

**2019 ANNUAL GROUNDWATER MONITORING  
AND CORRECTIVE ACTION REPORT  
BOTTOM ASH POND  
CROSS GENERATING STATION**

**by Santee Cooper  
Moncks Corner, South Carolina**

**January 2020**

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## 1. 40 CFR § 257.90 Applicability

### 1.1 40 CFR § 257.90(a)

***All CCR landfills, CCR surface impoundments, and lateral expansions of CCR units are subject to the groundwater monitoring and corrective action requirements under § 257.90 through § 257.99.***

The Bottom Ash Pond at Cross Generating Station (CGS) is subject to the groundwater monitoring and corrective action requirements set forth by the Environmental Protection Agency (EPA) in the Code of Federal Regulations Title 40 (40 CFR) § 257.90 through § 257.99. This document satisfies the requirement under § 257.90(e) which requires the CCR Unit Owner/Operator to prepare an Annual Report.

### 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 2019 for the Bottom Ash Pond at CGS as required by the Groundwater Monitoring and Corrective Action regulations. Groundwater sampling and analysis was conducted per the requirements of § 257.93, and the status of the groundwater monitoring program, set forth in § 257.95, is provided in this report.

#### 1.2.1 Status of the Groundwater Monitoring and Corrective Action Program

Statistically significant increases (SSI) of Appendix III constituents were identified downgradient of the Bottom Ash Pond, and the notification was provided on January 15, 2018. An alternate source demonstration (ASD) was conducted by Haley & Aldrich, Inc, and a report was provided to Santee Cooper in April 2018. The review by Haley & Aldrich did not identify contributing sources that could serve as an ASD for the SSI's observed in the CCR well network for the CGS Bottom Ash Pond. As a result, an Assessment Monitoring program was initiated as required by § 257.94(e)(2). The notification was placed in the facility's operating record as required by 257.106(h)(4).

As required by § 257.93(h)(2), the statistical evaluation of the Appendix IV constituents detected were determined to be statistically significant exceedance of groundwater protection standards set forth. Therefore, an assessment of corrective measures and nature and extent was initiated per §257.95(g)(3). Due to inclement weather, limited accessibility of the testing area, and limited trained personnel, discussed in depth at 1.2.3, there was difficulty in scheduling and implementing the field work required

for the assessment, so Santee Cooper utilized the 60-day extension allowed under § 257.95(a). Santee Cooper initiated an evaluation of the horizontal and vertical nature and extent of the SSLs (beryllium, cobalt, and lithium) downgradient of the Bottom Ash Pond, including the installation of monitoring wells at the downgradient property line. Groundwater sampling from the newly installed monitoring wells showed that the extent of the SSLs is confined to the uppermost aquifer on-site and does not extent into the underlying bedrock unit (Santee Limestone). Haley & Aldrich (H&A) was hired to create the Corrective Measures Assessment (CMA) report considering the presence and distribution of beryllium, cobalt, and lithium in the uppermost aquifer, the configuration of the Cross Bottom Ash Pond, operational history, hydrogeologic setting, and the results of the evaluation of the nature and extent available at the time of the CMA. This CMA discussed both remedial alternatives and their threshold criteria provided in §257.97(b), and then compared to the balancing criteria listed in §257.97(c)(1) of the CCR Rule. This CMA is filed in the Santee Cooper CCR operating record and on the Santee Cooper CCR Rule public website. The associated tables of analytical results and figures of sampling locations are provided in the appendix of this report. Finally, a public meeting was held December 3, 2019 to discuss six alternatives for a remedy per §257.96(e). The path forward will include selecting the final remedy, implementing the remedy, monitoring the progress, making any adjustments to the groundwater monitoring program or remedy if needed, and reporting the results.

### 1.2.2 Key Actions Completed

The following key actions were completed in 2019:

- Completed statistical evaluation to determined statistically significant exceedance of groundwater protection standards for Appendix IV constituents that were detected and initiated assessment of corrective measures for Bottom Ash Pond § 257.95(g)(3).
- Prepared 2018 Annual Report including:
  - The Annual Report was placed in the facility's operating record pursuant to § 257.105(h)(1);
  - Pursuant to § 257.106(h)(1), the notification was sent to the relevant State Director within 30 days of the Annual Report being placed in 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 in the facility's operating record [§ 257.107(d)];
- Placed a notification of initiation of assessment of corrective measures for Bottom Ash Pond in the operating record, as required by § 257.95(g)(5).
- Notification to the state and notice placed on public CCR website that assessment of corrective measures had been initiated, as required by § 257.106(h)(7)
- Scheduling challenges and difficulty due to scheduling appropriate certified well drillers, delays due to field accessibility, and unforeseen weather events, required utilization of the 60-day extension (Appendix A) for completion of the assessment of corrective measures per § 257.95(e)
- Initiated a characterization of the nature and extent of Appendix IV constituents identified at statistically significant levels above the GWPS in accordance with § 257.95(g)(1).
- Completed assessment of corrective measures and nature and extent per § 257.95(e) (Appendix B)
- Provided notification of completion of assessment of corrective measures and nature and extent to state; and place completed assessment on website per § 257.106(h)(8) and 257.107(h)(8)

- Collected and analyzed two rounds of groundwater monitoring (February and May) (Table 1) in accordance with § 257.95(b) and § 257.95(d)(1) and recorded the concentrations in the facility's operating record as required by § 257.95(d)(1); and
- Completed statistical evaluation to determine statistically significant exceedance of GWPS for Appendix IV in accordance with § 257.93(h)(2) (Appendix C);
- Held a public meeting December 3, 2019 to discuss proposed alternatives for corrective measures § 257.96(e).

### 1.2.3 Problems Encountered

It was difficult to get qualified well drillers for the field work scheduled at the appropriate times because multiple utilities were implementing the CCR Rule concurrently and there are a limited number of certified well drillers for South Carolina. There were also accessibility issues, as many parts of property boundaries and areas of investigation were heavily wooded with undergrowth which had to be cleared and surveyed. Lastly, unforeseen weather events prohibited field work during some phases. This led to delays and multiple mobilizations.

To determine Nature and Extent as set out in the regulations, the plan was to use Geoprobe™ technology to grab water samples for analysis along a transect, radiating outward from the CCR unit. Since multiple groundwater samples were turbid, there were interferences. The initial results were not definitive or reproducible in path or distribution of the analytes, likely due to high turbidity. Therefore, prior to the second mobilization of field work, geochemists were consulted to add analytes to the sample list in an attempt to better define Nature and Extent.

Detection monitoring analyte Boron was inadvertently not analyzed for CAP-1, 3, 5, 7 and 9.

### 1.2.4 Actions to Resolve Problems

Prior to the second mobilization of field work, the areas of investigation were clear cut using heavy equipment to provide better access of the drill rig. Geochemists were consulted to add analytes to the sample list to try to better define Nature and Extent.

Chains of custody, specific to each well, have been compiled to ensure that all analytes are captured for each groundwater monitoring event.

### 1.2.5 Project Key Activities for Upcoming Year

Key activities to be completed in 2020 include the following:

- Respond to any comments or questions brought up at the Public Meeting
- Consider the need for groundwater remedial interim measures § 257.98(e)(3)
- Selection of the remedy and preparation of Selection of Remedy Report including schedules for implementing and completing remedial activities § 257.97 (d)
- Initiate Groundwater Remedial Activities within 90 days of selecting the remedy which includes a reevaluation of the current groundwater monitoring plan § 257.98 (a)
- Collect Groundwater Remedy Engineering and Design Data which may include additional borings and/or groundwater monitoring wells § 257.98 (a)(1)

- Develop the Corrective Action Groundwater Monitoring Program (MNA Sampling Protocol) § 257.98 (a)(1)
- Field implementation (of the remedy with any associated additional groundwater ASD or monitoring activities)
- Conduct semi-annual groundwater monitoring § 257.95(d)(1)
- CMA Semi-Annual Progress Report § 257.97 (a), 257.105 (h)(12)
- Additional nature and extent activities as needed § 257.95(g)(1)
- Prepare the 2020 annual report; place it in the record as required by § 257.105(h)(1), notify the state [§ 257.106(d)]; and post to website [§ 257.107(d)].

### 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 Bottom Ash Pond 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 17 October 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;***

Groundwater monitoring wells were installed in 2019, as part of the Corrective Measures Assessment and Nature and Extent. CCMAP-1 and CCMAP-2 are groundwater wells installed near the property boundary to monitor the shallow aquifers near Angels Landing and Halls Subdivision, respectively in 2019. Pre-existing wells at the site which are part of the state groundwater monitoring program were used to further evaluate the nature and extent of contamination. These deeper wells located at the boundary of the waste were at depths of 62 to 66 ft bls.

Geoprobe sampling for both soil and groundwater were conducted, mainly along a transects for Nature and Extent. These were temporary borings that were properly installed and abandoned by a South Carolina Certified Well Driller.

#### 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), at least 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, and monitoring data

obtained for the groundwater monitoring program for the Bottom Ash Pond is presented in Table 1 of this report. In addition, as required by § 257.95(d)(3), Table 1 includes the groundwater protection standards established under § 257.95(d)(2).

**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 of the Appendix III constituents was completed January 15, 2018. Baseline analytical data collected from background monitoring wells CBW-1 and PM-1 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 CAP-1, CAP-3, CAP-5, CAP-7 and CAP-9. Constituents with analytical results exceeding the UTLs were identified as SSIs over background for the respective Appendix III constituent. An evaluation of alternate sources was initiated and completed on April 13, 2018 as provided in § 257.94(e)(2). A source causing the SSI over background levels other than the CCR unit was not identified at that time and an Assessment Monitoring program was initiated on July 16, 2018.

As required by § 257.93(h)(2), the statistical evaluation of the Appendix IV constituents detected were determined to be statistically significant exceedance of groundwater protection standards. Therefore, per §257.95(g)(3), an assessment of corrective measures and nature and extent was initiated on April 15, 2019, to evaluate the horizontal and vertical nature and extent of the SSLs downgradient of the Bottom Ash Pond. The Corrective Measures Assessment (CMA) report considering the presence and distribution of beryllium, cobalt, and lithium in the uppermost aquifer, the configuration of the Cross Bottom Ash Pond, operational history, hydrogeologic setting, and the results of the evaluation of the nature and extent available at the time of the CMA was created.

The sample concentrations from the downgradient wells for each of the detected Appendix IV constituents from the monitoring events of 2019 were compared to their respective background UTLs and GWPS (Appendix C). A sample concentration greater than the GWPS is considered to represent an SSL. Based on previous compliance sampling event and statistical evaluations, interwell comparisons were utilized for all downgradient wells and constituents. Based on this statistical evaluation on the groundwater sampling events in 2019, SSLs above GWPS were identified at the Ash Pond (beryllium, cobalt, and lithium), consistent with previous results.

**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.***

Other information including development of groundwater protection standards, recording groundwater monitoring results in the operating record, and an evaluation of alternate sources is discussed in preceding sections.

## TABLES












## FIGURES

GIS FILE PATH: I:\97130\CCR Rule & NPDES Compliance\Annual Reports\GIS\GIS Figures\CGS\_WELL\_LOCATIONS\_CCR.mxd -- USER: allicote -- LAST SAVED: 1/29/2020 10:44:31 AM

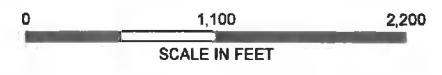


**LEGEND**

-  BACKGROUND WELL
-  PROPERTY BOUNDARY WELL
-  ASH POND WELL
-  CLASS 3 LANDFILL AREA B WELL
-  CLASS 2 LANDFILL WELL
-  CCR BOUNDARY
-  TRANSECT

**NOTES**

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. AERIAL IMAGERY SOURCE: ESRI



SANTEE COOPER  
CROSS GENERATING STATION  
CROSS, SOUTH CAROLINA

**LOCATION OF GROUNDWATER  
MONITORING WELLS FOR  
CCR COMPLIANCE - 2019**

JANUARY 2020

FIGURE 1

**Appendix A – Corrective Measures Assessment 60-Day Extension**

**SANTEE COOPER  
CROSS GENERATING STATION BOTTOM ASH POND  
CERTIFICATION OF 60-DAY EXTENSION OF ASSESSMENT OF CORRECTIVE MEASURES**

The South Carolina Public Service Authority (Santee Cooper) is implementing the April 17, 2015 U.S. EPA Federal Coal Combustion Residuals (CCR) Rule (40 CFR 257 and 261) for the Bottom Ash Pond at Cross Generating Station, located in Berkeley County, South Carolina.


