Hydrogeology, Water Quality and Well Construction at the ROMP 41–Torrey Site in North-Central Hardee County, Florida

Southwest Florida Water Management District
Regional Observation and Monitor-well Program

July 2012

Cover Photo: Permanent monitor wells at the ROMP 41–Torrey site in north-central Hardee County, Florida. Photograph was taken by Jim Clayton on November 21, 2011.

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By James M. Clayton, P.G.

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Southwest Florida Water Management District

Data Collection Bureau
Roberta Starks, Bureau Chief

Geohydrologic Data Section
Sandie Will, P.G., Manager

Southwest Florida Water Management District
2379 Broad Street
Brooksville, FL 34604-6899

For ordering information:

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Telephone: 1-800-423-1476 or (352) 796-7211

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The hydrogeologic evaluations and interpretations contained in *Hydrogeology, Water Quality and Well Construction at the ROMP 41–Torrey Site in North-Central Hardee County, Florida* have been prepared by or approved by a Certified Professional Geologist in the State of Florida, in accordance with Chapter 492, Florida Statutes.

JAMES M. CLAYTON
LICENSE
No. PG381
STATE OF FLORIDA
PROFESSIONAL GEOLOGIST

James M. Clayton
Professional Geologist
State of Florida License No. PG381

Date: 7/30/12

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 drinking water within southwest Florida. The original design of the ROMP consisted of a ten-mile grid network comprised of 122 well sites and a coastal transect network comprised of 24 coastal monitor transects of two to three wells sites each. Since its inception, the ROMP has taken on many more data collection and well construction activities outside these original two well networks. 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 of temporal changes in water quality and/or water level. The majority of these objectives are achieved by core drilling and testing, which provides data for the hydrogeologic characterization of the well site. The ROMP staff then uses this characterization to ensure the site's monitor wells are properly installed. The hydrogeologic data of each completed ROMP well site are presented in either an executive summary or report.

Each ROMP well site is given a unique number and site name. Numbering of the ten-mile grid network sites starts in the southern District with ROMP No. 1 and generally increases northward. Numbering of the coastal transect network sites starts with ROMP TR 1 in the south and also increases northward. Individual well sites within a coastal transect are further identified as the sites progress from coastal to inland, generally from west to east, with an additional numeric identifier such as TR 1-1 and TR 1-2, respectively.

Sandie Will

Manager

Acknowledgements

The Southwest Florida Water Management District would like to express sincere appreciation to the Florida Department of Transportation for conveying this north-central Hardee County parcel of land to the District. This land is being used to further the District's goal of monitoring the water resources in all potable aquifers/zones on site in perpetuity. Wells constructed on this property will enable changes in water level and water quality in the potable aquifers/zones to be monitored through time.

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Appendices **(Digital only — compact disc attached to back cover)**

Conversion Factors and Datums

Multiply	By	To Obtain
Length		
inch (in.)	2.54	centimeter (cm)
inch (in.)	25.4	millimeters (mm)
foot (ft)	0.3048	meters (m)
mile (mi)	1.609	kilometers (km)
Volume		
gallon (gal)	3.785	liter (L)
gallon (gal)	0.003785	cubic meter (m^3)
Discharge Rate		
gallons per minute (gpm, gal/min)	0.06309	liters per second (L/s)
Mass		
ounce (oz)	28.35	grams (g)
Hydraulic Conductivity		
feet per day (ft/day)	0.3048	meters per day (m/d)
Transmissivity*		
feet squared per day (ft^2/day)	0.09290	meters squared per day (m^2/day)

Temperature in degrees Celsius (^oC) may be converted to degrees Fahrenheit (^oF) as follows:
$^oF=(1.8x^oC)+32$

Temperature in degrees Fahrenheit (^oF) may be converted to degrees Celcius (^oC) as follows:
$^oC=(^oF-32)/1.8$

Vertical Coordinate information is referenced to the North American Vertical Datum of 1988 (NAVD88) and the National Geodetic Vertical Datum of 1929 (NGVD29)

Elevation, as used in this report, refers to distance above the vertical datum.
*Transmissivity: The standard unit for Transmissivity (T) is cubic feet per day per square foot times feet of aquifer thickness [(ft^3/day)/ft^2]ft. In this report, the mathematically reduced form, feet squared per day (ft^2/day), is used for convenience.
Specific conductance is given in microsiemens per centimeter at 25 degrees Celsius (µS/cm at 25 ^oC)

Concentrations of chemical constituents in water are given in milligrams per liter (mg/L).

Abbreviations

@	at
als	above land surface
Apr	April
APT	aquifer performance test
ASR	aquifer storage and recovery
bls	below land surface
Ca^{2+}	calcium
CME	Central Mining Equipment
cps	counts per second
$days^{-1}$	1/days, feet per day per foot
Dec.	December
DWL	daily water levels
FAS	Floridan aquifer system
FDOT	Florida Department of Transportation
FGS	Florida Geological Survey
FIPS	Federal Information Processing Standards
Fm	formation
ft	feet
ft/day	feet per day
ft^2/day	feet squared per day
gpm	gallons per minute
gypsum	$CaSO_4^{2+} \cdot 2H_2O$ (calcium sulfate dihydrate)
HARN	High Accuracy Reference Network
HW	4-inch steel casing
I-75	Interstate 75
K	hydraulic conductivity
LAA	lower Arcadia aquifer
LFA	Lower Floridan aquifer
m/d/yr	month/day/year
mg/L	milligrams per Liter
Mg^{2+}	magnesium
mm	millimeter
Mon.	monitor
MW	monitor well
NAD	North American Datum
NGVD	National Geodetic Vertical Datum of 1929
Nov.	November
NQ	2 ⅜-inch internal diameter core rods
NR	No readings recorded
OB	observation well
PE	perpetual easement
perm.	permeable
P.G.	Professional Geologist

Plio	Pliocene
PT	packer test
pvc	polyvinyl chloride
PW	pumped well
PZ	permeable zone
ROMP	Regional Observation and Monitor-well Program
S	storativity
SDWRAP	Southern District Water Resource Assessment Project
SID#	site identification number
sp.	species unidentified
Sp. Cond.	specific conductance
SR	state road
Sr^{2+}	strontium
Surf.	surficial
Suw.	Suwannee
SWFWMD	Southwest Florida Water Management District
T	transmissivity
TCE	temporary construction easement
TDS	total dissolved solids
TR	transect
UFA	Upper Florida aquifer
UNDIFF	undifferentiated
US	United States
USGS	US Geological Survey
UTM	Universal Transverse Mercator
WL	water level
XD	transducer
µS/cm	microsiemens per centimeter

Hydrogeology, Water Quality and Well Construction at the ROMP 41–Torrey Site in North-Central Hardee County, Florida

By James M. Clayton, P.G.

Introduction

The Regional Observation and Monitor-well Program (ROMP) 41 - Torrey site is one of numerous ROMP sites constructed for the Southern District Water Resource Assessment Project (SDWRAP). The SDWRAP is a long-term Southwest Florida Water Management District (SWFWMD or District) study of the groundwater resources in DeSoto, Hardee, and portions of Charlotte, Polk, and Sarasota Counties.

The ROMP 41 site was acquired by the District from the Florida Department of Transportation (FDOT). Exploratory core drilling, hydraulic testing and monitor-well construction were accomplished in several phases. Phase one included coring with the District-owned Central Mining Equipment (CME) 85 drill rig, collection of hydraulic and hydrogeologic data and construction of the surficial monitor and temporary observation well. Phase two included construction of all remaining monitor and observation wells by a contractor under the supervision of District staff. Phase three was the aquifer performance testing phase, whereas phase four included lining of the Suwannee and Avon Park monitor wells with 6-inch polyvinyl chloride (pvc) casing utilizing contractor services. Phase five included abandonment of all temporary wells. Data collected during all phases are presented in this report.

Site Location

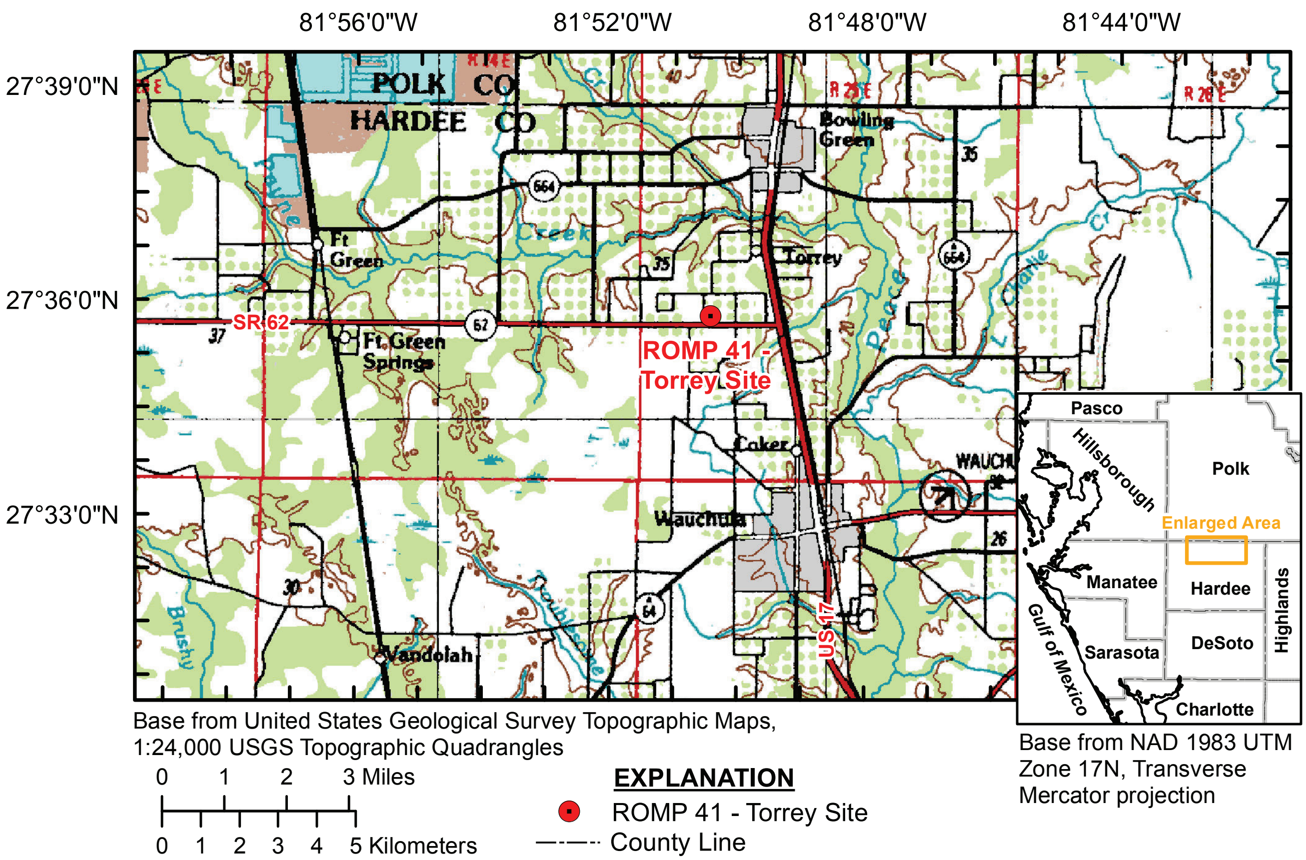
The ROMP 41–Torrey site is located off State Road 62 in north-central Hardee County (figure 1) on Florida Department of Transportation (FDOT) property (figure 2). The ROMP 41 site is approximately equidistant between Bowling Green to the north and Wauchula to the south (figure 1). The site lies in the northwest quarter of the southwest quarter of the northwest quarter of Section 20, Township 33 South, Range 25 East. The approximate coordinates of the site are 27^{o} 35’ 51.30” North latitude and 81^{o} 50’ 31.10” West longitude. The benchmark elevation at land surface at the site is 124.77 ft above the National Geodetic Vertical Datum of 1929 (NGVD). The temporary construction easement (TCE) measures 170 ft by 300 ft and the perpetual easement (PE) measures 20 feet (ft) by 80 ft. Discharge for all aquifer performance tests (APTs), except the surficial APT, was conducted to the ditch in the northeast corner of the FDOT property. This ditch conducted the discharged water to the south, under State Road 62 and eventually into a tributary of the Peace River. Discharge from the surficial APT was conducted to the perimeter ditch running north-south along the western boundary of the FDOT property. A map showing the layout of the ROMP 41 site, including well placement, is presented in figure 2.

The site can be located by turning east (left) off I-75 onto County Road 6, Moccasin Wallow Road, in Manatee County and proceeding east to US 301. Turn south (right) on US 301 and go approximately 0.4 miles to State Road 62 in Parrish, Florida. Turn east (left) on State Road 62 and proceed approximately 37 miles to the dirt road entrance to the ROMP 41 site (figure 1). The entrance road is immediately west of a single-wide mobile home and leads north to FDOT property. Turn north (left) on the dirt road and go about 100 ft to the FDOT gate. The ROMP 41 site is about 1,000 ft (0.18 miles) north of State Road 62 on FDOT property (figure 2). The site can also be accessed from the east by turning west off US 17 onto State Road 62 and proceeding about 1.25 miles to the dirt access road to the site. Turn north (right) on the dirt road and proceed as mentioned above to the well site.

Data Collection Methods

The overall objective of the data collection effort was to identify and characterize the hydrogeologic system present at the ROMP 41 site. This was accomplished by the following program of drilling, testing, and analysis. Data collected during all exploratory drilling and testing activities, monitor-well construction and aquifer performance testing at the ROMP 41 site are presented in this report.

The District collected the majority of the hydrogeologic data during the exploratory coring and testing phase of the project while utilizing the District’s CME 85 drill rig and crew. High-quality lithologic core samples were collected during the coring operation, whereas hydraulic and water-quality data were collected primarily during slug testing. Additional water level data were collected prior to initiating daily coring operations and additional water-quality data were collected between core runs when the corehole was airlifted to remove drill cuttings prior to adding additional core rods to advance the corehole. This additional water level and water-quality



[N, north; NAD, North American Datum; SR, state road; US, United States Highway; USGS, United States Geological Survey; UTM, Universal Transverse Mercator; W, west]

Figure 1. Location map of the ROMP 41 site in north-central Hardee County, Florida.

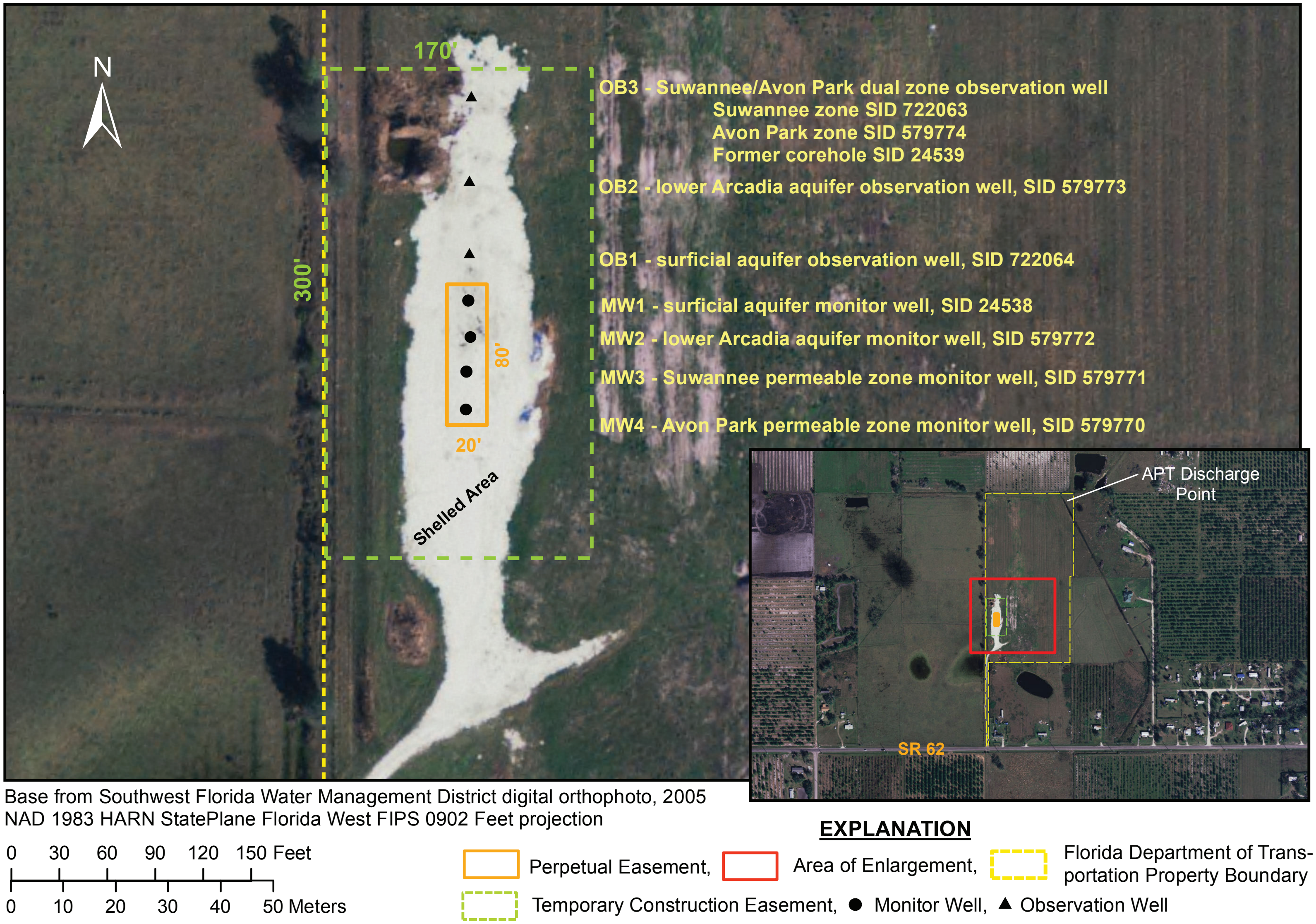
data was of a composite nature as a packer was not generally set during this data collection. Geophysical logging was conducted in the corehole providing additional hydrogeologic data. After well construction, APTs were conducted on each of the major aquifers and permeable zones encountered at the site. A detailed description of ROMP data collection methods can be found in Appendix A.

Well Construction

A total of four permanent wells and three temporary wells were constructed at the ROMP 41 site. Well construction, including lining pumped wells and abandoning temporary observation wells, was completed in four phases. Phase one was accomplished with the District CME 85 core rig and crew, while phases two and three were accomplished by Diversified Drilling Corporation under the supervision of a District representative. Phase four was accomplished by Guest Well Drilling.

The first phase, exploratory coring from land surface to 1,640 ft below land surface (bls), began December 2, 2003 and was completed August 12, 2004 (Appendix B, figure B.1, corehole). A coring hiatus occurred from January 15, 2004 to April 15, 2004 while the CME 85 and crew installed aquifer storage and recovery (ASR) monitor wells in Hillsborough County and reamed the ROMP 41 corehole to install 6-inch pvc casing at 463 ft bls. The diameter of the corehole prior to setting the 6-inch pvc is presented in the Gamma/Caliper log in Appendix C, figure C.1, whereas the 6-inch pvc casing set is confirmed at 463 ft bls in the Gamma/Caliper log in Appendix C, figure C.3. The first phase also included construction of the permanent surficial monitor well (Appendix B, figure B.2) and the temporary surficial observation well (Appendix B, figure B.3).

The second phase included construction of the remaining permanent wells: the Avon Park monitor, the Suwannee monitor and the lower Arcadia monitor (Appendix B, figures B.4 to B.6), respectively, as well as the temporary wells: the lower Arcadia observation well (Appendix B, figure B.7) and conversion of the corehole into a temporary dual zone observation well (Appendix B, figure B.8), monitoring the Avon Park and Suwannee permeable zones. Phase two commenced on March 14, 2006 and was completed on September 28, 2006, and was done by Diversified Drilling Corporation. The location of all wells is shown in figure 2.



[APT, aquifer performance test; FIPS, Federal Information Processing Standards; HARN, High Accuracy Reference Network; MW, monitor well; NAD 1983, North American Datum of 1983; OB, observation well; SID, site identification number; SR, state road]

Figure 2. Layout of the ROMP 41 site in north-central Hardee County, Florida

Phase three entailed lining the Avon Park and Suwannee pumped wells with 6-inch pvc casing, leaving them in their final configuration as permanent monitor wells. This was done by Diversified Drilling Corporation from February 16 to March 9, 2009.

Phase four, abandonment of all temporary observation wells, was done by Guest Well Drilling in July and August of 2010. This included plugging the dual zone Suwannee/Avon Park observation well, the lower Arcadia aquifer observation well and the surficial aquifer observation well.

Geology

The ROMP 41 site lies in the Polk Uplands physiographic region within the Central Highlands of the Midpeninsular Zone (White, 1970) on the Sunderland terrace (Healy, 1975). The Sunderland terrace lies between the elevations of 100 ft and 170 ft above sea level, whereas the land surface benchmark elevation of the ROMP 41 well site is 124.77 ft NGVD. The vicinity of the well site appears to be flat but generally drains southward in man-made ditches that eventually drain into a tributary of the Peace River (figure 1).

Geology for this well site was described from continuous core retrieved from the 1,640 ft corehole. Recent to Eocene age sediments were cored, described and archived at the Florida Geological Survey (FGS) in Tallahassee, Florida. Appendix D presents the lithologic description for all exploratory drilling, and figure 3 presents the hydrogeology at the ROMP 41 site. It should be noted that Appendix D is the result of the FGS description of the archived core samples. These core samples had been archived for some time prior to FGS description. This allowed desiccation of interstitial clays; therefore, an accurate estimate of interstitial clay percentage was rendered almost impossible. Also, while porosity types were often recorded, estimates of porosity percentages were not made by the FGS. Any reference in this report to clay content or porosity percent reflects initial impressions recorded during field description of core. Further discussion of hydraulic properties (water levels and slug test hydraulic conductivities, aquifer performance tests) will follow in the Hydrology section.

The geologic units underlying the study area, in ascending order (oldest to youngest) are the Avon Park Formation, the Ocala Limestone, the Suwannee Limestone, the Hawthorn Group, and the undifferentiated sand and clay deposits. The Hawthorn Group is composed of the Arcadia Formation and the Peace River Formation. The Arcadia Formation is further subdivided into the Nocatee Member and undifferentiated Arcadia. At the ROMP 41 site, the Peace River Formation is entirely composed of the Bone Valley Member.

Avon Park Formation (Middle Eocene)

The Avon Park Formation extends from 835 ft bls to beyond the total depth of exploration of 1,640 ft bls (figure 3). It is composed of dolostone (74 percent) and limestone (24 percent) with gypsum (2 percent). The 24 percent limestone is divided into packstone (11.5 percent), wackestone (9.3 percent), mudstone (3 percent) and grainstone (0.2 percent).

The 593.3 ft of dolostone, which dominates the lithology below 991 ft bls, is gray brown to light gray brown to dark yellow brown, well indurated with euhedral to rarely subhedral crystallinity, and microcrystalline to medium grained with dolomite cement. Accessory minerals include organic laminae (0 to 25 percent, commonly 2 to 3 percent), secondary calcite crystals (euhedral) lining 10 millimeter (mm) to 40 mm vugs at about 1,507 to 1,510 ft bls, gypsum/anhydrite nodules below about 1,520 ft bls (10 to 40 percent). Fossils encountered include fossil molds, organics, and echinoids: Neolaganum dalli (near top of formation). In the dolostones below about 1,000 ft bls there is a marked increase in vugular porosity (2 mm to 20 mm diameter vugs) where vug density is estimated to range from 5 to 25 percent. Fracture porosity was also observed to increase to as high as 30 percent in these dolostones. The caliper log (Appendix C, figure C.5) shows that the corehole below 991 ft bls is very near gauge (didn't wash out during coring) and remained approximately 3-inches in diameter (the size of the core bit) due to the competence (resistance to mechanical erosion during coring) of the dolostone in this interval.

The 92.4 ft of packstone is white to very light orange to gray brown, well indurated, with calcilutite, intraclasts, and pellets as grain types, microcrystalline to medium to rarely coarse grained, with a calcilutite matrix and some sparry calcite cement. Individual beds of packstone vary in thickness from 1 to 15 ft and can be found between 865 ft and 1,051.5 ft bls. Accessory minerals include less than 1 percent pyrite at 890 ft bls and organic laminations that first appear at 935 ft bls. Fossils include molds and fragments of mollusks, echinoids, and benthic forams. The foram Cushmania americana (formerly Dictyoconus americanus) was first observed at 920 ft bls. Porosity was 2 to 30 percent moldic, intergranular, intercrystalline and fracture.

The 75.2 ft of wackestone is gray brown to very light orange to white, moderately to well indurated, with intraclasts, calcilutite, skeletal and pellet grain types, microcrystalline to coarse grained, with calcilutite and dolomite cement. Individual beds of wackestone vary in thickness from .3 ft to 12 ft and can be found between 841.5 ft and 1,533 ft bls, with only one thin bed of wackestone below 1,090 ft bls which is from 1,531.5 ft to 1,533 ft bls. The wackestones below about 1,000 ft bls are often dolomitic with dolomite cement. Accessory minerals include organic laminations (0–5 percent) and gypsum encountered below 1,540 ft bls (0–10 percent). Fossils encountered within the wackestone include fossil molds and fragments of echinoids, mollusks and benthic forams such as Cushmania americana and Nummulites vanderstoki. Porosity was 2 to 25 percent intergranular, intercrystalline and moldic between 835 ft and 1,000 ft bls. Below 1,000 ft bls porosity was described as 3 to 30 percent intercrystalline, pinpoint vug, moldic and fracture.

The 24.9 ft of mudstone is white to yellow gray to very light orange, poorly to well indurated, with intraclasts, calcilutite and crystal grain types, microcrystalline to fine grained with a calcilutite matrix and some dolomite cement below 1,400 ft bls. Individual beds of mudstone ranged from 1 to 6 ft thick and were found throughout the corehole between 889 ft and 1,520 ft bls. Accessory minerals include dolomite (0 to 20 percent, below 1,500 ft bls), organic laminations (first observed at 934.7 ft bls) and disseminated pyrite (1 percent at 1,045 ft bls). Porosity values ranged from 2 to 12 percent, intergranular and intercrystalline, above 1,040 ft bls and 5 to 15 percent pinpoint vug, intercrystalline, moldic and fracture below 1,040 ft bls.

The 1.6 ft of grainstone described from 987 ft to 988.6 ft bls is gray brown to very light orange, dolomitic, well indurated, with crystals as the grain type, fine to medium grained, with sparry calcite cement. Intercrystalline and pinpoint vugular porosity is 15 percent.

The caliper log (Appendix C, figure C.5) run in the corehole in the upper portion of the Avon Park Fm, from 835 ft to 990 ft bls, shows that the corehole is enlarged to over 8 inches through much of the interval. This was caused by mechanical erosion of the limestones during the coring operation which is the same process that caused the enlargement of the corehole through the Ocala Limestone discussed below. These limestones are appreciably less competent than the above described dolostones; therefore they are more susceptible to mechanical erosion.

There is 17.6 ft of nodular and/or bedded gypsum between 1,540.2 ft and 1,609.6 ft bls. This gypsum is described as light brown gray to very light orange to white, well indurated, with gypsum and anhydrite cement. The resistance curves (Appendix C, figure C.6) show the bedded/nodular gypsum from 1,540.2 to 1,546 ft bls, 1,585 to 1,590 ft bls, 1,593.6 to 1,595.8 ft bls and 1,605 to 1,609.6 ft bls as beds of higher resistance than surrounding dolostones. Accessory minerals included dolomite (0 to 20 percent) and anhydrite (2 to 15 percent). Intercrystalline and pinpoint vugular porosity is quite low and estimated to be 2 to 3 percent.

Ocala Limestone (Late Eocene)

The Ocala Limestone extends from 585 ft to 835 ft bls and is composed almost entirely of limestone: 74 percent wackestone, 16 percent mudstone, 8 percent packstone, with only 2 percent dolostone (figure 3).

The 184.3 ft of wackestone is very light orange to yellow gray to white to gray brown, moderately to well indurated, with intraclasts, biogenic, calcilutite and skeletal grain types, microcrystalline to coarse grained, with a calcilutite matrix and some sparry calcite cement. Individual beds of wackestone ranged from 1.5 to 46.6 ft in thickness and spanned the entire formation. Accessory minerals include shell fragments (0 to 20 percent). Porosity was described as 10 to 25 percent intergranular, moldic and vugular, whereas, permeability was generally low. Fossils encountered within the wackestone include nondescript fossil molds as well as mollusk, coral and benthic foram fragments and molds. Identified foraminifera include: Lepidocyclina ocalana, Nummulites vanderstoki, and Heterostegina ocalana.

The 40.5 ft of mudstone is very light orange to yellow gray to white, moderately to well indurated, with intraclasts, skeletal and calcilutite grain types, microcrystalline to fine to granule grain size with a calcilutite matrix. Individual beds of mudstone ranged from 2 ft to 23.5 ft thick and occurred between 690 ft and 828.8 ft bls. The only significant accessory constituent was clay that was observed from 826.2 ft to 828.8 ft bls. A thin clayey mudstone was identified in the field from 826.2 ft to 828.8 ft bls which was verified on the gamma curve (Appendix C, figures C.3, C.4 and C.6) as an increase in gamma radiation from 25 to 80 counts per second (cps). Fossils included benthic forams and mollusks. Porosity of 5 to 20 percent intergranular and intercrystalline was observed.

The 20.2 ft of packstone is white to very light orange, moderately indurated with intraclasts, biogenic, calcilutite, and skeletal grain types, microcrystalline to coarse to granule grain size and a calcilutite matrix. Individual beds of packstone ranged in thickness from 1 ft to 9.4 ft and occurred between 631.6 ft and 821 ft bls. Accessory shell fragments (0 to 15 percent) were observed in the packstone from 631.6 ft to 641 ft bls. Fossils include mollusk fragments and molds, and benthic forams: Heterostegina ocalana. Intergranular and moldic porosity ranged from 12 to 20 percent.

The 5 ft of dolostone (830 ft–835 ft bls) is gray brown, well indurated, fine grained with euhedral crystallinity and dolomitic cement. This 5-foot bed of dolostone was observed on the resistance curves of the Multifunction log (Appendix C, figure C.4). The short normal resistance curve shows the 5-foot bed as a positive deflection, whereas the long normal resistance curve has a negative deflection, which indicates that the bed is indeed between 1.3 ft and 5.3 ft thick (Keys and MacCary, 1971). The short normal electrode spacing is 16 inches which allows detection of a bed 16 inches (1.3 ft) in thickness or larger, whereas a thinner bed will essentially be averaged over with adjacent beds. Similarly, the long normal electrode spacing is 64 inches which allows detection of beds 64 inches (5.3 ft) in thickness or larger, whereas thinner beds will be averaged over. Fossils encountered within this dolostone are mollusk and echinoids molds. Porosity was described as 25 percent intercrystalline, moldic, pinpoint vugular and intergranular.

Caliper logging showed a washed out and enlarged corehole through most of the Ocala Limestone (Appendix C, figure C.3). The Ocala Limestone is generally quite friable, granular and often somewhat crumbly which, when agitated by core drilling and pumping, tends to wash out causing an enlarged hole diameter. An enlarged corehole and reduction in accessory constituents in the majority of the Ocala Limestone produced the lowest gamma radiation counts within the corehole, as low as 7.5 cps at 700 ft.

Suwannee Limestone (Oligocene)

The Suwannee Limestone extends from 453.5 ft to 585 ft bls and is composed entirely of limestone: 68 percent packstone, 19 percent wackestone, and 13 percent mudstone (figure 3).

The 90 ft of packstone (480 ft–570 ft bls) is very light orange to yellow gray to white, poorly to well indurated with calcilutite, biogenic and skeletal cast grain types, microcrystalline to coarse grained with a calcilutite matrix and some sparry calcite cement. Accessory organics (1 percent) were encountered from 528 ft to 530 ft bls. Fossils include mollusk molds and benthic forams. Porosity is 10 to 30 percent moldic and intergranular with the highest porosity being encountered from 480 ft to 513 ft bls.

The 25 ft of wackestone (470 ft to 480 ft and 570 ft to 585 ft bls) is very light orange to yellow gray to white, moderately to well indurated, with intraclasts, biogenic and calcilutite grain types, microcrystalline to coarse grained with a calcilutite matrix and some sparry calcite cement. Accessory minerals include clay (3 to 10 percent). Fossils include mollusk (pelecypods and gastropods) and coral molds, benthic forams, and echinoid spines and fragments. The wackestone from 470 ft to 480 ft bls has about 5 percent pinpoint vug and intergranular porosity but the wackestone from 570 ft to 585 ft bls has 15 to 20 percent intergranular and moldic porosity.

The 16.5 ft of mudstone (453.5 ft to 470 ft bls) is yellow gray to white, poorly indurated, weathered, with calcilutite, intraclasts and biogenic grain types, microcrystalline to very fine grained, with a calcilutite matrix. Accessory minerals include quartz sand (3 to 10 percent). Fossils include mollusk molds and fragments. Intergranular porosity was about 10 percent. Geophysical logging with the Multifunction probe produced the characteristic low gamma-ray response that is common in the top of the Suwannee Limestone, as observed by this author on numerous occasions. Gamma radiation increased from 25 cps in the upper Suwannee Limestone to 100 cps as the base of the Nocatee member of the Arcadia Fm was encountered (Appendix C, figures C.3 and C.4). This is due to an appreciable increase in clay and phosphate content in the base of the Nocatee Member. The short (16-inch) and long (64-inch) normal resistance curves indicated beds as thin as about 4 ft and as thick as about 25 ft make up the Suwannee Limestone (Appendix C, figure C.4).

Hawthorn Group (Middle Oligocene to Early Pliocene)

At the ROMP 41 site, the Middle Oligocene to Early Pliocene age Hawthorn Group (Arthur et al, 2008) extends from 30 ft to 453.5 ft bls and includes, in ascending order, the Arcadia Formation and the Peace River Formation (figure 3). The Arcadia Formation includes the Nocatee Member as well as undifferentiated Arcadia sediments. The Peace River consists entirely of the Bone Valley Member.

Arcadia Formation (Middle Oligocene to Middle Miocene)

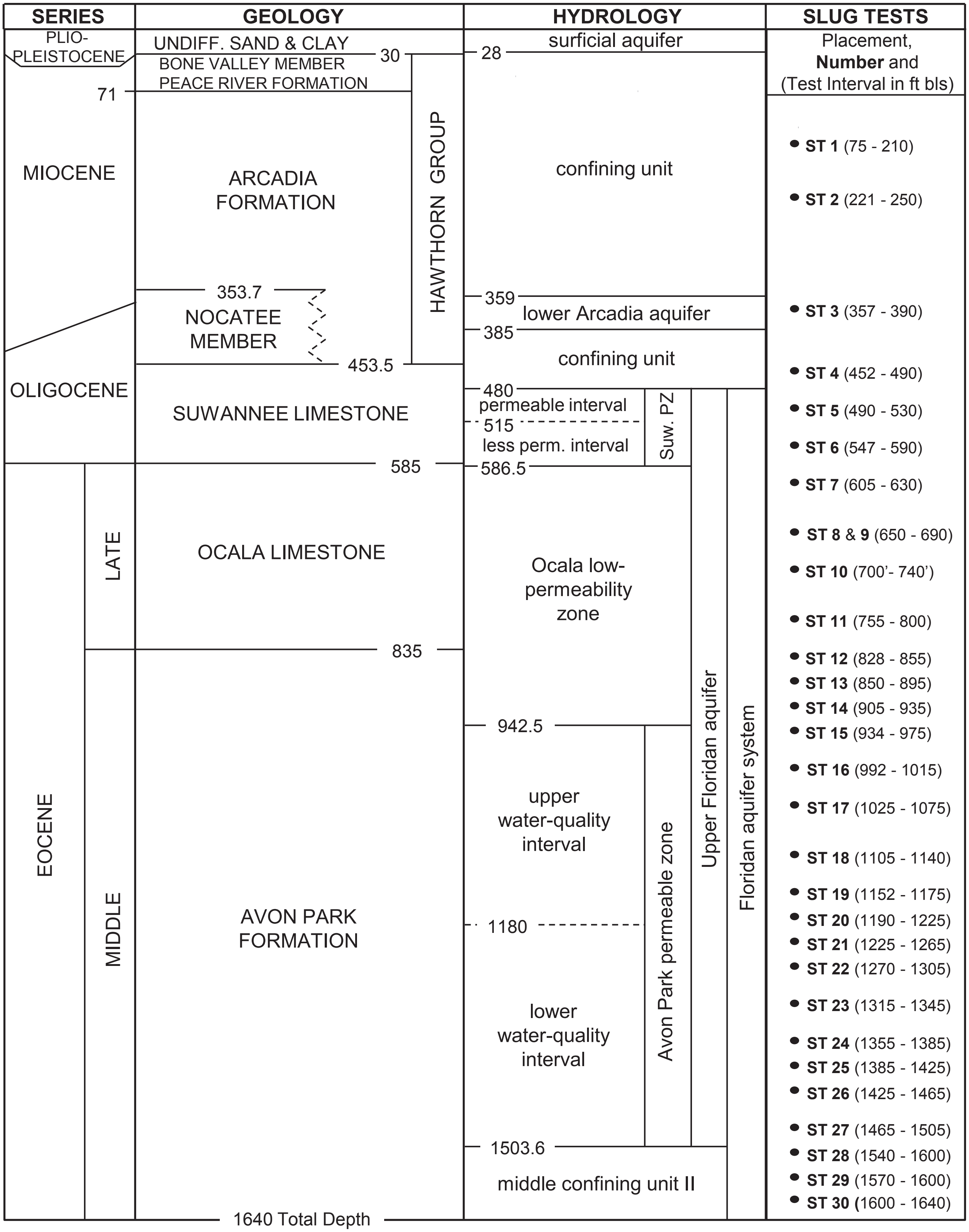
The Arcadia Formation of the Hawthorn Group contains the undifferentiated Arcadia sediments and the Nocatee Member and extends from 71.0 ft to 453.5 ft bls (figure 3).

The undifferentiated Arcadia Formation extends from 71.0 ft to 353.7 ft bls and is composed of about 48 percent wackestone, 23 percent packstone, 20 percent mudstone, 3 percent clay, 3 percent dolostone, 2 percent quartz sand and 1 percent chert. The bulk of the undifferentiated Arcadia Fm showed elevated gamma responses that peaked from about 120 to 300 cps, primarily caused by accessory phosphate and secondarily caused by interstitial and bedded clays (Appendix C, figures C.1 to C.4)

The 136.8 ft of undifferentiated Arcadia wackestone is yellow gray to gray to white, poorly to well indurated, microcrystalline to coarse grained with a calcilutite matrix, and typically a calcilutite grain type although intraclasts were observed. Individual beds of wackestone range from 2 ft to 19.9 ft thick and occurred throughout the undifferentiated Arcadia Fm. Accessory minerals include phosphatic sand (3 to 25 percent), quartz sand (5 to 30 percent), phosphatic gravel (0 to 3 percent) and chert (up to 2 percent). Fossils include mollusk molds and bryozoa fragments. Generally, the undifferentiated Arcadia wackestones are low in intergranular and moldic porosity.

The 66 ft of packstone is yellow gray to light gray to white, moderately to well indurated, microcrystalline to medium grained with intraclasts and calcilutite grain types, and sparry calcite and calcilutite matrices. Individual beds of packstone ranged in thickness from 1 ft to 21 ft and occur between 185 ft and 345 ft bls. Accessory minerals include phosphatic sand (3 to 30 percent), quartz sand (5 to 30 percent), dolomite (0 to 10 percent), chert and phosphatic gravel (up to 1 percent) and calcite (0 to 20 percent). Fossils include gastropod molds and foraminifera: Sorites sp. The Arcadia packstones have low to rarely moderate intergranular, vugular and moldic porosity.

The 55.8 ft of mudstone is yellow gray to very light gray to white, poorly to moderately indurated, with calcilutite and intraclasts grain types, microcrystalline to coarse grained with a calcilutite and rarely a clay matrix. Individual beds of mudstone range in thickness from 0.4 ft to 18.8 ft and occur between 80 ft and 340 ft bls. Accessory minerals include phosphatic sand (1 to 15 percent), quartz sand (0 to 10 percent), phosphatic gravel (0 to 3 percent), and chert (0 to 15 percent). Dark gray chert was observed in the mudstone from 106 ft to 106.5 ft bls and 305.9 ft to 306 ft bls. Porosity of these mudstones is generally low.



[All depths are ft bls, feet below land surface; perm., permeable; Plio, Pliocene; ST, slug test; Suw. PZ, Suwannee permeable zone; UNDIFF., Undifferentiated]

Figure 3. Hydrogeology and slug test placement at the ROMP 41 site in north-central Hardee County, Florida.

The 9.5 ft of clay, from 326.5 ft to 336 ft bls, is yellow gray to light olive gray to white, with poor to moderate induration, a clay and calcilutite matrix and thin interbeds of creamy white limestone (up to 10 percent of the interval). These clays showed a subdued gamma response of only about 45 cps (Appendix C, figures C.1 to C.4). This reduction in gamma response when compared to the majority of the above Arcadia Fm was primarily caused by a lack of accessory phosphate. Effective porosity of these clays is low.

The 7.6 ft of dolostone occurs between 225 ft and 397.7 ft bls in bed thicknesses ranging from .6 ft to 5.0 ft. These dolostones are yellow gray to light gray, well indurated with subhedral crystallinity, microcrystalline to fine grained with a dolomite and calcilutite matrix. Accessory minerals include limestone (0 to 45 percent), calcilutite (0 to 20 percent), phosphatic sand (1 to 10 percent) and quartz sand (0 to 10 percent). The only fossils observed in these dolostones were nondescript fossil molds. Porosity was estimated at 10 to 20 percent intergranular, vugular and moldic.

The 7.0 ft of sand, from 93 ft to 100 ft bls, is yellow gray to moderate gray, moderately indurated, fine to medium grained, sub-angular to sub-rounded with a calcilutite matrix. Accessory minerals include phosphatic sand (25 to 30 percent), calcilutite (20 to 25 percent) with a trace of phosphatic gravel. The majority of the potential intergranular poroity was compromised by the calcilutite matrix, causing low porosity.

The 3.5 ft of chert, from 141.5 ft to 145 ft bls, is olive gray to moderate gray, with good induration, low porosity and 3 percent phosphatic sand as an accessory mineral.

The Nocatee Member of the Arcadia Formation extends from 353.7 ft to 453.5 ft bls (99.8 ft thick) and is composed of approximately 37 percent packstone, 31 percent wackestone, 28 percent clay, 3 percent dolostone and 1 percent mudstone.

The majority of the 37 ft of packstone is located from 355.2 ft to 385 ft bls (29.8 ft thick) and the remaining 7.2 ft is located from 410 to 412.2 ft bls and 415 ft to 420 ft bls. The packstone is brown gray to yellow gray to light gray, moderately to well indurated with calcilutite, intraclasts, biogenic and crystal grain types, microcrystalline to coarse grained, has a calcilutite matrix and some sparry calcite cement. Accessory minerals include quartz sand (25 to 50 percent) and phosphatic sand (1 to 5 percent). The gamma response through the packstones from 355.2 ft to 385 ft bls was generally between 30 and 40 cps, relatively low compared to overlying Arcadia material. The resistivity curves show that there are at least three beds of packstone ranging in thickness from about 7 ft to 14 ft that make up this 29.8-foot interval (Appendix C, figure C.2). Fossils include mollusk molds and fragments. Field estimated porosity through these packstones range from 10 to 25 percent moldic, vugular and intergranular (see Hydrology, Lower Arcadia Aquifer).

The 30.6 ft of wackestone is gray brown to very light orange to yellow gray, poor to moderately indurated with intraclasts and calcilutite grain types, microcrystalline to fine grained with a calcilutite and clay matrix. Individual beds of wackestone range in thickness from 1 to 12.3 ft and occur between 353.7 ft and 441 ft bls. Accessory minerals include quartz sand (15 to 50 percent), phosphatic sand (0 to 2 percent), phosphatic gravel (0 to 1 percent) and a trace of dolomite. Intergranular porosity for these wackestones is low.

The 28.5 ft of clay is olive gray to dark gray to green black, poorly indurated, fissile and platy (after desiccation of clays) with a clay and calcilutite matrix. There are three individual clay beds that range in thickness from 2 ft to 14 ft and they are located from 393 ft to 395 ft bls, 426 ft to 440 ft bls and 441 ft to 453.5 ft bls. Accessory minerals include limestone (0 to 15 percent), gypsum crystals (0 to 20 percent, secondary crystal growth during desiccation of archived clay cores), quartz sand (0 to 25 percent) and phosphatic sand (0 to 1 percent). Effective porosity for these clays is low.

The 2.7 ft of dolostone (395 ft to 397.7 ft bls) is light olive gray to yellow gray, well indurated, fine grained with dolomitic cement. Intergranular porosity is low.

The one foot of mudstone (392 ft to 393 ft bls) is yellow gray to light olive gray, poorly indurated with intraclasts and calcilutite grain types, microcrystalline to fine grained with a clay and calcilutite matrix. Accessory minerals include clay (40 percent) and chert (5 percent). This clayey mudstone has low porosity.

Peace River Formation, Bone Valley Member (Middle Miocene to Early Pliocene)

The Peace River Formation extends from 30 ft to 71 ft bls at the ROMP 41 site (figure 3) and is entirely composed of the Bone Valley Member. It is predominantly composed of siliciclastic sediments: interbedded quartz sands and clayey sands with sandy wackestone, all phosphatic to some degree. The lithology can be separated into quartz sand (80 percent), wackestone (14 percent) and phosphate (6 percent).

There is a 2.5-foot layer of phosphate from 30 ft to 32.5 ft bls that contained phosphatic gravel (70 percent), phosphatic sand (15 percent) and calcilutite (15 percent) with a calcilutite matrix. These sediments exhibit low intergranular porosity. The phosphate in this interval generated an elevated gamma response of 280 cps on the gamma curves (Appendix C, figures C.1 to C.4).

The 32.8 ft of sands between 32.5 ft and 67.3 ft bls are composed of light gray to yellowish gray to very light orange, fine to rarely coarse grained, sub-angular to sub-rounded, poorly indurated, calcareous quartz sand with accessory calcilutite (15 to 20 percent) and phosphatic sand (5 to 30 percent). The sands in this unit exhibit low intergranular porosity.

The 5.7 ft of wackestone between 63 ft and 71 ft bls, in the base of the Bone Valley Member, is gray to yellowish gray, poorly indurated, has a calcilutite matrix, and is microcrystalline to coarse grained with accessory minerals that included quartz sand (10 to 25 percent), phosphatic sand (10 to 30 percent) with phosphatic gravel (up to 7 percent). These sandy wackestones exhibit low intergranular porosity.

Undifferentiated Sand and Clay Deposits (Early Pliocene-Recent)

The undifferentiated sand and clay deposits are the first encountered during exploratory coring at the wellsite and they extend from land surface to 30 ft bls. These Pleistocene to recent aged sediments are composed of very fine to rarely coarse grained, sub-angular to sub-rounded, light gray to grayish brown to very light orange quartz sands. These sands are poorly indurated to unconsolidated, variably clayey and have minor amounts of shell, plant remains and organics in the upper 10.5 ft of the section. The light greenish gray interstitial clays encountered in the sands from 28 ft to 30 ft bls may have contributed to the initial gamma response mentioned in the Peace River section above, but any response could have been overwhelmed by the Bone Valley phosphates. Fossils within these undifferentiated sands and clays include mollusk fragments. Intergranular porosity throughout this interval is estimated to range from 5 percent to as high as 25 percent depending on the amount of interstitial clay and grain size of the quartz sand.

Hydrology

Hydrology at the ROMP 41 well site relates to how the lithologic and hydraulic properties of the aquifers/zones, confining units and low permeability zones contribute to overall water movement and water level. Hydrology of the ROMP 41 site was characterized using lithologic samples, water level measurements, and hydraulic tests, including slug tests and aquifer performance tests.

A total of 30 hydraulic tests (slug tests) were conducted during the coring operation at ROMP 41 between 75 ft and 1,640 ft bls to provide hydraulic conductivity data on discrete core intervals. All 30 slug tests and the intervals tested are located on figure 3. These data provided insight as to how productive or confining specific core intervals were. The hydraulic conductivities calculated from the slug tests combined with water level, water quality and lithologic information, facilitate the aquifer delineation necessary to design monitor wells and an aquifer performance testing plan.

The District encountered four principal hydrologic units at the ROMP 41 site. They include, in descending order: the surficial aquifer, the lower Arcadia aquifer (DeWitt and Mallams, 2007), the Upper Floridan aquifer (UFA) and middle confining unit II (figures 3 and 4). The surficial aquifer is a moderately productive water table aquifer. The lower Arcadia aquifer (DeWitt and Mallams, 2007) is a moderately productive artesian aquifer. The UFA is a productive artesian aquifer that contains two productive intervals known as the Suwannee permeable zone and the Avon Park permeable zone. Four constant rate aquifer performance tests were conducted at the ROMP 41 site: a surficial aquifer test, a lower Arcadia aquifer test, a Suwannee permeable zone test, and an Avon Park permeable zone test. The UFA is separated from the deeper Lower Floridan aquifer (LFA) by middle confining unit II.

Consistent hydrologic unit references and nomenclature are essential to ensure clear and concise hydrologic interpretations. A correlation chart showing present and past references for the hydrologic units encountered within the SWFWMD can be seen in figure 4. From figure 4, Miller's interpretation of the surficial aquifer by W. L. Miller (1980) and the Floridan aquifer system by J. A. Miller (1986) as well as the names and ranks presented by DeWitt and Mallams (2007) for the Hawthorn aquifer system are used in this report. Only one aquifer was identified within the Hawthorn sediments at this site; the lower Arcadia aquifer, therefore the existence of the Hawthorn aquifer system is precluded. The UFA at this site is divided into two permeable zones, the Suwannee permeable zone and the Avon Park permeable zone, separated by the Ocala low-permeability zone. The Ocala low-permeability zone reduces but does not eliminate the hydraulic connection between the Suwannee and Avon Park permeable zones.

The aquifers underlying this site are separated by varying degrees of confinement. The lower Arcadia aquifer is confined and separated from the overlying surficial aquifer by 331 feet of clayey sands and carbonates. The UFA is confined and separated from the lower Arcadia aquifer by a 95-foot layer of generally low permeability sediments predominantly composed of clayey sands and carbonates (figure 3). The LFA is confined and separated from the UFA by middle confining unit II, which was only partially penetrated at this site.

Potentiometric levels (profiled from 95 ft to 1,640 ft bls) in the corehole and water levels from the surficial aquifer water supply well, referenced to land surface, are presented in table 1. Slug test interval water level and water quality (specific conductance) are associated in Table 2. Daily coring and slug test water levels are compared in figure 5, which illustrates that coring water levels were consistently higher than slug test water levels. Coring water levels were taken during the coring operation, usually first thing in the morning, after they were allowed to stabilize overnight. The interval that provides the water level can be large depending on how well connected the annulus around the NQ (2 ⅜-inch internal diameter) core rods (Shuter and Teasdale, 1989) is to the open interval below the core bit. This annular connection can be significant and it can connect (at least partially) multiple zones or aquifers. This water level is more of a composite water level than is a slug test water level. A slug test water level is from an interval that is isolated between a packer above and the bottom of the corehole below and is a more zone specific water level. Initially, UFA slug test water levels (figure 5) trended downward through the dry season as regional pumping (crop irrigation) increased due to a lack of rainfall. As the rainy season began in early June 2004, regional pumping was reduced, allowing Upper Floridan water levels to rebound. Not until middle confining unit II was encountered (below 1,503.6 ft bls) did degrading water quality and increasing water density cause water levels to again decline.

Table 1. Water levels recorded during the coring operation at ROMP 41.

[als, above land surface; bls, below land surface; ft, feet; HW, 4-inch steel casing; m/d/y, month/day/year; No DWL, No daily water level taken in NQ when packer set; NQ, core rods; NR, water level not recorded; OB, observation well; Surf Mon, surficial monitor well; surf OB, surficial observation well; ST, slug test; toc, top of casing; WLs, water levels; XD, transducer; ---, no comment]

Date	Time	HW Casing Depth	Corehole Depth	Water Levels			Comments
				Corehole		Surficial Monitor	
				HW Casing	NQ rods		
(m/d/y)	(24 hours)	(Feet bls)	(Feet bls)	(Feet bls)	(Feet bls)	(Feet bls)	
12/9/03	10:30	37	70	5.93	NR	NR	pumping surf mon for supply
12/9/03	14:00	37	85	NR	NR	5.51	---
12/12/03	9:00	75	95	NR	1.32	5.51	clay hole, NQ WL bad
12/13/03	10:00	75	130	14.43	13.39	5.53	Corehole WLs not recovered
12/15/03	10:45	75	170	17.09	12.10	4.04	Corehole WLs not recovered
12/29/03	11:30	75	210	50.00	NR	4.07	NQ rods out of hole
12/30/03	8:30	75	210	50.25	NR	4.15	---
12/31/03	8:35	75	230	54.80	54.90	4.21	---
1/1/04	8:45	75	250	54.62	No DWL	4.26	(ST2) packer set at 221 ft
1/5/04	11:25	75	280	55.12	55.00	NR	---
1/6/04	11:00	96	320	55.43	55.15	4.48	---
1/7/04	9:30	96	360	55.60	55.25	4.56	---
1/8/04	9:30	96	390	55.89	No DWL	4.59	(ST3) packer set at 357 ft
1/9/04	10:15	96	390	55.78	55.88	4.60	---
1/13/04	9:00	96	410	55.90	55.78	4.20	---
1/14/04	9:00	96.5	480	56.00	55.80	4.81	HW slid down hole ~.5 ft
1/15/04	9:00	96.5	490	58.13	56.94	NR	Hiatus (1/15-4/15/04)
4/15/04	10:00	490	510	59.94	59.91	4.18	Now using 2" Surf OB for WLs
4/16/04	9:30	490	530	60.22	60.04	4.24	toc = 2.85 ft als
4/19/04	10:00	490	530	59.51	59.56	4.60	---
4/21/04	11:00	490	570	61.50	60.09	4.77	---
4/22/04	10:30	490	590	60.48	60.48	4.85	---
4/23/04	9:30	490	590	61.01	61.11	4.94	---
4/24/04	9:00	490	630	62.81	59.35	4.96	---
4/26/04	8:30	490	630	61.29	61.25	5.12	---
4/27/04	10:00	490	650	62.95	59.69	5.15	---
4/28/04	8:45	490	690	64.52	60.58	5.17	---
4/29/04	8:20	490	690	62.38	No DWL	5.17	(ST8) packer set at 650 ft
4/30/04	10:00	490	690	62.04	62.80	5.26	---
5/1/04	8:30	490	710	66.48	62.70	3.17	2 ft rise in surficial WL
5/3/04	10:00	490	740	62.12	62.17	3.13	---
5/4/04	8:00	490	740	62.70	61.79	2.11	---
5/6/04	7:30	490	780	61.72	61.02	2.63	---
5/10/04	11:00	490	800	60.87	60.81	3.50	---
5/11/04	8:15	490	800	NR	NR	3.51	XD in place for ST11, no WLs
5/12/04	8:30	490	800	62.24	62.34	3.65	---
5/13/04	9:00	490	835	71.64	61.80	3.77	HW partially plugged? WL bad
5/14/04	9:30	490	855	62.28	62.20	3.90	---
5/15/04	8:30	490	855	62.70	62.78	3.92	---
5/17/04	10:00	490	895	62.40	62.26	4.18	---
5/18/04	9:00	490	895	63.09	No DWL	3.96	(ST13) packer at 850 ft
5/19/04	10:30	490	935	NR	NR	4.17	---
5/25/04	10:00	490	935	65.94	65.96	4.84	---
5/26/04	8:15	490	935	66.70	No DWL	4.90	(ST14) packer at 904 ft
5/27/04	7:30	491	975	66.96	66.97	4.95	---
5/28/04	10:00	506	995	68.25	67.19	5.04	---
5/29/04	8:30	506	995	68.26	68.14	5.15	---

Table 1 (cont). Water levels recorded during the coring operation at ROMP 41.

[als, above land surface; bls, below land surface; ft, feet; HW, 4-inch steel casing; m/d/y, month/day/year; No DWL, No daily water level taken in NQ when packer set; NQ, core rods; NR, water level not recorded; OB, observation well; Surf Mon, surficial monitor well; surf OB, surficial observation well; ST, slug test; toc, top of casing; WLs, water levels; XD, transducer; ---, no comment]

Date	Time	HW Casing Depth	Corehole Depth	Water Levels			Comments
				Corehole		Surficial Monitor	
				HW Casing	NQ rods		
(m/d/y)	(24 hours)	(Feet bls)	(Feet bls)	(Feet bls)	(Feet bls)	(Feet bls)	
6/1/04	11:00	506	1,035	69.03	69.00	5.38	---
6/2/04	9:15	506	1,055	69.73	69.75	5.45	---
6/3/04	9:45	506	1,075	69.87	69.89	4.52	---
6/5/04	9:00	506	1,095	69.83	70.56	4.59	---
6/8/04	9:00	506	1,098	69.29	70.00	4.80	---
6/9/04	9:00	506	1,100	68.87	69.02	4.55	---
6/10/04	10:00	506	1,101	68.86	69.44	4.64	---
6/11/04	9:30	506	1,120	68.68	68.36	4.03	---
6/12/04	10:00	506	1,140	67.85	No DWL	4.10	(ST18) packer set at 1,105 ft
6/14/04	10:30	506	1,140	66.80	67.13	3.85	---
6/15/04	9:30	823	1,160	66.70	66.79	3.81	---
6/16/04	11:00	823	1,160	66.23	66.29	3.92	---
6/17/04	9:45	823	1,175	66.03	65.94	4.11	---
6/21/04	10:00	823	1,175	64.86	64.94	4.68	---
6/22/04	10:00	823	1,175	64.69	64.81	4.78	---
6/23/04	10:00	823	1,185	64.58	64.73	4.87	---
6/26/04	9:15	823	1,187.50	NR	NR	5.00	---
6/28/04	9:45	823	1,205	64.02	63.83	3.91	---
6/29/04	9:45	823	1,225	63.65	No DWL	3.93	(ST20) packer set at 1,190 ft
6/30/04	9:15	823	1,225	63.38	63.38	3.53	---
7/1/04	9:30	823	1,265	63.07	63.01	3.67	---
7/2/04	9:20	823	1,265	62.85	62.81	3.79	---
7/3/04	8:30	823	1,305	62.55	62.46	2.65	---
7/6/04	9:20	823	1,305	61.75	61.75	3.00	---
7/7/04	9:20	823	1,345	60.54	61.52	2.96	---
7/8/04	9:45	823	1,345	61.13	61.22	3.17	---
7/9/04	9:30	823	1,385	60.97	61.01	3.36	---
7/10/04	8:45	823	1,385	60.81	60.91	3.48	---
7/12/04	9:30	823	1,425	60.41	60.49	2.97	---
7/13/04	9:30	823	1,425	60.04	60.23	3.26	---
7/14/04	9:30	823	1,465	59.81	60.13	3.55	---
7/15/04	9:45	823	1,465	59.74	60.17	3.75	---
7/16/04	10:00	823	1,485	59.61	60.15	3.84	---
7/17/04	9:00	823	1,505	59.43	60.03	3.55	---
7/20/04	9:30	823	1,505	58.80	59.41	1.97	---
7/21/04	10:00	823	1,505	58.47	60.38	1.93	---
7/22/04	9:45	823	1,545	NR	NR	2.11	---
7/23/04	9:45	823	1,560	57.98	58.18	3.06	---
7/24/04	9:00	823	1,580	57.86	59.25	2.57	---
7/26/04	10:30	823	1,600	57.53	58.96	2.97	Packer in hole but deflated
7/28/04	9:00	823	1,600	57.20	58.56	2.34	Packer in hole but deflated
7/29/04	8:30	823	1,600	56.82	61.32	2.20	---
7/30/04	9:30	823	1,600	56.66	No DWL	1.89	(ST29) packer set at 1,570 ft
7/31/04	9:15	823	1,600	56.40	57.74	2.15	---
8/2/04	9:15	823	1,635	55.82	57.29	2.06	---
8/3/04	8:45	823	1,640	58.52	No DWL	2.27	(ST30) packer set at 1,600 ft
8/5/04	8:30	823	1,640	55.16	66.94	1.81	---

Table 2. Test interval depth and thickness with field measured water level and water quality data collected during slug testing at ROMP 41.

[bls, below land surface; No., number; Sp. Cond.; specific conductance; µS/cm, microsiemens per centimeter]

Slug Test No.	Slug Test Interval From-To (Feet bls)	Thickness (Feet)	Water Level (Feet bls)	Water Quality Sp. Cond. (µS/cm)
1	75 - 210	135	51.60	397
2	221 - 250	29	56.79	472
3	357 - 390	33	56.20	419
4	452 - 490	38	57.22	413
5	490 - 530	40	63.20	407
6	547 - 590	43	66.47	363
7	605 - 630	25	64.31	440
8	650 - 690	40	65.67	422
9	650 - 690	40	65.50	422
10	700 - 740	40	64.67	422
11	755 - 800	45	64.28	425
12	829 - 855	26	66.26	375
13	850 - 895	45	65.97	408
14	904 - 935	31	69.87	403
15	934 - 975	41	70.53	378
16	992 - 1,015	23	73.33	479
17	1,025 - 1,075	50	72.75	489
18	1,105 - 1,140	35	70.86	665
19	1,152 - 1,175	23	71.42	639
20	1,190 - 1,225	35	66.73	417
21	1,225 - 1,265	40	66.25	446
22	1,270 - 1,305	35	65.74	506
23	1,313 - 1,345	32	64.34	510
24	1,355 - 1,385	30	64.15	531
25	1,385 - 1,425	40	63.30	568
26	1,425 - 1,465	40	63.11	821
27	1,465 - 1,505	40	62.50	1,730
28	1,540 - 1,600	60	64.60	928
29	1,570 - 1,600	30	64.39	1,165
30	1,600 - 1,640	40	65.09	3,166

As coring progressed below the surficial aquifer, through the lower Arcadia aquifer and the UFA into middle confining unit II, water levels generally declined (figure 5), suggesting a recharging system. Also, water levels measured by the Hydrologic Data Section taken after well construction was completed, support the above conclusion. To illustrate this point, at 6:00 AM on August 2, 2010, water level elevations in the surficial aquifer, the lower Arcadia aquifer, the Suwannee permeable zone and the Avon Park permeable zone were 120.580, 70.852, 70.762 and 70.559 ft NGVD, respectively. These water levels illustrate that the deeper the monitored interval, the deeper the water level; however, the lower Arcadia aquifer and both UFA permeable zones have very similar water levels. The similarity of these water levels suggests that only slight changes in water level could change the hydraulic gradient and turn a marginally recharging system into a marginally discharging system. It is possible that seasonal changes in rainfall and pumping could reverse vertical water movement in the area of the wellsite although there would be only a very minor pressure gradient as an impetus for water movement in either direction.

Surficial aquifer

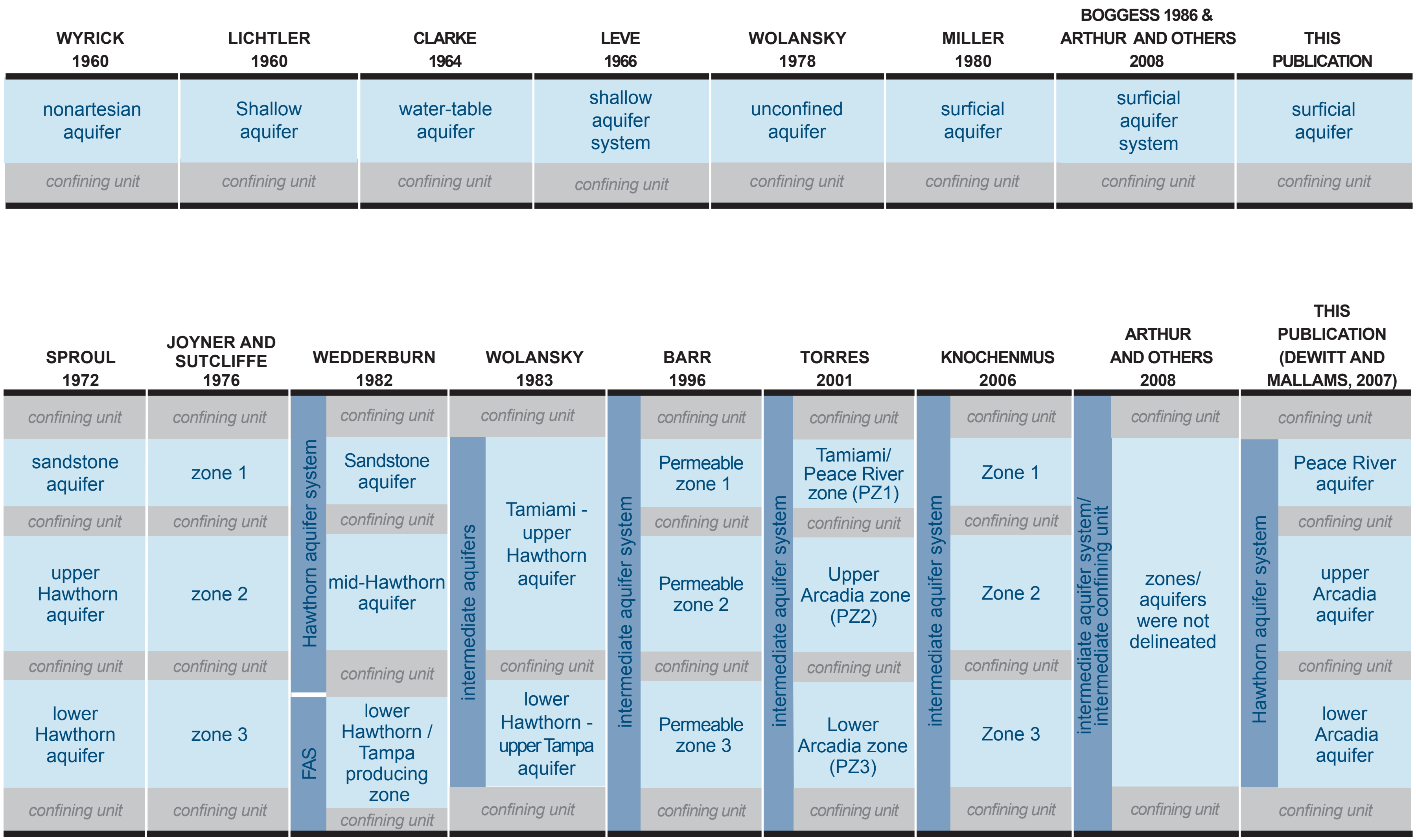
The surficial aquifer consists of very fine to medium grained, quartz sand that extends from land surface to 28 ft bls and includes all but the lower two feet of the undifferentiated sands and clays. Intergranular porosity described in the field ranged from 15 to 30 percent within the surficial sediments.

