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TECHNICAL MEMORANDUM

Date: May 4, 2010

To: Robert Beltran, P.E., Hydrosolutions/URS
Polk County Utilities

From: Kevin Dorsey, P.G, PBS&J

RE: Southeast Polk County Deep Exploratory Well Project
Frostproof, Florida
Dual Zone Monitor Well Construction

1.0 INTRODUCTION

1.1. Background

The 2005-2006 Kissimmee Basin Water Supply Plan concluded that traditional groundwater sources used in the Central Florida region may be limited over the twenty year planning horizon. This conclusion was, however, based upon a limited amount of information and it was identified that there is a need to gather additional hydrologic information and to look for new potential sources of potable water. In particular, hydrogeologic and geologic information for the upper and lower portions of the Floridan Aquifer System (FAS) in Osceola and Polk Counties was identified for future collection efforts.

In July 2008, Polk County and the South Florida Water Management District (SFWMD) entered into a cooperative agreement to investigate the hydrogeologic conditions of the FAS in southeast Polk County to answer questions regarding the extent and vertical connection of the FAS and to provide data on the regional extent of the freshwater portion of the FAS in central Florida. The investigation involves the construction and testing of one Upper Floridan aquifer (UFA) exploratory well, SE-UFA-MW1, and one Lower Floridan aquifer (LFA) exploratory well, SE-DEW. Testing during the construction of these wells included the collection of lithologic samples, geophysical logging, the collection and analysis of water quality samples, and conducting aquifer performance tests (APTs). In addition, the investigation included the construction of a shallow monitor well to monitor impacts to the water table of the surficial aquifer during the APTs. During construction of the LFA exploratory well, Polk County authorized the construction of a dual-zone monitor well to monitor impacts to water levels in the upper and lower portions of the FAS during the APTs. This report summarizes the construction

and testing of the dual-zone monitor well, herein referred to as the Southeast dual-zone monitor well or SE-DZMW.

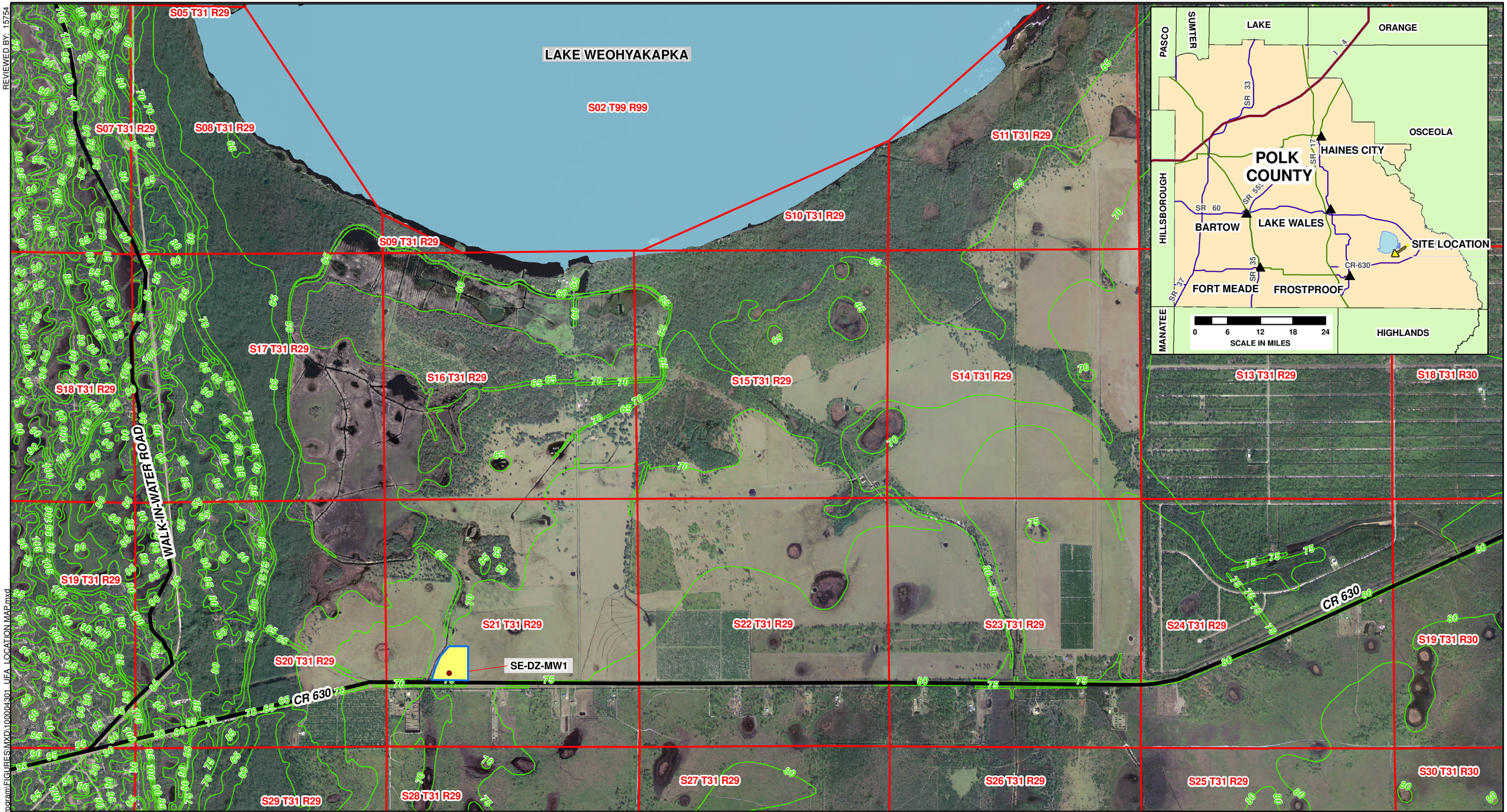
Technical specifications on the construction of SE-DZMW were prepared by PBS&J and submitted to Rowe Drilling Company, Inc. (RDC) of Polk City, Florida. SE-DZMW was to be constructed in close proximity to SE-UFA-MW1and SE-DEW for the primary purpose of monitoring water levels in the FAS during the APTs at these wells. SE-DZMW was constructed with an inner 8-inch diameter casing with an open interval from 1,400 to 2,141 feet bls, which mirrored the open hole interval of SE-DEW, and an outer 14-inch casing that was initially completed with an open interval from 270 to 1,250 feet bls to monitor the Avon Park permeable zone during the APT of the SE-DEW, then back-grouted to 950 ft bls after the SE DEW APT to mirror the open hole interval of SE-UFA-MW1 during its APT.

RDC initiated drilling operations at SE-DZMW on July 27, 2009 after obtaining the required well construction permit (WCP) from the South Florida Water Management District (SFWMD). WCP No.49-59-07907, which is included as **Attachment A**, was issued to RDC on July 18, 2009 authorizing the construction of a dual zone monitor well.

1.2. SE-DZMW Location

As depicted on **Figure 1**, SE-DZMW is located at the southeast Polk County Deep Exploratory Well site, which is located east of the City of Frostproof, Florida within Section 21, Township 31 South, Range 29 East, on property leased by Polk County Utilities. The Deep Exploratory well site is a 10.3 acre outparcel of the FX-Bar ranch property that is bordered on the west by a drainage ditch and County Road (C.R.) 630 on the south. The land surface elevation at the site is approximately 76 feet above the National Geodetic Vertical Datum of 1929. SE-DZMW is geographically located at 27˚ 46’ 02.2” North Latitude and 81˚ 25’ 43.38” West Longitude, approximately 200 feet north of C.R 630, 100 feet west of SE-UFA-MW1, and 200 feet west of SE-DEW.

CREATED BY: 20169
REVIEWED BY: 15754



FILE PATH: F:\COMMON\Hydrogeological Program\FIGURES\MXD\100004301_UFA_LOCATION_MAP.mxd

LEGEND:

- Southeast Dual Zone Monitor Well (SE-DZMW)
- Southeast Polk County Deep Exploratory Well Site
- Section , Township, Range
- Topographic Contours - 5 Foot Intervals
- Major Roads

NOTES:

1. THIS FIGURE IS GENERATED IN COLOR. PHOTOCOPYING IN BLACK AND WHITE WILL RESULT IN THE LOSS OF THE PRESENTED DATA.
2. AERIAL PHOTOGRAPH PROVIDED BY THE SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT (03-2006).
3. SHAPEFILES PROVIDED BY POLK COUNTY, THE FLORIDA DEPARTMENT OF TRANSPORTATION AND SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT.

N W E S

0 2,000 4,000 6,000 8,000
SCALE IN FEET

Polk County Utilities

330 WEST CHURCH STREET,
BARTOW, POLK COUNTY, FLORIDA

SOUTHEAST DEEP EXPLORATORY WELL SITE
DUAL ZONE FLORIDAN AQUIFER MONITOR WELL
SITE LOCATION MAP
FROSTPROOF, POLK COUNTY, FLORIDA

SCALE: AS SHOWN
FEBRUARY 2010

PBSJ **FIGURE 1**

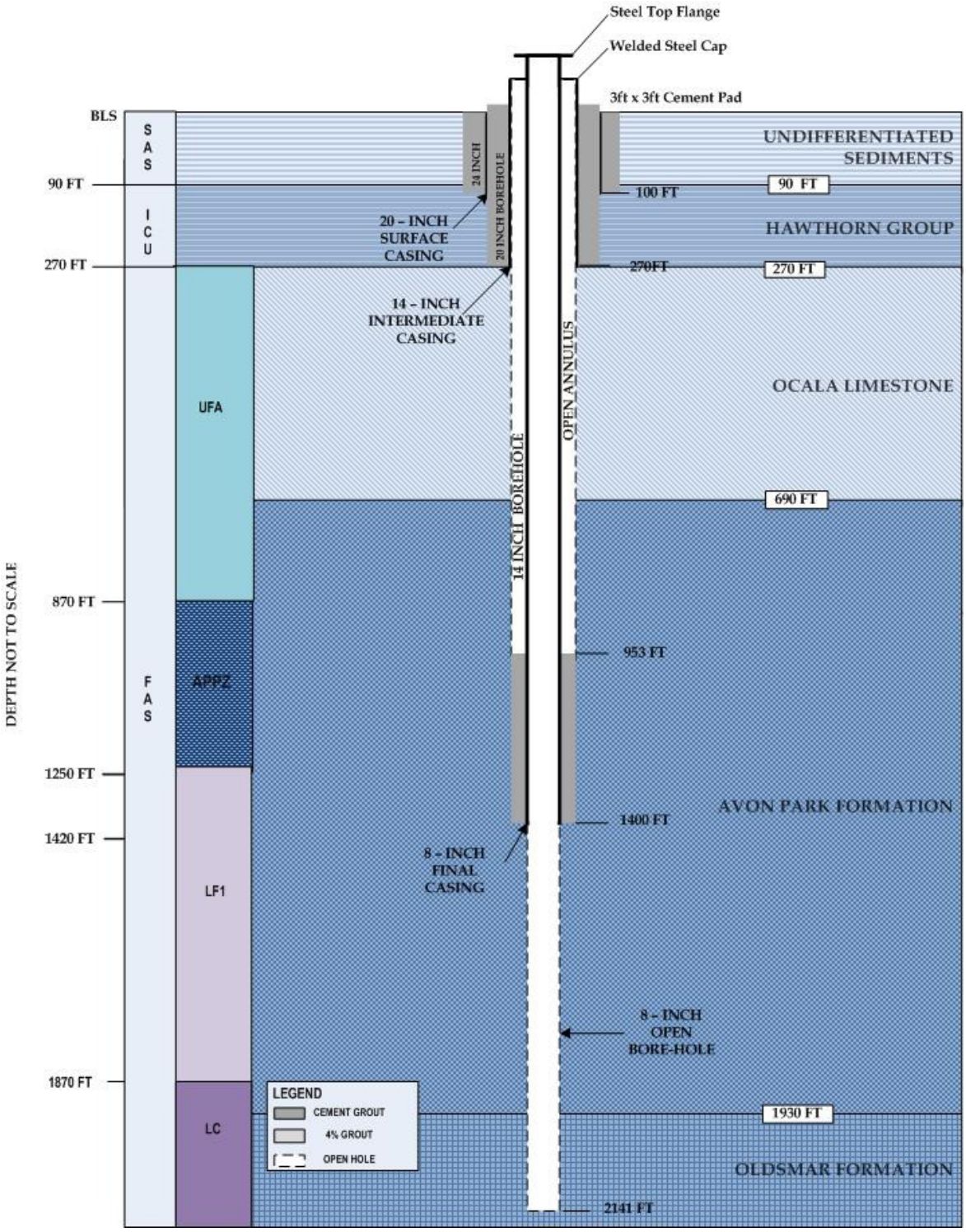
2.0 WELL CONSTRUCTION

Drilling operations during the construction of the SE-DZMW were conducted with a Gardner Denver 3000 trailer mounted drilling rig incorporating a Kelly drive table rotary system. The table rotary is located approximately 4.5 feet above land surface. The nominal sizes of the drilling bits used were 12, 18, and 24 inches in diameter. The drill rods were 7-inch outside diameter and ranged from approximately 30 to 32 feet in length. Photographs of the drilling equipment, selected well construction activities, and the completed wellhead are presented in **Attachment B.**

