GROUNDWATER MONITORING SYSTEM CERTIFICATION

NEW FGD POND
WILLIAMS STATION
GOOSE CREEK, SOUTH CAROLINA

Prepared For:

DOMINION ENERGY SOUTH CAROLINA, INC.
COLUMBIA, SOUTH CAROLINA

Prepared By:

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
PITTSBURGH, PENNSYLVANIA

CEC Project 306-309

MAY 2021

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1.0 INTRODUCTION

1.1 OBJECTIVE

This report has been prepared for South Carolina Generating Company (SCGENCO) and Dominion Energy South Carolina, Inc. (DESC) to demonstrate that the A.M. Williams Station (Williams Station) Coal Combustion Residuals (CCR) Unit described as the New FGD Pond meets the requirements of the United States Environmental Protection Agency (USEPA) CCR Rule which was published in the Federal Register (FR) on April 17, 2015 as part of the Code of Federal Regulations (CFR) Title 40, Part 257 (§257). Specifically, this report demonstrates the requirements for a Groundwater Monitoring System as defined in §257.91 are met for the New FGD Pond.

2.0 SITE OVERVIEW

2.1 BACKGROUND

The Williams Station is a coal-fired power generation station located at 2242 Bushy Park Road in Goose Creek, South Carolina (refer to Figure 1) that is owned by SCGENCO and operated by DESC. The 650 MW coal-fired electric generating station is generally positioned within a small strip of lowlands between meanders of the Back River (west) and the Cooper River (east) as depicted on Figure 2. The station property is bound by Bushy Park Road to the west and tidal wetlands and/or lowlands border the remainder of the property. The Williams Station wastewater management impoundment complex, comprised of six interconnected separate ponds labeled Ponds A through E and the Coal Pile Runoff Pond, is located north of main station structures (refer to Figure 3).

Williams Station infrastructure includes a flue gas desulfurization (FGD) air quality control system that produces an FGD wastewater blowdown waste stream that is managed in an on-site FGD Pond that was originally constructed in 2009 in accordance with applicable South Carolina Department of Health and Environmental Control (SCDHEC) regulations and permits. This CCR Unit is also regulated as a CCR Surface Impoundment per Title 40 CFR, Part 257, Subpart D published in April 2015 (CCR Rule) by the USEPA and subsequent revisions.

2.2 NEW CCR UNIT

The CCR Rule Location Restrictions compliance demonstration for the original FGD Pond dated October 2018, reported that the Williams Station FGD Pond did not satisfy the requirements of §257.63(a) – Seismic Impact Zones. As the FGD Pond is a critical operational component to Williams Station's ability to produce electricity and there were no other technically feasible on-site or off-site options to manage the FGD blowdown wastewater, DESC elected to continue operation of the FGD Pond in accordance with the alternative closure requirements identified in §257.103. Subsequently, DESC determined that the fastest technically feasible pathway to compliance was to open a new CCR impoundment within the footprint of the originally

constructed FGD Pond that meets the CCR Rule's seismic impact zone location and liner design criteria. This action required a structural improvement to the FGD Pond perimeter dikes, closure of the currently operating FGD Pond in accordance with §257.102 and §257.103 for existing CCR surface impoundments, and then opening a new pond (identified as the New FGD Pond) within the original pond footprint in accordance with the CCR Rule. The perimeter dikes were structurally improved by installing Deep Soil Mix (DSM) columns through and below the perimeter dikes surrounding the FGD Pond. The New FGD Pond, located in the footprint of the previously closed FGD Pond is compliant with the Location Restrictions defined in §257.60 through §257.64 of the CCR Rule.

2.3 DESCRIPTION OF THE NEW CCR UNIT

The FGD Pond is located within the boundaries of the wastewater management impoundment complex at the Williams Station facility and was originally constructed within the footprint of former Pond C in 2009. Figures 2 and 3 depict the location of the New FGD Pond in relation to Williams Station and the wastewater management impoundment complex, respectively. The New FGD Pond occupies essentially the same footprint as the former FGD Pond and is comprised of two approximate 700,000 gallon forebays (identified as Forebay 1 and Forebay 2) and approximately two acres in total.

The only waste stream to be placed in the New FGD Pond is wet FGD blowdown from the FGD system. The FGD blowdown contains residual gypsum solids that are discharged from the secondary hydrocyclone overflows and pumped to the operating forebay of the New FGD Pond. Each FGD forebay allows the gypsum solids to settle and provide temporary storage until removed, dewatered, and disposed in the Williams Station Highway 52 Landfill. A solids removal treatment system (i.e., Lamella clarifier with one filter press) is used to remove solids prior to discharge to the New FGD Pond. The New FGD Pond is permitted to receive approximately 0.319 million gallons a day (MGD) of wastewater which is the same as the former FGD Pond. There will be no non-CCR waste streams discharged to or placed in the New FGD Pond. The New FGD Pond discharges to Pond D which flows into Pond E and then to the National Pollutant Discharge

Elimination System (NPDES) permitted outfall in accordance with SCDHEC NPDES Permit SC0003883 (effective January 1, 2017).

