HALEY ALDRICH

www.haleyaldrich.com

REPORT ON

2018 ANNUAL GROUNDWATER MONITORING REPORT
CLASS 3 LANDFILL
CROSS GENERATING STATION
CROSS, SOUTH CAROLINA

by
Haley & Aldrich, Inc.
Greenville, South Carolina

for
South Carolina Public Service Authority (Santee Cooper)
Moncks Corner, South Carolina

File No. 131539-003
January 2019

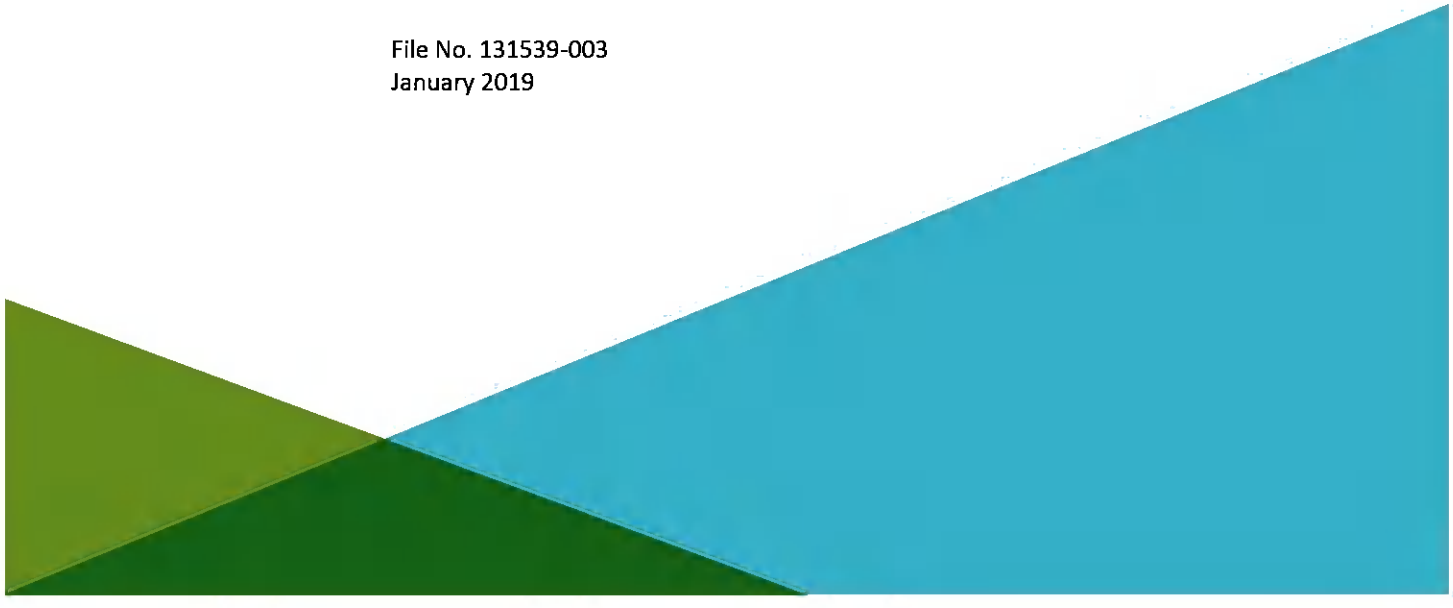


Table of Contents

List of Tables

List of Figures

1. 40 CFR § 257.90 Applicability

1.1 40 CFR § 257.90(a)

All CCR landfills, surface impoundments, and lateral expansions of CCR units are subject to the groundwater monitoring and corrective action requirements under § 257.90 through § 257.98.

The Class 3 Landfill at the Cross Generating Station (CGS) is subject to the groundwater monitoring and corrective action requirements described under Code of Federal Regulations Title 40 (40 CFR) § 257.90 through § 257.98. This document addresses the requirement for the Owner/Operator to prepare an Annual Report per § 257.90(e).

1.2 40 CFR § 257.90(e) - SUMMARY

Annual groundwater monitoring and corrective action report. For existing CCR landfills and existing CCR surface impoundments, no later than January 31, 2018, and annually thereafter, the owner or operator must prepare an annual groundwater monitoring and corrective action report. For new CCR landfills, new CCR surface impoundments, and all lateral expansions of CCR units, the owner or operator must prepare the initial annual groundwater monitoring and corrective action report no later than January 31 of the year following the calendar year a groundwater monitoring system has been established for such CCR unit as required by this subpart, and annually thereafter. For the preceding calendar year, the annual report must document the status of the groundwater monitoring and corrective action program for the CCR unit, summarize key actions completed, describe any problems encountered, discuss actions to resolve the problems, and project key activities for the upcoming year. For purposes of this section, the owner or operator has prepared the annual report when the report is placed in the facility's operating record as required by § 257.105(h)(1).

This Annual Report documents the activities completed in 2018 for the Class 3 Landfill as required by the Rule. Groundwater sampling and analysis was conducted per the requirements described in § 257.93, and the status of the groundwater monitoring program described in § 257.94 is provided in this report.

1.2.1 Status of the Groundwater Monitoring and Corrective Action Program

As provided in the notification on January 15, 2018 statistically significant increases (SSI) of Appendix III constituents were identified downgradient of the Class 3 Landfill. An evaluation of alternate sources was conducted and a successful alternative source demonstration (ASD) was completed in April 2018. The ASD concluded that the closed Class 2 Landfill, located immediately upgradient of the Class 3 Landfill, was responsible for the Appendix III SSIs. The successful ASD, certified by a qualified Professional Engineer, is included as Appendix A. As a result, the Unit remained in the Detection Monitoring program as required by § 257.94(e)(2).

1.2.2 Key Actions Completed

The following key actions were completed in 2018:

- Conducted statistical analysis of detection monitoring results to evaluate potential SSIs. This statistical analysis, completed in January 2018, identified statistically significant increases of boron, calcium, chloride pH, sulfate, and total dissolved solids (TDS) above background downgradient of the Class 3 Landfill. Output from the statistical analysis is summarized in Appendix B attached;

- Prepared 2017 Annual Report including:
    - Pursuant to § 257.105(h)(1), the Annual Report was placed in the facility's operating record;
    - Pursuant to § 257.106(h)(1), the notification was sent to the relevant State Director and/or Tribal authority within 30 days of the Annual Report being placed on the facility's operating record [§ 257.106(d)];
    - Pursuant to § 257.107(h)(1), the Annual Report was posted to the CCR Website within 30 days of the Annual Report being placed on the facility's operating record [§ 257.107(d)];
- Evaluated possible alternate sources for Appendix III SSIs consistent with § 257.94(d)(2) within 90-days of detecting an SSI of Appendix III constituents downgradient of the Class 3 Landfill. This alternate source demonstration (ASD), which was certified by a qualified professional engineer, determined that the source of the Appendix III SSI's was the closed Class 2 Landfill located adjacent to and upgradient from the Class 3 Landfill. As presented in the certified ASD (see Appendix A) this conclusion is based on the fact that comparable levels of the Appendix III constituents were detected in groundwater downgradient of the Class 3 Landfill before the Class 3 Landfill began receiving CCR's;
- Collected and analyzed two rounds of Detection Monitoring results in accordance with §257.94(b);
- Conducted a statistical analysis of the 2018 detection monitoring results to determine if statistically significant increases of Appendix III constituents are present downgradient of the Class 3 Landfill. Consistent with the Unified Guidance and in response to the certified ASD conducted for boron, calcium, chloride, pH, sulfate, and total dissolved solids (TDS) in April 2018, an intra-well statistical analysis, which compares the most recent background values calculated for the individual constituents/wells, was performed in November 2018. Since the ASD did not address fluoride, fluoride was evaluated using an inter-well statistical analysis, which compares the most recent detection monitoring results to background. This analysis identified SSI's for boron and chloride.
- Consistent with § 257.94(d)(2), an evaluation to determine if a source other than the CCR units caused the SSIs or that the SSIs resulted from error in sampling, analysis, statistical evaluation, or natural variability, was initiated. This evaluation identified laboratory reporting errors which have been resolved. The ASD will be finalized in February 2019. Groundwater monitoring in 2019 for the Class 3 Landfill will continue based on the outcome of the ASD and as required by either § 257.94 or § 257.95 of the CCR Rule.

1.2.3 Problems Encountered

Problems such as damaged wells, issues with sample collection or lack of sampling, were not encountered at the CGS Class 3 Landfill in 2018. an error was discovered regarding the laboratory reported unit of measure for Calcium. Calcium was analyzed per EPA 6020B and the results were incorrectly reported as ug/L instead of mg/L. This error has been corrected in the Santee Cooper database and this annual report so that Calcium is correctly reported in mg/L. Additionally, the 10/1/18 samples for groundwater wells PM-1 and CBW-1 were not analyzed within the required holding time for Mercury. As these were the background wells, and the oversight was caught in a timely manner, PM-1 and CBW-1 were resampled for Mercury on 11/29/18, with the same result (<0.20 ug/L).

1.2.4 Actions to Resolve Problems

The Calcium reporting values were corrected in the Santee Cooper database. As noted above, the wells were resampled for Mercury to ensure a sample was analyzed within the required holding time.

1.2.5 Project Key Activities for Upcoming Year

Key activities to be completed in 2019 include the following:

- Completion of the ASD for the Class 3 Landfill, which will include rerunning the statistical analysis of Detection Monitoring analytical data to determine if statistically significant increases (SSIs) of the Appendix III constituents are present;
- Based on the findings of the statistical analysis and the ASD, conduct semi-annual groundwater monitoring and subsequent statistical analysis as required by § 257.94 or § 257.95.

1.3 40 CFR § 257.90(e) - INFORMATION

At a minimum, the annual groundwater monitoring and corrective action report must contain the following information, to the extent available:

1.3.1 40 CFR § 257.90(e)(1)

A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit;

As required by § 257.90(e)(1), a map showing the locations of the CCR unit and associated upgradient and downgradient monitoring wells for the Class 3 Landfill is presented as Figure 1. In addition, this information is presented in the CCR Groundwater Monitoring Plan, which was placed in the facility's operating record by October 17, 2017 as required by § 257.105(h)(2).

1.3.2 40 CFR § 257.90(e)(2)

Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken;

Additional monitoring wells were not installed or decommissioned during 2018.

1.3.3 40 CFR § 257.90(e)(3)

In addition to all the monitoring data obtained under § 257.90 through § 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs;

In accordance with § 257.95(b) and § 257.95(d)(1), two independent samples from each background and downgradient monitoring well were collected and analyzed. A summary table including the sample names, dates of sample collection, reason for sample collection (detection or assessment), and monitoring data obtained for the groundwater monitoring program for the Class 3 Landfill is presented in Table I of this report.

1.3.4 40 CFR § 257.90(e)(4)

A narrative discussion of any transition between monitoring programs (e.g., the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels); and

As required by § 257.93(h) a statistical analysis for Appendix III SSIs was completed by January 15, 2018. Baseline analytical data collected from background monitoring wells were combined to develop Upper Tolerance Limits (UTLs). The UTLs for each Appendix III constituent were compared to the analytical results for the downgradient monitoring wells. Constituents with analytical results exceeding the UTLs were identified as SSIs over background for the respective Appendix III constituent. This analysis indicated that statistically significant increases of boron, calcium, chloride, pH, sulfate, and total dissolved were present downgradient of the Class 3 Landfill. Due to the successful ASD completed in April 2018, as described in Section 1.2.1 above and presented in Appendix A, the Class 3 Landfill remained in Detection Monitoring in 2018.

1.3.5 40 CFR § 257.90(e)(5)

Other information required to be included in the annual report as specified in § 257.90 through § 257.98.

Since the Class 3 Landfill remained in Detection Monitoring in 2018, no other information was required to be included in this annual report.

