2020 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT CLASS 3 LANDFILL AND CLOSED UNIT 2 SLURRY POND WINYAH GENERATING STATION

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1. Annual Groundwater Monitoring Report Summary

The South Carolina Public Service Authority (Santee Cooper) has prepared this 2020 Annual Groundwater Monitoring Corrective Action Report for the closed coal combustion residuals (CCR) management unit referred to as the Unit 2 Slurry Pond and currently operational Class 3 Landfill located at the Winyah Generating Station (WGS) in Georgetown, South Carolina. This 2020 Annual Report was prepared to comply with the United States Environmental Protection Agency (EPA) Hazardous and Solid Waste Management System; Disposal of CCR from Electric Utilities, 40 Code of Federal Regulations (CFR) Part 257, Subpart D dated April 17, 2015 (CCR Rule), specifically subsection § 257.90(e)(1) through (6).

The closed Unit 2 Slurry Pond was previously classified as an inactive surface impoundment as defined by 40 CFR §257.53. However, on August 5, 2016, the EPA issued a "Direct Final Rule" effective on 4 October 2016, constituting a vacatur of 40 CFR §257.100. The Direct Final Rule applies the requirements of existing surface impoundments that had been previously declared inactive. As a result, owners and operators of inactive CCR surface impoundments must comply with the groundwater monitoring requirements for existing CCR surface impoundments.

Santee Cooper filed a Notice of Intent (NOI) to initiate closure of the Unit 2 Slurry Pond and placed the NOI in the facility's operating record in December 2015. The South Carolina Department of Health and Environmental Control (SCDHEC) certified Pond closure was complete in accordance with SCDHEC regulations on November 9, 2017. After the Unit 2 Slurry Pond was certified closed, Santee Cooper constructed a new Class 3 Landfill at the site within the footprint of the closed Unit 2 Slurry Pond. Because both units (closed Unit 2 Slurry Pond and new Class 3 Landfill) occupy the same space, the groundwater monitoring network installed to monitor the Class 3 Landfill is also appropriate for the closed Unit 2 Slurry Pond and complies with §257.91.

This annual report addresses the groundwater monitoring requirements for both units at WGS (closed Unit 2 Slurry Pond and Class 3 Landfill). The Groundwater Monitoring System Certification was placed in the facility's operating record on November 1, 2018 for the Class 3 Landfill and amended December 12, 2019 to include reference to the closed Unit 2 Slurry Pond. The certification was posted on the facility's website as required by §257.107(h)(2).

In accordance with § 257.90(e)(6), an overview of the current status of groundwater monitoring and corrective action programs for the CCR unit is provided below:

In accordance with the CCR Rule, eight rounds of baseline sampling were conducted for the new Class 3 Landfill prior to receiving CCR materials. These eight rounds of sampling results also established baseline conditions for the closed Unit 2 Slurry Pond. After establishing baseline conditions and prior to placing CCR material in the new Class 3 Landfill, an additional sampling round was completed to comply with § 257.94 (Detection Monitoring). The statistical analysis of the detection monitoring results identified statistically significant increases (SSIs) of Appendix III constituents downgradient of the two units. Since the baseline and detection monitoring results were collected prior to placing CCR materials in the new Class 3 Landfill, the SSIs above background were attributed to the closed Unit 2 Slurry Pond. This condition was documented in a certified Alternate Source Demonstration (ASD) incorporated into the record as an appendix to the 2019 Annual Report. As a result of this determination, the closed Unit

2 Slurry Pond entered into assessment monitoring while the new Class 3 Landfill remained in detection monitoring.

At the start of the current annual reporting period (January 1, 2020), the Class 3 Landfill continued to operate under a detection monitoring program in accordance with § 257.94 and the closed Unit 2 Slurry Pond continued under an assessment monitoring program in accordance with § 257.95, which was initiated on December 12, 2019.

For the Class 3 Landfill, the Appendix III constituents were analyzed for SSIs using an intrawell statistical test consistent with the Unified Guidance and as a result of the certified ASD. In 2020, an SSI of calcium was identified in monitoring well WLF-1A-3 and an SSI was identified in monitoring well WLF-1A-2 during both the February and June 2020 sampling events. Chloride was also identified as an SSI in monitoring well WAP-7 for the February 2020 event, and an SSI of Total Dissolved Solids was identified in monitoring well WLF-1A-3 for June 2020. These findings are consistent with previous evaluations described in the ASD. As a result, an assessment monitoring program is not required for the Class 3 Landfill since the ASD identified the closed Unit 2 Slurry Pond as the source of SSIs. At the end of the current annual reporting period (December 31, 2020), the Class 3 Landfill remained in detection monitoring.

For the closed Unit 2 Slurry Pond in 2020, the Appendix IV constituents were analyzed using an interwell statistical test to determine if statistically significant levels (SSLs) of Appendix IV constituents were present downgradient of the units above groundwater protection standards (GWPS). SSLs above the GWPS were not identified in either the February or the June 2020 groundwater monitoring events. Therefore, at the end of the current annual reporting period (December 31, 2020), the closed Unit 2 Slurry Pond remains in assessment monitoring. Because SSLs of Appendix IV constituents have not been identified, initiating and completing an assessment of corrective measures, holding a public meeting, selecting a remedy, and initiating remedial activities are not required.

To report on the activities conducted during the prior calendar year and document progress complying with the CCR Rule, the specific requirements listed in § 257.90(e)(1) through (5) are provided in the next section in bold/italic type followed by a short narrative stating how that specific requirement was met.

2. 40 CFR § 257.90 Applicability

2.1 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 § 257.98.

The co-located Class 3 Landfill and closed Unit 2 Slurry Pond at the WGS are subject to the groundwater monitoring and corrective action requirements set forth by the EPA in the Code of Federal Regulations Title 40 (40 CFR) § 257.90 through § 257.98. This document satisfies the requirement under § 257.90(e) which requires the CCR Landfill Owner/Operator to prepare an Annual Report.

2.2 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 2020 for the Class 3 Landfill and closed Unit 2 Slurry Pond at WGS 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 § 257.94 and § 257.95, is provided in this report.

2.2.1 Status of the Groundwater Monitoring and Corrective Action Program

SSIs of Appendix III constituents were identified downgradient of the Class 3 Landfill/Unit 2 Slurry Pond, therefore the notification was provided, and an evaluation of alternate sources was conducted. A successful ASD was completed concluding that the closed Unit 2 Slurry Pond, on which the Class 3 Landfill was constructed, was responsible for the Appendix III SSIs. Notification that an assessment monitoring program was initiated for the closed Unit 2 Slurry Pond was posted on the facilities CCR website on December 12, 2019.

An SSI of chloride, calcium, and pH were identified in monitoring wells WAP-7, WLF1A-3, and WLF-1A-2, respectively, during the February 2020 sampling event. Then an SSI of calcium, pH and TDS were identified in monitoring wells WLF1A-3, WLF-1A-2, and, WLF-1A-3, respectively, during the June 2020 sampling event. Results are consistent with historical results and the findings of the ASD that identified the closed Unit 2 Slurry Pond as the source of the SSIs. As a result, the Class 3 Landfill remains in the detection monitoring program as required by § 257.94(e)(2) and the closed Unit 2 Slurry Pond remains in assessment monitoring. Output from the statistical analyses are summarized in Appendix A.

2.2.2 Key Actions Completed

The following key actions were completed in 2020:

- Prepared 2019 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)];

- Collected and analyzed two rounds of groundwater monitoring (February and June) (Table 1) in accordance with § 257.94 and § 257.95 and recorded the concentrations in the facility's operating record as required by § 257.94(f) and § 257.95(i); and
- Completed statistical evaluation to determine statistically significant increases for Appendix III constituents and statistically significant levels for Appendix IV constituents in accordance with § 257.93(h)(2).

2.2.3 Problems Encountered

Problems such as damaged wells or issues with sample collection or lack of sampling were not encountered at the Class 3 Landfill or closed Unit 2 Slurry Pond in 2020.

2.2.4 Actions to Resolve Problems

No problems needed resolution.

2.2.5 Project Key Activities for Upcoming Year

Key activities to be completed in 2021 include the following:

- Conduct semi-annual groundwater monitoring as required by § 257.94 or § 257.95.
- Review of the detection monitoring results and statistical output for the Class 3 Landfill to verify on-going validity of the certified ASD.
- Statistical analysis of Assessment Monitoring analytical data to determine if SSLs of the detected Appendix IV constituents are present.
- Prepare the 2021 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)].

2.3 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:

2.3.1 §257.90(e)(1) AERIAL IMAGE OF GROUNDWATER MONITORING PROGRAM

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 location of the co-located closed Unit 2 Slurry Pond and the Class 3 Landfill and associated upgradient and downgradient monitoring wells is included in this report as Figure 1. This groundwater monitoring network meets the requirements of §257.91.

2.3.2 §257.90(e)(2) ADJUSTMENTS TO GROUNDWATER MONITORING PROGRAM

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 2020.

2.3.3 §257.90(e)(3) SUMMARY OF GROUNDWATER ANALYSIS

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 **[upgradient]** ***and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs;***

Two independent samples from each background and downgradient monitoring well were collected and analyzed to satisfy the detection monitoring requirements for the Class 3 Landfill and the assessment monitoring requirements for the closed Unit 2 Slurry Pond. 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 closed Unit 2 Slurry Pond and Class 3 Landfill 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).

2.3.4 §257.90(e)(4) CURRENT GROUNDWATER MONITORING PROGRAM

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);

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 and closed Unit 2 Slurry Pond to evaluate the potential for SSIs of the Appendix III constituents to exist above background. A summary of the statistical evaluation is provided in Appendix A of this report. Findings from this evaluation indicated that SSIs for calcium, chloride, pH, and TDS were present at one or more downgradient wells. However, as described in the ASD provided in the 2019 Annual Groundwater Report, and recognizing that the new Class 3 Landfill was constructed in the footprint of the closed Unit 2 Slurry Pond, and had not received CCR prior to completing detection monitoring, Haley & Aldrich conducted an evaluation, consistent with §257.94(e)(2), to demonstrate that a source other than the Class 3 Landfill caused the statistically significant increase over background.

This ASD concluded that the closed Unit 2 Slurry Pond was the source for the Appendix III SSIs detected downgradient of the two units, and as a result, the new Class 3 Landfill remained in detection monitoring while the closed Unit 2 Slurry Pond has triggered assessment monitoring. The assessment monitoring program was established to meet the requirements of 40 CFR §

257.95 on December 12, 2019.