In accordance with 40 CFR 257.95 Santee Cooper initiated an Assessment of Corrective Measures (ACM) for the Bottom Ash Pond. Statistical analysis indicated beryllium, cobalt, and lithium were present at statistically significant levels above the respective groundwater protection standards in one or more monitoring well downgradient of the Bottom Ash Pond.

Pursuant to 40 CFR 257.96(a), Santee Cooper requires the deadline to complete the Assessment of Corrective Measures to be extended an additional 60 days, until September 11, 2019, due to site-specific conditions and circumstances.

The 60-day extension is required because activities are on-going to characterize the nature and extent of the beryllium, cobalt, lithium and relevant site conditions. Evaluation of the site is in progress in accordance with the CCR Rule. The collected data will be incorporated into the conceptual site model (CSM). A representative CSM is necessary for a complete evaluation of the corrective measures that have, and will be, undertaken to meet the requirements of 40 CFR 257.96(c). The need for the extension is also due to weather events impacting accessibility of the site, lack of availability of South Carolina certified well drillers, a lack of availability of the appropriate drilling equipment for heavily wooded remote areas, and delays in receipt of analytical data from certified analytical laboratories. The assessment is in progress as allowed under 40 CFR 257.96(a). An additional 60 days will enable the preparation of the ACM based on a more thorough evaluation of technical data to develop the most appropriate solutions for the protection of groundwater quality.

Pursuant to CFR Title 40 Chapter I Subchapter I Part 257 Subpart D §257.96(a), I certify that the optional 60-day extension to the deadline for the completion of the Assessment of Corrective measures is demonstrated, as described above. The certification submitted is, to the best of my knowledge accurate and complete.

HALEY & ALDRICH, INC.

Signature  7/9/2019

Jeffrey A. Klalber, P.E

Name

22576

Date

Professional Engineer Registration Number

**Appendix B – Corrective Measures Assessment Tables and Figures**

**TABLE 1  
DETECTION MONITORING ANALYTICAL RESULTS  
CROSS GENERATING STATION - BOTTOM ASH POND  
SANTEE COOPER  
CROSS, SOUTH CAROLINA**

Chemical Group				Detection Monitoring - EPA Appendix III Constituents					Field Parameters						
Impoundment	Location	Sample Date	Sample Type	Chemical Name	Boron, Total	Calcium, Total	Chloride	Fluoride	Sulfate	Total Dissolved Solids (TDS)	Dissolved Oxygen	ORP	pH	Temperature	Turbidity
				MCL/RSL Units	- mg/L	- mg/L	- mg/L	4 mg/L	- mg/L	- mg/L	- mg/L	- mg/L	- mg/L	- mv	- pH units
Background	CBW-1	10/19/2015	N		0.032	27	3.21	0.25	81.5	150	0.91	340	4.45	21.29	291
Background	CBW-1	01/26/2016	N		0.0218	27	2.95	0.3	88.2	120	0.8	346	4.12	17.01	7.9
Background	CBW-1	04/19/2016	N		0.0183	29.4	2.33	0.29	86	120	0.5	146	4.33	18.72	0
Background	CBW-1	07/18/2016	N		0.0217	28.7	2.95	0.27	90.1	132	0.84	84	4.38	22.89	0
Background	CBW-1	10/11/2016	N		0.0302	22.7	3	0.28	73.7	151.7	1.08	98	4.14	19.9	1.9
Background	CBW-1	01/23/2017	N		0.0249	26.2	2.45	0.25	77.7	148	0.81	150	4.32	18.58	1.3
Background	CBW-1	04/17/2017	N		0.018	25.6	2.96	0.22	71.2	62	0.72	248	4.26	22.55	2.8
Background	CBW-1	07/25/2017	N		0.022	-	2.61	-	73.3	92	3.52	75	4.21	24.41	0
Background	CBW-1	09/25/2017	N		0.024	21.9	2.51	0.23	74.5	< 40	0.76	142	4.32	25.07	41.3
Background	CBW-1	10/09/2017	N		0.023	23	2.73	0.22	76.8	115	0.83	111	4.25	25.04	0
Background	PM-1	01/26/2015	N		-	-	-	-	-	142.5	0.47	117	4.53	17.13	0
Background	PM-1	02/16/2015	N		-	-	-	-	-	106.2	-	74	4.68	14.88	26.5
Background	PM-1	06/16/2015	N		-	-	-	-	-	158	-	63	4.74	21.8	3.7
Background	PM-1	07/06/2015	N		-	-	-	-	-	151	-	-	5.25	23.05	0.4
Background	PM-1	10/19/2015	N		0.0178	26	12.7	< 0.1	26.5	206	1.33	20	5.47	20.94	19
Background	PM-1	01/26/2016	N		< 0.015	27	11.3	< 0.1	25.5	165	1.2	65	5.2	15.83	22.3
Background	PM-1	04/19/2016	N		< 0.015	23.3	12.1	< 0.1	20.2	130	0.52	81	5.32	18.9	0
Background	PM-1	07/18/2016	N		0.0163	18.8	13.2	< 0.1	16	124	0.97	61	5.2	24.19	0
Background	PM-1	10/11/2016	N		0.0165	16.4	12.8	< 0.1	19.3	200	1.37	54	5.01	19.75	2.2
Background	PM-1	01/23/2017	N		< 0.015	10.4	13.5	< 0.1	8.82	138	0.9	87	5.01	15.45	1.9
Background	PM-1	04/17/2017	N		0.019	12.5	12.7	< 0.1	9.71	56	0.85	84	5.19	21.17	1.4
Background	PM-1	07/12/2017	N		-	18.5	12.1	-	11.1	108	0.87	89	5.11	27.03	0
Background	PM-1	08/31/2017	RS		< 0.015	-	-	-	-	-	0.8	96	5.17	25.04	1.1
Background	PM-1	09/25/2017	N		0.018	15.4	13.3	< 0.1	8.03	< 40	0.92	92	5.27	24.37	0
Background	PM-1	10/09/2017	N		0.021	17	12.6	< 0.1	8.77	80	1.13	66	5.21	24.3	1.6
AshPond	CAP-1	10/21/2015	N		0.281	380	261	0.46	650	1858	0.47	-2	5.26	22.06	0
AshPond	CAP-1	10/21/2015	FD		0.274	380	262	0.44	654	1870	-	-	-	-	-
AshPond	CAP-1	01/25/2016	N		0.0713	140	86.5	0.16	262	792.5	1.16	-32	6.1	15.39	8.6
AshPond	CAP-1	01/25/2016	FD		0.0869	160	113	0.19	300	925	-	-	-	-	-
AshPond	CAP-1	04/19/2016	N		0.159	368	236	0.36	633	1687	0.38	108	5.48	20.04	0
AshPond	CAP-1	07/18/2016	N		0.33	284	220	< 0.1	516	1400	0.61	83	5.13	28.12	0
AshPond	CAP-1	10/12/2016	N		0.298	287	91	0.79	232	1560	0.56	-58	5.24	26.92	0
AshPond	CAP-1	01/26/2017	N		0.24	145	104	0.69	301	804	0.58	47	5.71	18.09	0
AshPond	CAP-1	04/17/2017	N		0.28	334	229	0.66	607	1444	0.86	56	5.37	19.74	0.7
AshPond	CAP-1	07/12/2017	N		-	177	157	-	333	880	1.03	104	5.14	27.07	8.8
AshPond	CAP-1	09/27/2017	N		0.42	181	160	1.4	373	782	0.89	61	5.2	24.33	6.1
AshPond	CAP-1	10/09/2017	N		0.4	300	247	0.95	693	1415	2.46	118	4.65	26.62	0
AshPond	CAP-3	10/19/2015	N		8.4	650	722	0.13	890	3654	0.46	75	6.24	24.17	0
AshPond	CAP-3	10/19/2015	FD		7.98	670	706	0.13	861	3516	-	-	-	-	-
AshPond	CAP-3	01/25/2016	N		6.98	670	1190	0.13	1630	3122	0.84	78	6.39	20.04	9.8
AshPond	CAP-3	04/19/2016	N		6.97	764	727	< 0.1	922	3555	0.46	104	6.35	22.74	0
AshPond	CAP-3	07/18/2016	N		7.21	715	702	< 0.1	863	2898	0.57	106	6.21	24.73	0
AshPond	CAP-3	10/12/2016	N		3.51	430	512	< 0.1	630	2518	0.73	219	6.08	21.55	0
AshPond	CAP-3	01/26/2017	N		8.44	697	726	0.1	929	3020	0.68	112	6.28	18	10
AshPond	CAP-3	03/01/2017	N		-	-	-	-	-	-	-	-	-	-	-
AshPond	CAP-3	04/18/2017	N		7.5	736	688	< 0.1	890	3152	0.79	177	6.25	24.2	0.5
AshPond	CAP-3	07/24/2017	N		-	655	746	-	966	3110	0.61	51	6.31	27.02	0
AshPond	CAP-3	09/27/2017	N		6.7	631	617	< 0.1	869	2788	0.64	131	6.2	27.88	0
AshPond	CAP-3	10/10/2017	N		8.1	710	707	0.11	1030	3550	0.84	72	6.49	23.02	2.3
AshPond	CAP-5	10/21/2015	N		< 0.015	130	359	0.25	4.99	1088	1.05	131	4.86	21.3	0
AshPond	CAP-5	01/25/2016	N		0.0154	110	447	0.36	< 2	915	0.98	353	3.85	19.52	0
AshPond	CAP-5	04/19/2016	N		< 0.015	125	490	0.6	< 2	1048	0.49	299	3.93	21.24	0
AshPond	CAP-5	07/19/2016	N		< 0.015	124	489	0.54	< 2	1094	0.97	245	3.83	26.07	0
AshPond	CAP-5	10/11/2016	N		< 0.015	121	468	0.44	10.8	1095	1.08	216	4	20.77	2
AshPond	CAP-5	01/26/2017	N		0.044	129	517	0.55	< 2	856	0.49	322	3.85	18.53	0
AshPond	CAP-5	03/01/2017	N		-	-	-	-	-	-	-	-	-	-	-

**TABLE 1  
DETECTION MONITORING ANALYTICAL RESULTS  
CROSS GENERATING STATION - BOTTOM ASH POND  
SANTEE COOPER  
CROSS, SOUTH CAROLINA**

Chemical Group				Detection Monitoring - EPA Appendix III Constituents						Field Parameters							
Impoundment	Location	Sample Date	Sample Type	Chemical Name						Dissolved Oxygen	ORP	pH	Temperature	Turbidity			
				MCL/RSL Units	Boron, Total	Calcium, Total	Chloride	Fluoride	Sulfate						Total Dissolved Solids (TDS)	mg/L	mv
				mg/L	mg/L	mg/L	4 mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
AshPond	CAP-5	04/18/2017	N	< 0.015	136	523	0.52	< 2	1054	0.7	295	3.9	21.45	0			
AshPond	CAP-5	07/24/2017	N	-	130	527	-	< 2	1170	0.81	128	3.81	21.8	3.9			
AshPond	CAP-5	09/27/2017	N	< 0.015	134	546	0.57	< 2	1046	0.73	286	3.85	25.12	0			
AshPond	CAP-5	10/10/2017	N	< 0.015	150	552	0.57	< 2	1293	0.84	159	4.06	25.14	0			
AshPond	CAP-7	10/21/2015	N	20.7	780	1440	0.12	1910	5026	1.12	102	5.29	23.36	0			
AshPond	CAP-7	01/25/2016	N	19.4	770	1390	0.15	2020	4795	0.92	78	5.42	19.3	8.7			
AshPond	CAP-7	04/19/2016	N	17.2	888	1340	< 0.1	1890	5033	0.4	109	5.32	20.72	0			
AshPond	CAP-7	07/19/2016	N	22.1	856	1520	< 0.1	2050	4982	0.67	72	5.49	31.55	2.8			
AshPond	CAP-7	10/11/2016	N	20.3	901	1510	0.16	1960	5282	0.81	83	5.39	22.34	0			
AshPond	CAP-7	01/28/2017	N	20.8	830	1390	< 0.1	1850	4782	0.66	110	5.37	19.04	0			
AshPond	CAP-7	03/01/2017	N	-	-	-	-	-	-	-	-	-	-	-			
AshPond	CAP-7	04/19/2017	N	20	900	1450	< 0.1	1820	4920	0.91	114	5.4	20.26	0			
AshPond	CAP-7	07/12/2017	N	-	855	1560	-	2000	4660	1.05	126	5.41	28.87	0			
AshPond	CAP-7	09/27/2017	N	24	836	1510	< 0.1	1960	4818	1.19	121	5.28	27.59	0			
AshPond	CAP-7	10/10/2017	N	24	880	1610	0.15	2200	5083	0.68	100	5.41	25.42	0			
AshPond	CAP-9	10/21/2015	N	4.46	430	1080	1.6	281	3192	0.92	313	3.71	24.11	0			
AshPond	CAP-9	01/25/2016	N	4.83	410	1030	1.41	284	2498	0.98	430	3.31	19.33	7.8			
AshPond	CAP-9	04/19/2016	N	4.21	459	1020	2.21	279	2905	0.48	345	3.55	22.57	0			
AshPond	CAP-9	04/19/2016	FD	3.98	464	1010	2.27	280	2875	-	-	-	-	-			
AshPond	CAP-9	07/19/2016	N	5.2	500	1080	1.93	345	2990	0.67	316	3.76	28.22	0			
AshPond	CAP-9	07/19/2016	FD	5.08	495	1090	2	351	2815	-	-	-	-	-			
AshPond	CAP-9	10/11/2016	N	5.24	432	1010	1.8	327	2900	0.96	271	3.71	21.93	3.8			
AshPond	CAP-9	10/11/2016	FD	4.59	424	1020	1.75	313	2728	-	-	-	-	-			
AshPond	CAP-9	01/28/2017	N	4.94	454	1010	2.25	333	2358	0.55	421	3.25	19.95	0			
AshPond	CAP-9	01/28/2017	FD	5.13	457	1010	2.22	327	2406	-	-	-	-	-			
AshPond	CAP-9	03/01/2017	N	-	-	-	-	-	-	-	-	-	-	-			
AshPond	CAP-9	03/01/2017	FD	-	-	-	-	-	-	-	-	-	-	-			
AshPond	CAP-9	04/19/2017	N	5.6	497	1020	2.16	358	3074	0.61	324	3.67	21.77	0			
AshPond	CAP-9	04/19/2017	FD	5.6	484	1030	2.33	349	3032	-	-	-	-	-			
AshPond	CAP-9	07/12/2017	N	-	489	1000	-	417	2526	0.84	303	3.88	30.4	0			
AshPond	CAP-9	09/27/2017	N	6.3	469	1160	4.4	498	2806	0.63	276	3.76	27.37	0.5			
AshPond	CAP-9	09/27/2017	FD	6	470	1160	3.1	452	2830	-	-	-	-	-			
AshPond	CAP-9	10/10/2017	N	6.2	490	1090	3.92	485	3013	0.63	253	3.92	25.64	0			
AshPond	CAP-9	10/10/2017	FD	6.5	520	1070	3.9	452	3155	-	-	-	-	-			