TABLES

TABLE 1
SUMMARY OF ANALYTICAL RESULTS
CROSS GENERATING STATION
CROSS, SOUTH CAROLINA

Well ID	Purpose	Date of Sample Event	Appendix III Constituents									Appendix IV Constituents																				Field Parameters							
			Boron	Boron	Calcium	Calcium	Chloride	Fluoride	Sulfate	Total Dissolved Solids	pH	Antimony	Arsenic	Barium	Barium	Beryllium	Cadmium	Chromium	Cobalt	Fluoride	Lead	Lithium	Lithium	Mercury	Molybdenum	Molybdenum	Radium 226	Radium 228	Radium 226 & 228 Combined	Selenium	Selenium	Thallium	Depth to Groundwater	Groundwater Elevation	pH	Specific Conductivity	Temperature	Oxidation Reduction Potential	Turbidity	Dissolved Oxygen
		Unit	ug/L	ug/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	SU	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	pCi/L	pCi/L	pCi/L	ug/L	ug/L	ug/L	Feet (bloc)	Feet (msl)	SU	uS	C	mv	NTU	ppm
		Method	EPA 6010D	EPA 6020B	EPA 6010D	EPA 6020B	EPA 300.0	EPA 300.0	EPA 300.0	SM 2540C		EPA 6020B	EPA 6020B	EPA 6010D	EPA 6020B	EPA 6020B	EPA 6020B	EPA 6020B	EPA 6020B	EPA 300.0	EPA 6020B	EPA 6010D	EPA 6020B	EPA 7470	EPA 6010D	EPA 6020B	EPA 900.1 Mod	EPA 904.0		EPA 6010D	EPA 6020B	EPA 6020B								
		US EPA MCL/RSL	-	-	-	-	-	4	-	-	-	6	10	2000	2000	4	5	100	6	4	15	40	40	2	100	100	-	-	5	50	50	2	-	-	-	-	-	-	-	-
Site Background Wells																																							
PM-1	Baseline	10/19/2015		17.8	26		12.7	<0.10	26.5	206	5.46	<5.0	4.2		100	<0.50	<0.50	<5.0	1	<0.10	<2.5		<10.0	<0.20	<10		1.59	<3.00	4.59 J	<20		<1.0							
PM-1	Baseline	1/26/2016		<15.0	27		11.3	<0.10	25.5	165	5.2	<5.0	3.5		87	<0.50	<0.50	<5.0	0.9	<0.10	<2.5		<10.0	<1.0	<10		1.31	<3.00	4.31 J	<20		<1.0							
PM-1	Baseline	4/19/2016		<15.0		23.3	12.1	<0.10	20.2	130	5.32	<5.0	<5.0		67.5	<0.5	<0.5	<5.0	0.79	<0.10	<1.0		<10.0	<0.200	<10.0		<1.00	<3.00	<4.00		<10.0	<1.0	7.62	75.62	5.32	220	16.97	51	0	0.49
PM-1	Baseline	7/16/2016		16.3		16.8	13.2	<0.10	16	124	5.21	<5.0	<5.0	66.8		<0.5	<0.5	<5.0	0.85	<0.10	<1.0		<10.0	<0.200	<10.0		<1.00	<3.00	<4.00		<10.0	<1.0	6.36	74.88	5.21	2060	24.53	57	0	0.95
PM-1	Baseline	10/11/2016		16.5		16.4	12.8	<0.10	19.3	200	5.04	<5	<5		77	<0.5	<0.50	<5	0.851	<0.10	<1		<10.0	<0.200	<10.0		1.49	<3.00	4.49 J		<10	<1	7.1	76.14	5.04	184	19.96	49	2.4	1.33
PM-1	Baseline	1/23/2017		<15.0		10.4	13.5	<0.10	8.82	138	5	<5.0	<5.0		70.3	<0.50	<0.50	<5.0	0.93	<0.10	<1.0		<10.0	<0.200	<10.0		<1.00	<3.00	<4.00		<10	<1.0	7.16	76.08	5	141	15.5	87	3.1	0.87
PM-1	Baseline	4/17/2017	19			12.5	12.7	<0.10	9.71	56	5.2	<5.0	<5.0		60.2	<0.50	<0.50	<5.0	0.98	<0.10	<1.0	<10		<0.200	<10.0		<1.00	<3.00	<4.00		<10	<1.0	7.48	75.76	5.2	149	21.42	86	1.1	0.8
PM-1	Baseline	9/25/2017	18			15.4	13.3	<0.10	8.03	<40	5.26	<5.0	<5.0		75.3	<0.50	<0.50	<5.0	0.91	<0.10	<1.0	<10		<0.20	<10.0		<1.00	<3.00	<4.00		<10	<1.0	7.81	75.43	5.26	179	24.34	92	0	0.85
PM-1	Background	10/9/2017	21		17		12.6	<0.10	8.77	80	5.21																						8.42	74.82	5.21	186	24.42	65	0	1.04
PM-1	Background	2/7/2018		<15		14.7	12.4	<0.10	13.5	112	5.29	<5.0	<5.0	75.6	<0.5	<0.50	<5.0	0.89	<0.10	<0.10	<1.0		<10	<0.2	<10		<1.00	<3.00	<4.00		<10	<1.0	7.91	75.33	5.29	188	17.02	85	1	1.09
PM-1	Background	6/20/2018		16	37		13.4	<0.10	0.58	200	5.58	<25	<5.0	103	<0.5	<0.5	<5.0	1	<0.10	<0.10	<1.0	<10		<0.2		<10	4.09	<3.00	7.09 J		<10	<1.0	8.88	74.36	5.58	279	23.54	123	1.6	0.81
PM-1	Background	10/1/2018		15		16.6	12.9	<0.10	11.9	130	5.08		<5.0	76.9	<0.50			0.84	<0.10	<0.10	<1.0		<10	<0.2			13.3	<3.00	16.3 J	<10.0			8.01	75.23	5.08	201	25.31	104	0	0.99
PM-1	Resample Hg	11/29/2018																						<0.20																
PM-1	**total samples**		**3**	**9**	**4**	**8**	**12**	**12**	**12**	**12**	**12**	**10**	**11**	**4**	**10**	**10**	**10**	**11**	**11**	**11**	**11**	**3**	**8**	**12**	**9**	**1**	**11**	**11**	**11**	**3**	**8**	**10**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**
CBW-1	Baseline	10/19/2015		32	27		3.21	0.25	61.5	150	4.46	<5.0	16		61	0.63	<0.50	14	3.4	0.25	11		<10.0	<0.20	<10		<1.00	<3.00	<4.00	<20		<1.0	7.78	76.02	4.46	243	21.36	345	285	0.86
CBW-1	Baseline	1/26/2016		21.8	27		2.95	0.3	86.2	120	4.13	<5.0	6.7		44	<0.50	<0.50	<5.0	1.3	0.3	3.6		<10.0	<1.0	<10		<1.00	<3.00	<4.00	<20		<1.0	6.11	77.69	4.13	240	17.09	350	8.4	0.78
CBW-1	Baseline	4/19/2016		16.3		29.4	2.33	0.29	86	120	4.33	<5.0	<5.0		43.8	<0.5	<0.5	<5.0	1.16	0.29	2.8		<10.0	<0.200	<10.0		<1.00	4.31	5.31 J		<10.0	<1.0	9.13	76.67	4.33	220	16.73	148	0	0.48
CBW-1	Baseline	7/18/2016		21.7		26.7	2.95	0.27	90.1	132	4.39	<5.0	<5.0	37.8		<0.5	<0.5	<5.0	1.15	0.27	3.18		<10.0	<0.200	<10.0		<1.00	<3.00	<4.00		<10.0	<1.0	10.67	75.13	4.39	2390	22.89	61	0	0.73
CBW-1	Baseline	10/11/2016		30.2		22.7	3	0.28	73.7	151.7	4.15	<5	5.37		47.3	<0.5	<0.50	<5	1.09	0.28	3.75		<10.0	<0.200	<10.0		1.43	<3.00	4.43 J		<10	<1	7.32	76.48	4.15	197	19.9	102	4.6	1.04
CBW-1	Baseline	1/23/2017		24.9		26.2	2.45	0.25	77.7	148	4.32	<5.0	<5.0		42.1	<0.50	<0.50	<5.0	1	0.25	3.1		<10.0	<0.200	<10.0		3.34	<3.00	6.34 J		<10	<1.0	6.33	77.47	4.32	214	16.66	153	2.1	0.78
CBW-1	Baseline	4/17/2017	18			25.6	2.96	0.22	71.2	62	4.26	<5.0	<5.0		41.8	<0.50	<0.50	<5.0	1.1	0.22	2.8	<10		<0.200	<10.0		<1.00	<3.00	<4.00		<10	<1.0	6.9	76.9	4.26	201	22.56	252	2	0.71
CBW-1	Baseline	9/26/2017	24			21.9	2.51	0.23	74.5	<40	4.34	<5.0	<5.0		44	<0.50	<0.50	<5.0	0.86	0.23	3.2	<10		<0.20	<10.0		<1.00	<3.00	<4.00		<10	<1.0	6.8	77	4.34	182	25.12	145	0	0.74
CBW-1	Background	10/9/2017	23		23		2.73	0.22	76.8	115	4.25																						9.73	76.07	4.25	203	25.06	112	0	0.82
CBW-1	Background	2/7/2018		18		24	2.88	0.19	69.1	92	4.42	<5.0	<5.0		43.6	<0.50	<0.50	<5.0	0.88	0.19	2.7		<10	<0.2	<10		<1.00	<3.00	<4.00		<10	<1.0	9.8	76	4.42	199	19.15	138	0.9	0.93
CBW-1	Background	6/26/2018		20	24		3	0.2	67.9	136.8	4.32	<25	<5.0		43	<0.5	<0.5	<5.0	1	0.2	3	<10		<0.2		<10	<1.00	<3.00	<4.00		<10	<1.0	10.35	75.45	4.32	196	22.69	105	1.9	0.85
CBW-1	Background	10/1/2018		25		22.7	2.71	0.19	65.5	107.5	4.09		<5.0		42.8	<0.50			0.76	0.19	3.1		<10	<0.2			2.11	<3.00	5.11 J	<10.0			10.51	75.29	4.09	196	23.78	127	0	0.92
CBW-1	Resample Hg	11/29/2018																						<0.20																
CBW-1	**total samples**		**3**	**9**	**4**	**8**	**12**	**12**	**12**	**12**	**12**	**10**	**11**	**1**	**10**	**11**	**10**	**10**	**11**	**11**	**11**	**3**	**8**	**12**	**9**	**1**	**11**	**11**	**11**	**3**	**8**	**10**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**
