Professional Services

J. W. Corbett Wildlife Management Area Hydrologic Assessment



Florida Fish and Wildlife Conservation Commission FWC - 14275

FINAL Geotechnical Data Report

January 28, 2016

Prepared For:



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1.0 Data Acquisition Summary

Objectives

This data report presents the results of the geotechnical engineering services, including soil boring, laboratory testing of soil samples, monitoring well installation and pumping/slug tests for the project site, as framed and limited in the Statement of Work issued with the subconsultant agreement between South Florida Engineering and Consulting, LLC (SFEC) and Gannett Fleming, Inc. (GF) and performed by GF, as a subconsultant to SFEC, a prime consultant under the contract (FWC-14275) between Florida Fish and Wildlife Conservation Commission (FWC) and SFEC.

A SPT soil boring, and monitoring well installations along with field permeability pumping tests were conducted to provide pertinent soil subsurface information. Refer to **Figure 1** for the location of the GW monitoring wells and boring location plan, as specified by SFWMD.

Scope of Work

The Scope of Work included the following task activities:

- Drilling and Sampling with SPT soil boring, Sample Classification, and Laboratory Analysis of Unconsolidated Samples. (Tasks 2.1, 2.2 & 2.3)
- Piezometers Installation, Well Completion. (Tasks 2.4 & 2.5)
- Borehole Geophysical Logging. (Task 2.6)
- Slug Tests and Constant Head Field Permeability Tests. (Task 2.7)

Collaboration Entities

- Drilling and Sampling with SPT soil boring Centerline Drilling, Inc.
- Soil Sample Classification, and Laboratory Analysis of Unconsolidated Samples Gannett Fleming, Inc.
- Piezometers Installation, Well Completion Centerline Drilling, Inc.
- Borehole Geophysical Logging RMBAKER LLC.
- Slug Tests and Constant Head Field Permeability Tests Gerhardt M. Witt & Associates, Inc.
- Surveying Erdman Anthony

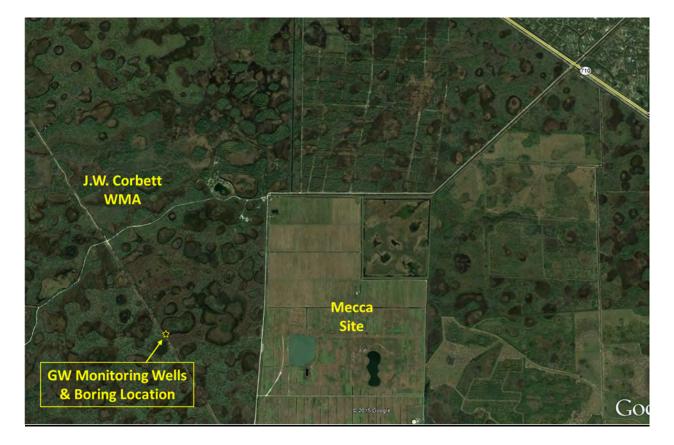


Figure 1. GW Monitoring Wells & Boring Location Plan

2.0 Site Conditions

Regional and Local Geology

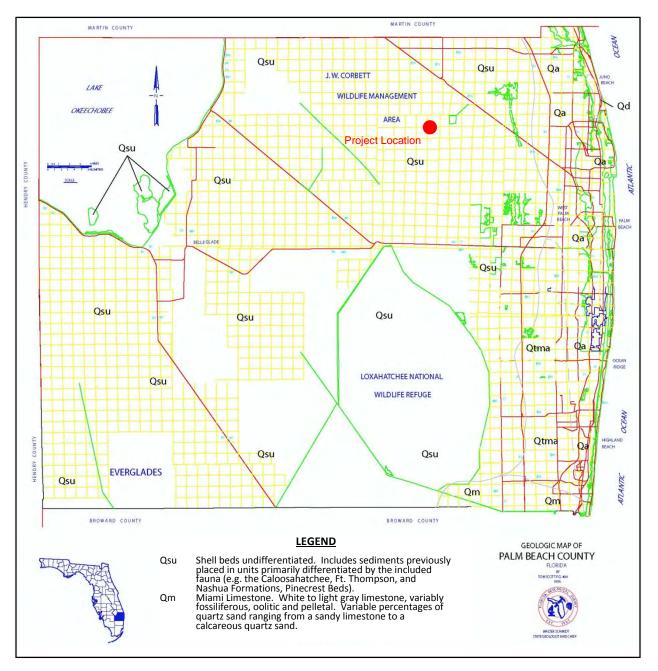
In Palm Beach County, the surficial sediments are comprised of quartz and calcareous sands, shell, and limestone with occasional sandstone (**Figure 2**). These sediments were deposited one to five million years ago during the Pleistocene and Pliocene Epochs. The geologic materials that underlie Palm Beach County were deposited in a mixture of environments that range from high energy beach (typically sands) to low energy lagoon (typically silts and clays), which may also represent both freshwater and marine environments. The geologic formations within the Pleistocene Epoch are the Pamlico Sand, the Anastasia Formation, and the Fort Thompson Formation. The Tamiami Formation delineates the Pliocene Epoch and the Hawthorn Group sediments delineate the Miocene time frame of 25 million years ago. The sediments of the Hawthorn Group underlie the Tamiami Formation. Together they combine to form a thickness ranging from 100 feet in western parts of the county to approximately 300 feet in eastern parts of the county.

Regional and Local Soils

The soil associations in Palm Beach County Area have been grouped into four general kinds of landscapes for broad interpretative purposes as follows (**Figure 3**):

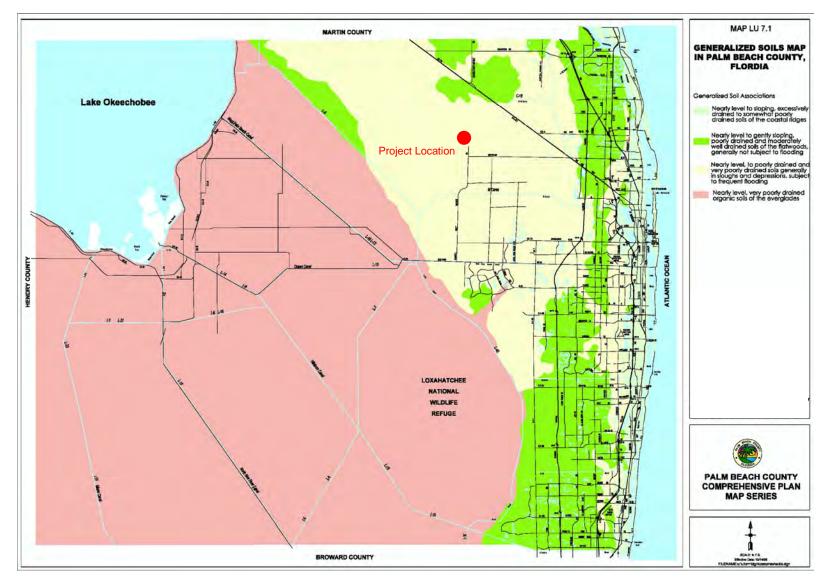
- The eastern coast consist mainly of nearly level to sloping, excessively drained soils that are sandy to a depth of 80 inches or more, but there are also moderately well drained to somewhat poorly drained soils that are mixtures of sand and shell fragments. Many areas have been modified and are in urban use.
- The eastern third of the county, just west of the coastal ridge consist mainly
 of nearly level, poorly drained soils and nearly level to gently sloping,
 moderately well drained soils on low ridges, all of which have a weakly
 cemented layer in the subsoil; and nearly level, poorly drained soils that have
 a loamy subsoil. Most areas of these soils are not subject to flooding, but
 small scattered areas in sloughs and depressions are frequently flooded.
- The east central part consist mainly of nearly level, poorly and very poorly drained soils that have a loamy subsoil, some of which have a thin organic surface layer; poorly drained sandy soils; and poorly drained soils that rest on limestone. These soils are mostly in low sloughs and depressions that are subject to frequent flooding and covered with water for long periods.
- The western part, including the Everglades consist mainly of nearly level, very poorly drained organic soils, some of which rest on limestone.

The J.W. Corbett Wildlife Management Area is located in the east central part of Palm Beach County and thus the soils underlying the project location area represent the soil characteristics of the third group of soil groupings above.









3.0 SPT Soil Boring

One (1) Standard Penetration Test (SPT) soil boring was conducted to characterize the subsurface conditions. The boring location is shown in **Figure 1**, and the soil boring logs were compiled in **Appendix A**.

Boring Logs

The SPT soil boring was drilled using mud rotary methods, and samples of the materials were obtained using SPT procedures described in **ASTM D1586**. SPT samples were obtained continuously for the 100-foot depth. The borehole was sealed with cement-bentonite grout upon completion. The soil boring summary is listed on **Table 1**.

Table 1. Soil Boring Summary

Boring	GPS L	ocation	Ground Elevation, ft NAVD88
Number	Latitude	Longitude	(estimated from DEM)
MFEBBH25	26° 50' 10"N	80° 18' 21"W	21.00

The soil boring log is included in **Appendix A**.

Representative samples from the boring were tested for index properties including moisture content (**ASTM D2216**), organic content (**ASTM D2974**), and grain size distribution (**ASTM C136**). The laboratory testing result table was included in **Appendix B**.

Subsurface Materials Encountered

Subsurface materials encountered in the borings generally consist of natural sandy soils within the undifferentiated shell bed and limestone formation associated with Caloosahatchee, Ft. Thompson, and Nashua Formations, Pinecrest Beds.

The upper soils, at depths ranging from 0 to 32 ft below ground surface (bgs), are composed of loose to medium dense dark gray sand with some shell fragments.

The underlying soils, at depths ranging from 32 to 60 ft bgs, are composed of dense to very dense gray sand with trace of shell fragments. These soils have an origin of limestone formation, based upon the HCl reaction.

The underlying soils, at depths ranging from 60 to 100 ft bgs, are composed of medium dense to dense silty gray fine sand with trace of shell fragments.

Groundwater Levels

Groundwater depth is located at ground surface.

4.0 Geophysical Borehole Logging

Geophysical logging and borehole imaging was performed by RMBAKER LLC on October 1, 2015 in accordance with SFWMD logging specifications. The intention of the logging and borehole imaging is to provide the in situ high resolution downhole data about the geologic formation(s) encountered. The logging data for the pilot borehole was presented as a series of downhole curves and images alongside summary information for lithology and relative soil density. This information collected will be provided to the SFWMD for their use and continuing efforts to characterize the hydrogeologic framework of the site.

The logging was performed on a 100 foot deep mudded pilot borehole using a variety of techniques (acoustic televiewer, caliper, natural gamma, dual induction, electric and sonic). The logging data collected was specified by the SFWMD as part of the overall geotechnical testing program. Each logging tool was advanced into the borehole using a logging cable and winch. Data was collected while trolling the tool from the bottom upward to the ground surface. The data was collected on a laptop computer and processed to form the completed logs provided herein. Logging data was provided in both PDF and .las ascii forms.

The SFWMD logging specifications called for the appropriate use of a video camera, optical televiewer or acoustic televiewer imaging device in the pilot hole. Given that the pilot hole was mud-filled, the only option was to utilize an acoustic televiewer. The HRAT tool (high resolution acoustic televiewer) used a sonic beam to record the first reflection time and amplitude of the inside of the borehole. The data was presented in the logs as a bitmap image of an unwrapped borehole. For the most part the HRAT imaging technique was not able to resolve bedding patterns or structural aspects of any limestone layers. The HRAT imaging of the borehole wall was partially impeded by the presence of the drilling mud and mud-cake loaded with sand, silt and shell material.

The dual induction method appeared to produce superior data as compared to the standard normal resistivity method, with more indications of sediment layering and variable porosity conditions. There also appeared to be a loose correlation between the dual induction resistivity curves and the SPT N-values, with higher resistivity layers corresponding to higher N-values. This relationship was presumably triggered by the combined increased presence of silts and clays in lower density sediments and the increased total porosity of the higher density sediments, although this relationship would require laboratory data as confirmation.

The SFWMD logging specifications called for a calculation of sonic porosity from the interval velocity (slowness velocity) of the formation. This calculation was complicated by the highly variable and unconsolidated nature of the sediments encountered, with sand (either siliceous or calcareous) being the predominant sediment type noted in the

sediment logs. We utilized a matrix velocity value (58.8 µsec/ft) consistent with highly unconsolidated "sandstone" in order to calculate the sonic porosity utilizing the interval velocity (DT) measured by our sonic logging tool. Table 2 lists the logging tools and their log types / codes utilized for geophysical logging and borehole imaging.