**ABBREVIATIONS AND NOTES:**

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uS/cm: microSiemen per centimeter

mv: millivolt

NTU: Nephelometric Turbidity Units

< 0.005: Analyte not detected above detection limit

-: Not Analyzed

MCL/RSL: The applicable Maximum Contaminant Level (MCL) or Regional Screening Level (RSL) is shown. Dashed where a standard is not provided.

FD: Field duplicate

RS: Resample

-Highlighted where a result exceeds the applicable MCL/RSL.

- Criteria used for cobalt, lithium, and molybdenum are RSL for Tapwater where THQ=1.0 (May 2018)

- USEPA. 2016. Final Rule: Disposal of Coal Combustion Residuals from

Electric Utilities. July 26. 40 CFR Part 257.

<https://www.epa.gov/coalash/coal-ash-rule>



**TABLE 2**  
**ASSESSMENT MONITORING ANALYTICAL RESULTS**  
**CROSS GENERATING STATION - BOTTOM ASH POND**  
**Santee Cooper**  
**CROSS, SOUTH CAROLINA**

Impoundment	Location	Sample Date	Sample Type	Chemical Group Chemical Name MCL/RSL Units	Assessment Monitoring - EPA Appendix IV Constituents												Radiological				
					Antimony, Total 0.006 mg/L	Arsenic, Total 0.01 mg/L	Barium, Total 2 mg/L	Beryllium, Total 0.004 mg/L	Cadmium, Total 0.005 mg/L	Chromium, Total 0.1 mg/L	Cobalt, Total 0.006 mg/L	Fluoride 4 mg/L	Lead, Total 0.015 mg/L	Lithium, Total 0.04 mg/L	Mercury, Total 0.002 mg/L	Molybdenum, Total 0.1 mg/L	Selenium, Total 0.05 mg/L	Thallium, Total 0.002 mg/L	Radium-226 - pCi/L	Radium-228 - pCi/L	Radium-226 & 228 5 pCi/L
Background	CBW-1	02/07/2018	N		< 0.005	< 0.005	0.0436	< 0.0005	< 0.0005	< 0.005	0.00088	0.19	0.0027	< 0.01	< 0.0002	< 0.01	< 0.01	< 0.001	1 U	3 U	4 U
Background	CBW-1	08/20/2018	N		< 0.025	< 0.005	0.043	< 0.0005	< 0.0005	< 0.005	0.001	0.2	0.003	< 0.01	< 0.0002	< 0.01	< 0.01	< 0.001	1 U	3 U	4 U
Background	CBW-1	10/01/2018	N		-	< 0.005	0.0428	< 0.0005	-	-	0.00076	0.19	0.0031	< 0.01	< 0.0002	-	< 0.01	-	2.11	3 U	5.11 J
Background	CBW-1	11/29/2018	RS		-	-	-	-	-	-	-	-	-	< 0.0002	-	-	-	-	-	-	-
Background	CBW-1	02/12/2019	N		< 0.005	< 0.005	0.0427	< 0.0005	< 0.005	0.00084	0.18	0.0025	< 0.01	< 0.0002	< 0.01	< 0.01	< 0.001	1 U	3 U	0.346	
Background	PM-1	02/07/2018	N		< 0.005	< 0.005	0.0756	< 0.0005	< 0.0005	< 0.005	0.00089	< 0.1	< 0.001	< 0.01	< 0.0002	< 0.01	< 0.01	< 0.001	1 U	3 U	4 U
Background	PM-1	08/20/2018	N		< 0.025	< 0.005	0.103	< 0.0005	< 0.0005	< 0.005	0.001	< 0.1	< 0.001	< 0.01	< 0.0002	< 0.01	< 0.01	< 0.001	4.09	3 U	7.09 J
Background	PM-1	10/01/2018	N		-	< 0.005	0.0769	< 0.0005	-	-	0.00084	< 0.1	< 0.001	< 0.01	< 0.0002	-	< 0.01	-	13.3	3 U	16.3 J
Background	PM-1	11/29/2018	RS		-	-	-	-	-	-	-	-	-	< 0.0002	-	-	-	-	-	-	-
Background	PM-1	02/12/2019	N		< 0.005	< 0.005	0.0817	< 0.0005	< 0.0005	< 0.005	0.00091	< 0.1	< 0.001	< 0.01	< 0.0002	< 0.01	< 0.01	< 0.001	1 U	3 U	0.585
AshPond	CAP-1	02/21/2018	N		< 0.005	< 0.005	0.042	< 0.0005	< 0.005	-	-	-	-	-	-	-	-	-	-	-	-
AshPond	CAP-1	08/26/2018	N		< 0.025	< 0.005	0.033	0.01	< 0.0005	< 0.005	0.024	0.63	< 0.001	0.13	< 0.0002	< 0.01	< 0.01	< 0.001	2.14	3 U	5.14 J
AshPond	CAP-1	10/02/2018	N		-	< 0.005	0.0442	0.0062	-	-	0.0187	1.97	0.0018	0.11	-	-	< 0.01	-	2.24	3 U	5.24 J
AshPond	CAP-1	10/02/2018	FD		-	< 0.005	0.0406	0.0059	-	-	0.02	1.82	0.0011	0.12	-	-	< 0.01	-	3.97	3 U	6.97 J
AshPond	CAP-1	02/14/2019	N		< 0.005	< 0.005	0.0543	0.0067	< 0.0005	< 0.005	0.0172	1.74	< 0.001	0.078	< 0.0002	< 0.01	< 0.01	< 0.001	1 U	3 U	2.1
AshPond	CAP-3	02/27/2018	N		-	< 0.005	0.237	-	< 0.0005	< 0.005	-	-	-	-	-	-	-	-	-	-	-
AshPond	CAP-3	08/20/2018	N		< 0.025	< 0.005	0.089	< 0.0005	< 0.0005	< 0.005	0.026	0.12	< 0.001	0.011	< 0.0002	< 0.01	< 0.01	< 0.001	0.868	3 U	3.868 J
AshPond	CAP-3	10/01/2018	N		-	< 0.005	0.0761	< 0.0005	-	-	0.0251	< 0.1	< 0.001	< 0.01	-	-	< 0.01	-	1 U	3 U	4 U
AshPond	CAP-3	02/14/2019	N		< 0.005	< 0.005	0.0852	< 0.0005	< 0.0005	< 0.005	0.0267	< 0.1	< 0.001	0.011	< 0.0002	< 0.01	< 0.01	< 0.001	1 U	3 U	2.14
AshPond	CAP-5	02/26/2018	N		< 0.005	< 0.005	1.43	< 0.0005	< 0.0005	< 0.005	-	-	-	-	-	-	-	-	-	-	-
AshPond	CAP-5	08/25/2018	N		< 0.025	< 0.005	1.43	0.005	< 0.0005	< 0.005	0.013	0.1	0.007	0.012	< 0.0002	< 0.01	< 0.01	< 0.001	6.71	10.8	17.51
AshPond	CAP-5	10/01/2018	N		-	< 0.005	1.29	0.0035	-	-	0.0124	0.54	0.008	0.012	-	-	< 0.01	-	8.48	4.05	12.51
AshPond	CAP-5	02/18/2019	N		< 0.005	< 0.005	1.49	0.0048	< 0.0005	< 0.005	0.0155	0.63	0.0053	0.012	< 0.0002	< 0.01	< 0.01	< 0.001	4.09	10.5	14.6
AshPond	CAP-7	02/26/2018	N		-	< 0.005	0.0287	-	< 0.0005	< 0.005	-	-	-	-	-	-	-	-	-	-	-
AshPond	CAP-7	08/25/2018	N		< 0.025	< 0.005	0.031	< 0.0005	< 0.0005	< 0.005	0.009	< 0.1	< 0.001	< 0.01	< 0.0002	< 0.01	< 0.01	< 0.001	3.56	3 U	6.56 J
AshPond	CAP-7	10/01/2018	N		-	0.0052	0.0363	< 0.0005	-	-	0.0102	0.11	< 0.01	< 0.01	-	-	< 0.01	-	2.99	3 U	5.99 J
AshPond	CAP-7	02/18/2019	N		< 0.005	< 0.005	0.0312	< 0.0005	< 0.0005	< 0.005	0.0095	< 0.1	< 0.001	< 0.01	< 0.0002	< 0.01	< 0.01	< 0.001	1 U	3.05	3.72
AshPond	CAP-9	02/22/2018	N		-	0.0067	0.048	-	< 0.0005	< 0.005	-	-	-	-	-	-	-	-	-	-	-
AshPond	CAP-9	08/25/2018	N		< 0.025	0.006	0.041	0.018	< 0.0005	< 0.005	0.038	0.5	0.009	0.051	< 0.0002	< 0.01	0.031	< 0.001	1 U	3.81	4.81 J
AshPond	CAP-9	08/25/2018	FD		< 0.025	0.006	0.042	0.018	< 0.0005	< 0.005	0.037	1.43	0.009	0.06	< 0.0002	< 0.01	0.028	< 0.001	1 U	3 U	4 U
AshPond	CAP-9	10/01/2018	N		-	0.0103	0.061	0.0123	-	-	0.036	2.62	0.0137	0.062	-	-	< 0.01	-	4.31	3 U	7.31 J
AshPond	CAP-9	02/18/2019	N		< 0.005	0.0056	0.0161	0.0152	< 0.0005	< 0.005	0.0169	3.56	0.0032	0.056	< 0.0002	< 0.04	< 0.01	< 0.001	1 U	3 U	1.19
AshPond	CAP-9	02/18/2019	FD		< 0.005	0.0055	0.0508	0.015	< 0.0005	< 0.005	0.0365	3.53	0.0123	0.056	< 0.0002	< 0.04	< 0.01	< 0.001	1 U	2.77	3.25

**ABBREVIATIONS AND NOTES:**

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 < 0.005: Analyte not detected above detection limit  
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- Criteria used for cobalt, lithium, and molybdenum are RSL for Tapwater where THQ=1.0 (May 2018)  
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**TABLE 2**  
**ASSESSMENT MONITORING ANALYTICAL RESULTS**  
**CROSS GENERATING STATION - BOTTOM ASH POND**  
**SANTEE COOPER**  
**CROSS, SOUTH CAROLINA**

