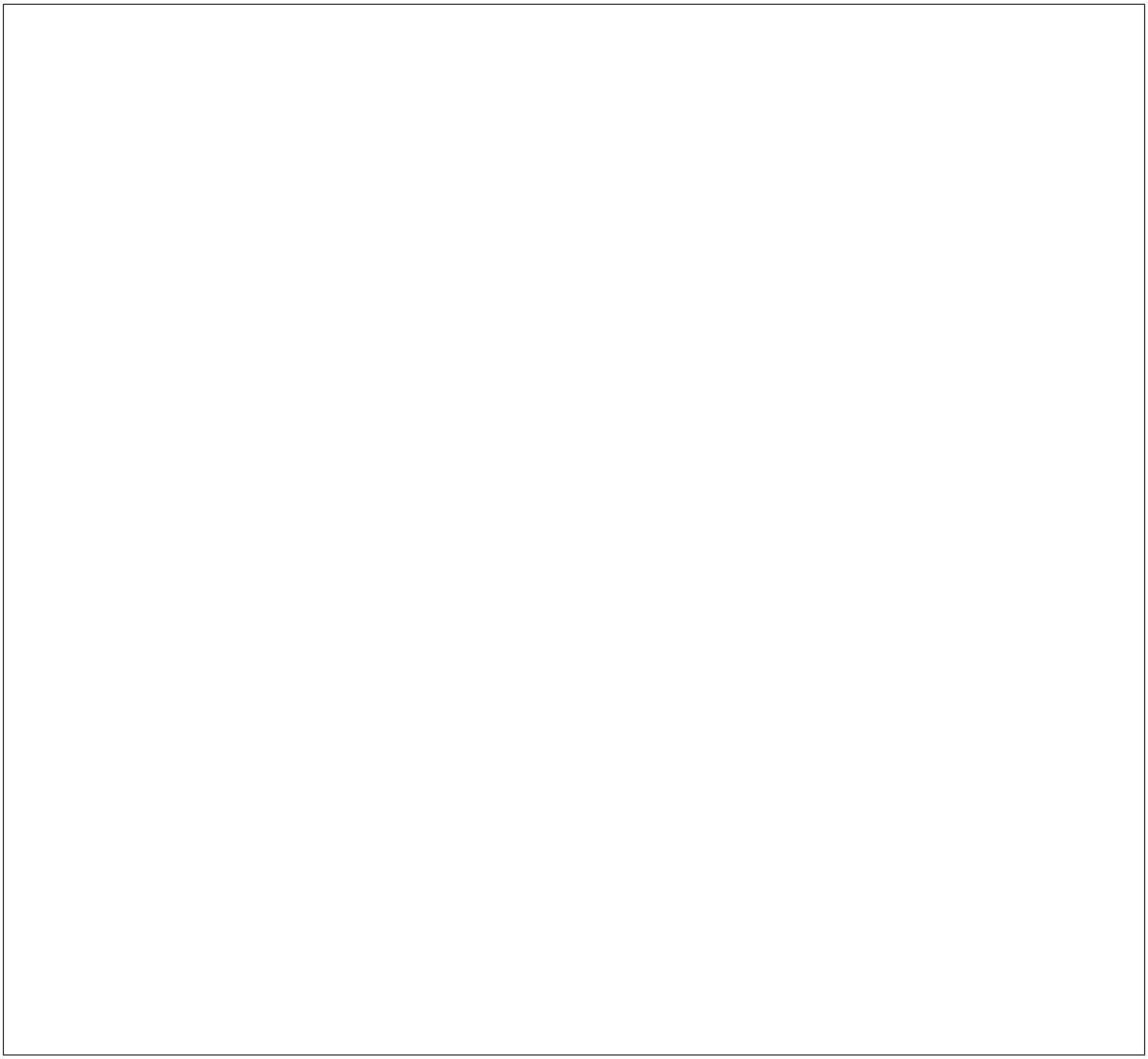
Southwest Florida
Water Management District

Hydrogeology, Water Quality, and Well Construction at the ROMP 133 – Arredondo Well Site in Marion County, Florida

Southwest Florida Water Management District
Geohydrologic Data Section

January 2014



Cover Photo: Permanent monitor wells at the ROMP 133 – Arredondo well site in Marion County, Florida in order from left to right: SURF AQ MONITOR, U FLDN AQ MONITOR/PRODUCTION. Photograph by Chris Tomlinson.

Hydrogeology, Water Quality, and Well Construction at the ROMP 133 – Well Site Marion County, Florida

By Tiffany Horstman

January 2014

Southwest Florida Water Management District
Geohydrologic Data Section

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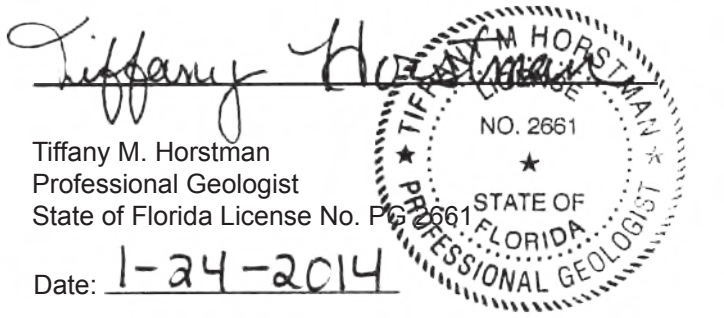
The hydrogeologic evaluations and interpretations contained in *Hydrogeology, Water Quality, and Well Construction at the ROMP 133 – Arredondo Well Site in Marion County, Florida* have been prepared by or approved by a licensed Professional Geologist in the State of Florida, in accordance with Chapter 492, Florida Statutes.



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Date: 1-24-2014

Foreword

The Regional Observation and Monitor-well Program (ROMP) was started in 1974 in response to the need for hydrogeologic information by the Southwest Florida Water Management District (District). The focus of the ROMP is to quantify the flow characteristics and water quality of the groundwater systems which serve as the primary source of water supply within southwest Florida. The original design of the ROMP consisted of a 10-mile grid network composed of 122 well sites and a coastal transect network composed of 24 coastal monitor transects of two to three well sites each. The number of wells at a well site varies with specific regional needs; usually two to five permanent monitor wells are constructed at each site. The numbering system for both networks generally increase from south to north with ROMP-labeled wells representing the inland grid network and TR-labeled wells representing the coastal transect network.

The ROMP networks have been the primary means for data collection; however, in recent years, changing District directives have created the need for more project-specific data collection networks outside the original two well networks for various programs throughout the District. The broad objectives at each well site are to determine the geology, hydrology, water quality, and hydraulic properties, and to install wells for long-term monitoring, depending on the goal of each project. Site activities include coring, testing, and well construction. These activities provide data for the hydrogeologic and groundwater quality characterization of the well sites. These characterizations are used to ensure the monitor wells are properly constructed. At the completion of each well site, a summary report is generated and can be found at the District's website at www.watermatters.org/data. The monitor wells form the backbone of the District's long-term aquifer monitoring networks, which supply critical data for the District's regional models and hydrologic conditions reporting.

Sandie Will

Manager

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Conversion Factors and Datums

Multiply	By	To obtain
	Length	
inch (in.)	2.54	centimeter (cm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
	Area	
acre	0.004047	square kilometer (km2)
square foot (ft2)	0.09290	square meter (m2)
square mile (mi2)	2.590	square kilometer (km2)
	Volume	
gallon (gal)	3.785	liter (L)
gallon (gal)	0.003785	cubic meter (m2)
cubic foot (ft3)	0.02832	cubic meter (m3)
	Flow Rate	
foot per day (ft/d)	0.3048	meters per day (m/d)
cubic foot per second (ft3/s)	0.02832	cubic meter per second (m3/s)
cubic foot per day (ft3/d)	0.02832	cubic meter per day (m3/d)
gallon per day (gal/d)	0.003785	cubic meter per day (m3/d)
	Pressure	
atmosphere, standard (atm)	101.3	kilopascal (kPa)
bar	100	kilopascal (kPa)
	Transmissivity*	
foot squared per day (ft2/d)	0.09290	meter squared per day (m2/d)
	Temperature	
Celsius (°C)	°F = (1.8 x °C) + 32	Fahrenheit (°F)
Fahrenheit (°F)	°C = (°F – 32) / 1.8	Celsius (°C)

Vertical coordinate information is referenced to the North American Vertical Datum of 1988 (NAVD 88).

Elevation, as used in this report, refers to distance above the vertical datum.

*Transmissivity: The standard unit for transmissivity is cubic foot per day per square foot times foot of aquifer thickness [(ft3/d)/ft2] ft. In this report, the mathematically reduced form, foot squared per day (ft2/d), is used for convenience.

Abbreviations and Acronyms

µg/L	micrograms per liter
µmhos/cm	micromhos per centimeter
als	above land surface
APT	aquifer performance test
AQ	aquifer
bls	below land surface
btoc	below top of casing
Ca^{2+}	calcium
CaCO3	calcium carbonate or limestone

Abbreviations and Acronyms Continued

CAL	caliper
[$CaMg(CO_3)^2$]	calcium magnesium carbonate or dolostone
$CaSO_4 \cdot 2H_2O$	gypsum
CME	Central Mining Equipment
commun.	communication
day^{-1}	per day (used to report leakance rate)
District	Southwest Florida Water Management District
FGS	Florida Geological Survey
FLDN	Floridan
ft	feet
ft/d	feet per day
ft2/d	foot squared per day
ft/m	feet per minute
GAM	gamma
gpm	gallons per minute
HCO_3^{1-}	bicarbonate
ID	identification
Inc.	Incorporated
K	horizontal hydraulic conductivity
LLC.	Limited Liability Company
meq	milliequivalent
Mg^{2+}	magnesium
mg/L	milligrams per liter
NAVD 88	North American Vertical Datum of 1988
NDWRAP	Northern District Water Resources Assessment Project
PVC	polyvinyl chloride
RES	resistance geophysical log
RES (16N)	short normal resistivity
RES (64N)	long normal resistivity
ROMP	Regional Observation and Monitor-well Program
rpm	revolutions per minute
SDR	standard dimension ratio
SID	site identification
SURF	surficial
TDS	total dissolved solids
U	upper or Upper
WMIS	Water Management Information System

Hydrogeology, Water Quality, and Well Construction at the ROMP 133 – Arredondo Well Site in Marion County, Florida

By Tiffany Horstman

Introduction

The Southwest Florida Water Management District (District) conducted a detailed hydrogeologic investigation at the Regional Observation and Monitor-well Program (ROMP) 133 - Arredondo well site in northwest Marion County (fig. 1). The ROMP 133 – Arredondo (herein referred to as ROMP 133) well site supports the Northern District Water Resources Assessment Project (NDWRAP) and fills a gap in the ROMP 10-mile grid network. The NDWRAP was established to assess the impacts of groundwater withdrawals, monitor the freshwater/saltwater interface, identify areas of poor groundwater quality, determine the nature of flow to major springs, and monitor groundwater levels in both the surficial and Upper Floridan aquifers in the northern portion of the District (R. Basso, written commun., 2007). The Northern District encompasses all of Hernando, Citrus, and Sumter counties and portions of Pasco, Polk, Marion, Lake, and Levy counties. Additionally, this site was selected to help ascertain the geographic extent of middle confining units I and II and the Lower Floridan aquifer(s). The data collected at this well site will aid the District in making informed management decisions central to its core mission of balancing water needs of current and future users while protecting and maintaining water and related natural resources.

The ROMP 133 well site was developed in three phases: (1) exploratory core drilling and testing to 1,337 feet below land surface (bls), (2) well construction, and (3) aquifer performance testing. Exploratory core drilling and testing began February 7, 2011, and was completed June 14, 2011, with the District's Central Mining Equipment (CME) core drilling rig and staff. Core drilling ended after three failed attempts to pass NQ rods below an obstruction in the core hole at 757 feet bls. Well construction began August 1, 2011, and ended December 20, 2011. Aquifer performance testing began March 15, 2012, and ended April 10, 2012. The purpose of this report is to present all the activities performed and all the data collected at the well site.

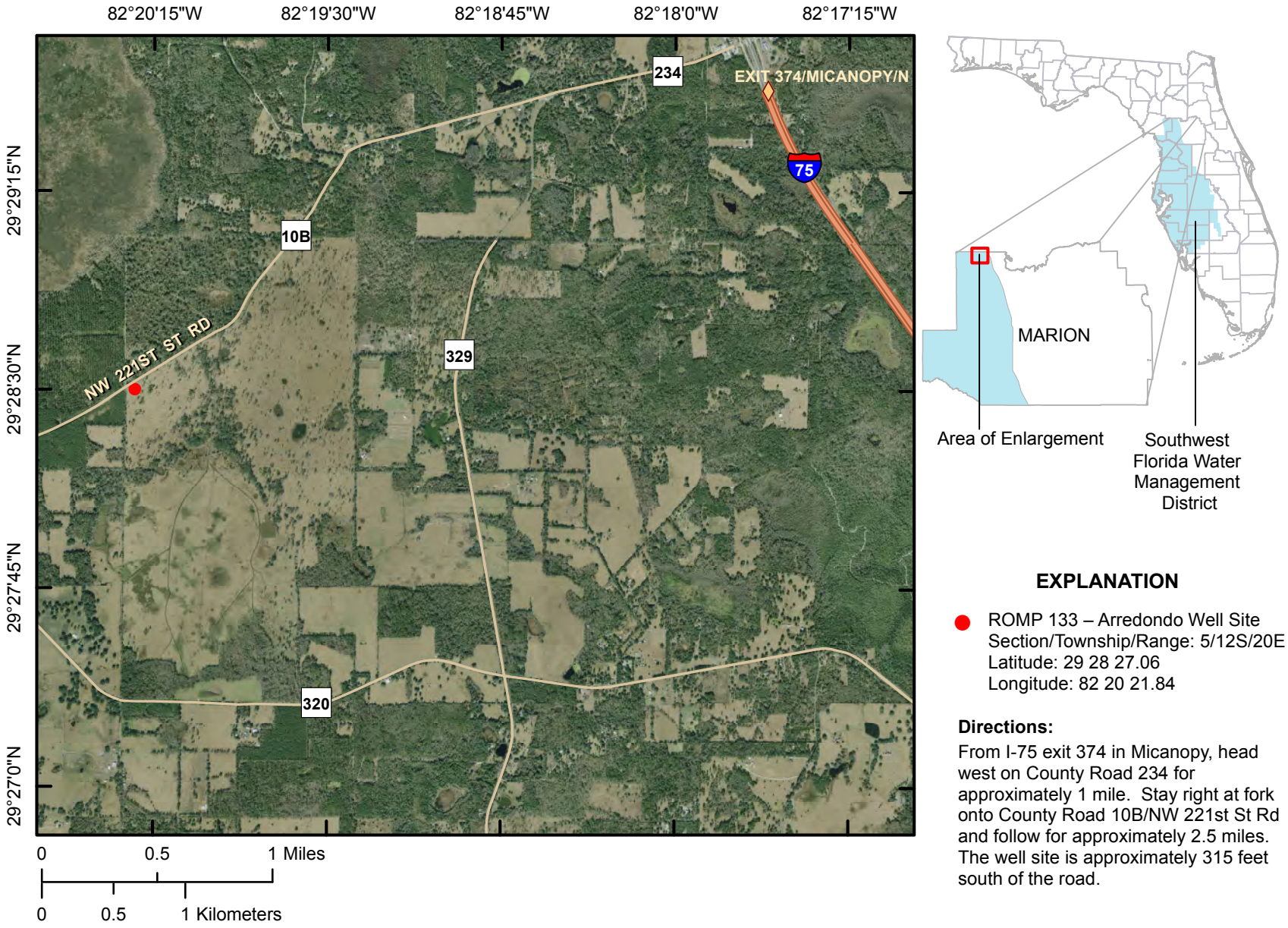
Site Location

The ROMP 133 well site is located on a parcel of land in northwest Marion County granted by easement agreement from John Rudnianyn. The well site consisted of a 10-foot by 30-foot permanent well site, a 239-foot by 481-foot by 200-foot by 350-foot temporary construction area, and a 10-foot wide ingress/egress easement (fig. 2). The temporary construction area was returned to John Rudnianyn after the site was completed. The site is approximately one mile south and three miles east of the District boundary (fig. 1). It is located in the northwest ¼ of the southwest ¼ of Section 5, Township 12 south, and Range 20 east at latitude 29° 28' 27.06" north and longitude 82° 20' 21.84" west. The elevation at the ROMP 133 well site is approximately 111 feet above the North American Vertical Datum of 1988 (NAVD 88). Two vertical control stations were installed at the site by District staff and surveyed by AMEC E&I, Inc. in 2011.

The well site can be found by heading north on Interstate 75 for approximately 109 miles from Tampa. Take exit 374 for County Road 234 and turn left. Follow County Road 234 for approximately one mile. Stay right onto County Road 10B/NW 221st Street Road and follow for approximately 2.5 miles. Turn left and enter the gate. The permanent well site is approximately 315 feet south of the gate.

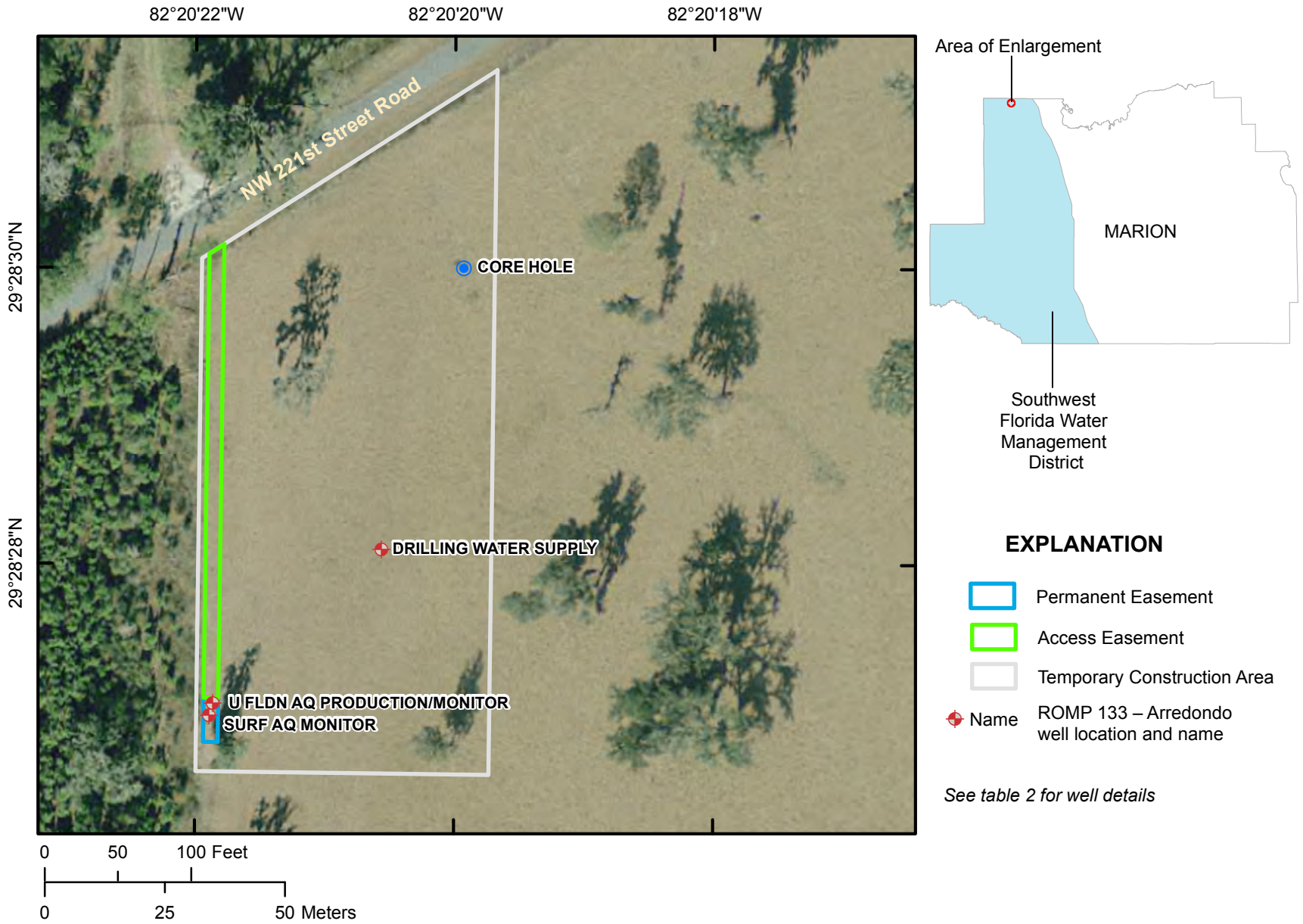
The well site is located in the Western Valley physiographic region of west-central Florida (White, 1970). At the site, the Western Valley lowlands are located between the Brooksville Ridge to the west and the Fairfield Hills to the east and south. The site is located about one mile from the edge of the Fairfield Hills and is likely the reason the well site has a higher elevation than the majority of the Western Valley.

The ROMP 133 well site is located in the Ocklawaha River Basin (Southwest Florida Water Management District, 1987). The Ocklawaha River Basin consists of two hydrologically distinct parts where Interstate 75 is the approximate dividing line. A surface drainage system lies to the east and a groundwater drainage system lies to the west of Interstate 75. The site is located in the groundwater drainage system part of the Ocklawaha River Basin, which is largely an internally drained area with little developed, connected surface hydrography (Florida Department of Environmental Protection, 2011).



Base from Southwest Florida Water Management District digital orthophoto, 2010
NAD 1983 HARN StatePlane Florida West FIPS 0902 Feet projection

Figure 1. Location of the ROMP 133 – Arredondo well site in Marion County, Florida.



Base from Southwest Florida Water Management District digital orthophoto, 2010
NAD 1983 HARN StatePlane Florida West FIPS 0902 Feet projection

Figure 2. Well site layout for the ROMP 133 – Arredondo well site in Marion County, Florida.

Methods

During construction of the ROMP 133 well site, a variety of hydrogeologic data was collected including lithologic, hydraulic, water quality, and geophysical data. After shallow exploratory core drilling and testing, monitor wells were constructed by a contract drilling company. The following sections provide data collection method details specific to the ROMP 133 well site. Detailed descriptions of the data collection methods used by the Geohydrologic Data section are presented in appendix A. Data collected at this well site are available for download from the District's website: www.swfwmd.state.fl.us (accessed October 21, 2013) using the Water Management Information System (WMIS). Data are compiled in the ROMP 133 – Arredondo portfolio (portfolio ID 827). As of October 2013, available data include water quality, geophysical, and long-term water level data. Aquifer performance test data, slug test data, and stratigraphy will be available in the future. This report, well construction details, and survey data are also available for download from WMIS.

Lithologic Sampling

Lithologic samples were collected from land surface to the total exploration depth of 1,337 feet bls. Huss Drilling, Inc. conducted split-spoon sampling of the unconsolidated sediments using the mud rotary method from land surface to 44 feet bls before the 10-inch steel surface casing was set for the core hole to 42 feet bls. From February 2011 to June 2011, the District conducted hydraulic-rotary core drilling from 45 to 1,337 feet bls using the District's CME 85 core drilling rig. Core samples were continuously collected and retrieved in 5-foot or 10-foot intervals using a wireline recovery system. Lithologic samples were boxed, labeled, and described.

Hydraulic Testing

Hydraulic properties were estimated from 13 slug test suites performed during core drilling. Testing began after core drilling through the unconsolidated sediments of the undifferentiated sand and clay unit, the undifferentiated Hawthorn Group, and the soft weathered portion of the Ocala Limestone. Three attempts were made to conduct a slug test with a packed interval from 74.1 to 105 feet bls; however, the bottom 10 feet of the core hole would not stay open, creating unsuitable testing conditions.

An off-bottom packer or the HWT casing (4-inch inside diameter temporary steel casing) working casing was used to isolate discrete intervals of the core hole for slug testing. Slug testing was performed approximately every 100 feet. The packer was typically installed 40 feet off bottom unless borehole conditions necessitated installing the packer at a different interval. With the packer installed, a slug of air was introduced into the interval lowering the hydraulic head (water level). The water level in the test interval was measured with a pressure transducer and recorded on a datalogger as it returned to static conditions. Slug test data were analyzed to determine the horizontal hydraulic conductivity estimates of the isolated test intervals. An aquifer performance test (APT) also was conducted to obtain large scale estimates of hydraulic properties of the Upper Floridan aquifer in the area around the well site. The composite water level in the core hole (the entire open interval) was measured daily with an electronic water level meter before core drilling continued. Rainfall data were collected daily with a digital rain gauge.

Water Quality Sampling

Fourteen groundwater samples were collected while core drilling. The groundwater samples were collected from the discrete intervals isolated by the off-bottom packer or the HWT casing before conducting the slug test suites. All samples were collected with a wireline retrievable bailer. A portion of each sample was analyzed in the field for temperature, specific conductance, pH, chloride, and sulfate. The remainder of each sample was prepared and delivered to the District's Chemistry Laboratory for additional water quality analyses (Southwest Florida Water Management District, 2009). In addition, the specific conductance, temperature, and pH of the drilling discharge were monitored at various intervals during core hole advancement.

Geophysical Logging

Borehole geophysical logs are used to delineate stratigraphic units, identify permeable zones and confining units, characterize water quality, and help determine well casing points and grouting requirements. Geophysical logging was performed four times at the ROMP 133 well site using District-owned Century® geophysical logging equipment (table 1 and appendix B). The first suite of logs was performed on August 9, 2010, after the shallow Upper Floridan aquifer drilling water supply well (DRILLING WATER SUPPLY) was installed. The 8144C multifunction and the 9165C caliper/gamma-ray tools were run from land surface to 132 feet bls and not to the total depth of the well of 150 feet bls because the tools would not pass below 132 feet bls. The second suite of logs was performed on March 15, 2011, on the core hole before setting the PW (5-inch inside diameter temporary steel casing) casing to 260.49 feet bls. The 8143C multifunction and the 9165C caliper/gamma-ray tools were run from land surface to 300.8 feet bls. Geophysical logging was not performed on the core hole after core drilling and testing were completed to 1,337 feet bls because of an obstruction at 757 feet bls. A second core drilling and testing phase to deepen the core hole and consequently remove the obstruction was not done because of a change in District priorities; therefore, the obstruction remained and geophysical logs could not be run. During well construction of the deep Upper Floridan aquifer production well (U FLDN AQ MONITOR/PRODUCTION) a third suite

of logs was run on August 22, 2011. The 9165C caliper/gamma-ray tool was run from land surface to 307.2 feet bls before setting 16-inch steel casing. After well construction of the U FLDN AQ MONITOR/PRODUCTION well was complete, on September 29, 2011, the 9165C caliper/gamma-ray tool was run from land surface to 1,296.4 feet bls.

Well Construction

The ROMP 133 well site consists of a surficial aquifer monitor well (SURF AQ MONITOR) and the U FLDN AQ MONITOR/PRODUCTION well on the permanent easement and the DRILLING WATER SUPPLY well on the temporary construction easement (fig. 2). The District contracted Huss Drilling, Inc. (Huss), Earl's Well Drilling & Pump Service, Inc., David Cannon Well Drilling, Inc. (Cannon), and Toomer & Associates, Inc. (who subcontracted Technical Pump Services, LLC.) to perform well construction at the site.

On August 3, 2010, Huss conducted split-spoon sampling, using the mud-rotary method, to the top of rock at 44 feet bls at the core hole location. Then, Huss plugged the hole with bentonite hole plug and cement grout. From August 4 to August 5, 2010, Huss installed the DRILLING WATER SUPPLY well on the temporary construction easement. On August 4, 2010, Huss moved the drill rig approximately 200 feet southwest of the split-spoon hole (core hole) and drilled a nominal 8-inch borehole to 102 feet bls. Then, Huss attempted to install 4-inch galvanized steel casing but could not pass below approximately 70 feet. Huss re-drilled the borehole to 102 feet bls, installed the 4-inch galvanized steel casing, and grouted it in place. On August 5, 2010, Huss drilled a 4-inch open hole to 150 feet bls and developed the well for 4 hours. On August 9, 2010, the total depth of the well was determined to be 132 feet because the geophysical log tools would not pass below that depth. In November and December 2011, Technical Pump Services, LLC. deepened the well to 351 feet bls with a cable tool rig. The DRILLING WATER SUPPLY well later served as an Upper Floridan aquifer observation well for the APT.

On August 5, 2010, Earl's Well Drilling & Pump Service, Inc. drove 10-inch steel casing to 42 feet bls in the core hole location to stabilize the unconsolidated sediments during core drilling and testing. Although rock was encountered at 44 feet bls during split-spoon sampling, a hard ledge was encountered while driving the casing and the casing would not advance beyond 42 feet bls. From February 2011 to March 2011, District staff core drilled from 45 to 300 feet bls while continually advancing the HWT temporary casing to stabilize the soft and unconsolidated limestone. In March 2011, District staff set PW casing to 260.49 feet bls (beginning of competent limestone) and resumed core drilling from 300 to 1,337 feet bls. The core hole also served as an Upper Floridan aquifer observation well during the APT. In October 2012, District staff plugged the core hole. District staff spent a week trying to pull the PW casing from the core hole but it separated 6 feet bls. It was decided to leave the 254 feet of PW casing and proceed with grouting. The 10-inch steel casing was cut 5 feet bls and covered with dirt.

From August 1 to September 30, 2011, Cannon installed the U FLDN AQ MONITOR/PRODUCTION well on the permanent easement. From August 1 to August 2, 2011, Cannon drilled a nominal 30-inch borehole to 39 feet bls using the mud-rotary method, installed 24-inch steel casing to 37 feet bls, and grouted it in place. On August 3, 2011, Cannon drilled the cement from 24 to 37 feet bls and a nominal 24-inch borehole from 37 to 53 feet bls using the mud-rotary method. Circulation was lost at 48 feet bls. From August 4 to August 11, 2011, Cannon continued to drill a nominal 24-inch borehole to 90 feet bls, installed 20-inch steel casing to 88 feet bls, and grouted it in place. The grout would not hold at various intervals between 35 and 80 feet bls; therefore, Cannon placed sand and bentonite hole plug in these intervals to aid the grout. On August 12, 2011, Cannon drilled the cement from 80 to 88 feet bls and a nominal 20-inch borehole to 120 feet bls

Table 1. Summary of geophysical logs collected at the ROMP 133 – Arredondo well site in Marion County, Florida

[ft, feet; bls, below land surface; --, not applicable; U, Upper; FLDN, Floridan; AQ, aquifer; ROMP, Regional Observation and Monitor-well Program; The multifunction tool includes natural gamma-ray, single-point resistance, short normal 16-inch resistivity, long normal 64-inch resistivity, fluid resistivity, spontenous potential, specific conductance, and temperature parameters]

Date (MM/DD/YYYY)	Well Name	Log Depth (ft bls)	Casing Type	Casing Depth (ft bls)	Borehole Diameter (inches)	Tool Type	Tool Number
08/09/2010	ROMP 133 DRILLING WATER SUPPLY	132	Steel	102	4	caliper/gamma-ray; multifunction	9165C; 8144C
03/15/2011	ROMP 133 COREHOLE	300.8	Steel	192	3	caliper/gamma-ray; multifunction	9165C; 8144C
08/22/2011	ROMP 133 U FLDN AQ PRODUCTION/MONITOR	307.2	Steel	88	20	caliper/gamma-ray	9165C
09/29/2011	ROMP 133 U FLDN AQ PRODUCTION/MONITOR	1,296.4	Steel	308	16	caliper/gamma-ray	9165C

using the mud-rotary method. From August 13 to August 22, 2011, Cannon continued to drill a nominal 20-inch borehole to 312 feet bls using the reverse-air method. On August 23, 2011, Cannon installed 16-inch steel casing to 308 feet bls and began grouting it in place. From August 24 to August 30, 2011, Cannon completed grouting the 16-inch casing. From September 8 to September 28, 2011, Cannon drilled a nominal 16-inch open borehole to 1,296.8 feet bls using the reverse-air method. From September 28 to September 29, 2011, Cannon reverse-air developed the well while pulling the drill rods. On September 30, 2011, Cannon installed a well head. The well was used as the production well during the APT. Based on APT results from the nearby ROMP 132 – Blitch Plantation well site (Janosik, 2011), a larger pump to sufficiently stress the aquifer would have been ideal. Consequently, casing larger than 16-inches would have been needed to accommodate the pump and pressure transducer; however, this was not possible because of the limitations of the well construction contract. As an alternative, Cannon welded a 1-inch steel tube to the outside of the 16-inch steel casing to 162 feet bls to accommodate the pressure transducer during the APT. After the APT was completed, District staff lined the well. In October 2012, District staff installed 6-inch Standard Dimension Ratio 17 (SDR 17) casing to 308 feet bls and grouted it in place utilizing a steel cement basket at 307 feet bls.

On December 20, 2011, Huss installed the SURF AQ MONITOR well on the permanent easement. Huss drilled a nominal 14-inch hole with 8¼-inch inside diameter augers from land surface to the top of clay at 5 feet bls. Then, Huss installed 6-inch, schedule 40, 0.010-inch slot, threaded PVC screen with a bottom cap from 2 to 5 feet bls, and 6-inch, schedule 40, threaded PVC casing from 3 feet above land surface (als) to 2 feet bls. A 20-30 silica sand filter pack was installed from 1 to 5 feet bls, a fine sand seal was installed from 0.5 to 1 foot bls, and neat cement grout was installed from land surface to 0.5 foot bls. The well was dry; therefore, Huss added three well volumes of water for well development. The well accepted the water but the water level appeared to remain steady at 2 feet bls after several minutes.

On March 19, 2012, District staff surveyed the elevations of the top of the 4-inch aluminum casing of the drilling water supply well, the top of the 6-inch polyvinyl chloride (PVC) casing of the permanent surficial aquifer well, the core hole measuring point (the top of the steel plate on the 10-inch steel casing), and the permanent Upper Floridan aquifer well measuring points (the notch and the top of the 1.5-inch steel pipe on the west side of the casing). These measuring points were used during the APT. The well as-built diagrams are presented in appendix C and a summary of the well construction details are presented in table 2. Daily logs for core drilling and well construction operations are available from the District's online document storage database (Alchemy Web®). Additional well construction details can be found in the District's WMIS.

Geology

The lithostratigraphy of the ROMP 133 well site is based on the lithologic samples collected from split-spoon sampling from land surface to 44 feet bls and exploratory core drilling that was conducted from 45 to 1,337 feet bls. The geologic units encountered at the well site include, in ascending order: the Oldsmar Formation, Avon Park Formation, Ocala Limestone, undifferentiated Hawthorn Group sediments, and undifferentiated sand and clay deposits. A stratigraphic column detailing the hydrogeology encountered at the well site is presented in figure 3. The lithologic log is presented in appendix D. Digital photographs of the lithologic core samples are presented in appendix E.

Oldsmar Formation (Early Eocene)

The early Eocene age Oldsmar Formation is a carbonate rock formation that underlies the entire Florida peninsula (Miller, 1986). At the ROMP 133 well site, the Oldsmar Formation extends from 982.6 feet bls to past the total depth of exploration of 1,337 feet bls. The transition to the Oldsmar Formation from the overlying Avon Park Formation is typically gradual and not easily differentiated (Chen, 1965). The top of the formation was picked based on the presence of organic laminations, the appearance of small round fossils that are suspected to be the benthic foraminifer *Helicostigina gyralis* (although not an index fossil, it is characteristic of the Oldsmar Formation), and the appearance of glauconite, which can be a marker horizon for the Oldsmar Formation (Reese and Richardson, 2008; Duncan and others, 1994). The top of the formation was picked at 982.6 feet bls within a dolostone bed rather than 984.6 feet bls at the top of a mudstone bed because of textural interpretation of the parent material. The dolostone in this interval was likely a fine-grained mudstone prior to dolomitization and recrystallization and thus should be included in the pick (Clint Kromhout, Florida Geological Survey, written commun., 2011). According to Chen (1965), the top of the Oldsmar Formation is not easily recognized on electric logs. However, there is a noticeable drop in gamma-ray activity below the top of the Oldsmar Formation (appendix B). A similar drop in gamma-ray activity below the top of the Oldsmar Formation was observed at the ROMP 45.5 – Progress Energy well site in Polk County, Florida (Horstman, 2011). The average core recovery achieved within the Oldsmar Formation was 90 percent.

At the ROMP 133 well site, the Oldsmar Formation predominantly consists of interbedded layers of grayish brown and very light orange, fossiliferous limestone and dark yellowish brown and moderate yellowish brown, highly altered dolostone. Two peat layers exist from 1,257.9 to 1,258.5 feet bls and from 1,268 to 1,268.5 feet bls and are apparent as peaks on the gamma-ray log (appendix B, fig. B4).

Limestones make up 49 percent (rounded up) of the Oldsmar Formation at the well site. The limestones consist of

Table 2. Summary of well construction details at the ROMP 133 – Arredondo well site in Marion County, Florida

[ft, feet; bls, below land surface; WCP No., well construction permit number(s), District, Southwest Florida Water Management District; SID, site identification; U, Upper; L, lower; SURF, surficial; AQ, aquifer; FLDN, Floridan; OB, observation; ROMP, Regional Observation and Monitor-well Program; --, not applicable]

SID	Well Name	Alternate Name	Open Interval (ft bls - ft bls)	Constructed By	Start Date (MM/DD/YYYY)	Complete Date (MM/DD/YYYY)	Status	WCP No.
771328	ROMP 133 DRILLING WATER SUPPLY	U FLDN AQ OB 2	102-351	Huss Drilling/ Technical Pump (Toomer)	08/04/2010	12/05/2011	Inactive[1]	806578, 816916
762921	ROMP 133 COREHOLE	U FLDN AQ OB	45-1,337	Earl's Well Drilling/ District	08/05/2010	10/11/2012	Plugged	806417, 810064, 812558, 822503
787986	ROMP 133 U FLDN AQ PRODUCTION/MONITOR	PRODUCTION WELL	308-1,296.8	Cannon Well Drilling/ District	08/01/2011	10/16/2012	Active	814416, 822506
787982	ROMP 133 SURF AQ MONITOR	--	2-5 (screen)	Huss Drilling	12/20/2011	12/20/2011	Active	817517

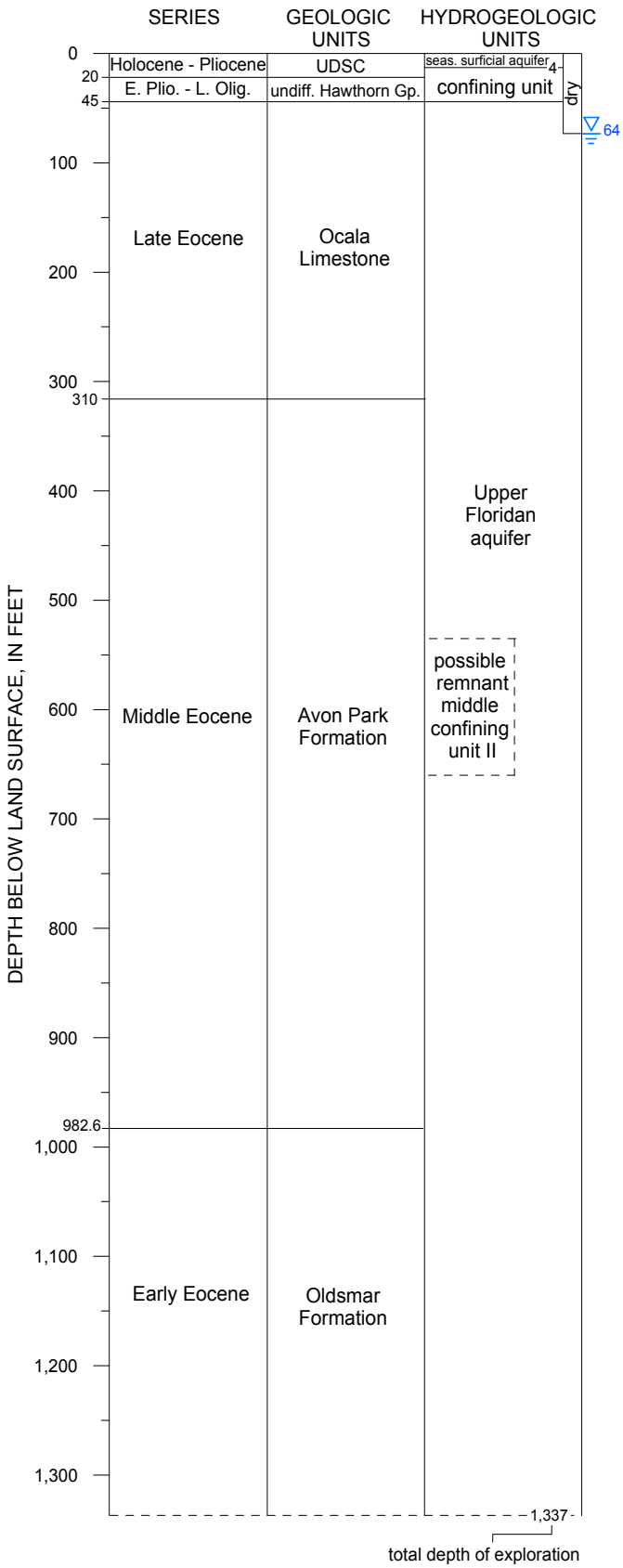
[1]Well is located on temporary construction easement and shall remain per license agreement.

20 percent packstone, 12 percent grainstone, 10 percent mudstone, and 6 percent wackestone. The limestones are moderately to well indurated with the exception of a mudstone from 1,033 to 1,034 feet bls that is poorly indurated (the drill rods moved downward without a lot of resistance in this interval). The limestones are fossiliferous and predominantly include benthic foraminifera such as miliolids (which are present throughout the limestones). Other fossils observed in the limestones that resemble benthic foraminifera but were not positively identified include *Helicostigina gyralis* from 983.7 to 1,100.6 feet bls, *Borelis floridanus* from 1,152.1 to 1,301 feet bls, and *Coskinolina elongata* from 1,254.8 to 1,275 feet bls. Abundant fossil fragments including bryozoa, coral, echinoids, spicules, and mollusks also were observed in the limestones. Plant remains were observed from 1,152.5 to 1,195.5 feet bls and other organics were observed throughout the limestones. Accessory minerals include glauconite, pyrite, dolomite, and calcite. Sedimentary structures include laminations and mottling. The limestones are dolomitic in areas and appear mottled and speckled likely because of selective dolomitization. Some of the limestones are varved, muddy, and chalky. The observed porosity ranges from 5 to 32 percent with an average observed porosity of 24 percent. The main sources of porosity in the limestones are intergranular, pinpoint vugular, and intragranular. Less common sources include moldic, vugular, intercrystalline, and fractures.

The dolostones make up 51 percent of the Oldsmar Formation at the ROMP 133 well site. The dolostones are well-indurated, highly altered, crystalline, anhedral to subhedral, and vuggy. The dolostones are predominantly microcrystalline but range up to coarsely crystalline. Various fossil fragments and molds were observed but only echinoid and mollusk remnants could be identified in the upper section of the dolostones. Organic laminae and plant remains also were observed. Accessory minerals include glauconite, pyrite, and quartz. Glauconite was not observed in the dolostones below about 1,023 feet bls. Rare drusy quartz begins to line vugs at about 1,135.9 feet bls. Some vugs also have euhedral dolomite. Sedimentary structures include laminations and mottling. The dolostones are varved and speckled in areas. The dolostone beds appear to have higher porosity than the limestone interbeds. Observed porosity ranges from 18 to 40 percent with an average observed porosity of 30 percent. The main sources are intergranular, vugular, pinpoint vugular, and fractures but moldic, intragranular, and intercrystalline sources are present. A rod drop occurred from 1,327 to 1,328 feet suggesting a void is present. Fractures appear more abundant in the deeper dolostones.

Avon Park Formation (Middle Eocene)

The middle Eocene age Avon Park Formation extends from 310 to 982.6 feet bls at the ROMP 133 well site. A substantial color change marks the top of the formation in addition to the start of an extensive dolostone sequence, which is a distinct lithologic change from the overlying Ocala Limestone. The appearance of the echinoid *Neoloaganum dalli* molds and tests, which is an index fossil characteristic of the Avon Park Formation, at 314 feet bls also indicates the Avon Park Formation. The Avon Park Formation conformably overlies the Oldsmar Formation (Chen, 1965). The average core recovery in the Avon Park Formation was 83 percent.



[E. Plio - L. Olig, Early Pliocene - Late Oligocene; UDSC, undifferentiated sand and clay; undiff. Hawthorn Gp., undifferentiated Hawthorn Group; seas., seasonal]

Figure 3. Stratigraphic column detailing the hydrogeologic setting at the ROMP 133 – Arredondo well site in Marion County, Florida.

At the ROMP 133 well site, the Avon Park Formation is predominantly moderately yellowish brown, fossiliferous, highly altered, subhedral and anhedral dolostone thickly interbedded with grayish brown, variably dolomitized, fossiliferous limestone. Organics are present throughout the formation as inclusions, laminae, and beds. However, the gamma-ray peak attributed to organic material that is characteristic to the top of the formation (Arthur and others, 2008; Tihansky and Knochenmus, 2001) was not observed. The Avon Park Formation is 60 percent dolostone, 38 percent limestone (31 percent packstone, 3 percent mudstone, 3 percent grainstone, and 1 percent wackestone), and 2 percent peat. The intense gamma-ray peaks throughout the Avon Park Formation appear coincident with the peat beds that are present from 545 to 550.4 feet bls, 555 to 555.2 feet bls, 580.3 to 582.3 feet bls, 586.5 to 586.6 feet bls, 588.3 to 589.8 feet bls, 602.4 to 607.4 feet bls, and 689.7 to 690.1 feet bls (appendix B, fig. B4).

From 310 to 589.8 feet bls, the lithology is predominantly moderate yellowish brown, very light orange, and yellowish gray, fossiliferous, microcrystalline to medium grained, moderate to well indurated, sucrosic, subhedral (to 407 feet bls) to anhedral (below 407 feet), highly altered dolostone. Beds (less than 6 feet) of yellowish gray mudstone and dark yellowish brown peat begin at 514.5 feet bls and 545 feet bls, respectively. Accessory pyrite is present throughout this section. Sedimentary structures include laminations (resulting in a varved and variegated appearance), bioturbation and mottling. Abundant burrows begin at 503 feet bls. Fossil molds and fragments observed within this section include mollusks, coral, echinoids, and benthic foraminifera. In addition to *Neolaganum dalli*, another index fossil characteristic to the Avon Park Formation, *Cushmania americana* (formerly *Dictyoconus americanus*), was observed beginning at 494.7 feet bls. Fossils resembling *Litounella floridana* were observed around 494.7 feet bls. Rare large vugs begin about 540 feet bls. The texture of the vug walls resemble past infilling and dissolution of evaporites. Drusy quartz lines some vugs beginning about 550.5 feet bls. The average observable porosity of the carbonates is 26 percent and ranges from 15 to 35 percent. The main sources are intergranular, intragranular, pin point vugular, and moldic but there is less common vugular, intercrystalline and fracture.

From 589.8 to 707 feet bls and 806 to 908.2 feet bls, the lithology is predominantly grayish brown, moderate to well indurated, medium to coarse grained, fossiliferous packstone. Some beds of mudstone, wackestone, and grainstone are present in both sections. The limestone is more weathered and soft in areas and results in poorer recovery of these areas. Peat beds are present to 690.1 feet bls and organic inclusions and laminae are present throughout both sections. Sedimentary structures include laminations (resulting in a varved appearance) and mottling. Fossil molds and fragments observed

within these sections include coral, mollusks, benthic foraminifera, echinoids, and miliolids. *Cushmania americana* forams are still present in these two sections. Abundant spiral shaped fossils resembling *Gunteria floridana* begin about 588.5 feet bls. The average observable porosity of the limestone in the two sections is 24 percent and ranges from 20 to 28 percent. The main sources are intergranular, intragranular, pin point vugular, and moldic.

From 707 to 806 feet bls and 908.2 to 982.6, the lithology is predominantly dark yellowish brown to moderate yellowish brown, moderate to well indurated, highly altered, subhedral to anhedral, sucrosic, dolostone. Few beds of mudstone, wackestone, and packstone are present in the deeper section. An unconsolidated grainstone bed is present from 735 to 745 feet bls that resulted in no core recovery. Fractures present from about 750 to 760 feet bls made core drilling difficult several times by plugging the NQ rods and blocking and filling the core hole where the NQ rods could not pass below. Quartz is present in the section from 794 to 803 feet bls. Glauconite appears as an accessory mineral beginning about 976.6 feet bls. Organic inclusions and laminae are present throughout both sections. Sedimentary structures include laminations (resulting in a varved appearance) and mottling. Fossil molds and fragments observed within these sections include coral, bryozoa, mollusks, benthic foraminifera (including *Cushmania americana*), echinoids, and miliolids. The average observable porosity of the dolostone in these two sections is 28 percent and ranges from 20 to 38 percent. The main sources are intergranular, intragranular, pin point vugular, moldic, vugular, and fracture. The dolostones in these two sections of the Avon Park Formation are more fractured than the dolostones above.

Ocala Limestone (Late Eocene)

At the ROMP 133 well site, the late Eocene age Ocala Limestone extends from 45 to 310 feet bls. The Ocala Limestone unconformably overlies the Avon Park Formation. The top of the Ocala Limestone is marked by the first occurrence of limestone containing the benthic foraminifers *Lepidocyclina ocalana* beginning at 49 feet bls and *Nummulites vanderstoki* beginning at 54 feet bls, which are fossils characteristic to this lithostratigraphic unit (Miller, 1986; Arthur and others, 2008). Additionally, a characteristic drop in gamma-ray activity corresponds with the contact (appendix B). This muted response remains throughout the formation (appendix B). The average core recovery achieved within the Ocala Limestone was 43 percent.

The general lithology is a very light orange, fossiliferous, weathered, soft, poorly indurated to unconsolidated packstone. The Ocala Limestone is 54 percent packstone, 24 percent grainstone, 13 percent mudstone, 4 percent wackestone, and 4 percent dolostone. Other fossil molds and fragments observed include mollusks, gastropods, bryozoa, coral, miliolids, echinoids, and benthic foraminifera. *Nummulites ocalanus* were observed from about 80 to about 250 feet bls. Fossils resembling *Gypsina globula*, *Cassidulus globosus*, *Periarchus lyelli floridanus*, and *Neolaganum durhami* were observed rarely in approximately the bottom 100 feet of the unit. Sparse chert nodules and beds are present from 60 to 150 feet bls. Two notable chert beds extend from 64.7 to 65.7 feet bls and from 74 to 74.7 feet bls. Rare accessory pyrite is present from 60 to 310 feet bls.

From 45 to about 60 feet bls, the limestone is a very light orange, fossiliferous, well indurated packstone to grainstone. During core drilling of this portion of the Ocala Limestone, the drill rods dropped two times with the first drop occurring from 54 to 56 feet bls and the second drop occurring from 59 to 60 feet bls. These rod drops could indicate voids in the limestone.

From 60 to 251 feet bls, the limestone is primarily very light orange, very fossiliferous, unconsolidated limestone or limestone hash with beds of soft mudstone, wackestone, and grainstone. Core drilling was difficult throughout this portion because of the unconsolidated character of the limestone. Sample recovery in the core barrel was poor even when using a punch shoe adapter. The HWT temporary casing would not stay seated in this portion either. Therefore, the HWT casing was advanced generally after every 5 feet of coring until a hard ledge was encountered around 190 feet bls. In addition to the samples collected from the core barrel, samples were collected from the airlift discharge after core drilling and from the circulation out of the top of the HWT while advancing. During core drilling of this section, the rods dropped two times with the first drop occurring from 191 to 192 feet bls and the second drop occurring from 194 to 195 feet bls.

From 251 to 300 feet bls, the limestone grades from a very light orange to grayish brown, fossiliferous, moderate to well indurated grainstone with two beds of packstone. The bottom 10 feet of the Ocala Limestone is a grayish brown to moderate yellowish brown, fossiliferous, well indurated, anhedral dolostone with accessory organics. Observable porosity in the Ocala Limestone ranges from 16 to 28 percent and is predominantly intergranular and intragranular with moldic, vugular, and pin point vugular.

Undifferentiated Hawthorn Group (Miocene)

At the ROMP 133 well site, the Miocene age undifferentiated Hawthorn Group sediments extend from 20 to 45 feet bls and unconformably overlies the Ocala Limestone. The unit consists of clay from 20 to 38 feet bls and sand with a clay matrix from 38 to 44 feet bls. No sample was recovered from 44 to 45 feet bls. The lithology from 20 to 21 feet bls is moderate brown to dark yellowish brown, sandy, silty clay with limonite. From 21 to 23.5 feet bls, the lithology is yellowish gray to light grayish green, iron-stained, sandy, silty clay. From 23.5 to 38 feet bls, the lithology is yellowish gray, sandy clay with silt from 36 to 38 feet bls and iron-staining from 23.5 to 25 and 36 to 38 feet bls. Sand content in the clay

generally decreases with depth and ranges from 15 (from 20 to 21 feet bls) to 1 percent. The observed porosity in the clay layers range from 20 to 25 percent and the types are intergranular, intragranular, and fracture. The lithology from 38 to 44 feet bls is yellowish gray, very fine to coarse grained, clayey sand with 22 percent intergranular and intragranular porosity. Average sediment recovery from the split-spoon samples was 85 percent.

Undifferentiated Sand and Clay (Pliocene-Holocene)

The Pliocene to Holocene age undifferentiated sand and clay unit is the uppermost geologic unit at the ROMP 133 well site. The unit extends from land surface to 20 feet bls and unconformably overlies the undifferentiated Hawthorn Group sediments. The unit consists of sand from land surface to 4 feet bls and clay from 4 to 20 feet bls. The lithology from land surface to 0.5 foot bls is dark gray to moderate yellowish brown, fine to coarse grained, clayey, quartz sand with organics. The lithology from 0.5 to 1.5 feet bls is brownish gray, fine to coarse grained, iron-stained, clayey, quartz sand with organics. From 1.5 to 4 feet bls, the lithology is grayish brown to moderate brown, fine to coarse grained, iron-stained, clayey, quartz sand with iron cement. Small firm concretions that resemble limonite were observed from land surface to 4 feet bls. The clay content in the sand increases with depth from 8 to 25 percent. Iron staining in the sand increases with depth from none between land surface and 0.5 feet bls to 10 percent between 2 and 4 feet bls. Observed intergranular and intragranular porosity in the sand is approximately 30 percent from land surface to 1.5 feet bls, 25 percent from 1.5 to 3 feet bls, and 20 percent from 3 to 4 feet bls. The apparent permeability decreased with depth because of the increase in clay content.

The lithology from 4 to 9 feet bls is grayish brown to moderate brown, iron-stained clay with iron cement and 10 percent quartz sand. From 9 to 17.8 feet bls, the lithology is yellowish gray to light grayish green, iron-stained clay with 10 percent sand. The lithology from 17.8 to 20 feet bls is light olive to dark yellowish orange clay with 2 percent sand. Iron staining in the clay decreases with depth from 3 percent to none. Observed intergranular and intragranular porosity in the clay is approximately 30 percent. Average sediment recovery from the split-spoon samples was 98 percent.

Hydrogeology

The ROMP 133 – Arredondo well site hydrogeology was delineated based on the results of 13 slug tests collected during exploratory core drilling and testing, as well as from an APT, lithologic descriptions, water levels, water quality data, and geophysical log data. The hydrogeologic units include, in descending order: a seasonal surficial aquifer, a confining unit, and the Upper Floridan aquifer (fig. 3). The ROMP 133 well site is located in an area where no middle confining unit is apparent and consequently a Lower Floridan aquifer is absent (Miller, 1986). A seasonal surficial aquifer likely exists during rainy periods; however, the uppermost sands were dry during exploratory core drilling and testing. The naming convention used for the hydrogeologic units in this report are consistent with aquifer nomenclature guidelines proposed by Laney and Davidson (1986) and the North American Stratigraphic Code (2005). A comparison of the nomenclature used in this report (District nomenclature that is not site-specific) and previously published reports is presented in appendix F.

As discussed in appendix A, the horizontal hydraulic conductivities (herein referred to as hydraulic conductivity) derived from the slug tests may be underestimated because of unavoidable testing errors and limitations of the analysis (Butler, 1998). Consequently, the values should be used as an approximation of the relative differences between permeable and confining intervals. The slug test results are presented in table 3. All the hydraulic conductivity estimates are within expected ranges for the lithology types encountered (Freeze and Cherry, 1979). A graph of the hydraulic conductivity estimates and core hole depth is presented in figure 4. The slug test data acquisition sheets are presented in appendix G and the curve-match analyses are given in appendix H.

The near daily water level data collected during the core drilling and testing phase in the DRILLING WATER SUPPLY well and the composite (non-isolated) core hole are presented in appendix I. Additionally, the core hole water level data measured within isolated test intervals provide a relative profile of water level change with depth within the Upper Floridan aquifer. The composite and test interval core hole water level data recorded during exploratory core drilling are presented in figure 4. Groundwater was first encountered approximately 64 feet bls during exploratory core drilling and testing.

A constant-rate APT was conducted to estimate hydraulic parameters for the Upper Floridan aquifer. The APT data collection sheets are presented in appendix J. The APT curve-match analyses are presented in appendix K.

Surficial Aquifer

The surficial aquifer is considered seasonal at the ROMP 133 well site. The quartz sand from land surface to 4 feet bls within the undifferentiated sand and clay unit was dry during split-spoon sampling in August 2010. Additionally, the 6-inch SURF AQ MONITOR well was dry during construction in December 2011. However, it is likely a surficial aquifer is present after rain events. Redoximorhpic features as described in the Undifferentiated Sand and Clay subsection of the Geology section indicate periods of saturation above 4 feet bls. According to the District core drilling staff, water was visible while digging the discharge pit in February 2011.The pit continually contained water but never overflowed during core drilling and testing. Ponding of water on the ground was

Table 3. Summary of the core hole slug test results performed at the ROMP 133 – Arredondo well site in Marion County, Florida

[No., number; ft., feet; bls, below land surface; ft/d, feet per day; --, not applicable; HWT, temporary steel working casing; All slug tests are pneumatic rising head except where otherwise noted; All slug test intervals were isolated with a NQ off-bottom inflatable packer except where otherwise noted. Hydraulic conductivity values are underestimated for higher K zones when using NQ packer assembly. Aquifer saturated thickness (b) estimated at 1,671 feet for analyses (based on bottom of the Upper Floridan aquifer at 1,735 feet as estimated from regional data). Analytical method details can be found in: Butler, J.J., Jr., 1998, The Design, Performance, and Analysis of Slug Tests: Boca Raton, Florida, Lewis Publishers, 252 p.]

Slug Test No.	Date (MM/DD/YYYY)	Test Interval (ft bls)	Visual Lithologic Characterization	Geologic/ Hydrogeologic Unit	Analytical Method	Horizontal Hydraulic Conductivity (K) (ft/d)	Comments
1	02/17/2011	74.1-95	Limestone - soft packstone to unconsolidated	Ocala Limestone/Upper Floridan aquifer	--	--	Two attempts to test on HWT. Test invalid, 10 ft bottom hole collapse.
2	03/08/2011	192.2-230	Limestone - fossiliferous packstone	Ocala Limestone/Upper Floridan aquifer	Butler-Zahn (2004) inertial (test well)	350	Tested on HWT
3	03/14/2011	260-300	Limestone - fossiliferous packstone to grainstone	Ocala Limestone/Upper Floridan aquifer	Butler-Zahn (2004) inertial (test well)	46	
4	03/24/2011	349-390	Dolostone - sucrosic	Avon Park Formation/Upper Floridan aquifer	Butler-Zahn (2004) inertial (test well)	68	
5	03/30/2011	450-490	Dolostone - sucrosic	Avon Park Formation/Upper Floridan aquifer	Butler-Zahn (2004) inertial (test well)	82	
6	04/05/2011	512-565	Dolostone with mudstone and peat	Avon Park Formation/Upper Floridan aquifer	Butler-Zahn (2004) inertial (test well)	30	
7	04/12/2011	600-640	Limestone - fossiliferous packstone with mudstone and peat	Avon Park Formation/Upper Floridan aquifer	KGS (Hyder and others, 1994)	9	
8	04/19/2011	685-725	Fossiliferous packstone with mudstone and peat; Bottom 18 feet is sucrosic, fractured dolostone	Avon Park Formation/Upper Floridan aquifer	Butler-Zahn (2004) inertial (test well)	74	
9	04/28/2011	762-800	Dolostone - sucrosic and fractured	Avon Park Formation/Upper Floridan aquifer	Butler-Zahn (2004) inertial (test well)	110	
10	05/04/2011	862-900	Limestone - fossiliferous packstone	Avon Park Formation/Upper Floridan aquifer	KGS (Hyder and others, 1994)	4	
11	05/10/2011	960-1,000	Dolostone - sucrosic and fractured	Avon Park and Oldsmar Formations/Upper Floridan aquifer	Butler-Zahn (2004) inertial (test well)	110	
12	05/17/2011	1,060-1,100	Limestone - fossiliferous packstone to grainstone	Oldsmar Formation/Upper Floridan aquifer	Butler-Zahn (2004) inertial (test well)	52	
13	05/24/2011	1,170-1,210	Fossiliferous mudstone and wackestone; Bottom 14.6 feet is microcrystalline to fine dolostone	Oldsmar Formation/Upper Floridan aquifer	Butler-Zahn (2004) inertial (test well)	70	
14	06/07/2011	1,270-1,310	Fossiliferous wackestone to packstone with microcrystalline to very fine dolostone	Oldsmar Formation/Upper Floridan aquifer	Butler-Zahn (2004) inertial (test well)	53	

observed after rainfall. The clay content of the sand in the undifferentiated sand and clay unit from land surface to 4 feet bls ranges from 8 to 25 percent, which suggests the sediments have decreased permeability and likely do not readily yield an appreciable amount of water. Clay with iron-cement that extends from 4 to 38 feet bls is sufficient to create a confining unit that slows the vertical movement of water into the Upper Floridan aquifer and a seasonal surficial aquifer after rain events thereby allowing time for redoximorphic features to develop in the sediments. This report presents only the findings at the location of exploration where surficial sediments may be thin as compared to surrounding areas. According to Arthur and others (2008), the well site is located in an area identified as having a surficial aquifer. No slug testing was performed in this unit because the sediments were dry during core drilling and testing. Long-term water level monitoring of the SURF AQ MONITOR began on March 1, 2012. Water was present in the well from July to October 2012, January to February 2013, June to October 2013, and December 2013 to January 2014.

Confining Unit

At the ROMP 133 well site, a confining unit extends from 4 to 45 feet bls. Clay from 4 to 38 feet bls and sandy clay from 38 to 45 feet bls are sufficient to form a low permeability unit that impedes vertical movement of water. The sediments are contained within the undifferentiated sand and clay unit and the undifferentiated Hawthorn Group. Delineation of the unit was based on the lithologic character and the apparent permeability of the core samples. Redoximorphic features were observed throughout the sediments in the confining unit suggesting it experiences similar saturated and unsaturated periods like the sediments in the overlying seasonal surficial aquifer. The lateral extent of this unit beyond the well site is unclear. Within the regional groundwater basin, the confining unit is often discontinuous and/or breached by karst features that allows direct infiltration of surface water into the Upper Floridan aquifer (Southwest Florida Water Management District, 1987). At the site-specific scale of this investigation, however, the presence of low permeability clay creates local restriction of vertical flow and local confinement of the Upper Floridan aquifer. Additionally, the well site is located in an area identified as having variable degrees of confinement that is more laterally continuous than discontinuous (Arthur and others, 2008). No slug testing was performed in this unit because the sediments were dry during core drilling and testing.

Upper Floridan Aquifer

At the ROMP 133 well site, the Upper Floridan aquifer is the only aquifer identified in the Floridan aquifer system during exploratory core drilling and testing. The Upper Floridan aquifer extends from approximately 64 feet bls (shallowest presence of groundwater during core drilling and testing) to beyond the total depth of exploration. The Upper Floridan aquifer, as encountered at the well site, consists of the Ocala Limestone (where saturated), the Avon Park Formation, and the Oldsmar Formation. The Ocala Limestone was encountered at 45 feet bls and drilling circulation was lost, suggesting permeable sediments are present from 45 to 64 feet bls. However, groundwater was not encountered until 64 feet bls. Technically, the Ocala Limestone between 45 to 64 feet bls is not considered part of the Upper Floridan aquifer during core drilling and testing because the sediments were dry. The top of the Upper Floridan aquifer is at the potentiometric surface, which fluctuates throughout the year. Therefore, the top of the aquifer presented in this report is the depth of the potentiometric surface during core drilling and testing.

The Upper Floridan aquifer is the only aquifer present in the Floridan aquifer system at the ROMP 133 well site because a middle confining unit was not conspicuous during exploratory core drilling and testing. Although the base of the Floridan aquifer system was not reached, the ROMP 133 well site is located in an area where no middle confining units are expected and consequently no Lower Floridan aquifer (Miller, 1986). At the ROMP 133 well site, the Upper Floridan aquifer is confined above by 41 feet of clay and sandy clay sediments. Although the water level was below the top of the permeable sediments, which could indicate the aquifer is not pressurized or non-artesian, air was felt and observed (caution tape that was placed over the 10-inch casing stood straight up) escaping the core hole while core drilling between 45 and 64 feet bls, which indicates locally confined conditions. Also, the Upper Floridan aquifer at the well site does not meet criteria to be considered unconfined because the aquifer does not contain "continuous layers of materials of high intrinsic permeability extending from land surface to the base of the aquifer" (Fetter, 2001). As discussed in the Confining Unit subsection, however, it is understood that regionally breaches in the confining unit exist allowing groundwater to directly infiltrate the Upper Floridan aquifer.

