CONSTRUCTION AND TESTING OF INJECTION WELLS #1 AND #2 WITH ASSOCIATED DEEP MONITOR WELL #1 BROWARD COUNTY NORTH DISTRICT REGIONAL WASTEWATER TREATMENT PLANT

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GERAGHTY & MILLER, INC.
Environmental Services

#1

CONSTRUCTION AND TESTING OF INJECTION WELLS #1 and #2 WITH ASSOCIATED DEEP MONITOR WELL #1 BROWARD COUNTY NORTH DISTRICT REGIONAL WASTEWATER TREATMENT PLANT POMPANO BEACH, FLORIDA

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Prepared for:
James M. Montgomery, Consulting Engineers, Inc.
in association with
Hazen and Sawyer, P.C. Engineers

Prepared by:
Geraghty & Miller, Inc.
Environmental Services
11382 Prosperity Farms Road, Suite 125
Palm Beach Gardens, Florida 33410

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INTRODUCTION

In June 1989, the Broward County UIC - North District Regional Wastewater Treatment Plant was issued Permit No. UC-06-154997, by the FDER (Florida Department of Environmental Regulation), to construct four 24-inch-diameter Class I Injection Wells in conjunction with two dual zone Deep Monitor Wells at the County's North District Regional Wastewater Treatment Plant in Pompano Beach, Florida (see Figure 1). Contract documents and specifications were made available to qualified Contractors at the offices of Hazen and Sawyer P.C., Engineers on May 2, 1989. The contract documents were made available in order to obtain bids on the entire injection well construction project.

The first phase of the Contract, consisting of two 24-inch-diameter Injection Wells and associated Dual-Zone Deep Monitor Well, was awarded to Youngquist Brothers Drilling Co. of Fort Meyers, Florida. Notice to proceed was issued on October 23, 1989.

The Contract Specifications contained provisions for the construction and testing of the two injection wells and the associated deep monitor well, by Youngquist Brothers Drilling Co., (referred to hereinafter as "the Contractor"). The Contractor agreed to construct and test two 24-inch-diameter injection wells to a depth of 3500 feet BPL (below pad level) and one dual-zone deep monitor well to a depth of approximately 1600 feet BPL. The provisions within the contract specifications included: 1) conducting straddle-packer tests in discrete zones of the pilot holes of each injection well in order to determine the hydraulic properties of lithologic units; 2) collection and analysis of conventional cores to complement the pump test data with in-situ samples;

3) collection and analysis of water samples in various zones to determine water quality variations with depth; 4) conducting geophysical logs, to confirm lithologic boundaries and gross lithologic properties, 5) conducting hydrostatic pressure tests, cement bond logs, Video (TV) Surveys, and Radioactive Tracer Surveys (see Figures 2 and 3); and 6) conducting injection tests in both completed injection wells to demonstrate the capacity of the injection zone to accept effluent at the designed rate. A plan for the plugging and abandonment of the wells was supplied in the event that suitable conditions were not found.

The Contractor mobilized manpower and equipment to the Broward County Wastewater Treatment Plant (BCWWTP) in Pompano Beach, Florida in the first week of November 1989. The contract completion time was specified as 180 days from the notice-to-proceed date. The contract contained specifications for the deep monitor well to be situated between the two injection wells and 150 feet from each injection well. Monitor Well #1 and Injection Well #2 were completed by March 21, 1990. Injection Well #1 was completed by May 20, 1990.

FINDINGS

1. The data demonstrate the existence of an extremely transmissive injection zone saturated with saline water (containing more than 10,000 mg/L TDS) similar to that which exists in locally operating injection wells at the Coral Springs Improvement District (CSID) in Coral Springs, Florida.

2. The top of the injection zone occurs at about 3000 feet with its base at 3500 feet, for a total thickness of 500 feet. Fluid will be pumped into the fracture and cavities throughout this interval.

3. This zone is capable of accepting the designed rate of effluent from the Broward County North District Regional Wastewater Treatment Plant at an acceptable injection pressure.

4. The contact between the waters with less than 10,000 mg/L of TDS and non-potable waters occurs at an approximate depth of 1500 feet.

5. Vertical hydraulic conductivities determined from core tests ranged from 0.000063 to 0.00032 cm/sec.

6. A monitor well was drilled and two monitor zones were selected. The lower zone is from 2000 feet to 2079 feet and the upper zone is from 1000 feet to 1128 feet.

7. The presence of favorable geologic conditions, a highly transmissive injection zone filled with water having greater than 10,000 mg/L TDS a suitable confining sequence, and suitable monitor zones will permit the use of injection wells for disposal of treated effluent at the Broward County North District Regional Wastewater Treatment Plant in accordance with existing State and Federal Underground Injection Control (UIC) Regulations.

RECOMMENDATIONS

The following recommendations are requirements of Chapter 17-28 FAC for the safe operation of an injection well. These procedures should be carried out conscientiously to ensure compliance with all regulatory requirements and to ensure successful operation of the well.

1. Well-head injection pressures should be monitored and recorded

continuously. Monthly averages as well as maximum and minimum daily values should be reported to the FDER on a monthly basis.

2. The flow rate into the well should be monitored and recorded continuously. Average daily flow rates as well as the total volume of effluent pumped into the well should be reported to the FDER on a monthly basis.

3. Samples from the two monitor well zones should be collected monthly and analyzed for fecal coliform, BOD, specific conductivity, pH, temperature and chlorides. The results of these analyses should be sent to the DER quarterly.

4. A specific injectivity test should be performed quarterly. The pumping rates should be established after the well is in operation. Well-head pressures should be recorded during this period. Test results should be reported to the FDER upon completion.

5. The well should be tested for mechanical integrity every five years in accordance with Chapter 17-28 FAC.

DATA COLLECTION

Data was collected during the construction of the injection well using various methods. Data collection procedures are described in this section, along with comments on the application and usefulness of each method. Except as noted, measurements of footage in the wells were referenced to the top of the cement pad floor.

Daily progress reports maintained during well construction were compiled by personnel from Geraghty & Miller, Inc., Hazen and Sawyer

P.C., Engineers, and James M. Montgomery, Consulting Engineers, Inc. The inspection staff was comprised of one representative from Hazen and Sawyer P.C., Engineers; one representative from James M. Montgomery, Consulting Engineers, Inc.; and two representatives from Geraghty & Miller, Inc. Daily footage was recorded, along with other pertinent drilling information such as drilling speed, penetration rates, weight on the drill bit, and relative hardness of the formations. Any problems encountered during drilling were observed and noted. All activities related to the installation of casing or monitor well tubing, cement, or other materials as well as their quantities, were designed in these reports. Detailed descriptions of test procedures and data collection, including results of inclination surveys to monitor hole straightness, were recorded. A separate construction log was used to record material quantities by bid item. The lengths and configurations of any tools introduced into the borehole were noted. Copies of the daily and weekly progress reports were forwarded to the Technical Advisory Committee (TAC) on a weekly basis. Separate reports were kept for the deep monitor well which was constructed, geographically, midway between Injection Well #1 and Injection Well #2.

Samples of drilled cuttings were collected every ten feet and at each change in formation during pilot hole drilling in all wells. Drill cutting samples were also collected from the injection zone boreholes. The samples were described after microscopic examination by the Geraghty & Miller and James M. Montgomery, Consulting Engineers, Inc. on-site personnel, and a geologic log of each sample was prepared. A copy of these logs is included in Appendix A. Circulation time (the time required for drilled cuttings to reach the surface) was calculated regularly to ensure that accurate sample depths were recorded. A set of samples from each well was sent to the Florida Bureau of Geology in Tallahassee, Florida.

During the drilling of the pilot hole on Injection Well #1, five conventional core samples were collected between 2300 and 2730 feet. The core barrel used was 20 feet in length and 4-inches in inside diameter. Each core was described in detail and samples from each core were selected, photographed, and sent to a laboratory. These samples were tested for several parameters including specific gravity and unconfined compressive strength. Laboratory results, core descriptions, and core photographs are included in Appendix B.

During the construction of the three wells, several sets of geophysical logs were conducted. A suite of logs was conducted at the completion of the pilot hole drilling to depths of approximately 2000, 3000, and 3500 feet in both injection wells. The purpose of these logs was to collect data on the presence and nature of both the injection zone and the confining sequence; as well as to help locate potential monitoring zones for the deep monitor well. The geophysical logs run at the above-mentioned intervals were: Dual Induction, Borehole Compensated Sonic, Temperature, Caliper, Natural Gamma-Ray, and Fluid Resistivity and/or Flowmeter surveys. Another log conducted at selected intervals was the Fracture Identification log. In addition, Caliper logs were conducted in each of the nominal 50, 40, 34, and 24-inch-diameter boreholes.

The Dual Induction log was used to differentiate between limestone and dolomite beds, and along with the Gamma Ray Log, aided in the correlation of lithologic units. The Borehole Compensated Sonic log was useful in identifying the injection zone and lower confining sequence, as well as in helping to identify zones which could cause problems during cementing. Temperature logs were used to determine the annular fill-up between cementing stages. The geophysical logs are included in Appendix C.

After the geophysical logs were conducted in the pilot holes, straddle-packer tests were conducted using the logs to select suitable testing intervals. Three intervals were selected for Injection Well #1 and two intervals were selected for Injection Well #2. The straddle-packers were lowered into the pilot hole to the selected interval on 7 5/8-inch (outside) diameter drill pipe, inflated, and seated against the formation. Figure 4 shows a typical straddle-packer assembly. A four-inch-diameter submersible pump was lowered to between 80 and 200 feet (depending on anticipated drawdown). During drawdown and recovery, water level measurements were obtained using a data logger attached to a pressure transducer which was lowered to a known depth above that of the pump.

Water samples obtained during the tests were analyzed in the field for chloride, temperature, and conductivity. Straddle-packer test data and drawdown/recovery are found in Table 1. The water quality results for each straddle-packer pump test are based on the laboratory analysis of samples collected during the drawdown phase of the test. The water quality results are presented in Appendix E. Water quality results are discussed later in this report. The same procedures were followed for the pump tests on Injection Well #2.

Unless otherwise specified, remaining data collection procedures will refer to both injection wells.

When the installation and cementing of the injection casing was completed, a hydrostatic pressure test was conducted (prior to drilling the open borehole through the injection zone). The casing was filled with water and placed under a hydrostatic pressure of 150 pounds per square inch (psi) for one hour. This pressure is over 1.5 times the expected maximum well-head operating pressure. The injection casing for each well held the 150 psi for the required period and therefore passed

the integrity test specified in Section 17-28.24(6)(c) FAC. A copy of the pressure test data is contained in Appendix D.

Once the pressure test was completed, the cement plug at the base of the injection casing was drilled out and the final open borehole drilled to total depth. After completion of each injection well, it was developed (using reverse-air) to obtain water samples from the injection zone. Samples were also obtained from both the shallow and deep monitor zones of Deep Monitor Well #1. The samples were analyzed for a variety of constituents to establish the "natural" or background quality of the water in the various zones, prior to any disposal of treated effluent. Copies of the laboratory results are found in Water Quality - Appendix E.

After water quality sampling was completed, various geophysical logs were conducted on the injection well open borehole. Fresh water from the Pompano Beach City Water supply was used to displace suspended solids from the well prior to performing a television survey. Schlumberger loggers completed the camera surveys to 3500 feet and copies of the VHS tapes have been given to the members of the Technical Advisory Committee (TAC). The purpose of the video survey is to visually inspect the integrity of the injection casing as well as to observe fracture and saltwater-flow zones within the injection zone. The favorable picture clarity obtained in each well provided visual data on the condition of the injection casings and the injection zones surveyed. A controlled Injection Test was then conducted, using the City's water supply, and an injection pressure/temperature profile was obtained.

Finally, a Radioactive Tracer Survey was performed on the final injection casing to evaluate the mechanical integrity of the well. Copies of the Radioactive Tracer Surveys (RTS) are found in Appendix C. The procedure for and results of those surveys are discussed in a subsequent section of this report.

WELL DRILLING AND CONSTRUCTION

Injection Wells

Construction of the injection well(s) began with the drilling of a nominal 58-inch-diameter hole to a depth of 160 feet. Next 50-inch-diameter conductor casing was installed in the nominal 58-inch-diameter hole and cemented in place. A nominal 50-inch-diameter hole was then drilled through the cement plug to a depth of 1000 feet. A string of 42-inch-diameter surface casing was set at 1000 feet and cemented in place. At this point, the drilling method was changed from mud-rotary to reverse-air. A nominal 12 1/4-inch-diameter hole was drilled from the cement plug at the base of the 42-inch-diameter casing to 2000 feet. The pilot hole was logged and straddle-packer pump tests were conducted to establish water quality. The pilot hole was then reamed to a nominal 42-inch-diameter down to 1960 feet. The string of 34-inch-diameter intermediate casing was set at 1950 feet and cemented in place. The 12 1/4-inch-diameter pilot hole was then extended to 3000 feet. At this point, on Injection Well #2, the deep zone straddle-packer tests were conducted to establish zones of hydraulic confinement. Following the drilling of the pilot hole to 2300 feet on Injection Well #1, five (5) core samples were collected at about 100 foot intervals. Once the pilot hole was completed at 3000 feet, it was reamed to a nominal 34 inches in diameter. At this stage of construction on Injection Well #1, the driller twisted-off at 2132 feet. The bottom hole assembly was retrieved with 48 hours using an overshot tool and reaming of the 12 1/4-inch-diameter pilot hole section proceeded without incident.

The 24-inch-diameter injection casing was set at 2990 feet and cemented in place. After successfully conducting a hydrostatic pressure

test on the final casing string as per Section 17-28.34(b)(c) FAC, the final 500 feet of open borehole was drilled through the injection zone. The nominal 24-inch-diameter hole was drilled through the cement plug of the injection casing to a total depth of 3500 feet. Upon completion, of the 24-inch-diameter hole, a Cement Bond log was conducted on the 24-inch-diameter casing. A copy of the Cement Bond log is included with all other geophysical logs in Appendix C. Hydrostatic Pressure Test and Water Quality Data are found in Appendices D and E, respectively. Review of the cementing records, temperature logs, pressure test data, and injection test data indicate that: 1) the injection casings are properly cemented, and 2) isolation between the injection horizon and overlying sources of drinking water has been achieved.

Deep Monitor Well #1

Deep Monitor Well #1 was constructed between Injection Well #1 and Injection Well #2. A nominal 30-inch-diameter borehole was drilled to a depth of 170 feet. An X-Y Caliper log was conducted to estimate annular cement volumes. The 24-inch-diameter steel casing was set at a depth of 160 feet and then cemented in place. Florida Geophysical Logging, Inc., conducted temperature logs following each stage of cementing on all casing strings, in order to estimate annular fill.

A nominal 24-inch-diameter hole was then drilled to 1000 feet. Another X-Y Caliper log was conducted prior to setting and cementing 16-inch-diameter casing at 1000 feet.

At this time, the drilling method was changed from mud-rotary to reverse-air. The Contractor was delayed for 50 days prior to receiving notification to proceed beyond 1000 feet. The Florida Department of Environmental Regulation required additional water quality data from the injection well test program in defining the local 10,000 mg/L TDS

interface. When the additional data was obtained, drilling on the deep monitor well continued. A nominal 16-inch-diameter hole was drilled from 1000 feet to 2010 feet. An X-Y Caliper log was conducted prior to setting and cementing 6 5/8-inch-diameter casing at 2000 feet. The final casing's annulus was then cemented up to a depth of 1128 feet, thus defining the shallow monitoring zone between 1000 and 1128 feet. A cement bond log and hydrostatic pressure test were conducted on the final casing string to determine the integrity of the casing and cement. The upper 1200 feet of the 6 5/8-inch-diameter casing was coated with an epoxy-phenolic compound. Copies of the casing mill certificates are found in Appendix F.

A nominal 6-inch-diameter hole was then drilled from the base of the 6 5/8-inch-diameter casing, through the cement plug and to a depth of 2079 feet. The well was disinfected with chlorine prior to the collection of water samples from each zone. The final open borehole from 2000 to 2079 feet defines the lower monitoring zone.

SUBSURFACE CONDITIONS

Background

The final design of the injection wells was based on the information collected during the drilling and testing of the pilot holes. The data from the injection well testing program also determined the final design of the dual zone deep monitor well. The drilling and testing program was designed to provide flexibility in well construction modifications as dictated by local geologic conditions. The drilling specifications were based on available data of regional geologic conditions and on data from existing injection wells in the area. This section presents the local geologic information obtained during this project.

Geologic Setting

A well defined, areally extensive sequence of carbonate sediments is present at the Broward County North District Regional Wastewater Treatment Plant site and throughout the area. The geologic units found during construction of the injection well system satisfy the requirements of Chapter 17-28 FAC. The injection zone is capable of receiving effluent at the designed rate. Disposal of the effluent into this zone should not result in contamination of any Underground Source of Drinking Water (USDW). A brief description of the various geologic units follows.

As shown in Figure 5, from land surface to approximately 390 feet in depth the sediments are comprised of limestone, sandy limestone, clay, and varying amounts of unconsolidated shell and sand. The limestone is a light gray to grayish olive micrite. Various amounts of shell and quartz sand are also present in these sediments. The sandy limestone is generally light gray to grayish olive, medium-grained, and sometimes slightly phosphatic. The solution features and generally poor cementation apparent in the upper 390 feet of sediments give this unit the high permeability characteristic of the Biscayne Aquifer. These sediments are Pleistocene to Miocene in age and correspond to descriptions of the Anastasia and Palmico Sand Formations.

From 390 feet to 590 feet, the sediment is dominantly composed of an olive gray, plastic, clay. From 590 feet to about 880 feet, the sediment is predominantly carbonate mud (marl). The marl is mostly pale or light grayish olive, soft, and composed of silty clay with interbedded limestone present throughout the interval. The limestone varies from grayish olive to dark gray and is micritic. The sediments in the interval between 390 and 880 feet are Miocene to Late Eocene in age and correspond to the descriptions of the Hawthorne Formation.

The limestone between 880 feet and about 2190 feet is typically a pale orange to light gray, medium to coarse grained, sandy, biosparite. The limestone in this sequence is Middle to Late Eocene in age and is delineated as part of the Avon Park Limestone. The upper Floridan aquifer is contained within this section.

In the depth interval from 2190 feet to 3000 feet, the limestone is interbedded with light to moderate yellowish-brown dolomite. Fine to medium grained and hard, these dolomite units comprise less than 9% of the sequence. The limestone in the interval is generally very pale orange, pellodial or micritic, fine to medium grained, and soft. The sonic logs indicate a decrease in porosity in this interval. The section is comprised of sediments of Early to Middle Eocene age of the corresponding Avon Park Limestone.

Owing to the absence of biostratigraphic evidence to determine this formation boundary, the use of the Lake City Limestone as a distinct unit name is abandoned and this report recognizes only the Avon Park Limestone Formation.

The interval between 2190 feet and 3000 feet consists of alternating layers of dolomite and limestone. Below 3000 feet the sequence is composed almost entirely of dolomite. The dolomite in the upper interval is predominantly pale yellowish or moderate brown, massive, fine grained or micritic, and dense with some dissolution features. The interbedded limestone in the upper interval consists of pale orange to tan, fine to medium grained, soft, biosparite. The porosity is fairly regular in the interval between 2300 and 2730 feet. Core samples taken from various locations within this interval revealed total porosities which range from 31% to 38%. This section contains sediments of Early Eocene age corresponding to the Lower Avon Park Limestone Formation.

The injection zone extends from approximately 3000 feet to 3500 feet in depth in the Lower Oldsmar Formation. Results from the television survey indicate the dolomite in this zone exhibits extensive dissolution cavities as well as fracturing.

The depth of each stratigraphically distinct geologic boundary for Injection Well #2 and Deep Monitor Well #1 varies somewhat from those noted above. Geologically speaking, these stratigraphic variations in wells of close geographic proximity are of relatively minor significance and are the expected norm. Exact reference points for all three wells are displayed in Figures 6, 7, and 8.

Hydrogeologic Setting

The upper 390 to 480 feet of rock and sediments are Pleistocene, Oligocene, and Upper Miocene sandstone, limestone, marl and unconsolidated sand and shell. The lithologies represent the surficial aquifer which is used as a source of drinking water throughout South Florida.

Underlying the surficial aquifer are 440 to 520 feet of Miocene clay and marl which form a confining bed between the surficial aquifer and the Oligocene to Eocene limestones and dolomites of the Floridan Aquifer. This confining sequence is called the Hawthorne Formation. Water from the Floridan Aquifer in the area contains concentrations of dissolved solids which exceed drinking water standards. The aquifer is not currently used as a main source of drinking water in Broward County. The Floridan Aquifer's limited use is due to the additional treatment required to meet potable standards and also to the availability of better quality water in the shallow, overlying aquifer.

Another confining sequence is present between 2200 and 3000 feet in the area of the Broward County Injection System. It consists of limestone with interbedded dolomite. This confining sequence overlies a section of the highly permeable dolomite of the Oldsmar Formation, often referred to as the "Boulder Zone". This zone contains highly mineralized water and is used throughout South Florida for the disposal of treated domestic waste effluent.

Confining Sequence

Based on interpretation of the various data, the injection zone is overlain by a confining sequence in the interval located approximately between 2200 and 3000 feet. The most significant section of the confining sequence occurs between 2464 and 2770 feet. The limestone that comprises this sequence is a fine-grained biomicrite which is interbedded with fine to medium-grained dolomite.

Within the confining sequence, five straddle packer tests were conducted. Figure 4 shows a typical straddle-packer assembly. The recovery data from the packer tests were analyzed using a method described by Schaefer (1980) for low yield formations. In particular, the zone between 2464 and 2770 shows the lowest permeability. Drawdown and recovery data obtained from these five tests plus associated water quality analyses can be applied to either well due to the close proximity of the two injection wells.

The values of horizontal hydraulic conductivity determined from these tests (Table 1, Injection Well #1 and Injection Well #2) ranged from 0.00008 cm/sec to 0.00190 cm/sec. Laboratory tests on the cores taken from the confining sequence showed vertical permeabilities ranging from 0.000063 cm/sec to 0.00015 cm/sec. From the core data shown in Table 2 (Injection Well 1), it can be seen that the porosities for

limestone in the confining sequence range from approximately 31 to 38 percent. The vertical permeability of the limestone cores average 0.000157 cm/sec. The horizontal permeabilities determined from the five successful straddle packer tests averaged 0.00071 cm/sec. Considering these low values of permeability, (see Tables) it can be concluded that not all pore spaces are interconnected and the effective porosity must be lower than the values obtained from the core analyses.

Injection Zone

The presence of a suitable injection zone in the Pompano Beach area was assumed on the basis of data from other injection wells in South Florida. A number of injection and exploratory wells have been drilled in Broward and Palm Beach Counties and it was believed that the thick, cavernous dolomites of the Oldsmar Formation existed throughout the area. This idea was confirmed during the drilling of the pilot holes on Injection Wells #1 and #2 at the Broward County North District Regional Wastewater Treatment Plant. The first indications of the presence of an injection zone (Boulder Zone) were found at approximately 3000 feet in the pilot hole of Injection Well #2.

For both injection wells at the Pompano Beach site, the injection zone drill cuttings were mainly composed of hard, cryptocrystalline to finely crystalline dolomite with evidence of dissolution features and fractures. Large cavities are observed on the Caliper logs (Appendix C) of both 24-inch-diameter boreholes below 3000 feet. Fracture zones within each well's injection zone were also visible on the television surveys performed on each injection well following their completion.

The injection zone and the occurrence of dolomite are shown clearly on the Dual Induction and Borehole Compensated Sonic logs presented in Appendix C. The resistivity profile shown on the Dual Induction logs

varies considerably within the respective injection zones for each injection well borehole. This variation is due to the presence of massive, dense dolomite (higher resistivity), along with fractures and cavities containing highly mineralized water (lower resistivity). All the geophysical logs conducted or performed on the three wells constructed by Youngquist Brothers Drilling, Inc., are found in Appendix C of this report. The injection test and pressure/temperature data for Injection Well #1 are found in Figure 9.

Water Quality

Water samples were collected from isolated sections of the boreholes during the straddle-packer tests, from the injection zones prior to the injection testing, and from the deep monitor well's deep and shallow monitor zones. The samples were analyzed for selected ions to establish the depth of the local 10,000 mg/L TDS interface and to verify the background water quality of the injection and monitor zones. Results of these analyses, from Broward Testing Labs, are presented in Appendix E.

During the straddle-packer pump tests, a sample of the formation water from the tested interval was collected just prior to shutting off the pump. Each of these samples were sent to a laboratory and analyzed for TDS, Chloride, Sulfate, and Specific Conductivity. The tests were conducted across intervals considered suitable as monitor zones. Based on the analysis of the straddle-packer and deep monitor well water samples, the 10,000 mg/L interface occurs between 1400 and 1600 feet.

Upon completion of each injection well borehole to total depth, the injection zone was developed and sampled for water quality data on the injection zone. The results of the laboratory analyses of the injection zone water samples show that the injection zone formation water contains

more than 10,000 mg/L of TDS. Therefore, this zone can be used for the disposal of treated wastewater in compliance with Chapter 17-28 FAC.

Following completion of the dual-zone Deep Monitor Well #1, the monitoring zones were developed, disinfected, and sampled. The samples were analyzed by a laboratory for several parameters in order to determine background water quality. As shown on the laboratory test results in Appendix E, the TDS concentration of the upper monitor zone sample (1000 feet to 1128 feet) was 4432 mg/L and the lower zone sample (2000 feet to 2079 feet) was 11514 mg/L. These values compare favorably with results from straddle-packer water samples collected at similar depths. All water quality data is found on the laboratory reports enclosed in Appendix E.

Radioactive Tracer Survey Injection Well #1

A detailed description and interpretation of the Radioactive Tracer Survey (RTS) is presented in the following text.

The test began with Schlumberger conducting a background Gamma-ray Log (GRL) from 3500 feet to 1500 feet. Next, the ejector was positioned at 2,991 feet, one foot below the casing seat. A two-millicurie (MCI) slug of Iodine 131 was released under static conditions, and time-drive monitoring was conducted for 60 minutes after the release. A second GRL was conducted from 2990 feet to 1900 feet. Following the second GRL, the casing was flushed for approximately five minutes using effluent at a rate of 5,000 gallons per minute (gpm). A third GRL was conducted from 3100 feet to 2730 feet. The tool was repositioned at 2985 feet, five feet above the casing seat. A two-MCI slug was ejected while injecting water from the adjacent monitor well into the injection well at 128 gpm. Time-drive monitoring proceeded for the next 61 minutes. A fourth GRL was conducted from 2985 feet to 1900 feet. Once again, the casing was

flushed with effluent for approximately 15 minutes at 5,000 gpm. A fifth GRL was conducted from 3050 feet to 1450 feet. Because a light stain was detected between 1700 feet and 1450 feet, a sixth GRL was conducted over this interval after additional flushing with effluent for 20 minutes at 8,800 gpm.

The results of the RTS are presented on the enclosed log. Starting from the back section of the log, the various surveys are presented in the same sequence as discussed above. Descriptions of the multiple logging measurements recorded are as follows:

Measurement	Description
GR	Upper gamma-ray detector
GR [1]	Upper gamma-ray detector (background date previously recorded)
CCL	Casing Collar locator
GRSG	Lower gamma-ray detector
GRTE	Middle gamma-ray detector

The initial background GRL shows a typical response for a new well with slightly higher readings in the open-hole section between 3000 and 3500 feet. Naturally, the middle detector (GRTE) measures much higher radiation levels because of its proximity to the source material.

Following the background log, a time-drive monitoring log of the first release of tracer material (2.0 MCI) is displayed under the heading "Static Test - Outside Casing". The spike mark on the right side of the time (center) track indicates the time at which the tracer slug was ejected.

Near the one-minute mark, the middle detector (located 2.8 feet below the ejector) shows evidence of the slug dispersing outward from the ejector. At the seven-minute mark, the upper detector indicates the arrival of the slug. Seconds later, the lower detector reveals evidence of the slug. Given the distances between the ejector and both the lower and upper detectors are 13.25 feet and 8.92 feet, respectively, the rate of dispersion appears to be greater in the downward direction. Expanded scale plots (0 - 2000 API) are presented as solid lines in the GRSG track for the lower detector and the GRTE track for the upper detector. At the ten-minute mark, the lower detector reaches a maximum reading of 1350 API units. Four minutes later, the upper detector reaches nearly the identical maximum reading. Near the 23-minute mark, both readings appear to be stabilizing at approximately 1000 API units. During the final 30 minutes of time-drive monitoring, the readings gradually decline to 700 API units for the lower detector and 500 API units for the upper detector. These observations indicate the rate of dispersion under static conditions is greater in the downward direction.

The second GRL results are displayed in the next log section labeled "Static Test - Log Out of Position". Background logs are included for easy reference. With the exception of the stained casing section between 2930 feet and 3000 feet, the upper GRL correlates favorably with the initial background data. The lower detector readings are higher than the background data due to stains on the detector. Given the greater rate of dispersion in the downward direction, this explanation would appear plausible. Additionally, discrepancies in the readings dissipate as the tool is pulled up the well because of the cleaning action of the tool moving through the unaffected water.

Next, the third GRL is presented. Conducted after flushing the casing, this log correlates extremely well with the background data. Typical of most RTS logs, heavy stains appear at the casing seat.

Time-drive monitoring data from the dynamic test are shown in the next log section. The slug reaches the middle detector almost instantaneously. Near the three-minute mark, the slug encounters the lower detector. The slug is completely displaced below the lower detector within the next 20 minutes. Further displacement over the next 25 minutes reduce the readings to within 5 API units of the initial level (25 API units). Readings from the upper detector remained generally constant throughout the monitoring period. These results provide tangible evidence of the injection-wells's integrity because of the lack of any upward migration of the slug at a relatively slow pumping rate (0.1 feet per second).

A fourth GRL is presented in the next section. Readings from the upper detector correlate accurately with the background data. Readings from the lower detector are significantly greater than the background data over the interval between 2985 feet and 2800 feet. For the next 150 feet the lower detector readings correlate favorably with the background data. At approximately 2640 feet, once again the readings are greater than the background data. This cycle is repeated several times over the length of the log. Since the upper detector did not reveal any of these discrepancies, the logical conclusion is that radioactive debris was dislodged from the tool (below the upper detector) at various depths during the ascent of the tool.

Results from the fifth GRL are shown in the next section. Excluding the heavy stains that appear near the casing seat, the log correlates extremely well with the background data over the interval from 2980 feet to 1700 feet. At approximately 1650 feet, the readings from both the upper and lower detectors begin to increase beyond the background data. In order to further investigate this response, the interval between 1700 feet and 1470 feet was logged again after additional flushing. The

results of this log (sixth GRL) are displayed in the final section. This log shows the previously recorded higher readings have completely dissipated. The higher readings were probably due to radioactive debris being jarred loose from the wireline cable during the ascent. Additional flushing rectified the problem.

Radioactive Tracer Survey Injection Well #2

A detailed description and interpretation of the Radioactive Tracer Survey (RTS) is presented in the following text.

The test began with Schlumberger conducting a background Gamma-ray Log (GRL) from 3480 feet to 40 feet. Next, a correlation (tie-in) log was conducted to facilitate positioning of the ejector at 2,990 feet, one foot below the casing seat. A two-millicurie (MCI) slug of Iodine 131 was released under static conditions, and time-drive monitoring was conducted for 60 minutes after the release. A third GRL was conducted from approximately 2990 feet to 2000 feet. Following the third GRL, the casing was flushed for approximately fifteen minutes using fresh water at a rate of 122 gallons per minute (gpm). A fourth GRL was conducted from 3070 feet to 2970 feet. Because of heavy stains, a fifth GRL was conducted over the same interval after flushing for an additional fifteen minutes at 122 gpm. The ejector was repositioned at 2984 feet, five feet above the casing seat. A two-MCI slug was ejected while injecting fresh water into the injection well at 122 gpm. Time-drive monitoring proceeded for the next 60 minutes. A sixth GRL was conducted from 2980 feet to 1880 feet. Because of lingering stains, the casing was flushed with fresh water for approximately four hours at 144 gpm. A seventh and final GRL was conducted from 3050 feet to 1950 feet.

The results of the RTS are presented on the enclosed log. Starting from the back section of the log, the various surveys are presented in

the same sequence as discussed above. Descriptions of the multiple logging measurements recorded are as follows:

Measurement	Description
GR	Upper gamma-ray detector
GR [8]	Upper gamma-ray detector
CCL	Casing Collar locator
GRSG	Lower gamma-ray detector
GRTE	Middle gamma-ray detector

The initial background GRL shows a typical response for a new well with slightly higher readings in the open-hole section between 3100 feet and 3480 feet. Naturally, the middle detector (GRTE) measures much higher radiation levels because of its proximity to the source material. The sharp drop on the middle detector at 200 feet indicates the fluid level in the well.

The next log section shows the second GRL which was used to position the ejector for the static test. Following the second GRL, a time-drive monitoring log of the first release of tracer material (2.0 MCI) is displayed under the label Static Test. The spike mark on the right side of the time (center) track indicates the time at which the tracer slug was ejected. Near the 30 minute mark, the lower detector shows evidence of the slug dispersing downward. At the 55 minute mark, tracer material encounters the upper detector. Upon cessation of time-drive monitoring, the lower detector readings have increased from an initial background level of 8 API units to 60 API units. Alternately, the upper detector readings have only increased from 18 API units to 30 API units, indicating a greater rate of dispersion in the downward direction. Considering that the distances between the ejector and both the lower

upper detectors are 13.3 feet and 8.9 feet, respectively, a higher rate of dispersion in the downward direction is again evident.