Class 3 Landfill Wells																																							
CLF1B-1	Baseline	10/21/2015		<15.0	180		36.7	0.17	123	594	6.49	<5.0	<3.0		230	<0.50	<0.50	<5.0	2.7	0.17	<2.5		<10.0	<0.20	<10		<1.00	<3.00	<4.00	<20		<1.0	6.67	77.09	6.49	968	21.74	16	0	0.65
CLF1B-1	Baseline	2/1/2016		<15.0	180		39.7	0.12	136	602	6.54	<5.0	<3.0		270	<0.50	<0.50	<5.0	3.6	0.12	<2.5		<10.0	<0.20	<10		<1.00	<3.00	4.16 J	<20		<1.0	6.05	77.71	6.54	974	17.13	141	0	0.83
CLF1B-1	Baseline	4/19/2016		<15.0		189	39.2	0.12	136	556.3	6.67	<5.0	<5.0		232	<0.5	<0.5	<5.0	4.11	0.12	<1.0		<10.0	<0.200	<10.0		<1.00	<3.00	<4.00		<10.0	<1.0	7.81	75.95	6.67	914	16.43	121	0	0.44
CLF1B-1	DUPLICATE	4/19/2016		<15.0		188	38.9	0.18	136	555		<5.0	<5.0		241	<0.5	<0.5	<5.0	3.76	0.18	<1.0		10.1	<0.200	<10.0		<1.00	<3.00	<4.00		<10.0	<1.0								
CLF1B-1	Baseline	7/16/2016		<15.0		181	41.5	0.12	134	574	6.52	<5.0	<5.0	198		<0.5	<0.5	<5.0	3.66	0.12	<1.0		<10.0	<0.200	<10.0		<1.00	<3.00	<4.00		<10.0	<1.0	9.07	74.69	6.52	8690	24.61	73	0	0.96
CLF1B-1	DUPLICATE	7/16/2016		<15.0		181	40.8	0.12	135	596		<5.0	<5.0	203		<0.5	<0.5	<5.0	3.7	0.12	<1.0		<10.0	<0.200	<10.0		<1.00	<3.00	<4.00		<10.0	<1.0								
CLF1B-1	Baseline	10/13/2016		<15.0		175	41	<0.10	153	651.7	6.56	<5	<5		206	<0.5	<0.50	<5	3.49	<0.10	<1		<10.0	<0.200	<10.0		4.29	<3.00	7.29 J		<10	<1	5.85	77.91	6.56	900	22.22	19	0	0.91
CLF1B-1	DUPLICATE	10/13/2016		<15.0		175	40.2	<0.10	149	496.7		<5	<5		202	<0.5	<0.50	<5	3.32	<0.10	<1		<10.0	<0.200	<10.0		<1.00	<3.00	<4.00		<10	<1								
CLF1B-1	Baseline	1/30/2017		<15.0		171	36.7	0.13	153	602	6.66	<5.0	<5.0		182	<0.50	<0.50	<5.0	2.4	0.13	<1.0		11.5	<0.200	<10.0		<1.00	<3.00	<4.00		<10	<1.0	6.51	77.25	6.66	972	12.84	169	2.6	1.21
CLF1B-1	DUPLICATE	1/30/2017		<15.0		175	36.6	0.13	151	578		<5.0	<5.0		198	<0.50	<0.50	<5.0	2.6	0.13	<1.0		10.9	<0.200	<10.0		<1.00	<3.00	<4.00		<10	<1.0								
CLF1B-1	Resample Hg	3/1/2017																						<0.200																
CLF1B-1	DUPLICATE for Resample Hg	3/1/2017																						<0.200																
CLF1B-1	Baseline	4/17/2017	16			191	34.2	0.14	150	556	6.57	<5.0	<5.0		184	<0.50	<0.50	<5.0	3.2	0.14	<1.0	10		<0.200	<10.0		<1.00	<3.00	<4.00		<10	<1.0	6.58	77.18	6.57	909	21.99	173	0	0.71
CLF1B-1	DUPLICATE	4/17/2017	<15	<15		185	33.9	0.15	154	696		<5.0	<5.0		181	<0.50	<0.50	<5.0	3.2	0.15	<1.0	11	11	<0.200	<10.0		<1.00	0.935	1.935 J		<10	<1.0								
CLF1B-1	Baseline	9/26/2017	<15			167	36.9	<0.10	135	498	6.67	<5.0	<5.0		158	<0.50	<0.50	<5.0	3.5	<0.10	<1.0	10		<0.20	<10.0		<1.00	<3.00	<4.00		<10	<1.0	6.71	77.05	6.67	942	23.58	79	0	0.83
CLF1B-1	DUPLICATE	9/25/2017	<15			169	36.7	0.11	136	548		<5.0	<5.0		162	<0.50	<0.50	<5.0	3.5	0.11	<1.0	10		<0.20	<10.0		1.63	<3.00	4.63 J		<10	<1.0								
CLF1B-1	Detection	10/10/2017	15		170		37.4	0.13	131	561.7	6.28																						7.79	75.97	6.28	990	22.56	62	0	0.63
CLF1B-1	DUPLICATE	10/10/2017	15		180		36.9	0.13	130	650																														
CLF1B-1	Detection	2/19/2018		<15		185	34.4	0.19	145	646.6	6.61		<5.0		171		<0.50	<5.0			<1.0											7.23	76.53	6.61	992	17.3	130	0	1.52
CLF1B-1	Detection	6/27/2018		<15	170		39.3	0.15	143	585	6.58	<25	<5.0		170	<0.5	0.7	<5.0	5	0.15	<1.0	<10		<0.2		<10	4.82	<3.00	7.82 J		<10	<1.0	9.74	74.62	6.58	957	19.85	113	0	0.72
CLF1B-1	Duplicate	6/27/2018		<15	170		38	0.16	138	596.2		<25	<5.0		167	<0.5	<0.5	<5.0	5	0.16	<1.0	<10		<0.2		<10	1.4	<3.00	4.4 J		<10	<1.0								
CLF1B-1	**total samples**		**6**	**14**	**6**	**13**	**19**	**19**	**19**	**19**	**11**	**16**	**17**	**2**	**15**	**16**	**17**	**17**	**16**	**16**	**17**	**6**	**11**	**18**	**14**	**2**	**16**	**16**	**16**	**2**	**15**	**16**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**
CLF1B-2	Baseline	10/21/2015		18.6	210		62.7	0.16	22.4	472	7.09	<5.0	<3.0		160	<0.50	<0.50	<5.0	2.5	0.16	<2.5		<10.0	<0.20	<10		<1.00	<3.00	<4.00	<20		<1.0	5.1	76.94	7.09	711	21.89	-39	0	0.83
CLF1B-2	DUPLICATE	10/21/2015		19.1	160		62.3	0.15	21.5	470		<5.0	<3.0		160	<0.50	<0.50	<5.0	1.3	0.15	<2.5		<10.0	<0.20	<10		1.16	<3.00	4.16 J	<20		<1.0								
CLF1B-2	Baseline	2/1/2016		<15.0	120		64.6	0.11	19.6	430	6.79	<5.0	<3.0		170	<0.50	<0.50	<5.0	1.2	0.11	<2.5		<10.0	<0.20	<10		<1.00	<3.00	<4.00	<20		<1.0	4.38	77.66	6.79	682	16.25	24	0	0.6
CLF1B-2	Baseline	4/19/2016		15.2		130	66.6	<0.10	16.3	415	6.92	<5.0	<5.0		157	<0.5	<0.5	<5.0	0.86	<0.10	<1.0		<10.0	<0.200	<10.0		<1.00	<3.00	<4.00		<10.0	<1.0	5.17	76.87	6.92	642	19.39	31	0	0.44
CLF1B-2	Baseline	7/19/2016		39.8		131	70.9	<0.10	13.7	512	6.94	<5.0	<5.0	147		<0.5	<0.5	<5.0	1.39	<0.10	<1.0		<10.0	<0.200	<10.0		<1.00	<3.00	<4.00		<10.0	<1.0	7.4	74.64	6.94	6570	22.65	9	0	0.68
CLF1B-2	Baseline	10/13/2016		15.7		121	69	<0.10	13.3	466.7	6.87	<5	<5		153	<0.5	<0.50	<5	1.25	<0.10	<1		<10.0	<0.200	<10.0		<1.00	<3.00	<4.00		<10	<1	4.22	77.82	6.87	640	24.46	-31	0	0.5
CLF1B-2	Baseline	1/30/2017		16.2		124	70.4	<0.10	13	462	6.85	<5.0	<5.0		157	<0.50	<0.50	<5.0	1	<0.10	<1.0		<10.0	<0.200	<10.0		<1.00	<3.00	<4.00		<10	<1.0	4.8	77.24	6.85	702	13.53	95	0	0.69
CLF1B-2	Resample Hg	3/1/2017																						<0.200									5.22	77.82	6.94	697	19.76	84	2.7	0.85
CLF1B-2	Baseline	4/17/2017	18			131	69.7	0.12	16.4	390	6.92	<5.0	<5.0		149	<0.50	<0.50	<5.0	1.4	0.12	<1.0	<10		<0.200	<10.0		<1.00	<3.00	<4.00		<10	<1.0	4.95	77.09	6.92	673	21.22	97	0	0.82
CLF1B-2	Baseline	9/26/2017	16			127	76	<0.10	12.5	398	6.97	<5.0	<5.0		153	<0.5	<0.50	<5.0	1.5	<0.10	<1.0	<10		<0.20	<10.0		<1.00	<3.00	<4.00		<10	<1.0	5.1	76.94	6.97	710	23.4	38	0	0.69
CLF1B-2	Detection	10/11/2017	17		140		74.1	0.11	12.9	396.7	7.07																						6.08	75.96	7.07	712	26.35	-75	0.3	0.67
CLF1B-2	Detection	2/19/2018		20		138	75.8	0.13	13.2	524.3	6.79		<5.0		158		<0.50	<5.0			<1.0											5.48	76.56	6.79	722	16.51	91	0	0.93
CLF1B-2	Detection	6/27/2018		<15	130		78	0.14	12.9	535	6.88	<25	<5.0		155	<0.5	<0.5	<5.0	2	0.14	<1.0	<10		<0.2		<10	1.23	<3.00	4.23 J		<10	<1.0	7.08	74.96	6.88	701	26.12	99	0	0.64
CLF1B-2	**total samples**		**3**	**9**	**5**	**7**	**12**	**12**	**12**	**12**	**11**	**10**	**11**	**1**	**10**	**10**	**11**	**11**	**10**	**10**	**11**	**3**	**7**	**11**	**9**	**1**	**10**	**10**	**10**	**3**	**8**	**10**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**

