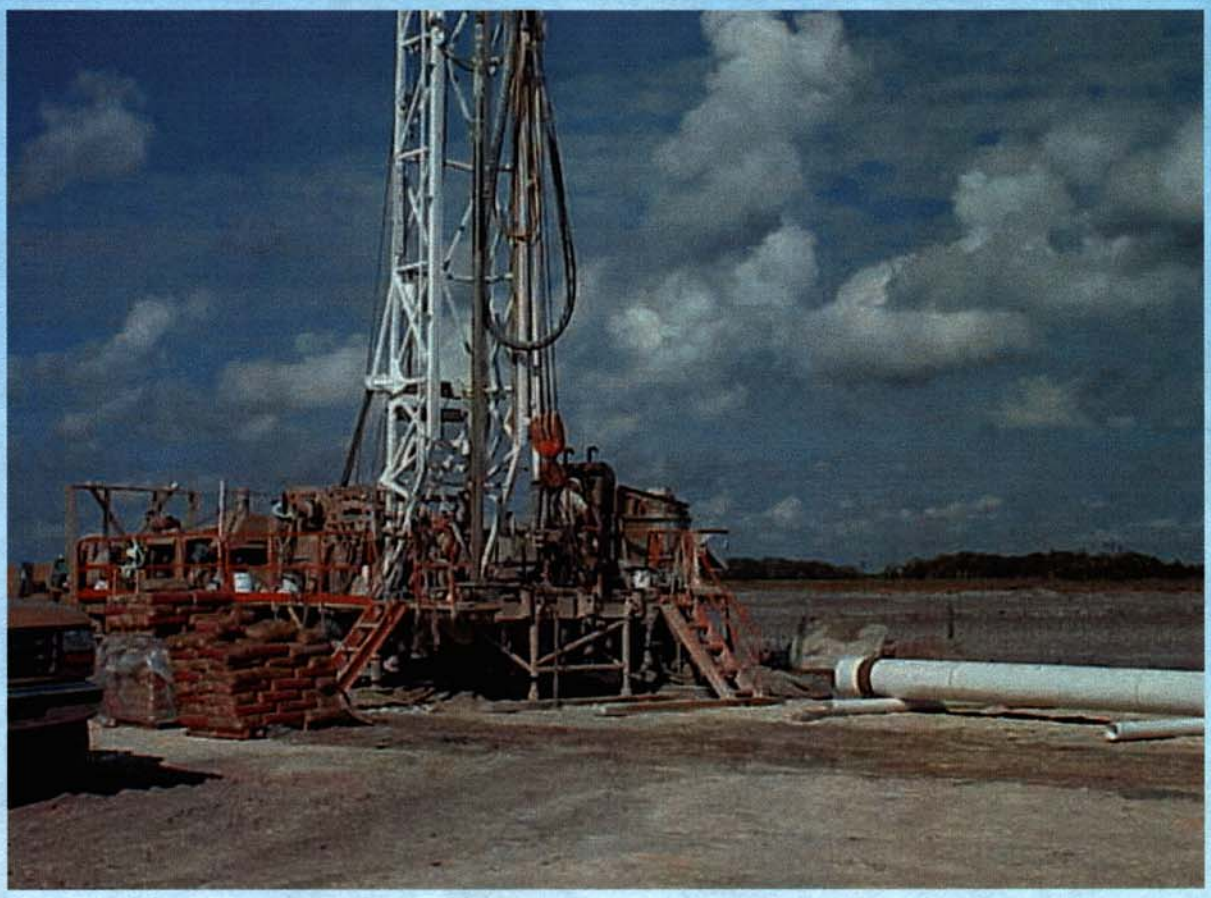
HYDROGEOLOGY OF THE ROMP 16.5 FORT OGDEN MONITOR WELL SITE DESOTO COUNTY, FLORIDA

Phase Two

Deep Exploratory Drilling and Monitor Well Construction



Geohydrologic Data Section
Resource Conservation and Development Department
Southwest Florida Water Management District
2379 Broad Street
Brooksville, FL 34604-6899

April 2001

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AND MONITOR WELL CONSTRUCTION

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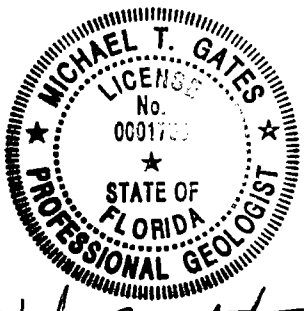
The geological evaluations and interpretations contained in the *Hydrogeology of the ROMP 16.5 Fort Ogden Monitor Well Site, DeSoto County, Florida, Phase Two Deep Exploratory Drilling and Monitor Well Construction* Report have been prepared by or approved by a licensed Professional Geologist in the State of Florida, in accordance with Chapter 492, Florida Statutes.



Michael T. Gates
Professional Geologist
License No. PG 1799

Date: 4-9-2001

HYDROGEOLOGY OF THE ROMP 16.5 FORT OGDEN MONITOR WELL SITE DESOTO COUNTY, FLORIDA

PHASE TWO

DEEP EXPLORATORY DRILLING AND MONITOR WELL CONSTRUCTION

By Michael T. Gates

Southwest Florida Water Management District

Resource Conservation and Development Department
Gregg W. Jones, Director

Geohydrologic Data Section
S. Greg McQuown, Manager

Southwest Florida Water Management District
2379 Broad Street
Brooksville, Florida 34609-6899

April 2001

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1.0 INTRODUCTION

The ROMP (Regional Observation and Monitor-well Program) 16.5 Fort Ogden site in DeSoto County was obtained to determine the hydrogeology of the area and to construct a multiple well monitor site for long-term data collection. The ROMP 16.5 site is one of several well sites constructed for the Southern Water Resource Assessment Project (SWRAP). The SWRAP is a long-term study of the ground-water systems in all of DeSoto, Hardee, Manatee, and Sarasota Counties and portions of Charlotte, Highlands, Hillsborough, and Polk Counties (SWFWMD, 1993). Figure 1 presents the SWRAP study area. Data collected from the ROMP 16.5 site will also be used in the joint Southwest Florida Water Management District (SWFWMD) - United States Geological Survey (USGS) regional study of the Intermediate Aquifer System (IAS). The IAS project will determine the regional hydrogeologic framework of the Intermediate Aquifer System in West Central Florida.

Drilling, testing, and monitor well construction at the ROMP 16.5 well site is planned in three phases: (1) Core drilling and Testing, (2) Deep Exploratory Drilling and Monitor Well Construction, and (3) Aquifer Performance Testing. Phase One of the project is complete. The results are presented in: Hydrogeology of the ROMP 16.5 Fort Ogden Monitor Well Site, DeSoto County Florida, Phase One Core Drilling and Testing (Gates 2000). Phase Two of the project, deep exploratory drilling (below 1,170 feet bls) began in October 2000 and was completed in February 2001. This report presents the data collected from the exploratory drilling and details the monitor well construction. Phase Three, when completed will present the data collected from the aquifer performance tests.

2.0 SITE LOCATION

The ROMP 16.5 well site is located in rural southern DeSoto County, west of the City of Fort Ogden (Figure 2). The temporary well site measures 200 feet x 250 feet and the permanent well site measures 20 feet x 80 feet. The well site is located on land purchased for one dollar from the Ryals Citrus and Cattle Partnership. Citrus and row crops are grown near the well site and cattle are grazed on the surrounding property. The well site is located in Section 26, Township 39 South, Range 24 East at latitude: 27° 03' 40.5" longitude: 81°53' 02.3" at a surface elevation of 40 feet above the National Geodetic Vertical Datum of 1929 (NGVD) (Figure 3). The ROMP 16.5 monitor well site diagram is presented in Figure 4.

3.0 DATA COLLECTION METHODS

Mud-rotary and reverse-air methods of drilling were used for the exploratory drilling and testing at ROMP 16.5. The mud-rotary method was used until circulation was lost or until ground-water sampling was required. The reverse-air method was used for ground-water sampling and for drilling in highly permeable zones. Ground-water samples were collected from the reverse-air discharge line after installing an off-bottom packer. All ground-water samples were collected in accordance with ROMP Water Quality Sampling Protocol.

3.1 DEEP EXPLORATORY DRILLING

The deep exploratory drilling (below 1,170 feet bls) at ROMP 16.5 was performed by Diversified Drilling Corporation under contract to the SWFWMD. The exploratory drilling was performed to determine the stratigraphy, permeable zones, ground-water quality, salt-water interface, and the top of the middle confining unit (evaporites). Exploratory drilling was performed during the construction of the Avon Park Water Quality well (MW-1). Figure 5 presents a diagram of MW-1 during the exploratory drilling.

Construction of the Exploratory/Avon Park Water Quality well began October 2, 2000. A 30-inch borehole was drilled from land surface to 40 feet bls using the mud-rotary method. Forty feet of 24-inch welded steel casing was installed and grouted to land surface. A 23-inch borehole was then drilled from 40 feet bls to 225 feet bls using the mud-rotary method. Two-hundred and twenty-five feet of 18-inch welded steel casing was installed and grouted to land surface. A 17-inch borehole was then drilled from 225 feet bls to 715 feet bls using the mud-rotary method. Seven-hundred and fifteen feet of 12-inch welded steel casing was installed and grouted to land surface. An 11.875-inch borehole was drilled using the mud-rotary method from 715 feet bls to 800 feet bls.

The borehole was flushed of drilling mud and a specific capacity test was performed to estimate the permeability of the Suwannee Limestone interval. Drilling resumed using the reverse-air method from 800 feet bls to 1,000 feet bls. Another specific capacity test was performed on the 715 to 1,000 feet bls interval to estimate the permeability of the combined

Suwannee/Ocala Limestone. Reverse-air drilling with the 11.875-inch bit continued to a depth of 1170 feet bls.

A 8.750-inch drill bit was used below 1170 feet bls so that a 6.0-inch diameter off-bottom packer could be used to isolate selected borehole intervals for hydraulic testing and water quality sampling. Off-bottom packer testing was performed approximately every 100 feet from 1,170 feet bls to 1,814 feet bls, the total depth of drilling. Figure 6 presents a diagram of the off-bottom packer. Drill cuttings were collected every 10 feet from 1170 feet bls to the total depth of the borehole.

3.2 GROUND-WATER SAMPLING

Ground-water samples were collected at approximate 100 feet intervals during packer testing from 1170 to 1814 feet bls to characterize the water quality of the Upper Floridan aquifer. Prior to sample collection, a volume of water equal to the open hole interval plus the drill rod volume was pumped from the well. The groundwater samples were then collected from the discharge line while pumping the borehole by the reverse-air method. The groundwater sample was then split. One sample was analyzed in the field for temperature, specific conductance, pH, chloride, sulfate, and density. The other sample was delivered to the District Environmental Chemistry Laboratory for more extensive analyses. Chain-of-Custody forms were used to track the samples. Tables 1 and 2 present a summary of the field water quality analyses during deep exploratory drilling at ROMP 16.5. Results of the ground-water sample analyses are presented in Section 6.0.

3.3 GEOPHYSICAL LOGGING

Downhole geophysical logs were collected in two phases during the exploratory drilling at ROMP 16.5. The first suite of logs (Gamma Ray, SP, Single-Point Resistance, Normal, Sonic, Caliper, Induction) were collected in November 2000 prior to installing the 12-inch steel casing to 715 feet bls. The second suite of logs were run in January 2001 after reaching the total depth of the borehole (1,814 feet bls). Geophysical logs were used to delineate stratigraphic

units, identify permeable zones, characterize water quality, determine packer set locations, and determine grouting requirement.

Figures 7, 8, and 9 present the geophysical logs run during the exploratory phases of drilling. All logs were run with the SWFWMD-owned Century® digital geophysical logging equipment and are archived with the ROMP 16.5 File of Record. The logging results are discussed in Sections 4.0, 5.0, and 6.0.

3.4 HYDRAULIC TESTING

Limited hydraulic testing was performed during the deep exploratory drilling in the UFA. Specific capacity testing was performed in the Ocala and Suwannee Limestones, and off-bottom packer tests were performed at selected intervals in the Avon Park Formation. These tests were performed to aid in the monitor well design and to estimate hydraulic parameters of the zones tested.

3.4.1 Specific Capacity Tests

Two specific capacity tests were performed while drilling through the Suwannee and Ocala Limestones. Both tests were performed after the 12-inch casing had been installed and grouted from land surface to 715 feet bls. The first test was performed after drilling from 715 feet bls to the bottom of the Suwannee Limestone (825 feet bls). The second test was performed after drilling from 825 feet bls to the bottom of the Ocala Limestone (1,000 feet bls). For each test the open borehole was pumped with a 2-inch centrifugal pump and the water level change was measured with a pressure transducer. Figure 5 shows the configuration of the exploratory well during the specific capacity tests. The results of the specific capacity tests are discussed in Section 7.0. Additionally, specific capacity tests were performed on each completed monitor well. The results are discussed in Section 8 and presented in Table 8.

3.4.2 Packer/Slug Tests

Six slug tests were performed with the off-bottom packer while drilling in the Avon Park Formation. The tests were performed approximately every 100 feet from 1,350 feet bls to the end of drilling at 1,814 feet bls. Prior to each test a caliper log was run to determine the proper interval to set the packer. Once the open interval was selected, the packer was lowered into the borehole on the drill rods and inflated. A slug of water was poured into the drill rods and the resulting water level change was measured with a pressure transducer. Figure 5 shows the configuration of the exploratory well during packer testing and Figure 6 presents a diagram of the off-bottom packer. The slug test results are discussed in Section 7.0.

4.0 GEOLOGY

The geology at the ROMP 16.5 well site is typical for the southern portion of the SWFWMD. Unconsolidated sediments of Miocene age and younger overlie well cemented Tertiary age carbonates. The ROMP 16.5 well site is located within the DeSoto Plain physiographic province, a division of the Mid-Peninsular zone of the Florida Peninsula (White, 1970). White identifies the DeSoto plain as a well preserved relict submarine shoal that escaped modification by shoreline processes. The well site is within the District's Peace River Hydrologic Basin and is located approximately five miles east of the Peace River (Figure 1).

4.1 STRATIGRAPHY

The ROMP 16.5 well site stratigraphy was defined from lithologic descriptions of the core samples collected during core drilling from land surface to 1,170 feet bls and from descriptions of the drill cuttings collected during deep exploratory drilling from 1,170 feet bls to 1,814 feet bls. Figure 10 depicts the geology and hydrogeology described at the ROMP 16.5 well site. The lithologic log for ROMP 16.5 is presented in Appendix A.

4.1.1 Undifferentiated Surficial Deposits

The Pliocene to Recent age undifferentiated surficial deposits are the uppermost geologic unit at the ROMP 16.5 well site. This unit is comprised of fine to medium grained, unconsolidated, quartz and phosphatic sand, with some inter-bedded silt, shell, clay and organic matter. The undifferentiated surficial deposits extend from land surface to 40 feet bls.

4.1.2 Peace River Formation

The Peace River Formation is a lower Pliocene to Miocene age marine siliciclastic unit that lies unconformably below the Undifferentiated Surficial Deposits at ROMP 16.5. The Peace River Formation is part of the Hawthorn Group sediments described by

Scott (1988). In the area of ROMP 16.5 the Peace River Formation is comprised of fine to medium grained quartz sand, fine to coarse grained phosphatic sand and gravel, clay, shell, and limestone lenses. The Peace River Formation extends from 40 feet bls to approximately 117 feet bls.

4.1.3 Arcadia Formation

The Arcadia Formation, part of the Hawthorn Group is middle-Miocene in age and underlies the Peace River Formation. In some areas of southern Florida the Arcadia Formation contains the Tampa and Nocatee Members. The Tampa member is generally comprised mostly of carbonate beds, while the Nocatee Member is made up of siliciclastic beds. That part of the Arcadia Formation not comprised of the Tampa or Nocatee Members is described as the *undifferentiated* Arcadia.

In the area of ROMP 16.5 the undifferentiated Arcadia Formation extends from 117 feet bls to 210 feet bls and is characterized by limestone and dolostone lenses with alternating layers of quartz and phosphatic sand and thick layers of stiff clay.

The Tampa Member of the Arcadia Formation was described from 210 feet bls to 445 feet bls at ROMP 16.5. The Tampa Member is composed of moldic, fossiliferous limestone with some layers of clay, quartz sand, phosphatic sand, and dolostone.

The Nocatee Member of the Arcadia Formation was described from 445 feet bls to 570 feet bls. The Nocatee consists of sandy, clayey, limestone beds, layers of sandy clay, sandstone and siltstone beds.

4.1.4 Suwannee Limestone

The Suwannee Limestone is Oligocene in age and extends from 570 feet bls to 825 feet bls at the ROMP 16.5 well site. The Suwannee Limestone is usually distinguished

from the overlying Arcadia Formation by the absence of phosphatic sediments. The pronounced decrease in activity of the gamma log indicates the top of the Suwannee Limestone in Figure 7. At the ROMP 16.5 site the Suwannee consists of a soft, chalky, crumbly limestone with some interbedded clay. Some thin lenses of dolostone were also present.

4.1.5 Ocala Limestone

The Eocene age Ocala Limestone lies beneath the Suwannee Limestone and extends from 825 feet bls to 1,003 feet bls. The Ocala Limestone at ROMP 16.5 was very similar to the overlying Suwannee Limestone. A thin clay lens indicated by the *16-inch Short Normal Resistivity Curve* RES(16N) in Figure 8, marks the top of the Ocala Limestone. The Ocala is comprised of soft, crumbly, chalky limestone with some interbedded clay. Near the bottom of the unit the limestone was harder, with moldic and vugular porosity. The typically numerous Foraminifera and echinoids found in the Ocala were noticeably absent at ROMP 16.5. A few *Eupatagus clevei* were identified near the bottom of the unit.

4.1.6 Avon Park Formation

The Avon Park Formation is Eocene in age and extends from 1,003 feet bls to more than 1,814 feet bls (exploratory drilling stopped at 1,814 feet bls) at ROMP 16.5. A thin dolostone lens, indicated by the sharp deflection to the right on the RES(16N) curve, marks the top of the Avon Park Formation in Figure 8. The Avon Park is comprised of alternating layers of limestone and dolostone, containing numerous foraminifera.

Permeable zones with the Avon Park are formed by molds, vugs, and fractures. One moderately permeable zone is found from 1,120 to 1,250 feet bls. A change in the temperature log (TEMP) at this depth indicates possible flow from this zone (Figure 9). One highly fractured dolostone zone was encountered from 1,520 to 1,540 feet bls. This fracture zone is visible on the caliper log in

Figure 9. The zone from 1,540 to 1,814 feet bls is comprised of hard crystalline dolostone with moderate porosity. The temperature log indicates possible flow at 1,520 feet bls and 1,740 feet bls.

5.0 HYDROLOGY

The ROMP 16.5 well site hydrogeology was defined during the initial wireline coring and the subsequent deep exploratory rotary drilling. Aquifer systems were delineated from lithologic descriptions of permeable and non-permeable units, potentiometric levels, geophysical logs, packer tests, and water quality data collected during drilling. Changes in water levels were recorded while core drilling through the various aquifers.

5.1 SURFICIAL AQUIFER

The surficial aquifer at ROMP 16.5 is unconfined and extends from land surface to approximately 35 feet bls. Quartz and phosphatic sand, silt, shell, and clay of the undifferentiated surficial deposits form the surficial aquifer. The base of the surficial aquifer is formed by a layer of sandy clay extending from 35 to 55 feet bls. The water level in the surficial aquifer measured approximately 4.5 feet bls in November 2000.

5.2 INTERMEDIATE AQUIFER SYSTEM

The intermediate aquifer system is a confined aquifer system that contains all transmissive and confining units between the overlying surficial aquifer system and the underlying Upper Floridan aquifer system (Southeastern Geological Society, 1986). In DeSoto County and other nearby counties, as many as three separate permeable artesian zones have been described within the intermediate aquifer system (Duerr and Enos, 1991). At ROMP 16.5 in DeSoto County, two confined permeable zones were delineated within the intermediate aquifer system.

The first or upper permeable zone occurs in the Peace River Formation and extends from 55 to 90 feet bls. The most permeable section occurs from 55 to 65 feet bls in a layer of moldic limestone. Sands and clays with moderate permeability comprise the remainder of the permeable zone from 65 to 90 feet bls. This unit may be equivalent to the "Tamiami-upper Hawthorn Aquifer" described by Wolansky (1983) and/or the

Permeable zone 2 unit described by Barr (1996). The potentiometric surface of this zone measured approximately 4.9 feet bls in November 2000.

The second or lower permeable zone of the IAS at ROMP 16.5 occurs in the Tampa Member of the Arcadia Formation from 310 feet bls to 460 feet bls. A thick sequence of clay and carbonates from 90 feet bls to 310 feet bls creates the confining unit between the upper and lower permeable zones. The lower permeable zone is comprised of moldic fossiliferous limestone and some thin layers of dolostone. This permeable zone is probably equivalent to the Permeable zone 3 described by Barr (1996). The water level of this zone measured 1.0 feet **above** land surface in November 2000.

5.3 UPPER FLORIDAN AQUIFER

The top of the Upper Floridan aquifer occurs in the Oligocene Age Suwannee Limestone at approximately 690 feet bls. A significant change in the potentiometric surface was noted during the wire-line coring phase of the project. While coring from 670 feet bls to 690 feet bls, the potentiometric surface increased from approximately 12.70 feet bls to 0.87 feet bls. This change in water level marked the top of the UFA. The base of the UFA, the middle confining unit or evaporites was not encountered while drilling to a total depth of 1,814 feet bls at ROMP 16.5. The Upper Floridan is comprised of the Suwannee Limestone, Ocala Limestone, and the Avon Park Formation.

Specific capacity testing of the Suwannee and Ocala Limestone during exploratory drilling indicated these units are poorly transmissive. The results of the specific capacity testing are presented in Table 4 and in Section 7.0. Additionally, review of the lithologic and geophysical logs revealed only a few thin isolated permeable zones, generally 15 feet or less in thickness.

The most significant permeable zones of the UFA occur in the Avon Park Formation at ROMP 16.5. A moderate permeable zone occurs from 1,120 to 1,250 feet bls in a

hard, moldic dolostone. Packer testing indicated the dolostone was relatively permeable from 1,400 feet bls to 1,814 feet bls (total depth). A large fracture zone extends from 1,520 to 1,540 feet bls. The caliper log (Figure 9) shows this fracture extends out to 18 inches. The water quality degrades rapidly below this zone. The potentiometric surface of the Upper Floridan aquifer at ROMP 16.5 measured 1.5 above land surface in November 2000.

6.0 GROUND-WATER QUALITY

Ground-water samples were collected approximately every 100 feet while exploratory drilling from 1,170 feet bls to 1,814 feet bls in the Upper Floridan aquifer. The ground water samples were collected with an off-bottom packer installed at selected intervals. The analytical results of the ground-water samples are presented in Tables 1 and 2. Figure 11 presents a graph of the water quality trends during exploratory drilling. Figure 12 presents stiff diagrams of the water quality samples collected. The water quality data previously collected from land surface to 1,170 feet bls is presented in the report: *Phase One - Core Drilling and Testing*.

Ground-water mineralization increased little with depth while drilling until reaching the highly fractured dolostone zone at 1,520 feet bls. The chloride and sulfate concentration were within potable limits (below 250 mg/L) for this portion of UFA. Specific conductance values for ground-water samples collected while drilling increased from 1,146 umhos/centimeter (cm) at the 1,260 - 1,290 feet bls interval to 1,166 umhos/cm at the 1,350 - 1,400 feet bls interval (Table 2). Chloride concentrations increased from 175 milligrams per liter (mg/l) to 180 mg/L for the same interval. Sulfate concentrations decreased rom 183 mg/L to 161 mg/l for the same interval.

Mineralization increased rapidly below 1,520 feet bls. This change in water quality is visible on the Specific Conductance log (SP COND) and on the Induction log (COND) in Figure 9. Specific conductance values for ground-water samples collected while drilling below 1,540 increased from 5,380 umhos/cm at the 1,520 - 1,540 feet bls interval to 38,740 umhos/cm at the 1,590 - 1,636 feet bls interval. Chloride increased from 1,510 mg/L a the 1,520 - 1,540 feet bls interval to 13,311 mg/L at the 1,590 - 1,636 feet bls interval. Sulfate increased from 303 mg/l at the 1,520 - 1,540 feet bls interval to 2,103 mg/L at the 1,590 - 1,636 feet bls interval.

The results of the ground-water sampling indicate a major change in the water quality occurs at the fractured dolostone zone located at 1,520 to 1,540 feet bls. The salt-water/freshwater interface (here defined as the location of the 1,000 mg/L chloride isochlor) is located at this highly permeable 1,520 to 1,540 feet bls zone. All major ion concentrations continued to

increased with depth until drilling was terminated. Exploratory drilling was stopped at 1,814 feet bls due to the high specific conductance of the encountered ground-water (45,900 umhos). The total dissolved solids were 31,300 mg/L near the bottom of the borehole. The base of the Upper Floridan aquifer (middle confining unit) was not located during drilling.

7.0 HYDRAULIC TESTING RESULTS

The hydraulic properties of the Suwannee Limestone and Ocala Limestone portions of the UFA were estimated by specific capacity testing. The hydraulic properties of the Avon Park Formation were determined by slug testing selected intervals during exploratory drilling. An off-bottom formation packer was used to isolate the selected intervals of the borehole. In addition, specific capacity tests were performed on each monitor well after completion. More extensive hydraulic testing of all aquifers will be performed during the third and final phase of the project, aquifer performance testing.

7.1 Suwannee Limestone and Ocala Limestone

The first specific capacity test was performed while exploratory drilling through the Suwannee Limestone. The borehole during the test was open from 715 feet bls (depth of casing) to 825 feet bls (bottom of the Suwannee Limestone). The borehole was pumped with a 2-inch centrifugal pump at 39 gallons per minute (gpm) for approximately 30 minutes. Drawdown in the well was 21. 5 feet. The specific capacity (pumping rate/drawdown) for this zone is 1.8 gpm/foot. The transmissivity for a well can be estimated from a known specific capacity by using a simplified Jacob equation:

$$\frac{Q}{s} = \frac{T}{264 \log \frac{0.3Tt}{r^2 S}}$$

where Q is the pumping rate, s is drawdown, T is transmissivity, t is time, r is the well radius, and S is storativity. Assuming typical values for the log function variables, the equation becomes (Driscoll, 1986):

$$\frac{Q}{s} = \frac{T}{2000}$$

The estimated transmissivity for the Suwannee Limestone (715 - 825 feet bls) interval is 3,600 gallons per day (gpd)/foot. The low transmissivity value obtained for this portion of the

Suwannee Limestone agrees with the visual description of the Suwannee Limestone lithology as low porosity, soft, clayey, limestone.

The second specific capacity test was performed after drilling to the base of the Ocala Limestone. The borehole for this test was open from 715 feet bls to 1,000 feet bls. The borehole was pumped with a 2-inch centrifugal pump at 78 gpm for approximately 30 minutes. Drawdown in the borehole was 16.4 feet. The calculated specific capacity for this zone is 4.8 gpm/foot. The estimated transmissivity is 9,600 gallons per day (gpd)/foot. The estimated hydraulic parameters from the specific capacity tests are presented in Table 4. Appendix A presents water level graphs during specific capacity testing.

7.2 Avon Park Formation

Six slug tests were performed in the Avon Park Formation from 1,350 feet bls to 1,814 feet bls. An off-bottom packer was used to isolate the borehole interval for each packer test. Appendix C presents a graph of the water level response for each slug test. The analytical method used for analysis of each slug test was determined by the water level response during the test. Five of the packer test intervals exhibited an underdamped oscillatory response indicative of high transmissivity aquifers. These intervals were analyzed using spreadsheets developed by Van Der Kamp (1976) and Weight and Wittman (1999).

The first slug test was performed in the 1350 - 1400 feet bls interval. The water level response after the slug was introduced was overdamped nonoscillatory. This data was analyzed with the AQTESOLV® software package. The Bower-Rice (1976), Cooper-Bredehoeft-Papadopulos (1967), and the KGS Model (Hyder et al. 1994) analytical solutions were used. The average estimated transmissivity based on the three methods was 63 feet^2/day. This zone was the least permeable of the zones tested in the Avon Park Formation.

The next four packer tests below 1400 feet exhibited the oscillatory water level response indicative of higher permeability aquifers. The highest transmissivity value was obtained from the 1,520 to 1,540 feet interval. This test interval was characterized by a large fracture extending horizontally for 18 inches. The transmissivity value from the Van Der Kamp analysis

was 4.67 x 10^3 feet²/day. The estimated transmissivity value from the Weight and Wittman analysis was 5.98 x 10^3 feet²/day. The remaining slug test values for transmissivity ranged from 6.5 x 10^2 feet²/day for the 1,430 - 1,500 feet bls interval to 3.81 x 10^3 feet²/day for the 1,761 - 1,814 feet bls interval. The hydraulic values calculated for each packer test are presented in Tables 5, 6, and 7. Appendices D presents the analyses for the 1,350 -1,400 feet analyses, Appendix E presents the Van Der Kamp spreadsheet analyses, and Appendix F presents the Weight and Wittman spreadsheet analyses.

8.0 MONITOR WELL CONSTRUCTION

Diversified Drilling Corporation under contract to SWFWMD, constructed five permanent monitor wells and two temporary monitor wells on the ROMP 16.5 wellsite from October 2000 to February 2001. One permanent surficial monitor well was previously constructed with the SWFWMD Central Mining and Equipment (CME) drill rig during the core drilling phase to supply water for drilling operations. Figure 4 shows the well locations and Table 8 presents the details of the wells.

8.1 PERMANENT SURFICIAL AQUIFER OBSERVATION WELL

The permanent 4-inch surficial aquifer observation well (Figure 13) was constructed in March 2000 using the District-owned CME drill rig. A 9-inch borehole drilled from land surface to 35 feet bls using hollow-stem augers. Four inch 0.010 slot schedule 40 poly-vinyl chloride (PVC) screen was installed from 35 feet bls to 5 feet bls and 4-inch schedule 40 PVC casing was installed from 5 feet bls to 3 feet above land surface. The annulus was filled with 6-20 silica sand from 35 feet bls to 3 feet bls. A bentonite seal was installed from 3.0 to 2.5 feet bls. Cement grout was installed from 2.5 feet bls to land surface. The specific capacity of the well is 2.2 gpm/foot. This well will be used as the surficial observation well during the aquifer performance test of the surficial aquifer.

8.2 PERMANENT SURFICIAL AQUIFER MONITOR WELL

The permanent 6-inch surficial aquifer monitor well was constructed in February 2001. An 11.5-inch borehole was drilled from land surface to 35 feet bls using the mud-rotary drilling method. Six inch 0.010 slot schedule 40 PVC screen was installed from 35 feet bls to 5 feet bls. Six inch schedule 40 PVC casing was installed from 5 feet bls to 3 feet above land surface. Number 20/30 silica sand was installed from 35 feet bls to 3 feet below land surface. A bentonite seal was installed from 3 feet bls to 2 feet bls. Cement grout was installed from 2 feet bls to land surface. Figure 14 presents a diagram of the well. The specific capacity of the well is 6.7 gpm/foot.

8.3 PERMANENT UPPER IAS MONITOR WELL

The permanent upper intermediate aquifer monitor well (Figure 15) was constructed in October 2000 by the District contractor, Diversified Drilling, Inc. The permeable zone for this well occurs in the Peace River Formation. An 11.5-inch borehole was drilled from land surface to 92 feet bls using the mud-rotary drilling method. Six-inch schedule 40 PVC 0.020-slot well screen was installed from 90 feet bls to 56 feet bls. Six-inch schedule 40 PVC casing was installed from 56 to 3 feet above land surface. Number 20/30 silica sand was installed from 92 feet bls to 53 feet bls. Bentonite pellets were installed from 53 feet bls to 47 feet bls. Portland cement grout was installed in the annulus from 47 feet bls to land surface using the tremie-method of grouting. The specific capacity of the well is 2.8 gpm/foot.

8.4 PERMANENT LOWER IAS MONITOR WELL

The permanent lower IAS well (Figure 16) was constructed in October 2000. A 17-inch borehole was drilled from land surface to 41 feet bls using the mud-rotary method of drilling. Forty-one feet of 12-inch welded steel casing was installed in the borehole and pressure grouted in place. An 11.5-inch borehole was then drilled from 41 feet bls to 348 feet bls using the mud-rotary method. Six inch schedule 40 PVC casing was installed from 348 feet bls to 3 feet above land surface and pressure grouted in place. A 5.625-inch borehole was then drilled from 347 feet bls to a total depth of 461 feet bls using the reverse-air method of drilling. The specific capacity of the well is 29.4 gpm/foot.

8.5 PERMANENT SUWANNEE/UFA WELL

The permanent Suwannee/UFA monitor well (Figure 18) was constructed in January and February 2001. A 29-inch borehole was drilled from land surface to 42 feet bls using the mud-rotary method. Eighteen-inch PVC casing was installed in the borehole from 39 feet bls to land surface and pressure grouted. A 12.5-inch borehole was drilled from 40 feet bls to 600 feet bls using the mud-rotary method. Six-inch schedule 40 PVC casing was installed from 600 feet bls to 3 feet above land surface and pressure grouted in place. A 5.625-inch

borehole was drilled from 600 feet bls to 827 feet bls using the reverse-air method. The specific capacity of the well is 2.5 gpm/foot.

8.6 PERMANENT AVON PARK/UFA MONITOR WELL

Well construction for the Avon Park well from land surface to 1,814 feet bls is described in Section 3.1. Figure 5 presents the Avon Park well configuration during exploratory drilling. After completing the exploratory testing the well was back-plugged with cement grout from 1,814 feet bls to 1,537 feet bls to monitor the highly transmissive dolostone zone (Figure 17). This well will be lined with 6-inch PVC after completion of the aquifer performance testing phase of project. The specific capacity of the well was 35.7 gpm/foot after back plugging.

8.7 TEMPORARY UPPER IAS MONITOR WELL

The temporary upper IAS monitor well was constructed in January 2001 on the temporary construction easement approximately 45 feet west of the 6-inch upper IAS monitor well (Figure 4). A 13.5-inch borehole was drilled from land surface to 92 feet bls using the mud-rotary method. Eight inch 0.020 slot schedule 40 well screen was installed from 87.5 feet bls to 53.5 feet bls. Eight inch schedule 40 PVC casing was installed from 53.5 feet bls to 3 feet above land surface. Number 20/30 silica sand was installed from 92 feet bls to 50 feet bls. A bentonite seal was installed from 50 feet bls to 44 feet bls. Cement grout was installed from 44 feet bls to land surface. Figure 19 presents a diagram of the well. The specific capacity of the well is 4.1 gpm/foot. This well be used as the pumped well for the aquifer performance test. The well will be abandoned following completion of the APT.