Chemical Group				Field Parameters						
Impoundment	Location	Sample Date	Sample Type	Chemical Name	Conductivity	Dissolved Oxygen	ORP	pH	Temperature	Turbidity
				MCL/RSL	uS/cm	mg/L	mv	pH units	Deg C	NTU
Background	CBW-1	02/07/2018	N	-	199	0.93	138	4.42	19.15	0.9
Background	CBW-1	06/20/2018	N	-	196	0.85	105	4.32	22.69	1.9
Background	CBW-1	10/01/2018	N	-	196	0.92	127	4.09	23.78	0
Background	CBW-1	11/29/2018	RS	-	-	-	-	-	-	-
Background	CBW-1	02/12/2019	N	-	202	0.99	111	4.5	18.04	0.5
Background	PM-1	02/07/2018	N	-	188	1.09	85	5.29	17.02	1
Background	PM-1	06/20/2018	N	-	279	0.81	123	5.58	23.54	1.6
Background	PM-1	10/01/2018	N	-	201	0.99	104	5.08	25.31	0
Background	PM-1	11/29/2018	RS	-	-	-	-	-	-	-
Background	PM-1	02/12/2019	N	-	191	0.92	78	5.47	17.02	9.4
AshPond	CAP-1	02/21/2018	N	-	1500	0.82	88	5.1	22.74	9.3
AshPond	CAP-1	06/26/2018	N	-	1920	0.52	111	4.62	27.58	8.9
AshPond	CAP-1	10/02/2018	N	-	1480	0.97	133	4.86	23.71	7.3
AshPond	CAP-1	10/02/2018	FD	-	-	-	-	-	-	-
AshPond	CAP-1	02/14/2019	N	-	1910	0.76	64	5.25	17.52	0
AshPond	CAP-3	02/27/2018	N	-	1300	1.03	1	6.15	18.01	7.3
AshPond	CAP-3	06/20/2018	N	-	3140	0.62	87	6.28	29.71	0
AshPond	CAP-3	10/01/2018	N	-	3400	0.76	100	5.97	26.67	0
AshPond	CAP-3	02/14/2019	N	-	1470	1.61	43	6.23	19.55	4.7
AshPond	CAP-5	02/26/2018	N	-	1900	0.69	270	3.9	18.84	0
AshPond	CAP-5	06/25/2018	N	-	1750	0.63	74	3.95	23.95	0
AshPond	CAP-5	10/01/2018	N	-	1720	0.69	228	3.72	29.4	0
AshPond	CAP-5	02/18/2019	N	-	2020	0.9	258	3.93	18.99	0
AshPond	CAP-7	02/26/2018	N	-	670	0.97	110	5.39	18.97	1.6
AshPond	CAP-7	06/25/2018	N	-	6480	0.67	90	5.48	26.18	0
AshPond	CAP-7	10/01/2018	N	-	6560	0.78	127	5.08	25.52	0
AshPond	CAP-7	02/18/2019	N	-	6890	0.81	90	5.5	19.03	0
AshPond	CAP-9	02/22/2018	N	-	3990	0.71	335	3.58	23.15	0
AshPond	CAP-9	06/25/2018	N	-	3770	0.57	175	3.92	28.16	7.1
AshPond	CAP-9	06/25/2018	FD	-	-	-	-	6.89	-	-
AshPond	CAP-9	10/01/2018	N	-	4080	0.87	281	3.46	25.84	0
AshPond	CAP-9	02/18/2019	N	-	4080	0.86	297	3.65	19.43	0
AshPond	CAP-9	02/18/2019	FD	-	-	-	-	-	-	-

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**TABLE 3  
SUMMARY OF GROUNDWATER MEASUREMENTS  
CROSS GENERATING STATION - BOTTOM ASH POND  
SANTEE COOPER  
CROSS, SOUTH CAROLINA**

Location	Measurement Date	Depth to Water	Groundwater Elevation
CBW-1	10/19/2015	7.78	78.02
CBW-1	1/26/2016	8.11	77.69
CBW-1	4/19/2016	9.13	76.67
CBW-1	7/18/2016	10.67	75.13
CBW-1	10/11/2016	7.32	78.48
CBW-1	1/23/2017	8.33	77.47
CBW-1	4/17/2017	8.90	76.90
CBW-1	7/25/2017	8.99	76.81
CBW-1	9/25/2017	8.80	77.00
CBW-1	10/9/2017	9.73	76.07
CBW-1	2/7/2018	9.80	76.00
CBW-1	6/20/2018	10.35	75.45
CBW-1	10/1/2018	10.51	75.29
CBW-1	2/12/2019	8.66	77.14
CBW-1	5/20/2019	8.66	77.14
PM-1	1/26/2015	7.25	75.99
PM-1	2/16/2015	7.60	75.64
PM-1	6/16/2015	7.92	75.32
PM-1	7/6/2015	8.45	74.79
PM-1	10/19/2015	7.42	75.82
PM-1	1/26/2016	7.03	76.21
PM-1	4/19/2016	7.62	75.62
PM-1	7/18/2016	8.36	74.88
PM-1	10/11/2016	7.10	76.14
PM-1	1/23/2017	7.16	76.08
PM-1	4/17/2017	7.48	75.76
PM-1	7/12/2017	7.58	75.66
PM-1	8/31/2017	7.11	76.13
PM-1	9/25/2017	7.81	75.43
PM-1	10/9/2017	8.42	74.82
PM-1	2/7/2018	7.91	75.33
PM-1	6/20/2018	8.88	74.36
PM-1	10/1/2018	8.01	75.23
PM-1	2/12/2019	7.32	75.92
PM-1	5/20/2019	8.52	74.72
CAP-1	1/26/2015	5.07	77.63
CAP-1	7/6/2015	6.81	75.89
CAP-1	10/21/2015	5.28	77.42
CAP-1	1/25/2016	5.15	77.55
CAP-1	4/19/2016	5.50	77.20
CAP-1	7/18/2016	7.92	74.78
CAP-1	10/12/2016	4.77	77.93
CAP-1	1/26/2017	5.24	77.46
CAP-1	4/17/2017	5.49	77.21
CAP-1	7/12/2017	7.14	75.56
CAP-1	9/27/2017	5.77	76.93
CAP-1	10/9/2017	6.30	76.40
CAP-1	2/21/2018	5.97	76.73
CAP-1	6/26/2018	6.65	70.05
CAP-1	10/2/2018	6.56	76.14
CAP-1	2/14/2019	5.40	77.30
CAP-1	5/21/2019	6.78	75.92
CAP-3	1/28/2015	14.71	76.78
CAP-3	7/8/2015	16.23	75.26
CAP-3	10/19/2015	14.48	77.01
CAP-3	1/25/2016	14.35	77.14
CAP-3	4/19/2016	14.70	76.79

**TABLE 3  
SUMMARY OF GROUNDWATER MEASUREMENTS  
CROSS GENERATING STATION - BOTTOM ASH POND  
SANTEE COOPER  
CROSS, SOUTH CAROLINA**

Location	Measurement Date	Depth to Water	Groundwater Elevation
CAP-3	7/18/2016	16.17	75.32
CAP-3	10/12/2016	14.09	77.40
CAP-3	1/26/2017	14.45	77.04
CAP-3	3/1/2017	14.79	76.70
CAP-3	4/18/2017	14.61	76.88
CAP-3	7/24/2017	15.11	76.38
CAP-3	9/27/2017	14.82	76.67
CAP-3	10/10/2017	15.61	75.88
CAP-3	2/27/2018	15.41	76.08
CAP-3	6/20/2018	15.75	75.74
CAP-3	10/1/2018	16.04	75.45
CAP-3	2/14/2019	14.39	77.10
CAP-3	5/21/2019	16.05	75.44
CAP-5	1/27/2015	14.42	77.36
CAP-5	7/7/2015	17.86	73.92
CAP-5	10/21/2015	14.83	76.95
CAP-5	1/25/2016	14.46	77.32
CAP-5	4/19/2016	15.21	76.57
CAP-5	7/19/2016	18.04	73.74
CAP-5	10/11/2016	14.26	77.52
CAP-5	1/26/2017	14.57	77.21
CAP-5	3/1/2017	15.23	76.55
CAP-5	4/18/2017	15.11	76.67
CAP-5	7/24/2017	16.51	75.27
CAP-5	9/27/2017	15.71	76.07
CAP-5	10/10/2017	16.18	75.60
CAP-5	2/26/2018	15.69	76.09
CAP-5	6/25/2018	17.85	73.93
CAP-5	10/1/2018	17.56	74.22
CAP-5	2/18/2019	14.89	76.89
CAP-5	5/22/2019	18.01	73.77
CAP-7	1/27/2015	14.32	77.32
CAP-7	7/7/2015	16.98	74.66
CAP-7	10/21/2015	14.39	77.25
CAP-7	1/25/2016	14.26	77.38
CAP-7	4/19/2016	14.90	76.74
CAP-7	7/19/2016	16.65	74.99
CAP-7	10/11/2016	13.96	77.68
CAP-7	1/26/2017	14.30	77.34
CAP-7	3/1/2017	14.81	76.83
CAP-7	4/19/2017	14.81	76.83
CAP-7	7/12/2017	15.34	76.30
CAP-7	9/27/2017	14.88	76.76
CAP-7	10/10/2017	15.39	76.25
CAP-7	2/26/2018	15.01	76.63
CAP-7	6/25/2018	16.79	74.85
CAP-7	10/1/2018	16.30	75.34
CAP-7	2/18/2019	14.57	77.07
CAP-7	5/22/2019	16.82	74.82
CAP-9	1/27/2015	14.23	77.36
CAP-9	7/7/2015	16.72	74.87
CAP-9	10/21/2015	14.17	77.42
CAP-9	1/25/2016	14.14	77.45
CAP-9	4/19/2016	14.51	77.08
CAP-9	7/19/2016	15.10	76.49
CAP-9	10/11/2016	13.75	77.84
CAP-9	1/26/2017	14.13	77.46

Location	Measurement Date	Depth to Water	Groundwater Elevation
CAP-9	3/1/2017	14.42	77.17
CAP-9	4/19/2017	14.50	77.09
CAP-9	7/12/2017	14.52	77.07
CAP-9	9/27/2017	14.31	77.28
CAP-9	10/10/2017	14.67	76.92
CAP-9	2/22/2018	14.41	77.18
CAP-9	6/25/2018	16.11	75.48
CAP-9	10/1/2018	14.86	76.73
CAP-9	2/18/2019	14.37	77.22
CAP-9	5/22/2019	16.56	75.03
CCMAP-1	6/4/2019	8.39	71.82
CCMAP-2	6/4/2019	8.28	72.96

**Notes and Abbreviations:**

-. Not Collected

**TABLE 4**  
**SUMMARY OF GROUNDWATER ANALYTICAL RESULTS FOR NATURE AND EXTENT**  
**CROSS GENERATING STATION - BOTTOM ASH POND**  
**SANTEE COOPER**  
**CROSS, SOUTH CAROLINA**