TABLE 1
SUMMARY OF ANALYTICAL RESULTS
CROSS GENERATING STATION
CROSS, SOUTH CAROLINA

			Appendix III Constituents									Appendix IV Constituents																					Field Parameters							
Well ID	Purpose	Date of Sample Event		Boron	Boron	Calcium	Calcium	Chloride	Fluoride	Sulfate	Total Dissolved Solids	pH	Antimony	Arsenic	Barium	Barium	Beryllium	Cadmium	Chromium	Cobalt	Fluoride	Lead	Lithium	Lithium	Mercury	Molybdenum	Molybdenum	Radium 226	Radium 228	Radium 226 & 228 Combined	Selenium	Selenium	Thallium	Depth to Groundwater	Groundwater Elevation	pH	Specific Conductivity	Temperature	Oxidation Reduction Potential	Turbidity	Dissolved Oxygen
			Unit	ug/L	ug/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	SU	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L	pCi/L	pCi/L	pCi/L	ug/L	ug/L	ug/L	Feet (btoc)	Feet (msl)	SU	uS	C	mv	NTU	ppm
			Method	EPA 6010D	EPA 6020B	EPA 6010D	EPA 6020B	EPA 300.0	EPA 300.0	EPA 300.0	SM 2540C		EPA 6020B	EPA 6020B	EPA 6010D	EPA 6020B	EPA 6020B	EPA 6020B	EPA 6020B	EPA 6020B	EPA 300.0	EPA 6020B	EPA 6010D	EPA 6020B	EPA 7470	EPA 6010D	EPA 6020B	EPA 900.1 Mod	EPA 904.0		EPA 6010D	EPA 6020B	EPA 6020B								
			US EPA MCL/RSL	-	-	-	-	-	4	-	-	-	6	10	2000	2000	4	5	100	6	4	15	40	40	2	100	100	-	-	5	50	50	2	-	-	-	-	-	-	-	-
Site Background Wells																																									
CLF1B-3	Baseline	10/22/2015			17.2	100		26.8	0.12	33	326	6.94	<5.0	<3.0		110	<0.50	<0.50	<5.0	<0.50	0.12	<2.5		<10.0	<0.20	<10		1.42	<3.00	4.42 J	<20		<1.0	5.63	77.12	6.94	551	19.69	173	0.7	0.68
CLF1B-3	DUPLICATE	10/22/2015			17.4	100		27.2	0.12	35.4	320		<5.0	<3.0		110	<0.50	<0.50	<5.0	<0.50	0.12	<2.5		<10.0	<0.20	<10		<1.00	<3.00	<4.00	<20		<1.0								
CLF1B-3	Baseline	2/1/2016			16.9	140		22.4	0.13	107	447	6.7	<5.0	<3.0		120	<0.50	<0.50	<5.0	0.88	0.13	<2.5		<10.0	<0.20	<10		1.29	<3.00	4.29 J	<20		<1.0	5.04	77.71	6.7	699	16.81	54	0	0.68
CLF1B-3	Baseline	4/19/2016			24.6		167	22.1	0.12	116	5355	6.82	<5.0	<5.0		107	<0.5	<0.5	<5.0	2.7	0.12	<1.0		<10.0	<0.200	<10.0		<1.00	<3.00	<4.00		<10.0	<1.0	5.97	76.78	6.82	771	19.89	23	0	0.35
CLF1B-3	Baseline	7/19/2016			41.7		207	23.5	<0.10	203	686	6.59	<5.0	<5.0	118		<0.5	<0.5	<5.0	5.6	<0.10	<1.0		<10.0	<0.200	<10.0		<1.00	<3.00	<4.00		<10.0	<1.0	6.32	74.43	6.59	9760	23.18	-3	0	0.67
CLF1B-3	Baseline	10/13/2016			25.8		113	25.2	<0.10	63.9	276.7	6.63	<5	<5		97.9	<0.5	<0.50	<5	4.05	<0.10	<1		<10.0	<0.200	<10.0		<1.00	<3.00	<4.00		<10	<1	4.68	76.07	6.63	576	25.47	21	0	0.5
CLF1B-3	Baseline	1/30/2017			25		128	23	0.12	64.4	430	6.81	<5.0	<5.0		93.6	<0.50	<0.50	<5.0	3.2	0.12	<1.0		<10.0	<0.200	<10.0		<1.00	<3.00	<4.00		<10	<1.0	5.36	77.39	6.81	655	14.23	90	0	0.6
CLF1B-3	Resample Hg	3/1/2017																							<0.200									5.91	76.84	6.73	982	19.72	67	1.4	0.64
CLF1B-3	Baseline	4/17/2017		27			177	20.8	0.13	159	452	6.77	<5.0	<5.0		123	<0.50	<0.50	<5.0	5.8	0.13	<1.0	<10		<0.200	<10.0		<1.00	<3.00	<4.00		<10	<1.0	5.66	77.09	6.77	794	22.56	74	7.1	0.66
CLF1B-3	Baseline	9/25/2017		50			183	22.7	<0.10	174	530	6.74	<5.0	<5.0		126	<0.50	<0.50	<5.0	8.5	<0.10	<1.0	<10		<0.20	<10.0		<1.00	<3.00	<4.00		<10	<1.0	5.82	76.93	6.74	947	23.62	17	0	0.58
CLF1B-3	Detection	10/11/2017		64		220		24.8	0.15	226	621.7	6.67																						6.77	75.98	6.67	1050	24.93	-13	0	0.63
CLF1B-3	Detection	2/19/2018			31		NA	23	0.15	132	542.9	6.73		<5.0		117		<0.50	<5.0			<1.0										<10		6.1	76.65	6.73	786	19.17	85	2.2	1.19
CLF1B-3	Detection	6/27/2018			48	200		34.2	0.15	166	656.2	6.67	<25	<5.0		122	<0.5	<0.5	<5.0	7	0.15	<1.0	<10		<0.2		<10	1.26	<3.00	4.26 J		<10	<1.0	7.97	74.78	6.67	931	27.71	12	0	0.47
CLF1B-3	**total samples**			3	9	5	7	12	12	12	12	11	10	11	1	10	10	11	11	10	10	11	3	7	11	9	1	10	10	10	3	8	10	12	12	12	12	12	12	12	12
CLF1B-4	Baseline	10/22/2015			27.2	110		51.1	0.12	34.3	350	7.17	<5.0	<3.0		45	<0.50	<0.50	<5.0	<0.50	0.12	<2.5		<10.0	<0.20	<10		<1.00	<3.00	<4.00	<20		<1.0	5.56	77.18	7.17	610	19.92	60	44	0.63
CLF1B-4	Baseline	1/27/2016			29.2	67		51.1	0.13	31.1	375	7.37	<5.0	<3.0		55	<0.50	<0.50	<5.0	<0.50	0.13	<2.5		<10.0	<1.0	<10		<1.00	<3.00	<4.00	<20		<1.0	5.04	77.7	7.37	471	15.57	25	19.7	2.62
CLF1B-4	Baseline	4/19/2016			16.2		94.5	50.9	<0.10	22.4	290	7.17	<5.0	<5.0		49.7	<0.5	<0.5	<5.0	<0.5	<0.10	<1.0		<10.0	<0.200	<10.0		<1.00	<3.00	<4.00		<10.0	<1.0	6.08	76.66	7.17	528	19.16	74	0	0.63
CLF1B-4	Baseline	7/19/2016			20.4		97.3	52.7	<0.10	17.4	384	7.16	<5.0	<5.0	44.6		<0.5	<0.5	<5.0	<0.5	<0.10	<1.0		<10.0	<0.200	<10.0		<1.00	<3.00	<4.00		<10.0	<1.0	8.84	73.9	7.16	5100	23.37	26	0	0.48
CLF1B-4	Baseline	10/13/2016			21.4		100	50.7	<0.10	15.3	360	6.98	<5	<5		51.4	<0.5	<0.50	<5	0.229	<0.10	<1		<10.0	<0.200	<10.0		<1.00	<3.00	<4.00		<10	<1	4.36	76.38	6.98	487	25.56	15	0	0.46
CLF1B-4	Baseline	1/30/2017			21.7		86.1	49.1	<0.10	16.3	344	7.23	<5.0	<5.0		46.4	<0.50	<0.50	<5.0	<0.50	<0.10	<1.0		<10.0	<0.200	<10.0		<1.00	<3.00	<4.00		<10	<1.0	5.27	77.47	7.23	524	16.02	104	0	1.95
CLF1B-4	Resample Hg	3/1/2017																							<0.200									5.93	76.81	7.21	529	19.78	346	6	0.87
CLF1B-4	Baseline	4/17/2017		19			92.9	47.4	0.11	16.1	278	7.24	<5.0	<5.0		54	<0.50	<0.50	<5.0	<0.50	0.11	<1.0	<10		<0.200	<10.0		<1.00	<3.00	<4.00		<10	<1.0	5.7	77.04	7.24	519	25.38	81	0	1.27
CLF1B-4	Baseline	9/25/2017		17			92.6	53.1	<0.10	14.3	286	7.25	<5.0	<5.0		52	<0.50	<0.50	<5.0	<0.50	<0.10	<1.0	<10		<0.20	<10.0		<1.00	<3.00	<4.00		<10	<1.0	5.96	76.78	7.25	556	25.58	-15	0	0.5
CLF1B-4	Detection	10/11/2017		20		92		49.9	<0.10	13.7	256.7	7.21																						6.85	75.89	7.21	535	23.85	-6	0	0.71
CLF1B-4	Detection	2/8/2018			17		89.9	47.2	<0.10	14.8	434	7.23		<5.0		46.7		<0.50	<5.0			<1.0										<10		5.67	77.07	7.23	536	16.81	-6	3.9	1.67
CLF1B-4	Detection	6/26/2018			17	92		50.5	<0.10	13.4	380	7.01	<25	<5.0		48	<0.5	<0.5	<5.0	<0.5	<0.10	<1.0	<10		<0.2		<10	<1.00	<3.00	<4.00		<10	<1.0	7.9	74.84	7.01	551	21.45	113	0	0.68
CLF1B-4	**total samples**			3	8	4	7	11	11	11	11	11	9	10	1	9	9	10	10	9	9	10	3	6	10	8	1	9	9	9	2	8	9	12	12	12	12	12	12	12	12
CLF1B-5	Baseline	10/22/2015			15.8	160		69.5	0.11	24.2	528	6.83	<5.0	<3.0		78	<0.50	<0.50	<5.0	2.9	0.11	<2.5		<10.0	<0.20	<10		2.09	<3.00	5.09 J	<20		<1.0	4.08	77.01	6.83	828	23.47	-72	60.8	0.61
CLF1B-5	Baseline	1/27/2016			15.5	160		90.9	<0.10	44.4	662.5	6.76	<5.0	<3.0		85	<0.50	<0.50	<5.0	3.6	<0.10	<2.5		<10.0	<1.0	<10		<1.00	<3.00	<4.00	<20		<1.0	3.51	77.58	6.76	906	15.98	43	11.1	1.01
CLF1B-5	DUPLICATE	1/26/2016			<15.0	160		90.7	0.12	43.8	675		<5.0	<3.0		84	<0.50	<0.50	<5.0	3.6	0.12	<2.5		<10.0	<1.0	<10		<1.00	<3.00	<4.00	<20		<1.0								
CLF1B-5	Baseline	4/25/2016			<15.0		192	99.8	<0.10	63.6	755	6.68	<5.0	<5.0		65.6	<0.5	<0.5	<5.0	2.33	<0.10	<1.0		<10.0	<0.200	<10.0		<1.00	<3.00	<4.00		<10.0	<1.0	4.65	76.44	6.68	909	21.23	-2	1.9	0.51
CLF1B-5	Baseline	7/19/2016			<15.0		202	113	<0.10	67.3	848	6.62	<5.0	<5.0	92		<0.5	<0.5	<5.0	2.44	<0.10	<1.0		<10.0	<0.200	<10.0		<1.00	<3.00	<4.00		<10.0	<1.0	7.52	73.57	6.62	9060	31.62	-47	9	0.77
CLF1B-5	Baseline	10/14/2016			<15.0		196	109	<0.10	110	763.3	6.51	<5	<5		97.4	<0.5	<0.50	<5	2.55	<0.10	<1		<10.0	<0.200	<10.0		<1.00	<3.00	<4.00		<10	<1	3.31	77.78	6.51	1040	20.56	2	0.2	0.69
CLF1B-5	Baseline	1/24/2017			15.3		205	110	<0.10	112	758	6.74	<5.0	<5.0		111	<0.50	<0.50	<5.0	4.2	<0.10	<1.0		<10.0	<0.200	<10.0		<1.00	3.55	4.55 J		<10	<1.0	3.31	77.78	6.74	1100	16.98	-6	0	0.88
CLF1B-5	Baseline	4/16/2017	<15				223	114	<0.10	130	756	6.61	<5.0	<5.0		102	<0.50	<0.50	<5.0	3.4	<0.10	<1.0	<10		<0.200	<10.0		<1.00	<3.00	<4.00		<10	<1.0	4.32	76.77	6.61	1140	20.83	54	0	0.85
CLF1B-5	Baseline	9/25/2017	15				224	118	<0.10	165	812	6.77	<5.0	<5.0		109	<0.50	<0.50	<5.0	3.1	<0.10	<1.0	<10		<0.20	<10.0		<1.00	<3.00	<4.00		<10	<1.0	4.5	76.59	6.77	1250	27.13	-42	0	0.52
CLF1B-5	Detection	10/11/2017	19		220			117	<0.10	177	776.7	6.72																						5.24	75.85	6.72	1210	24.85	-8	0	0.76
CLF1B-5	Detection	2/8/2018			16		279	120	0.12	278	1076	6.71		<5.0		193		<0.50	<5.0			<1.0										<10		3.91	77.18	6.71	1400	17.29	87	0	1.36
CLF1B-5	Detection	6/27/2018			16	250		117	0.15	176	936.2	6.71	<25	<5.0		102	<0.5	<0.5	<5.0	3	0.15	<1.0	<10		<0.2		<10	<1.00	<3.00	<4.00		<10	<1.0	6.9	74.19	6.71	1160	29.92	1	0	0.54
CLF1B-5	**total samples**			3	9	5	7	12	12	12	12	11	10	11	1	10	10	11	11	10	10	11	3	7	10	9	1	10	10	10	3	8	10	11	11	11	11	11	11	11	11

FIGURE

LEGEND

- CLASS II LANDFILL WELL
- ASH POND WELL
- CLASS 3 LANDFILL AREA B WELL
- BACKGROUND WELL
- CCR BOUNDARY

NOTE:

AERIAL IMAGERY SOURCE: ESRI

N

0 1,000 2,000

SCALE IN FEET

HALEY ALDRICH

SANTEE COOPER
CROSS GENERATING STATION
CROSS, SOUTH CAROLINA

LOCATION OF GROUNDWATER MONITORING WELLS FOR CCR COMPLIANCE – 2018

JANUARY 2019

FIGURE 1

GIS FILE PATH: \\haleyaldrich.com\share\boj_common\Projects\42122_Santee_Cooper\Global\GIS\Map_Projects\2019_01\132892_004_0001_CROSS_CCR_COMPLIANCE_WELLS.mxd — USER: ajospa — LAST SAVED: 1/30/2019 1:09:15 PM

APPENDIX A

Alternate Source Evaluation

HALEY ALDRICH

HALEY ALDRICH

www.haleyaldrich.com

REPORT ON

ALTERNATE SOURCE EVALUATION
CROSS GENERATING STATION; CLASS 3 LANDFILL
CROSS, SOUTH CAROLINA

by Haley & Aldrich, Inc.
Greenville, South Carolina

for South Carolina Public Service Authority (Santee Cooper)
Moncks Corner, South Carolina

File No. 131539-003
April 2018

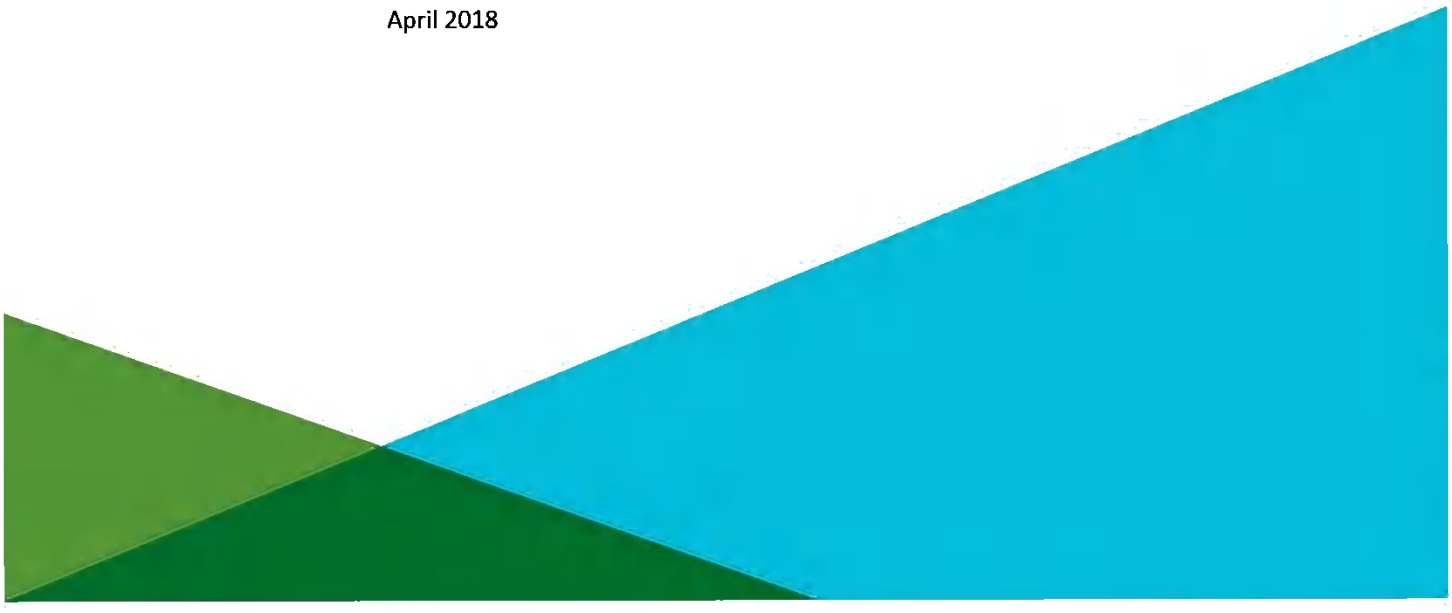


Table of Contents

List of Tables

List of Figures

1. Introduction

This memorandum was prepared by Haley & Aldrich to evaluate the occurrence of Appendix III constituents detected in groundwater downgradient of the Class 3 Landfill monitoring network and support the hypothesis that the closed Class 2 Landfill is the source of these detections.