2.3.5 §257.90(e)(5) OTHER REQUIRED INFORMATION

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 and the closed Unit 2 Slurry Pond remained in Assessment Monitoring in 2020, no other information was required to be included in this annual report. 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

TABLE 1 - Summary of Analytical Results
Winyah Generating Station Class 3 Landfill Detection Monitoring and Closed Unit 2 Slurry Pond Assessment Monitoring

					Appendix III Constituents								Appendix IV Constituents															Field Parameters							
Well ID	Purpose	Date of Sample Event	Laboratory Sample ID Number		Boron	Boron	Calcium	Chloride	Fluoride	Sulfate	Total Dissolved Solids	pH	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Fluoride	Lead	Lithium	Mercury	Molybdenum	Radium 225	Radium 228	Radium 226/Radium 228 Combined Calculation	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	SU	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L	ug/L	ug/L	ug/L	ug/L	pCi/L	pCi/L	pCi/L	ug/L	ug/L	Feet (btoc)	Feet (msl)	SU	uS	C	mv	NTU	ppm
				Method	EPA 200.7	EPA 6010D	EPA 6020B	EPA 300.0	EPA 300.0	EPA 300.0	SM 2540C		EPA 6020B	EPA 6020B	EPA 6020B	EPA 6020B	EPA 6020B	EPA 6020B	EPA 6020B	EPA 300.0	EPA 6020B	EPA 6010D	EPA 7470	EPA 6010D	EPA 903.1 Mod	EPA 904.0	EPA 903.1 Mod	EPA 6020B	EPA 6020B						SM2580		
				GWPS/US EPA MCL/RSL	—	—	—	—	4	—	—	—	6	10	2000	4	5	100	6	4	15	40	2	100	—	—	5	50	2	—	—	—	—	—	—	—	—
Site Background Wells																																				
WBW-A1-1	Background	2/6/2020	AE65527			30	44.8	13.6	<0.10	117	192.5	4.68			83.6					<0.10					1.16	0.753	1.91			6.05	22.09	4.68	318	20	-19.8	6.57	0.52
WBW-A1-1	Background	6/1/2020	AE73526			28	36.2	15.3	<0.10	107	180	4.48	<5.0	<5.0	72.9	<0.50	<0.50	<5.0	<0.50	<0.10	<1.0	<10	<0.20	<10	2.09	1.3	3.4	<10.0	<1.0	5.84	22.3	4.48	307	21.64	75	0	0.71
WBW-A1-1	**total samples**				**0**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
Class 3 Landfill /Closed Unit 2 Slurry Pond Wells																																				
WLF-A1-1	Detection/ Assessment	2/5/2020	AE65528			2500	413	70.1	<0.10	705	1455	6.44			30.7					<0.10					0.236	2.11	2.35			16.8	24.55	6.44	1701	21.5	-167	6.39	0.47
WLF-A1-1	Detection/ Assessment	6/15/2020	AE73529			2400	378	48.6	<0.10	644	1505	6.19	<5.0	<5.0	29.5	<0.50	<0.50	<5.0	<0.50	<0.10	<1.0	<10	<0.20	<10	0.612	1.19	1.8	<10.0	<1.0	16.54	24.81	6.19	1780	21	-175	0	0.69
WLF-A1-1	**total samples**				**0**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
WLF-A1-2	Detection/ Assessment	2/5/2020	AE65529			130	27.1	19.3	<0.10	49.1	151.2	5.37			41.4					<0.10					0.732	1.18	1.91			5.11	24.1	5.37	198	19.1	249	9.46	0.45
WLF-A1-2	Detection/ Assessment	6/16/2020	AE73530			110	12	9.23	<0.10	41.5	218.8	4.49	<5.0	<5.0	42.6	<0.50	<0.50	<5.0	<0.50	<0.10	<1.0	<10	<0.20	<10	0.346	1.18	1.53	<10.0	<1.0	4.73	24.48	4.49	154	20.44	-3	0	0.96
WLF-A1-2	**total samples**				**0**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
WLF-A1-3	Detection/ Assessment	2/5/2020	AE65530			78	26.1	4.5	<0.10	88.9	133.8	4.46			33.7					<0.10					1.1	0.134	1.24			4.98	23.33	4.46	216	18.9	-26.4	8.12	0.45
WLF-A1-3		6/16/2020	AE73531			75	26.3	4.13	<0.10	87.8	241.2	4.19	<5.0	<5.0	33.5	<0.50	<0.50	<5.0	<0.50	<0.10	<1.0	<10	<0.20	<10	2.36	0.893	3.25	<10.0	<1.0	4.57	23.74	4.19	238	20.56	7	0.2	0.9
WLF-A1-3	**total samples**				**0**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
WLF-A1-4	Detection/ Assessment	2/5/2020	AE65531			260	88.9	5.85	<0.10	109	337.5	6.44			40.2					<0.10					0.475	0.593	1.07			4.98	23.26	6.44	411	18.9	-96.5	8.63	0.44
WLF-A1-4	**Duplicate**	2/5/2020	AE65532			250	88.8	5.9	<0.10	109	327.5				39.4					<0.10					0.16	1.56	1.71										
WLF-A1-4	Detection/ Assessment	6/15/2020	AE73532			220	68.3	5.74	<0.10	72.2	366.2	6.25	<5.0	<5.0	32.9	<0.50	<0.50	<5.0	<0.50	<0.10	<1.0	<10	<0.20	<10	0.557	0.953	1.51	<10.0	<1.0	4.42	23.82	6.25	376	21.16	-116	0	0.74
WLF-A1-4	**Duplicate**	6/15/2020	AE73533			250	71.7	5.81	<0.10	73.5	355		<5.0	<5.0	33.3	<0.50	<0.50	<5.0	<0.50	<0.10	<1.0	<10	<0.20	<10	0.451	0.265	0.716	<10.0	<1.0								
WLF-A1-4	**total samples**				**0**	**4**	**4**	**4**	**4**	**4**	**4**	**2**	**2**	**2**	**4**	**2**	**2**	**2**	**2**	**4**	**2**	**2**	**2**	**2**	**4**	**4**	**4**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
WLF-A1-5	Detection/ Assessment	2/5/2020	AE65533			1300	321	66.7	<0.10	575	1191	7.07			53.4					<0.10					0.446	0.433	0.88			15.79	21.85	7.07	1396	21.2	-96.9	7.43	0.84
WLF-A1-5	Detection/ Assessment	6/15/2020	AE73534			2000	275	113	<0.10	494	1246	6.91	<5.0	<5.0	42.6	<0.50	<0.50	<5.0	<0.50	<0.10	<1.0	<10	<0.20	<10	0.555	-0.104	0.555	<10.0	<1.0	15.62	22.02	6.91	1580	19.73	-80	0	0.77
WLF-A1-5	**total samples**				**0**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
WAP-7	Detection/ Assessment	2/5/2020	AE65499		1.1		602	66.7	<0.10	1290	2296	6.57	<5.0	<5.0	53.7	<0.50	<0.50	<5.0	0.58	<0.10	<1.0	<10	<0.20	<10	1.2	2.47	3.66	<10.0	<1.0	9.72	20.22	6.57	2113	20.5	28.5	8.12	0.56
WAP-7	Detection/ Assessment	6/15/2020	AE73500			200	110	7.91	<0.10	255	482.5	5.37	<5.0	<5.0	25.9	<0.50	<0.50	<5.0	<0.50	<0.10	<1.0	<10	<0.20	<10	0.139	2.17	2.31	<10.0	<1.0	9.74	20.2	5.37	622	20.28	158	0	1.95
WAP-7	**total samples**				**1**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**

All groundwaler samples collected from the monitoring wells for Assessment Monitoring in 2020 for the constituents listed in Appendix III and Appendix IV of the EPA CCR Rule (40 CFR) were analyzed by South Carolina Certified laboratories: Sanlee Cooper Analytical Services (Certificaiton # 08552), GEL Laboratories, LLC (Certification # 10120), Test America Laboratories Inc. Savannah (Certification # 98001), Test America Laboratories Inc. Pensacola (Certification #96026), Rogers & Callcot, Inc. (Certification # 23105001), and Pace Analytical Services LLC (Certification #99030).

FIGURES

LEGEND

- BACKGROUND WELL
- UNIT 2 SLURRY POND/CLASS 3 LANDFILL WELL
- CCR UNIT BOUNDARY
- PROPERTY BOUNDARY

NOTES

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

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SCALE IN FEET

SANTEE COOPER
WINYAH GENERATING STATION
GEORGETOWN, SOUTH CAROLINA

LOCATION OF CLASS 3 LANDFILL & CLOSED UNIT 2 SLURRY POND GROUNDWATER MONITORING WELLS FOR CCR COMPLIANCE

DECEMBER 2020

FIGURE 1

Appendix A – Statistical Analysis

Data Evaluation Using Intrawell Statistical Analysis

The results of analytical testing performed on samples collected from the groundwater monitoring network were evaluated to determine whether there has been a Statistically Significant Increase (SSI) over background for one or more Appendix III constituent. For the Class 3 Landfill which is in Detection Monitoring in 2020 as a result of a successful Alternate Source Demonstration (ASD), an intrawell statistical analysis was conducted. Intrawell analysis compares each compliance well against a background value composed of its own historical data.

In order to statistically evaluate the analytical results, upper prediction background limit (or UPL), which is a type of prediction interval method was selected to evaluate the data. The prediction interval method is one of the five methods outlined in Part V, Subpart E, Section 258.53.g of R.61-107.19. A prediction interval procedure in which a concentration limits for each constituent is established from the distribution of the background data, with a specified confidence level (e.g., 95 percent). The upper endpoint of a concentration limit is called the upper prediction limit or UPL. Depending on the background data distribution, parametric or non-parametric prediction limits procedures are used to evaluate groundwater monitoring data using this method. Parametric prediction limits 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 prediction limit. If all the background data are non-detect, a maximum reporting limit (RL) may serve as an approximate upper prediction limit. In the case of the Class 3 Landfill the statistical analysis was conducted using both parametric and non-parametric prediction limits.

Following the establishment of background, the current analytical result for each inorganic constituent at each monitoring well was compared to the background value of that constituent to determine whether an SSI has occurred. Table 1 presents the statistical analysis summary. As presented in Table 1, SSIs were identified for calcium, chloride and pH using an intrawell statistical analysis.

The calcium concentration measured at WLF-A1-3 that resulted in an SSI using intrawell comparison was well below the background well concentration. As a result, and consistent with the Unified Guidance, an interwell statistical comparison was performed. The interwell comparison did not identify the calcium concentration at well WLF-A1-3 as an SSI. The increasing concentration trend for calcium at this location is consistent with the findings of the ASD and will continue to be monitored and evaluated during subsequent sampling rounds.

The chloride concentration measured at WAP-7 was determined by the statistical analysis to be an outlier, confirmation sampling will be completed during the next semiannual sampling event in June 2020. In addition, the pH measurement at WLF-A1-2 that was identified as an SSI was determined to be an outlier. The value measured was 5.37 versus an intrawell prediction limit of 5.45. This value falls within the range of accuracy for the pH meter and is well above the interwell prediction limit of 3.77 therefore pH at well WLF-A1-2 is not considered an SSI. pH will continue to be monitored and evaluated during the June 2020 semiannual sampling event.

TABLE 1
DETECTION MONITORING STATISTICAL ANALYSIS SUMMARY
WINYAH GENERATING STATION CLASS 3 LANDFILL
SANTEE COOPER
GEORGETOWN, SOUTH CAROLINA