The drilling operations, which are further described in the following Sections 2.1 and 2.2, utilized mud-rotary drilling to a depth of approximately 718 feet below land surface (bls) followed by reverse-air drilling to a depth of 2,141 ft bls. Formation samples were collected at 10-foot intervals during pilot-hole drilling and examined, identified and catalogued on-site by a PBS&J geologist. The formation samples were utilized to prepare a lithologic log for the SE-DZMW, which is presented in **Attachment C**. In general, formation materials encountered at the site included unconsolidated sands that comprise the surficial aquifer system (SAS) to approximately 93 ft bls, clay and limestone that comprises the intermediate confining unit (ICU) to approximately 265 ft bls, and limestone and dolostone of the FAS to the drilled depth of 2,141 feet bls.

Steel casings were installed and grouted in place at various depths as drilling proceeded to prevent collapse of the borehole and to prevent the interchange of water between hydrogeologic units. Installation and grouting of the casing are further described in the following **Sections 2.3 through 2.8**. The as-built diagram of the completed SE-DZMW and estimated depths of the geologic and hydrogeologic units that were encountered during the drilling of the well are depicted in **Figure 2**. Hydrogeologic units encountered during construction of the SE-DZMW included the SAS, the ICU, the middle semi-confining unit – upper part (MC1), the Avon Park permeable zone (APPZ), the middle semi-confining unit – lower part (MC2), the Lower Floridan aquifer –uppermost permeable zone (LF1), and a confining unit within the LFA (LC). Geologic units encountered included undifferentiated sediments, the Hawthorne Group, the Ocala Limestone, the Avon Park Formation, and the Oldsmar Formation.

Figure 2-1 As-built Drawing of SE-DZMW
Including Geologic and Hydrogeologic Units



2.1. Mud Rotary Drilling

Mud rotary drilling is utilized to drill through unconsolidated or poorly consolidated sediments that generally are unstable, have a tendency to collapse into the borehole and yield relatively low quantities of groundwater. The drilling mud stabilizes the borehole and removes the drill cuttings during the drilling operations. The mud rotary drilling operations at the site utilized bentonite drilling mud as the drilling fluid, which was mixed in an earthen pit approximately 10,000 gallons in volume.

During mud rotary drilling, the drilling mud is pumped through the drill rods and exits out the drill bit. The viscous drilling fluid suspends the cuttings and circulates back up the borehole to land surface. The returning mud, laden with formation cuttings, is routed back into the open pit, which is tiered and baffled allowing the formation cuttings to settle out. The drilling fluids are collected in another tier and re-circulated back down the drill rod. Following completion of the well, the drilling mud was removed from the 10,000-gallon dug pit and transported to a private landowner for fill purposes. The 10,000 gallon pit was then backfilled with clean sand and compacted.

2.2. Reverse-Air Drilling

Reverse-air drilling techniques are primarily used to drill competent water-bearing formations. Water produced by the formation during the drilling operations serves as the drilling fluid. Compressed air is piped down a 1-inch diameter air-line inside the drill pipe that aerates the water. This aeration causes a pressure differential, which in turn causes upward flow of the water inside the drill pipe. The drill pipe in effect becomes an air-lift pump. Water and cuttings at the bottom of the borehole are drawn into the drilling bit and conveyed up the drill rod to land surface.

The water and cuttings from the drill rod were routed to a series of coffered earthen pits, with turbidity mitigation controls installed. The discharge water, saturated with cuttings was directed through four pits, of varying size and construction, in an effort to allow the cuttings and suspended solids to settle leaving the discharge water clearer with very low turbidity. The final pit was a lined over-land-flow, burmed area that allowed the velocity of the discharge to slow significantly, reducing the sediment transport ability of the water. To further decrease the turbidity in the final pit, Jute mats were placed on the bottom of the approximately 300 square feet area, and dusted with an anionic polymer that, when in solution increases the mass of the suspended solids by coagulation causing them to settle out of suspension. The discharge water was continually monitored by RDC for Turbidity prior to being releasing into the county drainage ditch that parallels the north side of C.R. 630. Turbidity levels met the criteria required by the FDEP Generic Permit for the Discharge of Produced Ground Water from any Non-Contaminated Site Activity.

2.3. 20-Inch Casing Installation

Construction of SE-DZMW was initiated by RDC with the installation of a nominal 20-inch diameter steel pipe to a depth of 100 ft bls on June 27, 2009 into sandy clay of the ICU to

prevent potential borehole collapse during continued construction activities. The nominal 12-inch diameter pilot hole was reamed to a nominal 24-inch diameter to a depth of approximately 100 feet in preparation for installation of the casing. Two and a half sections of steel pipe, which were approximately 43 feet in length, were welded together and rotated by hand as they were lowered into the borehole to ensure that the casing hung free of obstructions and plumb within the borehole (photos in **Attachment B**). Steel centralizers, which were positioned at 0, 90, 180, and 270 degrees around the casing, were welded in place five feet above the bottom of the casing, 60 above that, and 5 feet below the top of the casing. Tremmie pipe was temporarily installed between the casing and borehole wall to approximately 5 feet from the bottom of the borehole in preparation for grouting of the annulus. Mill certificates for the casing are included in **Attachment D.**

2.4. 20-Inch Casing Grouting

Cement grouting of the surface casing was completed utilizing tremmie grouting methods. Tremmie grouting is performed by pumping grout through a tremmie pipe, which is installed into the annular space from the surface, to a depth just above the intended grout application.

RDC conducted cementing operations at the SE-DZMW with manufactured cement from CEMEX of Lake Wales, Florida. RDC cemented the nominal 20-inch diameter surface casing in place with two tremmie grout stages utilizing Portland Type II cement mixed with 5.2 gallons of water per 94 pounds of cement (1 sack). The theoretical volume to fill the annulus between the nominal 24-inch diameter borehole and the 20-inch O.D., 100 foot long casing, was approximately 81.3 sacks of neat cement grout.

The first grout stage was performed on July 27, 2009 and consisted of pumping 40 sacks of neat cement grout. On July 28, 2009, an additional 63 sacks of neat cement grout were installed in the annular space by tremmie pipe, which resulted in a return of grout to land surface. The total quantity of grout used was 103 sacks.

2.5. 14-Inch Casing Installation

Following grouting of the 20-inch casing, the pilot hole was advanced to a depth of 270 feet bls, and then reamed to a nominal 20-inch diameter utilizing mud-rotary drilling techniques. After reaming activities, geophysical logging event (**Run No. 1**), which is discussed further in **Section 3.0**, was conducted in preparation for installation of the nominal 14-inch diameter casing.

The 14-inch casing consisted of seven sections of butt-welded nominal 14-inch diameter, 3/8-inch thick wall, carbon steel pipe totaling approximately 270 feet in length. Steel centralizers, which were positioned at 0, 90, 180, and 270 degrees around the casing, were welded in place five feet above the bottom of the casing and every 60 feet thereafter with the final centralizer placed 20 feet below the top of the casing. After the bottom of the welded casing string was landed the limestone of the Ocala Formation, it was rotated by hand to demonstrate that it hung free of obstructions and plumb in the borehole. A temporary steel pressure head was welded onto the top of the casing in preparation for pressure grouting of the annulus between the casing and borehole wall. Casing mill certificates for the nominal 14-inch diameter casing are included in **Attachment D**.

2.6. 14-Inch Casing Grouting

The 14-inch diameter casing installation required a pressure grout for the first stage of grouting, ensuring a seal at the bottom of the casing to the surrounding lithology. Pressure grouting is performed by pumping grout inside the casing through a pipe that is sealed using a header assembly welded to the top of the casing, the casing is then pressurized. The grout is pumped down the tremmie pipe and forced around the bottom of the casing and up the outside, filling the annular space between the casing and reamed borehole wall. Tremmie grouting is performed by pumping grout through a small diameter tremmie pipe, which is installed into the annular space from the surface, to a depth just above the intended grout application.

RDC conducted grouting operations for the 14-inch casing installation at the SE-DZMW on August 3, 2009, utilizing manufactured cement from CEMEX of Lake Wales, Florida. RDC cemented the casing in place with one pressure grout stage and one tremmie grouting stage. Both cement applications utilized Portland Type II cement mixed with 5.2 gallons of water per 94 pounds of cement (1 sack). The theoretical volume to fill the annulus between the nominal 20-inch diameter borehole and the 14-inch diameter, 270 foot long casing string based on the annular hole volume of 268 cubic feet calculated from the caliper log and casing diameters is approximately 220 sacks of neat cement grout. RDC pumped 242 sacks of neat cement grout in the first stage. On August 4, 2009, a physical tag of the grout top revealed the grout had risen to with in eight feet of land surface. RDC brought the grout up to land surface with 12 sacks of neat cement grout.

2.7. 8-Inch Casing Installation

Following grouting of the 14-inch casing, the pilot hole was advanced to a depth of 718 feet bls utilizing mud-rotary drilling techniques. At that depth, the formation was producing sufficient water for drilling utilizing reverse-air techniques. RDC converted to reverse-air drilling and continued pilot hole drilling to 1,400 ft bls and then reamed the pilot hole to a nominal 20-inch diameter. After reaming activities, geophysical logging events (**Runs No. 2 and 2b**), which are discussed further in **Section 3.0**, were conducted in preparation for installation of the nominal 8-inch diameter casing. The bottom of the nominal 8-inch diameter casing was landed at approximately 1400 ft bls in the confining unit overlying the LFA.

The 8-inch casing was installed between September 2 and 3, 2009 and consisted of thirty-three sections of butt-welded nominal 8-inch diameter, 5/16-inch thick wall, carbon steel pipe totaling approximately 1400 feet in length. Steel centralizers, which were positioned at 0, 90, 180, and 270 degrees around the casing, were welded in place five feet above the bottom of the casing and every 60 feet thereafter with the final centralizer placed 20 feet below the top of the casing. After the bottom of the welded casing string was landed in dolomitic limestone of the LFA, it was rotated by hand to demonstrate that it hung free of obstructions and plumb in the borehole. A temporary steel pressure head was welded onto the top of the casing in preparation for pressure grouting of the annulus between the casing and borehole wall. Casing mill certificates for the nominal 8-inch diameter casing are included in **Attachment D**.

2.8. 8-Inch Casing Grouting

Grouting of the nominal 8-inch casing was conducted in two events. The annulus between the 8-inch casing and nominal 14-inch borehole was initially grouted from 1,400 to approximately 1,250 ft bls to provide an open interval below the 14-inch casing from 270 to 1,250 feet bls to monitor the Avon Park permeable zone during the APT of the SE-DEW. After the SE-DEW APT, the annulus was tremmie grouted from 1,250 to 950 ft bls to mirror the open hole interval of SE-UFA-MW1 during its APT.

