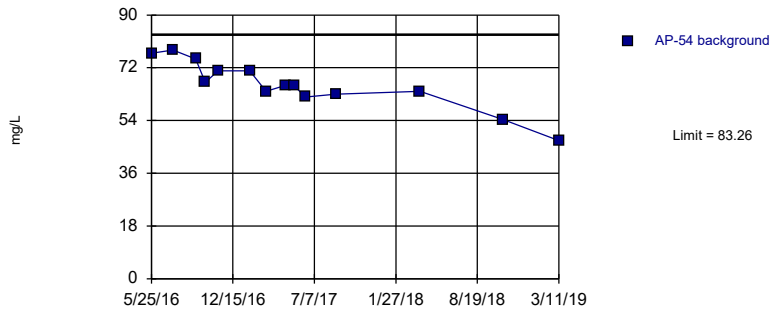


Background Data Summary: Mean=37.97, Std. Dev.=7.372, n=14. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9364, critical = 0.825. Kappa = 2.041 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Sulfate, total Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Prediction Limit

Intrawell Parametric, AP-54 (bg)



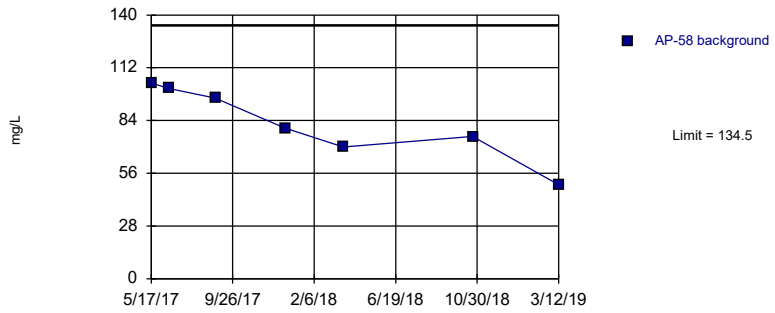
Background Data Summary: Mean=66.11, Std. Dev.=8.402, n=14. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9416, critical = 0.825. Kappa = 2.041 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Sulfate, total Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AP-58



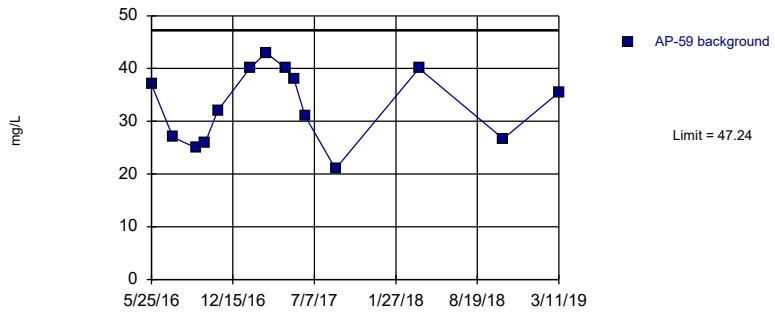
Background Data Summary: Mean=82.34, Std. Dev.=19.41, n=7. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9355, critical = 0.73. Kappa = 2.685 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Sulfate, total Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AP-59



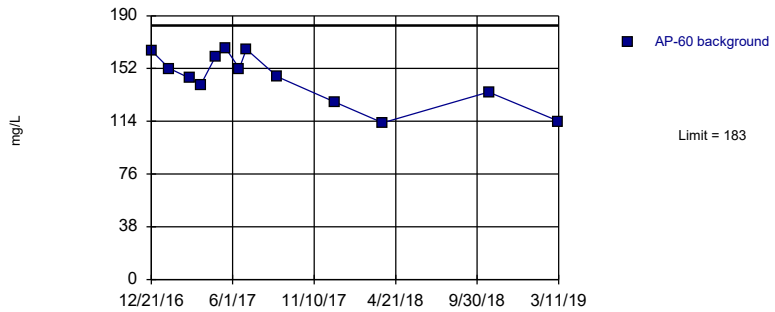
Background Data Summary: Mean=33.01, Std. Dev.=6.972, n=14. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9309, critical = 0.825. Kappa = 2.041 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Sulfate, total Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AP-60

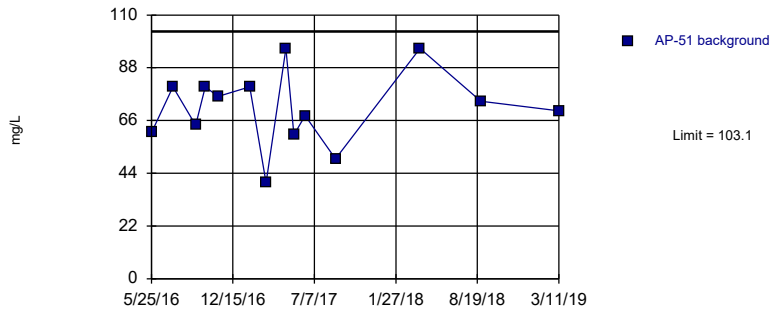


Background Data Summary: Mean=144.8, Std. Dev.=18.37, n=13. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9228, critical = 0.814. Kappa = 2.077 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Sulfate, total Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Prediction Limit

Intrawell Parametric, AP-51 (bg)



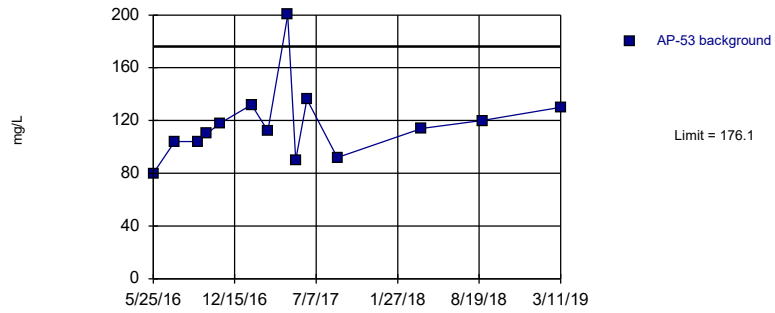
Background Data Summary: Mean=71.07, Std. Dev.=15.71, n=14. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9659, critical = 0.825. Kappa = 2.041 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Total Dissolved Solids [TDS] Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AP-53 (bg)



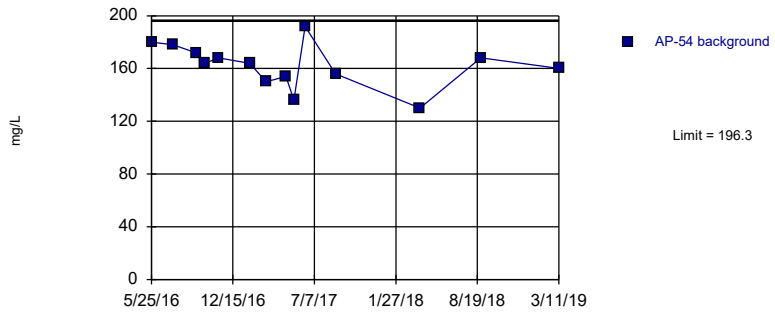
Background Data Summary: Mean=117.3, Std. Dev.=28.82, n=14. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8432, critical = 0.825. Kappa = 2.041 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Total Dissolved Solids [TDS] Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AP-54 (bg)



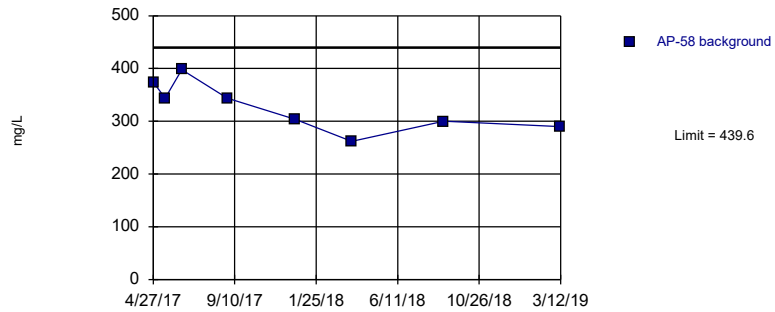
Background Data Summary: Mean=162.3, Std. Dev.=16.66, n=14. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9768, critical = 0.825. Kappa = 2.041 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Total Dissolved Solids [TDS] Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AP-58

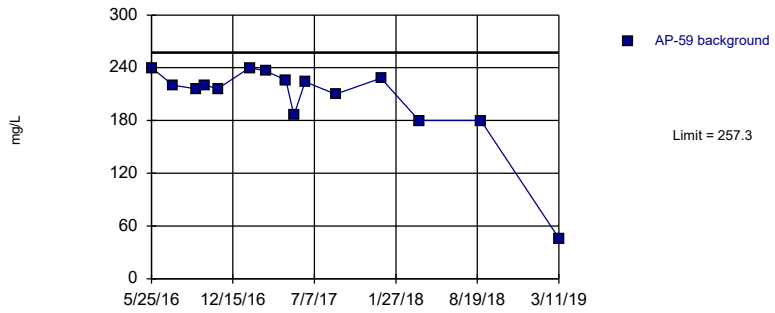


Background Data Summary: Mean=327, Std. Dev.=45.79, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9614, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Total Dissolved Solids [TDS] Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Prediction Limit

Intrawell Parametric, AP-59



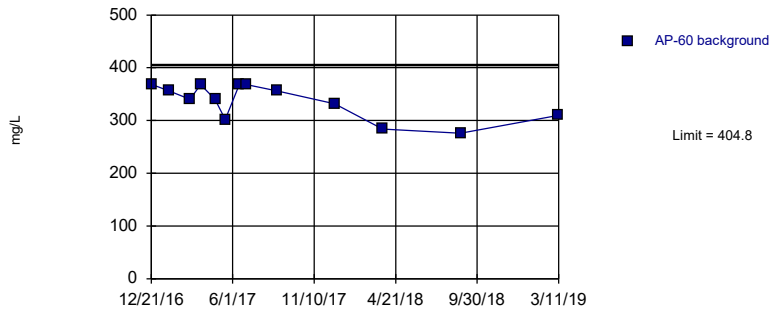
Background Data Summary (based on cube transformation): Mean=9622386, Std. Dev.=3696114, n=15. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8821, critical = 0.835. Kappa = 2.006 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Total Dissolved Solids [TDS] Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AP-60



Background Data Summary: Mean=336.1, Std. Dev.=33.1, n=13. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8724, critical = 0.814. Kappa = 2.077 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Total Dissolved Solids [TDS] Analysis Run 12/23/2019 9:49 AM View: PLs - Intrawell
Flint Creek BAP Client: Geosyntec Data: Flint Creek BAP

Geosyntec consultants

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www.geosyntec.com

Memorandum

Date:	July 6, 2020
To:	David Miller (AEP)
Copies to:	Bill Smith (AEP)
From:	Allison Kreinberg (Geosyntec)
Subject:	Evaluation of Detection Monitoring Data at Flint Creek Plant's Primary Bottom Ash Pond (PBAP)

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 semiannual detection monitoring event at the Primary Bottom Ash Pond (PBAP), an existing CCR unit at the Flint Creek Power Plant located in Gentry, Arkansas, was completed on March 23-24, 2020.

Background values for the PBAP were previously calculated in January 2018. 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 March 12, 2020 and revised June 23, 2020. As discussed in the report, the prediction limit calculated in January 2018 will be used for calcium at AP-58 while further research is completed regarding changes in observed calcium concentrations.

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 concluded only 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. No SSIs were observed at the Flint Creek PBAP CCR unit, and as a result the Flint Creek PBAP 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
Flint Creek - Primary Bottom Ash Pond

Geosyntec Consultants, Inc.