															Background Data				Full Data					Inter-well Analysis			Intra-well Analysis			
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	Detection Exceedances (Y/N)	Number of Detection Exceedances	Number of Non-Detection Exceedances	Outlier Presence	Outlier Removed	Trend	Distribution Well*	Outlier Presence	Outlier Removed	Trend	Distribution Well*	February 2020 Concentration (mg/L)	Upper Prediction Limit (mg/L)	Upper Tolerance Limit (ug/L)	Exceedance above Background at Individual Well (SSI)	Background Limit (Upper Prediction Limit) mg/L	Background Limit (Upper Prediction Limit) ug/L	SSI	
CCR Appendix-III: Boron, Total (mg/L)																															
MBW-A1-1	10/10	0%	-	0.0395	0.036	0.0618	0.078	0.0001969	0.01403	0.3553	NA	mg/L	N	0	0	Yes	No	Stable	Non-parametric	Yes	No	Stable	Non-parametric								
WAP-07	10/10	0%	-	0.598	0.72	1.015	1.1	0.1408	0.3753	0.6275	NA	mg/L	N	0	0	No	No	Stable	Normal	No	No	Stable	Normal	1.10				2.12	2122.74	N	
WLF-A1-1	11/11	0%	-	3.63	3.8	4.05	4.1	0.2502	0.5002	0.1379	NA	mg/L	N	0	0	No	No	Stable	Normal	No	No	Stable	Normal	2.50				4.74	4739.48	N	
WLF-A1-2	11/11	0%	-	0.562	0.55	1.26	1.8	0.2187	0.4676	0.8323	NA	mg/L	N	0	0	Yes	No	Stable	Normal	Yes	No	Stable	Non-parametric	0.13				2.89	2885.96	N	
WLF-A1-3	11/11	0%	-	0.127	0.095	0.305	0.48	0.01406	0.1186	0.9364	NA	mg/L	N	0	0	Yes	No	Stable	Non-parametric	Yes	No	Stable	Non-parametric	0.08				0.48	480	N	
WLF-A1-4	11/11	0%	-	0.455	0.37	0.88	1.2	0.07143	0.2673	0.588	NA	mg/L	N	0	0	Yes	No	Stable	Non-parametric	Yes	No	Stable	Non-parametric	0.26				1.20	1200	N	
WLF-A1-5	11/11	0%	-	2.26	2.2	3	3	0.3925	0.6265	0.2768	NA	mg/L	N	0	0	No	No	Stable	Normal	No	No	Stable	Normal	1.30				4.62	4620.09	N	
CCR Appendix-III: Calcium, Total (mg/L)																															
MBW-A1-1	11/11	0%	-	42.9	45.1	62.25	65	298.8	17.29	0.4026	NA	mg/L	N	0	0	Yes	No	Decrease	Normal	Yes	No	Stable	Normal		153.29	153286.0					
WAP-07	12/12	0%	-	303	270.5	587.2	602	45490	213.3	0.7027	NA	mg/L	N	0	0	No	No	Stable	Normal	No	No	Stable	Normal	602			Y	1319.80	1319800	N	
WLF-A1-1	11/11	0%	-	493	509	677.5	746	34840	186.7	0.3784	NA	mg/L	N	0	0	Yes	No	Stable	Normal	Yes	No	Stable	Normal	413			Y	1513.05	1513050	N	
WLF-A1-2	11/11	0%	-	101	104	173.5	187	4217	64.94	0.6406	NA	mg/L	N	0	0	Yes	No	Stable	Normal	Yes	No	Stable	Normal	27.1			N	392.42	392419	N	
WLF-A1-3	11/11	0%	-	11.4	8.46	23.05	26.1	54.41	7.377	0.6447	NA	mg/L	N	0	0	Yes	No	Stable	Normal	No	No	Increase	Normal	26.1			N	25.16	25164.3	Y	
WLF-A1-4	11/11	0%	-	127	133	199	212	3121	55.86	0.4414	NA	mg/L	N	0	0	Yes	No	Stable	Normal	No	No	Stable	Normal	88.9			N	421.68	421675	N	
WLF-A1-5	11/11	0%	-	212	233	297	321	6999	83.66	0.3951	NA	mg/L	N	0	0	Yes	No	Stable	Normal	Yes	No	Stable	Normal	321			Y	613.07	613072	N	
CCR Appendix-III: Chloride (mg/L)																															
MBW-A1-1	11/11	0%	-	15.6	9.48	41.95	67.5	302.8	17.4	1.113	NA	mg/L	N	0	0	Yes	No	Stable	Non-parametric	Yes	No	Stable	Non-parametric		67.50	67500.0					
WAP-07	12/12	0%	-	19.6	14.55	43.54	66.7	259.8	16.12	0.8219	NA	mg/L	N	0	0	No	No	Stable	Normal	Yes	No	Stable	Non-parametric	66.7			N	46.63	46626.9	Y	2/5/2020 concentration is an outlier
WLF-A1-1	11/11	0%	-	164	147	261.5	270	3694	60.77	0.3706	NA	mg/L	N	0	0	No	No	Decreasing	Normal	Yes	No	Decreasing	Normal	70.1			Y	416.39	416393	N	
WLF-A1-2	10/10	0%	-	55.9	30.2	170.9	211	3926	62.66	1.121	NA	mg/L	N	0	0	No	No	Stable	Non-parametric	No	No	Decreasing	Non-parametric	19.3			N	211.00	211000	N	
WLF-A1-3	11/11	0%	-	9.35	4	32.94	59.3	275.6	16.6	1.776	NA	mg/L	N	0	0	Yes	No	Stable	Non-parametric	Yes	No	Stable	Non-parametric	4.5			N	59.30	59300	N	
WLF-A1-4	11/11	0%	-	11.2	7.73	28.65	41.3	110.4	10.51	0.9371	NA	mg/L	N	0	0	Yes	No	Stable	Non-parametric	Yes	No	Stable	Non-parametric	5.9			N	41.30	41300	N	
WLF-A1-5	11/11	0%	-	124	107	174.5	175	1702	41.25	0.3324	NA	mg/L	N	0	0	No	No	Stable	Normal	No	No	Stable	Normal	66.7			N	306.49	306493	N	
CCR Appendix-III: Fluoride (mg/L)																															
MBW-A1-1	0/10	100%	0.1-0.1	0.1	0.1	0.1		6.168E-18	2.484E-09	2.484E-08	4	mg/L	N	0	0	NA	NA	NA	NA	NA	NA	NA	NA								
WAP-07	0/10	100%	0.1-0.1	0.1	0.1	0.1		6.168E-18	2.484E-09	2.484E-08	4	mg/L	N	0	0	NA	NA	NA	NA	NA	NA	NA	NA	0.1				0.10	100	N	
WLF-A1-1	0/11	100%	0.1-0.1	0.1	0.1	0.1		6.939E-18	2.634E-09	2.634E-08	4	mg/L	N	0	0	NA	NA	NA	NA	NA	NA	NA	NA	0.1				0.10	100	N	
WLF-A1-2	4/11	64%	0.1-0.1	0.109	0.1	0.135	0.14	0.0002091	0.01446	0.1325	4	mg/L	N	0	0	No	No	Stable	Normal	No	No	Stable	Non-parametric	0.1				0.18	184.665	N	
WLF-A1-3	0/11	100%	0.1-0.1	0.1	0.1	0.1		6.939E-18	2.634E-09	2.634E-08	4	mg/L	N	0	0	NA	NA	NA	NA	NA	NA	NA	NA	0.1				0.10	100	N	
WLF-A1-4	0/11	100%	0.1-0.1	0.1	0.1	0.1		6.939E-18	2.634E-09	2.634E-08	4	mg/L	N	0	0	NA	NA	NA	NA	NA	NA	NA	NA	0.1				0.10	100	N	
WLF-A1-5	1/11	91%	0.1-0.1	0.101	0.1	0.105	0.11	0.000009091	0.003015	0.02988	4	mg/L	N	0	0	NA	NA	NA	NA	NA	NA	NA	NA	0.1				0.11	110	N	
CCR Appendix-III: pH, Field (pH units)																															
MBW-A1-1	11/11	0%	-	4.51	4.52	4.69	4.7	0.01634	0.1278	0.02834	NA	pH units	N	0	0	No	No	Stable	Normal	No	No	Stable	Normal		3.77, 5.26						
WAP-07	12/12	0%	-	6.02	6.045	6.624	6.69	0.1887	0.4344	0.07214	NA	pH units	N	0	0	No	No	Stable	Normal	No	No	Stable	Normal	6.6			Y	3.7, 8.32		N	
WLF-A1-1	11/11	0%	-	6.39	6.41	6.47	6.47	0.005347	0.07313	0.01145	NA	pH units	N	0	0	No	No	Stable	Normal	No	No	Stable	Normal	6.4			Y	6.11, 6.7		N	
WLF-A1-2	11/11	0%	-	6.17	6.29	6.635	6.67	0.2408	0.4907	0.07954	NA	pH units	N	0	0	No	No	Stable	Normal	Yes	No	Decreasing	Normal	5.37			Y	5.45, 7.37		Y	
WLF-A1-3	11/11	0%	-	4.19	4.13	4.52	4.58	0.03346	0.1829	0.04364	NA	pH units	N	0	0	Yes	No	Stable	Normal	Yes	No	Stable	Normal	4.5			N	3.64, 4.6		N	
WLF-A1-4	11/11	0%	-	6.42	6.45	6.68	6.74	0.06807	0.2609	0.04064	NA	pH units	N	0	0	No	No	Stable	Normal	No	No	Stable	Normal	6.4			Y	4.99, 7.8		N	
WLF-A1-5	11/11	0%	-	6.92	6.89	7.05	7.07	0.006456	0.08035	0.01161	NA	pH units	N	0	0	No	No	Stable	Normal	No	No	Stable	Normal	7.1			Y	6.61, 7.18		N	
CCR Appendix-III: Sulfate (mg/L)																															
MBW-A1-1	11/11	0%	-	131	119	175.5	180	765.5	27.67	0.2111	NA	mg/L	N	0	0	No	No	Stable	Normal	No	No	Stable	Normal								
WAP-07	12/12	0%	-	734	659.5	1358	1440	211400	459.8	0.6264	NA	mg/L	N	0	0	No	No	Stable	Normal	No	No	Stable	Normal	1290				2969	2968700	N	
WLF-A1-1	11/11	0%	-	974	1000	1065	1070	11160	105.7	0.1084	NA	mg/L	N	0	0	No	No	Stable	Normal	Yes	No	Stable	Normal	705				1229	1229050	N	
WLF-A1-2	10/10	0%	-	276	247	717.3	1040	84640	290.9	1.055	NA	mg/L	N	0	0	Yes	No	Stable	Non-parametric	Yes	No	Stable	Normal	49				1040	1040000	N	
WLF-A1-3	11/11	0%	-	76	57.7	159.5	160	1980	44.49	0.5851	NA	mg/L	N	0	0	No	No	Stable	Non-parametric	Yes	No	Stable	Normal	89				160	160000	N	
WLF-A1-4	11/11	0%	-	173	169	305.5	366	6474	80.46	0.4663	NA	mg/L	N	0	0	No	No	Stable	Normal	No	No	Stable	Normal	109				590	589733	N	
WLF-A1-5	11/11	0%	-	357	366	488	575	7656	87.5	0.2453	NA	mg/L	N	0	0	No	No	Stable	Normal	Yes	No	Stable	Normal	575				587	587057	N	
CCR Appendix-III: Total Dissolved Solids (TDS) (mg/L)																															
MBW-A1-1	11/11	0%	-	252	247.5	343.8	352.5	3095	55.63	0.2203	NA	mg/L	N	0	0	No	No	Stable	Normal	No	No	Stable	Normal								
WAP-07	12/12	0%	-	1240	1220	2221	2296	558600	747.4	0.6039	NA	mg/L	N	0	0	No	No	Stable	Normal	No	No	Stable	Normal	2296				46140	46140000	N	
WLF-A1-1	11/11	0%	-	2100	2175	2436	2480	100300	316.8	0.1506	NA	mg/L	N	0	0	No	No	Decreasing	Normal	No	No	Decreasing	Normal	1455				2901	2900530	N	
WLF-A1-2	11/11	0%	-	476	477.5	766.3	890	53570	231.4	0.4863	NA	mg/L	N	0	0	No	No	Stable	Normal	No	No	Stable	Normal	151				1327	1326880	N	
WLF-A1-3	11/11	0%	-	102	96.25	130.6	133.8	297.9	17.26	0.1689	NA	mg/L	N	0	0	No	No	Stable	Normal	No	No	Stable	Normal	134				135	134720	N	
WLF-A1-4	11/11	0%	-	501	480	684.4	755	14990	122.4	0.2443	NA	mg/L	N	0	0	No	No	Stable	Normal	No	No	Stable	Normal	338				1018	1018250	N	
WLF-A1-5	11/11	0%	-	1020	1049	1222	1252	33840	184	0.1811	NA	mg/L	N	0	0	No	No	Stable	Normal	No	No	Stable	Normal	1191				1796	1795740	N	

Data Evaluation Using Intrawell Statistical Analysis

The results of analytical testing performed on samples collected from the groundwater monitoring network were evaluated to determine whether there has been a Statistically Significant Increase (SSI) over background for one or more Appendix III constituent. For the Class 3 Landfill which is in Detection Monitoring in 2020 as a result of a successful Alternate Source Demonstration (ASD), an intrawell statistical analysis was conducted. Intrawell analysis compares each compliance well against a background value composed of its own historical data.

In order to statistically evaluate the analytical results, upper prediction background limit (or UPL), which is a type of prediction interval method was selected to evaluate the data. The prediction interval method is one of the five methods outlined in Part V, Subpart E, Section 258.53.g of R.61-107.19. A prediction interval procedure in which a concentration limits for each constituent is established from the distribution of the background data, with a specified confidence level (e.g., 95 percent). The upper endpoint of a concentration limit is called the upper prediction limit or UPL. Depending on the background data distribution, parametric or non-parametric prediction limits procedures are used to evaluate groundwater monitoring data using this method. Parametric prediction limits 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 prediction limit. If all the background data are non-detect, a maximum reporting limit (RL) may serve as an approximate upper prediction limit. In the case of the Class 3 Landfill the statistical analysis was conducted using both parametric and non-parametric prediction limits.