8.8 TEMPORARY LOWER IAS MONITOR WELL

The temporary lower IAS monitor well was constructed in January 2001 on the temporary construction easement approximately 140 feet northeast of the permanent lower IAS well (Figure 4). A 29-inch borehole was drilled from land surface to 40 feet bls using the mud-rotary method. Eighteen inch PVC casing was installed from land surface to 39 feet bls. A 17-inch borehole was then drilled from 40 feet bls to 349 feet bls. Twelve inch PVC casing was

then installed from 3 feet above land surface to 345 feet below land surface and pressure grouted in place. An 11.625-inch borehole was then drilled from 347 feet bls to 460 feet bls. Figure 20 presents a diagram of the well. The specific capacity of the well is 6.1 gpm/foot. This well will be used as the pumped or observation well during the aquifer performance test and will be abandoned following the APT.

9.0 SUMMARY

The second phase of the hydrogeologic investigation at ROMP 16.5, deep exploratory drilling and monitor well construction, began in October 2000 and was completed in February 2001. Drilling and testing from 1,170 to 1,814 feet bls was performed to define the stratigraphy and hydrology and to locate the salt-water interface and/or the middle confining unit of the Upper Floridan aquifer. Drill cuttings were collected and archived for lithologic description. Ground-water samples were collected at approximately 100 ft intervals for water quality profiling with depth.

The results of the drilling and testing, ground-water sampling, and geophysical logging indicate the most permeable portion of the UFA occurs below 1400 feet bls. Permeable dolostone extends from 1,400 feet bls to 1,814 feet bls. The most permeable section occurs in a highly fractured dolostone zone from 1,520 ft bls to 1,540 ft bls. The top of the salt-water interface (1,000 mg/L chloride isochlor) was encountered at 1,520 feet bls - near the top of this highly fractured zone. Ground-water mineralization increased rapidly with depth below 1,520 feet bls. The middle confining unit was not encountered during drilling to 1,814 feet bls. Drilling was stopped at 1,814 feet bls due to the high total dissolved solids (TDS) of the discharged water during reverse-air drilling. The TDS of the ground-water was 31,330 mg/L and the specific conductance was 51,900 umhos/cm at 1,814 feet bls.

Five permanent monitor wells were constructed to monitor the surficial, intermediate, and Upper Floridan aquifers. A six-inch surficial, six-inch upper IAS, six-inch lower IAS, six-inch Suwannee/UFA, and a six-inch Avon Park/UFA monitor well were constructed on the permanent easement. In addition a 12-inch lower IAS, and a eight-inch upper IAS well was constructed on the temporary easement for use as pumping wells during aquifer performance testing. The third and final phase of work at the ROMP 16.5 well site is aquifer performance testing, scheduled for Spring/Summer 2001.

10.0 REFERENCES

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Table 1. Field Analyses of ROMP 16.5 Packer Test Samples Collected During Exploratory Drilling

UID # 2336-18239-0

Date (M/D/Y)	Time	Depth (feet bls)	Specific Cond (umhos)	H20 Temp (celcius)	CL	SO4	pH	Notes
12/06/00	1500	1260 to 1290	1140	24.8	200	250	8.46	Airlifted sample
12/11/00	1645	1350 to 1400	1147	25.8	240	300	7.92	Airlifted sample
12/13/00	1545	1430 to 1500	1198	29.0	260	325	7.94	Airlifted sample
12/18/00	1320	1520 to 1540	5520	28.4	2000	400	NA	Airlifted sample - Highly T Zone
12/21/00	905	1590 to 1636	37200	27.8	13000	1200	7.53	Airlifted sample
12/27/00	1700	1690 to 1740	45500	28.3	16000	1600	7.68	Airlifted sample
01/03/01	1530	1761 to 1814	45900	28.2	16000	NA	7.74	Airlifted sample

12" Steel casing Land Surface - 715' bls

explwq.wb3

* All concentrations reported in mg/L unless otherwise noted

NA - Not Analyzed

Table 2. Laboratory Analyses of ROMP 16.5 Packer Test Samples Collected During Exploratory Drilling

Date (M/D/Y)	Time	Depth (feet bls)	Specific Cond. (umhos)	CL	SO4	pH	TDS	Ca	Mg	Bicarb as (CaCO3)	K	Na	Si	Fe (ug/l)	Total Hardness (CaCO3)	ION %
12/06/00	1500	1260 to 1290	1146	175	183	8.3	683	67.4	41.3	126	4.63	87	17.5	<25	338	-0.7
12/11/00	1645	1350 to 1400	1166	180	161	8.0	724	71.9	40	131	4.03	91.7	22.8	<25	344	1.76
12/13/00	1545	1430 to 1500	1192	189	162	8.1	734	72.6	38	137	4.19	100	23.3	220	337	2.03
12/18/00	1320	1520 to 1540	5380	1510	303	8.0	3288	260	135	110	9.81	641	18.9	40	1205	2.99
12/21/00	905	1590 to 1636	38740	13311	2103	7.8	25060	846	866	102	238	6870	13.6	840	5679	-0.19
12/27/00	1700	1690 to 1740	49620	16019	2626	7.7	31140	894	1040	106	361	9020	12.4	1380	6515	2.28
01/03/01	1530	1761 to 1814	51900	16464	2477	7.8	31330	851	1060	107	373	9190	12.2	1100	6490	2.02

12" Steel casing Land Surface - 715' bls

* All concentrations reported in mg/L unless otherwise noted

NA - Not Analyzed

Table 3 . Water Levels During Exploratory Drilling

Date	Time	Open Hole Depth (feet from ls)	EXPL Bore Hole Water Level (feet from ls)	UIAS Monitor Well (feet from ls)	LIAS Monitor Well (feet from ls)
11/28/2000	600	927	1.40	-5.00	1.10
11/29/2000	600	1052	1.40	-5.00	1.65
11/30/2000	600	1293	1.30	-4.97	1.10
12/04/2000	600	1293	1.25	-5.15	1.02
12/05/2000	600	1293	1.27	-5.12	1.01
12/06/2000	600	1293	1.24	-5.10	-0.40
12/07/2000	600	1293	0.90	-5.14	-0.54
12/11/2000	600	1400	0.97	-5.12	-0.50
12/12/2000	600	1400	0.93	-5.16	-0.58
12/13/2000	600	1500	0.46	-5.17	-1.00
12/14/2000	600	1500	0.52	-5.18	-0.89
12/18/2000	600	1540	0.49	-5.23	-0.51
12/19/2000	600	1540	0.41	-5.17	-0.57
12/20/2000	600	1636	-1.17	-5.26	-2.00
12/21/2000	600	1650	-3.64	-5.25	-3.64
12/26/2000	600	1650	-0.70	-5.28	-1.68
12/27/2000	600	1740	-1.04	-5.27	-1.4
12/28/2000	600	1740	-0.90	-5.24	-1.17
01/02/2001	600	1791	-5.12	-5.03	-3.8
01/03/2001	600	1814	-5.48	-5.41	-2.57
01/04/2001	600	1814	-5.46	-5.43	-2.73

expl.xls

Table 4. Specific Capacity Test Results During Exploratory Drilling

Test Number	Test interval (feet below land surface)	Interval Thickness (feet)	Stratigraphic Unit	Hydrogeologic Unit	Specific Capacity (gpm/ft)	Estimated Horizontal Hydraulic Conductivity* (ft/day)	Estimated Transmissivity* (ft^2/day)	Comments
SCT 1	715 - 825'	110	Suwannee Lm	UFA	1.8	4	5E+02	Open hole interval - pumped.
SCT 2	715 - 1000'	285	Suwannee & Ocala Lm	UFA	4.8	5	1E+03	Open hole interval - pumped.

** Based on simplified Jacob equation (Driscoll, 1986).*

Table 5. Results from the 1350 - 1400' Slug Test Analyses

Test Number	Test interval (feet below land surface)	Interval Thickness (feet)	Stratigraphic Unit	Hydrogeologic Unit	Specific Capacity (gpm/ft)	Estimated Horizontal Hydraulic Conductivity[1] (ft/day)	Estimated Transmissivity[1] (ft^2/day)	Solution Method
PT 1	1350 -1400'	50	Avon Park Fm	UFA	N/A	5.30E-01	2.65E+01	Bower-Rice Analyses (Slug in)
PT 1	1350 -1400'	50	Avon Park Fm	UFA	N/A	1.54E+00	7.70E+01	Cooper-Bredehoeft-Papadopulos (Slug In)
PT 1	1350 -1400'	50	Avon Park Fm	UFA	N/A	1.70E+00	8.50E+01	KGS Model (Slug In)

Table 6. Results from the Van Der Kamp Analyses of the Packer Test Data

Test Number	Test interval (feet below land surface)	Interval Thickness (feet)	Stratigraphic Unit	Hydrogeologic Unit	Specific Capacity (gpm/ft)	Estimated Horizontal Hydraulic Conductivity[1] (ft/day)	Estimated Transmissivity[1] (ft^2/day)	Comments
PT 2	1430 - 1500'	70	Avon Park Fm	UFA	N/A	1.44E+01	1.01E+03	Packer interval -slug in test.
PT 3	1520 - 1540'	20	Avon Park Fm	UFA	N/A	2.33E+02	4.67E+03	Packer interval -slug in test.
PT 4	1590 - 1636'	46	Avon Park Fm	UFA	N/A	4.71E+01	2.17E+03	Packer interval -slug in test.
PT 5	1690 - 1740'	50	Avon Park Fm	UFA	N/A	2.10E+01	1.05E+03	Packer interval -slug in test.
PT 6	1761 - 1814'	53	Avon Park Fm	UFA	N/A	7.18E+01	3.81E+03	Pakcer interval - slug in test.

*[1] Based on T = K*b*

packtest.wb3

Table 7. Results from the Weight & Witman Analyses of the Packer Test Data

Test Number	Test interval (feet below land surface)	Interval Thickness (feet)	Stratigraphic Unit	Hydrogeologic Unit	Specific Capacity (gpm/ft)	Estimated Horizontal Hydraulic Conductivity[1] (ft/day)	Estimated Transmissivity[1] (ft^2/day)	Comments
PT 2	1430 - 1500'	70	Avon Park Fm	UFA	N/A	9.29E+00	6.50E+02	Packer interval -slug in test.
PT 3	1520 - 1540'	20	Avon Park Fm	UFA	N/A	2.99E+02	5.98E+03	Packer interval -slug in test.
PT 4	1590 - 1636'	46	Avon Park Fm	UFA	N/A	3.16E+01	1.46E+03	Packer interval -slug in test.
PT 5	1690 - 1740'	50	Avon Park Fm	UFA	N/A	1.48E+01	7.38E+02	Packer interval -slug in test.
PT 6	1761 - 1814'	53	Avon Park Fm	UFA	N/A	5.53E+01	2.93E+03	Pakcer interval - slug in test.

Table 8. Specific Capacity Results and Details of the Monitor Wells

Monitor Well	Monitored interval (feet below land surface)	Interval Thickness (feet)	Stratigraphic Unit	Hydrogeologic Unit	Specific Capacity (gpm/ft)	Estimated Horizontal Hydraulic Conductivity[1] (ft/day)	Estimated Transmissivity[1] (ft^2/day)	Comments
MW 1	715 - 1537	822	Avon Park Fm	UFA	35.7	1E+01	1E+04	12" open hole well
MW 2	5 - 35	30	Undiff Sand and Clay	Surficial	6.7	6E+01	2E+03	6" screened well
MW 3	600 - 825	20	Suwannee Lm	UFA	2.5	3E+01	7E+02	6" open hole well
MW 4	53 -88	35	Peace River Fm	IAS	2.8	2E+01	7E+02	6" screened well
MW 5	347 - 461	114	Tampa/Nocatee Fm	IAS	29.4	7E+01	8E+03	6" open hole well
MW 6	5 - 35	30	Undiff Sand and Clay	Surficial	2.2	2E+01	6E+02	4" screened well
Temp 1	347 - 461	114	Tampa/Nocatee Fm	IAS	6.1	1E+01	2E+03	12" open hole well
Temp2	53 -88	35	Peace River Fm	IAS	4.1	3E+01	1E+03	8" screened well

[1] *Based on T = K*b*

explpacktest.wb3

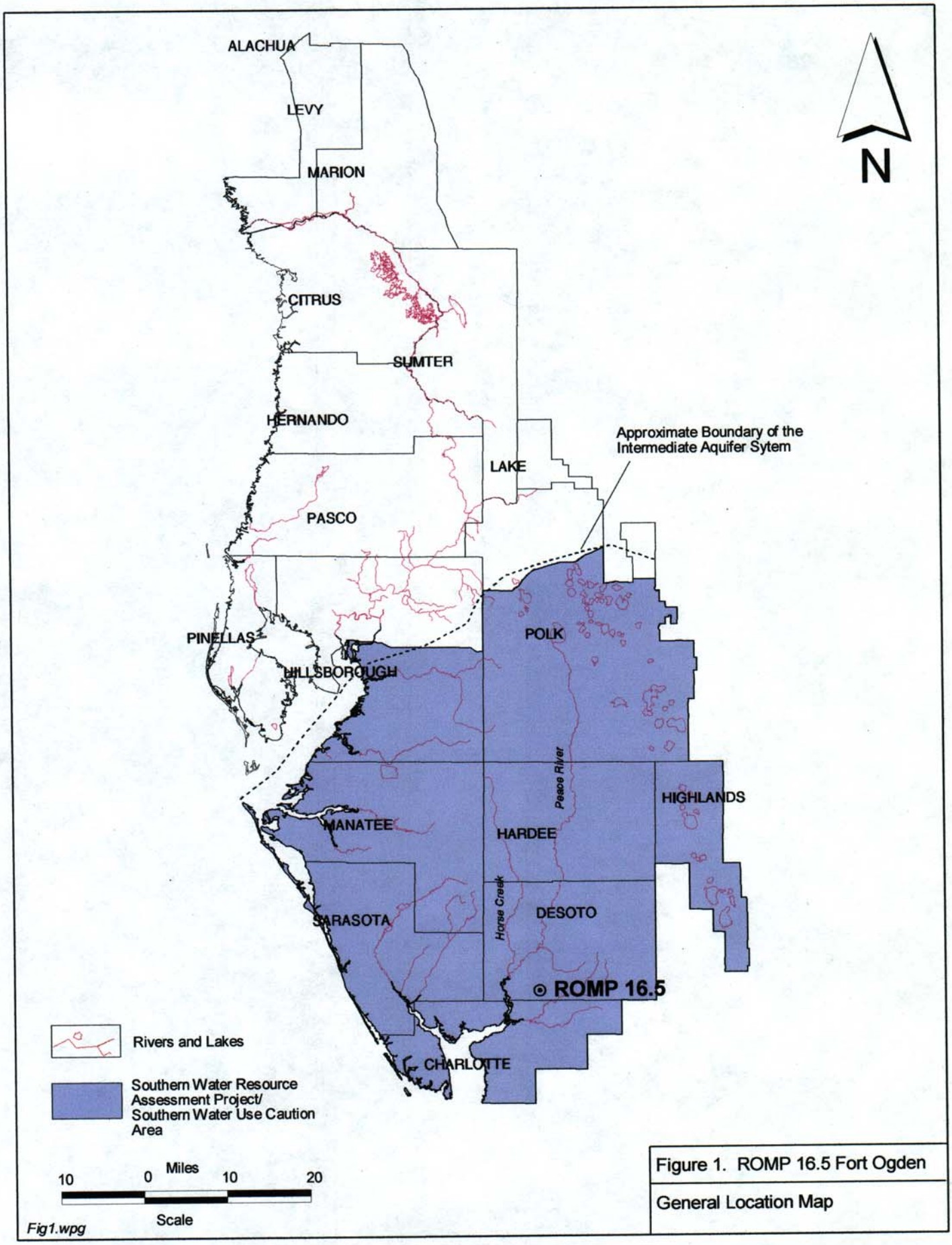
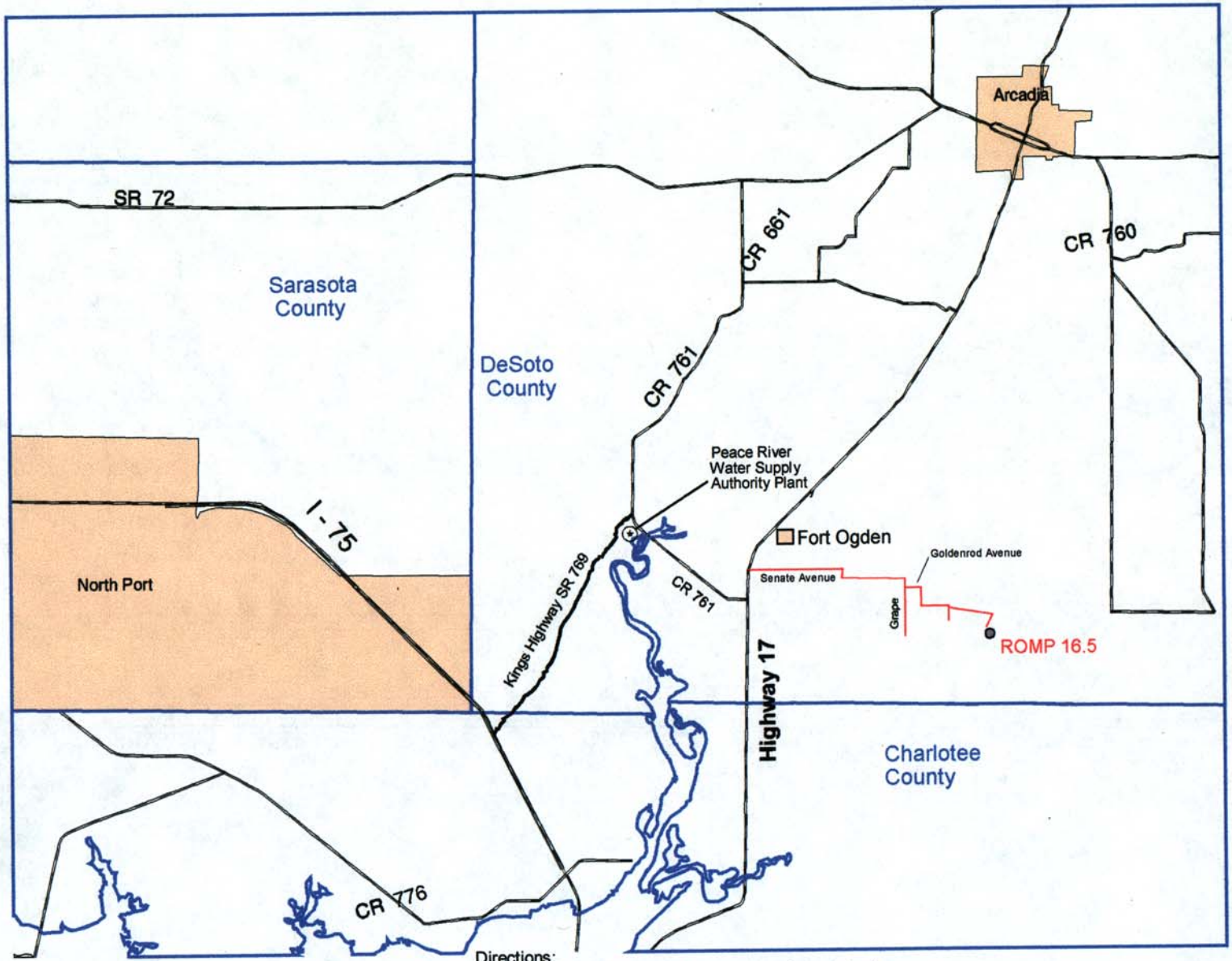


Figure 1. ROMP 16.5 Fort Ogden

General Location Map



Directions:
From Hwy 17/35 go East on Senate Ave for ~.3.4 miles.
Go South on Grape Ave for ~0.45 miles .
Go East on Goldenrod Ave for 0.25 miles.
Go South for 0.5 miles
Go East for 0.25 miles
Go through gate at end of citrus grove and drive East for 0.7 miles, wellsite will be visible to the South.

Figure 2. ROMP 16.5 Fort Ogden

Project Location Map

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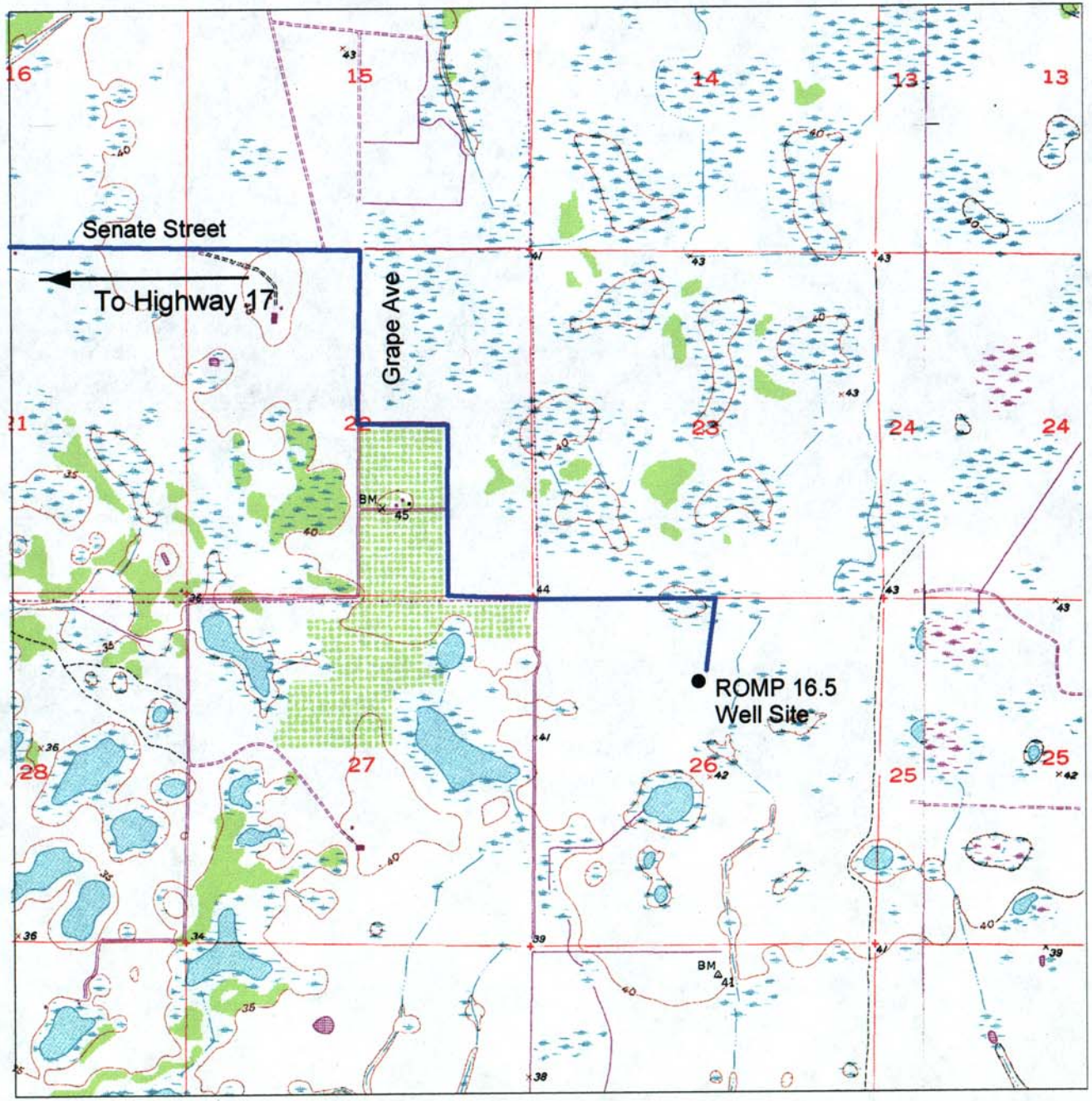


Figure 3. ROMP 16.5 Ft Ogden

Well Site Topogaphic Map

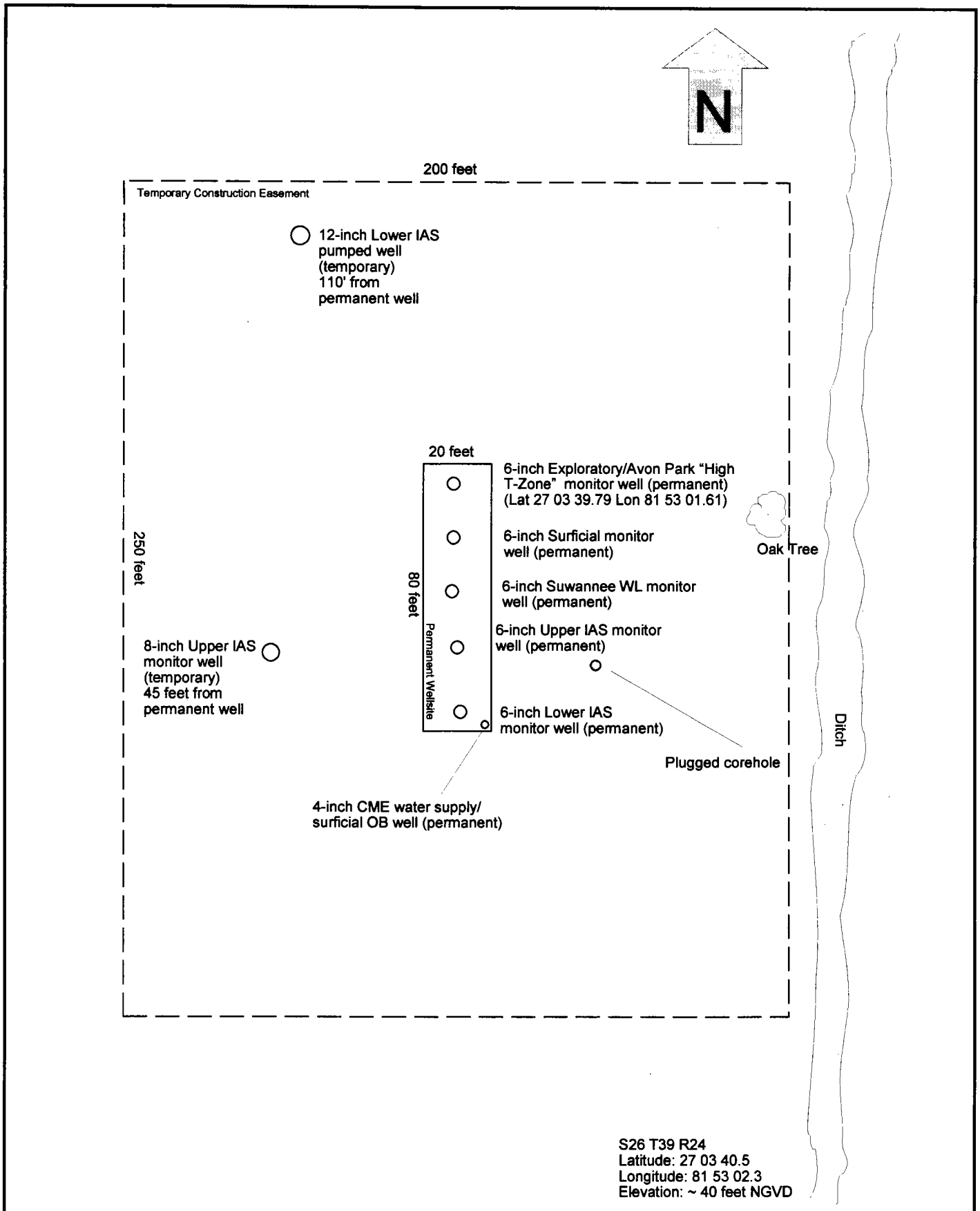


Figure 4. ROMP 16.5 Ft. Ogden

Monitor Well Site Diagram

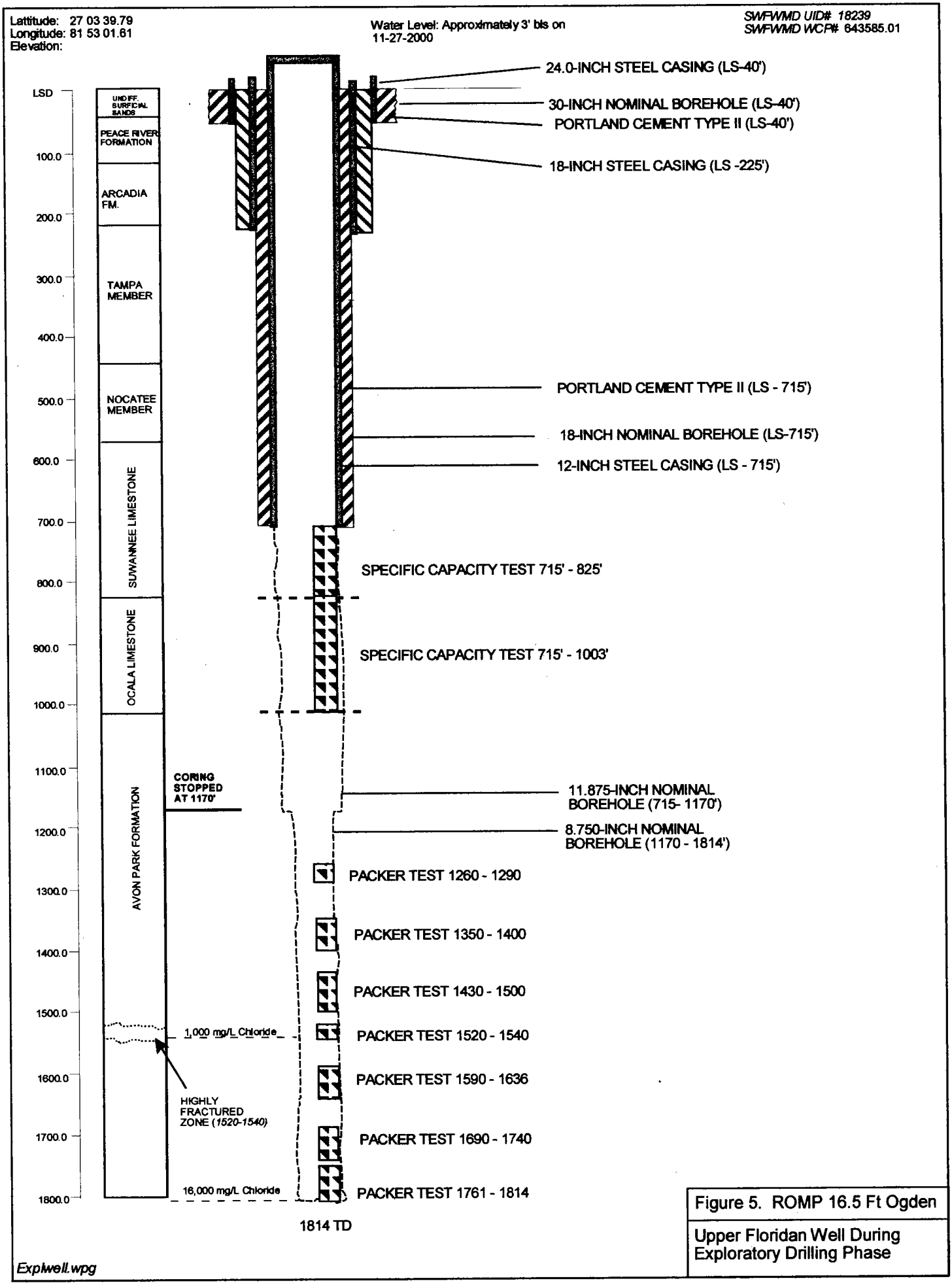


Figure 5. ROMP 16.5 Ft Ogden

Upper Floridan Well During Exploratory Drilling Phase

Explwell.wpg

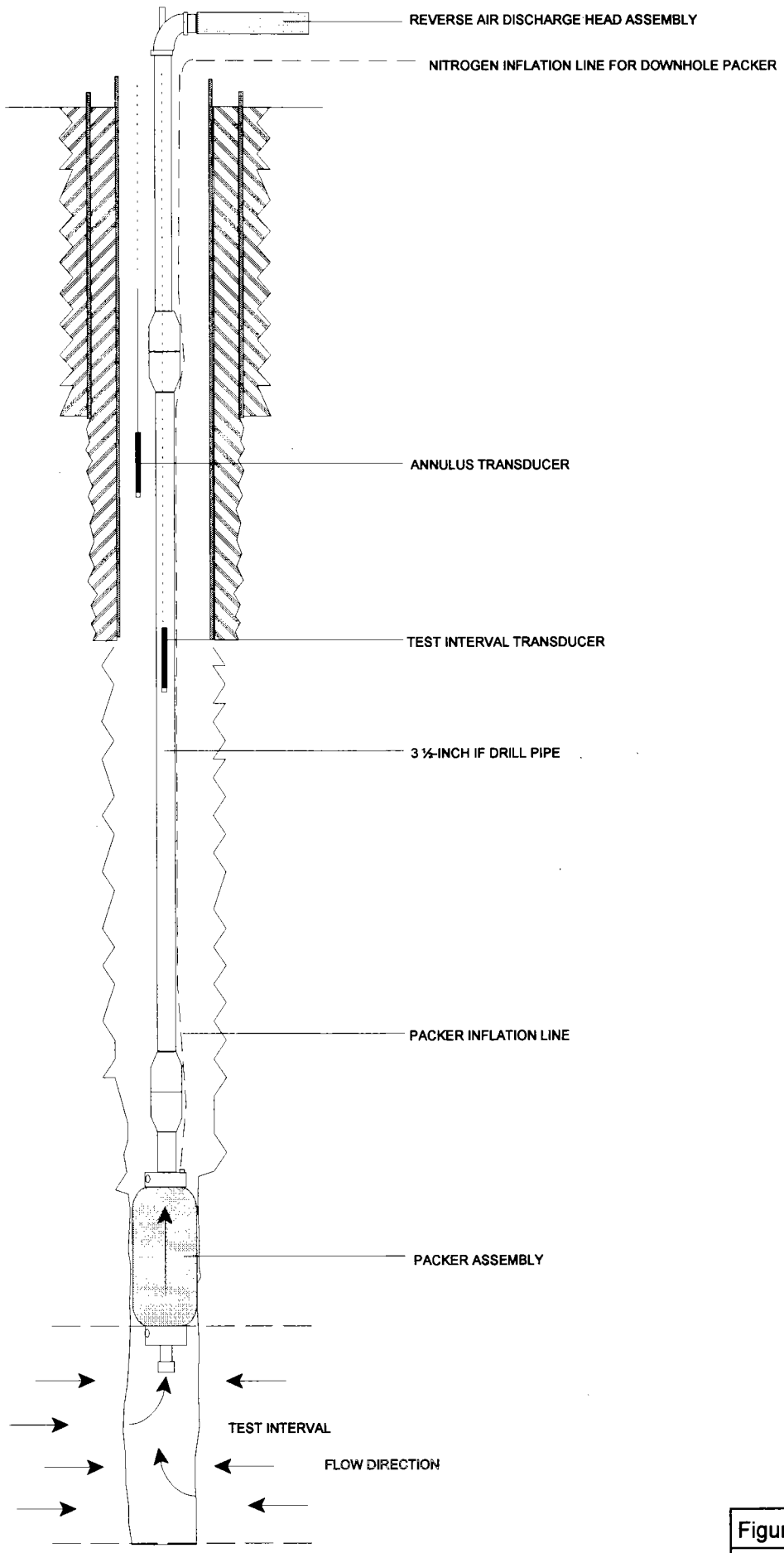
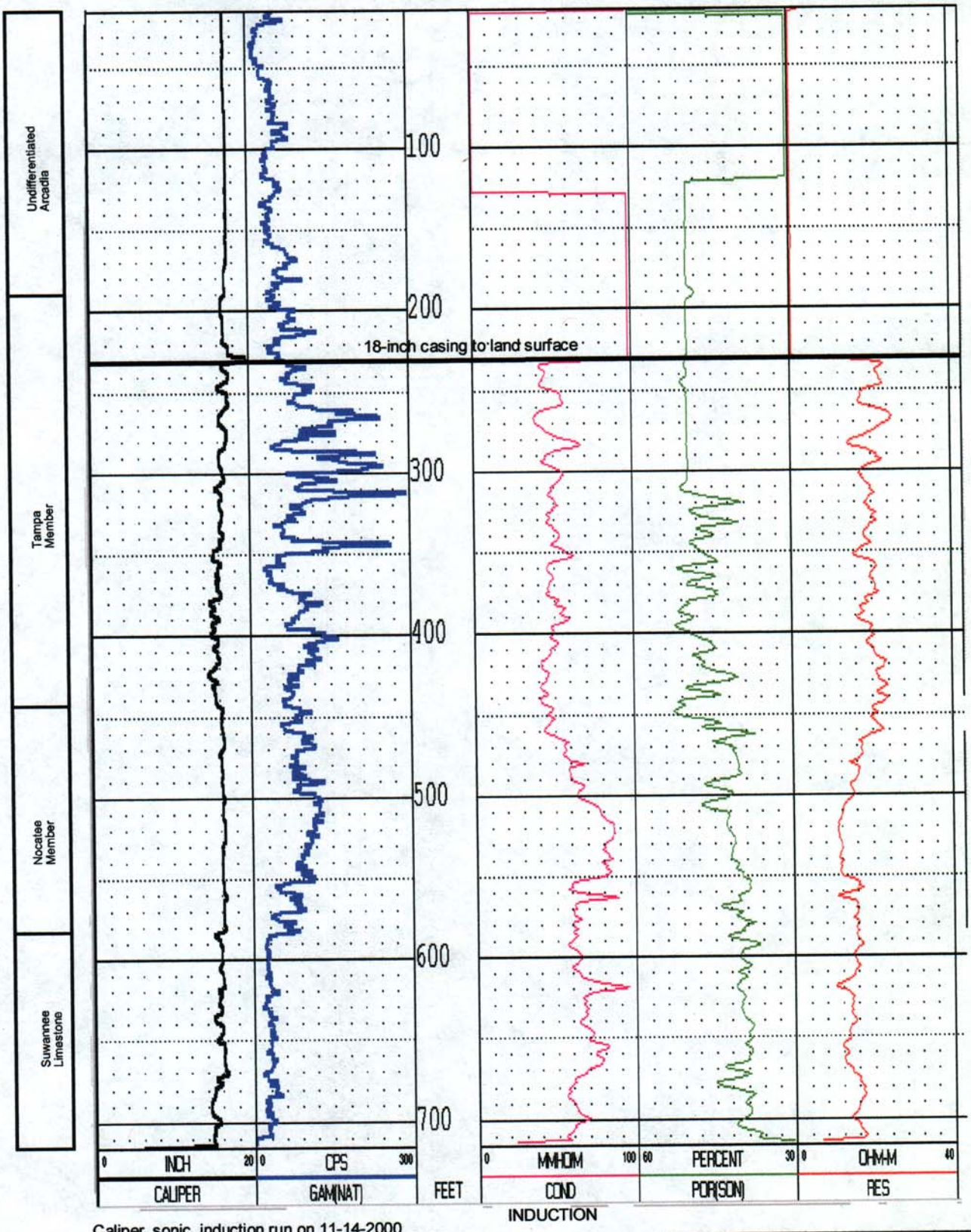