Logging Tool	Logs	Log Code
Caliper	Borehole diameter	CAL
Caliper		
	Natural gamma	GAMM
Dual Induction	Deep formation resistivity	ILD
	Shallow formation resistivity	ILM
Electric	Single point resistance	RES
	Spontaneous potential	ESP
	64 inch normal resistivity	RLN
	32 inch normal resistivity	R32
	16 inch normal resistivity	RSN
	8 inch normal resistivity	R8
Sonic	Interval velocity	DT
	Variable density log	RX3
	Calculated sonic porosity	SONIC POROSITY
High Resolution Acoustic	Travel time image	TRAVEL TIME
Televiewer		
	Amplitude image	AMPLITUDE

Table 2. Geophysical Borehole Logging Tools, Logs, and Log Codes

Source: RMBAKER LLC, 8600 Old Bridge Lane, Orlando FL 32819. Note: Below is the description of the information that can be reasonably obtained for the logs performed at this site. A more complete reference for a broad discussion of the possible information from logging is outlined in the publication "Borehole Geophysics Applied to Ground-Water Investigations", USGS Techniques of Water Resources Investigations, Chapter E2, by W. Scott Keys (1990).

Information from each log

Caliper: A caliper log is a measure of borehole diameter, and the presence of washouts and natural voids can be determined.

Natural Gamma: The presence of clays and/or phosphates will create gamma curve spikes as compared to the relatively low gamma signals from siliceous and calcareous detrital materials (sand, silt, shell and limestone).

Dual Induction: Shallow and deep penetrating induction dipoles measure the decay of an electrical current induced within the formation. The resultant resistivity curve data is a bulk measure of mineralogy, fluid chemistry and total porosity. Lower resistivity would be associated with an increase in fines content and/or a decrease in porosity. Higher resistivity would be associated with a decrease in fines content (more highly washed sediment) and/or an increase in porosity.

Electric:

Single point resistance: The single point resistance is a focused measure of the electrical resistance of the surface of the borehole sidewall.

Spontaneous potential: The spontaneous potential is a measure of the ambient electrical potential between two electrodes, and is used primarily as an indicator of changes in gross lithology.

Normal resistivity: The normal resistivities are measured in four layers with varying electrical current penetration into the formation. The resultant resistivity curve data is a bulk measure of mineralogy, fluid chemistry and total porosity. Lower resistivity would be associated with an increase in fines content and/or a decrease in porosity. Higher resistivity would be associated with a decrease in fines content (more highly washed sediment) and/or an increase in porosity.

Sonic: The sonic sonde measures the interval acoustic velocity of the formation, which is the difference in signal arrival time between two variably spaced receivers. The interval velocity can be used to estimate the primary porosity of the formation with an appropriately assumed matrix velocity value. The variable density log is a graphical representation of the acoustic signal returned to the nearest receiver.

Acoustic Televiewer: An acoustic televiewer is an imaging device that can provide a picture of conditions within the borehole when poor visibility prevents the use of optical/light based techniques. The compass-referenced televiewer data can be used to measure the strike and dip of structural surfaces within the borehole.

Referring to Geophysical Borehole Log, Appendix C (Pages 30 & 31)

- The elevated gamma values (>50 and <100 CPS) from 18 to 38 feet, including the spike at 20 feet, may indicate a slight increase in clay within the formation sediments. Background values of less than 50 CPS are typical of shell and calcareous sand. Gamma values up to 100 CPS are likely to be associated with interstitial clays.
- The SPT density and induction resistivity curves trend similarly with a notable dense layer from 40 to 57.5 feet. There lithology logs indicated a dense sand within this interval.
- There was no lithological variation in the logs that could be attributed as the cause of the rapid wiggle of the induction curves between 70 and 75 feet. The resistivity anomaly may be related to formation attributes such as porosity and bedding not represented by the relatively small split spoon samples.

5.0 Monitoring Well Installation and Data

In support of the project, the following work activities were conducted:

- One (1) monitoring 3-well cluster was installed at the SFWMD specified location by Centerline Drilling, Inc., a SFWMD-approved well-drilling subcontractor.
- One (1) aquifer pumping test and one (1) slug test was completed at each of the three (3) wells by Gerhardt M. Witt & Associates, Inc. (GWA), a subcontractor to Centerline Drilling. Each pumping test was completed for a relatively short duration, at a constant rate, and in accordance with industry standards.
- Pumping test water level drawdown data collected by GWA were analyzed by Gannett Fleming, utilizing the AQTESOLV computer program, to estimate aquifer hydraulic conductivity and transmissivity at the new monitoring well locations.

5.1 Well Cluster Location and Description

Welling Drilling

One (1) monitoring 3-well cluster (2-inch finished diameter) was installed at the SFWMD specified location (refer to **Figure 1**). Monitoring well cluster included three (3) wells, which were installed at various depths as noted in **Table 3**.

Well Name	Installation Depth (ft)
MFEB9-GW1	100
MFEB9-GW2	39
MFEB9-GW3	15

Table 3. Installation Depths of Monitoring Well Cluster

Well Logs and Well Permits

Appendix D shows the well logs to illustrate the boring log details as well as the well installation details. Also, included in **Appendix E** are a copy of the well installation permits filed with the Palm Beach County.

5.2 Pumping and Slug Tests Summary

Slug tests and constant-rate pumping tests were performed on October 15, 2015 at the three monitoring wells (MFEB9-GW1, -GW2, and –GW3) to evaluate aquifer hydraulic characteristics. The slug test water level displacement data and pumping test water level drawdown data were analyzed utilizing the AQTESOLV computer program to estimate aquifer hydraulic conductivity and transmissivity values. **Tables 4 and 5** summarize the monitoring well pumping and slug test data analysis results, respectively. The AQTESOLV analyses output reports are included in **Appendix F**.

Details Conducting Pumping and Slug Tests

A constant-rate pumping test was performed at each of the three (3) 2-inch diameter monitoring wells. The pumping tests were conducted by Gerhardt Witt & Associates (GWA) on behalf of Centerline Drilling under subcontract to SFEC. For the pumping tests, data loggers, recording at 4 sec intervals, were installed in the wells.

First, the deep well (MFEB9-GW1) was pumped for 1 hr. The pumping rate was maintained at a constant rate of 6.5 gpm during the pumping test. Then the pump was stopped after the water level in the pumping well stabilized, and the data on the recovery to the initial condition was recorded.

After deep well recovered, the middle well (MFEB9-GW2) was pumped for 1 hr. The pumping rate was maintained at a constant rate of 5.9 gpm during the pumping test. Then the pump was stopped after the water level in the pumping well stabilized, and the data on the recovery to the initial condition was recorded.

After middle well recovered, the shallow well (MFEB9-GW3) was pumped for 1 hr. The pumping rate was maintained at a constant rate of 2.3 gpm during the pumping test. Then the pump was stopped after the water level in the pumping well stabilized, and the data on the recovery to the initial condition was recorded.

Manual readings on water levels were obtained from each well throughout each pumping test.

For the slug tests, data loggers, recording at 4 sec intervals, were installed in the wells. The slug test was also conducted by GWA on behalf of Centerline Drilling under subcontract to SFEC. The slug test was performed by filling each monitoring well with water to the top and then recording the drop of water in the well. The slug test was performed three (3) times on each well.

Monitoring Well Aquifer Tests Analyses Summary

The well pumping test and slug test data obtained in the field were provided by GWA to Gannett Fleming to conduct the analyses to estimate hydraulic conductivity values of the subsurface material. These analyses were conducted using different aquifer model assumptions and curve-matching solutions available in the AQTESOLV computer program. These aquifer model solutions included the Hantush and the Neuman-Witherspoon solutions for leaky aquifers, the Neuman solution for unconfined aquifers, and the Bouwer-Rice solution for unconfined aquifers.

The pumping test drawdown data were analyzed using the Hantush and the Neuman-Witherspoon leaky aquifer model solutions. The leaky aquifer model solutions were selected because borehole stratigraphy showed a possible aquitard located between about 40 to 60 feet below ground surface. In addition, the type-curve for the leaky aquifer solutions could be matched to both very early and later drawdown data collected at the wells (i.e., data collected in the first 10 to 60 minutes) during the pumping period. Therefore, these two solutions were considered more appropriate for the pumping test data analyses than other available solutions in the program.

The slug test recovery data were analyzed using the Bouwer-Rice unconfined aquifer model solution. The type-curve for this solution was matched to falling head data collected in the first one to two minutes after the water was displaced by the slug-in stress period, which was considered most appropriate for the analyses. The results of the analyses are shown on the enclosed table.

The variation of hydraulic conductivity values determined from the constant rate pumping test drawdown data versus the slug test data is likely a result in variations between the extent of aquifer stressed by the two types of tests, and the solutions used to analyze the data. The slug tests only displaced up to 3.6 feet of water in the test wells for several seconds, which likely resulted in very little displacement of water in the surrounding aquifer. The pumping tests applied more stress on the local aquifer over 60 minutes, which resulted in about 8 to 15 feet of drawdown in the test wells and drawdown in the surrounding aquifer. Therefore, the slug test displacement data used to determine the near-well aquifer characteristics may provide hydraulic conductivity results that are different than the results determined from longer-term pumping test data influenced by portions of the aquifer located farther from the well. In addition, if the drawdown data collected in the first minute of the pumping period were influenced by well bore storage, the leaky aquifer model solution results may underestimate the aquifer transmissivity and hydraulic conductivity.

It is worthy of special mention that similar lithologic units can have hydraulic conductivity values that vary. For example, within the L-8 FEB project domain (92 square miles) in Palm Beach County, reported values of hydraulic conductivity for similar lithologic units in the vicinity of the reservoir and adjacent local areas ranged from less than 1 ft/day to more than 100 ft/day and vary both spatially and vertically.

Table 4. Summary of Estimated Aquifer Values Determined from Pumping Test Data

	Estimated Pumping		Early Drawdown Data Curve-Matching using Hantush Soln.		Early Drawc Curve-Matching Witherspo	using Newman-		Average		
Well ID	Screened Interval (ft)	Aquifer Thickness (ft)	Test Rate (gpm)	Transmissivity (ft²/d)	Hydraulic Conductivity (ft/d)	Transmissivity (ft²/d)	Hydraulic Conductivity (ft/d)	Average Transmissivity (ft²/d)	Hydraulic Conductivity (ft/d)	
MFEB9- GW1	95.0- 100.0	40.0	6.5	30.0	0.75	27.1	0.68	28.6	0.71	
MFEB9- GW2	34.0-39.0	39.3	5.9	15.6	0.40	16.1	0.41	15.9	0.40	
MFEB9- GW3	10.0-15.0	39.3	2.3	23.5	0.60	17.8	0.45	20.7	0.53	

Table 5. Summary of Hydraulic Conductivity Values Determined From Slug Testing

	Screened	Estimated	Slug-in Test
Well ID	Interval (ft)	Aquifer Thickness (ft)	Hydraulic Conductivity (ft/d)
MFEB9-GW1	95.0-100.0	40.0	42.68
MFEB9-GW2	34.0-39.0	39.3	10.17
MFEB9-GW3	12.5-17.5	39.3	6.89

6.0 Data Results

This data report presents the results of the geotechnical data collection, including soil boring, laboratory testing of soil samples, monitoring well installation and pumping/slug tests for the project site, as framed and limited in the Statement of Work issued with the subconsultant agreement between South Florida Engineering and Consulting, LLC (SFEC) and Gannett Fleming, Inc. (GF) and performed by GF, as a subconsultant to SFEC, a prime consultant under the contract (FWC-14275) between Florida Fish and Wildlife Conservation Commission (FWC) and SFEC.

One (1) SPT soil boring and monitoring well installation, consisting of one (1) 3-well cluster, along with field pumping and slug tests were conducted to provide pertinent soil subsurface and hydraulic conductivity information.

Field surveying was conducted by Erdman Anthony to support the SPT soil boring and monitoring well installation which located the locations of the borehole and the wells with state plane coordinates and reference elevations in NAVD88 vertical datum. The field survey data report is included in **Appendix G**.

7.0 References

- American Society for Testing and Materials (ASTM), **ASTM D1586-11** Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils.
- American Society for Testing and Materials (ASTM), **ASTM D4220-95(2007)** Standard Practices for Preserving and Transporting Soil Samples.
- American Society for Testing and Materials (ASTM), **ASTM D2487-11** Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
- American Society for Testing and Materials (ASTM), **ASTM D2974-07** Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils.
- American Society for Testing and Materials (ASTM), **ASTM C136-06** Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- American Society for Testing and Materials (ASTM), ASTM D2216-10 Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
- Florida Geological Survey, Open File Map Series No. 65 (OFMS 65) Geologic Map of Palm Beach County, Florida, by T. Scott, 1993. Scale: 1:126,720.
- Palm Beach County, Palm Beach County Comprehensive Plan Map Series Map LU 7.1 – Generalized Soils Map in Palm Beach County, Florida. Effective October 14, 1999.
- Keys, W. S., Borehole Geophysics Applied to Ground-Water Investigations, USGS Techniques of Water Resources Investigations, Chapter E2, 1990.