Impoundment	Location	Sample Date	Sample Type	Chemical Group	Detection Monitoring - EPA Appendix III Constituents				Assessment Monitoring - EPA Appendix IV Constituents			Field Parameters					Dissolved Metals							
				Chemical Name	Calcium, Total	Chloride	Sulfate	Total Dissolved Solids (TDS)	Beryllium, Total	Cobalt, Total	Lithium, Total	Conductivity	Dissolved Oxygen	ORP	pH	Temperature	Turbidity	Beryllium, Dissolved	Calcium, Dissolved	Cobalt, Dissolved	Iron, Dissolved	Lithium, Dissolved	Magnesium, Dissolved	Manganese, Dissolved
					MCL/RSL Units	mg/L	mg/L	mg/L	mg/L	0.004 mg/L	0.006 mg/L	0.04 mg/L	uS/cm	mg/L	mv	pH units	Deg C	NTU	0.004 mg/L	mg/L	0.006 mg/L	mg/L	0.04 mg/L	mg/L
Background	CBW-1	05/20/2019	N		42.2	2.9	115	181.2	< 0.0005	0.00079	< 0.01	202	0.99	111	4.5	18.04	0.5	< 0.0005	41.1	0.00075	< 0.05	< 0.01	2.3	0.015
Background	PM-1	05/20/2019	N		16.4	12.7	10.5	162.5	< 0.0005	0.00091	< 0.01	187	0.77	39	5.26	25.6	0	< 0.0005	15.8	0.00088	15.6	< 0.01	0.8	0.0135
AshPond	CAP-1	05/21/2019	N		291	256	704	1392	0.0111	0.024	0.12	1770	0.87	98	4.73	25.59	64	0.0094	297	0.0227	42.3	0.11	8.1	0.148
AshPond	CAP-3	05/21/2019	N		514	634	907	3080	< 0.0005	0.0273	0.011	3250	0.54	84	6.35	28.9	1.4	< 0.0005	550	0.0238	0.692	< 0.01	56.5	2.44
AshPond	CAP-4	02/21/2019	N		695	996	888	4060	< 0.0005	< 0.0005	0.028	4670	0.78	0	6.3	19.64	0.4	-	-	-	-	-	-	-
AshPond	CAP-4	02/21/2019	FD		-	-	-	-	< 0.0005	< 0.0005	0.028	-	-	-	-	-	-	-	-	-	-	-	-	-
AshPond	CAP-4	07/09/2019	N		577	940	793	4459	< 0.0005	< 0.0005	0.028	4170	1.89	444	7.02	25.25	0	-	-	-	-	-	-	-
AshPond	CAP-5	05/22/2019	N		149	578	< 2	1624	0.0046	0.014	0.012	1970	3.8	104	3.96	21.99	3.8	0.0044	139	0.0135	94.6	0.013	3.5	0.0573
AshPond	CAP-6	02/21/2019	N		291	425	180	1998	< 0.0005	< 0.0005	< 0.01	1890	3.85	125	7.19	18.55	1.3	-	-	-	-	-	-	-
AshPond	CAP-6	02/21/2019	FD		-	-	-	-	< 0.0005	< 0.0005	< 0.01	-	-	-	-	-	-	-	-	-	-	-	-	-
AshPond	CAP-6	07/10/2019	N		305	428	185	1955	< 0.0005	< 0.0005	< 0.01	1910	0.47	-201	7.06	22.02	0	-	-	-	-	-	-	-
AshPond	CAP-7	05/22/2019	N		867	1680	1700	5512	< 0.0005	0.0091	< 0.01	6880	0.79	81	5.47	23.34	0	< 0.0001	786	0.0091	214	< 0.01	225	7.11
AshPond	CAP-9	05/22/2019	N		509	1060	518	3422	0.0179	0.0372	0.06	-	-	-	-	-	-	0.0148	477	0.0372	82.2	0.059	47.9	0.89
AshPond	CAP-9	05/22/2019	N		518	1070	541	3359	0.0157	0.0383	0.065	4020	0.66	252	3.86	24.63	0	0.015	472	0.0365	84.3	0.062	49.9	0.903
AshPond	CAP-8	02/21/2019	N		773	1200	1250	5144	< 0.0005	0.0028	0.048	5560	8.22	138	7.24	18.32	2.2	-	-	-	-	-	-	-
AshPond	CAP-8	02/21/2019	FD		-	-	-	-	< 0.0005	0.003	0.048	-	-	-	-	-	-	-	-	-	-	-	-	-
AshPond	CAP-8	07/10/2019	N		810	1210	1290	5074	< 0.0005	0.00309	0.052	5410	2.5	103	6.81	21.79	0	-	-	-	-	-	-	-
AshPond	CAP-10	02/20/2019	N		72.9	18.5	10.9	288.8	< 0.0005	< 0.0005	< 0.01	471	4.33	228	7.57	17.34	0	-	-	-	-	-	-	-
AshPond	CAP-10	02/20/2019	FD		-	-	-	-	< 0.0005	< 0.0005	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AshPond	CAP-10	07/10/2019	N		76.9	18.2	9.45	450	< 0.0005	< 0.0005	< 0.01	448	3.31	53	7.35	22.34	0	-	-	-	-	-	-	-
AshPond	CCMAP-1	06/04/2019	N		79.9	6.5	< 2	231.2	< 0.0005	0.00119	0.011	-	-	-	-	-	-	< 0.0005	58.6	< 0.001	0.229	< 0.01	2	0.177
AshPond	CCMAP-1	06/04/2019	FD		72.8	6.31	< 2	263.8	< 0.0005	0.00103	< 0.01	-	-	-	-	-	-	< 0.0005	54.6	< 0.001	0.159	< 0.01	2.01	0.176
AshPond	CCMAP-2	06/04/2019	N		11.2	4.95	< 2	71.25	< 0.0005	< 0.001	< 0.01	-	-	-	-	-	-	< 0.0005	11.7	< 0.001	< 0.1	< 0.01	0.37	0.0232
AshPond_Tran1	CCMAPT 1-1S	05/17/2019	N		494	887	385	3201	0.0042	0.0277	0.017	3420	2.17	146	4.38	22.7	>1000	0.0031	490	0.024	2.42	0.018	31.8	0.746
AshPond_Tran1	CCMAPT 1-2S	05/17/2019	N		34.5	97.2	13.3	377.5	0.0023	0.0323	< 0.01	362	3.37	197	4.99	25.54	455	0.0022	32.9	0.0282	0.663	< 0.01	5.8	0.219
AshPond_Tran1	CCMAPT 1-3S	05/17/2019	N		75	185	18.7	595	0.0158	0.0726	0.015	527	0.96	187	4.97	27.69	155	0.002	67.7	0.0204	2.8	0.013	7.8	0.172
AshPond_Tran1	CCMAPT 1-4S	05/24/2019	N		11.6	12.1	< 2	136.2	0.0133	0.102	0.013	77	-	120	6.88	17.95	>1000	< 0.0005	5.9	0.0036	0.077	< 0.01	0.44	0.0934
AshPond_Tran1	CCMAPT 1-5S	05/24/2019	N		1.5	6.47	< 2	76.25	0.00079	0.0061	< 0.01	96	-	32	2.46	19.78	300	< 0.0005	1.6	0.0044	11.5	< 0.01	0.58	0.124
AshPond_Tran1	CCMAPT 1-6	05/30/2019	N		7000	9.9	< 2	423.8	< 0.004	0.0055	0.011	138	6.27	100	5.73	25.33	>1000	< 0.004	5900	0.0012	3.8	0.011	750	0.026
AshPond_Tran1	CCMAPT 1-7	05/30/2019	N		120000	< 2	< 2	273.8	< 0.004	0.0086	< 0.01	181	6.33	11	33.95	>1000	< 0.004	84000	0.0029	0.48	< 0.01	3100	0.47	
AshPond_Tran2	CCMAPT 2-2S	05/23/2019	N		18.9	6.1	2.65	348.8	0.0013	0.0045	< 0.01	159	6.31	135	6.86	28.72	>1000	< 0.0005	14.7	0.00084	0.666	< 0.01	0.66	0.0166
AshPond_Tran2	CCMAPT 2-3S	05/22/2019	N		81	15.9	< 2	438.8	0.011	0.0156	0.018	355	4.57	23	7.46	34.09	682	0.0021	72.3	0.0021	3	0.01	1.1	0.188
AshPond_Tran2	CCMAPT 2-4S	05/22/2019	N		499	568	489	2534	0.00092	0.149	< 0.01	2500	2.81	28	6.74	31.48	>1000	< 0.0005	46	0.13	1.93	< 0.01	18.6	1.8
AshPond_Tran2	CCMAPT 2-5S	05/22/2019	N		10.4	43.8	< 2	142.5	0.00065	0.0628	< 0.01	184	3.9	107	5.3	21.46	752	0.00061	10.9	0.0598	2.58	< 0.01	3.8	0.511
AshPond_Tran2	CCMAPT 2-6S	05/22/2019	N		3.3	7.13	< 2	58.75	0.00087	0.004	< 0.01	76	6.42	94	5.08	19.93	508	< 0.0005	3.1	0.00084	1.28	< 0.01	0.59	0.0599
AshPond_Tran2	CLMAPT 2-1S	05/16/2019	N		373	991	683	2746	0.012	0.0365	0.047	336	1.3	206	4.11	26.33	>1000	0.011	338	0.0292	135	0.043	46.4	0.698

**ABBREVIATIONS AND NOTES:**  
 mg/L: milligram per liter  
 uS/cm: microSiemen per centimeter  
 mv: millivolt  
 NTU: Nephelometric Turbidity Units  
 < 0.005: Analyte not detected above detection limit  
 -: Not Analyzed  
 MCL/RSL: The applicable Maximum Contaminant Level (MCL) or Regional Screening Level (RSL) is shown. Dashed where a standard is not provided.  
 FD: Field Duplicate  
 Highlighted where result exceeds the applicable MCL/RSL  
 Bold where detected above method detection limit  
 >1000: Turbidity greater than instrument limit

- Criteria used for cobalt, lithium, and molybdenum are RSL for Tapwater where THQ=1.0 (May 2018)  
 - USEPA. 2016. Final Rule: Disposal of Coal Combustion Residuals from Electric Utilities. July 26. 40 CFR Part 257.  
<https://www.epa.gov/coalash/coal-ash-rule>

**QUALIFIERS:**  
 U: Not detected, value is the laboratory reporting limit

TABLE 4  
SUMMARY OF GROUNDWATER ANALYTICAL RESULTS FROM  
CROSS GENERATING STATION - BOTTOM ASH POND  
SANTEE COOPER  
CROSS, SOUTH CAROLINA

Impoundment	Location	Sample Date	Chemical Group Chemical Name MCL/RSL Units Sample Type	Metals		Total Metals					Other				
				Potassium, Dissolved	Sodium, Dissolved	Iron, Total	Magnesium, Total	Manganese, Total	Potassium, Total	Sodium, Total	Alkalinity, Bicarbonate	Alkalinity, Total (as CaCO3)	Dissolved Organic Carbon (DOC)	Sulfide	Total Organic Carbon (TOC)
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Background	CBW-1	05/20/2019	N	0.58	1.9	0.141	2.1	0.0147	0.57	1.8	19.7	19.7	3.21	< 0.1	2.71
Background	PM-1	05/20/2019	N	0.57	5.5	16.9	0.75	0.0122	0.57	5.3	58.6	58.6	7.21	< 0.1	6.72
AshPond	CAP-1	05/21/2019	N	0.56	67	42.4	8.2	0.131	0.57	66.7	25.8	25.8	6.57	< 0.1	7.5
AshPond	CAP-3	05/21/2019	N	3.5	87.4	1.36	59.1	2.77	3.9	91.7	333	333	3.58	< 0.1	3.54
AshPond	CAP-4	02/21/2019	N	-	-	12	77.9	-	8.4	126	-	-	-	-	-
AshPond	CAP-4	02/21/2019	FD	-	-	-	-	-	-	-	-	-	-	-	-
AshPond	CAP-4	07/09/2019	N	-	-	< 0.05	68.6	-	7.9	121	-	-	-	-	-
AshPond	CAP-5	05/22/2019	N	0.66	78.6	0.0576	3.7	0.0576	0.72	87	< 4	< 4	3.23	< 0.1	2.34
AshPond	CAP-6	02/21/2019	N	-	-	0.569	6	-	1.8	41.9	-	-	-	-	-
AshPond	CAP-6	02/21/2019	FD	-	-	-	-	-	-	-	-	-	-	-	-
AshPond	CAP-6	07/10/2019	N	-	-	0.434	7.1	-	1.7	-	-	-	-	-	-
AshPond	CAP-7	05/22/2019	N	14.1	163	218	183	7.54	15.3	188	52.1	52.1	3.67	< 0.1	4.56
AshPond	CAP-9	05/22/2019	N	8.7	131	89.3	52300	0.904	8.8	155	< 4	< 4	1.93	< 0.1	3.11
AshPond	CAP-9	05/22/2019	N	6.9	136	94.6	55200	0.937	7.2	156	< 4	< 4	2.04	< 0.1	1.9
AshPond	CAP-8	02/21/2019	N	-	-	0.122	96.6	-	7.3	148	-	-	-	-	-
AshPond	CAP-8	02/21/2019	FD	-	-	-	-	-	-	-	-	-	-	-	-
AshPond	CAP-8	07/10/2019	N	-	-	< 0.05	110	-	8.3	-	-	-	-	-	-
AshPond	CAP-10	02/20/2019	N	-	-	< 0.05	1.8	-	1.5	10.4	-	-	-	-	-
AshPond	CAP-10	02/20/2019	FD	-	-	-	-	-	-	-	-	-	-	-	-
AshPond	CAP-10	07/10/2019	N	-	-	0.05	1.7	-	1.5	-	-	-	-	-	-
AshPond	CCMAP-1	06/04/2019	N	0.912	8.51	0.267	2.33	0.309	0.965	9.39	176	-	1.75	< 0.1	1.83
AshPond	CCMAP-1	06/04/2019	FD	0.916	9.09	0.362	2.17	0.248	0.943	8.8	194	-	3.7	< 0.1	-
AshPond	CCMAP-2	06/04/2019	N	1.01	9.45	< 0.1	0.357	0.0235	1.02	9.55	45.9	-	1.67	< 0.1	-
AshPond_Tran1	CCMAPT 1-1S	05/17/2019	N	7.5	95.9	36.1	32.8	0.805	9.4	98.2	< 4	< 4	1.18	< 0.1	< 1
AshPond_Tran1	CCMAPT 1-2S	05/17/2019	N	3.5	17.6	3.48	6	0.23	3.9	17.9	4.02	4.02	1.05	< 0.1	< 1
AshPond_Tran1	CCMAPT 1-3S	05/17/2019	N	3.7	22.5	147	14.2	0.485	7.6	20.2	11.1	11.1	1.18	< 0.1	1.01
AshPond_Tran1	CCMAPT 1-4S	05/24/2019	N	0.81	4.9	107	5.3	1.13	5.1	4.7	29.6	29.6	< 1	< 0.1	< 1
AshPond_Tran1	CCMAPT 1-5S	05/24/2019	N	0.6	5.2	19.9	1.2	0.149	1.5	5.8	29.8	29.8	1.22	< 0.1	< 1
AshPond_Tran1	CCMAPT 1-6	05/30/2019	N	830	8800	7.8	1300	0.046	1500	9000	21.1	21.1	1.98	< 0.1	< 2
AshPond_Tran1	CCMAPT 1-7	05/30/2019	N	1800	12000	6.2	3900	0.53	2200	11000	978	978	2.84	< 0.1	3.71
AshPond_Tran2	CCMAPT 2-2S	05/23/2019	N	1.1	3.8	18.9	2.5	0.0404	2.9	4	67.6	67.6	1.47	< 0.1	< 1
AshPond_Tran2	CCMAPT 2-3S	05/22/2019	N	0.8	6.4	36.4	1.9	0.493	1.9	6.4	183	183	1.39	< 0.1	< 1
AshPond_Tran2	CCMAPT 2-4S	05/22/2019	N	3.1	69.9	8.74	20	1.78	4.3	75.3	193	193	1.9	< 0.1	1.69
AshPond_Tran2	CCMAPT 2-5S	05/22/2019	N	2.6	9.6	2.89	3.8	0.515	2.9	10.1	36.2	36.2	1	< 0.1	< 1
AshPond_Tran2	CCMAPT 2-6S	05/22/2019	N	0.77	4.2	32.9	0.95	0.124	2	3.8	35.6	35.6	1.25	< 0.1	1.03
AshPond_Tran2	CLMAPT 2-1S	05/16/2019	N	5.3	136	178	47.8	0.774	6.3	143	< 4	< 4	1.87	< 0.1	1.84

