Cross Generating Station's Bottom Ash Pond Remedy Selection Report

Certification: I, Aubree Decoteau, being a registered Professional Engineer in the State of South Carolina do hereby certify to the best of my knowledge, information, and belief that the information contained in this Cross Bottom Ash Pond Remedy Selection Report dated September 30, 2020 was developed pursuant to the requirements of 40 CFR 257.97 and has been prepared with recognized and generally accepted good engineering practices.

Signature 

Date 9/30/2020

Overview

The South Carolina Public Service Authority (Santee Cooper) is implementing the April 17, 2015 U.S. Environmental Protection Agency (U.S. EPA) Federal Coal Combustion Residuals (CCR) Rule (40 CFR §257 and 261) for Cross Generating Station's Bottom Ash Pond, located in Berkeley County, South Carolina. In addition to Federal CCR Rule regulations, the Ash Pond is also regulated by South Carolina Department of Health and Environmental Control (SCDHEC) under National Pollutant Discharge Elimination System (NPDES) Permit #SC0037401.

Assessment monitoring conducted in 2018 identified the presence of beryllium, cobalt, lithium, and more recently detected radium-226/228 in one or more downgradient wells at a statistically significant level exceeding the established groundwater protection standard (GWPS). The GWPS are set as:

- Maximum Contaminant Level (MCL) of 0.004 mg/L for beryllium;
- Site-specific standard (derived from background concentrations) of 16.8 pCi/L for a combination of radium-226 and radium-228;
- EPA Regional Screening Level (RSL) of 0.006 mg/L for cobalt; and
- EPA Regional Screening Level (RSL) of 0.04 mg/L for lithium.

As a result, Santee Cooper initiated the corrective measures assessment process including conducting a nature and extent characterization, continuing groundwater sampling, and issuing a corrective measures assessment report. Haley & Aldrich completed the corrective measures assessment which proposed six alternatives and discussed how each met the threshold criteria and the balancing criteria.

This Remedy Selection Report concludes the corrective measures assessment process and will subsequently initiate the corrective measures implementation phase of the CCR Rule.

Purpose

This Remedy Selection Report is for Cross Generating Station's Bottom Ash Pond. The groundwater corrective measures remedy selected shall:

(i) Be protective of human health and the environment;
(ii) Attain the groundwater protection standard;
(iii) Control the source(s) of releases to reduce or eliminate further releases into the environment;
(iv) Remove as much of the contaminated material that was released from the CCR units as is feasible;
(v) Comply with the standards for management of wastes.

Pursuant to 40 CFR §257.97(a) and (d), this report describes the selected remedy, how it meets the standards outlined above, and specifies a schedule for implementing and completing remedial activities.

Remedy Selection Process

After the development of the Corrective Measures Assessment (CMA) report, the remedy selection process is continued by holding a public meeting to discuss the proposed alternatives for corrective measures. Pursuant to 40 CFR §257.96(e), *The owner or operator must discuss the results of the corrective measures assessment at least 30 days prior to the selection of remedy, in a public meeting with interested and affected parties.* A public meeting was conducted at Cross Generating Station on December 3, 2019. Six alternatives were presented at the public meeting in which the public was invited to comment. Comments were received and incorporated into the remedy selection process. See Figure 1 below for the public meeting comments which completes the §257.96 and §257.97 requirements for the CMA.

During the interim period between the issuance of the corrective measures assessment report and the issuance of this Remedy Selection Report, a semi-annual progress report was prepared and posted on Santee Cooper's publicly accessible website describing the progress in selecting and designing the remedy. This semi-annual progress report was posted in March 2020. Five planned activities were documented in the progress report: respond to comments from public meeting, expand the nature & extent study with the addition of one well, complete Remedy Selection Report, continue groundwater monitoring under assessment monitoring program, and continue beneficial use of CCR material. Since the publication of the semi-annual progress report, the additional well was installed for the continuation of the nature & extent study. During routine assessment monitoring, radium-226/228 was established as a statistically significant level (SSL) exceedance. This was incorporated into the existing groundwater model to determine any impacts on the remedial alternatives. The result of the modeling showed the addition of this SSL does not change the selected remedy. An addendum to the CMA report was placed in the operating record. Additionally, a notification was posted on the public website that the Bottom Ash Pond initiated closure on August 31, 2020.

Alternative 4 is selected as the remedial option and the remedial plan is described in more detail below. In accordance with §257.97, this alternative has been evaluated in the context of, and subsequently meets, the threshold criteria stated above. This remedy protects human health and the environment. Additionally, in accordance with §257.96 and §257.97, this alternative has been evaluated in the context of the balancing criteria compared to the other five alternatives and is outlined in the CMA Report which is available on Santee Cooper's public CCR website. Figure 1 provided at the end of this report is a summary of the six proposed alternatives and how each met the threshold criteria and the balancing criteria.