Cement grouting of the 8-inch diameter casing was completed using both pressure grouting and tremmie grouting methods. RDC conducted grouting operations at the SE-DZMW utilizing cement from CEMEX of Lake Wales, Florida.

On September 3, 2009, RDC pressure grouted the nominal 8-inch diameter casing in place for the first grouting event utilizing Portland Type II cement mixed with 5.2 gallons of water per 94 pounds of cement (1 sack) mixed with 4% hydrated bentonite. The theoretical volume to fill the annulus between the nominal 14-inch diameter borehole and the 8-inch diameter casing from 1,400 to 1,250 ft bls based on the annular hole volume of 82 cubic feet calculated from the caliper log is approximately 53 sacks of the cement and 4% bentonite grout. RDC pumped 66 sacks of the cement and 4% bentonite grout. The pressure gauge installed on the header assembly read 70 pounds per square inch (psi) at the end of the pressure grouting operation and maintained that pressure reading for approximately four hours until the grout set. On September 4, 2009, a physical tag revealed that the cement top was located at an approximate depth of 1250 ft bls. On September 04, 2009, a temperature log, which is discussed further in **Section 3.0,** was performed to confirm the top of the cement grout.

The second grouting event consisted of tremmie grouting the annulus in two stages utilizing the cement and 4% bentonite grout mix. The theoretical volume to fill the annulus between the nominal 14-inch diameter borehole and the 8-inch diameter casing from 1,250 to 1,950 ft bls based on the annular hole volume of 169 cubic feet calculated from the caliper log is approximately 53 sacks of the cement and 4% bentonite grout. RDC pumped 132 sacks of the cement and 4% bentonite grout on November 13, 2009. On November 16, 2009, a physical tag revealed that the cement top was located at an approximate depth of 1,057 ft bls. That same day RDC pumped 44 sacks of the cement and 4% bentonite grout. On November 17, 2009, a physical tag revealed that the cement top was located at an approximate depth of 953 ft bls, Temperature logging, which is discussed further in **Section 3.0,** was performed on November 17, 2009 to confirm the top of the cement grout.

2.9. Open Hole Interval

Following installation of the nominal 8-inch diameter final casing, an 8-inch borehole was advanced to a depth of approximately 2,140 ft bls between September 5 and 21, 2009 utilizing reverse-air drilling techniques.

2.10. Well Development

Development of the annulus between the 8-inch casing and the 14-inch casing and 14-inch borehole was performed on September 4, 2009 following completion of the first stage of grouting of the 8-inch casing from 1,400 to 1,250 ft bls. A bentonite mud cap, which was placed on top of the water inside the 14-inch casing to kill the artesian flow to facilitate the installation and grouting of the 8-inch casing, was broken apart and dissipated by allowing the well to flow under artesian conditions for approximately 4 hours, at which point the water was clear of bentonite mud and drill cuttings. Although the artesian flow was expected to remove the bentonite mud from the pressure grouting, in order to verify that it had not accumulated in the annulus atop the grout at 1,250 feet bls, RDC installed approximately 1,250 feet of tremmie pipe inside the annulus, and then pumped it with a centrifugal pump at approximately 25 gallons per minute for approximately 1.5 hours. The discharge water was free of visible mud and cloudiness for the duration of the pumping period.

The artesian flow in the annulus had to be killed again for the grouting of the 8-inch casing from 1,250 to 950 ft bls after the APT at the SE-DEW was completed. After the cement top was tremmie grouted to 953 feet bls, the mud cap was again broken apart and the development of the annulus was completed by allowing the well to flow under artesian conditions.

Development of the 8-inch diameter open borehole interval from 1,400 to 2140 ft bls was conducted on September 21 and 22, 2009 by air development using the drill rod for pumping and the 8-inch casing or the borehole itself as the educator line. SE-DZMW was intermittently surged and allowed to recover over a period of approximately ten hours at which point the discharge water was visibly clear and free of solids.

3.0 Geophysical Logging

Geophysical logging during the construction of the SE-DZMW was performed by MV Geophysical Surveys, Inc. (MV) of Fort Meyers Florida to determine borehole and grout conditions to assist in well construction. The logging program included collection of geophysical data under static conditions. Copies of the geophysical logs are presented in **Attachment E**. **Table 3-1** summarizes the geophysical logging events performed at the SE-DZMW.

Table 3-1. Geophysical Logging Events

SOUTHEAST DUAL-ZONE MONITOR WELL							
DATE		03-Aug-09	01-Sept-09	02-Sept-09	04-Sept-09	29-Sept-09	17-Nov-09
LOGGING RUN NUMBER		1	2	2b	3	4	6
BOREHOLE or CASING		20-inch reamed hole	14-inch reamed hole	14-inch reamed hole	14-inch Borehole	8-inch Borehole	14-inch Borehole
INTERVAL	BEGIN (FT BLS)	0	0	0	0	0	0
LOGGED	END (FT BLS)	278	1399	1405	1388	2139	1403
Logs Conducted	NATURAL GAMMA RAY	X	X	X		X	
	CALIPER	X	X	X		X	
	TEMPERATURE				X		X
COMMENTS		Indication of casing placement and grout volume	Indication of casing placement and grout volume	Indication of casing placement and grout volume	Indication of grout placement (cement top)	Indication of borehole depth	Indication of grout placement (cement top)

NOTE: FT BLS: Feet Below Land Surface

The geophysical logging series conducted on SE-DZMW consisted of six individual logging events, herein referred to as "Runs," that were performed during the course of well construction.

Run No. 1 consisted of running a combination gamma-ray and X-Y Caliper tool on the nominal 20-inch reamed hole between 100 and 278 ft bls in preparation for the installation of the 14-inch diameter casing to a depth of 270 ft bls. The logs were completed on August 03, 2009. The X-Y caliper log was used to identify borehole dimensions that may affect casing installation and grouting, and provide the annular hole volume between the casing and reamed borehole. The X-Y caliper log also confirmed the depth of the 20-inch casing at 100 ft bls.

Run No. 2 and 2b consisted of running a combination gamma-ray and X-Y Caliper tool on the nominal 14-inch reamed hole between 270 and 1,405 ft bls in preparation for the installation of the 8-inch diameter casing to a depth of 1,400 ft bls. The logs were completed on September 1 and 2, 2009. The X-Y caliper logs were used to identify borehole dimensions that may affect casing installation and grouting, and provide the annular hole volume between the 14-inch casing and the nominal 20-inch reamed borehole. **Run No.2** showed that the diameter of the borehole narrowed to approximately 11-inches near the bottom of the borehole so RDC went back in and reamed the borehole again. **Run No.2a** showed that the borehole diameter had been increased to an acceptable diameter. The X-Y caliper log also confirmed the depth of the 14-inch casing at 270 ft bls.

Run No. 3 consisted of running a temperature tool inside the 8-inch casing following the pressure grouting on Sept 3, 2009 to assist in verifying grout placement in the annulus between the casing and the nominal 14-inch borehole. The temperature log indicated a top of cement at 1,275 ft bls, which was 25 ft below the physical grout tag of 1,250 ft bls.

Run No. 4 consisted of running a combination gamma-ray and X-Y Caliper tool on the completed well to identify borehole dimensions and confirm the depths of the 8-inch casing and

open borehole. The logs were completed on August 03, 2009 and showed that the 8-inch casing depth is 1,400 ft bls and the total depth of the well is 2,139 ft bls.

Run No. 6 consisted of running a temperature tool inside the 8-inch casing following the last tremmie grouting on November 16, 2009 to assist in verifying grout placement in the annulus between the casing and the nominal 24-inch borehole. The temperature log indicated a top of cement at 953 ft bls, which was the same as the physical grout tag.

4.0 Wellhead Completion and Surveying

4.1. Wellhead Completion

The wellhead of SE-DZMW was completed by cutting the 8-inch diameter steel casing to a height of approximately 3.4 feet above land surface (als) and the 14-inch diameter steel casing to a height of approximately 2.6 feet als. A 12-inch diameter flat-face, hub type flange was welded to the 8-inch casing, which was capped with 1/4-inch thick steel plate with two 1 1/4-inch threaded ports with plugs installed near the center of the plate to allow access to the well for monitoring water levels of the uppermost permeable zone of the Lower Floridan aquifer. The steel plate was secured to the flange with a gasket, steel bolts and nuts.

A 1/4-inch thick steel "O-ring" plate was welded to the top of the 14-inch casing and the side of the 8-inch casing. Two 1 1/4-inch threaded ports with plugs were installed on the north side of the steel plate to allow access to the annular space between the two casings for monitoring water levels of the Avon Park permeable zone.

Both casings, flange, plates, nuts and bolts were coated with a black epoxy to inhibit rust. A square cement pad approximately three feet in diameter and 4-inches thick was poured around the 14-inch casing. Four protective 4-inch diameter steel poles (bollards) filled with concrete, were installed at the corners of the pad to a depth of 2 feet below land surface and extending to 3 feet above land surface. The casings and bollards were coated with the black epoxy. The Well Completion Report is included in **Attachment F**. A photograph of the completed wellhead is included in **Attachment B**.

On February 4, 2010, PBS&J installed Solinst Levelogger Gold Model 3001 water level transducers and recorders in SE-DZMW. The Leveloggers were programmed to record water levels every hour on the hour. Additional information on the Leveloggers and installation setups is provided in **Table 4-1**.

Table 4-1 SE-DZMW Levelogger Data

Casing	Make	Water Fluctuation Range (ft)	Serial Number	Installed Depth Below Plate (ft)	Communication Type
8-inch	F30	29.5	1037308	25 ft	Direct Read Cable
14-inch	F60	62.3	1026355	25 ft	Direct Read Cable

4.2. Surveying

SE-DZMW was surveyed in on February 23, 2010, by a registered professional Florida land surveyor, Accuright Surveys of Orlando, Inc. The survey data shows the land surface, well head, and measuring point elevations referenced to the National Geodetic Vertical Datum of 1929 (NGVD), as well as the location of the well based on latitude and longitude on the state plane coordinate system. The Survey Report is included in **Attachment G**. The results of the survey are listed in **Table 4.2** below.

Table 4-2 SE-DZMW Survey Data

Part A – Elevation Data in Feet above NGVD

Casing	Land Surface	Top of Pad	Top of Flange or Plate	Top of 11/4-inch ports
8-inch	76.7	77.2	80.12	80.20
14-inch			79.24	79.30

Part B – Location Data

NORTHING, FL W	EASTING, FL W	LATITUDE	LONGITUDE
1248437.70	840910.33	27.7670341	-81.4287179

Attachment A - Well Construction Permit

(863) 984-3100 Orig.

7907

STATE OF FLORIDA PERMIT APPLICATION TO CONSTRUCT, REPAIR, MODIFY, OR ABANDON A WELL

- ☐ Southwest
- ☐ Northwest
- ☐ St. Johns River
- ☒ South Florida
- ☐ Suwannee River

CHECK BOX FOR APPROPRIATE DISTRICT. ADDRESS ON BACK OF PERMIT FORM.

THIS FORM MUST BE FILLED OUT COMPLETELY.

The water well contractor is responsible for completing this form and forwarding the permit to the appropriate delegated county where applicable.