Figure 6. ROMP 16.5 Ft. Ogden

Off-Bottom Packer Diagram

Epixpkr.wpg

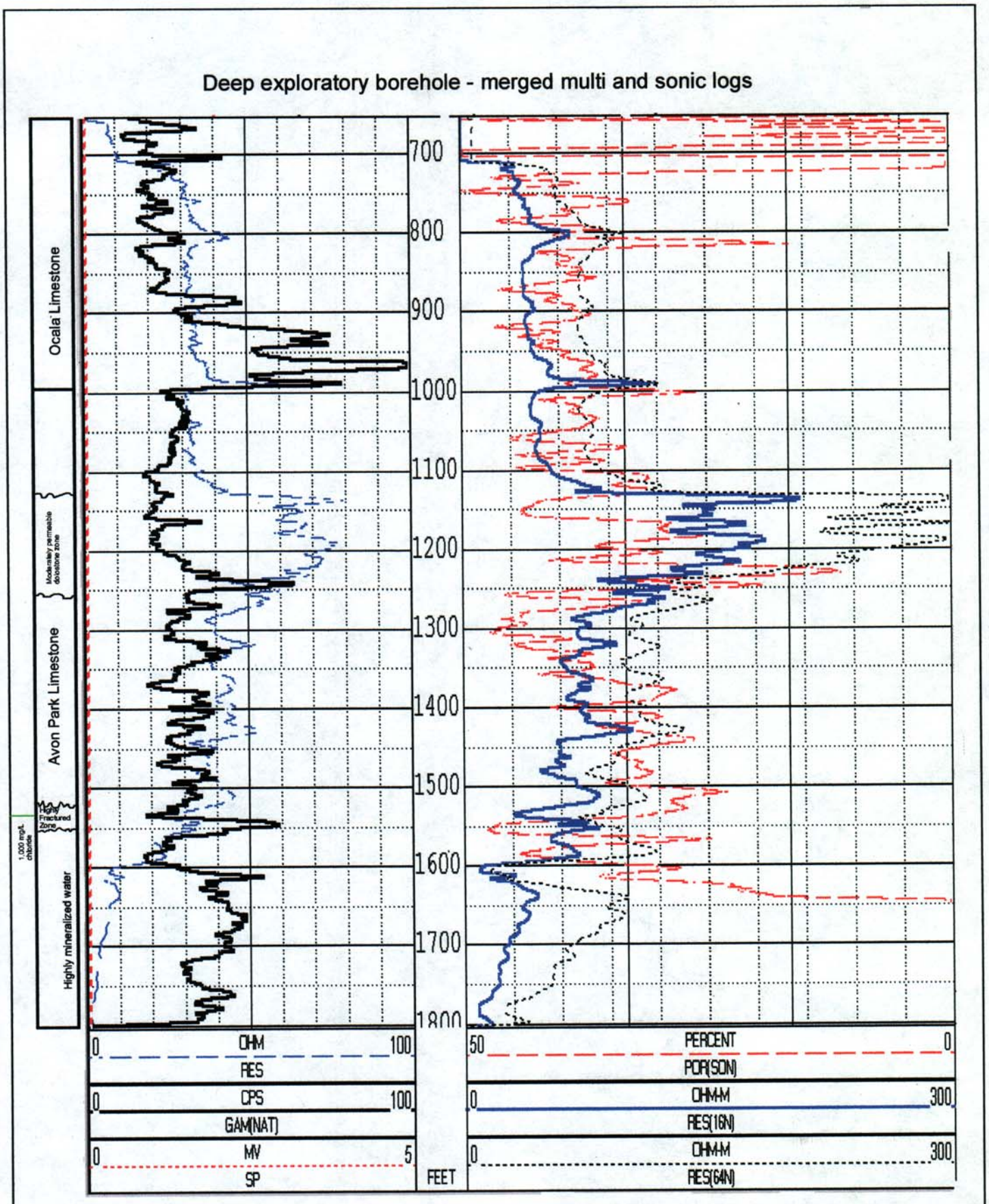


Caliper, sonic, induction run on 11-14-2000
Prior to installing 12-inch casing (borehole 225 - 715)

Figure 7. ROMP 16.5 Fort Ogden

Geophysical Logs (225 - 715 feet bls)

Explog715calsonic.wpg

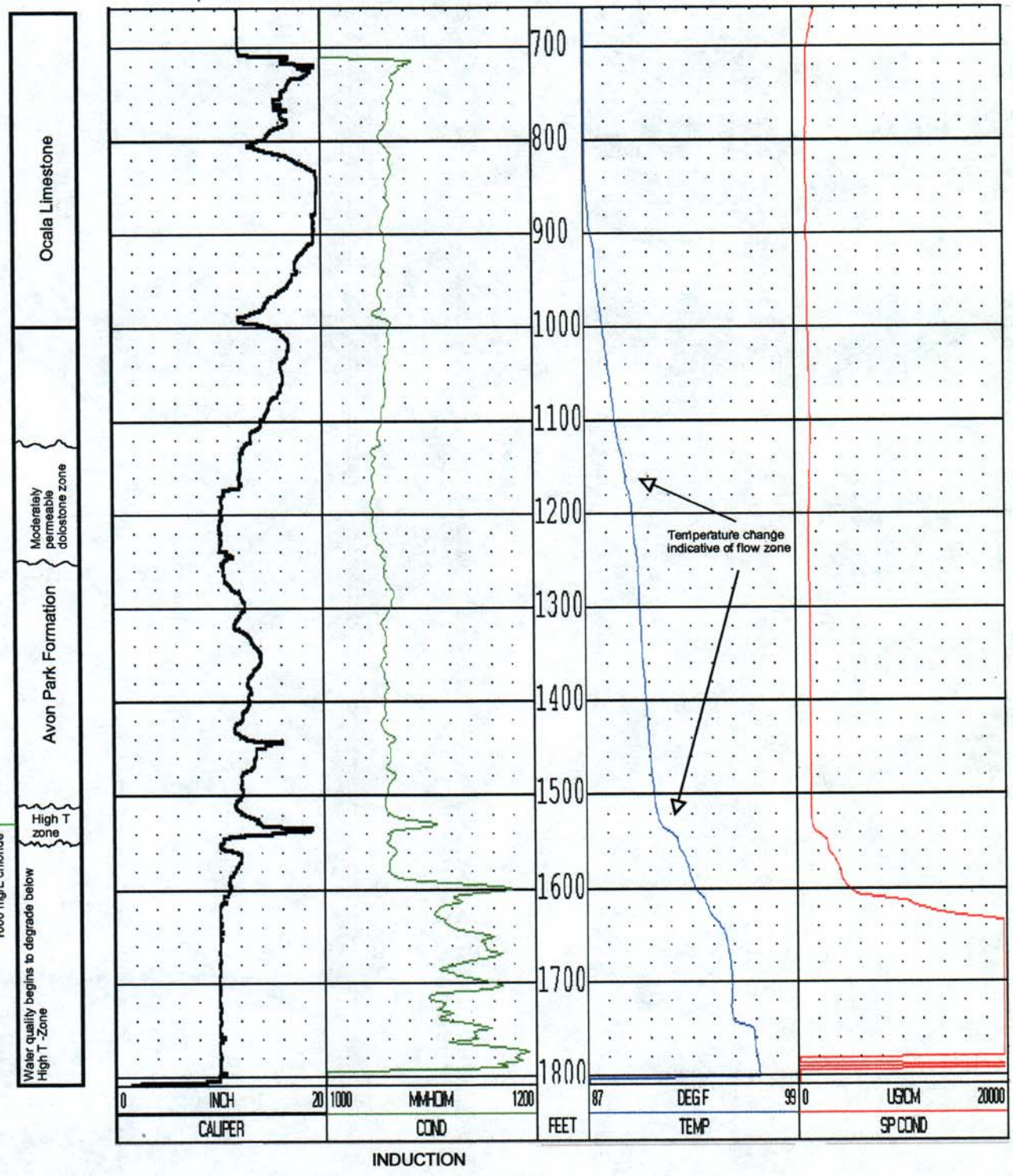


Multi tool run on 1-2-2001 (715 - 1814)
Sonic run on 12-20-2000 (715 - 1636)

Figure 8. ROMP 16.5 Fort Ogden

Geophysicl Logs (715 - 1814 feet bls)

Explog1811multisonic



All logs run 1-2-2001 (borehole 715 - 1814)

Figure 9. ROMP 16.5 Fort Ogden

Geophysical Logs (715 to 1814 feet bls)

Explog1811caltemp.wpg

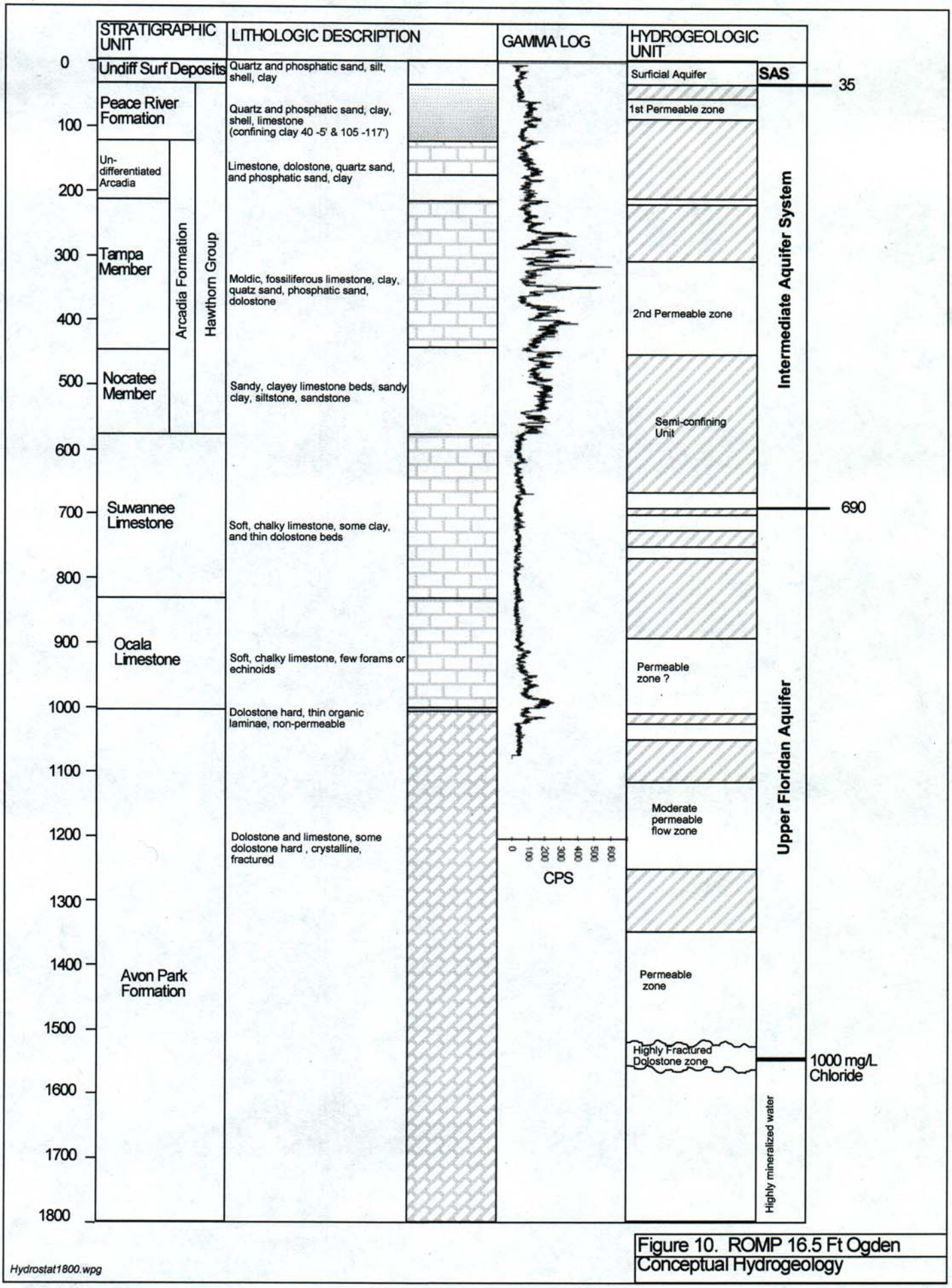
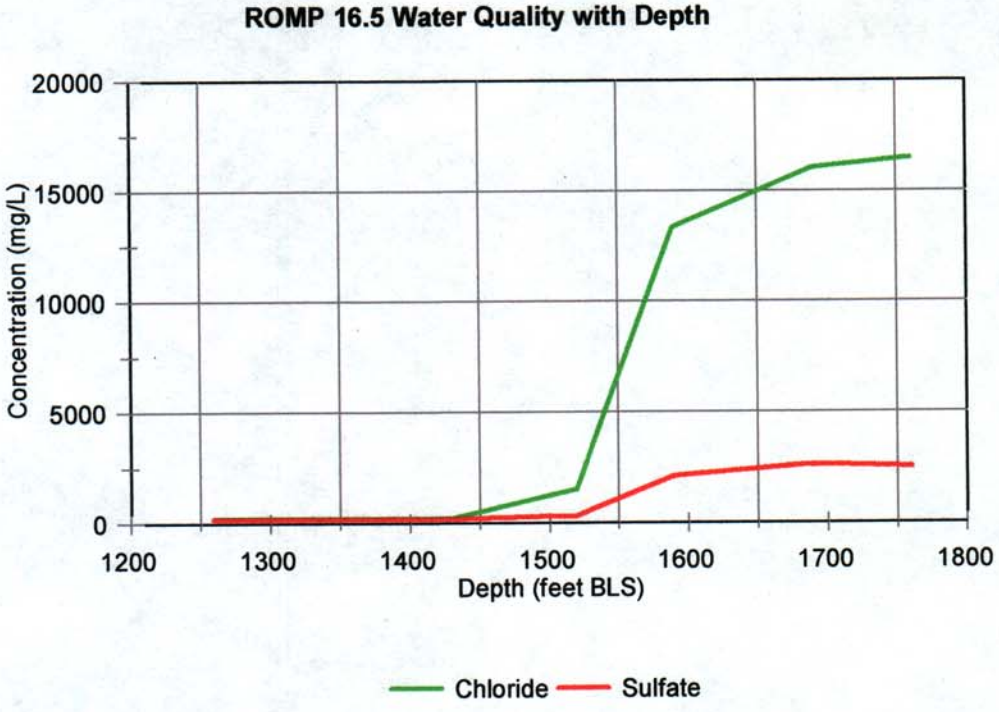


Figure 10. ROMP 16.5 Ft Ogden
Conceptual Hydrogeology

Hydrostat1800.wpg



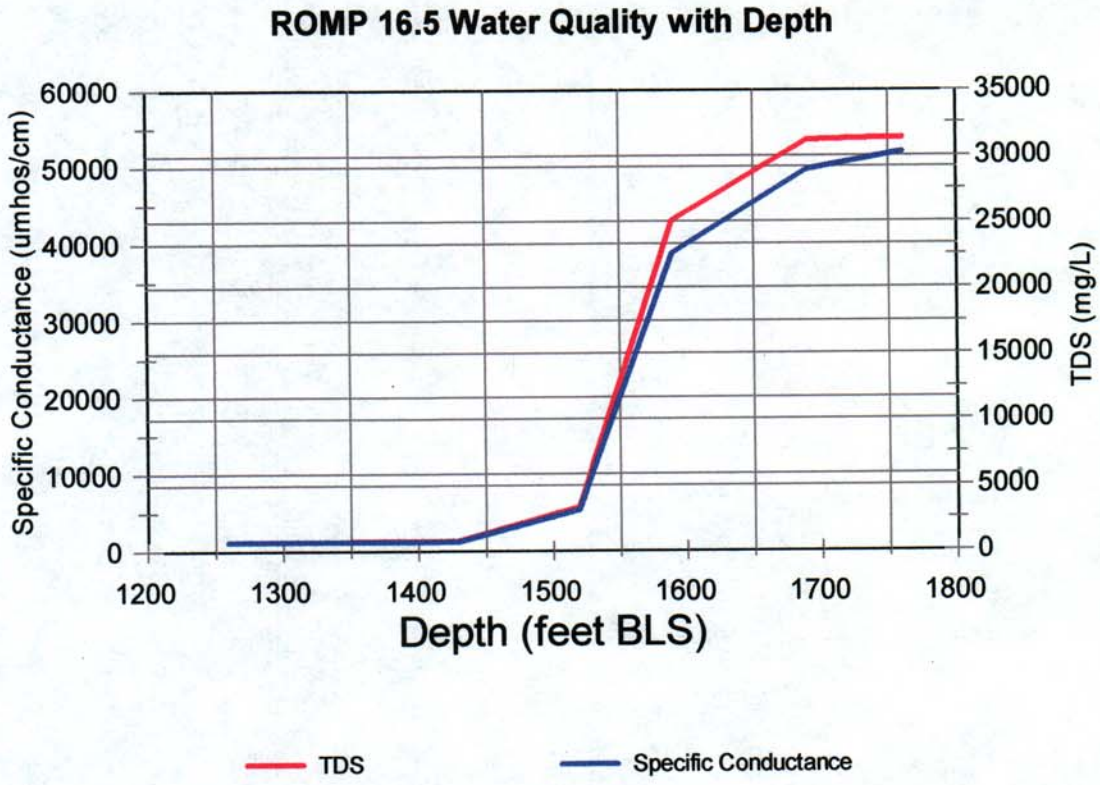
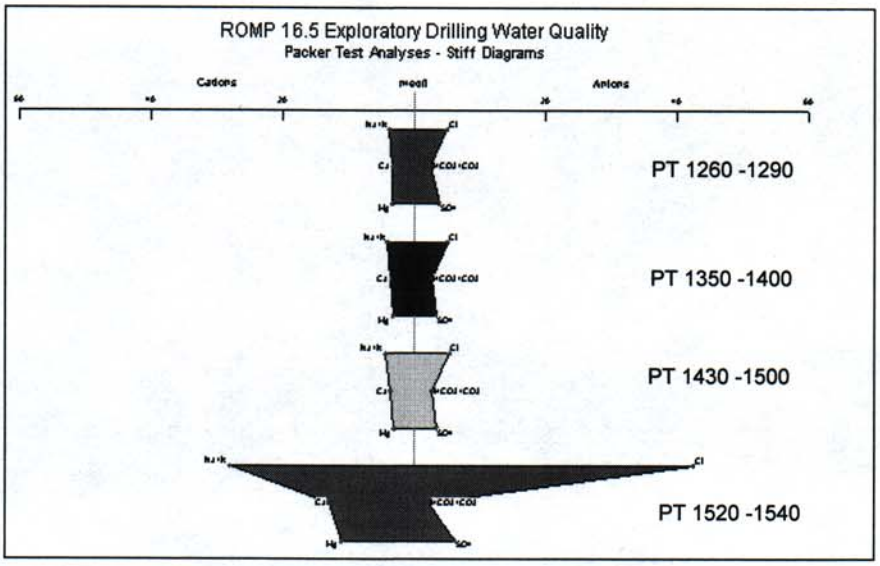


Figure 11. ROMP 16.5 Ft Ogden Water Quality Graphs

Explwqgraph.wpg



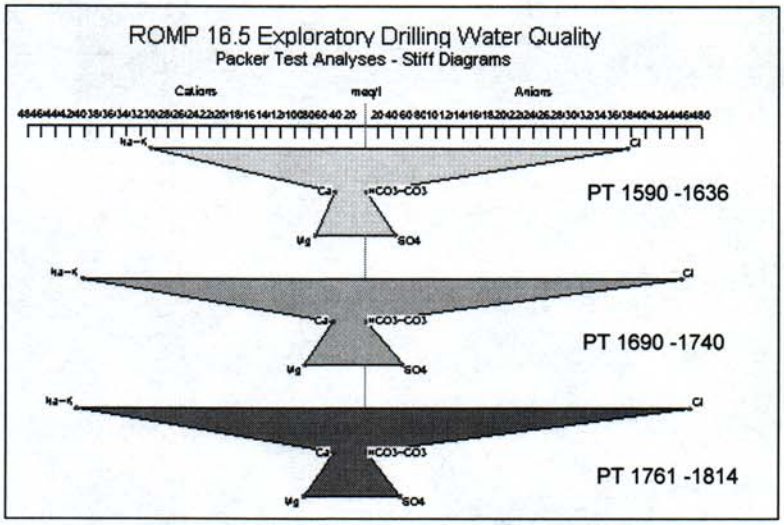
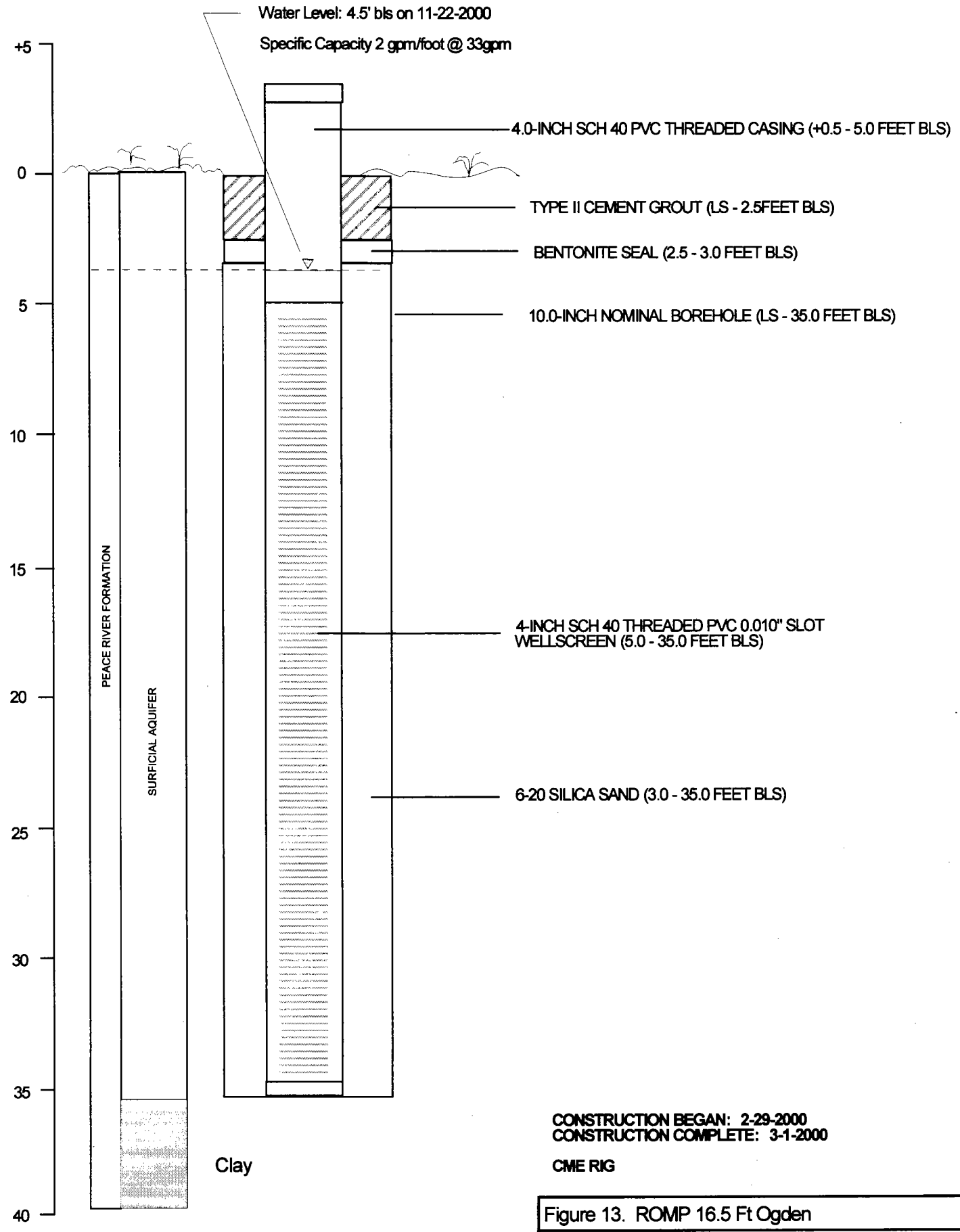