Analyte	Unit	Description	AP-58	AP-59	AP-60
			3/24/2020	3/23/2020	3/23/2020
Boron	mg/L	Intrawell Background Value (UPL)	0.706	0.386	1.66
		Analytical Result	0.129	0.228	1.25
Calcium	mg/L	Intrawell Background Value (UPL)	85.1	47.1	51.3
		Analytical Result	68.1	45.3	27.9
Chloride	mg/L	Intrawell Background Value (UPL)	27.4	19.0	17.7
		Analytical Result	5.78	12.3	10.9
Fluoride	mg/L	Intrawell Background Value (UPL)	1.00	1.00	0.791
		Analytical Result	0.32	0.61	0.36
pH	SU	Intrawell Background Value (UPL)	9.0	7.7	10.2
		Intrawell Background Value (LPL)	6.2	6.6	6.4
		Analytical Result	6.8	7.2	9.8
Sulfate	mg/L	Intrawell Background Value (UPL)	135	47.2	183
		Analytical Result	39.7	38.1	167
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	440	257	405
		Analytical Result	250	250	370

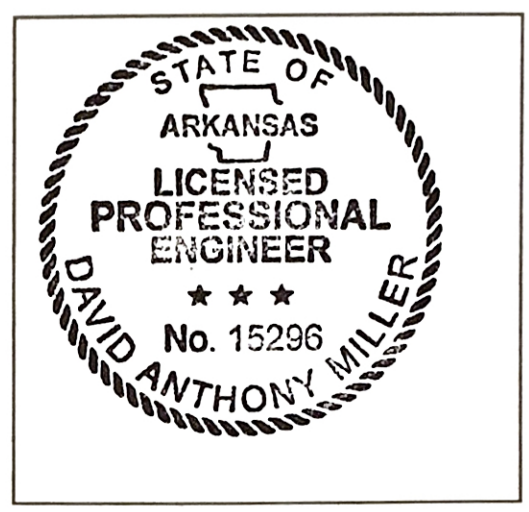
Notes
UPL: Upper prediction limit
LPL: Lower prediction limit
Bold values exceed the background value.
Background values are shaded gray.

ATTACHMENT A

Certification by a Qualified Professional Engineer

CERTIFICATION BY QUALIFIED PROFESSIONAL ENGINEER

I certify that the selected statistical method, described above and in the June 23, 2020 *Statistical Analysis Summary* report, is appropriate for evaluating the groundwater monitoring data for the Flint Creek PBAP CCR management area and that the requirements of 40 CFR 257.93(f) have been met.



DAVID ANTHONY MILLER
Printed Name of Licensed Professional Engineer

David Anthony Miller
Signature

15296	ARKANSAS	07.09.2020
License Number	Licensing State	Date

Geosyntec consultants

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MEMORANDUM

Date:	December 17, 2020
To:	Bill Smith (AEP)
Copies to:	David Miller (AEP)
From:	Allison Kreinberg and Ryan Fimmen (Geosyntec)
Subject:	Flint Creek PBAP Geochemical Investigation Results

The Primary Bottom Ash Pond (PBAP) is a regulated unit under 40 CFR 257 Subpart D ("the CCR Rule") at AEP's Flint Creek Power Plant located in Gentry, Arkansas. Ten groundwater monitoring events were completed prior to August 2017 to establish background concentrations for Appendix III and Appendix IV parameters under the CCR Rule. Following completion of four additional detection monitoring events, the newly collected data were evaluated for inclusion in the background dataset. During this evaluation, Mann-Whitney tests identified a statistically significant increasing trend for calcium at downgradient well AP-58[1].

In accordance with the Unified Guidance[2], an investigation was completed to identify possible causes for the increasing calcium trend. The results of this geochemical evaluation suggest that the increasing calcium trend at monitoring well AP-58 is not the result of a release from the Primary Bottom Ash Pond, and instead represents a return to conditions more representative of the calcium-rich limestone aquifer in question.

GEOCHEMICAL EVALUATION APPROACH

Geosyntec completed a geochemical evaluation to assess possible sources of the increasing calcium trend at AP-58. This evaluation included:

- A review of laboratory quality assurance and quality control (QA/QC) data and field forms from sampling events;
- Time series graphs and geochemical diagrams such as Piper plots;

[1] Geosyntec, 2020. Statistical Analysis Summary – Background Update Calculations. Primary Bottom Ash Pond – Flint Creek Plant. March.
[2] United States Environmental Protection Agency (USEPA). 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance. EPA 530/R-09-007. March.

- A review of historical data collected from the site for purposes other than the Federal CCR rule;
- Results of surface water samples collected from the PBAP and SWEPCO Lake; and,
- Expected major cation and anion concentrations for the regional lithology based on a review of academic literature.

The results of the evaluation were summarized in a presentation which was shared with AEP via teleconference on July 21, 2020 and are also summarized below.

DISCUSSION

Data from Federal CCR program sampling events for monitoring well AP-58 were plotted on a Piper diagram alongside a surface water sample collected from the PBAP and an averaged representative groundwater composition from the Boone Formation[3] (limestone formation in which monitoring well AP-58 is screened) (**Figure 1**). **Figure 1** demonstrates that the geochemical signature of AP-58 groundwater gradually changed from predominantly sodium sulfate ($Na\text{-}SO_4$) to calcium bicarbonate ($Ca\text{-}HCO_3$) dominated groundwater between October 2016 and August 2019. Both the PBAP and the Boone Formation samples are also calcium bicarbonate dominant; however, the more recent AP-58 samples have a higher relative percentage of both calcium and bicarbonate than the PBAP sample and appear to be more closely aligned with the Boone Formation groundwater data. Additional evidence refuting the likelihood of a PBAP release is provided by a set of time series graphs (**Figure 2**) which show that concentrations of recent AP-58 sample analytes are trending toward the composition of the representative Boone Formation groundwater data instead of the PBAP sample.

As noted in a previously completed ASD for calcium at AP-59[4], limestone lithologies at the well screen intervals differ between the upgradient and downgradient locations at the PBAP. Downgradient locations were characterized as consisting of massive limestone bedrock. The downgradient limestone is typically gray and crystalline. In contrast, upgradient earth materials at well screen elevations consist of reddish-brown clay with thin, intermittent gray limestone layers that are presumably weathered to heavily weathered reddish-brown limestone with cherty limestone layers. It is noteworthy that the upgradient limestone exhibits significantly more weathering than the limestone at the downgradient locations and the limestone within the screened interval at AP-58 is not described as weather at all. Boring logs for AP-58 and the upgradient

[3] Leidy, V.A., and Morris, E.E. 1990. Hydrogeology and Quality of Ground Water in the Boone Formation and Cotter Dolomite in Karst Terrain of Northwestern Boone County, Arkansas. USGS Water-Resources Investigations Report 90-4066.
[4] Geosyntec, 2018. Alternative Source Demonstration Report, Federal CCR Rule. Primary Bottom Ash Pond – Flint Creek Plant. April.

monitoring locations are provided as **Attachment A.** Additionally, the screened interval at AP-58 is approximately 19 to 39 feet lower in elevation than the other downgradient wells and approximately 44 to 54 feet lower than at the upgradient wells. Well installation logs which illustrate the screened interval are provided as **Attachment B**. These lithological/textural differences are illustrated in **Figure 3**.

The presence of highly weathered limestone in upgradient locations would suggest that groundwater-calcite ($CaCO_3$) thermodynamic equilibrium would govern concentrations of dissolved calcium and alkalinity (bicarbonate) in groundwater. Calcite saturation indices (SIs) calculated using USGS software package PHREEQC (**Table 1**) show that upgradient locations were highly undersaturated with respect to calcite. In such instances, calcite would ordinarily contribute aqueous calcium and alkalinity to the groundwater as a product of dissolution. However, low calcium concentrations (often <10 mg/L) and low pH (roughly 4.5 to 5.5) in upgradient groundwater suggests that the limestone has been passivated with respect to calcite dissolution and is therefore less reactive to acidic dissolution. The proposed mechanism by which limestone passivation occurs in upgradient locations is provided in the previously completed ASD[4].

Limestone passivation does not appear to be prevalent at the downgradient locations based on both the crystalline, competent appearance of the limestone and the groundwater chemistry at these locations. At location AP-58, and other downgradient monitoring wells, groundwater is characterized as more circumneutral pH values and higher concentrations of calcium and alkalinity. Unpassivated limestone of the aquifer units in downgradient locations are capable of buffering incoming acidic waters via dissolution of calcite and, as a consequence, higher concentrations of dissolved calcium and alkalinity are anticipated in groundwater at these locations.

SIs for calcite at AP-58 groundwater fluctuate between supersaturation, equilibrium, and undersaturation. (**Figure 4, Table 1**). Dissolution of calcite is thermodynamically possible whenever undersaturation is achieved. **Figure 5** shows that increasing trends of alkalinity and calcium begin as calcite SIs decrease from a state of supersaturation to a state of undersaturation. Calcium and alkalinity concentrations both begin to reach a steady state after the highest degree of calcite undersaturation is reached (June 2017) and calcite SIs begin to trend towards equilibrium with groundwater. These behaviors suggest that calcite-groundwater thermodynamic relationships are controlling the concentrations of calcium and alkalinity at AP-58.

CONCLUSIONS

Based on the geochemical evaluation, the PBAP is not the source of increasing calcium concentrations at AP-58. Instead, calcium concentrations appear to be controlled by groundwater-

calcite thermodynamic equilibrium relationships. The increasing calcium trend observed at AP-58 reflects a period of groundwater undersaturation with respect to calcite during the initial stages of data collection and is indicative of a return to representative aquifer conditions.

TABLES

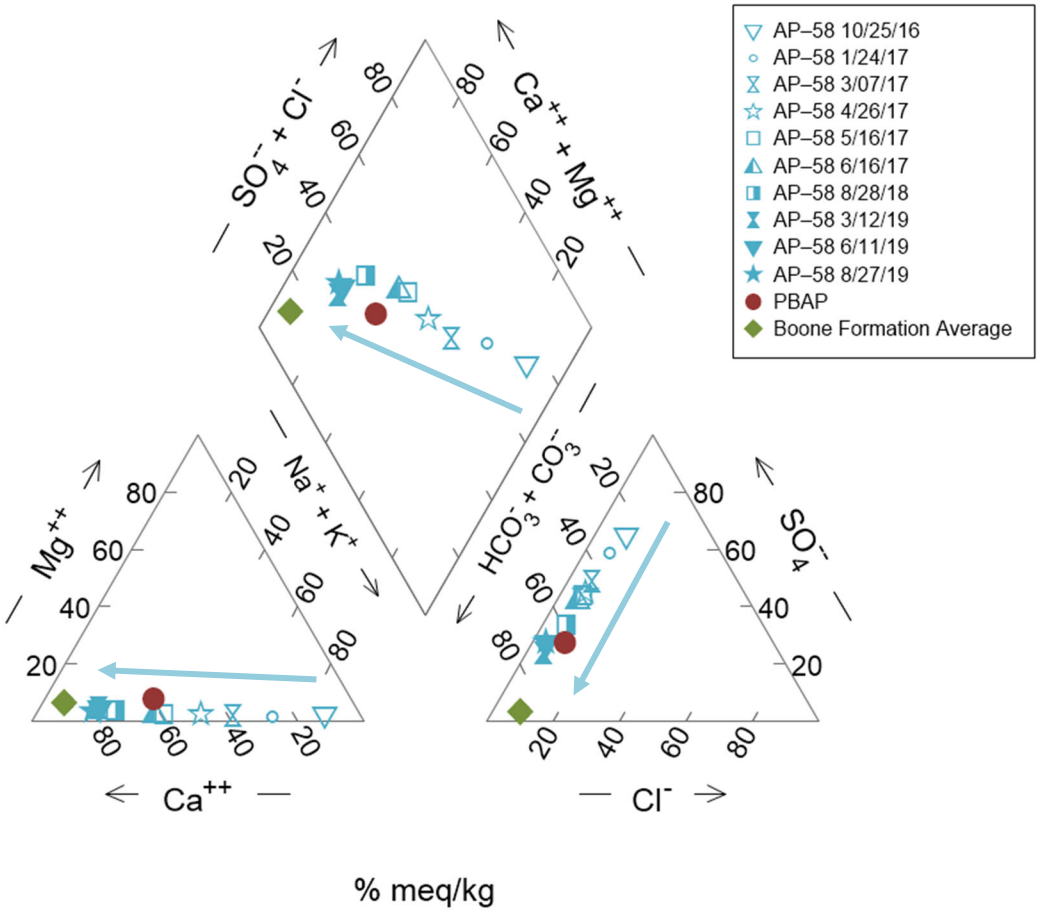
Table 1: Calculated Calcite Saturation Indices
Flint Creek Primary Bottom Ash Pond

Geosyntec Consultants, Inc.