Following the establishment of background, the current analytical result for each inorganic constituent at each monitoring well was compared to the background value of that constituent to determine whether an SSI has occurred. Table 1 presents the statistical analysis summary. As presented in Table 1, SSIs were identified for calcium, pH and TDS using an intrawell statistical analysis.

The calcium concentration measured at WLF-A1-3 that resulted in an SSI using intrawell comparison was well below the background well concentration. As a result, and consistent with the Unified Guidance, an interwell statistical comparison was performed. The interwell comparison did not identify the calcium concentration at well WLF-A1-3 as an SSI. The increasing concentration trend for calcium at this location is consistent with the findings of the ASD and will continue to be monitored and evaluated during subsequent sampling rounds.

The pH value measured at WLF-A1-2 resulted in an SSI using intrawell comparison. However, evaluating the pH using interwell statsitcial comparison consistent with the Unified Guidance does not identify the pH as an SSI. The value is above the interwell prediction limit of 3.77 and is within the historical range of background therefore pH at WLF-A1-2 is not considered an SSI and will continue to be monitored and evaluated during future semiannual sampling events.

Lastly, the TDS concentration measured at WLF-A1-3 resulted in an SSI using intrawell comparison. However, evaluating the TDS using interwell statsitcial comparison consistent with the Unified Guidance does not identify the TDS as an SSI. The value is within the historical range of background therefore TDS at WLF-A1-3 is not considered an SSI and will continue to be monitored and evaluated during future semiannual sampling events.

Winyah Class III Landfill

Detection Monitoring Statistical Analysis Summary

Prepared: October 1, 2020

															Background Data					Inter-well Analysis			Intra-well Analysis		
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	Detection Exceedances (Y/N)	Number of Detection Exceedances	Number of Non-Detection Exceedances	Outlier Presence	Outlier Removed	Trend	Distribution Well*	June 2020 Concentration (mg/L)	Upper Prediction Limit (mg/L)	Upper Tolerance Limit (ug/L)	Exceedance above Background at Individual Well (SSI)	Background Limit (Upper Prediction Limit) mg/L	Background Limit (Upper Prediction Limit) ug/L	SSI
CCR Appendix-III: Boron, Total (mg/L)																										
WBW-A1-1	11/11	0%	-	0.0385	0.036	0.06	0.078	0.0001893	0.01376	0.3578	NA	mg/L	N	0	0	Yes	No	Stable	Non-parametric		0.08	78.0				
WAP-07	11/11	0%	-	0.562	0.64	1.005	1.1	0.1411	0.3757	0.6687	NA	mg/L	N	0	0	No	No	Stable	Normal	0.20			Y	2.12	2122.74	N
WLF-A1-1	12/12	0%	-	3.53	3.75	4.045	4.1	0.353	0.5941	0.1685	NA	mg/L	N	0	0	No	No	Stable	Normal	2.40			Y	4.74	4739.48	N
WLF-A1-2	12/12	0%	-	0.524	0.46	1.206	1.8	0.2158	0.4646	0.8863	NA	mg/L	N	0	0	Yes	No	Stable	Normal	0.11			Y	2.89	2885.96	N
WLF-A1-3	12/12	0%	-	0.122	0.0905	0.2875	0.48	0.01301	0.114	0.9322	NA	mg/L	N	0	0	Yes	No	Stable	Non-parametric	0.08			N	0.48	480	N
WLF-A1-4	12/12	0%	-	0.435	0.365	0.848	1.2	0.06952	0.2637	0.6061	NA	mg/L	N	0	0	Yes	No	Stable	Non-parametric	0.22			Y	1.20	1200	N
WLF-A1-5	12/12	0%	-	2.24	2.15	3	3	0.3627	0.6022	0.2686	NA	mg/L	N	0	0	No	No	Stable	Normal	2.00			Y	4.62	4620.09	N
CCR Appendix-III: Calcium, Total (mg/L)																										
WBW-A1-1	12/12	0%	-	42.4	44.95	61.97	65	275.4	16.6	0.3916	NA	mg/L	N	0	0	Yes	Yes	Decrease	Normal		98.35	98354.0				
WAP-07	13/13	0%	-	289	228	585.8	602	44580	211.1	0.7315	NA	mg/L	N	0	0	No	No	Stable	Normal	110			Y	1319.80	1319800	N
WLF-A1-1	12/12	0%	-	484	498	670.7	746	32780	181.1	0.3744	NA	mg/L	N	0	0	Yes	No	Stable	Normal	378			Y	1513.05	1513050	N
WLF-A1-2	12/12	0%	-	93.9	103	172.1	187	4499	67.08	0.7141	NA	mg/L	N	0	0	Yes	No	Stable	Normal	12.0			N	392.42	392419	N
WLF-A1-3	12/12	0%	-	12.7	9.1	26.19	26.3	67.86	8.238	0.6496	NA	mg/L	N	0	0	Yes	No	Stable	Normal	26.3			N	25.16	25164.3	Y
WLF-A1-4	12/12	0%	-	122	131.5	197.7	212	3120	55.85	0.459	NA	mg/L	N	0	0	Yes	No	Stable	Normal	68.3			N	421.68	421675	N
WLF-A1-5	12/12	0%	-	217	237.5	295.7	321	6696	81.83	0.3771	NA	mg/L	N	0	0	Yes	No	Stable	Normal	275			Y	613.07	613072	N
CCR Appendix-III: Chloride (mg/L)																										
WBW-A1-1	12/12	0%	-	15.6	9.485	39.4	67.5	275.3	16.59	1.063	NA	mg/L	N	0	0	Yes	No	Stable	Non-parametric		67.50	67500.0				
WAP-07	13/13	0%	-	18.7	14.1	41.44	66.7	248.6	15.77	0.8428	NA	mg/L	N	0	0	No	No	Stable	Normal	7.9			N	46.63	46626.9	N
WLF-A1-1	12/12	0%	-	154	145	260.6	270	4467	66.84	0.4329	NA	mg/L	N	0	0	No	No	Decreasing	Normal	48.6			N	416.39	416393	N
WLF-A1-2	11/11	0%	-	51.6	28	166.5	211	3731	61.08	1.183	NA	mg/L	N	0	0	No	No	Stable	Non-parametric	9.2			N	211.00	211000	N
WLF-A1-3	12/12	0%	-	8.91	4.065	30.3	59.3	252.8	15.9	1.784	NA	mg/L	N	0	0	Yes	No	Stable	Non-parametric	4.1			N	59.30	59300	N
WLF-A1-4	12/12	0%	-	10.8	7.345	27.39	41.3	102.9	10.14	0.9429	NA	mg/L	N	0	0	Yes	No	Stable	Non-parametric	5.7			N	41.30	41300	N
WLF-A1-5	12/12	0%	-	123	110	174.4	175	1557	39.46	0.3203	NA	mg/L	N	0	0	No	No	Stable	Normal	113.0			Y	306.49	306493	N
CCR Appendix-III: Fluoride (mg/L)																										
WBW-A1-1	0/11	100%	0.1-0.1	0.1	0.1	0.1		6.939E-18	2.634E-09	2.634E-08	4	mg/L	N	0	0	NA	NA	NA	NA		0.10	100.0				
WAP-07	0/11	100%	0.1-0.1	0.1	0.1	0.1		6.939E-18	2.634E-09	2.634E-08	4	mg/L	N	0	0	NA	NA	NA	NA	0.1			N	0.10	100	N
WLF-A1-1	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	N	0	0	NA	NA	NA	NA	0.1			N	0.10	100	N
WLF-A1-2	4/12	67%	0.1-0.1	0.108	0.1	0.1345	0.14	0.000197	0.01403	0.1296	4	mg/L	N	0	0	No	No	Stable	Normal	0.1			N	0.18	184.665	N
WLF-A1-3	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	N	0	0	NA	NA	NA	NA	0.1			N	0.10	100	N
WLF-A1-4	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	N	0	0	NA	NA	NA	NA	0.1			N	0.10	100	N
WLF-A1-5	1/12	92%	0.1-0.1	0.101	0.1	0.1045	0.11	0.000008333	0.002887	0.02863	4	mg/L	N	0	0	NA	NA	NA	NA	0.1			N	0.11	110	N
CCR Appendix-III: pH, Field (pH units)																										
WBW-A1-1	12/12	0%	-	4.51	4.5	4.689	4.7	0.01493	0.1222	0.02711	NA	pH units	N	0	0	No	No	Stable	Normal		3.85, 5.17					
WAP-07	13/13	0%	-	5.97	5.99	6.618	6.69	0.2055	0.4533	0.07593	NA	pH units	N	0	0	No	No	Stable	Normal	5.4			Y	3.7, 8.32		N
WLF-A1-1	12/12	0%	-	6.37	6.405	6.47	6.47	0.008045	0.08969	0.01408	NA	pH units	N	0	0	No	No	Stable	Normal	6.2			Y	6.11, 6.7		N
WLF-A1-2	12/12	0%	-	6.03	6.27	6.631	6.67	0.4541	0.6739	0.1118	NA	pH units	N	0	0	No	No	Stable	Normal	4.49			N	5.45, 7.37		Y
WLF-A1-3	12/12	0%	-	4.19	4.14	4.514	4.58	0.03042	0.1744	0.04161	NA	pH units	N	0	0	Yes	No	Stable	Normal	4.2			N	3.64, 4.6		N
WLF-A1-4	12/12	0%	-	6.4	6.445	6.674	6.74	0.06426	0.2535	0.03958	NA	pH units	N	0	0	No	No	Stable	Normal	6.3			Y	4.99, 7.8		N
WLF-A1-5	12/12	0%	-	6.92	6.9	7.048	7.07	0.005881	0.07669	0.01108	NA	pH units	N	0	0	No	No	Stable	Normal	6.9			Y	6.61, 7.18		N
CCR Appendix-III: Sulfate (mg/L)																										
WBW-A1-1	12/12	0%	-	129	118	175.1	180	744.3	27.28	0.2113	NA	mg/L	N	0	0	No	No	Stable	Normal		261.08	261080.0				
WAP-07	13/13	0%	-	697	612	1350	1440	211400	459.8	0.6595	NA	mg/L	N	0	0	No	No	Stable	Normal	255			N	2969	2968700	N
WLF-A1-1	12/12	0%	-	947	989	1065	1070	19250	138.7	0.1465	NA	mg/L	N	0	0	No	No	Stable	Normal	644			Y	1229	1229050	N
WLF-A1-2	11/11	0%	-	255	238	681.5	1040	81170	284.9	1.119	NA	mg/L	N	0	0	Yes	No	Stable	Non-parametric	42			N	1040	1040000	N
WLF-A1-3	12/12	0%	-	77	66.7	159.4	160	1811	42.56	0.5525	NA	mg/L	N	0	0	No	No	Stable	Non-parametric	88			N	160	160000	N
WLF-A1-4	12/12	0%	-	164	148	299.5	366	6725	82	0.4995	NA	mg/L	N	0	0	No	No	Stable	Normal	72			N	590	589733	N
WLF-A1-5	12/12	0%	-	368	367	530.5	575	8531	92.36	0.2509	NA	mg/L	N	0	0	No	No	Stable	Normal	494			Y	587	587057	N
CCR Appendix-III: Total Dissolved Solids (TDS) (mg/L)																										
WBW-A1-1	12/12	0%	-	246	236.9	342.9	352.5	3251	57.02	0.2314	NA	mg/L	N	0	0	No	No	Stable	Normal		522.34	522335.0				
WAP-07	13/13	0%	-	1180	1151	2214	2296	555900	745.6	0.6321	NA	mg/L	N	0	0	No	No	Stable	Normal	483			N	46140	46140000	N
WLF-A1-1	12/12	0%	-	2050	2170	2432	2480	121000	347.8	0.1694	NA	mg/L	N	0	0	No	No	Decreasing	Normal	1505			Y	2901	2900530	N
WLF-A1-2	12/12	0%	-	455	453.8	753.9	890	54210	232.8	0.5122	NA	mg/L	N	0	0	No	No	Stable	Normal	219			N	1327	1326880	N
WLF-A1-3	12/12	0%	-	114	98.72	182.1	241.2	1881	43.37	0.3811	NA	mg/L	N	0	0	No	No	Stable	Normal	241			N	135	134720	Y
WLF-A1-4	12/12	0%	-	490	471.3	677.3	755	15150	123.1	0.2512	NA	mg/L	N	0	0	No	No	Stable	Normal	366			N	1018	1018250	N
WLF-A1-5	12/12	0%	-	1030	1084	1249	1252	35190	187.6	0.1813	NA	mg/L	N	0	0	No	No	Stable	Normal	1246			Y	1796	1795740	N

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TECHNICAL MEMORANDUM

June 18, 2020
File No. 132892-014

SUBJECT: 2020 Semi-annual Groundwater Assessment Monitoring Data
Statistical Evaluation
Winyah Generating Station
Closed Unit 2 Slurry 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 February 2020 semi-annual assessment monitoring groundwater sampling events for the Winyah Generating Station (WGS) Closed Unit 2 Slurry 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 (WBW-A1-1) 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 Table I.