The third GRL results are displayed in the next log section labeled "After Static Pass". A background log from the upper detector is included for easy reference. With the exception of the stained section near the casing seat, the upper GRL correlates favorably with the initial background data. Lower detector readings are higher than background levels over the interval from 3000 feet to 2900 feet because the lower detector was pulled up through the slug.

Next, the fourth GRL is presented. This log was conducted for correlating purposes, but because of inadequate flushing the log is of little or no use.

A fifth GRL, conducted after additional flushing is shown in the next log section. Although heavy stains are still apparent, the data is sufficient for correlating purposes. Note the heavy stain at the base of the casing (2989 feet).

Time-drive monitoring data from the dynamic test are shown in the next log section. The slug reaches the middle detector almost instantaneously. Near the three-minute mark, the slug encounters the lower detector. The slug is completely displaced below the lower detector within the next 30 minutes. Further displacement over the next 15 minutes reduce the readings to within 5 API units of the initial level (9 API units). Readings from the upper detector remained generally constant throughout the monitoring period. These results provide tangible evidence of the injection-well's integrity because of the lack of any upward migration of the slug at a relatively slow pumping rate (0.1 feet per second).

A sixth GRL is presented in the next section. This log correlates accurately with the background data except for the interval between 2500 feet and 2600 feet. This slight variation is probably due to tracer material inadvertently deposited in the casing during the testing procedure. After additional flushing, the log was repeated and the results of this log (seventh GRL) are displayed in the final log section. This log reveals the previously recorded discrepancies have completely dissipated.

OPERATION AND MAINTENANCE

When each injection well is operating during long term injection testing and over its operational life, a variety of data will be collected to satisfy statutory/permit requirements and to assist in managing the system. This section discusses the basic requirements for data collection to maintain permit compliance during both the initial testing, and long-term operation of the injection well system.

Injection Well Data Collection

Beginning with the start of injection at the Broward County North District Regional Wastewater Treatment Plant, records of the well-head pressure, injection rate, and cumulative injected volumes will be collected from each well on a continuous basis. Maximum and average injection pressures (psig) and rates (mg/d) will be recorded on a daily basis for monthly submission to the FDER. Monthly maximum, average, and minimum values of injection pressure, rate, and volume will also be reported to the FDER. Measurements of each wells's injection pressure and injection rate will be made simultaneously and recorded to aid in correlating the two values. It is essential that the performance data collection begin upon operational start-up in order to establish baseline

information which both satisfies regulatory requirements, and serves for future data comparison and performance analyses. These records should be maintained permanently.

Deep Monitor Well (Dual-Zone) Data Collection

The purpose of monitor-zone data collection is to detect changes in water quality attributable to the injection of treated effluent into the nearby injection wells. The established parameters for analysis are Fecal Coliform, Chloride, Specific Conductance, Biological Oxygen Demand (BOD), Temperature, Ammonia, and Total Dissolved Solids (TDS). Following initiation of injection, these parameters will be analyzed weekly until the issuance of the operating permit, then monthly for the life of the well. In order to collect the water quality samples, the deep monitor well zones have been equipped with two sampling pumps. At least three well volumes will be pumped from the monitor zones before samples are collected.

Injectivity Testing

A well's injectivity is a function of: 1) friction loss in the casing, 2) the bottom hole pressure (injection zone transmissivity), and 3) the density differential between treated effluent and the formation water in the injection zone. The latter is a constant as long as the temperature and density of the injection fluid remain constant. Friction loss in the casing and bottom hole pressure can vary as a result of changes in the flow rate, physical condition of the injection zone, and physical condition of the pipe. In general, pressure builds slowly with time (for a given pumping rate) as the casing "ages". Similarly, plugging of an injection zone can cause a gradual pressure buildup over time. This effect, however, is not expected at the Broward County Injection System because of the cavernous nature of the injection zone.

Periodic determination of a well's injectivity can be used as a measure of a well's efficiency and is recommended as a management tool for the injection well system. The injectivity test involves injecting fluid into a well at two (or more) injection rates and recording the injection pressure for each rate. The injectivity is calculated by dividing the injection rate by the required injection pressure (well-head injection pressure minus static well-head pressure). The result is expressed as gallons per minute per psi. As noted, testing should be conducted at a minimum of two rates so that future comparisons can be made.

The testing rates for injectivity testing should be established as soon as the well is placed in operation. The procedure should be easily repeatable to ensure that injectivities can be computed for the same injection rates. Testing should be conducted quarterly for the life of the well.

Mechanical Integrity

An injection well has mechanical integrity if there is no leak in the casing and no fluid movement into the underground sources of drinking water through channels adjacent to the well bore. In accordance with the FAC 17-28.13(6) and 17-28.25(1), the mechanical integrity of the injection well must be demonstrated every five years. Mechanical integrity testing will include a pressure test, a radioactive tracer survey, a high resolution temperature log, and a television survey. This testing will be conducted, along with the monitoring of the upper and lower Floridan aquifer monitor zones, to demonstrate the absence of fluid movement through channels adjacent to the injection well bore. The results of the initial mechanical integrity testing are found in Appendix

D (pressure test data), Appendix C (geophysical logs), and on the Video-Cassette copy of the television survey.

Plugging and Abandonment Plan

In the event that any of the injection wells initially constructed for the BCWWTP have to be abandoned, the well(s) in question must be effectively sealed (or plugged) to prevent upward migration of the injection zone fluid; or the interchange of formation water through the borehole or along the casing. In order to effectively plug a well it is necessary to mobilize a drill rig, kill the well, and remove the well-head valve. Next, a bridge-plug assembly must be set at the bottom of the 24-inch-diameter injection casing. The plug assembly consists of a short section of threaded pipe with a bottom plug and with two cement baskets attached to the outside. Above the plug assembly are approximately 100 feet of threaded pipe with cement ports and several sets of left-hand threaded couplings. These couplings are placed at the top and bottom of the lowermost joint of casing. This entire assembly is then lowered into the well to the approximately depth of the bottom of the injection casing.

The cement baskets are expanded and set by adding crushed limestone to the well and allowing it to settle. A mixture of neat cement is pumped into the casing through the drill pipe, and cement ports, above the cement baskets of the bridge-plug assembly. The quantity of cement used should be equivalent to the volume required to fill the casing from the top of the crushed limestone to one foot below the lowermost left-hand threaded coupling.

The cement is allowed to settle for 24 hours and then tagged with a wireline to determine if fill-up is achieved. If not, additional crushed

limestone is added and another stage of cement is pumped (a single stage of cement is ordinarily sufficient to build the first portion of the bridge-plug). A strain of no more than 1000 pounds above drill string weight is then exerted. If no movement occurs (other than pipe stretching), the plug is considered set and the Contractor disconnects the assembly by rotating the drill pipe and "backing off" (right-hand rotation will unscrew the pipe from the left-hand threaded coupling). At that time, two successive stages of no more than 100 feet of cement (fill-up) are pumped and given time to set. The remainder of the casing is then filled with neat cement.

ACKNOWLEDGEMENTS

The success of this program was due to the hard work and cooperative efforts of a number of persons from Broward County, the Florida Department of Environmental Regulation, the South Florida Water Management District, the U.S. Geological Survey, the U.S. Environmental Protection Agency, Heery Program Management, James M. Montgomery Consulting Engineers, Inc., Hazen and Sawyer P.C., Engineers Inc., and Youngquist Brothers Drilling Co.

Geraghty & Miller, Inc., would like to thank, in particular, each of the following individuals for their guidance and cooperation throughout the entire project.

Broward County	Florida Department of Environmental Regulation
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Jim Jones	Randy Cape
John Adams	James Brantley
	Kevin Greuel

Hazen and Sawyer P.C., Engineers
Patrick Davis
Steve Montemayor

James M. Montgomery Consulting Engineers, Inc.
Helen Madeksho
Kenneth Roberts

Respectfully submitted,
GERAGHTY & MILLER, INC.

Michael J. Waldron
Scientist

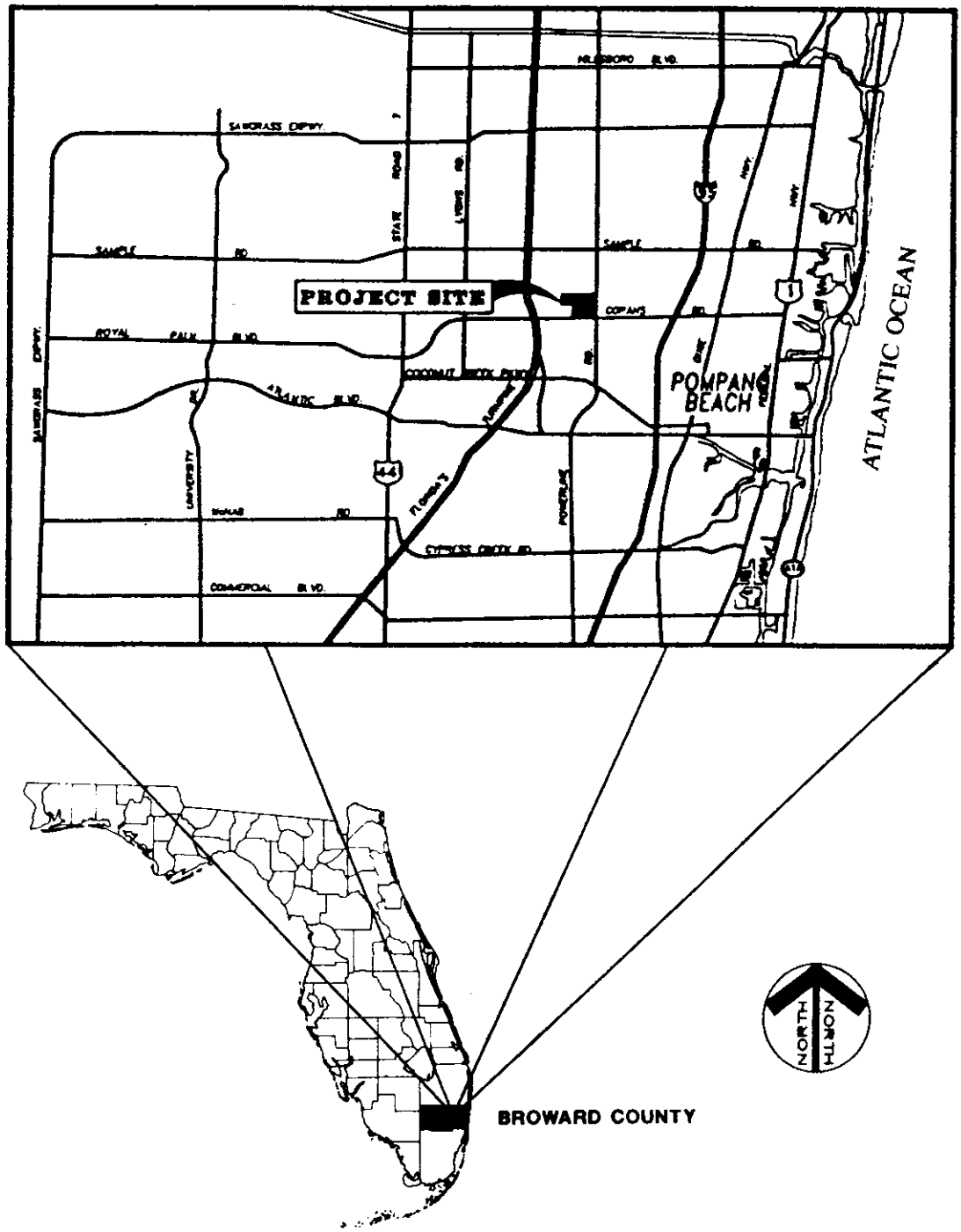
James A. Wheatley, P.G.
Senior Associate

MJW/JAW:lt

FIGURES

FIGURES

GERAGHTY & MILLER, INC. Environmental Services	COMPILED BY: M. WALDRON	DATE: JUN 98	SCALE: NONE	PREPARED FOR: JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC.
	PREPARED BY: B. OLIVA	FILE NO: PF07883		
	PROJECT MGR.: J. WHEATLEY			



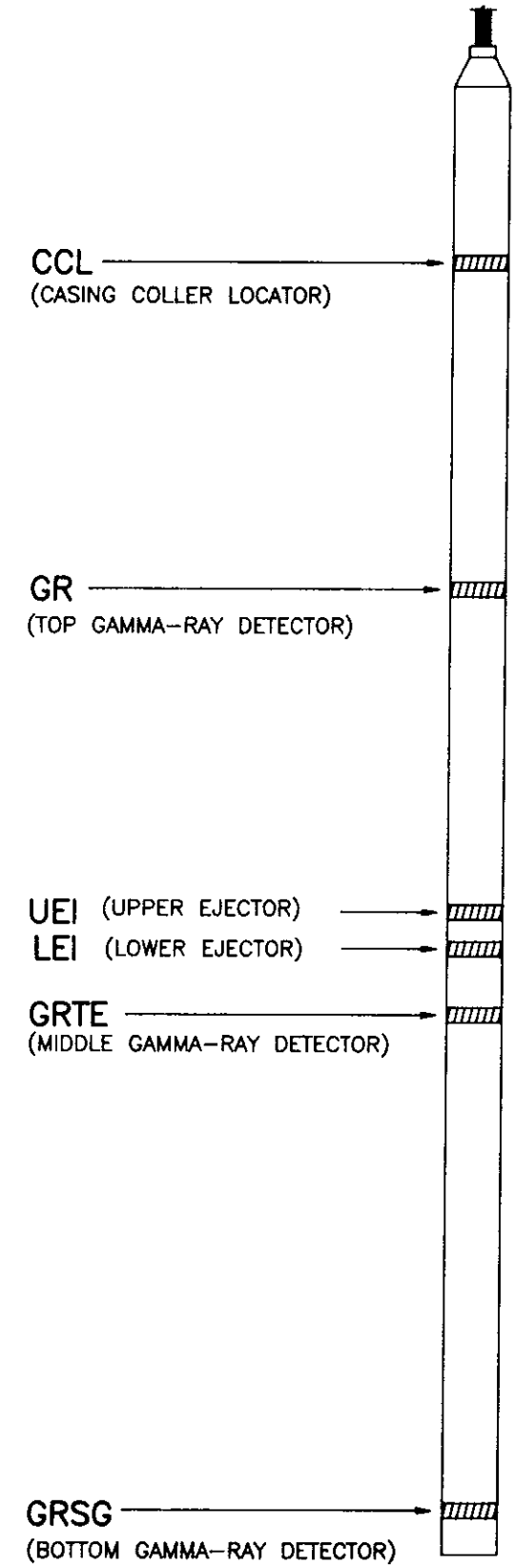
SUBJECT:

SITE LOCATION MAP

FIGURE

1

GERAGHTY & MILLER, INC. Environmental Services	COMPILED BY: M. WALDRON	DATE: JUN 90	SCALE: NONE	PREPARED FOR: JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC.
	PREPARED BY: B. OLIVA	FILE NO: PF07803		
	PROJECT MGR.: J. WHEATLEY			



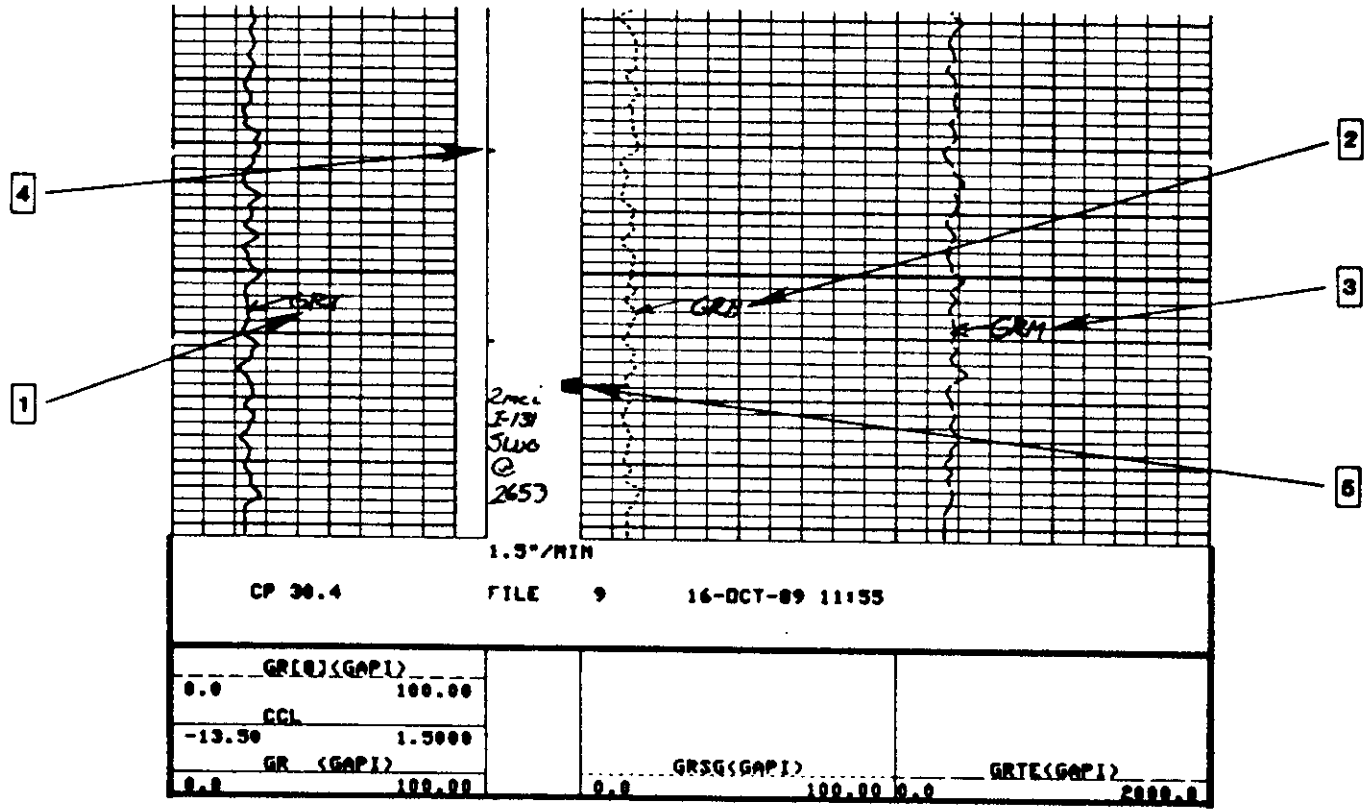
SUBJECT:

TYPICAL RADIOACTIVE TRACER SURVEY LOGGING TOOL

FIGURE **2**

GERAGHTY & MILLER, INC.
Environmental Services

COMPILED BY: M. WALDRON	DATE: JUN 90	SCALE: NONE	PREPARED FOR: JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC.
PREPARED BY: B. OLIVA	FILE NO: PF07803		
PROJECT MGR.: J. WHEATLEY			



LEGEND

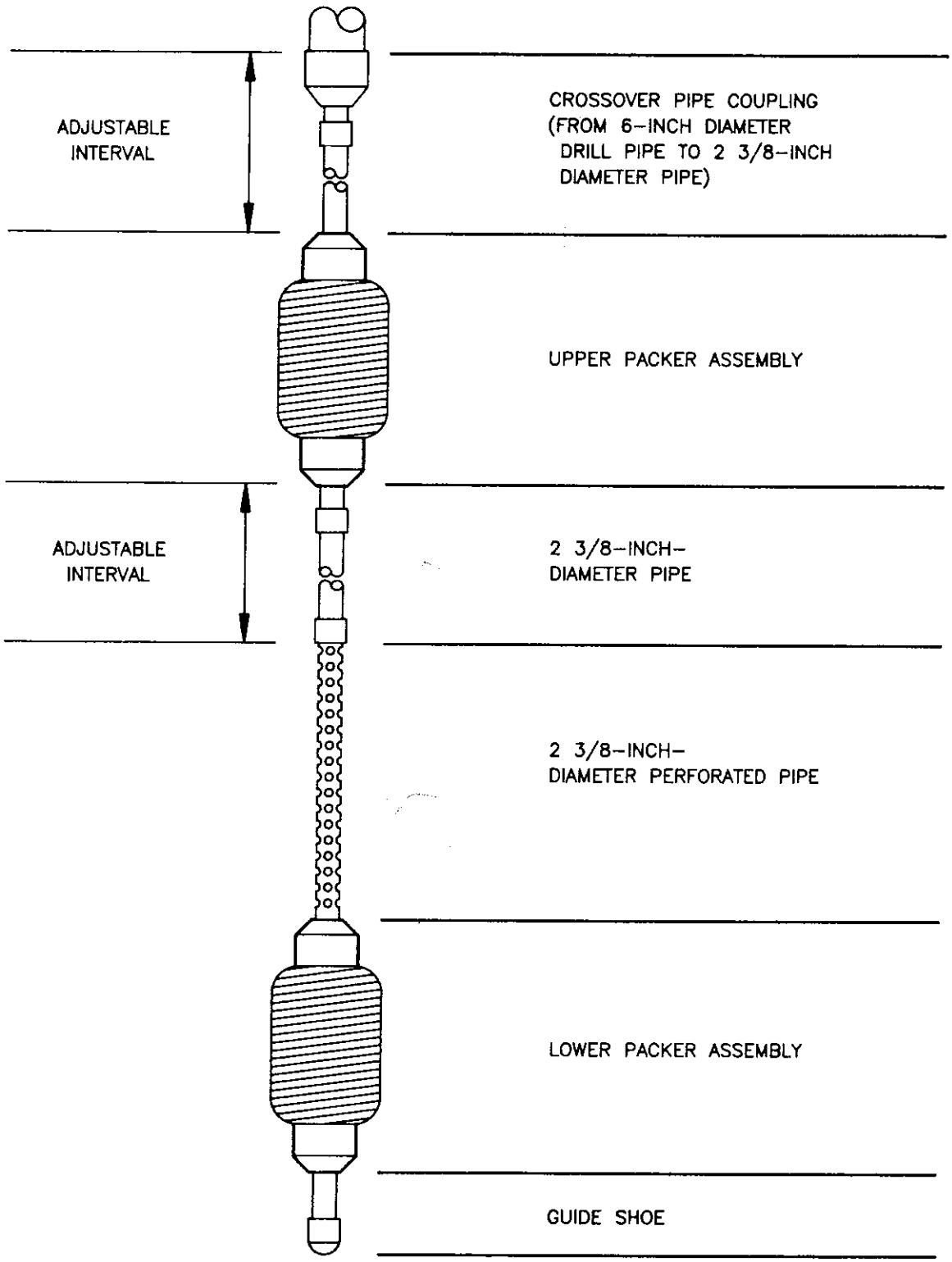
1. GRT = GR = TOP OF GAMMA-RAY DETECTOR
2. GRB = GRSG = BOTTOM GAMMA-RAY DETECTOR
3. GRM = GRTE = MIDDLE GAMMA-RAY DETECTOR
4. REPRESENTS ONE MINUTE ELAPSED TIME
5. REPRESENTS RELEASE OF RADIOACTIVE MATERIAL

SUBJECT:

TYPICAL LOG PRESENTATION OF A RADIOACTIVE TRACER SURVEY

FIGURE 3

GERAGHTY & MILLER, INC. Environmental Services	COMPILED BY: M. WALDRON	DATE: JUN 90	SCALE: NONE	PREPARED FOR: JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC.
	PREPARED BY: B. OLIVA	FILE NO: PF07803		
	PROJECT MGR.: J. WHEATLEY			



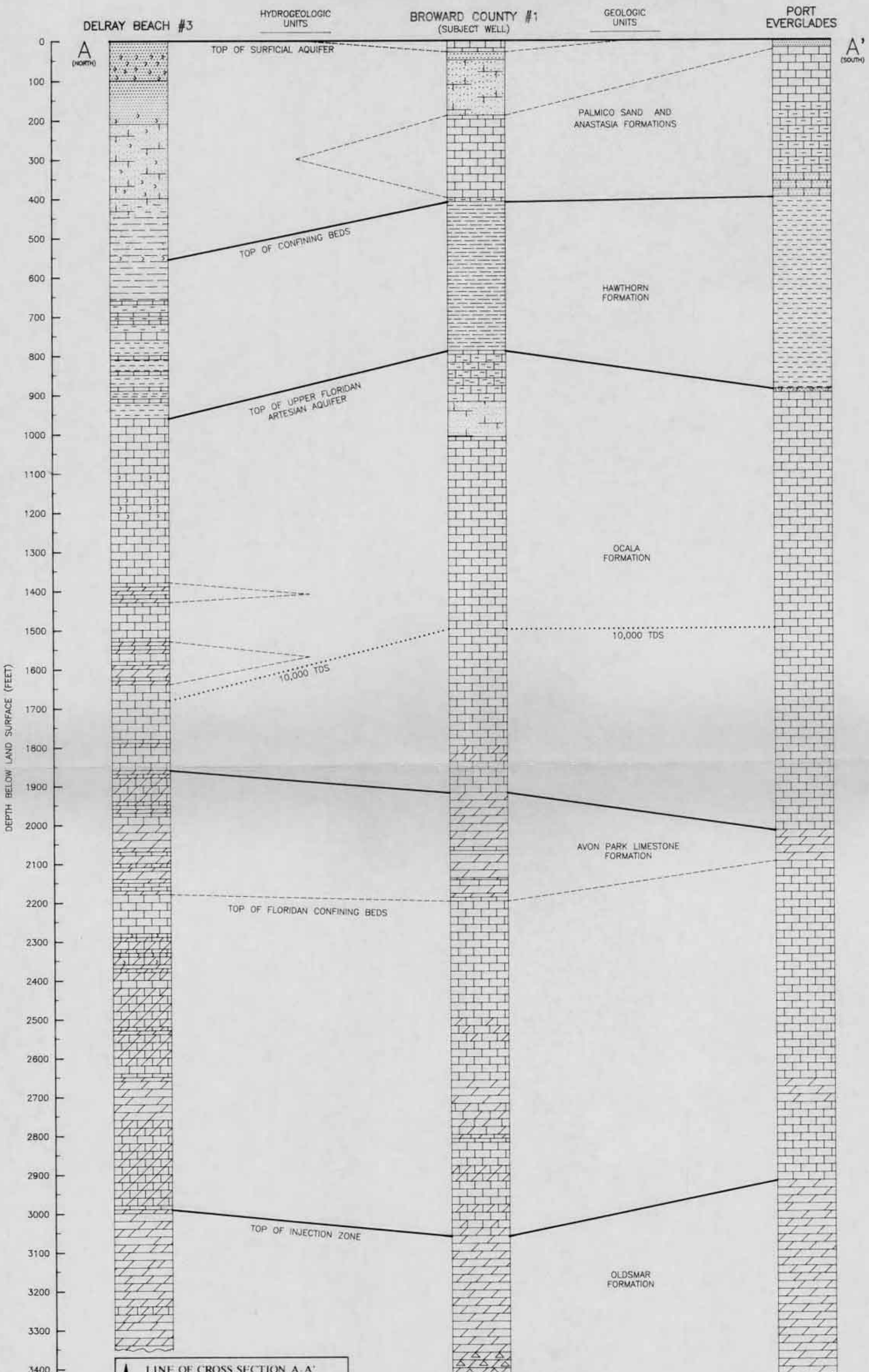
NOTE: DRAWING NOT TO SCALE.

SUBJECT:

TYPICAL STRADDLE-PACKER ASSEMBLY

FIGURE **4**

CROSS-SECTION SHOWING CORRELATION BETWEEN THREE INJECTION WELLS IN SOUTH FLORIDA



NOTES: 1.)TOP OF 10,000 TDS SURFACE IN PT. EVERGLADES WELL BASED UPON RESISTIVITY LOG CORRELATIONS. NO STRADDLE PACKER TEST DATA AVAILABLE FOR THIS WELL.
2.)NO HORIZONTAL SCALE.

LEGEND

SAND
SHELL
CLAY
CHERT
LIMESTONE
DOLOMITE
FORMATION TOPS
CORRELATION ZONES

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Environmental Services

FIGURE 5

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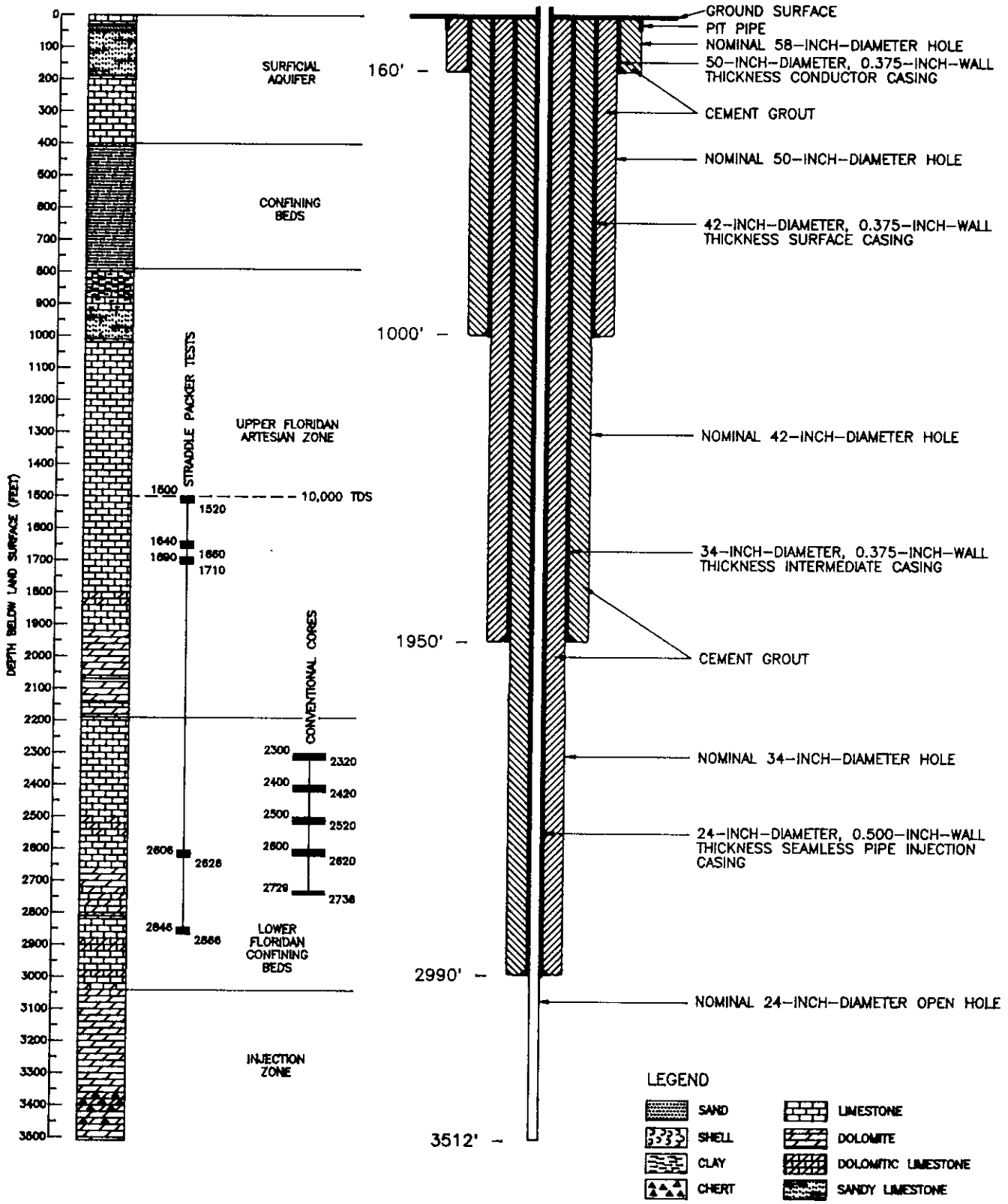
	PREPARED BY: B. OLIVA	FILE NO: PF07803		
	PROJECT MGR.: J. WHEATLEY			