The 13 slug tests conducted in the Upper Floridan aquifer at the ROMP 133 well site can be seen in table 3 and figure 4. The hydraulic conductivity estimates range from 4 to 350 feet per day (ft/d). Slug test 2 and slug test 3 were conducted within the Ocala Limestone. Slug test 2 with an interval from 192.2 to 230 feet bls yielded the highest hydraulic conductivity estimate of 350 ft/d and slug test 3 with an interval from 260 to 300 feet bls yielded a lower hydraulic conductivity value of 46 ft/d. Slug test 2 was performed without a packer assembly; therefore, the hydraulic conductivity estimate for this interval is a better representative value because of no packer orifice restriction. However, this result also contributes to a larger disparity between subsequent hydraulic conductivity estimates because of the need to use the packer assembly in the subsequent slug tests. The decrease in hydraulic conductivity from slug test 2 to slug test 3 is likely a combination of underestimation because of the packer orifice restriction and a change in lithology from predominantly unconsolidated lime-

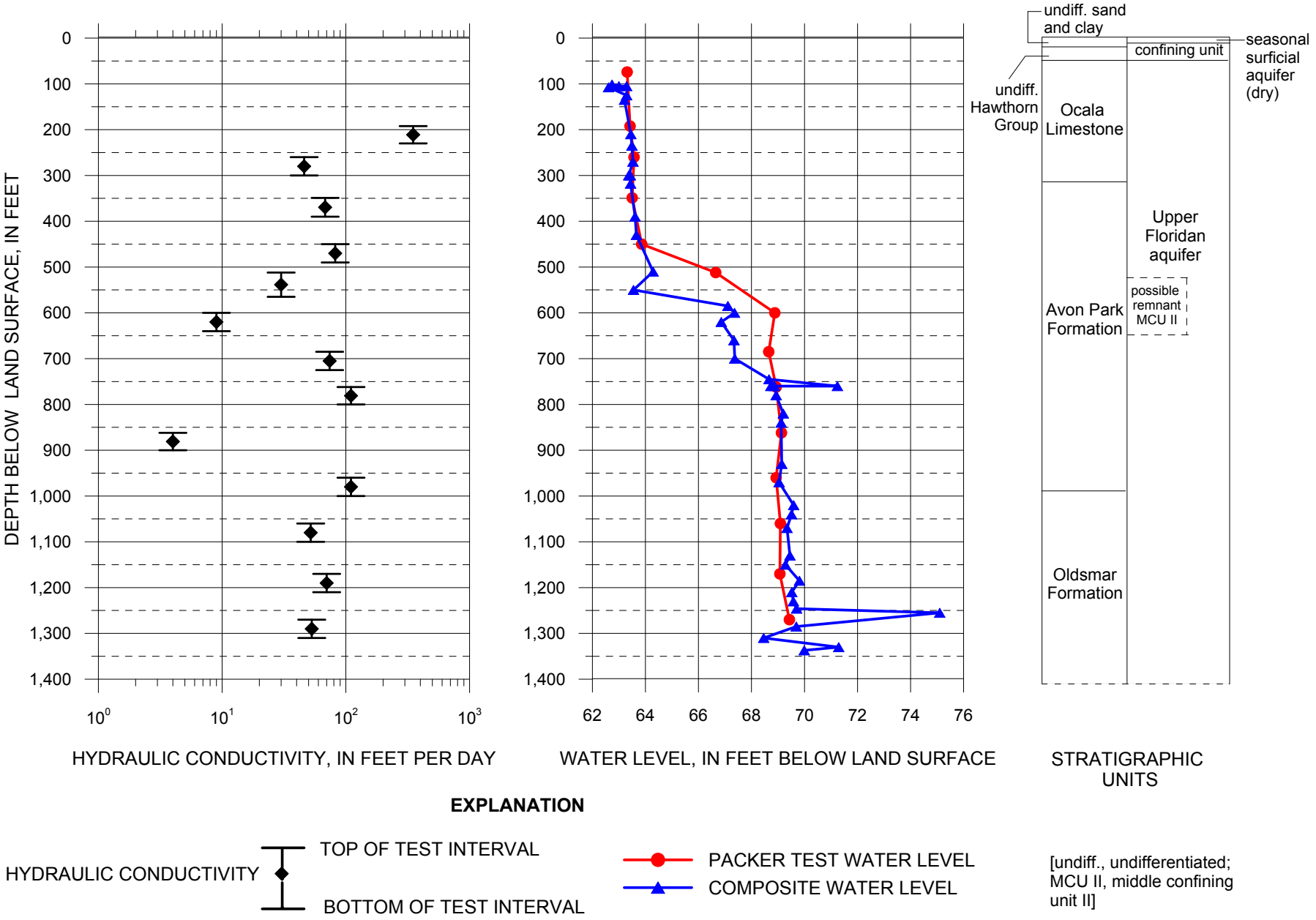
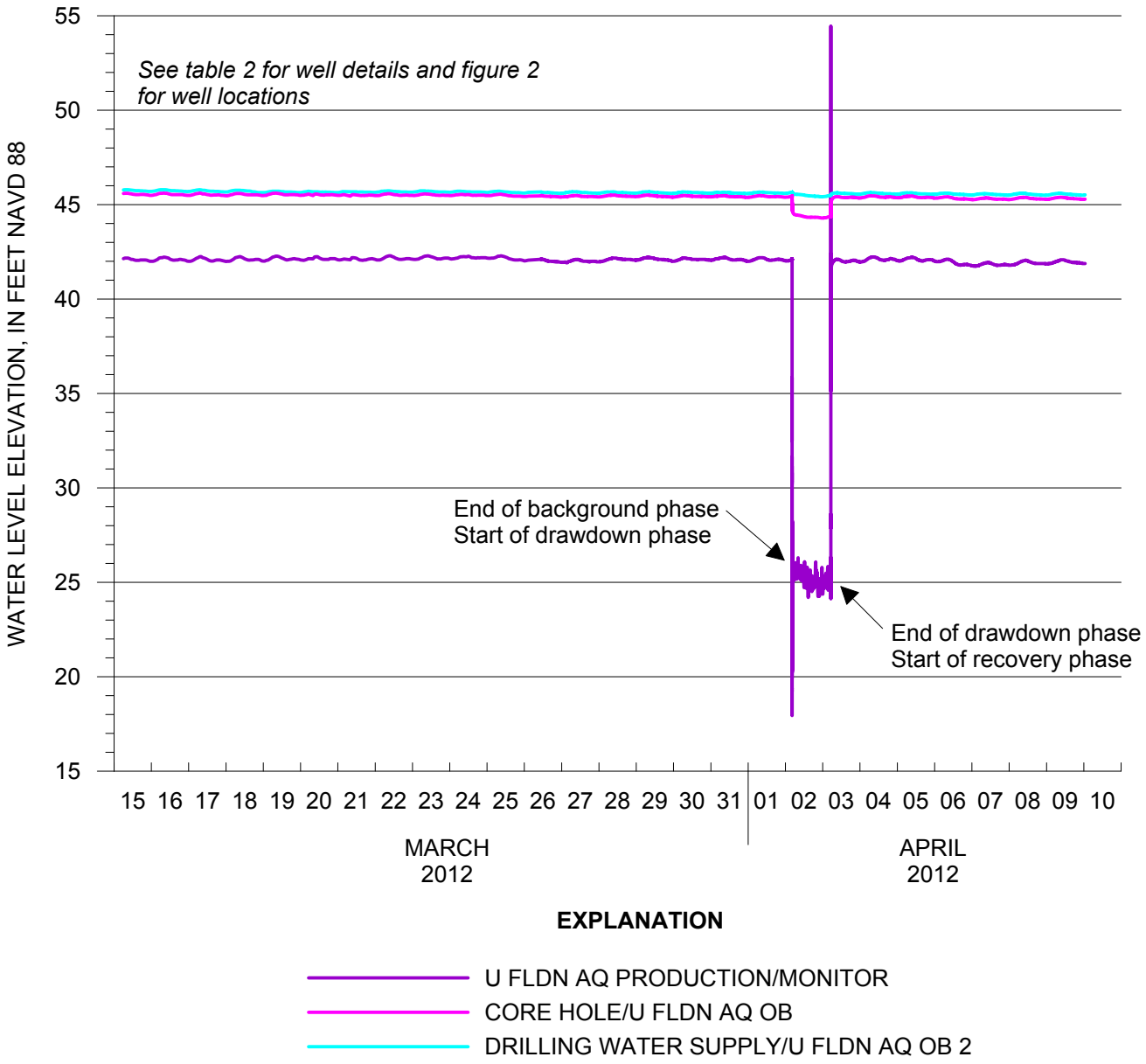


Figure 4. Horizontal hydraulic conductivity estimates and static water levels collected during core drilling at the ROMP 133 – Arredondo well site.

stone with voids to a better indurated limestone. An increase in resistivity supports that the decrease in hydraulic conductivity results, in part, because of a change to a less permeable lithology (appendix B, fig. B2). The hydraulic conductivity estimates range from 4 to 110 ft/d in the Avon Park Formation (table 3). Overall, the hydraulic conductivity in the Avon Park Formation is lower in the limestones and higher in the dolostones mainly because of fractures present in the dolostones. Two intervals of lower hydraulic conductivity are present from 600 to 640 feet bls (slug test 7) and from 862 to 900 feet bls (slug test 10). Slug test 7 yielded a hydraulic conductivity estimate of 9 ft/d and slug test 10 yielded a hydraulic conductivity estimate of 4 ft/d (table 3). Slug test 7 was conducted in an interval that contains mudstone, peat, and argillaceous packstone and slug test 10 was conducted in an interval that contains packstone with organics.

Generally, the water level declined with depth at the ROMP 133 well site during core drilling and testing from February 7 to June 14, 2011, and suggests a recharging system (fig. 4 and appendix I). The water level remained fairly constant until between about 550 to 745 feet bls where a nearly five foot drop in water level is apparent from the composite and packer test water levels (fig. 4). This drop in water level is indicative of the presence of a lower permeability unit. Coincidentally, the hydraulic conductivity value estimated from slug test 7 conducted from 600 to 640 feet bls decreased appreciably to 9 ft/d from 30 ft/d estimated from slug test 6 conducted from 512 to 565 feet bls. However, although the hydraulic conductivity decreased, the value does not suggest confinement. Interbeds of mudstone and peat are present beginning at 514.5 and extend to about 690.1 feet bls. The water level remained fairly constant at the lower level until exploratory core drilling and testing was completed. According to Miller (1986), no middle confining unit is present at the ROMP 133 well site. The middle confining unit I boundary is approximately 12 miles east and the middle confining unit II boundary is approximately 7 miles south of the ROMP 133 well site. Roughly extrapolating Miller's (1986) contours to the west, the middle confining unit I could be at or near land surface. Roughly extrapolating Miller's (1986) contours to the north, the middle confining unit II could be approximately 500 feet bls, which is close to the depth of the water level and hydraulic conductivity drop. The depth and location within the Avon Park Formation and the overall lithologic character of the formation indicates if a middle confining unit was present at the well site it would more likely be middle confining unit II. Evaporite material characteristic of middle confining unit II was not observed in the core samples. The sulfate concentration did increase from 1.7 mg/L from water quality sample 6 collected in the interval from 512 to 565 feet bls to 12.4 mg/L from water quality sample 7 collected in the interval from 600 to 640 feet bls. However, the concentration is still low and could be attributed to the increase in peat (refer to the Groundwater Quality section for more details). The ROMP 134 – Williston well site is approximately 8 miles southwest of the ROMP 133 well site and approximately 2 miles north of the Miller (1986) middle confining unit II boundary. The total depth of exploration was 1,185 feet and a middle confining unit was not encountered and water levels remained constant throughout the investigation (New, 1981). A middle confining unit was not encountered at the ROMP 132 – Blitch Plantation well site, located approximately 10 miles south of the ROMP 133 well site and about 2 miles inside the Miller (1986) middle confining unit II extent. Tropical Storm Fay occurred during the ROMP 132 well site investigation and caused a substantial rise in water level (Janosik, 2011). Consequently, a water level drop associated with a lower permeability unit (and possible remnant middle confining unit II) would have been masked. The results of the water quality sample collected from 486 to 555 at the ROMP 132 well site did show an increase in sulfate concentration but the value was still low at 15.5 mg/L (Janosik, 2011). It is possible this is a remnant of the middle confining unit II or it could be a local lower permeability unit present at the ROMP 133 well site.

A constant rate APT was conducted within the Upper Floridan aquifer from March 15, 2012, to April 10, 2012. Background water level data was collected before the drawdown phase (from March 15 to April 2, 2012) and after the recovery phase (from April 4 to April 10, 2012) to determine the regional water level trend. The U FLDN AQ PRODUCTION/MONITOR well was pumped with a 10-inch turbine pump at an average rate of 2,841 gallons per minute (gpm) for approximately 24 hours. The discharge rate measurements were used in the analysis of the drawdown data to correct for small variations in flow rate. The water was discharged off-site approximately 2,600 feet northeast and downhill to a ditch. The CORE HOLE was used as an observation well and was located 342 feet northeast of the production well (fig. 2). The DRILLING WATER SUPPLY well also was used as an observation well and is located 156 feet northeast of the U FLDN AQ PRODUCTION/MONITOR. Prior to starting the drawdown phase of the test on April 2, 2012, the static water level in the production well was 70.36 feet below top of casing (btoc) or 41.93 feet NAVD 88, the static water level in the CORE HOLE was 67.19 feet btoc or 45.51 feet NAVD 88, and the static water level in the DRILLING WATER SUPPLY well was 67.93 feet btoc or 45.77 feet NAVD 88. The maximum drawdown was 17.91 feet (disregarding the surge and fluctuations at test start while adjusting the pump revolutions per minute or rpm) in the production well, 1.159 feet in the CORE HOLE, and 0.236 feet in the DRILLING WATER SUPPLY well. A hydrograph of water levels before, during, and after the APT is presented in figure 5. The water level difference between the production well and the DRILLING WATER SUPPLY well and CORE HOLE evident on the hydrograph is presumed to be the result of the production well being cased through the Ocala Limestone whereas the DRILLING WATER SUPPLY well and the CORE HOLE are open to the Ocala Limestone. Prior to the analysis, all observation well data were corrected for a declining regional water level trend (0.00000625 ft/m) delineated from the background data collected from the production well and CORE HOLE. The



[AQ, aquifer; FLDN, Floridan; NAVD 88, North American Vertical Datum of 1988; OB, observation; U, Upper]

Figure 5. Hydrograph of the Upper Floridan aquifer wells before, during, and after the APT conducted at the ROMP 133 – Arredondo well site in Marion County, Florida.

regional trend was compared to the ROMP 132 well site water level data collected during the same period. All three water level datasets yielded the same regional trend.

Diagnostic radial flow plots and derivative analyses of the drawdown and recovery data were used to help characterize the type of aquifer present at the ROMP 133 well site. The derivative signature of the U FLDN AQ PRODUCTION/MONITOR well response data indicates the Upper Floridan aquifer is a confined aquifer (constant derivative) (appendix K, fig. K1). The derivative signature of the DRILLING WATER SUPPLY well response data initially resembles a leaky aquifer response but the drawdown clearly resumes in late time (appendix K, fig. K2). The derivative signature of the CORE HOLE also initially looks leaky (signature arch) but the drawdown data deviates from the derivative and type curve in late time (appendix K, fig. K3). The deviation in the CORE HOLE response data could be drawdown resuming but it is not as noticeable as it is in the DRILLING WATER SUPPLY well because the CORE HOLE was at a greater distance from the U FLDN AQ PRODUCTION/MONITOR well. Plotting the DRILLING WATER SUPPLY, CORE HOLE, AND U FLDN AQ PRODUCTION/MONITOR drawdown and recovery data together shows the response changes at distances from the U FLDN AQ PRODUCTION/MONITOR well (appendix K, fig. K4). This response could be dewatering of the permeable limestone (from 45 to 64 feet bls) above the potentiometric

surface. The CORE HOLE was 342 feet away and the DRILLING WATER SUPPLY well was 156 feet away from the U FLDN AQ PRODUCTION/MONITOR well and it is possible the limestone surface differs between the wells (the site lithology was based on the CORE HOLE). The top of the limestone could be deeper at the location of the U FLDN AQ PRODUCTION/MONITOR well than in the CORE HOLE and DRILLING WATER SUPPLY well. In which case, the confined aquifer response would be expected and signs of dewatering of the limestone would not be apparent in the U FLDN AQ PRODUCTION/MONITOR well response data. However, dewatering of the limestone would be possible in the CORE HOLE and DRILLING WATER SUPPLY well and possibly explains why the response data resembles a leaky response in early time but not in late time. The CORE HOLE response data is considered the most reliable data and was analyzed to estimate hydraulic parameters. The U FLDN AQ PRODUCTION/MONITOR response data is affected by friction loss and the DRILLING WATER SUPPLY response data is likely affected by partial penetration (well is shallow) and the drawdown was small. Curve-match analysis using the Hantush-Jacob (1955)/Hantush (1964) without aquitard storage solution of the drawdown and recovery data observed in the CORE HOLE yielded an estimated transmissivity value of 220,000 feet squared per day (ft^2/day) and a storativity of 0.002 (appendix K, fig. K3, and table 4). Analysis of all wells combined using the Theis (1935)/Hantush (1961) solution yielded the same estimates (curve match was fitted to CORE HOLE response data). The effect of dewatering of limestone on the estimation of storativity is not well understood; therefore, the value should be used with caution. A leakance value could not be estimated because the sediments above the Upper Floridan aquifer were dry.

Groundwater Quality

The ROMP 133 – Arredondo well site groundwater quality characterization is based on results from 14 discrete groundwater samples collected from 74.1 to 1,310 feet bls. No sampling was conducted above 74.1 feet because the sediments were either dry or unconsolidated. The water quality data collection field sheets are presented in appendix L. The field analyses results, laboratory analyses results, equivalent weights and water types, and select molar ratio calculations are presented in appendix M1, M2, M3, and M4, respectively. The secondary drinking water standards for total dissolved solids (TDS), sulfate, chloride, and iron are 500 milligrams per liter (mg/L), 250 mg/L, 250 mg/L and 0.3 mg/L (300 micrograms per liter, µg/L), respectively (Hem, 1985; U.S. Environmental Protection Agency, 2009).

Generally, the groundwater quality does not vary much throughout the Upper Floridan aquifer at the well site. The water quality sample results indicate the groundwater is fresh (TDS concentrations are less than 500 mg/L) throughout the Upper Floridan aquifer at the well site. The TDS values range from 230 to 374 mg/L (fig. 6 and appendix M2). The water quality sample results also indicate the groundwater is potable below about 230 feet bls because the constituents tested did not exceed secondary drinking water standards. Above 230 feet bls, iron was the only constituent tested that exceeded secondary drinking water standards. Water quality sample 1, with a sample interval from 74.1 to 95 feet bls, and water quality sample 2, with a sample interval from 192.2 to 230 feet bls, had an iron concentration of 1,240 µg/L and 794 µg/L, respectively. The increased iron content within the Ocala Limestone could be attributed to pyrite content. Chloride concentration ranges from 5.8 to 11.4 mg/L and sulfate concentration ranges from 0.4 to 18.7 mg/L. Sulfate concentrations in some of the water quality samples are elevated and could

Table 4. Summary of test results from the Upper Floridan aquifer performance test conducted at the ROMP 133 – Arredondo well site in Marion County, Florida

[ft/d, feet per day; ft^2/d, feet squared per day; gpm, gallons per minute; --, not estimated; w/o, without; Unit thickness (b) was estimated using Miller, 1986, and ROMP 132 well site stratigraphy]

Observation Well Analyzed	Test Phase	Unit Thickness (b) (ft)	Distance to Production Well (ft)	Average Pump Rate (gpm)	Analytical Method	Transmissivity (ft^2/d)	Storativity (dimensionless)	Leakance (day-1)
CORE HOLE	Drawdown/ Recovery Combined	1,680	342	2,841	Hantush-Jacob (1955)/ Hantush (1964) w/o aquitard storage	220,000	0.002	--
CORE HOLE	Drawdown/ Recovery Combined	1,680	342	2,841	Theis (1935) /Hantush (1961)	220,000	0.002	--

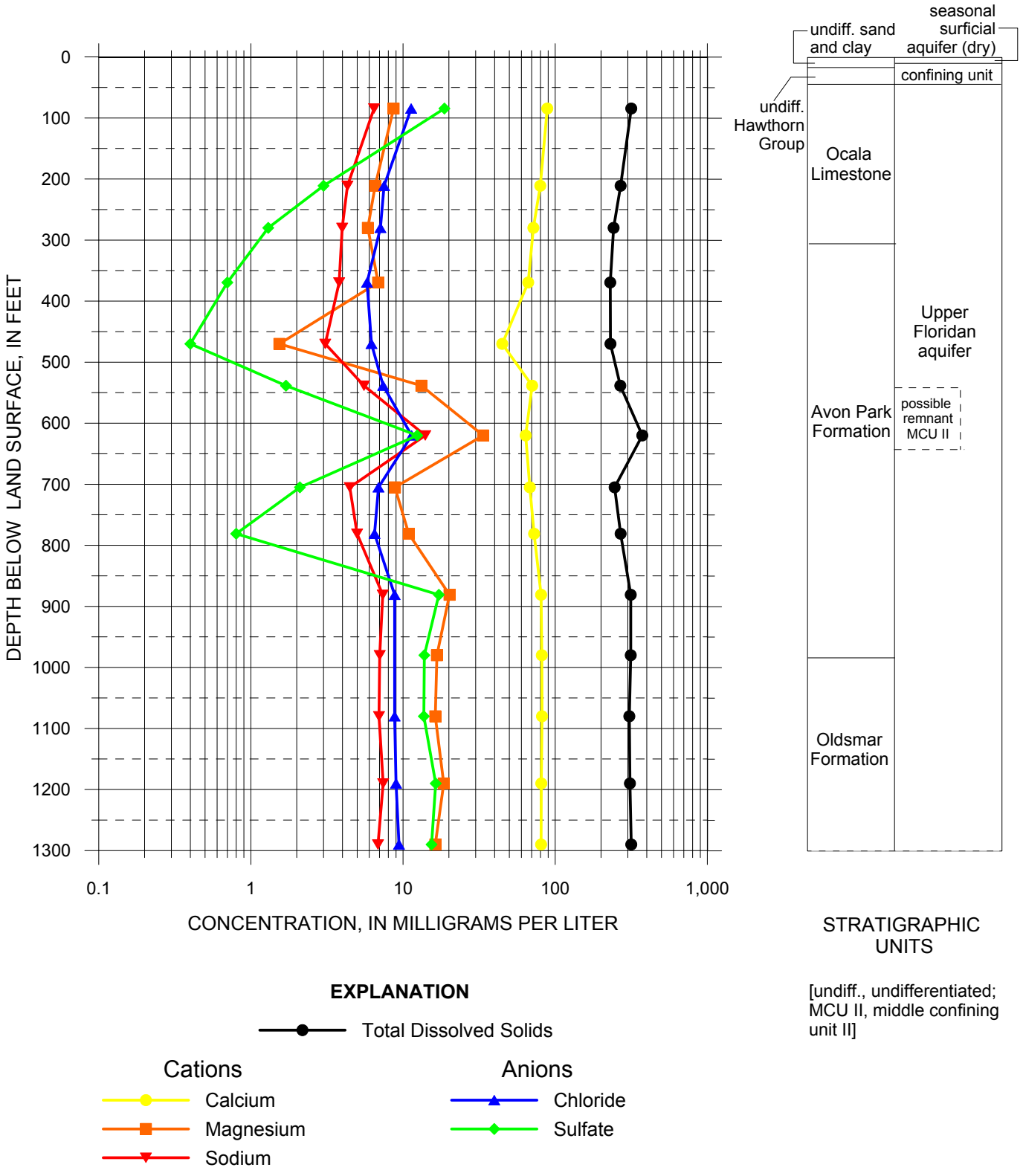


Figure 6. Select cations and anions, and total dissolved solids concentrations for groundwater quality samples collected at the ROMP 133 – Arredondo well site in Marion County, Florida. Depth represents the middle of the discrete open interval at the time of sampling.

be the effect of the peat beds. The groundwater in the Avon Park Formation has a hydrogen sulfide odor that also could be attributed to the organic content. The specific conductance ranges from 371 to 599.90 micromhos per centimeter (µmhos/cm), calcium concentration ranges from 44.9 to 88.7 mg/L, magnesium concentration ranges from 1.54 to 33.6 mg/L, and sodium concentration ranges from 3.08 to 14 mg/L (fig. 6 and appendix M2).

Equivalent weights and water types were determined for each groundwater quality sample and are presented in appendix M3. The major cation for 13 out of the 14 samples within the Upper Floridan aquifer is calcium (ranging from 48 to 89 percent of total cations). Magnesium is the next most abundant cation and ranges from 5 to 42 percent of the total cations. Sodium is the third most abundant cation and ranges from 4 to 9 percent of the total cations. The major anion (ranging from 84 to 95 percent of total anions) throughout the Upper Floridan aquifer is bicarbonate. The water type is calcium bicarbonate throughout the Upper Floridan aquifer except for the interval between 600 and 640 feet bls where the water type changes to mixed-cation bicarbonate because of an increase in magnesium and sodium and a slight decrease in calcium (appendix M2 and M3). As discussed in the Upper Floridan aquifer subsection of the Hydrogeology section, the interval around 600 to 640 feet bls has lower permeability that decreases groundwater flow. This decrease in flow allows more time for mineral dissolution. This is likely the reason most ions, TDS, and specific conductance increased in this interval (fig. 6 and appendix M2).

The trends of the relative abundances of each major cation and anion species analyzed for in the groundwater quality samples collected at the ROMP 133 well site are presented on a Piper (1944) diagram in figure 7 as percent milliequivalents. It is apparent that all but one of the groundwater samples are calcium bicarbonate water type because they plot in the lower left corner of the cation and anion ternary diagrams. The groundwater quality sample collected from the interval between 600 and 640 feet bls plots in the middle left of the cation ternary diagram because of the increased magnesium concentration. It is also apparent that all the groundwater samples are fresh because they plot in the middle left of the quadrilateral field and do not indicate trending along the deep-water or the seawater mixing lines.

Although, the groundwater quality does not vary much throughout the Upper Floridan aquifer at the well site, select molar ratios were calculated to investigate groundwater quality changes with depth (fig. 8 and appendix M4). The evaporite track illustrates the interaction between fresh water and evaporites. The dolomite track identifies fresh water affected by dolomite. The sodium chloride track depicts effects from connate or seawater. The chloride to sulfate molar ratio on the evaporite track increases in the interval from 450 to 490 feet bls and from 762 to 800 feet bls because the sulfate concentration decreases and the chloride concentration increases (fig. 8 and appendix M2 and M4). The calcium to bicarbonate and the sulfate to bicarbonate molar ratios do not vary and suggests there is no influence from evaporites on the groundwater at the well site. The calcium to magnesium molar ratio on the dolomite track increases in the interval from 450 to 490 feet bls because the calcium and magnesium concentrations decrease and the calcium concentration decreased greater than magnesium concentration decreased. It is apparent there is no influence from connate or seawater on the groundwater at the well site because the sodium chloride track does not vary.

During the APT, two water quality samples were collected from the well head of the production well at the beginning and end of the test (appendix M2). The purpose of these samples was to evaluate potential effects of changes to water quality from pumping. One water quality sample was collected after approximately 1 hour of pumping and the other water quality sample was collected after approximately 23 hours of pumping. All constituents tested except for TDS increased slightly and were similar to groundwater quality results from samples collected during exploratory core drilling and testing (appendix M2).

Summary

The ROMP 133 – Arredondo well site, located in northwest Marion County, was developed in three phases from February 2011 to April 2012. The phases included exploratory core drilling and testing, well construction, and aquifer performance testing. The well site was selected to support the NDWRAP and fill in a gap in the ROMP 10-mile grid network. This site also provided much needed data on the geographic extent of the middle confining units I and II and the Lower Floridan aquifer. Geohydrologic data including core samples, slug testing, aquifer performance testing, groundwater quality sampling, and geophysical logging were collected at the site during the three phases. Two permanent wells were constructed and are the U FLDN AQ MONITOR/PRODUCTION and the SURF AQ MONITOR.

The geologic units encountered at the well site include, in ascending order: the Oldsmar Formation, Avon Park Formation, Ocala Limestone, undifferentiated Hawthorn Group sediments, and the undifferentiated sand and clay deposits. The Oldsmar Formation extends from 982.6 feet bls to beyond the total depth of exploration of 1,337 feet. The Avon Park Formation extends from 310 to 982.6 feet bls, the Ocala Limestone extends from 45 to 310 feet bls, the undifferentiated Hawthorn Group extends from 20 to 45 feet bls, and the undifferentiated sand and clay deposits extend from land surface to 20 feet bls. The Oldsmar Formation predominantly consists of interbedded layers of grayish brown and very light orange, fossiliferous limestone and dark yellowish brown and moderate yellowish brown, highly altered dolostone. The Avon Park Formation is predominantly moderately yellowish brown, fossiliferous, highly altered, subhedral and anhedral dolostone with organics thickly interbedded with grayish brown, variably dolomitized, fossiliferous limestone with organics. The Ocala Limestone

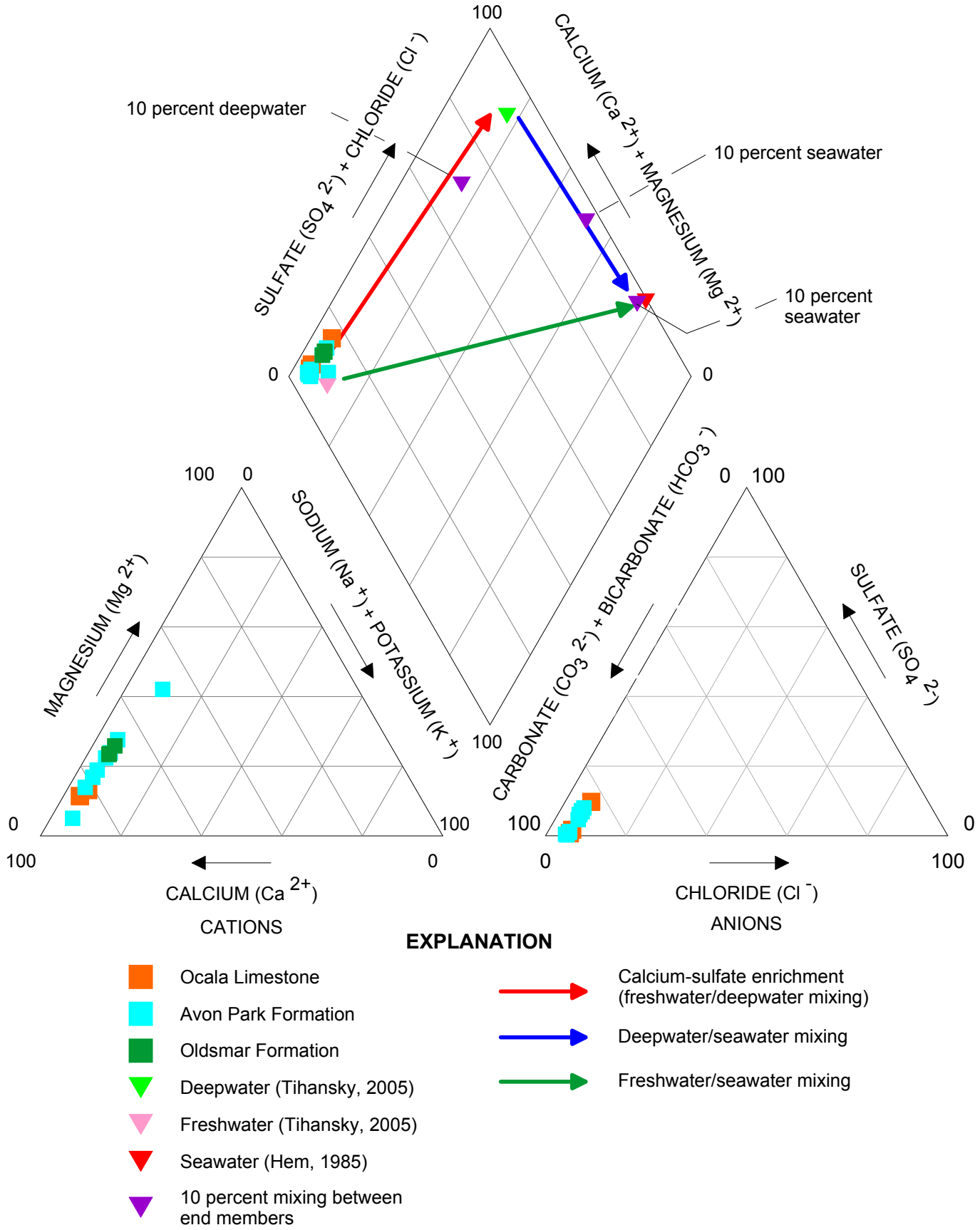


Figure 7. Piper Diagram of groundwater quality samples collected at the ROMP 133 – Arredondo well site in Marion County, Florida.

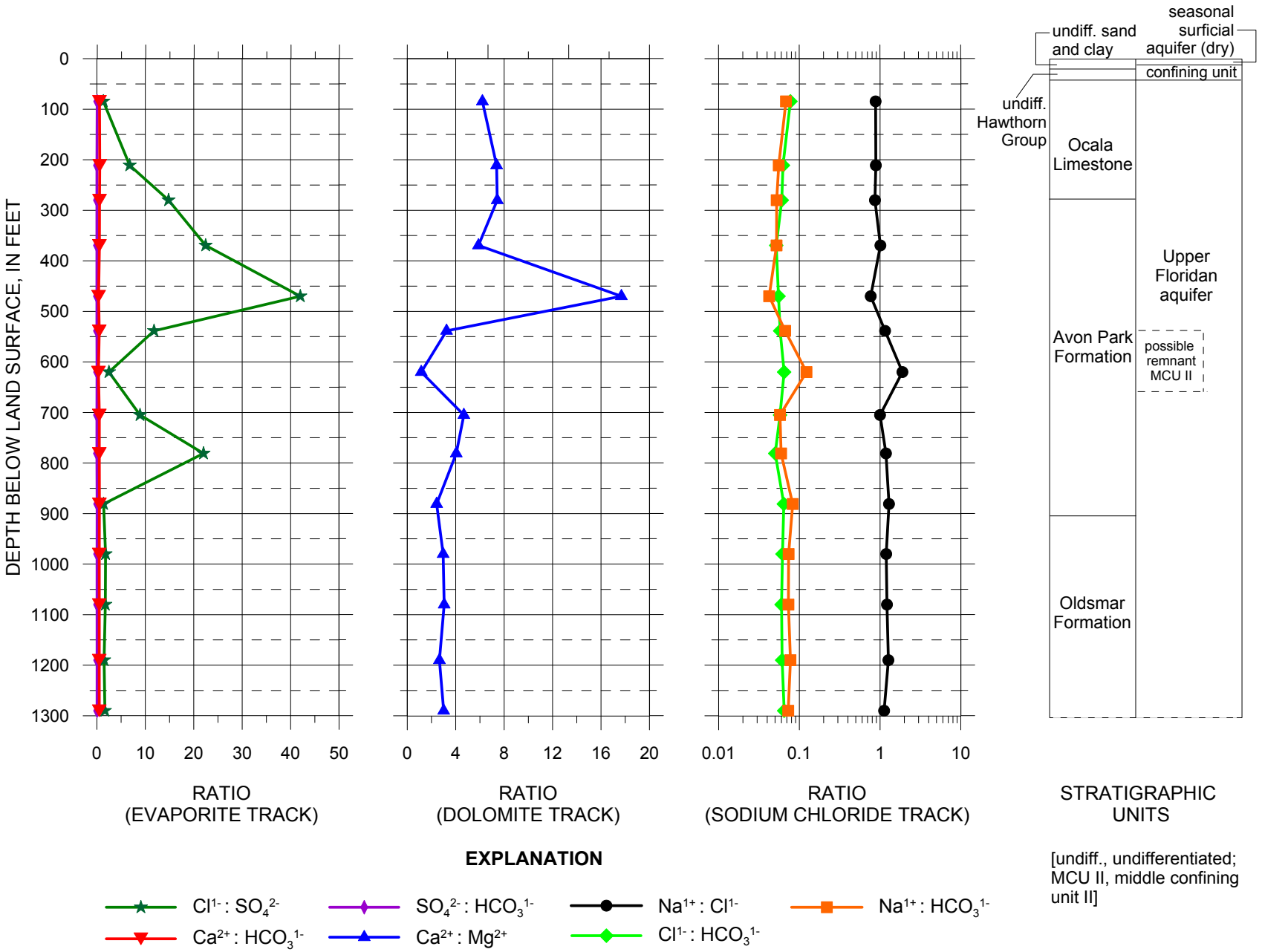


Figure 8. Select molar ratios with depth for groundwater quality samples collected at the ROMP 133 – Arredondo well site in Marion County, Florida. Depth represents the middle of the discrete open interval at the time of sampling.

is generally a very light orange, fossiliferous, weathered, soft, poorly indurated to unconsolidated packstone. The undifferentiated Hawthorn Group unit consists of clay from 20 to 38 feet bls and sand with a clay matrix from 38 to 44 feet bls. The undifferentiated sand and clay deposits consist of sand from land surface to 4 feet bls and clay from 4 to 20 feet bls.

The hydrogeologic units encountered at the well site include, in descending order: a seasonal surficial aquifer, a confining unit, and the Upper Floridan aquifer. The middle confining units I and II and the Lower Floridan aquifer were not conspicuous at the well site. A confining unit extends from 4 to 45 feet bls and the Upper Floridan aquifer extends from the first occurrence of groundwater at 64 feet bls to beyond the total depth of exploration at 1,337 feet bls. The clay and sandy clay within the confining unit is sufficient to create basal confinement for a surficial aquifer. However, the uppermost sands were dry during exploration. Redoximorphic features within the uppermost sediments and the sediments of the confining unit suggests they experience saturated and unsaturated periods. Therefore, it is inferred a seasonal surficial aquifer exists in the uppermost sands during rainy periods. Groundwater within the Upper Floridan aquifer was below the top of the permeable sediments of the Ocala Limestone (circulation was lost at 45 feet bls during core drilling and testing) and was about 64 feet bls during exploratory core drilling and testing. The Upper Floridan aquifer is considered confined at the ROMP 133 well site by the 41 feet of clay and sandy clay sediments above. However, the lateral extent of the confining unit beyond the well site is unclear and the confining unit in the northern portion of the District is often discontinuous and/or breached by karst features.

Thirteen slug tests were conducted in the Upper Floridan and yielded horizontal hydraulic conductivity estimates from 4 to 350 ft/d. An Upper Floridan APT was conducted from March to April 2012. The APT response curves indicate a confined aquifer near the U FLDN AQ PRODUCTION/MONITOR well. At distances from the U FLDN AQ PRODUCTION/MONITOR, the response curves resemble a leaky aquifer initially but the response data deviates from the type curve in later time. This response could be dewatering of limestone. The CORE HOLE response data is considered the most reliable and curve match analysis yielded a transmissivity estimate of 220,000 ft^2/d and a storativity of 0.002. The effect of dewatering of limestone on the estimation of storativity is not well understood; therefore, the value should be used with caution. A leakance value could not be estimated. Overall, the water level slowly declined during exploratory core drilling and testing but a nearly five foot water level drop occurred between about 550 to 745 feet bls. This water level drop is coincident with a hydraulic conductivity value of 9 ft/d estimated from slug test 7 conducted in an interval from 600 to 640 feet bls, which does not indicate confinement. Although previous regional studies indicate no middle confining unit is present at this site, the depth of the water level drop roughly coincides with the elevation of the middle confining unit II if it were extended north to the ROMP 133 well site. However, no indications of middle confining unit II were observed in the lithology or groundwater quality. Beds of mudstone and peat also are coincident with the water level drop and could be the cause. A remnant of middle confining unit II could be present or a locally occurring lower permeability unit.

Fourteen groundwater quality samples were collected and analyzed for the ROMP 133 well site. The groundwater quality in the Upper Floridan aquifer at the well site is fresh with TDS concentrations less than 500 mg/L. The groundwater quality results indicate the water is potable below about 230 feet bls because the constituents tested for did not exceed the U.S. Environmental Protection Agency's National Secondary Drinking Water Standards. Above 230 feet bls, iron concentration exceeds the secondary drinking water standards. The water type is calcium bicarbonate throughout the Upper Floridan aquifer except for the interval between 600 and 640 feet bls where the water type changes to mixed-ion bicarbonate because of an increase in magnesium and sodium concentrations and a slight decrease in calcium concentration. A Piper diagram shows the groundwater quality within the Upper Floridan aquifer is fresh and is not influenced by deepwater or seawater.

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Appendix A. Methods of the Geohydrologic Data Section

The Southwest Florida Water Management District (District) collects the majority of the hydrogeologic data during the exploratory core drilling phase of the project. Lithologic samples will be collected during the core drilling process. Hydraulic and water quality data are collected primarily during packer tests as the core hole is advanced. Geophysical logging will be conducted on the core hole providing additional hydrogeologic data. After well construction, an aquifer performance test (APT) will be conducted on each of the major freshwater aquifers or producing zones encountered at the project site. These data will be uploaded into the District's Water Management Information System (WMIS).

Collection of Lithologic Samples

The District conducts hydraulic rotary core drilling, referred to as diamond drilling, with a Central Mining Equipment (CME) 85 core drilling rig and an Universal Drilling Rigs (UDR) 200D LS. The basic techniques involved in hydraulic rotary core drilling are the same as in hydraulic rotary drilling (Shuter and Teasdale, 1989). The District applies a combination of HQ, HW, NW, and PW gauge working casings along with NQ or NRQ core drilling rods, associated bits, and reaming shells from Boart Longyear®. The HQ, HW, NW, and PW working casings are set and advanced as necessary to maintain a competent core hole. The NQ and NRQ size core bits produce a nominal 3-inch hole. The HQ, HW, NW, and PW working casings and NQ and NRQ coring rods are removed at the end of the project. Details on the core drilling activities are recorded on daily drilling logs completed by the District's drilling crew and hydrogeologists.

Recovery of the core samples is accomplished using a wireline recovery system (fig. A1). The District's drilling crew uses the Boart Longyear® NQ wireline inner barrel assembly. This system allows a 1.87-inch by 5 or 10-foot section and a 1.99-inch by 10-foot section of core to be retrieved with the CME 85 rig and UDR 200D LS rig, respectively. The core is retrieved without having to remove the core rods from the core hole. Grab samples of core hole cuttings are collected and bagged where poor core recovery occurs because of drilling conditions or where the formation is unconsolidated or poorly indurated. The core samples are placed in core boxes, depths marked, and recovery estimates calculated. Core descriptions are made in the field using standard description procedures. Rock color names are taken from the "Rock-Color Chart" of the National Research Council (Goddard and others, 1948). The textural terms used to characterize carbonate rocks are based on the classification system of Dunham (1962). The core samples are shipped to the Florida Geological Survey for detailed lithologic descriptions of core, cuttings, and unconsolidated sediments. All lithologic samples will be archived at the Florida Geological Survey in Tallahassee, Florida.

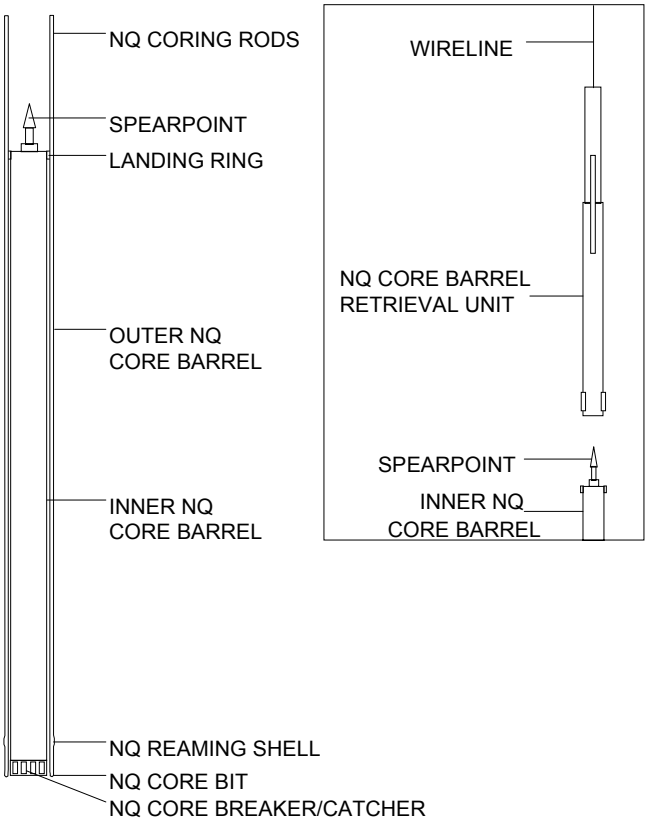


Figure A1. Boart Longyear® NQ Wireline Coring Apparatus.

Unconsolidated Coring

Various methods exist for obtaining unconsolidated material core samples, which is extremely difficult as compared to rock coring (Shuter and Teasdale, 1989). To ensure maximum sample recovery, the District drilling crew utilizes a punch shoe adapter on the bottom of the inner barrel along with an unconsolidated core catcher. The punch shoe extends the inner barrel beyond the bit allowing collection of the sample prior to disturbance by the bit or drilling fluid. A variety of bottom-discharge bits are used during unconsolidated coring. A thin bentonite mud may be used to help stabilize the unconsolidated material.

Rock Coring

During rock coring, the District drilling crew utilizes HQ, HW, NW, and PW working casings as well as permanent cas-

ings to stabilize the core hole. NQ and NRQ core drilling rods and associated products are employed during the core drilling process. Core drilling is conducted by direct-circulation rotary methods using fresh water for drilling fluid. Direct water is not effective in removing the cuttings from the core hole, therefore, a reverse-air (air-lift) pumping discharge method (fig. A2) is used to develop the core hole every 20 feet or as necessary. The District typically uses face-discharge bits for well indurated rock core drilling.

Formation Packer Testing

Formation (off-bottom) packer testing allows discrete testing of water levels, water quality, and hydraulic parameters. A competent core hole is necessary for packer testing, meaning unconsolidated sediments and some of the shallow weathered limestone cannot be tested using this technique. The packer assembly (fig. A3) is employed by raising the NQ or NRQ coring rods to a predetermined point, lowering the packer to the bottom of the rods by using a combination cable/air inflation line, and inflating the packer with nitrogen gas. This process isolates the test interval, which extends from the packer to the total depth of the core hole. Sometimes, the working casing may be used in place of the packer assembly. Test intervals are selected based on a regular routine of testing or at any distinct hydrogeologic change that warrants testing.

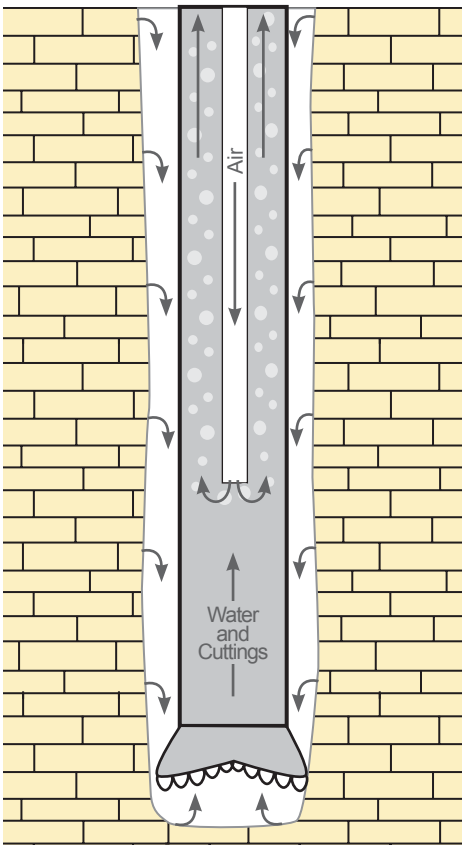
Collection of Water Level Data

Water level data is collected daily before core drilling. Additionally, water levels are recorded during each formation packer test after the necessary equilibration time. Equilibration is determined when the change in water level per unit time is negligible. Water levels are measured using a Solinst® water level meter. The water level is measured relative to an arbitrary datum near land surface, which is maintained throughout the project. These data provide a depiction of water level with core hole depth. However, these data are normally collected over several months and will include temporal variation.

Collection of Water Quality Data

Water quality samples are collected during each formation packer test. Sampling methods are consistent with the "Standard Operating Procedures for the Collection of Water Quality Samples" (Water Quality Monitoring Program, 2009). The procedure involves isolating the test interval with the off-bottom packer (fig. A3) as explained above, and air-lifting the water in the NQ or NRQ coring rods. To ensure a representative sample is collected, three core hole volumes of water are removed and temperature, pH, and specific conductance are monitored for stabilization using a YSI® multi-parameter meter. Samples are collected either directly from the air-lift discharge point, with a wireline retrievable stainless steel bailer (fig. A4), or with a nested bailer. When sampling a poorly producing interval, the purge time may be substantial. The nested bailer is an alternative that is attached directly to the packer orifice thereby reducing the volume of water to be evacuated from the core hole because it collects water directly from the isolated interval through the orifice. Bailers are better for obtaining non-aerated samples, which are more representative because aerated samples may have elevated pH and consequently iron precipitation.

Once the water samples are at the surface, they are transferred into a clean polypropylene beaker. A portion of the sample is bottled according to standard District procedure for laboratory analysis (SWFWMD, 2009). A 500 ml bottle is filled with unfiltered water. Two bottles, one 250 ml and one 500 ml, are filled with water filtered through a 0.45-micron



Reverse-air pumping

Reverse-air pumping allows cuttings to be removed without the introduction of man-made drilling fluids. As air bubbles leave the airline and move up inside the rods, they expand and draw water with them, creating suction at the bit. Groundwater comes from up-hole permeable zones and is natural formation water. Suction at the bit draws water and drill cuttings up the rods to be discharged at the surface.

Figure A2. Reverse-air drilling and water sampling procedure.

filter. A Masterflex® console pump is used to dispense the water into the bottles. The sample in the 250 ml bottle is acidified with nitric acid to a pH of 2 in order to preserve metals for analysis. The remainder is used to collect field parameters including specific conductance, temperature, pH, and chloride and sulfate concentrations. Temperature, specific conductance, and pH are measured using a YSI® multi-parameter handheld meter. Chloride and sulfate concentrations are analyzed with a YSI® 9000 photometer. The samples are delivered to the District's chemistry laboratory for additional analysis. A "Standard Complete" analysis that includes pH, calcium, chloride, ion balance, iron, magnesium, potassium, silica, sodium, strontium, specific conductance, sulfate, total dissolved solids (TDS), and total alkalinity is performed on each set of samples (SWFWMD, 2009). Chain of Custody forms are used to track the samples.

The analysis of the water quality data includes the evaluation of relative ion abundance and ion or molar ratios, and the determination of water type(s). The laboratory data are used to calculate milliequivalents per liter (meq/L) and percent meq/L. Using the criteria of 50 percent or greater of relative abundance of cations and anions, the water type for each sample is determined (Hem, 1985). The data are plotted on a Piper (1944) diagram to give a graphical depiction of the relative abundance of ions in an individual sample (Domenico and Schwartz, 1998) as well as how the individual samples compare to each other. Select ion ratios are calculated for each sample to further evaluate chemical similarities or differences among waters and to help explain why certain ions change with depth. Field pH is used in analyses because it is more likely to represent the actual conditions in the water since pH is sensitive to environmental changes (Driscolll, 1986; Fetter, 2001). Additionally, total alkalinity is used as bicarbonate concentration because hydroxyl ions generally are insignificant in natural groundwater and carbonate ions typically are not present in groundwater with a pH less than 8.3 (Fetter, 2001).

Collection of Slug Test Data

Some hydraulic properties can be estimated by conducting a series of slug tests. During slug tests, the static water level in the test interval is suddenly displaced, either up or down, and the water level response is recorded as it returns to a static state. Typically, the slug tests are conducted using the off-bottom packer assembly to isolate test intervals as the core hole is advanced. KPSI® pressure transducers are used to measure the water level changes in the test interval and the annulus between the HQ or HW casing and the NQ or NRQ coring rods. The annulus pressure transducer is used as a quality control device to detect water level changes indicative of a poorly seated packer or physical connection (i.e. fractures or very permeable rocks) within the formation. A third pressure transducer is used to measure air pressure during pneumatic slug testing. All pressure transducer output is recorded on a

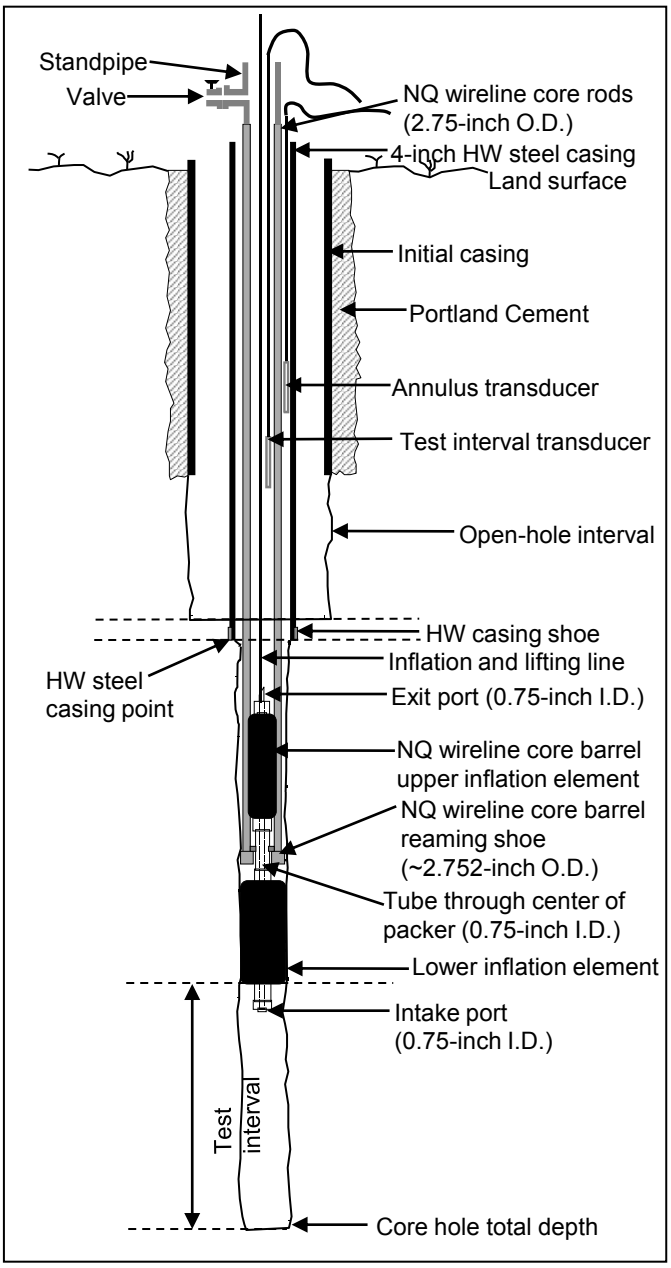


Figure A3. Formation (off-bottom) packer assembly deployed in the core hole.

Campbell Scientific, Inc. CR800 datalogger. Prior to all slug tests, the test interval is thoroughly developed.

Slug tests can be initiated several ways. The primary methods used by the District are the pneumatic slug method and the drop slug method. Core hole conditions and apparent formation properties dictate which method is used. The pneumatic slug method is used for moderate to high hydraulic conductivity formations because of the near instantaneous slug initiation. The pneumatic slug method uses a NQ rod modified to include a pressure gauge and regulator, and an electronic or manual valve. The opening is sealed with compression fittings. Air pressure is used to depress the static water level. The water

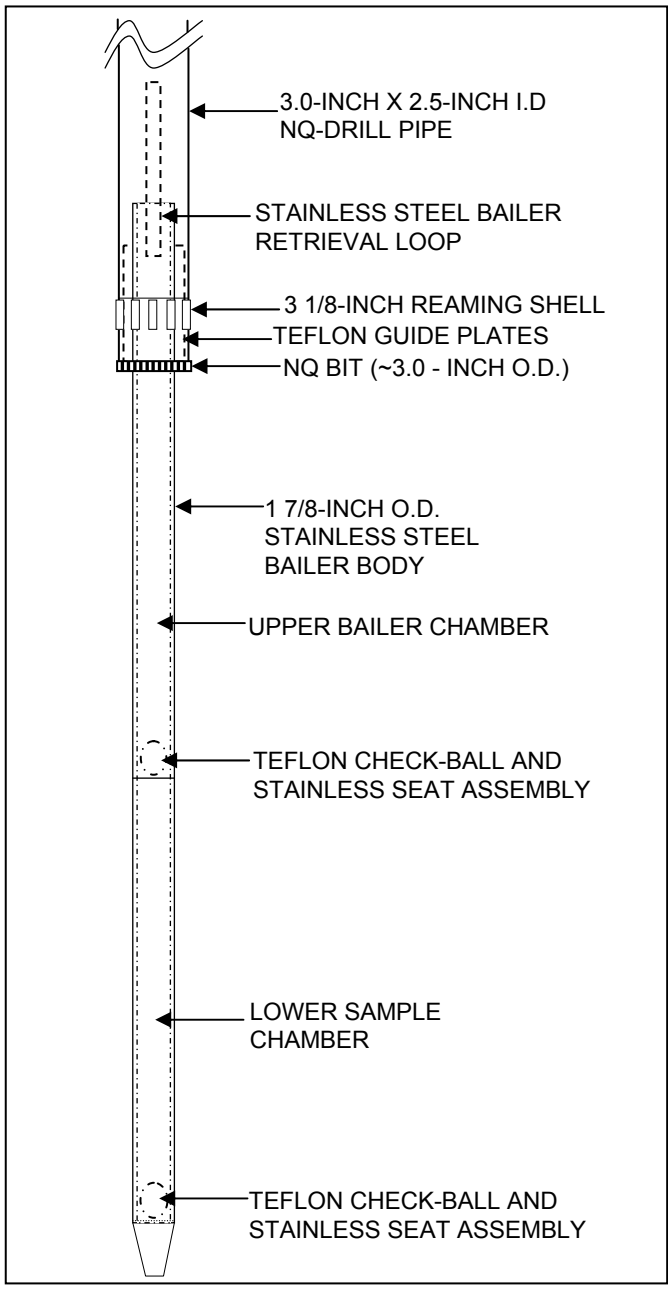


Figure A4. Diagram of the wireline retrievable bailer.

level is monitored for equilibration and once it returns to the initial static water level the test is initiated. The electronic or manual valve is opened to release the air pressure causing the water level to rise (rising head test). The water level is recorded until it reaches the initial static water level. The drop slug method is used for low hydraulic conductivity formations because of the slow slug initiation. This test initiation method is slower than the pneumatic method because the water has to travel down the core hole before reaching the test interval. The drop slug method involves adding a predetermined volume of water into the NQ or NRQ rods raising the static water level. A specially designed PVC funnel fitted with a ball valve placed over the NQ or NRQ rods is used to deliver the water. The valve is opened releasing the water causing the water level to rise. The water level is recorded until the raised level falls (falling head test) back to static level.

Several quality assurance tests are conducted in the field in order to identify any potential sources of error in the slug test data. The quality assurance tests include evaluation of the discrepancy between the expected and observed initial displacements (Butler, 1998), evaluation of the normalized plots for head dependence and evolving skin effects, and the evaluation of the annulus water level for movement. Lastly, estimates of the hydraulic conductivity values are made based on the slug test data using AQTESOLV® (Duffield, 2007) software by applying the appropriate analytical solution.

Slug tests in which the formation packer assembly is used all have one common source of error resulting from the orifice restriction (fig. A3). The water during the slug tests moves through NQ or NRQ coring rods with an inner diameter of 2.38 inches, the orifice on the packer assembly that has an inner diameter of 0.75 inch, and the core hole that has a diameter of approximately 3 inches. The error associated with this restriction is evident as head dependence in the response data of multiple tests conducted on the same test interval with varying initial displacements. The error associated with the orifice restriction will result in an underestimation of the hydraulic conductivity values. In order to reduce the error associated with the orifice restriction, the District inserts a spacer within the zone of water level fluctuation thereby reducing the effective casing radius from 1.19 inches to 0.81 inch. A second technique used to minimize the effects caused by the orifice restriction is the use of initial displacements (slugs) of less than 1.5-feet in height. Also, if the working casing is used instead of the packer, the error is eliminated.

Geophysical Logging

Geophysical logs are useful in determining subsurface geologic and groundwater characteristics (Fetter, 2001). Geophysical logs provide three major types of information from water wells: hydrologic (water quality, aquifer characteristics, porosity, and flow zone detection), geologic (lithology, formation delineation), and physical characteristics (depth, diameter, casing depth, texture of well bore, packer points, and integrity of well construction).

Geophysical logging entails lowering the geophysical tool into the monitor well on a wireline and measuring the tool's response to the formations and water quality in and near the core hole during retrieval. Core hole geophysical logs are run during various stages of core drilling. When feasible, geophysical logs are run prior to casing advancements, while the core hole is still open to the formation.

The District uses Century® geophysical logging equipment. The three types of geophysical probes used are the caliper/gamma, induction, and multifunction. The multifunc-

tion tool measures natural gamma-ray [GAM (NAT)], spontaneous potential (SP), single-point resistivity (RES), short [RES(16N)], long [RES(64N)] normal resistivity, fluid temperature (TEMP) and fluid specific conductance (SP COND). Each log type is explained below.

Caliper (CAL)

Caliper logs are used to measure the diameter of the borehole. This log can identify deviations from the nominal borehole diameter and, in turn, locate cavities, washouts, and build-up. This log is useful for determining packer and casing placement because competent, well-indurated layers can be located. The caliper log also aids in calculating volumes of material such as cement, gravel, sand, and bentonite needed when installing casing during well construction and filling open hole intervals for abandonment.

Gamma [GAM(NAT)]

Natural gamma-ray logs measure the amount of natural radiation emitted by materials surrounding the borehole. Natural gamma radiation is emitted from decaying radioactive elements present in certain types of geologic materials, thus specific rock materials can be identified from the log. Some of these materials include clays that trap radioactive isotopes as they migrate with groundwater, organic deposits, and phosphates. Clays contain high amounts of radioactive isotopes in contrast to more stable rock materials like carbonates and sands, therefore, can be identified easily. One advantage using natural gamma-ray radiation is that it can be measured through PVC and steel casing, although it is subdued by steel casing. Gamma-ray logs are used chiefly to identify rock lithology and correlate stratigraphic units because gamma-ray radiation can be measured through casing and is relatively consistent.

Spontaneous Potential (SP)

Spontaneous potential logs measure the electrical potential (voltages) that result from chemical and physical changes at the contacts between different types of geological materials (Driscoll, 1986). They must be run in fluid-filled, uncased boreholes, and function best when the fluid in the borehole is different from that in the formation. They are useful in identifying contacts between different lithologies and stratigraphic correlation.

Single-Point Resistance (RES)

Single-point resistance logs measure the electrical resistance, in ohms, from rocks and fluids in the borehole to a point at land surface. Electrical resistance of the borehole materials is a measure of the current drop between a current electrode placed in the borehole and the electrode placed on land surface. The log must be run in a fluid-filled, uncased borehole. They are used for geologic correlation, such as bed boundaries, changes in lithology, and identification of fractures in resistive rocks (Keys and MacCary, 1971).

Short-Normal [RES (16N)] and Long-Normal [RES (64N)]

Short-normal and long-normal resistivity logs measure the electrical resistivity of the borehole materials and the surrounding rocks and water by using two electrodes. The 16 and 64 refers to the space, in inches, between the potential electrodes on the logging probe. The short-normal curve indicates the resistivity of the zone close to the borehole and the long-normal has more spacing between the electrodes, therefore measures the resistivity of materials further away from the borehole (Fetter, 2001). Short-normal and long-normal logs are useful in locating highly resistive geologic materials such as limestone, dolostone, and pure, homogenous sand and low resistivity materials like clay or clayey, silty sand. Also, the logs indicate water quality changes because fresh water has high resistivity whereas poor quality water has low resistivity. Resistivity logs must be run in fluid-filled, open boreholes.

Temperature (TEMP)

Temperature logs record the water temperature in the borehole. Temperature variations may indicate water entering or exiting the borehole from different aquifers. Thus, the log is useful in locating permeable zones. The log must be run in fluid-filled boreholes.

Specific Conductance (SP COND)

Specific Conductance logs measure the capacity of borehole fluid to conduct an electrical current with depth. The log indicates the total dissolved solids concentration of the borehole fluid. The specific conductance log may be useful in determining permeable zones because zones of increased inflow or outflow may show a change in water quality.

Aquifer Performance Tests

An APT is a controlled field experiment conducted to determine the hydraulic properties of water-bearing (aquifers) units (Stallman, 1976). APTs can be either single-well or multi-well and may partially or fully penetrate the aquifer. An APT involves pumping the aquifer at a known rate and monitoring the water level response. The general procedure, applied by the District, for conducting an APT involves design, field observation, and data analysis. Test design is based on the geologic and hydraulic setting of the site, such as knowledge of the aquifer thickness, probable range in transmissivity and

storage, the presence of uncontrolled boundaries (sources/sinks), and any practical limitations imposed by equipment. Field observations of the discharge and water levels are recorded to ensure a successful test. The District measures the discharge rate using an impeller meter and circular orifice weir. The District measures water levels using pressure transducers and an electric tape. All the recording devices are calibrated and traceable to the National Institute of Standards and Technology.

Data analysis includes first making estimates of drawdown observed during the test and then using analytical and numerical methods to estimate hydraulic properties of the aquifer and adjacent confining units. Diagnostic radial flow plots and derivative analyses of APT data are valuable tools in characterizing the type of aquifer present and specific boundary conditions that may be acting on the system during an APT.