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 January 24, 2020. 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 groundwater sampling result 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 February 2020 semi-annual sampling event was 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 (WBW-A1-1) 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 for the February 2020 semi-annual sampling event based on statistical evaluation of analytical results collected through February 2020.

RESULTS OF APPENDIX IV DOWNGRADIENT STATISTICAL COMPARISONS

The sample concentrations from the downgradient wells for each of the detected Appendix IV constituents from the February 2020 semi-annual assessment monitoring event were compared to their respective background UTLs and GWPS (Tables I). A sample concentration greater than the GWPS is considered to represent a SSL. Based on previous compliance sampling event and statistical evaluations, interwell comparisons were utilized for all downgradient wells and constituents. Based on these statistical evaluations no SSLs above GWPS were identified at the Closed Unit 2 Slurry Pond, consistent with previous results.

Tables:

Table I – Summary of Assessment Monitoring Statistical Evaluation – February 2020

TABLES

Winyah Closed Unit 2 Slurry Pond

Assessment Monitoring Statistical Analysis Summary

Prepared: June 17, 2020

																			Inter-well Analysis					
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	Detection Exceedances (Y/N)	Number of Detection Exceedances	Number of Non-Detection Exceedances	Outlier Presence	Outlier Removed	Trend	Distribution Group	Distribution Well*	February 2020 Concentration (mg/L)	Detect?	Upper Tolerance Limit (mg/L)	SSI	GWPS (Higher of MCL/RSL or Upper Tolerance Limit) mg/L	SSL
CCR Appendix-IV: Antimony, Total (mg/L)																										
WBW-A1-1	0/8	100%	0.005-0.025	0.0075	0.005	0.018		0.00005	0.007071	0.9428	0.006	mg/L	N	0	1	NA	NA	NA	NA	NA			0.025		0.025	
WAP-07	0/9	100%	0.005-0.025	0.00722	0.005	0.017		0.00004444	0.006667	0.9231	0.006	mg/L	N	0	1	NA	NA	NA		NA	0.005	N		N		No
WLF-A1-1	0/8	100%	0.005-0.025	0.0075	0.005	0.018		0.00005	0.007071	0.9428	0.006	mg/L	N	0	1	NA	NA	NA		NA				N		No
WLF-A1-2	0/8	100%	0.005-0.025	0.0075	0.005	0.018		0.00005	0.007071	0.9428	0.006	mg/L	N	0	1	NA	NA	NA		NA				N		No
WLF-A1-3	0/8	100%	0.005-0.025	0.0075	0.005	0.018		0.00005	0.007071	0.9428	0.006	mg/L	N	0	1	NA	NA	NA		NA				N		No
WLF-A1-4	0/8	100%	0.005-0.025	0.0075	0.005	0.018		0.00005	0.007071	0.9428	0.006	mg/L	N	0	1	NA	NA	NA		NA				N		No
WLF-A1-5	0/8	100%	0.005-0.025	0.0075	0.005	0.018		0.00005	0.007071	0.9428	0.006	mg/L	N	0	1	NA	NA	NA		NA				N		No
CCR Appendix-IV: Arsenic, Total (mg/L)																										
WBW-A1-1	0/9	100%	0.005-0.005	0.005	0.005	0.005		6.776E-21	8.232E-11	1.646E-08	0.01	mg/L	N	0	0	NA	NA	NA	NA	NA			0.005		0.010	
WAP-07	0/12	100%	0.005-0.005	0.005	0.005	0.005		1.478E-20	1.216E-10	2.432E-08	0.01	mg/L	N	0	0	NA	NA	NA		NA	0.005	N		N		No
WLF-A1-1	0/8	100%	0.005-0.005	0.005	0.005	0.005		3.872E-21	6.223E-11	1.245E-08	0.01	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-2	0/8	100%	0.005-0.005	0.005	0.005	0.005		3.872E-21	6.223E-11	1.245E-08	0.01	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-3	5/8	38%	0.005-0.005	0.00662	0.00602	0.009305	0.0099	0.000003361	0.001833	0.2771	0.01	mg/L	N	0	0									N		No
WLF-A1-4	0/8	100%	0.005-0.005	0.005	0.005	0.005		3.872E-21	6.223E-11	1.245E-08	0.01	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-5	0/8	100%	0.005-0.005	0.005	0.005	0.005		3.872E-21	6.223E-11	1.245E-08	0.01	mg/L	N	0	0	NA	NA	NA		NA				N		No
CCR Appendix-IV: Barium, Total (mg/L)																										
WBW-A1-1	10/10	0%	-	0.0929	0.09055	0.1126	0.114	0.0002048	0.01431	0.154	2	mg/L	N	0	0	No	No	Stable	Normal	Normal			0.120		2.000	
WAP-07	12/12	0%	-	0.0299	0.0309	0.04369	0.0537	0.00008999	0.009486	0.3169	2	mg/L	N	0	0	Yes	No	Stable		Normal	0.054	Y		N		No
WLF-A1-1	9/9	0%	-	0.0386	0.0375	0.04936	0.0496	0.00006169	0.007854	0.2035	2	mg/L	N	0	0	No	No	Decreasing		Normal	0.031	Y		N		No
WLF-A1-2	9/9	0%	-	0.0488	0.0539	0.06494	0.0663	0.0003019	0.01738	0.3562	2	mg/L	N	0	0	No	No	Stable		Normal	0.041	Y		N		No
WLF-A1-3	9/9	0%	-	0.0366	0.0361	0.04014	0.0405	0.000005489	0.002343	0.06398	2	mg/L	N	0	0	No	No	Stable		Normal	0.034	Y		N		No
WLF-A1-4	9/9	0%	-	0.0459	0.0402	0.06808	0.0792	0.0001855	0.01362	0.2969	2	mg/L	N	0	0	Yes	No	Stable		Non-parametric	0.040	Y		N		No
WLF-A1-5	9/9	0%	-	0.0481	0.048	0.05212	0.0534	0.000009909	0.003148	0.06548	2	mg/L	N	0	0	No	No	Stable		Normal	0.053	Y		N		No
CCR Appendix-IV: Beryllium, Total (mg/L)																										
WBW-A1-1	0/8	100%	0.0005-0.0005	0.0005	0.0005	0.0005		0	0	0	0.004	mg/L	N	0	0	NA	NA	NA	NA	NA			0.0005		0.004	
WAP-07	0/9	100%	0.0005-0.0005	0.0005	0.0005	0.0005		0	0	0	0.004	mg/L	N	0	0	NA	NA	NA		NA	0.001	N		N		No
WLF-A1-1	0/8	100%	0.0005-0.0005	0.0005	0.0005	0.0005		0	0	0	0.004	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-2	0/8	100%	0.0005-0.0005	0.0005	0.0005	0.0005		0	0	0	0.004	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-3	0/8	100%	0.0005-0.0005	0.0005	0.0005	0.0005		0	0	0	0.004	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-4	0/8	100%	0.0005-0.0005	0.0005	0.0005	0.0005		0	0	0	0.004	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-5	0/8	100%	0.0005-0.0005	0.0005	0.0005	0.0005		0	0	0	0.004	mg/L	N	0	0	NA	NA	NA		NA				N		No
CCR Appendix-IV: Cadmium, Total (mg/L)																										
WBW-A1-1	0/9	100%	0.0005-0.002	0.000667	0.0005	0.0014		0.00000025	0.0005	0.75	0.005	mg/L	N	0	0	NA	NA	NA	NA	NA			0.002		0.005	
WAP-07	0/12	100%	0.0005-0.002	0.000625	0.0005	0.001175		1.875E-07	0.000433	0.6928	0.005	mg/L	N	0	0	NA	NA	NA		NA	0.001	N		N		No
WLF-A1-1	0/8	100%	0.0005-0.0005	0.0005	0.0005	0.0005		0	0	0	0.005	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-2	0/8	100%	0.0005-0.0005	0.0005	0.0005	0.0005		0	0	0	0.005	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-3	1/8	88%	0.0005-0.0005	0.000534	0.0005	0.0006755	0.00077	9.113E-09	0.00009546	0.1788	0.005	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-4	0/8	100%	0.0005-0.0005	0.0005	0.0005	0.0005		0	0	0	0.005	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-5	0/8	100%	0.0005-0.0005	0.0005	0.0005	0.0005		0	0	0	0.005	mg/L	N	0	0	NA	NA	NA		NA				N		No
CCR Appendix-IV: Chromium, Total (mg/L)																										
WBW-A1-1	0/9	100%	0.005-0.01	0.00556	0.005	0.008		0.000002778	0.001667	0.3	0.1	mg/L	N	0	0	NA	NA	NA	NA	NA			0.01		0.100	
WAP-07	0/12	100%	0.005-0.01	0.00542	0.005	0.00725		0.000002083	0.001443	0.2665	0.1	mg/L	N	0	0	NA	NA	NA		NA	0.005	N		N		No
WLF-A1-1	0/8	100%	0.005-0.005	0.005	0.005	0.005		3.872E-21	6.223E-11	1.245E-08	0.1	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-2	0/8	100%	0.005-0.005	0.005	0.005	0.005		3.872E-21	6.223E-11	1.245E-08	0.1	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-3	0/8	100%	0.005-0.005	0.005	0.005	0.005		3.872E-21	6.223E-11	1.245E-08	0.1	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-4	0/8	100%	0.005-0.005	0.005	0.005	0.005		3.872E-21	6.223E-11	1.245E-08	0.1	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-5	0/8	100%	0.005-0.005	0.005	0.005	0.005		3.872E-21	6.223E-11	1.245E-08	0.1	mg/L	N	0	0	NA	NA	NA		NA				N		No
CCR Appendix-IV: Cobalt, Total (mg/L)																										
WBW-A1-1	0/8	100%	0.0005-0.0005	0.0005	0.0005	0.0005		0	0	0	0.006	mg/L	N	0	0	NA	NA	NA	NA	NA			0.0005		0.006	
WAP-07	2/9	78%	0.0005-0.0005	0.000509	0.0005	0.000548	0.00058	7.111E-10	0.00002667	0.0524	0.006	mg/L	N	0	0	NA	NA	NA		NA	0.001	Y		Y		No
WLF-A1-1	1/8	88%	0.0005-0.0005	0.0005	0.0005	0.0005	0.0005	0	0	0	0.006	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-2	0/8	100%	0.0005-0.0005	0.0005	0.0005	0.0005		0	0	0	0.006	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-3	2/8	75%	0.0005-0.0005	0.000513	0.0005	0.000565	0.0006	1.25E-09	0.00003536	0.06899	0.006	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-4	0/8	100%	0.0005-0.0005	0.0005	0.0005	0.0005		0	0	0	0.006	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-5	0/8	100%	0.0005-0.0005	0.0005	0.0005	0.0005		0	0	0	0.006	mg/L	N	0	0	NA	NA	NA		NA				N		No
CCR Appendix-IV: Fluoride (mg/L)																										
WBW-A1-1	0/10	100%	0.1-0.1	0.1	0.1	0.1		6.168E-18	2.484E-09	2.484E-08	4	mg/L	N	0	0	NA	NA	NA	NA	NA			0.1		4.000	
WAP-07	0/10	100%	0.1-0.1	0.1	0.1	0.1		6.168E-18	2.484E-09	2.484E-08	4	mg/L	N	0	0	NA	NA	NA		NA	0.100	N		N		No
WLF-A1-1	0/11	100%	0.1-0.1	0.1	0.1	0.1		6.939E-18	2.634E-09	2.634E-08	4	mg/L	N	0	0	NA	NA	NA		NA	0.100	N		N		No
WLF-A1-2	4/11	64%	0.1-0.1	0.109	0.1	0.135	0.14	0.0002091	0.01446	0.1325	4	mg/L	N	0	0	NA	NA	NA		NA	0.100	N		N		No
WLF-A1-3	0/11	100%	0.1-0.1	0.1	0.1	0.1		6.939E-18	2.634E-09	2.634E-08	4	mg/L	N	0	0	NA	NA	NA		NA	0.100	N		N		No
WLF-A1-4	0/11	100%	0.1-0.1	0.1	0.1	0.1		6.939E-18	2.634E-09	2.634E-08	4	mg/L	N	0	0	NA	NA	NA		NA	0.100	N		N		No
WLF-A1-5	1/11	91%	0.1-0.1	0.101	0.1	0.105	0.11	0.000009091	0.003015	0.02988	4	mg/L	N	0	0	NA	NA	NA		NA	0.100	N		N		No