Location	Well ID	Date	Calcite ($CaCO_3$)	
			SI	Average
Upgradient	AP-51	10/05/2016	-4.63	-4.73
		01/24/2017	-4.79	
		03/07/2017	-4.95	
		04/26/2017	-4.09	
		05/16/2017	-4.78	
		06/16/2017	-4.64	
		8/28/2018	-2.08	
		6/10/2019	-1.67	
		8/28/2019	-3.80	
	AP-53	10/05/2016	-4.99	
		01/24/2017	-5.06	
		03/07/2017	-5.19	
		04/26/2017	-4.56	
		05/16/2017	-5.57	
		06/16/2017	-5.27	
		8/28/2018	-4.46	
		6/10/2019	-4.84	
		8/28/2019	-4.70	
	AP-54	10/05/2016	-3.56	
		01/24/2017	-3.81	
		03/07/2017	-3.69	
		04/26/2017	-3.01	
		05/16/2017	-4.21	
		06/16/2017	-4.17	
		8/28/2018	-2.63	
		6/10/2019	-2.40	
		8/28/2019	-1.92	
Downgradient	AP-58	10/5/2016	0.63	-0.54
		1/24/2017	0.16	
		3/7/2017	-0.71	
		4/26/2017	-0.40	
		5/16/2017	0.05	
		6/16/2017	-1.34	
		8/28/2018	-0.39	
		3/12/2019	0.98	
		6/11/2019	0.24	
		8/27/2019	0.15	

Notes:
SI - saturation index
Calculated SIs greater than -0.2 suggest saturation or supersaturation of the mineral and are shaded in red with red text.

FIGURES



Notes: Data for AP-58 was collected as part of the Federal CCR program. The Primary Bottom Ash Pond (PBAP) sample was collected on February 25, 2020. The Boone Formation Average sample represents the averaged value of Boone Formation springs sampled by Leidy and Morris (1990). Blue arrows indicate the geochemical trend at AP-58 over time.

AP-58 Piper Diagram
Flint Creek Primary Bottom Ash Pond

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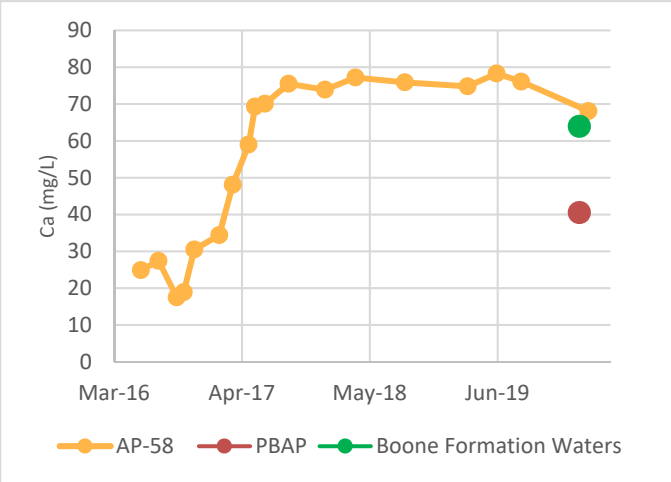
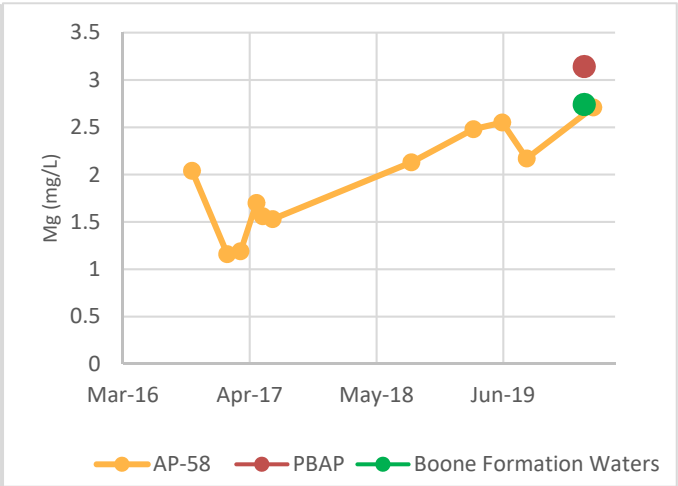
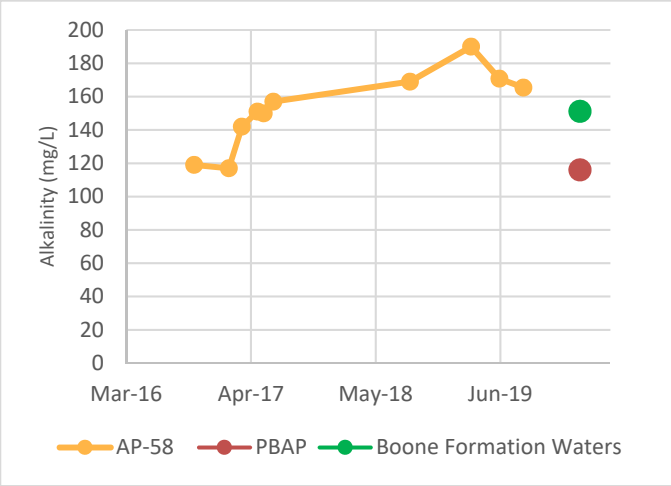
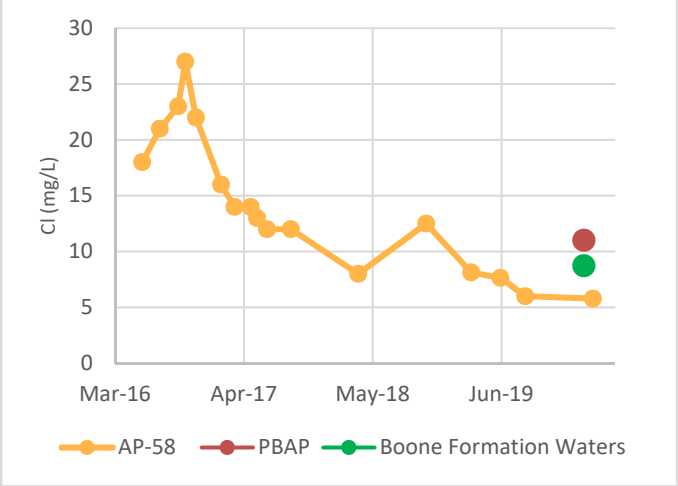
Columbus, Ohio | 8/18/2020

Figure **1**









Notes: Data for AP-58 was collected as part of the Federal CCR program. The Primary Bottom Ash Pond (PBAP) sample was collected on February 25, 2020. The Boone Formation Average sample represents the averaged value of Boone Formation springs sampled by Leidy and Morris (1990). The date of the Boone Formation data point is shown as June 2020 to allow for a better comparison to recent PBAP and groundwater samples.

Time Series Graphs
Flint Creek Primary Bottom Ash Pond

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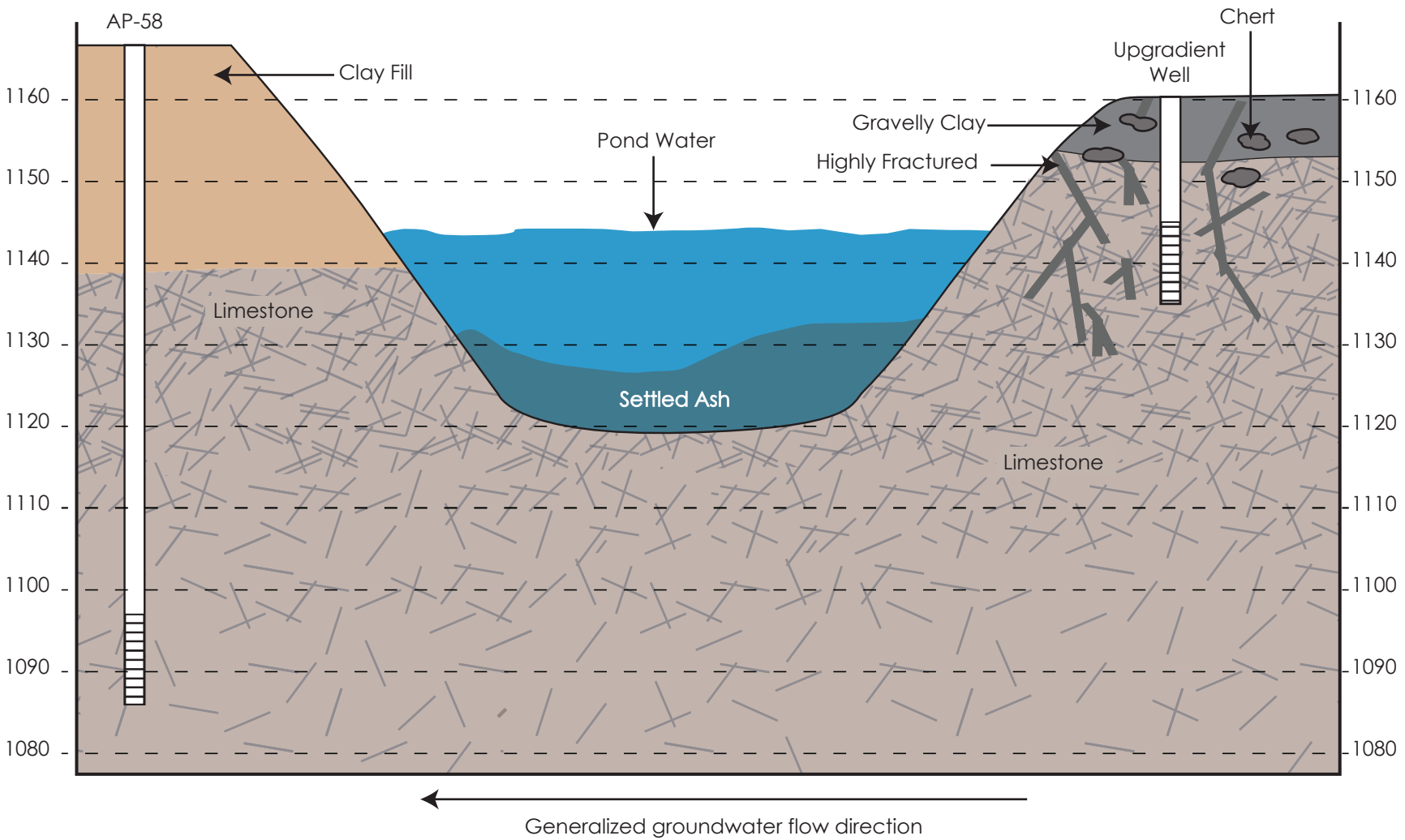