Single-Well Aquifer Performance Test

Single-well APTs includes one test (pumped) well within the production zone used for both pumping and monitoring the water level response. A single-well APT may include monitoring the background water level in the test well for a duration of at least twice the pumping period (Stallman, 1976). Background data collection may not be necessary if the duration of the single-well test is short and the on-site hydrogeologist does not consider background data necessary. After background data collection is complete and it is determined that a successful test can be accomplished, pumping is started. During the test, the discharge rate is monitored and controlled to less than 10 percent fluctuation to ensure a constant rate test. The water level is recorded in the test well during the drawdown (pumping) and recovery phases. Other wells outside of the production zone may be monitored in order to provide additional information on the flow system. The response data are used to estimate drawdown and then analyzed using analytical methods to estimate the hydraulic properties of the aquifer and adjacent confining units. Typically, response data is analyzed using AQTESOLV® (Duffield, 2007) software by applying the appropriate analytical solution.

Multi-Well Aquifer Performance Test

Multi-well APTs involve a test (pumped) well and at least one observation well for monitoring the water level response in the production zone. Background water level data is collected for a period of at least twice the planned pumping period (Stallman, 1976). The background data allows for the determination of whether a successful test can be conducted and permits the estimation of drawdown. After the background data collection period is complete and it is determined that a successful test can be completed, pumping is started. During the test, the discharge rate is monitored and controlled to less than 10 percent fluctuation. The water level response is recorded in both the test well and the observation well(s) during the drawdown (pumping) and recovery phases. Other wells outside of the production zone may be monitored in order to provide additional information on the flow system. The response data are used to estimate drawdown and then analyzed using analytical or numerical methods to estimate the hydraulic properties of the aquifer and adjacent confining units. Typically, response data is analyzed using AQTESOLV® (Duffield, 2007) software by applying the appropriate analytical solution.

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Appendix B. Geophysical Log Suites for the ROMP 133 – Arredondo Well Site in Marion County, Florida

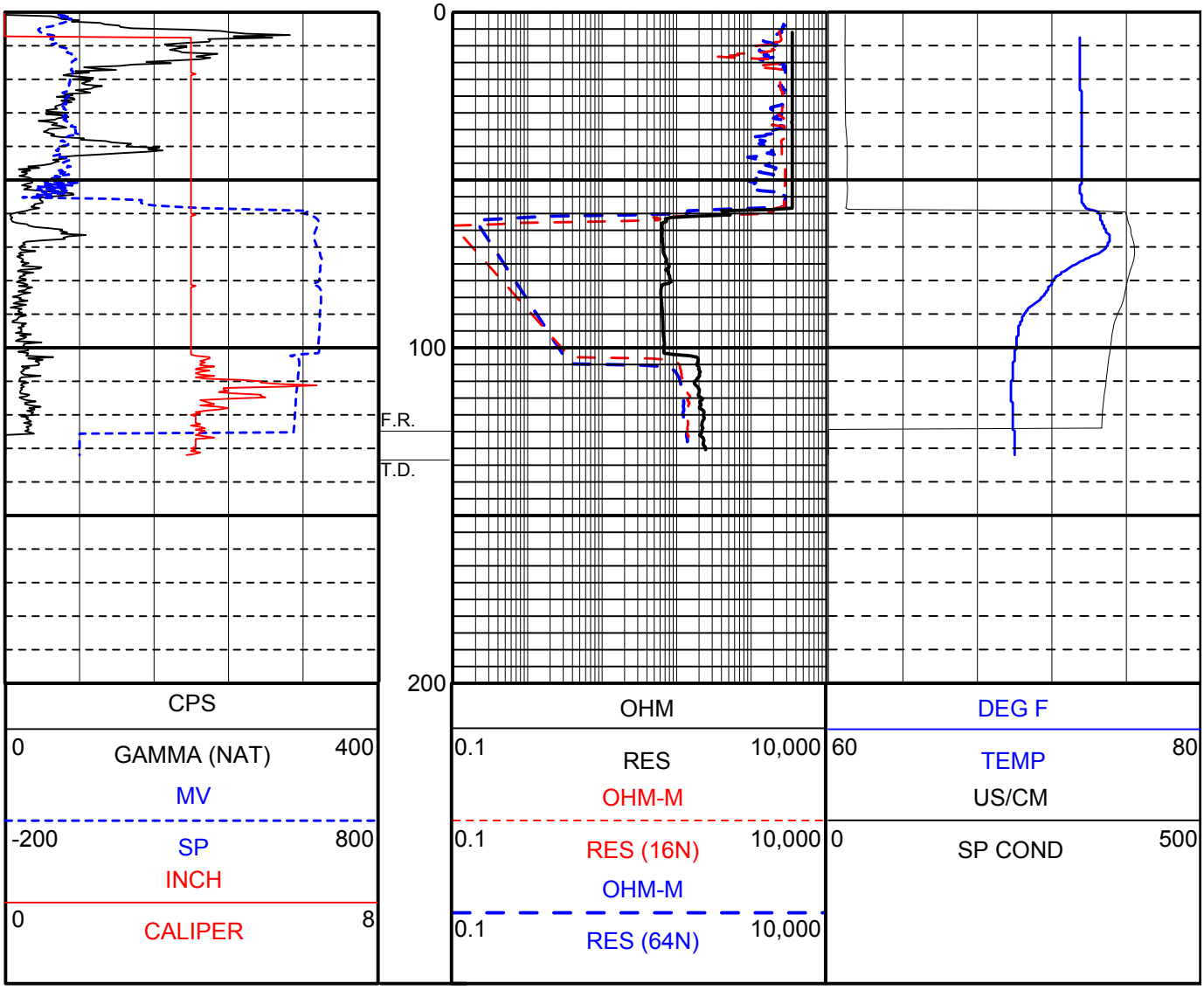


Figure B1. Geophysical log suite for the DRILLING WATER SUPPLY well from land surface to approximately 132 feet below land surface conducted at the ROMP 133 – Arredondo well site in Marion County, Florida. The log was performed on August 9, 2010, using the 9165C (caliper/gamma-ray) and 8144C (multifunction) tools. The log was run after well construction was completed. Four-inch steel casing was at 102 feet below land surface at time of logging. The water level was approximately 60 feet below land surface at time of logging. The log scale is 1 inches per 50 feet. Tracks 1 and 3 are linearly scaled and track 2 is in logarithmic scale. The FR is 125.6 feet below land surface for the caliper/gamma-ray log and is 124 feet below land surface for the multifunction log.

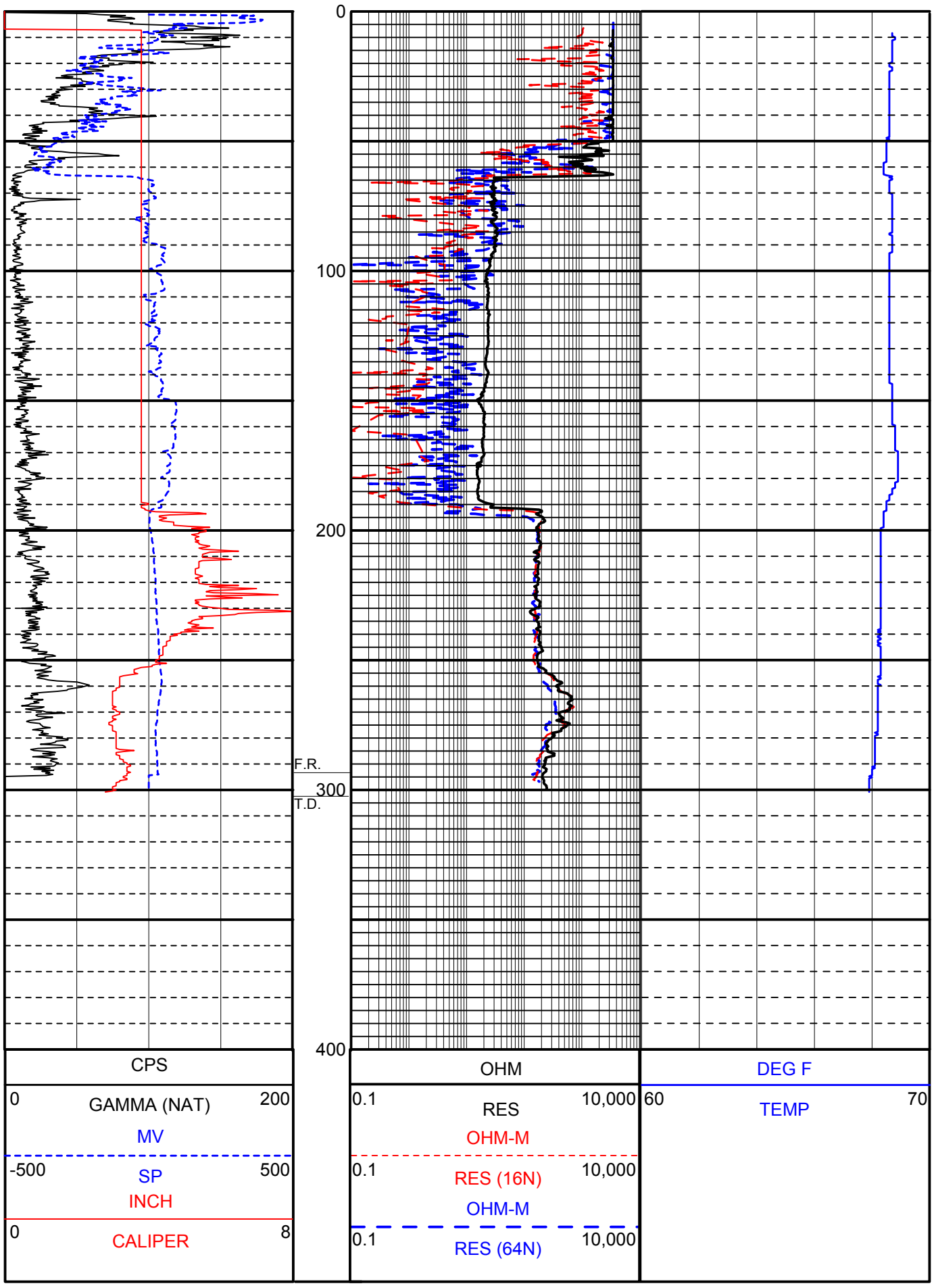


Figure B2. Geophysical log suite for the core hole from land surface to 300.8 feet below land surface conducted at the ROMP 133 – Arredondo well site in Marion County, Florida. The log was performed on March 15, 2011, using the 9165C (caliper/gamma-ray) and 8143C (multifunction) tools. Temporary casing (4-inch HWT) was approximately 192 feet below land surface at time of logging. The water level was approximately 63 feet below land surface at time of logging. The log scale is 2 inches per 100 feet. Tracks 1 and 3 are linearly scaled and track 2 is in logarithmic scale. The FR is 294.4 feet below land surface for the caliper/gamma-ray log and is 294 feet below land surface for the multifunction log.

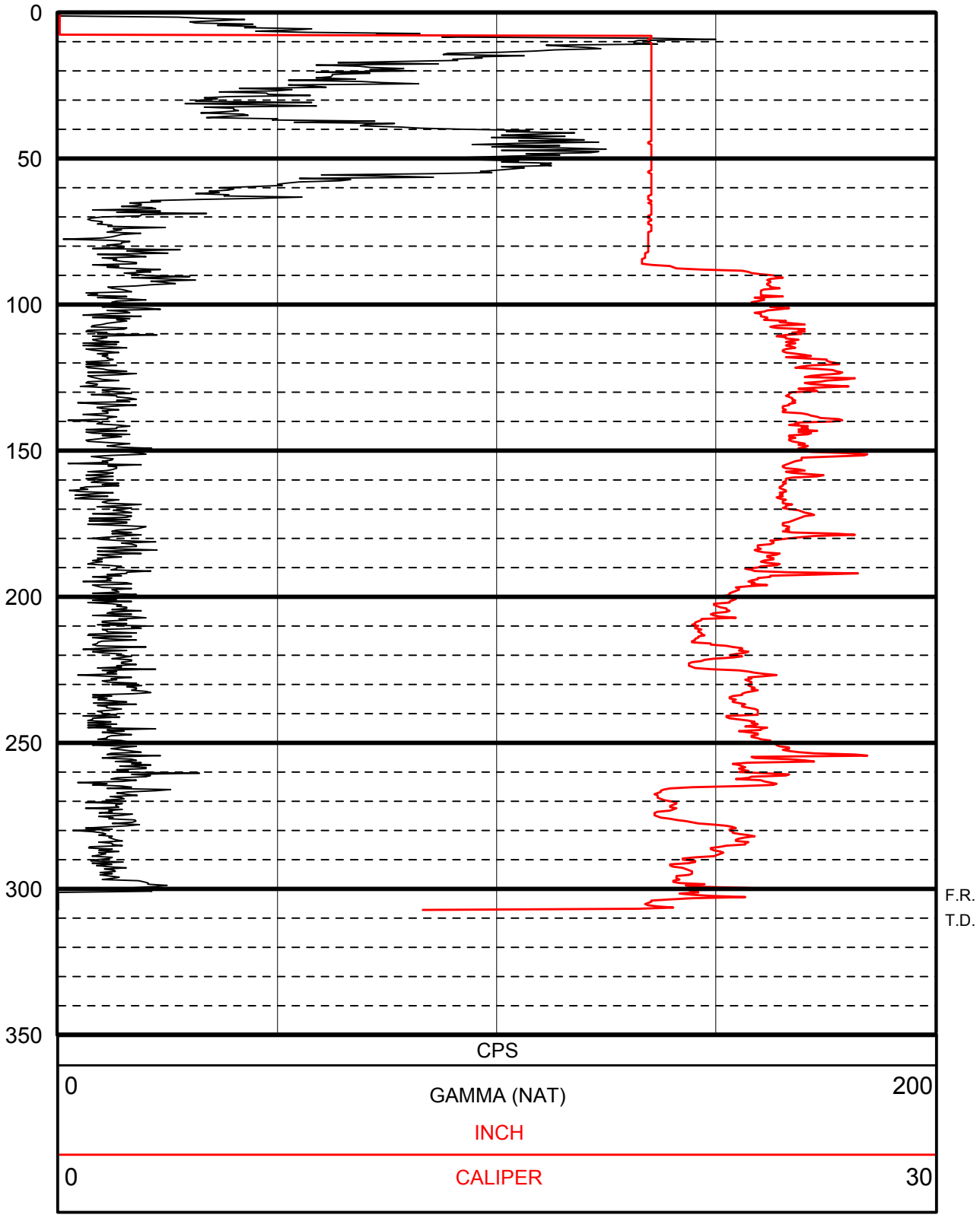


Figure B3. Gamma-ray and caliper log for the U FLDN AQ MONITOR/PRODUCTION well from land surface to 307.2 feet below land surface conducted at the ROMP 133 – Arredondo well site in Marion County, Florida. The log was performed on August 22, 2011, using the 9165C (caliper/gamma-ray) tool. The log was run before 16-inch steel casing was set. Steel 20-inch casing was installed to 88 feet below land surface at time of logging. The log scale is 1 inch per 50 feet and is linearly scaled. The FR is 301.2 feet below land surface.

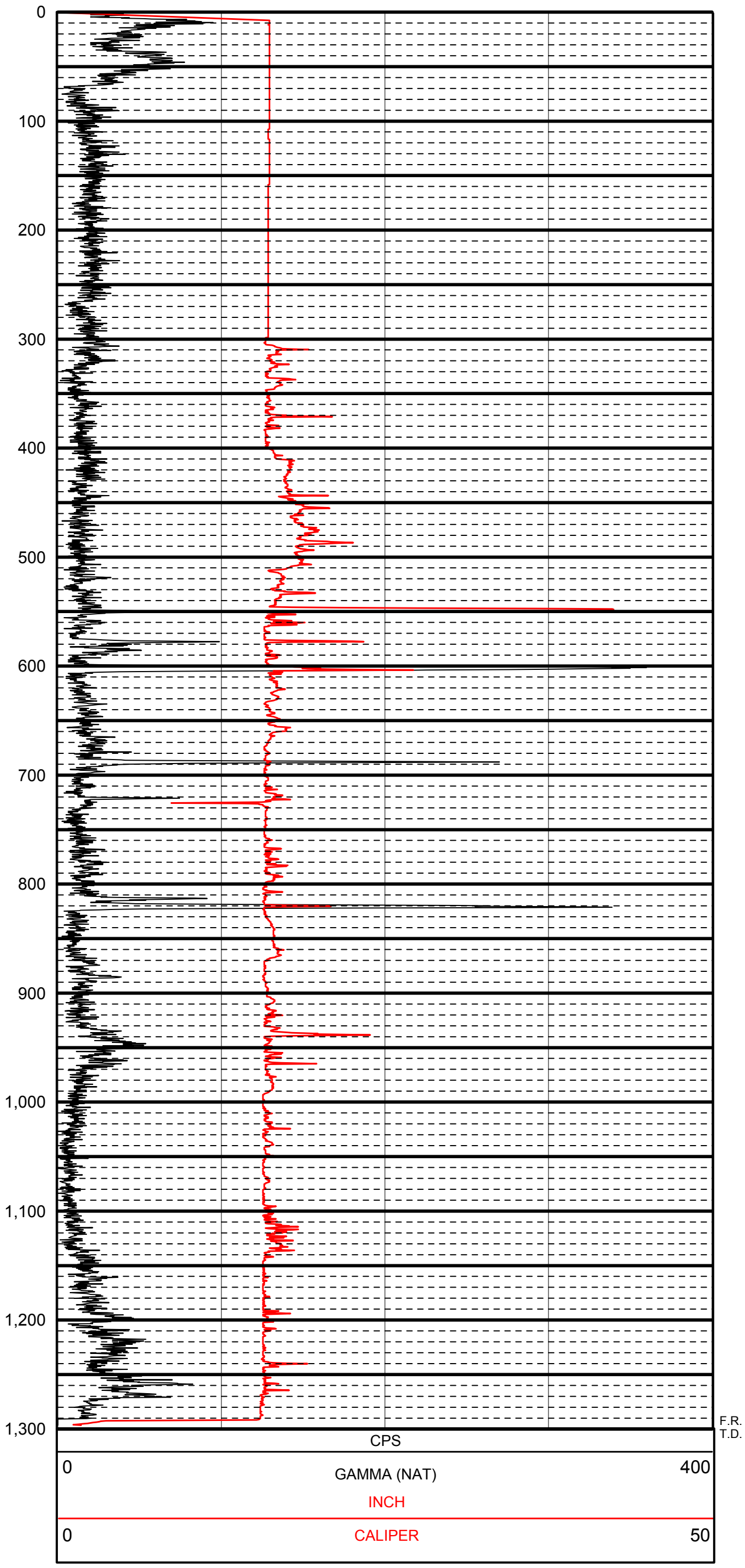
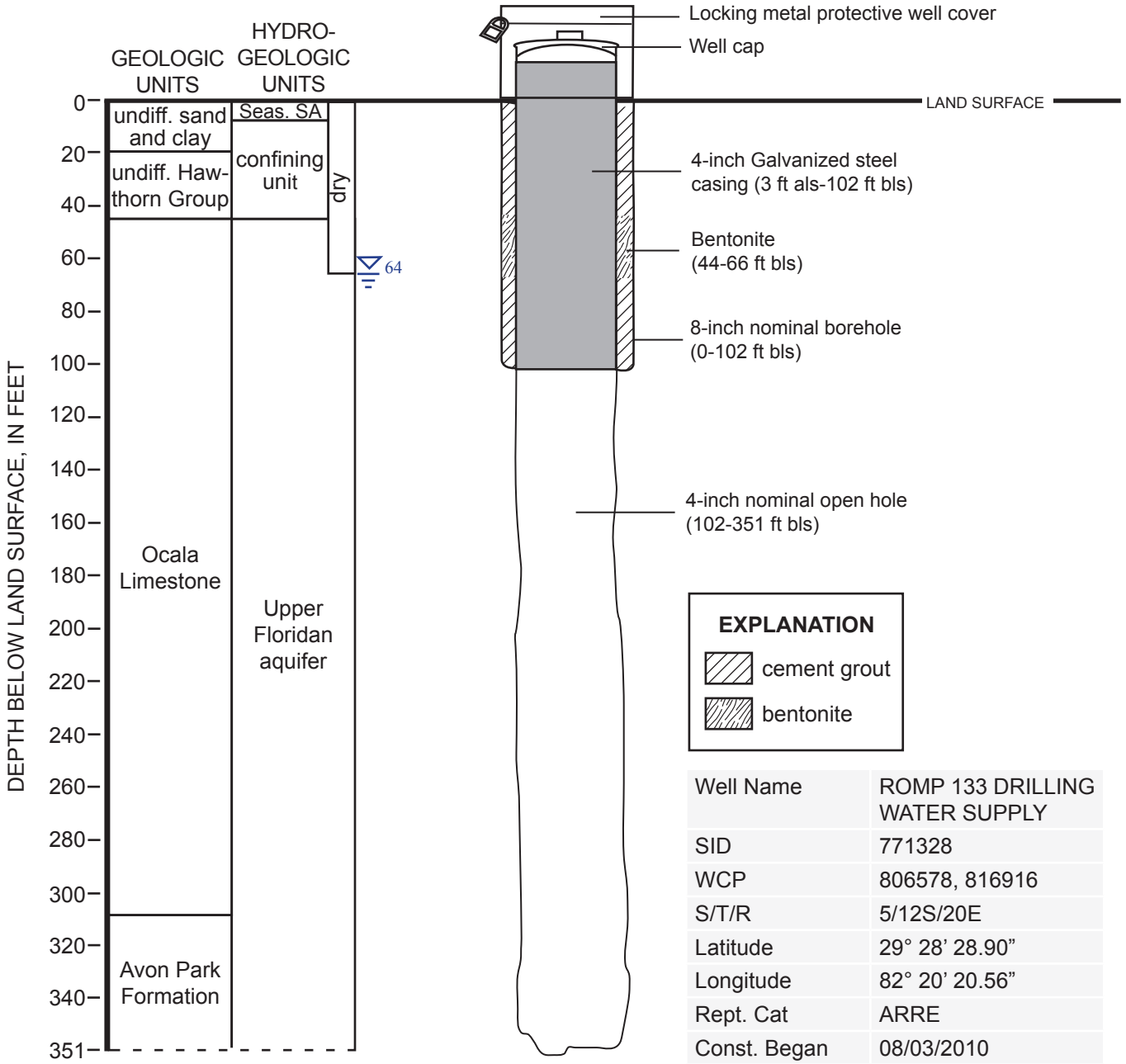


Figure B4. Geophysical log for the U FLDN AQ MONITOR/PRODUCTION well from land surface to 1,296.4 feet below land surface conducted at the ROMP 133 – Arredondo well site in Marion County, Florida. The log was performed on September 29, 2011, using the 9165C (caliper/gamma-ray) tool. Steel 16-inch casing depth at time of logging was 308 feet below land surface. The log scale is 1 inch per 100 feet and is linearly scaled. The FR is 1,290.4 feet below land surface.

Appendix C. Well As-Built Diagrams for the ROMP 133 – Arredondo Well Site in Marion County, Florida

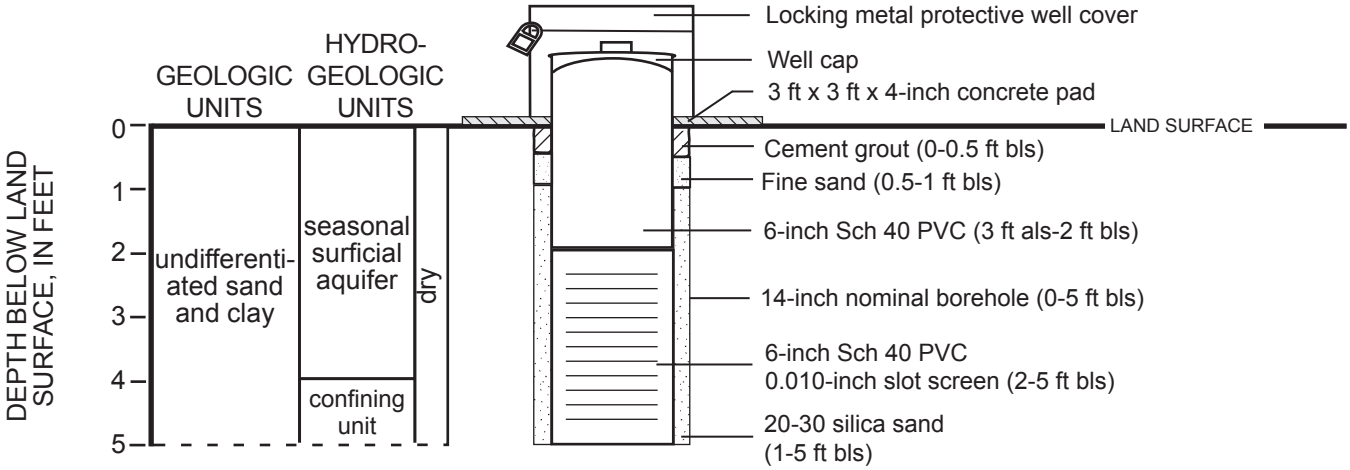


Well Name	ROMP 133 DRILLING WATER SUPPLY
SID	771328
WCP	806578, 816916
S/T/R	5/12S/20E
Latitude	29° 28’ 28.90”
Longitude	82° 20’ 20.56”
Rept. Cat	ARRE
Const. Began	08/03/2010
Const. Complete	12/05/2011

Note: Not to scale. Well is located on the temporary construction easement and shall remain per license agreement.

[undiff., undifferentiated; Seas. SA, seasonal surficial aquifer; bls, below land surface; als, above land surface; ft, feet; AQ, aquifer; SID, site identification number; WCP, well construction permit number; Rept. Cat., reporting category; Const., construction; S/T/R, section/township/range; E, east; S, south; Latitude and Longitude are in degrees, minutes, seconds]

Figure C1. Well as-built diagram for the DRILLING WATER SUPPLY well at the ROMP 133 – Arredondo well site in Marion County, Florida.

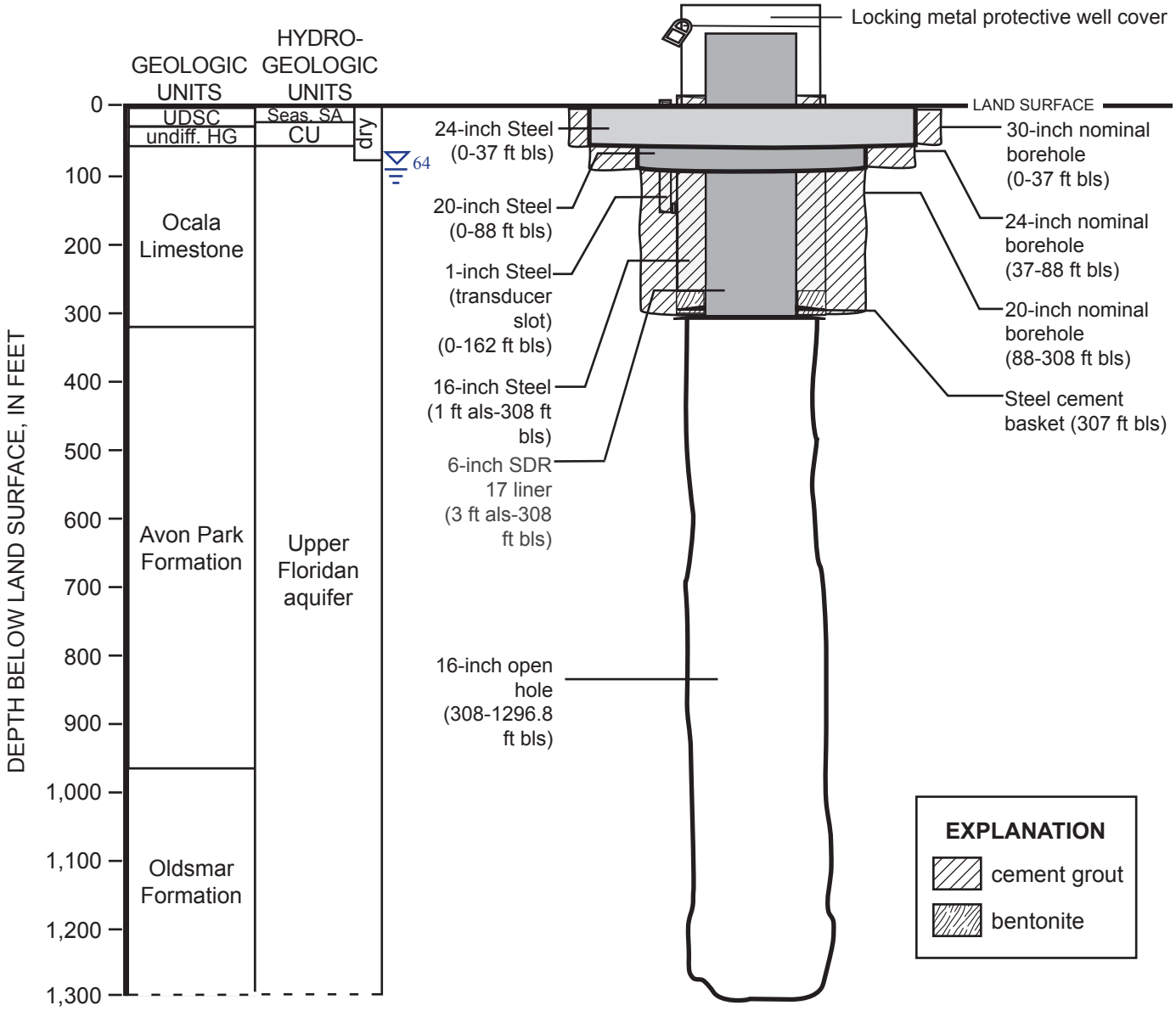


Well Name	ROMP 133 SURF AQ MONITOR
SID	787982
WCP	817517
S/T/R	5/12S/20E
Latitude	29° 28’ 26.98”
Longitude	82° 20’ 21.87”
Rept. Cat	ARRE
Const. Began	12/20/2011
Const. Complete	12/20/2011

Note: Not to scale. Well was dry at time of construction. Surficial aquifer is likely seasonal and well may be dry during dry season.

[als, above land surface; bls, below land surface; ft, feet; PVC, polyvinyl chloride; Sch, schedule; SID, site identification number; WCP, well construction permit number; SURF, surficial, AQ, aquifer; Rept. Cat., reporting category; Const., construction; S/T/R, section/township/range; S, south; E, east; Latitude and Longitude are in degrees, minutes, seconds]

Figure C2. Well as-built diagram for the SURF AQ MONITOR well at the ROMP 133 – Arredondo well site in Marion County, Florida.

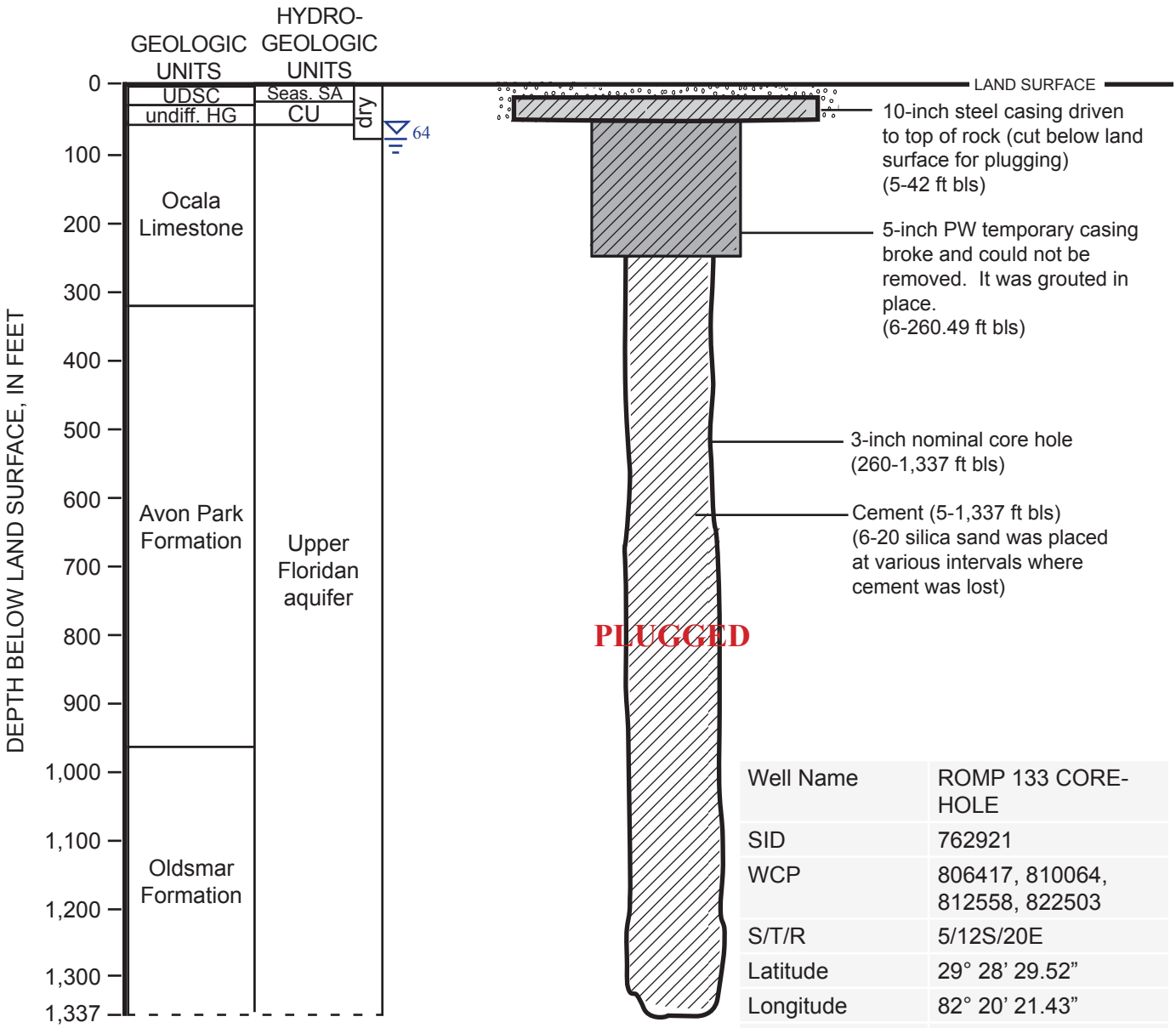


Note: Not to scale.

[UDSC, undifferentiated sand and clay; undiff. HG, undifferentiated Hawthorn Group; Seas. SA, seasonal surficial aquifer; CU, confining unit; bls, below land surface; ft, feet; als, above land surface; U, Upper; FLDN; Floridan; AQ, aquifer; SDR, standard dimension ratio; SID, site identification number; WCP, well construction permit number; Rept. Cat., reporting category; Const., construction; S/T/R, section/township/range; S, south; E, east; Latitude and Longitude are in degrees, minutes, seconds]

Well Name	ROMP 133 U FLDN AQ PRODUCTION/ MONITOR
SID	787986
WCP	814416, 822506
S/T/R	5/12S/20E
Latitude	29° 28’ 27.06”
Longitude	82° 20’ 21.84”
Rept. Cat	ARRE
Const. Began	08/01/2011
Const. Complete	10/16/2012

Figure C3. Well as-built diagram for the U FLDN AQ PRODUCTION/MONITOR well at the ROMP 133 – Arredondo well site in Marion County, Florida.



Well Name	ROMP 133 CORE-HOLE
SID	762921
WCP	806417, 810064, 812558, 822503
S/T/R	5/12S/20E
Latitude	29° 28’ 29.52”
Longitude	82° 20’ 21.43”
Rept. Cat	ARRE
Const. Began	08/05/2010
Const. Complete	10/11/2012

Note: Not to scale

[UDSC, undifferentiated sand and clay; undiff. HG, undifferentiated Hawthorn Group; Seas. SA, seasonal surficial aquifer; CU, confining unit; bls, below land surface; ft, feet; als, above land surface; Upper; FLDN; Floridan; AQ, aquifer; PVC, polyvinyl chloride; SID, site identification number; WCP, well construction permit number; Rept. Cat., reporting category; Const., construction; S/T/R, section/township/range; S, south; E, east; Latitude and Longitude are in degrees, minutes, seconds]

Figure C4. As-built diagram for the CORE HOLE at the ROMP 133 – Arredondo well site in Marion County, Florida.

Appendix D. Lithologic Log for the CORE HOLE at the ROMP 133 – Arredondo Well Site in Marion County, Florida

LITHOLOGIC WELL LOG PRINTOUT

SOURCE - FGS

WELL NUMBER: W-19300
TOTAL DEPTH: 1337 FT.
112 SAMPLES FROM 0 TO 1337 FT.

COUNTY: MARION
LOCATION: T.12 R.20 S. 5
LAT = 29D 28M 30S
LON = 82D 20M 20S

COMPLETION DATE: 06/07/11
OTHER TYPES OF LOGS AVAILABLE - NONE

ELEVATION: 110 FT

OWNER/DRILLER: SWFWMD / ROMP 133 - ARREDONDO

WORKED BY: SCOTT BARRETT DYER; NOVEMBER 4, 2011
LATITUDE SECONDS ROUNDED DOWN FROM 30.12 TO 30
LONGITUDE SECONDS ROUNDED DOWN FROM 20.43 TO 20
BOTH LATITUDE AND LONGITUDE ARE SURVEYED DATA
THERE ARE 112 BOXES OF CORE. CORE RECOVERY WAS GOOD AFTER APPROXIMATELY 520 FEET.
OLDSMAR PICK BASED ON TEXTURAL INTERPRETATION OF THE PARENT ROCK PRIOR TO RECRYSTALLIZATION AND PRESENCE OF ORGANIC LAMINATIONS.
NOTE: OCALA LIMESTONE NOT OCALA GROUP
OLDSMAR FORMATION NOT OLDSMAR LIMESTONE

0.0	-	20	090UDSC	UNDIFFERENTIATED SAND AND CLAY
20.0	-	45	122HTRN	HAWTHORN GROUP
45.0	-	310	124OCAL	OCALA GROUP
310.0	-	982.6	124AVPK	AVON PARK FM.
982.6	-	1337.0	124OLDM	OLDSMAR LIMESTONE

0 - 0.5 SAND; DARK GRAY TO MODERATE YELLOWISH BROWN
30% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRANULE
ROUNDNESS: SUB-ROUNDED TO SUB-ANGULAR; MEDIUM SPHERICITY
UNCONSOLIDATED
CEMENT TYPE(S): CLAY MATRIX
ACCESSORY MINERALS: CLAY-08%, ORGANICS-02%
FOSSILS: PLANT REMAINS

0.5 - 1.5 SAND; BROWNISH GRAY
30% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRANULE
ROUNDNESS: SUB-ROUNDED TO SUB-ANGULAR; MEDIUM SPHERICITY
UNCONSOLIDATED
CEMENT TYPE(S): CLAY MATRIX
ACCESSORY MINERALS: CLAY-08%, ORGANICS-02%, IRON STAIN-01%

1.5	-	2	SAND; GRAYISH BROWN TO MODERATE BROWN 25% POROSITY: INTERGRANULAR, INTRAGRANULAR GRAIN SIZE: MEDIUM; RANGE: FINE TO GRANULE ROUNDNESS: SUB-ROUNDED TO SUB-ANGULAR; MEDIUM SPHERICITY UNCONSOLIDATED CEMENT TYPE(S): CLAY MATRIX, IRON CEMENT ACCESSORY MINERALS: CLAY-08%, IRON STAIN-08%, ORGANICS-03%
2	-	3	SAND; GRAYISH BROWN TO MODERATE BROWN 25% POROSITY: INTERGRANULAR, INTRAGRANULAR GRAIN SIZE: MEDIUM; RANGE: FINE TO GRANULE ROUNDNESS: SUB-ROUNDED TO SUB-ANGULAR; MEDIUM SPHERICITY POOR INDURATION CEMENT TYPE(S): CLAY MATRIX, IRON CEMENT ACCESSORY MINERALS: CLAY-15%, IRON STAIN-10%, ORGANICS-05% FOSSILS: PLANT REMAINS
3	-	4	SAND; GRAYISH BROWN TO MODERATE BROWN 20% POROSITY: INTERGRANULAR, INTRAGRANULAR GRAIN SIZE: MEDIUM; RANGE: FINE TO GRANULE ROUNDNESS: SUB-ROUNDED TO SUB-ANGULAR; MEDIUM SPHERICITY POOR INDURATION CEMENT TYPE(S): CLAY MATRIX, IRON CEMENT ACCESSORY MINERALS: CLAY-25%, IRON STAIN-10%, ORGANICS-02%
4	-	9	CLAY; GRAYISH BROWN TO MODERATE BROWN 30% POROSITY: INTRAGRANULAR, INTERGRANULAR POOR INDURATION CEMENT TYPE(S): CLAY MATRIX, IRON CEMENT ACCESSORY MINERALS: QUARTZ SAND-10%, IRON STAIN-03%
9	-	17.8	CLAY; YELLOWISH GRAY TO LIGHT GRAYISH GREEN 30% POROSITY: INTRAGRANULAR, INTERGRANULAR POOR INDURATION CEMENT TYPE(S): CLAY MATRIX ACCESSORY MINERALS: QUARTZ SAND-10%, IRON STAIN-02%
17.8	-	20	CLAY; LIGHT OLIVE TO DARK YELLOWISH ORANGE 30% POROSITY: INTRAGRANULAR, INTERGRANULAR MODERATE INDURATION CEMENT TYPE(S): CLAY MATRIX ACCESSORY MINERALS: QUARTZ SAND-02%
20	-	21	CLAY; MODERATE BROWN TO DARK YELLOWISH BROWN 25% POROSITY: INTRAGRANULAR, INTERGRANULAR POOR INDURATION

CEMENT TYPE(S): CLAY MATRIX, IRON CEMENT
ACCESSORY MINERALS: LIMONITE-25%, QUARTZ-15%, SILT-05%

21 - 23.5 CLAY; YELLOWISH GRAY TO LIGHT GRAYISH GREEN
20% POROSITY: INTRAGRANULAR, INTERGRANULAR, FRACTURE
MODERATE INDURATION
CEMENT TYPE(S): CLAY MATRIX
ACCESSORY MINERALS: IRON STAIN-03%, QUARTZ-05%, SILT-05%

23.5 - 25 CLAY; YELLOWISH GRAY
20% POROSITY: INTRAGRANULAR, INTERGRANULAR, FRACTURE
MODERATE INDURATION
CEMENT TYPE(S): CLAY MATRIX
ACCESSORY MINERALS: QUARTZ-08%, IRON STAIN-01%

25 - 36 CLAY; YELLOWISH GRAY
20% POROSITY: INTRAGRANULAR, INTERGRANULAR, FRACTURE
MODERATE INDURATION
CEMENT TYPE(S): CLAY MATRIX
ACCESSORY MINERALS: QUARTZ-01%

36 - 38 CLAY; YELLOWISH GRAY
20% POROSITY: INTRAGRANULAR, INTERGRANULAR, FRACTURE
MODERATE INDURATION
CEMENT TYPE(S): CLAY MATRIX
ACCESSORY MINERALS: QUARTZ-02%, SILT-02%, ORGANICS-01%
IRON STAIN-01%
HAS A MEALY TEXTURE AND LESS UNIFORMITY

38 - 42 SAND; YELLOWISH GRAY
22% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN SIZE: FINE; RANGE: VERY FINE TO COARSE
ROUNDNESS: SUB-ANGULAR TO SUB-ROUNDED; LOW SPHERICITY
MODERATE INDURATION
CEMENT TYPE(S): CLAY MATRIX
ACCESSORY MINERALS: ORGANICS-02%, HEAVY MINERALS-02%
PLANT REMAINS-01%

42 - 44 AS ABOVE

44 - 45 NO SAMPLES

45 - 48.9 GRAINSTONE; VERY LIGHT ORANGE
22% POROSITY: INTERGRANULAR, MOLDIC, VUGULAR
GRAIN TYPE: SKELETAL, BIOGENIC, CRYSTALS
90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY COARSE

RANGE: MICROCRYSTALLINE TO GRANULE; GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-15%
OTHER FEATURES: GRANULAR, FOSSILIFEROUS
FOSSILS: ECHINOID, BENTHIC FORAMINIFERA, MOLLUSKS
FOSSIL FRAGMENTS

48.9 - 49.1 MUDSTONE; LIGHT GRAY
16% POROSITY: INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: CALCILUTITE; 04% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-01%
OTHER FEATURES: CHALKY
FOSSILS: NO FOSSILS

49.1 - 52 PACKSTONE; VERY LIGHT ORANGE
24% POROSITY: INTERGRANULAR, MOLDIC, VUGULAR
GRAIN TYPE: SKELETAL, BIOGENIC, CRYSTALS
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY COARSE
RANGE: MICROCRYSTALLINE TO GRANULE; GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-12%
OTHER FEATURES: CALCAREOUS
FOSSILS: ECHINOID, BENTHIC FORAMINIFERA, MOLLUSKS
FOSSIL MOLDS

52 - 54 GRAINSTONE; VERY LIGHT ORANGE
26% POROSITY: INTERGRANULAR, MOLDIC, VUGULAR
GRAIN TYPE: SKELETAL, BIOGENIC, CRYSTALS
90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY COARSE
RANGE: MICROCRYSTALLINE TO GRANULE; GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-10%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: MILIOLIDS, BENTHIC FORAMINIFERA, FOSSIL FRAGMENTS
FOSSIL MOLDS

54 - 60 GRAINSTONE; VERY LIGHT ORANGE
26% POROSITY: INTERGRANULAR, MOLDIC, VUGULAR
GRAIN TYPE: SKELETAL, BIOGENIC
92% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY COARSE
RANGE: MICROCRYSTALLINE TO GRANULE; POOR INDURATION

CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-05%
OTHER FEATURES: FOSSILIFEROUS, POOR SAMPLE
FOSSILS: FOSSIL FRAGMENTS, FOSSIL MOLDS
BENTHIC FORAMINIFERA, MOLLUSKS
NUMMULITES AT LOWER PORTION OF INTERVAL; LESS THAN 2 FEET OF SAMPLE REPRESENTING 6 FOOT SECTION

60 - 65 PACKSTONE; VERY LIGHT ORANGE
26% POROSITY: INTERGRANULAR, MOLDIC
POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: SKELETAL, BIOGENIC
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO GRANULE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-03%, PYRITE-02%, CHERT-02%
OTHER FEATURES: FOSSILIFEROUS, POOR SAMPLE
FOSSILS: FOSSIL FRAGMENTS, FOSSIL MOLDS
2 INCHES OF CHERT WITH SOME ALLOCHEM TEXTURE AT FRACTURE
CHERT NODULE AT BEGINNING OF INTERVAL; LESS THAN 2 FEET OF ROCK FOR A 5 FOOT SECTION

65 - 70 WACKESTONE; WHITE
20% POROSITY: INTRAGRANULAR, INTERGRANULAR
GRAIN TYPE: CALCILUTITE, BIOGENIC, SKELETAL
20% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO VERY COARSE
UNCONSOLIDATED
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-02%
OTHER FEATURES: CHALKY
FOSSILS: FOSSIL FRAGMENTS, FOSSIL MOLDS

70 - 75 PACKSTONE; WHITE
22% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO GRANULE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CHERT-15%
OTHER FEATURES: POOR SAMPLE
FOSSILS: FOSSIL FRAGMENTS, FOSSIL MOLDS
LESS THAN 2 FEET OF UNCONSOLIDATED CORE; 5 INCHES OF CRYSTALLIZED DOLOSTONE IN MIDDLE OF SECTION; LIMESTONE AT TOP HAS LESS ALLOCHEMS THAN AT BOTTOM; LOW % PACKSTONE IS

AN AVERAGE OF THE SAMPLE

75 - 80 GRAINSTONE; WHITE
26% POROSITY: INTERGRANULAR, MOLDIC, VUGULAR
GRAIN TYPE: SKELETAL, BIOGENIC, PELLET
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-02%
OTHER FEATURES: FOSSILIFEROUS, POOR SAMPLE
FOSSILS: FOSSIL FRAGMENTS, FOSSIL MOLDS
BENTHIC FORAMINIFERA, MOLLUSKS
ONLY 2 FEET OF CORE FOR 5 FOOT INTERVAL; UNKNOWN YELLOW
GREEN WAXY SUBSTANCE NEAR BOTTOM OF INTERVAL

80 - 90 MUDSTONE; WHITE
20% POROSITY: INTRAGRANULAR, INTERGRANULAR
GRAIN TYPE: CALCILUTITE, SKELETAL
10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO VERY COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: POOR SAMPLE
LESS THAN 4 FEET OF CORE FOR 10 FOOT SECTION

90 - 99 MUDSTONE; WHITE
20% POROSITY: INTRAGRANULAR, INTERGRANULAR
GRAIN TYPE: CALCILUTITE, SKELETAL
08% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO VERY COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: POOR SAMPLE
ONLY 4 FEET OF CORE FOR 9 FOOT INTERVAL

99 - 110 AS ABOVE

110 - 112 PACKSTONE; WHITE
24% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: SKELETAL, BIOGENIC
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO VERY COARSE
UNCONSOLIDATED
CEMENT TYPE(S): CALCILUTITE MATRIX
FOSSILS: FOSSIL FRAGMENTS, FOSSIL MOLDS

112 - 115 GRAINSTONE; VERY LIGHT ORANGE
26% POROSITY: INTERGRANULAR, INTRAGRANULAR

POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: SKELETAL, BIOGENIC
95% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO GRANULE
UNCONSOLIDATED
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: POOR SAMPLE
FOSSILS: FOSSIL FRAGMENTS, FOSSIL MOLDS
1 FT OF UNCONSOLIDATED CUTTINGS TO REPRESENT 3 FT SECTION
RUSTY METALLIC FLAKES ARE LARGE AND BRASS LIKE; LIKELY
MIXTURE OF DRILL BIT AND CASING MATERIAL

115 - 120.9 AS ABOVE

120.9 - 125 GRAINSTONE; VERY LIGHT ORANGE
26% POROSITY: INTERGRANULAR, INTRAGRANULAR
POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: SKELETAL, BIOGENIC
98% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: FINE TO COARSE; POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: IRON STAIN-02%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: FOSSIL FRAGMENTS
UNKNOWN RUSTY METALLIC FLAKES CAUSING IRON STAINING
INDURATION TENDS TOWARD UNCONSOLIDATED; SAMPLE IS LIKE A
FOSSIL HASH, SAND SIZE ALLOCHEM PIECES

125 - 135 PACKSTONE; VERY LIGHT ORANGE
24% POROSITY: INTERGRANULAR, INTRAGRANULAR
POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: SKELETAL, BIOGENIC, INTRACLASTS
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM; UNCONSOLIDATED
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: IRON STAIN-02%, PLANT REMAINS-01%
ORGANICS-01%
FINE TO MEDIUM GRAIN LIMESTONE; SAND SIZE ALLOCHEM HASH
NUMMULITES AND LEPIDOCYCLINA ARE PLENTIFUL

135 - 140 PACKSTONE; VERY LIGHT ORANGE
24% POROSITY: INTERGRANULAR, INTRAGRANULAR
POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: SKELETAL, BIOGENIC, INTRACLASTS
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY COARSE; RANGE: FINE TO GRANULE
UNCONSOLIDATED

CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CHERT-05%
OTHER FEATURES: GRANULAR, POOR SAMPLE
BAG OF CUTTINGS, NO CORE; COARSE GRAINED LIMESTONE HASH WITH CHERT NODULES

140 - 145 PACKSTONE; VERY LIGHT ORANGE
24% POROSITY: INTERGRANULAR, INTRAGRANULAR
POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: SKELETAL, BIOGENIC, INTRACLASTS
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO VERY COARSE
UNCONSOLIDATED
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: POOR SAMPLE
FOSSILS: BENTHIC FORAMINIFERA, FOSSIL FRAGMENTS
BAGS OF CUTTINGS, NO CORE; SAMPLE IS MEDIUM GRAINED LIMESTONE HASH; PLENTIFUL NUMMULITES AND LEPIDOCYCLINA
FOREIGN METAL FLAKES CONTINUE TO BE PRESENT

145 - 150 PACKSTONE; VERY LIGHT ORANGE
24% POROSITY: INTERGRANULAR, INTRAGRANULAR
POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: SKELETAL, BIOGENIC
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO COARSE
UNCONSOLIDATED
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CHERT-01%, ORGANICS-02%, PYRITE-02%
OTHER FEATURES: POOR SAMPLE
FOSSILS: BENTHIC FORAMINIFERA, FOSSIL FRAGMENTS
BAGS OF CUTTINGS, NO CORE; FINE TO MEDIUM GRAINED LIMESTONE HASH

150 - 155 PACKSTONE; VERY LIGHT ORANGE
24% POROSITY: INTERGRANULAR, INTRAGRANULAR
POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: SKELETAL, BIOGENIC
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO COARSE
UNCONSOLIDATED
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-01%
OTHER FEATURES: POOR SAMPLE
FOSSILS: BENTHIC FORAMINIFERA, FOSSIL FRAGMENTS
BAGS OF CUTTINGS, NO CORE; SAMPLE IS A FINE GRAINED LIMESTONE HASH

155	-	160	PACKSTONE; VERY LIGHT ORANGE 24% POROSITY: INTERGRANULAR, INTRAGRANULAR POSSIBLY HIGH PERMEABILITY GRAIN TYPE: SKELETAL, BIOGENIC 80% ALLOCHEMICAL CONSTITUENTS GRAIN SIZE: FINE; RANGE: VERY FINE TO COARSE UNCONSOLIDATED CEMENT TYPE(S): CALCILUTITE MATRIX ACCESSORY MINERALS: ORGANICS-01% FOSSILS: FOSSIL FRAGMENTS BAGS OF CUTTINGS, NO CORE; SAMPLE IS A FINE GRAINED LIMESTONE HASH
160	-	165	AS ABOVE
165	-	170	AS ABOVE
170	-	175	PACKSTONE; VERY LIGHT ORANGE 24% POROSITY: INTERGRANULAR, MOLDIC, VUGULAR GRAIN TYPE: SKELETAL, BIOGENIC 90% ALLOCHEMICAL CONSTITUENTS GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO GRANULE POOR INDURATION CEMENT TYPE(S): CALCILUTITE MATRIX OTHER FEATURES: POOR SAMPLE FOSSILS: BENTHIC FORAMINIFERA, FOSSIL FRAGMENTS FOSSIL MOLDS POOR RECOVERY
175	-	180	PACKSTONE; VERY LIGHT ORANGE 22% POROSITY: INTERGRANULAR, INTRAGRANULAR GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE 80% ALLOCHEMICAL CONSTITUENTS GRAIN SIZE: FINE; RANGE: VERY FINE TO COARSE UNCONSOLIDATED CEMENT TYPE(S): CALCILUTITE MATRIX OTHER FEATURES: POOR SAMPLE BAGS OF CUTTINGS, NO CORE
180	-	185	PACKSTONE; VERY LIGHT ORANGE 22% POROSITY: INTERGRANULAR, INTRAGRANULAR GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE 70% ALLOCHEMICAL CONSTITUENTS GRAIN SIZE: FINE; RANGE: VERY FINE TO COARSE UNCONSOLIDATED CEMENT TYPE(S): CALCILUTITE MATRIX

ACCESSORY MINERALS: IRON STAIN-04%
OTHER FEATURES: POOR SAMPLE
BAGS OF CUTTINGS, NO CORE; THERE IS AN INCREASE IN IRON STAINING FROM CASING MATERIAL

185 - 190 AS ABOVE

190 - 191 PACKSTONE; VERY LIGHT ORANGE
22% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: POOR SAMPLE
ONLY 3 INCHES OF CORE

191 - 192 NO SAMPLES

192 - 194 PACKSTONE; VERY LIGHT ORANGE
22% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO GRANULE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: POOR SAMPLE
FOSSILS: BENTHIC FORAMINIFERA, MOLLUSKS, FOSSIL FRAGMENTS
FOSSIL MOLDS

194 - 195 NO SAMPLES

195 - 205 PACKSTONE; VERY LIGHT ORANGE
24% POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO GRANULE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: POOR SAMPLE
FOSSILS: ECHINOID, BENTHIC FORAMINIFERA, FOSSIL FRAGMENTS
FOSSIL MOLDS

205 - 220 PACKSTONE; VERY LIGHT ORANGE TO LIGHT YELLOWISH ORANGE
24% POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
90% ALLOCHEMICAL CONSTITUENTS

GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO GRANULE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: POOR SAMPLE
FOSSILS: ECHINOID, BENTHIC FORAMINIFERA, FOSSIL FRAGMENTS
FOSSIL MOLDS
ONLY 7 FEET OF RUBBLE FOR THE 25 FOOT INTERVAL, 195 - 220

220 - 225 WACKESTONE; VERY LIGHT ORANGE TO LIGHT YELLOWISH ORANGE
20% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: CALCILUTITE, SKELETAL
10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: POOR SAMPLE

225 - 230 PACKSTONE; VERY LIGHT ORANGE
24% POROSITY: INTERGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC
90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO GRANULE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: POOR SAMPLE
FOSSILS: FOSSIL FRAGMENTS, FOSSIL MOLDS

230 - 231 MUDSTONE; VERY LIGHT ORANGE
18% POROSITY: INTRAGRANULAR, INTERGRANULAR
GRAIN TYPE: CALCILUTITE, SKELETAL
05% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX

231 - 235 PACKSTONE; VERY LIGHT ORANGE
24% POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO GRANULE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: POOR SAMPLE
FOSSILS: FOSSIL FRAGMENTS, FOSSIL MOLDS

235 - 237.5 MUDSTONE; VERY LIGHT ORANGE
20% POROSITY: INTRAGRANULAR, INTERGRANULAR

GRAIN TYPE: CALCILUTITE, SKELETAL
10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: POOR SAMPLE
DEPTH ESTIMATED FROM RECOVERY REPRESENTING 235-240 FEET

237.5 - 240 PACKSTONE; VERY LIGHT ORANGE TO LIGHT YELLOWISH ORANGE
22% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: IRON STAIN-04%
OTHER FEATURES: POOR SAMPLE
FOSSILS: FOSSIL FRAGMENTS, FOSSIL MOLDS

240 - 245 PACKSTONE; VERY LIGHT ORANGE
20% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: POOR SAMPLE

245 - 250 PACKSTONE; VERY LIGHT ORANGE
22% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: POOR SAMPLE
FOSSILS: FOSSIL FRAGMENTS, FOSSIL MOLDS

250 - 251 MUDSTONE; VERY LIGHT ORANGE
20% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: CALCILUTITE, SKELETAL
08% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO MEDIUM
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX

251 - 255 GRAINSTONE; VERY LIGHT ORANGE

24% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
92% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PYRITE-01%
PYRITE CONCENTRATED AT 254.0

255 - 265 GRAINSTONE; VERY LIGHT ORANGE TO GRAYISH ORANGE
26% POROSITY: INTERGRANULAR, MOLDIC, VUGULAR
GRAIN TYPE: SKELETAL, PELLET, BIOGENIC
95% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO GRANULE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: SPAR-02%
FOSSILS: ECHINOID, BENTHIC FORAMINIFERA, MILIOLIDS
MOLLUSKS, FOSSIL MOLDS

265 - 275 PACKSTONE; GRAYISH BROWN TO GRAYISH ORANGE
22% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, PELLET
90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO GRANULE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-10%, PYRITE-01%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: CORAL, ECHINOID, BENTHIC FORAMINIFERA, MILIOLIDS
FOSSIL FRAGMENTS
ALMOST A GRAINSTONE BUT DENSE MATRIX DUE TO SPAR

275 - 289 GRAINSTONE; GRAYISH BROWN
28% POROSITY: MOLDIC, INTERGRANULAR, VUGULAR
GRAIN TYPE: SKELETAL, BIOGENIC, PELLET
95% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: VERY FINE TO GRANULE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-01%, PYRITE-01%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: ECHINOID, MOLLUSKS, FOSSIL MOLDS
FOSSIL FRAGMENTS

289 - 295 GRAINSTONE; GRAYISH BROWN
28% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS

GRAIN TYPE: SKELETAL, BIOGENIC, PELLET
98% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: FOSSIL FRAGMENTS, MILIOLIDS, BENTHIC FORAMINIFERA

295 - 296 GRAINSTONE; GRAYISH BROWN
27% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, PELLET
94% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: FOSSIL FRAGMENTS, MILIOLIDS, BENTHIC FORAMINIFERA

296 - 300 PACKSTONE; GRAYISH BROWN
26% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, PELLET
90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: FOSSIL FRAGMENTS, MILIOLIDS, BENTHIC FORAMINIFERA

300 - 310 DOLOSTONE; GRAYISH BROWN TO MODERATE YELLOWISH BROWN
23% POROSITY: INTERGRANULAR, PIN POINT VUGS
INTERCRYSTALLINE; 50-90% ALTERED; ANHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: PYRITE-02%, ORGANICS-01%
OTHER FEATURES: POOR SAMPLE
FOSSILS: FOSSIL MOLDS
WITHIN THE 10 FOOT INTERVAL MORE POROUS TEXTURE AT 301.5
305, 307, 309 ONLY 4 FEET OF CORE FOR THE 10 FOOT INTERVAL

310 - 315 DOLOSTONE; MODERATE YELLOWISH BROWN
28% POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: PYRITE-01%

OTHER FEATURES: SUCROSIC, POOR SAMPLE
FOSSILS: FOSSIL MOLDS
ONLY 6 INCHES OF RUBBLE FOR 5 FOOT INTERVAL

315 - 327 DOLOSTONE; DARK YELLOWISH BROWN TO MODERATE YELLOWISH BROWN
32% POROSITY: INTERGRANULAR, PIN POINT VUGS
POSSIBLY HIGH PERMEABILITY; 90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-03%, PYRITE-03%
OTHER FEATURES: SUCROSIC
FOSSILS: FOSSIL MOLDS

327 - 330 DOLOSTONE; DARK YELLOWISH BROWN TO MODERATE YELLOWISH BROWN
28% POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-03%
OTHER FEATURES: SUCROSIC
FOSSILS: FOSSIL MOLDS

330 - 333 DOLOSTONE; DARK YELLOWISH BROWN TO MODERATE YELLOWISH BROWN
25% POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-03%
OTHER FEATURES: SUCROSIC
FOSSILS: FOSSIL MOLDS

333 - 338 DOLOSTONE; MODERATE YELLOWISH BROWN
29% POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-08%
OTHER FEATURES: SUCROSIC
FOSSILS: FOSSIL MOLDS

338 - 340 DOLOSTONE; MODERATE YELLOWISH BROWN TO GRAYISH BROWN
27% POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
90-100% ALTERED; SUBHEDRAL

GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-05%
OTHER FEATURES: SUCROSIC
FOSSILS: FOSSIL MOLDS

340 - 348.5 DOLOSTONE; MODERATE YELLOWISH BROWN
30% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-05%
OTHER FEATURES: SUCROSIC
FOSSILS: FOSSIL MOLDS

348.5 - 349.9 DOLOSTONE; MODERATE YELLOWISH BROWN
25% POROSITY: INTERGRANULAR, INTRAGRANULAR
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-03%

349.9 - 350.4 DOLOSTONE; MODERATE YELLOWISH BROWN
28% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-05%
OTHER FEATURES: SUCROSIC
FOSSILS: FOSSIL MOLDS

350.4 - 351.4 DOLOSTONE; MODERATE YELLOWISH BROWN TO GRAYISH BROWN
24% POROSITY: INTERGRANULAR, INTRAGRANULAR; 50-90% ALTERED
ANHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
POOR INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

351.4 - 355 DOLOSTONE; GRAYISH BROWN TO MODERATE YELLOWISH BROWN
26% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION

CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-02%
OTHER FEATURES: SUCROSIC

355 - 357 DOLOSTONE; MODERATE YELLOWISH BROWN
29% POROSITY: INTERGRANULAR, PIN POINT VUGS
POSSIBLY HIGH PERMEABILITY; 90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
POOR INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-02%
OTHER FEATURES: SUCROSIC, POOR SAMPLE
CRUMBLY AND VERY SUCROSIC, POOR RECOVERY

357 - 363.1 DOLOSTONE; MODERATE YELLOWISH BROWN TO DARK YELLOWISH BROWN
26% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-02%
OTHER FEATURES: SUCROSIC, CRYSTALLINE

363.1 - 368.2 DOLOSTONE; DARK YELLOWISH BROWN TO MODERATE YELLOWISH BROWN
29% POROSITY: PIN POINT VUGS, INTERGRANULAR
POSSIBLY HIGH PERMEABILITY; 90-100% ALTERED; EUHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-02%
OTHER FEATURES: SUCROSIC
CRYSTALLINE GRAINS SCATTERED OVER A SMALL 2 INCH SECTION

368.2 - 369.2 DOLOSTONE; MODERATE YELLOWISH BROWN
25% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-02%
OTHER FEATURES: SUCROSIC, CRYSTALLINE

369.2 - 370 DOLOSTONE; GRAYISH BROWN
22% POROSITY: INTERGRANULAR, INTERCRYSTALLINE
PIN POINT VUGS; 90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION

CEMENT TYPE(S): DOLOMITE CEMENT

370 - 370.1 DOLOSTONE; MODERATE YELLOWISH BROWN
25% POROSITY: INTERGRANULAR, INTRAGRANULAR
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
POOR INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-04%
OTHER FEATURES: SUCROSIC

370.1 - 371.5 DOLOSTONE; MODERATE YELLOWISH BROWN
24% POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-02%
FOSSILS: FOSSIL MOLDS

371.5 - 371.7 DOLOSTONE; MODERATE YELLOWISH BROWN
28% POROSITY: INTERGRANULAR, INTRAGRANULAR
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
OTHER FEATURES: SUCROSIC

371.7 - 376 DOLOSTONE; GRAYISH BROWN TO MODERATE YELLOWISH BROWN
26% POROSITY: INTERGRANULAR, PIN POINT VUGS
INTERCRYSTALLINE; 90-100% ALTERED; ANHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-02%
OTHER FEATURES: SUCROSIC, CRYSTALLINE