Figure 12. ROMP 16.5 Ft Ogden

Stiff Diagrams of Water Analyses

Explstiff.wpg

WCP # 631768.01



CONSTRUCTION BEGAN: 2-29-2000
CONSTRUCTION COMPLETE: 3-1-2000

CME RIG

Figure 13. ROMP 16.5 Ft Ogden

Diagram of Permanent 4-inch Surficial Aquifer Monitor Well

Watersupply.wpg

WCP # 643584.01

Water Level: 4.25 ft bls on 2-21-2001
Specific Capacity: 7gpm/foot @ 50gpm

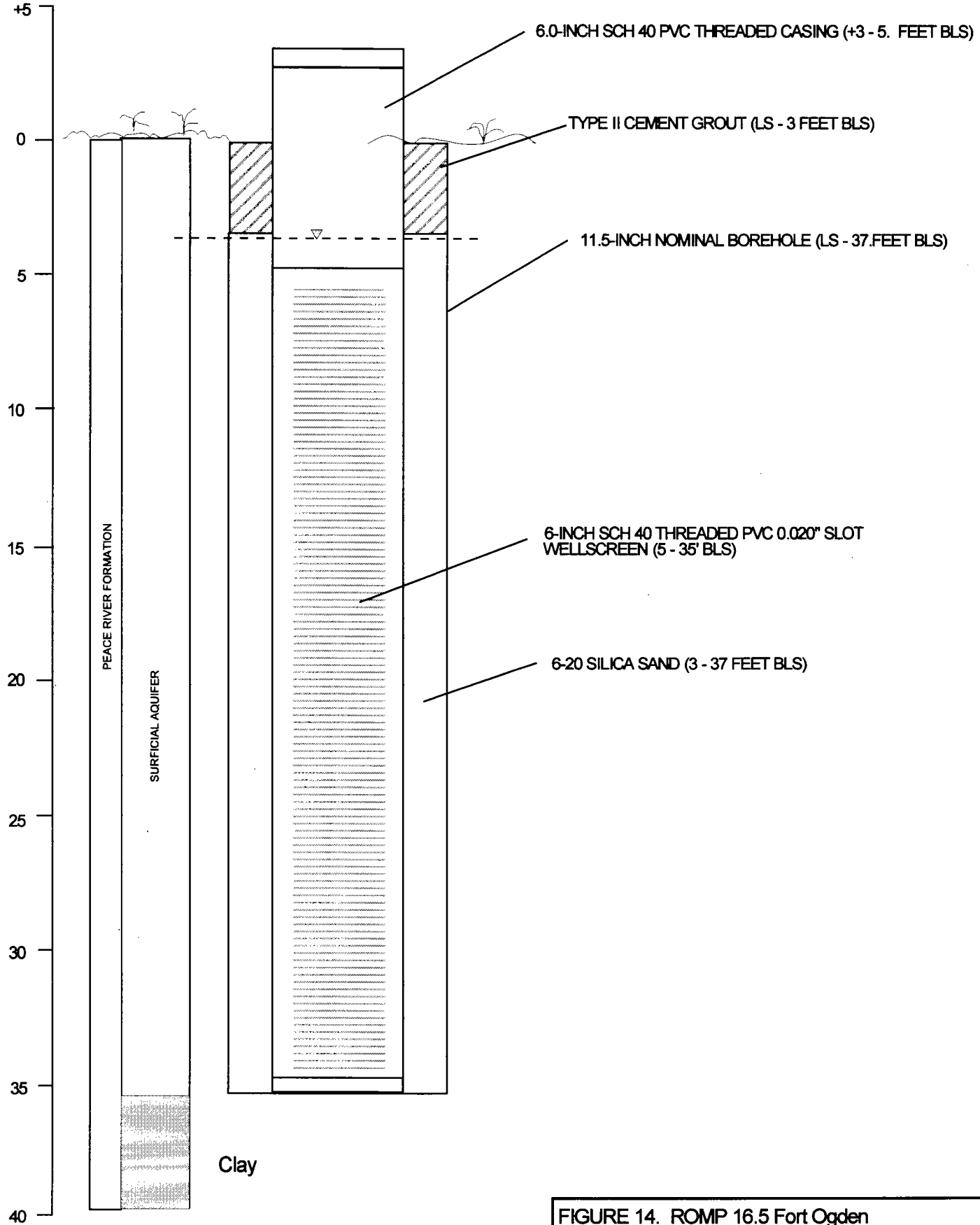


FIGURE 14. ROMP 16.5 Fort Ogden

Diagram of Permanent 6-inch Surficial Aquifer Monitor Well

Surficial.wpg

PERMIT # 634589.01

Water Level: 5.4 feet bls on 1-4-2001

Specific Capacity: 3gpm/foot @ 50 gpm

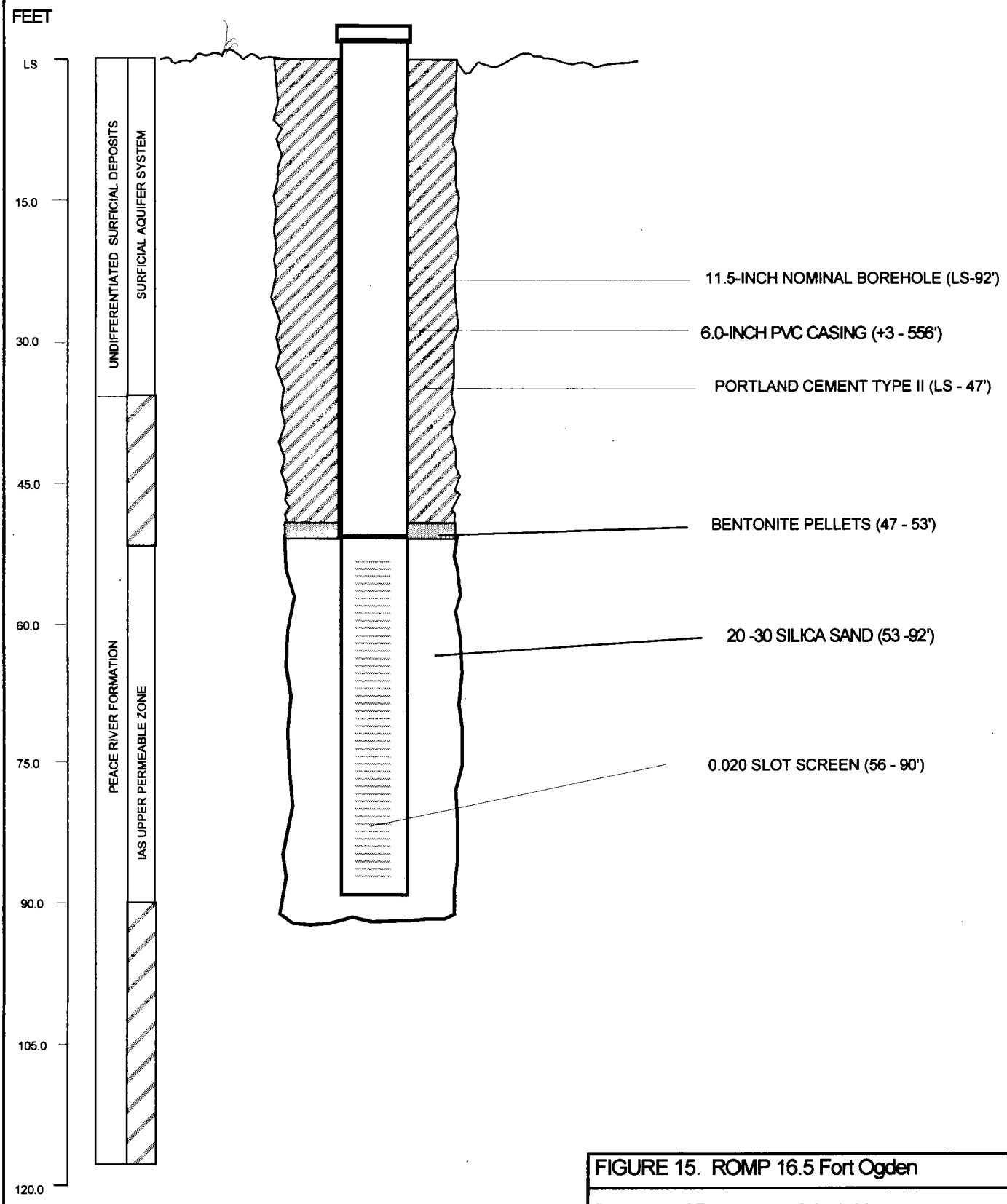


FIGURE 15. ROMP 16.5 Fort Ogden

Diagram of Permanent 6-inch Upper IAS Monitor Well

Upz.wpg

WCP # 643587.01

FEET

Water Level: 4.7 feet bls on 2-21-2001

Specific Capacity: 29 gpm/foot @ 125 gpm

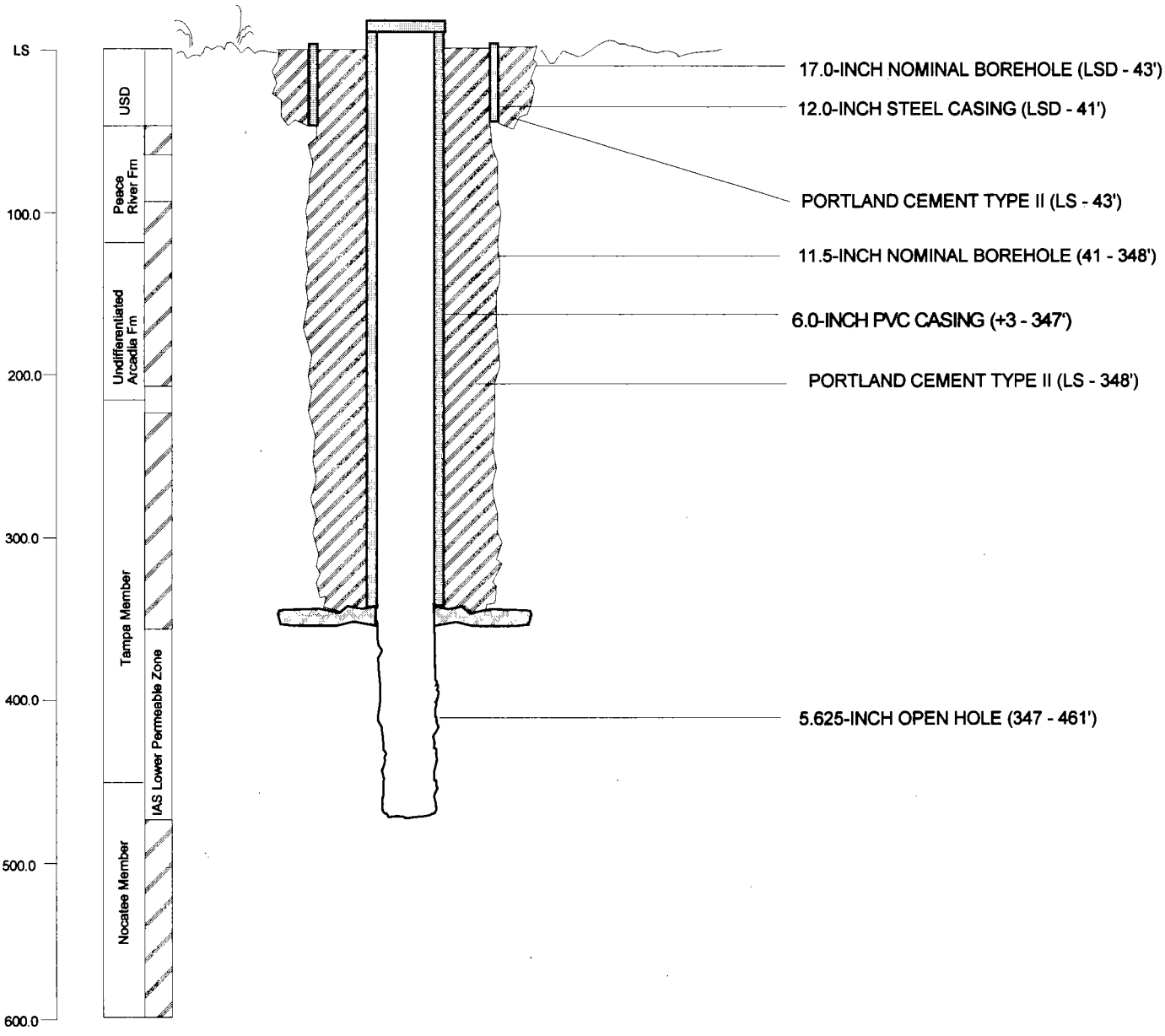


FIGURE 16. ROMP 16.5 Ft Ogden

Diagram of Permanent 6-inch Lower IAS Monitor Well

Lpz.WPG

Lattitude: 27 03 39.79
Longitude: 81 53 01.61
Elevation:

Water Level: 1.3 Feet bls on 2-21-2001
Specific Capacity:

SWFWMD UID# 18239
SWFWMD WCP# 643585.01

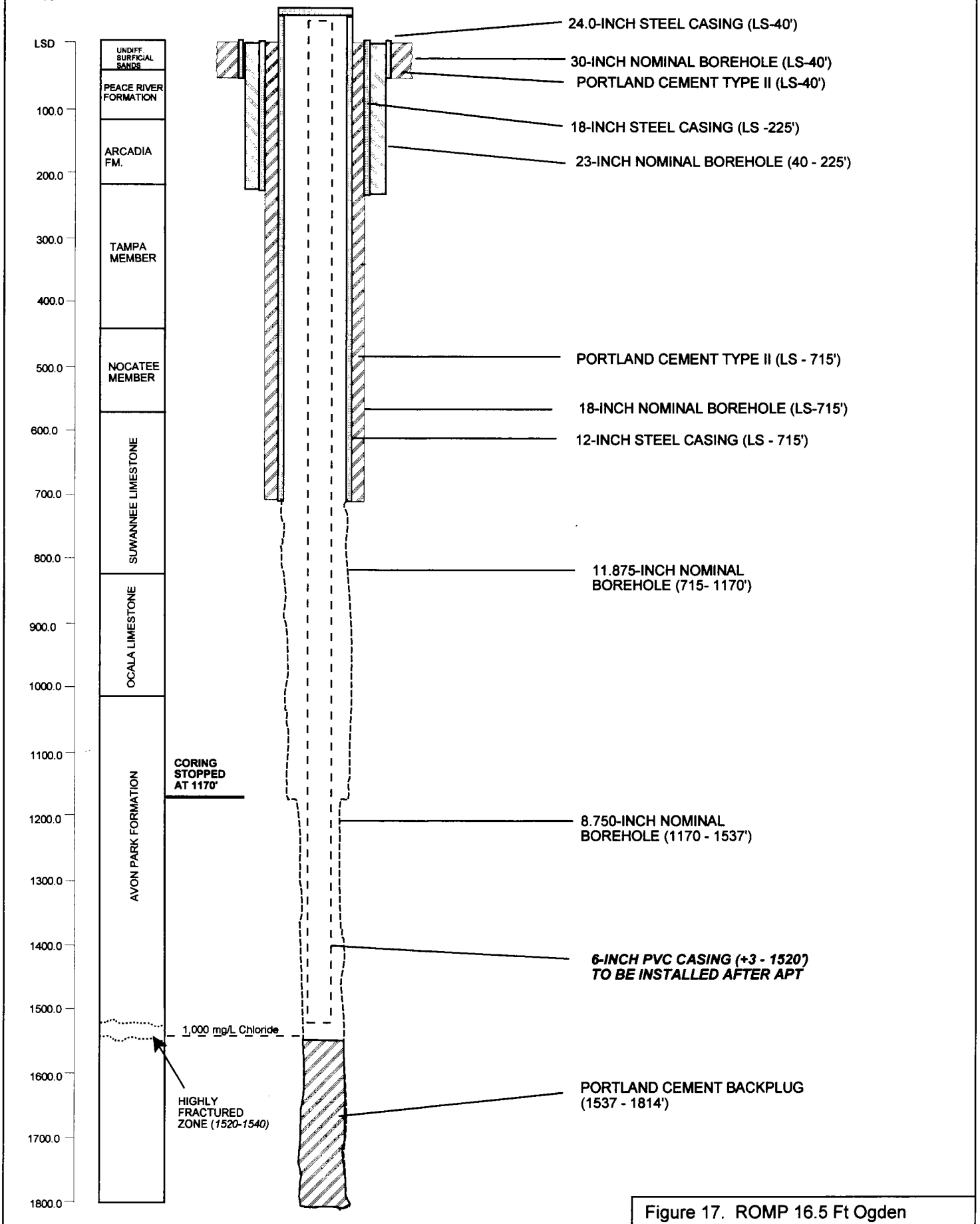


Figure 17. ROMP 16.5 Ft Ogden

Diagram of Permanent Upper Floridan Well (configuration after backplugging)

Expl1537.wpg

Water Level: 0.73 Feet bls on 2-21-2001

Specific Capacity: 2 gpm/foot @ 50 gpm

SWFWMD UID#
SWFWMD WCP# 643583.01

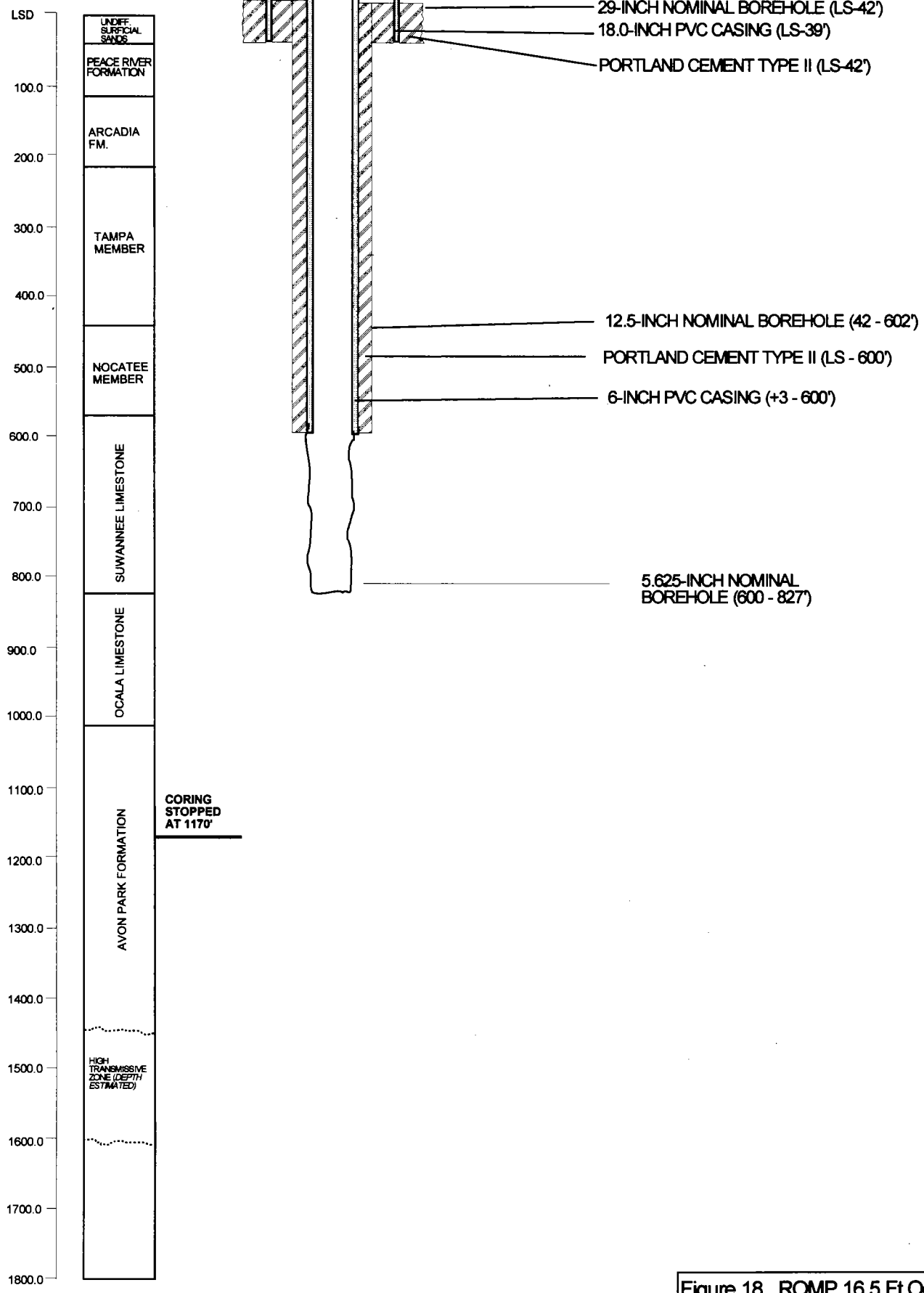


Figure 18. ROMP 16.5 Ft Ogden

Diagram of Permanent 6-inch Suwannee /UFA Monitor Well

Suwannee.wpg

PERMIT # 643588.01

Water Level: 4.3 feet bls on 2-21-2001

Specific Capacity : 4 gpm/foot @ 20gpm

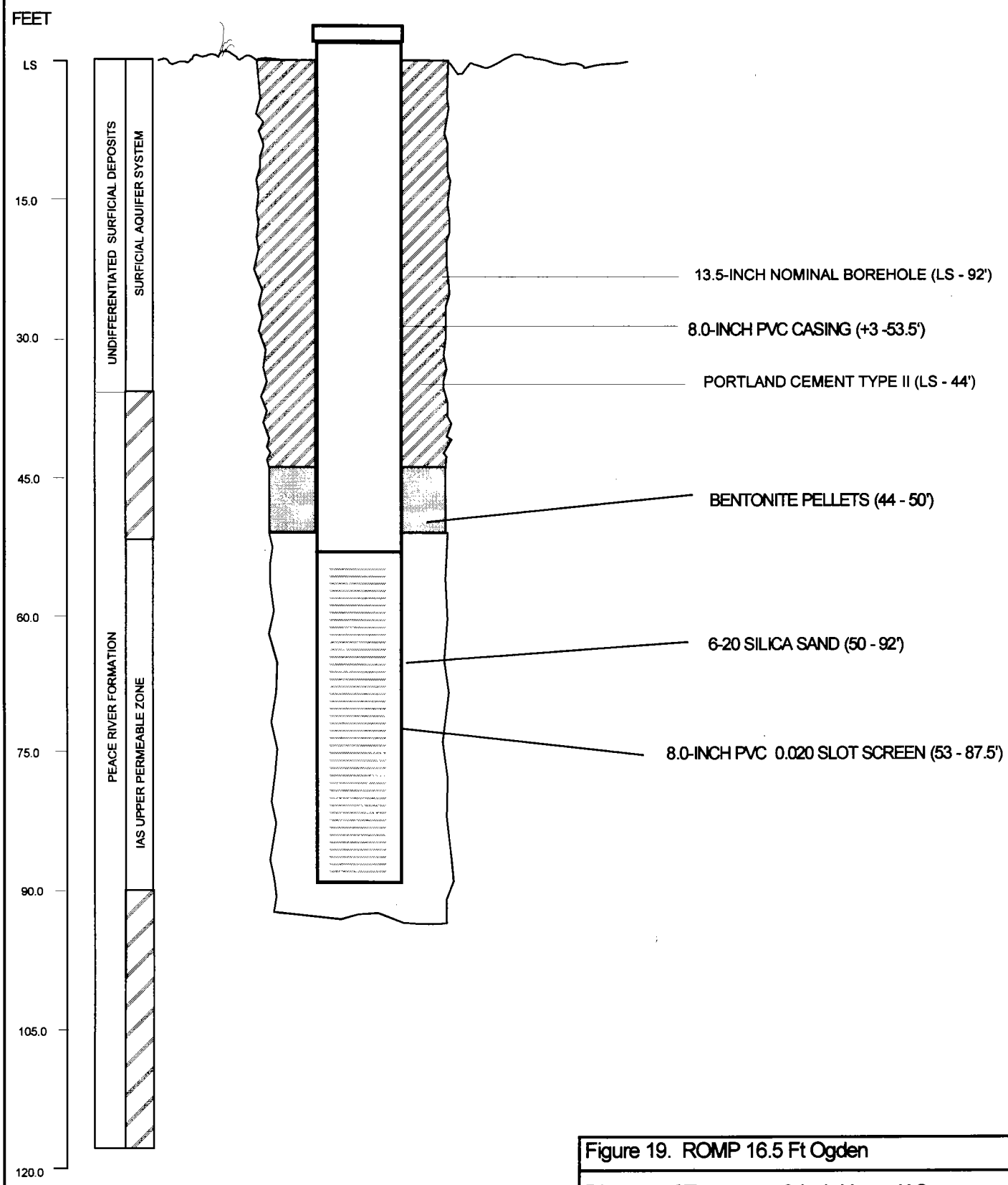


Figure 19. ROMP 16.5 Ft Ogden

Diagram of Temporary 8-inch Upper IAS Monitor Well

Upztemp.wpg

WCP # 643586.01

Water Level: 1.8 feet bls on 2-21-2001

Specific Capacity : 6 gpm/foot @ 94 gpm

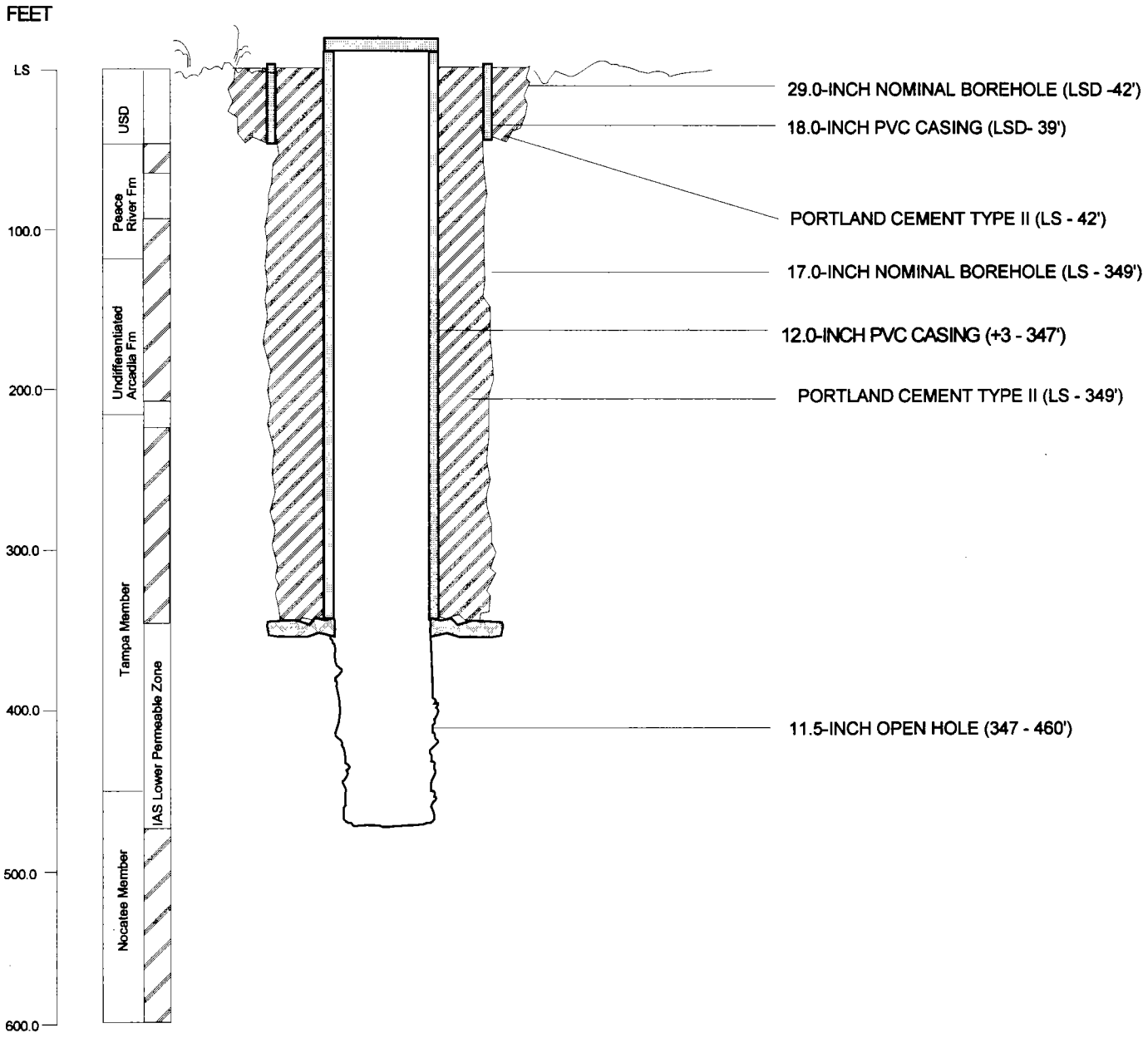


Figure 20. ROMP 16.5 Ft Ogden

Diagram of Temporary 12-inch Lower IAS Monitor Well

Lpztemp.wpg

LITHOLOGIC WELL LOG PRINTOUT SOURCE - FGS

WELL NUMBER: W-18116 COUNTY - DESOTO
TOTAL DEPTH: 1170 FT. LOCATION: T.39S R.24E S.26
SAMPLES - NONE LAT = 27D 03M 40S
LON = 81D 53M 02S
COMPLETION DATE: N/A ELEVATION: 40 FT
OTHER TYPES OF LOGS AVAILABLE - ELECTRIC, GAMMA, SONIC, FLUID CONDUCTIVITY

OWNER/DRILLER:DRILLER: GEORGE DE GROOT, EARL YOUNG (ROMP 16.5 FORT OGDEN)

WORKED BY:TED GATES SWFWMD HYDROLOGIST: WORKED FEB 2000 TO MAY 2000
WIRELINE CORE DESCRIPTION

0.	-	35.	090UDSC	UNDIFFERENTIATED SAND AND CLAY
35.	-	117.	122PCRV	PEACE RIVER FM.
117.	-	570.	122ARCA	ARCADIA FM.
210.	-	445.	122TAMP	TAMPA MEMBER OF ARCADIA FM.
445.	-	570.	122NOCA	NOCATEE MEMBER OF ARCADIA FM.
570.	-	825.	123SWNN	SUWANNEE LIMESTONE
825.	-	1003.	124OCAL	OCALA GROUP
1003.	-	.	124AVPK	AVON PARK FM.

0 - 2 SAND; LIGHT BROWNISH GRAY TO BROWNISH GRAY
15% POROSITY: INTRAGRANULAR
GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM
MEDIUM SPHERICITY; UNCONSOLIDATED
ACCESSORY MINERALS: ORGANICS-05%, PLANT REMAINS-01%

2 - 4 SAND; LIGHT BROWNISH GRAY TO DARK BROWN
15% POROSITY: INTRAGRANULAR
GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM
MEDIUM SPHERICITY; UNCONSOLIDATED
ACCESSORY MINERALS: SILT-03%

4 - 8 SAND; MODERATE YELLOWISH BROWN TO VERY LIGHT ORANGE
15% POROSITY: INTRAGRANULAR
GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM
MEDIUM SPHERICITY; UNCONSOLIDATED
ACCESSORY MINERALS: SILT-02%

8 - 10 SAND; YELLOWISH GRAY TO LIGHT OLIVE GRAY
05% POROSITY: INTRAGRANULAR
GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM
MEDIUM SPHERICITY; UNCONSOLIDATED
ACCESSORY MINERALS: CLAY-02%

10 - 14 SAND; LIGHT OLIVE TO GRAYISH OLIVE
05% POROSITY: INTRAGRANULAR
GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM
MEDIUM SPHERICITY; POOR INDURATION
ACCESSORY MINERALS: CLAY-40%
INTERBEDDED WITH CLAY LENSES, CLAY IS GREENISH GREY
APPEARS TO HAVE LITTLE POROSITY

14 - 21 SAND; LIGHT BROWNISH GRAY TO OLIVE GRAY
20% POROSITY: INTRAGRANULAR

GRAIN SIZE: MEDIUM; RANGE: MEDIUM TO COARSE
UNCONSOLIDATED
ACCESSORY MINERALS: PHOSPHATIC SAND-10%, CLAY-02%
FOSSILS: MOLLUSKS

21 - 22 GRAINSTONE; LIGHT BROWNISH GRAY TO LIGHT OLIVE GRAY
20% POROSITY: MOLDIC, POSSIBLY HIGH PERMEABILITY
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: QUARTZ SAND-40%, PHOSPHATIC SAND-02%
CLAY-10%
OTHER FEATURES: FOSSILIFEROUS
SHELL BED INTERBEDDED WITH QUARTZ SAND CLAY

22 - 24 SAND; LIGHT BROWNISH GRAY TO LIGHT OLIVE GRAY
25% POROSITY: INTRAGRANULAR
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE
MEDIUM SPHERICITY; UNCONSOLIDATED
ACCESSORY MINERALS: PHOSPHATIC SAND-02%, CLAY-02%
FOSSILS: MOLLUSKS

24 - 34 SAND; LIGHT OLIVE GRAY TO DARK GREENISH GRAY
20% POROSITY: INTRAGRANULAR
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM
ROUNDNESS: SUB-ANGULAR TO ROUNDED; MEDIUM SPHERICITY
UNCONSOLIDATED
CEMENT TYPE(S): CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: CLAY-15%, PHOSPHATIC SAND-04%
SHELL-02%
FOSSILS: MOLLUSKS
SAND QUARTZ GRAINS, SOME PHOSPHATIC SAND, CLAYEY, SOME
SHELL FRAGMENTS

34 - 40 SAND; LIGHT OLIVE GRAY TO DARK GREENISH GRAY
03% POROSITY: INTRAGRANULAR
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM
ROUNDNESS: SUB-ANGULAR TO ROUNDED; MEDIUM SPHERICITY
POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: CLAY-30%, PHOSPHATIC SAND-05%
SHELL-0Z%
FOSSILS: MOLLUSKS

40 - 50 CLAY; YELLOWISH GRAY TO LIGHT OLIVE GRAY
02% POROSITY: INTRAGRANULAR, LOW PERMEABILITY
MODERATE INDURATION
CEMENT TYPE(S): CLAY MATRIX
ACCESSORY MINERALS: QUARTZ SAND-05%, PHOSPHATIC SAND-01%
SHELL-02%
OTHER FEATURES: PLASTIC

50 - 55 CLAY; LIGHT OLIVE GRAY TO GRAYISH OLIVE
04% POROSITY: INTRAGRANULAR, LOW PERMEABILITY
POOR INDURATION

CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: QUARTZ SAND-25%, PHOSPHATIC SAND-10%
OTHER FEATURES: SPECKLED
FOSSILS: FOSSIL FRAGMENTS
CLAY, SANDY, CONFINING, LOW PERMEABILITY, CONFINING UNIT BELOW SURFACE

55 - 65 CALCARENITE; YELLOWISH GRAY TO PINKISH GRAY
25% POROSITY: INTRAGRANULAR, MOLDIC
POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: BIOGENIC, SKELETAL, SKELTAL CAST
RANGE: FINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: QUARTZ SAND-10%, PHOSPHATIC GRAVEL-05%
PHOSPHATIC SAND-02%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: MOLLUSKS, FOSSIL MOLDS, CORAL

65 - 75 SAND; YELLOWISH GRAY TO LIGHT OLIVE GRAY
05% POROSITY: INTRAGRANULAR
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE
ROUNDNESS: SUB-ROUNDED TO ROUNDED; MEDIUM SPHERICITY
POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: CLAY-30%, PHOSPHATIC SAND-15%

75 - 80 SAND; YELLOWISH GRAY TO PINKISH GRAY
20% POROSITY: INTRAGRANULAR
GRAIN SIZE: COARSE; RANGE: MEDIUM TO VERY COARSE
ROUNDNESS: ROUNDED TO SUB-ROUNDED; MEDIUM SPHERICITY
MODERATE INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-10%
PHOSPHATIC GRAVEL-02%, QUARTZ SAND-05%
OTHER FEATURES: FOSSILIFEROUS

80 - 85 SAND; YELLOWISH GRAY TO PINKISH GRAY
20% POROSITY: INTRAGRANULAR
GRAIN SIZE: COARSE; RANGE: MEDIUM TO VERY COARSE
ROUNDNESS: ROUNDED TO SUB-ROUNDED; MEDIUM SPHERICITY
UNCONSOLIDATED
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-40%
PHOSPHATIC GRAVEL-05%
SAND, PHOSPHATIC-MOST OF SAMPLE FELL OUT OF CORE BARREL

85 - 100 CLAY; YELLOWISH GRAY TO PINKISH GRAY
04% POROSITY: INTRAGRANULAR; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: QUARTZ SAND-20%, PHOSPHATIC SAND-10%
LIMESTONE-05%
OTHER FEATURES: CALCAREOUS

ALTERNATING CLAY & PHOSPHATIC SAND LENSES CLAY IS WAXY TIGHT, AND APPEARS TO BE GOOD CONFINING UNIT

100 - 110 CLAY; DARK GREENISH GRAY TO DARK GREENISH GRAY
00% POROSITY: NOT OBSERVED; GOOD INDURATION
CEMENT TYPE(S): CLAY MATRIX
ACCESSORY MINERALS: QUARTZ SAND-01%, PHOSPHATIC SAND-01%

110 - 117 CALCILUTITE; YELLOWISH GRAY TO PINKISH GRAY
04% POROSITY: FRACTURE
GRAIN TYPE: PELLET, CALCILUTITE
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: CLAY-05%, QUARTZ SAND-20%
PHOSPHATIC SAND-30%, PHOSPHATIC GRAVEL-01%
OTHER FEATURES: GRANULAR, SPECKLED
CALCILUTITE, INTERBEDDED WITH MUCH PHOSPHATIC SAND - POSSIBLE ARCADIA CONTACT

117 - 132 CLAY; GREENISH GRAY TO DARK GREENISH GRAY
02% POROSITY: FRACTURE; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED, MOTTLED
ACCESSORY MINERALS: QUARTZ SAND-20%, PHOSPHATIC SAND-20%
LIMESTONE-05%
OTHER FEATURES: CALCAREOUS, SPECKLED
CLAY, MUCH INTERBEDDED QTZ & PHOSPHATIC SAND, SOME THIN LIMESTONE LENSES PRESENT

132 - 142 DOLOSTONE; YELLOWISH GRAY TO PINKISH GRAY
02% POROSITY: INTRAGRANULAR, FRACTURE; 10-50% ALTERED SUBHEDRAL
RANGE: MICROCRYSTALLINE TO CRYPTOCRYSTALLINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: QUARTZ SAND-10%, PHOSPHATIC SAND-15%
CALCILUTITE-10%
OTHER FEATURES: CALCAREOUS, HIGH RECRYSTALLIZATION
PARTINGS, PARTINGS
FOSSILS: BENTHIC FORAMINIFERA, MOLLUSKS
DOLOSTONE HARD, MUCH INTERBEDDED PHOSPHATIC SAND GRADES INTO CLAY

142 - 146 CLAY; GREENISH GRAY TO DARK GREENISH GRAY
01% POROSITY: FRACTURE; MODERATE INDURATION
CEMENT TYPE(S): CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED, LAMINATED
ACCESSORY MINERALS: QUARTZ SAND-02%, PHOSPHATIC SAND-05%
OTHER FEATURES: CALCAREOUS, SPECKLED

146 - 150 CLAY; GREENISH GRAY TO DARK GREENISH GRAY
00% POROSITY: NOT OBSERVED; GOOD INDURATION
CEMENT TYPE(S): CLAY MATRIX

SEDIMENTARY STRUCTURES: MASSIVE
ACCESSORY MINERALS: QUARTZ SAND-01%, PHOSPHATIC SAND-01%

150 - 155.3 CLAY; GREENISH GRAY TO DARK GREENISH GRAY
00% POROSITY: NOT OBSERVED; GOOD INDURATION
CEMENT TYPE(S): CLAY MATRIX
SEDIMENTARY STRUCTURES: MASSIVE
ACCESSORY MINERALS: QUARTZ SAND-04%, PHOSPHATIC SAND-05%
CLAY, STIFF, VERY LITTLE SANDS CONFINING, PHOSPHATIC SAND CONTENT STARTS TO INCREASE AT 154'

155.3- 160.5 CLAY; OLIVE GRAY TO PINKISH GRAY
02% POROSITY: FRACTURE; MODERATE INDURATION
CEMENT TYPE(S): CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: QUARTZ SAND-15%, PHOSPHATIC SAND-15%
LIMESTONE-01%
FOSSILS: FOSSIL FRAGMENTS

160.5- 167 CALCILUTITE; LIGHT OLIVE GRAY TO GREENISH GRAY
04% POROSITY: FRACTURE, MOLDIC, LOW PERMEABILITY
GRAIN TYPE: BIOGENIC, SKELETAL, SKELTAL CAST
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
ACCESSORY MINERALS: CLAY-05%, QUARTZ SAND-05%
PHOSPHATIC SAND-30%
OTHER FEATURES: GRANULAR, FOSSILIFEROUS
FOSSILS: MOLLUSKS, FOSSIL FRAGMENTS, FOSSIL MOLDS
CALCILUTITE, MOLDIC, INTERBEDDED QTZ & PHOSPHATIC SAND LENSES OF PHOSPHATIC SAND, LOW POROSITY

167 - 175 PHOSPHATE; OLIVE GRAY TO PINKISH GRAY
03% POROSITY: INTRAGRANULAR; UNCONSOLIDATED
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: QUARTZ SAND-20%, CLAY-20%
OTHER FEATURES: CALCAREOUS