Permit No. 49-53-07907
Florida Unique I.D.
Permit Stipulations Required (See attached)
62-524 well ☐
CUP/WUP Application No.
ABOVE THIS LINE FOR OFFICIAL USE ONLY

1. Polk County BOCC 2470 Clower Lane Bartow 33831 (863)534-5630
   Owner, Legal Name of Entity if Corporation — Address — City — Zip — Telephone Number
2. CR 630 approx. 1 mile east of Walk-in-Water Rd. on North side
   Well Location — Address, Road Name or Number, City
3. Rowe Drilling Co. Inc 3206 863-984-3100
   Well Drilling Contractor — License No. — Telephone No.
   P.O. Box 1098
   Address
   Polk City, Fl. 33868
   City — State — Zip
4. ____ (smaller) 1/4 of ____ (largest) 1/4 of Section 21 (Indicate Well on Chart)
5. Township 31 Range 29

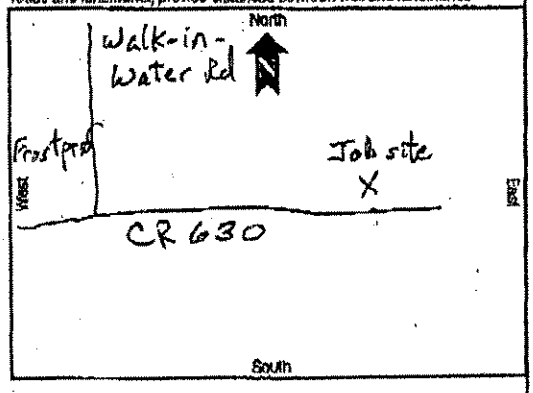
NW NE SW SE

6. Polk
   County — Subdivision Name — Lot — Block — Unit

Fold at this line in order that address is visible through envelope window

7. Number of proposed wells 1 Check the use of well: (See back of permit for additional choices) ____ Domestic Monitor (type) Dual-Zone
   ____ Irrigation (type) (See Back) Public Water Supply (type) ____ (See Back) List Other ____
   Distance from septic system ____ ft. Description of facility ____ Estimated start of construction date 7/20/09
8. Application for: X New Construction ____ Repair/Modify ____ Abandonment ____ (Reason for Abandonment)
   Date Stamp
9. Estimated: Well Depth 2140' Casing Depth 1400' Screen Interval from ____ to ____
   Casing Material: Blk-Steel / Gal / PVC Casing Diameter 8" Seal Material ____
10. If applicable: Proposed Grouting Interval From 0 to 270' Seal Material neat cement
    From 950' to 1400 Seal Material neat cement
    From ____ to ____ Seal Material ____
11. Telescope Casing ____ or Liner ____ (check one) Diameter ____
    Blk-Steel / Galvanized / PVC Other (specify): ____
12. Method of Construction: X Rotary ____ Cable Tool ____ Combination
    ____ Auger ____ Other (specify:) ____
13. Indicate total No. of wells on site ____. List number of unused wells on site ____.
14. Is this well or any other well or water withdrawal on the owner's contiguous property covered under a Consumptive/Water Use Permit (CUP/WUP) or CUP/WUP Application? X No ___ Yes
    (If yes, complete the following) CUP/WUP No. ____
    District well I.D. No. ____
    Latitude ____ Longitude ____
    Data obtained from GPS ____ or map ____ or survey ____ *(map datum NAD 27 ____ NAD 83 ____)*

Draw a map of well location and indicate well site with an "X". Identify known roads and landmarks; provide distances between well and landmarks.



15. I hereby certify that I will comply with the applicable rules of Title 40, Florida Administrative Code, and that a water use permit or artificial recharge permit, if needed, has been or will be obtained prior to commencement of well construction. I further certify that all information provided on this application is accurate and that I will obtain necessary approval from other federal, state, or local governments, if applicable. I agree to provide a well completion report to the District within 30 days after drilling or the permit expiration, whichever occurs first.

T. Salter 3206
Signature of Contractor — License No.

I certify that I am the owner of the property, that the information provided is accurate, and that I am aware of my responsibilities under Chapter 373, Florida Statutes, to maintain or properly abandon this well; or, I certify that I am the agent for the owner, that the information provided is accurate, and that I have informed the owner of his responsibilities as stated above. Owner consents to personnel of the WMD or a representative access to the well site.

Johnny Wilks 7/17/09
Owner's or Agent's Signature — Date

DO NOT WRITE BELOW THIS LINE — FOR OFFICIAL USE ONLY

Approval Granted By: ____ Issue Date: 7-17-09 Hydrologist Approval 7/16/09 (Initials)
Owner Number: ____ Fee Received: $ 150- Receipt No.: 63379 Check No.: 8991

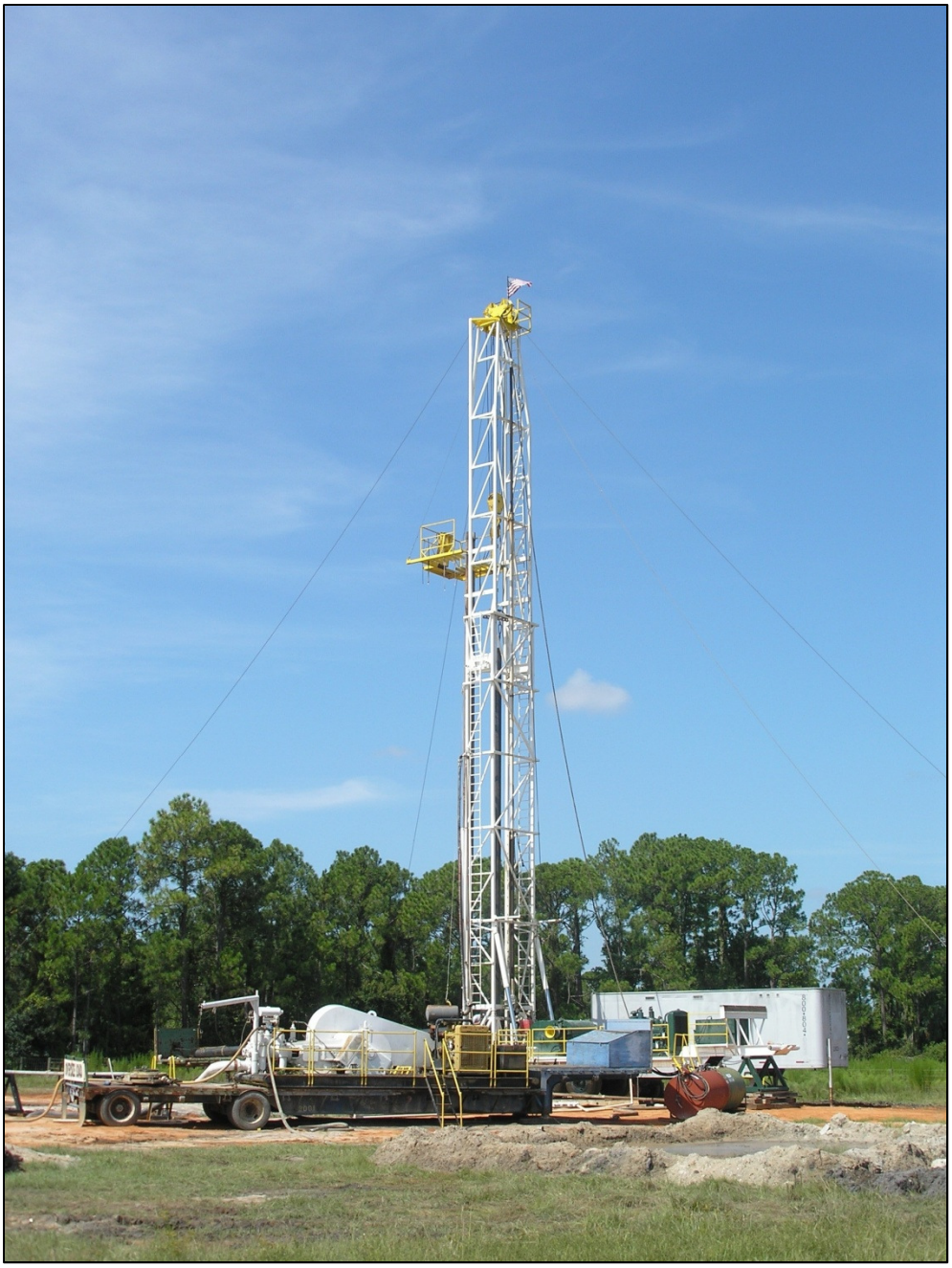
THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED BY AN AUTHORIZED OFFICER OR REPRESENTATIVE OF THE WMD. IT SHALL BE AVAILABLE AT THE WELL SITE DURING ALL DRILLING OPERATIONS. ***This permit is valid for 90 days from date of issue.***

WHITE: ORIGINAL FILE
YELLOW: DRILLING CONTRACTOR
PINK: OWNER

SRWMD FORM 40D-3-1 REV. 12/95

Orig 863-984-3100

Attachment B – Photographic Log



SE DZMW-1 DRILLING SITE &
GARDNER DENVER 3000 DRILLING RIG

DRILLING BITS

DRILLING ROD

STEEL CASING : 20-INCH

STEEL CASING : 14-INCH

STEEL CASING : 8-INCH

CEMENTING OPPERATIONS

SE DZMW-1 WELLHEAD

Attachment C – Lithologic Log

LITHOLOGIC LOG

Location: SEDEW Site, Polk County, FL **Owner:** Polk County Utilities **Date Drilled:** **Drilling Method:** **Drilling Contractor:** Rowe Drilling, Inc. **Sampling Method**: Grab samples from drill cuttings	**POLK COUNTY SEDEW** **Dual Zone** **Monitor Well**

DEPTH INTERVAL (ft)		DESCRIPTION	BY
FROM	**TO**		
0	10	SAND, medium grained, quartz, colorless; much organics.	MR
10	20	SAND, medium to fine grained, quartz, colorless to tan.	MR
20	30	SAME AS ABOVE	MR
30	40	SAME AS ABOVE; with some organic material, soft, sticky, black/brown.	MR
40	50	SAME AS ABOVE	MR
50	60	SAND, medium to fine grained, quartz, colorless to buff.	MR
60	70	SAME AS ABOVE; some grains are large and rounded.	MR
70	80	SAME AS ABOVE; trace phosphate grains.	MR
80	90	SAME AS ABOVE	MR
90	100	CLAY; sandy, soft, phosphate, gray/green; some phosphate nodules; trace shell fragments.	MR
100	110	SAME AS ABOVE; more phosphate nodules.	MR
110	120	SAME AS ABOVE; more shell fragments.	MR
120	130	CLAY, moderately firm, silty, phosphatic, green; some shell fragments; some phosphate nodules.	MR
130	140	SAME AS ABOVE	MR
140	150	LIMESTONE, moderately hard, phosphate, dark gray; much shell fragments; some medium grained sand; trace phosphate nodules.	MR
150	160	CLAY, silty, sandy, moderately loose, gray/green; much shell fragments; trace phosphate nodules.	MR
160	170	LIMESTONE, hard, phosphate, gray; some phosphate nodules	MR
170	180	SAME AS ABOVE; much shell fragments; some medium grained sand; trace phosphate nodules.	MR
180	190	LIMESTONE, moderately hard, micritic, light gray and phosphatic; some shell fragments; trace phosphate nodules.	MR
190	200	SAME AS ABOVE	MR
200	210	LIMESTONE, moderately hard, micritic, light gray and phosphatic; some shell fragments; trace medium grained sand.	MR

LITHOLOGIC LOG

DEPTH INTERVAL (ft)		DESCRIPTION	BY
210	220	SAME AS ABOVE	MR
220	230	SAME AS ABOVE	MR
230	240	SAME AS ABOVE	MR
240	250	CLAY, unconsolidated, phosphatic, light gray; much phosphate nodules and grains, some shell fragments, some Limestone, pelloid, friable, phosphatic, buff.	MR
250	260	LIMESTONE, moderately friable, tan; trace shell fragments (Foraminifera); trace Limestone, fine texture, micritic, hard, buff; trace calcareous sandstone, light gray.	MR
260	270	SAME AS ABOVE; more shell fragements	MR
270	280	LIMESTONE, friable, fossiliferous, chalky, light tan; much shell fragments (Foraminifera) and mollusk shell fragments.	MR
280	290	SAME AS ABOVE	MR
290	300	SAME AS ABOVE with Echinoids.	MR
300	310	SAME AS ABOVE	MR
310	320	LIMESTONE, fossiliferous, extremely friable, buff to white, abundant shell casts (Echinoid, Foraminifera, Mollusk).	MR
320	330	SAME AS ABOVE	MR
330	340	SAME AS ABOVE	MR
340	350	SAME AS ABOVE	MR
350	360	SAME AS ABOVE	MR
360	370	LIMESTONE, extremely friable, chalky, buff; much shell fragments (Foraminifera, Foraminifera)	MR
370	380	SAME AS ABOVE; with trace of Limestone, moderately hard, gray.	MR
380	400	SAME AS ABOVE	MR
400	410	SAME AS ABOVE	MR
410	420	LIMESTONE, fossiliferous, extremely friable, chalky, buff, abundant shell casts; some Limestone, moderately hard, gray.	MR
420	430	LIMESTONE, moderately hard, coarse texture, phosphatic, light tan to gray; trace shell fragments	MR
430	440	SAME AS ABOVE	MR
440	450	LIMESTONE, moderately friable, coarse texture, fossiliferous, light tan; some shell fragments	MR
450	460	SAME AS ABOVE; Limestone has phosphate grains in matrix	MR