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APPENDIX A

SOIL BORING LOGS (Borehole by Centerline Drilling, Inc.)



TEST BORING LOG

Boring Location 26° 50' 10" N, 80°18' 21" W

Project J. W. CORBETT WILDLIFE MANAGEMENT AREA

Ground Elevation +21.00 NAVD'88 (est. from survey)

Groundwater Depth 🗵 At Ground Surface

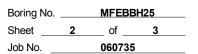
Boring No.		MFEBE	3H25
Sheet	1	of	3
Job No.		060735	5
Boring Cor	npleted	9/2	3/2015
Driller	SA	Y/DELM	AS
Drill Ria		ΜΑΝΠΑ	

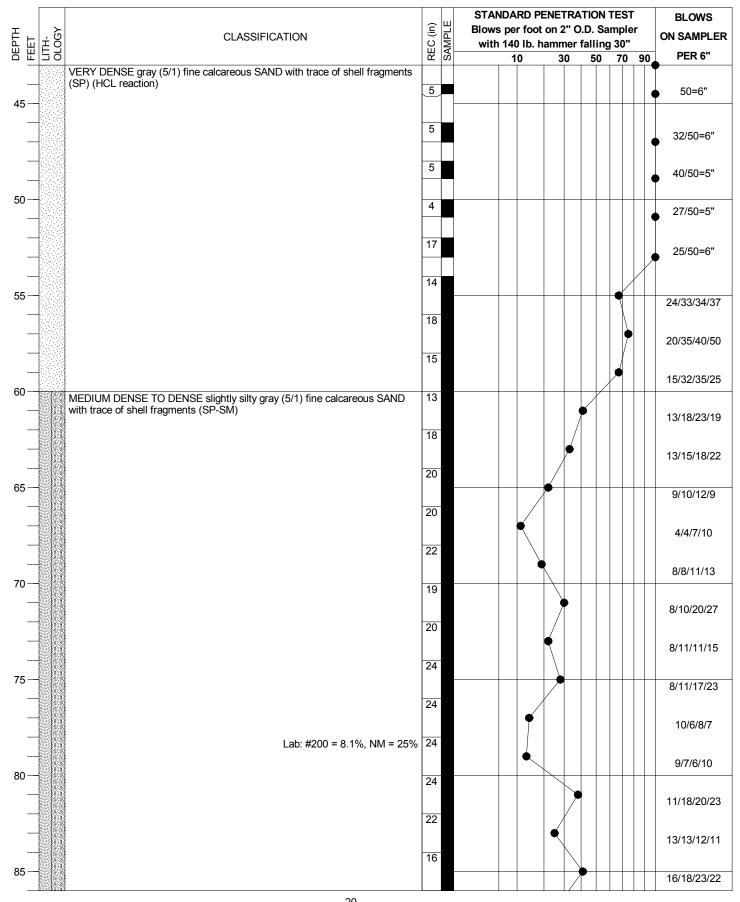
		Length of Casing Set	<u>110 (</u>					Rig			ANUAL
DEPTH FEET	ULTH- OLOGY	CLASSIFICATION	REC (in)	SAMDI E	Blows per with 140	ARD PENETRATION TEST er foot on 2" O.D. Sampler 40 lb. hammer falling 30" 10 30 50 70 90					BLOWS ON SAMPLER PER 6"
_		LOOSE black SAND with organics and roots (SP)	12 24								1/2/3/5
5		LOOSE light brownish gray (6/2) SAND with some shell fragments (limestone formation) (SP)	16								3/6/3/2
_		MEDIUM DENSE dark gray (4/1) fine SAND with little shell fragmets (SP) Lab: Org = 0.7%, NM = 18.6%	18								3/3/7/11
 10			17	-							4/7/16/14
_			17			×					9/10/11/11
15— —		MEDIUM DENSE dark gray (4/1) fine SAND with little shell fragmets (SP)	18 18								5/6/8/9
_		LOOSE gray (5/1) fine SAND with some shell fragments (SP)	15								8/8/11/7
20			16		•						7/4/3/3 3/3/5/3
_		VERY LOOSE to LOOSE dark gray (3/1) fine SAND with some shell	15 15								2/2/3/4
25 — —		fragments and trace of roots (SP)	16								1/2/1/2
_	-	Lab: #200 = 2.9%, NM = 27.6%	16			•					2/1/2/5
30 — 			20								6/10/11/12
-		DENSE to VERY DENSE gray (5/1) fine SAND with trace of shell fragments (SP) (HCL reaction)	24								5/11/17/20
35— — —			24								11/20/29/29 9/18/27/29
			15								11/20/27/27
- -			8								17/24/35/48 25/50=6"
_	<u> Politica (</u>	19	1								20/00-0



TEST BORING LOG

Project J. W. CORBETT WILDLIFE MANAGEMENT AREA







TEST BORING LOG

Project J. W. CORBETT WILDLIFE MANAGEMENT AREA

Boring No.		MFEBBI	125	
Sheet	3	of	3	
Job No.		060735		

DEPTH FEET LITH- OLOGY	CLASSIFICATION	REC (in)	SAMPLE	STANDARD PENETRATIOn Blows per foot on 2" O.D. with 140 lb. hammer fal	. Sampler	BLOWS ON SAMPLER	
の可思慮		H ا ا	SAN		50 70 90	PER 6 "	
	MEDIUM DENSE TO DENSE slightly silty gray (5/1) fine calcareous SAND with trace of shell fragments (SP-SM)	16 13				10/13/12/10	
90-		15		• •		10/11/12/10	
		15				10/13/12/10	
		16				18/18/14/12	
95 — 		18				11/15/12/11	
		18				15/12/13/11	
100	Boring Terminated @ 100.0'					7/9/20/17	
_							
_							
105—							
_							
 110							
_							
115— —							
120 —							
125—							
	21]	

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APPENDIX B

LABORATORY TESTING RESULTS TABLE (by Gannett Fleming, Inc.)

🎽 Gann	SUMMARY OF LABORATORY TESTING														
Client		South Florida Wat	outh Florida Water Management District												
Project Name		J.W. Corbett Wild	J.W. Corbett Wildlife Management Area												
Project Numbe	er	060735											_		
	-														
Sample ID	Sample #	Sample Depth (ft)			Sieve	Analysi	is (Per	cent Pa	issing)	1		Natural Moisture		berg s (%)	Organic Content
Sample ID	Sample #	Sample Depth (ft) From - To	3/8"	#4	Sieve /	Analysi #20	is (Pero #40	cent Pa #50	issing) #70	#100	#200			•	-
Sample ID S-5	Sample #		3/8"			-	•		•	1	#200	Moisture	Limit	:s (%)	Content
	-	From - To	3/8 " - 99.3			#20	•	#50	•	#100	#200 - 2.9	Moisture (%)	Limit LL	:s (%)	Content (%)

* No soil classification conducted for S-5. Only organic content is reported.

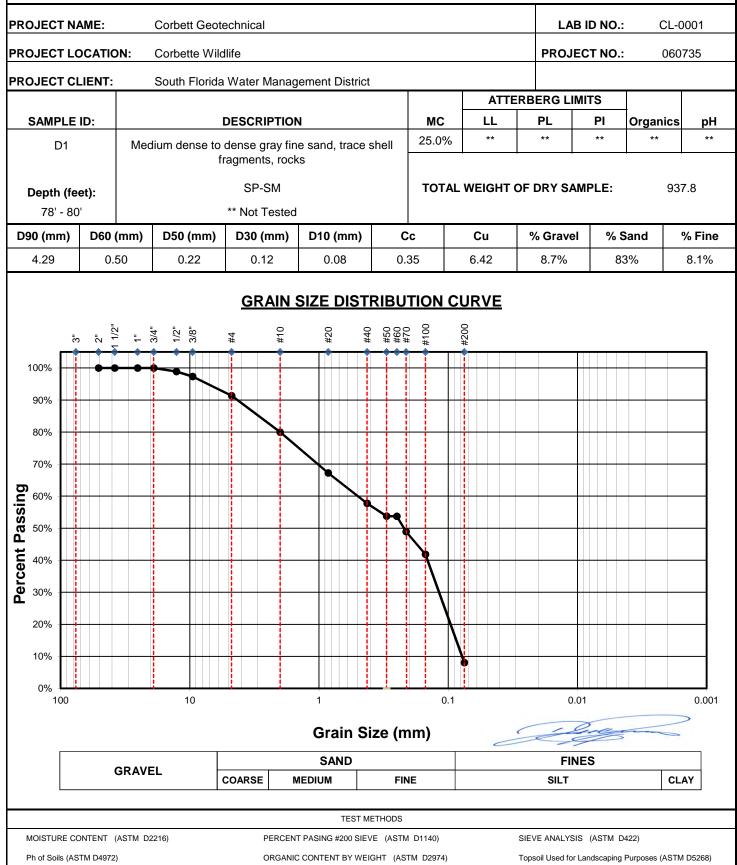


Gannett Fleming

1900 NW 40th Court Pompano Beach, FL 33064-8718 Phone: 954-972-7570

Fax: 954-972-6608

SOIL CLASSIFICATION - ASTM D 2487



FORM R0004, CLASSIFICATION REPORT, (Revised 7/2/12)

	SO	IL CLASS	IFICAT	ION - LAB OU	JTPUT					
PROJECT NAME: Corbett	Geotechnical			PROJECT NO.:	060735					
LAB ID NO.: CL-000	1 SAMPLE	LOCATION:		D1 78' - 8						
SAMPLE DESCRIPTION:	Medium dense	e to dense gra	y fine sar	nd, trace shell fragm	nents, rocks					
MOISTURE (CONTENT (ASTI	VI D2216)		PERCEN	T PASING #200 SIEVE (ASTM D1140)				
TARE NUMBER		J		TARE NUMBER		J				
WT. OF TARE		119.1	0	WT. OF TARE		119.10				
WT. OF WET SAMPLE + TA	RE	1290.9	90	WT. OF SAMPLE B	EFORE WASH + TARE	1056.90				
WT. OF DRY SAMPLE + TA	RE	1056.9	90	WT. OF SAMPLE A	FTER WASH + TARE	994.80				
WT. OF WATER		234.0	0	WT. OF SAMPLE A	FTER WASH	875.70				
MOISTURE CONTENT		25.0%	6	PERCENT PASSING	G #200 SIEVE	6.6%				
		SIEVE	ANALYSI	S (ASTM D422)						
TOTAL DRY WI	EIGHT OF SAMPI	E			937.80					
SIEVE SIZE	INDIVIDUAL WEI	GHT RETAINED	CUMULATI	VE WEIGHT RETAINED	PERCENT RETAINED	PERCENT PASSING				
2"	0.0	00		0.00	0%	100.0%				
1 1/2"	0.0	00		0.00	0%	100.0%				
1"	0.0	00		0.00	0%	100.0%				
3/4"	0.0	00		0.00	0%	100.0%				
1/2"	10.	30		10.30	1.1%	98.9%				
3/8"	14.	60		24.90	2.7%	97.3%				
#4	56.	30		81.20	8.7%	91.3%				
#10	106	.60		187.80	20.0%	80.0%				
#20	119	.40		307.20	32.8%	67.2%				
#40	89.	10		396.30	42.3%	57.7%				
#50	37.	40		433.70	46.2%	53.8%				
#60	30		434.00	46.3%	53.7%					
#70	45.	00		479.00	51.1%	48.9%				
#100	66.	60		545.60	58.2%	41.8%				
#200	316	.70		862.30	91.9%	8.1%				
Pan	13.	40	1	875.70	93.4%					

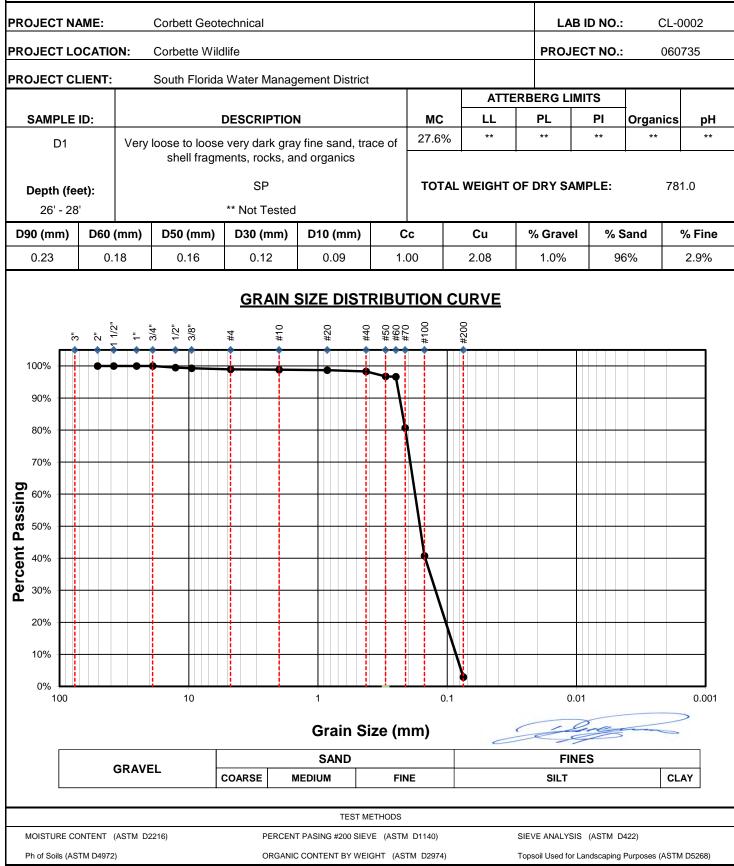


Gannett Fleming

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SOIL CLASSIFICATION - ASTM D 2487



