SOUTH FLORIDA WATER MANAGEMENT DISTRICT

# Hydrogeologic Investigation of the Floridan Aquifer System

# L-8 (PBF-15)

## Palm Beach County, Florida

Technical Publication WS-25

by
Steven Anderson

September 2008

sfwmd.gov

# Executive Summary

Water supply plans for the Lower East Coast Planning Area (LEC) have identified the Floridan aquifer system (FAS) as a possible water supply alternative. The Comprehensive Everglades Restoration Plan (Everglades Plan) is focused on storing available water currently lost to tides. Aquifer storage and recovery has been identified as a major storage option, especially near the planned L-8 Canal Reservoir. Based on these plans, the South Florida Water Management District (SFWMD or District) initiated an exploratory well construction, aquifer testing, and long-term monitoring program in the LEC. This report documents the hydrogeologic investigation of the FAS in the L-8 Basin.

The exploratory wells will supply information needed to characterize the water supply potential of the FAS and to develop groundwater models, which will support future planning and regulatory decisions for the LEC. The LEC includes Palm Beach, Broward, Miami-Dade, and Monroe counties, and the eastern portion of Hendry County. A combination of natural drainage basins and political boundaries define the extent of this planning area. The well site was selected to augment existing hydrogeologic data and provide broad, spatial coverage within the LEC.

The scope of the investigation involved drilling, constructing, and testing an exploratory tri-zone Floridan aquifer monitor well in the L-8 Basin. The tri-zone well, referred to as PBF-15, was constructed as a telescoping style well to monitor water levels and water quality in three distinct FAS intervals. The well was completed in three distinct hydrogeologic units, drilled to a total depth of 2,300 feet below land surface (bls). The well was constructed in two phases using two different contractors. The District provided oversight for both phases of the operations.

The first phase of construction involved drilling a pilot hole to approximately 1,400 feet bls, with a 16-inch-diameter steel casing set to 908 feet bls to complete the first monitor interval. The second phase continued the drilling process to 2,300 feet bls, back plugging the well to a depth of 2,100 feet bls. The second monitor interval was completed with a 12-inch diameter steel casing from 1,400 to 1,583 feet bls, and the third monitor interval was completed with a 4-inch diameter fiberglass casing from 2,010 to 2,100 feet bls.

The main findings of the exploratory drilling and testing program at this site are as follows:

- The top of the FAS as described by the Southeastern Geological Society AdHoc Committee on Florida Hydrostratigraphic Unit Definition (1986) was identified at a depth of approximately 885 feet bls.
- Lithologic descriptions, geophysical logs, specific capacity, packer test results, and water quality data indicate moderate production capacity in the upper and middle portions of the Floridan aquifer.
- Water quality data from straddle packer tests and completed monitor zones indicate that chloride and total dissolved solids in the Floridan aquifer waters exceed potable drinking water standards.
- The base of the underground source of drinking water (USDW), where water contains total dissolved solid concentrations less than 10,000 mg/L, is at an approximate depth of 1,920 feet bls; however, induction resistivity logs estimate the depth of the USDW to be further up the column.
- Productive horizons in the FAS were from 900 to 1,400 feet bls, and from 1,500 to 1,575 feet bls. Fluid resistivity logs indicate that higher water quality is produced from 900 to 940 feet bls, and water quality deteriorates rapidly below 1,890 feet bls.
- Long-term monitoring now records water levels in the FAS, identifying responses to external stresses, such as earth tides and barometric pressure variations.

# Table of Contents

# List of Tables



# List of Figures



# List of Appendices

# 1
# Introduction

## BACKGROUND

Water supply plans for the Lower East Coast Planning Area (LEC) of the South Florida Water Management District (SWFMD or District) have identified the Floridan aquifer system (FAS) as a possible alternative water supply source. The Comprehensive Everglades Restoration Plan (Everglades Plan) is focused on storing available water currently lost to tides. The aquifer storage and recovery (ASR) has been identified as a major storage option, especially near the planned L-8 Canal Reservoir. Based on these plans, the District initiated a program of exploratory well construction, aquifer testing, and long-term monitoring of water quality and hydraulic heads to provide data needed to assess the FAS underlying this area. The exploratory wells will supply information needed to characterize the water supply potential and aquifer storage of the FAS, and to develop a groundwater model, which will support future planning and regulatory decisions for the LEC.

The LEC includes Palm Beach, Broward, Miami-Dade, Monroe, and eastern portions of Hendry and Collier counties. A combination of natural drainage basins and political boundaries define the extent of this planning area.

### Well Site Location

The L-8 Canal tri-zone monitor well, referred to as PBF-15 by the SFWMD, and W-18728 by the Florida Geological Survey (FGS), is located at latitude 26°44'16.0"N and longitude 80°21'49.0"W (North American Datum of 1927). A survey benchmark is set at an elevation of 24.23 feet relative to the National Geodetic Vertical Datum of 1929 (NGVD 1929), or mean sea level, and 22.75 feet relative to North American Vertical Datum (NAVD 1988). The survey information for the monitor zones is described as follows:

| Monitor Zone | NGVD 1929 | NAVD 1988 |
|---|---|---|
| MZ-1 | 27.21 | 25.73 |
| MZ-2 | 27.85 | 26.37 |
| MZ-3 | 28.02 | 26.54 |

## PURPOSE

This report documents the hydrogeologic investigation of the FAS in the L-8 Basin. The report comprises data collected during well drilling, aquifer testing, and monitoring at the L-8 Canal site. The information includes a summary of: 1) well drilling and construction details; 2) lithostratigraphy and hydrogeology; 3) water quality and productive capacity; and 4) short-term hydraulic head data. **Figure 1** illustrates the site location and **Figure 2** shows a more detailed project location.

## PROJECT DESCRIPTION

The scope of the investigation involved drilling, constructing, and testing an exploratory tri-zone Floridan aquifer monitor well in the L-8 Basin. The exploratory well was constructed in two phases by two different drilling contractors. The District provided oversight for both phases of the operations. These two phases were separated as follows:

**Phase I Drilling:** A.C. Schultes, Inc. (ACS), a Tampa-based firm, was responsible for drilling, construction, and testing services under SFWMD contract CN-051190. The well was completed to a depth of 1,400 feet below land surface (bls) with a 16-inch diameter steel casing set to 908 feet bls.

**Phase II Drilling:** All Webb Enterprises, Inc. (AWE), a Jupiter-based firm, was responsible for completing construction and testing services of the final tri-zone monitor well (PBF-15) under SFWMD contract CN-060367. The well was drilled to a total depth of 2,300 feet bls and then back plugged to a depth of 2,100 feet bls.

PBF-15 was constructed in a telescope manner with three monitor intervals. The first monitor interval was completed with a 16-inch diameter steel casing from 908 to 1,144 feet bls in Phase I. The second interval was completed with a 12-inch diameter steel casing from 1,400 to 1,583 feet bls, and the third monitor interval was completed with a 4-inch diameter fiberglass casing from 2,010 to 2,100 feet bls in Phase II.

Mud-rotary and reverse-air drilling techniques were used. For instance, ACS employed closed-circulation mud-rotary drilling to advance a nominal 12-inch diameter pilot hole from land surface to 1,400 feet bls during Phase I. AWE employed the reverse-air, open-circulation method to drill the pilot-hole from 1,400 to 2,300 feet bls.

The District used formation samples (well cuttings) and geophysical logs to determine casing setting depths. A suitable aquifer horizon was identified for long-term monitoring and the contractors reamed the pilot hole to the specified

diameters and depths for the selected casings. Three concentric casings (36-, 24-, 16-inch diameter) were used in Phase I for the construction of the tri-zone monitor well. Two concentric casings (12- and 4-inch diameter) were used in Phase II to complete of the telescoping style tri-zone monitor well.


**Figure 1.** PBF-15 site location map along L-8 Canal.


**Figure 2.** PBF-15 project location map.

# 2

# Exploratory Drilling and Well Construction

## PHASE I DRILLING

On September 13, 2005, ACS mobilized at the L-8 Basin site to begin drilling and construction of the FAS test-monitor well (referred to as PBF-15). ACS installed (via a vibratory hammer) a 30-inch diameter steel pit casing American Society of Testing and Materials (ASTM) A53, Grade B to 36 feet bls. Then ACS cleared and rough-graded the site and built a 2-foot thick by 2-foot high earthen wall with crushed limestone. ACS then lined the earthen wall with a high-density polyethylene (HDPE) membrane to form a temporary drilling pad around the perimeter of the rig and settling tanks. The drilling pad served to contain drilling fluids and formation waters produced during well drilling, testing, and construction activities.

On October 22, 2005, ACS began drilling operations by advancing a 12-inch diameter borehole to a depth of 214 feet bls. ACS then reamed the pilot hole with a 30-inch diameter bit to 214 feet bls. On November 5, 2005, MV Geophysical Survey, Inc., a Fort Myers-based geophysical logging company, logged (natural gamma and 4-arm caliper) the nominal 30-inch borehole (**Appendix A**). On November 8, 2005, ACS installed a 24-inch diameter steel pit casing (ASTM A53, Grade B) to 205 feet bls and pressure grouted the annulus back to 80 feet bls using 15 cubic yards ($yd^3$) of ASTM Type II, Portland cement. On November 9, 2005, ACS pumped an additional stage (7 $yd^3$) of ASTM Type II neat cement, causing cement returns at land surface.

ACS installed a blow-off prevention valve on the 24-inch diameter casing to control potential artesian conditions while penetrating the intermediate aquifer/confining unit and the FAS. On November 15, 2005, ACS resumed mud rotary drilling of the pilot-hole through unconsolidated to semi-consolidated, Miocene-aged sediments and Oligocene/Eocene-aged carbonates. During drilling, a District representative selected five intervals for core collection.

On January 18, 2006, ACS drilled to a depth of 1,415 feet bls, with no noticeable fluid losses. ACS circulated the nominal 10-inch diameter borehole to prepare it

for geophysical logging operations. Schlumberger, an oil field services company, performed geophysical logging of the mud-filled pilot-hole from 205 to 1,415 feet bls on January 20, 2006. Formation evaluation logs consisted of the following: 4-arm Caliper, Gamma Ray, Spectralog®, Electron Capture Spectroscopy, High Resolution Array Induction with Spontaneous Potential, Dipole Sonic, Compensated Density with Photoelectric Effect, Compensated Neutron, and Formation Micro-Imager. These logs provide information on the subsurface permeability distribution within the open-hole section (460 to 1,500 feet bls). **Appendix A** contains the individual log traces from Geophysical Run No. 2.

The District reviewed the geophysical logs (**Appendix A**) and lithologic data (**Appendix B**), and identified the top of the FAS at a depth of approximately 885 feet bls. The 16-inch diameter casing was set to a depth of 908 feet bls to:

1. To avoid future drilling problems, seal off overlying silty clays of the Hawthorn Group and carbonate mud stringers, fine quartz, and phosphatic sands within the lower portion of the Arcadia Formation between 880 and 900 feet bls.
2. Locate the casing in a competent, well-indurated rock unit to reduce undermining (erosion) at its base because of natural and induced high-velocity upward flow.
3. Facilitate reverse-air drilling operations through the underlying permeable horizons of the FAS to the anticipated depth of 2,300 feet bls.
4. Evaluate flow characteristics of the FAS within the anticipated open-hole interval of 905 to 2,300 feet bls.

During logging operations, Schlumberger identified the borehole to be 3-degrees off deviation in the east/northeast direction. The District's Statement of Work stated that the borehole may not exceed 1-degree off deviation. ACS elected to back plug the borehole to 205 feet bls with neat cement and re-drill the borehole, taking deviation surveys every 30 to 1,400 feet bls.

On February 11, 2006, ACS back plugged the borehole from 1,415 feet bls to 176 feet bls with 39 cubic-yards ($yd^3$) of neat cement. Pilot-hole drilling was resumed with a 12-inch diameter bit on February 18, 2006. A problem was encountered at 670 feet bls where the borehole moved off deviation by slightly over 1-degree. Attempts were made to rectify the problem (i.e., side reaming), but the problem could not be corrected. ACS elected to back plug the borehole on March 3, 2006 with 13 $yd^3$ of neat cement to 590 feet bls.

A new pilot hole was drilled to 908 feet bls on March 6, 2006. ACS attempted to ream the pilot-hole with a 23-inch bit, although the bit would move 1-degree off deviation during drilling operations. This may have occurred because not enough bit subs (weight) was behind the drill bit, which helps drill a straight hole.

ACS elected to ream the borehole gradually by using a 17-inch diameter bit before using the 23-inch diameter bit. On April 19, 2005, ACS reamed the borehole with a 17-inch diameter bit to 908 feet bls and on April 24, 2006 they complete the borehole to 908 feet bls with a 23-inch diameter bit. All reaming operations stayed under 0.5-degree off deviation.

On May 2, 2006, MV Geophysical logged (natural gamma and 4-arm caliper) the nominal 23-inch diameter borehole to 903 feet bls without incident (see **Appendix A** for Geophysical Log Run 3). The caliper log identified the bottom of the borehole to be 903 feet bls, which would put the casing too close to the fine quartz and phosphatic sands of the Arcadia Formation. Directed by the District, ACS reamed the borehole to 915 feet bls and MV Geophysical re-logged (natural gamma and 4-arm caliper) the nominal 23-inch diameter borehole without incident on May 8, 2006. The caliper log trace showed no unusual borehole conditions that would prohibit proper installation of the 16-inch diameter steel casing (see **Appendix A** for Geophysical Log Run 4).

On May 8, 2006, ACS installed the 16-inch diameter steel casing (ASTM A53, Grade B) to a depth of 905 feet bls and pressure grouted the annular space using 70 $yd^3$ of ASTM Type II neat cement. A temperature log, run by MV Geophysical on May 9, 2006, identified the top of the cement to be 425 feet bls. Steel tubing was also used to physically locate (hard tag) cement levels within the annulus, indicating cement levels at 388 feet bls. ACS pumped an additional 52 $yd^3$ of ASTM Type II neat cement via the tremie method in two stages. This volume brought cement levels to 6 feet bls.

The wellhead was sealed at the surface with a temporary header for a casing pressure test. Next, the well was filled with water and pressurized to approximately 106-pounds per square inch (psi) with a high-pressure pump. A pressure test (witnessed by a SFWMD representative) on the 16-inch diameter steel casing was completed on May 23, 2006. During the course of the 60-minute pressure test, the total pressure within the 16-inch diameter casing decreased 2.0 psi, representing a 2.0 percent decline within the test tolerance limit of +/- 5 percent (**Table 1**).

**Table 1.** Results of casing pressure test.

| Time Hour | Elapsed Time (min) | Pressure Reading (psi) | Remarks | Recorded by |
|---|---|---|---|---|
| 10:27 | 0 | 106.0 | Start of test | ER |
| 10:32 | 5 | 106.0 | | ER |
| 10:37 | 10 | 105.5 | | ER |
| 10:42 | 15 | 105.5 | | ER |
| 10:47 | 20 | 105.0 | | ER |
| 10:52 | 25 | 105.0 | | ER |
| 10:57 | 30 | 105.0 | | ER |
| 11:02 | 35 | 104.5 | | ER |
| 11:07 | 40 | 104.5 | | ER |
| 11:12 | 45 | 104.5 | | ER |
| 11:17 | 50 | 104.5 | | ER |
| 11:22 | 55 | 104.5 | | ER |
| 11:27 | 60 | 104.0 | End of test: Total pressure change 2.0 psi | ER |

Witnessed and recorded by Ed Rectenwald, SFWMD.

As a result of pressure grouting, ACS drilled out a cement plug at the base of the 16-inch diameter casing using a nominal 15-inch diameter bit. ACS reconfigured the drill bit assembly using a 12-inch diameter bit and mud rotary drilled from 905 feet to 1,400 feet bls. On May 26, 2006, ACS completed Phase I drilling operations to a depth of 1,400 feet bls. MV Geophysical logged (natural gamma and 4-arm caliper) the borehole on June 2, 2006 to verify total depth and borehole conditions.

ACS constructed a 5-foot by 5-foot reinforced concrete pad at the surface of the monitor wellhead and placed traffic bumpers at its corners. By June 21, 2006, ACS completed Phase I well construction, demobilized drilling equipment, and restored the site.

## PHASE II DRILLING

AWE was considered the "Apparent Low Quote" for Phase II, and a "Notice to Proceed" was issued with an effective date of October 9, 2006. AWE mobilized and set up their Challenger 320 HD rig on the existing site. AWE entered the borehole and reverse-air drilled the open-hole interval. After the borehole was conditioned, drilling began on October 20, 2006.

AWE reverse-air drilled from 1,400 to 2,300 feet bls. On January 16, 2007, AWE ran production evaluation logs under artesian flow (dynamic) conditions. These production logs included a flowmeter, high-resolution temperature log, and fluid

resistivity log. On January 10, 2007, Schlumberger logged the water-filled nominal 10-inch diameter pilot-hole from 908 to 2,300 feet bls. The logging suite included Caliper, Gamma Ray, Spectralog®, Dual Induction-Focused Log, Multipole Array Acoustilog℠, Compensated Z-Densilog℠ (Z denotes electron density), and a Compensated Neutron. Logs are shown in **Appendix A** and discussed in the Hydrogeologic Testing section.

The District selected packer test intervals based on information provided by analysis of the geophysical logs, video survey, and formation samples (well cuttings). The first of three tests began on February 22, 2007. The tests characterized the water quality and production capacities of specific intervals within the middle portion of the FAS (1,560 to 1,940 feet bls). Packer testing operations were completed on February 27, 2007.

After packer testing, available information was compiled and used to select the open-hole sections for the two lower monitor zones. The District selected 1,400 feet bls as the casing setting depth for the nominal 12-inch diameter steel casing. AWE used a nominal 15-inch diameter bit to ream the pilot-hole from 908 feet bls (base of the 16-inch diameter casing) to 1,400 feet bls. On February 6, 2007, AWE ran a caliper log on the reamed borehole to evaluate its configuration/stability and to calculate cement volumes for grouting operations. AWE attached three steel cement baskets and centralizers to the nominal 12-inch diameter steel casing and installed it at 1,400 feet bls. AWE then grouted the annular space using 620 $ft^3$ of ASTM Type II neat cement placed by the tremie method in seven stages to 1,583 feet bls.

Next, AWE reverse-air drilled and developed the remaining open-hole section from 1,400 to 2,300 feet bls. Once the borehole was cleaned-out, geophysical logs were completed. AWE then installed threaded-and-coupled nominal 4-inch diameter fiberglass reinforced pipe (FRP-Smith Fiberglass, SDT 1510 series) to a depth of 2,010 feet bls. AWE filled the remaining open borehole with gravel and a fine sand cap and cement-grouted the FRP by the tremie method using 225 $ft^3$ of ASTM Type II neat cement pumped in multiple stages. Stage grouting operations caused cement levels to rise up and around the bottom of the casing from 2,010 feet bls to 1,583 feet bls. This volume brought cement levels to 1,583 feet bls, which formed the base of the second monitor interval (referred to as PBF-15 MZ-2). The cement was drilled out and gravel was pumped out to a depth of 2,100 feet bls. This formed the third monitor interval (referred to as PBF-15 MZ-3, 2,010-2,100 feet bls). On March 6, 2007, AWE completed the cement grouting of the nominal 4-inch diameter FRP.

AWE installed three 2-inch diameter stainless steel extensions equipped with 2-inch inner diameter stainless steel ball valves at the surface to complete the wellhead for the tri-zone monitor well. The telescoped-style well allows the SFWMD to monitor water levels and water quality in three distinct FAS intervals. The uppermost monitor zone (PBF-15 MZ-1) was constructed using a

16-inch diameter casing and completed with an annular zone between 908 and 1,144 feet bls. The next zone (PBF-15 MZ-2) was completed within the second productive interval in the FAS, from 1,400 to 1,583 feet bls. The lowermost monitor zone, identified as PBF-15 MZ-3, was completed in the lower section of the middle confining unit below the base of the underground source of drinking water (USDW), from 2,010 to 2,100 feet bls. **Table 2** lists the monitor intervals and completion methods for the tri-zone monitor well.

**Table 2.** Summary of monitor intervals for tri-zone FAS monitor well.

| Identifier | Monitor Interval (feet bls) | Completion Method | Aquifer |
|---|---|---|---|
| PBF-15 MZ-1 | 908–1,144 | Annular Zone | Upper Floridan |
| PBF-15 MZ-2 | 1,400–1,583 | Annular Zone | Middle Floridan |
| PBF-15 MZ-3 | 2,010–2,100 | Open Hole | Middle Confining Unit |

AWE developed the three monitor intervals via over-pumping and artesian flow techniques until the sediment concentration of produced formation waters was 5 milligrams per liter (mg/L) or less using an Imhoff cone. AWE then built a 5-foot by 5-foot reinforced concrete pad at the surface of the monitor wellhead and placed traffic bumpers at its corners. AWE completed well construction of PBF-15 on March 13, 2007. **Figure 5** is a Well Completion Diagram of the tri-zone monitor well, and **Figure 6** is a photograph of the completed PBF-15 wellhead.

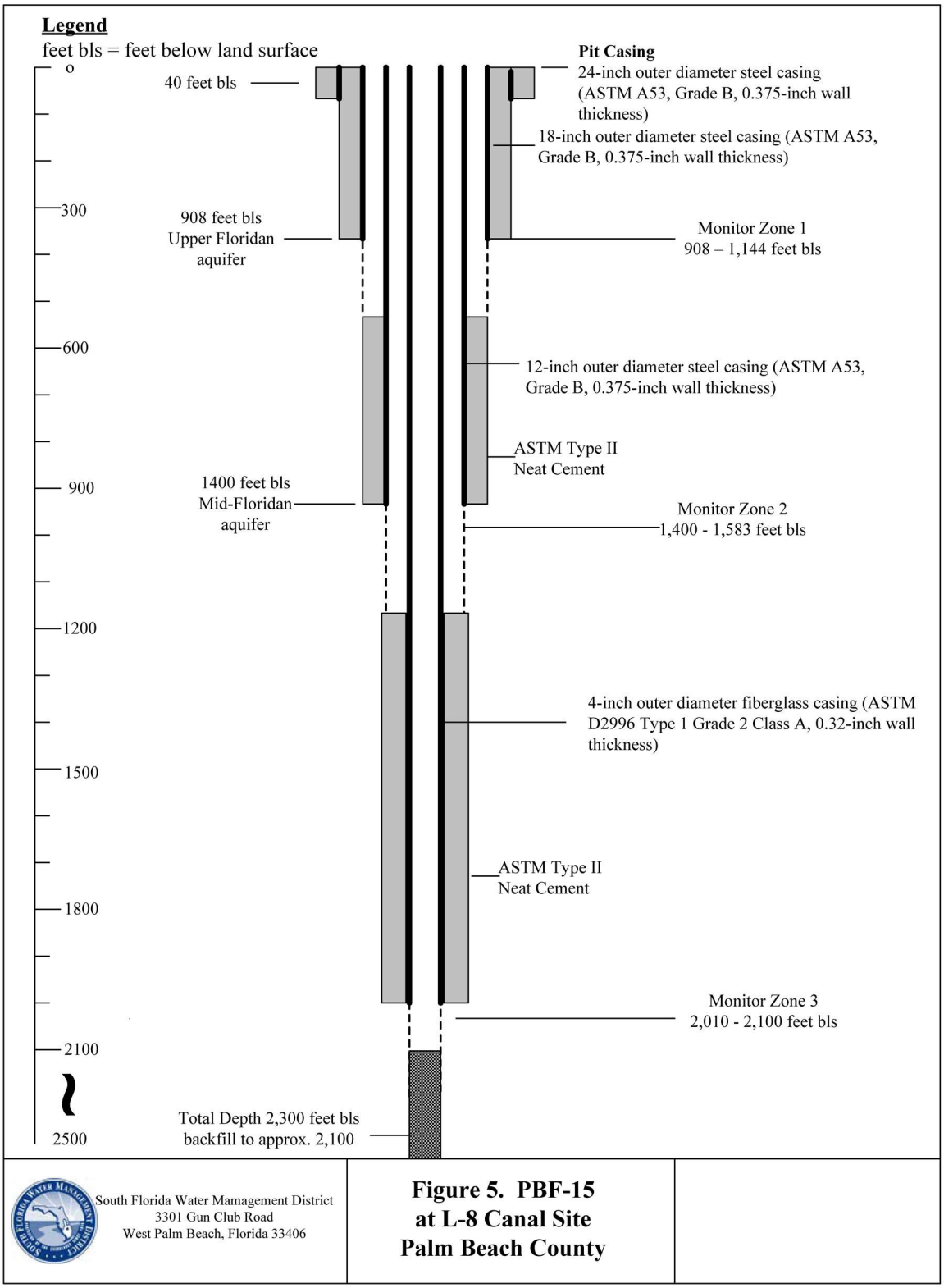



**Figure 3.** PBF-15 well completion diagram.


**Figure 4.** Photograph of PBF-15 wellhead.

# 3
# Stratigraphic Framework

The District collected geologic formation samples (well cuttings) from the pilot hole during drilling operations for the PBF-15 tri-zone monitor well and analyzed them based on their dominant lithologic or textural characteristics, and, to a lesser extent, color. Formation samples were washed and shipped to the Florida Geological Survey (FGS) for analysis and long-term storage. **Appendix B** contains a copy of the FGS's detailed lithologic description for the pilot-hole/monitor well PBF-15 (FGS reference no. W-18728). An electronic version of the lithologic description is available from the FGS at: http://www.dep.state.fl.us/geology/gisdatamaps/litholog.htm.

## PLIOCENE SERIES

The sediments occur from land surface to a depth of approximately 200 feet at this site. These sediments consist of quartz sand and shell beds (moderate to well-indurated) typically from the Holocene and Pleistocene age. The well-indurated calcareous sandstone and limestone encountered from 100 to 200 feet bls represent the Pliocene-age of the Tamiami Formation. This formation consists of fine to very coarse-grained quartz sands with varying percentages of silt, clay, and shell material (Reese 2000).

## MIOCENE SERIES

### Hawthorn Group

The Hawthorn Group is composed of a heterogeneous mixture of silt, clay, calcareous clay, dolosilt, quartz sand, shell, phosphate grains, limestone, and dolomite. The Hawthorn Group can be subdivided into two lithostratigraphic units. The upper unit, the Peace River Formation, is composed predominantly of green to olive-gray siliciclastic material. The lower unit, the Arcadia Formation, is composed principally of carbonates (Scott 1988). A major regional disconformity separates these two units (Scott 1988 and Missimer 1997, 2002). The contact between these two units can often be identified by the occurrence of a rubble bed of coarse- to pebble-size quartz sand and phosphatic sand and gravel. If

present, this unit produces a distinctive response or "peak" on the natural gamma ray log.

#### *Peace River Formation*

The top of the Peace River Formation is recognized as the first appearance of an olive-gray to yellowish-gray, poorly indurated clayey silt unit with a minor phosphate component. These poorly indurated silts are at a depth of 200 feet bls. These low permeable sediments are approximately 340 feet thick and extend to a depth of 540 feet bls. The lower portion of the Peace River Formation from 300 to 540 feet bls consists of a low permeability, poorly indurated, light olive-gray to olive-gray clay matrix with minor shell.

#### *Arcadia Formation*

Generally, the Arcadia Formation is separated from the Peace River Formation by a lithologic change from predominantly siliciclastic to mixed siliciclastic-carbonate sediments. The matrix shifts from clay to calcilutite. At this site, a distinctive lithologic break occurs at 540 feet bls, where a yellowish-gray to light-gray, moderately indurated, mudstone/wackestone with dolomitic and sparry calcite cement is encountered. There is a distinct change at 720 feet bls from wackestone to packstone, with increased allochemical constituents, and accessory minerals. This lithologic unit is noted on the geophysical logs by a moderate increase in gamma-ray emissions, (see **Appendix A**, PBF-15 Geophysical Log Run No. 2).

The lithology below 570 feet bls shifts to a poorly indurated phosphatic wackestone-packstone. This interval is marked by varying formation resistivity and bulk density readings, and decreased sonic transit times. Between 720 and 885 feet bls, the grain size ranges from microcrystalline to coarse with poor induration. The "marker unit" is located just above this basal Hawthorn Group unit identified by Reese (2000). Reese (2000) found this marker unit to be laterally continuous throughout much of Collier, Lee, Hendry, and Palm Beach counties.

## OLIGOCENE SERIES

### Suwannee Limestone

The FGS did not identify any contact between the Arcadia Formation and the Suwannee Limestone, based on lithologic considerations. The Suwannee Limestone of the early Oligocene age is interpreted to be present only in western Palm Beach County (Reese 2000).

## EOCENE SERIES

### Ocala Limestone

The Ocala Limestone is identified at a depth of 885 feet bls. The lithologic character of the upper portion of the Ocala Limestone is similar to the yellowish-gray packstones of the lower Arcadia Formation, as seen in the well cuttings and geophysical log responses. The FGS identified the top of the Ocala Limestone at a depth of 885 feet bls, with the first occurrence of benthic foraminifera, a diagnostic microfossil assumed to be *Lepidocycina ocalana* (primarily a biostratigraphic designation, Applin and Applin 1944). The lack of lithologic differences between the two lithostratigraphic units may indicate similar depositional environments were present at this location.