175 - 184.5 CALCILUTITE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
03% POROSITY
GRAIN TYPE: BIOGENIC, CALCILUTITE, SKELETAL
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: QUARTZ SAND-10%, PHOSPHATIC SAND-10%
CLAY-10%
OTHER FEATURES: GRANULAR, FOSSILIFEROUS
FOSSILS: MOLLUSKS, BENTHIC FORAMINIFERA, FOSSIL FRAGMENTS
FOSSIL MOLDS

184.5- 190 CLAY; YELLOWISH GRAY TO LIGHT OLIVE GRAY
00% POROSITY: NOT OBSERVED; MODERATE INDURATION
CEMENT TYPE(S): CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: QUARTZ SAND-03%, PHOSPHATIC SAND-10%
LIMESTONE-02%
OTHER FEATURES: CALCAREOUS
FOSSILS: BENTHIC FORAMINIFERA

190 - 200 CLAY; GREENISH GRAY TO DARK GREENISH GRAY
00% POROSITY: NOT OBSERVED; GOOD INDURATION
CEMENT TYPE(S): CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: QUARTZ SAND-02%, PHOSPHATIC SAND-10%
PHOSPHATIC GRAVEL-02%
FOSSILS: BENTHIC FORAMINIFERA
CLAY, WAXY, STIFF, INTERBEDDED PHOSPHATE

200 - 205 CLAY; YELLOWISH GRAY TO LIGHT OLIVE GRAY
01% POROSITY: FRACTURE; MODERATE INDURATION
CEMENT TYPE(S): CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: LIMESTONE-02%, QUARTZ SAND-01%
PHOSPHATIC SAND-20%
OTHER FEATURES: CALCAREOUS, GRANULAR, MUDDY
FOSSILS: CORAL

205 - 210 CALCILUTITE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
05% POROSITY: INTRAGRANULAR, FRACTURE, PIN POINT VUGS
GRAIN TYPE: BIOGENIC, CALCILUTITE, SKELETAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: CLAY-10%, QUARTZ SAND-02%
PHOSPHATIC SAND-20%
OTHER FEATURES: SPECKLED

210 - 220 CALCARENITE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
10% POROSITY: INTRAGRANULAR, FRACTURE, MOLDIC
GRAIN TYPE: BIOGENIC, SKELETAL, SKELTAL CAST
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: CLAY-03%, QUARTZ SAND-02%
PHOSPHATIC SAND-03%
OTHER FEATURES: HIGH RECRYSTALLIZATION
FOSSILS: MOLLUSKS, BENTHIC FORAMINIFERA
CALCARENITE, MOLDIC, GOOD POROSITY, DECREASING CLAY AND
PHOSPHATIC CONTENT-- POSSIBLE TAMPA MBR CONTACT

220 - 221 CLAY; YELLOWISH GRAY TO LIGHT OLIVE GRAY
C2% POROSITY: LOW PERMEABILITY; MODERATE INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: QUARTZ SAND-01%, PHOSPHATIC SAND-02%
LIMESTONE-01%
OTHER FEATURES: CALCAREOUS, CHALKY
FOSSILS: ECHINOID, BENTHIC FORAMINIFERA

221 - 224 CALCARENITE; VERY LIGHT ORANGE TO MODERATE DARK GRAY
15% POROSITY: INTRAGRANULAR, PIN POINT VUGS
POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: CRYSTALS

GRAIN SIZE: MICROCRYSTALLINE
CEMENT TYPE(S): IRON CEMENT
ACCESSORY MINERALS: QUARTZ SAND-01%, PHOSPHATIC SAND-03%
PHOSPHATIC GRAVEL-01%, CLAY-01%
OTHER FEATURES: GRANULAR, FOSSILIFEROUS
CALCARENITE, INTERBEDDED PHOSPHATIC SAND, PIN-POINT VUGS

224 - 227 DOLOSTONE; VERY LIGHT ORANGE TO YELLOWISH GRAY
N % POROSITY, SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO CRYPTOCRYSTALLINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: QUARTZ SAND-01%, PHOSPHATIC SAND-02%
PHOSPHATIC GRAVEL-01%, LIMESTONE-02%
DOLOSTONE, HARD, NO POROSITY

227 - 251 CLAY; LIGHT OLIVE GRAY TO OLIVE GRAY
02% POROSITY: INTRAGRANULAR, LOW PERMEABILITY
POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: QUARTZ SAND-05%, PHOSPHATIC SAND-10%
LIMESTONE-03%
OTHER FEATURES: CALCAREOUS
FOSSILS: PLANKTONIC FORAMINIFERA, BENTHIC FORAMINIFERA
FOSSIL FRAGMENTS
CLAY, INTERBEDDED PHOSPHATIC SAND, SOME THIN LIMESTONE
LENSES

251 - 256 CLAY; LIGHT OLIVE GRAY TO OLIVE GRAY
01% POROSITY: INTRAGRANULAR; MODERATE INDURATION
CEMENT TYPE(S): CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: QUARTZ SAND-10%, PHOSPHATIC SAND-10%

256 - 261 CLAY; LIGHT OLIVE GRAY TO OLIVE GRAY
00% POROSITY: NOT OBSERVED; GOOD INDURATION
CEMENT TYPE(S): CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: QUARTZ SAND-05%, PHOSPHATIC SAND-05%

261 - 265 CLAY; VERY LIGHT ORANGE TO YELLOWISH GRAY
02% POROSITY: INTRAGRANULAR; MODERATE INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: QUARTZ SAND-05%, PHOSPHATIC SAND-05%
LIMESTONE-05%
OTHER FEATURES: CALCAREOUS, REEFAL
FOSSILS: CORAL, MOLLUSKS
INCREASING LIMESTONE FRAGMENTS, MOLLUSK FRAGMENTS, &
BARNACLES

265 - 275 CLAY; YELLOWISH GRAY TO LIGHT GREENISH GRAY
04% POROSITY: MOLDIC, FRACTURE
CEMENT TYPE(S): PHOSPHATE CEMENT, CLAY MATRIX

CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED, LAMINATED
ACCESSORY MINERALS: LIMESTONE-40%, QUARTZ SAND-01%
PHOSPHATIC SAND-02%, CALCITE-04%
OTHER FEATURES: CALCAREOUS, HIGH RECRYSTALLIZATION
FOSSILIFEROUS
FOSSILS: CORAL, ECHINOID, MOLLUSKS, FOSSIL FRAGMENTS
FOSSIL MOLDS

275 - 280.2 CLAY; YELLOWISH GRAY TO LIGHT OLIVE GRAY
00% POROSITY: NOT OBSERVED
CEMENT TYPE(S): GYPSUM CEMENT, CLAY MATRIX
CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED, LAMINATED
ACCESSORY MINERALS: LIMESTONE-40%, PHOSPHATIC SAND-02%
CALCITE-03%
OTHER FEATURES: CALCAREOUS, HIGH RECRYSTALLIZATION
FOSSILIFEROUS
FOSSILS: CORAL, MOLLUSKS, FOSSIL FRAGMENTS
CLAY WITH INTERBEDDED RECRYSTALLIZED LIMESTONE FRAGMENTS
SOLID -- APPEARS IMPERMEABLE

280.2- 285 CLAY; YELLOWISH GRAY TO LIGHT OLIVE GRAY
00% POROSITY: NOT OBSERVED; MODERATE INDURATION
CEMENT TYPE(S): CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: LIMESTONE-05%, QUARTZ SAND-01%
PHOSPHATIC SAND-02%
OTHER FEATURES: CALCAREOUS
FOSSILS: FOSSIL FRAGMENTS

285 - 290 CLAY; DARK GREENISH GRAY TO GREENISH BLACK
00% POROSITY: NOT OBSERVED; GOOD INDURATION
CEMENT TYPE(S): CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: LIMESTONE-05%, QUARTZ SAND-01%
PHOSPHATIC SAND-02%
OTHER FEATURES: CALCAREOUS

290 - 297 LIMESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
10% POROSITY: FRACTURE
GRAIN TYPE: CALCILUTITE, BIOGENIC
GRAIN SIZE: MICROCRYSTALLINE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: CLAY-20%, QUARTZ SAND-01%
PHOSPHATIC SAND-02%, SHALE-X0%
OTHER FEATURES: FOSSILIFEROUS, FOSSILIFEROUS
FOSSILS: MOLLUSKS, FOSSIL MOLDS
LIMESTONE MOLDIC, BUT MOLDS FILLED WITH CLAY

297 - 307 CLAY; YELLOWISH GRAY TO LIGHT OLIVE GRAY
01% POROSITY: FRACTURE; MODERATE INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-01%
OTHER FEATURES: CALCAREOUS

ALTERNATING LENSES OF LIMESTONE AND CLAY

307 - 314 LIMESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
15% POROSITY: MOLDIC, VUGULAR, FRACTURE
GRAIN TYPE: BIOGENIC, CALCILUTITE, SKELETAL
GRAIN SIZE: COARSE; RANGE: MICROCRYSTALLINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: CLAY-05%, QUARTZ SAND-01%
PHOSPHATIC SAND-01%, PHOSPHATIC GRAVEL-01%
OTHER FEATURES: WEATHERED
FOSSILS: MOLLUSKS, FOSSIL FRAGMENTS, BENTHIC FORAMINIFERA

314 - 327 LIMESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
15% POROSITY: MOLDIC, VUGULAR, FRACTURE
GRAIN TYPE: BIOGENIC, CALCILUTITE, SKELETAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO VERY FINE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: CLAY-05%, PHOSPHATIC SAND-01%
OTHER FEATURES: REEFAL, WEATHERED
FOSSILS: MOLLUSKS, FOSSIL FRAGMENTS, BENTHIC FORAMINIFERA
CORAL
LIMESTONE MOLDIC, VUGULAR, APPEARS IMPERMEABLE

327 - 340 CALCARENITE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
20% POROSITY: FRACTURE, MOLDIC, POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: BIOGENIC, CALCILUTITE, SKELTAL CAST
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: QUARTZ SAND-01%, PHOSPHATIC SAND-01%
DOLOMITE-03%, CLAY-03%
OTHER FEATURES: DOLOMITIC, CHALKY
FOSSILS: CORAL, MOLLUSKS, BENTHIC FORAMINIFERA
FOSSIL FRAGMENTS, FOSSIL MOLDS

340 - 344.5 DOLOSTONE; LIGHT OLIVE GRAY TO DARK GREENISH GRAY
01% POROSITY: FRACTURE; 10-50% ALTERED
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-01%
PHOSPHATIC GRAVEL-01%

344.5- 368 CALCARENITE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
25% POROSITY: FRACTURE, MOLDIC, POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: BIOGENIC, SKELETAL, SKELTAL CAST
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: CLAY-05%, PHOSPHATIC SAND-01%
QUARTZ SAND-01%

OTHER FEATURES: REEFAL, FOSSILIFEROUS
FOSSILS: MOLLUSKS, BENTHIC FORAMINIFERA, FOSSIL FRAGMENTS
LIMESTONE MOLDIC, PERMEABLE, SOME LENSES OF CALCAREOUS CLAY

368 - 390 CALCARENITE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
20% POROSITY: FRACTURE, MOLDIC, POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: BIOGENIC, SKELETAL, SKELTAL CAST
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: REEFAL, FOSSILIFEROUS
FOSSILS: CORAL, MOLLUSKS, BENTHIC FORAMINIFERA, ECHINOID
CALCARENITE MOLDIC, HIGHLY FOSSILIFEROUS, SORITES COMMON

390 - 392 CLAY; YELLOWISH GRAY TO LIGHT OLIVE GRAY
05% POROSITY: FRACTURE, INTRAGRANULAR; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: LIMESTONE-10%
OTHER FEATURES: CALCAREOUS

392 - 446 CALCARENITE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
20% POROSITY: FRACTURE, MOLDIC, POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: BIOGENIC, SKELETAL, SKELTAL CAST
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-01%, DOLOMITE-02%
OTHER FEATURES: REEFAL
FOSSILS: MOLLUSKS, BENTHIC FORAMINIFERA, WORM TRACES
CORAL, FOSSIL MOLDS
CALCARENITE MOLDIC, FOSSILIFEROUS, VERY PERMEABLE

446 - 452 LIMESTONE; LIGHT OLIVE GRAY TO OLIVE GRAY
15% POROSITY: INTRAGRANULAR, FRACTURE
POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: CALCILUTITE
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-20%, QUARTZ SAND-15%
DOLOMITE-02%
OTHER FEATURES: DOLOMITIC, SPECKLED
FOSSILS: MOLLUSKS, FOSSIL MOLDS
LIMESTONE, VERY SANDY, INCREASING PHOSPHATIC SAND, POSSIBLE
NOCATEE MEMBER CONTACT

452 - 466 LIMESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
10% POROSITY: INTRAGRANULAR, FRACTURE, MOLDIC
GRAIN TYPE: CALCILUTITE, SKELTAL CAST
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-10%, CLAY-10%

QUARTZ SAND-03%, DOLOMITE-02%
OTHER FEATURES: CHALKY
FOSSILS: MOLLUSKS, FOSSIL FRAGMENTS

466 - 469 CLAY; LIGHT OLIVE GRAY TO OLIVE GRAY
00% POROSITY: NOT OBSERVED; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-25%, QUARTZ SAND-03%
LIMESTONE-10%
CLAY WITH ALTERNATING LENSES OF SANDY PHOSPHATIC LIMESTONE

469 - 490 LIMESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
02% POROSITY: INTRAGRANULAR
GRAIN TYPE: BIOGENIC, CALCILUTITE, PELLET
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-25%, CLAY-20%
QUARTZ SAND-01%
OTHER FEATURES: WEATHERED
FOSSILS: FOSSIL FRAGMENTS
LIMESTONE VERY SANDY, CLAYEY, NOCATEE MEMBER

490 - 495 LIMESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
02% POROSITY: INTRAGRANULAR, LOW PERMEABILITY
GRAIN TYPE: CALCILUTITE
GRAIN SIZE: MICROCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO MICROCRYSTALLINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED, MOTTLED
ACCESSORY MINERALS: PHOSPHATIC SAND-20%, CLAY-10%
QUARTZ SAND-01%
OTHER FEATURES: VARVED, CALCAREOUS

495 - 503 SANDSTONE; LIGHT OLIVE GRAY TO OLIVE GRAY
03% POROSITY: INTRAGRANULAR
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
ROUNDNESS: ROUNDED TO SUB-ANGULAR; MEDIUM SPHERICITY
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-40%, QUARTZ SAND-20%
CLAY-10%
OTHER FEATURES: CALCAREOUS, FROSTED, GRANULAR, SPECKLED
WEATHERED
FOSSILS: FOSSIL FRAGMENTS
SANDSTONE, PHOSPHATIC SAND, WELL CEMENTED, CALCAREOUS, FEW
FOSSILS

503 - 510 LIMESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
02% POROSITY: INTRAGRANULAR
GRAIN TYPE: BIOGENIC, PELLET
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX

SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-20%, CLAY-05%
OTHER FEATURES: SPECKLED, WEATHERED
FOSSILS: FOSSIL FRAGMENTS

510 - 525 SILT; LIGHT OLIVE GRAY TO OLIVE GRAY
02% POROSITY: INTRAGRANULAR, LOW PERMEABILITY
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: CLAY-20%, PHOSPHATIC SAND-03%
OTHER FEATURES: CALCAREOUS, WEATHERED
SILTSTONE, WELL CEMENTED, CLAYEY, DECREASING PHOSPHATIC GRAINS

525 - 534 WACKESTONE; LIGHT OLIVE GRAY TO OLIVE GRAY
02% POROSITY: INTRAGRANULAR, LOW PERMEABILITY
GOOD INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED, MASSIVE
ACCESSORY MINERALS: QUARTZ SAND-02%, PHOSPHATIC SAND-03%
LIMESTONE-03%
OTHER FEATURES: CALCAREOUS, GRANULAR, WEATHERED

534 - 540 LIMESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
01% POROSITY: FRACTURE, LOW PERMEABILITY
GRAIN TYPE: CALCILUTITE, BIOGENIC
GRAIN SIZE: MICROCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED, MOTTLED
ACCESSORY MINERALS: CLAY-30%, PHOSPHATIC SAND-10%
QUARTZ SAND-01%, PHOSPHATIC GRAVEL-01%
LIMESTONE, INTERBEDDED CLAY, VERY WEATHERED, VERY TIGHT GRAINED

540 - 543 LIMESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
05% POROSITY: INTRAGRANULAR, LOW PERMEABILITY
GRAIN TYPE: BIOGENIC, PELLET, SKELETAL
GRAIN SIZE: VERY FINE
RANGE: CRYPTOCRYSTALLINE TO VERY FINE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-25%, CLAY-03%
OTHER FEATURES: CHALKY, SPECKLED, WEATHERED
FOSSILS: BENTHIC FORAMINIFERA

543 - 545 LIMESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
05% POROSITY: INTRAGRANULAR, LOW PERMEABILITY
GRAIN TYPE: BIOGENIC, PELLET, SKELETAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO MICROCRYSTALLINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-02%
OTHER FEATURES: CHALKY
FOSSILS: ECHINOID, BENTHIC FORAMINIFERA, FOSSIL FRAGMENTS

545 - 553 LIMESTONE; LIGHT OLIVE GRAY TO OLIVE GRAY
01% POROSITY: INTRAGRANULAR, LOW PERMEABILITY
GRAIN TYPE: BIOGENIC, CALCILUTITE
GRAIN SIZE: MICROCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO MICROCRYSTALLINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: CLAY-15%, PHOSPHATIC SAND-10%
QUARTZ SAND-02%
OTHER FEATURES: CHALKY
FOSSILS: ECHINOID, BENTHIC FORAMINIFERA, FOSSIL FRAGMENTS

553 - 556 LIMESTONE; VERY LIGHT ORANGE TO YELLOWISH GRAY
02% POROSITY: INTRAGRANULAR, LOW PERMEABILITY
GRAIN TYPE: BIOGENIC, CALCILUTITE
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO VERY FINE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: CLAY-15%, PHOSPHATIC SAND-03%
OTHER FEATURES: CHALKY, WEATHERED

556 - 559 CLAY; VERY LIGHT ORANGE TO YELLOWISH GRAY
01% POROSITY: NOT OBSERVED; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: LIMESTONE-25%, PHOSPHATIC SAND-05%
OTHER FEATURES: CALCAREOUS, CHALKY, WEATHERED

559 - 564 LIMESTONE; VERY LIGHT ORANGE TO YELLOWISH GRAY
01% POROSITY: INTRAGRANULAR, LOW PERMEABILITY
GRAIN TYPE: CALCILUTITE, PELLET
GRAIN SIZE: VERY FINE
RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: CLAY-10%, PHOSPHATIC SAND-03%
QUARTZ SAND-01%
OTHER FEATURES: CHALKY, WEATHERED
FOSSILS: FOSSIL FRAGMENTS, WORM TRACES

564 - 569 CLAY; OLIVE GRAY TO DARK GREENISH GRAY
00% POROSITY: NOT OBSERVED, LOW PERMEABILITY
GOOD INDURATION
CEMENT TYPE(S): CLAY MATRIX
CLAY, WAXY, NO PERMEABILITY--CONTACT WITH SUWANNEE LS

569 - 572 LIMESTONE; VERY LIGHT ORANGE TO MODERATE GRAY
10% POROSITY: INTRAGRANULAR, MOLDIC, FRACTURE
GRAIN TYPE: CALCILUTITE, PELLET
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-02%
OTHER FEATURES: CHALKY

FOSSILS: MOLLUSKS, FOSSIL FRAGMENTS

572 - 579 DOLOSTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
05% POROSITY: FRACTURE, MOLDIC; 10-50% ALTERED; SUBHEDRAL
GRAIN SIZE: VERY FINE
RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, DOLOMITE CEMENT
CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: MASSIVE
ACCESSORY MINERALS: LIMESTONE-20%
OTHER FEATURES: MEDIUM RECRYSTALLIZATION
FOSSILS: FOSSIL FRAGMENTS
CALCARENITE, GRANULAR, FEW ACCESSORY MINERALS, TYPICAL SUWANNEE

579 - 595 LIMESTONE; VERY LIGHT ORANGE TO YELLOWISH GRAY
00% POROSITY: NOT OBSERVED
GRAIN TYPE: CALCILUTITE, BIOGENIC
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO VERY FINE; POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: CLAY-10%, PHOSPHATIC SAND-01%
OTHER FEATURES: CHALKY, MUDDY, WEATHERED
FOSSILS: FOSSIL FRAGMENTS, BENTHIC FORAMINIFERA, ECHINOID
LIMESTONE, VERY SOFT, HIGHLY WEATHERED, CLAYEY

595 - 615 LIMESTONE; VERY LIGHT ORANGE TO YELLOWISH GRAY
01% POROSITY: INTRAGRANULAR, FRACTURE, LOW PERMEABILITY
GRAIN TYPE: CALCILUTITE, BIOGENIC
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
ACCESSORY MINERALS: CLAY-20%
OTHER FEATURES: CHALKY, MUDDY, WEATHERED
FOSSILS: ECHINOID, BENTHIC FORAMINIFERA, FOSSIL FRAGMENTS

615 - 629 LIMESTONE; VERY LIGHT ORANGE TO YELLOWISH GRAY
10% POROSITY: FRACTURE, MOLDIC, POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: CALCILUTITE, BIOGENIC
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: CHALKY
FOSSILS: ECHINOID, BENTHIC FORAMINIFERA, FOSSIL FRAGMENTS

629 - 637 CALCARENITE; VERY LIGHT ORANGE TO YELLOWISH GRAY
15% POROSITY: MOLDIC, PIN POINT VUGS
POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: BIOGENIC, SKELETAL, SKELTAL CAST
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: CHALKY
FOSSILS: ECHINOID, BENTHIC FORAMINIFERA, MOLLUSKS
FOSSIL FRAGMENTS
CALCARENITE, MOLDIC

637 - 645 CALCARENITE; VERY LIGHT ORANGE TO YELLOWISH GRAY
05% POROSITY: PIN POINT VUGS, FRACTURE, INTRAGRANULAR
GRAIN TYPE: BIOGENIC, SKELETAL, CALCILUTITE
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCITE-01%
OTHER FEATURES: GRANULAR, CHALKY
FOSSILS: ECHINOID, BENTHIC FORAMINIFERA, MOLLUSKS
FOSSIL FRAGMENTS

645 - 662 CALCARENITE; VERY LIGHT ORANGE TO YELLOWISH GRAY
-2% POROSITY: FRACTURE, LOW PERMEABILITY
GRAIN TYPE: BIOGENIC, PELLET, CALCILUTITE
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCITE-01%, CLAY-02%
OTHER FEATURES: GRANULAR, CHALKY, FOSSILIFEROUS
FOSSILS: ECHINOID, BENTHIC FORAMINIFERA, FOSSIL FRAGMENTS
CALCARENITE, NO MOLDS, VERY FEW VUGS, LOW POROSITY, SOME
CLAY LENSES, FOSSIL FRAGMENTS

662 - 664 MUDSTONE; VERY LIGHT ORANGE TO DARK YELLOWISH BROWN
00% POROSITY: NOT OBSERVED
GOOD INDURATION
CEMENT TYPE(S): CLAY MATRIX
OTHER FEATURES: VARIEGATED

664 - 665 CLAY; VERY LIGHT ORANGE TO YELLOWISH GRAY
00% POROSITY: NOT OBSERVED; MODERATE INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: LIMESTONE-20%
OTHER FEATURES: CHALKY

665 - 670 LIMESTONE; VERY LIGHT ORANGE TO YELLOWISH GRAY
00% POROSITY: NOT OBSERVED
GRAIN TYPE: CALCILUTITE
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
ACCESSORY MINERALS: CLAY-20%
OTHER FEATURES: CHALKY

670 - 689 CALCARENITE; VERY LIGHT ORANGE TO YELLOWISH GRAY
15% POROSITY: INTRAGRANULAR, FRACTURE
POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: BIOGENIC, PELLET, SKELETAL
95% ALLOCHEMICAL CONSTITUENTS
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: CHALKY, GRANULAR
FOSSILS: ECHINOID, BENTHIC FORAMINIFERA, FOSSIL FRAGMENTS
CALCARENITE SOFT, CRUMBLY, FRACTURES & PIN-POINT VUGS
APPEARS PERMEABLE, VERY GRAINY TEXTURE

689 - 697 CALCARENITE; VERY LIGHT ORANGE TO YELLOWISH GRAY
03% POROSITY: INTRAGRANULAR, FRACTURE, PIN POINT VUGS
GRAIN TYPE: BIOGENIC, CALCILUTITE, SKELETAL
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
ACCESSORY MINERALS: CLAY-03%
OTHER FEATURES: GRANULAR, CHALKY, REEFAL
FOSSILS: MOLLUSKS, FOSSIL FRAGMENTS

697 - 704 LIMESTONE; VERY LIGHT ORANGE TO YELLOWISH GRAY
01% POROSITY: INTRAGRANULAR, FRACTURE, LOW PERMEABILITY
GRAIN TYPE: CALCILUTITE
GRAIN SIZE: MICROCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO VERY FINE; POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: CLAY-20%
OTHER FEATURES: PLASTIC, CHALKY

704 - 715 CALCARENITE; VERY LIGHT ORANGE TO YELLOWISH GRAY
10% POROSITY: INTRAGRANULAR, FRACTURE, MOLDIC
GRAIN TYPE: BIOGENIC, SKELETAL
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CLAY-05%
OTHER FEATURES: CHALKY, POOR SAMPLE
FOSSILS: FOSSIL FRAGMENTS, MOLLUSKS

715 - 721 CALCARENITE; VERY LIGHT ORANGE TO YELLOWISH GRAY
15% POROSITY: MOLDIC, PIN POINT VUGS
POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: BIOGENIC, SKELETAL, SKELTAL CAST
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: GRANULAR, REEFAL, PLATY
FOSSILS: CORAL, ECHINOID, BENTHIC FORAMINIFERA, MOLLUSKS
CALCARENITE, MOLDIC, FOSSILIFEROUS, PERMEABLE

721 - 735 CALCARENITE; VERY LIGHT ORANGE TO YELLOWISH GRAY
10% POROSITY: INTRAGRANULAR, FRACTURE, PIN POINT VUGS
GRAIN TYPE: BIOGENIC, PELLET, SKELETAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: GRANULAR, CHALKY
FOSSILS: FOSSIL FRAGMENTS, WORM TRACES
BENTHIC FORAMINIFERA

735 - 745 NO RECOVERY: 735' TO 745' APPEARS TO HAVE
BEEN A LENS OF FINE TO MEDIUM GRAINED QTZ SAND

745 - 770 CALCARENITE; WHITE TO YELLOWISH GRAY
15% POROSITY: FRACTURE, MOLDIC, POSSIBLY HIGH PERMEABILITY

GRAIN TYPE: PELLET, SKELETAL, SKELTAL CAST
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCITE-01%
OTHER FEATURES: CHALKY, GRANULAR

770 - 772.5 LIMESTONE; VERY LIGHT ORANGE TO YELLOWISH GRAY
01% POROSITY: FRACTURE, LOW PERMEABILITY
GRAIN TYPE: CALCILUTITE, PELLET, BIOGENIC
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO VERY FINE; POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: CLAY-20%
OTHER FEATURES: CHALKY, WEATHERED
FOSSILS: FOSSIL FRAGMENTS

772.5- 786 LIMESTONE; VERY LIGHT ORANGE TO YELLOWISH GRAY
05% POROSITY: FRACTURE, PIN POINT VUGS
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: CLAY-15%, QUARTZ SAND-03%
OTHER FEATURES: CHALKY, WEATHERED
FOSSILS: FOSSIL FRAGMENTS
LIMESTONE SOFT TO HARD ALTERNATING LAYERS OF CALCAREOUS
CLAY, MINOR AMOUNTS OF QTZ SAND

786 - 805 LIMESTONE; VERY LIGHT ORANGE TO YELLOWISH GRAY
20% POROSITY: FRACTURE, MOLDIC, POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: BIOGENIC, CALCILUTITE, PELLET
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
UNCONSOLIDATED
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CLAY-02%
OTHER FEATURES: CHALKY, WEATHERED
FOSSILS: FOSSIL FRAGMENTS, MOLLUSKS

805 - 806.5 CALCARENITE; VERY LIGHT ORANGE TO YELLOWISH GRAY
20% POROSITY: FRACTURE, MOLDIC, POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: BIOGENIC, PELLET
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: QUARTZ SAND-05%, CLAY-01%
OTHER FEATURES: CHALKY, WEATHERED

806.5- 814.5 LIMESTONE; VERY LIGHT ORANGE TO YELLOWISH GRAY
05% POROSITY: FRACTURE, PIN POINT VUGS
GRAIN TYPE: BIOGENIC, PELLET
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED

ACCESSORY MINERALS: QUARTZ SAND-05%, CLAY-01%
OTHER FEATURES: PARTINGS, CHALKY
FOSSILS: FOSSIL FRAGMENTS, MOLLUSKS
LIMESTONE WITH INTERBEDDED QTZ SAND FRACTURES COMMON

814.5- 820 LIMESTONE; VERY LIGHT ORANGE TO YELLOWISH GRAY
20% POROSITY: FRACTURE, MOLDIC, PIN POINT VUGS
GRAIN TYPE: BIOGENIC, CALCILUTITE, SKELETAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
UNCONSOLIDATED
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: QUARTZ SAND-05%, CLAY-03%
OTHER FEATURES: GRANULAR, CHALKY, PARTINGS, WEATHERED
FOSSILS: MOLLUSKS, FOSSIL FRAGMENTS
LIMESTONE, MOLDIC, FRACTURED, CRUMBLY, SOME LENSES OF
CALCAREOUS CLAY, POORLY INDURATED

820 - 825 LIMESTONE; VERY LIGHT ORANGE TO YELLOWISH GRAY
02% POROSITY: LOW PERMEABILITY
GRAIN TYPE: CALCILUTITE
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO MICROCRYSTALLINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CLAY-01%, ORGANICS-01%, CHERT-01%
OTHER FEATURES: CHALKY

825 - 829.5 LIMESTONE; VERY LIGHT ORANGE
02% POROSITY: LOW PERMEABILITY
GRAIN TYPE: CALCILUTITE
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO VERY FINE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-01%
OTHER FEATURES: CHALKY

829.5- 835.5 LIMESTONE; VERY LIGHT ORANGE
15% P0ROSITY: PIN POINT VUGS, FRACTURE
POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: CALCILUTITE
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: CHALKY, GRANULAR
FOSSILS: MOLLUSKS, ECHINOID, BENTHIC FORAMINIFERA
FOSSIL FRAGMENTS
CALCERITE, PIN POINT VUGS, WEATHERED FOSSILS

835.5- 851 LIMESTONE; VERY LIGHT ORANGE TO YELLOWISH GRAY
10% POROSITY: FRACTURE, INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: CALCILUTITE, PELLET, BIOGENIC
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
UNCONSOLIDATED
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
ACCESSORY MINERALS: CLAY-02%
OTHER FEATURES: CHALKY, GRANULAR

FOSSILS: BENTHIC FORAMINIFERA, MOLLUSKS

851 - 855 LIMESTONE; VERY LIGHT ORANGE TO YELLOWISH GRAY
01% POROSITY: INTRAGRANULAR, LOW PERMEABILITY
GRAIN TYPE: CALCILUTITE, PELLET
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
ACCESSORY MINERALS: CLAY-25%
OTHER FEATURES: CHALKY, GRANULAR
FOSSILS: FOSSIL FRAGMENTS

855 - 860 CALCARENITE; VERY LIGHT ORANGE TO YELLOWISH GRAY
20% POROSITY: FRACTURE, PIN POINT VUGS
POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: CALCILUTITE, PELLET, BIOGENIC
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: CHALKY, GRANULAR
FOSSILS: FOSSIL FRAGMENTS

860 - 879 LIMESTONE; WHITE
15% POROSITY: PIN POINT VUGS, FRACTURE
POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: BIOGENIC, CALCILUTITE, PELLET
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: CLAY-02%
OTHER FEATURES: CHALKY, GRANULAR
FOSSILS: FOSSIL FRAGMENTS, MOLLUSKS
LIMESTONE, POOR RECOVERY, CRUMBLY, SOME INTERBEDDED CLAY

879 - 891 LIMESTONE; WHITE
05% POROSITY: FRACTURE
GRAIN TYPE: BIOGENIC, CALCILUTITE, PELLET
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
ACCESSORY MINERALS: CLAY-05%
OTHER FEATURES: CHALKY, GRANULAR, WEATHERED
FOSSILS: FOSSIL FRAGMENTS, MOLLUSKS

891 - 901 CALCARENITE; WHITE
20% POROSITY: FRACTURE, MOLDIC, PIN POINT VUGS
GRAIN TYPE: BIOGENIC, PELLET
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: CHALKY, GRANULAR, WEATHERED
FOSSILS: MOLLUSKS, FOSSIL FRAGMENTS, ECHINOID
BENTHIC FORAMINIFERA

901 - 906 LIMESTONE; WHITE
OI% POROSITY: LOW PERMEABILITY

GRAIN TYPE: CALCILUTITE
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO VERY FINE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
ACCESSORY MINERALS: CLAY-15%
OTHER FEATURES: CHALKY, WEATHERED
FOSSILS: FOSSIL FRAGMENTS

906 - 911 CALCARENITE; VERY LIGHT ORANGE TO YELLOWISH GRAY
20% POROSITY: FRACTURE, MOLDIC, PIN POINT VUGS
GRAIN TYPE: BIOGENIC, PELLET, SKELETAL
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: GRANULAR, CHALKY, WEATHERED
FOSSILS: FOSSIL FRAGMENTS, ECHINOID, BENTHIC FORAMINIFERA
MOLLUSKS
CALCARENITE, VERY WEATHERED, INDIVIDUAL FOSSIL
UNIDENTIFIABLE DUE TO WEATHERING - PERMEABLE

911 - 925 CALCARENITE; VERY LIGHT ORANGE TO YELLOWISH GRAY
20% POROSITY: FRACTURE, MOLDIC, POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: BIOGENIC, PELLET, SKELETAL
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: GRANULAR, CHALKY, WEATHERED
FOSSILS: ECHINOID, BENTHIC FORAMINIFERA, MOLLUSKS
FOSSIL FRAGMENTS
CALCARENITE, MOLDIC - EUPATAGUS CLEVI IDENTIFIED, OCALA
LIMESTONE VERY FOSSILIFEROUS BUT HIGHLY WEATHERED.