FORM R0004, CLASSIFICATION REPORT, (Revised 7/2/12)

	SO	IL CLASS	IFICAT	ION - LAB OU	JTPUT					
PROJECT NAME: Corbet	t Geotechnical			PROJECT NO.:	060735					
LAB ID NO.: CL-000	02 SAMPLE	LOCATION:		 D126' - 28'						
SAMPLE DESCRIPTION:	Very loose to	loose very dai	rk gray fin	e sand, trace of she	ell fragments, rocks, and	d organics				
MOISTURE	CONTENT (AST	V D2216)		PERCEN	T PASING #200 SIEVE (ASTM D1140)				
TARE NUMBER		K		TARE NUMBER		К				
WT. OF TARE		119.7	0	WT. OF TARE		119.70				
WT. OF WET SAMPLE + TA	RE	1115.9	90	WT. OF SAMPLE B	EFORE WASH + TARE	900.70				
WT. OF DRY SAMPLE + TA	RE	900.7	0	WT. OF SAMPLE A	FTER WASH + TARE	881.40				
WT. OF WATER		215.2	0	WT. OF SAMPLE A	FTER WASH	761.70				
MOISTURE CONTENT		27.6%	6	PERCENT PASSING	G #200 SIEVE	2.5%				
		SIEVE	ANALYSI	S (ASTM D422)						
TOTAL DRY W	EIGHT OF SAMPI	E			781.00					
SIEVE SIZE	INDIVIDUAL WEI	GHT RETAINED	CUMULATI	VE WEIGHT RETAINED	PERCENT RETAINED	PERCENT PASSING				
2"	0.0	00		0.00	0%	100.0%				
1 1/2"	0.0	00		0.00	0%	100.0%				
1"	0.0	00		0.00	0%	100.0%				
3/4"	0.0	00		0.00	0%	100.0%				
1/2"	3.9	90		3.90	0.5%	99.5%				
3/8"	1.7	70		5.60	0.7%	99.3%				
#4	2.5	50		8.10	1.0%	99.0%				
#10	1.1	10		9.20	1.2%	98.8%				
#20	0.9	90		10.10	1.3%	98.7%				
#40	3.2	10		13.20	1.7%	98.3%				
#50	12.	30	T	25.50	3.3%	96.7%				
#60 0.60				26.10	3.3%	96.7%				
#70	124	.90		151.00	19.3%	80.7%				
#100	311	.60	T	462.60	59.2%	40.8%				
#200	295	.70	Ī	758.30	97.1%	2.9%				
Pan	3.4	40		761.70	97.5%					

SOIL	CLASS	IFICAT	ION -	LAB OL	JTPUT	
PROJECT NAME: Corbett Geotechnical			PROJEC	T NO.:	060735	
LAB ID NO.: CL-0003 SAMPLE L	OCATION:	D1			8' - 10'	
SAMPLE DESCRIPTION: Medium dense i	norganic da	rk gray fii	ne sand, t	race of sh	ell fragments, rocks	
MOISTURE CONTENT (ASTM	D2216)			PERCEN	T PASING #200 SIEVE (ASTM D1140)
TARE NUMBER	V		TARE NU	IMBER		V
WT. OF TARE	118.1	0	WT. OF 1	ARE		118.10
WT. OF WET SAMPLE + TARE	1073.1	0	WT. OF S	SAMPLE BE	EFORE WASH + TARE	0.00
WT. OF DRY SAMPLE + TARE	923.3	0	WT. OF S	SAMPLE AF	TER WASH + TARE	0.00
WT. OF WATER	149.8	0	WT. OF S	SAMPLE AF	-118.10	
MOISTURE CONTENT	18.6%	6	PERCEN	T PASSING	0.0%	
ORGANIC CONTENT BY WEIGH	T (ASTM D2	974)				
TARE NUMBER	254	263	199	PH VALUE		N/A
WT. OF DRY SAMPLE + TARE	186.85	134.02	149.23			
WT. OF SAMPLE AFTER IGNITION + TARE	185.95	133.31	148.43	1		
WT. OF TARE	67.22	37.92	41.11	1		
ORGANIC CONTENT BY WEIGHT	0.8%	0.7%	0.7%	0.7%		

* No soil classification conducted for S-5. Only organic content is reported.

=

APPENDIX C

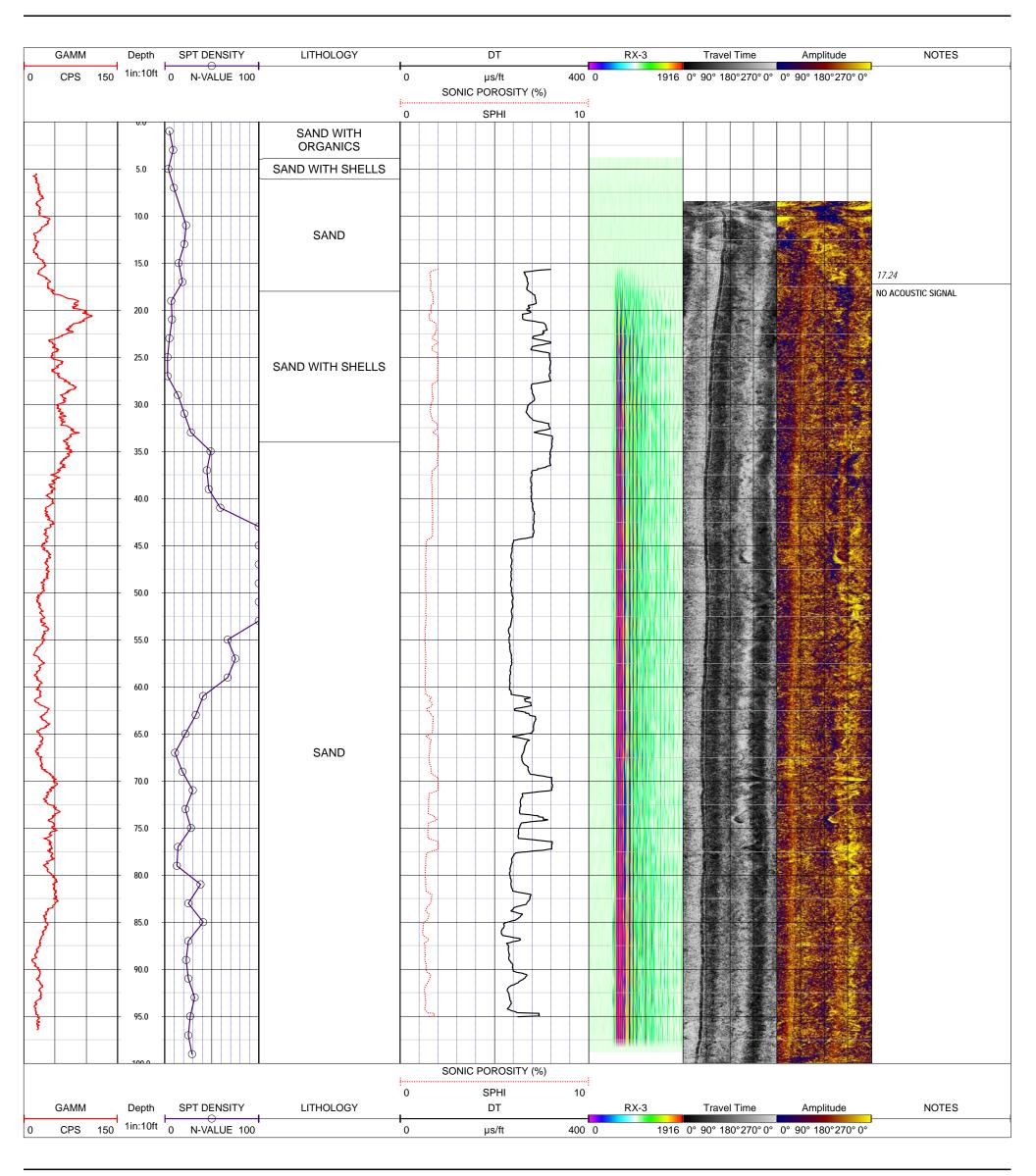
GEOPHYSICAL BOREHOLE LOGS (by RMBAKER LLC)

RMBAKER LLC	Location:	JW Corbett	Driller:	Centerline	WELL ID:	MFEB9-GW1
	County:	Palm Beach	Depth (ft):	102.5	Date(s):	1 OCT 2015
rob@rmbaker.com 407-733-8958	State: Country:	Florida USA	Logger: Witness:	R. Baker Centerline	()	

PROJECT NOTES:

-The well was logged as a mudded pilot hole (HRAT, dual induction, electric, caliper, natural gamma, sonic). The well was also known as MFEBBH25.

-The lithology and SPT density data was provided by Centerline/SFEC via Gannett Fleming. We have summarized some aspects of the original logs for our purposes. -The sonic slowness velocity (DT) was calculated using the arrival times from dual transmittors to a single receiver. -The sonic porosity was calculated using the Wyllie method, a velocity of 189 usec/ft for the freshwater mud, and a matrix velocity of 58.8 usec/ft for unconsolidated mixed sands, silts and shells (unconsolidated sandstone equivalent).



NOTES:

While due care has been exercised in the performance of these measurements and observations, in accordance with methodologies utilized by the general practitioner, RMBAKER LLC can make no representations, varranties, or guarantees with respect to latent or concealed conditions that may exist, which may be beyond the detection The geophysical well logs show subsurface conditions as they existed at the dates and locations shown, and it is not warranted that they are representative of subsurface conditions at other locations and times.

If, at any time, different subsurface conditions from those observed are determined to be present, we must be advised and allowed to review and revise our observations if necessary.