**ABBREVIATIONS AND NOTES:**  
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 µS/cm: microSiemen per centimeter  
 mv: millivolt  
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 Bold where detected above method detection limit  
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<https://www.epa.gov/coalash/coal-ash-rule>

**QUALIFIERS:**  
 U: Not detected, value is the laboratory reporting limit

**Cross Generating Station**  
**CCR Assessment of Corrective Measures and Nature & Extent**  
**Ash Pond Transect**  
**Transect 1**

Sample Location	Transect	Screen Intervals (ft, bgs)	GW Depth (feet)	Sample Date	Sample Time	Temp round 1 (celcius)	pH round 1 (units)	Eh ORP (mV)	Spec Cond round 1 (uS/cm)	Turbidity (NTU)	Dissolved Oxygen (ppm)	Comments
CCMAPT1-1S	start	26-30	22.4	5/17/2019	1115	22.7	4.38	146	3420	>1000	2.17	tan, very turbid, cleans up some, but still >1000 NTU
CCMAPT1-1S Soil	start	25-30	----	5/17/2019	1050	----	----	----	----	----	----	top 2 ft, fine to medium mottled tan, orange and gray sand with some silt, then clayey/silty lenses toward the end of the run.
CCMAPT1-2S	500 ft	16-20	13.55	5/17/2019	1600	25.54	4.99	197	362	455	3.37	Started out very turbid and chalky, tan color.
CCMAPT1-2S soil	500 ft	15-20	----	5/17/2019	1540	----	----	----	----	----	----	Clay from 10 to 15 ft, so had to push down another 5 ft. Still clay, silty clay, banded tan, gray and orange to first 4 ft. Then same colored medium to coarse sand with lenses of that clayey silt from above. Saturated, but not runny.
CCMAPT1-3S	approx. 1000 ft	15-19	5.04	5/17/2019	1725	27.69	4.97	187	527	155	0.96	chalky tan, but cleaned up and cleared up fairly quickly
CCMAPT1-3S soil	approx. 1000 ft	14-19	----	5/17/2019	1700	----	----	----	----	----	----	lt gray clay at the top 2.5 ft. then lt gray fine grained soupy, running sand that grades to less saturated, but wet, and more consolidated tan, orange and lt gray medium to coarse sand with some silt and clay lenses.
CCMAPT1-4S	1180 ft	15-19	6.88	5/24/2019	1000	17.95	5.14	120	77	>1000	2.06	tan to orange, silts out, but still high turbidity. Lots of water
CCMAPT1-4S Soil	1180 ft	14-19	----	5/24/2019	952	----	----	----	----	----	----	tan to orange medium to coarse grained with pebbles, saturated with clay and silt so consolidated the first 1 ft., then orange soupy coarse to very coarse with pebbles, lots of water for 2.5 ft. grades to more silt and clay and coarse to medium consolidated sand. starts getting lt gray lenses toward the end of the run.
CCMAPT1-5S	1600 ft	15-19	2.46	5/24/2019	1102	19.78	5.67	32	96	300	6.37	lt gray color. Still high turbidity.
CCMAPT1-5S Soil	1600 ft	14-19	----	5/24/2019	1045	----	----	----	----	----	----	tan to orange, medium to coarse sand, moist to saturated but consolidated at top 2.4 ft. Then grades to lt gray to greenish gray sand, more coarse and flowing for 2 ft, then grades to more cohesive, silty clayey medium sand at bottom of the run.
CCMAPT1-6S	2000 ft	14-18	9.11	5/30/2019	1325	25.33	5.73	100	138	>1000	6.27	gray to white color. Still high turbidity.
CCMAPT1-6S Soil	2000 ft	13-18	----	5/30/2019	1240	----	----	----	----	----	----	17-22 ft run--gray to greenish gray fine to medium silty sand, running sand at top 0.6 ft. Then grades to more clay to silty/sandy gray clay, dry. So ran a soil sample from 13 to 18 ft--alternates from the gray silty, clayey sand (saturated) to dry silty, sandy clay.
CCMAPT1-7S	2500	11-15	7.78	5/30/2019	1636	33.95	5.81	181	11	>1000	6.33	tan to gray color. Still high turbidity.
CCMAPT1-7S Soil	2500	17-22	----	5/30/2019	1600	----	----	----	----	----	----	17-22 ft run- lt gray to greenish gray silty/sandy clay with lenses of organic material. then at 3.5 ft, more sandy, clayey silt but is wet. Not much to get water so did another run. 22- 26 ft - top 3 inches, as above, then tan to orange soupy/running medium to coarse grained sand with some silt and clay. Then some drier, more consolidated layers with shell fragments in it until 3 ft, then more silty/fine to medium tan sand with clay, dry, consolidated.
CCMAP-1 23	boundary well	13-23	----	5/29/2029	1725	----	----	----	----	----	----	13 to 18 ft run, brown to tan fine to silty sand with clay, moist but consolidated with organic material that grades to gray/greenish gray silty, sandy clay for last foot. 18 to 23 ft run, orange fine to medium sand with some silt, saturated to running, gets coarser at 3.5 ft with coarse to very coarse and pebbles, grades to white shell hash material, silty fine to coarse grained with shell fragments, moist, but not running, consolidated, but comes apart when you handle it.
CCMAP-1	boundary well	13-23	----	5/29/2019	----	----	----	----	----	----	----	screen from 13 to 23 ft, sand to 11 ft, bentonite chips to 8.5 ft

CCR ACM and Nature & Extent---Sulfide, Total and Bicarbonate Alkalinity, TOC (Total Organic Carbon), DOC (Dissolved Organic Carbon), Total and Dissolved Metals (Fe, Mg, Mn, Ca, Na, K, Be, Li and Co), Cl, SO4, TDS

Comments/Conditions: "S" is Shallow" and "D" is Deep

Samples were collected by Melanie Goings



**Cross Generating Station**  
**CCR Assessment of Corrective Measures and Nature & Extent**  
**Ash Pond Transect**  
**Transect 2**

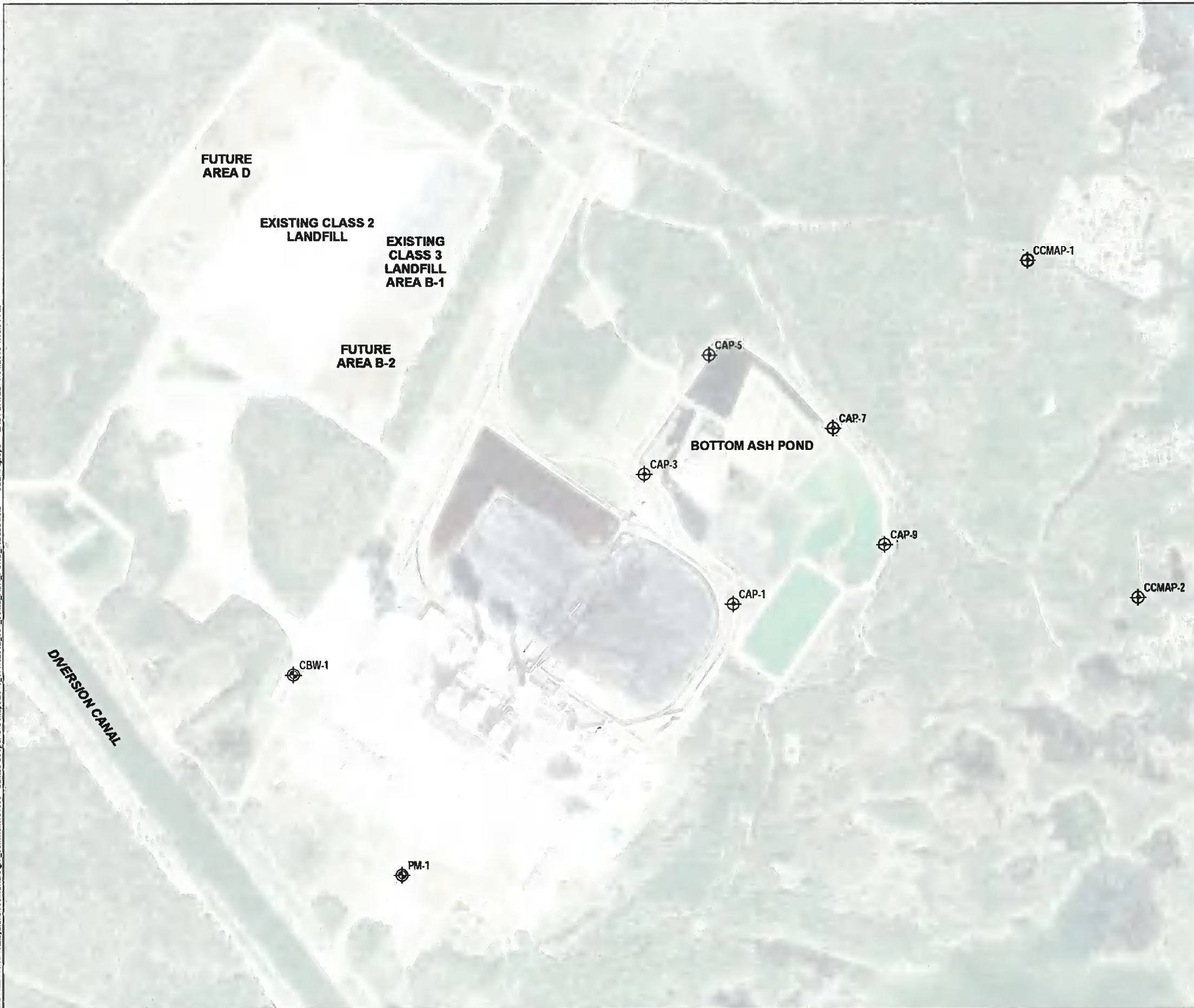
Sample Location	Transect	Screen Intervals (ft, bgs)	GW Depth (feet)	Sample Date	Sample Time	Temp round 1 (celcius)	pH round 1 (units)	Eh ORP (mV)	Spec Cond round 1 (uS/cm)	Turbidity (NTU)	Dissolved Oxygen (ppm)	Comments
CCMAPT2-1S	start	26-30	9.52	5/16/2019	1841	26.23	4.11	206	336	>1000	1.3	
CCMAPT2-1S Soil	start	25-30	----	5/16/2019	1813	----	----	----	----	----	----	First 8 inches is gray clay. Next 1 foot 5 inches is silty sandy with some coarse sand particles. Remaining is light gray tight packed clay. Water is evident especially in coarse sandy section.
CCMAPT1-2S	500 ft	16-20	12.4	5/23/2019	1730	28.72	6.86	135	159	>1000	6.31	tan and kept going dry. Took almost 2 hours to fill sample bottles
CCMAPT2-2S	500 ft	15-20	----	5/23/2019	1656	----	----	----	----	----	----	tan clay, medium to coarse sand in lenses to approx 19 ft bls, then greenish gray, silty/clayey fine to medium sand. Was moist, but hole caved in to 14 ft. Took another soil sample in another hole from 10 to 15 ft. even drier, lt gray to tan silty clay with some sand lenses.
CCMAPT2-3S	1000 ft	15-19	11.21	5/22/2019	1649	34.09	7.46	23	355	682	4.57	tan went dry
CCMAPT2-3S Soil	1000 ft	15-20	----	5/22/2019	1620	----	----	----	----	----	----	medium to coarse grained, saturated sand but still consolidated with very little clay or silt, tan to orange for first 1.1 ft. Then grades to tan to orange coarser sand, very coarse and even pebbles, super saturated, and running. At 3.11 ft, green fine grained silt with some clay, still saturated, mushy.
CCMAPT2-4S	1500 ft	15-19	1.05	5/22/2019	1500	31.48	6.74	28	2500	>1000	2.81	tan. Went dry
CCMAPT2-4S Soil	1500 ft	15-20	----	5/22/2019	1437	----	----	----	----	----	----	Top 3.5 ft, lt gray, Coarse to very coarse grained, saturated sand with little clay and silt stringers--pretty clean sand, almost running. Starts gradeing to more silt and clay and more medium to coarse grained. Color also gets more tan and orange. drier and more consolidated.
CCMAPT2-5S	2000 ft	15-19	7.75	5/22/2019	1151	21.46	5.3	107	184	752	3.9	tan to orange color. Went dry.
CCMAPT2-5S Soil	2000 ft	14-19	----	5/22/2019	1131	----	----	----	----	----	----	very coarse to coarse white to lt gray sand with little silt. Saturated bu cohesive for 3.4 ft. Then grades more silt and clay, less coarse, tan to reddish sand.
CCMAPT2-6S	2280 ft	15-19	2	5/22/2019	1043	19.93	5.08	94	76	508	6.42	tan or brown color. Turbidity better
CCMAPT2-6S Soil	2280 ft	15-20	----	5/22/2019	1027	----	----	----	----	----	----	tan to orange, medium to coarse sand, very saturated sand at top 2.2 ft. Then grading to less coarse (medium to fine) sand to silt, with silty clay lenses, more cohesive. At 4 ft, backto tan sand with red, some silty tomedium and coarse sand. Not as saturated.
CCMAP-2 23	boundary well	13-23	----	5/29/2019	1126	----	----	----	----	----	----	first run, 13-18 ft--mottled tan, orange, red and lt gray fine to medium sand with some silt, saturated but cohesive to 3.4 ft, then grades to medium to coarse sand, very saturated sand, tan to orange. next run of 18 to 23 was tan sand as above but running to 4 ft then grades more silt and consolidated and not as running.
CCMAP-2	boundary well	13-23		5/29/2029								Screen from 13 to 23, sand from 11 to 13 ft, and bentonite chips to 8.5 ft. neat cement to surface