Not to Scale

Site Geology Illustration
Flint Creek Primary Bottom Ash Pond

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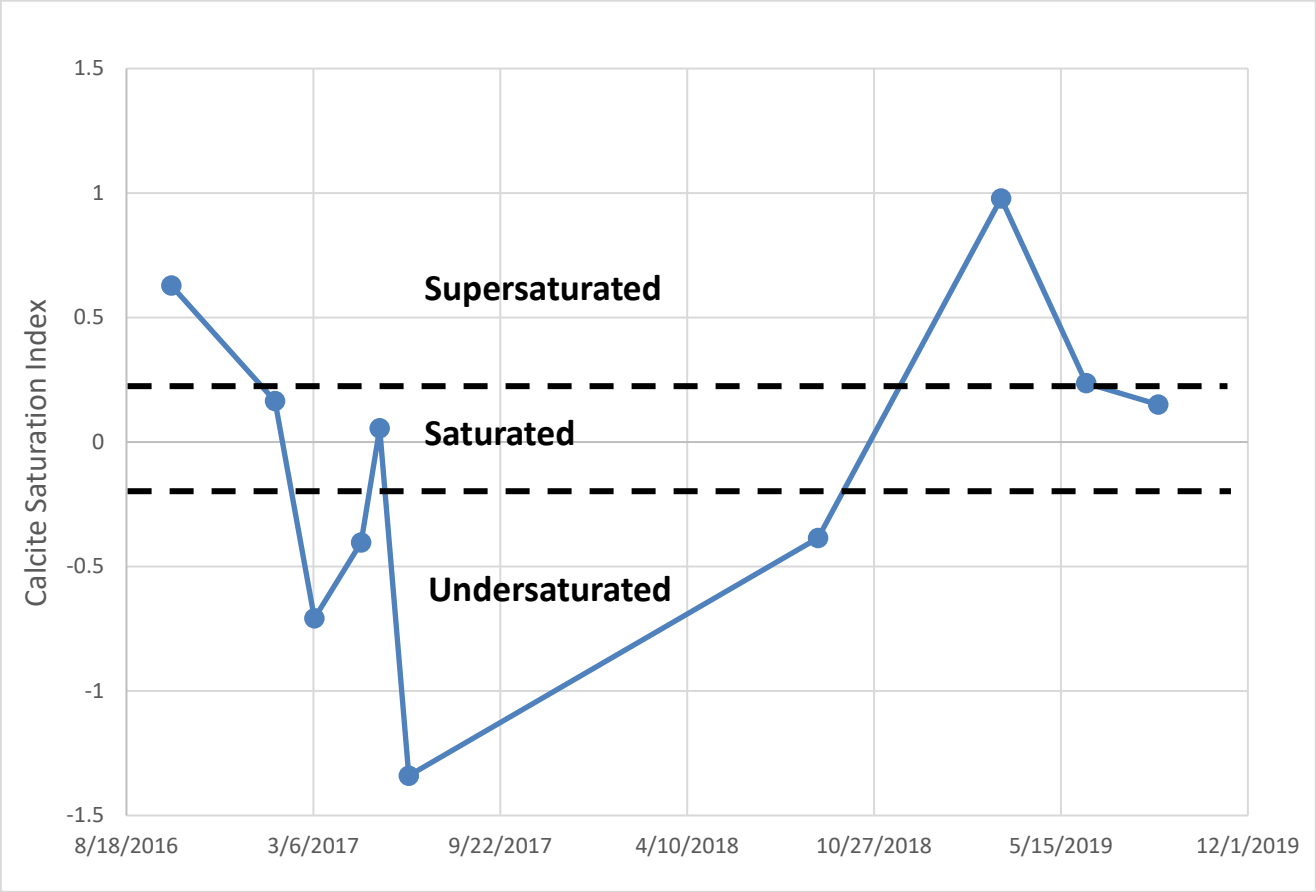
Columbus, Ohio | December 2020

Figure **3**

FlintCreekIllustration_CHA8495.ai



Notes: Data for AP-58 was collected as part of the Federal CCR program. Saturation indices (SIs) were calculated using USGS software package PHREEQC. SIs between -0.2 and 0.2 suggest mineral saturation.

AP-58 Calcite Saturation Indices
Flint Creek Primary Bottom Ash Pond

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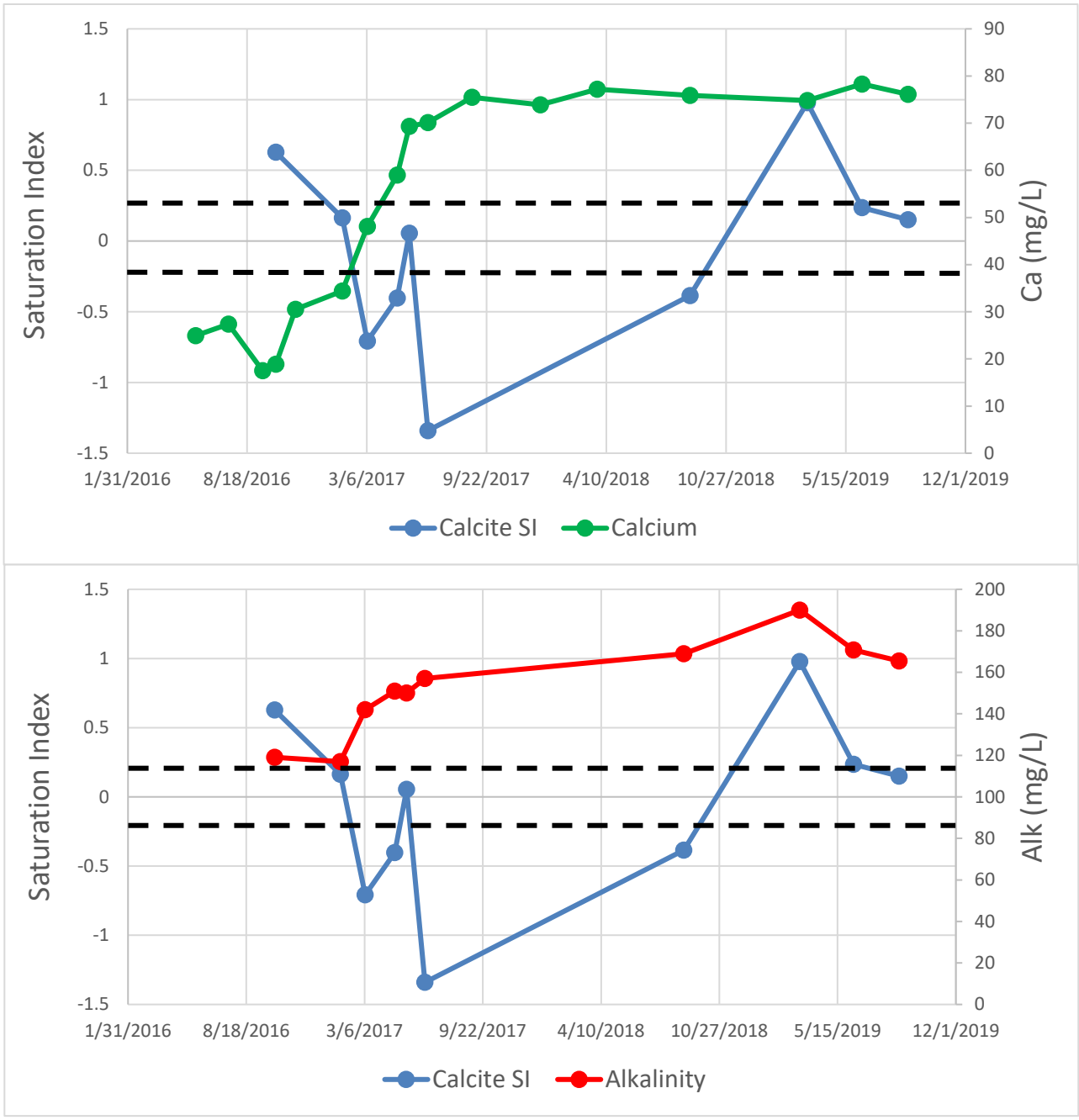

Notes: Data for AP-58 was collected as part of the Federal CCR program. Saturation indices (SIs) were calculated using USGS software package PHREEQC. SIs between -0.2 and 0.2 suggest mineral saturation.

AP-58 Calcite SI Comparison to Calcium and Alkalinity

Flint Creek Primary Bottom Ash Pond

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ATTACHMENT A

Upgradient and AP-58 Boring Logs

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FIELD BORING LOG

BORING NO.: AP-51 PAGE: 1 of 1

TOTAL DEPTH: 35 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER - FLINT CREEK	PROJECT: ASH POND WELLS
JOB NO.: 216-001-35117108-008	DRILLING CO.: ANDERSON ENGINEERING
LOGGED BY: JODY ADAMS	DRILLER: GARRY MOYERS
DATE DRILLED: 6/12/11	RIG TYPE: ATV

DRILLING METHOD: HOLLOW STEM AUGER, AIR ROTARY

SAMPLING METHOD: SPLIT SPOON

N: 708,641.27 E: 1,257,949.01 G.S. ELEV. 1,160.10

Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Remarks
0	0' - 2' SILTY GRAVEL brown with boulders					
	2' - 4' GRAVELLY CLAY reddish brown					
5	4' - 5.5' CHERTY LIMESTONE white					
	5.5' - 8' GRAVELLY CLAY reddish brown		1	2"		
	8' - 10' LIMESTONE gray			LOGGED BY CUTTINGS		Refusal at 8' bgs (Started air rotary at 8')
10	10' - 11' CLAY reddish brown					
	11' - 11.5' LIMESTONE gray					
	11.5' - 13' CLAY reddish brown					
	13' - 13.5' LIMESTONE gray					
15	13.5' - 35' CLAY reddish brown with intermittent gray limestone layers, limestone layers are approximately 0.6' to 1' thick					
20	Moist at 21'					
25						
30						
35	Total Depth of Boring at 35' bgs					Stopped at 35' for 1 hr. Water recharged to 17.8' bgs
40						

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FIELD BORING LOG

BORING NO.: AP-53 PAGE: 1 of 1

TOTAL DEPTH: 30 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER - FLINT CREEK	PROJECT: ASH POND WELLS
JOB NO.: 216-001-35117108-010	DRILLING CO.: ANDERSON ENGINEERING
LOGGED BY: JODY ADAMS	DRILLER: GARRY MOYERS
DATE DRILLED: 6/9/11	RIG TYPE: ATV

DRILLING METHOD: HOLLOW STEM AUGER, AIR ROTARY

SAMPLING METHOD: SPLIT SPOON

N: 707,650.49 E: 1,256,859.93 G.S. ELEV. 1,156.40

Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Remarks
0	0' - 3' SILTY GRAVEL cobble size gravel					
	3' - 8' GRAVELLY CLAY reddish brown		1			
5						
	8' - 10.5' LIMESTONE reddish brown, heavily weathered, soft drilling, moist					
10	10.5' - 11' CHERTY LIMESTONE gray		2	4"		
	11' - 30' LIMESTONE reddish brown, very heavily weathered with thin (<5") layers of cherty limestone					Water observed at 14.5' bgs while drilling
15			3	10"		
20						
25						Allowed boring to sit open overnight at 30' bgs. water at 12.2' bgs on 6/10/11
30	Total Depth of Boring at 30' bgs					
35						
40						

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FIELD BORING LOG

BORING NO.: AP-54 PAGE: 1 of 1

TOTAL DEPTH: 31.5 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER - FLINT CREEK	PROJECT: ASH POND WELLS
JOB NO.: 216-001-35117108-011	DRILLING CO.: ANDERSON ENGINEERING
LOGGED BY: JODY ADAMS	DRILLER: GARRY MOYERS
DATE DRILLED: 6/9/11	RIG TYPE: ATV