2.4 GEOLOGIC SETTING

Williams Station is located on the lower Coastal Plain, north of the where the Back River and the Cooper River meet. The geology generally consists of fine sands and clays, interbedded with marine deposits. The area is dominated by tidal marsh deposits of clays and occasional peat deposits and clayey sand and clay facies of the Ten Mile Beds. Underlying these materials is the Cooper Marl Formation (CMF). The CMF is a well-studied, over-consolidated sandy silt to clayey silt. The CMF was encountered between 26 and 30 feet below existing grade at this site. This unit is approximately 200 feet thick and functions as an aquitard. Underlying the "Cooper Marl" is a limestone aquifer. Sedimentary rocks in this area sit over 2,000 ft. above a crystalline rock formation associated with the Piedmont (F&ME, 2017).

2.5 HYDROGEOLOGIC SETTING

Groundwater flow direction, average hydraulic gradient, and average interstitial flow velocity at Williams Station FGD Pond were derived from water-level measurements recorded in March 2019 and the results of slug tests conducted at the CCR Rule compliance monitoring wells in May 2016 and January 2017. The direction of shallow groundwater flow in the vicinity of the FGD Pond is generally west to east, which is consistent with previous delineations of groundwater flow direction at the site. Water levels in the ponds surrounding the FGD Pond are typically varied as part of normal operations and exert short-term influences on the direction of groundwater flow in the surficial aquifer. This information is confirmed in the *Analysis of Groundwater Flow Direction* Report prepared by Nautilus Geologic Consulting, PLLC, (NGC) in 2017.

The direction of groundwater flow in the surficial aquifer has been delineated numerous times over many years based on groundwater gauging data at monitoring wells used for NPDES compliance monitoring associated with the site wastewater ponds. Typically, the delineated direction of

groundwater flow in the surficial aquifer in the area of the wastewater ponds (including the New FGD Pond) is to the northeast, east and southeast toward the tidal wetlands bordering the area.

3.0 CRITERIA FOR THE GROUNDWATER MONITORING SYSTEM §257.91

The applicable sections of §257.91 are presented below in bold, italic font. The responses follow each section of the rule and are provided in normal font.

3.1 PERFORMANCE STANDARD (§257.91(A))

(a) Performance standard. 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:

(1) Accurately represent the quality of background groundwater that has not been affected by leakage from a CCR unit. A determination of background quality may include sampling of wells that are not hydraulically upgradient of the CCR management area where:

(i) Hydrogeologic conditions do not allow the owner or operator of the CCR unit to determine what wells are hydraulically upgradient; or

(ii) Sampling at other wells will provide an indication of background groundwater quality that is as representative or more representative than that provided by the upgradient wells; and

(2) Accurately represent the quality of groundwater passing the waste boundary of the CCR unit. The downgradient monitoring system must be installed at the waste boundary that ensures detection of groundwater contamination in the uppermost aquifer. All potential contaminant pathways must be monitored.

As will be discussed in Section 3.2, the groundwater monitoring system meets the Performance Standard described in §257.91(a). It consists of a sufficient number of wells at appropriate locations and depths to provide groundwater samples from the uppermost aquifer that accurately represents background groundwater quality that has not been affected by leakage from the CCR unit and accurately represents the quality of groundwater passing the waste boundary of the CCR unit.

3.2 SYSTEM DESIGN (§257.91(B) THROUGH §257.91(E))

(b) 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; and***
>
> ***(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.***

(c) 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; and***
>
> ***(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.***

(d) 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.

> ***(1) The multiunit groundwater monitoring system must be equally as capable of detecting monitored constituents at the waste boundary of the CCR unit as the individual groundwater monitoring system specified in paragraphs (a) through (c) of this section for each CCR unit based on the following factors:***
>
> > ***(i) Number, spacing, and orientation of each CCR unit;***
> >
> > ***(ii) Hydrogeologic setting;***
> >
> > ***(iii) Site history; and***
> >
> > ***(iv) Engineering design of the CCR unit.***

(e) Monitoring wells must be cased in a manner that maintains the integrity of the monitoring well 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. The qualified professional engineer must be given access to this documentation when completing the groundwater monitoring system certification required under paragraph (f) of this section.

(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.

There are numerous monitoring wells around the New FGD Pond that were installed for past and on-going investigations. The use of the six (6) PVC-cased wells with 0.010-slot screens, listed below, will be used to meet the CCR Rule groundwater monitoring performance standard. These monitoring wells are cased in a manner that maintains the integrity of the monitoring well borehole and include a sand-packed screen to enable collection of groundwater samples. The locations described below are consistent with the monitoring network associated with the previous FGD Pond. The integrity of interior well construction as well as the hydraulic conductivity and groundwater chemistry were evaluated before and after DSM construction to ensure the original groundwater monitoring network was not damaged by the stabilization efforts. No noticeable change to the well integrity was observed after DSM construction; and, therefore the groundwater monitoring network for the new FGD Pond remains consistent with the previous network.

The well locations are shown on Figure 4. Table 1 summarizes all wells that are included as the CCR Rule Groundwater Monitoring System. Boring and well construction logs are provided in Appendix A.

TABLE 1. CCR RULE GROUNDWATER MONITORING SYSTEM

Location	Relative Location	Well Diameter (in.)	Bottom of Screen (ft-bgs)	Screen Length (ft)
MW-FGD-16	Upgradient	2	15.0	10
MW-FGD-17	Downgradient	2	18.0	10
MW-FGD-18	Downgradient	2	18.0	10
MW-FGD-19D	Downgradient	2	28.0	10
MW-FGD-20AR	Downgradient	2	20.0	10
MW-FGD-21	Upgradient	2	18.0	10

Additionally, MW-FGD-19 will be utilized for groundwater elevation measurements. This well does not produce enough groundwater volume to obtain a sample, however it is useful for interpreting groundwater movement around the New FGD Pond.