Surficial aquifer water levels were monitored in both the permanent and temporary surficial monitors during the coring operation from December 9, 2003 to August 5, 2004 and fluctuated over a 3.64-foot range between 5.53 ft bls during the dry winter months to as high as 1.89 ft bls during the wetter summer months (table 1, figure 6). This, of course, excludes the coring hiatus from January 15 to April 15, 2004.

A constant rate surficial aquifer performance test was conducted from April 2 to 5, 2007. Water levels were recorded in all monitored zones on site (surficial aquifer, lower Arcadia aquifer, and Suwannee and Avon Park permeable zones) before (background), during (drawdown) and after (recovery) the pumping phase. The hydrograph of surficial water levels for drawdown and recovery phases is presented in figure 7.

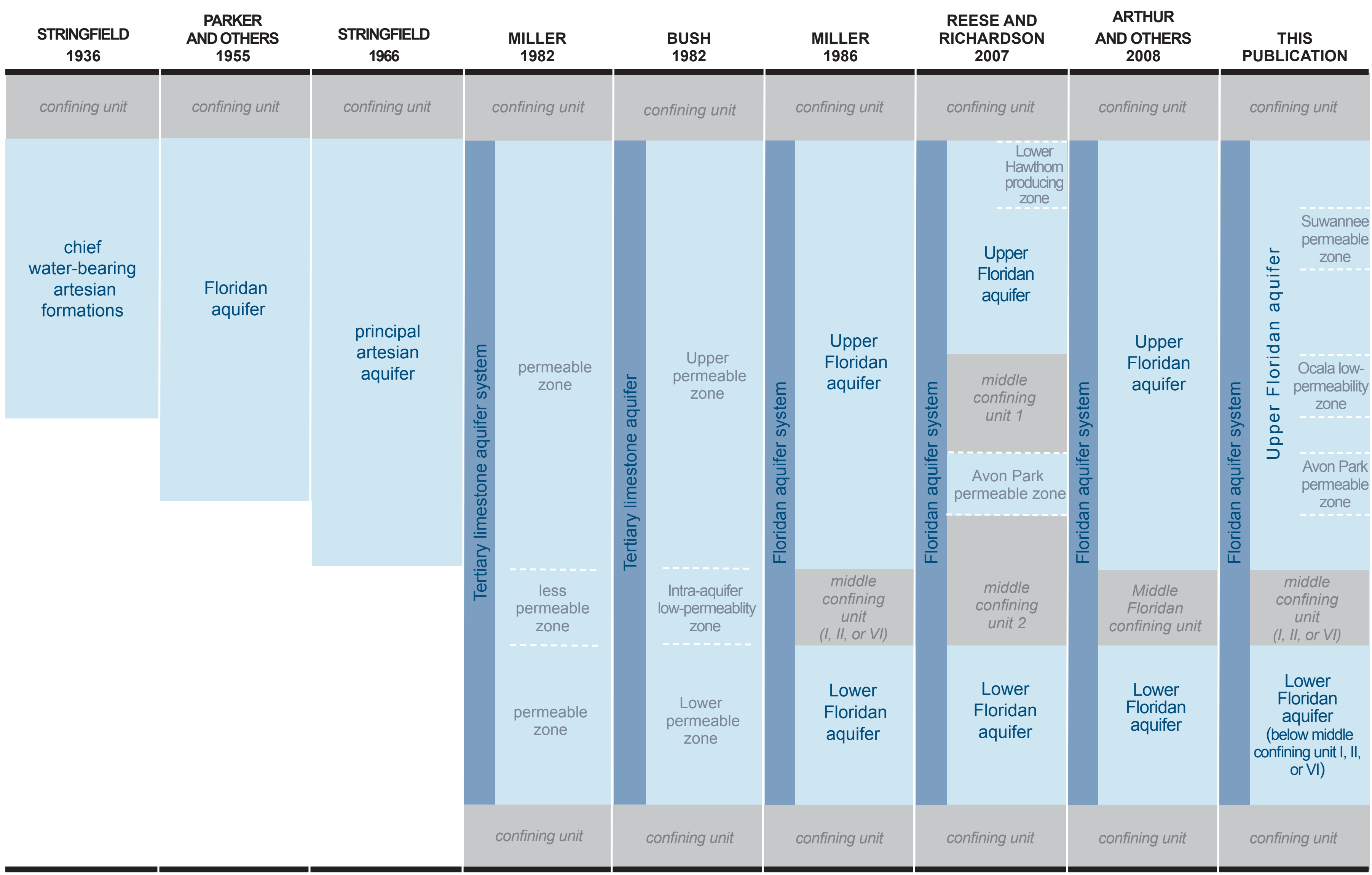
The 6-inch permanent surficial aquifer monitor well (Appendix B, figure B.2), screened from 4 ft to 24 ft bls, was pumped with a submersible pump at 12 gpm for 66.4 hours or 2.76 days. Discharge was directed west to an on-site perimeter ditch along the west side of FDOT property that conducted the water to the south (figure 2) and it was measured by timing the discharge into a 5 gallon bucket. An in-line flow meter was used but it malfunctioned. The 2-inch surficial aquifer observation well (Appendix B, figure B.3) was located 25.5 ft north of the pumped well (figure 2). Maximum drawdown in the pumped well was 11 ft, and it was 1.35 ft in the observation well.

Drawdown and recovery phase water levels from the pumped and observation wells (and all other zones monitored on site) were recorded with an In-Situ® Hermit 3000 data logger and pressure transducers and analyzed with Aqtesolv® for Windows® software utilizing the Neuman (1974) analytical method for unconfined aquifers with delayed gravity response, also known as delayed yield (Appendix E, figures E.1 and E.2). Transmissivity for the drawdown phase calculated to be 550 ft^2/day and the recovery phase calculated to be 510 ft^2/day (table 3). The geometric mean of these two values is 530 ft^2/day. Storativity for the drawdown phase calculated to be 1.6 X 10^{-3}, whereas it calculated to be 3.0 X 10^{-3} (table 3) from the recovery phase, yielding a geometric mean of 2.2 X 10^{-3}.



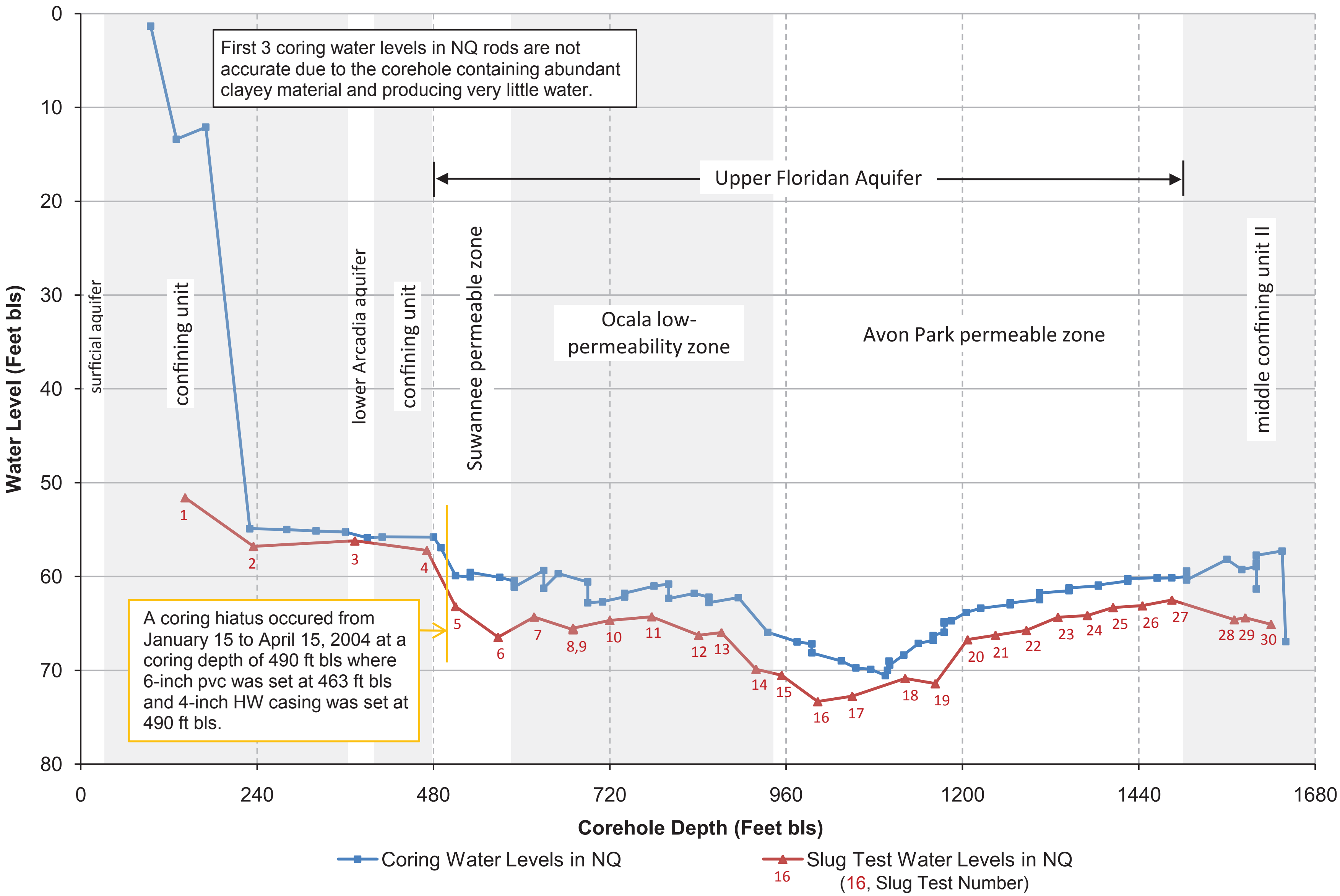
[FAS, Floridan aquifer system; Terms shown are for hydrogeologic units present within the Southwest Florida Water Management District.]

Figure 4a. Hydrogeologic nomenclature comparison charts by author for the surficial aquifer and the Hawthorn aquifer system. All units shown are not present at the ROMP 41 site.



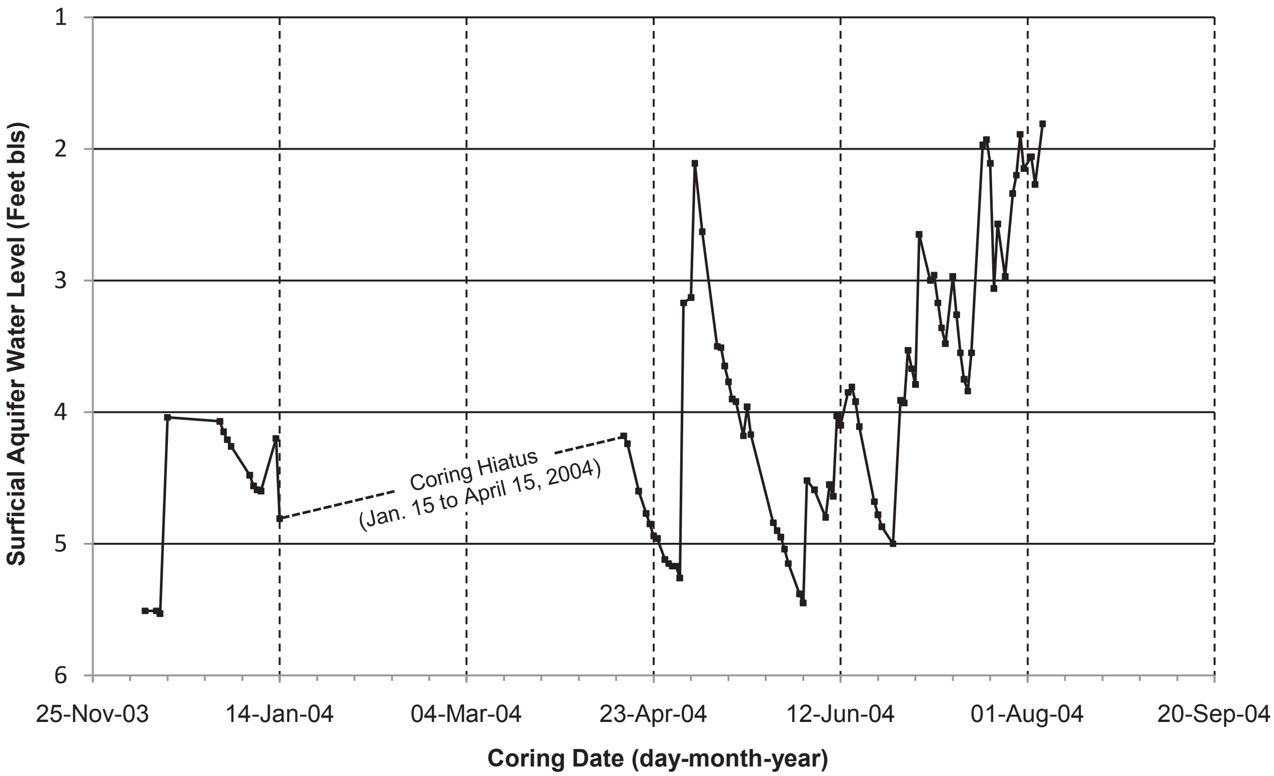
[Terms shown are for hydrogeologic units present within the Southwest Florida Water Management District]

Figure 4b. Hydrogeologic nomenclature comparison chart by author for the Floridan aquifer system. All units shown were not penetrated at the ROMP 41 site.



[ft bls, feet below land surface; HW, temporary 4-inch steel casing; NQ, core rods; pvc, polyvinyl chloride casing]

Figure 5. Graph comparing daily coring and slug test water levels with aquifer delineation at ROMP 41.



[Apr, April; Aug, August; bls, below land surface; Jan, January; Jun, June; Mar, March; Nov, November; Sep, September]

Figure 6. Graph showing fluctuation of the surficial aquifer water level while coring at ROMP 41.

Confining Unit

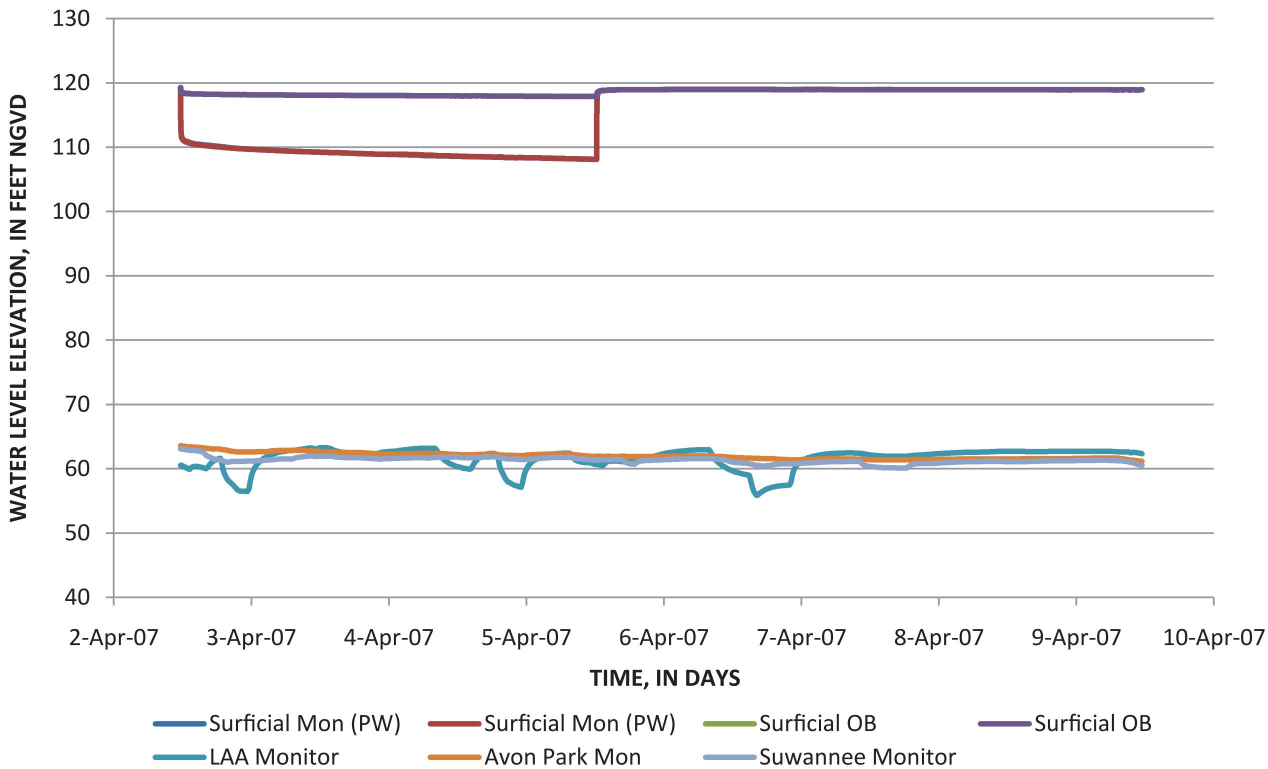
The confining unit between the surficial and lower Arcadia aquifers extends from 28 ft to 359 ft bls at the ROMP 41 site. This unit consists of clayey, calcareous, phosphatic sands and sandy, phosphatic, often clayey carbonates with 9.5 feet of clay from 326.5 ft to 336 ft bls. This confining unit encompasses the lower 2 ft of the undifferentiated sands and clays and the upper 329 ft of the Arcadia Formation which includes the upper 5.3 ft of the Nocatee Member.

The majority of this unit had low porosity and permeability. For example, the first slug test was a slug-in test and encompassed a large interval (75 ft–210 ft bls). A slug-in test means a physical slug is dropped into the casing or core rods, which raises the water level. Changes in water level are recorded as the water level falls back to equilibrium. In this first slug test, the HW casing (4-inch internal diameter steel casing, Shuter and Teasdale, 1989) was used (core rods were removed from the corehole) with no packer and it yielded a hydraulic conductivity of only .06 feet per day (table 4, figure 8). There was an 8-foot interval however, from 222 ft to 230 ft bls, that had slightly elevated porosity of 10 to 20 percent intergranular, vugular and moldic (Appendix D). Slug test 2 tested the interval from 221 ft to 250 ft bls, utilized the packer assembly, was a slug-in test and yielded a hydraulic conductivity value of 6.15 ft/day. This hydraulic conductivity value indicates the interval may produce small amounts of water but was still relatively non-productive when compared to subsequent hydraulic conductivity values of deeper productive intervals. Curve match analyses of slug tests 1 and 2 are presented in Appendix F, figures F.1 and F.2, respectively. Valid water levels (table 1, figure 5) collected within this confining unit during coring ranged from 54.9 ft to 55.25 ft bls.

Lower Arcadia Aquifer

The lower Arcadia aquifer extends from 359 ft to 385 ft bls within the upper portion of the Nocatee Member. It is composed of almost equal parts very sandy packstone and sandstone with a calcilutite matrix with up to 25 percent intergranular, moldic and vugular porosity. Water levels measured as the corehole was advanced through the lower Arcadia aquifer ranged from 55.25 ft to 55.88 ft bls (table 1), whereas the water level measured during slug test 3 was 56.2 ft bls. Slug test 3, utilizing a packer, tested the interval from 357 ft to 390 ft bls, which included the entire lower Arcadia aquifer interval (359 ft–385 ft bls), and yielded a moderately productive hydraulic conductivity value of 30 ft/day (table 4, figure 8) (Appendix F, figure F.3).

A constant rate aquifer performance test of the lower Arcadia aquifer was conducted from November 27 to 29, 2007. Water levels were recorded in all monitored zones on site before, during and after the pumping phase. The hydro-



[Apr, April; LAA, lower Arcadia aquifer; Mon, Monitor; NGVD, National Geodetic Vertical Datum of 1929; OB, observation well; PW, pumped well]

Figure 7. Hydrograph of the surficial aquifer performance test at ROMP 41.

graph of lower Arcadia aquifer water levels for drawdown and recovery phases is presented in figure 9.

The 6-inch permanent lower Arcadia aquifer monitor well (Appendix B, figure B.6), screened from 358.5 ft to 383.5 ft bls, was pumped with a submersible pump at 180 gpm for 46 hours or 1.92 days. Discharge was directed north of the site about 1,000 ft into a large ditch in the northeast corner of the FDOT property and measured with an in-line flow meter as well as a manometer and orifice plate. The 2-inch temporary lower Arcadia aquifer observation well (Appendix B, figure B.7) is located 100 ft north of the pumped/monitor well (figure 2). Maximum drawdown was 45.8 ft in the pumped well and 6.75 ft in the observation well. A portion of the drawdown in the later stages of the aquifer performance test was caused by adjacent local pumping. Interference from local pumping was even more apparent during the recovery phase.

An effort was made to mitigate the effects of local agricultural pumping by contacting adjacent property owners prior to the aquifer performance test and asking if they could adjust their irrigation schedules to provide the District a window to perform the aquifer performance test. This effort was only marginally successful.

Drawdown and recovery phase water levels from the pumped and observation wells, and all other zones on site, were recorded and subsequently analyzed using Hantush–Jacob (1955) and Theis (1935) methods, respectively. Transmissivity calculated from the drawdown phase was 6,300 ft^2/day and from the recovery phase was 4,500 ft^2/day, from which a geometric mean of 5,300 ft^2/day was calculated (table 3). Storativity calculated to be 2.8 X 10^{-6}. Leakance, from Hantush-Jacob (1955), calculated to be 5.409 X 10^{-9} min^{-1} which, if multiplied by 1,440 minutes per day, can be expressed as 7.8 X 10^{-6} $days^{-1}$. Interference from local agricultural pumping caused distortion of drawdown and recovery curves (Appendix E, figures E.3 and E.4); however, that distortion was most apparent in the recovery phase.

Confining Unit

The confining unit between the lower Arcadia aquifer and the UFA is 95 ft thick, extends from 385 ft to 480 ft bls and is comprised of the lower 68.5 ft of the Nocatee Member of the Arcadia Formation and the upper 26.5 ft of the Suwannee Limestone. The Nocatee sediments are typically sandy and clayey carbonates although 28.5 ft of these Nocatee sediments are described as low-permeability clays. These clays constitute 30 percent of the entire confining unit. The upper 26.5 ft of the

Table 3. Summary of aquifer hydraulic parameters as derived from analyses of aquifer performance tests at ROMP 41.

[bls, below land surface; days^{-1}, feet per day per foot; ft^2/day, feet squared per day; PZ, permeable zone; UFA, Upper Floridan aquifer; ---, method does not solve for given parameter; Bold, italicized numbers are geometric mean of drawdown and recovery results for given parameter]

Aquifer/Zone Pumped interval (feet bls)	**Well Analyzed** *Distance from Pumped Well*	**Test Phase**	**Analytical Method**	**Storativity (S)** (unitless)	**Leakance** (days^{-1})	**Transmissivity (T)** (ft^2/day)
Surficial Aquifer	Observation Well	Drawdown	Neuman	1.6 X 10^{-3}	---	550
	at 25.5 feet	Recovery	Neuman	3.0 X 10^{-3}	---	510
(3 - 24)			geometric mean of S →	***2.2 X 10^{-3}***	geom. mean of T →	***530***
Lower Arcadia Aquifer	Observation Well	Drawdown	Hantush-Jacob	2.8 X 10^{-6}	7.8 X 10^{-6}	6,300
	at 100 feet	Recovery	Theis	---	---	4,500
(353 - 386)					geometric mean of T →	***5,300***
Suwannee PZ (UFA)	Observation Well	Drawdown	Hantush-Jacob	1.0 X 10^{-4}	4.6 X 10^{-3}	6,000
	at 184.2 feet	Recovery	Theis	---	---	6,700
(475 - 591)					geometric mean of T →	***6,300***
Avon Park PZ (UFA)	Observation Well	Drawdown	Cooper-Jacob	1.5 X 10^{-3}	---	2.2 X 10^5
	at 205 feet	Recovery	Theis	---	---	2.6 X 10^5
(835 - 1401)					geometric mean of T →	***2.4 X 10^5***

Suwannee Limestone contains low-permeability mudstones and wackestones. Coring water levels through this confining layer remained rather stable as the corehole was advanced. They ranged between 55.78 ft and 55.88 ft bls (table 1, figure 5). Slug test 4 (452 ft–490 ft bls) did encompass the lower 28 ft of this confining unit, however, it also included the upper 10 ft of the Suwannee permeable zone (Appendix F, figure F.4). The 10 ft of Suwannee permeable zone hydraulically overwhelmed the low permeability packstones of the confining unit.

Upper Floridan Aquifer

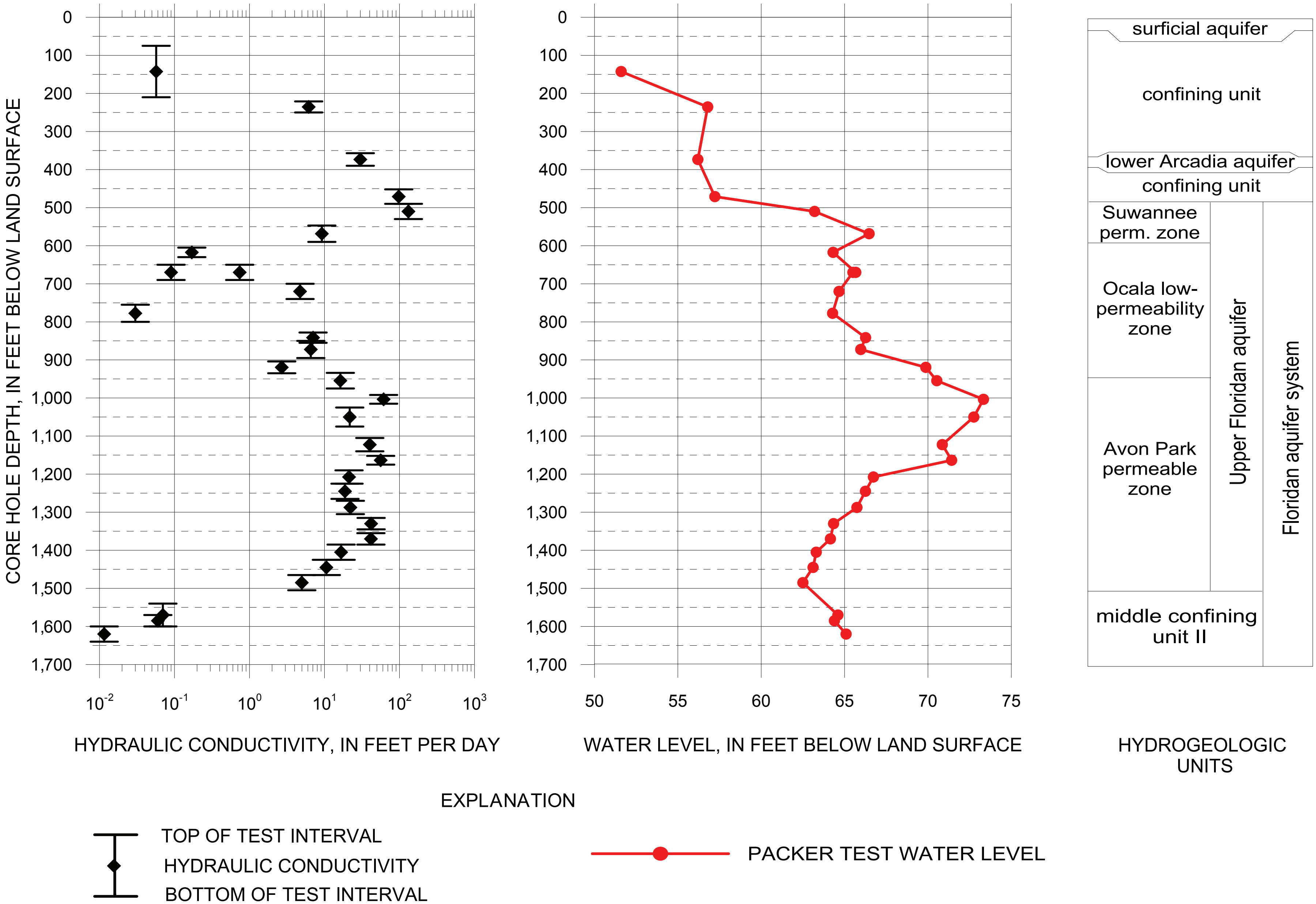
The Floridan aquifer system consists of the Upper Floridan aquifer (UFA) and the Lower Floridan aquifer (LFA), which are separated by middle confining units. Middle confining unit II (Miller, 1986) was identified at ROMP 41. Only the UFA and a portion of middle confining unit II were penetrated at the ROMP 41 site during exploratory coring. The UFA is subdivided into three hydrologic units at this site. These units are the Suwannee permeable zone, the Ocala low-permeability zone, and the Avon Park permeable zone.

Suwannee Permeable Zone

The Suwannee permeable zone of the UFA extends from 480 ft to 586.5 ft bls and it is predominantly composed of packstone with minor wackestone. The Suwannee permeable zone encompasses the lower 105 ft of the Suwannee Limestone and the upper 1.5 ft of the Ocala Limestone.

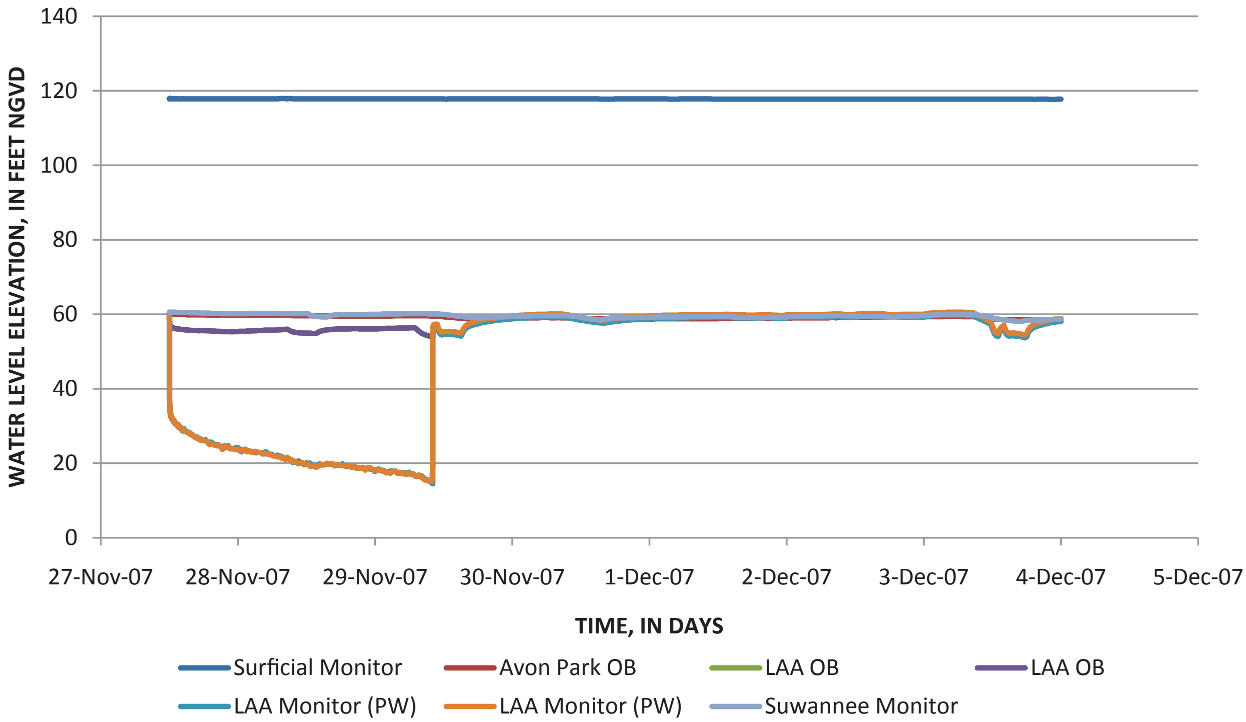
Slug tests 4 to 6 were conducted in the Suwannee permeable zone. Slug tests 4 and 5 indicated a high permeability interval exists from 480 ft to 515 ft bls (Appendix F, figures F.4 and F.5). Slug test 4 (452 ft–490 ft bls) produced a hydraulic conductivity value of 97.81 ft/day and contained both a low permeability packstone from 452 ft to 480 ft bls and permeable packstone from 480 ft to 490 ft bls with moldic and intergranular porosity as high as 30 percent. The 10-foot interval from 480 ft to 490 ft bls represents the upper 10 ft of a 35-foot high permeability interval (figure 3). The productivity of the permeable interval from 480 ft to 490 ft bls essentially hydraulically overwhelmed the lower permeability interval above from 452 ft–480 ft bls during slug test 4. Slug test 5 (490 ft–530 ft bls) tested the lower 25 ft of the high permeability interval (480 ft–515 ft bls) and 15 ft of the lower permeability packstones from 515 ft to 530 ft bls. Slug test 5 was a pneumatic test in the HW casing without a packer and it produced the highest hydraulic conductivity value (131.5 ft/day) calculated at the ROMP 41 site.

The remainder of the Suwannee permeable zone (515 ft–586.5 ft bls) is predominantly packstone with only the lower 16.5 ft (570 ft–586.5 ft bls) consisting of wackestone. This interval is not non-productive but is significantly less productive than the above high permeability interval (figure 3) and exhibits generally lower porosity, ranging from 10 to 20 percent intergranular and moldic. There were, however, two small intervals totaling 3 ft, from 555 ft to 555.5 ft bls and 584 ft to 586.5 ft bls that had up to 25 percent intergranular and moldic porosity. Slug test 6 tested the interval from 547 ft to 590 ft bls, including the above mentioned 3 ft, and produced a hydraulic conductivity value of 9.23 ft/day (Appendix F,



[perm., permeable]

Figure 8. Graph showing hydraulic conductivity values and water levels from slug tests with aquifer delineation at the ROMP 41 site.



[Dec, December; LAA, lower Arcadia aquifer; NGVD, National Geodetic Vertical Datum of 1929; Nov, November; OB, observation well; PW, pumped well]

Figure 9. Hydrograph of the lower Arcadia aquifer performance test at ROMP 41.

figure F.6)

Water levels measured during advancement of the corehole through the Suwannee permeable zone showed a slight decline of 1.14 ft as the UFA was initially penetrated between 480 ft and 490 ft bls (figure 5). The water level in the NQ rods (Shuter and Teasdale, 1989) declined from 55.78 ft bls at a coring depth of 410 ft bls to 55.80 ft bls at a core depth of 480 ft bls to 56.94 ft bls at a core depth of 490 ft bls (table 1).

A coring hiatus occurred from January 15 to April 15, 2004 at a coring depth of 490 ft bls, just 10 ft into the Suwannee permeable zone. During the coring hiatus, 6-inch pvc casing was installed to 463 ft bls and the HW casing was advanced to 490 ft bls; the bottom of the corehole. This isolated the UFA from the lower Arcadia aquifer, allowing the UFA water level to be fully expressed and not influenced by the head pressure of the lower Arcadia aquifer. After returning to coring in the newly cased well on April 15, 2004, the initial water level was measured at 59.91 ft bls, a further decline of 2.97 ft. The 2.97-foot water-level decline was caused by two factors: seasonal decline in aquifer levels during the dry season and hydraulic separation of the lower Arcadia and UFA by casing installation.

As coring continued through the remainder of the Suwannee permeable zone, water levels generally fell to 61.11 ft bls at a corehole depth of 590 ft bls. Water levels measured during slug tests 4 through 6, utilizing the packer assembly, fell from 57.22 ft bls (slug test 4) to 63.20 ft bls (slug test 5) to 66.45 ft bls (slug test 6); a dramatic decline of 9.23 ft (figure 5). The majority of this decline, 5.98 ft, is due to the coring hiatus mentioned above.

A constant rate Suwannee permeable zone pumping test was conducted from April 16 to 18, 2007. Background, drawdown and recovery water level fluctuations were recorded in all monitored zones on site. Figure 10 presents the hydrograph of water levels for pumping and recovery phases.

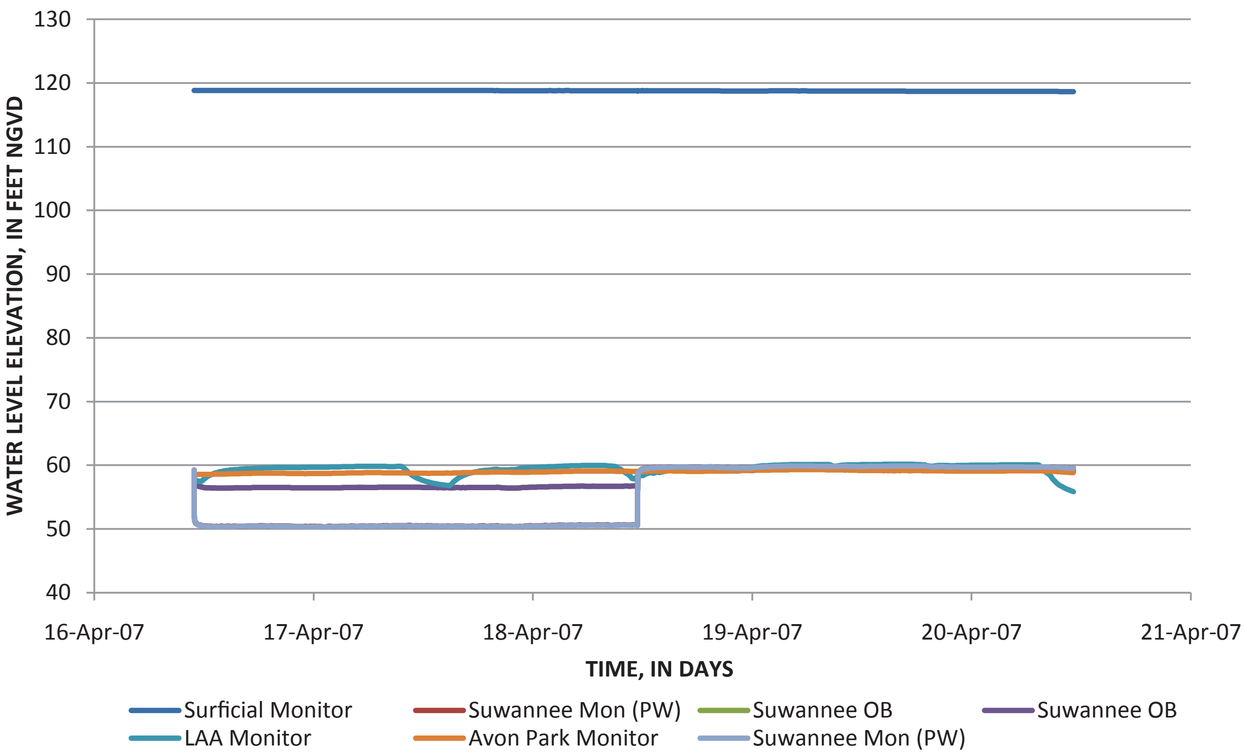
The 12-inch Suwannee permeable zone monitor well (Appendix B, figure B.5) was pumped with an 8-inch vertical line shaft turbine at 232 gpm for 48.4 hours or 2.02 days. Discharge was directed about 1,000 ft to the large ditch in the northeast corner of FDOT property and measured with an in-line flow meter and verified with a manometer and orifice plate. The 6-inch open hole Suwannee permeable zone interval in the dual zone observation well (Appendix B, figure B.8) was located 184.2 ft north of the pumped well (figure 2). Maximum drawdown in the pumped well was 8.94 ft, and it was 2.47 ft in the Suwannee zone in observation well 3.

Drawdown and recovery phase water levels from the pumped and observation wells were recorded and subsequently analyzed using Hantush–Jacob (1955) and Theis (1935) methods, respectively (Appendix E, figures E.5 and E.6). Transmissivity calculated from the drawdown phase was 6,000 ft^2/day and 6,700 ft^2/day from the recovery phase,

Table 4. Slug test data and calculated hydraulic conductivities at ROMP 41.

[bls, below land surface; Fm., Formation; ft/day, feet per day; HW, 4-inch steel casing; NQ, core rods; perm., permeability; pvc, polyvinyl chloride; “, inch; ‘, feet; all slug tests analyzed using the Butler method]

Slug Test Number and Type	Tested Interval (feet bls)	Hydraulic Conductivity (ft/day)	Hydrogeology of Test Interval	Comments
1 - falling head	75 - 210	0.0568	Arcadia Fm., confining	4" HW steel casing only, no spacer, no packer
2 - falling head	221 - 250	6.15	Arcadia Fm., confining/low perm.	NQ core rods, 0.51" packer orifice, no spacer
3 - falling head	357 - 390	30.0	lower Arcadia aquifer	0.75" NQ packer with check valve & 1"x 7' pvc spacer
4 - falling head	452 - 490	97.8	Suwannee permeable zone	0.75" NQ packer with check valve & 1"x 7' pvc spacer
5 - rising head	490 - 530	132	Suwannee permeable zone	4" HW steel casing only, no spacer, no packer
6 - rising head	547 - 590	9.23	Suwannee permeable zone	0.75" NQ packer with check valve & 1"x 7' pvc spacer
7 - rising head	605 - 630	0.170	Ocala low-permeability Zone	0.75" NQ packer with check valve & 1"x 7' pvc spacer
8 - rising head	650 - 690	0.743	Ocala low-permeability Zone	0.75" NQ packer with check valve & 1"x 7' pvc spacer
9 - falling head	650 - 690	0.0896	Ocala low-permeability Zone	0.75" NQ packer with check valve & 1"x 7' pvc spacer
10 - rising head	700 - 740	4.72	Ocala low-permeability Zone	0.75" NQ packer with check valve & 1"x 7' pvc spacer
11 - rising head	755 - 800	0.0321	Ocala low-permeability Zone	0.75" NQ packer with check valve & 1"x 7' pvc spacer
12 - rising head	828 - 855	7.04	Ocala low-permeability Zone	0.75" NQ packer with check valve & 1"x 7' pvc spacer
13 - rising head	850 - 895	6.57	Ocala low-permeability Zone	0.75" NQ packer with check valve & 1"x 7' pvc spacer
14 - rising head	904 - 935	2.69	Ocala low-permeability Zone	0.75" NQ packer with check valve & 1"x 7' pvc spacer
15 - rising head	934 - 975	16.3	Avon Park permeable zone	0.75" NQ packer with check valve & 1"x 7' pvc spacer
16 - rising head	992 - 1,015	61.4	Avon Park permeable zone	0.75" NQ packer with check valve & 1"x 7' pvc spacer
17 - rising head	1,025 - 1,075	21.7	Avon Park permeable zone	0.75" NQ packer with check valve & 1"x 7' pvc spacer
18 - rising head	1,105 - 1,140	40.2	Avon Park permeable zone	0.75" NQ packer with check valve & 1"x 7' pvc spacer
19 - rising head	1,152 - 1,175	56.1	Avon Park permeable zone	0.75" NQ packer with check valve & 1"x 7' pvc spacer
20 - rising head	1,190 - 1,225	21.2	Avon Park permeable zone	0.75" NQ packer with check valve & 1"x 7' pvc spacer
21 - rising head	1,225 - 1,265	18.8	Avon Park permeable zone	0.75" NQ packer with check valve & 1"x 7' pvc spacer
22 - rising head	1,270 - 1,305	22.1	Avon Park permeable zone	0.75" NQ packer with check valve & 1"x 7' pvc spacer
23 - rising head	1,315 - 1,345	41.8	Avon Park permeable zone	0.75" NQ packer with check valve & 1"x 7' pvc spacer
24 - rising head	1,355 - 1,385	41.6	Avon Park permeable zone	0.75" NQ packer with check valve & 1"x 7' pvc spacer
25 - rising head	1,385 - 1,425	16.7	Avon Park permeable zone	0.75" NQ packer with check valve & 1"x 7' pvc spacer
26 - rising head	1,425 - 1,465	10.6	Avon Park permeable zone	0.75" NQ packer with check valve & 1"x 7' pvc spacer
27 - rising head	1,465 - 1,505	4.98	Avon Park permeable zone	0.75" NQ packer with check valve & 1"x 7' pvc spacer
28 - rising head	1,540 - 1,600	0.0700	middle confining unit II	0.75" NQ packer with check valve & 1"x 7' pvc spacer
29 - falling head	1,570 - 1,600	0.0635	middle confining unit II	0.75" NQ packer with check valve & 1"x 7' pvc spacer
30 - falling head	1,600 - 1,640	0.00891	middle confining unit II	0.75" NQ packer with check valve & 1"x 7' pvc spacer



[Apr, April; LAA, lower Arcadia aquifer; Mon, Monitor; NGVD, National Geodetic Vertical Datum of 1929; OB, observation well; PW, pumped well]

Figure 10. Hydrograph of the Suwannee permeable zone pumping test at ROMP 41.

from which a geometric mean of 6,300 ft^2/day was calculated. Storativity was 1.0 X 10^{-4} and leakance was 4.6 X 10^{-3} days^{-1} (table 3).

Ocala Low-Permeability Zone

The Ocala low-permeability zone extends from 586.5 ft to 942.5 ft bls and is composed of the lower 248.5 ft of the Ocala Limestone and the upper 107.5 ft of the Avon Park Formation. The interval is predominantly wackestone (61.5 percent) with lesser amounts of packstone (20.5 percent), mudstone (13 percent), and dolostone (5 percent). The majority of this interval has from 10 to 30 percent intergranular and moldic porosity with generally low permeability. As is often the case with the Ocala low-permeability zone, porosity can be relatively high but permeability is not well developed.

Slug tests 7 through 14 were conducted in the Ocala low-permeability zone (Appendix F, figures F.7 to F.14). All eight of these tests yielded low hydraulic conductivity values, ranging from 0.03 to 7.04 ft/day (figure 8, table 4). Slug tests 10 (700 ft–740 ft bls), 12 (828 ft–855 ft bls) and 13 (850 ft–895 ft bls) yielded the highest hydraulic conductivity values within this zone of 4.72, 7.04, and 6.57 ft/day, respectively. Slug tests 7, 8, 9, 11 and 14, the lower hydraulic conductivity value tests, averaged 0.74 ft/day, with the lowest calculated hydraulic conductivity value being 0.03 ft/day (slug test 11) and the highest being 2.69 ft/day (slug test 14). All eight slug tests performed in the Ocala low-permeability zone verify the variable but consistently low permeability through this zone.

Water levels fluctuated but generally declined as the corehole was advanced through the Ocala low-permeability zone. The majority of the decline was most likely due to a reduction in rainfall during the dry season. Coring water levels ranged from as high as 59.69 ft bls at a corehole depth of 650 ft bls to as low as 65.96 ft bls at a corehole depth of 935 ft bls (figure 5, table 1), a decline of 6.27 ft. Slug test water levels through this zone ranged from 64.31 ft bls (slug test 7) to 69.87 ft bls (slug test 14), a decline of 5.56 ft (figure 5).

Avon Park Permeable Zone

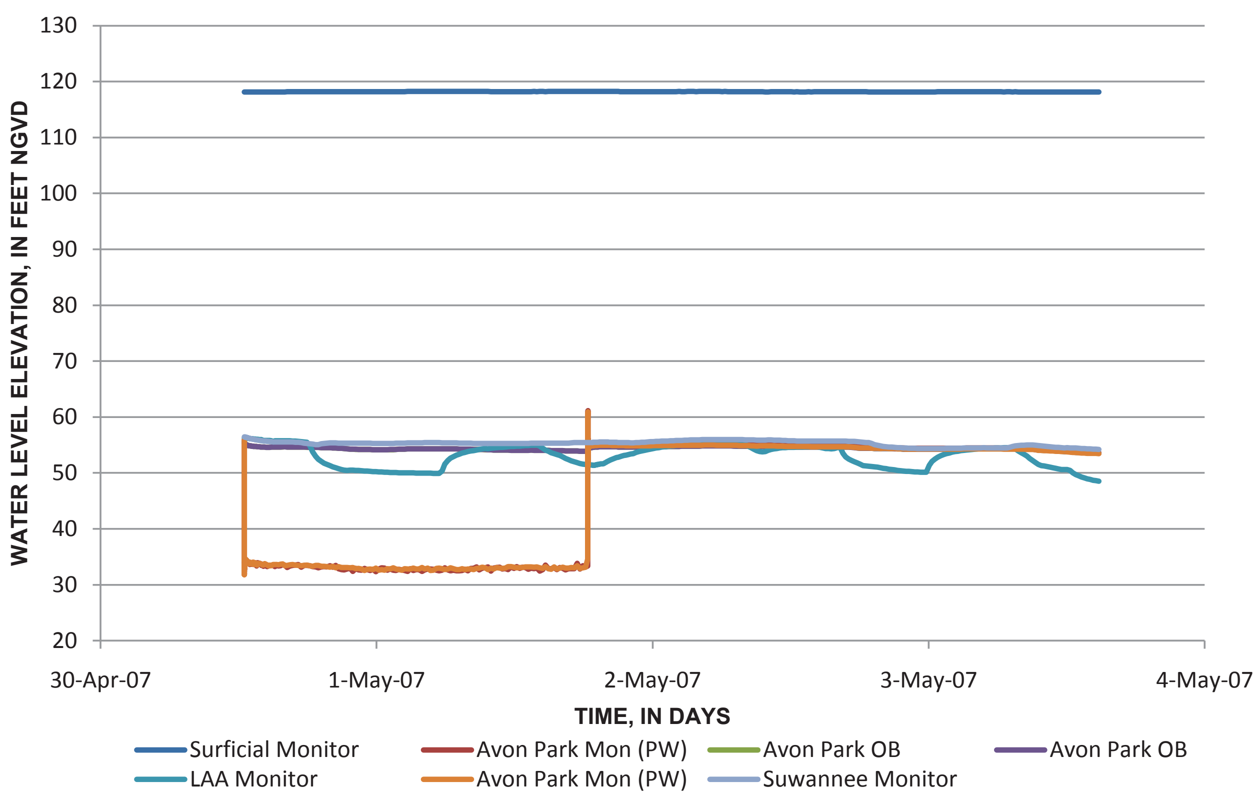
The Avon Park permeable zone extends from 942.5 ft to 1,503.6 ft bls and is contained entirely within the Avon Park Formation. The vast majority (84.5 percent) of the Avon Park permeable zone is composed of dolostone, whereas the remaining 15.5 percent is composed of packstone, wackestone, mudstone and grainstone. The dolostone was first encountered at 991 ft bls, and had from 15 to 30 percent intercrystalline, moldic and fracture porosity. Dolostone comprises the majority (92.3 percent) of the material between 991 ft bls and 1,503.6 ft bls.

Thirteen slug tests (numbers 15 through 27) were conducted in the Avon Park permeable zone, (table 4, figure 8). Hydraulic conductivities ranged from 61.37 ft/day (slug test 16, 992 ft–1,015 ft bls) to 4.98 ft/day (slug test 27, 1,465 ft–1,505 ft bls) (Appendix F, figures F.15–F.27). The last three slug tests (numbers 25 through 27) performed in the Avon Park permeable zone produced three of the lowest hydraulic conductivity values within the Avon Park permeable zone. Slug tests 25 through 27 produced hydraulic conductivity values of 16.65, 10.60, and 4.98 ft/day, respectively. These declining hydraulic conductivity values illustrate that the porosity and permeability of the Avon Park permeable zone decreases with depth as middle confining unit II is approached. A hydraulic conductivity value of only 4.98 ft/day may be considered low to be included in a permeable zone; however, the interval tested (1,465 ft–1,505 ft bls) had intercrystalline, intergranular and some fracture porosity. Also, slug tests conducted in middle confining unit II yielded hydraulic conductivity values approximately two orders of magnitude lower.

Water levels measured during advancement of the corehole through the Avon Park permeable zone fell from 66.97 ft bls at a coring depth of 975 ft bls to 70.56 ft bls at a coring depth of 1,095 ft bls (figure 5, table 1). The water level began to rise as the corehole was advanced through the remainder of the Avon Park permeable zone to 59.41 ft bls at a coring depth of 1,505 ft bls. This rise in water level was probably caused by summer rains which took place between June 5 and July 21, 2004. These rains also allowed a reduction in regional pumping which would also permit the water level to rebound. Slug test water levels showed a similar trend which started with a water level for slug test 16 (992 ft–1,015 ft bls) of 73.33 ft bls that steadily rose to 62.5 ft bls during slug test 27 (1,465 ft–1,505 ft bls) (figure 5), a water level rise of 10.83 ft.

A constant rate Avon Park permeable zone pumping test was conducted from April 30 to May 1, 2007. Background, pumping and recovery water level fluctuations were recorded in all monitored zones on site. Figure 11 presents the hydrograph of water levels for pumping and recovery phases.

The 24-inch Avon Park permeable zone monitor well (Appendix B, figure B.4), with 12-inch telescoping steel casing from 376 ft to 835 ft bls, was pumped with a 13-inch line shaft turbine at 2,320 gpm for 29.7 hours or 1.24 days. Discharge was directed about 1,000 ft to the large ditch in the northeast corner of FDOT property and measured with an in-line flow meter and verified with a manometer and orifice



[Apr, April; LAA, lower Arcadia aquifer; Mon, Monitor; NGVD, National Geodetic Vertical Datum of 1929; OB, observation well; PW, pumped well]

Figure 11. Hydrograph of the Avon Park permeable zone pumping test at ROMP 41.

plate. The 2-inch Avon Park tube in the dual zone observation well (Appendix B, figure B.8) was located 205 ft north of the pumped well (figure 2). Maximum drawdown in the Avon Park pumped well was 23.9 ft and 1.77 ft in the observation well.

The high pumping rate (2,320 gpm) caused water in the discharge ditch to slowly back up, forming a large pool of water at the northeast corner of FDOT property. This pool gradually grew and eventually moved on to an adjacent property causing minor flooding in a citrus grove. At this point pumping was terminated, only 1.24 days into pumping.

Drawdown and recovery phase water levels from the pumped and observation wells (and all other zones) were recorded and subsequently analyzed using Cooper-Jacob (1946) and Theis (1935) analytical methods, respectively (Appendix E, figures E.7 and E.8). Transmissivities calculated from drawdown and recovery phases were 2.2 X 10^5 ft^2/day and 2.6 X 10^5 ft^2/day, respectively, from which a geometric mean of 2.4 X 10^5 ft^2/day was calculated (table 3). Storativity was calculated at 1.5 X 10^{-3} (table 3).

Middle Confining Unit II

Middle confining unit II (Miller, 1986) extends from 1,503.6 ft bls through the total depth of coring of 1,640 ft bls at ROMP 41. It is predominantly composed of low permeability dolostone and minor limestone that, below 1,525 ft bls, has from 3 to 40 percent pore-filling and nodular gypsum and up to 15 percent anhydrite. A total of 17.6 ft of bedded gypsum is also present below 1,540 ft bls, with bed thickness ranging from 2.2 ft to 5.8 ft.

A total of three slug tests (numbers 28 through 30) were conducted below 1,540 ft bls. All three slug tests produced quite low hydraulic conductivities that decreased with depth (figure 8). Slug tests 28, 29 and 30 produced hydraulic conductivities of 0.07, 0.06, and 0.01 ft/day, respectively (Appendix F, figures F.28–F.30). Slug test 28 tested the interval from 1,540 ft to 1,600 ft bls, slug test 29 retested the lower 30 ft (1,570–1,600 ft bls) of the previous 60 ft interval, and slug test 30 tested the interval from 1,600 ft to 1,640 ft bls, the bottom 40 ft of the corehole. The interval from 1,570 ft to 1,600 ft bls was isolated and retested to quantify the hydraulic conductivity because it had almost 30 percent more bedded/nodular gypsum than did the interval from 1,540 ft to 1,570 ft bls and it was expected to have an even lower hydraulic conductivity than the entire 60-foot interval. This was confirmed as the deeper interval (1,570 ft–1,600 ft bls) showed a 14 percent reduction in hydraulic conductivity from that of the larger interval (1,540 ft–1,600 ft bls).

Water levels measured during advancement of the corehole through the confining unit were erratic but generally trended downward from 59.41 ft bls at a depth of 1,505 ft bls to 66.94 ft bls at a depth of 1,640 ft bls (figure 5). Water levels measured during slug testing also showed a general downward trend from 62.5 ft bls during slug test 27 to 65.09 ft bls during slug test 30 (figure 5). Water levels generally declined as water quality degraded causing water density to increase.

Water Quality

Water quality was profiled with depth throughout the coring operation. Water quality samples were collected between core runs and during slug tests. Slug test intervals are isolated by the use of a packer or casing placement. After being hydraulically tested, the isolated interval also provides a water sample for field and laboratory analysis. Any reference to slug test water quality refers to a water sample taken from an isolated interval associated with a slug test. Field analyzed and laboratory analyzed water-quality data are presented in Appendix G, tables G.1 and G.2, respectively. Table 2 associates slug test interval water quality (specific conductance) with water level. Presented in figure 12 is a graph of ion concentration from laboratory analyzed water samples. Figure 13 presents a Piper (1944) diagram displaying laboratory results from a surficial aquifer water sample and water-quality samples from all intervals slug tested in the ROMP 41 corehole.

Surficial Aquifer

The surficial aquifer monitor well, used initially as a water supply for the coring operation, produced fresh water with a field measured specific conductance of 137 microsiemens per centimeter (µS/cm) on December 30, 2003 (Appendix G, table G.1). A laboratory-analyzed water sample from the surficial aquifer monitor well was collected on November 15, 2010, with a centrifugal pump and yielded a specific conductance of 197 µS/cm, a chloride concentration of 13.6 milligrams per liter (mg/L), a sulfate concentration of 20.1 mg/L, and a total dissolved solids concentration of 120 mg/L (Appendix G, table G.2).

The above laboratory-analyzed sample from the surficial aquifer was plotted on a Piper diagram (figure 13). This diagram shows that the surficial aquifer has a calcium bicarbonate water type and the freshest water encountered at the ROMP 41 site.

Confining Unit

Two slug tests (numbers 1 and 2) were conducted in the confining unit above the lower Arcadia aquifer and yielded discrete interval water quality samples with field measured specific conductance of 397 and 472 µS/cm, respectively (Appendix G, table G.1). Laboratory analyzed water quality (Appendix G, table G.2) for slug test 1 (75 ft to 210 ft bls) produced a specific conductance of 419 µS/cm, a chloride concentration of 9.89 mg/L, a sulfate concentration of 3.95 mg/L and a total dissolved solids concentration of 265 mg/L (figure 12). Laboratory analyzed water quality (Appendix G, table G.2) for slug test 2 (221 ft–250 ft bls) produced a specific conductance of 464 µS/cm, a chloride concentration of 21.10 mg/L, a sulfate concentration of 10.30 mg/L, and a total dissolved solids concentration of 279 mg/L (figure 12).

There were several water-quality constituents that showed marked increases in concentration when comparing water samples from slug tests 1 and 2 (figure 12). Those constituents were strontium, up from 0.37 to 1.73 mg/L; sulfate, up from 3.95 to 10.3 mg/L; sodium, up from 13.7 to 23.5 mg/L; and chloride, up from 9.89 to 21.1 mg/L. These increases in concentration were probably caused by a combination of factors. The test interval for slug test 1 was quite large, from 75 ft to 210 ft bls, and contained water that most recently percolated down from the surficial aquifer, giving the sample a fresher character (lower constituent concentrations) than deeper intervals. The water quality from slug test 2 included a marginally productive interval from 222 ft to 230 ft bls that had a water-quality similar to that of the deeper lower Arcadia aquifer.

Lower Arcadia Aquifer

The groundwater within the lower Arcadia aquifer was fresh, meaning total dissolved solids for all samples were below 500 mg/L (Appendix G, table G.2). Slug test 3 (357 ft–390 ft bls) was run in the lower Arcadia aquifer (359 ft–385 ft bls) and yielded a field measured specific conductance of 419 µS/cm. Laboratory results (Appendix G, table G.2) on samples for this interval indicated fresh water (total dissolved solids less than 500 mg/L) with a specific conductance of 411 µS/cm, a chloride concentration of 9.66 mg/L, a sulfate concentration of 54.9 mg/L and a total dissolved solids of 247 mg/L (figure 12). Additionally, all lower Arcadia water samples collected met the Environmental Protection Agency's National Secondary Drinking Water Regulation standards for the parameters tested. The most noticeable change from slug test 2 was the over five-fold increase in sulfate concentration in the water quality sample from slug test 3, which rose from 10.3 mg/L to 54.9 mg/L. Strontium concentration also continued to climb from 1.73 (slug test 2) to 3.66 mg/L. Sodium concentration remained almost constant at 23.1 mg/L and chloride concentration actually dropped from 21.1 to 9.66 mg/L.

Water quality from slug test 3, performed in the lower Arcadia aquifer, and the overlying confining unit (slug tests 1 and 2) were plotted on a Piper (1944) diagram (figure 13). This diagram shows that the water in the confining unit above the lower Arcadia aquifer is predominantly freshwater (calcium-bicarbonate type), whereas the water from the lower Arcadia aquifer shows some freshwater-deepwater mixing with a noticeable increase in sulfate concentration, as mentioned above.

Confining Unit

Water quality within the confining unit above the UFA (385 ft–480 ft bls) was not specifically tested as no slug test was performed solely within these sediments; however, specific conductance was measured on samples as the corehole was airlifted clean between core runs with the HW casing set at 96.5 ft bls. These samples were taken with the bottom of the corehole at 410 ft, 430 ft, 450 ft and 480 ft bls and yielded specific conductivities that ranged from 405 and 421 µS/cm (Appendix G, table G.1). In general, water quality improved slightly, specific conductance decreased, as the Suwannee permeable zone was approached.

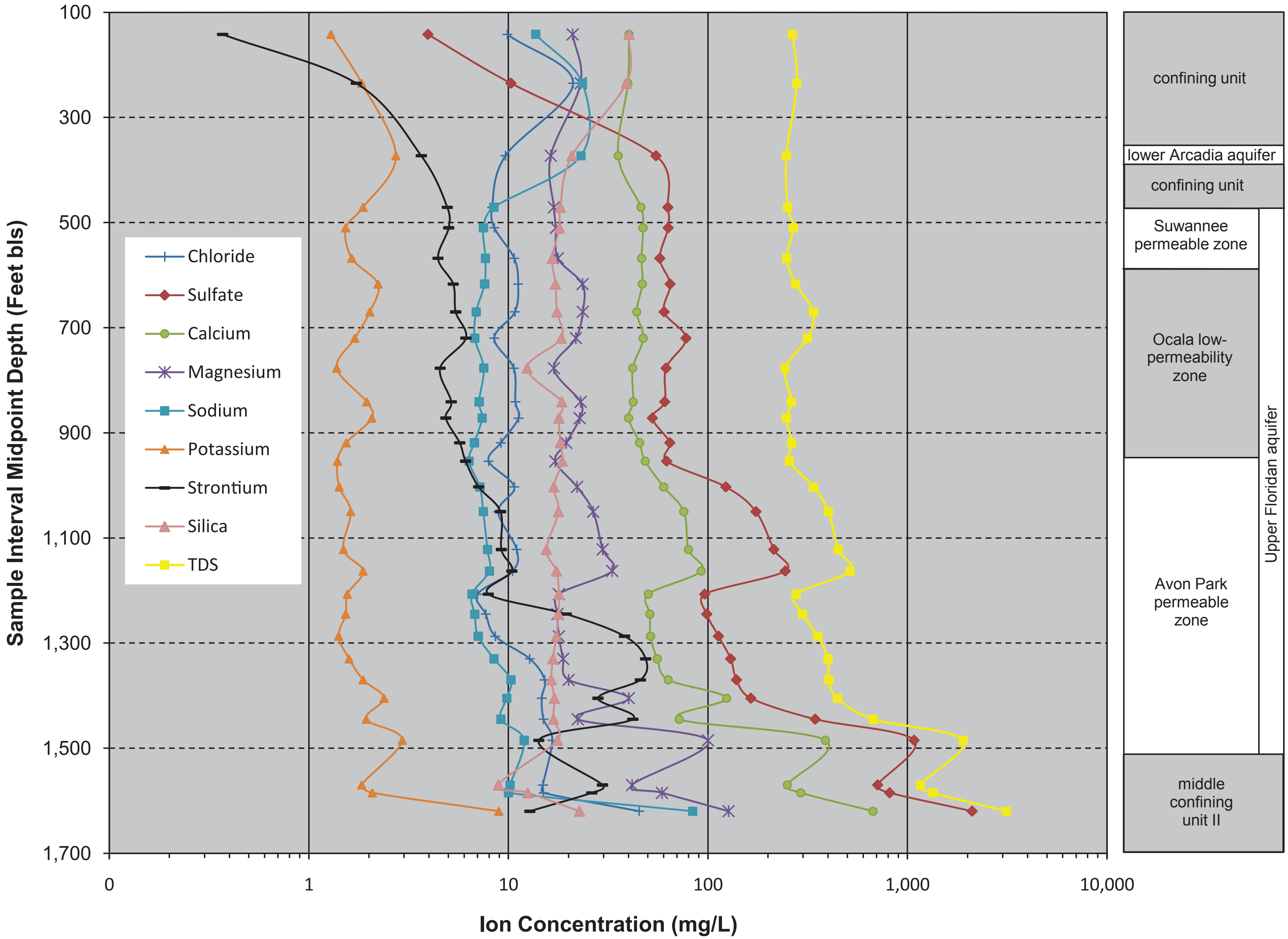
Suwannee Permeable Zone

Water quality was measured as fresh based on National Drinking Water Regulation standards within the Suwannee permeable zone. Slug tests 4 through 6 provided discrete intervals for water-quality sampling from the Suwannee permeable zone. Field measured specific conductivity ranged from 363 to 407 µS/cm (Appendix G, table G.1). Laboratory analyzed water quality for slug tests 4 through 6 yielded a specific conductance range of 397 to 409 µS/cm, a chloride concentration range of 8.29 to 10.7 mg/L, a sulfate concentration range of 57.4 to 63.0 mg/L, and a total dissolved solids concentration range from 248 to 268 mg/L (figure 12) (Appendix G, table G.2). All measured constituents remained at concentration levels very similar to those of the lower Arcadia aquifer with the exception of sodium which fell from 23.1 to 8.46 mg/L. Water within the Suwannee permeable zone remained within the National Secondary Drinking Water Regulation standards for all parameters tested.

The Piper diagram (figure 13) shows all three Suwannee permeable zone points plotted along the fresher end of the freshwater-deepwater mixing line. The freshwater component of the Suwannee permeable zone has undergone calcium-sulfate enrichment (Tihansky, 2005) as deep aquifer dissolution of gypsum is encouraged to migrate upward in the UFA. This deepwater enrichment was most likely induced or at least exacerbated by the lowering of the potentiometric surface by groundwater withdrawals. The region around the ROMP 41 site is heavily pumped for citrus production.

Ocala Low-Permeability Zone

Water quality within the Ocala low-permeability zone was sampled during eight slug tests (slug tests 7–14). Field measured specific conductance for these eight slug test intervals ranged from 375 to 440 µS/cm (Appendix G, table G.1). Laboratory analyzed water samples had a specific conductance that ranged from 390 to 456 µS/cm, a chloride concentration that varied from 8.49 to 11.25 mg/L, a sulfate concentration that ranged from 52.66 to 77.65 mg/L, and a total dissolved solids concentration that fluctuated between 244 and 338 mg/L



[bls, below land surface; mg/L, milligrams per liter; TDS, total dissolved solids]

Figure 12. Graph showing changes in ion concentration with depth from slug test interval and surficial aquifer water-quality samples with aquifer delineation at ROMP 41.

(figure 12) (Appendix G, table G.2). No major trends were observed and all measured constituents remained at similar concentration levels as were observed in the Suwannee permeable zone.