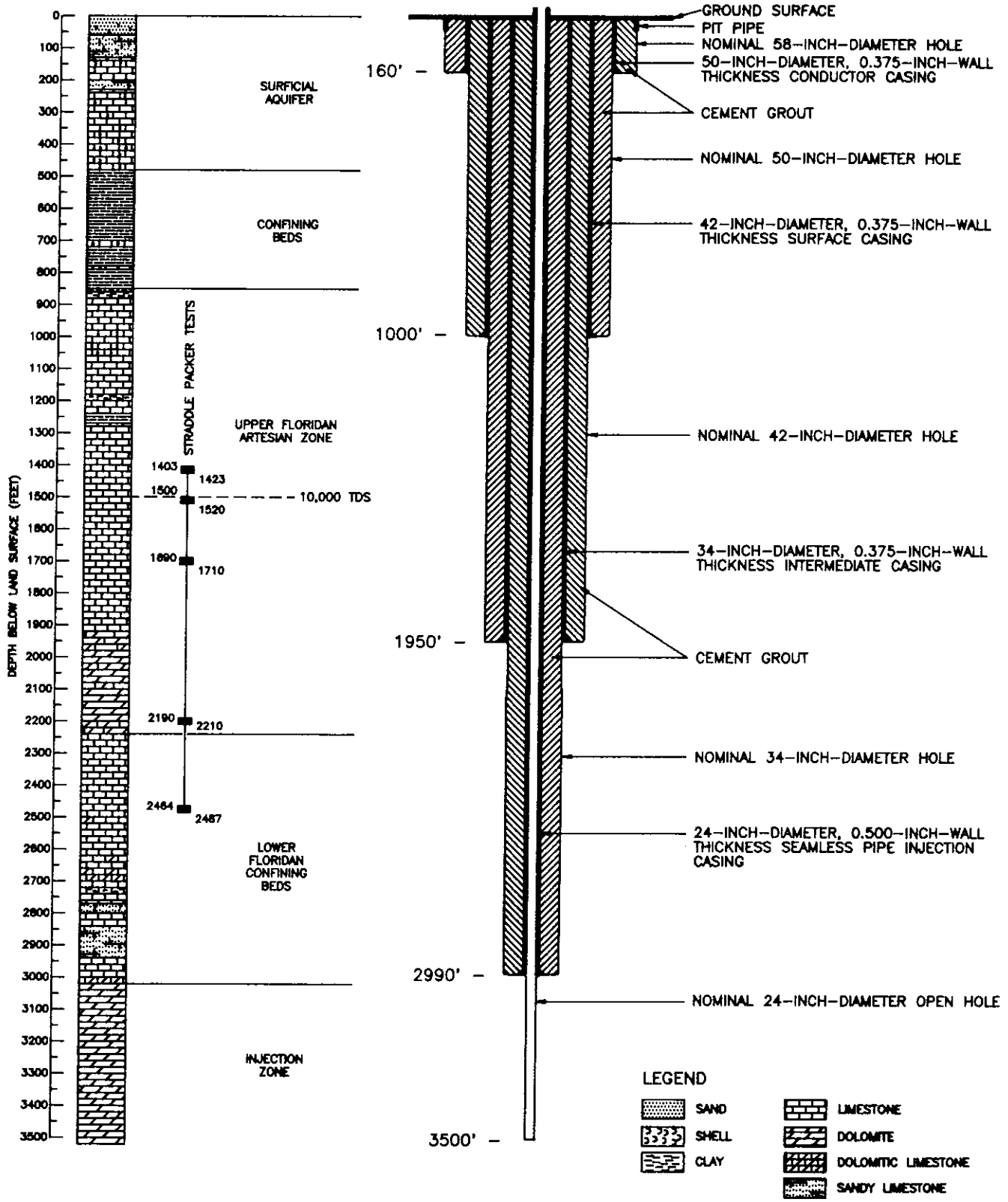


SUBJECT:

DETAILS OF CORING AND TESTING PROGRAM

FIGURE 6

GERAGHTY & MILLER, INC. Environmental Services	COMPILED BY: M. WALDRON	DATE: JUN 90	SCALE: NONE	PREPARED FOR: JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC.
	PREPARED BY: B. OLIVA	FILE NO: PF07803		
	PROJECT MGR.: J. WHEATLEY			



SUBJECT:

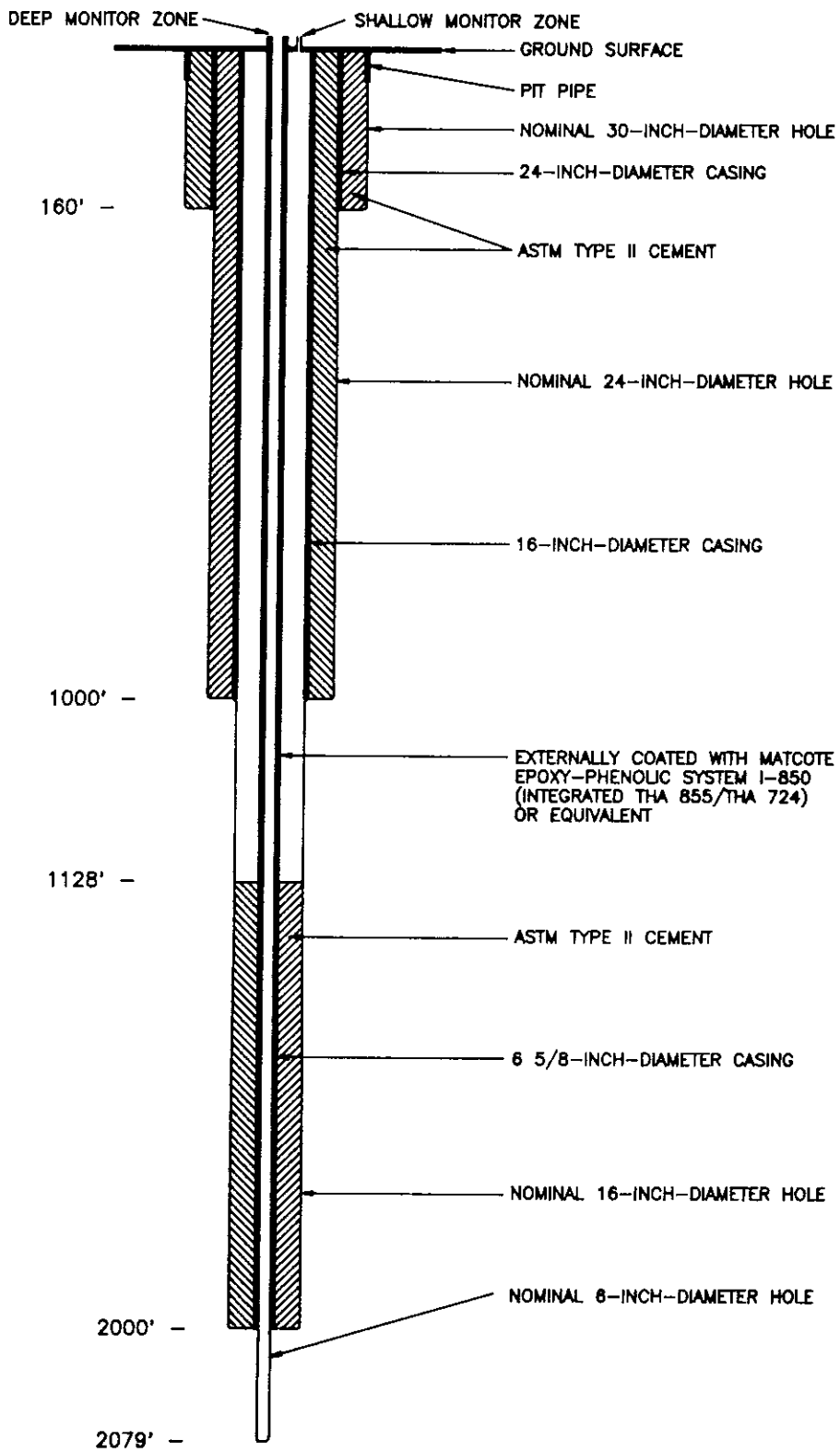
DETAILS OF TESTING PROGRAM

FIGURE **7**

GERAGHTY & MILLER, INC.
Environmental Services

COMPILED BY:	M. WALDRON
PREPARED BY:	B. OLIVA
PROJECT MGR.:	J. WHEATLEY
DATE:	JUN 90
SCALE:	NONE
FILE NO:	PF07803

PREPARED FOR: **JAMES M. MONTGOMERY**
CONSULTING ENGINEERS, INC.



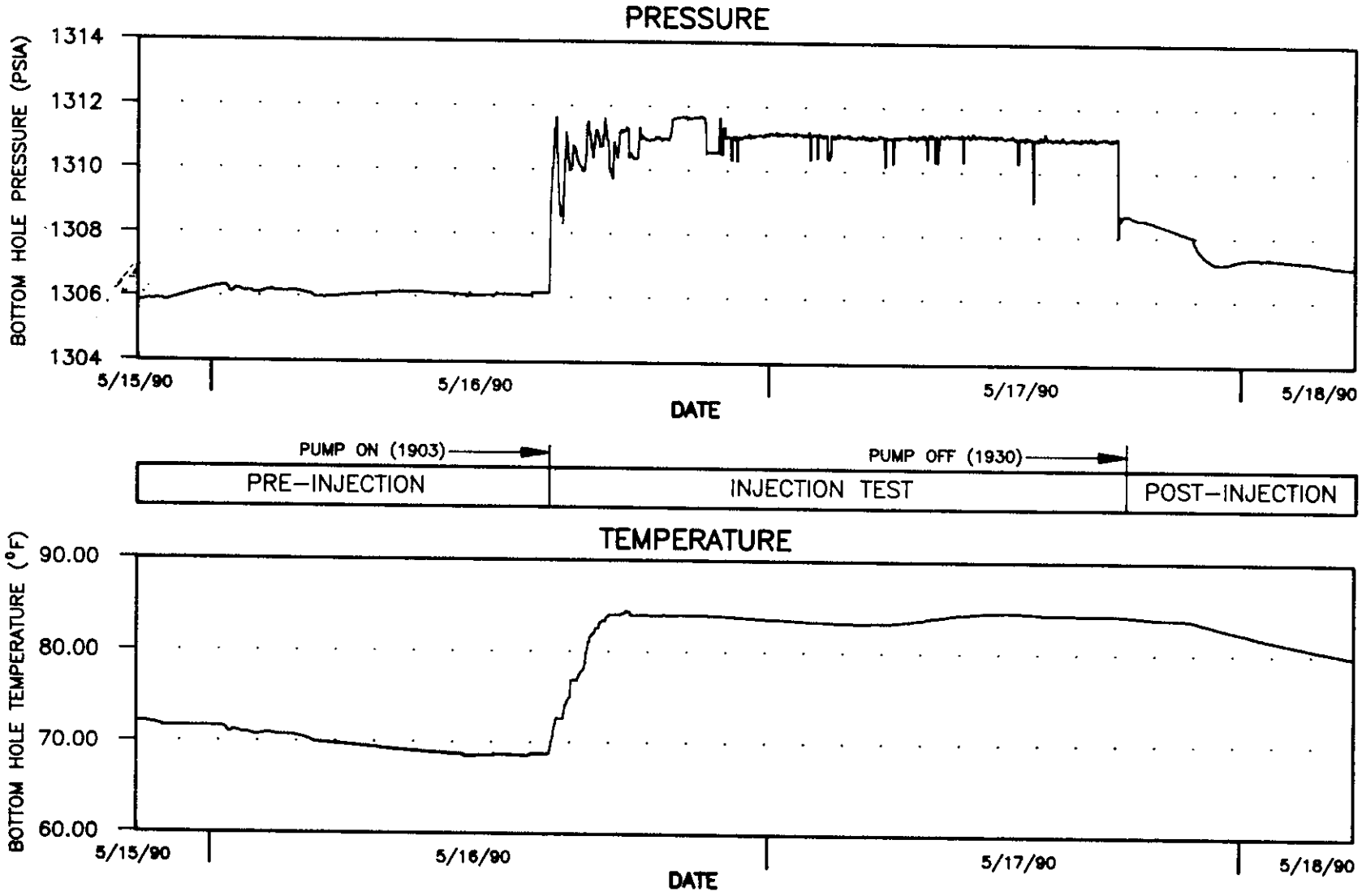
SUBJECT:

COMPLETED DEEP MONITOR WELL CONSTRUCTION DETAILS

FIGURE **8**

GERAGHTY & MILLER, INC.
Environmental Services

COMPILED BY: B. OLIVA	DATE: JUN 90	SCALE: NONE	PREPARED FOR: JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC.
PREPARED BY: B. OLIVA	FILE NO: PF07803		
PROJECT MGR.: J. WHEATLEY			

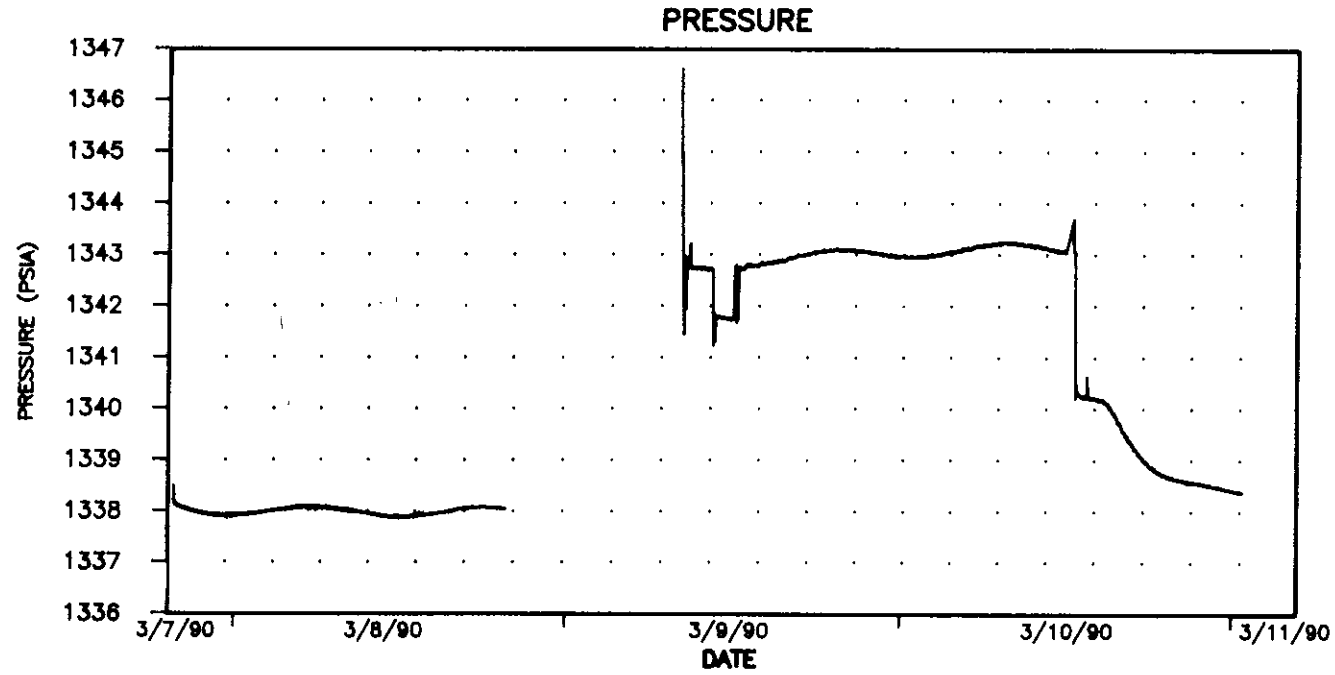


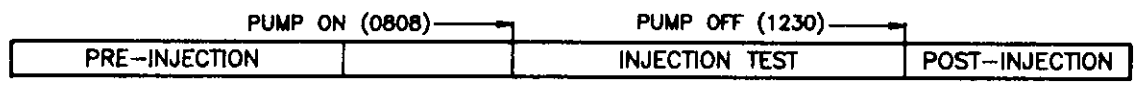
SUBJECT:

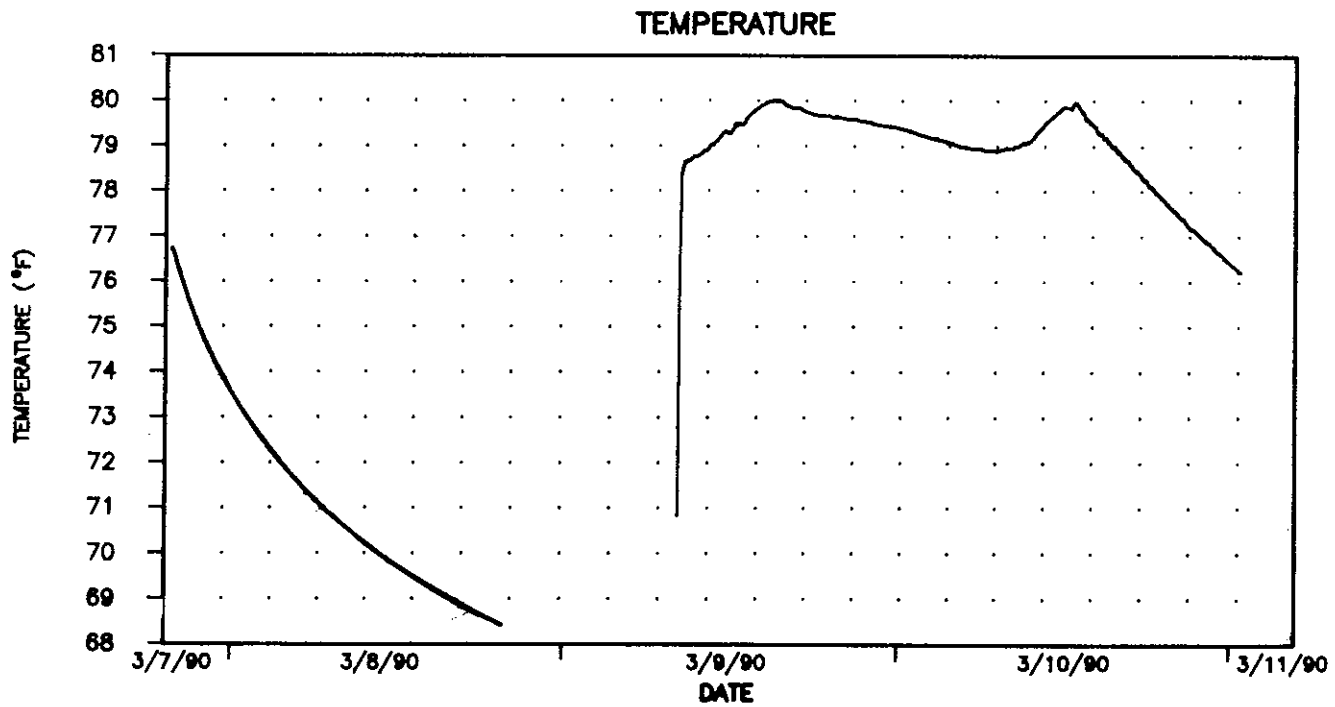
INJECTION TEST-PRESSURE AND TEMPERATURE TEST DATA
BROWARD COUNTY INJECTION WELL #1

FIGURE
9

GERAGHTY & MILLER, INC. Environmental Services	COMPILED BY: K. VERON	DATE: JUL 90	SCALE: NONE	PREPARED FOR: JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC.
	PREPARED BY: B. OLIVA	FILE NO: PF07803		
	PROJECT MGR.: J. WHEATLEY			







SUBJECT:

INJECTION TEST-PRESSURE AND TEMPERATURE TEST DATA
BROWARD COUNTY INJECTION WELL #2

FIGURE **10**

TABLES

TABLES

INJECTION WELL #1

Table 1. Summary of Straddle-Packer Test Analyses, Injection Well #1, Broward County North District Regional Wastewater Treatment Plant

Test Interval (feet below pad)	Internal Thickness (feet)	Hydraulic (K) Conductivity (cm/sec)	Transmissivity (T) (gpd/ft)
1	(20) 1690 - 1710	1.55×10^{-4}	66
2	(20) 1500 - 1520	9.64×10^{-4}	409
3	(20) 1640 - 1660	2.05×10^{-4}	87
4	(20) 2846 - 2866	1.90×10^{-3}	807
5	(20) 2606 - 2626	8.50×10^{-5}	36

Table 2. Summary of Core Data, Injection Well #1, Broward County North District Regional Wastewater Treatment Plant

Core No.	Depth (ft)	Moisture Content Initial/Final %	Final Dry Density (pcf)	Hydraulic Conductivity (cm/sec)	Porosity
1H	2303	13.9/19.6	109.2	7.2×10^{-4}	0.37
1V	2303	10.9/13.2	118.4	1.5×10^{-4}	0.32
2H	2405	12.3/14.8	113.9	4.6×10^{-4}	0.34
2V	2405	13.0/16.9	109.8	6.3×10^{-5}	0.37
3H	2503	11.5/13.6	118.7	5.1×10^{-5}	0.32
3V	2503	7.7/10.8	120.8	8.4×10^{-5}	0.31
4H	2616	11.4/13.3	119.8	1.7×10^{-5}	0.31
4V	2616	9.8/13.1	118.6	1.7×10^{-4}	0.3
5H	2730	17.2/20.2	105.3	2.5×10^{-4}	0.38
5V	2730	13.5/16.9	110.8	3.2×10^{-4}	0.35

Core No.	Depth (ft)	Moisture Content (%)	Dry Density (pcf)	Unconfined Compressive Strength (kg/cm2)	Porosity	Specific Gravity
1	2303	9.2	119.3	63	0.31	2.78
2	2405	13.8	107.9	34	0.38	2.78
3	2503	9.3	117.7	48	0.33	2.79
4	2616	10.8	115.9	68	0.33	2.77
5	2730	13.4	105.8	56	0.38	2.74

Notes: (1) Four-inch-diameter cores were trimmed to 3.3 cm. diameter.

(2) Analyses performed by Ardaman & Associates, Inc.

INJECTION WELL #2

Table 1. Summary of Straddle-Packer Test Analyses, Injection Well #2, Broward County District North Regional Wastewater Treatment Plant

Test Interval (feet below pad)	Internal Thickness (feet)	Hydraulic (K) Conductivity (cm/sec)	Transmissivity (T) (gpd/ft)
1	(20) 1690 - 1710	*	*
2	(20) 1403 - 1423	3.3031 x 10-4	140
3	(20) 1500 - 1520	*	*
4	(23) 2464 - 2487	1.4566 x 10-4	71
5	(20) 2190 - 2210	*	*

* Drawdown and recovery data unreliable because of problems with the seal between straddle-packers and formation.

APPENDIX A

Geologic Log

INJECTION WELL #1

GEOLOGIC LOG
OF
BROWARD COUNTY - NORTH DISTRICT REGIONAL
WASTEWATER TREATMENT PLANT
INJECTION WELL 1
POMPANO BEACH, FLORIDA

Depth Interval (feet)	Thickness (feet)	Sample Description
0 - 30	30	LIMESTONE AND SHELL - Limestone, 90%, tan to pale orange, large fragments, fossiliferous (coral), slightly weathered, moderately well-cemented; Shell, 10%, tan to pale orange, valves, large fragments, angular, unweathered.
30 - 50	20	SAND - Sand, 98%, colorless to very light gray, quartz, medium to coarse-grained, sub-angular, well sorted; Shell, 2%, tan to pale orange, angular, sub-angular, weathered.
50 - 60	10	LIMESTONE AND SAND - Limestone, 50%, tan to pale orange, fossiliferous coral, large fragments, angular, slightly weathered; Sand, 50%, colorless to very light gray, sub-angular, well sorted.
60 - 70	10	SAND - Sand, 100%, clear to very light gray, little phosphatic, some black-phosphatic, medium- to coarse-grained, sub-angular, well sorted; Limestone, trace, tan to pale orange, medium size fragments, fossiliferous coral.
70 - 80	10	LIMESTONE AND SAND - Limestone, 60%, mostly very light gray to light gray, tan to very pale orange, sandy, medium- to coarse-grained, sucrosic texture, very angular; Sand, 40%, clear to very pale orange, quartz, medium- to coarse-grained, some frosted, much as inclusions in limestone, sub-angular, poorly sorted.

Depth Interval (feet)	Thickness (feet)	Sample Description
80 - 110	30	LIMESTONE AND SAND - Limestone, 80%, light gray to very pale olive, sandy, medium- to very coarse-grained, sucrosic texture, angular; Sand, 20%, clear to frosted, very light gray, quartz, medium-grained, sub-angular.
110 - 140	30	LIMESTONE AND SAND - Limestone, 95%, light to medium light gray, medium- to coarse-grained, sucrosic texture, medium large to large size fragments, angular; Sand, 5%, clear to frosted, very light gray, quartz, medium-grained.
140 - 190	50	LIMESTONE - Limestone, 100%, half-light gray to very light gray, slightly phosphatic, half-tan to very pale orange, all fine- to medium-grained, angular.
190 - 230	40	LIMESTONE - Limestone, 100%, light yellowish gray, to light olive gray to olive gray, micritic, soft to hard.
230 - 290	60	LIMESTONE - Limestone, 100%, yellowish gray to pale olive, micritic, soft to hard.
290 - 310	20	LIMESTONE - Limestone, 100%, yellowish gray to grayish olive, fine- to medium-grained (coarsing upward), soft; Limestone, trace, phospholiferous.
310 - 390	80	LIMESTONE - Limestone, 98%, light olive, micritic, soft; Marl, 2%, soft; Limestone, trace, phospholiferous.
390 - 410	20	CLAY AND LIMESTONE - Clay, 50%, grayish olive, plastic, soft; Limestone, 50%, grayish olive, fine-grained, silt.

Depth Interval (feet)	Thickness (feet)	Sample Description
410 - 590	180	CLAY - Clay, 100%, grayish olive, plastic, soft.
590 - 770	180	CLAY - Clay, 100%, light grayish olive to dusky yellow, plastic, soft; Limestone, trace, phospholiferous.
770 - 790	20	CLAY - Clay, 99%, light grayish olive to dusky yellow, plastic, soft; Limestone, 1%, light grayish olive, very fine-grained, micritic, soft.
790 - 830	40	LIMESTONE AND CLAY - Limestone, 90%, light grayish olive, fine-grained, micritic to medium-grained, soft; Clay, 10%, light grayish olive to dusky yellow, plastic, soft.
830 - 860	30	CLAY AND LIMESTONE - Clay, 90%, pale olive to grayish olive, plastic, soft; Limestone, 10%, medium to dark gray, fine-grained, angular, moderately hard, well cemented.
860 - 880	20	CLAY - Clay, 100%, olive to grayish yellow green, plastic, soft: Limestone, trace, micritic, angular, well cemented.
880 - 890	10	CLAY AND LIMESTONE - Clay, 85%, grayish yellow green to olive, plastic, soft; Limestone, 15%, medium to dark gray, micritic, very small to large fragments, angular, moderately hard; Limestone, trace, very pale orange, micritic.

Depth Interval (feet)	Thickness (feet)	Sample Description
950 - 970	20	SANDY LIMESTONE, LIMESTONE, AND SHELL - Sandy Limestone, 70%, grayish orange to light gray, coarse-grained, sparry with calcite, multi-colored coarse sand grains, angular; Limestone, 20%, very pale orange, micritic to medium-grained, some slightly phosphatic; Shell, 10%, tan to very pale orange, angular, weathered.
970 - 1010	40	SANDY LIMESTONE - Sandy Limestone, 100%, much - light gray, with calcareous sand, medium- to coarse-grained, sparry with calcite, poorly cemented, rest - very pale orange, medium-grained, angular, moderately well-cemented.
1010 - 1030	20	LIMESTONE - Limestone, 100%, light gray to pale olive gray, medium- to coarse-grained, angular, hard.
1030 - 1050	20	LIMESTONE - Limestone, 100%, light gray to pale olive gray, some pale orange, coarse-grained, angular, soft to moderately hard.
1050 - 1370	320	LIMESTONE - Limestone, 100%, very pale orange, coarse-grained, angular, soft.
1370 - 1510	140	LIMESTONE - Limestone, 100%, very pale orange to medium gray, fine- to coarse-grained, angular, soft.
1510 - 1800	290	LIMESTONE - Limestone 100%, very pale orange to medium gray, medium- to coarse-grained, angular, soft.
1800 - 1830	30	DOLOMITIC LIMESTONE - Limestone, 50%, very pale orange, fine- to medium-grained, angular, soft; Dolomite, 50%, dark yellowish brown, medium-grained, angular, hard.

Depth Interval (feet)	Thickness (feet)	Sample Description
1830 - 1920	90	LIMESTONE - Limestone, 98%, very pale orange to medium gray, fine- to medium-grained, soft to moderately hard; Clay, 2%, grayish yellow green to very pale orange, plastic, soft, in lower section of interval; Dolomite, trace.
1920 - 1980	60	DOLOMITE - Dolomite, 95%, grayish brown to moderate brown, very fine-grained, angular, hard; Limestone, 5%, very pale orange to medium gray, fine-grained, soft to moderately hard.
1980 - 2010	30	DOLOMITE - Dolomite, 100%, moderate brown to medium gray, fine-grained, angular, hard, few large fragments.
2010 - 2060	50	DOLOMITE - Dolomite, 100%, moderately brown to dark yellowish brown, fine-grained, slightly sparry with calcite, angular, brittle to hard.
2060 - 2070	10	DOLOMITIC LIMESTONE - Limestone, 50%, very pale orange, micritic, hard; Dolomite, 50%, moderate brown to dark yellowish brown, fine- to medium-grained, angular, hard.
2070 - 2150	80	DOLOMITE - Dolomite, 100%, moderate brown to dark yellowish brown, very coarse-grained, angular hard.
2150 - 2160	10	LIMESTONE - Limestone, 95%, very pale orange to grayish orange, medium-grained, moderately soft; Dolomite, 5%, moderate brown to dark yellowish brown, very coarse-grained, angular, hard.
2160 - 2180	20	DOLOMITE - Dolomite, 100%, moderate yellowish brown, to dark yellowish brown, medium to coarse-grained, angular, hard.

Depth Interval (feet)	Thickness (feet)	Sample Description
2180 - 2190	10	DOLOMITIC LIMESTONE - Dolomite, 60%, moderate to dark yellowish brown, medium- to coarse-grained, angular, hard; Limestone, 40%, very pale orange, fine-grained, micritic to medium-grained, soft.
2190 - 2240	50	LIMESTONE - Limestone, 100%, very pale orange, fine-grained, micritic to medium-grained, soft.
2240 - 2500	260	LIMESTONE - Limestone, 100%, very pale orange, fine- to medium-grained, soft; Dolomite, trace, in upper half of interval.
2500 - 2510	10	LIMESTONE AND DOLOMITE - Limestone, 70%, very pale orange, dolomitic, fine- to medium-grained, sucrosic texture, poorly cemented, soft; Dolomite, 30%, pale to moderate yellowish brown, medium- to fine-grained, sparry with calcite, moderately well-cemented.
2510 - 2530	20	DOLOMITE AND LIMESTONE - Dolomite, 75%, most-dusky brown to olive black, medium-grained, inclusions of very pale orange, limestone and yellowish brown dolomite, moderately well-cemented, rest - yellowish brown, fine- to medium-grained; Limestone, 25%, very pale orange, fine- to medium-grained, pellodial, soft.
2530 - 2550	20	DOLOMITE AND LIMESTONE - Dolomite, 60%, most-yellowish brown, fine- to medium-grained, moderately well-cemented, rest - dusky brown to olive black, medium-grained; Limestone, 40%, very pale orange, fine- to medium-grained, pelloidal, soft.

Depth Interval (feet)	Thickness (feet)	Sample Description
2550 - 2620	70	LIMESTONE - Limestone, 100%, very pale orange, fine- to medium-grained, pellodial, soft; Dolomite, little, at upper extreme of interval.
2620 - 2660	40	LIMESTONE AND DOLOMITIC LIMESTONE- Limestone, 65%, very pale orange, fine- to medium-grained, pelloidal, soft; Dolomitic Limestone, 35%, pale yellowish brown, medium-grained, sucrosic, poorly cemented, percentage increases relative to limestone in lower one-quarter of interval.
2660 - 2690	30	DOLOMITE - Dolomite, 100%, dark yellowish orange to light brown, fine- to medium-grained, sucrosic, sparry with calcite, moderately hard, poorly cemented, brittle.
2690 - 2720	30	DOLOMITE - Dolomite, 100%, light to moderate brown, micritic, slightly sparry with calcite, some vesicular, moderately well-cemented, angular.
2720 - 2740	20	LIMESTONE AND DOLOMITE - Limestone, 65%, pale to very pale orange, fine- to medium-grained, pelloidal, angular fragments, poorly cemented; Dolomite, 35%, pale yellowish orange to light gray to olive black, fine-grained, gray, fraction, sparry with calcite, angular, hard.
2740 - 2780	40	LIMESTONE AND DOLOMITE - Limestone, 60%, very pale orange, slightly argillaceous, some pelloidal, angular, very poorly cemented; Dolomite, 40%, light gray, fine-grained, micritic, angular, hard, entire sample interval weathered.

Depth Interval (feet)	Thickness (feet)	Sample Description
890 - 900	10	LIMESTONE AND CLAY - Limestone, 50%, mostly light gray to very pale olive, medium-grained, micritic, slightly phosphatic, some tan to very pale orange, all poorly sorted, angular to sub-angular, slightly weathered; Clay, 50%, grayish yellow green, plastic, soft.
900 - 910	10	LIMESTONE AND CLAY - Limestone, 75%, half-tan to very pale orange, medium-grained, fossiliferous, half-pale olive, medium-grained, sparry with calcite, angular, moderately well-cemented; Clay, 25%, grayish yellow green plastic, soft.
910 - 930	20	SANDY LIMESTONE AND CLAY - Sandy Limestone, 95%, grayish orange to very light gray, medium- to coarse-grained, sparry with calcite and calcite inclusions, medium to large fragments, angular to sub-angular, few calcite fragments, multi-colored coarse sands grains on some fragments; Clay, 5%, grayish yellow green, plastic, soft.
930 - 950	20	SANDY LIMESTONE, LIMESTONE AND CLAY- Sandy Limestone, 65%, grayish orange to very light gray, coarse-grained, sparry with calcite, multi-colored coarse sand grains, angular; Limestone, 30%, very pale orange, micritic to medium-grained, very slightly phosphatic, angular; Clay, 5%, very pale olive, plastic soft.

Depth Interval (feet)	Thickness (feet)	Sample Description
2780 - 2800	20	DOLOMITE AND LIMESTONE - Dolomite, 85%, light to medium dark gray, fine-grained, very angular, hard; Limestone, 15%, very pale orange, pelloidal, angular, brittle to soft; slightly weathered.
2800 - 2810	10	DOLOMITIC LIMESTONE AND DOLOMITE- Dolomitic Limestone, 70%, pale orange to pale yellowish brown, medium-grained, sucrosic, angular, brittle, weathered; Dolomite, 30%, light to medium gray, fine-grained, angular, hard.
2810 - 2880	70	LIMESTONE - Limestone, 100%, very pale orange, medium-grained, pelloidal, sub-angular fragments, brittle to moderately soft, weathered.
2880 - 2920	40	LIMESTONE AND DOLOMITE - Limestone, 85%, very pale orange, medium-grained, pelloidal, brittle to moderately hard, weathered; Dolomite, pale yellowish brown, fine- to medium-grained, small to medium large fragments, angular, hard.
2920 - 2960	40	LIMESTONE - Limestone, 100%, very pale orange, medium-grained, pelloidal, sub-angular fragments, brittle to moderately soft.
2960 - 3010	50	LIMESTONE AND DOLOMITE - Limestone, 95%, very pale orange to pale yellowish brown, medium-grained, pelloidal, moderately soft; Dolomite, 5%, olive gray to pale yellowish brown, fine-grained, micritic, medium large fragments, angular, moderately hard, more dolomite in upper end of interval, absent at lower extreme.