Supporting information associated with the groundwater monitoring system for the New FGD Pond can be found in the following reports, available in the operating record:

- *Groundwater Sampling and Analysis Plan* (NCG, 2016)
- *Groundwater Monitoring Well Installation Report* (NCG, 2017(1))
- *Analysis of Groundwater Flow Rate and Direction* (NCG, 2017(2))

CEC has reviewed these documents and compared the relevant information to the New FGD Pond conditions. Because the New FGD Pond is located within the footprint of the original FGD Pond without modification to the pond configuration or surrounding topography/land use, the previously demonstrated compliance with the requirements in 40 CFR §257.91(b) through (d) remain applicable; and therefore, CEC certifies the Groundwater Monitoring System described in Section 3.0 for the New FGD Pond.

3.3 OBTAIN CERTIFICATION (§257.91(F))

> ***(f) The owner or operator must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the groundwater monitoring system has been designed and constructed to meet the requirements of this section. If the groundwater monitoring system includes the minimum number of monitoring wells specified in paragraph (c)(1) of this section, the certification must document the basis supporting this determination.***

A written certification from a qualified professional engineer licensed in South Carolina is provided in Section 4.0.

3.4 RECORD KEEPING REQUIREMENTS §257.91(G)

> ***(g) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in §257.105(h), the notification requirements specified in §257.106(h), and the internet requirements specified in §257.107(h).***

A record of the certification must be placed in the facility's operating record [§257.105(h)] and the publicly accessible internet site [§257.107(h)] and the state must be notified [§257.106(h)] that the information is available.

4.0 GROUNDWATER MONITORING CERTIFICATION

By means of this certification, I certify that I have reviewed this Groundwater Monitoring System, New FGD Pond, Williams Station meets the requirements of Section 40 CFR 257.91.

Scott L. Brown, P.E.

Printed Name of Professional Engineer

Signature

25687	South Carolina	5-7-21
Registration No.	Registration State	Date

By means of this certification, I certify that I have reviewed this Groundwater Monitoring System, New FGD Pond, Williams Station meets the requirements of Section 40 CFR 257.91.

Donald M. Cobb, P.G.

Printed Name of Professional Geologist

Signature

2621	South Carolina	5-7-21
Registration No.	Registration State	Date

5.0 REFERENCES

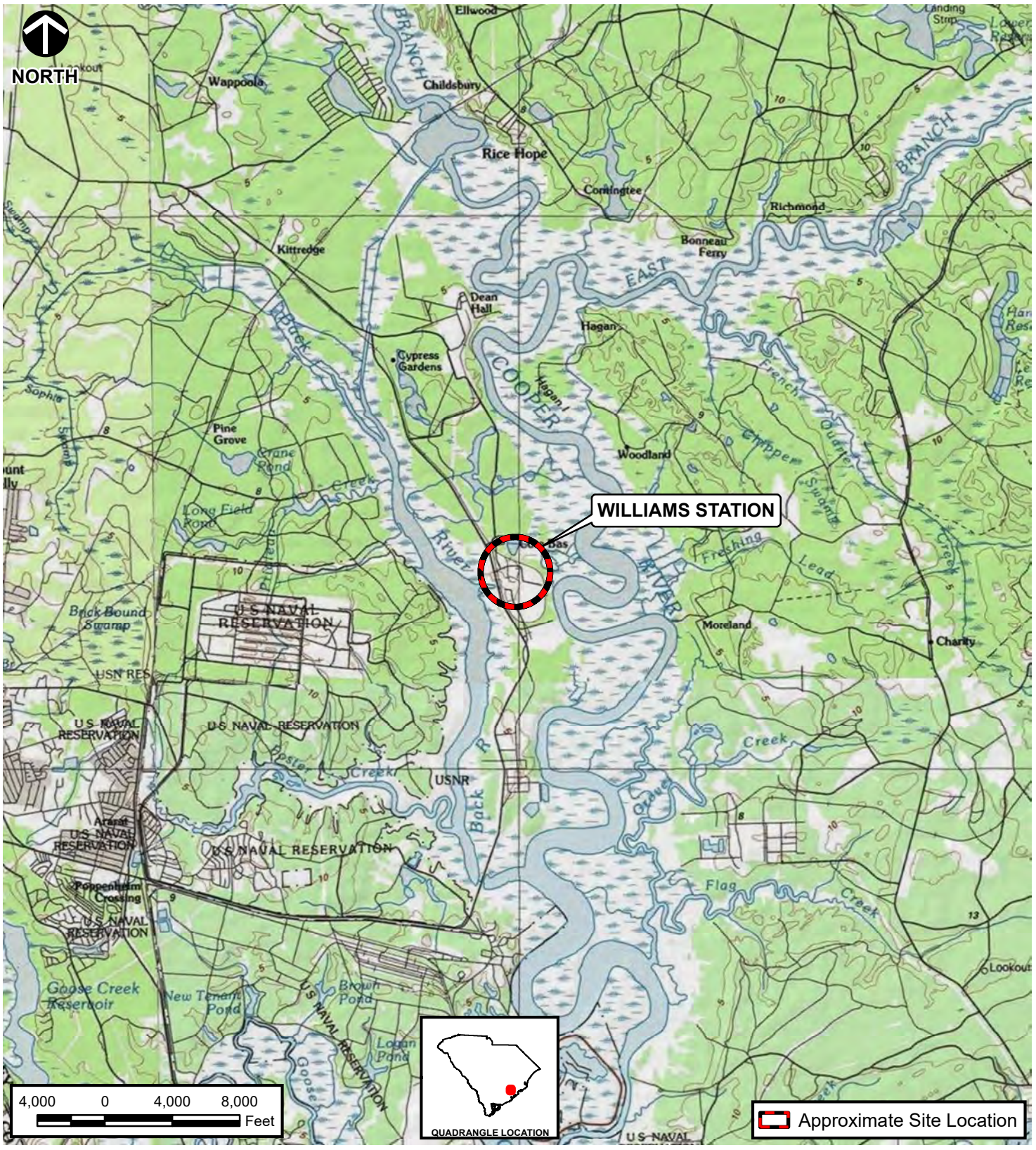
F&ME, 2017. Location Restriction for CCR Ponds, PowerAdvocate Event 67204:EA0003(2017), Prepared for SCANA Corporation, Cayce, SC, Prepared by F&ME Consultants, Inc., Submitted October 2017.