The Piper diagram (figure 13) shows samples from this zone plotted along the freshwater-deepwater mixing line, very similar to those of the Suwannee permeable zone.

Avon Park Permeable Zone

The Avon Park permeable zone is subdivided into two intervals based on water quality. The upper water-quality interval extends from 942.5 ft to 1,180 ft bls and was verified through analysis of water-quality samples from the intervals of slug tests 15 through 19 (figure 3). The lower water-quality interval extends from 1,180 ft bls to 1,503.6 ft bls and includes analysis of water-quality samples from the intervals of slug tests 20 through 27 (figure 3).

Field measured specific conductance performed on slug test interval water samples in the upper water-quality interval ranged from 378 to 665 µS/cm (Appendix G, table G.1). Laboratory analysis of these samples yielded a specific conductance range of 401 to 706 µS/cm, chloride concentration range of 7.97 to 11.00 mg/L, sulfate concentration range of 62.1 to 244 mg/L, and total dissolved solids range of 256 to 516 mg/L (figure 12) (Appendix G, table G.2). The water-quality sample from slug test 19 (1,152 ft–1,175 ft bls) was the first sample to exceed drinking water standards, yielding a total dissolved solids concentration of 516 mg/L, just marginally over the 500 mg/L standard.

Water quality improved somewhat as the lower interval

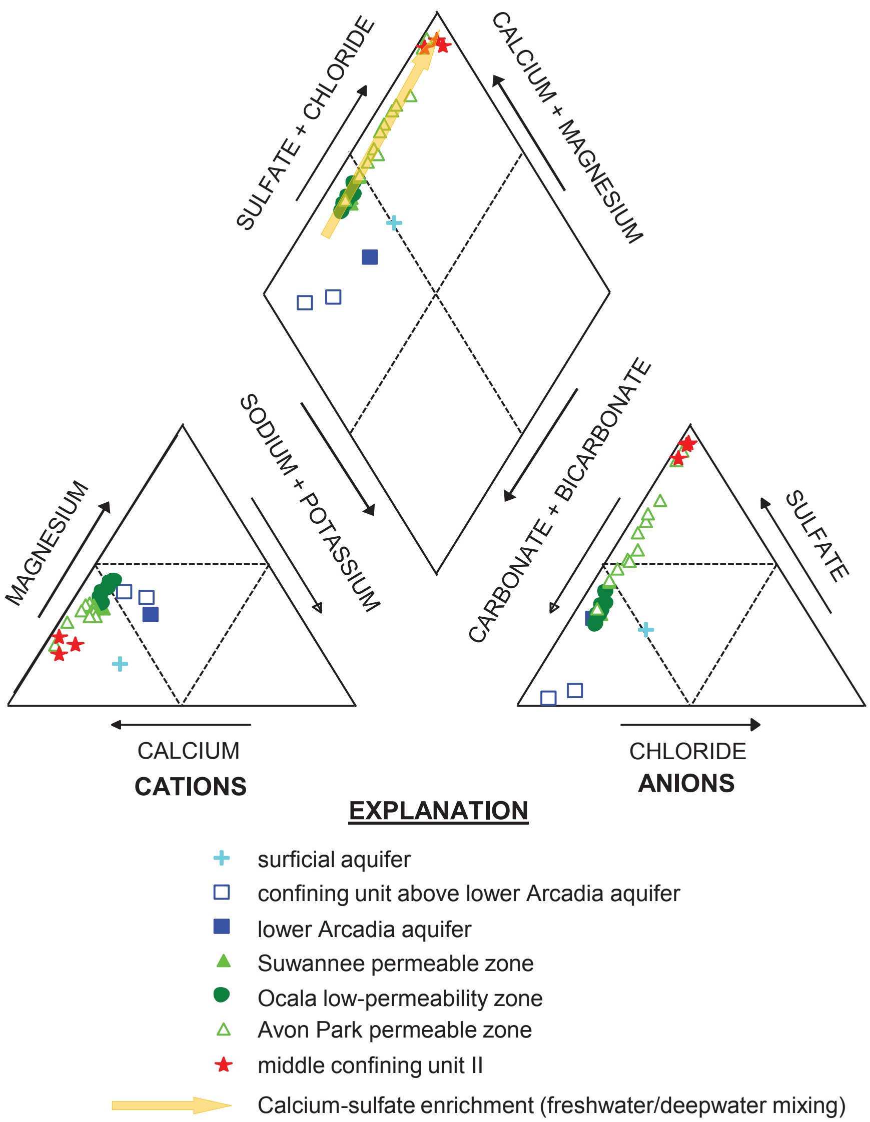


Figure 13. Piper diagram displaying laboratory analyzed water-quality data from the surficial aquifer and slug test intervals at ROMP 41.

was initially penetrated but then degraded toward its base. Field measured specific conductance for this interval ranged from 417 to 1,730 µS/cm. Laboratory analysis for these samples yielded a specific conductance range from 436 to 2,060 µS/cm, a chloride concentration range from 7.0 to 16.60 mg/L, a sulfate concentration range from 96.40 to 1,080 mg/L, and a total dissolved solids concentration range from 277 to 1,900 mg/L (figure 12). Water quality exceeded drinking water standard once again in the interval from 1,425 ft to 1,465 ft bls (slug test 26) where total dissolved solids measured 674 mg/L. The most drastic degradation of water quality within the lower water-quality interval occurred between the intervals of slug tests 26 and 27. Water quality degraded between these two sample intervals with a minor increase in chloride concentration of 1.60 mg/L, an appreciable increase in sulfate concentration of 735 mg/L, a large increase in total dissolved solids of 1,226 mg/L, and a comparable increase in specific conductance of 1,156 µS/cm.

The interval tested by slug test 27 (1,465 ft–1,505 ft bls) produced a low hydraulic conductivity value of 4.98 ft/day, but the intervals tested in slug tests 28 through 30, in middle confining unit II, produced hydraulic conductivity values that were up to almost 500 times lower (0.07 to 0.01 ft/day). These very low hydraulic conductivity values in middle confining unit II allow the poorest quality water in the base of the Avon Park permeable zone to sit on top of middle confining unit II due to poorer quality waters having higher density.

A possible explanation for the slight improvement in water quality in the lower interval is that organic laminations and accessory organics became common throughout this interval below about 1,180 ft bls. Drever (1982) explains “organic matter generally reacts strongly with trace metals, probably through formation of chelate-type complexes. Thus complexation by dissolved organic matter can lead to unexpectedly high concentrations of metals in solution, and complexation by solid organic matter can lead to removal of metals from solution.” This “complexation” happens through the process of adsorption which is the assimilation of dissolved matter by the surface of a solid or liquid. While the solid organic material in the wellbore may remove [calcium (Ca^{2+}) and magnesium (Mg^{2+})] from solution, it is possible that this process also releases strontium (Sr^{2+}) into solution. It may be that strontium reacts with dissolved organic matter and is released into solution while calcium and magnesium are pulled out of solution as they react with solid organic matter. Water-quality samples taken below 1,200 ft bls showed that as the concentration of calcium and magnesium decreased, strontium concentration increased and vice versa.

The Piper diagram (figure 13) shows all samples from the Avon Park permeable zone plotted along the freshwater-deepwater mixing line as water quality generally degraded as middle confining unit II was approached.

Middle Confining Unit II

Water-quality samples from middle confining unit II were collected from the isolated intervals of the last three slug tests (slug tests 28 - 30). Field measured specific conductivity ranged from 928 to 3,166 µS/cm (Appendix G, table G.1). Laboratory analysis of these water-quality samples yielded a specific conductance range of 1,381 to 3,220 µS/cm, chloride concentration range from 14.9 to 45.3 mg/L, sulfate concentration range from 709 to 2,110 mg/L, and a total dissolved solids range of 1,160 to 3,130 mg/L (Appendix G, table G.2).

Water samples from slug tests 28 (1,540 ft–1,600 ft bls) and 29 (1,570 ft–1,600 ft bls) provided water that was actually fresher than water from slug test 27 (1,465 ft–1,505 ft bls), in the base of the lower water-quality interval of the Avon Park permeable zone. Laboratory analysis of the water samples from the intervals of slug tests 28 and 29 show specific conductance of 1,381 and 1,560 µS/cm, chloride concentration of 14.9 and 15.0 mg/L, sulfate concentration of 709 and 814 mg/L, and total dissolved solids concentration of 1,160 and 1,340 mg/L, respectively. Slightly improved water quality within the upper portion of the middle confining unit is explained by the same adsorption processes discussed in the above Avon Park permeable zone section. Slug test 30 (1,600 ft–1,640 ft bls) yielded the poorest water quality encountered during the coring operation at ROMP 41. It produced water with all the upper concentration limits mentioned in the above paragraph.

The three water quality samples taken in middle confining unit II fell in the upper portion of the quadrilateral on the Piper diagram (figure 13). This area indicates the poorest quality water along the freshwater–deepwater mixing line and can be explained by dissolution of some of the vug-filling and nodular gypsum ($CaSO_4 \cdot 2H_2O$) encountered below 1,520 ft bls.

Summary

The overall objective of the data collection effort at the ROMP 41 site was to delineate and characterize the hydrogeologic system present at the site. The District collected the majority of the hydrogeologic data during the exploratory coring and testing phase of the project while utilizing the District’s CME 85 drill rig and crew. Extensive testing and sampling were performed during development of this site including: lithologic (core) sampling, geophysical logging, water quality and water level profiling, slug testing and aquifer performance testing. The 1,640 ft deep corehole, constructed with the District-owned CME 85 core rig, was extensively slug tested and all permanently monitored aquifers/zones on site were aquifer tested.

A total of four permanent wells were constructed at the ROMP 41–Torrey site: a surficial monitor (Appendix B, figure B.2), a lower Arcadia aquifer monitor (Appendix B, figure

B.6), a Suwannee permeable zone monitor (Appendix B, figure B.5) and an Avon Park permeable zone monitor (Appendix B, figure B.4). To aid in aquifer performance test analysis the corehole was converted into a dual zone Suwannee/Avon Park observation well (Appendix B, figure B.8). A lower Arcadia aquifer observation well (Appendix B, figure B.7) and a surficial aquifer observation well (Appendix B, figure B.3) were also constructed. The corehole (Appendix B, figure B.1) and both the surficial aquifer monitor well and surficial observation well were constructed with the CME 85 core rig. All other wells and modification of the corehole were done with contractor services. The Suwannee permeable zone and Avon Park permeable zone monitor wells were lined with 6-inch pvc and the observation wells were plugged and abandoned in 2010 with contractor services.

The geologic units underlying the study area, in ascending order (oldest to youngest) are the Avon Park Formation (835 ft–1,640 ft bls), the Ocala Limestone (585 ft–835 ft bls), the Suwannee Limestone (453.5 ft–585 ft bls), the Hawthorn Group (30 ft–453.5 ft bls), and the undifferentiated sand and clay deposits (land surface–30 ft bls). The Hawthorn Group sediments are composed of the Arcadia Formation (71 ft–453.5 ft bls) and the Peace River Formation (30 ft–71 ft bls). The Arcadia Formation is further subdivided into the Nocatee Member (353.7 ft–453.5 ft bls) and undifferentiated Arcadia sediments (71 ft–353.7 ft bls). At the ROMP 41 site, the Peace River Formation is entirely composed of the Bone Valley Member.

Water levels were profiled with depth during the coring operation with daily coring water levels and water levels from discrete slug test intervals being recorded. Water levels generally fell with increased penetration, indicating a recharging system but confined water levels within the lower Arcadia aquifer, and the Suwannee and Avon Park permeable zones are very similar. This similarity increases the probability that the gradient that governs flow between these aquifers/zones could change direction with abundant rainfall or pumping in the vicinity of the ROMP 41 wellsite. The surficial aquifer water level is about 50 ft higher than the water levels of the underlying confined aquifers, which puts the surficial aquifer in a constant state of downward discharge.

In an effort to profile hydraulic conductivity with depth, 30 slug tests were conducted between 75 ft and 1,640 ft bls during the coring operation. These slug tests produced hydraulic conductivity values that were used to help identify zones of relative permeability or confinement. These relative hydraulic conductivity values were instrumental in defining the hydrologic system at the ROMP 41 site. The aquifers/zones within this system in descending order include the surficial aquifer (land surface–28 ft bls), the lower Arcadia aquifer (359 ft–385 ft bls), the Suwannee permeable zone (480 ft–586.5 ft bls) and the Avon Park permeable zone (942.5 ft–1503.6 ft bls). Confining units were identified from 28 ft to 359 ft bls and from 385 ft to 480 ft bls. The Ocala low-permeability zone was identified from 586.5 ft to 942.5 ft bls and the top of middle confining unit II was located at 1,503.6 ft bls.

Water quality was potable through the surficial aquifer and the lower Arcadia aquifer into the UFA to a depth of about 1,455 ft bls where water quality showed a rise in sulfate concentration. Total dissolved solids increased above potable standards and specific conductance also increased through the same interval. As middle confining unit II was approached, sulfates were the major ion of water quality degradation. The poorest water quality was encountered in middle confining unit II where sulfate concentration rose to 2,110 mg/L, total dissolved solids rose to 3,130 mg/L and specific conductance increased to 3,220 µS/cm, while chloride concentration only rose to 45.3 mg/L.

Aquifer performance tests were conducted in all four aquifers/zones monitored at this site. The geometric mean of drawdown and recovery phase transmissivity values for each aquifer/zone yielded 530 ft^2/day for the surficial aquifer, 5,300 ft^2/day for the lower Arcadia aquifer, 6,300 ft^2/day for the Suwannee permeable zone, and 2.40 X 10^5 ft^2/day for the Avon Park permeable zone.

The data collected and analyzed from this site investigation and subsequent temporal data collection (changes in water levels and water quality with time) will be used in the Southern District Water Resource Assessment Project and for parameterization of District groundwater flow models.

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Appendix A

Methods of the Regional Observation and Monitor-well Program

Appendix A. Methods of the Regional Observation and Monitor-well Program

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 are 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 is conducted on the core hole providing additional hydrogeologic data. After well construction, an aquifer performance test (APT) is conducted on each of the major freshwater aquifers or producing zones encountered at the project site. These data are 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 a 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 HW and HQ gauge working casings along with NQ and NRQ core drilling rods, associated bits, and reaming shells from Boart Longyear®. The HW and HQ 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 HW and HQ working casings and NQ 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 hydrologists.

Recovery of the core samples is accomplished using a wireline recovery system (fig. A-1). The District's drilling crew uses the Boart Longyear® NQ wireline inner barrel assembly. This system allows a 1.87-inch by 5-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 are marked, and recovery estimates

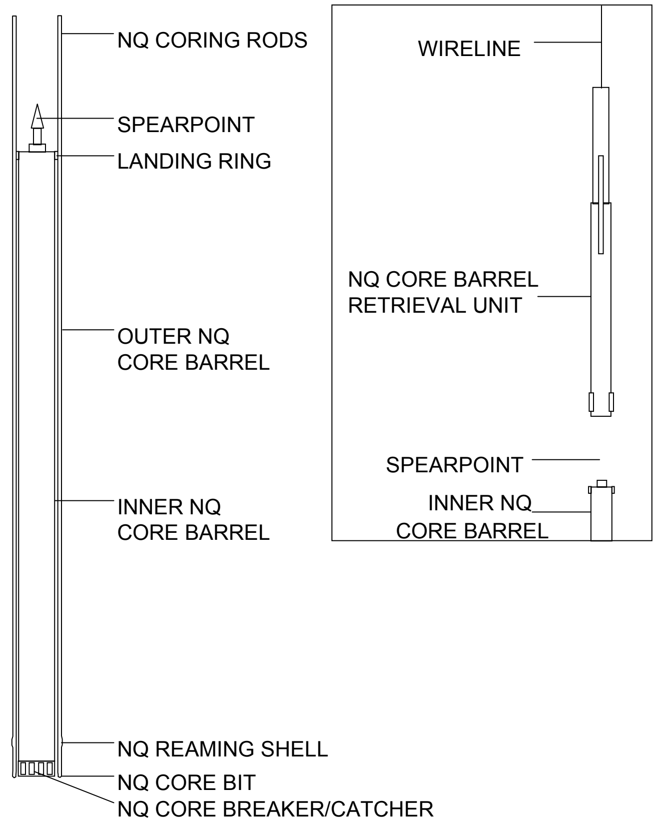


Figure A-1. Boart Longyear® NQ Wireline Coring Apparatus.

are 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 are archived at the Florida Geological Survey in Tallahassee, Florida.

Unconsolidated Coring

Various methods exist for obtaining core of unconsolidated material, 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

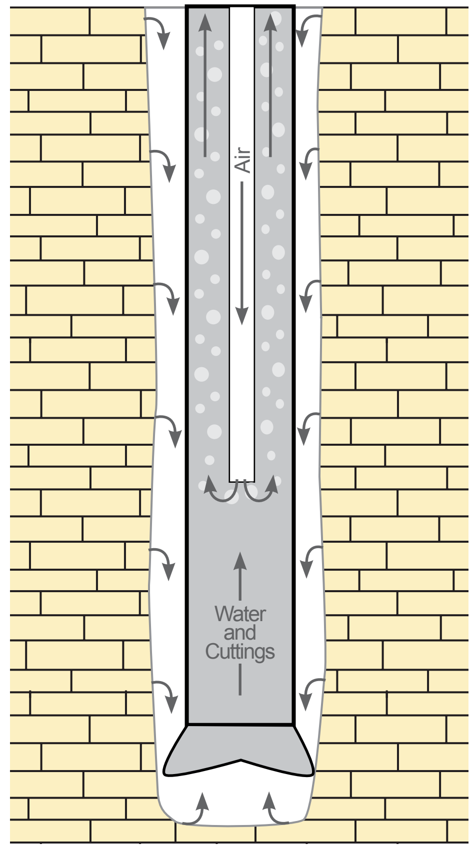
During rock coring, the District drilling crew utilizes HW and HQ working casings as well as permanent casings to stabilize the core hole. NQ core drilling rods and associated products are employed during the core drilling process. Core drilling is conducted by direct-circulation rotary methods using fresh water for drilling fluid. Direct water is not effective in removing the cuttings from the core hole, therefore, a reverse-air (air-lift) discharge method (fig. A-2) 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 weathered limestone cannot be tested using this technique. The packer assembly (fig. A-3) is utilized by raising the NQ coring rods to a predetermined point, lowering the packer to the bottom of the rods using a combination cable/air inflation line, and inflating the packer with nitrogen gas. This process isolates the test interval, which extends below 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



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 A-2. Reverse-air pumping

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, although they 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, 2006). The procedure involves isolating the test interval with the off-bottom packer (fig. A-3) and reverse-air pumping the water in the NQ 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 at land surface, with a wireline retrievable stainless steel bailer (fig. A-4), 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.

The water quality sample is collected using a clean polypropylene beaker. A portion of the sample is bottled according to standard District procedure for laboratory analysis (SWFWMD, 2009). Two bottles, one 250 milliliter and one 500 milliliter, are filled with water filtered through a 0.45-micron filter. Another 500 milliliter bottle is filled with unfiltered water. A peristaltic console pump is used to dispense the water into the bottles. The sample in the 250 milliliter bottle is acidified with nitric acid to a pH of 2 in order to preserve metals for analysis. The remainder of the sample is used to measure field parameters including specific conductance, temperature, pH, and chloride and sulfate concentrations. Temperature and specific conductance are measured using a YSI® multi-parameter handheld meter. Chloride and sulfate concentrations, and pH are analyzed with a YSI® 9000 photometer. The samples are delivered to the District's environmental 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 data is plotted on a Piper 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. 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).

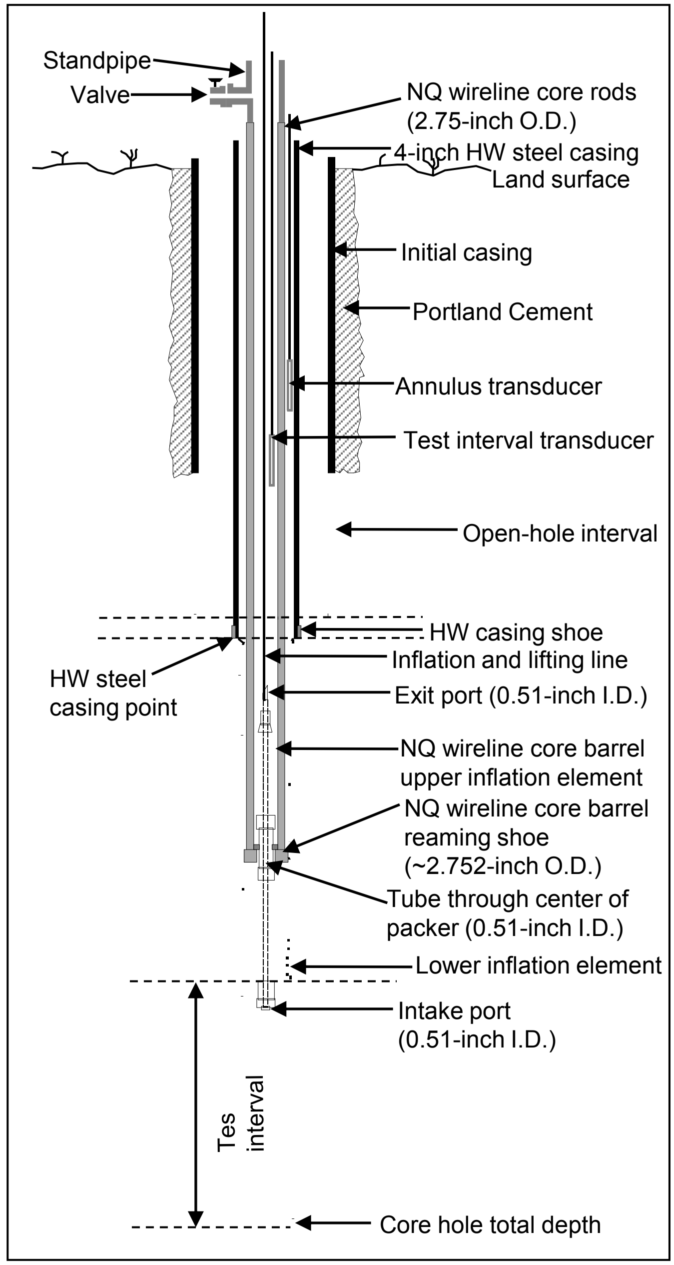


Figure A-3. Formation (off-bottom) packer assembly deployed in the core hole.

Collection of Slug Test Data

Hydraulic conductivity is estimated by conducting slug tests. During slug testing, 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. In-Situ® pressure transducers are used to measure the water level changes in the test interval and the annulus between the HW or

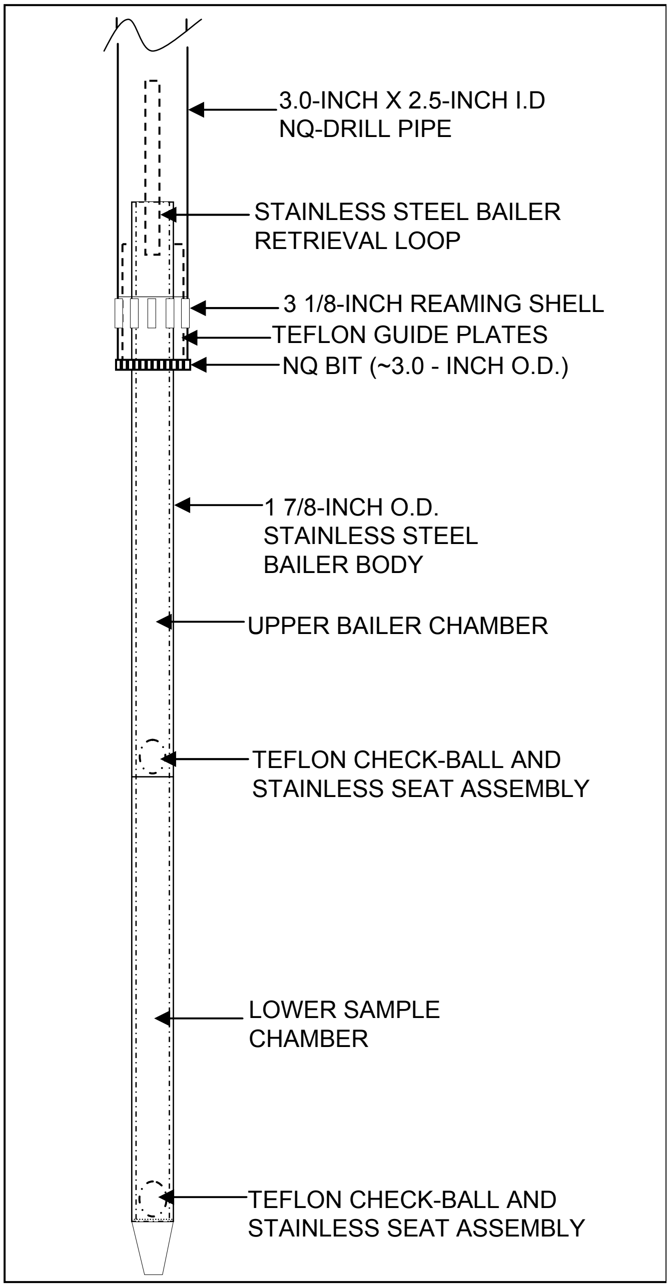


Figure A-4. Diagram of the wireline retrievable bailer.

HQ casing and the NQ 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 an In-Situ® Hermit 3000 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 it provides 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 level is monitored for equilibration. 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 returns to the initial static water level. The drop slug method is used for low hydraulic conductivity formations. This test initiation method is slower than the pneumatic method because the slug 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 rods raising the static water level. A specially designed PVC funnel fitted with a ball valve placed over the NQ rods is used to deliver the water. The water level is recorded until the raised level falls (falling head test) back to the 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, an estimate of the hydraulic conductivity value is made using AQTESOLVE® (Duffield, 2007) software by applying the appropriate analytical solution to the data.

Slug tests in which the formation packer assembly is used have a source of error resulting from the orifice restriction (fig. A-3). During the slug test, water must move through the NQ coring rods that have an inner diameter of 2.38-inches, then through the orifice on the packer assembly that has an inner diameter of 0.75-inch, and finally through the core hole that has a diameter of approximately 3-inches. The error associated with the orifice restriction is manifested as head dependence in the response data. It can be seen when multiple tests are conducted on the same test interval with varying initial displacements. The error associated with the orifice restriction results in an underestimation of the hydraulic conductivity values. In order to reduce the error associated with the orifice restriction, a spacer in introduced into 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, porosity, and flow zone detection), geologic (lithology, formation delineation), and physical characteristics (depth, diameter, casing depth, texture of well bore, and integrity of well construction).

Geophysical logging entails lowering the geophysical tool into the core hole or monitor well on a wireline, and measuring the tool's response to the formation and water quality as the tool is moved up the hole. 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 multifunction tool measures natural gamma-ray [GAM (NAT)], spontaneous potential (SP), single-point resistance (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 tool is 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 casing placement because competent, well-indurated layers can be located. The caliper log is also very useful in calculating the volume of materials needed to grout in casings, gravel or sand pack an interval, or plug the well.

Gamma [GAM(NAT)]

Natural gamma logs measure the amount of natural radiation emitted by rocks in the borehole. Radioactive elements present in certain types of geologic materials emit natural gamma radiation, thus specific rock materials can be identified from the log. Typically, clays contain high amounts of radioactive isotopes in contrast to more stable rock materials like carbonates and sands. Natural gamma can be measured through PVC and steel casing, although it is attenuated by steel casing. Gamma is used chiefly to identify rock lithology and correlate stratigraphic units because it can be measured through casing and is relatively regionally 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. They are useful in identifying contacts between different lithologies and stratigraphic correlation.

Single-Point Resistance (RES)

Single-point resistance logs measures the electrical resistance of 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 the electrode in the borehole and the electrode at land surface. The log must be run in a fluid-filled, uncased borehole.

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

Short-normal and long-normal resistivity logs measure the electrical resistivity of 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 farther 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 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 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. 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.

Single-Well Aquifer Pumping Test

Single-well APTs are conducted on one well within the production zone which is used for both pumping and monitoring the water level response. Background water level in the test well is collected for a time period twice as long as the pumping period (Stallman, 1976). Background water level 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. During pumping, 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 analyzed using analytical methods to estimate the hydraulic properties of the aquifer and adjacent confining units. Typically, response data is analyzed using AQTESOLVE® (Duffield, 2007) software by applying the appropriate analytical solution.

Multi-Well Aquifer Performance Test

Multi-well APTs are conducted with a 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 time period at least twice the pumping period (Stallman, 1976). During pumping, 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 analyzed using analytical or numerical methods to estimate the hydraulic properties of the aquifer and adjacent confining units. Typically, response data is analyzed using AQTESOLVE® (Duffield, 2007) software by applying the appropriate analytical solution.

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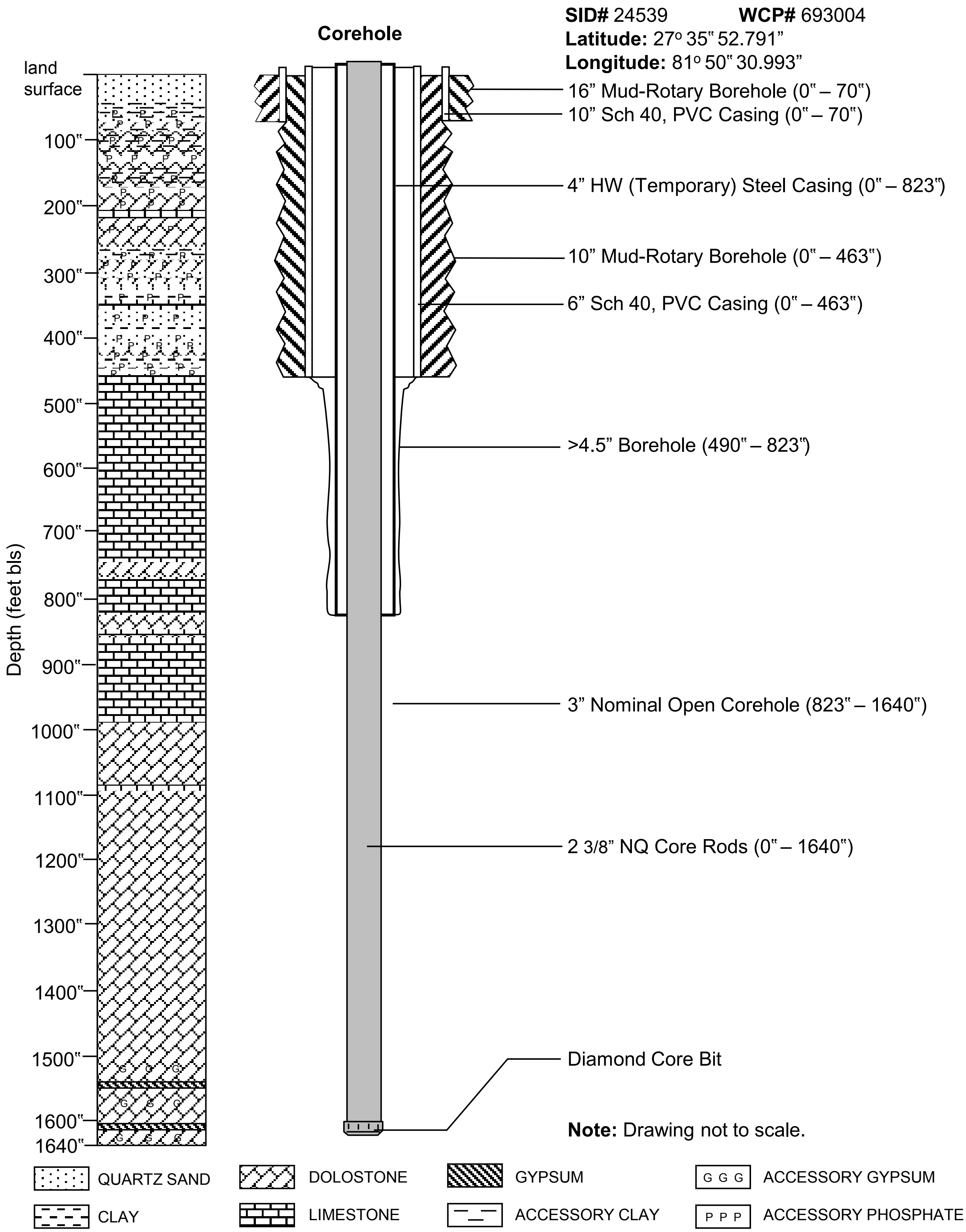
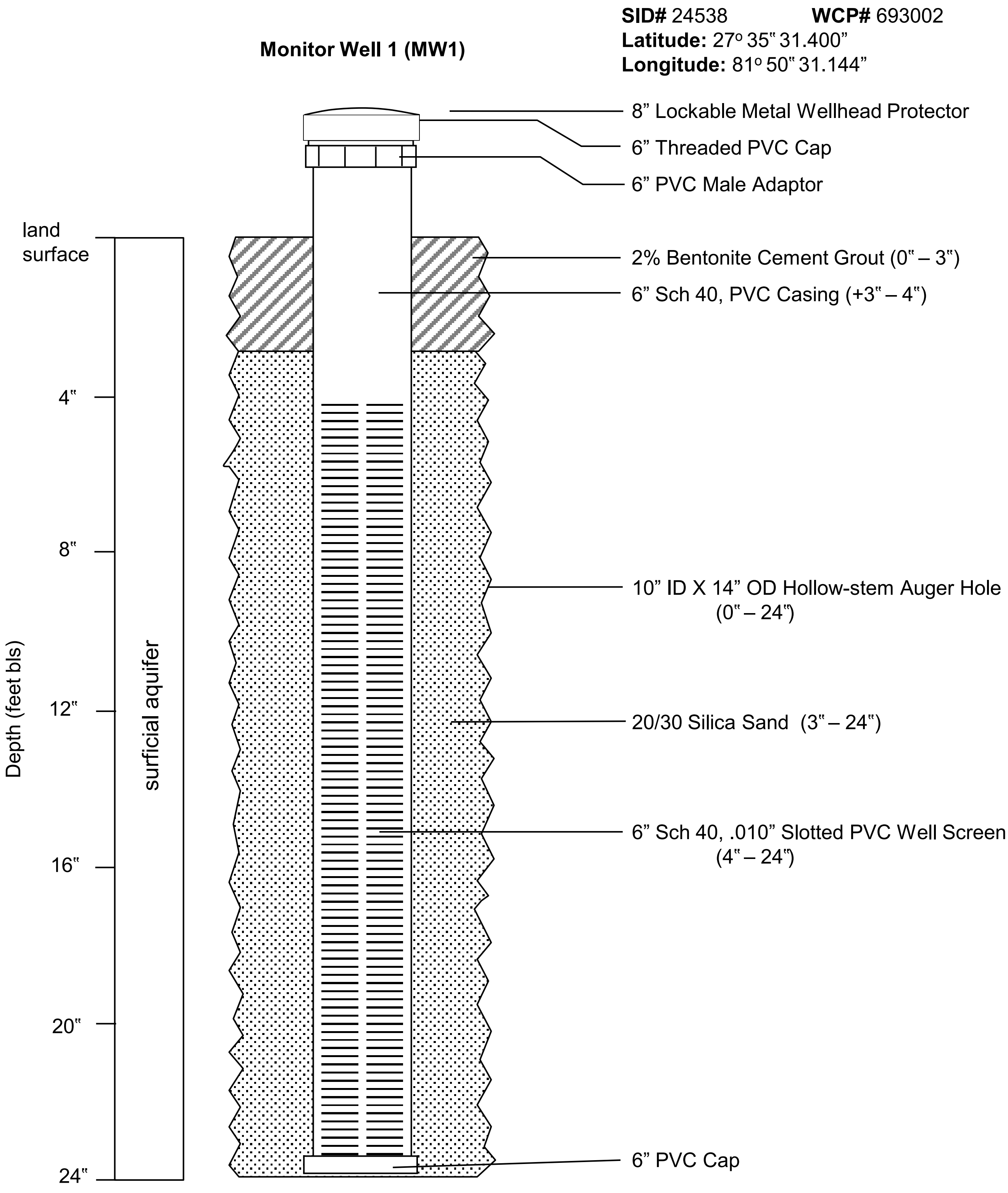
Appendix B

Well Diagrams for the ROMP 41 site

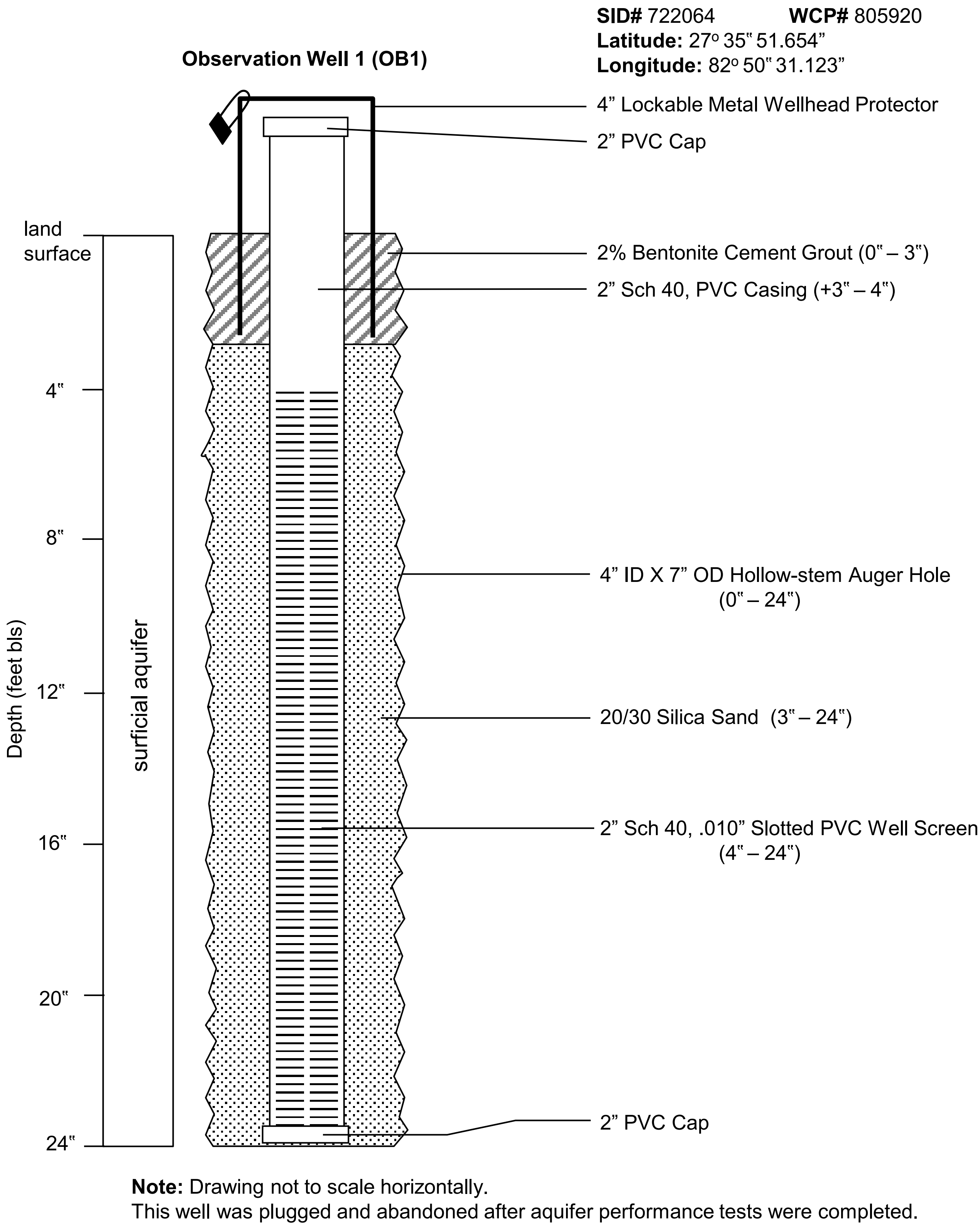


Appendix B, Figure B.1. Configuration of the ROMP 41 corehole at total depth (1,640 feet bls).
[bls, below land surface; G, gypsum; HW, 4-inch steel casing; NQ, core rods; P, phosphate; PVC, polyvinyl chloride; Sch, schedule; SID#, site identification number; WCP#, well construction permit number; ", inches; ', feet]



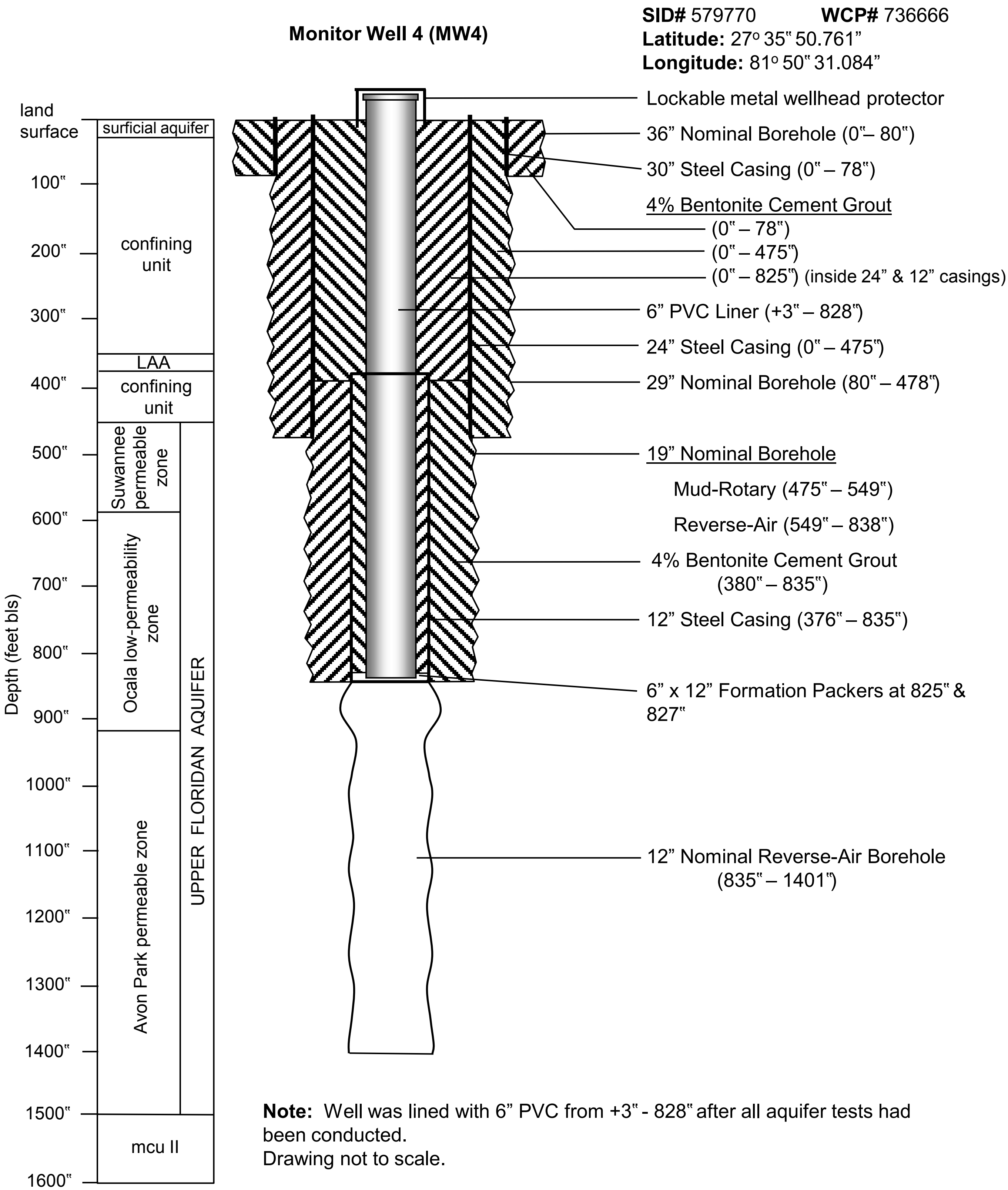
Note: Drawing not to scale horizontally.

Appendix B, Figure B.2. As-Built Well Diagram for the surficial aquifer monitor at the ROMP 41 site.
[bls, below land surface; ID, internal diameter; OD, outside diameter; PVC, polyvinyl chloride; Sch, schedule; SID#, site identification number; WCP#, well construction permit number; „ feet; “, inches]

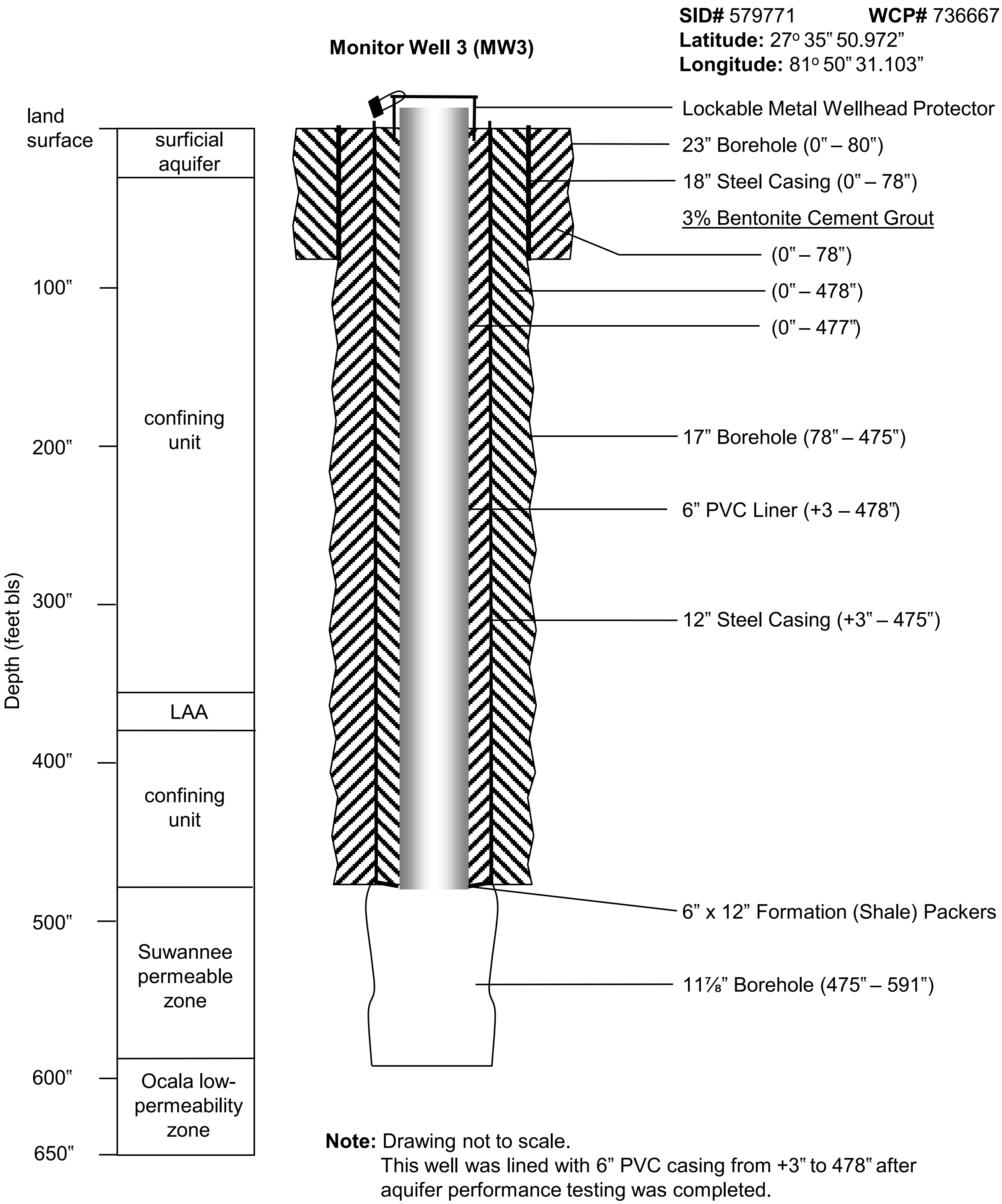


Appendix B, Figure B.3. As-Built Well Diagram for the surficial aquifer observation well at the ROMP 41 site.

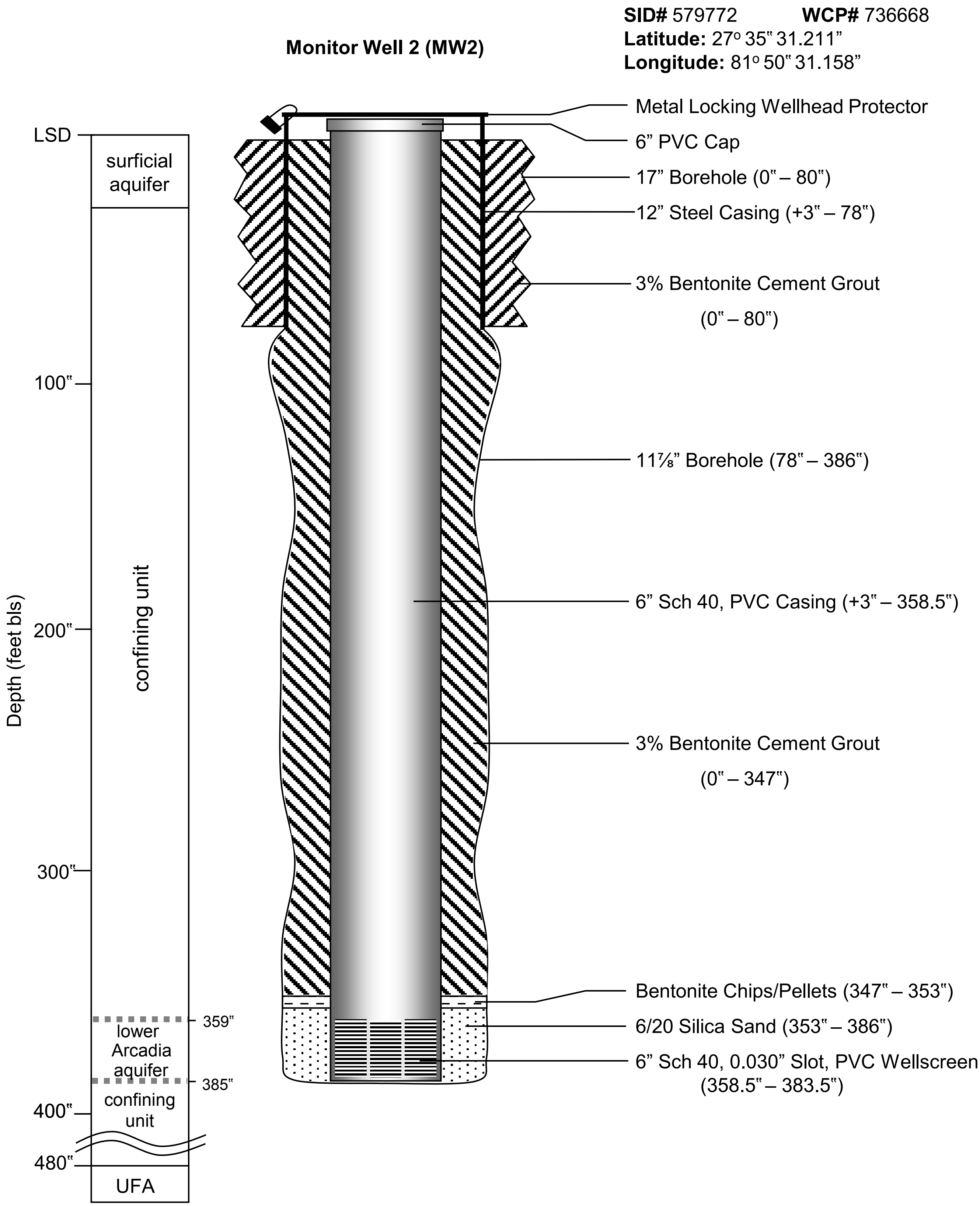
[bls, below land surface; ID, internal diameter; OD, outside diameter; PVC, polyvinyl chloride; Sch, schedule; SID#, site identification number; WCP#, well construction permit number; „ feet; “, inches]



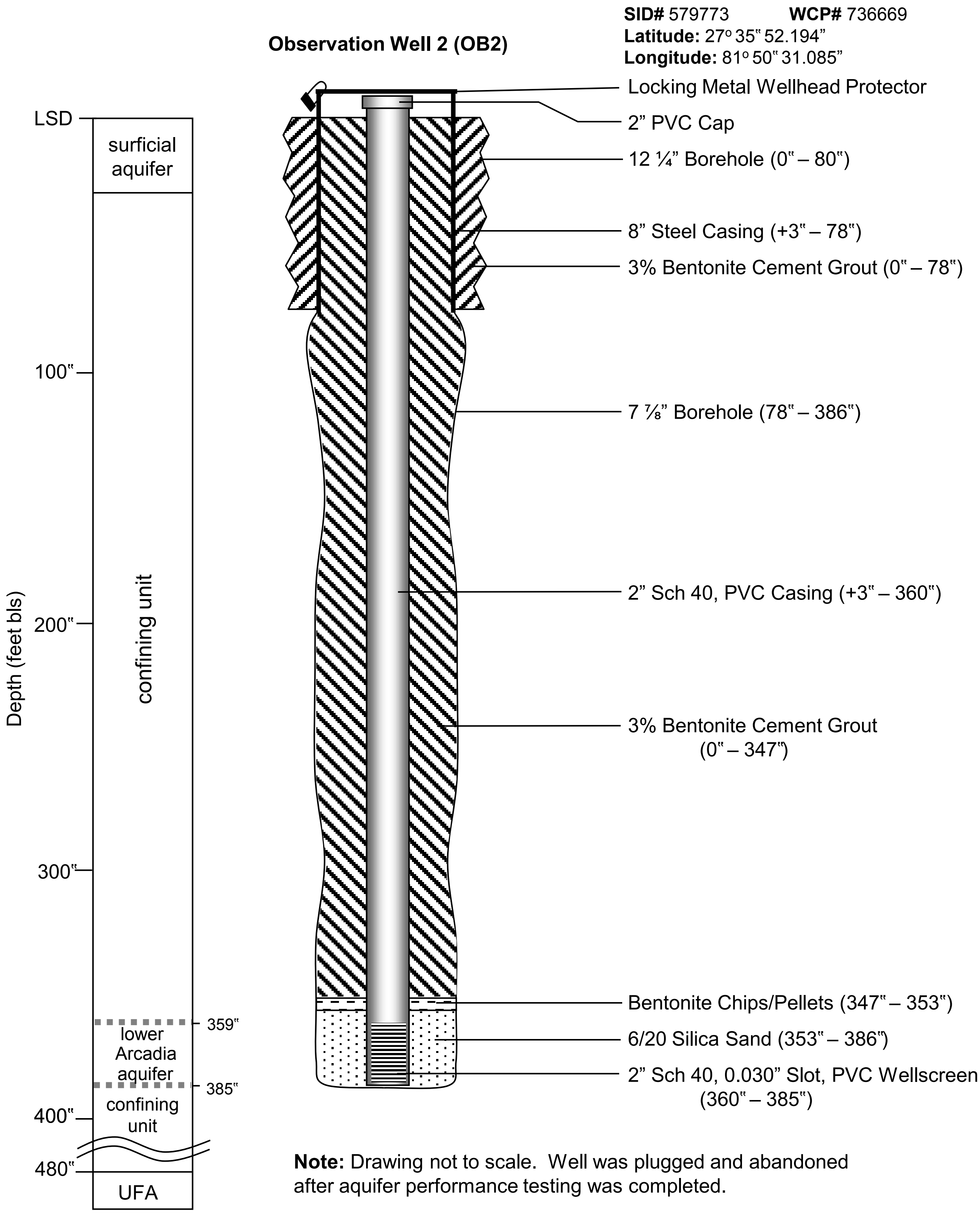
Appendix B, Figure B.4. As-Built Well Diagram for the Avon Park permeable zone monitor at the ROMP 41 site. [bls, below land surface; LAA, lower Arcadia aquifer; mcu, middle confining unit; PVC, polyvinyl chloride; SID#, site identification number; WCP#, well construction permit number; „ feet; “, inches]



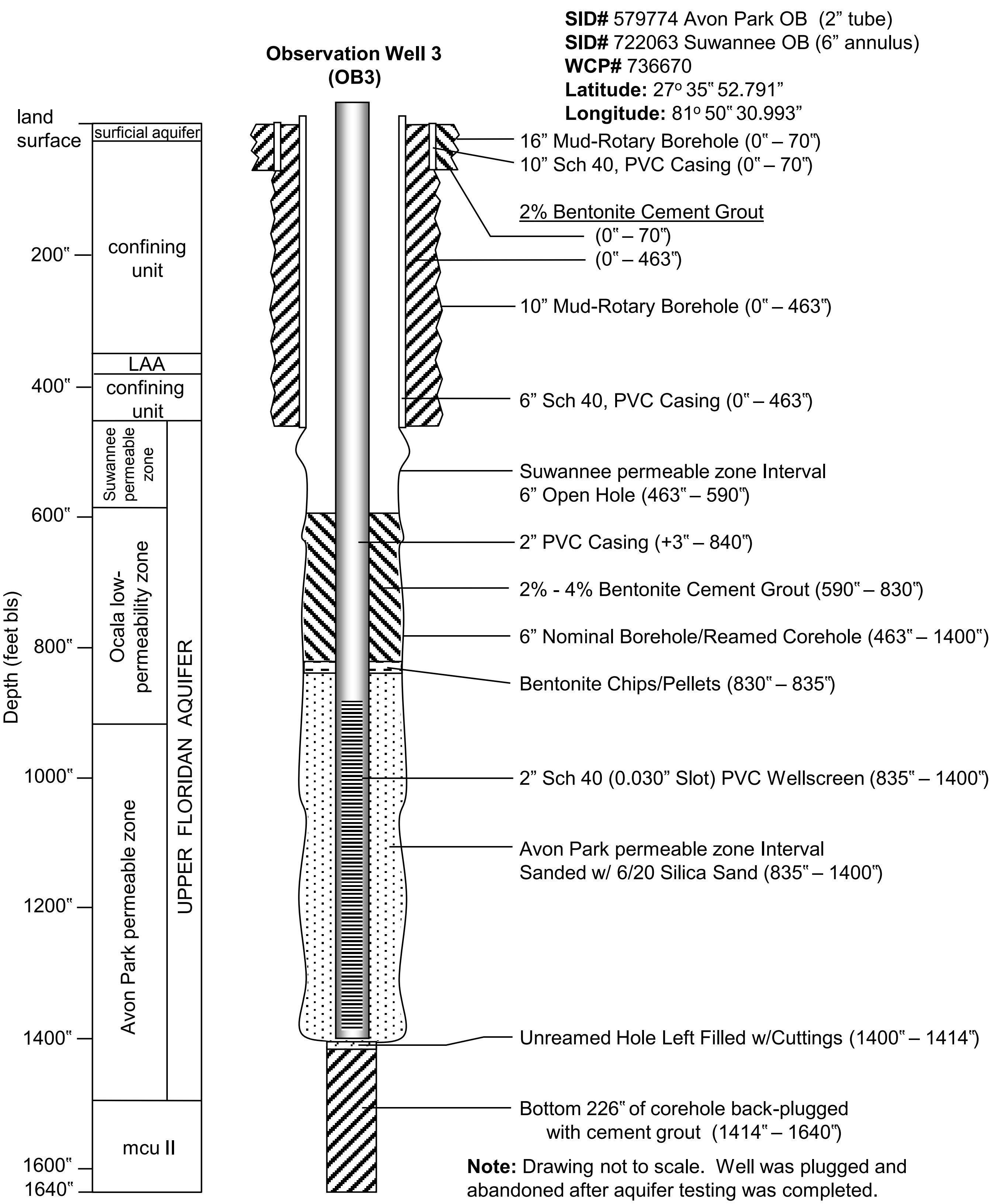
Appendix B, Figure B.5. As-Built Well Diagram for the Suwannee permeable zone monitor at the ROMP 41 site. [bls, below land surface; LAA, lower Arcadia aquifer; PVC, polyvinyl chloride; SID#, site identification number; WCP#, well construction permit number; ‟, feet; “, inches]



Appendix B, Figure B.6. As-Built Well Diagram for the lower Arcadia aquifer monitor at the ROMP 41 site. [bls, below land surface; PVC, polyvinyl chloride; Sch, schedule; SID#, site identification number; UFA, Upper Floridan aquifer; WCP#, well construction permit number; „ feet; “, inches]



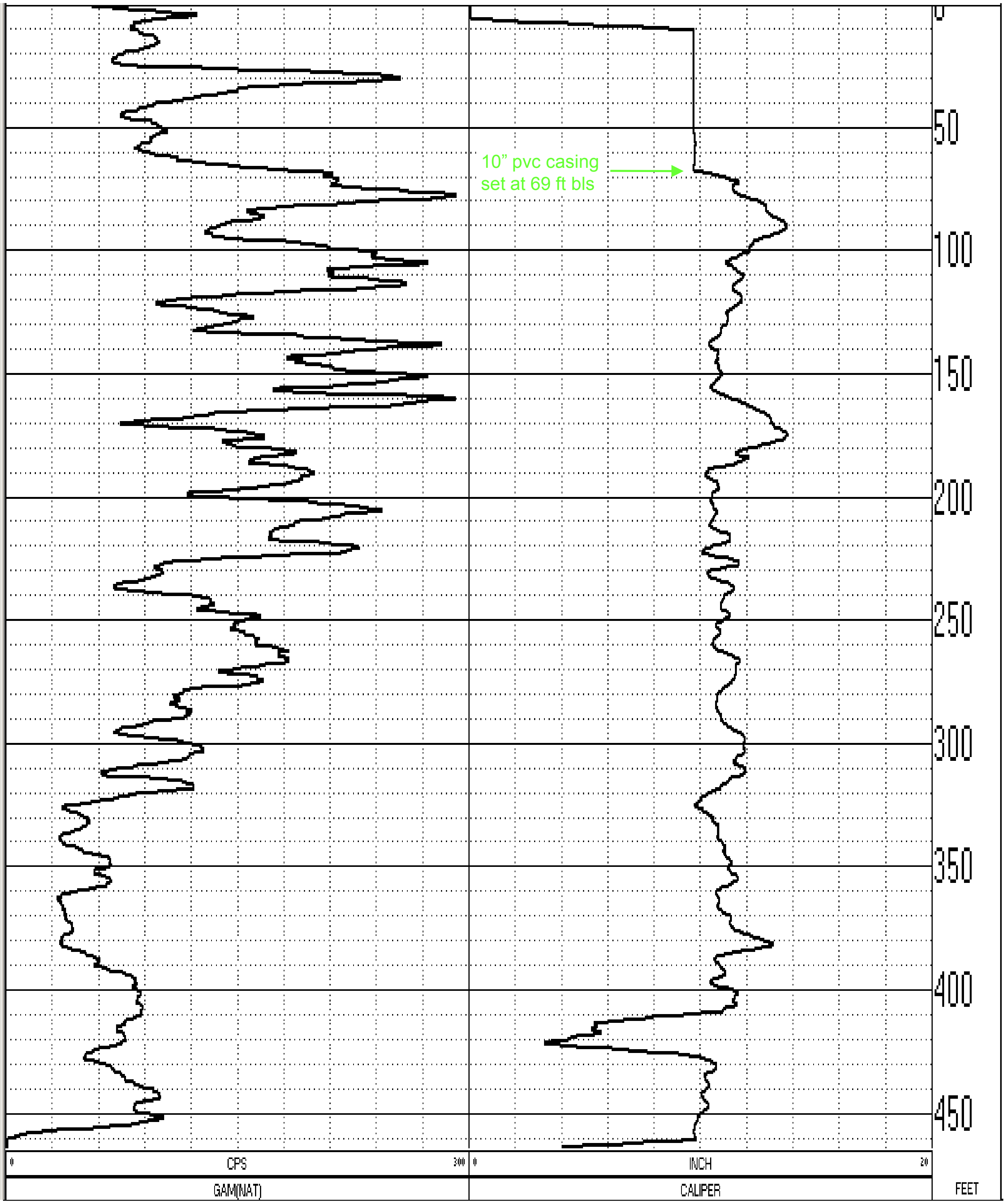
Appendix B, Figure B.7. As-Built Well Diagram for the lower Arcadia aquifer observation well at the ROMP 41 site. [bls, below land surface; PVC, polyvinyl chloride; Sch, schedule; SID#, site identification number; UFA, Upper Floridan aquifer; WCP#, well construction permit number; ' feet; ", inches]



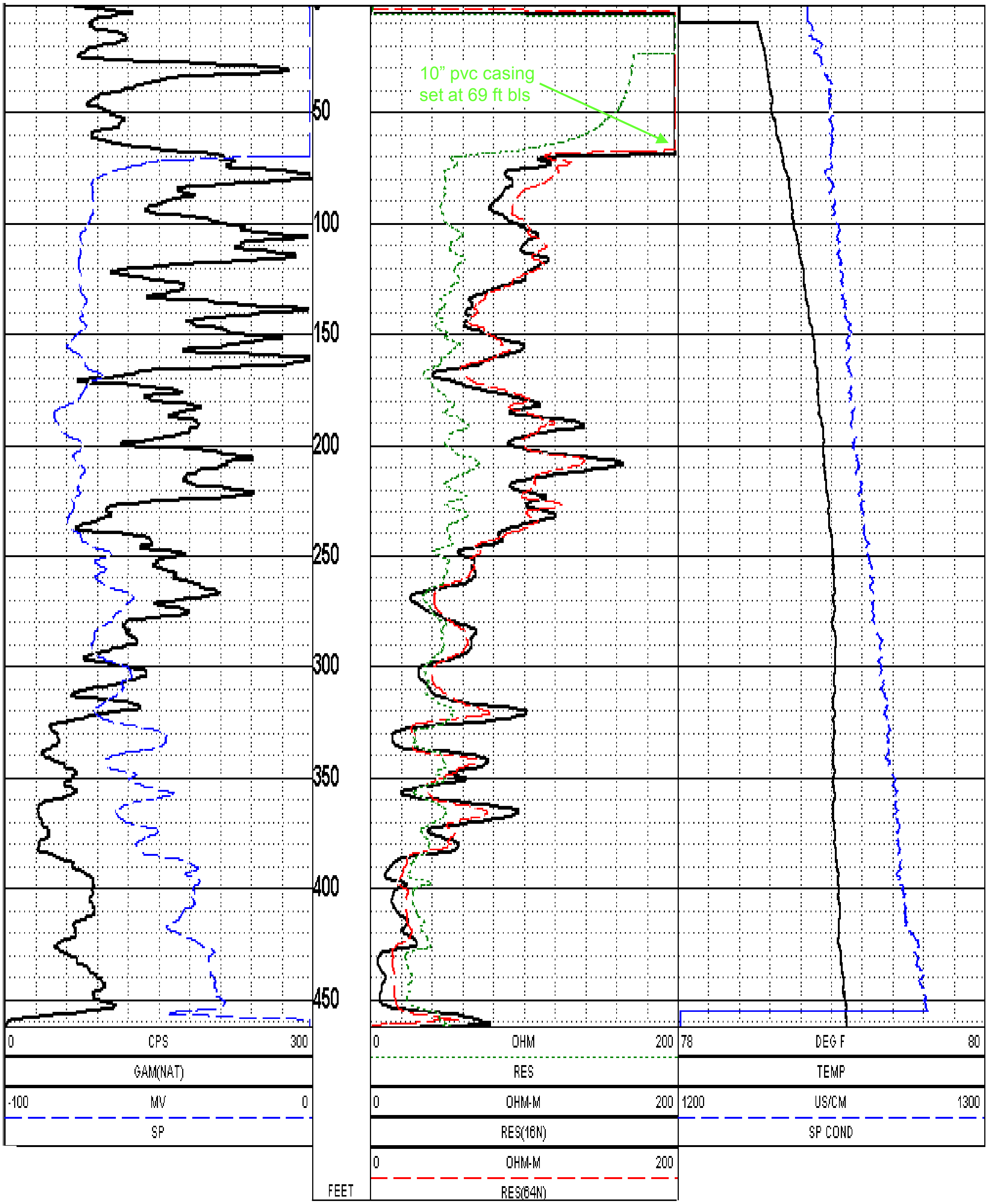
Appendix B, Figure B.8. As-Built Well Diagram for the dual zone (Suwannee and Avon Park permeable zones) observation well constructed by modifying the corehole. [bls, below land surface; LAA, lower Arcadia aquifer; mcu, middle confining unit; OB, observation well; PVC, polyvinyl chloride; Sch, schedule; SID#, site identification number; WCP#, well construction permit number; ' feet; ", inches]