The evaluation focuses on groundwater quality conditions downgradient of the Class 3 Landfill by comparing concentrations detected in groundwater *prior to* receiving coal combustion residuals (CCR) to those concentration trends observed *after* the Class 3 Landfill began operation.

As required by §257.93(h) of the Federal CCR Rule, Haley & Aldrich performed a statistical analysis of the Appendix III constituents detected in groundwater downgradient of the Class 3 Landfill to evaluate the potential for statistically significant increases (SSIs) of the Appendix III constituents to exist above background. Findings from this evaluation indicated that SSIs for boron, calcium, chloride, pH, sulfate, and total dissolved solids (TDS) were present at one or more downgradient wells. However, as described below and consistent with §257.94(e)(2), Haley & Aldrich conducted an evaluation to demonstrate that a source other than the Class 3 Landfill caused the SSI over background. This memorandum documents the findings and conclusions of this evaluation.

2. Background

The Cross-Generating Station (CGS; Site) is located approximately 5.2 miles northeast of Cross on the east bank of the Diversion Canal that connects Lake Marion and Lake Moultrie in Berkeley County, South Carolina. The location of the CGS is shown on **Figure 1**. The CGS is a coal burning electricity generating facility. Operations at the facility generate CCRs that have historically been managed in four separate units including the Bottom Ash Pond, the closed Gypsum Pond, the closed Class 2 Landfill, and the Class 3 Landfill. The Class 2 Landfill and the Class 3 Landfill are the focus of this alternate source evaluation.

Prior to 2016, CCR was managed on the Site in a 91-acre State Permitted Class 2 Landfill (Industrial Solid Waste Permit # IWP-186), a 1-acre State Permitted Gypsum Pond, and a 79-acre State permitted Bottom Ash Pond (NPDES Permit # SC0037401). The Bottom Ash Pond and the Gypsum Pond were not considered in this evaluation as they are not hydraulically upgradient of the Class 3 Landfill. The CGS Class 2 Landfill is regulated under the SCDHEC's Solid Waste Management Regulation and Federal CCR Rule and is currently in assessment monitoring under the State and Federal programs. The Class 2 Landfill began operation in 1982 and was permitted to receive flue gas emissions control residuals (FGD), bottom ash, fixated fly ash, and boiler slag during its operation. The original permit allowed placement of material up to elevation 120 feet (NGVD 1929), which is approximately 38 feet above grade. A consent agreement in 2011 allowed Santee Cooper to continue placement of material above this elevation, with a maximum top elevation of 210 feet (NGVD 1929). All placement operations ceased in December 2015 and closure was completed within six months of final placement.

In December 2015, the newly permitted Class 3 Landfill began receiving CCRs generated at the Site. The Class 3 landfill (Cell B-1) was constructed immediately adjacent to the eastern slope of the recently closed Class 2 landfill. For this reason, the east and west slopes and the top deck of the Class 2 landfill are covered with a HDPE liner capable of serving as the bottom liner for the Class 3 landfill. The Class 3 Landfill abuts the Class 2 Landfill and consists of lined cells with a geocomposite drainage net and sand drainage layer to facilitate removal of leachate water from the landfill into the lined leachate pond to the south of the landfill. Placement of CCR in the Class 3 Landfill began in December 2015.

3. Groundwater Monitoring and Monitoring Well Network

Beginning in 1996, as required by the Class 2 Landfill permit, Santee Cooper began collecting semiannual groundwater samples from 5 wells located downgradient and 1 well located upgradient of the Class 2 Landfill. In 2015, two additional wells were installed to the monitoring network (POZ-6 and POZ-7) around the Class 2 Landfill to comply with the Federal CCR Rule at the unit boundary. For the new Class 3 Landfill, which was under construction in 2015 and not receiving CCR, five downgradient monitoring wells (CLF1B-1, CLF1B-2, CLF1B-3, CLF1B-4, and CLF1B-5) and 1 upgradient well (CBW-1) were installed in 2015 to comply with the Federal CCR Rule by monitoring the uppermost aquifer at the CCR unit boundary. The location of the CGS monitoring well network is shown on **Figure 2**.

The first sampling round from the newly installed wells downgradient of the Class 3 Landfill was in October 2015, three months prior to the Class 3 Landfill receiving CCR. After the Class 3 Landfill began receiving CCR, routine groundwater sampling continued on a quarterly schedule. To date, nine sampling rounds have been conducted (eight initial rounds of sampling plus one round of detection monitoring). A summary of the groundwater sampling results for the Appendix III constituents is included as **Table 1**.

Groundwater quality data obtained from existing wells surrounding the Class 2 Landfill (POZ-1, POZ-2, POZ-3, POZ-4, MW1B-1R and MW1B-2), while the Class 2 Landfill was in operation and prior to the new Class 3 Landfill receiving CCR, was compared to the newly installed wells around the Class 3 Landfill (CLF1B-1, CLF1B-2, CLF1B-3, CLF1B-4, and CLF1B-5). The comparison was performed to evaluate the potential that the detections of Appendix III constituents downgradient of the Class 3 Landfill are attributable to the Class 2 Landfill. The SSIs of Appendix III constituents that were analyzed in both the Class 2 and Class 3 Landfill wells include calcium, total dissolved solids (TDS), sulfate, and pH. While the historical groundwater monitoring program for the Class 2 Landfill did not include all of the Appendix III constituents' preliminary statistical analysis for the Class 3 Landfill also identified SSIs of chloride and boron. The significance of chloride and boron are discussed in section 4.2.

4. Findings and Conclusions

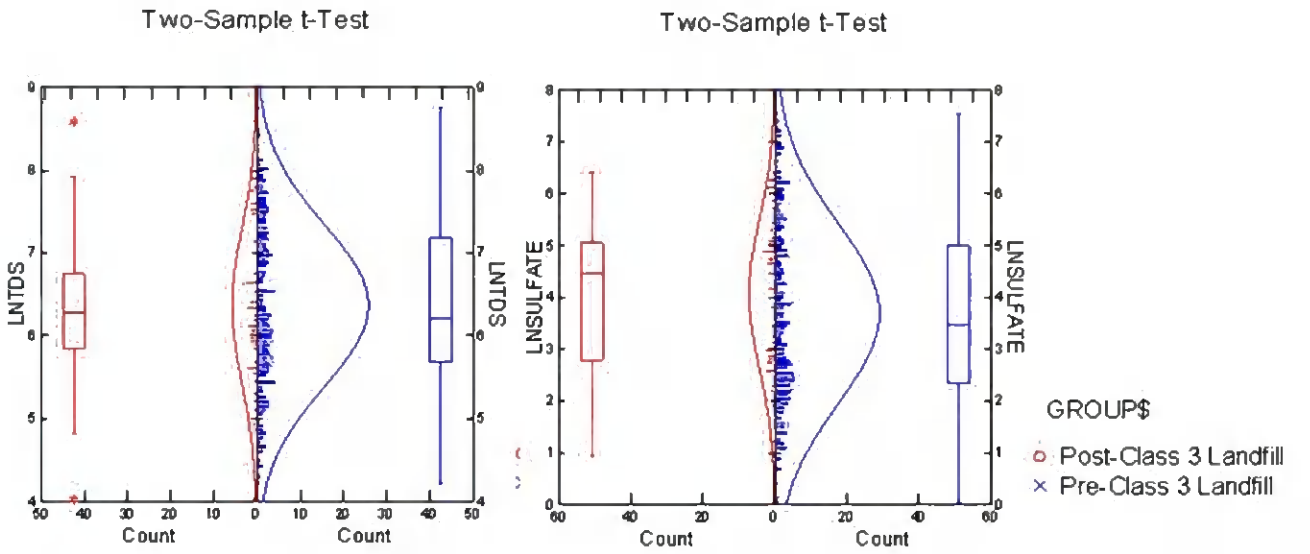
Haley & Aldrich has concluded that the closed Class 2 Landfill represents a potential alternate source for the Appendix III SSIs detected downgradient of the new Class 3 Landfill. The analysis supporting this conclusion is provided in the following bullet points.

4.1 HYDROGEOLOGY

- The newly installed monitoring wells downgradient of the Class 3 Landfill are also located downgradient of the Class 2 Landfill. Groundwater flow direction has remained consistent throughout the CCR monitoring period. (see **Figure 3**)
- These newly installed monitoring wells downgradient of the Class 3 Landfill were constructed to monitor groundwater quality in the uppermost aquifer and are screened in the same hydrostratigraphic unit as the existing wells surrounding the Class 2 landfill.
- Groundwater flow velocity in the uppermost aquifer in the vicinity of the Class 2 and Class 3 Landfills is calculated to be approximately 30-feet per year. In addition, the distance between the eastern edge of the Class 2 Landfill and the groundwater wells monitoring the Class 3 Landfill varies from 500- to 800-feet. This represents between 17 and 27 years for a release from the Class 2 Landfill to reach the Class 3 Landfill monitoring wells. Given that the Class 2 Landfill began receiving CCRs 34 years ago, there has been a sufficient amount of time for impacts from the Class 2 Landfill to have migrated to the Class 3 Landfill monitoring locations.

4.2 GROUNDWATER QUALITY

- In general, the concentration of the Appendix III constituents detected around the Class 3 Landfill in October 2015, prior to receiving CCRs, are comparable to the concentrations observed after the Class 3 Landfill was put into operation (see **Table 1**).
- Calcium has been detected in Class 2 Landfill monitoring well POZ-1 at concentrations up to 200,000 ug/L. The newly installed wells around the Class 3 Landfill, downgradient of POZ-1, yield lower concentrations for calcium ranging from 40 to 225 ug/L.
- Historical concentrations of TDS and sulfate recorded downgradient of the Class 2 Landfill have been detected at concentrations up to 3,100 ug/L and 1,900 mg/L, respectively. The newly installed Class 3 Landfill wells record lower concentrations, ranging from 275 to 850 ug/L and 13 to 200 mg/L, respectively.
- Statistical comparison (two-sample t-Test) of the pre- and post-constructions samples for TDS and sulfate were completed (see Graph 1 and 2, respectively). This testing does not indicate a statistically significant ($p<0.05$) difference ($p=0.977$ and $p=0.102$) between the pre- and post-construction of the Class 3 Landfill groundwater sample results for TDS or sulfate. Therefore, the conditions observed post-construction appear to be consistent with the pre-construction conditions and is not indicative of a Class 3 release.



Graph 1 and 2. Initial Two-Sample t-Test comparsion of pre- and post-construction (1/1/2016) groundwater sample results of total dissolved solids and sulfate (mg/L). Data appears lognormal therefore transformed for statistical testing usina natural loarithm.

- The range of pH in existing wells around the Class 2 Landfill vary from 5.6 to 7.4 s.u. except for POZ-1 which exhibited increasing acidity recording values as low as 2.9 s.u. Except for POZ-1, which has been abandoned, the range of pH measured in the Class 3 Landfill wells is consistent with the historical values obtained from the Class 2 Landfill. The observation of pH will be further evaluated in assessment monitoring of the Class 2 Landfill.
- Based on these observations of groundwater impacts observed prior to the construction of the Class 3 Landfill, boron and chloride (also detected at SSIs above background) observed in the wells monitoring the Class 3 Landfill originated from the Class 2 Landfill and are representative of pre-existing conditions.