Winyah Closed Unit 2 Slurry Pond

Assessment Monitoring Statistical Analysis Summary

Prepared: June 17, 2020

CCR Appendix-IV: Lead, Total (mg/L)																								
WBW-A1-1	0/9	100%	0.001-0.002	0.00111	0.001	0.0016		1.111E-07	0.0003333	0.3	0.015	mg/L	N	0	0	NA	NA	NA	NA	NA			0.002		0.015	
WAP-07	1/12	92%	0.001-0.002	0.00109	0.001	0.001505	0.0011	8.265E-08	0.0002875	0.2634	0.015	mg/L	N	0	0	NA	NA	NA		NA	0.001	N		N		No
WLF-A1-1	0/8	100%	0.001-0.001	0.001	0.001	0.001		0	0	0	0.015	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-2	0/8	100%	0.001-0.001	0.001	0.001	0.001		0	0	0	0.015	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-3	0/8	100%	0.001-0.001	0.001	0.001	0.001		0	0	0	0.015	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-4	0/8	100%	0.001-0.001	0.001	0.001	0.001		0	0	0	0.015	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-5	0/8	100%	0.001-0.001	0.001	0.001	0.001		0	0	0	0.015	mg/L	N	0	0	NA	NA	NA		NA				N		No
CCR Appendix-IV: Lithium, Total (mg/L)																								
WBW-A1-1	0/8	100%	0.01-0.01	0.01	0.01	0.01		1.549E-20	1.245E-10	1.245E-08	0.04	mg/L	N	0	0	NA	NA	NA	NA	NA			0.01		0.040	
WAP-07	0/9	100%	0.01-0.01	0.01	0.01	0.01		2.711E-20	1.646E-10	1.646E-08	0.04	mg/L	N	0	0	NA	NA	NA		NA	0.010	N		N		No
WLF-A1-1	0/8	100%	0.01-0.01	0.01	0.01	0.01		1.549E-20	1.245E-10	1.245E-08	0.04	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-2	0/8	100%	0.01-0.02	0.0112	0.01	0.0165		0.0000125	0.003536	0.3143	0.04	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-3	0/8	100%	0.01-0.01	0.01	0.01	0.01		1.549E-20	1.245E-10	1.245E-08	0.04	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-4	0/8	100%	0.01-0.01	0.01	0.01	0.01		1.549E-20	1.245E-10	1.245E-08	0.04	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-5	0/8	100%	0.01-0.01	0.01	0.01	0.01		1.549E-20	1.245E-10	1.245E-08	0.04	mg/L	N	0	0	NA	NA	NA		NA				N		No
CCR Appendix-IV: Mercury, Total (mg/L)																								
WBW-A1-1	0/8	100%	0.0002-0.0002	0.0002	0.0002	0.0002		0	0	0	0.002	mg/L	N	0	0	NA	NA	NA	NA	NA			0.0002		0.002	
WAP-07	0/9	100%	0.0002-0.0002	0.0002	0.0002	0.0002		0	0	0	0.002	mg/L	N	0	0	NA	NA	NA		NA	0.000	N		N		No
WLF-A1-1	0/8	100%	0.0002-0.0002	0.0002	0.0002	0.0002		0	0	0	0.002	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-2	0/8	100%	0.0002-0.0002	0.0002	0.0002	0.0002		0	0	0	0.002	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-3	0/8	100%	0.0002-0.0002	0.0002	0.0002	0.0002		0	0	0	0.002	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-4	0/8	100%	0.0002-0.0002	0.0002	0.0002	0.0002		0	0	0	0.002	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-5	0/8	100%	0.0002-0.0002	0.0002	0.0002	0.0002		0	0	0	0.002	mg/L	N	0	0	NA	NA	NA		NA				N		No
CCR Appendix-IV: Molybdenum, Total (mg/L)																								
WBW-A1-1	0/8	100%	0.01-0.05	0.015	0.01	0.036		0.0002	0.01414	0.9428	0.1	mg/L	N	0	0	NA	NA	NA	NA	NA			0.05		0.100	
WAP-07	0/9	100%	0.01-0.01	0.01	0.01	0.01		2.711E-20	1.646E-10	1.646E-08	0.1	mg/L	N	0	0	NA	NA	NA		NA	0.010	N		N		No
WLF-A1-1	0/8	100%	0.01-0.05	0.015	0.01	0.036		0.0002	0.01414	0.9428	0.1	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-2	0/8	100%	0.01-0.01	0.01	0.01	0.01		1.549E-20	1.245E-10	1.245E-08	0.1	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-3	0/8	100%	0.01-0.01	0.01	0.01	0.01		1.549E-20	1.245E-10	1.245E-08	0.1	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-4	0/8	100%	0.01-0.01	0.01	0.01	0.01		1.549E-20	1.245E-10	1.245E-08	0.1	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-5	0/8	100%	0.01-0.01	0.01	0.01	0.01		1.549E-20	1.245E-10	1.245E-08	0.1	mg/L	N	0	0	NA	NA	NA		NA				N		No
CCR Appendix-IV: Radium-226 & 228 (pG/L)																								
WBW-A1-1	6/9	33%	4-4	4.11	4.16	4.974	5.07	0.8416	0.9174	0.2234	5	pCi/L	Y	1	0	Yes	No	Stable	Normal	Normal			5.9037		5.90	
WAP-07	3/9	67%	4-4	4.19	4	5.07	5.31	0.2528	0.5028	0.1201	5	pCi/L	Y	1	0						3.660	Y		N		No
WLF-A1-1	4/9	56%	4-4	3.89	4	4.296	4.34	0.351	0.5924	0.1521	5	pCi/L	N	0	0						2.350	Y		N		No
WLF-A1-2	3/9	67%	4-4	3.98	4	5.156	5.92	1.006	1.003	0.2519	5	pCi/L	Y	1	0						1.910	Y		N		No
WLF-A1-3	8/9	11%	4-4	4.26	4.33	5.214	5.25	1.491	1.221	0.2867	5	pCi/L	Y	2	0						1.240	Y		N		No
WLF-A1-4	3/9	67%	4-4	3.74	4	4.322	4.51	1.027	1.013	0.2713	5	pCi/L	N	0	0						1.070	Y		N		No
WLF-A1-5	4/9	56%	4-4	3.76	4	4.338	4.37	1.188	1.09	0.2901	5	pCi/L	N	0	0						0.880	Y		N		No
CCR Appendix-IV: Selenium, Total (mg/L)																								
WBW-A1-1	0/9	100%	0.005-0.01	0.00944	0.01	0.01		0.000002778	0.001667	0.1765	0.05	mg/L	N	0	0	NA	NA	NA	NA	NA			0.01		0.050	
WAP-07	0/12	100%	0.005-0.01	0.00958	0.01	0.01		0.000002083	0.001443	0.1506	0.05	mg/L	N	0	0	NA	NA	NA		NA	0.010	N		N		No
WLF-A1-1	0/8	100%	0.01-0.01	0.01	0.01	0.01		1.549E-20	1.245E-10	1.245E-08	0.05	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-2	0/8	100%	0.01-0.01	0.01	0.01	0.01		1.549E-20	1.245E-10	1.245E-08	0.05	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-3	0/8	100%	0.01-0.01	0.01	0.01	0.01		1.549E-20	1.245E-10	1.245E-08	0.05	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-4	0/8	100%	0.01-0.01	0.01	0.01	0.01		1.549E-20	1.245E-10	1.245E-08	0.05	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-5	0/8	100%	0.01-0.01	0.01	0.01	0.01		1.549E-20	1.245E-10	1.245E-08	0.05	mg/L	N	0	0	NA	NA	NA		NA				N		No
CCR Appendix-IV: Thallium, Total (mg/L)																								
WBW-A1-1	0/8	100%	0.001-0.001	0.001	0.001	0.001		0	0	0	0.002	mg/L	N	0	0	NA	NA	NA	NA	NA			0.001		0.002	
WAP-07	0/9	100%	0.001-0.001	0.001	0.001	0.001		0	0	0	0.002	mg/L	N	0	0	NA	NA	NA		NA	0.001	N		N		No
WLF-A1-1	0/8	100%	0.001-0.001	0.001	0.001	0.001		0	0	0	0.002	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-2	0/8	100%	0.001-0.001	0.001	0.001	0.001		0	0	0	0.002	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-3	0/8	100%	0.001-0.001	0.001	0.001	0.001		0	0	0	0.002	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-4	0/8	100%	0.001-0.001	0.001	0.001	0.001		0	0	0	0.002	mg/L	N	0	0	NA	NA	NA		NA				N		No
WLF-A1-5	0/8	100%	0.001-0.001	0.001	0.001	0.001		0	0	0	0.002	mg/L	N	0	0	NA	NA	NA		NA				N		No

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TECHNICAL MEMORANDUM

October 21, 2020
File No. 132892-014

SUBJECT: 2020 Semi-annual Groundwater Assessment Monitoring Data
Statistical Evaluation
Winyah Generating Station
Closed Unit 2 Slurry 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 June 2020 semi-annual assessment monitoring groundwater sampling events for the Winyah Generating Station (WGS) Closed Unit 2 Slurry 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 (WBW-A1-1) 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 Table I.

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 January 24, 2020. 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 groundwater sampling result 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 June 2020 semi-annual sampling event was 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 (WBW-A1-1) 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 for the February 2020 semi-annual sampling event based on statistical evaluation of analytical results collected through February 2020.

RESULTS OF APPENDIX IV DOWNGRADIENT STATISTICAL COMPARISONS

The sample concentrations from the downgradient wells for each of the detected Appendix IV constituents from the June 2020 semi-annual assessment monitoring event 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 the results from previous compliance sampling events and statistical evaluations, interwell comparisons were utilized for all downgradient wells and constituents. Consistent with previous statistical evaluations SSLs above GWPS were not identified at the Closed Unit 2 Slurry Pond and as a result, the closed Unit 2 Slurry Pond will remain in assessment monitoring.