NGC, 2016. Groundwater Sampling and Analysis Plan – EPA CCR Rule Compliance Monitoring Wells, Williams Generating Station FGD Pond C, Prepared for South Carolina Electric & Gas Company, Cayce, SC, Prepared by Nautilus Geologic Consulting, PLLC, Submitted May 2016 and Revised December 2016.

NGC, 2017 (1). Groundwater Monitoring Well Installation Report – EPA CCR Rule Compliance Monitoring Wells, Prepared for South Carolina Electric & Gas Company, Cayce, SC, Prepared by Nautilus Geologic Consulting, PLLC, Submitted July 2016 and Revised January 2017.

NGC, 2017 (2). Analysis of Groundwater Flow Rate and Direction: July 2017 Monitoring Data – EPA CCR Rule Compliance Monitoring Wells, Prepared for South Carolina Electric & Gas Company, Cayce, SC, Prepared by Nautilus Geologic Consulting, PLLC, Submitted September 2017.

FIGURES



SOURCE: PORTION OF THE USGS 7.5-MINUTE SERIES TOPOGRAPHIC QUADRANGLE MAP(S): KITTREDGE, SOUTH CAROLINA, 1979.

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SITE LOCATION MAP

DRAWN BY:	CEJ	CHECKED BY:	APA	APPROVED BY:	APA*	FIGURE NO:	1
DATE:	APRIL 27, 2021	DWG SCALE:	1 " = 8,000 '	PROJECT NO:	306-309-AW01		

Signature on File *

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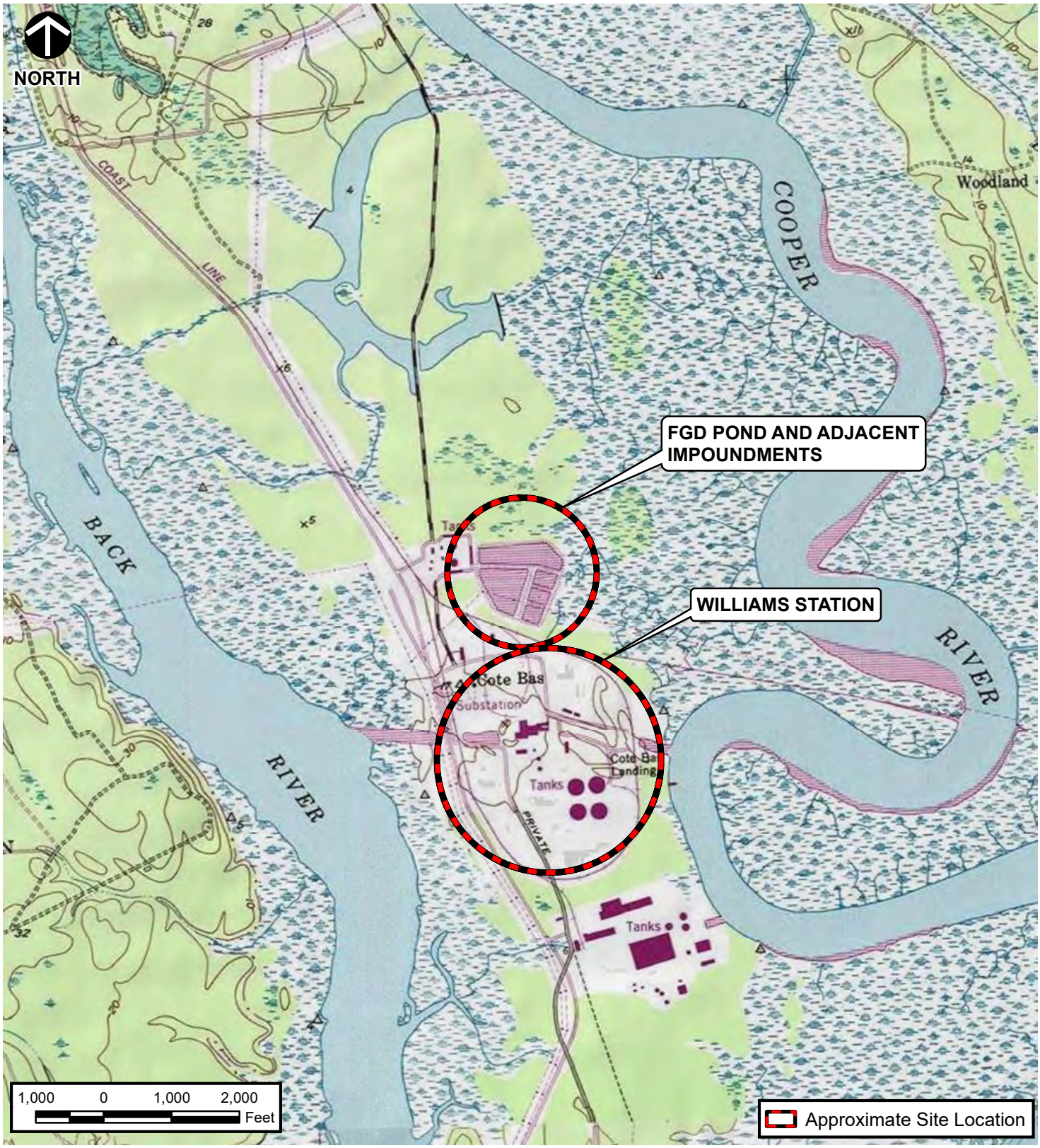