925 - 932 CALCARENITE; VERY LIGHT ORANGE TO YELLOWISH GRAY
20% POROSITY: FRACTURE, PIN POINT VUGS
POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: BIOGENIC, PELLET, SKELETAL
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: GRANULAR, CHALKY, WEATHERED
FOSSILS: FOSSIL FRAGMENTS, BENTHIC FORAMINIFERA

932 - 950 CALCARENITE; VERY LIGHT ORANGE TO YELLOWISH GRAY
15% POROSITY: FRACTURE, PIN POINT VUGS
POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: BIOGENIC, PELLET, SKELETAL
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: GRANULAR, CHALKY, WEATHERED
FOSSILS: FOSSIL FRAGMENTS, BENTHIC FORAMINIFERA, ECHINOID

950 - 960 CALCARENITE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
10% POROSITY: FRACTURE
GRAIN TYPE: BIOGENIC, PELLET, SKELETAL
GRAIN SIZE: MEDIUM; RANGE: MICROCRYSTALLINE TO COARSE
POOR INDURATION

CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-01%
OTHER FEATURES: GRANULAR, CHALKY, WEATHERED
FOSSILS: FOSSIL FRAGMENTS
CALCARENITE, CRUMBLY, VERY WEATHERED, SOFT, COLOR CHANGES

960 - 970 CALCARENITE; VERY LIGHT ORANGE TO YELLOWISH GRAY
05% POROSITY: INTRAGRANULAR, FRACTURE, PIN POINT VUGS
GRAIN TYPE: BIOGENIC, PELLET, SKELETAL
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-01%, QUARTZ SAND-01%
OTHER FEATURES: GRANULAR, CHALKY, WEATHERED
FOSSILS: FOSSIL FRAGMENTS

970 - 975.2 CALCARENITE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
10% POROSITY: FRACTURE, PIN POINT VUGS
GRAIN TYPE: BIOGENIC, PELLET, SKELETAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-01%, CALCITE-01%
OTHER FEATURES: GRANULAR, CHALKY, WEATHERED
FOSSILS: FOSSIL FRAGMENTS

975.2- 980.3 CALCARENITE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
15% POROSITY: FRACTURE, MOLDIC, PIN POINT VUGS
GRAIN TYPE: BIOGENIC, PELLET, SKELETAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCITE-01%
OTHER FEATURES: GRANULAR, CHALKY, WEATHERED
FOSSILS: FOSSIL FRAGMENTS, CORAL, BENTHIC FORAMINIFERA
ECHINOID

980.3- 987.4 CALCARENITE; WHITE TO YELLOWISH GRAY
10% POROSITY: FRACTURE, PIN POINT VUGS
GRAIN TYPE: BIOGENIC, PELLET, SKELETAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCITE-01%
OTHER FEATURES: GRANULAR, CHALKY, CHALKY
FOSSILS: FOSSIL FRAGMENTS, CORAL, BENTHIC FORAMINIFERA

987.4- 997 CALCARENITE; VERY LIGHT ORANGE TO YELLOWISH GRAY
15% POROSITY: FRACTURE, PIN POINT VUGS, MOLDIC
GRAIN TYPE: BIOGENIC, PELLET, SKELETAL
GRAIN SIZE: MEDIUM; RANGE: VERY FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCITE-01%
OTHER FEATURES: GRANULAR, CHALKY, WEATHERED
FOSSILS: FOSSIL FRAGMENTS, BENTHIC FORAMINIFERA, ECHINOID

997 - 1002 CALCARENITE; VERY LIGHT ORANGE TO YELLOWISH GRAY
20% POROSITY: FRACTURE, PIN POINT VUGS, MOLDIC
GRAIN TYPE: BIOGENIC, PELLET, SKELETAL
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: GRANULAR, CHALKY, WEATHERED
FOSSILS: FOSSIL FRAGMENTS, ECHINOID, BENTHIC FORAMINIFERA MOLLUSKS

1002 - 1003 CALCARENITE; VERY LIGHT ORANGE TO YELLOWISH GRAY
10% POROSITY: INTRAGRANULAR, FRACTURE
GRAIN TYPE: BIOGENIC, PELLET, SKELETAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCITE-01%, PHOSPHATIC SAND-01%
OTHER FEATURES: GRANULAR, CHALKY, WEATHERED
FOSSILS: FOSSIL FRAGMENTS

1003 - 1014 DOLOSTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
01% POROSITY: LOW PERMEABILITY; 10-50% ALTERED; SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO MICROCRYSTALLINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: MASSIVE
ACCESSORY MINERALS: LIMESTONE-03%, ORGANICS-02%
OTHER FEATURES: CALCAREOUS
DOLOSTONE, HARD, SOME THIN LAMINAE OF ORGANICS, SOME FRACTURES

1014 - 1015 LIMESTONE; VERY LIGHT ORANGE TO YELLOWISH GRAY
01% POROSITY: LOW PERMEABILITY
GRAIN TYPE: CALCILUTITE
GRAIN SIZE: MICROCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO MICROCRYSTALLINE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CLAY-05%, ORGANICS-05%
OTHER FEATURES: CHALKY, WEATHERED

1015 - 1031 CALCARENITE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
10% POROSITY: INTRAGRANULAR, PIN POINT VUGS
GRAIN TYPE: BIOGENIC, PELLET, SKELETAL
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CLAY-01%, DOLOMITE-01%
OTHER FEATURES: GRANULAR, FOSSILIFEROUS
FOSSILS: BENTHIC FORAMINIFERA
CALCARENITE: GRANULAR, NUMEROUS FAGIANIA CUBENSIS FORAMINIFERA; AVON PARK FORMATION CONTACT AT 1003.5'

1031 - 1035 CALCARENITE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
10% POROSITY: PIN POINT VUGS, FRACTURE
GRAIN TYPE: BIOGENIC, PELLET, SKELETAL

GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCITE-01%
OTHER FEATURES: GRANULAR, WEATHERED
FOSSILS: FOSSIL FRAGMENTS, BENTHIC FORAMINIFERA, MOLLUSKS

1035 - 1050 CALCARENITE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
05% POROSITY: PIN POINT VUGS, FRACTURE
GRAIN TYPE: BIOGENIC, PELLET, SKELETAL
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCITE-01%
OTHER FEATURES: GRANULAR, WEATHERED
FOSSILS: FOSSIL FRAGMENTS, BENTHIC FORAMINIFERA

1050 - 1055 CALCARENITE; YELLOWISH GRAY TO YELLOWISH GRAY
03% POROSITY: FRACTURE, INTRAGRANULAR
GRAIN TYPE: BIOGENIC, PELLET, SKELETAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCITE-01%
OTHER FEATURES: GRANULAR, WEATHERED, CHALKY
FOSSILS: FOSSIL FRAGMENTS, BENTHIC FORAMINIFERA, ECHINOID

1055 - 0000 CALCARENITE; YELLOWISH GRAY TO YELLOWISH GRAY
05% POROSITY: FRACTURE, INTRAGRANULAR
GRAIN TYPE: BIOGENIC, PELLET, SKELETAL
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCITE-01%
OTHER FEATURES: GRANULAR, WEATHERED, CHALKY
FOSSILS: FOSSIL FRAGMENTS, BENTHIC FORAMINIFERA, ECHINOID

0000 - 1055 NO DEPTH ON ORIGINAL LOG, PER RICK LEE
CALCARENITE, WEATHERED, SMALLER GRAIN SIZE, NUMEROUS FORAMS
- FABIANIA DICTYOCUNUS

1055 - 1085 LIMESTONE; YELLOWISH GRAY TO YELLOWISH GRAY
03% POROSITY: PIN POINT VUGS, FRACTURE
GRAIN TYPE: BIOGENIC, PELLET, SKELETAL
GRAIN SIZE: VERY FINE; RANGE: COARSE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CLAY-01%
OTHER FEATURES: WEATHERED, CHALKY
FOSSILS: FOSSIL FRAGMENTS, ECHINOID, BENTHIC FORAMINIFERA
MOLLUSKS

1085 - 1114.5 LIMESTONE; YELLOWISH GRAY TO YELLOWISH GRAY
03% POROSITY: FRACTURE
GRAIN TYPE: BIOGENIC, PELLET, SKELETAL
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION

CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: WEATHERED, CHALKY
FOSSILS: FOSSIL FRAGMENTS, ECHINOID, BENTHIC FORAMINIFERA MOLLUSKS

1114.5- 1130.5 LIMESTONE; YELLOWISH GRAY TO YELLOWISH GRAY
02% POROSITY: FRACTURE
GRAIN TYPE: BIOGENIC, PELLET, SKELETAL
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: WEATHERED, CHALKY
FOSSILS: ECHINOID, BENTHIC FORAMINIFERA, CORAL
LIMESTONE, POOR INDURATION, NUMEROUS FORAMS

1130.5- 1137 DOLOSTONE; VERY LIGHT ORANGE TO YELLOWISH GRAY
15% POROSITY: MOLDIC, PIN POINT VUGS
POSSIBLY HIGH PERMEABILITY; 10-50% ALTERED; SUBHEDRAL
GRAIN SIZE: VERY FINE; RANGE: FINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: LIMESTONE-10%, CALCITE-03%
OTHER FEATURES: CALCAREOUS, CHALKY, REEFAL
FOSSILS: ECHINOID, BENTHIC FORAMINIFERA, FOSSIL FRAGMENTS MOLLUSKS
DOLOSTONE, CRYSTALLINE, NUMEROUS LIMESTONE ECHNOID & FORAM FRAGMENTS, MOLDIC POROSITY

1137 - 1144 DOLOSTONE; GRAYISH BROWN TO MODERATE YELLOWISH BROWN
20% POROSITY: MOLDIC, PIN POINT VUGS
POSSIBLY HIGH PERMEABILITY; 10-50% ALTERED; SUBHEDRAL
GRAIN SIZE: VERY FINE; RANGE: FINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): ORGANIC MATRIX, CALCILUTITE MATRIX
FOSSILS: ECHINOID, BENTHIC FORAMINIFERA, FOSSIL FRAGMENTS

1144 - 1144.5 LIMESTONE; VERY LIGHT ORANGE TO YELLOWISH GRAY
00% POROSITY: NOT OBSERVED
GRAIN TYPE: BIOGENIC, PELLET
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
ACCESSORY MINERALS: DOLOMITE-01%
OTHER FEATURES: DOLOMITIC, WEATHERED, CHALKY
FOSSILS: BENTHIC FORAMINIFERA

1144.5- 1170 DOLOSTONE; GRAYISH BROWN TO MODERATE YELLOWISH BROWN
20% POROSITY: MOLDIC, PIN POINT VUGS
POSSIBLY HIGH PERMEABILITY; 10-50% ALTERED; EUHEDRAL
GRAIN SIZE: VERY FINE; RANGE: FINE TO MEDIUM

FORM C-01 Basic well description

CARD CODE	FGB File No.	DEPTH WORKED	COUNTY	TOWNSHIP	S or N	RANGE	E or W	SECTION	1/4	1/4	LATITUDE Deg.	Min.	Sec.	LONGITUDE Deg.	Min.	Sec.	TOTAL DEPTH (Feet)	ELEV. (Feet)	SAMPLES No.	Interval (Feet) From	To	DATE of COMPLETION Year	Month	Day	CORE	GEOPHYSICAL LOGS
1	W-	1814	D	39S		24	E	26			27	03	40	81	53	02	18/14	40		11	70	18/14	01	01	03		CEFS

WELL NUMBER Owner-No. (Driller)

2	W-	ROMP 16.5 12" Alan Plark Exploratory well SWFWMD

REMARKS (For example: Geologist's name, date worked, sample quality, etc.)

3	W-	SWFWMD ROMP 16.5 Ft Osden (DEEP EXPLORATORY DRILLING) Driller: Diversified Drilling - Charlie Godwin SWFWMD Supervisor: Lloyd Johanson SWFWMD Geologist: Ted Gates Reverse-air drilling - button bit - cuttings only described
4		

ROMP 16.5 Ft. Ogden Avon Park Exploratory Drilling - Cutting Description

GEOLOGIST Ted Gates DATE 11-30-2005 PAGE 1 of 4

(Geologic sample descriptions)

Depth (to 0.1 ft.)	Rock Type	Color	Porosity %	Porosity Types	Sand	Limestone Grain Type(s)	Limestone Size	Dolomite	Induration	Cement Type	Sedimentary Structures	Accessory Minerals	Other Features	General Fossils	Index Fossils
1180.0	D	3031	05	F	/		/	MSMMC	G	D	V	L02			
1190.0	D	3031	05	F	/		/	MSMMC	G	D	V	L02			
1200.0	D	3037	10	FM	/		/	MEMMC	G	D	V	L01			
—	Z	DOLOSTONE, HARD, CRYSTALLINE SOME MOLDS, PERMEABLE											O		
1210.0	D	3038	05	F	/		/	MSOCV	G	D	V	L02	O		
1220.0	D	3031	05	FM	/		/	MSMOC	G	D	V	L05	O		
1230.0	D	3031	10	FMY	/		/	MSMOC	G	D	V	L02	O		
1240.0	D	3037	10	FMY	/		/	MSMFC	G	D	V	L02			
1250.0	D	3037	15	FMY	/		/	MSMOC	G	D	V	E01	O		
—	Z	DOLOSTONE, LARGER CUTTINGS, SOME MOLDIC CRYSTALLINE, APPEARS PERMEABLE													
1260.0	D	3037	15	FMY	/		/	MSMCC	G	D	V	L01	O		
1270.0	D	3039	15	FMY	/		/	MSMOC	G	D	V	L02	O		
1280.0	D	2937	15	FMY	/		/	MSMOC	G	D	V	L01	O		
—	Z	DOLOSTONE, MORE MOLDIC, CRYSTALLINE, PERMEABLE													
1290.0	D	2939	15	FMY	/		/	MSMOC	G	D	V	L01	O		
—	Z	PACKER TEST FROM 1260-1290 INDICATED LOW PERMEABILITY													
1300.	L	2986	10	AP	/	MS	FNC	/	P	M	I	D05	K		
—	Z	LIMESTONE, SOFT, SKELETAL													
1310.	L	2987	05	A	/	MPS	FFM	/	P	LC	I	CTOD03	KU	F	
—	Z	LIMESTONE, PELLETS, IN CLAY MATRIX													
1320.0	L	2986	05	AM	/	BMS	VVM	/	M	L	I	C03D02	KU	F	
1330.0	L	2987	05	AM	/	BMS	VVM	/	M	L	I	D05	K		
1340.0	L	2987	05	AMF	/	BCS	VVM	/	M	LD		E01D05	K		

CONTINUED ON NEXT PAGE (2)

ROMP 16.5 Ft. Ogden Exploratory Drilling (Cuttings)

GEOLOGIST Ted Gates DATE 12-12-200[illegible]

PAGE 2 of 4

(Geologist sample descriptions)

FBG File No. W—	Depth (To 0.1 Ft.)	Rock Type	Color 1 2	Porosity % Types	Sand	Limestone Grain Type(s)	Limestone % > .062mm	Limestone Size	Dolomite	Induration	Cement Type	Sedimentary Structures	Accessory Minerals	Other Features	General Fossils	Index Fossils
	1350.0	L	2986	0 SAM		MBS		VOC		M	L		DOIEO/	K		
	—	Z	SOME CRYSTALS VISIBLE APPEARS MOLDIC													
	1360.0	L	2986	0 SAM		MBS		VOC		M	L		DOI	K		
	1370.0	L	2986	0 SAMP		MB		VCM		M	L			K		
	1380.0	L	2989	0 SM		MB		VOM		M	L		EC/DC/	K		
	1390.0	L	2987	0 SAMP		MB		VCM		M	LD	I	D03EOF	K		
	1400.0	L	2986	0 SAMP		MB		VOM		M	L	I	DOI	K		
	—	Z	LIMESTONE FEW CRYSTALS VISIBLE CALCITE & DOLOMITE, SOFT													
	1410.0	L	2986	10		MBP		FOM		M	L		DOI	K		
	—	Z	SAME AS ABOVE TO 1440													
	1450.0	L	2987	10 AMF		MBP		FOM		M	LDC	I	D10CC3EO/	K	F	
	1460.0	L	2987	10 AMF		MBP		FOM		G	LDC	I	D10C05	K	F	
	—	Z	LIMESTONE INTERBEDDED DOLOSTONE & CLAY													
	1470.0	D	2987	20 MPF					MSMC	C	GD		L30	K	F	
	—	Z	DOLOSTONE MOLDIC FRACTURES APPEARS PERMEABLE													
	1480.0	D	2988	20 MFY					M MMC	G	DC	I	C25	K		
	1490.0	L	2987	20 MPY		BSP		FFC		G	LD	I	D10EC/	K		
	1500.0	D	2987	20 FPY					ASMFC	G	D	I	L10	K		
	—	Z	DOLOSTONE BROWN HARD POSSIBLE FRACTURES													
	1510.0	L	2986	10 AP		BMS		FVM		M	I		D10	K		
	1520.0	D	2987	25 MFY					MSMFC	M	I	I	L30	K	E	
	1530.0	D	2987	25 MFY		BMS			MSFFC		I		L10		E	
	—	Z	TOP OF FRACTURED DOLOSTONE (HIGH T ZONE) AT 1525. HIGHLY FRACTURED DOLOSTONE MANY SMALL CRYSTALS. ECHINOIDS COMMON. LARGE [illegible] FRAGMENTS													

#6 (Geological sample descriptions) ROMP 16.5 Fort Ogden Site Exploratory Drilling (cuttings)

GEOLOGIST Ted Gates DATE 12-16-2004

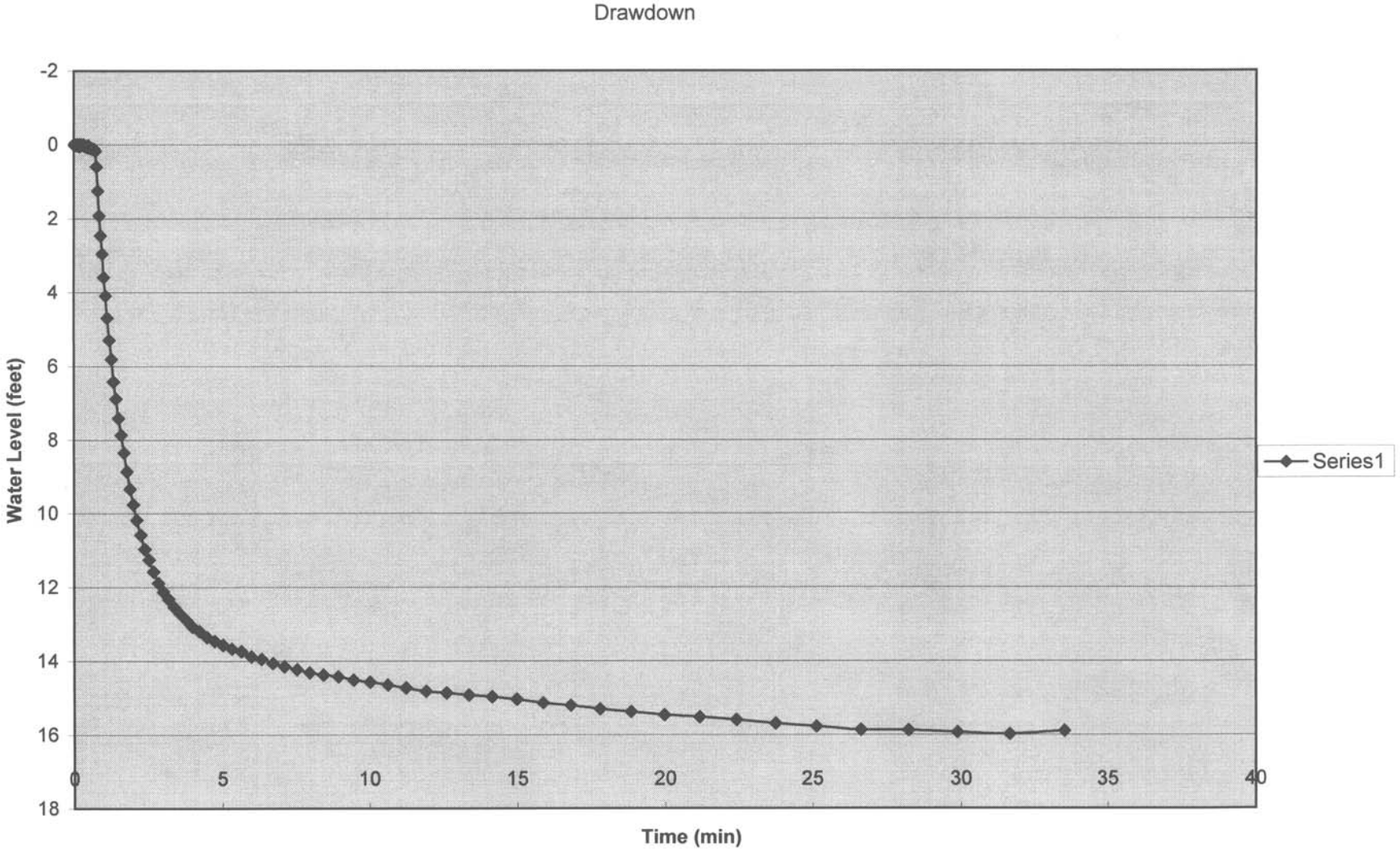
FBG File No. W—	DEPTH (To 0.1 Ft.)	ROCK TYPE	COLOR (1, 2)	POROSITY %	POROSITY Types	SAND	LIMESTONE Grain Type(s)	LIMESTONE Size	DOLOMITE	INDURATION	CEMENT TYPE	SEDIMENTARY STRUCTURES	ACCESSORY MINERALS	OTHER FEATURES	GENERAL FOSSILS	INDEX FOSSILS
	1540.0	D	30 88	40	FMY	/		/	MSMVC	G	D		L05 E01	F	E	
	——	Z	DOLOSTONE FRACTURED, MOLDIC, CRYSTALS COMMON, ECHINOIDS COMMON													
	——	Z	LARGE FRAGMENTS 1-2 INCHES IN CUTTINGS - HARD DRILLING													
	1550.0	D	30 39	25	FMY	/		/	MSVOC	G	D		L05 E01	O		
	——	Z	LESS FRACTURED, FEWER LARGE FRAGMENTS IN CUTTINGS													
	1560.0	L	29 37	10	AF	/	MB	MFC	/	M	MD	I	D30	K		
	——	Z	LIMESTONE SOME DOLOSTONE STILL PRESENT IN CUTTINGS													
	1570.0	L	29 87	10	AP	/	MB	VOM	/	M	M		D10	K		
	1580.0	L	29 87	10	AP	/	MB	FVC	/	M	M		D05	K		
	——	Z	LIMESTONE VERY LITTLE DOLOSTONE, DRILLING FAST - SOFT													
	1600.0	D	29 32	30	FMY	/		/	MSFVC	G	D		L20	O		
	——	Z	DOLOSTONE APPEARS FRACTURED & CUTTINGS ARE STAINED BLACK													
	1620.0	L	29 37	05	A	/	MB	FOM		M	M	I	D10	K		
	1630.0	D	25 32	30	FMY	/		/	MS	G	D					
	1640.0	D	38 23	25	AMY	/		/	MSOOM	G	D		L02	H		
	——	Z	DOLOSTONE, HARD, MOLDIC, CRYSTALLINE, PERMEABLE													
	1650.0	L	29 36	15	AMY	/	BPS	VOM	/	M	MD		D10	K	Y	
	1660.0	D	84 85	15	AX	/		/	MEOOM	G	D		L05 E01	O		
	1670.0	D	30 37	10	XM	/		/	MEOOM	G	D		L05 E01	O		
	1680.0	D	30 31	10	XMY	/		/	MEOOM	G	D		L02 E01 Q01	O		
	1690.0	D	30 31	10	X	/		/	MSOOV	G	D		L02 E01	O		
	1700.0	D	35 32	15	XMY	/		/	MEOOM	G	D		L02 E01	O		
		Z	DOLOSTONE HARD CRYSTALLINE, MOLDIC & INTERCRYSTALLINE POROSITY													
			CONTINUED ON PAGE 4													

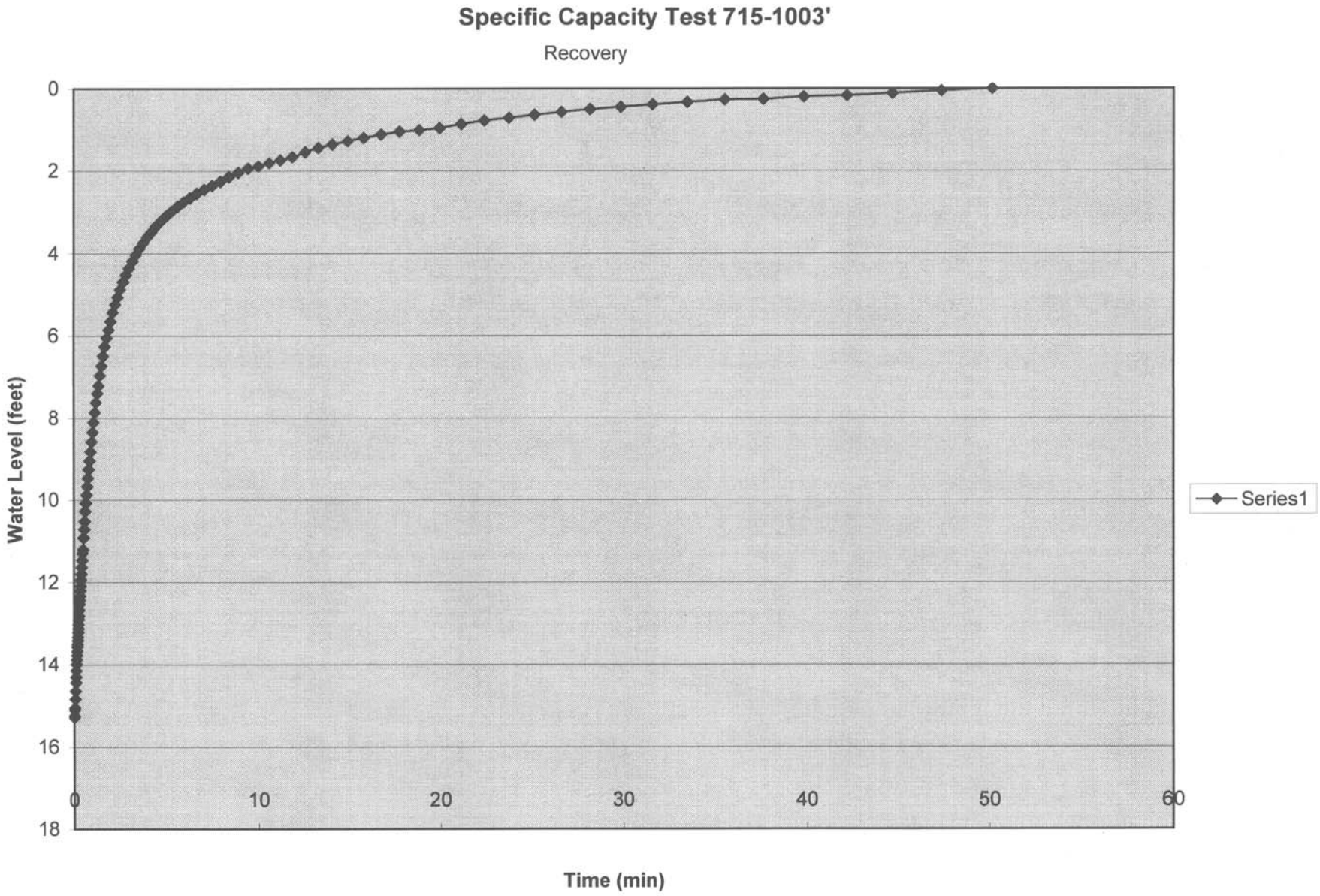
(Geologist sample descriptions) ROMP 16.5 Fort Ogden Site Exploratory Drilling (cuttings)

GEOLOGIST Ted Gates DATE

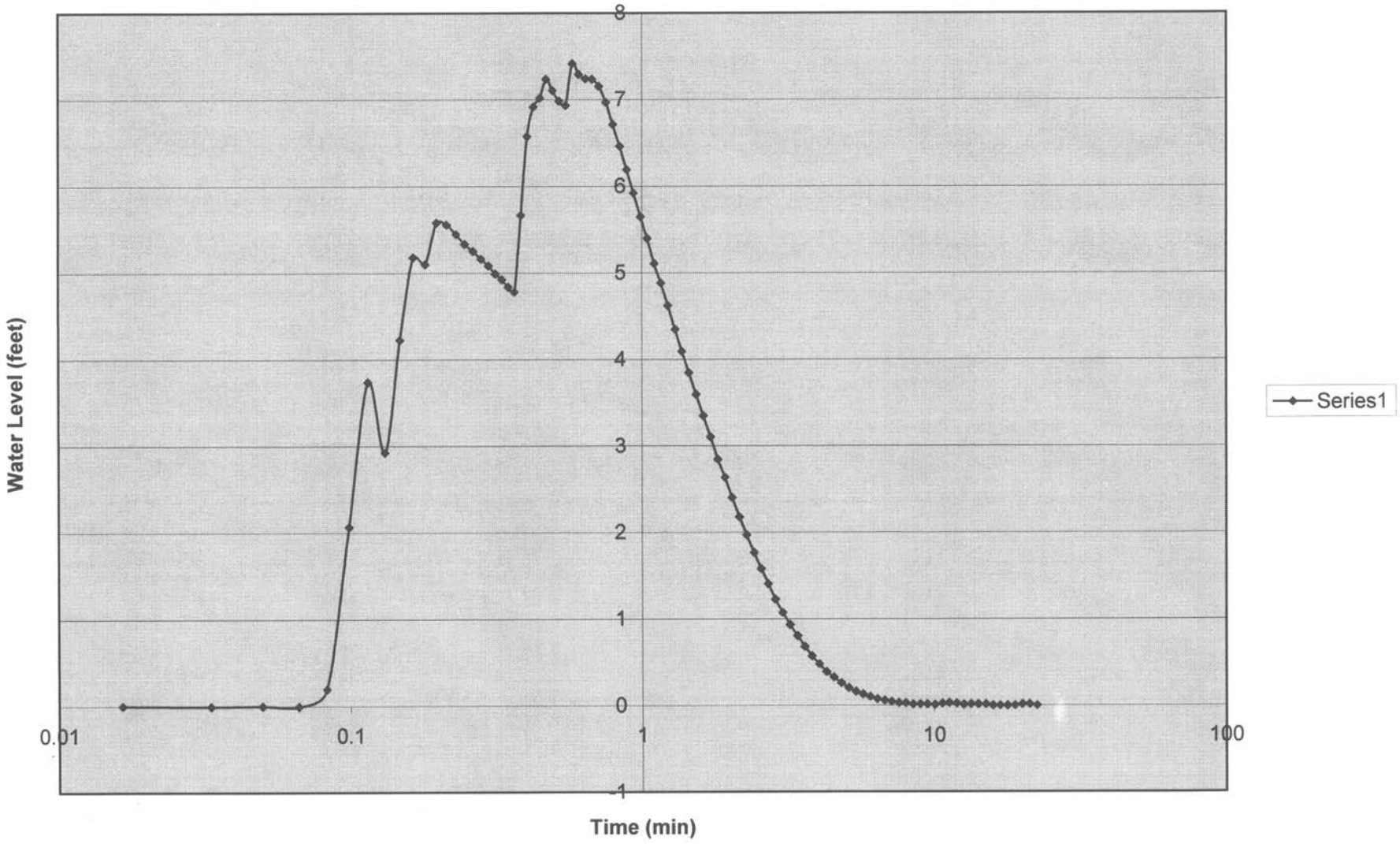
Depth (To 0.1 Ft.)	Rock Type	Color 1	Color 2	Porosity %	Porosity Types	Sand	Limestone	Dolomite (Alteration, Crystallinity, Mode, Size, Range)	Induration	Cement Type	Sedimentary Structures	Accessory Minerals	Other Features	General Fossils	Index Fossils
1710.0	D	30	31	10	XM	/	/	MS00F	G	D		L02E01	0		
1720.0	D	30	31	10	XM	/	/	MS00F	G	D		L02E01	0		
1730.0	D	30	37	10	XM	/	/	MS00F	G	D		L02E01	0		
1740.0	D	30	37	10	XM	/	/	MS00F	G	D		L02	0		
1750.0	D			30	XMY	/	/	ME00M	G	D		L02	0		
——	Z	DOLOSTONE, HARD, CRYSTALLINE, INTERCRYSTALLINE POROSITY													
1760.0	D	30	37	25	XM	/	/	ME00M	G	D		L02	0		
1770.0	D	30	37	25	XM	/	/	ME00M	G	D	V	L02	0		
1780.0	D	30	37	25	XMY	/	/	ME00M	G	D		L02	0		
1790.0	D	30	37	25	XM	/	/	ME00M	G	D		L02	0		
1800.0	D	30	37	30	XMY	/	/	ME00M	G	D	V	L02	0		
1814.0	D	30	37	30	XMY	/	/	ME00M	G	D	V	L02	0		
——	Z	END OF DRILLING AT 1814.													