FL Licensed Geology Business GB 458

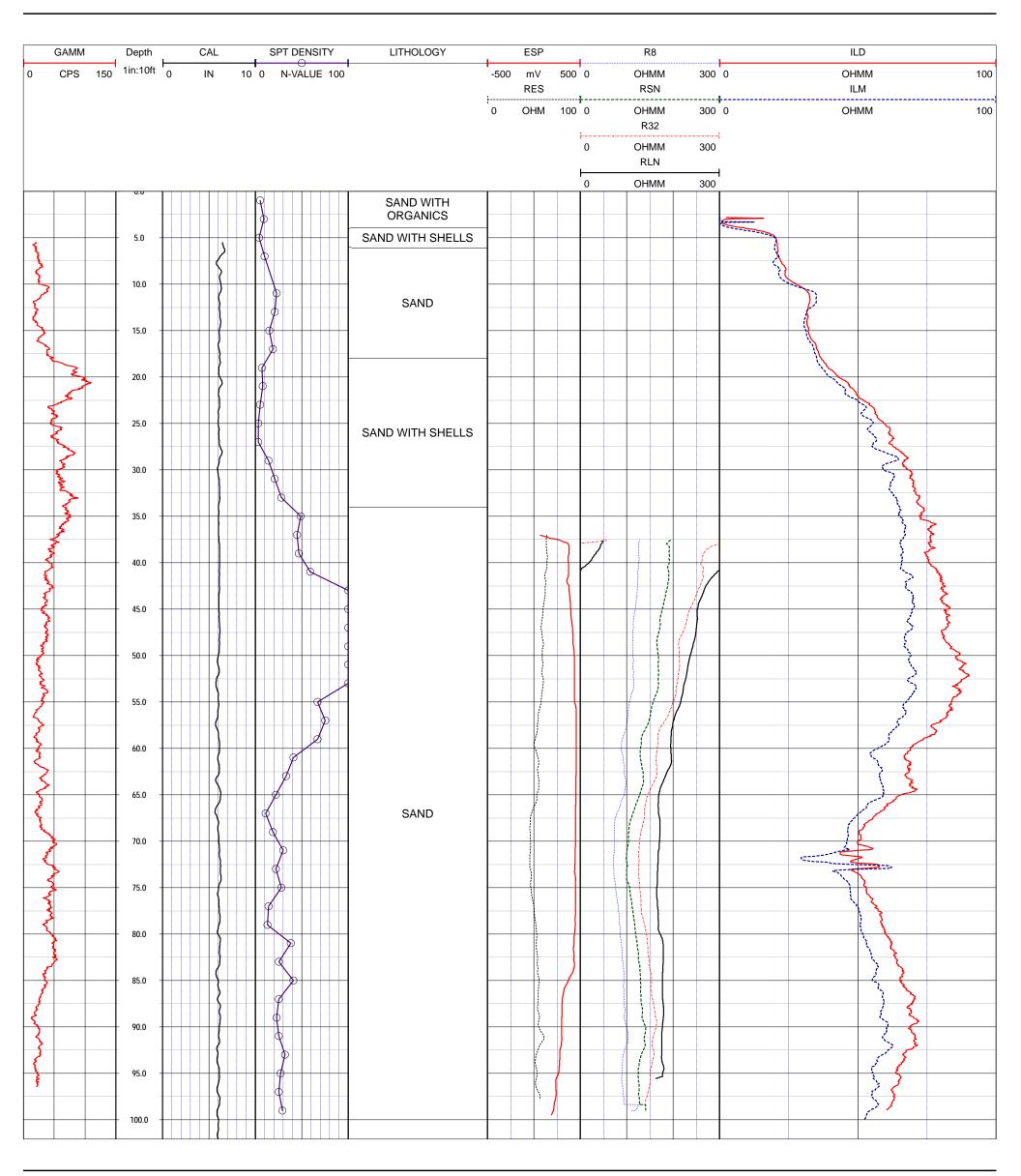
END OF LOG

RMBAKER LLC	Location: County:	JW Corbett Palm Beach	Driller: Depth (ft):	Centerline 102.5	WELL ID: Date(s):	MFEB9-GW1
rob@rmbaker.com 407-733-8958	State: Country:	Florida USA	Logger: Witness:	R. Baker Centerline		

PROJECT NOTES:

-The well was logged as a mudded pilot hole (HRAT, dual induction, electric, caliper, natural gamma, sonic). The well was also known as MFEBBH25. -The lithology and SPT density data was provided by Centerline/SFEC via Gannett Fleming. We have summarized some aspects of the original logs for our purposes.

-The electric logging tool utilized a downhole bridle for the remote electrode. Logging effectively stopped with the bridle electrode rose above the water level in the borehole.



NOTES:

While due care has been exercised in the performance of these measurements and observations, in accordance with methodologies utilized by the general practitioner, RMBAKER LLC can make no representations, warranties, or guarantees with respect to latent or concealed conditions that may exist, which may be beyond the detection capabilities of the methodologies used, or that may existed beyond the areas and depths surveyed. The geophysical well logs show subsurface conditions as they existed at the dates and locations shown, and it is not warranted that they are representative of subsurface conditions at other locations and times. If, at any time, different subsurface conditions from those observed are determined to be present, we must be advised and allowed to review and revise our observations if necessary.

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END OF LOG

APPENDIX D

WELL CORE BORING LOGS WITH WELL COMPLETION DETAILS (Well Development by Centerline Drilling, Inc.)

Gannett Fleming

Well Number: MFEB9-GW1 Client Name: South Florida Water Management District Project Name: J. W. Corbett Wildlife Management Area Project Number: 060735 Logged By: Y. Delmas City & State: West Palm Beach , Florida Attachment:

	38)		SUBSURFACE PROFILE		AMPL	E		Well Completion Details ⊢←─── 8"──── NTS			ails		
Depth (ft)	Elev (ft) (NAVD88)	Symbol	Description	Depth/Elev	Number	Туре	n - Value	Vapor			- 8" — G.S.	<u> </u>	
l °Ŧ	21.0		Black SAND with organics and roots (SP)		1	SS	5					/	
‡			-	4/17.0	2	SS	9				ſ	/	'
‡			Light brownish gray (6/2) SAND with some shell fragments (limestone formation) (SP)	6/15.0	3	SS	4						
‡					4	SS	10					/	
10 +	11.0		Dark gray (4/1) fine SAND with little shell		5	SS					ſ	/	
‡		fragments (SP)		6	SS	23							
‡				14/7.0	7	SS	21					/ '	
‡			Dark gray (4/1) fine SAND with little shell		8	SS	14		Cement Grout		ſ	/	Surface Casing
‡			fragments (SP)	18/3.0	9	SS	19		U U		Y		Cai
20	1.0		Gray (5/1) fine SAND with some shell		10	SS	7		nen				e e e e e e e e e e e e e e e e e e e
‡		fragments (SP)	11	SS	8		Cel		ſ	/	urfa		
‡				24/-3.0	12	SS	5		_		ľ		v
+					13	SS	3						
‡			Dark gray (3/1) fine SAND with some shell		14	SS	3				Í	/	
30 +	-9.0		fragments and trace of roots (SP)	15	ss	14			Y				
‡				32/-11.0	16	SS	21						
±					17	SS	28			ĺ,	ľ	\times	
+					18	SS	49				ľ		
±			Gray (5/1) fine SAND with trace of shell fragments (SP) (HCL reaction)		19	SS	45]
40	-19.0				20	SS	47			· /	Í	/	ing
<u>+</u>				42/ 22.0	21	SS	59				ľ		Cas
±				43/-22.0	22	SS	50=6"						ν
+					23	SS	50=6"			· /	ĺ	/	ch PVC Casing
±					24	SS	50=6"				Y	,	<u>l c</u>
50 +	-29.0				25	SS	50=5"						2
			Gray (5/1) fine calcareous SAND with trace of shell fragments (SP) (HCL reaction)		26	ss	50=5"					/	
±					27	SS	50=6"				Y		
+					28	ss	67					/	
<u>f</u>					29	SS	75			· /	Í	/	
1 ₆₀ <u>F</u>	-39.0			60/-39.0	30	SS	67			/			
		d By	: Centerline Drilling, inc.	Hole	Size	: 6	inch a	liame	eter				
		-	ethod: Bentonite Mud Rotary	Datun						ion es	timate	d)	

Drill Date: September, 2015

Gannett Fleming Project No. 060735

Sheet:

1 of 2



Well Number: MFEB9-GW1 Client Name: South Florida Water Management District Project Name: J. W. Corbett Wildlife Management Area Project Number: 060735 Logged By: Y. Delmas City & State: West Palm Beach , Florida Attachment:

	38)		SUBSURFACE PROFILE		S	AMPL	E		Well Completion Details			
⁸ Depth (ft)	0.66 0.68 0.68	Symbol	Description	Depth Elev	Number	Type	n – Value	Vapo r			8"	NTS .0. .0. .2.
	69.0 -	1 와 한 수 값 수 나가 한 수 나가 한 수 있는 것 같아. 이는 것 같아. 이는 것 같아. 가 가 가 가 가 가 가 가 가 가 가 가 다 하는 것 같아. 이는 것 같아. 이는 것 같아. 이는 것 이는 것 같아. 이는 이	Slightly silty gray (5/1) fine calcareous SAND with trace of shell fragments (SP-SM)	100/-79.0	31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50	SS SS	41 33 22 11 19 30 22 28 14 13 38 25 41 25 32 27 25 32 27 25 32 27 25 32 27 25 32 27 25 32 37 25 32 27 25 32 27 25 29			ter Pack	2 inch PVC Screen	2 inch PVC Casing Surface Casing
Dı	- <i>i</i> // <i>i</i> /	ng M	: Centerline Drilling, inc. ethod: Bentonite Mud Rotary September, 2015	Hole Datur Sheet	n: N.	AVD		(E		'on esti	mated)	

Gannett Fleming Project No. 060735



Well Number: MFEB9-GW2 Client Name: South Florida Water Management District Project Name: J. W. Corbett Wildlife Management Area Project Number: 060735 Logged By: Y. Delmas City & State: West Palm Beach , Florida Attachment:

	38)		SUBSURFACE PROFILE		S	AMPL	E		Wel	Compl	etion De	tails
> Depth (ft)	Elev (ft) (NAVD88)	Symbol	Description	Depth\Elev	Number	Type	n - Value	Vapor			G.S.	
	- 21.0 -		Black SAND with organics and roots (SP)		1	SS	5					
1 1			5	4/17.0	2	SS	9					
	-		Light brownish gray (6/2) SAND with some shell fragments (limestone formation) (SP)	6/15.0	3	SS	4					
‡	-				4	SS	10					
10	- 11.0		Dark gray (4/1) fine SAND with little shell		5	SS						
1 1			fragments (SP)		6	SS	23					
1 1	-			14/7.0	7	SS	21					• · ·
	-		Dark gray (4/1) fine SAND with little shell		8	SS	14		۲ ۲			Surface Casing
‡			fragments (SP)	18/3.0	9	SS	19		Cement Grout			Cas
20	- 1.0				10	SS	7		ut O			g
‡			Gray (5/1) fine SAND with some shell fragments (SP)		11	SS	8		me			urfa
‡				24/-3.0	12	SS	5		ပိ		ľ,	S
	-		Dark gray (3/1) fine SAND with some shell fragments and trace of roots (SP)		13	SS	3					
‡	-				14	SS	3					
30	- 9.0		tragments and trace of roots (SP)		15	SS	14				E=	
1 1				32/-11.0	16	SS	21		г		• EE	
1 1					17	SS	28			= =		<u>34.0</u>
	-				18	SS	49		nite			\searrow
‡			Gray (5/1) fine SAND with trace of shell fragments (SP) (HCL reaction)		19	SS	45		Bentonite	•		 9.0 _
40	- 19.0				20	SS	47		Be	: : [ich PVC Casing
1 1	-			43/-22.0	21	SS	59					Cas
‡	-			43/-22.0	22	SS	50=6"			승	L L	ÿ
+	-				23	SS	50=6"			er Pack	Screen	۲ ۲
1 1	-				24	SS	50=6"					inct
50	- 29.0				25	SS	50=5"			Ē	0	7
‡			Gray (5/1) fine calcareous SAND with trace of shell fragments (SP) (HCL reaction)		26	SS	50=5"				су Н	
‡					27	SS	50=6"				2 inch PVC	
	-				28	SS	67					
‡	-				29	SS	75					
60 ±	- 39.0			60/-39.0	30	SS	67					
		d By	: Centerline Drilling, inc.	Hole	Size	: 6	inch a	liame	eter			
D	rillir	ng M	ethod: Bentonite Mud Rotary	Datun	n: N.	AVD	1988	(E	levat	ion est	timated)	
D	rill [Date:	September, 2015	Sheet	•	1 0	of I					



Well Number: MFEB9-GW3 Client Name: South Florida Water Management District Project Name: J. W. Corbett Wildlife Management Area Project Number: 060735 Logged By: Y. Delmas City & State: West Palm Beach , Florida Attachment:

	38)		SUBSURFACE PROFILE		S	AMPL	E		Well C	ompletio	n Det	ails
Depth (f1)	Elev (ft) (NAVD88)	Symbol	Description	Depth\Elev	Number	Туре	n - Value	Vapo r		G.S		NTS
	- 21.0		Black SAND with organics and roots (SP)		1	SS	5					
ĮĮ			Light brownish gray (6/2) SAND with some shell fragments (limestone formation) (SP)	4/17.0	2	SS	9			\land		6
IŦ	-		fragments (limestone formation) (SP)	6/15.0	3	SS	4				//	/ . Surface Casing
ΙŦ					4	SS	10		0	Cement Grout	E=.	Ŭ O O O
10 -	- 11.0		Dark gray (4/1) fine SAND with little shell fragments (SP)		5	SS			uer		-1	<u>a</u> g <u>0.0</u>
ĮĮ					6	SS	23		<u>e</u> <u>e</u>			Sur 🗸
]				14/7.0	7	SS	21		Ce Bentonite		1	5.0
±			Dark gray (4/1) fine SAND with little shell fragments (SP)		8	SS	14		Ber)	
±				18/3.0	9	SS	19					Casing
20	- 1.0		Gray (5/1) fine SAND with some shell fragments (SP)		10	SS	7		ack	Filter Pack 2 inch PVC Screen		Ca:
±				04/00	11	SS	8		ы Б С			2 V
±	_			24/-3.0	12	SS	5		Filte	Ş		2 inch PVC
±			Dark gray (3/1) fine SAND with some shell fragments and trace of roots (SP)		13	SS SS	3		-	P		i.
±					14 15				-	nch		~
30	9.0			32/-11.0	15	SS SS	14 21		-	2 II		
±				32/-11.0	17	SS	21					
±	_				17	SS	49		-			
‡			Gray (5/1) fine SAND with trace of shell fragments (SP) (HCL reaction)		18	SS	49		-			
‡					20	ss	47		-			
40 +	19.0				20	ss	59		-			
‡				43/-22.0	22	ss	50=6"		-			
‡	-				23	ss	50=6"		-			
‡					24	ss	50=6"		-			
‡					25	SS	50=5"					
50 +	29.0		Gray (5/1) fine calcareous SAND with trace of shell fragments (SP) (HCL reaction)		26	SS	50=5"					
‡					27	SS	50=6"		-			
‡	-				28	SS	67					
‡					29	SS	75					
1‡				60/-39.0	30	SS	67					
	- _{-39.0} 1 rillea	1 Bv	: Centerline Drilling, inc.	Hole				liame	eter			
		-	ethod: Bentonite Mud Rotary							n estima	ted)	
		-	September, 2015	Sheet			of I			-		