LITHOLOGIC LOG

DEPTH INTERVAL (ft)		DESCRIPTION	BY
460	470	LIMESTONE, moderately hard, coarse texture, phosphatic, light tan to gray; trace shell fragments	MR
470	480	LIMESTONE, hard, micritic, fossiliferous, tan; some crystallized Echinoid fossils (also Foraminifera and Nautloid fragments)	MR
480	490	LIMESTONE, moderately friable, medium textured, fossiliferous, buff; some shell fragments	MR
490	500	SAME AS ABOVE	MR
500	510	SAME AS ABOVE, more crystallized echinoid fragments; trace Limestone, moderately friable, light gray	MR
510	520	LIMESTONE, micritic, hard, medium textured, buff; some shell fragments, crystallized	MR
520	530	SAME AS ABOVE	MR
530	540	LIMESTONE, friable, gritty, fossiliferous, buff; some shell fragments	MR
540	550	SAME AS ABOVE; less crystallized shell fragments	MR
550	560	SAME AS ABOVE	MR
560	570	SAME AS ABOVE; trace very firm, dry, gritty clay(weathered Limestone), buff	MR
570	580	SAME AS ABOVE	MR
580	590	SAME AS ABOVE	MR
590	600	SAME AS ABOVE; more shell castings	MR
600	610	SAME AS ABOVE	MR
610	620	LIMESTONE, gritty/granular, [wackestone to grainstone], fine to medium grained, moderately friable, buff; trace shell fragments	MR
620	630	LIMESTONE, micritic, fine grained, fossiliferous, moderately friable, buff; some shell fragments (Foraminifera)	MR
630	640	LIMESTONE, micritic, fine grained, moderately friable, buff; some shell fragments; trace forams	MR
640	650	LIMESTONE, micritic, fine to medium grained, fossiliferous, friable to moderately friable, buff; trace shell fragments and echinoid and shell casts interbed with calcite.	MR
650	660	SAME AS ABOVE, except no shell casts or calcite; less Foraminifera and shell fragments	MR

LITHOLOGIC LOG

DEPTH INTERVAL (ft)		DESCRIPTION	BY
660	670	LIMESTONE, fossiliferous, fine to medium grained, moderately friable to moderately hard, light grayish-buff; trace shell fragments	MR
670	680	SAME AS ABOVE	MR
680	690	SAME AS ABOVE	MR
690	700	SAME AS ABOVE; more shell fragments (Foraminifera)	MR
700	710	SAME AS ABOVE	MR
710	720	LIMESTONE, hard, fossiliferous, tan; some shell fragments	MR
720	730	LIMESTONE, moderately hard, gritty, fossiliferous, tan; some shell fragments	MR
730	740	SAME AS ABOVE	MR
740	750	SAME AS ABOVE; more shell fragments	MR
750	760	DOLOMITIC LIMESTONE, micritic, some vugs, light tan; some Limestone, friable, fossiliferous, pelloid, buff; some shell fragments (forams, Echinoids)	MR
760	770	LIMESTONE, micritic, fine grained, moderately friable to moderately hard, light grayish-buff; some Limestone, weathered, clayey, moderately soft, light grayish-buff; trace shell fragments	MR
770	780	LIMESTONE, micritic, fossiliferous, fine grained, moderately friable to moderately hard, buff to light tan; trace shell fragments	MR
780	790	SAME AS ABOVE	MR
790	800	LIMESTONE, dolomitic, fine grained, moderately hard to hard, light tan; some Limestone, fossiliferous, fine grained, moderately friable to moderately hard, buff	MR
800	810	LIMESTONE, micritic, gritty, moderately friable to moderately hard, buff; trace shell fragments.	MR
810	820	SAME AS ABOVE, trace Limestone, dolomitic, fine grained, hard, light tan	MR
820	830	LIMESTONE, micritic, fine to medium grained, moderately friable to moderately hard, light tanish-brown to light gray	MR
830	840	LIMESTONE, micritic, fine grained, moderately friable, buff to light tan	MR

LITHOLOGIC LOG

DEPTH INTERVAL (ft)		DESCRIPTION	BY
840	850	LIMESTONE, micritic, fine grained, moderately friable to moderately hard, buff to light tan; some Limestone, weathered, clayey, moderately soft, light tan; some shell fragments	MR
850	860	LIMESTONE, micritic, fine grained, moderately friable to moderately hard, buff	MR
860	870	LIMESTONE, dolomitic, slightly vuggy, fine grained, hard, light tan; some Limestone, micritic, fine grained, moderately hard, buff; trace shell fragments	MR
870	880	LIMESTONE, micritic, fine to medium grained, moderately friable to moderately hard, buff to light tan; some Limestone, fine grained, hard, angular fractures, gray; trace Limestone, dolomitic, sucrosic texture, moderately hard, yellowish-tan; trace shell fragments	MR
880	890	LIMESTONE, micritic, fine to medium grained, moderately hard, buff to light tan; trace Limestone, fine grained, hard, light gray; trace Limestone, dolomitic, fine grained, hard, angular fractures, light brownish-tan	MR
890	900	DOLOMITE, fine grained, very hard, brown; some Limestone, micritic, fine grained, moderately friable, buff; trace shell fragments	MR
900	910	DOLOMITE, fine grained, very hard, crystalline, brown; trace shell fragments (foram); trace Limestone, micritic, friable, white; trace green clay, dry, sandy	MR
910	920	DOLOMITE, fine grained, very hard, crystalline, brown; trace shell fragments (foram); some Limestone, micritic (dolomitized), tan	MR
920	930	LIMESTONE, micritic, dolomitic, fine grained, no visible porosity, hard, light tanish-brown; trace Limestone, micritic, moderately hard, buff	MR
930	940	SAME AS ABOVE; trace dolomite, fine grained, very hard, angular fractures, light brown	MR

LITHOLOGIC LOG

DEPTH INTERVAL (ft)		DESCRIPTION	BY
940	950	LIMESTONE, dolomitic, fine grained, no visible porosity, angular fractures, very hard, light tanish-gray to light gray; trace Limestone, dolomitic, sucrosic texture, fine to medium grained, slightly vuggy, moderately hard, tan; trace Limestone, micritic, moderately friable to moderately hard, buff	MR
950	960	LIMESTONE, dolomitic, fine to medium grained, sucrosic texture, slightly vuggy, hard, tan; trace Limestone, micritic, fine grained, hard, buff	MR
960	970	SAME AS ABOVE	MR
970	980	LIMESTONE, dolomitic, fine grained, very hard, tan; some Limestone, dolomitic, fine to medium grained, sucrosic texture, moderately hard tan; trace Limestone, micritic, moderately friable, buff	MR
980	990	LIMESTONE, dolomitic, fine grained, no visible porosity, hard, angular fractures, light tan to tan; some shell fragments (Foraminiferas); trace Limestone, dolomitic, medium grained, slightly vuggy, sucrosic texture, moderately hard, light brown; trace Limestone, micritic, friable to moderately friable, buff	MR
990	1000	LIMESTONE, dolomitic, slightly vuggy, hard, light tan to light tanish-brown; some Limestone, dolomitic, sucrosic texture, fine to medium grained, moderately friable, light brown; trace Limestone, micritic, fossiliferous, chalky, moderately friable to moderately hard, buff	MR
1000	1010	SAME AS ABOVE	MR
1010	1020	SAME AS ABOVE	MR
1020	1030	DOLOMITIC LIMESTONE, hard, crystalline, buff, vuggy; some, micritic limestone, moderately hard, light tan	MR
1030	1040	SAME AS ABOVE, less dolomitic limestone	MR
1040	1050	DOLOSTONE, hard, microcrystalline, tan; trace, dolomitic limestone, hard, tan, vugs	MR
1050	1060	DOLOTIMITE, hard, microcrystalline, tan; trace limestone, hard, tan	MR
1060	1070	DOLOSTONE, hard, microcrystalline, tan; trace, limestone, hard, crystalline, light tan	MR
1070	1080	SAME AS ABOVE	MR

LITHOLOGIC LOG

DEPTH INTERVAL (ft)		DESCRIPTION	BY
1080	1090	SAME AS ABOVE	MR
1090	1100	SAME AS ABOVE	MR
1100	1110	DOLOSTONE, moderately hard, crystalline, slightly vuggy, light brown; trace limestone, micritic, moderately hard, buff	MR
1110	1120	SAME AS ABOVE, dolostone is harder and tan	MR
1120	1130	SAME AS ABOVE	MR
1130	1140	SAME AS ABOVE	MR
1140	1150	DOLOSTONE, moderately hard, sucrosic texture, fine to medium grained, vuggy, light brown; trace limestone, dolomitic, hard, fine grained	MR
1150	1160	SAME AS ABOVE	MR
1160	1170	SAME AS ABOVE	MR
1170	1180	DOLOSTONE, clastic, crystalline, hard, brown; trace limestone, moderately hard, micritic, gray	MR
1180	1190	DOLOSTONE, hard, crystalline, light brown; some limestone, hard, micritic, gray	MR
1190	1200	SAME AS ABOVE, more limestone	MR
1200	1210	DOLOSTONE, moderately hard, vuggy, brown; some dolomitic limestone, moderately friable, fossiliferous, light tan	MR
1210	1220	LIMESTONE, micritic, moderately hard, fine grained, buff; trace dolostone, hard, brown	MR
1220	1230	LIMESTONE, micritic, moderately hard, fine grained, light tan	MR
1230	1240	LIMESTONE, micritic, hard, fine grained, gray; some limestone, fossiliferous, moderately hard, tan; trace dolostone, hard, brown	MR
1240	1250	SAME AS ABOVE	MR
1250	1260	LIMESTONE, micritic, fine grained, chalky, moderately hard, buff to light tan; trace limestone, dolostone, vuggy, fine grained, hard, dark tan with gray banding	MR
1260	1270	LIMESTONE, micritic, fine grained, moderately hard, chalky, light tan; some limestone, moderately hard, tan	MR
1270	1280	SAME AS ABOVE	MR
1280	1290	LIMESTONE, micritic, fine grained, chalky, hard, buff; some limestone, dolomitic, hard, dark tan	MR

LITHOLOGIC LOG

DEPTH INTERVAL (ft)		DESCRIPTION	BY
1290	1300	SAME AS ABOVE	MR
1300	1310	SAME AS ABOVE	MR
1310	1320	SAME AS ABOVE	MR
1320	1330	SAME AS ABOVE	MR
1330	1340	SAME AS ABOVE	MR
1340	1350	LIMESTONE, fossiliferous, moderately friable, light tan; trace limestone, micritic, friable, light tan	MR
1350	1360	LIMESTONE, micritic, fossiliferous, hard, tan; some limestone, friable, fine grained, fossiliferous, buff	MR
1360	1370	LIMESTONE, micritic, vuggy, moderately friable to moderately hard, light tan	MR
1370	1380	DOLOSTONE, crystalline, sucrosic, hard, brown; some limestone, friable, fossiliferous, buff	MR
1380	1390	SAME AS ABOVE	MR
1390	1400	SAME AS ABOVE; more limestone	MR
1400	1410	LIMESTONE, micritic, fine grained, moderately hard, light tan; trace limestone, dolomitic, fine grained, hard, light brown	MR
1410	1420	LIMESTONE, micritic, fine grained, moderately hard, light tan	MR
1420	1430	SAME AS ABOVE	MR
1430	1440	DOLOMITIC LIMESTONE, micritic, hard, buff; some limestone, fossiliferous, chalky, moderately friable, white	MR
1440	1450	DOLOMITE, hard, crystalline, hard, dark brown; some dolomitic limestone, micritic, hard, fossiliferous, tan	MR
1450	1460	DOLOSTONE, crystalline, slightly vuggy, hard, brown; trace limestone, dolomitic, moderately hard, fossiliferous, light tan	MR
1460	1470	SAME AS ABOVE	MR
1470	1480	SAME AS ABOVE	MR
1480	1490	SAME AS ABOVE	MR
1490	1500	LIMESTONE, micritic, chalky, moderately hard, buff; some dolostone, crystalline, vuggy, hard, brown	MR
1500	1510	SAME AS ABOVE	MR
1510	1520	DOLOMITIC LIMESTONE, hard, light brown; some limestone, fossiliferous, hard, tan; trace limestone, micritic, hard, tan	MR