376 - 377.5 DOLOSTONE; GRAYISH BROWN TO MODERATE YELLOWISH BROWN
28% POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-01%
OTHER FEATURES: SUCROSIC
FOSSILS: FOSSIL MOLDS

377.5 - 379.5 DOLOSTONE; MODERATE YELLOWISH BROWN
30% POROSITY: INTERGRANULAR, MOLDIC, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
OTHER FEATURES: SUCROSIC
FOSSILS: FOSSIL MOLDS

379.5 - 382.1 DOLOSTONE; GRAYISH BROWN
28% POROSITY: INTERGRANULAR, MOLDIC, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-01%
OTHER FEATURES: SUCROSIC, CRYSTALLINE
FOSSILS: FOSSIL MOLDS

382.1 - 385 DOLOSTONE; GRAYISH BROWN
30% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
POOR INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
OTHER FEATURES: SUCROSIC, POOR SAMPLE
SAMPLE IS CRUMBLY AND MOSTLY RUBBLE, 50% RECOVERY

385 - 385.7 DOLOSTONE; MODERATE YELLOWISH BROWN
28% POROSITY: INTERGRANULAR, INTRAGRANULAR; 50-90% ALTERED
ANHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
POOR INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-02%

385.7 - 391.2 DOLOSTONE; GRAYISH BROWN
22% POROSITY: INTERGRANULAR, INTRAGRANULAR
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

391.2 - 393.2 DOLOSTONE; MODERATE YELLOWISH BROWN TO GRAYISH BROWN
24% POROSITY: INTERGRANULAR, INTRAGRANULAR
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE

MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

393.2 - 398.8 DOLOSTONE; MODERATE YELLOWISH BROWN TO GRAYISH BROWN
24% POROSITY: INTERGRANULAR, INTRAGRANULAR
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-06%
OTHER FEATURES: VARVED
VARVES BETWEEN 393-395

398.8 - 399.5 DOLOSTONE; MODERATE YELLOWISH BROWN TO GRAYISH BROWN
22% POROSITY: INTERGRANULAR, INTRAGRANULAR
INTERCRYSTALLINE; 90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-04%
OTHER FEATURES: VARVED

399.5 - 400 DOLOSTONE; GRAYISH BROWN
30% POROSITY: MOLDIC, PIN POINT VUGS, INTERCRYSTALLINE
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

400 - 403.1 DOLOSTONE; GRAYISH BROWN
28% POROSITY: MOLDIC, VUGULAR, INTERCRYSTALLINE
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

403.1 - 405 DOLOSTONE; MODERATE YELLOWISH BROWN TO GRAYISH BROWN
28% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-02%

405 - 407 DOLOSTONE; GRAYISH BROWN
28% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL

GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
SEDIMENTARY STRUCTURES: MOTTLED
OTHER FEATURES: VARIEGATED

407 - 410 DOLOSTONE; GRAYISH BROWN
28% POROSITY: PIN POINT VUGS, INTERGRANULAR, INTRAGRANULAR
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

410 - 413 DOLOSTONE; VERY LIGHT ORANGE
22% POROSITY: INTERGRANULAR, INTRAGRANULAR, VUGULAR
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

413 - 415 DOLOSTONE; GRAYISH BROWN
28% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-02%

415 - 419.1 DOLOSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
26% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
OTHER FEATURES: VARIEGATED, VARVED

419.1 - 420 DOLOSTONE; VERY LIGHT ORANGE
24% POROSITY: INTERGRANULAR, INTRAGRANULAR; 50-90% ALTERED
ANHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-03%
OTHER FEATURES: CALCAREOUS
SLIGHT HCL FIZZ

420 - 425 DOLOSTONE; VERY LIGHT ORANGE

24% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
50-90% ALTERED; ANHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-03%
OTHER FEATURES: CALCAREOUS
SLIGHT HCL FIZZ

425 - 426.4 DOLOSTONE; VERY LIGHT ORANGE
24% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
50-90% ALTERED; ANHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-04%, CALCILUTITE-03%
OTHER FEATURES: CALCAREOUS, VARVED

426.4 - 428.4 DOLOSTONE; YELLOWISH GRAY
35% POROSITY: VUGULAR, PIN POINT VUGS, MOLDIC
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: COARSE; RANGE: VERY FINE TO VERY COARSE
POOR INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
OTHER FEATURES: SPECKLED
FOSSILS: FOSSIL MOLDS

428.4 - 432 DOLOSTONE; VERY LIGHT ORANGE
24% POROSITY: INTERGRANULAR, INTRAGRANULAR; 50-90% ALTERED
ANHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-05%
OTHER FEATURES: CALCAREOUS, VARVED

432 - 443 DOLOSTONE; YELLOWISH GRAY
31% POROSITY: VUGULAR, PIN POINT VUGS, MOLDIC
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: COARSE; RANGE: VERY FINE TO VERY COARSE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-02%
OTHER FEATURES: CALCAREOUS, POOR SAMPLE
POOR RECOVERY

443 - 445 DOLOSTONE; VERY LIGHT ORANGE

20% POROSITY: INTERGRANULAR, INTRAGRANULAR; 50-90% ALTERED
ANHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-05%, ORGANICS-02%
OTHER FEATURES: CALCAREOUS, POOR SAMPLE
POOR RECOVERY

445 - 455 DOLOSTONE; VERY LIGHT ORANGE
30% POROSITY: PIN POINT VUGS, VUGULAR, MOLDIC
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO VERY COARSE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-02%, ORGANICS-02%
OTHER FEATURES: CALCAREOUS, POOR SAMPLE
POOR RECOVERY

455 - 459 DOLOSTONE; VERY LIGHT ORANGE
22% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-01%

459 - 460 DOLOSTONE; VERY LIGHT ORANGE
26% POROSITY: PIN POINT VUGS, MOLDIC, INTERGRANULAR
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
OTHER FEATURES: POOR SAMPLE
455-460 ONLY 2 FEET OF RECOVERY

460 - 465 DOLOSTONE; VERY LIGHT ORANGE
24% POROSITY: INTERGRANULAR, INTRAGRANULAR
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
OTHER FEATURES: POOR SAMPLE
ONLY 1 FOOT OF RECOVERY

465 - 466 DOLOSTONE; VERY LIGHT ORANGE
22% POROSITY: INTERGRANULAR, INTRAGRANULAR

90-100% ALTERED; ANHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
POOR INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-08%
OTHER FEATURES: CALCAREOUS

466 - 469.7 DOLOSTONE; VERY LIGHT ORANGE
33% POROSITY: VUGULAR, MOLDIC, POSSIBLY HIGH PERMEABILITY
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO VERY COARSE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
OTHER FEATURES: POOR SAMPLE
FOSSILS: FOSSIL MOLDS
ONLY 2 FEET OF RECOVERY, POSSIBLY DUE TO LARGE VUGS

469.7 - 470.2 DOLOSTONE; VERY LIGHT ORANGE
22% POROSITY: INTERGRANULAR, INTRAGRANULAR; 50-90% ALTERED
ANHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: CALCILUTITE-05%

470.2 - 476 DOLOSTONE; VERY LIGHT ORANGE
30% POROSITY: VUGULAR, MOLDIC, INTERGRANULAR
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: COARSE; RANGE: VERY FINE TO GRANULE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-03%
OTHER FEATURES: CALCAREOUS, POOR SAMPLE
FOSSILS: FOSSIL MOLDS

476 - 480 DOLOSTONE; VERY LIGHT ORANGE
22% POROSITY: INTERGRANULAR, INTRAGRANULAR; 50-90% ALTERED
ANHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-08%, ORGANICS-01%
OTHER FEATURES: CALCAREOUS

480 - 482 DOLOSTONE; VERY LIGHT ORANGE
28% POROSITY: INTERGRANULAR, PIN POINT VUGS, VUGULAR
90-100% ALTERED; ANHEDRAL

GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

482 - 484 DOLOSTONE; VERY LIGHT ORANGE
22% POROSITY: INTERGRANULAR, PIN POINT VUGS
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: CALCILUTITE-03%
OTHER FEATURES: CALCAREOUS

484 - 485 DOLOSTONE; VERY LIGHT ORANGE
22% POROSITY: INTERGRANULAR, PIN POINT VUGS
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: CALCILUTITE-03%
OTHER FEATURES: CALCAREOUS, POOR SAMPLE
ONLY 1 INCH RECOVERY FOR 1 FOOT INTERVAL

485 - 494.8 DOLOSTONE; VERY LIGHT ORANGE
30% POROSITY: INTERGRANULAR, MOLDIC, VUGULAR
90-100% ALTERED; ANHEDRAL
RANGE: VERY FINE TO GRANULE; MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-04%, ORGANICS-02%
OTHER FEATURES: CALCAREOUS
FOSSILS: FOSSIL MOLDS

494.8 - 496 DOLOSTONE; YELLOWISH GRAY TO VERY LIGHT GRAY
28% POROSITY: INTERGRANULAR, PIN POINT VUGS, VUGULAR
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-01%
FOSSILS: FOSSIL MOLDS

496 - 501 DOLOSTONE; YELLOWISH GRAY TO VERY LIGHT GRAY
30% POROSITY: INTERGRANULAR, MOLDIC, VUGULAR
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: COARSE; RANGE: VERY FINE TO GRANULE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX

ACCESSORY MINERALS: CALCILUTITE-08%
OTHER FEATURES: CALCAREOUS
FOSSILS: FOSSIL MOLDS

501 - 501.7 DOLOSTONE; VERY LIGHT GRAY TO YELLOWISH GRAY
25% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-03%
OTHER FEATURES: CALCAREOUS

501.7 - 503 DOLOSTONE; LIGHT OLIVE GRAY TO MODERATE LIGHT GRAY
26% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: COARSE; RANGE: VERY FINE TO VERY COARSE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-02%

503 - 505 DOLOSTONE; YELLOWISH GRAY TO LIGHT GRAY
30% POROSITY: VUGULAR, MOLDIC, INTERCRYSTALLINE
50-90% ALTERED; ANHEDRAL
GRAIN SIZE: VERY FINE
RANGE: MICROCRYSTALLINE TO MICROCRYSTALLINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-O2%
OTHER FEATURES: SPECKLED, VARIEGATED
FOSSILS: FOSSIL MOLDS

505 - 506 DOLOSTONE; MODERATE LIGHT GRAY TO YELLOWISH GRAY
24% POROSITY: INTERGRANULAR, INTRAGRANULAR; 50-90% ALTERED
ANHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO MEDIUM
POOR INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-15%
OTHER FEATURES: CALCAREOUS

506 - 514.5 DOLOSTONE; LIGHT GRAY TO YELLOWISH GRAY
30% POROSITY: VUGULAR, FRACTURE, INTERGRANULAR
50-90% ALTERED; ANHEDRAL
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO COARSE
MODERATE INDURATION

CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: CALCILUTITE-10%
OTHER FEATURES: CALCAREOUS
VUGS INFILLED WITH VERY FINE CALCAREOUS DOLOSILT

514.5 - 516.1 MUDSTONE; YELLOWISH GRAY TO MODERATE LIGHT GRAY
23% POROSITY: INTERGRANULAR, PIN POINT VUGS, FRACTURE
GRAIN TYPE: CALCILUTITE, INTRACLASTS
05% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: DOLOMITE-20%
OTHER FEATURES: DOLOMITIC, SPECKLED, CHALKY

516.1 - 520.6 MUDSTONE; YELLOWISH GRAY
22% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: CALCILUTITE; 02% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: SILT-SIZE DOLOMITE-20%
OTHER FEATURES: DOLOMITIC, POOR SAMPLE, CHALKY
ONLY 2 FEET OF RECOVERY

520.6 - 522.1 DOLOSTONE; LIGHT GRAY TO YELLOWISH GRAY
22% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
50-90% ALTERED; ANHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-10%, PYRITE-01%
OTHER FEATURES: CALCAREOUS, CHALKY

522.1 - 523.1 MUDSTONE; YELLOWISH GRAY
22% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: CALCILUTITE, SKELETAL
05% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: SILT-SIZE DOLOMITE-20%, PYRITE-02%
ORGANICS-01%
OTHER FEATURES: DOLOMITIC, CHALKY

523.1 - 524.3 DOLOSTONE; LIGHT GRAY TO YELLOWISH GRAY
28% POROSITY: VUGULAR, MOLDIC, INTERGRANULAR

50-90% ALTERED; ANHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-20%
OTHER FEATURES: CALCAREOUS
FOSSILS: FOSSIL MOLDS

524.3 - 525.2 MUDSTONE; YELLOWISH GRAY
22% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: CALCILUTITE, SKELETAL
05% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: SILT-SIZE DOLOMITE-20%, ORGANICS-01%
OTHER FEATURES: DOLOMITIC, CHALKY

525.2 - 531 DOLOSTONE; YELLOWISH GRAY TO LIGHT GRAY
28% POROSITY: VUGULAR, MOLDIC, INTERGRANULAR
50-90% ALTERED; ANHEDRAL
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-10%, ORGANICS-01%
PYRITE-01%
OTHER FEATURES: CALCAREOUS
FOSSILS: FOSSIL MOLDS

531 - 533 DOLOSTONE; LIGHT GRAY
30% POROSITY: VUGULAR, MOLDIC, INTERGRANULAR
50-90% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO COARSE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-02%
OTHER FEATURES: CALCAREOUS

533 - 534.4 DOLOSTONE; LIGHT GRAY
28% POROSITY: VUGULAR, MOLDIC, INTERGRANULAR
50-90% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

534.4 - 535 DOLOSTONE; YELLOWISH GRAY TO VERY LIGHT GRAY
26% POROSITY: VUGULAR, MOLDIC, INTERCRYSTALLINE

50-90% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

535 - 538.5 DOLOSTONE; YELLOWISH GRAY
28% POROSITY: VUGULAR, MOLDIC, INTERCRYSTALLINE
50-90% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

538.5 - 539.9 MUDSTONE; YELLOWISH GRAY TO VERY LIGHT ORANGE
22% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: CALCILUTITE; 98% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: DOLOMITE-10%, CLAY-05%
OTHER FEATURES: DOLOMITIC, CHALKY
CLAY IS AT 538.7 AND IS 1 INCH THICK

539.9 - 545 DOLOSTONE; YELLOWISH GRAY TO LIGHT GRAY
28% POROSITY: VUGULAR, MOLDIC, INTERGRANULAR
50-90% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-05%, PYRITE-03%
OTHER FEATURES: CALCAREOUS, SPECKLED, VARIEGATED
FOSSILS: FOSSIL MOLDS
ON BRINK OF BEING A CALCAREOUS DOLO-SILTSTONE

545 - 550.4 PEAT; DARK YELLOWISH BROWN

550.4 - 552.2 DOLOSTONE; GRAYISH BROWN TO DARK YELLOWISH BROWN
28% POROSITY: VUGULAR, PIN POINT VUGS, MOLDIC
50-90% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-01%, ORGANICS-05%
OTHER FEATURES: CRYSTALLINE
FOSSILS: FOSSIL MOLDS

552.2 - 553 DOLOSTONE; GRAYISH BROWN
26% POROSITY: INTERGRANULAR, PIN POINT VUGS

50-90% ALTERED; ANHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-15%, ORGANICS-02%
QUARTZ-01%
OTHER FEATURES: CALCAREOUS

553 - 554.3 DOLOSTONE; DARK YELLOWISH BROWN TO GRAYISH BROWN
28% POROSITY: VUGULAR, PIN POINT VUGS, MOLDIC
50-90% ALTERED; ANHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-15%, CALCILUTITE-10%
OTHER FEATURES: CALCAREOUS, VARIEGATED

554.3 - 555 DOLOSTONE; MODERATE YELLOWISH BROWN TO DARK YELLOWISH BROWN
22% POROSITY: INTERCRYSTALLINE, MOLDIC, PIN POINT VUGS
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-K0%, ORGANICS- %
OTHER FEATURES: CALCAREOUS
FOSSILS: FOSSIL MOLDS
SECTION CONTAINS SEVERAL RECRYSTALLIZED CUSHMANIA CONES

555 - 555.2 PEAT; DARK YELLOWISH BROWN

555.2 - 556.2 DOLOSTONE; MODERATE YELLOWISH BROWN TO GRAYISH BROWN
26% POROSITY: INTERGRANULAR, VUGULAR, PIN POINT VUGS
50-90% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-02%, QUARTZ-03%
ORGANICS-02%
OTHER FEATURES: CALCAREOUS, VARVED, CRYSTALLINE, FROSTED

556.2 - 557.3 DOLOSTONE; GRAYISH BROWN
22% POROSITY: INTERCRYSTALLINE, PIN POINT VUGS, MOLDIC
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

557.3 - 558.5 DOLOSTONE; GRAYISH BROWN TO MODERATE YELLOWISH BROWN
24% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
50-90% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-05%, CALCILUTITE-02%
OTHER FEATURES: CALCAREOUS, VARVED

558.5 - 561 DOLOSTONE; GRAYISH BROWN
20% POROSITY: INTERCRYSTALLINE, PIN POINT VUGS, VUGULAR
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-03%

561 - 561.6 DOLOSTONE; GRAYISH BROWN
26% POROSITY: INTERGRANULAR, INTRAGRANULAR; 50-90% ALTERED
ANHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
POOR INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-20%, ORGANICS-03%
OTHER FEATURES: CALCAREOUS

561.6 - 562.3 DOLOSTONE; GRAYISH BROWN
28% POROSITY: MOLDIC, PIN POINT VUGS, INTERCRYSTALLINE
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

562.3 - 563.7 DOLOSTONE; GRAYISH BROWN TO GREENISH GRAY
30% POROSITY: INTERGRANULAR, VUGULAR, FRACTURE
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-03%, QUARTZ-05%
OTHER FEATURES: FROSTED, CRYSTALLINE, WEATHERED
CRYSTALLINE DOLOSTONE INFILLED WITH SUCROSIC DOLOSTONE
DRUSY QUARTZ PRESENT IN THE SUCROSIC DOLOSTONE

563.7 - 564.1 DOLOSTONE; GRAYISH BROWN TO MODERATE YELLOWISH BROWN
26% POROSITY: INTERGRANULAR, INTRAGRANULAR, FRACTURE
50-90% ALTERED; ANHEDRAL

GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
POOR INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-08%, ORGANICS-06%
OTHER FEATURES: CALCAREOUS, MUDDY, VARIEGATED

564.1 - 568.7 DOLOSTONE; MODERATE YELLOWISH BROWN TO GRAYISH BROWN
28% POROSITY: VUGULAR, MOLDIC, FRACTURE; 90-100% ALTERED
ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-03%
FOSSILS: FOSSIL MOLDS

568.7 - 569.3 DOLOSTONE; MODERATE YELLOWISH BROWN
24% POROSITY: INTERGRANULAR, INTRAGRANULAR; 50-90% ALTERED
ANHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-20%, ORGANICS-08%
OTHER FEATURES: CALCAREOUS, VARVED
VARVES AND ORGANICS AT BOTTOM OF INTERVAL

569.3 - 570 DOLOSTONE; GRAYISH BROWN
24% POROSITY: VUGULAR, PIN POINT VUGS, MOLDIC
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
FOSSILS: FOSSIL MOLDS

570 - 570.2 DOLOSTONE; GRAYISH BROWN
26% POROSITY: INTERGRANULAR, INTRAGRANULAR
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-20%, ORGANICS-03%
OTHER FEATURES: CALCAREOUS

570.2 - 571.1 DOLOSTONE; GRAYISH BROWN
22% POROSITY: INTERCRYSTALLINE, INTERGRANULAR
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION

CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-02%
FOSSILS: FOSSIL MOLDS

571.1 - 572.2 DOLOSTONE; GRAYISH BROWN
26% POROSITY: PIN POINT VUGS, MOLDIC, VUGULAR
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
FOSSILS: FOSSIL MOLDS

572.2 - 572.4 DOLOSTONE; GRAYISH BROWN
24% POROSITY: INTERGRANULAR, INTRAGRANULAR; 50-90% ALTERED
ANHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
POOR INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-25%
OTHER FEATURES: CALCAREOUS

572.4 - 572.8 DOLOSTONE; GRAYISH BROWN
26% POROSITY: VUGULAR, MOLDIC, PIN POINT VUGS
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
FOSSILS: FOSSIL MOLDS

572.8 - 573.6 DOLOSTONE; GRAYISH BROWN
25% POROSITY: INTERGRANULAR, VUGULAR, FRACTURE
50-90% ALTERED; ANHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO MEDIUM
POOR INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-30%
OTHER FEATURES: CALCAREOUS

573.6 - 576.3 DOLOSTONE; GRAYISH BROWN
28% POROSITY: VUGULAR, MOLDIC, INTERGRANULAR
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
FOSSILS: FOSSIL MOLDS

576.3 - 577 MUDSTONE; GRAYISH BROWN

24% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: CALCILUTITE; 01% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: DOLOMITE-30%, ORGANICS-01%
OTHER FEATURES: DOLOMITIC

577 - 578.5 DOLOSTONE; GRAYISH BROWN
28% POROSITY: MOLDIC, PIN POINT VUGS, INTERCRYSTALLINE
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

578.5 - 578.7 MUDSTONE; GRAYISH BROWN
22% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: CALCILUTITE; 01% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-02%, SILT-SIZE DOLOMITE-05%
OTHER FEATURES: DOLOMITIC

578.7 - 580 DOLOSTONE; GRAYISH BROWN
15% POROSITY: INTERCRYSTALLINE, INTERGRANULAR
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-07%

580 - 580.3 CLAY; OLIVE GRAY
30% POROSITY: INTERGRANULAR, INTRAGRANULAR
POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX
ACCESSORY MINERALS: ORGANICS-20%
FOSSILS: ORGANICS

580.3 - 581.3 PEAT; BLACK

581.3 - 582.3 PEAT; DARK YELLOWISH BROWN
ACCESSORY MINERALS: CALCILUTITE-15%, CLAY-05%
OTHER FEATURES: CALCAREOUS
MOSTLY PEAT/ORGANICS WITH SIGNIFICANT MICRITE AND CLAY

582.3 - 583.8 WACKESTONE; DARK YELLOWISH BROWN

20% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: SKELETAL, BIOGENIC
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-20%
FOSSILS: ORGANICS, FOSSIL FRAGMENTS

583.8 - 585.3 DOLOSTONE; DARK YELLOWISH BROWN TO DARK YELLOWISH BROWN
22% POROSITY: INTERCRYSTALLINE, INTERGRANULAR
PIN POINT VUGS; 90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-15%

585.3 - 586 DOLOSTONE; DARK YELLOWISH BROWN TO DARK YELLOWISH BROWN
25% POROSITY: VUGULAR, MOLDIC, INTERCRYSTALLINE
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: CRYPTOCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-20%
FOSSILS: FOSSIL MOLDS

586 - 586.5 DOLOSTONE; DARK YELLOWISH BROWN TO DARK YELLOWISH BROWN
26% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-20%, QUARTZ-02%

586.5 - 586.6 PEAT; DARK YELLOWISH BROWN

586.6 - 588 DOLOSTONE; DARK YELLOWISH BROWN TO DARK YELLOWISH BROWN
22% POROSITY: INTERCRYSTALLINE, PIN POINT VUGS, MOLDIC
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-07%
FOSSILS: FOSSIL MOLDS

588 - 588.3 DOLOSTONE; DARK YELLOWISH BROWN
22% POROSITY: INTERGRANULAR, POSSIBLY HIGH PERMEABILITY

50-90% ALTERED; ANHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-25%
OTHER FEATURES: CALCAREOUS

588.3 - 589.8 PEAT; DARK YELLOWISH BROWN TO GRAYISH BROWN
ACCESSORY MINERALS: CALCILUTITE-10%
OTHER FEATURES: CALCAREOUS

589.8 - 594.6 PACKSTONE; GRAYISH BROWN TO LIGHT BROWNISH GRAY
24% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: SKELETAL, BIOGENIC, CRYSTALS
88% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: VERY FINE TO VERY COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-14%
FOSSILS: FOSSIL FRAGMENTS, ORGANICS

594.6 - 600.5 GRAINSTONE; GRAYISH BROWN
24% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CRYSTALS
92% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY COARSE
RANGE: MICROCRYSTALLINE TO GRANULE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-08%, ORGANICS-04%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: FOSSIL FRAGMENTS, BENTHIC FORAMINIFERA

600.5 - 601.5 PACKSTONE; GRAYISH BROWN
24% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CRYSTALS
82% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: VERY FINE TO VERY COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: ORGANICS-15%, SPAR-04%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: FOSSIL FRAGMENTS, BENTHIC FORAMINIFERA

601.5 - 602.4 GRAINSTONE; GRAYISH BROWN
24% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CRYSTALS
90% ALLOCHEMICAL CONSTITUENTS

GRAIN SIZE: VERY COARSE
RANGE: MICROCRYSTALLINE TO GRANULE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: ORGANICS-15%, SPAR-03%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: FOSSIL FRAGMENTS, BENTHIC FORAMINIFERA

602.4 - 607.4 PEAT; DARK YELLOWISH BROWN
ACCESSORY MINERALS: CALCILUTITE-08%
THIN MUDSTONE BEDS WITH IN PEAT AT 603, 604 AND 604.8

607.4 - 607.9 PACKSTONE; DARK YELLOWISH BROWN
22% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO VERY COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-25%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: ORGANICS, FOSSIL FRAGMENTS

607.9 - 608.5 MUDSTONE; DARK YELLOWISH BROWN
20% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: CALCILUTITE, SKELETAL
05% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX

608.5 - 610 PACKSTONE; DARK YELLOWISH BROWN
26% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-05%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: ORGANICS, FOSSIL FRAGMENTS

610 - 611.7 PACKSTONE; GRAYISH BROWN
22% POROSITY: INTERGRANULAR, INTRAGRANULAR
INTERCRYSTALLINE
GRAIN TYPE: SKELETAL, BIOGENIC, CRYSTALS
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM

GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-10%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: FOSSIL FRAGMENTS

611.7 - 624.9 PACKSTONE; GRAYISH BROWN
26% POROSITY: INTERGRANULAR, MOLDIC, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC
90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-05%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: CORAL, BENTHIC FORAMINIFERA, MILIOLIDS, CONES
FOSSIL FRAGMENTS

624.9 - 626.6 PACKSTONE; GRAYISH BROWN
24% POROSITY: INTERGRANULAR, MOLDIC, INTERCRYSTALLINE
GRAIN TYPE: SKELETAL, BIOGENIC, CRYSTALS
88% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-10%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: CORAL, BENTHIC FORAMINIFERA, MILIOLIDS, CONES
FOSSIL FRAGMENTS

626.6 - 627.8 PACKSTONE; GRAYISH BROWN
26% POROSITY: INTERGRANULAR, MOLDIC, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-05%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: CORAL, BENTHIC FORAMINIFERA, MILIOLIDS, CONES
FOSSIL FRAGMENTS

627.8 - 628.7 PACKSTONE; GRAYISH BROWN
22% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO VERY COARSE

GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-03%, ORGANICS-03%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: CORAL, BENTHIC FORAMINIFERA, MILIOLIDS, CONES
FOSSIL FRAGMENTS

628.7 - 629.6 PACKSTONE; GRAYISH BROWN
26% POROSITY: MOLDIC, INTERGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-04%, ORGANICS-04%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: CORAL, BENTHIC FORAMINIFERA, MILIOLIDS, CONES
FOSSIL FRAGMENTS

629.6 - 631.5 PACKSTONE; GRAYISH BROWN
26% POROSITY: INTERGRANULAR, MOLDIC, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: VERY FINE TO GRANULE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-01%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: CONES, FOSSIL FRAGMENTS, BENTHIC FORAMINIFERA
LOTS OF CUSHMANIA AMERICANA CONES

631.5 - 636.6 MUDSTONE; GRAYISH BROWN
22% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
GRAIN TYPE: CALCILUTITE, BIOGENIC
05% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCITE-03%, ORGANICS-02%
OTHER FEATURES: CHALKY
FOSSILS: NO FOSSILS

636.6 - 640.5 MUDSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
24% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
GRAIN TYPE: CALCILUTITE, BIOGENIC, INTRACLASTS
08% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO MEDIUM

GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-05%, CALCITE-01%
OTHER FEATURES: CHALKY
FOSSILS: ORGANICS

640.5 - 645 PACKSTONE; GRAYISH BROWN
28% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
88% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY COARSE
RANGE: MICROCRYSTALLINE TO GRANULE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCITE-03%, ORGANICS-01%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: ECHINOID, BENTHIC FORAMINIFERA, CONES
FOSSIL FRAGMENTS, FOSSIL MOLDS

645 - 647 WACKESTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
24% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
GRAIN TYPE: CALCILUTITE, SKELETAL, BIOGENIC
25% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCITE-03%, ORGANICS-01%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: FOSSIL FRAGMENTS, FOSSIL MOLDS, CONES
BENTHIC FORAMINIFERA
INFILLED VOIDS OR BURROWS CONTAIN GRAINS LARGER THAN VERY FINE

647 - 654 PACKSTONE; GRAYISH BROWN
28% POROSITY: INTERGRANULAR, PIN POINT VUGS
POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: VERY FINE TO GRANULE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-03%, ORGANICS-01%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: FOSSIL FRAGMENTS, CONES, MILIOLIDS, ECHINOID

654 - 655.1 PACKSTONE; GRAYISH BROWN
28% POROSITY: INTERGRANULAR, PIN POINT VUGS
POSSIBLY HIGH PERMEABILITY

GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: VERY FINE TO GRANULE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: ORGANICS-05%, SPAR-03%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: FOSSIL FRAGMENTS, CONES, MILIOLIDS, ECHINOID

655.1 - 658.8 PACKSTONE; GRAYISH BROWN
26% POROSITY: INTERGRANULAR, PIN POINT VUGS
POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: VERY FINE TO GRANULE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: ORGANICS-03%, SPAR-03%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: FOSSIL FRAGMENTS, CONES, MILIOLIDS, ECHINOID

658.8 - 665.6 PACKSTONE; GRAYISH BROWN
24% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-05%, ORGANICS-01%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: FOSSIL FRAGMENTS, MILIOLIDS

665.6 - 670.3 PACKSTONE; GRAYISH BROWN
26% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
88% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: VERY FINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: ORGANICS-03%, SPAR-02%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: FOSSIL FRAGMENTS, MILIOLIDS

670.3 - 675 PACKSTONE; GRAYISH BROWN TO DARK YELLOWISH BROWN
22% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS

GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: ORGANICS-10%, SPAR-04%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: FOSSIL FRAGMENTS, MILIOLIDS

675 - 680 PACKSTONE; GRAYISH BROWN TO MODERATE YELLOWISH BROWN
20% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CRYSTALS
75% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-10%, CALCITE-02%, ORGANICS-01%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: FOSSIL FRAGMENTS, MILIOLIDS, ECHINOID
BENTHIC FORAMINIFERA

680 - 688.1 PACKSTONE; GRAYISH BROWN TO MODERATE YELLOWISH BROWN
22% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
GRAIN TYPE: SKELETAL, BIOGENIC, CRYSTALS
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-05%, CALCITE-02%, ORGANICS-02%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: FOSSIL FRAGMENTS, MILIOLIDS, ECHINOID
BENTHIC FORAMINIFERA

688.1 - 689.7 PACKSTONE; GRAYISH BROWN
22% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCITE-02%, ORGANICS-05%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: FOSSIL FRAGMENTS, MILIOLIDS, ECHINOID
BENTHIC FORAMINIFERA

689.7 - 690.1 PEAT; DARK YELLOWISH BROWN
ACCESSORY MINERALS: CALCILUTITE-15%
OTHER FEATURES: CALCAREOUS

690.1 - 691.9 PACKSTONE; GRAYISH BROWN TO DARK GRAY
24% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-12%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: FOSSIL FRAGMENTS, MILIOLIDS

691.9 - 696.1 PACKSTONE; GRAYISH BROWN
24% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: VERY FINE TO VERY COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-08%, ORGANICS-05%, CALCITE-02%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: FOSSIL FRAGMENTS, MILIOLIDS, ORGANICS

696.1 - 700 PACKSTONE; GRAYISH BROWN
22% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CRYSTALS
75% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: VERY FINE TO VERY COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-12%, CALCITE-03%, ORGANICS-02%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: FOSSIL FRAGMENTS, MILIOLIDS

700 - 707 PACKSTONE; GRAYISH BROWN
22% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CRYSTALS
75% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: VERY FINE TO VERY COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-10%, CALCITE-05%, ORGANICS-01%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: FOSSIL FRAGMENTS, MILIOLIDS

707 - 710.2 DOLOSTONE; DARK YELLOWISH BROWN
26% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL

GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
OTHER FEATURES: SUCROSIC

710.2 - 715 DOLOSTONE; DARK YELLOWISH BROWN
24% POROSITY: INTERCRYSTALLINE, INTERGRANULAR
PIN POINT VUGS; 90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO COARSE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

715 - 721 DOLOSTONE; DARK YELLOWISH BROWN
26% POROSITY: INTERGRANULAR, INTERCRYSTALLINE
PIN POINT VUGS; 90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: CALCILUTITE-02%

721 - 726.4 DOLOSTONE; DARK YELLOWISH BROWN
22% POROSITY: INTERCRYSTALLINE, INTERGRANULAR
PIN POINT VUGS; 90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO COARSE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: CALCILUTITE-02%

726.4 - 728.1 DOLOSTONE; DARK YELLOWISH BROWN
28% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-02%
OTHER FEATURES: SUCROSIC
FOSSILS: FOSSIL MOLDS

728.1 - 730.7 DOLOSTONE; DARK YELLOWISH BROWN
20% POROSITY: INTERCRYSTALLINE, INTERGRANULAR
PIN POINT VUGS; 90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-01%
OTHER FEATURES: CRYSTALLINE

730.7 - 735 DOLOSTONE; DARK YELLOWISH BROWN
24% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: CALCILUTITE-02%, CALCITE-01%
OTHER FEATURES: CALCAREOUS, SUCROSIC, CRYSTALLINE

735 - 745 NO CORE RECOVERY FROM 735 - 745

745 - 745.5 DOLOSTONE; DARK YELLOWISH BROWN
24% POROSITY: INTERGRANULAR, INTRAGRANULAR
INTERCRYSTALLINE; 90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-03%
OTHER FEATURES: POOR SAMPLE
SAMPLE IS RUBBLE, POSSIBLY FROM ABOVE

745.5 - 757.1 PACKSTONE; GRAYISH BROWN TO MODERATE YELLOWISH BROWN
28% POROSITY: INTERGRANULAR, INTRAGRANULAR
POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: SKELETAL, BIOGENIC, CRYSTALS
88% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY COARSE
RANGE: MICROCRYSTALLINE TO GRANULE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: DOLOMITE-20%
OTHER FEATURES: DOLOMITIC
FOSSILS: FOSSIL FRAGMENTS, CORAL, BRYOZOA, MILIOLIDS
CONES
DOLOMITE VARIES OVER THE INTERVAL, UP TO 30% AS LOW AS 10%

757.1 - 760 DOLOSTONE; DARK YELLOWISH BROWN TO MODERATE YELLOWISH BROWN
28% POROSITY: INTERGRANULAR, INTRAGRANULAR
POSSIBLY HIGH PERMEABILITY; 90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
OTHER FEATURES: POOR SAMPLE
ONLY 6 INCHES OF RUBBLE FOR THE INTERVAL

760 - 765.5 DOLOSTONE; DARK YELLOWISH BROWN
28% POROSITY: INTERGRANULAR, PIN POINT VUGS, FRACTURE
90-100% ALTERED; SUBHEDRAL

GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
OTHER FEATURES: CRYSTALLINE, SUCROSIC

765.5 - 772 DOLOSTONE; DARK YELLOWISH BROWN
30% POROSITY: INTERGRANULAR, VUGULAR, FRACTURE
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
OTHER FEATURES: CRYSTALLINE, SUCROSIC
LESS CRYSTALLINE MORE SUCROSIC WITH LARGER VUGS THAN
PREVIOUS INTERVAL

772 - 773 DOLOSTONE; DARK YELLOWISH BROWN TO MODERATE YELLOWISH BROWN
32% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
OTHER FEATURES: SUCROSIC

773 - 780.4 DOLOSTONE; DARK YELLOWISH BROWN
28% POROSITY: INTERGRANULAR, INTERCRYSTALLINE
PIN POINT VUGS; 90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-02%, ORGANICS-01%
OTHER FEATURES: CRYSTALLINE
MOSTLY CRYSTALLINE WITH FROSTED ANHEDRAL FINES

780.4 - 781.2 DOLOSTONE; MODERATE YELLOWISH BROWN TO DARK YELLOWISH BROWN
28% POROSITY: INTERGRANULAR, INTRAGRANULAR
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-03%
OTHER FEATURES: FROSTED

781.2 - 782.2 DOLOSTONE; MODERATE YELLOWISH BROWN
24% POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

OTHER FEATURES: CRYSTALLINE

782.2 - 783.5 DOLOSTONE; MODERATE YELLOWISH BROWN
26% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-04%
OTHER FEATURES: VARVED
VARVES OF ORGANICS AT 782.5 FEET

783.5 - 787 DOLOSTONE; DARK YELLOWISH BROWN TO MODERATE YELLOWISH BROWN
26% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-05%

787 - 790.7 DOLOSTONE; MODERATE YELLOWISH BROWN
28% POROSITY: INTERGRANULAR, INTERCRYSTALLINE, VUGULAR
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
OTHER FEATURES: CRYSTALLINE, SUCROSIC

790.7 - 791.8 DOLOSTONE; MODERATE YELLOWISH BROWN TO DARK YELLOWISH BROWN
26% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-04%
OTHER FEATURES: FROSTED

791.8 - 792.1 DOLOSTONE; MODERATE YELLOWISH BROWN
24% POROSITY: INTERCRYSTALLINE, INTERGRANULAR
PIN POINT VUGS; 90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

792.1 - 792.4 DOLOSTONE; MODERATE YELLOWISH BROWN
26% POROSITY: INTERGRANULAR, INTRAGRANULAR
90-100% ALTERED; SUBHEDRAL

GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

792.4 - 793 DOLOSTONE; MODERATE YELLOWISH BROWN TO GRAYISH BROWN
24% POROSITY: INTERCRYSTALLINE, MOLDIC, PIN POINT VUGS
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

793 - 794 DOLOSTONE; MODERATE YELLOWISH BROWN
26% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-02%
OTHER FEATURES: FROSTED

794 - 797 DOLOSTONE; MODERATE YELLOWISH BROWN
24% POROSITY: INTERCRYSTALLINE, MOLDIC, PIN POINT VUGS
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-01%, QUARTZ-01%
OTHER FEATURES: CRYSTALLINE, FROSTED

797 - 798.3 DOLOSTONE; MODERATE YELLOWISH BROWN
26% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: QUARTZ-01%
OTHER FEATURES: FROSTED

798.3 - 799.3 DOLOSTONE; MODERATE YELLOWISH BROWN
28% POROSITY: VUGULAR, INTERGRANULAR, INTRAGRANULAR
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: QUARTZ-01%

799.3 - 800.4 DOLOSTONE; MODERATE YELLOWISH BROWN

28% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
POOR INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-02%, CALCILUTITE-02%
OTHER FEATURES: FROSTED

800.4 - 803 DOLOSTONE; MODERATE YELLOWISH BROWN TO DARK YELLOWISH BROWN
30% POROSITY: VUGULAR, INTERGRANULAR, INTERCRYSTALLINE
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: QUARTZ-01%
OTHER FEATURES: CRYSTALLINE, SUCROSIC

803 - 803.3 DOLOSTONE; MODERATE YELLOWISH BROWN TO DARK YELLOWISH BROWN
28% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
POOR INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-05%
OTHER FEATURES: VARVED
ORGANIC VARVES ARE AT TOP OF INTERVAL

803.3 - 803.7 DOLOSTONE; MODERATE YELLOWISH BROWN
28% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
OTHER FEATURES: SUCROSIC

803.7 - 804.9 DOLOSTONE; MODERATE YELLOWISH BROWN TO DARK YELLOWISH BROWN
26% POROSITY: INTERGRANULAR, PIN POINT VUGS
INTERCRYSTALLINE; 90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
OTHER FEATURES: CRYSTALLINE, SUCROSIC

804.9 - 806 DOLOSTONE; GRAYISH BROWN
20% POROSITY: INTERGRANULAR, INTRAGRANULAR
INTERCRYSTALLINE; 50-90% ALTERED; ANHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE

GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-25%, ORGANICS-10%
OTHER FEATURES: CALCAREOUS
FOSSILS: ORGANICS, FOSSIL FRAGMENTS

806 - 807.1 PACKSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
24% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CRYSTALS
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: DOLOMITE-25%, ORGANICS-10%
OTHER FEATURES: DOLOMITIC
FOSSILS: ORGANICS

807.1 - 810.5 PACKSTONE; BROWNISH GRAY
22% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-25%
FOSSILS: ORGANICS

810.5 - 811 WACKESTONE; GRAYISH BROWN TO LIGHT BROWNISH GRAY
20% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
40% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-15%
OTHER FEATURES: VARVED
WITHIN THE INTERVAL THERE ARE A COUPLE THIN 3MM LAYERS
WITH LARGER AND HIGHER PERCENTAGE ALLOCHEMS

811 - 814.5 PACKSTONE; GRAYISH BROWN
22% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-07%, ORGANICS-03%, CLAY-01%

OTHER FEATURES: SPECKLED
FOSSILS: FOSSIL FRAGMENTS

814.5 - 814.8 WACKESTONE; DARK YELLOWISH BROWN
20% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE
50% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-10%
OTHER FEATURES: VARVED
CONTAINS SEVERAL INFILLED AREAS WITH MEDIUM GRAINS
ORGANICS ARE SCATTERED AND VARVED

814.8 - 816.8 PACKSTONE; GRAYISH BROWN
22% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
88% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-02%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: CORAL, BENTHIC FORAMINIFERA, CONES
FOSSIL FRAGMENTS

816.8 - 817.2 WACKESTONE; GRAYISH BROWN TO DARK YELLOWISH BROWN
20% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE
45% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-10%
OTHER FEATURES: VARVED
FOSSILS: FOSSIL FRAGMENTS
THERE IS ONE 3MM SECTION OF MEDIUM GRAINED PACKSTONE
ORGANICS ARE SCATTERED AND VARVED

817.2 - 818.2 PACKSTONE; GRAYISH BROWN
22% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: SKELETAL, CRYSTALS, CALCILUTITE
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT

ACCESSORY MINERALS: SPAR-08%, CALCITE-02%, ORGANICS-02%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: CORAL, ECHINOID, BENTHIC FORAMINIFERA, CONES
MILIOLIDS

818.2 - 822.5 PACKSTONE; GRAYISH BROWN
22% POROSITY: INTERGRANULAR, INTRAGRANULAR
INTERCRYSTALLINE
GRAIN TYPE: SKELETAL, CRYSTALS, CALCILUTITE
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: VERY FINE TO GRANULE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-10%, CALCITE-06%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: CORAL, ECHINOID, BENTHIC FORAMINIFERA, CONES
MILIOLIDS

822.5 - 823.8 PACKSTONE; GRAYISH BROWN
24% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-03%, CALCITE-01%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: CORAL, ECHINOID, BENTHIC FORAMINIFERA, CONES
MILIOLIDS

823.8 - 825.7 PACKSTONE; GRAYISH BROWN
22% POROSITY: INTERGRANULAR, INTRAGRANULAR
INTERCRYSTALLINE
GRAIN TYPE: SKELETAL, CRYSTALS, CALCILUTITE
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: VERY FINE TO GRANULE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-10%, CALCITE-06%, ORGANICS-02%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: CORAL, ECHINOID, BENTHIC FORAMINIFERA, CONES
MILIOLIDS

825.7 - 831.7 AS ABOVE

831.7 - 834 PACKSTONE; GRAYISH BROWN
24% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS

GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO GRANULE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: ORGANICS-02%, SPAR-03%, CALCITE-01%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: CORAL, BENTHIC FORAMINIFERA, CONES, MILIOLIDS

834 - 840 PACKSTONE; GRAYISH BROWN
24% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: ORGANICS-04%, SPAR-01%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: CORAL, BENTHIC FORAMINIFERA, MILIOLIDS

840 - 845 PACKSTONE; GRAYISH BROWN
26% POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
88% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-10%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: CORAL, BENTHIC FORAMINIFERA, MILIOLIDS, CONES
ORGANICS IN THIN 1-3MM LENSES AND LAMINATIONS

845 - 846.7 PACKSTONE; GRAYISH BROWN
28% POROSITY: INTERGRANULAR, MOLDIC, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
88% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: VERY FINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-01%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: CORAL, ECHINOID, BENTHIC FORAMINIFERA, MILIOLIDS
CONES

846.7 - 847.5 PACKSTONE; GRAYISH BROWN
28% POROSITY: INTERGRANULAR, MOLDIC, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE

88% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: VERY FINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-04%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: CORAL, ECHINOID, BENTHIC FORAMINIFERA, MILIOLIDS
CONES

847.5 - 861.7 PACKSTONE; GRAYISH BROWN
26% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-02%, ORGANICS-01%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: CORAL, ECHINOID, BENTHIC FORAMINIFERA, MILIOLIDS
CONES

861.7 - 862.5 PACKSTONE; GRAYISH BROWN
26% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: ORGANICS-07%, SPAR-03%, CALCITE-01%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: CORAL, ECHINOID, BENTHIC FORAMINIFERA, MILIOLIDS
CONES
ORGANIC LENSES CONCENTRATED FROM 860.0-861.8

862.5 - 865.5 PACKSTONE; GRAYISH BROWN
26% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-03%, ORGANICS-01%, CALCITE-01%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: CORAL, ECHINOID, BENTHIC FORAMINIFERA, MILIOLIDS
CONES

865.5 - 868.1 PACKSTONE; GRAYISH BROWN

25% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
82% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: ORGANICS-05%, SPAR-02%, CALCITE-01%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: CORAL, ECHINOID, BENTHIC FORAMINIFERA, MILIOLIDS CONES

868.1 - 868.2 DOLOSTONE; DARK YELLOWISH BROWN
23% POROSITY: INTERGRANULAR, INTRAGRANULAR; 50-90% ALTERED EUHEDRAL
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-20%
OTHER FEATURES: CALCAREOUS
FOSSILS: FOSSIL FRAGMENTS

868.2 - 875 DOLOSTONE; DARK YELLOWISH BROWN
26% POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: COARSE; RANGE: COARSE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: CALCILUTITE-04%
FOSSILS: FOSSIL MOLDS
THERE IS SOME EUHEDRAL AND ANHEDRAL DOLOMITE CRYSTALS

875 - 875.5 WACKESTONE; GRAYISH BROWN
24% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: CALCILUTITE, SKELETAL, BIOGENIC
45% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: FOSSILIFEROUS

875.5 - 880 PACKSTONE; GRAYISH BROWN
26% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: VERY FINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX

OTHER FEATURES: FOSSILIFEROUS
FOSSILS: CORAL, ECHINOID, BENTHIC FORAMINIFERA, MILIOLIDS
CONES

880 - 885.8 PACKSTONE; GRAYISH BROWN
28% POROSITY: INTERGRANULAR, VUGULAR, MOLDIC
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: VERY FINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-01%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: BENTHIC FORAMINIFERA, MILIOLIDS, CONES

885.8 - 890 PACKSTONE; GRAYISH BROWN TO MODERATE YELLOWISH BROWN
28% POROSITY: INTERGRANULAR, VUGULAR, INTRAGRANULAR
GRAIN TYPE: SKELETAL, CRYSTALS, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: VERY FINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: DOLOMITE-25%
OTHER FEATURES: DOLOMITIC
FOSSILS: CONES, BENTHIC FORAMINIFERA, MILIOLIDS
FOSSIL FRAGMENTS
887-889 IS HIGHLY DOLOMITIC

890 - 895.6 PACKSTONE; GRAYISH BROWN
28% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: VERY FINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: CONES, MILIOLIDS, BENTHIC FORAMINIFERA
FOSSIL FRAGMENTS

895.6 - 897.3 PACKSTONE; GRAYISH BROWN
26% POROSITY: INTERGRANULAR, PIN POINT VUGS
INTERCRYSTALLINE
GRAIN TYPE: SKELETAL, CALCILUTITE, OOLITE CLAST
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT

ACCESSORY MINERALS: SPAR-07%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: FOSSIL FRAGMENTS

897.3 - 907.1 PACKSTONE; GRAYISH BROWN
26% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: VERY FINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-03%, ORGANICS-03%
OTHER FEATURES: FOSSILIFEROUS, SPECKLED
FOSSILS: FOSSIL FRAGMENTS, CORAL, BENTHIC FORAMINIFERA
MILIOLIDS

907.1 - 908.2 PACKSTONE; GRAYISH BROWN TO MODERATE YELLOWISH BROWN
28% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, OOLITE CLAST, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: DOLOMITE-15%
OTHER FEATURES: DOLOMITIC
FOSSILS: FOSSIL FRAGMENTS

908.2 - 908.7 DOLOSTONE; DARK YELLOWISH BROWN TO MODERATE YELLOWISH BROWN
28% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
50-90% ALTERED; SUBHEDRAL
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-15%
OTHER FEATURES: CALCAREOUS
FOSSILS: FOSSIL FRAGMENTS

908.7 - 909.4 DOLOSTONE; DARK YELLOWISH BROWN
32% POROSITY: INTERGRANULAR, INTRAGRANULAR, VUGULAR
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: COARSE; RANGE: VERY FINE TO VERY COARSE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-05%, ORGANICS-02%
OTHER FEATURES: CALCAREOUS

909.4 - 911 DOLOSTONE; DARK YELLOWISH BROWN

30% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO VERY COARSE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: CALCILUTITE-05%, ORGANICS-02%
OTHER FEATURES: CALCAREOUS

911 - 914.6 DOLOSTONE; DARK YELLOWISH BROWN
33% POROSITY: INTERGRANULAR, INTRAGRANULAR, VUGULAR
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: COARSE; RANGE: VERY FINE TO VERY COARSE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: CALCILUTITE-05%, ORGANICS-02%
OTHER FEATURES: CALCAREOUS

914.6 - 915.7 DOLOSTONE; DARK YELLOWISH BROWN
30% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-08%, ORGANICS-08%
OTHER FEATURES: CALCAREOUS

915.7 - 918.6 DOLOSTONE; DARK YELLOWISH BROWN
35% POROSITY: INTERGRANULAR, INTRAGRANULAR, VUGULAR
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-05%, ORGANICS-03%
OTHER FEATURES: CALCAREOUS

918.6 - 920 DOLOSTONE; DARK YELLOWISH BROWN
32% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-10%, ORGANICS-10%
OTHER FEATURES: CALCAREOUS

920 - 921.6 DOLOSTONE; DARK YELLOWISH BROWN
30% POROSITY: FRACTURE, VUGULAR, INTERGRANULAR
90-100% ALTERED; ANHEDRAL

GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO COARSE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: CALCILUTITE-01%

921.6 - 922 DOLOSTONE; DARK YELLOWISH BROWN
35% POROSITY: INTERGRANULAR, INTRAGRANULAR
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM
POOR INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: CALCILUTITE-02%

922 - 931.2 DOLOSTONE; DARK YELLOWISH BROWN
30% POROSITY: FRACTURE, VUGULAR, INTERGRANULAR
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO COARSE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

931.2 - 931.6 DOLOSTONE; DARK YELLOWISH BROWN
35% POROSITY: INTERGRANULAR, INTRAGRANULAR
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
POOR INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-03%, ORGANICS-05%
OTHER FEATURES: CALCAREOUS

931.6 - 935.5 DOLOSTONE; DARK YELLOWISH BROWN
28% POROSITY: FRACTURE, PIN POINT VUGS, INTERGRANULAR
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO COARSE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-02%, CALCILUTITE-02%

935.5 - 937 DOLOSTONE; DARK YELLOWISH BROWN
33% POROSITY: VUGULAR, FRACTURE, INTERGRANULAR
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-02%, ORGANICS-02%
VUGS IN CRYSTALLINE DOLOSTONE FILLED WITH MEDIUM GRAINED
SUBHEDRAL DOLOMITE GRAINS

937 - 937.8 MUDSTONE; VERY LIGHT ORANGE
24% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: CALCILUTITE, CRYSTALS, SKELETAL
08% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: DOLOMITE-20%
OTHER FEATURES: DOLOMITIC
FOSSILS: MILIOLIDS, FOSSIL FRAGMENTS

937.8 - 938.1 DOLOSTONE; DARK YELLOWISH BROWN TO VERY LIGHT ORANGE
28% POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
INTERGRANULAR; 90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO COARSE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX

938.1 - 938.6 WACKESTONE; VERY LIGHT ORANGE TO DARK YELLOWISH BROWN
26% POROSITY: INTERGRANULAR, INTRAGRANULAR, VUGULAR
GRAIN TYPE: CALCILUTITE, SKELETAL, CRYSTALS
40% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO VERY COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
SEDIMENTARY STRUCTURES: MOTTLED
ACCESSORY MINERALS: DOLOMITE-20%
OTHER FEATURES: DOLOMITIC
FOSSILS: FOSSIL FRAGMENTS, CONES, MILIOLIDS

938.6 - 940.6 WACKESTONE; VERY LIGHT ORANGE TO DARK YELLOWISH BROWN
24% POROSITY: INTERGRANULAR, INTRAGRANULAR, VUGULAR
GRAIN TYPE: CALCILUTITE, SKELETAL
40% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO VERY COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: DOLOMITE-05%, ORGANICS-04%
OTHER FEATURES: DOLOMITIC
FOSSILS: FOSSIL FRAGMENTS, CONES, MILIOLIDS
BENTHIC FORAMINIFERA

940.6 - 941.3 MUDSTONE; GRAYISH BROWN TO LIGHT BROWNISH GRAY
22% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: CALCILUTITE, SKELETAL
05% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO MEDIUM

MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: DOLOMITE-08%, ORGANICS-05%
OTHER FEATURES: DOLOMITIC
FOSSILS: FOSSIL FRAGMENTS

941.3 - 943.3 DOLOSTONE; DARK YELLOWISH BROWN
22% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-25%

943.3 - 944.3 WACKESTONE; GRAYISH BROWN TO DARK YELLOWISH BROWN
22% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
50% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-05%
FOSSILS: FOSSIL FRAGMENTS

944.3 - 947.1 PACKSTONE; GRAYISH BROWN
24% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: VERY FINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-03%, CALCITE-01%
FOSSILS: FOSSIL FRAGMENTS, CORAL, BENTHIC FORAMINIFERA
MILIOLIDS

947.1 - 952.8 PACKSTONE; GRAYISH BROWN
26% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-03%, ORGANICS-02%, CALCITE-01%
FOSSILS: FOSSIL FRAGMENTS

952.8 - 956.6 PACKSTONE; GRAYISH BROWN
26% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS

GRAIN TYPE: SKELETAL, BIOGENIC, CRYSTALS
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: DOLOMITE-15%, ORGANICS-03%
CALCITE-02%
OTHER FEATURES: DOLOMITIC
FOSSILS: FOSSIL FRAGMENTS

956.6 - 966 DOLOSTONE; DARK YELLOWISH BROWN
24% POROSITY: INTERCRYSTALLINE, FRACTURE, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
OTHER FEATURES: POOR SAMPLE
LOWER PORTION OF INTERVAL MISSING, POSSIBLY A LARGE VUG

966 - 967.5 DOLOSTONE; MODERATE YELLOWISH BROWN TO DARK YELLOWISH BROWN
30% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

967.5 - 968.6 DOLOSTONE; MODERATE YELLOWISH BROWN TO DARK YELLOWISH BROWN
30% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-15%

968.6 - 980 DOLOSTONE; DARK YELLOWISH BROWN
32% POROSITY: FRACTURE, VUGULAR, PIN POINT VUGS
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: GLAUCONITE-01%, ORGANICS-01%
FOSSILS: FOSSIL MOLDS

980 - 982.2 DOLOSTONE; DARK YELLOWISH BROWN TO MODERATE YELLOWISH BROWN
38% POROSITY: INTERGRANULAR, PIN POINT VUGS, FRACTURE
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE

GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: GLAUCONITE-02%, ORGANICS-01%
OTHER FEATURES: SUCROSIC
FOSSILS: FOSSIL MOLDS

982.2 - 984.6 DOLOSTONE; DARK YELLOWISH BROWN
30% POROSITY: FRACTURE, VUGULAR, INTERCRYSTALLINE
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: GLAUCONITE-02%, ORGANICS-01%
FOSSILS: FOSSIL MOLDS

984.6 - 985.9 MUDSTONE; GRAYISH BROWN
28% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: CALCILUTITE, CRYSTALS, BIOGENIC
10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: GLAUCONITE-02%, ORGANICS-04%
DOLOMITE-02%
OTHER FEATURES: SPECKLED
FOSSILS: FOSSIL FRAGMENTS

985.9 - 988 PACKSTONE; GRAYISH BROWN
28% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: SKELETAL, CRYSTALS, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: DOLOMITE-15%, GLAUCONITE-15%
ORGANICS-08%
OTHER FEATURES: DOLOMITIC, GRANULAR, SPECKLED
FOSSILIFEROUS
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID, FOSSIL FRAGMENTS
ORGANICS

988 - 997.4 DOLOSTONE; DARK YELLOWISH BROWN TO MODERATE YELLOWISH BROWN
28% POROSITY: INTERGRANULAR, INTRAGRANULAR
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX

ACCESSORY MINERALS: CALCILUTITE-05%, GLAUCONITE-04%
ORGANICS-03%
OTHER FEATURES: SUCROSIC, CALCAREOUS
MICRITE PRESENT IN THE FIRST AND LAST FOOT OF THE INTERVAL

997.4 - 1000 PACKSTONE; MODERATE YELLOWISH BROWN TO GRAYISH BROWN
28% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: BIOGENIC, CRYSTALS, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO VERY COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: DOLOMITE-15%, GLAUCONITE-04%
ORGANICS-03%
OTHER FEATURES: DOLOMITIC, SPECKLED, GRANULAR
FOSSILIFEROUS
FOSSILS: FOSSIL FRAGMENTS

1000 - 1000.7 DOLOSTONE; DARK YELLOWISH BROWN TO MODERATE YELLOWISH BROWN
28% POROSITY: INTERGRANULAR, INTRAGRANULAR; 50-90% ALTERED
SUBHEDRAL
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-10%, GLAUCONITE-05%
ORGANICS-04%
OTHER FEATURES: CALCAREOUS, SPECKLED, GRANULAR, SUCROSIC

1000.7 - 1008 DOLOSTONE; DARK YELLOWISH BROWN
30% POROSITY: INTERGRANULAR, INTRAGRANULAR
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: COARSE; RANGE: VERY FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-04%, GLAUCONITE-02%
OTHER FEATURES: SUCROSIC, SPECKLED, GRANULAR

1008 - 1015.5 DOLOSTONE; DARK YELLOWISH BROWN
30% POROSITY: FRACTURE, VUGULAR, INTERGRANULAR
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO COARSE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-02%, GLAUCONITE-O1%
SUCROSIC DOLOMITE IN VUGS, FRACTURES AND PARTINGS

1015.5 - 1015.8 DOLOSTONE; DARK YELLOWISH BROWN TO MODERATE YELLOWISH BROWN

34% POROSITY: INTERGRANULAR, INTRAGRANULAR
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-08%
OTHER FEATURES: SUCROSIC

1015.8 - 1019.7 DOLOSTONE; DARK YELLOWISH BROWN
36% POROSITY: FRACTURE, VUGULAR, INTERGRANULAR
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-02%

1019.7 - 1020.8 DOLOSTONE; DARK YELLOWISH BROWN
40% POROSITY: VUGULAR, FRACTURE
POSSIBLY HIGH PERMEABILITY; 90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

1020.8 - 1022.8 DOLOSTONE; DARK YELLOWISH BROWN
32% POROSITY: FRACTURE, VUGULAR, INTERCRYSTALLINE
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

1022.8 - 1023.8 DOLOSTONE; DARK YELLOWISH BROWN
34% POROSITY: INTERGRANULAR, INTRAGRANULAR
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-10%, GLAUCONITE-08%
ORGANICS ARE PREDOMINANTLY IN UPPER PORTION OF INTERVAL

1023.8 - 1028 DOLOSTONE; DARK YELLOWISH BROWN
40% POROSITY: FRACTURE, VUGULAR, INTERGRANULAR
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
OTHER FEATURES: POOR SAMPLE
ONLY 2.5 FEET OF RUBBLE FOR THE INTERVAL; RUBBLE IS

FRACTURED AND VUGULAR LINED WITH SUCROSIC MEDIUM GRAINED
DOLOMITE

1028 - 1033 DOLOSTONE; DARK YELLOWISH BROWN
30% POROSITY: FRACTURE, INTERCRYSTALLINE; 90-100% ALTERED
ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

1033 - 1034 MUDSTONE; GRAYISH BROWN
28% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: CALCILUTITE, BIOGENIC
10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCITE-06%, ORGANICS-02%
GLAUCONITE-01%
OTHER FEATURES: CHALKY
FOSSILS: BENTHIC FORAMINIFERA, FOSSIL FRAGMENTS

1034 - 1042 PACKSTONE; GRAYISH BROWN
28% POROSITY: INTERGRANULAR, MOLDIC, VUGULAR
GRAIN TYPE: SKELETAL, PELLET, CRYSTALS
90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: VERY FINE TO GRANULE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCITE-04%, SPAR-02%
FOSSILS: FOSSIL MOLDS, BENTHIC FORAMINIFERA, MILIOLIDS
FOSSIL FRAGMENTS

1042 - 1048.5 GRAINSTONE; GRAYISH BROWN
26% POROSITY: INTERGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
92% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCITE-02%, SPAR-02%
FOSSILS: FOSSIL FRAGMENTS

1048.5 - 1052.1 PACKSTONE; GRAYISH BROWN
26% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CRYSTALS
85% ALLOCHEMICAL CONSTITUENTS

GRAIN SIZE: FINE; RANGE: VERY FINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-05%, CALCITE-02%
FOSSILS: FOSSIL FRAGMENTS

1052.1 - 1054 DOLOSTONE; GRAYISH BROWN TO MODERATE YELLOWISH BROWN
28% POROSITY: FRACTURE, PIN POINT VUGS, INTERCRYSTALLINE
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

1054 - 1054.4 DOLOSTONE; MODERATE YELLOWISH BROWN TO GRAYISH BROWN
28% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
50-90% ALTERED; SUBHEDRAL
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-20%
OTHER FEATURES: CALCAREOUS

1054.4 - 1055.4 PACKSTONE; GRAYISH BROWN TO MODERATE YELLOWISH BROWN
26% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
GRAIN TYPE: SKELETAL, CRYSTALS, CALCILUTITE
65% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: DOLOMITE-15%, GLAUCONITE-01%
OTHER FEATURES: DOLOMITIC
FOSSILS: FOSSIL FRAGMENTS

1055.4 - 1058 PACKSTONE; GRAYISH BROWN
28% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, CRYSTALS, CALCILUTITE
75% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: DOLOMITE-05%, SPAR-03%, CALCITE-02%
GLAUCONITE-01%

1058 - 1070 GRAINSTONE; GRAYISH BROWN
28% POROSITY: MOLDIC, VUGULAR, INTERGRANULAR
GRAIN TYPE: SKELETAL, PELLET, CRYSTALS
95% ALLOCHEMICAL CONSTITUENTS

GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-04%, ORGANICS-01%, GLAUCONITE-01%
PYRITE-01%
FOSSILS: FOSSIL FRAGMENTS, BENTHIC FORAMINIFERA, MILIOLIDS
FOSSIL MOLDS
NOTE: 1% GYPSUM OBSERVED BETWEEN 1058' to 1068' IS LIKELY
SECONDARY PRECIPITATION THAT OCCURRED IN THE BOXES

1070 - 1071.4 GRAINSTONE; GRAYISH BROWN
32% POROSITY: MOLDIC, VUGULAR, INTERGRANULAR
GRAIN TYPE: SKELETAL, PELLET, BIOGENIC
95% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-02%, ORGANICS-01%, GLAUCONITE-01%
FOSSILS: FOSSIL FRAGMENTS, BENTHIC FORAMINIFERA, MILIOLIDS
FOSSIL MOLDS

1071.4 - 1072.1 PACKSTONE; GRAYISH BROWN
26% POROSITY: INTERCRYSTALLINE, INTERGRANULAR
PIN POINT VUGS
GRAIN TYPE: SKELETAL, CRYSTALS, BIOGENIC
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-20%, ORGANICS-02%, PYRITE-01%
GLAUCONITE-01%
FOSSILS: FOSSIL FRAGMENTS, BENTHIC FORAMINIFERA, MILIOLIDS

1072.1 - 1072.9 GRAINSTONE; GRAYISH BROWN
30% POROSITY: INTERGRANULAR, MOLDIC, PIN POINT VUGS
GRAIN TYPE: SKELETAL, PELLET
95% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: PYRITE-04%, SPAR-03%, GLAUCONITE-02%
ORGANICS-01%
FOSSILS: FOSSIL FRAGMENTS, BENTHIC FORAMINIFERA, MILIOLIDS
FOSSIL MOLDS

1072.9 - 1077.5 GRAINSTONE; GRAYISH BROWN
30% POROSITY: INTERGRANULAR, MOLDIC, PIN POINT VUGS

GRAIN TYPE: SKELETAL, PELLET
95% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PYRITE-06%, GLAUCONITE-01%
ORGANICS-02%
FOSSILS: FOSSIL FRAGMENTS, BENTHIC FORAMINIFERA, MILIOLIDS
FOSSIL MOLDS