Appendix C

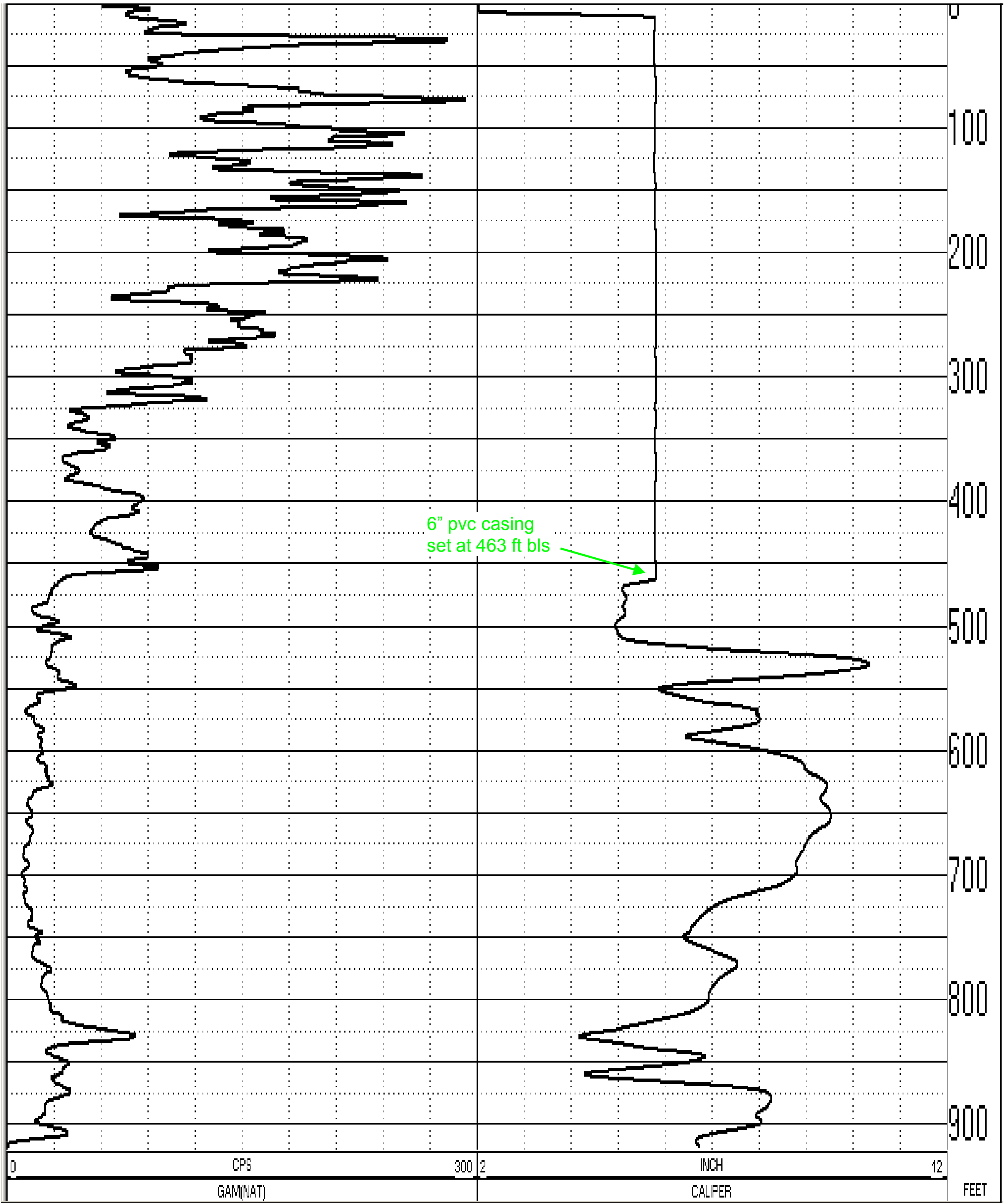
Geophysical Logs run in the Corehole at the ROMP 41 site



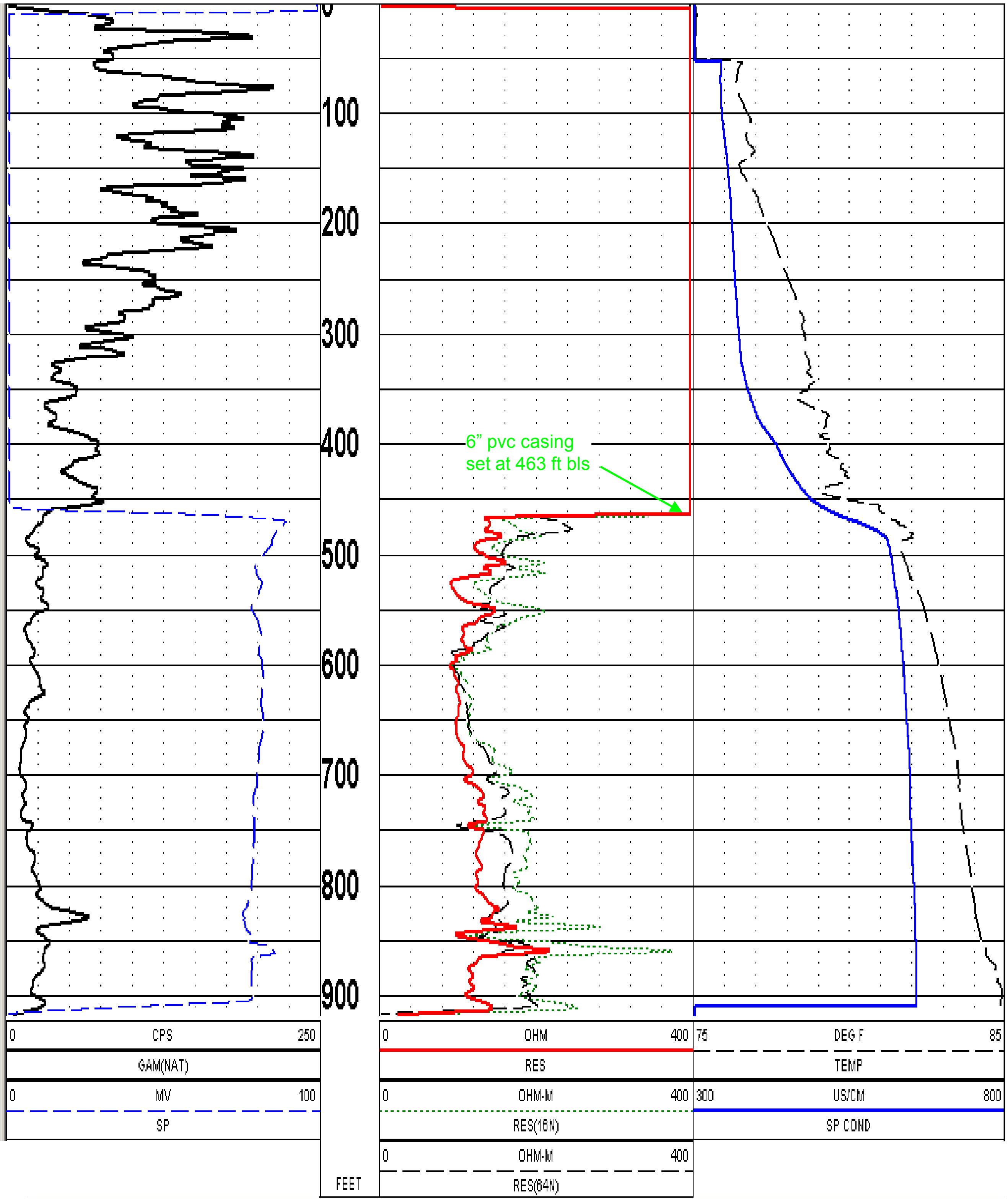
Appendix C, Figure C.1, Gamma/Caliper Log run prior to setting 6-inch pvc at 463 ft bls in ROMP 41 corehole. [CPS, counts per second; ft bls, feet below land surface; GAM(NAT), natural gamma; pvc, polyvinyl chloride; ", inch]



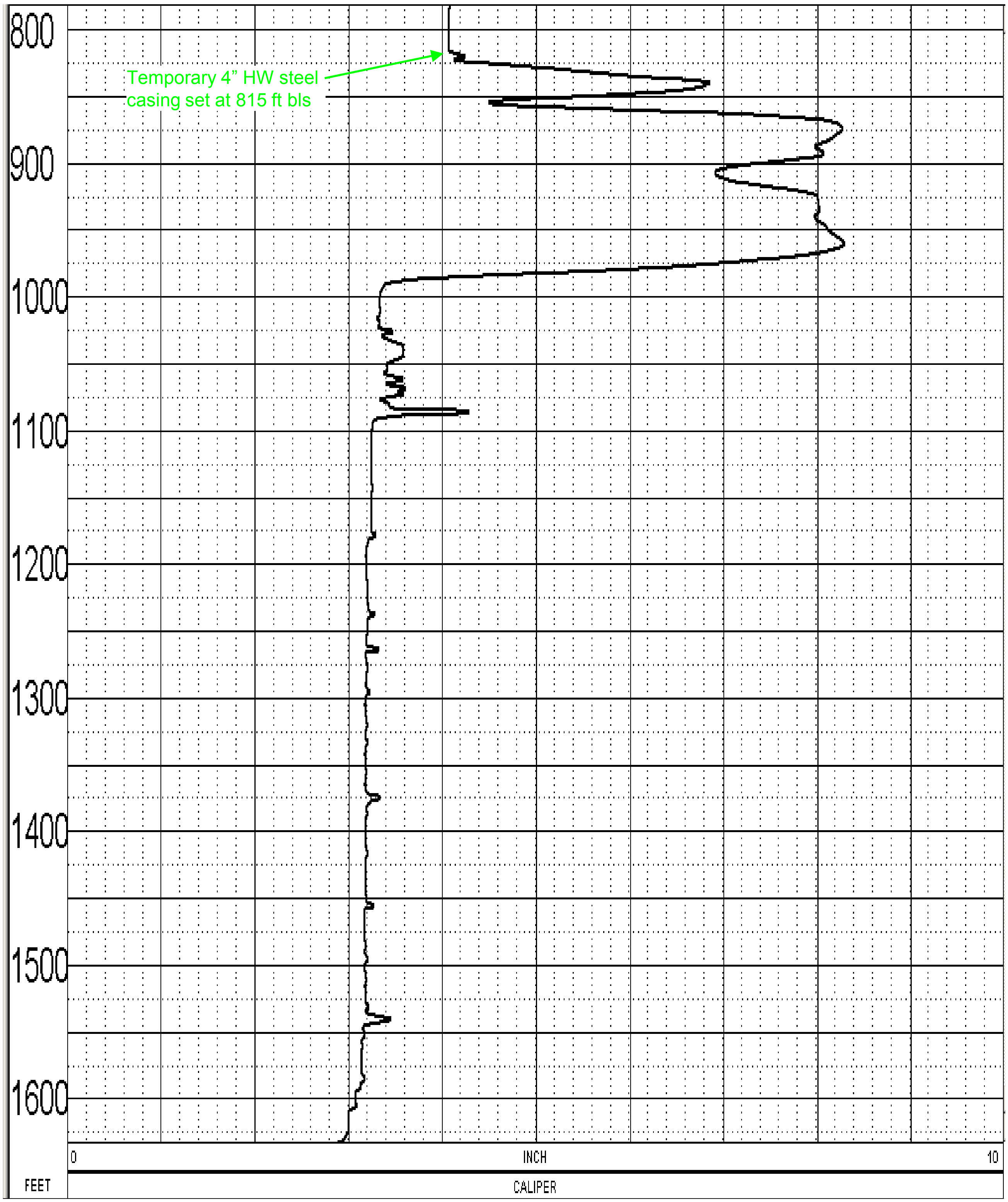
Appendix C, Figure C.2, Multifunction Log run prior to installing 6-inch pvc at 463 ft bls in ROMP 41 corehole. [CPS, counts per second; DEG F, degrees Fahrenheit; ft bls, feet below land surface; MV, millivolts; OHM-M, ohm-meters; RES, resistance; RES(16N), short (16-inch) normal resistivity; RES(64N), long (64-inch) normal resistivity; SP, spontaneous potential; SP COND; specific conductance; TEMP, temperature; US/CM, microsiemens/centimeter; “, inch]



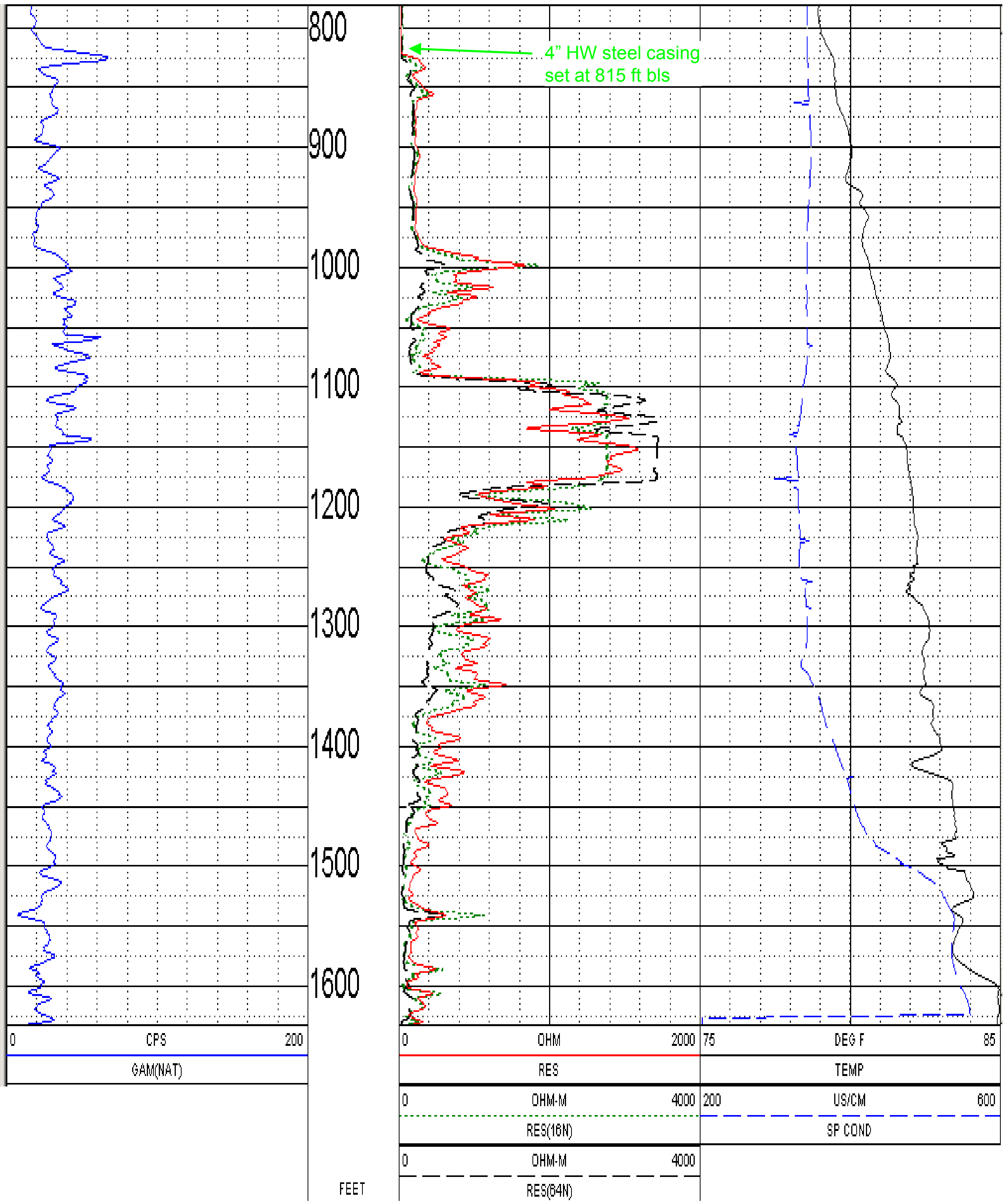
Appendix C, Figure C.3, Gamma/Caliper Log run after removal of 4-inch HW steel casing in ROMP 41 corehole. [CPS, counts per second; ft bls, feet below land surface; GAM(NAT), natural gamma; pvc, polyvinyl chloride; ", inch]



Appendix C, Figure C.4, Multifunction Log run in the corehole at ROMP 41 after removal of 4-inch HW casing. [CPS, counts per second; DEG F, degrees Fahrenheit; ft bls, feet below land surface; MV, millivolts; OHM-M, ohm-meters; pvc, polyvinyl chloride; RES, resistance; RES(16N), short (16-inch) normal resistivity; RES(64N), long (64-inch) normal resistivity; SP, spontaneous potential; SP COND; specific conductance; TEMP, temperature; US/CM, microsiemens/centimeter; ", inch]



Appendix C, Figure C.5, Caliper Log run at total depth (1640 ft bls) of corehole prior to back-plugging (1640 ft – 1440 ft bls) and removal of 4-inch HW steel casing at the ROMP 41 site.
[ft bls, feet below land surface; HW, temporary 4-inch steel casing; ", inch]



Appendix C, Figure C.6, Multifunction Log run at total depth of corehole prior to back-plugging (1640 ft – 1440 ft bls) and removal of 4-inch HW steel casing at ROMP 41 site. [CPS, counts per second; DEG F, degrees Fahrenheit; ft bls, feet below land surface; HW, temporary 4-inch steel casing; OHM-M, ohm-meters; RES, resistance; RES(16N), short (16-inch) normal resistivity; RES(64N), long (64-inch) normal resistivity; SP COND; specific conductance; TEMP, temperature; US/CM, microsiemens/centimeter; ", inch]

Appendix D

ROMP 41 – Torrey Lithologic Log

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                                   ROMP 41.TOR
LITHOLOGIC WELL LOG PRINTOUT                      SOURCE - FGS

WELL NUMBER:   W-18675                            COUNTY -   HD18675
TOTAL DEPTH:    1640  FT.                         LOCATION:  T.33S R.25E S.20
149 SAMPLES FROM 1.5 TO 1640 FT.                             LAT = 27D 35M 52S
                                                             LON = 81D 50M 31S
COMPLETION DATE: N/A                              ELEVATION: 125 FT
OTHER TYPES OF LOGS AVAILABLE - NONE

OWNER/DRILLER:ROMP 41 TORREY

WORKED BY:STEVE PETRUSHAK 13FEB.2006
Picks by: Clint Kromhout and Steve Petrushak

    0.   -    1.5  000NOSM   NO SAMPLES
    1.5  -   30.   090UDSC   UNDIFFERENTIATED SAND AND CLAY
   30.   -   71.   122BNVL   BONE VALLEY MEMBER OF PEACE RIVER FM.
   30.   -   71.   122PCRV   PEACE RIVER FM.
   71.   -  353.7  122ARCA   ARCADIA FM.
  353.7  -  453.5  122NOCA   NOCATEE MEMBER OF ARCADIA FM.
  453.5  -  585.   123SWNN   SUWANNEE LIMESTONE
  585.   -  835.   124OCAL   OCALA GROUP
  835.   -   TD.   124AVPK   AVON PARK FM.

    0  -    1.5 NO SAMPLES

    1.5-    3   SAND; LIGHT GRAY TO MODERATE LIGHT GRAY
                POROSITY: INTERGRANULAR
                GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
                ROUNDNESS: SUB-ANGULAR TO SUB-ROUNDED; MEDIUM SPHERICITY
                UNCONSOLIDATED
                ACCESSORY MINERALS: SHELL-10%

    3  -    5.5 SAND; DARK YELLOWISH BROWN
                POROSITY: INTERGRANULAR
                GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO MEDIUM
                ROUNDNESS: SUB-ANGULAR TO SUB-ROUNDED; MEDIUM SPHERICITY
                UNCONSOLIDATED

    5.5-   10.5 SAND; LIGHT GRAYISH BROWN TO GRAYISH ORANGE PINK
                POROSITY: INTERGRANULAR
                GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
                ROUNDNESS: SUB-ANGULAR TO SUB-ROUNDED; MEDIUM SPHERICITY
                UNCONSOLIDATED
                ACCESSORY MINERALS: PLANT REMAINS-10%, ORGANICS-15%

   10.5-   13.5 SAND; VERY LIGHT ORANGE
                POROSITY: INTERGRANULAR
                GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
                ROUNDNESS: SUB-ANGULAR TO SUB-ROUNDED; MEDIUM SPHERICITY
                POOR INDURATION

   13.5-   15.5 SAND; VERY LIGHT ORANGE
                POROSITY: INTERGRANULAR
                GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM
                ROUNDNESS: SUB-ANGULAR TO SUB-ROUNDED; MEDIUM SPHERICITY
                UNCONSOLIDATED

   15.5-   20   SAND; VERY LIGHT ORANGE
                POROSITY: INTERGRANULAR
                GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE
                ROUNDNESS: SUB-ANGULAR TO SUB-ROUNDED; MEDIUM SPHERICITY
                UNCONSOLIDATED
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ROMP 41.TOR

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20   -   25.5 SAND; YELLOWISH GRAY TO VERY LIGHT ORANGE
              POROSITY: INTERGRANULAR
              GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM
              ROUNDNESS: SUB-ANGULAR TO SUB-ROUNDED; MEDIUM SPHERICITY
              POOR INDURATION

25.5-    28   SAND; VERY LIGHT ORANGE
              POROSITY: INTERGRANULAR
              GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM
              ROUNDNESS: SUB-ANGULAR TO SUB-ROUNDED; MEDIUM SPHERICITY
              POOR INDURATION

28   -   30   SAND; LIGHT GREENISH GRAY
              POROSITY: INTERGRANULAR
              GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM
              ROUNDNESS: SUB-ANGULAR TO SUB-ROUNDED; MEDIUM SPHERICITY
              POOR INDURATION
              REWORKING OF UNDERLYING PHOSPHATIC SAND (~05%) AT 29-30FT..

30   -   32.5 PHOSPHATE; MODERATE LIGHT GRAY TO DARK GRAY
              POROSITY: INTERGRANULAR; POOR INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              ACCESSORY MINERALS: PHOSPHATIC GRAVEL-70%
              PHOSPHATIC SAND-15%, CALCILUTITE-15%

32.5-    35.5 SAND; LIGHT OLIVE GRAY TO YELLOWISH GRAY
              POROSITY: INTERGRANULAR
              GRAIN SIZE: COARSE; RANGE: MEDIUM TO COARSE
              ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY
              POOR INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              ACCESSORY MINERALS: PHOSPHATIC SAND-30%, CALCILUTITE-15%
              PHOSPHATIC GRAVEL-05%

35.5-    40   SAND; YELLOWISH GRAY
              POROSITY: INTERGRANULAR
              GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM
              ROUNDNESS: SUB-ANGULAR TO SUB-ROUNDED; MEDIUM SPHERICITY
              POOR INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              ACCESSORY MINERALS: PHOSPHATIC SAND-20%, CALCILUTITE-15%

40   -   42.5 SAND; YELLOWISH GRAY
              POROSITY: INTERGRANULAR
              GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM
              ROUNDNESS: SUB-ANGULAR TO SUB-ROUNDED; MEDIUM SPHERICITY
              POOR INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              ACCESSORY MINERALS: PHOSPHATIC SAND-20%, CALCILUTITE-15%

42.5-    45   SAND; YELLOWISH GRAY
              POROSITY: INTERGRANULAR
              GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM
              ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY
              POOR INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              ACCESSORY MINERALS: PHOSPHATIC SAND-10%, CALCILUTITE-15%

45   -   49   SAND; YELLOWISH GRAY
              POROSITY: INTERGRANULAR
              GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE
              ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY
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                POOR INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-15%, CALCILUTITE-15%

  49  -   50    SAND; VERY LIGHT ORANGE
                POROSITY: INTERGRANULAR
                GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE
                ROUNDNESS: SUB-ANGULAR TO SUB-ROUNDED; MEDIUM SPHERICITY
                POOR INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-10%

  50  -   54    SAND; VERY LIGHT ORANGE
                POROSITY: INTERGRANULAR
                GRAIN SIZE: FINE; RANGE: FINE TO COARSE
                ROUNDNESS: SUB-ANGULAR TO SUB-ROUNDED; MEDIUM SPHERICITY
                POOR INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-05%, CLAY-30%
                INTERLAYERED WITH MEDIUM YELLOWISH ORANGE CLAY.

  54  -   55    SAND; YELLOWISH GRAY TO LIGHT OLIVE GRAY
                POROSITY: INTERGRANULAR
                GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE
                ROUNDNESS: SUB-ANGULAR TO SUB-ROUNDED; MEDIUM SPHERICITY
                POOR INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-07%, CALCILUTITE-20%

  55  -   60    SAND; VERY LIGHT ORANGE
                POROSITY: INTERGRANULAR
                GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE
                ROUNDNESS: SUB-ANGULAR TO SUB-ROUNDED; MEDIUM SPHERICITY
                POOR INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-10%, CALCILUTITE-15%

  60  -   63    SAND; VERY LIGHT ORANGE TO LIGHT OLIVE GRAY
                POROSITY: INTERGRANULAR
                GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE
                ROUNDNESS: SUB-ANGULAR TO SUB-ROUNDED; MEDIUM SPHERICITY
                POOR INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-10%, CALCILUTITE-20%

  63  -   64    WACKESTONE; VERY LIGHT ORANGE TO LIGHT OLIVE GRAY
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                50% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MICROCRYSTALLINE
                RANGE: MICROCRYSTALLINE TO COARSE; POOR INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC GRAVEL-07%
                PHOSPHATIC SAND-10%, QUARTZ SAND-25%

  64  -   65    WACKESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                50% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
                POOR INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-15%, QUARTZ SAND-10%
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ROMP 41.TOR

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65   -    67.3 SAND; LIGHT OLIVE GRAY TO MODERATE GRAY
               POROSITY: INTERGRANULAR
               GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE
               ROUNDNESS: SUB-ANGULAR TO SUB-ROUNDED; MEDIUM SPHERICITY
               POOR INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               ACCESSORY MINERALS: PHOSPHATIC SAND-30%
               PHOSPHATIC GRAVEL-03%, CALCILUTITE-20%

67.3-     70   WACKESTONE; MODERATE GRAY TO YELLOWISH GRAY
               POROSITY: INTERGRANULAR
               GRAIN TYPE: INTRACLASTS, CALCILUTITE
               50% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: MICROCRYSTALLINE
               RANGE: MICROCRYSTALLINE TO COARSE; POOR INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               ACCESSORY MINERALS: PHOSPHATIC SAND-30%
               PHOSPHATIC GRAVEL-07%

70   -    71   WACKESTONE; YELLOWISH GRAY TO MODERATE GRAY
               POROSITY: INTERGRANULAR
               GRAIN TYPE: INTRACLASTS, CALCILUTITE
               50% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: MICROCRYSTALLINE
               RANGE: MICROCRYSTALLINE TO COARSE; POOR INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               ACCESSORY MINERALS: PHOSPHATIC SAND-15%, QUARTZ SAND-10%

71   -    75   WACKESTONE; YELLOWISH GRAY
               POROSITY: INTERGRANULAR
               GRAIN TYPE: CALCILUTITE, INTRACLASTS
               25% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: MICROCRYSTALLINE
               RANGE: MICROCRYSTALLINE TO COARSE; GOOD INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               ACCESSORY MINERALS: PHOSPHATIC SAND-07%, QUARTZ SAND-10%
               FOSSILS: FOSSIL MOLDS

75   -    79.5 WACKESTONE; YELLOWISH GRAY
               POROSITY: INTERGRANULAR
               GRAIN TYPE: CALCILUTITE, INTRACLASTS
               25% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: MICROCRYSTALLINE
               RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               ACCESSORY MINERALS: PHOSPHATIC SAND-07%, QUARTZ SAND-07%
               FOSSILS: FOSSIL MOLDS

79.5-     80   WACKESTONE; YELLOWISH GRAY
               POROSITY: INTERGRANULAR
               GRAIN TYPE: CALCILUTITE, INTRACLASTS
               25% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: MICROCRYSTALLINE
               RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               ACCESSORY MINERALS: PHOSPHATIC SAND-05%, QUARTZ SAND-05%

80   -    85   MUDSTONE; YELLOWISH GRAY TO WHITE
               POROSITY: LOW PERMEABILITY
               GRAIN TYPE: CALCILUTITE, INTRACLASTS
               10% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: MICROCRYSTALLINE
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                              ROMP 41.TOR
              RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              ACCESSORY MINERALS: PHOSPHATIC SAND-07%
              PHOSPHATIC GRAVEL-01%
              FOSSILS: FOSSIL MOLDS

  85   -   87.5 WACKESTONE; YELLOWISH GRAY
              POROSITY: INTERGRANULAR
              GRAIN TYPE: CALCILUTITE, INTRACLASTS
              25% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: MICROCRYSTALLINE
              RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              ACCESSORY MINERALS: PHOSPHATIC SAND-10%

  87.5-    90   WACKESTONE; YELLOWISH GRAY TO MODERATE LIGHT GRAY
              POROSITY: INTERGRANULAR
              GRAIN TYPE: CALCILUTITE, INTRACLASTS
              25% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: MICROCRYSTALLINE
              RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              ACCESSORY MINERALS: PHOSPHATIC SAND-25%

  90   -   93   WACKESTONE; YELLOWISH GRAY TO MODERATE LIGHT GRAY
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, CALCILUTITE
              35% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
              MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              ACCESSORY MINERALS: PHOSPHATIC SAND-25%

  93   -   95   SAND; YELLOWISH GRAY TO MODERATE GRAY
              POROSITY: INTERGRANULAR
              GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM
              ROUNDNESS: SUB-ANGULAR TO SUB-ROUNDED; MEDIUM SPHERICITY
              MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              ACCESSORY MINERALS: PHOSPHATIC SAND-30%, CALCILUTITE-20%

  95   -  100   SAND; YELLOWISH GRAY TO MODERATE GRAY
              POROSITY: INTERGRANULAR
              GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM
              ROUNDNESS: SUB-ANGULAR TO SUB-ROUNDED; MEDIUM SPHERICITY
              MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              ACCESSORY MINERALS: PHOSPHATIC SAND-25%, CALCILUTITE-25%
              PHOSPHATIC GRAVEL-%

 100   -  104.9 WACKESTONE; YELLOWISH GRAY TO MODERATE GRAY
              POROSITY: INTERGRANULAR, MOLDIC
              GRAIN TYPE: CALCILUTITE, INTRACLASTS
              40% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
              MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              ACCESSORY MINERALS: PHOSPHATIC SAND-20%, CHERT-10%
              PHOSPHATIC GRAVEL-03%
              FOSSILS: FOSSIL MOLDS, MOLLUSKS

 104.9-  105    MUDSTONE; YELLOWISH GRAY
              POROSITY: LOW PERMEABILITY
```

GRAIN TYPE: CALCILUTITE, INTRACLASTS
20% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-05%, QUARTZ SAND-10%
PHOSPHATIC GRAVEL-03%

105 - 110 MUDSTONE; YELLOWISH GRAY TO WHITE
POROSITY: INTERGRANULAR, MOLDIC
GRAIN TYPE: CALCILUTITE, INTRACLASTS
20% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-15%, CHERT-15%
PHOSPHATIC GRAVEL-01%
FOSSILS: FOSSIL MOLDS
DARK GRAY CHERT LAYER AT 106-106.5FT.

110 - 112.5 MUDSTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: CALCILUTITE, INTRACLASTS
10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO COARSE; POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-10%, CHERT-02%
FOSSILS: FOSSIL MOLDS

112.5- 115 WACKESTONE; YELLOWISH GRAY TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: CALCILUTITE, INTRACLASTS
20% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-20%

115 - 116.2 WACKESTONE; YELLOWISH GRAY TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: CALCILUTITE, INTRACLASTS
20% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-15%
PHOSPHATIC GRAVEL-02%

116.2- 120 WACKESTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: CALCILUTITE, INTRACLASTS
20% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-15%
INDURATION IS GOOD AT 118-120FT..

120 - 125 WACKESTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: CALCILUTITE, INTRACLASTS
25% ALLOCHEMICAL CONSTITUENTS

```
                GRAIN SIZE: MICROCRYSTALLINE
                RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-25%, QUARTZ SAND-10%
                CHERT-02%

125  -  128.3  WACKESTONE; YELLOWISH GRAY
                POROSITY: INTERGRANULAR
                GRAIN TYPE: CALCILUTITE, INTRACLASTS
                30% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MICROCRYSTALLINE
                RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-25%, QUARTZ SAND-15%

128.3-  130    WACKESTONE; YELLOWISH GRAY
                POROSITY: INTERGRANULAR
                GRAIN TYPE: CALCILUTITE, INTRACLASTS
                15% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MICROCRYSTALLINE
                RANGE: MICROCRYSTALLINE TO COARSE; POOR INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-10%, QUARTZ SAND-05%
                PHOSPHATIC GRAVEL-01%

130  -  135    MUDSTONE; YELLOWISH GRAY
                POROSITY: LOW PERMEABILITY
                GRAIN TYPE: CALCILUTITE, INTRACLASTS
                10% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MICROCRYSTALLINE
                RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-05%
                PHOSPHATIC GRAVEL-01%

135  -  139.6  WACKESTONE; YELLOWISH GRAY
                POROSITY: INTERGRANULAR, MOLDIC
                GRAIN TYPE: CALCILUTITE, INTRACLASTS
                20% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MICROCRYSTALLINE
                RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-07%
                FOSSILS: FOSSIL MOLDS, MOLLUSKS

139.6-  140    MUDSTONE; YELLOWISH GRAY
                POROSITY: LOW PERMEABILITY
                GRAIN TYPE: CALCILUTITE, INTRACLASTS
                10% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MICROCRYSTALLINE
                RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-03%