DRILLING METHOD: HOLLOW STEM AUGER, AIR ROTARY

SAMPLING METHOD: SPLIT SPOON

N: 707,183.78 E: 1,256,185.57 G.S. ELEV. 1,164.70

Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Remarks
0	0' - 3' GRAVELLY CLAY reddish brown 3' - 10.5' GRAVELLY CLAY reddish brown, more clay		1	13"		
10	10.5' - 11' LIMESTONE gray 11' - 12' SILTY CLAY tan and gray, very hard 12' - 12.5' LIMESTONE white		2	4"		
15	12.5' - 26' LIMESTONE reddish brown, heavily weathered with intermittent (<4" thick) hard cherty limestone layers		3	15"		
20			4	2"		Water observed at 20.5' bgs while drilling
25	26' - 27' LIMESTONE 27' - 28.5' LIMESTONE heavily weathered, soft drilling 28.5' - 31.5' LIMESTONE intermittent hard and soft beds, cherty					Allowed boring to sit open for 30 min. at 25' water recharged to 22.5' bgs Refusal at 26' bgs Boring sat open at 26' for 15 min. water recharged to 23.2' bgs
30	Total Depth of Boring at 31.5' bgs					6-11-11 water at 21' bgs
35						
40						

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FIELD BORING LOG

BORING NO.: AP-58 PAGE: 1 of 2

TOTAL DEPTH: 69 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER	PROJECT: FLINT CREEK - CCR WELL INSTALLATION
JOB NO.: 216-001-35157182-002	DRILLING CO.: ANDERSON ENGINEERING
LOGGED BY: ADAM HOOPER	DRILLER: GARY MOYERS
DATE DRILLED: 2/16/2016	RIG TYPE: CME 75 BUGGY

DRILLING METHOD: HOLLOW STEM AUGER /AIR ROTARY

SAMPLING METHOD: 5' CONTINUOUS SAMPLER - LOGGED BY CUTTINGS

N: N/A E: N/A G.S. ELEV. N/A

Depth BGS	DESCRIPTION	Litho. Symbol	Remarks
			Flush - mounted boring
0	0'-15' SILTY CLAY - FILL brown and red, poor sample return		
15	15'-56' SILTY CLAY red, moist zones at 30' - 40' and 45' - 50'		

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FIELD BORING LOG

BORING NO.: AP-58 PAGE: 2 of 2

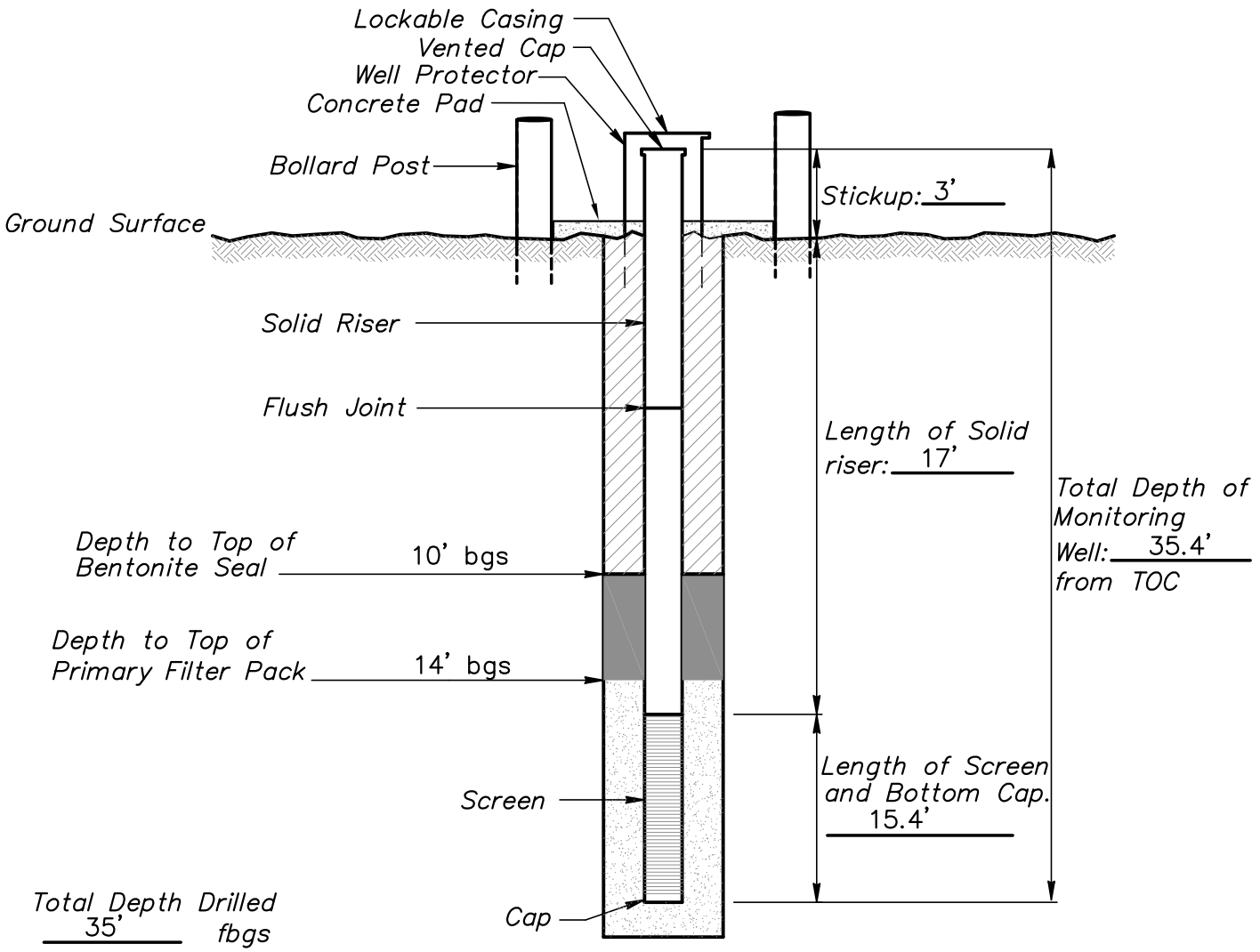
TOTAL DEPTH: 69 FEET BELOW GROUND SURFACE (BGS)

Depth BGS	DESCRIPTION	Litho. Symbol	Remarks
40	15'-56' SILTY CLAY red, moist zones at 30' - 40' and 45' - 50'		
45			
50			
55			56' - 59' bgs logged by cuttings
60	56'-69' LIMESTONE gray, crystalline		
65			
70	Total Depth of Boring at 69' bgs		
75			

ATTACHMENT B
Well Construction Logs

MONITORING WELL INSTALLATION RECORD

Job Name AEP FLINT CREEK – ASH POND WELLS Well Number AP–51
Job Number 35117108 Installation Date 6/12/2011 Location GENTRY, AR.
Datum Elevation 1,163.23 Surface Elevation 1,160.10
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", 3.25"
Granular Backfill Material 12–20 SAND Terracon Representative JODY ADAMS
Drilling Method HOLLOW STEM AUGER, AIR ROTARY Drilling Contractor ANDERSON ENGINEERING



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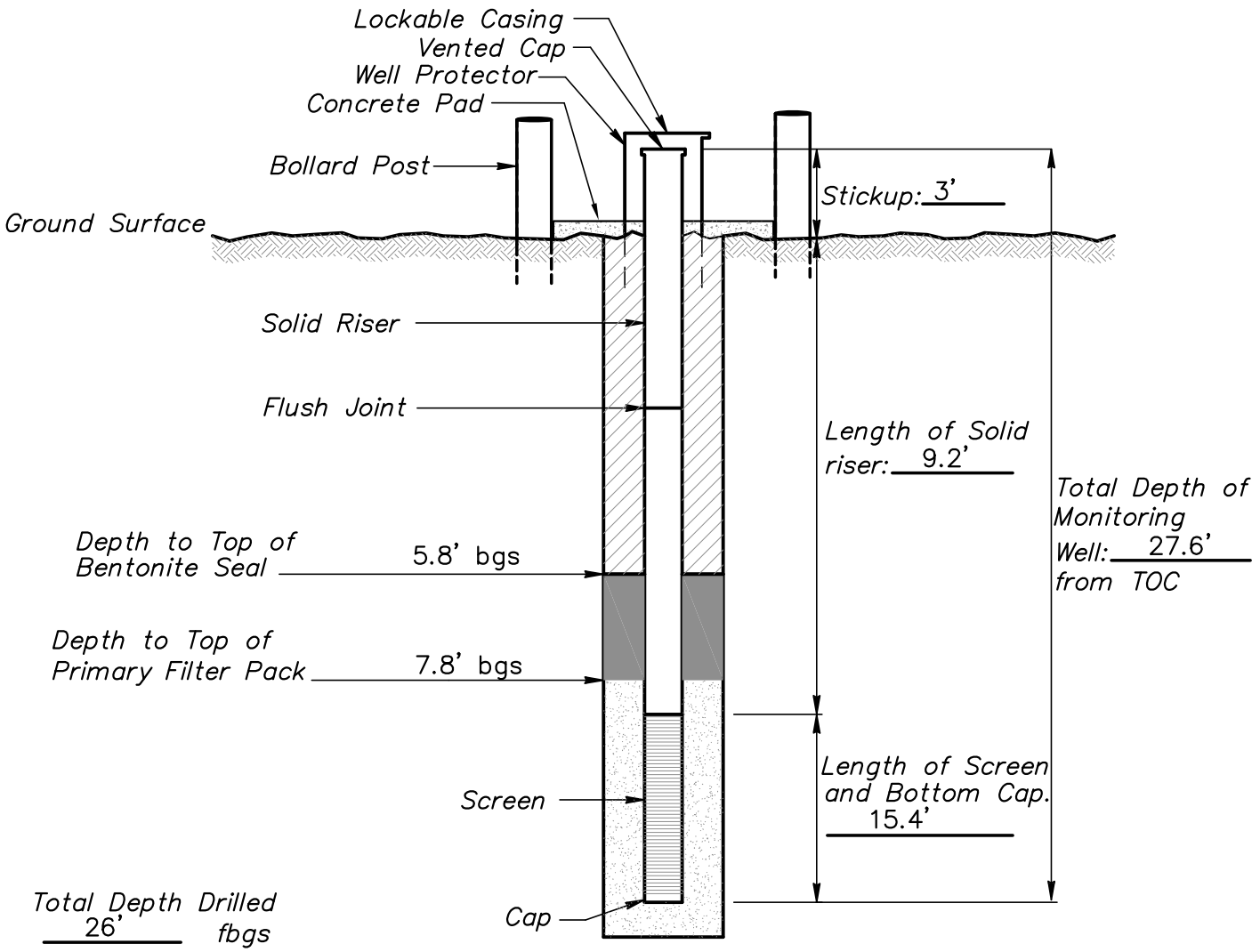
MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216–001–35117108
WELL NUMBER: AP–51
DRAWING NUMBER: 021 **CHECKED BY:** QEB

MONITORING WELL INSTALLATION RECORD

Job Name AEP FLINT CREEK – ASH POND WELLS | Well Number AP–52
Job Number 35117108 | Installation Date 6/13/2011 | Location GENTRY, AR.
Datum Elevation 1,158.89 | Surface Elevation 1,155.90
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", 3.25"
Granular Backfill Material 12–20 SAND | Terracon Representative JODY ADAMS
Drilling Method HOLLOW STEM AUGER, AIR ROTARY | Drilling Contractor ANDERSON ENGINEERING



Bentonite Grout
Bentonite Plug
Granular Backfill

(Not to Scale)