Tables:

Table I – Summary of Assessment Monitoring Statistical Evaluation – June 2020

TABLES

Winyah Class III Landfill

Assessment Monitoring Statistical Analysis Summary

Prepared: October 21, 2020

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	Detection Exceedances (Y/N)	Number of Detection Exceedances	Number of Non-Detection Exceedances	Outlier Presence	Outlier Removed	Trend	Distribution Group	Distribution Well*	Inter-well Analysis				GWPS (Higher of MCL/RSL or Upper Tolerance Limit) mg/L	SSL
																					June 2020 Concentration (mg/L)	Detect?	Upper Tolerance Limit (mg/L)	SSI		
CCR Appendix-IV: Antimony, Total (mg/L)																										
WBW-A1-1	0/9	100%	0.005-0.025	0.00722	0.005	0.017		0.00004444	0.006667	0.9231	0.006	mg/L	N	0	1	NA	NA	NA	NA	NA			0.025		0.025	
WAP-07	0/10	100%	0.005-0.025	0.007	0.005	0.016		0.00004	0.006325	0.9035	0.006	mg/L	N	0	1	NA	NA	NA		NA	0.005	0.000		N		No
WLF-A1-1	0/9	100%	0.005-0.025	0.00722	0.005	0.017		0.00004444	0.006667	0.9231	0.006	mg/L	N	0	1	NA	NA	NA		NA	0.005	0.000		N		No
WLF-A1-2	0/9	100%	0.005-0.025	0.00722	0.005	0.017		0.00004444	0.006667	0.9231	0.006	mg/L	N	0	1	NA	NA	NA		NA	0.005	0.000		N		No
WLF-A1-3	0/9	100%	0.005-0.025	0.00722	0.005	0.017		0.00004444	0.006667	0.9231	0.006	mg/L	N	0	1	NA	NA	NA		NA	0.005	0.000		N		No
WLF-A1-4	0/9	100%	0.005-0.025	0.00722	0.005	0.017		0.00004444	0.006667	0.9231	0.006	mg/L	N	0	1	NA	NA	NA		NA	0.005	0.000		N		No
WLF-A1-5	0/9	100%	0.005-0.025	0.00722	0.005	0.017		0.00004444	0.006667	0.9231	0.006	mg/L	N	0	1	NA	NA	NA		NA	0.005	0.000		N		No
CCR Appendix-IV: Arsenic, Total (mg/L)																										
WBW-A1-1	0/10	100%	0.005-0.005	0.005	0.005	0.005		1.205E-20	1.098E-10	2.195E-08	0.01	mg/L	N	0	0	NA	NA	NA	NA	NA			0.005		0.010	
WAP-07	0/13	100%	0.005-0.005	0.005	0.005	0.005		1.807E-20	1.344E-10	2.688E-08	0.01	mg/L	N	0	0	NA	NA	NA		NA	0.005	0.000		N		No
WLF-A1-1	0/9	100%	0.005-0.005	0.005	0.005	0.005		6.776E-21	8.232E-11	1.646E-08	0.01	mg/L	N	0	0	NA	NA	NA		NA	0.005	0.000		N		No
WLF-A1-2	0/9	100%	0.005-0.005	0.005	0.005	0.005		6.776E-21	8.232E-11	1.646E-08	0.01	mg/L	N	0	0	NA	NA	NA		NA	0.005	0.000		N		No
WLF-A1-3	5/9	44%	0.005-0.005	0.00644	0.00564	0.00922	0.0099	0.000003232	0.001798	0.2792	0.01	mg/L	N	0	0						0.005	0.000		N		No
WLF-A1-4	0/9	100%	0.005-0.005	0.005	0.005	0.005		6.776E-21	8.232E-11	1.646E-08	0.01	mg/L	N	0	0	NA	NA	NA		NA	0.005	0.000		N		No
WLF-A1-5	0/9	100%	0.005-0.005	0.005	0.005	0.005		6.776E-21	8.232E-11	1.646E-08	0.01	mg/L	N	0	0	NA	NA	NA		NA	0.005	0.000		N		No
CCR Appendix-IV: Barium, Total (mg/L)																										
WBW-A1-1	11/11	0%	-	0.0911	0.087	0.1125	0.114	0.0002208	0.01486	0.1631	2	mg/L	N	0	0	No	No	Stable	Normal	Normal			0.1204		2.000	
WAP-07	13/13	0%	-	0.0296	0.0302	0.04278	0.0537	0.00008375	0.009151	0.3089	2	mg/L	N	0	0	Yes	No	Stable		Normal	0.026	1.000		N		No
WLF-A1-1	10/10	0%	-	0.0377	0.0352	0.04933	0.0496	0.00006312	0.007945	0.2108	2	mg/L	N	0	0	No	No	Decreasing		Normal	0.030	1.000		N		No
WLF-A1-2	10/10	0%	-	0.0482	0.0523	0.06477	0.0663	0.0002722	0.0165	0.3426	2	mg/L	N	0	0	No	No	Stable		Normal	0.043	1.000		N		No
WLF-A1-3	10/10	0%	-	0.0363	0.03565	0.0401	0.0405	0.000005854	0.00242	0.06664	2	mg/L	N	0	0	No	No	Stable		Normal	0.034	1.000		N		No
WLF-A1-4	10/10	0%	-	0.0446	0.03995	0.06669	0.0792	0.0001817	0.01348	0.3024	2	mg/L	N	0	0	Yes	No	Stable		Non-parametric	0.033	1.000		N		No
WLF-A1-5	10/10	0%	-	0.0475	0.04765	0.05196	0.0534	0.00001181	0.003436	0.0723	2	mg/L	N	0	0	No	No	Stable		Normal	0.043	1.000		N		No
CCR Appendix-IV: Beryllium, Total (mg/L)																										
WBW-A1-1	0/9	100%	0.0005-0.0005	0.0005	0.0005	0.0005		0	0	0	0.004	mg/L	N	0	0	NA	NA	NA	NA	NA			0.0005		0.004	
WAP-07	0/10	100%	0.0005-0.0005	0.0005	0.0005	0.0005		0	0	0	0.004	mg/L	N	0	0	NA	NA	NA		NA	0.001	0.000		N		No
WLF-A1-1	0/9	100%	0.0005-0.0005	0.0005	0.0005	0.0005		0	0	0	0.004	mg/L	N	0	0	NA	NA	NA		NA	0.001	0.000		N		No
WLF-A1-2	0/9	100%	0.0005-0.0005	0.0005	0.0005	0.0005		0	0	0	0.004	mg/L	N	0	0	NA	NA	NA		NA	0.001	0.000		N		No
WLF-A1-3	0/9	100%	0.0005-0.0005	0.0005	0.0005	0.0005		0	0	0	0.004	mg/L	N	0	0	NA	NA	NA		NA	0.001	0.000		N		No
WLF-A1-4	0/9	100%	0.0005-0.0005	0.0005	0.0005	0.0005		0	0	0	0.004	mg/L	N	0	0	NA	NA	NA		NA	0.001	0.000		N		No
WLF-A1-5	0/9	100%	0.0005-0.0005	0.0005	0.0005	0.0005		0	0	0	0.004	mg/L	N	0	0	NA	NA	NA		NA	0.001	0.000		N		No
CCR Appendix-IV: Cadmium, Total (mg/L)																										
WBW-A1-1	0/10	100%	0.0005-0.002	0.00065	0.0005	0.001325		0.000000225	0.0004743	0.7298	0.005	mg/L	N	0	0	NA	NA	NA	NA	NA			0.002		0.005	
WAP-07	0/13	100%	0.0005-0.002	0.000615	0.0005	0.0011		1.731E-07	0.000416	0.676	0.005	mg/L	N	0	0	NA	NA	NA		NA	0.001	0.000		N		No
WLF-A1-1	0/9	100%	0.0005-0.0005	0.0005	0.0005	0.0005		0	0	0	0.005	mg/L	N	0	0	NA	NA	NA		NA	0.001	0.000		N		No
WLF-A1-2	0/9	100%	0.0005-0.0005	0.0005	0.0005	0.0005		0	0	0	0.005	mg/L	N	0	0	NA	NA	NA		NA	0.001	0.000		N		No
WLF-A1-3	1/9	89%	0.0005-0.0005	0.00053	0.0005	0.000662	0.00077	8.1E-09	0.00009	0.1698	0.005	mg/L	N	0	0	NA	NA	NA		NA	0.001	0.000		N		No
WLF-A1-4	0/9	100%	0.0005-0.0005	0.0005	0.0005	0.0005		0	0	0	0.005	mg/L	N	0	0	NA	NA	NA		NA	0.001	0.000		N		No
WLF-A1-5	0/9	100%	0.0005-0.0005	0.0005	0.0005	0.0005		0	0	0	0.005	mg/L	N	0	0	NA	NA	NA		NA	0.001	0.000		N		No
CCR Appendix-IV: Chromium, Total (mg/L)																										
WBW-A1-1	0/10	100%	0.005-0.01	0.0055	0.005	0.00775		0.0000025	0.001581	0.2875	0.1	mg/L	N	0	0	NA	NA	NA	NA	NA			0.01		0.100	
WAP-07	0/13	100%	0.005-0.01	0.00538	0.005	0.007		0.000001923	0.001387	0.2575	0.1	mg/L	N	0	0	NA	NA	NA		NA	0.005	0.000		N		No
WLF-A1-1	0/9	100%	0.005-0.005	0.005	0.005	0.005		6.776E-21	8.232E-11	1.646E-08	0.1	mg/L	N	0	0	NA	NA	NA		NA	0.005	0.000		N		No
WLF-A1-2	0/9	100%	0.005-0.005	0.005	0.005	0.005		6.776E-21	8.232E-11	1.646E-08	0.1	mg/L	N	0	0	NA	NA	NA		NA	0.005	0.000		N		No
WLF-A1-3	0/9	100%	0.005-0.005	0.005	0.005	0.005		6.776E-21	8.232E-11	1.646E-08	0.1	mg/L	N	0	0	NA	NA	NA		NA	0.005	0.000		N		No
WLF-A1-4	0/9	100%	0.005-0.005	0.005	0.005	0.005		6.776E-21	8.232E-11	1.646E-08	0.1	mg/L	N	0	0	NA	NA	NA		NA	0.005	0.000		N		No
WLF-A1-5	0/9	100%	0.005-0.005	0.005	0.005	0.005		6.776E-21	8.232E-11	1.646E-08	0.1	mg/L	N	0	0	NA	NA	NA		NA	0.005	0.000		N		No
CCR Appendix-IV: Cobalt, Total (mg/L)																										
WBW-A1-1	0/9	100%	0.0005-0.0005	0.0005	0.0005	0.0005		0	0	0	0.006	mg/L	N	0	0	NA	NA	NA	NA	NA			0.0005		0.006	
WAP-07	2/10	80%	0.0005-0.0005	0.000508	0.0005	0.000544	0.00058	6.4E-10	0.0000253	0.0498	0.006	mg/L	N	0	0	NA	NA	NA		NA	0.001	0.000		N		No
WLF-A1-1	1/9	89%	0.0005-0.0005	0.0005	0.0005	0.0005	0.0005	0	0	0	0.006	mg/L	N	0	0	NA	NA	NA		NA	0.001	0.000		N		No
WLF-A1-2	0/9	100%	0.0005-0.0005	0.0005	0.0005	0.0005		0	0	0	0.006	mg/L	N	0	0	NA	NA	NA		NA	0.001	0.000		N		No
WLF-A1-3	2/9	78%	0.0005-0.0005	0.000511	0.0005	0.00056	0.0006	1.111E-09	0.00003333	0.06522	0.006	mg/L	N	0	0	NA	NA	NA		NA	0.001	0.000		N		No
WLF-A1-4	0/9	100%	0.0005-0.0005	0.0005	0.0005	0.0005		0	0	0	0.006	mg/L	N	0	0	NA	NA	NA		NA	0.001	0.000		N		No
WLF-A1-5	0/9	100%	0.0005-0.0005	0.0005	0.0005	0.0005		0	0	0	0.006	mg/L	N	0	0	NA	NA	NA		NA	0.001	0.000		N		No
CCR Appendix-IV: Fluoride (mg/L)																										
WBW-A1-1	0/11	100%	0.1-0.1	0.1	0.1	0.1		6.939E-18	2.634E-09	2.634E-08	4	mg/L	N	0	0	NA	NA	NA	NA	NA			0.1		4.000	
WAP-07	0/11	100%	0.1-0.1	0.1	0.1	0.1		6.939E-18	2.634E-09	2.634E-08	4	mg/L	N	0	0	NA	NA	NA		NA	0.100	0.000		N		No
WLF-A1-1	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	N	0	0	NA	NA	NA		NA	0.100	0.000		N		No
WLF-A1-2	4/12	67%	0.1-0.1	0.108	0.1	0.1345	0.14	0.000197	0.01403	0.1296	4	mg/L	N	0	0	NA	NA	NA		NA	0.100	0.000		N		No
WLF-A1-3	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	N	0	0	NA	NA	NA		NA	0.100	0.000		N		No
WLF-A1-4	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	N	0	0	NA	NA	NA		NA	0.100	0.000		N		No
WLF-A1-5	1/12	92%	0.1-0.1	0.101	0.1	0.1045	0.11	0.000008333	0.002887	0.02863	4	mg/L	N	0	0	NA	NA	NA		NA	0.100	0.000		N		No