140  -  141.5  WACKESTONE; YELLOWISH GRAY
                POROSITY: INTERGRANULAR
                GRAIN TYPE: CALCILUTITE, INTRACLASTS
                20% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MICROCRYSTALLINE
                RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-10%
                FOSSILS: FOSSIL MOLDS, MOLLUSKS
```

ROMP 41.TOR

141.5- 145 CHERT; OLIVE GRAY TO MODERATE DARK GRAY
POROSITY: LOW PERMEABILITY; GOOD INDURATION
ACCESSORY MINERALS: PHOSPHATIC SAND-03%

145 - 150 WACKESTONE; YELLOWISH GRAY TO MODERATE GRAY
POROSITY: INTERGRANULAR, MOLDIC
GRAIN TYPE: INTRACLASTS, CALCILUTITE
50% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-20%, QUARTZ SAND-30%
FOSSILS: FOSSIL MOLDS, MOLLUSKS

150 - 155 WACKESTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR, MOLDIC
GRAIN TYPE: INTRACLASTS, CALCILUTITE
40% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-15%
OTHER FEATURES: MEDIUM RECRYSTALLIZATION
FOSSILS: FOSSIL MOLDS

155 - 156 MUDSTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: CALCILUTITE, INTRACLASTS
10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-05%, CHERT-02%
OTHER FEATURES: MEDIUM RECRYSTALLIZATION
FOSSILS: FOSSIL MOLDS

156 - 160 MUDSTONE; YELLOWISH GRAY TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: CALCILUTITE, INTRACLASTS
10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-05%
PHOSPHATIC GRAVEL-03%, CHERT-02%

160 - 162 WACKESTONE; LIGHT OLIVE GRAY TO YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO COARSE; POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-03%
PHOSPHATIC GRAVEL-03%

162 - 165 MUDSTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: CALCILUTITE, INTRACLASTS
10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION

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                 CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
                 ACCESSORY MINERALS: QUARTZ SAND-03%

165   -  170     MUDSTONE; YELLOWISH GRAY TO LIGHT GREENISH GRAY
                 POROSITY: INTERGRANULAR
                 GRAIN TYPE: CALCILUTITE, INTRACLASTS
                 10% ALLOCHEMICAL CONSTITUENTS
                 GRAIN SIZE: MICROCRYSTALLINE
                 RANGE: MICROCRYSTALLINE TO COARSE; POOR INDURATION
                 CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
                 ACCESSORY MINERALS: PHOSPHATIC GRAVEL-02%
                 PHOSPHATIC SAND-02%

170   -  171     MUDSTONE; YELLOWISH GRAY
                 POROSITY: INTERGRANULAR
                 GRAIN TYPE: CALCILUTITE, INTRACLASTS
                 10% ALLOCHEMICAL CONSTITUENTS
                 GRAIN SIZE: MICROCRYSTALLINE
                 RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION
                 CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
                 ACCESSORY MINERALS: PHOSPHATIC SAND-03%

171   -  173.5   MUDSTONE; YELLOWISH GRAY
                 POROSITY: INTERGRANULAR
                 GRAIN TYPE: CALCILUTITE, INTRACLASTS
                 10% ALLOCHEMICAL CONSTITUENTS
                 GRAIN SIZE: MICROCRYSTALLINE
                 RANGE: MICROCRYSTALLINE TO FINE; MODERATE INDURATION
                 CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
                 ACCESSORY MINERALS: PHOSPHATIC SAND-02%

173.5-   175     MUDSTONE; YELLOWISH GRAY
                 POROSITY: INTERGRANULAR
                 GRAIN TYPE: CALCILUTITE, INTRACLASTS
                 10% ALLOCHEMICAL CONSTITUENTS
                 GRAIN SIZE: MICROCRYSTALLINE
                 RANGE: MICROCRYSTALLINE TO MEDIUM; MODERATE INDURATION
                 CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
                 ACCESSORY MINERALS: PHOSPHATIC SAND-03%
                 PHOSPHATIC GRAVEL-01%

175   -  180     MUDSTONE; YELLOWISH GRAY
                 POROSITY: INTERGRANULAR
                 GRAIN TYPE: CALCILUTITE, INTRACLASTS
                 10% ALLOCHEMICAL CONSTITUENTS
                 GRAIN SIZE: MICROCRYSTALLINE
                 RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION
                 CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
                 ACCESSORY MINERALS: PHOSPHATIC SAND-02%
                 PHOSPHATIC GRAVEL-02%
                 FOSSILS: FOSSIL MOLDS

180   -  180.8   MUDSTONE; YELLOWISH GRAY
                 POROSITY: INTERGRANULAR
                 GRAIN TYPE: CALCILUTITE, INTRACLASTS
                 10% ALLOCHEMICAL CONSTITUENTS
                 GRAIN SIZE: MICROCRYSTALLINE
                 RANGE: MICROCRYSTALLINE TO COARSE; MODERATE INDURATION
                 CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
                 ACCESSORY MINERALS: PHOSPHATIC GRAVEL-03%
                 PHOSPHATIC SAND-01%

180.8-   183     WACKESTONE; YELLOWISH GRAY TO WHITE
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POROSITY: INTERGRANULAR
GRAIN TYPE: CALCILUTITE, INTRACLASTS
20% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO GRANULE; GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-07%
FOSSILS: FOSSIL MOLDS, BRYOZOA

183 - 185 WACKESTONE; YELLOWISH GRAY TO VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: CALCILUTITE, INTRACLASTS
25% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO GRANULE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-10%, QUARTZ SAND-10%
HAS A SLIGHT BROWNISH TINT.

185 - 190 PACKSTONE; YELLOWISH GRAY TO VERY LIGHT ORANGE
POROSITY: INTERGRANULAR, MOLDIC
GRAIN TYPE: INTRACLASTS, CALCILUTITE
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO GRANULE; GOOD INDURATION
CEMENT TYPE(S): SPARRY CALCITE CEMENT
ACCESSORY MINERALS: PHOSPHATIC SAND-05%
OTHER FEATURES: HIGH RECRYSTALLIZATION, FOSSILIFEROUS
FOSSILS: FOSSIL MOLDS

190 - 192.5 PACKSTONE; YELLOWISH GRAY TO LIGHT GRAY
POROSITY: VUGULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO GRANULE
GOOD INDURATION
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: QUARTZ SAND-10%, DOLOMITE-10%
PHOSPHATIC SAND-05%, CHERT-01%
OTHER FEATURES: MEDIUM RECRYSTALLIZATION

192.5- 195 WACKESTONE; YELLOWISH GRAY TO VERY LIGHT ORANGE
POROSITY: VUGULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-10%, QUARTZ SAND-10%

195 - 196 WACKESTONE; YELLOWISH GRAY TO VERY LIGHT ORANGE
POROSITY: INTERGRANULAR, VUGULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: QUARTZ SAND-15%, PHOSPHATIC SAND-07%
PHOSPHATIC GRAVEL-01%
HIGH (UPPER LIMIT) OF TAMPA CONTACT.

196 - 200 MUDSTONE; VERY LIGHT GRAY
POROSITY: LOW PERMEABILITY
GRAIN TYPE: CALCILUTITE, INTRACLASTS

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                10% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MICROCRYSTALLINE
                RANGE: MICROCRYSTALLINE TO COARSE; GOOD INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-05%
                AT 199-200FT., POOR TO MOD. INDURATION AND GRAIN SIZE IS
                ~GRAVEL.

200  -  204     WACKESTONE; YELLOWISH GRAY TO YELLOWISH GRAY
                POROSITY: LOW PERMEABILITY
                GRAIN TYPE: CALCILUTITE, INTRACLASTS
                20% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MICROCRYSTALLINE
                RANGE: MICROCRYSTALLINE TO COARSE; GOOD INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-05%, QUARTZ SAND-10%

204  -  205     PACKSTONE; YELLOWISH GRAY TO WHITE
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                80% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-03%
                OTHER FEATURES: LOW RECRYSTALLIZATION
                FOSSILS: FOSSIL MOLDS
                LOWER LIMIT OF TAMPA/ARCADIA CONTACT.

205  -  210     PACKSTONE; YELLOWISH GRAY
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                80% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: QUARTZ SAND-15%, PHOSPHATIC SAND-03%
                OTHER FEATURES: LOW RECRYSTALLIZATION
                FOSSILS: FOSSIL MOLDS, MOLLUSKS, BENTHIC FORAMINIFERA
                MOLD OF FORAMINIFERA SORITIES.

210  -  215     PACKSTONE; YELLOWISH GRAY TO VERY LIGHT GRAY
                POROSITY: INTERGRANULAR, MOLDIC
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                80% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
                GOOD INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: QUARTZ SAND-15%, PHOSPHATIC SAND-07%
                OTHER FEATURES: MEDIUM RECRYSTALLIZATION
                FOSSILS: FOSSIL MOLDS, MOLLUSKS

215  -  220     PACKSTONE; YELLOWISH GRAY TO VERY LIGHT GRAY
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                65% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-15%, QUARTZ SAND-10%
                OTHER FEATURES: MEDIUM RECRYSTALLIZATION
                FOSSILS: FOSSIL MOLDS
                TOP OF IAS LOWER PERM. ZONE.
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220  -  221   PACKSTONE; YELLOWISH GRAY TO VERY LIGHT ORANGE
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS; 70% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
              GOOD INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              ACCESSORY MINERALS: PHOSPHATIC SAND-15%, QUARTZ SAND-05%
              OTHER FEATURES: MEDIUM RECRYSTALLIZATION
              FOSSILS: FOSSIL MOLDS
              LARGE, (2IN.DIAMETER), GASTROPOD MOLD.

221  -  225   PACKSTONE; YELLOWISH GRAY TO YELLOWISH GRAY
              POROSITY: INTERGRANULAR, VUGULAR, MOLDIC
              GRAIN TYPE: INTRACLASTS, CALCILUTITE
              70% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
              GOOD INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              ACCESSORY MINERALS: PHOSPHATIC SAND-15%, DOLOMITE-15%
              OTHER FEATURES: FOSSILIFEROUS
              FOSSILS: FOSSIL MOLDS
              PORTIONS OF THIS SECTION HAVE UP TO 50% ALTERATION TO
              DOLOMITE.

225  -  230   DOLOSTONE; YELLOWISH GRAY TO YELLOWISH GRAY
              POROSITY: INTERGRANULAR, VUGULAR, MOLDIC; 10-50% ALTERED
              SUBHEDRAL
              GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
              GOOD INDURATION
              CEMENT TYPE(S): DOLOMITE CEMENT
              ACCESSORY MINERALS: LIMESTONE-45%, PHOSPHATIC SAND-03%
              OTHER FEATURES: MEDIUM RECRYSTALLIZATION
              FOSSILS: FOSSIL MOLDS
              PACKSTONE TEXTURE VISABLE THROUGH DOLOMITIC ALTERATION.

230  -  234.5 PACKSTONE; YELLOWISH GRAY TO WHITE
              POROSITY: INTERGRANULAR, VUGULAR, MOLDIC
              GRAIN TYPE: INTRACLASTS, CALCILUTITE
              80% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
              GOOD INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              ACCESSORY MINERALS: PHOSPHATIC SAND-03%
              FOSSILS: FOSSIL MOLDS
              SEVERAL SMALL (1IN) POCKETS OF SAND AND PHOSPHATE GRAINS.

234.5-  235   PACKSTONE; YELLOWISH GRAY TO WHITE
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, CALCILUTITE
              75% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
              GOOD INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              ACCESSORY MINERALS: PHOSPHATIC SAND-03%
              OTHER FEATURES: LOW RECRYSTALLIZATION

235  -  236   PACKSTONE; YELLOWISH GRAY
              POROSITY: INTERGRANULAR, MOLDIC
              GRAIN TYPE: INTRACLASTS, CALCILUTITE
              60% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
              GOOD INDURATION
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              CEMENT TYPE(S): CALCILUTITE MATRIX
              ACCESSORY MINERALS: PHOSPHATIC SAND-05%
              OTHER FEATURES: LOW RECRYSTALLIZATION
              FOSSILS: FOSSIL MOLDS

 236  -  237  DOLOSTONE; YELLOWISH GRAY TO LIGHT GRAY
              POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
              10-50% ALTERED; SUBHEDRAL
              GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
              GOOD INDURATION
              CEMENT TYPE(S): DOLOMITE CEMENT
              OTHER FEATURES: MEDIUM RECRYSTALLIZATION, FOSSILIFEROUS
              FOSSILS: FOSSIL MOLDS

 237  -  240  PACKSTONE; YELLOWISH GRAY
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, CALCILUTITE
              60% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
              MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              ACCESSORY MINERALS: PHOSPHATIC SAND-10%

 240  -  245  PACKSTONE; YELLOWISH GRAY
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, CALCILUTITE
              60% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
              MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              ACCESSORY MINERALS: PHOSPHATIC SAND-15%, QUARTZ SAND-10%

 245  -  248  PACKSTONE; YELLOWISH GRAY TO MODERATE GRAY
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, CALCILUTITE
              40% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: MICROCRYSTALLINE
              RANGE: MICROCRYSTALLINE TO FINE; MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              SEDIMENTARY STRUCTURES: STREAKED
              ACCESSORY MINERALS: PHOSPHATIC SAND-20%, QUARTZ SAND-10%

 248  -  250  PACKSTONE; YELLOWISH GRAY TO WHITE
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, CALCILUTITE
              40% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: MICROCRYSTALLINE
              RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              ACCESSORY MINERALS: PHOSPHATIC SAND-20%, QUARTZ SAND-15%
              PHOSPHATIC GRAVEL-01%
              FOSSILS: FOSSIL MOLDS

 250  -  252  WACKESTONE; YELLOWISH GRAY
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, CALCILUTITE
              20% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: MICROCRYSTALLINE
              RANGE: MICROCRYSTALLINE TO FINE; MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              ACCESSORY MINERALS: QUARTZ SAND-15%, PHOSPHATIC SAND-05%

 252  -  255  PACKSTONE; LIGHT GRAY TO YELLOWISH GRAY
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                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                20% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MICROCRYSTALLINE
                RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-30%, QUARTZ SAND-30%

255  -  257     PACKSTONE; YELLOWISH GRAY
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                20% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MICROCRYSTALLINE
                RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: QUARTZ SAND-25%, PHOSPHATIC SAND-20%
                DOLOMITE-05%
                DOLOMITE FOUND NEAR 257FT..

257  -  258     DOLOSTONE; MODERATE LIGHT GRAY TO YELLOWISH GRAY
                POROSITY: INTERGRANULAR; 10-50% ALTERED; SUBHEDRAL
                GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
                ACCESSORY MINERALS: CALCILUTITE-20%, PHOSPHATIC SAND-10%
                QUARTZ SAND-10%
                FOSSILS: FOSSIL MOLDS

258  -  260     PACKSTONE; YELLOWISH GRAY
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                20% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MICROCRYSTALLINE
                RANGE: MICROCRYSTALLINE TO MEDIUM; MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-20%, QUARTZ SAND-15%

260  -  265     PACKSTONE; YELLOWISH GRAY
                POROSITY: INTERGRANULAR
                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-25%, CALCILUTITE-20%

265  -  270     MUDSTONE; YELLOWISH GRAY
                POROSITY: LOW PERMEABILITY, INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                10% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-03%, QUARTZ SAND-02%

270  -  272     WACKESTONE; YELLOWISH GRAY
                POROSITY: LOW PERMEABILITY, INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                20% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: QUARTZ SAND-02%, PHOSPHATIC SAND-02%

272  -  275     PACKSTONE; YELLOWISH GRAY TO LIGHT GRAY
                POROSITY: INTERGRANULAR
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                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                70% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-20%, QUARTZ SAND-02%

 275  -  276    WACKESTONE; YELLOWISH GRAY
                POROSITY: LOW PERMEABILITY, INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                20% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-03%, QUARTZ SAND-01%

 276  -  280    WACKESTONE; YELLOWISH GRAY
                POROSITY: LOW PERMEABILITY, INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                25% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO GRANULE
                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-05%
                PHOSPHATIC GRAVEL-01%, QUARTZ SAND-01%

 280  -  285    WACKESTONE; YELLOWISH GRAY TO LIGHT GRAY
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                70% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO GRANULE
                POOR INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-15%
                OTHER FEATURES: MEDIUM RECRYSTALLIZATION, WEATHERED

 285  -  287.7  WACKESTONE; YELLOWISH GRAY TO LIGHT GRAY
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                90% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
                POOR INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-20%
                OTHER FEATURES: MEDIUM RECRYSTALLIZATION, WEATHERED
                SOME PORTIONS OF THIS SECTION HAVE A GRAINSTONE TEXTURE.

 287.7-  290    WACKESTONE; YELLOWISH GRAY TO LIGHT GRAY
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                20% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-10%
                OTHER FEATURES: MEDIUM RECRYSTALLIZATION

 290  -  295    WACKESTONE; YELLOWISH GRAY TO LIGHT GRAY
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                20% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
                MODERATE INDURATION
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CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-07%
OTHER FEATURES: LOW RECRYSTALLIZATION

295 - 297 WACKESTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
50% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-05%
PHOSPHATE INCREASED TO 10% AT 296-297FT..

297 - 299 WACKESTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
40% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-05%

299 - 300 PACKSTONE; MODERATE LIGHT GRAY TO YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
30% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-20%

300 - 305 WACKESTONE; YELLOWISH GRAY TO YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
50% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-10%

305 - 306 MUDSTONE; YELLOWISH GRAY TO YELLOWISH GRAY
POROSITY: LOW PERMEABILITY
GRAIN TYPE: CALCILUTITE, INTRACLASTS
10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CHERT-10%, PHOSPHATIC SAND-07%
305.9-306FT. IS A DARK GRAY CHERT.

306 - 310 WACKESTONE; YELLOWISH GRAY TO YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
30% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-10%

310 - 312 WACKESTONE; YELLOWISH GRAY TO YELLOWISH GRAY
POROSITY: LOW PERMEABILITY
GRAIN TYPE: CALCILUTITE, INTRACLASTS

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                20% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
                POOR INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-05%

312   -  315    WACKESTONE; YELLOWISH GRAY
                POROSITY: LOW PERMEABILITY, INTERGRANULAR
                GRAIN TYPE: CALCILUTITE, INTRACLASTS
                20% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-02%

315   -  315.4  WACKESTONE; YELLOWISH GRAY
                POROSITY: LOW PERMEABILITY, INTERGRANULAR
                GRAIN TYPE: CALCILUTITE, INTRACLASTS
                30% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
                POOR INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-10%
                FOSSILS: FOSSIL MOLDS

315.4-   316.4  WACKESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                80% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
                POOR INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-15%

316.4-   320    WACKESTONE; YELLOWISH GRAY TO WHITE
                POROSITY: INTERGRANULAR, LOW PERMEABILITY, MOLDIC
                GRAIN TYPE: BIOGENIC, INTRACLASTS, CALCILUTITE
                40% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-01%
                OTHER FEATURES: FOSSILIFEROUS, LOW RECRYSTALLIZATION
                FOSSILS: FOSSIL MOLDS, MOLLUSKS

320   -  325.9  WACKESTONE; VERY LIGHT ORANGE TO YELLOWISH GRAY
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, BIOGENIC, CALCILUTITE
                40% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
                POOR INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                OTHER FEATURES: FOSSILIFEROUS, WEATHERED
                FOSSILS: FOSSIL MOLDS
                320-321FT. HAS ~03% PHOSPHATE.

325.9-   326.5  DOLOSTONE; YELLOWISH GRAY TO MODERATE LIGHT GRAY
                POROSITY: INTERGRANULAR; 50-90% ALTERED; SUBHEDRAL
                GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                ACCESSORY MINERALS: PHOSPHATIC SAND-01%
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326.5- 330 CLAY; YELLOWISH GRAY
POROSITY: LOW PERMEABILITY, INTERGRANULAR
MODERATE INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: LIMESTONE-05%

330 - 335 CLAY; LIGHT OLIVE GRAY TO WHITE
POROSITY: LOW PERMEABILITY, INTERGRANULAR; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: LIMESTONE-10%
CREAMY WHITE LIMESTONE INTERBEDDED IN LIGHT OLIVE GRAY
CLAY.

335 - 336 CLAY; LIGHT OLIVE GRAY TO WHITE
POROSITY: LOW PERMEABILITY, INTERGRANULAR; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: LIMESTONE-10%
SAME AS 330-335FT. INTERVAL.

336 - 340 MUDSTONE; WHITE
POROSITY: LOW PERMEABILITY
GRAIN TYPE: CALCILUTITE, INTRACLASTS
10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: WEATHERED

340 - 342.5 WACKESTONE; WHITE
POROSITY: INTERGRANULAR, LOW PERMEABILITY
GRAIN TYPE: INTRACLASTS, CALCILUTITE
50% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: LOW RECRYSTALLIZATION, WEATHERED
FOSSILS: FOSSIL MOLDS

342.5- 345 PACKSTONE; WHITE
POROSITY: INTERGRANULAR, LOW PERMEABILITY
GRAIN TYPE: INTRACLASTS, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: WEATHERED
FOSSILS: FOSSIL MOLDS

345 - 346.5 WACKESTONE; WHITE
POROSITY: INTERGRANULAR, LOW PERMEABILITY
GRAIN TYPE: INTRACLASTS, CALCILUTITE
30% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: WEATHERED
FOSSILS: FOSSIL MOLDS

346.5- 349 WACKESTONE; YELLOWISH GRAY TO VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE

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                30% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
                ACCESSORY MINERALS: CLAY-15%

  349  -  350   WACKESTONE; YELLOWISH GRAY TO VERY LIGHT ORANGE
                POROSITY: INTERGRANULAR, PIN POINT VUGS
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                75% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                FOSSILS: FOSSIL MOLDS

  350  -  354   WACKESTONE; VERY LIGHT ORANGE
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                65% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
                POOR INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: CHERT-02%, PHOSPHATIC SAND-01%
                QUARTZ SAND-45%
                FOSSILS: FOSSIL MOLDS

  354  -  355.2 WACKESTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                50% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: QUARTZ SAND-45%

  355.2-  358   PACKSTONE; BROWNISH GRAY TO LIGHT BROWNISH GRAY
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                90% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-01%, QUARTZ SAND-25%
                FOSSILS: FOSSIL MOLDS

  358  -  360   PACKSTONE; LIGHT OLIVE GRAY TO YELLOWISH GRAY
                POROSITY: INTERGRANULAR, VUGULAR, MOLDIC
                GRAIN TYPE: INTRACLASTS, BIOGENIC
                90% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: QUARTZ SAND-30%
                FOSSILS: FOSSIL MOLDS

  360  -  365   PACKSTONE; VERY LIGHT ORANGE
                POROSITY: INTERGRANULAR, VUGULAR, MOLDIC
                GRAIN TYPE: INTRACLASTS, BIOGENIC
                90% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
                GOOD INDURATION
                CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
                ACCESSORY MINERALS: PHOSPHATIC SAND-01%, QUARTZ SAND-30%
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OTHER FEATURES: MEDIUM RECRYSTALLIZATION
FOSSILS: FOSSIL MOLDS, MOLLUSKS

365 - 366 PACKSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, BIOGENIC
90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: QUARTZ SAND-30%
FOSSILS: FOSSIL MOLDS

366 - 370 PACKSTONE; VERY LIGHT ORANGE TO YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: BIOGENIC, INTRACLASTS
90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-01%, QUARTZ SAND-45%
OTHER FEATURES: MEDIUM RECRYSTALLIZATION
FOSSILS: FOSSIL MOLDS

370 - 375 PACKSTONE; VERY LIGHT ORANGE TO YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: QUARTZ SAND-50%

375 - 380 PACKSTONE; YELLOWISH GRAY TO LIGHT GRAY
POROSITY: INTERGRANULAR, VUGULAR, MOLDIC
GRAIN TYPE: BIOGENIC, CRYSTALS, INTRACLASTS
90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-05%, QUARTZ SAND-40%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: FOSSIL MOLDS, MOLLUSKS
375.7-376.7FT. IS POORLY INDURATED AND HAS MICRITE CEMENT.

380 - 380.5 PACKSTONE; YELLOWISH GRAY TO LIGHT GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: PHOSPHATIC SAND-02%, QUARTZ SAND-50%

380.5- 385 PACKSTONE; YELLOWISH GRAY TO LIGHT GRAY
POROSITY: INTERGRANULAR, VUGULAR, MOLDIC
GRAIN TYPE: BIOGENIC, CRYSTALS, INTRACLASTS
90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE; POOR INDURATION
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-02%, QUARTZ SAND-45%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: FOSSIL MOLDS, MOLLUSKS

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385   -  390   WACKESTONE; YELLOWISH GRAY
               POROSITY: INTERGRANULAR
               GRAIN TYPE: INTRACLASTS, CALCILUTITE
               70% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
               POOR INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               ACCESSORY MINERALS: PHOSPHATIC SAND-01%, QUARTZ SAND-30%

390   -  392   WACKESTONE; YELLOWISH GRAY
               POROSITY: INTERGRANULAR
               GRAIN TYPE: INTRACLASTS, CALCILUTITE
               50% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
               POOR INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               ACCESSORY MINERALS: QUARTZ SAND-15%
               COLOR VARIES FROM YELLOWISH GRAY TO CREAMY WHITE.

392   -  393   MUDSTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
               POROSITY: LOW PERMEABILITY
               GRAIN TYPE: INTRACLASTS, CALCILUTITE
               10% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: MICROCRYSTALLINE
               RANGE: MICROCRYSTALLINE TO FINE; POOR INDURATION
               CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
               ACCESSORY MINERALS: CLAY-40%, CHERT-05%

393   -  395   CLAY; OLIVE GRAY TO LIGHT OLIVE GRAY
               POROSITY: LOW PERMEABILITY; POOR INDURATION
               CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
               ACCESSORY MINERALS: LIMESTONE-15%

395   -  397.7 DOLOSTONE; LIGHT OLIVE GRAY TO YELLOWISH GRAY
               POROSITY: LOW PERMEABILITY, INTERGRANULAR; 50-90% ALTERED
               SUBHEDRAL
               GRAIN SIZE: FINE; GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT

397.7-   400   WACKESTONE; YELLOWISH GRAY
               POROSITY: INTERGRANULAR
               GRAIN TYPE: INTRACLASTS, CALCILUTITE
               10% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
               POOR INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               ACCESSORY MINERALS: PHOSPHATIC SAND-02%, QUARTZ SAND-35%
               DOLOMITE-%
               PARTIALLY ALTERED TO DOLOMITE.

400   -  403   WACKESTONE; YELLOWISH GRAY
               POROSITY: INTERGRANULAR
               GRAIN TYPE: INTRACLASTS, CALCILUTITE
               10% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
               POOR INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               ACCESSORY MINERALS: PHOSPHATIC SAND-02%, QUARTZ SAND-35%
               DOLOMITE-%
               PARTIALLY ALTERED TO DOLOMITE.

403   -  405   WACKESTONE; YELLOWISH GRAY TO YELLOWISH GRAY
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              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, CALCILUTITE
              10% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
              POOR INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
              ACCESSORY MINERALS: PHOSPHATIC SAND-01%, QUARTZ SAND-35%

405   -  410  WACKESTONE; YELLOWISH GRAY
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, CALCILUTITE
              50% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
              POOR INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
              ACCESSORY MINERALS: PHOSPHATIC SAND-02%, QUARTZ SAND-40%

410   -  412.2 PACKSTONE; LIGHT OLIVE GRAY TO YELLOWISH GRAY
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, CALCILUTITE
              75% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
              POOR INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              ACCESSORY MINERALS: PHOSPHATIC SAND-05%, QUARTZ SAND-30%
              FOSSILS: SHARKS TEETH

412.2-  415   WACKESTONE; YELLOWISH GRAY
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, CALCILUTITE
              70% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
              POOR INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
              ACCESSORY MINERALS: PHOSPHATIC SAND-03%
              PHOSPHATIC GRAVEL-01%, QUARTZ SAND-50%

415   -  420  PACKSTONE; YELLOWISH GRAY
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, CALCILUTITE
              40% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
              POOR INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              ACCESSORY MINERALS: PHOSPHATIC SAND-03%, QUARTZ SAND-25%

420   -  421.7 WACKESTONE; YELLOWISH GRAY
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, CALCILUTITE
              30% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
              POOR INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              ACCESSORY MINERALS: PHOSPHATIC SAND-05%, QUARTZ SAND-30%

421.7-  425   WACKESTONE; YELLOWISH GRAY TO LIGHT GRAY
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, CALCILUTITE
              25% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
              MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              ACCESSORY MINERALS: PHOSPHATIC SAND-07%
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425  -  426   WACKESTONE; YELLOWISH GRAY
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, CALCILUTITE
              60% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
              MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              ACCESSORY MINERALS: PHOSPHATIC SAND-10%, QUARTZ SAND-15%
              FOSSILS: SHARKS TEETH
              COLOR VARIED FROM YELLOWISH GRAY TO CREAMY WHITE.

426  -  427   CLAY; YELLOWISH GRAY
              POROSITY: LOW PERMEABILITY
              NOTE ON CORE BOX INDICATES THE BOX HAD FALLEN AND CONTENTS
              OF ROWS1-3 WERE DISPLACED (421.7-427FT.). THEIR REPLACEMENT
              IS APPROXIMATE. ABOVE DISCREPTION IS BASED ON THEIR
              REPLACEMENT POSITION.

427  -  430   CLAY; OLIVE GRAY
              POROSITY: LOW PERMEABILITY; POOR INDURATION
              CEMENT TYPE(S): CLAY MATRIX
              SEDIMENTARY STRUCTURES: FISSILE
              ACCESSORY MINERALS: GYPSUM-  %
              OTHER FEATURES: PLATY
              GYPSUM CRYSTALS FORMING BETWEEN PLATY LAYERS

430  -  431.4 CLAY; DARK GREENISH GRAY
              POROSITY: LOW PERMEABILITY; POOR INDURATION
              CEMENT TYPE(S): CLAY MATRIX
              SEDIMENTARY STRUCTURES: FISSILE
              OTHER FEATURES: PLATY

431.4-  435   CLAY; GREENISH BLACK
              POROSITY: LOW PERMEABILITY; POOR INDURATION
              CEMENT TYPE(S): CLAY MATRIX
              SEDIMENTARY STRUCTURES: FISSILE
              ACCESSORY MINERALS: GYPSUM-  %
              OTHER FEATURES: PLATY
              GYPSUM CRYSTALS FORMING BETWEEN PLATY LAYERS AND OUTSIDE OF
              CORE. SLICKENLINES AT 432.4FT.(MAY HAVE OCCURED DURING
              HANDLING OF WET CORE).

435  -  440   CLAY; MODERATE DARK GRAY TO LIGHT GRAY
              POROSITY: LOW PERMEABILITY; POOR INDURATION
              CEMENT TYPE(S): CLAY MATRIX
              ACCESSORY MINERALS: GYPSUM-20%, QUARTZ SAND-25%
              PHOSPHATIC SAND-01%
              GYPSUM HAS AN EARTHY (LOOSE) FINE GRAIN TEXTURE.

440  -  441   WACKESTONE; YELLOWISH GRAY TO MODERATE DARK GRAY
              POROSITY: LOW PERMEABILITY
              GRAIN TYPE: INTRACLASTS, CALCILUTITE
              40% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: FINE; POOR INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
              ACCESSORY MINERALS: QUARTZ SAND-30%, PHOSPHATIC SAND-01%
              CLAY/WACKSTONE MIXTURE.

441  -  445   CLAY; DARK GRAY
              POROSITY: LOW PERMEABILITY; POOR INDURATION
              CEMENT TYPE(S): CLAY MATRIX
              ACCESSORY MINERALS: QUARTZ SAND-25%
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445   -  447   CLAY; MODERATE DARK GRAY TO WHITE
               POROSITY: LOW PERMEABILITY; POOR INDURATION
               CEMENT TYPE(S): CLAY MATRIX
               ACCESSORY MINERALS: QUARTZ SAND-25%

447   -  448   CLAY; MODERATE DARK GRAY
               POROSITY: LOW PERMEABILITY; POOR INDURATION
               CEMENT TYPE(S): CLAY MATRIX
               ACCESSORY MINERALS: QUARTZ SAND-05%, GYPSUM-01%

448   -  450   CLAY; MODERATE DARK GRAY TO WHITE
               POROSITY: LOW PERMEABILITY; POOR INDURATION
               CEMENT TYPE(S): CLAY MATRIX
               ACCESSORY MINERALS: QUARTZ SAND-25%

450   -  453.5 CLAY; DARK GREENISH GRAY TO WHITE
               POROSITY: LOW PERMEABILITY; POOR INDURATION
               CEMENT TYPE(S): CLAY MATRIX
               ACCESSORY MINERALS: QUARTZ SAND-20%

453.5-   455   MUDSTONE; WHITE
               POROSITY: LOW PERMEABILITY
               GRAIN TYPE: CALCILUTITE, INTRACLASTS
               GRAIN SIZE: MICROCRYSTALLINE
               RANGE: MICROCRYSTALLINE TO VERY FINE; POOR INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               ACCESSORY MINERALS: PHOSPHATIC GRAVEL-01%
               PHOSPHATE GRAVEL MOST LIKELY CAVINGS

455   -  460   MUDSTONE; YELLOWISH GRAY
               POROSITY: LOW PERMEABILITY
               GRAIN TYPE: CALCILUTITE, INTRACLASTS
               GRAIN SIZE: MICROCRYSTALLINE
               RANGE: MICROCRYSTALLINE TO VERY FINE; POOR INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX

460   -  463   MUDSTONE; WHITE
               POROSITY: LOW PERMEABILITY
               GRAIN TYPE: CALCILUTITE, INTRACLASTS
               40% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
               POOR INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               OTHER FEATURES: WEATHERED
               FOSSILS: MOLLUSKS
               CREAMY WHITE TO WHITE COLOR.

463   -  465   MUDSTONE; YELLOWISH GRAY
               POROSITY: LOW PERMEABILITY
               GRAIN TYPE: CALCILUTITE, INTRACLASTS
               GRAIN SIZE: MICROCRYSTALLINE
               RANGE: MICROCRYSTALLINE TO VERY FINE; POOR INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX

465   -  470   MUDSTONE; YELLOWISH GRAY
               POROSITY: LOW PERMEABILITY
               GRAIN TYPE: BIOGENIC, CALCILUTITE, INTRACLASTS
               60% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
               POOR INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               OTHER FEATURES: WEATHERED
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               FOSSILS: MOLLUSKS, FOSSIL MOLDS

 470  -  475   WACKESTONE; YELLOWISH GRAY
               POROSITY: LOW PERMEABILITY, INTERGRANULAR
               GRAIN TYPE: BIOGENIC, INTRACLASTS, CALCILUTITE
               75% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
               POOR INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               OTHER FEATURES: WEATHERED
               FOSSILS: MOLLUSKS, FOSSIL MOLDS

 475  -  480   WACKESTONE; YELLOWISH GRAY
               POROSITY: LOW PERMEABILITY, INTERGRANULAR
               GRAIN TYPE: INTRACLASTS, CALCILUTITE
               75% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
               POOR INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               OTHER FEATURES: WEATHERED

 480  -  485   PACKSTONE; YELLOWISH GRAY
               POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
               GRAIN TYPE: BIOGENIC, SKELTAL CAST, CALCILUTITE
               85% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO COARSE
               MODERATE INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               OTHER FEATURES: LOW RECRYSTALLIZATION
               FOSSILS: FOSSIL MOLDS, MOLLUSKS, BENTHIC FORAMINIFERA

 485  -  490   PACKSTONE; VERY LIGHT ORANGE TO YELLOWISH GRAY
               POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
               GRAIN TYPE: BIOGENIC, SKELTAL CAST, CALCILUTITE
               85% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
               GOOD INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               OTHER FEATURES: MEDIUM RECRYSTALLIZATION
               FOSSILS: FOSSIL MOLDS, MOLLUSKS

 490  -  495   PACKSTONE; YELLOWISH GRAY TO VERY LIGHT ORANGE
               POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
               GRAIN TYPE: BIOGENIC, SKELTAL CAST, CALCILUTITE
               85% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
               MODERATE INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               OTHER FEATURES: LOW RECRYSTALLIZATION
               FOSSILS: FOSSIL MOLDS, MOLLUSKS, BENTHIC FORAMINIFERA

 495  -  500   PACKSTONE; YELLOWISH GRAY
               POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
               GRAIN TYPE: BIOGENIC, SKELTAL CAST, CALCILUTITE
               80% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
               MODERATE INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               OTHER FEATURES: LOW RECRYSTALLIZATION
               FOSSILS: FOSSIL MOLDS, MOLLUSKS

 500  -  505   PACKSTONE; YELLOWISH GRAY
               POROSITY: INTERGRANULAR, PIN POINT VUGS
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GRAIN TYPE: BIOGENIC, SKELTAL CAST, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: LOW RECRYSTALLIZATION
FOSSILS: FOSSIL MOLDS, MOLLUSKS

505 - 510 PACKSTONE; WHITE
POROSITY: INTERGRANULAR, PIN POINT VUGS
GRAIN TYPE: BIOGENIC, SKELTAL CAST, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: LOW RECRYSTALLIZATION
FOSSILS: FOSSIL MOLDS, MOLLUSKS

510 - 515 PACKSTONE; YELLOWISH GRAY TO VERY LIGHT ORANGE
POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
GRAIN TYPE: BIOGENIC, SKELTAL CAST, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: LOW RECRYSTALLIZATION
FOSSILS: FOSSIL MOLDS, MOLLUSKS

515 - 518 PACKSTONE; YELLOWISH GRAY TO WHITE
POROSITY: INTERGRANULAR, PIN POINT VUGS
GRAIN TYPE: BIOGENIC, SKELTAL CAST, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: LOW RECRYSTALLIZATION
FOSSILS: FOSSIL MOLDS, MOLLUSKS

518 - 520 PACKSTONE; VERY LIGHT ORANGE TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, BIOGENIC, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: WEATHERED
FOSSILS: FOSSIL MOLDS

520 - 525 PACKSTONE; VERY LIGHT ORANGE TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX

525 - 528 PACKSTONE; VERY LIGHT ORANGE TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX

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                FOSSILS: FOSSIL MOLDS, MOLLUSKS

528  -  530     PACKSTONE; VERY LIGHT ORANGE TO WHITE
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                80% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: ORGANICS-01%
                FOSSILS: FOSSIL MOLDS, MOLLUSKS

530  -  530.5   PACKSTONE; VERY LIGHT ORANGE TO WHITE
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                80% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM; GOOD INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX

530.5-  535     PACKSTONE; VERY LIGHT ORANGE TO WHITE
                POROSITY: INTERGRANULAR, PIN POINT VUGS
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                80% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM
                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX

535  -  540     PACKSTONE; VERY LIGHT ORANGE TO WHITE
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                80% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE; GOOD INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                FOSSILS: FOSSIL MOLDS

540  -  541.3   PACKSTONE; VERY LIGHT ORANGE TO WHITE
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, BIOGENIC, SKELTAL CAST
                75% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE; GOOD INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                FOSSILS: FOSSIL MOLDS, MOLLUSKS

541.3-  544     PACKSTONE; VERY LIGHT ORANGE
                POROSITY: INTERGRANULAR
                GRAIN TYPE: SKELTAL CAST, INTRACLASTS
                70% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE
                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                FOSSILS: FOSSIL MOLDS, MOLLUSKS

544  -  545     PACKSTONE; VERY LIGHT ORANGE
                POROSITY: INTERGRANULAR, PIN POINT VUGS
                GRAIN TYPE: SKELTAL CAST, INTRACLASTS
                80% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM
                GOOD INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                FOSSILS: FOSSIL MOLDS, MOLLUSKS

545  -  550     PACKSTONE; VERY LIGHT ORANGE TO YELLOWISH GRAY
                POROSITY: INTERGRANULAR, PIN POINT VUGS
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GRAIN TYPE: INTRACLASTS, SKELTAL CAST, CALCILUTITE
75% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: LOW RECRYSTALLIZATION
FOSSILS: FOSSIL MOLDS, MOLLUSKS

550 - 555 PACKSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
GRAIN TYPE: INTRACLASTS, SKELTAL CAST, BIOGENIC
75% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
OTHER FEATURES: MEDIUM RECRYSTALLIZATION
FOSSILS: FOSSIL MOLDS, MOLLUSKS

555 - 558 PACKSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR, PIN POINT VUGS
GRAIN TYPE: INTRACLASTS, SKELTAL CAST, BIOGENIC
75% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
FOSSILS: FOSSIL MOLDS, MOLLUSKS

558 - 560 PACKSTONE; VERY LIGHT ORANGE TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
FOSSILS: FOSSIL MOLDS

560 - 565 PACKSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, SKELTAL CAST, BIOGENIC
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
FOSSILS: FOSSIL MOLDS, MOLLUSKS

565 - 570 PACKSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
HIGH LIMIT OF OCALA/SWANNEE CONTACT.

570 - 575 WACKESTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR, MOLDIC
GRAIN TYPE: INTRACLASTS, SKELTAL CAST, BIOGENIC
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: FINE TO COARSE; GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
FOSSILS: FOSSIL MOLDS, MOLLUSKS

575 - 575.5 WACKESTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR

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                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                70% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE; GOOD INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                FOSSILS: FOSSIL MOLDS, MOLLUSKS

575.5-  580     WACKESTONE; VERY LIGHT ORANGE
                POROSITY: INTERGRANULAR, MOLDIC
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                70% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: FINE; RANGE: FINE TO COARSE
                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                FOSSILS: FOSSIL MOLDS, MOLLUSKS

580   -  585    WACKESTONE; VERY LIGHT ORANGE
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                80% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: FINE; MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                FOSSILS: FOSSIL MOLDS
                LOWER LIMIT OF OCALA/SWANNEE CONTACT.

585   -  587    WACKESTONE; WHITE TO YELLOWISH GRAY
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, SKELTAL CAST, BIOGENIC
                80% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: COARSE; RANGE: FINE TO COARSE; GOOD INDURATION
                CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
                FOSSILS: FOSSIL MOLDS, MOLLUSKS, BENTHIC FORAMINIFERA
                LARGE FORAMS PRESENT.

587   -  590    WACKESTONE; VERY LIGHT ORANGE TO WHITE
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                10% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                FOSSILS: FOSSIL MOLDS

590   -  595    WACKESTONE; VERY LIGHT ORANGE TO WHITE
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                50% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                FOSSILS: FOSSIL MOLDS

595   -  597    WACKESTONE; VERY LIGHT ORANGE
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                50% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                ACCESSORY MINERALS: SHELL-01%
                FOSSILS: FOSSIL MOLDS

597   -  600    WACKESTONE; VERY LIGHT ORANGE
                POROSITY: INTERGRANULAR
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GRAIN TYPE: INTRACLASTS, CALCILUTITE
50% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: SHELL-01%
FOSSILS: FOSSIL MOLDS, MOLLUSKS

600 - 605 WACKESTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: SHELL-01%
FOSSILS: FOSSIL MOLDS

605 - 608 WACKESTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: SHELL-01%
FOSSILS: FOSSIL MOLDS, MOLLUSKS, CORAL

608 - 610 WACKESTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: SHELL-10%
FOSSILS: FOSSIL MOLDS, MOLLUSKS

610 - 615 WACKESTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, BIOGENIC, SKELETAL
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: SHELL-20%
FOSSILS: FOSSIL MOLDS, MOLLUSKS, BENTHIC FORAMINIFERA
LARGE FORAMINIFERA PRESENT (LEPIDOCYCLINA OCALANA)

615 - 618 WACKESTONE; VERY LIGHT ORANGE TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, BIOGENIC, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: SHELL-02%
FOSSILS: FOSSIL MOLDS, MOLLUSKS, BENTHIC FORAMINIFERA

618 - 620 WACKESTONE; VERY LIGHT ORANGE TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, BIOGENIC, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS

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              GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
              POOR INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              ACCESSORY MINERALS: SHELL-01%
              FOSSILS: FOSSIL MOLDS, MOLLUSKS, BENTHIC FORAMINIFERA

620  -  625   WACKESTONE; VERY LIGHT ORANGE
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, CALCILUTITE
              80% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
              MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              FOSSILS: FOSSIL MOLDS, MOLLUSKS, BENTHIC FORAMINIFERA

625  -  630   WACKESTONE; VERY LIGHT ORANGE TO WHITE
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, CALCILUTITE, BIOGENIC
              70% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
              MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              FOSSILS: FOSSIL MOLDS, BENTHIC FORAMINIFERA, MOLLUSKS

630  -  631.6 WACKESTONE; WHITE TO VERY LIGHT ORANGE
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, BIOGENIC, CALCILUTITE
              75% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
              MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              FOSSILS: FOSSIL MOLDS, BENTHIC FORAMINIFERA, MOLLUSKS

631.6-  635   PACKSTONE; WHITE TO VERY LIGHT ORANGE
              POROSITY: INTERGRANULAR
              GRAIN TYPE: BIOGENIC, INTRACLASTS, CALCILUTITE
              75% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO COARSE
              MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              ACCESSORY MINERALS: SHELL-15%
              FOSSILS: FOSSIL MOLDS, BENTHIC FORAMINIFERA, MOLLUSKS

635  -  640   PACKSTONE; WHITE TO VERY LIGHT ORANGE
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, CALCILUTITE, BIOGENIC
              30% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
              MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              ACCESSORY MINERALS: SHELL-07%
              FOSSILS: FOSSIL MOLDS, BENTHIC FORAMINIFERA, MOLLUSKS

640  -  641   PACKSTONE; WHITE TO VERY LIGHT ORANGE
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, CALCILUTITE, BIOGENIC
              30% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
              MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              ACCESSORY MINERALS: SHELL-10%
              FOSSILS: FOSSIL MOLDS, BENTHIC FORAMINIFERA, MOLLUSKS
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641   -  645   WACKESTONE; VERY LIGHT ORANGE TO WHITE
               POROSITY: INTERGRANULAR
               GRAIN TYPE: INTRACLASTS, CALCILUTITE
               30% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
               MODERATE INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               ACCESSORY MINERALS: SHELL-07%
               FOSSILS: FOSSIL MOLDS, BENTHIC FORAMINIFERA, MOLLUSKS

645   -  650   WACKESTONE; VERY LIGHT ORANGE
               POROSITY: INTERGRANULAR
               GRAIN TYPE: INTRACLASTS, CALCILUTITE, BIOGENIC
               20% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
               MODERATE INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               ACCESSORY MINERALS: SHELL-07%
               OTHER FEATURES: WEATHERED, FOSSILIFEROUS
               FOSSILS: BENTHIC FORAMINIFERA

650   -  650.3 WACKESTONE; VERY LIGHT ORANGE TO WHITE
               POROSITY: INTERGRANULAR
               GRAIN TYPE: INTRACLASTS, BIOGENIC, CALCILUTITE
               20% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
               MODERATE INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               ACCESSORY MINERALS: SHELL-10%
               OTHER FEATURES: FOSSILIFEROUS
               FOSSILS: FOSSIL MOLDS

650.3-   655   WACKESTONE; VERY LIGHT ORANGE
               POROSITY: INTERGRANULAR, VUGULAR
               GRAIN TYPE: INTRACLASTS, CALCILUTITE, BIOGENIC
               30% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
               MODERATE INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               ACCESSORY MINERALS: SHELL-10%
               OTHER FEATURES: LOW RECRYSTALLIZATION, FOSSILIFEROUS
               FOSSILS: BENTHIC FORAMINIFERA

655   -  658   WACKESTONE; VERY LIGHT ORANGE
               POROSITY: INTERGRANULAR
               GRAIN TYPE: INTRACLASTS, CALCILUTITE, BIOGENIC
               30% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
               MODERATE INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               OTHER FEATURES: FOSSILIFEROUS
               FOSSILS: BENTHIC FORAMINIFERA, FOSSIL MOLDS

658   -  659.7 WACKESTONE; WHITE TO VERY LIGHT ORANGE
               POROSITY: INTERGRANULAR
               GRAIN TYPE: INTRACLASTS, CALCILUTITE
               20% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
               MODERATE INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               OTHER FEATURES: WEATHERED, FOSSILIFEROUS

659.7-   660   PACKSTONE; VERY LIGHT ORANGE TO WHITE
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                 POROSITY: INTERGRANULAR
                 GRAIN TYPE: INTRACLASTS, CALCILUTITE
                 10% ALLOCHEMICAL CONSTITUENTS
                 GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
                 MODERATE INDURATION
                 CEMENT TYPE(S): CALCILUTITE MATRIX
                 FOSSILS: BENTHIC FORAMINIFERA, MOLLUSKS

 660  -  661.5   WACKESTONE; VERY LIGHT ORANGE TO WHITE
                 POROSITY: INTERGRANULAR
                 GRAIN TYPE: INTRACLASTS, CALCILUTITE
                 10% ALLOCHEMICAL CONSTITUENTS
                 GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
                 MODERATE INDURATION
                 CEMENT TYPE(S): CALCILUTITE MATRIX
                 FOSSILS: BENTHIC FORAMINIFERA, MOLLUSKS

 661.5-  665     WACKESTONE; VERY LIGHT ORANGE
                 POROSITY: INTERGRANULAR
                 GRAIN TYPE: INTRACLASTS, CALCILUTITE
                 20% ALLOCHEMICAL CONSTITUENTS
                 GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
                 MODERATE INDURATION
                 CEMENT TYPE(S): CALCILUTITE MATRIX
                 OTHER FEATURES: FOSSILIFEROUS
                 FOSSILS: BENTHIC FORAMINIFERA, FOSSIL MOLDS

 665  -  669.2   WACKESTONE; WHITE TO VERY LIGHT ORANGE
                 POROSITY: INTERGRANULAR
                 GRAIN TYPE: INTRACLASTS, CALCILUTITE
                 30% ALLOCHEMICAL CONSTITUENTS
                 GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO COARSE
                 MODERATE INDURATION
                 CEMENT TYPE(S): CALCILUTITE MATRIX
                 OTHER FEATURES: FOSSILIFEROUS
                 FOSSILS: BENTHIC FORAMINIFERA, MOLLUSKS

 669.2-  670     WACKESTONE; VERY LIGHT ORANGE
                 POROSITY: INTERGRANULAR, VUGULAR
                 GRAIN TYPE: INTRACLASTS, CALCILUTITE
                 70% ALLOCHEMICAL CONSTITUENTS
                 GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO GRANULE
                 MODERATE INDURATION
                 CEMENT TYPE(S): CALCILUTITE MATRIX
                 OTHER FEATURES: FOSSILIFEROUS
                 FOSSILS: BENTHIC FORAMINIFERA

 670  -  675     WACKESTONE; VERY LIGHT ORANGE
                 POROSITY: INTERGRANULAR
                 GRAIN TYPE: INTRACLASTS, CALCILUTITE
                 70% ALLOCHEMICAL CONSTITUENTS
                 GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO GRANULE
                 MODERATE INDURATION
                 CEMENT TYPE(S): CALCILUTITE MATRIX
                 OTHER FEATURES: FOSSILIFEROUS
                 FOSSILS: BENTHIC FORAMINIFERA

 675  -  678.5   WACKESTONE; VERY LIGHT ORANGE TO WHITE
                 POROSITY: INTERGRANULAR
                 GRAIN TYPE: INTRACLASTS, CALCILUTITE
                 70% ALLOCHEMICAL CONSTITUENTS
                 GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO GRANULE
                 MODERATE INDURATION
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CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: BENTHIC FORAMINIFERA
FORAMINIFERA NUMMULITIES SP. PRESENT.

678.5- 680 PACKSTONE; WHITE TO VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, SKELETAL, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO GRANULE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: BENTHIC FORAMINIFERA, MOLLUSKS

680 - 685 PACKSTONE; WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, SKELETAL, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO GRANULE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: BENTHIC FORAMINIFERA

685 - 688 WACKESTONE; WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, SKELETAL, CALCILUTITE
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO GRANULE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: WEATHERED, FOSSILIFEROUS
FOSSILS: BENTHIC FORAMINIFERA

688 - 690 WACKESTONE; WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, SKELETAL, CALCILUTITE
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: BENTHIC FORAMINIFERA, MOLLUSKS

690 - 695 MUDSTONE; WHITE TO VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, SKELETAL, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO GRANULE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: BENTHIC FORAMINIFERA, MOLLUSKS

695 - 697 MUDSTONE; WHITE TO VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, SKELETAL, CALCILUTITE
75% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO GRANULE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: FOSSILIFEROUS

FOSSILS: BENTHIC FORAMINIFERA, MOLLUSKS

697 - 700 WACKESTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, SKELETAL, CALCILUTITE
75% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: BENTHIC FORAMINIFERA

700 - 705 WACKESTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, SKELETAL, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: BENTHIC FORAMINIFERA

705 - 706 WACKESTONE; VERY LIGHT ORANGE TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, SKELETAL, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: BENTHIC FORAMINIFERA

706 - 710 WACKESTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, SKELETAL, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: BENTHIC FORAMINIFERA

710 - 715 WACKESTONE; VERY LIGHT ORANGE TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, SKELETAL, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
FOSSILS: BENTHIC FORAMINIFERA

715 - 720 WACKESTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, SKELETAL, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: BENTHIC FORAMINIFERA

720 - 722 WACKESTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR

GRAIN TYPE: INTRACLASTS, SKELETAL, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: BENTHIC FORAMINIFERA

722 - 724.5 PACKSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, SKELETAL, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: BENTHIC FORAMINIFERA

724.5- 725 PACKSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, SKELETAL, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: BENTHIC FORAMINIFERA
FORAMINIFERA HETEROSTEGINA OCALANA PRESENT.

725 - 730 WACKESTONE; YELLOWISH GRAY TO VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, SKELETAL, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: BENTHIC FORAMINIFERA

730 - 735 WACKESTONE; YELLOWISH GRAY TO VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, SKELETAL, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: BENTHIC FORAMINIFERA

735 - 740 WACKESTONE; VERY LIGHT ORANGE TO YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, SKELETAL, CALCILUTITE
75% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
FOSSILS: BENTHIC FORAMINIFERA

740 - 745 WACKESTONE; YELLOWISH GRAY TO VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, SKELETAL, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE

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              MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              FOSSILS: BENTHIC FORAMINIFERA
              743-745FT. HAS GOOD INDURATION.

745   -  750   WACKESTONE; GRAYISH BROWN TO WHITE
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, SKELETAL, CALCILUTITE
              60% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO COARSE
              MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              FOSSILS: BENTHIC FORAMINIFERA
              COLOR IS BETWEEN VERY PALE ORANGE AND PALLE YELLOWISH
              BROWN. 747-750 HAS GOOD INDURATION.

750   -  750.2 WACKESTONE; GRAYISH BROWN TO WHITE
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, SKELETAL, CALCILUTITE
              60% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO COARSE
              GOOD INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              FOSSILS: BENTHIC FORAMINIFERA

750.2-  753   WACKESTONE; VERY LIGHT ORANGE
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, CALCILUTITE, SKELETAL
              60% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO COARSE
              POOR INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              OTHER FEATURES: WEATHERED

753   -  755   WACKESTONE; VERY LIGHT ORANGE TO WHITE
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, SKELETAL, CALCILUTITE
              70% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO COARSE
              GOOD INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              FOSSILS: BENTHIC FORAMINIFERA

755   -  760   WACKESTONE; VERY LIGHT ORANGE TO WHITE
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, SKELETAL, CALCILUTITE
              70% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO COARSE
              GOOD INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              FOSSILS: BENTHIC FORAMINIFERA

760   -  762.2 WACKESTONE; VERY LIGHT ORANGE
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, SKELETAL, CALCILUTITE
              70% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
              MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              OTHER FEATURES: WEATHERED
              FOSSILS: BENTHIC FORAMINIFERA

762.2-  765   WACKESTONE; VERY LIGHT ORANGE
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                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, SKELETAL, CALCILUTITE
                70% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
                GOOD INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                FOSSILS: BENTHIC FORAMINIFERA

765   -  770    MUDSTONE; YELLOWISH GRAY TO VERY LIGHT ORANGE
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                10% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
                POOR INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                FOSSILS: BENTHIC FORAMINIFERA

770   -  773    MUDSTONE; YELLOWISH GRAY TO WHITE
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                10% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
                POOR INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX

773   -  775    WACKESTONE; YELLOWISH GRAY TO WHITE
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE, SKELETAL
                70% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
                GOOD INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                FOSSILS: BENTHIC FORAMINIFERA

775   -  775.6  WACKESTONE; YELLOWISH GRAY
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE, SKELETAL
                70% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
                POOR INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                OTHER FEATURES: WEATHERED
                FOSSILS: BENTHIC FORAMINIFERA

775.6-   777    WACKESTONE; YELLOWISH GRAY
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                50% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
                POOR INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                OTHER FEATURES: WEATHERED
                FOSSILS: BENTHIC FORAMINIFERA

777   -  780    WACKESTONE; YELLOWISH GRAY
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE, SKELETAL
                25% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
                GOOD INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                FOSSILS: BENTHIC FORAMINIFERA
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780  -  781   WACKESTONE; YELLOWISH GRAY TO WHITE
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, CALCILUTITE, SKELETAL
              25% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
              GOOD INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              FOSSILS: BENTHIC FORAMINIFERA

781  -  782.2 WACKESTONE; YELLOWISH GRAY
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, CALCILUTITE, SKELETAL
              25% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
              POOR INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              OTHER FEATURES: WEATHERED
              FOSSILS: BENTHIC FORAMINIFERA

782.2-  785   WACKESTONE; YELLOWISH GRAY TO WHITE
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, CALCILUTITE, SKELETAL
              20% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
              GOOD INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              FOSSILS: BENTHIC FORAMINIFERA

785  -  787   MUDSTONE; WHITE
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, CALCILUTITE
              20% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
              POOR INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              OTHER FEATURES: MUDDY

787  -  790   WACKESTONE; YELLOWISH GRAY
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, CALCILUTITE, SKELETAL
              20% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
              GOOD INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              FOSSILS: BENTHIC FORAMINIFERA

790  -  792.6 WACKESTONE; YELLOWISH GRAY
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, CALCILUTITE, SKELETAL
              20% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
              POOR INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              OTHER FEATURES: WEATHERED
              FOSSILS: BENTHIC FORAMINIFERA

792.6-  795   WACKESTONE; YELLOWISH GRAY TO WHITE
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, CALCILUTITE, SKELETAL
              20% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
              GOOD INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
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FOSSILS: BENTHIC FORAMINIFERA

795 - 798 MUDSTONE; YELLOWISH GRAY TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: MUDDY

798 - 799.5 MUDSTONE; YELLOWISH GRAY TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
20% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
FOSSILS: BENTHIC FORAMINIFERA

799.5- 800 MUDSTONE; YELLOWISH GRAY TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
05% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
FOSSILS: BENTHIC FORAMINIFERA

800 - 805 MUDSTONE; YELLOWISH GRAY TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
07% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
FOSSILS: BENTHIC FORAMINIFERA
FORAMINIFERA HETEROSTEGINA OCALANA PRESENT.

805 - 810 MUDSTONE; YELLOWISH GRAY TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
07% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
FOSSILS: BENTHIC FORAMINIFERA

810 - 812.2 MUDSTONE; YELLOWISH GRAY TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
07% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
FOSSILS: BENTHIC FORAMINIFERA

812.2- 815 MUDSTONE; YELLOWISH GRAY TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
MODERATE INDURATION

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                CEMENT TYPE(S): CALCILUTITE MATRIX
                FOSSILS: BENTHIC FORAMINIFERA

815  -  818.5 MUDSTONE; YELLOWISH GRAY TO WHITE
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                10% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                FOSSILS: BENTHIC FORAMINIFERA

818.5-  820     WACKESTONE; YELLOWISH GRAY TO WHITE
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE, BIOGENIC
                25% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO COARSE
                GOOD INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                OTHER FEATURES: FOSSILIFEROUS, LOW RECRYSTALLIZATION
                FOSSILS: BENTHIC FORAMINIFERA

820  -  821     PACKSTONE; YELLOWISH GRAY TO WHITE
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE, BIOGENIC
                30% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
                GOOD INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                OTHER FEATURES: FOSSILIFEROUS, LOW RECRYSTALLIZATION
                FOSSILS: BENTHIC FORAMINIFERA

821  -  823     WACKESTONE; YELLOWISH GRAY TO WHITE
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                15% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO COARSE
                GOOD INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                OTHER FEATURES: LOW RECRYSTALLIZATION
                FOSSILS: BENTHIC FORAMINIFERA

823  -  825     WACKESTONE; YELLOWISH GRAY TO WHITE
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                07% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
                GOOD INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                OTHER FEATURES: LOW RECRYSTALLIZATION

825  -  826.5 WACKESTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                50% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
                GOOD INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
                OTHER FEATURES: LOW RECRYSTALLIZATION, DOLOMITIC
                PARTIALLY ALTERED TO DOLOMITE.

826.5-  830     WACKESTONE; VERY LIGHT ORANGE
                POROSITY: INTERGRANULAR
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               GRAIN TYPE: INTRACLASTS, CALCILUTITE
               20% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
               POOR INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX

830   -  835   DOLOSTONE; GRAYISH BROWN
               POROSITY: INTERGRANULAR, PIN POINT VUGS; 50-90% ALTERED
               EUHEDRAL
               GRAIN SIZE: FINE; GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               OTHER FEATURES: HIGH RECRYSTALLIZATION
               FOSSILS: FOSSIL MOLDS, ECHINOID

835   -  840   DOLOSTONE; GRAYISH BROWN
               POROSITY: INTERGRANULAR, PIN POINT VUGS; 50-90% ALTERED
               EUHEDRAL
               GRAIN SIZE: FINE; GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               OTHER FEATURES: HIGH RECRYSTALLIZATION
               FOSSILS: FOSSIL MOLDS, ECHINOID

840   -  841.5 SILT-SIZE DOLOMITE; GRAYISH BROWN
               POROSITY: INTERGRANULAR; MODERATE INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               OTHER FEATURES: HIGH RECRYSTALLIZATION
               FOSSILS: FOSSIL MOLDS, ECHINOID

841.5-   845   WACKESTONE; VERY LIGHT ORANGE TO WHITE
               POROSITY: INTERGRANULAR
               GRAIN TYPE: INTRACLASTS, CALCILUTITE, SKELETAL
               50% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
               GOOD INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
               OTHER FEATURES: LOW RECRYSTALLIZATION, DOLOMITIC
               FOSSILS: FOSSIL MOLDS, ECHINOID

845   -  847.2 WACKESTONE; VERY LIGHT ORANGE TO WHITE
               POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
               GRAIN TYPE: INTRACLASTS, CALCILUTITE, SKELETAL
               70% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
               GOOD INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               OTHER FEATURES: LOW RECRYSTALLIZATION, DOLOMITIC
               FOSSILS: FOSSIL MOLDS, ECHINOID

847.2-   849.2 WACKESTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
               POROSITY: INTERGRANULAR, MOLDIC
               GRAIN TYPE: INTRACLASTS, CALCILUTITE, SKELETAL
               70% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
               MODERATE INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               OTHER FEATURES: LOW RECRYSTALLIZATION, DOLOMITIC
               FOSSILS: FOSSIL MOLDS, ECHINOID

849.2-   853.5 WACKESTONE; VERY LIGHT ORANGE
               POROSITY: INTERGRANULAR
               GRAIN TYPE: INTRACLASTS, CALCILUTITE, SKELETAL
               75% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
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              MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              OTHER FEATURES: LOW RECRYSTALLIZATION
              FOSSILS: FOSSIL MOLDS, MOLLUSKS

853.5-  855   DOLOSTONE; GRAYISH BROWN
              POROSITY: INTERGRANULAR; 50-90% ALTERED; EUHEDRAL
              GRAIN SIZE: FINE; GOOD INDURATION
              CEMENT TYPE(S): DOLOMITE CEMENT
              OTHER FEATURES: HIGH RECRYSTALLIZATION
              FOSSILS: FOSSIL MOLDS, ECHINOID

855   -  859  DOLOSTONE; GRAYISH BROWN
              POROSITY: INTERGRANULAR, MOLDIC; 50-90% ALTERED; EUHEDRAL
              GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
              GOOD INDURATION
              CEMENT TYPE(S): DOLOMITE CEMENT
              OTHER FEATURES: HIGH RECRYSTALLIZATION
              FOSSILS: FOSSIL MOLDS, ECHINOID

859   -  860  SILT-SIZE DOLOMITE; GRAYISH BROWN
              POROSITY: INTERGRANULAR; GOOD INDURATION
              CEMENT TYPE(S): DOLOMITE CEMENT
              OTHER FEATURES: HIGH RECRYSTALLIZATION
              FOSSILS: FOSSIL MOLDS, ECHINOID

860   -  865  WACKESTONE; WHITE
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, CALCILUTITE
              70% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
              MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              FOSSILS: FOSSIL MOLDS, ECHINOID, MOLLUSKS

865   -  870  PACKSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
              POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
              GRAIN TYPE: INTRACLASTS, CALCILUTITE
              80% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: COARSE; GOOD INDURATION
              CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
              OTHER FEATURES: HIGH RECRYSTALLIZATION
              FOSSILS: FOSSIL MOLDS, ECHINOID

870   -  871  PACKSTONE; VERY LIGHT ORANGE
              POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
              GRAIN TYPE: INTRACLASTS, CALCILUTITE
              80% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO COARSE
              GOOD INDURATION
              CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
              OTHER FEATURES: HIGH RECRYSTALLIZATION
              FOSSILS: FOSSIL MOLDS, MOLLUSKS

871   -  872  PACKSTONE; VERY LIGHT ORANGE
              POROSITY: INTERGRANULAR, PIN POINT VUGS
              GRAIN TYPE: INTRACLASTS, CALCILUTITE
              80% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO COARSE
              MODERATE INDURATION
              CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
              OTHER FEATURES: HIGH RECRYSTALLIZATION
              FOSSILS: FOSSIL MOLDS, MOLLUSKS
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872 - 875 WACKESTONE; WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
15% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX

875 - 876 PACKSTONE; WHITE TO VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
FOSSILS: FOSSIL MOLDS, MOLLUSKS

876 - 877 PACKSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR, MOLDIC
GRAIN TYPE: INTRACLASTS, CALCILUTITE
75% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: FOSSIL MOLDS, ECHINOID

877 - 880 PACKSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX

880 - 885 PACKSTONE; VERY LIGHT ORANGE TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX

885 - 887 PACKSTONE; WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX

887 - 888 WACKESTONE; WHITE TO VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: LOW RECRYSTALLIZATION, WEATHERED
FOSSILS: FOSSIL MOLDS, MOLLUSKS

888 - 889 PACKSTONE; VERY LIGHT ORANGE

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                  POROSITY: INTERGRANULAR
                  GRAIN TYPE: INTRACLASTS, CALCILUTITE
                  80% ALLOCHEMICAL CONSTITUENTS
                  GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
                  MODERATE INDURATION
                  CEMENT TYPE(S): CALCILUTITE MATRIX

  889  -  890     MUDSTONE; WHITE
                  POROSITY: INTERGRANULAR
                  GRAIN TYPE: INTRACLASTS, CALCILUTITE
                  05% ALLOCHEMICAL CONSTITUENTS
                  GRAIN SIZE: MICROCRYSTALLINE
                  RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
                  CEMENT TYPE(S): CALCILUTITE MATRIX

  890  -  893     PACKSTONE; WHITE
                  POROSITY: INTERGRANULAR
                  GRAIN TYPE: INTRACLASTS, CALCILUTITE
                  80% ALLOCHEMICAL CONSTITUENTS
                  GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
                  MODERATE INDURATION
                  CEMENT TYPE(S): CALCILUTITE MATRIX
                  ACCESSORY MINERALS: PYRITE-  %
                  <01% PYRITE IS PRESENT.

  893  -  894.5   MUDSTONE; WHITE
                  POROSITY: INTERGRANULAR
                  GRAIN TYPE: INTRACLASTS, CALCILUTITE
                  07% ALLOCHEMICAL CONSTITUENTS
                  GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
                  MODERATE INDURATION
                  CEMENT TYPE(S): CALCILUTITE MATRIX

  894.5-  899.5   WACKESTONE; VERY LIGHT ORANGE
                  POROSITY: INTERGRANULAR
                  GRAIN TYPE: INTRACLASTS, CALCILUTITE
                  25% ALLOCHEMICAL CONSTITUENTS
                  GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
                  GOOD INDURATION
                  CEMENT TYPE(S): CALCILUTITE MATRIX

  899.5-  900     PACKSTONE; VERY LIGHT ORANGE
                  POROSITY: INTERGRANULAR
                  GRAIN TYPE: INTRACLASTS, CALCILUTITE
                  75% ALLOCHEMICAL CONSTITUENTS
                  GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
                  GOOD INDURATION
                  CEMENT TYPE(S): CALCILUTITE MATRIX

  900  -  905     PACKSTONE; VERY LIGHT ORANGE TO WHITE
                  POROSITY: INTERGRANULAR
                  GRAIN TYPE: INTRACLASTS, CALCILUTITE
                  75% ALLOCHEMICAL CONSTITUENTS
                  GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
                  GOOD INDURATION
                  CEMENT TYPE(S): CALCILUTITE MATRIX
                  OTHER FEATURES: DOLOMITIC
                  LOWER SECTION 904-905FT HAS LOW TO MED ALTERATION TO
                  DOLOMITE.

  905  -  906     PACKSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
                  POROSITY: INTERGRANULAR
                  GRAIN TYPE: INTRACLASTS, CALCILUTITE
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               75% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
               GOOD INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               OTHER FEATURES: LOW RECRYSTALLIZATION, DOLOMITIC

906   -  910   PACKSTONE; VERY LIGHT ORANGE TO WHITE
               POROSITY: INTERGRANULAR
               GRAIN TYPE: INTRACLASTS, CALCILUTITE
               80% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: FINE; GOOD INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX

910   -  912.5 WACKESTONE; VERY LIGHT ORANGE TO WHITE
               POROSITY: INTERGRANULAR
               GRAIN TYPE: INTRACLASTS, CALCILUTITE
               80% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
               POOR INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX

912.5-   915   PACKSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
               POROSITY: INTERGRANULAR, PIN POINT VUGS
               GRAIN TYPE: INTRACLASTS, CALCILUTITE
               80% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
               GOOD INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               OTHER FEATURES: LOW RECRYSTALLIZATION, DOLOMITIC
               FOSSILS: FOSSIL MOLDS
               SLIGHTLY DOLOMITIC(<10%ALTERATION).

915   -  920   PACKSTONE; VERY LIGHT ORANGE
               POROSITY: INTERGRANULAR
               GRAIN TYPE: INTRACLASTS, CALCILUTITE
               80% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
               GOOD INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX

920   -  923   PACKSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
               POROSITY: INTERGRANULAR
               GRAIN TYPE: INTRACLASTS, SKELETAL, CALCILUTITE
               80% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO COARSE
               GOOD INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               FOSSILS: ECHINOID, BENTHIC FORAMINIFERA, CONES

923   -  925   WACKESTONE; VERY LIGHT ORANGE TO WHITE
               POROSITY: INTERGRANULAR
               GRAIN TYPE: INTRACLASTS, CALCILUTITE
               70% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
               MODERATE INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               FOSSILS: MOLLUSKS, BENTHIC FORAMINIFERA, CONES

925   -  927.5 PACKSTONE; VERY LIGHT ORANGE TO WHITE
               POROSITY: INTERGRANULAR
               GRAIN TYPE: INTRACLASTS, CALCILUTITE
               80% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
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                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                FOSSILS: BENTHIC FORAMINIFERA

 927.5-  930    WACKESTONE; VERY LIGHT ORANGE
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                70% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                SEDIMENTARY STRUCTURES: LAMINATED
                THIN ORGANIC LAMINAE FOUND BETWEEN 929-930FT.

 930   -  933   WACKESTONE; VERY LIGHT ORANGE
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                75% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: FINE; MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX

 933   -  934   MUDSTONE; YELLOWISH GRAY TO WHITE
                POROSITY: INTERGRANULAR, LOW PERMEABILITY
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                10% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX

 934   -  935   MUDSTONE; YELLOWISH GRAY TO WHITE
                POROSITY: INTERGRANULAR, LOW PERMEABILITY
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                10% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                SEDIMENTARY STRUCTURES: LAMINATED
                THIN ORGANIC LAMINAEPRESENT AT 934.7FT.

 935   -  940   PACKSTONE; YELLOWISH GRAY TO WHITE
                POROSITY: INTERGRANULAR, PIN POINT VUGS
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                80% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                SEDIMENTARY STRUCTURES: LAMINATED
                THIN ORGANIC LAMINAE PRESENT.

 940   -  941   MUDSTONE; YELLOWISH GRAY TO WHITE
                POROSITY: INTERGRANULAR, LOW PERMEABILITY
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                10% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
                POOR INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX

 941   -  945   PACKSTONE; VERY LIGHT ORANGE
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                80% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
                MODERATE INDURATION
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CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
OTHER FEATURES: MEDIUM RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, MOLLUSKS, FOSSIL MOLDS
FORAMINIFERA DICTYOCONUS SP. PRESENT.

945 - 945.6 PACKSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE, PELLET
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): SPARRY CALCITE CEMENT
OTHER FEATURES: MEDIUM RECRYSTALLIZATION
FOSSILS: FOSSIL MOLDS, MOLLUSKS, BENTHIC FORAMINIFERA

945.6- 950 WACKESTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET, CALCILUTITE
75% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: LOW RECRYSTALLIZATION
FOSSILS: FOSSIL MOLDS, MOLLUSKS, BENTHIC FORAMINIFERA

950 - 955 PACKSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
OTHER FEATURES: MEDIUM RECRYSTALLIZATION
FOSSILS: FOSSIL MOLDS, BENTHIC FORAMINIFERA

955 - 959.6 PACKSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
OTHER FEATURES: MEDIUM RECRYSTALLIZATION
FOSSILS: FOSSIL MOLDS, BENTHIC FORAMINIFERA

959.6- 960 PACKSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: LOW RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA

960 - 965 PACKSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: LOW RECRYSTALLIZATION

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                 FOSSILS: BENTHIC FORAMINIFERA

965  -  968.3 WACKESTONE; VERY LIGHT ORANGE
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, PELLET, CALCILUTITE
              80% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE
              MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
              OTHER FEATURES: MEDIUM RECRYSTALLIZATION

968.3-  969   WACKESTONE; VERY LIGHT ORANGE
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, PELLET, CALCILUTITE
              70% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM
              MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              OTHER FEATURES: LOW RECRYSTALLIZATION

969  -  970   PACKSTONE; VERY LIGHT ORANGE
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, PELLET, CALCILUTITE
              75% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM
              MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              OTHER FEATURES: LOW RECRYSTALLIZATION
              FOSSILS: BENTHIC FORAMINIFERA, FOSSIL FRAGMENTS

970  -  972   PACKSTONE; VERY LIGHT ORANGE
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, PELLET, CALCILUTITE
              75% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM
              MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              FOSSILS: BENTHIC FORAMINIFERA, FOSSIL MOLDS

972  -  975   PACKSTONE; VERY LIGHT ORANGE
              POROSITY: INTERGRANULAR
              GRAIN TYPE: BIOGENIC, PELLET, CALCILUTITE
              85% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: COARSE; GOOD INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
              OTHER FEATURES: LOW RECRYSTALLIZATION, FOSSILIFEROUS
              FOSSILS: BENTHIC FORAMINIFERA
              THIS INTERVAL IS SLIGHTLY DARKER THAN PALE ORANGE.

975  -  977.5 PACKSTONE; VERY LIGHT ORANGE
              POROSITY: INTERGRANULAR
              GRAIN TYPE: BIOGENIC, PELLET, CALCILUTITE
              75% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE
              MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              FOSSILS: BENTHIC FORAMINIFERA

977.5-  978.5 WACKESTONE; VERY LIGHT ORANGE
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, PELLET, CALCILUTITE
              70% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM
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MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX

978.5- 980 PACKSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: BIOGENIC, PELLET, CALCILUTITE
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MEDIUM TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: FOSSILIFEROUS, LOW RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA

980 - 984.2 PACKSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: BIOGENIC, PELLET, CALCILUTITE
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MEDIUM TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: FOSSILIFEROUS, LOW RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA

984.2- 985 WACKESTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: BIOGENIC, PELLET, CALCILUTITE
75% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: FOSSILIFEROUS, LOW RECRYSTALLIZATION

985 - 987 WACKESTONE; VERY LIGHT ORANGE TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
FOSSILS: BENTHIC FORAMINIFERA

987 - 988.5 GRAINSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
GRAIN TYPE: CRYSTALS; 90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): SPARRY CALCITE CEMENT
OTHER FEATURES: DOLOMITIC, MEDIUM RECRYSTALLIZATION

988.5- 988.6 GRAINSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
GRAIN TYPE: CRYSTALS; 90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): SPARRY CALCITE CEMENT
OTHER FEATURES: DOLOMITIC

988.6- 990 WACKESTONE; VERY LIGHT ORANGE TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX

990 - 991 PACKSTONE; VERY LIGHT ORANGE

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                POROSITY: INTERGRANULAR, INTERCRYSTALLINE
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                85% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
                GOOD INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
                OTHER FEATURES: DOLOMITIC
                INTERLAYERED WITH SLIGHTLY DOLOMITIC ALTERED LAYERS.
                DOLOMITIC LAYERS BECOME MORE PREVELANT WITH DEPTH.

 991  -  995    DOLOSTONE; GRAYISH BROWN TO DARK YELLOWISH BROWN
                POROSITY: INTERCRYSTALLINE, PIN POINT VUGS, INTERGRANULAR
                50-90% ALTERED; EUHEDRAL
                GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT

 995  -  996    DOLOSTONE; MODERATE YELLOWISH BROWN
                POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 90-100% ALTERED
                EUHEDRAL
                GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT

 996  -  996.8  DOLOSTONE; MODERATE YELLOWISH BROWN TO DARK YELLOWISH BROWN
                POROSITY: INTERCRYSTALLINE, INTERGRANULAR, PIN POINT VUGS
                90-100% ALTERED; EUHEDRAL
                GRAIN SIZE: FINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT

 996.8-  999    DOLOSTONE; DARK YELLOWISH BROWN
                POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 90-100% ALTERED
                EUHEDRAL
                GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT

 999  - 1000    DOLOSTONE; GRAYISH BROWN TO DARK YELLOWISH BROWN
                POROSITY: INTERCRYSTALLINE, VUGULAR; 90-100% ALTERED
                EUHEDRAL
                GRAIN SIZE: MICROCRYSTALLINE
                RANGE: VERY FINE TO MICROCRYSTALLINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                VUGS ARE 3-4MM AND HAVE A DENSITY OF ~05%.

1000  - 1002.1  DOLOSTONE; DARK YELLOWISH BROWN TO GRAYISH BROWN
                POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
                90-100% ALTERED; EUHEDRAL
                GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                VUG DENSITY IS~7-10%.

1002.1- 1005    DOLOSTONE; DARK YELLOWISH BROWN TO MODERATE YELLOWISH BROWN
                POROSITY: INTERCRYSTALLINE, PIN POINT VUGS, VUGULAR
                90-100% ALTERED; EUHEDRAL
                GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: INTERBEDDED
                INTERBEDDED WITH LIGHTER COLORED LAYERS OF DOLOSILT. VUG
                DENSITY IS~15-20%.

1005  - 1008.5  DOLOSTONE; DARK YELLOWISH BROWN TO GRAYISH ORANGE
                POROSITY: INTERCRYSTALLINE, PIN POINT VUGS, INTERGRANULAR
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                50-90% ALTERED; EUHEDRAL
                GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
                SEDIMENTARY STRUCTURES: INTERBEDDED
                MICRITIC INTERLAYERS INCREASE WITH DEPTH.

1008.5- 1009.9 WACKESTONE; VERY LIGHT ORANGE
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                50% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
                MODERATE INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                OTHER FEATURES: DOLOMITIC
                CLASTS WITHIN MICRITIC MATRIX ARE DOLOMITIC.

1009.9- 1010.5 DOLOSTONE; GRAYISH BROWN
                POROSITY: INTERCRYSTALLINE, INTERGRANULAR, PIN POINT VUGS
                50-90% ALTERED; EUHEDRAL
                GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                VUG DENSITY IS ~25%.

1010.5- 1012   DOLOSTONE; DARK YELLOWISH BROWN TO MODERATE YELLOWISH BROWN
                POROSITY: INTERCRYSTALLINE, VUGULAR; 90-100% ALTERED
                EUHEDRAL
                GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                VUGS ARE 2-3MM IN DIAMETER AND HAVE A DENSITY OF ~25-30%.

1012  - 1015   DOLOSTONE; DARK YELLOWISH BROWN
                POROSITY: INTERCRYSTALLINE, PIN POINT VUGS, INTERGRANULAR
                90-100% ALTERED; EUHEDRAL
                GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT

1015  - 1020   DOLOSTONE; DARK YELLOWISH BROWN
                POROSITY: INTERCRYSTALLINE, INTERGRANULAR, PIN POINT VUGS
                90-100% ALTERED; EUHEDRAL
                GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: INTERBEDDED
                THIN LAMINAE OF DOLOSILT 1019.3-1020FT.

1020  - 1020.5 DOLOSTONE; MODERATE YELLOWISH BROWN TO DARK YELLOWISH BROWN
                90-100% ALTERED; EUHEDRAL
                GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: INTERBEDDED
                INTERLAYERED WITH THIN LAMINAE OF DOLOSILT.

1020.5- 1022.5 DOLOSTONE; MODERATE YELLOWISH BROWN
                POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
                90-100% ALTERED; EUHEDRAL
                GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT

1022.5- 1025   DOLOSTONE; MODERATE YELLOWISH BROWN
                POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
                90-100% ALTERED; EUHEDRAL
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              GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
              GOOD INDURATION
              CEMENT TYPE(S): DOLOMITE CEMENT
              INTERLAYERED WITH THIN LAMINAE OF DOLOSILT THAT INCREASES
              WITH DEPTH.

1025  - 1028  DOLOSTONE; GRAYISH BROWN
              POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
              90-100% ALTERED; EUHEDRAL
              GRAIN SIZE: MICROCRYSTALLINE
              RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
              CEMENT TYPE(S): DOLOMITE CEMENT

1028  - 1030  DOLOSTONE; DARK YELLOWISH BROWN TO GRAYISH BROWN
              POROSITY: INTERCRYSTALLINE, VUGULAR, PIN POINT VUGS
              90-100% ALTERED; EUHEDRAL
              GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM; GOOD INDURATION
              CEMENT TYPE(S): DOLOMITE CEMENT
              VUGS VARIED FROM PINPOINT TO 25MM. AND HAVE A DENSITY OF
              ~30%.

1030  - 1031.3 DOLOSTONE; DARK YELLOWISH BROWN TO GRAYISH BROWN
              POROSITY: INTERCRYSTALLINE, VUGULAR, PIN POINT VUGS
              90-100% ALTERED; EUHEDRAL
              GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM; GOOD INDURATION
              CEMENT TYPE(S): DOLOMITE CEMENT
              TEXTURE IS THE SAME AS 1028-130FT.

1031.3- 1031.9 DOLOSTONE; DARK YELLOWISH BROWN TO GRAYISH BROWN
              POROSITY: INTERCRYSTALLINE, VUGULAR, PIN POINT VUGS
              90-100% ALTERED; EUHEDRAL
              GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM; GOOD INDURATION
              CEMENT TYPE(S): DOLOMITE CEMENT

1031.9- 1033.5 WACKESTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
              POROSITY: INTERGRANULAR, MOLDIC
              GRAIN TYPE: INTRACLASTS, CALCILUTITE
              80% ALLOCHEMICAL CONSTITUENTS
              RANGE: MICROCRYSTALLINE TO GRAVEL; MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              SEDIMENTARY STRUCTURES: BRECCIATED
              LARGE,UP TO 20MM, BRECIATED MICROCRYSTALLINE LIMESTONE
              CLASTS.

1033.5- 1034.9 MUDSTONE; VERY LIGHT ORANGE TO WHITE
              GRAIN TYPE: INTRACLASTS, CALCILUTITE
              05% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: MICROCRYSTALLINE
              RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX

1034.9- 1036  DOLOSTONE; DARK YELLOWISH BROWN TO VERY LIGHT ORANGE
              POROSITY: INTERGRANULAR; 50-90% ALTERED
              GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
              GOOD INDURATION
              CEMENT TYPE(S): DOLOMITE CEMENT
              SEDIMENTARY STRUCTURES: BRECCIATED
              CONTAINS BRECCIATED,VERY PALE ORANGE MICRITIC CLASTS
              (2-5MM).

1036  - 1037  AS ABOVE
              50/50 MIX DOLOMITE AND MICRITIC CLASTS.
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1037  - 1040   PACKSTONE; VERY LIGHT ORANGE TO LIGHT GRAY
               POROSITY: INTERGRANULAR
               GRAIN TYPE: INTRACLASTS, PELLET, CALCILUTITE
               80% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: COARSE; RANGE: FINE TO COARSE
               MODERATE INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               FOSSILS: FOSSIL MOLDS, BENTHIC FORAMINIFERA

1040  - 1041.6 PACKSTONE; VERY LIGHT ORANGE TO LIGHT GRAY
               POROSITY: INTERGRANULAR
               GRAIN TYPE: INTRACLASTS, CALCILUTITE
               80% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM
               MODERATE INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               FOSSILS: BENTHIC FORAMINIFERA, FOSSIL MOLDS

1041.6- 1042.8 DOLOSTONE; DARK YELLOWISH BROWN TO VERY LIGHT ORANGE
               POROSITY: INTERGRANULAR; 50-90% ALTERED; SUBHEDRAL
               GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM; GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               SEDIMENTARY STRUCTURES: INTERBEDDED, BRECCIATED
               CONTAINS BRECCIATED MICRITIC CLASTS(2-5MM.DIA.).

1042.8- 1045   MUDSTONE; VERY LIGHT ORANGE
               POROSITY: INTERGRANULAR, LOW PERMEABILITY
               GRAIN TYPE: INTRACLASTS, CALCILUTITE
               05% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: MICROCRYSTALLINE
               RANGE: MICROCRYSTALLINE TO MEDIUM; MODERATE INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               ACCESSORY MINERALS: PYRITE-01%
               DISSEMINATED PYRITE PRESENT AT 1045FT.(<01%).

1045  - 1045.2 MUDSTONE; VERY LIGHT ORANGE
               POROSITY: INTERGRANULAR, LOW PERMEABILITY
               GRAIN TYPE: INTRACLASTS, CALCILUTITE
               05% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: MICROCRYSTALLINE
               RANGE: MICROCRYSTALLINE TO FINE; MODERATE INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX

1045.2- 1050   WACKESTONE; VERY LIGHT ORANGE
               POROSITY: INTERGRANULAR
               GRAIN TYPE: INTRACLASTS, BIOGENIC, PELLET
               75% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO COARSE
               GOOD INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               FOSSILS: BENTHIC FORAMINIFERA, FOSSIL MOLDS

1050  - 1051.5 PACKSTONE; VERY LIGHT ORANGE
               POROSITY: INTERGRANULAR
               GRAIN TYPE: INTRACLASTS, CALCILUTITE, PELLET
               80% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
               MODERATE INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
               OTHER FEATURES: DOLOMITIC
               DOLOMITE ALTERATION OF~20% IS FOUND THROUGHOUT THIS
               INTERVAL.
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1051.5- 1054   DOLOSTONE; DARK YELLOWISH BROWN
               POROSITY: INTERGRANULAR, VUGULAR, PIN POINT VUGS
               90-100% ALTERED; EUHEDRAL
               GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM; GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               VUGS FROM PINPOINT TO 10MM. HAVE A DENSITY OF~25-30%.

1054  - 1055   DOLOSTONE; DARK YELLOWISH BROWN TO VERY LIGHT ORANGE
               50-90% ALTERED; EUHEDRAL
               GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM; GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               SEDIMENTARY STRUCTURES: INTERBEDDED
               INTERLAYERS OF MICRITE PRESENT.

1055  - 1057.5 WACKESTONE; VERY LIGHT ORANGE
               POROSITY: INTERGRANULAR
               GRAIN TYPE: INTRACLASTS, PELLET, CALCILUTITE
               75% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
               MODERATE INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX

1057.5- 1058.7 DOLOSTONE; DARK YELLOWISH BROWN TO VERY LIGHT ORANGE
               POROSITY: INTERGRANULAR, INTERCRYSTALLINE; 50-90% ALTERED
               EUHEDRAL
               GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM
               MODERATE INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
               SEDIMENTARY STRUCTURES: BRECCIATED
               APPROXIMATILY 50/50 MIX OF DOLOMITE AND BRECCIATED MICRITIC
               CLASTS.

1058.7- 1059.9 DOLOSTONE; DARK YELLOWISH BROWN
               POROSITY: INTERCRYSTALLINE, VUGULAR; 90-100% ALTERED
               EUHEDRAL
               GRAIN SIZE: MEDIUM; GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               VUGS 2-5MM. HAVE A DENSITY OF~15-20%.

1059.9- 1060.2 WACKESTONE; VERY LIGHT ORANGE
               POROSITY: INTERGRANULAR
               GRAIN TYPE: INTRACLASTS, CALCILUTITE
               20% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: MICROCRYSTALLINE
               RANGE: MICROCRYSTALLINE TO FINE

1060.2- 1061.5 DOLOSTONE; DARK YELLOWISH BROWN
               POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
               GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
               GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               VUGS 2-10MM HAVE A DENSITY OF ~10%.

1061.5- 1065   WACKESTONE; VERY LIGHT ORANGE
               POROSITY: INTERGRANULAR
               GRAIN TYPE: INTRACLASTS, CALCILUTITE
               75% ALLOCHEMICAL CONSTITUENTS
               GRAIN SIZE: MEDIUM; RANGE: COARSE TO MEDIUM
               MODERATE INDURATION
               CEMENT TYPE(S): CALCILUTITE MATRIX
               POOR RECOVERY.

1065  - 1066   WACKESTONE; VERY LIGHT ORANGE
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POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
75% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
FOSSILS: FOSSIL MOLDS, MOLLUSKS

1066 - 1067 DOLOSTONE; DARK YELLOWISH BROWN
POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
GRAIN SIZE: MEDIUM; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
VUGS 2-8MM. HAVE A DENSITY OF~15%.

1067 - 1067.2 AS ABOVE

1067.2- 1070.2 DOLOSTONE; GRAYISH ORANGE TO VERY LIGHT ORANGE
10-50% ALTERED; EUHEDRAL
GRAIN SIZE: FINE; MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCILUTITE-40%
POOR REVOVERY(ONLY 1FT. RECOVERED FROM INTERVAL
1070-1075FT.).

1070.2- 1075 DOLOSTONE; DARK YELLOWISH BROWN
POROSITY: INTERCRYSTALLINE, VUGULAR; 90-100% ALTERED
EUHEDRAL
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
VUGS 2-7MM. HAVE A DENSITY OF ~15%.

1075 - 1076 DOLOSTONE; DARK YELLOWISH BROWN
POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

1076 - 1077 DOLOSTONE; MODERATE YELLOWISH BROWN
POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; FIBROUS
GRAIN SIZE: FINE; POOR INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: SILT-SIZE DOLOMITE-15%

1077 - 1080 DOLOSTONE; DARK YELLOWISH BROWN
POROSITY: INTERCRYSTALLINE, VUGULAR; 90-100% ALTERED
EUHEDRAL
GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
VUGS 2-4MM. HAVE A DENSITY OF ~07-10%.

1080 - 1081 DOLOSTONE; DARK YELLOWISH BROWN
POROSITY: INTERCRYSTALLINE, VUGULAR; 90-100% ALTERED
EUHEDRAL
GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

1081 - 1085 WACKESTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM

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              MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              OTHER FEATURES: DOLOMITIC

1085  - 1090  WACKESTONE; VERY LIGHT ORANGE TO YELLOWISH GRAY
              POROSITY: INTERGRANULAR
              GRAIN TYPE: INTRACLASTS, CALCILUTITE
              75% ALLOCHEMICAL CONSTITUENTS
              GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
              MODERATE INDURATION
              CEMENT TYPE(S): CALCILUTITE MATRIX
              OTHER FEATURES: MEDIUM RECRYSTALLIZATION

1090  - 1101  DOLOSTONE; DARK YELLOWISH BROWN
              POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
              90-100% ALTERED; EUHEDRAL
              GRAIN SIZE: MICROCRYSTALLINE
              RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
              CEMENT TYPE(S): DOLOMITE CEMENT
              VUG DENSITY ~05-10%.

1101  - 1102  DOLOSTONE; GRAYISH BROWN TO DARK YELLOWISH BROWN
              POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
              GRAIN SIZE: MICROCRYSTALLINE
              RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
              CEMENT TYPE(S): DOLOMITE CEMENT
              OTHER FEATURES: SUCROSIC

1102  - 1105  DOLOSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
              POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
              GRAIN SIZE: MICROCRYSTALLINE
              RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
              CEMENT TYPE(S): DOLOMITE CEMENT
              OTHER FEATURES: SUCROSIC

1105  - 1106  DOLOSTONE; DARK YELLOWISH BROWN
              POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
              GRAIN SIZE: MICROCRYSTALLINE
              RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
              CEMENT TYPE(S): DOLOMITE CEMENT
              OTHER FEATURES: SUCROSIC

1106  - 1108  DOLOSTONE; LIGHT GRAYISH BROWN
              POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
              GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
              GOOD INDURATION
              CEMENT TYPE(S): DOLOMITE CEMENT

1108  - 1109  DOLOSTONE; GRAYISH ORANGE
              POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
              90-100% ALTERED; EUHEDRAL
              GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
              GOOD INDURATION
              CEMENT TYPE(S): DOLOMITE CEMENT

1109  - 1110  DOLOSTONE; LIGHT GRAYISH BROWN
              POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
              GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
              GOOD INDURATION
              CEMENT TYPE(S): DOLOMITE CEMENT

1110  - 1114.5 DOLOSTONE; LIGHT GRAYISH BROWN TO DARK YELLOWISH BROWN
              POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
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GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
OTHER FEATURES: SUCROSIC

1114.5- 1115 DOLOSTONE; DARK YELLOWISH BROWN
POROSITY: INTERCRYSTALLINE, VUGULAR; 90-100% ALTERED
EUHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
VUGS 2-10MM. HAVE A DENSITY OF ~05%.

1115 - 1119.5 DOLOSTONE; DARK YELLOWISH BROWN
POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
90-100% ALTERED; EUHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

1119.5- 1121 DOLOSTONE; BROWNISH GRAY
POROSITY: INTERCRYSTALLINE, VUGULAR; 90-100% ALTERED
EUHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
VUGS 2-5MM. HAVE A DENSITY OF ~20%.

1121 - 1124 DOLOSTONE; BROWNISH GRAY
POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

1124 - 1125 DOLOSTONE; BROWNISH GRAY
POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
OTHER FEATURES: SUCROSIC

1125 - 1130 DOLOSTONE; DARK YELLOWISH BROWN TO GRAYISH BROWN
POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
90-100% ALTERED; EUHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

1130 - 1133 DOLOSTONE; DARK YELLOWISH BROWN TO GRAYISH BROWN
POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
90-100% ALTERED; EUHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
OTHER FEATURES: SUCROSIC

1133 - 1135 DOLOSTONE; BROWNISH GRAY TO DARK YELLOWISH BROWN
POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

1135 - 1138 DOLOSTONE; DARK YELLOWISH BROWN

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                POROSITY: INTERCRYSTALLINE, VUGULAR; 90-100% ALTERED
                EUHEDRAL
                GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                VUGS 2-5MM HAVE A DENSITY OF ~10%.

1138   - 1140   DOLOSTONE; GRAYISH BROWN
                POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
                90-100% ALTERED; EUHEDRAL
                GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                COLOR VARIED FROM VERY PALE ORANCE TO DARK YELLOWISH BROWN.
                AVERAGE COLOR IS PALE YELLOWISH BROWN. VUG DENSITY
                IS~15-20%.

1140   - 1142.1 DOLOSTONE; DARK YELLOWISH BROWN
                POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
                GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT

1142.1- 1145    DOLOSTONE; DARK YELLOWISH BROWN
                POROSITY: INTERCRYSTALLINE, VUGULAR, PIN POINT VUGS
                90-100% ALTERED; EUHEDRAL
                GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                1143.8-1144FT. IS SLIGHTLY DARKER (DUSKY YELLOWISH BROWN).

1145   - 1148   DOLOSTONE; DARK YELLOWISH BROWN TO BROWNISH GRAY
                POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
                GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT

1148   - 1150   DOLOSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
                POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
                90-100% ALTERED; EUHEDRAL
                GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                VUG DENSITY IS~15%.

1150   - 1150.8 AS ABOVE

1150.8- 1151    DOLOSTONE; DARK YELLOWISH BROWN TO BROWNISH GRAY
                POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
                GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT

1151   - 1155   DOLOSTONE; DARK YELLOWISH BROWN TO GRAYISH BROWN
                POROSITY: INTERCRYSTALLINE, VUGULAR, PIN POINT VUGS
                90-100% ALTERED; EUHEDRAL
                GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                ACCESSORY MINERALS: ORGANICS-01%
                VUG SIZE VARIED FROM PINPOINT TO 5MM., DENSITY ~10%. DARK
                BLACK ORGANIC LAMINAE PRESENT AT <01%.
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1155 - 1157.2 DOLOSTONE; DARK YELLOWISH BROWN
POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
90-100% ALTERED; EUHEDRAL
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-01%

1157.2- 1160 DOLOSTONE; GRAYISH BROWN
POROSITY: INTERCRYSTALLINE, MOLDIC; 90-100% ALTERED
EUHEDRAL
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-01%
FOSSILS: FOSSIL MOLDS
VUGS 2-4MM.HAVE A DENSITYOF~20%.

1160 - 1165 DOLOSTONE; DARK YELLOWISH BROWN TO GRAYISH BROWN
POROSITY: INTERCRYSTALLINE, VUGULAR, MOLDIC
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
VUGS 1-3MM HAVE A DENSITY OF ~20%.

1165 - 1168 DOLOSTONE; GRAYISH BROWN TO DARK YELLOWISH BROWN
POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

1168 - 1169.1 DOLOSTONE; GRAYISH BROWN
POROSITY: INTERCRYSTALLINE, VUGULAR, MOLDIC
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
FOSSILS: FOSSIL MOLDS
VUG DENSITY ~20%.

1169.1- 1170 DOLOSTONE; GRAYISH BROWN TO DARK YELLOWISH BROWN
POROSITY: INTERCRYSTALLINE, PIN POINT VUGS, VUGULAR
90-100% ALTERED; EUHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
VUG DENSITY ~10%.

1170 - 1175 DOLOSTONE; DARK YELLOWISH BROWN TO GRAYISH BROWN
POROSITY: INTERCRYSTALLINE, PIN POINT VUGS, VUGULAR
90-100% ALTERED; EUHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
VUG DENSITY IS~20-25%.

1175 - 1178.5 DOLOSTONE; DARK YELLOWISH BROWN TO GRAYISH BROWN
POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
90-100% ALTERED; EUHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION

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                CEMENT TYPE(S): DOLOMITE CEMENT
                VUG DENSITY IS ~10-15%.

 1178.5- 1180   DOLOSTONE; DARK YELLOWISH BROWN
                POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
                GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT

 1180  - 1181.5 DOLOSTONE; DARK YELLOWISH BROWN
                POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
                GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT

 1181.5- 1185   DOLOSTONE; GRAYISH BROWN TO DARK YELLOWISH BROWN
                POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
                GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: STREAKED

 1185  - 1187.8 DOLOSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
                POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
                GRAIN SIZE: VERY FINE
                RANGE: MICROCRYSTALLINE TO VERY FINE; MODERATE INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                THIN ORGANIC LAMINAE THROUGHOUT THIS INTERVAL.

 1187.8- 1189.1 DOLOSTONE; VERY LIGHT ORANGE
                POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
                90-100% ALTERED; EUHEDRAL
                GRAIN SIZE: VERY FINE
                RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                VUG DENSITY IS ~20%.

 1189.1- 1190   DOLOSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
                90-100% ALTERED; EUHEDRAL
                GRAIN SIZE: VERY FINE
                RANGE: MICROCRYSTALLINE TO VERY FINE; MODERATE INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                ACCESSORY MINERALS: ORGANICS-25%
                THIN ORGANIC LAMINAE COMPOSE ~25% OF THIS INTERVAL.

 1190  - 1192.5 DOLOSTONE; DARK YELLOWISH BROWN TO GRAYISH ORANGE
                POROSITY: INTERCRYSTALLINE, VUGULAR, MOLDIC
                90-100% ALTERED; EUHEDRAL
                GRAIN SIZE: VERY FINE
                RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                FOSSILS: FOSSIL MOLDS
                VUGS 1-4MM.HAVE A DENSITY OF ~15-20%.

 1192.5- 1195   DOLOSTONE; GRAYISH BROWN TO GRAYISH ORANGE
                POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
                GRAIN SIZE: VERY FINE
                RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                THIN ORGANIC LAMINAE PRESENT. AT ~1193 THERE IS A SMALL
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DISPLACEMENT OF ~2-3MM. IN THE ORGANIC LAMINAE.

1195 - 1197 DOLOSTONE; GRAYISH BROWN
POROSITY: INTERCRYSTALLINE, VUGULAR; 90-100% ALTERED
EUHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
VUGS 1-5MM. HAVE A DENSITY OF~20%.

1197 - 1200 DOLOSTONE; DARK YELLOWISH BROWN TO GRAYISH BROWN
POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
90-100% ALTERED; EUHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

1200 - 1201 DOLOSTONE; DARK YELLOWISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
SEDIMENTARY STRUCTURES: LAMINATED
THIN ORGANIC LAMINAE PRESENT.

1201 - 1205 DOLOSTONE; GRAYISH BROWN TO DARK YELLOWISH BROWN
POROSITY: INTERCRYSTALLINE, VUGULAR, PIN POINT VUGS
90-100% ALTERED; EUHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-01%
VUG DENSITY VARIES FROM 10-30%.

1205 - 1206 DOLOSTONE; GRAYISH BROWN TO DARK YELLOWISH BROWN
POROSITY: INTERCRYSTALLINE, VUGULAR, PIN POINT VUGS
90-100% ALTERED; EUHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
SEDIMENTARY STRUCTURES: LAMINATED
ACCESSORY MINERALS: ORGANICS-01%
THIN ORGANIC LAMINAE PRESENT.

1206 - 1208 DOLOSTONE; DARK YELLOWISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-01%
1206-1206.1 AND 1207.2-1207.4FT. HAS POOR TO MODERATE
INDURATION.

1208 - 1210 DOLOSTONE; GRAYISH BROWN TO DARK YELLOWISH BROWN
POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
90-100% ALTERED; EUHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
SEDIMENTARY STRUCTURES: LAMINATED
ACCESSORY MINERALS: ORGANICS-01%
THIN DARK YELLOWISH BROWN LAMINAE PRESENT.

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1210  - 1213.5 DOLOSTONE; GRAYISH BROWN
               POROSITY: INTERCRYSTALLINE, VUGULAR; 90-100% ALTERED
               EUHEDRAL
               GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
               GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               VUGS VARIED IN SIZE 1-20MM. SOME HAD A LONG FRACTURE LIKE
               APPEARANCE.

1213.5- 1215   DOLOSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
               POROSITY: INTERCRYSTALLINE, VUGULAR; 90-100% ALTERED
               EUHEDRAL
               GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
               GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               SEDIMENTARY STRUCTURES: INTERBEDDED
               SEVERAL 2IN. THICK, VF GRAIN VUG FREE BEDS PRESENT.

1215  - 1215.2 DOLOSTONE; GRAYISH BROWN
               POROSITY: INTERCRYSTALLINE, VUGULAR; 90-100% ALTERED
               EUHEDRAL
               GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
               GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT

1215.2- 1216.2 DOLOSTONE; GRAYISH BROWN
               POROSITY: INTERCRYSTALLINE, VUGULAR; 90-100% ALTERED
               EUHEDRAL
               GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
               GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT

1216.2- 1220   DOLOSTONE; GRAYISH BROWN TO DARK YELLOWISH BROWN
               POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
               90-100% ALTERED; EUHEDRAL
               GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
               GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               SEDIMENTARY STRUCTURES: LAMINATED
               ACCESSORY MINERALS: ORGANICS-02%
               THIN ORGANIC LAMINAE PRESENT.

1220  - 1221   DOLOSTONE; DARK YELLOWISH BROWN TO GRAYISH BROWN
               POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
               GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM; GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               SEDIMENTARY STRUCTURES: LAMINATED

1221  - 1223.1 DOLOSTONE; GRAYISH ORANGE
               POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
               GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM; GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT

1223.1- 1224.5 DOLOSTONE; VERY LIGHT ORANGE
               POROSITY: INTERCRYSTALLINE, VUGULAR; 90-100% ALTERED
               EUHEDRAL
               GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
               GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT

1224.5- 1225   DOLOSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
               POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; SUBHEDRAL
               GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
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GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

1225 - 1227 DOLOSTONE; VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE; 90-100% ALTERED
GRAIN SIZE: VERY FINE
RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

1227 - 1228 DOLOSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE; 50-90% ALTERED
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
SEDIMENTARY STRUCTURES: LAMINATED
ACCESSORY MINERALS: ORGANICS-03%, CALCILUTITE-07%

1228 - 1230 DOLOSTONE; GRAYISH BROWN
POROSITY: INTERCRYSTALLINE, VUGULAR, MOLDIC
90-100% ALTERED; EUHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-01%
OTHER FEATURES: GREASY

1230 - 1234 DOLOSTONE; GRAYISH BROWN
POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: ORGANICS-05%
ORGANIC RICH LAMINAE LAYERS 1231.4-1233FT.

1234 - 1235 DOLOSTONE; DARK YELLOWISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: VERY FINE
RANGE: MICROCRYSTALLINE TO VERY FINE; MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
OTHER FEATURES: SUCROSIC

1235 - 1240 DOLOSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 50-90% ALTERED
SUBHEDRAL
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
SEDIMENTARY STRUCTURES: LAMINATED

1240 - 1243.3 DOLOSTONE; VERY LIGHT ORANGE TO DARK YELLOWISH BROWN
POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 50-90% ALTERED
SUBHEDRAL
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
SEDIMENTARY STRUCTURES: LAMINATED
ACCESSORY MINERALS: ORGANICS-10%
OTHER FEATURES: GREASY
THIN ORGANIC LAMINAE PRESENT.

1243.3- 1245 DOLOSTONE; VERY LIGHT ORANGE TO DARK YELLOWISH BROWN
POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 50-90% ALTERED
ANHEDRAL

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                              ROMP 41.TOR
                GRAIN SIZE: MICROCRYSTALLINE
                RANGE: MICROCRYSTALLINE TO VERY FINE; MODERATE INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                HIGHLYALTERED VERY PALE ORANGE DOLOMITE CLASTS
                (5-10MM)PRESENT.

 1245  - 1247.4 SILT-SIZE DOLOMITE; VERY LIGHT ORANGE TO DARK YELLOWISH BROWN
                MODERATE INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                THIN ORGANIC LAMINAE PRESENT.

 1247.4- 1250   DOLOSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
                POROSITY: INTERGRANULAR, INTERCRYSTALLINE, MOLDIC
                50-90% ALTERED
                GRAIN SIZE: MICROCRYSTALLINE
                RANGE: MICROCRYSTALLINE TO VERY FINE; MODERATE INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                OTHER FEATURES: SUCROSIC

 1250  - 1252.5 DOLOSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
                POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 50-90% ALTERED
                SUBHEDRAL
                GRAIN SIZE: MICROCRYSTALLINE
                RANGE: MICROCRYSTALLINE TO VERY FINE; MODERATE INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                OTHER FEATURES: GREASY, MEDIUM RECRYSTALLIZATION
                THIN ORGANIC LAMINAE PRESENT.

 1252.5- 1255   SILT-SIZE DOLOMITE; VERY LIGHT ORANGE TO GRAYISH BROWN
                POROSITY: INTERGRANULAR, INTERCRYSTALLINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                ACCESSORY MINERALS: ORGANICS-01%

 1255  - 1260   SILT-SIZE DOLOMITE; VERY LIGHT ORANGE TO GRAYISH BROWN
                POROSITY: INTERGRANULAR, INTERCRYSTALLINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                ACCESSORY MINERALS: ORGANICS-02%

 1260  - 1262   SILT-SIZE DOLOMITE; VERY LIGHT ORANGE TO GRAYISH BROWN
                POROSITY: INTERGRANULAR, INTERCRYSTALLINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                ACCESSORY MINERALS: ORGANICS-05%
                THIN ORGANIC LAMINAE PRESENT.

 1262  - 1263   DOLOSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
                POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 90-100% ALTERED
                EUHEDRAL
                GRAIN SIZE: VERY FINE
                RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                ACCESSORY MINERALS: ORGANICS-02%

 1263  - 1265   DOLOSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
                POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
                GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
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GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

1265 - 1270 DOLOSTONE; DARK YELLOWISH BROWN TO GRAYISH BROWN
POROSITY: INTERCRYSTALLINE, VUGULAR; 90-100% ALTERED
EUHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
SEDIMENTARY STRUCTURES: LAMINATED
ACCESSORY MINERALS: ORGANICS-01%

1270 - 1271.3 DOLOSTONE; GRAYISH BROWN
POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
90-100% ALTERED; EUHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
SLICKENLINES PRESENT(1270.9-1271.3FT.).

1271.3- 1272.5 DOLOSTONE; GRAYISH BROWN
POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

1272.5- 1273 SILT-SIZE DOLOMITE; DARK YELLOWISH BROWN TO GRAYISH BROWN
POROSITY: INTERCRYSTALLINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
SEDIMENTARY STRUCTURES: LAMINATED
ACCESSORY MINERALS: ORGANICS-20%
ORGANIC LAMINAE PRESENT.

1273 - 1275 DOLOSTONE; GRAYISH BROWN
POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
90-100% ALTERED; EUHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
SEDIMENTARY STRUCTURES: LAMINATED
ACCESSORY MINERALS: ORGANICS-03%

1275 - 1280 DOLOSTONE; GRAYISH BROWN TO DARK YELLOWISH BROWN
POROSITY: INTERCRYSTALLINE, VUGULAR, PIN POINT VUGS
90-100% ALTERED; EUHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
SEDIMENTARY STRUCTURES: LAMINATED
ACCESSORY MINERALS: ORGANICS-10%
THIN ORGANIC LAMINAE PRESENT.

1280 - 1283.2 DOLOSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 90-100% ALTERED
SUBHEDRAL
GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
SEDIMENTARY STRUCTURES: LAMINATED

1283.2- 1284 DOLOSTONE; MODERATE YELLOWISH BROWN
POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 90-100% ALTERED
SUBHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE

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                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED

1284   - 1285   DOLOSTONE; GRAYISH ORANGE TO GRAYISH BROWN
                POROSITY: INTERCRYSTALLINE, VUGULAR; 90-100% ALTERED
                SUBHEDRAL
                GRAIN SIZE: VERY FINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT

1285   - 1289   DOLOSTONE; GRAYISH BROWN
                POROSITY: INTERCRYSTALLINE, VUGULAR; 90-100% ALTERED
                SUBHEDRAL
                GRAIN SIZE: VERY FINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT

1289   - 1290   DOLOSTONE; GRAYISH ORANGE TO GRAYISH BROWN
                POROSITY: INTERCRYSTALLINE, VUGULAR; 90-100% ALTERED
                FIBROUS
                GRAIN SIZE: VERY FINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                VUGS 1-15MM. HAVE A DENSITY OF 20%.

1290   - 1290.5 AS ABOVE

1290.5- 1292    DOLOSTONE; MODERATE YELLOWISH BROWN TO DARK YELLOWISH BROWN
                POROSITY: INTERCRYSTALLINE, VUGULAR; 90-100% ALTERED
                EUHEDRAL
                GRAIN SIZE: FINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT

1292   - 1294   DOLOSTONE; DARK YELLOWISH BROWN TO MODERATE YELLOWISH BROWN
                POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
                GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                ACCESSORY MINERALS: ORGANICS-40%
                THIS INTERVAL HAS A HIGH DENSITY OF THIN ORGANIC LAMINAE.

1294   - 1295   DOLOSTONE; GRAYISH BROWN
                POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
                GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                ACCESSORY MINERALS: ORGANICS-02%

1295   - 1296.5 DOLOSTONE; GRAYISH BROWN
                POROSITY: INTERCRYSTALLINE, VUGULAR, PIN POINT VUGS
                90-100% ALTERED; EUHEDRAL
                GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT

1296.5- 1298    DOLOSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
                POROSITY: INTERCRYSTALLINE, VUGULAR; 90-100% ALTERED
                EUHEDRAL
                GRAIN SIZE: FINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED, MOTTLED

1298   - 1300   DOLOSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
                POROSITY: INTERCRYSTALLINE, VUGULAR; 90-100% ALTERED
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                EUHEDRAL
                GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT

1300   - 1305   DOLOSTONE; VERY LIGHT ORANGE
                POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
                GRAIN SIZE: FINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT

1305   - 1307   DOLOSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
                POROSITY: INTERCRYSTALLINE, VUGULAR; 90-100% ALTERED
                EUHEDRAL
                GRAIN SIZE: FINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                ACCESSORY MINERALS: ORGANICS-01%

1307   - 1310   DOLOSTONE; VERY LIGHT ORANGE
                POROSITY: INTERCRYSTALLINE, VUGULAR; 90-100% ALTERED
                EUHEDRAL
                GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: MOTTLED
                VUGS 2-10MM. HAVE A DENSITY OF ~10%.

1310   - 1312.1 DOLOSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
                POROSITY: INTERCRYSTALLINE, VUGULAR; 90-100% ALTERED
                EUHEDRAL
                GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                VUGS 2-5MM. HAVE A DENSITY OF ~15-20%.

1312.1- 1315    DOLOSTONE; GRAYISH BROWN TO DARK YELLOWISH BROWN
                POROSITY: INTERCRYSTALLINE, VUGULAR; 90-100% ALTERED
                EUHEDRAL
                GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                ACCESSORY MINERALS: ORGANICS-07%
                VUGS 2-20MM. PRESENT BETWEEN 1312.6-1313.1FT.. THIN ORGANIC
                LAMINAE PRESENT BETWEEN 1314-1315FT.

1315   - 1316.5 DOLOSTONE; MODERATE YELLOWISH BROWN
                POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 90-100% ALTERED
                EUHEDRAL
                GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT

1316.5- 1320    DOLOSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
                POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
                90-100% ALTERED; SUBHEDRAL
                GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                DARK YELLOWISH BROWN LAMINATION PRESEN 1318.5-1319FT.

1320   - 1323.5 DOLOSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
                POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
                GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
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1323.5- 1325   DOLOSTONE; VERY LIGHT ORANGE
               POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; SUBHEDRAL
               GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
               GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               SEDIMENTARY STRUCTURES: LAMINATED
               THIN DARK YELLOWISH BROWN LAMINATION PRESENT 1323-1323.5FT.

1325  - 1325.2 DOLOSTONE; VERY LIGHT ORANGE
               POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 50-90% ALTERED
               SUBHEDRAL
               GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO MEDIUM
               GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               OTHER FEATURES: GREASY, MEDIUM RECRYSTALLIZATION

1325.2- 1330   DOLOSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
               POROSITY: INTERCRYSTALLINE, VUGULAR, MOLDIC
               90-100% ALTERED; EUHEDRAL
               GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM; GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               SEDIMENTARY STRUCTURES: LAMINATED
               ACCESSORY MINERALS: ORGANICS-01%
               THIN ORGANIC LAMINAE PRESENT AT 1329.3.

1330  - 1334.5 DOLOSTONE; VERY LIGHT ORANGE
               POROSITY: INTERCRYSTALLINE, PIN POINT VUGS, MOLDIC
               90-100% ALTERED; EUHEDRAL
               GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
               GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               SEDIMENTARY STRUCTURES: LAMINATED
               OTHER FEATURES: GREASY, MEDIUM RECRYSTALLIZATION
               VUG DENSITY IS ~15%.

1334.5- 1335   DOLOSTONE; VERY LIGHT ORANGE
               POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 90-100% ALTERED
               SUBHEDRAL
               GRAIN SIZE: VERY FINE; GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               SEDIMENTARY STRUCTURES: MOTTLED

1335  - 1340   DOLOSTONE; VERY LIGHT ORANGE
               POROSITY: INTERCRYSTALLINE, VUGULAR; 90-100% ALTERED
               EUHEDRAL
               GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
               GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               VUGS 1-4MM PRESENT WITH A DENSITY OF 25%.

1340  - 1342.5 DOLOSTONE; MODERATE YELLOWISH BROWN
               POROSITY: INTERCRYSTALLINE, PIN POINT VUGS; 50-90% ALTERED
               SUBHEDRAL
               GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
               GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               SEDIMENTARY STRUCTURES: MOTTLED

1342.5- 1343.5 DOLOSTONE; VERY LIGHT ORANGE
               POROSITY: INTERCRYSTALLINE, PIN POINT VUGS; 50-90% ALTERED
               SUBHEDRAL
               GRAIN SIZE: VERY FINE
               RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
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                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                OTHER FEATURES: SUCROSIC
                THIN ORGANIC LAMINAE PRESENT AT1342.5-1342.9FT.

1343.5- 1345    DOLOSTONE; VERY LIGHT ORANGE
                POROSITY: INTERCRYSTALLINE, VUGULAR, MOLDIC
                50-90% ALTERED; SUBHEDRAL
                GRAIN SIZE: VERY FINE
                RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                OTHER FEATURES: GREASY, MEDIUM RECRYSTALLIZATION
                VUG DENSITY IS ~10%.

1345  - 1347    DOLOSTONE; VERY LIGHT ORANGE
                POROSITY: INTERCRYSTALLINE, VUGULAR; 50-90% ALTERED
                SUBHEDRAL
                GRAIN SIZE: VERY FINE
                RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                OTHER FEATURES: GREASY, MEDIUM RECRYSTALLIZATION

1347  - 1350    DOLOSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
                POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; SUBHEDRAL
                GRAIN SIZE: VERY FINE
                RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                ACCESSORY MINERALS: ORGANICS-05%
                THIN ORGANIC LAMINAE PRESENT AT 1347-1347.5
                AND1348.5-1348.8FT.

1350  - 1352.5 DOLOSTONE; VERY LIGHT ORANGE TO DARK YELLOWISH BROWN
                POROSITY: INTERCRYSTALLINE, PIN POINT VUGS, INTERGRANULAR
                50-90% ALTERED; SUBHEDRAL
                GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO MEDIUM
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                THIN DARK BROWN LAMINAE PRESENT.

1352.5- 1354    DOLOSTONE; GRAYISH BROWN
                POROSITY: INTERCRYSTALLINE, VUGULAR; 90-100% ALTERED
                EUHEDRAL
                GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                ACCESSORY MINERALS: ORGANICS-03%
                THIN DARK BROWN LAMINAE PRESENT AT 1352.5-1352.7FT.

1354  - 1354.2 DOLOSTONE; GRAYISH BROWN TO DARK YELLOWISH BROWN
                POROSITY: INTERCRYSTALLINE, VUGULAR; 90-100% ALTERED
                EUHEDRAL
                GRAIN SIZE: MEDIUM; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: MOTTLED
                ACCESSORY MINERALS: ORGANICS-25%
                DOLOMITIC CONGLOMERATE WITH ORGANIC MATRIX, (CLAST SIZE
                1-12MM).

1354.2- 1355.2 DOLOSTONE; MODERATE YELLOWISH BROWN TO GRAYISH ORANGE
                POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
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                 90-100% ALTERED; EUHEDRAL
                 GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM; GOOD INDURATION
                 CEMENT TYPE(S): DOLOMITE CEMENT

1355.2- 1356.2 DOLOSTONE; MODERATE YELLOWISH BROWN TO DARK YELLOWISH BROWN
                 POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
                 GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
                 GOOD INDURATION
                 CEMENT TYPE(S): DOLOMITE CEMENT

1356.2- 1360   DOLOSTONE; MODERATE YELLOWISH BROWN TO GRAYISH ORANGE
                 POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
                 GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM; GOOD INDURATION
                 CEMENT TYPE(S): DOLOMITE CEMENT
                 SEDIMENTARY STRUCTURES: LAMINATED, MOTTLED, BRECCIATED
                 ACCESSORY MINERALS: ORGANICS-10%
                 THIN ORGANIC LAMINAE PRESENT. PORTIONS OF THIS INTERVAL
                 HAVE A BRECCIATED APPEARANCE.

1360  - 1361.5 DOLOSTONE; VERY LIGHT ORANGE
                 POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
                 GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
                 GOOD INDURATION
                 CEMENT TYPE(S): DOLOMITE CEMENT

1361.5- 1363.5 DOLOSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
                 POROSITY: INTERCRYSTALLINE, VUGULAR; 90-100% ALTERED
                 EUHEDRAL
                 GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
                 GOOD INDURATION
                 CEMENT TYPE(S): DOLOMITE CEMENT
                 VUG DENSITY IS~15%.

1363.5- 1365   DOLOSTONE; VERY LIGHT ORANGE TO DARK YELLOWISH BROWN
                 POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; SUBHEDRAL
                 GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM
                 GOOD INDURATION
                 CEMENT TYPE(S): DOLOMITE CEMENT
                 SEDIMENTARY STRUCTURES: MOTTLED
                 ACCESSORY MINERALS: ORGANICS-15%

1365  - 1369   DOLOSTONE; VERY LIGHT ORANGE
                 POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
                 90-100% ALTERED; SUBHEDRAL
                 GRAIN SIZE: MICROCRYSTALLINE
                 RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
                 CEMENT TYPE(S): DOLOMITE CEMENT
                 OTHER FEATURES: SUCROSIC
                 VUGDENSITY IS~20%.

1369  - 1370   DOLOSTONE; GRAYISH ORANGE TO GRAYISH BROWN
                 POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
                 90-100% ALTERED; EUHEDRAL
                 GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
                 GOOD INDURATION
                 CEMENT TYPE(S): DOLOMITE CEMENT
                 VUG DENSITY IS~25%.

1370  - 1370.3 DOLOSTONE; GRAYISH ORANGE TO GRAYISH BROWN
                 POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; EUHEDRAL
                 GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
                 GOOD INDURATION
                 CEMENT TYPE(S): DOLOMITE CEMENT
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1370.3- 1373.5 DOLOSTONE; GRAYISH BROWN
               POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
               90-100% ALTERED; SUBHEDRAL
               GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
               GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               VUG DENSITY IS ~15-20%.

1373.5- 1375   DOLOSTONE; LIGHT GRAYISH BROWN TO GRAYISH ORANGE
               POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
               90-100% ALTERED; SUBHEDRAL
               GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
               GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               SEDIMENTARY STRUCTURES: LAMINATED
               VUG DENSITY IS ~10-15%.

1375  - 1380   DOLOSTONE; DARK YELLOWISH BROWN TO GRAYISH BROWN
               POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
               90-100% ALTERED; SUBHEDRAL
               GRAIN SIZE: FINE; RANGE: VERY FINE TO FINE
               GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               SEDIMENTARY STRUCTURES: LAMINATED
               VUG DENSITY IS ~10%. THIN ORGANIC LAMINAE PRESENT
               1375-1376FT.

1380  - 1381.7 DOLOSTONE; GRAYISH ORANGE TO VERY LIGHT ORANGE
               POROSITY: INTERCRYSTALLINE, INTERGRANULAR, PIN POINT VUGS
               90-100% ALTERED; SUBHEDRAL
               GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
               GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               VUG DENSITY IS ~15-20%.

1381.7- 1385   DOLOSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
               POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 90-100% ALTERED
               ANHEDRAL
               GRAIN SIZE: VERY FINE; MODERATE INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               SEDIMENTARY STRUCTURES: MOTTLED, BRECCIATED

1385  - 1387.9 DOLOSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
               POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
               90-100% ALTERED; SUBHEDRAL
               GRAIN SIZE: VERY FINE; GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               SEDIMENTARY STRUCTURES: LAMINATED, MOTTLED
               VUG DENSITY IS ~20-25%. ORGANIC LAMINAE AND MOTTLING
               PRESENT 1386.8-1387.9FT.

1387.9- 1390   SILT-SIZE DOLOMITE; VERY LIGHT ORANGE
               POROSITY: INTERCRYSTALLINE; GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               POOR INDURATION 1389.8-1390FT. EUHEDRAL MEDIUM GRAIN SIZE
               CRYSTALS ACCOUNT FOR~03%.

1390  - 1391.7 AS ABOVE

1391.7- 1395   DOLOSTONE; VERY LIGHT ORANGE
               POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
               90-100% ALTERED; SUBHEDRAL
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                GRAIN SIZE: VERY FINE
                RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                ACCESSORY MINERALS: ORGANICS-01%
                VUG DENSITY IS ~25-30%. THIN ORGANIC LAMINAE PRESENT.

1395   - 1400   DOLOSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
                POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
                90-100% ALTERED; EUHEDRAL
                GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO MEDIUM
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                THIN ORGANIC LAMINAE PRESENT.

1400   - 1400.4 AS ABOVE

1400.4- 1405    DOLOSTONE; VERY LIGHT ORANGE
                POROSITY: INTERCRYSTALLINE, PIN POINT VUGS; 50-90% ALTERED
                EUHEDRAL
                GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO COARSE
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                ACCESSORY MINERALS: LIMESTONE-05%
                COARSE GRAIN CRYSTALS DENSITY, UP TO 20% IN SOME PARTS OF
                THIS INTERVAL. VUG DENSITY IS ~15-20%.

1405   - 1409   MUDSTONE; WHITE
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                10% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
                GOOD INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                ACCESSORY MINERALS: DOLOMITE-50%
                OTHER FEATURES: DOLOMITIC
                DOLOMITE ALTERATION IS ~40-50%.

1409   - 1410   SILT-SIZE DOLOMITE; VERY LIGHT ORANGE
                POROSITY: INTERCRYSTALLINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                ACCESSORY MINERALS: LIMESTONE-25%
                FOSSILS: FOSSIL MOLDS

1410   - 1411   DOLOSTONE; VERY LIGHT ORANGE
                POROSITY: INTERCRYSTALLINE, PIN POINT VUGS; 50-90% ALTERED
                SUBHEDRAL
                GRAIN SIZE: MICROCRYSTALLINE
                RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                FOSSILS: FOSSIL MOLDS, MOLLUSKS
                VUG DENSITY IS ~07%.

1411   - 1411.9 DOLOSTONE; VERY LIGHT ORANGE
                POROSITY: INTERCRYSTALLINE, VUGULAR; 50-90% ALTERED
                SUBHEDRAL
                GRAIN SIZE: VERY FINE
                RANGE: MICROCRYSTALLINE TO VERY FINE; MODERATE INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                OTHER FEATURES: SUCROSIC
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VUGS UP TO 20MM. HAVE A DENSITY OF~30%.

1411.9- 1413 DOLOSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
SEDIMENTARY STRUCTURES: LAMINATED
MED SIZE DOLOMITE CRYSTALS FOUND WITHIN LAYERS OF ORGANIC LAMINAE.

1413 - 1415 DOLOSTONE; VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE, VUGULAR; 50-90% ALTERED SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: LAMINATED
ACCESSORY MINERALS: LIMESTONE-10%, ORGANICS-01%
FOSSILS: FOSSIL MOLDS
VUG DENSITY IS ~20%.

1415 - 1416.8 AS ABOVE

1416.8- 1417 DOLOSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: LAMINATED
ACCESSORY MINERALS: ORGANICS-01%

1417 - 1418.6 MUDSTONE; VERY LIGHT ORANGE TO WHITE
POROSITY: INTERGRANULAR, LOW PERMEABILITY
GRAIN TYPE: INTRACLASTS, CALCILUTITE
05% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO VERY FINE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: LAMINATED

1418.6- 1420 DOLOSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE; MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: MOTTLED
ACCESSORY MINERALS: LIMESTONE-15%
FOSSILS: FOSSIL MOLDS

1420 - 1424 DOLOSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE, PIN POINT VUGS; 50-90% ALTERED SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
SEDIMENTARY STRUCTURES: LAMINATED
VUG DENSITY IS ~15%.

1424 - 1426 DOLOSTONE; WHITE TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE, INTERGRANULAR, VUGULAR
10-50% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX

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                APPROXIMATILY 50% DOLOMITE ALTERATION.

1426  - 1426    AS ABOVE

1426  - 1427.7  DOLOSTONE; VERY LIGHT ORANGE
                POROSITY: INTERCRYSTALLINE, PIN POINT VUGS; 10-50% ALTERED
                SUBHEDRAL
                GRAIN SIZE: MICROCRYSTALLINE
                RANGE: MICROCRYSTALLINE TO MEDIUM; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                ACCESSORY MINERALS: LIMESTONE-15%
                THIN ORGANIC LAMINAE PRESENT. VUG DENSITY IS ~20%.

1427.7- 1428.8  DOLOSTONE; VERY LIGHT ORANGE
                POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; EUHEDRAL
                GRAIN SIZE: MEDIUM; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT

1428.8- 1430    DOLOSTONE; VERY LIGHT ORANGE
                POROSITY: INTERCRYSTALLINE, VUGULAR; 50-90% ALTERED
                SUBHEDRAL
                GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                FOSSILS: FOSSIL MOLDS, MOLLUSKS

1430  - 1435    SILT-SIZE DOLOMITE; VERY LIGHT ORANGE
                POROSITY: INTERCRYSTALLINE, LOW PERMEABILITY
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED

1435  - 1436.5  SILT-SIZE DOLOMITE; VERY LIGHT ORANGE
                POROSITY: INTERCRYSTALLINE, LOW PERMEABILITY
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT

1436.5- 1438.7  SILT-SIZE DOLOMITE; GRAYISH BROWN TO VERY LIGHT ORANGE
                POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
                MODERATE INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                VUGDENSITY IS ~15-20%.

1438.7- 1440    SILT-SIZE DOLOMITE; GRAYISH BROWN TO VERY LIGHT ORANGE
                POROSITY: INTERCRYSTALLINE, VUGULAR, PIN POINT VUGS
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: MOTTLED

1440  - 1445    SILT-SIZE DOLOMITE; GRAYISH BROWN TO VERY LIGHT ORANGE
                POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
                MODERATE INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: MOTTLED, LAMINATED

1445  - 1446    DOLOSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
                POROSITY: INTERCRYSTALLINE, PIN POINT VUGS; 50-90% ALTERED
                EUHEDRAL
                GRAIN SIZE: VERY FINE
                RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: MOTTLED
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1446 - 1447	DOLOSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE POROSITY: INTERCRYSTALLINE, PIN POINT VUGS; 50-90% ALTERED EUHEDRAL GRAIN SIZE: VERY FINE RANGE: MICROCRYSTALLINE TO VERY FINE; MODERATE INDURATION CEMENT TYPE(S): DOLOMITE CEMENT SEDIMENTARY STRUCTURES: MOTTLED	
1447 - 1450	DOLOSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE POROSITY: INTERCRYSTALLINE, PIN POINT VUGS; 50-90% ALTERED SUBHEDRAL GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE GOOD INDURATION CEMENT TYPE(S): DOLOMITE CEMENT SEDIMENTARY STRUCTURES: LAMINATED, MOTTLED	
1450 - 1452.1	DOLOSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; ANHEDRAL GRAIN SIZE: MICROCRYSTALLINE; GOOD INDURATION CEMENT TYPE(S): DOLOMITE CEMENT	
1452.1- 1454.8	DOLOSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE POROSITY: INTERCRYSTALLINE, PIN POINT VUGS; 50-90% ALTERED SUBHEDRAL GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE GOOD INDURATION CEMENT TYPE(S): DOLOMITE CEMENT SEDIMENTARY STRUCTURES: LAMINATED ACCESSORY MINERALS: ORGANICS-01%	
1454.8- 1455	DOLOSTONE; VERY LIGHT ORANGE TO DARK YELLOWISH BROWN POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; ANHEDRAL GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE MODERATE INDURATION CEMENT TYPE(S): DOLOMITE CEMENT SEDIMENTARY STRUCTURES: LAMINATED COARSE GRAIN EUHEDRAL DOLOMITE CRYSTALS FOUND ALONG LAMINATIONS.	
1455 - 1460	SILT-SIZE DOLOMITE; GRAYISH BROWN POROSITY: INTERCRYSTALLINE, INTERGRANULAR; GOOD INDURATION CEMENT TYPE(S): DOLOMITE CEMENT SEDIMENTARY STRUCTURES: LAMINATED, MOTTLED ACCESSORY MINERALS: ORGANICS-01%	
1460 - 1464.5	SILT-SIZE DOLOMITE; GRAYISH BROWN TO VERY LIGHT ORANGE POROSITY: INTERCRYSTALLINE; GOOD INDURATION CEMENT TYPE(S): DOLOMITE CEMENT SEDIMENTARY STRUCTURES: LAMINATED ACCESSORY MINERALS: ORGANICS-02% FOSSILS: FOSSIL MOLDS	
1464.5- 1465	SILT-SIZE DOLOMITE; VERY LIGHT ORANGE TO GRAYISH BROWN POROSITY: INTERCRYSTALLINE, INTERGRANULAR; GOOD INDURATION CEMENT TYPE(S): DOLOMITE CEMENT SEDIMENTARY STRUCTURES: LAMINATED ACCESSORY MINERALS: ORGANICS-01% COARSE GRAIN EUHEDRAL DOLOMITE CRYSTALS COMPOSE ~03% OF THIS INTERVAL.	
1465 - 1466.2	AS ABOVE	

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1466.2- 1469.4 DOLOSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
               POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; ANHEDRAL
               GRAIN SIZE: MICROCRYSTALLINE
               RANGE: MICROCRYSTALLINE TO COARSE; GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               SEDIMENTARY STRUCTURES: LAMINATED, MOTTLED
               ACCESSORY MINERALS: ORGANICS-02%

1469.4- 1470   SILT-SIZE DOLOMITE; VERY LIGHT ORANGE
               POROSITY: INTERCRYSTALLINE, INTERGRANULAR
               MODERATE INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
               ACCESSORY MINERALS: CALCILUTITE-05%

1470  - 1473.8 SILT-SIZE DOLOMITE; VERY LIGHT ORANGE
               POROSITY: INTERCRYSTALLINE, INTERGRANULAR; GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
               SEDIMENTARY STRUCTURES: LAMINATED
               ACCESSORY MINERALS: CALCILUTITE-05%

1473.8- 1475.2 SILT-SIZE DOLOMITE; VERY LIGHT ORANGE
               POROSITY: INTERCRYSTALLINE, INTERGRANULAR; POOR INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
               02% COARSE GRAIN EUHEDRAL DOLOMITE CRYSTALS PRESENT.

1475.2- 1480   SILT-SIZE DOLOMITE; VERY LIGHT ORANGE
               POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
               GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               SEDIMENTARY STRUCTURES: LAMINATED
               ACCESSORY MINERALS: ORGANICS-05%

1480  - 1483   DOLOSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
               POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; SUBHEDRAL
               GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
               GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               SEDIMENTARY STRUCTURES: LAMINATED
               ACCESSORY MINERALS: ORGANICS-02%
               FOSSILS: FOSSIL MOLDS

1483  - 1485   DOLOSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
               POROSITY: INTERCRYSTALLINE, PIN POINT VUGS; 50-90% ALTERED
               ANHEDRAL
               GRAIN SIZE: MICROCRYSTALLINE
               RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               SEDIMENTARY STRUCTURES: LAMINATED
               INTERLAYERED WITH VUG DENSE LAYERS.

1485  - 1490   DOLOSTONE; VERY LIGHT ORANGE
               POROSITY: INTERCRYSTALLINE, PIN POINT VUGS; 50-90% ALTERED
               ANHEDRAL
               GRAIN SIZE: MICROCRYSTALLINE
               RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               SEDIMENTARY STRUCTURES: LAMINATED, MOTTLED

1490  - 1493.5 DOLOSTONE; VERY LIGHT ORANGE TO WHITE
               POROSITY: INTERCRYSTALLINE, PIN POINT VUGS; 50-90% ALTERED
               ANHEDRAL
               GRAIN SIZE: MICROCRYSTALLINE
               RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
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                 CEMENT TYPE(S): DOLOMITE CEMENT
                 SEDIMENTARY STRUCTURES: LAMINATED
                 THIN ORGANIC LAMINAE PRESENT.

1493.5- 1495     DOLOSTONE; VERY LIGHT ORANGE
                 POROSITY: INTERCRYSTALLINE, FRACTURE; 50-90% ALTERED
                 ANHEDRAL
                 GRAIN SIZE: MICROCRYSTALLINE; GOOD INDURATION
                 CEMENT TYPE(S): DOLOMITE CEMENT
                 SEDIMENTARY STRUCTURES: LAMINATED
                 THIN ORGANIC LAMINAE PRESENT.

1495   - 1500    DOLOSTONE; VERY LIGHT ORANGE TO WHITE
                 POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; ANHEDRAL
                 GRAIN SIZE: MICROCRYSTALLINE; MODERATE INDURATION
                 CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX

1500   - 1503.6  DOLOSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
                 POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; SUBHEDRAL
                 GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
                 GOOD INDURATION
                 CEMENT TYPE(S): DOLOMITE CEMENT
                 SEDIMENTARY STRUCTURES: LAMINATED
                 THIN ORGANIC LAMINAE PRESENT.

1503.6- 1505     DOLOSTONE; VERY LIGHT ORANGE
                 POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; SUBHEDRAL
                 GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
                 GOOD INDURATION
                 CEMENT TYPE(S): DOLOMITE CEMENT
                 SEDIMENTARY STRUCTURES: LAMINATED
                 THIN ORGANIC LAMINAE PRESENT.

1505   - 1507    DOLOSTONE; VERY LIGHT ORANGE
                 POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; SUBHEDRAL
                 GRAIN SIZE: FINE; RANGE: FINE TO MEDIUM; GOOD INDURATION
                 CEMENT TYPE(S): DOLOMITE CEMENT

1507   - 1510    DOLOSTONE; VERY LIGHT ORANGE
                 POROSITY: INTERCRYSTALLINE, VUGULAR; 50-90% ALTERED
                 SUBHEDRAL
                 GRAIN SIZE: MICROCRYSTALLINE
                 RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
                 CEMENT TYPE(S): DOLOMITE CEMENT
                 SEDIMENTARY STRUCTURES: LAMINATED
                 VUGS 10-40MM ARE LINED WITH SECONDARY EUHEDRAL CALCITE
                 CRYSTALS.

1510   - 1512    MUDSTONE; VERY LIGHT ORANGE TO WHITE
                 GRAIN TYPE: INTRACLASTS, CALCILUTITE, CRYSTALS
                 25% ALLOCHEMICAL CONSTITUENTS
                 GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO COARSE
                 MODERATE INDURATION
                 CEMENT TYPE(S): CALCILUTITE MATRIX
                 SEDIMENTARY STRUCTURES: BANDED
                 ACCESSORY MINERALS: DOLOMITE-20%

1512   - 1514    LIMESTONE; DARK YELLOWISH BROWN TO VERY LIGHT ORANGE
                 GRAIN TYPE: INTRACLASTS, CALCILUTITE, CRYSTALS
                 60% ALLOCHEMICAL CONSTITUENTS
                 GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
                 MODERATE INDURATION
                 CEMENT TYPE(S): CALCILUTITE MATRIX
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                SEDIMENTARY STRUCTURES: MOTTLED
                DARK YELLOWISH BROWN PORTION OF MOTTLING IS COMPOSED OF
                MED-COARSE GRAIN CALCITE CRYSTALS.

 1514  - 1515   MUDSTONE; VERY LIGHT ORANGE
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                05% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MICROCRYSTALLINE
                RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                SEDIMENTARY STRUCTURES: LAMINATED
                OTHER FEATURES: DOLOMITIC
                THIN DARK BROWN LAMINATIONS

 1515  - 1520   MUDSTONE; VERY LIGHT ORANGE
                POROSITY: INTERGRANULAR
                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                10% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: MICROCRYSTALLINE
                RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX
                SEDIMENTARY STRUCTURES: LAMINATED
                OTHER FEATURES: DOLOMITIC

 1520  - 1523.7 DOLOSTONE; VERY LIGHT ORANGE
                POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; ANHEDRAL
                GRAIN SIZE: MICROCRYSTALLINE
                RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                ACCESSORY MINERALS: ORGANICS-10%
                THIN ORGANIC LAMINAE PRESENT. SEVERAL GYPSUM/ANHYDRATE
                NODULES (5-20MM) PRESENT.

 1523.7- 1525   DOLOSTONE; VERY LIGHT ORANGE
                POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; SUBHEDRAL
                GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                ACCESSORY MINERALS: ORGANICS-05%

 1525  - 1530   DOLOSTONE; VERY LIGHT ORANGE
                POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; SUBHEDRAL
                GRAIN SIZE: MICROCRYSTALLINE
                RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                ACCESSORY MINERALS: ORGANICS-10%, GYPSUM-10%
                ANHYDRITE-05%
                GYPSUM LIGHT GRAY 5-30MM PRESENT. THIN ORGANIC LAMINAE
                PRESENT.

 1530  - 1531.5 DOLOSTONE; VERY LIGHT ORANGE
                POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; ANHEDRAL
                GRAIN SIZE: MICROCRYSTALLINE
                RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED

 1531.5- 1533   WACKESTONE; VERY LIGHT ORANGE
                POROSITY: INTERGRANULAR
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                GRAIN TYPE: INTRACLASTS, CALCILUTITE
                20% ALLOCHEMICAL CONSTITUENTS
                GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
                GOOD INDURATION
                CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                ACCESSORY MINERALS: ORGANICS-05%, GYPSUM-10%
                OTHER FEATURES: DOLOMITIC
                LT.GRAY ANHEDRAL GYPSUM 2-15MM PRESENT

1533  - 1535    DOLOSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
                POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; SUBHEDRAL
                GRAIN SIZE: MICROCRYSTALLINE
                RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: MOTTLED
                ACCESSORY MINERALS: GYPSUM-30%, ANHYDRITE-10%

1535  - 1540.2  DOLOSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
                POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; ANHEDRAL
                GRAIN SIZE: MICROCRYSTALLINE
                RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                ACCESSORY MINERALS: GYPSUM-25%, ANHYDRITE-15%

1540.2- 1542.5  GYPSUM; VERY LIGHT ORANGE TO GRAYISH BROWN
                POROSITY: INTERCRYSTALLINE, LOW PERMEABILITY
                GOOD INDURATION
                CEMENT TYPE(S): GYPSUM CEMENT
                ACCESSORY MINERALS: GYPSUM-85%, ANHYDRITE-15%

1542.5- 1545    GYPSUM; LIGHT BROWNISH GRAY TO WHITE
                POROSITY: INTERCRYSTALLINE, LOW PERMEABILITY
                GOOD INDURATION
                CEMENT TYPE(S): GYPSUM CEMENT
                ACCESSORY MINERALS: GYPSUM-95%, ANHYDRITE-05%

1545  - 1546    GYPSUM; LIGHT BROWNISH GRAY
                POROSITY: INTERCRYSTALLINE, LOW PERMEABILITY
                GOOD INDURATION
                CEMENT TYPE(S): GYPSUM CEMENT
                ACCESSORY MINERALS: GYPSUM-95%, ANHYDRITE-05%
                AT 1545-1545.1 GYPSUM IS TRANSLUCENT.

1546  - 1550    DOLOSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
                POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 50-90% ALTERED
                SUBHEDRAL
                GRAIN SIZE: VERY FINE
                RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                ACCESSORY MINERALS: GYPSUM-15%
                FOSSILS: FOSSIL MOLDS

1550  - 1551.5  DOLOSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
                POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 50-90% ALTERED
                SUBHEDRAL
                GRAIN SIZE: VERY FINE
                RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                ACCESSORY MINERALS: GYPSUM-25%
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                 FOSSILS: FOSSIL MOLDS

 1551.5- 1555    DOLOSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
                 POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; SUBHEDRAL
                 GRAIN SIZE: VERY FINE
                 RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
                 CEMENT TYPE(S): DOLOMITE CEMENT
                 SEDIMENTARY STRUCTURES: MOTTLED
                 ACCESSORY MINERALS: GYPSUM-25%, ANHYDRITE-02%

 1555  - 1560    DOLOSTONE; GRAYISH ORANGE TO LIGHT GRAY
                 POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; ANHEDRAL
                 GRAIN SIZE: VERY FINE
                 RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
                 CEMENT TYPE(S): DOLOMITE CEMENT
                 SEDIMENTARY STRUCTURES: MOTTLED, LAMINATED
                 ACCESSORY MINERALS: GYPSUM-40%, ANHYDRITE-02%

 1560  - 1565    DOLOSTONE; VERY LIGHT ORANGE TO LIGHT GRAY
                 POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; SUBHEDRAL
                 GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
                 GOOD INDURATION
                 CEMENT TYPE(S): DOLOMITE CEMENT
                 SEDIMENTARY STRUCTURES: LAMINATED, MOTTLED
                 ACCESSORY MINERALS: GYPSUM-15%, ANHYDRITE-01%
                 ORGANICS-01%

 1565  - 1570    DOLOSTONE; VERY LIGHT ORANGE TO LIGHT GRAY
                 POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; SUBHEDRAL
                 GRAIN SIZE: VERY FINE
                 RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
                 CEMENT TYPE(S): DOLOMITE CEMENT
                 SEDIMENTARY STRUCTURES: LAMINATED
                 ACCESSORY MINERALS: GYPSUM-20%

 1570  - 1574    DOLOSTONE; VERY LIGHT ORANGE
                 POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; ANHEDRAL
                 GRAIN SIZE: VERY FINE
                 RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
                 CEMENT TYPE(S): DOLOMITE CEMENT
                 ACCESSORY MINERALS: GYPSUM-25%

 1574  - 1575    DOLOSTONE; VERY LIGHT ORANGE
                 POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; ANHEDRAL
                 GRAIN SIZE: VERY FINE
                 RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
                 CEMENT TYPE(S): DOLOMITE CEMENT
                 SEDIMENTARY STRUCTURES: LAMINATED
                 20 X40MM GYPSUM NODULE AT 1579.1FT. GYPSUM LAYER WITH
                 ANHYDRATE CLASTS AT 1576.8-1577FT.

 1575  - 1579.6  DOLOSTONE; VERY LIGHT ORANGE
                 POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; ANHEDRAL
                 GRAIN SIZE: MICROCRYSTALLINE
                 RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
                 CEMENT TYPE(S): DOLOMITE CEMENT
                 SEDIMENTARY STRUCTURES: LAMINATED

 1579.6- 1580    DOLOSTONE; VERY LIGHT ORANGE
                 POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; SUBHEDRAL
                 GRAIN SIZE: VERY FINE
                 RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
                 CEMENT TYPE(S): DOLOMITE CEMENT
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1580  - 1581   DOLOSTONE; VERY LIGHT ORANGE
               POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; SUBHEDRAL
               GRAIN SIZE: VERY FINE
               RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT

1581  - 1583.8 DOLOSTONE; VERY LIGHT ORANGE
               POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; SUBHEDRAL
               GRAIN SIZE: MICROCRYSTALLINE
               RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT

1583.8- 1585   DOLOSTONE; VERY LIGHT ORANGE
               POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; SUBHEDRAL
               GRAIN SIZE: MICROCRYSTALLINE
               RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               ACCESSORY MINERALS: GYPSUM-20%

1585  - 1589   GYPSUM; LIGHT GRAY TO WHITE
               POROSITY: INTERCRYSTALLINE; GOOD INDURATION
               CEMENT TYPE(S): GYPSUM CEMENT, ANHYDRITE CEMENT
               ACCESSORY MINERALS: GYPSUM-65%, DOLOMITE-20%
               ANHYDRITE-15%
               MAJORITY OF DOLOMITE CONCENTRATED BETWEEN 1585.5-1586.7FT.

1589  - 1590   GYPSUM; LIGHT GRAY TO WHITE
               POROSITY: INTERCRYSTALLINE; GOOD INDURATION
               CEMENT TYPE(S): GYPSUM CEMENT, ANHYDRITE CEMENT
               ACCESSORY MINERALS: GYPSUM-65%, DOLOMITE-20%
               ANHYDRITE-15%

1590  - 1593.6 DOLOSTONE; VERY LIGHT ORANGE
               POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; ANHEDRAL
               GRAIN SIZE: MICROCRYSTALLINE; GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               SEDIMENTARY STRUCTURES: LAMINATED

1593.6- 1595.8 GYPSUM; LIGHT GRAY TO WHITE
               POROSITY: INTERCRYSTALLINE; GOOD INDURATION
               CEMENT TYPE(S): GYPSUM CEMENT, ANHYDRITE CEMENT
               ACCESSORY MINERALS: GYPSUM-75%, ANHYDRITE-10%
               DOLOMITE-15%

1595.8- 1598.8 DOLOSTONE; VERY LIGHT ORANGE
               POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; ANHEDRAL
               GRAIN SIZE: MICROCRYSTALLINE
               RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               SEDIMENTARY STRUCTURES: LAMINATED
               ACCESSORY MINERALS: GYPSUM-03%

1598.8- 1600   DOLOSTONE; VERY LIGHT ORANGE
               POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; ANHEDRAL
               GRAIN SIZE: MICROCRYSTALLINE
               RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
               CEMENT TYPE(S): DOLOMITE CEMENT
               SEDIMENTARY STRUCTURES: LAMINATED
               ACCESSORY MINERALS: GYPSUM-10%, ANHYDRITE-03%
               GYPSUM AND ANHYDRATE CONCENTRATED BETWEEN 1598.8-1599.1FT.

1600  - 1605   DOLOSTONE; VERY LIGHT ORANGE
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                POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; SUBHEDRAL
                GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
                GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                ACCESSORY MINERALS: GYPSUM-15%, ANHYDRITE-02%
                SEVERAL NODULE LIKE SECTIONS OF GYPSUM.

1605  - 1608    GYPSUM; LIGHT BROWNISH GRAY TO DARK YELLOWISH BROWN
                POROSITY: INTERCRYSTALLINE; GOOD INDURATION
                CEMENT TYPE(S): GYPSUM CEMENT
                ACCESSORY MINERALS: GYPSUM-95%, ANHYDRITE-02%
                DOLOMITE-03%

1608  - 1609.6  GYPSUM; LIGHT BROWNISH GRAY TO DARK YELLOWISH BROWN
                POROSITY: INTERCRYSTALLINE; GOOD INDURATION
                CEMENT TYPE(S): GYPSUM CEMENT
                ACCESSORY MINERALS: GYPSUM-95%, ANHYDRITE-02%
                DOLOMITE-03%

1609.6- 1610.7  DOLOSTONE; VERY LIGHT ORANGE TO LIGHT BROWNISH GRAY
                POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; ANHEDRAL
                GRAIN SIZE: VERY FINE
                RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                ACCESSORY MINERALS: GYPSUM-40%, ANHYDRITE-10%

1610.7- 1612.8  DOLOSTONE; VERY LIGHT ORANGE
                POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; ANHEDRAL
                GRAIN SIZE: MICROCRYSTALLINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                THIN ORGANIC LAMINAE PRESENT.

1612.8- 1615    DOLOSTONE; VERY LIGHT ORANGE
                POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; SUBHEDRAL
                GRAIN SIZE: VERY FINE
                RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                SEDIMENTARY STRUCTURES: LAMINATED
                ACCESSORY MINERALS: GYPSUM-20%

1615  - 1617.2  DOLOSTONE; VERY LIGHT ORANGE
                POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; SUBHEDRAL
                GRAIN SIZE: VERY FINE
                RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                ACCESSORY MINERALS: GYPSUM-25%

1617.2- 1620    DOLOSTONE; VERY LIGHT ORANGE
                POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; SUBHEDRAL
                GRAIN SIZE: VERY FINE
                RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
                ACCESSORY MINERALS: GYPSUM-10%

1620  - 1621    AS ABOVE

1621  - 1625    DOLOSTONE; VERY LIGHT ORANGE
                POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; ANHEDRAL
                GRAIN SIZE: MICROCRYSTALLINE
                RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
                CEMENT TYPE(S): DOLOMITE CEMENT
```