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SITE AND VICINITY AERIAL MAP

DRAWN BY:	CEJ	CHECKED BY:	APA	APPROVED BY:	APA*	FIGURE NO:	2
DATE:	APRIL 27, 2021	DWG SCALE:	1 " = 2,000 '	PROJECT NO:	306-309-AW01		

Signature on File *

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SOURCE: ESRI WORLD IMAGERY (CLARITY) / ARCGIS MAP SERVICE ACCESSED 4/26/21, IMAGERY DATE: 2020.

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WILLIAMS STATION OVERVIEW MAP

DRAWN BY:	CEJ	CHECKED BY:	APA	APPROVED BY:	APA*	FIGURE NO:	3
DATE:	APRIL 27, 2021	DWG SCALE:	1 " = 600 '	PROJECT NO:	306-309-AW01		

Signature on File *

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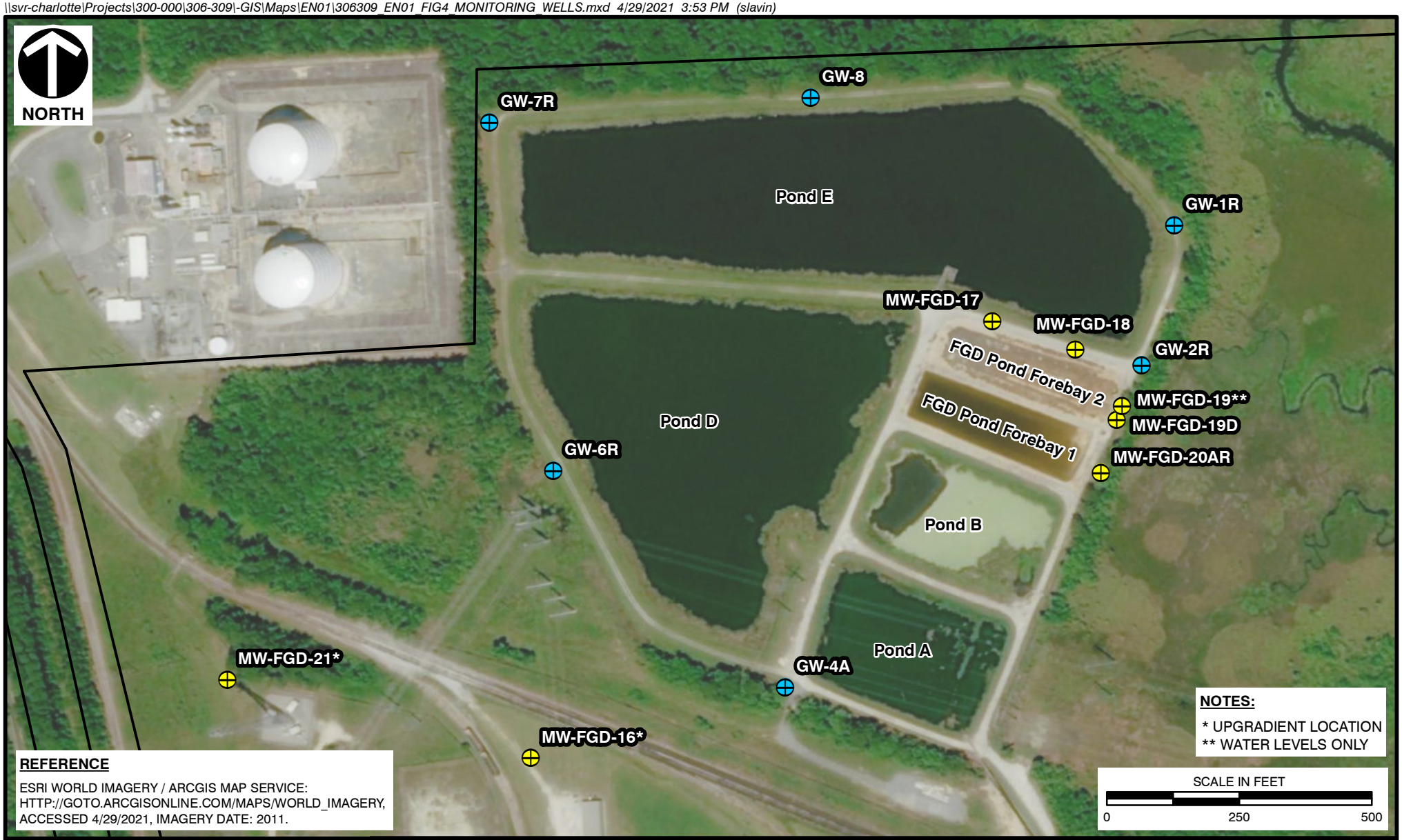