Depth Interval (feet)	Thickness (feet)	Sample Description
3010 - 3040	30	LIMESTONE AND DOLOMITE - Limestone, 90%, tan to very pale orange, medium-grained, pelloidal, sub-angular to angular fragments, soft; Dolomite, 10%, pale yellowish brown to grayish orange, sucrosic to micritic, respectively, medium- to fine-grained, very angular, hard.
3040 - 3070	30	DOLOMITE AND LIMESTONE - Dolomite, 93%, grayish orange to pale yellowish brown, fine-grained, micritic to medium-grained, very angular, hard; Limestone, 7%, tan to very pale orange, fine- to medium-grained, sub-angular to angular, soft to moderately hard.
3070 - 3130	60	DOLOMITE - Dolomite, 100%, pale yellowish brown, little light gray, fine- to medium-grained, small to medium size fragments, very angular, moderate to very hard, well sorted.
3130 - 3150	20	DOLOMITE - Dolomite, 100%, very pale orange to pale yellowish brown, with some light to very light gray, fine-grained, very angular, small to medium size fragments, moderately hard.
3150 - 3370	220	DOLOMITE - Dolomite, 100%, pale yellowish brown with some light gray, fine-grained, small to medium size fragments, very angular, hard to moderately hard.
3370 - 3420	50	DOLOMITIC CHERT - Chert, 60%, tan to gray, fine+ to medium+grained, angular, hard; Dolomite, pale yellowish brown, fine+ to medium+ grained, angular, hard.

Depth Interval (feet)	Thickness (feet)	Sample Description
3420 - 3440	20	DOLOMITE - Dolomite, 100%, mostly pale yellowish brown, some grayish pink to pale orange, fine- to medium-grained, irregular to platy fracture, very angular, hard to moderately hard.
2440 - 3470	30	DOLOMITE AND CHERT - Dolomite, 75%, moderately yellowish brown, fine-grained, angular, hard; Chert, 25%, olive black, very fine-grained, very angular, brittle to hard, interbedded.
3470 - 3512	42+	DOLOMITE - Dolomite, 100%, pale yellowish brown to olive gray, fine- to medium-fine-grained, mostly planar fracture, very angular, hard.

TOTAL DEPTH: 3512

INJECTION WELL #2

GEOLOGIC LOG
OF
BROWARD COUNTY - NORTH DISTRICT REGIONAL
WASTEWATER TREATMENT PLANT
INJECTION WELL 2
POMPANO BEACH, FLORIDA

Depth Interval (feet)	Thickness (feet)	Sample Description
0 - 10	10	SAND, FILL AND SHELL - Sand, 50%, colorless, quartz, fine- to coarse-grained, well rounded to sub-angular, poorly sorted; Organics, 35%, dark brown to black, wood fibers; Shell, 15%, white to tan, mainly fragments; Silt, trace, very pale orange.
10 - 20	10	SAND AND SHELL - Sand, 70%, colorless to very light gray, quartz, medium- to coarse-grained, sub-rounded to rounded, silty, moderately sorted; Shell, 20%, very pale orange, mostly fragments, some whole valves; Organics, 10%, dark brown to black, wood fibers; Oolites, trace, very pale orange, calcareous.
20 - 40	20	SANDSTONE AND SHELL - Sandstone, 60%, light gray to gray, quartz, fine- to coarse-grained, sub-angular to sub-rounded, moderately sorted; Shell, 30%, pale to very pale orange, tests; Organics, 10%, dark brown to black, wood fibers, seeds, bone.
40 - 60	20	SAND AND SHELL - Sand, 70%, clear to light gray, quartz, fine- to very coarse-grained, sub-rounded to angular, poorly to moderately sorted, some silt; Shell, 25%, very pale orange to light gray, tests; Organics, 5%, light brown to black, wood fiber.

Depth Interval (feet)	Thickness (feet)	Sample Description
60 - 100	40	LIMESTONE, SAND AND SHELL - Limestone, 70%, light gray to gray, sucrosic texture; Sand, 30%, clear to light gray to very pale orange, sub-angular to angular; Shell, trace, very pale orange, fragments; Organics, trace, brown to black, wood fiber.
100 - 130	30	LIMESTONE AND SAND - Limestone, 80%, light gray to gray, biomicritic, very hard to hard; Sand, 20%, clear to very pale orange, medium- to very coarse-grained, sub-angular to sub-rounded; Shell, trace, very pale orange, fragments.
130 - 170	40	LIMESTONE - Limestone, 100%, light gray to gray, medium-grained, hard; Shell, trace, phospholiferous limestone.
170 - 200	30	LIMESTONE - Limestone, 100%, very light gray to gray, medium-grained, hard; Shell, trace, phospholiferous limestone.
200 - 230	30	LIMESTONE - Limestone, 50%, tan to very pale orange, micritic, medium size fragments with many tests, all angular, unweathered; Limestone, 50%, light to medium gray, phosphatic, medium-grained, angular, moderately hard, well cemented.
230 - 250	20	SHELL AND LIMESTONE - Shell, 70%, very pale orange, tests, small to medium size fragments, angular, unweathered; Limestone, 30%, light gray, phosphatic, fine- to medium-grained, angular, moderately hard, well-cemented; Organics, trace, wood fibers.

Depth Interval (feet)	Thickness (feet)	Sample Description
250 - 280	30	SHELL AND LIMESTONE - shell, 50%, very pale orange, tests, small fragments, angular; Limestone, 50%, light gray to very pale olive, fine- to medium-grained, angular moderately hard, well-cemented; Sand, trace, colorless, quartz, coarse-grained, subangular.
280 - 300	20	LIMESTONE - Limestone, 70%, very pale orange, micritic, small to medium size fragments, some tests, all angular, mostly unweathered; Limestone, 20%, tan to light gray, phosphatic, fine- to medium-grained, angular, moderately hard, well cemented; Organics, 10%, black, wood and plant fibers.
300 - 440	140	SANDY LIMESTONE AND SHELL - Limestone, 40%, pale olive to very pale orange, micritic with some sparry with calcite, all angular, small to medium-size fragments; Sand, 30%, clear to frosted- light gray, quartz, medium- to coarse-grained, angular to sub-angular; Shell, 30%, tan, to medium gray, small to medium-size tests, angular, slightly to very weathered.
440 - 480	40	LIMESTONE, SHELL, AND MARL- Limestone, 75%, very pale olive to light gray, slightly argillaceous and phosphatic respectively, medium-fine to fine-grained, very angular, moderately hard; Shell, 20%, tan to very pale orange, tests, medium size fragments, sub-angular to angular; Mar, 5%, pale olive arenaceous, non-plastic, soft.
480 - 700	220	CLAY - Clay, 100%, pale olive to very pale olive, plastic, soft.

Depth Interval (feet)	Thickness (feet)	Sample Description
700 - 720	20	SHELL AND LIMESTONE - Shell, 85%, tan to very pale orange, small to medium size fragments, poorly to uncemented; Limestone, 15%, very pale orange, micritic, poorly cemented.
720 - 780	60	CLAY - Clay, 100%, very pale olive, plastic, soft; Shell, trace, very pale orange, poorly cemented to uncemented, upper two-thirds of interval only.
780 - 790	10	SHELL, LIMESTONE AND CLAY - Shell, 80%, tan to very pale orange, poorly cemented; Limestone, 10%, very pale orange, micritic, poorly cemented; Clay, 10%, pale olive, plastic soft.
790 - 840	50	CLAY - Clay, 100%, pale to very pale olive, plastic, soft; Shelly Limestone, little to trace, tan to very pale orange, poorly to uncemented, found in upper extreme of interval.
840 - 880	40	CLAY - Clay, 95%, pale to very pale olive, plastic, soft; Dolomite, 5%, dusky brown to grayish green, very fine-grained, well-cemented, angular, sucrosic, hard.
880 - 900	20	CLAY - Clay, 95%, pale to very pale olive, plastic, soft; Dolomite, 5%, dusky brown to grayish green, very fine-grained, well-cemented, angular, sucrosic, hard.
900 - 920	20	LIMESTONE AND CLAY - Limestone, 50%, tan to very pale orange, micritic, sub-rounded, well-cemented; Clay, 50%, pale olive, plastic, soft; Shell, trace, very pale orange, small fragments, weathered.

Depth Interval (feet)	Thickness (feet)	Sample Description
920 - 930	10	LIMESTONE AND CLAY - Limestone, 90%, tan to light gray, micritic, small to medium large fragments, poorly sorted, sub-angular, well-cemented; Clay, 10%, pale olive, plastic, soft; Shell, trace, very pale orange, small fragments, weathered.
930 - 970	40	LIMESTONE AND SHELL - Limestone, 83%, tan to dark olive gray, micritic, medium size fragments, angular; Shell, 10%, small fragments, very weathered; Clay, 7%, pale olive, plastic, soft.
970 - 1010	40	LIMESTONE - Limestone, 93%, tan to medium gray (80%), phosphatic; pale orange (20%), micritic with calcite, some pelloidel texture (medium-grained), well-cemented; Shell, 7%, tan to very pale orange, slightly weathered.
1010 - 1150	140	LIMESTONE - Limestone, 95%, yellowish gray to grayish orange, micritic, hard to moderately hard; Shell, 5%, very pale orange, fragments.
1150 - 1180	30	LIMESTONE - Limestone, 100%, yellowish gray to grayish orange, very pale orange, sucrosic texture, hard to very hard; shell, trace, fragments.
1180 - 1200	20	MARL LIMESTONE - Marl, 75%, yellowish gray, fine-grained, very soft; Limestone, 25%, yellowish gray to grayish orange, fine-grained, soft.
1200 - 1300	100	LIMESTONE MARL - Limestone, 75%, yellowish gray to grayish orange, fine-grained, soft; Marl, 25%, yellowish gray, fine-grained, very soft.

Depth Interval (feet)	Thickness (feet)	Sample Description
1300 - 1650	350	LIMESTONE - Limestone 100%, moderate yellowish brown, fine-grained, micritic to medium-grained, soft; Chert, trace, hard.
1650 - 1700	50	CHERTY LIMESTONE - Chert, 50%, gray, medium-grained, hard; Limestone, 50%, moderate yellowish brown, fine- to medium-grained, some micritic, soft.
1700 - 1760	60	LIMESTONE - Limestone, 100%, moderate yellowish brown, fine-grained, micritic to medium-grained, soft; Chert, trace, gray, hard.
1760 - 1920	160	LIMESTONE - Limestone, 100%, moderate yellowish brown, fine-grained, micritic to medium-grained, soft; Chert, trace, gray, hard.
1920 - 1950	30	DOLOMITIC LIMESTONE - Dolomite, 80%, dark yellowish brown, fine-grained, very well-cemented, very hard; Limestone, 20%, very pale orange to light yellowish brown, fine-grained, sucrosic texture; Marl, trace.
1950 - 1970	20	DOLOMITIC LIMESTONE - Limestone, 90%, very pale orange to light yellowish brown, medium-grained, hard; Dolomite, 10%, dark yellowish brown, fine- to coarse-grained, very hard; Marl, trace.
1970 - 2100	130	DOLOMITE AND LIMESTONE - Dolomite, 95%, dark yellowish brown to olive black, medium- to coarse-grained, very hard; Limestone, 5%, very pale orange, fine-grained, micritic, soft.
2100 - 2210	110	DOLOMITE - Dolomite, 100%, very pale orange to dark yellowish brown, medium-grained, angular, moderately hard to very hard.

Depth Interval (feet)	Thickness (feet)	Sample Description
2210 - 2240	30	DOLOMITE AND LIMESTONE - Dolomite, 50%, dark yellowish brown, medium-grained, angular, hard; Limestone, 50%, very pale orange, fine-grained, micritic to medium-grained, moderately hard.
2240 - 2290	50	LIMESTONE - Limestone, 100%, very pale orange, fine-grained, micritic to medium-grained, moderately hard.
2290 - 2470	180	LIMESTONE - Limestone, 100%, very pale orange, fine- to medium-grained, fine fraction, micritic, soft; Dolomite, trace to very little, dark yellowish brown, fine-grained, angular, hard, within upper half of interval.
2470 - 2500	30	LIMESTONE - Limestone, 100%, mostly (95%) very pale orange, fine- to medium-grained, moderately soft to soft; little (5%) medium gray, very fine-grained, well-cemented, moderately soft.
2500 - 2550	50	LIMESTONE - Limestone, 95%, very pale orange and little medium gray, fine- to medium-grained, well-cemented, moderately soft to soft; Dolomite, 5%, dusky yellowish brown, fine-grained, angular, hard.
2550 - 2630	80	LIMESTONE - Limestone, 100%, very pale orange to medium gray, fine-grained, micritic, soft.
2630 - 2680	50	LIMESTONE AND DOLOMITE - Limestone, 80%, very pale orange to medium gray, micritic, soft; Dolomite, 20%, light olive brown to light olive gray, very fine-grained, moderately hard.

Depth Interval (feet)	Thickness (feet)	Sample Description
2680 - 2700	20	DOLOMITE - Dolomite, 100%, dark yellowish brown, very fine-grained, moderately hard to very hard.
2700 - 2770	70	LIMESTONE - Limestone, 100%, very pale orange to medium gray, medium to fine-grained, micritic (coarsing upward), moderately hard; Clayey Limestone, 13% of interval, interbedded clay layer, very pale orange, plastic soft.
2770 - 2800	30	LIMESTONE AND SANDSTONE - Limestone, 60%, very pale orange to medium gray, micritic, moderately hard; Sandstone, 40%, medium dark gray to dark gray, very fine-grained, moderately hard to hard.
2800 - 2840	40	LIMESTONE - Limestone, 100%, very pale orange, micritic, moderately hard to hard.
2840 - 2940	100	LIMESTONE AND SANDSTONE - Limestone, 70%, very pale orange, micritic, moderately hard to hard; Sandstone, 30%, gray to medium dark gray, very fine-grained, moderately hard to hard.
2940 - 3000	60	LIMESTONE - Limestone, 100%, very pale orange, fine- to medium-grained, soft.
3000 - 3020	20	DOLOMITE AND LIMESTONE - Dolomite, 60%, pale yellowish brown to olive black, fine- to coarse-grained, small to large fragments, poorly sorted, angular to sub-angular, hard; Limestone, 40%, very pale orange, fine- to medium-grained, moderately hard, angular.

Depth Interval (feet)	Thickness (feet)	Sample Description
3020 - 3050	30	DOLOMITE - Dolomite, 100%, pale yellowish brown to dusky yellowish brown, fine- to medium-grained, angular, hard; Limestone, trace, very pale orange, fine-grained, lower part of interval.
3050 - 3090	40	DOLOMITE - Dolomite, 100%, pale to moderate yellowish brown, some medium gray, fine- to medium-grained, small to medium large fragments, moderately-well cemented, brittle to hard, poorly sorted.
3090 - 3130	40	DOLOMITE - Dolomite, 100%, tan to moderate yellowish brown, fine- to medium-grained, small to very large fragments, angular, brittle to hard, poorly sorted.
3130 - 3350	220	DOLOMITE - Dolomite, 100%, tan to pale yellowish brown, fine- to medium-grained, medium to medium small fragments, angular, brittle to hard, moderately well sorted.
3350 - 3370	20	DOLOMITE - Dolomite, 100%, tan to pale yellowish brown, fine- to medium-grained, medium to medium small fragments, angular, brittle to hard, moderately-well sorted.
3370 - 3390	20	DOLOMITE - Dolomite, 100%, pale yellowish brown and medium gray, fine-grained, micritic to medium-grained, much sparry with calcite, angular, hard.
3390 - 3460	70	DOLOMITE - Dolomite, 100%, pale yellowish brown to olive black, fine-grained, micritic to medium-grained, angular hard.

Depth Interval (feet)	Thickness (feet)	Sample Description
3460 - 3490	30	DOLOMITE - Dolomite, 100%, pale yellowish brown, medium-grained, sucrosic, solution pitting, angular to sub-angular, moderately hard to brittle.
3490 - 3521	31+	DOLOMITE - Dolomite, 100%, pale yellowish brown, fine-grained, micritic, very angular, medium size fragments, hard.

TOTAL DEPTH: 3521

DEEP MONITOR WELL #1

GEOLOGIC LOG
OF
BROWARD COUNTY - NORTH DISTRICT REGIONAL WASTEWATER TREATMENT PLANT
DEEP MONITOR WELL 1
POMPANO BEACH, FLORIDA

Depth Interval (feet)	Thickness (feet)	Sample Description
0 - 20	20	SAND, FILL, AND SHELL - Sand, 40%, colorless to light gray, quartz, fine- to coarse-grained, sub-angular to rounded, poorly sorted; Fill, 40%, dark brown to olive black, wood fibers, also limestone fragments, tan to very pale orange; Shell, 20%, very pale orange, small fragments, angular.
20 - 30	10	SAND, FILL, AND SHELL - Sand, 75%, colorless to very light gray, quartz, medium- to coarse-grained, sub-angular to rounded; Fill, 20%, tan to pale orange, limestone, medium to large fragments; Shell, 5%, tan to pale orange, mostly fragments, angular, weathered; Organics, trace, wood and leaf fibers.
30 - 50	20	SANDSTONE AND SHELL - Sandstone, 60%, colorless to gray, quartz, fine- to coarse-grained, poorly to moderately well-cemented; Shell, 40%, tan to pale orange, small to large fragments, angular; Organics, trace, brown to black, wood fibers.
50 - 60	10	SANDSTONE, SHELL, AND LIMESTONE- Sandstone, 60%, colorless to light gray, quartz, fine- to coarse-grained, poorly to moderately well-cemented; Shell, 20%, tan to pale orange, medium size fragments, angular; Limestone, 20%, light gray, some black, phosphatic, moderately well-cemented.

Depth Interval (feet)	Thickness (feet)	Sample Description
60 - 100	40	LIMESTONE AND SAND - Limestone, 75%, light gray to gray, sucrosic texture, angular; Sand, 25%, colorless to light gray, quartz, angular to sub-angular; Shell, trace, very pale orange, small fragments.
100 - 130	30	LIMESTONE - Limestone, 85%, light to medium light gray, slightly phosphatic, biomicritic; Sand, 15%, colorless to very pale orange, medium- to coarse-grained, angular to sub-angular; Shell, trace, very pale orange.
130 - 360	230	LIMESTONE - Limestone, 100%, mostly light gray to gray, slightly phosphatic, some tan to very pale orange, all medium-grained, sucrosic texture, sub-angular, hard.
360 - 400	40	LIMESTONE, SAND, AND SHELL- Limestone, 90%, tan to pale olive, some light to medium light gray, medium- to coarse-grained, sucrosic texture, angular, hard; Sand, 5%, clear to frosted-light gray, quartz, medium-grained, angular; Shell, 5%, tan to very pale orange, slightly weathered.
400 - 430	30	CLAY AND LIMESTONE - Clay, 60%, very pale to pale olive, plastic, soft; Limestone, 40%, tan to pale olive, medium-grained, sucrosic texture, hard.
430 - 680	250	CLAY - Clay, 100%, very pale to pale olive, plastic, soft.

Depth Interval (feet)	Thickness (feet)	Sample Description
680 - 770	90	CLAY AND SILTY LIMESTONE - Clay, 95%, pale olive, plastic, soft; Limestone, 5%, tan to pale olive, argillaceous, fine- to medium-grained, sucrosic texture, angular, moderately soft.
770 - 930	160	CLAY - Clay, 100%, very pale olive to grayish yellow green, plastic, soft.
930 - 980	50	CLAY AND LIMESTONE - Clay, 90%, grayish yellow green, plastic, soft; Limestone, 10%, tan, micritic, angular.
980 - 1140	160	LIMESTONE - Limestone, 100%, tan to very pale orange, medium-grained, sucrosic texture, medium to large fragments, moderately well-cemented, angular.
1140 - 1280	140	LIMESTONE - Limestone, 100%, very pale orange to pale yellowish brown, medium-grained, sucrosic texture, small to medium size fragments, moderately well-cemented, angular.
1280 - 1380	100	LIMESTONE - Limestone, 100%, very pale orange to pale yellowish brown, fine- to medium-grained, medium size fragments, moderately well-cemented.
1380 - 1420	40	LIMESTONE AND CHERT - Limestone, 95%, pale orange to pale yellowish brown, very fine- to medium-grained, moderately well-cemented; Chert, 5%, medium gray, angular, interbedded (laminae to thin bells).
1420 - 1450	30	LIMESTONE - Limestone, 100%, pale yellowish brown to very pale orange, medium-grained, moderately well-cemented.

Depth Interval (feet)	Thickness (feet)	Sample Description
1450 - 1480	30	CHERT - Chert, 100%, medium gray, fine-grained, very angular.
1480 - 1510	30	LIMESTONE - Limestone, 100%, pale yellowish brown to gray, medium- to fine-grained, micritic; Chert, trace, medium gray, very angular.
1510 - 1550	40	CHERT - Chert, 100%, medium gray, fine-grained, very angular.
1550 - 1880	330	CHERTY LIMESTONE - Limestone, 95%, pale yellowish brown to very pale orange, micritic to medium-grained; chert, 5%, medium gray, medium- to fine-grained, very angular, interbedded in limestone (thick to thin beds) with variable composition within interval.
1880 - 1910	30	DOLOMITIC LIMESTONE - Limestone, 80%, very pale orange to grayish orange, medium- to fine-grained, micritic, soft to moderately soft; Dolomite, 20%, dark yellowish brown to dark gray, fine- to medium-grained, sub-rounded to angular.
1910 - 1930	20	CHERTY LIMESTONE - Chert, 50%, gray, medium-grained, hard; Limestone, 50%, very pale orange, medium- to fine-grained, micritic, moderately soft.
1930 - 1960	30	LIMESTONE - Limestone, 100%, very pale orange,medium- to fine-grained, micritic, soft; Dolomite, trace.
1960 - 1970	10	DOLOMITE - Dolomite, 100%, tan and moderate brown, sucrosic and micritic, respectively, medium and fine-grained, respectively, vesicular and platey, respectively, medium to medium large fragments, brittle to hard.

Depth Interval (feet)	Thickness (feet)	Sample Description
1970 - 1990	20	DOLOMITE AND LIMESTONE - Dolomite, 95%, pale yellowish brown and medium dark gray, fine-grained, micritic, angular, hard; Limestone, 5%, very pale orange, micritic, soft.
1990 - 2080	90+	DOLOMITE - Dolomite, 100%, pale to moderate yellowish brown, fine- to medium-grained, angular, hard; Limestone, trace, very pale orange, micritic, soft.

TOTAL DEPTH: 2080

APPENDIX B

Core Analyses

Core Descriptions

Core Photographs

CORE ANALYSES

Ardaman & Associates, Inc.

Consultants in Soils, Hydrogeology,
Foundations and Materials Testing

File Number 90-029
March 26, 1990

Youngquist Brothers, Inc.
15000 Pine Ridge Road
Ft. Myers, Florida 33908

Attn: Mr. Don Douglas

Subject: Geotechnical Laboratory Test Results

Gentlemen:

As requested, the five core samples you provided us were tested to determine the horizontal and vertical hydraulic conductivity, porosity, specific gravity and unconfined compressive strength.

The specific gravity of the specimens was determined in accordance with ASTM D 854. To obtain the specific gravity of the solids, a representative portion of the rock core was crushed such that the entire portion passed a # 20 U S Standard sieve. The results of the specific gravity determinations were as follows:

Sample	Depth (feet)	Specific (Gravity)
1	2303	2.78
2	2405	2.78
3	2503	2.79
4	2616	2.77
5	2730	2.74

The permeability test specimens from the rock cores were subcored and trimmed to a length between 7.5 and 9.4 cm and a diameter of 3.3 cm. Each specimen was placed within a flexible latex membrane, and mounted in a triaxial-type permeameter. The specimens were consolidated under an isotropic effective consolidation stress of 5 to 10 lbs/in^2 and permeated with deaired water under a backpressure of at least 92 lb/in^2. The specimens were permeated using an net hydraulic head ranging between 50 and 200 cm of water. The inflow to and outflow from the specimen were monitored with time, and the coefficient of permeability calculated for each recorded flow increment. The test was continued until steady-state flow was achieved, as evidenced by values of inflow and outflow within ±10% of the mean of the inflow and outflow for each increment, and stable values of the coefficient of permeability were measured. The porosity was calculated from the dry density and the specific

gravity. The results were as follows:

Core Number	Depth (ft)	Initial/Final Moisture Content (%)	Final Dry Density (pcf)	Coefficient of Permeability (cm/sec)	Porosity
1H	2303	13.9/19.6	109.2	7.2×10^{-4}	0.37
1V	2303	10.9/13.2	118.4	1.5×10^{-4}	0.32
2H	2405	12.3/14.8	113.9	4.6×10^{-4}	0.34
2V	2405	13.0/16.9	109.8	6.3×10^{-5}	0.37
3H	2503	11.5/13.6	118.7	5.1×10^{-5}	0.32
3V	2503	7.7/10.8	120.8	8.4×10^{-5}	0.31
4H	2616	11.4/13.3	119.8	1.7×10^{-5}	0.31
4V	2616	9.8/13.1	118.6	1.7×10^{-4}	0.31
5H	2730	17.2/20.2	105.3	2.5×10^{-4}	0.38
5V	2730	13.5/16.9	110.8	3.2×10^{-4}	0.35

where: H=horizontal, V=vertical

The specimens for the unconfined compression tests were obtained in the same manner as the permeability specimens. The cores were tested in accordance with ASTM D 2938, Unconfined Compressive Strength of Intact Rock Core Specimens, except that the strain rate was such that failure generally occurred in less than five minutes. The deformation during loading was recorded and the stress was corrected for area change. The stress-strain curves are presented in Figures 1 through 5, and the test data are tabulated in Appendix A. The porosity was calculated from the dry density and the specific gravity. Test results are summarized below:

Core Number	Depth (ft)	Moisture Content (%)	Dry Density (pcf)	Unconfined Compressive Strength (kg/cm^2)	Porosity
1	2303	9.2	119.3	63	0.31
2	2405	13.8	107.9	34	0.38
3	2503	9.3	117.7	48	0.33
4	2616	10.8	115.9	68	0.33
5	2730	13.4	105.8	56	0.38

If you have any questions or if you require additional testing, please contact us.

Very Truly Yours,
ARDAMAN & ASSOCIATES, INC.

Jan C. Wildman
Manager of Technical Services

Nadim F. Fulcihan
Principal
Florida Registration No. 31953

CORE DESCRIPTIONS

GERAGHTY & MILLER, INC.
Ground-Water Consultants

SAMPLE/CORE LOG #1

Boring/Well IW-1 Project/No. FF07803 Page 1 of 1

Site Location BCWWTP - Pompano Beach, FL Drilling Started _____ Drilling Completed _____

Total Depth Drilled 13 feet Hole Diameter 12 1/4 inches Type of Sample/Coring Device Christianson Core Barrel

Length and Diameter of Coring Device 20 feet long, 4-inch I.D. Sampling Interval 2300-2313 feet

Land-Surface Elev. _____ feet ☐ Surveyed ☐ Estimated Datum _____

Drilling Fluid Used Water Drilling Method Rotary

Drilling Contractor Youngquist Bros, Co. Driller _____ Helper _____

Prepared By Ken Roberts - J.M. Montgomery Hammer Weight _____ Hammer Drop _____ inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
2300	2313	6	46%	LIMESTONE - Limestone, 100%, very pale orange, fine to medium grained-pelloidal, soft to moderately hard.

G&M Form 03 6-86 Southpoint 87-1718

GERAGHTY & MILLER, INC.
Ground-Water Consultants

SAMPLE/CORE LOG #2

Boring/Well IW-1 Project/No. PF01803 Page 1 of 1

Site Location BCWWTP - Pompano Beach, FL Drilling Started ____ Drilling Completed ____

Total Depth Drilled 17 feet Hole Diameter 12¼ inches Type of Sample/ Coring Device Christianson Core Barrel

Length and Diameter of Coring Device 20 feet long, 4-inch I.D. Sampling Interval 2400-2417 feet

Land-Surface Elev. ____ feet ☐ Surveyed ☐ Estimated Datum ____

Drilling Fluid Used water Drilling Method Rotary

Drilling Contractor Youngquist Bros, Co. Driller ____ Helper ____

Prepared By Ken Roberts, J. M. Montgomery Hammer Weight ____ Hammer Drop ____ inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
2400	2417	17	100%	Limestone — Limestone, 100%, very pale orange, fine to medium grained, pelloidal, soft to moderately hard

G&M Form 03 6-86 Southpoint 87-1718

GERAGHTY & MILLER, INC.
Ground-Water Consultants

SAMPLE/CORE LOG #3.

Boring/Well: IW-1 Project/No. PF07803 Page 1 of 1

Site Location: BCWWTP - Pompano Beach, FL. Drilling Started: _____ Drilling Completed: _____

Total Depth Drilled: 16 feet Hole Diameter: 12¼ inches Type of Sample/ Coring Device: Christenson Core Barrel

Length and Diameter of Coring Device: 20 feet long, 4-inch I.D. Sampling Interval: 2500-2516 feet

Land-Surface Elev.: _____ feet ☐ Surveyed ☐ Estimated Datum: _____

Drilling Fluid Used: water Drilling Method: Rotary

Drilling Contractor: Youngquist Bros, Co. Driller: _____ Helper: _____

Prepared By: M. Waldron - Geraghty & Miller, Inc. Hammer Weight: _____ Hammer Drop: _____ inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
2500	2516	7'	43.8%	LIMESTONE - Limestone, 100%, very pale orange, fine to medium grained-pelloidal, soft. (30 segments, some as fragments)

GERAGHTY & MILLER, INC.
Ground-Water Consultants

SAMPLE/CORE LOG

Boring/Well IW-1 Project/No. PF07803 Page 1 of 1

Site Location BCWWTP - Pompano Beach, FL. Drilling Started _____ Drilling Completed _____

Total Depth Drilled 20 feet Hole Diameter 12 1/4 inches Type of Sample/Coring Device Christianson Core Barrel

Length and Diameter of Coring Device 20 feet long, 4-inch I.D. Sampling Interval 2600 - 2620 feet

Land-Surface Elev. _____ feet ☐ Surveyed ☐ Estimated Datum _____

Drilling Fluid Used Water Drilling Method Rotary

Drilling Contractor Youngquist Bros, Co. Driller _____ Helper _____

Prepared By M. Waldron - Geraghty and Miller, Inc Hammer Weight _____ Hammer Drop _____ inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
2600	2620	8.5	42.5%	LIMESTONE - Limestone, 100%, very pale orange, fine to medium grained-pelbidal, soft.

