



WINYAH GENERATING STATION

Groundwater Monitoring System for New Class 3 CCR Landfill Area 1

40 CFR Part 257
Operating Criteria
§257.91(f)



WINYAH GENERATING STATION
GROUNDWATER MONITORING SYSTEM FOR NEW CLASS 3 CCR LANDFILL AREA 1

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1. INTRODUCTION

The United States Environmental Protection Agency (EPA) promulgated regulations (40 CFR Part 257) for coal combustion residuals (CCRs). The CCR rule was published in the Federal Register on April 17, 2015 and became effective on October 19, 2015. The Class Three CCR Landfill is subject to the CCR Rule as a new landfill as defined in 40 CFR §257.53. A requirement of the CCR rule is to install a groundwater monitoring system (§257.91) for new CCR landfills. Prior to the initial receipt of CCR by the CCR unit, the owner or operator must be in compliance with the groundwater monitoring requirements as required by §257.90(b)(1)(i) and (b)(1)(ii).

This document serves as certification that the Class 3 Landfill Area 1 groundwater monitoring system at the Winyah Generating Station in Georgetown, South Carolina has been designed and constructed to meet the requirements of §257.91. Geosyntec Consultants designed the groundwater monitoring system based on the detailed site hydrogeologic characterization study they conducted during the period 2013 to 2016. The groundwater monitoring system is documented in the Winyah Generating Station Class Three Landfill Permit Application prepared by Geosyntec Consultants and approved by the South Carolina Department of Health and Environmental Control (DHEC) on 15 September 2017 (Permit #LF3-00042). The groundwater monitoring system meets the design criteria requirements of 40 CFR §257.91 and the South Carolina solid waste management regulation R.61-107.19 and was designed under the direction of Scott M. Graves, P.E., Geosyntec Consultants, Inc., the design engineer-of-record. The South Carolina Department of Health and Environmental Control approved installation of the groundwater monitoring wells when the construction permit was issued. The date of installation was selected within the advance timeframe required by the CCR rule to establish background water quality conditions at those wells. This certification has been prepared based upon a review of these documents.

2. DISCUSSION

Title 40 CFR §257.91 requires the owner or operator to design and install a groundwater monitoring system to meet the applicable requirements of this section. The applicable requirements for the groundwater monitoring system are listed below, with a description of how the system was designed and installed to satisfy each requirement. Supporting documentation is included in the Appendix.

257.91(a) states *the owner or operator of a CCR unit must install a groundwater monitoring system that consists of a sufficient number of wells, installed at appropriate locations and depths, to yield groundwater samples from the uppermost aquifer that:*



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- (1) *Accurately represent the quality of background groundwater that has not been affected by leakage from a CCR unit.*

The background well location was selected to yield representative groundwater samples from the uppermost aquifer that represent the quality of groundwater that has not been affected by any potential leakage from the landfill and are based on the groundwater flow directions at this site. The well is located northwest and approximately 1,100 feet upgradient of the landfill A.

- (2) *Accurately represent the quality of groundwater passing the waste boundary of the CCR unit.*

There are six (6) downgradient compliance wells. The locations were selected to yield representative groundwater samples from the uppermost aquifer that represent the quality of groundwater passing the relevant point of compliance. The downgradient compliance wells are installed along all four sides of the landfill at the closest practicable distance hydraulically downgradient from the relevant point of compliance.

257.91(b) states *the number, spacing, and depths of monitoring systems shall be determined based upon site-specific technical information that must include thorough characterization of:*

- (1) *Aquifer thickness, groundwater flow rate, groundwater flow direction including seasonal and temporal fluctuations in groundwater flow:*

The surficial aquifer consists of mixtures of predominantly well-sorted sand with minor amounts of silt and clay and ranges from approximately 10 to 55 feet thick across the site.

Hydrogeologic conditions at WGS indicate water within the surficial aquifer will not migrate downward into the next water bearing zone used for potable supply within a reasonable timeframe. The range of horizontal groundwater flow velocities is between 0.2 and 268 feet per year (ft/yr.) with an average of 13.2 ft/yr.

Groundwater flow direction at the Area 1 landfill is influenced by a northwest-oriented groundwater divide underlying the landfill footprint. This causes groundwater to flow towards the north-north east with discharge occurring along Turkey Creek and to the south with discharge to the intake canal of the onsite cooling pond. There are no seasonal or temporal fluctuations in groundwater flow directions.

- (2) *Saturated and unsaturated geologic units and fill materials overlying the uppermost aquifer, materials comprising the uppermost aquifer, and materials comprising the confining unit defining the lower boundary of the uppermost aquifer, including, but not limited to, thicknesses, stratigraphy, lithology, hydraulic conductivities, porosities and effective porosities:*

WGS is located within the Atlantic Coastal Plain of South Carolina, which is a wedge of unconsolidated to well consolidated sediments. Regionally, the surficial aquifer is underlain by the upper confining unit for the Gordon Aquifer. The regional confining unit between the Gordon Aquifer and the surficial aquifer is not present at WGS. The surficial aquifer and



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Gordon Aquifer exhibit similar hydrogeologic properties and are collectively considered the surficial aquifer for groundwater monitoring at WGS. The surficial aquifer consists of mixtures of predominantly well-sorted sand with minor amounts of silt and clay. The surficial aquifer is underlain by a confining unit comprised of dense, low permeability clay locally termed "Black Mingo" clay. This impermeable layer is continuous at the site and is conservatively estimated to be greater than 230 feet thick. Hydrogeologic conditions at WGS indicate water within the surficial aquifer will not migrate downward into the next water bearing zone used for potable supply within a reasonable timeframe.