CCR ACM and Nature & Extent--Sulfide, Total and Bicarbonate Alkalinity, TOC (Total Organic Carbon), DOC (Dissolved Organic Carbon), Total and Dissolved Metals (Fe, Mg, Mn, Ca, Na, K, Be, Li and Co), Cl, SO4, TDS



Comments/Conditions: "S" is Shallow and "D" is Deep

Samples were collected by Melanie Goings

GIS FILE PATH: \\haleyaldrich.com\haleyn\common\131539 - Santee Cooper\GIS\Maps\2019\_07\132802\_004\_00MB\_ASH\_POND\_WELLS.mxd — USER: ajpsps — LAST SAVED: 7/31/2019 1:19:04 PM



**LEGEND**

-  ASH POND WELL
-  BACKGROUND WELL

**NOTES**

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. AERIAL IMAGERY SOURCE: ESRI



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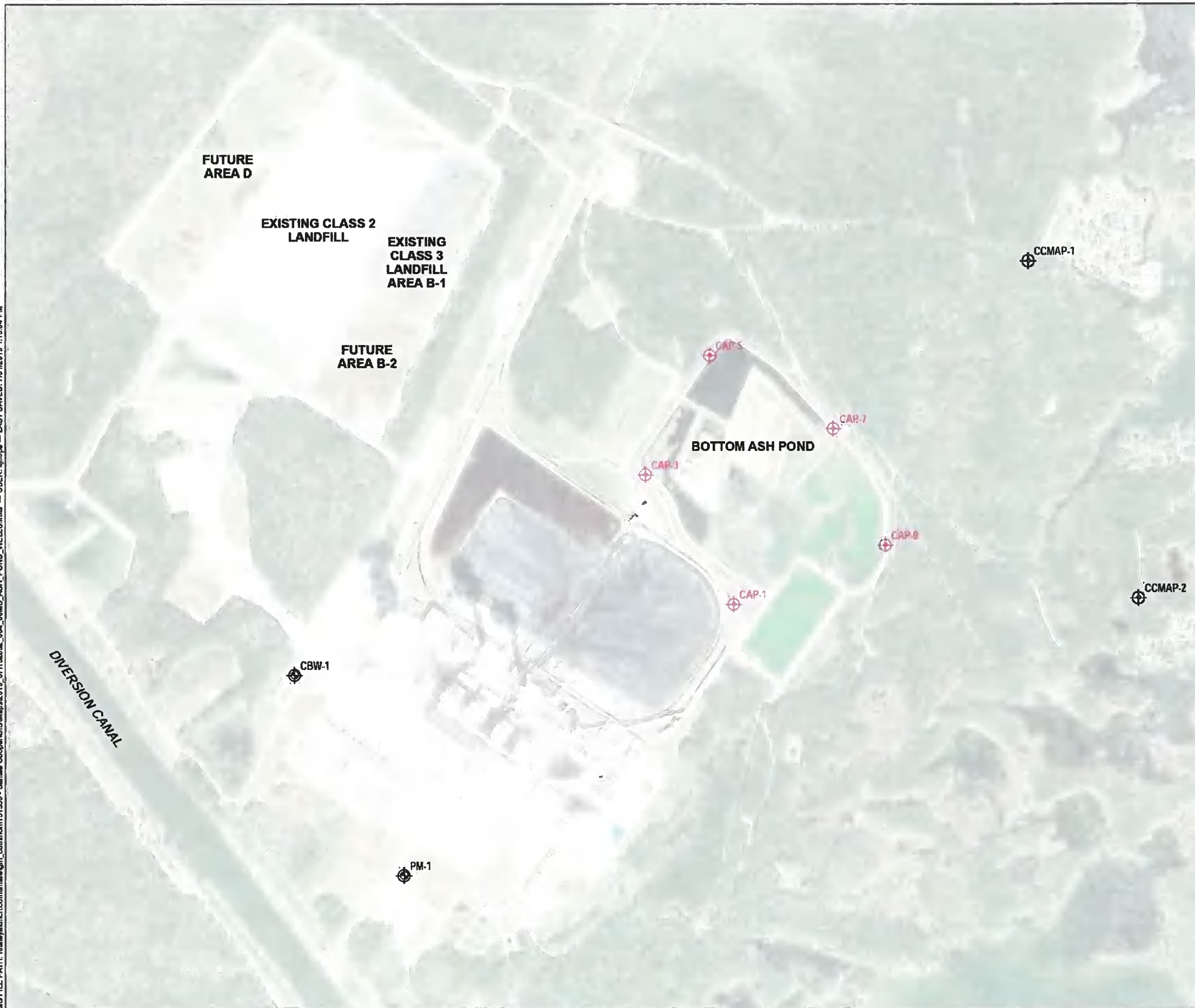
SANTEE COOPER  
CROSS GENERATING STATION  
CROSS, SOUTH CAROLINA

**LOCATION OF GROUNDWATER  
MONITORING WELLS FOR CCR  
COMPLIANCE - BOTTOM ASH POND**




SEPTEMBER 2019

**FIGURE 2**

GIS FILE PATH: \\haleyaldrich.com\haleym\gim\common\131539 - Santee Cooper\GIS\Maps\2019\_07\132822\_004\_00MD\_ASH\_POND\_WELLS.mxd — USER: gjs — LAST SAVED: 7/13/2019 1:16:04 PM



**LEGEND**

-  APPENDIX IV SSL
-  ASH POND WELL
-  BACKGROUND WELL

**NOTES**

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. AERIAL IMAGERY SOURCE: ESRI



**HALEY  
ALDRICH**

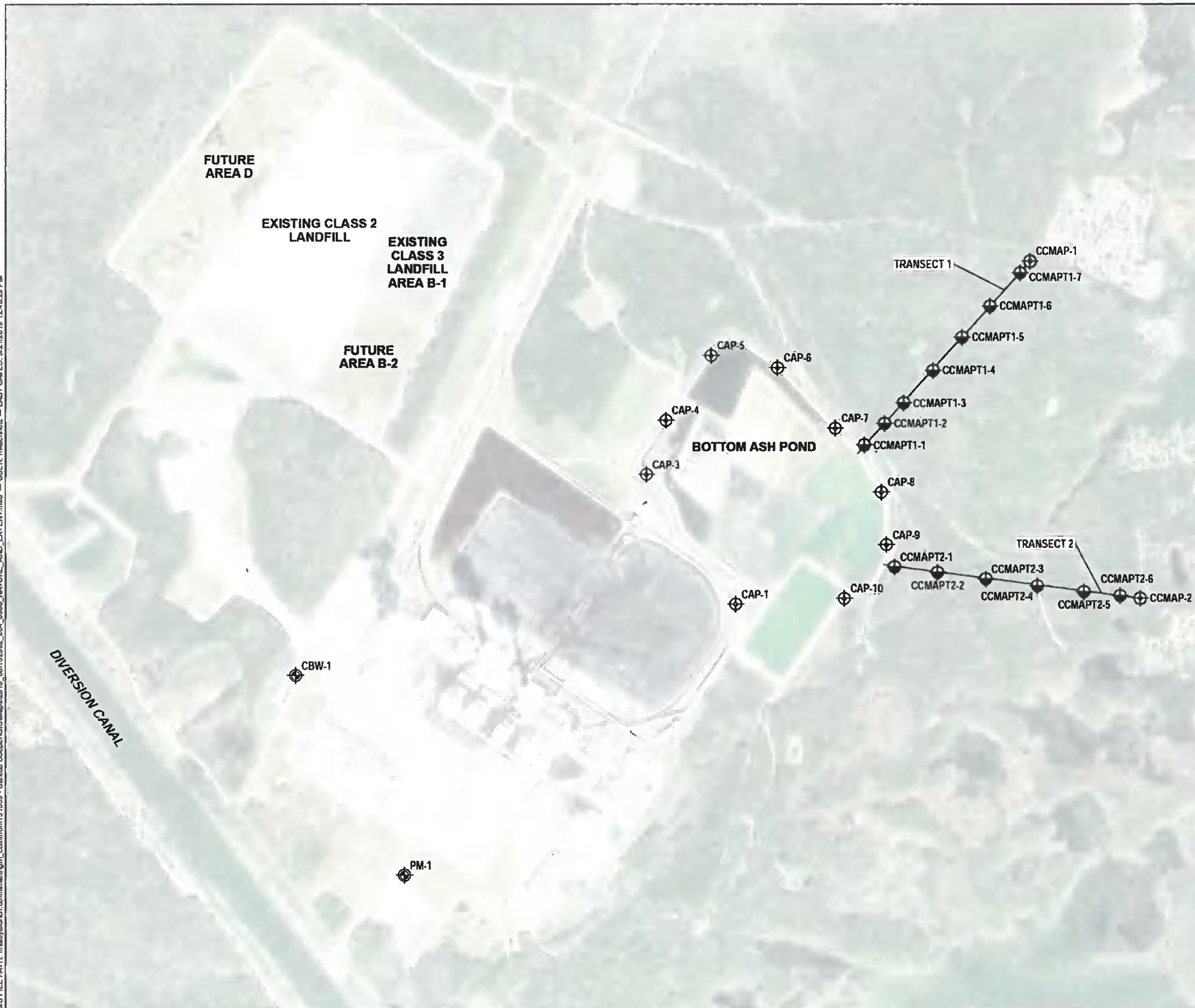
SANTEE COOPER  
CROSS GENERATING STATION  
CROSS, SOUTH CAROLINA

**LOCATION OF APPENDIX IV SSLS**





SEPTEMBER 2019

**FIGURE 4**

GIS FILE PATH: \\haleyaldrich.com\share\gim\_common\131536 - Santee Cooper\GIS\Mapa\2019\_061132822\_004\_0006\_NATURE\_AND\_EXTENT.mxd — USER: hvachhoiz — LAST SAV/ED: 8/27/2019 12:48:28 PM



**LEGEND**

-  ASH POND WELL
-  BACKGROUND WELL
-  NATURE AND EXTENT EVACUATION TEMPORARY LOCATION
-  TRANSECT

**NOTES**

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. AERIAL IMAGERY SOURCE: ESRI



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CROSS GENERATING STATION  
CROSS, SOUTH CAROLINA

**NATURE AND EXTENT  
EVALUATION LOCATIONS**

SEPTEMBER 2019

**FIGURE 6**

**Appendix C – Statistical Analysis**



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## TECHNICAL MEMORANDUM

January 30, 2020  
File No. 132892-010

**SUBJECT:** 2019 Semi-annual Groundwater Assessment Monitoring Data  
Statistical Evaluation  
Cross Generating Station  
Ash Pond

Pursuant to Title 40 Code of Federal Regulations (40 CFR) § 257.93 and 257.95 (Rule), this memorandum summarizes the statistical evaluation of the analytical results for the 2019 semi-annual assessment monitoring groundwater sampling events for the Cross Generating Station (CGS) Ash Pond. The statistical evaluation discussed in this memorandum was conducted to determine if Appendix IV groundwater monitoring constituents have been detected in downgradient wells at concentrations that represent a statistically significant level (SSL) above background or upgradient wells consistent with the requirements in 40 CFR § 257.95.