GERAGHTY & MILLER, INC.
Ground-Water Consultants

SAMPLE/CORE LOG*s

Boring/Well IW-1 Project/No. PF07803 Page 1 of 1

Site Location BCWWTP - Pompano Beach, FL. Drilling Started _____ Drilling Completed _____

Total Depth Drilled 7 feet Hole Diameter _____ inches Type of Sample/ Coring Device Christianson Core Barrel

Length and Diameter of Coring Device 20 feet long, 4-inch I.D. Sampling Interval 2729 - 2736 feet

Land-Surface Elev. _____ feet ☐ Surveyed ☐ Estimated Datum _____

Drilling Fluid Used Water Drilling Method Rotary

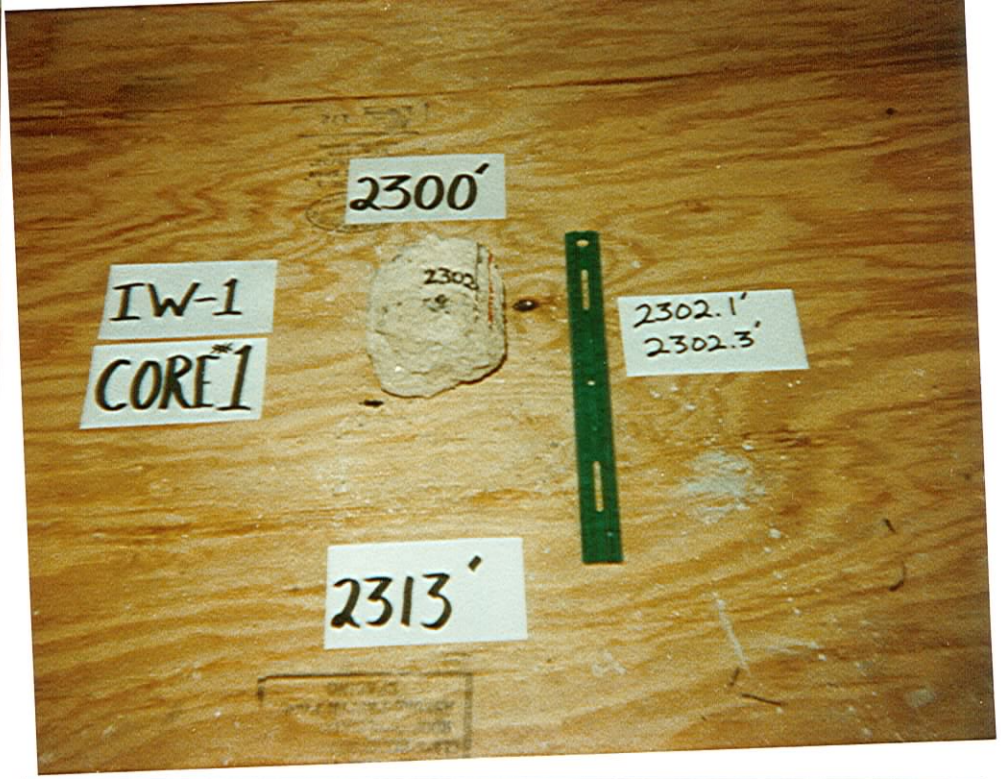
Drilling Contractor Youngquist Bros, Co. Driller _____ Helper _____

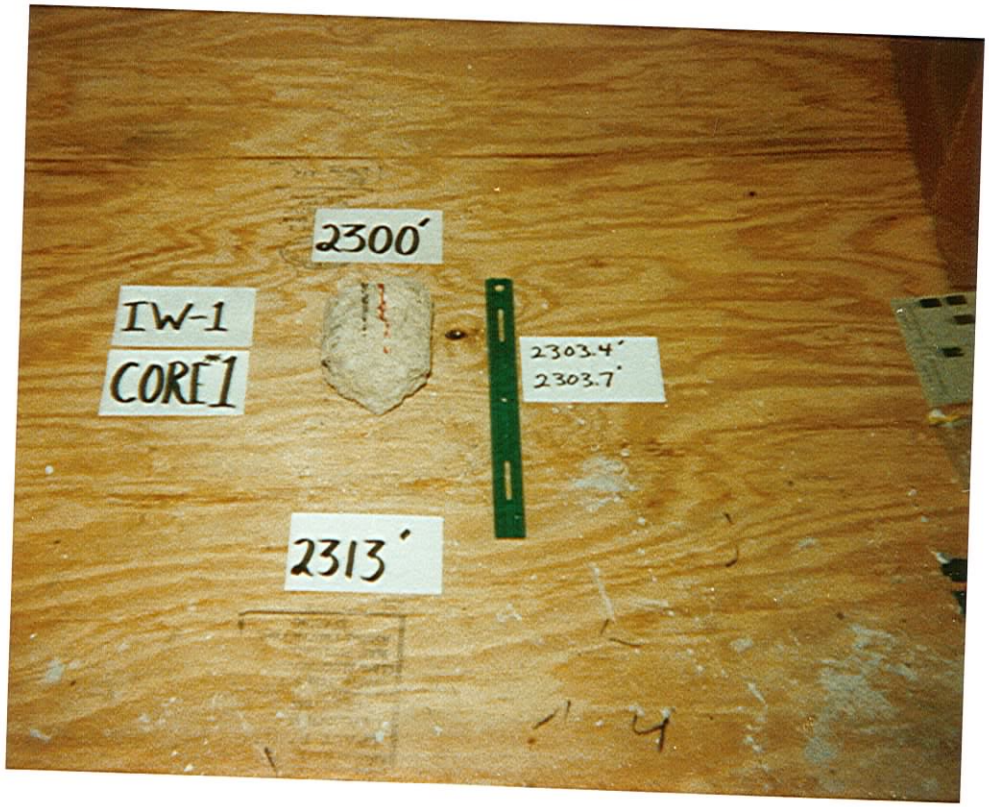
Prepared By M. Walton - Geraghty & Miller, Inc. Hammer Weight _____ Hammer Drop _____ inches

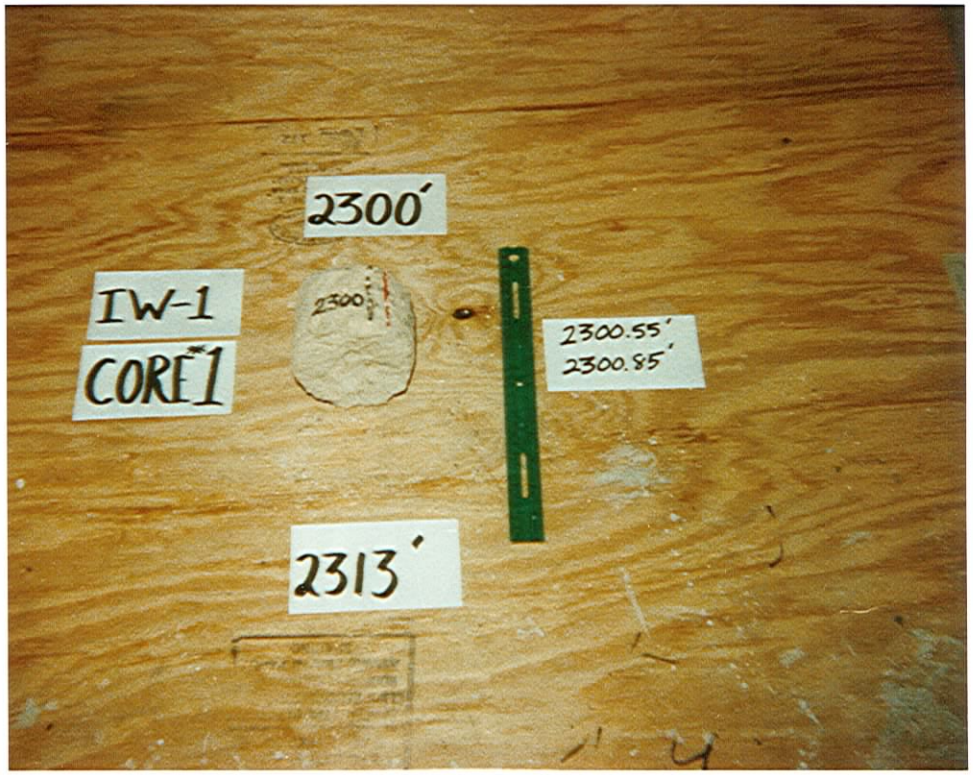
Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
2729	2736	4	57.1%	LIMESTONE - Limestone, 100%, very pale orange, fine to medium grained-pelloidal, soft.

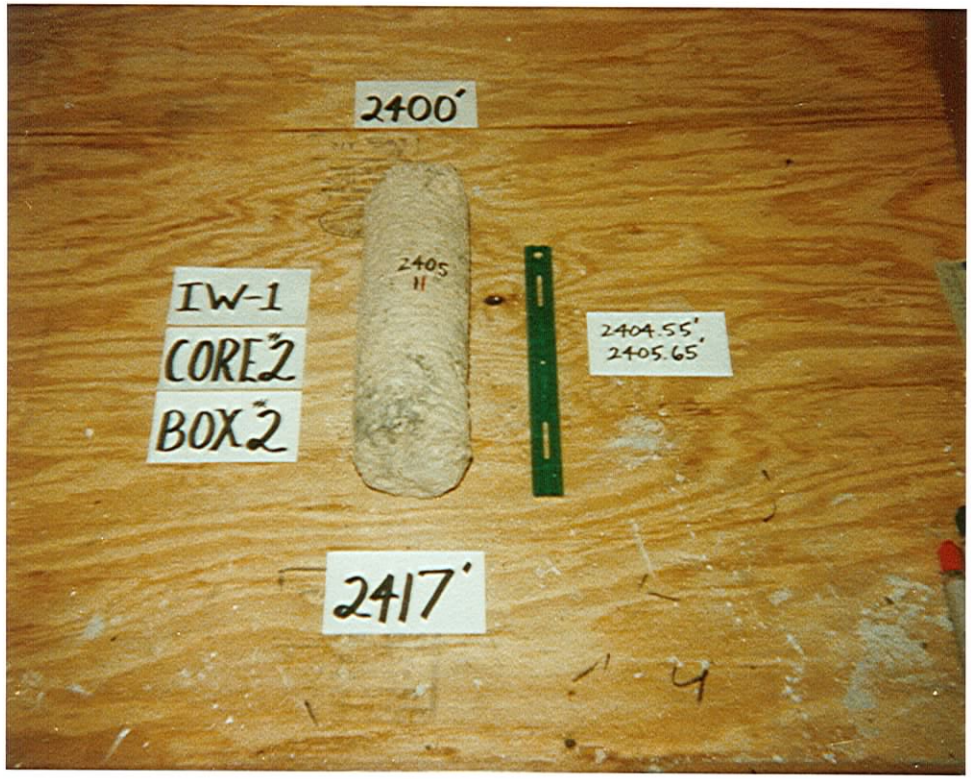
CORE PHOTOGRAPHS


2313'
IW-1
CORE 1


2300'
IW-1
CORE 1
2302.1'
2302.3'
2313'


2300'
IW-1
CORE 1
2303.4'
2303.7'
2313'


2300'
IW-1
CORE 1
2300.55'
2300.85'
2313'


2400'
IW-1
CORE 2
BOX 2
2405
2404.55'
2405.65'
2417'


2400'
IW-1
CORE 2
BOX 1
2411
2411.45'
2411.90'
2417'

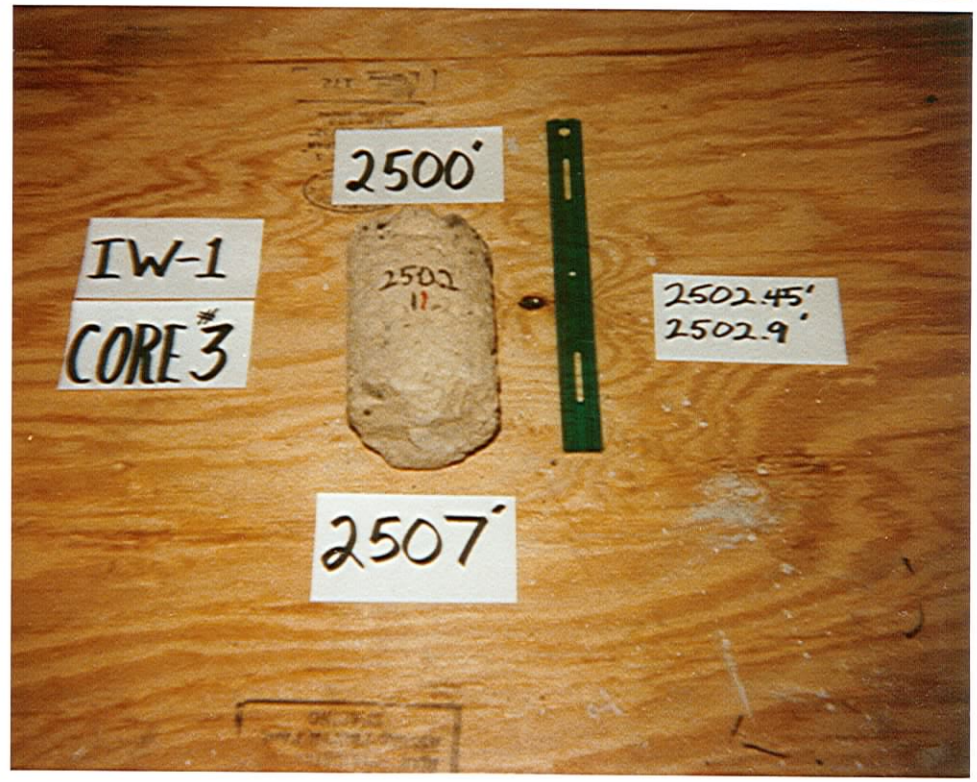

2402'
2403'
2402'
IW-1
CORE 2
BOX 2
2400'


2400'
IW-1
CORE 2
BOX 1
2408
2408.2'
2408.75'
2417'


IW-1
CORE 3
2500'
2502'

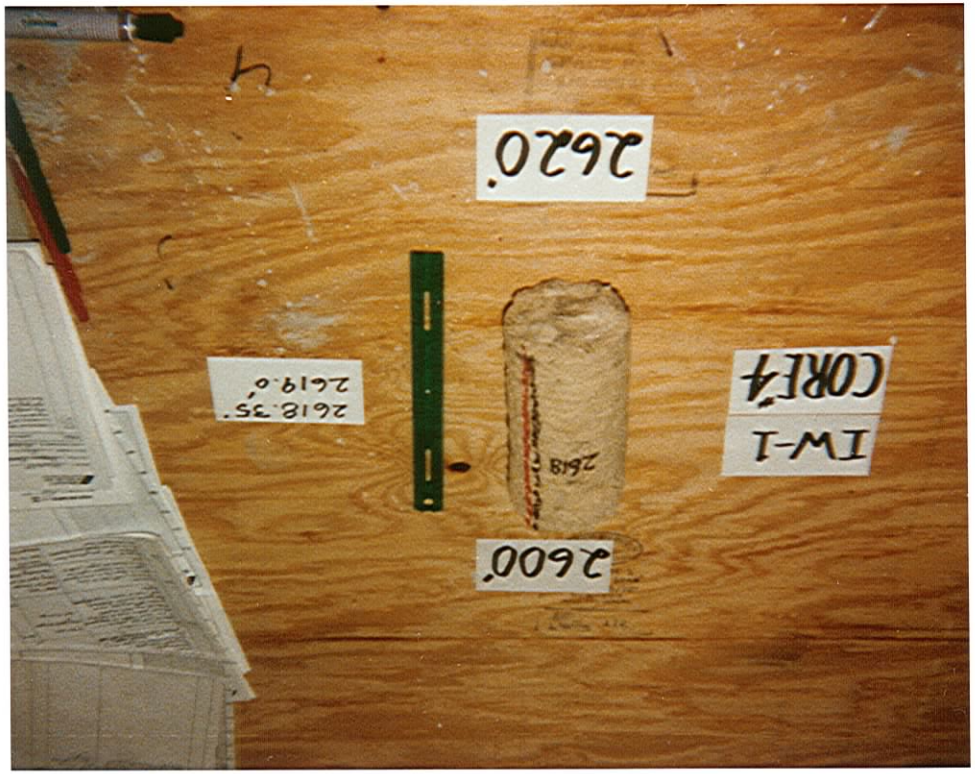

2500'
IW-1
CORE 3
2503
II
2503.35
2504.05
2507'


2500'
IW-1
CORE 3
2505
II
2505.05'
2505.55
2507'

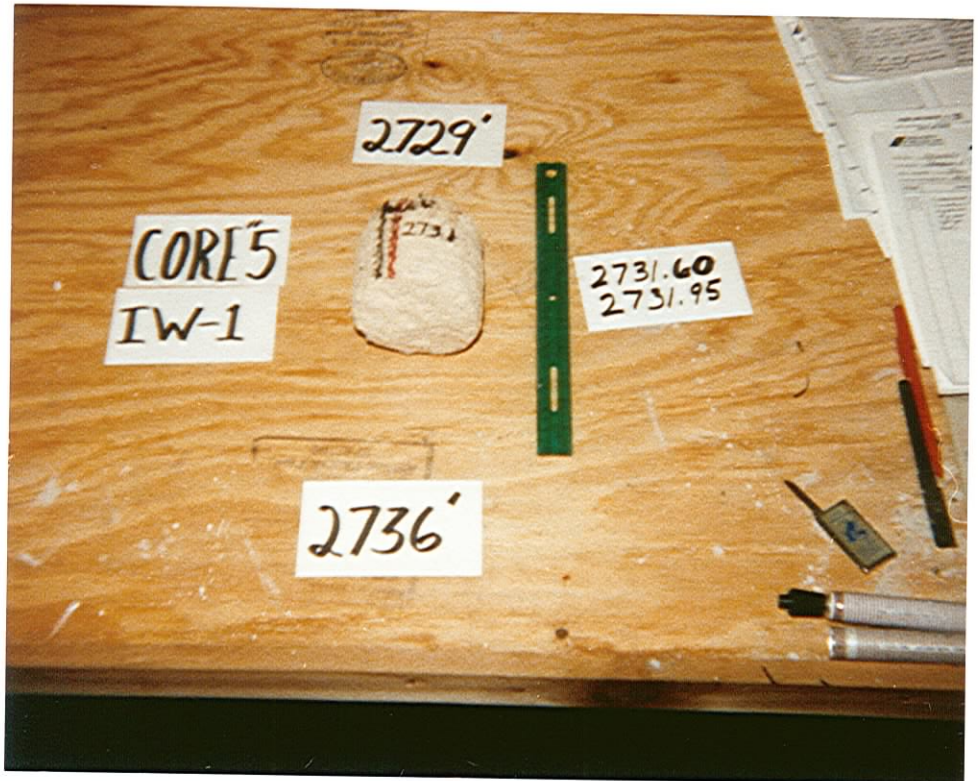

2500'
IW-1
CORE 3
2502
II
2502.45'
2502.9'
2507'


2600'
IW-1
CORE 4
2616
2616.3'
2617.2'
2620'

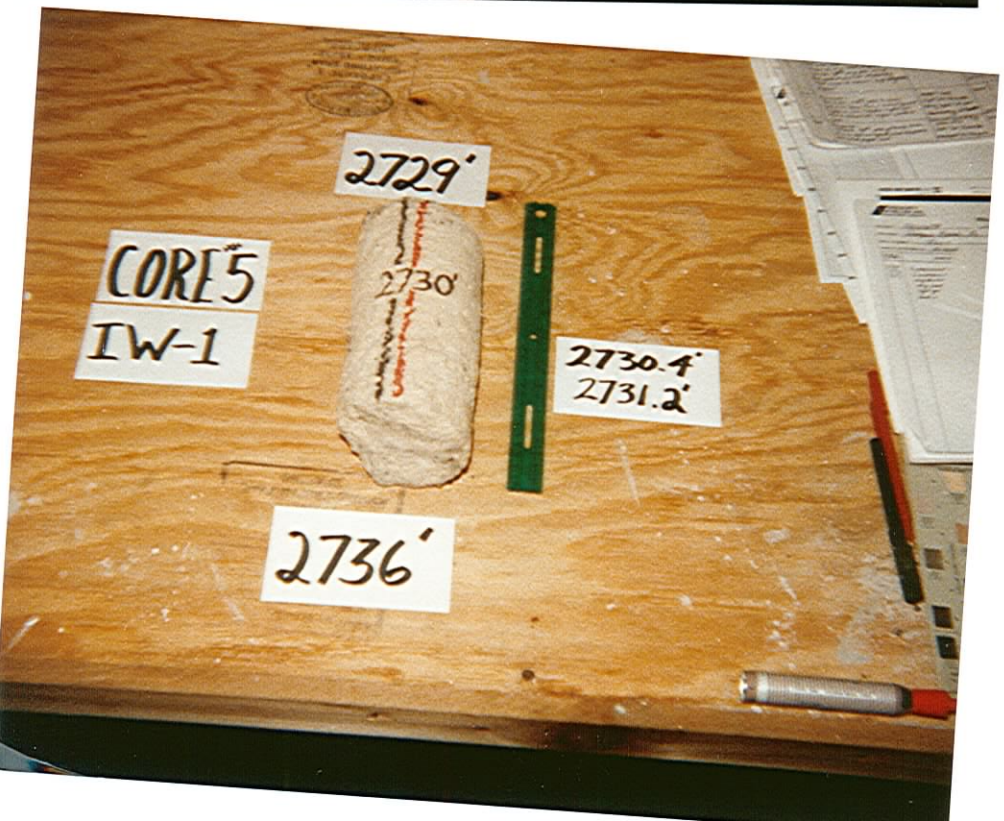

2600'
IW-1
CORE 4
2619
2619.45'
2620.0'
2620'


2620'
IW-1
CORE 4
2618.35'
2619.0'
2618
2600'

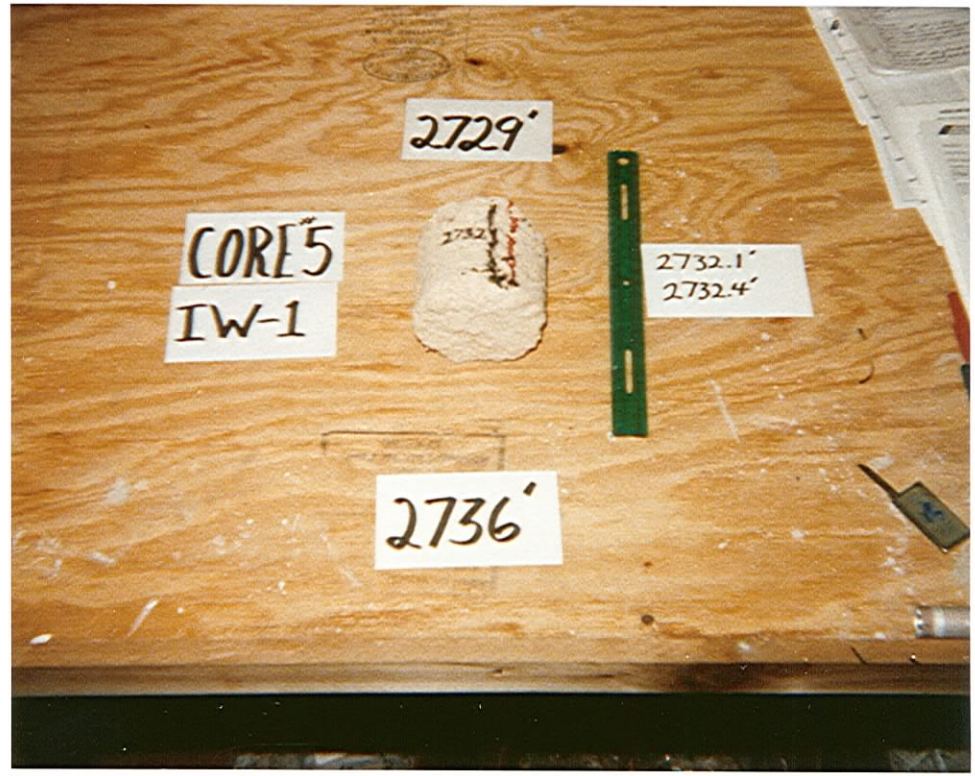

CORE 4
IW-1
2620'
2600'


2729'
CORE 5
IW-1
2731
2731.60
2731.95
2736'


IW-1
CORES 1-5
2730'


2729'
CORE 5
IW-1
2730'
2730.4'
2731.2'
2736'


IW-1
CORE 2
BOX 1
2407'
2412'


2729'
CORE 5
IW-1
2732.1'
2732.4'
2736'


CORE 5
2729'

APPENDIX C

Geophysical Logs

INJECTION WELL #1

APPENDIX C

GEOPHYSICAL LOGS

BROWARD COUNTY NORTH DISTRICT REGIONAL
WASTEWATER TREATMENT PLANT
INJECTION WELL #1

Date	Log	Casing/Hole Diameter and Stage No.	Interval
12/10/89	X-Y Caliper	Nominal 58-inch hole	16 - 164 feet pad level
	Temperature	50-inch Casing, St. 1	0 - 160 feet pad level
12/21/89	X-Y Caliper	Nominal 50-inch hole	160 -1007 feet pad level
01/01/90	Flowmeter Survey	Nominal 12 1/4-inch hole	999 -2003 feet pad level
	X-Y Caliper	Nominal 12 1/4-inch hole	999 -2003 feet pad level
	HR Temperature	Nominal 12 1/4-inch hole	999 -1999 feet pad level
	Fracture Identification	Nominal 12 1/4-inch hole	999 -2006 feet pad level
	Dual Induction/SFL	Nominal 12 1/4-inch hole	999 -2000 feet pad level
	Borehole Compensated-Sonic w/VDL	Nominal 12 1/4-inch hole	999 -2000 feet pad level
01/14/90	X-Y Caliper	Nominal 42-inch hole	999 -1968 feet pad level
01/16/90	Temperature	34-inch Casing, St. 1	150 -1500 feet pad level
01/17/90	Temperature	34-inch Casing, St. 2 & 3	
01/18/90	Temperature	24-inch Casing, St. 4 & 5	
02/02/90	Flowmeter Survey	Nominal 12 1/4-inch hole	1950 -3010 feet pad level
	Dual Induction/SFL		1950 -3004 feet pad level
	HR Temperature		1950 -3010 feet pad level
	Borehole Compensated-Sonic w/VDL		1950 -3001 feet pad level
02/03/90	X-Y Caliper		1950 -3006 feet pad level
	Fracture Identification		1950 -3006 feet pad level
02/04/90	Fluid Resistivity	Nominal 12 1/4-inch hole	1950 -3001 feet pad level
02/28/90	X-Y Caliper	Nominal 34-inch hole	1950 -3006 feet pad level
03/03/90	Temperature	24-inch Casing, St. 1 & 2	244 -2750 feet pad level
03/04/90	Temperature	24-inch Casing, St. 3 & 4	
03/05/90	Temperature	24-inch Casing, St. 5 & 6	
03/06/90	Temperature	24-inch Casing, St. 7 & 8	

Injection Well #1 -2-

Date	Log	Casing/Hole Diameter and Stage No.	Interval
03/07/90	Temperature	24-inch Casing, St. 9 & 10	
03/08/90	Temperature	24-inch Casing, St. 11	
03/08/90	Cement Bond/ Variable Density	24-inch Casing	0 -2946 feet pad level
03/28/90	Dual Induction/SFL	Nominal 24-inch Hole	2987 -3501 feet pad level
	Borehole Compensated-Sonic w/VDL		2987 -3501 feet pad level
	Fluid Resistivity		2987 -3505 feet pad level
	X-Y Caliper		2987 -3505 feet pad level
	Flowmeter Survey		2987 -3498 feet pad level
	HR Temperature		2987 -3498 feet pad level
05/18/90	HR Temperature	24-inch Casing	3507 - 0 feet pad level
	Radioactive Tracer Survey	24-inch Casing	3507 - 0 feet pad level

INJECTION WELL #2

APPENDIX C

GEOPHYSICAL LOGS

BROWARD COUNTY NORTH DISTRICT REGIONAL
WASTEWATER TREATMENT PLANT
INJECTION WELL #2

Date	Log	Casing/Hole Diameter and Stage No.	Interval
11/15/89	X-Y Caliper	Nominal 58-inch hole	0 - 172 feet pad level
11/16/89	Temperature	50-inch Casing, St. 1	0 - 153 feet pad level
11/26/89	X-Y Caliper	Nominal 50-inch hole	160 -1004 feet pad level
11/28/89	Temperature	42-inch Casing, St. 1 & 2	0 - 998 feet pad level
11/29/89	Temperature	St. 3	
12/02/89	Borehole Compensated-Sonic Log	12 1/4-inch pilot hole	990 -2059 feet pad level
	X-Y Caliper	12 1/4-inch pilot hole	950 -2020 feet pad level
	Dual Induction w/SFL	12 1/4-inch pilot hole	998 -2102 feet pad level
12/03/89	Field Resistivity		980 -2010 feet pad level
	Temperature/Flow Fluid Meter Survey	12 1/4-inch pilot hole	980 -2010 feet pad level
12/15/89	X-Y Caliper	Nominal 40-inch hole	998 -1953 feet pad level
12/17/89	Temperature	34-inch Casing, St. 1	0 -1941 feet pad level
12/18/89	Temperature	34-inch Casing, St. 2 & 3	
12/19/89	Temperature	34-inch Casing, St. 4 & 5	
12/20/89	Temperature	34-inch Casing, St. 6 & 7	
01/01/90	Fracture Identification	12 1/4-inch pilot hole	2080 -2995 feet pad level
	HR Temperature	12 1/4-inch pilot hole	2080 -3001 feet pad level
	Fluid Resistivity	12 1/4-inch pilot hole	2080 -2995 feet pad level
	Flow Meter Survey	12 1/4-inch pilot hole	2080 -3001 feet pad level
	Borehole Compensated w/VDL	12 1/4-inch pilot hole	2080 -3001 feet pad level
	X-Y Caliper	12 1/4-inch pilot hole	1950 -2993 feet pad level
	Dual Induction w/SFL	12 1/4-inch pilot hole	2080 -2995 feet pad level
01/19/90	X-Y Caliper	Nominal 34-inch hole	1950 -2994 feet pad level
01/22/90	Temperature	24-inch Casing, St. 1	2130 -2990 feet pad level

Injection Well #2

Date	Log	Casing/Hole Diameter and Stage No.	Interval
01/23/90	Temperature	24-inch Casing, St. 2	230 -2990 feet pad level
	Temperature	24-inch Casing, St. 3	
01/24/90	Temperature	24-inch Casing, St. 4	
	Temperature	24-inch Casing. St. 5	
01/25/90	Temperature	24-inch Casing, St. 6	
	Temperature	24-inch Casing, St. 7	
01/26/90	Temperature	24-inch Casing, St. 8	
01/27/90	Temperature	24-inch Casing, St. 9	
	Temperature	24-inch Casing, St. 10	
01/28/90	Cement Bond	24-inch Casing	0 -2990 feet pad level
02/16/90	Dual Induction/SFL	24-inch Casing	2989 -3512 feet pad level
	Borehole Compensated Sonic w/VDL	Nominal 24-inch hole	2989 -3510 feet pad level
	X-Y Caliper	Nominal 24-inch hole	2989 -3517 feet pad level
02/17/90	Fluid Resistivity	Nominal 24-inch hole	2989 -3516 feet pad level
	HR Temperature	Nominal 24-inch hole	2989 -3516 feet pad level
	Flowmeter Survey	Nominal 24-inch hole	2989 -3516 feet pad level
03/12/90	HR Temperature	Nominal 24-inch hole	0 -3514 feet pad level
	Radioactive Tracer Survey	Nominal 24-inch hole	0 -3514 feet pad level

DEEP MONITOR WELL #1

APPENDIX C

GEOPHYSICAL LOGS

BROWARD COUNTY NORTH DISTRICT REGIONAL
WASTEWATER TREATMENT PLANT
MONITOR WELL #1

Date	Log	Casing/Hole Diameter and Stage No.	Interval
12/06/89	X-Y Caliper	Nominal 30-inch hole	0 - 166 feet pad level
12/07/89	HR Temperature	24-inch Casing	0 - 165 feet pad level
12/12/89	X-Y Caliper	Nominal 24-inch hole	29.5 -1012.5 feet pad level
12/13/89	Temperature	16-inch Casing, St. 1	0 - 985 feet pad level
12/14/89	Temperature	16-inch Casing, St. 2	
02/13/90	X-Y Caliper	Nominal 16-inch hole	1002 -2008 feet pad level
02/18/90	Cement Bond/ Variable Density	6 5/8-inch Casing	800 -1991 feet pad level

APPENDIX D

Hydrostatic Pressure Test Data

HYDROSTATIC PRESSURE TEST DATA
OF
BROWARD COUNTY - NORTH DISTRICT REGIONAL
WASTEWATER TREATMENT PLANT
INJECTION WELL 1
POMPANO BEACH, FLORIDA

Hydrostatic Pressure Test on 24-inch Injection Casing

Date: 1/30/90

Project: J. M. Montgomery, BCWWTP

Project #: PF07803

Time	Delta Time (min)	Pressure (PSI)
1120	0	150.0
1125	5	149.0
1130	10	149.0
1135	15	149.0
1140	20	149.0
1145	25	148.0
1150	30	148.0
1155	35	148.0
1200	40	148.0
1205	45	148.0
1210	50	148.0
1215	55	148.0
1220	60	148.0

Pressure test completed with a total decrease 2.0 P.S.I., equal to 1.3% pressure drop.

Witnessed by:	Michael J. Waldron	Geraghty & Miller, Inc.
	Margaret Highsmith	Florida Dept. of Environmental Reg.
	Kevin Grueul	Youngquist Brothers, Co.

HYDROSTATIC PRESSURE TEST DATA
OF
BROWARD COUNTY - NORTH DISTRICT REGIONAL
WASTEWATER TREATMENT PLANT
INJECTION WELL 2
POMPANO BEACH, FLORIDA

Hydrostatic Pressure Test on 24-inch Injection Casing

Date: 1/30/90

Project: J. M. Montgomery, BCWWTP

Project #: PF07803

Time	Delta Time (min)	Pressure (PSI)
1105	0	150.0
1110	5	149.5
1115	10	149.0
1120	15	148.5
1125	20	148.0
1130	25	147.5
1135	30	147.0
1140	35	146.5
1145	40	145.5
1150	45	145.5
1155	50	145.0
1200	55	144.0
1205	60	143.5

Witnessed by: Steve Montemayor Hazen & Sawyer Engineers

APPENDIX E

Water Quality Laboratory Results

INJECTION WELL #1

UUNE

86

8327

ORDER ENTRY INFORMATION

te of order 1/3/90 Date required _____ Entered by: AH

IW1 Sample code from 8327 to _____

:omer name and address Youngquist Brothers

lling address QU File

_____ Contact _____ Phone _____

SAMPLE INFORMATION

urce 1690' - 1710' Sampled by Client

mple date 1-3-90 Sample time 7 ~~am~~ pm

mpletion date 1-4 Reviewed by GM

ecial instructions RUSH CHARGE

FAX 407 622 6379 Attention Jim Wheat

	PARAMETER	METHOD	RESULT	UNIT	DATE	ANALYST
10	TDS 3320	160.1	14,602	mg/l	1-4	ugb
0	Conductivity 3471	120.1	29,600	~~umhos~~/cm	1-5	GM
0	Chlorides 3090	407A	7650	mg/l	1-3	EGB
5	Sulfate 3430	426C	~~375~~ 750	mg/l	1-3	GM
	Note TDS as NaCl		12,000 mg/l	(1191)		
	conductivity 1.184 mS/cm @		1:25 dilution			

DONE

86

0031

ORDER ENTRY INFORMATION

Date of order 1/4/90 Date required _____ Entered by: ALI

Sample code from 0031 to _____

Customer name and address Youngquist Brothers

Billing address

ON FILE

PO # _____ Contact _____ Phone _____

SAMPLE INFORMATION

Source IW-2 1500'-1520' Sampled by CLIENT

Sample date 1-4-90 Sample time 12 am (pm)

Completion date 1-4 Reviewed by _____

Special instructions RUSH CHARGE

Jim Wheatley (407) 622 6379

DE	PARAMETER	METHOD	RESULT	UNIT	DATE	ANALYST
7300	3420 TDS	160.1	5,550	mg/L	1-4	cgl
95	3471 Conductivity	120.1	10,110	µmhos/cm	1-4	cgl
940	3080 Chlorides	407A	4226	mg/L	1-4	cgl
945	5781 Sulfate	426C	6116	"	"	GM
	SO_4 = 635,672 over range of std					
	SO_4 #2 600,633 w/ std range $\bar{x}$ = 6116					
	$270					

DONE

06

0042

ORDER ENTRY INFORMATION

Date of order 1/5/90 Date required _____ Entered by: AH

Sample code from 0042 to _____

Customer name and address Youngquist Brothers

Billing address ON FILE

PO # _____ Contact _____ Phone _____

SAMPLE INFORMATION

Source IW-1 Packer 1640-1660' Sampled by Client

Sample date 1/5/90 Sample time 0805 am pm

Completion date 1-8 Reviewed by GM

Special instructions RUSH CHARGE

ODE	PARAMETER	METHOD	RESULT	UNIT	DATE	ANALYST
70300	TDS ✓	160.1	10,805	mg/l	1-5	eglr
295	Conductivity ✓	120.1	17,590	um/hos/cm	1-5	eglr
20940	Chlorides ✓	407A	6,550	mg/l	1-6	eglr
20945	Sulfate ✓	426C	1,110	"	"	GM
	TDS as NaCl 8,800					

BROWARD TESTING LABORATORY, INC.
POTABLE WATER LABORATORY CERTIFICATION NUMBER 86137
ENVIRONMENTAL LABORATORY CERTIFICATION NUMBER 86035

LABORATORY PARAMETER ANALYSIS REPORT

PROJECT YOUNGQUIST BROS.