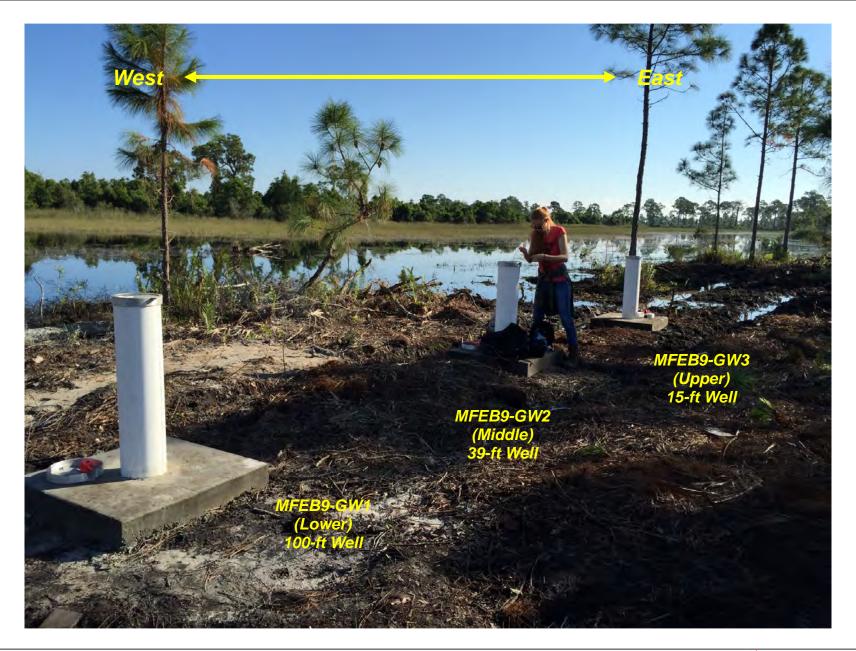
Gannett Fleming Project No. 060735

APPENDIX E

WELL INSTALLATION DETAILS AND PERMITS

- Well Installation Snapshot
- Sample Data Logging Data from Installed Electronic Telemetry Equipment
- Well Installation Permits

WELL INSTALLATION SNAPSHOT



SAMPLE DATA LOGGING DATA FROM INSTALLED ELECTRONIC TELEMETRY EQUIPMENT



				10.00	and the second se	Data
	Company: SFEC			1-102-01	8-1501-1-64	0-145-7 181
	User: MichaelCox					
author .	WEEDO OWA					
avigation ite Index	MFEB9-GW1					
efault	Device: Level TROLL S	500, S/N: 4267	79, TROLL Link FW: 1.	40		
	Report Time: 14 Da	ys 🗸				
anobe		ph View D	ate Range View	Export to CSV		
eporting	Received	Temperatur	eWater Elevation	External Voltage	Tin Total	Rain Fall
eate new report			FL	V	100	in
nage reports	23-Nov-15 3:00 PM	76.20	20,90		221	0.00
er Management	23-Nov-15 11:00 AM 23-Nov-15 7:00 AM	76.19 76.19	20,92	-	221	0.00
ate New User	23-Nov-15 3:00 AM	76.19	20.97		221	0.00
nage Users	22-Nov-15 11:00 PM	76.19	20.98		221	0.00
te Management	22-Nov-15 7;00 PM	76.19	21.00		221	0.00
anage Site	22-Nov-15 3:00 PM	76.20	21.05		221	0.02
anage Device	22-Nov-15 11:00 AM 22-Nov-15 7:00 AM	76.20 76.20	21.02		218	0.06
nfigure Graph	22-Nov-15 7:00 AM	76.19	21.02		207	0.03
arm Management	21-Nov-15 11:00 PM	76.20	20.95		179	0.06
ontacts	21-Nov-15 7:00 PM	76.20	20.88		172	0.61
vices	21-Nov-15 3:00 PM	76.20	20.34		94	0.08
	21-Nov-15 11:00 AM 21-Nov-15 7:00 AM	76.20	20.23		84	0.00
uick Help	21-Nov-15 7(UU AM 21-Nov-15 3:00 AM	76.19 76.20	20.23		84 84	0.00
ne Device Detail page	20-Nov-15 11:00 PM	76.20	20,23		84	0.00
ows you to view	20-Nov-15 7:00 PM	76.20	20.22		84	0.00
torical data for the	20-Nov-15 3:00 PM	76.20	20.27		84	0.00
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WELL INSTALLATION PERMITS

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Mission: To protect, promote & improve the health of all people in Florida through integrated state, county & community efforts.

Permit Number: 5268 - 2015



Vision: To be the Healthiest State in the Nation

PERMIT CONDITIONS

Page 2 of 2

John H. Armstrong, MD, FACS

State Surgeon General & Secretary

	Condition
1.	The Well Driller shall provide notice to the Department of the approximate start date and time that construction of the well at least 24 hours prior to the start of construction either by fax (561-837-5293) or e-mail (FDOHPB.Wells@FLhealth.gov)
2.	The well shall be drilled in accordance with the construction details and site plan submitted with the application.
3.	The well shall not be located in any low area subject to flooding or within the minimum setback distance from any know hazard.
4.	If this is a replacement well, the existing well shall be abandoned by filling it from the bottom to the top with neat cement grout. This shall be accomplished before the new well is released for service.
5.	This permit does not indicate a waiver of or approval of any permits required by other federal/state/local agencies or of any permit required by the Department for other aspects of the total project.
6.	Upon completion of the well and prior to use, the following must be submitted to the Department before the well can be put into service:
	 a. Private Drinking Water Well. (i). A well completion Report (No Later than 30 days from completion of construction). (ii). One satisfactory bacteriological sample result, no older than 30 days. Sample to be taken by the well contractor.
(b. Non-Potable Wells (Irrigation, Fire Protection, etc.). (i). A well completion Report (No Later than 30 days from completion of construction).
	 c. Limited Use Well. (i). A well completion Report (No Later then 30 days from completion of construction). (ii). Five (5) satisfactory bacteriological sample results taken for five (5) consecutive days. Sample shall be taken by a certified lab. The last sample shall be no older than 30 days. (iii). Chemical analysis for lead and nitrate.
7.	Other Condition(s): Environmental Control Rule II, Section 8, A.5 - For private and multi-family water wells and irrigation wells the casing shall be surrounded at grade level by a two-inch thick concrete pad extending at least six inches in all directions and the upper terminus of the well casing shall project at least 12 inches above finished grade, [Ord, 2005 - 003] Environmental Control Rule II, Section 8, A.6 - Whenever the pump is not set at the vertical casing, the line between the vertical casing and pump shall be considered an extension of the casing and protected from sanitary hazards in a similar manner as the casing.

	State of FLORIDA PERMIT APPLICATION TO CONSTRUCT, REPAIR, MODIFY, OR ABANDON A WELL Permit No. S 2 6 4-15 OScuthwest PLEASE FILL DUT ALL APPLICABLE FIELDS Please Fill DUT ALL APPLICABLE FIELDS ON onthwest, D Nonthwest, St Johns River PLEASE FILL DUT ALL APPLICABLE FIELDS Permit No. S 2 6 4-15
No. 10	Difference The water well contractor is responsible for complexing this form and followering the parmit copile dation to the appropriate delegated authority where optile dates to the optile date. G2-524 Outed No Delineation No DEP Delegated Authority (if Applicable) Outer this Linke of the optile dates are optile to a contractor is responsible. G2-524 Outed No Delineation No
4	1. Florida Fish & Wildlife Conser 8535 Northlake Blvd. West Palm Beach Florida 33412
	*Owner, Legal Name If Corporation *Address *City *State *ZIP Telephone Number 2 <u>11835 Seminole Pratt Whitney Road West Paint Beach, Florida 33412 - JW Corbett Wildlife Management Area</u> *Well Location - Address, Road Name or Number, City 3 00-40-42-12-00-000-9000
Ĩ.	"Parcel ID No. (PIN) or Alfernate Key (Circle One)
	4 12 42 40 Paim Beach Check if 62-524[] Yes [] No *Section or Land Grant Township *Range *County Subdivision 5 Centerline Drilling, Inc. 11132 581-615-0986 ctrlinedrilling@aol.com
	Water Well Contractor Lieense Number Telephone Number E-mail Address Le 1696 Old Okeechobee Road, Suite 3C West Palm Beach Florida 33409
154	Water Well Contractor's Address City State ZIP
	8 "Number of Proposed Wells 1 Ner demand
	Domestic Landscape Inigation Aprioutural Integrition Site Investigations
-1	Bottled Water Supply Climited Use/COH)
	Public Water Supply (Community or Non-Community/DEP)
۰.	HVAC Return
	Class V Injection: Recharge Commercial/Industrial Disposal: Aquifer Storage and Recovery Displayer Coverses Recharge Covers Cove
	10 *Distance from Septic System if < 200 h. 1Mile 11 Facility Description 12. Estimated Start Date 09/2013
	14. Battmated Soraen Interval From 40. To 45 n.
1	15.*Primery Casing Material Black Steel Galvanized / PVC Stainlese Steel
	16. Secondary Casing Material Black Steel Galvanized & RVC Stainlese Steel Not Cased Cither 16. Secondary Casing: Telescope Casing Liner Surface Casing Diameter
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Mission: To protect, promote & improve the health of all people in Florida through integrated state, county & community efforts.



John H. Armstrong, MD, FACS State Surgeon General & Secretary

Vision: To be the Healthiest State in the Nation

PERMIT CONDITIONS

Per	mit Number: <u>5269 - 2015</u>	Page	<u>2</u> of <u>2</u>
X	Condition		
1.	The Well Driller shall provide notice to the Department of the approximate start date and to of the well at least 24 hours prior to the start of construction either by fax (561-837-5293) (FDOHPB.Wells@FLhealth.gov)		
2.	The well shall be drilled in accordance with the construction details and site plan submitte	d with the	e application.
3.	The well shall not be located in any low area subject to flooding or within the minimum se any know hazard.	tback dist	tance from
4.	If this is a replacement well, the existing well shall be abandoned by filling it from the bott neat cement grout. This shall be accomplished before the new well is released for service.		top with
5.	This permit does not indicate a waiver of or approval of any permits required by other fede agencies or of any permit required by the Department for other aspects of the total project.		local
6.	 Upon completion of the well and prior to use, the following must be submitted to the Depa can be put into service: a. Private Drinking Water Well. (i). A well completion Report (No Later than 30 days from completion of construction (ii). One satisfactory bacteriological sample result, no older than 30 days. Sample to contractor. (b. Non-Potable Wells (Irrigation, Fire Protection, etc.). (i). A well completion Report (No Later than 30 days from completion of construction (ii). A well completion Report (No Later than 30 days from completion of construction (ii). A well completion Report (No Later than 30 days from completion of construction (ii). A well completion Report (No Later then 30 days from completion of construction (ii). Five (5) satisfactory bacteriological sample results taken for five (5) consecutive taken by a certified lab. The last sample shall be no older than 30 days. (iii). Chemical analysis for lead and nitrate. 	n). be taken l n). n).	by the well
7.	Other Condition(s): Environmental Control Rule II, Section 8, A.5 - For private and multi-family water wells and ir casing shall be surrounded at grade level by a two-inch thick concrete pad extending at least six directions and the upper terminus of the well casing shall project at least 12 inches above finish 2005 - 003] Environmental Control Rule II, Section 8, A.6 - Whenever the pump is not set at the vertical ca between the vertical casing and pump shall be considered an extension of the casing and protec hazards in a similar manner as the casing.	k inches in ted grade, sing, the l	n all [Ord, ine