Remedial Plan

Alternative 4 in the CMA Report is closure by removal (CBR) of the Bottom Ash Pond CCR material followed by monitored natural attenuation (MNA) of beryllium, cobalt, lithium, and radium-226/228 in groundwater. This remedy eliminates the source through removal thereby meeting the source control requirement stated above. Over time, the removal remedy allows the concentrations of these constituents in downgradient groundwater to attenuate. Through the on-going beneficial use of reclaimed ponded bottom ash and gypsum, the amount of material that will need to be removed from the Pond has been greatly reduced already and provides an interim remedial measure. This beneficial use program's success makes the option of CBR extremely viable. Since the Class 3 Landfill is an operating non-commercial landfill at Cross, on-site and off-site disposal options were considered for non-marketable CCR material from the pond. The Class 3 Landfill was sized and constructed to store existing and future CCRs from Cross Generating Station and any residual CCR material from the Bottom Ash Pond. Additionally, the on-going strong beneficial use program minimizes the use of the on-site landfill in this CBR scenario.

Groundwater remediation will be addressed through MNA. MNA is a viable remedial technology recognized by both state and federal regulators that is applicable to inorganic compounds in groundwater. The USEPA defines MNA as "the reliance on natural attenuation processes to achieve site-specific remediation objectives within a time frame that is reasonable compared to that offered by other more active methods", which is a balancing criteria used to evaluate all remedies considered. The 'natural attenuation processes' that are at work in such a remediation approach include a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater. These in-situ processes include biodegradation; dispersion; dilution; sorption; volatilization; radioactive decay; and chemical or biological stabilization, transformation, or destruction of contaminants" (USEPA, 2015). MNA is intended to reduce concentrations of beryllium, cobalt, lithium, and radium-226/228 in groundwater at the Bottom Ash Pond boundary thereby attaining the groundwater protection standard and removing as much of the contaminated material that was released from the CCR units as is feasible.

A corrective measures groundwater monitoring plan for MNA will be prepared and implemented in accordance with §257.98, to document the effectiveness of the selected remedial alternative. Corrective measures are considered complete when groundwater monitoring reflects that the SSL constituent concentrations in groundwater downgradient of the Bottom Ash Pond do not exceed Appendix IV GWPS for three consecutive years. The plan will ensure that the handling of all CCR will comply with the standards of management of wastes.

USEPA is in the process of modifying certain CCR Rule requirements and, depending upon the nature of such changes, assessments made herein could be modified or supplemented to reflect such future regulatory revisions. See Federal Register (March 15, 2018; 83 FR 11584).

Remedy Selection, Interim Steps, Implementation & Schedule

The Bottom Ash Pond presents materials management challenges that may impact the implementation and closure times for the CBR alternative. CCRs in the Bottom Ash Pond will be dewatered to remove free water before being hauled to, and placed in, the existing on-site lined Class 3 Landfill. After removal of the CCRs and any residual materials from the Pond, the existing liner and revetment material will be evaluated. If there is residual CCR contamination of the liner and revetment materials, they will be disposed of in either the on-site Cross Class 3 landfill, assuming permit approval by SC DHEC, or an off-site permitted landfill, whichever option is most feasible.

Technical and logistical challenges of implementing a large-scale CCR removal project have been considered. Removal activities require dewatering and temporary staging/stockpiling of material for drying prior to transportation, which may affect productivity and increase removal duration. During periods of rain and inclement weather, the removal schedule will be negatively impacted. Excavation and construction safety during the removal duration is another concern due to heavy equipment (e.g., bulldozers, excavators, front end loaders, and off-road trucks) and dump truck operations around the active station site. The factors outlined in §257.97(d) were considered in the development of the schedule for design, implementation, and completion of the selected remedy.

Activity	Estimated Completion Date
On-going beneficial use to reduce volume of CCR material and exploration of new markets. This is an interim groundwater remediation measure since it reduces the overall closure time period once initiated.	Currently on-going
Submit state Closure Plan to SC DHEC for approval	Completed – March 2020
Commissioning of low volume waste and coal pile runoff wastewater treatment systems	Completed – August 31, 2020
Final receipt of industrial stormwater and wastewater flows/Notification of intent to initiate closure	Completed – August 31, 2020
CCR Excavation for Beneficial Use and/or Landfilling	Current – August 2024
SC DHEC approval of state Closure Plan	December 2020
Publish Remedial Groundwater (MNA) sampling plan	December 2020
Conduct Remedial Groundwater (MNA) sampling	2021 until GWPS met
Annual Performance Review	Initiate January 2021
Post-excavation evaluations and removals (liner, dikes, and appurtenant structures)	Sept 2024 – Aug 2025
Notification of closure completion[1]	Until GWPS met consecutively for 3 years

Notes:

1. Closure notification 30 days after closure complete. Closure is complete when groundwater meets groundwater protection standards.

