FINAL TECHNICAL REPORT

USGS NGWMN Grant G21AC10411
9/15/2021 - 4/14/2024

Chalk Banks Monitoring Wells

Lumber River State Park
Wagram, NC
Scotland County

Prepared by

N C Department of Environmental Quality
Division of Water Resources
Groundwater Management Branch
512 N. Salisbury St
Raleigh, NC 27604

September 13, 2024

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Overview of Work Planned and Accomplished

In September 2021, the North Carolina Division of Water Resources (DWR) was awarded a $71,575 grant (G21AC10411) in support of the USGS National Ground-Water Monitoring Network (NGWMN) under Objective 5. The grant period for work completed under this grant was 9/15/2021 to 4/14/2024. Figures, tables, well records, and other attachments are provided in the Appendices at the back of this report.

Work planned and accomplished consisted of installing a groundwater monitoring station in Scotland County, NC, comprised of three wells. Project work phases included obtaining a permit from NC State Parks, contracting a driller, well installation, sampling, logging, installation of data loggers, and adding the wells to the NGWMN Well Registry. The physical address for the well site is the Lumber River State Park/Chalk Banks Access, 26040 Raeford Rd (US Highway 401), Wagram, Scotland County, NC 28314. Well site coordinates are 34.92052 latitude and -79.35417 longitude. The wells at Chalk Banks have provided daily water level data to the state well network and NGWMN since late December 2023. Data from the wells is being used to better understand the hydrogeology and transboundary conditions along the North Carolina-South Carolina boundary. Site maps and other figures are provided in Appendix A and a table of wells added to the NGWMN Well Registry is provided in Appendix B.

Expenditures for the project consisted of contracted well services, staff support, data loggers, and other equipment and supplies in support of DWR's groundwater monitoring program. Final contracted well services cost for the three wells was $72,425.

Detailed Description of Work Accomplished under Each Objective

During 2023, three monitoring wells were installed at Chalk Banks under Objective 5 by A. C. Schultes of Carolina, Inc. of Rocky Point, NC. Drilling was completed using a mud rotary drilling rig and water-based drilling fluid. Consisting of three wells completed to depths of 35, 161, and 217 feet (ft) deep, the station fills an important data gap in the Sandhills-Southwestern Coastal Plain of North Carolina. From shallowest to deepest, the aquifers monitored by these wells are North Carolina's Surficial, Black Creek, and Upper Cape Fear aquifers. The Surficial aquifer is equivalent to the USGS Surficial aquifer system, and the Black Creek and Upper Cape Fear are part of the USGS Northern Atlantic Coastal Plain aquifer system.

During drilling of the deepest well, drill cuttings were collected and described at ten-foot intervals. Upon reaching a total well depth of 309 ft, geophysical logs consisting of gamma, spontaneous potential, single point resistivity, and 16" and 64" normal resistivity were made by the driller. Washed and unwashed drill cuttings samples were preserved for future reference and are in storage at the NC Geological Survey, Coastal Plain Office, in Raleigh, NC.

Each of the three wells was constructed using 4" poly-vinyl chloride (PVC) well casing, 10 ft of stainless steel screen and a 5 ft section of blank casing and cap beneath the well screen. Additionally, the two deepest wells were cased with 40 ft of 10" PVC pipe grouted to surface. Following pipe installation, sanding, and grouting, the wells were purged until clear using compressed air. To complete construction, wells were cut to 2.5 ft above grade, and 6" steel protective casing, locking cap, and 2 ft by 2 ft concrete pads were installed around each well and tags were attached.

Following well construction, DWR field staff installed and surveyed an elevation monument, leveled casing elevations, measured static water levels, and installed water level data loggers and a barometric pressure logger for data calibration. The three wells were then added to the NC well network and USGS NGWMN Well Registry at www.ncwater.org/gwmb and https://cida.usgs.gov/ngwmn/, respectively.

Work Done as Data Provider in Support of NGWMN for Each Objective

Work done as data provider under Objective 5 is previously described.

Description of Data Collection and Well Drilling Activities

Data collection and well drilling activities for Objective 5 are previously described.

Table of New Wells Added to the NGWMN

A table of new wells added to the NGWMN is provided in Appendix B.

Methods Used for Data Collection

Data collection, management, and quality assurance methods used prior to data entry into agency databases and the NGWMN Well Registry are described in the Data Management Plan in Appendix C.

Updates to Web Services

DWR shifted to a new server with separate domain for web services in 2020 and has made other changes and web service improvements as discussed in the Data Management Plan in Appendix C.

Problems Encountered Serving Data to the NGWMN Data Portal

No problems were encountered serving data to the NGWMN portal.

Well Construction Diagrams

Well construction records, lithologic and geophysical logs, and a generalized well diagram are provided in Appendix D.

Grant Award

A copy of the USGS grant award is provided in Appendix E.

Acknowledgements

Special thanks are extended to NC State Parks for providing access to the Chalk Banks well drilling site. Additional thanks are extended to Park Superintendent Brett Godwin, James "Drew" Baxley, and other staff at Lumber River State Park for their support and assistance with this project.

Disclaimer

The views and conclusions contained in this document are those of the authors and should not be interpreted as representing the opinions or policies of the U.S. Geological Survey. Mention of trade names or commercial products does not constitute their endorsement by the U.S. Geological Survey.

Copies for USGS

PDF copies of this report are being submitted to:

Jason Fine jfine@usgs.gov
Bill Cunningham wcunning@usgs.gov

References

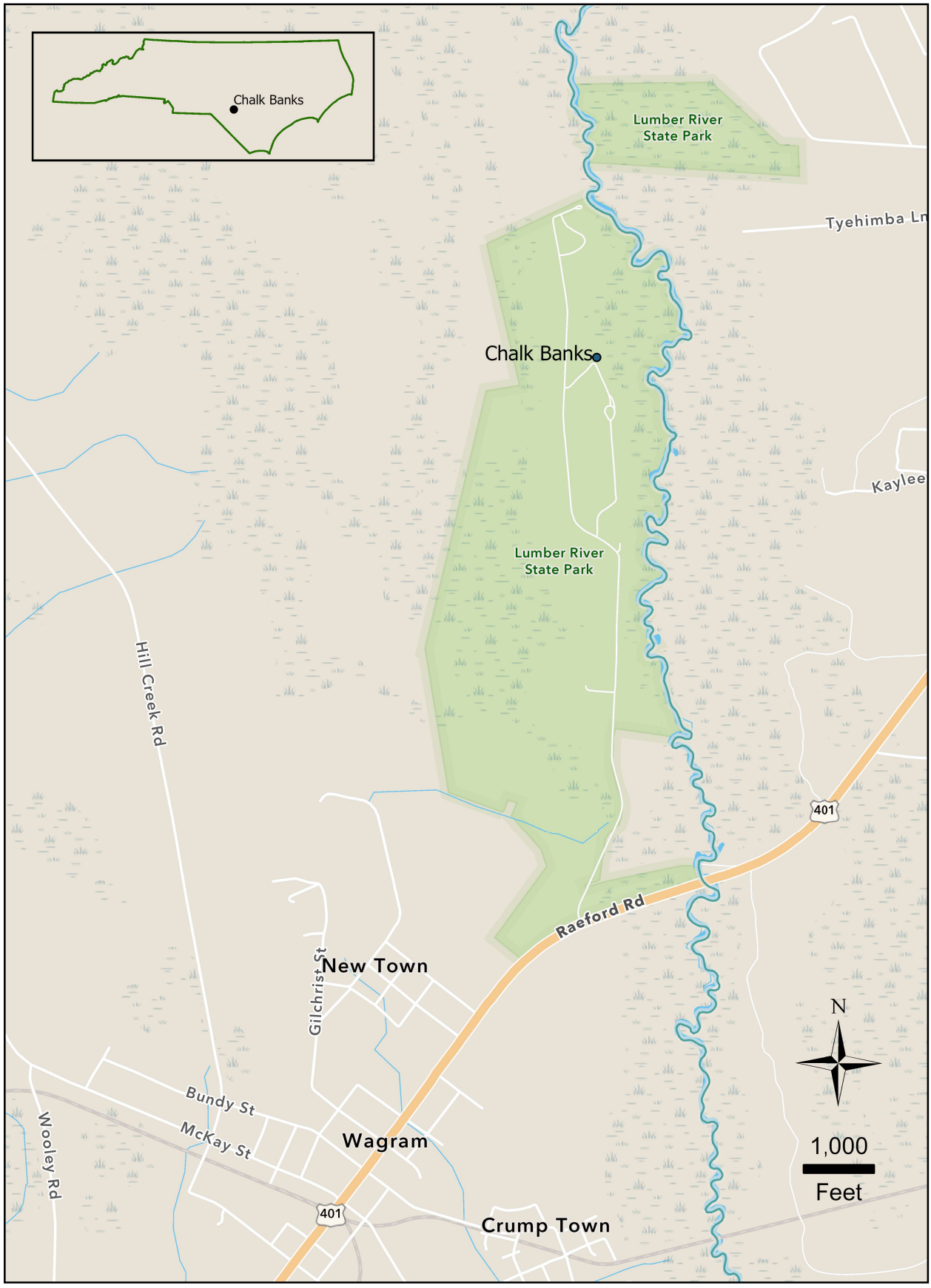
1) Subcommittee on Ground Water of the Advisory Committee on Water Information, 2009 (revised 2013), A national framework for ground water monitoring in the United States: Advisory Committee on Water Information, accessed January 2017, at https://acwi.gov/sogw/ngwmn_framework_report_july2013.pdf.

2) G21AC10411 Cooperative Agreement Grant Proposal, NCDWR, 2019, and Grant Modification, 2021.

3) Cunningham, William L., Thomas E. Reilly, Daryll Pope, April 25, 2016, Use of the National Ground-Water Monitoring Network to Evaluate Selected Transboundary Aquifer Systems, presentation at NGWA Groundwater Summit, Denver, CO.

Appendix A

Figures


Chalk Banks
Lumber River State Park
Tyehimba Ln
Chalk Banks
Kaylee
Lumber River State Park
Hill Creek Rd
401
Raeford Rd
Gilchrist St
New Town
N
Bundy St
McKay St
Wooley Rd
Wagram
1,000
Feet
401
Crump Town

View from west to east of Chalk Banks wells U 48V1, U 48V2, and U 48V3 (left to right).

Geologist work area with drilling rig in the background.

Appendix B

Tables

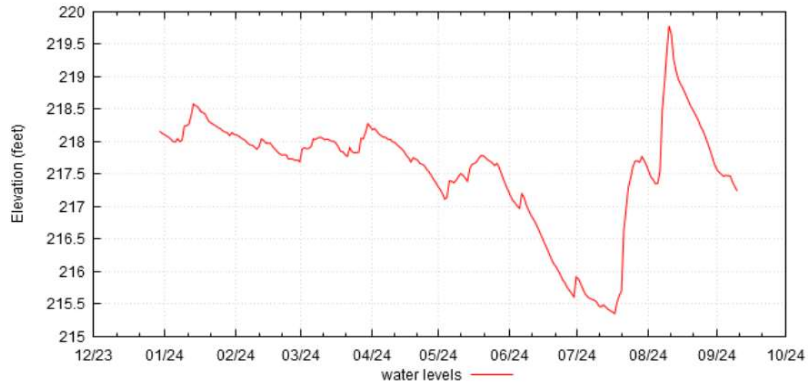
Table of Wells Installed at Chalk Banks								
NGWMN ID	Name	County	Elevation (ft)	Depth (ft)	Screen Top (ft)	Screen Bottom (ft)	NC Aquifer Name	Principal Aquifer System
NCDWR:U48V1	Chalk Banks	Scotland	227.223	35	20	30	Surficial	Surficial
NCDWR:U48V2	Chalk Banks	Scotland	226.473	217	202	212	Cape Fear	Northern Atlantic Coastal Plain
NCDWR:U48V3	Chalk Banks	Scotland	224.893	161	146	156	Black Creek	Northern Atlantic Coastal Plain
Notes								
elev	elevation above sea level (feet)							
ft	feet							
Funding	USGS NGWMN Grant G21AC10411							
location	order of wells U48V1, U48V2, and V48V3 at this monitoring station is west to east, respectively							

Chalk Banks Hydrographs for Surficial, Black Creek, and Upper Cape Fear Aquifers

	U 48V1	U 48V2	U 48V3	
	(west)	x	x	(east)

DWR Monitoring Well Database Detail for U 48V1 -- Station WLs -- Pics -- Geo-Cons

HEADER	REDUCERS	CHLORIDES	WATER LEVELS	STS	RECORDERS	LAND OWNER	MONUMENT
	0 reducers	0 samples	260 water levels download water levels		Hobo30, Hobo13	susceptibility 1	installed 2023-12-30



west well

Field	Data
County	Scotland
Quad Show Map	U 48V1
Name	Chalk Banks Chalk Banks Site Map.pdf
USGS Netname	
USGS ID	
Region	4
Latitude	34.920520
Longitude	-79.354170
Location Accuracy	G
Aquifer	S
Land Surface NED elevation = 225.10 feet	227.223
Measuring Point	2.89
Date Constructed	11/02/2023
Diameter	4
Outer Protective Casing Diameter	6
Depth	35
Casing Material	
Top of Screen	20
Bottom of Screen	30

DWR Monitoring Well Database Detail for U 48V2 -- Station WLs -- Pics -- Geo-Cons