Therefore, Haley & Aldrich concludes that the Class 2 Landfill has caused the SSIs calculated downgradient of the Class 3 Landfill. Consistent with §257.94(e)(2), this successful alternate source demonstration, which includes obtaining a certification from a qualified professional engineer (certification follows), has been completed within 90-days of detecting a SSI above background levels. As a result of the certified ASD, and consistent with §257.94(e)(2), the Class 3 Landfill at the CGS will remain in detection monitoring in accordance 40 CFR §257.94(e)(2).

SANTEE COOPER
CROSS GENERATING STATION; CLASS 3 LANDFILL
APPENDIX III SSI ALTERNATE SOURCE EVALUATION

Pursuant to 40 CFR §257.94(e)(2), Haley & Aldrich, Inc., on behalf of Santee Cooper conducted an alternate source evaluation to demonstrate that a source other than the Class 3 Landfill caused the statistically significant increase over background identified during detection monitoring. I certify that this report and all attachments were prepared by me or under my direct supervision. I am a professional engineer who is registered in the State of South Carolina.

This certification and the underlying data support the conclusion that a source other than the Class 3 Landfill is the cause of the statistically significant increase (SSI) over background levels for Appendix III constituents detected during detection monitoring of this unit.

The information contained in this evaluation is, to the best of my knowledge, true, accurate and complete.

HALEY & ALDRICH, INC.

Jeffrey A. Klaiber, P.E.
Principal Consultant

South Carolina Professional Engineer
Registration Number PE019857

April 16, 2018

HALEY ALDRICH

TABLES

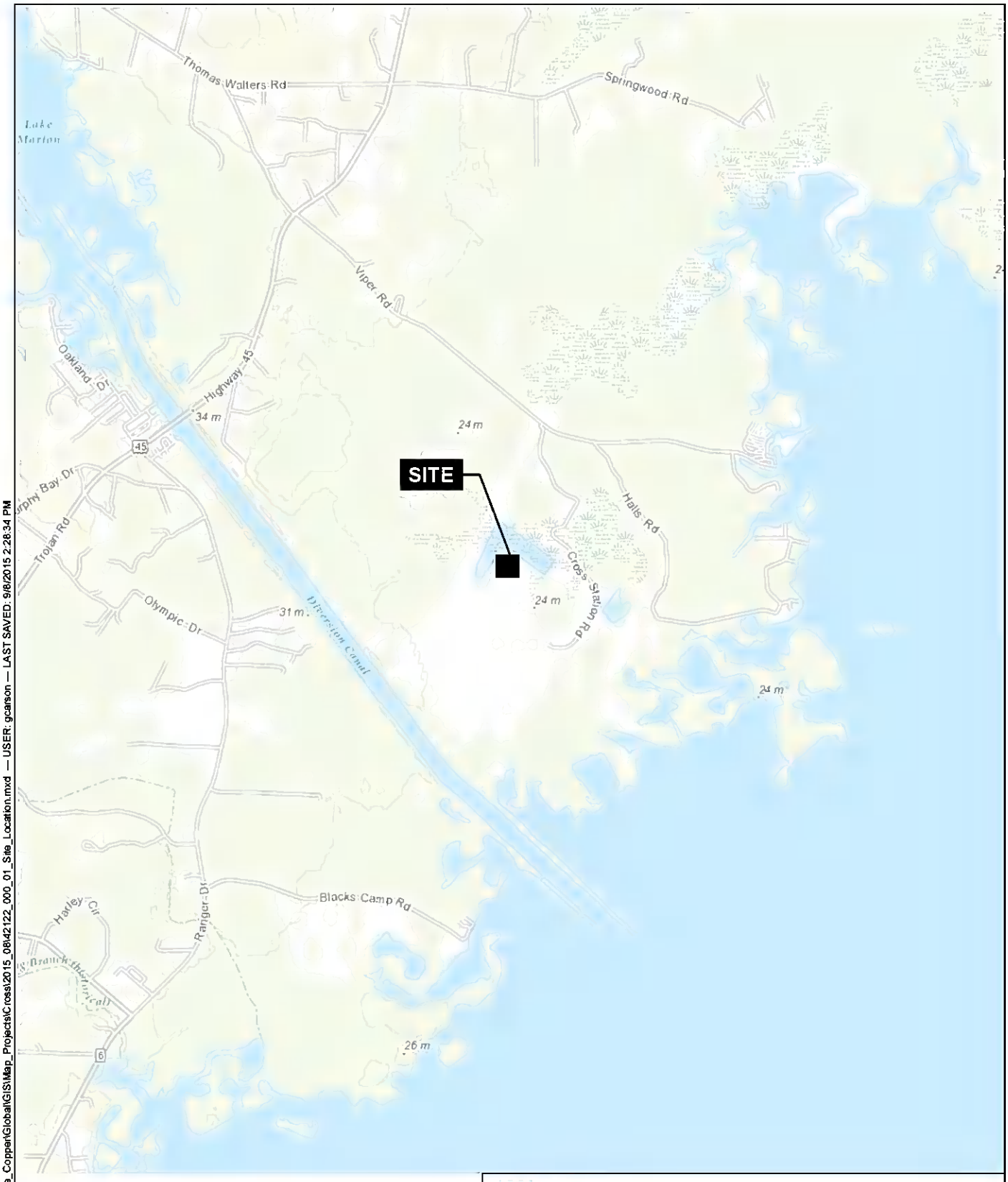
TABLE 1 - Summary of Groundwater Analytical Results

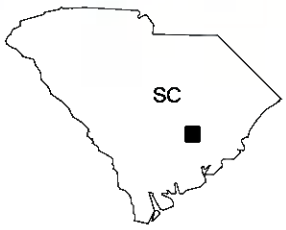
			Appendix III Constituents								
Well ID	Purpose	Date of Sample Event	Boron	Boron	Calcium	Calcium	Chloride	Fluoride	Sulfate	Total Dissolved Solids	pH
		Unit	ug/L	ug/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	SU
		Method	EPA 6010D	EPA 6020B	EPA 6010D	EPA 6020B	EPA 300.0	EPA 300.0	EPA 300.0	SM 2540C	
Site Background Wells											
PM-1	Baseline	10/19/2015		17.8	26		12.7	<0.10	26.5	206	5.46
PM-1	Baseline	1/26/2016		<15.0	27		11.3	<0.10	25.5	165	5.2
PM-1	Baseline	4/19/2016		<15.0		23.3	12.1	<0.10	20.2	130	5.32
PM-1	Baseline	7/18/2016		16.3		18.8	13.2	<0.10	16	124	5.21
PM-1	Baseline	10/11/2016		16.5		16.4	12.8	<0.10	19.3	200	5.04
PM-1	Baseline	1/23/2017		<15.0		10.4	13.5	<0.10	8.82	138	5
PM-1	Baseline	4/17/2017	19			12.5	12.7	<0.10	9.71	56	5.2
PM-1	Baseline	9/25/2017	18			15.4	13.3	<0.10	8.03	<40	5.26
PM-1	Detection	10/9/2017	21		17		12.6	<0.10	8.77	80	5.21
PM-1	**total samples**		**3**	**6**	**3**	**6**	**9**	**9**	**9**	**9**	**9**
CBW-1	Baseline	10/19/2015		32	27		3.21	0.25	81.5	150	4.46
CBW-1	Baseline	1/26/2016		21.8	27		2.95	0.3	88.2	120	4.13
CBW-1	Baseline	4/19/2016		18.3		29.4	2.33	0.29	86	120	4.33
CBW-1	Baseline	7/18/2016		21.7		28.7	2.95	0.27	90.1	132	4.39
CBW-1	Baseline	10/11/2016		30.2		22.7	3	0.28	73.7	151.7	4.15
CBW-1	Baseline	1/23/2017		24.9		26.2	2.45	0.25	77.7	148	4.32
CBW-1	Baseline	4/17/2017	18			25.6	2.96	0.22	71.2	62	4.26
CBW-1	Baseline	9/25/2017	24			21.9	2.51	0.23	74.5	<40	4.34
CBW-1	Detection	10/9/2017	23		23		2.73	0.22	76.8	115	4.25
CBW-1	**total samples**		**3**	**6**	**3**	**6**	**9**	**9**	**9**	**9**	**9**
Class 3 Landfill Wells											
CLF1B-1	Baseline	10/21/2015		<15.0	180		38.7	0.17	123	594	6.49
CLF1B-1	Baseline	2/1/2016		<15.0	180		39.7	0.12	136	602	6.54
CLF1B-1	Baseline	4/19/2016		<15.0		189	39.2	0.12	136	558.3	6.67
CLF1B-1	DUPLICATE	4/19/2016		<15.0		188	38.9	0.18	136	555	
CLF1B-1	Baseline	7/18/2016		<15.0		181	41.5	0.12	134	574	6.52
CLF1B-1	DUPLICATE	7/18/2016		<15.0		181	40.8	0.12	135	596	
CLF1B-1	Baseline	10/13/2016		<15.0		175	41	<0.10	153	651.7	6.56
CLF1B-1	DUPLICATE	10/13/2016		<15.0		175	40.2	<0.10	149	496.7	
CLF1B-1	Baseline	1/30/2017		<15.0		171	38.7	0.13	153	602	6.66
CLF1B-1	DUPLICATE	1/30/2017		<15.0		175	38.6	0.13	151	578	
CLF1B-1	Resample Hg	3/1/2017									
CLF1B-1	DUPLICATE for Resample Hg	3/1/2017									
CLF1B-1	Baseline	4/17/2017	16			191	34.2	0.14	150	556	6.57
CLF1B-1	DUPLICATE	4/17/2017	<15	<15		185	33.9	0.15	154	696	
CLF1B-1	Baseline	9/25/2017	<15			167	38.9	<0.10	135	498	6.67
CLF1B-1	DUPLICATE	9/25/2017	<15			169	38.7	0.11	136	548	
CLF1B-1	Detection	10/10/2017	15		170		37.4	0.13	131	581.7	6.28
CLF1B-1	DUPLICATE	10/10/2017	15		180		36.9	0.13	130	650	
CLF1B-1	**total samples**		**6**	**11**	**4**	**12**	**16**	**16**	**16**	**16**	**9**
CLF1B-2	Baseline	10/21/2015		18.6	210		62.7	0.16	22.4	472	7.09
CLF1B-2	DUPLICATE	10/21/2015		19.1	160		62.3	0.15	21.5	470	
CLF1B-2	Baseline	2/1/2016		<15.0	120		64.6	0.11	19.6	433	6.79
CLF1B-2	Baseline	4/19/2016		15.2		130	66.6	<0.10	16.3	415	6.92
CLF1B-2	Baseline	7/19/2016		39.8		131	70.9	<0.10	13.7	512	6.94
CLF1B-2	Baseline	10/13/2016		15.7		121	69	<0.10	13.3	486.7	6.87
CLF1B-2	Baseline	1/30/2017		16.2		124	70.4	<0.10	13	462	6.85
CLF1B-2	Resample Hg	3/1/2017									
CLF1B-2	Baseline	4/17/2017	18			131	69.7	0.12	16.4	390	6.92
CLF1B-2	Baseline	9/25/2017	16			127	76	<0.10	12.5	398	6.97
CLF1B-2	Detection	10/11/2017	17		140		74.1	0.11	12.9	396.7	7.07
CLF1B-2	**total samples**		**3**	**7**	**4**	**6**	**10**	**10**	**10**	**10**	**9**
CLF1B-3	Baseline	10/22/2015		17.2	100		26.8	0.12	33	326	6.94
CLF1B-3	DUPLICATE	10/22/2015		17.4	100		27.2	0.12	35.4	320	
CLF1B-3	Baseline	2/1/2016		18.9	140		22.4	0.13	107	447	6.7
CLF1B-3	Baseline	4/19/2016		24.6		167	22.1	0.12	116	5355	6.82
CLF1B-3	Baseline	7/19/2016		41.7		207	23.5	<0.10	203	686	6.59
CLF1B-3	Baseline	10/13/2016		25.8		113	25.2	<0.10	63.9	276.7	6.63
CLF1B-3	Baseline	1/30/2017		25		128	23	0.12	84.4	430	6.81
CLF1B-3	Resample Hg	3/1/2017									
CLF1B-3	Baseline	4/17/2017	27			177	20.8	0.13	159	452	6.77
CLF1B-3	Baseline	9/25/2017	50			183	22.7	<0.10	174	530	6.74
CLF1B-3	Detection	10/11/2017	64		220		24.8	0.15	226	621.7	6.67
CLF1B-3	**total samples**		**3**	**7**	**4**	**6**	**10**	**10**	**10**	**10**	**9**
CLF1B-4	Baseline	10/22/2015		27.2	110		51.1	0.12	34.3	350	7.17
CLF1B-4	Baseline	1/27/2016		29.2	67		51.1	0.13	31.1	375	7.37
CLF1B-4	Baseline	4/19/2016		18.2		94.5	50.9	<0.10	22.4	290	7.17
CLF1B-4	Baseline	7/19/2016		20.4		97.3	52.7	<0.10	17.4	384	7.16
CLF1B-4	Baseline	10/13/2016		21.4		180	50.7	<0.10	15.3	360	6.98
CLF1B-4	Baseline	1/30/2017		21.7		88.1	49.1	<0.10	16.3	344	7.23
CLF1B-4	Resample Hg	3/1/2017									