Specific Capacity Test 715-1003'

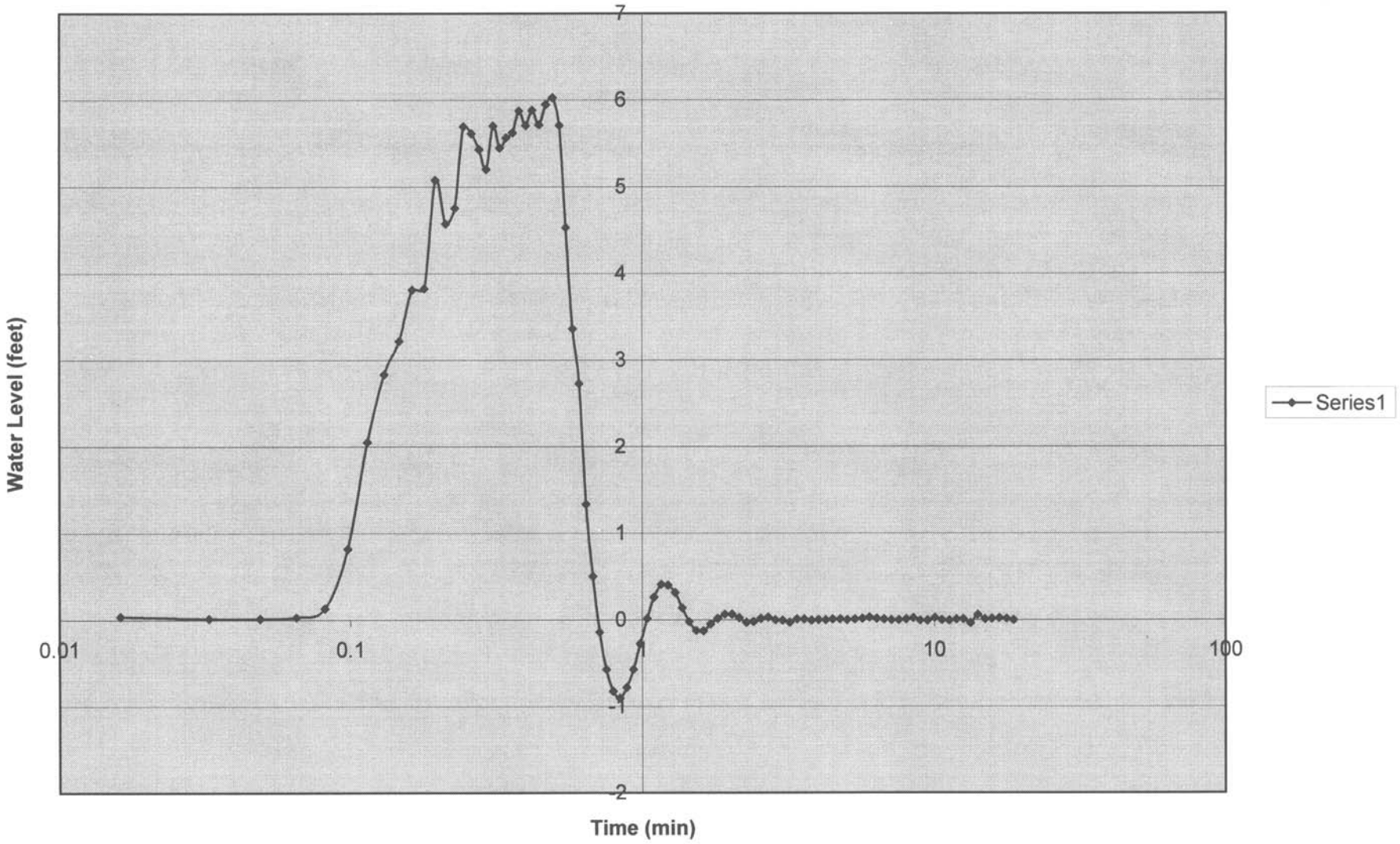



Specific Capacity Test 715-1003'
Recovery
Water Level (feet)
0
2
4
6
8
10
12
14
16
18
0
10
20
30
40
50
60
Time (min)
Series1

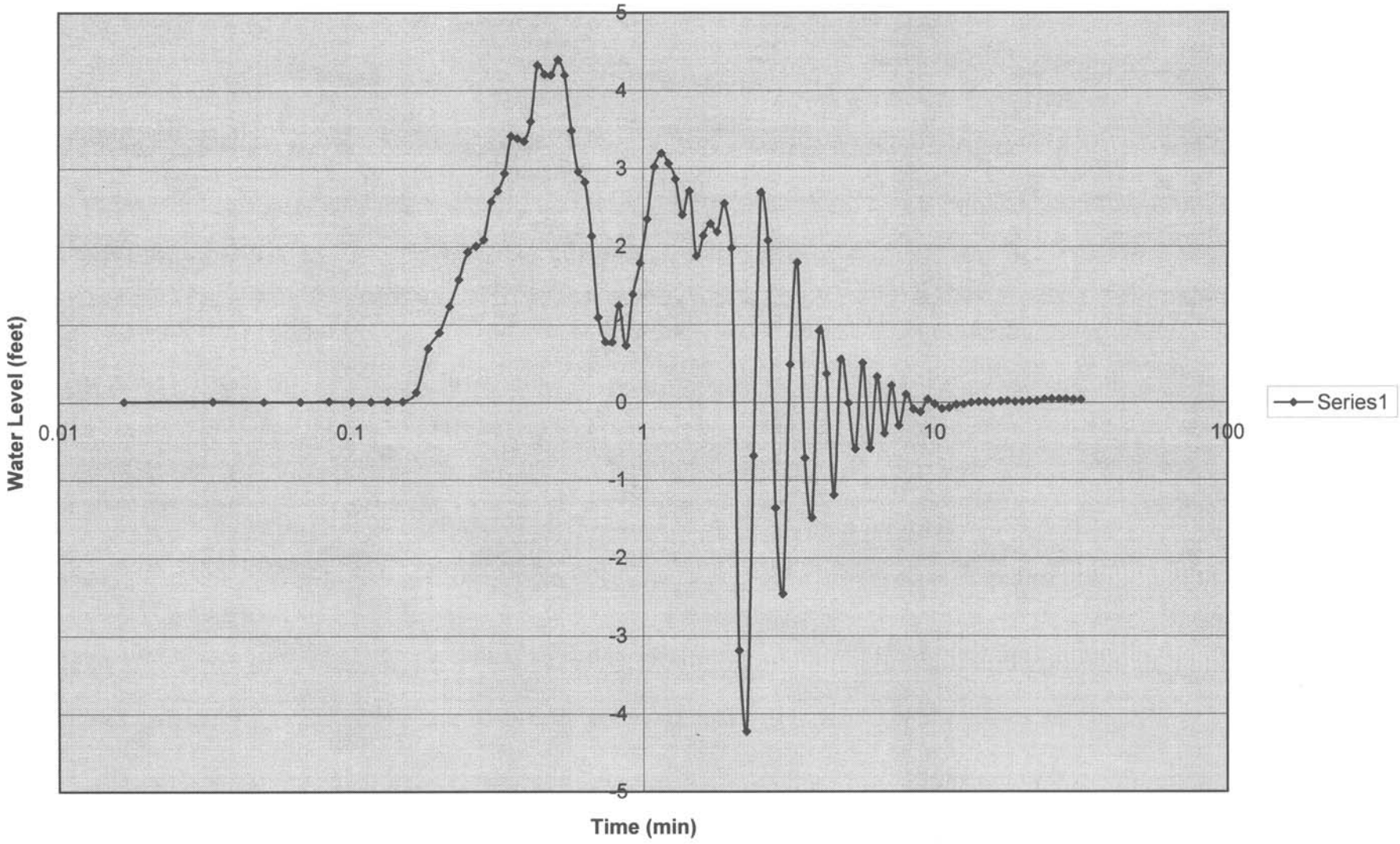
ROMP 16.5 Packer/Slug Test 1350 - 1400



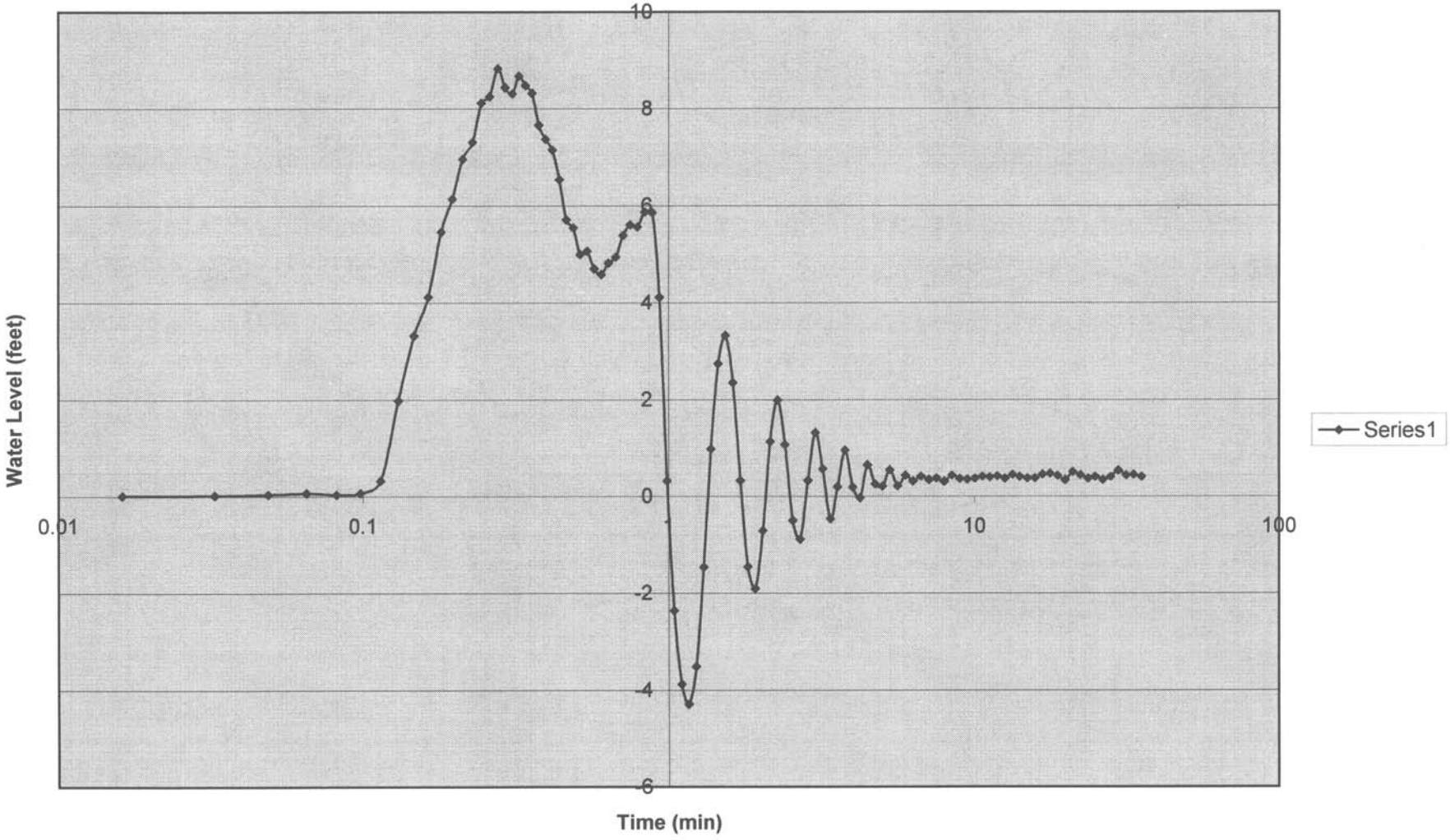
Romp 16.5 Packer/Slug Test 1430 - 1500'



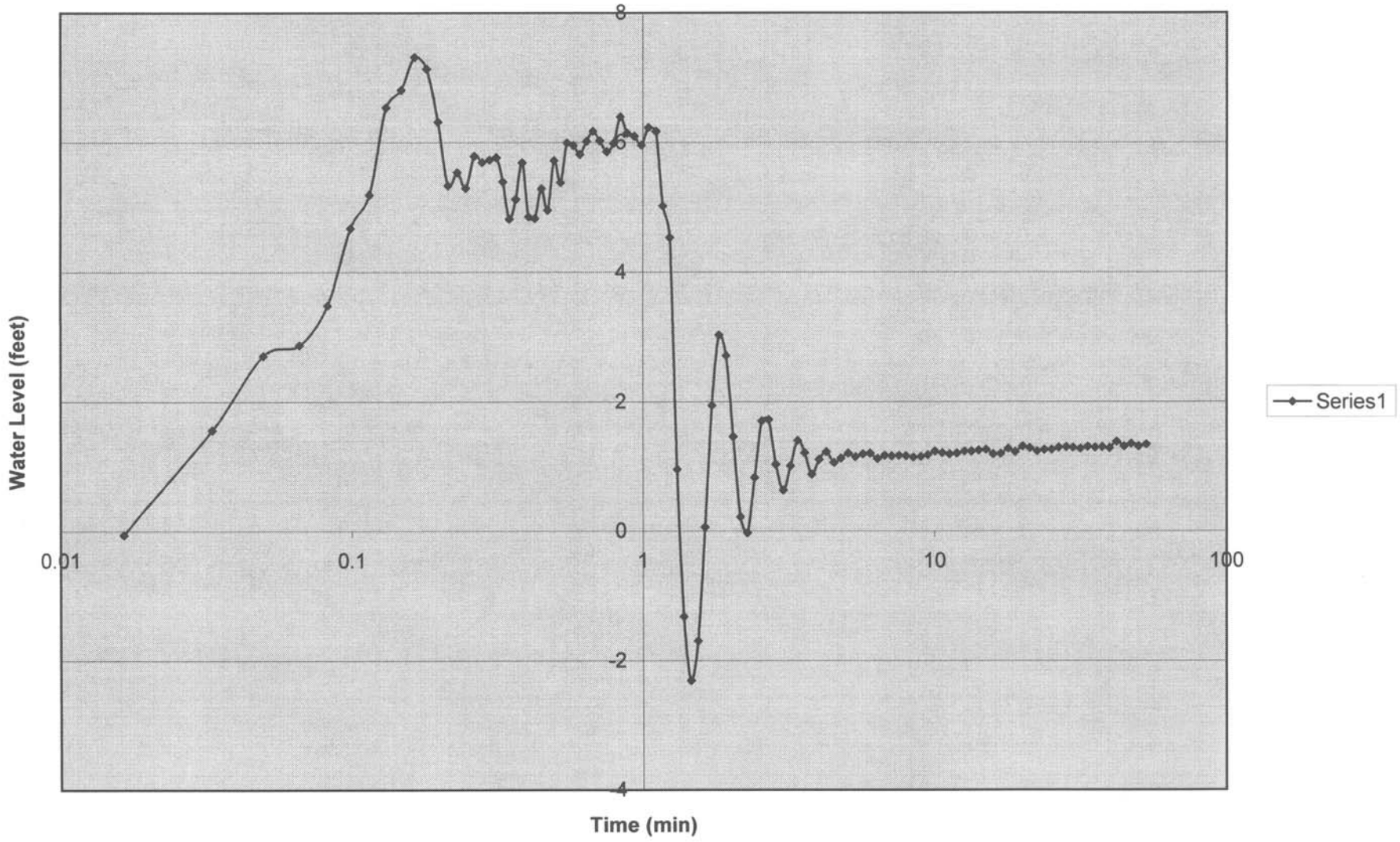
ROMP 16.5 Packer/Slug Test 1520 - 1540'



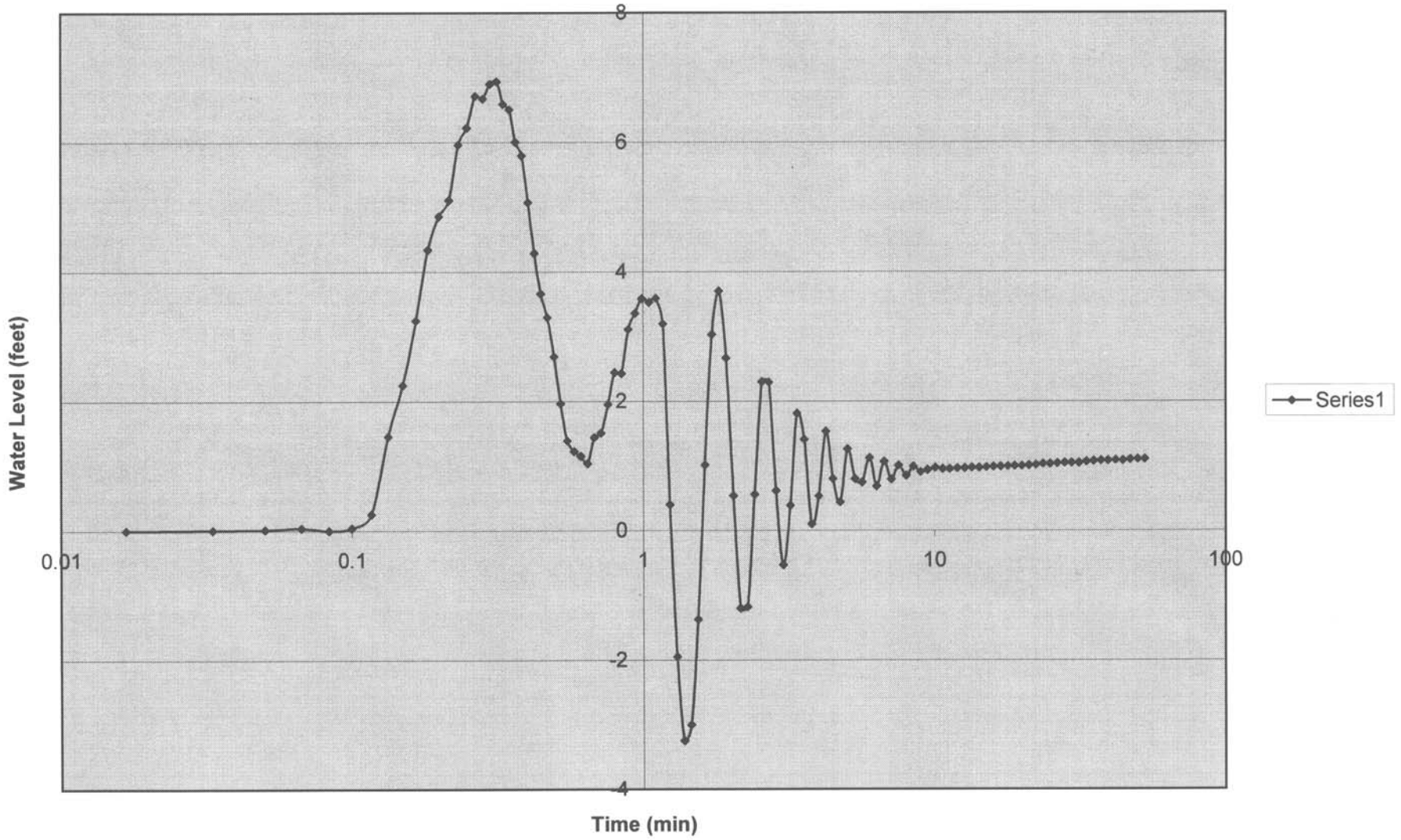
ROMP 16.5 Packer/Slug Test 1590 - 1636'

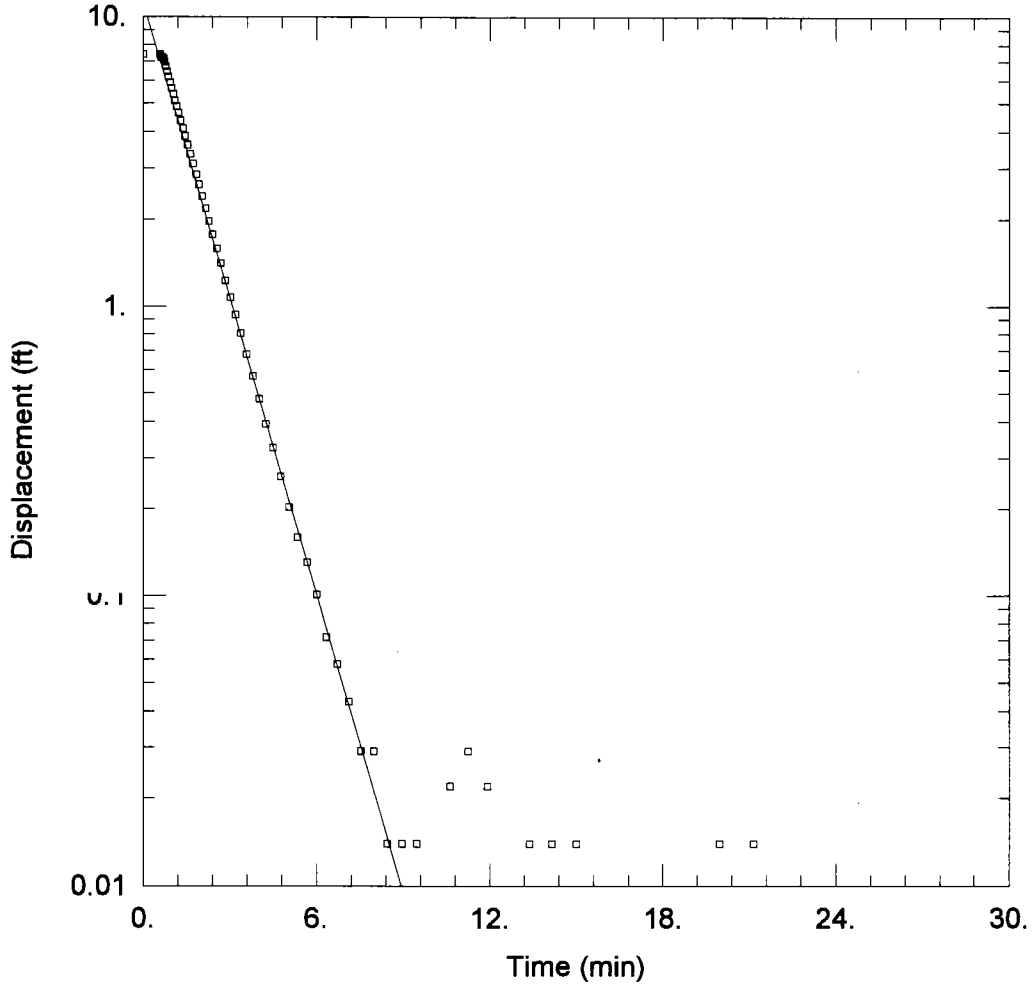


ROMP 16.5 Packer/Slug Test 1690 - 1740



ROMP 16.5 Packer/Slug Test 1761 - 1814'





PACKER TEST 1350 - 1400

Data Set: D:\MyFiles\Project Files\Romp16.5\Exploratory Drilling tests\PT1400.aqt
Date: 03/08/01 Time: 11:30:20

PROJECT INFORMATION

Company: SWFWMD
Client: Geohydrologic Data
Project: ROMP 16.5
Test Location: Fort Ogden
Test Well: Exploratory
Test Date: 12-11-2000

AQUIFER DATA

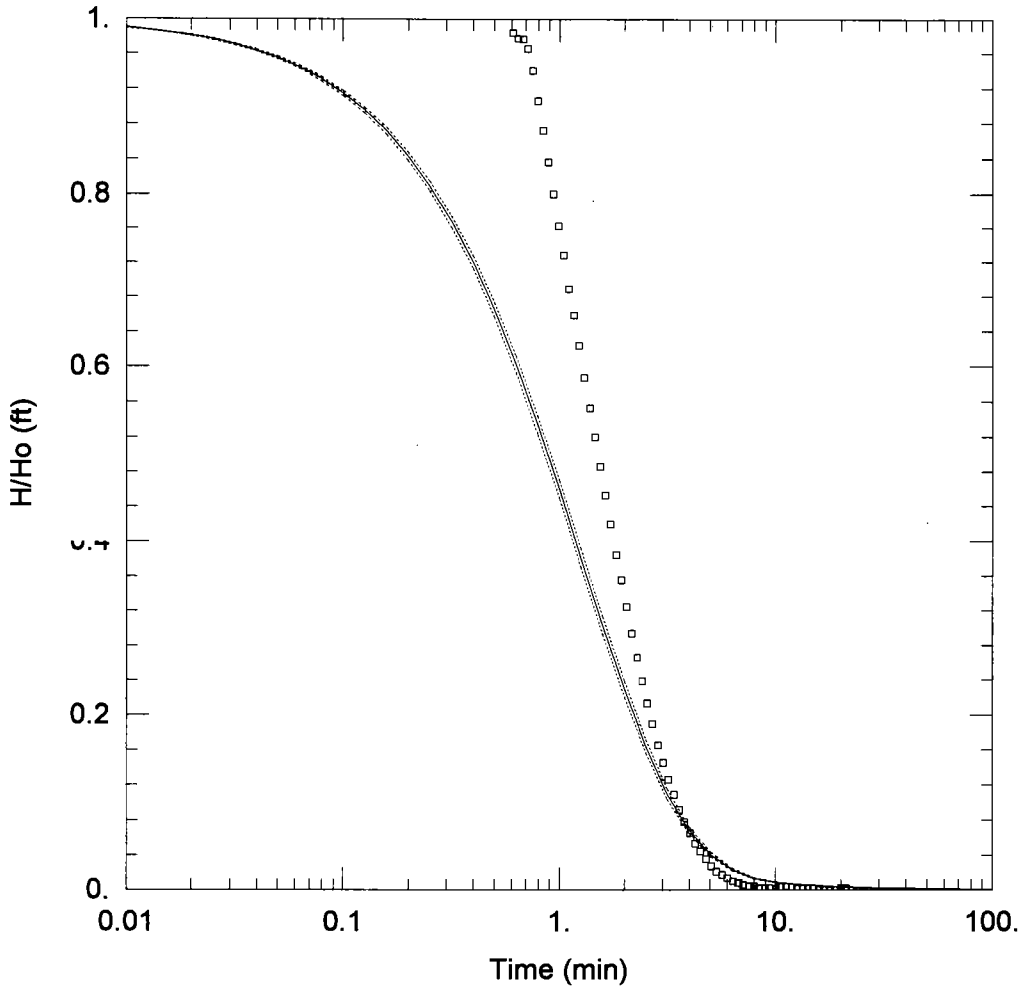
Saturated Thickness: 50. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (Expl)

Initial Displacement: 7.41 ft
Wellbore Radius: 0.33 ft
Screen Length: 50. ft
Casing Radius: 0.11 ft
Well Skin Radius: 0.33 ft
Total Well Penetration Depth: 50. ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.5317 ft/day
y0 = 11.28 ft



PACKER TEST 1350 - 1400

Data Set: D:\MyFiles\Project Files\Romp16.5\Exploratory Drilling tests\PT1400.aqt
Date: 03/08/01 Time: 11:33:55

PROJECT INFORMATION

Company: SWFWMD
Client: Geohydrologic Data
Project: ROMP 16.5
Test Location: Fort Ogden
Test Well: Exploratory
Test Date: 12-11-2000

AQUIFER DATA

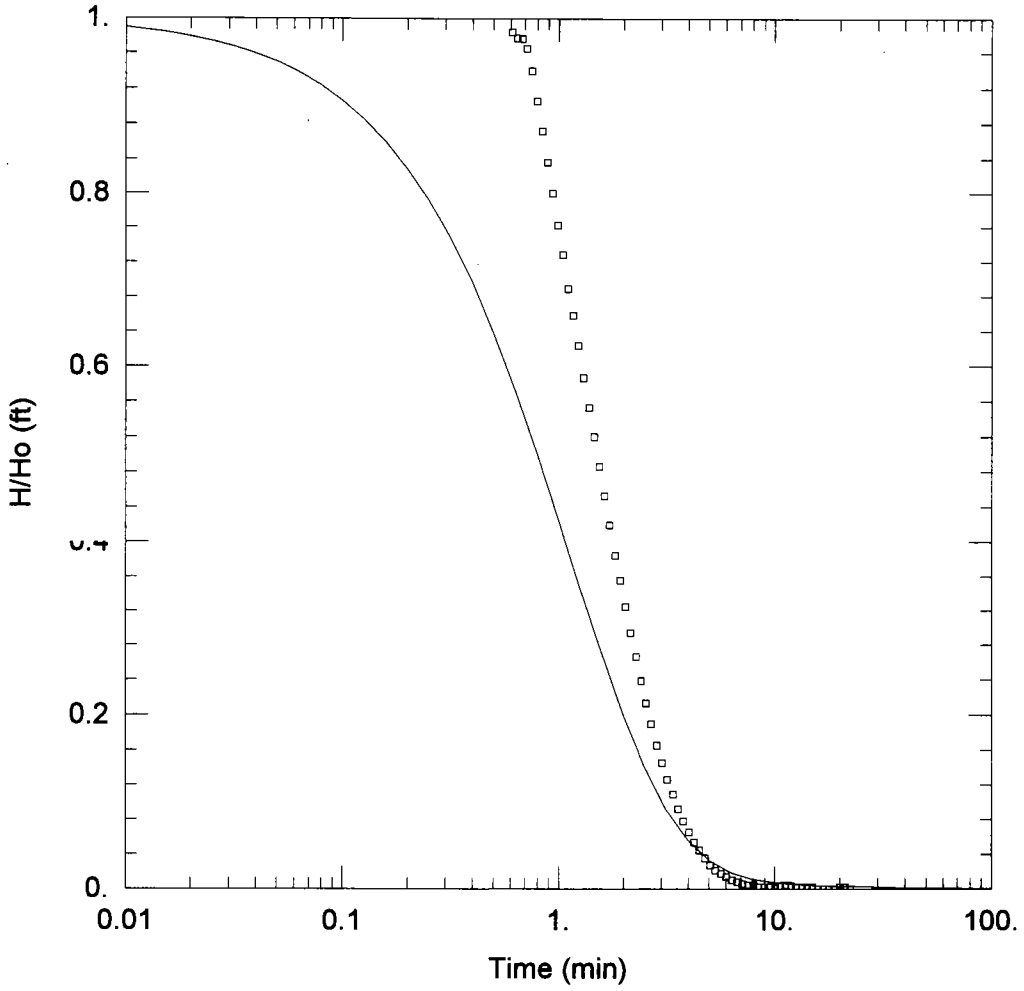
Saturated Thickness: 50. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (Exploratory)

Initial Displacement: 7.41 ft
Wellbore Radius: 0.33 ft
Screen Length: 50. ft
Casing Radius: 0.11 ft
Well Skin Radius: 0.33 ft
Total Well Penetration Depth: 50. ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 76.82 ft^2/day
S = 1.E-10



PACKER TEST 1350 - 1400

Data Set: D:\MyFiles\Project Files\Romp16.5\Exploratory Drilling tests\PT1400.aqt
Date: 03/08/01 Time: 11:50:00

PROJECT INFORMATION

Company: SWFWMD
Client: Geohydrologic Data
Project: ROMP 16.5
Test Location: Fort Ogden
Test Well: Exploratory
Test Date: 12-11-2000

AQUIFER DATA

Saturated Thickness: 50. ft

WELL DATA (Exploratory)

Initial Displacement: 7.41 ft
Wellbore Radius: 0.33 ft
Screen Length: 50. ft
Casing Radius: 0.11 ft
Well Skin Radius: 0.33 ft
Total Well Penetration Depth: 50. ft

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 1.703 ft/day
Kz/Kr = 1.
Ss = 2.E-12 ft^{-1}

VANDERKAMP UNDERDAMPED SOLUTION

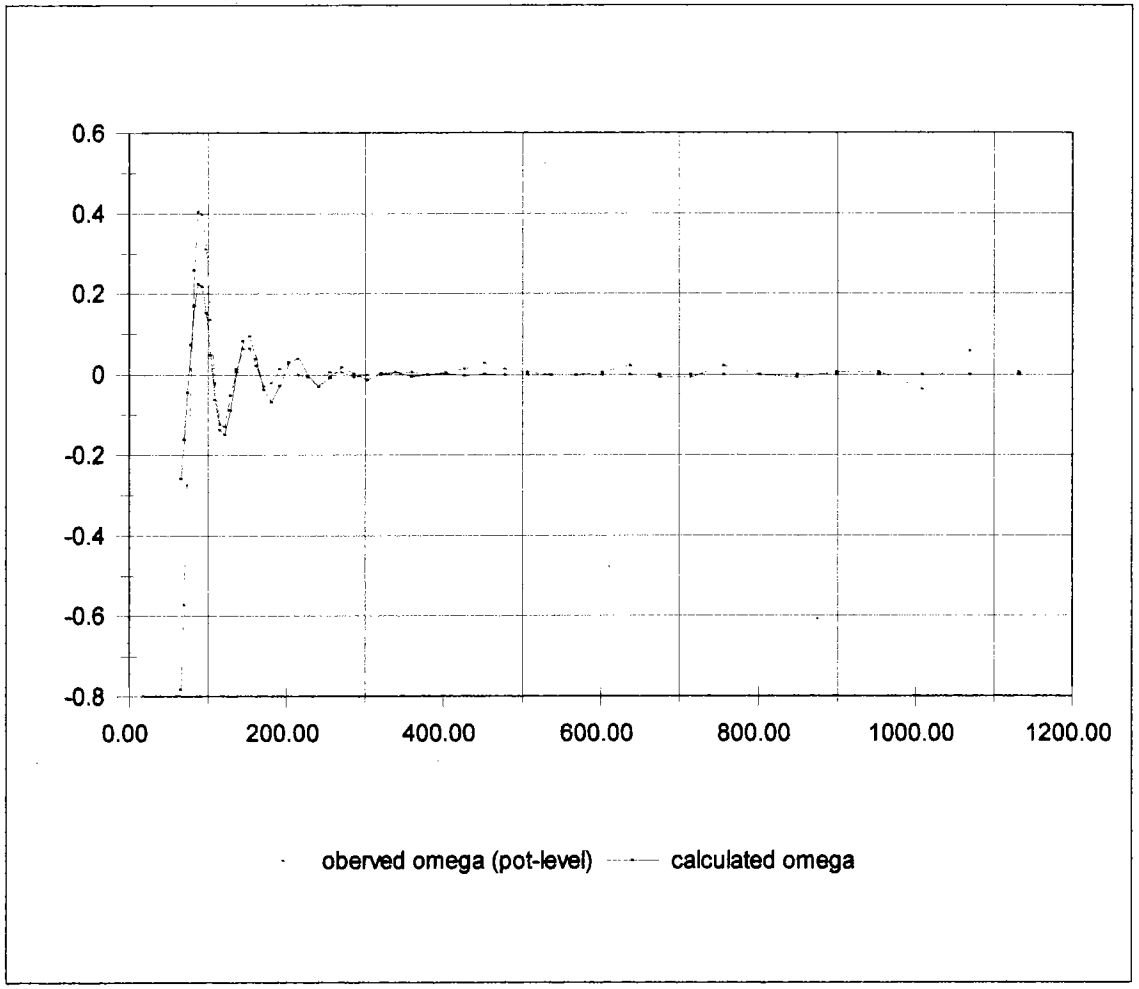
calculates transmissivity via an iterative routine

omega	gamma	radius casing	radius filter	Storativity (est.)
0.13	0.017	0.11	0.33	5.00E-04