SEDIMENTARY STRUCTURES: LAMINATED
ACCESSORY MINERALS: GYPSUM-05%

1625 - 1626.5 DOLOSTONE; VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

1626.5- 1630 DOLOSTONE; VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
SEDIMENTARY STRUCTURES: LAMINATED
ACCESSORY MINERALS: GYPSUM-20%, ANHYDRITE-02%
ORGANICS-03%
SEVERAL NODULE LIKE GYPSUM DEPOSITS. THIN ORGANIC LAMINAE
PRESENT.

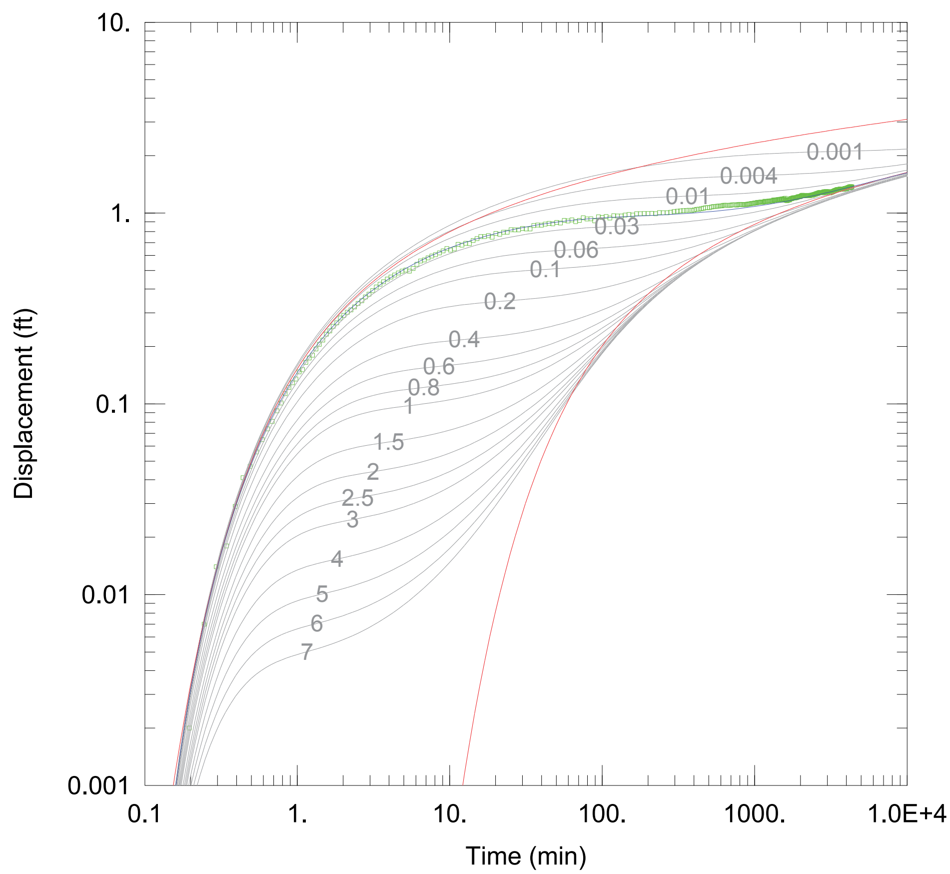
1630 - 1635 DOLOSTONE; VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
SEDIMENTARY STRUCTURES: LAMINATED
ACCESSORY MINERALS: GYPSUM-10%, ORGANICS-03%

1635 - 1640 DOLOSTONE; VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE; 90-100% ALTERED; ANHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
SEDIMENTARY STRUCTURES: LAMINATED
ACCESSORY MINERALS: GYPSUM-20%, ORGANICS-01%

1640 TOTAL DEPTH

Appendix E

Analytical Solutions and Curve-Match Analyses of Aquifer Performance Tests



SURFICIAL APT

Data Set: D:\MyFiles 2\R41APTs\Surficial\R41SurfAPT_Neuman(dd).aqt
Date: 06/10/12 Time: 17:49:36

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: Hardee County
Test Well: Surficial Monitor
Test Date: 4/2/07

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
Surficial Monitor	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
Surficial OB	25.5	0

SOLUTION

Aquifer Model: Unconfined

Solution Method: Neuman

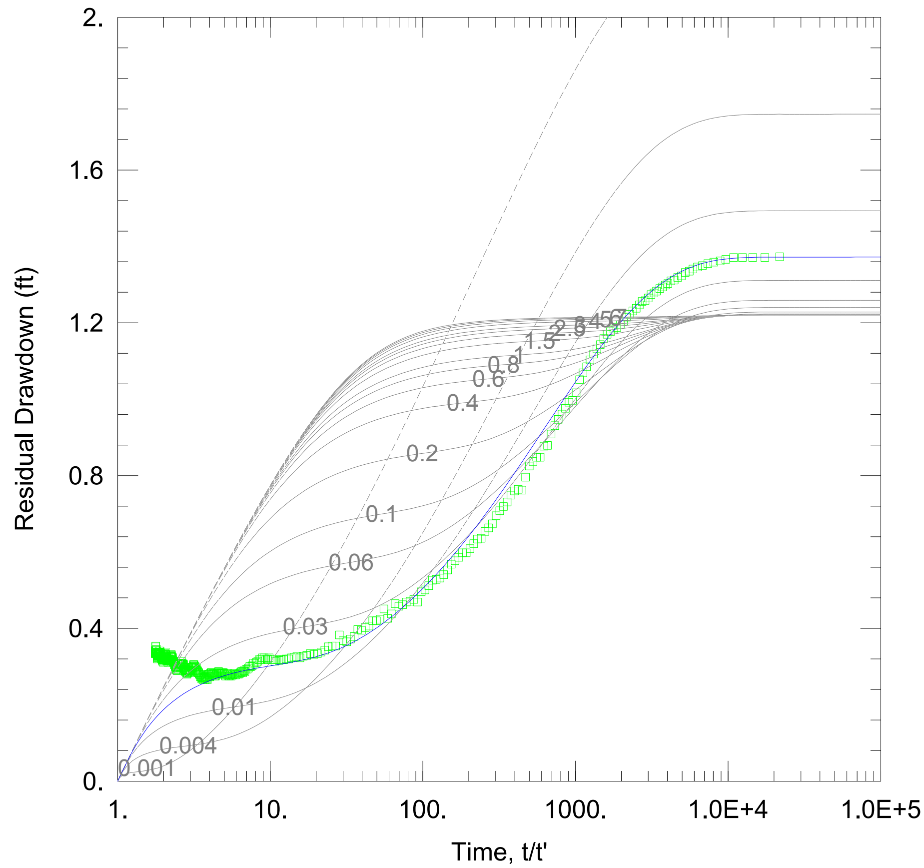
T = 547.7 ft^2/day

Sy = 0.1234

S = 0.00156

ß = 0.02124

Appendix E, Figure E.1, surficial aquifer performance test analysis, drawdown phase, Neuman solution.



SURFICIAL APT

Data Set: D:\MyFiles 2\R41APTs\Surficial\R41SurfAPT_Neuman(rec).aqt
Date: 06/10/12 Time: 17:53:41

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: Hardee County
Test Well: Surficial Monitor
Test Date: 4/2/07

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
Surficial Monitor	0	0

Observation Wells

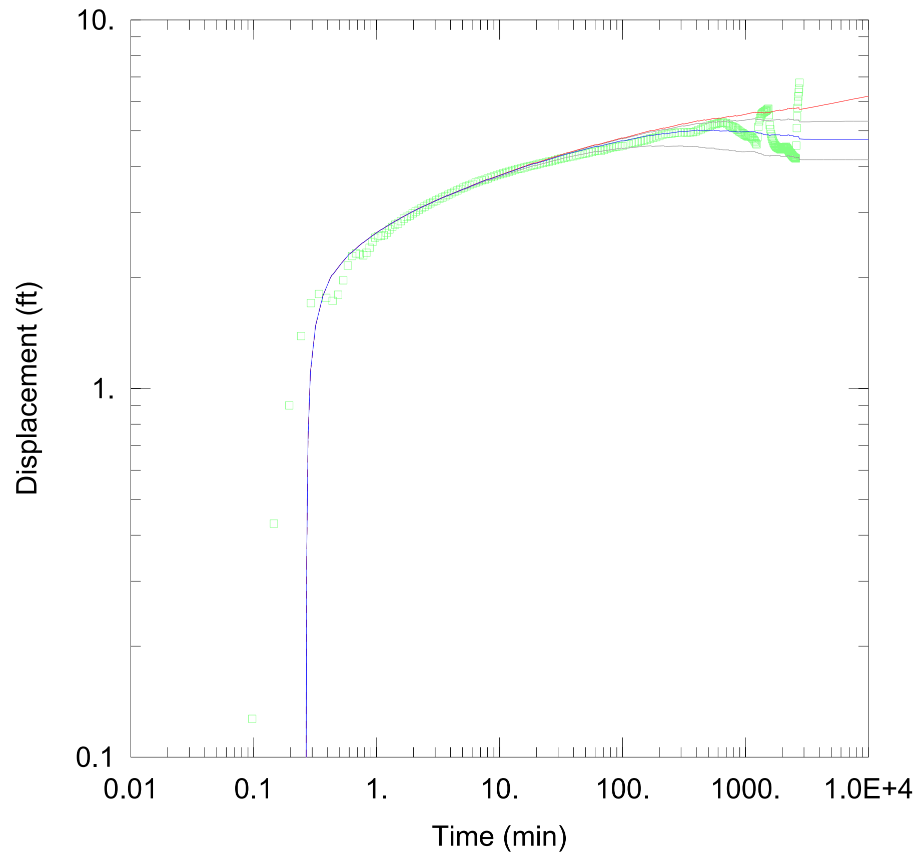
Well Name	X (ft)	Y (ft)
Surficial OB	0	25.5

SOLUTION

Aquifer Model: Unconfined
Solution Method: Neuman

T = 511.1 ft^2/day
S = 0.003005
Sy = 0.1793
ß = 0.01878

Appendix E, Figure E.2, surficial aquifer performance test analysis, recovery phase, Neuman solution.



LOWER ARCADIA AQUIFER APT

Data Set: D:\MyFiles 2\R41APTs\LAA\R41LAAdd_H-J.aqt
Date: 06/10/12 Time: 17:54:24

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41
Location: Hardee Co., near Wauchula, FL
Test Well: LAA PW
Test Date: 11/27-29/07

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
LAA PW	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
LAA OB	0	100

SOLUTION

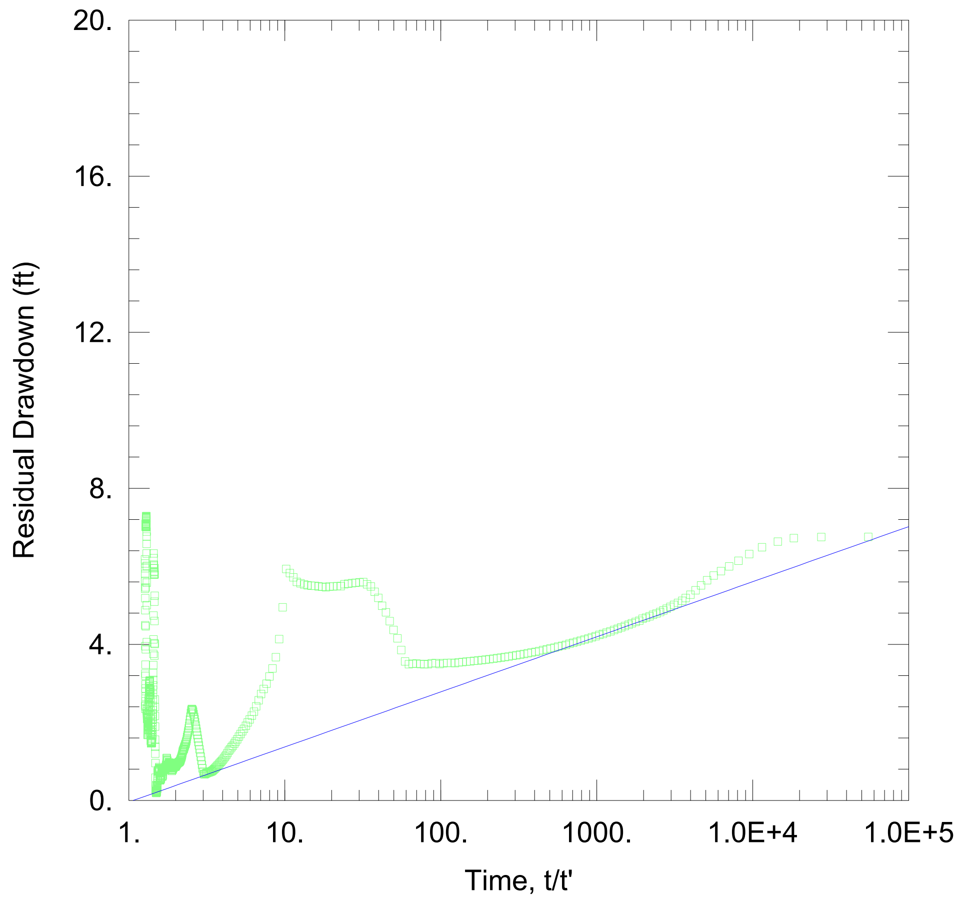
Aquifer Model: Leaky

Solution Method: Hantush-Jacob

T = 6266.5 ft^2/day
r/B = 0.003526
b = 26. ft

S = 2.764E-6
Kz/Kr = 0.1

Appendix E, Figure E.3, lower Arcadia aquifer performance test analysis, drawdown phase, Hantush-Jacob solution.