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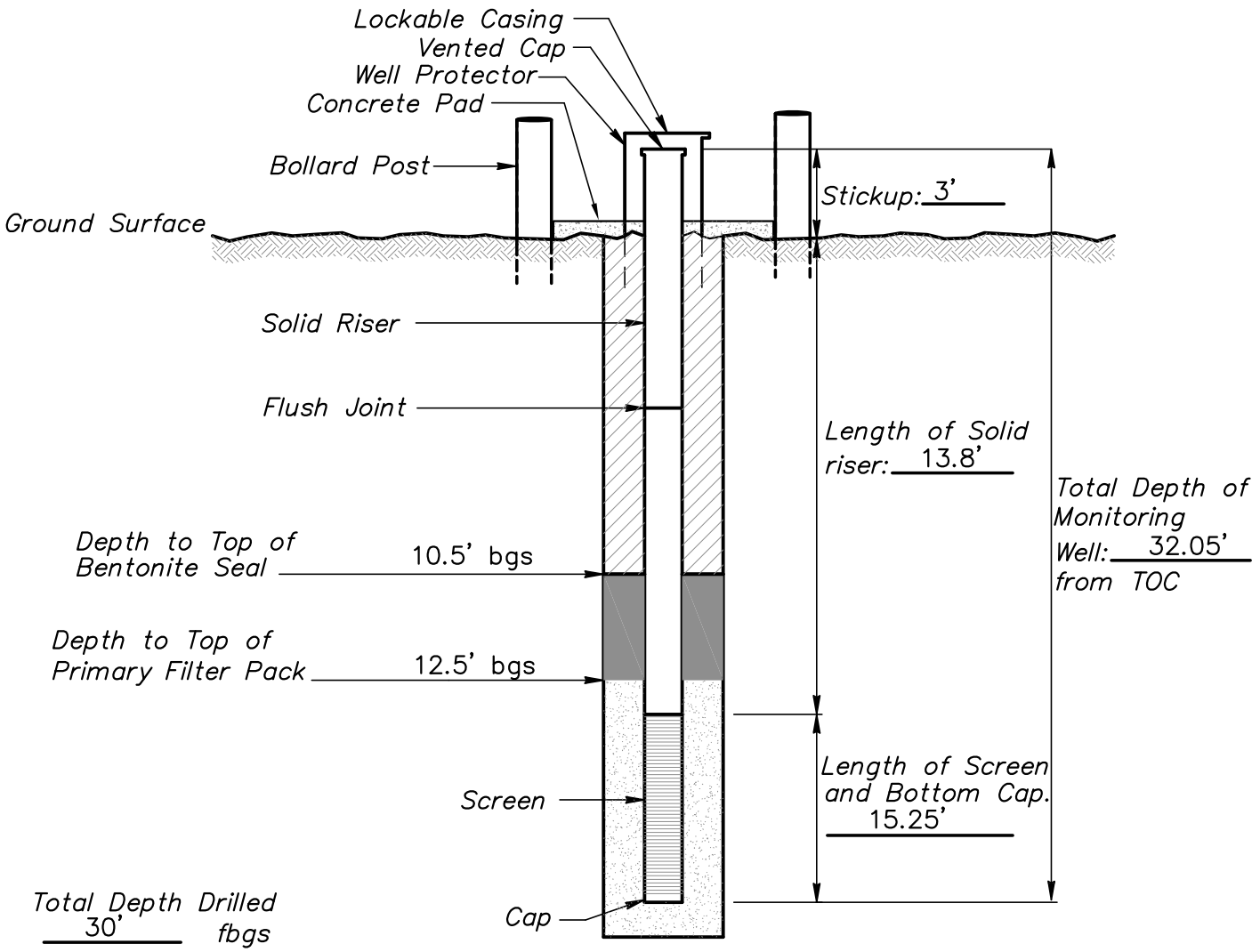
PH. (501) 847-9292 FAX. (501) 847-9210

MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216–001–35117108
WELL NUMBER: AP–52
DRAWING NUMBER: 022 **CHECKED BY:** QEB

MONITORING WELL INSTALLATION RECORD

Job Name AEP FLINT CREEK – ASH POND WELLS | Well Number AP–53
Job Number 35117108 | Installation Date 6/12/2011 | Location GENTRY, AR.
Datum Elevation 1,159.34 | Surface Elevation 1,156.40
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", 3.25"
Granular Backfill Material 12–20 SAND | Terracon Representative JODY ADAMS
Drilling Method HOLLOW STEM AUGER | Drilling Contractor ANDERSON ENGINEERING



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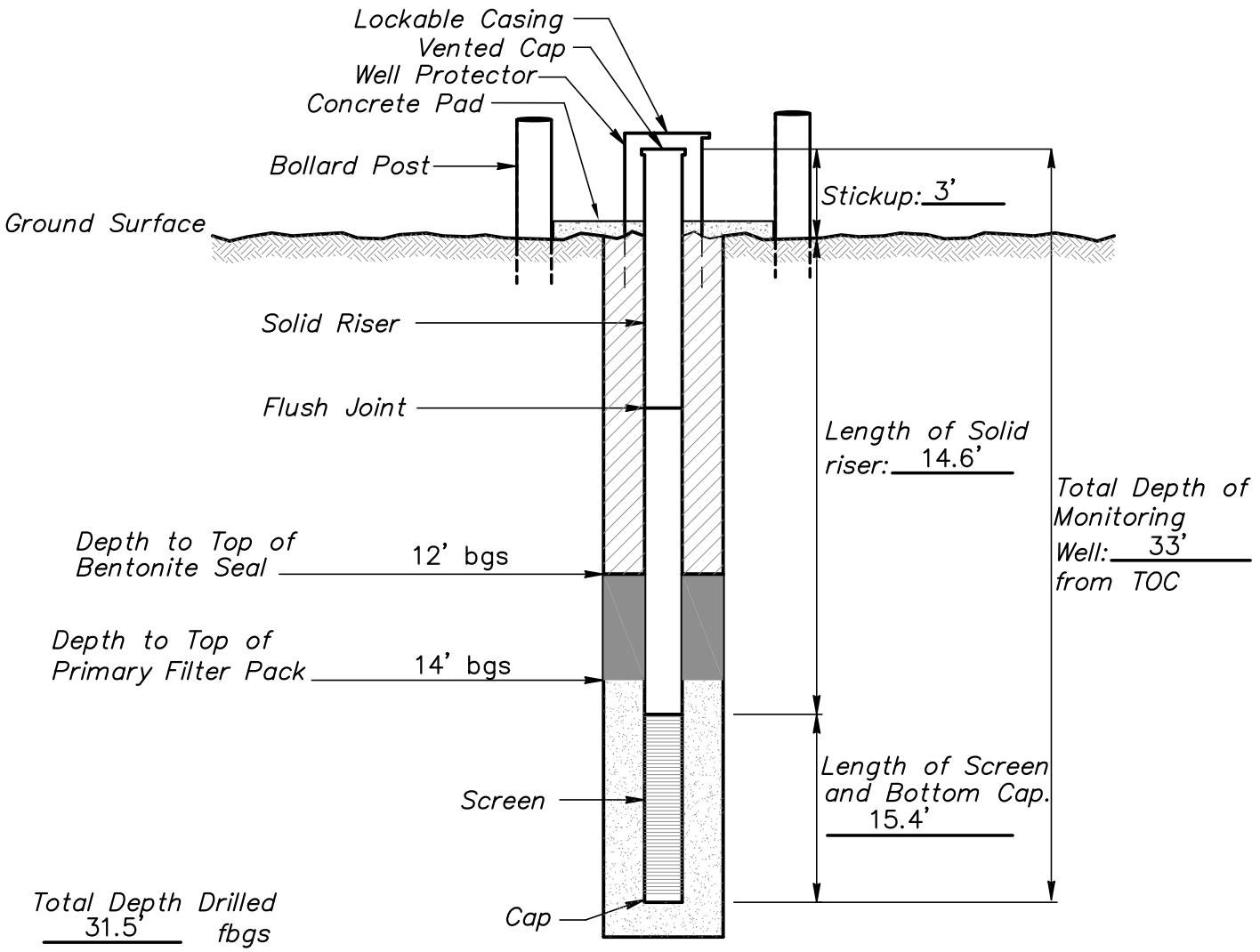
MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216–001–35117108
WELL NUMBER: AP–53
DRAWING NUMBER: 023 **CHECKED BY:** QEB

MONITORING WELL INSTALLATION RECORD

Job Name AEP FLINT CREEK – ASH POND WELLS Well Number AP–54
Job Number 35117108 Installation Date 6/11/2011 Location GENTRY, AR.
Datum Elevation 1,167.71 Surface Elevation 1,164.70
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", 3.25"
Granular Backfill Material 12–20 SAND Terracon Representative JODY ADAMS
Drilling Method HOLLOW STEM AUGER, AIR ROTARY Drilling Contractor ANDERSON ENGINEERING



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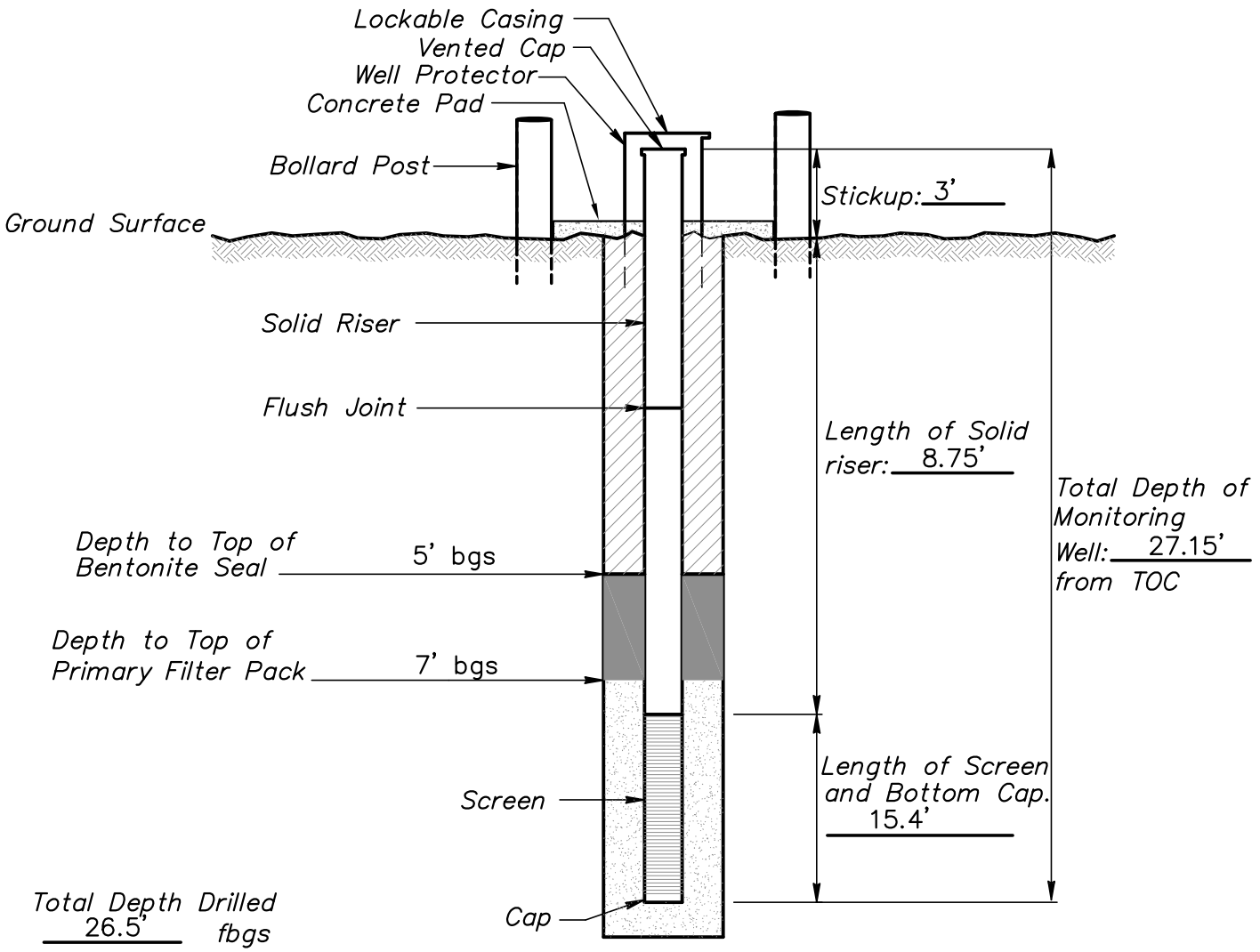
MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216–001–35117108
WELL NUMBER: AP–54
DRAWING NUMBER: 024 **CHECKED BY:** QEB