13	REPAIR, MODIFY, OR AB	MIT APPLICATION TO GO ANDON A WELL	DINSTRUCT,	Permit No. 52 Florida Unigue ID	70-15
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	DSt. Johns River R South Florida	The water well contractor is capta this form and forwarding the pure oppropriate gehadiop authority w	nsible for completing tit application to the	62:524 Quad No.	Delineation No
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2. 11835 Seminal	Pratt Whitney Road W	est Palm Beach, Flori			
3 00-40-42-12-00					
Parcel ID No. (PI 4 12	1) of Alternate Key (Circle On 42 40	e) Peim Beach		Lot	Block Unit eck if 62-524 Yes 7 N
Section or Land G			Subdi 11-615-0988	visión ctrlinedniling@	aol.com
Water Well Contr		License Number	Telephone Number st Palm Beach		-mail/Address rida 33409
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8. "Number of Propo	Construction Repair and Wells 1	Medification Abat	idonment	Sobron for Repair. Modille	
9 *Specify Intended Domestic	Use(s) of Well(s). [] Ländscape Iniga	tion 🗂 Aericultu	ral Imgalion [] Si	e investigations	6
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Public Water Sup	ply (Community or Non-Comp	nunity/DEP) Commen	siel/industrial 🚺 Et	nth-Coupled Geotherm AC Supply	al 🔤 🔁 🏅
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Permit Number: <u>5270 - 2015</u>



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Vision: To be the Healthiest State in the Nation

PERMIT CONDITIONS

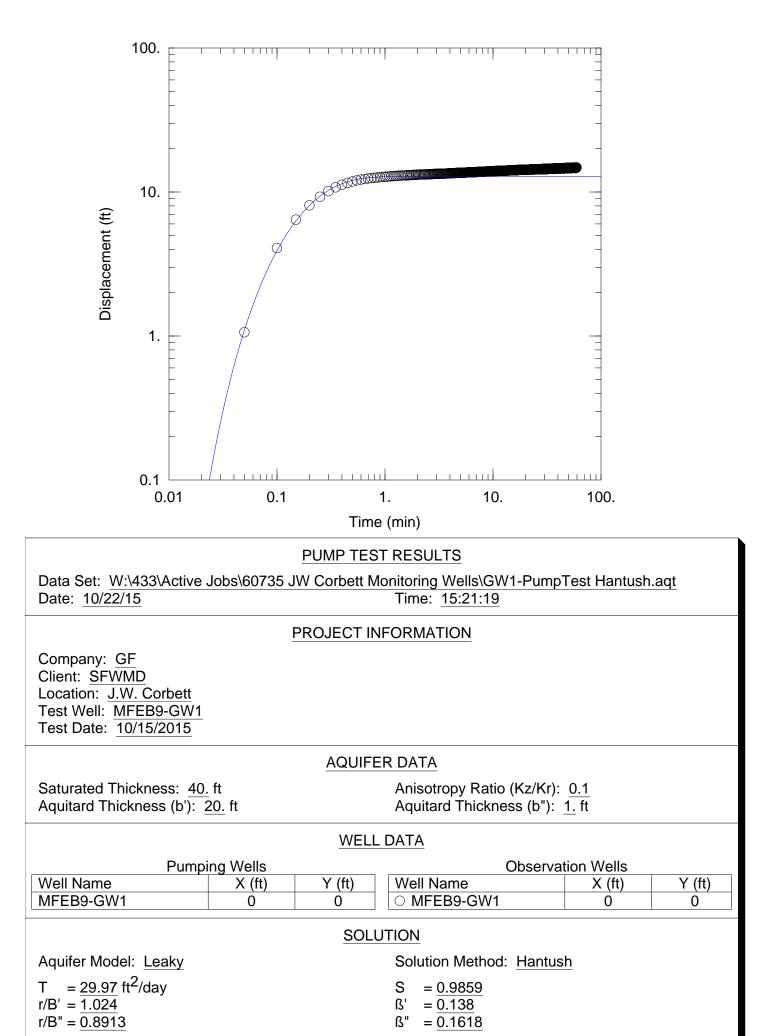
Page 2 of 2____

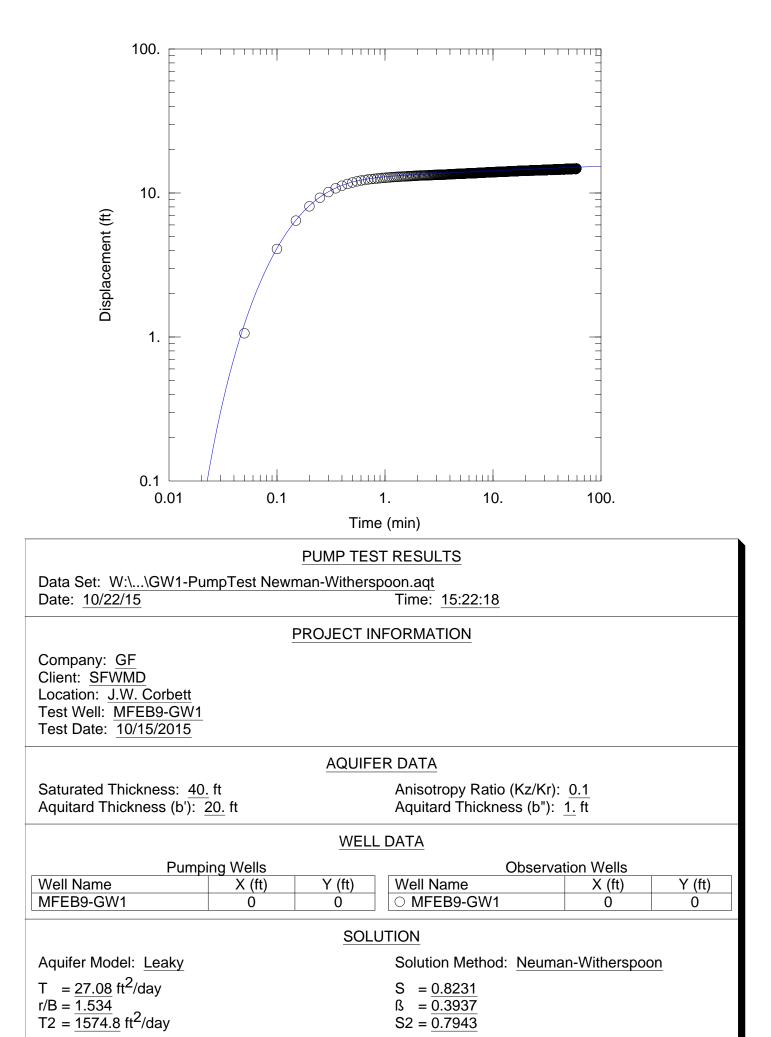
X	Condition
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2.	The well shall be drilled in accordance with the construction details and site plan submitted with the application.
3.	The well shall not be located in any low area subject to flooding or within the minimum setback distance from any know hazard.
4.	If this is a replacement well, the existing well shall be abandoned by filling it from the bottom to the top with neat cement grout. This shall be accomplished before the new well is released for service.
5.	This permit does not indicate a waiver of or approval of any permits required by other federal/state/local agencies or of any permit required by the Department for other aspects of the total project.
6.	 Upon completion of the well and prior to use, the following must be submitted to the Department before the well can be put into service: a. Private Drinking Water Well. (i). A well completion Report (No Later than 30 days from completion of construction). (ii). One satisfactory bacteriological sample result, no older than 30 days. Sample to be taken by the well contractor. b. Non-Potable Wells (Irrigation, Fire Protection, etc.). (i). A well completion Report (No Later than 30 days from completion of construction). c. Limited Use Well. (i). A well completion Report (No Later than 30 days from completion of construction). c. Limited Use Well. (i). A well completion Report (No Later then 30 days from completion of construction). (ii). Five (5) satisfactory bacteriological sample results taken for five (5) consecutive days. Sample shall be taken by a certified lab. The last sample shall be no older than 30 days. (iii). Chemical analysis for lead and nitrate.
7.	Other Condition(s): Environmental Control Rule II, Section 8, A.5 - For private and multi-family water wells and irrigation wells the casing shall be surrounded at grade level by a two-inch thick concrete pad extending at least six inches in all directions and the upper terminus of the well casing shall project at least 12 inches above finished grade, [Ord, 2005 - 003] Environmental Control Rule II, Section 8, A.6 - Whenever the pump is not set at the vertical casing, the line between the vertical casing and pump shall be considered an extension of the casing and protected from sanitary hazards in a similar manner as the casing.