LOWER ARCADIA APT

Data Set: D:\MyFiles 2\R41APTs\LAA\R41LAArec_Theis.aqt
Date: 06/10/12 Time: 18:17:18

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41
Location: Hardee Co., near Wauchula, FL
Test Well: IAS PW
Test Date: 11/27-29/07

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
LAA PW	0	0

Observation Wells

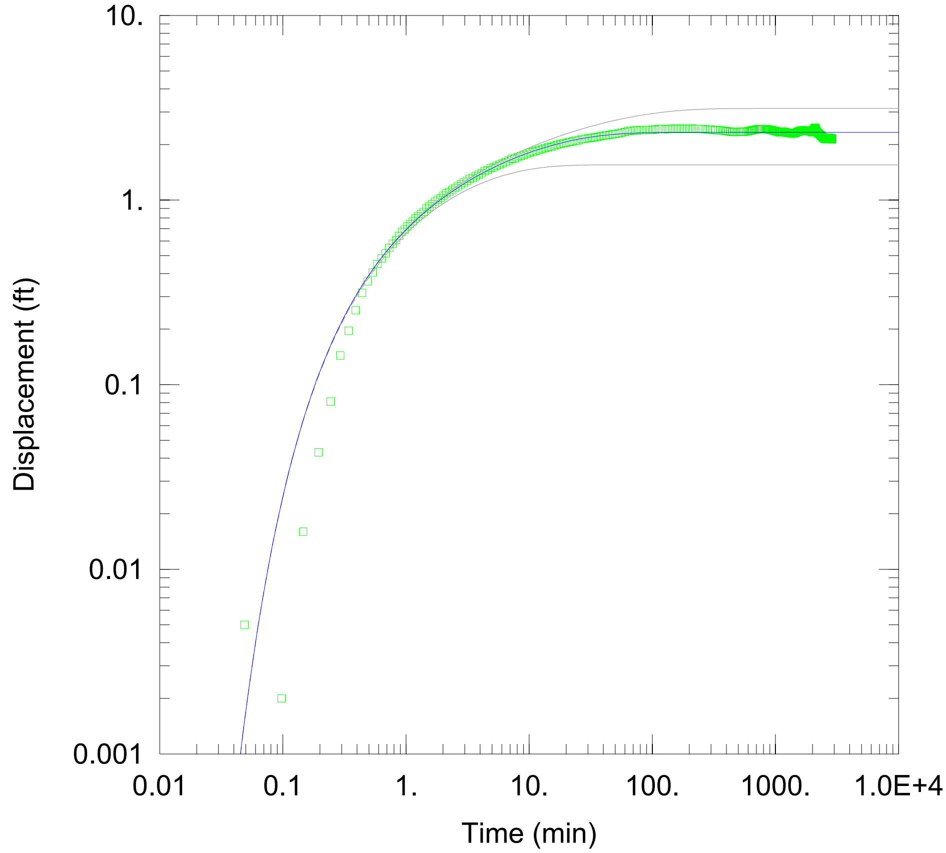
Well Name	X (ft)	Y (ft)
LAA OB	0	100

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Recovery)

T = 4473. ft^2/day S/S' = 1.071

Appendix E, Figure E.4, lower Arcadia aquifer performance test analysis, recovery phase, Theis solution.



SUWANNEE APT

Data Set: D:\MyFiles 2\R41APTs\Suwannee\SuwAPTddOB_full-p_H-J.aqt
Date: 06/10/12 Time: 17:56:09

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: Hardee County
Test Well: Suwannee Monitor
Test Date: 4/16/07

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
Suwannee PW	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
Suwannee OB	0	184.2

SOLUTION

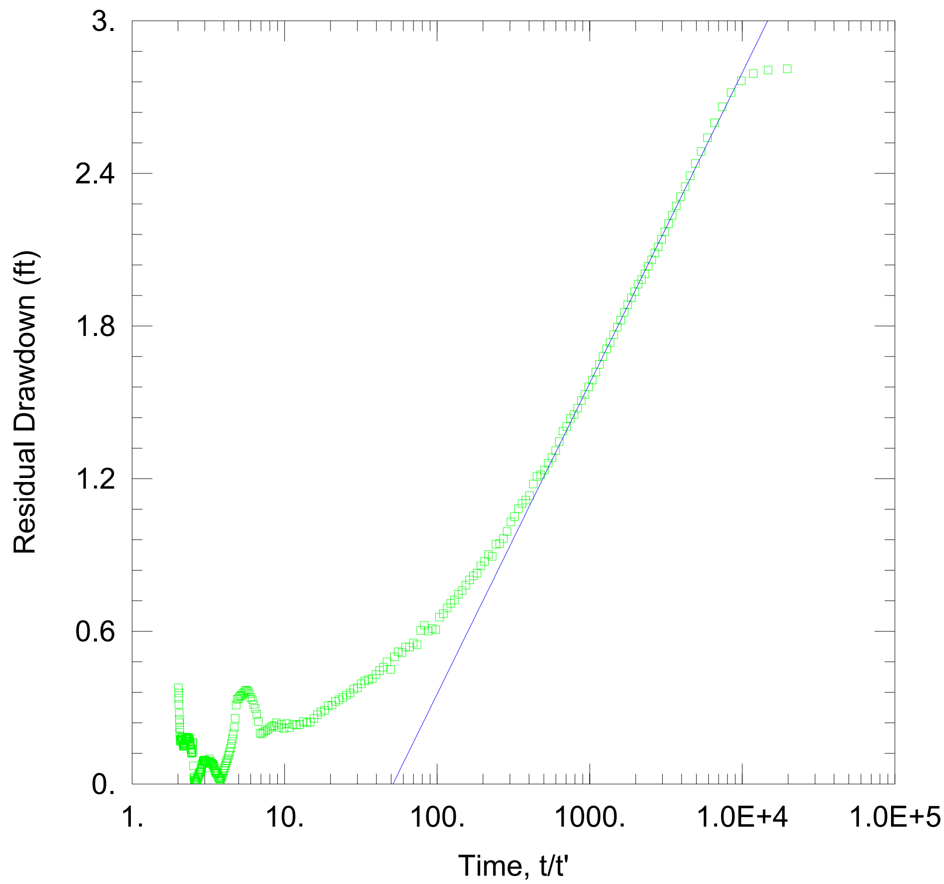
Aquifer Model: Leaky

Solution Method: Hantush-Jacob

T = 5982.9 ft^2/day
r/B = 0.1613
b = 106.5 ft

S = 0.0001036
Kz/Kr = 0.1

Appendix E, Figure E.5, Suwannee permeable zone aquifer performance test analysis, drawdown phase, Hantush-Jacob solution.



SUWANNEE APT

Data Set: D:\MyFiles 2\R41APTs\Suwannee\SuwAPTrecOB_part_p_Theis.aqt
Date: 06/10/12 Time: 17:57:08

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: Hardee County
Test Well: Suwannee Monitor
Test Date: 4/16/07

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
Suwannee PW	0	0

Observation Wells

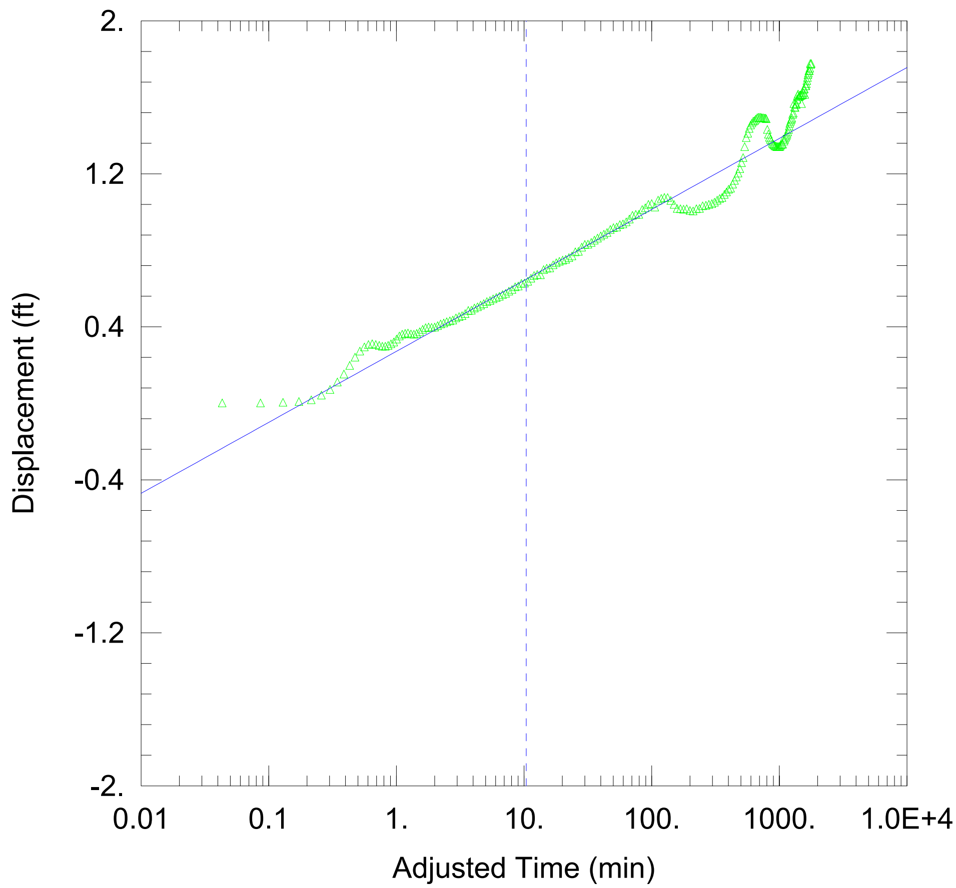
Well Name	X (ft)	Y (ft)
Suwannee OB	0	183.7

SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Recovery)

T = 6700.9 ft^2/day
S/S' = 51.36

Appendix E, Figure E.6, Suwannee permeable zone aquifer performance test analysis, recovery phase, Theis solution.



AVON PARK APT

Data Set: D:\MyFiles 2\R41APTs\Avon Park\AvPkAPT_C-J_dd-OB.aqt
Date: 06/10/12 Time: 17:58:00

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: Near Wauchula, Hardee Co., FL
Test Well: von Park Monitor
Test Date: 4/30/07

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
Avon Park Monitor	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
△ Avon Park OB	0	205

SOLUTION

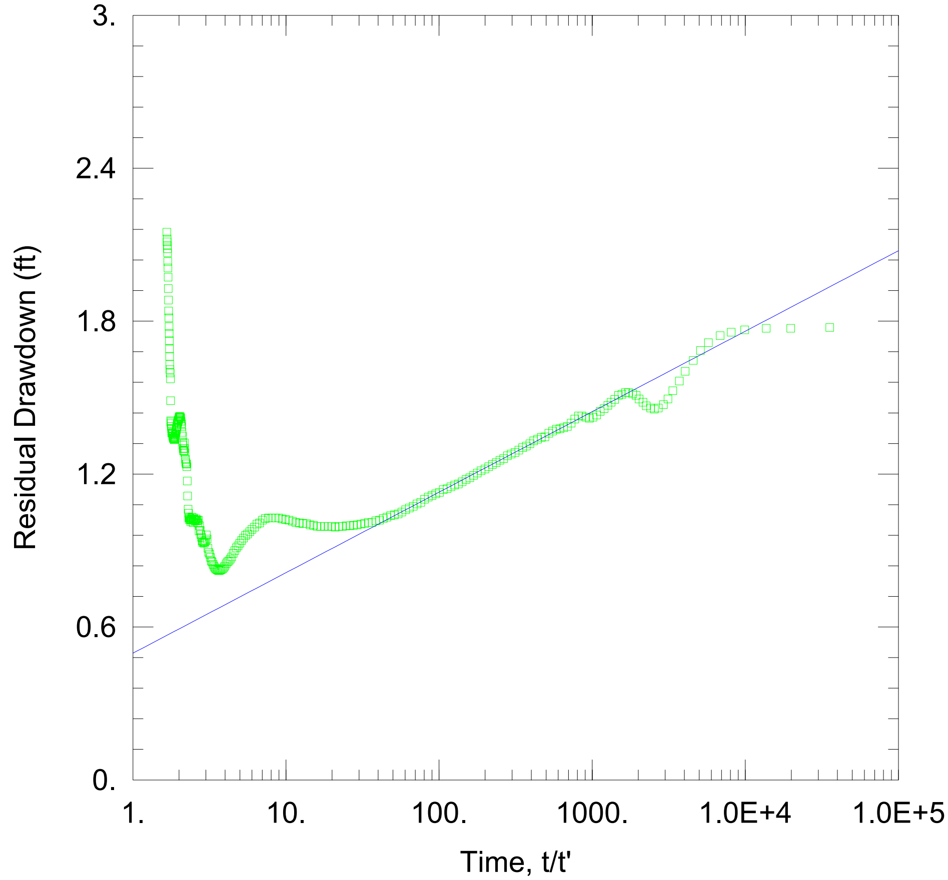
Aquifer Model: Confined

Solution Method: Cooper-Jacob

T = 2.205E+5 ft^2/day

S = 0.001519

Appendix E, Figure E.7, Avon Park permeable zone aquifer performance test analysis, drawdown phase, Cooper-Jacob solution.



AVON PARK APT

Data Set: D:\MyFiles 2\R41APTs\Avon Park\AvPkAPT_Theis(Rec).aqt
Date: 06/10/12 Time: 17:58:34

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: Near Wauchula, Hardee Co., FL
Test Well: von Park Monitor
Test Date: 4/30/07

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
Avon Park Monitor	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
Avon Park OB	0	205

SOLUTION

Aquifer Model: Confined

Solution Method: Theis (Recovery)

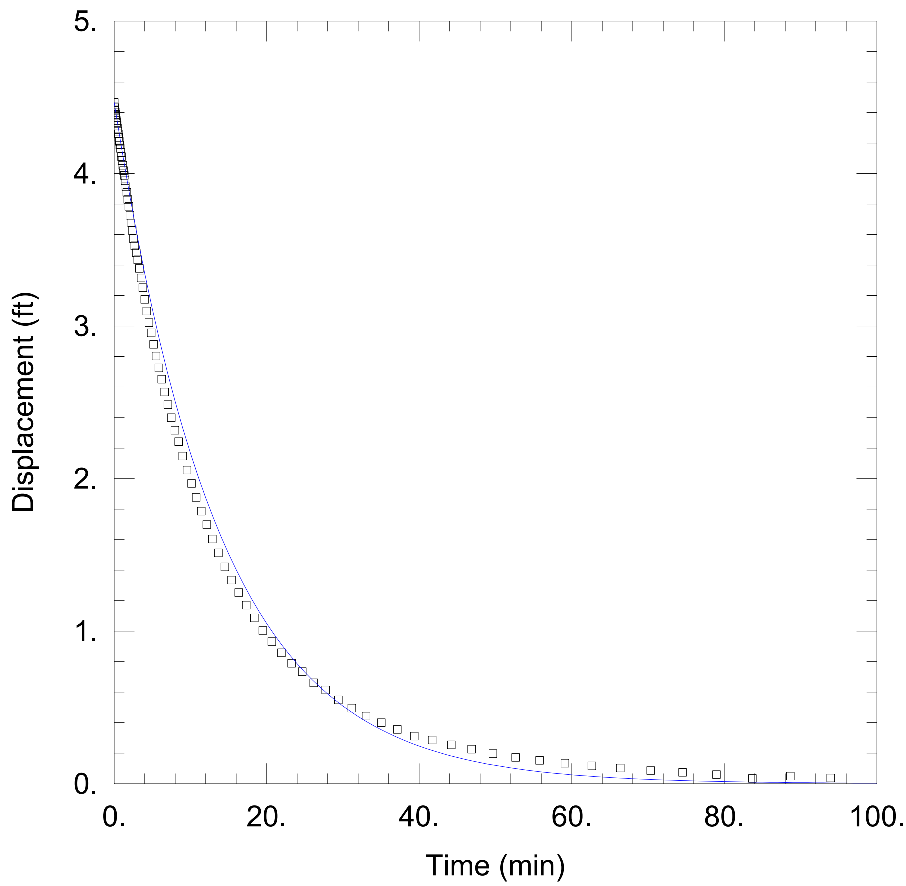
T = 2.592E+5 ft^2/day

S/S' = 0.0266

Appendix E Figure E.8, Avon Park permeable zone aquifer performance test analysis, recovery phase, Theis solution.

Appendix F

Analytical Solutions and Curve-Match Analyses of Slug Tests



R41SLUG1A(75-210)

Data Set: D:\MyFiles 2\R41AqtFiles-ST\R41Slug1A(75-210)Butler.aqt
Date: 06/10/12 Time: 17:30:02

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: near Wauchula, Hardee Co., FL
Test Well: Core Hole
Test Date: 12/29/03

WELL DATA (Core Hole)

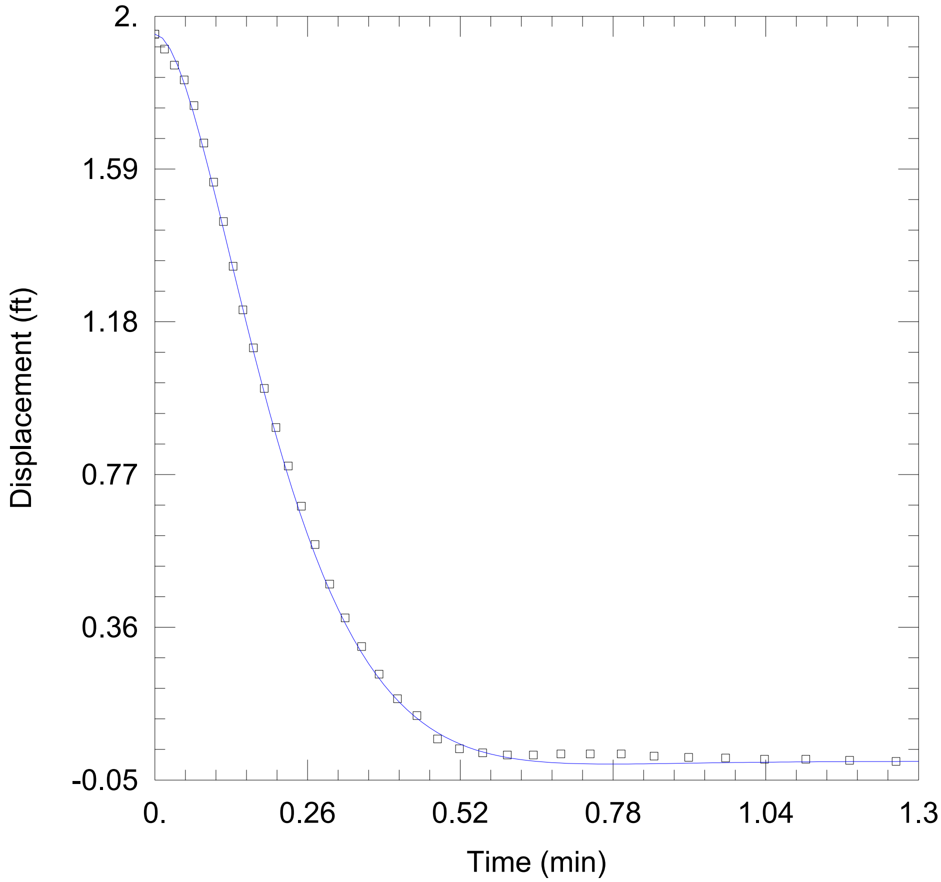
Initial Displacement: 4.466 ft
Total Well Penetration Depth: 158.4 ft
Casing Radius: 0.1667 ft
Static Water Column Height: 158.4 ft
Screen Length: 135. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler

K = 0.0568 ft/day
Le = 2.227E+4 ft

Appendix F, Figure F.1, Slug Test 1 (75 ft – 210 ft bls), falling head method, Butler solution.



R41PT2ASLUG(221-250)

Data Set: D:\MyFiles 2\R41AqtFiles-ST\R41PT2A_slug_(221-250)Butler.aqt
Date: 06/10/12 Time: 17:31:06

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: near Wauchula, Hardee Co., FL
Test Well: Core Hole
Test Date: 12/31/03

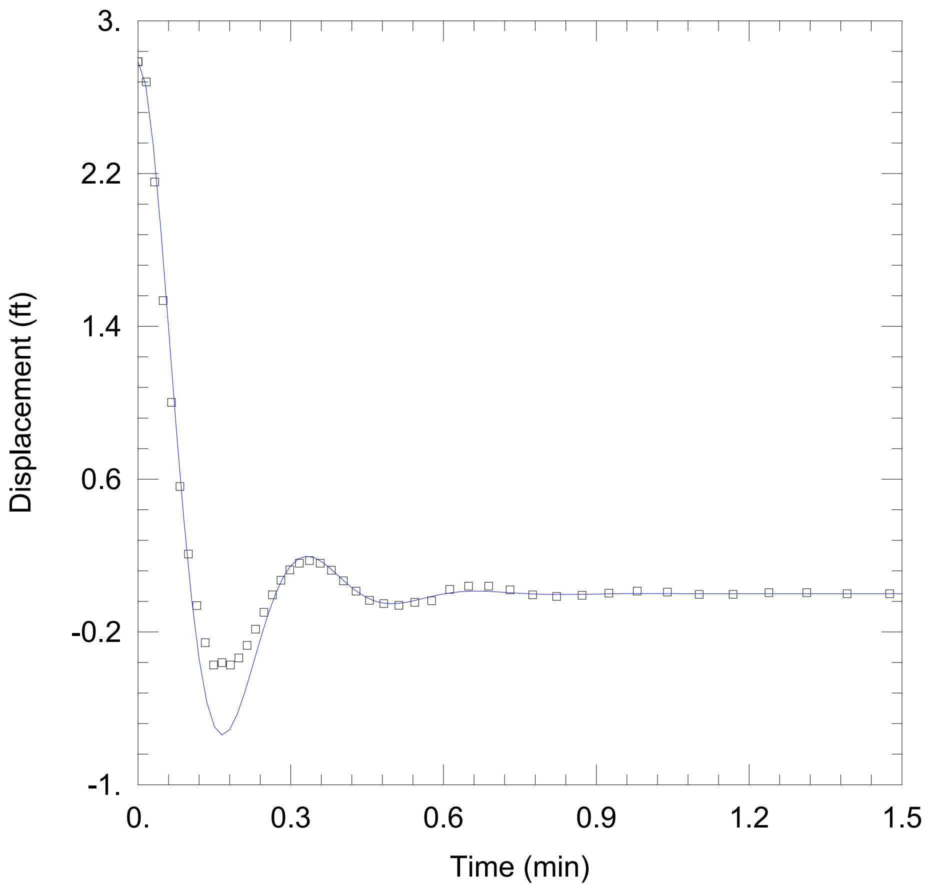
WELL DATA (Core Hole)

Initial Displacement: 1.952 ft
Total Well Penetration Depth: 29. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 193.2 ft
Screen Length: 29. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler
K = 6.151 ft/day
Le = 1681.7 ft

Appendix F, Figure F.2, Slug Test 2 (221 ft – 250 ft bls), falling head method, Butler solution.



R41PT3BSLUGW/SPACER(357-390)

Data Set: D:\MyFiles 2\R41AqtFiles-ST\R41PT3Bslug-spacer(357-390)Butler.aqt
Date: 06/10/12 Time: 17:32:10

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: near Wauchula, Hardee Co., FL
Test Well: Core Hole
Test Date: 1/8/04

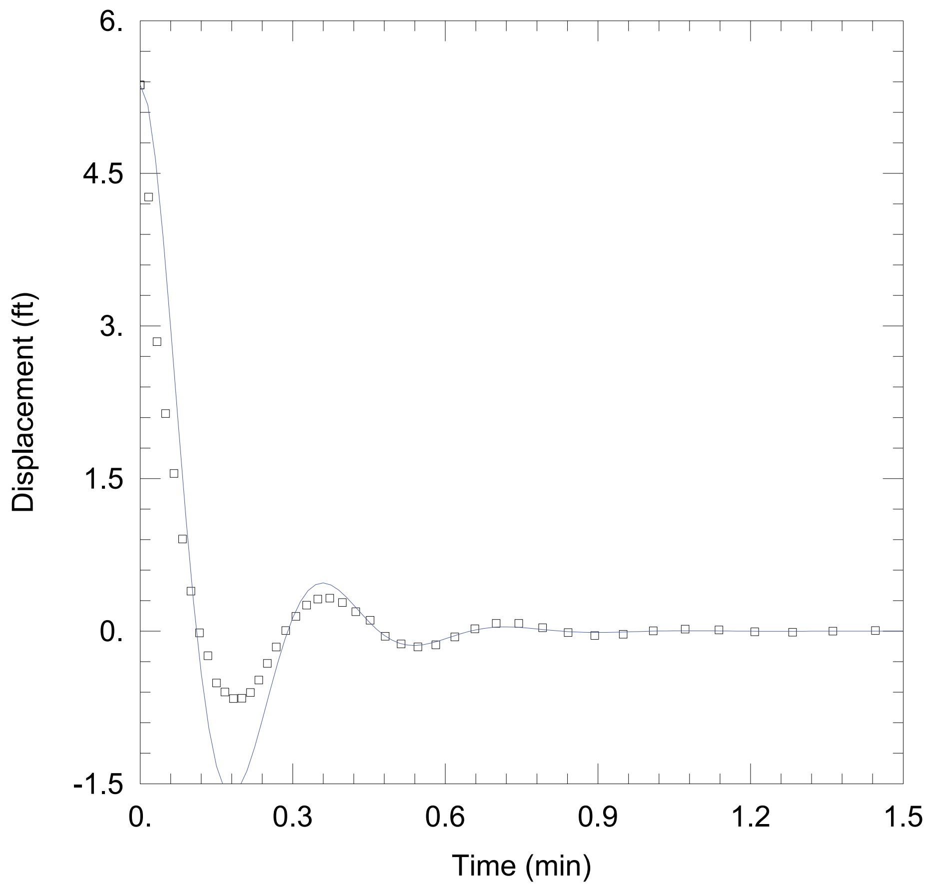
WELL DATA (Core Hole)

Initial Displacement: 2.786 ft
Total Well Penetration Depth: 33. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 333.8 ft
Screen Length: 33. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler
K = 30. ft/day
Le = 274.5 ft

Appendix F, Figure F.3, Slug Test 3 (357 ft – 390 ft bls), falling head method, Butler solution.



R41PT4BSLUGW/SPACER(452-490)

Data Set: D:\MyFiles 2\R41AqtFiles-ST\R41PT4Bslug-spacer(452-490)Butler.aqt
Date: 06/10/12 Time: 17:33:06

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: near Wauchula, Hardee Co., FL
Test Well: Core Hole
Test Date: 1/14/04

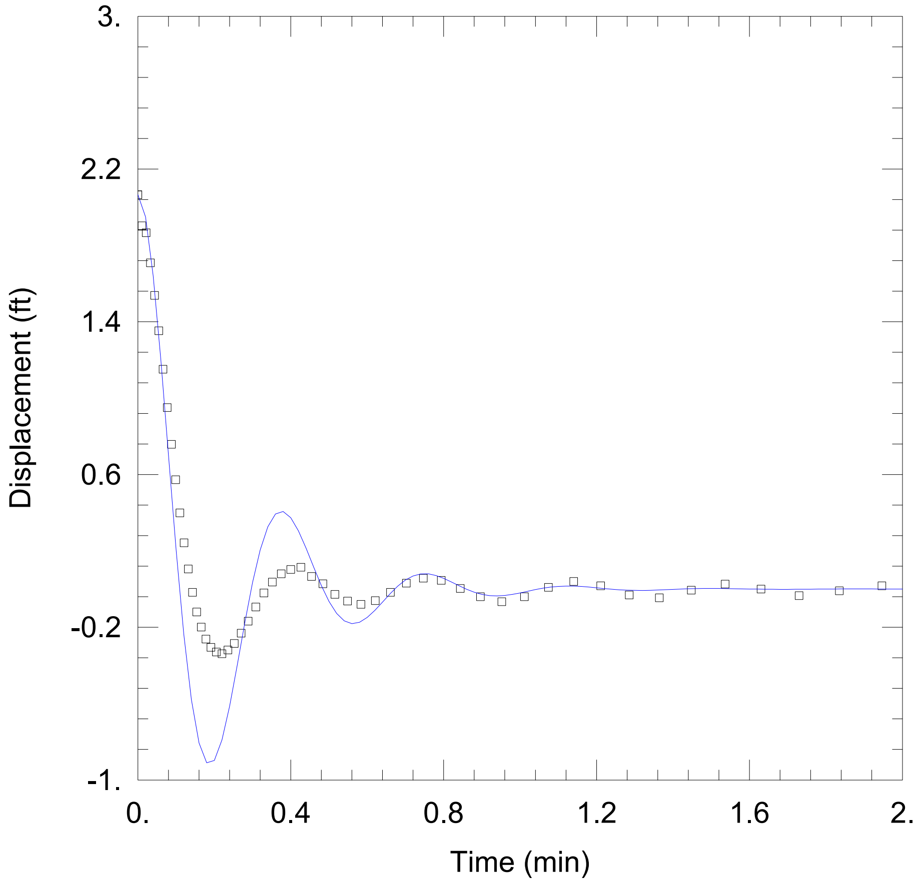
WELL DATA (Core Hole)

Initial Displacement: 5.369 ft
Total Well Penetration Depth: 66. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 432.8 ft
Screen Length: 38. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler
K = 97.81 ft/day
Le = 328.3 ft

Appendix F, Figure F.4, Slug Test 4 (452 ft – 490 ft bls), falling head method, Butler solution.



R41PT5BAIR-SPACER-NO PACKER(490-530)

Data Set: D:\MyFiles 2\R41AqtFiles-ST\R41PT5Bair-spacer-no packer(490-530)Butler.aqt
Date: 06/10/12 Time: 17:33:44

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: near Wauchula, Hardee Co., FL
Test Well: Core Hole
Test Date: 1/16/04

WELL DATA (Core Hole)

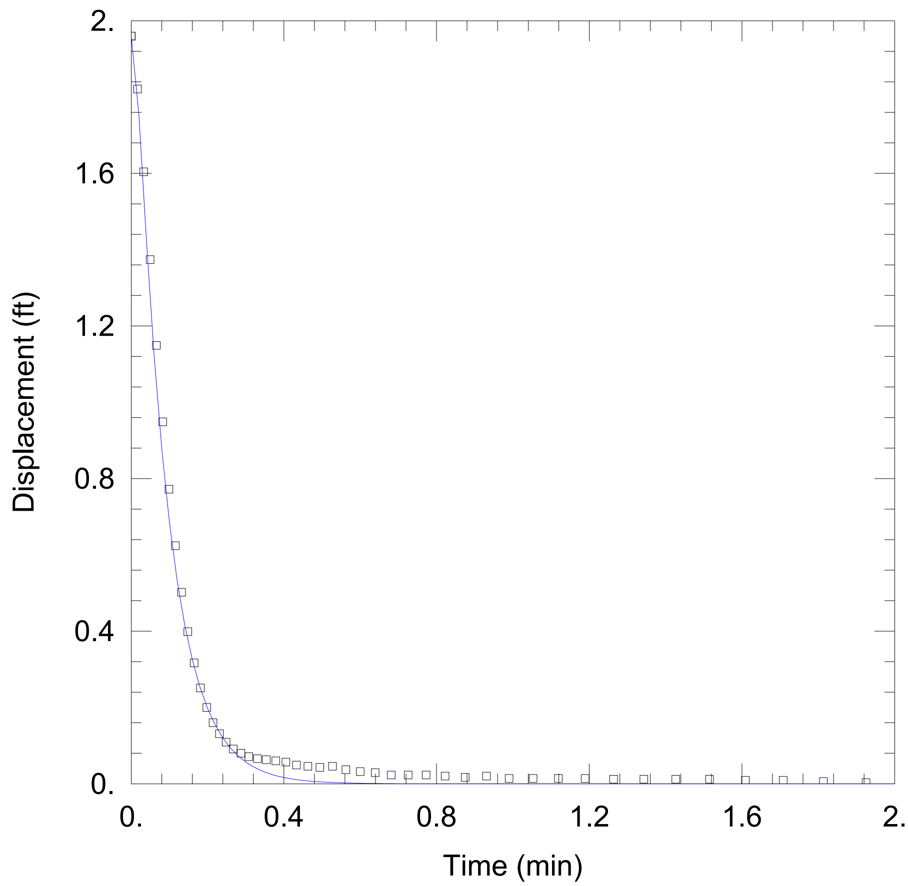
Initial Displacement: 2.065 ft
Total Well Penetration Depth: 40. ft
Casing Radius: 0.1667 ft
Static Water Column Height: 466.8 ft
Screen Length: 40. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler

K = 131.5 ft/day
Le = 387.1 ft

Appendix F, Figure F.5, Slug Test 5 (490 ft – 530 ft bls), rising head method, Butler solution.



R41PT6BAIR-SPACER(547-590)

Data Set: D:\MyFiles 2\R41AqtFiles-ST\R41PT6Bair-spacer(547-590)Butler.aqt
Date: 06/10/12 Time: 17:34:23

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: near Wauchula, Hardee Co., FL
Test Well: Core Hole
Test Date: 4/22/04

WELL DATA (Core Hole)

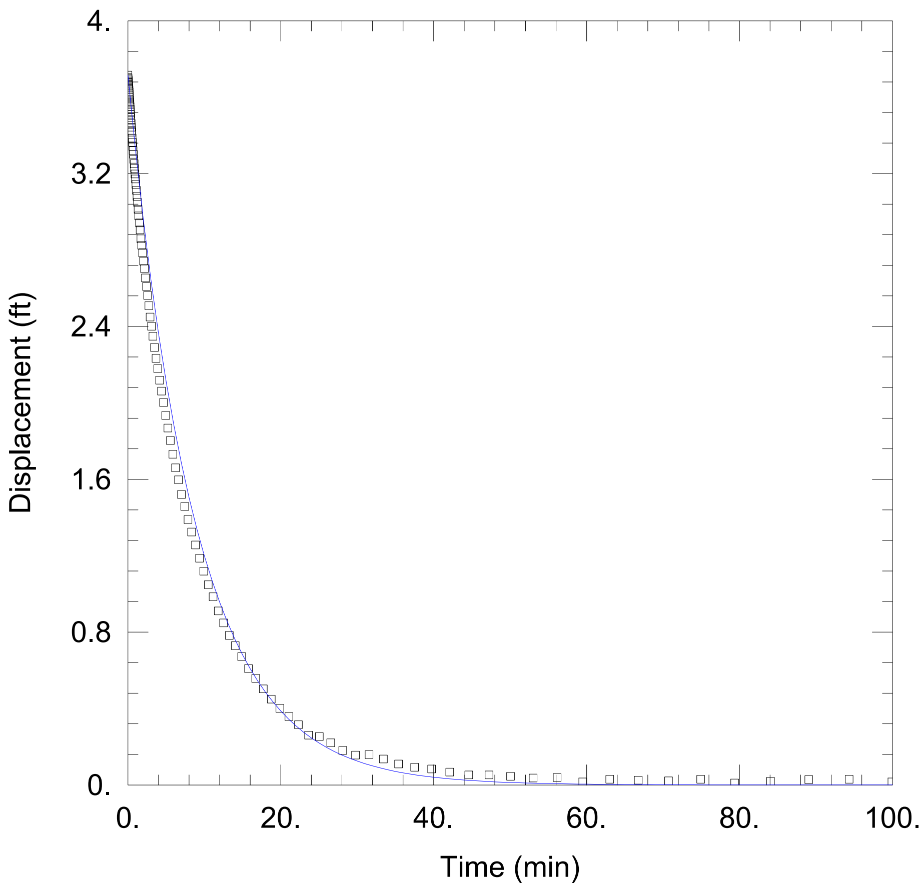
Initial Displacement: 1.96 ft
Total Well Penetration Depth: 43. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 527.9 ft
Screen Length: 43. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler

K = 9.225 ft/day
Le = 131.7 ft

Appendix F, Figure F.6, Slug Test 6 (547 ft – 590 ft bls), rising head method, Butler solution.



R41PT7AAIR-SPACER(605-630)

Data Set: D:\MyFiles 2\R41AqtFiles-ST\R41PT7Aair-spacer(605-630)Butler.aqt
Date: 06/10/12 Time: 17:34:46

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: near Wauchula, Hardee Co., FL
Test Well: Core Hole
Test Date: 4/24/04

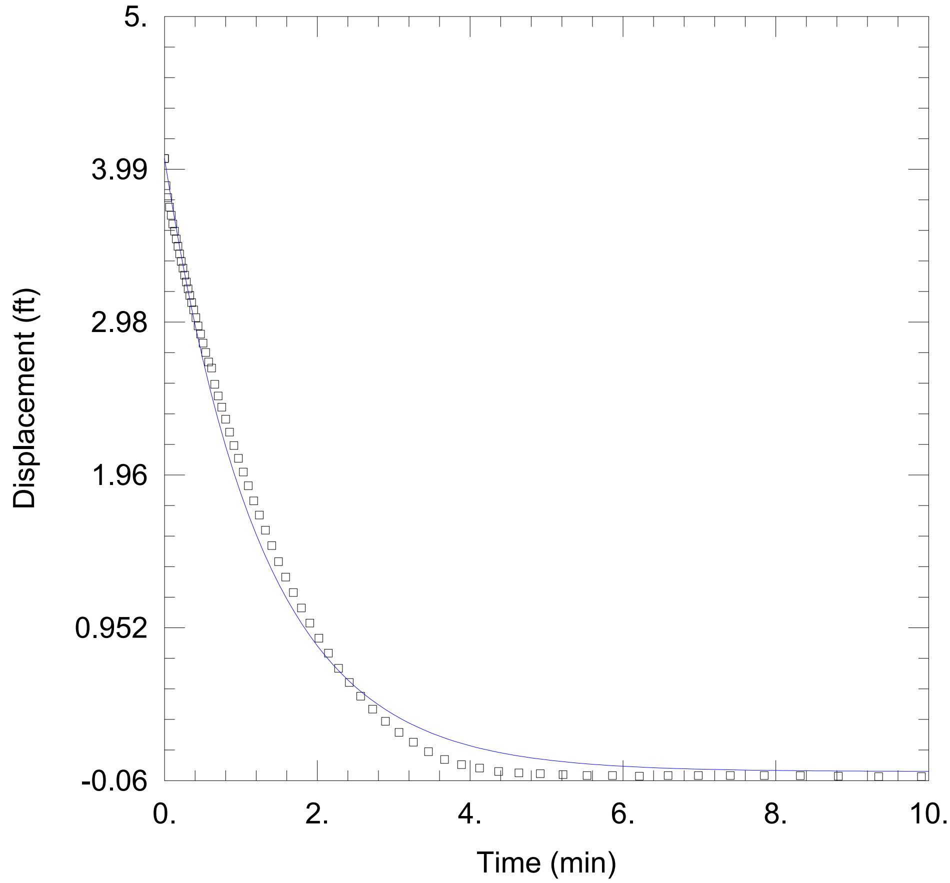
WELL DATA (Core Hole)

Initial Displacement: 3.716 ft
Total Well Penetration Depth: 25. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 567.5 ft
Screen Length: 25. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler
K = 0.1697 ft/day
Le = 0.1 ft

Appendix F, Figure F.7, Slug Test 7 (605 ft – 630 ft bls), rising head method, Butler solution.



R41PT8AAIR-SPACER(650-690)

Data Set: D:\MyFiles 2\R41AqtFiles-ST\R41PT8Aair-spacer(650-690)Butler.aqt
Date: 06/10/12 Time: 17:35:08

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: near Wauchula, Hardee Co., FL
Test Well: Core Hole
Test Date: 4/28/04

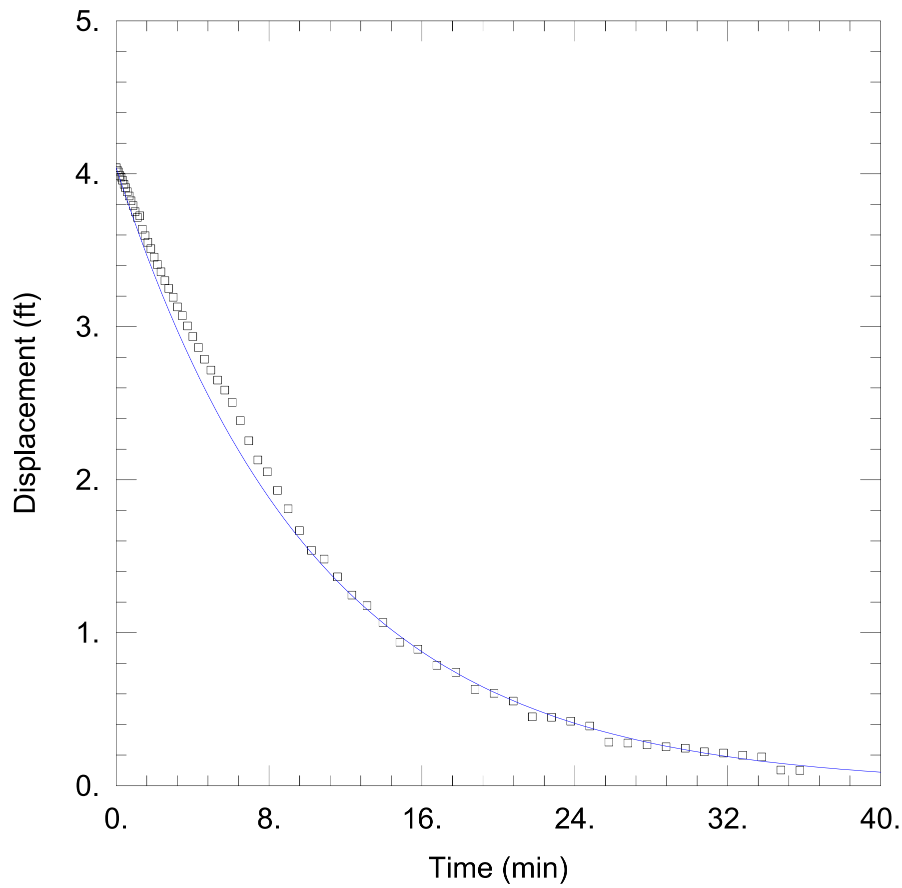
WELL DATA (Core Hole)

Initial Displacement: 4.059 ft
Total Well Penetration Depth: 40. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 624.3 ft
Screen Length: 40. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler
K = 0.7429 ft/day
Le = 0.1 ft

Appendix F, Figure F.8, Slug Test 8 (650 ft – 690 ft bls), rising head method, Butler solution.



R41PT9ASLUG-SPACER(650-690)

Data Set: D:\MyFiles 2\R41AqtFiles-ST\R41PT9Aslug-spacer(650-690)Butler.aqt
Date: 06/10/12 Time: 17:36:00

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: near Wauchula, Hardee Co., FL
Test Well: Core Hole
Test Date: 4/29/04

WELL DATA (Core Hole)

Initial Displacement: 4.04 ft
Total Well Penetration Depth: 40. ft
Casing Radius: 0.09917 ft

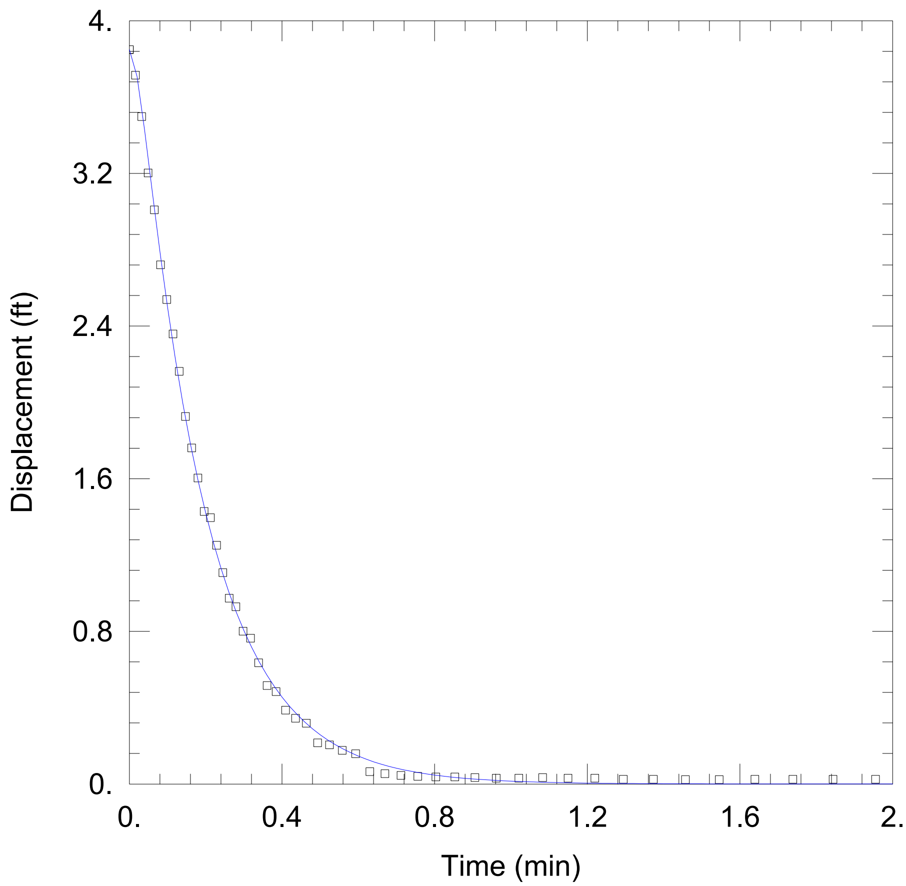
Static Water Column Height: 624.5 ft
Screen Length: 40. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
K = 0.08959 ft/day

Solution Method: Butler
Le = 1000. ft

Appendix F, Figure F.9, Slug Test 9 (650 ft – 690 ft bls), falling head method, Butler solution.



R41PT10CAIR-SPACER(700-740)

Data Set: D:\MyFiles 2\R41AqtFiles-ST\R41PT10Cair-spacer(700-740)Butler.aqt
Date: 06/10/12 Time: 17:36:19

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: near Wauchula, Hardee Co., FL
Test Well: Core Hole
Test Date: 5/04/04

WELL DATA (Core Hole)

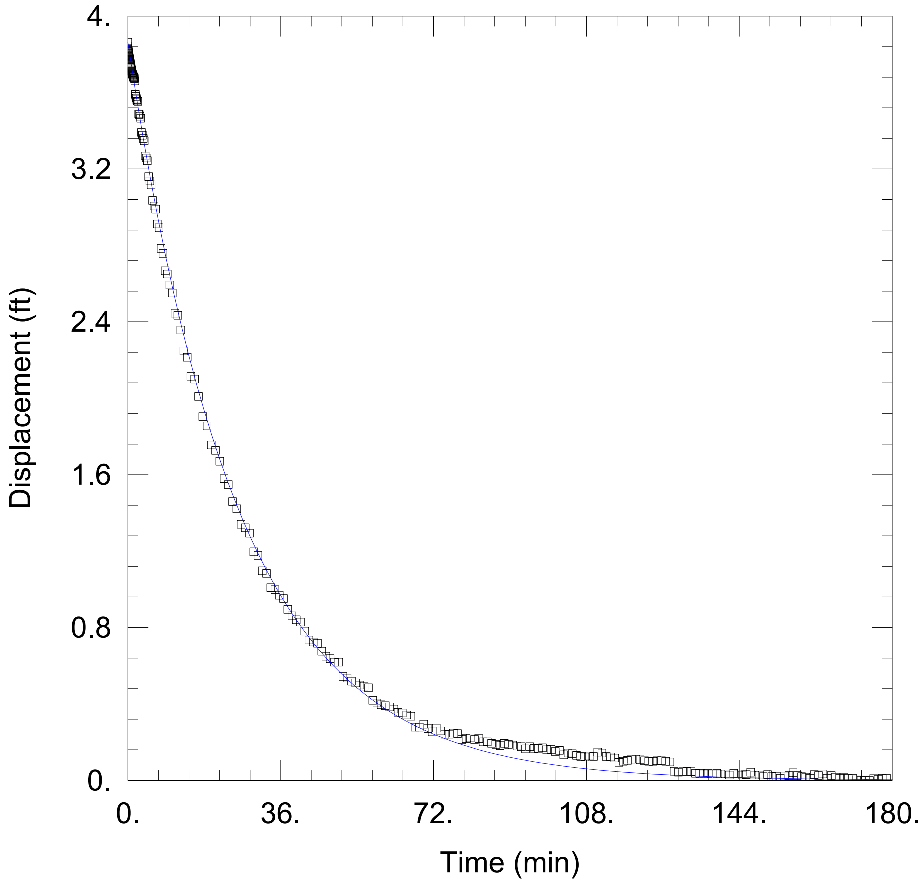
Initial Displacement: 3.849 ft
Total Well Penetration Depth: 40. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 675.2 ft
Screen Length: 40. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler

K = 4.716 ft/day
Le = 464.9 ft

Appendix F, Figure F.10, Slug Test 10 (700 ft – 740 ft bls), rising head method, Butler solution.



R41PT11BAIR-SPACER(755-800)

Data Set: D:\MyFiles 2\R41AqtFiles-ST\R41PT11Bair-spacer(755-800)Butler.aqt
Date: 06/10/12 Time: 17:37:00

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: near Wauchula, Hardee Co., FL
Test Well: Core Hole
Test Date: 5/11/04

WELL DATA (Core Hole)

Initial Displacement: 3.863 ft
Total Well Penetration Depth: 45. ft
Casing Radius: 0.09917 ft

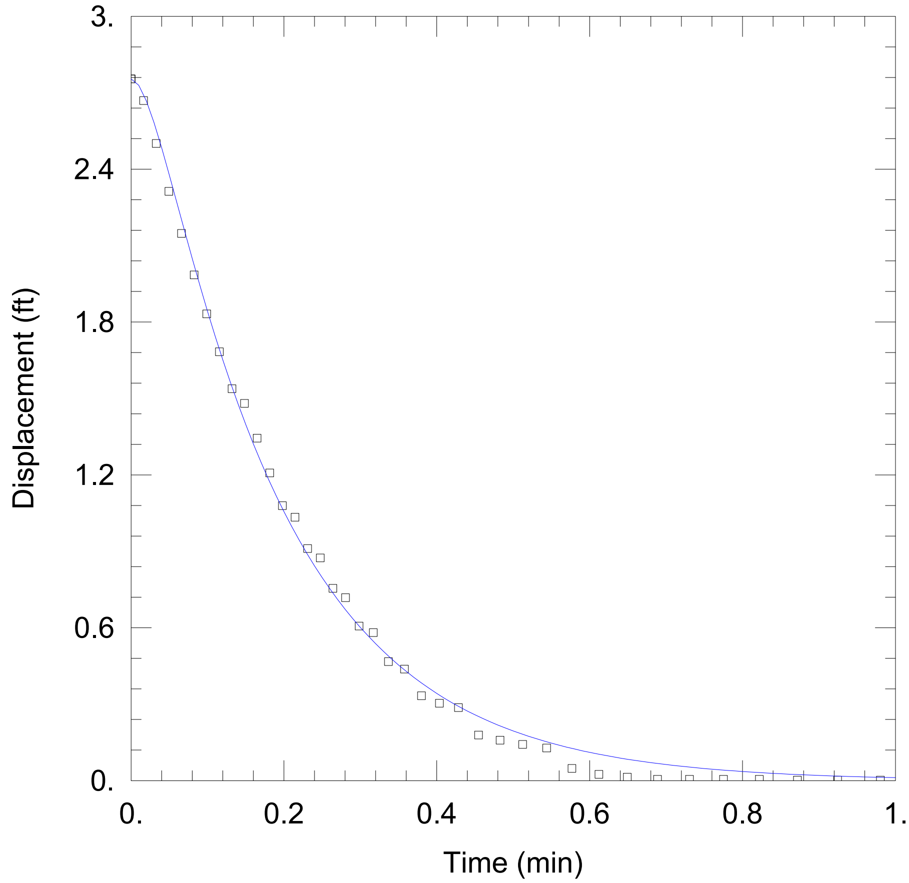
Static Water Column Height: 735.7 ft
Screen Length: 45. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler

K = 0.03206 ft/day
Le = 0.1 ft

Appendix F, Figure F.11, Slug Test 11 (755 ft – 800 ft bls), rising head method, Butler solution.



R41PT12BAIR-SPACER(829-855)

Data Set: D:\MyFiles 2\R41AqtFiles-ST\R41PT12Bair-spacer(829-855)Butler.aqt
Date: 06/10/12 Time: 17:37:19

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: near Wauchula, Hardee Co., FL
Test Well: Core Hole
Test Date: 5/14/04

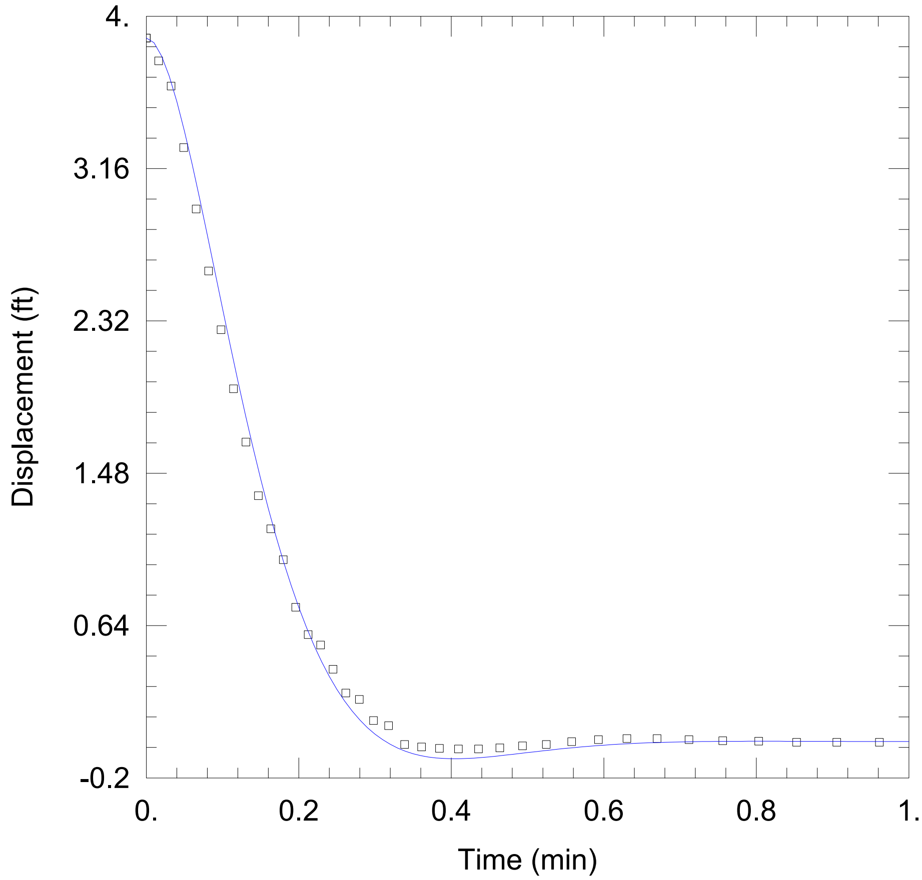
WELL DATA (Core Hole)

Initial Displacement: 2.754 ft
Total Well Penetration Depth: 26. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 788.7 ft
Screen Length: 26. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler
K = 7.037 ft/day
Le = 565.1 ft

Appendix F, Figure F.12, Slug Test 12 (829 ft – 855 ft bls), rising head method, Butler solution.



R41PT13AAIR-SPACER(850-895)

Data Set: D:\MyFiles 2\R41AqtFiles-ST\R41PT13Aair-spacer(850-895)Butler.aqt
Date: 06/10/12 Time: 17:37:42

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: near Wauchula, Hardee Co., FL
Test Well: Core Hole
Test Date: 5/17/04

WELL DATA (Core Hole)

Initial Displacement: 3.88 ft
Total Well Penetration Depth: 45. ft
Casing Radius: 0.09917 ft

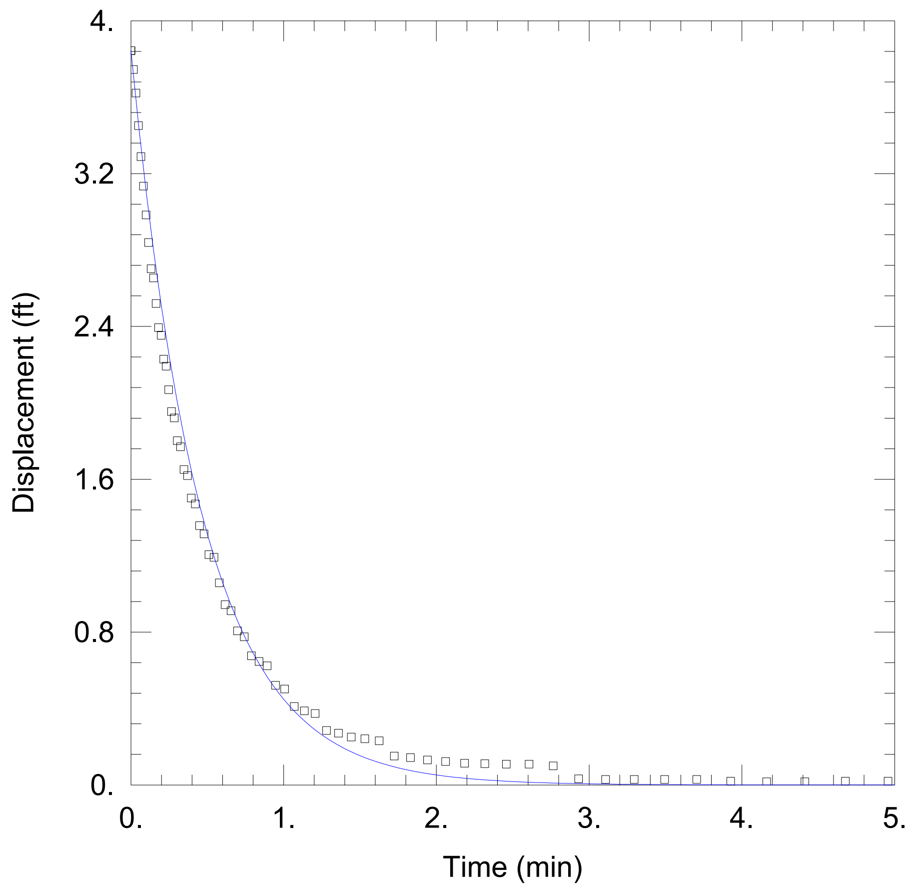
Static Water Column Height: 829. ft
Screen Length: 45. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler

K = 6.569 ft/day
Le = 799.1 ft

Appendix F, Figure F.13, Slug Test 13 (850 ft – 895 ft bls), rising head method, Butler solution.



R41PT14AAIR-SPACER(905-935)

Data Set: D:\MyFiles 2\R41AqtFiles-ST\R41PT14Aair-spacer(904-935)Butler.aqt
Date: 06/10/12 Time: 17:38:03

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: near Wauchula, Hardee Co., FL
Test Well: Core Hole
Test Date: 5/25/04

WELL DATA (Core Hole)

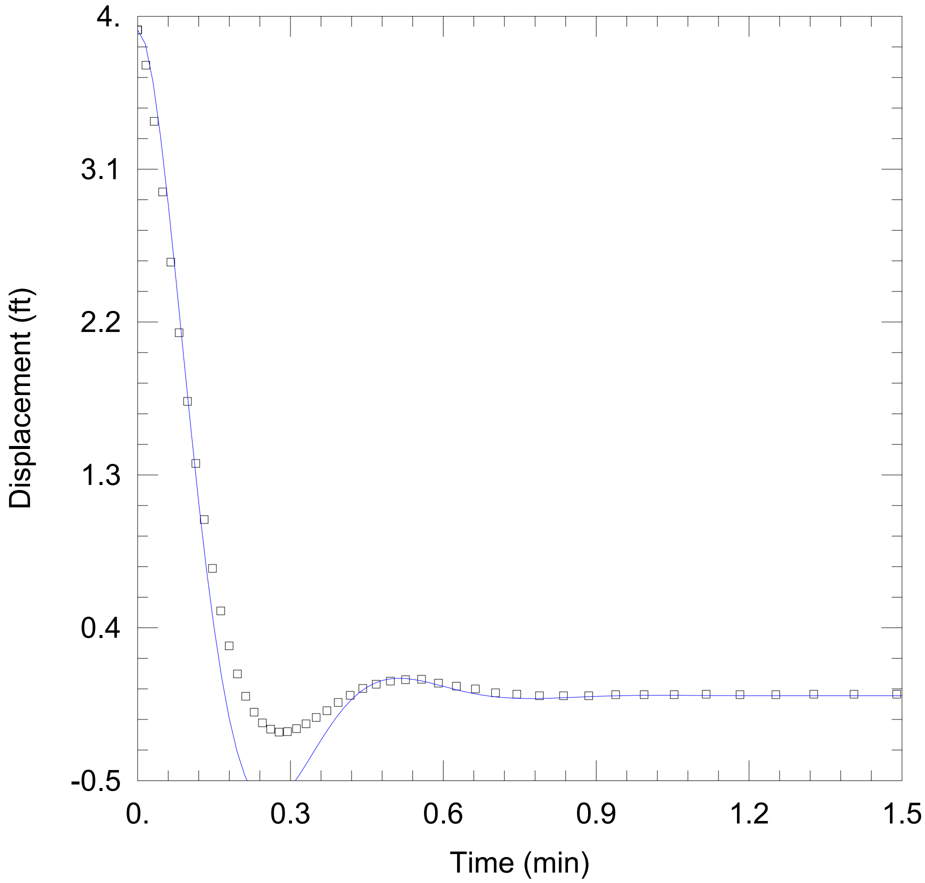
Initial Displacement: 3.844 ft
Total Well Penetration Depth: 47. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 865.1 ft
Screen Length: 31. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler

K = 2.686 ft/day
Le = 0.01 ft

Appendix F, Figure F.14, Slug Test 14 (905 ft – 935 ft bls), rising head method, Butler solution.



R41PT15AAIR-SPACER(934-975)

Data Set: D:\MyFiles 2\R41AqtFiles-ST\R41PT15Aair-spacer(934-975)Butler.aqt
Date: 06/10/12 Time: 17:38:29

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: near Wauchula, Hardee Co., FL
Test Well: Core Hole
Test Date: 5/27/04

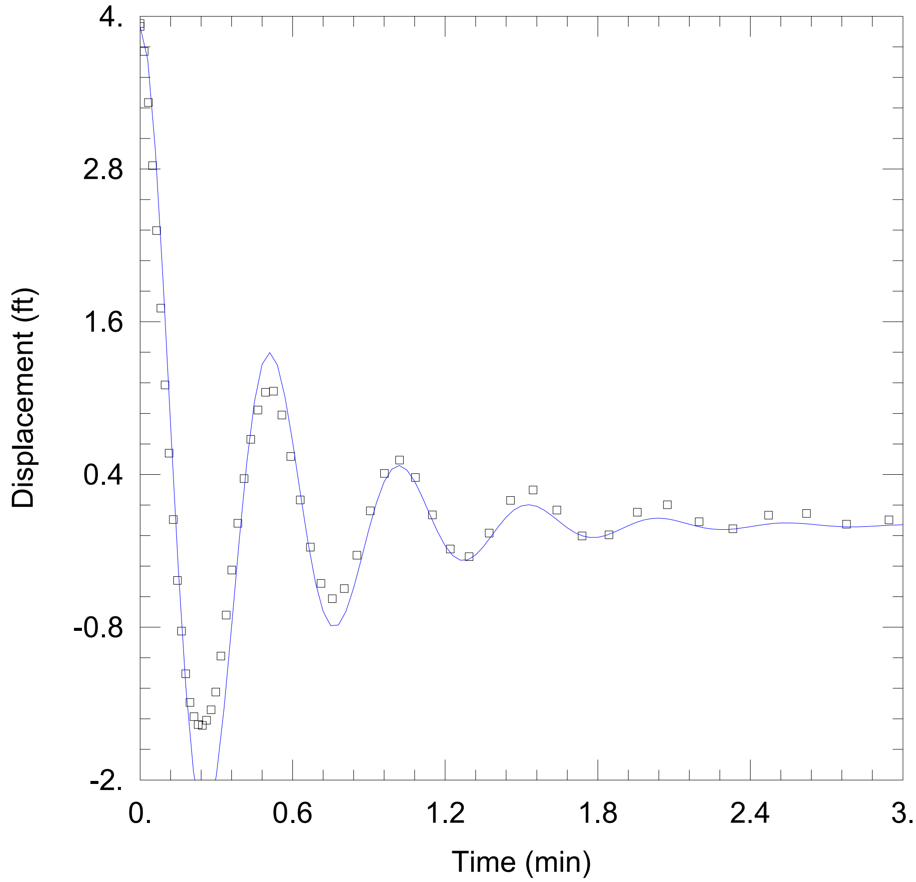
WELL DATA (Core Hole)

Initial Displacement: 3.92 ft
Total Well Penetration Depth: 48.5 ft
Casing Radius: 0.09917 ft
Static Water Column Height: 904.5 ft
Screen Length: 41. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler
K = 16.29 ft/day
Le = 578.7 ft

Appendix F, Figure F.15, Slug Test 15 (934 ft – 975 ft bls), rising head method, Butler solution.



R41PT16CAIR-SPACER(992-1015)

Data Set: D:\MyFiles 2\R41AqtFiles-ST\R41PT16Cair-spacer(992-1015)Butler.aqt
Date: 06/10/12 Time: 17:38:49

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: near Wauchula, Hardee Co., FL
Test Well: Core Hole
Test Date: 5/28/04

WELL DATA (Core Hole)

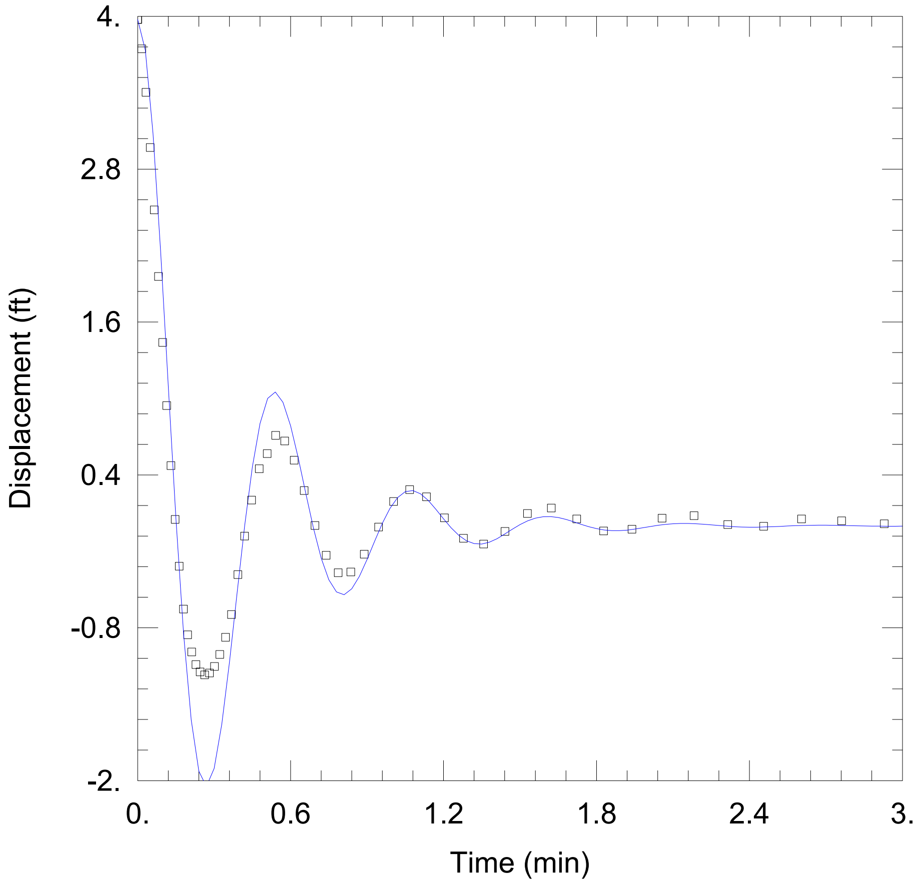
Initial Displacement: 3.92 ft
Total Well Penetration Depth: 23. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 904.5 ft
Screen Length: 23. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler

K = 61.37 ft/day
Le = 738.4 ft

Appendix F, Figure F.16, Slug Test 16 (992 ft – 1015 ft bls), rising head method, Butler solution.