At this site, the Ocala Limestone is from 885 to 920 feet bls, consisting primarily of yellowish-gray, moderate to well-indurated wackestone. The allochemical constituent consists primarily of benthic foraminiferal tests, fossil fragments, and cones. Through this lithostratigraphic unit, the natural gamma log records lower emissions than in units above, and varying log-derived neutron/density porosity curves (see **Appendix A**, Geophysical Log Run No. 1).

## MIDDLE EOCENE

### Avon Park Formation

The FGS identified the Avon Park Formation from 920 to 1,860 feet bls. The formation consists predominantly of moderately to well-indurated, yellowish-gray wackestone and grainstone units that exhibit the effects of low-grade recrystallization. The formation resistivity, photoelectric, density, neutron, sonic, and caliper log responses remain fairly consistent throughout this limestone sequence, noting minor variations in lithology, porosity, and structure, as seen in their individual log traces obtained from Geophysical Log Run No. 1 and 2 (**Appendix A**). A composite of density, sonic, and neutron measurements set at a limestone matrix, coupled with post processing and correlation of conventional 4-inch diameter core, allowed the production of the composite plot of PBF-15 (provided by HuntWallace ™ and shown in **Appendix A**, Geophysical Log Run No. 4). This log trace shows a dolomitic limestone that contains varying amounts of interbedding limestone and dolomite.

Dolostones are limited to the interval from 1,310 to 1,330 feet bls, comprising only a small percentage of this large Avon Park Formation, which is considered unusual since a thicker and higher number of dolostone units are generally found. Multi-layers of dolostones were encountered at lower intervals within the borehole under Phase II of the drilling operation. The lithologic logs, based on

cuttings collected every 5 feet, indicate approximately a 10-foot section of dolostone increasing in thickness within the lower portion of the borehole.

## LOWER EOCENE

### Oldsmar Formation

The top of the Oldsmar Formation was identified by the FGS at a depth of 1,860 feet bls. Its diagnostic microfossils are often obliterated by diagenetic effects, and its lithologic character is similar to the overlying Avon Park Formation. A review of the borehole data by FGS indicates that the Oldsmar Formation was determined based on the first occurrence of light-gray limestone and brown vuggy dolomite, using established lithologic data that is supported by an increase in gamma activity. The foraminifera that resemble Oldsmar index forams (Applin and Applin 1944; Chen 1965; Miller 1986; Duncan *et al.* 1994) were too highly recrystallized to make definitive identifications. The actual top of the Oldsmar Formation may be deeper where limestone is the predominant rock type.

# 4

# Hydrogeologic Framework

Three major hydrogeologic systems underlie this site: the surficial aquifer system, the intermediate confining unit, and the Floridan aquifer system, with the latter being the focus of this investigation. These aquifer systems are composed of multiple, discrete aquifers separated by low permeability "confining" units that occur throughout this Tertiary/Quaternary-aged sequence. **Figure 7** shows a generalized hydrogeologic section underlying the L-8 Canal Basin (PBF-15) site.

## SURFICIAL AQUIFER SYSTEM

At this location, the surficial aquifer system (SAS) consists of the Holocene-aged Pamlico Sand, Pleistocene-aged Anastasia and Ft. Thompson Formations, and the Pliocene-aged Tamiami Formation.

## INTERMEDIATE CONFINING UNIT

The intermediate confining unit is below the SAS. This intermediate confining unit extends from the base of the SAS to the top of the FAS, from 200 to 800 feet bls within this study area. The Pliocene-Miocene-aged and the Miocene-aged Hawthorn Group (Scott 1988) separate the FAS from the SAS. The Hawthorn Group sediments consist of unconsolidated shell beds, soft non-indurated clay, silt and quartz-phosphatic sand units, and poorly to moderately indurated mudstones/wackestones (see **Appendix B**, FGS lithologic description).

Underlying the Lower East Coast Planning Area (LEC), the intermediate confining unit contains multiple low permeable confining units. The top of the confining unit is marked by low permeable unconsolidated, clay-rich shell beds and poorly indurated wackestone from 200 to 540 feet bls. Below this interval is a relatively thick, confining unit that extends from 540 to 575 feet bls. This confining unit consists of low permeable, yellowish to light-gray, unconsolidated to poorly-indurated mudstone. A distinctive lithologic break occurs at 575 feet bls where a yellowish-gray, poorly indurated, wackestone/packstone is encountered that continues to 885 feet bls.

## FLORIDAN AQUIFER SYSTEM

The Floridan aquifer system (FAS) consists of a series of Tertiary-aged limestone and dolostone units. The system includes permeable sediments of the lower Arcadia Formation, Suwannee (if present) and Ocala Limestones, Avon Park Formation, and Oldsmar Formation. The Paleocene-aged Cedar Keys Formation with evaporitic gypsum and anhydrite forms the lower boundary of the FAS (Miller 1986).

### Upper Floridan Aquifer

The top of the FAS, as described by the Southeastern Geological Society AdHoc Committee on Florida Hydrostratigraphic Unit Definition (1986), coincides with the top of a vertically continuous permeable carbonate sequence. The Upper Floridan aquifer consists of thin water-bearing horizons with high permeability interspersed within thick units of late Miocene- to middle-Eocene aged sediments having low permeability. These units include the basal Arcadia Formation, Suwannee and Ocala Limestones, and the Avon Park Formation.

On a regional scale, two zones of high permeability exist within the Upper Floridan aquifer, typically occurring between 850 and 1,600 feet bls. The most transmissive part of this upper zone usually occurs near the top, coincident with zones of dissolution in association with unconformities of the Oligocene- or Eocene-aged formations (Miller 1986). The first transmissive horizon in the FAS at the L-8 Canal site is from 850 to 1,150 feet bls, and includes the basal Arcadia Formation and the Ocala Limestone with no presence of the Suwannee Limestone of the early Oligocene age. This productive unit is composed of yellowish to medium-gray, moderately indurated wackestone to packstone units.

While drilling, minor drilling fluid losses were noted within an interval from 890 to 1,100 feet bls, which is indicative of a porous/permeable horizon. The flowmeter log data indicated that the majority of the water production within this interval is found at 980 feet bls to the casing set at 908 feet bls (**Appendix A**). The temperature and fluid resistivity survey indicate a significant change starting at 960 feet bls. The District selected the depth interval of 908 to 1,144 feet bls for long-term monitoring and hydraulic testing based on moderate to good water production potential and similar water characteristics. Formation water samples obtained from this completed monitor zone (908–1,144 feet bls) yielded chloride and total dissolved solids (TDS) concentrations of 1,700 and 3,400 mg/L, respectively. The production logs indicate production in this packstone unit from 908 to 1,144 feet. Using the current hydrogeologic nomenclature of the hydraulically connected permeable unit, the interval from 908 to 1,144 feet bls can be considered the Upper Floridan aquifer.

A second flow zone was isolated based on drilling logs and geophysical logs run on the drilled interval from 1,400 to 1,600 feet bls. Higher resistivity values were

associated within this horizon and determined to be of interest for a long-term monitor interval. The lithologic log indicates a fairly consistent, very light orange grainstone with intergranular porosity (**Appendix B**). Faster sonic travel times are indicated by the geophysical logs (**Appendix A**). Formation water samples obtained from this completed monitor zone (1,400–1,583 feet bls) were of lower flow and yielded chloride and TDS concentrations of 2,100 and 4,100 mg/L, respectively. This production zone showed similar characteristics to the first production zone, with slightly poorer water quality and flow.

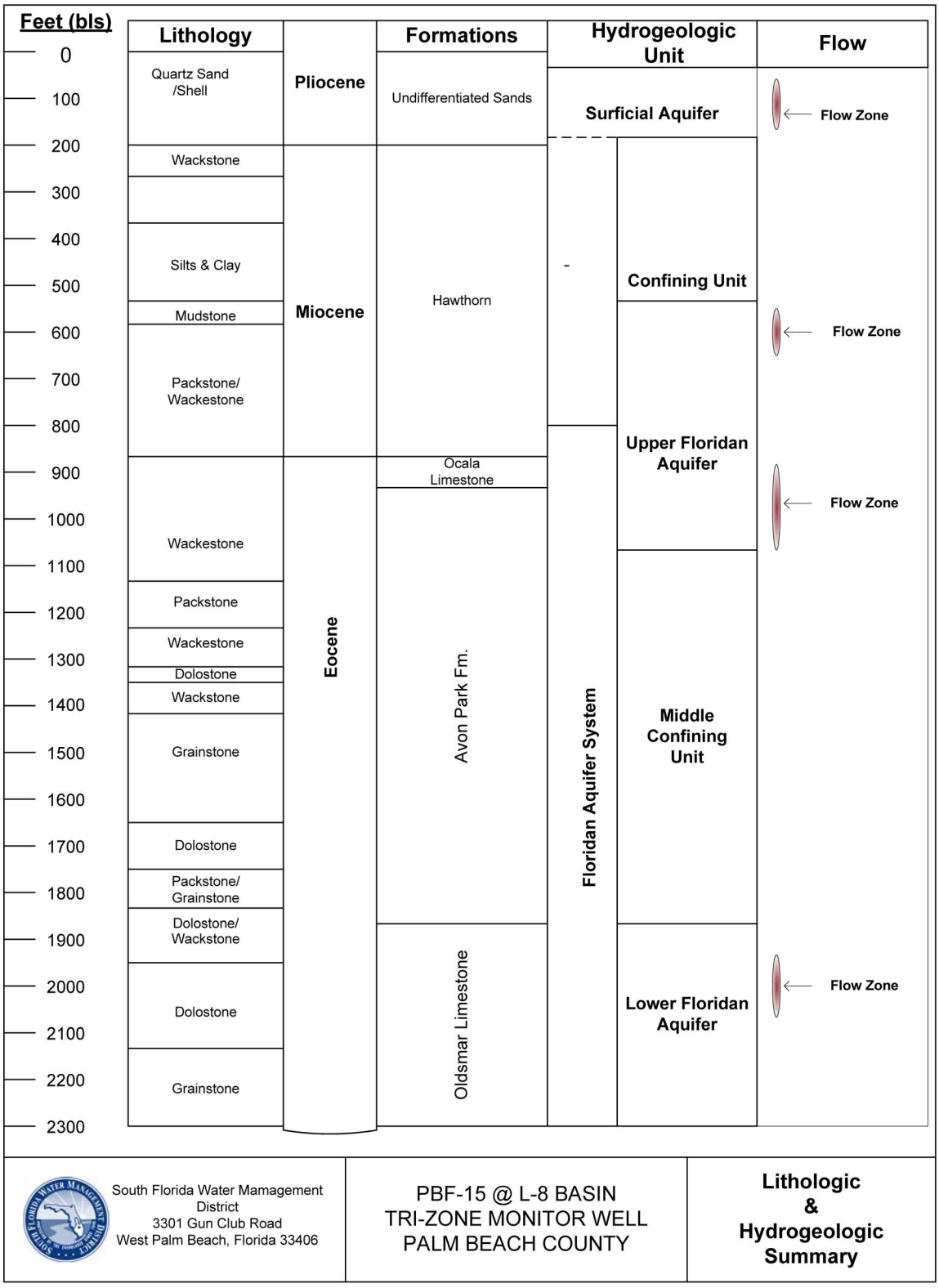



**Figure 5.** PBF-15 lithologic and hydrogeologic summary.

## Middle Confining Unit

Below this productive horizon is a thick, low permeable, inter-aquifer semi-confining carbonate unit that extends from 1,300 to 1,860 feet bls. This Avon Park Formation consists of poorly to moderately indurated "chalky" wackestone and packstone units. Formation samples from this interval do not show evidence of large-scale secondary porosity development (e.g., good pinhole or moldic porosity). The Avon Park Formation from 1,600 to 1,860 feet bls consists of low permeable moderately indurated wackestone and packstone units. Through this interval formation, resistivity values range from 2.0 to 90.0 ohmmeters (ohm-m), bulk density averages of 2.15 gram per centimeter (G/C3) with varying stringers as high as 2.65 G/C3, sonic transit time averages of 90 micro-seconds, and log-derived porosity averages of 28 porosity units. In addition, the production type geophysical log traces indicate no significant productive horizons, as seen by smooth temperature and flowmeter log traces (after correcting for borehole diameter). This supports the confining nature of the interval. The District conducted two separate packer tests from 1,560 to 1,590 feet bls and 1,700 to 1,730 feet bls, which yielded average specific capacity values of 12.0 gallons per minute, per foot, and 7.9 gallons per minute, per foot, respectively.

## Lower Floridan Aquifer

The predominant feature in the upper portion was calcilutite matrix with intergranular porosity, grading to a more dolomitic environment. The Oldsmar Formation is reported to be 1,100 to 1,500 thick and is predominantly micritic limestone. The lower portion of the formation is locally called the boulder zone. The boulder zone consists of massive beds of fractured and cavernous dolomite with high permeability. This saline-high permeability zone, which prevents pressure buildup from injection wells, has long been used as an injection horizon. The top of the Lower Floridan aquifer in south Florida is marked by the shallowest zone of highly transmissive dolomite in the Oldsmar or Avon Park Formations (Reese and Memberg 2000). Thick confining units may exist between this permeable zone and the boulder zone (Miller 1986).

The geophysical logs indicate a change in faster travel times and a decrease in sonic porosity at the contact of this dolostone unit. The signature of the deep induction log and fluid resistivity log indicates that a water quality transition is below 1,880 feet bls (identified as the Oldsmar Limestone). Between 1,880 and 1,920 feet bls, fluid resistivity values decrease rapidly with changes in lithology, as noted in the well cuttings. The change in the quality (TDS concentration) of the pore fluids, as well as the occurrence of dolostone, appears to be associated with contact of the Avon Park Formation and the Oldsmar Limestone. This area was also identified by a dynamic flow log as production intervals that range from 1,880 to 1,955 feet bls and 2,040 to 2,070 feet bls.

Formation waters with TDS concentrations less than 10,000 mg/L are considered an underground source of drinking water (USDW). Based on a packer test performed from 1,910 to 1,940 feet bls, the USDW was identified at approximately 1,920 feet bls. The District identified productive intervals that contained waters of similar TDS concentrations from 1,880 to 1,955 feet bls and 2,040 to 2,070 feet bls (Oldsmar Limestone). In addition, the geophysical log data shows a general increase in bulk density and a decrease in sonic transit times, as well as log-derived porosity values (**Appendix A**). However, deflections, in the temperature log (gradient and differential) indicated moderate production. Based on moderate production capacity and similar water characteristics, the District identified this interval (from 2,010 to 2,100 feet bls) to be below the USDW and adequate for long-term monitoring. Formation water samples obtained from this packer test (1,910 to 1,940 feet bls) yielded chloride and TDS concentrations of 7,300 and 15,000 mg/L, respectively. This particular packer test was set to straddle the horizon, which was determined to be the base of the USDW.

# 5
# Hydrogeologic Testing

## FORMATION SAMPLING

The District collected information during the drilling program to determine the lithologic, hydraulic, and water-quality characteristics of the Floridan aquifer system. These data were used in the final design of the Floridan aquifer monitor well for use in site-specific aquifer tests, and in a long-term water level and water-quality monitoring program.

## GEOPHYSICAL LOGGING

Geophysical logging was conducted in the pilot-holes after each stage of drilling and prior to reaming the boreholes for casing installations. The resulting logs provide a continuous record of the physical properties of the subsurface formations and their respective fluids. These logs were later used to interpret lithology, provide estimates of permeability, porosity, bulk density, and resistivity of the aquifer, and determine the salinity profile of the groundwater (using the Archie Equation, Archie 1942). In addition, the extent of confinement of discrete intervals can be discerned from the individual logs. **Table 3** lists the formation evaluation logs conducted at the L-8 Canal (PBF-15) site, their physical characteristics, and properties measured.

**Table 3.** Formation evaluation logs

| Log Name | Log Type | Principal Application | Maximum Hole Size | Benefit to Ground-water Studies |
|---|---|---|---|---|
| 4-arm Caliper | Mechanical (inches) | Determines borehole diameter and rugosity in two horizontal planes and used to correct other logs | 22 inches | Used to correct flowmeter logs and aids in identifying suitable inflatable packer and casing placement |
| Gamma Ray (GR) | Natural Radioactive Nuclear reported in American Petroleum Institute Units (API) | Correlation, stratigraphic boundaries | 24 inches | Correlation, used to estimate shale and clay volume |
| Spectralog® (SL) | Nuclear -Natural Gamma Emissions of the 256 Mineral spectrum reported in API units. | Correlation, mineral identification - uranium, thorium, and potassium, and clay content | 22 inches | Correlation, defines clay type and aids in mineral identification and fracture detection |
| Dual Induction-Focused Log (DIFL) | Conductivity converted to Resistivity. Bedding resolution to 2 feet in smooth borehole values reported in ohmmeter (ohm-m) | Provides invasion profile and accurate water resistivity (Rw) determination | 20 inches | Water Quality - determination of Rw via Archie Equation, and provides estimates of permeability from invasion profile |
| Compensated Z-Density with Photoelectric absorption | Nuclear - Induced Radioactive - Pad mounted, reports bulk density in grams per cubic centimeters (gm/cc) and porosity in porosity units (p.u) | Porosity analysis, bulk density and lithologic and fluid determination | 14 inches affected by rugose borehole | Porosity estimates and lithologic indicator - porosity may be used in Archie Equation. |
| Compensated Neutron (CN) | Nuclear - Induced Radioactive reports porosity in porosity units (p.u) | Porosity analysis, and lithologic determination | 14 inches good in rough or washed out borehole | Porosity estimates, porosity may be used in Archie Equation. |
| Multipole Array AcoustilogSM (MAC) | Acoustic Sonic - Full wave form records the primary, secondary and tube wave velocities and reports travel times in micro-seconds per foot (usec/ft) | Porosity and permeability analysis, dynamic and mechanical properties | 15 inches sensitive to washouts | Evaluates porosity and permeability plus rock mechanical properties - aids in fracture and lithology estimates |
| Fluid Resistivity Log | Reports the fluid resistivity of borehole fluid at that point within the borehole | Determination of pore water quality | Measures resistivity of fluid independent of borehole size | Function of water quality determination |

**Table 3.** Formation evaluation logs (Continued).

| Log Name | Log Type | Principal Application | Maximum Hole Size | Benefit to Ground-water Studies |
|---|---|---|---|---|
| Temperature Log | Reports temperature variations within the borehole environment | Determination of temperature fluctuations within borehole environment | 15 inches sensitive to washouts | Determination of flow zones due to temperature fluctuations |
| Caliper Flow Logs (Static and Dynamic) | Reports the variation from static flow and dynamic flow | Determines flow zones and is corrected for borehole variations | 36 inches | Determinations of flow zone due to flow entering the borehole |
| Cement Bond Log/Casing Collar Locator | Reports the cement bond and casing collars | Looks at variations of sound to determine cement integrity | Depends on tool type | Determination of the quality of cement bond of casing to matrix |
| Downhole Camera Survey | Visual display of borehole conditions | Visual confirmation of borehole features from other geophysical logs | 36 inches sensitive to water quality clarity | Used to verify bedding planes, rock matrix, and large discontinuities |

The geophysical logging contractors downloaded data directly from the onsite logging processor onto CD/DVD disks using the log ASCII standard version 1.2 or 2.0 format. **Appendix A** contains the geophysical log traces from the various log runs for PBF-15. The original geophysical logs and video surveys from the PBF-15 site are archived and available for review at the SFWMD headquarters in West Palm Beach, Florida.

## PACKER TESTS

Three packer tests were conducted at the PBF-15 site in the Floridan aquifer system (FAS) between 1,560 and 1,940 feet bls. The tests obtained water quality and production capacity data on discrete intervals within the aquifer. The District selected intervals based on lithologic, hydraulic, and water quality using drill cutting, drill-stem water quality, and geophysical log data collected during well construction.

The following procedures were used to conduct straddle packer tests in PBF-15 at the L-8 site:

1. Lower the straddle packer assembly to the test interval based on geophysical and lithologic logs.

2. Set and inflate packers to 190 pounds per square inch (psi) and open the ports between the packers.
3. Install a 4-inch diameter submersible pump to a depth of 60 to 120 feet below the drill floor.
4. Install two 100-psig-pressure transducers inside the drill pipe and one 30-psig transducer in the annulus.
5. Purge a minimum of three drill-stem volumes.
6. Monitor pressure transducer readings and field parameters (e.g., temperature, specific conductance, and pH) from the purged formation water until they are stable. These parameters are used to determine the quality of isolation of the "packed-off" interval.
7. Once the interval is effectively isolated, pump the interval with increasing discharge rates and collect water level data (step-drawdown).
    - Collect formation water samples per SFWMD sampling protocol for laboratory analyses.
    - Record recovery data until the water level returns to static (pre-pumping) conditions.

The Contractor purged the packer intervals at a minimum of three borehole volumes or until field parameters of samples collected from the discharge pipe had stabilized. The District then obtained individual groundwater samples. A limit of +/-5 percent variation in consecutive field parameter readings was used to determine chemical stability. District personnel collected unfiltered and filtered water according to SFWMD sampling protocol. The water samples were placed on ice and transported to the SFWMD water quality laboratory, where they were analyzed for major cations and anions using U.S. Environmental Protection Agency (EPA) and/or Standard Method procedures (SFWMD 1995). **Table 4** lists the field parameters and laboratory results for the individual packer tests.

The Hazen-Williams equation was used to calculate the friction (head) losses for drawdown data because of induced flow up the drill pipe. These head losses were then used to correct the drawdown data for specific capacity determinations. Curve-matching techniques were not used to determine transmissivity values from the drawdown or recovery data. These tests generally involve partial penetration, have significant friction loss due to small pipe diameter, and have short pumping periods, all of which violate the various analytical methods' basic assumptions. However, the District estimated transmissivity from specific capacity data collected at each interval to provide a reference value for future testing.

**Packer Test No. 1 (1,910 to 1,940 feet bls)**: This packer test obtained water samples for analyses, determined the confining nature of the interval, and collected pertinent hydraulic information before setting the casing through this interval. All Webb Enterprises, Inc. (AWE) conducted this test on February 22, 2007, which consisted of pumping an interval between 1,910 and 1,940 feet bls (part of the Avon Park Formation).

During this test, AWE pumped this interval for two hours. They pumped the zone for 30 minutes at each of the following rates: 50, 75, 100, and 125 gallons per minute (gpm). The specific capacity (SC) at each discharge rate was calculated using the following method:

**SC = Q / Drawdown** (gpm/ft) **Equation 1**

Q = Pumping rate in gpm as measured by an in-line flowmeter

s = Measured Drawdown: aquifer head loss in feet

The SFWMD estimated the transmissivity (T) of each tested interval using Equation 2.

**T =2000 * SC** gallons per day per foot (gpd/ft) **Equation 2**

| Q (gpm) | s (feet) | SC (gpm/ft) | Transmissivity (gpd/ft) |
|---|---|---|---|
| 50 | 2.56 | 19.53 | 39,060 |
| 75 | 6.63 | 11.31 | 22,620 |
| 100 | 12.04 | 8.31 | 16,620 |
| 125 | 18.87 | 6.62 | 13,240 |

**Packer Test No. 2 (1,700 to 1,730 feet bls)**: This packer test identified the hydraulic properties and water quality characteristics, and collected pertinent hydraulic information needed before the casing was set in the confining interval of the middle part of the Avon Park Formation. AWE set a dual-packer assembly to isolate an interval between 1,700 and 1,730 feet bls. The District conducted and completed a drawdown/recovery test on February 26, 2007.

During this test, AWE pumped this interval for two hours. They pumped the zone for 30 minutes at each of the following rates: 50, 75, 100, and 125 gpm. The SC and T were calculated at each discharge rate.

| Q (gpm) | s (feet) | SC (gpm/ft) | T (gpd/ft) |
|---|---|---|---|
| 50 | 3.49 | 14.33 | 28,660 |
| 75 | 11.53 | 6.50 | 13,000 |
| 100 | 17.58 | 5.69 | 11,380 |
| 125 | 23.71 | 5.27 | 10,540 |

**Packer Test No. 3 (1,560 to 1,590 feet bls)**: This packer test evaluated the hydraulic and water quality characteristics, and collected pertinent hydraulic information before setting the casing through the middle confining unit. AWE set a dual-packer assembly, which isolated an interval between 1,560 and 1,590 feet bls. The District conducted and completed a drawdown/recovery test at this depth on February 27, 2007.

During this test, AWE pumped this interval for two hours. They pumped the zone for 30 minutes at each of the following rates: 50, 75, 100, and 125 gpm. The SC and T were calculated at each discharge rate.

| Q (gpm) | s (feet) | SC (gpm/ft) | T (gpd/ft) |
|---|---|---|---|
| 50 | 1.86 | 26.88 | 53,760 |
| 75 | 7.26 | 10.33 | 20,660 |
| 100 | 17.24 | 5.80 | 11,600 |
| 125 | 24.57 | 5.09 | 10,180 |

## INORGANIC WATER CHEMISTRY

The water samples for packer tests were analyzed by SFWMD contracted laboratories Tetra Tech and Jupiter Environmental Laboratories, Inc. **Table 5** presents the results from the three packer tests and some of the lab analyses. **Appendix C** presents the complete lab analyses, including the field blank.

**Table 4.** Summary of inorganic water quality data from PBF-15 packer tests and completed monitor zones.

| Identifier | Depth Interval (feet bls) | Cations | | | | Anions | | | TDS mg/L | Field Parameters | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $Na^+$ mg/L | $K^+$ mg/L | $Ca^{2+}$ mg/L | $Mg^{2+}$ mg/L | $Cl^-$ mg/L | Alka as $CaCO_3$ mg/L | $SO_4^{2-}$ mg/L | | Specific Conduct. umhos/cm | Temp ° C | pH. |
| PBF-15 PK1 | 1910-1940 | 4,300 | 18 | 210 | 80 | 7,300 | 73 | 960 | 15,000 | 23,547 | 28.65 | 7.46 |
| PBF-15 PK2 | 1700-1730 | 4,100 | 18 | 220 | 86 | 6,300 | 75 | 880 | 13,000 | 20,576 | 28.05 | 7.72 |
| PBF-15 PK3 | 1560-1590 | 3,800 | 20 | 170 | 60 | 6,000 | 77 | 850 | 12,000 | 19,839 | 28.55 | 7.43 |
| PBF-15 MZ-1 | 908-1144 | 916 | 36 | 108 | 123 | 1,500 | 128 | 414 | 3,526 | 5,771 | 27.72 | 7.77 |
| PBF-15 MZ-2 | 1400-1583 | 749 | 28 | 92 | 126 | 1,351 | 127 | 340 | 2,996 | 4,995 | 28.52 | 8.33 |
| PBF-15 MZ-3 | 2010-2100 | 10,080 | 358 | 529 | 1,150 | 18,010 | 110 | 2,249 | 34,416 | 48,536 | 27.93 | 7.28 |

mg/L = milligrams per liter
umhos/cm = micromhos per centimeter
pH = standard unit
° C = degree Celisus
feet bls = feet below land surface
PK = Packer Test
MZ = Completed Monitor Zone

After construction, the PBF-15 monitor zones were purged and sampled by Golder Associates, Inc. and Columbia Analytical Services, Inc. for major cations and anions using EPA and/or Standard Method procedures (SFWMD 1995).

The Piper trilinear diagram (**Figure 6**) indicated that sodium and chloride are the dominant ions and as shown in **Table 4,** that the concentrations of dissolved constituents are similar in depth. The inorganic data suggest similar water quality as a dominant source, but stable isotope and noble gas data provided additional information on the recharge sources to the upper and middle segments of the FAS, discussed as follows.