LEGEND

- EPA CCR RULE COMPLIANCE MONITORING WELLS
- NPDES MONITORING WELLS
- APPROXIMATE PARCEL BOUNDARY

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EPA CCR RULE COMPLIANCE MONITORING WELLS

DRAWN BY:	SML	CHECKED BY:	BJH	APPROVED BY:	* Hand signature on file DMC*	FIGURE NO:	4
DATE:	4/29/2021	SCALE:	1 " = 250 '	PROJECT NO:	306-309		

APPENDIX A

CCR RULE BORING LOGS

GARRETT & MOORE
Engineering for the Power and Waste Industries

SCE&G Williams Station
FGD Pond
CCR Groundwater Monitoring Wells

Well ID
GW-16

Date Started:	4/5/16	**Logged By:**	SB	**Well Construction Record**	
Date Completed:	4/5/16	**Located By:**	SCANA	**ToC Elev.:**	Edit-Text
Drilling Method:	4.25" ID Hollow Stem Augers	**Northing:**	0	**Screen Int. (ft, BGS):**	5.0-15.0
Sampling Method:	Geoprobe	**Easting:**	0	**Seal (ft, BGS):**	3.0-4.0
Drilling Company:	S&ME	**GS Elev.:**	0	**Completion:**	4"x4" Steel Casing w/ Lock

Elev.	Depth (ft)	Profile	Description	Well Diagram
0	0		SM: SILTY CLAYEY SAND: fine to medium sand, fines 30-50%, brown/tan, moist, with rootmat upper 4".	Steel Casing, Conc. Pad, 2" PVC, Grout, Bentonite
			CL: SANDY CLAY: mostly fine sand to 20-30%, low plastic fines with medium plastic @ ~4', orange/grey/tan, moist.	
-5	5		CL: SANDY CLAY: fine to medium sand to 15-20%, orange/red/grey.	
			CL: SANDY CLAY: fine sand to 10-15%, low plastic fines, blue/grey and orange, moist with wet lense @ 8.5'.	Sand, Screen
-10	10			
			SM: SILTY SAND: fine to medium sand, low elastic fines to 15-20%, olive/orange/tan, wet.	
-15	15			

GARRETT & MOORE
Engineering for the Power and Waste Industries

SCE&G Williams Station
FGD Pond
CCR Groundwater Monitoring Wells

Well ID
GW-17

Date Started:	4/5/2016	**Logged By:**	SB	**Well Construction Record**	
Date Completed:	4/5/2016	**Located By:**	SCANA	**ToC Elev.:**	Edit-Text
Drilling Method:	4.25" ID Hollow Stem Augers	**Northing:**	0	**Screen Int. (ft, BGS):**	8.0-18.0
Sampling Method:	Geoprobe	**Easting:**	0	**Seal (ft, BGS):**	4.0-6.0
Drilling Company:	S&ME	**GS Elev.:**	0	**Completion:**	Flush Mount

Elev.	Depth (ft)	Profile	Description	Well Diagram
0	0		SW: FILL - ROADBASE	Conc. Pad
			CL: SANDY CLAY (FILL): fine to medium sand to 35-50%, low plastic fines, tan/orange, moist.	Grout
			CL: SANDY CLAY: fine sand to 15-20%, medium to high plastic fines, blue/tan transitioning to orange/tan/blue, moist to wet.	2" PVC
-5	5			Bentonite
-10	10			Sand
-15	15		SC: CLAYEY SAND: mostly fine sand, with heavy organics (limb/root)	Screen
			SM: CLAYEY SILTY SAND: fine to medium sand, low elastic fines to 25-35%, orange/tan/olive, wet.	

GARRETT & MOORE
Engineering for the Power and Waste Industries

SCE&G Williams Station
FGD Pond
CCR Groundwater Monitoring Wells

Well ID
GW-18

Date Started:	4/5/2016	Logged By:	SB	Well Construction Record	
Date Completed:	4/5/2016	Located By:	SCANA	ToC Elev.:	Edit-Text
Drilling Method:	4.25" ID Hollow Stem Augers	Northing:	0	Screen Int. (ft, BGS):	8.0-18.0
Sampling Method:	Geoprobe	Easting:	0	Seal (ft, BGS):	4.0-6.0
Drilling Company:	S&ME	GS Elev.:	0	Completion:	Flush Mount

Elev.	Depth (ft)	Profile	Description	Well Diagram
0	0		SW: FILL - ROADBASE	Conc. Pad
			CL: SANDY CLAY (FILL): fine to medium sand, 15-20%, low plastic, tan/brown, moist, with trace organics 4-4.5.	Grout
-5	5		CL: SANDY CLAY (FILL): fine to medium sand to 20-25%, low to medium plastic fines, brown/black/orange, moist.	2" PVC Bentonite
-10	10		CL: SANDY CLAY: mostly fine sand with variable content 10-25%, medium to high plastic fines, blue, moist/wet. With 1" lense of gravelly white fine to coarse sand (shells).	Sand Screen
-15	15		CH: SANDY FAT CLAY: fine sand to 15%, blue, medium to high plastic fines, moist/wet.	