R41PT17CAIR-SPACER(1025-1075)

Data Set: D:\MyFiles 2\R41AqtFiles-ST\R41PT17Cair-spacer(1025-1075)Butler.aqt
Date: 06/10/12 Time: 17:39:09

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: near Wauchula, Hardee Co., FL
Test Well: Core Hole
Test Date: 6/3/04

WELL DATA (Core Hole)

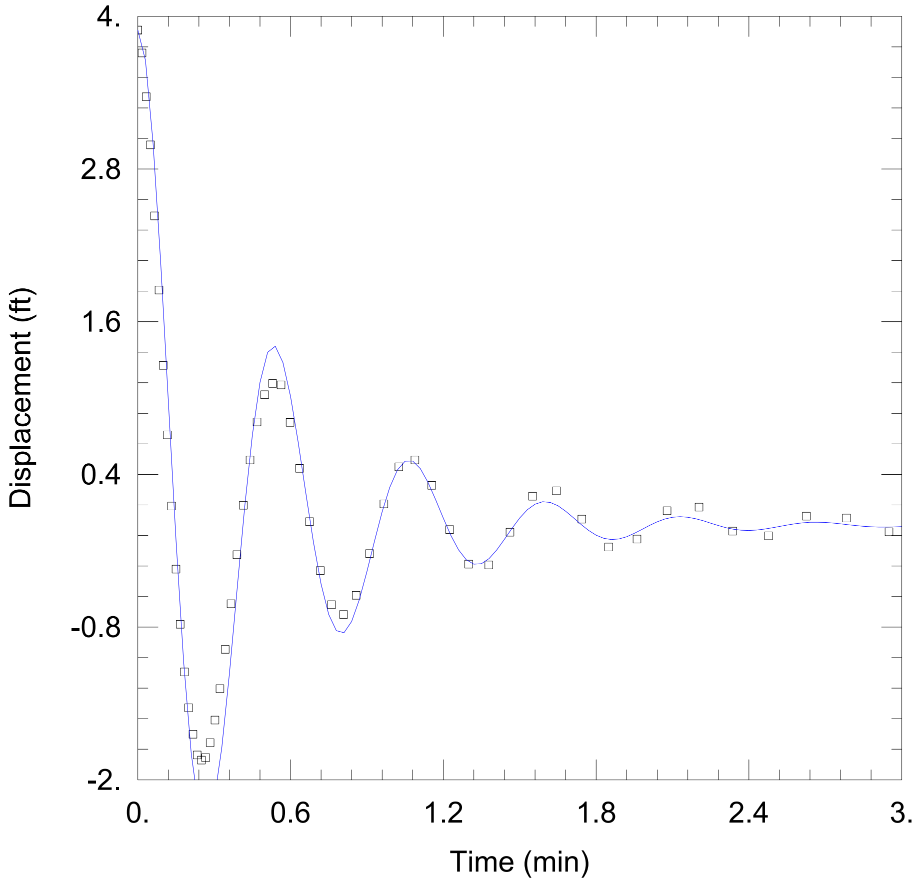
Initial Displacement: 3.975 ft
Total Well Penetration Depth: 50. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 1002.3 ft
Screen Length: 50. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler

K = 21.73 ft/day
Le = 805.8 ft

Appendix F, Figure F.17, Slug Test 17 (1025 ft – 1075 ft bls), rising head method, Butler solution.



R41PT18AAIR-SPACER(1105-1140)

Data Set: D:\MyFiles 2\R41AqtFiles-ST\R41PT18Aair-spacer(1105-1140)Butler.aqt
Date: 06/10/12 Time: 17:39:31

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: near Wauchula, Hardee Co., FL
Test Well: Core Hole
Test Date: 6/12/04

WELL DATA (Core Hole)

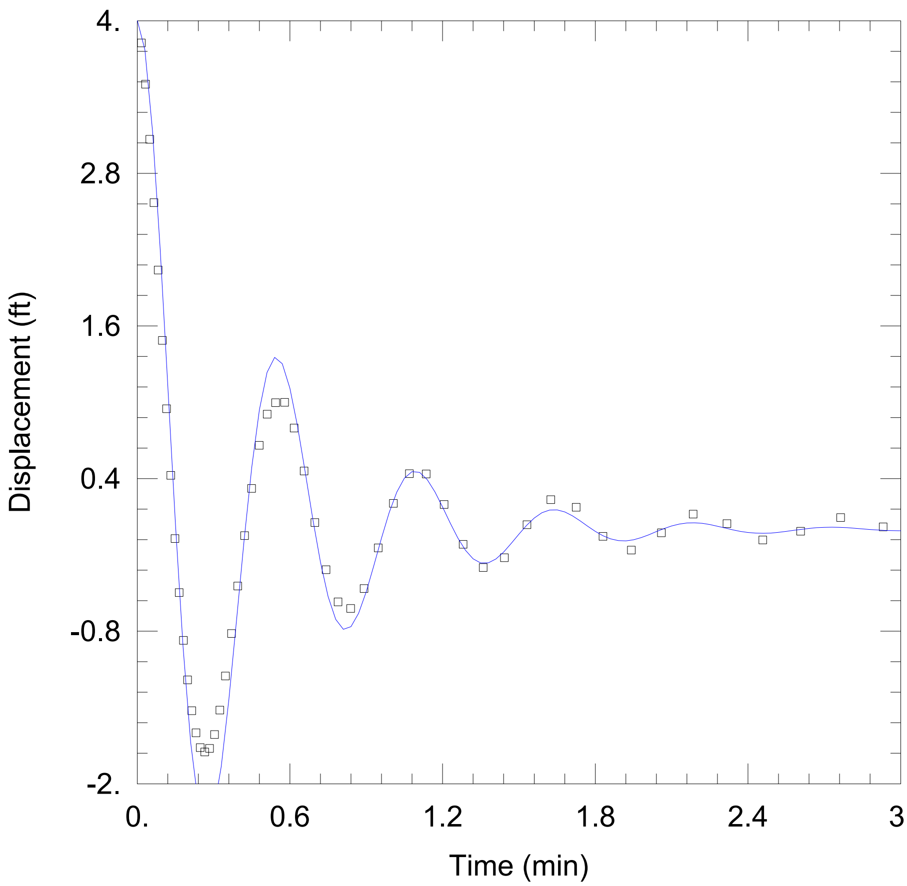
Initial Displacement: 3.892 ft
Total Well Penetration Depth: 35. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 1069.1 ft
Screen Length: 35. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler

K = 40.21 ft/day
Le = 810.6 ft

Appendix F, Figure F.18, Slug Test 18 (1105 ft – 1140 ft bls), rising head method, Butler solution.



R41PT19AAIR-SPACER(1152-1175)

Data Set: D:\MyFiles 2\R41AqtFiles-ST\R41PT19Aair-spacer(1152-1175)Butler.aqt
Date: 06/10/12 Time: 17:39:55

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: near Wauchula, Hardee Co., FL
Test Well: Core Hole
Test Date: 6/17/04

WELL DATA (Core Hole)

Initial Displacement: 4.005 ft
Total Well Penetration Depth: 23. ft
Casing Radius: 0.09917 ft

Static Water Column Height: 1103.6 ft
Screen Length: 23. ft
Well Radius: 0.1263 ft

SOLUTION

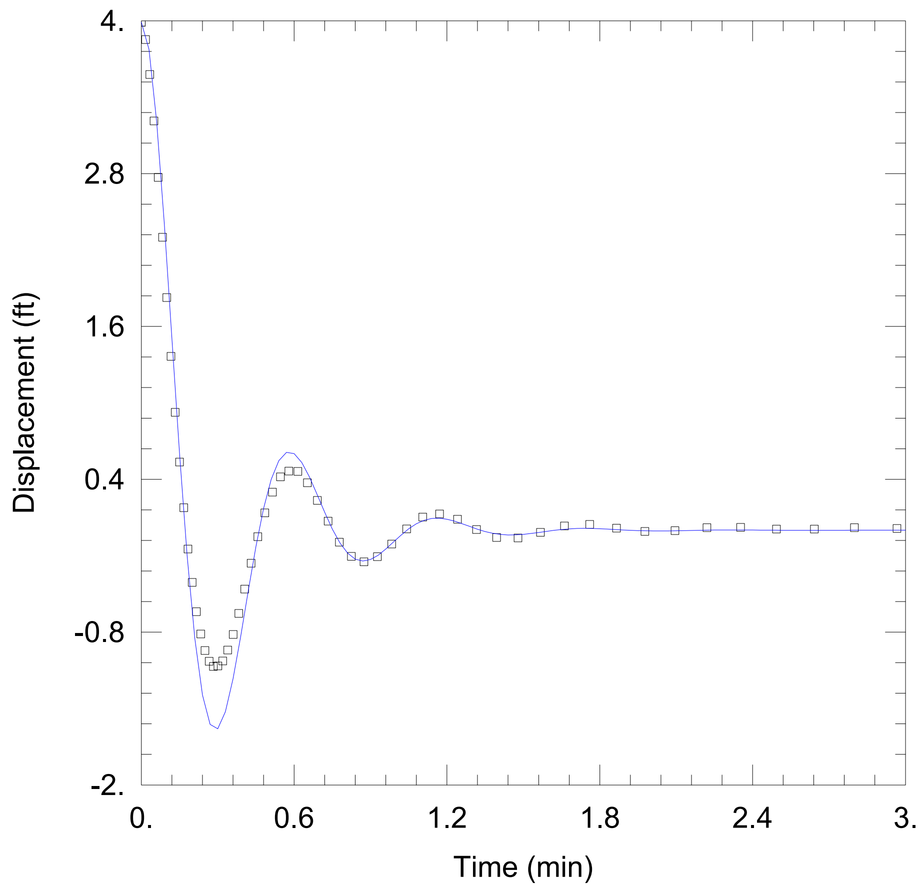
Aquifer Model: Confined

Solution Method: Butler

K = 56.09 ft/day

Le = 847.7 ft

Appendix F, Figure F.19, Slug Test 19 (1152 ft – 1175 ft bls), rising head method, Butler solution.



R41PT20CAIR-SPACER(1190-1225)

Data Set: D:\MyFiles 2\R41AqtFiles-ST\R41PT20Cair-spacer(1190-1225)Butler.aqt
Date: 06/10/12 Time: 17:40:15

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: near Wauchula, Hardee Co., FL
Test Well: Core Hole
Test Date: 6/29/04

WELL DATA (Core Hole)

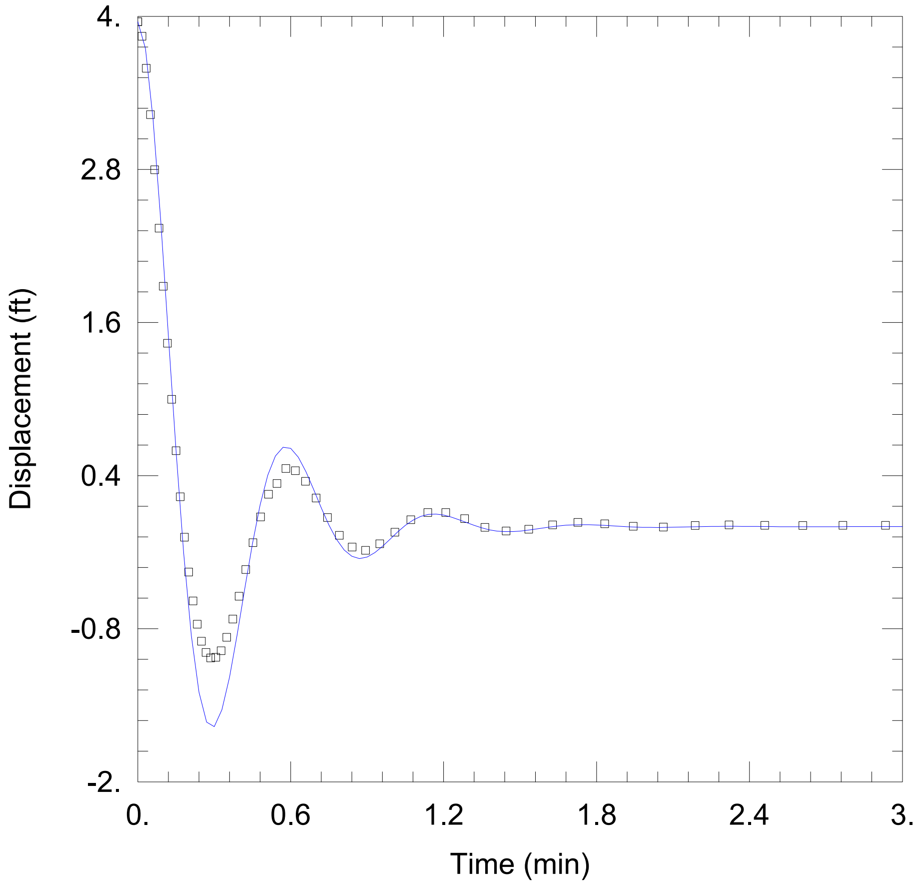
Initial Displacement: 3.988 ft
Total Well Penetration Depth: 35. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 1158.3 ft
Screen Length: 35. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler

K = 21.24 ft/day
Le = 908. ft

Appendix F, Figure F.20, Slug Test 20 (1190 ft – 1225 ft bls), rising head method, Butler solution.



R41PT21CAIR-SPACER(1225-1265)

Data Set: D:\MyFiles 2\R41AqtFiles-ST\R41PT21Cair-spacer(1225-1265)Butler.aqt
Date: 06/10/12 Time: 17:40:38

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: near Wauchula, Hardee Co., FL
Test Well: Core Hole
Test Date: 7/1/04

WELL DATA (Core Hole)

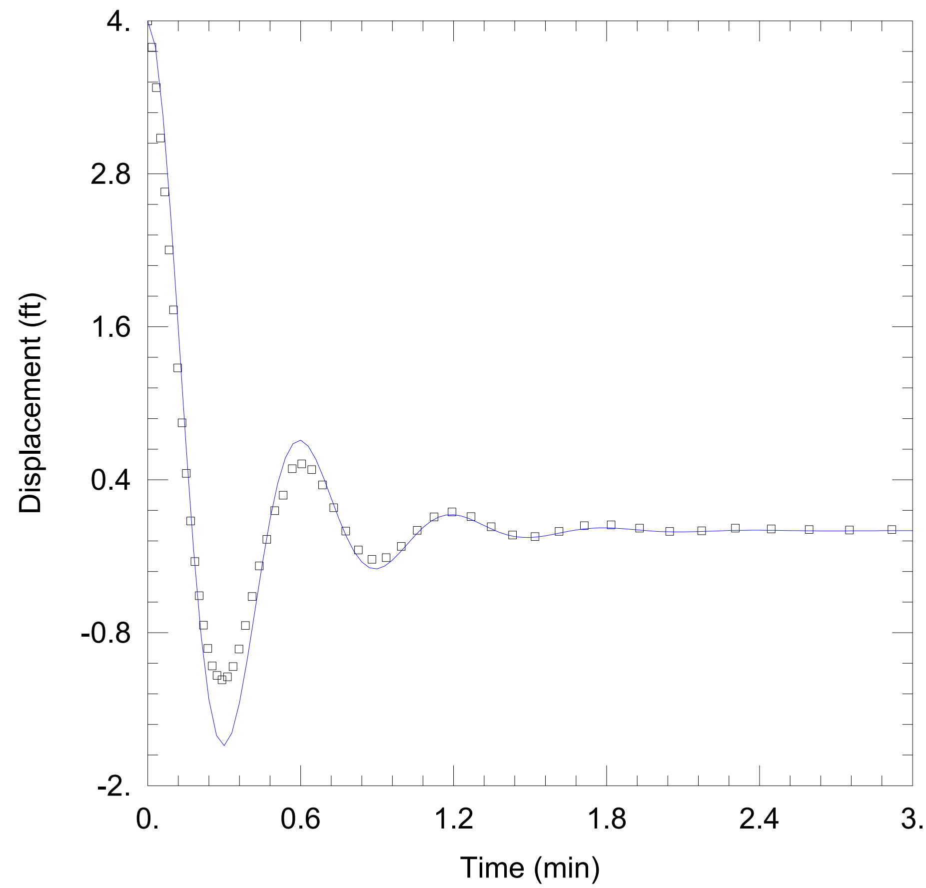
Initial Displacement: 3.958 ft
Total Well Penetration Depth: 40. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 1198.7 ft
Screen Length: 40. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler

K = 18.77 ft/day
Le = 912.5 ft

Appendix F, Figure F.21, Slug Test 21 (1225 ft – 1265 ft bls), rising head method, Butler solution.



R41PT22DAIR-SPACER(1270-1305)

Data Set: D:\MyFiles 2\R41AqtFiles-ST\R41PT22Dair-spacer(1270-1305)Butler.aqt
Date: 06/10/12 Time: 17:40:58

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: near Wauchula, Hardee Co., FL
Test Well: Core Hole
Test Date: 7/3/04

WELL DATA (Core Hole)

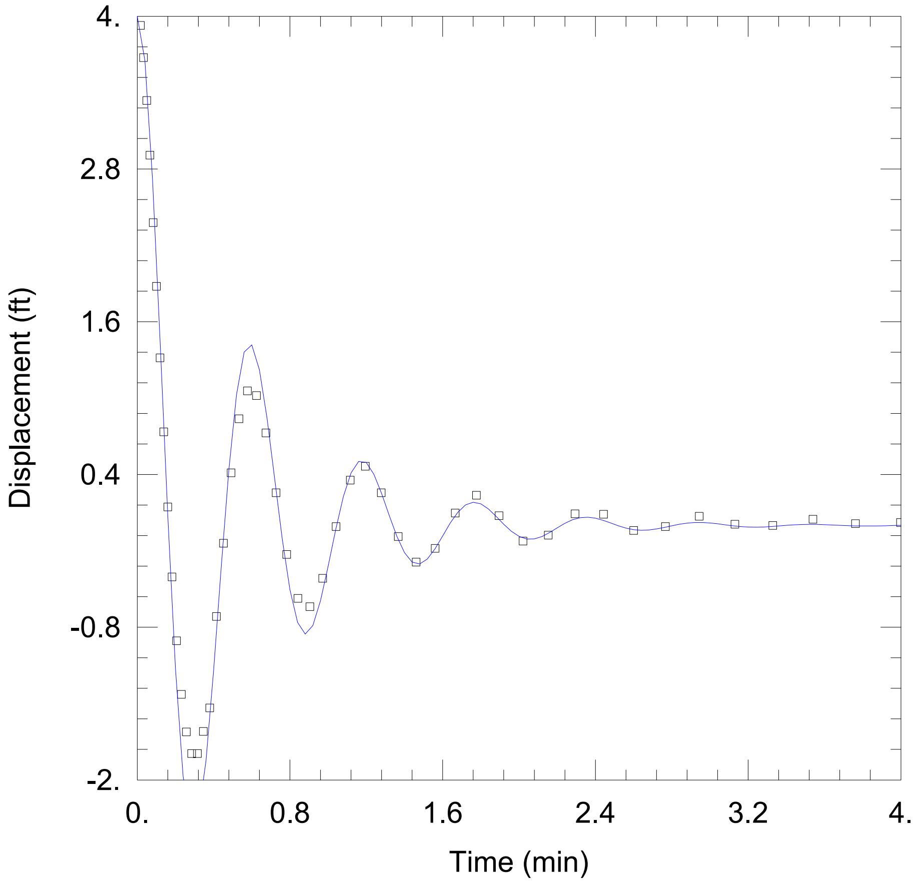
Initial Displacement: 4. ft
Total Well Penetration Depth: 35. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 1239.2 ft
Screen Length: 35. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler

K = 22.14 ft/day
Le = 965.4 ft

Appendix F, Figure F.22, Slug Test 22 (1270 ft – 1305 ft bls), rising head method, Butler solution.



R41PT23DAIR-SPACER(1315-1345)

Data Set: D:\MyFiles 2\R41AqtFiles-ST\R41PT23Dair-spacer(1315-1345)Butler.aqt
Date: 06/10/12 Time: 17:41:27

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: near Wauchula, Hardee Co., FL
Test Well: Core Hole
Test Date: 7/7/04

WELL DATA (Core Hole)

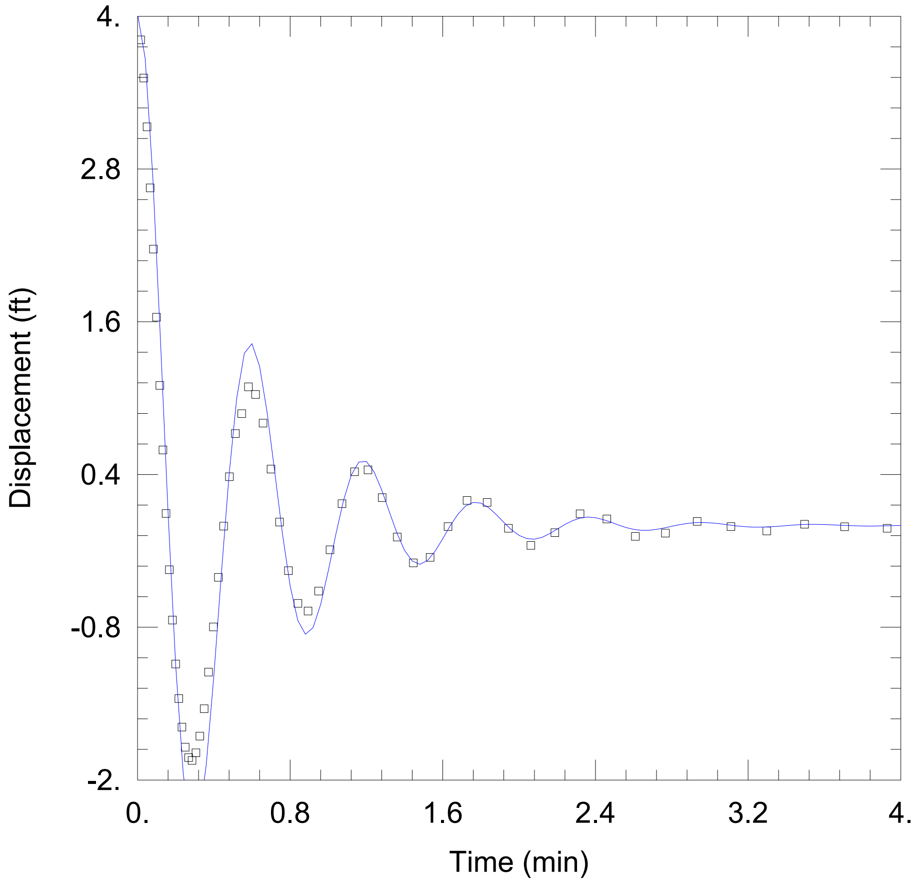
Initial Displacement: 4.005 ft
Total Well Penetration Depth: 30. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 1280.6 ft
Screen Length: 30. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler

K = 41.83 ft/day
Le = 987.4 ft

Appendix F, Figure F.23, Slug Test 23 (1315 ft – 1345 ft bls), rising head method, Butler solution.



R41PT24CAIR-SPACER(1355-1385)

Data Set: D:\MyFiles 2\R41AqtFiles-ST\R41PT24Cair-spacer(1355-1385)Butler.aqt
Date: 06/10/12 Time: 17:41:53

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: near Wauchula, Hardee Co., FL
Test Well: Core Hole
Test Date: 7/9/04

WELL DATA (Core Hole)

Initial Displacement: 4.022 ft
Total Well Penetration Depth: 30. ft
Casing Radius: 0.09917 ft

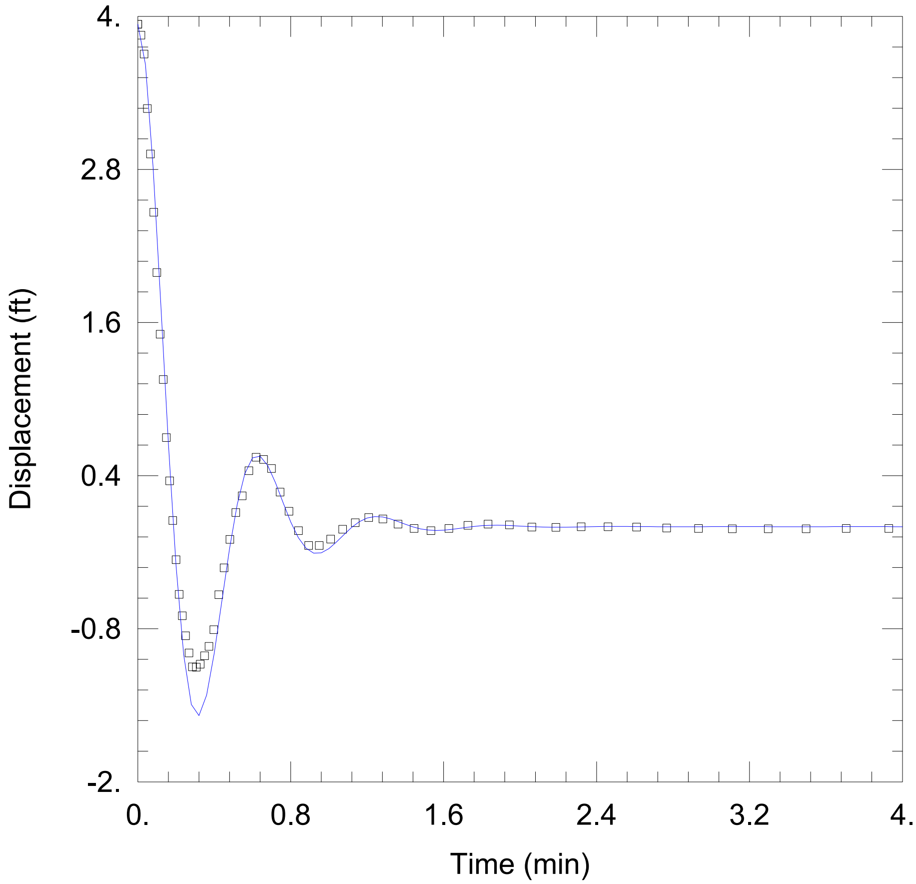
Static Water Column Height: 1320.8 ft
Screen Length: 30. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler

K = 41.62 ft/day
Le = 997. ft

Appendix F, Figure F.24, Slug Test 24 (1355 ft – 1385 ft bls), rising head method, Butler solution.



R41PT25AAIR-SPACER(1385-1425)

Data Set: D:\MyFiles 2\R41AqtFiles-ST\R41PT25Aair-spacer(1385-1425)Butler.aqt
Date: 06/10/12 Time: 17:42:16

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: near Wauchula, Hardee Co., FL
Test Well: Core Hole
Test Date: 7/12/04

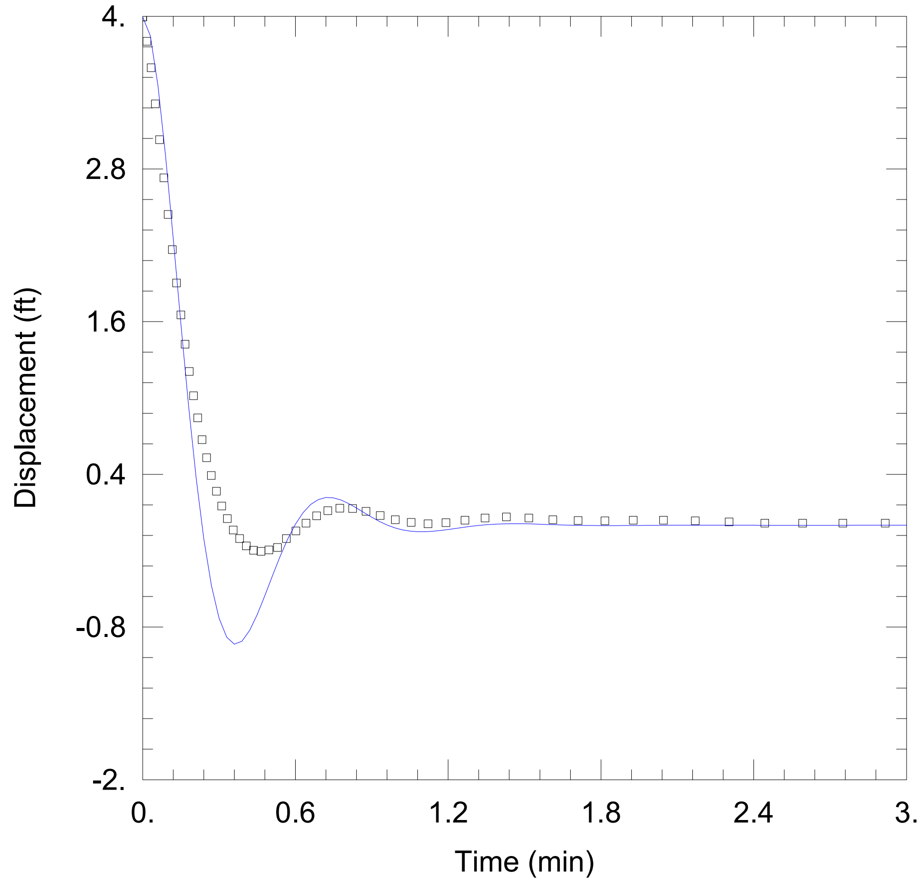
WELL DATA (Core Hole)

Initial Displacement: 3.938 ft
Total Well Penetration Depth: 40. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 1361.7 ft
Screen Length: 40. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler
K = 16.65 ft/day
Le = 1044.5 ft

Appendix F, Figure F.25, Slug Test 25 (1385 ft – 1425 ft bls), rising head method, Butler solution.



R41PT26AAIR-SPACER(1425-1465)

Data Set: D:\MyFiles 2\R41AqtFiles-ST\R41PT26Aair-spacer(1425-1465)Butler.aqt
Date: 06/10/12 Time: 17:42:37

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: near Wauchula, Hardee Co., FL
Test Well: Core Hole
Test Date: 7/14/04

WELL DATA (Core Hole)

Initial Displacement: 3.995 ft
Total Well Penetration Depth: 40. ft
Casing Radius: 0.09917 ft

Static Water Column Height: 1401.9 ft
Screen Length: 40. ft
Well Radius: 0.1263 ft

SOLUTION

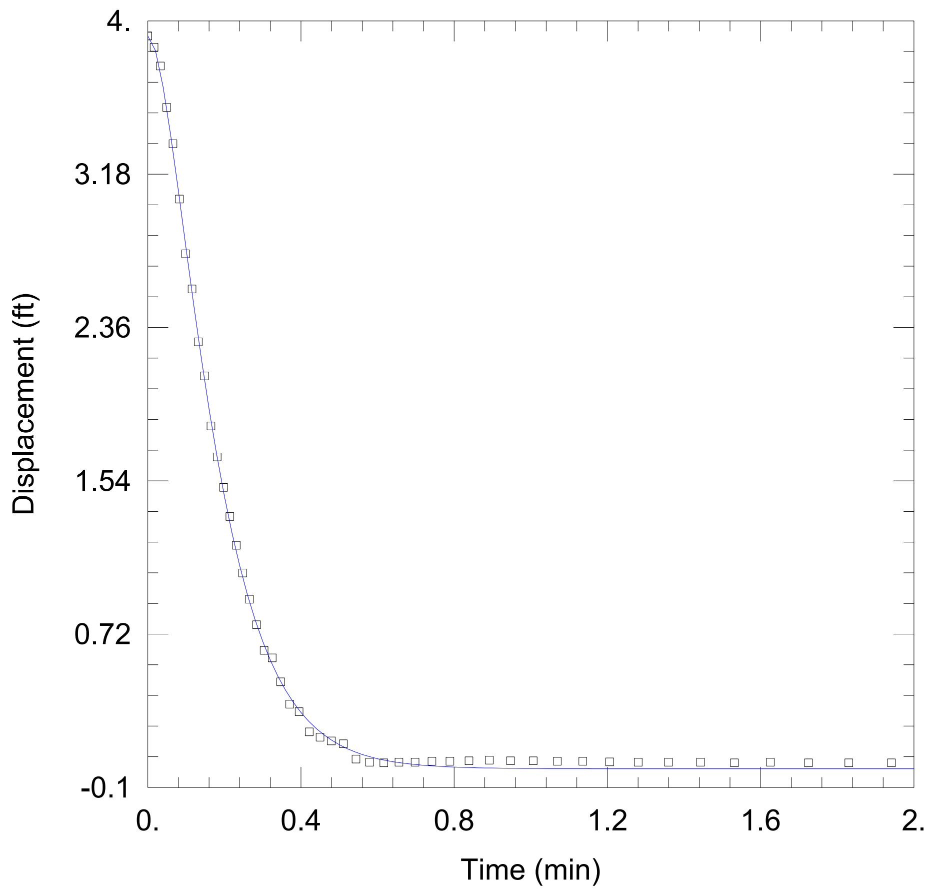
Aquifer Model: Confined

Solution Method: Butler

K = 10.6 ft/day

Le = 1287. ft

Appendix F, Figure F.26, Slug Test 26 (1425 ft – 1465 ft bls), rising head method, Butler solution.



R41PT27CAIR-SPACER(1465-1505)

Data Set: D:\MyFiles 2\R41AqtFiles-ST\R41PT27Cair-spacer(1465-1505)Butler.aqt
Date: 06/10/12 Time: 17:43:01

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: near Wauchula, Hardee Co., FL
Test Well: Core Hole
Test Date: 7/20/04

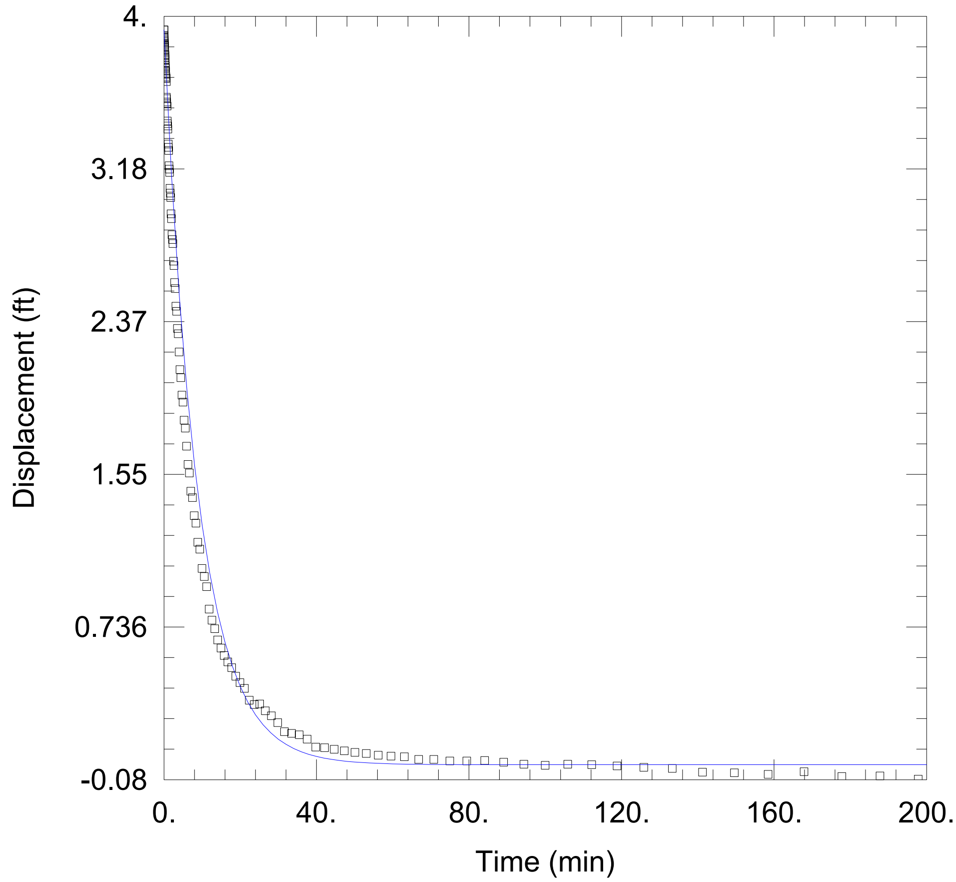
WELL DATA (Core Hole)

Initial Displacement: 3.919 ft
Total Well Penetration Depth: 40. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 1442.4 ft
Screen Length: 40. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler
K = 4.975 ft/day
Le = 1000. ft

Appendix F, Figure F.27, Slug Test 27 (1465 ft – 1505 ft bls), rising head method, Butler solution.



R41PT28BAIR-SPACER(1540-1600)

Data Set: D:\MyFiles 2\R41AqtFiles-ST\R41PT28Bair-spacer(1540-1600)Butler.aqt
Date: 06/10/12 Time: 17:43:25

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: near Wauchula, Hardee Co., FL
Test Well: Core Hole
Test Date: 7/26/04

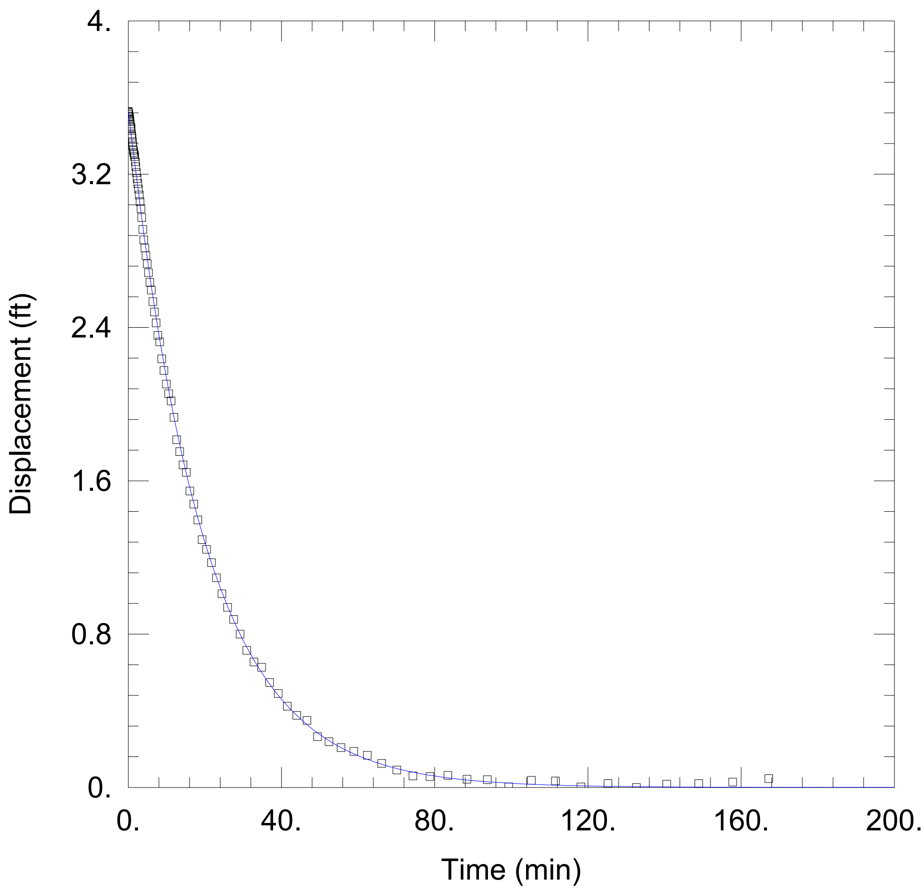
WELL DATA (Core Hole)

Initial Displacement: 3.927 ft
Total Well Penetration Depth: 60. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 1535.3 ft
Screen Length: 60. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler
K = 0.07004 ft/day
Le = 0.1 ft

Appendix F, Figure F.28, Slug Test 28 (1540 ft – 1600 ft bls), rising head method, Butler solution.



R41PT29AAIR-SPACER(1570-1600)

Data Set: D:\MyFiles 2\R41AqtFiles-ST\R41PT29Aair-spacer(1570-1600)Butler.aqt
Date: 06/10/12 Time: 17:43:47

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: near Wauchula, Hardee Co., FL
Test Well: Core Hole
Test Date: 7/27/04

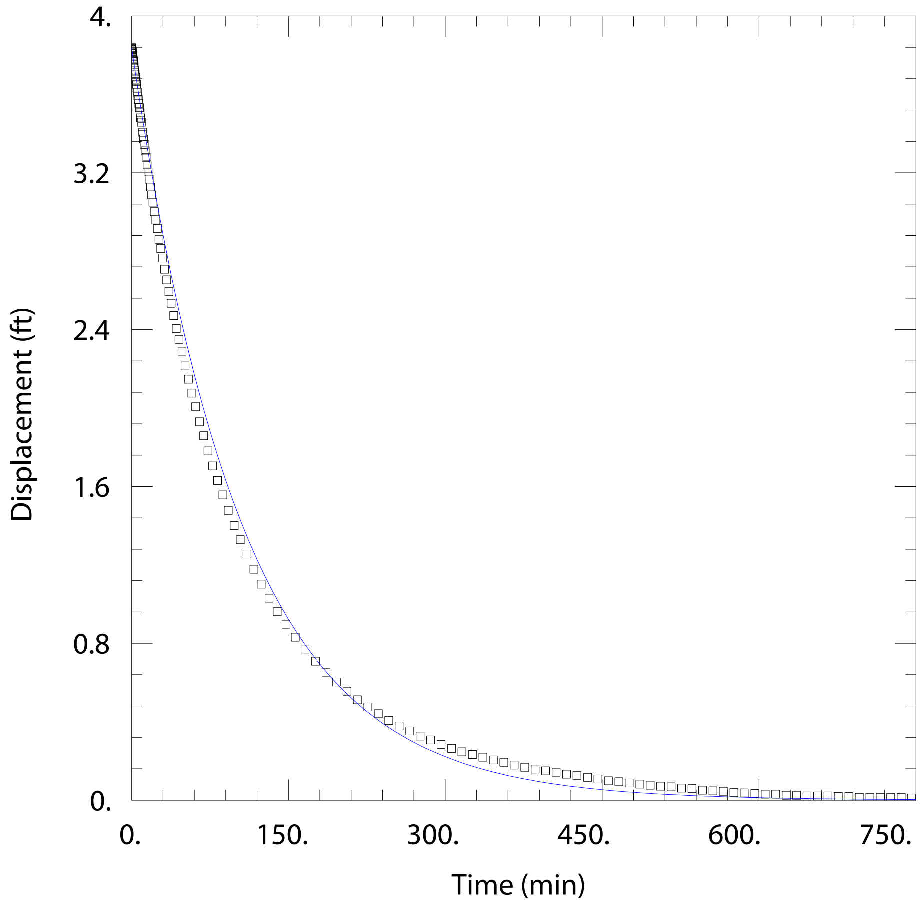
WELL DATA (Core Hole)

Initial Displacement: 3.527 ft
Total Well Penetration Depth: 30. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 1535.6 ft
Screen Length: 30. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler
K = 0.06345 ft/day
Le = 3.122E+5 ft

Appendix F, Figure F.29, Slug Test 29 (1570 ft – 1600 ft bls), falling head method, Butler solution.



R41PT30ASLUG-SPACER(1600-1640)

Data Set: D:\MyFiles 2\R41AqtFiles-ST\R41PT30Aair-spacer(1600-1640)Butler.aqt
Date: 06/10/12 Time: 17:44:11

PROJECT INFORMATION

Company: SWFWMD
Client: JMC
Project: ROMP 41 (Torrey)
Location: near Wauchula, Hardee Co., FL
Test Well: Core Hole
Test Date: 8/2/04

WELL DATA (Core Hole)

Initial Displacement: 3.837 ft
Total Well Penetration Depth: 40. ft
Casing Radius: 0.09917 ft
Static Water Column Height: 1574.8 ft
Screen Length: 40. ft
Well Radius: 0.1263 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler

K = 0.00891 ft/day
Le = 0.8394 ft

Appendix F, Figure F.30, Slug Test 30 (1600 ft – 1640 ft bls), falling head method, Butler solution.

Appendix G

Field and Laboratory Water Quality Data

Appendix G, Table G.1. Results of field analyses of water quality samples during coring at the ROMP 41 site.

[First sample collected from surficial monitor well, all others collected from corehole; Cl, chloride; HW, 4-inch steel casing; ID No., identifier number; mg/L, miligrams per liter; m/d/y, month/day/year; na, sample not analyzed for given parameter; pH, hydrogen ion concentration; SID, site identification number; SO_4 , sulfate; ST, slug test; SU, standard units; TS, thief sample; UID, District unique identification number; WQ, water quality; ^{o}C, degrees Centigrade; µS/cm, microsiemens per centimeter; #, number; --, none (field sample only); surficial monitor SID# 24538 (first sample only); Corehole SID# 24539 (all other samples); Corehole historical UID# 2954 2377 0]

Date Collected (m/d/y)	Time (24 hour)	Laboratory Sample ID No.	Slug Test WQ Sample Number	Interval/ Depth Sampled (feet bls)	Temperature (°C)	pH (SU)	Fluid Conductivity (µS/cm)	MAJOR ANIONS Chloride (mg/L)	MAJOR ANIONS Sulfate (mg/L)	Sample Collection Method/Remarks
12/30/2003	1500	--	--	3 - 24	na	na	137	na	na	Drilling water from surficial monitor added during coring
12/30/2003	1225	200060942	1	75 - 210	23.9	na	397	20	<50	Airlifted Sample after ST #1. Tested Interval below HW without packer. Hach Kit for Cl & SO_4
12/30/2003	1505	--	--	75 - 230	na	na	328	na	na	Airlifted water while cleaning corehole between runs
12/30/2003	1540	--	--	75 - 230	23.4	na	418	na	na	Airlifted between core runs
12/30/2003	1600	--	--	75 - 230	23.4	na	439	na	na	Airlifted between core runs
12/31/2003	1200	--	--	75 - 250	23.5	na	445	na	na	Airlifted between core runs
12/31/2003	1300	--	--	75 - 250	24.4	na	462	na	na	Airlifted between core runs
12/31/2003	1330	--	--	75 - 250	24.7	na	461	na	na	Airlifted between core runs
1/1/2004	1015	200061477	2	221 - 250	24.3	8.27	472	60	<50	Airlifted with packer set for ST #2. Hach Kit used for field analysis of Cl & SO_4
1/1/2004	1340	--	--	75 - 270	24.4	na	448	na	na	Airlifted between core runs
1/5/2004	1245	--	--	96 - 300	24.2	na	452	na	na	Airlifted between core runs
1/6/2004	1330	--	--	96 - 340	24.9	na	459	na	na	Airlifted between core runs
1/7/2004	1030	--	--	96 - 360	20.5	na	450	na	na	Airlifted between core runs
1/7/2004	1500	--	--	96 - 390	22.1	na	420	na	na	Airlifted between core runs
1/9/2004	1110	200062234	3	357 - 390	24	na	419	1.8	74	Airlifted with packer set for ST #3. Used YSI Photometer for field analysis of Cl & SO_4
1/9/2004	1500	--	--	96 - 410	24	na	407	na	na	Airlifted between core runs
1/13/2004	1300	--	--	96.5 - 430	22.2	na	421	na	na	Airlifted between core runs
1/13/2004	1600	--	--	96.5 - 450	23.6	na	415	na	na	Airlifted between core runs
1/14/2004	1000	--	--	96.5 - 480	23	na	405	na	na	Airlifted between core runs
1/14/2004	1030	200063037	4	452 - 490	na	na	na	na	na	Airlifted with packer set for ST #4. Hach Kit used for field analysis of Cl & SO_4.
1/15/2004	1000	--	--	96.5 - 490	22.4	na	413	na	na	Airlifted between core runs
4/15/2004	1100	--	--	490 - 510	24.2	na	408	na	na	Airlifted between core runs
4/16/2004	1440	200078063	5	490 - 530	25.9	7.8	407	60	60	Airlifted sample with packer set for ST #5 (490' - 530')
4/19/2004	1300	--	--	490 - 550	25.4	na	399	na	na	Airlifted between core runs
4/22/2004	1610	200078152	6	547 - 590	28.7	na	363	40	55	Airlifted with packer set for ST #6. Hach Kit used for field analysis of Cl & SO_4.
4/23/2004	1340	--	--	490 - 610	25.8	na	384	na	na	Airlifted between core runs
4/23/2004	1645	--	--	490 - 630	25.6	na	375	na	na	Airlifted between core runs
4/26/2004	1400	200079698	7	605 - 630	23.8	na	440	1	93	Airlifted with packer set for ST #7. YSI Photometer used for field analysis of Cl & SO_4
4/27/2004	1000	--	--	490 - 650	24.6	na	357	na	na	Airlifted between core runs
4/27/2004	1330	--	--	490 - 670	23.8	na	392	na	na	Airlifted between core runs
4/28/2004	1320	--	--	490 - 690	26.5	na	372	na	na	Airlifted between core runs
4/29/2004	1230	200080378	8 & 9	650 - 690	27.9	na	422	1.3	85	Airlifted with packer set for ST #8 & #9 (same interval). YSI Photometer used for field Cl, SO_4 & pH, henceforth.

Appendix G, Table G.1 (cont.). Results of field analyses of water quality samples during coring at the ROMP 41 site.

[First sample collected from surficial monitor well, all others collected from corehole; Cl, chloride; HW, 4-inch steel casing; ID No., identifier number; mg/L, miligrams per liter; m/d/y, month/day/year; na, sample not analyzed for given parameter; pH, hydrogen ion concentration; SID, site identification number; SO_4 , sulfate; ST, slug test; SU, standard units; TS, thief sample; UID, District unique identification number; WQ, water quality; °C, degrees Centigrade; µS/cm, microsiemens per centimeter; #, number; --, none (field sample only); surficial monitor SID# 24538 (first sample only); Corehole SID# 24539 (all other samples); Corehole historical UID# 2954 2377 0]

Date Collected (m/d/y)	Time (24 hour)	Laboratory Sample ID No.	Slug Test WQ Sample Number	Interval/ Depth Sampled (feet bls)	Temperature (°C)	pH (SU)	Fluid Conductivity (µS/cm)	MAJOR ANIONS Chloride (mg/L)	MAJOR ANIONS Sulfate (mg/L)	Sample Collection Method/Remarks
4/30/2004	1530	--	--	490 - 710	26.5	na	377	na	na	Airlifted between core runs
5/1/2004	1000	--	--	490 - 710	26.1	na	390	na	na	Airlifted between core runs
5/1/2004	1330	--	--	490 - 730	26	na	388	na	na	Airlifted between core runs
5/4/2004	930	--	--	490 - 740	26.3	na	390	na	na	Airlifted between core runs
5/4/2004	1345	200080377	10	700 - 740	26.6	8.05	425	5	110	Airlifted with packer set for ST #10. YSI Photometer
5/5/2004	930	--	--	490 - 760	25	na	390	na	na	Airlifted between core runs
5/6/2004	1230	--	--	490 - 780	25.9	na	385	na	na	Airlifted between core runs
5/11/2004	1700	200081752	11	755 - 800	25.9	8.2	375	7.5	82	Bailer Sample, Bailer attached to packer assembly. ST #11. YSI Photometer for field Cl , SO_4 & pH.
5/12/2004	1230	--	--	490 - 815	26.4	na	412	na	na	Airlifted between core runs
5/13/2004	1245	--	--	490 - 835	25.7	na	382	na	na	Airlifted between core runs
5/14/2004	1100	--	--	490 - 855	26.2	na	383	na	na	Airlifted between core runs
5/14/2004	1515	200083056	12	829 - 855	27.1	7.8	409	1.2	87	Airlifted with packer set for ST #12. YSI Photometer
5/15/2004	1320	--	--	490 - 875	26.7	na	398	na	na	Airlifted between core runs
5/15/2004	1600	--	--	490 - 895	26.2	na	375	na	na	Airlifted between core runs
5/18/2004	1000	200083057	13	850 - 895	26.7	7.7	408	5.1	104	Airlifted, ST #13. Photometer for field Cl, SO_4, pH
5/18/2004	1645	--	--	490 - 915	26.5	na	367	na	na	Airlifted between core runs
5/26/2004	930	200083939	14	904 - 935	27	8	403	14.5	94	Airlifted, ST #14, Photometer
5/27/2004	1430	200083940	15	934 - 975	26.9	7.9	378	4.5	108	Airlifted, ST #15, Photometer
5/28/2004	1145	--	--	506 - 995	28.6	na	361	na	na	Airlifted between core runs
5/29/2004	1000	200085260	16	992 - 1,015	27.9	8.2	479	5.6	130	Airlifted, ST #16, Photometer
5/29/2004	1430	--	--	506 - 1,035	27.8	na	434	na	na	Airlifted between core runs
6/1/2004	1330	--	--	506 - 1,035	28.8	na	518	na	na	Airlifted between core runs
6/2/2004	1300	--	--	506 - 1,055	28.4	na	508	na	na	Airlifted between core runs
6/4/2004	1010	200086005	17	1,025 - 1,075	28.2	7.55	589	4.7	268	Airlifted, ST #17, Photometer
6/5/2004	1030	--	--	506 - 1,095	27.8	na	647	na	na	Airlifted between core runs
6/8/2004	1400	--	--	506 - 1,100	26.8	na	555	na	na	Airlifted between core runs
6/10/2004	1100	--	--	506 - 1,101	27.6	na	556	na	na	Airlifted between core runs
6/10/2004	1500	--	--	506 - 1,120	26.6	na	639	na	na	Airlifted between core runs
6/11/2004	1530	--	--	506 - 1,140	27.3	na	623	na	na	Airlifted between core runs
6/12/2004	1420	200086627	18	1,105 - 1,140	28.7	7.9	665	4.8	292	Airlifted, ST #18, Photometer
6/14/2004	1230	--	--	506 - 1,140	27.2	na	665	na	na	Airlifted between core runs
6/16/2004	1230	--	--	823 - 1,160	27.2	na	636	na	na	Airlifted between core runs
6/17/2004	1130	--	--	823 - 1,175	27.6	na	576	na	na	Airlifted between core runs
6/21/2004	1130	200088087	19	1,152 - 1,175	29	7.7	639	8.8	312	Airlifted, ST #19, Photometer
6/22/2004	1100	--	--	823 - 1,175	29.2	na	586	na	na	Airlifted between core runs
6/23/2004	1130	--	--	823 - 1,185	27.8	na	600	na	na	Airlifted between core runs
6/26/2004	1300	--	--	823 - 1,187.5	26.8	na	644	na	na	Airlifted between core runs
6/28/2004	1200	--	--	823 - 1,205	27	na	504	na	na	Airlifted between core runs

Appendix G, Table G.1 (cont.). Results of field analyses of water quality samples during coring at the ROMP 41 site.

[First sample collected from surficial monitor well, all others collected from corehole; Cl, chloride; HW, 4-inch steel casing; ID No., identifier number; mg/L, miligrams per liter; m/d/y, month/day/year; na, sample not analyzed for given parameter; pH, hydrogen ion concentration; SID, site identification number; SO_4 , sulfate; ST, slug test; SU, standard units; TS, thief sample; UID, District unique identification number; WQ, water quality; °C, degrees Centigrade; µS/cm, microsiemens per centimeter; #, number; --, none (field sample only); surficial monitor SID# 24538 (first sample only); Corehole SID# 24539 (all other samples); Corehole historical UID# 2954 2377 0]

Date Collected (m/d/y)	Time (24 hour)	Laboratory Sample ID No.	Slug Test WQ Sample Number	Interval/ Depth Sampled (feet bls)	Temper-ature (°C)	pH (SU)	Fluid Conductivity (µS/cm)	MAJOR ANIONS Chloride (mg/L)	MAJOR ANIONS Sulfate (mg/L)	Sample Collection Method/Remarks
6/29/2004	1400	200089244	20	1,190 - 1,225	28.2	7.9	417	12.5	94	Airlifted, ST #20, Photometer
6/30/2004	1000	--	--	823 - 1,225	27.3	na	468	na	na	Airlifted between core runs
6/30/2004	1320	--	--	823 - 1,245	28	na	415	na	na	Airlifted between core runs
6/30/2004	1800	--	--	823 - 1,265	25.4	na	447	na	na	Airlifted between core runs
7/1/2004	1400	200089245	21	1,225 - 1,265	28	8	446	4.5	110	Airlifted, ST #21, Photometer
7/2/2004	1315	--	--	823 - 1,285	28.5	na	448	na	na	Airlifted between core runs
7/3/2004	1305	--	--	823 - 1,305	27.8	na	494	na	na	Airlifted between core runs
7/3/2004	1520	200089551	22	1,270 - 1,305	28.5	8.05	506	4.9	160	Airlifted, ST #22, Photometer
7/6/2004	1415	--	--	823 - 1,325	28.3	na	521	na	na	Airlifted between core runs
7/7/2004	1030	--	--	823 - 1,345	27.6	na	544	na	na	Airlifted between core runs
7/7/2004	1550	200089552	23	1,313 - 1,345	28	8.05	510	7.5	180	Airlifted, ST #23, Photometer
7/8/2004	1350	--	--	823 - 1,365	28.4	na	494	na	na	Airlifted between core runs
7/9/2004	1600	200090061	24	1,355 - 1,385	28.5	7.85	531	8.4	195	Airlifted, ST #24, Photometer
7/10/2004	1330	--	--	823 - 1,405	28.2	na	491	na	na	Airlifted between core runs
7/12/2004	1110	--	--	823 - 1,425	27.9	na	504	na	na	Airlifted between core runs
7/12/2004	1600	200090572	25	1,385 - 1,425	28.7	8	568	21	240	Airlifted, ST #25, Photometer
7/14/2004	1600	200090573	26	1,425 - 1,465	28.2	7.8	821	8.3	495	Airlifted, ST #26, Photometer
7/16/2004	1215	--	--	823 - 1,485	28.5	na	692	na	na	Airlifted between core runs
7/17/2004	1345	--	--	823 - 1,505	28.1	na	950	na	na	Airlifted between core runs
7/17/2004	1730	200091947	27	1,465 - 1,505	28	7.85	1,730	11	1,650	Airlifted, ST #27, Photometer
7/21/2004	1900	--	--	823 - 1,545	27.1	na	1,230	na	na	Airlifted between core runs
7/22/2004	1230	--	--	823 - 1,545	28.8	na	1,212	na	na	Airlifted between core runs
7/23/2004	1400	--	--	823 - 1,560	28.3	na	1,146	na	na	Airlifted between core runs
7/24/2004	1015	--	--	823 - 1,580	27.7	na	1,243	na	na	Airlifted between core runs
7/24/2004	1500	--	--	823 - 1,600	27.8	na	1,366	na	na	Airlifted between core runs
7/28/2004	1300	200092821	28	1,540 - 1,600	26.6	7.4	928	26	585	Bailer Sample, Bailer attached to packer assembly. ST #28. YSI Photometer for field Cl , SO_4 & pH.
7/30/2004	1300	200093323	29	1,570 - 1,600	28	7.55	1,165	7	1,380	Bailer Sample, Bailer attached to packer assembly. ST #29. YSI Photometer for field Cl , SO_4 & pH.
7/30/2004	1400	--	--	823 - 1,600	27.8	7.6	1,385	9.2	1,400	Packer removed and hole airlifted with rods at 1,570'. Rods then lowered to 1590' and bailer run to 1600'.
7/31/2004	1500	--	--	823 - 1,620	28	na	1,348	na	na	Airlifted between core runs
8/2/2004	1100	--	--	823 - 1,635	27.8	na	1,483	na	na	Airlifted between core runs
8/5/2004	1000	200094021	30	1,600-1,640	27.9	8.3	3,166	36	2,895	Bailer Sample, Bailer attached to packer assembly. ST #30. YSI Photometer for field Cl , SO_4 & pH.
8/6/2004	1600	200094469	TS	1,628	26.2	8.35	2,725	29	2,715	Thief Sample at 1,628', Open hole 823' - 1,640'

Appendix G, Table G.2. Results of laboratory analyses of water quality samples from the ROMP 41 site.

[First sample from surficial monitor, all others from corehole; bls, below land surface; Ca^{2+}, calcium; $CaCO_3$, calcium carbonate; Cl^-, chloride; Cond., conductance; Fe^{2+}, iron; ID No., identifier number; K^+, potassium; Mg^{2+}, magnesium; m/d/y,month/day/year; mg/L, milligrams per liter; Na^+, sodium; pH, hydrogen ion concentration; SiO_2, silica dioxide; SO_4^{2-}, sulfate; Sr^{2+}, strontium; SU, standard units; Surf, surficial monitor; TS, geophysical thief sample; WQ, water quality; µS/cm, microsiemens per centimeter; Surficial monitor site identification number (SID#) 24538 (Sample ID No. 200499052 only), Corehole SID# 24539 (all other samples), Historical Corehole unique identification number (UID#) 2954 2377 0]

Laboratory Sample ID No.	Date (m/d/y)	Time (24 hr)	Slug Test WQ Sample Number	Interval/ Depth Sampled (feet bls)	pH (SU)	Specific Cond. (µS/cm)	MAJOR ANIONS Cl^- (mg/L)	MAJOR ANIONS SO_4^{2-} (mg/L)	Ca^{2+} (mg/L)	Mg^{2+} (mg/L)	MAJOR CATIONS Na^+ (mg/L)	MAJOR CATIONS K^+ (mg/L)	Fe^{2+} (mg/L)	Sr^{2+} (mg/L)	Silica as SiO_2 (mg/L)	Total Dissolved Solids (mg/L)	Total Alkalinity $CaCO_3$ (mg/L)
200499052	11/15/2010	1500	Surf	4 - 24	6.38	197	13.60	20.10	23.0	3.30	10.6	1.71	1.75	0.100	4.70	120	48.10
200060942	12/30/2003	1225	1	75 - 210	8.21	419	9.890	3.950	40.2	21.0	13.7	1.29	<0.0125	0.370	40.2	265	197.0
200061477	1/1/2004	1015	2	221 - 250	8.23	464	21.10	10.30	39.7	23.0	23.5	1.84	0.0266	1.73	39.0	279	205.0
200062234	1/9/2004	1110	3	357 - 390	8.35	411	9.660	54.90	35.5	16.3	23.1	2.73	0.0979	3.66	20.8	247	143.0
200063037	1/14/2004	1030	4	452 - 490	8.17	403	8.290	63.00	46.2	16.9	8.46	1.87	0.0279	4.94	18.2	251	133.0
200078063	4/16/2004	1440	5	490 - 530	7.84	397	8.510	63.20	47.3	17.3	7.50	1.53	0.0884	5.02	18.0	268	133.0
200078152	4/22/2004	1610	6	547 - 590	7.91	409	10.70	57.40	46.5	17.7	7.68	1.64	0.0349	4.44	16.6	248	137.0
200079698	4/26/2004	1400	7	605 - 630	8.15	456	11.20	64.60	46.9	23.5	7.60	2.22	<0.0125	5.29	17.2	275	156.0
200080378	4/29/2004	1230	8 & 9	650 - 690	8.03	430	10.79	60.32	44.0	23.6	6.90	2.02	<0.0125	5.44	17.5	338	147.3
200080377	5/4/2004	1345	10	700 - 740	7.91	437	8.490	77.65	47.4	21.8	6.79	1.70	0.0189	6.12	18.4	315	132.9
200081752	5/11/2004	1700	11	755 - 800	7.57	390	10.64	61.70	42.0	16.9	7.53	1.38	0.271	4.55	12.4	244	124.0
200083056	5/14/2004	1515	12	829 - 855	7.88	413	10.84	60.72	42.2	23.0	7.14	1.95	<0.0125	5.17	18.5	262	139.0
200083057	5/18/2004	1000	13	850 - 895	7.84	404	11.25	52.66	40.0	22.8	7.39	2.07	<0.0125	4.86	17.9	247	147.0
200083939	5/26/2004	930	14	904 - 935	8.06	410	9.170	64.43	45.4	19.5	6.76	1.54	<0.0125	5.70	18.2	263	137.0
200083940	5/27/2004	1430	15	934 - 975	8.10	401	7.970	62.10	48.5	17.2	6.35	1.39	0.0337	6.10	18.6	256	140.0
200085260	5/29/2004	1000	16	992 - 1,015	8.14	497	10.70	123.0	60.0	22.1	7.20	1.42	0.0191	7.09	16.9	338	128.6
200086005	6/4/2004	1010	17	1,025 - 1,075	7.75	594	8.900	174.0	75.7	26.6	7.49	1.62	0.0171	9.13	17.8	401	128.7
200086627	6/12/2004	1420	18	1,105 - 1,140	8.07	644	11.00	214.0	79.9	29.7	7.86	1.49	0.0427	9.22	15.5	450	127.7
200088087	6/21/2004	1130	19	1,152 - 1,175	7.85	706	10.50	244.0	92.5	33.1	8.04	1.87	<0.0125	10.40	17.4	516	129.4
200089244	6/29/2004	1400	20	1,190 - 1,225	8.20	437	7.000	96.40	50.3	17.9	6.57	1.56	<0.0125	7.93	17.9	277	147.2
200089245	7/1/2004	1400	21	1,225 - 1,265	8.02	459	7.700	98.70	51.2	17.6	6.78	1.53	<0.0125	19.5	17.8	298	147.2
200089551	7/3/2004	1520	22	1,270 - 1,305	8.11	489	8.600	113.0	51.6	17.9	7.06	1.41	0.0313	38.2	17.4	355	139.8
200089552	7/7/2004	1550	23	1,313 - 1,345	7.87	538	12.80	130.0	55.7	18.8	8.47	1.59	0.0202	48.7	16.7	400	139.7
200090061	7/9/2004	1600	24	1,355 - 1,385	7.91	572	15.20	139.0	63.3	20.0	10.3	1.87	0.0289	45.9	16.4	403	147.6
200090572	7/12/2004	1600	25	1,385 - 1,425	8.10	613	14.70	164.0	124	40.1	9.82	2.38	<0.0125	28.1	17.0	446	146.0
200090573	7/14/2004	1600	26	1,425 - 1,465	8.17	904	15.00	345.0	71.7	22.3	9.17	1.94	<0.0125	42.0	16.8	674	139.9
200091947	7/17/2004	1730	27	1,465 - 1,505	7.59	2,060	16.60	1,080	388	100	12.0	2.94	<0.0125	14.2	17.6	1,900	124.6
200092821	7/28/2004	1300	28	1,540 - 1,600	7.53	1,381	14.90	709.0	250	41.7	10.2	1.84	0.189	29.6	8.9	1,160	114.0
200093323	7/30/2004	1300	29	1,570 - 1,600	7.21	1,560	15.00	814.0	292	58.8	10.0	2.08	0.634	26.2	12.5	1,340	118.4
200094021	8/5/2004	1000	30	1,600 - 1,640	7.51	3,220	45.30	2,110	672	127	83.8	8.94	0.401	12.8	22.7	3,130	109.4
200094469	8/6/2004	1600	TS	1,628	7.62	2,880	38.20	1,740	632	90.1	51.7	5.32	0.0304	17.4	15.6	2,790	119.6