1077.5 - 1081.2 GRAINSTONE; GRAYISH BROWN
30% POROSITY: INTERGRANULAR, MOLDIC, PIN POINT VUGS
GRAIN TYPE: SKELETAL, PELLET
95% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: VERY FINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: GLAUCONITE-01%, ORGANICS-01%
FOSSILS: FOSSIL FRAGMENTS, BENTHIC FORAMINIFERA, MILIOLIDS
FOSSIL MOLDS

1081.2 - 1081.6 PACKSTONE; GRAYISH BROWN
26% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
GRAIN TYPE: SKELETAL, PELLET, CALCILUTITE
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: VERY FINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: GLAUCONITE-01%
FOSSILS: FOSSIL FRAGMENTS, BENTHIC FORAMINIFERA, MILIOLIDS

1081.6 - 1082.2 PACKSTONE; GRAYISH BROWN
22% POROSITY: INTERGRANULAR, INTERCRYSTALLINE
PIN POINT VUGS
GRAIN TYPE: SKELETAL, CRYSTALS
75% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-20%, GLAUCONITE-01%
FOSSILS: FOSSIL FRAGMENTS, BENTHIC FORAMINIFERA, MILIOLIDS

1082.2 - 1083.9 GRAINSTONE; GRAYISH BROWN
28% POROSITY: VUGULAR, INTERGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, PELLET, BIOGENIC
92% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: VERY FINE TO VERY COARSE

GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PYRITE-03%, GLAUCONITE-03%
ORGANICS-01%
FOSSILS: SPICULES, CORAL, BENTHIC FORAMINIFERA, MILIOLIDS

1083.9 - 1085.1 PACKSTONE; GRAYISH BROWN
22% POROSITY: INTERGRANULAR, INTERCRYSTALLINE, MOLDIC
GRAIN TYPE: SKELETAL, CRYSTALS, BIOGENIC
75% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-15%, PYRITE-01%
FOSSILS: FOSSIL FRAGMENTS, FOSSIL MOLDS
BENTHIC FORAMINIFERA, MILIOLIDS

1085.1 - 1097.2 GRAINSTONE; GRAYISH BROWN
30% POROSITY: INTERGRANULAR, MOLDIC, VUGULAR
GRAIN TYPE: SKELETAL, PELLET, BIOGENIC
95% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: VERY FINE TO GRAVEL
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PYRITE-02%, CALCITE-02%
FOSSILS: FOSSIL FRAGMENTS, FOSSIL MOLDS, MILIOLIDS
MOLLUSKS

1097.2 - 1100 PACKSTONE; GRAYISH BROWN
28% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCITE-03%, GLAUCONITE-01%
OTHER FEATURES: SPECKLED, CHALKY
FOSSILS: FOSSIL FRAGMENTS, FOSSIL MOLDS, MILIOLIDS

1100 - 1100.5 WACKESTONE; GRAYISH BROWN TO MODERATE YELLOWISH BROWN
26% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: CALCILUTITE, SKELETAL, CRYSTALS
40% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: DOLOMITE-20%

OTHER FEATURES: DOLOMITIC, SPECKLED, CHALKY
FOSSILS: FOSSIL FRAGMENTS, FOSSIL MOLDS

1100.5 - 1101.2 DOLOSTONE; MODERATE YELLOWISH BROWN
26% POROSITY: INTERGRANULAR, INTERCRYSTALLINE
PIN POINT VUGS; 90-100% ALTERED; ANHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-01%
OTHER FEATURES: CRYSTALLINE, SUCROSIC

1101.2 - 1105.1 DOLOSTONE; MODERATE YELLOWISH BROWN
26% POROSITY: INTERCRYSTALLINE, FRACTURE, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

1105.1 - 1111 DOLOSTONE; DARK YELLOWISH BROWN TO GRAYISH BROWN
30% POROSITY: FRACTURE, VUGULAR, INTERCRYSTALLINE
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-03%
1110.3 - 1110.8 CONTAINS MANY RECRYSTALLIZED FOSSILS

1111 - 1114.4 DOLOSTONE; MODERATE YELLOWISH BROWN TO GRAYISH BROWN
35% POROSITY: VUGULAR, FRACTURE, INTERGRANULAR
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
VUGS ARE INFILLED WITH SUCROSIC DOLOMITE GRAINS

1114.4 - 1131.2 DOLOSTONE; MODERATE YELLOWISH BROWN TO GRAYISH BROWN
35% POROSITY: VUGULAR, FRACTURE
POSSIBLY HIGH PERMEABILITY; 90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO COARSE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-03%
VERY VUGULAR, HIGHLY FRACTURED CRYSTALLINE DOLOSTONE WITH
SUCROSIC AREAS AROUND VUGS

1131.2 - 1133.9 DOLOSTONE; MODERATE YELLOWISH BROWN TO GRAYISH BROWN

28% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-15%
OTHER FEATURES: VARVED

1133.9 - 1136 DOLOSTONE; MODERATE YELLOWISH BROWN TO GRAYISH BROWN
32% POROSITY: VUGULAR, INTERGRANULAR, MOLDIC
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-04%, QUARTZ-01%
OTHER FEATURES: FOSSILIFEROUS

1136 - 1140.4 DOLOSTONE; MODERATE YELLOWISH BROWN
30% POROSITY: INTERCRYSTALLINE, FRACTURE, MOLDIC
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-01%

1140.4 - 1141.1 DOLOSTONE; MODERATE YELLOWISH BROWN TO GRAYISH BROWN
35% POROSITY: MOLDIC, INTERGRANULAR, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

1141.1 - 1142.2 DOLOSTONE; DARK YELLOWISH BROWN
38% POROSITY: VUGULAR, FRACTURE, INTERCRYSTALLINE
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

1142.2 - 1143 DOLOSTONE; MODERATE YELLOWISH BROWN
38% POROSITY: INTERGRANULAR, VUGULAR, FRACTURE
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: QUARTZ-01%

1143 - 1144 DOLOSTONE; MODERATE YELLOWISH BROWN
28% POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

1144 - 1144.5 DOLOSTONE; MODERATE YELLOWISH BROWN
30% POROSITY: INTERGRANULAR, VUGULAR, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: QUARTZ-01%

1144.5 - 1147 DOLOSTONE; MODERATE YELLOWISH BROWN
25% POROSITY: INTERCRYSTALLINE, FRACTURE, PIN POINT VUGS
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

1147 - 1147.5 DOLOSTONE; MODERATE YELLOWISH BROWN
32% POROSITY: INTERGRANULAR, FRACTURE, VUGULAR
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
POOR INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-02%
OTHER FEATURES: POOR SAMPLE
RUBBLE RECOVERED POSSIBLY A CAVITY OR VOID

1147.5 - 1150.4 DOLOSTONE; MODERATE YELLOWISH BROWN TO GRAYISH BROWN
20% POROSITY: INTERCRYSTALLINE, LOW PERMEABILITY
PIN POINT VUGS; 90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
DENSE UNFRACTURED LOW PERMEABILITY

1150.4 - 1152.2 DOLOSTONE; MODERATE YELLOWISH BROWN TO GRAYISH BROWN
36% POROSITY: VUGULAR, INTERGRANULAR, FRACTURE
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-02%

OTHER FEATURES: SPECKLED

1152.2 - 1152.5 WACKESTONE; VERY LIGHT ORANGE
24% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: CALCILUTITE, SKELETAL, BIOGENIC
40% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO VERY COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: DOLOMITE-20%, ORGANICS-08%
OTHER FEATURES: DOLOMITIC, FOSSILIFEROUS, VARVED
FOSSILS: FOSSIL FRAGMENTS

1152.5 - 1163.3 MUDSTONE; VERY LIGHT ORANGE
26% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: CALCILUTITE, SKELETAL, BIOGENIC
10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-04%, PLANT REMAINS-04%
OTHER FEATURES: SPECKLED
FOSSILS: FOSSIL FRAGMENTS, BENTHIC FORAMINIFERA, ORGANICS

1163.3 - 1166 DOLOSTONE; DARK YELLOWISH BROWN TO MODERATE YELLOWISH BROWN
22% POROSITY: INTERCRYSTALLINE, PIN POINT VUGS, VUGULAR
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO COARSE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: QUARTZ-02%
DRUSY QUARTZ IN VUGS

1166 - 1172 MUDSTONE; VERY LIGHT ORANGE
22% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: CALCILUTITE, SKELETAL
10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PLANT REMAINS-04%, ORGANICS-03%
OTHER FEATURES: VARVED, MUDDY, CHALKY
FOSSILS: ORGANICS

1172 - 1173.4 DOLOSTONE; GRAYISH BROWN
26% POROSITY: INTERGRANULAR, PIN POINT VUGS, VUGULAR
50-90% ALTERED; SUBHEDRAL

GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-10%
OTHER FEATURES: DOLOMITIC

1173.4 - 1178.1 MUDSTONE; VERY LIGHT ORANGE
22% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: CALCILUTITE, SKELETAL
10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PLANT REMAINS-03%, ORGANICS-02%
OTHER FEATURES: MUDDY, CHALKY

1178.1 - 1183.3 DOLOSTONE; GRAYISH BROWN TO DARK YELLOWISH BROWN
30% POROSITY: VUGULAR, FRACTURE, INTERGRANULAR
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

1183.3 - 1184.1 MUDSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
24% POROSITY: INTERGRANULAR, VUGULAR, FRACTURE
GRAIN TYPE: CALCILUTITE, SKELETAL, CRYSTALS
10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: DOLOMITE-20%, PLANT REMAINS-04%
ORGANICS-04%
OTHER FEATURES: DOLOMITIC, CHALKY, MUDDY

1184.1 - 1185.4 MUDSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
24% POROSITY: INTERGRANULAR, FRACTURE, PIN POINT VUGS
GRAIN TYPE: CALCILUTITE, SKELETAL
10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PLANT REMAINS-02%, ORGANICS-03%
OTHER FEATURES: CHALKY, MUDDY

1185.4 - 1186 WACKESTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
24% POROSITY: INTERGRANULAR, FRACTURE, PIN POINT VUGS
GRAIN TYPE: CALCILUTITE, SKELETAL, CRYSTALS

40% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: VERY FINE TO VERY COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: DOLOMITE-20%
OTHER FEATURES: DOLOMITIC, CHALKY, MUDDY

1186 - 1194 WACKESTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
22% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
GRAIN TYPE: CALCILUTITE, SKELETAL
15% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-05%, PLANT REMAINS-02%
DOLOMITE-02%
OTHER FEATURES: CHALKY, MUDDY

1194 - 1195.4 WACKESTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
22% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: CALCILUTITE, SKELETAL
15% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: DOLOMITE-30%, PLANT REMAINS-02%
ORGANICS-02%
OTHER FEATURES: DOLOMITIC, CHALKY
FOSSILS: FOSSIL FRAGMENTS, MILIOLIDS

1195.4 - 1206.3 DOLOSTONE; DARK YELLOWISH BROWN
30% POROSITY: VUGULAR, FRACTURE, INTERCRYSTALLINE
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: QUARTZ-05%, ORGANICS-01%, PYRITE-01%
FOSSILS: FOSSIL MOLDS
DRUSY QUARTZ AND EUHEDRAL DOLOSTONE IN VUGS AND FRACTURES

1206.3 - 1207.9 DOLOSTONE; DARK YELLOWISH BROWN
32% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-03%, PYRITE-01%

OTHER FEATURES: SUCROSIC
FOSSILS: FOSSIL MOLDS

1207.9 - 1208.7 DOLOSTONE; DARK YELLOWISH BROWN
28% POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-01%

1208.7 - 1209.7 DOLOSTONE; MODERATE YELLOWISH BROWN TO DARK YELLOWISH BROWN
30% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-08%, PYRITE-01%
OTHER FEATURES: WEATHERED, SUCROSIC, VARVED, MUDDY

1209.7 - 1212.1 DOLOSTONE; MODERATE YELLOWISH BROWN TO DARK YELLOWISH BROWN
30% POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-05%
OTHER FEATURES: SUCROSIC
FOSSILS: FOSSIL MOLDS

1212.1 - 1215.8 DOLOSTONE; MODERATE YELLOWISH BROWN TO DARK YELLOWISH BROWN
28% POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-04%, GYPSUM-01%, PYRITE-01%

1215.8 - 1216 DOLOSTONE; GRAYISH BROWN TO DARK YELLOWISH BROWN
28% POROSITY: INTERCRYSTALLINE, PIN POINT VUGS, MOLDIC
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-04%, PYRITE-01%, QUARTZ-01%
OTHER FEATURES: VARVED
FOSSILS: FOSSIL MOLDS

1216 - 1216.3 DOLOSTONE; MODERATE YELLOWISH BROWN
30% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-07%, PYRITE-01%
OTHER FEATURES: VARVED, SUCROSIC
FOSSILS: FOSSIL MOLDS

1216.3 - 1217.8 DOLOSTONE; DARK YELLOWISH BROWN
28% POROSITY: MOLDIC, PIN POINT VUGS, INTERCRYSTALLINE
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-02%, QUARTZ-01%

1217.8 - 1220 DOLOSTONE; MODERATE YELLOWISH BROWN TO GRAYISH RED
30% POROSITY: MOLDIC, PIN POINT VUGS; 90-100% ALTERED
EUHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-05%, QUARTZ-01%
OTHER FEATURES: WEATHERED, SUCROSIC
FOSSILS: FOSSIL MOLDS

1220 - 1222.7 DOLOSTONE; DARK YELLOWISH BROWN TO BROWNISH GRAY
26% POROSITY: INTERCRYSTALLINE, MOLDIC, PIN POINT VUGS
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-03%, GYPSUM-01%, QUARTZ-01%
OTHER FEATURES: CRYSTALLINE

1222.7 - 1222.9 DOLOSTONE; DARK YELLOWISH BROWN
30% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
90-100% ALTERED; EUHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-05%, GYPSUM-01%
OTHER FEATURES: SUCROSIC

1222.9 - 1223 PACKSTONE; DARK YELLOWISH BROWN TO GRAYISH BROWN
26% POROSITY: INTERGRANULAR, MOLDIC, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: VERY FINE TO VERY COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: DOLOMITE-30%
OTHER FEATURES: DOLOMITIC
FOSSILS: FOSSIL FRAGMENTS, FOSSIL MOLDS

1223 - 1226.7 PACKSTONE; GRAYISH BROWN
28% POROSITY: INTERGRANULAR, MOLDIC, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: DOLOMITE-15%, GYPSUM-02%, ORGANICS-02%
OTHER FEATURES: DOLOMITIC
FOSSILS: FOSSIL FRAGMENTS, FOSSIL MOLDS

1226.7 - 1229.5 PACKSTONE; GRAYISH BROWN
26% POROSITY: INTERGRANULAR, MOLDIC, PIN POINT VUGS
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: DOLOMITE-05%, ORGANICS-03%
PLANT REMAINS-01%, PYRITE-01%
OTHER FEATURES: CHALKY
FOSSILS: FOSSIL FRAGMENTS

1229.5 - 1229.8 MUDSTONE; GRAYISH BROWN TO MODERATE YELLOWISH BROWN
24% POROSITY: INTERGRANULAR, MOLDIC
GRAIN TYPE: CALCILUTITE, CRYSTALS, SKELETAL
05% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: DOLOMITE-15%, ORGANICS-01%
OTHER FEATURES: DOLOMITIC
FOSSILS: FOSSIL FRAGMENTS

1229.8 - 1234.6 DOLOSTONE; DARK YELLOWISH BROWN
28% POROSITY: INTERCRYSTALLINE, PIN POINT VUGS

90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
OTHER FEATURES: POOR SAMPLE
ONLY 10 INCHES OF CORE FOR THE INTERVAL

1234.6 - 1236 MUDSTONE; VERY LIGHT ORANGE
26% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: CALCILUTITE, CRYSTALS, SKELETAL
04% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: DOLOMITE-07%, ORGANICS-03%, PYRITE-02%
PLANT REMAINS-01%
OTHER FEATURES: CHALKY

1236 - 1236.8 DOLOSTONE; MODERATE YELLOWISH BROWN TO GRAYISH BROWN
28% POROSITY: INTERGRANULAR, INTERCRYSTALLINE
PIN POINT VUGS; 90-100% ALTERED; ANHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
OTHER FEATURES: SUCROSIC, CRYSTALLINE
INTERBEDDED SUCROSIC FINES AND CRYSTALLINE

1236.8 - 1238.2 DOLOSTONE; DARK YELLOWISH BROWN TO MODERATE YELLOWISH BROWN
20% POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MICROCRYSTALLINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

1238.2 - 1241.4 DOLOSTONE; YELLOWISH GRAY TO GRAYISH BROWN
18% POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MICROCRYSTALLINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
OTHER FEATURES: POOR SAMPLE
LOW RECOVERY

1241.4 - 1241.8 MUDSTONE; VERY LIGHT ORANGE
22% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: CALCILUTITE; 03% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO MEDIUM

MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-08%
OTHER FEATURES: POOR SAMPLE
POOR RECOVERY, DEPTHS APPROXIMATED

1241.8 - 1242.2 DOLOSTONE; MODERATE YELLOWISH BROWN
28% POROSITY: INTERGRANULAR, PIN POINT VUGS, FRACTURE
50-90% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
POOR INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
OTHER FEATURES: SUCROSIC, POOR SAMPLE
POOR RECOVERY, DEPTHS APPROXIMATED

1242.2 - 1248.5 DOLOSTONE; DARK YELLOWISH BROWN TO DARK YELLOWISH BROWN
18% POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MICROCRYSTALLINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
OTHER FEATURES: CRYSTALLINE
SAMPLE IS RUBBLE, MAY BE HIGHLY FRACTURED

1248.5 - 1249 MUDSTONE; GRAYISH BROWN
20% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: CALCILUTITE, SKELETAL
98% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-03%
OTHER FEATURES: CHALKY

1249 - 1249.5 MUDSTONE; DARK YELLOWISH BROWN
20% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: CALCILUTITE, BIOGENIC
99% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-30%
FOSSILS: ORGANICS

1249.5 - 1251.3 PACKSTONE; GRAYISH BROWN
20% POROSITY: INTERGRANULAR, INTRAGRANULAR

GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-10%, SPAR-02%
OTHER FEATURES: CHALKY

1251.3 - 1251.7 PACKSTONE; GRAYISH BROWN
18% POROSITY: INTERGRANULAR, INTERCRYSTALLINE
PIN POINT VUGS
GRAIN TYPE: SKELETAL, CRYSTALS
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-30%
OTHER FEATURES: FOSSILIFEROUS, CRYSTALLINE, VARVED
FOSSILS: CONES, MILIOLIDS

1251.7 - 1252 PACKSTONE; GRAYISH BROWN
24% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: VERY FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: FOSSILIFEROUS, CHALKY
FOSSILS: FOSSIL FRAGMENTS

1252 - 1252.5 WACKESTONE; GRAYISH BROWN
22% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE
30% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-05%
OTHER FEATURES: CHALKY

1252.5 - 1252.9 PACKSTONE; GRAYISH BROWN
24% POROSITY: INTERGRANULAR, INTERCRYSTALLINE
PIN POINT VUGS
GRAIN TYPE: SKELETAL, CRYSTALS
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION

CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-25%, CALCITE-02%
OTHER FEATURES: FOSSILIFEROUS, CRYSTALLINE

1252.9 - 1253.2 WACKESTONE; GRAYISH BROWN
22% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE
30% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-03%
OTHER FEATURES: CHALKY

1253.2 - 1253.6 PACKSTONE; GRAYISH BROWN
24% POROSITY: INTERGRANULAR, INTERCRYSTALLINE
PIN POINT VUGS
GRAIN TYPE: SKELETAL, CRYSTALS
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-25%, CALCITE-02%
OTHER FEATURES: FOSSILIFEROUS, CRYSTALLINE
FOSSILS: FOSSIL FRAGMENTS, CONES, MILIOLIDS

1253.6 - 1255.5 PACKSTONE; YELLOWISH GRAY TO GRAYISH ORANGE
24% POROSITY: INTERGRANULAR, INTERCRYSTALLINE
PIN POINT VUGS
GRAIN TYPE: CRYSTALS, SKELETAL, BIOGENIC
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-20%, CALCITE-02%
OTHER FEATURES: FOSSILIFEROUS, CRYSTALLINE

1255.5 - 1257.9 PACKSTONE; YELLOWISH GRAY TO YELLOWISH GRAY
22% POROSITY: INTERCRYSTALLINE, INTERGRANULAR
PIN POINT VUGS
GRAIN TYPE: CRYSTALS, SKELETAL, BIOGENIC
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-15%
OTHER FEATURES: FOSSILIFEROUS, CRYSTALLINE

1257.9 - 1258.5 PEAT; DARK YELLOWISH BROWN
ACCESSORY MINERALS: LIMESTONE-03%

1258.5 - 1259.5 DOLOSTONE; OLIVE GRAY TO DARK YELLOWISH BROWN
22% POROSITY: INTERGRANULAR, INTRAGRANULAR; 50-90% ALTERED
SUBHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: LIMESTONE-05%
LIMESTONE NODULES IN UPPER HALF OF INTERVAL

1259.5 - 1260.7 MUDSTONE; GRAYISH BROWN
18% POROSITY: INTERCRYSTALLINE, FRACTURE, PIN POINT VUGS
GRAIN TYPE: CRYSTALS, CALCILUTITE
03% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX

1260.7 - 1261.6 MUDSTONE; VERY LIGHT ORANGE TO LIGHT OLIVE GRAY
22% POROSITY: INTERGRANULAR, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: CALCILUTITE, SKELETAL, CRYSTALS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-03%
OTHER FEATURES: CHALKY

1261.6 - 1265.2 PACKSTONE; GRAYISH BROWN
24% POROSITY: INTERCRYSTALLINE, INTERGRANULAR
PIN POINT VUGS
GRAIN TYPE: SKELETAL, CRYSTALS
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO VERY COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX

1265.2 - 1266.4 DOLOSTONE; MODERATE DARK GRAY TO DARK YELLOWISH BROWN
22% POROSITY: INTERCRYSTALLINE, VUGULAR, INTERGRANULAR
50-90% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-15%

1266.4 - 1268 PACKSTONE; DARK YELLOWISH BROWN TO MODERATE YELLOWISH BROWN
20% POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
INTERGRANULAR
GRAIN TYPE: SKELETAL, CRYSTALS
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: SPAR-20%
OTHER FEATURES: CRYSTALLINE
FOSSILS: FOSSIL FRAGMENTS, MILIOLIDS, CONES

1268 - 1268.5 PEAT; DARK YELLOWISH BROWN

1268.5 - 1270.9 MUDSTONE; GRAYISH BROWN
20% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: CALCILUTITE, SKELETAL
02% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: MOTTLED
ACCESSORY MINERALS: DOLOMITE-05%, ORGANICS-02%
OTHER FEATURES: CRYSTALLINE

1270.9 - 1271.9 WACKESTONE; DARK YELLOWISH BROWN
20% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: CALCILUTITE, BIOGENIC
15% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-15%

1271.9 - 1294.1 PACKSTONE; GRAYISH BROWN
26% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: VERY FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-02%

1294.1 - 1298.3 PACKSTONE; GRAYISH BROWN
26% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
GRAIN TYPE: SKELETAL, BIOGENIC, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS

GRAIN SIZE: COARSE; RANGE: VERY FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: DOLOMITE-15%
OTHER FEATURES: DOLOMITIC
FOSSILS: FOSSIL FRAGMENTS, MILIOLIDS, CONES
DOLOMITE IS FINE TO MEDIUM GRAIN CRYSTALS IN BANDS AT
1294.6, 1297.0 AND 1297.5

1298.3 - 1300.6 MUDSTONE; VERY LIGHT ORANGE
22% POROSITY: INTERGRANULAR, PIN POINT VUGS, INTRAGRANULAR
GRAIN TYPE: CALCILUTITE, SKELETAL
91% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: MOTTLED
ACCESSORY MINERALS: CALCITE-04%, ORGANICS-04%

1300.6 - 1302.4 DOLOSTONE; MODERATE YELLOWISH BROWN TO DARK YELLOWISH BROWN
26% POROSITY: FRACTURE, INTERCRYSTALLINE, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MICROCRYSTALLINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

1302.4 - 1308.2 DOLOSTONE; DARK YELLOWISH BROWN TO VERY LIGHT ORANGE
26% POROSITY: INTERGRANULAR, INTERCRYSTALLINE, VUGULAR
50-90% ALTERED; SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; POOR INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: MOTTLED
ACCESSORY MINERALS: CALCILUTITE-45%
OTHER FEATURES: CALCAREOUS
VUGULAR DOLOSTONE INFILLED WITH MUDSTONE INTERVAL IS NEARLY
HALF AND HALF DOLOSTONE TO LIMESTONE

1308.2 - 1313.9 WACKESTONE; VERY LIGHT ORANGE TO MODERATE YELLOWISH BROWN
24% POROSITY: INTERGRANULAR, INTRAGRANULAR
GRAIN TYPE: CALCILUTITE, CRYSTALS
20% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: DOLOMITE-25%

OTHER FEATURES: DOLOMITIC
DOLOMITE CRYSTALS ARE SUSPENDED IN MUDSTONE MATRIX

1313.9 - 1325.8 DOLOSTONE; DARK YELLOWISH BROWN TO MODERATE YELLOWISH BROWN
35% POROSITY: FRACTURE, VUGULAR, INTERCRYSTALLINE
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
EUHEDRAL DOLOMITE CRYSTALS IN THE VUGS AND FRACTURES

1325.8 - 1330 WACKESTONE; GRAYISH BROWN RED TO GRAYISH RED
5% POROSITY: VUGULAR, INTERCRYSTALLINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
SEDIMENTARY STRUCTURES: MOTTLED

1330 - 1333 SAMPLE IS MOSTLY RUBBLE, POSSIBLY HIGHLY FRACTURED

1333 - 1337 DOLOSTONE; GRAYISH BROWN
35% POROSITY: FRACTURE, VUGULAR, INTERCRYSTALLINE
90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

Appendix E. Digital Photographs of Split-Spoon and Core Samples Retrieved at the ROMP 133 – Arredondo Well Site in Marion County, Florida

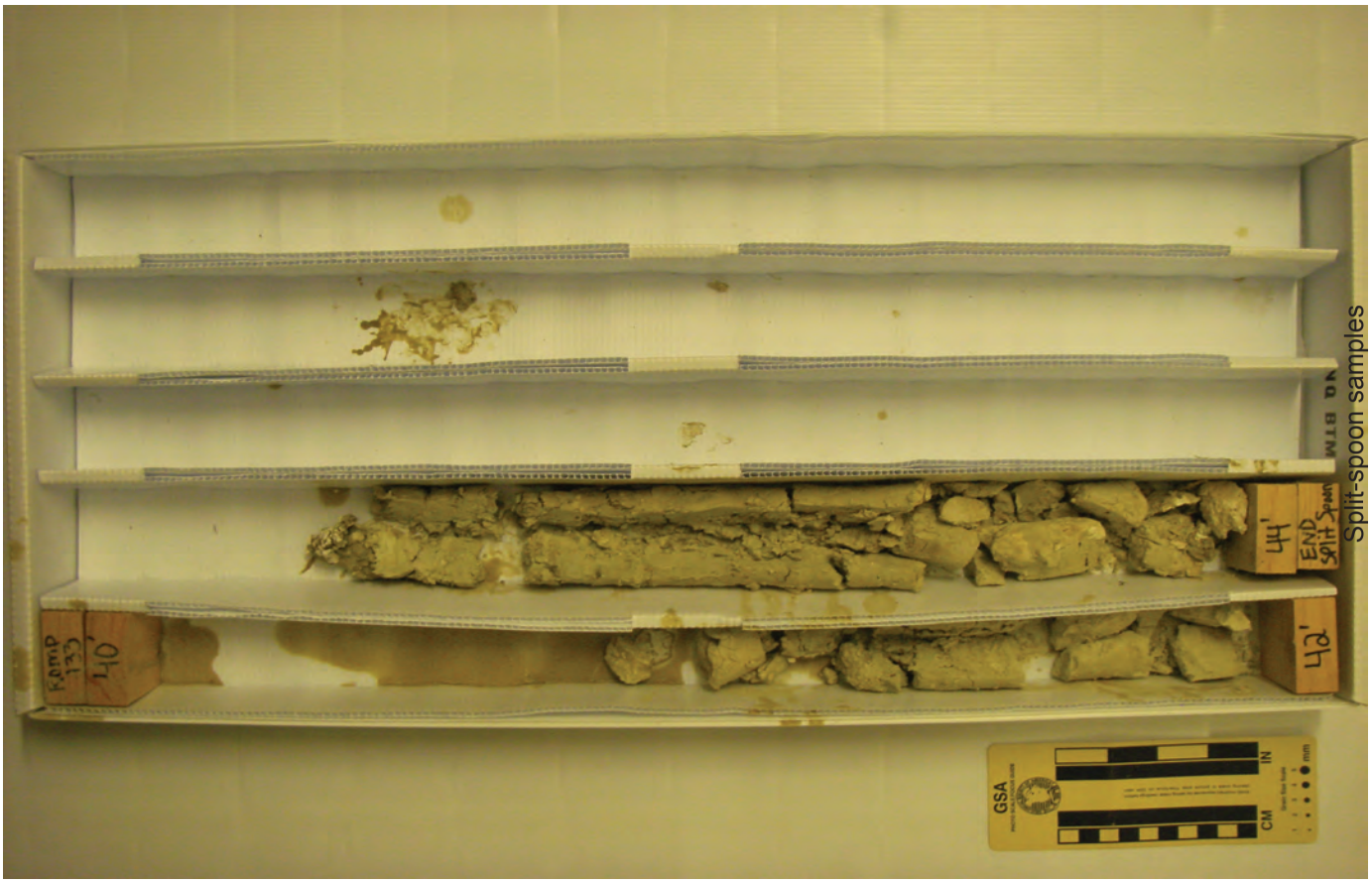

ROMP 133
10'
12'
14'
16'
18'
20'
GSA
IN
CM
Split-spoon samples


ROMP 133
0'
2'
4'
6'
8'
10'
GSA
IN
CM
Split-spoon samples

Split-spoon samples

Split-spoon samples

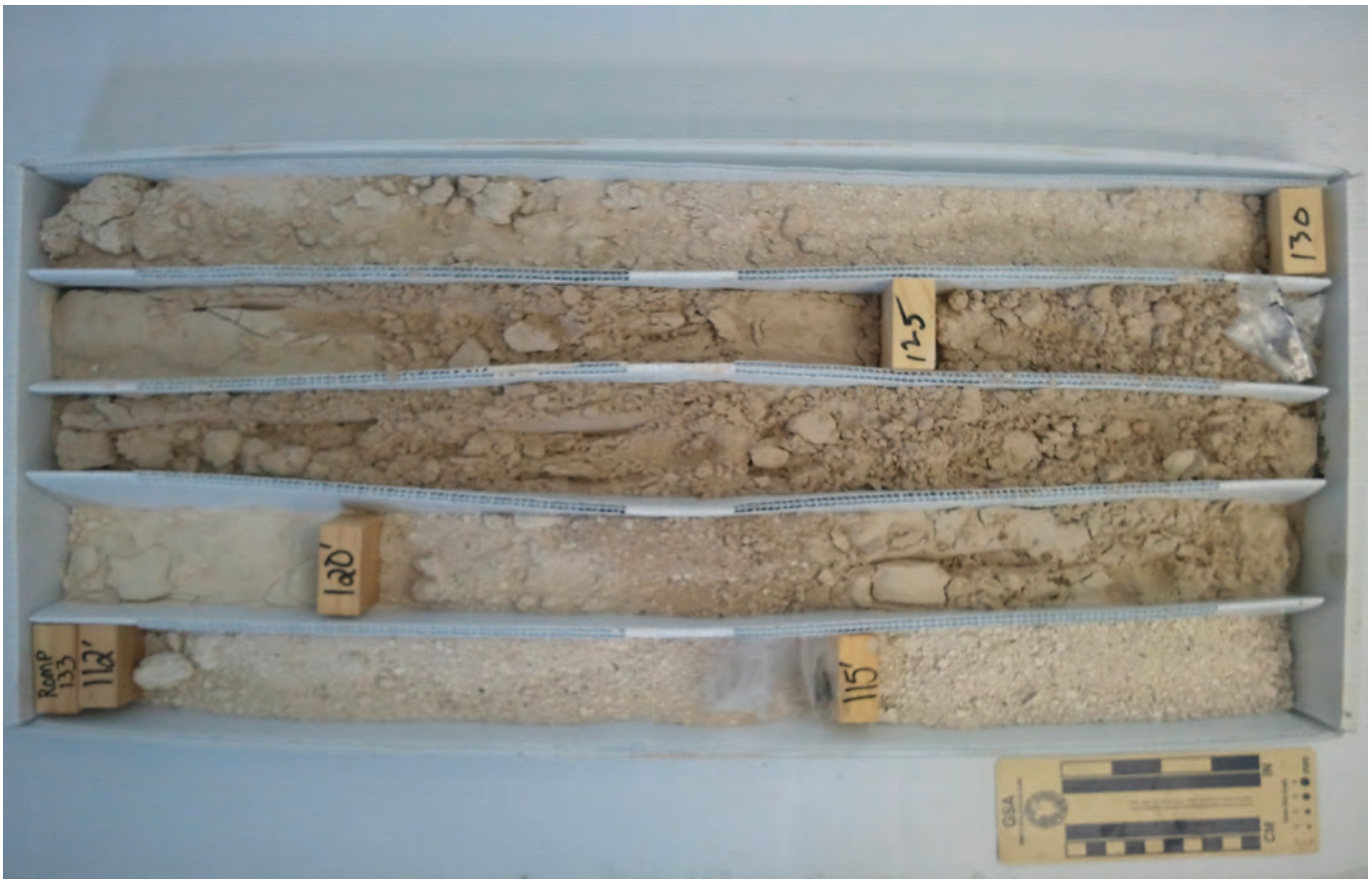
Begin NQ core samples



Split-spoon samples


98.5'
99'
95'
90'
85'
80'
Ramp 133' 75'
TR BTM
GSA


70'
75'
65'
60'
Ramp 133' 54'
TR BTM
GSA

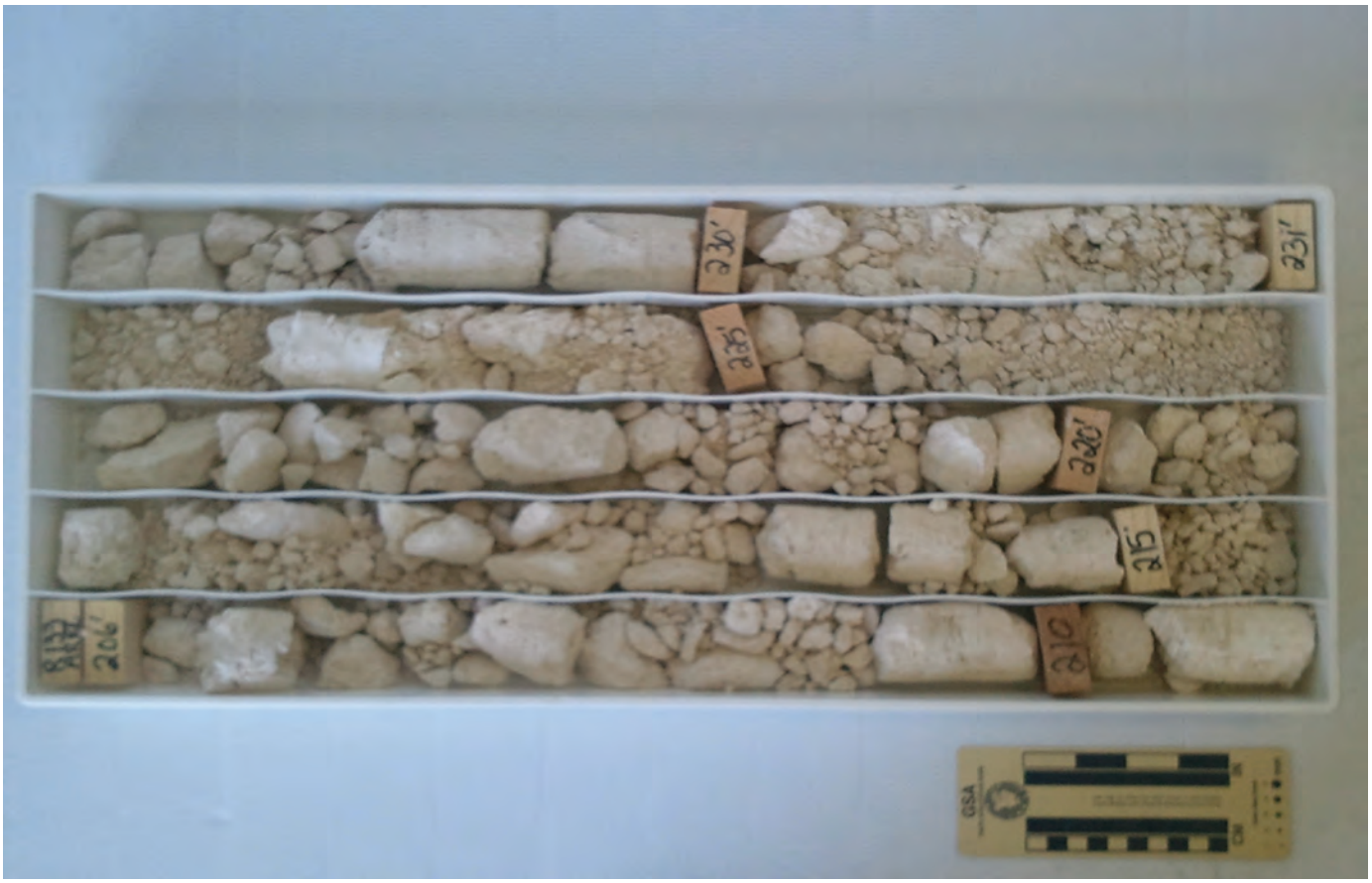

130
125
120'
Romp 133 112'
115'


112'
110
105'
R 133 99'
100'


R133
171.4
175'
180'
190'
191'
VOID
192'
195'
VOID
194'
200'
205'
206'
GSA


R133
130'
135'
140'
145'
150'
155'
160'
165'
171.4'
GSA


250'
251.3'
245'
240'
ROMP 133
231'
235'


230'
231'
225'
220'
215'
210'
205'


Ocala Limestone/ Avon Park Formation transition.
ROMP 133 296'
305
310
315
320
320.4'
GSA


ROMP 133 275'
280
285
290
295
296'
GSA


343.1'
340
335
Romp 133
332'
GSA
IN
CM


332'
330
325
Romp 133
320.4'
GSA
IN
CM


365
360
369.2'
Romp 133
365'
GSA


355
350'
345'
Romp 133
341.1'
GSA


390
391.a
385
180
379.5'


379.5'
375
370
369.a


410'
405
ROMP 133
401.1'
GSA
IN
CM


401.1'
400
395
ROMP 133
391.0'
GSA
IN
CM


430
431.2'
425
RMP 133 420'
GSA
IN
CM
mm


420
415
RMP 133 410
GSA
IN
CM
mm


ROMP 133
445'
450
455
460
465
467'
GSA
IN
CM


ROMP 133
431.2'
435
440
445
GSA
IN
CM


496'
495
490'
485'
GSA
IN
CM


484'
480
475
470'
467'
GSA
IN
CM


ROMP 133
505'
510
515
516'
GSA
IN
CM


ROMP 133
496
500
505
GSA
IN
CM


Rom 173
528.4'
530
535
540
GSA
IN
CM


516.1
525
528.4'
GSA
IN
CM


555
548.6'
550
GSA
IN
CM


548.6'
545
540
GSA
IN
CM


R-133
568'
570
575
577'
GSA
IN
CM


R-133
558.5
565
568'
560'
GSA
IN
CM


595'
590'
R-133
587.3'
GSA
IN
CM


587.3
585
580
R-133
577.7'
GSA
IN
CM


615'
610'
616'
R-733
GSA
IN
CM


605
600'
606.5
R-133
597'
GSA
IN
CM


R-133
625.4
630
635
635.3
GSA
IN
CM
mm


R-133
616'
620
625
625.4
GSA
IN
CM
mm


R-133
644.5
645
650
654'
GSA
IN
CM


R-133
635.3
640
644.5'
GSA
IN
CM


R-133
663.5
670
675
676
665
GSA
IN
CM


R-133
654
660
663.5
655
GSA
IN
CM


700
703'
695
R-133
690.5
GSA
IN
CM

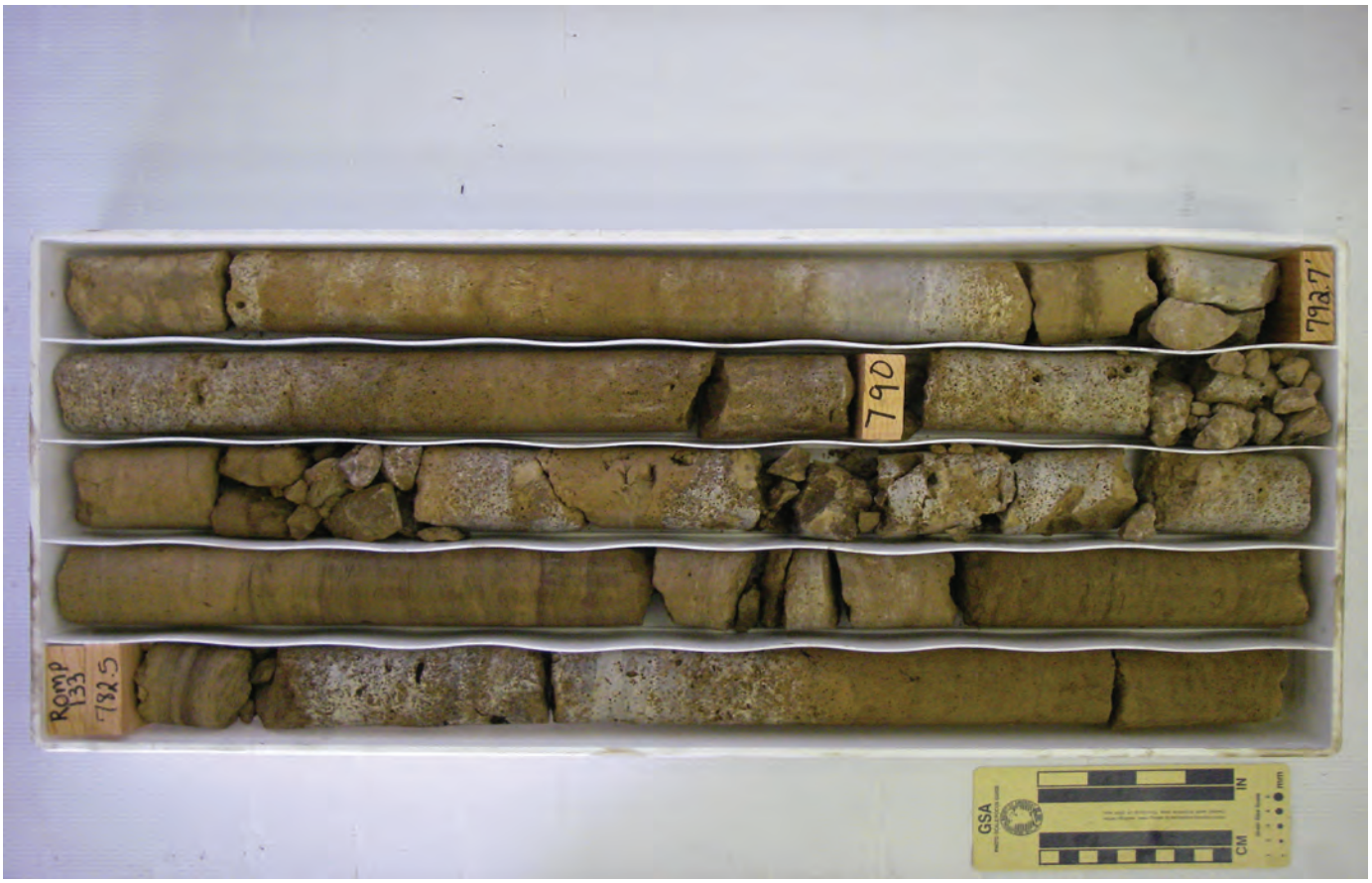

690
690.5
685
R-133
676
680'
GSA
IN
CM


735'
No Recovery
740'
No Recovery
745'
747'
730'
R-133
725'
GSA
IN
CM


725'
720
715
710
705
R-133
703
GSA
IN
CM


Romp
133
757'
760
769'
GSA
IN
CM


Romp
133
747'
750
755
757'
GSA
IN
CM


ROMP 133 782.5
790
792.7'
GSA
IN
CM
mm


ROMP 133 769.5
770
780
782.5
GSA
IN
CM
mm


8133'
810
ROMP 133 803
GSA
IN
CM

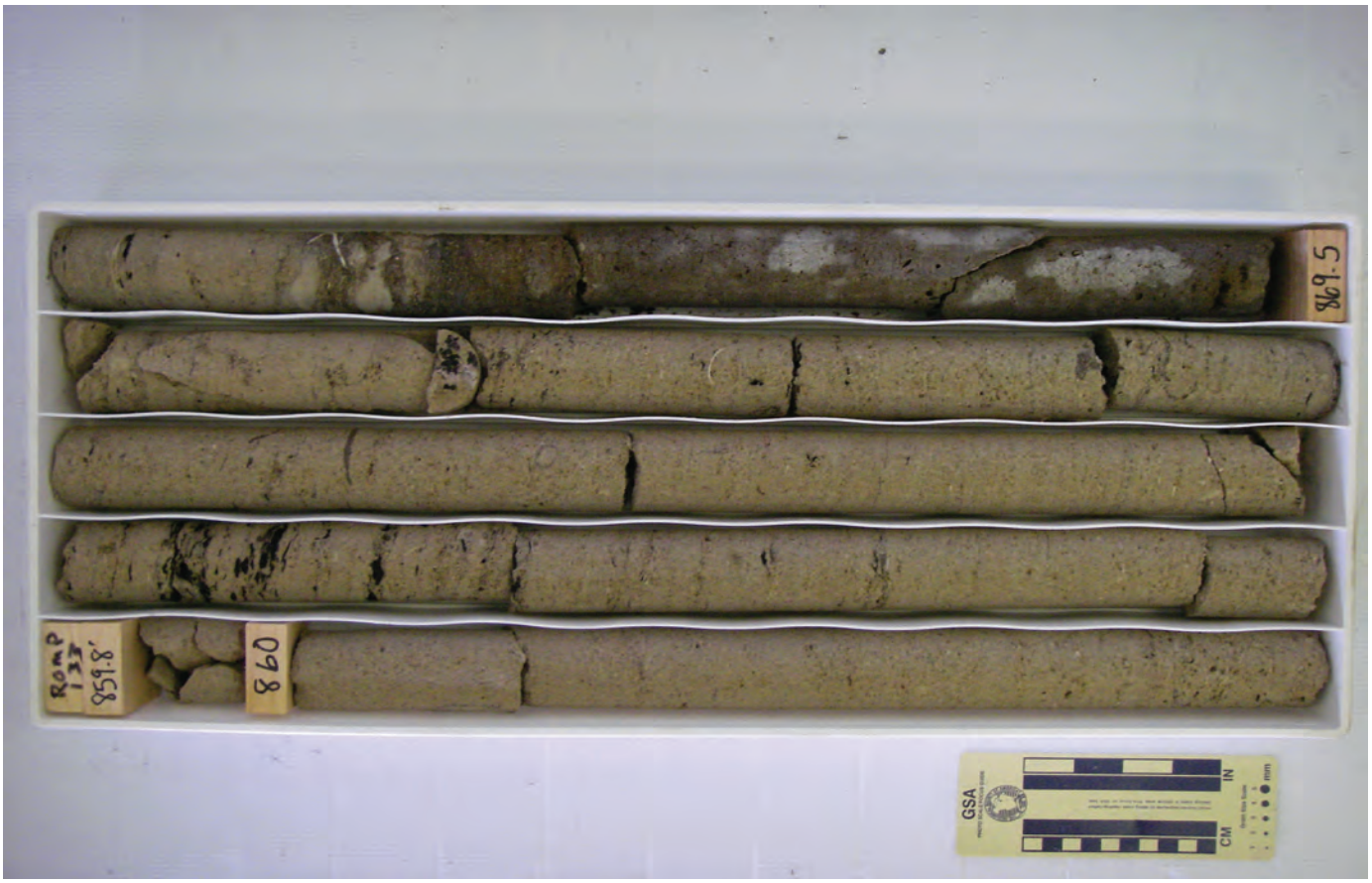

803'
800
ROMP 133 7927'
GSA
IN
CM


830
831.7'
ROMP 133 822.5'
GSA
IN
CM


822.5'
820
ROMP 133 813.3'
GSA
IN
CM


RDMP 133
840.7'
850
850.2'
GSA
IN
CM

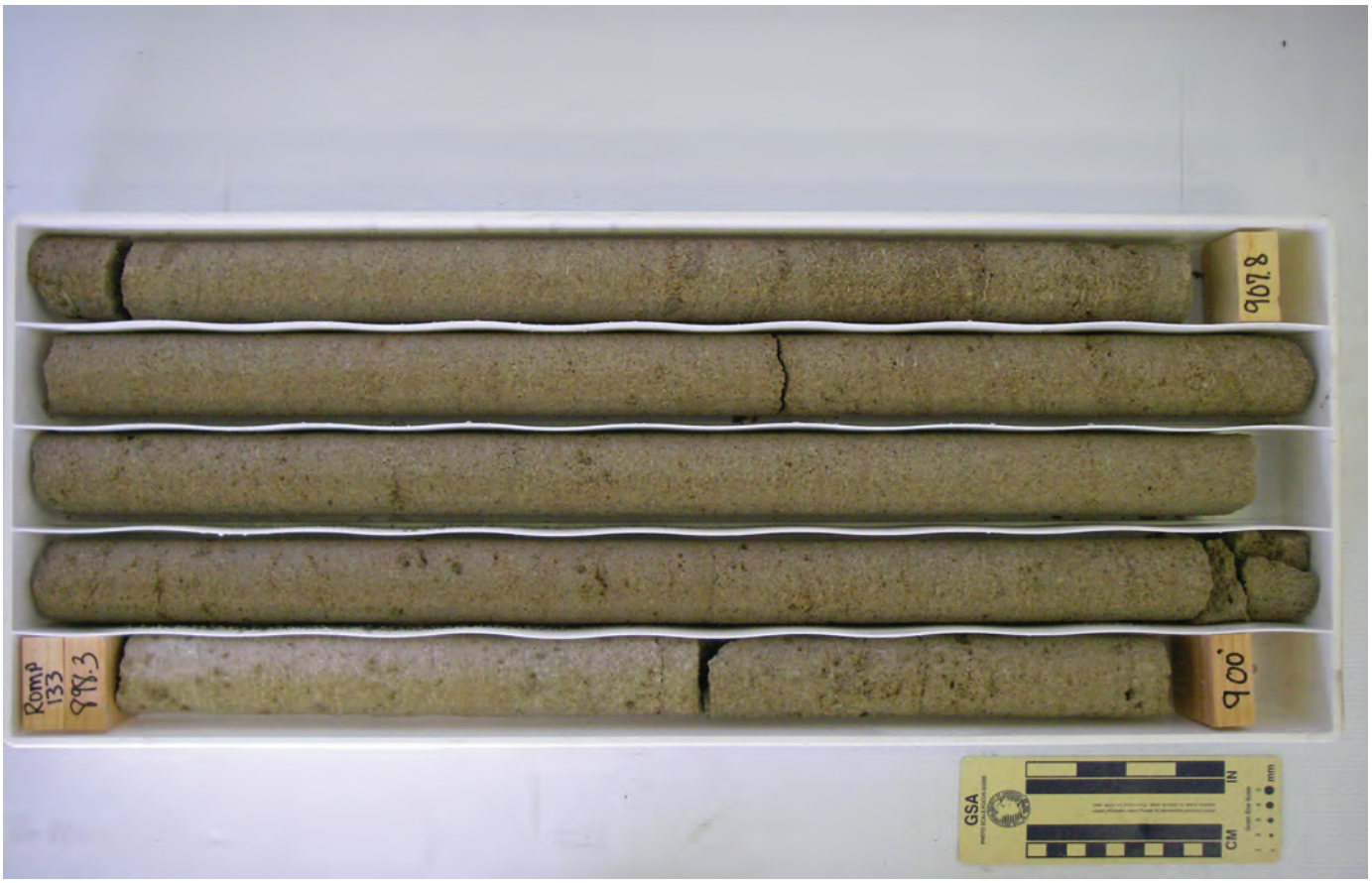

RDMP 133
831.7'
840
840.7
GSA
IN
CM


ROMP 133 851.8'
860
859.5
GSA
IN
CM


Romp 133 850.2'
858.8
GSA
IN
CM

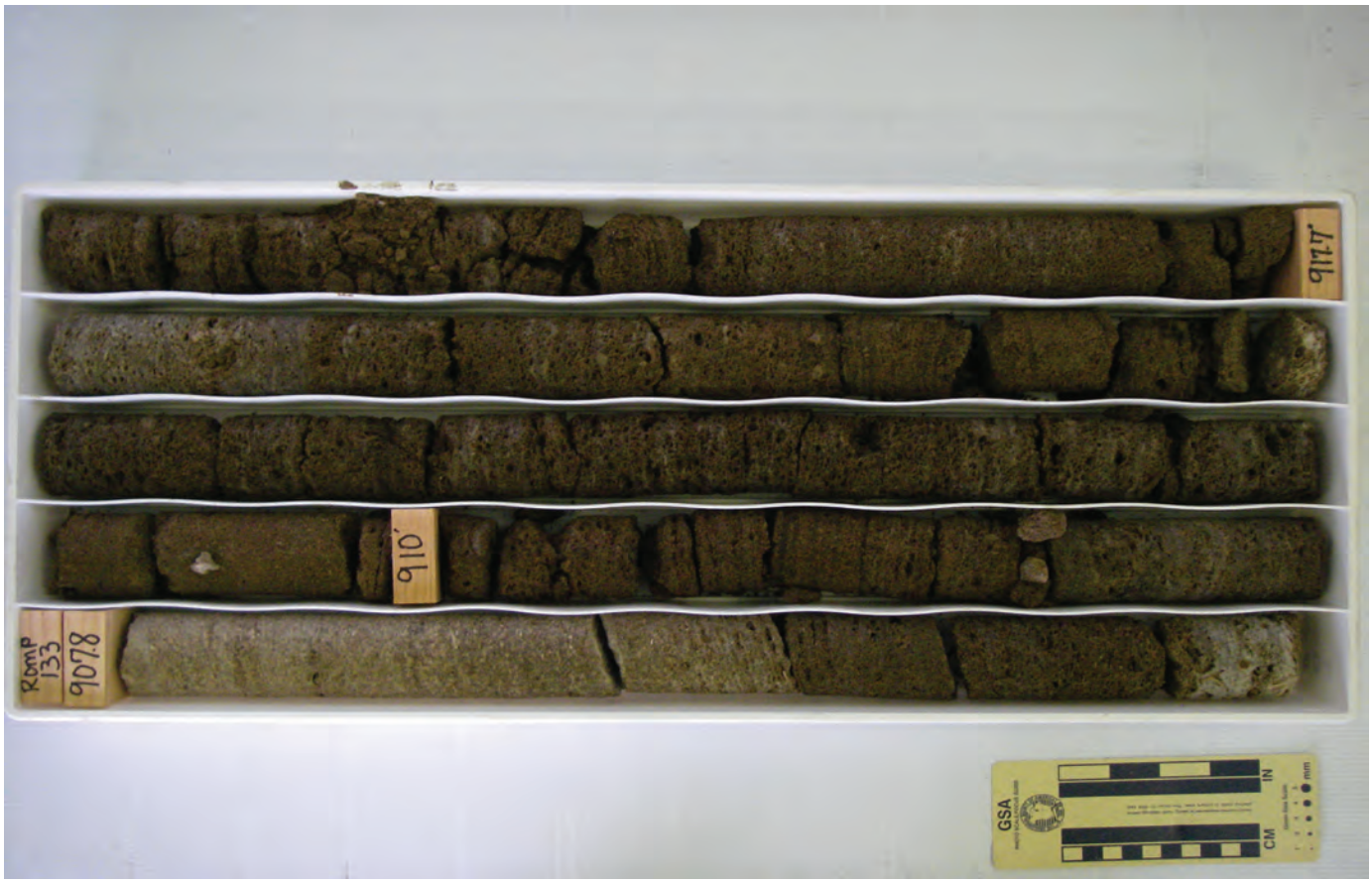

ROMP 133 879.3'
880
889'
GSA
IN
CM


ROMP 133 869.5'
870
879.3
GSA
IN
CM

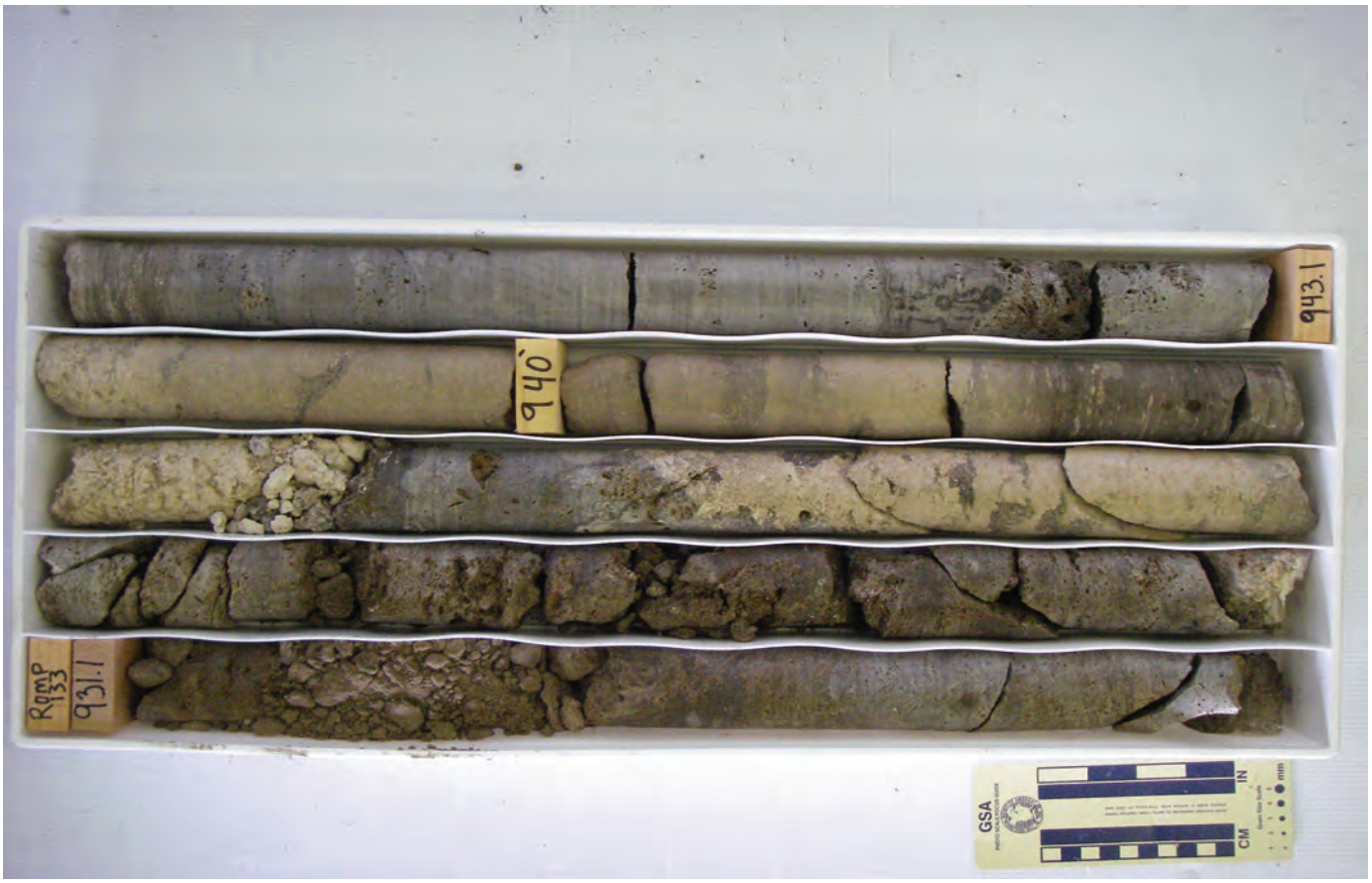

907.8
Romp 133 898.3
900'
GSA
IN
CM

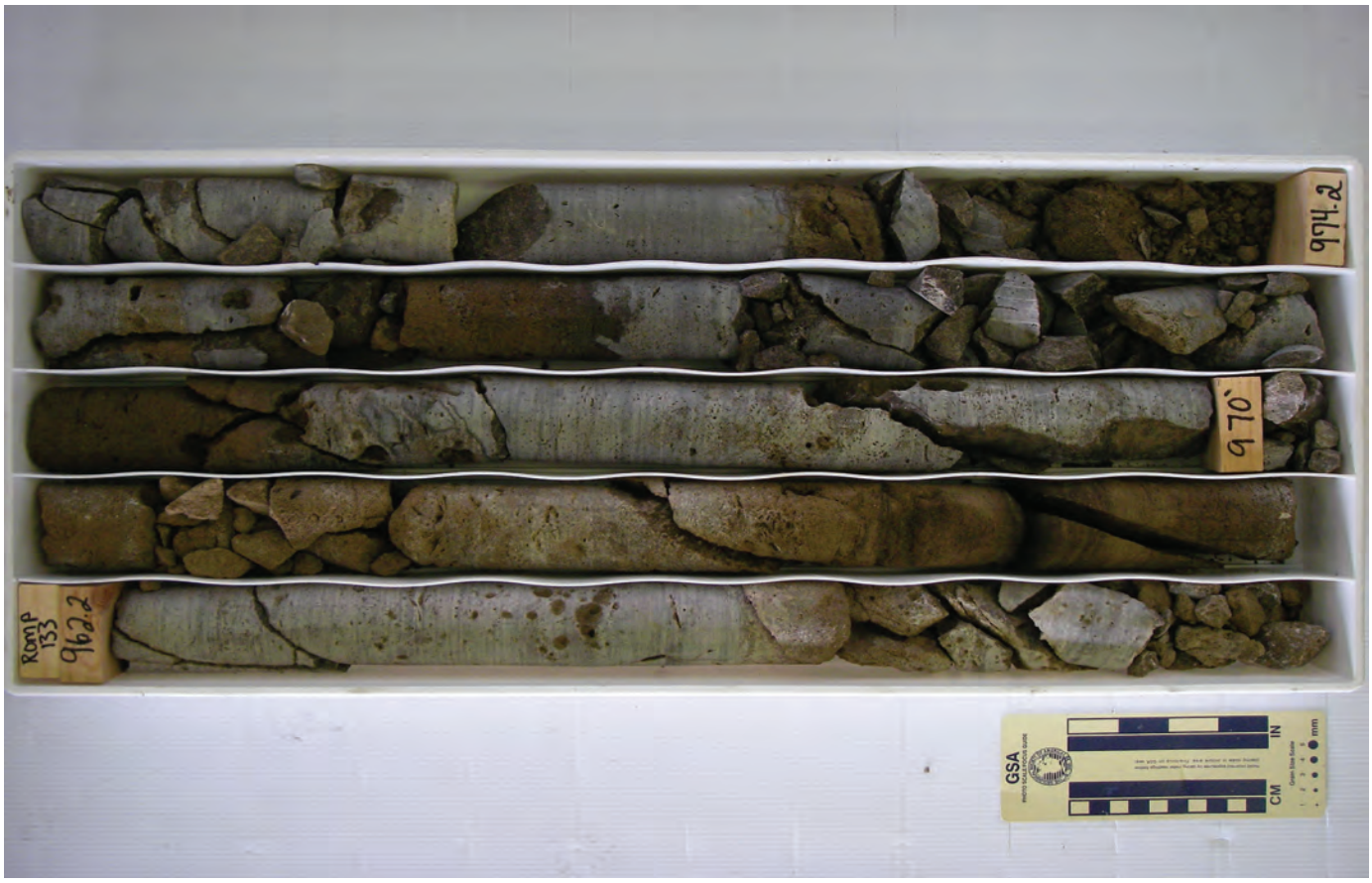

898.3
Romp 133 889'
890'
GSA
IN
CM


930'
931.1
920
RomP
133
917.9
GSA
IN
CM

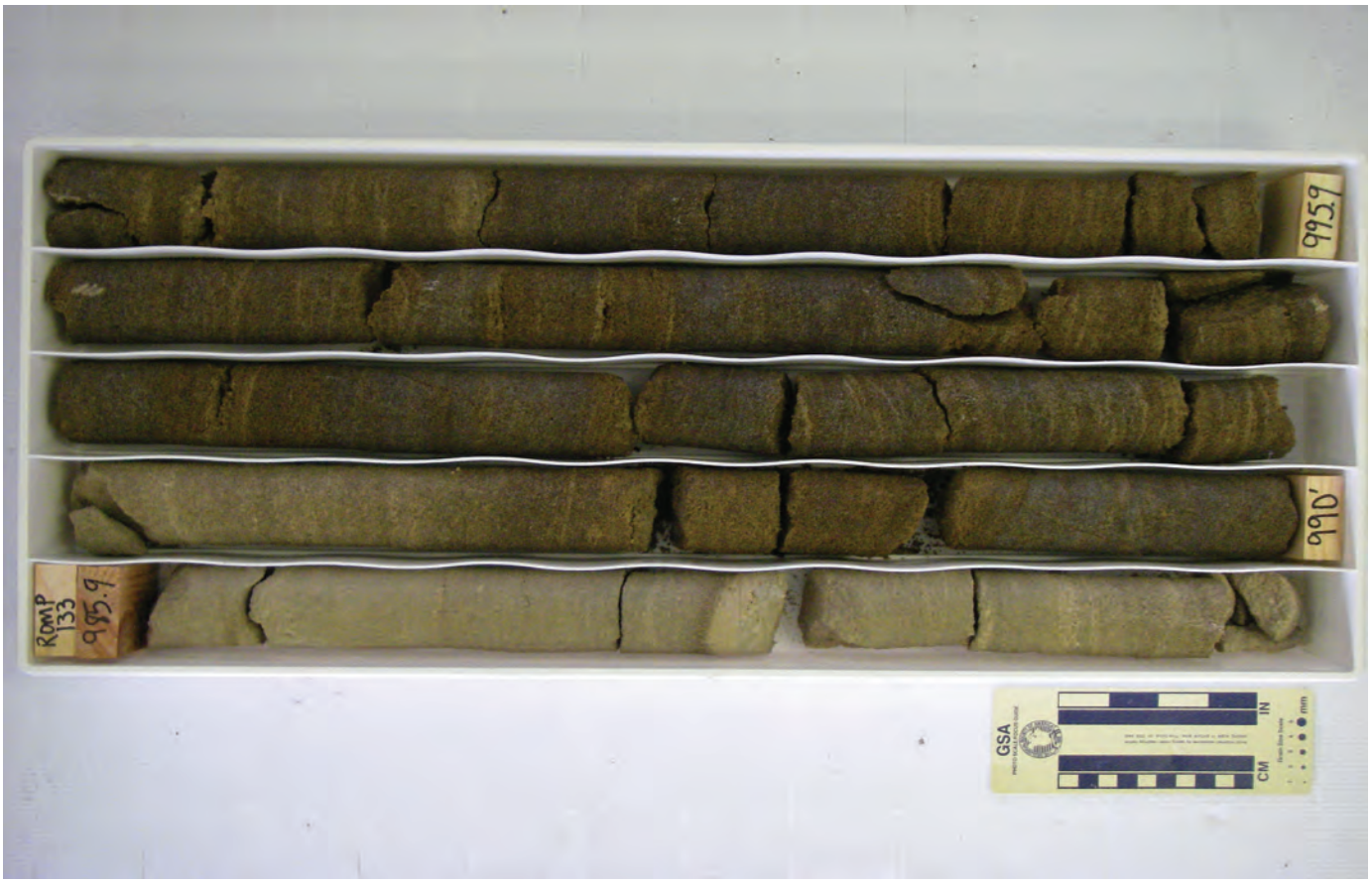

917.7'
910'
RomP
133
907.8
GSA
IN
CM


ROMP 133
943.1
950'
954.8
GSA
IN
CM

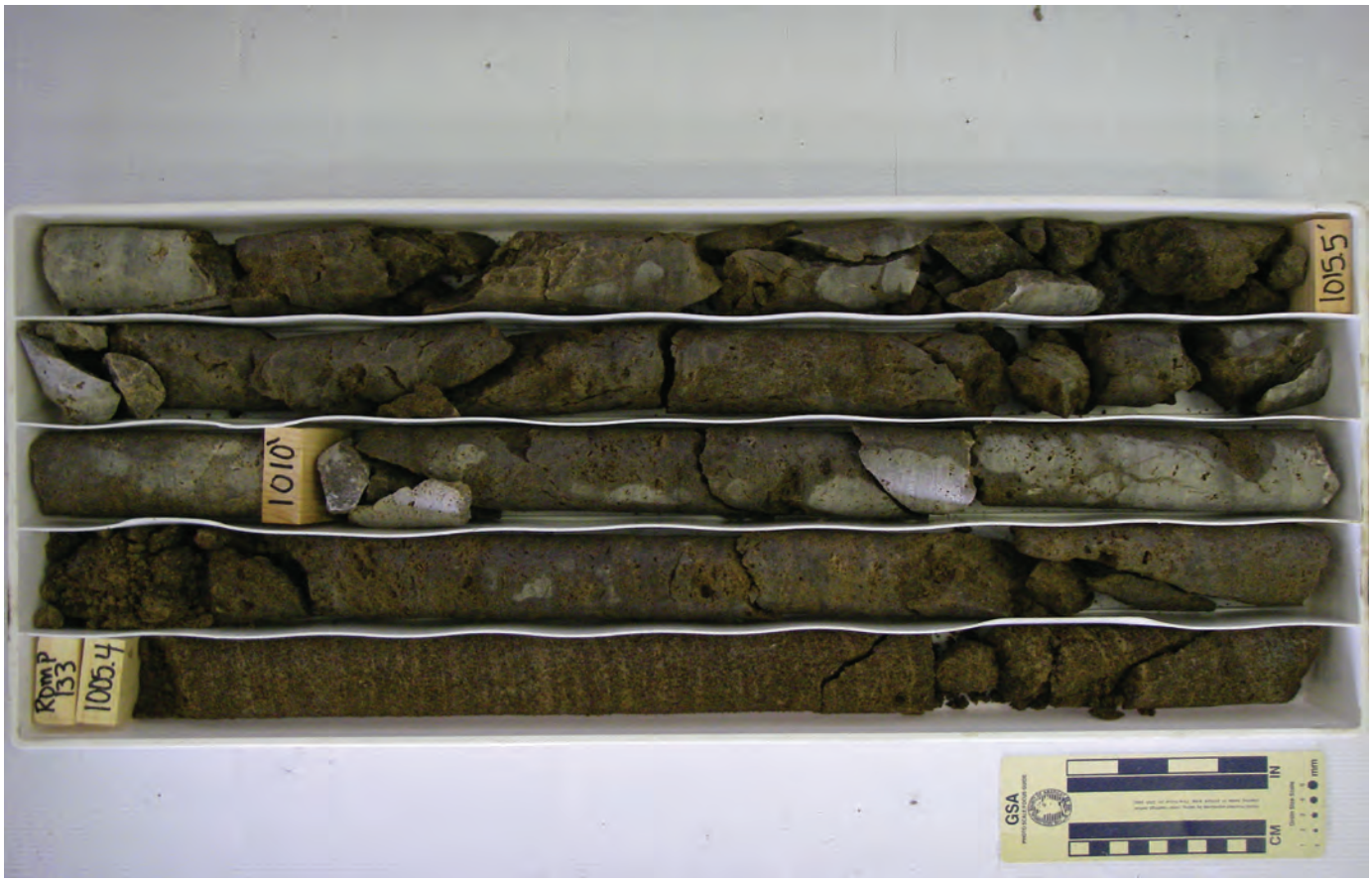

ROMP 133
931.1
940'
943.1
GSA
IN
CM


RDMP
133
962.2
970'
974.2
GSA
IN
CM
mm


RDMP
133
962.8
960'
962.2'
GSA
IN
CM
mm


ROMP 133 995.9
990'
995.9
GSA
IN
CM


Avon Park Formation/ Oldsmar Formation transition.
ROMP 133 974.2
980'
985.9
GSA
IN
CM