Utilizing interwell evaluations, data from the groundwater sampling events for the downgradient monitoring wells were compared to the Groundwater Protection Standard (GWPS) established from the background dataset for the upgradient monitoring well (PM-1 and CBW-1) for detected Appendix IV constituents. GWPS for each of the Appendix IV constituents have been set equal to the highest value of the maximum contaminant level, regional screening level, or background concentration. The Rule requires statistical evaluation of groundwater monitoring data to determine whether or not there is a statistically significant increase (SSI) above background values for each Appendix IV constituent and if one or more constituents are detected at SSLs above the GWPS. The results of the groundwater assessment monitoring statistical evaluation are discussed below and provided in Tables I and II.

### Statistical Evaluation of Appendix IV Constituents

The Rule provides four specific options for statistical evaluation of groundwater quality data collected at a coal combustion residual (CCR) unit (40 CFR §257.93(f) (1-4)). The statistical method used for these evaluations, tolerance limit (TL), was certified by Haley & Aldrich, Inc. on October 14, 2017. The TL method, as determined applicable for this sampling event, was used to evaluate potential SSLs above background. Background levels for each constituent listed in Appendix IV were computed as upper tolerance limits (UTL), and a minimum 95 percent confidence coefficient and 95 percent coverage. The most recent groundwater sampling event from each compliance well was compared to the corresponding background UTL to determine if a SSL existed.

### STATISTICAL EVALUATION

An interwell evaluation was used to determine SSLs. Interwell evaluation compares the most recent values from downgradient compliance wells against a background dataset composed of upgradient well data. Because the CCR unit has transitioned into assessment monitoring, no statistical evaluations were conducted on Appendix III (detection monitoring) semi-annual assessment monitoring data.

The parametric TL methods were used to complete statistical evaluations of the referenced dataset. The TL procedure is one in which a concentration limit for each constituent is established from the distribution of the background data, with a minimum 95 percent confidence level. The upper endpoint of a tolerance interval is called the UTL. Depending on the data distribution, parametric or non-parametric TL procedures are used to evaluate groundwater monitoring data using this method. Parametric TLs utilize normally distributed data or normalized data via a transformation of the sample background data used to construct the limit. If the data are non-normal and a transformation is not indicated, non-parametric procedures (order statistics or bootstrap methods) are used to calculate the TL. If all the background data are non-detect, a maximum reporting limit may serve as an appropriate UTL.

These statistical evaluations were conducted using the background dataset for all detected Appendix IV constituents using parametric TL. If an Appendix IV constituent concentration from the semi-annual sampling events in 2019 were above the GWPS, the lower confidence limit (LCL) for the downgradient well constituent was used to evaluate if a SSL was present. The LCL is the lower end of the confident interval range, which is an estimated concentration range intended to contain the true mean or median of the population from which the sample is drawn. The confidence interval range is designed to locate the true population mean or median with a high degree of statistical confidence, or conversely, with a low probability of error.

The UTLs were calculated from the background well dataset using Chemstat software after testing for outlier sample results that would warrant removal from the dataset based on likely error in sampling or measurement. Both visual and statistical outlier tests for the background data were performed using Chemstat and U.S. Environmental Protection Agency's ProUCL 5.1 software, and a visual inspection of the data was performed using box plots and distribution plots for the downgradient sample data. No sample data were identified as outliers that warranted removal from the dataset.

## BACKGROUND DISTRIBUTIONS

The groundwater analytical results for each sampling event from the background sample location (PM-1 and CBW-1) were combined to calculate the UTL for each detected Appendix IV constituent. The variability and distribution of the pooled dataset was evaluated to determine the method for UTL calculation. Per the document *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance, March 2009*, background concentrations were updated based on statistical evaluation of analytical results collected through 2018.

## RESULTS OF APPENDIX IV DOWNGRADIENT STATISTICAL COMPARISONS

The sample concentrations from the downgradient wells for each of the detected Appendix IV constituents from the semi-annual assessment monitoring events of 2019 were compared to their respective background UTLs and GWPS (Table I). A sample concentration greater than the GWPS is considered to represent a SSL. Based on previous compliance sampling events and statistical evaluations, interwell comparisons were utilized for all downgradient wells and constituents. Based on this statistical evaluation on the semi-annual groundwater sampling events in 2019, SSLs above GWPS were identified at the Ash Pond (beryllium, cobalt, and lithium), consistent with previous results.

**Tables:**

Table I – Summary of Assessment Monitoring Statistical Evaluation – February 2019

Table II – Summary of Assessment Monitoring Statistical Evaluation – May 2019



## TABLES





Location ID	Frequency of Detection	Percent Non-Detects	Range of Non-Detects	Mean	SD (Standard Deviation)	SPK Percent	Maximum Detect	Velocity	Standard Deviation	Coefficient of Variation	CFL	Report Unit	Direction Conventions	Number of Non-Detections	Number of Detections	Trend	Outlier Flagged	Cylinder Presence	Calibration Year	February 2020		Exceeds above Background Line (Higher of MFL or UFL)	Background Line (Higher of MFL or UFL)	Exceeds below Background Line (Lower of MFL or UFL)
																				Upper Tolerance Limit, µg/L	Lower Tolerance Limit, µg/L			
CW-1	0/11	100%	0.075-0.025	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
FW-1	0/11	100%	0.025-0.025	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
CA-1	0/10	100%	0.025-0.025	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
CA-3	0/10	100%	0.025-0.025	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
CA-5	0/10	100%	0.025-0.025	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
CA-7	0/10	100%	0.025-0.025	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
CA-9	0/10	100%	0.025-0.025	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
CW-1	3/13	77%	0.025-0.025	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
FW-1	3/13	77%	0.025-0.025	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
CA-1	0/13	100%	0.025-0.025	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
CA-3	0/13	100%	0.025-0.025	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
CA-5	0/13	100%	0.025-0.025	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
CA-7	6/13	54%	0.025-0.025	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
CA-9	12/13	8%	0.025-0.025	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
CW-1	12/13	0%	..	0.0449	0.0449	0.0449	0.0449	0.0449	0.0449	0.0449	0.0449	µg/L	N	0	0	..				0.0449	0.0449	7.0000	0.0449	
FW-1	12/13	0%	..	0.0319	0.0319	0.0319	0.0319	0.0319	0.0319	0.0319	0.0319	µg/L	N	0	0	..				0.0319	0.0319	7.0000	0.0319	
CA-1	12/13	0%	..	0.0471	0.0471	0.0471	0.0471	0.0471	0.0471	0.0471	0.0471	µg/L	N	0	0	..				0.0471	0.0471	7.0000	0.0471	
CA-3	12/13	0%	..	0.0771	0.0771	0.0771	0.0771	0.0771	0.0771	0.0771	0.0771	µg/L	N	0	0	..				0.0771	0.0771	7.0000	0.0771	
CA-5	12/13	0%	..	1.34	1.34	1.34	1.34	1.34	1.34	1.34	1.34	µg/L	N	0	0	..				1.34	1.34	7.0000	1.34	
CA-7	12/13	0%	..	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	µg/L	N	0	0	..				0.0014	0.0014	7.0000	0.0014	
CA-9	12/13	0%	..	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	µg/L	N	0	0	..				0.0011	0.0011	7.0000	0.0011	
CW-1	1/12	92%	0.005-0.005	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
FW-1	1/12	92%	0.005-0.005	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
CA-1	12/13	100%	0.005-0.005	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
CA-3	0/12	100%	0.005-0.005	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
CA-5	0/12	100%	0.005-0.005	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
CA-7	0/12	100%	0.005-0.005	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
CA-9	13/13	0%	..	0.0158	0.0158	0.0158	0.0158	0.0158	0.0158	0.0158	0.0158	µg/L	N	0	0	..				0.0158	0.0158	0.0000	0.0158	
CW-1	0/12	100%	0.0025-0.0025	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
FW-1	0/12	100%	0.0025-0.0025	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
CA-1	0/12	100%	0.0025-0.0025	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
CA-3	0/12	100%	0.0025-0.0025	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
CA-5	0/12	100%	0.0025-0.0025	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
CA-7	0/12	100%	0.0025-0.0025	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
CA-9	0/12	100%	0.0025-0.0025	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
CW-1	1/13	92%	0.025-0.025	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001	0.0000	0.0000	
FW-1	1/13	92%	0.025-0.025	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001	0.0000	0.0000	
CA-1	0/13	100%	0.025-0.025	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
CA-3	0/13	100%	0.025-0.025	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
CA-5	1/13	92%	0.025-0.025	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001	0.0000	0.0000	
CA-7	0/13	100%	0.025-0.025	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
CA-9	0/13	100%	0.025-0.025	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	µg/L	N	0	0	..				0.00001	0.00001			
CW-1	13/13	0%	..	0.00118	0.00118	0.00118	0.00118	0.00118	0.00118	0.00118	0.00118	µg/L	N	0	0	..				0.00118	0.00118	0.0000	0.0000	
FW-1	13/13	0%	..	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	µg/L	N	0	0	..				0.00005	0.00005	0.0000	0.0000	
CA-1	12/13	8%	..	0.0159	0.0159	0.0159	0.0159	0.0159	0.0159	0.0159	0.0159	µg/L	N	0	0	..				0.0159	0.0159	4.0000	0.0159	
CA-3	12/13	8%	..	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	µg/L	N	0	0	..				0.0033	0.0033	4.0000	0.0033	
CA-5	12/13	8%	..	0.0111	0.0111	0.0111	0.0111	0.0111	0.0111	0.0111	0.0111	µg/L	N	0	0	..				0.0111	0.0111	4.0000	0.0111	
CA-7	12/13	8%	..	0.0104	0.0104	0.0104	0.0104	0.0104	0.0104	0.0104	0.0104	µg/L	N	0	0	..				0.0104	0.0104	4.0000	0.0104	
CA-9	12/13	8%	..	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	µg/L	N	0	0	..				0.0118	0.0118	4.0000	0.0118	
FW-1	0/13	100%	0.1-0.1	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	µg/L	N	0	0	..				0.26	0.26	4.0000	0.26	
CA-1	1/13	92%	0.1-0.1	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	µg/L	N	0	0	..				0.11	0.11	4.0000	0.11	
CA-3	1/13	92%	0.1-0.1	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	µg/L	N	0	0	..				0.86	0.86	4.0000	0.86	
CA-5	5/13	58%	0.1-0.1	0.107	0.107	0.107	0.107	0.107	0.107	0.107	0.107	µg/L	N	0	0	..				0.107	0.107	4.0000	0.107	
CA-7	12/13	8%	0.1-0.1	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	µg/L	N	0	0	..				0.73	0.73	4.0000	0.73	
CA-9	5/17	58%	0.1-0.1	0.116	0.116	0.116	0.116	0.116	0.116	0.116	0.116	µg/L	N	0	0	..				0.116	0.116	4.0000	0.116	
FW-1	12/13	8%	..	2.18	2.18	2.18	2.18	2.18	2.18	2.18	2.18	µg/L	N	0	0	..				2.18	2.18	4.0000	2.18	

Intermittent Analysis

February 2020

Upper Tolerance