MONITORING WELL INSTALLATION RECORD

Job Name AEP FLINT CREEK – ASH POND WELLS | Well Number AP–55
Job Number 35117108 | Installation Date 6/9/2011 | Location GENTRY, AR.
Datum Elevation 1,156.86 | Surface Elevation 1,153.80
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", 3.25"
Granular Backfill Material 12–20 SAND | Terracon Representative JODY ADAMS
Drilling Method HOLLOW STEM AUGER | Drilling Contractor ANDERSON ENGINEERING



Bentonite Grout
Bentonite Plug
Granular Backfill

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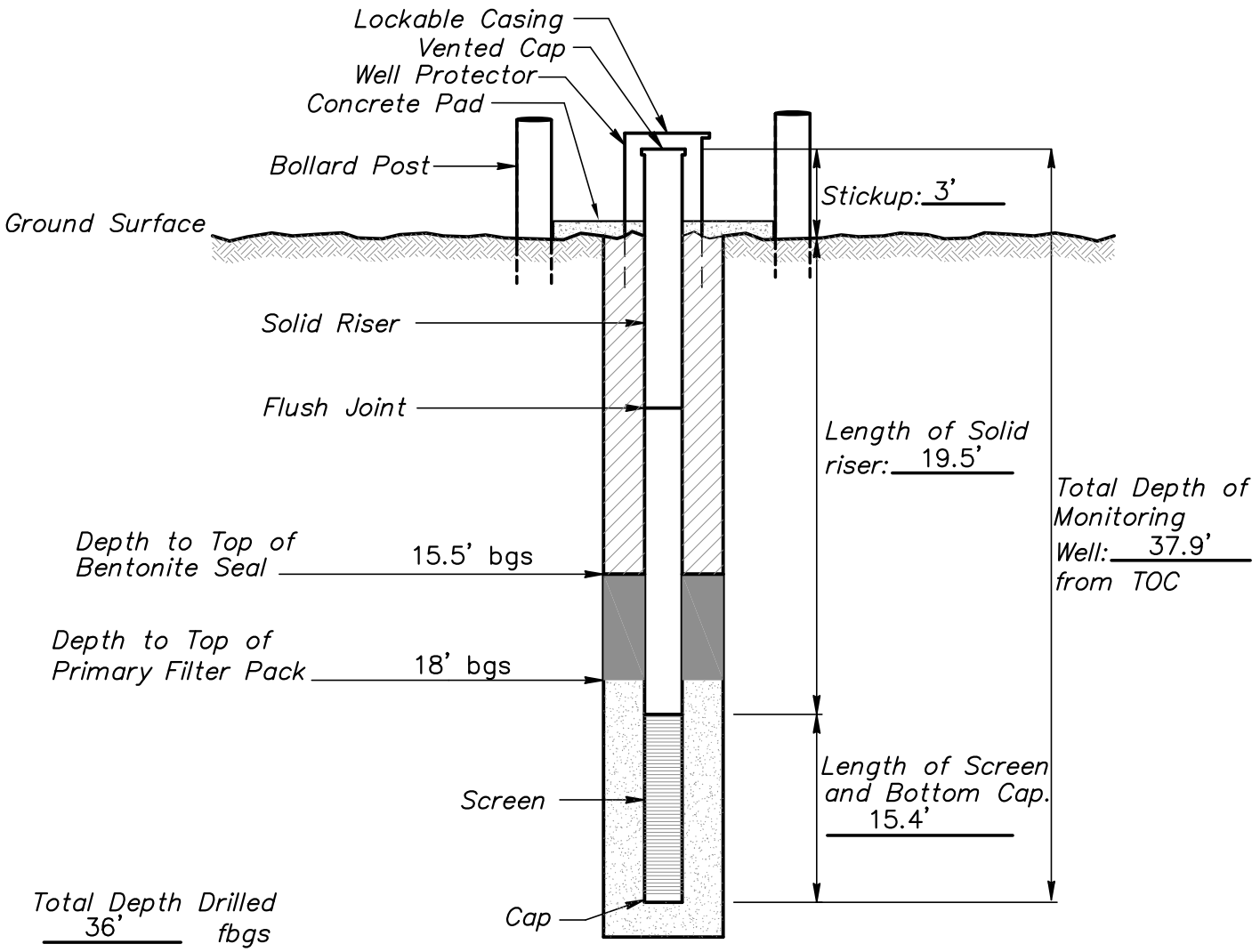
MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216–001–35117108
WELL NUMBER: AP–55
DRAWING NUMBER: 025 **CHECKED BY:** QEB

MONITORING WELL INSTALLATION RECORD

Job Name AEP FLINT CREEK – ASH POND WELLS | Well Number AP–56
Job Number 35117108 | Installation Date 6/8/2011 | Location GENTRY, AR.
Datum Elevation 1,158.77 | Surface Elevation 1,155.60
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", 3.25"
Granular Backfill Material 12–20 SAND | Terracon Representative JODY ADAMS
Drilling Method HOLLOW STEM AUGER | Drilling Contractor ANDERSON ENGINEERING



Bentonite Grout
Bentonite Plug
Granular Backfill

(Not to Scale)

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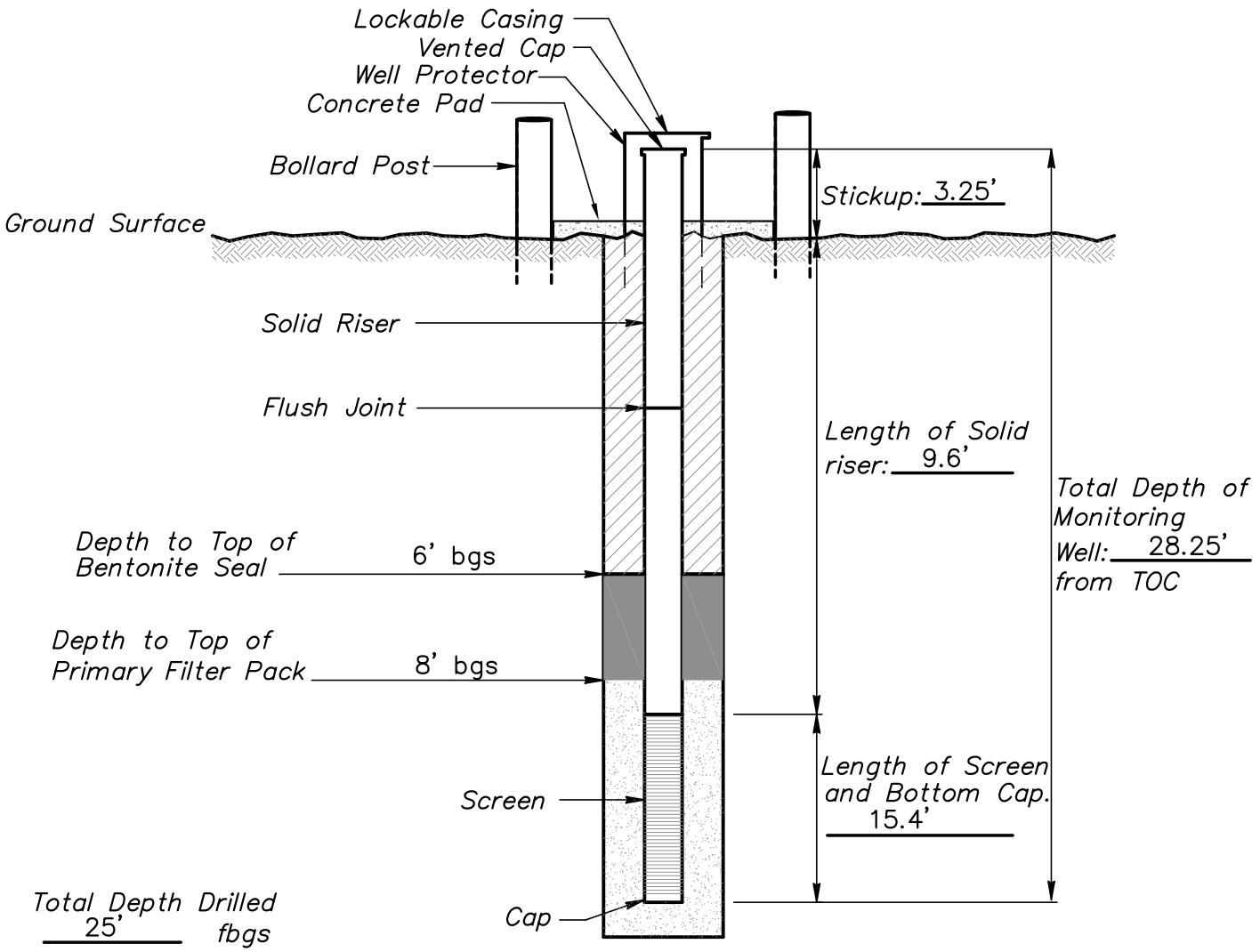
MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216–001–35117108
WELL NUMBER: AP–56
DRAWING NUMBER: 026 **CHECKED BY:** QEB

MONITORING WELL INSTALLATION RECORD

Job Name AEP FLINT CREEK – ASH POND WELLS | Well Number AP–57
Job Number 35117108 | Installation Date 6/8/2011 | Location GENTRY, AR.
Datum Elevation 1,157.31 | Surface Elevation 1,154.10
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", 3.25"
Granular Backfill Material 12–20 SAND | Terracon Representative JODY ADAMS
Drilling Method HOLLOW STEM AUGER | Drilling Contractor ANDERSON ENGINEERING



Bentonite Grout
Bentonite Plug
Granular Backfill

(Not to Scale)

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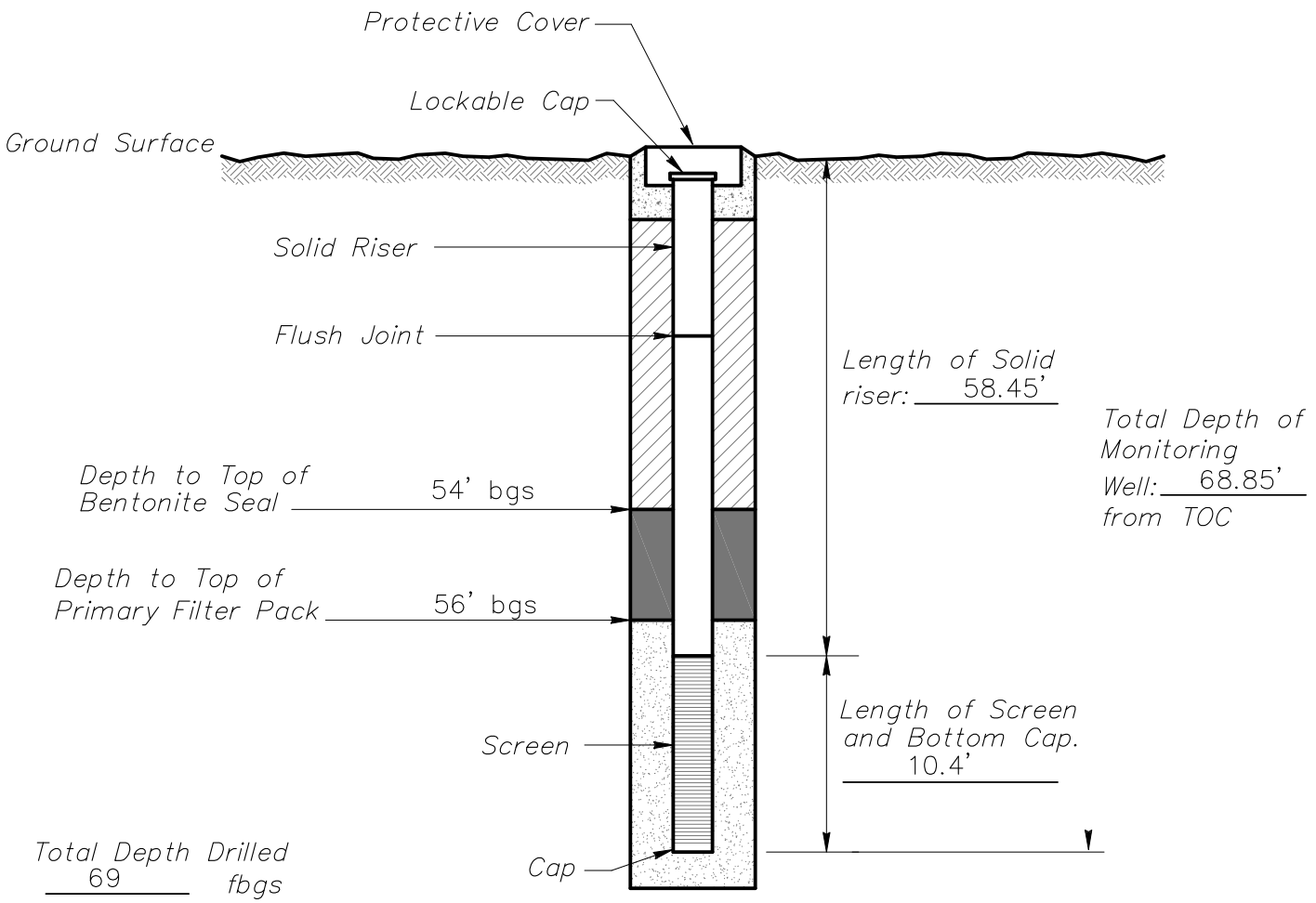
MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216–001–35117108
WELL NUMBER: AP–57
DRAWING NUMBER: 027 **CHECKED BY:** QEB