RDMP
133
1005.4
1010'
1015.5'
GSA
IN
CM


RDMP
133
995.9
1000'
1005.4
GSA
IN
CM

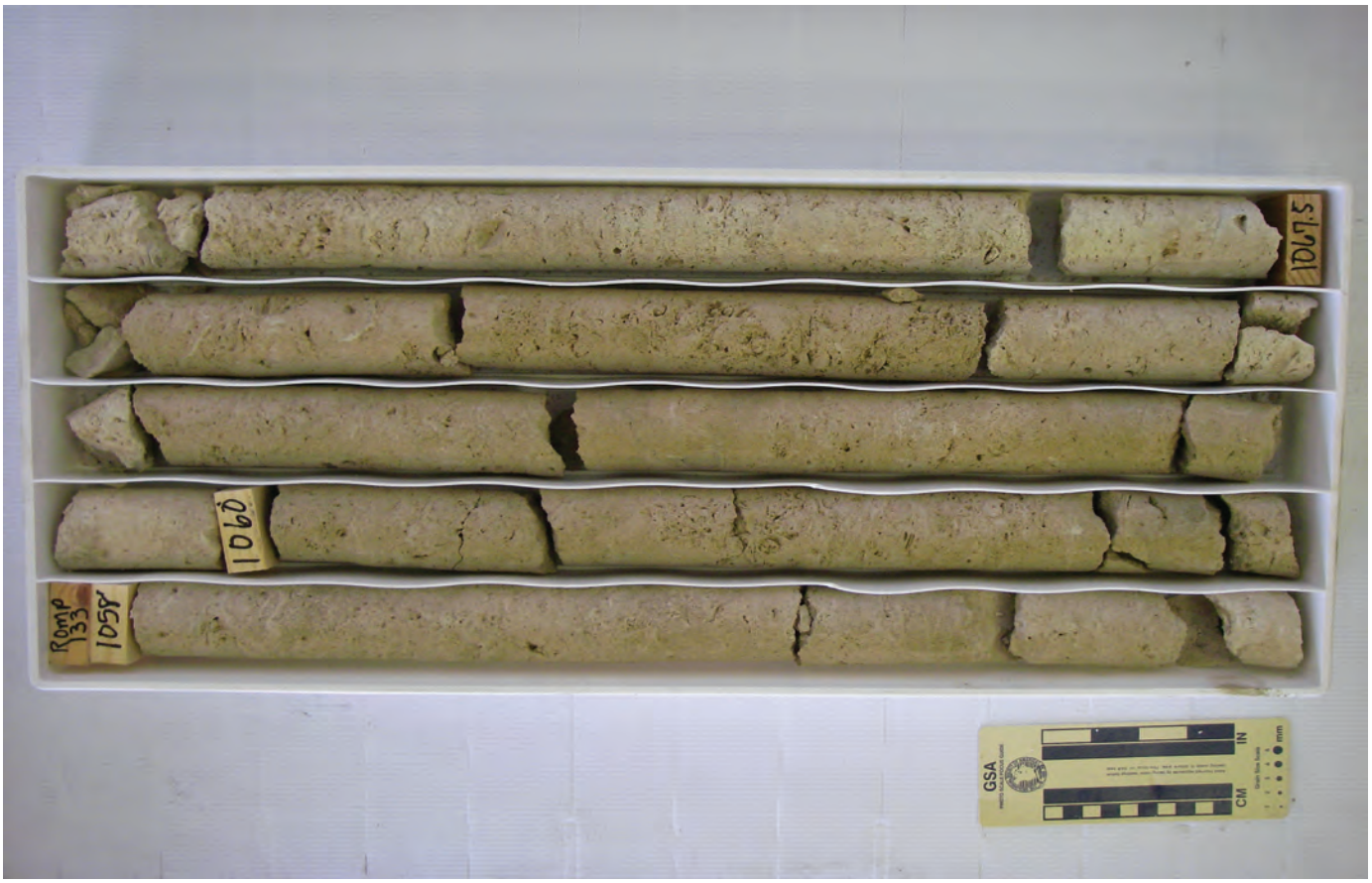

Romp 133
1027
1035
1038.7
GSA
IN
CM
mm


Romp 133
1015.5
1020'
1025'
1029'
GSA
IN
CM
mm


Romp 133
1048.5'
1050'
1058'
GSA
IN
CM


Romp 133
1038.7
1040'
1048.5
GSA
IN
CM


1076.5
1070'
Romp 133
1067.5
GSA
IN
CM


1067.5
1060'
Romp 133
1058'
GSA
IN
CM

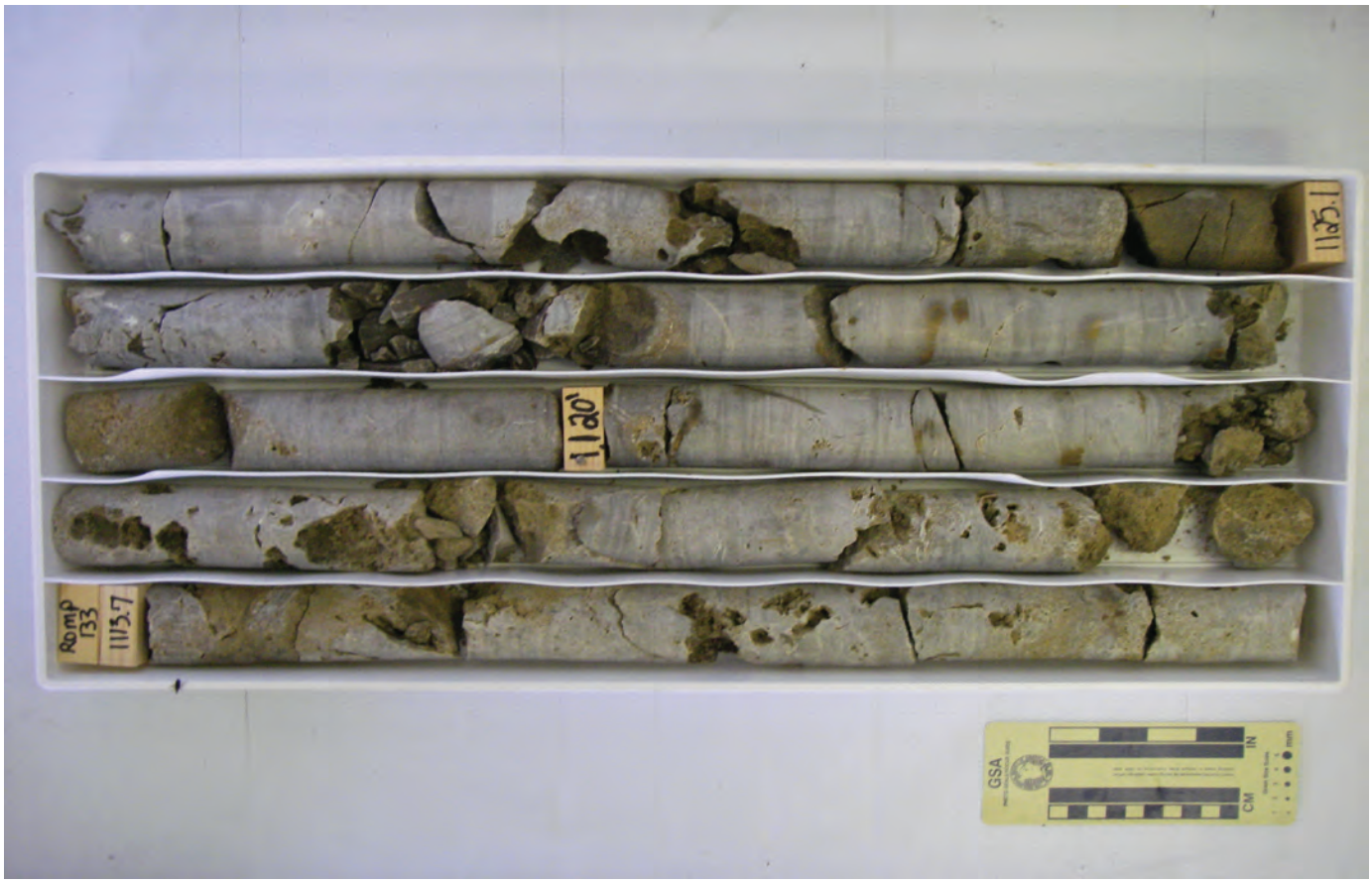

RDMP
133
1085.8
1090
1095
GSA
IN
CM


RDMP
133
1076.5
1080
1085.8
GSA
IN
CM


1110'
1113.7'
ROMP 133
1104.5
GSA
IN
CM

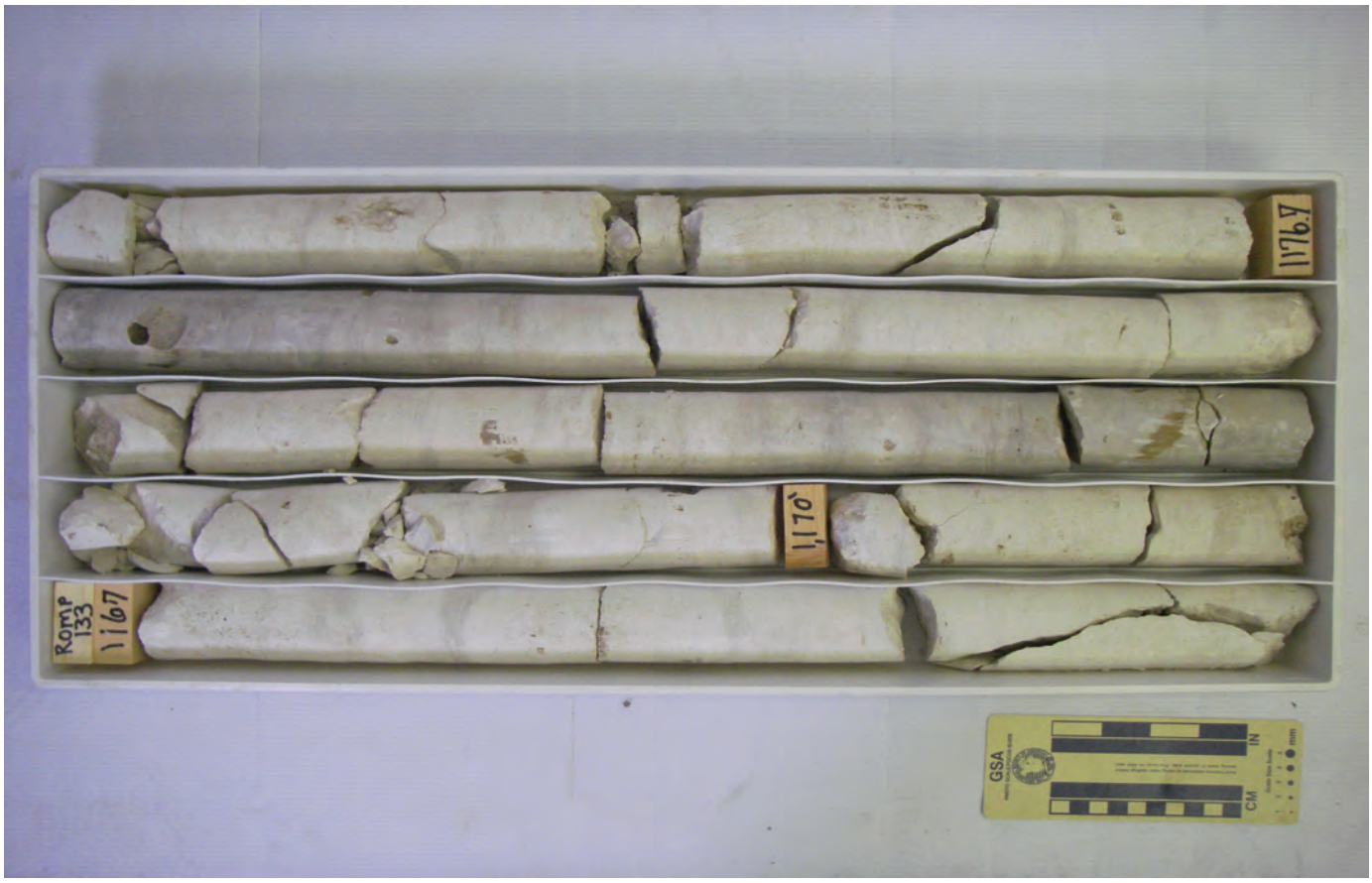

1104.5
1100'
ROMP 133
1095
GSA
IN
CM


ROMP 133
1125-1
1130'
1135-9
GSA
IN
CM


ROMP 133
1113-7
1120'
1125-1
GSA
IN
CM

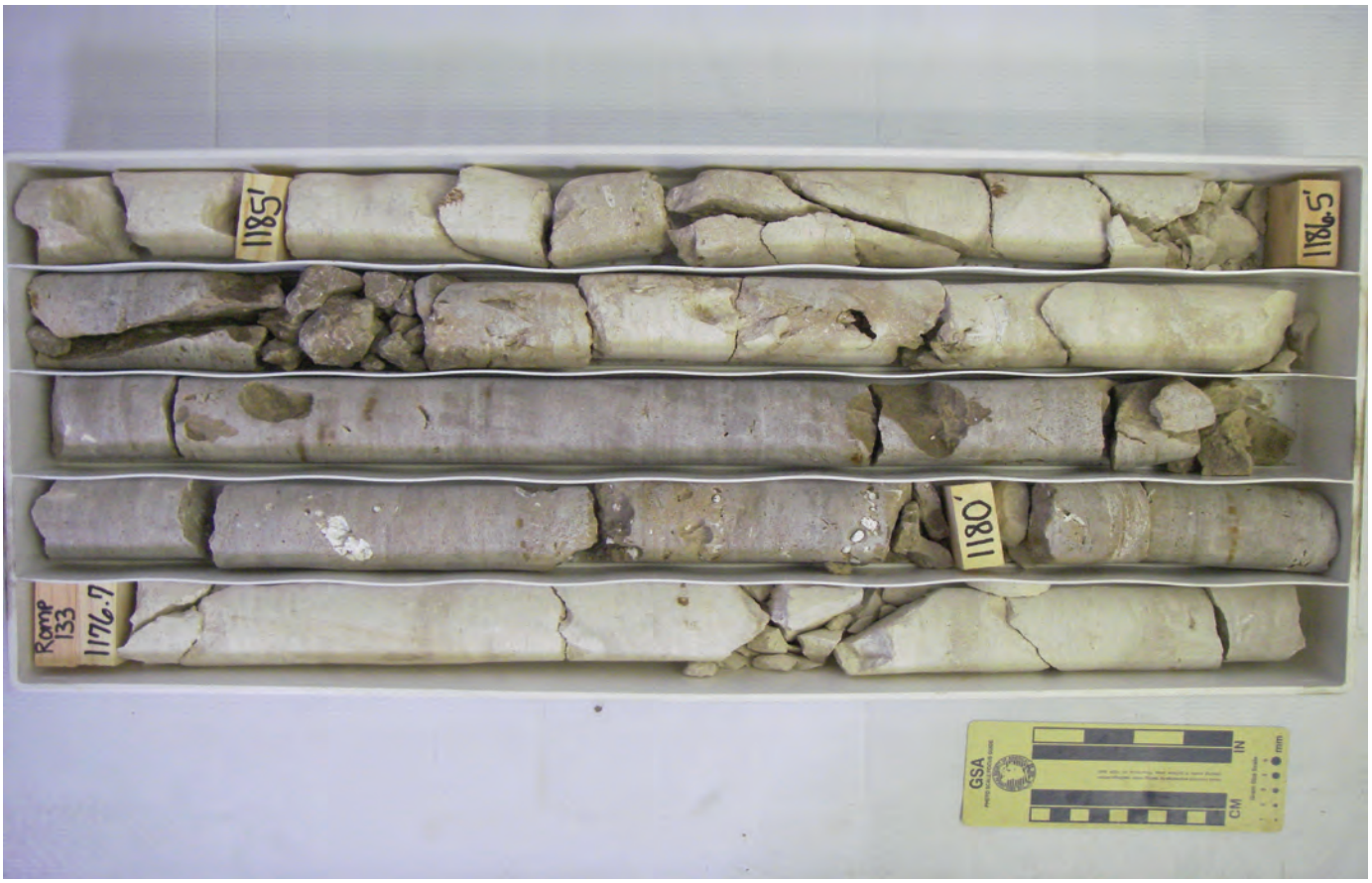

1157'
1150'
ROMP 133 1147
GSA
IN
CM
mm


1147'
1140'
ROMP 133 1135.9
GSA
IN
CM
mm


Romp
133
1167
1170'
1176.7
GSA
IN
CM


Romp
133
1157
1160'
1167'
GSA
IN
CM


ROMP 133
1178.5
1190
1196.3
GSA
IN
CM


ROMP 133
1176.7
1180'
1185'
1186.5'
GSA
IN
CM


ROMP 133
1206.5'
1210'
1216.6'
GSA
IN
CM


ROMP 133
1196.3
1200'
1206.3'
GSA
IN
CM


ROMP 133
1226.7
1230'
1240'
1240.2
GSA
IN
CM


ROMP 133
1214.6
1220'
1224.7
GSA
IN
CM


ROMP 133
12525
1255
12615
GSA
IN
CM


ROMP 133
12402
1240
12525
GSA
IN
CM


ROMP 133
1271.3
1275
1280.6
GSA
IN
CM


ROMP 133
1261.5
1265
1271.3
GSA
IN
CM


ROMP 133
1290
1295'
1300
GSA
IN
CM


ROMP 133
1285
1290
GSA
IN
CM


W-19300
IN
CM
mm
Romp 133
1,311'
1,320'
1,322.3


W-19300
IN
CM
mm
Romp 133
1299.4
1,310'
1,305'
1311


Romp 133 1334
1,337' TD Phase 1
1,335'
CM
IN
mm


W-19300
CM
IN
mm
1334
1332
VOED 1327-1330'
1,330'
1,325'
Romp 133 1,322.3

Appendix F. Correlation Charts

A

WYRICK 1960	LICHTLER 1960	CLARKE 1964	LEVE 1966	WOLANSKY 1978	MILLER 1980	BOGGESS 1986 & AUTHUR AND OTHERS 2008	SWFWMD NOMENCLATURE
nonartesian aquifer	Shallow aquifer	water-table aquifer	shallow aquifer system	unconfined aquifer	surficial aquifer	surficial aquifer system	surficial aquifer
confining unit	*confining unit*	*confining unit*	*confining unit*	*confining unit*	*confining unit*	*confining unit*	*confining unit*

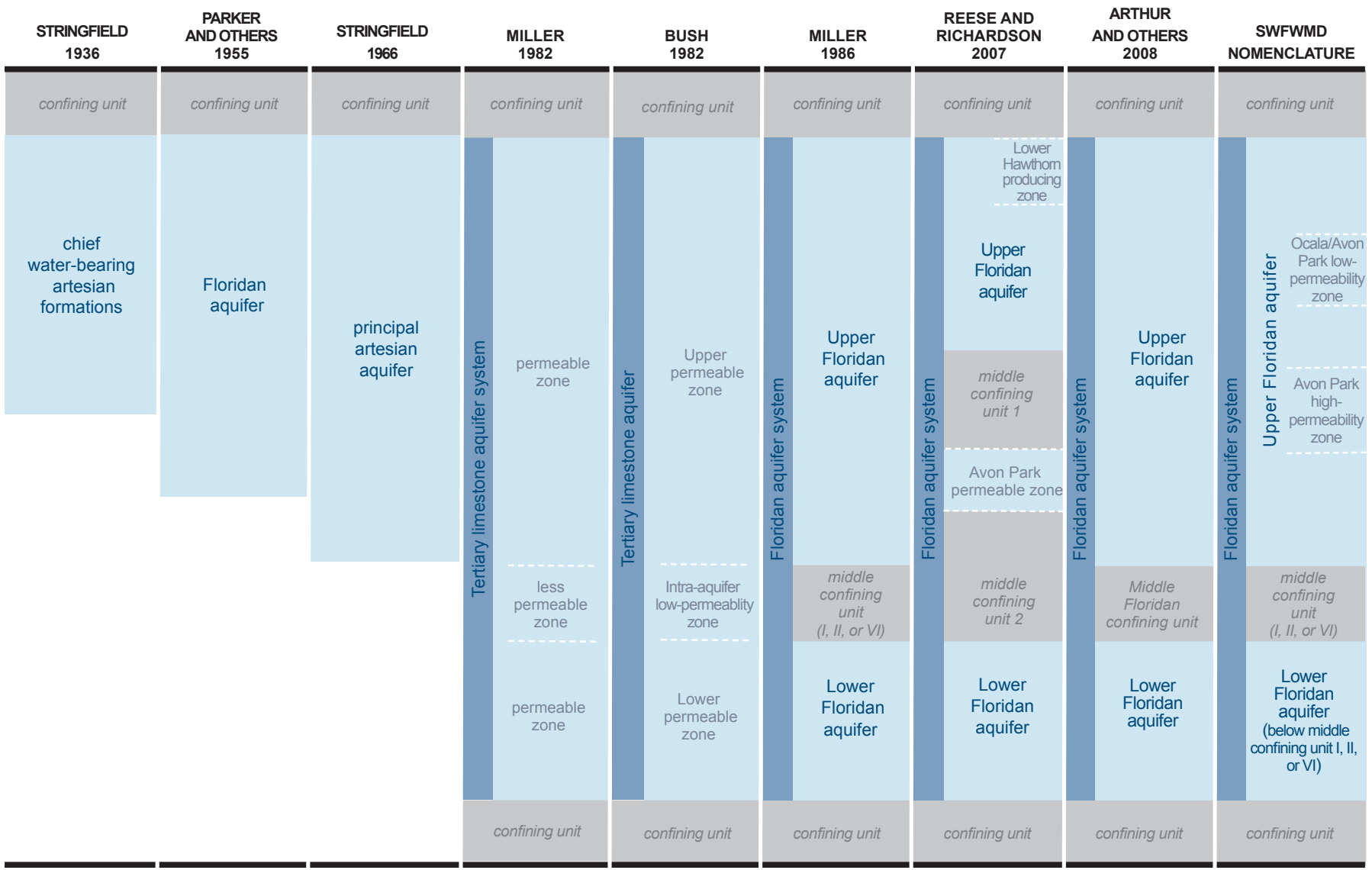
B

SPROUL 1972	JOYNER, SUTCLIFFE 1976	WEDDERBURN 1982	WOLANSKY 1983	BARR 1996	TORRES 2001	KNOCHENMUS 2006	ARTHUR AND OTHERS 2008	SWFWMD NOMENCLATURE
confining unit	*confining unit*	Hawthorn aquifer system: *confining unit*	*confining unit*	intermediate aquifer system: *confining unit*	intermediate aquifer system: *confining unit*	intermediate aquifer system: *confining unit*	Intermediate aquifer system / intermediate confining unit: *confining unit*	*confining unit*
sandstone aquifer	zone 1	Hawthorn aquifer system: Sandstone aquifer	intermediate aquifers: Tamiami - upper Hawthorn aquifer	intermediate aquifer system: Permeable zone 1	intermediate aquifer system: Tamiami/ Peace River zone (PZ1)	intermediate aquifer system: Zone 1	zones/ aquifers were not delineated	Hawthorn aquifer system: Peace River aquifer
confining unit	*confining unit*	Hawthorn aquifer system: *confining unit*	intermediate aquifers: *confining unit*	intermediate aquifer system: *confining unit*	intermediate aquifer system: *confining unit*	intermediate aquifer system: *confining unit*	zones/ aquifers were not delineated	Hawthorn aquifer system: *confining unit*
upper Hawthorn aquifer	zone 2	Hawthorn aquifer system: mid-Hawthorn aquifer	intermediate aquifers: Tamiami - upper Hawthorn aquifer	intermediate aquifer system: Permeable zone 2	intermediate aquifer system: Upper Arcadia zone (PZ2)	intermediate aquifer system: Zone 2	zones/ aquifers were not delineated	Hawthorn aquifer system: upper Arcadia aquifer
confining unit	*confining unit*	Hawthorn aquifer system: *confining unit*	intermediate aquifers: *confining unit*	intermediate aquifer system: *confining unit*	intermediate aquifer system: *confining unit*	intermediate aquifer system: *confining unit*	zones/ aquifers were not delineated	Hawthorn aquifer system: *confining unit*
lower Hawthorn aquifer	zone 3	FAS: lower Hawthorn / Tampa producing zone	intermediate aquifers: lower Hawthorn - upper Tampa aquifer	intermediate aquifer system: Permeable zone 3	intermediate aquifer system: Lower Arcadia zone (PZ3)	intermediate aquifer system: Zone 3	zones/ aquifers were not delineated	Hawthorn aquifer system: lower Arcadia aquifer
confining unit	*confining unit*	FAS: *confining unit*	*confining unit*	*confining unit*	*confining unit*	*confining unit*	*confining unit*	*confining unit*

[FAS, Floridan aquifer system]

Figure F1. Nomenclature of (*A*), the surficial aquifer, (*B*), the Hawthorn aquifer system, and (*C*), the Floridan aquifer system used for the ROMP 133 – Arredondo well site compared to names in previous reports.

C



[Terms shown are for hydrogeologic units present within the Southwest Florida Water Management District]

Figure F1. (Continued) Nomenclature of (*A*), the surficial aquifer, (*B*), the Hawthorn aquifer system, and (*C*), the Floridan aquifer system used for the ROMP 133 – Arredondo well site compared to names in previous reports.

Appendix G. Slug Test Data Acquisition Sheets for the ROMP 133 – Arredondo Well Site in Marion County, Florida

SLUG TEST - DATA ACQUISITION SHEET

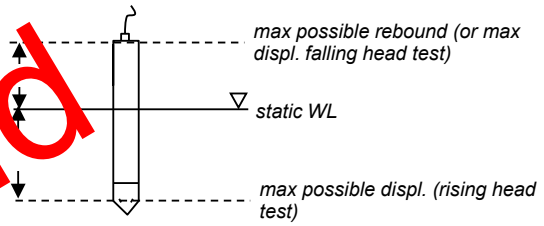
ST NO. 1

Well site:	ROMP 133 - Arredondo	Date:	2/17/2011
Well:	Core Hole	Performed by:	T. Horstman
Well Depth (ft bls)	95	Test Interval (ft - ft bls)	74.1-95
Test Casing Height (ft als)	4.58	Date of Last Development	2/17/2011
Test Casing Diameter (in)	4	Initial Static WL (ft btoc)	67.89
Test Casing Type	HWT	Final Static WL (ft btoc)	67.98
Test Interval Length (ft)	20.9	Slot Size & Filter Pack Type	none
Annulus Casing Height (ft als)	none	Initial Annulus WL (ft btoc)	none

Set-up Information

	Type (psi)	Serial No.	Purpose & Depth (ft btoc)		Reading in air (ft)	Submergence (ft)
Transducer #1	15	Spacer	test casing	69	0.04	
Transducer #2	15	0603325	pressure		-0.02	
Transducer #3	NA	NA	annulus	NA	NA	NA

Data Logger: CME CR800
Spacer Length:
Spacer OD.:
Comments: Used HWT to isolate test interval.



Note: Reading in Air of the Transducer should be < +/-1% of the Full Scale of the Transducer

Invalid

Test Data

	Test A	Test B	Test C	Test D
Target Displacement (ft)	1	1	0.5	
Initiation method	Pneumatic	Pneumatic	Pneumatic	
Rising/Falling head	Rising	Rising	Rising	
Pre-test XD #1	1.26	1.24	1.26	
Pre-test XD #3	NA	NA	NA	
Expected Displacement (ft)	0.892	0.994	0.5	
Observed Displacement (ft)	0.907	1.153	0.558	
Slug Discrepancy (%)	2%	16%	12%	
Max Rebound above Static				
Post-test XD #1	1.26	1.26	1.25	
Residual Dev. from H_o (%)	0%	2%	1%	
Data Logger File Name	R133_ST1_74_1-95A	R133_ST1_74_1-95B	R133_ST1_74_1-95C	
Specific Conductance (uS)	498	498	498	
Temperature (C)	22	22	22	
Lithology	Soft packstone to unconsolidated limestone			
Other				

Comments: Bad test. Interval supposed to be 74.1 to 105 feet bls but the hole collapsed from 95 to 105 feet bls. This is second time hole collapsed.

Notes: Slug Discrepancy <10%; Residual Deviation from H_o < 5%; and Maximum Rebound < Spacer Placement above Static

SLUG TEST - DATA ACQUISITION SHEET

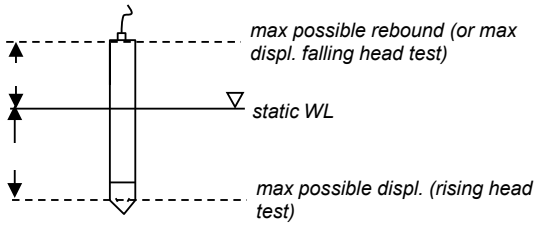
ST NO. 2

Well site:	ROMP 133 - Arredondo	Date:	3/8/2011
Well:	Core Hole	Performed by:	T. Horstman
Well Depth (ft bls)	230	Test Interval (ft - ft bls)	192.2-230
Test Casing Height (ft als)	4.45	Date of Last Development	3/8/2011
Test Casing Diameter (in)	4	Initial Static WL (ft btoc)	67.87
Test Casing Type	HWT	Final Static WL (ft btoc)	67.85
Test Interval Length (ft)	37.8	Slot Size & Filter Pack Type	none
Annulus Casing Height (ft als)	0.5	Initial Annulus WL (ft btoc)	none

Set-up Information

	Type (psi)	Serial No.	Purpose & Depth (ft btoc)		Reading in air (ft)	Submergence (ft)
Transducer #1	15	0608164	test casing	69	0.01	1.11
Transducer #2	15	0603325	pressure		0.02	
Transducer #3	-	-	annulus	-	-	-

Data Logger	CME CR800
Spacer Length	not used
Spacer OD.	not used
Comments:	Used HWT to isolate test interval, therefore, spacer not needed



Note: Reading in Air of the Transducer should be < +/-1% of the Full Scale of the Transducer

Test Data

	Test A	Test B	Test C	Test D
Target Displacement (ft)	1	0.5	1	0.5
Initiation method	Pneumatic	Pneumatic	Pneumatic	Pneumatic
Rising/Falling head	Rising	Rising	Rising	Rising
Pre-test XD #1	1.1	1.1	1.1	1.1
Pre-test XD #2	1.05	0.5	0.98	0.49
Expected Displacement (ft)	1.066	0.53	1.008	0.53
Observed Displacement (ft)	1.066	0.588	1.03	0.522
Slug Discrepancy (%)	0%	11%	2%	2%
Max Rebound above Static				
Post-test XD #1	1.1	1.1	1.1	1.1
Residual Dev. from H_o (%)	0%	0%	0%	0%
Data Logger File Name	R133_ST2_192.2-230A	R133_ST2_192.2-230B	R133_ST2_192.2-230C	R133_ST2_192.2-230D
Specific Conductance (uS)	446.3	446.3	446.3	446.3
Temperature (C)	21.3	21.3	21.3	21.3
Lithology	Packstone to grainstone, fossiliferous			
Other				
K_h (ft/day)	350			
Comments	Underdamped, oscillatory; no significant dependence on magnitude of H_o as normalized plots coincide			

Notes: Slug Discrepancy <10%; Residual Deviation from H_o < 5%; and Maximum Rebound < Spacer Placement above Static

SLUG TEST - DATA ACQUISITION SHEET

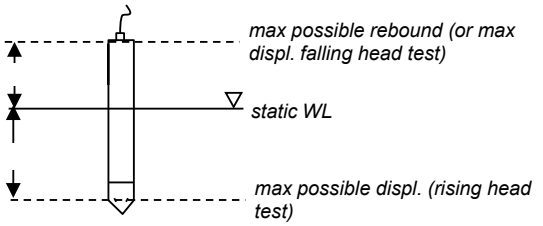
ST NO. 3

Well site:	ROMP 133 - Arredondo	Date:	3/14/2011
Well:	Core Hole	Performed by:	T. Horstman
Well Depth (ft bls)	300	Test Interval (ft - ft bls)	260-300
Test Casing Height (ft als)	4.54	Date of Last Development	3/14/2011
Test Casing Diameter (in)	2.38	Initial Static WL (ft btoc)	68.11
Test Casing Type	NQ	Final Static WL (ft btoc)	67.98
Test Interval Length (ft)	40	Slot Size & Filter Pack Type	none
Annulus Casing Height (ft als)	1.29	Initial Annulus WL (ft btoc)	64.66

Set-up Information

	Type (psi)	Serial No.	Purpose & Depth (ft btoc)		Reading in air (ft)	Submergence (ft)
Transducer #1	15	Spacer	test casing	68	0.01	3.04
Transducer #2	15	0603325	pressure		0.0	
Transducer #3	15	0603300	annulus	70	0.03	5.36

Data Logger	CME CR800
Spacer Length (ft)	5
Spacer OD. (inches)	1.66
Comments:	



Note: Reading in Air of the Transducer should be < +/-1% of the Full Scale of the Transducer

Test Data

	Test A	Test B	Test C	Test D
Target Displacement (ft)	1	0.5	0.5	1
Initiation method	Pneumatic	Pneumatic	Pneumatic	Pneumatic
Rising/Falling head	Rising	Rising	Rising	Rising
Pre-test XD #1	3.04	3.04	3.04	3.03
Pre-test XD #2	1.01	0.5	0.52	0.99
Expected Displacement (ft)	1.03	0.522	0.544	1.03
Observed Displacement (ft)	0.994	0.5	0.558	1.066
Slug Discrepancy (%)	3%	4%	3%	3%
Max Rebound above Static				
Post-test XD #1	3.04	3.04	3.04	3.03
Residual Dev. from H_o (%)	0%	0%	0%	0%
Data Logger File Name	R133_ST3_260-300A	R133_ST3_260-300B	R133_ST3_260-300C	R133_ST3_260-300D
Specific Conductance (uS)	415.4	415.4	415.4	415.4
Temperature (C)	22.5	22.5	22.5	22.5
Lithology	Packstone to grainstone, fossiliferous			
Other				
K_h (ft/day)				46
Comments				

Notes: Slug Discrepancy <10%; Residual Deviation from H_o < 5%; and Maximum Rebound < Spacer Placement above Static

SLUG TEST - DATA ACQUISITION SHEET

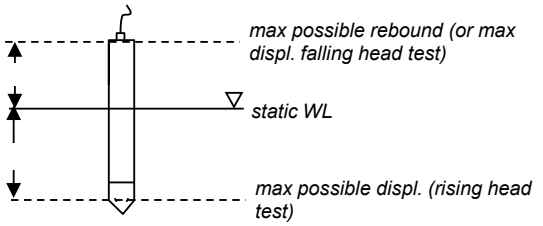
ST NO. 4

Well site:	ROMP 133 - Arredondo	Date:	3/24/2011
Well:	Core Hole	Performed by:	T. Horstman
Well Depth (ft bls)	390	Test Interval (ft - ft bls)	349-390
Test Casing Height (ft als)	5.35	Date of Last Development	3/24/2011
Test Casing Diameter (in)	2.38	Initial Static WL (ft btoc)	68.85
Test Casing Type	NQ	Final Static WL (ft btoc)	68.84
Test Interval Length (ft)	41	Slot Size & Filter Pack Type	none
Annulus Casing Height (ft als)	0.91	Initial Annulus WL (ft btoc)	64.76

Set-up Information

	Type (psi)	Serial No.	Purpose & Depth (ft btoc)		Reading in air (ft)	Submergence (ft)
Transducer #1	15	Spacer	test casing	69	0.0	3.21
Transducer #2	15	0603325	pressure		-0.04	
Transducer #3	15	0603300	annulus	70	0.03	5.22

Data Logger	CME CR800
Spacer Length (ft)	5
Spacer OD. (inches)	1.66
Comments:	



Note: Reading in Air of the Transducer should be < +/-1% of the Full Scale of the Transducer

Test Data

	Test A	Test B	Test C	Test D
Target Displacement (ft)	1	0.5	0.75	1
Initiation method	Pneumatic	Pneumatic	Pneumatic	Pneumatic
Rising/Falling head	Rising	Rising	Rising	Rising
Pre-test XD #1	3.21	3.22	3.22	3.22
Pre-test XD #2	5.22	5.22	5.22	5.22
Expected Displacement (ft)	1.023	0.533	0.769	0.972
Observed Displacement (ft)	1.487	0.928	1.305	1.385
Slug Discrepancy (%)	45%	74%	70%	42%
Max Rebound above Static				
Post-test XD #1	3.22	3.22	3.22	3.22
Residual Dev. from H_o (%)	0%	0%	0%	0%
Data Logger File Name	R133_ST4_349-390A	R133_ST4_349-390B	R133_ST2_349-390C	R133_ST4_349-390D
Specific Conductance (uS)	389.6	389.6	389.6	389.6
Temperature (C)	23.1	23.1	23.1	23.1
Lithology	Sucrosic dolostone			
Other				
K_h (ft/day)	68			
Comments				

Notes: Slug Discrepancy <10%; Residual Deviation from H_o < 5%; and Maximum Rebound < Spacer Placement above Static

SLUG TEST - DATA ACQUISITION SHEET

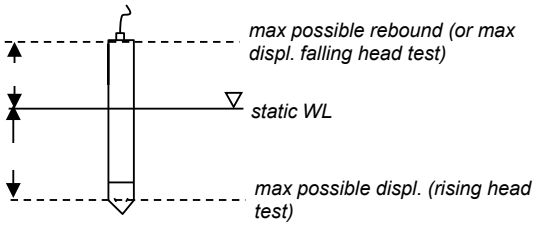
ST NO. 5

Well site:	ROMP 133 - Arredondo	Date:	3/30/2011
Well:	Core Hole	Performed by:	T. Horstman
Well Depth (ft bls)	490	Test Interval (ft - ft bls)	450-490
Test Casing Height (ft als)	5.54	Date of Last Development	3/30/2011
Test Casing Diameter (in)	2.38	Initial Static WL (ft btoc)	69.4
Test Casing Type	NQ	Final Static WL (ft btoc)	69.38
Test Interval Length (ft)	40	Slot Size & Filter Pack Type	none
Annulus Casing Height (ft als)	2.56	Initial Annulus WL (ft btoc)	66.16

Set-up Information

	Type (psi)	Serial No.	Purpose & Depth (ft btoc)		Reading in air (ft)	Submergence (ft)
Transducer #1	15	Spacer	test casing	72.5	0.01	3.16
Transducer #2	15	0603325	pressure		-0.01	
Transducer #3	15	0603300	annulus	70	0.05	3.9

Data Logger	CME CR800
Spacer Length (ft)	5
Spacer OD. (inches)	1.66
Comments:	



Note: Reading in Air of the Transducer should be < +/-1% of the Full Scale of the Transducer

Test Data

	Test A	Test B	Test C	Test D
Target Displacement (ft)	1	0.5	0.75	1
Initiation method	Pneumatic	Pneumatic	Pneumatic	Pneumatic
Rising/Falling head	Rising	Rising	Rising	Rising
Pre-test XD #1	3.14	3.16	3.16	3.16
Pre-test XD #2	3.9	3.91	3.9	3.91
Expected Displacement (ft)	1.03	0.551	0.776	1.001
Observed Displacement (ft)	1.059	0.624	0.986	1.095
Slug Discrepancy (%)	3%	13%	27%	9%
Max Rebound above Static				
Post-test XD #1	3.16	3.18	3.16	3.18
Residual Dev. from H_o (%)	1%	1%	0%	1%
Data Logger File Name	R133_ST5_450-490A	R133_ST5_450-490B	R133_ST5_450-490C	R133_ST5_450-490D
Specific Conductance (uS)	391.6	391.6	391.6	391.6
Temperature (C)	22.7	22.7	22.7	22.7
Lithology	Dolostone, vuggy, coarse to very finely crystalline			
Other				
K_h (ft/day)	82			
Comments				

Notes: Slug Discrepancy <10%; Residual Deviation from H_o < 5%; and Maximum Rebound < Spacer Placement above Static

SLUG TEST - DATA ACQUISITION SHEET

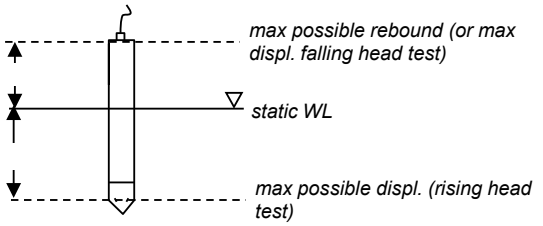
ST NO. 6

Well site:	ROMP 133 - Arredondo	Date:	4/5/2011
Well:	Core Hole	Performed by:	T. Horstman
Well Depth (ft bls)	565	Test Interval (ft - ft bls)	512-565
Test Casing Height (ft als)	4.49	Date of Last Development	4/5/2011
Test Casing Diameter (in)	2.38	Initial Static WL (ft btoc)	71.14
Test Casing Type	NQ	Final Static WL (ft btoc)	70.89
Test Interval Length (ft)	53	Slot Size & Filter Pack Type	none
Annulus Casing Height (ft als)	2.56	Initial Annulus WL (ft btoc)	66.12

Set-up Information

	Type (psi)	Serial No.	Purpose & Depth (ft btoc)		Reading in air (ft)	Submergence (ft)
Transducer #1	15	Spacer	test casing	74.5	0.04	3.58
Transducer #2	15	0603325	pressure		0.01	
Transducer #3	15	0603300	annulus	70	0.09	3.96

Data Logger	CME CR800
Spacer Length (ft)	5
Spacer OD. (inches)	1.66
Comments:	



Note: Reading in Air of the Transducer should be < +/-1% of the Full Scale of the Transducer

Test Data

	Test A	Test B	Test C	Test D
Target Displacement (ft)	1	0.5	0.75	1
Initiation method	Pneumatic	Pneumatic	Pneumatic	Pneumatic
Rising/Falling head	Rising	Rising	Rising	Rising
Pre-test XD #1	3.58	3.63	3.64	3.66
Pre-test XD #2	3.96	3.97	3.97	3.97
Expected Displacement (ft)	1.045	0.508	0.798	1.002
Observed Displacement (ft)	1.096	0.581	0.827	1.082
Slug Discrepancy (%)	5%	14%	4%	8%
Max Rebound above Static				
Post-test XD #1	3.61	3.63	3.66	3.66
Residual Dev. from H_o (%)	1%	0%	1%	0%
Data Logger File Name	R133_ST6_512-565A	R133_ST6_512-565B	R133_ST6_512-565C	R133_ST6_512-565D
Specific Conductance (uS)	446.7	446.7	446.7	446.7
Temperature (C)	20.8	20.8	20.8	20.8
Lithology	Fossiliferous mudstone			
Other				
K_h (ft/day)	30			

Comments

Notes: Slug Discrepancy <10%; Residual Deviation from H_o < 5%; and Maximum Rebound < Spacer Placement above Static

SLUG TEST - DATA ACQUISITION SHEET

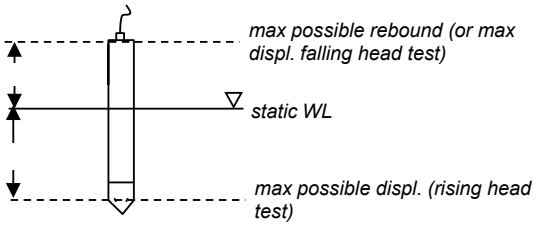
ST NO. 7

Well site:	ROMP 133 - Arredondo	Date:	4/12/2011
Well:	Core Hole	Performed by:	T. Horstman
Well Depth (ft bls)	640	Test Interval (ft - ft bls)	600-640
Test Casing Height (ft als)	4.37	Date of Last Development	4/12/2011
Test Casing Diameter (in)	2.38	Initial Static WL (ft btoc)	73.25
Test Casing Type	NQ	Final Static WL (ft btoc)	73.21
Test Interval Length (ft)	40	Slot Size & Filter Pack Type	none
Annulus Casing Height (ft als)	1.63	Initial Annulus WL (ft btoc)	65.37

Set-up Information

	Type (psi)	Serial No.	Purpose & Depth (ft btoc)		Reading in air (ft)	Submergence (ft)
Transducer #1	15	Spacer	test casing	77	0.0	3.91
Transducer #2	15	0603325	pressure		-0.04	
Transducer #3	15	0603300	annulus	70	0.05	4.8

Data Logger	CME CR800
Spacer Length (ft)	5
Spacer OD. (inches)	1.66
Comments:	



Note: Reading in Air of the Transducer should be < +/-1% of the Full Scale of the Transducer

Test Data

	Test A	Test B	Test C	Test D
Target Displacement (ft)	1	0.5	0.75	1
Initiation method	Pneumatic	Pneumatic	Pneumatic	Pneumatic
Rising/Falling head	Rising	Rising	Rising	Rising
Pre-test XD #1	3.91	3.92	3.92	3.92
Pre-test XD #2	4.78	4.78	4.78	4.79
Expected Displacement (ft)	0.972	0.464	0.696	0.943
Observed Displacement (ft)	1.088	0.566	0.711	1.175
Slug Discrepancy (%)	12%	22%	2%	25%
Max Rebound above Static				
Post-test XD #1	3.91	3.92	3.92	3.93
Residual Dev. from H_o (%)	0%	0%	0%	0%
Data Logger File Name	R133_ST7_600-640A	R133_ST7_600-640B	R133_ST7_600-640C	R133_ST7_600-640D
Specific Conductance (uS)	620	620	620	620
Temperature (C)	22.8	22.8	22.8	22.8
Lithology	Soft packstone and soft fossiliferous mudstone			
Other				
K_h (ft/day)	9			
Comments				

Notes: Slug Discrepancy <10%; Residual Deviation from H_o < 5%; and Maximum Rebound < Spacer Placement above Static

SLUG TEST - DATA ACQUISITION SHEET

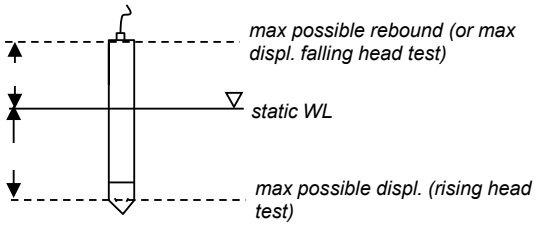
ST NO. 8

Well site:	ROMP 133 - Arredondo	Date:	4/19/2011
Well:	Core Hole	Performed by:	T. Horstman
Well Depth (ft bls)	725	Test Interval (ft - ft bls)	685-725
Test Casing Height (ft als)	5.4	Date of Last Development	4/19/2011
Test Casing Diameter (in)	2.38	Initial Static WL (ft btoc)	74.05
Test Casing Type	NQ	Final Static WL (ft btoc)	74.06
Test Interval Length (ft)	40	Slot Size & Filter Pack Type	none
Annulus Casing Height (ft als)	1.46	Initial Annulus WL (ft btoc)	65.29

Set-up Information

	Type (psi)	Serial No.	Purpose & Depth (ft btoc)		Reading in air (ft)	Submergence (ft)
Transducer #1	15	Spacer	test casing	77	0.03	3.12
Transducer #2	15	0603325	pressure		-0.03	
Transducer #3	15	0603300	annulus	70	0.02	4.78

Data Logger	CME CR800
Spacer Length (ft)	5
Spacer OD. (inches)	1.66
Comments:	



Note: Reading in Air of the Transducer should be < +/-1% of the Full Scale of the Transducer

Test Data

	Test A	Test B	Test C	Test D
Target Displacement (ft)	1	0.5	0.75	1
Initiation method	Pneumatic	Pneumatic	Pneumatic	Pneumatic
Rising/Falling head	Rising	Rising	Rising	Rising
Pre-test XD #1	3.12	3.11	3.11	3.11
Pre-test XD #2	4.78	4.78	4.78	4.78
Expected Displacement (ft)	1.016	0.544	0.711	1.001
Observed Displacement (ft)	1.03	0.595	0.762	1.037
Slug Discrepancy (%)	1%	9%	7%	4%
Max Rebound above Static				
Post-test XD #1	3.12	3.11	3.11	3.11
Residual Dev. from H_o (%)	0%	0%	0%	0%
Data Logger File Name	R133_ST8_685-725A	R133_ST8_685-725B	R133_ST8_685-725C	R133_ST8_685-725D
Specific Conductance (uS)	424.2	424.2	424.2	424.2
Temperature (C)	22.5	22.5	22.5	22.5
Lithology	Mudstone to crystalline limestone, bottom 19 feet sucrosic dolostone			
Other				
K_h (ft/day)	74			
Comments				

Notes: Slug Discrepancy <10%; Residual Deviation from H_o < 5%; and Maximum Rebound < Spacer Placement above Static

SLUG TEST - DATA ACQUISITION SHEET

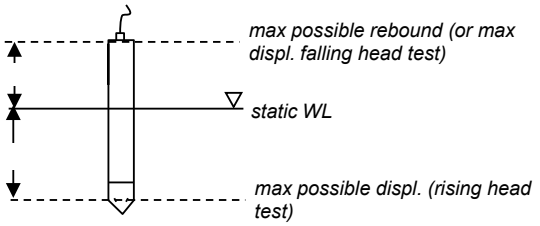
ST NO. 9

Well site:	ROMP 133 - Arredondo	Date:	4/28/2011
Well:	Core Hole	Performed by:	T. Horstman
Well Depth (ft bls)	800	Test Interval (ft - ft bls)	762-800
Test Casing Height (ft als)	4.58	Date of Last Development	4/28/2011
Test Casing Diameter (in)	2.38	Initial Static WL (ft btoc)	73.51
Test Casing Type	NQ	Final Static WL (ft btoc)	73.55
Test Interval Length (ft)	38	Slot Size & Filter Pack Type	none
Annulus Casing Height (ft als)	1.23	Initial Annulus WL (ft btoc)	65.11

Set-up Information

	Type (psi)	Serial No.	Purpose & Depth (ft btoc)		Reading in air (ft)	Submergence (ft)
Transducer #1	15	Spacer	test casing	77	0.01	3.58
Transducer #2	15	0603325	pressure		-0.03	
Transducer #3	15	0603300	annulus	70	0.04	5.06

Data Logger	CME CR800
Spacer Length (ft)	5
Spacer OD. (inches)	1.66
Comments:	



Note: Reading in Air of the Transducer should be < +/-1% of the Full Scale of the Transducer

Test Data

	Test A	Test B	Test C	Test D
Target Displacement (ft)	1	0.5	0.75	1
Initiation method	Pneumatic	Pneumatic	Pneumatic	Pneumatic
Rising/Falling head	Rising	Rising	Rising	Rising
Pre-test XD #1	3.56	3.56	3.56	3.56
Pre-test XD #2	5.05	5.06	5.06	5.07
Expected Displacement (ft)	1.066	0.573	0.798	1.001
Observed Displacement (ft)	1.088	0.602	0.841	1.03
Slug Discrepancy (%)	2%	5%	5%	3%
Max Rebound above Static				
Post-test XD #1	3.56	3.56	3.56	3.56
Residual Dev. from H_o (%)	0%	0%	0%	0%
Data Logger File Name	R133_ST9_762-800A	R133_ST9_762-800B	R133_ST9_762-800C	R133_ST9_762-800D
Specific Conductance (uS)	450.7	450.7	450.7	450.7
Temperature (C)	23.2	23.2	23.2	23.2
Lithology	Fractured sucrosic dolostone			
Other				
K_h (ft/day)	110			
Comments				

Notes: Slug Discrepancy <10%; Residual Deviation from H_o < 5%; and Maximum Rebound < Spacer Placement above Static

SLUG TEST - DATA ACQUISITION SHEET

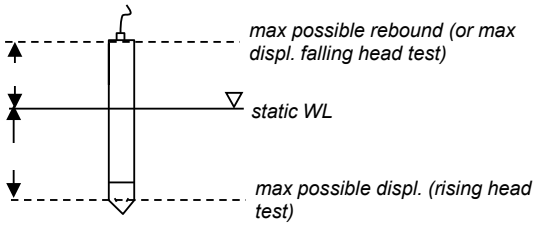
ST NO. 10

Well site:	ROMP 133 - Arredondo	Date:	5/4/2011
Well:	Core Hole	Performed by:	T. Horstman
Well Depth (ft bls)	900	Test Interval (ft - ft bls)	862-900
Test Casing Height (ft als)	4.58	Date of Last Development	5/4/2011
Test Casing Diameter (in)	2.38	Initial Static WL (ft btoc)	73.71
Test Casing Type	NQ	Final Static WL (ft btoc)	73.78
Test Interval Length (ft)	38	Slot Size & Filter Pack Type	none
Annulus Casing Height (ft als)	2.53	Initial Annulus WL (ft btoc)	66.46

Set-up Information

	Type (psi)	Serial No.	Purpose & Depth (ft btoc)		Reading in air (ft)	Submergence (ft)
Transducer #1	15	Spacer	test casing	77	0.01	3.38
Transducer #2	15	0603325	pressure		-0.04	
Transducer #3	15	0603300	annulus	70	0.07	3.67

Data Logger	CME CR800
Spacer Length (ft)	5
Spacer OD. (inches)	1.66
Comments:	



Note: Reading in Air of the Transducer should be < +/-1% of the Full Scale of the Transducer

Test Data

	Test A	Test B	Test C	Test D
Target Displacement (ft)	1	0.5	0.75	1
Initiation method	Pneumatic	Pneumatic	Pneumatic	Pneumatic
Rising/Falling head	Rising	Rising	Rising	Rising
Pre-test XD #1	3.38	3.39	3.39	3.4
Pre-test XD #2	3.67	3.67	3.68	3.69
Expected Displacement (ft)	0.972	0.45	0.689	0.965
Observed Displacement (ft)	0.812	0.406	0.711	0.95
Slug Discrepancy (%)	16%	10%	3%	2%
Max Rebound above Static				
Post-test XD #1	3.37	3.39	3.39	3.39
Residual Dev. from H_o (%)	0%	0%	0%	0%
Data Logger File Name	R133_ST10_862-900A	R133_ST10_862-900B	R133_ST10_862-900C	R133_ST10_862-900D
Specific Conductance (uS)	537	537	537	537
Temperature (C)	22.1	22.1	22.1	22.1
Lithology	Mudstone to crystalline limestone with a 7 foot dolostone bed			
Other				
K_h (ft/day)		4		
Comments				

Notes: Slug Discrepancy <10%; Residual Deviation from H_o < 5%; and Maximum Rebound < Spacer Placement above Static

SLUG TEST - DATA ACQUISITION SHEET

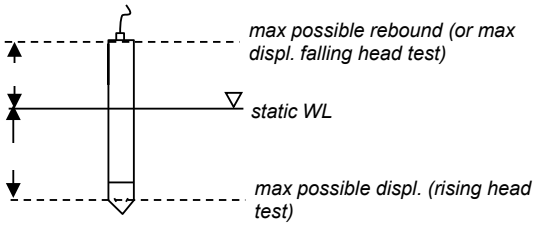
ST NO. 11

Well site:	ROMP 133 - Arredondo	Date:	5/10/2011
Well:	Core Hole	Performed by:	T. Horstman
Well Depth (ft bls)	1,000	Test Interval (ft - ft bls)	962-1,000
Test Casing Height (ft als)	4.57	Date of Last Development	5/10/2011
Test Casing Diameter (in)	2.38	Initial Static WL (ft btoc)	73.55
Test Casing Type	NQ	Final Static WL (ft btoc)	73.66
Test Interval Length (ft)	40	Slot Size & Filter Pack Type	none
Annulus Casing Height (ft als)	2.25	Initial Annulus WL (ft btoc)	66.19

Set-up Information

	Type (psi)	Serial No.	Purpose & Depth (ft btoc)		Reading in air (ft)	Submergence (ft)
Transducer #1	15	Spacer	test casing	77	0.04	3.54
Transducer #2	15	0603325	pressure		-0.04	
Transducer #3	15	0603300	annulus	70	0.05	3.97

Data Logger	CME CR800
Spacer Length (ft)	5
Spacer OD. (inches)	1.66
Comments:	



Note: Reading in Air of the Transducer should be < +/-1% of the Full Scale of the Transducer

Test Data

	Test A	Test B	Test C	Test D
Target Displacement (ft)	1	0.5	0.75	1
Initiation method	Pneumatic	Pneumatic	Pneumatic	Pneumatic
Rising/Falling head	Rising	Rising	Rising	Rising
Pre-test XD #1	3.54	3.54	3.54	3.54
Pre-test XD #2	3.96	3.96	3.96	3.96
Expected Displacement (ft)	0.979	0.5	0.718	0.986
Observed Displacement (ft)	1.08	0.544	0.805	1.03
Slug Discrepancy (%)	10%	9%	12%	4%
Max Rebound above Static				
Post-test XD #1	3.54	3.54	3.54	3.54
Residual Dev. from H_o (%)	0%	0%	0%	0%
Data Logger File Name	R133_ST11_962-1000A	R133_ST11_962-1000B	R133_ST11_962-1000C	R133_ST11_962-1000D
Specific Conductance (uS)	539	539	539	539
Temperature (C)	25.2	25.2	25.2	25.2
Lithology	Fractured finely crystalline dolostone			
Other				
K_h (ft/day)	110			
Comments	May have nonlinear mechanisms, translated to lessen affects			

Notes: Slug Discrepancy <10%; Residual Deviation from H_o < 5%; and Maximum Rebound < Spacer Placement above Static

SLUG TEST - DATA ACQUISITION SHEET

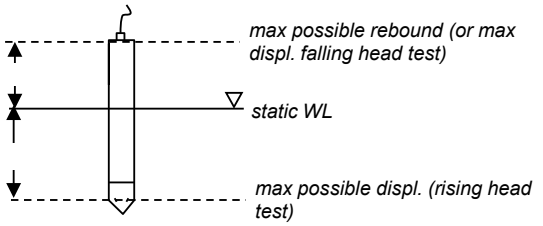
ST NO. 12

Well site:	ROMP 133 - Arredondo	Date:	5/17/2011
Well:	Core Hole	Performed by:	T. Horstman
Well Depth (ft bls)	1,060	Test Interval (ft - ft bls)	1,060-1,100
Test Casing Height (ft als)	4.77	Date of Last Development	5/17/2011
Test Casing Diameter (in)	2.38	Initial Static WL (ft btoc)	73.86
Test Casing Type	NQ	Final Static WL (ft btoc)	73.98
Test Interval Length (ft)	40	Slot Size & Filter Pack Type	none
Annulus Casing Height (ft als)	2.12	Initial Annulus WL (ft btoc)	66.21

Set-up Information

	Type (psi)	Serial No.	Purpose & Depth (ft btoc)		Reading in air (ft)	Submergence (ft)
Transducer #1	15	Spacer	test casing	77	0.05	3.27
Transducer #2	15	0603325	pressure		0.01	
Transducer #3	15	0603300	annulus	70	0.09	3.94

Data Logger	CME CR800
Spacer Length (ft)	5
Spacer OD. (inches)	1.66
Comments:	



Note: Reading in Air of the Transducer should be < +/-1% of the Full Scale of the Transducer

