FINAL TECHNICAL REPORT

USGS NGWMN Grant G19AC00193

7/15/2019 - 5/14/2022

Wells and Transboundary Conditions at Shingle Landing and Maple Well Stations in Currituck County, NC

Prepared by

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July 14, 2022

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Overview of Work Planned and Accomplished

On 7/15/2019, the North Carolina Division of Water Resources (DWR) was awarded a $234,153 grant (G19AC00193) in support of the USGS National Ground-Water Monitoring Network (NGWMN). During the two-year grant period from 7/15/2019 to 5/14/2022, funding was used to install two groundwater monitoring stations in Currituck County, NC. These stations consist of two wells (735 feet total) at Shingle Landing in Moyock, and two wells (790 feet total) at Maple Airport near Currituck. Shingle Landing well station was completed for a total of $102,006.25 at a unit cost of approximately $138.78 per foot, and Maple was completed for a total cost of $99,468.75 at a unit cost of approximately $125.91 per foot.

State matching funds of $219,380 were expended by DWR during the grant period for new wells at Turkey and Pondberry Bay well stations in Sampson County and Chinquapin Elementary School in Duplin County, NC, at an average cost ranging from $65.90 per foot to $157.53 per foot.

Wells constructed with grant funds and state matching funds have been added to the state well network and NGWMN.

Description of Work Accomplished under Each Objective

Shingle Landing Well Station

During 2021, following approval of a grant modification related to drilling contract cost increases, two monitoring wells were installed at Shingle Landing well station by Toano Well and Pump Service, Inc. of Toano, VA, using a mud rotary drilling rig and water-based drilling fluid. Consisting of a surficial aquifer well to 25 feet (ft) and a Beaufort aquifer well to 710 ft deep, the station fills an important data gap within the Albemarle-Tidewater area of northeastern North Carolina. This station will aid in resolving transboundary issues related to regional groundwater use, assist with correlation of hydrogeologic units, provide persistent groundwater levels, and be used for periodic water quality testing. The absence of an identifiable Castle Hayne aquifer unit at this station resulted in designating the deep well as a Beaufort aquifer well, though site geology at this location is still subject to interpretation.

Maple Well Station

During 2022, following approval of a second grant modification extending DWR's work completion date, two monitoring wells were installed at the Maple station. This work was also performed by Toano Well and Pump Service using a mud rotary drilling rig and water-based drilling fluid. Consisting of a surficial aquifer well to 30 feet (ft) and a Castle Hayne aquifer well to 760 ft deep, this station also fills an important data gap within the Albemarle-Tidewater area of northeastern North Carolina. This

station will also aid in resolving transboundary issues related to regional groundwater use, assist with correlation of hydrogeologic units, provide persistent groundwater levels, and be used for periodic water quality testing. A planned Yorktown aquifer well was not drilled at this station after receiving permission to install a data logger in a county-owned monitoring well located next to the other two wells. The county's Yorktown well has now been incorporated into DWR's monitoring network and added to the NGWMN registry.

Both Well Stations

Wells drilled at both stations were completed with 4" poly-vinyl chloride (PVC) well casing and 10 to 20 ft of stainless steel or PVC screen. Additionally, screen for the two deep wells was set above a 5 ft section of blank casing with cap to minimize screen clogging with residual suspended solids. Wells were terminated approximately 2.5 ft above grade and protected by a 6" steel casing, locking cap, and 2 ft by 2 ft concrete pad. The wells were then developed by the driller using compressed air injected until water from each well ran clear.

Following well completion, DWR field staff purged each well, measured water levels and water quality field parameters, surveyed casing elevations, and installed water level data loggers. The wells were then added to the state well network and NGWMN at www.ncwater.org/gwmb and https://www.usgs.gov, respectively.

Figures including site maps, geophysical and lithologic logs, well hydrographs, and potentiometric surface maps are provided in Appendix A. A detailed list of all grant and match-funded wells constructed under this grant are tabulated in Appendix B. State GW-1 well construction records are provided in Appendix C, DWR's data management plan is provided in Appendix D., and a copy of the NGWMN grant award is provided in Appendix E.

Description of Work Accomplished with DWR Matching Funds

During the grant period, new and replacement wells were installed at Turkey and Pondberry Bay well stations in Sampson County and Chinquapin Elementary School in Duplin County, NC, at an average cost ranging from $65.90 per foot to $157.53 per foot. The total state expenditure for these wells was $219,380. Well construction, sampling, logging, datalogger installation, and other tasks were performed in the same manner as at the Shingle Landing and Maple well stations.

Data for the grant match wells is accessible through both the NGWMN Registry and DWR websites and well details are provided on the List of Wells in Appendix B.

Work Done as Data Provider in Support of NGWMN

Work completed has consisted of well drilling under Objective 5.

Data Collection and Drilling Activities Completed

Data collection and drilling activities is discussed in previous sections describing work accomplished.

Table of New or Replacement Wells Added to the NGWMN

Well construction and related work completed during this project is overviewed in the List of Wells in Appendix B, Table 1.

Well Construction Details

Well construction details are provided in the GW-1 Well Construction Records in Appendix C.

Methods Used for Data Collection

Methods used for data collection are provided in the Data Management Plan in Appendix D.

Procedures Used to Quality Assure Data Prior to Entry Into NGWMN

Data quality assurance procedures are provided in the Data Management Plan in Appendix D.

Updates to Web Services

In 2020, DWR advised USGS that it had shifted to a new server with separate domain for web services.

Problems Serving Data to the NGWMN Data Portal

There have been no problems serving data to the NGWMN portal and services have recently been enhanced under a separate NGWMN grant to include expanded groundwater quality analytical data.

Setting and Hydrogeology of Monitoring Stations

The Shingle Landing and Maple groundwater monitoring stations are situated in the northeastern coastal plain physiographic province at approximately 6 ft above mean

sea level (MSL). Relative to nearby points of reference, the monitoring stations are each located several miles west of the Atlantic Ocean and near the North Carolina - Virginia state line.

The general region these monitoring stations are located is referred to in this report as the Albemarle-Tidewater area and consists of northeastern North Carolina and southeastern Virginia. The general boundaries of the Albemarle-Tidewater area are the James River and Chesapeake Bay to the north, the Atlantic Ocean to the east, the Albemarle Sound to the south, and the Chowan and Blackwater Rivers to the west. Elevation of the Albemarle-Tidewater area generally increases from east to west ranging from sea level to nearly 100 ft above sea level. The terrain within the area is generally broad and flat to the east becoming dissected and gently rolling to the west.

The geology of the area consists of Recent to Cretaceous coastal plain sediments which dip and thicken eastward. Based on well records, basement bedrock consists of igneous and metamorphic bedrock, and in localized areas, Triassic basin sediments. Depth to basement in the vicinity of the two monitoring stations is estimated to be 2500 ft or more below land surface. The geology of the Albemarle-Tidewater area is complicated by multiple marine transgression and regression events, and structural and stratigraphic complexities related to the Chesapeake Bay impact crater of 35 million years ago.

Principal Aquifers within the Albemarle-Tidewater area consist of the Surficial, Castle Hayne, and Northern Atlantic coastal plain aquifer systems, the latter of which includes the Beaufort, Upper Cape Fear, and Lower Cape Fear North Carolina aquifers. The two wells constructed at the Shingle Landing station are screened in the surficial and Beaufort aquifers and the two wells constructed at the Maple station are screened in the surficial and Castle Hayne aquifers.

Within the Albemarle-Tidewater area, chlorides and other dissolved solids generally increase in all aquifers with increasing depth and proximity to the Atlantic Ocean. Recent groundwater and chloride data for the Shingle Landing and Maple monitoring stations are summarized in Appendix B.

Regional Hydrogeology and Transboundary Conditions

The Albemarle-Tidewater area lies in the Northern Atlantic Coastal Plain. Within this area, aquifer names used in North Carolina, Virginia, and by the USGS often vary, as shown in Table 1. The absence of consistent, uniform naming conventions frequently makes correlating geologic and hydrologic units across state boundaries difficult. The geologic and water level data from the new monitoring stations is expected to aid in resolving such transboundary conditions within the Albemarle-Tidewater area.

Acknowledgements

Special thanks are extended to Currituck County for assistance throughout this project, in particular Eric Weatherly, County Engineer, and Will Rumsey, Public Utilities Director.

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.G. Geological Survey.

Copies for USGS

PDF copies of this report are being submitted to:

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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) USGS NGWMN Cooperative Agreement G19AC00193.

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.

4) https://cida.usgs.gov/ngwmn/

5) http://www.ncwater.org/gwmb

6) Lautier, Jeff C., 1998, Hydrogeologic Framework and Ground Water Resources of the North Albemarle Region, North Carolina: NC Department of Environment and Natural Resources, Division of Water Resources, 61 p.

7) Status of Virginia's Water Resources, October 2018, A Report on Virginia's Water Resources Management Activities, Virginia Department of Environmental Quality, Commonwealth of Virginia, 49 p.

8) McFarland, E. Randolph and T. Scott Bruce, 2006, The Virginia Coastal Plain Hydrogeologic Framework, U. S. Geological Survey Professional Paper 1731, 119 p.

9) Trapp, Henry, Jr., and Marilee A. Horn, 1997, Ground Water Atlas of the United States, Hydrologic Investigations Atlas 730-L, Segment 11 Delaware, Maryland, New Jersey, North Carolina, Pennsylvania, Virginia, West Virginia: U.S. Geological Survey, --p. (https://pubs.usgs.gov/ha/730l/report.pdf).

Appendix A

FIGURES

Figure 1. NGWMN and grant match well station locations

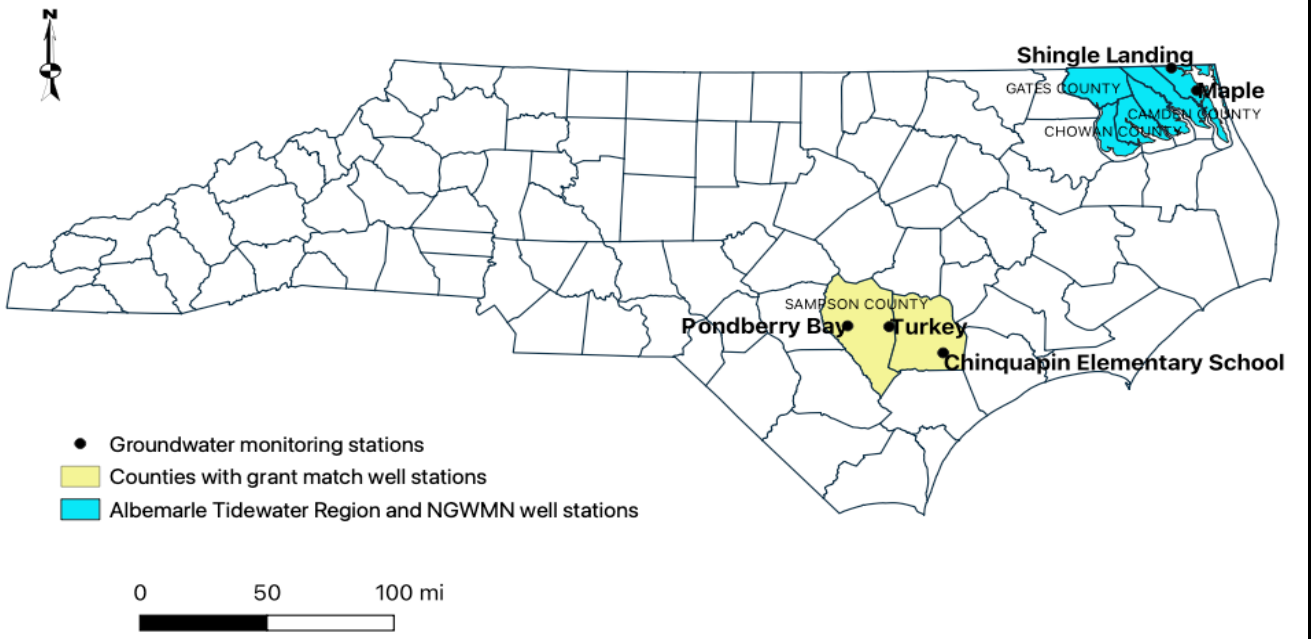


Figure 2. Shingle Landing and Maple NGWMN Well Stations in Currituck County, North Carolina

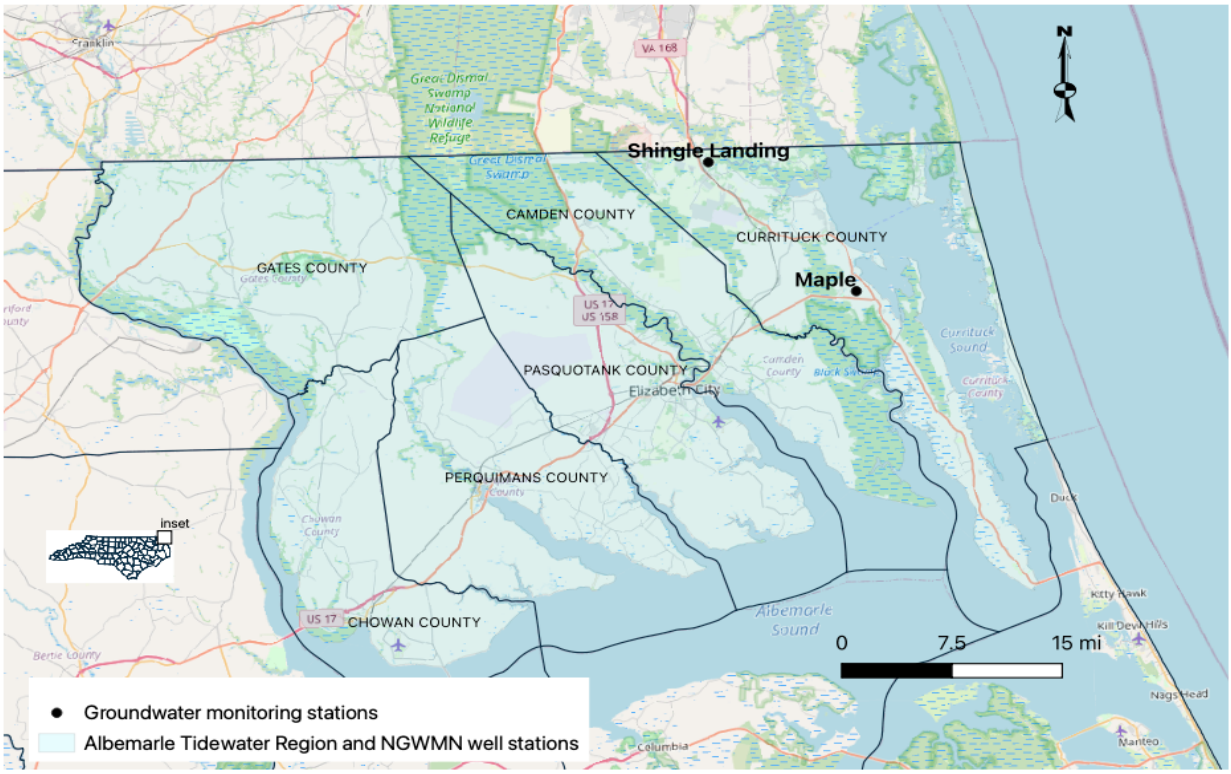


Figure 3. Shingle Landing Geophysical Log

DWR Geophysical Log Database Detail for B 10K, Shingle Landing Park

Field	Data
County	Currituck
Latitude	36.536600
Longitude	-76.175500
Location Accuracy Show Map	Map
Quad link to framework & wells	B 10K
Land Surface	6.00
Dates	07/15/2021
Source	DWR

click on each log chart to access complete log

log legend

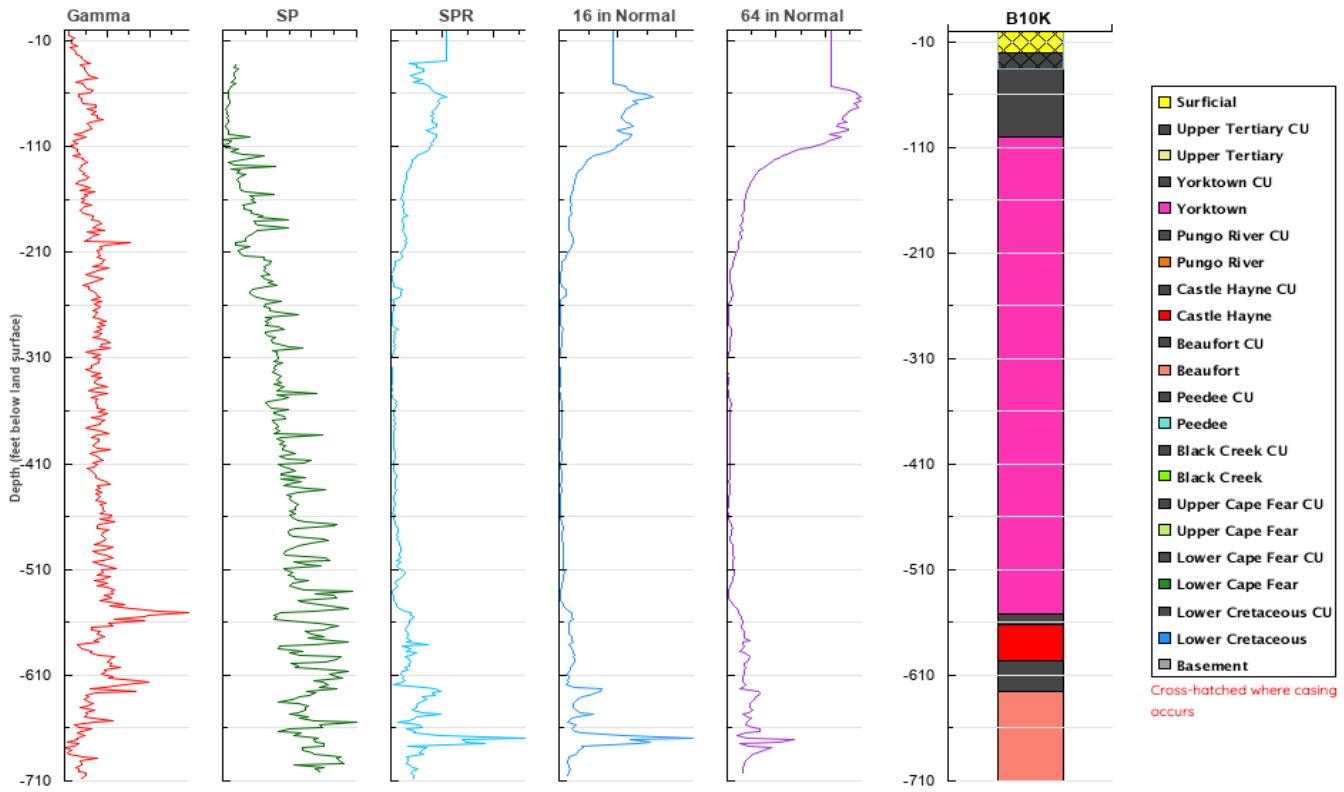


Figure 4. Maple Geophysical Log

Field	Data
County	Currituck
Latitude	36.395400
Longitude	-75.999800
Location Accuracy Show Map	Map
Quad link to framework & wells	D 7F
Land Surface	6.00
Dates	02/22/2022
Source	DWR

click on each log chart to access complete log

log legend

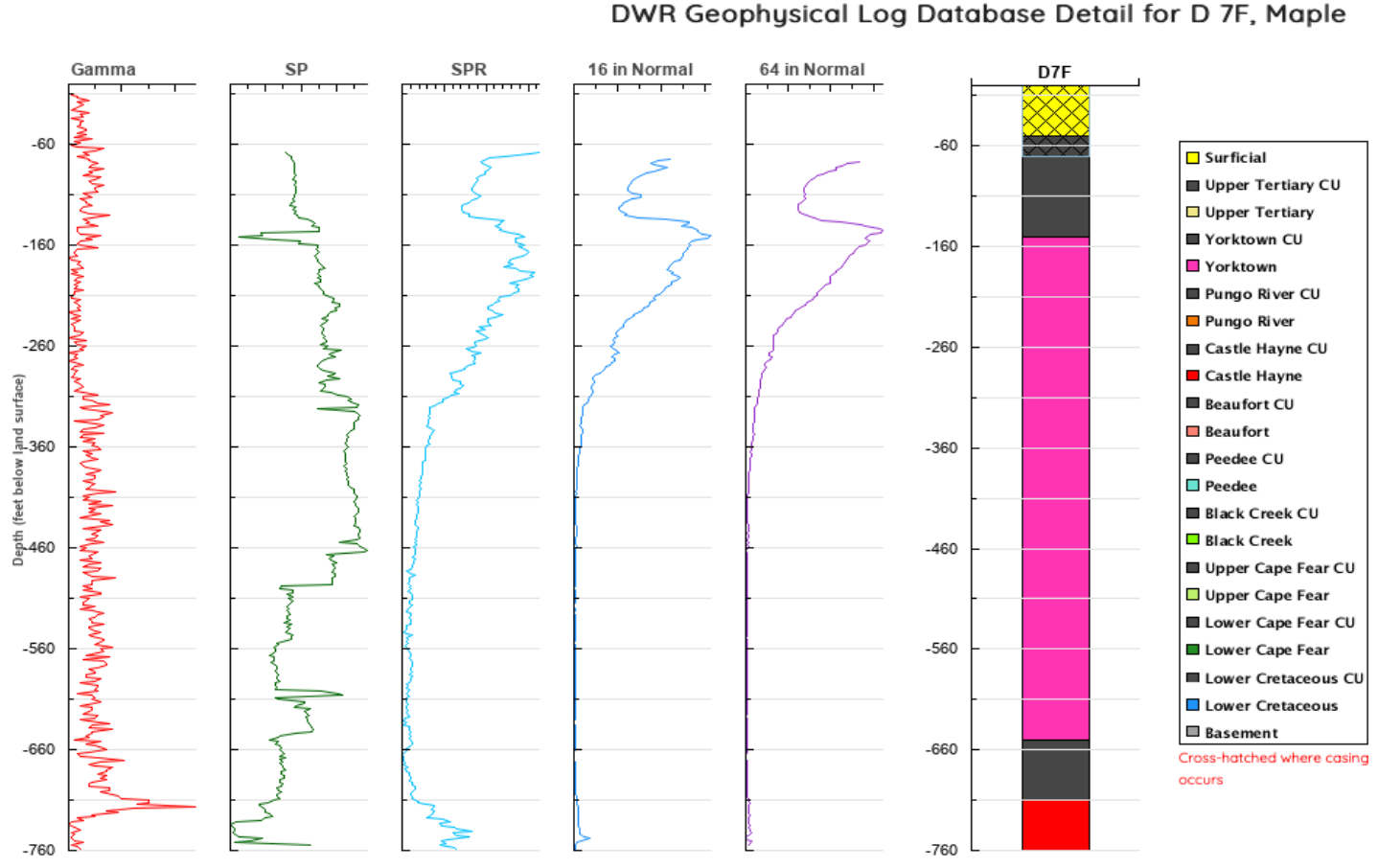


Figure 5. Shingle Landing Lithologic Log

Quad	**B 10K**			
Well Name	**Shingle Landing**			
County	**Currituck**			
Lat	**36.5366**			
Lon	**-76.1755**			
Driller	**Toano Well and Pump Co., Inc.**			
Log	**Toano Well and Pump Co., Inc.**			
TD (ft)	**710**			
Elevation (ft)	**5.72**			

Unit Top (bls)		**Depth (ft)**			**Lithology**	**Color**
Surficial (0 ft)		0	-	10	shell hash	yel gy, lt gy
		10	-	20	sand	med gy
Yorktown (20 ft)		20	-	175	silt with shell, calc	dk grn gy
(no substantial Yorktown permeability identified)		175	-	205	silt with abun soft "black sand" glauconite or phosphate; high gamma, hard around 200-205; silt similar to 40-175	dk grn gy
		205	-	220	silt	dk grn gy
		220	-	310	silt, sticky, predom non to sli calc, occ shell beds, clayey, clay increasing with depth	gy ol green
		310	-	552	clay with silt, uniform texture, sli calc, minor mica and black specks	dk grn gy
		552	-	560	sandy silt with thin calc bands, high gamma though no phosphate obsvd, similar to 310-553	dk grn gy
Castle Hayne (562')		560	-	620	silt with abun 'black sand'; abun vf-c qtz grains, loose, varying from clr, wh, gy, grn, rose, orng; high gamma 610-620, 625	dk grn gy
Beaufort (625 ft)		620	-	630	sand with calc and silt; notable color change for this interval	dusky yel, lt ol brn
		630	-	655	silt with sand	grn gy
		655	-	660	silt with abun black wood up to 0.5 inch and small qtz pebbles	ol gy
		660	-	710	silt with sand, occ mica, occ calc-cmtd sandstone, occ glauc; distinct lithologic change at 660	ol gy

Comments

all depths in feet (ft)
log describes bulk lithology and wet sample colors
bls = feet below land surface
Also see GW-1 well construction record at back of appendices

Figure 6. Maple Lithologic Log

Quad	**D 7F**			
Well Name	**Maple**			
County	**Currituck**			
Lat	**36.3954**			
Lon	**-75.9998**			
Driller	**Toano Well and Pump Co., Inc.**			
Log	**Toano Well and Pump Co., Inc.**			
TD (ft)	**760**			
Elevation (ft)	**6**			

Unit Top (bls)		**Depth (ft)**			**Lithology**	**Color**
		0	-	20	sand	lt gray
Yorktown confining unit (20 ft)		20	-	30	clay with small pelecypods (1/8 in)	gray
		30	-	150	clay with shell hash interbeds	"
Yorktown aquifer (150 ft)		150	-	160	shell hash with abun turitella	gray to white
		160	-	190	shell hash	gray to white
		190	-	230	shell hash with color change	light brown and gray
		230	-	300	clay with shell hash interbeds	gray
		300	-	700	clay	gray
Castle Hayne aquifer (710 ft)		700	-	720	clay with fine sand, phosphate, glauconite,	gray
					and shark and ray fossil fragments; gamma spike 703-720 ft	
		720	-	730	limestone	gray to light gray
		730	-	740	limestone	gray to light gray
		740	-	750	limestone	gray to light gray
		750	-	760	marl/clay	light gray to white

Comments

all depths in feet (ft)

log describes bulk lithology and wet sample colors

bls = feet below land surface

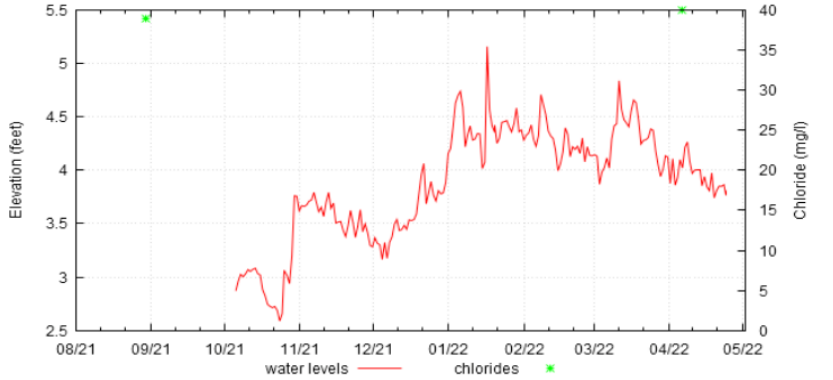
Also see GW-1 well construction record at back of appendices

Figure 7. Shingle Landing Hydrographs and Well Data from DWR Webpage

Shingle Landing - Well B 10K2 (Surficial Aquifer)

DWR Monitoring Well Database Detail for B 10K2 -- Station WLs -- Pics -- Geo-Cons

HEADER	REDUCERS	CHLORIDES	WATER LEVELS	STS	RECORDERS	LAND OWNER	MONUMENT
	0 reducers	2 samples download chlorides	206 water levels download water levels		Hobo30	susceptibility 2	installed 2021-09-15

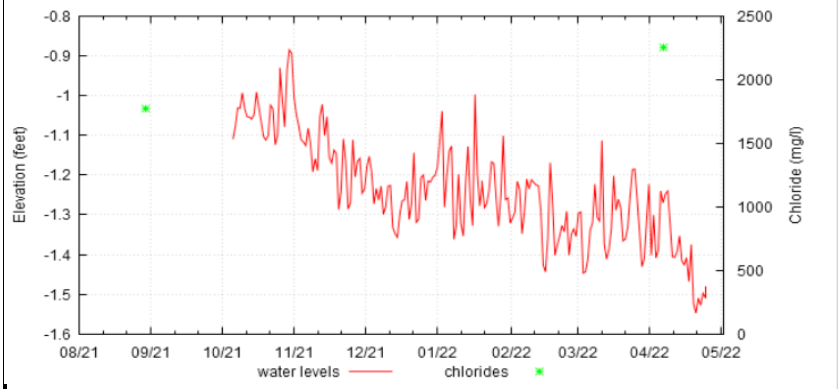


Field	Data
County	Currituck
Quad Show Map	B 10K2
Name	Shingle Landing Shingle Landing Site Map.pdf
USGS Netname	
USGS ID	
Region	5
Latitude	36.536716
Longitude	-76.175390
Location Accuracy	G
Aquifer	S
Land Surface NED elevation = 5.72 feet	6
Measuring Point	3.35
Date Constructed	07/21/2021
Diameter	4
Outer Protective Casing Diameter	6
Depth	25
Casing Material	
Top of Screen	15
Bottom of Screen	25

Shingle Landing - Well B 10K1 (Beaufort Aquifer)

DWR Monitoring Well Database Detail for B 10K1 -- Station WLs -- Pics -- Geo-Cons

HEADER	REDUCERS	CHLORIDES	WATER LEVELS	STS	RECORDERS	LAND OWNER	MONUMENT
	0 reducers	2 samples download chlorides	205 water levels download water levels		Hobo30, Hobo13	susceptibility 2	installed 2021-09-15



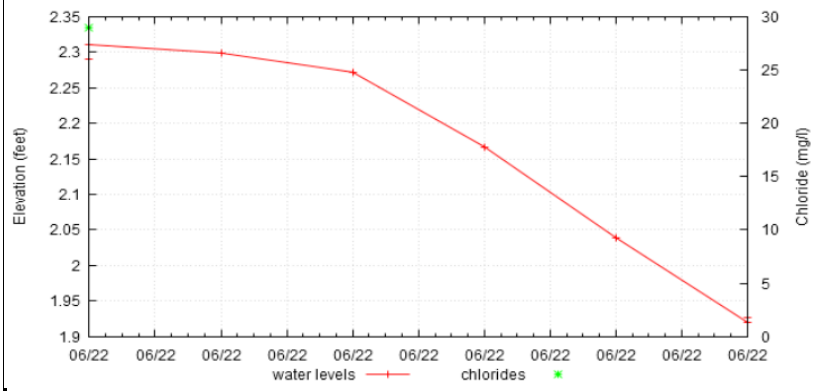
Field	Data
County	Currituck
Quad Show Map	B 10K1
Name	Shingle Landing Shingle Landing Site Map.pdf
USGS Netname	
USGS ID	
Region	5
Latitude	36.536716
Longitude	-76.175390
Location Accuracy	G
Aquifer	Tb
Land Surface NED elevation = 5.72 feet	6
Measuring Point	3.30
Date Constructed	07/20/2021
Diameter	4
Outer Protective Casing Diameter	6
Depth	710
Casing Material	
Top of Screen	660
Bottom of Screen	680

Figure 8. Maple Hydrographs and Well Data from DWR Webpage

Maple - Well D 7F1 (Surficial Aquifer)

DWR Monitoring Well Database Detail for D 7F1 -- Station WLs -- Pics -- Geo-Cons

HEADER	REDUCERS	CHLORIDES	WATER LEVELS	STS	RECORDERS	LAND OWNER	MONUMENT
	0 reducers	1 samples download chlorides	8 water levels download water levels		Hobo30	susceptibility 2	installed 2022-06-15

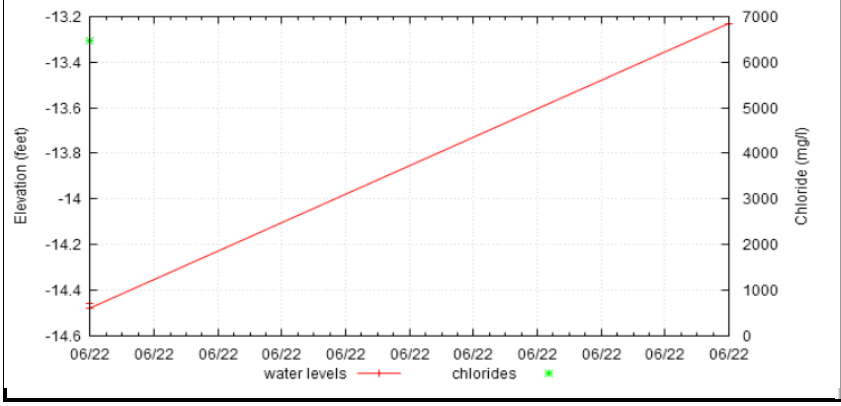


Field	Data
County	Currituck
Quad Show Map	D 7F1
Name	Maple
USGS Netname	
USGS ID	
Region	5
Latitude	36.395400
Longitude	-75.999800
Location Accuracy	G
Aquifer	S
Land Surface NED elevation = 5.97 feet	0
Measuring Point	
Date Constructed	03/08/2022
Diameter	4
Outer Protective Casing Diameter	6
Depth	30
Casing Material	SCH 40 PVC
Top of Screen	15
Bottom of Screen	25

Maple - Well D 7F3 (Castle Hayne Aquifer)

DWR Monitoring Well Database Detail for D 7F3 -- Station WLs -- Pics -- Geo-Cons

HEADER	REDUCERS	CHLORIDES	WATER LEVELS	STS	RECORDERS	LAND OWNER	MONUMENT
	0 reducers	1 samples download chlorides	3 water levels download water levels		Hobo30, Hobo13	susceptibility 2	installed 2022-06-15



Field	Data
County	Currituck
Quad Show Map	D 7F3
Name	Maple
USGS Netname	
USGS ID	
Region	5
Latitude	36.395400
Longitude	-75.999800
Location Accuracy	G
Aquifer	Tch
Land Surface NED elevation = 5.97 feet	0
Measuring Point	
Date Constructed	03/08/2022
Diameter	4
Outer Protective Casing Diameter	6
Depth	760
Casing Material	SCH 40 PVC
Top of Screen	730
Bottom of Screen	750

Figure 9. Potentiometric Surface and Extent of the Castle Hayne Aquifer

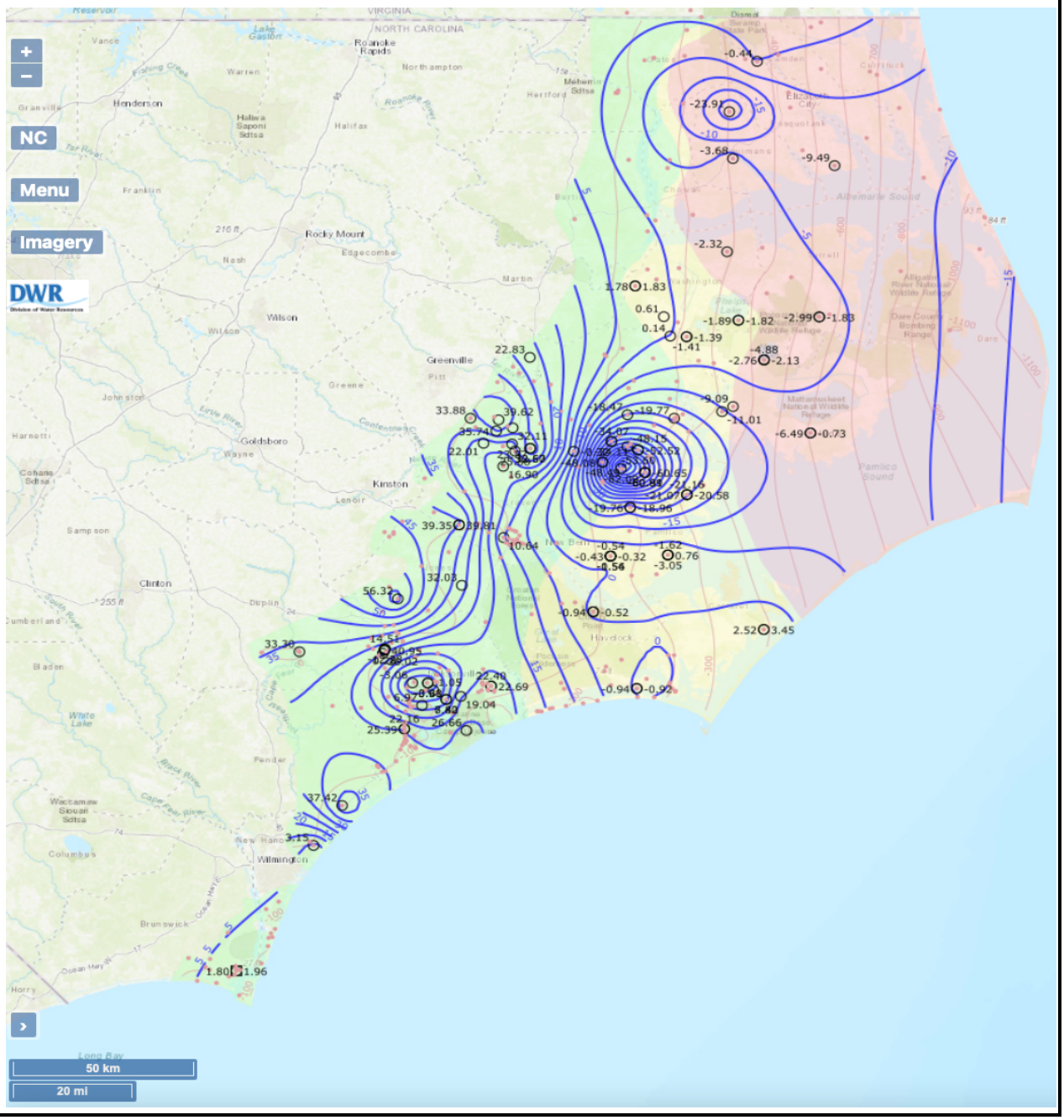


Figure 10. Potentiometric Surface and Extent of the Beaufort Aquifer

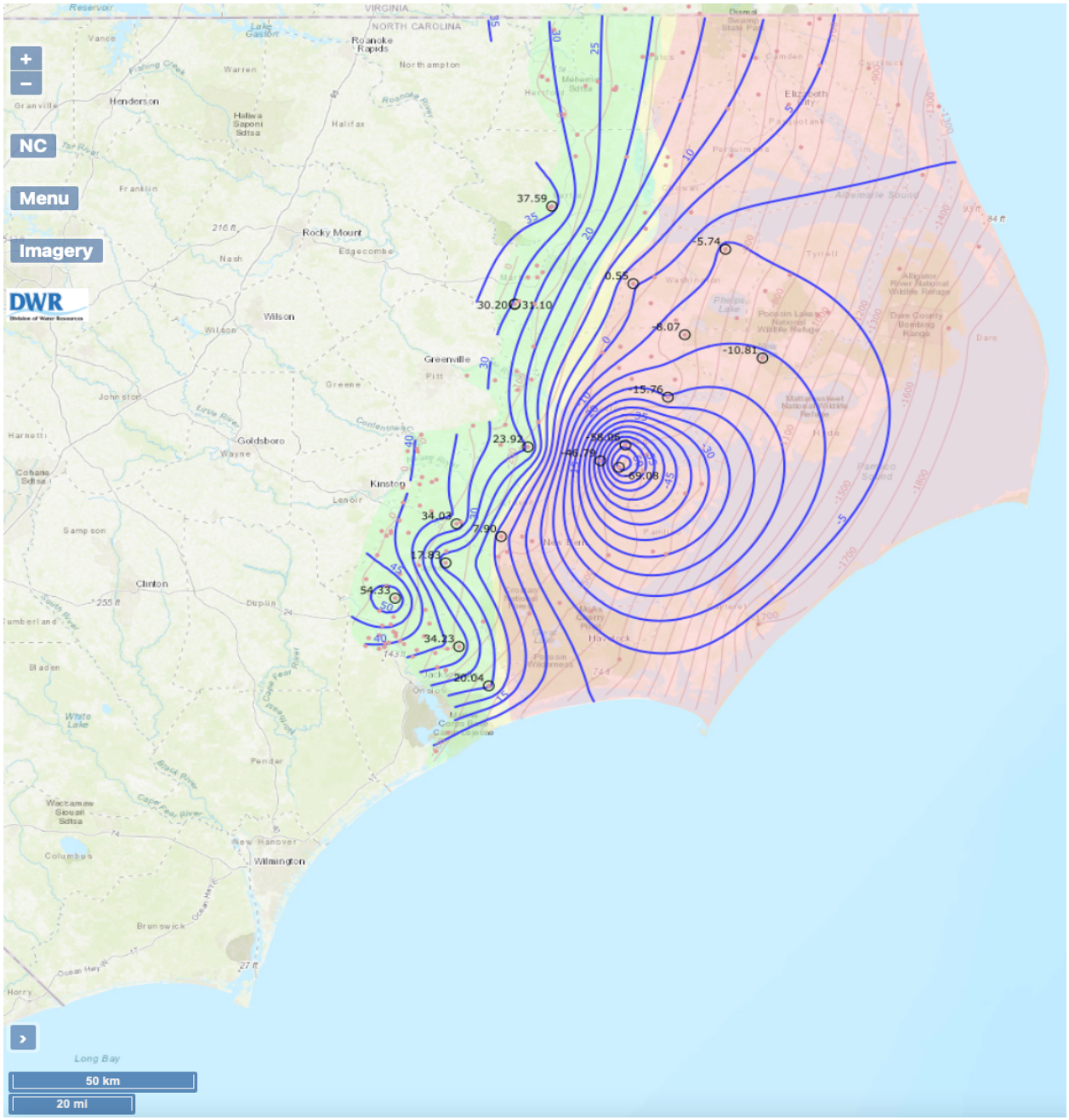


Figure 11. Wells at Shingle Landing

Figure 12. Wells at Maple

Yellow well on left is an existing Yorktown aquifer well which Currituck County has allowed DWR to equip with a water level logger.

Appendix B

TABLES

Table 1. List of Wells

NGWMN ID	Name	County	Funding Source	Elevation (ft)	Depth (ft)	Screen Top (ft)	Screen Bottom (ft)	NC Aquifer Code	NC Aquifer Name	VA Aquifer Name	Principal Aquifer Name	Principal Aquifer Code	Well Replaced and Gap Filled	NGWMN Well Replaced	Well Cost per Foot	Average Well Cost	Latest Water Level (ft)	Water Level Date	Chloride (ppm)	Chloride Date	Latitude	Longitude
B 10K2	Shingle Landing	Currituck	G19AC00193	6.00	25	15	25	S	Surficial	Surficial	Surficial aquifer system	S100SURFCL	Fill Gap in Network	None	$138.78	$3,469.60	3.13	4/25/22	40	4/7/22	36.536716	-76.17539
B 10K1	Shingle Landing	Currituck	G19AC00193	6.00	710	660	680	Tb	Beaufort	Aquia/Brightseat	Northern Atlantic Coastal Plain aquifer system	S100NATLCP	Fill Gap in Network	None	$138.78	$98,536.65	7.11	4/25/22	2257	4/7/22	36.536716	-76.17539
					735											**$102,006.25**						
D 7F1	Maple	Currituck	G19AC00193	6.00	30	15	25	S	Surficial	Surficial	Surficial aquifer system	S100SURFCL	Fill Gap in Network	None	$125.91	$3,777.29	pending	pending	pending	pending	36.3954	-75.9998
D 7F3	Maple	Currituck	G19AC00193	6.00	760	730	750	Tch	Castle Hayne	Calvert	Castle Hayne aquifer	N400CSLHYN	Fill Gap in Network	None	$125.91	$95,691.46	pending	pending	pending	pending	36.3954	-75.9998
					790											**$99,468.75**						
U 34B10	Turkey	Sampson	NC DWR match	135.83	39	22	32	S	Surficial	Surficial	Surficial aquifer system	S100SURFCL	Fill Gap in Network	None	$65.90	$2,570.11	6.87	4/28/22	<32	3/8/22	34.988899	-78.189357
U 34B11	Turkey	Sampson	NC DWR match	135.80	142	127	137	Kbc	Black Creek	Virginia Beach	Northern Atlantic Coastal Plain aquifer system	S100NATLCP	Abandon and Replace Well 4	None	$65.90	$9,357.82	38.45	4/28/22	<32	3/8/22	34.988899	-78.189357
U 34B12	Turkey	Sampson	NC DWR match	136.15	260	245	255	Kbc	Black Creek	Virginia Beach	Northern Atlantic Coastal Plain aquifer system	S100NATLCP	Abandon and Replace Well 6	None	$65.90	$17,134.04	41.63	4/28/22	<29	4/11/22	34.988899	-78.189357
U 34B13	Turkey	Sampson	NC DWR match	135.99	335	320	330	Kucf	Upper Cape Fear	Potomac	Northern Atlantic Coastal Plain aquifer system	S100NATLCP	Fill Gap in Network	None	$65.90	$22,076.55	42.31	4/28/22	<29	4/11/22	34.988899	-78.189357
U 34B14	Turkey	Sampson	NC DWR match	135.83	446	427	437	Klcf	Lower Cape Fear	Potomac	Northern Atlantic Coastal Plain aquifer system	S100NATLCP	Fill Gap in Network	None	$65.90	$29,391.47	50.83	4/28/22	<29	4/11/22	34.988899	-78.189357
					1222											**$80,530.00**						
U 37D1	Pondberry Bay	Sampson	NC DWR match	165.80	38	26	36	S	Surficial	Surficial	Surficial aquifer system	S100SURFCL	Fill Gap in Network	None	$109.88	$4,175.54	9.92	4/28/22	<32	3/8/22	34.995133	-78.478227
U 37D3	Pondberry Bay	Sampson	NC DWR match	166.02	199	175	185	Kbc	Black Creek	Virginia Beach	Northern Atlantic Coastal Plain aquifer system	S100NATLCP	Fill Gap in Network	None	$109.88	$21,866.67	38.27	4/28/22	<32	3/8/22	34.995133	-78.478227
U 37D2	Pondberry Bay	Sampson	NC DWR match	166.45	360	303	313	Kucf	Upper Cape Fear	Potomac	Northern Atlantic Coastal Plain aquifer system	S100NATLCP	Fill Gap in Network	None	$109.88	$39,557.79	144.88	4/28/22	70	3/8/22	34.995133	-78.478227
					597											**$65,600.00**						
W 29D13	Chinquapin Elementary School	Duplin	NC DWR match	42.21	465	450	460	Kucf	Upper Cape Fear	Potomac	Northern Atlantic Coastal Plain aquifer system	S100NATLCP	Fill Gap in Network	None	$157.53	$73,250.00	39.95	5/9/22	<32	4/12/22	34.82593	-77.816446
					465											**$73,250.00**						

Key

ft	water level in feet above or below top of casing or other measuring point (negative value indicates feet above measuring point)
<32	chloride detection limit (parts per million, ppm)

Appendix C

GW-1
WELL CONSTRUCTION RECORDS

WELL CONSTRUCTION RECORD (GW-1)

For Internal Use Only:

1. Well Contractor Information:

Charles N Dozier
Well Contractor Name

4088-A
NC Well Contractor Certification Number

Toano Well and Pump Service 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: 7-21-2021 **Well ID#** B10K (2)

5a. Well Location:

NCDENR
Facility/Owner Name

Facility ID# (if applicable)

219 Arrow Head LN Moyock NC 27958
Physical Address, City, and Zip

Currituck
County

Parcel Identification No. (PIN)

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

36.536716 N -76.175390 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: 27 **(ft.)**
For multiple wells list all depths if different (example- 3@200' and 2@100')

10. Static water level below top of casing: 5 **(ft.)**
If water level is above casing, use "+"

11. Borehole diameter: 10 **(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
17 ft.	27 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
3 ft.	17 ft.	4.5 in.	SDR 17	PVC
ft.	ft.	in.		

17. SCREEN

FROM	TO	DIAMETER	SLOT SIZE	THICKNESS	MATERIAL
ft.	27 ft.	4 in.	0.020	Sch 40	PVC
ft.	ft.	in.			

18. GROUT

FROM	TO	MATERIAL	EMPLACEMENT METHOD & AMOUNT
15 ft.	0 ft.	Quick Grout	Tremmie
ft.	ft.		
ft.	ft.		

19. SAND/GRAVEL PACK (if applicable)

FROM	TO	MATERIAL	EMPLACEMENT METHOD
15 ft.	27 ft.	#3 Silica	Tremmie
ft.	ft.		

20. DRILLING LOG (attach additional sheets if necessary)

FROM	TO	DESCRIPTION (color, hardness, soil/rock type, grain size, etc.)
0 ft.	10 ft.	Shell Hash
10 ft.	20 ft.	Sand
20 ft.	27 ft.	Silt with Shell
ft.	ft.	
ft.	ft.	
ft.	ft.	
ft.	ft.	

21. REMARKS

22. Certification:

_____ 10-6-21
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

WELL CONSTRUCTION RECORD (GW-1)

For Internal Use Only:

1. Well Contractor Information:

Charles N Dozier
Well Contractor Name

4088-A
NC Well Contractor Certification Number

Toano Well and Pump Service
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: 7/15/2021 **Well ID#** B10K

5a. Well Location:

NCDENR
Facility/Owner Name

Shingle Landing
Facility ID# (if applicable)

219 Arrow Head Ln
Physical Address, City, and Zip

Currituck
County

Parcel Identification No. (PIN)

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

36.536716 N -76.175390 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: 710 **(ft.)**
For multiple wells list all depths if different (example- 3@200' and 2@100')

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

11. Borehole diameter: 10 **(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
660 ft.	710 ft.	Beaufort
ft.	ft.	

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

FROM	TO	DIAMETER	THICKNESS	MATERIAL
0 ft.	35 ft.	14 in.	sch 40	pvc

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

FROM	TO	DIAMETER	THICKNESS	MATERIAL
+2.5 ft.	660 ft.	4.5 in.	SDR 17	PVC
705 ft.	710 ft.	4 in.	SCH 40	Stainless

17. SCREEN

FROM	TO	DIAMETER	SLOT SIZE	THICKNESS	MATERIAL
660 ft.	680 ft.	4 in.	0.020	SCH 40	Stainless
ft.	660 ft.	in.			

18. GROUT

FROM	TO	MATERIAL	EMPLACEMENT METHOD & AMOUNT
650. ft.	0 ft.	Quick Grout	Pumped via Tremmie
ft.	ft.		
ft.	ft.		

19. SAND/GRAVEL PACK (if applicable)

FROM	TO	MATERIAL	EMPLACEMENT METHOD
650 ft.	710 ft.	#3 Silica	Tremmie
ft.	ft.		

20. DRILLING LOG (attach additional sheets if necessary)

FROM	TO	DESCRIPTION (color, hardness, soil/rock type, grain size, etc.)
0 ft.	10 ft.	Clay and shell
10 ft.	20 ft.	Sand
20 ft.	220 ft.	Silt with shell and black sand
220 ft.	553 ft.	Silt to clay and sillt
553 ft.	620 ft.	Sandy silt with black sand
620 ft.	660 ft.	silt and black sand (wood 665-660)
660 ft.	710 ft.	Sand with small pebbles

21. REMARKS

22. Certification:

_____ 10-6-21
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

WELL CONSTRUCTION RECORD (GW-1)

NORTH CAROLINA
Environmental Quality

Form GW-1 Well Construction Electronic Form
North Carolina Department of Environmental Quality
Division of Water Resources
November 18, 2021

Submission ID#

GW1-2022-03739

Are you submitting a scanned form? *

- ○ Yes
- ◉ No

CONTACT INFORMATION

Contact Name *
CHARLES DOZIER, II "BO"

Email Address *
DebHenderson1020@aol.com

Is this a revision to the form you have previously submitted? *

○ Yes ◉ No

WELL CONSTRUCTION INFORMATION

1. Who is installing these wells? *

○ Owner ◉ Well Contractor

1. Well Contractor Information:

Certificate #	Cert Level	First Name	Last Name	Company Name
4088	A	CHARLES	DOZIER, II	TOANO WELL AND PUMP SERVICE, INC.

2. Well Construction Permit #:

List all applicable well construction permits (i.e. Monitoring Wells, UIC, County, CCPCUA, etc.)

What type of well is this? *

- ○ Injection Well
- ○ Water Supply Well (includes irrigation wells)
- ◉ Non-Water Supply Well

3. Non-Water Supply Well *

- ◉ Monitoring
- ○ Recovery

4. Date well was completed and ID#

Date Well Completed *	Well ID#	Well Yield
3/8/2022	MAPLE #2	(gallons per minute)"

5. Well Location

Facility/Owner Name *
CURRITUCK COUNTY
(Required)

Facility ID#
MAPLE #2
(If applicable)

County *
Currituck

Parcel Identification No. (PIN)

Physical Address *
Street Address
AIRPORT ROAD
Address Line 2
AVATION PARKWAY
City
MAPLE
State / Province / Region
NORTH CAROLINA
Postal / Zip Code
27956
Country
UNITED STATES

Latitude * 36.3954000000
Decimal degrees

Longitude * -75.9998000000
Decimal degrees

6. Is(are) the well(s): * (•) Permanent ( ) Temporary

7. Is this a repair to an existing well: * ( ) Yes (•) 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.

For multiple Geoprobe/DPT or Closed-Loop Geothermal Wells having the same construction, only 1 GW-1 is needed.

8a. Indicate TOTAL NUMBER of wells drilled: 1

9. Total well depth below land surface: (ft.)
30
For multiple wells list all depths if different (example- 3@200' and 2@100')

9a. What is the depth of the casing from ground surface?
in feet

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

11. Borehole diameter:
10
in inches

12. Well construction method:

( ) Auger ( ) Air Rotary ( ) Cable Tool
( ) Direct Push (•) Mud Rotary ( ) Rotosonic
( ) Other

14. WATER BEARING/FRACTURE ZONES

From	To	Description
15 in feet	25 in feet	GRAY SAND AND SHELLS

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

From	To	Diameter	Thickness	Material
0.00 in feet	15.00 in feet	4.50 in inches	SDR 17	PVC

17. SCREEN

From	To	Diameter	Thickness	Material
15.00 in feet	25.00 in feet	4.00 in inches	.020	SCH 40 STAINLESS STEEL

18. GROUT

From	To	Material	Emplacment Method & Amount
10.00 in feet	0.00 in feet	BENTONITE	PUMPED FROM BOTTOM TO TOP WITH TRIMMIE PIPE

19. SAND/GRAVEL PACK (if applicable)

From	To	Material	Emplacment Method
30.00 in feet	10.00 in feet	SILICIA #3	PUMPED FROM BOTTOM TO TOP WITH TRIMMIE PIPE

20. DRILLING LOG

From	To	Description (color, hardness, soil/rock type, grain size, etc.)
0.00 in feet	20.00 in feet	TAN SAND
20.00 in feet	30.00 in feet	GRAY SAND/SHELL MIX

21. Remarks

22. Site diagram or additional well details:

You may upload additional well construction information here.

pdf only

CERTIFICATION INFORMATION

* ☑ 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. Certification

Signature of Certified Well Contractor

WELL CONSTRUCTION RECORD (GW-1)

NORTH CAROLINA
Environmental Quality

Form GW-1 Well Construction Electronic Form
North Carolina Department of Environmental Quality
Division of Water Resources
November 18, 2021

Submission ID#

GW1-2022-03740

Are you submitting a scanned form? *

- ○ Yes
- ◉ No

CONTACT INFORMATION

Contact Name *
CHARLES N. DOZIER, II

Email Address *
DebHenderson1020@aol.com

Is this a revision to the form you have previously submitted? *

○ Yes ◉ No

WELL CONSTRUCTION INFORMATION

1. Who is installing these wells? *

○ Owner ◉ Well Contractor

1. Well Contractor Information:

Certificate #	Cert Level	First Name	Last Name	Company Name
4088	A	CHARLES	DOZIER, II	TOANO WELL AND PUMP SERVICE, INC.

2. Well Construction Permit #:

List all applicable well construction permits (i.e. Monitoring Wells, UIC, County, CCPCUA, etc.)

What type of well is this? *

- ○ Injection Well
- ○ Water Supply Well (includes irrigation wells)
- ◉ Non-Water Supply Well

3. Non-Water Supply Well *

- ◉ Monitoring
- ○ Recovery

4. Date well was completed and ID#

Date Well Completed *	Well ID#	Well Yield
3/8/2022	MAPLE #1	(gallons per minute)"

5. Well Location

Facility/Owner Name *
CURRITUCK COUNTY
(Required)

Facility ID#
MAPLE #1
(If applicable)

County *
Currituck

Parcel Identification No. (PIN)

Physical Address *
Street Address
AIRPORT ROAD
Address Line 2
AVATION PARKWAY
City
MAPLE
State / Province / Region
NORTH CAROLINA
Postal / Zip Code
27956
Country
United States

Latitude * 36.3954000000
Decimal degrees

Longitude * -75.9998000000
Decimal degrees

6. Is(are) the well(s): * (•) Permanent ( ) Temporary

7. Is this a repair to an existing well: * ( ) Yes (•) 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.

For multiple Geoprobe/DPT or Closed-Loop Geothermal Wells having the same construction, only 1 GW-1 is needed.

8a. Indicate TOTAL NUMBER of wells drilled: 1

9. Total well depth below land surface: (ft.)
760
For multiple wells list all depths if different (example- 3@200' and 2@100')

9a. What is the depth of the casing from ground surface?
in feet

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

11. Borehole diameter:
10
in inches

12. Well construction method:

( ) Auger ( ) Air Rotary ( ) Cable Tool
( ) Direct Push (•) Mud Rotary ( ) Rotosonic
( ) Other

14. WATER BEARING/FRACTURE ZONES

From	To	Description
730 in feet	750 in feet	SHELLS AND LIMESTONE

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

From	To	Diameter	Thickness	Material
0.00 in feet	60.00 in feet	10.00 in inches	SCH 40	PVC

17. SCREEN

From	To	Diameter	Thickness	Material
730.00 in feet	750.00 in feet	4.00 in inches	.020	SCH 40 STAINLESS STEEL

18. GROUT

From	To	Material	Emplacment Method & Amount
720.00 in feet	0.00 in feet	BENTONITE	PUMPED FROM BOTTOM TO TOP WITH TRIMMIE PIPE

19. SAND/GRAVEL PACK (if applicable)

From	To	Material	Emplacment Method
760.00 in feet	720.00 in feet	SILICIA #3	PUMPED FROM BOTTOM TO TOP WITH TRIMMIE PIPE

20. DRILLING LOG

From	To	Description (color, hardness, soil/rock type, grain size, etc.)
0.00 in feet	20.00 in feet	TAN SAND
20.00 in feet	40.00 in feet	GRAY SAND/SHELL MIX
40.00 in feet	60.00 in feet	SAND AND SHELL MIX
60.00 in feet	80.00 in feet	GRAY/BLUE CLAY
80.00 in feet	120.00 in feet	BLUE CLAY
120.00 in feet	140.00 in feet	BLUE CLAY WITH SHELLS
140.00 in feet	160.00 in feet	WHITE SHELLS
160.00 in feet	180.00 in feet	WHITE SHELL AND CLAY MIX
180.00 in feet	240.00 in feet	ORANGE/TAN SAND WITH SHELLS
240.00 in feet	260.00 in feet	BROWN/TAN SAND, SHELL WITH BROWN CLAY MIX
260.00 in feet	280.00 in feet	BROWN CLAY AND SHELL MIX
280.00 in feet	300.00 in feet	GRAY CLAY AND SHELL MIX
300.00 in feet	320.00 in feet	BLUE CLAY AND SHELL MIX
320.00 in feet	730.00 in feet	STICKY BLUE CLAY

730.00 in feet	740.00 in feet	CLAY/SHELL MIX WITH BLACK SAND
740.00 in feet	750.00 in feet	LIMESTONE
750.00 in feet	760.00 in feet	WHITE CLAY
in feet	in feet	
in feet	in feet	

21. Remarks

22. Site diagram or additional well details:

You may upload additional well construction information here.

pdf only

CERTIFICATION INFORMATION

* ☑ 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. Certification

Signature of Certified Well Contractor

Appendix D

DATA MANAGEMENT PLAN

NC DWR Data Management Plan

Effective: January 1, 2022

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

Contacts: USGS
Daryll Pope, Tel (804) 261-2630/(609) 462-7119, dpope@usgs.gov
Candice Hopkins, Tel (208) 387-1331, chopkins@usgs.gov

NC DWR
Mark Durway, (919) 707-9018, mark.durway@ncdenr.gov
Susan Laughinghouse, (252) 229-3349, susan.laughinghouse@ncdenr.gov

Budget: State and USGS Funding Sources

Types of Data Collected

Four data types are routinely collected by the NC DWR Groundwater Management Branch (GWMB). These data types consist of groundwater levels, groundwater quality analyses, well drilling data, and locational data. Currently, NC 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 will be acquired hourly or at other regular intervals, validated, and downloaded to the appropriate NC DWR database. Water quality data will be collected at less frequent intervals and will consist primarily of chloride concentrations from discrete depth intervals within the aquifer.

Drilling data consisting of lithology, geophysical logs, and well construction specifications will be acquired during the drilling and well completion process. Lithology will be determined from rock cuttings collected at 10 ft intervals during well drilling. Lithologic data and well specifications including total depth, casing and screen dimensions, and other information will be used to produce a drilling log once the well has been completed. The geology of the well will be further evaluated after the well has been drilled to total depth using open-hole geophysical logging techniques. The geophysical data will be used to produce the following geophysical logs: gamma, spontaneous potential (SP), single-point resistivity (SPR), 16" normal resistivity, 64" normal resistivity. Lithologic descriptions, geophysical logging, drilling, and well completion will be overseen by a geologist and drilling will be performed by a certified well contractor in accordance with state requirements.

Accuracy of locational data will be accomplished using survey grade GPS equipment to determine latitude, longitude, and altitude. Accuracy and geodetic reference systems used by NC 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

NC 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 data meeting standards are unloaded to public tables listed above.

Policies for Access and Sharing

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

Policies and Provisions for Re-Use and Re-Distribution

There will be 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 NC DWR through this USGS/NGWMN Cooperative.

Plans for Archiving and Preservation of Access

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

Project Personnel and Qualifications

GWMB staff oversee project management, supervision and administration, procurement, data collection and analysis, and reporting. Project staff and their qualifications are:

Mark Durway, PG, NC DWR GWMB Hydrogeologist
Susan Laughinghouse, PG, NC DWR GWMB Monitoring Unit Head
Kevin McVerry, NC DWR GWMB Environmental Specialist
Nathaniel C. Wilson, PG (Retired/Consultant), Former Head, NC DWR GWMB

Mark Durway is a licensed geologist in NC and Louisiana and has BS and MS degrees in geology from Guilford College and NCSU. He has oil and gas experience with Core Laboratories and Halliburton, regulatory and resource management experience with the NC Superfund Program, Petroleum UST Program and Division of Water Resources, and private sector experience as an environmental consultant. His current position as GWMB hydrogeologist includes all aspects of data review and interpretation, groundwater use and availability studies, drilling oversight, grant and contract procurement, and reporting.

Susan Laughinghouse is a licensed geologist in NC and has BS degree in geology from East Carolina University. She has regulatory and resource management experience with the NC Division of Water Resources, and private sector experience as an environmental consultant. Her current position as GWMB Monitoring Unit Head includes all aspects of operation and maintenance of the state well network, data collection and entry, well procurement and drilling contracts, access agreements and reporting, and staff supervision.

Kevin McVerry is an Environmental Specialist with a BA in geology from NCSU. He has regulatory and resource management experience with the NC Division of Water Resources and the NC Division of Coastal Management, and private sector experience as an environmental consultant. His current position as GWMB geologist/hydrogeologic field technician involves all aspects of well network maintenance and data collection and serving as team leader on special projects.

Nat Wilson, PG, is a licensed geologist and has BS and MS degrees in geology from Middlebury College and University of Oregon. His qualifications include a combination of education, licensing, and experience in the fields of geology, hydrology, computer programming, and data analysis. He served as GWMB Branch Head for 20 years during which time he created the existing map interface, website, and numerous applications and tables which define the state Groundwater Management Branch. He has over 20 years of experience developing complex groundwater database programs and websites. He retired from DWR in December 2020 after a total of 34 years with the state and currently works as an independent consultant.

Appendix E

NGWMN GRANT AWARD

NOTICE OF AWARD

1. DATE ISSUED *MM/DD/YYYY*
11/09/2021

1a. SUPERSEDES AWARD NOTICE dated 04/26/2021
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. G19AC00193-02
Originating MCA #

5. TYPE OF AWARD
Research

4a. FAIN G19AC00193

5a. ACTION TYPE Post Award Amendment

6. PROJECT PERIOD *MM/DD/YYYY*
From 07/15/2019 **Through** *MM/DD/YYYY* 05/14/2022

7. BUDGET PERIOD *MM/DD/YYYY*
From 07/15/2019 **Through** *MM/DD/YYYY* 05/14/2022

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)
Installation of monitoring stations within the Albemarle - Tidewater area along the NC/VA border

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

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

10a. GRANTEE AUTHORIZING OFFICIAL
Julia Gore
217 W Jones St Ste 5103
DIVISION OF ENVIR HLTH
Raleigh, NC 27603-6100

10b. FEDERAL PROJECT OFFICER
Mr. Daryll Pope
1730 East Parham Road
USGS
Richmond, VA 23228
Phone: 804-261-2630

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		I
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	$	234,153.00
i. Contractual	$	0.00
j. TOTAL DIRECT COSTS	$	234,153.00
k. INDIRECT COSTS	$	0.00
l. **TOTAL APPROVED BUDGET**	$	234,153.00
m. Federal Share	$	234,153.00
n. Non-Federal Share	$	0.00

12. AWARD COMPUTATION

a. Amount of Federal Financial Assistance (from item 11m)	$	234,153.00
b. Less Unobligated Balance From Prior Budget Periods	$	0.00
c. Less Cumulative Prior Award(s) This Budget Period	$	234,153.00
d. **AMOUNT OF FINANCIAL ASSISTANCE THIS ACTION**	$	0.00
13. Total Federal Funds Awarded to Date for Project Period	$	234,153.00

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.	$	d.	$
b.	$	e.	$
c.	$	f.	$

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)*

☐

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:

Faith Graves, Grants Management Specialist
National Center 12201 Sunrise Valley Drive
Reston, VA 20192
Phone: 703-648-7356

17. VENDOR CODE 0070066320 **18. DUNS** 809785280 **19. CONG. DIST.** 02

LINE#	FINANCIAL ACCT	AMT OF FIN ASST	START DATE	END DATE	TAS ACCT	PO LINE DESCRIPTION
10	20177368-10	$0.00	07/15/2019	05/14/2022	0804	Modification 02 - NCE through 5/14/2022

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:
Daryll Pope
USGS National Groundwater Monitoring Network
1730 East Parham Road
Richmond, VA 23228
Phone: (804) 261-2630
Email: dpope@usgs.gov

Principal Investigator:
D. Mark Durway
NC DEQ Division of Water Resources
1611 Mail Service Center
Raleigh, NC 27699 1611
Phone: (919) 707-9018
Email: mark.durway@ncdenr.gov

Federal Financial Report Cycle			
Reporting Period Start Date	Reporting Period End Date	Reporting Type	Reporting Period Due Date
07/15/2019	07/14/2020	Annual	10/12/2020
07/15/2020	07/14/2021	Annual	10/12/2021
07/15/2021	05/14/2022	Final	09/11/2022

AWARD ATTACHMENTS

North Carolina Department Of Environmental Quality G19AC00193-02

1. Modification 02 Attachment

Modification Attachment
North Carolina Department of Environmental Quality
Award Number G19AC00193
Modification 02

1. In accordance with Section 8, “Revisions and Prior Approvals,” the Contracting Officer hereby extends the budget and project periods to 5/14/2022, at no additional cost to the Government, and updates the Principal Investigator. The recipient's email, dated 10/19/2021, is incorporated herein by reference.

2. The budget period is hereby changed from 7/15/2019 through 11/14/2021 to 7/15/2019 through 05/14/2022.

3. The project period is hereby changed from 7/15/2019 through 11/14/2021 to 7/15/2019 through 05/14/2022.

4. All other terms and conditions remain unchanged.

-- End of Modification No. 02--