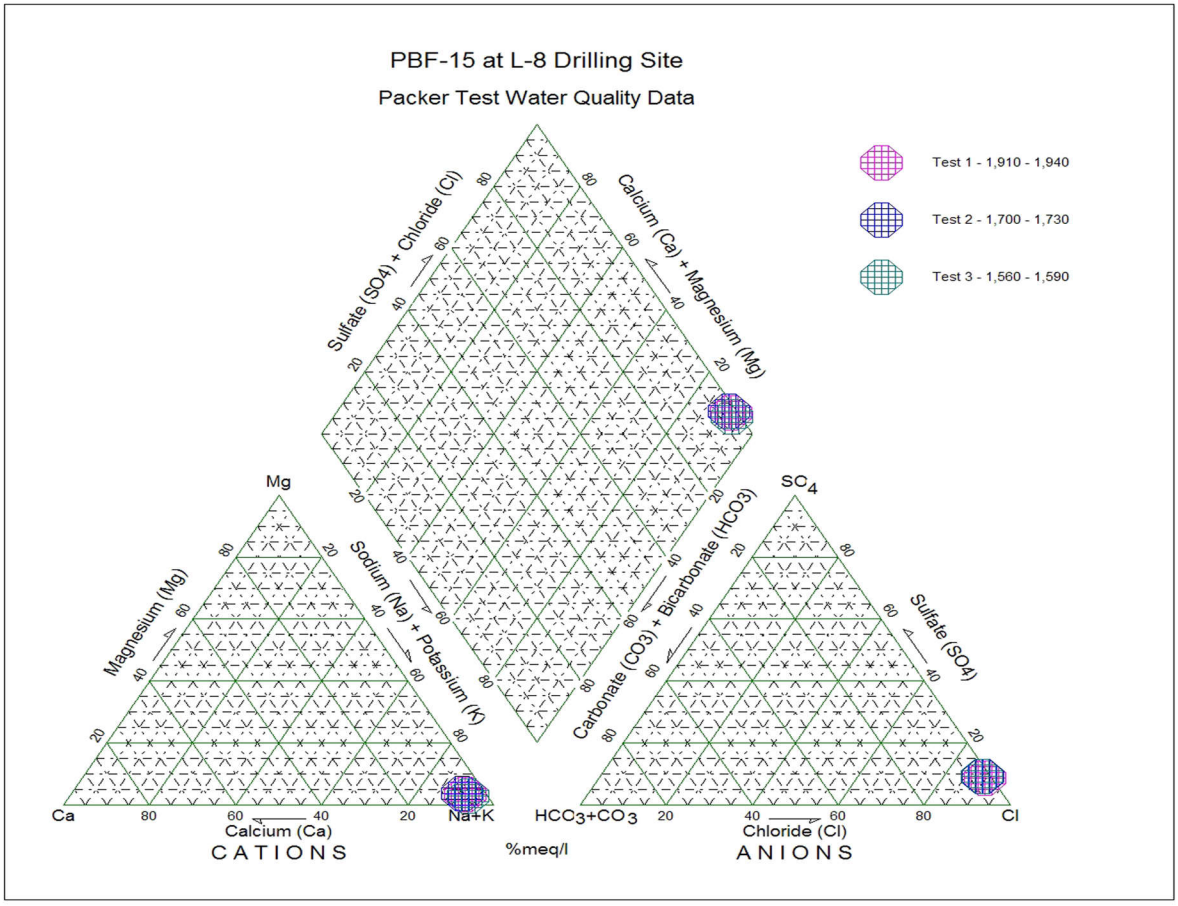



**Figure 6. PBF-15 piper trilinear diagram of inorganic constituents of the FAS.**

## CORE DATA AND ROCK CHEMISTRY

Upon completion of the formation evaluation logs, the District identified seven core intervals from 410 to 2,100 feet bls in the open-hole section of PBF-15 well site. The cores constrained log-derived porosity and permeability values from a carbonate aquifer with laboratory-determined values. The cores were collected by a conventional core barrel tool. A 4-inch diameter, 20-foot long, diamond-tipped core barrel was used. Core recoveries from the seven core runs ranged between 0 and 100 percent, with an average of only 25 percent. **Table 5** is a summary of the full-diameter coring program conducted at this site. Low core recovery may be the result of unfamiliar subsurface conditions or the friable nature of the carbonate section due to its high intergranular porosity and mixed lithology (i.e., carbonate and siliciclastics). The SFWMD sent the full-diameter cores to the

Florida Geological Survey (FGS) in Tallahassee, Florida to determine the rock chemistry parameters. The complete core descriptions were completed for the first phase of the drilling program with six from various rocks of the Upper Floridan aquifer. The FGS selected four intervals from the core samples to perform complete analyses, which are described in the following section. The complete results are covered in the draft interim report titled, *Geochemical and Mineralogical Characterization of Potential Aquifer Storage and Recovery Storage Zones in the Floridan Aquifer System, Comprehensive Everglades Restoration Plan* (Arthur *et al.* 2007).

After the selection process, the FGS cleaned and dried the selected core samples by using a convection oven to remove any residual fluid. The FGS used thin sections and standard petrographic techniques, such as staining, thin sectioning, and impregnation to determine the lithology, rock fabric, grain types, biotic constituents, sedimentary structures, pore type(s), and diagenetic alteration. Rock fabric description followed Dunham's (1962) descriptions with slight modifications. Samples with no dolomite rhombs were classed as limestone. Samples with dolomite rhombs were classified as follows: trace to 50 percent dolomite – dolomitic limestone; 50 percent to 90 percent dolomite – limey dolostones; and greater than 90 percent dolomite – dolostones. The classification of pore types in each sample followed Choquette and Pray (1970). The FGS impregnated each sample with a blue-dyed epoxy before cutting each thin section. This dye filled the voids and spaces in the samples and appeared blue in each thin section. The impregnation process involved immersing each sample in the liquid epoxy, drawing a vacuum for five minutes, applying a pressure of 2,000 psi for eight hours, and then curing in an oven.

The FGS measured the porosity of each sample using a bulk-density technique. The process involved weighing each sample, wrapping it in parafilm wax, and weighing it again. By placing the wrapped sample in a beaker of water, the FGS measured the displacement, which equaled the bulk volume of the sample. The porosity was calculated from the bulk volume and the mass of the sample by using the rock density (2.71 grams per cubic centimeter [$gm/cm^3$] for pure limestone and adjusted based on mineral content) and wax density (0.74 $gm/cm^3$).

The intrinsic (matrix) permeability required each sample to be at least 1-inch thick and 2-inches wide. The matrix permeability was measured by minipermeametry (Goggin 1993; Sutherland *et al.* 1993; Hurst and Goggin 1995). Gas was then injected into the samples at a pressure of 13.8 psi (measured by pressure transducer) and an electronic mass flow meter measured the gas flow rates through the core samples. To calculate the matrix permeability, the FGS unconverted the measured gas flow rates from the minipermeameter to equivalent liquid permeabilites using an empirical correlation between flow rates and Klinkenberg permeabilities of a suite of standards. The standards were cylindrical sandstone core plugs determined by a Core Laboratories, Inc.

PDPK-200 instrument, which is a pressure-decay gas permeameter. The fine scale of this investigation does not reflect the contribution of vugs, molds, fractures, or cavernous porosity greater than the diameter of the minipermeameter's tip (3 millimeters).

The core sample from 797 to 798 feet bls in the Hawthorn Group is classified as a calcareous, dolomitic, phosphatic sandstone. The Schlumberger formation evaluation logs (natural gamma ray) match well with this unit. The porosity and intrinsic permeability are 32.5 percent and 18.5 millidarcies (md), respectively. Sandstone contains very fine quartz, and detrital phosphate is 25 percent of the rock with carbonate mud, which fill much, but not all, of the interparticle pore space.

**Table 5.** Coring summary for Phase I and II drilling.

| Date | Core Interval (feet bls) | Recovery (%) |
|---|---|---|
| Phase I | | |
| November 16, 2005 | 410–420 | 70 |
| November 22, 2005 | 797–817 | 12 |
| December 9, 2005 | 944–964 | 12 |
| January 12, 2006 | 1,040–1,060 | 25 |
| January 17, 2006 | 1,275–1,290 | 100 |
| Phase II | | |
| November 23, 2006 | 1,600–1,620 | 25 |
| December 11, 2006 | 1,900–1,920 | 55 |

The dominant pore type throughout the rock is microporosity within the carbonate micrite that occurs between grains, followed by interparticle pore space where mud is absent, and intraparticle pore space within forams and bryozoa. Poor connectivity of these pores results in low permeability. Very small benthic forams and fragments of oyster shells, echinoderms, and ostracods are also present in minor amounts. This host is cut by large burrow structures that are infilled with a coarser grained, phosphatic and sandy quartz-bearing low-mud packstone. Rhombs of authigenic dolomite occur throughout the rock and are the main cementing agent. A low-birefringent clay appears to be present in interparticle pore spaces within the burrow fills, and an analysis indicates the clay is illite. Individual and coalesced framboids of pyrite are also present in the rock and often seem concentrated within the burrow fills.

The core sample from 944 to 945 feet bls in the Avon Park Limestone is classified as a bioturbated, small foraminifera, peloidal high-mud packstone. The porosity and intrinsic permeability are 45.41 percent and 69.3 millidarcies (md), respectively. Dominant pore type is intraparticle with microporosity within the interparticle mud. Matrix permeability is low due to the presence of the interparticle mud. Peloids and a diverse assemblage of shallow-water benthic

forams are the only grain types present. Mud is present in all interparticle pores, but does not completely fill all of them. Some grains are partially to completely micritized. Overall, the sample is suggestive of a moderate-energy, shallow-water platform setting with enough mud to yield a packstone.

The core sample from 1,040 to 1,050 feet bls in the Avon Park Formation is classified as a small foraminifera, peloidal, very low-mud packstone. The porosity and intrinsic permeability are 43.0 percent and 117 millidarcies (md), respectively. Dominant pore types are interparticle and intraparticle. Porosity and matrix permeability are high due to the presence of open and well-connected interparticle pores. Pores have minor amounts of very fine-crystalline cement in them. Dolomite rhombs are small and isolated and make up approximately 3 percent of the matrix. Peloids and a diverse assemblage of shallow-water benthic forams are the dominant grain types present. A depositional setting suggests a shallow, normal marine, moderate-energy shallow subtidal platform.

The core sample from 1,289 to 1,290 feet bls in the Avon Park Formation is classified as a small forminifera, pelodal grainstone. The Schlumberger formation evaluation logs indicate faster sonic travel times, increased density and resistivity, and an increase in the ratio of density to neutron porosity due to dolomitization, which comprises approximately 35 percent of the rock. The porosity and intrinsic permeability are 33.9 percent and 104 millidarcies (md), respectively. Dominant pore type is interparticle, with some intraparticle. In areas of high dolomite concentration, the original interparticle porosity is reduced and intercrystalline porosity is dominant. Porosity is high and matrix permeability is moderately high due to the presence of open and well-connected pores. Peloids and a diverse assemblage of shallow-water benthic forams are the dominant grain types. Original depositional fabric is hard to assess due to the presence of dolomite.

## Rock Geochemistry

Quantitative estimates of mineral content were determined using powder x-ray diffraction. After air-drying, a side-packed powder mount of the finely ground bulk sample was prepared. The x-ray diffraction scan was performed on a Scintag PADV. Peak positions of the mineral abundances were determined on the resultant diffractograms. The mineralogy of the fine silt and clay size components of the insoluble mineral fractions were also assessed after a separate process. The results of the Whole-Rock Bulk Mineralogy indicate that the Hawthorn unit (797–798 ft bls) was considered to be a quartz-bearing, phosphatic, dolomitic limestone with 58.3 percent calcite, 13.5 percent dolomite and quartz, and 9.9 percent apatite. The Ocala unit (944–945 ft bls) was identified as a limestone with 66.8 percent calcite and 31.1 percent quartz. The last of the analyses, the Avon Park unit (1,289–1,290 ft bls), was considered to be a dolomitic limestone with 70.6 percent calcite and 28.9 percent dolomite.

The analyses of the Insoluble Residue (for fine particles) Mineralogy indicated that the most common non-clay phase observed was quartz. Quartz was present in the Hawthorn Group (797–798) in the bulk mineralogy and in the insoluble fractions. However, insoluble fractions indicate that quartz was a minor fraction with abundant clay (illite) and trace amounts of apatite. The apatite analyses indicate that fluorapatite [$Ca_5(PO_4)_3F$] and carbonate hydroxyl apatite [$Ca_{10}(PO_4)_5(CO_3)(OH)F$] are present in the Hawthorn Group. The analyses of the Ocala Limestone (944–945) indicated the presence of moderate amounts of clay (smectite-illite) and kaolinite with trace amounts of quartz. The analyses of the Avon Park Formation (1,289–1,290) showed trace amounts of clay (smectite-illite) and orthoclase with pyrite. Pyrite was not present in the Hawthorn and Ocala samples.

## LONG-TERM GROUNDWATER MONITORING PROGRAM

Shortly after tri-zone FAS monitor well (PBF-15) was constructed, District staff collected water samples to establish baseline water quality conditions. Unfiltered and filtered water samples were taken directly from the discharge point or hose of the peristaltic pump where the sample bottles filled slowly, minimizing aeration. As part of the District's water quality sampling protocol, duplicate samples were collected from consecutive bailers with sample splits collected from the same bailer. Once collected, water samples were preserved and immediately placed on ice in a closed container and transported to a SFWMD water quality laboratory. The laboratory analyzed the samples using EPA and/or Standard Method procedures (SFWMD 1995). **Appendix D** and **Table 4** summarize the analytical results.

In addition, the District established a potentiometric-head monitoring program for this well site. A transducer and Campbell CR-10X data logger recorded pressures from the various monitor zones on a 15-minute interval. The data is converted from pounds psi of 2.308 to foot of head. The SFWMD then added the converted pressure readings to the surveyed measuring point elevation (located on the concrete well pad) to obtain a hydraulic head referenced to the National Geodetic Vertical Datum of 1929 (NGVD 1929) and North American Vertical Datum (NAVD 1988). **Table 6** lists the monitor intervals within the FAS, average recorded hydraulic head, and standard deviation.

**Table 6.** Water level data collected from monitor zones.

| Identifier | Monitor Interval (feet bls) | Average Measured Hydraulic Head | Standard Deviation (feet) |
|---|---|---|---|
| PBF-15 MZ-1 | 908–1,144 | 52.20 (NAVD 1988) | .44 |
| PBF-15 MZ-2 | 1,400–1,583 | 53.04 (NAVD 1988) | .47 |
| PBF-15 MZ-3 | 2,010–2,100 | 24.81 (NGVD 1929) | .49 |

Period of Record -one reading from 01/01/08 to 09/01/08.

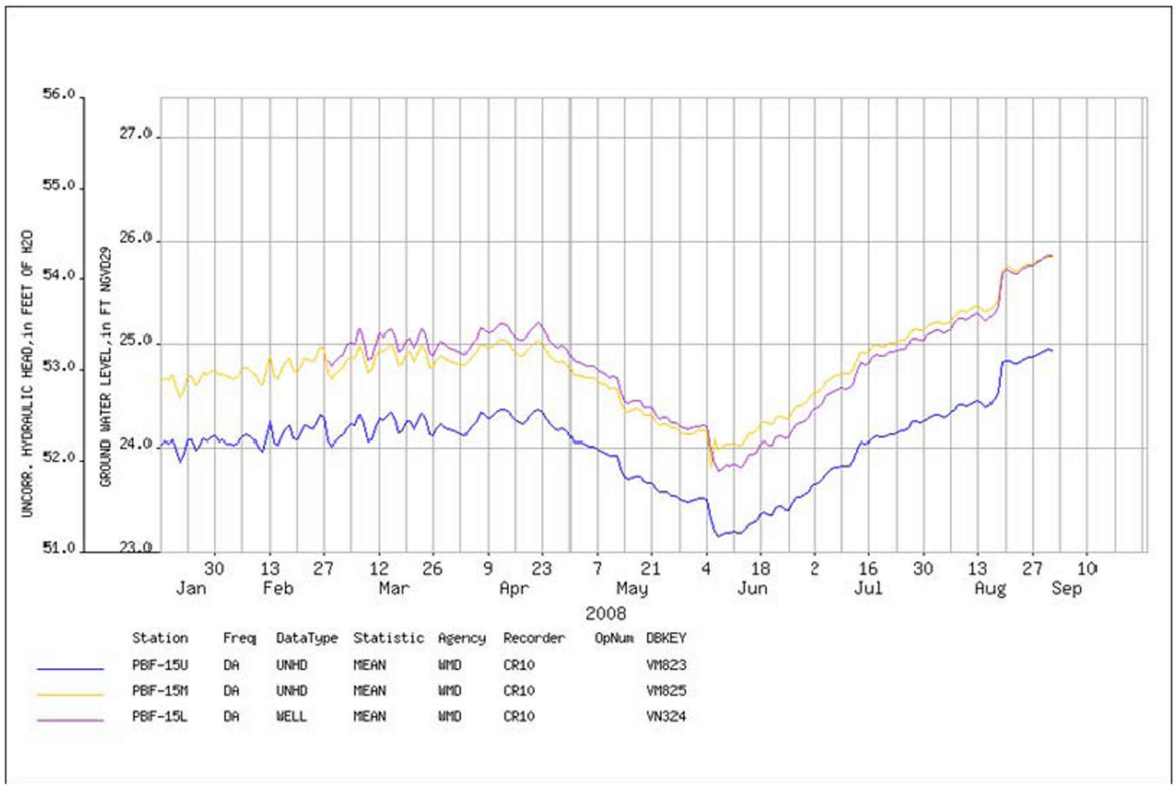



**Figure 9.** Water level data collected from monitor zones.

# 6

# Summary

1. The top of the Floridan aquifer system (FAS), as described by the Southeastern Geological Society AdHoc Committee on Florida Hydrostratigraphic Unit Definition (1986), was identified at a depth of approximately 885 feet below land surface (bls).
2. Lithologic and geophysical logs, specific capacity and packer test results, and petrophysical data indicate moderate production capacity in the upper and middle Floridan aquifer.
3. Water quality data from straddle packer tests and completed monitor zones indicate that chloride and total dissolved solids (TDS) in the Floridan aquifer waters exceed potable drinking water standards.
4. The base of the underground source of drinking water (USDW), where water contains TDS concentrations less than 10,000 mg/L, is at an approximate depth of 1,920 feet bls.
5. The inorganic water quality results from samples obtained from 908 to 2,100 feet bls are saline in composition, suggesting that the Floridan aquifer has been intruded by seawater.
6. The Middle Floridan confining unit (1,560–1,590 feet bls) yielded a specific capacity of 5.09 gpm/ft, and a transmissivity of 10,180 gpd/ft.
7. The Middle Floridan confining unit (1,700–1,730 feet bls) yielded a specific capacity of 5.27 gpm/ft, and a transmissivity of 10,540 gpd/ft.
8. The lower portion of the Middle Floridan confining unit (1,910–1,940 feet bls) yielded a specific capacity of 6.62 gpm/ft, and a transmissivity of 13,240 gpd/ft.
9. All packer tests indicate that the Middle Floridan confining unit is consistent, from 1,500 feet bls to 2,000 feet bls, in the L-8 Basin area.
10. The average measured hydraulic heads for the FAS monitor intervals are as follows:
    - 52.20 feet above mean sea level for the 908 to 1,144 feet bls monitor interval.
    - 53.04 feet above mean sea level for the 1,400 to 1,583 feet bls monitor interval.

- Water levels in the FAS respond to external stresses, such as tidal loading and barometric pressure variations.
- Long-term monitoring now records water levels in the FAS, identifying responses to external stresses, such as earth tides and barometric pressure variations.

# 7
# References


Applin, P.L. and E.R. Applin. 1944. Regional Subsurface Stratigraphy and Structure of Florida and Southern Georgia. Bulletin 28(12):1673–1753. *American Association of Petroleum Geologists.*

Archie, G.E. 1942. The Electrical Resistivity Log as an Aid in Determining Some Reservoir Characteristics. *American Institute of Mining, Metallurgical, and Petroleum Engineers Transaction*, 146:54–61.

Arthur, J.D., et al. 2007 (In Press). Geochemical and Mineralogical Characterization of Potential ASR Storage Zones in the Floridan Aquifer System, Comprehensive Everglades Restoration Plan. *Florida Geological Survey.*

Chen, C.S. 1965. The Regional Lithostratigraphic Analysis of Paleocene and Eocene Rocks of Florida. Bulletin 45:105. *Florida Geological Survey.*

Choquette, P.W. and L.C. Pray. 1970. Geologic Nomenclature and Classification of Porosity in Sedimentary Carbonates. *American Association of Petroleum Geologists Bulletin*, 54:207-250.`

Duncan, J.C., W.L. Evan, III, and K.L. Taylor. 1994. The Geologic Framework of the Lower Floridan Aquifer System in Brevard County, Florida. Bulletin 64:90. *Florida Geological Survey.*

Dunham, R.J. 1962. "Classification of Carbonate Rocks According to Depositional Texture." In Classification of Carbonate Rocks, ed. W.E. Ham. *American Association of Petroleum Geologists*, 1:108–121.

Goggin, D.J. 1993. Probe Permeametry: Is it Worth the Effort? *Marine and Petroleum Geology* 10:299–308.

Hantush, M.S. 1964. "Hydraulics of Wells." In Advances in Hydroscience, ed. V.T. Chow, Volume 1: 281–432. Academic Press, New York and London.

Hurst, A. and D.J. Goggin. 1995. Probe Permeametry: an Overview and Bibliography. *AAPG Bulletin*, 79:463–473.

Miller, J.A. 1986. *Hydrogeologic Framework of the Floridan Aquifer System in Florida and Parts of Georgia, Alabama and South Carolina.* USGS Professional Paper 1403-B. U.S. Geological Survey, Washington, D.C., 91.

Missimer, T.M. 1997. *Late Paleogene and Neogene Sea Level History of the Southern Florida Platform Based on Seismic and Sequence Stratigraphy.* PhD diss., University of Miami, 942.

Missimer, T.M. 2002. Late Oligocene to Pliocene Evolution of the Central Portion of the South Florida Platform: Mixing of Siliciclastic and Carbonate Sediments. *Florida Geological Survey*, Bulletin 65:184.

Reese, R.S. 2000. *Hydrogeology and the Distribution of Salinity in the Floridan Aquifer System, Southwestern Florida.* USGS Water Resources Investigations Report 98-4253. U.S. Geological Survey, Tallahassee, FL.

Reese, R.S. and S.J. Memberg. 2000. *Hydrogeology and the Distribution of Salinity in the Floridan Aquifer System, Palm Beach County, Florida.* USGS Water Resources Investigation Report 99-4061. U.S. Geological Survey, Tallahassee, FL.

Scott, T.M. 1988. The Lithostratigraphy of the Hawthorn Group (Miocene) of Florida. Bulletin No. 59. *Florida Geological Survey.*

SFWMD. 1995. *Comprehensive Quality Assurance Plan.* South Florida Water Management District, West Palm Beach, FL.

Southeastern Geologic Ad Hoc Committee on Florida Hydrostratigraphy Unit Definition. 1986. Hydrogeologic Units of Florida: Florida Department of Natural Resources. Special Publication 28:9. *Bureau of Geology.*

Sutherland, W.J., et al. 1993. Recommended Practice for Probe Permeametry. *Marine and Petroleum Geology*, 10:309–317.

Winsauer, W.O., et al. 1952. Resistivity of Brinesaturated Sand in Relation to Pore Geometry. *Bulletin of the American Association of Petroleum Geologists*, 36(2):253–277.

Wyllie, M.R.J., A.R. Gregory, and L.W. Gardner. 1956. Elastic Wave Velocities in Heterogeneous and Porous Media. *Geophysics*, 21(1):41–70.

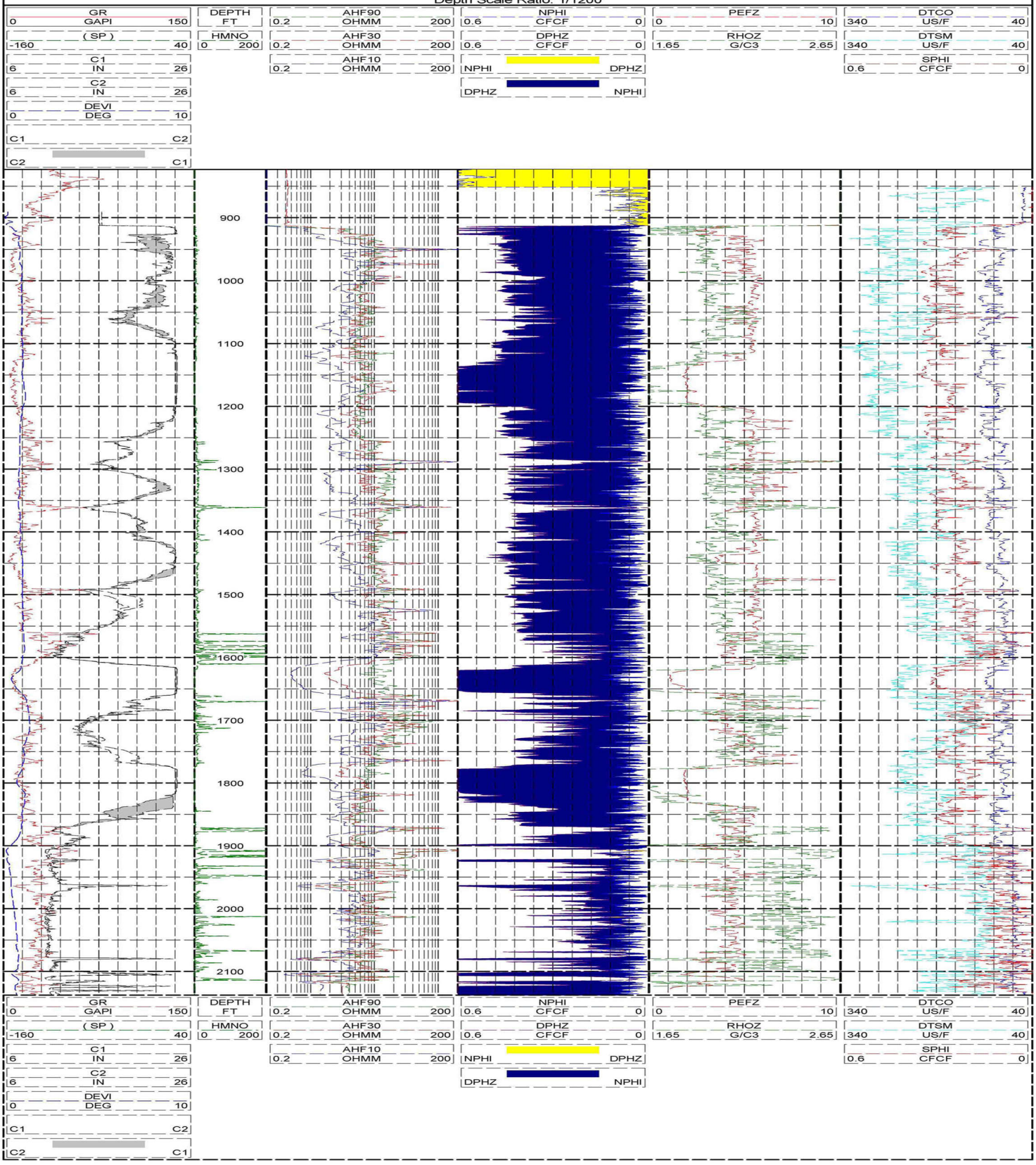
# A

# Geophysical Logs

| | |
|---|---|
| Company | South Florida Water Management District |
| Well | PBF-15 |
| Field | S-5A, L-8 Canal (Datum in Feet ;1929 NGVD) |
| County | Palm Beach State Florida Country USA |
| Location | This well was initially logged as PBF-14 for Phase I (Upper) then Schlumberger logged lower borehole re-named as PBF-15. |

| | | | | | |
|---|---|---|---|---|---|
| Section | 17 | Township 43 | Range 40 | API Num 1 | |
| Permanent Datum | Bn Mark | Elevation 24.23 | K.B. 31.135 | | |
| Log Measured From | KB/TOC | ,6.90 | Above Perm Datum | D.F. 31.135 | |
| Drilling Meas From | KB/TOC | | | G.L. 24.19 | |

PBF-15
29 Feb 2008 @ 9:54
DEPTH (FT)
Interval: 823.00 to 2138.00
Depth Scale Ratio: 1/1200

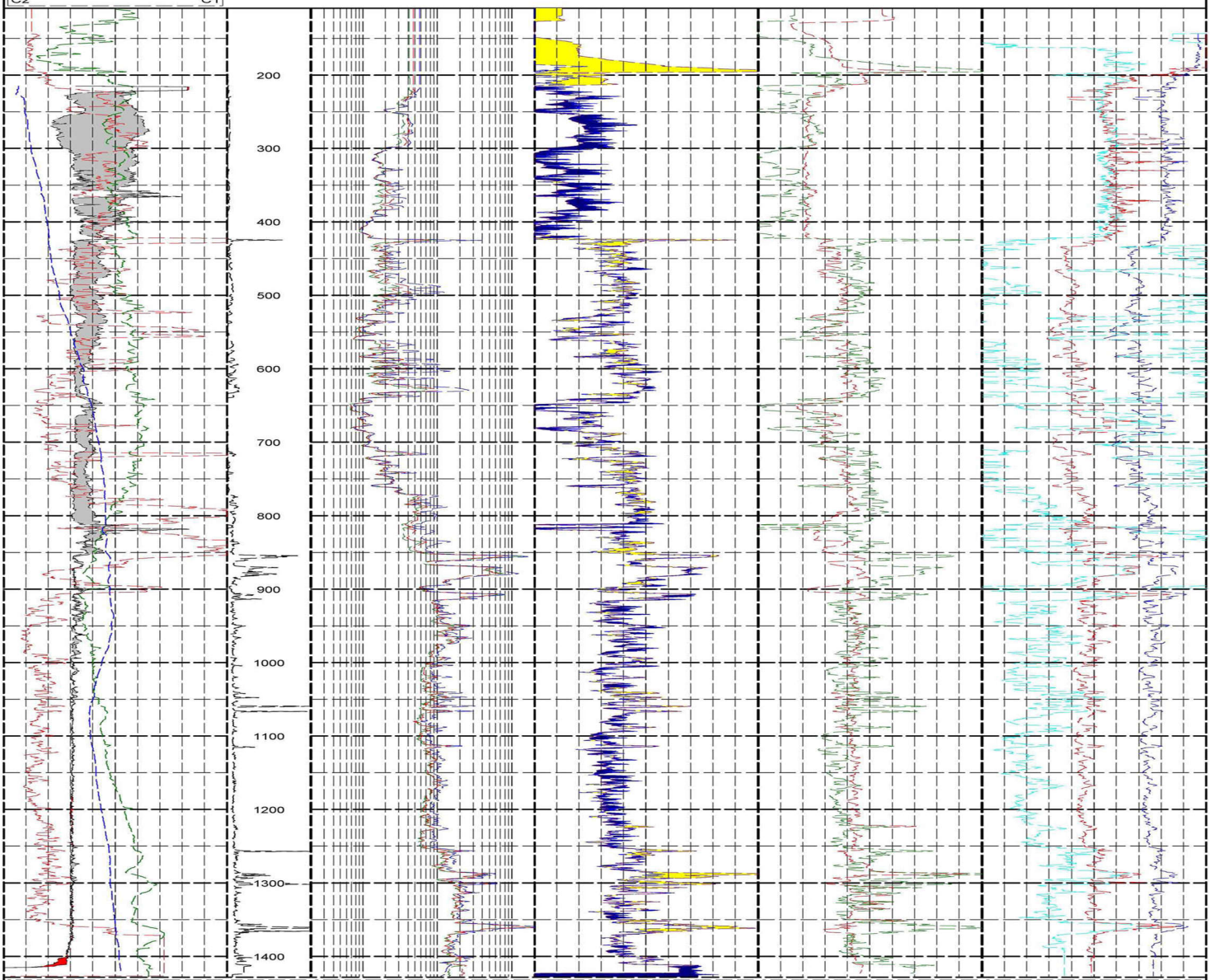


| | |
|---|---|
| Company | SOUTH FLORIDA WATER MANAGEMENT DISTRICT |
| Well | PBF-14 |
| Field | S-5A; L-8 Canal (Datum in Feet; 1929 NGVD) |
| County | PALM BEACH — State FLORIDA — Country USA |
| Location | This borehole was initially logged as PBF-14 (upper) permanently re-named PBF-15. This log run was created by Schlumberger (PBF-15) |

| | | | | | |
|---|---|---|---|---|---|
| Section | 17 | Township 43 | Range 40 | API Num | 1 |
| Permanent Datum | Bn Mark | | Elevation 24.23 | K.B. | 29.48 |
| Log Measured From | KB/TOC | 5.299 | Above Perm Datum | D.F. | 29.48 |
| Drilling Meas From | KB/TOC | | | G.L. | 24.19 |