LITHOLOGIC LOG

DEPTH INTERVAL (ft)		DESCRIPTION	BY
1520	1530	SAME AS ABOVE	MR
1530	1540	SAME AS ABOVE; trace limestone, friable, chalky, white	MR
1540	1550	SAME AS ABOVE	MR
1550	1560	DOLOSTONE, crystalline, fine grained, hard, light brown to brown; trace limestone, dolomitic, vuggy, moderately hard, tan	MR
1560	1570	SAME AS ABOVE	MR
1570	1580	SAME AS ABOVE	MR
1580	1590	DOLOMITE, crystalline, clastic, fine grained, hard, brown; some Limestone, micritic, moderately hard, light brown	MR
1590	1600	SAME AS ABOVE	MR
1600	1610	SAME AS ABOVE	MR
1610	1620	SAME AS ABOVE; less limestone	MR
1620	1630	SAME AS ABOVE	MR
1630	1640	LIMESTONE, micritic, granular texture, , moderately friable, gray; some dolomite, hard, tan	MR
1640	1650	SAME AS ABOVE	MR
1650	1660	LIMESTONE, micritic, hard, tan; trace dolomite, hard, tan	MR
1660	1670	SAME AS ABOVE	MR
1670	1680	SAME AS ABOVE	MR
1680	1690	SAME AS ABOVE; more dolomite	MR
1690	1700	SAME AS ABOVE	MR
1700	1710	DOLOMITIC LIMESTONE, crystalline, hard, brown; trace limestone, micritic, chalky, moderately friable, light tan	MR
1710	1720	DOLOMITIC LIMESTONE, course, vuggy, hard, light brown; some dolostone, crystalline, hard, dark brown	MR
1720	1730	SAME AS ABOVE	MR
1730	1740	DOLOMITIC LIMESTONE, hard, light brown; some limestone, dolomitic, fossiliferous, hard, light tan	MR
1740	1750	DOLOMITIC LIMESTONE, hard, gray; some limestone, micritic, friable, tan;	MR
1750	1760	LIMESTONE, micritic, fine grained, hard, tan	MR
1760	1770	SAME AS ABOVE	MR
1770	1780	SAME AS ABOVE	MR
1780	1790	SAME AS ABOVE	MR
1790	1800	DOLOSTONE, crystalline, hard, gray-brown	MR

LITHOLOGIC LOG

DEPTH INTERVAL (ft)		DESCRIPTION	BY
1800	1810	SAME AS ABOVE	MR
1810	1820	SAME AS ABOVE; some dolomitic limestone	MR
1820	1830	SAME AS ABOVE	MR
1830	1840	SAME AS ABOVE	MR
1840	1850	DOLOMITE, moderately hard, tan; trace quartz, crystalline, hard, white	MR
1850	1860	DOLOMITE, hard, tan; some quartz, crystalline, hard, white	MR
1860	1870	DOLOMITIC LIMESTONE , hard, light brown; trace limestone, vuggy, hard, light tan; trace limestone, micritic, fine grained, hard, buff; trace quartz, crystalline, hard, white	MR
1870	1880	DOLOMITE, fine grained, moderately hard, tan; trace quartz, crystalline, hard, white	MR
1880	1890	SAME AS ABOVE	MR
1890	1900	DOLOMITIC LIMESTONE, hard, light tan to dark tan; some limestone, hard, tan; trace limestone, micritic, hard, buff; trace quartz, crystalline, hard, white	MR
1900	1910	SAME AS ABOVE; trace limestone, weathered, soft, white	MR
1910	1920	QUARTZ, crystalline, hard, white; some limestone, dolomitic, fine grained, moderately hard, tan; some dolomitic limestone banded with gypsum; trace gypsum, soft, white	MR
1920	1930	LIMESTONE, micritic, fossiliferous, chalky, moderately friable, white; some limestone, dolomitic, moderately hard, light tan; trace dolostone, hard, gray; trace gypsum	MR
1930	1940	SAME AS ABOVE	MR
1940	1950	SAME AS ABOVE	MR
1950	1960	SAME AS ABOVE	MR
1960	1970	LIMESTONE, micritic, gritty, friable with black specks, light tan; some gypsum, soft, white; trace limestone, dolomitic, moderately hard, light brown	MR
1970	1980	LIMESTONE, micritic, fossiliferous, fine to medium grained, moderately friable, light tan with gray specs; trace quartz, crystalline, white hard	MR
1980	1990	DOLOMITIC LIMESTONE, hard to light brown; trace limestone, micritic, friable, tan; some quartz, crystalline, hard, white	MR

LITHOLOGIC LOG

DEPTH INTERVAL (ft)		DESCRIPTION	BY
1990	2000	SAME AS ABOVE	MR
2000	2010	SAME AS ABOVE	MR
2010	2020	LIMESTONE, micritic, moderately friable, light gray; trace limestone, fine grained, moderately hard, gray	MR
2020	2030	LIMESTONE, micritic, fine grained, moderately friable to moderately hard, light gray to light tan; some limestone, vuggy, moderately hard, tan	MR
2030	2040	LIMESTONE, micritic, very friable, light tan; abundant shell fragments (Foraminifera), light gray to buff to tan; trace dolostone, crystalline, hard, brown	MR
2040	2050	SAME AS ABOVE	MR
2050	2060	SAME AS ABOVE	MR
2060	2070	SAME AS ABOVE	MR
2070	2080	SAME AS ABOVE; trace limestone, micritic, moderately hard, buff to light tan; less shell fragments	MR
2080	2090	LIMESTONE, friable, light tan; some limestone, hard, light gray	MR
2090	2100	LIMESTONE, moderately friable, tan; trace limestone, hard, light gray	MR
2100	2110	LIMESTONE, friable, light tan; trace limestone moderately hard, light tan	MR
2110	2120	LIMESTONE, micritic, friable to moderately friable, buff to light tan; trace limestone, fine grained, moderately hard, light tan to tan	MR
2120	2130	SAMEAS ABOVE	MR
2130	2140	SAME AS ABOVE	MR

Attachment D – Mill Certificates

SUBMITTAL FORM

Owner: Polk County
2470 Clower Lane
Bartow, FL 33830

Project: Southeast Polk County Deep Exploratory Well

Contractor: Rowe Drilling Company, Inc.
PO Box 1098
Polk City, FL 33868

FOR ENGINEER USE ONLY
DATE RECEIVED _____
DATE RETURNED _____

Owner's Project No.: 08-045

Contractor's Submittal No.: 28

Contractor's Project No.: 09-468

Resubmittal Yes ___ No X

ITEM NO		NO. COPIES	VENDOR	DESCRIPTION	ENGINEER'S ACTION
1		5	Bartow Steel	20", 14" and 8" Casing Mill Certs	
					5

ACTION CODE (As defined in the General Conditions)

A	NO EXCEPTION TAKEN
AN	FURNISH AS CORRECTED
AR	REVISE AND RESUBMIT
R	REJECTED

SUBMITTED BY: Jean Wells
Contractor

DATE: July 15, 2009

ENGINEERS COMMENTS:

☒ REVIEWED, NO COMMENTS
☐ REVIEWED, COMMENTS AS NOTED
☐ REJECTED; REVISE AND RESUBMIT
☐ NOT REVIEWED

REVIEW OF THIS SHOP DRAWING IS LIMITED TO GENERAL DESIGN CONCEPTS AND GE... WIT... THE INFORMATION IN THE PROJECT PLANS AND SPECIFICATIONS ONLY, AND IS ... OF VERIFICATION OF TOTAL MATERIAL REQUIRED OR THAT ALL ITEMS PROPERLY ARE SH... RELIEVE THE CONTRACTOR FROM THE RESPONSIBILITY OF DETAILS OF ... CONSTRUCTION MEANS AND METHODS, COORDINATION WITH OTHER TRADES, ... THE PLANS, SPECIFICATIONS OR CONTRACT. ANY NOTATIONS ON THE ... SCHUH & JERNIGAN, INC. SHALL NOT BE CONSTRUED TO AUTHORIZE ANY ... LE

REVIEW OF DESIGN CALCULATIONS AND DRAWINGS PER... INTENT AND DOES NOT CONSTITUTE A DETAILED CHECK OF ... ENGINEERS FROM THE RESPONSIBILITY OF THE DETAIL... COMPONENT OF ... ALO

POST, BUCKLEY, SCHUH & JERNIGAN, INC.

BY: _____ DATE: 7 [illegible] 09

11/93

NO. : 8701501

DATE : 2008-07-14

P.O) NO. :

: E.R.W. STEEL PIPE

ON : API 5L X42/API 5LB PSL1/ASTM A53B/ASME SA53B

검 사 증 명 서(A)

MILL INSPECTION CERTIFICATE

200018835

MILL INSPECTION CERTIFICATE

고 객 사 CUSTOMER : 현대종합상사

HYUNDAI HYSCO 현대하이스코주식회사 HYUNDAI HYSCO

본사·공장 (ULSAN PLANT) : 울산광역시 북구 염포동 265번지 683-040
#265 YUMPO-DONG, BUK-KU, ULSAN,KOREA
TEL:82-52-280-014, FAX:82-52-287-8916

서울사무소 (SEOUL OFFICE) : 서울시 서초구 잠원동 28-6번지 137-904
28-6, JAMWON-DONG, SEOCHO-KU, SEOUL 137-904, KOREA
TEL:82-2-2112-9114, FAX:82-2-775-7095

치수 DIMENSION 외경 × 두께 × 길이 DIA × THICK × LENGTH) ※3 ※4	수량 QUAN-TITY (PCS)	중량 WEIGHT (KG)	수압시험 HYDRO-STATIC TEST PSI	※5	제강번호 HEAT NO.	인장시험 TENSILE TEST (Gage Length : 2 INCH) 항복강도 YIELD STRENGTH ※6 Mpa/PSI	인장강도 TENSILE STRENGTH ※7 B	※7 W	연신율 E.L %	※8	화학성분(%) CHEMICAL COMPOSITION C ×100	Si	Mn	P ×1000	S	Cu	Ni	Cr	Mo	V	Ti	Nb	Al	CEQ ※9 ×1000	경도 HARD-NESS HV	충격시험 IMPACT TEST (℃) 흡수에너지 ABSOR-BED ENERGY JOULE	전단파면율 SHEAR AREA %	도막시험 COATING TEST 아연부착량 WEIGHT OF ZINC COAT g/㎡	균일성 DIP TEST TI-MES	※5	비고 REM-ARK
	6	3,572	1,670	G	C812242	325 (48,900)	480 (69,700)	502 (72,500)	37		16	1	79	15	6	2	2	1	1	TR	TR	TR								
	28	15,664	1,670	G	C821672	315 (45,500)	460 (66,800)	478 (69,700)	36		15	1	78	20	9	2	2	1	1	TR	TR	TR								
	4	2,381	1,670	G	C832011	315 (45,500)	470 (68,200)	494 (71,100)	36		16	1	78	11	8	2	2	1	1	TR	TR	TR								
	2	1,190	1,670	G	C832012	315 (45,500)	480 (69,700)	501 (72,800)	35		16	1	74	14	8	2	2	1	1	TR	TR	TR								
16" X 0.375" X 42.000'	18	21,425	1,670	G	C812242	325 (48,900)	480 (69,700)	507 (73,500)	37		16	1	79	15	6	2	2	1	1	TR	TR	TR								
	26	30,947	1,670	G	C832011	315 (45,500)	470 (68,200)	499 (72,500)	36		16	1	76	11	8	2	1	2	1	TR	TR	TR								
20" X 0.375" X 42.000'	17	25,411	1,420	G	C832166	340 (49,300)	460 (66,800)	473 (68,600)	38		16	1	79	12	4	2	1	2	1	TR	TR	TR								