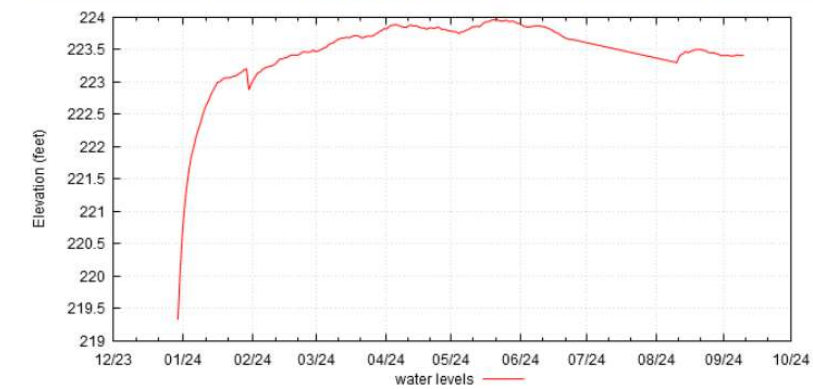
HEADER	REDUCERS	CHLORIDES	WATER LEVELS	STS	RECORDERS	LAND OWNER	MONUMENT
	0 reducers	0 samples	255 water levels download water levels		Hobo30	susceptibility 1	installed 2023-12-30

middle well

Field	Data
County	Scotland
Quad Show Map	U 48V2
Name	Chalk Banks Chalk Banks Site Map.pdf
USGS Netname	
USGS ID	
Region	4
Latitude	34.920520
Longitude	-79.354170
Location Accuracy	G
Aquifer	Kucf
Land Surface NED elevation = 226.65 feet	226.473
Measuring Point	2.92
Date Constructed	11/02/2023
Diameter	4
Outer Protective Casing Diameter	6
Depth	217
Casing Material	PVC
Top of Screen	202
Bottom of Screen	212

DWR Monitoring Well Database Detail for U 48V3 -- Station WLs -- Pics -- Geo-Cons

HEADER	REDUCERS	CHLORIDES	WATER LEVELS	STS	RECORDERS	LAND OWNER	MONUMENT
	0 reducers	0 samples	213 water levels download water levels		Hobo30	susceptibility 1	installed 2023-12-30



east well

Field	Data
County	Scotland
Quad Show Map	U 48V3
Name	Chalk Banks Chalk Banks Site Map.pdf
USGS Netname	
USGS ID	
Region	4
Latitude	34.920520
Longitude	-79.354170
Location Accuracy	G
Aquifer	Kbc
Land Surface NED elevation = 226.65 feet	224.893
Measuring Point	2.9
Date Constructed	11/02/2023
Diameter	4
Outer Protective Casing Diameter	6
Depth	161
Casing Material	PVC
Top of Screen	146
Bottom of Screen	156

Appendix C

Data Management Plan

NC DWR Data Management Plan

Effective: January 5, 2024

Project: All DWR Operations and DWR-USGS Cooperative Agreements for the National Ground-Water Monitoring Network (NGWMN)

Contacts: USGS
Jason Fine, Tel (919) 571-4034, jmfine@usgs.gov
Candice Hopkins, Tel (208) 387-1331, chopkins@usgs.gov

NC DWR Principal Investigator
Mark Durway, (919) 707-9018, mark.durway@deq.nc.gov

Budget: State and USGS Funding Sources

Types of Data Collected

Four data types are routinely collected by the NC Division of Water Resources (DWR) Groundwater Management Branch (GWMB). These data types consist of groundwater levels, groundwater quality analyses, well drilling data, and locational data. Currently, DWR provides persistent data to the NGWMN from over 600 wells. Nine USGS Principal Aquifers located in the North Carolina coastal plain, piedmont, and mountains are monitored by these wells.

Groundwater levels are acquired hourly or at other regular intervals, validated, and downloaded to the appropriate DWR database. Water quality data are collected at less frequent intervals and may consist of chlorides and other inorganic and organic parameters including PFAS and similar compounds.

Drilling data consisting of lithology, geophysical logs, and well construction specifications are acquired during the drilling and well completion process. Lithology is determined from drill cuttings collected at 10 ft intervals during well drilling. Lithologic data and well specifications including total depth, casing and screen dimensions, and other information are used to produce a drilling log once the well has been completed. Typically, wells are also logged using open-hole geophysical techniques. Geophysical data typically consists of gamma, spontaneous potential (SP), single-point resistivity (SPR), 16" normal resistivity, and 64" normal resistivity logs. Work is overseen by a geologist and drilling is performed by a state-certified well contractor in accordance with state requirements.

Accuracy of locational data is accomplished using survey grade GPS equipment to determine latitude, longitude, and altitude. Accuracy and geodetic reference systems used by DWR are state plane coordinates and latitude/longitude (<0.05 ft), altitude (<0.1 ft), horizontal datum (NAD83), and altitude datum (NAVD88).

Data and Metadata Standards

DWR stores data in the following databases:

Data Type	Database Tables
Groundwater Levels	gwb.dwr, gwb.dwrwatlev, gwb.dwrwatlevhourly
Groundwater Quality	gwb.dwrchloride
Well Logs	gwb.logs, gwb.logdata, gwb.resstafr
Location, Latitude/Longitude, Altitude	gwb.dwr

The NC DWR groundwater monitoring network uses the MariaDB database management platform. This platform is supported by branch and division level IT staff. The NC DWR Groundwater Monitoring Branch website is hosted by Apache web server. Internal database tables are used to maintain database quality control and allow for editing. Water level and water quality data meeting standards are unloaded to public tables listed above.

Policies for Access and Sharing

Project data collected is available through the NGWMN Data Portal without restriction.

Policies and Provisions for Re-Use and Re-Distribution

There is no restriction on the use of the data through the portal. Any data obtained through the portal and redistributed is expected to cite the original source of the data as DWR through this USGS/NGWMN Cooperative.

Plans for Archiving and Preservation of Access

Paper copies of field data are scanned and stored by DWR and included in regular system backups. This data and all databases are backed up at least weekly.

Appendix D

Well Construction Records

WELL CONSTRUCTION RECORD (GW-1)

For Internal Use Only:

1. Well Contractor Information:

Connor Cordingley
Well Contractor Name

4568 A
NC Well Contractor Certification Number

A.C. Schultes of Carolina, Inc.
Company Name

2. Well Construction Permit #: _____
List all applicable well construction permits (i.e. UIC, County, State, Variance, etc.)