PBF-14
29 Feb 2008 @ 10:28
DEPTH (FT)
Interval: 109.00 to 1428.00
Depth Scale Ratio: 1/1200

| | | | | | |
|---|---|---|---|---|---|
| GR 0 GAPI 150 | DEPTH FT | AHT90 0.2 OHMM 200 | NPHI 0.6 CFCF 0 | PEFZ 0 10 | DTCO 340 US/F 40 |
| SP -160 MV 40 | HMNO 0 200 | AHT30 0.2 OHMM 200 | DPHZ 0.6 CFCF 0 | RHOZ 1.65 G/C3 2.65 | DTSM 340 US/F 40 |
| C1 6 IN 26 | | AHT10 0.2 OHMM 200 | NPHI DPHZ | | SPHI 0.6 CFCF 0 |
| C2 6 IN 26 | | | DPHZ NPHI | | |
| DEVI 0 DEG 10 | | | | | |
| C1 C2 | | | | | |
| C2 C1 | | | | | |



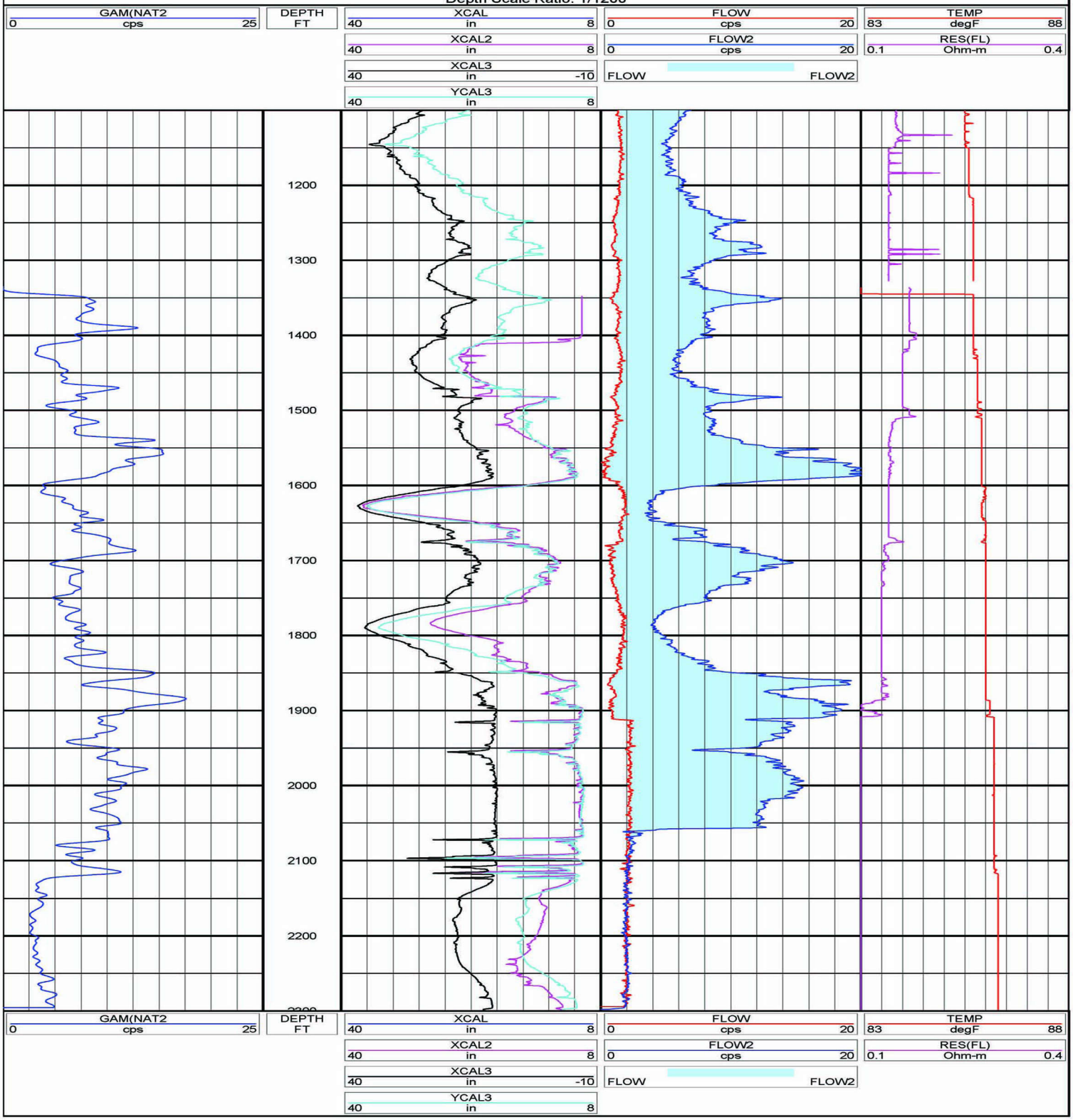


| | | | | | |
|---|---|---|---|---|---|
| GR 0 GAPI 150 | DEPTH FT | AHT90 0.2 OHMM 200 | NPHI 0.6 CFCF 0 | PEFZ 0 10 | DTCO 340 US/F 40 |
| SP -160 MV 40 | HMNO 0 200 | AHT30 0.2 OHMM 200 | DPHZ 0.6 CFCF 0 | RHOZ 1.65 G/C3 2.65 | DTSM 340 US/F 40 |
| C1 6 IN 26 | | AHT10 0.2 OHMM 200 | NPHI DPHZ | | SPHI 0.6 CFCF 0 |
| C2 6 IN 26 | | | DPHZ NPHI | | |
| DEVI 0 DEG 10 | | | | | |
| C1 C2 | | | | | |
| C2 C1 | | | | | |

| | |
|---|---|
| Company | South Florida Water Management District |
| Well | PBF-14 |
| Field | S-5A; L-8 Basin Datum in Feet (1929 NGVD) |
| County | PALM BEACH |
| State | FLORIDA |
| Country | USA |
| Location | This is All Webb log for the lower portion of PBF-15. |

| | | | | | |
|---|---|---|---|---|---|
| Section | 17 | Township | 43 | Range | 40 |
| API Num | 1 | | | | |
| Permanent Datum | Bn Mark | | | Elevation | 24.23 |
| K.B. | 31.13 | | | | |
| Log Measured From | KB/TOC | 6.90 | Above Perm Datum | | |
| D.F. | 31.13 | | | | |
| Drilling Meas From | KB/TOC | | | | |
| G.L. | 24.19 | | | | |

PBF-14
29 Feb 2008 @ 15:03
DEPTH (FT)
Interval: 1100.00 to 2300.00
Depth Scale Ratio: 1/1200



HuntWallace™

| | |
|---|---|
| Company | ALL WEBB ENTERPRISES |
| Well | L-8 CANAL |
| Field | PB3F-14 |
| County | PALM BEACH State FLORIDA Country USA |
| Location | |

| | | | | | |
|---|---|---|---|---|---|
| Section | 17 | Township 43 | Range 40 | API Num 1 | |
| Permanent Datum | GROUND L | | Elevation 15.00000 | K.B.: | |
| Log Measured From | KELLY BU | 5.299 | Above Perm. Datum | D.F.: | |
| Drilling Meas From | | | | G.L.: | |

| | Run 1 | Run 2 | Run 3 |
|---|---|---|---|
| Date | 06/05/2006 | | |
| Depth - Driller | 1450 | | |
| Depth - Logger | 1450 | | |
| Top Log Interval | 215 | | |
| Casing - Driller | 200 | | |
| Casing - Logger | 200 | | |
| Bit Size | 7.875 | | |
| Type Fluid in Hole | WATER | | |
| Dens / Visc | 9.2 58/34.7 | | |
| pH / Fluid Loss | | | |
| Source of Sample | PIT | | |
| Rm @ Meas. Temp | | | |
| Rmf @ Meas. Temp | | | |
| Rmc @ Meas. Temp | | | |
| Source: Rmf / Rmc | | | |
| Rm @ BHT | | | |
| Max. Rec. Temp. | 91F | | |

L-8 CANAL
6 Jun 2006, 08:14:38
PB3F-14
Interval: 2050.00 to 2130.00
Depth Scale Ratio 1/200

# B

# Florida Geological Survey Lithologic Description

LITHOLOGIC WELL LOG PRINTOUT SOURCE - FGS

WELL NUMBER: W-18728 COUNTY - PALMBEAC
TOTAL DEPTH: 1415 FT. LOCATION: T.43S R.40E S.17
SAMPLES - NONE LAT = 26D 44M 17S
LON = 80D 21M 49S
COMPLETION DATE: N/A ELEVATION: 15 FT
OTHER TYPES OF LOGS AVAILABLE - NONE

OWNER/DRILLER:SFWMD (PBF-14)

WORKED BY:STEVEN PETRUSHAK, 2006
ELEVATION IS BASED ON LAT/LONG AND TOPOGRAPHIC MAP (NAD-83)

| | | | | |
|---|---|---|---|---|
| 0.0 | - | 10.0 | 000NOSM | NO SAMPLES |
| 10.0 | - | 200.0 | 090UDSC | UNDIFFERENTIATED SAND AND CLAY |
| 200.0 | - | 540.0 | 122PCRV | PEACE RIVER FM. |
| 540.0 | - | 885.0 | 122ARCA | ARCADIA FM. |
| 885.0 | - | 920.0 | 124OCAL | OCALA GROUP |
| 920.0 | - | TD. | 124AVPK | AVON PARK FM. |

0 - 10 NO SAMPLES

10 - 15 SAND; YELLOWISH GRAY TO VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY
UNCONSOLIDATED
ACCESSORY MINERALS: SHELL-05%
FOSSILS: MOLLUSKS

15 - 20 SAND; VERY LIGHT ORANGE TO YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY
UNCONSOLIDATED
ACCESSORY MINERALS: SHELL-10%
FOSSILS: MOLLUSKS

20 - 25 AS ABOVE

25 - 30 AS ABOVE

30 - 35 SAND; VERY LIGHT ORANGE TO YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY
UNCONSOLIDATED
ACCESSORY MINERALS: SHELL-15%
FOSSILS: MOLLUSKS

35 - 40 AS ABOVE

40 - 45 AS ABOVE

45 - 50 SHELL BED; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR; UNCONSOLIDATED
ACCESSORY MINERALS: QUARTZ SAND-03%
FOSSILS: MOLLUSKS

50 - 55 SHELL BED; VERY LIGHT ORANGE TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR; UNCONSOLIDATED
FOSSILS: MOLLUSKS

55 - 60 SHELL BED; VERY LIGHT ORANGE TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR; UNCONSOLIDATED
ACCESSORY MINERALS: QUARTZ SAND-20%
FOSSILS: MOLLUSKS

60 - 65 SAND; LIGHT OLIVE GRAY TO VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY
UNCONSOLIDATED
ACCESSORY MINERALS: SHELL-30%
FOSSILS: MOLLUSKS

65 - 70 SAND; LIGHT OLIVE GRAY TO VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY
UNCONSOLIDATED
ACCESSORY MINERALS: SHELL-15%, PHOSPHATIC SAND-01%
FOSSILS: MOLLUSKS

70 - 75 AS ABOVE

75 - 80 SAND; VERY LIGHT ORANGE TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR
GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY
UNCONSOLIDATED
ACCESSORY MINERALS: SHELL-30%, PHOSPHATIC SAND-01%
FOSSILS: MOLLUSKS

80 - 85 SHELL BED; LIGHT OLIVE GRAY TO VERY LIGHT ORANGE
POROSITY: INTERGRANULAR; UNCONSOLIDATED
ACCESSORY MINERALS: QUARTZ SAND-40%, PHOSPHATIC SAND-01%
FOSSILS: MOLLUSKS

85 - 90 SHELL BED; VERY LIGHT ORANGE TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR; UNCONSOLIDATED
ACCESSORY MINERALS: QUARTZ SAND-30%, PHOSPHATIC SAND-01%
FOSSILS: MOLLUSKS

90 - 95 SAND; LIGHT OLIVE GRAY TO VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY
UNCONSOLIDATED
ACCESSORY MINERALS: SHELL-20%, PHOSPHATIC SAND-02%
FOSSILS: MOLLUSKS

95 - 100 SAND; LIGHT OLIVE GRAY TO VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM
ROUNDNESS: SUB-ANGULAR TO ANGULAR; MEDIUM SPHERICITY
UNCONSOLIDATED
ACCESSORY MINERALS: SHELL-25%, PHOSPHATIC SAND-02%
FOSSILS: MOLLUSKS

100 - 105 SHELL BED; VERY LIGHT ORANGE TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR; UNCONSOLIDATED
ACCESSORY MINERALS: QUARTZ SAND-07%, PHOSPHATIC SAND-01%
FOSSILS: MOLLUSKS

105 - 110 SHELL BED; LIGHT OLIVE GRAY TO VERY LIGHT ORANGE
POROSITY: INTERGRANULAR; UNCONSOLIDATED
ACCESSORY MINERALS: QUARTZ SAND-05%, PHOSPHATIC SAND-01%
FOSSILS: MOLLUSKS, CORAL

110 - 115 SHELL BED; VERY LIGHT ORANGE TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR; UNCONSOLIDATED
ACCESSORY MINERALS: QUARTZ SAND-03%, PHOSPHATIC SAND-01%
FOSSILS: MOLLUSKS, CORAL

115 - 120 SHELL BED; VERY LIGHT ORANGE TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR; UNCONSOLIDATED
ACCESSORY MINERALS: QUARTZ SAND-07%, PHOSPHATIC SAND-01%
FOSSILS: MOLLUSKS, CORAL

120 - 125 SHELL BED; VERY LIGHT ORANGE TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR; UNCONSOLIDATED
ACCESSORY MINERALS: QUARTZ SAND-10%, PHOSPHATIC SAND-01%
FOSSILS: MOLLUSKS

125 - 130 SHELL BED; VERY LIGHT ORANGE TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR; UNCONSOLIDATED
ACCESSORY MINERALS: QUARTZ SAND-15%, PHOSPHATIC SAND-01%
FOSSILS: MOLLUSKS

130 - 135 SHELL BED; VERY LIGHT ORANGE TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR; UNCONSOLIDATED
ACCESSORY MINERALS: QUARTZ SAND-25%, PHOSPHATIC SAND-01%
FOSSILS: MOLLUSKS

135 - 140 SHELL BED; VERY LIGHT ORANGE TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR; UNCONSOLIDATED
ACCESSORY MINERALS: QUARTZ SAND-15%
FOSSILS: MOLLUSKS

140 - 145 SHELL BED; VERY LIGHT ORANGE TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR; UNCONSOLIDATED
ACCESSORY MINERALS: QUARTZ SAND-20%, PHOSPHATIC SAND-01%
FOSSILS: MOLLUSKS, BARNACLES

145 - 150 SHELL BED; VERY LIGHT ORANGE TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR; UNCONSOLIDATED
ACCESSORY MINERALS: QUARTZ SAND-15%, PHOSPHATIC SAND-01%
FOSSILS: MOLLUSKS

150 - 155 SHELL BED; VERY LIGHT ORANGE TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR; UNCONSOLIDATED
ACCESSORY MINERALS: QUARTZ SAND-20%, PHOSPHATIC SAND-01%
FOSSILS: MOLLUSKS

155 - 160 SHELL BED; VERY LIGHT ORANGE TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR; UNCONSOLIDATED
ACCESSORY MINERALS: QUARTZ SAND-20%, PHOSPHATIC SAND-01%
FOSSILS: MOLLUSKS

160 - 165 AS ABOVE

165 - 170 SHELL BED; LIGHT OLIVE GRAY TO VERY LIGHT ORANGE
POROSITY: INTERGRANULAR; POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: QUARTZ SAND-15%, PHOSPHATIC SAND-01%
FOSSILS: MOLLUSKS

170 - 175 SHELL BED; VERY LIGHT ORANGE TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR; UNCONSOLIDATED
ACCESSORY MINERALS: QUARTZ SAND-15%, PHOSPHATIC SAND-01%
FOSSILS: MOLLUSKS, BARNACLES

175 - 180 SHELL BED; YELLOWISH GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR; UNCONSOLIDATED
ACCESSORY MINERALS: QUARTZ SAND-20%
FOSSILS: MOLLUSKS, BARNACLES, BENTHIC FORAMINIFERA

180 - 185 SHELL BED; YELLOWISH GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR; UNCONSOLIDATED
ACCESSORY MINERALS: QUARTZ SAND-30%
FOSSILS: MOLLUSKS

185 - 190 SAND; LIGHT OLIVE GRAY TO YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE
ROUNDNESS: SUB-ROUNDED TO SUB-ANGULAR; MEDIUM SPHERICITY
UNCONSOLIDATED
ACCESSORY MINERALS: SHELL-40%
FOSSILS: MOLLUSKS

190 - 195 SAND; LIGHT OLIVE GRAY TO YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE
ROUNDNESS: SUB-ROUNDED TO SUB-ANGULAR; MEDIUM SPHERICITY
UNCONSOLIDATED
ACCESSORY MINERALS: SHELL-30%, PHOSPHATIC SAND-01%
FOSSILS: MOLLUSKS

195 - 200 SHELL BED; LIGHT OLIVE GRAY TO VERY LIGHT ORANGE
POROSITY: INTERGRANULAR; UNCONSOLIDATED
ACCESSORY MINERALS: QUARTZ SAND-35%
FOSSILS: MOLLUSKS

200 - 225 WACKESTONE; LIGHT OLIVE GRAY TO 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: SHELL-10%, CLAY-10%, SILT-10%
QUARTZ SAND-01%
FOSSILS: MOLLUSKS

225 - 230 WACKESTONE; LIGHT OLIVE GRAY TO 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: SHELL-07%, CLAY-10%, SILT-10%
QUARTZ SAND-01%
FOSSILS: MOLLUSKS

230 - 235 AS ABOVE

235 - 240 WACKESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE

70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
ACCESSORY MINERALS: SHELL-10%, CLAY-10%, SILT-10%
QUARTZ SAND-01%
FOSSILS: MOLLUSKS

240 - 245 AS ABOVE

245 - 250 WACKESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
ACCESSORY MINERALS: SHELL-10%, CLAY-10%, SILT-10%
QUARTZ SAND-01%
FOSSILS: SHARKS TEETH, MOLLUSKS

250 - 255 NO SAMPLES

255 - 260 WACKESTONE; LIGHT OLIVE GRAY TO YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
ACCESSORY MINERALS: SHELL-07%, CLAY-10%, SILT-15%
QUARTZ SAND-01%
FOSSILS: MOLLUSKS

260 - 265 CLAY; LIGHT OLIVE GRAY TO OLIVE GRAY
POROSITY: INTERGRANULAR; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SHELL-01%, SILT-25%
HEAVY MINERALS-01%

265 - 270 CLAY; LIGHT OLIVE GRAY TO YELLOWISH GRAY
POROSITY: INTERGRANULAR; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SILT-25%, CALCILUTITE-03%
FOSSILS: SHARKS TEETH

270 - 275 NO SAMPLES

275 - 280 CLAY; OLIVE GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SILT-20%, SHELL-02%

280 - 285 CLAY; LIGHT OLIVE GRAY TO OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SILT-25%, SHELL-03%

285 - 290 CLAY; LIGHT OLIVE GRAY TO OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SILT-30%, SHELL-05%
FOSSILS: MOLLUSKS

290 - 295 WACKESTONE; LIGHT OLIVE GRAY TO YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, SKELETAL, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
ACCESSORY MINERALS: CLAY-15%, SILT-10%
PHOSPHATIC SAND-01%

295 - 300 WACKESTONE; YELLOWISH GRAY TO LIGHT OLIVE 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, CLAY MATRIX
ACCESSORY MINERALS: CLAY-05%, SILT-05%
PHOSPHATIC SAND-01%

300 - 305 CLAY; LIGHT OLIVE GRAY TO YELLOWISH GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SHELL-07%, CALCILUTITE-05%, SILT-15%
FOSSILS: MOLLUSKS

305 - 310 CLAY; DARK GRAYISH YELLOW TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX
ACCESSORY MINERALS: SHELL-07%, CALCILUTITE-02%, SILT-15%
FOSSILS: MOLLUSKS

310 - 315 AS ABOVE

315 - 320 CLAY; LIGHT OLIVE GRAY TO DARK GRAYISH YELLOW
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SHELL-03%, SILT-20%, CALCILUTITE-05%
FOSSILS: MOLLUSKS

320 - 325 AS ABOVE

325 - 330 AS ABOVE

330 - 335 CLAY; YELLOWISH GRAY TO YELLOWISH GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SHELL-02%, SILT-20%, CALCILUTITE-03%
FOSSILS: MOLLUSKS

335 - 340 CLAY; YELLOWISH GRAY TO YELLOWISH GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SHELL-03%, SILT-15%, CALCILUTITE-03%
FOSSILS: MOLLUSKS

340 - 345 CLAY; LIGHT OLIVE GRAY TO YELLOWISH GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SILT-25%, CALCILUTITE-03%

345 - 350 CLAY; LIGHT OLIVE GRAY TO YELLOWISH GRAY

POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SILT-20%, CALCILUTITE-03%
IRON STAIN-03%

350 - 355 AS ABOVE

355 - 360 CLAY; OLIVE GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SILT-15%, CALCILUTITE-03%

360 - 365 AS ABOVE

365 - 370 AS ABOVE

370 - 375 AS ABOVE

375 - 380 CLAY; OLIVE GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SILT-15%, CALCILUTITE-07%

380 - 385 CLAY; OLIVE GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SILT-15%, CALCILUTITE-03%

385 - 390 CLAY; OLIVE GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SILT-15%, CALCILUTITE-02%
LIMESTONE-02%

390 - 395 AS ABOVE

395 - 400 CLAY; OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX
ACCESSORY MINERALS: SILT-15%, CALCILUTITE-01%

400 - 405 CLAY; OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SILT-20%, CALCILUTITE-02%

405 - 410 CLAY; OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SILT-20%, CALCILUTITE-02%
QUARTZ SAND-01%

410 - 415 CLAY; OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SILT-20%, CALCILUTITE-07%

415 - 420 AS ABOVE

420 - 425 AS ABOVE

425 - 430 CLAY; OLIVE GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION

CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SILT-20%, CALCILUTITE-02%, SHELL-01%

430 - 435 AS ABOVE

435 - 440 NO SAMPLES

440 - 445 CLAY; OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SILT-20%, CALCILUTITE-02%, SHELL-01%

445 - 450 CLAY; OLIVE GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SILT-20%, CALCILUTITE-02%, SHELL-02%

450 - 455 CLAY; OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SILT-20%, CALCILUTITE-05%
PHOSPHATIC SAND-01%, SHELL-01%

455 - 460 AS ABOVE

460 - 465 CLAY; LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SILT-15%, CALCILUTITE-07%, SHELL-01%

465 - 470 CLAY; LIGHT OLIVE GRAY TO OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SILT-15%, CALCILUTITE-07%, SHELL-01%

470 - 475 CLAY; LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SILT-15%, CALCILUTITE-10%, SHELL-01%
FOSSILS: SHARKS TEETH

475 - 480 NO SAMPLES

480 - 485 CLAY; OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SILT-20%, CALCILUTITE-05%, SHELL-03%

485 - 490 CLAY; OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SILT-20%, CALCILUTITE-03%, SHELL-01%

490 - 495 AS ABOVE

495 - 500 CLAY; OLIVE GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SILT-15%, CALCILUTITE-05%
PHOSPHATIC SAND-03%, SHELL-01%

500 - 505 CLAY; OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION

CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SILT-20%, CALCILUTITE-03%
PHOSPHATIC SAND-02%, SHELL-02%

505 - 510 CLAY; OLIVE GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SILT-20%, CALCILUTITE-03%
PHOSPHATIC SAND-01%, SHELL-05%

510 - 515 CLAY; OLIVE GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SILT-20%, CALCILUTITE-03%, SHELL-05%

515 - 520 CLAY; OLIVE GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SILT-20%, CALCILUTITE-03%, SHELL-07%
PHOSPHATIC SAND-01%

520 - 525 CLAY; OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SILT-20%, CALCILUTITE-02%, SHELL-01%

525 - 530 CLAY; OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SILT-20%, CALCILUTITE-03%, SHELL-02%
PHOSPHATIC SAND-02%

530 - 535 CLAY; OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: SILT-20%, CALCILUTITE-03%, SHELL-05%
PHOSPHATIC SAND-01%
INTERVAL INCLUDES LESS THAN 01% GLAUCONITE

535 - 540 AS ABOVE

540 - 545 MUDSTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: CALCILUTITE, INTRACLASTS
10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MEDIUM; POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: SHELL-05%, PHOSPHATIC SAND-01%
FOSSILS: SHARKS TEETH

545 - 550 MUDSTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: CALCILUTITE, INTRACLASTS
10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MEDIUM; POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: SHELL-07%, PHOSPHATIC SAND-03%

550 - 555 MUDSTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: CALCILUTITE, INTRACLASTS

10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MEDIUM; POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: SHELL-02%, PHOSPHATIC SAND-03%

555 - 560 MUDSTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: CALCILUTITE, INTRACLASTS
10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MEDIUM; POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: SHELL-01%, PHOSPHATIC SAND-05%

560 - 565 MUDSTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: CALCILUTITE, INTRACLASTS
10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MEDIUM; POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: SHELL-01%, PHOSPHATIC SAND-07%

565 - 570 MUDSTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: CALCILUTITE, INTRACLASTS
10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-07%

570 - 575 MUDSTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: CALCILUTITE, INTRACLASTS
10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-07%, SHELL-01%

575 - 580 WACKESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: CALCILUTITE, INTRACLASTS
15% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-15%, SHELL-02%

580 - 585 WACKESTONE; LIGHT OLIVE GRAY TO YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: SHELL-05%, PHOSPHATIC SAND-15%

585 - 590 WACKESTONE; LIGHT OLIVE GRAY TO YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE

60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: SHELL-02%, PHOSPHATIC SAND-15%

590 - 595 AS ABOVE

595 - 600 AS ABOVE

600 - 605 WACKESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: SHELL-01%, PHOSPHATIC SAND-15%

605 - 610 AS ABOVE

610 - 615 MUDSTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: CALCILUTITE, INTRACLASTS
10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-10%, SHELL-01%

615 - 620 WACKESTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
20% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-07%

620 - 625 WACKESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-20%, SHELL-05%

625 - 630 PACKSTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE, SKELETAL
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO VERY COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-15%, SHELL-05%
FOSSILS: FOSSIL FRAGMENTS

630 - 635 AS ABOVE

635 - 640 WACKESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE

75% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO VERY COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-10%, SHELL-03%

640 - 645 AS ABOVE

645 - 650 WACKESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
75% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO VERY COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-05%, SHELL-03%

650 - 655 GRAINSTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, INTRACLASTS
90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO VERY COARSE
UNCONSOLIDATED
ACCESSORY MINERALS: PHOSPHATIC SAND-03%
FOSSILS: MOLLUSKS, BRYOZOA, FOSSIL FRAGMENTS

655 - 660 AS ABOVE

660 - 665 AS ABOVE

665 - 670 WACKESTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, INTRACLASTS, CALCILUTITE
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO VERY COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-07%
FOSSILS: MOLLUSKS, FOSSIL FRAGMENTS

670 - 675 PACKSTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, INTRACLASTS, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO COARSE
UNCONSOLIDATED
ACCESSORY MINERALS: PHOSPHATIC SAND-07%
FOSSILS: FOSSIL FRAGMENTS