SOURCE I W1 NORTH REGIONAL
LAB. NUMBER 90-1320
GROUND WATER CLASS
SAMPLED BY CLIENT
NO. WELL CASING VOL. PURGED

SAMPLE DATE 3/28/90
SAMPLE TIME 10:30
COMPLETION DATE 4/20/90
SAMPLE TYPE ( ) BACKGROUND
( ) SITE BOUNDRY
( ) INTERMEDIATE
( ) COMPLIANCE

STORET CODE	PARAMETER MONITORED	ANALYSIS METHOD	ANALYSIS RESULT	UNIT	DATE	ANALYST
80110	SPECIFIC GRAVITY	213E	10227	G/KG	4/2	E. BEROLDI
00010	WATER TEMPERATURE	170.1	20	°C	4/2	E. BEROLDI
00403	PH	150.1	7.76	UNITS	3/29	M. HILL
00076	TURBIDITY	180.1	170	NTU	4/?	E. BEROLDI
00080	COLOR	110.3	0	UNITS	3/29	M. HILL
00945	SULFATE	426C	759	MG/L	4/4	E. GOLEM
01046	IRON	236.1	9.20	MG/L	4/18	K. VAGI
70300	TOTAL DISSOLVED SOLIDS	160.1	34,948	MG/L	4/4	M. HILL
00900	TOTAL HARDNESS	130.2	6,500	MG/L	3/29	E. BEROLDI
71830	HYDROXIDE	406C	0.0	MG/L	4/19	E. BEROLDI
00746	HYDROGEN SULFIDE	427C	0.038	MG/L	4/2	E. BEROLDI
00902	NON-CARBONATE HARDNESS	130.2	6,344	MG/L	4/19	E. BEROLDI
00440	BICARBONATE	406C	95.2	MG/L	4/19	E. BEROLDI
00930	SODIUM	273.1	8850	MG/L	4/19	K. VAGI
00665	TOTAL PHOSPHORUS	365.4	0.331	MG/L	4/18	E. BEROLDI
00625	TOTAL NITROGEN	351.2	0.450	MG/L	4/19	E. BEROLDI
00630	NITRATE	353.2	0.262	MG/L	4/10	E. BEROLDI
00615	NITRITE	353.2	0.069	MG/L	4/10	E. BEROLDI
00625	ORGANIC NITROGEN	351.2	0.0	MG/L	4/19	E. BEROLDI
00610	AMMONIA	351.2	0.119	MG/L	4/18	E. BEROLDI
00095	CONDUCTIVITY	120.1	3761	UMHOS/CM	3/29	M. HILL
00910	CALCIUM	406C	978	MG/L	3/29	E. BEROLDI
00925	MAGNESIUM	242.2	1746	MG/L	4/19	E. BEROLDI
00405	CARBON DIOXIDE	406C	5.40	MG/L	4/19	E. BEROLDI
00445	CARBONATE	406C	0.0	MG/L	4/19	E. BEROLDI
00935	POTASSIUM	258.1	498	MG/L	4/19	K. VAGI
00941	CHLORIDE	4500-CL-C	20,650	MG/L	3/29	E. BEROLDI
00410	ALKALINITY	403	156	MG/L	3/29	E. BEROLDI
00625	TKN	351.2	0.119	MG/L	4/18	E. BEROLDI
00410	BICARBONATE	406C	156	MG/L	4/19	E. BEROLDI

REMARKS:

REVIEWED BY: G. MEYER

INJECTION WELL #2

BROWARD TESTING LABORATORY, INC.

POTABLE WATER LABORATORY CERTIFICATION NUMBER 86137
ENVIRONMENTAL LABORATORY CERTIFICATION NUMBER 86035

LABORATORY PARAMETER ANALYSIS REPORT

Test #1

PROJECT YOUNGQUIST BROTHERS

SOURCE STRADDLE PACKER TEST ZONE C 1403 - 1423'
LAB. NUMBER 89-7928
GROUND WATER CLASS
SAMPLED BY CLIENT
NO. WELL CASING VOL. PURGED

SAMPLE DATE -
SAMPLE TIME -
COMPLETION DATE 12/13/89
SAMPLE TYPE ( ) BACKGROUND
( ) SITE BOUNDRY
( ) INTERMEDIATE
( ) COMPLIANCE

STORET CODE	PARAMETER MONITORED	ANALYSIS METHOD	ANALYSIS RESULT	UNIT	DATE	ANALYST
70300	TOTAL DISSOLVED SOLIDS	160.1	4850	MG/L	12/13	E.GOLEM
00940	CHLORIDE	407A	5030	MG/L	12/13	E.BEROLDI
00095	CONDUCTIVITY	120.1	8,280	UMHOS/CM	12/12	E.BEROLDI
00945	SULFATE	426	429	MG/L	12/13	E.GOLEM

BROWARD TESTING LABORATORY, INC.

LABORATORY CERTIFICATION NUMBER 86137

LABORATORY PARAMETER ANALYSIS REPORT

PROJECT YOUNGQUIST BROS.

SOURCE I-W-2 INJECTION ZONE
LAB. NUMBER 90-0724
GROUND WATER CLASS
SAMPLED BY CLIENT
NO. WELL CASING VOL. PURGED

SAMPLE DATE 2/16/90
SAMPLE TIME -
COMPLETION DATE 3/27/90
SAMPLE TYPE ( ) BACKGROUND
( ) SITE BOUNDRY
( ) INTERMEDIATE
( ) COMPLIANCE

STORET CODE	PARAMETER MONITORED	ANALYSIS METHOD	ANALYSIS RESULT	UNIT	DATE	ANALYST
80110	SPECIFIC GRAVITY	2710F	1.0212	G/CM^3	2/22	E. BEROLDI
00010	WATER TEMP. (FIELD)	170.1	62	F°	IN FIELD	
00403	PH	150.1	7.83	UNIT	2/20	M. HILL
00076	TURBIDITY	180.1	138	NTU	2/20	E. BEROLDI
00080	COLOR	110.3	10	UNITS	2/20	E. BEROLDI
00945	SULFATE	426C	2270	MG/L	2/21	E. GOLEM
01046	IRON	236.1	2.01	MG/L	2/19	K. VAGI
70300	TDS	160.1	35,308	MG/L	3/8	M. HILL
00900	TOTAL HARDNESS	130.2	6,900	MG/L	2/21	E. BEROLDI
71830	HYDROXIDE	406C	0.0	MG/L	3/23	E. BEROLDI
00746	HYDROGEN SULFIDE	427C	0.057	MG/L	3/19	E. BEROLDI
00902	NON-CAR HARDNESS	354.1	6,780	MG/L	3/23	E. BEROLDI
00440	BICARBONATE	406C	73.2	MG/L	3/23	E. BEROLDI
00930	SODIUM	273.1	7780	MG/L	3/21	K. VAGI
00665	TOTAL PHOSPHORUS	365.4	0.519	MG/L	3/12	E. BEROLDI
00600	TOTAL NITROGEN	CALC.	1.58	MG/L	3/6	E. BEROLDI
00630	NITRATE	353.2	0.33	MG/L	3/5	E. BEROLDI
00615	NITRITE	353.2	<0.05	MG/L	3/5	E. BEROLDI
00605	ORGANIC NITROGEN	CALC.	0.0	MG/L	3/26	E. BEROLDI
00625	AMMONIA	351.2	1.23	MG/L	3/26	E. BEROLDI
00095	CONDUCTIVITY	120.1	50,900	UMHOS/CM	2/20	E. BERDLDI
00910	CALCIUM	406C	505	MG/L	2/21	E. BEROLDI
00927	MAGNESIUM	242.1	2425	MG/L	3/23	E. BEROLDI
00405	CARBON DIOXIDE	406C	3.6	MG/L	3/23	E. BEROLDI
00445	CARBONATE	406C	0.0	MG/L	3/23	E. BEROLDI
00935	POTASSIUM	258.1	232	MG/L	2/19	K. VAGI
00941	CHLORIDE	4500CL-C	20544	MG/L	2/21	E. BEROLDI
00410	BICARB AS $CACO_3$	406C	120	MG/L	3/23	E. BEROLDI

REMARKS:

REVIEWED BY: G. MEYER

DEEP MONITOR WELL #1

BROWARD TESTING LABORATORY, INC.

FRANK D. HOBLE
POST OFFICE BOX 23541
FORT LAUDERDALE, FLORIDA 33307
TELEPHONE (305) 776-7238

NAME AND MAILING ADDRESS OF PERSON/FIRM TO RECEIVE REPORT

YOUNGQUIST BROTHERS
2401 N. POWERLINE RD.,
BLDG 1, RM. 116
POMPANO BEACH, FL 33069

LAB I.D. NO. 86137
86035

SYSTEM NAME:_____ SYSTEM I. D. NO.:_____

ADDRESS:_____ COUNTY:_____ COLLECTOR:_____

SAMPLE SITE (Locality or Subdivision): 2 ZONES, 1 WELL (1100 FT, 2000 FT.)

RAW OR TREATED: TREATED DATE AND TIME COLLECTED: 3/19/90 16:20

TYPE OF SUPPLY (Circle one): Community public water system | Non-community public water system | Other public water system | Private well | Swimming pool | Bottled water

TYPE OF SAMPLE (Circle one): Compliance | Recheck | Main Clearance | X Well Survey | Other (specify)_____

TOTAL COLIFORM METHOD 909A FECAL COLIFORM METHOD 909C ANALYSIS DATE 3/19/90

TO BE COMPLETED BY COLLECTOR OF SAMPLE				*TO BE COMPLETED BY LAB*			
COLL. NO.	SAMPLE POINT	Cl RES'D	pH	SAMPLE NUMBER	NON COLIFORM	COLIFORM MF/100 ML TOTAL	COLIFORM MF/100 ML FECAL
1	ZONE 2 (1100 FT.)	2.5		90-1204		1	
2	ZONE 1 (2000 FT.)	1.75		1205		<1	

REMARKS:

ANALYSIS BY Frank D. Hoble
Certified by the Florida State Health and Rehabilitative Services Department of Bacteriology.

BROWARD TESTING LABORATORY, INC.
POTABLE WATER LABORATORY CERTIFICATION NUMBER 86137
ENVIRONMENTAL LABORATORY CERTIFICATION NUMBER 86035

LABORATORY PARAMETER ANALYSIS REPORT

PROJECT YOUNGQUIST BROS.

SOURCE #2 SHALLOW ZONE
LAB. NUMBER 90-1205
GROUND WATER CLASS
SAMPLED BY R. SHARON
NO. WELL CASING VOL. PURGED

SAMPLE DATE 3/15/90
SAMPLE TIME 1:00
COMPLETION DATE 4/26/90
SAMPLE TYPE ( ) BACKGROUND
( ) SITE BOUNDRY
( ) INTERMEDIATE
( ) COMPLIANCE

STORET CODE	PARAMETER MONITORED	ANALYSIS METHOD	ANALYSIS RESULT	UNIT	DATE	ANALYST
00746	HYDROGEN SULFIDE	427C	0.034	MG/L	3/19	E. BEROL
00610	AMMONIA	351.2	1.22	MG/L	3/26	E. BERO
38260	MBAS	512B	<0.10	MG/L	3/22	E. BEROL
00403	PH	150.1	8.0	UNIT	3/15	R. SHAR
00010	TEMPERATURE	170.1	23.4	°C	3/15	R. SHAR
00299	DISSOLVED OXYGEN	360.1	1.5	MG/L	3/15	R. SHAR
50060	TOTAL CHLORINE	330.5	0.0	MG/L	3/15	R. SHAR
01000	ARSENIC	206.2	<0.003	MG/L	3/27	K. VAGI
01005	BARIUM	208.1	<0.3	MG/L	3/22	K. VAGI
01025	CADMIUM	213.2	<0.0005	MG/L	3/29	K. VAGI
01030	CHROMIUM	218.2	0.0105	MG/L	3/26	K. VAGI
01049	LEAD	239.2	<0.002	MG/L	3/26	K. VAGI
71890	MERCURY	245.5	<0.0005	MG/L	4/10	K. VAGI
01145	SELENIUM	270.2	0.0342	MG/L	4/28	K. VAGI
01075	SILVER	272.2	0.0042	MG/L	4/9	K. VAGI
00930	SODIUM	273.1	3170	MG/L	4/21	K. VAGI
01040	COPPER	220.1	<0.03	MG/L	3/19	K. VAGI
01046	IRON	236.1	0.45	MG/L	3/19	K. VAGI
01090	ZINC	289.1	<0.03	MG/L	3/19	K. VAGI
01056	MANGANESE	243.2	0.0197	MG/L	3/29	K. VAGI
01095	ANTIMONY	204.2	<0.005	MG/L	4/20	K. VAGI
00925	MAGNESIUM	242.2	361.0	MG/L	4/19	E.BEROLD
00935	POTASSIUM	258.1	56.8	MG/L	4/19	K. VAGI
	CONTINUED ON NEXT PAGE					

REMARKS:

REVIEWED BY: G. MEYER

BROWARD TESTING LABORATORY, INC.
POTABLE WATER LABORATORY CERTIFICATION NUMBER 86137
ENVIRONMENTAL LABORATORY CERTIFICATION NUMBER 86035

LABORATORY PARAMETER ANALYSIS REPORT

PROJECT YOUNGQUIST BROS.

SOURCE #2 SHALLOW ZONE
LAB. NUMBER 90-1205
GROUND WATER CLASS
SAMPLED BY R. SHARON
NO. WELL CASING VOL. PURGED

SAMPLE DATE 3/15/90
SAMPLE TIME 1:00
COMPLETION DATE 4/26/90
SAMPLE TYPE ( ) BACKGROUND
( ) SITE BOUNDRY
( ) INTERMEDIATE
( ) COMPLIANCE

STORET CODE	PARAMETER MONITORED	ANALYSIS METHOD	ANALYSIS RESULT	UNIT	DATE	ANALYST
00910	CALCIUM	406C	153	MG/L	3/29	E. BEROLD
01080	STRONTIUM	303A	38.6	MG/L	4/23	K. VAGI
80110	SPECIFIC GRAVITY	213E	1.0001	G/ML	3/29	E. BEROLD
00950	FLOURIDE	340.2	1.20	MG/L	3/21	M. HILL
00630	NITRATE	353.2	0.850	MG/L	3/27	E. BEROLD
00080	COLOR	110.3	0	UNITS	3/16	E. BEROLD
00941	CHLORIDES	4500CLC	2333	MG/L	3/22	M. HILL
00900	TOTAL HARDNESS	130.2	1222	MG/L	3/29	E. BEROLD
00410	ALKALINITY	403	140	MG/L	3/16	E. BEROLD
00901	CALCIUM HARDNESS	215.2	382	MG/L	3/29	E. BEROLD
00310	BOD	405.1	<2.0	MG/L	3/21	M. HILL
00076	TURBIDITY	180.1	2.30	NTU	3/27	M. HILL
00085	ODOR	140.1	1	TON	3/16	E. BEROLD
00945	SULFATE	426 C	124	MG/L	4/4	E. GOLEM
70300	TOTAL DISSOLVED SOLID	160.1	4432	MG/L	3/22	M. HILL
00665	TOTAL PHOSPHATE	365.4	<0.20	MG/L	3/26	E. BEROLD
70507	ORTHO PHOSPHATE	365.4	<0.20	MG/L	3/26	E. BEROLD
00625	TKN	351.2	1.68	MG/L	3/26	E. BEROLD
00440	BOCARBONATE	406C	85.4	MG/L	4/19	E. BEROLD
00681	TOTAL ORGANIC CARBON	415.1	1.46	MG/L	3/23	E. GOLEM
00530	TOTAL SUSPENDED SOLIDS	160.2	10	MG/L	3/16	M. HILL
01020	BORON	212.3	<0.5	MG/L	4/23	K. VAGI
	625 SCAN					
	608 SCAN					
	504 SCAN	SEE ATTACHED SHEETS				
	502.2 SCAN					
	GROSS ALPHA					

REMARKS:

REVIEWED BY: G. MEYER

BROWARD TESTING LABORATORY, INC.
POST OFFICE BOX 23541 FORT LAUDERDALE, FLORIDA 33307 TELEPHONE: (305) 776-7238 FAX: (305) 776-0689

CLIENT: YOUNGQUIST BROS.

REPORT NO: _____ LAB ID NO: 86137
PWS ID NO: _____
SAMPLE SITE: #1 SHALLOW WELL

DATE SAMPLED: 3/15/90 TIME SAMPLED: 12:41
DATE RECEIVED AT LAB: _____ TIME RECEIVED AT LAB: _____

ANALYTICAL SERIES: FLORIDA SAFE DRINKING WATER COMPLIANCE.
RADIOLOGICAL ANALYSIS 17-550.310(5). (PWS033)
ALL VALUES IN pCi/L UNLESS OTHERWISE NOTED.
LAB # 90-1205

PARAMETER	REPORTED VALUE	
RADIONUCLIDES:		
	0.3+/-1.3	PCI/L

Frank D. Hoble

FRANK D. HOBLE, DIRECTOR
BROWARD TESTING LABORATORY, INC.

POTABLE WATER LABORATORY CERTIFICATION NUMBER #6137
ENVIRONMENTAL LABORATORY CERTIFICATION NUMBER #0035

METHOD 504 EDB AND DBCP: MICROEXTRACTION/ECGC

LABORATORY PARAMETER ANALYSIS REPORT

PROJECT YOUNGQUIST BROS.

SOURCE #2 SHALLOW ZONE
LAB. NUMBER 90-1205
GROUND WATER CLASS
SAMPLED BY R. SHARON
NO. WELL CASING VOL. PURGED

SAMPLE DATE 3/15/90
SAMPLE TIME 1:00
COMPLETION DATE 4/26/90
SAMPLE TYPE ( ) BACKGROUND
( ) SITE BOUNDRY
( ) INTERMEDIATE
( ) COMPLIANCE

CAS NO.	PARAMETER MONITORED	ANALYSIS METHOD	ANALYSIS RESULT	UNIT	DATE	ANALYS
106-93-4	1,2-DIBROMOETHANE (EDB)	504	<0.02	UG/L	3/15	C. AMON
96-12-8	1,2-DIBROMO-3-CHLOROPROPANE (DBCP)	504	<0.02	UG/L	"	"

Remarks:

REVIEWED BY: G. MEYER

POTABLE WATER LABORATORY CERTIFICATION NUMBER #6137
ENVIRONMENTAL LABORATORY CERTIFICATION NUMBER #6035

METHOD 502.2. VOLATILE ORGANIC COMPOUNDS IN WATER BY PURGE AND TRAP CAPILLARY COLUMN GAS CHROMATOGRAPHY WITH PHOTOIONIZATION AND ELECTROLYTIC CONDUCTIVITY DETECTORS IN SERIES

LABORATORY PARAMETER ANALYSIS REPORT

PROJECT YOUNGQUIST BROS.

SOURCE #2 SHALLOW ZONE
LAB. NUMBER 90-1205
GROUND WATER CLASS
SAMPLED BY R. SHARON
NO. WELL CASING VOL. PURGED

SAMPLE DATE 3/15/90
SAMPLE TIME 1:00
COMPLETION DATE 4/26/90
SAMPLE TYPE ( ) BACKGROUND
( ) SITE BOUNDRY
( ) INTERMEDIATE
( ) COMPLIANCE

CAS NO.	PARAMETER MONITORED	ANALYSIS METHOD	ANALYSIS RESULT	UNIT	DATE	ANALYS
71-43-2	BENZENE	502.2	<1.0	UG/L	3/19	C. AMO
108-86-1	BROMOBENZENE	502.2	<1.0	UG/L	"	"
74-97-5	BROMOCHLOROMETHANE	502.2	<1.0	UG/L	"	"
75-27-4	BROMODICHLOROMETHANE	502.2	<1.0	UG/L	"	"
75-25-2	BROMOFORM	502.2	<1.6	UG/L	"	"
74-83-9	BROMOMETHANE	502.2	<1.1	UG/L	"	"
104-51-8	n-BUTYLBENZENE	502.2	<1.0	UG/L	"	"
135-98-8	sec-BUTYLBENZENE	502.2	<1.0	UG/L	"	"
98-06-6	tert-BUTYLBENZENE	502.2	<1.0	UG/L	"	"
56-23-5	CARBON TETRACHLORIDE	502.2	<1.0	UG/L	"	"
108-90-7	CHLOROBENZENE	502.2	<1.0	UG/L	"	"
75-00-3	CHLOROETHANE	502.2	<1.0	UG/L	"	"
67-66-3	CHLOROFORM	502.2	<1.0	UG/L	"	"
74-87-3	CHLOROMETHANE	502.2	<1.0	UG/L	"	"
95-49-8	2-CHLOROTOLUENE	502.2	<1.0	UG/L	"	"
106-43-4	4-CHLOROTOLUENE	502.2	<1.0	UG/L	"	"
124-48-1	DIBROMOCHLOROMEHTANE	502.2	<2.0	UG/L	"	"
96-12-8	1,2-DIBROMO-3-CHLOROPROPANE	502.2	<3.0	UG/L	"	"
106-93-4	1,2-DIBROMOETHANE	502.2	<0.8	UG/L	"	"
74-95-3	DIBROMOMETHANE	502.2	<2.2	UG/L	"	"
95-50-1	1,2-DICHLOROBENZENE	502.2	<1.0	UG/L	"	"
541-73-1	1,3-DICHLOROBENZENE	502.2	<1.0	UG/L	"	"
106-46-7	1,4-DICHLOROBENZENE	502.2	<1.0	UG/L	"	"
75-71-8	DICHLORODIFLUOROMETHANE	502.2	<1.0	UG/L	"	"
75-34-3	1,1-DICHLOROETHANE	502.2	<1.0	UG/L	"	"
107-06-2	1,2-DICHLOROETHANE	502.2	<1.0	UG/L	"	"
75-35-4	1,1-DICHLOROETHENE	502.2	<1.0	UG/L	"	"
156-59-4	cis-1,2-DICHLOROETHENE	502.2	<1.0	UG/L	"	"
156-60-5	trans-1,2-DICHLOROETHENE	502.2	<1.0	UG/L	"	"
78-87-5	1,2-DICHLOROPROPANE	502.2	<1.0	UG/L	"	"

REMARKS:

REVIEWED BY: G. MEYER

ENVIRONMENTAL LABORATORY CERTIFICATION NUMBER 86035

METHOD 502.2, VOLATILE ORGANIC COMPOUNDS IN WATER BY PURGE AND TRAP CAPILLARY COLUMN GAS CHROMATOGRAPHY WITH PHOTOIONIZATION AND ELECTROLYTIC CONDUCTIVITY DETECTORS IN SERIES

LABORATORY PARAMETER ANALYSIS REPORT

PROJECT YOUNGQUIST BROS.

SOURCE #2 SHALLOW ZONE
LAB. NUMBER 90-1205
GROUND WATER CLASS
SAMPLED BY R. SHARON
NO. WELL CASING VOL. PURGED

SAMPLE DATE 3/15/90
SAMPLE TIME 1:00
COMPLETION DATE 4/26/90
SAMPLE TYPE ( ) BACKGROUND
( ) SITE BOUNDI
( ) INTERMEDIAT
( ) COMPLIANCE

CAS NO.	PARAMETER MONITORED	ANALYSIS METHOD	ANALYSIS RESULT	UNIT	DATE	ANALI
142-28-9	1,3-DICHLOROPROPANE	502.2	<1.0	UG/L	3/19	C. AM
590-20-7	2,2-DICHLOROPROPANE	502.2	<1.0	UG/L	"	"
563-58-6	1,1-DICHLOROPROPENE	502.2	<1.0	UG/L	"	"
100-41-4	ETHYLBENZENE	502.2	292	UG/L	"	"
87-68-3	HEXACHLOROBUTADIENE	502.2	<1.0	UG/L	"	"
98-82-8	ISOPROPYLBENZENE	502.2	<1.0	UG/L	"	"
99-87-6	p-ISOPROPYLTOLUENE	502.2	<1.0	UG/L	"	"
75-09-2	METHYLENE CHLORIDE	502.2	<1.0	UG/L	"	"
91-20-3	NAPHTHALENE	502.2	<1.0	UG/L	"	"
103-65-1	n-PROPYLBENZENE	502.2	<1.0	UG/L	"	"
100-42-5	STYRENE	502.2	<1.0	UG/L	"	"
630-20-6	1,1,1,2-TETRACHLOROETHANE	502.2	<1.0	UG/L	"	"
79-34-5	1,1,2,2-TETRACHLOROETHANE	502.2	<1.0	UG/L	"	"
127-18-4	TETRACHLOROETHENE	502.2	<1.0	UG/L	"	"
108-88-3	TOLUENE	502.2	5.35	UG/L	"	"
87-61-6	1,2,3-TRICHLOROBENZENE	502.2	<1.0	UG/L	"	"
120-82-1	1,2,4-TRICHLOROBENZENE	502.2	<1.0	UG/L	"	"
71-55-6	1,1,1-TRICHLOROETHANE	502.2	<1.0	UG/L	"	"
79-00-5	1,1,2-TRICHLOROETHANE	502.2	<1.0	UG/L	"	"
79-01-6	TRICHLOROETHENE	502.2	<1.0	UG/L	"	"
75-69-4	TRICHLOROFLUOROMETHANE	502.2	<1.0	UG/L	"	"
96-18-4	1,2,3-TRICHLOROPROPANE	502.2	<1.0	UG/L	"	"
95-63-6	1,2,4-TRIMETHYLBENZENE	502.2	<1.0	UG/L	"	"
108-67-8	1,3,5-TRIMETHYLBENZENE	502.2	<1.0	UG/L	"	"
75-01-4	VINYL CHLORIDE	502.2	<1.0	UG/L	"	"
95-47-6	o-XYLENE	502.2	<1.0	UG/L	"	"
108-38-3	m-XYLENE	502.2	<1.0	UG/L	"	"
106-42-3	p-XYLENE	502.2	<1.0	UG/L	"	"

REMARKS:

REVIEWED BY: G. MEYER

BROWARD TESTING LABORATORY, INC.
POTABLE WATER LABORATORY CERTIFICATION NUMBER #6137
ENVIRONMENTAL LABORATORY CERTIFICATION NUMBER #6035

ORGANOCHLORINE PESTICIDES AND PCB'S
METHOD - 608

LABORATORY PARAMETER ANALYSIS REPORT

PROJECT YOUNGQUIST BROS.

SOURCE #2 SHALLOW ZONE
LAB. NUMBER 90-1205
GROUND WATER CLASS
SAMPLED BY R. SHARON
NO. WELL CASING VOL. PURGED

SAMPLE DATE 3/15/90
SAMPLE TIME 1:00
COMPLETION DATE 4/26/90
SAMPLE TYPE ( ) BACKGROUND
( ) SITE BOUNDRY
( ) INTERMEDIATE
( ) COMPLIANCE

STORET CODE	PARAMETER MONITORED	ANALYSIS METHOD	ANALYSIS RESULT	UNIT	DATE	ANALYST
39330	ALDRIN	608	<1.0	UG/L	4/3	C. AMON
39337	A-BHC	608	<1.0	UG/L	"	"
39338	B-BHC	608	<1.0	UG/L	"	"
34259	D-BHC	608	<1.0	UG/L	"	"
39340	Y-BHC	608	<1.0	UG/L	"	"
39350	CHLORDANE	608	<1.0	UG/L	"	"
39310	4,4'-DDD	608	<1.0	UG/L	"	"
39320	4,4'-DDE	608	<1.0	UG/L	"	"
39300	4,4'-DDT	608	<1.0	UG/L	"	"
39380	DIELDRIN	608	<1.0	UG/L	"	"
34361	ENDOSULFAN I	608	<1.0	UG/L	"	"
34356	ENDOSULFAN II	608	<1.0	UG/L	"	"
34351	ENDOSULFAN SULFATE	608	<1.0	UG/L	"	"
39390	ENDRIN	608	<1.0	UG/L	"	"
34366	ENDRIN ALDEHYDE	608	<1.0	UG/L	"	"
39410	HEPTACHLOR	608	<1.0	UG/L	"	"
39420	HEPTACHLOR EPOXIDE	608	<1.0	UG/L	"	"
39400	TOXAPHENE	608	<1.0	UG/L	"	"
34671	PCB-1016	608	<1.0	UG/L	"	"
39488	PCB-1221	608	<1.0	UG/L	"	"
39492	PCB-1232	608	<1.0	UG/L	"	"
39496	PCB-1242	608	<1.0	UG/L	"	"
39500	PCB-1248	608	<1.0	UG/L	"	"
39504	PCB-1254	608	<1.0	UG/L	"	"
39508	PCB-1260	608	<1.0	UG/L	"	"
39480	METHOXYCHLOR	608	<1.0	UG/L	"	"

REMARKS:

REVIEWED BY: G. MEYR

POTABLE WATER LABORATORY CERTIFICATION NUMBER 86137
ENVIRONMENTAL LABORATORY CERTIFICATION NUMBER 86035

METHOD 625 - BASE NEUTRALS

LABORATORY PARAMETER ANALYSIS REPORT

PROJECT YOUNGQUIST BROS.

SOURCE #2 SHALLOW ZONE
LAB. NUMBER 90-1205
GROUND WATER CLASS
SAMPLED BY R. SHARON
NO. WELL CASING VOL. PURGED

SAMPLE DATE 3/15/90
SAMPLE TIME 1:00
COMPLETION DATE 4/26/90
SAMPLE TYPE ( ) BACKGROUND
( ) SITE BOUNDRY
( ) INTERMEDIATE
( ) COMPLIANCE

STORET CODE	PARAMETER MONITORED	ANALYSIS METHOD	ANALYSIS RESULT	UNIT	DATE	ANALYS
34205	ACENAPHTHENE	625	<1.9	UG/L	4/9/90	E. BURE
34200	ACENAPHTHYLENE	625	<3.5	UG/L	"	"
34220	ANTHRACENE	625	<1.9	UG/L	"	"
39330	ALDRIN	625	<1.9	UG/L	"	"
39120	BENZIDINE	625	<44	UG/L	"	"
34526	BENZO(A)ANTHRACENE	625	<3.7	UG/L	"	"
34230	BENZO(B)FLUORANTHENE	625	<2.5	UG/L	"	"
34242	BENZO(K)FLUORANTHENE	625	<2.5	UG/L	"	"
34247	BENZO(A)PYRENE	625	<3.7	UG/L	"	"
34521	BENZO(GHI)PERYLENE	625	<4.1	UG/L	"	"
34292	BENZYLBUTYLPHTHALATE	625	<2.5	UG/L	"	"
39337	A-BHC	625	<4.2	UG/L	"	"
39338	B-BHC	625	<10.0	UG/L	"	"
34259	D-BHC	625	<10.0	UG/L	"	"
39340	G-BHC	625	<3.1	UG/L	"	"
34273	BIS(2-CHLOROETHYL)ETHER	625	<5.6	UG/L	"	"
34278	BIS(2-CHLOROETHOXY)METHANE	625	<5.3	UG/L	"	"
39100	BIS(2-ETHYLHEXYL) PHTHALATE	625	<2.5	UG/L	"	"
34283	BIS(2-CHLOROISOPROPYL)ETHER	625	<5.7	UG/L	"	"
34636	4-BROMOPHENYLPHENYLETHER	625	<1.9	UG/L	"	"
39350	CHLORDANE	625	<10.0	UG/L	"	"
34581	2-CHLORONAPHTHALENE	625	<1.9	UG/L	"	"
34641	4-CHLOROPHENYLPHENYLETHER	625	<4.2	UG/L	"	"
34320	CHRYSENE	625	<2.5	UG/L	"	"
39310	4,4'-DDD	625	<2.8	UG/L	"	"
39320	4,4'-DDE	625	<5.6	UG/L	"	"
39300	4,4'-DDT	625	<4.7	UG/L	"	"
34556	DIBENZO(A,H)ANTHRACENE	625	<2.5	UG/L	"	"
39110	DI-N-BUTYLPHTHALATE	625	<2.5	UG/L	"	"
34566	1,3-DICHLOROBENZENE	625	<1.9	UG/L	"	"
34536	1,2-DICHLOROBENZENE	625	<1.9	UG/L	"	"
34571	1,4-DICHLOROBENZENE	625	<4.4	UG/L	"	"
34631	3,3'DICHLOROBENZIDINE	625	<16.5	UG/L	"	"
39380	DIELDRIN	625	<2.5	UG/L	"	"
34336	DIETHYLPHTHALATE	625	<1.9	UG/L	"	"

Remarks:

REVIEWED BY:
G. MEYER

ENVIRONMENTAL LABORATORY CERTIFICATION NUMBER 86035

METHOD 625 - BASE NEUTRALS

LABORATORY PARAMETER ANALYSIS REPORT

PROJECT YOUNGQUIST BROS.