3. Well Use (check well use):

Water Supply Well:
☐Agricultural ☐Municipal/Public
☐Geothermal (Heating/Cooling Supply) ☐Residential Water Supply (single)
☐Industrial/Commercial ☐Residential Water Supply (shared)
☐Irrigation ☐Wells > 100,000 GPD

Non-Water Supply Well:
☒Monitoring ☐Recovery

Injection Well:
☐Aquifer Recharge ☐Groundwater Remediation
☐Aquifer Storage and Recovery ☐Salinity Barrier
☐Aquifer Test ☐Stormwater Drainage
☐Experimental Technology ☐Subsidence Control
☐Geothermal (Closed Loop) ☐Tracer
☐Geothermal (Heating/Cooling Return) ☐Other (explain under #21 Remarks)

4. Date Well(s) Completed: 11/2/23 **Well ID#** U48V1

5a. Well Location:

NCDEQ - DWR
Facility/Owner Name

Facility ID# (if applicable)

Physical Address, City, and Zip

Scotland
County

Parcel Identification No. (PIN)

5b. Latitude and longitude in degrees/minutes/seconds or decimal degrees: (if well field, one lat/long is sufficient)

_____ N _____ W

6. Is(are) the well(s): ☒Permanent or ☐Temporary

7. Is this a repair to an existing well: ☐Yes or ☒No
If this is a repair, fill out known well construction information and explain the nature of the repair under #21 remarks section or on the back of this form.

8. For Geoprobe/DPT or Closed-Loop Geothermal Wells having the same construction, only 1 GW-1 is needed. Indicate TOTAL NUMBER of wells drilled: _____

9. Total well depth below land surface: _____ **(ft.)**
For multiple wells list all depths if different (example- 3@200' and 2@100')

10. Static water level below top of casing: 17 **(ft.)**
If water level is above casing, use "+"

11. Borehole diameter: _____ **(in.)**

12. Well construction method: Mud Rotary
(i.e. auger, rotary, cable, direct push, etc.)

FOR WATER SUPPLY WELLS ONLY:

13a. Yield (gpm) _____ **Method of test:** _____

13b. Disinfection type: _____ **Amount:** _____

14. WATER ZONES

FROM	TO	DESCRIPTION
20 ft.	30 ft.	Surficial
ft.	ft.	

15. OUTER CASING (for multi-cased wells) OR LINER (if applicable)

FROM	TO	DIAMETER	THICKNESS	MATERIAL
ft.	ft.	in.		

16. INNER CASING OR TUBING (geothermal closed-loop)

FROM	TO	DIAMETER	THICKNESS	MATERIAL
0 ft.	20 ft.	4.5 in.	SDR-17	PVC
30 ft.	35 ft.	4 in.	SDR-17	PVC

17. SCREEN

FROM	TO	DIAMETER	SLOT SIZE	THICKNESS	MATERIAL
20 ft.	30 ft.	4 in.	.20	SCH40	304SS
ft.	ft.	in.			

18. GROUT

FROM	TO	MATERIAL	EMPLACEMENT METHOD & AMOUNT
0 ft.	15 ft.	#2	TREMMIE
ft.	ft.		
ft.	ft.		

19. SAND/GRAVEL PACK (if applicable)

FROM	TO	MATERIAL	EMPLACEMENT METHOD
15 ft.	35 ft.	#2	TREMMIE
ft.	ft.		

20. DRILLING LOG (attach additional sheets if necessary)

FROM	TO	DESCRIPTION (color, hardness, soil/rock type, grain size, etc.)
ft.	ft.	SEE ATTACHED
ft.	ft.	
ft.	ft.	
ft.	ft.	
ft.	ft.	
ft.	ft.	
ft.	ft.	

21. REMARKS

22. Certification:

Signature of Certified Well Contractor — Date: 11/3/23

By signing this form, I hereby certify that the well(s) was (were) constructed in accordance with 15A NCAC 02C .0100 or 15A NCAC 02C .0200 Well Construction Standards and that a copy of this record has been provided to the well owner.

23. Site diagram or additional well details:
You may use the back of this page to provide additional well construction info (add 'See Over' in Remarks Box). You may also attach additional pages if necessary.

24. SUBMITTAL INSTRUCTIONS

Submit this GW-1 within 30 days of well completion per the following:

24a. For All Wells: Original form to Division of Water Resources (DWR), Information Processing Unit, 1617 MSC, Raleigh, NC 27699-1617

24b. For Injection Wells: Copy to DWR, Underground Injection Control (IUC) Program, 1636 MSC, Raleigh, NC 27699-1636

24c. For Water Supply and Open-Loop Geothermal Return Wells: Copy to the county environmental health department of the county where installed

24d. For Water Wells producing over 100,000 GPD: Copy to DWR, CCPCUA Permit Program, 1611 MSC, Raleigh, NC 27699-1611

Formation Description for Well Record

C-1407 NCDENR – Chalk Banks Access at Lumber River State Park – U48V1

0 – 20	Pea Gravel, Coarse Sand
20 – 30	Coarse Sand, Trace of Clay
30 – 35	Orange Clay

WELL CONSTRUCTION RECORD (GW-1)

For Internal Use Only:

1. Well Contractor Information:

Connor Cordingley
Well Contractor Name

4568 A
NC Well Contractor Certification Number

A.C. Schultes of Carolina, Inc.
Company Name

2. Well Construction Permit #: _____
List all applicable well construction permits (i.e. UIC, County, State, Variance, etc.)

3. Well Use (check well use):

Water Supply Well:
☐Agricultural ☐Municipal/Public
☐Geothermal (Heating/Cooling Supply) ☐Residential Water Supply (single)
☐Industrial/Commercial ☐Residential Water Supply (shared)
☐Irrigation ☐Wells > 100,000 GPD

Non-Water Supply Well:
☑Monitoring ☐Recovery

Injection Well:
☐Aquifer Recharge ☐Groundwater Remediation
☐Aquifer Storage and Recovery ☐Salinity Barrier
☐Aquifer Test ☐Stormwater Drainage
☐Experimental Technology ☐Subsidence Control
☐Geothermal (Closed Loop) ☐Tracer
☐Geothermal (Heating/Cooling Return) ☐Other (explain under #21 Remarks)

4. Date Well(s) Completed: 11/2/23 **Well ID#** U48V2

5a. Well Location:

NCDEQ - DWR
Facility/Owner Name

Facility ID# (if applicable)

Physical Address, City, and Zip
Scotland
County

Parcel Identification No. (PIN)

5b. Latitude and longitude in degrees/minutes/seconds or decimal degrees:
(if well field, one lat/long is sufficient)

_____ N _____ W

6. Is(are) the well(s): ☑Permanent or ☐Temporary

7. Is this a repair to an existing well: ☐Yes or ☑No
If this is a repair, fill out known well construction information and explain the nature of the repair under #21 remarks section or on the back of this form.

8. For Geoprobe/DPT or Closed-Loop Geothermal Wells having the same construction, only 1 GW-1 is needed. Indicate TOTAL NUMBER of wells drilled: _____

9. Total well depth below land surface: _____ **(ft.)**
For multiple wells list all depths if different (example- 3@200' and 2@100')

10. Static water level below top of casing: 26 **(ft.)**
If water level is above casing, use "-"

11. Borehole diameter: _____ **(in.)**

12. Well construction method: Mud Rotary
(i.e. auger, rotary, cable, direct push, etc.)

FOR WATER SUPPLY WELLS ONLY:

13a. Yield (gpm) _____ **Method of test:** _____

13b. Disinfection type: _____ **Amount:** _____

14. WATER ZONES

FROM	TO	DESCRIPTION
202 ft.	212 ft.	CAPE FEAR
ft.	ft.	

15. OUTER CASING (for multi-cased wells) OR LINER (if applicable)

FROM	TO	DIAMETER	THICKNESS	MATERIAL
0 ft.	40 ft.	10 in.	SCH40	PVC

16. INNER CASING OR TUBING (geothermal closed-loop)

FROM	TO	DIAMETER	THICKNESS	MATERIAL
0 ft.	202 ft.	4.5 in.	SDR-17	PVC
212 ft.	217 ft.	4 in.	SDR-17	PVC

17. SCREEN

FROM	TO	DIAMETER	SLOT SIZE	THICKNESS	MATERIAL
202 ft.	212 ft.	4 in.	.20	SCH40	304SS
ft.	ft.	in.			

18. GROUT

FROM	TO	MATERIAL	EMPLACEMENT METHOD & AMOUNT
0 ft.	197 ft.	BENTONITE SLURRY	TREMMIE
ft.	ft.		
ft.	ft.		

19. SAND/GRAVEL PACK (if applicable)

FROM	TO	MATERIAL	EMPLACEMENT METHOD
197 ft.	220 ft.	#2	TREMMIE
ft.	ft.		

20. DRILLING LOG (attach additional sheets if necessary)

FROM	TO	DESCRIPTION (color, hardness, soil/rock type, grain size, etc.)
ft.	ft.	SEE ATTACHED
ft.	ft.	
ft.	ft.	
ft.	ft.	
ft.	ft.	
ft.	ft.	
ft.	ft.	

21. REMARKS

22. Certification:

Signature of Certified Well Contractor — Date: 11/3/23

By signing this form, I hereby certify that the well(s) was (were) constructed in accordance with 15A NCAC 02C .0100 or 15A NCAC 02C .0200 Well Construction Standards and that a copy of this record has been provided to the well owner.

23. Site diagram or additional well details:
You may use the back of this page to provide additional well construction info (add 'See Over' in Remarks Box). You may also attach additional pages if necessary.

24. SUBMITTAL INSTRUCTIONS

Submit this GW-1 within 30 days of well completion per the following:

24a. For All Wells: Original form to Division of Water Resources (DWR), Information Processing Unit, 1617 MSC, Raleigh, NC 27699-1617

24b. For Injection Wells: Copy to DWR, Underground Injection Control (IUC) Program, 1636 MSC, Raleigh, NC 27699-1636

24c. For Water Supply and Open-Loop Geothermal Return Wells: Copy to the county environmental health department of the county where installed

24d. For Water Wells producing over 100,000 GPD: Copy to DWR, CCPCUA Permit Program, 1611 MSC, Raleigh, NC 27699-1611

Formation Description for Well Record

C-1407 NCDENR – Chalk Banks Access at Lumber River State Park –U48V2

0 – 20	Pea Gravel, Coarse Sand
20 – 30	Coarse Sand, Trace of Clay
30 – 40	Orange Clay
40 – 50	Pea Gravel, Sand, Clay
50 – 60	White Firm Clay/Sand, Trace of Gravel
60 – 70	Mostly Sand, Trace of Clay
70 – 80	Firm White Clay, Sand
80 – 90	Firm White Clay, Some Sand
90 – 100	Firm White/Red Clay, Some Sand
100 – 110	Firm White Clay, Sandy Clay
110 – 130	Clay/Sand
130 – 140	White/Red Sandy Clay
140 – 150	White/Red Clay, Sand, Trace of Gold Sandy Clay
150 – 160	Mostly Sand, Clay
160 – 190	Sand/Clay
190 – 200	Course Sand, Trace of Clay
200 – 210	Sand/Clay
210 – 217	Mostly Clay, Trace of Sand

WELL CONSTRUCTION RECORD (GW-1)

For Internal Use Only:

1. Well Contractor Information:

Connor Cordingley
Well Contractor Name

4568 A
NC Well Contractor Certification Number

A.C. Schultes of Carolina, Inc.
Company Name

2. Well Construction Permit #: _____
List all applicable well construction permits (i.e. UIC, County, State, Variance, etc.)

3. Well Use (check well use):

Water Supply Well:	
☐Agricultural	☐Municipal/Public
☐Geothermal (Heating/Cooling Supply)	☐Residential Water Supply (single)
☐Industrial/Commercial	☐Residential Water Supply (shared)
☐Irrigation	☐Wells > 100,000 GPD
Non-Water Supply Well:	
☑Monitoring	☐Recovery
Injection Well:	
☐Aquifer Recharge	☐Groundwater Remediation
☐Aquifer Storage and Recovery	☐Salinity Barrier
☐Aquifer Test	☐Stormwater Drainage
☐Experimental Technology	☐Subsidence Control
☐Geothermal (Closed Loop)	☐Tracer
☐Geothermal (Heating/Cooling Return)	☐Other (explain under #21 Remarks)

4. Date Well(s) Completed: 11/2/23 **Well ID#** U48V3

5a. Well Location:

NCDEQ - DWR
Facility/Owner Name

Facility ID# (if applicable)

Physical Address, City, and Zip

Scotland
County

Parcel Identification No. (PIN)

5b. Latitude and longitude in degrees/minutes/seconds or decimal degrees:
(if well field, one lat/long is sufficient)

_____ N _____ W

6. Is(are) the well(s): ☑Permanent or ☐Temporary

7. Is this a repair to an existing well: ☐Yes or ☑No
If this is a repair, fill out known well construction information and explain the nature of the repair under #21 remarks section or on the back of this form.

8. For Geoprobe/DPT or Closed-Loop Geothermal Wells having the same construction, only 1 GW-1 is needed. Indicate TOTAL NUMBER of wells drilled: _____

9. Total well depth below land surface: _____ **(ft.)**
For multiple wells list all depths if different (example- 3@200' and 2@100')

10. Static water level below top of casing: 84 **(ft.)**
If water level is above casing, use "+"

11. Borehole diameter: _____ **(in.)**

12. Well construction method: Mud Rotary
(i.e. auger, rotary, cable, direct push, etc.)

FOR WATER SUPPLY WELLS ONLY:

13a. Yield (gpm) _____ **Method of test:** _____

13b. Disinfection type: _____ **Amount:** _____

14. WATER ZONES

FROM	TO	DESCRIPTION
146 ft.	156 ft.	BLACK CREEK
ft.	ft.	

15. OUTER CASING (for multi-cased wells) OR LINER (if applicable)

FROM	TO	DIAMETER	THICKNESS	MATERIAL
0 ft.	40 ft.	10 in.	SCH40	PVC

16. INNER CASING OR TUBING (geothermal closed-loop)

FROM	TO	DIAMETER	THICKNESS	MATERIAL
0 ft.	146 ft.	4.5 in.	SDR-17	PVC
156 ft.	161 ft.	4 in.	SDR-17	PVC

17. SCREEN

FROM	TO	DIAMETER	SLOT SIZE	THICKNESS	MATERIAL
146 ft.	156 ft.	4 in.	.20	SCH40	304SS
ft.	ft.	in.			

18. GROUT

FROM	TO	MATERIAL	EMPLACEMENT METHOD & AMOUNT
0 ft.	141 ft.	BENTONITE SLURRY	TREMMIE
ft.	ft.		
ft.	ft.		

19. SAND/GRAVEL PACK (if applicable)

FROM	TO	MATERIAL	EMPLACEMENT METHOD
141 ft.	165 ft.	#2	TREMMIE
ft.	ft.		

20. DRILLING LOG (attach additional sheets if necessary)

FROM	TO	DESCRIPTION (color, hardness, soil/rock type, grain size, etc.)
ft.	ft.	SEE ATTACHED
ft.	ft.	
ft.	ft.	
ft.	ft.	
ft.	ft.	
ft.	ft.	
ft.	ft.	

21. REMARKS

22. Certification:

_____ 11/3/23
Signature of Certified Well Contractor — Date

By signing this form, I hereby certify that the well(s) was (were) constructed in accordance with 15A NCAC 02C .0100 or 15A NCAC 02C .0200 Well Construction Standards and that a copy of this record has been provided to the well owner.

23. Site diagram or additional well details:
You may use the back of this page to provide additional well construction info (add 'See Over' in Remarks Box). You may also attach additional pages if necessary.

24. SUBMITTAL INSTRUCTIONS

Submit this GW-1 within 30 days of well completion per the following:

24a. For All Wells: Original form to Division of Water Resources (DWR), Information Processing Unit, 1617 MSC, Raleigh, NC 27699-1617

24b. For Injection Wells: Copy to DWR, Underground Injection Control (IUC) Program, 1636 MSC, Raleigh, NC 27699-1636

24c. For Water Supply and Open-Loop Geothermal Return Wells: Copy to the county environmental health department of the county where installed

24d. For Water Wells producing over 100,000 GPD: Copy to DWR, CCPCUA Permit Program, 1611 MSC, Raleigh, NC 27699-1611

Formation Description for Well Record

C-1407 NCDENR – Chalk Banks Access at Lumber River State Park –U48V3

0 – 20	Pea Gravel, Coarse Sand
20 – 30	Coarse Sand, Trace of Clay
30 – 40	Orange Clay
40 – 50	Pea Gravel, Sand, Clay
50 – 60	White Firm Clay/Sand, Trace of Gravel
60 – 70	Mostly Sand, Trace of Clay
70 – 80	Firm White Clay, Sand
80 – 90	Firm White Clay, Some Sand
90 – 100	Firm White/Red Clay, Some Sand
100 – 110	Firm White Clay, Sandy Clay
110 – 130	Clay/Sand
130 – 140	White/Red Sandy Clay
140 – 150	White/Red Clay, Sand, Trace of Gold Sandy Clay
150 – 161	Mostly Sand, Clay

Lithologic Log

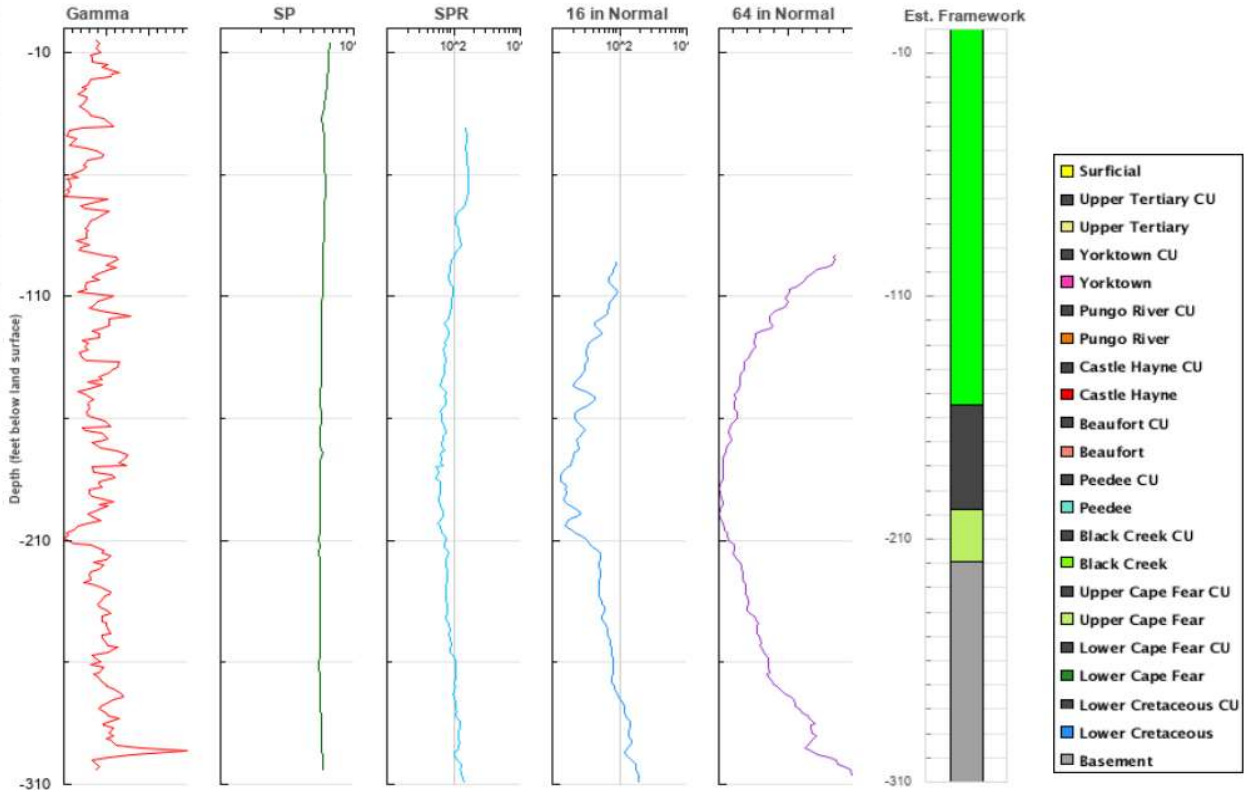
Quad	**U 48V3 (eastern-most well)**
Well Name	**Chalk Banks (Chalk Banks Access Lumber River State Park. Wagram, NC)**
County	**Scotland**
Lat	**34.920520**
Lon	**-79.354170**
Driller	**AC Schultes of Carolina, Inc.**
Log	**AC Schultes of Carolina, Inc.**
TD (ft)	**309 ft (completed to approximately 161' as Kbc well)**
Elevation (ft)	**224 ft +-**
Completed	**11/2/2023**
Depth (ft)	**Lithology**
	Surficial aquifer (0-34')
0-34	Quartz sand and pebbles (up to 0.5"), loose, clear-white, angular-round, some white clay
	Kbc confining unit (34-40')
34-40	Clay, dark yellow orange (10 YR 6/6)
	Kbc aquifer (40-172')
40-50	Sand and pebbles, clear-white, light orange tint common, coarse-fine
50-60	Clay and sand mix, clay is very pale orange (10 YR 8/2)
60-70	Sand with minor clay
70-80	Clay-sand mix similar to 50-60' but with more reddish tint
80-90	Clay, minor sand, very pale orange (10 YR 8/2)
90-100	Clay, minor sand as at 80-90' except gray to slightly orange (10 YR 7/4)
100-110	Clay , minor sand, light to very light gray (N7 - N8)
110-120	Clay and sand mix, pale to light pale yellowish brown (10 YR 6/2)
120-130	Clay and sand mix as at 110-120'
130-140	Clay and sand mix, more clayey than 110-130', distinctly grayish red (10 R 4/2),
	trace metasemimentary rock fragments
140-150	Clay with minor sand and rock fragments, color as at 130-140'
150-172	Sand and clay mix, hard drilling reported by driller from 158-162'
	Kucf confining unit (172-202')
172-202	Clay and sand mix; similar to overlying Kbc; top of unit picked from geophysical log
	where total clay and silt appear to exceed total sand
	Kucf aquifer (202-212')
202-212	Sand, predominantly coarse, clear-white, minor clay similar to possibly same as overlying Kbc
	Basement (212'+)
212-309	Metasedimentary basement rock (schist or phyllite?) consiting of alternating zones of silt
	with minor very fine sand, clay, mica, and crystalline rock fragments ranging from
	yellowish-gray (5Y 7/2) to very pale orange (10 YR 8/2), abundant quartz from 250-260'
Notes:	
Non-fossiliferous throughout	
depth units in feet (ft or ')	
colors described wet	
S=Surficial	
Kbc=Cretaceous Black Creek	
Kucf=Cretaceous Cape Fear (upper)	
After reaching total depth of 309', well was plugged back and completed as Kbc well	
Log prepared by Mark Durway/DWR. Also see geophysical log and GW-1 Well Construction Records	

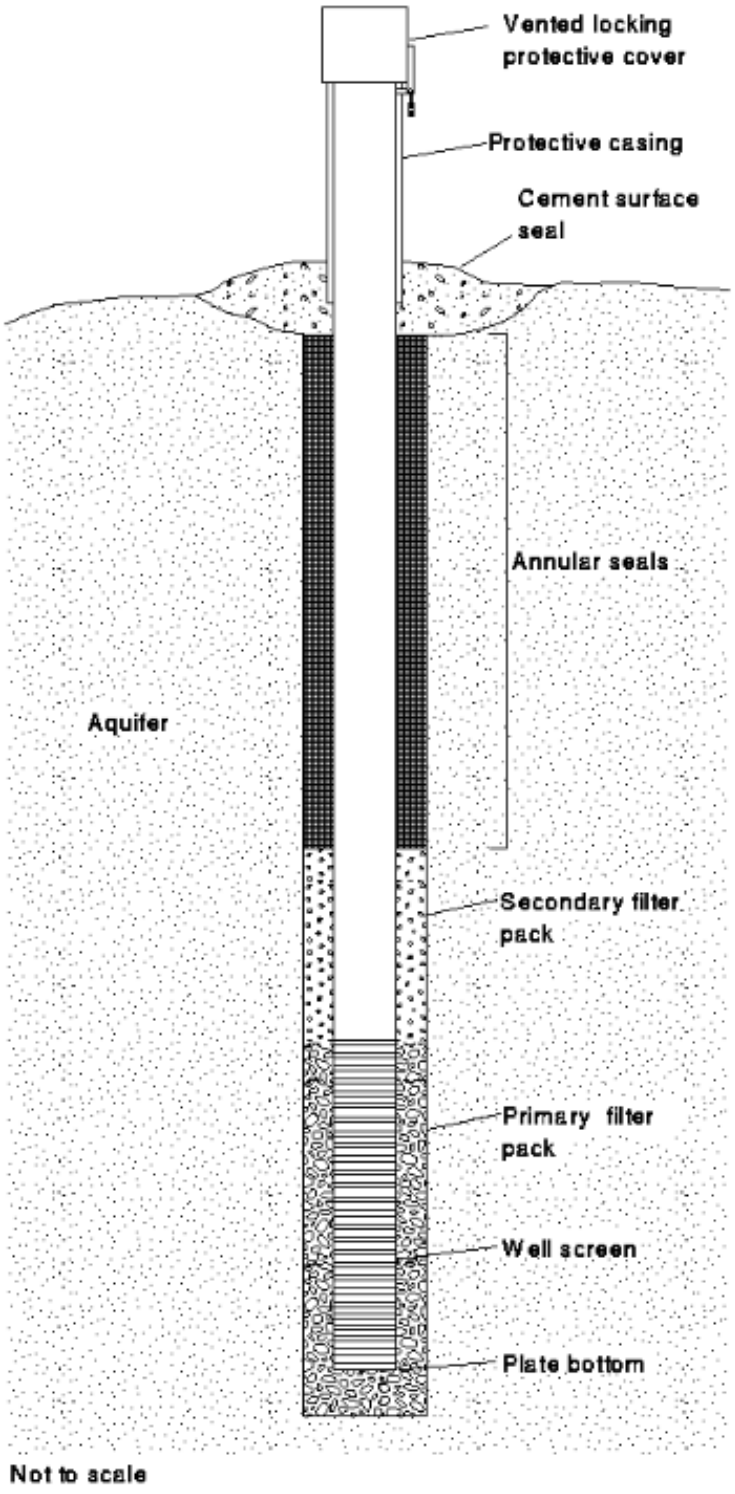
Chalk Banks Geophysical Logs

Field	Data
County	Scotland
Latitude	34.920520
Longitude	-79.354170
Location Accuracy Show Map	GPS
Quad	U 48V
Land Surface	225.00
Dates	10/06/2023
Source	AC Schultes of Carolina, Inc
LAS File	U48V_all_160601.las

click on each log chart to access complete log

log legend





Generalized groundwater monitoring well diagram. NC DWR monitoring wells must be installed in accordance with state requirements by a certified well contractor. Design and geology may vary. Image from USGS OFR95-398 NAWQA Ground Water Protocols.

Appendix E

Grant Award

NOTICE OF AWARD

1. DATE ISSUED *MM/DD/YYYY*
09/21/2023

1a. SUPERSEDES AWARD NOTICE dated 07/29/2021
except that any additions or restrictions previously imposed remain in effect unless specifically rescinded

2. CFDA NO.
15.980 - National Ground-Water Monitoring Network

3. ASSISTANCE TYPE Cooperative Agreement

4. GRANT NO. G21AC10411-01
Originating MCA #

5. TYPE OF AWARD
Research

4a. FAIN G21AC10411

5a. ACTION TYPE Post Award Amendment

6. PROJECT PERIOD *MM/DD/YYYY*
From 09/15/2021 **Through** *MM/DD/YYYY* 04/14/2024

7. BUDGET PERIOD *MM/DD/YYYY*
From 09/15/2021 **Through** *MM/DD/YYYY* 04/14/2024

AUTHORIZATION (Legislation/Regulations)

Public Law 111-11, Subtitle F—Secure Water: Section 9507 Water Data Enhancement by the United States Geological Survey

8. TITLE OF PROJECT (OR PROGRAM)
Groundwater and Transboundary Conditions Along the NC-SC Coastal Plain Boundary

9a. GRANTEE NAME AND ADDRESS
North Carolina Department Of Environmental Quality
1612 Mail Service Ctr
Raleigh, NC, 27699-1600

9b. GRANTEE PROJECT DIRECTOR
D. Mark Durway
1611 Mail Service Center
Raleigh, NC, 27699-1611
Phone: 919-707-9018

10a. GRANTEE AUTHORIZING OFFICIAL
Ms. Susan Eulaine Pope
1617 Mail Service Center
Raleigh, NC, 27699-1617
Phone: 919-707-9225

10b. FEDERAL PROJECT OFFICER
Jason Fine
National Center 12201 Sunrise Valley Drive
Reston, VA, 20192
Phone: 919-571-4041

ALL AMOUNTS ARE SHOWN IN USD

11. APPROVED BUDGET (Excludes Direct Assistance)

		I Financial Assistance from the Federal Awarding Agency Only	II Total project costs including grant funds and all other financial participation
a.	Salaries and Wages		0.00
b.	Fringe Benefits		0.00
c.	Total Personnel Costs		0.00
d.	Equipment		0.00
e.	Supplies		0.00
f.	Travel		0.00
g.	Construction		0.00
h.	Other		0.00
i.	Contractual		143,150.00
j.	TOTAL DIRECT COSTS		143,150.00
k.	INDIRECT COSTS		0.00
l.	**TOTAL APPROVED BUDGET**		143,150.00
m.	Federal Share		71,575.00
n.	Non-Federal Share		71,575.00

12. AWARD COMPUTATION

a. Amount of Federal Financial Assistance (from item 11m)	$ 71,575.00
b. Less Unobligated Balance From Prior Budget Periods	$ 0.00
c. Less Cumulative Prior Award(s) This Budget Period	$ 71,575.00
d. **AMOUNT OF FINANCIAL ASSISTANCE THIS ACTION**	$ 0.00
13. Total Federal Funds Awarded to Date for Project Period	$ 71,575.00

14. RECOMMENDED FUTURE SUPPORT
(Subject to the availability of funds and satisfactory progress of the project):

YEAR	TOTAL DIRECT COSTS	YEAR	TOTAL DIRECT COSTS
a. 2	$	d. 5	$
b. 3	$	e. 6	$
c. 4	$	f. 7	$

15. PROGRAM INCOME SHALL BE USED IN ACCORD WITH ONE OF THE FOLLOWING ALTERNATIVES:
a. DEDUCTION
b. ADDITIONAL COSTS
c. MATCHING
d. OTHER RESEARCH (Add / Deduct Option)
e. OTHER *(See REMARKS)*

b

16. THIS AWARD IS BASED ON AN APPLICATION SUBMITTED TO, AND AS APPROVED BY, THE FEDERAL AWARDING AGENCY ON THE ABOVE TITLED PROJECT AND IS SUBJECT TO THE TERMS AND CONDITIONS INCORPORATED EITHER DIRECTLY OR BY REFERENCE IN THE FOLLOWING:
a. The grant program legislation
b. The grant program regulations.
c. This award notice including terms and conditions, if any, noted below under REMARKS.
d. Federal administrative requirements, cost principles and audit requirements applicable to this grant.

In the event there are conflicting or otherwise inconsistent policies applicable to the grant, the above order of precedence shall prevail. Acceptance of the grant terms and conditions is acknowledged by the grantee when funds are drawn or otherwise obtained from the grant payment system.

REMARKS (Other Terms and Conditions Attached - ● Yes ○ No)
See next page

GRANTS MANAGEMENT OFFICIAL:
Sherri Bredesen, Chief, National Grants Branch
National Center 12201 Sunrise Valley Drive
205
Reston, VA, 20192
Phone: 703-648-7485

17. VENDOR CODE 0070066320 **18a. UEI** TFQVKH1E8Y41 **18b. DUNS** 809785280 **19. CONG. DIST.** 02

LINE#	FINANCIAL ACCT	AMT OF FIN ASST	START DATE	END DATE	TAS ACCT	PO LINE DESCRIPTION
1	0051009610-00010	$0.00	09/15/2021	04/14/2024	0804	Mod 01: NCE to 4/14/2024

REMARKS:

Issuing Office:
U.S. Geological Survey
Office of Acquisition and Grants
12201 Sunrise Valley Drive, M205
Reston, VA 20192
Sara Roser, Grant Specialist
Phone: (703) 648-7357
Email: sroser@usgs.gov

USGS Program Officer:
Jason M. Fine
U.S. Geological Survey
National Groundwater Networks Coordinator
Hydrologic Networks Branch
3916 Sunset Ridge Road
Raleigh, NC 27607
office: 919-571-4034
cell: 919-818-6969
Email: jmfine@usgs.gov

Principal Investigator:
Mark Durway, L.G., Hydrogeologist
NC DEQ DWR Groundwater Management Branch
1611 Mail Service Center
Raleigh, NC 27699-1611
Tel (919) 707-9018
mark.durway@ncdenr.gov

See Section 5(b)(2) of the Award Terms and Conditions for the Final Technical Report Due Date.

Federal Financial Report Cycle			
Reporting Period Start Date	Reporting Period End Date	Reporting Type	Reporting Period Due Date
09/15/2021	09/14/2022	Annual	12/13/2022
09/15/2022	09/14/2023	Annual	12/13/2023
09/15/2023	04/14/2024	Final	08/12/2024

AWARD ATTACHMENTS

North Carolina Department Of Environmental Quality G21AC10411-01

1. Modification 01 Attachment

Modification Attachment
North Carolina Department of Environmental Quality
Award Number G21AC10411
Modification 01

1. In accordance with Section 8, “Revisions and Prior Approvals,” the Contracting Officer hereby extends the budget and project periods to 04/14/2024. The Recipient's email, dated 08/09/2023, is incorporated herein by reference.

2. The budget period is hereby changed from 09/15/2021 through 09/14/2023 to 09/15/2021 through 04/14/2024.

3. The project period is hereby changed from 09/15/2021 through 09/14/2023 to 09/15/2021 through 04/14/2024.

4. All other terms and conditions remain unchanged.

-- End of Modification No. 01--