675 - 680 AS ABOVE

680 - 685 PACKSTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, INTRACLASTS, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO COARSE
UNCONSOLIDATED
ACCESSORY MINERALS: PHOSPHATIC SAND-02%, QUARTZ SAND-03%
FOSSILS: FOSSIL FRAGMENTS

685 - 690 WACKESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE, INTRACLASTS

80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-02%, QUARTZ SAND-02%
FOSSILS: FOSSIL FRAGMENTS

690 - 695 WACKESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, INTRACLASTS, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-05%, QUARTZ SAND-01%
FOSSILS: FOSSIL FRAGMENTS

695 - 700 WACKESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY
GRAIN TYPE: CALCILUTITE, SKELETAL, INTRACLASTS
50% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO COARSE; POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-02%
FOSSILS: FOSSIL FRAGMENTS

700 - 705 WACKESTONE; LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY
GRAIN TYPE: CALCILUTITE, SKELETAL, INTRACLASTS
50% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO COARSE; POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-03%
FOSSILS: FOSSIL FRAGMENTS

705 - 710 AS ABOVE

710 - 715 AS ABOVE

715 - 720 AS ABOVE

720 - 725 PACKSTONE; LIGHT OLIVE GRAY TO YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, INTRACLASTS, CALCILUTITE
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
UNCONSOLIDATED
ACCESSORY MINERALS: PHOSPHATIC SAND-07%, QUARTZ SAND-15%
SHELL-02%
FOSSILS: FOSSIL FRAGMENTS

725 - 730 PACKSTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, SKELETAL, CALCILUTITE
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
UNCONSOLIDATED
ACCESSORY MINERALS: PHOSPHATIC SAND-07%, QUARTZ SAND-03%
SHELL-02%
FOSSILS: SHARKS TEETH, FOSSIL FRAGMENTS

730 - 735 WACKESTONE; LIGHT OLIVE GRAY TO YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, INTRACLASTS, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-07%, QUARTZ SAND-02%
SHELL-05%
FOSSILS: FOSSIL FRAGMENTS

735 - 740 MUDSTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY
GRAIN TYPE: CALCILUTITE, INTRACLASTS
10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-01%, SHELL-01%

740 - 745 MUDSTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY
GRAIN TYPE: CALCILUTITE, INTRACLASTS
10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-02%, SHELL-02%

745 - 750 MUDSTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY
GRAIN TYPE: CALCILUTITE, INTRACLASTS
07% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-01%, QUARTZ SAND-01%

750 - 755 AS ABOVE

755 - 760 PACKSTONE; LIGHT OLIVE GRAY TO YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, SKELETAL
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-10%, QUARTZ SAND-05%
SHELL-05%
FOSSILS: FOSSIL FRAGMENTS, MOLLUSKS

760 - 765 WACKESTONE; YELLOWISH GRAY
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
ACCESSORY MINERALS: PHOSPHATIC SAND-02%, QUARTZ SAND-02%
SHELL-01%
FOSSILS: FOSSIL FRAGMENTS

765 - 770 WACKESTONE; LIGHT OLIVE GRAY TO YELLOWISH GRAY

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
ACCESSORY MINERALS: PHOSPHATIC SAND-02%, QUARTZ SAND-05%
SHELL-02%

770 - 775 MUDSTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY
GRAIN TYPE: CALCILUTITE, INTRACLASTS
10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MEDIUM; POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-01%, QUARTZ SAND-01%

775 - 780 AS ABOVE

780 - 785 WACKESTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY
GRAIN TYPE: INTRACLASTS, CALCILUTITE
20% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO COARSE; POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX

785 - 790 MUDSTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR, LOW PERMEABILITY
GRAIN TYPE: CALCILUTITE, INTRACLASTS
10% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MEDIUM; POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: QUARTZ SAND-01%, PHOSPHATIC SAND-01%

790 - 795 AS ABOVE

795 - 800 AS ABOVE

800 - 805 AS ABOVE

805 - 810 WACKESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, SKELETAL, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-01%
FOSSILS: FOSSIL FRAGMENTS

810 - 815 PACKSTONE; LIGHT OLIVE GRAY TO YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, INTRACLASTS, CALCILUTITE
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-01%
FOSSILS: FOSSIL FRAGMENTS

815 - 825 NO SAMPLES

825 - 830 WACKESTONE; LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, INTRACLASTS, CALCILUTITE
75% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-15%, QUARTZ SAND-03%
FOSSILS: FOSSIL FRAGMENTS, BRYOZOA, BENTHIC FORAMINIFERA

830 - 835 WACKESTONE; LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, SKELETAL, CALCILUTITE
75% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-15%, QUARTZ SAND-03%
FOSSILS: FOSSIL FRAGMENTS, BENTHIC FORAMINIFERA
SHARKS TEETH, BRYOZOA

835 - 840 WACKESTONE; OLIVE GRAY TO LIGHT OLIVE GRAY
GRAIN TYPE: INTRACLASTS, CALCILUTITE, SKELETAL
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-20%, QUARTZ SAND-03%
FOSSILS: FOSSIL FRAGMENTS, BENTHIC FORAMINIFERA

840 - 845 AS ABOVE

845 - 850 WACKESTONE; LIGHT OLIVE GRAY TO YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE, SKELETAL
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-07%, QUARTZ SAND-02%
FOSSILS: FOSSIL FRAGMENTS, WORM TRACES

850 - 855 PACKSTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE, SKELETAL
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-07%, QUARTZ SAND-05%
SHELL-01%
FOSSILS: FOSSIL FRAGMENTS, BENTHIC FORAMINIFERA

855 - 860 AS ABOVE

860 - 865 AS ABOVE

865 - 870 PACKSTONE; LIGHT OLIVE GRAY TO YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE, SKELETAL
80% ALLOCHEMICAL CONSTITUENTS

GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-07%, QUARTZ SAND-05%
FOSSILS: FOSSIL FRAGMENTS, BENTHIC FORAMINIFERA

870 - 875 AS ABOVE

875 - 880 PACKSTONE; LIGHT OLIVE GRAY TO YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE, SKELETAL
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-07%, QUARTZ SAND-03%
FOSSILS: FOSSIL FRAGMENTS

880 - 885 WACKESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE, SKELETAL
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-10%, QUARTZ SAND-02%
FOSSILS: FOSSIL FRAGMENTS

885 - 890 WACKESTONE; YELLOWISH GRAY TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-03%, QUARTZ SAND-01%
OTHER FEATURES: LOW RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA

890 - 895 AS ABOVE

895 - 900 WACKESTONE; YELLOWISH GRAY TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-03%, QUARTZ SAND-01%
OTHER FEATURES: LOW RECRYSTALLIZATION
FOSSILS: FOSSIL FRAGMENTS, WORM TRACES

900 - 910 WACKESTONE; YELLOWISH GRAY TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-03%
OTHER FEATURES: LOW RECRYSTALLIZATION
FOSSILS: FOSSIL FRAGMENTS

910 - 915 WACKESTONE; YELLOWISH GRAY TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-02%
FOSSILS: FOSSIL FRAGMENTS

915 - 920 WACKESTONE; YELLOWISH GRAY TO VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-02%
OTHER FEATURES: LOW RECRYSTALLIZATION
FOSSILS: FOSSIL FRAGMENTS, CONES

920 - 925 WACKESTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-01%
FOSSILS: BENTHIC FORAMINIFERA, CONES

925 - 930 WACKESTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-02%, PHOSPHATIC SAND-02%
FOSSILS: BENTHIC FORAMINIFERA, CONES
INTERVAL INCLUDES FORAMINIFERA CRIBROBULIMINA (VALVULINA)
CUSHMANI

930 - 935 WACKESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
75% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-01%, DOLOMITE-01%
FOSSILS: BENTHIC FORAMINIFERA, CONES

935 - 940 WACKESTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-01%, PHOSPHATIC SAND-02%
FOSSILS: BENTHIC FORAMINIFERA, CONES

940 - 945 WACKESTONE; YELLOWISH GRAY TO VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-01%
FOSSILS: BENTHIC FORAMINIFERA, CONES

945 - 950 WACKESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-01%, PHOSPHATIC SAND-02%
FOSSILS: BENTHIC FORAMINIFERA, CONES, SHARKS TEETH

950 - 955 WACKESTONE; YELLOWISH GRAY TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
30% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-02%

955 - 960 WACKESTONE; YELLOWISH GRAY TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-02%, PHOSPHATIC SAND-02%
FOSSILS: CONES

960 - 965 AS ABOVE

965 - 970 WACKESTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-02%, QUARTZ SAND-01%
DOLOMITE-01%

970 - 975 WACKESTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-03%, DOLOMITE-01%
FOSSILS: CONES

975 - 980 WACKESTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR

GRAIN TYPE: INTRACLASTS, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-01%, DOLOMITE-02%
FOSSILS: CONES, MOLLUSKS

980 - 985 WACKESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-01%, QUARTZ SAND-01%
DOLOMITE-02%
FOSSILS: CONES

985 - 990 WACKESTONE; LIGHT OLIVE GRAY TO YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-01%, QUARTZ SAND-01%
DOLOMITE-01%
FOSSILS: CONES

990 - 995 WACKESTONE; YELLOWISH GRAY TO VERY LIGHT GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-01%

995 - 1000 WACKESTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-01%, DOLOMITE-01%
FOSSILS: CONES

1000 - 1005 WACKESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
75% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-01%, DOLOMITE-01%
FOSSILS: BENTHIC FORAMINIFERA

1005 - 1010 WACKESTONE; YELLOWISH GRAY TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
60% ALLOCHEMICAL CONSTITUENTS

GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-01%
FOSSILS: CONES

1010 - 1015 WACKESTONE; YELLOWISH GRAY TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: SHELL-01%
FOSSILS: CONES

1015 - 1020 AS ABOVE

1020 - 1025 AS ABOVE

1025 - 1030 WACKESTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-01%, DOLOMITE-01%
FOSSILS: CONES

1030 - 1035 WACKESTONE; YELLOWISH GRAY TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-01%, SHELL-01%
FOSSILS: CONES

1035 - 1040 WACKESTONE; YELLOWISH GRAY TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-01%, SHELL-02%
FOSSILS: CONES

1040 - 1050 NO SAMPLES

1050 - 1055 WACKESTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: SHELL-01%
FOSSILS: CONES

1055 - 1060 WACKESTONE; YELLOWISH GRAY

POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: SHELL-01%, PYRITE-01%
FOSSILS: CONES

1060 - 1065 WACKESTONE; YELLOWISH GRAY
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: SHELL-01%, PYRITE-01%
OTHER FEATURES: MUDDY
FOSSILS: CONES

1065 - 1070 AS ABOVE

1070 - 1075 WACKESTONE; YELLOWISH GRAY TO 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
ACCESSORY MINERALS: DOLOMITE-30%
OTHER FEATURES: DOLOMITIC, LOW RECRYSTALLIZATION
FOSSILS: CONES

1075 - 1080 WACKESTONE; YELLOWISH GRAY TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
75% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: SHELL-01%, DOLOMITE-20%
OTHER FEATURES: LOW RECRYSTALLIZATION
FOSSILS: CONES

1080 - 1085 WACKESTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-40%, SHELL-01%
OTHER FEATURES: DOLOMITIC, LOW RECRYSTALLIZATION
FOSSILS: CONES

1085 - 1090 WACKESTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
75% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: SHELL-01%, DOLOMITE-30%

OTHER FEATURES: DOLOMITIC, LOW RECRYSTALLIZATION
FOSSILS: CONES
INTERVAL INCLUDES LESS THAN 01% DISSIMIMATED PYRITE

1090 - 1095 WACKESTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
75% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: SHELL-01%, DOLOMITE-20%
OTHER FEATURES: DOLOMITIC, LOW RECRYSTALLIZATION
FOSSILS: CONES

1095 - 1100 WACKESTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: SHELL-01%, DOLOMITE-03%
OTHER FEATURES: DOLOMITIC, LOW RECRYSTALLIZATION
FOSSILS: CONES

1100 - 1105 WACKESTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: SHELL-02%, DOLOMITE-03%
OTHER FEATURES: DOLOMITIC, LOW RECRYSTALLIZATION
FOSSILS: CONES

1105 - 1110 WACKESTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, CALCILUTITE
70% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-01%, SHELL-01%
OTHER FEATURES: DOLOMITIC, LOW RECRYSTALLIZATION
FOSSILS: CONES

1110 - 1115 PACKSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-07%
OTHER FEATURES: DOLOMITIC, LOW RECRYSTALLIZATION
FOSSILS: CONES

1115 - 1120 AS ABOVE

1120 - 1125 PACKSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR

GRAIN TYPE: INTRACLASTS, PELLET
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-05%
OTHER FEATURES: LOW RECRYSTALLIZATION, DOLOMITIC
FOSSILS: CONES

1125 - 1130 PACKSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-05%, SHELL-01%
OTHER FEATURES: LOW RECRYSTALLIZATION, DOLOMITIC
FOSSILS: CONES

1130 - 1135 PACKSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: DOLOMITIC, LOW RECRYSTALLIZATION

1135 - 1140 PACKSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-03%, SHELL-01%
OTHER FEATURES: LOW RECRYSTALLIZATION
FOSSILS: CONES

1140 - 1145 PACKSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-05%, SHELL-01%
OTHER FEATURES: LOW RECRYSTALLIZATION
FOSSILS: CONES

1145 - 1150 AS ABOVE

1150 - 1155 PACKSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: SHELL-01%, DOLOMITE-02%
OTHER FEATURES: LOW RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, CONES

1155 - 1160 PACKSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: SHELL-01%
OTHER FEATURES: LOW RECRYSTALLIZATION
FOSSILS: CONES

1160 - 1165 PACKSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: LOW RECRYSTALLIZATION
FOSSILS: CONES, BENTHIC FORAMINIFERA

1165 - 1170 PACKSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-03%
OTHER FEATURES: LOW RECRYSTALLIZATION, DOLOMITIC
FOSSILS: CONES, BENTHIC FORAMINIFERA

1170 - 1175 AS ABOVE

1175 - 1180 AS ABOVE

1180 - 1185 PACKSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-03%
OTHER FEATURES: LOW RECRYSTALLIZATION, DOLOMITIC
FOSSILS: CONES, BENTHIC FORAMINIFERA

1185 - 1190 PACKSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-03%
OTHER FEATURES: LOW RECRYSTALLIZATION, DOLOMITIC
FOSSILS: CONES, BENTHIC FORAMINIFERA
INTERVAL INCLUDES FORAMINIFERA SPIROLINA CORYENSIS

1190 - 1195 PACKSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET, SKELETAL

85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-05%
OTHER FEATURES: LOW RECRYSTALLIZATION, DOLOMITIC
FOSSILS: CONES, BENTHIC FORAMINIFERA
INTERVAL INCLUDES FORAMINIFERA CRIBROBULIMINA (VALVULINA) CUSHMANI

1195 - 1200 AS ABOVE

1200 - 1205 AS ABOVE

1205 - 1210 PACKSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET, SKELETAL
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-01%
OTHER FEATURES: LOW RECRYSTALLIZATION, DOLOMITIC
FOSSILS: CONES, BENTHIC FORAMINIFERA

1210 - 1215 AS ABOVE

1215 - 1220 PACKSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET, SKELETAL
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-01%, SHELL-01%
OTHER FEATURES: LOW RECRYSTALLIZATION, DOLOMITIC
FOSSILS: CONES, BENTHIC FORAMINIFERA

1220 - 1225 AS ABOVE

1225 - 1230 PACKSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: PELLET, INTRACLASTS
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-01%
OTHER FEATURES: LOW RECRYSTALLIZATION, DOLOMITIC
FOSSILS: CONES, BENTHIC FORAMINIFERA

1230 - 1235 AS ABOVE

1235 - 1240 AS ABOVE

1240 - 1245 WACKESTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: PELLET, INTRACLASTS
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
OTHER FEATURES: LOW RECRYSTALLIZATION, DOLOMITIC

FOSSILS: CONES, BENTHIC FORAMINIFERA

1245 - 1250 WACKESTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: PELLET, INTRACLASTS
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: DOLOMITE-01%
OTHER FEATURES: LOW RECRYSTALLIZATION, DOLOMITIC
FOSSILS: CONES, BENTHIC FORAMINIFERA

1250 - 1255 AS ABOVE

1255 - 1260 AS ABOVE

1260 - 1265 AS ABOVE

1265 - 1270 AS ABOVE

1270 - 1275 AS ABOVE

1275 - 1280 WACKESTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: PELLET, INTRACLASTS
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-03%
OTHER FEATURES: LOW RECRYSTALLIZATION, DOLOMITIC
FOSSILS: CONES, BENTHIC FORAMINIFERA

1280 - 1285 AS ABOVE

1285 - 1290 WACKESTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: PELLET, INTRACLASTS
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-05%
OTHER FEATURES: LOW RECRYSTALLIZATION, DOLOMITIC
FOSSILS: CONES

1290 - 1295 AS ABOVE

1295 - 1300 AS ABOVE

1300 - 1305 WACKESTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-07%
OTHER FEATURES: LOW RECRYSTALLIZATION, DOLOMITIC
FOSSILS: CONES

1305 - 1310 WACKESTONE; VERY LIGHT ORANGE TO GRAYISH BROWN

POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-10%
OTHER FEATURES: MEDIUM RECRYSTALLIZATION, DOLOMITIC

1310 - 1315 DOLOSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 50-90% ALTERED
SUBHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: LIMESTONE-30%
OTHER FEATURES: MEDIUM RECRYSTALLIZATION, DOLOMITIC
FOSSILS: CONES

1315 - 1320 AS ABOVE

1320 - 1325 DOLOSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 50-90% ALTERED
SUBHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: LIMESTONE-25%
OTHER FEATURES: MEDIUM RECRYSTALLIZATION
FOSSILS: CONES

1325 - 1330 DOLOSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 50-90% ALTERED
SUBHEDRAL
GRAIN SIZE: VERY FINE; RANGE: VERY FINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: LIMESTONE-30%
OTHER FEATURES: MEDIUM RECRYSTALLIZATION
FOSSILS: CONES

1330 - 1335 WACKESTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-30%
OTHER FEATURES: MEDIUM RECRYSTALLIZATION
FOSSILS: CONES

1335 - 1340 AS ABOVE

1340 - 1345 WACKESTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-10%
OTHER FEATURES: DOLOMITIC, LOW RECRYSTALLIZATION
FOSSILS: CONES

1345 - 1350 WACKESTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-15%
OTHER FEATURES: DOLOMITIC, LOW RECRYSTALLIZATION
FOSSILS: CONES

1350 - 1355 WACKESTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-10%
OTHER FEATURES: DOLOMITIC, LOW RECRYSTALLIZATION
FOSSILS: CONES, BENTHIC FORAMINIFERA

1355 - 1360 WACKESTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-05%
OTHER FEATURES: DOLOMITIC, LOW RECRYSTALLIZATION
FOSSILS: CONES

1360 - 1365 WACKESTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-10%, ORGANICS-01%
OTHER FEATURES: DOLOMITIC, LOW RECRYSTALLIZATION
FOSSILS: CONES

1365 - 1370 AS ABOVE

1370 - 1375 WACKESTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-02%, ORGANICS-01%
OTHER FEATURES: DOLOMITIC, LOW RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, CONES

1375 - 1380 WACKESTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION

CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-15%, ORGANICS-01%
OTHER FEATURES: DOLOMITIC, LOW RECRYSTALLIZATION

1380 - 1385 WACKESTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-10%
OTHER FEATURES: DOLOMITIC, LOW RECRYSTALLIZATION
FOSSILS: CONES

1385 - 1390 AS ABOVE

1390 - 1395 AS ABOVE

1395 - 1400 WACKESTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-05%
OTHER FEATURES: DOLOMITIC, LOW RECRYSTALLIZATION
FOSSILS: CONES

1400 - 1405 AS ABOVE

1405 - 1410 WACKESTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET
75% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-07%
OTHER FEATURES: DOLOMITIC, LOW RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, CONES

1410 - 1415 WACKESTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: INTRACLASTS, PELLET
25% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-10%
OTHER FEATURES: DOLOMITIC, LOW RECRYSTALLIZATION
FOSSILS: CONES

1415 - 1420 AS ABOVE

1420 TOTAL DEPTH

LITHOLOGIC WELL LOG PRINTOUT SOURCE - FGS

WELL NUMBER: W-18728 COUNTY - PB18728
TOTAL DEPTH: 2300 FT. LOCATION: T.43S R.40E S.17 BB
SAMPLES - NONE LAT = 26D 44M 17S
LON = 80D 21M 49S
COMPLETION DATE: N/A ELEVATION: 15 FT
OTHER TYPES OF LOGS AVAILABLE - NONE

OWNER/DRILLER:SFWMD / SFWMD WELL NAME: PBF-15 AND ALSO L-8

WORKED BY:DAVID WAGNER DECEMBER 2007
ENTERED BY DAVID WAGNER JANUARY 2008
ELEVATION AND STR TAKEN FROM GIS MAP, DATUM WGS84
THIS DESCRIPTION IS FOR THE BOTTOM 900' OF CUTTINGS FOR THIS WELL.
THE DEPTH INTERVAL OF THIS 900' IS 1400'-2300'.
THE NUMBER OF 5' INTERVAL SAMPLES COMPRISING THIS 900' IS 175
FOLLOWING THE DESCRIPTION OF MILLER(1986) FOR THE OLDSMAR LIMESTONE
1860' WAS CHOSEN FOR THE TOP OF OLDSMAR DUE TO THE FIRST OCCURRENCE
OF LIGHT GREY LIMESTONE AND BROWN VUGGY DOLOMITE. ACTUAL TOP OF
OLDSMAR MAY BE DEEPER WHERE LIMESTONE BECOMES THE MAIN ROCK TYPE IN
A COUPLE INTERVALS, 1865'-1880' AND 1955'-1965'. THESE LIMESTONES
CONTAIN FORAMINIFERA THAT RESEMBLE OLDSMAR INDEX FORAMS BUT ARE TOO
HIGHLY RECRYSTALLIZED TO MAKE DEFINITIVE IDENTIFICATIONS.

| | | | |
|---|---|---|---|
| 1400. | - 1860. | 124AVPK | AVON PARK FM. |
| 1860. | - 2175. | 124OLDM | OLDSMAR LIMESTONE |
| 2175. | - 2200. | 000NOSM | NO SAMPLES |
| 2200. | - . | 124OLDM | OLDSMAR LIMESTONE |

0 - 1400 NO SAMPLES
SAMPLES FOR 0'-1400'WERE RECIEVED AT AN EARLIER DATE AND
DESCRIBED BY STEVEN PETRUSHAK.

1400 - 1405 GRAINSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
GRAIN TYPE: SKELETAL, PELLET, CRYSTALS
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRANULE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: GYPSUM-01%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA
TWO TO THREE PERCENT OF THE SAMPLE IS MADE UP OF MUDSTONE
FRAGMENTS WITH LOW POROSITY AND MAY BE DOLOMITIC.

1405 - 1410 GRAINSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
GRAIN TYPE: SKELETAL, PELLET, CRYSTALS
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRANULE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: GYPSUM-01%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA
FIVE PERCENT OF SAMPLE IS MADE UP OF MUDSTONE FRAGMENTS
WITHLOW POROSITY AND MAY BE DOLOMITIC.

1410 - 1415 GRAINSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
GRAIN TYPE: SKELETAL, PELLET, CRYSTALS
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRAVEL
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT

OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
TWO TO THREE PERCENT OF SAMPLE IS MADE UP OF MUDSTONE FRAGMENTS WITH LOW POROSITY AND MAY BE DOLOMITIC. TRACE AMOUNTS OF ORGANICS ALSO PRESENT IN SAMPLE.

1415 - 1420 GRAINSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
GRAIN TYPE: SKELETAL, PELLET, CRYSTALS
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRAVEL
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
TWO PERCENT OF SAMPLE IS MADE UP OF MUDSTONE FRAGMENTS WITH LOW POROSITY AND MAY BE DOLOMITIC. FIVE PERCENT OF SAMPLE IS PACKSTONE FRAGMENTS.

1420 - 1425 GRAINSTONE; VERY LIGHT ORANGE
IP% POROSITY: MOLDIC
GRAIN TYPE: SKELETAL, PELLET, CRYSTALS
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRANULE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
TRACE AMOUNTS OF DOLOMITE AND ORGANICS PRESENT IN SAMPLE. COUPLE PERCENT OF BOTH MUDSTONE AND PACKSTONE FRAGMENTS ALSO PRESENT IN SAMPLE.

1425 - 1430 GRAINSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
GRAIN TYPE: SKELETAL, PELLET, CRYSTALS
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRANULE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
TRACE AMOUNTS OF DOLOMITE AND ORGANICS PRESENT IN SAMPLE. FIVE PERCENT OF SAMPLE IS MUDSTONE FRAGMENTS WITH LOW POROSITY WHICH MAY BE DOLOMITIC. TWO PERCENT OF SAMPLE IS PACKSTONE FRAGMENTS.

1430 - 1435 GRAINSTONE; VERY LIGHT ORANGE TO WHITE
POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
GRAIN TYPE: SKELETAL, PELLET, CRYSTALS
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRAVEL
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: DOLOMITE-03%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
GRAINSTONE IS THE MAIN ROCK TYPE BUT ~15% OF SAMPLE IS FRAGMENTS OF A WHITE LIMESTONE THAT RANGES FROM WACKESTONE TO PACKSTONE. FIVE PERCENT OF SAMPLE IS A LIGHT GREY DOLOMITIC MUDSTONE.

1435 - 1440 GRAINSTONE; VERY LIGHT ORANGE TO WHITE
POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
GRAIN TYPE: SKELETAL, PELLET, CRYSTALS
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: FINE TO GRAVEL
MODERATE INDURATION

CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: DOLOMITE-03%, CALCITE-01%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
MOST OF SAMPLE CONSISTS OF VERY SMALL FRAGMENTS OF GRAINSTONE. TWENTY PERCENT OF SAMPLE IS A WHITE LIMESTONE RANGING FROM WACKESTONE TO PACKSTONE. ABOUT 7% OF SAMPLE IS A GREY MUDSTONE WITH HIGHER INDURATION AND LOW POROSITY.

1440 - 1445 AS ABOVE

1445 - 1450 GRAINSTONE; VERY LIGHT ORANGE TO WHITE
POROSITY: INTERGRANULAR, PIN POINT VUGS, MOLDIC
GRAIN TYPE: SKELETAL, PELLET, CRYSTALS
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRAVEL
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: DOLOMITE-03%, CALCITE-01%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
ABOUT 30% OF SAMPLE IS A WHITE LIMESTONE RANGING FROM WACKESTONE TO PACKSTONE. ABOUT 5% OF SAMPLE IS A GREY MUDSTONE WITH HIGHER INDURATION AND LOW POROSITY. THE WHITE LIMESTONE IS ALSO MORE HIGHLY INDURATED.

1450 - 1455 AS ABOVE

1455 - 1460 AS ABOVE

1460 - 1465 GRAINSTONE; VERY LIGHT ORANGE TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CRYSTALS
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO GRANULE
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCITE-02%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
SAMPLE ALMOST COMPLETELY MADE UP OF VERY SMALL ROCK FRAGMENTS MOSTLY IN THE VERY FINE TO FINE GRAIN SIZE RANGE AND MOST OF REST BEING MEDIUM TO COARSE GRAIN SIZE. INDURATION IS HARD TO DISCERN BECAUSE THE ROCK PIECES ARE SO SMALL, MAY BE VERY POOR.

1465 - 1470 AS ABOVE

1470 - 1475 AS ABOVE

1475 - 1480 GRAINSTONE; VERY LIGHT ORANGE TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CRYSTALS
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO GRANULE
POOR INDURATION
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCITE-02%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
SAMPLE IS BASICALLY THE SAME AS ABOVE BUT THE ROCK PIECES HAVE INCREASED IN SIZE A BIT HAVING MORE COARSE GRAIN SIZE PIECES. ABOUT 5% OF SAMPLE IS A GREY DOLOMITIC WELL INDURATED MUDSTONE.

1480 - 1485 AS ABOVE

1485 - 1490 GRAINSTONE; VERY LIGHT ORANGE TO WHITE

POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CRYSTALS
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO GRANULE
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCITE-01%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
ROCK FRAGMENTS ARE TO SMALL TO DISCERN INDURATION, BUT IT MAY BE VERY POOR. ABOUT 3% OF SAMPLE IS WELL INDURATED GREY MUDSTONE. ABOUT 15% OF SAMPLE IS A WHITE WACKESTONE TO PACKSTONE.

1490 - 1495 GRAINSTONE; VERY LIGHT ORANGE TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CRYSTALS
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO GRANULE
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCITE-02%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
ROCK FRAGMENTS ARE VERY SMALL MOSTLY RANGING FROM VERY FINE TO FINE GRAIN SIZE. THERE IS 2% OF EACH A GREY MUDSTONE AND A WHITE WACKESTONE TO PACKSTONE INCORPORATED IN SAMPLE.

1495 - 1500 AS ABOVE

1500 - 1505 GRAINSTONE; VERY LIGHT ORANGE TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CRYSTALS
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO GRANULE
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCITE-01%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
TRACE AMOUNTS OF DOLOMITE ALSO PRESENT. ROCK PIECES TO SMALL TO DISCERN INDURATION, MAY BE VERY POOR. ABOUT 2% OF SAMPLE IS A GREY WELL INDURATED MUDSTONE AND 15% OF SAMPLE IS A WHITE WACKESTONE TO PACKSTONE.