SOURCE #2 SHALLOW ZONE
LAB. NUMBER 90-1205
GROUND WATER CLASS
SAMPLED BY R. SHARON
NO. WELL CASING VOL. PURGED

SAMPLE DATE 3/15/90
SAMPLE TIME 1:00
COMPLETION DATE 4/26/90
SAMPLE TYPE ( ) BACKGROUND
( ) SITE BOUNDA
( ) INTERMEDIAT
( ) COMPLIANCE

STORET CODE	PARAMETER MONITORED	ANALYSIS METHOD	ANALYSIS RESULT	UNIT	DATE	ANALY
34341	DIMETHYLPHTHALATE	625	<1.6	UG/L	4/9	E.BUR
34611	2,4-DINITROTOLUENE	625	<5.7	UG/L	"	"
34626	2,6-DINITROTOLUENE	625	<1.9	UG/L	"	"
34596	DI-N-OCTYLPHTHALATE	625	<4.8	UG/L	"	"
34361	ENDROSULFAN I	625	<5.0	UG/L	"	"
34356	ENDROSULFAN II	625	<7.5	UG/L	"	"
34531	ENDROSULFAN SULFATE	625	<5.6	UG/L	"	"
39390	ENDRIN	625	<4.5	UG/L	"	"
34366	ENDRIN ALDEHYDE	625	<5.0	UG/L	"	"
34376	FLUORANTHENE	625	<2.2	UG/L	"	"
34381	FLUORENE	625	<1.9	UG/L	"	"
39410	HEPTACHLOR	625	<1.9	UG/L	"	"
39420	HEPTCHLOR EPOXIDE	625	<2.2	UG/L	"	"
39700	HEXACHLOROBENZENE	625	<1.9	UG/L	"	"
34391	HEXACHLOROBUTADIENE	625	<1.0	UG/L	"	"
34396	HEXACHLOROETHANE	625	<1.6	UG/L	"	"
34386	HEXACHLOROCYLOPENTADIENE	625	<10.0	UG/L	"	"
34403	INDENO(1,2,3-CD)PYRENE	625	<3.7	UG/L	"	"
34408	ISOPHORONE	625	<2.2	UG/L	"	"
34696	NAPHTHALENE	625	<1.6	UG/L	"	"
34447	NITROBENZENE	625	<1.9	UG/L	"	"
34338	N-NITROSODIMETHYLAMINE	625	<8.0	UG/L	"	"
34433	N-NITROSODIPHENYLAMINE	625	<1.9	UG/L	"	"
34428	N-NITROSODI-N-PROPYLAMINE	625	<10.0	UG/L	"	"
34671	PCB-1016	625	<30.0	UG/L	"	"
39488	PCB-1221	625	<50.0	UG/L	"	"
39492	PCB-1232	625	<50.0	UG/L	"	"
39496	PCB-1242	625	<30.0	UG/L	"	"
39500	PCB-1248	625	<40.0	UG/L	"	"
39504	PCB-1254	625	<30.5	UG/L	"	"
39508	PCB-1260	625	<30.5	UG/L	"	"
34461	PHENANTHRENE	625	<5.4	UG/L	"	"
34469	PYRENE	625	<1.9	UG/L	"	"
39400	TOXAPHENE	625	<20.0	UG/L	"	"
34551	1,2,4-TRICHLOROBENZENE	625	<1.4	UG/L	"	"

REMARKS:

REVIEWED BY: G. MEYER

LABORATORY CERTIFICATION NUMBER 86137
E-86035

METHOD 625 - ACIDS

LABORATORY PARAMETER ANALYSIS REPORT

PROJECT YOUNGQUIST BROS.

SOURCE #2 SHALLOW ZONE
LAB. NUMBER 90-1205
GROUND WATER CLASS
SAMPLED BY R. SHARON
NO. WELL CASING VOL. PURGED

SAMPLE DATE 3/15/90
SAMPLE TIME 1:00
COMPLETION DATE 4/26/90
SAMPLE TYPE ( ) BACKGROUND
( ) SITE BOUNDR
( ) INTERMEDIAT
( ) COMPLIANCE

STORET CODE	PARAMETER MONITORED	ANALYSIS METHOD	ANALYSIS RESULT	UNIT	DATE	ANALY
34452	4-CHLORO-3-METHYLPHENOL	625	<3.0	UG/L	4/9	E. BU
34586	2-CHLOROPHENOL	625	<3.3	UG/L	"	"
34601	2,4-DICHLOROPHENOL	625	<2.7	UG/L	"	"
34606	2,4-DIMETHYLPHENOL	625	<2.7	UG/L	"	"
34616	2,4-DINITROPHENOL	625	<42	UG/L	"	"
34657	2-MET'-4,6-DINITROPHENOL	625	<24	UG/L	"	"
34591	2-NITROPHENOL	625	<3.6	UG/L	"	"
34646	4-NITROPHENOL	625	<2.4	UG/L	"	"
39032	PENTACHLOROPHENOL	625	<3.6	UG/L	"	"
34694	PHENOL	625	<1.5	UG/L	"	"
34621	2,4,6-TRICHLOROPHENOL	625	<2.7	UG/L	"	"

REMARKS:

REVIEWED BY: G. MEYER

[illegible] LABORATORY CERTIFICATION NUMBER 86035

EPA METHOD 625 SECT. 17
SCREEN FOR 2,3,7,8-TCDD

PROJECT YOUNGQUIST BROS.
MONITORING SITE #2 SHALLOW ZONE
SAMPLED BY R SHARON

SAMPLE DATE 3/15/90
SAMPLE TIME 12:41
SAMPLE TYPE: ( ) BACKGROUND
( ) COMPLIANCE

STORET CODE	PARAMETER MONITORED	Presence	
		indicated	not indicat
34675	2,3,7,8-Tetra chlorodibenzo-p-dioxin		X

BROWARD TESTING LABORATORY, INC.

POTABLE WATER LABORATORY CERTIFICATION NUMBER 86137
ENVIRONMENTAL LABORATORY CERTIFICATION NUMBER 86035

LABORATORY PARAMETER ANALYSIS REPORT

PROJECT YOUNGQUIST BROS.

SOURCE #1 DEEP ZONE
LAB. NUMBER 90-1204
GROUND WATER CLASS
SAMPLED BY R. SHARON
NO. WELL CASING VOL. PURGED

SAMPLE DATE 3/15/90
SAMPLE TIME 12:41
COMPLETION DATE 4/26/90
SAMPLE TYPE ( ) BACKGROUND
( ) SITE BOUNDRY
( ) INTERMEDIATE
( ) COMPLIANCE

STORET CODE	PARAMETER MONITORED	ANALYSIS METHOD	ANALYSIS RESULT	UNIT	DATE	ANALYST
00746	HYDROGEN SULFIDE	427C	0.034	MG/L	3/19	E. BEROLD
00610	AMMONIA	351.2	0.612	MG/L	3/26	E. BEROLD
38260	MBAS	512B	<0.10	MG/L	3/22	E. BEROLD
00403	PH	150.1	8.94	UNIT	3/15	R. SHARON
00010	TEMPERATURE	170.1	24.3	°C	3/15	R. SHARON
00299	DISSOLVED OXYGEN	360.1	2.1	MG/L	3/15	R. SHARON
50060	TOTAL CHLORINE	330.5	0.0	MG/L	3/15	R. SHARON
01000	ARSENIC	206.2	<0.003	MG/L	3/27	K. VAGI
01005	BARIUM	208.1	<0.03	MG/L	3/22	K. VAGI
01025	CADMIUM	213.2	<0.0005	MG/L	3/29	K. VAGI
01030	CHROMIUM	218.2	0.0123	MG/L	3/26	K. VAGI
01049	LEAD	239.2	0.0066	MG/L	3/26	K. VAGI
71890	MERCURY	245.5	0.0005	MG/L	4/10	K. VAGI
01145	SELENIUM	270.2	0.0891	MG/L	4/28	K. VAGI
01075	SILVER	272.2	0.0064	MG/L	4/9	K. VAGI
00930	SODIUM	273.1	3180	MG/L	4/21	K. VAGI
01040	COPPER	220.1	<0.03	MG/L	3/19	K. VAGI
01046	IRON	236.1	<0.1	MG/L	3/19	K. VAGI
01090	ZINC	289.1	<0.03	MG/L	3/19	K. VAGI
01056	MANGANESE	243.2	0.0822	MG/L	3/29	K. VAGI
01095	ANTIMONY	204.2	<0.005	MG/L	4/20	K. VAGI
00925	MAGNESIUM	242.2	649.4	MG/L	4/19	E.BEROLDI
00935	POTASSIUM	258.1	155	MG/L	4/19	K. VAGI
	CONTINUED ON NEXT PAGE					

REMARKS:

REVIEWED BY: G. MEYER

BROWARD TESTING LABORATORY, INC.

POTABLE WATER LABORATORY CERTIFICATION NUMBER 86137
ENVIRONMENTAL LABORATORY CERTIFICATION NUMBER 86035

LABORATORY PARAMETER ANALYSIS REPORT

PROJECT YOUNGQUIST BROS.

SOURCE #1 DEEP ZONE
LAB. NUMBER 90-1204
GROUND WATER CLASS
SAMPLED BY R. SHARON
NO. WELL CASING VOL. PURGED

SAMPLE DATE 3/15/90
SAMPLE TIME 12:41
COMPLETION DATE 4/26/90
SAMPLE TYPE ( ) BACKGROUND
( ) SITE BOUNDRY
( ) INTERMEDIATE
( ) COMPLIANCE

STORET CODE	PARAMETER MONITORED	ANALYSIS METHOD	ANALYSIS RESULT	UNIT	DATE	ANALYST
00910	CALCIUM	406C	258.1	MG/L	3/29	E. BEROLDI
01080	STRONTIUM	303A	25.7	MG/L	4/23	K. VAGI
80110	SPECIFIC GRAVITY	213E	1.0037	G/ML	3/29	E. BEROLDI
00950	FLOURIDE	340.2	1.02	MG/L	3/21	M. HILL
00630	NITRATE	353.2	2.06	MG/L	3/27	E. BEROLDI
00080	COLOR	110.3	0	UNITS	3/16	E. BEROLDI
00941	CHLORIDES	4500CLC	6550	MG/L	3/22	M. HILL
00900	TOTAL HARDNESS	130.2	2154	MG/L	3/29	E. BEROLDI
00410	ALKALINITY	403	56	MG/L	3/16	E. BEROLDI
00901	CALCIUM HARDNESS	215.2	644	MG/L	3/29	E. BEROLDI
00310	BOD	405.1	<2.0	MG/L	3/21	M. HILL
00076	TURBIDITY	180.1	1.60	NTU	3/27	M. HILL
00085	ODOR	140.1	1	TON	3/16	E. BEROLDI
00945	SULFATE	426 C	1970	MG/L	4/4	E. GOLEM
70300	TOTAL DISSOLVED SOLID	160.1	11,514	MG/L	3/22	M. HILL
00665	TOTAL PHOSPHATE	365.4	<0.20	MG/L	3/26	E. BEROLDI
70507	ORTHO PHOSPHATE	365.4	<0.20	MG/L	3/26	E. BEROLDI
00625	TKN	351.2	0.75	MG/L	3/26	E. BEROLDI
00440	BICARBONATE	406C	34.2	MG/L	4/19	E. BEROLDI
00681	TOTAL ORGANIC CARBON	415.1	4.04	MG/L	3/23	E. GOLEM
00530	TOTAL SUSPENDED SOLIDS	160.2	36	MG/L	3/16	M. HILL
01020	BORON	212.3	<0.5	MG/L	4/23	K. VAGI
	625 SCAN					
	608 SCAN					
	504 SCAN	SEE ATTACHED SHEETS				
	502.2 SCAN					
	GROSS ALPHA					

REMARKS:

BROWARD TESTING LABORATORY, INC.
POST OFFICE BOX 23541 FORT LAUDERDALE, FLORIDA 33307 TELEPHONE: (305) 776-7236 FAX: (305) 776-0689

CLIENT: YOONGQUIST BROS.

REPORT NO: _____ LAB ID NO: 86137

PWS ID NO: 87240

SAMPLE SITE: #1 DEEP ZONE

DATE SAMPLED: 3/15/90 TIME SAMPLED: 12:41

DATE RECEIVED AT LAB: _____ TIME RECEIVED AT LAB: _____

ANALYTICAL SERIES: FLORIDA SAFE DRINKING WATER COMPLIANCE.
RADIOLOGICAL ANALYSIS 17-550.310(5). (PWS033)
ALL VALUES IN pCi/L UNLESS OTHERWISE NOTED.

LAB # 90-1204

PARAMETER	REPORTED VALUE	
RADIONUCLIDES:	0+/-5	PCI/L

Frank D. Hoble

FRANK D. HOBLE, DIRECTOR
BROWARD TESTING LABORATORY, INC.

POTABLE WATER LABORATORY CERTIFICATION NUMBER #6137
ENVIRONMENTAL LABORATORY CERTIFICATION NUMBER #6035

METHOD 504 EDB AND DBCP: MICROEXTRACTION/ECGC

LABORATORY PARAMETER ANALYSIS REPORT

PROJECT YOUNGQUIST BROS.

SOURCE #1 DEEP ZONE
LAB. NUMBER 90-1204
GROUND WATER CLASS
SAMPLED BY R. SHARON
NO. WELL CASING VOL. PURGED

SAMPLE DATE 3/15/90
SAMPLE TIME 12:41
COMPLETION DATE 4/26/90
SAMPLE TYPE ( ) BACKGROUND
( ) SITE BOUNDRY
( ) INTERMEDIATE
( ) COMPLIANCE

CAS NO.	PARAMETER MONITORED	ANALYSIS METHOD	ANALYSIS RESULT	UNIT	DATE	ANALYST
106-93-4	1,2-DIBROMOETHANE (EDB)	504	<0.02	UG/L	3/15	C. AMON
96-12-8	1,2-DIBROMO-3-CHLOROPROPANE (DBCP)	504	<0.02	UG/L	"	"

Remarks:

REVIEWED BY: G. MEYER

POTABLE WATER LABORATORY CERTIFICATION NUMBER #6137
ENVIRONMENTAL LABORATORY CERTIFICATION NUMBER #6035

METHOD 502.2. VOLATILE ORGANIC COMPOUNDS IN WATER BY PURGE AND TRAP CAPILLARY COLUMN GAS CHROMATOGRAPHY WITH PHOTOIONIZATION AND ELECTROLYTIC CONDUCTIVITY DETECTORS IN SERIES

LABORATORY PARAMETER ANALYSIS REPORT

PROJECT YOUNGQUIST BROS.

SOURCE # 1 DEEP ZONE
LAB. NUMBER 90-1204
GROUND WATER CLASS
SAMPLED BY R. SHARON
NO. WELL CASING VOL. PURGED

SAMPLE DATE 3/15/90
SAMPLE TIME 12:41
COMPLETION DATE 4/26/90
SAMPLE TYPE ( ) BACKGROUND
( ) SITE BOUNDRY
( ) INTERMEDIATE
( ) COMPLIANCE

CAS NO.	PARAMETER MONITORED	ANALYSIS METHOD	ANALYSIS RESULT	UNIT	DATE	ANALYST
71-43-2	BENZENE	502.2	<1.0	UG/L	3/19	C. AMON
108-86-1	BROMOBENZENE	502.2	<1.0	UG/L	"	"
74-97-5	BROMOCHLOROMETHANE	502.2	<1.0	UG/L	"	"
75-27-4	BROMODICHLOROMETHANE	502.2	<1.0	UG/L	"	"
75-25-2	BROMOFORM	502.2	<1.6	UG/L	"	"
74-83-9	BROMOMETHANE	502.2	<1.1	UG/L	"	"
104-51-8	n-BUTYLBENZENE	502.2	<1.0	UG/L	"	"
135-98-8	sec-BUTYLBENZENE	502.2	<1.0	UG/L	"	"
98-06-6	tert-BUTYLBENZENE	502.2	<1.0	UG/L	"	"
56-23-5	CARBON TETRACHLORIDE	502.2	<1.0	UG/L	"	"
108-90-7	CHLOROBENZENE	502.2	<1.0	UG/L	"	"
75-00-3	CHLOROETHANE	502.2	<1.0	UG/L	"	"
67-66-3	CHLOROFORM	502.2	<1.0	UG/L	"	"
74-87-3	CHLOROMETHANE	502.2	<1.0	UG/L	"	"
95-49-8	2-CHLOROTOLUENE	502.2	<1.0	UG/L	"	"
106-43-4	4-CHLOROTOLUENE	502.2	<1.0	UG/L	"	"
124-48-1	DIBROMOCHLOROMEHTANE	502.2	<2.0	UG/L	"	"
96-12-8	1,2-DIBROMO-3-CHLOROPROPANE	502.2	<3.0	UG/L	"	"
106-93-4	1,2-DIBROMOETHANE	502.2	<0.8	UG/L	"	"
74-95-3	DIBROMOMETHANE	502.2	<2.2	UG/L	"	"
95-50-1	1,2-DICHLOROBENZENE	502.2	<1.0	UG/L	"	"
541-73-1	1,3-DICHLOROBENZENE	502.2	<1.0	UG/L	"	"
106-46-7	1,4-DICHLOROBENZENE	502.2	<1.0	UG/L	"	"
75-71-8	DICHLORODIFLUOROMETHANE	502.2	<1.0	UG/L	"	"
75-34-3	1,1-DICHLOROETHANE	502.2	<1.0	UG/L	"	"
107-06-2	1,2-DICHLOROETHANE	502.2	<1.0	UG/L	"	"
75-35-4	1,1-DICHLOROETHENE	502.2	<1.0	UG/L	"	"
156-59-4	cis-1,2-DICHLOROETHENE	502.2	<1.0	UG/L	"	"
156-60-5	trans-1,2-DICHLOROETHENE	502.2	<1.0	UG/L	"	"
78-87-5	1,2-DICHLOROPROPANE	502.2	<1.0	UG/L	"	"

REMARKS:

REVIEWED BY: G. MEYER

POTABLE WATER LABORATORY CERTIFICATION NUMBER 86137
ENVIRONMENTAL LABORATORY CERTIFICATION NUMBER 86035

METHOD 502.2, VOLATILE ORGANIC COMPOUNDS IN WATER BY PURGE AND TRAP CAPILLARY COLUMN GAS CHROMATOGRAPHY WITH PHOTOIONIZATION AND ELECTROLYTIC CONDUCTIVITY DETECTORS IN SERIES

LABORATORY PARAMETER ANALYSIS REPORT

PROJECT YOUNGQUIST BROS.

SOURCE #1 DEEP ZONE
LAB. NUMBER 90-1204
GROUND WATER CLASS
SAMPLED BY R. SHARON
NO. WELL CASING VOL. PURGED

SAMPLE DATE 3/15/90
SAMPLE TIME 12:41
COMPLETION DATE 4/26/90
SAMPLE TYPE ( ) BACKGROUND
( ) SITE BOUNDRY
( ) INTERMEDIATE
( ) COMPLIANCE

CAS NO.	PARAMETER MONITORED	ANALYSIS METHOD	ANALYSIS RESULT	UNIT	DATE	ANALYS
142-28-9	1,3-DICHLOROPROPANE	502.2	<1.0	UG/L	3/19	C. AMO
590-20-7	2,2-DICHLOROPROPANE	502.2	<1.0	UG/L	"	"
563-58-6	1,1-DICHLOROPROPENE	502.2	<1.0	UG/L	"	"
100-41-4	ETHYLBENZENE	502.2	<1.0	UG/L	"	"
87-68-3	HEXACHLOROBUTADIENE	502.2	<1.0	UG/L	"	"
98-82-8	ISOPROPYLBENZENE	502.2	<1.0	UG/L	"	"
99-87-6	p-ISOPROPYLTOLUENE	502.2	<1.0	UG/L	"	"
75-09-2	METHYLENE CHLORIDE	502.2	<1.0	UG/L	"	"
91-20-3	NAPHTHALENE	502.2	<1.0	UG/L	"	"
103-65-1	n-PROPYLBENZENE	502.2	<1.0	UG/L	"	"
100-42-5	STYRENE	502.2	<1.0	UG/L	"	"
630-20-6	1,1,1,2-TETRACHLOROETHANE	502.2	<1.0	UG/L	"	"
79-34-5	1,1,2,2-TETRACHLOROETHANE	502.2	<1.0	UG/L	"	"
127-18-4	TETRACHLOROETHENE	502.2	<1.0	UG/L	"	"
108-88-3	TOLUENE	502.2	<1.0	UG/L	"	"
87-61-6	1,2,3-TRICHLOROBENZENE	502.2	<1.0	UG/L	"	"
120-82-1	1,2,4-TRICHLOROBENZENE	502.2	<1.0	UG/L	"	"
71-55-6	1,1,1-TRICHLOROETHANE	502.2	<1.0	UG/L	"	"
79-00-5	1,1,2-TRICHLOROETHANE	502.2	<1.0	UG/L	"	"
79-01-6	TRICHLOROETHENE	502.2	<1.0	UG/L	"	"
75-69-4	TRICHLOROFLUOROMETHANE	502.2	<1.0	UG/L	"	"
96-18-4	1,2,3-TRICHLOROPROPANE	502.2	<1.0	UG/L	"	"
95-63-6	1,2,4-TRIMETHYLBENZENE	502.2	<1.0	UG/L	"	"
108-67-8	1,3,5-TRIMETHYLBENZENE	502.2	<1.0	UG/L	"	"
75-01-4	VINYL CHLORIDE	502.2	<1.0	UG/L	"	"
95-47-6	o-XYLENE	502.2	<1.0	UG/L	"	"
108-38-3	m-XYLENE	502.2	<1.0	UG/L	"	"
106-42-3	p-XYLENE	502.2	<1.0	UG/L	"	"

REMARKS:

REVIEWED BY: G. MEYER

BROWARD TESTING LABORATORY, INC.
POTABLE WATER LABORATORY CERTIFICATION NUMBER #6137
ENVIRONMENTAL LABORATORY CERTIFICATION NUMBER #6035

ORGANOCHLORINE PESTICIDES AND PCB'S
METHOD - 608
LABORATORY PARAMETER ANALYSIS REPORT

PROJECT YOUNGQUIST BROS.

SOURCE #1 DEEP ZONE
LAB. NUMBER 90-1204
GROUND WATER CLASS
SAMPLED BY R. SHARON
NO. WELL CASING VOL. PURGED

SAMPLE DATE 3/15/90
SAMPLE TIME 12:41
COMPLETION DATE 4/26/90
SAMPLE TYPE ( ) BACKGROUND
( ) SITE BOUNDRY
( ) INTERMEDIATE
( ) COMPLIANCE

STORET CODE	PARAMETER MONITORED	ANALYSIS METHOD	ANALYSIS RESULT	UNIT	DATE	ANALYST
39330	ALDRIN	608	<1.0	UG/L	4/3	C. AMON
39337	A-BHC	608	<1.0	UG/L	"	"
39338	B-BHC	608	<1.0	UG/L	"	"
34259	D-BHC	608	<1.0	UG/L	"	"
39340	Y-BHC	608	<1.0	UG/L	"	"
39350	CHLORDANE	608	<1.0	UG/L	"	"
39310	4,4'-DDD	608	<1.0	UG/L	"	"
39320	4,4'-DDE	608	<1.0	UG/L	"	"
39300	4,4'-DDT	608	<1.0	UG/L	"	"
39380	DIELDRIN	608	<1.0	UG/L	"	"
34361	ENDOSULFAN I	608	<1.0	UG/L	"	"
34356	ENDOSULFAN II	608	<1.0	UG/L	"	"
34351	ENDOSULFAN SULFATE	608	<1.0	UG/L	"	"
39390	ENDRIN	608	<1.0	UG/L	"	"
34366	ENDRIN ALDEHYDE	608	<1.0	UG/L	"	"
39410	HEPTACHLOR	608	<1.0	UG/L	"	"
39420	HEPTACHLOR EPOXIDE	608	<1.0	UG/L	"	"
39400	TOXAPHENE	608	<1.0	UG/L	"	"
34671	PCB-1016	608	<1.0	UG/L	"	"
39488	PCB-1221	608	<1.0	UG/L	"	"
39492	PCB-1232	608	<1.0	UG/L	"	"
39496	PCB-1242	608	<1.0	UG/L	"	"
39500	PCB-1248	608	<1.0	UG/L	"	"
39504	PCB-1254	608	<1.0	UG/L	"	"
39508	PCB-1260	608	<1.0	UG/L	"	"
39480	METHOXYCHLOR	608	<1.0	UG/L	"	"

REMARKS:

REVIEWED BY: G. MEYR

BROWARD TESTING LABORATORY
POTABLE WATER LABORATORY CERTIFICATION NUMBER 86137
ENVIRONMENTAL LABORATORY CERTIFICATION NUMBER 86035

METHOD 625 - BASE NEUTRALS

LABORATORY PARAMETER ANALYSIS REPORT

PROJECT YOUNGQUIST BROS.

SOURCE #1 DEEP ZONE
LAB. NUMBER 90-1204
GROUND WATER CLASS
SAMPLED BY R. SHARON
NO. WELL CASING VOL. PURGED

SAMPLE DATE 3/15/90
SAMPLE TIME 12:41
COMPLETION DATE 4/26/90
SAMPLE TYPE ( ) BACKGROUND
( ) SITE BOUNDRY
( ) INTERMEDIATE
( ) COMPLIANCE

STORET CODE	PARAMETER MONITORED	ANALYSIS METHOD	ANALYSIS RESULT	UNIT	DATE	ANALYST
34205	ACENAPHTHENE	625	<1.9	UG/L	4/3/90	E. BURR
34200	ACENAPHTHYLENE	625	<3.5	UG/L	"	"
34220	ANTHRACENE	625	<1.9	UG/L	"	"
39330	ALDRIN	625	<1.9	UG/L	"	"
39120	BENZIDINE	625	<44	UG/L	"	"
34526	BENZO(A)ANTHRACENE	625	<3.7	UG/L	"	"
34230	BENZO(B)FLUORANTHENE	625	<2.5	UG/L	"	"
34242	BENZO(K)FLUORANTHENE	625	<2.5	UG/L	"	"
34247	BENZO(A)PYRENE	625	<3.7	UG/L	"	"
34521	BENZO(GHI)PERYLENE	625	<4.1	UG/L	"	"
34292	BENZYLBUTYLPHTHALATE	625	<2.5	UG/L	"	"
39337	A-BHC	625	<4.2	UG/L	"	"
39338	B-BHC	625	<10.0	UG/L	"	"
34259	D-BHC	625	<10.0	UG/L	"	"
39340	G-BHC	625	<3.1	UG/L	"	"
34273	BIS(2-CHLOROETHYL)ETHER	625	<5.6	UG/L	"	"
34278	BIS(2-CHLOROETHOXY)METHANE	625	<5.3	UG/L	"	"
39100	BIS(2-ETHYLHEXYL) PHTHALATE	625	<2.5	UG/L	"	"
34283	BIS(2-CHLOROISOPROPYL)ETHER	625	<5.7	UG/L	"	"
34636	4-BROMOPHENYLPHENYLETHER	625	<1.9	UG/L	"	"
39350	CHLORDANE	625	<10.0	UG/L	"	"
34581	2-CHLORONAPHTHALENE	625	<1.9	UG/L	"	"
34641	4-CHLOROPHENYLPHENYLETHER	625	<4.2	UG/L	"	"
34320	CHRYSENE	625	<2.5	UG/L	"	"
39310	4,4'-DDD	625	<2.8	UG/L	"	"
39320	4,4'-DDE	625	<5.6	UG/L	"	"
39300	4,4'-DDT	625	<4.7	UG/L	"	"
34556	DIBENZO(A,H)ANTHRACENE	625	<2.5	UG/L	"	"
39110	DI-N-BUTYLPHTHALATE	625	<2.5	UG/L	"	"
34566	1,3-DICHLOROBENZENE	625	<1.9	UG/L	"	"
34536	1,2-DICHLOROBENZENE	625	<1.9	UG/L	"	"
34571	1,4-DICHLOROBENZENE	625	<4.4	UG/L	"	"
34631	3,3'DICHLOROBENZIDINE	625	<16.5	UG/L	"	"
39380	DIELDRIN	625	<2.5	UG/L	"	"
34336	DIETHYLPHTHALATE	625	<1.9	UG/L	"	"

Remarks:

REVIEWED BY: G. MEYER

POTABLE WATER LABORATORY CERTIFICATION NUMBER #6137
ENVIRONMENTAL LABORATORY CERTIFICATION NUMBER #6035

METHOD 625 - BASE NEUTRALS

LABORATORY PARAMETER ANALYSIS REPORT

PROJECT YOUNGQUIST BROS.

SOURCE #1 DEEP ZONE
LAB. NUMBER 90-1204
GROUND WATER CLASS
SAMPLED BY P. SHARON
NO. WELL CASING VOL. PURGED

SAMPLE DATE 3/15/90
SAMPLE TIME 12:41
COMPLETION DATE 4/26/90
SAMPLE TYPE ( ) BACKGROUND
( ) SITE BOUNDRY
( ) INTERMEDIATE
( ) COMPLIANCE

STORET CODE	PARAMETER MONITORED	ANALYSIS METHOD	ANALYSIS RESULT	UNIT	DATE	ANALYST
34341	DIMETHYLPHTHALATE	625	<1.6	UG/L	4/3	E.BURR
34611	2,4-DINITROTOLUENE	625	<5.7	UG/L	"	"
34626	2,6-DINITROTOLUENE	625	<1.9	UG/L	"	"
34596	DI-N-OCTYLPHTHALATE	625	<4.8	UG/L	"	"
34361	ENDROSULFAN I	625	<5.0	UG/L	"	"
34356	ENDROSULFAN II	625	<7.5	UG/L	"	"
34531	ENDROSULFAN SULFATE	625	<5.6	UG/L	"	"
39390	ENDRIN	625	<4.5	UG/L	"	"
34366	ENDRIN ALDEHYDE	625	<5.0	UG/L	"	"
34376	FLUORANTHENE	625	<2.2	UG/L	"	"
34381	FLUORENE	625	<1.9	UG/L	"	"
39410	HEPTACHLOR	625	<1.9	UG/L	"	"
39420	HEPTCHLOR EPOXIDE	625	<2.2	UG/L	"	"
39700	HEXACHLOROBENZENE	625	<1.9	UG/L	"	"
34391	HEXACHLOROBUTADIENE	625	<1.0	UG/L	"	"
34396	HEXACHLOROETHANE	625	<1.6	UG/L	"	"
34386	HEXACHLOROCYLOPENTADIENE	625	<10.0	UG/L	"	"
34403	INDENO(1,2,3-CD)PYRENE	625	<3.7	UG/L	"	"
34408	ISOPHORONE	625	<2.2	UG/L	"	"
34696	NAPHTHALENE	625	<1.6	UG/L	"	"
34447	NITROBENZENE	625	<1.9	UG/L	"	"
34338	N-NITROSODIMETHYLAMINE	625	<8.0	UG/L	"	"
34433	N-NITROSODIPHENYLAMINE	625	<1.9	UG/L	"	"
34428	N-NITROSODI-N-PROPYLAMINE	625	<10.0	UG/L	"	"
34671	PCB-1016	625	<30.0	UG/L	"	"
39488	PCB-1221	625	<50.0	UG/L	"	"
39492	PCB-1232	625	<50.0	UG/L	"	"
39496	PCB-1242	625	<30.0	UG/L	"	"
39500	PCB-1248	625	<40.0	UG/L	"	"
39504	PCB-1254	625	<30.5	UG/L	"	"
39508	PCB-1260	625	<30.5	UG/L	"	"
34461	PHENANTHRENE	625	<5.4	UG/L	"	"
34469	PYRENE	625	<1.9	UG/L	"	"
39400	TOXAPHENE	625	<20.0	UG/L	"	"
34551	1,2,4-TRICHLOROBENZENE	625	<1.4	UG/L	"	"

REMARKS:

REVIEWED BY: G. MEYER

BROWARD TESTING LABORATORY, INC.
LABORATORY CERTIFICATION NUMBER 86137
E-86035

METHOD 625 - ACIDS

LABORATORY PARAMETER ANALYSIS REPORT

PROJECT YOUNGQUIST BROS .