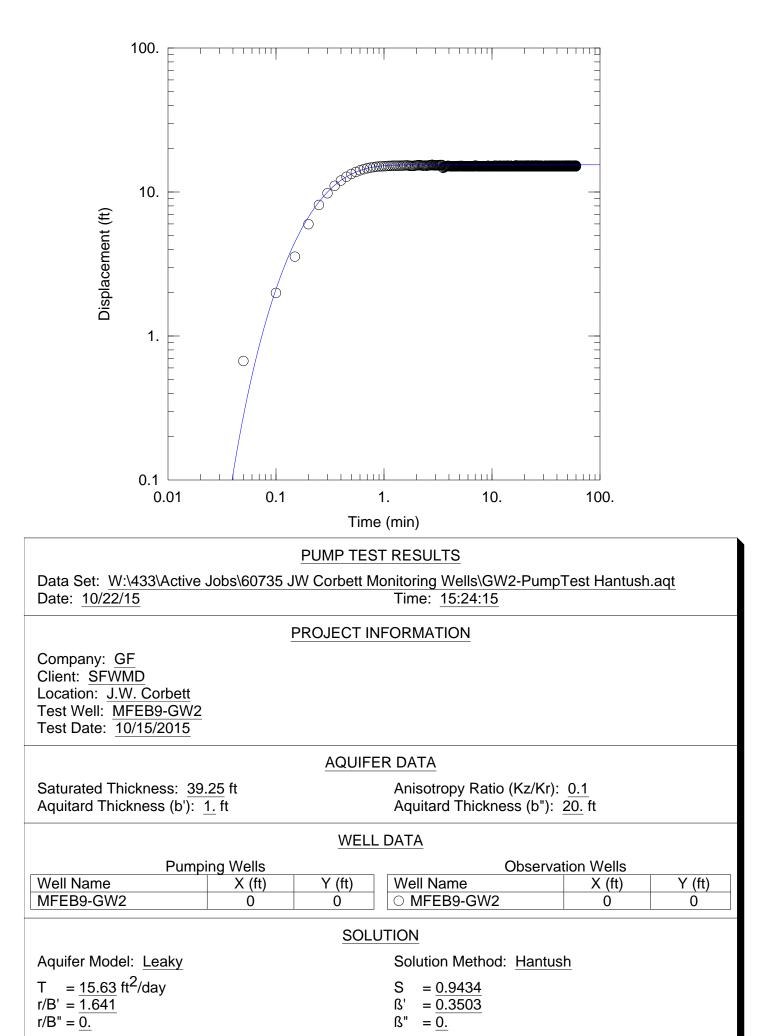
APPENDIX F

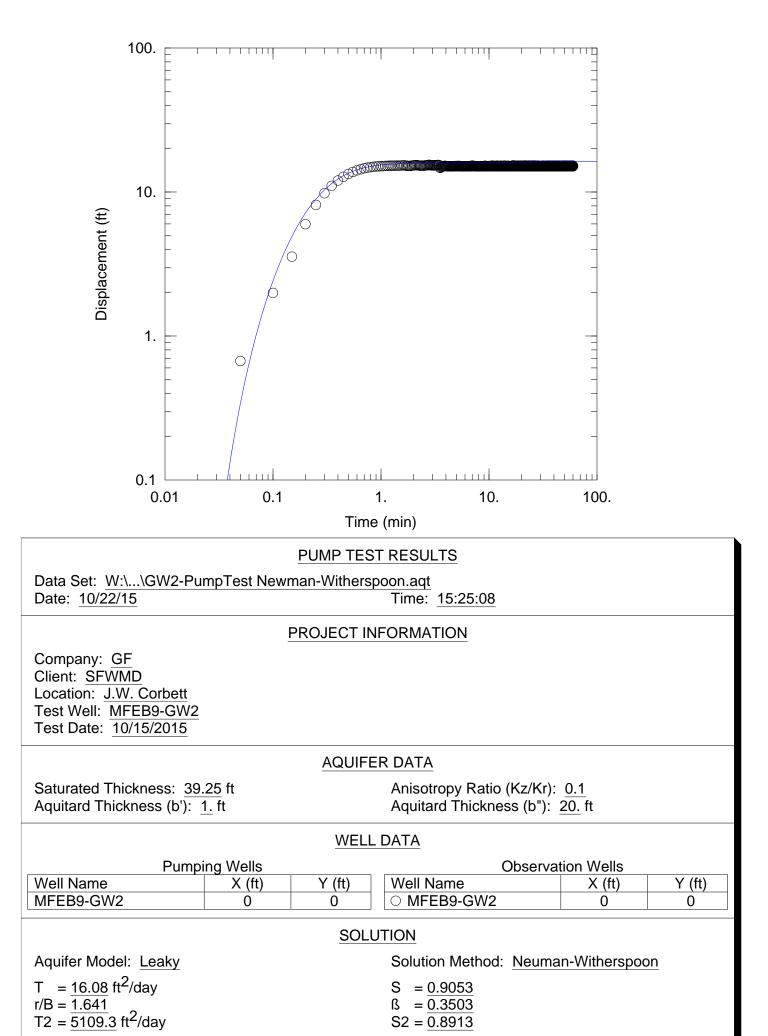
AQTESOLV PUMPING DATA ANALYSES OUTPUT & PUMPING / SLUG TEST FIELD NOTES

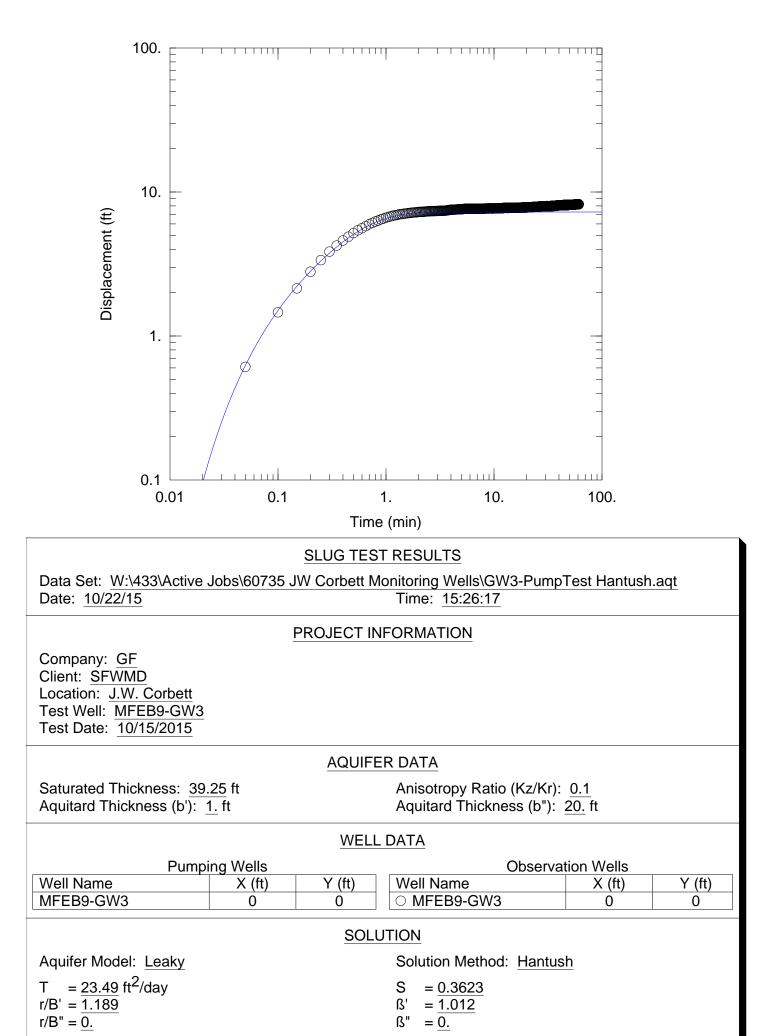
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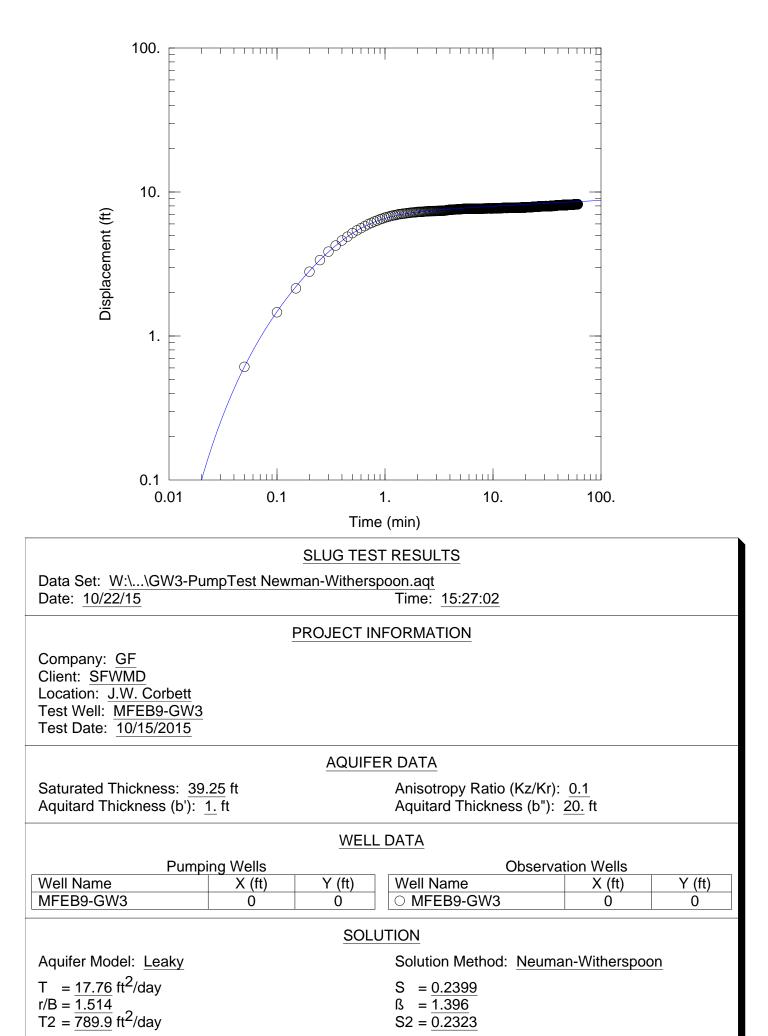












PUMPING / SLUG TEST FIELD NOTES

UNT: 44	
VV ZZZZ d Associates, Inc.	1495 Forest Hill Blvd., Suite F West Falm Beach, Floreta 33406-6073 (561) 642-9923 Fax: (561) 642-3327
Remping @ 6.5 gpm for	W 10:34 to 11:33 (suppliforce)
* Loggera 100 /t from top of PV C Project No. Well No. MF - GW - 9A Date: 10/15/15 Reference Point: Top of PVC Elevation of Ground Level:	W 10:34 to 11:33 (pumplitopped) Nown Test Form Project Location: Corbett Wildlife Step Drawdown & Recovery = Elevation of Measuring Point: Pretest Water Level: 4.35 Perf
	ongitude Page of
Elapsed Time (minutes) Time (HH:MM) Reading (fi) Level Below Reference Point (fi)	Drawdown Rate Remarks (fi) (spm)
10:34 4:35 10:24 4:35 10:24:10 6.00 21 min 10:35:00 17.80 3 10:37 17.80	Remping Rate 65 gpm
46 10 40 17.96 5 10 49 8.28 6 10.50 18 58	Pretext Water Levels
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	9A - P 4.35 9B - P 4.37
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Water Level @ 10:50
18 11:33 19.28 20 25	9A - 7 18.58 9B - 7 4 45 9C - 7 4 12 4 12 4
30 35 Water level @ 1:3B	Water level @ 11:12
45 94 - 19.28 × 50 98 4.45 × 53 90 4.12 Pt	9A - P 1925 A 9B - P 4.45 A 9C - 7 4.12 A
Data Collected By: AWOMM	QA Check:
1 4	New New Step Forms and Uster Resources

Witt & Associates, Inc.		1495 Forest Hill Blvd., Suite F est Palm Beach, Florida 33406-6073 51) 642-9923 Fax: (561) 642-3327
Recoren from 11:33 to Step-Drawd	11 i 570 Iown Test Form	0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
Project No. Well No. <u>MFGW-JA</u> Date: <u>10/15/15</u> Reference Point: <u>Top 07 PVC</u> Elevation of Ground Level:	Pretest Water L	Drawdown Recovery casuring Point: evel: 19,28 ff
GPS Location: Latitude Level Below Elapsed Time Reading Level Below Time (HH:MM) (ft) Reference (minutes) (H:33 19.28 Point (ft)	ongitude Drawdown Rate (ft) (gpm)	Remarks
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Wit	t Tey	t from	e (2) 6.0 2 11:56 onn top o	to 12:50		(11, 56 to 12) Lett Revers Mit Bled, Suite # ant Bears, Pleness Sontik, entro 25-0000 Par (581) 0422-5527
Date <u>//C</u> Reference Elevation (MF-G //5//5 Point of Ground 1	bvet	VC			Contett Wildliffe Drawing to Recovery D Hotel Hotel Page Lol
M A B P P P P P P P P P P P P P P P P P P	2:38 2:40 12:48 2:50	Reading (11) 4,42 8.0 19.69 19.79 19.79	Level Below Reference Port (19)	Drawdows (A)	Parryany Rate Anti- Anti	Marker H.

Hydiopeology, Geology, and Water Resources

Data Collected By:

QA Check

69

5 Syph

Gerhardt M.
W:44
rruu
& Associates, Inc.

1495 Forest Hill Blvd, Suite F West Palm Beach, Finnida 33406-6673 (561) 642-9923 Fax (561) 642-3327

Step-	Draw	down	Tares	* investor
and a set of a	A. A	2323 23 2 2 3	1 2 2 2 2	· · · · · · · · · · · · · · · · · · ·

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a Collected B	"An	lojni	And Rev. 10041		QA	Check:

Pumping @ 2.65 gp 2 from 1:34 to 2:35 Gerhardt M.	
Witt & Associales, Inc. 1495 Forest Hill Blvd., Sune F West Pairn Beach, Florida 33406-6073 (561) 642-9923 Fax: (561) 642-3327	
doyger @ 14.8 H Step-Drawdown Test Form 6 best Wildlife	
Well No. MF-GW+9C Step: Drawdown Date: Drawdown Draw	
Reference Point: Top of PVC Elevation of Measuring Point: Elevation of Ground Level: Pretest Water Level: Y. 2014 GPS Location: Latitude Longitude Page	
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& Associates, Inc.				1495 Forest Hill Blvd., Suite F Palm Beach, Florida 33406-6073 642-9923 Fax: (561) 642-3327
4 2 Wrong	Step-Drawde			
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Well No. MH-GW-	JC	_ Step: _		_ Drawdown 🗆
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Elevation of Ground Level:		Pretest	Water Lev	
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GPS Location: Latitude	Level Below	ongitude	Pumping	Page of
Time (HH:MM) (G)	Reference	Drawdown (ft)	Rate	Remarks
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Project No Well No		/	Step		Drawd	Iown D	
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APPENDIX G

FIELD SURVEY DATA (Field Surveying by Erdman Anthony)





SOUTH FLORIDA WATER MANAGEMENT DISTRICT

				Rev. 4/08					
COUNTY PALM BEACH	PROJECT J.W. CORBETT DESIGNATION MFEB9								
SECTION 12	TOWNSHIP 42	2 SOUTH	RANGE 40 EAST						
NAME OF QUADRANGLE									
Established by ERDMAN ANTHONY		Recovered by		_ (Surveyor / Firm Name)					
DATE 11/03/2015 (Established)		FIELD BOOK CO	RBETT B	OOK 1 PAGE 33-35					
HORIZONTAL DATUM: 1927 198	3 ADJ 201	1 Other (circ	le one)	ZONE Or W					
STATE PLANE COORDINATES		N 910,138.87	7 ft	E 882,547.55 ft					
LATITUDE: N 26° 50' 09.2"		LONGITUDE: W a	80° 18' 20.	.8"					
VERTICAL DATUM: MSL 1929	1988) Other _	(circle	one)	EL. 21.44 ft					
VERTICAL DATUM: MSL 1929 1	988 Other _	(circle	one)	EL. ft					
CONTROL ACCURACY: HORIZONT	AL 1 2 3 (SUB-METER (cir	rcle one)	VERTICAL 1 23					
	DES	CRIPTION							
To Reach:									
The benchmark is located within the J.W. Corbett Wildlife Management Area ("Corbett"). Near the southeast corner of said Corbett. To reach the benchmark from the intersection of Northlake Boulevard and Seminole Pratt Whitney Road, travel 3 miles north along Seminole Pratt Whitney Road to the south entrance of Corbett on the left, being Stumper's Grade trail. Travel west approximately 1.5 miles along Stumper's Grade trail to a (northwest/southeast) powerline corridor. Travel 1.0 mile southeast along said corridor to the station on the left. The benchmark is 99 feet perpendicular (northeast) to the center of the dirt road that runs along said corridor. The benchmark is 53.5 feet east of a 15 inch pine tree and 22.5 feet east-southeast of the most easterly well concrete pad. NGS Benchmarks Used: U537, V537, & W537									
Notable Land marks: J.W. CORBETT W SKETCH	/ILDLIFE MANAG	<u>SEMENT AREA</u>							
	AN N N N N N N N N N N N N N N N N N N	WELLS - MFEB9-GW1 - MFEB9-GW2 - MFEB9-GW2		MFEB 9					



SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 4/08

PICTURE