1505 - 1510 GRAINSTONE; VERY LIGHT ORANGE TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CRYSTALS
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO GRANULE
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-02%
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
INDURATION CANNOT BE DISCERNED FROM THE SMALL PIECES WHICH ARE BASICALLY INDIVIDUAL GRAINS, BUT INDURATION IS PROBABLY UNCONSOLIDATED TO VERY POOR. APPROXIMATELY 15%-20% OF SAMPLE IS MADE UP OF A WHITE PACKSTONE WHICH IS MODERATELY TO WELL INDURATED. THREE PERCENT OF SAMPLE IS A GREY MUDSTONE.

1510 - 1515 AS ABOVE

1515 - 1520 GRAINSTONE; VERY LIGHT ORANGE TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CRYSTALS
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO GRANULE
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-02%
OTHER FEATURES: HIGH RECRYSTALLIZATION

FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
SAMPLE BASICALLY THE SAME AS ABOVE BUT PERCENTAGE OF WHITE PACKSTONE FRAGMENTS HAS REDUCED TO 7%-10%.

1520 - 1525 AS ABOVE

1525 - 1530 AS ABOVE

1530 - 1535 GRAINSTONE; VERY LIGHT ORANGE TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CRYSTALS
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO GRANULE
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-02%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
PERCENTAGE OF WHITE PACKSTONE FRAGMENTS HAS INCREASED TO 15%-20%. INDURATION IS UNDISCERNABLE, BUT PROBABLY VERY POOR.

1535 - 1540 AS ABOVE

1540 - 1545 GRAINSTONE; VERY LIGHT ORANGE TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CRYSTALS
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO GRANULE
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-02%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
INDURATION CANNOT BE DISCERNED FROM THE SMALL FRAGMENTS BUT IT IS PROBABLY VERY POORLY INDURATED.

1545 - 1550 AS ABOVE

1550 - 1555 GRAINSTONE; VERY LIGHT ORANGE TO WHITE
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CRYSTALS
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO GRANULE
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-02%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
INDURATION CANNOT BE DISCERNED FROM THE SMALL FRAGMENTS. SAMPLE IS BASICALLY MADE UP OF A LOOSE FORAM BED. ROCK IS MOST LIKELY VERY POORLY INDURATED.

1555 - 1560 AS ABOVE

1560 - 1565 GRAINSTONE; VERY LIGHT ORANGE TO DARK YELLOWISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CRYSTALS
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO GRANULE
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-15%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
LIMESTONE INDURATION CANNOT BE DISCERNED FROM THE SMALL FRAGMENTS MOST WHICH ARE JUST INDIVIDUAL FORAMS. INDURATION IS PROBABLY VERY POOR. APPROXIMATELY 3%-5% OF SAMPLE IS A WHITE PACKSTONE. DOLOMITE PRESENT HIGHLY ALTERED, SUBHEDRAL AND HAS A GRAIN SIZE RANGE OF MICROCRYSTALLINE TO VERY FINE WITH A MODAL SIZE OF

MICROCRYSTALLINE. DOLOMITE INDURATION IS GOOD.

1565 - 1570 GRAINSTONE; VERY LIGHT ORANGE TO DARK YELLOWISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CRYSTALS, CALCILUTITE
90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO GRAVEL
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-20%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
LIMESTONE INDURATION CANNOT BE DISCERNED FROM THE SMALL FRAGMENTS. DOLOMITE PRESENT IS HIGHLY ALTERED, SUBHEDRAL AND HAS A GRAIN SIZE RANGE OF MICROCRYSTALLINE TO VERY FINE WITH A MODAL SIZE OF MICROCRYSTALLINE. INDURATION OF THE DOLOMITE IS GOOD. ABOUT 7% OF SAMPLE IS A WHITE PACKSTONE.

1570 - 1575 GRAINSTONE; VERY LIGHT ORANGE TO DARK YELLOWISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CRYSTALS
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO GRANULE
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-25%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
LIMESTONE INDURATION CANNOT BE DISCERNED FROM THE SMALL FRAGMENTS. DOLOMITE PRESENT IS HIGHLY ALTERED, SUBHEDRAL AND HAS A GRAIN SIZE RANGE OF MICROCRYSTALLINE TO VERY FINE WITH A MODAL SIZE OF MICROCRYSTALLINE. INDURATION OF THE DOLOMITE IS GOOD. ABOUT 20% OF THE SAMPLE IS A WHITE PACKSTONE.

1575 - 1580 PACKSTONE; WHITE TO DARK YELLOWISH BROWN
GRAIN TYPE: SKELETAL, CALCILUTITE, CRYSTALS
75% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO GRANULE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: DOLOMITE-30%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
DOLOMITE PRESENT IS HIGHLY ALTERED, SUBHEDRAL AND HAS A GRAIN SIZE RANGE OF MICROCRYSTALLINE TO VERY FINE WITH A MOADL SIZE OF MICROCRYSTALLINE. DOLOMITE INDURATION IS GOOD.

1580 - 1585 PACKSTONE; WHITE TO DARK YELLOWISH BROWN
GRAIN TYPE: SKELETAL, CALCILUTITE, CRYSTALS
60% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRAVEL
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: DOLOMITE-25%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA
DOLOMITE PRESENT IS HIGHLY ALTERED, SUBHEDRAL AND HAS A GRAIN SIZE RANGE OF MICROCRYSTALLINE TO VERY FINE WITH A MODAL SIZE OF MICROCRYSTALLINE. INDURATION OF THE DOLOMITE IS GOOD. LIMESTONE RANGES FROM A WACKESTONE TO A PACKSTONE.

1585 - 1590 GRAINSTONE; VERY LIGHT ORANGE TO DARK YELLOWISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CRYSTALS
90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO GRAVEL
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX

ACCESSORY MINERALS: DOLOMITE-30%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
DOLOMITE PRESENT IS HIGHLY ALTERED, SUBHEDRAL-EUHEDRAL AND HAS A GRAIN SIZE RANGE OF MICROCRYSTALLINE TO VERY FINE WITH A MODAL SIZE OF MICROCRYSTALLINE. INDURATION OF THE DOLOMITE IS GOOD. INDURATION IS NOT DISCERNABLE, BECAUSE OF HOW SMALL THE SAMPLE FRAGMENTS ARE. MOST OF SAMPLE ARE INDIVIDUAL LOOSE GRAINS. INDURATION OF LIMESTONE IS PROBABLY VERY POOR.

1590 - 1595 DOLOSTONE; GRAYISH ORANGE TO DARK YELLOWISH BROWN
POROSITY: INTERCRYSTALLINE, MOLDIC, INTERGRANULAR
50-90% ALTERED; SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: LIMESTONE-20%
FOSSILS: BENTHIC FORAMINIFERA
LIMESTONE PRESENT IS COMPOSED 93% OF ALLOCHEMS LARGER THAN SILT SIZED. GRAIN SIZE RANGE IS VERY FINE TO GRAVEL WITH A MODAL SIZE OF FINE. LIMESTONE GRAIN TYPES PRESENT ARE SKELETAL AND CRYSTALLINE. INDURATION OF LIMESTONE IS PROBABLY VERY POOR.

1595 - 1600 DOLOSTONE; GRAYISH ORANGE TO DARK YELLOWISH BROWN
POROSITY: INTERCRYSTALLINE, MOLDIC, INTERGRANULAR
50-90% ALTERED; SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: LIMESTONE-10%
FOSSILS: BENTHIC FORAMINIFERA
LIMESTONE PRESENT IS THE SAME LOOSE GRAINSTONE SEEN ABOVE.

1600 - 1605 PACKSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR, INTERCRYSTALLINE, MOLDIC
GRAIN TYPE: SKELETAL, CALCILUTITE, CRYSTALS
75% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO GRANULE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
OTHER FEATURES: DOLOMITIC
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
INDURATION RANGES FROM POOR TO MODERATE. TRACE AMOUNTS OF ORGANIC LAMINATIONS PRESENT.

1605 - 1610 PACKSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR, INTERCRYSTALLINE, MOLDIC
GRAIN TYPE: SKELETAL, CALCILUTITE, CRYSTALS
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY COARSE; RANGE: FINE TO GRANULE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: DOLOMITE-01%
OTHER FEATURES: DOLOMITIC
FOSSILS: BENTHIC FORAMINIFERA
INDURATION RANGES FROM POOR TO MODERATE. TRACE AMOUNTS OF ORGANIC LAMINATIONS PRESENT.

1610 - 1615 AS ABOVE

1615 - 1620 AS ABOVE

1620 - 1625 PACKSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR, INTERCRYSTALLINE, MOLDIC
GRAIN TYPE: SKELETAL, CALCILUTITE, CRYSTALS

85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY COARSE; RANGE: FINE TO GRANULE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: DOLOMITE-02%
OTHER FEATURES: DOLOMITIC
FOSSILS: BENTHIC FORAMINIFERA
INDURATION RANGES FROM POOR TO MODERATE. TRACE AMOUNTS OF ORGANIC LAMINATIONS PRESENT IN SAMPLE. ABOUT 3% OF SAMPLE IS A LIGHT-MEDIUM GREY MUDSTONE.

1625 - 1630 AS ABOVE

1630 - 1635 GRAINSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CRYSTALS
90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO GRAVEL
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: DOLOMITE-02%
FOSSILS: BENTHIC FORAMINIFERA
ABOUT 3% OF SAMPLE IS WHITE PACKSTONE FRAGMENTS WHICH HAVE AN ALLOCHEM PERCENTAGE GREATER THAN SILT SIZE OF ABOUT 80%. MOST OF SAMPLE CONSISTS OF LOOSE ALLOCHEMS.

1635 - 1640 AS ABOVE

1640 - 1645 AS ABOVE

1645 - 1650 AS ABOVE

1650 - 1655 DOLOSTONE; 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
ACCESSORY MINERALS: LIMESTONE-15%
OTHER FEATURES: SUCROSIC
FOSSILS: BENTHIC FORAMINIFERA
CRYSTALLINITY RANGES FROM SUBHEDRAL TO EUHEDRAL. LIMESTONE PRESENT HAS AN ALLOCHEM PERCENTAGE THAT IS GREATER THAN SILT SIZE OF 90% AND GRAIN SIZE RANGE OF VERY FINE TO GRAVEL WITH A MODAL SIZE OF FINE. LIMESTONE GRAIN TYPES PRESENT ARE SKELETAL AND CRYSTALLINE.

1655 - 1660 GRAINSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CRYSTALS
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO VERY COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: DOLOMITE-15%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA
DOLOMITE PRESENT IS HIGHLY ALTERED, EUHEDRAL AND HAS A GRAIN SIZE RANGE OF MICROCRYSTALLINE TO VERY FINE WITH A MODAL SIZE OF VERY FINE. DOLOMITE IS MODERATELY INDURATED. INDURATION OF LIMESTONE IS VERY POOR.

1660 - 1665 GRAINSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CRYSTALS
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO GRANULE

POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: DOLOMITE-07%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA
TRACE AMOUNTS OF GYPSUM PRESENT IN SAMPLE. INDURATION IS VERY POOR.

1665 - 1670 PACKSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CRYSTALS
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO GRANULE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: DOLOMITE-10%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA
TRACE AMOUNTS OF ORGANIC LAMINATIONS PRESENT IN SAMPLE.

1670 - 1675 DOLOSTONE; GRAYISH BROWN TO DARK YELLOWISH BROWN
POROSITY: INTERCRYSTALLINE, PIN POINT VUGS, INTERGRANULAR
50-90% ALTERED; SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: LIMESTONE-15%
OTHER FEATURES: SUCROSIC
FOSSILS: BENTHIC FORAMINIFERA
LIMESTONE PRESENT HAS AN ALLOCHAME PRECENTAGE THAT IS GREATER THAN SILT SIZED OF 80% AND A GRAIN SIZE RANGE OF VERY FINE TO GRANULE WITH MODAL SIZE OF MEDIUM. LIMESTONE GRAIN TYPES PRESENT ARE SKELETAL AND CRYSTALLINE. TRACE AMOUNTS OF ORGANICS ARE PRESENT IN SAMPLE.

1675 - 1680 DOLOSTONE; MODERATE YELLOWISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE, MOLDIC, INTERGRANULAR
50-90% ALTERED; SUBHEDRAL
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: LIMESTONE-25%
FOSSILS: BENTHIC FORAMINIFERA
INDURATION VARIES FROM POOR TO MODERATE. LIMESTONE PRESENT HAS AN ALLOCHEM PERCENTAGE THAT IS GREATER THAN SILT SIZED OF 75% AND A GRAIN SIZE RANGE OF FINE TO GRAVEL WITH A MODAL SIZE OF VERY COARSE. LIMESTONE GRAIN TYPES PRESENT ARE SKELETAL, MICRITE AND CRYSTALLINE.

1680 - 1685 DOLOSTONE; VERY LIGHT ORANGE TO MODERATE YELLOWISH BROWN
POROSITY: INTERCRYSTALLINE, INTERGRANULAR, MOLDIC
50-90% ALTERED; SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: LIMESTONE-40%
FOSSILS: BENTHIC FORAMINIFERA
LIMSTONE PRESENT HAS AN ALLOCHEM PERCENTAGE THAT IS GREATER THAN SILT SIZED OF 75% AND A GRAIN SIZE RANGE OF FINE TO GRAVEL WITH A MODAL SIZE OF VERY COARSE. LIMESTONE GRAIN TYPES PRESENT ARE SKELETAL, MICRITE AND CRSYTALLINE. LIMESTONE IS HIGHLY RECRYSTALLIZED.

1685 - 1690 DOLOSTONE; MODERATE YELLOWISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE, MOLDIC, INTERGRANULAR
50-90% ALTERED; SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE

RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: LIMESTONE-25%
FOSSILS: BENTHIC FORAMINIFERA
LIMESTONE PRESENT HAS AN ALLOCHEM PERCENTAGE THAT IS GREATER THAN SILT SIZED OF 75% AND A GRAN SIZE RANGE OF FINE TO GRAVEL WITH A MODAL SIZE OF VERY COARSE. LIMESTONE GRAIN TYPES PRESENT ARE SKELETAL, MICRITE AND CRYSTALLINE. LIMESTONE IS HIGHLY RECRYSTALLIZED.

1690 - 1695 DOLOSTONE; MODERATE YELLOWISH BROWN TO MODERATE DARK GRAY
POROSITY: INTERCRYSTALLINE, PIN POINT VUGS; 50-90% ALTERED SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; MODERATE INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: LIMESTONE-03%
FOSSILS: BENTHIC FORAMINIFERA
INDURATION IS HIGHER IN THE GREY DOLOSTONES VERSUS THE BROWN DOLOSTONES.

1695 - 1700 DOLOSTONE; MODERATE YELLOWISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE, MOLDIC; 50-90% ALTERED SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: LIMESTONE-03%
FOSSILS: BENTHIC FORAMINIFERA
PERMEABILITY POSSIBLY LOW.

1700 - 1705 DOLOSTONE; GRAYISH BROWN TO MODERATE GRAY
POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 50-90% ALTERED SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: LIMESTONE-30%
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
LIMESTONE PRESENT HAS AN ALLOCHEM PERCENTAGE THAT IS GREATER THAN SILT SIZED OF 75% AND A GRAIN SIZE RANGE OF FINE TO GRAVEL WITH A MODAL SIZE OF MEDIUM. LIMESTONE GRAIN TYPES PRESENT ARE SKELETAL, MICRITE AND CRYSTALLINE. COLOR OF LIMESTONE IS VERY PALE ORANGE (10YR 8/2).

1705 - 1710 DOLOSTONE; GRAYISH ORANGE TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 50-90% ALTERED EUHEDRAL
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: LIMESTONE-15%
FOSSILS: BENTHIC FORAMINIFERA
MOST OF SAMPLE IS VERY SMALL PIECES OF DOLOSTONE OR INDIVIDUAL DOLOMITE GRAINS. ONE OF THE LARGER PIECES SHOWS GOOD INDURATION AND ANOTHER SHOWS POOR INDURATION.

1710 - 1715 WACKESTONE; WHITE TO DARK YELLOWISH BROWN
POROSITY: INTERGRANULAR, INTERCRYSTALLINE
GRAIN TYPE: CALCILUTITE, SKELETAL, CRYSTALS
40% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRANULE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-40%
FOSSILS: BENTHIC FORAMINIFERA
DOLOMITE PRESENT IS HIGHLY ALTERED, SUBHEDRAL AND HAS A GRAIN SIZE RANGE OF MICROCRYSTALLINE TO FINE WITH A MODAL

SIZE OF VERY FINE. INDURATION FOR DOLOMITE IS MODERATE.

1715 - 1720 WACKESTONE; WHITE TO DARK YELLOWISH BROWN
POROSITY: INTERGRANULAR, INTERCRYSTALLINE
GRAIN TYPE: CALCILUTITE, CRYSTALS, SKELETAL
30% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRANULE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-25%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA
DOLOMITE PRESENT IS HIGHLY ALTERED, SUBHEDRAL AND HAS A GRAN SIZE RANGE OF MICROCRYSTALLINE TO FINE WITH A MODAL GRAIN SIZE OF VERY FINE. INDURATION OF DOLOMITE IS GOOD.

1720 - 1725 PACKSTONE; WHITE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE, CRYSTALS
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY COARSE; RANGE: FINE TO GRAVEL
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-07%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, FOSSIL MOLDS

1725 - 1730 DOLOSTONE; MODERATE YELLOWISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE; 50-90% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
ACCESSORY MINERALS: LIMESTONE-20%
FOSSILS: BENTHIC FORAMINIFERA
LIMESTONE PRESENT IS A POORLY INDURATED GRAINSTONE WITH DOLOMITE CRYSTALS INCORPORATED IN THEM.

1730 - 1735 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
ACCESSORY MINERALS: LIMESTONE-25%
FOSSILS: BENTHIC FORAMINIFERA
LIMESTONE PRESENT HAS AN ALLOCHEM PERCENTAGE THAT IS GREATER THAN SILT SIZED OF 85% AND A GRAIN SIZE RANGE OF FINE TO GRANULE WITH A MODAL SIZE OF COARSE. LIMESTONE GRAIN TYPES PRESENT ARE SKELETAL AND MICRITE.

1735 - 1740 PACKSTONE; WHITE TO MODERATE YELLOWISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE, CRYSTALS
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO VERY COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-05%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA
INDURATION RANGES FROM POOR TO MODERATE.

1740 - 1745 AS ABOVE

1745 - 1750 AS ABOVE

1750 - 1755 GRAINSTONE; WHITE TO MODERATE YELLOWISH BROWN
POROSITY: INTERGRANULAR

GRAIN TYPE: SKELETAL, CALCILUTITE
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: COARSE TO GRAVEL; POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: DOLOMITE-07%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA

1755 - 1760 PACKSTONE; WHITE TO MODERATE YELLOWISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE
90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: COARSE TO GRAVEL; POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: DOLOMITE-07%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA

1760 - 1765 GRAINSTONE; VERY LIGHT ORANGE TO GRAYISH ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE
95% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: FINE TO VERY COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-02%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
SAMPLE IS PREDOMINANTLY COMPOSED OF LOOSE FINE TO MEDIUM GRAIN SIZE ALLOCHEMS.

1765 - 1770 PACKSTONE; VERY LIGHT ORANGE TO GRAYISH ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO VERY COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: DOLOMITE-02%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID

1770 - 1775 AS ABOVE

1775 - 1780 AS ABOVE

1780 - 1785 PACKSTONE; VERY LIGHT ORANGE TO GRAYISH ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE, CRYSTALS
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO VERY COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-05%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID

1785 - 1790 AS ABOVE

1790 - 1795 PACKSTONE; VERY LIGHT ORANGE TO GRAYISH ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE, CRYSTALS
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: FINE TO GRANULE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-05%

OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA

1795 - 1800 AS ABOVE

1800 - 1805 GRAINSTONE; VERY LIGHT ORANGE TO GRAYISH ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE, CRYSTALS
90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: VERY FINE TO GRANULE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-05%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA

1805 - 1810 GRAINSTONE; VERY LIGHT ORANGE TO GRAYISH ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE, CRYSTALS
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: FINE; RANGE: FINE TO GRANULE; POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-05%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA
MAJORITY OF SAMPLE CONSISTS OF LOOSE FINE TO MEDIUM GRAIN SIZE ALLOCHEMS AND ROCK FRAGMENTS. INDURATION IS VERY POOR.

1810 - 1815 AS ABOVE

1815 - 1820 GRAINSTONE; VERY LIGHT ORANGE TO GRAYISH ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE, CRYSTALS
90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: FINE TO GRANULE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: DOLOMITE-03%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA
MAJORITY OF SAMPLE CONSISTS OF LOOSE MEDIUM TO COARSE GRAIN SIZE ALLOCHEMS AND ROCK FRAGMENTS.

1820 - 1825 AS ABOVE

1825 - 1830 PACKSTONE; VERY LIGHT ORANGE TO GRAYISH ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE, CRYSTALS
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRANULE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: DOLOMITE-20%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA
DOLOMITE PRESENT IS HIGHLY ALTERED, SUBHEDRAL AND HAS A GRAIN SIZE RANGE OF MICROCRYSTALLINE TO MEDIUM WITH A MODAL SIZE OF VERY FINE.

1830 - 1835 PACKSTONE; VERY LIGHT ORANGE TO GRAYISH ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE, CRYSTALS
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRANULE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT

ACCESSORY MINERALS: DOLOMITE-40%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA
DOLOMITE PRESENT IS COMPLETELY ALTERED, SUBHEDRAL AND HAS A GRAIN SIZE RANGE OF MICROCRYSTALLINE TO MEDIUM WITH A MODAL SIZE OF VERY FINE.

1835 - 1840 DOLOSTONE; DARK YELLOWISH ORANGE TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 90-100% ALTERED SUBHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: LIMESTONE-15%
FOSSILS: BENTHIC FORAMINIFERA
INDURATION OF DOLOMITE IS PROBABLY VERY POOR BUT IS NOT DISCERNABLE BECAUSE DOLOMITES PRESENT ARE LOOSE CRYSTALS OF GIVEN GRAIN SIZE. LIMESTONE PRESENT HAS AN ALLOCHEM PERCENTAGE GREATER THAN SILT SIZED OF 85% AND A GRAIN SIZE RANGE OF FINE TO GRANULE WITH A MODAL SIZE OF MEDIUM.
LIMESTONE GRAIN TYPES PRESENT ARE SKELETAL, MICRITE AND CRYSTALLINE.

1840 - 1845 DOLOSTONE; DARK YELLOWISH ORANGE TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 90-100% ALTERED SUBHEDRAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM
POOR INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: LIMESTONE-40%
FOSSILS: BENTHIC FORAMINIFERA
INDURATION IS PROBABLY VERY POOR, BECAUSE DOLOMITES PRESENT ARE LOOSE CRYSTALS OF GIVEN GRAIN SIZE. LIMESTONE PRESENT HAS AN ALLOCHEM PERCENTAGE GREATER THAN SILT SIZED OF 85% AND A GRAIN SIZE RANGE OF FINE TO GRANULE WITH A MODAL SIZE OF MEDIUM. LIMESTONE GRAIN TYPES PRESENT ARE SKELETAL MICRITE AND CRYSTALLINE.

1845 - 1850 PACKSTONE; VERY LIGHT ORANGE TO DARK YELLOWISH ORANGE
POROSITY: INTERGRANULAR, INTERCRYSTALLINE
GRAIN TYPE: SKELETAL, CALCILUTITE, CRYSTALS
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: FINE TO VERY COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: DOLOMITE-40%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
DOLOMITE PRESENT IS COMPLETELY ALTERED, SUBHEDRAL AND HAS A GRAIN SIZE RANGE OF VERY FINE TO MEDIUM WITH A MODAL SIZE OF VERY FINE.

1850 - 1855 PACKSTONE; VERY LIGHT ORANGE TO DARK YELLOWISH ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE, CRYSTALS
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: FINE TO GRANULE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: DOLOMITE-15%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
DOLOMITE PRESENT IS COMPLETELY ALTERED, SUBHEDRAL AND HAS A GRAIN SIZE RANGE OF MICROCRYSTALLINE TO FINE WITH A MODAL SIZE OF VERY FINE.

1855 - 1860 PACKSTONE; VERY LIGHT ORANGE TO DARK YELLOWISH ORANGE
POROSITY: INTERGRANULAR

GRAIN TYPE: SKELETAL, CALCILUTITE, CRYSTALS
80% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: COARSE; RANGE: FINE TO GRANULE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: DOLOMITE-20%
FOSSILS: BENTHIC FORAMINIFERA
DOLOMITE PRESENT IS COMPLETELY ALTERED, SUBHEDRAL AND HAS A GRAIN SIZE RANGE OF MICROCRYSTALLINE TO FINE WITH A MODAL SIZE OF VERY FINE.

1860 - 1865 DOLOSTONE; VERY LIGHT ORANGE TO DARK YELLOWISH BROWN
POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 90-100% ALTERED EUHEDRAL
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: LIMESTONE-25%
FOSSILS: BENTHIC FORAMINIFERA
TWO DOLOSTONES PRESENT ONE THAT IS MORE HIGHLY INDURATED AND COLORED PALE YELLOWISH BROWN WITH A GRAIN SIZE ALMOST COMPLETELY MICROCRYSTALLINE. THE OTHER DOLOSTONE IS IDENTICAL TO THE DOLOSTONES SEEN ABOVE AND IT IS DESCRIBED IN THE MAIN DESCRIPTION FOR THIS INTERVAL. THERE IS ABOUT A 50/50 SPLIT BETWEEN THE TWO DOLOSTONES. LIMESTONE PRESENT HAS AN ALLOCHEM PERCENTAGE OF 90% AND HAS A GRAIN SIZE RANGE OF FINE TO GRAVEL WITH A MODAL SIZE OF COARSE.
LIMESTONE GRAIN TYPES PRESENT ARE SKELETAL, MICRITE AND CRYSTALLINE.

1865 - 1870 DOLOSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 50-90% ALTERED SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: LIMESTONE-15%
FOSSILS: BENTHIC FORAMINIFERA
LIMESTONE PRESENT HAS AN ALLOCHEM PERCENTAGE GREATER THAN SILT SIZED OF 80% AND A GRAIN SIZE RANGE OF FINE TO GRANULE WITH A MODAL SIZE OF FINE. LIMESTONE GRAIN TYPES PRESENT ARE SKELETAL, MICRITE AND CRYSTALLINE.

1870 - 1875 PACKSTONE; VERY LIGHT ORANGE TO MODERATE YELLOWISH BROWN
POROSITY: INTERGRANULAR, INTERCRYSTALLINE
GRAIN TYPE: SKELETAL, CALCILUTITE
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY COARSE; RANGE: FINE TO GRAVEL
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-30%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
DOLOMITE PRESENT IS COMPLETELY ALTERED, SUBHEDRAL AND HAS A GRAIN SIZE RANGE OF MICROCRYSTALLINE TO FINE WITH A MODAL SIZE OFVERY FINE. INDURATION OF DOLOSTONE IS VARIABLE BEING MOSTLY GOOD TO MODERATE IN SOME OF THE FRAGMENTS WITH MORE EUHEDRAL CRYSTALLINITY.

1875 - 1880 PACKSTONE; VERY LIGHT ORANGE TO MODERATE YELLOWISH BROWN
POROSITY: INTERGRANULAR, INTERCRYSTALLINE
GRAIN TYPE: SKELETAL, CALCILUTITE
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: VERY COARSE; RANGE: FINE TO GRAVEL
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-40%

OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
DOLOMITE PRESENT IS COMPLETELY ALTERED, SUBHEDRAL AND HAS A GRAIN SIZE RANGE OF MICROCRYSTALLINE TO FINE WITH A MODAL SIZE OF VERY FINE. INDURATION OF DOLOSTONE IS VARIABLE BEING HIGH IN MOST OF THE DOLOSTONES AND MODERATE IN THE MORE EUHEDRAL DOLOSTONES. DOLOSTONES ARE VARIABLY SUCROSIC. A FEW SMALL VUGS PRESENT IN LARGE DOLOSTONE FRAGMENTS.

1880 - 1885 DOLOSTONE; DARK YELLOWISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 90-100% ALTERED SUBHEDRAL
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: LIMESTONE-20%
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
FEW SMALL VUGS IN DOLOSTONE BUT THE ROCK IS PRIMARILY MASSIVE WITH LOW PERMEABILITY UNLESS THERE IS FRACTURING PRESENT THAT CANNOT BE SEEN IN CUTTINGS. LIMESTONE PRESENT HAS AN ALLOCHEM PERCENTAGE THAT IS GREATER THAN SILT SIZED OF 85% AND A GRAIN SIZE RANGE OF FINE TO GRAVEL WITH A MODAL SIZE OF VERY COARSE. LIMESTONE GRAIN TYPES PRESENT ARE SKELETAL AND MICRITE.

1885 - 1890 DOLOSTONE; DARK YELLOWISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 50-90% ALTERED SUBHEDRAL
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: LIMESTONE-30%
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID, FOSSIL MOLDS
INDURATION RANGES FROM MODERATE TO GOOD. DOLOSTONES ARE VARIABLY SUCROSIC WITH FEW SMALL VUGS. LIMESTONE PRESENT HAS AN ALLOCHEM PERCENTAGE THAT IS GREATER THAN SILT SIZED OF 90% AND A GRAIN SIZE RANGE OF FINE TO GRAVEL WITH A MODAL SIZE OF COARSE. LIMESTONE GRAIN TYPES PRESENT ARE SKELETAL AND MICRITE.