Test Data

	Test A	Test B	Test C	Test D
Target Displacement (ft)	1	0.5	0.75	1
Initiation method	Pneumatic	Pneumatic	Pneumatic	Pneumatic
Rising/Falling head	Rising	Rising	Rising	Rising
Pre-test XD #1	3.27	3.26	3.24	3.25
Pre-test XD #2	3.95	3.95	3.95	3.95
Expected Displacement (ft)	1.009	0.566	0.755	1.009
Observed Displacement (ft)	0.907	0.53	0.704	0.929
Slug Discrepancy (%)	10%	6%	7%	8%
Max Rebound above Static				
Post-test XD #1	3.26	3.26	3.24	3.25
Residual Dev. from H_o (%)	0%	0%	0%	0%
Data Logger File Name	R133_ST12_1060-1100A	R133_ST12_1060-1100B	R133_ST12_1060-1100C	R133_ST12_1060-1100D
Specific Conductance (uS)	526	526	526	526
Temperature (C)	21.1	21.1	21.1	21.1
Lithology	Fossiliferous grainstone			
Other				
K_h (ft/day)	52			
Comments	Test B had noise at about 58 seconds, subsequent tests did not			

Notes: Slug Discrepancy <10%; Residual Deviation from H_o < 5%; and Maximum Rebound < Spacer Placement above Static

SLUG TEST - DATA ACQUISITION SHEET

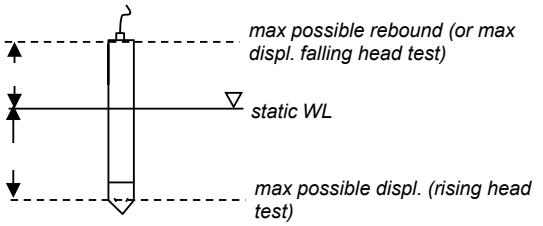
ST NO. 13

Well site:	ROMP 133 - Arredondo	Date:	5/24/2011
Well:	Core Hole	Performed by:	T. Horstman
Well Depth (ft bls)	1,210	Test Interval (ft - ft bls)	1,170-1,210
Test Casing Height (ft als)	4.85	Date of Last Development	5/24/2011
Test Casing Diameter (in)	2.38	Initial Static WL (ft btoc)	73.92
Test Casing Type	NQ	Final Static WL (ft btoc)	not recorded
Test Interval Length (ft)	40	Slot Size & Filter Pack Type	none
Annulus Casing Height (ft als)	1.35	Initial Annulus WL (ft btoc)	65.45

Set-up Information

	Type (psi)	Serial No.	Purpose & Depth (ft btoc)		Reading in air (ft)	Submergence (ft)
Transducer #1	15	Spacer	test casing	77	0.02	3.12
Transducer #2	15	0603325	pressure		-0.05	
Transducer #3	15	0603300	annulus	70	0.04	4.63

Data Logger	CME CR800
Spacer Length (ft)	5
Spacer OD. (inches)	1.66
Comments:	



Note: Reading in Air of the Transducer should be < +/-1% of the Full Scale of the Transducer

Test Data

	Test A	Test B	Test C	Test D
Target Displacement (ft)	1	0.5	0.75	1
Initiation method	Pneumatic	Pneumatic	Pneumatic	Pneumatic
Rising/Falling head	Rising	Rising	Rising	Rising
Pre-test XD #1	3.11	3.12	3.12	3.12
Pre-test XD #2	4.61	4.61	4.62	4.62
Expected Displacement (ft)	0.957	0.529	0.761	1.059
Observed Displacement (ft)	0.986	0.602	0.805	1.059
Slug Discrepancy (%)	3%	14%	6%	0%
Max Rebound above Static				
Post-test XD #1	3.11	3.12	3.12	3.12
Residual Dev. from H_o (%)	0%	0%	0%	0%
Data Logger File Name	R133_ST13_1170-1210A	R133_ST13_1170-1210B	R133_ST13_1170-1210C	R133_ST13_1170-1210D
Specific Conductance (uS)	536	536	536	536
Temperature (C)	24.2	24.2	24.2	24.2
Lithology	Fossiliferous mudstone and fractured finely crystalline dolostone			
Other				
K_h (ft/day)	70			
Comments				

Notes: Slug Discrepancy <10%; Residual Deviation from H_o < 5%; and Maximum Rebound < Spacer Placement above Static

SLUG TEST - DATA ACQUISITION SHEET

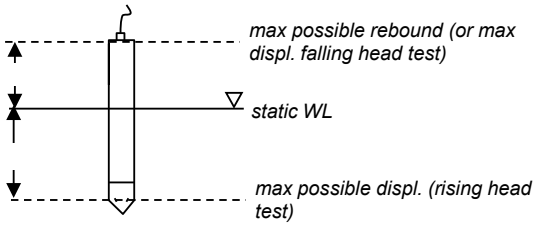
ST NO. 14

Well site:	ROMP 133 - Arredondo	Date:	6/7/2011
Well:	Core Hole	Performed by:	T. Horstman
Well Depth (ft bls)	1,310	Test Interval (ft - ft bls)	1,270-1,310
Test Casing Height (ft als)	4.82	Date of Last Development	6/7/2011
Test Casing Diameter (in)	2.38	Initial Static WL (ft btoc)	74.25
Test Casing Type	NQ	Final Static WL (ft btoc)	74.26
Test Interval Length (ft)	40	Slot Size & Filter Pack Type	none
Annulus Casing Height (ft als)	1.89	Initial Annulus WL (ft btoc)	66.23

Set-up Information

	Type (psi)	Serial No.	Purpose & Depth (ft btoc)		Reading in air (ft)	Submergence (ft)
Transducer #1	15	Spacer	test casing	77	0.01	2.89
Transducer #2	15	0603325	pressure		-0.05	
Transducer #3	15	0603300	annulus	70	0.03	3.92

Data Logger	CME CR800
Spacer Length (ft)	5
Spacer OD. (inches)	1.66
Comments:	



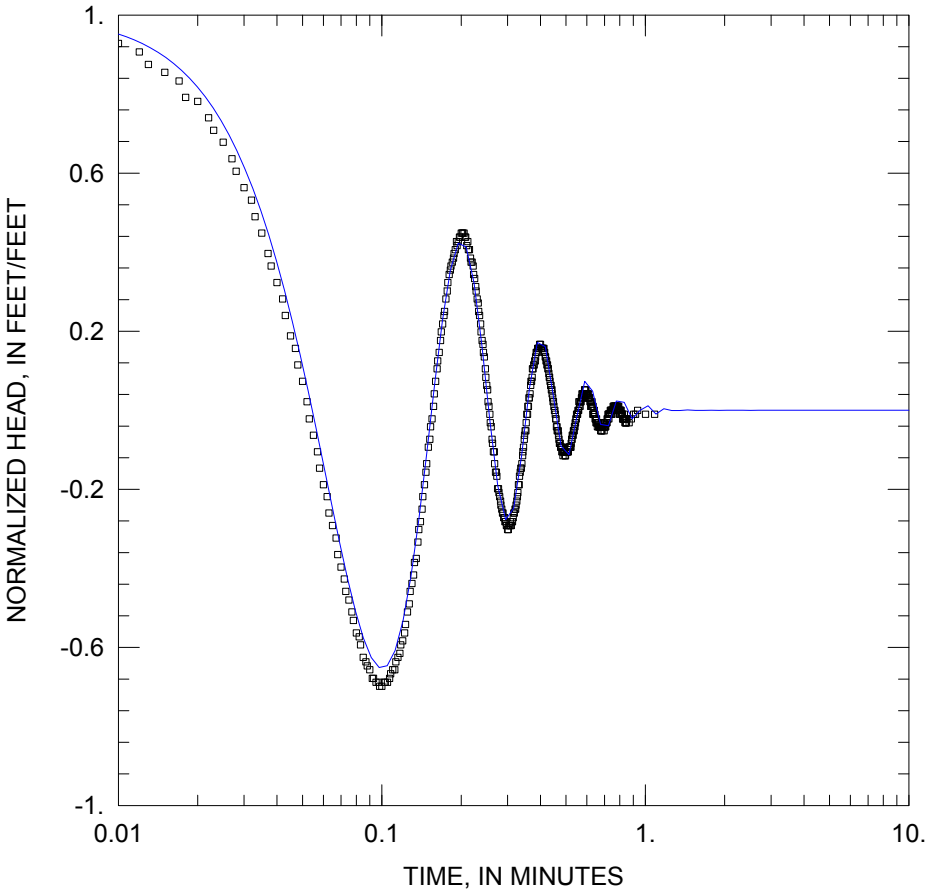
Note: Reading in Air of the Transducer should be < +/-1% of the Full Scale of the Transducer

Test Data

	Test A	Test B	Test C	Test D
Target Displacement (ft)	1	0.5	0.75	1
Initiation method	Pneumatic	Pneumatic	Pneumatic	Pneumatic
Rising/Falling head	Rising	Rising	Rising	Rising
Pre-test XD #1	2.89	2.89	2.88	2.87
Pre-test XD #2	3.92	3.92	3.92	3.93
Expected Displacement (ft)	1.074	0.544	0.798	1.066
Observed Displacement (ft)	1.074	0.551	0.783	1.117
Slug Discrepancy (%)	0%	1%	2%	5%
Max Rebound above Static				
Post-test XD #1	2.89	2.88	2.88	2.87
Residual Dev. from H_o (%)	0%	0%	0%	0%
Data Logger File Name	R133_ST14_1270-1310A	R133_ST14_1270-1310B	R133_ST14_1270-1310C	R133_ST14_1270-1310D
Specific Conductance (uS)	528	528	528	528
Temperature (C)	23.6	23.6	23.6	23.6
Lithology	Fossiliferous crystalline limestone to mudstone			
Other				
K_h (ft/day)	53			
Comments				

Notes: Slug Discrepancy <10%; Residual Deviation from H_o < 5%; and Maximum Rebound < Spacer Placement above Static

Appendix H. Slug Test Curve-Match Analyses for the ROMP 133 – Arredondo Well Site in Marion County, Florida



SLUG TEST ANALYSIS

Data Set: D:\...\ROMP 133 ST 2A Translated 1st Peak.aqt
Date: 08/05/13 Time: 10:48:18

PROJECT INFORMATION

Company: SWFWMD
Project: ROMP 133 - ARREDONDO
Location: MARION COUNTY
Test Well: CORE HOLE
Test Date: 3/8/2011

AQUIFER DATA

Saturated Thickness: 1671. ft
Anisotropy Ratio (Kz/Kr): 0.5

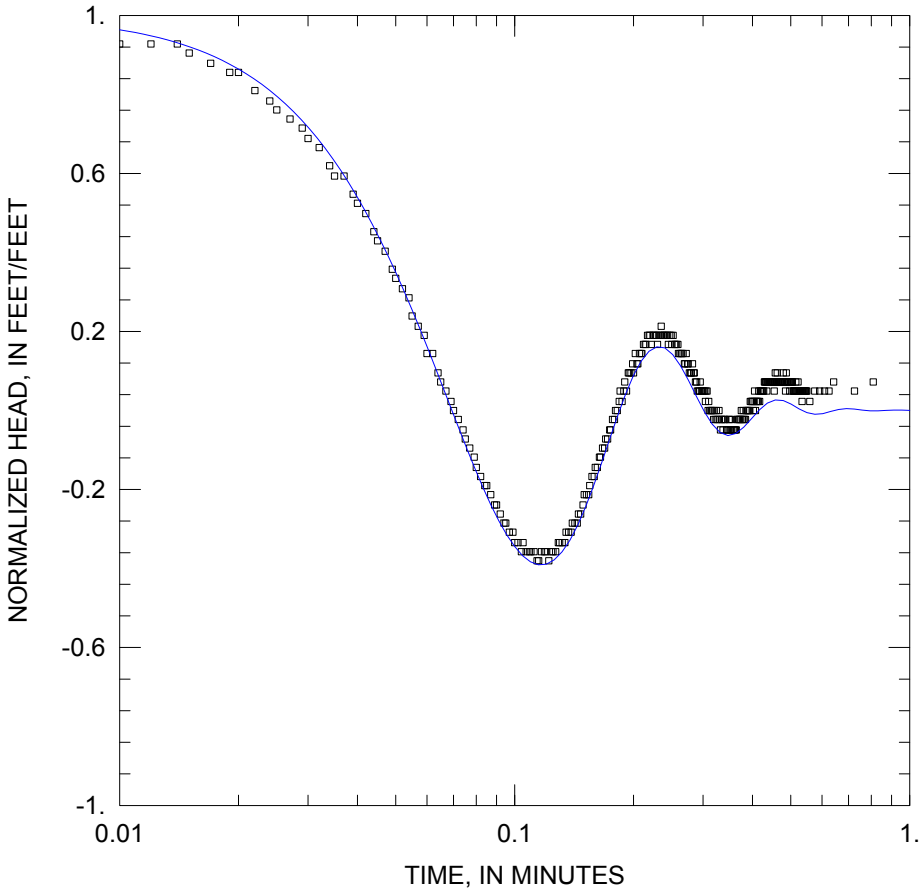
WELL DATA (CORE HOLE)

Initial Displacement: 0.696 ft
Total Well Penetration Depth: 166. ft
Casing Radius: 0.1667 ft
Static Water Column Height: 166.6 ft
Screen Length: 37.8 ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler-Zhan

Kr = 350.5 ft/day
Kz/Kr = 0.5
Ss = 1.0E-6 ft^{-1}
Le = 116.6 ft



SLUG TEST ANALYSIS

Data Set: D:\...\ROMP 133 ST 3D Translated 1st Peak.aqt
Date: 08/05/13 Time: 10:51:32

PROJECT INFORMATION

Company: SWFWMD
Project: ROMP 133 - ARREDONDO
Location: MARION COUNTY
Test Well: CORE HOLE
Test Date: 3/14/2011

AQUIFER DATA

Saturated Thickness: 196. ft
Anisotropy Ratio (Kz/Kr): 0.5

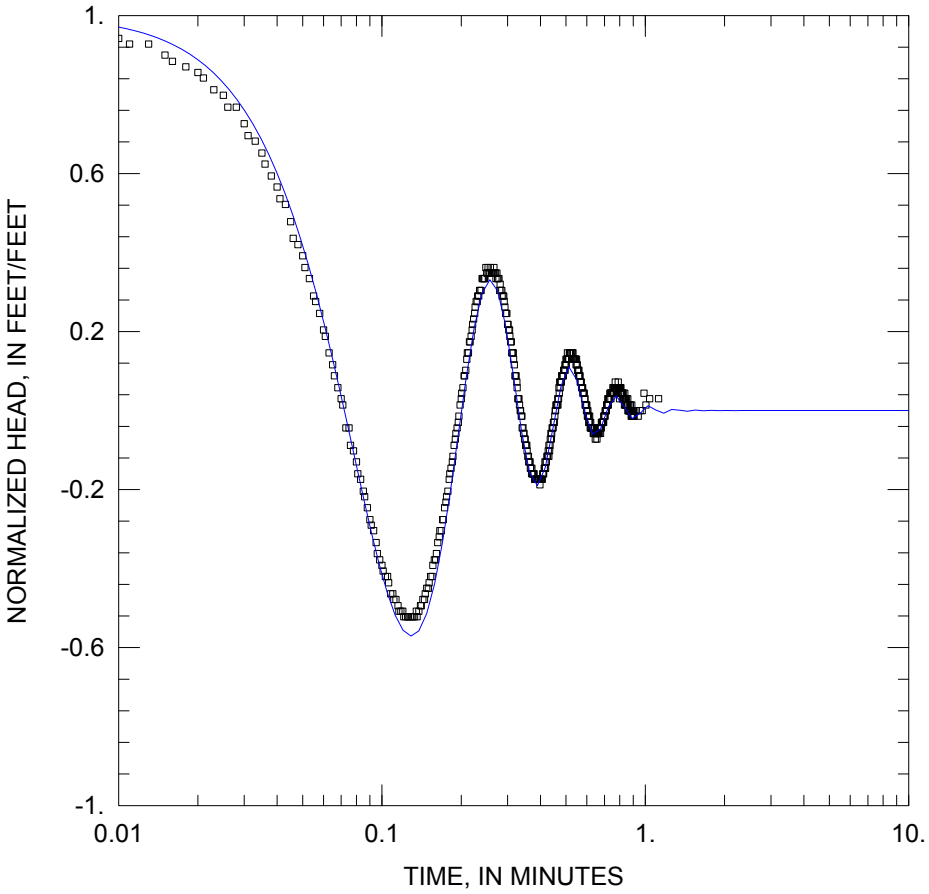
WELL DATA (CORE HOLE)

Initial Displacement: 0.305 ft
Total Well Penetration Depth: 1711. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 236.4 ft
Screen Length: 40. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler-Zhan

Kr = 46.27 ft/day
Kz/Kr = 0.5
Ss = 1.0E-6 ft^{-1}
Le = 152.5 ft



SLUG TEST ANALYSIS

Data Set: D:\...\ROMP 133 ST 4A Translated 1st Peak.aqt
Date: 08/05/13 Time: 10:55:51

PROJECT INFORMATION

Company: SWFWMD
Project: ROMP 133 - ARREDONDO
Location: MARION COUNTY
Test Well: CORE HOLE
Test Date: 3/24/2011

AQUIFER DATA

Saturated Thickness: 1671. ft Anisotropy Ratio (Kz/Kr): 0.5

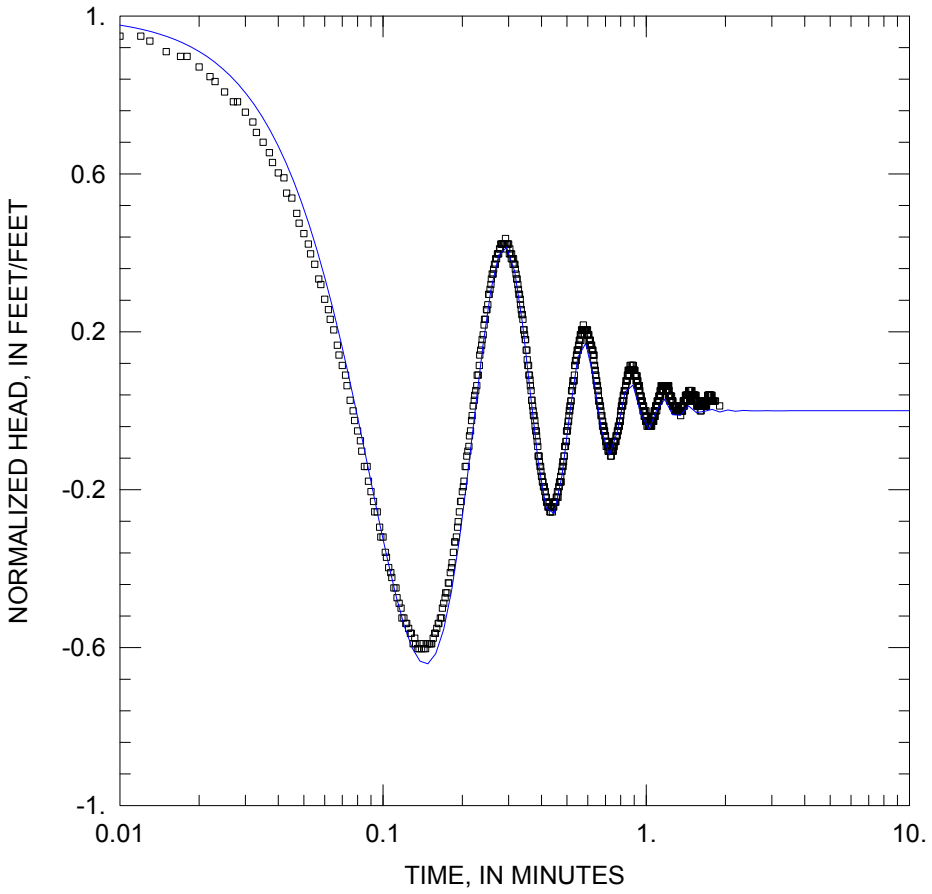
WELL DATA (CORE HOLE)

Initial Displacement: 0.5 ft
Total Well Penetration Depth: 327. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 326.5 ft
Screen Length: 41. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler-Zhan

Kr = 67.74 ft/day
Kz/Kr = 0.5
Ss = 1.0E-6 ft^{-1}
Le = 193.4 ft



SLUG TEST ANALYSIS

Data Set: D:\...\ROMP 133 ST 5A Translated 1st Peak.aqt
Date: 08/05/13 Time: 11:05:15

PROJECT INFORMATION

Company: SWFWMD
Project: ROMP 133 - ARREDONDO
Location: MARION COUNTY
Test Well: CORE HOLE
Test Date: 3/30/2011

AQUIFER DATA

Saturated Thickness: 1671. ft
Anisotropy Ratio (Kz/Kr): 0.5

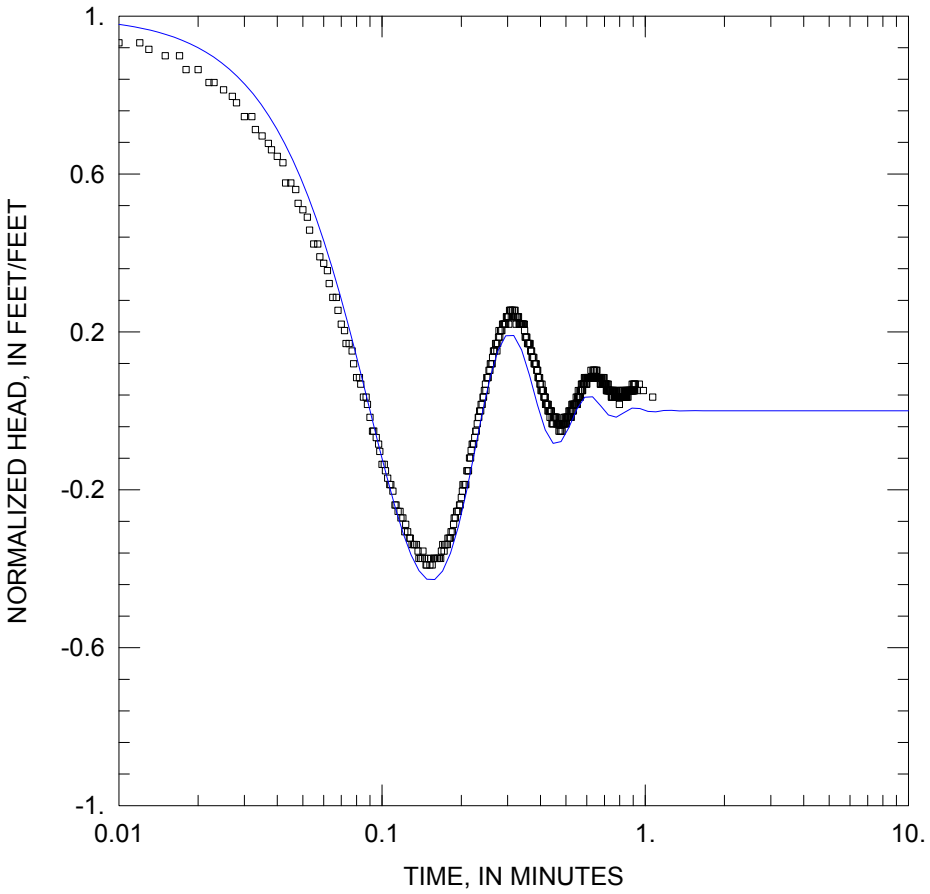
WELL DATA (CORE HOLE)

Initial Displacement: 0.566 ft
Total Well Penetration Depth: 426. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 426.1 ft
Screen Length: 40. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler-Zhan

Kr = 81.99 ft/day
Kz/Kr = 0.5
Ss = 1.0E-6 ft^{-1}
Le = 245.2 ft



SLUG TEST ANALYSIS

Data Set: D:\...\ROMP 133 ST 6A Translated 1st Peak.aqt
Date: 08/05/13 Time: 11:29:30

PROJECT INFORMATION

Company: SWFWMD
Project: ROMP 133 - ARREDONDO
Location: MARION COUNTY
Test Well: CORE HOLE
Test Date: 4/5/2011

AQUIFER DATA

Saturated Thickness: 1671. ft Anisotropy Ratio (Kz/Kr): 0.5

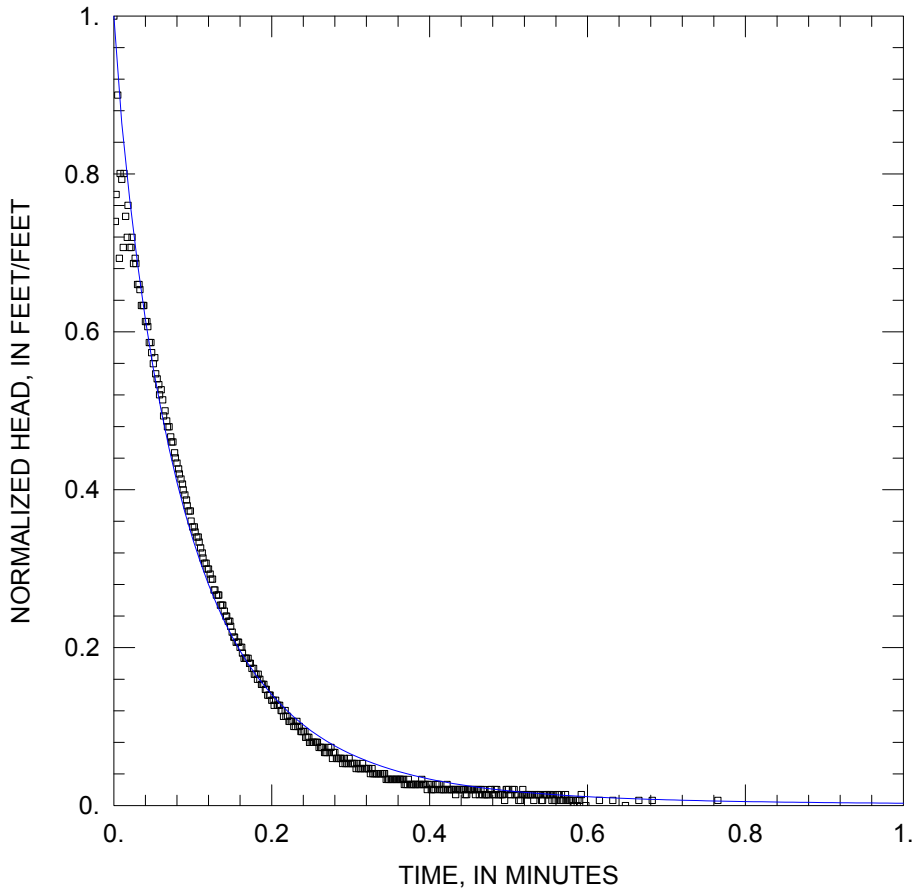
WELL DATA (CORE HOLE)

Initial Displacement: 0.428 ft
Total Well Penetration Depth: 501. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 498.4 ft
Screen Length: 53. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler-Zhan

Kr = 30.16 ft/day
Kz/Kr = 0.5
Ss = 1.0E-6 ft^{-1}
Le = 269.4 ft



SLUG TEST ANALYSIS

Data Set: D:\...\ROMP 133 ST 7A.aqt
Date: 08/05/13 Time: 11:45:11

PROJECT INFORMATION

Company: SWFWMD
Project: ROMP 133 - ARREDONDO
Location: MARION COUNTY
Test Well: CORE HOLE
Test Date: 4/12/2011

AQUIFER DATA

Saturated Thickness: 1671. ft

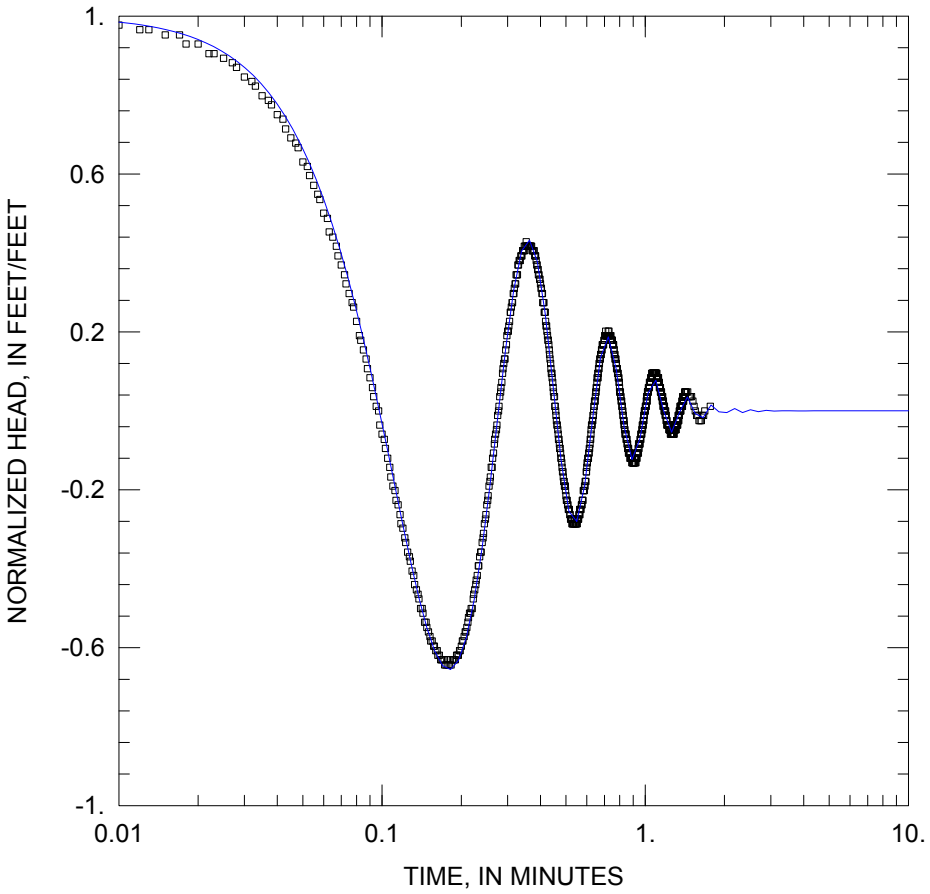
WELL DATA (CORE HOLE)

Initial Displacement: -1.088 ft
Total Well Penetration Depth: 576. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 571.1 ft
Screen Length: 40. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 9.076 ft/day
Kz/Kr = 0.5
Ss = 1.6E-6 ft^{-1}



SLUG TEST ANALYSIS

Data Set: D:\...\ROMP 133 ST 8A Translated 1st Peak.aqt
Date: 08/05/13 Time: 12:06:34

PROJECT INFORMATION

Company: SWFWMD
Project: ROMP 133 - ARREDONDO
Location: MARION COUNTY
Test Well: CORE HOLE
Test Date: 4/12/2011

AQUIFER DATA

Saturated Thickness: 1671. ft Anisotropy Ratio (Kz/Kr): 0.5

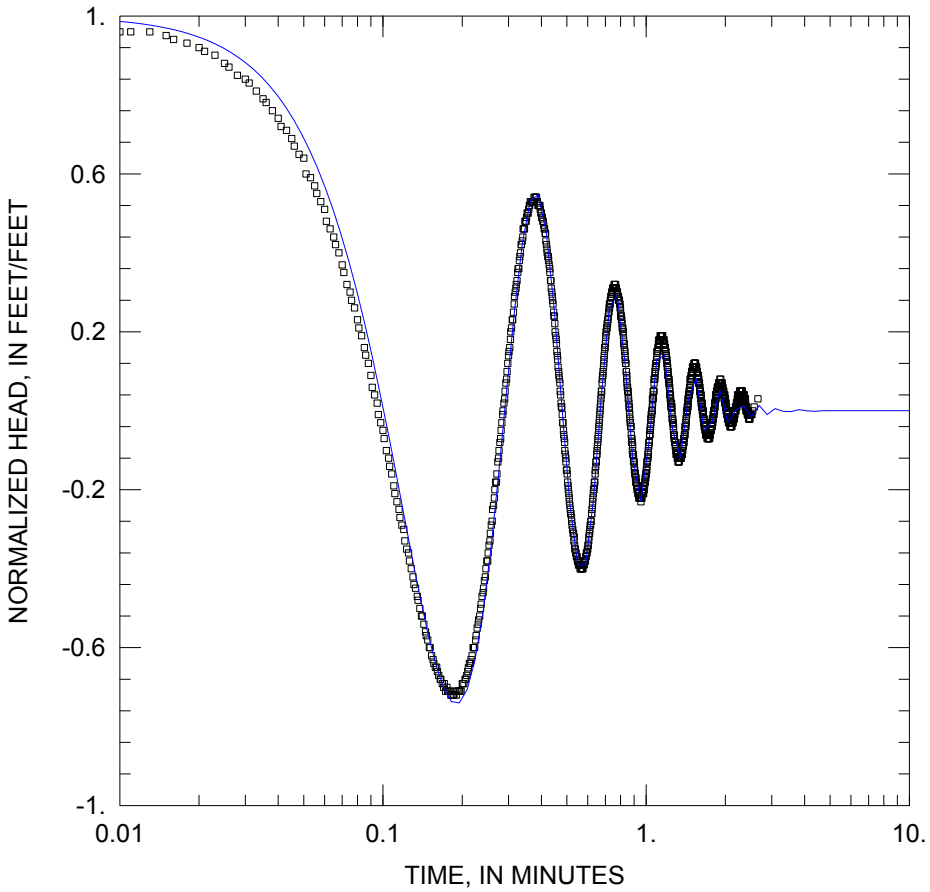
WELL DATA (CORE HOLE)

Initial Displacement: 0.609 ft
Total Well Penetration Depth: 701. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 656.4 ft
Screen Length: 40. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler-Zhan

Kr = 73.53 ft/day
Kz/Kr = 0.5
Ss = 1.0E-6 ft^{-1}
Le = 376.5 ft



SLUG TEST ANALYSIS

Data Set: D:\...\ROMP 133 ST 9A Translated 1st Peak.aqt
Date: 08/05/13 Time: 13:59:04

PROJECT INFORMATION

Company: SWFWMD
Project: ROMP 133 - ARREDONDO
Location: MARION COUNTY
Test Well: CORE HOLE
Test Date: 4/28/2011

AQUIFER DATA

Saturated Thickness: 1671. ft
Anisotropy Ratio (Kz/Kr): 0.5

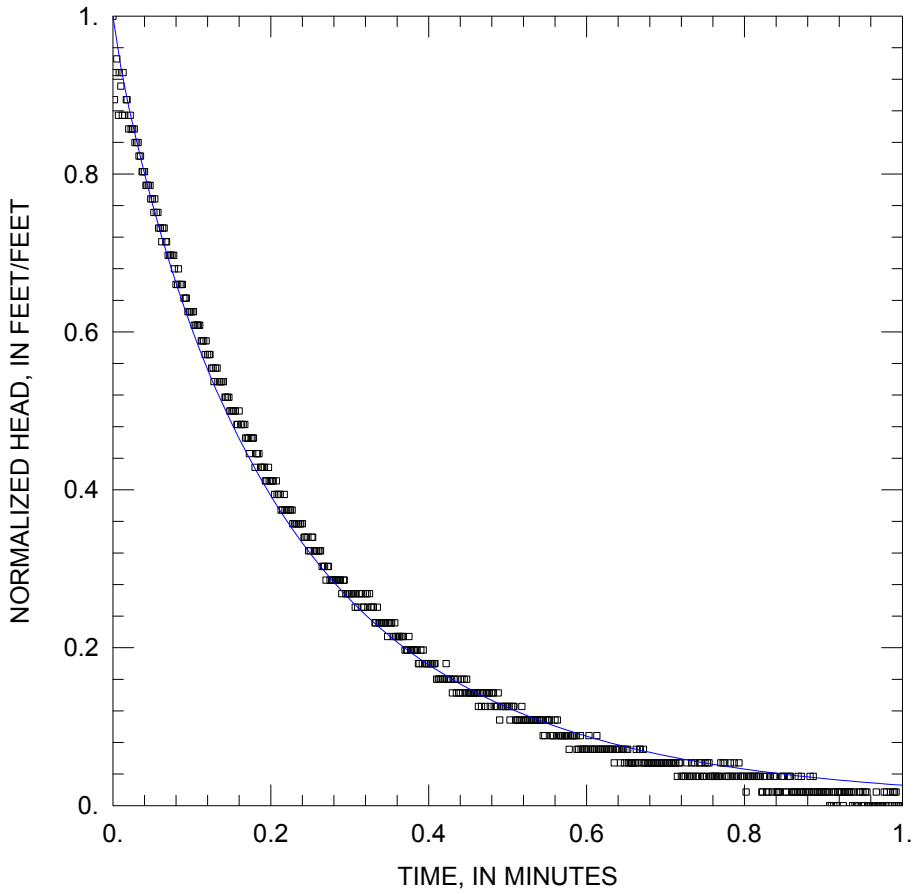
WELL DATA (CORE HOLE)

Initial Displacement: 0.725 ft
Total Well Penetration Depth: 738. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 731.1 ft
Screen Length: 40. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler-Zhan

Kr = 111.7 ft/day
Kz/Kr = 0.5
Ss = 1.0E-6 ft^{-1}
Le = 421. ft



SLUG TEST ANALYSIS

Data Set: D:\...\ROMP 133 ST 10B.aqt
Date: 08/05/13 Time: 08:41:43

PROJECT INFORMATION

Company: SWFWMD
Project: ROMP 133 - ARREDONDO
Location: MARION COUNTY
Test Well: CORE HOLE
Test Date: 5/4/2011

AQUIFER DATA

Saturated Thickness: 1671. ft

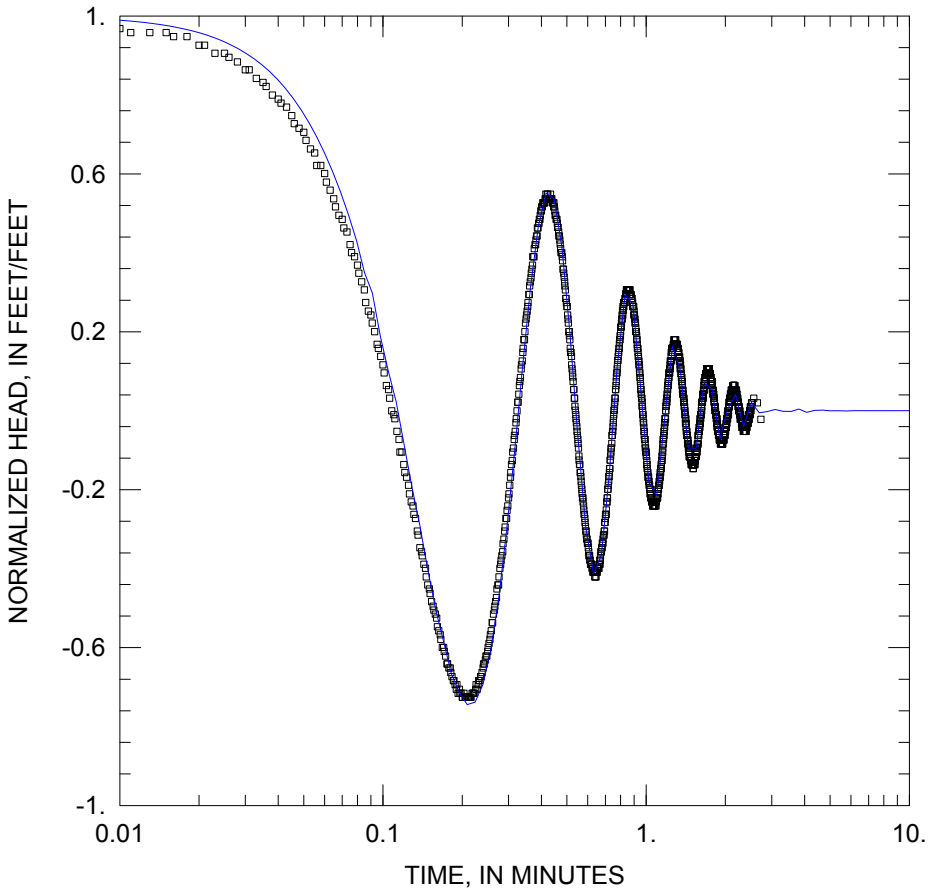
WELL DATA (CORE HOLE)

Initial Displacement: -0.406 ft
Total Well Penetration Depth: 838. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 830.9 ft
Screen Length: 40. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 3.953 ft/day
Kz/Kr = 0.5
Ss = 1.0E-6 ft^{-1}



SLUG TEST ANALYSIS

Data Set: D:\...\ROMP 133 ST 11A_Translated 1st Peak.aqt
Date: 08/05/13 Time: 15:02:28

PROJECT INFORMATION

Company: SWFWMD
Project: ROMP 133 - ARREDONDO
Location: MARION COUNTY
Test Well: CORE HOLE
Test Date: 5/10/2011

AQUIFER DATA

Saturated Thickness: 1671. ft
Anisotropy Ratio (Kz/Kr): 0.5

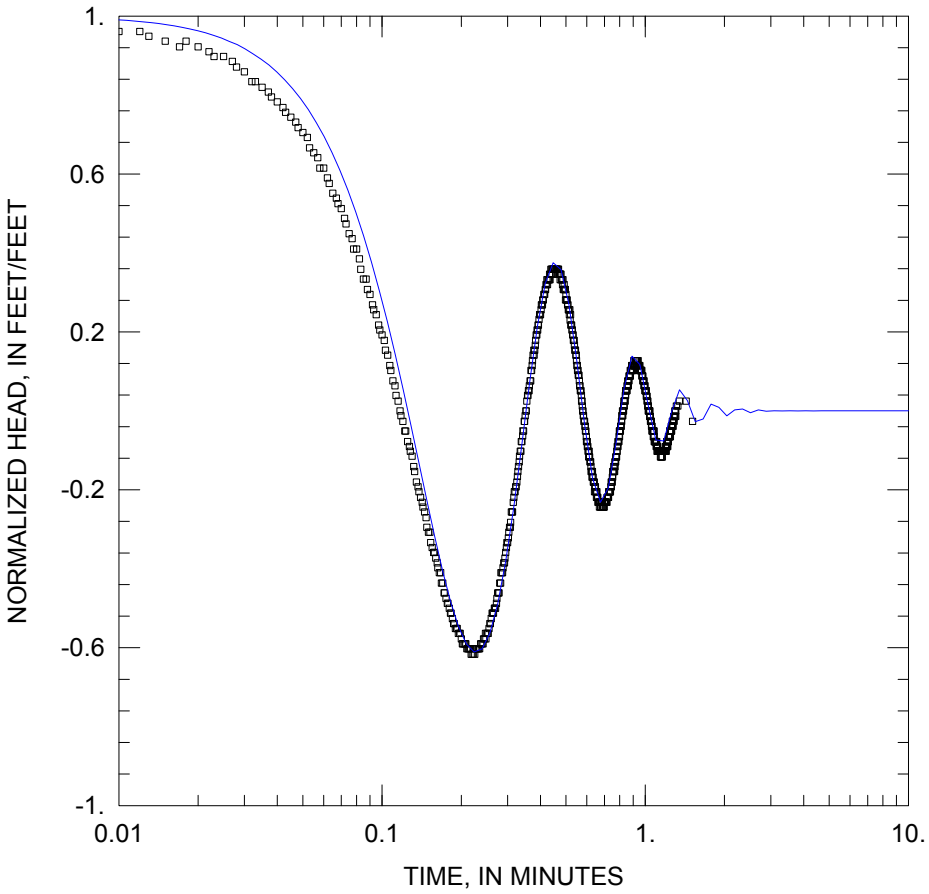
WELL DATA (CORE HOLE)

Initial Displacement: 0.689 ft
Total Well Penetration Depth: 775. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 931.1 ft
Screen Length: 40. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler-Zhan

Kr = 105.2 ft/day
Kz/Kr = 0.5
Ss = 1.0E-6 ft^{-1}
Le = 534.7 ft



SLUG TEST ANALYSIS

Data Set: D:\...\ROMP 133 ST 12A_Translated 1st Peak.aqt
Date: 08/05/13 Time: 16:15:11

PROJECT INFORMATION

Company: SWFWMD
Project: ROMP 133 - ARREDONDO
Location: MARION COUNTY
Test Well: CORE HOLE
Test Date: 5/17/2011

AQUIFER DATA

Saturated Thickness: 1671. ft Anisotropy Ratio (Kz/Kr): 0.5

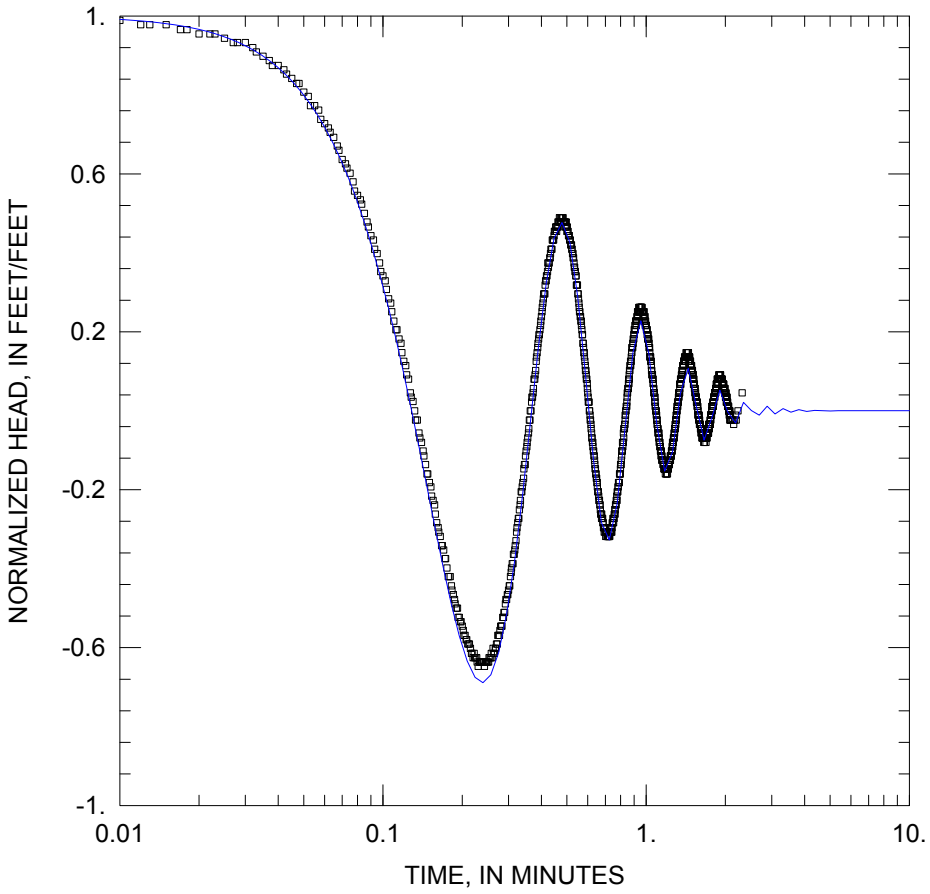
WELL DATA (CORE HOLE)

Initial Displacement: 0.566 ft
Total Well Penetration Depth: 675. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 1030.9 ft
Screen Length: 40. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler-Zhan

Kr = 51.63 ft/day
Kz/Kr = 0.5
Ss = 1.0E-6 ft^{-1}
Le = 601.2 ft



SLUG TEST ANALYSIS

Data Set: D:\...\ROMP 133 ST 13A_Translated 1st Peak.aqt
Date: 08/05/13 Time: 16:58:24

PROJECT INFORMATION

Company: SWFWMD
Project: ROMP 133 - ARREDONDO
Location: MARION COUNTY
Test Well: CORE HOLE
Test Date: 5/24/2011

AQUIFER DATA

Saturated Thickness: 1671. ft
Anisotropy Ratio (Kz/Kr): 0.5

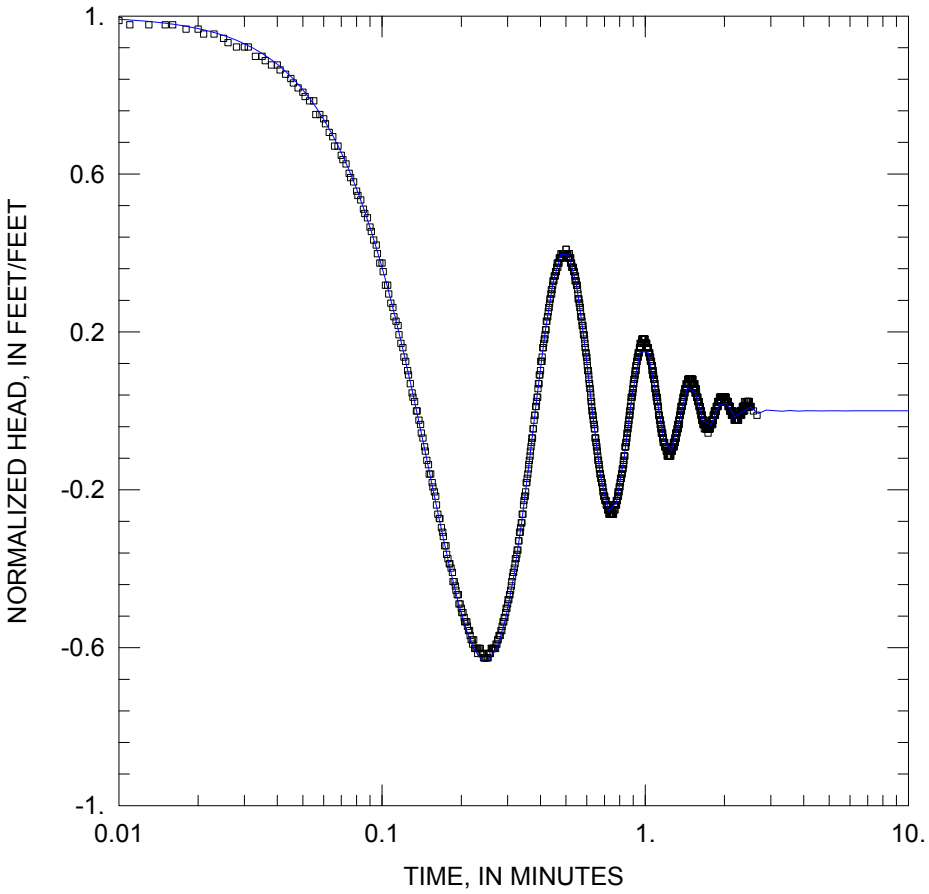
WELL DATA (CORE HOLE)

Initial Displacement: 0.638 ft
Total Well Penetration Depth: 565. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 1140.9 ft
Screen Length: 40. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler-Zhan

Kr = 70.45 ft/day
Kz/Kr = 0.5
Ss = 1.0E-6 ft^{-1}
Le = 664.5 ft



SLUG TEST ANALYSIS

Data Set: D:\...\ROMP 133 ST 14A_Translated 1st Peak.aqt
Date: 08/05/13 Time: 16:58:48

PROJECT INFORMATION

Company: SWFWMD
Project: ROMP 133 - ARREDONDO
Location: MARION COUNTY
Test Well: CORE HOLE
Test Date: 6/07/2011

AQUIFER DATA

Saturated Thickness: 1671. ft Anisotropy Ratio (Kz/Kr): 0.5

WELL DATA (CORE HOLE)

Initial Displacement: 0.638 ft
Total Well Penetration Depth: 465. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 1240.6 ft
Screen Length: 40. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler-Zhan

Kr = 53.02 ft/day
Kz/Kr = 0.5
Ss = 1.0E-6 ft^{-1}
Le = 711.3 ft

Appendix I. Daily water levels recorded during exploratory core drilling and testing at the ROMP 133 – Arredondo

[ft, feet; bls, below land surface; btoc, below top of casing; --, not recorded; NAVD 88, North American Vertical Datum of 1988; PW, 5-inch temporary drill NAVD 88; Elevation of top of casing for the DRILLING WATER SUPPLY well is 113.70 ft NAVD 88]

Date (MM/DD/YYYY)	Time (HH:MM)	Deepest Casing Depth (ft bls)	Temporary Casing Static Water Level (ft btoc)	Temporary Casing Static Water Level (ft bls)	Temporary Casing Static Water Level (ft NAVD 88)	CORE HOLE Total Depth (ft bls)	CORE HOLE Static Water Level (ft btoc)
02/07/2011	12:30	45.5	--	--	--	45.5	--
02/08/2011	10:30	45.5	--	--	--	60	--
02/09/2011	07:45	--	--	--	--	70	--
02/10/2011	07:45	65.3	64.5	63.4	50.8	75	66.05
02/14/2011	11:43	64.9	64.71	63.26	50.9	101.5	65.77
02/16/2011	09:00	74.1	64.89	63.20	51.0	105	65.69
02/17/2011	07:30	74.1	64.88	63.19	51.0	105	--
02/21/2011	10:00	74.2	64.86	63.29	50.9	105	66.38
02/22/2011	07:00	105.9	64.71	63.50	50.7	107.5	64.89
02/23/2011	07:30	105.99	64.44	63.32	50.9	125	66.94
02/24/2011	07:00	106	65.11	63.36	50.8	135	66.09
02/28/2011	10:10	132	65.88	63.50	50.7	135	--
03/01/2011	07:00	142	65.2	62.4	51.8	155	--
03/02/2011	07:05	180	63.2	60.2	54.0	180	--
03/03/2011	07:50	190	65.11	63.24	51.0	190	--
03/07/2011	11:30	192.1	65.06	63.46	50.7	210	66.19
03/08/2011	07:00	192.23	64.88	63.41	50.8	230	66.04
03/09/2011	07:30	192.23	64.84	63.37	50.8	235	66.73
03/10/2011	07:30	192.37	64.77	63.47	50.7	270	66.23
03/14/2011	11:00	192.38	64.71	63.42	50.8	300	66.24
03/15/2011	07:00	192	64.71	63.42	50.8	300	66.51
03/16/2011	07:00	--	--	--	--	300	--
03/17/2011	07:00	--	--	--	--	300	--
03/21/2011	11:45	--	--	--	--	300	--
03/22/2011	07:00	251.6	65.25	63.40	50.80	300	66.29
03/23/2011	07:30	251.83	65.15	63.53	50.67	318	66.45
03/24/2011	07:00	252.54	64.50	63.59	50.61	370	66.71
03/28/2011	11:45	254.6	64.84	63.56	50.64	390	67.47
03/29/2011	07:15	254.6	66.26	63.70	50.50	430	67.47
03/30/2011	07:00	254.6	66.20	63.64	50.56	490	67.61
03/31/2011	07:50	254.6	66.25	63.69	50.51	510	67.60
04/04/2011	12:15	254.6	66.19	63.63	50.57	550	67.58
04/05/2011	08:00	254.6	66.21	63.65	50.55	565	67.68
04/06/2011	07:30	255.26	65.78	63.88	50.32	585	71.75

well site in Marion County, Florida

casing; HWT, 4-inch temporary casing; Tops of NQ and temporary casing were measured from top of 10-inch steel casing that has elevation of 114.20 feet

CORE HOLE Static Water Level (ft bls)	CORE HOLE Static Water Level (ft NAVD 88)	DRILLING WATER SUPPLY Static Water Level (ft btoc)	DRILLING WATER SUPPLY Static Water Level (ft bls)	DRILLING WATER SUPPLY Static Water Level (ft NAVD 88)	Rain Gauge (inches)	Comments
--	--	64.95	62.35	48.75	--	PW set at 45.5 ft bls with 1.30 feet stick up
--	--	64	61.40	49.70	0.12	PW set at 45.5 ft bls with 1.30 feet stick up
--	--	64.2	61.60	49.50	--	Removed PW, advancing HWT
63.05	51.15	64	61.40	49.70	--	
62.74	51.46	64	61.40	49.70	0	
63.00	51.20	64.02	61.42	49.68	0	
--	--	64.03	61.43	49.67	0	
63.29	50.91	64.03	61.43	49.67	0	
62.61	51.59	64.05	61.45	49.65	0	
63.29	50.91	64.06	61.46	49.64	0	
63.21	50.99	64.08	61.48	49.62	0	
--	--	64.10	61.50	49.60	0	NQ tripped out
--	--	64.10	61.50	49.60	0	NQ tripped out
--	--	64.12	61.52	49.58	0	NQ tripped out
--	--	64.16	61.56	49.54	0	NQ tripped out
63.45	50.75	64.13	61.53	49.57	0.16	
63.22	50.98	64.18	61.58	49.52	0	
63.49	50.71	64.15	61.55	49.55	0	
63.53	50.67	64.16	61.56	49.54	0	
63.41	50.79	64.21	61.61	49.49	1.14	
63.37	50.83	64.21	61.61	49.49	0	
--	--	64.20	61.60	49.50	0	
--	--	64.21	61.61	49.49	0	
--	--	64.21	61.61	49.49	0	hole was not to 300 because of setting PW
63.43	50.77	64.25	61.65	49.45	0	hole was at 270 (fill to 300) because of setting PW
63.44	50.76	64.25	61.65	49.45	0	
63.45	50.75	64.22	61.62	49.48	0	
63.61	50.59	64.39	61.79	49.31	0	
63.66	50.54	64.43	61.83	49.27	0.02	Rain gauge likely did not record all rainfall. Heavy rain fell.
63.72	50.48	64.41	61.81	49.29	0.02	
64.29	49.91	64.45	61.85	49.25	1.12	
63.55	50.65	64.45	61.85	49.25	0	
64.20	50.00	64.45	61.85	49.25	0.64	Rained in morning
67.11	47.09	64.51	61.91	49.19	0	

Appendix I. Daily water levels recorded during exploratory core drilling and testing at the ROMP 133 – Arredondo

[ft, feet; bls, below land surface; btoc, below top of casing; --, not recorded; NAVD 88, North American Vertical Datum of 1988; PW, 5-inch temporary drill NAVD 88; Elevation of top of casing for the DRILLING WATER SUPPLY well is 113.70 ft NAVD 88]

Date (MM/DD/YYYY)	Time (HH:MM)	Deepest Casing Depth (ft bls)	Temporary Casing Static Water Level (ft btoc)	Temporary Casing Static Water Level (ft bls)	Temporary Casing Static Water Level (ft NAVD 88)	CORE HOLE Total Depth (ft bls)	CORE HOLE Static Water Level (ft btoc)
04/07/2011	09:00	255.47	65.41	63.72	50.48	600	71.29
04/11/2011	10:00	255.5	65.41	63.75	50.45	620	70.62
04/12/2011	07:30	255.53	65.38	63.75	50.45	640	71.4
04/13/2011	07:00	255.55	65.44	63.83	50.37	660	71.11
04/14/2011	07:00	255.63	65.31	63.78	50.42	700	71.01
04/18/2011	09:45	255.7	65.57	64.11	50.09	725	--
04/19/2011	07:00	255.7	65.21	63.75	50.45	725	--
04/20/2011	07:00	255.75	65.30	63.89	50.31	745	72.24
04/21/2011	07:00	255.75	65.15	63.74	50.46	760	74.65
04/25/2011	10:00	255.77	65.29	63.90	50.30	760	72.41
04/26/2011	07:00	255.78	64.55	63.17	51.03	760	72.59
04/27/2011	07:45	255.83	65.19	63.86	50.34	780	72.80
04/28/2011	07:00	255.93	65.16	63.93	50.27	800	--
05/02/2011	11:45	256.13	64.96	63.93	50.27	820	73.0
05/03/2011	07:00	256.32	64.81	63.97	50.23	840	72.89
05/04/2011	07:00	257.6	66.49	63.96	50.24	900	--
05/05/2011	07:00	257.66	66.50	64.03	50.17	930	72.85
05/09/2011	09:30	257.81	66.29	63.97	50.23	970	72.89
05/10/2011	07:00	257.88	66.29	64.04	50.16	1,000	73.54
05/11/2011	07:30	257.93	66.25	64.05	50.15	1,020	73.47
05/12/2011	07:15	257.97	66.21	64.05	50.15	1,040	74.31
05/16/2011	11:00	257.98	66.25	64.10	50.10	1,070	73.40
05/17/2011	07:00	258.01	66.21	64.09	50.11	1,100	72.91
05/18/2011	07:00	258.42	65.79	64.08	50.12	1,130	73.36
05/19/2011	07:30	258.79	65.44	64.10	50.10	1,150	73.27
05/23/2011	11:00	259.43	64.90	64.20	50.00	1,185	73.68
05/24/2011	07:00	259.43	65.58	64.23	49.97	1,210	73.41
05/25/2011	10:30	259.43	65.54	64.19	50.01	1,210	73.45
05/26/2011	07:00	259.43	66.45	64.14	50.06	1,230	73.04
05/31/2011	14:15	259.56	66.46	64.28	49.92	1,246	73.26
06/01/2011	07:30	259.60	66.45	64.31	49.89	1,255	79.05
06/02/2011	07:00	259.74	66.34	64.34	49.86	1,285	73.57
06/06/2011	12:00	259.84	66.28	64.38	49.82	1,310	72.73
06/07/2011	07:00	259.85	66.31	64.42	49.78	1,310	73.40
06/08/2011	07:30	260.27	65.89	64.42	49.78	1,330	76.86
06/09/2011	07:00	260.49	65.67	64.42	49.78	1,337	74.51
06/13/2011	13:00	260.49	66.65	65.40	48.80	1,337	--
06/14/2011	07:00	260.49	65.68	64.43	49.77	1,337	--

well site in Marion County, Florida

casing; HWT, 4-inch temporary casing; Tops of NQ and temporary casing were measured from top of 10-inch steel casing that has elevation of 114.20 feet

CORE HOLE Static Water Level (ft bls)	CORE HOLE Static Water Level (ft NAVD 88)	DRILLING WATER SUP-PLY Static Water Level (ft btoc)	DRILLING WATER SUPPLY Static Water Level (ft bls)	DRILLING WATER SUPPLY Static Water Level (ft NAVD 88)	Rain Gauge (inches)	Comments
67.36	46.84	64.49	61.89	49.21	0	
66.86	47.34	64.51	61.91	49.19	0	
67.54	46.66	64.51	61.91	49.19	0	
67.34	46.86	64.55	61.95	49.15	0.28	
67.37	46.83	64.54	61.94	49.16	0	
--	--	64.58	61.98	49.12	0	NQ tripped out
--	--	64.57	61.97	49.13	0	NQ tripped out
68.66	45.54	64.59	61.99	49.11	0	Rained in the evening
71.24	42.96	64.52	61.92	49.18	0.28	
68.73	45.47	64.64	62.04	49.06	0	
68.87	45.33	64.55	61.95	49.15	0	
68.93	45.27	64.65	62.05	49.05	0	
--	--	64.67	62.07	49.03	0	Packer set in hole
69.2	45	64.69	62.09	49.01	0.64	
69.12	45.08	64.69	62.09	49.01	0	
--	--	64.70	62.10	49.00	0	Packer set in hole
69.14	45.06	64.73	62.13	48.97	0	
69.04	45.16	64.74	62.14	48.96	0.16	
69.22	44.98	64.76	62.16	48.94	0	
69.59	44.61	64.82	62.22	48.88	0	
69.51	44.69	64.81	62.21	48.89	0	
69.34	44.86	64.83	62.23	48.87	0.84	
69.30	44.9	64.85	62.25	48.85	0	
69.45	44.75	64.86	62.26	48.84	0	
69.28	44.92	64.83	62.23	48.87	0	
69.81	44.39	64.92	62.32	48.78	0	
69.47	44.73	64.93	62.33	48.77	0	
69.52	44.68	64.91	62.31	48.79	0	
69.58	44.62	64.95	62.35	48.75	0	
69.7	44.5	65.00	62.40	48.70	0	
75.1	39.1	65.03	62.43	48.67	0	
69.69	44.51	65.05	62.45	48.65	0.16	
68.46	45.74	65.07	62.47	48.63	0.04	
69.63	44.57	65.01	62.41	48.69	0	
71.29	42.91	65.11	62.51	48.59	0	
69.99	44.21	65.13	62.53	48.57	0	
--	--	65.16	62.56	48.54	1.36	NQ tripped out 240 feet bls
--	--	65.15	62.55	48.55	0	NQ tripped out to 660 feet bls

Appendix J. Aquifer Performance Test Data Acquisition Sheets for the ROMP 133 – Arredondo Well Site in Marion County, Florida

AQUIFER PUMPING TEST - DATA ACQUISITION SHEET

General Information: Set 1 transducers

Site Name:	ROMP 133 - Arredondo	Date:	3/14/2012
Reporting Code:	ARRE	Performed by:	T. Horstman
County:	Marion	S/T/R:	5/12S/20E
Pumped Well:	U FLDN AQ PROD PERM	Pumped Zone OB(s):	U FLDN AQ PROD (TD = 1,296.8 ft)
Pump Type:	10-inch lineshaft diesel		CORE HOLE (TD = 1,337 ft bls)
Test Rate/Duration:	2,850 gpm/25 hours		DRILLING WATER SUPPLY (TD = 351 ft bls
Pump Set Depth:	Intake at 137 feet btoc; 16" discharge pipe with 10" orifice	Non-Pumped Zone OB(s):	None, SURF (Dry)

Setup Information:

Datalogger:	Michelangelo	Time Synchronized:	3/14/2012 @ 11:34:44
Datalogger SN:	11462 (CR1000)	Time Datum:	Laptop SW12737
Program Name:	R133_U_FLDN APT_MICHELANGELO_Card_FLOWMETER.CR1		
Program Start Date:	03/15/2012 14:36:03		
Program End Date:	04/10/2012 09:55:55		

Test Information:

Pump On Time:	04/2/2012 13:16:41	Flow Meter Totalizer Start:	68,296.5 X 1,000
Pump Off Time:	04/3/2012 14:13:51	Flow Meter Totalizer End:	72,585.5 X 1,000

		CH 1	CH 2	CH 3	CH 4	CH 5	CH 6	CH 7	CH 8	
Well		Not used	U FLDN PROD	Water Supply	Core hole	Not used	Not used	Not used	10" Flowmeter	Elevations in NAVD 88. U FLDN PROD ground elev is 111.5. Elevations from survey dated 03/23/2012, work order 12-190, field book 19/202, pages 62-66
Riser ht.	***als ft***		0.79	2.6	1.8					
TOC elev	***ft NAVD 88***		112.29	113.7	114.7					<- Elev Ref. Per survey
static W/L	***btoc ft***		70.36	67.93	69.19					<- Date: 03/14/2012
static W/L	***ft NAVD 88***		41.93	45.77	45.51					TOC elev - static WL(btoc)
XD Rating	***psi***		50	20	20					
Serial No.			1108431	0809063	0901240				20031058	Engine running at 1,840 rpms pumps 2,850 gpm. Idle engine at 1,600 rpms.
Reading in Air	***ft***		-0.02	0.04	0.13				-7.40	
XD depth	***btoc ft***		100	90	90					
XD elev	***ft NAVD 88***		12.29	23.7	24.7					TOC elev - XD depth(btoc)
XD subm.	***wl tape ft***		29.64	22.07	20.81					WL tape value of submergence
XD subm.	***XD read ft***		29.82	22.11	21.10					XD value of submergence
XD Diff.	***ft***		-0.18	-0.04	-0.29					$Subm._{WL\ tape} - Subm._{XD}$

Date	Time	CH 1	CH 2	CH 3	CH 4	CH 5	CH 6	CH 7	CH 8	Totalizer (g x 1000)	Notes
Units	---------->										
03/13/2012			Set pump intake at 137 ft bls.								
03/14/2012			Record water levels and install transducers. Water level in the 1-inch tube on the U FLDN PROD								
			well is 70.40 feet below top of casing (same water level in 16-inch casing).								
03/15/2012	14:36:03		Begin background water level data collection. **Need to delete pre-test data from background.**								
03/20/2012	14:43		Start pump pre-test 1. Start with rpms of 1,450 at idle speed and work up to 1,840 rpms after								
			engaged, which yielded about 2,850 gpm (datalogger reading). Raised rpms upt o 2,100 to keep								
			constant discharge rate of about 2,850 (friction loss because of long discharge route).								
03/20/2012	16:15		Total drawdown in the U FLDN PROD well, drilling water supply well, and core hole was about 18								
			feet, 0.2 feet, and 1 foot, respectively. Totalizer was 66,707 at start and was 66,974 at end.								
			Average gpm was 2,900. Manometer read 4.3 tenths or 51.6 inches or about 2,830 gpm.								