Winyah Class III Landfill

Assessment Monitoring Statistical Analysis Summary

Prepared: October 21, 2020

CCR Appendix-IV: Lead, Total (mg/L)																									
WBW-A1-1	0/10	100%	0.001-0.002	0.0011	0.001	0.00155		0.0000001	0.0003162	0.2875	0.015	mg/L	N	0	0	NA	NA	NA	NA	NA			0.002		0.015	
WAP-07	1/13	92%	0.001-0.002	0.00108	0.001	0.00146	0.0011	7.641E-08	0.0002764	0.2549	0.015	mg/L	N	0	0	NA	NA	NA		NA	0.001	0.000		N		No
WLF-A1-1	0/9	100%	0.001-0.001	0.001	0.001	0.001		0	0	0	0.015	mg/L	N	0	0	NA	NA	NA		NA	0.001	0.000		N		No
WLF-A1-2	0/9	100%	0.001-0.001	0.001	0.001	0.001		0	0	0	0.015	mg/L	N	0	0	NA	NA	NA		NA	0.001	0.000		N		No
WLF-A1-3	0/9	100%	0.001-0.001	0.001	0.001	0.001		0	0	0	0.015	mg/L	N	0	0	NA	NA	NA		NA	0.001	0.000		N		No
WLF-A1-4	0/9	100%	0.001-0.001	0.001	0.001	0.001		0	0	0	0.015	mg/L	N	0	0	NA	NA	NA		NA	0.001	0.000		N		No
WLF-A1-5	0/9	100%	0.001-0.001	0.001	0.001	0.001		0	0	0	0.015	mg/L	N	0	0	NA	NA	NA		NA	0.001	0.000		N		No
CCR Appendix-IV: Lithium, Total (mg/L)																									
WBW-A1-1	0/9	100%	0.01-0.01	0.01	0.01	0.01		2.711E-20	1.646E-10	1.646E-08	0.04	mg/L	N	0	0	NA	NA	NA	NA	NA			0.01		0.040	
WAP-07	0/10	100%	0.01-0.01	0.01	0.01	0.01		4.819E-20	2.195E-10	2.195E-08	0.04	mg/L	N	0	0	NA	NA	NA		NA	0.010	0.000		N		No
WLF-A1-1	0/9	100%	0.01-0.01	0.01	0.01	0.01		2.711E-20	1.646E-10	1.646E-08	0.04	mg/L	N	0	0	NA	NA	NA		NA	0.010	0.000		N		No
WLF-A1-2	0/9	100%	0.01-0.02	0.0111	0.01	0.016		0.00001111	0.003333	0.3	0.04	mg/L	N	0	0	NA	NA	NA		NA	0.010	0.000		N		No
WLF-A1-3	0/9	100%	0.01-0.01	0.01	0.01	0.01		2.711E-20	1.646E-10	1.646E-08	0.04	mg/L	N	0	0	NA	NA	NA		NA	0.010	0.000		N		No
WLF-A1-4	0/9	100%	0.01-0.01	0.01	0.01	0.01		2.711E-20	1.646E-10	1.646E-08	0.04	mg/L	N	0	0	NA	NA	NA		NA	0.010	0.000		N		No
WLF-A1-5	0/9	100%	0.01-0.01	0.01	0.01	0.01		2.711E-20	1.646E-10	1.646E-08	0.04	mg/L	N	0	0	NA	NA	NA		NA	0.010	0.000		N		No
CCR Appendix-IV: Mercury, Total (mg/L)																									
WBW-A1-1	0/9	100%	0.0002-0.0002	0.0002	0.0002	0.0002		0	0	0	0.002	mg/L	N	0	0	NA	NA	NA	NA	NA			0.0002		0.002	
WAP-07	0/10	100%	0.0002-0.0002	0.0002	0.0002	0.0002		0	0	0	0.002	mg/L	N	0	0	NA	NA	NA		NA	0.000	0.000		N		No
WLF-A1-1	0/9	100%	0.0002-0.0002	0.0002	0.0002	0.0002		0	0	0	0.002	mg/L	N	0	0	NA	NA	NA		NA	0.000	0.000		N		No
WLF-A1-2	0/9	100%	0.0002-0.0002	0.0002	0.0002	0.0002		0	0	0	0.002	mg/L	N	0	0	NA	NA	NA		NA	0.000	0.000		N		No
WLF-A1-3	0/9	100%	0.0002-0.0002	0.0002	0.0002	0.0002		0	0	0	0.002	mg/L	N	0	0	NA	NA	NA		NA	0.000	0.000		N		No
WLF-A1-4	0/9	100%	0.0002-0.0002	0.0002	0.0002	0.0002		0	0	0	0.002	mg/L	N	0	0	NA	NA	NA		NA	0.000	0.000		N		No
WLF-A1-5	0/9	100%	0.0002-0.0002	0.0002	0.0002	0.0002		0	0	0	0.002	mg/L	N	0	0	NA	NA	NA		NA	0.000	0.000		N		No
CCR Appendix-IV: Molybdenum, Total (mg/L)																									
WBW-A1-1	0/9	100%	0.01-0.05	0.0144	0.01	0.034		0.0001778	0.01333	0.9231	0.1	mg/L	N	0	0	NA	NA	NA	NA	NA			0.05		0.100	
WAP-07	0/10	100%	0.01-0.01	0.01	0.01	0.01		4.819E-20	2.195E-10	2.195E-08	0.1	mg/L	N	0	0	NA	NA	NA		NA	0.010	0.000		N		No
WLF-A1-1	0/9	100%	0.01-0.05	0.0144	0.01	0.034		0.0001778	0.01333	0.9231	0.1	mg/L	N	0	0	NA	NA	NA		NA	0.010	0.000		N		No
WLF-A1-2	0/9	100%	0.01-0.01	0.01	0.01	0.01		2.711E-20	1.646E-10	1.646E-08	0.1	mg/L	N	0	0	NA	NA	NA		NA	0.010	0.000		N		No
WLF-A1-3	0/9	100%	0.01-0.01	0.01	0.01	0.01		2.711E-20	1.646E-10	1.646E-08	0.1	mg/L	N	0	0	NA	NA	NA		NA	0.010	0.000		N		No
WLF-A1-4	0/9	100%	0.01-0.01	0.01	0.01	0.01		2.711E-20	1.646E-10	1.646E-08	0.1	mg/L	N	0	0	NA	NA	NA		NA	0.010	0.000		N		No
WLF-A1-5	0/9	100%	0.01-0.01	0.01	0.01	0.01		2.711E-20	1.646E-10	1.646E-08	0.1	mg/L	N	0	0	NA	NA	NA		NA	0.010	0.000		N		No
CCR Appendix-IV: Radium-226 & 228 (pCi/L)																									
WBW-A1-1	7/10	30%	4-4	4.03	4.08	4.962	5.07	0.7978	0.8932	0.2214	5	pCi/L	Y	1	0	Yes	No	Stable	Normal	Normal			5.9037		5.90	
WAP-07	4/10	60%	4-4	4	4	5.04	5.31	0.5769	0.7595	0.1899	5	pCi/L	Y	1	0						2.310	1.000		N		No
WLF-A1-1	5/10	50%	4-4	3.69	4	4.291	4.34	0.7506	0.8664	0.2351	5	pCi/L	N	0	0						1.800	1.000		N		No
WLF-A1-2	4/10	60%	4-4	3.74	4	5.061	5.92	1.496	1.223	0.3273	5	pCi/L	Y	1	0						1.530	1.000		N		No
WLF-A1-3	9/10	10%	4-4	4.16	4.285	5.209	5.25	1.427	1.194	0.2873	5	pCi/L	Y	2	0						3.250	1.000		N		No
WLF-A1-4	4/10	60%	4-4	3.51	4	4.299	4.51	1.408	1.187	0.3378	5	pCi/L	N	0	0						1.510	1.000		N		No
WLF-A1-5	5/10	50%	4-4	3.44	4	4.334	4.37	2.082	1.443	0.4198	5	pCi/L	N	0	0						0.555	1.000		N		No
CCR Appendix-IV: Selenium, Total (mg/L)																									
WBW-A1-1	0/10	100%	0.005-0.01	0.0095	0.01	0.01		0.0000025	0.001581	0.1664	0.05	mg/L	N	0	0	NA	NA	NA	NA	NA			0.01		0.050	
WAP-07	0/13	100%	0.005-0.01	0.00962	0.01	0.01		0.000001923	0.001387	0.1442	0.05	mg/L	N	0	0	NA	NA	NA		NA	0.010	0.000		N		No
WLF-A1-1	0/9	100%	0.01-0.01	0.01	0.01	0.01		2.711E-20	1.646E-10	1.646E-08	0.05	mg/L	N	0	0	NA	NA	NA		NA	0.010	0.000		N		No
WLF-A1-2	0/9	100%	0.01-0.01	0.01	0.01	0.01		2.711E-20	1.646E-10	1.646E-08	0.05	mg/L	N	0	0	NA	NA	NA		NA	0.010	0.000		N		No
WLF-A1-3	0/9	100%	0.01-0.01	0.01	0.01	0.01		2.711E-20	1.646E-10	1.646E-08	0.05	mg/L	N	0	0	NA	NA	NA		NA	0.010	0.000		N		No
WLF-A1-4	0/9	100%	0.01-0.01	0.01	0.01	0.01		2.711E-20	1.646E-10	1.646E-08	0.05	mg/L	N	0	0	NA	NA	NA		NA	0.010	0.000		N		No
WLF-A1-5	0/9	100%	0.01-0.01	0.01	0.01	0.01		2.711E-20	1.646E-10	1.646E-08	0.05	mg/L	N	0	0	NA	NA	NA		NA	0.010	0.000		N		No
CCR Appendix-IV: Thallium, Total (mg/L)																									
WBW-A1-1	0/9	100%	0.001-0.001	0.001	0.001	0.001		0	0	0	0.002	mg/L	N	0	0	NA	NA	NA	NA	NA			0.001		0.002	
WAP-07	0/10	100%	0.001-0.001	0.001	0.001	0.001		0	0	0	0.002	mg/L	N	0	0	NA	NA	NA		NA	0.001	0.000		N		No
WLF-A1-1	0/9	100%	0.001-0.001	0.001	0.001	0.001		0	0	0	0.002	mg/L	N	0	0	NA	NA	NA		NA	0.001	0.000		N		No
WLF-A1-2	0/9	100%	0.001-0.001	0.001	0.001	0.001		0	0	0	0.002	mg/L	N	0	0	NA	NA	NA		NA	0.001	0.000		N		No
WLF-A1-3	0/9	100%	0.001-0.001	0.001	0.001	0.001		0	0	0	0.002	mg/L	N	0	0	NA	NA	NA		NA	0.001	0.000		N		No
WLF-A1-4	0/9	100%	0.001-0.001	0.001	0.001	0.001		0	0	0	0.002	mg/L	N	0	0	NA	NA	NA		NA	0.001	0.000		N		No
WLF-A1-5	0/9	100%	0.001-0.001	0.001	0.001	0.001		0	0	0	0.002	mg/L	N	0	0	NA	NA	NA		NA	0.001	0.000		N		No