L=	1871.77846
sqr(g/l)=	0.13110683
d=	0.12966525
a=	0.00152932
b=	0.01848284
T1=	0.01237947
T2=	0.01176652
T ft^2/day=	1009.91725

time (minutes)	time (seconds)	omega measured (feet)	omega calculated (feet)
0.8847	53.082	-0.781	-0.2582776
0.9345	56.07	-0.572	-0.1611744
0.9872	59.232	-0.275	-0.0437164
1.043	62.58	0.014	0.07485612
1.1022	66.132	0.26	0.17169212
1.1648	69.888	0.405	0.2244749
1.2312	73.872	0.398	0.21892296
1.3015	78.09	0.311	0.15472575
1.376	82.56	0.137	0.04985208
1.455	87.3	-0.022	-0.0612821
1.5387	92.322	-0.123	-0.1373463
1.6272	97.632	-0.13	-0.147363
1.721	103.26	-0.051	-0.0883312
1.8203	109.218	0.014	0.00745733
1.9257	115.542	0.065	0.08466215
2.0372	122.232	0.065	0.096153
2.1553	129.318	0.022	0.03905453
2.2805	136.83	-0.029	-0.0371829

convergance output: Packer Interval 1430 - 1500



VANDERKAMP UNDERDAMPED SOLUTION

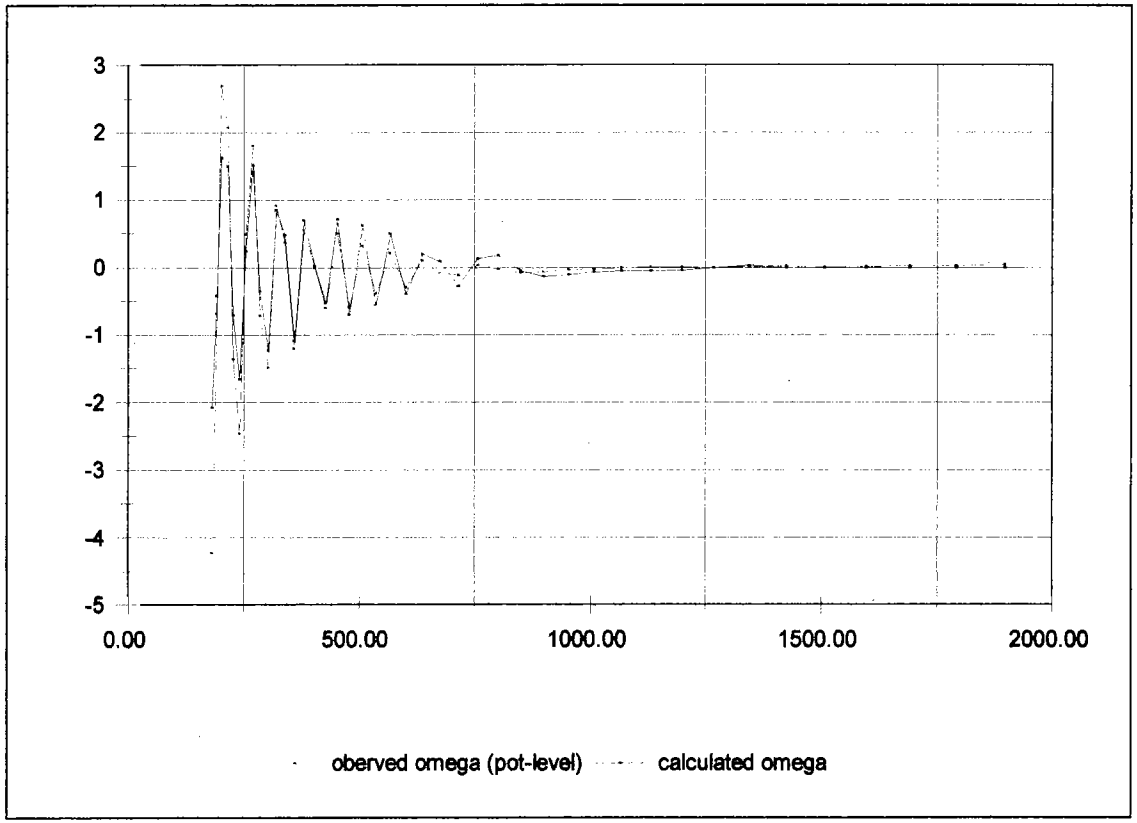
calculates transmissivity via an iterative routine

omega	gamma	radius casing	radius filter	Storativity (est.)
0.14	0.005	0.11	0.33	5.00E-04

L=	1639.4394904
sqr(g/l)=	0.1400892573
d=	0.0356915305
a=	0.0059365625
b=	0.071354071
T1=	0.0556809471
T2=	0.0542085824
T ft^2/day=	4669.8759153

time (minutes)	time (seconds)	omega measured (feet)	omega calculated (feet)
2.2738	136.428	-4.225	-2.0692892
2.4063	144.378	-0.687	-0.4227379
2.5468	152.808	2.692	1.62638533
2.6957	161.742	2.077	1.49507459
2.8532	171.192	-1.36	-0.707195
3.02	181.2	-2.46	-1.6604469
3.1968	191.808	0.485	0.24131305
3.3842	203.052	1.794	1.51288302
3.5825	214.95	-0.716	-0.3538637
3.7927	227.562	-1.483	-1.2236199
4.0153	240.918	0.919	0.85581232
4.2512	255.072	0.369	0.47932486

convergance output: Packer Interval 1520 - 1540



VANDERKAMP UNDERDAMPED SOLUTION

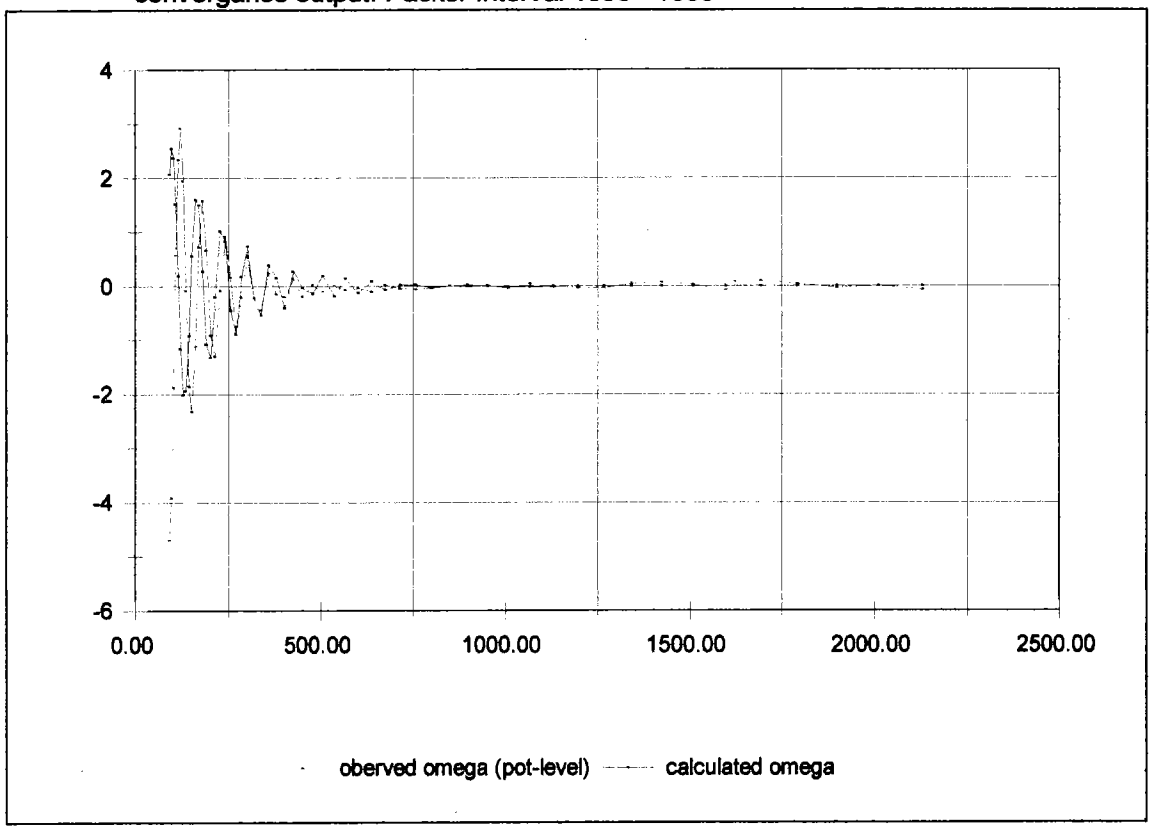
calculates transmissivity via an iterative routine

omega	gamma	radius casing	radius filter	Storativity (est.)
0.125	0.008	0.11	0.33	5.00E-04

L=	2050.73618
sqr(g/l)=	0.12525574
d=	0.06386933
a=	0.0029662
b=	0.03598402
T1=	0.02612235
T2=	0.02517232
T ft^2/day=	2165.39469

time (minutes)	time (seconds)	omega measured (feet)	omega calculated (feet)
1.1648	69.888	-4.695	2.07228856
1.2312	73.872	-3.921	2.55285547
1.3015	78.09	-1.866	2.3727981
1.376	82.56	0.579	1.51674597
1.455	87.3	2.337	0.19377213
1.5387	92.322	2.923	-1.1623151
1.6272	97.632	1.946	-2.0103253
1.721	103.26	-0.079	-1.9368611
1.8203	109.218	-1.859	-0.9134505
1.9257	115.542	-2.315	0.56046764
2.0372	122.232	-1.114	1.60587546
2.1553	129.318	0.731	1.49747959
2.2805	136.83	1.585	0.2735786

convergance output: Packer Interval 1590 - 1630



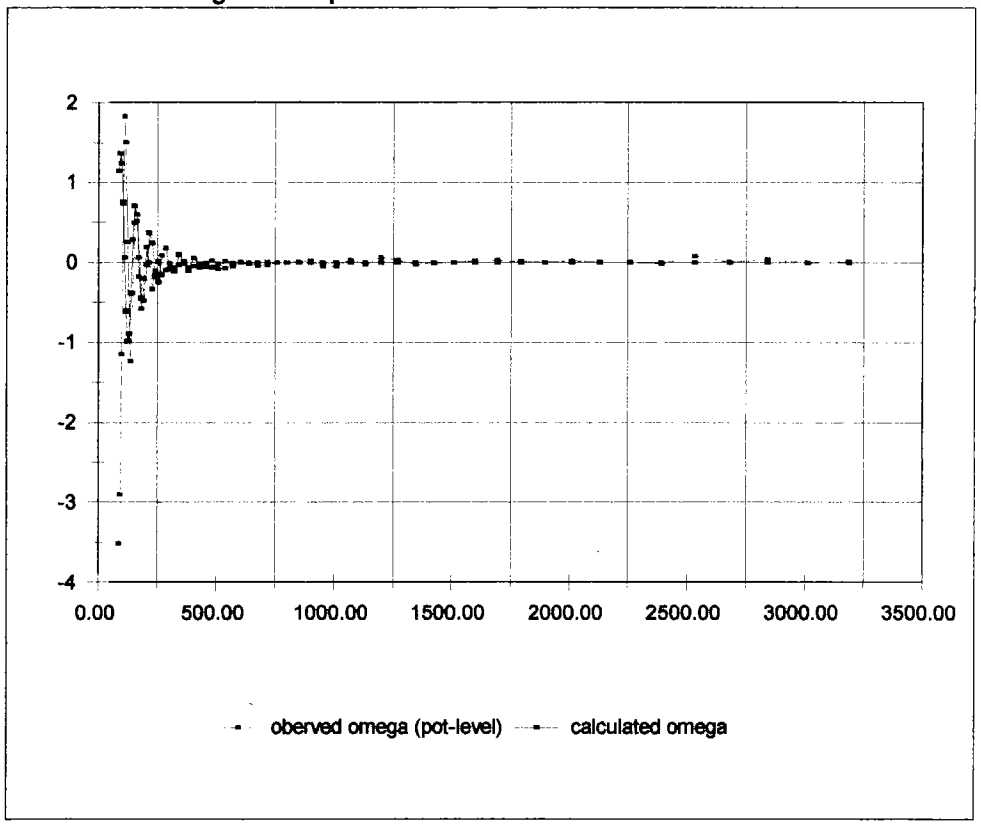
VANDERKAMP UNDERDAMPED SOLUTION

calculates transmissivity via an iterative routine

omega	gamma	radius casing	radius filter	Storativity (est.)
0.1	0.00999	0.11	0.33	5.00E-04

L=	3185.6076
sqr(g/l)=	0.10049776
d=	0.0994052
a=	0.00152912
b=	0.01888708
T1=	0.01281756
T2=	0.01222478
T ft^2/day=	1049.96522

time (minutes)	time (seconds)	omega measured (feet)	omega calculated (feet)
1.4583	87.498	-3.5115	1.14385081
1.542	92.52	-2.8967	1.37268339
1.6305	97.83	-1.14591	1.23755661
1.7243	103.458	0.734862	0.75577022
1.8237	109.422	1.827623	0.06278849
1.929	115.74	1.50837	-0.6040836
2.0405	122.43	0.257103	-0.9799496
2.1587	129.522	-0.98818	-0.8920464
2.2838	137.028	-1.23448	-0.3759203
2.4163	144.978	-0.3808	0.29113971
2.5568	153.408	0.493864	0.70788169
2.7057	162.342	0.515506	0.59982219
2.8632	171.792	-0.17987	0.0627366
3.03	181.8	-0.57827	-0.4476214



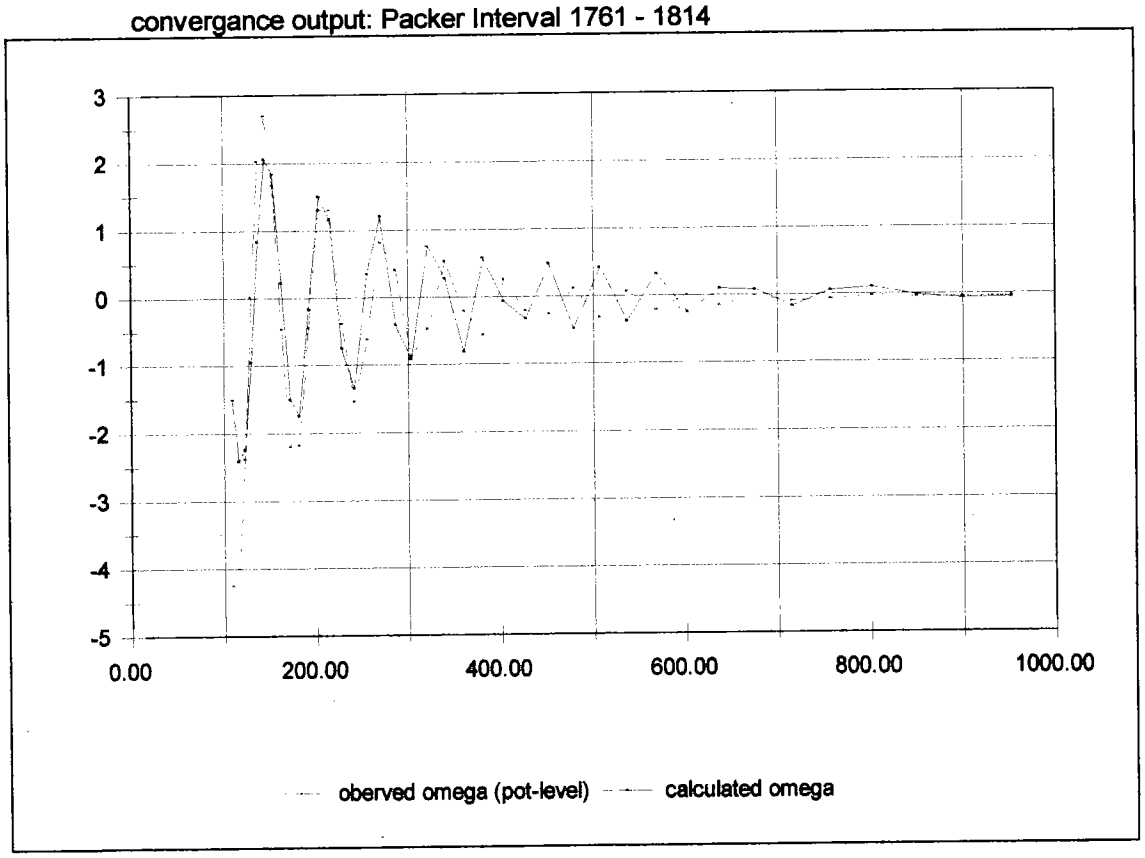
VANDERKAMP UNDERDAMPED SOLUTION

calculates transmissivity via an iterative routine

omega	gamma	radius casing	radius filter	Storativity (est.)
0.14	0.006	0.11	0.33	5.00E-04

L=	1638.52108
sqr(g/l)=	0.14012851
d=	0.04281784
a=	0.00494991
b=	0.05949367
T1=	0.04552559
T2=	0.04420102
T ft^2/day=	3806.34053

time (minutes)	time (seconds)	omega measured (feet)	omega calculated (feet)
1.3827	82.962	-4.248	-1.4985207
1.4617	87.702	-4.002	-2.4064464
1.5453	92.718	-2.375	-2.229574
1.6338	98.028	0.013	-0.9473794
1.7277	103.662	2.031	0.83644134
1.827	109.62	2.704	2.05862774
1.9323	115.938	1.67	1.83513666
2.0438	122.628	-0.465	0.22513854
2.162	129.72	-2.201	-1.5059228
2.2872	137.232	-2.179	-1.743162
2.4197	145.182	-0.443	-0.1684076
2.5602	153.612	1.301	1.4948027
2.709	162.54	1.293	1.15621145
2.8665	171.99	-0.385	-0.7476929

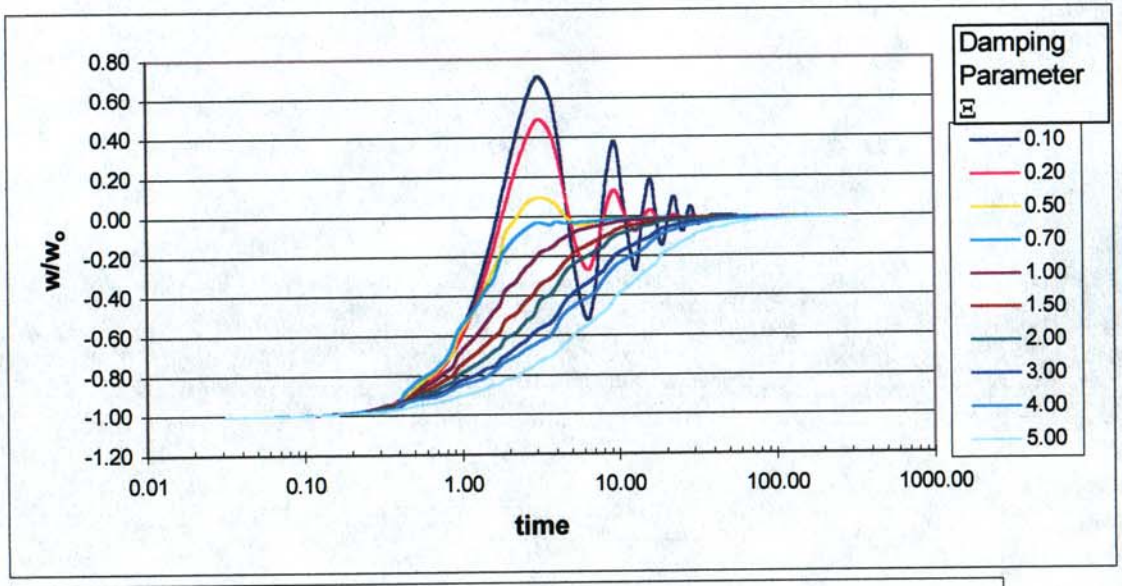


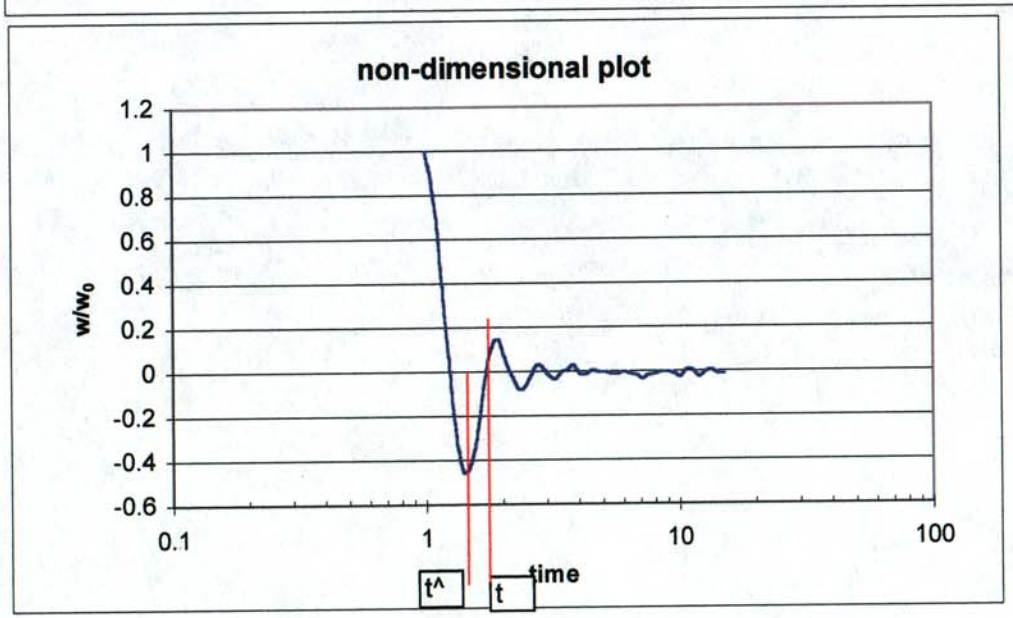
ROMP 16.5 Slug-In Test
Packer Set 1430 - 1500

Weight & Wittman (1999)
Kenneth Kipp (1985)

Well Number	
Ξ	0.4
t^	1.5
t	1.7
r_s	0.33
r_c	0.11
S	0.0005
L_e	41.35911111
α	111.1111111
C	0.0288
β	24500
T ft^2/s	0.007520094
T ft^2/day	**650**

1) Construct Non-dimensional plot of field data.
2) Choose Ξ from Kipp curv es.
3) Determine t^ and t.
4) Input r_s and r_c.
5) Estimate S.
6) Run Iterative solver for β



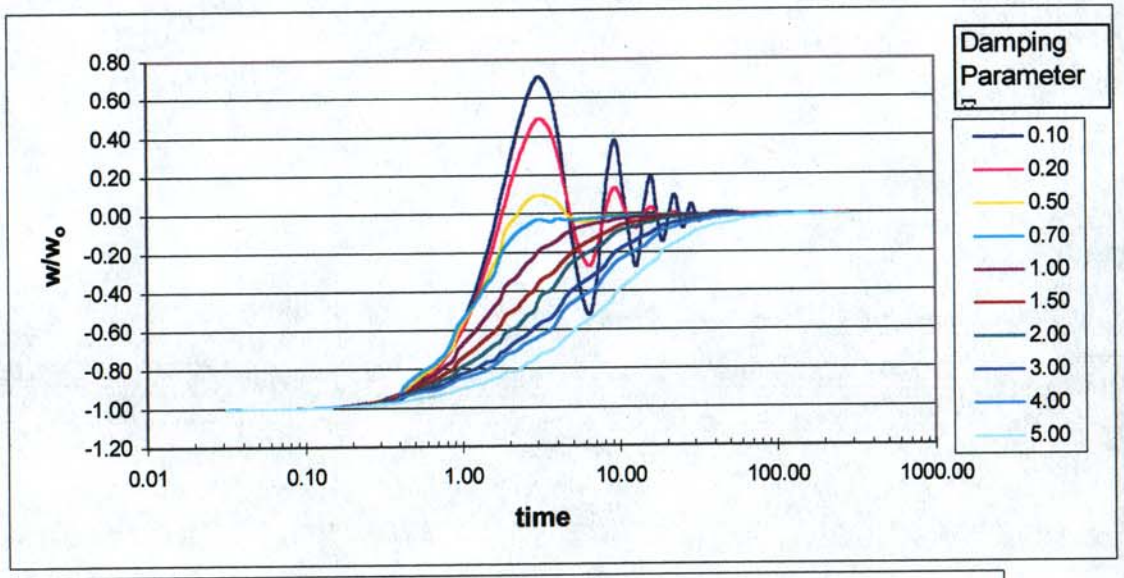


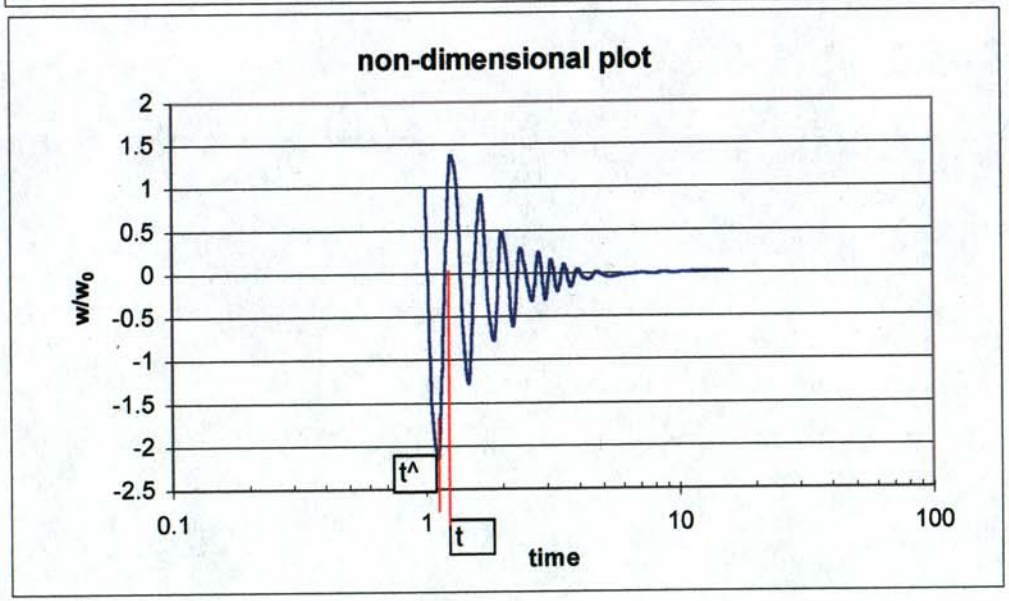
ROMP 16.5 Slug-In Test
Packer Set 1520-1540

Weight & Wittman (1999)
Kenneth Kipp (1985)

Well Number	
Ξ	0.05
t^	1.1
t	1.3
r_s	0.33
r_c	0.11
S	0.0005
L_e	44.97355372
α	111.1111111
C	0.0036
β	2260000
T ft^2/s	0.069263022
T ft^2/day	**5984**

1) Construct Non-dimensional plot of field data.
2) Choose Ξ from Kipp curv es.
3) Determine t^ and t.
4) Input r_s and r_c.
5) Estimate S.
6) Run Iterative solver for β



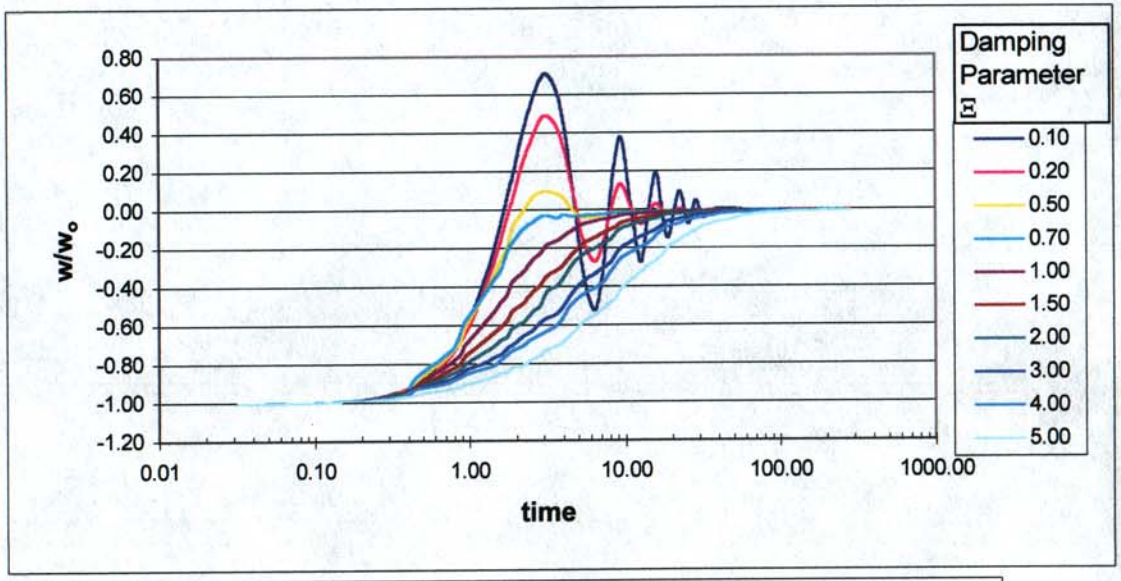


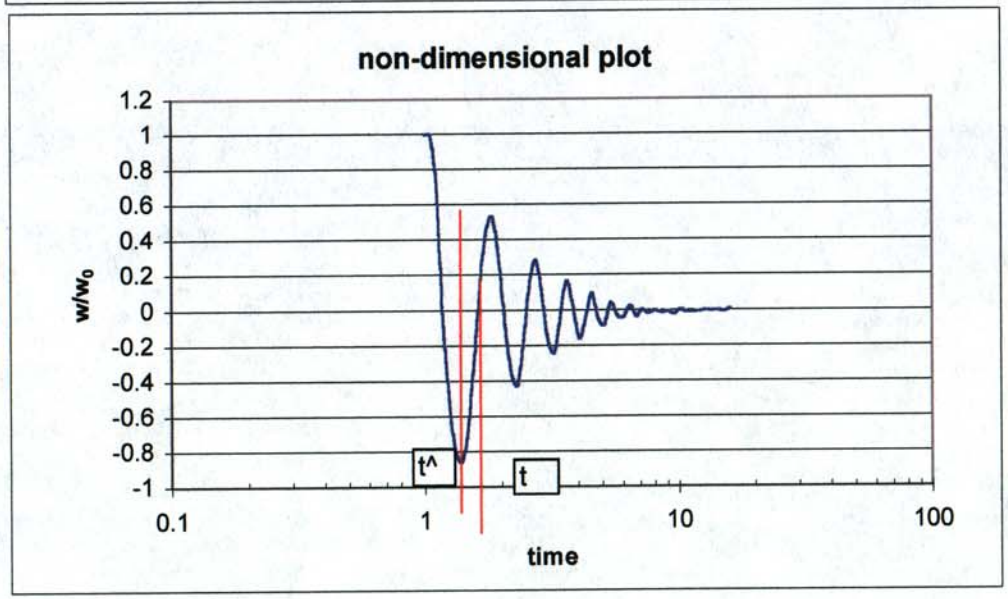
ROMP 16.5 Slug-In Test
Packer Set 1590-1636

Weight & Wittman (1999)
Kenneth Kipp (1985)

Well Number	
Ξ	0.18
t^	1.4
t	1.7
r_s	0.33
r_c	0.11
S	0.0005
L_e	47.47857143
α	111.1111111
C	0.01296
β	141000
T ft^2/s	0.02
T ft^2/day	**1455**

1) Construct Non-dimensional plot of field data.
2) Choose Ξ from Kipp curv es.
3) Determine t^ and t.
4) Input r_s and r_c.
5) Estimate S.
6) Run Iterative solver for β



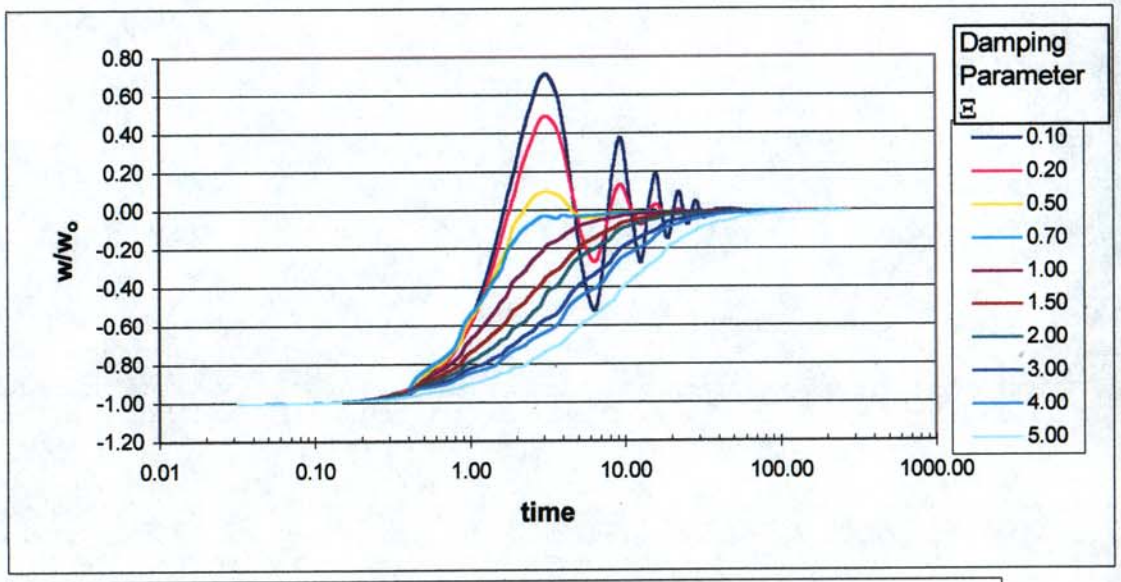


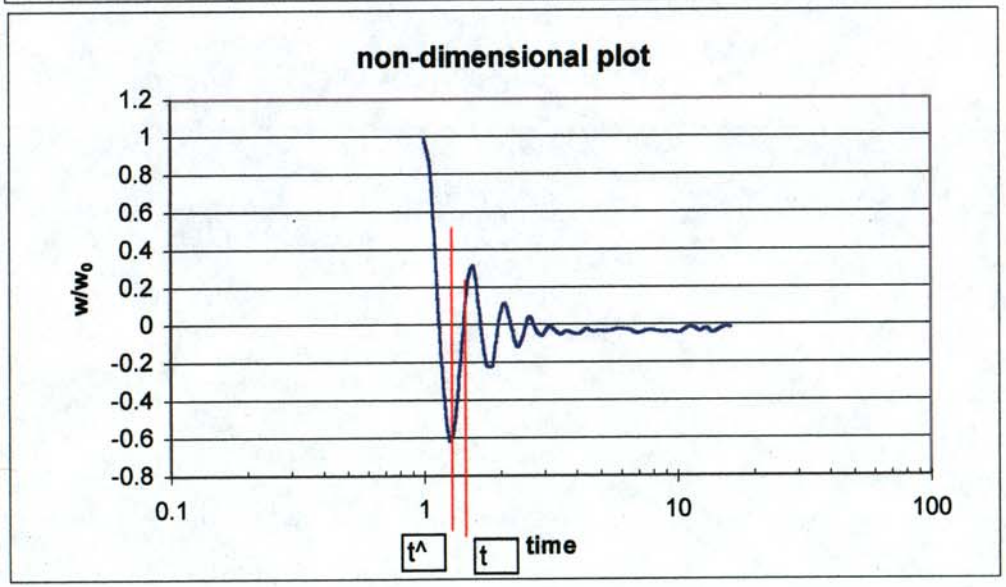
ROMP 16.5 Slug-In Test
Packer Set 1690-1740

Weight & Wittman (1999)
Kenneth Kipp (1985)

Well Number	
Ξ	0.35
t^	1.3
t	1.5
r_s	0.33
r_c	0.11
S	0.0005
L_e	42.86982249
α	111.1111111
C	0.0252
β	32750
T ft^2/s	0.01
T ft^2/day	**738**

1) Construct Non-dimensional plot of field data.
2) Choose Ξ from Kipp curv es.
3) Determine t^ and t.
4) Input r_s and r_c.
5) Estimate S.
6) Run Iterative solver for β





ROMP 16.5 Slug-In Test
Packer Set 1761 - 1814

Weight & Wittman (1999)
Kenneth Kipp (1985)

Well Number	
Ξ	0.1
t^	1.4
t	1.6
r_s	0.33
r_c	0.11
S	0.0005
L_e	42.05714286
α	111.1111111
C	0.0072
β	506900
T ft^2/s	0.03
T ft^2/day	**2931**

1) Construct Non-dimensional plot of field data.
2) Choose Ξ from Kipp curv es.
3) Determine t^ and t.
4) Input r_s and r_c.
5) Estimate S.
6) Run Iterative solver for β