MONITORING WELL INSTALLATION RECORD

Job Name FLINT CREEK – CCR WELL INSTALLATION Well Number AP–58
Job Number 35157182 Installation Date 2/16/2016 Location AEP–FLINT CREEK –GENTRY, AR.
Datum Elevation NA Surface Elevation NA
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 16–30 SAND Terracon Representative ADAM HOOPER
Drilling Method HOLLOW STEM AUGER AND AIR ROTARY Drilling Contractor ANDERSON ENGINEERING



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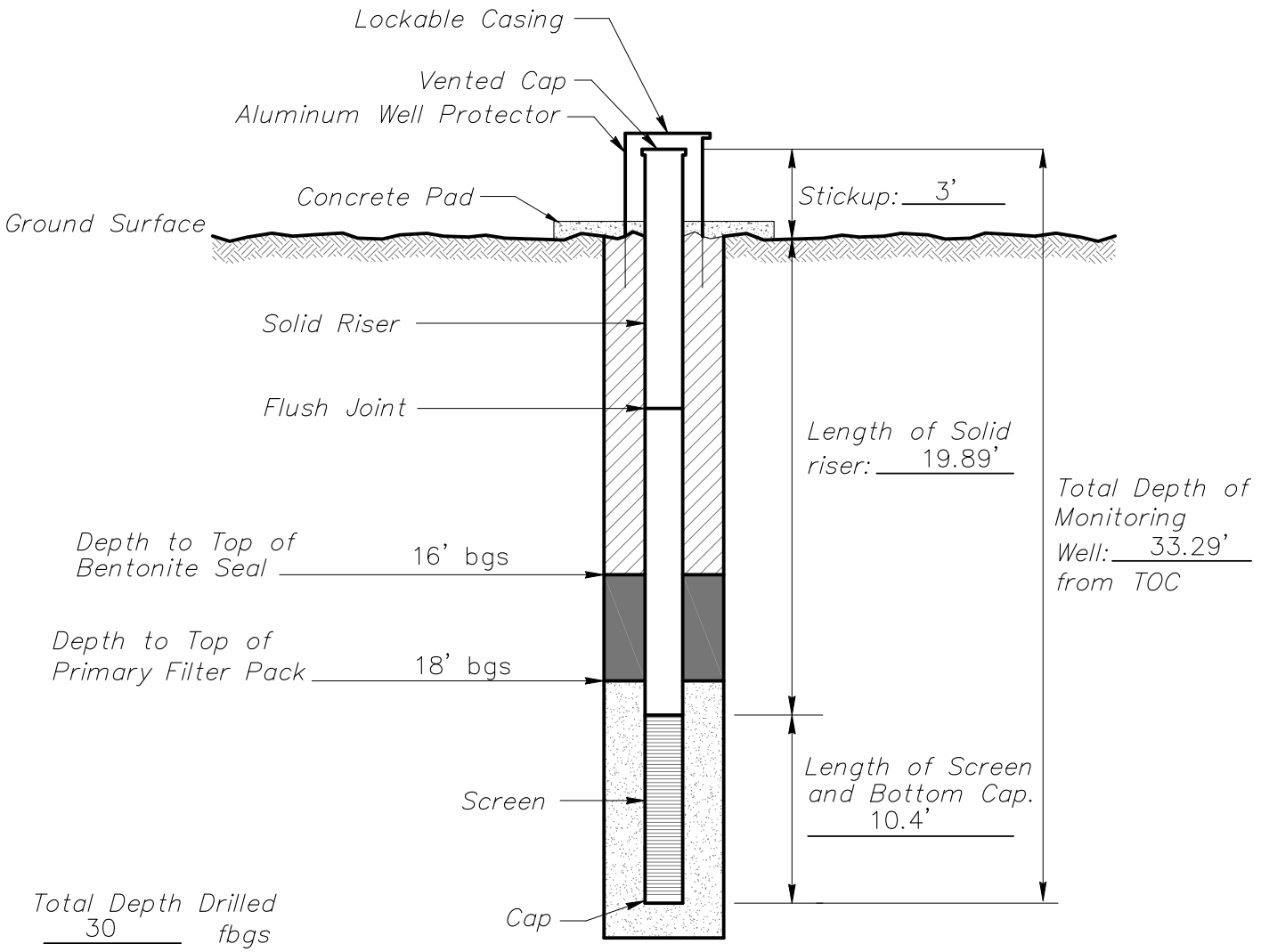
MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216–001–35157182
WELL NUMBER: AP–58
DRAWING NUMBER: 006 CHECKED BY: MR

MONITORING WELL INSTALLATION RECORD

Job Name FLINT CREEK – CCR WELL INSTALLATION Well Number AP–59
Job Number 35157182 Installation Date 2/4/2016 Location AEP–FLINT CREEK –GENTRY, AR.
Datum Elevation NA Surface Elevation NA
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 16–30 SAND Terracon Representative ADAM HOOPER
Drilling Method HOLLOW STEM AUGER AND AIR ROTARY Drilling Contractor ANDERSON ENGINEERING



Portland/Bentonite Grout

Bentonite Pellet Plug

Granular Backfill

(Not to Scale)

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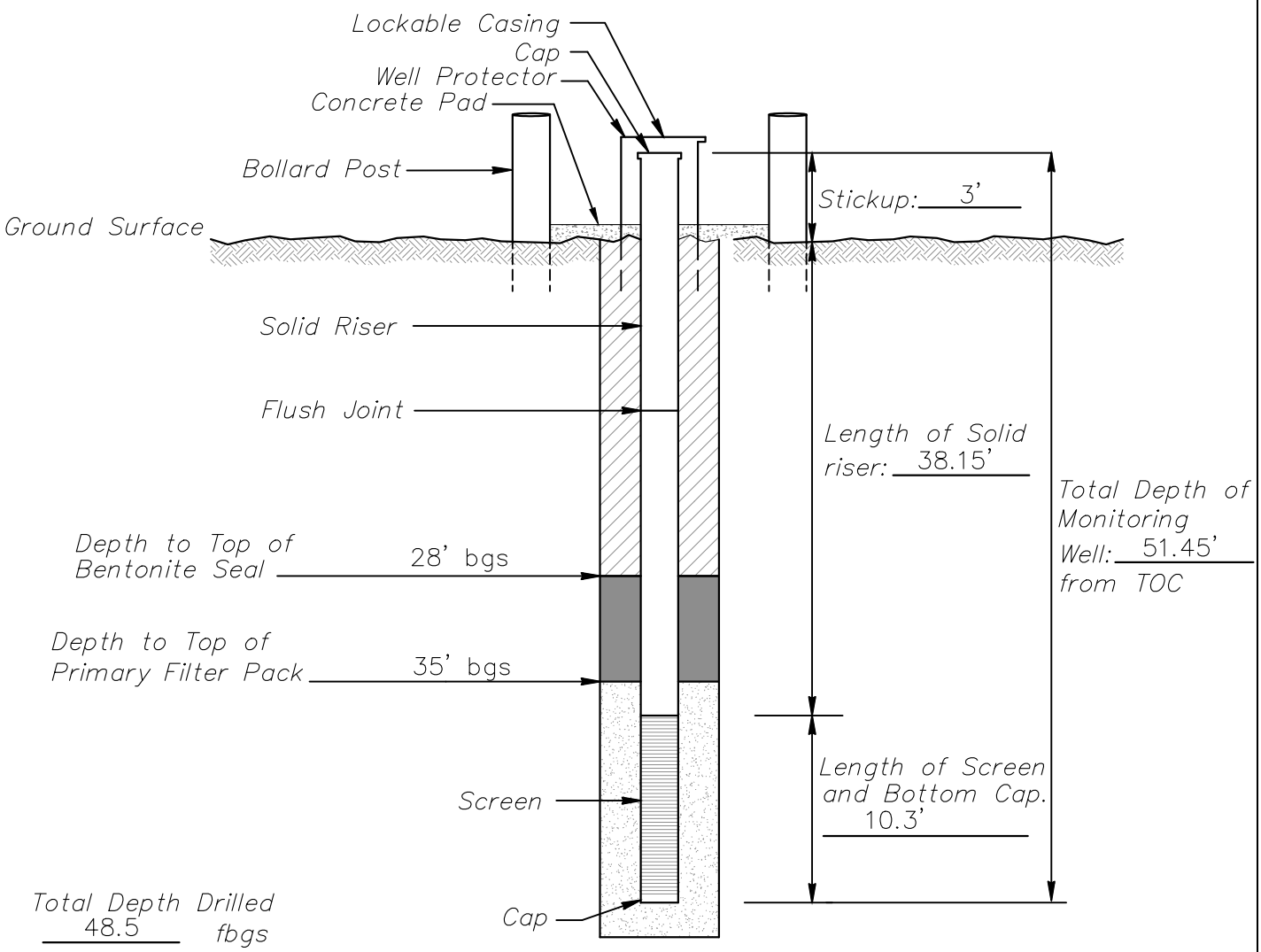
MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216–001–35157182
WELL NUMBER: AP–59
DRAWING NUMBER: 005 CHECKED BY: MR

MONITORING WELL INSTALLATION RECORD

Job Name: AEP – FLINT CREEK WELL INSTALLATION | Well Number: AP-60
Job Number: 35167278 | Installation Date: 1/9/2017 | Location: AEP-FLINT CREEK-GENTRY, AR.
Datum Elevation: 1156.93 | Surface Elevation: 1154.01
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: 16-30 SAND | Terracon Representative: JODY ADAMS
Drilling Method: HOLLOW STEM AUGER/AIR ROTARY | Drilling Contractor: ANDERSON ENGINEERING



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: 216-001-35167278
WELL NUMBER: AP-60
DRAWING NUMBER: 002 CHECKED BY: JBA

APPENDIX 3 – Alternative Source Demonstrations

No alternative source demonstrations were completed in association with the August/December 2019 or March 2020 detection monitoring sampling events and corresponding statistical analyses. Alternative source demonstrations are not applicable at this time.

APPENDIX 4 - Notices for Monitoring Program Transitions

No transition between monitoring requirements occurred in 2020; 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 2020. Well installation/decommissioning logs are not applicable at this time.