References

Haley & Aldrich, 2019. Corrective Measures Assessment, Santee Cooper Bottom Ash Pond, Cross, South Carolina. September 11, 2019.

Haley & Aldrich, 2020. Corrective Measures Assessment Addendum, Santee Cooper Bottom Ash Pond, Cross, South Carolina. September 2020.

U.S. EPA, 2015. Use of Monitored Natural Attenuation for Inorganic Contaminants in Groundwater at Superfund Sites. U.S. Environmental Protection Agency Office of Solid Waste and Emergency Response, Directive 9283.1-36. August 2015.

FIGURE 1: SUMMARY OF CORRECTIVE MEASURES

SANTEE COOPER – CROSS BOTTOM ASH POND

Alternative Number	Remedial Alternative Description	THRESHOLD CRITERIA					BALANCING CRITERIA			
		Be protective of human health and the environment	Attain the groundwater protective standard	Control the source of releases	Remove from the environment as much of the contaminated material that was released from the CCR unit as feasible	Management of waste in accordance with RCRA requirements	CATEGORY 1 Long- and Short-Term Effectiveness, Protectiveness, and Certainty of Success	CATEGORY 2 Effectiveness in Controlling the Source to Reduce Further Releases.	CATEGORY 3 Ease of Implementation	CATEGORY 4 Consideration of Community Concerns*
1	**Closure in Place (CIP) with Capping and Monitoring & Natural Attenuation (MNA)**	✓	✓	✓	✓	✓	Effective short-term & long-term	Moderate effectiveness to control further releases but not as good as beneficial use since ash remains in place	Relative ease to implement. State permitting might be more difficult than the CBR alternative #4.	*A public meeting was held December 3, 2019. There were 7 attendees and verbal feedback was positive. These are the only written comments received on the Cross Bottom Ash Pond alternatives: Comment #1: "Definitely like the removal process and CIP monitoring of the cobalt in wells. Please keep informed. Any air pollants [sic] as well." – Neighbor of Cross Generating Station Comment #2: "We support removal of the bottom ash pond to the Class 3 Landfill and/or beneficial use. This has been a big success at Grainger and is the right solution at Cross. Thank you for your leadership on cleaning up coal ash!" – Southern Environmental Law Center
2	**CIP with Capping and Hydraulic Containment through groundwater pumping and direct discharge**	✓	✓	✓	✓	✓	Effective short-term; long-term requires ongoing operations & maintenance	Moderate effectiveness to control further releases but not as good as beneficial use	More difficult to implement due to more complexity. Permitting will be required.	
3	**CIP with Capping and Hydraulic Containment through groundwater pumping and ex-situ treatment**	✓	✓	✓	✓	✓	Effective short-term; long-term requires ongoing operations & maintenance	Moderate effectiveness to control further releases but not as good as beneficial use	Much more difficult to implement due to more complexity and treatment. Permitting will be required.	
4	**Closure By Removal (CBR) with MNA: Ash & gypsum beneficial used or go to the onsite landfill**	✓	✓	✓	✓	✓	Effective short-term & highly effective long-term since ash is removed from the environment and success is certain.	Moderate effectiveness short-term (beneficial use is ongoing & successful). High degree of long-term release control since ash is removed from the environment.	Relative ease to implement & straightforward permitting; however, volume of material takes time to move.	
5	**CBR with Capping and Hydraulic Containment through groundwater pumping and direct discharge**	✓	✓	✓	✓	✓	Effective long-term but requires ongoing operations & maintenance to manage hydraulic discharge	Eliminates long-term releases; still a risk of release from the hydraulic discharge	More difficult to implement due to more complexity. Permitting will be required.	
6	**CBR with Capping and Hydraulic Containment through groundwater pumping and ex-situ treatment**	✓	✓	✓	✓	✓	Effective long-term but requires ongoing operations & maintenance to manage treatment system; short-term effectiveness not certain	Eliminates long-term releases; still a risk of release from the treatment system chemicals	More difficult to implement due to more complexity. Logistical and safety challenges expected.	

Most favorable when compared to other alternatives

Less favorable when compared to other alternatives

Least favorable when compared to other alternatives

Santee Cooper's selected alternative is No. 4.

HALEY ALDRICH