GARRETT & MOORE
Engineering for the Power and Waste Industries

SCE&G Williams Station
FGD Pond
CCR Groundwater Monitoring Wells

Well ID
GW-19

Date Started:	4/5/2016	Logged By:	SB	Well Construction Record	
Date Completed:	4/5/2016	Located By:	SCANA	ToC Elev.:	Edit-Text
Drilling Method:	4.25" ID Hollow Stem Augers	Northing:	0	Screen Int. (ft, BGS):	8.0-18.0
Sampling Method:	Geoprobe	Easting:	0	Seal (ft, BGS):	4.0-6.0
Drilling Company:	S&ME	GS Elev.:	0	Completion:	Flush Mount

Elev.	Depth (ft)	Profile	Description	Well Diagram
0	0		CL: SANDY SILTY CLAY (FILL): fine to medium sand varying 10-20%, low plastic fines,	Conc. Pad
-5	5		CL: SANDY CLAY (FILL): fine to medium sand to 20%, low plastic fines, brown/grey, moist to wet.	Grout 2" PVC Bentonite
-10	10		CL: SANDY CLAY: mostly fine sand to 40-50%, low plastic fines, brown/orange/grey/green, moist to wet.	Sand Screen
-15	15			

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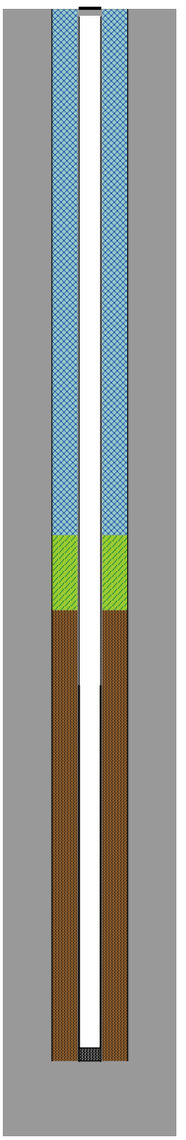
11112 Branding Iron Pl
Wendell, NC 27591
919-366-3663 (Office)
919-995-0363 (Cell)
nautilusgeocon@gmail.com

PROJECT: **Williams Station**	Well ID: **GW-19D**		
LOCATION: **Goose Creek, SC**	Client: **SCE&G**		
DRILLING CONTRACTOR: **Red Dog Drilling**	NORTHING: **434254.04**	EASTING: **2328550.03**	
DRILLING EQUIPMENT: **CME 45C**	GROUND SURFACE ELEV.: **12.5**	TOC ELEVATION: **12.56**	
DRILLING METHOD: **Hollow stem auger**	TOTAL DEPTH: **30**	DEPTH TO WATER:	
LOGGED BY: **Brian S. Boutin, PG**	SAMPLING METHOD: **2-foot split spoon every 5 feet**	DATE STARTED: **4/28/16**	DATE COMPLETED: **4/28/16**

Elev. (feet)	USCS	Description	REC (in)	# Blows/ft
12	CL	Sandy Silty CLAY (FILL): little fine to medium sand; little silt; low plastic fines.		
8	CL	Sandy CLAY (FILL): little fine to medium sand; low plastic fines; brown/gray; moist to wet..		
4	CL	Sandy CLAY: some fine sand; low plastic fines; brown/orange/gray/green; moist to wet.		
-6	CL	Silty CLAY: little silt; loose; plastic; gray-green; wet.	18	5
-8	CL	Sandy CLAY: little to some very fine to medium sand; little silt; loose; gray-green; wet.		
-12	SM	Silty SAND: calcareous; partially indurated with cemented fragments up to approx. 0.75" diameter; fine to coarse, poorly sorted sand; some silt; tan-brown; wet; saturated.	18	4
-16	CL	Silty Sandy CLAY: calcareous; little silt; trace very fine to fine sand; plastic; olive-brown; Cooper Marl.	18	6



Finished within steel, flush mount, bolt down well protector.

2" ID Sch 40 PVC solid riser.

Grout

Bentonite seal

2" ID Sch 40 PVC 0.010" machine slotted well screen.

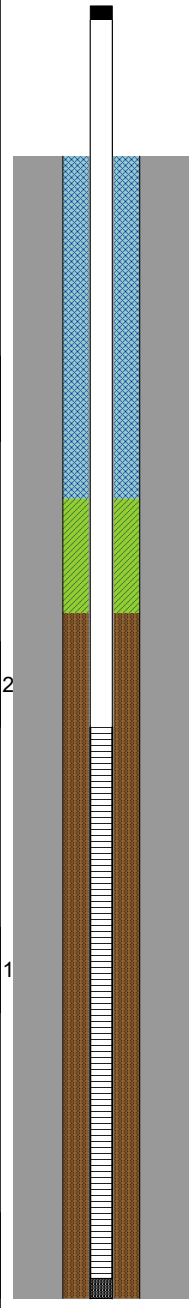
No. 2 Sand Filter Pack

NOTES: Descriptions from 0-20' depth taken from drilling log for GW-19.