1890 - 1895 DOLOSTONE; GRAYISH BROWN TO DARK YELLOWISH BROWN
POROSITY: INTERCRYSTALLINE, LOW PERMEABILITY
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
SAMPLE IS VARIABLY SUCROSIC. ROCK FRAGMENTS ARE UNUSUALLY LARGE FOR CUTTINGS, LARGE ENOUGH TO MAKE A MASSIVE SEDIMENTARY STRUCTURE SEEM POSSIBLE.

1895 - 1900 DOLOSTONE; GRAYISH BROWN
POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
LOW PERMEABILITY; 50-90% ALTERED; SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

1900 - 1905 AS ABOVE

1905 - 1910 AS ABOVE

1910 - 1915 DOLOSTONE; GRAYISH BROWN TO DARK YELLOWISH BROWN
POROSITY: INTERCRYSTALLINE, PIN POINT VUGS
90-100% ALTERED; SUBHEDRAL
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

MOST OF THE SAMPLE LOOKS MASSIVE WITH LOW PERMEABILITY. ABOUT 3% OF SAMPLE IS POORLY INDURATED AND IS MORE OF A YELLOWISH ORANGE COLOR AND ALSO CONTAINS DARK LAMINATIONS.

1915 - 1920 DOLOSTONE; DARK YELLOWISH BROWN TO GRAYISH 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
TWO DOLOSTONES ARE PRESENT. THE ONE DESCRIBED IN THE MAIN FOR THE INTERVAL MAKES UP ~70% OF THE SAMPLE THE SECOND DOLOSTONE IS YELLOWISH ORANGE, EUHEDRAL, HIGHLY PERMEABLE AND POORLY TO MODERATELY INDURATED.

1920 - 1925 DOLOSTONE; MODERATE YELLOWISH BROWN TO DARK YELLOWISH BROWN
POROSITY: INTERCRYSTALLINE, MOLDIC; 50-90% ALTERED SUBHEDRAL
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

1925 - 1930 DOLOSTONE; MODERATE YELLOWISH BROWN TO DARK YELLOWISH BROWN
POROSITY: INTERCRYSTALLINE, MOLDIC
POSSIBLY HIGH PERMEABILITY; 50-90% ALTERED; SUBHEDRAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
OTHER FEATURES: SUCROSIC
TRACE AMOUNTS OF ORGANICS PRESENT IN THE SAMPLE. TWO DOLOSTONES ARE PRESENT, THE ONE DESCRIBED IN THE MAIN DESCRIPTION MEAKES UP ~70% OF SAMPLE. THE OTHER DOLOSTONE MAY BE MASSIVE AND RESEMBLES THE DOLOSTONE DESCRIBED FOR THE INTERVAL 1920'-1925'.

1930 - 1935 DOLOSTONE; DARK YELLOWISH ORANGE
POROSITY: INTERCRYSTALLINE, MOLDIC
POSSIBLY HIGH PERMEABILITY; 50-90% ALTERED; EUHEDRAL
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
CEMENT TYPE(S): DOLOMITE CEMENT
OTHER FEATURES: SUCROSIC
INDURATION RANGES FROM MODERATE TO GOOD. APPROXIMATELY 20% OF SAMPLE IS A DARK YELLOWISH BROWN DOLOMITE DESCRIBED FOR THE INTERVAL 1920'-1925'.

1935 - 1940 DOLOSTONE; GRAYISH BROWN TO GRAYISH ORANGE
POROSITY: INTERCRYSTALLINE, MOLDIC; 50-90% ALTERED SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
OTHER FEATURES: SUCROSIC
DESPITE THE SMALL MOLD/VUG PORES PRESENT PERMEABILITY APPEARS TO BE LOW. WATER POURED/DRIPPED ON SAMPLE DOESN'T INFILTRATE.

1940 - 1945 AS ABOVE

1945 - 1950 AS ABOVE

1950 - 1955 AS ABOVE

1955 - 1960 WACKESTONE; WHITE TO DARK YELLOWISH BROWN
POROSITY: INTERGRANULAR, MOLDIC
GRAIN TYPE: CALCILUTITE, SKELETAL
15% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE

ACCESSORY MINERALS: DOLOMITE-40%
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
DOLOMITE PRESENT RANGES FROM A COMPLETELY ALTERED SUBHEDRAL DARK YELLOWISH BRONW DOLOMITE TO A VERY PALE ORANGE DOLOMITE OF MEDIUM ALTERATION, SUBHEDRAL CRYSTALLINITY. BOTH HAVE A GRAIN SIZE RANGE OF MICROCRYSTALLINE TO FINE. FORAMS PRESENT ARE DICTYOCONUS AND ROTALIDS POSSIBLY MISCELLANEA NASSAUENSIS.

1960 - 1965 WACKESTONE; WHITE TO DARK YELLOWISH BROWN
POROSITY: INTERGRANULAR, MOLDIC
GRAIN TYPE: CALCILUTITE, SKELETAL, CRYSTALS
20% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE
ACCESSORY MINERALS: DOLOMITE-15%
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
THE DOLOSTONE PRESENT IS HIGHLY ALTERED, SUBHEDRAL AND HAS A GRAIN SIZE RANGE OF MICROCRYSTALLINE TO VERY FINE WITH A MODAL SIZE OF VERY FINE. DOLOSTONE IS WELL INDURATED.

1965 - 1970 DOLOSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR, INTERCRYSTALLINE; 50-90% ALTERED SUBHEDRAL
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
POOR INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: LIMESTONE-05%
FOSSILS: BENTHIC FORAMINIFERA
INDURATION IN MOST OF THE SMAPLE IS VERY POOR ALMOST UNCONSOLIDATED LOOSE GRAINS OF DOLOMITE. APPROXIMATELY 10% OF SAMPLE IS A WELL INDURATED DOLOSTONE RANGING IN COLOR FROM PALE YELLOWISH BROWN TO DARK YELLOWISH BROWN.

1970 - 1975 WACKESTONE; DARK YELLOWISH BROWN TO LIGHT GREENISH GRAY
X% POROSITY: INTERGRANULAR, MOLDIC
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: LIMESTONE-05%
FOSSILS: BENTHIC FORAMINIFERA
INDURATION VARIES FROM MEDIUM TO GOOD.

1975 - 1980 AS ABOVE

1980 - 1985 DOLOSTONE; GRAYISH ORANGE TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE, INTERGRANULAR, MOLDIC
10-50% ALTERED; SUBHEDRAL
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: LIMESTONE-03%
FOSSILS: BENTHIC FORAMINIFERA
INDURATION RANGES FROM MODERATE TO GOOD.

1985 - 1990 DOLOSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 50-90% ALTERED SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: LIMESTONE-02%
FOSSILS: BENTHIC FORAMINIFERA
INDURATION VARIES FROM POOR TO GOOD. ABOUT 15% OF THE DOLOMITE LOOKS LIKE A COLOR MIXTURE BETWEEN PALE YELLOWISH BROWN TO DARK YELLOWISH BROWN.

1990 - 1995 DOLOSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 50-90% ALTERED SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE

RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: LIMESTONE-02%
FOSSILS: BENTHIC FORAMINIFERA

1995 - 2000 AS ABOVE

2000 - 2005 DOLOSTONE; GRAYISH BROWN TO GRAYISH ORANGE
POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 50-90% ALTERED
SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ACCESSORY MINERALS: LIMESTONE-01%
FOSSILS: BENTHIC FORAMINIFERA

2005 - 2010 DOLOSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 50-90% ALTERED
SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
FOSSILS: BENTHIC FORAMINIFERA

2010 - 2015 DOLOSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE, INTERGRANULAR; 50-90% ALTERED
SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
ALSO PRESENT IS A VARIABLE FINE MOLDIC/VUGGY POROSITY.
SAMPLE APPEARS TO HAVE LOW PERMEABILITY FROM WATER BEING
POURED/DRIPPED ON IT.

2015 - 2020 DOLOSTONE; GRAYISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE, LOW PERMEABILITY
50-90% ALTERED; SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

2020 - 2025 DOLOSTONE; VERY LIGHT ORANGE TO DARK YELLOWISH BROWN
POROSITY: INTERCRYSTALLINE; SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO VERY FINE
CEMENT TYPE(S): DOLOMITE CEMENT
SAMPLE COLOR IS VARIABLE. COLORS ALSO PRESENT ARE GRAYISH
ORANGE, MODERATE YELLOWISH BROWN AND PALE YELLOWISH BROWN.
INDURATION VARIES FROM POOR TO GOOD. MAJORITY OF THE
SAMPLE HAS GOOD INDURATION BUT THE FRAGMENTS WITH GRAYISH
TO YELLOWISH ORANGE HAVE AN ABUNDANCE OF MOLDIC PORES AND
HAS POOR INDURATION. THE ALTERATION VARIES FROM MEDIUM TO
HIGH BEING HIGHER IN THE DARKER DOLOMITES.

2025 - 2030 AS ABOVE

2030 - 2035 AS ABOVE

2035 - 2040 DOLOSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERCRYSTALLINE; 10-50% ALTERED; SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO VERY FINE
CEMENT TYPE(S): DOLOMITE CEMENT
INDURATION RANGES FROM MODERATE TO POOR. DOLOSTONE HAS AN
INTRACLASTIC GRAINTYPE IN SOME OF THE FRAGMENTS OF WHICH
HAVE POOR INDURATION.

2040 - 2045 AS ABOVE

2045 - 2050 AS ABOVE

2050 - 2055 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
THERE ARE FEW SMALL VUG PORES BUT OTHER THAN THAT THE SAMPLE APPEARS MASSIVE AND IMPERMEABLE.

2055 - 2060 AS ABOVE

2060 - 2065 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
THERE ARE FEW SMALL VUG PORES BUT OTHER THAN THAT THE SAMPLE APPEARS MASSIVE AND IMPERMEABLE. THERE ARE TWO DARKER (DARK YELLOWISH BROWN) DOLOSTONE FRAGMENTS PRESENT WHICH ARE ANHEDRAL TO SUBHEDRAL AND HIGHLY TO COMPLETELY ALTERED AND VERY WELL INDURATED. THESE TWO FRAGMENTS MAKE UP 3-5 PERCENT OF THE SAMPLE.

2065 - 2070 DOLOSTONE; GRAYISH ORANGE TO DARK YELLOWISH BROWN
POROSITY: INTERCRYSTALLINE, MOLDIC; 50-90% ALTERED
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
CEMENT TYPE(S): DOLOMITE CEMENT
INDURATION RANGES FROM POOR IN THE MORE POROUS EUHEDRAL DOLOSTONES TO VERY GOOD IN THE MORE FINE GRAIN SUBHEDRAL SOLOSTONES. CRYSTALLINITY RANGES FROM SUBHEDRAL TO EUHEDRAL.

2070 - 2075 DOLOSTONE; DARK YELLOWISH BROWN TO GRAYISH BROWN
POROSITY: INTERCRYSTALLINE, MOLDIC; 50-90% ALTERED
SUBHEDRAL
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
APPROXIMATELY 2% OF SAMPLE HAS BETTER CRYSTALLINITY AND POOR INDURATION.

2075 - 2080 DOLOSTONE; DARK YELLOWISH BROWN TO GRAYISH BROWN
POROSITY: INTERCRYSTALLINE, MOLDIC; 50-90% ALTERED
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
CRYSTALLINITY RANGES FROM SUBHEDRAL TO EUHEDRAL. COLOR ASLO HAS A HINT OF ORANGE MIXED IN.

2080 - 2085 DOLOSTONE; DARK YELLOWISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE, MOLDIC; 50-90% ALTERED
SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT

2085 - 2090 DOLOSTONE; DARK YELLOWISH BROWN TO GRAYISH ORANGE
POROSITY: INTERCRYSTALLINE, MOLDIC; 50-90% ALTERED
SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
APPROXIMATELY 5% OF SAMPLE HAS BETTER CRYSTALLINITY AND LOWER INDURATION AND IS MORE POROUS.

2090 - 2095 AS ABOVE

2095 - 2100 DOLOSTONE; DARK YELLOWISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE, MOLDIC, LOW PERMEABILITY
50-90% ALTERED; SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
THREE PERCENT OF SAMPLE HAS MUCH HIGHER POROSITY THAN THE REST AND IS USUALLY COLORED MODERATE YELLOWISH BROWN (10YR 5/4).

2100 - 2105 DOLOSTONE; DARK YELLOWISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE, MOLDIC, LOW PERMEABILITY
50-90% ALTERED; SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
THREE PERCENT OF SAMPLE HAS MUCH HIGHER POROSITY THAN THE REST OF THE SAMPLE AND IS USUALLY COLORED VERY PALE ORANGE.

2105 - 2110 AS ABOVE

2110 - 2115 AS ABOVE

2115 - 2120 DOLOSTONE; DARK YELLOWISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE, INTERGRANULAR, MOLDIC
50-90% ALTERED; SUBHEDRAL
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: LIMESTONE-02%
FOSSILS: BENTHIC FORAMINIFERA
POSSIBLE CAVINGS DUE TO LIMESTONE AND INTRACLASTIC POORLY INDURATED DOLOSTONES PRESENT.

2120 - 2125 DOLOSTONE; DARK YELLOWISH BROWN TO GRAYISH ORANGE
POROSITY: INTERCRYSTALLINE, MOLDIC; 50-90% ALTERED
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
CRYSTALLINITY VARIES FROM SUBHEDRAL TO EUHEDRAL.
INDURATION IS LOWER IN THE MORE EUHEDRAL FRAGMENTS.

2125 - 2130 AS ABOVE

2130 - 2135 DOLOSTONE; DARK YELLOWISH BROWN TO VERY LIGHT ORANGE
POROSITY: INTERCRYSTALLINE, INTERGRANULAR, MOLDIC
50-90% ALTERED; SUBHEDRAL
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: LIMESTONE-02%
FOSSILS: BENTHIC FORAMINIFERA

2135 - 2140 GRAINSTONE; VERY LIGHT ORANGE TO DARK YELLOWISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE
90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRANULE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: DOLOMITE-07%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA

2140 - 2145 AS ABOVE

2145 - 2150 AS ABOVE

2150 - 2155 GRAINSTONE; VERY LIGHT ORANGE TO DARK YELLOWISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO VERY COARSE
MODERATE INDURATION
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-07%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA

2155 - 2160 AS ABOVE

2160 - 2165 GRAINSTONE; VERY LIGHT ORANGE TO DARK YELLOWISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRAVEL
MODERATE INDURATION
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-05%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID

2165 - 2170 GRAINSTONE; VERY LIGHT ORANGE TO DARK YELLOWISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRANULE
MODERATE INDURATION
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-10%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA

2170 - 2175 AS ABOVE

2175 - 2200 NO SAMPLES

2200 - 2205 GRAINSTONE; VERY LIGHT ORANGE TO DARK YELLOWISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE
90% ALLOCHEMICAL CONSTITUENTS
RANGE: MEDIUM TO FINE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: DOLOMITE-07%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID

2205 - 2210 AS ABOVE

2210 - 2215 GRAINSTONE; VERY LIGHT ORANGE TO DARK YELLOWISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE
90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRANULE
MODERATE INDURATION
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-05%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA

2215 - 2220 GRAINSTONE; VERY LIGHT ORANGE TO DARK YELLOWISH BROWN

POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE
90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRAVEL
MODERATE INDURATION
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-05%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID

2220 - 2225 AS ABOVE

2225 - 2230 AS ABOVE

2230 - 2235 GRAINSTONE; VERY LIGHT ORANGE TO DARK YELLOWISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE, CRYSTALS
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRAVEL
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-03%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
INDURATION RANGES FROM POOR TO MODERATE BUT MOST OF SAMPLE IS MODERATE.

2235 - 2240 GRAINSTONE; VERY LIGHT ORANGE TO DARK YELLOWISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE, CRYSTALS
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRAVEL; POOR INDURATION
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-03%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID

2240 - 2245 GRAINSTONE; VERY LIGHT ORANGE TO DARK YELLOWISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE, CRYSTALS
93% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: GRAVEL TO FINE
CEMENT TYPE(S): SPARRY CALCITE CEMENT, CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-03%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
INDURATION VARIES FROM POOR TO MODERATE.

2245 - 2250 AS ABOVE

2250 - 2255 AS ABOVE

2255 - 2260 AS ABOVE

2260 - 2265 PACKSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE, CRYSTALS
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRAVEL
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: DOLOMITE-01%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
INDURATION VARIES FROM POOR TO MODERATE.

2265 - 2270 PACKSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE, CRYSTALS

85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRAVEL
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: DOLOMITE-01%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
ANOTHER FOSSIL TYPE FOUND LOOKS LIKE ALGAE OR CORAL.

2270 - 2275 PACKSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE, CRYSTALS
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRANULE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: DOLOMITE-03%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID
DOLOMITE PERCENTAGE MAY BE HIGHER OR LOWER BUT IS HARD TO DISCERN DUE TO THE SMALL AND LOOSE CRYSTALS PRESENT. SOME APPEAR TO BE CALCITE AND SOME DOLOMITE.

2275 - 2280 AS ABOVE

2280 - 2285 PACKSTONE; VERY LIGHT ORANGE
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE, CRYSTALS
85% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRANULE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: DOLOMITE-05%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID

2285 - 2290 GRAINSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE, CRYSTALS
90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRANULE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: DOLOMITE-05%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA

2290 - 2295 GRAINSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE, CRYSTALS
90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRAVEL
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: DOLOMITE-07%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: BENTHIC FORAMINIFERA, ECHINOID

2295 - 2300 GRAINSTONE; VERY LIGHT ORANGE TO GRAYISH BROWN
POROSITY: INTERGRANULAR
GRAIN TYPE: SKELETAL, CALCILUTITE, CRYSTALS
90% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: FINE TO GRAVEL
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, SPARRY CALCITE CEMENT
ACCESSORY MINERALS: DOLOMITE-07%
OTHER FEATURES: HIGH RECRYSTALLIZATION

FOSSILS: BENTHIC FORAMINIFERA, ECHINOID, FOSSIL MOLDS

2300 TOTAL DEPTH

# C

# Water Quality Data from Packer Tests

Jupiter
Environmental Laboratories, Inc.

Jupiter Environmental Laboratories, Inc.
150 S. Old Dixie Highway
Jupiter, FL 33458
Phone: (561)575-0030
Fax: (561)575-4118
www.jupiterlabs.com
clientservices@jupiterlabs.com

March 14, 2007

Randy Keyser
Tetra-Tech EC, Inc.
759 S. Federal Hwy
Ste. 100
Stuart, FL 34994

RE: LOG# 717987
Project ID: 3300 PBF-15 Parker Test
COC# 29391

Dear Randy Keyser:

Enclosed are the analytical results for sample(s) received by the laboratory on Friday, February 23, 2007. Results reported herein conform to the most current NELAC standards, where applicable, unless indicated by * in the body of the report.

The enclosed Chain of Custody is a component of this package and should be retained with the package and incorporated therein.

Results for all solid matrices are reported in dry weight unless otherwise noted. Results for all liquid matrices are reported as received in the laboratory unless otherwise noted.

Samples are disposed of after 30 days of their receipt by the laboratory unless archiving is requested in writing. The laboratory maintains the right to charge storage fees for archived samples.

Certain analyses are subcontracted to outside NELAC certified laboratories, please see the Footnotes section of this report for NELAC certification numbers of laboratories used.

A Statement of Qualifiers is available upon request.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Poonam Kalkat for
Kacia Baldwin
kbaldwin@jupiterlabs.com

Enclosures



**FDOH# E86546**

**CERTIFICATE OF ANALYSIS**



nelac

Jupiter
Environmental Laboratories, Inc.

Jupiter Environmental Laboratories, Inc.
150 S. Old Dixie Highway
Jupiter, FL 33458
Phone: (561)575-0030
Fax: (561)575-4118

## SAMPLE ANALYTE COUNT

LOG# 717987
Project ID: 3300 PBF-15 Parker Test

| Lab ID | Sample ID | Method | Analytes Reported |
|---|---|---|---|
| 717987001 | PBF-15 GWB | EPA 160.1 | 1 |
| 717987001 | PBF-15 GWB | EPA 200.8 (Total) | 4 |
| 717987001 | PBF-15 GWB | EPA 310.2 | 1 |
| 717987001 | PBF-15 GWB | EPA 325.2 | 1 |
| 717987001 | PBF-15 GWB | EPA 340.1 | 1 |
| 717987001 | PBF-15 GWB | EPA 375.4 | 1 |
| 717987001 | PBF-15 GWB | EPA 9060 | 1 |
| 717987001 | PBF-15 GWB | EPA 6010B | 2 |
| 717987001 | PBF-15 GWB | SW-846 9056 | 1 |
| 717987002 | PBF-15 GW001 | EPA 160.1 | 1 |
| 717987002 | PBF-15 GW001 | EPA 200.8 (Total) | 4 |
| 717987002 | PBF-15 GW001 | EPA 310.2 | 1 |
| 717987002 | PBF-15 GW001 | EPA 325.2 | 1 |
| 717987002 | PBF-15 GW001 | EPA 340.1 | 1 |
| 717987002 | PBF-15 GW001 | EPA 375.4 | 1 |
| 717987002 | PBF-15 GW001 | EPA 9060 | 1 |
| 717987002 | PBF-15 GW001 | EPA 6010B | 2 |
| 717987002 | PBF-15 GW001 | SW-846 9056 | 1 |



**FDOH# E86546**

**CERTIFICATE OF ANALYSIS**



nelac

Jupiter
Environmental Laboratories, Inc.

Jupiter Environmental Laboratories, Inc.
150 S. Old Dixie Highway
Jupiter, FL 33458
Phone: (561)575-0030
Fax: (561)575-4118

## SAMPLE SUMMARY

LOG# 717987
Project ID: 3300 PBF-15 Parker Test

| Lab ID | Sample ID | Matrix | Date Collected | Date Received |
|---|---|---|---|---|
| 717987001 | PBF-15 GWB | Aqueous Liquid | 2/23/2007 12:45 | 2/23/2007 16:00 |
| 717987002 | PBF-15 GW001 | Aqueous Liquid | 2/23/2007 14:25 | 2/23/2007 16:00 |



**FDOH# E86546**

**CERTIFICATE OF ANALYSIS**

Jupiter
Environmental Laboratories, Inc.

Jupiter Environmental Laboratories, Inc.
150 S. Old Dixie Highway
Jupiter, FL 33458
Phone: (561)575-0030
Fax: (561)575-4118

# ANALYTICAL RESULTS

LOG# 717987
Project ID: 3300 PBF-15 Parker Test

Lab ID: **717987001** Date Received: 2/23/2007 Matrix: Aqueous Liquid
Sample ID: **PBF-15 GWB** Date Collected: 2/23/2007

| Parameters | Results | Units | Report Limit | MDL | DF | Prepared | By | Analyzed | By | Qual | CAS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Analysis Desc: TDS by EPA 160.1 [REF] (W) | | | Analytical Method: EPA 160.1 | | | | | | | | |
| Total Dissolved Solids | U | mg/L | 1.0 | 0.33 | 1 | | | 03/01/07 | ESC | | |
| Analysis Desc: Bromide by EPA 9056 [REF] (W) | | | Analytical Method: SW-846 9056 | | | | | | | | |
| Bromide | U | mg/L | 1.0 | 0.098 | 1 | | | 02/27/07 | ESC | | 24959-67-9 |
| Analysis Desc: Silica 6010B Calc. [REF] (W) | | | Analytical Method: EPA 6010B | | | | | | | | |
| Silica | U | mg/L | 0.43 | 0.20 | 1 | | | 03/01/07 | ESC | | 7631-86-9 |
| Analysis Desc: TOC by EPA 9060 [REF] (W) | | | Analytical Method: EPA 9060 | | | | | | | | |
| TOC | 0.27 | mg/L | 1.0 | 0.18 | 1 | | | 02/28/07 | ESC | I | |
| Analysis Desc: Chloride by EPA 325.2 (W) | | | Analytical Method: EPA 325.2 | | | | | | | | |
| Chloride | U | mg/L | 0.50 | | 1 | | | 02/28/07 | SS | | 16887-00-6 |
| Analysis Desc: Sulfate by 375.4 (W) | | | Analytical Method: EPA 375.4 | | | | | | | | |
| Sulfate | U | mg/L | 1.0 | | 1 | | | 02/28/07 | SS | J4 | 14808-79-8 |
| Analysis Desc: Fluoride by EPA 340.1 (W) | | | Analytical Method: EPA 340.1 | | | | | | | | |
| Fluoride | U | mg/L | 0.10 | | 1 | | | 02/28/07 | SS | J4 | 16984-48-8 |
| Analysis Desc: Alkalinity, EPA 310.2 (W) | | | Analytical Method: EPA 310.2 | | | | | | | | |
| Alkalinity | 5.2 | mg/L | 5.0 | | 1 | | | 02/28/07 | SS | J4 | |
| Analysis Desc: EPA 200.8 Metals (W) | | | Analytical Method: EPA 200.8 (Total) | | | | | | | | |
| Strontium | U | mg/L | 0.0040 | 0.0020 | 1 | 02/27/07 | ZS | 02/27/07 | ZS | | 7440-24-6 |
| Sodium (EPA 6010B) | 0.32i | mg/L | 0.50 | 0.16 | 1 | 02/28/07 | ESC | 03/09/07 | ESC | | 7440-23-5 |
| Magnesium | 0.0031 | mg/L | 0.00082 | 0.00041 | 1 | 02/27/07 | ZS | 02/27/07 | ZS | | 7439-95-4 |
| Potassium | U | mg/L | 0.0068 | 0.0034 | 1 | 02/27/07 | ZS | 02/27/07 | ZS | | 7440-09-7 |
| Calcium | U | mg/L | 0.048 | 0.024 | 1 | 02/27/07 | ZS | 02/27/07 | ZS | | 7440-70-2 |



**FDOH# E86546**

**CERTIFICATE OF ANALYSIS**



nelac

Jupiter
Environmental Laboratories, Inc.

Jupiter Environmental Laboratories, Inc.
150 S. Old Dixie Highway
Jupiter, FL 33458
Phone: (561)575-0030
Fax: (561)575-4118

# ANALYTICAL RESULTS

LOG# 717987
Project ID: 3300 PBF-15 Parker Test

Lab ID: **717987002** Date Received: 2/23/2007 Matrix: Aqueous Liquid
Sample ID: **PBF-15 GW001** Date Collected: 2/23/2007

| Parameters | Results | Units | Report Limit | MDL | DF | Prepared | By | Analyzed | By | Qual | CAS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Analysis Desc: TDS by EPA 160.1 [REF] (W) | | | Analytical Method: EPA 160.1 | | | | | | | | |
| Total Dissolved Solids | 15000 | mg/L | 1.0 | 0.33 | 1 | | | 03/01/07 | ESC | | |
| Analysis Desc: Bromide by EPA 9056 [REF] (W) | | | Analytical Method: SW-846 9056 | | | | | | | | |
| Bromide | 30 | mg/L | 10 | 0.98 | 10 | | | 03/01/07 | ESC | | 24959-67-9 |
| Analysis Desc: Silica 6010B Calc. [REF] (W) | | | Analytical Method: EPA 6010B | | | | | | | | |
| Silica | 11 | mg/L | 0.43 | 0.20 | 1 | | | 03/01/07 | ESC | | 7631-86-9 |
| Analysis Desc: TOC by EPA 9060 [REF] (W) | | | Analytical Method: EPA 9060 | | | | | | | | |
| TOC | 2.0 | mg/L | 1.0 | 0.18 | 1 | | | 02/28/07 | ESC | | |
| Analysis Desc: Chloride by EPA 325.2 (W) | | | Analytical Method: EPA 325.2 | | | | | | | | |
| Chloride | 7300 | mg/L | 500 | | 1000 | | | 02/28/07 | SS | | 16887-00-6 |
| Analysis Desc: Sulfate by 375.4 (W) | | | Analytical Method: EPA 375.4 | | | | | | | | |
| Sulfate | 960 | mg/L | 100 | | 100 | | | 02/28/07 | SS | J4 | 14808-79-8 |
| Analysis Desc: Fluoride by EPA 340.1 (W) | | | Analytical Method: EPA 340.1 | | | | | | | | |
| Fluoride | 3.0 | mg/L | 0.50 | | 5 | | | 02/28/07 | SS | J4 | 16984-48-8 |
| Analysis Desc: Alkalinity, EPA 310.2 (W) | | | Analytical Method: EPA 310.2 | | | | | | | | |
| Alkalinity | 73 | mg/L | 5.0 | | 1 | | | 02/28/07 | SS | J4 | |
| Analysis Desc: EPA 200.8 Metals (W) | | | Analytical Method: EPA 200.8 (Total) | | | | | | | | |
| Strontium | 7.0 | mg/L | 0.0040 | 0.0020 | 1 | 02/27/07 | ZS | 02/27/07 | ZS | | 7440-24-6 |
| Sodium (EPA 6010B) | 4300 | mg/L | 5.0 | 1.6 | 10 | 02/28/07 | ESC | 03/09/07 | ESC | | 7440-23-5 |
| Magnesium | 80 | mg/L | 0.00082 | 0.00041 | 1 | 02/27/07 | ZS | 02/27/07 | ZS | | 7439-95-4 |
| Potassium | 18 | mg/L | 0.0068 | 0.0034 | 1 | 02/27/07 | ZS | 02/27/07 | ZS | | 7440-09-7 |
| Calcium | 210 | mg/L | 0.048 | 0.024 | 1 | 02/27/07 | ZS | 02/27/07 | ZS | | 7440-70-2 |



**FDOH# E86546**

**CERTIFICATE OF ANALYSIS**



nelac

Jupiter
Environmental Laboratories, Inc.