PROVIDED BY SANTEE COOPER

				Appendix III Constituents								
Well ID	Purpose	Date of Sample Event		Boron	Boron	Calcium	Calcium	Chloride	Fluoride	Sulfate	Total Dissolved Solids	pH
			Unit	ug/L	ug/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	SU
			Method	EPA 6010D	EPA 6020B	EPA 6010D	EPA 6020B	EPA 300.0	EPA 300.0	EPA 300.0	SM 2540C	
CLF1B-4	Baseline	4/17/2017		19			92.9	47.4	0.11	16.1	278	7.24
CLF1B-4	Baseline	9/26/2017		17			92.6	53.1	<0.10	14.3	286	7.25
CLF1B-4	Detection	10/11/2017		20		92		49.9	<0.10	13.7	256.7	7.21
CLF1B-4	**total samples**			**3**	**6**	**3**	**6**	**9**	**9**	**9**	**9**	**9**
CLF1B-5	Baseline	10/22/2015			15.8	160		69.5	0.11	24.2	528	6.83
CLF1B-5	Baseline	1/27/2016			15.5	160		90.9	<0.10	44.4	662.5	6.76
CLF1B-5	DUPLICATE	1/28/2016			<15.0	160		90.7	0.12	43.8	675	
CLF1B-5	Baseline	4/25/2016			<15.0		192	99.8	<0.10	63.6	755	6.68
CLF1B-5	Baseline	7/19/2016			<15.0		202	113	<0.10	87.3	848	6.62
CLF1B-5	Baseline	10/14/2016			<15.0		196	109	<0.10	110	763.3	6.51
CLF1B-5	Baseline	1/24/2017			15.3		205	110	<0.10	112	758	6.74
CLF1B-5	Baseline	4/18/2017		<15			223	114	<0.10	130	756	6.61
CLF1B-5	Baseline	9/26/2017		15			224	118	<0.10	165	812	6.77
CLF1B-5	Detection	10/11/2017		19		220		117	<0.10	177	776.7	6.72
CLF1B-5	**total samples**			**3**	**7**	**4**	**6**	**10**	**10**	**10**	**10**	**9**

FIGURE





MAP SOURCE: ESRI

HALEY ALDRICH

SANTEE COOPER
CROSS GENERATING STATION
CROSS, SOUTH CAROLINA

SITE LOCATION MAP

APPROXIMATE SCALE: 1 IN = 2000 FT
APRIL 2018

FIGURE 1

GIS FILE PATH: G:\Projects\42122_Santee_Cooper\Global\GIS\Map_Projects\Cross\2015_08\42122_000_01_Site_Location.mxd — USER: gcarson — LAST SAVED: 9/8/2015 2:28:34 PM

LEGEND

BACKGROUND WELLS
EXISTING

CLASS 2 LANDFILL WELLS
EXISTING

CLASS 3 LANDFILL AREA B WELLS
EXISTING

ASH POND WELLS
EXISTING

NOTE:

IMAGE SOURCE: GOOGLE EARTH (DIGITAL GLOBE) 2015

N

0 1,000 2,000
SCALE IN FEET

HALEY ALDRICH

SANTEE COOPER
CROSS GENERATING STATION
CROSS, SOUTH CAROLINA

SITE INDEX MAP WITH GROUNDWATER MONITORING LOCATIONS FOR COMPLIANCE WITH CCR RULE

APRIL 2018

FIGURE 2

GIS FILE PATH: G:\Projects\42122_Santee_Cooper\GlobalGIS\Map_Projects\Cross\2015_08\42122_000_01All_MW_Location_submittal.mxd — USER: gcarson — LAST SAVED: 9/3/2015 11:21:06 AM

LEGEND

ESTIMATED GROUNDWATER ELEVATION
CONTOUR FEET - ABOVE MEAN SEA LEVEL

INTERPRETED GROUNDWATER
FLOW DIRECTION

NOTE:

IMAGE SOURCE: GOOGLE EARTH (DIGITAL GLOBE) 2015

N

0 1,000 2,000
SCALE IN FEET

HALEY ALDRICH

SANTEE COPPER
CROSS GENERATING STATION
CROSS, SOUTH CAROLINA

WATER TABLE CONFIGUATION MAP

APRIL 2018

FIGURE 3

GIS FILE PATH: G:\Projects\42122_Santee_Cooper\Global\GIS\Map_Projects\2015_08\42122_000_03_Water_Table_Contours.mxd — USER: gcarson — LAST SAVED: 8/19/2015 12:18:08 PM

APPENDIX B

Statistical Analysis

HALEY ALDRICH

Summary of Appendix III Groundwater Monitoring Results Pursuant to 40 CFR § 257393 and 40 CFR § 257.94, Cross Generating Station, Class 3 Landfill

The South Carolina Public Service Authority (Santee Cooper) is implementing the 17 April 2015 U.S. Environmental Protection Agency (U.S. EPA) Federal Coal Combustion Residuals (CCR) Rule (40 CFR § 257 and 261) for the Cross Generating Station, located in Berkeley County, South Carolina. Santee Cooper provided Haley & Aldrich with groundwater monitoring data collected from a groundwater monitoring system that meets the requirements of 40 CFR §257.91. This memorandum documents the results of statistical tests conducted to determine if Appendix III groundwater monitoring constituents detected in downgradient wells are at levels that exhibit a statistically significant increase above background or upgradient wells consistent with the requirements in 40 CFR § 257.94.

Collection dates for baseline and initial detection groundwater sampling span from 21 October 2015, prior to CCR being placed in the Landfill, through 11 October 2017. The data satisfy the CCR Rule requirement of collecting a minimum of 8 rounds of hydrological and groundwater quality data from upgradient wells. The Upper Tolerance Limit (UTL) statistical analysis was used as specified in the certification statement of October 15, 2017. The UTL is an accepted method under the CCR Rule and is the upper endpoint of a tolerance interval that is designed to contain a pre-specified proportion (e.g. 95 percent) of the background dataset.

Statistical Evaluation of Appendix III Constituents

The Rule, 40 CFR §257.93(f) (1-4), provides four specific options to statistically evaluate whether water quality downgradient of the CCR Unit represents an SSI of Appendix III parameters compared to background water quality of the CCR Unit. The Upper Tolerance Limit (UTL) was used to evaluate potential SSIs. A 95% Upper Tolerance Limit for 99% coverage was calculated to compare to downgradient groundwater analytical results for this evaluation.

UTL STATISTICAL ANALYSIS

The UTL is an accepted statistical method identified in the CCR Rule to evaluate the groundwater analytical data at CCR Units. A tolerance interval is a concentration range, with some confidence level, designed to contain a pre-specified proportion (e.g., 99 percent) of the underlying population from which the statistical sample is drawn (background). The upper endpoint of a tolerance interval is called the upper tolerance limit or UTL. Depending on the assumed distribution of background, parametric or non-parametric procedures were used to develop the UTL. Parametric tolerance limits utilize assumed distributions of the sample background data to develop the UTL, and non-parametric limits utilize order statistics or bootstrap methods to develop the UTL. The UTL was calculated using the U.S. EPA's ProUCL 5.1 software from the background well data after testing for outlier sample results that would warrant removal from the data set based on likely error in sampling or measurement. Both visual and statistical outlier tests for the background data were performed using ProUCL, and a visual inspection of the data was performed for the downgradient sample data.

RESULTS OF APPENDIX III DOWNGRADIENT STATISTICAL COMPARISONS

Data from the October 2017 sampling event from the downgradient monitoring wells for the Class 3 Landfill were compared to the UTL calculated from the background data (Table 1) from upgradient wells for the Appendix III constituents (boron, calcium, chloride, fluoride, pH, sulfate, and total dissolved

solids). Based on these comparisons, a statistically significant increase above background was indicated for boron, calcium, chloride, pH, sulfate, and total dissolved solids in one or more downgradient sample(s), as follows:

- Boron at CLF1B-1;
- Calcium at CLF1B-1, CLF1B-2, CLF1B-3, CLF1B-4, and CLF1B-5;
- Chloride at CLF1B-1, CLF1B-2, CLF1B-3, CLF1B-4, and CLF1B-5;
- pH at CLF1B-1, CLF1B-2, CLF1B-3, CLF1B-4, and CLF1B-5;
- Sulfate at CLF1B-1, CLF1B-3, and CLF1B-5;
- Total Dissolved Solids at CLF1B-1, CLF1B-2, CLF1B-3, and CLF1B-5.

Following completion of a certified alternate source demonstration (ASD) semiannual detection monitoring continued in 2018. The second round of detection monitoring was completed on August 30, 2018 with the statistical analysis being conducted within 90-days thereafter. Consistent with the Unified Guidance and in response to the certified ASD conducted for boron, calcium, chloride, pH, sulfate, and total dissolved solids (TDS) in April 2018, an intra-well statistical analysis, which compares the most recent detection monitoring results to the background values calculated for the individual constituents/wells, was performed in November 2018. Since the ASD did not address fluoride, fluoride was evaluated using an inter-well statistical analysis, which compares the most recent detection monitoring results to background. This analysis identified SSI's for boron and chloride. Consistent with § 257.94(d)(2), an evaluation to determine if a source other than the CCR units caused the SSIs or that the SSIs resulted from error in sampling, analysis, statistical evaluation, or natural variability, was initiated. This evaluation identified laboratory reporting errors which have been resolved. The ASD will be finalized in February 2019.

January 2018 Statistics

HALEY ALDRICH

Table 1
Summary of background sample results and comparison of downgradient sample results
Cross Generating Station
Berkeley County, South Carolina

Background Samples								
CBW-1	**Sample Date**	**Boron (ug/L)**	**Calcium (ug/L)**	**Chloride (mg/L)**	**Fluoride (ug/L)**	**pH**	**Sulfate (mg/L)**	**Total Dissolved Solids (mg/L)**
AD33587	10/19/2015	32	27	3.21	0.25	4.46	81.5	150
AD40794	1/26/2016	21.8	27	2.95	0.3	4.13	88.2	120
AD47597	4/19/2016	18.3	29.4	2.33	0.29	4.33	86	120
AD56662	7/18/2016	21.7	28.7	2.95	0.27	4.39	90.1	132
AD65015	10/11/2016	30.2	22.7	3	0.28	4.15	73.7	151.7
AD72819	1/23/2017	24.9	26.2	2.45	0.25	4.32	77.7	148
AD79015	4/17/2017	18	25.6	2.96	0.22	4.26	71.2	62
AD86327	7/25/2017	22	-	2.61	-	4.22	73.3	92
AD93494	9/25/2017	24	21.9	2.51	0.23	4.34	74.5	ND (<40.0)
AD94541	10/9/2017	23	23	2.73	0.22	4.25	76.8	115
PM-1								
AD33581	10/19/2015	17.8	26	12.7	ND (<0.10)	5.46	26.5	206
AD40780	1/26/2016	ND (<15.0)	27	11.3	ND (<0.10)	5.2	25.5	165
AD47596	4/19/2016	ND (<15.0)	23.3	12.1	ND (<0.10)	5.32	20.2	130
AD56653	7/18/2016	16.3	18.8	13.2	ND (<0.10)	5.21	16	124
AD65014	10/11/2016	16.5	16.4	12.8	ND (<0.10)	5.04	19.3	200
AD72805	1/23/2017	ND (<15.0)	10.4	13.5	ND (<0.10)	5	8.82	138
AD79006	4/17/2017	19	12.5	12.7	ND (<0.10)	5.2	9.71	56
AD86311	7/12/2017	-	18.5	12.1	-	5.07	11.1	108
AD93483	9/25/2017	18	15.4	13.3	ND (<0.10)	5.26	8.03	ND (<40.0)
AD94530	10/9/2017	21	17	12.6	ND (<0.10)	5.21	8.77	80
Assumed Data Distribution for Calculation of UTL		Normal	Normal	Non-parametric	Non-parametric	Non-parametric	Non-parametric	Normal
95% Upper Tolerance Limit with 99% coverage*		36.18	40.71	13.5	0.3	5.46	90.1	269.7
Minimum Detection		16.3	10.4	2.33	0.22	4.13	8.03	56
Maximum Detection		32	29.4	13.3	0.3	5.46	90.1	206
Mean Detection		20.5	21.94	7.7	0.178	4.741	47.35	118.9
Frequency of Detection		84%	100%	100%	50%	100%	100%	90%
Downgradient Well	**Sample Date**	**Boron**	**Calcium**	**Chloride**	**Fluoride**	**pH**	**Sulfate**	**Total Dissolved Solids**
Class III Landfill								
CLF1B-1	10/10/17	15.00	170.00	37.40	0.13	6.28	131.00	581.70
CLF1B-2	10/11/17	17.00	140.00	74.10	0.11	7.07	12.90	396.70
CLF1B-3	10/11/17	64.00	220.00	24.80	0.15	6.67	226.00	621.70
CLF1B-4	10/11/17	20.00	92.00	49.90	ND (<0.10)	7.21	13.70	256.70
CLF1B-5	10/11/17	19.00	220.00	117.00	ND (<0.10)	6.72	177.00	776.70

Notes and Abbreviations:
1. ND: Not Detected at concentrations greater than specified reporting limit.
2. Shaded downgradient result is a statistically significant increase based on comparison to calculated UTL.
3. Non-parametric methods of UTL calculation confidence coefficient is 0.165 to 0.182 based on pooled background n=18 to 20. Approximately 299 samples required to achieve 0.95.