AQUIFER PUMPING TEST - DATA ACQUISITION SHEET

General Information:

Site Name: ROMP 133 - Arredondo
Date: 3/14/12
Reporting Code: ARRE
Performed by: T. Horstman
County: Marion
S/T/R: 5/12S/20E

Datalogger:		CH 1	CH 2	CH 3	CH 4	CH 5	CH 6	CH 7	CH 8	Totalizer	Notes
Date	Time	Not used	U FLDN PROD	Water Supply	Core hole	Not used	Not used	Not used	10" Flowmeter	(g x 1000)	
03/21/2012	14:00	Begin Pre-test 2 to verify leaks in discharge are fixed and to further the develop well because during									
		pre-test 1, abundant organics were observed in the discharge.									
03/21/2012	16:00	Stop pre-test 2. **Need to delete pre-test data from background.**									
03/26/2012	11:40:52	Begin drawdown phase. Pump turned on about 11:41.									
03/26/2012	16:30	Pump turned off because Cat engine was bogging down and revving up.									
03/26/2012	18:50	Water levels recovered. **Need to delete aborted test data from background.**									
03/27/2012	12:10	Fuel filter/lines clogged per mechanic. Repaired and tested. **Need to delete data from background.**									
04/02/2012		Downloaded data and restarted program. Re-set clock at 12:20:56.									
04/02/2012	12:23:28	Start background data collection 2.									
04/02/2012	13:16:28	Restart drawdown phase.									
04/02/2012	14:40	Manometer read 4.2 feet.									
04/03/2012	13:30	Collect water quality sample and process for laboratory analysis.									
04/03/2012	14:13:40	Begin recovery phase. Step program on datalogger.									
04/03/2012	14:13:51	Turn pump off.									
04/10/2012	09:55:55	Stop recording all data.									
		Post test time on datalogger is 09:56:36									
		Post test time on laptop is 09:56:35									

AQUIFER PUMPING TEST - DATA ACQUISITION SHEET

General Information: Set 2 transducers

Site Name:	ROMP 133 - Arredondo	Date:	3/14/2012
Reporting Code:	ARRE	Performed by:	T. Horstman
County:	Marion	S/T/R:	5/12S/20E
Pumped Well:	U FLDN AQ PROD PERM	Pumped Zone OB(s):	U FLDN AQ PROD (TD = 1,296.8 ft)
Pump Type:	10-inch lineshaft diesel		CORE HOLE (TD = 1,337 ft bls)
Test Rate/Duration:	2,850 gpm/25 hours		DRILLING WATER SUPPLY (TD = 351 ft bls
Pump Set Depth:	Intake at 137 feet btoc; 16" discharge pipe with 10" orifice	Non-Pumped Zone OB(s):	None, SURF (Dry)

Setup Information:

Datalogger:	Leonardo	Time Synchronized:	3/14/2012 @ 11:44:53
Datalogger SN:	4714 (CR1000)	Time Datum:	Laptop SW12737
Program Name:	R133_U_FLDN APT_MICHELANGELO_Card_FLOWMETER.CR1		
Program Start Date:	03/15/2012 14:34:05		
Program End Date:	04/10/2012 09:50:50		

Test Information:

Pump On Time:	04/2/2012 13:16:41	Flow Meter Totalizer Start:	68,296.5 X 1,000
Pump Off Time:	04/3/2012 14:13:51	Flow Meter Totalizer End:	72,585.5 X 1,000

		CH 1	CH 2	CH 3	CH 4	CH 5	CH 6	CH 7	CH 8	
Well		Barometer	U FLDN PROD	Water Supply	Core hole	Not used	Not used	Not used	Not used	Elevations in NAVD 88. U FLDN PROD ground elev is 111.5. Elevations from survey dated 03/23/2012, work order 12-190, field book 19/202, pages 62-66
Riser ht.	***als ft***		0.83	2.6	1.8					
TOC elev	***ft NAVD 88***		112.33	113.7	114.7					<- Elev Ref. Per survey
static W/L	***btoc ft***		70.4	67.93	69.19					<- Date: 03/14/2012
static W/L	***ft NAVD 88***		41.93	45.77	45.51					TOC elev - static WL(btoc)
XD Rating	***psi***		50	20	20					
Serial No.			0809064	0901234	0901238					Engine running at 1,840 rpms pumps 2,850 gpm. Idle engine at 1,600 rpms.
Reading in Air	***ft***		0.08	-0.14	-0.05					
XD depth	***btoc ft***		100	90	90					
XD elev	***ft NAVD 88***		12.33	23.7	24.7					TOC elev - XD depth(btoc)
XD subm.	***wl tape ft***		29.6	22.07	20.81					WL tape value of submergence
XD subm.	***XD read ft***		29.84	22.07	20.86					XD value of submergence
XD Diff.	***ft***		-0.24	0	-0.05					$Subm._{WL\ tape}$ - $Subm._{XD}$

Date	Time	CH 1	CH 2	CH 3	CH 4	CH 5	CH 6	CH 7	CH 8	Totalizer (g x 1000)	Notes
Units	---------->										
03/13/2012			Set pump intake at 137 ft bls.								
03/14/2012			Set transducer in 1-inch tube attached to 16-inch casing.								
03/15/2012	14:34:54		Begin background water level data collection.								
03/26/2012	11:39:59		Begin drawdown phase. Pump turned on about 11:41.								
03/26/2012	16:30		Pump turned off because Cat engine was bogging down and revving up.								
04/02/2012	12:07:32		Re-set clock on datalogger.								
04/02/2012	12:17:10		Start background data collection 2.								
04/02/2012	13:15:33		Restart drawdown phase.								
04/03/2012	14:12:51		Begin recovery phase. Step program on datalogger.								
04/03/2012	14:13:51		Turn pump off.								

AQUIFER PUMPING TEST - DATA ACQUISITION SHEET

General Information:

Site Name: ROMP 133 - Arredondo
Date: 3/14/12
Reporting Code: ARRE
Performed by: T. Horstman
County: Marion
S/T/R: 5/12S/20E

Datalogger:		CH 1	CH 2	CH 3	CH 4	CH 5	CH 6	CH 7	CH 8	Totalizer	Notes
Date	Time	Barometer	U FLDN PROD	Water Supply	Core hole	Not used	Not used	Not used	Not used	(g x 1000)	
04/10/2012	09:50:50	Stop recording all data.									
		Post test time on datalogger is 09:50:36									
		Post test time on laptop is 09:56:37									

AQUIFER PUMPING TEST - DATA ACQUISITION SHEET

General Information: Manometer/orifice

Site Name:	ROMP 133 - Arredondo	Date:	3/14/2012
Reporting Code:	ARRE	Performed by:	T. Horstman
County:	Marion	S/T/R:	5/12S/20E
Pumped Well:	U FLDN AQ PROD PERM	Pumped Zone OB(s):	U FLDN AQ PROD (TD = 1,296.8 ft)
Pump Type:	10-inch lineshaft diesel		CORE HOLE (TD = 1,337 ft bls)
Test Rate/Duration:	2,850 gpm/25 hours		DRILLING WATER SUPPLY (TD = 351 ft bls
Pump Set Depth:	Intake at 137 feet btoc; 16" discharge pipe with 10" orifice	Non-Pumped Zone OB(s):	None, SURF (Dry)

Setup Information:

Datalogger:	Donatello	Time Synchronized:	3/26/2012 11:20
Datalogger SN:	11463 (CR1000)	Time Datum:	Laptop SW12737
Program Name:	R133_U FLDN APT_DONATELLO_Card_MANOMETER.CR1		
Program Start Date:	03/20/2012 13:48:27		
Program End Date:	04/11/2012		

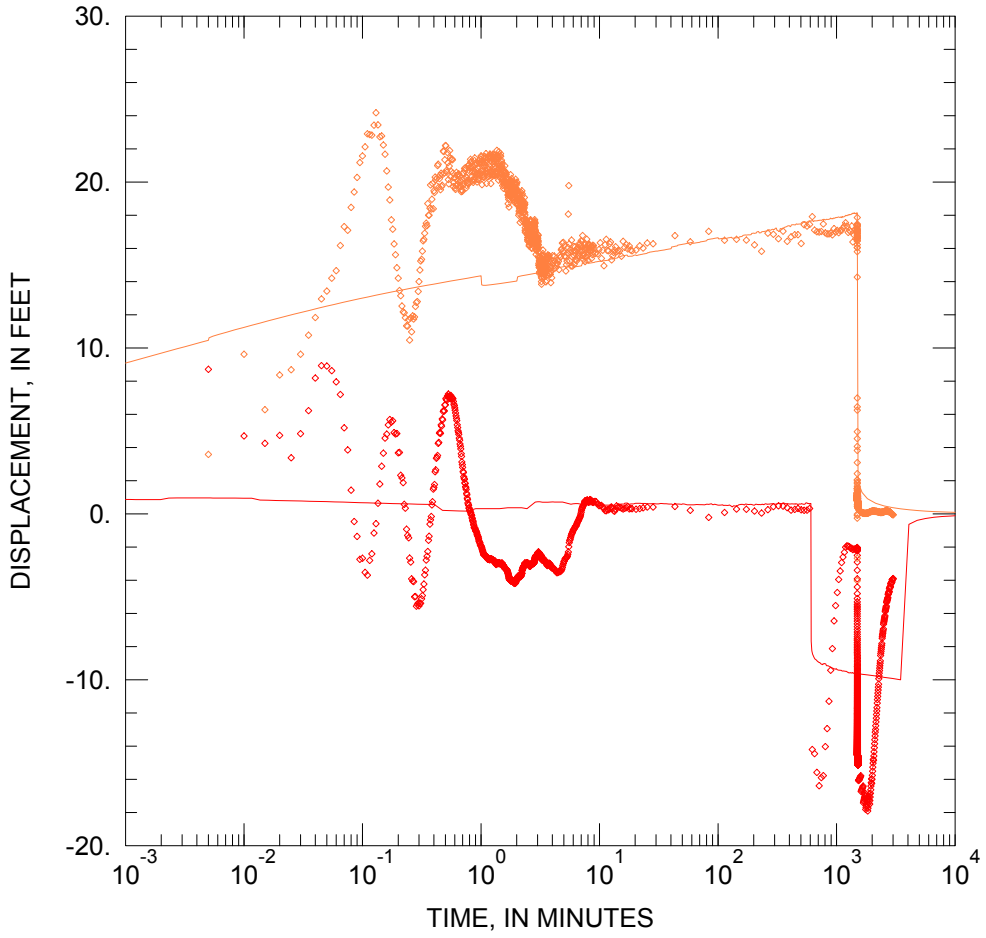
Test Information:

Pump On Time:	04/2/2012 13:16:41	Flow Meter Totalizer Start:	68,296.5 X 1,000
Pump Off Time:	04/3/2012 14:13:51	Flow Meter Totalizer End:	72,585.5 X 1,000

		CH 1	CH 2	CH 3	CH 4	CH 5	CH 6	CH 7	CH 8	
Well		Manometer	Manometer (backup)	Not used	Not used	Not used	Not used	Not used	Not used	
Riser ht.	***als ft***	--	--							
TOC elev	***ft NAVD 88***	--	--							<- Elev Ref. _____
static W/L	***btoc ft***	--	--							<- Date _____
static W/L	***ft NAVD 88***	--	--							TOC elev - static WL(btoc)
XD Rating	***psi***	20	20							
Serial No.		809056	0809057							
Reading in Air	***ft***	0.02	0							
XD depth	***btoc ft***	--	--							
XD elev	***ft NAVD 88***	--	--							TOC elev - XD depth(btoc)
XD subm.	***wl tape ft***	--	--							WL tape value of submergence
XD subm.	***XD read ft***	--	--							XD value of submergence
XD Diff.	***ft***	--	--							$Subm._{WL\ tape}$ - $Subm._{XD}$

Date	Time	CH 1	CH 2	CH 3	CH 4	CH 5	CH 6	CH 7	CH 8	Totalizer (g x 1000)	Notes
Units	---------->										
03/20/2012	13:48:27	Begin background water level data collection.									
3/26/2012	11:41	Pump turned on.									
03/26/2012	16:40	Pump turned off because Cat engine was bogging down and revving up.									
04/02/2012	12:58:45	Re-set clock on datalogger.									
04/02/2012	13:02:19	Restart program									
04/11/2012		Post test time on datalogger is 07:48:19									
		Post test time on laptop is 07:48:18									

Appendix K. Aquifer Performance Test Curve-Match Analyses for the ROMP 133 – Arredondo Well Site in Marion County, Florida



UPPER FLORIDAN AQUIFER PERFORMANCE TEST

PROJECT INFORMATION

Project: ROMP 133 – Arredondo
Location: Marion County, Florida
Test Well: U FLDN AQ PRODUCTION/MONITOR
Test Date: 4/2/2012

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
U FLDN AQ PROD/MON	0	0

Observation Wells

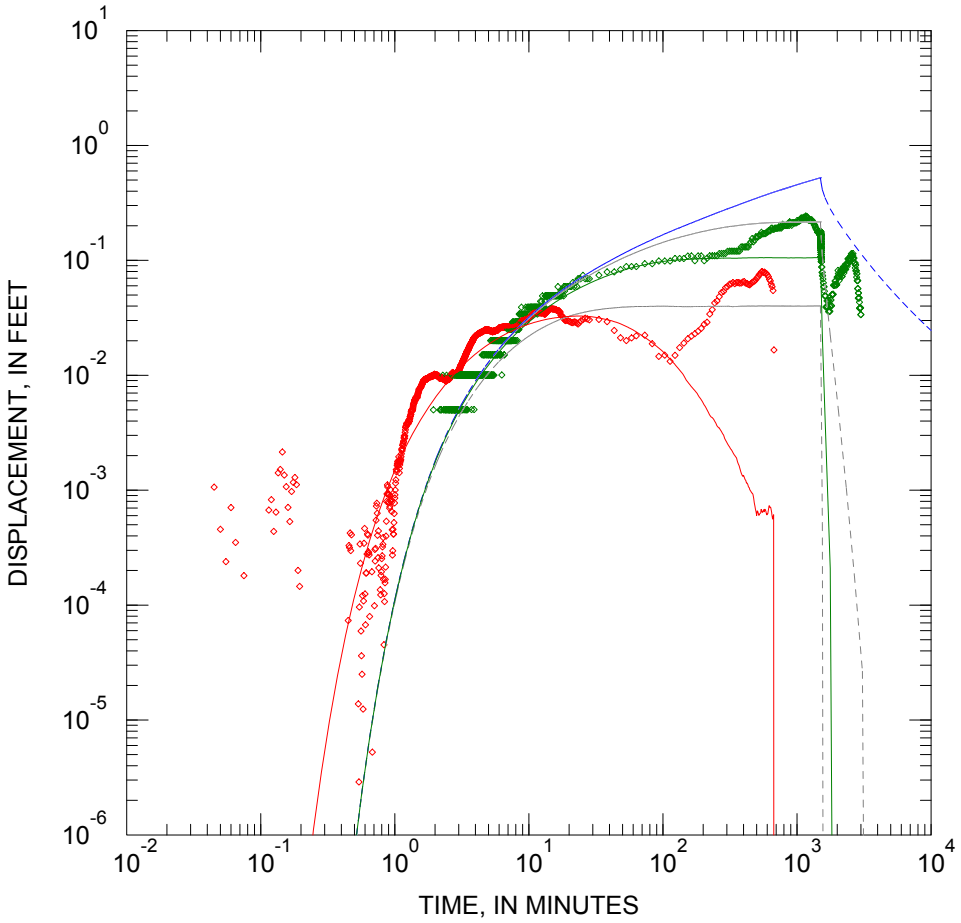
Well Name	X (ft)	Y (ft)
U FLDN AQ PROD/MON	0	0

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 8.319E+4 ft^2/day
S = 1.0E-5
Kz/Kr = 0.1
b = 1680. ft

Figure K1. AQTESOLV© curve-match solution using drawdown and recovery data collected from the U FLDN AQ PRODUCTION/MONITOR well during the Upper Floridan aquifer performance test conducted at the ROMP 133 – Arredondo well site in Marion County, Florida.



UPPER FLORIDAN AQUIFER PERFORMANCE TEST

PROJECT INFORMATION

Company: SWFWMD
Project: ROMP 133
Location: Marion County
Test Well: U FLDN AQ PRODUCTION/MONITOR
Test Date: 4/2/2012

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
U FLDN AQ PROD/MON	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
◇ DRILLING WATER SUPPLY	156	0

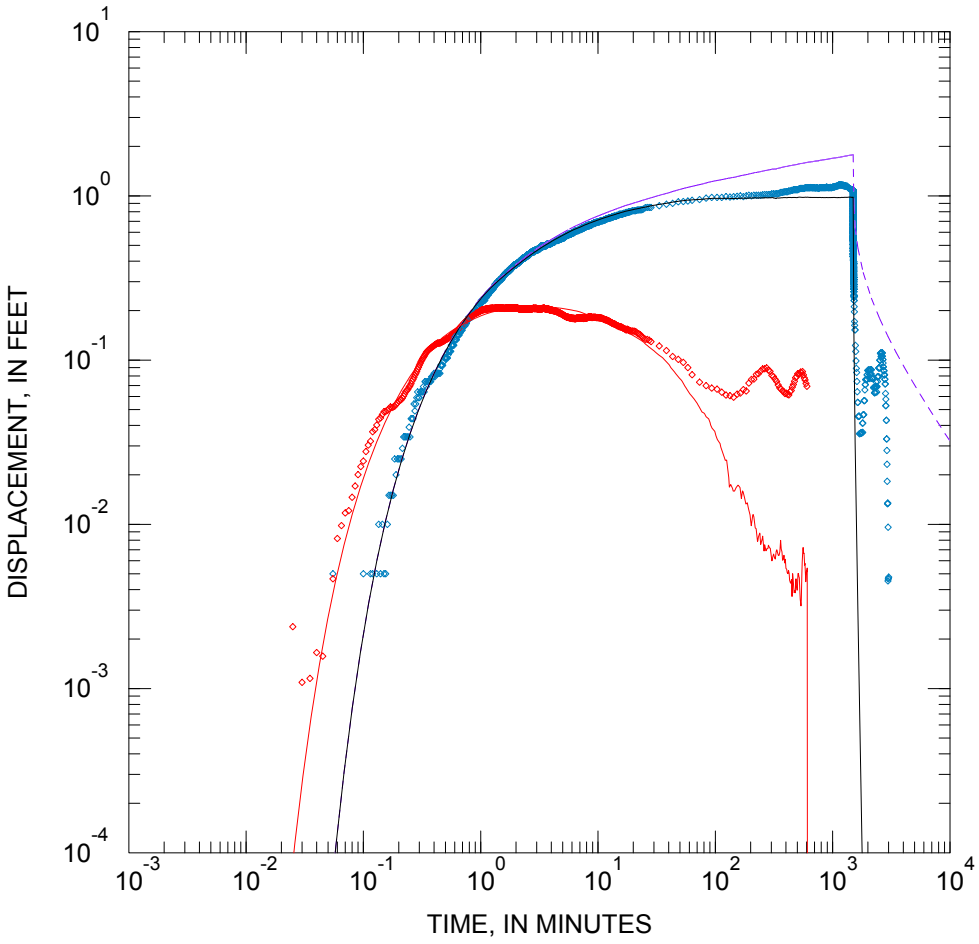
SOLUTION

Aquifer Model: Leaky
Solution Method: Hantush-Jacob

T = 2.915E+5 ft^2/day
1/B = 0.00352 ft^{-1}
b = 1680. ft

S = 0.1472
Kz/Kr = 0.1

Figure K2. AQTESOLV© curve-match solution using drawdown and recovery data collected from the DRILLING WATER SUPPLY well during the Upper Floridan aquifer performance test conducted at the ROMP 133 – Arredondo well site in Marion County, Florida.



UPPER FLORIDAN AQUIFER PERFORMANCE TEST

PROJECT INFORMATION

Project: ROMP 133 – Arredondo
Location: Marion County, Florida
Test Well: U FLDN AQ PRODUCTION/MONITOR
Test Date: 4/2/2012

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
U FLDN AQ PROD/MON	0	0

Observation Wells

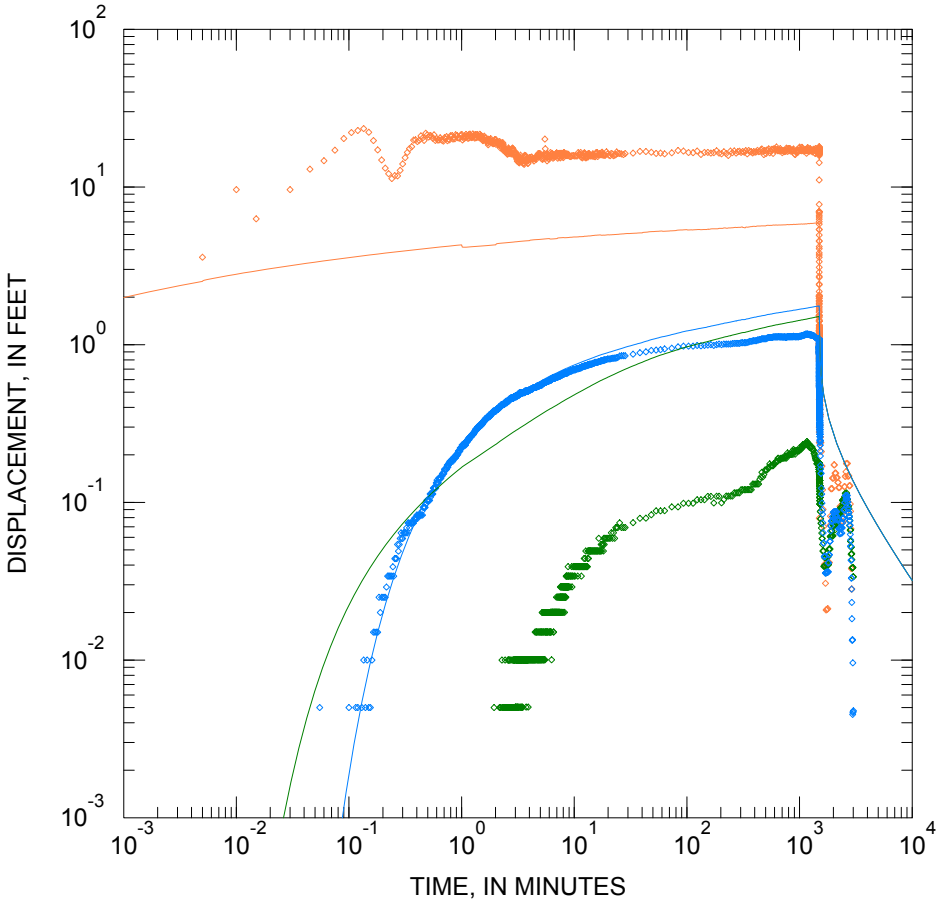
Well Name	X (ft)	Y (ft)
◇ CORE HOLE	342	0

SOLUTION

Aquifer Model: Leaky
Solution Method: Hantush-Jacob

T = 2.219E+5 ft^2/day
S = 0.001842
r/B = 0.1672
Kz/Kr = 0.1
b = 1680. ft

Figure K3. AQTESOLV© curve-match solution using drawdown and recovery data collected from the CORE HOLE during the Upper Floridan aquifer performance test conducted at the ROMP 133 – Arredondo well site in Marion County, Florida.



UPPER FLORIDAN AQUIFER PERFORMANCE TEST

PROJECT INFORMATION

Company: SWFWMD
Project: ROMP 133
Location: Marion County
Test Well: U FLDN AQ PRODUCTION/MONITOR
Test Date: 4/2/2012

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
U FLDN AQ PROD/MON	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
U FLDN AQ PROD/MON	0	0
DRILLING WATER SUPPLY	156	0
CORE HOLE	342	0

SOLUTION

Aquifer Model: Confined
T = 2.233E+5 ft^2/day
Kz/Kr = 0.1

Solution Method: Theis
S = 0.001908
b = 1680. ft

Figure K4. AQTESOLV© curve-match solution using drawdown and recovery data collected from the U FLDN AQ PRODUCTION/MONITOR well, DRILLING WATER SUPPLY well, and CORE HOLE during the Upper Floridan aquifer performance test conducted at the ROMP 133 – Arredondo well site in Marion County, Florida.

Appendix L. Water Quality Sample Data Acquistion Sheets for the ROMP 133 – Arredondo Well Site in Marion County, Florida

WATER QUALITY SAMPLE ACQUISITION **WQ No.** 1

General Information

Well site	ROMP 133 - Arredondo	Date	2/17/2011
Well	Core Hole	Time	0730
SID#	762921	Performed by	T. Horstman

Well Depth (ft bls)	95	Packed Interval (ft-ft bls)	74.1-95
Casing (HW) Depth (ft bls)	74.1	Packed Interval (m-m bls)	22-29
Casing (HW) Diameter (in.)	4	Initial Test Interval WL (ft bls)	63.31
Hole Diameter (in.)	3	Initial Annulus WL (ft bls)	none

Note: 1ft = 0.3048 m

Purge Volume (gallons)

1	0.3623	g/ft	X	20.9	ft (interval)	=	8	gallons
2	0.6528	g/ft	X	11.1	ft (interval)	=	7	gallons
				TOTAL PURGE VOLUME (one) =			15	gallons

Pump Method: Airlift

Airline Length: 80 feet

Discharge Rate (gpm): 2 gpm

Pump Time / Volume: 8 minutes **X THREE =** 24 minutes

Collection Method: Surface Discharge or (Wireline Bailer) or Nested Bailer

Comments: Purged till discharge was clear. Discharge rate was variable

Note: NQ=0.2301 gal/ft; HW=0.6528 gal/ft; open hole(NQ)=0.3623 gal/ft

Test Information

Water Quality During Purge

Time	Sp. Cond.	Temp.	pH

Not Recorded

Start Purge: 0730

End Purge: 1235

Sample Time: 1340

Shipping Batch ID: 02/17/2011 17:31

	Multimeter
Sp. Cond. (µS/cm)	498
Temperature (°C)	22
pH (SU)	7.23

	Photometer
Chloride (mg/l)	4.7
Sulfate (mg/l)	0

Samples Sent to District's Laboratory for Standard Complete Analysis? (Y) or N

WATER QUALITY SAMPLE ACQUISITION **WQ No.** 2

General Information

Well site	ROMP 133 - Arredondo	Date	3/8/2011
Well	Core Hole	Time	0715
SID#	762921	Performed by	T. Horstman

Well Depth (ft bls)	230	Packed Interval (ft-ft bls)	192.2-230
Casing (HW) Depth (ft bls)	192.2	Packed Interval (m-m bls)	58-69
Casing (HW) Diameter (in.)	4	Initial Test Interval WL (ft bls)	63.42
Hole Diameter (in.)	3	Initial Annulus WL (ft bls)	none

Note: 1ft = 0.3048 m

Purge Volume (gallons)

1	0.6528	g/ft	X	127.1	ft (interval)	=	83	gallons
2	0.3623	g/ft	X	37.9	ft (interval)	=	14	gallons
				TOTAL PURGE VOLUME (one) =			97	gallons

Pump Method: Airlift

Airline Length: 180 feet

Discharge Rate (gpm): 17 gpm

Pump Time / Volume: 6 minutes **X THREE =** 18 minutes

Collection Method: Surface Discharge or (Wireline Bailer) or Nested Bailer

Comments:

Note: NQ=0.2301 gal/ft; HW=0.6528 gal/ft; open hole(NQ)=0.3623 gal/ft

Test Information

Water Quality During Purge			
Time	Sp. Cond.	Temp.	pH
0955	427.3	21	8.08
1030	432.9	21.3	8.11
1040	435.6	21.5	8.11

Start Purge 0715

End Purge 1042

Sample Time 1100

Shipping Batch ID 03/08/2011 16:53

Multimeter	
Sp. Cond. (µS/cm)	446.3
Temperature (°C)	21.3
pH (SU)	7.54

Photometer	
Chloride (mg/l)	3.2
Sulfate (mg/l)	0

Samples Sent to District's Laboratory for Standard Complete Analysis? (Y) or N

WATER QUALITY SAMPLE ACQUISITION **WQ No.** 3

General Information

Well site	ROMP 133 - Arredondo	Date	3/14/2011
Well	Core Hole	Time	1435
SID#	762921	Performed by	T. Horstman

Well Depth (ft bls)	300	Packed Interval (ft-ft bls)	260-300
Casing (HW) Depth (ft bls)	192.38	Packed Interval (m-m bls)	79-91
Casing (HW) Diameter (in.)	4	Initial Test Interval WL (ft bls)	63.44
Hole Diameter (in.)	3	Initial Annulus WL (ft bls)	63.37

Note: 1ft = 0.3048 m

Purge Volume (gallons)

1	0.2301	g/ft	X	197	ft (interval)	=	45	gallons
2	0.3623	g/ft	X	40	ft (interval)	=	14	gallons
				TOTAL PURGE VOLUME (one) =			60	gallons

Pump Method: Airlift

Airline Length: 180 feet

Discharge Rate (gpm): 9 gpm

Pump Time / Volume: 6.7 minutes **X THREE =** 20 minutes

Collection Method: Surface Discharge or (Wireline Bailer) or Nested Bailer

Comments:

Note: NQ=0.2301 gal/ft; HW=0.6528 gal/ft; open hole(NQ)=0.3623 gal/ft

Test Information

Water Quality During Purge			
Time	Sp. Cond.	Temp.	pH
1440	405.8	22.1	8.04
1450	404.2	22.3	8.25
1455	405	22.3	8.25
1500	405.3	22.2	8.23

Start Purge 1435

End Purge 1505

Sample Time 1510

Shipping Batch ID 03/14/2011 18:23

Multimeter	
Sp. Cond. (µS/cm)	415.4
Temperature (°C)	22.5
pH (SU)	7.73

Photometer	
Chloride (mg/l)	5.9
Sulfate (mg/l)	0

Samples Sent to District's Laboratory for Standard Complete Analysis? (Y) or N

WATER QUALITY SAMPLE ACQUISITION **WQ No.** 4

General Information

Well site	ROMP 133 - Arredondo	Date	3/24/2011
Well	Core Hole	Time	1430
SID#	762921	Performed by	T. Horstman

Well Depth (ft bls)	390	Packed Interval (ft-ft bls)	349-390
Casing (PW) Depth (ft bls)	252.54	Packed Interval (m-m bls)	106-119
Casing (PW) Diameter (in.)	5	Initial Test Interval WL (ft bls)	63.49
Hole Diameter (in.)	3	Initial Annulus WL (ft bls)	63.85

Note: 1ft = 0.3048 m

Purge Volume (gallons)

1	0.2301	g/ft	X	287	ft (interval)	=	66	gallons
2	0.3623	g/ft	X	41	ft (interval)	=	15	gallons
				TOTAL PURGE VOLUME (one) =			81	gallons

Pump Method: Airlift

Airline Length: 300 feet

Discharge Rate (gpm): 27.5 gpm

Pump Time / Volume: 3 minutes **X THREE =** 9 minutes

Collection Method: Surface Discharge or (Wireline Bailer) or Nested Bailer

Comments:

Note: NQ=0.2301 gal/ft; HW=0.6528 gal/ft; open hole(NQ)=0.3623 gal/ft

Test Information

Water Quality During Purge			
Time	Sp. Cond.	Temp.	pH
1440	358.8	23.8	8.19
1450	388.4	22.5	8.17
1455	386.2	22.6	8.18
1500	386.5	22.5	8.18

Start Purge 1430

End Purge 1505

Sample Time 1525

Shipping Batch ID 03/24/2011 18:27

Multimeter	
Sp. Cond. (µS/cm)	389.6
Temperature (°C)	23.1
pH (SU)	7.98

Photometer	
Chloride (mg/l)	4.8
Sulfate (mg/l)	5

Samples Sent to District's Laboratory for Standard Complete Analysis? (Y) or N

WATER QUALITY SAMPLE ACQUISITION **WQ No.** 5

General Information

Well site	ROMP 133 - Arredondo	Date	3/30/2011
Well	Core Hole	Time	0945
SID#	762921	Performed by	T. Horstman

Well Depth (ft bls)	490	Packed Interval (ft-ft bls)	450-490
Casing (PW) Depth (ft bls)	254.6	Packed Interval (m-m bls)	137-149
Casing (PW) Diameter (in.)	5	Initial Test Interval WL (ft bls)	63.72
Hole Diameter (in.)	3	Initial Annulus WL (ft bls)	63.64

Note: 1ft = 0.3048 m

Purge Volume (gallons)

1	0.2301	g/ft	X	387	ft (interval)	=	89 gallons
2	0.3623	g/ft	X	40	ft (interval)	=	14 gallons
				TOTAL PURGE VOLUME (one) =			104 gallons

Pump Method: Airlift

Airline Length: 300 feet

Discharge Rate (gpm): 22 gpm

Pump Time / Volume: 5 minutes **X THREE =** 15 minutes

Collection Method: Surface Discharge or (Wireline Bailer) or Nested Bailer

Comments:

Note: NQ=0.2301 gal/ft; HW=0.6528 gal/ft; open hole(NQ)=0.3623 gal/ft

Test Information

Water Quality During Purge			
Time	Sp. Cond.	Temp.	pH
0955	358	22.2	8.18
1010	387	22.2	8.20
1019	388	22.2	8.21
1025	388.2	22.2	8.21

Start Purge 0945

End Purge 1028

Sample Time 1040

Shipping Batch ID 03/30/2011 16:43

Multimeter	
Sp. Cond. (µS/cm)	391.6
Temperature (°C)	22.7
pH (SU)	7.98

Photometer	
Chloride (mg/l)	5.3
Sulfate (mg/l)	12

Samples Sent to District's Laboratory for Standard Complete Analysis? (Y) or N

WATER QUALITY SAMPLE ACQUISITION **WQ No.** 6

General Information

Well site	ROMP 133 - Arredondo	Date	4/5/2011
Well	Core Hole	Time	1140
SID#	762921	Performed by	T. Horstman

Well Depth (ft bls)	565	Packed Interval (ft-ft bls)	512-565
Casing (PW) Depth (ft bls)	254.6	Packed Interval (m-m bls)	156-172
Casing (PW) Diameter (in.)	5	Initial Test Interval WL (ft bls)	64.2
Hole Diameter (in.)	3	Initial Annulus WL (ft bls)	66.12

Note: 1ft = 0.3048 m

Purge Volume (gallons)

1	0.2301	g/ft	X	450	ft (interval)	=	104	gallons
2	0.3623	g/ft	X	53	ft (interval)	=	19	gallons
				TOTAL PURGE VOLUME (one) =			123	gallons

Pump Method: Airlift

Airline Length: 300 feet

Discharge Rate (gpm): 22 gpm

Pump Time / Volume: 6 minutes **X THREE =** 18 minutes

Collection Method: Surface Discharge or (Wireline Bailer) or Nested Bailer

Comments:

Note: NQ=0.2301 gal/ft; HW=0.6528 gal/ft; open hole(NQ)=0.3623 gal/ft

Test Information

Water Quality During Purge			
Time	Sp. Cond.	Temp.	pH
1110	443.6	21.5	8.16
1115	444.7	21.8	8.14
1120	445.7	21.7	8.12

Start Purge 1050

End Purge 1124

Sample Time 1140

Shipping Batch ID 04/05/2011 16:31

Multimeter	
Sp. Cond. (µS/cm)	446.7
Temperature (°C)	20.8
pH (SU)	7.94

Photometer	
Chloride (mg/l)	4.5
Sulfate (mg/l)	26

Samples Sent to District's Laboratory for Standard Complete Analysis? (Y) or N

WATER QUALITY SAMPLE ACQUISITION **WQ No.** 7

General Information

Well site	ROMP 133 - Arredondo	Date	4/12/2011
Well	Core Hole	Time	0830
SID#	762921	Performed by	T. Horstman

Well Depth (ft bls)	640	Packed Interval (ft-ft bls)	600-640
Casing (PW) Depth (ft bls)	255.53	Packed Interval (m-m bls)	183-195
Casing (PW) Diameter (in.)	5	Initial Test Interval WL (ft bls)	67.54
Hole Diameter (in.)	3	Initial Annulus WL (ft bls)	63.75

Note: 1ft = 0.3048 m

Purge Volume (gallons)

1	0.2301	g/ft	X	537	ft (interval)	=	124	gallons
2	0.3623	g/ft	X	40	ft (interval)	=	15	gallons
				TOTAL PURGE VOLUME (one) =			139	gallons

Pump Method: Airlift

Airline Length: 400 feet

Discharge Rate (gpm): 9 gpm

Pump Time / Volume: 15 minutes **X THREE =** 45 minutes

Collection Method: Surface Discharge or (Wireline Bailer) or Nested Bailer

Comments:

Note: NQ=0.2301 gal/ft; HW=0.6528 gal/ft; open hole(NQ)=0.3623 gal/ft

Test Information

Water Quality During Purge			
Time	Sp. Cond.	Temp.	pH
0920	579	22.6	8.31
0930	614	22.6	8.26
0940	617	22.6	8.26
0950	617	22.5	8.26

Start Purge 0830

End Purge 0950

Sample Time 1000

Shipping Batch ID 04/12/2011 16:43

	Multimeter
Sp. Cond. (µS/cm)	620
Temperature (°C)	22.8
pH (SU)	8.08

	Photometer
Chloride (mg/l)	16
Sulfate (mg/l)	9

Samples Sent to District's Laboratory for Standard Complete Analysis? (Y) or N

WATER QUALITY SAMPLE ACQUISITION **WQ No.** 8

General Information

Well site	ROMP 133 - Arredondo	Date	4/19/2011
Well	Core Hole	Time	0800
SID#	762921	Performed by	T. Horstman

Well Depth (ft bls)	725	Packed Interval (ft-ft bls)	685-725
Casing (PW) Depth (ft bls)	255.7	Packed Interval (m-m bls)	209-221
Casing (PW) Diameter (in.)	5	Initial Test Interval WL (ft bls)	not recorded
Hole Diameter (in.)	3	Initial Annulus WL (ft bls)	63.75

Note: 1ft = 0.3048 m

Purge Volume (gallons)

1	0.2301	g/ft	X	617	ft (interval)	=	142	gallons
2	0.3623	g/ft	X	45	ft (interval)	=	16	gallons
				TOTAL PURGE VOLUME (one) =			158	gallons

Pump Method Airlift
Airline Length 400 feet
Discharge Rate (gpm) 28 gpm
Pump Time / Volume 6 minutes **X THREE =** 18 minutes
Collection Method: Surface Discharge or (Wireline Bailer) or Nested Bailer
Comments:

Note: NQ=0.2301 gal/ft; HW=0.6528 gal/ft; open hole(NQ)=0.3623 gal/ft

Test Information

Water Quality During Purge			
Time	Sp. Cond.	Temp.	pH
0900	404.1	22.1	8.11
0910	418.5	22.2	8.11
0920	419.6	22.2	8.10

Start Purge 0800
End Purge 0923
Sample Time 0930
Shipping Batch ID 04/19/2011 16:19

Multimeter	
Sp. Cond. (µS/cm)	424.2
Temperature (°C)	22.5
pH (SU)	7.80

Photometer	
Chloride (mg/l)	7.2
Sulfate (mg/l)	8

Samples Sent to District's Laboratory for Standard Complete Analysis? (Y) or N

WATER QUALITY SAMPLE ACQUISITION **WQ No.** 9

General Information

Well site	ROMP 133 - Arredondo	Date	4/28/2011
Well	Core Hole	Time	0730
SID#	762921	Performed by	T. Horstman

Well Depth (ft bls)	800	Packed Interval (ft-ft bls)	762-800
Casing (PW) Depth (ft bls)	255.93	Packed Interval (m-m bls)	232-244
Casing (PW) Diameter (in.)	5	Initial Test Interval WL (ft bls)	68.93
Hole Diameter (in.)	3	Initial Annulus WL (ft bls)	63.93

Note: 1ft = 0.3048 m

Purge Volume (gallons)

1	0.2301	g/ft	X	699	ft (interval)	=	161	gallons
2	0.3623	g/ft	X	38	ft (interval)	=	14	gallons
				TOTAL PURGE VOLUME (one) =			175	gallons

Pump Method: Airlift

Airline Length: 160 feet

Discharge Rate (gpm): 16 gpm

Pump Time / Volume: 11 minutes **X THREE =** 33 minutes

Collection Method: Surface Discharge or (Wireline Bailer) or Nested Bailer

Comments: Drillers shortened airline to make it easier to pull.

Note: NQ=0.2301 gal/ft; HW=0.6528 gal/ft; open hole(NQ)=0.3623 gal/ft

Test Information

Water Quality During Purge

Time	Sp. Cond.	Temp.	pH
0825	418.3	22.9	8.46
0835	441.4	22.8	8.30
0845	442.0	22.8	8.26
0855	441.5	23	8.26

Start Purge: 0730

End Purge: 0902

Sample Time: 0915

Shipping Batch ID: 04/28/2011 16:16

Multimeter	
Sp. Cond. (µS/cm)	450.7
Temperature (°C)	23.2
pH (SU)	7.82

Photometer	
Chloride (mg/l)	16.5
Sulfate (mg/l)	3

Samples Sent to District's Laboratory for Standard Complete Analysis? (Y) or N

WATER QUALITY SAMPLE ACQUISITION **WQ No.** 10

General Information

Well site	ROMP 133 - Arredondo	Date	5/4/2011
Well	Core Hole	Time	0730
SID#	762921	Performed by	T. Horstman

Well Depth (ft bls)	900	Packed Interval (ft-ft bls)	862-900
Casing (PW) Depth (ft bls)	257.6	Packed Interval (m-m bls)	263-275
Casing (PW) Diameter (in.)	5	Initial Test Interval WL (ft bls)	69.2
Hole Diameter (in.)	3	Initial Annulus WL (ft bls)	63.96

Note: 1ft = 0.3048 m

Purge Volume (gallons)

1	0.2301	g/ft	X	800	ft (interval)	=	184	gallons
2	0.3623	g/ft	X	38	ft (interval)	=	14	gallons
				TOTAL PURGE VOLUME (one) =			198	gallons

Pump Method: Airlift

Airline Length: 160/460 feet

Discharge Rate (gpm): 3.5/8 gpm

Pump Time / Volume: 57/25 minutes **X THREE =** 171/75 minutes

Collection Method: Surface Discharge or (Wireline Bailer) or Nested Bailer

Comments: Drillers lengthened airline to increase discharge rate, therefore, there are two sets of calculations. Purged 75 minutes at 3.5 gpm and 60 minutes at 8 gpm.

Note: NQ=0.2301 gal/ft; HW=0.6528 gal/ft; open hole(NQ)=0.3623 gal/ft

Test Information

Water Quality During Purge			
Time	Sp. Cond.	Temp.	pH
0940	541	22.5	7.65
0945	541	22.5	7.67
0950	541.0	22.5	7.84

Start Purge 0730/0857

End Purge 0845/0957

Sample Time 1000

Shipping Batch ID 05/04/2011 16:18

Multimeter	
Sp. Cond. (µS/cm)	537
Temperature (°C)	22.1
pH (SU)	8.05

Photometer	
Chloride (mg/l)	6.8
Sulfate (mg/l)	17

Samples Sent to District's Laboratory for Standard Complete Analysis? (Y) or N

WATER QUALITY SAMPLE ACQUISITION **WQ No.** 11

General Information

Well site	ROMP 133 - Arredondo	Date	5/10/2011
Well	Core Hole	Time	1048
SID#	762921	Performed by	T. Horstman

Well Depth (ft bls)	1,000	Packed Interval (ft-ft bls)	960-1,000
Casing (PW) Depth (ft bls)	257.88	Packed Interval (m-m bls)	293-305
Casing (PW) Diameter (in.)	5	Initial Test Interval WL (ft bls)	69.22
Hole Diameter (in.)	3	Initial Annulus WL (ft bls)	64.04

Note: 1ft = 0.3048 m

Purge Volume (gallons)

1	0.2301	g/ft	X	897	ft (interval)	=	206	gallons
2	0.3623	g/ft	X	40	ft (interval)	=	15	gallons
				TOTAL PURGE VOLUME (one) =			221	gallons

Pump Method: Airlift

Airline Length: 460 feet

Discharge Rate (gpm): 28 gpm

Pump Time / Volume: 8 minutes **X THREE =** 24 minutes

Collection Method: Surface Discharge or (Wireline Bailer) or Nested Bailer

Comments:

Note: NQ=0.2301 gal/ft; HW=0.6528 gal/ft; open hole(NQ)=0.3623 gal/ft

Test Information

Water Quality During Purge			
Time	Sp. Cond.	Temp.	pH
1115	518	24.1	8.13
1120	529	23.9	8.07
1125	533.0	23.9	7.99
1150	531	23.9	8.02

Start Purge 1048

End Purge 1223

Sample Time 1250

Shipping Batch ID 05/10/2011 16:39

Multimeter	
Sp. Cond. (µS/cm)	539
Temperature (°C)	25.2
pH (SU)	7.83

Photometer	
Chloride (mg/l)	7.2
Sulfate (mg/l)	5

Samples Sent to District's Laboratory for Standard Complete Analysis? (Y) or N

WATER QUALITY SAMPLE ACQUISITION **WQ No.** 12

General Information

Well site	ROMP 133 - Arredondo	Date	5/17/2011
Well	Core Hole	Time	0808
SID#	762921	Performed by	T. Horstman

Well Depth (ft bls)	1,100	Packed Interval (ft-ft bls)	1,060-1,100
Casing (PW) Depth (ft bls)	258.01	Packed Interval (m-m bls)	323-336
Casing (PW) Diameter (in.)	5	Initial Test Interval WL (ft bls)	69.21
Hole Diameter (in.)	3	Initial Annulus WL (ft bls)	64.09

Note: 1ft = 0.3048 m

Purge Volume (gallons)

1	0.2301	g/ft	X	997	ft (interval)	=	229	gallons
2	0.3623	g/ft	X	40	ft (interval)	=	15	gallons
				TOTAL PURGE VOLUME (one) =			244	gallons

Pump Method: Airlift

Airline Length: 460 feet

Discharge Rate (gpm): 27 gpm

Pump Time / Volume: 9 minutes **X THREE =** 27 minutes

Collection Method: Surface Discharge or (Wireline Bailer) or Nested Bailer

Comments: Strong hydrogen sulfide smell

Note: NQ=0.2301 gal/ft; HW=0.6528 gal/ft; open hole(NQ)=0.3623 gal/ft

Test Information

Water Quality During Purge			
Time	Sp. Cond.	Temp.	pH
0825	517	22.5	8.24
0830	520	22.9	8.22
0840	520	22.9	8.16

Start Purge 0808

End Purge 0844

Sample Time 0900

Shipping Batch ID 05/17/2011 16:33

Multimeter	
Sp. Cond. (µS/cm)	526
Temperature (°C)	21.1
pH (SU)	7.95

Photometer	
Chloride (mg/l)	6.4
Sulfate (mg/l)	8

Samples Sent to District's Laboratory for Standard Complete Analysis? (Y) or N

WATER QUALITY SAMPLE ACQUISITION **WQ No.** 13

General Information

Well site	ROMP 133 - Arredondo	Date	5/17/2011
Well	Core Hole	Time	0808
SID#	762921	Performed by	T. Horstman

Well Depth (ft bls)	1,210	Packed Interval (ft-ft bls)	1,170-1,210
Casing (PW) Depth (ft bls)	259.43	Packed Interval (m-m bls)	357-369
Casing (PW) Diameter (in.)	5	Initial Test Interval WL (ft bls)	69.47
Hole Diameter (in.)	3	Initial Annulus WL (ft bls)	64.23

Note: 1ft = 0.3048 m

Purge Volume (gallons)

1	0.2301	g/ft	X	1110	ft (interval)	=	255	gallons
2	0.3623	g/ft	X	40	ft (interval)	=	15	gallons
				TOTAL PURGE VOLUME (one) =			270	gallons

Pump Method: Airlift
Airline Length: 460 feet
Discharge Rate (gpm): 30 gpm
Pump Time / Volume: 9 minutes **X THREE =** 27 minutes
Collection Method: Surface Discharge or (Wireline Bailer) or Nested Bailer
Comments:

Note: NQ=0.2301 gal/ft; HW=0.6528 gal/ft; open hole(NQ)=0.3623 gal/ft

Test Information

Water Quality During Purge			
Time	Sp. Cond.	Temp.	pH
0955	535	24.0	8.27
1000	536	23.9	8.20
1005	536	23.9	8.13
1010	536	23.9	8.09

Start Purge 0933
End Purge 1015
Sample Time 1020
Shipping Batch ID 05/24/2011 16:31

Multimeter	
Sp. Cond. (µS/cm)	536
Temperature (°C)	24.2
pH (SU)	7.99

Photometer	
Chloride (mg/l)	40
Sulfate (mg/l)	11

Samples Sent to District's Laboratory for Standard Complete Analysis? (Y) or N

WATER QUALITY SAMPLE ACQUISITION **WQ No.** 14

General Information

Well site	ROMP 133 - Arredondo	Date	6/7/2011
Well	Core Hole	Time	0820
SID#	762921	Performed by	T. Horstman

Well Depth (ft bls)	1,310	Packed Interval (ft-ft bls)	1,270-1,310
Casing (PW) Depth (ft bls)	259.85	Packed Interval (m-m bls)	387-400
Casing (PW) Diameter (in.)	5	Initial Test Interval WL (ft bls)	69.63
Hole Diameter (in.)	3	Initial Annulus WL (ft bls)	64.42

Note: 1ft = 0.3048 m

Purge Volume (gallons)

1	0.2301	g/ft	X	1207	ft (interval)	=	278	gallons
2	0.3623	g/ft	X	40	ft (interval)	=	15	gallons
				TOTAL PURGE VOLUME (one) =			293	gallons

Pump Method: Airlift
Airline Length: 460 feet
Discharge Rate (gpm): 16 gpm
Pump Time / Volume: 18 minutes **X THREE =** 54 minutes
Collection Method: Surface Discharge or (Wireline Bailer) or Nested Bailer
Comments: Strong hydrogen sulfide smell

Note: NQ=0.2301 gal/ft; HW=0.6528 gal/ft; open hole(NQ)=0.3623 gal/ft

Test Information

Water Quality During Purge			
Time	Sp. Cond.	Temp.	pH
0905	501	23.5	8.34
0915	517	23.6	8.32
0925	520	23.8	8.05
0930	522	23.8	8.05
935	522	23.8	8.05

Start Purge 0820
End Purge 0940
Sample Time 0945
Shipping Batch ID 06/07/2011 16:31

Multimeter	
Sp. Cond. (µS/cm)	528
Temperature (°C)	23.6
pH (SU)	7.81

Photometer	
Chloride (mg/l)	13
Sulfate (mg/l)	21

Samples Sent to District's Laboratory for Standard Complete Analysis? (Y) or N

Appendix M. Water Quality Data for the Groundwater Quality Samples Collected at the ROMP 133 – Arredondo Well Site in Marion County, Florida

Table M1. Field analyses results of the water quality samples collected during exploratory core drilling and testing at the ROMP 133 – Arredondo well site in Marion County, Florida

[No., number; bls, below land surface; ft, feet; CH, core hole; SU, standard units; SID, Site identification; ummhos/cm, micromhos per centimeter; mg/L, milligrams per Liter; (°C), degrees Celsius; --, not applicable/not recorded; APT, aquifer performance test; gpm, gallons per minute; All sample intervals were isolated with a NQ off-bottom inflatable packer and all samples were collected with a wireline bailer except where otherwise noted.]

								MAJOR ANIONS		
Water Quality Sample No.	Monitor Well SID No.	Date MM/DD/ YYYY	Time (HH:MM)	Sample Interval (ft bls)	Tem-perature (°C)	pH (SU)	Specific Conduc-tance (umhos/ cm)	Cl^{1-} (mg/L)	SO_4^{2-} (mg/L)	Sample Collection Method/Remarks
1	762921	02/17/2011	13:40	74.1-95	22	7.23	498	4.7	0	HWT acted as packer.
2	762921	03/08/2011	11:00	192.2-230	21.3	7.54	446.3	3.2	0	HWT acted as packer.
3	762921	03/14/2011	15:10	260-300	22.5	7.73	415.4	5.9	0	
4	762921	03/24/2011	15:25	349-390	23.1	7.98	389.6	4.8	5	
5	762921	03/30/2011	10:40	450-490	22.7	7.98	391.6	5.3	12	
6	762921	04/05/2011	11:40	512-565	20.8	7.94	447	4.5	26	
7	762921	04/12/2011	10:00	600-640	22.8	8.08	620	16	9	
8	762921	04/19/2011	09:30	685-725	22.5	7.80	424	7.2	8	
9	762921	04/28/2011	09:15	762-800	23.2	7.82	451	16.5	3	
10	762921	05/04/2011	10:00	862-900	22.1	8.05	537	6.8	17	
11	762921	05/10/2011	12:50	960-1,000	25.2	7.83	539	7.2	5	
12	762921	05/17/2011	9:00	1,060-1,100	21.1	7.95	526	6.4	8	
13	762921	05/24/2011	10:20	1,170-1,210	24.2	7.99	536	40	11	
14	762921	06/07/2011	09:45	1,270-1,310	23.6	7.81	528	13	21	
--	787986	03/26/2012	12:40	308-1296.8	22.3	7.88	392	--	--	Sample taken from discharge at well head during Upper Floridan APT after about 1 hour of pumping at 2,850 gpm.
--	787986	04/03/2012	13:30	308-1296.8	23.3	7.86	403	--	--	Sample taken from discharge at well head during the Upper Floridan APT after about 24 hours of pumping at 2,850 gpm.

Table M2. Laboratory analyses results of the water quality samples collected during exploratory core drilling and

[No., number; bls, below land surface; ft, feet; CH, core hole; SU, standard units; SID, Site identification; ummhos/cm, micromhos per centimeter; mg/L, off-bottom inflatable packer and all samples were collected with a wireline bailer except where otherwise noted.]

Water Quality Sample No.	Monitor Well SID No.	Date MM/DD/YYYY	Time (HH:MM)	Sample Interval (ft bls)	pH[Q] (SU)	Specific Conductance (umhos/cm)	MAJOR ANIONS	
							Cl^{1-} (mg/L)	SO_4^{2-} (mg/L)
1	762921	02/17/2011	13:40	74.1-95	7.77	501	11.3	18.7
2	762921	03/08/2011	11:00	192.2-230	8.01	427	7.5	3.0
3	762921	03/14/2011	15:10	260-300	8.18	400	7.1	1.3
4	762921	03/24/2011	15:25	349-390	8.30	371	5.8	0.7
5	762921	03/30/2011	10:40	450-490	8.34	377.20	6.2	0.4
6	762921	04/05/2011	11:40	512-565	8.35	431.30	7.4	1.7
7	762921	04/12/2011	10:00	600-640	8.17	599.90	11.4	12.4
8	762921	04/19/2011	09:30	685-725	8.17	404.70	6.9	2.1
9	762921	04/28/2011	09:15	762-800	8.22	431.60	6.5	0.8
10	762921	05/04/2011	10:00	862-900	8.14	500.90	8.8	17.2
11	762921	05/10/2011	12:50	960-1,000	8.29	517.60	9.1	13.8
12	762921	05/17/2011	09:00	1,060-1,100	8.23	504.80	8.8	13.7
13	762921	05/24/2011	10:20	1,170-1,210	8.35	519.80	9.0	16.4
14	762921	06/07/2011	09:45	1,270-1,310	8.18	511.10	9.4	15.4
--	787986	03/26/2012	12:40	308-1,296.8	8.28	406.20	6.7	0.6
--	787986	04/03/2012	13:30	308-1,296.8	8.36	413.40	7.0	1.5

[U] The ion was analyzed for but not detected. Value is reported as the method detection limit.

[Q] Sample was held beyond holding time. Field pH is used in analyses due to a 15 minute holding time.

[I] Value is between the method detection limit and the practical quantitation limit, which is four times the detection limit.

testing at the ROMP 133 – Arredondo well site in Marion County, Florida

milligrams per Liter; --, not applicable/not recorded; APT, aquifer performance test; gpm, gallons per minute; All sample intervals were isolated with a NQ

MAJOR CATIONS									
Ca^{2+} (mg/L)	Mg^{2+} (mg/L)	Na^{+} (mg/L)	K^{+} (mg/L)	Fe^{2+} (ug/L)	Sr^{2+} (mg/L)	Si as SiO_2 (mg/L)	Total Dissolved Solids (mg/L)	Total Alkalinity $CaCO_3$ (mg/L)	Sample Collection Method/Remarks
88.7	8.67	6.45	0.76	1,240	0.15	28.8	316	250.8	HWT acted as packer.
79.8	6.56	4.31	0.38	794	0.04[I]	33.8	269	206.0	HWT acted as packer.
71.9	5.87	3.98	0.39	244	0.04[I]	28.5	242	201.6	
66.5	6.86	3.8	0.4[I]	7.84[I]	0.06[I]	22.1	230	193.2	
44.9	1.54	3.08	0.23[I]	2.5[U]	0.03[U]	25.3	231	193.4	
70.6	13.2	5.54	0.54	4.71[I]	0.08[I]	31.4	268	220.3	
64	33.6	14	1.46	67.9	0.98	32.9	374	302.9	
68.1	8.84	4.47	0.43	2.5[U]	0.1[I]	26.5[Q]	246	206.1	
72.7	10.9	4.99	0.53	230	0.11[I]	27.3	269	222.8	
80.8	20.2	7.36	0.88	11.8	0.87	28.9	314	236.0	
81.6	16.7	7.03	0.77	8.43[I]	0.49	30.2	314	253.3	
81.9	16.3	6.95	0.77	7.27[I]	0.52	29.6	307	251.8	
81	18.5	7.4	0.87	3.80[I]	0.6	29.6	310	253.3	
80.8	16.3	6.84	0.75	7.47[I]	0.47	28.0	316	249.3	
64.4	9.54	4.75	0.44	15.6	0.075[I]	27.2	249	209.9	Sample taken from discharge at well head during Upper Floridan APT after about 1 hour of pumping at 2,850 gpm.
65.5	10.1	4.87	0.46	20.3	0.127	27.5	243	213.0	Sample taken from discharge at well head during the Upper Floridan APT after about 24 hours of pumping at 2,850 gpm.

Table M3. The equivalent weight and percent equivalent weight for select ions and the water type for groundwater site in Marion County, Florida

[No., number; ft, feet; bls, below land surface; meq/L, milliequivalents per liter; %, percent; total alkalinity is used as HCO_3^{1-} because it is assumed CO_3^{2-} ions are typically not present if pH is less than 8.3 standard units (SU) (Hem, 1985); All samples have site identification (SID) number 762921.]

Water Quality Sample No.	Sample Interval (ft bls)	CATIONS							
		Ca^{2+}		Mg^{2+}		Na^{+}		K^{+}	
		meq/L	%	meq/L	%	meq/L	%	meq/L	%
1	74.1-95	4.43	81.4	0.713	13.1	0.28	5.2	0.02	0.15
2	192.2-230	3.98	84.4	0.540	11.4	0.19	4.0	0.01	0.08
3	260-300	3.59	84.3	0.483	11.4	0.17	4.1	0.01	0.09
4	349-390	3.32	81.8	0.564	13.9	0.17	4.1	0.01	0.08
5	450-490	2.24	89.4	0.127	5.1	0.13	5.3	0.01	0.12
6	512-565	3.52	72.4	1.086	22.3	0.24	5.0	0.01	0.06
7	600-640	3.19	48.4	2.764	41.9	0.61	9.2	0.04	0.09
8	685-725	3.40	78.5	0.727	16.8	0.19	4.5	0.01	0.07
9	762-800	3.63	76.3	0.897	18.9	0.22	4.6	0.01	0.07
10	862-900	4.03	66.8	1.662	27.5	0.32	5.3	0.02	0.08
11	960-1,000	4.07	70.6	1.374	23.8	0.31	5.3	0.02	0.08
12	1,060-1,100	4.09	71.1	1.341	23.3	0.30	5.3	0.02	0.08
13	1,170-1,210	4.04	68.4	1.522	25.8	0.32	5.4	0.02	0.09
14	1,270-1,310	4.03	70.9	1.341	23.6	0.30	5.2	0.02	0.08

Table M4. Select molar ratios for groundwater quality samples collected during exploratory core dilling and testing at the ROMP 133 – Arredondo well site in Marion County, Florida

[No., number; ft, feet; bls, below land surface; meq/L, milliequivalents per liter; %, percent; total alkalinity is used as HCO_3^{1-} because it is assumed CO_3^{2-} and H_2CO_3 are negligible based on groundwater pH at this site because hydroxyl ions are insignificant in groundwater and carbonate ions are typically not present if pH is less than 8.3 standard units (SU) (Hem, 1985); All samples have site identification (SID) number 762921.]

Water Quality Sample No.	Open Interval (ft bls)	$Cl^{1-}:SO_4^{2-}$	$Ca^{2+}:HCO_3^{1-}$	$Ca^{2+}:Mg_{2+}$	$Cl^{1-}:HCO_3^{1-}$	$Na^{1+}:HCO_3^{1-}$	$Na^{1+}:Cl^{1-}$	$SO_4^{2-}:HCO_3^{1-}$
1	74.1-95	1.33	0.538	6.21	0.078	0.068	0.88	0.0582
2	192.2-230	6.77	0.590	7.38	0.063	0.056	0.89	0.0093
3	260-300	14.80	0.543	7.43	0.061	0.052	0.86	0.0041
4	349-390	22.45	0.524	5.88	0.052	0.052	1.01	0.0023
5	450-490	42.00	0.353	17.68	0.055	0.042	0.77	0.0013
6	512-565	11.80	0.488	3.24	0.058	0.067	1.15	0.0049
7	600-640	2.49	0.322	1.16	0.065	0.123	1.89	0.0260
8	685-725	8.90	0.503	4.67	0.058	0.058	1.00	0.0065
9	762-800	22.02	0.497	4.05	0.050	0.059	1.18	0.0023
10	862-900	1.39	0.521	2.43	0.064	0.083	1.29	0.0463
11	960-1,000	1.79	0.490	2.96	0.062	0.074	1.19	0.0346
12	1,060-1,100	1.74	0.495	3.05	0.060	0.073	1.22	0.0346
13	1,170-1,210	1.49	0.487	2.66	0.061	0.078	1.27	0.0411
14	1,270-1,310	1.65	0.493	3.01	0.065	0.073	1.12	0.0392

quality samples collected during exploratory core drilling and testing at the ROMP 133 – Arredondo well

and H_2CO_3 are negligible based on groundwater pH at this site because hydroxyl ions are insignificant in groundwater and carbonate

ANIONS						Water Type
HCO_3^{1-}		Cl^{1-}		SO_4^{2-}		
meq/L	%	meq/L	%	meq/L	%	
4.110	83.76	0.319	6.50	0.478	9.75	Calcium Bicarbonate
3.376	92.49	0.212	5.80	0.062	1.71	Calcium Bicarbonate
3.304	93.56	0.200	5.67	0.027	0.77	Calcium Bicarbonate
3.166	94.67	0.164	4.89	0.015	0.44	Calcium Bicarbonate
3.170	94.54	0.175	5.22	0.008	0.25	Calcium Bicarbonate
3.610	93.67	0.209	5.42	0.035	0.92	Calcium Bicarbonate
4.964	89.54	0.322	5.80	0.258	4.66	Mixed-Cation Biacarbonate
3.378	93.41	0.195	5.38	0.044	1.21	Calcium Bicarbonate
3.651	94.81	0.183	4.76	0.017	0.43	Calcium Bicarbonate
3.868	86.45	0.248	5.55	0.358	8.00	Calcium Bicarbonate
4.151	88.41	0.257	5.47	0.287	6.12	Calcium Bicarbonate
4.127	88.55	0.248	5.33	0.285	6.12	Calcium Bicarbonate
4.151	87.46	0.254	5.35	0.341	7.19	Calcium Bicarbonate
4.086	87.46	0.265	5.68	0.321	6.86	Calcium Bicarbonate

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