ENT	※11 VISUAL & DIMENSION TEST	※12 FLATTENING, BEND, GUIDED BEND TEST	※13 R-FLATTENING TEST	※14 FLARING TEST	※15 NONDESTRUCTIVE TEST (E.C.T/U.T)	※16 R.M.T	※17 CRUSH TEST	※18 DRIFT TEST	※19 FLANGE TES.
	GOOD	GOOD			GOOD	GOOD			

of pipe End 끝종		
End	RB:SAW Black	TC:Thread Coupling
ling	RG:SAW Galvanizing	RG:Roll Grooving
izing	RS:SAW Spriel	VG:Victaulic Grooving
Thread	PE:Plain End	PC:Plain End + Coupled
izing Thread	BE:Bevel End	PB:Plain End + Bevel End
izing Scaffolding	TE:Thread End	BD:Bell End

※2 NB:Norminal Bore 호칭경, OD:Outside Diameter
※3 Unit 단위(M:mm, I:inch)
※4 Unit 단위(M:Meter, F:Feet, I:Inch)
※5 G:GOOD
※6 L:Longitudinal 압연방향, T:Transverse 원주방향
※7 B:Base Metal 모재부, W:Weld Part 용접부
※8 H:Heat(Ladle) Analysis 얼연분석, P:Product Analysis 제품분석, WP:Weld Product Analysis 용접부 제품분석
※9 CEQ=C+Mn/6+(Ni+Cu)/15+(Cr+Mo+V)/5 등가탄소량
※10:Heat Treatment 열처리
※11 Visual & Diemension Test 육안 및 치수검사
※12 Flattening/Bend/Guided Bend Test 편평/벤드/굽힘시험
※13:Reverse Flattening Test 전개시험
※14 Flaring Test 입목시험
※15 Nondestructive Test 비파괴검사
※16:Residual Magnetism Test 잔류자장시험
※17:Crush Test 중압시험
※18:Drift Test 관통시험
※19:Flange Test 플레지시험

NOTE 2 * SPEC YEAR – API 2004/ASTM 2006/ASME 2004
* NACE MR-0175

SURVEYOR

본 제품은 관련 규격에 합격되었음을 보증합니다.
WE HEREBY CERTIFY THAT MATERIAL DESCRIBED HEREIN HAS BEEN ACCEPTED IN ACCORDANCE WITH THE PRESCRIBED SPECIFICATION AND ORDER
* 본 검사증명서에 명기된 규격등도외 사용시 안전상 문제가 발생할 수 있으며, 검사증명서 위.변조시 사문서 위조로 불이익을 당하실 수 있습니다.

H. J. KIM

INSPECTION MANAGER

631 – 1 – QLT

HYUNDAI HYSCO

A4(210×297)

성적서 번호
CERTIFICATE NO. : 7800272
발행일자
DATE OF ISSUE : 2007-08-07
계약번호
CONTRACT(P/O) NO. :
품명
COMMODITY : E.R.W. STEEL PIPE
제품규격
SPECIFICATION : API 5L X42/API 5LB PSL1/ASTM A53B/ASME SA53B

검 사 증 명 서(A)

MILL INSPECTION CERTIFICATE

200011068

고 객 사
CUSTOMER : 현대종합상사

HYUNDAI HYSCO 현대하이스코주식회사
HYUNDAI HYSCO

본사·공장
(ULSAN PLANT) : 울산광역시 북구 염포동 285번지 683-040
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LANDMARK TOWER 837-38, YEOKSAM-DONG,
GANGNAM-KU, SEOUL, KOREA
TEL:82-2-2112-8114, FAX:82-2-776-7095

관종 TYPE OF PIPE END ※1		규격 DIMENSION 외경 × 두께 × 길이 (OUTDIA × THICK × LENGTH) ※3	※4	수량 QUANTITY (PCS)	중량 WEIGHT (KG)	수압시험 HYDRO-STATIC TEST PSI	※5	제강번호 HEAT NO.
EB	BE	NB	6-5/8" X .432" X 42.000'	36	19,871	3,000	G	G016193
EB	BE	NB	8-5/8" X .500" X 21.000'	42	17,375	3,000	G	J04481
EB	BE	NB	8-5/8" X .500" X 42.000'	24	19,858	3,000	G	J04481
EB	BE	NB	10-3/4" X .500" X 42.000'	43	44,887	3,000	G	887751)
EB	BE	NB	16" X .375" X 21.000'	71	42,255	1,670	G	8R30123
EB	BE	NB	20" X .375" X 21.000'	111	32,960	1,420	G	C713877
				39	29,149	1,420	G	C714184

인장시험 TENSILE TEST (Gage Length : 2 INCH) 항복강도 YIELD STRENGTH ※6	인장강도 TENSILE STRENGTH ※7 B	※7 W	연신율 EL.	※8
	Mpa/PSI			%
396	483			32
303	458	485		35
303	466	485		35
310	471	492		35
313	460	481		36
330	470	497		37
345	485	503		36

화학성분(%) CHEMICAL COMPOSITION	C	Si	Mn	P	S	Cu	Ni	Cr	Mo	V	Ti	Nb		Al	CEQ ※9	경도 HARD - NESS
	×100			×1000		×100								×1000		HV
	18	23	58	11	9	2	2	i	i	TR	TR	TR				
	16	i	72	10	4	2	2	i	i	TR	TR	TR				
	16	i	72	10	4	2	2	i	i	TR	TR	TR				
	18	2	79	14	8	2	i	2	i	TR	TR	TR.				
	17	2	29	11	3	2	2	i	i	TR	TR	TR				
	15	C	77	20	8	2	2	i	i	TR	TR	TR				
	15	i	79	17	10	2	i	2	i	TR	TR	TR				

충격시험 IMPACT TEST (°C) 흡수에너지 ABSORBED ENERGY	전단파면율 SHEAR AREA	도막시험 COATING TEST 아연부착량 WEIGHT OF ZINC COAT	굽힘성 DIP TEST TIMES	※5	비고 REMARK
JOULE	%	g/㎡			

※10 HEAT TREATMENT	※11 VISUAL & DIMENSION TEST	※12 FLATTENING, BEND, GUIDED BEND TEST	※13 R-FLATTENING TEST	※14 FLARING TEST	※15 NONDESTRUCTIVE TEST (U.T)	※16 R.M.T	※17 CRUSH TEST	※18 DRIFT TEST	※19 FLANGE TEST
GOOD	GOOD	GOOD			GOOD	GOOD			

NOTE 1 ※1 Type of pipe End 관종

EB:ERW Black End	RB:SAW Black	TC:Thread Coupling
EA:ERW Annealing	RG:SAW Galvanizing	RG:Roll Grooving
EG:ERW Galvanizing	RS:SAW Spiral	VG:Victaulic Grooving
EC:ERW Black Thread	PE:Plain End	PC:Plain End + Coupled
ED:ERW Galvanizing Thread	BE:Beval End	PB:Plain End + Beval End
EN:ERW Galvanizing Scaffolding	TE:Thread End	BC:Bell End

※2 NB:Nominal Bore 호칭경, OD:Outside Diameter
※3 Unit 단위(M:mm, Inch)
※4 Unit 단위(M:Meter, F:Feet, I:Inch)
※5 G:GOOD
※6 L:Longitudinal 길이방향, T:Transverse 원주방향
※7 B:Base Metal 모재부, W:Weld Part 용접부
※8 H:Heat(Ladle) Analysis 용융분석, P:Product Analysis 제품분석, WP:Weld Product Analysis 용접부 제품분석
※9 CEQ=C+Mn/6+(Ni+Cu)/15+(Cr+Mo+V)/5 탄가탄소량
※10:Heat Treatment 열처리
※11 Visual & Dimension Test 육안 및 치수검사
※12 Flattening/Bend/Guided Bend Test 편평/벤드/굽힘시험
※13:Reverse Flattening Test 역편시험
※14 Flaring Test 확관시험
※16 Nondestructive Test 비파괴검사
※16:Residual Magnetism Test 잔류자성시험 ※17:Crush Test 압궤시험
※18:Drift Test 관통시험
※19:Flange Test 플랜지시험

NOTE 2 * SPEC YEAR - API 2004/ASTM 2006/ASME 2004

SURVEYOR

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본 제품은 관련 규격에 합격되었음을 보증합니다.

H. J. KIM
INSPECTION MANAGER

HYUNDAI HYSCO

HYS - B301 - 631 - 1 - QLT

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성적서 번호
CERTIFICATE NO. : 8800170
발행일자
DATE OF ISSUE. : 2008-11-04
계약번호
CONTRACT(P/O) NO. :
품명
COMMODITY : E.R.W. STEEL PIPE
제품규격
SPECIFICATION : API 5L X42/API 5LB PSL1/ASTM A53B/ASME SA53B

페이지
PAGE 1 of 2

검 사 증 명 서(A)

MILL INSPECTION CERTIFICATE

MILL INSPECTION CERTIFICATE

200023753

고 객 사
CUSTOMER : 현대중합상사

HYUNDAI HYSCO 현대하이스코주식회사
HYUNDAI HYSCO
본사-공장 (ULSAN PLANT) : 울산광역시 북구 염포동 285번지 683-040
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서울사무소 (SEOUL OFFICE) : 서울시 서초구 잠원동 28-6번지 137-904
28-6, JAMWON-DONG, SEOCHO-KU, SEOUL 137-904, KOREA
TEL:82-2-2112-9114, FAX:82-2-775-7095

관단 TYPE OF PIPE END ※1	치수 DIMENSION 외경 × 두께 × 길이 (OUTDIA × THICK × LENGTH) ※2 ※3 ※4	수량 QUAN-TITY (PCS)	중량 WEIGHT (KG)	수압시험 HYDRO-STATIC TEST PSI	※5	제강번호 HEAT NO.	인장시험 TENSILE TEST (Gage Length : 2 INCH) 항복강도 YIELD STRENGTH ※6 Mpa/PSI	인장강도 TENSILE STRENGTH ※7 B Mpa/PSI	※7 W Mpa/PSI	연신율 EL %	화학성분(%) CHEMICAL COMPOSITION ※8 C ×100	Si	Mn	P ×1000	S	Cu ×100	Ni	Cr	Mo	V	Ti	Nb	Al ×1000	CEQ ※9	경도 HARD-NESS HV	충격시험 IMPACT TEST (℃) 흡수에너지 ABSORBED ENERGY JOULE	전단파면율 SHEAR AREA %	도막시험 COATING TEST 아연부착량 WEIGHT OF ZINC COAT g/㎡	균일상 DIP TEST TI-MES	※5	비고 REMARK
EB BE	NB 10-3/4" X 0.365" X 42.000'	2	1,549	2,420	G	C836993	305 44,000	455 66,000	475 69,000	36	17	2	86	14	7	2	2	1	1	TR	TR	TR								
EB BE	NB 14" X 0.375" X 42.000'	2	2,076	1,910	G	C836153	320 46,500	485 71,100	504 72,800	37	17	2	78	10	8	2	2	1	1	TR	TR	TR								
EB BE	NB 14" X 0.375" X 42.000'	2	2,076	1,910	G	C836153	320 46,500	485 71,100	504 72,800	37	17	2	78	10	8	2	2	1	1	TR	TR	TR								
EB BE	NB 18" X 0.375" X 42.000'	1	1,343	1,490	G	C815740	300 44,000	453 66,400	472 68,300	38	16	1	77	7	9	2	2	1	1	TR	TR	TR								
		1	1,342	1,490	G	C836551	305 44,300	450 65,400	476 69,000	38	17	1	75	12	8	2	2	1	1	TR	TR	TR								
EB BE	NB 18" X 0.375" X 42.000'	1	1,343	1,490	G	C836293	315 45,700	475 68,900	492 71,400	37	17	1	75	12	8	2	2	1	1	TR	TR	TR								
		1	1,342	1,490	G	C836551	305 44,300	460 66,700	468 67,900	38	17	1	75	12	8	2	2	1	1	TR	TR	TR								