November 2018 Statistics

(Revised January 2019 Due to Analytical Errors)

HALEY ALDRICH

Crose Generating Station

Class 3 Landfill

Detection Monitoring Statistical Analysis Summary

November 28, 2018, Revised January 22, 2019 Due to Laboratory Reporting Errors

Location Id	Frequency of Detection	Percent Non-Detects	Range of Non-Detect	Mean	50th Percentile (Median)	95th Percentile	Maximum Detect	Variance	Standard Deviation	Coefficient of Variance	CCR MCL/RSL	Report Result Unit	Outlier Presence	Outlier Removed	Trend	Distribution Group	Distribution Well*	Group Difference	Background Limit (Upper Prediction Limit)	Background Limit (Upper Prediction Limit) ug/L	SSI	Background Limit (Upper Prediction Limit)	Background Limit (Upper Prediction Limit) ug/L	SSI
CCR Appendix-III: Boron, Total (mg/L)																								
PM-1	8/13	38%	0.015-0.015	0.0165	0.016	0.0198	0.021	0.000003686	0.00192	0.1163	NA	mg/L	No	No	Stable	Non-parametric			0.03	32				
CBW-1	13/13	0%	-	0.023	0.022	0.03092	0.032	0.00001889	0.004346	0.189	NA	mg/L	No	No	Stable									
CLF1B-1	2/12	83%	0.015-0.015	0.0151	0.015	0.01545	0.016	8.333E-08	0.0002887	0.01914	NA	mg/L	No	No	Stable		Non-parametric				No	0.02	16	No
CLF1B-2	10/12	17%	0.015-0.015	0.0185	0.0161	0.02891	0.0398	0.00004722	0.006872	0.3706	NA	mg/L	Yes	No	Stable		Non-parametric				No	0.04	39.8	No
CLF1B-3	12/12	0%	-	0.035	0.029	0.0563	0.064	0.0002157	0.01469	0.4194	NA	mg/L	No	No	Increasing	Non-parametric	Normal	Yes			Yes	0.08	83.0956	No
CLF1B-4	12/12	0%	-	0.0207	0.02	0.0281	0.0292	0.00001521	0.003899	0.1886	NA	mg/L	Yes	No	Stable		Normal				No	0.04	39.0409	No
CLF1B-5	8/12	33%	0.015-0.015	0.0156	0.01515	0.01735	0.019	0.000001288	0.001135	0.07259	NA	mg/L	Yes	No	Stable		Non-parametric				No	0.02	15.8	Yes
CCR Appendix-III: Calcium, Total (mg/L)																								
PM-1	13/13	0%	-	19.5	17	31	37	51.38	7.168	0.3675	NA	mg/L	No	No	Stable	Normal			42.17	42166.9				
CBW-1	12/12	0%	-	25.2	24.8	29.01	29.4	6.24	2.498	0.09919	NA	mg/L	No	No	Stable									
CLF1B-1	11/11	0%	-	178	180	190	191	66.29	8.142	0.04572	NA	mg/L	No	No	Stable		Normal				Yes	216.79	216788	No
CLF1B-2	11/11	0%	-	137	130	175	210	632.1	25.14	0.1841	NA	mg/L	Yes	No	Stable		Non-parametric				Yes	210.00	210000	No
CLF1B-3	10/10	0%	-	164	172	214.1	220	1710	41.35	0.2529	NA	mg/L	No	No	Stable	Normal	Normal	Yes			Yes	322.48	322482	No
CLF1B-4	11/11	0%	-	99.7	92.6	145	180	810.2	28.46	0.2856	NA	mg/L	Yes	No	Stable		Non-parametric				Yes	180.00	180000	No
CLF1B-5	11/11	0%	-	210	205	264.5	279	1243	35.26	0.1678	NA	mg/L	No	No	Increasing		Normal				Yes	307.49	307492	No
CCR Appendix-III: Chloride (mg/L)																								
PM-1	13/13	0%	-	12.7	12.7	13.44	13.5	0.3808	0.6171	0.04862	NA	mg/L	No	No	Stable	Non-parametric			13.50	13500				
CBW-1	13/13	0%	-	2.79	2.88	3.084	3.21	0.06673	0.2583	0.09254	NA	mg/L	No	No	Decreasing									
CLF1B-1	12/12	0%	-	38.5	38.9	41.22	41.5	4.975	2.231	0.05795	NA	mg/L	No	No	Stable		Normal				Yes	47.83	47826.9	No
CLF1B-2	12/12	0%	-	71	70.65	76.9	78	23.24	4.82	0.06785	NA	mg/L	No	No	Increasing		Normal				Yes	88.04	88039.5	No
CLF1B-3	12/12	0%	-	24.2	23	30.13	34.2	12.53	3.539	0.1462	NA	mg/L	Yes	No	Stable	Non-parametric	Non-parametric	Yes			Yes	26.80	26800	Yes
CLF1B-4	12/12	0%	-	50.8	50.8	54.4	56	5.859	2.421	0.04764	NA	mg/L	No	No	Stable		Normal				Yes	61.49	61487.8	No
CLF1B-5	12/12	0%	-	108	113.5	118.9	120	217.7	14.76	0.1367	NA	mg/L	No	No	Increasing		Non-parametric				Yes	118.00	118000	Yes
CCR Appendix-III: Fluoride (mg/L)																								
PM-1	0/12	100%	0.1-0.1	0.1	0.1	0.1		5.046E-18	2.246E-09	2.246E-08	4	mg/L	No	No	Stable	Non-parametric			0.30	300				
CBW-1	12/12	0%	-	0.241	0.24	0.2945	0.3	0.001481	0.03848	0.1598	4	mg/L	Yes	No	Decreasing									
CLF1B-1	9/11	18%	0.1-0.1	0.134	0.13	0.18	0.19	0.0007655	0.02767	0.207	4	mg/L	No	No	Stable		Normal				No	0.23	228.504	No
CLF1B-2	6/11	45%	0.1-0.1	0.115	0.11	0.15	0.16	0.0004073	0.02018	0.1748	4	mg/L	No	No	Stable		Normal				No	0.21	207.104	No
CLF1B-3	8/11	27%	0.1-0.1	0.125	0.12	0.15	0.15	0.0003873	0.01968	0.158	4	mg/L	No	No	Stable	Non-parametric	Normal	Yes			No	0.17	174.758	No
CLF1B-4	3/11	73%	0.1-0.1	0.105	0.1	0.125	0.13	0.0001073	0.01036	0.09822	4	mg/L	No	No	Stable		Non-parametric				No	0.13	130	No
CLF1B-5	3/11	73%	0.1-0.1	0.107	0.1	0.135	0.15	0.0002418	0.01555	0.145	4	mg/L	Yes	No	Stable		Non-parametric				No	0.11	110	Yes
CCR Appendix-III: pH, Field (pH units)																								
PM-1	14/14	0%	-	5.22	5.2	5.509	5.58	0.02566	0.1602	0.03068	NA	pH units	No	No	Stable	Non-parametric			4.09, 5.58					
CBW-1	13/13	0%	-	4.28	4.32	4.432	4.45	0.01277	0.113	0.02642	NA	pH units	No	No	Stable									
CLF1B-1	12/12	0%	-	6.57	6.59	6.674	6.68	0.01089	0.1043	0.01588	NA	pH units	Yes	No	Stable		Normal				Yes	6.22, 6.96		No
CLF1B-2	12/12	0%	-	6.91	6.9	7.084	7.09	0.009064	0.0952	0.01377	NA	pH units	No	No	Stable		Normal				Yes	6.53, 7.3		No
CLF1B-3	12/12	0%	-	6.72	6.72	6.874	6.94	0.01192	0.1092	0.01626	NA	pH units	No	No	Stable	Normal	Normal	Yes			Yes	6.14, 7.31		No
CLF1B-4	12/12	0%	-	7.17	7.19	7.299	7.37	0.01306	0.1143	0.01595	NA	pH units	No	No	Stable		Normal				Yes	6.62, 7.73		No
CLF1B-5	12/12	0%	-	6.69	6.71	6.792	6.83	0.007745	0.08801	0.01316	NA	pH units	No	No	Stable		Normal				Yes	6.21, 7.16		No
CCR Appendix-III: Sulfate (mg/L)																								
PM-1	13/13	0%	-	14.5	11.9	25.9	26.5	42.25	6.5	0.4497	NA	mg/L	No	No	Stable	Non-parametric			90.10	90100				
CBW-1	13/13	0%	-	76.6	74.5	88.96	90.1	61.54	7.845	0.1024	NA	mg/L	No	No	Decreasing									
CLF1B-1	12/12	0%	-	139	136	153	153	94.91	9.742	0.07009	NA	mg/L	No	No	Stable		Normal				Yes	184.99	184987	No
CLF1B-2	12/12	0%	-	14.9	13.25	20.86	22.4	10.28	3.206	0.2154	NA	mg/L	Yes	No	Decreasing		Non-parametric				No	22.40	22400	No
CLF1B-3	12/12	0%	-	138	145.5	213.4	226	3500	59.16	0.4281	NA	mg/L	Yes	No	Stable	Non-parametric	Normal	Yes			Yes	382.82	382818	No
CLF1B-4	12/12	0%	-	18.7	15.7	32.54	34.3	49.04	7.003	0.3753	NA	mg/L	Yes	No	Decreasing		Non-parametric				No	34.30	34300	No
CLF1B-5	12/12	0%	-	127	121	222.4	278	4892	69.94	0.5491	NA	mg/L	No	No	Increasing		Normal				Yes	311.12	311121	No
CCR Appendix-III: Total Dissolved Solids (TDS) (mg/L)																								
PM-1	12/13	8%	40-40	130	130	202.4	206	2815	53.06	0.4084	NA	mg/L	No	No	Stable	Normal			266.86	266864				
CBW-1	12/13	8%	40-40	113	120	150.7	151.7	1172	34.23	0.3029	NA	mg/L	No	No	Stable									
CLF1B-1	12/12	0%	-	589	589.5	650	651.7	1734	41.65	0.07073	NA	mg/L	No	No	Stable		Normal				Yes	770.20	770196	No
CLF1B-2	12/12	0%	-	461	467	529.1	535	2865	53.52	0.116	NA	mg/L	No	No	Stable		Normal				Yes	653.42	653415	No
CLF1B-3	12/12	0%	-	916	536.5	2787	5355	1972000	1404	1.532	NA	mg/L	Yes	No	Stable	Non-parametric	Non-parametric	Yes			Yes	5355.00	5355000	No
CLF1B-4	12/12	0%	-	344	355	413.1	434	3019	54.94	0.1595	NA	mg/L	No	No	Stable		Normal				Yes	532.69	532685	No
CLF1B-5	12/12	0%	-	793	770	999.1	1076	18060	134.4	0.1695	NA	mg/L	Yes	No	Increasing		Normal				Yes	1172.64	1172640	No