Jupiter Environmental Laboratories, Inc.
150 S. Old Dixie Highway
Jupiter, FL 33458
Phone: (561)575-0030
Fax: (561)575-4118

# ANALYTICAL RESULTS QUALIFIERS

LOG# 717987
Project ID: 3300 PBF-15 Parker Test

## PARAMETER QUALIFIERS

| | |
|---|---|
| I | Estimated value below the lowest calibration point. Confidence correlates with concentration. |
| J4 | MS/MSD recovery exceeded control limits due to matrix interference. LCS/LCSD recovery was within acceptable range. |
| [] | |

## PROJECT COMMENTS

| | |
|---|---|
| 717987 | Report Limit = PQL<br>"i" Flag indicates that the reported value is between the laboratory method detection limit and the practical quantitation limit. |

## SUBCONTRACTOR NELAC CERTIFICATION

| ID | |
|---|---|
| 717987 | ESC = E87487 |



**FDOH# E86546**

**CERTIFICATE OF ANALYSIS**



nelac

BAR CODE

# Chain of Custody Record

LAB USE ONLY

J.E.L. Log # 717987

P.O. # _____

Quote# _____

## Jupiter Environmental Laboratories

Company Name: Tetra Tech EC1

Address: 759 S. Federal Hwy - Suite 100

City: Stuart State: FL Zip: 34994

Sampling Site Address: PBF-15 Packer Test

Attn: Randy Keyser Fax/Email: 772-781-3411

Project Name: PBF-15 Packer Test Project #: 3300

Sampler Name/Signature: Lacy Salomone

**Parameters**

| Press Codes | I | I | H | I | N | N | | | | | | Field Filtered (Y/N) | Integrity OK (Y/N) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Alkalinity, chloride, Sulfate, Flouride | TDS | Toc | Bromide | Calcium, Potassium, Magnesium, Sodium, Strontium | $SiO_2$ - Silica | | | | | | | |

| # | Sample Label (Client ID) | Collected Date | Collected Time | Matrix Code* | # of Cont | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | PBF-15 - GWB | 2-23-07 | 1245 | GW | 6 | X | X | X | X | X | X | | | | | | | |
| 2 | PBF-15 - GW001 | 2-23-07 | 1425 | GW | 6 | X | X | X | X | X | X | | | | | | | |
| 3 | | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | |

**Comments**

Questions - Call

Randy Keyser

772-781-3401

ORIGINAL

**Matrix Codes***

| | | | |
|---|---|---|---|
| S | Soil/Solid Sediment | SW | Surface Water |
| GW | Ground Water | SL | Sludge |
| WW | Waste Water | O | Other (Please Specify) |
| DW | Drinking Water | | |

**Pres Codes****

| | | | |
|---|---|---|---|
| A- | none | I- | Ice |
| B- | $HNO_3$ | O- | Other |
| C- | $H_2SO_4$ | M- | MeOH |
| D- | NaOH | | |
| E- | HCl | | |

| Relinquished by | Date | Time | Received by | Date | Time |
|---|---|---|---|---|---|
| | 2.23.07 | 1600 | | 2/23/07 | 1600 |
| | | | | | |
| | | | | | |
| | | | | | |

QA/QC level with report

None ___ 1 ___ 2 ___ 3 ___ See price guide for applicable fees

T.A.T. Request

___ Standard

___ Rush

FDEP ___

SFWMD X

Date Required _____

Temp Control: 3 °C

Jupiter Environmental Laboratories, Inc.
150 Old Dixie Highway, Jupiter, FL 33458
(561) 575-0030 • Fax (561) 575-4118 • clientservices@jupiterlabs.com

C.O.C.# 29391

Jupiter
Environmental Laboratories, Inc.

Jupiter Environmental Laboratories, Inc.
150 S. Old Dixie Highway
Jupiter, FL 33458
Phone: (561)575-0030
Fax: (561)575-4118
www.jupiterlabs.com
clientservices@jupiterlabs.com

March 14, 2007

Randy Keyser
Tetra-Tech EC, Inc.
759 S. Federal Hwy
Ste. 100
Stuart, FL 34994

RE: LOG# 717995
Project ID: 3300 PBF-15 Packer Test
COC# 29392

Dear Randy Keyser:

Enclosed are the analytical results for sample(s) received by the laboratory on Tuesday, February 27, 2007. Results reported herein conform to the most current NELAC standards, where applicable, unless indicated by * in the body of the report.

The enclosed Chain of Custody is a component of this package and should be retained with the package and incorporated therein.

Results for all solid matrices are reported in dry weight unless otherwise noted. Results for all liquid matrices are reported as received in the laboratory unless otherwise noted.

Samples are disposed of after 30 days of their receipt by the laboratory unless archiving is requested in writing. The laboratory maintains the right to charge storage fees for archived samples.

Certain analyses are subcontracted to outside NELAC certified laboratories, please see the Footnotes section of this report for NELAC certification numbers of laboratories used.

A Statement of Qualifiers is available upon request.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Poonam Kalkat for
Kacia Baldwin
kbaldwin@jupiterlabs.com

Enclosures



**FDOH# E86546**

**CERTIFICATE OF ANALYSIS**

Jupiter
Environmental Laboratories, Inc.

Jupiter Environmental Laboratories, Inc.
150 S. Old Dixie Highway
Jupiter, FL 33458
Phone: (561)575-0030
Fax: (561)575-4118

## SAMPLE ANALYTE COUNT

LOG# 717995
Project ID: 3300 PBF-15 Packer Test

| Lab ID | Sample ID | Method | Analytes Reported |
|---|---|---|---|
| 717995002 | PBF-15-GW002 | EPA 160.1 | 1 |
| 717995002 | PBF-15-GW002 | EPA 200.8 (Total) | 4 |
| 717995002 | PBF-15-GW002 | EPA 310.2 | 1 |
| 717995002 | PBF-15-GW002 | EPA 325.2 | 1 |
| 717995002 | PBF-15-GW002 | EPA 340.1 | 1 |
| 717995002 | PBF-15-GW002 | EPA 375.4 | 1 |
| 717995002 | PBF-15-GW002 | EPA 9060 | 1 |
| 717995002 | PBF-15-GW002 | EPA 6010B | 2 |
| 717995002 | PBF-15-GW002 | SW-846 9056 | 1 |

Jupiter
Environmental Laboratories, Inc.

Jupiter Environmental Laboratories, Inc.
150 S. Old Dixie Highway
Jupiter, FL 33458
Phone: (561)575-0030
Fax: (561)575-4118

## SAMPLE SUMMARY

LOG# 717995
Project ID: 3300 PBF-15 Packer Test

| Lab ID | Sample ID | Matrix | Date Collected | Date Received |
|---|---|---|---|---|
| 717995001 | No Sample | Aqueous Liquid | | 2/27/2007 09:10 |
| 717995002 | PBF-15-GW002 | Aqueous Liquid | 2/26/2007 18:10 | 2/27/2007 09:10 |



**FDOH# E86546**

**CERTIFICATE OF ANALYSIS**

Jupiter Environmental Laboratories, Inc.
150 S. Old Dixie Highway
Jupiter, FL 33458
Phone: (561)575-0030
Fax: (561)575-4118

# ANALYTICAL RESULTS

LOG# 717995
Project ID: 3300 PBF-15 Packer Test

Lab ID: **717995002** Date Received: 2/27/2007 Matrix: Aqueous Liquid
Sample ID: **PBF-15-GW002** Date Collected: 2/26/2007

| Parameters | Results | Units | Report Limit | MDL | DF | Prepared | By | Analyzed | By | Qual | CAS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Analysis Desc: TDS by EPA 160.1 [REF] (W) | | | Analytical Method: EPA 160.1 | | | | | | | | |
| Total Dissolved Solids | 13000 | mg/L | 1.0 | 0.33 | 1 | | | 03/02/07 | ESC | | |
| Analysis Desc: Bromide by EPA 9056 [REF] (W) | | | Analytical Method: SW-846 9056 | | | | | | | | |
| Bromide | 24 | mg/L | 1.0 | 0.098 | 1 | | | 02/28/07 | ESC | | 24959-67-9 |
| Analysis Desc: Silica 6010B Calc. [REF] (W) | | | Analytical Method: EPA 6010B | | | | | | | | |
| Silica | 9.80 | mg/L | 0.430 | 0.20 | 1 | | | 03/02/07 | ESC | | 7631-86-9 |
| Analysis Desc: TOC by EPA 9060 [REF] (W) | | | Analytical Method: EPA 9060 | | | | | | | | |
| TOC | 3.5 | mg/L | 1.0 | 0.18 | 1 | | | 03/05/07 | ESC | | |
| Analysis Desc: Chloride by EPA 325.2 (W) | | | Analytical Method: EPA 325.2 | | | | | | | | |
| Chloride | 6300 | mg/L | 500 | | 1000 | | | 03/01/07 | SS | J4 | 16887-00-6 |
| Analysis Desc: Sulfate by 375.4 (W) | | | Analytical Method: EPA 375.4 | | | | | | | | |
| Sulfate | 880 | mg/L | 100 | | 100 | | | 02/28/07 | SS | J4 | 14808-79-8 |
| Analysis Desc: Fluoride by EPA 340.1 (W) | | | Analytical Method: EPA 340.1 | | | | | | | | |
| Fluoride | 3.0 | mg/L | 0.50 | | 5 | | | 02/28/07 | SS | J4 | 16984-48-8 |
| Analysis Desc: Alkalinity, EPA 310.2 (W) | | | Analytical Method: EPA 310.2 | | | | | | | | |
| Alkalinity | 75 | mg/L | 5.0 | | 1 | | | 02/28/07 | SS | J4 | |
| Analysis Desc: EPA 200.8 Metals (W) | | | Analytical Method: EPA 200.8 (Total) | | | | | | | | |
| Strontium | 7.6 | mg/L | 0.0040 | 0.0020 | 1 | 02/27/07 | ZS | 02/27/07 | ZS | | 7440-24-6 |
| Sodium (EPA 6010B) | 4100 | mg/L | 2.5 | 0.81 | 5 | 03/01/07 | ESC | 03/08/07 | ESC | V | 7440-23-5 |
| Magnesium | 86 | mg/L | 0.00082 | 0.00041 | 1 | 02/27/07 | ZS | 02/27/07 | ZS | | 7439-95-4 |
| Potassium | 18 | mg/L | 0.0068 | 0.0034 | 1 | 02/27/07 | ZS | 02/27/07 | ZS | | 7440-09-7 |
| Calcium | 220 | mg/L | 0.048 | 0.024 | 1 | 02/27/07 | ZS | 02/27/07 | ZS | | 7440-70-2 |



**FDOH# E86546**

**CERTIFICATE OF ANALYSIS**

Jupiter
Environmental Laboratories, Inc.

Jupiter Environmental Laboratories, Inc.
150 S. Old Dixie Highway
Jupiter, FL 33458
Phone: (561)575-0030
Fax: (561)575-4118

# ANALYTICAL RESULTS QUALIFIERS

LOG# 717995
Project ID: 3300 PBF-15 Packer Test

## PARAMETER QUALIFIERS

| | |
|---|---|
| J4 | MS/MSD recovery exceeded control limits due to matrix interference. LCS/LCSD recovery was within acceptable range. |
| V | Indicates that the analyte was detected in both the sample and the associated method blank. |

## PROJECT COMMENTS

| | |
|---|---|
| 717995 | Report Limit = PQL |

## SUBCONTRACTOR NELAC CERTIFICATION ID

| | |
|---|---|
| 717995 | ESC = E87487 |



**FDOH# E86546**
**CERTIFICATE OF ANALYSIS**

BAR CODE

# Chain of Custody Record

LAB USE ONLY

J.E.L. Log # 717995
P.O. # _____
Quote# _____

## Jupiter Environmental Laboratories

Company Name: Tetra Tech EC I
Address: 759 S. Federal Hwy. Suite 100
City: Stuart State: FL Zip: 34994
Sampling Site Address: PBF-15 Packer Test
Attn: Randy Keyser Fax/Email: 772-781-3411
Project Name: PBF-15 Packer Test Project #: 3300
Sampler Name/Signature: Lacy Salomone

| # | Sample Label (Client ID) | Collected Date | Collected Time | Matrix Code* | # of Cont |
|---|---|---|---|---|---|
| 1 | ~~PBF-15-GW002B~~ | ~~2-26-07~~ | ~~1700~~ | ~~GW~~ | ~~6~~ |
| 2 | PBF-15-GW002 | 2-26-07 | 1810 | GW | 6 |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |
| 10 | | | | | |

LAB ANALYSIS

Parameters

| Bottle Order | 1 | 2 | 3 | 4 | 5 | 6 | | | | | | Field Filtered (Y/N) | Integrity OK (Y/N) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Alkalinity, chloride, sulfate, fluoride | TDS | TOC | Bromide | Calcium, Potassium, Magnesium, Sodium, Strontium | $SiO_2$ - Silica | | | | | | | |
| 1 | X | X | X | X | X | X | | | | | | | |
| 2 | X | X | X | X | X | X | | | | | | | |

Comments

Questions - Call
Randy Keyser
772-781-3401
GW002B CANCELED
PER LACY

ORIGINAL

| Matrix Codes* | | | |
|---|---|---|---|
| S | Soil/Solid Sediment | SW | Surface Water |
| GW | Ground Water | SL | Sludge |
| WW | Waste Water | O | Other (Please Specify) |
| DW | Drinking Water | | |

| Pres Codes ** | | | |
|---|---|---|---|
| A- none | | I- Ice | |
| B- $HNO_3$ | | O- Other | |
| C- $H_2SO_4$ | | M- MeOH | |
| D- NaOH | | | |
| E- HCl | | | |

| Relinquished by | Date | Time | Received by | Date | Time |
|---|---|---|---|---|---|
| | 2-27-07 | 0910 | | 2/27/07 | 0910 |
| | | | | | |
| | | | | | |
| | | | | | |

QA/QC level with report
None ___ 1 ___ 2 ___ 3 ___ See price guide for applicable fees

T.A.T. Request
___ Standard
___ Rush
FDEP ___
SFWMD X
Date Required _____

Temp Control: 4 °C

Jupiter Environmental Laboratories, Inc.
150 Old Dixie Highway, Jupiter, FL 33458
(561) 575-0030 • Fax (561) 575-4118 • clientservices@jupiterlabs.com

C.O.C.# 29392

Jupiter
Environmental Laboratories, Inc.

Jupiter Environmental Laboratories, Inc.
150 S. Old Dixie Highway
Jupiter, FL 33458
Phone: (561)575-0030
Fax: (561)575-4118
www.jupiterlabs.com
clientservices@jupiterlabs.com

March 14, 2007

Randy Keyser
Tetra-Tech EC, Inc.
759 S. Federal Hwy
Ste. 100
Stuart, FL 34994

RE: LOG# 718014
Project ID: 3300 PBF-15 Parker Test
COC# 29785

Dear Randy Keyser:

Enclosed are the analytical results for sample(s) received by the laboratory on Wednesday, February 28, 2007. Results reported herein conform to the most current NELAC standards, where applicable, unless indicated by * in the body of the report.

The enclosed Chain of Custody is a component of this package and should be retained with the package and incorporated therein.

Results for all solid matrices are reported in dry weight unless otherwise noted. Results for all liquid matrices are reported as received in the laboratory unless otherwise noted.

Samples are disposed of after 30 days of their receipt by the laboratory unless archiving is requested in writing. The laboratory maintains the right to charge storage fees for archived samples.

Certain analyses are subcontracted to outside NELAC certified laboratories, please see the Footnotes section of this report for NELAC certification numbers of laboratories used.

A Statement of Qualifiers is available upon request.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Poonam Kalkat for
Kacia Baldwin
kbaldwin@jupiterlabs.com

Enclosures



**FDOH# E86546**

**CERTIFICATE OF ANALYSIS**

Jupiter
Environmental Laboratories, Inc.

Jupiter Environmental Laboratories, Inc.
150 S. Old Dixie Highway
Jupiter, FL 33458
Phone: (561)575-0030
Fax: (561)575-4118

## SAMPLE ANALYTE COUNT

LOG# 718014
Project ID: 3300 PBF-15 Parker Test

| Lab ID | Sample ID | Method | Analytes Reported |
|---|---|---|---|
| 718014001 | PBF-15-GW003 | EPA 160.1 | 1 |
| 718014001 | PBF-15-GW003 | EPA 200.8 (Total) | 4 |
| 718014001 | PBF-15-GW003 | EPA 310.2 | 1 |
| 718014001 | PBF-15-GW003 | EPA 325.2 | 1 |
| 718014001 | PBF-15-GW003 | EPA 340.1 | 1 |
| 718014001 | PBF-15-GW003 | EPA 375.4 | 1 |
| 718014001 | PBF-15-GW003 | EPA 9060 | 1 |
| 718014001 | PBF-15-GW003 | EPA 6010B | 2 |
| 718014001 | PBF-15-GW003 | SW-846 9056 | 1 |

Jupiter
Environmental Laboratories, Inc.

Jupiter Environmental Laboratories, Inc.
150 S. Old Dixie Highway
Jupiter, FL 33458
Phone: (561)575-0030
Fax: (561)575-4118

## SAMPLE SUMMARY

LOG# 718014
Project ID: 3300 PBF-15 Parker Test

| Lab ID | Sample ID | Matrix | Date Collected | Date Received |
|---|---|---|---|---|
| 718014001 | PBF-15-GW003 | Aqueous Liquid | 2/27/2007 17:45 | 2/28/2007 09:40 |



**FDOH# E86546**

**CERTIFICATE OF ANALYSIS**

Jupiter
Environmental Laboratories, Inc.

Jupiter Environmental Laboratories, Inc.
150 S. Old Dixie Highway
Jupiter, FL 33458
Phone: (561)575-0030
Fax: (561)575-4118

# ANALYTICAL RESULTS

LOG# 718014
Project ID: 3300 PBF-15 Parker Test

Lab ID: **718014001** Date Received: 2/28/2007 Matrix: Aqueous Liquid
Sample ID: **PBF-15-GW003** Date Collected: 2/27/2007

| Parameters | Results | Units | Report Limit | MDL | DF | Prepared | By | Analyzed | By | Qual | CAS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Analysis Desc: TDS by EPA 160.1 [REF] (W) | | | Analytical Method: EPA 160.1 | | | | | | | | |
| Total Dissolved Solids | 12000 | mg/L | 1.0 | 0.33 | 1 | | | 03/05/07 | ESC | | |
| Analysis Desc: Bromide by EPA 9056 [REF] (W) | | | Analytical Method: SW-846 9056 | | | | | | | | |
| Bromide | 23 | mg/L | 10 | 0.98 | 10 | | | 03/02/07 | ESC | | 24959-67-9 |
| Analysis Desc: Silica 6010B Calc. [REF] (W) | | | Analytical Method: EPA 6010B | | | | | | | | |
| Silica | 9.60 | mg/L | 0.43 | 0.20 | 1 | | | 03/02/07 | ESC | | 7631-86-9 |
| Analysis Desc: TOC by EPA 9060 [REF] (W) | | | Analytical Method: EPA 9060 | | | | | | | | |
| TOC | 2.2 | mg/L | 1.0 | 0.18 | 1 | | | 03/07/07 | ESC | | |
| Analysis Desc: Chloride by EPA 325.2 (W) | | | Analytical Method: EPA 325.2 | | | | | | | | |
| Chloride | 6000 | mg/L | 500 | | 1000 | | | 03/06/07 | SS | J4 | 16887-00-6 |
| Analysis Desc: Sulfate by 375.4 (W) | | | Analytical Method: EPA 375.4 | | | | | | | | |
| Sulfate | 850 | mg/L | 100 | | 100 | | | 03/06/07 | SS | | 14808-79-8 |
| Analysis Desc: Fluoride by EPA 340.1 (W) | | | Analytical Method: EPA 340.1 | | | | | | | | |
| Fluoride | 2.8 | mg/L | 0.50 | | 5 | | | 03/06/07 | SS | J4 | 16984-48-8 |
| Analysis Desc: Alkalinity, EPA 310.2 (W) | | | Analytical Method: EPA 310.2 | | | | | | | | |
| Alkalinity | 77 | mg/L | 5.0 | | 1 | | | 03/07/07 | SS | | |
| Analysis Desc: EPA 200.8 Metals (W) | | | Analytical Method: EPA 200.8 (Total) | | | | | | | | |
| Strontium | 6.7 | mg/L | 0.0040 | 0.0020 | 1 | 03/01/07 | ZS | 03/01/07 | ZS | | 7440-24-6 |
| Sodium (EPA 6010B) | 3800 | mg/L | 2.5 | 0.81 | 5 | 03/01/07 | ESC | 03/08/07 | ESC | V | 7440-23-5 |
| Magnesium | 60 | mg/L | 0.00082 | 0.00041 | 1 | 03/01/07 | ZS | 03/01/07 | ZS | | 7439-95-4 |
| Potassium | 20 | mg/L | 0.0068 | 0.0034 | 1 | 03/01/07 | ZS | 03/01/07 | ZS | | 7440-09-7 |
| Calcium | 170 | mg/L | 0.048 | 0.024 | 1 | 03/01/07 | ZS | 03/01/07 | ZS | | 7440-70-2 |



**FDOH# E86546**

**CERTIFICATE OF ANALYSIS**



nelac

Jupiter
Environmental Laboratories, Inc.

Jupiter Environmental Laboratories, Inc.
150 S. Old Dixie Highway
Jupiter, FL 33458
Phone: (561)575-0030
Fax: (561)575-4118

# ANALYTICAL RESULTS QUALIFIERS

LOG# 718014
Project ID: 3300 PBF-15 Parker Test

## PARAMETER QUALIFIERS

| | |
|---|---|
| J4 | MS/MSD recovery exceeded control limits due to matrix interference. LCS/LCSD recovery was within acceptable range. |
| V | Indicates that the analyte was detected in both the sample and the associated method blank. |

## PROJECT COMMENTS

| | |
|---|---|
| 718014 | Report Limit = PQL |

## SUBCONTRACTOR NELAC CERTIFICATION ID

| | |
|---|---|
| 718014 | ESC = E87487 |



**FDOH# E86546**

**CERTIFICATE OF ANALYSIS**



nelac

BAR CODE

# Chain of Custody Record

LAB USE ONLY

J.E.L. Log # 718014
P.O. # _____
Quote# _____

## Jupiter Environmental Laboratories

Company Name: Tetra Tech FCI
Address: 759 S. Federal Hwy - Suite 100
City: Stuart State: FL Zip: 34994
Sampling Site Address: PBF-15 - Packer Test, Palm Beach FL
Attn: Randy Meyser Fax/Email: 772-781-3411
Project Name: PBF-15 Packer Test Project #: 3305
Sampler Name/Signature: Lacy Salomone

| # | Sample Label (Client ID) | Collected Date | Collected Time | Matrix Code* | # of Cont |
|---|---|---|---|---|---|
| 1 | PBF-15-GW003 | 2-27-07 | 1745 | GW | 6 |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |
| 10 | | | | | |

LAB ANALYSIS

| Parameters | Alkalinity, chloride, sulfate, Flouride | TDS | TOC | Bromide | Calcium, potassium, magnesium, Sodium, Strontium | $SiO_2$, Silica | | | | | | Field Filtered (Y/N) | Integrity OK (Y/N) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Preservation Code | I | I | H | I | N | N | | | | | | | |
| 1 | X | X | X | X | X | X | | | | | | | |
| 2 | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

Comments

ORIGINAL

**Matrix Codes***

| | | | |
|---|---|---|---|
| S | Soil/Solid Sediment | SW | Surface Water |
| GW | Ground Water | SL | Sludge |
| WW | Waste Water | O | Other (Please Specify) |
| DW | Drinking Water | | |

**Pres Codes****

| | | | |
|---|---|---|---|
| A- | none | I- | Ice |
| B- | $HNO_3$ | O- | Other |
| C- | $H_2SO_4$ | M- | MeOH |
| D- | NaOH | | |
| E- | HCl | | |

| Relinquished by | Date | Time | Received by | Date | Time |
|---|---|---|---|---|---|
| | 2-28-07 | 0940 | Adam Strayer | 2/28/07 | 940 |
| | | | | | |
| | | | | | |
| | | | | | |

QA/QC level with report
None ___1___2___3___ See price guide for applicable fees

T.A.T. Request
___ Standard
___ Rush
FDEP___
SFWMD X
Date Required_____

Temp Control: 4 °C

Jupiter Environmental Laboratories, Inc.
150 Old Dixie Highway, Jupiter, FL 33458
(561) 575-0030 • Fax (561) 575-4118 • clientservices@jupiterlabs.com

C.O.C.# 29785

# D

# Long-term Water Level Monitoring

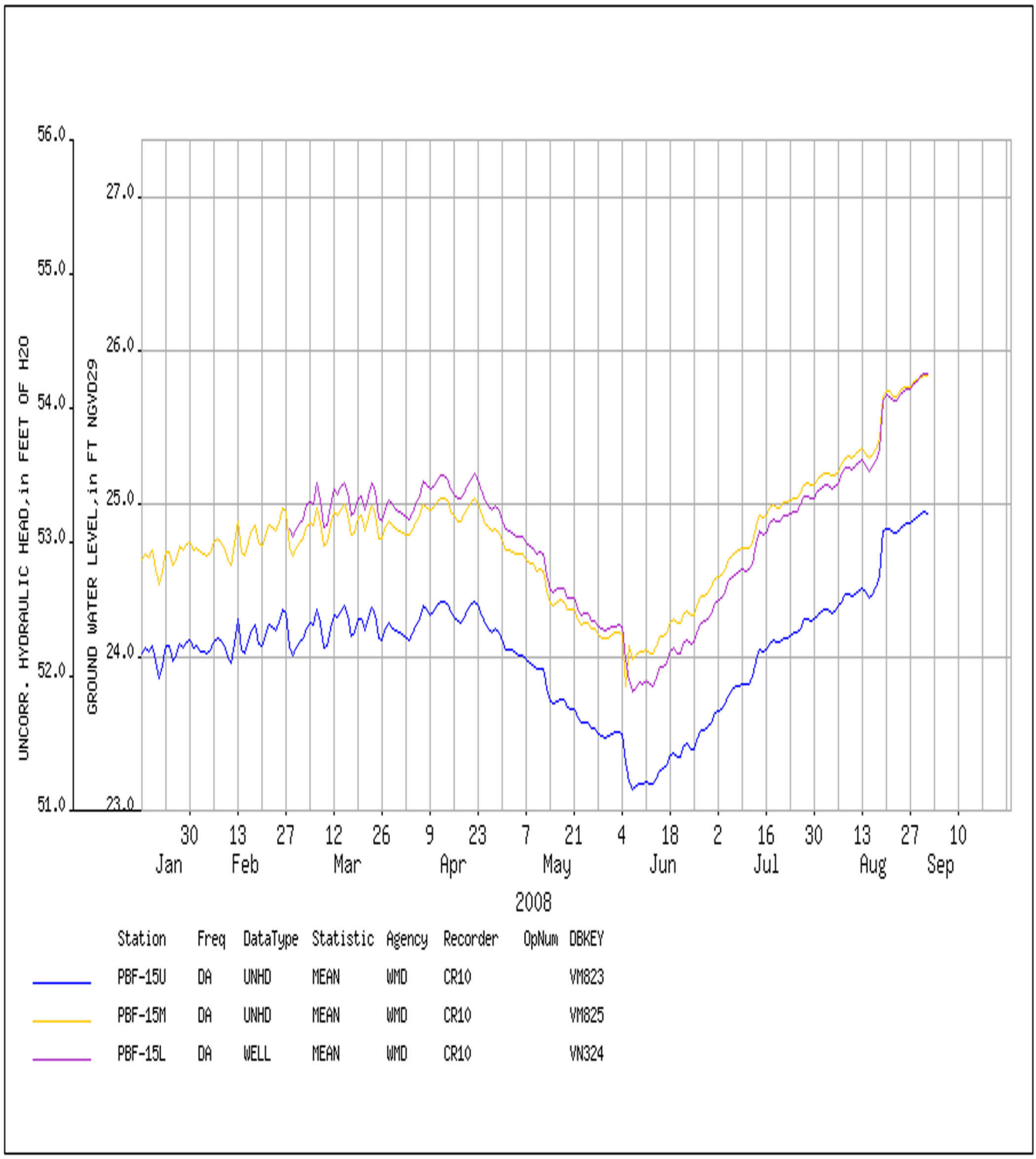



**Figure D-1**. Long-term water level monitoring.

sfwmd.gov

South Florida Water Management District
3301 Gun Club Road
West Palm Beach, Florida 33406
561-686-8800 • FL WATS 1-800-432-2045
www.sfwmd.gov

MAILING ADDRESS: P.O. Box 24680
West Palm Beach, FL 33416-4680