Nautilus Geologic Consulting, PLLC
11112 Branding Iron Pl
Wendell, NC 27591
919-366-3663 (Office)
919-995-0363 (Cell)
nautilusgeocon@gmail.com

PROJECT: **Williams Station**		Well ID: **MW-FGD-20A**	
LOCATION: **Goose Creek, SC**		Client: **SCE&G**	
DRILLING CONTRACTOR: **Red Dog Drilling**		NORTHING: **434128.295**	EASTING: **2328509.584**
DRILLING EQUIPMENT: **CME 45C**		GROUND SURFACE ELEV.: **4.61**	TOC ELEVATION: **6.99**
DRILLING METHOD: **Hollow stem auger**		TOTAL DEPTH: **20**	DEPTH TO WATER:
LOGGED BY: **Brian S. Boutin, PG**	SAMPLING METHOD: **2-foot split spoon every 5 feet**	DATE STARTED: **11/28/17**	DATE COMPLETED: **11/28/17**

Elev. (feet)	USCS	Description	REC (in)	# Blows/ft
8				
7				
6				
5				
4	CL	CLAY: tr vf-med sand; plastic; brown.		
3				
2				
1				
0		Silty CLAY: some silt; abundant organics (plant matter) with wood fragments; plastic at top of section becomes loose with depth; gray-black; moist.	12	4
-1				
-2				
-3	CL			
-4				
-5			18	WOH, 2
-6				
-7		Sandy CLAY: some vf-c sand; calcareous; indurated limestoe fragments up to 1" diameter; loose; gray; wet at approx. 14.5'.		
-8				
-9				
-10	CL		18	WOH, 1
-11				
-12				
-13		Sandy SILT: calcareous; some f-c, poorly sorted sand; partially indurated calcareous fragments to approx. 1.5" diameter; litte to tr clay; gray-green; wet.		
-14	SM			
-15	CL	Silty Sandy CLAY: some vf-f sand; calcareous, partially indurated; tr silt; hard; olive-brown; Cooper Marl.	18	6
-16				



Finished with steel, stick-up well protector with hinged, locking lid.

2" ID Sch 40 PVC solid riser.

Grout

Bentonite seal

No. 2 Sand Filter Pack

2" ID Sch 40 PVC 0.010" machine slotted well screen.

NOTES:

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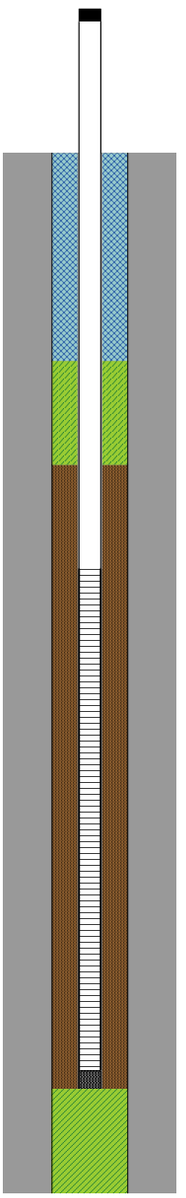
PROJECT: **Williams Station**	Well ID: **GW-21**		
LOCATION: **Goose Creek, SC**	Client: **SCE&G**		
DRILLING CONTRACTOR: **Red Dog Drilling**	NORTHING: **433737.35**	EASTING: **2326861.16**	
DRILLING EQUIPMENT: **CME 45C**	GROUND SURFACE ELEV.: **11.28**	TOC ELEVATION: **13.8**	
DRILLING METHOD: **Hollow stem auger**	TOTAL DEPTH: **20**	DEPTH TO WATER:	
LOGGED BY: **Brian S. Boutin, PG**	SAMPLING METHOD: **2-foot split spoon every 5 feet**	DATE STARTED: **11/14/16**	DATE COMPLETED: **11/14/16**

Elev. (feet)	USCS	Description	REC (in)	# Blows/ft
15				
14				
13				
12				
11		Silty CLAY: little to some silt; plastic; brown.		
10				
9	CL			
8				
7			16	11
6		Sandy SILT: little very fine to fine sand; tr clay; gr-black.		
5	ML			
4				
3		Silty CLAY: little to some silt; plastic; mottled gr-or-br.		
2	CL		9	9
1				
0		Sandy SILT: some very fine to med sand; very loose in upper part of section; wet; saturated; or-light br in upper part of section to olive green-br in lower part of section; becomes calcareous and partially indurated with depth with cemented pieces up to 0.25" diameter.		
-1				
-2				
-3			15	2
-4	ML			
-5				
-6				
-7				
-8			18	7
-9				

Well Construction



Finished with steel, stick-up well protector with hinged, locking lid.

2" ID Sch 40 PVC solid riser.

Grout

Bentonite seal

No. 2 Sand Filter Pack

2" ID Sch 40 PVC 0.010" machine slotted well screen.

NOTES: