Report of Test Well Exploration of the Yorktown Aquifer as a Water Source for the Rodanthe, Waves, Salvo Reverse Osmosis Water Treatment Plant

Test Well Site #3
N 35° 34.985', W 75° 27.864'
at Seabreeze Drive
Rodanthe, North Carolina

Groundwater Management Associates, Inc.

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N 35° 34.985', W 75° 27.864'
at Seabreeze Drive
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Prepared for:

Mr. Ken Flatt
Utilities Director
Dare County Water
600 Mustian St.
Kill Devil Hills, NC 27948

Prepared by:

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September 11, 2008

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1.0 Introduction

Dare County Water (the County) is expanding its wellfield at the Rodanthe, Waves, Salvo (RWS) water treatment plant. The RWS plant uses reverse osmosis (RO) treatment of brackish groundwater withdrawn from two wells open to the Yorktown Aquifer (Figure 1). The County identified a third possible well site (Test Well #3) on Seabreeze Drive (Figure 1). The County contracted GMA to provide hydrogeologic consulting during the exploration and testing of the Yorktown Aquifer at the Test Well #3 (TW#3) site. This report presents the results of GMA's investigation.

2.0 Scope of Work

GMA developed a work plan that the County used to solicit bids from North Carolina Certified Well Contractors to perform drilling and testing of the Yorktown Aquifer. GMA's scope of work involved the following:

- GMA provided a qualified geologist on site to collect geologic data during the drilling of a pilot hole to a depth of 450 feet. We documented penetration rates, drilling characteristics, fluid loss zones, described drill cuttings, and recorded other indicators of aquifers and confining beds penetrated by the pilot hole.
- GMA reviewed geophysical logs collected by the well drilling contractor and used these logs, along with field drilling observations, to select appropriate screen placements for the test well.
- We directed two 6-hour constant-rate pumping tests on the test well. GMA deployed pressure transducers/data loggers and electronic water level meters to gather water level data during the pumping tests. We also documented pumping rates and worked with the well drilling contractor to maintain a constant pumping rate for the duration of each test. Following completion of each pumping test, GMA collected one hour of recovering water level data.
- Water samples were collected at the end of each pumping test and submitted for laboratory analysis.
- GMA analyzed the aquifer test data to determine aquifer properties and to establish design elements for a future production well at the TW#3 site.

3.0 Results

3.1 Exploratory Drilling and Test Well Construction

The County contracted Skippers Well Drilling Company to provide all Well Contractor services required for the project. A GMA geologist was present during the pilot hole drilling to prepare a lithologic log of the sediments penetrated (Figure 2). Following advancement of the pilot hole to 450 feet depth, Skippers ran a series of borehole geophysical logs, including: natural gamma, self potential, single point resistance, and normal resistivity. GMA interpreted the geophysical logs, compared them with the lithologic log, and selected the appropriate screen depths for the test well. Figure 2 presents the geophysical logs along with GMA's hydrostratigraphic

interpretations of the pilot hole data. GMA interprets the top of the Yorktown Aquifer to occur at 290 feet depth, and the aquifer extends deeper than 450 feet below land surface at the TW#3 site. The Yorktown Aquifer exhibited two distinctive water-bearing zones, one from 290 to 350 feet depth and a lower zone from 360 to 400 feet depth. These two water-bearing zones are separated by a layer of light gray to white sandy clay. Considering the differences in lithology and geophysical signatures of these two zones, GMA recommended that the test well be constructed with two screens so that the water-bearing zones could be tested separately. Based upon the muted resistivity on the geophysical logs from 75 to about 240 feet, GMA believes that this upper section of sediments (including the Upper and Lower Principal Aquifers) contains pore waters with much higher salinity than the underlying Yorktown Aquifer.

Based upon GMA's instructions, Skippers constructed a PVC test well with two screen sections. The test well was constructed with nominal 4-inch diameter PVC casing from the land surface down to 290 feet depth. Skippers installed two stainless steel screens, one placed from 290 to 350 feet depth, and the second placed from 360 to 400 feet depth. The screen sections were separated by a stainless steel casing installed from 350 to 360 feet depth. The annular spaces of the well screen sections were filled with #2 well gravel, and a bentonite seal was placed in the annulus of the blank casing to separate the annular spaces of the two screens. Well construction details are presented in Figure 3. Upon completion of the well, Skippers developed TW#3 until the turbidity was low and the water produced was free from excessive sand. Appendix I includes a copy of the well construction record.

3.2 Aquifer Testing and Analysis

Following development of the test well, Skippers performed two aquifer tests designed to evaluate the hydraulic properties and water quality of the zones screened at TW#3. April 23, 2008, the well was pumped at a constant flow rate of 80.2 gpm for 362 minutes. This test provided data on the aquifer properties and water quality of the whole well with both screens producing. The static water level prior to the pumping test was 5.37 feet below the top of the well casing (TOC), which is approximately 1 foot below land surface. The pumping water level after 360 minutes of pumping at 80.2 gpm was 13.85 feet below TOC. The specific capacity of the well with both screens open was 9.46 gallons per minute per foot of drawdown (gpm/ft). Upon completion of the pumping test, Skippers removed the pump and installed an inflatable packer in the well. The packer was set between 350 and 360 feet depth to seal off the lower screen. The pump was reinserted in the well, and the water level was allowed to recover overnight.

On April 24, 2008, the second test was conducted at a pumping rate of 79.2 gpm for a period of 360 minutes. This test provided data on the aquifer properties and water quality of the upper screen section from 290 to 350 feet depth. The static water level prior to the pumping test was 5.48 feet below the top of the well casing (TOC), which is 0.11 feet lower than was observed for the whole well. The pumping water level, after 360 minutes of pumping at 80 gpm, was 15.18 feet below TOC. The specific capacity of the well with only the upper screen open was 8.16 gpm/ft. This testing indicates that 86% of the specific capacity of the well is produced by the upper screen section of the well.

GMA performed analyses of the drawdown and recovery data from the pumped well using the Cooper-Jacob and Theis Recovery Methods, respectively. Table 1 presents a summary of the results of the two tests. Appendix II includes details of the aquifer test data analyses.

Table 1. Summary of Aquifer Test Results from Test Well #3.

Test Date	Pumping Rate	6-hour Specific Capacity	Transmissivity (Cooper-Jacob Method)	Transmissivity (Theis Recovery Method)
4/23/08 (Whole well)	80.2 gpm	9.46 gpm/ft	4272 ft^2/day	4138 ft^2/day
4/24/08 (Upper screen)	79.2 gpm	8.16 gpm/ft	3939 ft^2/day	4047 ft^2/day

Results of aquifer testing indicate that the average transmissivity of the upper aquifer zone is about 4000 ft^2/day at the TW#3 site, and the upper zone appears to produce more than 86% of the yield of the well.

3.3 Laboratory Analyses

Near the end of each 6-hour pumping test, GMA collected water samples for laboratory analyses. The sample from the dual-screen well test (4/23/08) was submitted to a North Carolina certified laboratory (Environmental Chemists, Inc.) for the following analyses:

- New Well Series Inorganics,
- Volatile Organic Compounds (VOCs)
- Synthetic Organic Compounds (SOCs)
- Trihalomethane Formation Potential (THMFP)
- Haloacetic Acid Formation Potential (HAAFP)
- Radiologicals
- Dissolved Arsenic
- Total and Dissolved Silica
- Strontium

The sample collected on 4/24/08 from the upper-screen zone test was submitted for the following analyses:

- New Well Series Inorganics,
- Dissolved Arsenic
- Total and Dissolved Silica
- Strontium

No VOCs or SOCs were detected at TW#3. The chloride concentration in the whole well test was **340 mg/L**. The chloride concentration from the upper screen test was **288 mg**/L. The chloride data indicate that the upper screen zone is nearly fresh (fresh being defined as <250 mg/L chloride), and the lower screen is producing water with higher chloride content than the upper zone. In addition, the fluoride concentration in the upper screen sample (**1.8 mg/L**) was lower than the whole well sample (**2.3 mg/L**). Water quality at the TW#3 site is reasonably consistent with existing production wells serving the RWS plant. Laboratory analyses indicate

that the upper screen zone has better water quality than the lower zone. Appendix III includes the full laboratory report.

4.0 Conclusions and Recommendations

Based upon the exploratory drilling and testing results from TW#3, GMA makes the following conclusions and recommendations:

- The top of the Yorktown Aquifer occurs at a depth of 290 feet below land surface. The upper portion of the Yorktown Aquifer includes interbedded shelly sands, soft sandy limestone, and white to light gray clay.
- Two distinct permeable zones were identified in the Yorktown Aquifer at TW#3: an upper zone from 290 to 350 feet depth, and a lower zone from 360 to 400 feet depth. These two zones were separated by a layer of light gray to white sandy clay.
- The upper and lower zones identified at the TW#3 site were discretely screened in the test well so that sections of the well could be sealed off using an inflatable packer. This allowed for hydraulic and water-quality testing of specific screen sections of the well.
- The upper screen zone at TW#3 produces more than 86% of the yield of the well. In addition, the upper screen zone of the well produces water with lower concentrations of dissolved inorganic chemicals (most notably chloride, fluoride, silica, and sodium) than the whole well with both screens producing.
- Dare County should construct a new water-supply well at the TW#3 site that includes a screen placed from 290 to 350 feet depth.
- Existing wells serving the RWS plant have pump intakes placed at approximately 80 feet depth. GMA anticipates that a production well at the TW#3 site could easily produce 500 gallons per minute with a pump intake placed at 80 feet depth. This volume is similar to the individual yields of the existing wells serving the RWS plant. Higher flow rates could be supported by utilizing more of the available drawdown.
- GMA anticipates that the proposed production well at the TW#3 site will produce slightly better water quality than the two existing wells. However, we cannot predict the long-term water quality conditions that may occur from the operation of a new water-supply well at the TW#3 site. Because the closest existing water-supply well (RWS-2) is approximately 2900 feet from the TW#3 site, we do not anticipate significant well interference if wells are operated on pumping cycles of less than 12 hours per day.
- GMA also recommends that wells be pumped on alternating cycles wherein adjacent wells are not pumped at the same time. This alternating schedule will help to minimize well interference effects on the wellfield, thereby minimizing the potential for water-quality changes.

5.0 Report Certification

This report was prepared by Groundwater Management Associates, Inc., a professional corporation licensed to practice geology and engineering in North Carolina.

James K Holley

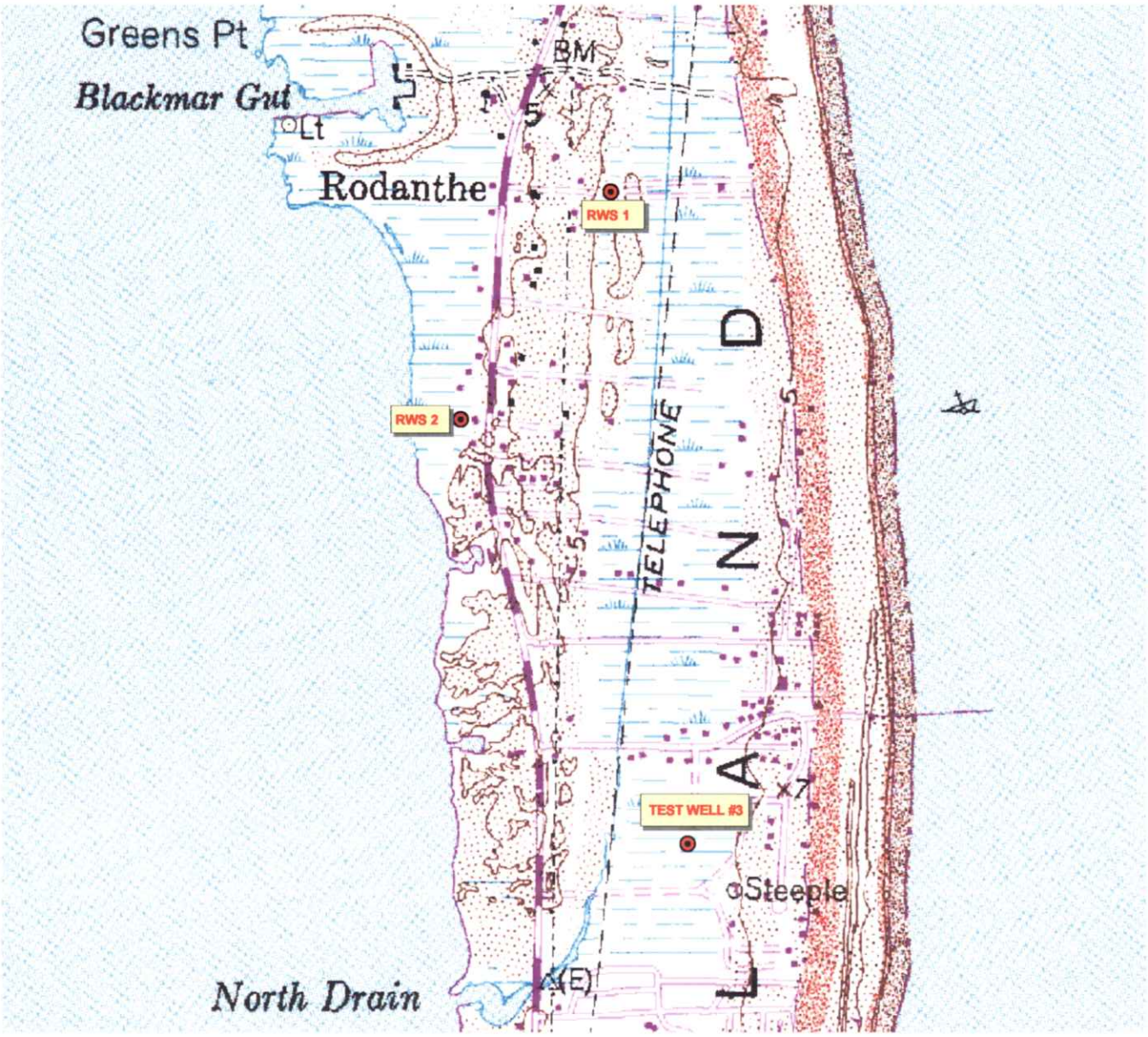
James K. Holley, P.G.
Senior Hydrogeologist

Richard K. Spruill

Dr. Richard K. Spruill, P.G.
Principal Hydrogeologist

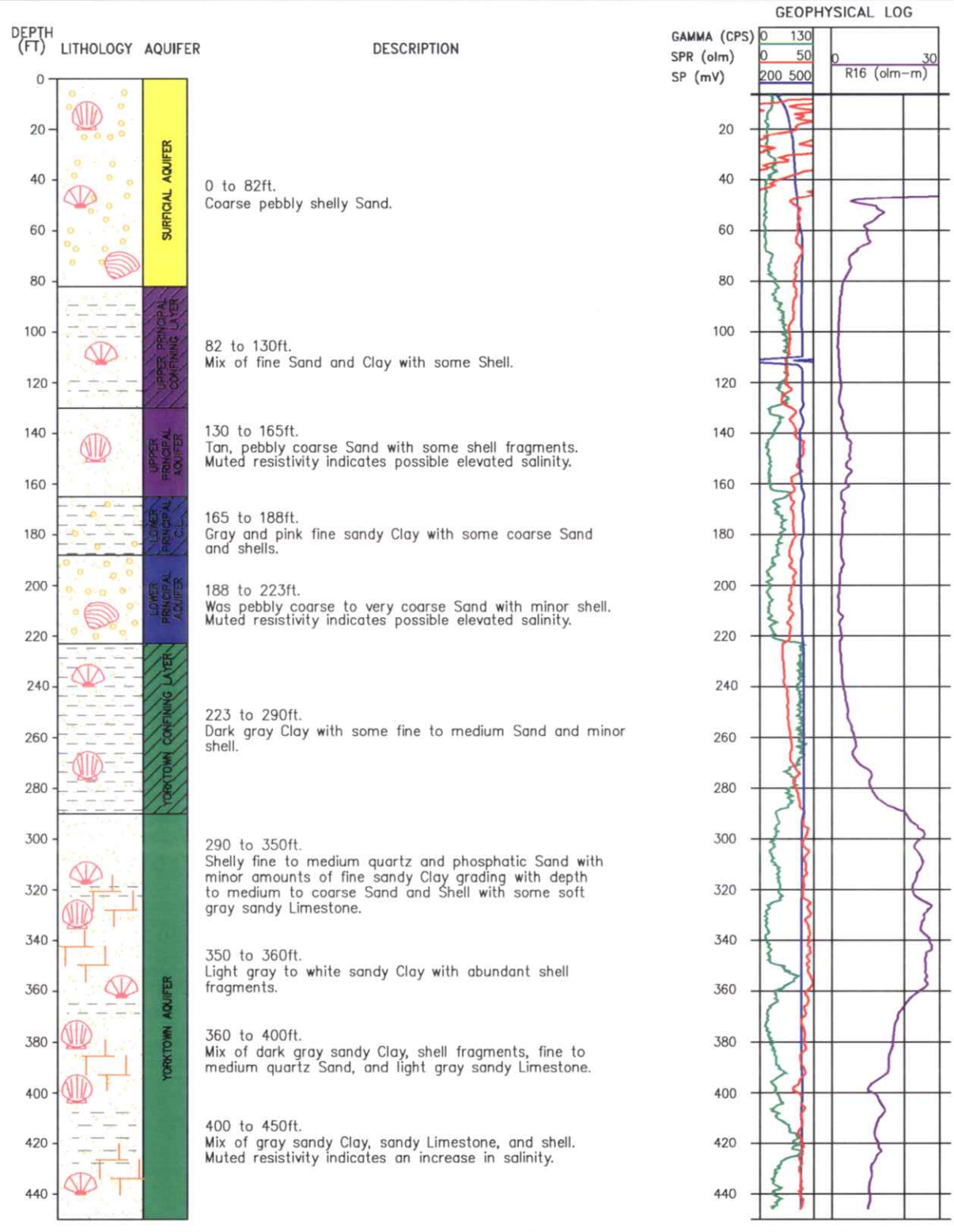
NORTH CAROLINA LICENSED SEAL 942 GEOLOGIST RICHARD K. SPRUILL

TEST WELL #3 LOCATION



RODANTHE QUADRANGLE
NORTH CAROLINA - DARE COUNTY
7.5 MINUTE SERIES (TOPOGRAPHIC)
CONTOUR INTERVAL=5 FEET
PHOTO REVISED 1983

DARE COUNTY WATER RODANTHE, WAVES, SALVO WATER SYSTEM	FIGURE 1
GMA GROUNDWATER MANAGEMENT ASSOCIATES, INC. 4300 SAPPHIRE COURT, SUITE 100 GREENVILLE, NORTH CAROLINA 27858	DATE 8/21/2008 PROJECT 103502



LEGEND

COARSE SAND

SAND

SHELL

CLAY

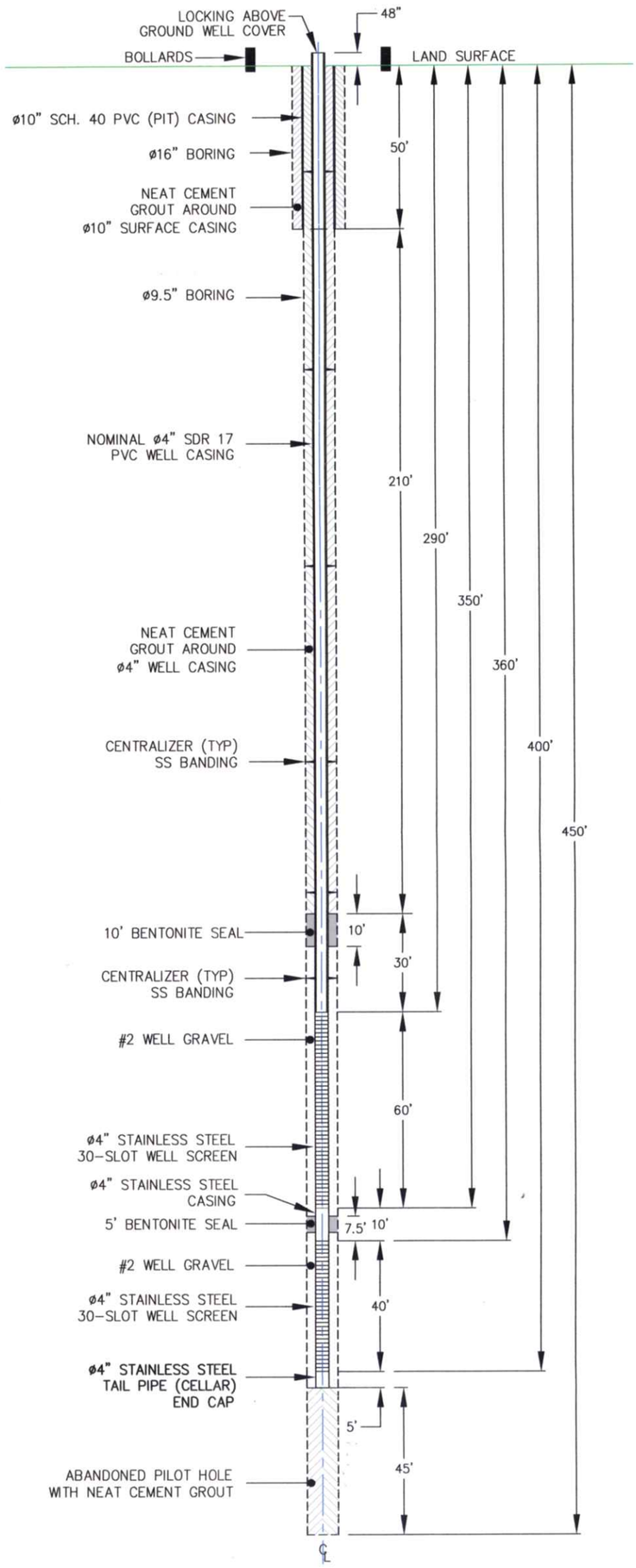
LIMESTONE

GMA

GROUNDWATER MANAGEMENT ASSOCIATES, INC.

File: DRAWINGS\103502 GEOLOG	DRILLING LOG OF TEST WELL #3	Date: 8/21/2008
Project No. 103502	DARE CO. WATER RODANTHE, WAVES, SALVO WATER SYSTEM	Figure 2

DARE COUNTY WATER
RODANTHE, WAVES, SALVO WATER SYSTEM
TEST WELL #3



LEGEND

SCALE
HORIZONTAL 1"=40"
VERTICAL 1"=40'

GMA
GROUNDWATER MANAGEMENT ASSOCIATES, INC.

File: DRAWINGS\103502 TEST WELL	TEST WELL #3 WELL CONSTRUCTION DIAGRAM	Date: 8/21/2008
Project No. 103502	DARE COUNTY WATER RODANTHE, WAVES, SALVO WATER SYSTEM	Figure: 3

Appendix I

Well Construction Record

WELL CONSTRUCTION RECORD

Rodanthe Test Well #3

North Carolina-Department of Environment and Natural Resources - Division of Water Quality - Groundwater Section

WELL CONTRACTOR (INDIVIDUAL) NAME (print): Sean Cropsey — CERTIFICATION#: 2485

WELL CONTRACTOR COMPANY NAME: SKIPPER'S WELL DRILLING & PUMP SERVICE, INC. — PHONE #(910) 371-2770

STATE WELL CONSTRUCTION PERMIT #: (if applicable) — ASSOCIATED WQ PERMIT # (if applicable)

1. WELL USE (Check Applicable box): Residential [ ] Municipal/Public [ ] Industrial [ ] Agricultural [ ]
Monitoring [ ] Recovery [ ] Heat Pump Water Injection [ ] Other [X] If Other, List Use: Test well

2. WELL LOCATION:
Nearest town: Rodanthe County: Dare
(Street Name, Numbers, Community, subdivision, Lot No., Zip Code)

Topographic/Land setting: [ ] Ridge [ ] Slope [ ] Valley [X] Flat (check appropriate box)

3. OWNER: Dare County Att: Ken Flatt
Address: 600 Mustian Street (Street or Route No.)
Manteo, N. C. 27946 (City or town / State / Zip Code)
Area code-Phone Number

Latitude/longitude of well location: N30° 34.985' W075° 27.864' (degrees/minutes/second)

4. DATE DRILLED: 4/21/2008 — USE OF WELL: Test Well
5. TOTAL DEPTH: 405
6. DOES WELL REPLACE EXISTING WELL? [ ] Yes [X] No
7. STATIC WATER LEVEL: Below Top of Casing: 5 Ft. (Use "+" if above Top of Casing)
8. TOP OF CASING IS 3 FT. ABOVE LAND SURFACE.
*Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C .0118.
9. YIELD (gpm): 80 — METHOD OF TEST: pump
10. WATER ZONES (depth): 290-400
11. DISINFECTION: Type 70%HTH — Amount: cup
12. CASING:

	Depth			Diameter	Wall Thickness Weight/ft.	Material
From	+2	To 50	Ft.	10	Sch 40	pvc
From	+3	To 290	Ft.	4.5	SDR17	pvc
From	350	To 360	Ft.	4	sch 40	ss

13. GROUT:

	Depth				Method
From	250	To 260	Ft.	Ben. Clay	pump
From	0	To 250	Ft.	cement	pump
From		To	Ft.		

14. SCREEN:

	Depth			Diameter	Slot size		Material
From	290	To 350	Ft.	4	30	in	stainless
From	360	To 400	Ft.	4	30	in	stainless
From		To	Ft.			in	

15. SAND/GRAVEL PACK:

	Depth			Size	Material
From	260	To 352	Ft.	#2	southern products
From	356	To 450	Ft.	#2	southern products

Depth From	To	Drilling log Formation Description
0 to	30	Sand
30 to	40	Clay
40 to	50	Clay and sand
50 to	70	Coarse sand and shells
70 to	90	Mostly shells, some clay
90 to	100	Shells, some clay
100 to	110	Clay-silty, fine sand
110 to	120	More clay, some shells
120 to	130	Clay and more sand
130 to	140	Some clay sand
140 to	150	Sand and coarse gravel
150 to	160	Sand coarse gravel
160 to	170	Sand and clay layers
170 to	190	Sand, shells, some clay
190 to	200	Shells, sand, some clay
200 to	210	Fine med sand, little clay
210 to	220	Clay, some sand
220 to	230	Clay
230 to	240	Clay, shell and sand layers
240 to	260	Sticky clay
260 to	270	Clay sticky to soft
220 to	290	Clay soft, sand, shells
290 to	300	Clay, shells fine sand
300 to	320	Shells, fine sand, some clay
320 to	360	Shells, gravel
360 to	380	Shells , limestone, sand
380 to	400	Darker shells, sand
400 to	410	Same - more clay
410 to	420	Shell clay layers
420 to	430	Shells, sandy clay layers
430 to	440	Shells, some sand, less clay
440 to	450	Shells, some sand, less clay

16. REMARKS:

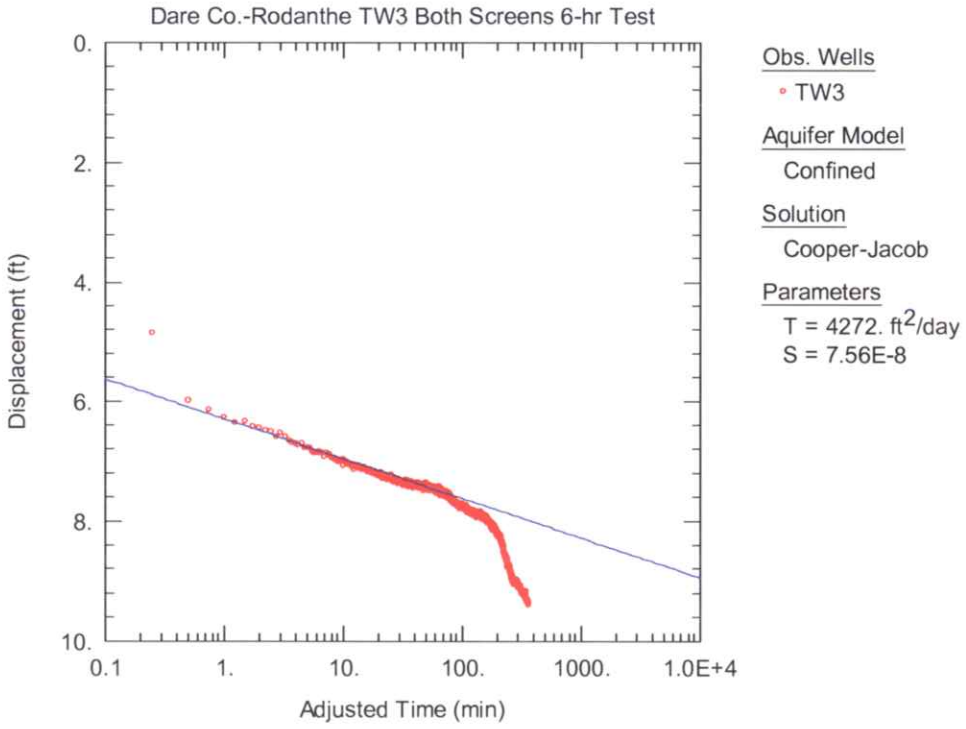
I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15 NCAN 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF PERSON CONSTRUCTING THE WELL — Date

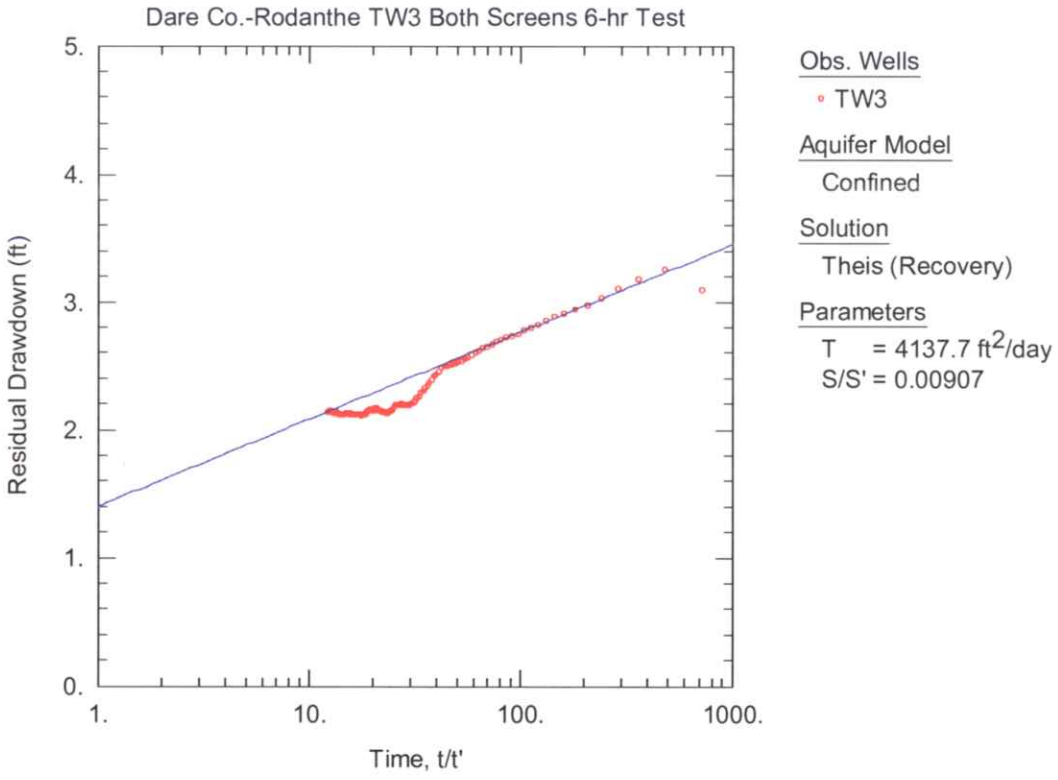
Submit the original to the Division of Water Quality, Groundwater Section, 1636 Mail Service Center - Raleigh, NC 27699-1636 Phone No (919) 733-3221, within 30 days.

Appendix II

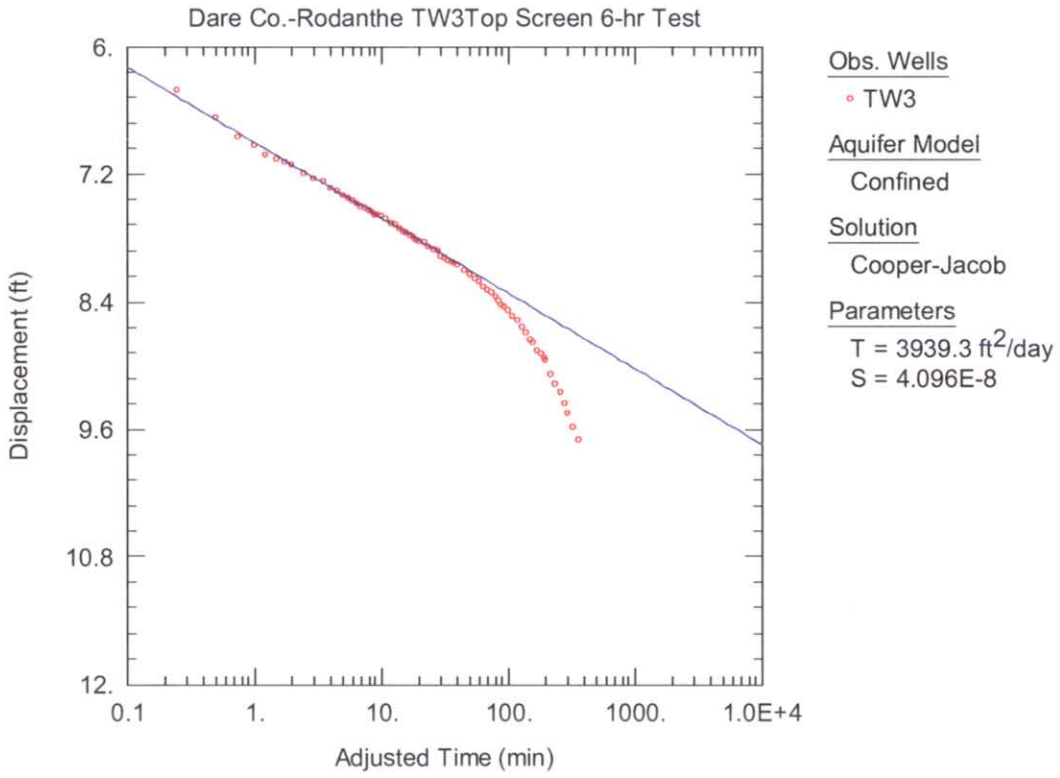
Aquifer Test Data and Analyses



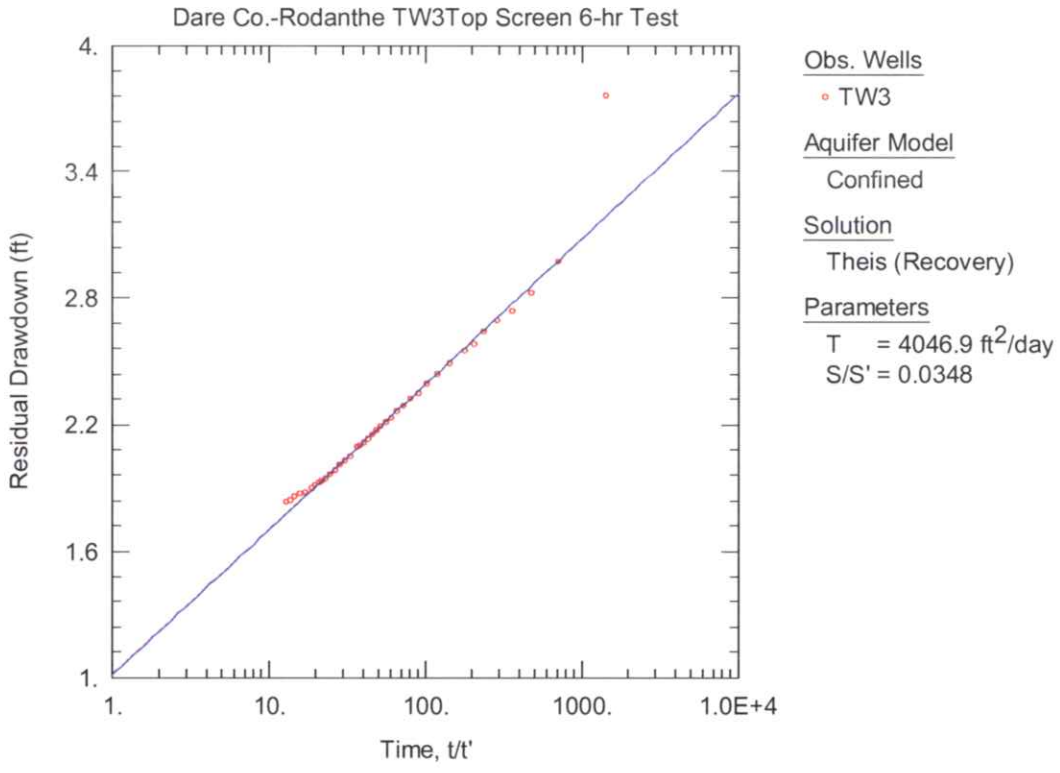
TW#3 Aquifer Test Data, Both Screens Producing, Cooper-Jacob Method of Analysis



TW#3 Aquifer Test Data, Both Screens Producing, Theis Recovery Method of Analysis



TW#3 Aquifer Test Data, Top Screen Producing, Cooper-Jacob Method of Analysis



TW#3 Aquifer Test Data, Top Screen Producing, Theis Recovery Method of Analysis

Pumping Test Monitoring Log Form						
Project Number & Location: 103502-Dare Co. (Rodanthe)						Well#: TW3 (Top Screen)
Date: 4-24-08		Start Time:				Static Water Level: 5.48'
Latitude:			Longitude:			
hr., min., & sec.	minutes	Time	Water Level (ft)	Drawdown (ft)	Spec. Cap. (Q/s)	Comments
15sec	0.25		11.89	6.41	12.36	
30sec	0.5		12.15	6.67	11.87	
45sec	0.75		12.33	6.85	11.56	
1min	1		12.41	6.93	11.43	
1min 15sec	1.25		12.50	7.02	11.28	
1min 30sec	1.5		12.54	7.06	11.22	
1min 45sec	1.75		12.57	7.09	11.17	
2min	2		12.60	7.12	11.12	
2min 30sec	2.5		12.67	7.19	11.02	
3min	3		12.72	7.24	10.94	
3min 30sec	3.5		12.75	7.27	10.89	
4min	4		12.82	7.34	10.79	
4min 30sec	4.5		12.84	7.36	10.76	
5min	5		12.88	7.40	10.70	
5min 30sec	5.5		12.91	7.43	10.66	
6min	6		12.93	7.45	10.63	
6min 30sec	6.5		12.96	7.48	10.59	
7min	7		12.98	7.50	10.56	
7min 30sec	7.5		13.00	7.52	10.53	
8min	8		13.02	7.54	10.50	
8min 30sec	8.5		13.04	7.56	10.48	
9min	9		13.06	7.58	10.45	
9min 30sec	9.5		13.07	7.59	10.43	
10min	10		13.08	7.60	10.42	
11min	11		13.11	7.63	10.38	
12min	12		13.14	7.66	10.34	
13min	13		13.16	7.68	10.31	
14min	14		13.19	7.71	10.27	
15min	15		13.22	7.74	10.23	
16min	16		13.24	7.76	10.21	
17min	17		13.26	7.78	10.18	
18min	18		13.27	7.79	10.17	
19min	19		13.30	7.82	10.13	
20min	20		13.31	7.83	10.11	
22min	22		13.33	7.85	10.09	
24min	24		13.36	7.88	10.05	
26min	26		13.39	7.91	10.01	
28min	28		13.41	7.93	9.99	
30min	30		13.45	7.97	9.94	
32min	32		13.47	7.99	9.91	
34min	34		13.49	8.01	9.89	
36min	36		13.51	8.03	9.86	
38min	38		13.52	8.04	9.85	
40min	40		13.54	8.06	9.83	
45min	45		13.59	8.11	9.77	
50min	50		13.62	8.14	9.73	
55min	55		13.67	8.19	9.67	
1hr	60		13.69	8.21	9.65	
1hr 5min	65		13.74	8.26	9.59	
1hr 10min	70		13.77	8.29	9.55	
1hr 15min	75		13.80	8.32	9.52	
1hr 20min	80		13.84	8.36	9.47	
1hr 25min	85		13.87	8.39	9.44	
1hr 30min	90		13.91	8.43	9.40	
1hr 35min	95		13.93	8.45	9.37	
1hr 40min	100		13.97	8.49	9.33	
1hr 50min	110		14.02	8.54	9.27	
2hr	120		14.06	8.58	9.23	

Project Number & Location: 103502-Dare Co. (Rodanthe)						Well#: TW3 (Top Screen)
Date: 4-24-08		Start Time:				Static Water Level: 5.48'
hr., min., & sec.	minutes	Time	Water Level (ft)	Drawdown (ft)	Spec. Cap. (Q/s)	Comments
2hr 10min	130		14.12	8.64	9.17	
2hr 20min	140		14.17	8.69	9.11	
2hr 30min	150		14.24	8.76	9.04	
2hr 40min	160		14.27	8.79	9.01	
2hr 50min	170		14.34	8.86	8.94	
3hr 3min	183		14.37	8.89	8.91	
3hr 13min	193		14.41	8.93	8.87	
3hr 20min	200		14.43	8.95	8.85	
3hr 40min	220		14.56	9.08	8.72	
4hr	240		14.66	9.18	8.63	
4hr 20min	260		14.74	9.26	8.55	
4hr 40min	280		14.84	9.36	8.46	
5hr	300		14.93	9.45	8.38	
5hr 30min	330		15.06	9.58	8.27	
6hr	360		15.18	9.70	8.16	

Notes:

Distance from Pumping Well to Observation well = NA

GMA Project #: 103502-Dare Co. (Rodanthe)

Measuring Point Description: Top of Casing

MP Height above Land Surface: ~4.0'

Test Pump Information:

Type:		Make:	
Horsepower:		Capacity:	GPM @ TDH
Intake Depth:			

Well Pipe ID:

Target Q: 80 GPM

Flow Meter Description:

If Orifice Weir, Flow Rate Measuring Point Height:

Totalizer Start: 59,837,500 gal.

Totalizer End: 59,866,000 gal. (Avg. 79.2 GPM)

Field Chemistry Tests:

Chloride =	316 mg/L @ 2hr.
Iron =	No color on strip @ 2hr. - Hannah Meter = 0.0 mg/L
Hydrogen Sulfide =	0.0-0.1 mg/L @ 2hr.
pH =	7.98 @ 2hr.
Temperature =	68.0 @ 2hr.
=	
=	

Samples Collected @:

Samples Collected by:

Pumping Equipment Contractor: Skippers

Person Recoring Data: Kelley Smith

Pumping Test Monitoring Log Form						
Project Number & Location: 103502-Dare Co. (Rodanthe)						Well#: TW3 (Top Screen) - RECOVERY
Date: 4-24-08		Start Time:				Static Water Level: 5.48'
Latitude:			Longitude:			
hr., min., & sec.	minutes	Time	Water Level (ft)	Drawdown (ft)	Spec. Cap. (Q/s)	Comments
15sec	0.25		9.24	3.76		Recovery
30sec	0.5		8.45	2.97		
45sec	0.75		8.30	2.82		
1min	1		8.22	2.74		
1min 15sec	1.25		8.17	2.69		
1min 30sec	1.5		8.12	2.64		
1min 45sec	1.75		8.06	2.58		
2min	2		8.03	2.55		
2min 30sec	2.5		7.97	2.49		
3min	3		7.92	2.44		
3min 30sec	3.5		7.87	2.39		
4min	4		7.83	2.35		
4min 30sec	4.5		7.80	2.32		
5min	5		7.77	2.29		
5min 30sec	5.5		7.74	2.26		
6min	6		7.71	2.23		
6min 30sec	6.5		7.69	2.21		
7min	7		7.67	2.19		
7min 30sec	7.5		7.65	2.17		
8min	8		7.63	2.15		
8min 30sec	8.5		7.61	2.13		
9min	9		7.59	2.11		
9min 30sec	9.5		7.58	2.10		
10min	10		7.57	2.09		
11min	11		7.53	2.05		
12min	12		7.51	2.03		
13min	13		7.49	2.01		
14min	14		7.46	1.98		
15min	15		7.44	1.96		
16min	16		7.42	1.94		
17min	17		7.41	1.93		
18min	18		7.40	1.92		
19min	19		7.39	1.91		
20min	20		7.38	1.90		
22min	22		7.36	1.88		
24min	24		7.35	1.87		
26min	26		7.34	1.86		
28min	28		7.32	1.84		
30min	30		7.31	1.83		
Notes:						
Distance from Pumping Well to Observation well = NA						
GMA Project #: 103502-Dare Co. (Rodanthe)						
Measuring Point Description: Top of Casing						
MP Height above Land Surface: ~4.0'						
Pumping Equipment Contractor: Skippers						
Person Recoring Data: Kelley Smith						

Pumping Test Monitoring Log Form						
Project Number & Location: 103502-Dare Co. (Rodanthe)						Well#: TW3 (Both Screens)
Date: 4-23-08		Start Time:				Static Water Level: 5.37'
Latitude:			Longitude:			
hr., min., & sec.	minutes	Time	Water Level (ft)	Drawdown (ft)	Spec. Cap. (Q/s)	Comments
15sec	0.25					
30sec	0.5		11.24	5.87	13.66	
45sec	0.75		11.55	6.18	12.98	
1min	1		11.57	6.20	12.94	
1min 15sec	1.25		11.65	6.28	12.77	
1min 30sec	1.5		11.67	6.30	12.73	
1min 45sec	1.75					
2min	2		11.74	6.37	12.59	80-81 GPM
2min 30sec	2.5		11.83	6.46	12.41	
3min	3		11.88	6.51	12.32	
3min 30sec	3.5		11.94	6.57	12.21	
4min	4		11.96	6.59	12.17	
4min 30sec	4.5		11.99	6.62	12.11	
5min	5		12.02	6.65	12.06	
5min 30sec	5.5		12.05	6.68	12.01	80-81 GPM
6min	6		12.09	6.72	11.93	
6min 30sec	6.5		12.11	6.74	11.90	
7min	7		12.13	6.76	11.86	
7min 30sec	7.5		12.15	6.78	11.83	
8min	8		12.18	6.81	11.78	
8min 30sec	8.5		12.20	6.83	11.74	
9min	9		12.21	6.84	11.73	
9min 30sec	9.5		12.22	6.85	11.71	
10min	10		12.22	6.85	11.71	
11min	11		12.28	6.91	11.61	
12min	12		12.30	6.93	11.57	
13min	13		12.33	6.96	11.52	
14min	14		12.35	6.98	11.49	
15min	15		12.36	6.99	11.47	
16min	16		12.38	7.01	11.44	80-81 GPM
17min	17		12.38	7.01	11.44	
18min	18		12.43	7.06	11.36	
19min	19		12.44	7.07	11.34	
20min	20		12.44	7.07	11.34	
22min	22		12.47	7.10	11.30	
24min	24		12.50	7.13	11.25	
26min	26		12.52	7.15	11.22	80 GPM
28min	28		12.55	7.18	11.17	
30min	30		12.57	7.20	11.14	
32min	32		12.58	7.21	11.12	80 GPM
34min	34		12.60	7.23	11.09	
36min	36		12.61	7.24	11.08	
38min	38		12.63	7.26	11.05	
40min	40		12.64	7.27	11.03	
45min	45		12.66	7.29	11.00	
50min	50		12.69	7.32	10.96	
55min	55		12.69	7.32	10.96	80 GPM
1hr	60		12.72	7.35	10.91	
1hr 5min	65		12.75	7.38	10.87	
1hr 10min	70		12.76	7.39	10.85	80 GPM
1hr 15min	75		12.78	7.41	10.82	
1hr 20min	80		12.78	7.41	10.82	80 GPM
1hr 25min	85					
1hr 30min	90		12.82	7.45	10.77	
1hr 35min	95		12.84	7.47	10.74	
1hr 40min	100		12.85	7.48	10.72	
1hr 50min	110		12.89	7.52	10.66	
2hr	120		12.91	7.54	10.64	80 GPM

Project Number & Location: 103502-Dare Co. (Rodanthe)						Well#: TW3 (Both Screens)
Date: 4-23-08		Start Time:				Static Water Level: 5.37'
hr., min., & sec.	minutes	Time	Water Level (ft)	Drawdown (ft)	Spec. Cap. (Q/s)	Comments
2hr 10min	130		12.92	7.55	10.62	
2hr 20min	140		12.93	7.56	10.61	80 GPM
2hr 30min	150		13.01	7.64	10.50	
2hr 40min	160					
2hr 50min	170		13.07	7.70	10.42	
3hr 3min	183		13.10	7.73	10.38	
3hr 13min	193		13.15	7.78	10.31	
3hr 20min	200		13.18	7.81	10.27	80 GPM
3hr 40min	220		13.26	7.89	10.16	
4hr	240		13.35	7.98	10.05	
4hr 20min	260		13.43	8.06	9.95	
4hr 40min	280		13.55	8.18	9.80	
5hr	300		13.61	8.24	9.73	80 GPM
5hr 30min	330		13.73	8.36	9.59	
6hr	360		13.85	8.48	9.46	

Notes:

Distance from Pumping Well to Observation well = NA

GMA Project #: 103502-Dare Co. (Rodanthe)

Measuring Point Description: Top of Casing

MP Height above Land Surface: ~4.0'

Test Pump Information:

Type:		Make:	
Horsepower:		Capacity:	GPM @ TDH
Intake Depth:			

Well Pipe ID:

Target Q: 80 GPM

Flow Meter Description:

	If Orifice Weir, Flow Rate Measuring Point Height:
	Totalizer Start: 59,799,960 gal.
	Totalizer End: 59,829,000 gal. (Avg. 80.2 GPM)

Field Chemistry Tests:

Chloride =	338-363 mg/L @ 2hr.
Iron =	No color on strip @ 2hr. - Hannah Meter = 0.03 mg/L
Hydrogen Sulfide =	0.0-0.1 mg/L @ 2hr.
pH =	7.94 @ 2hr.
Temperature =	68.1 @ 2hr.
=	
=	

Samples Collected @:

Samples Collected by:

Pumping Equipment Contractor: Skippers

Person Recoring Data: Kelley Smith

Pumping Test Monitoring Log Form						
Project Number & Location: 103502-Dare Co. (Rodanthe)						Well#: TW3 (Both Screens) - RECOVERY
Date: 4-23-08		Start Time:				Static Water Level: 5.37'
Latitude:			Longitude:			
hr., min., & sec.	minutes	Time	Water Level (ft)	Drawdown (ft)	Spec. Cap. (Q/s)	Comments
15sec	0.25		9.09	3.72		Recovery
30sec	0.5		7.95	2.58		
45sec	0.75		7.70	2.33		
1min	1		7.63	2.26		
1min 15sec	1.25		7.55	2.18		
1min 30sec	1.5		7.50	2.13		
1min 45sec	1.75		7.44	2.07		
2min	2		7.40	2.03		
2min 30sec	2.5		7.34	1.97		
3min	3		7.28	1.91		
3min 30sec	3.5		7.23	1.86		
4min	4		7.19	1.82		
4min 30sec	4.5		7.15	1.78		
5min	5		7.12	1.75		
5min 30sec	5.5		7.07	1.70		
6min	6		7.05	1.68		
6min 30sec	6.5		7.02	1.65		
7min	7		6.99	1.62		
7min 30sec	7.5		6.98	1.61		
8min	8		6.95	1.58		
8min 30sec	8.5		6.94	1.57		
9min	9		6.92	1.55		
9min 30sec	9.5		6.91	1.54		
10min	10		6.89	1.52		
11min	11		6.86	1.49		
12min	12		6.83	1.46		
13min	13		6.81	1.44		
14min	14		6.78	1.41		
15min	15		6.78	1.41		
16min	16		6.76	1.39		
17min	17		6.74	1.37		
18min	18		6.71	1.34		
19min	19		6.70	1.33		
20min	20		6.70	1.33		
22min	22		6.68	1.31		
24min	24		6.64	1.27		
26min	26		6.63	1.26		
28min	28		6.62	1.25		
30min	30		6.61	1.24		
Notes:						
Pumping Equipment Contractor: Skippers						
Person Recoring Data: Kelley Smith						

Appendix III

Laboratory Analytical Reports

envirochem (SM)

ANALYTICAL & CONSULTING CHEMISTS

Environmental Chemists, Inc.

6602 Windmill Way • Wilmington, NC 28405
(910) 392-0223 (Lab) • (910) 392-4424 (Fax)

710 Bowsertown Road • Manteo, NC 27954
(252) 473-5702

NCDENR: DWQ CERTIFICATE #94. DLS CERTIFICATE #37729

GMA

Index for Rodanthe TW-3

Sample # 8056 Report 8-3722

Collected 04/23/08 @ 01:30 PM

envirochem
Analytical & Consulting Chemists

Environmental Chemists, Inc.
6602 Windmill Way • Wilmington, North Carolina 28405
(910) 392-0223 Phone • (910) 392-4424 Fax
EChemW@aol.com
NCDENR: DWQ Certificate #94, DLS Certificate #37729

NEW WELL INORGANIC CHEMICAL ANALYSIS

Note: All information must be supplied for plan review credit.

WATER SYSTEM ID #: * New Well * **County:** Dare

Name of Water System: Rodanthe TW- 3

Sample Type: X Source for Plan Review

Location Where Collected: Well
(Note: Compliance sample MUST be collected at the entry point.)

Location Code: N/A

Collection Date: 04/23/08 (MM/DD/YY)

Collection Time: 13:30 PM (Specify AM or PM)

Collected By: Kelley Smith (Please Print)

Mail Results to (water system representative):

GMA - Jay Holley
4300 Sapphire Ct. Suite 100
Greenville, NC 27834

Phone #: (252) 758-3310

Fax #: ( )

*NOTE: Please complete portion above double line on Page 2.

LABORATORY ID #: 37729 ☐ SAMPLE UNSATISFACTORY ☐ RESAMPLE REQUIRED

CONTAM CODE	CONTAMINANT	METHOD CODE	REQUIRED REPORTING LIMIT (R.R.L.)		NOT DETECTED (i.e. < R.R.L) (X)	QUANTIFIED RESULTS*		ALLOWABLE LIMIT
0100	Turbidity	SM2130 B	0.10	ntu	☐	6.8	NTU	N/A
1005	Total Arsenic	EPA 200.9	0.005	mg/L	X	.	mg/L	0.010 mg/L
-	Dissolved Arsenic	EPA 200.9	0.005	mg/L	X	.	mg/L	
1010	Barium	EPA 200.7	0.400	mg/L	X	.	mg/L	2.000 mg/L
1015	Cadmium	EPA 200.7	0.001	mg/L	X	.	mg/L	0.005 mg/L
1016	Calcium	EPA 200.7	0.001	mg/L	☐	4.70	mg/L	N/A
1017	Chloride	SM 4500 Cl-B	5.0	mg/L	☐	340.	mg/L	250.0 mg/L
1020	Chromium	EPA 200.7	0.020	mg/L	X	.	mg/L	0.100 mg/L
1022	Copper	EPA 200.7	0.050	mg/L	X	.	mg/L	1.300 mg/L
1024	Cyanide	SM 4500 CN F	0.040	mg/L	X	.	mg/L	0.200 mg/L
1025	Fluoride	SM 4500 F B	0.100	mg/L	☐	2.3	mg/L	4.000 mg/L
1028	Iron	EPA 200.7	0.060	mg/L	X	.	mg/L	0.300 mg/L
1030	Lead	EPA 200.9	0.003	mg/L	X	.	mg/L	0.015 mg/L
1031	Magnesium	EPA 200.7	1.0	mg/L	☐	5.6	mg/L	N/A
1032	Manganese	EPA 200.7	0.010	mg/L	X	.	mg/L	0.050 mg/L
1035	Mercury	EPA 245.1	0.0004	mg/L	X	.	mg/L	0.002 mg/L

*Note: Concentrations for Lead and Copper are action levels, not MCLs.

8056 8-3722

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Analytical & Consulting Chemists

Environmental Chemists, Inc.
6602 Windmill Way • Wilmington, North Carolina 28405
(910) 392-0223 Phone • (910) 392-4424 Fax
EChemW@aol.com
NCDENR: DWQ Certificate #94, DLS Certificate #37729

NEW WELL INORGANIC CHEMICAL ANALYSIS

(Continued)
Note: All information must be supplied for plan review credit.

WATER SYSTEM ID #: New Well **Collection Date:** 04/23/08 (MM/DD/YY) **Collection Time:** 13:30 PM (Specify AM or PM)

Location Code: Rodanthe TW-3

LABORATORY ID #: 37729

CONTAM CODE	CONTAMINANT	METHOD CODE	REQUIRED REPORTING LIMIT (R.R.L.)	NOT DETECTED (i.e. < R.R.L) (X)	QUANTIFIED RESULTS*	ALLOWABLE LIMIT
1036	Nickel	EPA 200.7	0.100 mg/L	X	. mg/L	N/A
1040	Nitrate	SM 4500 NO_3-E	1.00 mg/L	X	. mg/L	10.00 mg/L
1041	Nitrite	SM 4500 NO_2-B	0.10 mg/L	X	. mg/L	1.00 mg/L
1045	Selenium	EPA 200.9	0.010 mg/L	X	. mg/L	0.050 mg/L
1050	Silver	EPA 200.7	0.05 mg/L	X	. mg/L	0.100 mg/L
-	Total Silica	EPA 200.7	-	☐	12.4 mg/L	-
-	Dissolved Silica	EPA 200.7	-	☐	12.4 mg/L	-
1052	Sodium	EPA 200.7	1.0 mg/L	☐	489. mg/L	N/A
1055	Sulfate	SM 426 C	5.0 mg/L	X	. mg/L	250.0 mg/L
1068	Acidity	SM 2310 B	1.0 mg/L	X	. mg/L	N/A
1074	Antimony	EPA 200.9	0.003 mg/L	X	. mg/L	0.006 mg/L
1075	Beryllium	EPA 200.7	0.002 mg/L	X	. mg/L	0.004 mg/L
1085	Thallium	EPA 200.9	0.001 mg/L	X	. mg/L	0.002 mg/L
-	Strontium	EPA 200.7	-	☐	0.265 mg/L	
1095	Zinc	EPA 200.7	1.0 mg/L	X	. mg/L	5.0 mg/L
1905	Color	SM 2120 B	5 units	☐	30. Units	15 units
1915	Total Hardness	SM 2340 C	1.0 mg/L	☐	55. mg/L	N/A
1925	pH	SM 4500 H^+-B	N/A	N/A	8.26 Units	6.50 – 8.50 units
1927	Alkalinity	SM 2320 B	1.0 mg/L	☐	464. mg/L	N/A
1930	Total Dissolved Solids	SM 2540 C	10.0 mg/L	☐	1250. mg/L	500.0 mg/L

*Note: Concentrations for Lead and Copper are action levels, not MCLs.

	DATE:	TIME:
ANALYSES BEGUN:	04/24/08 (MM/DD/YY)	14:57 (Specify AM or PM)
ANALYSES COMPLETED:	05/09/08 (MM/DD/YY)	17:00 (Specify AM or PM)

Laboratory Log #: 8056 **Certified By:** Jim Pierce Jim Pierce (Print and sign name)

COMMENTS: Alkalinity Brown

REPORT # 8-3722

envirochem
ANALYTICAL & CONSULTING CHEMISTS

Environmental Chemists, Inc.

6602 Windmill Way • Wilmington, NC 28405
(910) 392-0223 (Lab) • (910) 392-4424 (Fax)
710 Bowsertown Road • Manteo, NC 27954
(252) 473-5702
NCDENR: DWQ CERTIFICATE #94. DLS CERTIFICATE #37729

Customer:

GMA
4300 Sapphire Ct. Ste.100
Greenville, NC 27834

Date of Report: May 16, 2008

Purchase Order No.:

Report Number: 8-3722

REPORT OF ANALYSIS

Date Collected: 04/23/08

Sampled By: Kelley Smith

Report To:

Project: Rodanthe TW-3 Both Screens

I.D. # 8056

TRIHALOMETHANE FORMATION POTENTIAL – 7 Day Incubation

Chlorine Residual after incubation = 1.0 ppm Cl_2 from a 30 ppm dose

THMFP Analysis

Chloroform mg/L	**= 0.018**
Bromoform mg/L	**= < 0.001**
Chlorodibromomethane mg/L	**= < 0.001**
Bromodichloromethane mg/L	**= < 0.001**

TFP mg/L = 0.018

4 hour Chlorine Demand = 19.9 ppm Cl_2

HALOACETIC ACID FORMATION POTENTIAL – 7 Day Incubation

HAAFP Analysis

Monochloroacetic Acid mg/L	**= < 0.002**
Dichloroacetic Acid mg/L	**= 0.011**
Trichloroacetic Acid mg/L	**= 0.010**
Monobromoacetic Acid mg/L	**= 0.001**
Dibromoacetic Acid mg/L	**= 0.017**

TFP mg/L = 0.039

Reviewed by Jim Pierce / Alan Boyd

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Environmental Chemists, Inc.
6602 Windmill Way • Wilmington, North Carolina 28405
(910) 392-0223 Phone • (910) 392-4424 Fax EChemW@aol.com
NCDENR: DWQ Certificate #94, DLS Certificate #37729

VOLATILE ORGANIC CHEMICALS ANALYSIS (VOCs)

Note: All information must be supplied for compliance credit.

WATER SYSTEM ID #: _____ **County:** Dare

Name of Water System: Rodanthe TW-3 – Both Screens

Sample Type: ☐ Entry Point X Special/Non-compliance

Location Where Collected: Well
(Note: Compliance samples MUST be collected at the Entry Point)

Location Code: _____

Collection Date	Collection Time
04/23/08 (MM/DD/YY)	13:30 PM (Specify AM or PM)

Collected By: Kelley Smith (Please Print)

Mail Results to (water system representative):

GMA

4300 Sapphire Ct. Suite 100 **Phone #:** (____) _____

Greenville, NC 27834 **Fax #:** (____) _____

LABORATORY ID #: 37729 ☐ SAMPLE UNSATISFACTORY ☐ RESAMPLE REQUIRED

CONTAM CODE	CONTAMINANT	METHOD CODE	REQUIRED REPORTING LIMIT (R.R.L.)	NOT DETECTED (i.e. < R.R.L.) (X)	QUANTIFIED RESULTS*	ALLOWABLE LIMIT
2030	p-Isopropyltoluene	502.2	0.0005 mg/L	X	___.______ mg/L	N/A
2210	Chloromethane	502.2	0.0005 mg/L	X	___.______ mg/L	N/A
2212	Dichlorodifluoromethane	502.2	0.0005 mg/L	X	___.______ mg/L	N/A
2214	Bromomethane	502.2	0.0005 mg/L	X	___.______ mg/L	N/A
2216	Chloroethane	502.2	0.0005 mg/L	X	___.______ mg/L	N/A
2218	Fluorotrichloromethane	502.2	0.0005 mg/L	X	___.______ mg/L	N/A
2246	Hexachlorobutadiene	502.2	0.0005 mg/L	X	___.______ mg/L	N/A
2248	Naphthalene	502.2	0.0005 mg/L	X	___.______ mg/L	N/A
2378	1,2,4-Trichlorobenzene	502.2	0.0005 mg/L	X	___.______ mg/L	0.07 mg/L
2380	Cis-1,2-Dichloroethylene	502.2	0.0005 mg/L	X	___.______ mg/L	0.07 mg/L
2408	Dibromomethane	502.2	0.0005 mg/L	X	___.______ mg/L	N/A
2410	1,1-Dichloropropene	502.2	0.0005 mg/L	X	___.______ mg/L	N/A
2412	1,3-Dichloropropane	502.2	0.0005 mg/L	X	___.______ mg/L	N/A
2413	1,3-Dichloropropene	502.2	0.0005 mg/L	X	___.______ mg/L	N/A
2414	1,2,3-Trichloropropane	502.2	0.0005 mg/L	X	___.______ mg/L	N/A
2416	2,2-Dichloropropane	502.2	0.0005 mg/L	X	___.______ mg/L	N/A
2418	1,2,4-Trimethylbenzene	502.2	0.0005 mg/L	X	___.______ mg/L	N/A
2420	1,2,3-Trichlorobenzene	502.2	0.0005 mg/L	X	___.______ mg/L	N/A
2422	n-Butylbenzene	502.2	0.0005 mg/L	X	___.______ mg/L	N/A
2424	1,3,5-Trimethylbenzene	502.2	0.0005 mg/L	X	___.______ mg/L	N/A
2426	Tert-Butylbenzene	502.2	0.0005 mg/L	X	___.______ mg/L	N/A
2428	Sec-Butylbenzene	502.2	0.0005 mg/L	X	___.______ mg/L	N/A
2430	Bromochloromethane	502.2	0.0005 mg/L	X	___.______ mg/L	N/A
2941	Chloroform	502.2	0.0005 mg/L	X	___.______ mg/L	N/A

*Note: If result exceeds allowable limit, the laboratory must fax analytical results to the State within 48 hours # 8056 8-3722

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6602 Windmill Way • Wilmington, North Carolina 28405
(910) 392-0223 Phone • (910) 392-4424 Fax EChemW@aol.com
NCDENR: DWQ Certificate #94, DLS Certificate #37729

VOLATILE ORGANIC CHEMICALS ANALYSIS (VOCs)

Note: All information must be supplied for compliance credit.continued)

WATER SYSTEM ID #: Rodanthe TW-3

Location Code: Well

Collection Date	Collection Time
04/23/08 (MM/DD/YY)	13:30 PM (Specify AM or PM)

LABORATORY ID #: 37729

CONTAM CODE	CONTAMINANT	METHOD CODE	REQUIRED REPORTING LIMIT (R.R.L.)	NOT DETECTED ABOVE R.R.L. (X)	QUANTIFIED RESULTS*		ALLOWABLE LIMIT
2942	Bromoform	502.2	0.0005 mg/L	X	___.______	mg/L	N/A
2943	Bromodichloromethane	502.2	0.0005 mg/L	X	___.______	mg/L	N/A
2944	Chlorodibromomethane	502.2	0.0005 mg/L	X	___.______	mg/L	N/A
2955	Xylenes (Total)	502.2	0.0005 mg/L	X	___.______	mg/L	10.00 mg/L
2964	Dichloromethane	502.2	0.0005 mg/L	X	___.______	mg/L	0.005 mg/L
2965	o-Chlorotoluene	502.2	0.0005 mg/L	X	___.______	mg/L	N/A
2966	p-Chlorotoluene	502.2	0.0005 mg/L	X	___.______	mg/L	N/A
2967	m-Dichlorobenzene	502.2	0.0005 mg/L	X	___.______	mg/L	N/A
2968	o-Dichlorobenzene	502.2	0.0005 mg/L	X	___.______	mg/L	0.60 mg/L
2969	p-Dichlorobenzene	502.2	0.0005 mg/L	X	___.______	mg/L	0.075 mg/L
2976	Vinyl Chloride	502.2	0.0005 mg/L	X	___.______	mg/L	0.002 mg/L
2977	1,1,-Dichloroethylene	502.2	0.0005 mg/L	X	___.______	mg/L	0.007 mg/L
2978	1,1-Dichloroethane	502.2	0.0005 mg/L	X	___.______	mg/L	N/A
2979	Trans-1,2,-Dichloroethylene	502.2	0.0005 mg/L	X	___.______	mg/L	0.10 mg/L
2980	1,2-Dichloroethane	502.2	0.0005 mg/L	X	___.______	mg/L	0.005 mg/L
2981	1,1,1-Trichloroethane	502.2	0.0005 mg/L	X	___.______	mg/L	0.20 mg/L
2982	Carbon Tetrachloride	502.2	0.0005 mg/L	X	___.______	mg/L	0.005 mg/L
2983	1,2-Dichloropropane	502.2	0.0005 mg/L	X	___.______	mg/L	0.005 mg/L
2984	Trichloroethylene	502.2	0.0005 mg/L	X	___.______	mg/L	0.005 mg/L
2985	1,1,2-Trichloroethane	502.2	0.0005 mg/L	X	___.______	mg/L	0.005 mg/L
2986	1,1,1,2-Tetrachloroethane	502.2	0.0005 mg/L	X	___.______	mg/L	N/A
2987	Tetrachloroethylene	502.2	0.0005 mg/L	X	___.______	mg/L	0.005 mg/L
2988	1, 1,2,2-Tetrachloroethane	502.2	0.0005 mg/L	X	___.______	mg/L	N/A
2989	Chlorobenzene	502.2	0.0005 mg/L	X	___.______	mg/L	0.10 mg/L
2990	Benzene	502.2	0.0005 mg/L	X	___.______	mg/L	0.005 mg/L
2991	Toluene	502.2	0.0005 mg/L	X	___.______	mg/L	1.00 mg/L
2992	Ethylbenzene	502.2	0.0005 mg/L	X	___.______	mg/L	0.70 mg/L
2993	Bromobenzene	502.2	0.0005 mg/L	X	___.______	mg/L	N/A
2994	Isopropylbenzene	502.2	0.0005 mg/L	X	___.______	mg/L	N/A
2996	Styrene	502.2	0.0005 mg/L	X	___.______	mg/L	0.10 mg/L
2998	n-Propylbenzene	502.2	0.0005 mg/L	X	___.______	mg/L	N/A

*Note: If result exceeds allowable limit, the laboratory must fax analytical results to the State within 48 hours

	DATE:	TIME:
ANALYSES BEGUN:	04/24/08 (MM/DD/YY)	12:20 PM (Specify AM or PM)
ANALYSES COMPLETED:	04/24/08 (MM/DD/YY)	04:20 PM (Specify AM or PM)

Laboratory Log #: 8056

Certified By: Jim Pierce Jim Pierce (Print and sign name)

COMMENTS:

REPORT # 8-3722

envirochem
Analytical & Consulting Chemists

Environmental Chemists, Inc.
6602 Windmill Way • Wilmington, North Carolina 28405
(910) 392-0223 Phone • (910) 392-4424 Fax EChemW@aol.com
NCDENR: DWO Certificate #94, DLS Certificate #37729

PESTICIDES AND SYNTHETIC ORGANIC CHEMICALS ANALYSIS (SOCs)

Note: All information must be supplied for compliance credit.

WATER SYSTEM ID #: _____ **County:** Dare

Name of Water System: Rodanthe TW 3 – Both Screens

Sample Type: ☐ Entry Point X Special/Non-compliance

Location Where Collected: Well
(Note: Compliance sample MUST be collected at the Entry Point.)

Location Code: _____

Collection Date	Collection Time
04/23/08 (MM/DD/YY)	13:30 PM (Specify AM or PM)

Collected By: Kelley Smith (Please Print)

Mail Results to (water system representative):

GMA - Jay Holley

4300 Sapphire Ct. Suite 100 **Phone #:** (____) _____

Greenville, NC 27834 **Fax #:** (____) _____

LABORATORY ID #: 37729 ☐ SAMPLE UNSATISFACTORY ☐ RESAMPLE REQUIRED

CONTAM CODE	CONTAMINANT	METHOD CODE	REQUIRED REPORTING LIMIT (R.R.L.)	NOT DETECTED (i.e. < R.R.L.) (X)	QUANTIFIED RESULTS*	ALLOWABLE LIMIT
2005	Endrin	508.1	0.00001 mg/L	X	___._____ mg/L	0.002 mg/L
2010	Lindane	508.1	0.00002 mg/L	X	___._____ mg/L	0.0002 mg/L
2015	Methoxychlor	508.1	0.0001 mg/L	X	___._____ mg/L	0.04 mg/L
2020	Toxaphene	508.1	0.001 mg/L	X	___._____ mg/L	0.003 mg/L
2021	Carbaryl	531.1	0.004 mg/L	X	___._____ mg/L	N/A
2022	Methomyl	531.1	0.004 mg/L	X	___._____ mg/L	N/A
2031	Dalapon	515.1	0.001 mg/L	X	___._____ mg/L	0.2 mg/L
2035	Di(2-ethylhexyl)adipate	525.2	0.0006 mg/L	X	___._____ mg/L	0.4 mg/L
2036	Oxamyl(vydate)	531.1	0.002 mg/L	X	___._____ mg/L	0.2 mg/L
2037	Simazine	508.1	0.00007 mg/L	X	___._____ mg/L	0.004 mg/L
2040	Picloram	515.1	0.0001 mg/L	X	___._____ mg/L	0.5 mg/L
2041	Dinoseb	515.1	0.0002 mg/L	X	___._____ mg/L	0.007 mg/L
2042	Hexachlorocyclopentadiene	508.1	0.0001 mg/L	X	___._____ mg/L	0.05 mg/L
2043	Aldicarb Sulfoxide	531.1	0.0005 mg/L	X	___._____ mg/L	N/A
2044	Aldicarb Sulfone	531.1	0.0008 mg/L	X	___._____ mg/L	N/A
2045	Metolachlor	508.1	0.0008 mg/L	X	___._____ mg/L	N/A
2046	Carbofuran	531.1	0.0009 mg/L	X	___._____ mg/L	0.04 mg/L
2047	Aldicarb	531.1	0.0005 mg/L	X	___._____ mg/L	N/A
2050	Atrazine	508.1	0.0001 mg/L	X	___._____ mg/L	0.003 mg/L
2051	Alachlor	508.1	0.0002 mg/L	X	___._____ mg/L	0.002 mg/L
2065	Heptachlor	508.1	0.00004 mg/L	X	___._____ mg/L	0.0004 mg/L

* Note: If result exceeds allowable limit, the laboratory must fax analytical results to the State within 48 hours.

8056 8-3722

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Analytical & Consulting Chemists

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6602 Windmill Way • Wilmington, North Carolina 28405
(910) 392-0223 Phone • (910) 392-4424 Fax EChemW@aol.com
NCDENR: DWQ Certificate #94, DLS Certificate #37729

PESTICIDES AND SYNTHETIC ORGANIC CHEMICALS ANALYSIS (SOCs) Page 7 of 9

(continued)
Note: All information must be supplied for compliance credit.

WATER SYSTEM ID #: Rodanthe TW-3
Location Code: TW-3

Collection Date	Collection Time
04/23/08 (MM/DD/YY)	13:30 PM (Specify AM or PM)

LABORATORY ID #: 37729

CONTAM CODE	CONTAMINANT	METHOD CODE	REQUIRED REPORTING LIMIT (R.R.L.)	NOT DETECTED ABOVE R.R.L. (X)	QUANTIFIED RESULTS*	ALLOWABLE LIMIT
2066	3-Hydroxycarbofuran	531.1	0.004 mg/L	X	___.___ mg/L	N/A
2067	Heptachlor Epoxide	508.1	0.00002 mg/L	X	___.___ mg/L	0.0002 mg/L
2070	Dieldrin	508.1	0.0002 mg/L	X	___.___ mg/L	N/A
2076	Butachlor	508.1	0.008 mg/L	X	___.___ mg/L	N/A
2077	Propachlor	508.1	0.006 mg/L	X	___.___ mg/L	N/A
2105	2,4-D	515.1	0.0001 mg/L	X	___.___ mg/L	0.07 mg/L
2110	2,4,5-TP (Silvex)	515.1	0.0002 mg/L	X	___.___ mg/L	0.05 mg/L
2274	Hexachlorobenzene	508.1	0.0001 mg/L	X	___.___ mg/L	0.001 mg/L
2298	Di(2-ethylhexyl)phthalate	525.2	0.00132 mg/L	X	___.___ mg/L	0.006 mg/L
2306	Benzo(a)pyrene	525.2	0.00002 mg/L	X	___.___ mg/L	0.0002 mg/L
2326	Pentachlorophenol	515.1	0.00004 mg/L	X	___.___ mg/L	0.001 mg/L
2356	Aldrin	508.1	0.0002 mg/L	X	___.___ mg/L	N/A
2383	PCB's	508.1	0.0001 mg/L	X	___.___ mg/L	0.0005 mg/L
2440	Dicamba	515.1	0.001 mg/L	X	___.___ mg/L	N/A
2595	Metribuzin	508.1	0.0008 mg/L	X	___.___ mg/L	N/A
2931	DBCP	504.1	0.00002 mg/L	X	___.___ mg/L	0.0002 mg/L
2946	Ethylene Dibromide (EDB)	504.1	0.00001 mg/L	X	___.___ mg/L	0.00005 mg/L
2959	Chlordane	508.1	0.0002 mg/L	X	___.___ mg/L	0.002 mg/L

*Note: If result exceeds allowable limit, the laboratory must fax analytical results to the State within 48 hours.

	DATE:	TIME:
ANALYSES BEGUN:	04/25/08 (MM/DD/YY)	07:00 AM (Specify AM or PM)
ANALYSES COMPLETED:	05/13/08 (MM/DD/YY)	03:30 PM (Specify AM or PM)

Laboratory Log #: 8056

Certified By: Jim Pierce Jim Pierce
(Print and sign name)

COMMENTS: Alvin Brew

REPORT # 8-3722

Florida Radiochemistry Services, Inc.

5456 Hoffner Ave., Suite 201 Orlando, FL 32812
Phone: (407) 382-7733 Fax: (407- 382-7744

Radiological Analysis

Note: ALL information must be supplied for compliance credit

WATER SYSTEM ID #: __-___-____ **County:** Dare

Name of Water System: RWS TW3

Sample Type: ☐ Single Sample - Entry Point ☐ Composite Sample – Entry Point ☒ Special/Non-compliance

Facility ID No. ___

Sample Point: ___

Mail Results to (systems representative):
Environchem
6602 Windward Way
Wilmington NC 28405

Telephone #: (___) _____

Fax #: (___) _____

Responsible Person's email: _____

Collection Data

Period	Date (MM/DD/YY)	Time (Specify AM or PM)	Collected By
Single or 1st Qtr	04/22/05	1:30 PM	HS
2nd Qtr	__/__/__	__:__ M	
3rd Qtr	__/__/__	__:__ M	
4th Qtr	__/__/__	__:__ M	

LABORATORY ID #: 12709 ☐ SAMPLE UNSATISFACTORY ☐ RESAMPLE REQUIRED

Contam Code	Contaminant	Method Code	Required Reporting Limit (R.R.L.)	NOT Detected (i.e. <R.R.L.) (X)	Quantified Results*	Counting Error	Allowable Limit
4002	Gross Alpha	EPA 900.0	3 pCi/L	☒	___.___ pCi/L	2.8	15 pCi/L
4004	Radon		100 pCi/L	☐	___.___ pCi/L	__.___	N/A
4006	Uranium	EPA 908.0	0.67 pCi/L	☒	___.___ pCi/L	0.5**	20.1 pCi/L
4010	Combined Radium	N/A	N/A	N/A	___.___ pCi/L	__.___	5 pCi/L
4020	Radium 226	EPA 903.1	1 pCi/L	☒	___.___ pCi/L	0.1	3 pCi/L
4030	Radium 228	EPA Ra-05	1 pCi/L	☒	___.___ pCi/L	0.6	2 pCi/L
4100	Gross Beta	EPA 900.0	4 pCi/L	☐	22.2 pCi/L	3.0	50 pCi/L

*Note: If result exceeds allowable limit, the laboratory must fax analytical results to the State within 48 hours.
**Note: Not applicable if using ICP-MS

	Date: (MM/DD/YY)	Time: (Specify AM or PM)
Analyses Begun:	05/02/08	09:15 AM
Analyses Completed:	05/13/08	11:41 AM

Laboratory Log #: 0804267-02 **Certified by:** Mike Naumann / Mike Naumann

Comments: # 8056

Report # 8-3722

envirochem
Analytical & Consulting Chemists

Environmental Chemists, Inc.
6602 Windmill Way, Wilmington, North Carolina 28405
910•392•0223 phone 910•392•4424 fax Email: EChemW@aol.com
NCDENR: DWQ Certificate #94; DLS Certificate #37729

01-15-03

COLLECTION SHEET FOR DRINKING WATER

Water System ID#: ____ - ____ - ____ County: Dare

Name of System: RODANTHE TW3 - BOTH SCREENS

Results to: GMA

4300-100 SAPPHIRE CT.

GREENVILLE NC 27834

Phone #: (252) 758-3310

Fax #:

Email or Cell #: Kelly@GMA-NC.com

( ) Chlorinated
Free ____
Total ____

*Sample Type: (E=Entry Point; D=Distribution; M=Maximum; S=Special/Non-Compliance)

Requested Test/Method	Collection Date	Collection Time	Sample Type	Location Code	Disp.	Location Where Collected	Lab #	Permit #
( )Nitrate ( ) Nitrite								
(X)Inorganics, Regular ( ) New Well ( )	4-23-05	1330						
(X)Trihalomethanes (THM)/HAAFP							80560	6-372
(X)Voc by EPA 502.2 or ( ) EPA 524.2								
(X)SOC *Check appropriate methods listed below:*								
( )EPA Method 504 (EDB + DBCP)								
( )EPA Method 507 (N&P Compounds)								
( )EPA Method 508 (Chlorinated Pesticides)								
( )EPA Method 515 (Chlorinated Herbicides)								
( )EPA Method 525.1 (Organic Compounds)								
( )EPA Method 531.1 (Carbamates)								
(X)Other Rads								
(X)Other Arsenic J/strontium		1335						

Collected by: Kelly Smith Date: 4-23-05 Time: 1340

Relinquished by: Kelly A. Smith Date/Time: 4-23-05 1525PM Received By: Date/Time:

Delivered By: Received by: Date/Time: 4/24/05 102-A

Temperature When Sampled: 64.1° Initials: KAS Temperature When Received: 2°C Initials: JCM

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6602 Windmill Way • Wilmington, North Carolina 28405
(910) 392-0223 Phone • (910) 392-4424 Fax
EChemW@aol.com
NCDENR: DWQ Certificate #94, DLS Certificate #37729

NEW WELL INORGANIC CHEMICAL ANALYSIS

Note: All information must be supplied for plan review credit.

WATER SYSTEM ID #: * New Well * **County:** Dare

Name of Water System: Rodanthe TW- 3

Sample Type: X Source for Plan Review

Location Where Collected: Well – Top Screen
(Note: Compliance sample MUST be collected at the entry point.)

Location Code: N/A **Collection Date** **Collection Time**

Collected By: Kelley Smith (Please Print) 04/24/08 (MM/DD/YY) 12:45 PM (Specify AM or PM)

Mail Results to (water system representative):

GMA - Jay Holley
4300 Sapphire Ct. Suite 100
Greenville, NC 27834

Phone #: (252) 758-3310
Fax #: ( )

*NOTE: Please complete portion above double line on Page 2.

LABORATORY ID #: 37729 ☐ SAMPLE UNSATISFACTORY ☐ RESAMPLE REQUIRED

CONTAM CODE	CONTAMINANT	METHOD CODE	REQUIRED REPORTING LIMIT (R.R.L.)		NOT DETECTED (i.e. < R.R.L) (X)	QUANTIFIED RESULTS*		ALLOWABLE LIMIT
0100	Turbidity	SM2130 B	0.10	ntu	☐	8.4	NTU	N/A
1005	Total Arsenic	EPA 200.9	0.005	mg/L	X	.	mg/L	0.010 mg/L
-	Dissolved Arsenic	EPA 200.9	0.005	mg/L	X	.	mg/L	-
1010	Barium	EPA 200.7	0.400	mg/L	X	.	mg/L	2.000 mg/L
1015	Cadmium	EPA 200.7	0.001	mg/L	X	.	mg/L	0.005 mg/L
1016	Calcium	EPA 200.7	0.001	mg/L	☐	4.43	mg/L	N/A
1017	Chloride	SM 4500 Cl-B	5.0	mg/L	☐	288.	mg/L	250.0 mg/L
1020	Chromium	EPA 200.7	0.020	mg/L	X	.	mg/L	0.100 mg/L
1022	Copper	EPA 200.7	0.050	mg/L	X	.	mg/L	1.300 mg/L
1024	Cyanide	SM 4500 CN F	0.040	mg/L	X	.	mg/L	0.200 mg/L
1025	Fluoride	SM 4500 F B	0.100	mg/L	☐	1.8	mg/L	4.000 mg/L
1028	Iron	EPA 200.7	0.060	mg/L	X	.	mg/L	0.300 mg/L
1030	Lead	EPA 200.9	0.003	mg/L	X	.	mg/L	0.015 mg/L
1031	Magnesium	EPA 200.7	1.0	mg/L	☐	5.9	mg/L	N/A
1032	Manganese	EPA 200.7	0.010	mg/L	X	.	mg/L	0.050 mg/L
1035	Mercury	EPA 245.1	0.0004	mg/L	X	.	mg/L	0.002 mg/L

*Note: Concentrations for Lead and Copper are action levels, not MCLs.

8175 8-3782

envirochem
Analytical & Consulting Chemists

Environmental Chemists, Inc.
6602 Windmill Way • Wilmington, North Carolina 28405
(910) 392-0223 Phone • (910) 392-4424 Fax
EChemW@aol.com
NCDENR: DWQ Certificate #94, DLS Certificate #37729

NEW WELL INORGANIC CHEMICAL ANALYSIS

(Continued)
Note: All information must be supplied for plan review credit.

WATER SYSTEM ID #: New Well **Collection Date** 04/24/08 (MM/DD/YY) **Collection Time** 12:45 PM (Specify AM or PM)

Location Code: Rodanthe TW-3 – Top Screen

LABORATORY ID #: 37729

CONTAM CODE	CONTAMINANT	METHOD CODE	REQUIRED REPORTING LIMIT (R.R.L.)	NOT DETECTED (i.e. < R.R.L) (X)	QUANTIFIED RESULTS*	ALLOWABLE LIMIT
1036	Nickel	EPA 200.7	0.100 mg/L	X	. mg/L	N/A
1040	Nitrate	SM 4500 NO_3-E	1.00 mg/L	X	. mg/L	10.00 mg/L
1041	Nitrite	SM 4500 NO_2-B	0.10 mg/L	X	. mg/L	1.00 mg/L
1045	Selenium	EPA 200.9	0.010 mg/L	X	. mg/L	0.050 mg/L
1050	Silver	EPA 200.7	0.05 mg/L	X	. mg/L	0.100 mg/L
-	Total Silica	EPA 200.7	-	☐	11.3 mg/L	-
-	Dissolved Silica	EPA 200.7	-	☐	11.3 mg/L	-
1052	Sodium	EPA 200.7	1.0 mg/L	☐	450. mg/L	N/A
1055	Sulfate	SM 426 C	5.0 mg/L	X	. mg/L	250.0 mg/L
1068	Acidity	SM 2310 B	1.0 mg/L	X	. mg/L	N/A
1074	Antimony	EPA 200.9	0.003 mg/L	X	. mg/L	0.006 mg/L
1075	Beryllium	EPA 200.7	0.002 mg/L	X	. mg/L	0.004 mg/L
1085	Thallium	EPA 200.9	0.001 mg/L	X	. mg/L	0.002 mg/L
-	Strontium	EPA 200.7	-	☐	0.253 mg/L	
1095	Zinc	EPA 200.7	1.0 mg/L	X	. mg/L	5.0 mg/L
1905	Color	SM 2120 B	5 units	☐	35. Units	15 units
1915	Total Hardness	SM 2340 C	1.0 mg/L	☐	53.0 mg/L	N/A
1925	pH	SM 4500 H^+-B	N/A	N/A	8.17 Units	6.50 – 8.50 units
1927	Alkalinity	SM 2320 B	1.0 mg/L	☐	650. mg/L	N/A
1930	Total Dissolved Solids	SM 2540 C	10.0 mg/L	☐	1285. mg/L	500.0 mg/L

*Note: Concentrations for Lead and Copper are action levels, not MCLs.

	DATE:	TIME:
ANALYSES BEGUN:	04/25/08 (MM/DD/YY)	08:00 AM (Specify AM or PM)
ANALYSES COMPLETED:	05/09/08 (MM/DD/YY)	05:00 PM (Specify AM or PM)

Laboratory Log #: 8175 **Certified By:** Jim Pierce Alina Brown (Print and sign name)

COMMENTS: **REPORT #** 8-3782

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Analytical & Consulting Chemists

Environmental Chemists, Inc.
6602 Windmill Way, Wilmington, North Carolina 28405
910•392•0223 phone 910•392•4424 fax Email: EChemW@aol.com
NCDENR: DWQ Certificate #94; DLS Certificate #37729 01-15-03

COLLECTION SHEET FOR DRINKING WATER

Water System ID#: _____ - _____ - _____ County: Dare

Name of System: RODANTHE TW3 - TOP SCREEN

Results to: GMA

4300-100 SAPPHIRE CT.

GREENVILLE NC 27834

Phone #: (252) 758-3310

Fax #:

Email or Cell #:

( ) Chlorinated

Free _____

Total _____

*Sample Type: (E=Entry Point; D=Distribution; M=Maximum; S=Special/Non-Compliance)

Requested Test/Method	Collection Date	Collection Time	Sample Type*	Location Code	Pres.	Location Where Collected	Lab ID	Report No.
( )Nitrate ( ) Nitrite	4-24-08						8175	8-3782
(X)Inorganics, Regular ( ) New Well ( )		1245						
( )Trihalomethanes (THM)								
( )Voc by EPA 502.2 or ( ) EPA 524.2								
( )SOC *Check appropriate methods listed below:*								
( )EPA Method 504 (EDB + DBCP)								
( )EPA Method 507 (N&P Compounds)								
( )EPA Method 508 (Chlorinated Pesticides)								
( )EPA Method 515 (Chlorinated Herbicides)								
( )EPA Method 525.1 (Organic Compounds)								
( )EPA Method 531.1 (Carbamates)								
(X)Other Silica/strontium								
(X)Other +UCI As V	9/24/08	1300						

Collected by: Kelly Smith Date: 4-24-08 Time: 1300

Relinquished by: Kelly G. Lig Date/Time: 4-24-08 1431 Received By: KRS Date/Time: 4/24/08 2:33

Delivered By: Received by: 2C Date/Time: 4/25/8 1015 A

KRS 4/24/08 430

Temperature When Sampled: _____ Initials: _____ Temperature When Received: 1°C Initials: JC