※10 HEAT TREATMENT: GOOD
※11 VISUAL & DIMENSION TEST: GOOD
※12 FLATTENING, BEND, GUIDED BEND TEST: GOOD
※13 R-FLATTENING TEST
※14 FLARING TEST
※15 NONDESTRUCTIVE TEST (U.T): GOOD
※16 R.M.T: GOOD
※17 CRUSH TEST
※18 DRIFT TEST
※19 FLANGE TEST

NOTE 1 ※1 Type of pipe End 관단

EB:ERW Black End	RB:SAW Black	TC:Thread Coupling
EA:ERW Annealing	RG:SAW Galvanizing	RG:Roll Grooving
EG:ERW Galvanizing	RS:SAW Spiral	VG:Victaulic Grooving
EC:ERW Black Thread	PE:Plain End	PC:Plain End + Coupled
ED:ERW Galvanizing Thread	BE:Bevel End	PB:Plain End + Bevel End
EN:ERW Galvanizing Scaffolding	TE:Thread End	BD:Ball End

※2 NB:Nominal Bore 호칭경, OD:Outside Diameter
※3 Unit 단위(M:mm, I:inch)
※4 Unit 단위(M:Meter, F:Feet, Finch)
※5 G:GOOD
※6 L:Longitudinal 압연방향, T:Transverse 원주방향
※7 B:Base Metal 모재부, W:Weld Part 용접부
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※9 CEQ=C+Mn/6+(Ni+Cu)/15+(Cr+Mo+V)/5 등가탄소량
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※17 Crush Test 압궤시험
※18 Drift Test 관통시험
※19 Flange Test 플랜지시험

NOTE 2 • SPEC YEAR – API 2004/ASTM 2006/ASME 2004
• NACE MR-0175

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SURVEYOR

H. J. KIM
INSPECTION MANAGER

HYS – 8301 – 631 – 1 – QLT

HYUNDAI HYSCO

A4(210×297)

성적서 번호
CERTIFICATE NO. : BA01181
발행일자
DATE OF ISSUE : 2008-10-16
계약번호
CONTRACT(P/O) NO. :
품명
COMMODITY : E.R.W. STEEL PIPE
제품규격
SPECIFICATION : API 5L X42/API 5LB PSL1/ASTM A53B/ASME SA53B

페이지
PAGE 1 of 1

검 사 증 명 서(A)

MILL INSPECTION CERTIFICATE

MILL INSPECTION CERTIFICATE

20080316

고 객 사
CUSTOMER : 현대종합상사

HYUNDAI HYSCO 현대하이스코주식회사 HYUNDAI HYSCO

본사·공장 (ULSAN PLANT) : 울산광역시 북구 염포동 265번지 683-040
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TEL:82-2-2112-9114, FAX:82-2-775-7095

관종 TYPE OF PIPE END	호수 DIMENSION 외경 x 두께 x 길이 (OUTDIA x THICK x LENGTH)			수량 QUANTITY	중량 WEIGHT	수압시험 HYDRO-STATIC TEST		제강번호 HEAT NO.	인장시험 TENSILE TEST (Gage Length = 2 INCH)				화학성분(%) CHEMICAL COMPOSITION														경도 HARD-NESS	충격시험 IMPACT TEST (-℃)		도막시험 COATING TEST			비고 REMARK
									항복강도 YIELD STRENGTH	인장강도 TENSILE STRENGTH		연신율	C	Si	Mn	P	S	Cu	Ni	Cr	Mo	V	Ti	Nb		Al	CEQ ※9		흡수에너지 ABSORBED ENERGY	전단파면율 SHEAR AREA	아연부착량 WEIGHT OF ZINC COAT	급랭성 DIP TEST		
										※7 B	※7 W																					
#1	※2	※3	※4	(PCS)	(KG)	PSI	※5		※6	kips/PSI		%	※8	×100		×1000					×100					×1000	HV	JOULE	%	g/㎡	TIMES	※5	
EB·BE	NB	8-5/8" X 0.322" X 42.000'		238	129,948	2,350	G	H21286																								
TOTAL →				238	129,948				375	439	461	35	8	2	81	11	7	2	2	1	1	TR	TR	TR								
									PLANE	PLANE	PLANE																					

※10 HEAT TREATMENT	※11 VISUAL & DIMENSION TEST	※12 FLATTENING, BEND, GUIDED BEND TEST	※13 R-FLATTENING TEST	※14 FLARING TEST	※15 NONDESTRUCTIVE TEST (U.T)	※16 RT	※17 CRUSH TEST	※18 DRIFT TEST	※19 FLANGE TEST
GOOD	GOOD	GOOD			GOOD	GOOD			

NOTE-1 ※1 Type of pipe End 관종

EB:ERW Black End	RB:SAW Black	TC:Thread Coupling
EA:ERW Annealing	RG:SAW Galvanizing	RG:Roll Grooving
EG:ERW Galvanizing	RS:SAW Spiral	VG:Victaulic Grooving
EC:ERW Black Thread	PE:Plain End	PC:Plain End + Coupled
ED:ERW Galvanizing Thread	BE:Bevel End	PB:Plain End + Bevel End
EH:ERW Galvanizing Scaffolding	TE:Thread End	BD:Bell End

※2:NB:Norminal Bore 호칭경, OD:Outside Diameter
※3:G:GOOD
※8:H:Heat(Ladle) Analysis 용융분석, P:Product Anolysis 제품분석, WP:Weld Product Analysis 용접부 제품분석
※10:Heat Treatment 열처리
※13:Reverse Flattening Test 역계시험
※16:Residual Magnetism Test 잔류자장시험 ※17:Crush Test 압축시험
※4:Unit 단위(M:Meter) F:Feet, I:Inch)
※6:L:Longitudinal 종방향, T:Transverse 횡주방향
※11:Visual & Dimension Test 육안 및 치수검사
※14 Flaring Test 확관시험
※18:Drift Test 관경시험
※7:B:Base Metal 모재부, W:Weld Port 용접부
※9 CEQ=C+Mn/6+(Ni+Cu)/15+(Cr+Mo+V)/5 탄가(탄소당량)
※12 Flattening/Bend/Guided Bend Test 편평/벤드/굽힘시험
※15 Nondestructive Test 비파괴검사
※19:Flange Test 플랜지시험

NOTE 2:※ SPEC YEAR – API 2004/ASTM 2006/ASME 2004
* NACE MR-0175

SURVEYOR

HYS – 8301 – 631 – 1 – QLT

WE HEREBY CERTIFY THAT MATERIAL DESCRIBED HEREIN HAS BEEN ACCEPTED IN ACCORDANCE WITH THE PRESCRIBED SPECIFICATION AND ORDER
본 제품은 관련 규격에 만족함을 보증합니다.
- 본 검사증명서에 명기된 규격항목의 시험상 문제가 발생할 수 있으며, 검사증명서 위·변조시 사문서 위조로 처벌받을 수 있습니다.

HYUNDAI HYSCO

H. J. KIM
INSPECTION MANAGER

A4(210×297)

Attachment E – Geophysical Logs

Attachment F – Well Completion Report

WELL COMPLETION REPORT (Please complete in black ink or type.)

PERMIT #: 49507907 CUP/WUP#: N/A DID#: N/A

Indicate the number of wells drilled/abandoned for this report: 1

Indicate the number of wells permitted but not drilled/abandoned that are being cancelled: _____

WATER WELL CONTRACTOR'S SIGNATURE: _____ License #: 3206

I certify that the information provided in this report is accurate and true.

Grout	No. of Bags	From (ft.)	To (ft.)
Neat Cement:	627	0	1400
Bentonite:			
(Other)			

WELL LOCATION: County Polk

_____ 1/4 of _____ 1/4 of Section 21 Township 31 Range 29

Latitude: 27.767034 Longitude: -81.428717

DATE STAMP

Official Use Only

Sketch of well location on property

Give distances from septic tank and house, or other reference points

CHEMICAL ANALYSIS WHEN REQUIRED

Iron: ____ppm Sulfate: ____ppm

Chlorides: ____ ppm TDS ____ mg/l

Conductivity ____ umhos/cm

[ ] Lab Test [ ] Field Test Kit

Pump Type

[ ] Centrifugal [ ] Jet [ ] Submersible [ ] Turbine

Horsepower: _____ Capacity: _____ GPM: _____

Pump Depth: _____ ft. Intake Depth: _____ ft.

FORM LEG-R.005.00(10/05)

OWNER'S NAME: Polk Cty BOCC

COMPLETION DATE: 9/21/09 Florida Unique I.D.: _____

Parcel # (Pin): _____

WELL USE:

[ ] Public Supply [ ] Irrigation [ ] Domestic [X] Monitor

[ ] Injection [ ] Other

DRILL METHOD:

[X] Rotary [ ] Cable Tool [ ] Combination

[ ] Jet [ ] Auger [ ] Other _____

Measured Static Water Level: _____ Measured Pumping Water Level: _____

After ____ Hours at ____ GPM Measuring Pt. (Describe): _____

Which is ____ ft. [ ] above [ ] below land surface

Casing: [ ] Black Steel [ ] Galvanized [ ] PVC [ ] Other: _____

[X] Open Hole [ ] Screen	Depth (feet)		DRILL CUTTINGS LOG Examine cuttings every 20 ft. or at formation changes. Note cavities, depth to producing zones.
Casing Diameter and Depth (ft.)	From	To	*Color | Grain Size | Type of Material*
Diameter: 20" From: 0 To: 100			
Diameter: 14" From: 0 To: 272			
Liner [ ] or Casing [X] Diameter: 8" From: 0 To: 1400			

Driller's Name (print or type): Tom Toy

Attachment G – Survey Report

Special Purpose Survey

WELL SITES IN SECTION 20, TOWNSHIP 31 SOUTH, RANGE 29 EAST, POLK COUNTY, FLORIDA

PTNO	Well Name	Northing, FL West Zone)	Easting, FL West Zone)	LATITUDE	LONGITUDE
100	SEDEW	1248435.64	841109.32	27.7670259	-81.4281026
103	SEUFA	1248435.86	841009.72	27.7670277	-81.4284106
104	SED2 4A	1248437.70	840910.33	27.7670341	-81.4287179
105	SED2 4B	1248437.70	840910.33	27.7670341	-81.4287179
106	SAMW1	1248516.51	841060.84	27.7672489	-81.4285130

			ELEVATIONS	NGVD	1929		
	Well Name	Land surface	Top of Concrete	Top of Bottom Flange	Top of Top Flange	Monitoring Points 1 & 2 Top of Fitting	Monitoring Point South Top of Fitting	Top of Ball Valve
	SEDEW	77.46	78.01	81.12	81.23	81.29		
	SEUFA	76.91	77.36	79.92	80.02	80.09	80.12	80.63
	SED2 4A	76.71	77.21		79.24	79.3		
	SED2 4B	76.69	77.19	80.05	80.12	80.2		
	SAMW1	76.43	76.63	79.68				

Notes:

1. Horizontal and vertical datums based on GPS Network L-Net Reference Frame provided by Lengemann of Florida
2. The purpose of this survey is to show the location of well points in Section 20, Township 31 South, Range 29 East, Polk County, Florida, in terms of coordinate data on a spreadsheet.
3. Field Date: February 23, 2010

Accuright Surveys of Orlando, Inc.
LB 4475
2012 E. Robinson St.
Orlando, Florida 32803
Tel. 407-894-6314, Fax. 407-897-3777

Frank A. Raymond, III, PSM 5325