257.91(c) states *the groundwater monitoring system must include the minimum number of monitoring wells necessary to meet the performance standards specified in paragraph (a) of this section, based on the site-specific information specified in paragraph (b) of this section. The groundwater monitoring system must contain:*

- (1) *A minimum of one upgradient and three downgradient monitoring wells.*

The groundwater monitoring system exceeds the minimum requirement for one upgradient and three downgradient monitoring wells pursuant to §2573.91(c). The actual number of wells used in the groundwater monitoring system for the Class 3 Landfill Area 1 includes 1 upgradient and 6 downgradient wells.

- (2) *Additional monitoring wells as necessary to accurately represent the quality of background groundwater that has not been affected by leakage from the CCR unit and the quality of groundwater passing the waste boundary of the CCR unit.*

This number of wells is sufficient and appropriate to characterize the quality of groundwater, in the uppermost aquifer, from background groundwater not affected by leakage from the CCR unit and groundwater passing the waste boundary of the CCR landfill Area 1 based on site-specific conditions.

257.91(d) states *the owner or operator of multiple CCR units may install a multiunit groundwater monitoring system instead of separate groundwater monitoring systems for each CCR unit.*

Santee Cooper has installed a separate groundwater monitoring system for this CCR unit.

257.91(e) states *monitoring wells must be cased in a manner that maintains the integrity of the monitoring wells borehole. This casing must be screened or perforated and packed with gravel or sand, where necessary, to enable collection of groundwater samples. The annular space (i.e., the space between the borehole and well casing) above the sampling depth must be sealed to prevent contamination of samples and the groundwater:*

- (1) *The owner or operator of the CCR unit must document and include in the operating record the design, installation, development, and decommissioning of any monitoring wells, piezometers and other measurement, sampling, and analytical devices.*



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Santee Cooper has documented the design, installation, development, and decommissioning of any monitoring wells, piezometers and other measurement, sampling, and analytical devices. Details are retained in the facility operating record. The documentation was reviewed prior to completing this certification.

- (2) *The monitoring wells, piezometers, and other measurement, sampling, and analytical devices must be operated and maintained so that they perform to the design specifications throughout the life of the monitoring program*

The monitoring wells were installed by a South Carolina certified well driller under the direction of a qualified geologist or engineer. Details for construction of the monitoring wells were approved by SC DHEC prior installation. During installation a soil boring log was prepared by the geologist or engineer by visually inspecting drill cutting directly from the auger flights to ensure the screened portion of the well was installed at the appropriate interval. The horizontal location of the wells and the elevation of the ground surface and the measuring reference point on the top of the inner well casing were determined by a State of South Carolina registered land surveyor.

Monitoring wells will be maintained in accordance with the design specifications throughout the life of the monitoring program. Routine well maintenance will include inspection and correction/repair of, as necessary, identification labels, concrete aprons, locking caps and locks, and access to the wells. If it is determined that background or detection monitoring wells no longer provide samples representative of the quality of groundwater passing the relevant point of compliance Santee Cooper will re-evaluate and prepare a plan to modify, rehabilitate, decommission, or replace monitoring wells as appropriate.

This document satisfies the requirements of §257.91(f) by providing a certification from a qualified professional engineer stating that the groundwater monitoring system has been designed and constructed to meet the requirements of this section. The groundwater monitoring system for the new Class Three CCR landfill Area 1 at the Winyah Generating Station includes more than the minimum number of wells and has been designed and installed to meet the applicable requirements of this section and state regulations.

3. CONCLUSIONS

The groundwater monitoring system has been developed to monitor the uppermost aquifer during the active life and the post-closure period. It was designed to detect changes in groundwater quality, if any, resulting from landfilling activities at the WGS Class Three Landfill Area 1. This document serves as certification that the groundwater monitoring system for the new CCR landfill Area 1 at Winyah Generating Station in Georgetown, South Carolina has been designed and installed to meet the requirements of Title 40 CFR §257.91 for new CCR landfills.



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4. CERTIFICATION

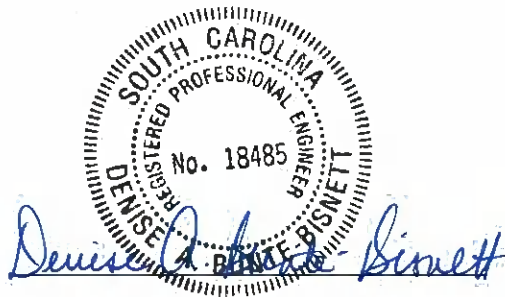
Certification for Groundwater Monitoring System

Federal CCR Rule: 40 CFR §257.91

CCR Unit: WGS Class Three Landfill Area 1 - New CCR Landfill

I, the undersigned Professional Engineer registered in good standing in the State of South Carolina, do hereby certify under penalty of law that I have personally examined and am familiar with the information submitted in this demonstration, and that, based on my inquiry of the individuals responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. I certify, for the above-referenced CCR Unit, that the groundwater monitoring system meets the requirements of Title 40 CFR §257.91.

Seal and Signature:



Printed Name: Denise A. Bunte-Bisnett

P.E. License Number: 18485 State of South Carolina