SOURCE #1 DEEP ZONE
LAB. NUMBER 90-1204
GROUND WATER CLASS
SAMPLED BY R. SHARON
NO. WELL CASING VOL. PURGED

SAMPLE DATE 3/15/90
SAMPLE TIME 12:41
COMPLETION DATE 4/26/90
SAMPLE TYPE ( ) BACKGROUND
( ) SITE BOUNDRY
( ) INTERMEDIATE
( ) COMPLIANCE

STORET CODE	PARAMETER MONITORED	ANALYSIS METHOD	ANALYSIS RESULT	UNIT	DATE	ANALYST
34452	4-CHLORO-3-METHYLPHENOL	625	<3.0	UG/L	4/3	E. BURR
34586	2-CHLOROPHENOL	625	<3.3	UG/L	"	"
34601	2,4-DICHLOROPHENOL	625	<2.7	UG/L	"	"
34606	2,4-DIMETHYLPHENOL	625	<2.7	UG/L	"	"
34616	2,4-DINITROPHENOL	625	<42	UG/L	"	"
34657	2-MET'-4,6-DINITROPHENOL	625	<24	UG/L	"	"
34591	2-NITROPHENOL	625	<3.6	UG/L	"	"
34646	4-NITROPHENOL	625	<2.4	UG/L	"	"
39032	PENTACHLOROPHENOL	625	<3.6	UG/L	"	"
34694	PHENOL	625	<1.5	UG/L	"	"
34621	2,4,6-TRICHLOROPHENOL	625	<2.7	UG/L	"	"

REMARKS:

REVIEWED BY: G. MEYER

ENVIRONMENTAL LABORATORY CERTIFICATION NUMBER 86035

EPA METHOD 625 SECT. 17
SCREEN FOR 2,3,7,8-TCDD

PROJECT YOUNGQUIST BROS.
MONITORING SITE #1 DEEP WELL
SAMPLED BY R. SHARON

SAMPLE DATE 3/15/90
SAMPLE TIME 12:41
SAMPLE TYPE: ( ) BACKGROUND
( ) COMPLIANCE

STORET CODE	PARAMETER MONITORED	Presence	
		indicated	not indicat
34675	2,3,7,8-Tetra chlorodibenzo-p-dioxin		X

APPENDIX F

Well Casing Mill Certificates

12.1.6
12.5.6

LETTER OF TRANSMITTAL

HOME OFFICE
YOUNGQUIST BROS., INC.
15000 PINERIDGE ROAD
FORT MYERS, FL 33908
(813) 489-4444

FIELD OFFICE (RETURN TO) Jimmy Brantley
2401 N. Powerline
Pompano Beach, Fl. 33069

DATE: 12-28-89 JOB NO.:

RE: BCOES Monitor Well
Mill Certs

RECEIVED
JAMES M. MONTGOMERY,
CONSULTING ENGINEERS, INC.
~~IN ASSOCIATION WITH~~
HAZEN AND SAWYER, P.C.
FIELD OFFICE
JAN 0 2 1990

TO: Hazen & Sawyer

ADDRESS: BCOES Field Office

CITY: Pompano Beach Fl, 33069

ATTENTION: Ron Courtney

PLEASE BE ADVISED:

WE ARE SENDING YOU ☒ ATTACHED ☐ UNDER SEPARATE COVER VIA _____ THE FOLLOWING:

☐ PRINTS ☐ PLANS ☐ SHOP DRAWINGS ☐ SAMPLES ☐ SPECIFICATIONS

☐ ARTWORK ☐ PROOFS ☐ PHOTOGRAPHS ☐ COPY OF LETTER ☐ CHANGE ORDER

☐ Mill Certifications on 6 5/8" Casing

	NO.	DATE	COPIES	DESCRIPTION
1		12-28	4	Mill Certifications for 6 5/8" Casing
2				
3				
4				
5				

THESE ARE BEING TRANSMITTED AS INDICATED BELOW:

☐ AS REQUESTED ☐ APPROVED AS IS ☐ SUBMIT ____ COPIES FOR DISTRIBUTION

☒ FOR APPROVAL ☐ APPROVED WITH CORRECTIONS ☐ RETURN ____ CORRECTED ____

☐ FOR YOUR USE ☐ RETURNED WITH CORRECTIONS ☐ RETURNED AFTER LOAN TO US

☐ FOR YOUR COMMENTS ☐ RESUBMIT ____ COPIES FOR APPROVAL ☐ _____

☐ FOR BID(S) DUE _____

COMMENTS: _____

SIGNED: _____

METALLURGICAL TEST REPORT

REQ. JOB, CONTRACT NO.

P.O. DATE | PURCHASE ORDER NO. WW022-44

SHIPPERS NO. P18580 | MILL ORDER NO. DR55145 | INVOICE NO. 488-28712

VEHICLE IDENTITY 0475 11/02/89

VENDOR
FAIRFIELD WORKS
P.O. BOX 599
FAIRFIELD, AL 35064

SOLD TO
L B FOSTER CO
TUBULAR PRODUCTS DIV
415 HOLIDAY DRIVE
PITTSBURGH PA 15220

MAIL TO
L B FOSTER CO
ORLANDO FL

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MFGD., SAMPLED, TESTED, AND/OR INSPD. IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECTS.

PREPARED BY THE OFFICE OF:
F.W. MOORE MGR Q.A.

DATE 11/07/89

SPEC. & YR. PSAA PIPE CARBON SMLS STD PIPE API 5L/ASTM A53-88A/ASTM A106-88A GRADE B TRIPLE STENCIL BLK BARE PE BEV 30 DEG SPEC REV NAME 37TH EDITION DTD 5/88 SPEC DATE 88/88

INSP 01 MILL
CERTIFIED T/R

ITEM NO.	MATERIAL DESCRIPTION: SIZE	WALL	SPECIFICATION & GRADE	MATL.	HEAT/LOT NO.	MIN. HYDRO PSI	YIELD STR. PSI	TENSILE STR. PSI	ELONG. % IN 2"	GAGE WIDTH OR	FLAT	BEND
001	8.8250	0.5620		SMLS	RY1569	4450	45,700	78,000	42.0	1.5	UR	
						END OF DATA						

ALSO MEETS THE REQUIREMENTS OF ASME SA53 1989
& SA106 - 1989
LONGITUDINAL STRIP TENSILE SPECIMENS UNLESS NOTED
YIELD STRENGTH @ .005 EXT.

ITEM NO	HEAT NO.	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO
001	RY1569	HEAT	.25	.90	.010	.003	.24	.02	.03	.08	.02				.000				
		PROD	.24	.93	.012	.009	.24	.02	.02	.09	.02				.000				
		PROD	.27	.93	.012	.009	.24	.02	.03	.09	.02				.000				
				END OF DATA															

476001010 3- - CAA

K61078-26

METALLURGICAL TEST REPORT

REQ. JOB. CONTRACT NO.

P.O. DATE | PURCHASE ORDER NO. WW022-44[illegible]

SHIPPERS NO. P18580 | BILL OF LADING NO. DR35145 | INVOICE NO. 488-28712

VEHICLE IDENTITY 8475 | 11702789

VENDOR
FAIRFIELD WORKS
P O BOX 599
FAIRFIELD, AL 35064

SOLD TO
L B FOSTER CO
TUBULAR PRODUCTS DIV
415 HOLIDAY DRIVE
PITTSBURGH PA 15220

MAIL TO
L B FOSTER CO
ORLANDO FL

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WA MFGD., SAMPLED, TESTED, AND OR INSPD. IN ACCORDANCE WIT THE SPECIFICATION AND FUL-FILLS REQUIREMENTS IN SUCH RESPECTS.

PREPARED BY THE OFFICE OF:
F.W. MOORE MGR Q.A.

DATE 11/07/89

SPEC. & INSP. PSAA PIPE CARBON SMLS STD PIPE API 5L/ASTM A53-88A/ASTM A106-88A GRADE B TRIPLE STENCIL BLK BARE PE BEV 30 DEG SPEC REV NAME 37Th EDITION DTD 5/88 SPEC DATE 88/88

INSP 01 MILL
CERTIFIED T/R

ITEM NO.	MATERIAL DESCRIPTION: SIZE	WALL	SPECIFICATION & GRADE	MATL	HEAT/ LOT NO.	MIN. HYDRO PSI	YIELD STR. PSI	TENSILE STR. PSI	ELONG. % IN 2"	GAGE WIDTH IN	FLAT	BEND
001	8.6250	0.5620		SMLS	RY1569	4450	45,700	78,000	42.0	1.5	UR	
						END OF DATA						

ALSO MEETS THE REQUIREMENTS OF ASME SA53 1989
& SA106 - 1989
LONGITUDINAL STRIP TENSILE SPECIMENS UNLESS NOTED
YIELD STRENGTH @ .005 EXT.

ITEM NO	HEAT NO.	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO
001	RY1569	HEAT	.25	.90	.010	.003	.24	.02	.03	.08	.02								
		PROD	.24	.93	.012	.009	.24	.02	.03	.09	.02				.000				
		PROD	.27	.93	.012	.009	.24	.02	.03	.09	.02				.000				
		END OF DATA																	

476001010 3- - CAA

K6107B-26

METALLURGICAL TEST REPORT

REQ. JOB, CONTRACT NO.

P.O. DATE | PURCHASE ORDER NO. WW022-41[illegible]

SHIPPERS NO. P18580 | MILL ORDER NO DR35145 | INVOICE NO. 488-28712

VEHICLE IDENTITY 0495 | 11/02/89

VENDOR
FAIRFIELD WORKS
P. O. BOX 599
FAIRFIELD, AL 35064

SOLD TO
L B FOSTER CO
TUBULAR PRODUCTS DIV
415 HOLIDAY DRIVE
PITTSBURGH PA 15220

MAIL TO
L B FOSTER CO
ORLANDO FL

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MFGD., SAMPLED, TESTED, AND/OR INSPD. IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECTS.

PREPARED BY THE OFFICE OF:
F.W. MOORE MGR Q.A.

DATE 11/07/89

SPEC. & INSP. PSAA PIPE CARBON SMLS STD PIPE API 5L/ASTM A53-88A/ASTM A106-88A GRADE B TRIPLE STENCIL BLK BARE PE BEV 30 DEG SPEC REV NAME 37Th EDITION OTD 5/88 SPEC DATE 88/88

INSP 01 MILL
CERTIFIED T/R

ITEM NO.	MATERIAL DESCRIPTION: SIZE	WALL	SPECIFICATION & GRADE	MATL.	HEAT/LOT NO.	MIN. HYDRO PSI	YIELD STR. PSI	TENSILE STR. PSI	ELONG. % IN 2"	GAGE WIDTH IN	FLAT	BEND
001	8.6250	0.5620		SMLS	RY1589	4450	45,700	78,000	42.0	1.5	DR	
						END OF DATA						

ALSO MEETS THE REQUIREMENTS OF ASME SA53 1989
& SA106 - 1989
LONGITUDINAL STRIP TENSILE SPECIMENS UNLESS NOTED
YIELD STRENGTH @ .005 EXT.

ITEM NO	HEAT NO.	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO
001	RY1589	HEAT	.25	.90	.010	.009	.24	.02	.03	.08	.02				.000				
		PROD	.24	.93	.012	.009	.24	.02	.02	.09	.02				.000				
		PROD	.27	.95	.012	.009	.24	.02	.03	.09	.02				.000				
		END OF DATA																	

17600101O 3- - CAA

R6107B-26

METALLURGICAL TEST REPORT

REQ. JOB, CONTRACT NO.

P.O. DATE | PURCHASE ORDER NO. WW022-414

SHIPPERS NO. 18580 | MILL ORDER NO. DR35145 | INVOICE NO. 488-28712

VEHICLE IDENTITY 8495 | 11/02/89

FROM: FAIRFIELD WORKS
P.O. BOX 599
FAIRFIELD AL 35064

SOLD TO: L B FOSTER CO
TUBULAR PRODUCTS DIV
415 HOLIDAY DRIVE
PITTSBURGH PA 15220

MAIL TO: L B FOSTER CO
ORLANDO FL

THIS IS TO CERTIFY THAT TH
PRODUCT DESCRIBED HEREIN W
MFGD, SAMPLED, TESTED, AN
OR INSPD IN ACCORDANCE WI
THE SPECIFICATION AND FUL-
FILLS REQUIREMENTS IN SUCH
RESPECTS.

PREPARED BY THE OFFICE OF:
F.W. MOORE MGR Q.A.

DATE 11/07/89

SPEC. & INSP. PSAA PIPE CARBON SMLS STD PIPE API 5L/ASTM A53-88A/ASTM A106-88A GRADE B TRIPLE STENCIL BLK BARE PE BEV 30 DEG SPEC REV NAME 37TH EDITION DTD 5/88 SPEC DATE 88/88

INSP 01 MILL
CERTIFIED T/R

ITEM NO.	MATERIAL DESCRIPTION: SIZE	WALL	SPECIFICATION & GRADE	MATL	HEAT/LOT NO.	MIN. HYDRO PSI	YIELD STR. PSI	TENSILE STR. PSI	ELONG. % IN 2"	GAGE WIDTH IN.	FLAT	BE
001	8.6250	0.5620		SML	RY1569	4450	45,700	78,000	42.0	1.5	UK	
			END OF DATA									
			ALSO MEETS THE REQUIREMENTS OF ASME SA53 1989 & SA106 - 1989									
			LONGITUDINAL STRIP TENSILE SPECIMENS UNLESS NOTED									
			YIELD STRENGTH @ .005 EXT.									

ITEM NO.	HEAT NO.	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO
001	RY1569	HEAT	.25	.90	.010	.033	.24	.02	.03	.08	.02				.000				
		PROD	.24	.93	.012	.009	.24	.02	.02	.09	.02				.000				
		PROD	.27	.93	.012	.009	.24	.02	.03	.09	.02				.000				
				END OF DATA															

476001010 3- - CAA

R&107B-26

L. B. FOSTER COMPANY
Route 1, Box 15
Washington, WV 26181

STANDARD CERTIFIED TEST REPORT
TUBULAR PRODUCTS

CUSTOMER

Name: Youngquist Bros. Inc.

Address: 15000 Pine Ridge Road

City & State: Ft. Myers, Florida 33908

Date: November 8, 1989

Customer's Order No.: Phone - Jimmy

LBF Invoice No.: 23H-049721

Material: FOSTERWELD

Grade: ASTM A139 Gr.B

Coil or Lot. No.	Size O.D.	Wt/Ft. or Wall Thick.	Min. Hydro. Test Pres. P.S.I.	MECHANICAL PROPERTIES			CHEMICAL ANALYSIS (%)				
				Yield Strength P.S.I. Point	Tensile Strength P.S.I.	Elong. in 2" %	C	Mn	P	S	Si
765056	42"	.375	375	49,700	68,000	31.	.20	.50	.013	.013	
Y66921	42"	.375	375	45,900	64,000	34.	.19	.40	.008	.015	
Y40227	42"	.375	375	52,000	74,500	29.	.21	.44	.005	.011	
Y65739	42"	.375	375	55,000	74,500	33.	.23	.48	.011	.012	
W63605	42"	.375	375	52,000	70,000	30.	.20	.48	.008	.012	
Y66972	42"	.375	375	39,800	65,500	33.	.20	.46	.009	.013	
W63605	50"	.375	315	52,000	70,000	30.	.20	.48	.008	.012	
Y40227	50"	.375	315	52,000	74,500	29.	.21	.44	.005	.011	

OFFICIAL SEAL
NOTARY PUBLIC
STATE OF WEST VIRGINIA
Donald E. Adams
Rt. 4, Box 371
Parkersburg, W. Va. 26101
My commission expires August 4, 1996

The undersigned, in behalf of The L. B. Foster Company, hereby certifies that the above materials have been inspected and tested in accordance with the methods prescribed in the applicable specifications and the results of such inspection and tests shown above. In determining properties or characteristics for which no methods of inspecting or testing are prescribed by said specifications, the standard mill inspection and testing practices of The L. B. Foster Company have been applied. Unless it appears otherwise in the results of such inspection and tests shown above, the undersigned agent of The L. B. Foster Company believes that said materials conform to said specifications.

Subscribed and sworn to before me this 8th day of Nov. 19 89

Donald E. Adams
Notary Public

Robert E Blankensop
Robert E. Blankensop, Office Manager
Agents' Name & Title

L.B. Foster Company, Washington, W.Va.
COMPANY

Form No. - SW 4-69

L. B. FOSTER COMPANY
P. O. BOX 7796
GARDEN CITY, GA 31418-7796

STANDARD CERTIFIED TEST REPORT
TUBULAR PRODUCTS

CUSTOMER

Name: YOUNGQUIST BROS.

Address: 2401 N POWERLINE RD,

BLD #1-RM #116

City & State: POMPANO BEACH, FL 33069

Date: 11-28-89

PHONE: JIMMY

Customer's Order No.: 23H010-049720

LBF Invoice No.:

Material: 34" OD X .375

Grade: A-139 GR B

Heat No.	Size O.D.	Wt/Ft. or Wall Thick.	Min. Hydro. Test Pres. P.S.I.	MECHANICAL PROPERTIES			CHEMICAL ANALYSIS (%)				
				Yield Strength P.S.I. Point	Tensile Strength P.S.I.	Elong. in 2"	C	Mn	P	S	Si
C88070	34"	.375		43,500	71,100	35.4	22	41	013	022	
C88072	34"	.375		44,000	67,900	36.0	20	43	010	017	
C88073	34"	.375		42,400	72,900	36.5	21	44	011	016	
C88076	34"	.375		44,700	72,000	41.0	20	39	010	017	
5B00910	34"	.375		48,100	70,600	32.4	20	43	025	010	
U81790	34"	.375		41,800	62,700	40.0	21	46	008	009	
X85605	34"	.375		40,500	61,300	36.5	22	48	010	014	
X85604	34"	.375		45,800	72,000	31.0	21	45	009	011	

The undersigned, in behalf of The L. B. Foster Company, hereby certifies that the above materials have been inspected and tested in accordance with the methods prescribed in the applicable specifications and the results of such inspection and tests shown above. In determining properties or characteristics for which no methods of inspecting or testing are prescribed by said specifications, the standard mill inspection and testing practices of The L. B. Foster Company have been applied. Unless it appears otherwise in the results of such inspection and tests shown above, the undersigned agent of The L. B. Foster Company believes that said materials conform to said specifications.

Subscribed and sworn to before me this 28 day of Nov 19 89

Robert G. Stevenson
Notary Public

ROBERT G. STEVENSON
Notary Public, Effingham County, GA
MY Commission Expires May 18, 1993

Otis R Kessler
OTIS R. KESSLER, PLANT MANAGER
Agents' Name & Title

L. B. FOSTER CO
COMPANY

Form No. - SW 469

METALLURGICAL TEST REPORT

Q. JOB, CONTRACT NO.

P.O. DATE

PURCHASE ORDER NO. 149-71Y

SHIPPERS NO.

MILL ORDER NO. DR64925

INVOICE NO

VEHICLE IDENTITY 12/04/89

VENDOR USS TUBULAR PRODUCTS

SOLD TO
L E FOSTER CO
TUBULAR PRODUCTS DIV
415 HOLIDAY DRIVE
PITTSBURGH PA 15220

MAILED TO
L E FOSTER CO
TUBULAR PRODUCTS DIV
415 HOLIDAY DRIVE
PITTSBURGH PA 15220

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MFGD., SAMPLED, TESTED, AND/OR INSPD. IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECTS.
APPROVED BY THE OFFICE OF:
D.S. DABKOWSKI MGR. MET. & Q.A. USS TUBULAR PRODUCTS.

DATE 12/05/89

SPEC & INSP.

ITEM NO.	MATERIAL DESCRIPTION SIZE	WALL	SPECIFICATION & GRADE	MATL.	HEAT/ LOT NO.	MIN. HYDRO PSI	YIELD STR. PSI	TENSILE STR. PSI	ELONG. % IN 2"	GAGE WIDTH IN.	FLAT	BEN
1	24 OD	.500	ASTMA5388AGRBASMESA53GRB86	SMLS	N88552	1090	45800	75900	40.0	1 1/2	OK	
	ED1988ADDASTMA10688AGRBASMESA106GRB86ED1988ADDAPI5LGRB37TH						ED 5/88					
1	24 OD	.500	ASTMA5388AGRBASMESA53GRB86	SMLS	N88554	1090	42600	74400	41.0	1 1/2	OK	
	ED1988ADDASTMA10688AGRBASMESA106GRB86ED1988ADDAPI5LGRB37TH						ED 5/88					
1	24 OD	.500	ASTMA5388AGRBASMESA53GRB86	SMLS	N88557	1090	42000	73800	40.0	1 1/2	OK	
	ED1988ADDASTMA10688AGRBASMESA106GRB86ED1988ADDAPI5LGRB37TH						ED 5/88					
1	24 OD	.500	ASTMA5388AGRBASMESA53GRB86	SMLS	N88558	1090	43900	73800	38.0	1 1/2	OK	
	ED1988ADDASTMA10688AGRBASMESA106GRB86ED1988ADDAPI5LGRB37TH						ED 5/88					

ITEM NO.	HEAT NO.	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO	
1	N85352	HEAT	.25	.67	.010	.006	.260	.02	.02	.06	.02				**					**LESS THAN .01
1	N88352	PROD	.25	.66	.009	.005	.250													
1	N88354	HEAT	.26	.64	.011	.013	.210	.02	.02	.06	.02				**					**LESS THAN .01
1	N88354	PROD	.27	.67	.011	.017	.240													
1	N88357	HEAT	.25	.65	.009	.008	.230	.02	.02	.06	.02				**					**LESS THAN .01
1	N88357	PROD	.25	.68	.009	.009	.230													
1	N88358	HEAT	.25	.66	.010	.011	.230	.02	.02	.07	.02				**					**LESS THAN .01
1	N88358	PROD	.24	.67	.010	.012	.230													

** END OF DATA THIS SHEET ***

31.000 0790 (REV. 7-88) DECIMAL POSITIONS FOR ELEMENTS ARE INDICATED BY THE LEFT MARGIN, VERTICAL DOTTED LINE OR DECIMAL POINT.

L. B. FOSTER COMPANY
P. O. BOX 7796
GARDEN CITY, GA 31418-7796

STANDARD CERTIFIED TEST REPORT
TUBULAR PRODUCTS

CUSTOMER
Name: YOUNGQUIST BROS.
Address: 15000 PINE RIDGE ROAD
City & State: FT MYERS, FL 33908

Date: 11-13-89
Customer's Order No.: PHONE-JIMMY
L&F Invoice No.: 23R010-049720

Material: 16" @ 24" X .375
Grade: A-139 GR B

Heat No.	Size O.D.	Wt/Ft. or Wall Thick.	Min. Hydro. Test Pres. P.S.I.	MECHANICAL PROPERTIES: Yield Strength P.S.I. Point	Tensile Strength P.S.I.	Elong. in 2" %	CHEMICAL ANALYSIS (%): C	Mn	P	S	Si
512898	16"	.375		58,900	77,700	30	.22	.76	.008	.020	
96D044	24"	.375		40,400	74,200	34	.24	.86	.008	.027	

The undersigned, in behalf of The L. B. Foster Company, hereby certifies that the above materials have been inspected and tested in accordance with the methods prescribed in the applicable specifications and the results of such inspection and tests shown above. In determining properties or characteristics for which no methods of inspecting or testing are prescribed by said specifications, the standard mill inspection and testing practices of The L. B. Foster Company have been applied. Unless it appears otherwise in the results of such inspection and tests shown above, the undersigned agent of The L. B. Foster Company believes that said materials conform to said specifications.

Subscribed and sworn to before me this 13 day of Nov., 19 89

ROBERT G. STEVENSON
Notary Public, Chatham County, Georgia
My Commission Expires July 10, 1993

Robert G. Stevenson
Notary Public

Otis R Kessler
OTIS R KESSLER, PLANT MANAGER
Agents' Name & Title

L.B. FOSTER, CO.
COMPANY

sion of USX Corporation

TUBULAR PRODUCTS

METALLURGICAL TEST REPORT

REQ., JOB, CONTRACT NO.

P.O. DATE | PURCHASE ORDER NO. 19698 01/27/89

SHIPPERS NO. P 13847 | MILL ORDER NO. DR47685 | INVOICE NO. 488-40546

VEHICLE IDENTITY NW99525 02/22/89

VENDOR: FAIRFIELD WORKS
P. O. BOX 599
FAIRFIELD, AL 35064

SOLD TO: VALLEY STEEL PRODUCTS CO
P O BOX 503
ST LOUIS MO 63166

MAIL TO: VALLEY STEEL PRODUCTS CO
SPARTA ILL

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WA MFGD., SAMPLED, TESTED, AND OR INSPD. IN ACCORDANCE WIT THE SPECIFICATION AND FUL-FILLS REQUIREMENTS IN SUCH RESPECTS.

PREPARED BY THE OFFICE OF:
F.W. MOORE MGR Q.A.

DATE 02/24/89

SPEC. & INSP. PSAA PIPE CARBON SMLS STD PIPE API 5L/ASTM A53-87B/ASTM A106-87A GRADE B TRIPLE STENCIL BLK REG MILL COAT PE SC SPEC REV NAME 37TH EDITION DTD 5/88 SPEC DATE 87/87

INSP 01 MILL
CERTIFIED T/R

VALLEY STEEL PRODUCTS
HEAVY WALL DEPT.
KMM 3/1/89
By Date

ITEM NO.	MATERIAL DESCRIPTION SIZE	WALL	SPECIFICATION & GRADE	MATL	HEAT/ LOT NO.	MIN. HYDRO PSI	YIELD STR. PSI	TENSILE STR. PSI	ELONG. % IN 2"	GAGE WIDTH IN.	FLAT	BEND
001	6.6250	0.5620		SMLS	C86517	4450	49,600	80,600	40.9	1.5	OK	
					X83745	4450	49,200	78,500	43.6	1.5	OK	
						END OF DATA						

MEETS THE REQUIREMENTS OF ASTM A53-87B & A106-87A
ASME SA53 - 1986 A87 & SA106 - 1986 A87 &
API 5L DTD MAY 31, 1988
LONGITUDINAL STRIP TENSILE SPECIMENS UNLESS NOTED
YIELD STRENGTH @ .005 EXT.

ITEM NO.	HEAT NO.	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO
001	C86517	HEAT	.25	.96	.006	.005	.22	.01	.01	.02	.01				.00				
		PROD	.27	.98	.007	.007	.22	.01	.01	.02	.01				.00				
		PROD	.27	.97	.007	.008	.22	.01	.01	.02	.01				.00				
	X83745	HEAT	.25	.94	.012	.008	.21	.01	.01	.03	.01				.00				
		PROD	.25	.97	.011	.009	.20	.02	.01	.03	.01				.00				
		PROD	.24	.97	.011	.009	.20	.01	.01	.03	.01				.00				
				END OF DATA															

LOCATIONS FOR ELEMENTS ARE INDICATED BY THE LEFT DIGIT OF THE DECIMAL POINT

K6107A-18

U.S. States Steel Corporation

0x.000.0798 (REV. 7-78)

TUBULAR PRODUCTS

METALLURGICAL TEST REPORT

REQ., JOB, CONTRACT NO.

P.O. DATE

PURCHASE ORDER NO. 17566

VENDOR
FAIRFIELD WORKS
P. O. BOX 599
FAIRFIELD, AL 35064

SHIPPERS NO. P18250

MILL ORDER NO. DR26706

INVOICE NO. 488-22833

VEHICLE IDENTITY NW99923

05/16/88

SOLD TO
VALLEY STEEL PRODUCTS CO
P O BOX 503
ST LOUIS MO 63166

MAIL TO
VALLEY STEEL PRODUCTS CO
SPARTA ILL

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WA MFGD., SAMPLED, TESTED, AND OR INSPD. IN ACCORDANCE WIT THE SPECIFICATION AND FUL-FILLS REQUIREMENTS IN SUCH RESPECTS.

PREPARED BY THE OFFICE OF:
F.W. MOORE MGR Q.A.

DATE 05/26/88

SPEC. & INSP. PSAA PIPE CARBON SMLS STD PIPE API 5L/ASTM A53/ASTM A106 GRADE B TRIPLE
SEE PRIOR PAGE FOR FULL SPEC INFORMATION

VALLEY STEEL PRODUCTS
HEAVY WALL DEPT.
By [signature] Date

INSP 01 MILL CERTIFIED T/R

ITEM NO.	MATERIAL DESCRIPTION SIZE	WALL	SPECIFICATION & GRADE	MATL	HEAT/ LOT NO.	MIN. HYDRO PSI	YIELD STR. PSI	TENSILE STR. PSI	ELONG. % IN 2"	GAGE WIDTH IN.	FLAT	BE
004	6.6250	0.5620		SMLS	A61688	4450 OSSEC	47,700	76,900	40.6	1.5	OK	
					B65913	4450 OSSEC	48,800	76,600	43.1	1.5	OK	
					B65914	4450 OSSEC	47,000	77,300	41.4	1.5	OK	
						END OF DATA						
			MEETS THE REQUIREMENTS OF ASTM A53-84A & A106-85, ASME SA53 & SA106 & API 5L DTD MAY 31,1985 LONGITUDINAL STRIP TENSILE SPECIMENS UNLESS NOTED YIELD STRENGTH @ .005 EXT.									

ITEM NO.	HEAT NO.	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO
004	A61688	HEAT	.26	.88	.007	.011	.25	.02	.02	.05	.01								
		PROD	.27	.89	.007	.010	.24	.02	.02	.05	.02								
		PROD	.26	.89	.007	.009	.24	.02	.02	.05	.02								
	B65913	HEAT	.23	.94	.009	.007	.23	.05	.06	.04	.03								
		PROD	.26	.91	.008	.007	.23	.05	.06	.04	.03								
		PROD	.26	.91	.009	.007	.23	.05	.06	.04	.03								
	B65914	HEAT	.25	.91	.012	.009	.23	.02	.03	.06	.02								
		PROD	.26	.91	.013	.007	.24	.02	.03	.05	.02								
		PROD	.26	.92	.013	.007	.24	.02	.03	.05	.02								

CAR

K6107A-59

APPENDIX G

Cement Record

INJECTION WELL #1

CEMENT RECORDS
OF
BROWARD COUNTY NORTH DISTRICT REGIONAL
WASTEWATER TREATMENT PLANT
INJECTION WELL 1
POMPANO BEACH, FLORIDA

Casing Size (inches)	Stage No.	Cemented Interval (feet)	Cement Type & Additives	Volume Pumped (cubic feet)
50	I	21 - 160	Both ASTM Neat & 12% Gel	1016
	II	0 - 21	12% Gel	67
42	I	256 - 1000	Both ASTM Neat & 12% Gel	1909
	II	0 - 256	12% Gel	898
34	I	1379 - 1950	Both ASTM Neat & 12% Gel	1909
	II	1103 - 1379	12% Gel	775
	III	970 - 1103	12% Gel	775
	IV	690 - 970	12% Gel	775
	V	470 - 690	12% Gel	674
	VI	235 - 470	12% Gel	702
	VII	0 - 248	12% Gel	718
24	I	2667 - 2990	Both ASTM Neat & 12 % Gel	1898
	II	2454 - 2667	12% Gel	1123
	III	2280 - 2454	12% Gel	1123
	IV	2122 - 2280	12% Gel	1123
	V	2065 - 2122	12% Gel	561
	VI	2042 - 2065	12% Gel	561
	VII	1976 - 2042	12% Gel	561
	VIII	1916 - 1976	12% Gel	561
	IX	1449 - 1916	12% Gel	1460
	X	849 - 1449	12% Gel	1741
	XI	240 - 849	12% Gel	1741
	XII	0 - 240	12% Gel	657

INJECTION WELL #2

CEMENT RECORDS
OF
BROWARD COUNTY NORTH DISTRICT REGIONAL
WASTEWATER TREATMENT PLANT
INJECTION WELL 2
POMPANO BEACH, FLORIDA

Casing Size (inches)	Stage No.	Cemented Interval (feet)	Cement Type & Additives	Volume Pumped (cubic feet)
50	I	24 - 160	Both ASTM Neat & 12% Gel	853
	II	0 - 24	12% Gel	90
42	I	508 - 1000	Both ASTM Neat & 12% Gel	1780
	II	100 - 508	12% Gel	842
	III	4 - 100	12% Gel	281
34	I	1510 - 1950	Both ASTM Neat & 12% Gel	1516
	II	1284 - 1510	12% Gel	628
	III	1149 - 1284	12% Gel	786
	IV	966 - 1149	12% Gel	702
	V	723 - 966	12% Gel	842
	VI	449 - 723	12% Gel	730
	VII	210 - 449	12% Gel	730
	VIII	0 - 210	12% Gel	623
24	I	2658 - 2990	Both ASTM Neat & 12 % Gel	2105
	II	2380 - 2658	12% Gel	1123
	III	2170 - 2380	12% Gel	1101
	IV	2033 - 2170	12% Gel	842
	V	2025 - 2033	12% Gel	562
	VI	1975 - 2025	12% Gel	281
	VII	1887 - 1975	12% Gel	421
	VIII	1404 - 1887	12% Gel	1471
	IX	827 - 1404	12% Gel	1797
	X	230 - 827	12% Gel	1752
	XI	0 - 230	12% Gel	618

DEEP MONITOR WELL #1

CEMENT RECORDS
OF
BROWARD COUNTY NORTH DISTRICT REGIONAL WASTEWATER TREATMENT PLANT
MONITOR WELL 1
POMPANO BEACH, FLORIDA

Casing Size (inches)	Stage No.	Cemented Interval (feet)	Cement Type & Additives	Volume Pumped (cubic feet)
24	I	0 - 160	Both ASTM Neat & 12% Gel	309
16	I	360 - 1000	Both ASTM Neat & 12% Gel	814
	II	135 - 360	12% Gel	270
	III	0 - 135	12% Gel	152
6-5/8	I	2004 - 2009	Both ASTM Neat & 6% Gel	505
	II	1940 - 2004	Neat	337
	III	1906 - 1940	Both ASTM Neat & 12% Gel	112
	IV	1749 - 1906	Neat	174
	V	1595 - 1749	6% Gel	202
	VI	1424 - 1595	6% Gel	208
	VII	1228 - 1424	6% Gel	225
	VIII	1128 - 1228	6% Gel	129